BOEING 757

Maintenance Manual

CHAPTER 21 - AIR CONDITIONING

THOMSON AIRWAYS CUSTOMISATIONS

Monarch Aircraft Engineering Ltd

Luton Airport, Luton, Beds. LU2 9LX

2

PUBLICATION REVISION - SHEET

AIRCRAFT TYPE & SERIES BOEING 757-2YO

OPERATOR(S) FIRST CHOICE AIRWAYS

REVISION No. FCA/757/2YO/MM/1

DATE 05.07.04

MANUAL DESCRIPTION MM

MODIFICATION No. MON/757/21/2934

MODIFICATION TITLE INSTALLATION OF SAINT-GOBAIN FOAM OVERHEAD DISTRIBUTION

COMPILED DMB

EFFECTIVITY G-OOOX (21658) G-CPEP (25268)

CHECKED

A.T.A. CHAPTER 21-23-01

APPROVED

C.A.A. APPROVAL No. DAI/8021/68

THIS REVISION COMPLIES WITH B.C.A.R. SECTION A CHAPTER A6-2, AND RELEVANT J.A.R. REQUIREMENTS

INCORPORATE THE FOLLOWING NEW AND REVISED PAGES:

CHAPTER SECTION SUBJECT - FIGURE	PAGE	DATE	ACTION/LOCATION
21-CONTENTS	MON 2	05.07.04	INSERT THIS NEW 21-CONTENTS PAGE MON 2 WHERE APPROPRIATE.
21-23-01	MON 401 Thru MON 411	05.07.04	INSERT THESE NEW 21-23-01 PAGES MON 1 Thru MON 411 WHERE APPROPRIATE.

RETAIN THIS TRANSMITTAL SHEET AT FRONT OF RELATED MANUAL. RECORD DETAILS ON RECORD OF REVISION SHEET. CHECK THAT ALL PREVIOUS REVISIONS HAVE BEEN INCORPORATED IN RELATED MANUAL. IF NOT, PLEASE CONTACT THE TECHNICAL AUTHOR, DESIGN AND PROJECTS DEPT, MONARCH AIRCRAFT ENGINEERING, LUTON AIRPORT ENGLAND.

D & P form No. 500 issue 1

Monarch BOEING 757

FIRST CHOICE 757-2YO

MAINTENANCE MANUAL

CHAPTER 21 – AIR CONDITIONING

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EFFECTIVITY
G-OOOX (MSN 21658) G-CPEP (MSN 25268)

ModificationMON/757/21/2934

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CHAPTER 21 – AIR CONDITIONING

SAINT-GOBAIN FOAM OVERHEAD DISTRIBUTION DUCT – REMOVAL/INSTALLATION/MAINTENANCE

1. General

A. This procedure contains instructions to remove original design foam duct and replace with Saint-Gobain design foam duct.

2. Foam Overhead Distribution Duct Removal

A. References
(1) AMM 25-22-01/401, Sculptured Ceiling Panels Removal/Installation
(2) AMM 25-28-05/401, Centre Overhead Storage Compartment
(3) AMM 23-32-02/401, Fixed Video Monitor Removal/Installation
(4) AMM 24-22-00/201, Electrical Power Supply
(5) Service Bulletin 757-33-0041, Emergency Lighting Battery Pack Relocation

B. Access
(1) Location Zones
Section 43 – Body Station 549.35 – 789.35
Section 44 – Body Station 989.35 – 1169.35
Section 46 – Body Station 1169.35 – 1449.35

C. Prepare for Removal
(1) Supply electrical power (AMM 24-22-00/201)
(2) Push the L and R RECIRC FAN switch-lights, on the pilots overhead P5 panel, to the OFF position.
(a) Make sure the INOP lights come on.
(b) Put a DO-NOT-OPERATE tag on the switch-lights.
(3) Turn the L and R PACK selectors, on the P5 panel, to the OFF position.
(a) Make sure the PACK OFF lights come on.
(b) Put a DO-NOT-OPERATE tag on the selectors.
(4) Remove the applicable sculptured ceiling panel in the passenger compartment to get access to duct.
(5) Remove video monitors as applicable.
(6) Remove battery packs as applicable.
(7) Detach telephone antenna wire, which may be attached to plenum.

Monarch BOEING *757*

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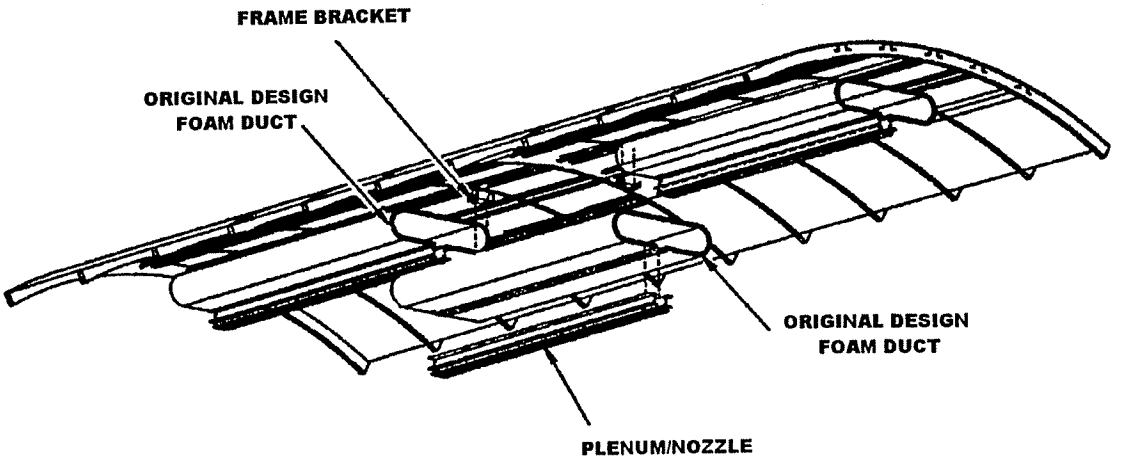
MAINTENANCE MANUAL

CHAPTER 21 – AIR CONDITIONING



Original Design Duct Removal
Figure 1

EFFECTIVITY
G-OOOX (MSN 21658) G-CPEP (MSN 25268)

Modification MON/757/21/2934

21-23-01
MON 402
05.07.04

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D. Original Design Foam Distribution Duct Removal (Figure 1)

(1) Remove Plenum/Nozzle Assembly (4) by removing the screws attaching the assembly to the foam duct (Figure 1).
(2) Remove air diffuser (perforated plate under Plenum/Nozzle Assembly) by carefully pulling down.
(3) Carefully cut duct-to-duct joining seam at ¼ inch gap between ducts being careful not to damage the adjoining duct. Saint-Gobain suggests using a hack saw blade to cut joint if necessary.
(4) Remove flexible hoses from spuds on duct.
(5) Unbolt duct from frame bracket (1) and remove duct (Figure 1).

3. Saint-Gobain Design Overhead Distribution Duct Installation

A. Consumable Materials
(1) Adhesive – 3M DP-100 FR
(2) Sealant – Dow 3145 RTV
(3) Isopropyl Alcohol or equivalent

B. References
(1) AMM 25-22-01/401, Sculptured Ceiling Panels Removal/Installation
(2) AMM 25-28-05/401, Centre Overhead Storage Compartment
(3) AMM 23-32-02/401, Fixed Video Monitor Removal/Installation
(4) AMM 36-00-00/201, Pneumatics Systems

C. Access
(1) Location Zones
Section 43 – Body Station 549.35 – 789.35
Section 44 – Body Station 989.35 – 1169.35
Section 46 – Body Station 1169.35 – 1449.35

Monarch BOEING 757

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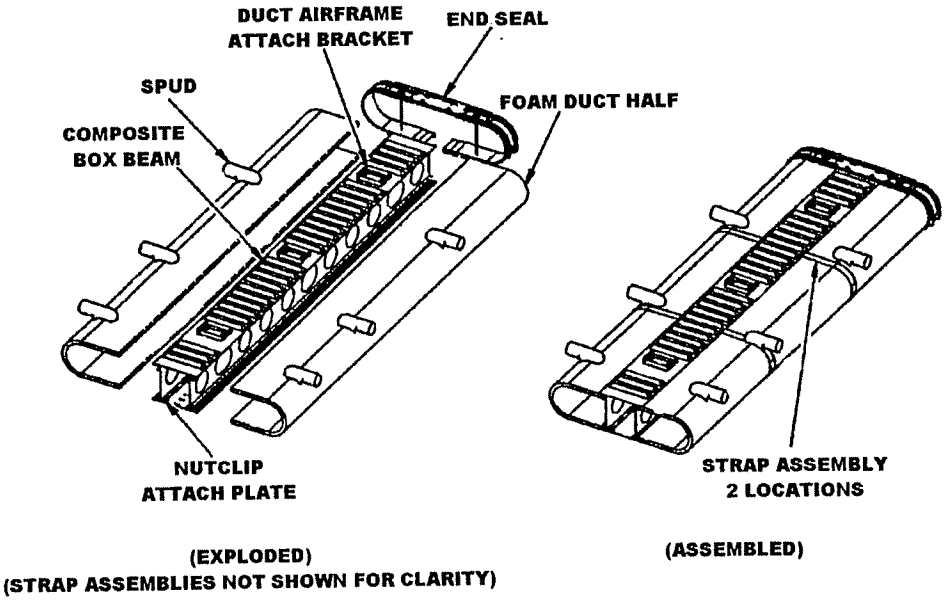
CHAPTER 21 – AIR CONDITIONING



Saint-Gobain Design Duct Kit
Figure 2

EFFECTIVITY
G-OOOX (MSN 21658) G-CPEP (MSN 25268)

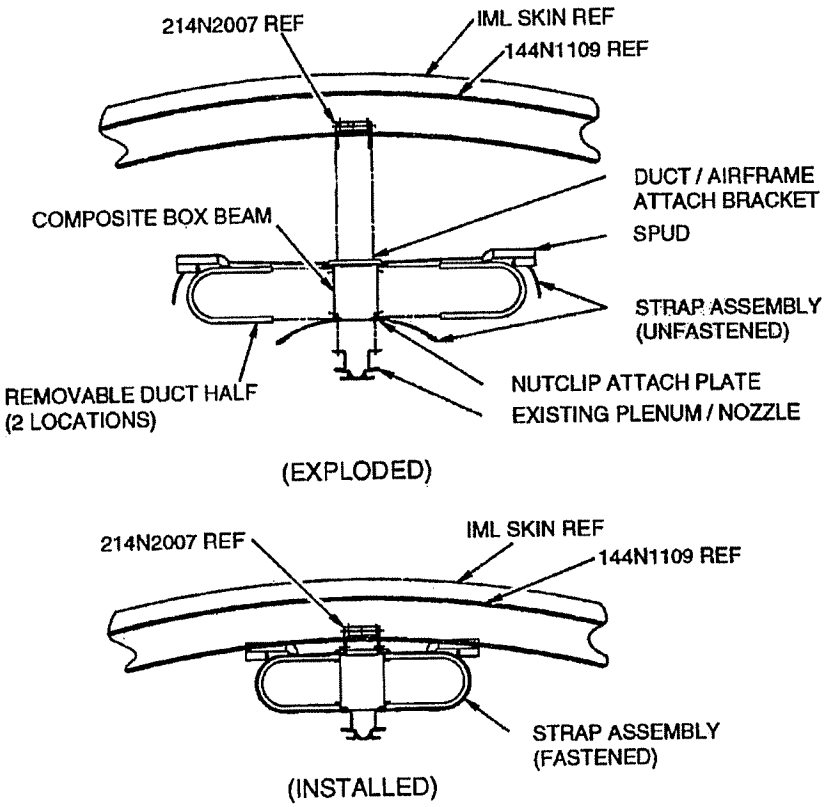
Modification MON/757/21/2934

Monarch BOEING 757

FIRST CHOICE 757-2YO

MAINTENANCE MANUAL

CHAPTER 21 – AIR CONDITIONING



Saint-Gobain Design Duct Installation
Figure 3

EFFECTIVITY
G-OOOX (MSN 21658) G-CPEP (MSN 25268)

Modification MON/757/21/2934

21-23-01
MON 405
05.07.04

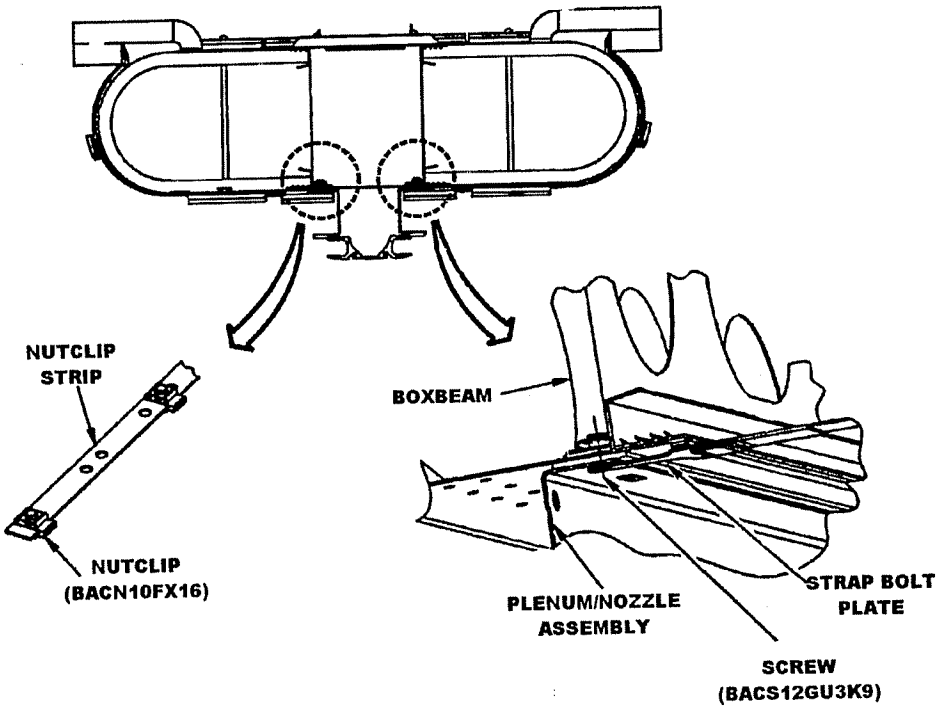
D & P form No 505 issue 1

Monarch BOEING *757*

FIRST CHOICE 757-2YO

MAINTENANCE MANUAL

CHAPTER 21 – AIR CONDITIONING



Saint-Gobain Design Duct End View
Figure 4

EFFECTIVITY
G-OOOX (MSN 21658) G-CPEP (MSN 25268)

Modification MON/757/21/2934

21-23-01
MON 406
05.07.04

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D. Saint-Gobain Overhead Distribution Duct Installation (Figures 2 & 3)

(1) Select proper Saint-Gobain replacement duct from Aircraft Illustrated Parts Catalogue. (See special note for SGDDK-2109-2 installation).

NOTE: SGDDK-2019-2 Duct Kit is slightly different from all other kits. Because of clearance limitations near the beacon light, one Duct on the SGDDK-2109-2 kit is permanently bonded to the Box Beam. This allows for a five-inch tube through the duct to gain access to change the beacon light. When installing this duct kit please note that references made to install the duck halves do not apply to the pre bonded duct half. All other references including the need for Velcro straps and strap plates apply to the SGDDK-2109-2 Kit.

(2) Preparation of remaining foam ducts for Saint-Gobain design installation.
- (a) Prepare the end of the remaining foam ducts (2) (Figure 1) by peeling or cutting the old seals away (Figure 1 (seals not shown)). If necessary, smooth exterior of foam duct by carefully sanding with 100 grit or finer sandpaper.
- (b) Fill and gaps, holes, or uncovered foam with 3M DP-100 FR. Allow adhesive to cure.
- (c) Clean outside end of duct approximately 2 inches back from end with Isopropyl Alcohol or equivalent.

(3) Prepare Box Beam for Installation.
- (a) Temporarily remove the two Nut-clip Strip Assemblies (10) (Figure 4) from Box Beam Assembly (2) (Figure 2).
- (b) Lay out necessary hole locations in Nut-Clip Strip Assembly by aligning with plenum/nozzle assembly or using the foam duct which is being replaced.
- (c) Install Nut clips (11) with rubber seal on bottom at noted locations (Figure 4). Install all nut-clips with the spring retainer on the inside edge of the Nut-Clip Strip.
- (d) Reassemble Nut-Clip Strip Assemblies into the box beam, noting forward end.

(4) Install Box Beam (2) (Figure 2)
- (a) Using the existing airplane frame brackets (1) (Figure 1) and screws, bolt Box Beam Assembly into place noting fwd end. The Attach Brackets (3) (Figure 2) on the Box Beam are manufactured to mate to the original design frame brackets. If the brackets don't align, move the Attach Bracket on the Box Beam to the predrilled and sealed alternate location. If Attach Bracket is moved, seal original location with silicone sealant Dow 3145 RTV (colour optional).

(5) Install Plenum/Nozzle Assembly (7) (Figure 3)

(a) Assemble original design air diffuser to plenum nozzle assembly where necessary. The joints in the plenum/nozzle assembly usually don't align with the joints in the distribution duct assemblies. Where the plenum/nozzle assembly mates with original design ducts, the original design air diffuser must be used. It may be necessary to cut the removed air diffuser to fit original design foam ducts.

NOTE: Do not apply air diffuser to Saint-Gobain design Duct or Box Beam. Discard excess air diffuser.

NOTE; Assure there are no gaps in the air diffuser at the junctions with the Saint- Gobain design Duct.

(b) Install plenum/nozzle assembly using screws (13) (Figure 4).

NOTE: Use caution when installing the first screw through the plenum/nozzle assembly to align the Nut-Clip Strip (10) (Figure 4). The holes in the side of the BOX Beam allow the Nut Clip Strips to be manipulated during this process.

(c) Install Strap bolt plates (12) (Figure 3) at locations along the plenum that closely match the locations of the Strap Assemblies (4) (Figure 2) pre-attached to the Box Beam. Exact alignment is not necessary, if spuds interfere. It may be necessary to screw telephone antenna brackets into place at this time. When the same attach point must be used for antenna bracket and Strap Bolt Plate, place Strap Bolt Plate under antenna bracket so the Strap Assembly doesn't interfere with the antenna bracket or wire. Do not install four (two at each end) screws closest to the duct ends at this time. These four locations will be used to install the Duct End Seals.

(6) Install Duct End Seal Top Plate. (14) (Figure 5)

NOTE: The Saint-Gobain Design Duct End Seal may be used for three types of installations (Figure 5).

1) Saint-Gobain Duct to Saint-Gobain Duct
2) Saint-Gobain Duct to Original Design Duct
3) Original Design Duct to Original Design Duct

(7) Check alignment of pre installed spud locations on Foam Duct Halves (5) (Figure 2) with aircraft flexible hose locations. Remove spud caps at desired locations only.
NOTE: If an aircraft flexible hose wont reach to any of the pre-installed spud locations, install spud into foam duct half by cutting fitting hole in foam with a razor knife and bonding spud with 3M DP-100FR. Fill all gaps between foam duck and spud. Allow adhesive to cure before installing Foam Duct Half.

(8) Install Foam Duct Halves (5) (Figure 2) into the Box Beam by lightly setting the top edge into the Box Beam and flexing the bottom edge into place. Align Duct Half/Box Beam ends and push duct well into Box Beam.
NOTE: It may be necessary to remove the lavatory duct temporarily while installing the nearest Foam Duct Half.

(9) Fasten Foam Duct Halves into place by looping Strap Assemblies (4) (Figure 2) through the Bolt Plates (12) (Figure 4) and back onto the mating Velcro. Apply enough pressure with the Strap Assemblies to keep Foam Duct Half seated in Box Beam.

(10) Apply beads of silicone sealant Dow 3145 RTV (colour optional) to duct where End Seal will be installed. Remove tape applied to hold Tie Rods and the rest of the End Seal out of the way during Foam Duct Half Installation. Apply Duct End Seal to duct, centering it on the gap between the two ducts.

(11) Install Duct Seal Attach Plates (15) (Figure 5) at plenum/nozzle attach points using screws provided with kit. Insert Tie Rod through Bottom Compression Plates (18) (Figure 5). Install Tie Rod Nuts (21) (Figure 5) to the end of Tie Rods. Tighten Tie Rod Nuts until silicone foam is compressed to approximately ½ its original thickness.

(12) Tighten four Worm Drive Clamps (20) (Figure 5) until silicone foam is compressed all along the Duct Seal End Seal.

(13) Apply extra silicone sealant Dow 3145 RTV (colour optional) at four small gap locations shown in Figure 5. Allow sealant to cure before applying pressure to system.

(14) Attach flexible hoses to spuds.

(15) As applicable, return telephone antenna to original position.

E. Overhead Distribution Duct Test
  (1) Allow all adhesives and sealants to cure before performing this check of the overhead distribution duct.
    (a) Supply pressure to the pneumatic system (AMM 36-00-00-00/201).
    (b) Put the L and R pack switch on the P5 air conditioning panel to the AUTO position.
    (c) Check the distribution duct to make sure there is no leakage of air at connections.

F. Put the airplane back to its usual condition
  (1) Install video monitors (AMM 23-32-02/401)
  (2) Install the sculptured ceiling panel (AMM 25-22-01/401).
  (3) Remove DO-NOT-OPERATE tags from the L and R PACK selectors on the P5 panel.
  (4) Remove DO-NOT-OPERATE tags from the L and R RECIRC FAN switch-lights on the P5 panel.
  (5) Remove the electrical power is it is not necessary. (AMM 24-22-00/201).

4. <u>Saint-Gobain Foam Duct Kit Maintenance</u>

A. At regular intervals (major checks) inspect duct for leaks and damage.

B. Leak Repair
  (1) Small leaks at end seals, duct-to-box beam seals, through box beam, or through foam duct, can be sealed.
    (a) Clean leaking area with Isopropyl Alcohol or other compatible solvent and allow to dry.
    (b)
    (c) Work Dow 3145 RTV (colour optional) into gap or seam and smooth out.
    (d) Allow sealant to dry before pressurising system.
  (2) Larger leaks through box beam or foam duct can be sealed in the same manner as a repair.

C. Damage Repair
  (1) Small fractures and hole in box beam, or foam duct, can be repaired.
    (a) Clean fractured area with Isopropyl Alcohol or other compatible solvent and allow to dry.
    (b) Apply patch of fiberglass cloth saturated with 3M DP-100FR epoxy adhesive. Use excess epoxy to assure complete saturation. Smooth out patch with brush, putty knife or gloved finger. If the area is larger than ½ inch diameter, apply a second patch over the first patch as soon as the first patch has gelled.
    (c) Allow patch to completely cure before pressurising system.
  (2) Small areas of delamination in a box beam, or foam duct can be repaired

(2) Small areas of delamination in a box beam, or foam duct can be repaired.

(a) It may be necessary to remove delaminated fabric unless it can be peeled back in such a way as to allow rebonding. If possible clean under delamination and rebond delamination into place using 3M DP-100FR epoxy adhesive.

(b) If delamination must be removed, remove as much of the delamination as possible. Clean delaminated area with Isopropyl Alcohol or other compatible solvent and allow to dry.

(c) Apply overlapping (by ½ inch minimum) patch of fiberglass cloth saturated with 3M DP-100FR epoxy adhesive. Use excess epoxy to assure complete saturation. Smooth out patch with brush, putty knife or gloved finger. If delamination was removed, apply a slightly larger second patch over the first patch as soon as the first patch has gelled.

(d) Allow patch to completely cure before pressurising system.

(3) Large damaged or delaminated areas (larger than 6 square inches) should not be repaired but the damaged part should be replaced.

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TECHNICAL EVALUATION, PLANNING & MATERIALS BRIEF

Document:	Issue Date:
MCP-757-1281	15th FEBUARY 2005

Title: INSTALLATION OF GALLEY / LAV VENT DUCT

Hyperlink:

Task No:	Task Date:
MCP-757-1281-1	15TH FEBUARY 2005

Classification:	Cross References:	Purchase Orders:
[] MANDATORY [] Safety [] Reliability [] Recommended / Desirable [] Commercial [✓] Warranty	BRITANNIA MOD MCP/757/1281 ISS4.	

	BA	BB	BG	BH	BI	BJ	EP	OC	OK	OX	OZ
Eff	-1	-1	-1	-1	-2	-2	-2	-2	-2	-2	-2
Acc											

Accomplishment Timescale: CONVIENT MAINTENANCE SLOT

Manhours:	Men:	Skill:	Elapsed Time:
6.0 hrs	2	Airframe	3.0 hrs

Specialist Services: NIL

Comments:

PLANNING.
PLEASE ADD THIS MODIFICATION TO THE NEXT CONVIENENT 2A CHECK IF TIME ALLOWS.
MOD KITS ARE TO BE PRODUCED AND WHEN THESE WILL ALLOW THE INSTALLATION TO TAKE PLACE WITHIN A SHORT PERIOD OF TIME, BUT DUE TO THE REQUIREMENT OF AIRLINES, DRILLS AND RIVETING EQUIPMENT IT IS UNSUITABLE FOR THE LINE TO ACTION.
2 OFF TASKS CREATED AS NOT ALL A/C ARE THE SAME (SOME REQUIRE LONGER DUCTS THAN OTHERS).

MATERIALS.
There are 4 –1 Kits required for BA, BB, BG and BH. There are 7 –2 Kits required for BI, BJ, EP, OC, OK, OX and OZ. The –1 kits are the short duct kits and the –2 kits are the long duct kits.

Weight:	Arm:	Moment:

Evaluation:	Airworthiness:	Flight Ops:	Performance:	ATA Chapter(s):	Manuals:
TI / EB / PCR	AD	AFM / MEL / CCM	AFM / W&B		MM / IPC / WDM

Evaluation:	Materials:	Planning:	Approval:	Digital Doc. Control:
DAVE GODSON Sign: Date:	Sign: Date:	Sign: Date:	Sign: Date:	Sign: Date:

Planning Task Instruction Index
Title Sheet / ____ Worksheets / SB Copy / VSB Copy / Feedback Sheet / Other _____

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ENGINEERING DEPARTMENT
MATERIALS & TOOLING REQUIREMENT

Task Kit No: MCP-757-1281-2		A/C: BI, BJ, EP, OC, OK, OX and OZ		Due Date:
Part Number	Description	Qty Per Aircraft	Batch Number	Comments
BWT10-3440480A	LONG DUCTS	1		ONLY REQUIRED FOR OC, OK, OZ, OX, BI, BJ AND PEP.
NAS1922-0575-1	DUCT CLAMP	2		
757-1410-000	BRACKET ASSY	1		
757-1410-004	FWD SUPPORT BRACKET	1		
757-1410-006	AFT SUPPORT BRACKET	1		
757-1410-008	PACKER	1		

Goods Complete:.....….....(Date) Location:..... Signed:.....(Stores)

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ENGINEERING DEPARTMENT
MATERIALS & TOOLING REQUIREMENT

Task Kit No: MCP-757-1281-1		A/C: BA, BB, BG, AND BH.		Due Date:
Part Number	Description	Qty Per Aircraft	Batch Number	Comments
BWT10-3440360A	SHORT DUCTS	1		ONLY REQUIRED FOR BA, BB, BG, AND BH.
NAS1922-0575-1	DUCT CLAMP	2		
757-1410-000	BRACKET ASSY	1		
757-1410-004	FWD SUPPORT BRACKET	1		
757-1410-006	AFT SUPPORT BRACKET	1		
757-1410-008	PACKER	1		

Goods Complete:.....….....(Date) Location:..... Signed:.....(Stores)

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ENGINEERING DEPARTMENT
MATERIALS DISPOSITION LIST

Disposition List: -1		A/C:		Due Date:	
Part Number	Description	Qty Per Aircraft	Serial Number	Disposition	Materials Ref

Goods Complete:.....….....(Date) Location:..... Signed:.....(Stores)

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

Modification Certification Plan:

MCP/757/1281 Issue 4

Title : Installation of Galley/Lav vent duct

Scope:

This modification will be raised to install an extension to the existing Galley/Lav vent duct to the Britannia Airways B757-204/236 fleet to prevent unpleasant smells entering the passenger cabin.

A new duct and support is added to redirect the existing Galley/Lav vent through 90 degrees and disperse the unpleasant smells towards an external vent.

Subsequent to the initial issue Monarch airlines, Thomas Cook airlines and First Choice airlines have been added to the effectivity of the modification.

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

1. Contents

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

2. Revision History

Issue	Date	Raised Issue Details	Sheets Affected
1	16/10/03	Initial Issue	All
2	30/06/04	Including JMC / Thomas Cook aircraft to effectivity of mod	5
3	15/10/04	Including Monarch aircraft to the effectivity of mod. Transferred to new PART 21 Approval Format.	All
4	17/01/05	Including First Choice aircraft to effectivity of MOD.	1, 7, 8, 9, 10, 11

3. Aircraft Effectivities

Aircraft Type	Aircraft Variable No.	Aircraft Serial No.	Aircraft Registration (Ref only)
B757-204	NB422	26963	G-BYAD
B757-204	NB423	26964	G-BYAE
B757-204	NB424	26266	G-BYAF
B757-204	NB426	26966	G-BYAH
B757-204	NB427	26967	G-BYAI
B757-204	NB428	25623	G-BYAJ
B757-204	NB429	26267	G-BYAK
B757-204	NB430	25626	G-BYAL
B757-204	NB431	27219	G-BYAN
B757-204	NB432	27235	G-BYAO
B757-204	NB433	27236	G-BYAP
B757-204	NB434	27237	G-BYAR
B757-204	NB435	27238	G-BYAS
B757-204	NB436	27208	G-BYAT
B757-204	NB437	27220	G-BYAU
B757-204	NB438	27234	G-BYAW
B757-204	NT431	28834	G-BYAX
B757-204	NT432	28836	G-BYAY
B757-236	NA343	24792	G-CDUO
B757-236	NA344	24793	G-CDUP

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Aircraft Type	Aircraft Variable No.	Aircraft Serial No.	Aircraft Registration (Ref only)
B757-28A	NB226	27621	G-FCLA
B757-28A	NB227	28164	G-FCLB
B757-28A	NB228	28166	G-FCLC
B757-25F	NB230	28718	G-FCLD
B757-28A	NT233	28171	G-FCLE
B757-28A	NT234	28835	G-FCLF
B757-28A	NA445	24367	G-FCLG
B757-28A	NB223	26274	G-FCLH
B757-28A	NB222	26275	G-FCLI
B757-2YO	NB330	26160	G-FCLJ
B757-2YO	NB331	26161	G-FCLK
B757-25F	NT237	30757	G-JMCD
B757-25F	NT238	30758	G-JMCE
B757-28A	NB201	24369	G-JMCF
B757-2G5	NB446	26278	G-JMCG

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Aircraft Type	Aircraft Variable No.	Aircraft Serial No.	Aircraft Registration (Ref only)
B757-2T7	NA401	22780	G-MONB
B757-2T7	NA402	22781	G-MONC
B757-2T7	NA403	22960	G-MOND
B757-2T7	NA404	23293	G-MONE
B757-2T7	NA405	23770	G-DAJB
B757-2T7	NA407	24104	G-MONJ
B757-2T7	NA408	24105	G-MONK

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Aircraft Type	Aircraft Variable No.	Aircraft Serial No.	Aircraft Registration (Ref only)
B757-28A	NA442	23822	G-OOOB
B757-2B7	NB507	27147	G-OOBJ
B757-28A	NA443	24017	C-FTDV
B757-23A	NB134	24292	C-GOOG
B757-2B7	NB506	27146	G-OOBI
B757-28A	NA447	24235	C-GBOD
B757-2YO	NB329	26158	G-OOOX
B757-28A	NT232	28203	G-OOOY
B757-28A	NJ001	33098	G-OOBC
B757-28A	NJ002	33099	G-OOBD
B757-28A	NJ003	33100	G-OOBE
B757-28A	NJ004	33101	G-OOBF
B757-236	NA346	25054	G-OOOK
B757-236	NA352	25593	G-OOOZ
B757-236	NT404	29941	G-CPEU
B757-236	NT405	29942	G-OOBG
B757-236	NT406	29943	G-CPEV
B757-236	NT407	29944	G-OOBH
B757-28A	NT245	32446	C-GUBA
B757-28A	NT246	32447	C-GTBB

4. Documents required for continued airworthiness

The owner of the manuals stated below must be contacted and informed of the proposed modification change. It is the responsibility of the manual owner to reflect any change raised by the introduction of this modification. A copy of the response will be filed in the project folder.

Aircraft Maintenance Manual	Yes/~~No~~*
Aircraft Modification Record	Yes/~~No~~*
Wiring Diagram Manual	~~Yes~~/No*
Illustrated Parts Catalogue	Yes/~~No~~*
Line E.T.O.P.S. Manual	~~Yes~~/No*
MEL	~~Yes~~/No*
Weight Schedule	~~Yes~~/No*
Maintenance Schedule	~~Yes~~/No*
Configuration Manual	~~Yes~~/No*
Operation Manual	~~Yes~~/No*
Flight Manual	~~Yes~~/No*
Cabin/Emergency Manual	~~Yes~~/No*
Simulator	~~Yes~~/No*
Capability List	~~Yes~~/No*
Advisory Bulletin	~~Yes~~/No*
Other (Please Specify Below)	~~Yes~~/No*

It is the responsibility of Thomas Cook, Monarch and First Choice to amend any manuals affected by this modification.

***Strike through as required**

5. Privileges

Airframe Engineer	:	Ben Hyde
Avionics Engineer	:	Anton Hessig
Stress Engineer	:	Mark Evans
Airworthiness Engineer (Ops)	:	TBD
Verification Engineer	:	Dean Jackson

6. Certification Basis

UK TCDS JAR25	:	FA 28 Issue 5. Compliance will be demonstrated against amendment 16
FAA TCDS	:	A2NM
Other	:	None

7. Applicable Requirements

ANO	:	None
BCAR	:	None
FAR	:	FAR25
JAR	:	JAR25
JAR OPS	:	None
CAA ARI'S	:	None
CAA AWN'S	:	None
CAA SPEC'S	:	None
CAA LTO'S	:	None
CAA AD'S	:	None
FAA AD'S	:	None
FAA AC'S	:	None
JAA TGL'S	:	None
OTHER	:	None

8. Compliance Plan

Requirements JAR 25	Means of Compliance (MC – CODES)										Remarks
	0	1	2	3	4	5	6	7	8	9	
25.301	x										Statement to be made
25.303	x										Statement to be made
25.305	x										Statement to be made
25.307	x										Statement to be made
25.321	x										Statement to be made
25.331	x										Statement to be made
25.333	x										Statement to be made
25.337	x										Statement to be made
25.341	x										Statement to be made
25.571	x										Statement to be made
25.601	x										Statement to be made
25.603 (a)(b)(c)	x	x									Statement to be made/Drawing definition
25.605 (a)(b)	x	x									Statement to be made/Drawing definition
25.607	x										Statement to be made
25.609(a)	x	x									Statement to be made/Drawing definition
25.613	x	x									Statement to be made/Drawing definition
25.625 (a)(1)(2)(	x										Statement to be made
25.899 (a)(b)	x										Statement to be made
25.1301 (a)(c)		x									Drawing definition
25.1309	x	x									Statement to be made/Drawing definition
25.1519			x								Statement to be made
25.1529	x										Statement to be made
25.1541	x										Statement to be made

Means of Compliance Codes (MoC)

0 = General Definitions, Statement etc
1 = Drawings, Descriptions
2 = Calculations
3 = Safety Analysis/Failure Analysis
4 = Test Data
5 = Ground Test on Airc
6 = Flight Test
7 = Inspections, Visual Examinations
8 = Simulator Test
9 = Component Data Sheet

9. Co-ordination Memorandum

Verify that rules pertinent to the plan checklist are complete and add any relevant notes.

STRUCTURE/STRESS (complete/~~incomplete~~)*: MOC **Signed:**
Date:

INTERIOR (complete/~~incomplete~~)*: MOC **Signed:**
Date:

AVIONICS/ELECTRICAL (complete/~~incomplete~~)*: MOC **Signed:**
Date:

10. Office of Airworthiness Approval

CLASSIFICATION HAS BEEN DETERMINED AND AGREED WITH THE CAA
Yes/~~No~~*

MODIFICATION: MINOR/~~MAJOR~~* STC: N/A

THE CERTIFICATION PLAN IDENTIFIES THE RELEVANT RULES.

Print: **Signed:** **Date:**

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

***Strike through as required**

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

Modification Summary: MOD/757/1281 Issue 4

Title : Installation of Galley/Lav vent duct

Reason for Modification :		**This Modification has been is raised to install the Galley/Lav vent duct to the Britannia Airways B757-204/236 fleet to prevent unpleasant smells within the passenger cabin.**
CAA Mod Classification :		**MINOR/~~MAJOR~~***
E.T.O.P.S. Affected	:	**~~Yes~~/No***
Flight Test Required	:	**~~Yes~~/No***
Interchangeability Affected	:	**~~Yes~~/No***
ATA Chapter(s)	:	**21, 25 & 38**
Weight Change	:	**Weight Increase/~~Decrease~~ of (see page 8) kg**
Moment Change	:	**Moment Increase/~~Decrease~~ of (see page 8) kg**
Electrical Load Change :		**None.**

*** Strike through as required**

Certificate of Design

I hereby certify that this modification defines all the changes associated with this certificate
The technical information contained within or associated with this document has been approved under the authority of PART 21 Design Organisation Approval No. **EASA.21J.049.**
I further certify that, including the exceptions listed below, the design of this modification complies with the requirements specified by the agency as the certification basis for this type of aircraft and with any additional requirements notified by the agency in respect of this particular modification.

Exceptions

Office of Airworthiness
Approved:.....

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

Date:.....
.....

1. Contents

2. Documents Affected

Aircraft Maintenance Manual	~~Yes~~/No*
Aircraft Modification Record	Yes/~~No~~*
Wiring Diagram Manual	~~Yes~~/No*
Illustrated Parts Catalogue	Yes/~~No~~*
Line E.T.O.P.S. Manual	~~Yes~~/No*
MEL	~~Yes~~/No*
Weight Schedule	~~Yes~~/No*
Maintenance Schedule	Yes/~~No~~*
Configuration Manual	~~Yes~~/No*
Operation Manual	~~Yes~~/No*
Flight Manual	~~Yes~~/No*
Cabin/Emergency Manual	~~Yes~~/No*
Simulator	~~Yes~~/No*
Capability List	~~Yes~~/No*
Advisory Bulletin	~~Yes~~/No*
Other (Please Specify)	~~Yes~~/No*

It is the responsibility of Thomas Cook, Monarch and First Choice to amend any manuals affected by this modification.

*** Strike through as required**

3. Revision History

Issue	Date	Raised Issue Details	Sheets Affected
1	16/10/03	Initial Issue	All
2	30/06/04	JMC / Thomas Cook added to effectivity of modification DOI 1321 & 1305 embodied	3, 6, 8
3	15/10/04	Monarch added to effectivity of modification. Transferred to new PART 21 Approval Format	All
4	17/01/05	First Choice aircraft added to effectivity of MOD.	8, 9, 10

4. Aircraft Effectivities

Aircraft Type	Aircraft Variable No.	Aircraft Serial No.	Aircraft Registration (Ref only)
Boeing 757-204	NB422	26963	G-BYAD
Boeing 757-204	NB423	26964	G-BYAE
Boeing 757-204	NB424	26266	G-BYAF
Boeing 757-204	NB426	26966	G-BYAH
Boeing 757-204	NB427	26967	G-BYAI
Boeing 757-204	NB428	25623	G-BYAJ
Boeing 757-204	NB429	26267	G-BYAK
Boeing 757-204	NB430	25626	G-BYAL
Boeing 757-204	NB431	27219	G-BYAN
Boeing 757-204	NB432	27235	G-BYAO
Boeing 757-204	NB433	27236	G-BYAP
Boeing 757-204	NB434	27237	G-BYAR
Boeing 757-204	NB435	27238	G-BYAS
Boeing 757-204	NB436	27208	G-BYAT
Boeing 757-204	NB437	27220	G-BYAU
Boeing 757-204	NB438	27234	G-BYAW
Boeing 757-204	NT431	28834	G-BYAX
Boeing 757-204	NT432	28836	G-BYAY
Boeing 757-236	NA343	24792	G-CDUO
Boeing 757-236	NA344	24793	G-CDUP

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

Aircraft Type	Aircraft Variable No.	Aircraft Serial No.	Aircraft Registration (Ref only)
Boeing 757-28A	NB226	27621	G-FCLA
Boeing 757-28A	NB227	28164	G-FCLB
Boeing 757-28A	NB228	28166	G-FCLC
Boeing 757-25F	NB230	28718	G-FCLD
Boeing 757-28A	NT233	28171	G-FCLE
Boeing 757-28A	NT234	28835	G-FCLF
Boeing 757-28A	NA445	24367	G-FCLG
Boeing 757-28A	NB223	26274	G-FCLH
Boeing 757-28A	NB222	26275	G-FCLI
Boeing 757-2YO	NB330	26160	G-FCLJ
Boeing 757-2YO	NB331	26161	G-FCLK
Boeing 757-25F	NT237	30757	G-JMCD
Boeing 757-25F	NT238	30758	G-JMCE
Boeing 757-28A	NB201	24369	G-JMCF
Boeing 757-2G5	NB446	26278	G-JMCG

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

Aircraft Type	Aircraft Variable No.	Aircraft Serial No.	Aircraft Registration (Ref only)
Boeing 757-2T7	NA401	22780	G-MONB
Boeing 757-2T7	NA402	22781	G-MONC
Boeing 757-2T7	NA403	22960	G-MOND
Boeing 757-2T7	NA404	23293	G-MONE
Boeing 757-2T7	NA405	23770	G-DAJB
Boeing 757-2T7	NA407	24104	G-MONJ
Boeing 757-2T7	NA408	24105	G-MONK

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

Aircraft Type	Aircraft Variable No.	Aircraft Serial No.	Aircraft Registration (Ref only)
B757-2B7	NB507	27147	G-OOBJ
B757-28A	NA443	24017	C-FTDV
B757-23A	NB134	24292	C-GOOG
B757-2B7	NB506	27146	G-OOBI
B757-2YO	NB329	26158	G-OOOX
B757-28A	NT232	28203	G-OOOY
B757-28A	NJ001	33098	G-OOBC
B757-28A	NJ002	33099	G-OOBD
B757-28A	NJ003	33100	G-OOBE
B757-28A	NJ004	33101	G-OOBF
B757-236	NA346	25054	G-OOOK
B757-236	NA352	25593	G-OOOZ
B757-236	NT404	29941	G-CPEU
B757-236	NT405	29942	G-OOBG
B757-236	NT406	29943	G-CPEV
B757-236	NT407	29944	G-OOBH
B757-28A	NT245	32446	C-GUBA
B757-28A	NT246	32447	C-GTBB
B757-2YO	NB322	25268	G-CPEP

Modification Details

4.1 Description

This Modification has been raised to install a Galley/Lav vent duct to the Britannia Airways B757-204/236 fleet, the JMC / Thomas Cook B757-28A/25F/2YO/2G5 fleet, the Monarch B757-2T7 fleet and the First Choice B757-28A/2B7/23A/2YO/236 fleet to prevent unpleasant smells entering the passenger cabin.

The additional support is added to redirect the existing Galley/Lav vent through 90 degrees and points the unpleasant smells towards an external vent.

For later production aircraft, the support is mounted on an existing frame and stringer at STN.1640, STR.26L using Rivets. A longer duct (P/N BWT10-3440480A) needs to be installed to early production aircraft (Britannia G-BYAD, G-BYAE, G-CDUO, G-CDUP, JMC / Thomas Cook G-FCLG, G-JMCF, all Monarch aircraft and First Choice C-FTDV, C-GOOG, G-CPEP, G-OOBI, G-OOBJ, G-OOOK , G-OOOX, G-OOOZ) as the Galley/Lav Vent duct fan is at STN.1680.

4.2 Parts Required Per Aircraft

PART NO.	DESCRIPTION	QTY
Mod757-1281-000	Mod Kit (IES only)	1
BWT10-3440360A *	Duct Tubing	1
NAS1922-0575-1	Duct Clamp	2
757-1410-000	Bracket assembly	1
757-1410-004	Fwd Support Bracket	1
757-1410-006	Aft Support Bracket	1
757-1410-008	Packer	A/R

* Alternative part number BWT10-3440480A for aircraft G-BYAD, G-BYAE, G-CDUO, G-CDUP, G-FCLG, G-JMCF, C-FTDV, G-OOG, G-CPEP, G-OOBI, G-OOBJ, G-OOOK, G-OOOX, G-OOOZ and all Monarch aircraft only.

4.3 Parts Removed Per Aircraft

PART NO.	DESCRIPTION	QTY
NONE		

4.4 Documents & Drawings Required

DOCUMENT/DRAWING No.	TITLE	ISSUE
757-1410	Bracket -- Lav/Galley vent duct	latest
757-1411	Installation Lav/Galley vent duct	latest

5. Basis of Approval

5.1 CAA Approval Basis for the Modification

The Type Certification Basis for the B757 is described in the UK Type Certificate Data Sheet number FA28 Issue 5. The relevant requirements within this basis are applicable to this modification. However Britannia Airways elected to comply with JAR 25 at change 15.

5.2 Design Requirements for Certificate of Airworthiness

A review of JAR 25 has identified that JAR 25.301 thru 25.333, 25.337, 25.341, 25.571 and 25.601 thru 609, 25.613, and 25.625, 25.899 (a)(b), 25.1301 (a)(c), 25.1309, 25.1519, 25.1529, 25.1541 are the only parts of JAR 25 that are needed for the certificate of airworthiness.

5.3 Design Requirements Associated with Operational Approvals

None

5.4 Environmental Requirements

None

6. Compliance with Requirements

6.1 Compliance with the Certification Basis for the Modification

The certification basis as defined in section 6.1 of this document is unaffected by the introduction of this modification.

6.2 Compliance with Requirements for Certificate of Airworthiness

Compliance is established with JAR 25 Subpart C (Structure) and Subpart D (Design and Construction), specifically:

JAR 25.301 thru 25.333, 25.337, 25.341, 25.571 and 25.601 thru 609, 25.613, and 25.625. -

The installed weight of the vent duct support is small (1.5lb approx), resulting in negligible loads attributed to flight inertia, maneuver and ground load cases. A light weight flexible hose is attached to the vent duct bracket which has a negligible affect on the attachment loads.
[Reference D6-55441, the flight load cases are 1.5g Fwd/aft, 3.5g up, 6.5g down, 2.0g side. Note, emergency landing conditions are not applicable since the installation is outside the passenger compartment].

The vent duct support utilizes approved aerospace materials and fabrication techniques. Airframe attachments and protective treatments conform to the requirements of the airplane SRM and do not affect the integrity of the structure.

JAR 25.899

The extension to the Galley/Lav vent duct does not form part of any primary or secondary bonding path. No bonding is considered necessary for additional ducting introduced by this modification.

JAR 25. 1301, 25.1309

The installation of the Galley/Lav vent duct is illustrated on BAL Dwg; 757-1411 issue 2 and installation notes there on. Installation of the duct is covered in TEO/7571281 accomplishment instruction & is illustrated. This is an extension to the original Galley/Lav vent system that was installed during the aircraft build by Boeing.

25.1519

See Section 9, page 9

25.1529

The support and ducting is to be visually inspected every 4C for support and ducting integrity.

25.1541

The duct is indicated, with a directional arrow, on the outside of the duct and is clearly visible.

The flexible ducting introduced by this modification is manufactured by SENIOR Aerospace. Drawing BWT10 (se appendix A) shows that the duct is manufactured from 'SPS' with bonded cuffs. All materials introduced have been thoroughly tested to reflect installation requirements, a copy of the test report is included in appendix A. Although the duct is not installed within the crew or passenger compartment it has been tested to and meets the requirements of JAR25.853 – see appendix A.

6.3 Design Requirements Associated with Operational Approvals

None

6.4 Environmental Requirements

None

7. Flight Test

Not Required

8. Weight & Balance

There is a slight increase of 0.7kgs in the overall weight of the bracket and duct assembly, which is less than 50kgs.

Britannia's policy is to only issue a weighing statement if there is an increase/decrease greater than 50kgs. Any minor increase/decrease will be included in the basic weight when the aircraft is weighed on its 4 yearly weighing programme.

The Design Engineer (Weight & Performance) will record any minor weight changes and if a cumulative weight increase/decrease exceeds 50kgs then a weighing statement will be issued.

The weight and balance manual does not need to be amended to reflect the installation of the bracket and duct assembly as this is deemed structure and is part of the Basic weight of the aircraft

9. Electrical Load Analysis

Not Applicable

10. Reports

None

11. Limitations & Concessions

None

12. Modification Verification

Compiled by:	:	Ben Hyde	**Signed:**	**Date:**
Verification (Avionic)	:	Anton Hessig	**Signed:**	**Date:**
Verification (Airframe)	:	Dean Jackson	**Signed:**	**Date:**
Verification (Stress)	:	Mark Evans	**Signed:**	**Date:**

APPENDIX A

Senior Aerospace Qualification Test Report, Report No.BWT148 Dated 6th January 2003

(48 Pages)

Senior Aerospace Material Data Sheet MDS No. 6065 Issue 4 Dated 26th May 2000

(2 Pages)

Senior Aerospace Material Data Sheet MDS No. 6010 Issue 5 Dated 4th May 1999

(1 Page)

Senior Aerospace Material Data Sheet MDS No. 6046 Issue 4 Dated 6th June 2001

(1 Page)

Senior Aerospace Material Data Sheet MDS No. 6005 Issue 8 Dated 25th July 2002

(2 Pages)

Senior Aerospace Material Data Sheet MDS No. 6066 Issue 3 Dated 26th May 2000

(2 Pages)

Senior Aerospace Material Data Sheet MDS No. 6140 Issue 3 Dated 7th June 2001

(2 Pages)

Senior Aerospace Material Drawing BWT10 Revision C Dated 11th November 1999

(3 Sheets)

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

Technical Engineering Order: TEO/757/1281 Issue 5

Title : Installation of Galley/Lav vent duct

Modification Classification : **Minor/~~Major~~**

ATA Chapter(s) : 21, 25, 38

Aircraft Effectivities :

Type	Variable No.	Serial No.
B757-204	NB422 to NB438	26963, 26964, 26266 26966, 26967, 25623 26267, 25626, 27219 27235, 27236, 27237 27238, 27208, 27220 27234
B757-204	NT431 to NT432	28834, 28836
B757-236	NA343 to NA344	24792, 24793
B757-28A	NB226 to NB228	27621, 28164, 28166
B757-25F	NB230	28718
B757-28A	NT233 to NT234	28171, 28835
B757-28A	NA445	24367
B757-28A	NB222 to NB223	26275, 26274
B757-2YO	NB330 to NB331	26160, 26161
B757-25F	NT237 to NT238	30757, 30758
B757-28A	NB201	24369
B757-2G5	NB446	26278
B757-2T7	NA401 to NA405	22780, 22781, 22960, 23293, 23770
B757-2T7	NA407 to NA408	24104, 24105
B757-28A	NA443, NT232, NJ001 – NJ004, NT245 –NT246	24017, 28203 33098 - 33101 32446, 32447
B757-2B7	NB507, NB506	27147, 27146
B757-23A	NB134	24292
B757-2YO	NB329, NB322	26158, 25268
B757-236	NA346, NA352, NT404 – NT407	25054, 25593 29941 - 29944

Certificate of Design

I hereby certify that this Technical Engineering Order defines the changes associated with the relevant Modification Summary.

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

The technical information contained within or associated with this document has been approved under the authority of the EASA Approval No. **EASA.21J.049**

Office of Airworthiness (or Nominee) Approved: Date:

Record Drawing Office Instructions (DOI) Numbers raised as a result of this modification

DOI No.	Details

Compiled	: Ben Hyde	**Signed:**	**Date:**
Avionics Checked	: Anton Hessig	**Signed:**	**Date:**
Airframe Checked	: Dean Jackson	**Signed:**	**Date:**
Stress Checked	: Mark Evans	**Signed:**	**Date:**

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

1. Contents

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

2. Revision History

Issue	Date	Raised Issue Details	Sheets Affected
1	16/10/03	Initial Issue	All
2	30/06/04	JMC / Thomas Cook added to effectivity DOI 1305 & 1321 embodied A.T.	1, 6, 7
3	21/09/04	Aft Support Bracket Altered for G-JMCF only DOI 1347 embodied B.H.	1, 7, 8
4	15/10/04	Monarch aircraft added to effectivity of MOD. Transferred to new part 21 Approval format. B.H.	All
5	17/01/05	First Choice aircraft added to effectivity of MOD	5, 6, 7, 8, 9, 10

3. Document required or Continued airworthiness

Documents Affected : Aircraft Maintenance Manual Yes/~~No~~

Aircraft Modification Record Yes/~~No~~

Wiring Diagram Manual ~~Yes~~/No

Illustrated Parts Catalogue Yes/~~No~~

Line E.T.O.P.S. Manual ~~Yes~~/No

MEL ~~Yes~~/No

Weight Schedule ~~Yes~~/No

Maintenance Schedule Yes/~~No~~

Configuration Manual ~~Yes~~/No

Operation Manual ~~Yes~~/No

Flight Manual ~~Yes~~/No

Cabin/Emergency Manual ~~Yes~~/No

Simulator ~~Yes~~/No

Capability List ~~Yes~~/No

Advisory Bulletin ~~Yes~~/No

Other (Please Specify) ~~Yes~~/No

It is the responsibility of Thomas Cook, Monarch and First Choice to amend any manuals affected by this modification.

4. Modification Details

4.1 Description

This Technical Engineering Order has been raised to install a Galley/Lav vent duct to the Britannia Airways B757-204/236 fleet, the JMC / Thomas Cook B757-28A/25F/2YO/2G5 fleet, the Monarch 2T7 fleet and the First Choice B757-28A/2B7/23A/2YO/236 fleet to prevent unpleasant smells entering the passenger cabin.

This additional support is added to redirect the Galley/Lav vent through 90 degrees and disperses the unpleasant smell towards an external vent.

For later production aircraft, the support is mounted on an existing frame and stringer at STN.1640, STR.26L using Rivets. A longer duct (P/N BWT10-3440480A) needs to be installed to early production aircraft (Britannia G-BYAD, G-BYAE, G-CDUO, G-CDUP, JMC / Thomas Cook G-FCLG, G-JMCF, First Choice C-FTDV, C-GOOG, G-CPEP, G-OOBI, G-OOBJ, G-OOOK, G-OOOX, G-OOOZ and all Monarch aircraft) as the Galley/Lav Vent duct fan is at STN.1680.

4.2 Parts Required Per Aircraft

PART NO.	DESCRIPTION	QTY
. **Mod757-1281-000**	Mod Kit (IES only). All Aircraft except G-JMCF	1

. BWT10-3440360A	Duct Tubing (all a/c except as shown below)	1
. BWT10-3440480A	Duct Tubing (NB422, NB423, NA343, NA344, NA445, NB201, NA401, NA402, NA403, NA404, NA405, NA407, NA408, NA443, NB134, NB322, NB506, NB507, NA346, NB329, NA352)	1
. NAS1922-0575-1	Duct Clamp	2
. 757-1410-000	Bracket assembly	1
.. 757-1410-201	Duct bracket	1
... 2024-T3X0.063 QQ-A-250/4	Aluminium Alloy	18"x 15"
.. 757-1410-002	Duct flange assembly	1
.. 757-1410-202	Duct flange	1
... 6061-T6X0.063 QQ-A-250/11	Aluminium Alloy (Clad)	18"x 3"
.. 757-1410-203	Flange attachment	1
... 6061-T6X0.063 QQ-A-250/11	Aluminium Alloy (Clad)	9"x 9"
. BACR15BB5AD6C	Rivet	4

4.2 Parts Required Per Aircraft (cont)

PART NO.	DESCRIPTION	QTY
. PR1422A1	Sealant	A/R
. 757-1410-004	Fwd Support bracket	1
... 2024-T3X0.063 QQ-A-250/5	Aluminium Alloy (Clad)	8"x 4"
. 757-1410-006	Aft Support bracket	1
... 2024-T3X0.063 QQ-A-250/5	Aluminium Alloy (Clad)	10"x 3.1"
. 757-1410-008	Packer	1

... 2024-T3X0.090 QQ-A-250/5	Aluminium Alloy (Clad)	3.1"x 1"
. BACR15BB4AD5C	Rivet	3
. BACR15BA5AD[*]	Rivet	2
. BACR15FT6D[*]	Rivet	4
. **Mod757-1281-002**	Mod Kit (IES only). Aircraft G-JMCF only	1
. BWT10-3440480A	Duct Tubing	1
. NAS1922-0575-1	Duct Clamp	2
. 757-1410-000	Bracket assembly	1
.. 757-1410-201	Duct bracket	1
... 2024-T3X0.063 QQ-A-250/4	Aluminium Alloy	18"x 15"
.. 757-1410-002	Duct flange assembly	1
.. 757-1410-202	Duct flange	1
... 6061-T6X0.063 QQ-A-250/11	Aluminium Alloy (Clad)	18"x 3"
.. 757-1410-203	Flange attachment	1

4.2 Parts Required Per Aircraft (cont)

... 6061-T6X0.063 QQ-A-250/11	Aluminium Alloy (Clad)	9"x 9"
. BACR15BB5AD6C	Rivet	4
. PR1422A1	Sealant	A/R
. 757-1410-004	Fwd Support bracket	1
... 2024-T3X0.063 QQ-A-250/5	Aluminium Alloy (Clad)	8"x 4"

. 757-1410-008	Packer	1
... 2024-T3X0.090 QQ-A-250/5	Aluminium Alloy (Clad)	3.1"x 1"
. 757-1410-010	Aft Support bracket	1
... 2024-T3X0.063 QQ-A-250/5	Aluminium Alloy (Clad)	10"x 4"
. BACR15BB4AD5C	Rivet	3
. BACR15BA5AD[*]	Rivet	2
. BACR15FT6D[*]	Rivet	4

4.3 Parts Removed Per Aircraft

PART NO.	DESCRIPTION	QTY
None		

4.4 Documents & Drawings Required

DOCUMENT/DRAWING No.	TITLE	ISSUE
757-1410	Bracket – Lav/Galley vent duct	2
757-1411	Installation Lav/Galley vent duct	3

5 Accomplishment Instructions

Note: It is not necessary to shut down the exhaust fan during installation. If shutdown is desired, open appropriate circuit breakers as per MM21-26-01 page 401 "Aft equipment Ventilation Fan – removal and Installation".

Note 2: During embodiment of this modification onto aircraft G-BYAS it was noted that bracket P/N 757-1410-006 had been manufactured incorrectly. However it was deemed acceptable for aircraft installation – see figure 2.

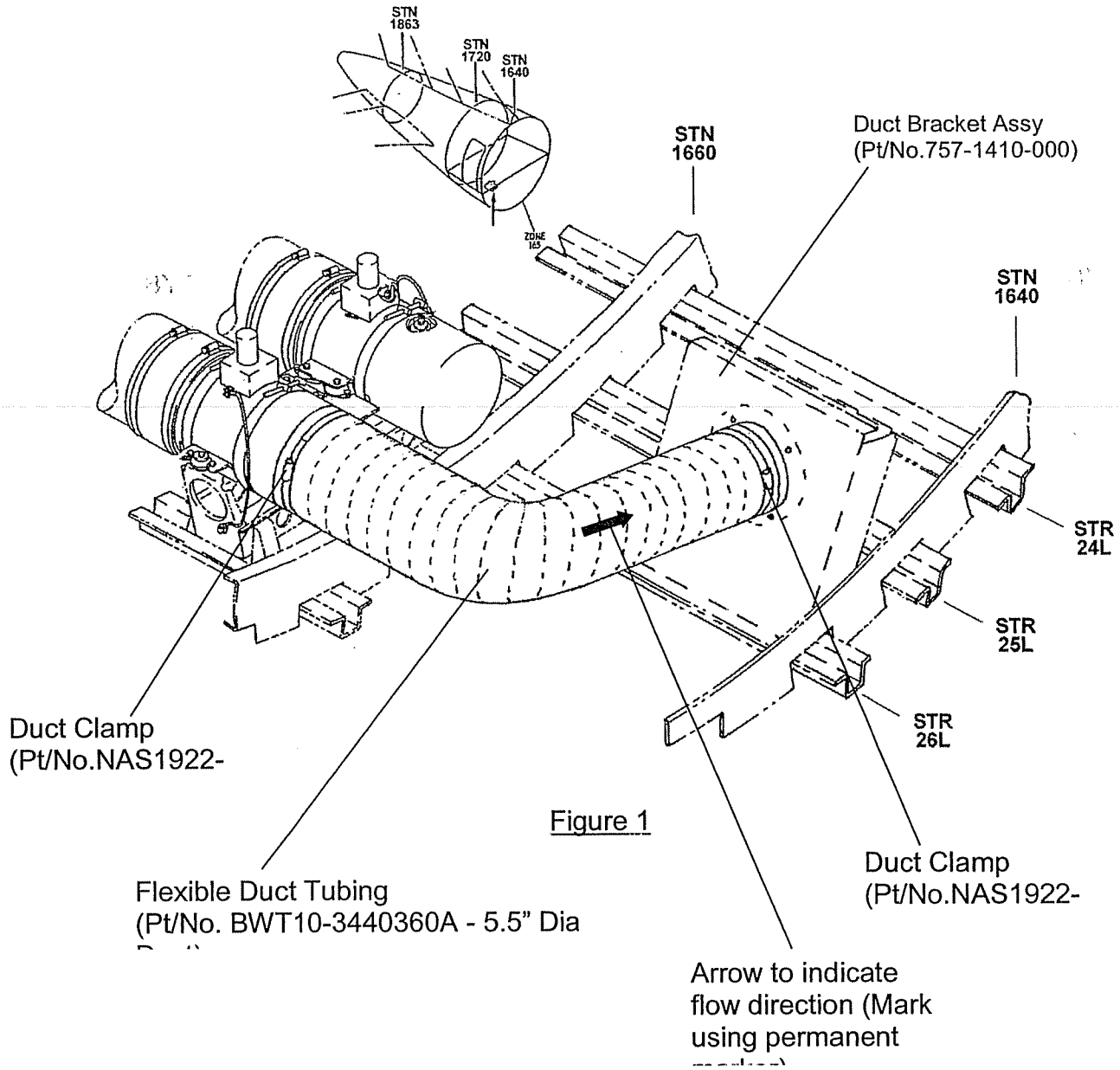


Figure 1

1. Gain access to the Lav/Galley vent fan and outflow valve area by removing the aft bulkhead lining in the bulk cargo compartment (MM25-50-03 page 401).

2. Gain access to the frame at STN.1640, STR.26L by removing the cargo wall panel 161DW at STN.1640 per MM25-50-04 page 401.

3.

   a) For all aircraft apart from G-JMCF. (-000 installation) install bracket assembly 757-1410-000, support brackets 757-1410-004 & 757-1410-006 and packer(s) 757-1410-008 as per BAL installation drawing 757-1411.

   b) For aircraft G-JMCF. (-002 installation) install bracket assembly 757-1410-000, support brackets 757-1410-004 & 757-1410-010 and packer(s) 757-1410-008 as per BAL installation drawing 757-1411.

4. Install duct tubing BWT10-3440360A. For Britannia aircraft G-BYAD (NB422), G-BYAE (NB423), G-CDUO (NA343), G-CDUP (NA344), JMC / Thomas Cook aircraft G-FCLG (NA445), G-JMCF (NB201), First Choice aircraft C-FTDV (NA443), C-GOOG (NB134), G-CPEP (NB322), G-OOBI (NB506), G-OOBJ (NB507), G-OOOK (NA346), G-OOOX (NB329), G-OOOZ (NA352) and all Monarch aircraft only, install duct tubing BWT10-3440480A. Pull one end of the tubing over the exit nozzle Fan No.1 (Boeing 757 IPC, chapter 21-26-01-04, Item 60). Pull the other end of the of the duct tubing over the duct flange on the newly installed bracket. Secure each end with clamps (Pt/No.NAS1922-0575-1). (See figure 1)

Note: If exhaust fan was shut down, restart it now by closing appropriate circuit breakers as per MM 21-26-01 page 405, step F. Check installation for proper operation.

5. Check operation of fan and verify duct is venting air though the outflow valve. Also verify that a clearance of at least 2 inches exists between the aft fully open outflow door and the New Bracket Assembly.

6. Reinstall cargo floor panel 161DW per MM25-50-04 page 401.

7. Reinstall the aft bulkhead lining in the bulk cargo compartment (MM 25-50-03 page 401).

8. Indicate the outside of the ducting with an arrow pointing in the direction of the air flow. Indication to be marked using a black permanent marker, clear and legible.

Note 1: Integrity visual inspections to be carried out every 4C.

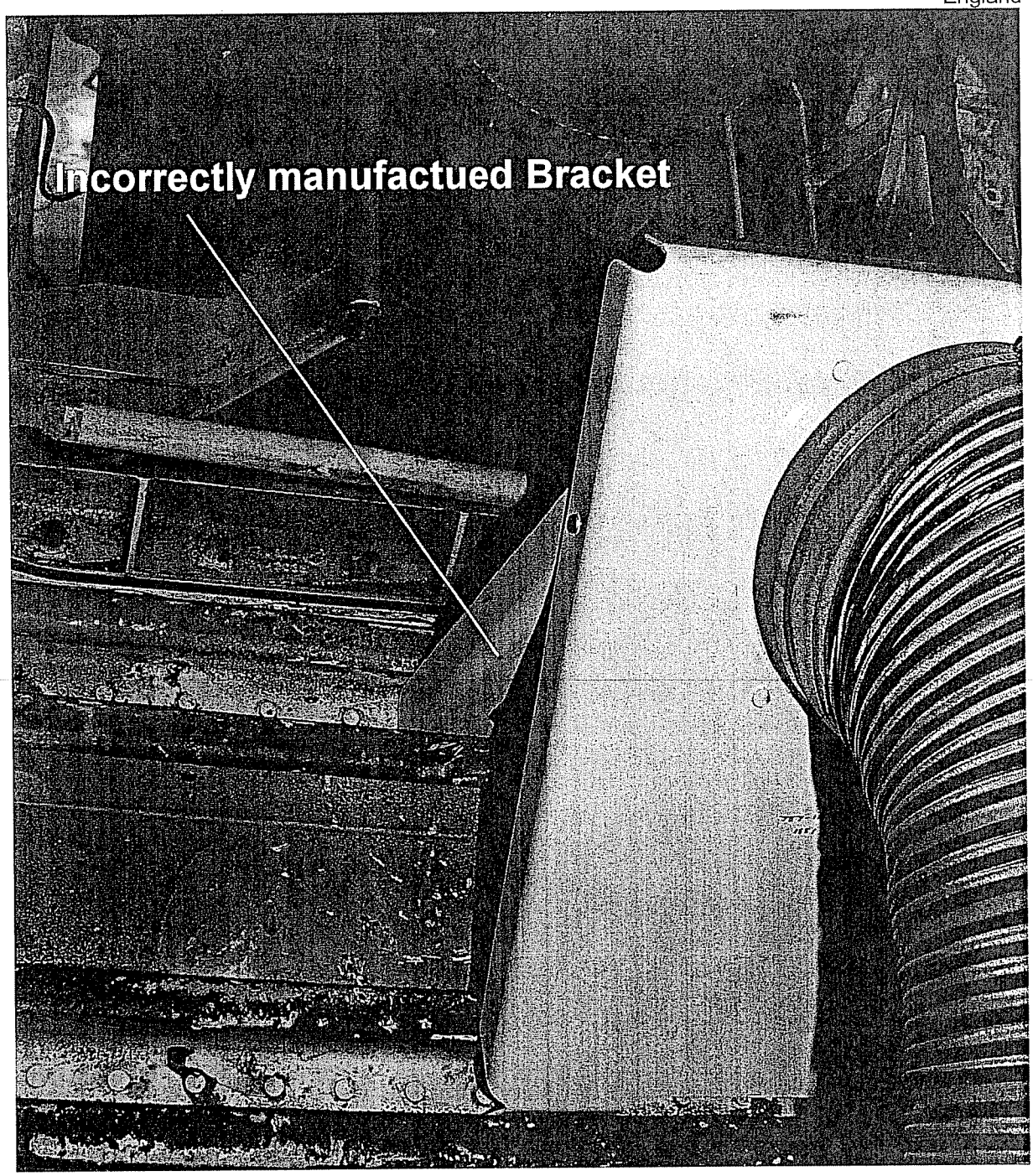


Figure 2

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

9. Co-ordination Memorandum

Verify that rules pertinent to the plan checklist are complete and add any relevant notes.

STRUCTURE/STRESS (complete/~~incomplete~~)*:	MOC	**Signed:**	**Date:**
INTERIOR (complete/~~incomplete~~)*:	MOC	**Signed:** D. Jacks	**Date:** 27/1/05
AVIONICS/ELECTRICAL (complete/~~incomplete~~)*:	MOC	**Signed:**	**Date:**

10. Office of Airworthiness Approval

CLASSIFICATION HAS BEEN DETERMINED AND AGREED WITH THE CAA Yes/~~No~~*

MODIFICATION: MINOR/~~MAJOR~~* STC: N/A

THE CERTIFICATION PLAN IDENTIFIES THE RELEVANT RULES.

Print: **Signed:** **Date:**

***Strike through as required**

7. Flight Test

Not Required

8. Weight & Balance

There is a slight increase of 0.7kgs in the overall weight of the bracket and duct assembly, which is less than 50kgs.

Britannia's policy is to only issue a weighing statement if there is an increase/decrease greater than 50kgs. Any minor increase/decrease will be included in the basic weight when the aircraft is weighed on its 4 yearly weighing programme.

The Design Engineer (Weight & Performance) will record any minor weight changes and if a cumulative weight increase/decrease exceeds 50kgs then a weighing statement will be issued.

The weight and balance manual does not need to be amended to reflect the installation of the bracket and duct assembly as this is deemed structure and is part of the Basic weight of the aircraft

9. Electrical Load Analysis

Not Applicable

10. Reports

None

11. Limitations & Concessions

None

12. Modification Verification

Compiled by:	:	Ben Hyde	**Signed:** B. Hyde	**Date:** 27/01/05
Verification (Avionic)	:	Anton Hessig	**Signed:**	**Date:**
Verification (Airframe)	:	Dean Jackson	**Signed:** D. Jackson	**Date:** 27/1/05
Verification (Stress)	:	Mark Evans	**Signed:**	**Date:**

Britannia

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

9. Electrical Load Analysis

Not Applicable

10. Reports

None

11. Limitations & Concessions

None

12. Modification Verification

Compiled by:	:	Ben Hyde	**Signed:**	**Date:**
Verification (Avionic)	:	Anton Hessig	**Signed:**	**Date:** 27-1-05
Verification (Airframe)	:	Dean Jackson	**Signed:**	**Date:**
Verification (Stress)	:	Mark Evans	**Signed:**	**Date:** 27-1-05

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

Record Drawing Office Instructions (DOI) Numbers raised as a result of this modification

DOI No.	Details

Compiled	: Ben Hyde	**Signed:**	**Date:** 27/01/05
Avionics Checked	: Anton Hessig	**Signed:**	**Date:**
Airframe Checked	: Dean Jackson	**Signed:**	**Date:** 27.1.05
Stress Checked	: Mark Evans	**Signed:**	**Date:**

Britannia

Britannia Airways Ltd.
London Luton Airport
Bedfordshire
LU2 9ND
England

The technical information contained within or associated with this document has been approved under the authority of the EASA Approval No. **EASA.21J.049**

Office of Airworthiness (or Nominee) Approved: Date:

Record Drawing Office Instructions (DOI) Numbers raised as a result of this modification

DOI No.	Details

Compiled : Ben Hyde **Signed:** **Date:**

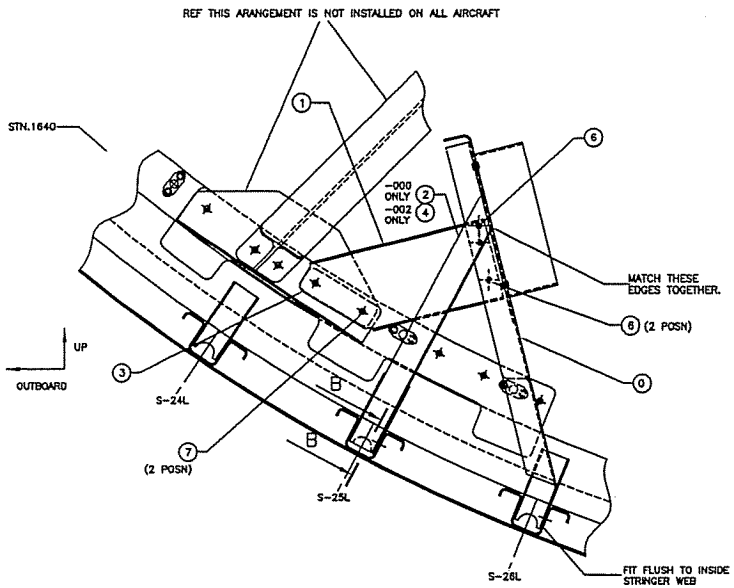
Avionics Checked : Anton Hessig **Signed:** **Date:** 27-1-05

Airframe Checked : Dean Jackson **Signed:** **Date:**

Stress Checked : Mark Evans **Signed:** **Date:** 27-1-05

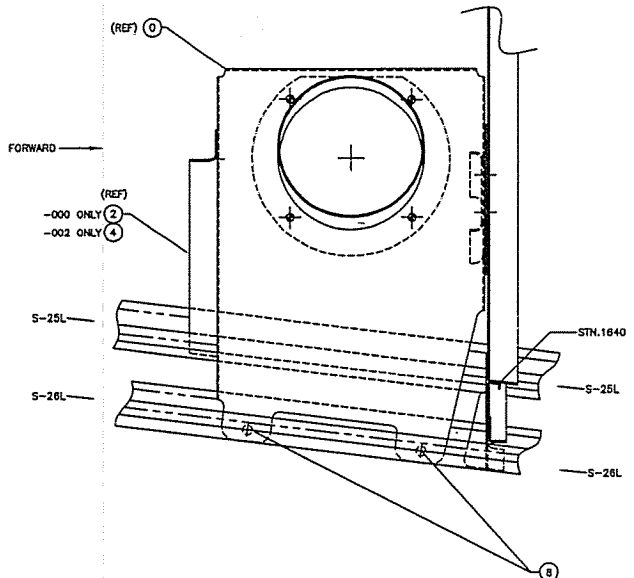
757-1411																	3	2	1	DRAWING ISSUE
Britannia Airways Ltd LUTON AIRPORT BEDFORDSHIRE																	27-09-04 D. JACKSON	10 FEB 04 D. JACKSON	09-10-03 D. JACKSON	ISSUE DATE APPROVAL
																	AFT SUPPORT ALTERED FOR G-JMCF DH	NOTE ADDED to -000 INSTATLATION	NEW DRAWING	DRAWING CHANGE

DO NOT SCALE DRAWINGS – IF IN DOUBT ASK – REPORT ALL ERRORS TO DRAWING OFFICE



-000 INSTALLATION
(VIEW LOOKING FORWARD STN.1640)

-002 INSTALLATION
(AS -000 EXCEPT AS NOTED THOMAS COOK G-JMCF ONLY)



VIEW LOOKING OUTBOARD

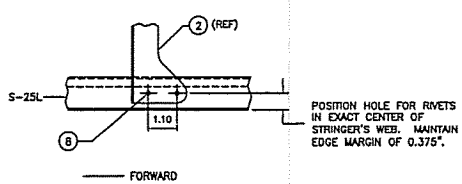
Ø3/16 NOM, REF SRM51-40-05 THE ACTUAL SIZE IS TOLERANCED, HOLES THROUGH ITEM 0 (757-1410-000) BRACKET ASSY AND STRINGER WEB S-26L (2 PLCS). MAINTAIN 2D EDGE MARGIN PER STANDARD PRACTICE.

INSTALLATION NOTES

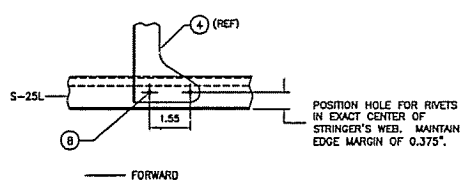
1. DRILL OUT 2 EXISTING RIVETS AS INDICATED ABOVE ✛
2. POSITION ITEMS 0, 1, 2 & 3 ONTO FRAME AT STN.1640, STRINGER S-25L & S-26L AS PER DRAWING, CLAMPING TOGETHER TO ENSURING A 2D EDGE MARGIN.

NOTE. PACKER ITEM 3, A MAXIMUM OF TWO PACKERS CAN BE FITTED TO ENSURE THAT THERE IS A CLEARANCE WITH ANY EXISTING STRUCTURE.

3. TRANSFER EXISTING FASTENERS HOLES THROUGH ITEM 1 (FWD SUPPORT BRACKET) AND ITEM 3 (PACKER)
4. DRILL NO.41 PILOT HOLES THROUGH BRACKET ASSEMBLY AND STRINGERS S-25L & S-26L, ENSURING 2D IN ALL POSITIONS
5. OPEN UP ALL HOLE TO THERE CORRECT DIAMETERS
6. DISMANTLE STRUCTURE AND DEBURR ALL HOLES
7. ASSEMBLE ITEM 0 AND 1 USING RIVETS ITEM 6 WET USING ITEM 5 (PR1422)
8. INSTALL BRACKET ASSEMBLY TO AIRCRAFT STRUCTURE WET USING ITEM 5 (PR1422)
9. INSTALL RIVETS ITEM 6 INTO THE EXISTING FASTENER POSITIONS ON FRAME AT STN.1640
10. INSTALL RIVETS ITEM 8 INTO STRINGER S-26L
11. POSITION ITEM 2 (AFT SUPPORT BRACKET) AND INSTALL RIVETS ITEM 7 INTO STRINGER S-25L
12. INSTALL FINAL RIVET ITEM 5 THROUGH ITEM 0 BRACKET ASSEMBLY AND ITEM 2 (AFT SUPPORT BRACKET).



SECTION B-B
ALL AIRCRAFT EXCEPT G-JMCF
SEE B1-B1 FOR G-JMCF



SECTION B1-B1
G-JMCF ONLY

GENERAL NOTES:

1. INSTALL ALL FASTENERS WET WITH PR1422 (ITEM 5) OR EQUIVALENT.
2. INSTALL ALL FASTENERS PER STANDARD 757 SRM CHAP 51 PRACTICES.
3. BREAK SHARP EDGES.
4. 63 RMS SURFACE TYPICAL.
5. SHIM AS REQ'D TO RELIEVE PRELOAD.
6. PROTECT AGAINST DISSIMILAR METAL PER SRM CHAP 51.
7. HOLE STANDARDS, FASTENER INSTALLATION, MANUFACTURING PROCESSES, PROTECTIVE TREATMENT AND INTERFAY TO CONFORM WITH THE REQUIREMENTS OF THE SRM.

757-1410-008 IS TO BE USED FOR ALL AIRCRAFT EXCEPT G-JMCF
757-1410-010 IS TO BE USED ONLY FOR G-JMCF

PART NO.	USED ON

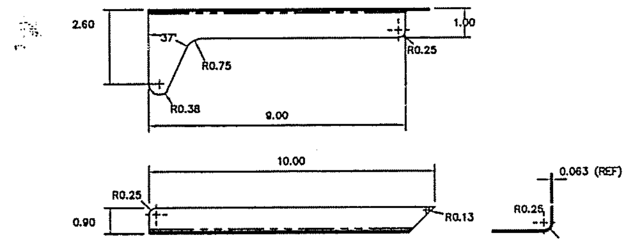
A/R	A/R		8	BACR15FT6D[*]	RIVET				
2	2		7	BACR15BA5AD[*]	RIVET				
3	3		6	BACR15BB4AD5C	RIVET				
A/R	A/R		5	PR1422A1	SEALANT				
1			4	757-1410-010	AFT SUPPORT BRACKET				
A/R	A/R		3	757-1410-008	PACKER				
	1		2	757-1410-006	AFT SUPPORT BRACKET				
1	1		1	757-1410-004	FWD SUPPORT BRACKET				
1	1		0	757-1410-000	BRACKET ASSEMBLY				
					INSTALLATION				
					INSTALLATION				
NO. OFF	NO. OFF	MAP REF.	ITEM NO.	PART NUMBER	DESCRIPTION	MATL. SPECN. OR REMARKS ▲		PROT.TR. CODE	
A/D	A/D	HAND							
1	2	DES.							

757-1411-002
757-1411-000
PART NUMBER

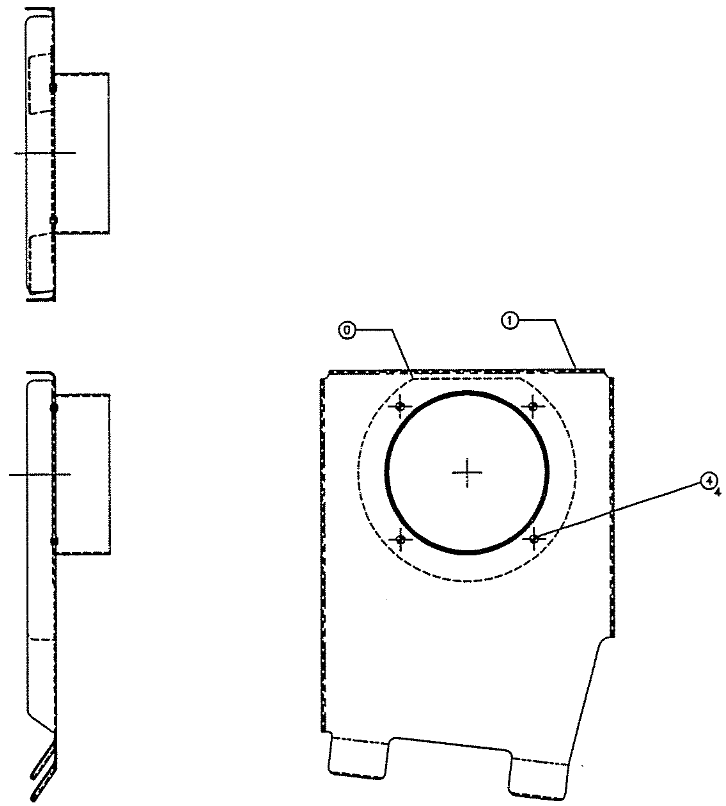
DRN. BY	P.G.NOEL	APP. BY	D. JACKSON 09-10-03	PART MARK TO WHERE SHOWN THUS	
DATE	01-08-03	STRESS	M.A.EVANS 09-10-03	LIMITS TO UNLESS OTHERWISE STATED	ALL DIMENSIONS IN INCHES
CH. BY	D. JACKSON 09-10-03				
THIRD ANGLE PROJECTION		SCALE	N.T.S.	MODIFICATION NUMBER	MOD/757/1281
TITLE	INSTALLATION LAV/GALLEY VENT DUCT			SHEET – OF – SHEETS	757-1411

757-1410														2	1	DRAWING ISSUE
Britannia Airways Ltd LUTON AIRPORT BEDFORDSHIRE														27-09-04	09-10-03	ISSUE DATE
														D. JACKSON	D. JACKSON	APPROVAL
														TRIMABLE AREA ADDED TO PART -201 (SEE SHEET 2). AFT SUPPORT ALTERED FOR G-BMCP PN. DH	NEW DRAWING	DRAWING CHANGE

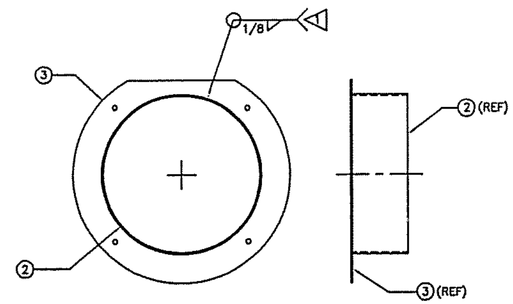
DO NOT SCALE DRAWINGS – IF IN DOUBT ASK – REPORT ALL ERRORS TO DRAWING OFFICE



–010 AFT SUPPORT BRACKET ⑷ ⑸ ⑺



–000 BRACKET FRAME ASSEMBLY ⑺ ⑻



–002 FLANGE ASSEMBLY ⑶ ⑷ ⑺

NOTES:

1. ASSEMBLE –002 FLANGE ASSY BY WELDING –203 FLANGE ATTACHMENT TO –202 DUCT FLANGE USING A 1/8" ALL AROUND FILLET WELD ON ARROW SIDE ONLY.
2. SMOOTH AND DEBURR ALL SHARP EDGES AS NEEDED.
3. WELD PER BOEING PROCESS SPECIFICATION BAC 5975.
4. ALL METAL PARTS TO BE FINISHED WITH ONE COAT OF BMS10-11 TYPE 1 PRIMER & ONE COAT OF BMS10-11 TYPE 2 GLOSS WHITE PAINT (ALTERATIVLY POLYURETHANE C21100 TOP COAT GLOSS WHITE)
5. ALL BEND RADII TO BE R0.25, UNLESS OTHERWISE STATED.
6. ALL CORNER RADII TO BE R0.25, UNLESS OTHERWISE STATED.
7. LABEL WITH WATERPROOF MARKER OR EQUIVALENT PER BAL STANDARD PRACTICES.
8. INSTALL ALL FASTENERS PER STANDARD 757 SRM CHAP 51 PRACTICES.
9. PROTECT AGAINST DISSIMILAR METALS PER SRM CHAP 51.

No. OFF	No. OFF	No. OFF	No. OFF	No. OFF	No. OFF	MAP REF.	ITEM No.	PART NUMBER	DESCRIPTION	MATL.	SPECN.	RUL. DIM.	PROT.TR. CODE
					4		4	BACR15BB5AD6C	RIVET				
				1			3	-203	FLANGE ATTACHMENT	AL.AL	6061-T6x0.063	9"x 9"	QQ-A-250/11
				1			2	-202	DUCT FLANGE	AL.AL	6061-T6x0.063	18"x 3"	QQ-A-250/11
					1		1	-201	DUCT BRACKET	AL.AL	2024-T3x0.063	18"x 13"	QQ-A-250/5
					1		0	-002	DUCT FLANGE ASSY				
									AFT SUPPORT BRACKET	AL.AL	2024-T3x0.063	10"x4.0"	QQ-A-250/5
									PACKER	AL.AL	2024-T3x0.090	3.1"x 1"	QQ-A-250/5
									AFT SUPPORT BRACKET	AL.AL	2024-T3x0.063	10"x3.1"	QQ-A-250/5
									FWD SUPPORT BRACKET	AL.AL	2024-T3x0.063	8"x 4"	QQ-A-250/5
									DUCT FLANGE ASSY				
									BRACKET FRAME ASSY				
A/D	A/D	A/D	A/D	A/D	A/D	HAND				OR REMARKS			
2	2	2	2	2	2	ISS.							
757-1410-010	757-1410-008	757-1410-006	757-1410-004	757-1410-002	757-1410-000	PART NUMBER							

DRN. BY P.G.NOEL	APP. BY D.JACKSON 09-10-03	PART MARK TO WHERE SHOWN THUS
DATE 01-08-03	STRESS M.A.EVANS 09-10-03	LIMITS TO OTHERWISE STATED UNLESS
CH. BY D. JACKSON 09-10-03		ALL DIMENSIONS IN INCHES
THIRD ANGLE PROJECTION	SCALE N.T.S.	MODIFICATION NUMBER MOD/757/1281
TITLE BRACKET – LAV/GALLEY VENT DUCT		SHEET 1 OF 2 SHEETS
		757-1410

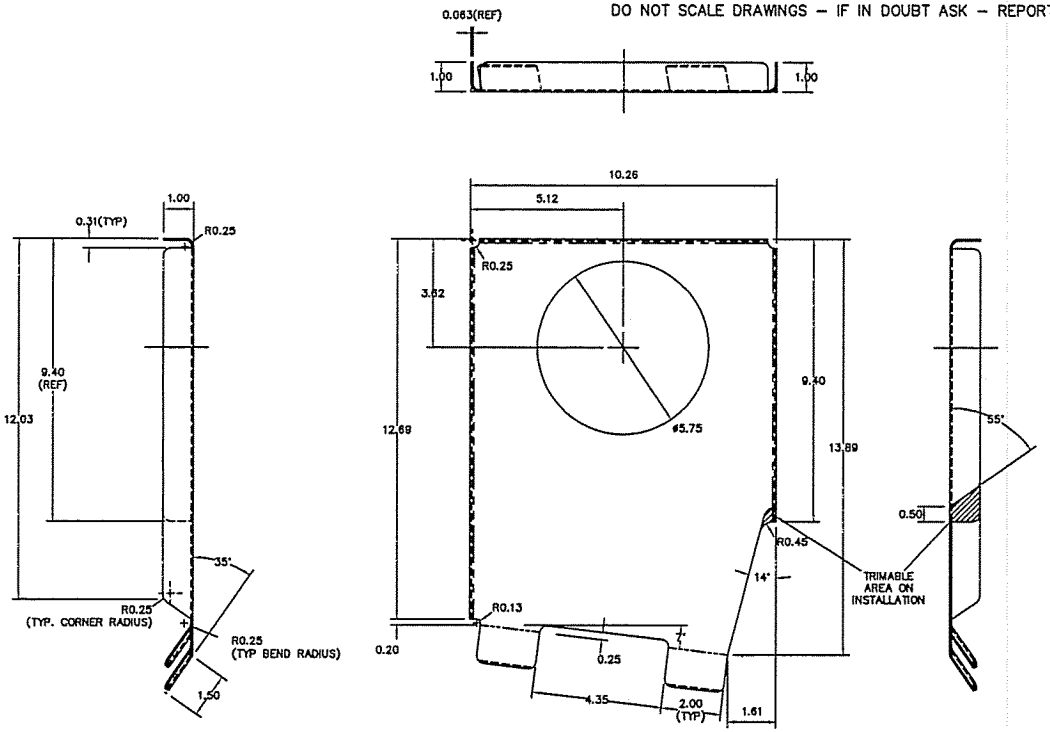
PART NO.	USED ON

A1

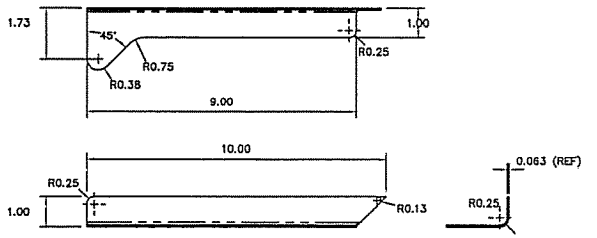
Britannia Airways Ltd
LUTON AIRPORT
BEDFORDSHIRE

DRAWING ISSUE	1	2
ISSUE DATE	09-10-03	27-09-04
APPROVAL	D. JACKSON	D. JACKSON
DRAWING CHANGE	NEW DRAWING	TRIMABLE AREA ADDED TO PART -201. AFT SUPPORT ALTERED FOR O-MCF (SEE SHEET 1) PN

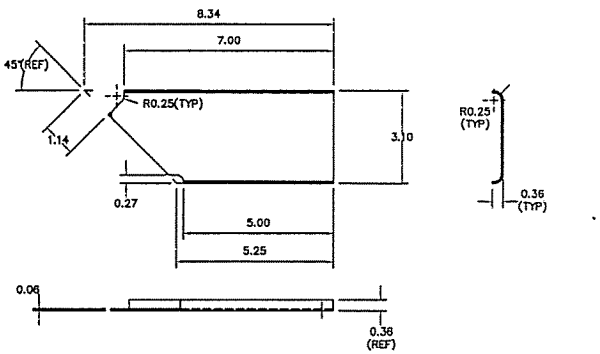
DO NOT SCALE DRAWINGS – IF IN DOUBT ASK – REPORT ALL ERRORS TO DRAWING OFFICE



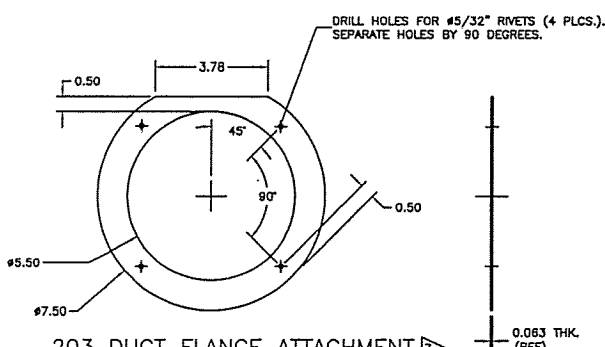
-201 DUCT BRACKET ▷4 ▷5 ▷6 ▷7



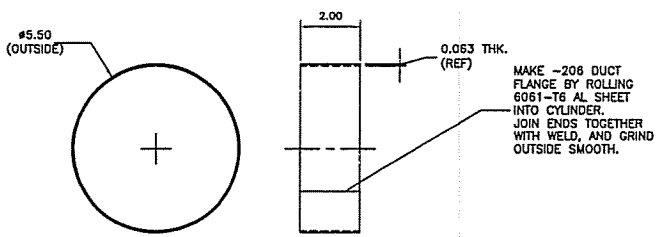
-006 AFT SUPPORT BRACKET (A) ▷4 ▷5 ▷7



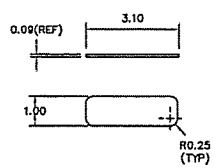
-004 FWD SUPPORT BRACKET ▷4 ▷5 ▷6 ▷7



-203 DUCT FLANGE ATTACHMENT ▷7



-202 DUCT FLANGE ▷3 ▷7



-008 PACKER ▷4 ▷6 ▷7

PART NO.	USED ON

SEE SHEET 1

ITEM No.	PART NUMBER	DESCRIPTION	MATL.	SPECIL	RUL. DIM.	PROT.TR. CODE
			OR REMARKS ▲			

DRN. BY	P.G.NOEL
DATE	01-08-03
CHD. BY	D. JACKSON 09-10-03
APP'D BY	D. JACKSON 09-10-03
STRESS	M.A.EVANS 09-10-03
PART MARK TO WHERE SHOWN THUS	
UNITS TO UNLESS OTHERWISE STATED	ALL DIMENSIONS IN INCHES
THIRD ANGLE PROJECTION	SCALE N.T.S.
MODIFICATION NUMBER	MOD/757/1281
SHEET 2 OF 2 SHEETS	
TITLE	BRACKET – LAV/GALLEY VENT DUCT
PART NUMBER	757-1410

SEE SHEET 1

QUALIFICATION TEST REPORT

BWT148

Low Pressure Flexible, Semi-Rigid and Rigid Ducting

Summary: This report details the procedures and results of a number of airworthiness and environmental tests carried out on products manufactured by Senior Aerospace BWT. Testing was carried out on representative items manufactured by BWT. All testing was carried out by approved test houses.

ORIGINATED BY	REVIEWED BY	APPROVED BY
R.C.Ayerst Materials Dev Engineer	T.S.Wright Technical Manager	D.Dollan Engineering Director
Date: 6th January 2003	Date: 10t January 2002	Date: 13th January 2003

RECORD OF CHANGES

Issue	Date	Pages Affected	Details of Change
1	April 94	All	New Document
2	July 94	All	Document released
3	04/01/95	Various	PDS, PDP, PDF semi-rigid now reads rigid. Section 148.3.15 & 4.15 corrosion testing added. F6069 Fibredux 917 added as appendix B. DTD585 removed from pages 17-26 and MIL-L-23699 & MIL-H5606 added to tables on same pages. Section 148.4.7,4.8 & 4.9 further detailed data added to tables.
4	12/07/95	Various	Information on F6071 Fibrelam LS incorporated as appendix C.
5	18/08/00	All	Document rewritten into new format, all tests and data reviewed
6	14/11/00	All	Product descriptions of all ducting types & data on S4B, SPSB, PDA, PDC & PDCh added. Order of results presentation standardised. Appendix A eliminated as replaced by new data in 148.4.13. Product data in Appendices B & C eliminated as available in MDS form. F6069 environmental data in Appendix B retained but renamed Appendix A.
7	06/01/03	All	All data on product types UVU, SVS, SIS & PDCh removed. FST results updated, order of toxicity & smoke reversed, and PDB, PDFB & PDPB added.

CONTENTS

148.1. SUMMARY OF TEST RESULTS BY DUCT TYPE

The following tables show the conclusions of the tests that were carried out on the various types of Senior Aerospace BWT low pressure air conditioning ducting.

148.1.1. FLEXIBLE DUCTS

148.3 TEST	U62	S4	SPS
1 Leak Rate	PASS	PASS	PASS
2 Salt Water	PASS TO A	PASS TO A	PASS TO A
3 Water Immersion	PASS	PASS	PASS
4 Fluid Contamination	PASS TO A & B	PASS TO A (& ALSO B BY SIMILARITY)	PASS TO A & B
5 Solvents	PASS	PASS	PASS
6 Plexiglas	PASS	PASS	PASS
7 Flammability	PASS	PASS [1]	PASS [1]
8 Smoke Emission	PASS	PASS [2]	PASS [1]
9 Toxic Gas Emission	PASS	PASS [2]	PASS [1]
10 Odour	PASS	PASS	PASS
11 Pressure at Low Temp.	PASS	PASS	PASS
12 Pressure at High Temp.	PASS	PASS	PASS
13 Fungal Growth	PASS TO A	PASS TO A BY SIMILARITY	PASS TO A
14 Damage	PASS	PASS	PASS
15 Corrosion	PASS	PASS	PASS

NOTES
1 Also qualified in black versions **S4B** and **SPSB**
2 Also qualified in black version **S4B** by similarity

148.1 SUMMARY OF TEST RESULTS BY DUCT TYPE (Cont.)

148.1.2. SEMI-RIGID DUCTS

148.3 TEST	PD	PDA	PDC	PDS
1 Leak Rate	PASS	PASS	PASS	PASS
2 Salt Water	PASS TO A	PASS TO B	PASS TO B	PASS TO A
3 Water Immersion	PASS	TO BE TESTED	TO BE TESTED	PASS
4 Fluid Contamination	PASS TO A & B	PASS TO B	PASS TO B	PASS TO A (& ALSO B BY SIMILARITY)
5 Solvents	PASS 6 OF 7	PASS 6 OF 7 BY SIMILARITY	PASS 6 OF 7 BY SIMILARITY	PASS 6 OF 7
6 Plexiglas	PASS	PASS BY SIMILARITY	PASS BY SIMILARITY	PASS
7 Flammability	PASS [1]	PASS	PASS	PASS
8 Smoke Emission	PASS [1]	PASS	PASS	PASS BY SIMILARITY
9 Toxic Gas Emission	PASS [1]	PASS	PASS	PASS BY SIMILARITY
10 Odour	PASS	TO BE TESTED	TO BE TESTED	PASS
11 Pressure at Low Temp.	NOT TESTED	NOT TESTED	NOT TESTED	NOT TESTED
12 Pressure at High Temp.	NOT TESTED	NOT TESTED	NOT TESTED	NOT TESTED
Fungal Growth	PASS TO A	PASS TO B	PASS TO B	PASS TO A BY SIMILARITY
14 Damage	PASS 2 OF 3	NOT TESTED	NOT TESTED	NOT TESTED
15 Corrosion	PASS	TO BE TESTED	NOT REQUIRED BY DESIGN	PASS

NOTE

1 Also qualified in black version **PDB**

148.1 SUMMARY OF TEST RESULTS BY DUCT TYPE (Cont.)

148.1.3. RIGID DUCTS

148.3 TEST	PDF	PDP
1 Leak Rate	NOT TESTED	NOT TESTED
2 Salt Water	PASS TO A	PASS TO A
3 Water Immersion	PASS	PASS
4 Fluid Contamination	PASS TO A & B	PASS TO A & B
5 Solvents	PASS 6 OF 7	PASS 5 OF 7
6 Plexiglas	PASS	PASS
7 Flammability	PASS [1]	PASS [2]
8 Smoke Emission	PASS [1]	PASS [2]
9 Toxic Gas Emission	PASS [1]	PASS [2]
10 Odour	PASS	PASS
11 Pressure at Low Temp.	NOT TESTED	NOT TESTED
12 Pressure at High Temp.	NOT TESTED	NOT TESTED
13 Fungal Growth	PASS TO A	PASS TO A
14 Damage	NOT TESTED	NOT TESTED
15 Corrosion	PASS	PASS

NOTES
1 Also qualified in black version **PDFB**
2 Also qualified in black version **PDPB**

148.2. INTRODUCTION

This qualification test report is designed to illustrate the performance of Senior Aerospace - BWT flexible, rigid and semi-rigid lightweight air conditioning ducts, when subjected to specific environmental conditions.

Senior Aerospace BWT is approved to design, manufacture and test these under the following certification:

CAA Approval Certificate AD/1820/00

CAA JAR 21 sub part G Approval Certificate CAA.G02116

BSI ISO 9001 : 1994 Approval Certificate FM33092

Most of the tests have been carried out under conditions considered to be more extreme than those under which these ducts would normally be operating. It can therefore be deduced that, if the flexible, rigid and semi-rigid ducts survive the testing conditions without any delamination, deformation or permanent damage, they shall be suitable to operate at the conditions that they may encounter on an aircraft during service.

However it is recognised that in order to fully characterise ducting certain mechanical testing is necessary, e.g. endurance (pressure cycling), vibration and/or operational shocks. Given that mechanical testing is mass, size, shape, attachment design and operation condition (pressure) dependent, existing BWT data is not included in this general report.

148.2.1. PRODUCT DESCRIPTIONS

This report outlines the procedures of the tests that have been carried out, the results and conclusions drawn, and in some cases the suitability of ducting to operate under similar conditions for the following BWT product types:

U62 FLEXIBLE

An F6011 polyurethane coated nylon cloth membrane reinforced by an F6142 polyamide helix applied with F6077 polyurethane adhesive.

S4 FLEXIBLE

An F6010 red silicone coated glasscloth membrane reinforced by an F6141 metallic helix applied with F6046 silicone adhesive.

S4B FLEXIBLE

An F6083 black silicone coated glasscloth membrane reinforced by an F6141 metallic helix applied with F6046 silicone adhesive.

SPS FLEXIBLE

An F6010 red silicone coated glasscloth membrane reinforced by an F6140 non-metallic helix applied with F6046 silicone adhesive.

148.2.1 PRODUCT DESCRIPTIONS (Cont.)

SPSB FLEXIBLE

An F6083 black silicone coated glasscloth membrane reinforced by an F6140 non-metallic helix applied with F6046 silicone adhesive.

PD SEMI-RIGID

A glass reinforced plastic (GRP) laminate consisting of F6033 glasscloth with F6074 PAS adhesive (F6143 matrix deposit). May also include layer(s) of F6034 fine glasscloth and/or F6205 leno glasscloth.

PDA SEMI-RIGID

A fibre reinforced plastic (FRP) laminate consisting of F6033 glasscloth and F6227 aramid cloth with F6074 PAS adhesive (F6143 matrix deposit). May also include layer(s) of F6034 fine glasscloth and/or F6205 leno glasscloth.

PDC SEMI-RIGID

An FRP laminate consisting of F6033 glasscloth reinforced with laminations of F6226 carbon cloth with F6074 PAS adhesive (F6143 matrix deposit). May also include layer(s) of F6034 fine glasscloth and/or F6205 leno glasscloth and/or F6227 aramid cloth.

PDS SEMI-RIGID

A GRP laminate consisting of F6034 and F6033 glasscloth with F6074 PAS adhesive (F6143 matrix deposit) reinforced by an F6141 metallic helix.

PDF RIGID

A GRP laminate consisting of F6034 and F6033 glasscloth with F6074 adhesive (F6143 matrix deposit) and an F6037 rigid white foam core.

PDP RIGID

A GRP laminate consisting of F6033 glasscloth with F6074 adhesive (F6143 matrix deposit) and an F6159 dual wall polycarbonate sheet core.

BLACK SEMI-RIGID AND RIGIDS

Black versions **PDB**, **PDFB** & **PDPB** of **PD**, **PDF** & **PDP** respectively can be produced by incorporating F6162 black metallic oxide dye into the F6074 for the outer layers with no effect on performance. However these still have a shiny finish and where a matte finish is required F6231 matte black epoxy paint is then applied and cured on the completed duct. As this epoxy would directionally have a detrimental effect on FST, these properties have been evaluated to demonstrate qualification for each duct type.

F6069 RIGID

A GRP laminate cured from a 7781 glasscloth containing 46% high performance modified phenolic pre-impregnated resin matrix.

148.3. TEST PROCEDURES

This section of the report illustrates the procedures that are used to attain the results summarised in section 148.1. Testing was carried out at BWT except where another organisation is indicated in a particular procedure.

148.3.1. LEAK RATES

Flexible, semi-rigid and rigid ducts are tested for their leak flow rates. This involved pressurising an enclosed length of ducting and recording the rate at which air leaks through the wall of the duct. The readings are taken when the air pressure inside the duct reaches 1 psig. Ducts are deemed to have failed the test if they exceed the maximum allowable leak flow rate defined as 0.03 ft^3/min/inch diameter/ft length, which is equivalent to 3.245 lpm/ft^2 of surface or 34.93 lpm/m^2. (1 scfm = 28.32 lpm)

148.3.2. SALT WATER IMMERSION

Foot lengths of flexible, semi-rigid and rigid ducts are tested for their resistance to attack by salt water by one of the following two procedures.

A. This test involved checking the ducts for leak rate before and after being immersed in a 3.5% weight by volume salt solution at room temperature (RT), for a period of 7 days. This particular percentage volume of salt is used as it is a similar level to that found in seawater. A duct is considered to have failed if any delamination occurs or the leak flow rate increases above the maximum allowed.

B. Immersion to DEF STAN 07 – 55 (Part 2) Section 4/1 – D5 Severity A, where the samples are submerged to a depth of not less than 0.15m (5.9in) for 2 hours in salt water (5 parts NaCl in 95 parts demineralized water by weight). A duct is considered to have failed if any delamination, crack or structural failure occurs. Tested by GKN Westland Aerospace Ltd., Isle of Wight.

148.3.3. WATER IMMERSION

This test is the same as 148.3.2 procedure A but with ordinary tap water replacing the 3.5% salt solution as the contaminating medium. Again a duct is considered to have failed if any delamination occurs or the leak flow rate increases above the maximum allowed.

148.3.4. AVIATION FLUIDS CONTAMINATION

Determination of whether the materials used in the duct construction can withstand the deleterious effects of fluid contaminants according to two procedures as follows:

A Small plaques of each type of duct, 2in x 4in, are used for each of the contaminants to be tested. The contaminants are brush applied at ambient (RT) to each test plaque and left for 24 hours before the next application of contaminant.

148.3.4 AVIATION FLUIDS CONTAMINATION (Cont.)

This is repeated for a total of 10 applications. Samples are checked for any signs of delamination or reinforcement and base cloth deterioration, 24 hours and 72 hours after the final application of contaminants. Any cross contamination would also be classed as a sample failure.

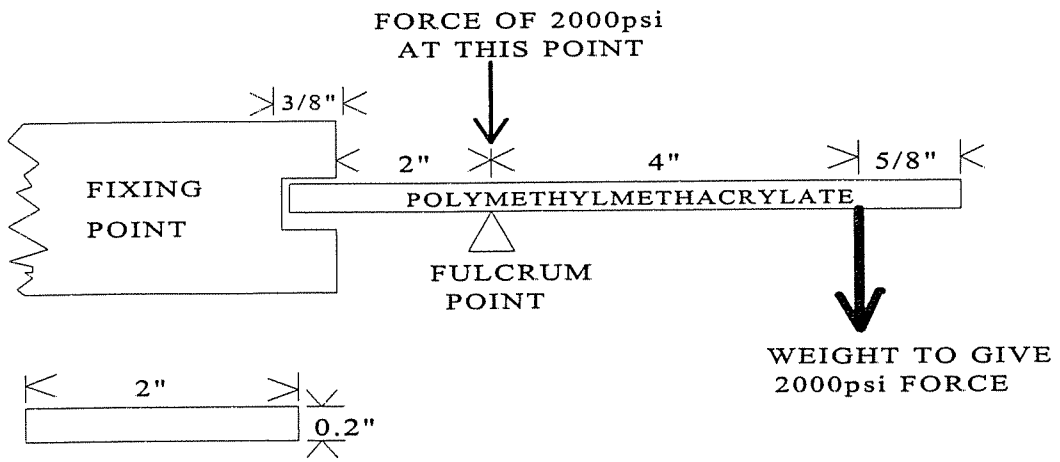
B Fluids Susceptibility according to RTCA/DO – 160D Section 11. Initial tests at the temperatures specified and indicated in the results tables were carried out to the immersion test (11.4.2), but this is considered to be vastly more severe than any condition likely to be encountered in service. Hence any sample that failed on immersion was retested using the spray method (11.4.1), which was specified for all subsequent tests. RAPRA Technology Ltd., Shawbury, carried out this testing.

148.3.5. SOLVENT CONTAMINATION

This test is similar to that described in section 148.3.4 procedure A in that 2in x 4in sample plaques of individual ducts were required for each of the solvents used. The solvents were then applied at ambient (RT) to the plaques at 8 hourly intervals for a total of 10 applications. Inspection of the samples for signs of reinforcement and base cloth deterioration or total delamination was carried out 48 hours after the final application of solvents. Any cross contamination would also be classed as a sample failure.

148.3.6. PLEXIGLAS CRAZING

A test (similar to that defined in AS1501) that determines whether any of the flexible, semi-rigid or rigid ducts will have an effect on acrylics.



End view of PMMA bar.

DIAGRAM 1

148.3.6 PLEXIGLAS CRAZING (Cont.)

The acrylic used is PMMA (polymethylmethacrylate), also known as Plexiglas. (Plexiglas is a tradename of Rohm and Haas). The test requires that 40g of ½in square pieces of ducts are dissolved in 50ml of toluene over a period of 72 hours. 30ml of the resultant solution is collected and the toluene allowed to evaporate off. The final residue is placed over the fulcrum point of a stressed 7in x 2in x 0.2in thick bar of PMMA with a weight, exerting 2000 psi, centrally located 5/8in from the free end, as shown in Diagram 1.

After 48 hours the stressed bars of PMMA were examined for any signs of cracking, crazing or any other form of degradation, which will result in sample failure.

148.3.7. FLAMMABILITY

Flexible, semi-rigid and rigid ducts are tested to determine their self-extinguishing properties. The 12-second vertical procedure used is in accordance with CAA specification 8 part 2.2, equivalent to FAR 25.853, JAR 25.853 and also ABD0031 (AITM2.0002). The tests were carried out at BWT and are reported separately in detail in BWT/TR748.

148.3.8. SMOKE EMISSION

This test is a determination of the density of smoke that is emitted from flexible, semi-rigid and rigid ducts when heated and burned, illustrating whether they would have serious effects on life in the event of an aircraft fire. The tests are carried out in conjunction with 148.3.9 in accordance with the requirements of ABD0031. The tests were carried out following procedure AITM2.0007 at BAE Systems, Woodford and reported separately in detail in BWT/TR748.

148.3.9. TOXIC GAS EMISSION

Ducts are tested to determine the levels of toxic gases that are emitted from the ducts in both flaming and non-flaming conditions, illustrating whether they would have serious effects to life in the event of an aircraft fire. The tests were carried out following procedure AITM3.0005 in conjunction with the 148.3.8 smoke emission tests at BAE Systems, Woodford and also reported separately in detail in BWT/TR748.

148.3.10. ODOUR TESTING

Flexible, semi-rigid and rigid ducts are heated for long periods to determine whether they would emit noxious odours or fumes when operating under normal operating conditions. Samples of ducts are heated for 3 hours at 150°C (302°F), although U62 was heated for 3 hours at 120°C (248°F) due to the nature of its construction. The ducts are then allowed to cool and checked for any signs of odour by passing air at 30°C (86°F) through the ducts at 7 litres per minute (lpm). Failure occurs if any unpleasant or noxious odour is apparent.

148.3.11. PRESSURE TEST AT LOW TEMPERATURE

As this test involves pressure cycling and product manipulation, it can only be carried out on flexible ducts. The test illustrates how flexible ducts are effected by severe conditioning. Each duct is allowed to stabilise at 5 psi for 3 hours. The temperature of the ducts is reduced to -48°C (-55°F) for 1½ hours. Immediately after this cooling period the pressure inside the ducts is varied from 0 psi to 5 psi for 40 cycles whilst flexing the ducts through angles of 45°. After recovering to ambient conditions the duct temperatures are reduced to -72°C (-98°F) and held for a period of 1½ hours. Again, immediately after this cooling period the pressure inside the ducts is varied from 0 psi to 5 psi for 60 cycles whilst the ducts are flexed through angles of 45°. Finally, after recovering to ambient conditions the pressure inside the ducts is varied from 0 psi to 5 psi for a total of 200 cycles again whilst flexing the ducts through angles of 45°. If any signs of cracking, delamination or deterioration occurred the ducts will have failed the test. Leak rates indicate if deterioration occurred, with a higher than maximum allowed leak rate resulting in failure.

148.3.12. PRESSURE TEST AT HIGH TEMPERATURE

This is a similar test to that described in 148.3.11, but carried out at elevated temperatures. Again, it is not possible to carry out this test on semi-rigid or rigid ducts. Leak rates of the ducts are checked before and after testing. The temperature of the ducts is raised to 100°C (212°F) and held for 24 hours. During this time period the ducts are flexed through angles of 45° and the pressure inside varied from 0 psi to 1 psi for 28,800 cycles. The ducts are checked for any signs of delamination and deterioration. If any occurs and the leak rates are found to exceed the maximum allowed, the ducts are deemed to have failed.

148.3.13. FUNGAL TESTING

Flexible, semi-rigid and rigid ducts are tested to demonstrate that the materials from which they are constructed are non-nutrients to mould growth. Catomance Technologies Ltd, Welwyn Garden City, carried out testing in accordance with one of the following procedures:

A MIL-STD-810D method 508.3, using cultures of Aspergillus niger, Aspergillus flavus, Aspergillus versicolor, Penicillium funiculosum and Chaetomium globosum. This is also the basic procedure followed by RTCA/DO – 160D Section 13.

B BS2011 : Part 2.1 J : 28 days : Variant One, using cultures of Aspergillus niger, Aspergillus terreus, Aureobasidium pullulans, Paecilomyces variotii, Penicillium funiculosum, Penicillium ochro-chloron, Scopulariopsis brevicaulis and Trichoderma viride.

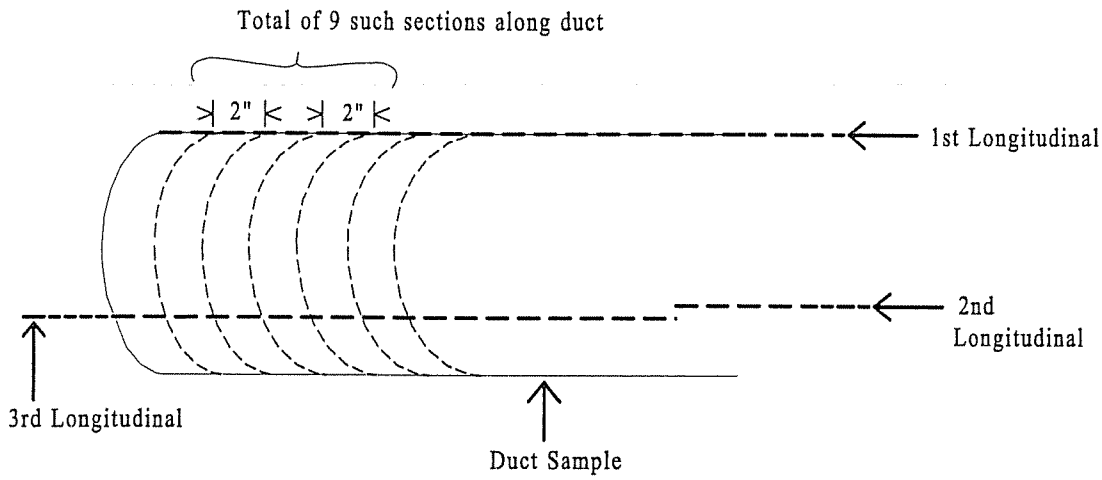
148.3.14. DAMAGE TESTING

Flexible and semi-rigid ducts are tested to destruction. Each duct was divided into 2in sections and marked longitudinally every 120° around the ducting circumference i.e. thus splitting the duct into 3 equal sections (see Diagram 2 on next page).

The ducts are 'crushed' a total of 9 times, prior to rechecking the leak rates, at equidistant intervals around the circumference as follows:

At the first 2in wide section the duct is simultaneously pressed flat and bent double at one of the longitudinal marks as illustrated:

DIAGRAM 2



It is then turned to the second longitudinal mark simultaneously pressed flat and bent double. Finally, it is turned to the third longitudinal mark simultaneously pressed flat and bent double. This is repeated at the fourth 2in section, after exposing the duct to its maximum operating temperature for 2 hours and at the seventh 2in section after exposing the duct to its minimum operating temperature for 2 hours. The leak rate for the duct is rechecked and if it exceeds the maximum allowed the duct is deemed to have failed.

The whole procedure is repeated for the second, fifth and eighth 2in sections and finally for the third, sixth and ninth 2in sections.

148.3.15. CORROSION TESTING

Flexible, semi-rigid and rigid ducts are tested to determine if any of the materials have a corrosive effect on metallic materials. This test involved two aluminium tubes, one $1^1/_2$in outside diameter by 4in in length and the other $1^3/_8$in outside diameter by 4in in length. The inner surface of the $1^1/_2$in tube and outer surface of $1^3/_8$in tube were cleaned free from surface pitting and contamination.

Each material tested was cut into a suitable size to fit tightly between the $1^1/_2$in and $1^3/_8$in tubes, in some cases this required cutting the ducting material into strips. At the same time a control sample was prepared using filter paper in place of the ducting material. All of the samples are then conditioned for 72 hours at 80°C (176°F). The duct was deemed to have failed if there is evidence of corrosion or contamination on the tube surfaces that were in contact with the ducting material.

148.4. TEST RESULTS

To aid information retrieval results corresponding to each test procedure are always listed in the same product order commencing with flexibles, followed by semi-rigids, and finally rigids. This gives the order by BWT product type wherever tested as:

U62, **S4**, **S4B**, **SPS**, **SPSB** (flexibles)
PD, **PDA**, **PDC**, **PDS** (semi-rigids)
PDF, **PDFB**, **PDP** & **PDPB** (rigids)

148.4.1. LEAK RATE

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS AND RIGIDS LISTED**

TYPE	DUCT	SIZE, in	LEAK RATE, lpm	
			ACTUAL	MAX ALLOWED
FLEXIBLE	**U62**	2.25 ID	1.3	1.9
	S4	2.5 ID	0.00	2.1
	SPS	2.0 ID	0.6	1.7
SEMI-RIGID	**PD**	2.0 ID	0.0	1.7
	PDA	3.0 ID	0.6	2.5
	PDC	4.0 ID	0.7	3.4
	PDS	2.0 ID	1.1	1.7
RIGID	**PDF**	2.25 square	2.2	2.4
	PDP	2.25 square	1.8	2.4

NOTES
1 In all cases lpm refers to litres per minute.
2 28.32 lpm = 1 scfm

CONCLUSION

All the ducting tested satisfactorily and did not exceed the maximum allowed leak rate. (Note : All ducting is quality control tested to specified leak rate requirements as part of the acceptance test procedure.)

148.4.2. SALT WATER IMMERSION

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS & RIGIDS LISTED**

TYPE	DUCT	SIZE, in	LEAK RATE, lpm				OBSERVATIONS
			INITIAL	INTER-MEDIATE	FINAL	MAX ALLOWED	
TESTED TO PROCEDURE A							
FLEXIBLE	**U62**	2.0 ID	1.0	0.6	1.1	1.7	No delamination
	S4	2.0 ID	1.4	0.8	0.9	1.7	No failure
	SPS	2.0 ID	0.8	0.8	0.8	1.7	No effect.
SEMI-RIGID	**PD**	2.0 ID	0.4	0.8	0.8	1.7	No delamination
	PDS	4.0 ID	0.7	0.7	0.9	3.4	No failure
RIGID	**PDF**	2.25 square	2.2	0.7	1.7	2.4	No effect
	PDP	2.25 square	1.8	0.8	0.8	2.4	No failure
TESTED TO PROCEDURE B							
SEMI-RIGID	**PDA**	4.0 ID	No delamination or structural failure.				
	PDC	4.0 ID	No delamination or structural failure.				

NOTE Wherever used lpm refers to litres per minute.

CONCLUSION

All the ducts were found to have satisfactorily passed the requirements of the test. Neither the leak rates were found to have exceeded the maximum allowable, nor were any signs of delamination or deterioration found. If any of the ducts are contaminated with salt water the functionality and structure of the parts will not be affected in any way.

148.4.3. WATER IMMERSION

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS AND RIGIDS LISTED**

TYPE	DUCT	OBSERVATIONS
FLEXIBLE	U62	No detrimental effect was evident.
	S4	No detrimental effect was evident.
	SPS	No detrimental effect was evident.
SEMI-RIGID	PD	Duct not affected by water immersion.
	PDA	Duct not affected by water immersion.
	PDC	Duct not affected by water immersion.
	PDS	Duct not affected by water immersion.
RIGID	PDF	No delamination or structural failure.
	PDP	No delamination or structural failure.

CONCLUSION

All ducts tested passed the requirements of this test with no evidence of delamination or deterioration. If any of the ducts are contaminated with water the functionality and structure of the parts will not be affected in any way.

148.4.4. AVIATION FLUIDS CONTAMINATION

PROCEDURE: A (at room temperature)

MATERIAL TESTED: **U62 FLEXIBLE**

STANDARD	TYPE	CONTAMINANT	OBSERVATIONS
DERD 2494	FUEL	AVTUR / JET A1	UNAFFECTED
MIL-T-5624, DERD 2454	FUEL	JP4	UNAFFECTED
MIL-T-5624, DERD 2452	FUEL	JP5	UNAFFECTED
MIL-T-83133, DERD 2453	FUEL	JP8	UNAFFECTED
MIL-L-7808J, 0148	LUBRICATING OIL	AEROSHELL TURBINE OIL 308	UNAFFECTED
AS1241 HIGH DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL 500B4	UNAFFECTED
MIL-H-83282C, DTD 585	HYDRAULIC OIL (SYNTHETIC)	AEROSHELL FLUID 31	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	CHEVRON HYJET IV	UNAFFECTED
	HYDRAULIC FLUID (SILICATE ESTER)	CHEVRON ORONITE M2V	UNAFFECTED
MIL-F-5566, TT-I-735B	ANTI-ICING	AEROSHELL COMPOUND 06A	UNAFFECTED
OX7	LUBRICATING OIL	AEROSHELL TURBINE OIL 390	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL LD4	UNAFFECTED
	LUBRICATING OIL (TURBINE)	ESSO 274	UNAFFECTED
DERD 2487, OX38	LUBRICATING OIL (TURBINE)	AEROSHELL 750	UNAFFECTED
MIL-L-23699	LUBRICATING OIL	AEROSHELL TURBINE OIL 500	UNAFFECTED
MIL-H-5606	HYDRAULIC OIL	AEROSHELL FLUID 41	UNAFFECTED

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: A (at room temperature)

MATERIAL TESTED: **S4 FLEXIBLE**

STANDARD	TYPE	CONTAMINANT	OBSERVATIONS
DERD 2494	FUEL	AVTUR / JET A1	UNAFFECTED
MIL-T-5624, DERD2454	FUEL	JP4	UNAFFECTED
MIL-T-5624, DERD2452	FUEL	JP5	UNAFFECTED
MIL-T-83133, DERD 2453	FUEL	JP8	UNAFFECTED
MIL-L-7808J, 0148	LUBRICATING OIL	AEROSHELL TURBINE OIL 308	UNAFFECTED
AS1241 HIGH DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL 500B4	UNAFFECTED
MIL-H-83282C, DTD 585	HYDRAULIC OIL (SYNTHETIC)	AEROSHELL FLUID 31	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	CHEVRON HYJET IV	UNAFFECTED
	HYDRAULIC FLUID (SILICATE ESTER)	CHEVRON ORONITE M2V	UNAFFECTED
MIL-F-5566, TT-I-735B	ANTI-ICING	AEROSHELL COMPOUND 06A	UNAFFECTED
OX7	LUBRICATING OIL	AEROSHELL TURBINE OIL 390	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL LD4	UNAFFECTED
	LUBRICATING OIL (TURBINE)	ESSO 274	UNAFFECTED
DERD 2487, OX38	LUBRICATING OIL (TURBINE)	AEROSHELL 750	UNAFFECTED
MIL-L-23699	LUBRICATING OIL	AEROSHELL URBINE OIL 500	UNAFFECTED
MIL-H-5606	HYDRAULIC OIL	AEROSHELL FLUID 41	UNAFFECTED

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: A (at room temperature)

MATERIAL TESTED: **SPS FLEXIBLE**

STANDARD	TYPE	CONTAMINANT	OBSERVATIONS
DERD 2494	FUEL	AVTUR / JET A1	UNAFFECTED
MIL-T-5624, DERD 2454	FUEL	JP4	UNAFFECTED
MIL-T-5624, DERD 2452	FUEL	JP5	UNAFFECTED
MIL-T-83133, DERD 2453	FUEL	JP8	UNAFFECTED
MIL-L-7808J, 0148	LUBRICATING OIL	AEROSHELL TURBINE OIL 308	UNAFFECTED
AS1241 HIGH DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL 500B4	UNAFFECTED
MIL-H-83282C, DTD 585	HYDRAULIC OIL (SYNTHETIC)	AEROSHELL FLUID 31	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	CHEVRON HYJET IV	UNAFFECTED
	HYDRAULIC FLUID (SILICATE ESTER)	CHEVRON ORONITE M2V	UNAFFECTED
MIL-F-5566, TT-I-735B	ANTI-ICING	AEROSHELL COMPOUND 06A	UNAFFECTED
OX7	LUBRICATING OIL	AEROSHELL TURBINE OIL 390	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL LD4	UNAFFECTED
	LUBRICATING OIL (TURBINE)	ESSO 274	UNAFFECTED
DERD 2487, OX38	LUBRICATING OIL (TURBINE)	AEROSHELL 750	UNAFFECTED
MIL-L-23699	LUBRICATING OIL	AEROSHELL TURBINE OIL 500	UNAFFECTED
MIL-H-5606	HYDRAULIC OIL	AEROSHELL FLUID 41	UNAFFECTED

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: A (at room temperature)

MATERIAL TESTED: **PD SEMI-RIGID**

STANDARD	TYPE	CONTAMINANT	OBSERVATIONS
DERD 2494	FUEL	AVTUR / JET A1	UNAFFECTED
MIL-T-5624, DERD 2454	FUEL	JP4	UNAFFECTED
MIL-T-5624, DERD 2452	FUEL	JP5	UNAFFECTED
MIL-T-83133, DERD 2453	FUEL	JP8	UNAFFECTED
MIL-L-7808J, 0148	LUBRICATING OIL	AEROSHELL TURBINE OIL 308	UNAFFECTED
AS1241 HIGH DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL 500B4	UNAFFECTED
MIL-H-83282C, DTD 585	HYDRAULIC OIL (SYNTHETIC)	AEROSHELL FLUID 31	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	CHEVRON HYJET IV	UNAFFECTED
	HYDRAULIC FLUID (SILICATE ESTER)	CHEVRON ORONITE M2V	UNAFFECTED
MIL-F-5566, TT-I-735B	ANTI-ICING	AEROSHELL COMPOUND 06A	UNAFFECTED
OX7	LUBRICATING OIL	AEROSHELL TURBINE OIL 390	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL LD4	UNAFFECTED
	LUBRICATING OIL (TURBINE)	ESSO 274	UNAFFECTED
DERD 2487, OX38	LUBRICATING OIL (TURBINE)	AEROSHELL 750	UNAFFECTED
MIL-L-23699	LUBRICATING OIL	AEROSHELL TURBINE OIL 500	UNAFFECTED
MIL-H-5606	HYDRAULIC OIL	AEROSHELL FLUID 41	UNAFFECTED

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: A (at room temperature)

MATERIAL TESTED: **PDS SEMI-RIGID**

STANDARD	TYPE	CONTAMINANT	OBSERVATIONS
DERD 2494	FUEL	AVTUR / JET A1	UNAFFECTED
MIL-T-5624, DERD 2454	FUEL	JP4	UNAFFECTED
MIL-T-5624, DERD 2452	FUEL	JP5	UNAFFECTED
MIL-T-83133, DERD 2453	FUEL	JP8	UNAFFECTED
MIL-L-7808J, 0148	LUBRICATING OIL	AEROSHELL TURBINE OIL 308	UNAFFECTED
AS1241 HIGH DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL 500B4	UNAFFECTED
MIL-H-83282C, DTD 585	HYDRAULIC OIL (SYNTHETIC)	AEROSHELL FLUID 31	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	CHEVRON HYJET IV	UNAFFECTED
	HYDRAULIC FLUID (SILICATE ESTER)	CHEVRON ORONITE M2V	UNAFFECTED
MIL-F-5566, TT-I-735B	ANTI-ICING	AEROSHELL COMPOUND 06A	UNAFFECTED
OX7	LUBRICATING OIL	AEROSHELL TURBINE OIL 390	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL LD4	UNAFFECTED
	LUBRICATING OIL (TURBINE)	ESSO 274	UNAFFECTED
DERD 2487, OX38	LUBRICATING OIL (TURBINE)	AEROSHELL 750	UNAFFECTED
MIL-L-23699	LUBRICATING OIL	AEROSHELL TURBINE OIL 500	UNAFFECTED
MIL-H-5606	HYDRAULIC OIL	AEROSHELL FLUID 41	UNAFFECTED

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: A (at room temperature)

MATERIAL TESTED: **PDF RIGID**

STANDARD	TYPE	CONTAMINANT	OBSERVATIONS
DERD 2494	FUEL	AVTUR / JET A1	UNAFFECTED
MIL-T-5624, DERD 2454	FUEL	JP4	UNAFFECTED
MIL-T-5624, DERD 2452	FUEL	JP5	UNAFFECTED
MIL-T-83133, DERD 2453	FUEL	JP8	UNAFFECTED
MIL-L-7808J, 0148	LUBRICATING OIL	AEROSHELL TURBINE OIL 308	UNAFFECTED
AS1241 HIGH DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL 500B4	UNAFFECTED
MIL-H-83282C, DTD 585	HYDRAULIC OIL (SYNTHETIC)	AEROSHELL FLUID 31	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	CHEVRON HYJET IV	UNAFFECTED
	HYDRAULIC FLUID (SILICATE ESTER)	CHEVRON ORONITE M2V	UNAFFECTED
MIL-F-5566, TT-I-735B	ANTI-ICING	AEROSHELL COMPOUND 06A	UNAFFECTED
OX7	LUBRICATING OIL	AEROSHELL TURBINE OIL 390	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL LD4	UNAFFECTED
	LUBRICATING OIL (TURBINE)	ESSO 274	UNAFFECTED
DERD 2487, OX38	LUBRICATING OIL (TURBINE)	AEROSHELL 750	UNAFFECTED
MIL-L-23699	LUBRICATING OIL	AEROSHELL TURBINE OIL 500	UNAFFECTED
MIL-H-5606	HYDRAULIC OIL	AEROSHELL FLUID 41	UNAFFECTED

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: A (at room temperature)

MATERIAL TESTED: **PDP RIGID**

STANDARD	TYPE	CONTAMINANT	OBSERVATIONS
DERD 2494	FUEL	AVTUR / JET A1	UNAFFECTED
MIL-T-5624, DERD 2454	FUEL	JP4	UNAFFECTED
MIL-T-5624, DERD 2452	FUEL	JP5	UNAFFECTED
MIL-T-83133, DERD 2453	FUEL	JP8	UNAFFECTED
MIL-L-7808J, 0148	LUBRICATING OIL	AEROSHELL TURBINE OIL 308	UNAFFECTED
AS1241 HIGH DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL 500B4	UNAFFECTED
MIL-H-83282C, DTD 585	HYDRAULIC OIL (SYNTHETIC)	AEROSHELL FLUID 31	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	CHEVRON HYJET IV	UNAFFECTED
	HYDRAULIC FLUID (SILICATE ESTER)	CHEVRON ORONITE M2V	UNAFFECTED
MIL-F-5566, TT-I-735B	ANTI-ICING	AEROSHELL COMPOUND 06A	UNAFFECTED
OX7	LUBRICATING OIL	AEROSHELL TURBINE OIL 390	UNAFFECTED
AS1241 LOW DENSITY	HYDRAULIC OIL (PHOSPHATE ESTER)	MONSANTO SKYDROL LD4	UNAFFECTED
	LUBRICATING OIL (TURBINE)	ESSO 274	UNAFFECTED
DERD 2487, OX38	LUBRICATING OIL (TURBINE)	AEROSHELL 750	UNAFFECTED
MIL-L-23699	LUBRICATING OIL	AEROSHELL TURBINE OIL 500	UNAFFECTED
MIL-H-5606	HYDRAULIC OIL	AEROSHELL FLUID 41	UNAFFECTED

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: B (Test types – I for Immersion, S for Spray)

MATERIAL TESTED: **U62 FLEXIBLE**

FLUID CLASS	TEST FLUID	TEST TYPE	TEMP. °C	OBSERVATIONS
AVIATION FUELS	Turbine, Jet A-1	S	23 ± 2	No obvious damage
	Piston Engine, Avgas 100LL	I	40 ± 1	No obvious damage
HYDRAULIC FLUIDS	Mineral Based, OM-65	S	80 ± 1	No obvious damage
	Non-mineral Based, OX-40	I	50 ± 1	No obvious damage
	Phosphate Ester-Based (Synthetic), Skydrol 500B4	I	70 ± 1	No obvious damage
	Silicate Ester-Based (Synthetic), Chevron M2V	I	80 ± 1	No obvious damage
	Silicone Based (Synthetic), Dow Corning 200/200Cs	I	80 ± 1	No obvious damage
	Synthetic Hydrocarbon Based, Brayco Micronic 882	I	70 ± 1	No detrimental damage Stained pink
LUBRICATING OILS	Mineral Based, Aeroshell 100	I	70 ± 1	No detrimental damage Stained yellow
	Ester Based, Anderol 774	S	150 ± 1	No detrimental damage Stained brownish
SOLVENTS & CLEANING FLUIDS	Isopropyl Alcohol	I	50 ± 1	No obvious damage
	Denatured Alcohol	I	50 ± 1	No obvious damage
	1,1,1-Trichloroethane	S	50 ± 1	No obvious damage
	Detergent TS 10281, Aviawash 2000	I	23 ± 2	No obvious damage
DE-ICING FLUIDS	Ethylene Glycol	I	50 ± 1	No obvious damage
	Propylene Glycol	I	50 ± 1	No detrimental damage Discoloured
	AEA Type 1, Kilfrost DF	I	50 ± 1	No obvious damage
	AEA Type 2, Kilfrost ABC-3	I	50 ± 1	No obvious damage
	Runway, 25% Urea and 25% Ethylene Glycol in Water	I	23 ± 2	No obvious damage
	Runway, 50% Potassium Acetate in Water	I	23 ± 2	No obvious damage
INSECTICIDES	Dichlorvos-Based	S	23 ± 2	No detrimental damage Slightly discoloured
	Pyrethrum-Based	I	23 ± 2	No obvious damage
SULLAGE	Killgerm Chemical Closet Fluid	I	23 ± 2	No detrimental damage Stained blue

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: B (Test types – I for Immersion, S for Spray)

MATERIAL TESTED: **SPS FLEXIBLE**

FLUID CLASS	TEST FLUID	TEST TYPE	TEMP. °C	OBSERVATIONS
AVIATION FUELS	Turbine, Jet A-1	S	23 ± 2	No obvious damage
	Piston Engine, Avgas 100LL	S	23 ± 2	No obvious damage
HYDRAULIC FLUIDS	Mineral Based, OM-65	I	80 ± 1	No obvious damage
	Non-mineral Based, OX-40	I	50 ± 1	No obvious damage
	Phosphate Ester-Based (Synthetic), Skydrol 500B4	I	70 ± 1	No obvious damage
	Silicate Ester-Based (Synthetic), Chevron M2V	I	80 ± 1	No obvious damage
	Silicone Based (Synthetic), Dow Corning 200/200Cs	I	80 ± 1	No obvious damage
	Synthetic Hydrocarbon Based, Brayco Micronic 882	I	70 ± 1	No obvious damage
LUBRICATING OILS	Mineral Based, Aeroshell 100	I	70 ± 1	No obvious damage
	Ester Based, Anderol 774	I	150 ± 1	No obvious damage
SOLVENTS & CLEANING FLUIDS	Isopropyl Alcohol	I	50 ± 1	No obvious damage
	Denatured Alcohol	I	50 ± 1	No obvious damage
	1,1,1-Trichloroethane	S	50 ± 1	No obvious damage
	Detergent TS 10281, Aviawash 2000	I	23 ± 2	No obvious damage
DE-ICING FLUIDS	Ethylene Glycol	I	50 ± 1	No obvious damage
	Propylene Glycol	I	50 ± 1	No obvious damage
	AEA Type 1, Kilfrost DF	I	50 ± 1	No obvious damage
	AEA Type 2, Kilfrost ABC-3	I	50 ± 1	No obvious damage
	Runway, 25% Urea and 25% Ethylene Glycol in Water	I	23 ± 2	No obvious damage
	Runway, 50% Potassium Acetate in Water	I	23 ± 2	No obvious damage
INSECTICIDES	Dichlorvos-Based	I	23 ± 2	No obvious damage
	Pyrethrum-Based	I	23 ± 2	No obvious damage
SULLAGE	Killgerm Chemical Closet Fluid	I	23 ± 2	No detrimental damage Stained blue

NOTE The above results also qualify **S4** by similarity as the thermoplastic helix in **SPS** is replaced by a stainless steel helix.

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: B (Test types – I for Immersion, S for Spray)

MATERIAL TESTED: **PD SEMI-RIGID**

FLUID CLASS	TEST FLUID	TEST TYPE	TEMP. °C	OBSERVATIONS
AVIATION FUELS	Turbine, Jet A-1	I	40 ± 1	No obvious damage
	Piston Engine, Avgas 100LL	I	40 ± 1	No obvious damage
HYDRAULIC FLUIDS	Mineral Based, OM-65	I	80 ± 1	No obvious damage
	Non-mineral Based, OX-40	I	50 ± 1	No obvious damage
	Phosphate Ester-Based (Synthetic), Skydrol 500B4	I	70 ± 1	No obvious damage
	Silicate Ester-Based (Synthetic), Chevron M2V	I	80 ± 1	No obvious damage
	Silicone Based (Synthetic), Dow Corning 200/200Cs	I	80 ± 1	No obvious damage
	Synthetic Hydrocarbon Based, Brayco Micronic 882	I	70 ± 1	No detrimental damage Stained pink
LUBRICATING OILS	Mineral Based, Aeroshell 100	I	70 ± 1	No detrimental damage Stained yellow
	Ester Based, Anderol 774	I	150 ± 1	No detrimental damage Some discolouration
SOLVENTS & CLEANING FLUIDS	Isopropyl Alcohol	I	50 ± 1	No obvious damage
	Denatured Alcohol	I	50 ± 1	No obvious damage
	1,1,1-Trichloroethane	S	50 ± 1	No obvious damage
	Detergent TS 10281, Aviawash 2000	I	23 ± 2	No obvious damage
DE-ICING FLUIDS	Ethylene Glycol	I	50 ± 1	No obvious damage
	Propylene Glycol	I	50 ± 1	No obvious damage
	AEA Type 1, Kilfrost DF	I	50 ± 1	No obvious damage
	AEA Type 2, Kilfrost ABC-3	I	50 ± 1	No obvious damage
	Runway, 25% Urea and 25% Ethylene Glycol in Water	I	23 ± 2	No obvious damage
	Runway, 50% Potassium Acetate in Water	I	23 ± 2	No obvious damage
INSECTICIDES	Dichlorvos-Based	I	23 ± 2	No obvious damage
	Pyrethrum-Based	I	23 ± 2	No obvious damage
SULLAGE	Killgerm Chemical Closet Fluid	I	23 ± 2	No detrimental damage Stained blue

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: B (Test types – I for Immersion, S for Spray)

MATERIAL TESTED: **PDA SEMI-RIGID**

FLUID CLASS	TEST FLUID	TEST TYPE	TEMP. °C	OBSERVATIONS
AVIATION FUELS	Turbine, Jet A-1	S	23 ± 2	No detrimental damage Surface dulled
	Piston Engine, Avgas 100LL	S	23 ± 2	No detrimental damage Surface blotchy / dulled
HYDRAULIC FLUIDS	Mineral Based, OM-65	S	80 ± 1	No detrimental damage Surface yellower / transparent
	Non-mineral Based, OX-40	S	50 ± 1	No detrimental damage More yellow / transparent
	Phosphate Ester-Based (Synthetic), Skydrol 500B4	S	70 ± 1	No detrimental damage Dulled, more transparent / flexible
	Silicate Ester-Based (Synthetic), Chevron M2V	S	80 ± 1	No detrimental damage Dulled, more transparent / flexible
	Silicone Based (Synthetic), Dow Corning 200/200Cs	S	80 ± 1	No detrimental damage More yellow / transparent
	Synthetic Hydrocarbon Based, Brayco Micronic 882	S	70 ± 1	No detrimental damage Slightly darker / transparent / flexible
LUBRICATING OILS	Mineral Based, Aeroshell 100	S	70 ± 1	No detrimental damage More yellow / transparent
	Ester Based, Anderol 774	S	150 ± 1	No detrimental damage Darker, more transparent / flexible
SOLVENTS & CLEANING FLUIDS	Isopropyl Alcohol	S	50 ± 1	No detrimental damage Surface dulled
	Denatured Alcohol	S	50 ± 1	No detrimental damage Surface dulled
	Detergent Def-Stan 79-17, Ardox 6092	S	23 ± 2	No detrimental damage Surface dulled
DE-ICING FLUIDS	Ethylene Glycol	S	50 ± 1	No detrimental damage Darker, more transparent
	Propylene Glycol	S	50 ± 1	No detrimental damage Slightly darker, more transparent
	AEA Type 1, Kilfrost DF	S	50 ± 1	No detrimental damage Slightly darker / transparent / flexible
	AEA Type 2, Kilfrost ABC-3	S	50 ± 1	No detrimental damage Slightly darker / transparent / flexible
	Runway, 25% Urea and 25% Ethylene Glycol in Water	S	23 ± 2	No detrimental damage Slightly darker / transparent
	Runway, 50% Potassium Acetate in Water	S	23 ± 2	No detrimental damage Slightly darker / transparent
INSECTICIDES	Dichlorvos-Based	S	23 ± 2	No detrimental damage Surface very slightly dulled
	Pyrethrum-Based	S	23 ± 2	No detrimental damage Surface very slightly dulled
SULLAGE	Killgerm Chemical Closet Fluid	S	23 ± 2	No detrimental damage Stained blue

NOTE The above results relate only to the aramid layer 'external' surface as the opposite 'internal' surface is always glass reinforced and its performance will be as given for PD.

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: B (Test types – I for Immersion, S for Spray)

MATERIAL TESTED: **PDC SEMI-RIGID**

FLUID CLASS	TEST FLUID	TEST TYPE	TEMP. °C	OBSERVATIONS
AVIATION FUELS	Turbine, Jet A-1	S	23 ± 2	No obvious damage
	Piston Engine, Avgas 100LL	S	23 ± 2	No obvious damage
HYDRAULIC FLUIDS	Mineral Based, OM-65	S	80 ± 1	No obvious damage
	Non-mineral Based, OX-40	S	50 ± 1	No obvious damage
	Phosphate Ester-Based (Synthetic), Skydrol 500B4	S	70 ± 1	No detrimental damage Dulled, more flexible
	Silicate Ester-Based (Synthetic), Chevron M2V	S	80 ± 1	No obvious damage
	Silicone Based (Synthetic), Dow Corning 200/200Cs	S	80 ± 1	No obvious damage
	Synthetic Hydrocarbon Based, Brayco Micronic 882	S	70 ± 1	No obvious damage
LUBRICATING OILS	Mineral Based, Aeroshell 100	S	70 ± 1	No obvious damage
	Ester Based, Anderol 774	S	150 ± 1	No obvious damage
SOLVENTS & CLEANING FLUIDS	Isopropyl Alcohol	S	50 ± 1	No change
	Denatured Alcohol	S	50 ± 1	No change
	Detergent Def-Stan 79-17, Ardox 6092	S	23 ± 2	No change
DE-ICING FLUIDS	Ethylene Glycol	S	50 ± 1	No obvious damage
	Propylene Glycol	S	50 ± 1	No obvious damage
	AEA Type 1, Kilfrost DF	S	50 ± 1	No obvious damage
	AEA Type 2, Kilfrost ABC-3	S	50 ± 1	No obvious damage
	Runway, 25% Urea and 25% Ethylene Glycol in Water	S	23 ± 2	No obvious damage
	Runway, 50% Potassium Acetate in Water	S	23 ± 2	No obvious damage
INSECTICIDES	Dichlorvos-Based	S	23 ± 2	No change
	Pyrethrum-Based	S	23 ± 2	No change
SULLAGE	Killgerm Chemical Closet Fluid	S	23 ± 2	No obvious damage

NOTE The above results relate only to the carbon layer 'external' surface as the opposite 'internal' surface is always glass reinforced and its performance will be as given for PD.

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: B (Test types -- I for Immersion, S for Spray)

MATERIAL TESTED: **PDF RIGID**

FLUID CLASS	TEST FLUID	TEST TYPE	TEMP. °C	OBSERVATIONS
AVIATION FUELS	Turbine, Jet A-1	I	40 ± 1	No obvious damage Slightly discoloured
	Piston Engine, Avgas 100LL	I	40 ± 1	No obvious damage Slightly discoloured
HYDRAULIC FLUIDS	Mineral Based, OM-65	I	80 ± 1	No obvious damage Turned yellow
	Non-mineral Based, OX-40	I	50 ± 1	No obvious damage
	Phosphate Ester-Based (Synthetic), Skydrol 500B4	I	70 ± 1	No obvious damage
	Silicate Ester-Based (Synthetic), Chevron M2V	I	80 ± 1	No obvious damage Slight yellowing
	Silicone Based (Synthetic), Dow Corning 200/200Cs	I	80 ± 1	No obvious damage
	Synthetic Hydrocarbon Based, Brayco Micronic 882	I	70 ± 1	No detrimental damage Stained pink
LUBRICATING OILS	Mineral Based, Aeroshell 100	I	70 ± 1	No detrimental damage Stained yellow
	Ester Based, Anderol 774	I	150 ± 1	No detrimental damage Some discolouration
SOLVENTS & CLEANING FLUIDS	Isopropyl Alcohol	I	50 ± 1	No obvious damage
	Denatured Alcohol	S	50 ± 1	Some inward shrinking of the walls could reduce strength
	1,1,1-Trichloroethane	I	50 ± 1	No obvious damage
	Detergent TS 10281, Aviawash 2000	I	23 ± 2	No obvious damage
DE-ICING FLUIDS	Ethylene Glycol	I	50 ± 1	Slight shrinkage / distortion
	Propylene Glycol	I	50 ± 1	No obvious damage
	AEA Type 1, Kilfrost DF	I	50 ± 1	No obvious damage
	AEA Type 2, Kilfrost ABC-3	I	50 ± 1	No obvious damage
	Runway, 25% Urea and 25% Ethylene Glycol in Water	S	23 ± 2	No obvious damage Very slightly discoloured
	Runway, 50% Potassium Acetate in Water	I	23 ± 2	No obvious damage
INSECTICIDES	Dichlorvos-Based	I	23 ± 2	No obvious damage
	Pyrethrum-Based	I	23 ± 2	No obvious damage
SULLAGE	Killgerm Chemical Closet Fluid	I	23 ± 2	No detrimental damage Stained blue

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

PROCEDURE: B (Test types – I for Immersion, S for Spray)

MATERIAL TESTED: **PDP RIGID**

FLUID CLASS	TEST FLUID	TEST TYPE	TEMP. °C	OBSERVATIONS
AVIATION FUELS	Turbine, Jet A-1	I	40 ± 1	No obvious damage Slightly discoloured
	Piston Engine, Avgas 100LL	I	40 ± 1	No obvious damage Slightly discoloured
HYDRAULIC FLUIDS	Mineral Based, OM-65	I	80 ± 1	No obvious damage Turned yellow
	Non-mineral Based, OX-40	I	50 ± 1	No obvious damage
	Phosphate Ester-Based (Synthetic), Skydrol 500B4	I	70 ± 1	No obvious damage
	Silicate Ester-Based (Synthetic), Chevron M2V	I	80 ± 1	No obvious damage Slight yellowing
	Silicone Based (Synthetic), Dow Corning 200/200Cs	I	80 ± 1	No obvious damage
	Synthetic Hydrocarbon Based, Brayco Micronic 882	I	70 ± 1	No detrimental damage Stained pink
LUBRICATING OILS	Mineral Based, Aeroshell 100	I	70 ± 1	No detrimental damage Stained yellow
	Ester Based, Anderol 774	I	150 ± 1	No detrimental damage Some discolouration
SOLVENTS & CLEANING FLUIDS	Isopropyl Alcohol	I	50 ± 1	No obvious damage
	Denatured Alcohol	I	50 ± 1	No obvious damage
	1,1,1-Trichloroethane	I	50 ± 1	No obvious damage
	Detergent TS 10281, Aviawash 2000	I	23 ± 2	No obvious damage
DE-ICING FLUIDS	Ethylene Glycol	I	50 ± 1	No obvious damage
	Propylene Glycol	I	50 ± 1	No obvious damage
	AEA Type 1, Kilfrost DF	I	50 ± 1	No obvious damage
	AEA Type 2, Kilfrost ABC-3	I	50 ± 1	No obvious damage
	Runway, 25% Urea and 25% Ethylene Glycol in Water	S	23 ± 2	No obvious damage Slightly discoloured
	Runway, 50% Potassium Acetate in Water	I	23 ± 2	No obvious damage
INSECTICIDES	Dichlorvos-Based	I	23 ± 2	No obvious damage
	Pyrethrum-Based	I	23 ± 2	No obvious damage
SULLAGE	Killgerm Chemical Closet Fluid	I	23 ± 2	No detrimental damage Stained blue

148.4.4 AVIATION FLUIDS CONTAMINATION (Cont.)

CONCLUSION

All of the ducts were found to be unaffected in any way when they were coated with the contaminants listed in procedure A. The far greater range of fluids tested to the much greater severity procedure B only produced minor effects that were insufficient to render the ducts unfit for purpose. Therefore these ducts are suitable for use on all types of aircraft, where they may come into accidental and/or incidental contact with any of the contaminants that have been listed.

Although included in some of the above results tables, Trichloroethane is no longer being used for testing because it is a banned substance. Consequently contact with duct surfaces should be avoided in all circumstances.

148.4.5. SOLVENT CONTAMINATION

MATERIALS TESTED: **U62, S4 AND SPS FLEXIBLES** (at room temperature)

DUCT TESTED	SOLVENT	OBSERVATIONS	RESULTS
U62	TOLUENE	There was no deterioration.	PASS
	XYLENE	No delamination occurred.	PASS
	BENZENE	The duct was unaffected.	PASS
	ACETONE	No deterioration was apparent.	PASS
	CYCLOHEXANE	The duct was not affected.	PASS
	ISOPROPYL ALCOHOL	No evidence of delamination.	PASS
	WHITE SPIRIT	No signs of deterioration apparent.	PASS
S4	TOLUENE	No affect occurred to the duct.	PASS
	XYLENE	No delamination was found on duct.	PASS
	BENZENE	No deterioration of the duct.	PASS
	ACETONE	The duct was unaffected.	PASS
	CYCLOHEXANE	No apparent deterioration.	PASS
	ISOPROPYL ALCOHOL	No delamination occurred.	PASS
	WHITE SPIRIT	There was no delamination.	PASS
SPS	TOLUENE	No deterioration was apparent.	PASS
	XYLENE	No delamination occurred.	PASS
	BENZENE	The duct was unaffected.	PASS
	ACETONE	No evidence of deterioration.	PASS
	CYCLOHEXANE	No delamination occurred.	PASS
	ISOPROPYL ALCOHOL	No evidence of deterioration.	PASS
	WHITE SPIRIT	The duct was unaffected.	PASS

148.4.5 SOLVENT CONTAMINATION (Cont.)

MATERIALS TESTED: **PD, PDS SEMI-RIGIDS AND PDF RIGID** (at room temperature)

DUCT TESTED	SOLVENT	OBSERVATIONS	RESULTS
PD	TOLUENE	Glaze on the PD was dulled.	PASS
	XYLENE	Glaze on the material dulled.	PASS
	BENZENE	The glaze on the material dulled.	PASS
	ACETONE	The material had totally delaminated.	FAIL
	CYCLOHEXANE	Slight glaze loss on the PD.	PASS
	ISOPROPYL ALCOHOL	Very slight glaze loss on PD.	PASS
	WHITE SPIRIT	The material was unaffected.	PASS
PDS	TOLUENE	Glaze on the PD had dulled.	PASS
	XYLENE	The glaze on the material had dulled.	PASS
	BENZENE	Glaze had dulled and blisters formed.	PASS
	ACETONE	The material had totally delaminated.	FAIL
	CYCLOHEXANE	There was slight loss of glaze on PD.	PASS
	ISOPROPYL ALCOHOL	Very slight loss of glaze on PD.	PASS
	WHITE SPIRIT	The material was not affected.	PASS
PDF	TOLUENE	The glaze on the PD had dulled.	PASS
	XYLENE	The glaze on the material had dulled.	PASS
	BENZENE	The glaze on the material had dulled.	PASS
	ACETONE	All the PD plastic had dissolved out.	FAIL
	CYCLOHEXANE	There was slight loss of PD glaze.	PASS
	ISOPROPYL ALCOHOL	Very slight loss of glaze on PD outer.	PASS
	WHITE SPIRIT	The material was unaffected.	PASS

148.4.5 SOLVENT CONTAMINATION (Cont.)

MATERIALS TESTED: **PDP RIGID** (at room temperature)

DUCT TESTED	SOLVENT	OBSERVATIONS	RESULTS
PDP	TOLUENE	No glaze left, flutes had collapsed.	FAIL
	XYLENE	The material glaze had dulled.	PASS
	BENZENE	Glaze on the material had dulled.	PASS
	ACETONE	The duct had completely collapsed.	FAIL
	CYCLOHEXANE	Slight glaze loss on the PD outer.	PASS
	ISOPROPYL ALCOHOL	Very slight glaze loss on PD outer.	PASS
	WHITE SPIRIT	The material was unaffected.	PASS

CONCLUSIONS

From the results obtained none of the semi-rigid or rigid ducts tested can be used in areas where they come into contact with ketones such as acetone without possible structural collapse. This is due to matrix breakdown of the **PD** material (on **PDP** and **PDF** this is the outer surface material). Although the results illustrate surface glaze loss occurring to **PD** material with all other solvents, there is no evidence that this caused serious affect to the ducting materials. These conclusions can be extended to **PDA** and **PDC** semi-rigid ducts by similarity, the matrix material of each being identical to that of **PD**. Therefore all semi-rigid and rigid types of BWT ducting can safely be used in areas where they may come into accidental and/or incidental contact with the remaining solvents without the functionality and structure of the parts being affected in any way. The only possible exception is excessive exposure of **PDP** to toluene where any damage leading to ingress into the core could cause collapse as found for the sample tested with exposed cross-sectional edges.

All of the flexible ducts were found to be unaffected by any of the solvents that were used for testing. Hence all the BWT flexible ducts can be used in areas where they are likely to come into accidental and/or incidental contact with any of the solvents that have been used without the functionality and structure of the parts being affected in any way.

148.4.6. PLEXIGLAS CRAZING

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS AND RIGIDS LISTED**

TYPE	DUCT	OBSERVATIONS
FLEXIBLE	**U62**	Produced a minute amount of amber liquid.
	S4	Slight amount of amber oil was produced.
	SPS	A small amount of residue was produced.
SEMI-RIGID	**PD**	A small amount of a dry grey residue was produced.
	PDS	Very small amount of a dry grey residue was produced.
RIGID	**PDF**	Gave almost no residue, although what was produced was dry and grey.
	PDP	Produced a reasonable amount of a white dry residue.

CONCLUSION

None of the ducts tested caused cracking, crazing or degradation of the polymethylmethacrylate whilst it was stressed. Therefore these ducts can be considered to be non-reactive if they come into contact with any type of acrylics, i.e. the acrylics will be unaffected.

This conclusion can also be extended by similarity to **PDA** and **PDC** that both have the same matrix as **PD** but additional reinforcement layers (aramid cloth, and/or carbon fibre cloth respectively versus only glasscloth). Neither of these reinforcements are soluble in toluene, and therefore could not influence Plexiglas crazing in this test.

148.4.7. FLAMMABILITY

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS AND RIGIDS LISTED**

TYPE	DUCT	Flame Time & Afterglow Av, seconds (15 Max)	Flame Time of Droppings Av, seconds (5 Max)	Burn Length inches (8 Max)
FLEXIBLE	U62	0	0	2.95
	S4	1	0	1.20
	S4B	2	0	0.60
	SPS	3	0	1.85
	SPSB	3	0	2.20
SEMI-RIGID	PD	1.5	0	2.53
	PDB	1.0	0	2.90
	PDA	0	0	1.45
	PDC	0	0	1.20
RIGID	PDF	2.3	0	2.55
	PDFB	4.0	0	3.20
	PDP	1	0	1.65
	PDPB	1.5	0	1.40

CONCLUSION

All of the ducts tested were found to pass the requirements of the 12-second vertical burn standards listed in 148.3.7. Therefore these ducts can be classed as being self-extinguishing and will not sustain a flame.

148.4.3. SMOKE EMISSION

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS AND RIGIDS LISTED**

TYPE	DUCT	CONDITION	AVERAGE D_m	
			at 1.5 min	at 4 min
FLEXIBLE	U62	Flaming	9	27
		Non-Flaming	4	23
	S4	Flaming	4	9
		Non-Flaming	3	8
	SPS	Flaming	25	60
		Non-Flaming	4	19
	SPSB	Flaming	5	16
		Non-Flaming	1	4
SEMI-RIGID	PD	Flaming	0	1
		Non-Flaming	0	1
	PDB	Flaming	4	8
		Non-Flaming	2	6
	PDA	Flaming	0	1
		Non-Flaming	0	0
	PDC	Flaming	0	1
		Non-Flaming	0	0
RIGID	PDF	Flaming	8	28
		Non-Flaming	1	8
	PDFB	Flaming	9	25
		Non-Flaming	9	11
	PDP	Flaming	0	18
		Non-Flaming	0	0
	PDPB	Flaming	5	16
		Non-Flaming	4	5

NOTES

1 D_m = maximum specific optical density (Limit 100 maximum).
2 **PDS** is qualified by similarity to **PD**, the only difference between the two being that the **PDS** incorporates a non-flammable metallic helix.
3 **S4B** is qualified by similarity to **SPSB**, the only difference between the two being that the **S4B** incorporates a non-flammable metallic reinforcement in place of the non-metallic helix of **SPSB**.
4 When ABD0031 replaced ATS1000.001, smoke measurements for both flaming and non-flaming conditions were reduced from checks at 1.5 and 4 minutes to a single check of maximum specific optical density (average), D_m, at 4 minutes under flaming and non-flaming conditions requiring a value <100 for ventilation ducting. Any material meeting ABD0031 is considered qualified to ATS1000.001.

CONCLUSIONS

All of the flexible, semi-rigid and rigid ducts passed the requirements of ABD0031 issue C for smoke emission. None are expected to cause any problems with regards to the density of the smoke that is emitted when the ducts are exposed to decomposition temperatures and in the event of any fire.

148.4.9. TOXIC GAS EMISSION

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS AND RIGIDS LISTED**

All toxicity average levels are reported in parts per million, where HCN stands for Hydrogen Cyanide, CO for Carbon Monoxide, NO_x for Nitrous gasses, SO_2 for Sulphur Dioxide, H_2S for Hydrogen Sulphide, HCl for Hydrogen Chloride, HF for Hydrogen Fluoride, and HBr for Hydrogen Bromide.

TYPE	DUCT	CONDITION	HCN	CO	NO_X	SO_2/H_2S	HCl	HF	HBr
		Limit	150	1000	100	100	150	150	No limit
FLEXIBLE	U62	Flaming	5	10	2	0	10	3	0
		Non-Flaming	2	<10	3	0	8	0	0
	S4	Flaming	<2	25	0	0	7	<1	0
		Non-Flaming	<2	<10	0	0	9	0	0
	SPS	Flaming	2	50	0	5	8	8	0
		Non-Flaming	2	10	0	1	13	4	0
	SPSB	Flaming	<2	50	0	1	9	1	<1
		Non-Flaming	<2	<10	0	1	7	1	0
SEMI-RIGID	PD	Flaming	<2	10	0	10	13	2	0
		Non-Flaming	<2	<10	0	<1	13	4	0
	PDB	Flaming	2	100	0	4	12	2	0
		Non-Flaming	2	50	0	0	8	<1	0
	PDA	Flaming	2	50	0	3	8	1	0
		Non-Flaming	<2	10	0	0	7	<1	0
	PDC	Flaming	<2	10	0	4	5	1	0
		Non-Flaming	<2	<10	0	0	4	0	0
RIGID	PDF	Flaming	5	100	0	15	8	4	0
		Non-Flaming	2	25	0	0	10	3	0
	PDFB	Flaming	10	100	0	12	10	5	0
		Non-Flaming	2	50	0	1	13	3	0
	PDP	Flaming	2	100	0	8	21	2	0
		Non-Flaming	2	10	0	0	9	1	0
	PDPB	Flaming	2	300	0	1	17	7	1
		Non-Flaming	2	25	0	1	18	2	0

NOTES

1 **PDS** is qualified by similarity to **PD**, the only difference between the two being that the **PDS** incorporates a non-flammable metallic helix.
2 **S4B** is qualified by similarity to **SPSB**, the only difference between the two being that the **S4B** incorporates a non-flammable metallic reinforcement in place of the non-metallic helix of **SPSB**.
3 When ABD0031 replaced ATS1000.001, toxicity measurements for both flaming and non-flaming conditions were reduced from checks at 1.5 and 4 minutes to a single check at 4 minutes but with some reduced gas limits. Any material required to meet ATS1000.001 is considered qualified if shown to meet the requirements of ABD0031.

CONCLUSION

All of the flexible, semi-rigid and rigid ducts passed the ABD0031 requirements of the toxicity test. None are expected to cause any problems with regards to toxic fumes when the ducts are exposed to decomposition temperatures and in the event of a fire.

148.4.10. ODOUR TEST

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS AND RIGIDS LISTED**

TYPE	DUCT	CONDITIONING	OBSERVATIONS
FLEXIBLE	**U62**	120°C for 3 hours	No odour apparent.
	S4	150°C for 3 hours	No odour was present.
	SPS	150°C for 3 hours	No odour was evident.
SEMI-RIGID	**PD**	150°C for 3 hours	No odour was present.
	PDA	150°C for 3 hours	No odour was evident.
	PDC	150°C for 3 hours	No odour was present.
	PDS	150°C for 3 hours	No odour was found.
RIGID	**PDF**	150°C for 3 hours	No odour was present.
	PDP	150°C for 3 hours	No odour apparent.

CONCLUSION

The flexible, semi-rigid and rigid ducts tested passed the requirements of this test. Therefore, under normal operating conditions, if the ducts are exposed to elevated temperatures, none of them are expected to emit any form of noxious or unpleasant odour.

148.4.11. PRESSURE TEST AT LOW TEMPERATURE

MATERIALS TESTED: **ALL FLEXIBLES**

DUCT	DIAMETER, in	LEAK RATE, lpm		OBSERVATIONS
		Before	After	
U62	2.0	0.57	0.57	No detrimental effect found.
S4	2.0	0.43	0.57	No apparent detrimental effect.
SPS	2.0	0.67	0.81	No detrimental effect occurred.

NOTES:

1 Sample length 12in
2 MAXIMUM LEAK RATE ALLOWED: 1.7 lpm.
3 lpm refers to litres per minute.

CONCLUSION

All the flexible ducts tested passed the test and illustrate that if they are harshly treated at low temperatures they will not be severely affected. The only observed changes were slight increases in leak flow rates that still do not approach, and certainly do not exceed, the maximum allowable.

S4B and **SPSB** are qualified by similarity to **S4** and **SPS** as the only difference is in the colour of the silicone coating of the membrane cloth achieved by the use of black rather than red iron oxide.

148.4.12. PRESSURE TEST AT HIGH TEMPERATURE

MATERIALS TESTED: **ALL FLEXIBLES**

DUCT	DIAMETER in	LEAK RATE, lpm		OBSERVATIONS
		Before	After	
U62	2.0	1.20	1.00	No detrimental effect occurred.
S4	2.0	1.50	1.75	No detrimental effect found.
SPS	2.0	1.35	1.70	No detrimental effect occurred.

NOTES

1 Sample length 18in
2 MAXIMUM LEAK RATE ALLOWED: 2.55 lpm.
3 lpm refers to litres per minute.

CONCLUSION

All the flexible ducts passed, illustrating that when harshly treated at high temperatures they will not be severely affected. The only effects observed in some cases were slight changes in leak flow rate that still do not approach the maximum allowed.

S4B and **SPSB** are qualified by similarity to **S4** and **SPS** as the only difference is in the colour of the silicone coating of the membrane cloth achieved by the use of black rather than red iron oxide.

In addition, pressure cycle testing has been carried out on individual semi-rigid and rigid parts as well as flexibles. They have successfully completed up to 150,000 cycles at temperatures up to 74°C (165°F) with no indication of ply separation, delamination, fibre damage, material degradation or permanent distortion, and the cycled ducts still met burst pressure requirements of up to 10psig.

148.4.13. FUNGAL TESTING

148.4.13.1. PROCEDURE A

MATERIALS TESTED: **U62 FLEXIBLE WITH A NEOPRENE (CR) CUFF, SPS FLEXIBLE WITH A SILICONE (Si) CUFF, PD SEMI-RIGID, PDF AND PDP RIGIDS.**

DUCT	TYPE	OBSERVATIONS
U62 + CR CUFF	FLEXIBLE	No visible mould growth
SPS + Si CUFF	FLEXIBLE	No visible mould growth
PD	SEMI-RIGID	No visible mould growth
PDF	RIGID	Rating 1 - Trace of mould growth on the external surface
PDP	RIGID	Rating 1 - Trace of mould growth on the external surface

NOTES

1 Rating 1 is applied to sparse growth covering 1 to 10% of the surface with no damage to the substrate after 28 days.

2 Control specimens gave profuse growth after only 7 days demonstrating the conditions within the test chamber are suitable for mould growth.

DISCUSSION

S4 is the same material construction as **SPS** but with an F6141 metallic reinforcement containing no fungal nutrients replacing the F6140 non-metallic reinforcement. Therefore the **SPS** qualification will also cover **S4** by similarity.

PD could be used to represent directly **PDS**, and the rigids **PDF** and **PDP** through similarity. **PDS** is the same material construction as the **PD** but with the inclusion of an F6141 metallic reinforcement, which is fully encapsulated and can be ignored as a fungal nutrient. **PDF** is the same material construction as the **PD** but with the inclusion of a F6037 rigid foam core, which is fully encapsulated and thus can be ignored as a potential fungal nutrient. In the same way the **PDP** fully encapsulated core of F6159 twin walled polycarbonate sheet can be ignored. The actual finding of a trace of mould growth on the external surfaces of both **PDF** and **PDP** sample box ducts is explained by the significant handling of these surfaces during sample manufacture leaving contamination that was not subsequently cleaned off. All these ducts are non-nutrient to the spores used.

148.4.13.2. PROCEDURE B

MATERIALS TESTED: **PDA AND PDC SEMI-RIGIDS**

DUCT	TYPE	OBSERVATIONS
PDA	SEMI-RIGID	No visible mould growth on either glass or aramid reinforced sides
PDC	SEMI-RIGID	No visible mould growth on either glass or carbon reinforced sides

NOTE: Control specimens gave profuse growth after only 7 days demonstrating the conditions within the test chamber are suitable for mould growth.

DISCUSSION

Both **PDA** and **PDC** samples were surfaced on one side by glass laminations that are the same reinforced matrix as used in **PD**. As no fungal growth occurred on these surfaces **PD** semi-rigid is also qualified to this procedure. **PDS**, **PDF** and **PDP** would also be qualified by similarity to **PD** by the same arguments used above for procedure A.

CONCLUSION ON FUNGAL GROWTH

Flexibles, semi-rigid and rigid ducts and the cuffs used to attach them are not expected to be a cause for concern with regards to forms of fungal attack as the materials utilised in their construction have been demonstrated to be non-nutrients.

148.4.14. DAMAGE TEST

MATERIALS TESTED: **FLEXIBLES LISTED AND PD SEMI-RIGID**

DUCT	LEAK RATE, lpm					OBSERVATIONS
	Initial	Rate 1	Rate 2	Rate 3	Max Allowed	
U62	0	0.35	0.35	0.9	4.20	No sign of delamination.
S4	0	0.3	0.31	0.31	4.20	No sign of delamination.
SPS	0	0.4	0.4	0.45	4.20	No sign of delamination.
PD 3 LAYER	1.0	1.5	2.7	4.2	4.15	Creases increasingly evident.
PD 5 LAYER	0.9	1.2	1.7	> 5.0	2.81	Creases evident finally resulting in small splits.
PD 10 LAYER	0.8	1.1	1.75	> 5.0	4.59	Creases evident finally resulting in small splits.

NOTES

1 lpm refers to leak rate in litres per minute measured at 1psi.

2 None of the ducts tested burst when they were exposed to a pressure of 5psi after continual crushing.

CONCLUSIONS

All flexibles satisfactorily pass the requirements of this test. Although it would not be recommended that they be used after being crushed a number of times, the flexibles will still retain their low leak flow rates.

The **PD** ducts at 3, 5 and 10 layer did pass this test after two 'crushes'. After 3 'crushes' the ducts were found to have sustained minor damage resulting in the maximum allowable leak rates being exceeded. Both the 5 and 10 layer **PD** ducts were also found to contain small longitudinal splits. Consequently it is not recommended that **PD** ducts be used after any number of crushes even though they may appear to have survived from their relatively low leak rate values. The thicker that the **PD** duct is, then the more likely it is to sustain irreversible damage in the form of longitudinal splits illustrated by the increased leak rate.

For this reason other semi-rigids such as **PDA**, **PDC** and **PDS**, and rigids such as **PDF** and **PDP** have not been tested. It is recommended that all these duct types are not used after being fully crushed, even if they may appear to have survived according to their relatively low leak rate values. Their mechanical strength will definitely be impaired and may further drop on being stressed and/or vibrated, leading to subsequent leaking or failure.

148.4.15. CORROSION TESTING

MATERIALS TESTED: **FLEXIBLES, SEMI-RIGIDS AND RIGIDS LISTED**

TYPE	DUCT	OBSERVATIONS
FLEXIBLE	**U62**	No evidence of corrosion or contamination was found on the aluminium.
	S4	There was no evidence of corrosion or contamination on the aluminium.
	SPS	The aluminium surfaces were found to be unaffected by the duct.
SEMI-RIGID	**PD**	The surfaces of aluminium in contact with the material were unaffected.
RIGID	**PDS**	No evidence or corrosion or contamination was found on the aluminium.
	PDF	There was no contamination or corrosion in evidence on the aluminium.
	PDP	The surfaces of aluminium in contact with the duct were unaffected.

CONCLUSION

These flexible, semi-rigid and rigid ducts all passed the requirements of this test. Therefore if the ducts are in contact with any metals under normal operating conditions, no corrosion, contamination or detrimental effect is expected to occur.

Neither **PDA** nor **PDC** have been tested, and are claimed to meet requirements by similarity to **PD** as only the thermoplastic matrix is in contact with the aluminium surface. The electrochemical behaviour of graphite that could lead to problems when CFRPs containing F6226 carbon fibre cloth come into contact with metal alloys is well known. Carbon is cathodic to most metal alloys and this can lead to corrosion unless adequate precautions are taken. All ducts containing carbon fabric reinforcement are specifically designed and constructed so that the carbon cannot come into contact with metal inserts or brackets.

APPENDIX A : F6069 RIGID DUCT - ENVIRONMENTAL REPORT

Test results for **F6069 RIGID DUCTING** cured from
Fibredux 917 Prepreg
are presented in the Table on the next page.

TEST RESULTS SUMMARY FOR F6069 RIGID DUCTING

148.3 TEST	RESULTS & OBSERVATIONS	CONCLUSION
1 Leak Rate	NOT TESTED – Individual ducts are tested before release and meet requirements.	—
2 Salt Water (Procedure A)	There was no sign of delamination or deterioration after removal from test solution.	PASS
3 Water Immersion	No detrimental effect was evident to material on removal from test solution.	PASS
4 Fluid Contamination (Procedure A)	The material was unaffected when contaminated with: DERD 2494 (JET A1) MIL-T-5624 / DERD 2454 (JP4) MIL-T-5624 / DERD 2452 (JP5) MIL-T-83133 / DERD 2453 (JP8) MIL-L-7808J / 0148 (AEROSHELL 308) AS1241 HD (SKYDROL 500B4) MIL-H-83282C / DTD585 (AEROSHELL 31) AS1241 LD (HYJET IV & SYDROL LD4) ORONITE M2V MIL-F-5566 / TT-I-735B (AEROSHELL 06A) OX7 (AEROSHELL 390) ESSO 274 DERD 2487 / OX38 (AEROSHELL 750) MIL-H-5606 (AEROSHELL 41) MIL-L-23699 (AEROSHELL 500).	PASS
5 Solvent Contamination	The material was found to be unaffected when contaminated with; TOLUENE, XYLENE, BENZENE, ACETONE, CYCLOHEXANE, ISOPROPYL ALCOHOL, and WHITE SPIRIT.	PASS
6 Plexiglas Crazing	A minute amount of residue was produced which did not affect the stressed acrylic in anyway.	PASS
7 Flammability	Available supplier's data qualifies.	PASS
8 Toxic Gas Emission	Available supplier's data qualifies.	PASS
9 Smoke Emission	Available supplier's data qualifies.	PASS
10 Odour	Tested at 120°C (248°F) for 3 hours. No odour was evident.	PASS
11 Pressure at Low Temp.	NOT TESTED	—
12 Pressure at High Temp.	NOT TESTED	—
13 Fungal Growth	BWT do not expect the material to support fungal attack.	—
14 Damage	NOT TESTED	—
15 Corrosion	Tested at 80 °C (176°F) for 72 hours. The surfaces of the metal in contact with the material were unaffected.	PASS

MATERIAL DATA SHEET

senior Aerospace

MDS No: 6065	MDS Issue: 4	Sheet: 1 of 2
BWT Material Reference: F6065		
Description: SILICONE PRESSURE SENSITIVE ADHESIVE. A low viscosity, pressure sensitive adhesive, which is translucent and light straw in colour.		

ISSUE	DESCRIPTION	ORIGINATOR	CHECKED	APPROVED	DATE
3	New Format	L.McGuinness	R.C.Ayerst	T.S.Wright	06/05/98
4	Minimum Temp added in 4.	R.C.Ayerst	R.C.Ayerst	T.S.Wright	26/05/00

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1. INTRODUCTION

Silicone pressure sensitive adhesives are comprised of two major components, a flexible elastic silicone gum and a crystalline hard siloxane resin. The properties of this type of adhesive will vary with the ratio of gum to resin. If the percentage of gum is high then the adhesive will be sticky, but if the percentage of resin is high then the adhesive will have good peel and shear strength. By combining the basic silicone with a phenyl functional group, gums can be produced which have higher temperature performance, better electrical properties and more aggressive tactile adhesive response. To fully achieve any of these properties, it is essential the solvents are removed from the adhesive film and that it is properly cured using an appropriate accelerator. For room temperature cure F6065 is premixed with F6154.

2. PROPERTIES

2.1 F6065 will exhibit good adhesion to the most difficult to bond substrates, including dissimilar materials.

2.2 When cured F6065 will exhibit good peel strength, typically 2.7 kg/25 mm (6 lb/in). It also has excellent creep resistance.

2.3 Unlike some of the adhesives that are available, F6065 will retain many of its elastomeric properties when cured.

3. CHEMICAL RESISTANCE

This material offers good resistance to most organic and inorganic chemicals. In particular it shows a good resistance to solvents.

MATERIAL DATA SHEET

senior Aerospace

MDS No: 6065	MDS Issue: 4	Sheet: 2 of 2
BWT Material Reference: F6065		
Description: SILICONE PRESSURE SENSITIVE ADHESIVE. A low viscosity, pressure sensitive adhesive, which is translucent and light straw in colour.		

4. TEMPERATURE LIMITATIONS

F6065 can operate at temperatures up to 149°C (300°F) without losing any significant strength in its adhesion properties, and has a maximum overrun temperature of 260°C (500°F). It will remain flexible down to -60°C (-76°F), but if cooled below this will regain its flexibility on rewarming.

5. SPECIFICATIONS

F6065 will meet the requirements of the following:

CAA specifications no 8, issue 2

FAR 25.853(a) amendment 25-83, Appendix F Part 1, section a.1.ii

MATERIAL DATA SHEET

senior Aerospace

MDS No: 6010	MDS Issue: 5	Sheet: 1 of 1
BWT Material Reference: F6010		
Description: RED SILICONE COATED GLASS CLOTH. A flexible glass fabric coated on one side only with red silicone rubber.		

ISSUE	DESCRIPTION	ORIGINATOR	CHECKED	APPROVED	DATE
4	New Format	L. McGuinness	R.C.Ayerst	T.S.Wright	23/03/98
5	Weight as typical / Tensile & ABD 0031 added	R.C.Ayerst	R.C.Ayerst	T.S.Wright	04/05/99

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1. INTRODUCTION

Silicone rubbers are based on linear polymers and have a high molecular weight with a backbone construction of silicon-oxygen linkages. As with other elastomers of this nature, it is necessary to cross-link or heat cure the gum material into its pre-formed shape, in this case spread onto one side of rolls of glass fabric, to produce the properties typical of elastomers. The physical and chemical properties of silicone rubbers can be modified by the incorporation of appropriate fillers and additives.

2. PROPERTIES

2.1 Silicone rubber coated fabrics are found to be excellent electrical insulators. Resistance to ultra-violet light and ozone attack are also very good.

2.2 Oxidation, that can quickly destroy organic elastomers, is virtually non-existent with silicone rubber.

2.3 Silicones are noted for their "non stick" properties and water resistance. Their mechanical properties show little change after long periods of immersion.

2.4 The tensile strength of F6010 is >250 N/cm (>143 lbf/in) for both warp & weft.

2.5 Typical coated fabric weight is 200 g/m^2 (5.9 oz/yd^2).

3. CHEMICAL RESISTANCE

F6010 is resistant to moderate or oxidising chemicals, and aviation fluids and fuels.

4. TEMPERATURE LIMITATIONS

This fabric will operate continuously from -65 to 200°C (-85 to 392°F) and has a maximum overrun operating temperature of 260°C (500°F). Exposure to higher temperatures may have a limiting effect on the life of the material.

5. SPECIFICATIONS

F6010 will meet the requirements of the following:

CAA Specification no 8, issue 2	ATS 1000.001	ABD 0031
FAR 25.853	BS476 part 7	

MATERIAL DATA SHEET

senior Aerospace

MDS No: 6046	MDS Issue: 4	Sheet: 1 of 1
BWT Material Reference: F6046		
Description: FR RTV SILICONE SEALANT. A one component, ready to use, room temperature curable, silicone sealant paste, which contains a non-halogen flame retardant.		

ISSUE	DESCRIPTION	ORIGINATOR	CHECKED	APPROVED	DATE
3	New Format	L. McGuinness	R.C.Ayerst	T.S.Wright	26/03/98
4	Min. temp. elaborated	R.C.Ayerst	R.C.Ayerst	T.S.Wright	06/06/01

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1. INTRODUCTION

Silicones are based on polymers that are comprised of a backbone of silicon-oxygen-silicon atoms linked together. It is the silicon-oxygen linkages that account for the properties of silicones. Therefore they are different from other organic materials which are based on backbones of carbon-carbon atoms linked together. The silicone bond linkage is similar to those bond linkages found in other high temperature resistant materials such as quartz, sand and glass. The chemical structure of the sealant also accounts for its general inertness towards many deteriorating influences such as ozone, chemicals, weathering and radiation.

2. PROPERTIES

2.1 F6046 has low flammability properties that have been enhanced with the addition of a flame retardant.

2.2 It is resistant to high temperatures and shows low temperature flexibility, being able to retain its elastomeric properties.

2.3 It exhibits excellent weatherability and ozone resistance, providing a long service life and reliability in harsh conditions.

2.4 It has excellent electrical insulation properties.

3. CHEMICAL RESISTANCE

F6046 offers very good resistance to most organic chemicals and inorganic chemicals, solvents and oils, but it may swell or degrade on prolonged contact with gas or fuel.

4. TEMPERATURE LIMITATIONS

This material maintains full flexibility for continuous use from -60 to 204°C (-76 to 400°F), with a maximum overrun temperature of 250°C (482°F). At even lower temperatures flexibility may be reduced, but will be regained on rewarming.

5. SPECIFICATIONS

F6046 will meet the requirements of the following:

CAA Specification no 8, issue 2 UL 94 V-0

MATERIAL DATA SHEET

senior Aerospace

MDS No: 6005	MDS Issue: 8	Sheet: 1 of 2
BWT Material Reference: F6005		
Description: SILICONE SHEETING. A flexible silicone rubber sheeting material, red in colour and used at a thickness of 0.8 mm ($^{1}/_{32}$ in).		

ISSUE	DESCRIPTION	ORIGINATOR	CHECKED	APPROVED	DATE
6	New format	L.McGuinness	R.C.Ayerst	T.S.Wright	23/03/98
7	Add item 2.5 & ABD0031	R.C.Ayerst	R.C.Ayerst	T.S.Wright	21/01/00
8	Clarify low temperature in 4	R.C.Ayerst	R.C.Ayerst	T.S.Wright	25/07/02

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1. INTRODUCTION

Silicone rubbers are based on linear polymers and have a high molecular weight. As with other rubbers, it is necessary to cross-link or cure these linear polymers in order to obtain the characteristic elastic properties of elastomers. General purpose silicones are based on polydimethylsiloxanes. Physical and chemical properties of these materials can be varied by the addition of an appropriate filler.

2. PROPERTIES

2.1 In cured form, silicone rubbers are resistant to oxidative degradation.

2.2 Weathering and ozone resistances of silicones are found to be very good.

2.3 The oil resistant properties of silicones are far superior to natural, butyl and SBR rubbers.

2.4 Silicone rubbers in general have very good water resistance, but may break down if immersed in superheated water or steam above 0.35 MPa (50 psi).

2.5 Typical physical properties are as follows:

Hardness:	60 Shore A	
Specific Gravity:	1.55	
Minimum Tensile Strength:	4.0 MPa	(480 psi)
Elongation:	125% minimum	
Minimum Tear Strength:	9.0 kN/m	(51 lbf/in)

3. CHEMICAL RESISTANCE

F6005 will offer very good resistance to most organic chemicals and inorganic chemicals. It will also offer good resistance to solvents and oils.

MATERIAL DATA SHEET

senior Aerospace

MDS No: 6005	MDS Issue: 8	Sheet: 2 of 2
BWT Material Reference: F6005		
Description: SILICONE SHEETING. A flexible silicone rubber sheeting material, red in colour and used at a thickness of 0.8 mm ($^{1}/_{32}$ in).		

4. TEMPERATURE LIMITATIONS

Silicone rubber will easily retain its properties down to temperatures of at least -60°C (-75°F) and up to 200°C (392°F). At lower temperatures it will gradually lose its flexibility but this will be regained on rewarming. It has a maximum overrun temperature of 250°C (482°F). Exposure to higher temperatures may have a limiting effect on the life of the rubber, but it will recover from any hardening experienced at even lower temperatures on warming.

5. SPECIFICATIONS

F6005 silicone sheeting will meet the requirements of the following:

CAA Specification no 8, issue 2
FAR 25.853(a) amendment 25-83, Appendix F Part 1, section a.1.ii
ABD0031

MATERIAL DATA SHEET

Senior Aerospace

MDS No: 6066	MDS Issue: 3	Sheet: 1 of 2
BWT Material Reference: F6066		
Description: ROOM TEMPERATURE CURE SILICONE SEALANT. A one part, transparent, moisture activated, room temperature curing, silicone rubber sealant that is relatively soft when cured.		

ISSUE	DESCRIPTION	ORIGINATOR	CHECKED	APPROVED	DATE
2	New Format	L.McGuinness	R.C.Ayerst	T.S.Wright	30/03/98
3	Revised paragraph 4	R.C.Ayerst	R.C.Ayerst	T.S.Wright	26/05/00

This data sheet has been compiled by Senior Aerospace BWT, Adlington Industrial Estate, Adlington, Macclesfield, Cheshire, England, SK10 4NL. Tel: +44 (0) 1625 870700 Fax: +44 (0) 1625 879472. E-mail: technical@bwt.co.uk Website: www.senior-bwt.com

1. INTRODUCTION

One part room temperature curing silicones consist of polydimethylsiloxanes, cross-linking agents and in most cases fillers. Occasionally these materials may also include solvents and additives. Actual curing of the material will occur on exposure to moisture contained in the air that liberates the hydrolysis products. A skin forms at the surface of the rubber, which gradually move inwards as cure progresses. F6066 will adhere well to many substrates. The quality of the bond depends upon the nature of the substrate. Adhesion may be enhanced by preparing the surfaces beforehand with a suitable primer.

2. PROPERTIES

2.1 This material has good thermal resistance properties and retains flexibility at upper and lower limit temperatures.

2.2 F6066 has a good resistance to weathering and ageing with many of its physical properties remaining unchanged after years of outdoor exposure.

2.3 This silicone-based material has better gas permeability properties than natural rubber, particularly at room temperature.

2.4 F6066 has a water vapour permeability of around 20 $g/m^2/d$ (0.6 oz/yd^2) tested by DIN 53122 (climatic conditions D) at a thickness of 2 mm (0.079 in).

2.5 Electrical properties of this material, particularly at room temperature, are comparable to those of other insulating materials. Temperature is found to have very little effect on volume resistivity, dielectric constant and dissipation factor.

2.6 Cured F6066 has a maximum 4% shrinkage when tested by DIN 52451.

MDS No: 6066	MDS Issue: 3	Sheet: 2 of 2
BWT Material Reference: F6066		
Description: ROOM TEMPERATURE CURE SILICONE SEALANT. A one part, transparent, moisture activated, room temperature curing, silicone rubber sealant that is relatively soft when cured.		

2. PROPERTIES (Cont.):

2.7 Typical Electrical Properties are as follows:

Volume Resistivity (DIN 53482):		
at 23°C (73°F) dry	$8x10^{14}$	Ω .cm
at 60°C (140°F) wet	$5x10^{13}$	Ω .cm
Dielectric Strength (DIN 53482):	21	kV/mm
Tracking Resistance (DIN 53480):	KA3c	
Dielectric Constant (DIN 53483):		
at RT, 50 Hz to 5 MHz	3.1 – 2.8	
Dissipation factor tan δ:		
at RT, 50 Hz to 5 MHz	$(28 - 10) \times 10^{-4}$	

2.8 Typical Mechanical Properties are as follows:

Shore A Hardness (DIN 53505):	30°	
Tensile Strength (DIN 5304, S3A):	4.5 MPa	(650 psi)
Elongation at Break (DIN 53504, S3A):	500 %	
Tear Strength (ASTM D624 form B):	13 N/mm	(74 lb/in)

3. CHEMICAL RESISTANCE

This material shows good resistance to weak acids and alkalis, polar solvents and salt solutions. Some hydrocarbons and chlorinated hydrocarbons will cause a reversible swelling to varying degrees.

4. TEMPERATURE LIMITATIONS

F6066 has good retention of properties from -50°C (-58°F) up to 250°C (482°F). It will stiffen at lower temperatures and lose its flexibility below-60°C (-76°F), but this will be regained on rewarming.

5. SPECIFICATIONS

This material will meet the requirements of the following:

CAA specification no 8, issue 2
FAR 25.853(a) amendment 25-83, Appendix F Part 1, section a.1.ii
ATS 1000.001

MATERIAL DATA SHEET

senior Aerospace

MDS No: 6140	MDS Issue: 3	Sheet: 1 of 2
BWT Material Reference: F6140		
Description: HIGH TEMPERATURE THERMOPLASTIC REINFORCEMENT. A black extruded filament of high temperature thermoplastic.		

ISSUE	DESCRIPTION	ORIGINATOR	CHECKED	APPROVED	DATE
2	New format	L.McGuinness	R.C.Ayerst	T.S.Wright	16/04/98
3	Temp limitations revised	R.C.Ayerst	R.C.Ayerst	T.S.Wright	07/06/01

This data sheet has been compiled by Senior Aerospace BWT, Adlington Industrial Estate, Adlington, Macclesfield, Cheshire, England, SK10 4NL. Tel: +44 (0) 1625 870700 Fax: +44 (0) 1625 879472. E-mail: technical@bwt.co.uk Website: www.senior-bwt.com

1. INTRODUCTION

Polyarylsulphones are polymers that contain recurring sulphone groups in the main chain. The sulphone group is highly polar, and those polymers that contain sulphone, ether and phenyl groups are expected to have high temperature softening points. Additions of these groups into the structure of the material will contribute to interchain flexibility of the polymer. This is manifested as high toughness, elongation and ductility, as well as ease of melt fabrication.

2. PROPERTIES

2.1 F6140 has outstanding thermal properties and thermal stability over extended periods of use.

2.2 It has excellent toughness properties and creep resistance.

2.3 F6140 has excellent resistance to boiling water and steam.

2.4 It exhibits good electrical properties.

2.5 Typical Specific Properties are as follows:

2.5.1 Thermal Properties:

Heat Deflection Temperature: 207°C (405°F)
[By ASTM D648 - 0.125 in bar at 1.82 MPa (264 psi) annealed 1h at 200°C (392°F)]

2.5.2 Mechanical Properties: Tested by ASTM

Tensile Strength:	D-638	69.6 MPa	(10100 psi)
Tensile Modulus:	D-638	2,340 MPa	(340000 psi)
Flexural Strength:	D-790	91 MPa	(13200 psi)
Flexural Modulus:	D-790	2,410 MPa	(350000 psi)

MATERIAL DATA SHEET

senior Aerospace

MDS No: 6140	MDS Issue: 3	Sheet: 2 of 2
BWT Material Reference: F6140		
Description: HIGH TEMPERATURE THERMOPLASTIC REINFORCEMENT. A black extruded filament of high temperature thermoplastic.		

3. CHEMICAL RESISTANCE

F6140 is only soluble in a limited number of organic solvents including methylene chloride. It exhibits excellent hydrolytic stability and resistance to mineral acids, alkalis and salt solutions even under stressed conditions at elevated temperatures. However this material may be stress crazed by the most aggressive solvents such as ketones, esters and aromatic hydrocarbons, which should be avoided.

4. TEMPERATURE LIMITATIONS

F6140 exhibits outstanding thermal resistance which will allow long term exposure to elevated temperatures, being resistant to continuous use at 200°C (392°F), short term exposure at 210°C (410°F) and intermittent at 240°C (464°F). However as it has a glass transition temperature of 220°C (428°F) it will lose its rigidity above that temperature. Below this glass transition temperature F6140 will be a rigid material that will withstand very low temperatures with no loss in performance.

5. SPECIFICATIONS

F6140 will meet the requirements of the following:

CAA Specification 8, issue 2.
FAR 25.853
ATS1000.001
ABD0031
UL 94V-0

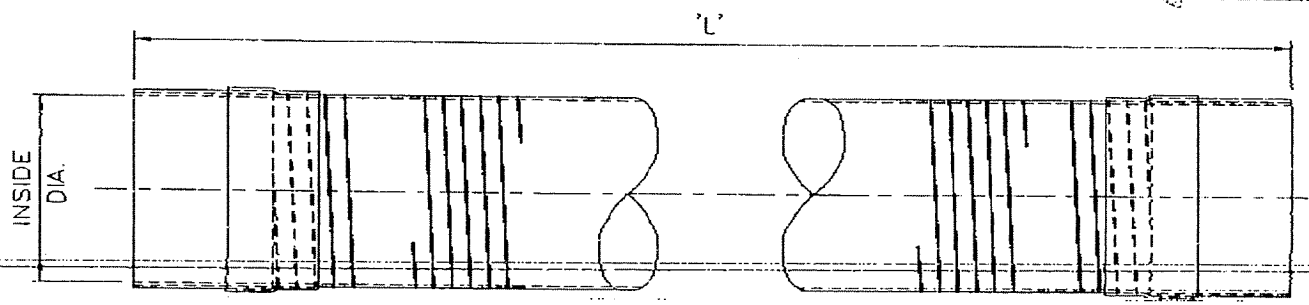

FIG.1–DUCT WITH STANDARD CUFF ENDS

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
NC	NEW DRAWING	16/3/94	M.D.S.
A	NOTE b) v. ADDED LOC. SHT. 3 NOTE d) iii WAS "FOR BLADED INSERT TOLERANCES SEE BWT7500" LOC. SHT. 3 AL. INSERT REF. DWG. WAS BWT7500 LOC. SHT. 1 ZONE B6	26/7/96	M.D.S.
B	CODE 4 & 5 ADDED TO SHT.2. LOC A5 & C6. NOTE b vi). ADDED AND NOTE d iv) MODIFIED SHEET 3 LOC.B6 AND C6.	10/2/98	I.PARROTT
C	CODE X ADDED TO CALL UP NO. 7 OC. D5 SHT. 2	11.11.99	I.P.
	NOTE x ADDED TO NOTEBLOCK LOC. A5 SHT.3 REF. WQN 01489		

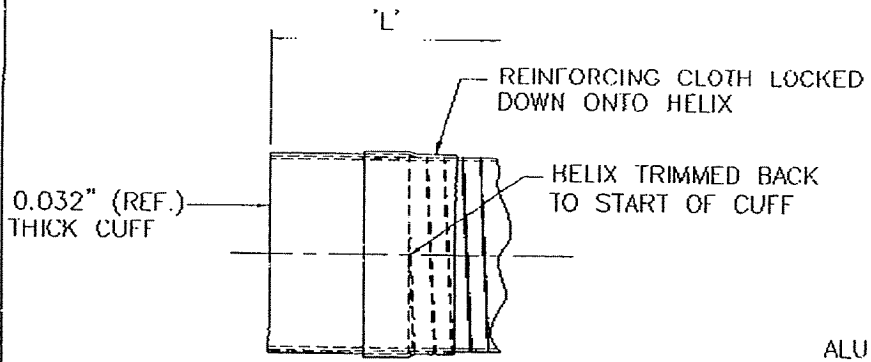

FIG.2–STANDARD CUFF END
SEE NOTE d).iv.

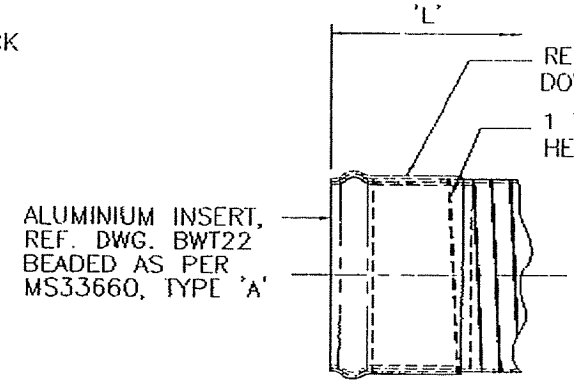

FIG.3–BEADED INSERT END

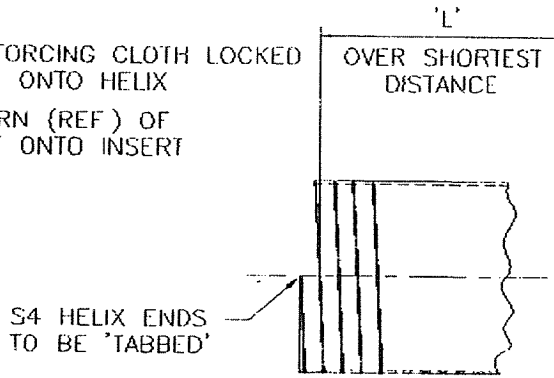

FIG.4–FREE END

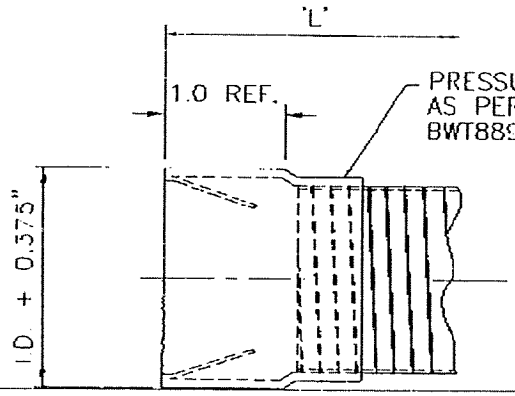

FIG.5–PRESSURE CUFF END
SEE NOTE b).vi.

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UNLESS OTHERWISE STATED DIMENSIONS ARE IN INCHES	DRN. G.E.O.	BAXTER WOODHOUSE & TAYLOR LTD.	
UNLESS OTHERWISE STATED TOLERANCES ARE AS FOLLOWS	CKD. M.D.SHORTMAN	TITLE STANDARD LIGHTWEIGHT LOW PRESSURE IMPERIAL FLEXIBLE DUCTING	
LENGTHS ±0.125	APPD. M.D.SHORTMAN		
DIAMETERS ±0.030	PROJECTION	B	DRG.No. BWT10 REV C
ANGLES N/A		SCALE N.T.S.	SHEET 1 OF 3

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
NC	NEW DRAWING	16/3/94	M.D.S.
A	NOTE b) v. ADDED LOC. SHT. 3 NOTE d) iii. WAS 'FOR BEADED INSERT TOLERANCES SEE BWT7500" LOC. SHT. 3 AL. INSERT REF. DWG. WAS BWT7500 LOC. SHT. 1 ZONE B6	26/7/96	M.D.S.
B	CODE 4 & 5 ADDED TO SHT.2. LOC A5 & C6. NOTE b vi). ADDED AND NOTE d iv) MODIFIED SHEET 3 LOC.B6 AND C6	18/2/98	I.PARROTT
C	CODE X ADDED TO CALL UP NO. LOC. B5 SHT. 2	11.11.99	I.P.
	NOTE x ADDED TO NOTEBLOCK LOC. A5 SHT.3 REF. WQN 01489		

TABLE 1–OPERATING TEMPERATURES & APPROX. WEIGHTS

DUCT TYPE	MINIMUM TEMP.		NORMAL OPERATING TEMP.		SHORT TERM OPERATING TEMP.		OVER RUN MAXIMUM TEMP.		APPROX. WEIGHT/FOOT (2.0" DIA.)	MATERIAL
	C	F	C	F	C	F	C	F		
S4	-65	-85	200	392	225	437	250	482	34 grammes	RED SILICONE COATED GLASSCLOTH MEMBRANE WITH STAINLESS STEEL HELIX
U62	-65	-85	80	176	100	212	120	248	28 grammes	POLYURETHANE COATED NYLON MEMBRANE WITH NYLON HELIX
SPS	-65	-85	200	392	210	410	240	464	28 grammes	RED SILICONE COATED GLASSCLOTH MEMBRANE WITH NON-METALLIC HELIX
S4B	-65	-85	200	392	225	437	250	482	34 grammes	BLACK SILICONE COATED GLASSCLOTH MEMBRANE WITH STAINLESS STEEL HELIX
SPSB	-65	-85	200	392	210	410	240	464	28 grammes	BLACK SILICONE COATED GLASSCLOTH MEMBRANE WITH NON METALLIC HELIX

EXAMPLE OF PART NUMBER CALL UP

BWT10-10B0452A (i.e. S4 DUCT, 1.0" DIA. x 45.5" LONG, FITTED WITH 2 STANDARD CUFFS)

- CODE A = DUCT HAVING 2 STANDARD CUFFS
- CODE B = DUCT HAVING 2 BEADED INSERTS
- CODE C = DUCT HAVING 2 PRESSURE CUFFS
- CODE D = DUCT HAVING 2 FREE ENDS (NO FITTED ENDS)
- CODE E = DUCT HAVING 1 STANDARD CUFF & 1 BEADED INSERT
- CODE F = DUCT HAVING 1 STANDARD CUFF & 1 PRESSURE CUFF
- CODE G = DUCT HAVING 1 STANDARD CUFF & 1 FREE END
- CODE H = DUCT HAVING 1 BEADED INSERT & 1 PRESSURE CUFF
- CODE J = DUCT HAVING 1 BEADED INSERT & 1 FREE END
- CODE K = DUCT HAVING 1 PRESSURE CUFF & 1 FREE END
- CODE X = BULK DUCTING HAVING 2 FREE ENDS (SEE NOTE x SHEET 3)

FRACTIONAL LENGTH IN 0.25" INCREMENTS (2 x 0.25" IS 0.50"). SEE TABLE 2 FOR AVAILABLE INCREMENTS WITH RESPECT TO LENGTH 'L'. IF NO INCREMENT IS REQUIRED, INSERT 'D' IN CODE AT THIS POINT.

MAJORITY/OVERALL LENGTH (L), INCLUDING ENDS, IN INCHES (EXPRESSED BY THREE DIGITS i.e. 045 IS 45")

INSIDE DIAMETER IN 0.125" INCREMENTS

- CODE 1 = MATERIAL S4
- CODE 2 = MATERIAL U62
- CODE 3 = MATERIAL SPS
- CODE 4 = MATERIAL S4B
- CODE 5 = MATERIAL SPSB

STANDARD DRAWING NUMBER

TABLE 2–LENGTHS, INCREMENTS & TOLERANCES

'L' HOSE LENGTH	AVAILABLE LENGTH INCREMENT	'L' LENGTH TOLERANCE
4.00 TO 12.00	0.25	+0.25/-.00
12.50 TO 24.00	0.50	+0.50/-.00
24.50 TO 60.00	0.50	+0.75/-.00
60.50 TO 96.00	0.50	+1.00/-.00
97.00 TO 144.00	1.00	+1.50/-.00
145.00 TO 999.00	1.00	+2.00/-.00

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UNLESS OTHERWISE STATED DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE STATED TOLERANCES ARE AS FOLLOWS
LENGTHS ±0.125
DIAMETERS ±0.030
ANGLES N/A

DRN. G.E.D.
CKD. M.D.SHORTMAN
APPD. M.D.SHORTMAN
PROJECTION

BAXTER WOODHOUSE & TAYLOR LTD.
ADLINGTON, MACCLESFIELD, CHESHIRE, SK10 4AU, ENGLAND.

TITLE STANDARD LIGHTWEIGHT LOW PRESSURE IMPERIAL FLEXIBLE DUCTING

B | DRG.No. BWT10 | REV C

SCALE N.T.S. | SHEET 2 OF 3

NOTES

a). OTHER FLEXIBLE STANDARD DRAWINGS IN THE B.W.T RANGE INCLUDE –
- i. BWT11/16 : FLEX. DUCTING : METRIC & PURE METRIC* RESPECTIVELY
- ii. BWT12/13/17 : INSULATED FLEX. DUCTING : IMPERIAL,METRIC & PURE METRIC* RESPECTIVELY
- iii. BWT14/15/18 : FLEX. SILENCER : IMPERIAL,METRIC & PURE METRIC* RESPECTIVELY

* : METRIC & PURE METRIC IS WITH RESPECT TO DIAMETERS ONLY
e.g. METRIC = 50.8mm(2.0"), PURE METRIC – 50mm

b). PRESSURE CUFFS (REF. FIG. 5 & 6)
- i. MAX. DIAMETER AVAILABLE 2.50".
- ii. LIMITING PRESSURE 2.5 P.S.I. BURST
- iii. FOR DIMENSIONAL DETAIL AND MODE OF OPERATION SEE DRAWING BWT8891.
- iv. DEPENDING ON QUANTITY AND DIAMETER, TOOLING CHARGES MAY APPLY. THIS WILL BE ADVISED AT TIME OF ENQUIRY.
- v. INTERNATIONAL PATENT APPLICATION WO95/24580
- vi). PRESSURE CUFF COATED WITH BLACK SILICONE RUBBER COMPOUND FOR ALL FLEXIBLES CODED 4 & 5.

c). DIAMETERS
- i. MINIMUM DIAMETER 0.75"– S4, SPS, S4B & SPSB 0.375"– U62.
  MAXIMUM DIAMETER 6.0"– S4, SPS, S4B, SPSB & U62.
- ii. 0.375" DIAMETER TO 3.0" DIAMETERS ARE AVAILABLE IN INCREMENTS OF 0.125". ABOVE 3.0" DIAMETER, INCREMENTS ARE IN 0.25" STEPS.

d). STANDARD CUFFS AND BEADED INSERTS (REFER FIGS. 2 , 3 & 7).
- i. MINIMUM DIAMETER AVAILABLE = 0.50"
- ii. LENGTHS OF CUFFS AND INSERTS ARE AS FOLLOWS:–
  UP TO AND INCLUDING 1.375" DIAMETER = 1.25" LONG
  1.50" DIAMETER AND ABOVE = 1.50" LONG.
- iii. FOR BEADED INSERT TOLERANCES SEE DRAWING BWT22
- iv. CUFF MATERIAL – SILICONE RUBBER FOR S4 & SPS, NEOPRENE RUBBER FOR U62.
  – SILICONE RUBBER COATED WITH BLACK SILICONE RUBBER COMPOUND FOR ALL FLEXIBLES CODED 4 & 5.

e). IDENTIFICATION
EACH DUCT SHALL BE LEGIBLY MARKED WITH THE FOLLOWING:–
- i. PART NUMBER
- ii. BATCH NUMBER
- iii. DATE OF MANUFACTURE EXPRESSED IN TERMS OF MONTH AND YEAR e.g. JAN 94
- iv. BWT NAME AND TRADEMARK

f). DUCT CUFF ENDS SHALL BE SUITABLE FOR INSTALLATION OVER A RIGID TUBE END WITH MS33660, TYPE 'A' BEADS OR SIMILAR.

g). NO JOINTS ALLOWED CLOSER THAN 6.0" TO THE END OF DUCT, OTHERWISE AS REQUIRED. JOINTS ACHIEVED BY SCREWING ONE END INSIDE ANOTHER FOR A MINIMUM OF TWO TURNS AND ADHESIVE BONDING MATING SURFACES. THERE SHALL BE NO MEASURABLE PRESSURE DROP AS A RESULT OF SUCH JOINT OR JOINTS.

h). ANY NEGATIVE PRESSURE REQUIREMENTS MUST BE DISCUSSED WITH BAXTER, WOODHOUSE & TAYLOR, REF. BWT TEST REPORT 175: NEGATIVE PRESSURE CAPABILITIES OF FLEXIBLE DUCTING.

i). NON–CIRCULAR DUCTING, TAPERS, SEMI–RIGID CONNECTORS AND COMPLETE AIR DISTRIBUTION SYSTEMS AVAILABLE TO CUSTOMERS OWN REQUIREMENTS ON REQUEST.

j). SPECIAL CUFFS, FLANGES AND DUCT TERMINATIONS AVAILABLE TO CUSTOMERS OWN REQUIREMENTS ON REQUEST.

x) CODE X IS FOR STOCK LENGTHS OF FLEXIBLE DUCTING ONLY
- i. NOTES b), d), e) AND f) DO NOT APPLY
- ii. 'L' LENGTH TOLERANCE TO BE ±6.00
- iii. LEAK CHECK TO BE CARRIED OUT ON ONE REPRESENTATIVE SAMPLE LENGTH FROM EACH BATCH
- iv. EACH BATCH TO BE LEGIBLY MARKED WITH PART NUMBER, BATCH NUMBER, DATE OF MANUFACTURE, BWT NAME AND TRADEMARK

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REVISIONS

REV	DESCRIPTION	DATE	APPROVED
NC	NEW DRAWING	15/3/94	M.D.S.
A	NOTE b) v. ADDED 10C. SHT. 3 NOTE d) iii. WAS "FOR BEADED INSERT TOLERANCES SEE BWT7500" LOC. SHT. 3 AL. INSERT REF. DWG. WAS BWT7500 LOC. SHT. 1 ZONE B8	26/7/96	M.D.S.
B	CODE 4 & 5 ADDED TO SHT.2. LOC A5 & C6. NOTE b vi). ADDED AND NOTE d iv) MODIFIED SHEET 3 LOC.B6 AND C6.	10/2/98	I.PARROTT
C	CODE X ADDED TO CALL UP NO. LOC. B5 SHT. 2. NOTE x ADDED TO NOTEBLOCK LOC. A5 SHT.3 REF. WQN 01489	11.11.99	I.P

GENERAL DATA

1. OPERATING PRESSURE TO BE AGREED WITH PURCHASER.
2. ALL FLEXIBLE DUCTS MEET FLAMMABILITY REQUIREMENTS OF CAA 8.2 & FAR 25.853(b).
3. ALL FLEXIBLE DUCTS MEET AIRBUS SPEC. ATS1000.001 ISS.5 (FLAMMABILITY, SMOKE & TOXICITY).
4. ALL FLEXIBLE DUCTS RESIST ACCIDENTAL EXPOSURE TO THE FOLLOWING:

AEROSHELL 500 MIL–L–23699	LUBRICANT
EXON TURBO OIL 2380	LUBRICANT
MOBIL JET II	LUBRICANT
SKYDROL 500B4	LUBRICANT
CHEVRON HYJET 4	LUBRICANT
ORONITE H2V	LUBRICANT
DTD 585/MIL–H–5606	LUBRICANT
MIL–H–83282	LUBRICANT
JET A1	FUEL
JET B	FUEL
JP 4	FUEL
JP 5	FUEL
JP 8	FUEL

5. LEAK RATE SHALL NOT EXCEED 0.03 CFM/INCH DIA./FOOT LENGTH AT 1 P.S.I.
6. MINIMUM BEND RADIUS EQUIVALENT TO ONE DIAMETER.

UNLESS OTHERWISE STATED DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE STATED TOLERANCES ARE AS FOLLOWS
LENGTHS ± ±0.125
DIAMETERS ±0.030
ANGLES N/A

DRN. G.F.D.
CKD. M.D.SHORTMAN
APPD. M.D.SHORTMAN
PROJECTION

BAXTER WOODHOUSE & TAYLOR LTD.
MACCLESFIELD, CHESHIRE, SK10 4NL, ENGLAND.

TITLE STANDARD LIGHTWEIGHT LOW PRESSURE IMPERIAL FLEXIBLE DUCTING

B | DRG.No. BWT10 | REV C
SCALE N.T.S. | SHEET 3 OF 3

B757 MANUAL SUPPLEMENT - ATP 3510
SECTION 1 CHAPTER 21
CONTROL PAGE - ISSUE 1

A. File the attached Temporary Revision/Alerts in the Manual Supplement in ATA Chapter/Section/Subject/Page sequence

B. File this Control Page in front of the Chapter TRs/Alerts.

C. The following list shows active TRs/Alerts together with TRs/Alerts added by this control page.

Chapter Section Subject	Page	TR/Alert No.
21-00-00	101	* 21-544
21-00-00	201	* 21-562
21-00-02	201	21-560

D. Remove and Destroy the following TRs/Alerts:

* Indicates TRs/Alerts issued with this control page

757 FAULT ISOLATION MANUAL

TEMPORARY REVISION No. 21-544

THIS TEMPORARY REVISION IS ISSUED BY BRITISH AIRWAYS ENGINEERING (TECHNICAL INFORMATION SERVICES, G2, TBA, S401, P. O. BOX 10, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX TW6 2JA).
CAA DESIGN APPROVAL No. DAI/8566/78.

Manual Reference 21-00-00 as Page 101

REASON FOR REVISION

To add a procedure for isolating the source of an oil smell in the cabin.

ACTION

AIR CONDITIONING - GENERAL

ISOLATING THE SOURCE OF AN OIL SMELL IN THE CABIN

(This procedure is similar to AMM TASK 21-00-01-002-001 Para C.)

NOTE: The air is checked indirectly by being positioned approximately 2 to 3 feet from the air outlet so that as the air bounces off the floor it can be sampled nasally.

Procedure

(1) Using the APU start the left and right engines.
(2) Turn OFF left and right packs. Both packs are to remain OFF for the duration of the test.
(3) Isolate the APU air supply by putting the APU air delivery push button to OFF.
(4) Isolate the left and right engine air supplies by putting the left and right engine air delivery push buttons to OFF.
(5) Confirm the left and right duct pressures are zero from EICAS or the overhead duct pressure gauge.
(6) Gain access to the left pack bay by lowering access door 193HL.

(7) CAUTION: ENSURE PNEUMATIC SYSEM IS DEPRESSURISED. INJURY CAN RESULT IF CONNECTOR IS REMOVED WITH DUCT PRESSURE PRESENT.

Remove one of the pneumatic ground connector points (AMM TASK 36-11-03-004-001).

(8) Inspect at least a six foot radius of floor area under the connection point. There must be no foreign objects that could be blown into personnel or engines or that could cause damage to aircraft.

(9) WARNING: ALL PERSONNEL INVOLVED MUST WEAR EAR DEFENDERS AND GOGGLES. LOOSE CLOTHING MUST NOT BE WORN.

Position personnel forward and aft of the pneumatic ground connector so that air from the connection point may be sampled nasally indirectly as it bounces off the floor.

(10) With personnel in position supply air from one pneumatic source and sample the air as described in (9). Initially the velocity of the air will be quite slow but will rapidly increase. It is important to sample the air as soon as it first comes out of the pneumatic ground connector. Experience has proved that if an oily smell is present it can only be detected upon the initial application of the air supply. Once the air velocity has increased to maximum an oily smell is very difficult to detect.

(11) Turn OFF the air supply.

(12) Repeat steps 8, 9, 10 and 11 for the other two sources of air.

(13) Repeat steps 8, 9, 10, 11 and 12 but sample the three air supplies in a different order. This will ensure a good air source blows the ducting out prior to the suspect source being sampled again.

(14) Isolate all air supplies.

(15) Confirm the left and right duct pressures are zero from EICAS or the overhead duct pressure gauge.

(16) Refit the removed pneumatic ground connector (AMM TASK 36-11-03-404-011).

(17) Shut down the left and right engines and the APU.

(18) If no oily smell was noted from the APU or left or right engine air then lock closed the left and right high stage bleed valves (DDM 36-11-2 Para B).

(19) Restart the left and right engines and action items 7, 8, 9 and 10. This test will allow the LP air bleed to be sampled.

(20) Action items 14, 15, 16 and 17.

(21) Reinstate the left and right engine HP bleed valves.

(22) Record all findings on the appropriate documentation. Forward copies to Fleet 1 Powerplant Technical Engineer (Fax 37670).

(23) If the oily smell was noted from the APU air, isolate the APU air (DDM 36-11-4 Para B) and carry out left and right pack decontamination (AMM TASK 21-00-01-002-001 Para C) using engine air only.

(24) If the oily smell was noted from the left or right engine note this on the documentation in step (22). The appropriate action will be taken dependent upon engine availability.

757 MAINTENANCE MANUAL

TEMPORARY REVISION No. 21-562

THIS TEMPORARY REVISION IS ISSUED BY BRITISH AIRWAYS ENGINEERING (TECHNICAL INFORMATION SERVICES, G2, TBA, S401, P. O. BOX 10, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX TW6 2JA).
CAA DESIGN APPROVAL No. DAI/8566/78.

Manual Reference 21-00-00 Page 201

REASON FOR REVISION

Recommendation from Boeing Service Letters.

ACTION

In order to reduce heat input into the Center Wing Tank (CWT), when available and practical, it is recommended that ground conditioned air is used to service the aircraft in lieu of using the APU and operating the ECS air conditioning packs.

757 MAINTENANCE MANUAL

TEMPORARY REVISION No. 21-560

THIS TEMPORARY REVISION IS ISSUED BY BRITISH AIRWAYS ENGINEERING (TECHNICAL INFORMATION SERVICES, G2, TBA, S401, P. O. BOX 10, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX TW6 2JA) AND COMPLIES WITH BCAR'S CHAPTER A5-3, B5-3 AND/OR TSS No. 0-2 AS REQUIRED. CAA DESIGN APPROVAL No. DAI/8566/78.

G Litchfield For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 21-00-02 Page 201

REASON FOR REVISION

Additional information.

ACTION

AIR CONDITIONING SYSTEM - PACK HEALTH CHECK

{ TASK 21-00-02-712-027
{ 1. Do the Pack Health Check
{ A. Prepare for the Test

{ S 862-005
{ (1) Make sure that these circuit breakers are closed:
{ (a) On the overhead circuit breaker panel, P11:
{ 1) 11A13, AIR COND PACK LEFT AUTO CONT
{ 2) 11A14, AIR COND PACK LEFT FLOW CONT
{ 3) 11A15, AIR COND RIGHT STANDBY CONT
{ 4) 11A26, AIR COND LEFT STANDBY CONT
{ 5) 11A28, AIR COND PACK RIGHT AUTO CONT
{ 6) 11A29, AIR COND PACK RIGHT FLOW CONT
{ 7) 11M11, LEFT PACK AUTO POWER
{ 8) 11M15, RIGHT PACK STANDBY POWER
{ 9) 11M17, PACK FLOW IND
{ 10) 11M19, RIGHT PACK AUTO POWER
{ 11) 11M24, LEFT PACK STANDBY POWER
{ 12) EICAS circuit breakers (6 locations).

{ (2) DELETED

{ S 862-006
{ (3) Supply electrical power (AMM 24-22-00/201).

←

{ S 862-007
{ (4) Push the ECS MSG button on the EICAS maintenance panel.
{ (a) Make sure that these messages are not shown:
{ 1) ZONE TEMP BITE
{ 2) RIGHT PACK BITE
{ 3) LEFT PACK BITE
{ (b) If any of the messages do show, do the BITE test on the applicable controller.

{ S 862-008
{ (5) Supply pneumatic pressure with the APU (AMM 36-00-00/201).
{ (a) Make sure that the bleed air duct pressure is at least 30 PSI.

{ S 862-009
{ (6) Set the left and right pack selectors to AUTO.

{ S 862-010
{ (7) Set the temperature control selectors to AUTO.

{ S 862-011
{ (8) Set the isolation valve to OPEN.

{ S 862-012
{ (9) Set the two recirculation fans to ON.

{ S 862-013
{ (10) Set the trim air to ON.

B. Do the Auto and Standby Pack Temperature Control Check

{ S 712-014
{ (1) Do the Auto Check
{ (a) After five minutes, make sure these things have occurred:
{ 1) The duct pressures are approximately 8-20 PSI
{ 2) The left and right pack temperature valve positions are approximately the same
{ 3) The pack flow rates are more than 1500 CFM (42 CMM)
{ 4) The pack flow rates are approximately the same

{ NOTE: The difference between the left and the right side should not be more than 100 CFM (3 CMM).

{ 5) The left and right pack out temperatures are approximately the same.

(b) Write down all the ECS information (such as pack flows and temperatures).
(c) Set the right pack selector to OFF.
1) Make sure EICAS shows the flow rate for the left pack to be above 1500 CFM (42 CMM) and that it increases.
(d) Open this circuit breaker:
1) On the P11 panel:
a) 11A14, AIR COND PACK LEFT FLOW CONT
(e) Make sure EICAS shows the flow rate for the left pack to be above 1500 CFM (42 CMM) when it is stable.
(f) Close this circuit breaker:
1) On the P11 panel:
a) 11A14, AIR COND PACK LEFT FLOW CONT
(g) Set the left pack selector to OFF.
(h) Set the right pack selector to ON.
1) Make sure EICAS shows the flow rate for the right pack to be above 1500 CFM (42 CMM) and that it increases.
(i) Open this circuit breaker:
1) On the P11 panel:
a) 11A29, AIR COND PACK RIGHT FLOW CONT
(j) Make sure EICAS shows the flow rate for the right pack to be above 1500 CFM (42 CMM) when it is stable.
(k) Close this circuit breaker:
1) On the P11 panel:
a) 11A29, AIR COND PACK RIGHT FLOW CONT
(l) If there is a large difference in flow rates, you must isolate the problem.

NOTE: This problem can be caused by a bad flow control valve, a bad flow sensor, or a bad flow control module.

S 712-015
(2) Do the Standby Check
(a) Set the left and right pack control selectors to STBY-N.

NOTE: In STBY-N the Pack Standby Controller is in control and is connected to the low-limit valve torque motor.

(b) After five minutes, make sure these things have occurred:
1) The pack outlet temperatures are approximately the same for the left and right packs.

{ NOTE: If there is a large difference in pack outlet temperatures in STBY-N it can be a bad low-limit valve or a bad standby temperature controller.

{ 2) The pack flow rates are more than 1500 CFM (42 CMM).
{ 3) The pack flow rates are approximately the same.
{ 4) The temperature control valve is less than 0.06 fully closed.

{ (c) Write down all the ECS information (such as pack flows and temperatures).

{ (d) Set the left and right pack control selectors to STBY-W.

{ NOTE: In STBY-W the packs are in heat exchanger-only cooling mode. The air bypasses the air cycle machine and no electronic controllers are in control.

{ (e) After five minutes, make sure these things have occurred:
{ 1) The pack outlet temperatures are approximately the same for the left and right packs
{ 2) The pack flow rates are more than 1500 CFM (42 CMM)
{ 3) The pack flow rates are approximately the same
{ 4) The temperature control valve is more than 0.94 fully open.

{ NOTE: If the ambient temperature is hot, the pack outlet overheat sensor can sense an overheat condition. This will cause an INOP light on the pack control panel and a L(R) PACK TEMP message on EICAS. If this occurs, the temperature control valve will close to 0.00 - 0.06. Push the INOP switch/light to start the pack operation.

{ (f) Set the left and right pack control selectors to STBY-C.

{ NOTE: In STBY-C the low-limit valve is the primary temperature control component. It is controlled by pneumatic pressure to the differential pressure servo.

(g) After five minutes, make sure these things have occurred:
1) The pack outlet temperatures are approximately the same for the left and right packs
2) The pack flow rates are more than 1500 CFM (42 CMM)
3) The pack flow rates are approximately the same
4) The temperature control valve is more than 0.06 fully closed.

C. Do a Check of the Zone Temperature Control System

S 712-016
(1) Do the Auto Check

NOTE: In the AUTO mode, the cabin zone temperature controller finds the lowest temperature that is asked for by the selectors. The controller calculates the difference between that temperature and the temperature that is measured by the zone duct temperature sensors. Then the controller sends a signal to the appropriate trim valve to change the temperature in the direction it is necessary.

(a) Set the left and right pack control selectors to AUTO.
(b) Set the temperature control selectors to AUTO.
(c) Turn the FLT DECK selector for the zone temperature control toward WARM.
1) Make sure that EICAS shows the trim air valve for the FLT DECK zone increases to more than 0.94.

NOTE: On Airplanes without the optional EICAS measurements, you must look at the trim air modulating valve to see its position (AMM 21-61-00/501, Do the Trim Air Modulating Valves System Test).

(d) Turn the FLT DECK selector for the zone temperature control toward COLD.
1) Make sure that EICAS shows the trim air valve for the FLT DECK zone decreases to less than 0.06.
(e) Set the FLT DECK selector to AUTO.
(f) Turn the FWD CAB selector for the zone temperature control toward WARM.
1) Make sure that EICAS shows the trim air valve for the FWD CAB zone increases to more than 0.94.

{ (g) Turn the FWD CAB selector for the zone temperature control toward COLD.
{ 1) Make sure that EICAS shows the trim air valve for the FWD CAB zone decreases to less than 0.06.
{ (h) Set the FWD CAB selector to AUTO.
{ (i) Turn the AFT CAB selector for the zone temperature control toward WARM.
{ 1) Make sure that EICAS shows the trim air valve for the AFT CAB zone increases to more than 0.94.
{ (j) Turn the AFT CAB selector for the zone temperature control toward COLD.
{ 1) Make sure that EICAS shows the trim air valve for the AFT CAB zone decreases to less than 0.06.
{ (k) Set the AFT CAB selector to AUTO.

{ TASK 21-00-02-212-017
{ 2. Do the Physical Check
{ A. References
{ (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
{ (2) AMM 21-51-01/201, Flow Control and Shutoff Valve
{ (3) AMM 21-51-02/601, Heat Exchangers
{ (4) AMM 21-51-03/401, Air Cycle Machine
{ (5) AMM 21-51-04/401, Water Extractor
{ (6) AMM 21-51-05/401, Compressor Outlet Overheat Switch
{ (7) AMM 21-51-06/401, Compressor Outlet Sensor
{ (8) AMM 21-51-08/401, Pack Temperature Sensor
{ (9) AMM 21-51-11/201, Pack Low Limit Control Valve
{ (10) AMM 21-51-12/401, Pack Temperature Control Valve
{ (11) AMM 21-51-15/401, Cabin Air Supply Check Valve
{ (12) AMM 21-51-21/401, Split-Duct Water Separator
{ (13) AMM 24-22-00/201, Manual Control
{ B. Access
{ (1) Location Zones 135/136 Environmental Control System (ECS) Bay
{ (2) Access Doors
{ 193HL ECS Bay (Left)
{ 194ER ECS Bay (Right)

{ C. Prepare for the Check

{ S 862-018
{ (1) Supply electrical power (AMM 24-22-00/201).

{ S 862-019
{ (2) Turn the left (right) pack selector, on the overhead panel, P5, to the OFF position.
{ (a) Make sure the PACK OFF light comes on.
{ (b) Attach a DO-NOT-OPERATE tag on the selector.

S 012-020
(3) Open the left (right) ECS bay access door, 193HL (194ER) (AMM 06-41-00/201).

D. Do the Check of the Cooling Pack

S 212-021
(1) Examine these components to make sure there are no signs of a leak:
(a) Air cycle machine (AMM 21-51-03/401)
(b) Water extractor (AMM 21-51-04/401)
(c) Split-duct water separator (AMM 21-51-21/401).

S 902-022
(2) Replace the componenets or connections if it is necessary.

S 212-023
(3) Examine these valves to make sure there are no signs of a leak in the valves or the pneumatic lines:
(a) Flow control and shutoff valve (AMM 21-51-01/201)
(b) Low limit control valve (AMM 21-51-11/201)
(c) Temperature control valve (AMM 21-51-12/401)
(d) Cabin air supply check valve (AMM 21-51-15/401).

S 902-024
(4) Replace the valves or repair the connections if it is neccessary.

S 212-025
(5) Examine these components to make sure there are no signs of a leak or blockage:
(a) Water drain lines
(b) Air conditioning ducts
(c) Pneumatic lines.

S 902-026
(6) Replace or repair the lines or ducts if it is necessary.

E. Put the Airplane Back to Its Usual Condition

S 412-004
(1) Close the left (right) ECS bay access door, 193HL (194ER) (AMM 06-41-00/201).

S 932-003
(2) Remove the DO-NOT-OPERATE tag from the left (right) pack selector on the P5 panel.

S 862-002
(3) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

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R 210	JAN 20/09	03.1
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R 213	JAN 20/09	03.1
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205	MAY 28/01	02
206	SEP 20/95	02
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19	MAR 20/89	03
20	SEP 20/87	05

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55	MAR 20/89	07
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512	MAY 28/06	05

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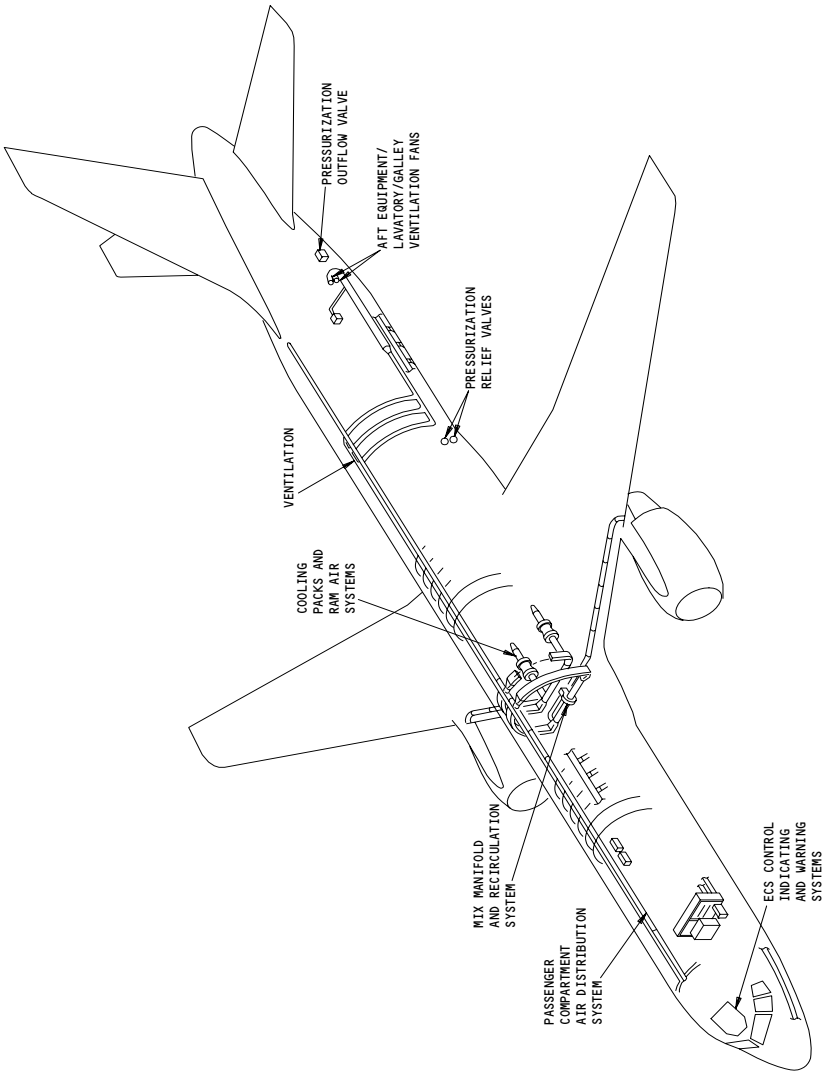
AIR CONDITIONING - GENERAL - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The air conditioning system maintains airplane environmental control for the comfort of passengers and crew. The total system is made up of the conditioned air distribution system, pressurization control system, cargo compartment heating system, cooling system and temperature control system.
   B. Distribution
      (1) The distribution system channels temperature-controlled air to the flight deck and passenger cabin through a network of distribution ducts. The main mix manifold (AMM 21-21-00/001) combines cooled air from the air cooling packs (AMM 21-51-00/001) with recirculation air (AMM 21-25-00/001) drawn from the passenger cabin. The air is channeled to the flight deck through ducts (AMM 21-22-00/001) and to the passenger compartment through risers, overhead ducting and outlets (AMM 21-23-00/001). Separate exhaust ducting provides positive ventilation for all lavatory and galley areas (AMM 21-26-00/001).
   C. Pressurization Control
      (1) The air conditioning system provides pressurization control by regulating the amount of air discharged from the airplane (AMM 21-31-00/001). Backup positive and negative pressurization relief systems prevent the cabin pressure from exceeding established limits (AMM 21-32-00/001). Pressurization indication and warning systems (AMM 21-33-00/001) allow the operator to monitor the pressurization control system.
   D. Heating
      (1) Independent cargo compartment heating systems provide temperature control for the forward (AMM 21-43-00/001), aft and bulk (AMM 21-44-00/001) cargo compartments.
      (2) The supplemental heating system channels heated air to the captain's and first officer's foot and shoulder areas (AMM 21-45-00/001).
   E. Cooling
      (1) Cooled air is supplied to the distribution system by two air cooling packs (AMM 21-51-00/001). The pneumatic system (AMM 36-00-00/001) provides source air to the packs. The ram air system (AMM 21-53-00/001) assures pack temperature control. The pack indicating system allows flight deck monitoring of pack operation (AMM 21-52-00/001).
      (2) The equipment cooling system removes heat generated by electrical and electronic equipment in the flight compartment, forward equipment area, main equipment racks (AMM 21-58-00/001), and aft equipment area (AMM 21-26-00/001).



Environmental Control Systems
Figure 1

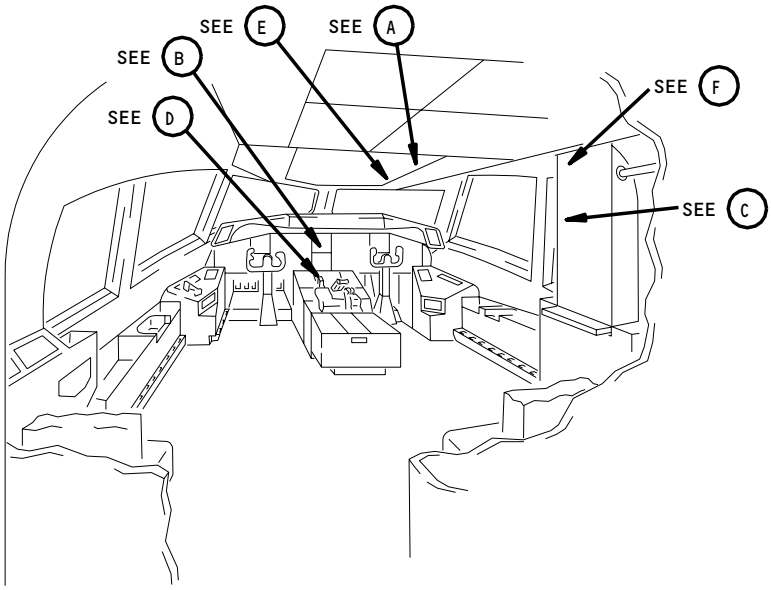
F. Temperature Control

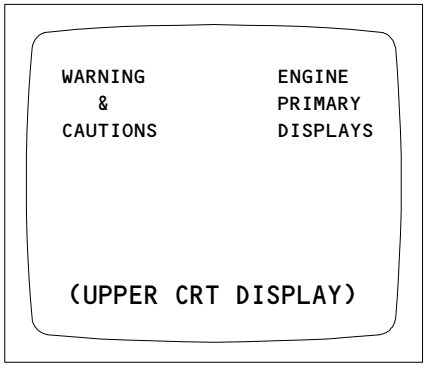
(1) The temperature control system regulates the environment within the airplane's three primary zones (AMM 21-61-00/001). Cooled air mixes with hot "trim" air to obtain the desired temperature at each zone. Monitoring of the system is provided by valve position indication (AMM 21-64-00/001) and the zone temperature indication system (AMM 21-64-00/001).

G. Control and Indication (Fig. 2)

(1) Control selectors and switchlights, on the pilot's overhead panel P5, and one control selector on the right side panel P61 allow control of all air conditioning systems. Warning lights, position indicators and other gages on the P5 panel provide partial indication of system operation. The Engine Indication and Crew Alerting System (EICAS) (AMM 31-41-00/001) provides the remaining indication for the air conditioning system.

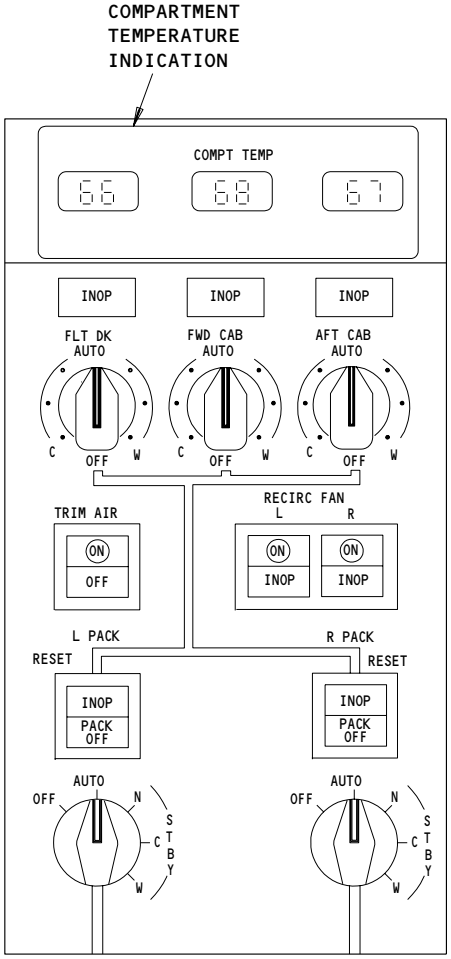
(2) EICAS provisions include two cathode-ray tube (CRT) display screens on the pilot's center instrument panel P2, a display select panel on the forward electrical control stand P9, and an EICAS maintenance panel on the right side panel P61. EICAS displays primary engine parameters on the upper CRT. Warning, caution, and advisory messages also appear on the upper CRT during certain system malfunctions. Aural tones occur in the flight deck with each of the above types of messages. Two other types of messages may also appear, status or maintenance. These two types of messages both appear on the lower CRT only when called upon by an operator. Status messages display data on the current status of operation and may be called upon by selecting the STATUS switch on the display select panel. The airplane may be either inflight or on the ground. Maintenance messages are available only on the ground by selecting the ECS/MSG switch on the EICAS MAINT panel. Current maintenance information is usually displayed unless a recorded page is called up. A recorded page is a page with information about the status of the system inflight when certain failures occurred. These are called AUTO EVENTS and are called up by selecting the AUTO EVENT READ switch on the EICAS MAINT panel.





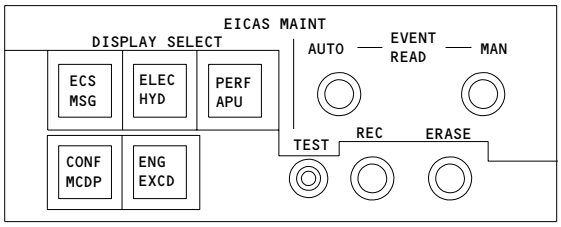
EICAS DISPLAY SCREENS (REF)

B



AIR CONDITIONING CONTROL PANEL
(PILOT'S OVERHEAD PANEL P5)

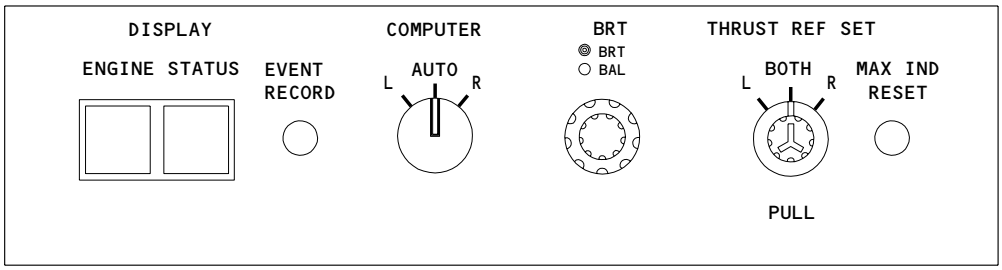
A



EICAS MAINTENANCE PANEL (REF)

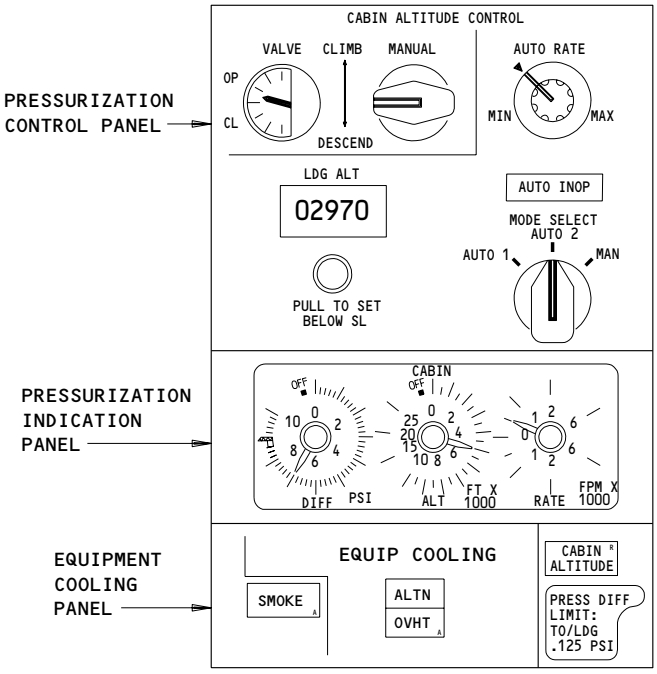
C

ECS Control and Indication
Figure 2 (Sheet 1)



EICAS DISPLAY SELECT PANEL
(FORWARD ELECTRICAL CONTROL STAND P9)

D



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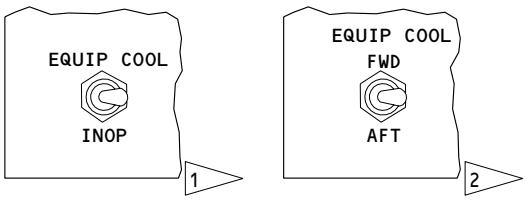


EQUIPMENT COOLING
TEST SWITCH
(RIGHT SIDE PANEL P61)

F

1 AIRPLANES WITHOUT AFT COOLING SYSTEM

2 AIRPLANES WITH AFT COOLING SYSTEM

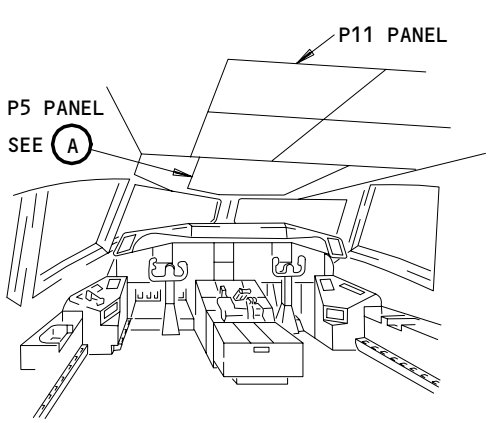
ECS Control and Indication
Figure 2 (Sheet 2)

AIR CONDITIONING - GENERAL - MAINTENANCE/PRACTICES

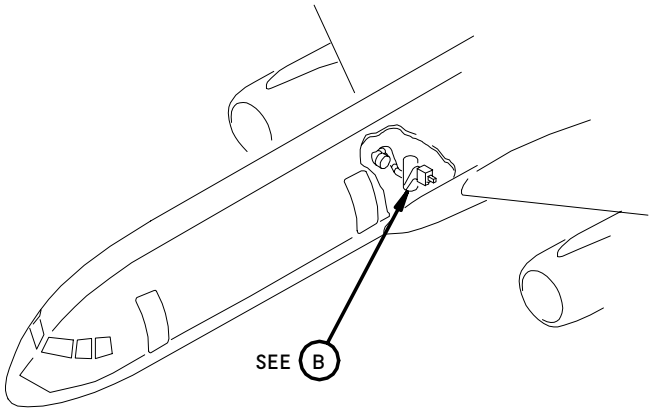
1. General
   A. This procedure has instructions on how to supply the conditioned air to the airplane while the airplane is on the ground. You can supply the conditioned air by the packs or by a ground cart.
   B. It is recommended that conditioned air to cool the airplane on the ground be supplied from a ground conditioned air source, when practical, as an alternative to conditioned air from the air conditioning packs. Refer to 757-SL-21-051 for more data about this maintenance practice.
   C. When you use the air conditioning packs, you must supply electrical and pneumatic power to the airplane. The pneumatic power is supplied from one of these sources (AMM 36-00-00/201):
      (1) A pneumatic ground cart
      (2) The APU
      (3) The engines
   D. A ground cart supplies the conditioned air directly to the mix manifold, and on airplanes with the bypass duct, to the flight deck. The electrical power, pneumatic power, and pack operation are not necessary when you use the ground cart.

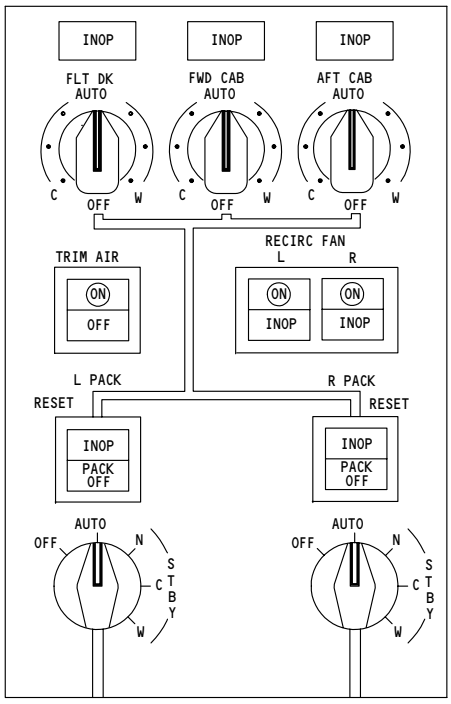
TASK 21-00-00-862-001

2. Air Conditioning Pack Operation
   A. General
      (1) It is recommended that when ambient temperatures are greater than 60 degrees F that conditioned air to cool the airplane on the ground be supplied from a ground conditioned air source, when practical, as an alternative to conditioned air from the air conditioning packs. Refer to 757-SL-21-051 for more data about this maintenance practice.
   B. References
      (1) AMM 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power Control
      (3) AMM 36-00-00/201, Pneumatic - General



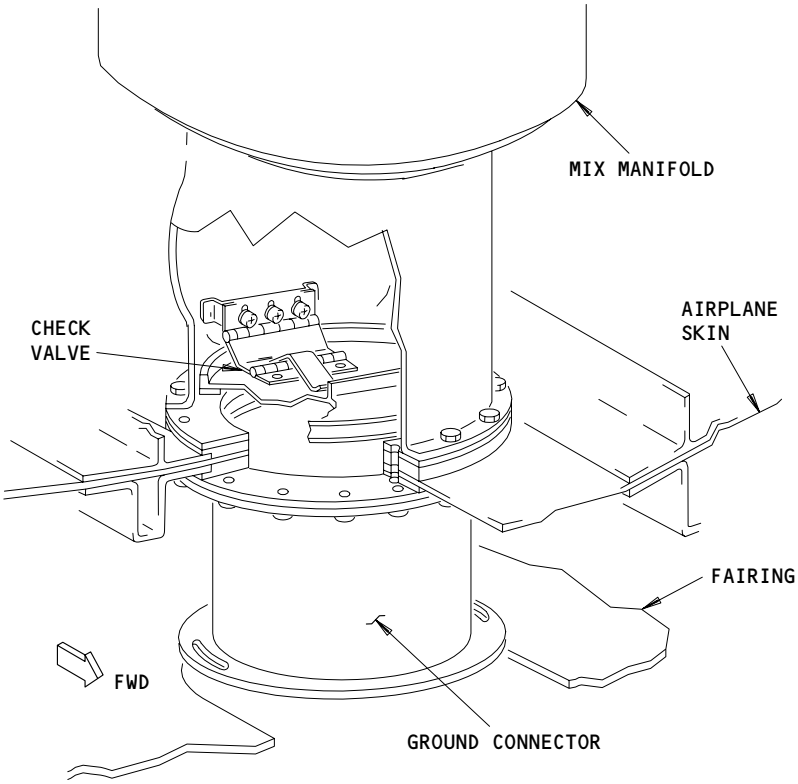
FLIGHT COMPARTMENT





AIR CONDITIONING CONTROL PANEL

A



GROUND CONDITIONED AIR CONNECTOR

B

Air Conditioning – General – Maintenance Practices
Figure 201

C. Operate the Air Conditioning Pack

S 862-021

CAUTION: DO NOT OPERATE A COOLING PACK AND A GROUND AIR SOURCE AT THE SAME TIME. THE COOLING PACK CAN NOT CONTROL THE AIR TEMPERATURE IF A GROUND AIR SOURCE IS OPERATED AT THE SAME TIME. YOU CAN CAUSE DAMAGE TO EQUIPMENT IF YOU OPERATE A COOLING PACK AND A GROUND AIR SOURCE AT THE SAME TIME.

(1) Obey this CAUTION during all of this task.

S 862-014

(2) If applicable, disconnect the source of external conditioned air.

NOTE: If the packs are operated in AUTO when the external conditioned air is used, the cabin temperatures will increase instead of decrease. The temperature sensors in the mix manifold feel the cold air from the ground cart. This causes the packs to increase their exit temperature.

S 862-002

(3) Start the packs in the AUTO mode.
  (a) Supply electrical power (AMM 24-22-00/201).
  (b) Supply pneumatic power (AMM 36-00-00/201).
  (c) Turn the L and R PACK selectors, on the pilot's overhead panel P5, to the AUTO position.
  (d) Make sure the PACK OFF lights go off.

S 862-003

(4) Start the packs in the STBY mode.
  (a) Supply electrical power (AMM 24-22-00/201).
  (b) Supply pneumatic power (AMM 36-00-00/201).
  (c) Turn the L and R PACK selectors, on the pilot's overhead panel P5, to the STBY-N position.
  (d) Make sure the PACK OFF lights go off.

S 212-006

(5) Make sure the packs are on.
  (a) Make sure the EICAS circuit breakers (5 locations), on the overhead circuit breaker panel P11, are closed.
  (b) Push the ECS MSG switch, on the EICAS MAINT panel, on the right side panel P61.
  (c) On the EICAS ECS display page, on the pilot's center instrument panel P2, make sure the L and R PACK OUT indications change.

S 862-005

(6) Stop the pack operation.
  (a) Turn the L and R PACK selectors, on the P5 panel, to the OFF position.

(b) Make sure the PACK OFF lights come on.
(c) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).
(d) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

TASK 21-00-00-862-004

3. Ground Cart Conditioned Air Supply

A. General

B. Access

(1) Location Zone
135 Environmental control system bay (Left)

(2) Access Panel
193DL Environmental control system access door (Left)

C. Supply the conditioned air with a ground cart

S 862-022

CAUTION: DO NOT OPERATE A COOLING PACK AND A GROUND AIR SOURCE AT THE SAME TIME. THE COOLING PACK CAN NOT CONTROL THE AIR TEMPERATURE IF A GROUND AIR SOURCE IS OPERATED AT THE SAME TIME. YOU CAN CAUSE DAMAGE TO EQUIPMENT IF YOU OPERATE A COOLING PACK AND A GROUND AIR SOURCE AT THE SAME TIME.

(1) Obey this CAUTION during all of this task.

S 862-015

(2) If applicable, shut the packs off.

NOTE: If the packs are operated in AUTO when the external conditioned air is used, the cabin temperatures will increase instead of decrease. The temperature sensors in the mix manifold feel the cold air from the ground cart. This causes the packs to increase their exit temperature.

S 012-006

(3) Open the ECS access panel, 193DL (AMM 06-41-00/201) to find the ground connector for the conditioned air.

S 012-007

(4) Open the cover of the ground connector.

S 492-008

(5) Connect the ground cart to the ground connector.
(a) Put the flange of the cart supply hose into position against the flange of the ground connector.
(b) Make sure the fasteners on the supply hose flange go into the slots of the ground connector flange.
(c) Turn the supply hose flange so that it locks into position.

CAUTION: MAKE SURE THAT THE SUPPLY HOSE FLANGE IS CORRECTLY LOCKED INTO POSITION. IF THE SUPPLY HOSE FLANGE IS NOT IN THE CORRECT POSITION WHEN THE AIR FLOW STARTS, IT CAN CAUSE DAMAGE TO THE GROUND CONNECTOR FLANGE.

(d) Make sure that the supply hose flange is correctly locked into position.

S 862-009

(6) Turn the ground cart on, to supply the conditioned air to the airplane.

D. Remove the conditioned air supplied by the ground cart

S 862-010

(1) Stop the ground cart operation, to stop the supply of conditioned air.

S 082-011

(2) Disconnect the ground cart from the ground connector.
   (a) Turn the flange of the cart supply hose to loosen the fasteners.
   (b) Remove the supply hose from the ground connector.

E. Put the airplane back to its usual condition.

S 412-012

(1) Close the cover of the ground connector.

S 412-013

(2) Close the ECS access panel, 193DL (AMM 06-41-00/201).

AIR CONDITIONING SYSTEM OIL CONTAMINATION (REMOVAL) - MAINTENANCE PRACTICES

1. General
   A. This procedure has the steps to remove the oil contamination from the air conditioning and pneumatic systems. You must first isolate the cause of the oil contamination and repair the problem before you do this procedure (FIM 21-00-01/101).
   B. The oil fumes and the smoke from an APU/engine failure can get into the airplane cabin and cause contamination of the conditioned air.
   C. The APU is the most likely source of the smoke or odors. Any APU failure can release oil into the air conditioning system. Oil, glycol, or hydraulic fluid ingested into the inlet of the APU is another possible source of the contamination.
   D. When oil enters the pneumatic and/or air conditioning system, it tends to accumulate in the heat exchangers or the precoolers. The oil, hydraulic fluid, or the glycol vaporizes at a higher temperature and enters the cabin.
   E. Do not do this procedures with the crew and passengers on board, since this procedure generates a high concentration of smoke.
   F. Do not do this procedures with the crew on board, since this procedure generates a high concentration of smoke.

TASK 21-00-01-002-001

2. Removal of Oil Contamination from the Air Conditioning and Pneumatic Systems
   A. References
      (1) AMM 24-22-00/201, Manual Control
      (2) AMM 36-11-03/401, Pneumatic Ground Connector
      (3) AMM 36-00-00/201, Pneumatic System
      (4) AMM 49-11-00/201, Auxiliary Power Unit
      (5) AMM 71-00-00/201, Power Plant
      (6) FIM 21-00-01/101, Smoke or Fumes Removal from the Air Conditioning System
   B. Access
      (1) Location Zone
          135 Environmental Control System Bay, L
          136 Environmental Control System Bay, R
          211 Control Cabin - L
          212 Control Cabin - R

      (2) Access Panels
          193HL Environmental Control System Bay, L
          194ER Environmental Control System Bay, R
   C. Procedure

      S 012-002
      (1) Open the access doors to the air conditioning bays.

      S 812-028
      (2) Perform fault isolation procedure in accordance with FIM 21-00-01/101 to isolate/repair the cause of the contamination.

S 862-005

(3) Supply electrical power (AMM 24-22-00/201).

S 862-006

(4) Make sure these switches are set to OFF on the overhead P5 panel:
  (a) L and R PACK.
  (b) APU.
  (c) TRIM AIR.
  (d) L and R RECIRC FAN.

S 862-007

(5) Make sure the ISOLATION valve switch on the overhead P5 panel is set to ON (open).

S 022-008

(6) Remove the check valve at the pneumatic ground connector on the right side of the airplane (AMM 36-11-03/401).

NOTE: this will permit the initial bleed air, which has more oil contamination, to go out through the check valve opening.

S 862-026

WARNING: DO NOT GO NEAR THE CHECK VALVES WHEN YOU PRESSURIZE THE APU PNEUMATIC DUCT. THE APU BLEED AIR CAN CAUSE INJURY TO PERSONS WHEN THE BLEED AIR GOES OUT THROUGH THE CHECK VALVE OPENING.

(7) Pressurize the pneumatic duct:

NOTE: This procedure will remove the oil contamination from the APU bleed air. The APU bleed air will go out through the check valve opening.

  (a) Start the APU and let the operation of the APU become stable (AMM 49-11-00/201).
  (b) Put the APU switch to ON.
  (c) Let the APU operate until the APU bleed air has no smell of the oil contamination.
  (d) Put the APU switch to OFF.
  (e) Stop the APU (MM 49-11-00/201).

S 422-012
(8) Install the check valve that you removed from the pneumatic ground connector (AMM 36-11-03/401).

S 862-013
(9) Start the APU again (AMM 49-11-00/201).

S 862-014
(10) Set the APU switch to ON.

S 862-015
(11) Operate the left and right air conditioning packs:

NOTE: this procedure uses the APU bleed air to remove the oil from the air conditioning system.

WARNING: MAKE SURE THERE IS AN EXIT FOR THE CONDITIONED AIR IN THE AIRPLANE. ACCIDENTAL CABIN PRESSURIZATION CAN CAUSE INJURY TO PERSONS.

(a) Make sure the pressurization outflow valve is open or a minimum of one passenger entry door is open.
(b) Set the position of these switches on the overhead P5 panel as follows:
    1) L and R PACK switches to STBY-C (or STBY-N)
    2) TRIM AIR to ON.
    3) Cabin Temp Selectors to W.
    4) L and R RECIRC FAN to ON.
(c) Let the air conditioning packs operate until the conditioned air in the airplane has no smell of the oil contamination.
(d) Set the L and R PACK switches of OFF.

S 862-016
(12) Start the engines and let the engines operate at ground idle speed (AMM 71-00-00/201).

S 862-017
(13) Set the APU switch to OFF.

S 862-018
(14) Operate the air conditioning packs:

NOTE: This procedure uses the engine bleed air to remove the oil contamination from the conditioned air in the airplane.

(a) Set these switches on the overhead P5 panel as follows:
1) L and R PACK switches to STBY-C (or STBY-N)
2) L and R ENG bleed air switch to ON.
(b) Let the air conditioning packs operate until the conditioned air in the airplane has no smell of the oil contamination.
(c) Set the L and R PACK switches of OFF.

S 862-019
(15) Stop the engines (AMM 71-00-00/201).

S 862-020
(16) Set these switches to OFF on the overhead P5 panel:
(a) TRIM AIR.
(b) L and R RECIRC FAN.

S 282-021
(17) Examine these components for oil contamination.
(a) Air conditioning packs.
(b) Cabin air supply duct.
(c) Mix manifold.
(d) Cabin air supply check valve.
(e) Condenser/plenum, continuing upstream into the pack.
(f) Recirculation air filter.
(g) Galley vent fan filter.

S 162-022
(18) Clean the components or replace them if they have too much contamination.

NOTE: This is a very important step in the overall contamination removal procedure.

S 162-023
(19) Do the procedure again until the conditioned air in the airplane has no smell of the oil contamination.

D. Put the Airplane Back to its Usual Condition.

S 412-024
(1) Close the access doors to the air conditioning bays.

S 862-025

(2) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

DISTRIBUTION

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS	1		FLT COMPT, P11	
EQUIP COOLING FAN CONT AFT EXH XFER, C705		1	11N11	*
RECIRC CARGO FIRE CONT LEFT, C660		1	11P14	*
RECIRC CARGO FIRE CONT RIGHT, C661		1	11P23	*
CIRCUIT BREAKERS	5		119BL, MAIN EQUIP CTR, P37	
AFT EQPT COOLING FAN EXH NO. 1, C333		1	37D5	*
R RECIRC FAN CONT, C4374		1	37D7	*
RECIRC FAN R, C337		1	37J5	*
CIRCUIT BREAKERS	5		119BL, MAIN EQUIP CTR, P70	
AFT EQPT COOLING FAN EXH NO. 2, C334		1	70B2	*
L RECIRC FAN CONT, C4373		1	70B16	*
RECIRC FAN LEFT, C336		1	70C10	*
COMPUTER - (REF 31-41-00, FIG. 101)				
EICAS L, M10181				
EICAS R, M10181				
CONNECTOR - GROUND AIR SERVICE	3	1	821, FWD CARGO COMPT	21-21-02
DIFFUSER - WINDSHIELD	1	1	FLT COMPT	21-22-00
FAN - AFT EQUIPMENT/LAVATORY/GALLEY VENTILATION, B15,B16	2	2	822, AFT CARGO COMPT, AFT BULKHEAD LINING	21-26-01
FAN - L RECIRCULATION AIR, B13	3	1	821, FWD CARGO COMPT	21-25-01
FAN - R RECIRCULATION AIR, B14	3	1	821, FWD CARGO COMPT	21-25-01
FILTER - GALLEY VENTILATION	3	5	GALLEY	21-26-03
FILTER - RECIRCULATION AIR	3	4	821, FWD CARGO COMPT	21-25-02
GASPERS - FLIGHT DECK	1	4	FLT COMPT	21-22-00
GRILLES - RETURN AIR	5		PASSENGER COMPT	21-23-05
MANIFOLD - MAIN DISTRIBUTION	3	1	821, FWD CARGO COMPT	21-21-00
MODULE - (REF 27-58-00)				
FSEU 3, M10333				
OUTLETS - AIR CONDTIONING SYSTEM	2	65	PASSENGER CABIN	21-23-02
OUTLETS - FLOOR	1	4	FLT COMPT	21-22-01
OUTLETS - OVERHEAD	1	1	FLT DOMPT	21-22-03
PANEL - AIR CONDITIONING CONTROL, M10193	1	1	P5, FLT DECK	*
PANEL - (REF 26-22-00, FIG. 101)				
APU/CARGO FIRE CONTROL, M10444				
RELAYS - (REF 31-01-36, FIG. 101)				
AFT CARGO FIRE, K10443				
AFT EQUIP EXH FAN 2, K347				
AIR/GND SYS 1, K124				
AUTO TEST RELAY, K10511				
EXH SMOKE SENSING, K10509				
RECIRC OVERRIDE, K10497				
SUPPLY SMOKE SENSING, K369				

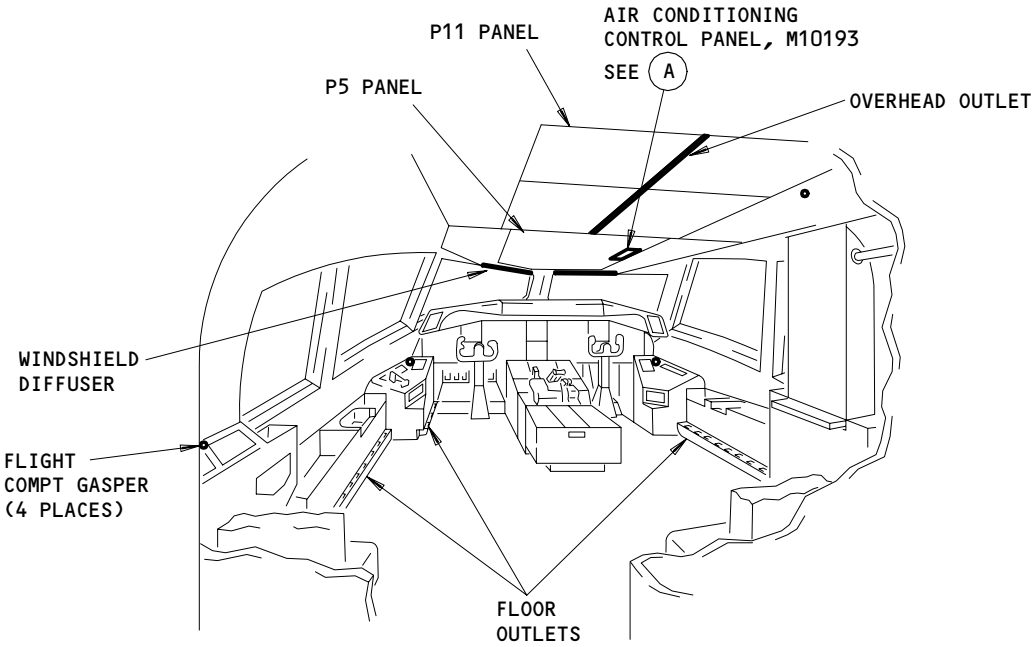
* SEE WM EQUIPMENT LIST

Component Index
Figure 101 (Sheet 1)

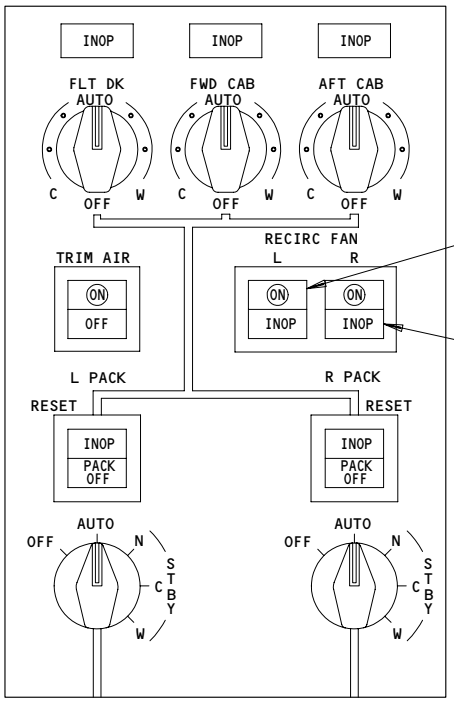
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
RELAYS - (REF 31-01-37, FIG. 101) AFT EQUIP EXH FAN 1, K346 AFT EQUIP EXH FAN 1 FAIL, K10322 AIR/GND SYS 2, K201 FWD CARGO FIRE, K10432 R RECIRC FAN, K416				
RELAYS - (REF 31-01-70, FIG. 101) L RECIRC FAN, K415				
SWITCH/LIGHT - AFT CARGO FIRE, YQPS2		1	FLT COMPT, P8, APU/CARGO FIRE CONTROL PANEL M10444	*
SWITCH/LIGHT - FWD CARGO FIRE, YQPS1		1	FLT COMPT, P8, APU/CARGO FIRE CONTROL PANEL M10444	*
SWITCH/LIGHT - L RECIRC FAN, YNRS1	1	1	FLT COMPT, P5 AIR COND CONTROL PANEL, M10193	*
SWITCH/LIGHT - R RECIRC FAN, YNRS2	1	1	FLT COMPT, P5 AIR COND CONTROL PANEL, M10193	*
VALVE - AFT EQUIP/LAV/GALLEY VENTILATION CHECK	2	2	822, AFT CARGO COMPT, AFT BULKHEAD LINING	21-26-02
VALVE - CONDITIONED AIR CHECK	3	2	821, FWD CARGO COMPT MIX BAY	21-21-01
VALVE - L RECIRCULATION AIR CHECK	3	1	821, FWD CARGO COMPT	21-25-03
VALVE - R RECIRCULATION AIR CHECK	3	1	821, FWD CARGO COMPT	21-25-03

* SEE WM EQUIPMENT LIST

Component Index
Figure 101 (Sheet 2)



FLT COMPT



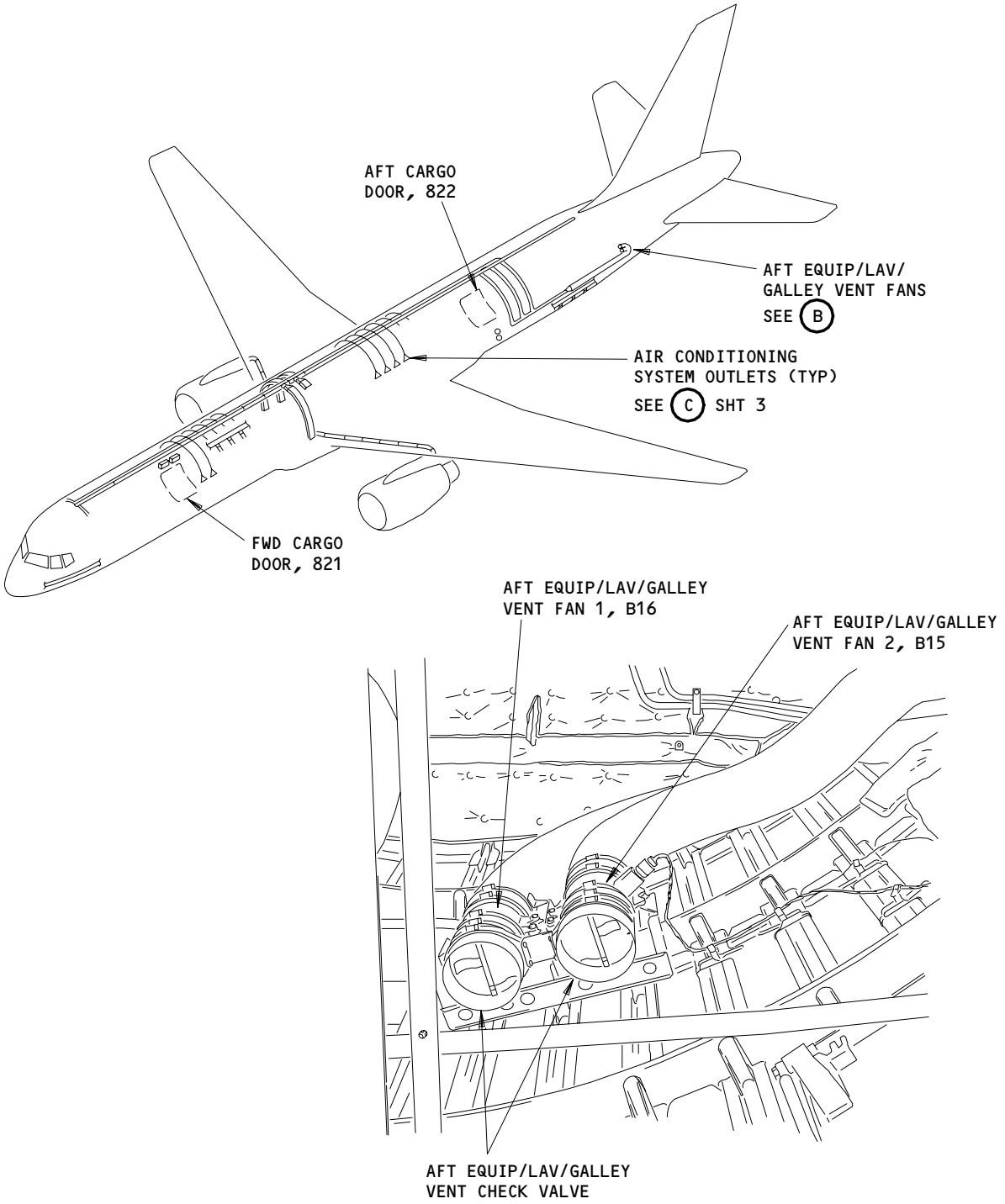
L RECIRC FAN SWITCH/LIGHT, YNRS1

R RECIRC FAN SWITCH/LIGHT, YNRS2

AIR CONDITIONING CONTROL PANEL, M10193

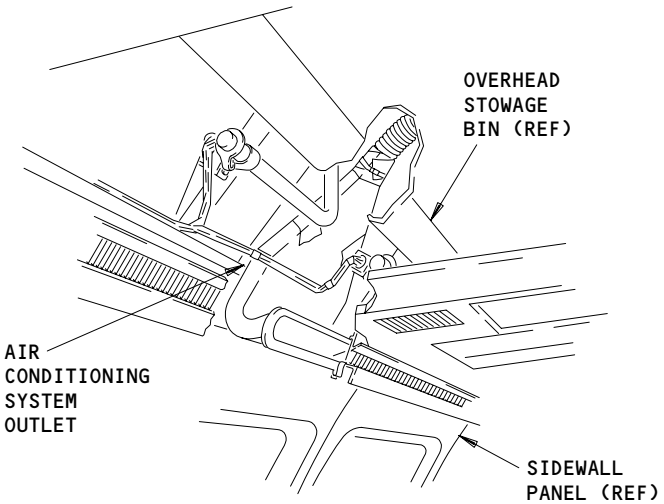
A

Component Location
Figure 102 (Sheet 1)



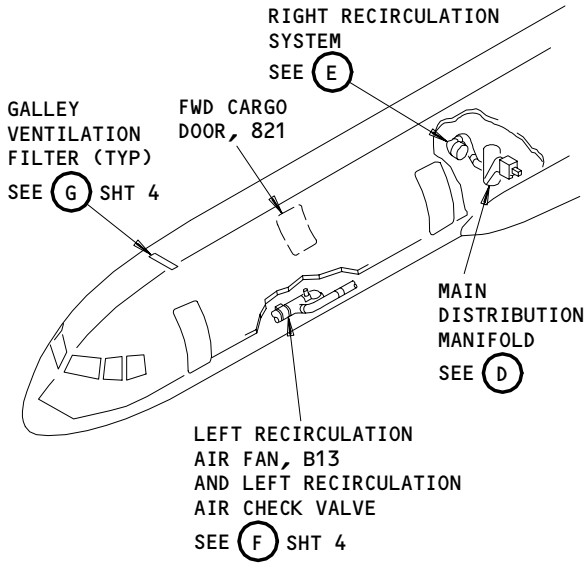
AFT EQUIP/LAV/GALLEY VENT FANS
(VIEW LOOKING AFT)
B

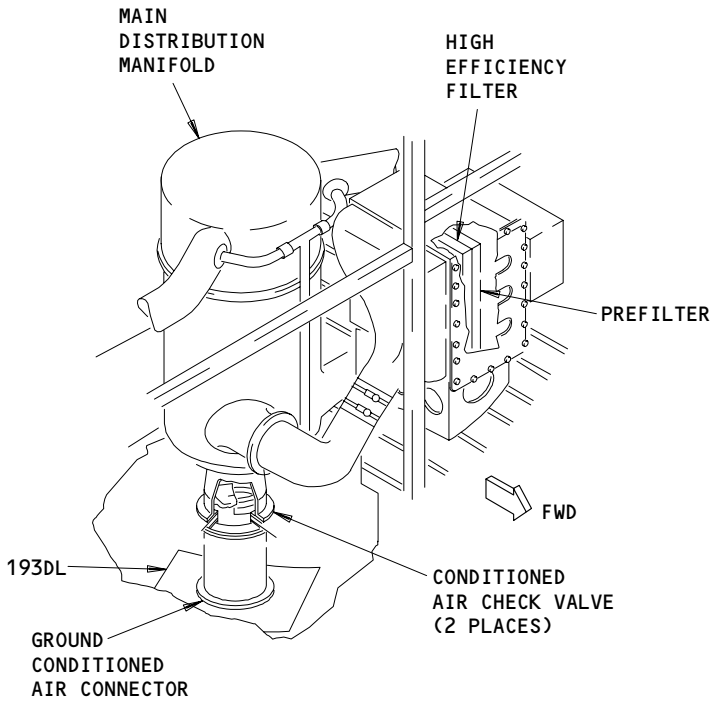
Component Location
Figure 102 (Sheet 2)



AIR CONDITIONING SYSTEM OUTLETS (TYP)

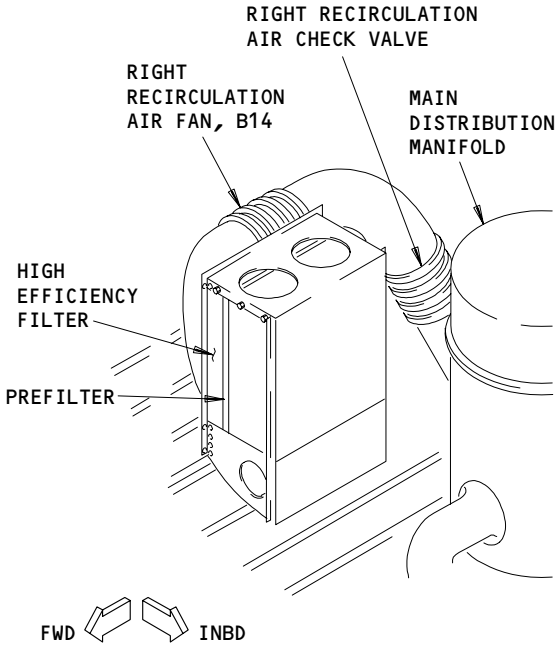
C FROM SHT 2





MAIN DISTRIBUTION MANIFOLD

D

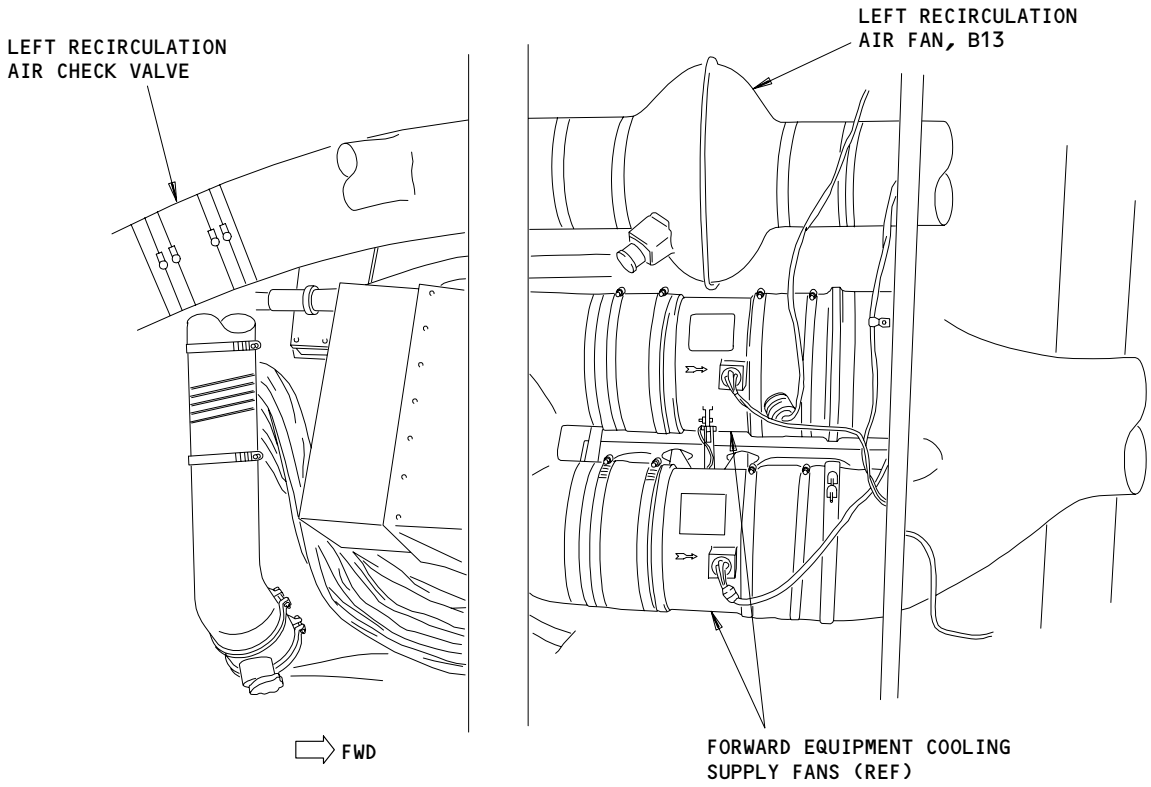


RIGHT RECIRCULATION SYSTEM

E

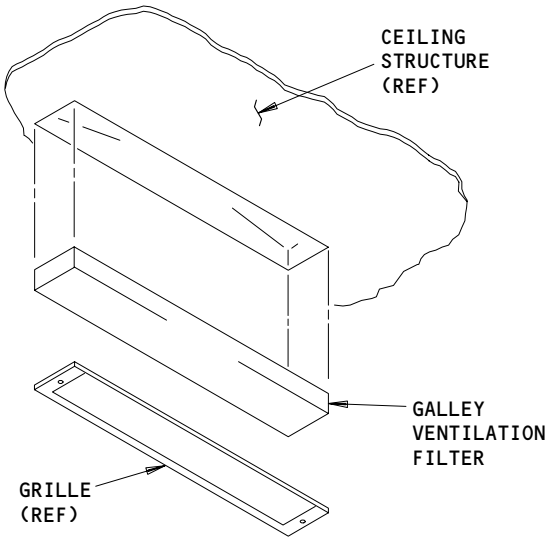
Component Location
Figure 102 (Sheet 3)

627589



LEFT RECIRCULATION AIR FAN

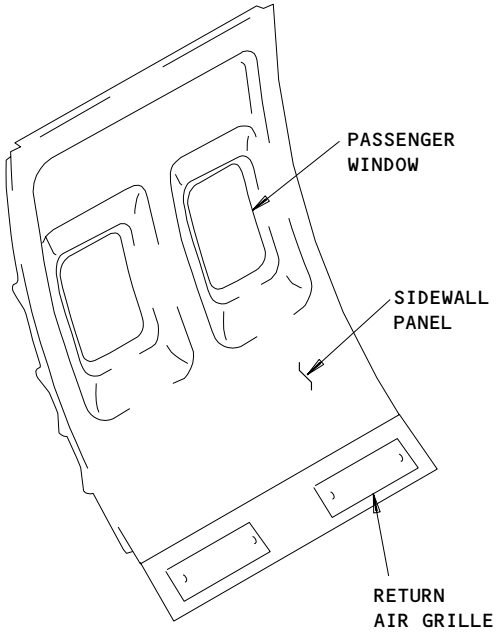
F

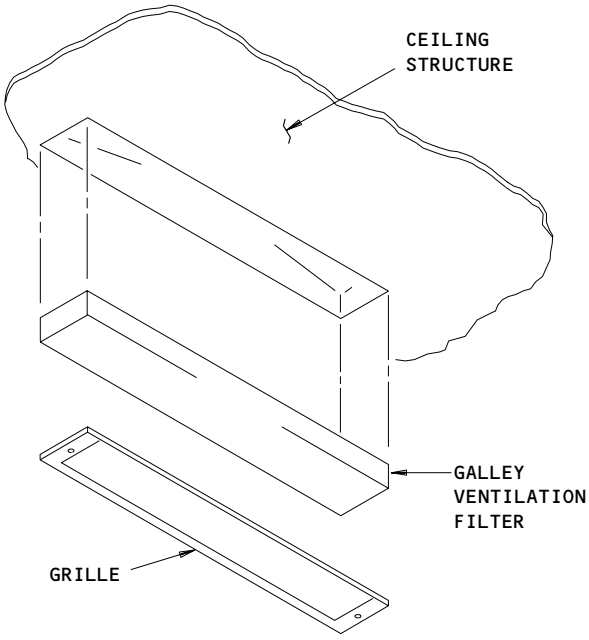


GALLEY VENTILATION FILTER (TYP)

G

Component Location (Details from Sht 3)
Figure 102 (Sheet 4)





GALLEY VENTILATION FILTER
(EXAMPLE)

G FROM SHT 3

Component Location
Figure 102 (Sheet 5)

AIR SUPPLY FLOW CONTROL ORIFICE - REMOVAL/INSTALLATION

1. General
   A. This procedure has these tasks:
      (1) A removal of a flow control orifice.
      (2) An installation of a flow control orifice.
   B. There are many flow control orifices installed in the air conditioning ducts. Orifices control and balance the flow of conditioned air to the airplane compartments. Orifices can be found in all areas of the airplane. An orifice is usually found where a small duct is connected to a larger duct.
   C. The orifice and duct connection is sealed in a flexible sleeve. The orifice has identification tags that extend out of the sleeve. To determine if a duct has an orifice installed, look for the orifice identification tags.

TASK 21-20-01-004-073

2. Flow Control Orifice Removal (Fig. 401)
   A. Prepare for the Removal.

S 844-054

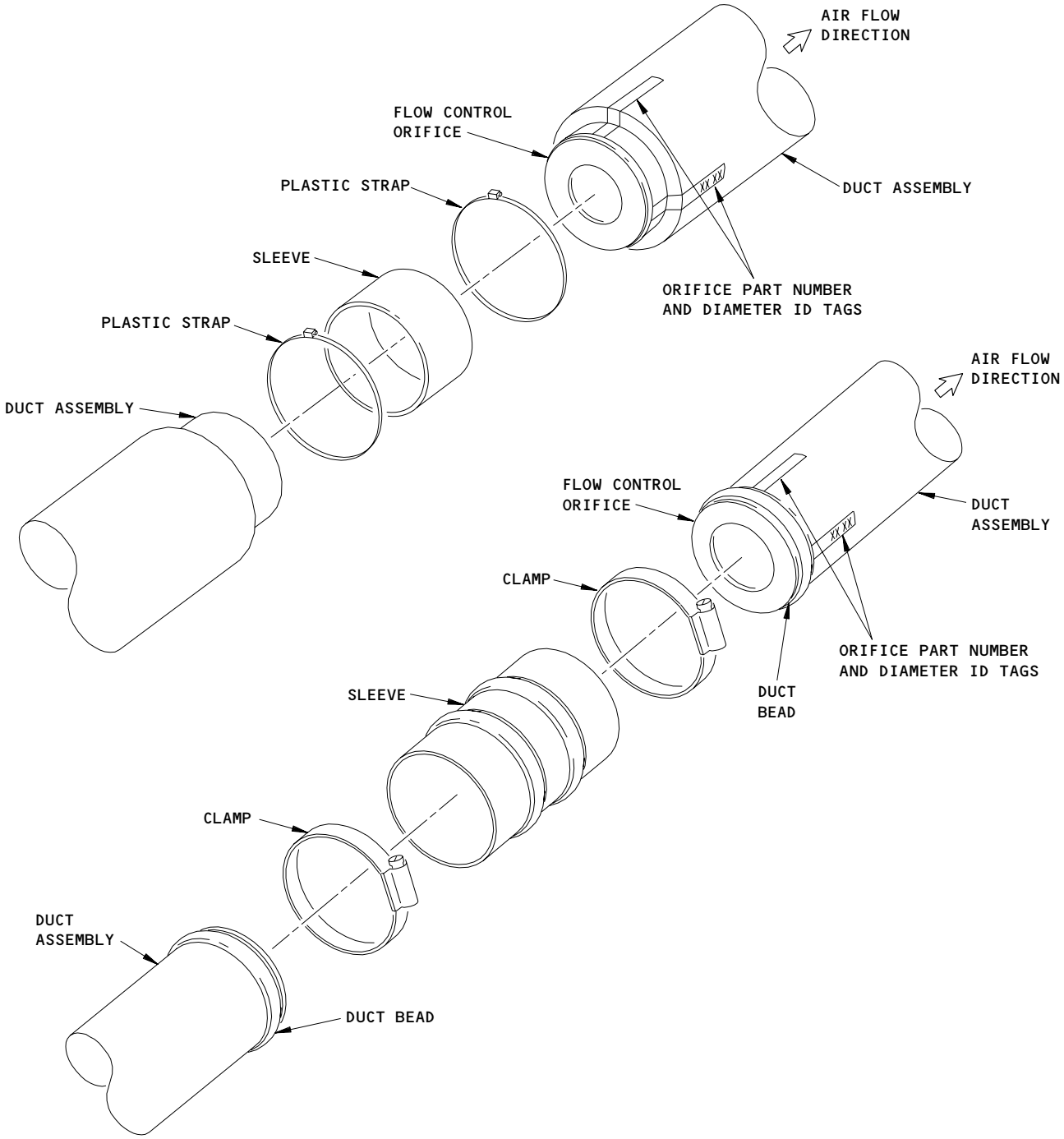
(1) Make sure there is no air flow in the duct that contains the orifice. To do this, turn off one or more of the following systems:
   (a) The lavatory/galley ventilation system.

NOTE: Remove electrical power from the airplane when the lavatory/galley ventilation system is off. The electrical equipment can be damaged if electrical power is on and this cooling system is off.

   (b) The equipment cooling system.

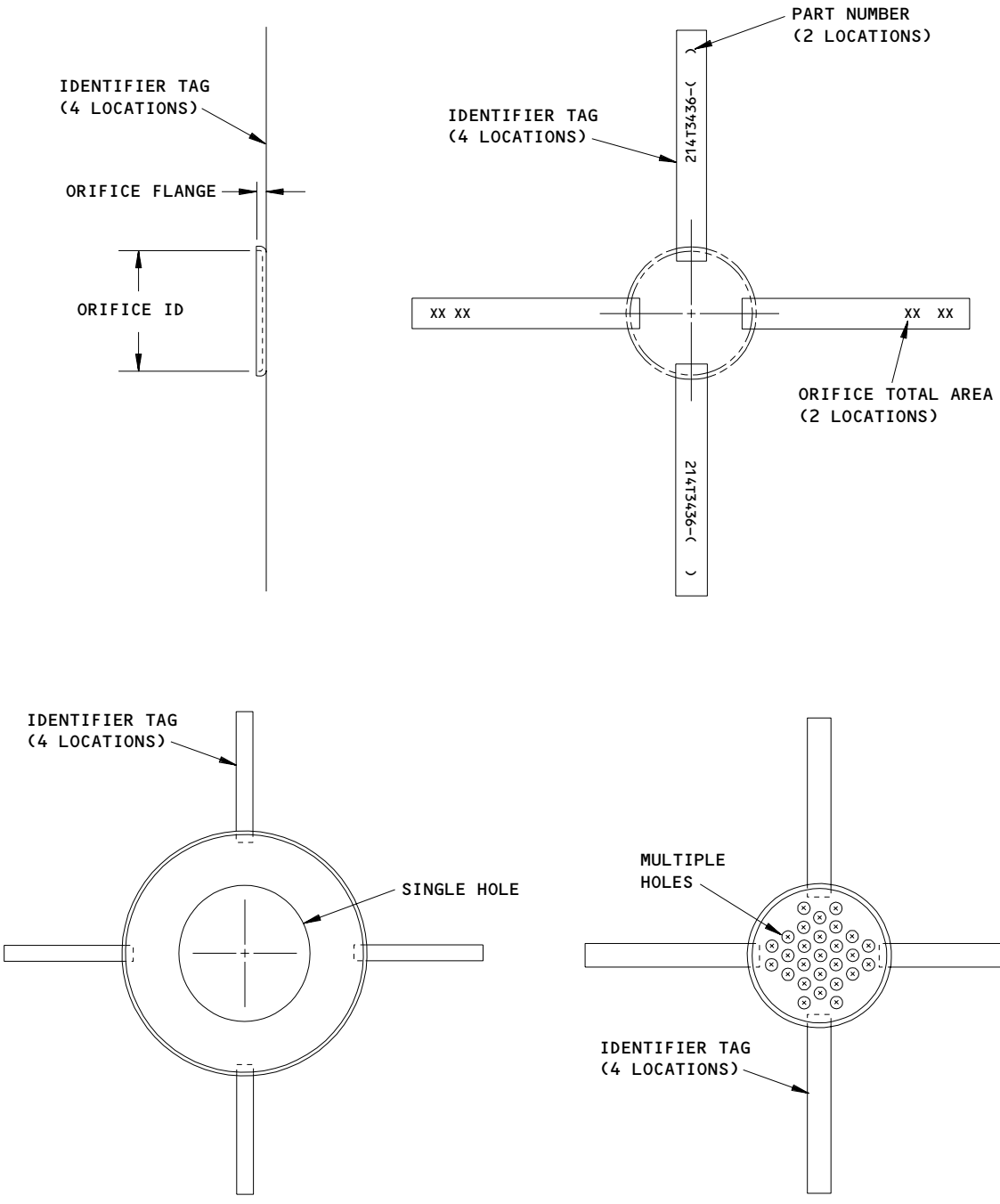
NOTE: Remove electrical power from the airplane when the equipment cooling system is off. The electrical equipment can be damaged if electrical power is on and this cooling system is off.

   (c) The supplemental heating systems.
   (d) The cooling packs.
   (e) The pneumatic air supply system.



ORIFICE INSTALLATION
(EXAMPLES)

Air Supply Flow Control Orifice
Figure 401 (Sheet 1)



ORIFICE ASSEMBLY
(EXAMPLES)

Air Supply Flow Control Orifice
Figure 401 (Sheet 2)

S 014-055
(2) Get access to the duct. To do this, open or remove:
(a) A ceiling panel.
(b) A floor panel.
(c) A sidewall panel.

B. Orifice Removal

S 024-056
(1) If the flexible sleeve is attached to the duct with plastic straps remove and discard the plastic straps.

S 024-057
(2) If the flexible sleeve is attached to the duct with clamps, do these steps:
(a) Loosen the clamps.
(b) Move the clamps away from the flexible sleeve.

S 024-058
(3) Move the flexible sleeve away from the orifice identifier tags.

S 024-059
(4) Remove the orifice from the end of the duct.

TASK 21-20-01-404-074

3. Flow Control Orifice Installation (Fig. 401)

A. Consumable Materials
(1) A00028 Adhesive, modified epoxy for rigid PVC, foam cored sandwiches - BAC5010, Type 70 (BMS5-92, Type 1)

B. Prepare for the Installation

S 214-062
(1) Make sure the new orifice is the same as the orifice that was removed.

S 104-063
(2) Clean the mating surfaces of the orifice.

S 104-064
(3) Clean the mating surfaces of the duct.

NOTE: The new adhesive will not bond to the duct unless the old adhesive is removed.

C. Orifice Installation

S 424-065

(1) Do these steps to install the orifice in the duct:
  (a) Apply the adhesive, BAC5010, Type 70 (BMS5-92, Type 1) to the mating surfaces of the duct and the orifice.
  (b) When the adhesive is tacky, put the orifice on the end of the duct.

    NOTE: Make sure that none of the holes in the orifice are blocked by the adhesive.

  (c) Remove the unwanted adhesive from the outer side of the duct and the orifice.

    NOTE: The flexible sleeve can be bonded to the duct if the unwanted adhesive is not removed.

  (d) Bend the indentification tags to the same shape as the end of the duct.

    NOTE: If possible, bend the identification tags in the direction of the airflow through the duct.

  (e) Make sure all of the identification tags are on the outer side of the duct.
  (f) Make sure none of the identification tags are bonded to the duct.
  (g) Make sure the orifice is tightly attached to the duct.

S 424-066

(2) Do these steps to install the flexible sleeve on the duct:
  (a) Move the flexible sleeve onto the duct connection.
  (b) Make sure the flexible sleeve has the same overlap on each side of the duct connection.
  (c) Make sure you can see the part number on the orifice identification tags.

S 424-067

(3) Do these steps to install the plastic straps or clamps on the sleeve:
  (a) If the flexible sleeve was attached to the duct with plastic straps, install new straps on the sleeve.
  (b) If the flexible sleeve was attached to the duct with clamps, move the clamps onto the sleeve.

(c) Align the straps or the clamps with the duct wall.

NOTE: Do not align the straps or the clamps with the duct bead. The flexible sleeve will not make a good seal if it is tightened against the duct bead.

(d) Tighten the clamps or the straps.

D. Orifice Installation Test

S 844-068

(1) Make sure there is air flow in the duct that contains the orifice. To do this, operate one or more of these systems:
(a) The lavatory/galley ventilation system.
(b) The equipment cooling system.
(c) The supplemental heating systems.
(d) The cooling packs.
(e) The pneumatic air supply system.

S 794-071

(2) Make sure there is no air leakage from the duct connections.

S 794-070

(3) Make sure the conditioned air outlet does not have excessive noise or excessive air flow.

E. Put the Airplane Back to Its Usual Condition

S 414-072

(1) Install the applicable access panels that were removed.

AIR SUPPLY FLOW CONTROL ORIFICE - INSPECTION/CHECK

1. General
   A. This procedure has one task. This task gives instructions to do a visual inspection of the condition of the flow control orifices installed in the airplanes air conditioning ducts.

   TASK 21-20-01-206-001

2. Air Supply Flow Control Orifice - Inspection/Check
   A. References
      (1) AMM 21-20-01/401, Air Supply Flow Control Orifice
   B. Prepare for the Inspection

      S 026-006
      (1) Remove the flow control orifice(s) that will be inspected (AMM 21-20-01/401).
   C. Orifice Inspection

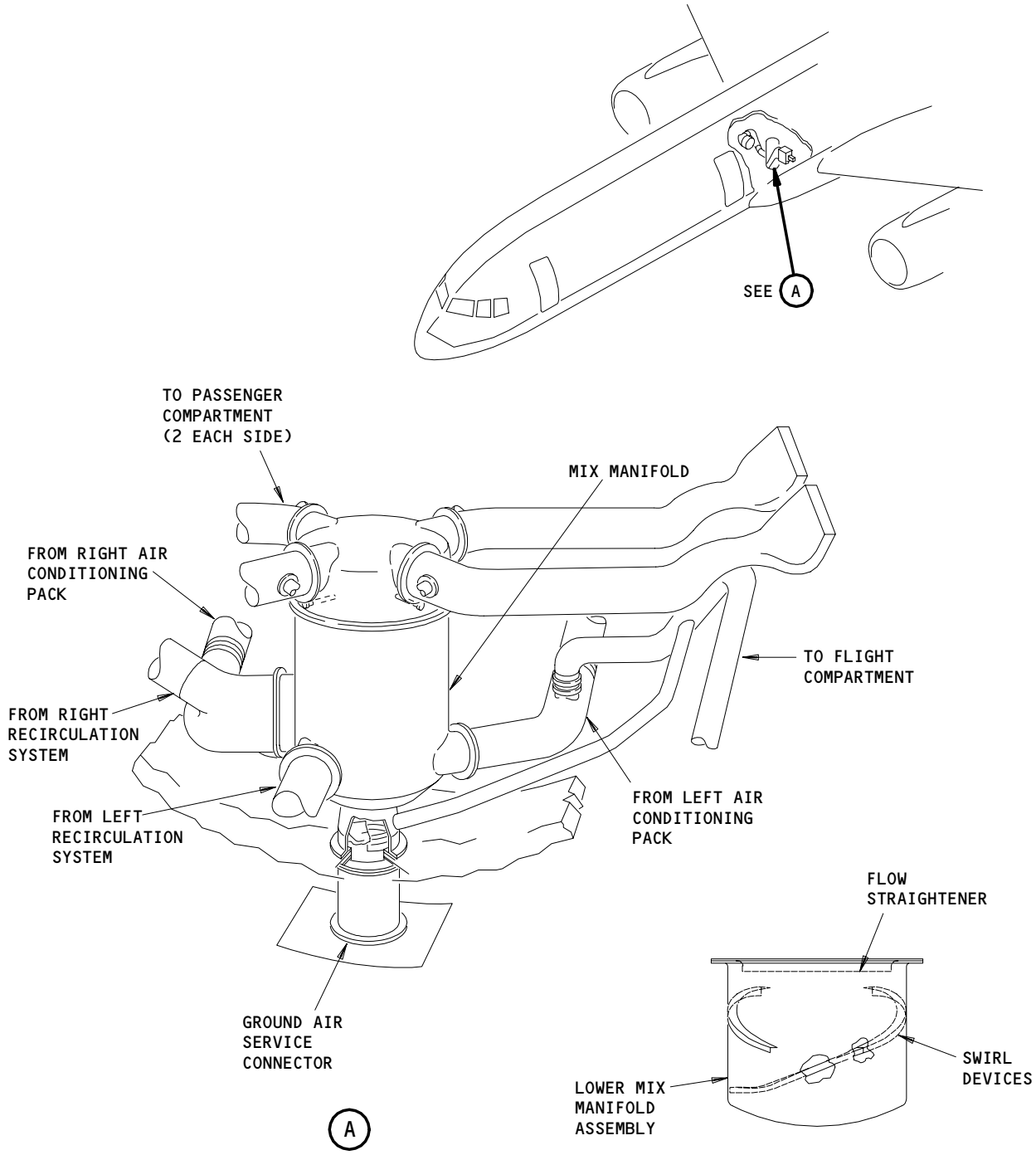
      S 216-002
      (1) Examine the flow control orifice and make sure the restrictor hole(s) are free from blockage and contamination.
         (a) Remove all blockage from the restrictor hole(s) to restore proper airflow.

      S 216-004
      (2) Examine the duct and make sure it is free from blockage and contamination.
         (a) Remove any blockage found.

      S 426-007
      (3) Install the flow control orifices (AMM 21-20-01/401).

MAIN DISTRIBUTION MANIFOLD - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The main distribution manifold consists of a mix manifold, ducting, and a ground-air-service connector. The mix manifold is supplied with cold air from the air conditioning packs (AMM 21-51-00/001) and warm air from the recirculation system (AMM 21-25-00/001). Then it mixes the air and distributes it to the passenger compartment, lavatories, and the galleys (AMM 21-23-00/001). The mix manifold also provides humidity control by extracting water from the combined airflow.
   B. Air from the left-air-conditioning pack can bypass the mix manifold. This conditioned air flows into the flight-deck-distribution duct and is distributed directly to the flight compartment (AMM 21-22-00/001).
   C. Whenever the airplane is parked, the air conditioning packs do not have to be used. Conditioned air can be supplied to the mix manifold through the ground air service connector. The conditioned air can be supplied by any standard air-conditioning ground cart.
   D. Like the air from the left-air-conditioning pack, air from the ground-air-service connector can bypass the mix manifold and flow directly into the flight-deck-distribution duct.
2. Component Details
   A. Mix Manifold
      (1) The mix manifold sits immediately aft of the forward cargo compartment aft bulkhead. Cylindrical in shape with a domed top, the manifold stands about 44 inches high and 24 inches in diameter. The manifold is constructed of thermosetting resin-impregnated aramid fiber fabric.
      (2) Three inlet ducts enter the mix manifold's lower section. The inlet ducts allow only tangential airflow into the manifold. Four 8.5 inch diameter outlet ducts exit the manifold from the upper section and channel the airflow to the conditioned air distribution ducts. A spacer between the bottom of the mix manifold and the airplane skin has a hole to drain condensed water from the manifold.
      (3) Two aluminum channels called swirl devices mount on the inside of the mix manifold. The 1.25-inch wide channel starts at the bottom of the mix manifold and makes approximately 3/4 of a revolution around the inside to just below the flow straightener. The 2-inch-wide channel starts at a point halfway up the mix manifold and makes approximately 1/3 of a revolution around the inside. The swirl devices spiral upward in a direction opposite to the normal airflow.
      (4) A flow straightener completes the manifold's interior. The four-inch-thick aluminum grid mounts below the outlet ducts at the flange between the upper and lower manifold assemblies.



Main Distribution Manifold
Figure 1

(5) Air enters the mix manifold tangentially from the inlet ducts. This tangential entrance creates a centrifugal flow within the manifold. The swirl devices inhibit this flow, creating turbulence. The turbulence causes water to separate from the air and collect on the manifold's inner wall.
The air continues to spiral up the manifold and enters the flow straightener. The straightener breaks up the swirling motion of the air, and allows an even pressure and volume distribution to each outlet duct.

(6) The water removed at the swirl devices runs down the manifold's inside wall. The water collects at the bottom and is drawn off through the water drain tube and leaves the airplane through a drain port.

B. Ground Conditioned Air Connector

(1) The ground-conditioned-air connector allows conditioned air to be supplied directly into the mix manifold from a ground air cart. The connector consists of an eight-inch-diameter receptacle, a cover, a swing check valve, and a butterfly check valve. The connector is on the underside of the fuselage, just forward of the left-air-conditioning pack.

(a) Conditioned air from the ground cart forces the swing check valve to open. The check valve automatically closes, but does not seat, whenever pressurized ground air is not available. The check valve is spring loaded so it only seats when the air conditioning packs operate (i.e. a pressurized system).

(b) The butterfly check valve allows air to enter the mix manifold when the ground air cart is used. When the air conditioning packs are used, the check valve does not allow air to enter the ground-conditioned-air connector and flow into the flight-deck-distribution duct.

CONDITIONED AIR CHECK VALVE - REMOVAL/INSTALLATION

1. General
   A. Two check valves are installed below the mix manifold and above the ground connector for the conditioned air.
      (1) The swing check valve is installed in the ground connector duct.
      (2) The butterfly check valve is on the top flange of the ground connector duct, immediately below the mix manifold. No fasteners are used to hold the butterfly check valve into its position.
      (3) This procedure has instructions to remove and install the ground connector duct, the swing check valve, and the butterfly check valve. You must remove the ground connector duct, with the swing check valve in it, before you can remove the butterfly check valve.

TASK 21-21-01-004-001

2. Remove the Check Valve For The Conditioned Air (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electric Power Control
      (2) AMM 25-50-03/401, Cargo Compartment Bulkhead Lining
      (3) AMM 52-34-00/201, No.1 and No.2 Cargo Doors
   B. Access
      (1) Location Zones
          125/126 Area aft of the forward cargo compartment
   C. Prepare for the Removal

      S 864-056
      (1) Supply electrical power (AMM 24-22-00/201).

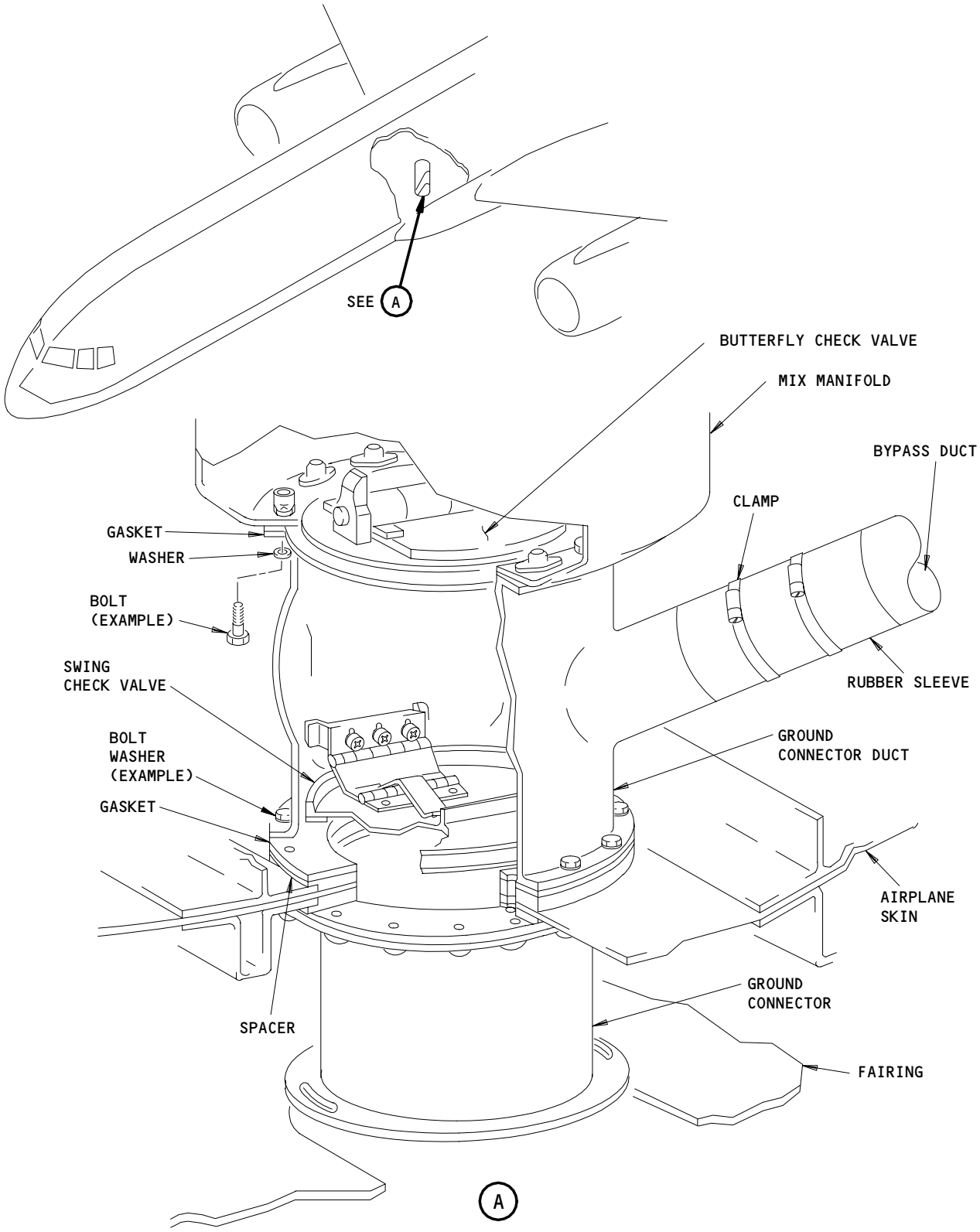
      S 864-002
      (2) Turn the L and R PACK selectors, on the pilots overhead panel P5, to the OFF position.
          (a) Make sure the PACK OFF lights go off.
          (b) Put a DO-NOT-OPERATE tag on the selectors.

      S 014-064

      WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE CARGO DOOR. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

      (3) Open the No. 1 cargo door, 821 (AMM 52-34-00/201).

      S 014-004
      (4) Remove the aft bulkhead lining of the forward cargo compartment (AMM 25-50-03/401).



Conditioned Air Check Valve Installation
Figure 401

596783

S 014-060
(5) Remove the mix manifold.
(a) Remove the filter duct from the bottom section of the mix manifold.
(b) Remove the filter housing.
(c) Remove the forward muffler from the top section of the mix manifold.
(d) Remove the top section of the mix manifold.
(e) Remove the bottom section of the mix manifold from the ground service duct.
(f) Remove the gasket from the top section of the mix manifold.

D. Remove the check valve assembly

S 034-005
(1) Remove the ground connector duct.
(a) Remove the bolts from the lower flange of the ground connector duct.
(b) Remove the bolts from the top flange of the ground connector duct.
(c) Disconnect the bypass duct from the ground connector duct.
1) Loosen the clamp on the ground connector duct.
2) Move the rubber sleeve and the clamp away from the ground connector duct.
(d) Remove the ground connector duct.

S 034-006
(2) Remove the gasket from the top flange.

S 024-007
(3) Remove the butterfly check valve.

S 024-023
(4) Remove the check valve from the inside of the ground connector duct
(a) Remove the screws from the check valve hinge.
(b) Pull the check valve out of the ground connector duct.

TASK 21-21-01-404-024

3. Install the Check Valve For The Conditioned Air (Fig. 401)

A. Consumable Materials
(1) A00027 - Adhesive - Misc, BAC5010, Type 60
(2) A00247 - Sealant - Chromate Type, BMS5-95
(3) B00148 Solvent - Methyl Ethyl Ketone (MEK), TT-M-261

B. References
(1) AMM 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service and Cargo Doors (Major Zone 800) Access Doors and Panels
(3) AMM 24-22-00/201, Electric Power Control
(4) AMM 25-50-03/401, Cargo Compartment Bulkhead Lining
(5) AMM 36-00-00/201, Pneumatic General

(6) AMM 51-31-01/201, Seals and Sealing

C. Access

(1) Location Zones

125/126 Area aft of the forward cargo compartment

D. Prepare for the Installation

S 214-025

(1) Make sure the lower flange gasket, which is bonded to the spacer, is not damaged.

NOTE: The gasket and spacer divides the connector duct from the airplane skin.

S 904-026

(2) If the gasket is damaged, do the steps that follow to replace it.

(a) Remove the gasket and the adhesive from the spacer.

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(b) Use Acetone, Isopropyl Alcohol, or Ethyl alcohol to clean the adhesive and other contamination off of the surface of the spacer.

(c) Use Acetone, Isopropyl alcohol, or Ethyl Alcohol to clean the bond area of a new gasket.

(d) Apply a continuous bead of the adhesive to the bond area of the new gasket.

1) A bead width of 15 mm (0.6 inches) gives the best bond.
2) Make sure you do not apply the adhesive out of the bond area.
3) Make sure that no part of the bond area is more than 12 mm (0.5 inches) away from the adhesive.

(e) Put the new gasket, with the adhesive side down, on the spacer immediately after the adhesive is applied.

(f) Apply a light pressure to the gasket so that all parts of the gasket are bonded to the spacer.

(g) Do not apply a pressure that will make the adhesive move out of the bond area.
(h) Let the adhesive cure for at least 24 hours at 65° to 100° F, with a minimum relative humidity of 20 percent.

NOTE: The bond will smell of acetic acid until it is fully cured.

S 424-027
(3) Install the screws into the check valve hinge to attach the swing check valve in the ground connector duct.

S 214-028
(4) Make sure the swing check valve will seat correctly.

NOTE: The swing check valve is spring loaded so it will not seat unless the cabin is pressurized (i. e. the packs are on).

(a) Put a straight edge or a rod against the lower flange of the ground connector duct.
(b) Make sure the flapper edge opposite the hinge touches the straight edge.
(c) Make sure a small clearance is between the straight edge and the flapper edge at the hinge.
(d) Push down on the flapper at the hinge.
(e) Make sure check the flapper closes with a very small force and opens when the force is removed.
(f) If there is no clearance or if more force is necessary to close the flapper, then do the steps that follow.
1) Loosen the screw on the hinge.
2) Move the hinge up and down, as is necessary.
3) Tighten the screws.

E. Install the check valve assembly

S 434-029
(1) Apply the sealant to the inside surface of the spacer and the airplane skin.

S 424-030
(2) Put the butterfly check valve into position below the mix manifold.
(a) Make sure the shaft of the check valve is in the lateral direction.

S 434-046
(3) Install the ground connector duct, with the check valve in it.
(a) Install a new gasket to the top flange of the ground connector duct.
(b) Put the ground connector duct into position below the mix manifold.

(c) Make sure the lower spacer is in the correct position to fit the contour of the airplane skin.
1) Make sure the holes are aligned.
(d) Install and tighten the bolts and washers into the lower flange of the ground connector duct.
(e) Fillet seal the edge of the lower flange gasket (Ref 51-31-01).
1) Install and tighten the bolts and washers to the top flange of the ground connector duct.
(f) Move the rubber sleeve of the bypass duct on to the joint with the ground connector duct.
(g) Install the clamp on the ground connector duct.

S 434-059
(4) Install the mix manifold.
(a) Attach the bottom section of the mix manifold to the ground service duct with a new gasket.
(b) Install the top section of the mix manifold.
(c) Attach the forward muffler to the top section of the mix manifold.
(d) Install the filter housing.
(e) Attach the filter duct to the bottom section of the mix manifold.

F. Do the installation test for the check valve assembly

S 014-058
(1) Open the access door for the ground connector, 193DL (AMM 06-41-00/201).

S 864-046
(2) Supply electrical power (AMM 24-22-00/201).

S 864-047
(3) Supply pneumatic power (AMM 36-00-00/201).

S 864-048
(4) Remove the DO-NOT-OPERATE tags from the L and R PACK selectors, on the pilot's overhead panel P5.
(a) Turn the selectors to the AUTO positions.
(b) Make sure the PACK OFF lights go off.

S 214-049
(5) Feel for leaks in the check valve or the connector duct.
(a) A small leak is permitted.
(b) You must repair a large leak.

S 864-050
(6) Turn the L and R PACK selectors, on the P5 panel, to the OFF position.

S 864-051
(7) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 214-052
(8) From the out side the airplane, make sure the check valve opens a little.

G. Put the airplane back to its usual condition

S 414-053
(1) Install the aft bulkhead lining of the forward cargo compartment (AMM 25-50-03/401).

S 414-065

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE CARGO DOOR. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the No. 1 cargo door, 821 (AMM 52-34-00/201).

S 414-057
(3) Close the access door for the ground connector, 193DL (AMM 06-41-00/201).

S 864-055
(4) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

CONDITIONED AIR GROUND CONNECTOR - REMOVAL/INSTALLATION

1. General
   A. The ground connector is used to supply the conditioned air to the airplane without the use of the air conditioning packs. The connector lets a ground cart be attached directly to the mix manifold. This procedure has instructions to remove and install the connector.

TASK 21-21-02-004-001

2. Remove the Conditioned Air Ground Connector (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels.
      (2) 25-50-03/401, Bulkhead Lining
      (3) AMM 52-34-00/201, No. 1 and 2 Cargo Doors
   B. Access
      (1) Location Zones
          125/126 Area aft of the forward cargo compartment
          821 Forward Cargo Door

      (2) Access Panel
          193DL Conditioned air ground service access door
   C. Prepare for the Removal

      S 014-002
      (1) Open the access door for the ground connector, 193DL (Ref 06-41-00).

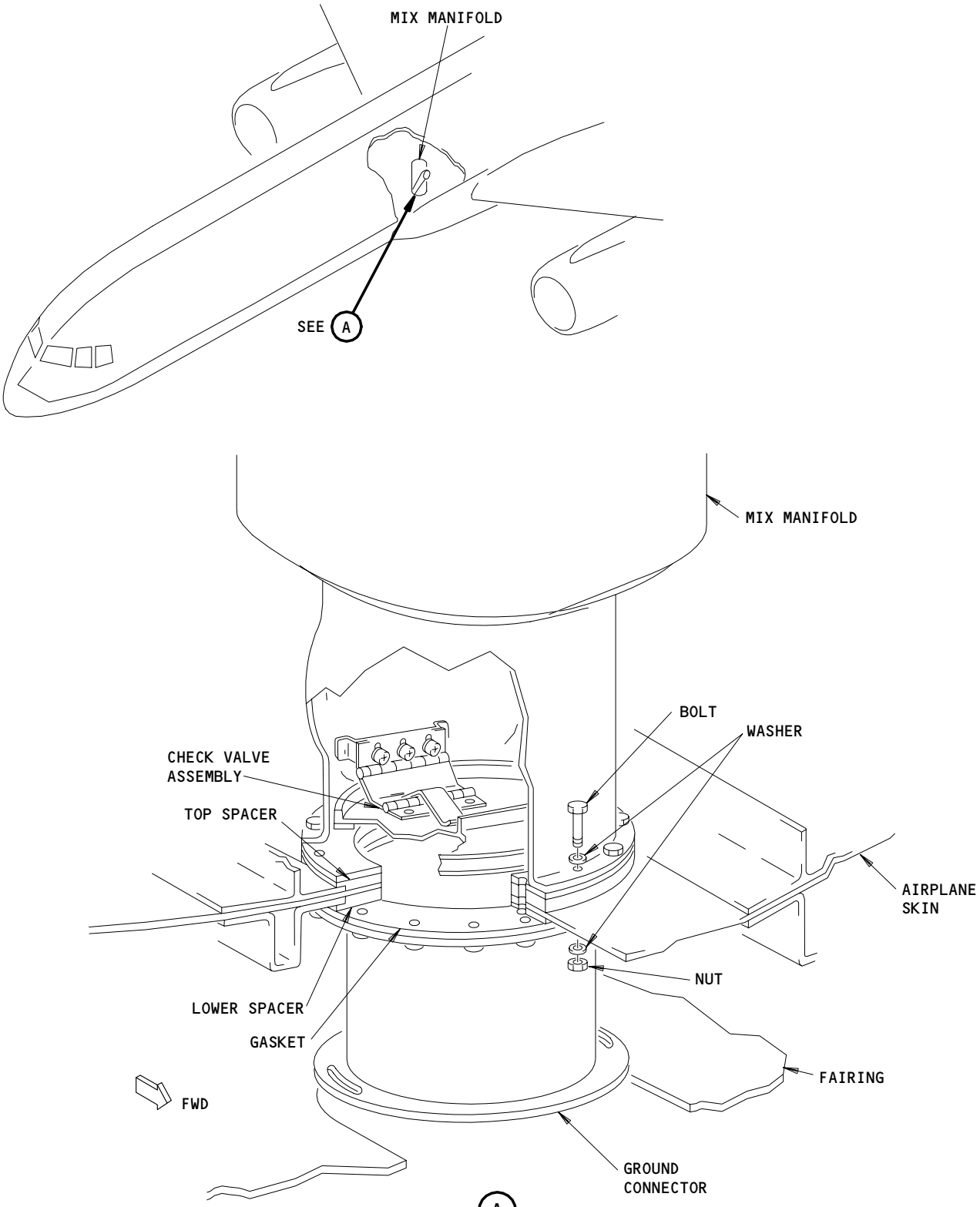
      S 014-021

      WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE CARGO DOOR. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

      (2) Open the forward cargo door, 821 (AMM 52-34-00/201).

      S 014-004
      (3) Remove the aft bulkhead lining of the forward cargo compartment (AMM 25-50-03/401).
   D. Remove the ground connector

      S 034-005
      (1) Remove the bolts from the flange between the check valve assembly and the ground connector.



Conditioned Air Ground Connector Installation
Figure 401

S 024-006
(2) From the out side of the airplane, remove the ground connector.

TASK 21-21-02-404-007

3. Install the Conditioned Air Ground Connector (Fig. 401)
   A. Consumable Materials
      (1) A00027 - Adhesive - BAC5010, Type 60
      (2) A00247 - Sealant - BMS 5-95
      (3) B00148 Solvent - Methyl Ethyl Ketone (MEK), TT-M-261
   B. References
      (1) 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels.
      (2) 21-00-00/201, Air Conditioning - General
      (3) 25-50-03/401, Bulkhead Lining
      (4) AMM 52-34-00/201, No. 1 and 2 Cargo Doors
   C. Access
      (1) Location Zones
          125/126 Area aft of the forward cargo compartment
          821 Forward Cargo Door

      (2) Access Panel
          193DL Conditioned air ground service access door
   D. Prepare for the Installation

S 214-008
(1) Make sure the gasket, which is bonded to the lower spacer, is not damaged.

NOTE: The gasket and spacer divides the connector from the airplane skin.

S 904-009
(2) If the gasket is damaged, do the steps that follow to replace it.
(a) Remove the gasket and the adhesive from the spacer.

WARNING: DO NOT GET SOLVENT IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(b) Use Acetone, Isopropyl Alcohol, or Ethyl Alcohol to clean the adhesive and other contamination off of the surface of the spacer.
(c) Use acetone, Isopropyl Alcohol, or Ethyl Alcohol to clean the bond area of a new gasket.
(d) Apply a continuous bead of the adhesive to the bond area of the gasket.
    1) A bead width of 15 mm (0.6 inches) gives the best bond.
    2) Make sure you do not apply the adhesive out of the bond area.
    3) Make sure that no part of the bond area is more than 12 mm (0.5 inches) away from the adhesive.
(e) Put the new gasket, with the adhesive side up, against the lower spacer immediately after the adhesive is applied.
(f) Apply a light pressure to the gasket so that all parts of the gasket are bonded to the spacer.
(g) Do not apply a pressure that will make the adhesive move out of the bond area.
(h) Let the adhesive cure for at least 24 hours at between 65° and 100° F, with a minimum relative humidity of 20 percent.

NOTE: The bond will smell of acetic acid until it is fully cured.

E. Install the ground connector

S 434-010
(1) Apply the sealant to the inside surface of the spacer and the airplane skin.

S 424-011
(2) Put the ground connector into position, with all of the holes aligned.

S 434-012
(3) Install the bolts and washers to the flange between the ground connector and the check valve assembly.

S 434-013
(4) Fillet seal the flange with the sealant.

F. Do the installation test for the ground connector

S 484-014
(1) Supply conditioned air from a ground cart (Ref 21-00-00).

S 214-015
(2) Feel for leaks around the connector joint.
(a) Small leaks are permitted.
(b) You must repair a large leak.

G. Put the airplane back to its usual condition

S 414-016
(1) Install the aft bulkhead lining of the forward cargo compartment (AMM 25-50-03/401).

S 414-022

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE CARGO DOOR. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

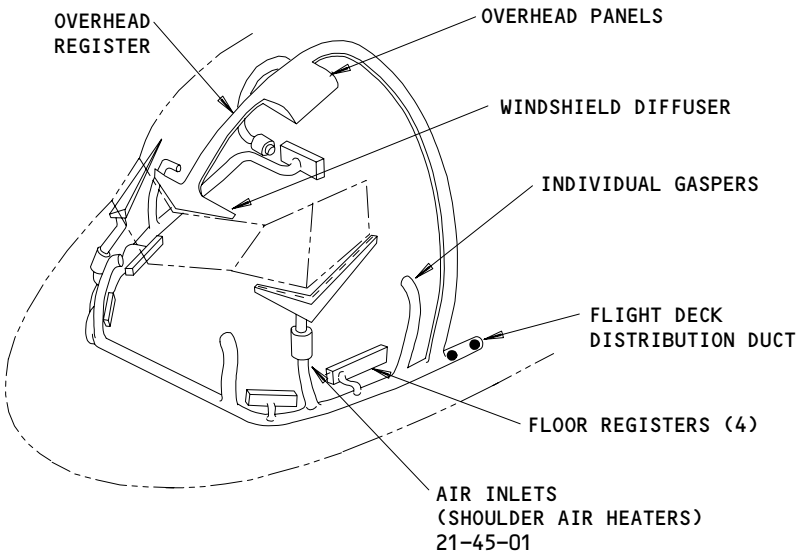
(2) Close the forward cargo door, 821 (AMM 52-34-00/201).

S 084-018
(3) Remove the supply of conditioned air from the ground cart (Ref 21-00-00).

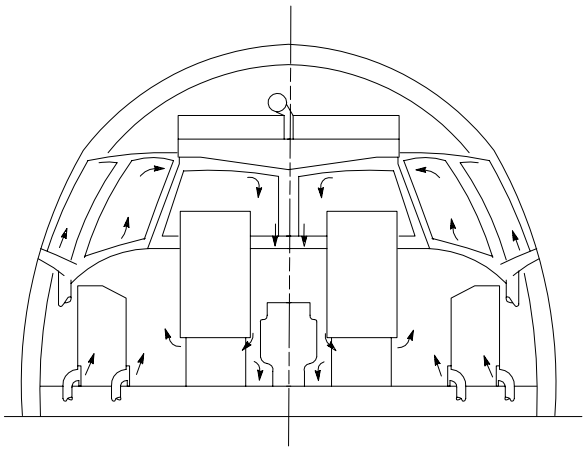
S 414-019
(4) Close the access dooor for the ground connector, 193DL (Ref 06-41-00).

FLIGHT DECK CONDITIONED AIR DISTRIBUTION - DESCRIPTION AND OPERATION

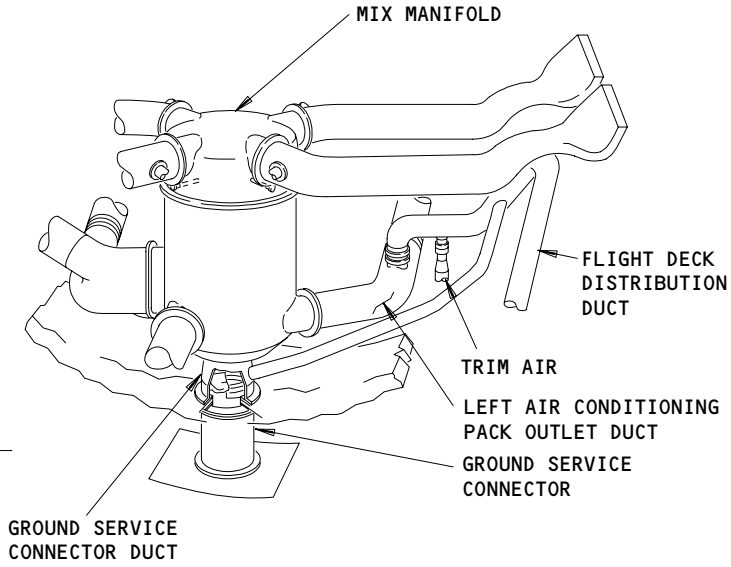
1. General (Fig. 1)
   A. The flight-deck-conditioned-air-distribution system supplies conditioned air to the flight deck to provide a comfort-controlled environment for the flight crew. The system consists of a flight-deck-conditioned-air-distribution duct, floor registers, individual crew gaspers, windshield diffusers, and an overhead register.
      (1) The conditioned air is supplied to the flight deck area by the flight-deck-distribution duct. Then it is distributed throughout the flight deck by the registers, gaspers, and the windshield diffuser.
   B. Conditioned air from the left-pack-outlet duct (AMM 21-51-00/001) flows into the flight-deck-distribution duct before it enters the mix manifold (AMM 21-21-00/001)in the flight-deck-distribution duct, the conditioned air mixes with trim air (AMM 21-61-00/001) flows to the flight deck.
      (1) When the left-air-conditioning pack is not operating, conditioned air can still enter the flight-deck-distribution duct.
         (a) If only the right-air-conditioning pack is used, conditioned air flows into the mix manifold, then exits the manifold through the left-pack-outlet duct and flows into the flight-deck-distribution duct.
         (b) If only the ground cart is used, the conditioned air can flow from the ground-service-connector duct into the flight-deck-distribution duct before it enters the mix manifold.
2. Component Details
   A. Floor Registers
      (1) The flight deck floor perimeter contains four floor registers. The floor registers consist of a housing enclosing a restrictor and diffuser. A cover caps the housing on both ends and a perforated aluminum sheet with a staggered hole pattern makes up the diffuser.
      (2) All outlets attach to flexible ducting. Air flows through the flexible ducting into the outlets. The outlets then disperse the air throughout the flight deck.
   B. Overhead Register
      (1) The overhead register mounts in the ceiling of the flight deck, in between halves of the overhead circuit breaker panel P11. The overhead register consists of a plenum enclosing an acoustic baffle and register assembly. The baffle, made of perforated needle nomex felt, bonds to the top of the register assembly. The baffle prevents excess noise by restricting the airflow through the register. The register assembly, made of formed plastic, attaches to the plenum flanges. The register assembly directs airflow in three different directions within the flight deck. Silicon sponge seals, between the plenum and the register, ensure an air-tight assembly.
      (2) Conditioned air enters the overhead outlet from two inlet ducts on the top side of the plenum. Air then flows through the baffle and the nozzle disperses the air to the flight deck.



FLIGHT DECK CONDITIONED AIR DISTRIBUTION



FLIGHT DECK AIRFLOW
(VIEW LOOKING FWD)



MIX MANIFOLD BAY

Flight Deck Conditioned Air Distribution System
Figure 1

C. Windshield Diffuser

(1) The overhead dripshield contains the forward windshield diffusers. The diffusers incorporate an airflow straightener, a baffle plate, and a nozzle to ensure uniform distribution of air over the windshield.

(2) The sidewall panels contain the side window diffusers. The diffusers consist of a nomex honeycomb air grille.

D. Gaspers

(1) The flight deck has four adjustable gaspers. There are 2 gaspers in the forward end of the cockpit, on the outboard side of the captain's station and first officer's station, respectively. A third gasper is located below and aft of the number 3 window, on the left side of the cockpit. The fourth gasper is mounted in the ceiling, to the right of the overhead circuit breaker panel P11. All gaspers consist of a drilled ball within a socket and an adjustable valve to control airflow volume.

E. Air Inlets

(1) Four air inlets, two on each side of the flight deck (L, R) provide supplemental heated air to the flight deck. The inlets are made of epoxy resin-impregnated aramid fabric.

FLOOR OUTLETS - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the floor outlets in the flight compartment. Two of the outlets are installed on the left side of the flight compartment. One is installed an the right side and one is installed in the aft end of the flight compartment.

   TASK 21-22-01-004-001

2. Remove the Floor Outlets (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electric Power-Control
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

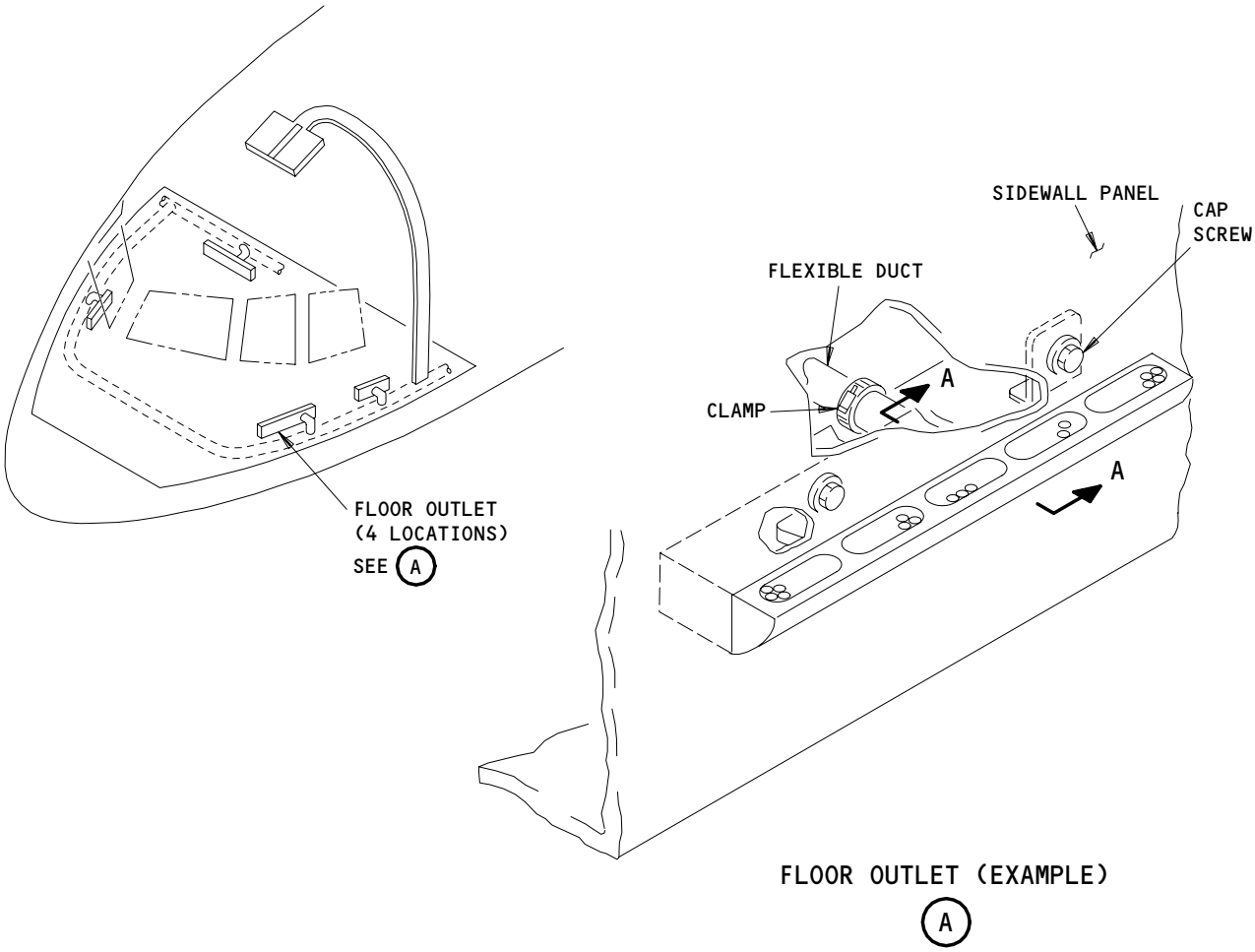
      S 864-003
      (2) AIRPLANES WITH PASSENGER CONFIGURATION;
      Push the L and R RECIRC FAN switch-lights, on the pilots overhead panel P5, to the off position.
      (a) Make sure the INOP light comes on.
      (b) Put a DO-NOT-OPERATE tag on the switch-lights.

      S 864-004
      (3) Turn the L and R PACK selectors, on the P5 panel, to the OFF positions.
      (a) Make sure the PACK OFF lights come on.
      (b) Put a DO-NOT-OPERATE tag on the selectors.
   D. Remove the floor outlets

      S 034-005
      (1) Remove the cap screws from the support angles.

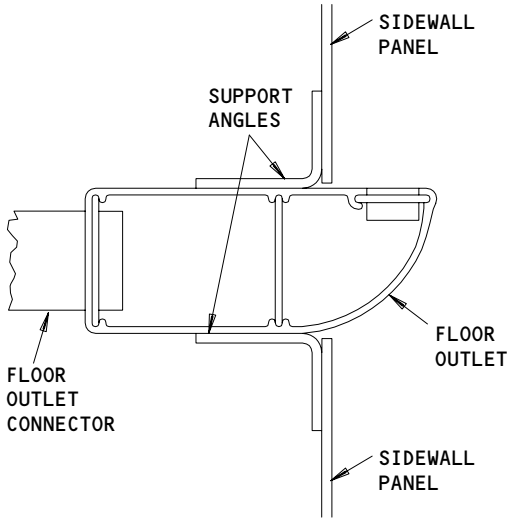
      S 014-006
      (2) Remove the top sidewall panel to get access to the flexible duct.

      S 034-007
      (3) Remove the clamp between the flexible duct and the floor outlet.



FLOOR OUTLET (EXAMPLE)

(A)



A-A

Floor Outlets Installation
Figure 401

S 024-008
(4) Remove the floor outlet.

TASK 21-22-01-404-009
3. Install the Floor Outlets (Fig. 401)
A. References
(1) AMM 24-22-00/201, Electric Power-Control
B. Access
(1) Location Zones
211/212 Control Cabin - Section 41
C. Install the floor outlets

S 424-010
(1) Put the floor outlet into position between the sidewall panels.

S 434-011
(2) Put 1.5 inches (38mm) of the flexible duct on to the floor outlet connector.

S 434-012
(3) Install the clamp between the flexible duct and the floor outlet, at approximately 0.25 inches (6 mm) from the end of the flexible duct.
(a) Tighten the clamp as follows:
1) If the duct diameter is less than 2.0 inches (50 mm), tighten the clamp to 18 - 22 inch-pounds.
2) If the duct diameter is larger than 2.0 inches (50 mm), tighten the clamp to 20 - 25 inch-pounds.

S 434-013
(4) Install the cap screws and washers that are below the floor outlet, to attach the support angles to the sidewall panel.
D. Do the installation test for the floor outlets

S 864-014
(1) AIRPLANES WITH PASSENGER CONFIGURATION;
Remove the DO-NOT-OPERATE tags from the L and R RECIRC FAN switch-lights, on the P5 panel.
(a) Push the switch-lights to the on position.
(b) Make sure the ON lights come on, and the INOP lights go off.

S 214-015
(2) Feel for the airflow from the floor outlet.

S 214-016
(3) Feel for leaks from the flexible duct joint.
(a) A small leak is permitted.
(b) You must repair a large leak.

E. Put the airplane back to its usual condition

S 414-017
(1) Install the top sidewall panel.

S 434-018
(2) Install the cap screws and washers that are above the floor outlet, to attach the support angles to the sidewall panel.

S 864-019
(3) Remove the DO-NOT-OPERATE tags from the L and R PACK selectors, on the P5 panel.

S 864-020
(4) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

FLIGHT DECK OVERHEAD OUTLET - REMOVAL/INSTALLATION

1. General
   A. The main overhead outlet is installed longitudinally in the overhead circuit breaker panel P11. This procedure has instructions to remove and install the main overhead outlet.

TASK 21-22-03-004-001

2. Remove the Overhead Outlet (Fig. 401)
   A. References
      (1) 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) AIRPLANES WITH PASSENGER CONFIGURATION;
      Push the L and R RECIRC FAN switch-lights, on the pilots overhead panel P5, to the off position.
      (a) Make sure the INOP lights come on.
      (b) Put a DO-NOT-OPERATE tag on the switch-lights.

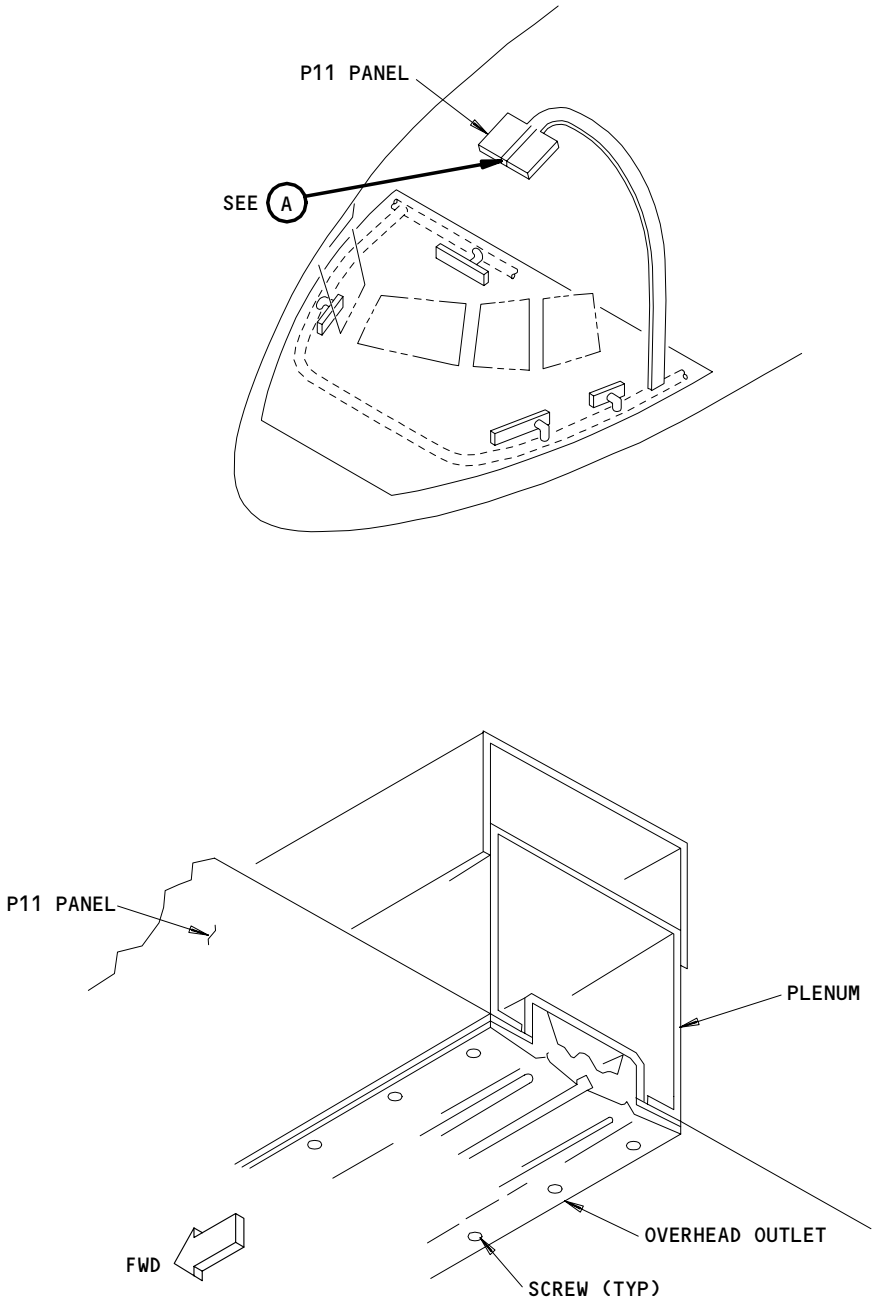
      S 864-004
      (3) Turn the L and R PACK selectors, on the P5 panel, to the OFF positions.
      (a) Make sure the PACK OFF lights come on.
      (b) Put a DO-NOT-OPERATE tag on the selectors.
   D. Remove the overhead outlet.

      S 034-005
      (1) Remove the screws from the overhead outlet flange.

      S 024-006
      (2) Remove the overhead outlet.

TASK 21-22-03-404-007

3. Install the Overhead Outlet (Fig. 401)
   A. References
      (1) 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41



Flight Deck Overhead Outlet Installation
Figure 401

C. Install the overhead outlet

S 424-008
(1) Put the overhead outlet into position in the P11 panel.

S 434-015
(2) Make sure the holes in the support structure align with the holes in the overhead outlet. If the holes do not match, slot the holes in the overhead outlet to allow the screws to align properly.

S 434-009
(3) Install the screws in the overhead outlet flange. Tighten the screws.

D. Do the installation test for the overhead outlet.

S 864-011
(1) AIRPLANES WITH PASSENGER CONFIGURATION;
Remove the DO-NOT-OPERATE tags from the L and R RECIRC FAN switch-lights, on the P5 panel.
(a) Push the switch-lights to the on position.
(b) Make sure the ON lights come on, and the INOP lights go off.

S 214-010
(2) Feel for the airflow from the overhead outlet.

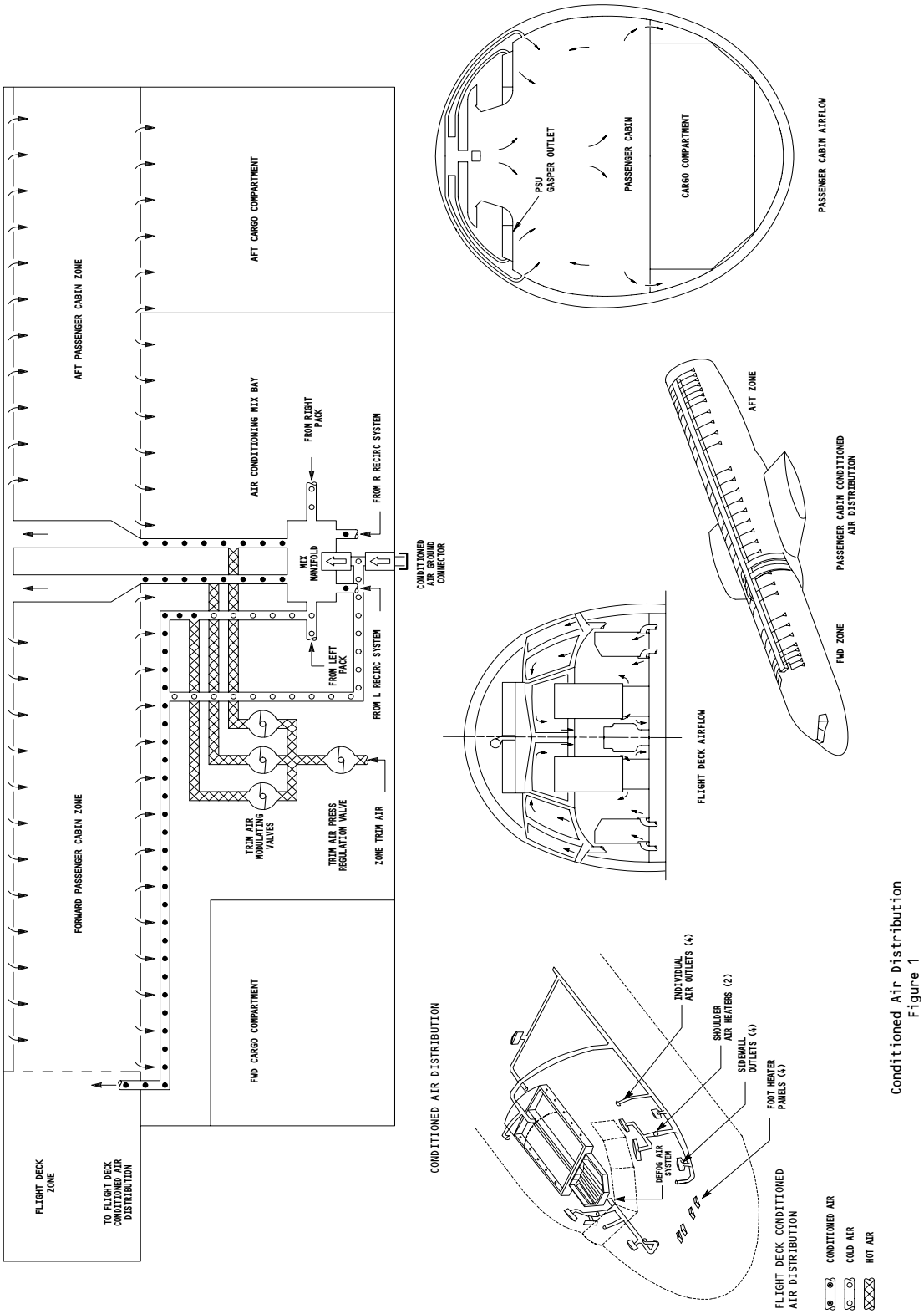
E. Put the airplane back to its usual condition.

S 864-012
(1) Remove the DO-NOT-OPERATE tags from the L and R PACK selectors, on the P5 panel.

S 864-013
(2) Remove the electrical power, if it is not necessary (Ref 24-22-00).

PASSENGER CABIN CONDITIONED AIR DISTRIBUTION - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The passenger cabin conditioned air distribution system channels air from the mix manifold (AMM 21-21-00/001) throughout the passenger cabin. The distribution system provides a comfortable environment for the passengers. The distribution system consists of sidewall risers, overhead ducts, overhead outlets, sidewall outlets, and return air grills.
   B. Conditioned air from the mix manifold mixes with trim air and enters four sidewall risers (two on each side). The air then flows through each sidewall riser into the overhead duct. Air is dispersed into the passenger compartments from the overhead duct through overhead outlets located along the overhead duct, and sidewall outlets located under the stowage bins. Gasper outlets, connected to the overhead ducts, disperse conditioned air into each lavatory. Adjustable outlets disperse conditioned air into the galley areas. Air exits the passenger cabin through the return air grills located in the sidewalls near the floor.
2. Component Details
   A. Ducts
      (1) Sidewall Riser Ducts
         (a) The sidewall risers are rectangular, 1.5 by 17.5 inch ducts located in the wall lining of the passenger compartment, just aft of the wing leading edge. Three-ply Kevlar and a thick honeycomb wall make up the riser ducts.
      (2) Overhead Duct
         (a) The overhead ducting extends the full length of the passenger cabin. The ducts are made of rigid plastic foam. Adaptor assemblies attach the main overhead duct to each overhead outlet.
      (3) Sidewall Outlet Ducts
         (a) The sidewall outlets are attached to the main overhead duct by smaller, 1.5 inch diameter flex ducts. The ducts are made of silicone rubber-impregnated fiberglass.
   B. Return Air Grills
      (1) The return air grills are made of a molded plastic screen with 2 clips on the top and 2 screws on the bottom to attach them to the carpet risers. The screens have 8 or 23 air vents that are about 1/4 inch wide and 14 inches long.
      (2) The air vents in the return air grill allow air to escape from the passenger compartment into the lower lobe of the airplane. This allows air to recirculate and to leave the passenger compartment if there is a rapid decompression.
   C. Outlets
      (1) Overhead Outlets
         (a) The overhead outlets consist of a flow divider and a blade inside a housing. The flow divider and blade break up the airflow to prevent drafts in the passenger compartment.



Conditioned Air Distribution
Figure 1

597381

(2) Sidewall Outlets
    (a) The sidewall outlets consist of an air deflector inside a housing. The housing and air deflector disperse the air flow as it enters the passenger compartment.
(3) Galley and Lavatory Outlets
    (a) Separate adjustable outlets provide conditioned air to galley areas and non-adjustable gasper outlets provide conditioned air to each lavatory.

OVERHEAD DISTRIBUTION DUCT - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install a section of the overhead distribution duct.

   B. Do not remove the tape at the duct joints of foam ducts. You can cause damage to the foam ducts if you remove tape from the duct joints.

   TASK 21-23-01-004-206

2. Overhead Distribution Duct Removal (Fig. 401 and 401A)
   A. References
      (1) AMM 23-32-02/401, Fixed Video Monitor
      (2) AMM 24-22-00/201, Control (Supply Power)
      (3) AMM 25-22-01/401, Sculptured Ceiling Panels

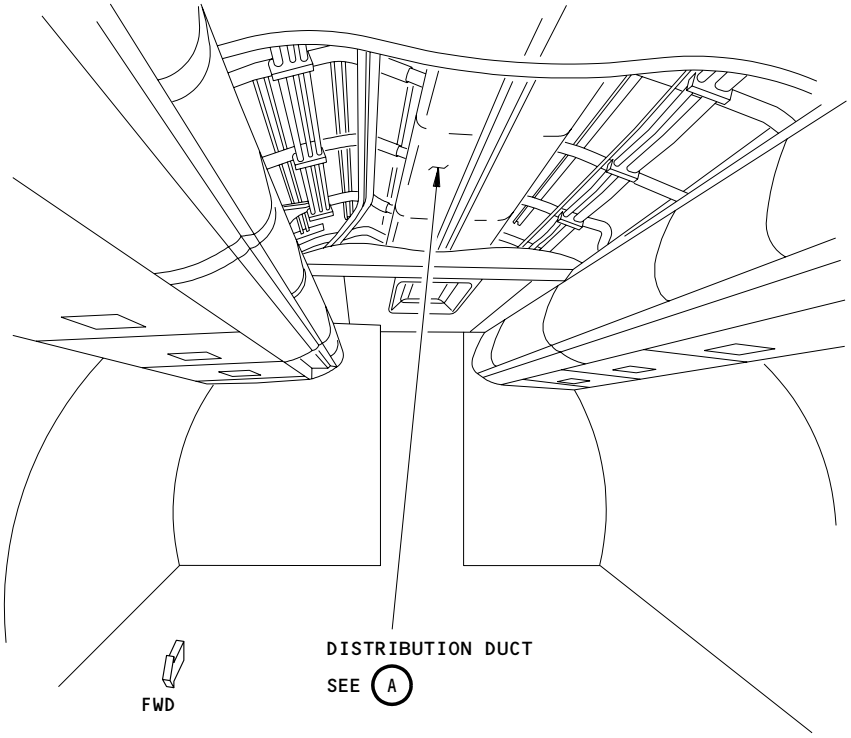
   B. Access
      (1) Location Zones
          Section 43 - Body Station 549.35 - 789.35
          Section 44 - Body Station 989.35 - 1169.35
          Section 46 - Body Station 1169.35 - 1449.35
   C. Prepare for the Removal

      S 864-003
      (1) Supply electrical power (AMM 24-22-00/201).

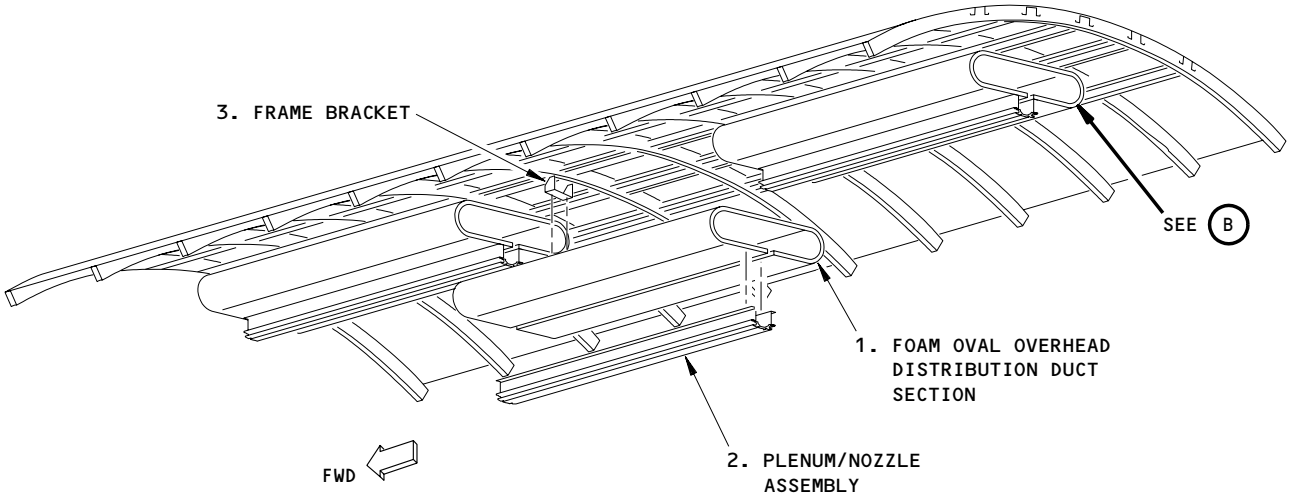
      S 864-004
      (2) Push the L and R RECIRC FAN switch-lights, on the pilots overhead P5 panel, to the OFF position.
          (a) Make sure the INOP lights come on.
          (b) Put a DO-NOT-OPERATE tag on the switch-lights.

      S 864-005
      (3) Turn the L and R PACK selectors, on the P5 panel, to the OFF position.
          (a) Make sure the PACK OFF lights come on.
          (b) Put a DO-NOT-OPERATE tag on the selectors.

      S 014-006
      (4) Remove the applicable sculptured ceiling panel in the passenger compartment to get access to the duct (AMM 25-22-01/401).

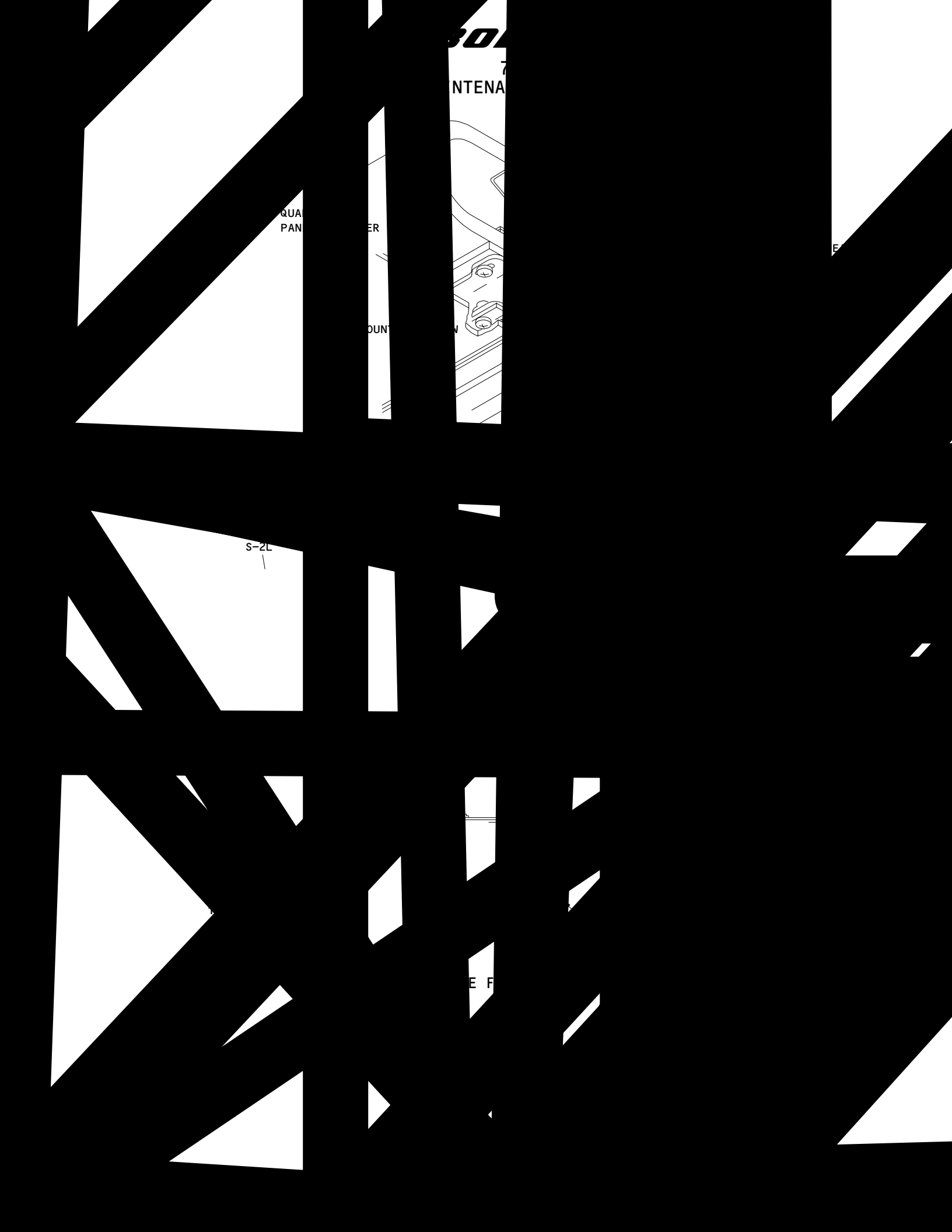


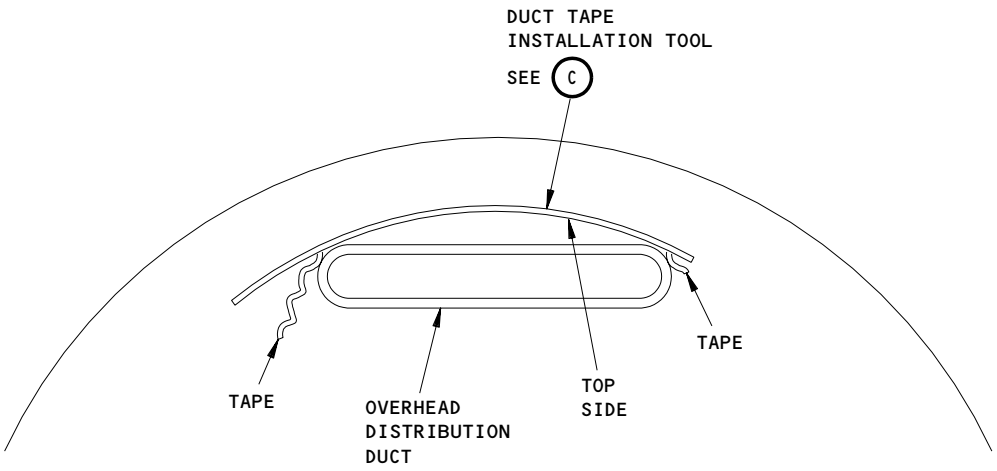
PASSENGER COMPARTMENT
(CEILING PANEL REMOVED)



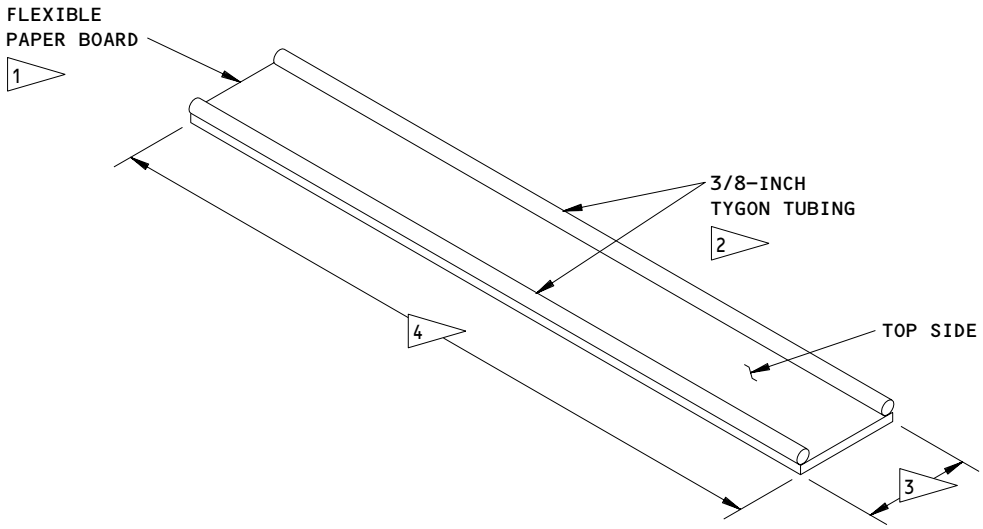
DISTRIBUTION DUCT
A

Passenger Cabin Overhead Air Distribution Duct Installation
Figure 401A (Sheet 1)





DISTRIBUTION DUCT TAPED JOINT



DUCT TAPE INSTALLATION TOOL

C

1. PAPER BOARD SHOULD BE THIN TO PROVIDE MAXIMUM FLEXIBILITY WITHOUT DAMAGE.
2. BOND THE TYGON TUBING (OR EQUIVALENT) TO THE PAPER BOARD.
3. MAKE THE WIDTH OF THE PAPER BOARD A MINIMUM OF 1 INCH WIDER THAN THE WIDTH OF THE TAPE USED FOR THE REPAIR.
4. MAKE THE LENGTH OF THE PAPER BOARD A MINIMUM OF 12 INCHES LONGER THAN THE WIDTH OF THE DISTRIBUTION DUCT JOINT TO BE RETAPED.

Passenger Cabin Overhead Air Distribution Duct Installation
Figure 401A (Sheet 3)

D. Foam Oval Overhead Distribution Duct Removal

S 014-225
(1) Remove the video monitors as applicable (AMM 23-32-02/401).

S 024-227
(2) AIRPLANES POST-SB 21-0088;
Remove the overhead distribution duct lanyards (7) from the brackets (8) on each side of the conditioned air outlets.

S 024-228
(3) Remove the plenum/nozzle assembly (2):
(a) Remove the mounting screws (5) that attach the plenum/nozzle assembly (2) to the duct (1).
(b) Remove the plenum/nozzle assembly (2).

S 864-229
(4) Put a piece of sheet metal between the top of the duct and the ceiling insulation.

NOTE: This will help to prevent damage to the ceiling insulation when you cut the tape.

S 034-230
(5) Cut through the duct tape at the duct joints.

NOTE: To prevent damage to the duct, do not remove the tape from the duct.

S 024-232
(6) Remove the flexible hoses from the spuds on the duct.

S 024-233
(7) Unbolt the duct (1) from the frame bracket (3) and remove the duct (1).

TASK 21-23-01-404-208

3. Overhead Distribution Duct Installation (Fig. 401 and 401A)

A. Equipment

(1) Tape Installation Tool (for duct locations which have limited access)

(a) Make the tape installation tool that is shown in Figure 401A.

NOTE: The purpose of this tool is to make the installation of the tape between the taped joints of the overhead distribution duct easier. The tool will be used to put the replacement tape into position where limited access exists.

The tool is intended to be used only one time and then discarded.

B. Consumable Materials

(1) Adhesive

(a) A00929 - BAC 5010, Type 58 (BMS 5-7, Type II) (EC-4419)

(2) Solvent

(a) E00049 - Toluene, TT-T-548 or JAN-T-171 Grade A

(3) Tape - Nomex Fabric

(a) G01400 - HT1-4, 4-inches wide

(4) Wipers

(a) G00034 - Wipers - Cloth

C. References

(1) AMM 23-32-02/401, Fixed Video Monitor

(2) AMM 24-22-00/201, Control (Supply Power)

(3) AMM 25-22-01/401, Sculptured Ceiling Panels

(4) AMM 36-00-00/201, Pneumatics System

D. Access

(1) Location Zones

Section 43 - Body Station 549.35 - 789.35

Section 44 - Body Station 989.35 - 1169.35

Section 46 - Body Station 1169.35 - 1449.35

E. Foam Overhead Distribution Duct Installation

S 424-223

(1) Put the duct (1) in position.

S 434-224

(2) Install the duct (1) to the frame bracket (3) with the quarter-turn panel fasteners (6).

S 424-239

(3) Install the flexible hoses on the spuds on the duct (1).

S 394-245

WARNING: OBEY THE INSTRUCTIONS FROM THE INDUSTRIAL HYGIENE, FIRE, AND SAFETY ORGANIZATIONS FOR THE NECESSARY PROCEDURES AND EQUIPMENT WHEN YOU USE SOLVENTS. DO NOT GET THE SOLVENTS IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE SOLVENTS. USE A PROTECTIVE SPLASH GOGGLE, GLOVES, AND A RESPIRATOR (IN CONFINED AREAS) WHEN YOU USE THE SOLVENTS. KEEP THE SOLVENTS AWAY FROM ALL SOURCES OF IGNITION (HEAT, FLAME, AND SPARKS). THE SOLVENTS YOU USE ARE POISONOUS AND FLAMMABLE. IF YOU DO NOT USE THE CORRECT PROCEDURES AND EQUIPMENT, INJURY TO PERSONS OR DAMAGE TO THE EQUIPMENT CAN OCCUR.

CAUTION: DO NOT USE THE ADHESIVE BMS 5-7 TYPE II IF THE DUCTS HAVE THE ADHESIVE GE RTV 133 ON IT. THE ADHESIVE BMS 5-7 TYPE II WILL NOT BOND CORRECTLY. YOU MUST USE THE CORRECT PROCEDURE TO APPLY THE ADHESIVE TO THE DUCTS.

(4) Do these steps to apply the new tape to the duct joints:
   (a) Clean the duct joint area with a cloth wiper that is moist with solvent.
   (b) Dry the duct joint with a clean cloth wiper before the solvent dries fully.
   (c) Do one of these procedures to apply the tape to the duct joints:
      1) Procedure 1
         a) Mix one part of the toluene with two parts of the adhesive by volume to make the adhesive thin.
         b) Apply a 0.020 to 0.030 inch thick layer of the adhesive to one side of the tape and to the end of the duct.

            or

            Apply a 0.040 to 0.060 thick layer of the adhesive which is 3 inches wide to each end of the duct.
         c) Apply the tape to the duct while the adhesive is wet.

            NOTE: A maximum of four layers of the old tape can be on the duct at one time. If there are more than four layers of old tape on the duct, replace that section of the duct.

         d) Make sure that the tape makes a 1.5 inch overlap (minimum) on each side of the duct joint.
         e) Make sure that the ends of the tape overlap by 1 to 2 inches on each other except where a nozzle opening occurs.

f) Make sure that the tape makes a 1.5 inch overlap (minimum) on each side of the duct joint.
g) Make sure the tape is free of wrinkles and air bubbles.
h) Apply a layer of the adhesive to the top of the tape to make sure that the tape is soaked with adhesive.
i) Let the adhesive dry for a minimum of 4 hours at a temperature of 65° to 100°F (18.3° to 37.8°C).

NOTE: Do not supply air to the duct until the adhesive dries fully.

2) Procedure 2 (for duct locations which have limited access)
a) Mix one part of the toluene with two parts of the adhesive by volume to make the adhesive thin.
b) Apply a 0.040 to 0.060 inch thick layer of the adhesive to the tape.

NOTE: The adhesive must go through the tape and hold it temporarily to the installation tool.

c) Put the tape on the installation tool so that the side of the tape with the adhesive does not touch the tool.
d) Put the tape on the installation tool so that the end of the tape that will be installed first is almost to the end of the tool.
e) Position the tool so that the top surface of the tool is down.
f) If the tape does not stick to the tool, put a small amount of adhesive on the back side of the tape that touches the tool.

NOTE: The tape with adhesive must stick to the tool so that it does not touch the duct joint until it is properly positioned.

g) While the adhesive is still wet, place the tool with the tape over the distribution duct joint so that the tape is approximately centered over the joint.

NOTE: A maximum of 4 layers of the used tape can be on the duct at one time. If there are more than four layers of used tape on the duct, replace that section of the duct.

h) Make sure that the tape makes a 1.5 inch overlap (minimum) on each side of the duct joint.
i) Make sure that the ends of the tape overlap by 1 to 2 inches on each other except where a nozzle opening occurs.
j) Push down on the bottom surface of the tool so that the replacement tape evenly touches the ends of the distribution ducts to be connected.

k) Hold one end of the tape and move the tool out from above the distribution duct in the direction of the other end of the tape.
l) Make sure the tape is free of wrinkles and air bubbles.
m) Apply a layer of the adhesive to the top of the tape to make sure that the tape is soaked with adhesive.
n) Let the adhesive dry for a minimum of 4 hours at a temperature of 65° to 100°F (18.3° to 37.8°C).

NOTE: Do not supply air to the duct until the adhesive dries fully.

S 414-247
(5) Install the plenum/nozzle assembly (2):
(a) Position the plenum/nozzle assembly (2) in place below the duct (1).
(b) Install the mounting screws (5) into the plenum/nozzle assembly (2) to secure the plenum/nozzle assembly (2) to the duct (1).

F. Overhead Distribution Duct Test

S 794-236
(1) Do this check of the overhead distribution duct:
(a) Supply pressure to the pneumatic system (AMM 36-00-00/201).
(b) Put the L and R pack switch on the P5 air conditioning panel to the AUTO position.
(c) Check the distribution duct to make sure there is no leakage of air at the connections.

G. Put the airplane back to its usual condition

S 414-240
(1) AIRPLANES POST-SB 21-0088;
Connect the overhead distribution duct lanyards (7) to the brackets (8) on each side of the conditioned air outlet.

S 414-235
(2) Install the sculptured ceiling panel (AMM 25-22-01/401).

S 414-242
(3) Install the video monitors (AMM 23-32-02/401).

S 864-234
(4) Remove DO-NOT-OPERATE tags from the L and R PACK selectors on the P5 panel.

S 864-237
(5) Remove DO-NOT-OPERATE tags from the L and R RECIRC FAN switch-lights on the P5 panel.

S 864-238

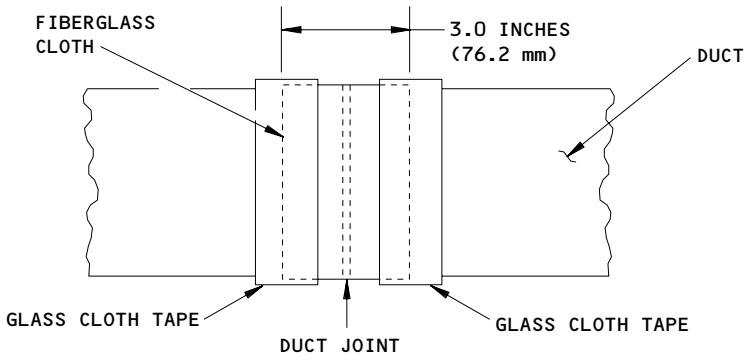
(6) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

AIR CONDITIONING SYSTEM DUCTS - REPAIRS

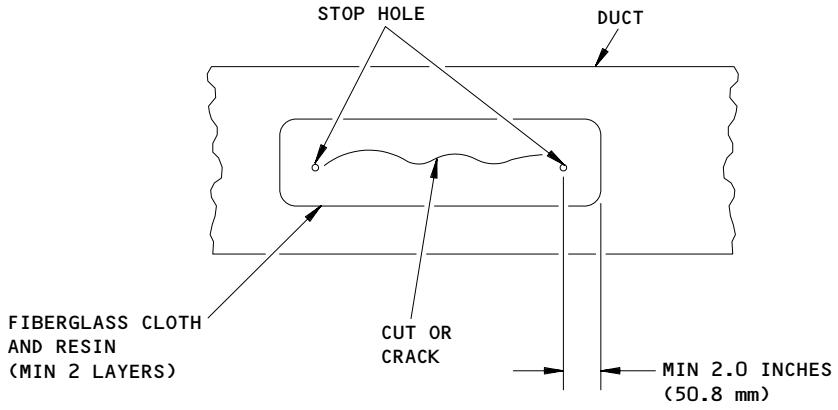
1. General
   A. This procedure gives instructions for the repair of the following types of air conditioning ducts:
      (1) Fiberglass or Kevlar Duct (Fig. 801)
         (a) Taped Joint Repair
         (b) External Patch Repair
         (c) Structural Repair
      (2) Polyurethane Foam Duct (Fig. 802)
         (a) Taped Joint Repair
         (b) Duct End Repair
         (c) External Patch Repair
         (d) Structural Repair
         (e) Inner Lining Repair
         (f) Duct Section Replacement
      (3) Ducts Insulated with Melamine or Polyimide Foam (Fig. 803)
         (a) Rework Ducts Insulated with Polyimide Foam Insulation
         (b) Tape Replacement
         (c) Insulation Repair
         (d) Insulation Replacement
      (4) Ducts with Fiberglass Insulation/Flame-Resistant Covering (Fig. 805)
         (a) Tape Replacement
         (b) Insulation and Covering Repair
         (c) Duct Replacement

TASK 21-23-01-308-001

2. Taped Joint Repair - Fiberglass or Kevlar Duct (Fig. 801)
   A. General
      (1) This procedure gives instructions for the repair of a taped joint that connects two sections of fiberglass or Kevlar air conditioning ducts.
      (2) This procedure may also be used to make a temporary repair to a damaged fiberglas or Kevlar air conditioning duct when time is not available to make a permanent repair or if the materials are not available to make a permanent repair. If a temporary repair is made, make the permanent repair as soon as possible.
   B. Consumable Materials
      (1) Cloth - Glass
         (a) G00031 Cloth - Glass (Fiberglas), minimum 0.007-inch thick (MIL-C-9084 Type VIII)
         (b) G02454 Fabric - Aromatic Polyamide Fiber (Kevlar), minimum 0.007-inch thick (alternative to the Fiberglas glass cloth)
      (2) Plastic sheet - polyethylene or vinyl - commercially available
      (3) Primer - Dow Corning 1200
      (4) Sandpaper - 320 grit - commercially available
      (5) Sealant - Dow Corning 90-006

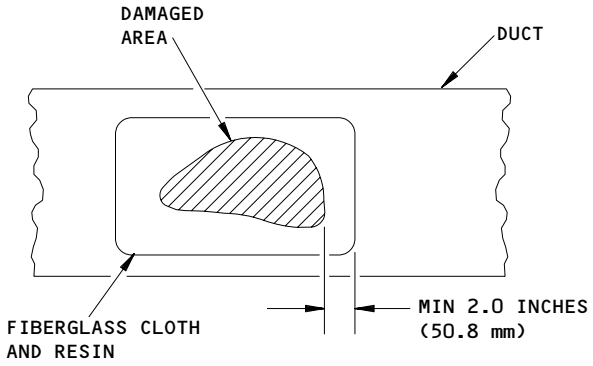


TAPED JOINT REPAIR – FIBERGLASS/KEVLAR DUCT

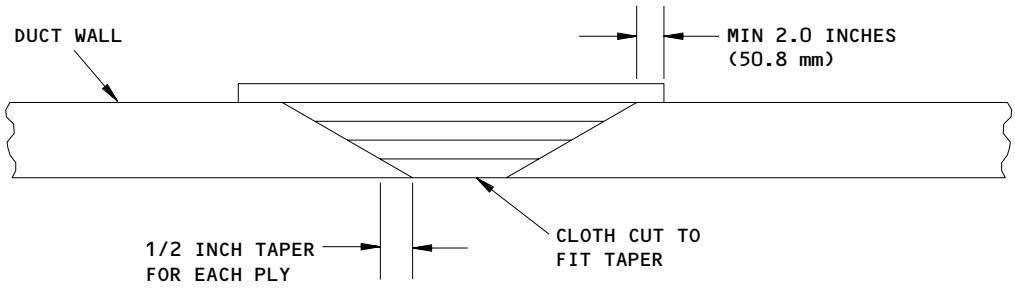


EXTERNAL PATCH – FIBERGLASS/KEVLAR DUCT

Air Conditioning System Ducts Repair (Fiberglass/Kevlar)
Figure 801 (Sheet 1)



STRUCTURAL REPAIR – FIBERGLASS/KEVLAR DUCT – OVERHEAD VIEW



STRUCTURAL REPAIR – FIBERGLASS/KEVLAR DUCT – CROSS-SECTION VIEW

Air Conditioning System Ducts Repair (Fiberglass/Kevlar)
Figure 801 (Sheet 2)

(6) Solvent
(a) Solvent - Butyl carbitol (alternative to B01011, Series 91) - commercially available (AMM 20-30-91/201)
(b) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)
(7) Squeegee - commercially available
(8) Tape - Glass Cloth, Thermosetting, Pressure-Sensitive Adhesive
(a) G00511 Tape - Glass Cloth, 3M Scotch brand No.361
(b) G50344 Tape - Glass Cloth, Heavy-Duty, Permacel P-212HD
(c) Tape - Glass Cloth, Polyken 292 (optional)
(Kendall Company, Boston, MA)
(Tyco/Covalence Adhesives, Franklin, MA)
(9) Tape - Cargo Liner Joint Sealing (alternative to glass cloth tape)
(a) G02361 Tape - Cargo Liner (BMS 5-146, Type 1, Class 1, Grade A)
(b) Tape - Cargo Liner, Polyken 294FR (optional)
(Tyco/Covalence Adhesives, Franklin, MA)
(10) Wiping cloth, lint-free - commercially available

C. References
(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-002
(1) Release the pressure from the pneumatic system (AMM 36-00-00/201).

NOTE: This will make sure that there is no airflow in the ducts when you do the repair.

S 868-003
(2) On the bleed air control module on the pilots' overhead panel, P5, put the pack control switches in the OFF position.

S 018-004
(3) Remove the applicable ceiling, sidewall, or floor panels to gain access to the damaged air conditioning duct joint.

S 018-005
(4) If insulation is installed on the duct joint, remove the insulation.

S 348-006
(5) Do these steps to prepare the damaged area of the duct.

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(a) Use the solvent and a wiping cloth to clean the damaged area.
(b) Sand the damaged area to remove any remaining adhesive and contamination.
(c) Use the solvent and a wiping cloth to clean the damaged area.

S 348-007
(6) Cut a piece of the fiberglass or Kevlar cloth that is 3 inches wide and long enough to wind around the duct a minimum of two times.

E. Repair the Taped Joint

S 348-008
(1) Apply a thin, smooth layer of the primer to the duct joint area and let it dry at room temperature for a minimum of 1 hour.

S 348-009
(2) Apply the sealant to one side of the fiberglass or Kevlar cloth.

S 348-010
(3) Wind the fiberglass or Kevlar cloth around the duct joint a minimum of two times.

NOTE: Make sure that the sealant on the fiberglass or Kevlar cloth is in contact with the duct.

S 348-011
(4) Put a piece of plastic sheet on the fiberglass or Kevlar cloth and press lightly with a squeegee or with your hand. Make the fiberglass or Kevlar cloth smooth from the center to the edges of the fiberglass or Kevlar cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-012
(5) Remove the plastic sheet from the fiberglass or Kevlar cloth and remove unwanted resin with a wiping cloth.

S 348-013
(6) Wind the glass cloth tape around the two edges of the fiberglass or Kevlar cloth repair.

NOTE: Make sure the tape is flat with no wrinkles or gaps.

F. Put the Airplane Back to Its Usual Condition

S 418-014
(1) If insulation was removed from the duct joint, install new insulation.

S 418-015
(2) Replace the panels or other airplane structure removed to gain access to the duct joint.

TASK 21-23-01-308-016

3. External Patch Repair - Fiberglass or Kevlar Duct (Fig. 801)
A. General
(1) This procedure gives instructions for the repair of a crack or cut in a fiberglass or Kevlar air conditioning duct with an external patch.
(2) An external patch is applicable when the cut or the crack is less than 1/4 inch wide and is less than 3 inches long.
B. Consumable Materials
(1) Cloth - Glass
(a) G00031 Cloth - Glass, Finished, For Resin Laminates minimum 0.007-inch thick, SAE-AMS-C-9084 (Supercedes MIL-C-9084)
(b) G02454 Fabric - Aromatic Polyamide Fiber (Kevlar), minimum 0.007-inch thick (alternative to the Fiberglass glass cloth)
(2) G50305 Sheeting - Plastic - polyethylene or vinyl, commercially available
(3) Resin - Fiberglass (two part resin system, resin and hardener)
(a) G50400 Resin - Fiberglass, BMS 8-201 Type IV (Supercedes BMS 8-201 Type II)
(b) G50399 Resin - Fiberglass, BMS 8-201 Type III (Supersedes BMS 8-201 Type I)
(c) G02137 Resin - Polyester, Hetron 92 (alternate)

NOTE: For the repair of fiberglass ducts only.

(4) Sandpaper - 320 grit - commercially available

(5) Solvent
(a) BO1027 Solvent - Butyl carbitol (alternative to BO1011, Series 91 solvent)
(b) BO1011 Solvent - Series 91, commercially available (AMM 20-30-91/201)
(6) GOOO34 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper (Cheesecloth, Gauze)
(7) Squeegee - commercially available

C. References
(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-017
(1) Release the pressure from the pneumatic system (AMM 36-00-00/201)

NOTE: This will make sure that there is no airflow in the ducts when you do the repair.

S 868-018
(2) On the bleed air control module on the pilots' overhead panel, P5, put the pack control switches in the OFF position.

S 018-019
(3) Remove the applicable ceiling, sidewall, or floor panels to gain access to the damaged air conditioning duct.

S 018-020
(4) If insulation is installed on the duct, remove the insulation.

S 348-021
(5) Do these steps to prepare the damaged area of the duct.

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(a) Use the solvent and a wiping cloth to clean the damaged area.
(b) Drill a hole at each end of the cut or crack to prevent the cut or crack from getting larger. The holes should be a maximum of 1/16 inch diameter.
(c) Sand the damaged area to remove any remaining adhesive and contamination.
(d) Use the solvent and a wiping cloth to clean the damaged area.

S 348-022
(6) Prepare the Fiberglass or Kevlar cloth.
(a) Cut sufficient pieces of fiberglass or Kevlar cloth to equal the thickness of the duct.
(b) Cut the fiberglass or Kevlar cloth pieces 1/2 inch larger on all sides than the damage.
(c) Round the corners of the pieces of fiberglass or Kevlar cloth.

S 348-023
(7) Prepare the applicable resin.

E. Repair the Air Conditioning Duct

S 348-024
(1) Apply a thin, smooth layer of resin to the duct where the fiberglass or Kevlar cloth will be applied.

NOTE: Make sure the area of the resin is larger than the size and shape of the fiberglass or Kevlar cloth pieces.

S 348-025
(2) Put a piece of fiberglass or Kevlar cloth on the resin so that it extends beyond the cut or crack a minimum of 1/2 inch on all sides.

S 348-026
(3) Soak the fiberglass or Kevlar cloth with the applicable resin.

S 348-027
(4) Put a piece of plastic sheet on the fiberglass or Kevlar cloth and press lightly with a squeegee or with your hand. Make the fiberglass or Kevlar cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-028
(5) Remove the plastic sheet from the fiberglass or Kevlar cloth and remove unwanted resin with a wiping cloth.

S 348-029
(6) Put another piece of the fiberglass or Kevlar cloth on the first piece, soak it with resin, and make it smooth.

NOTE: Continue using the same procedure until the thickness of the patch equals the thickness of the duct.

S 348-030
(7) Let the resin cure for 24 hours at room temperature.

F. Put the Airplane Back to Its Usual Condition

S 418-031

(1) If insulation was removed from the duct joint, install new insulation.

S 418-032

(2) Replace the panels or other airplane structure removed to gain access to the duct joint.

TASK 21-23-01-308-033

4. Structural Repair - Fiberglass or Kevlar Duct (Fig. 801)

A. General

(1) This procedure gives instructions for making a structural repair to a fiberglass or Kevlar air conditioning duct.

(2) A structural repair is applicable when the damage to the air conditioning duct is a cut or a hole that is more than 1/4 inch wide and more than 3 inches long but less than 5 percent of the total surface area of the duct. If the damage is more than 5 percent of the total surface area of the duct, replace the duct section.

B. Consumable Materials

(1) Cloth - Glass

(a) G00031 Cloth - Glass, Finished, For Resin Laminates minimum 0.007-inch thick, SAE-AMS-C-9084 (Supercedes MIL-C-9084)

(b) G02454 Fabric - Aromatic Polyamide Fiber (Kevlar), minimum 0.007-inch thick (alternative to the Fiberglass glass cloth)

(2) G50305 Sheeting - Plastic - polyethylene or vinyl, commercially available

(3) Resin - Fiberglass (two part resin system, resin and hardener)

(a) G50400 Resin - Fiberglass, BMS 8-201 Type IV (Supercedes BMS 8-201 Type II)

(b) G50399 Resin - Fiberglass, BMS 8-201 Type III (Supersedes BMS 8-201 Type I)

(c) G02137 Resin - Polyester, Hetron 92 (alternate)

NOTE: For the repair of fiberglass ducts only.

(4) Sandpaper - 320 grit - commercially available

(5) Solvent
(a) B01027 Solvent - Butyl carbitol (alternative to B01011, Series 91 solvent)
(b) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)
(6) G00034 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper (Cheesecloth, Gauze)
(7) Squeegee - commercially available

C. References
(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-034
(1) Release the pressure from the pneumatic system (AMM 36-00-00/201).

NOTE: This will make sure that there is no airflow in the ducts when you do the repair.

S 868-035
(2) On the bleed air control module on the pilots' overhead panel, P5, put the pack control switches in the OFF position.

S 018-036
(3) Remove the applicable ceiling, sidewall, or floor panels to gain access to the damaged air conditioning duct.

S 018-037
(4) If insulation is installed on the duct, remove the insulation.

S 348-038
(5) Do these steps to prepare the damaged area of the duct.

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(a) Use the solvent and a wiping cloth to clean the damaged area.
(b) Cut away the damaged area to make a rounded opening with a smooth shape. Cut the sides of the opening at an angle to make a taper of 1/2 inch between each ply of material.
(c) Sand the edge of the opening to make a smooth surface.
(d) Sand the surface of the duct around the opening a distance of 1/2 inch for each ply in the duct. For example, if there are 6 plies, sand 3 inches from the opening on all sides (1/2 x 6 = 3 inches).
(e) Use the solvent and a wiping cloth to clean the edge of the opening and the sanded surface of the duct.

S 348-039
(6) Prepare the Fiberglass or Kevlar cloth.
(a) Cut sufficient pieces of fiberglass or Kevlar cloth to equal the thickness of the duct.
(b) Cut each piece of fiberglass or Kevlar cloth 1/2 inch larger to fit the taper of the opening.
(c) Cut one piece of fiberglass or Kevlar cloth a minimum of 2 inches larger on all sides than the opening in the duct.

S 348-040
(7) Cut a piece of plastic sheet 2 to 3 inches larger on all sides than the opening.

S 348-041
(8) Cut a piece of cardboard or aluminum 2 to 3 inches larger than the opening on all sides.

S 348-042
(9) Attach the plastic sheet to the inside of the opening with adhesive tape so that it covers the opening.

S 348-043
(10) Attach the cardboard or aluminum to the inside of the opening with adhesive tape so that it covers the opening and provides support for the plastic sheet.

S 348-044
(11) Prepare the applicable resin.

E. Repair the Air Conditioning Duct

S 348-045
(1) Apply a thin, smooth layer of resin to the plastic sheet in the opening in the duct.

S 348-046
(2) Put a piece of fiberglass or Kevlar cloth in the opening over the plastic sheet so that it covers the opening completely.

S 348-047
(3) Soak the fiberglass or Kevlar cloth with the applicable resin.

S 348-048
(4) Put a piece of plastic sheet on the fiberglass or Kevlar cloth and press lightly with a squeegee or with your hand. Make the fiberglass or Kevlar cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-049
(5) Remove the plastic sheet from the fiberglass or Kevlar cloth and remove unwanted resin with a wiping cloth.

S 348-050
(6) Put another piece of fiberglass or Kevlar cloth on the first piece so that it covers the opening, soak it with resin, and make it smooth.

NOTE: Continue using the same procedure until the thickness of the patch equals the thickness of the duct.

S 348-051
(7) Put the last piece of fiberglass or Kevlar cloth on top of the patch so it extends beyond the opening a minimum of 2 inches on all sides. Make the fiberglass or Kevlar cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-052

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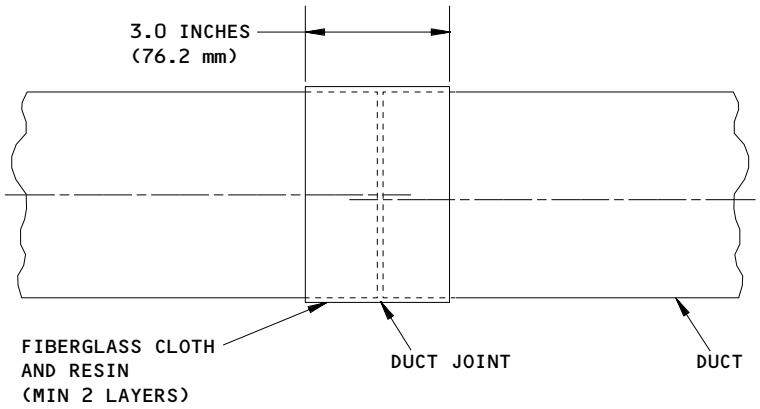
(8) Wipe the duct around the patch with a wiping cloth and solvent to remove unwanted resin.

S 348-053
(9) Let the resin to cure for 24 hours at room temperature.

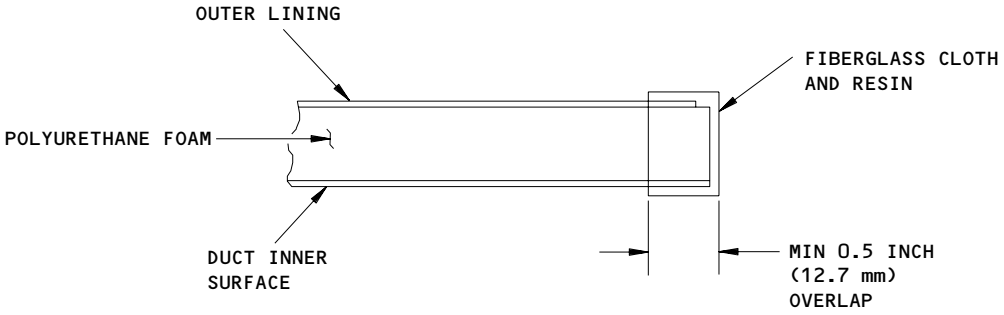
F. Put the Airplane Back to Its Usual Condition

S 418-054
(1) If insulation was removed from the duct joint, install new insulation.

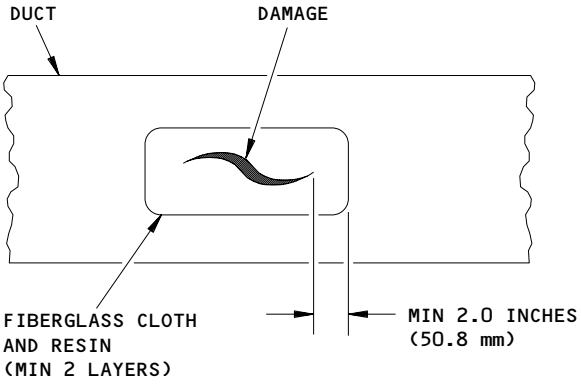
S 418-055
(2) Replace the panels or other airplane structure removed to gain access to the duct joint.



TAPED JOINT REPAIR – POLYURETHANE FOAM DUCT

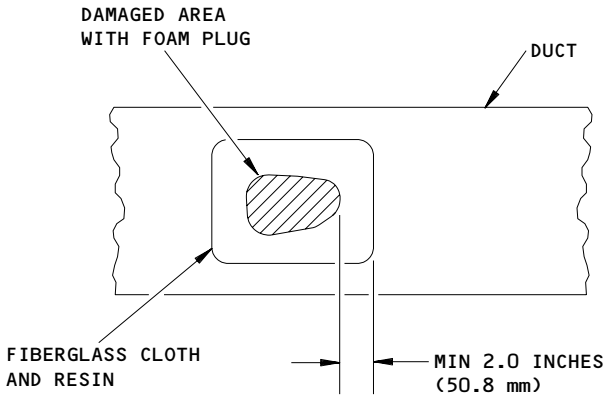


DUCT END REPAIR – POLYURETHANE FOAM DUCT

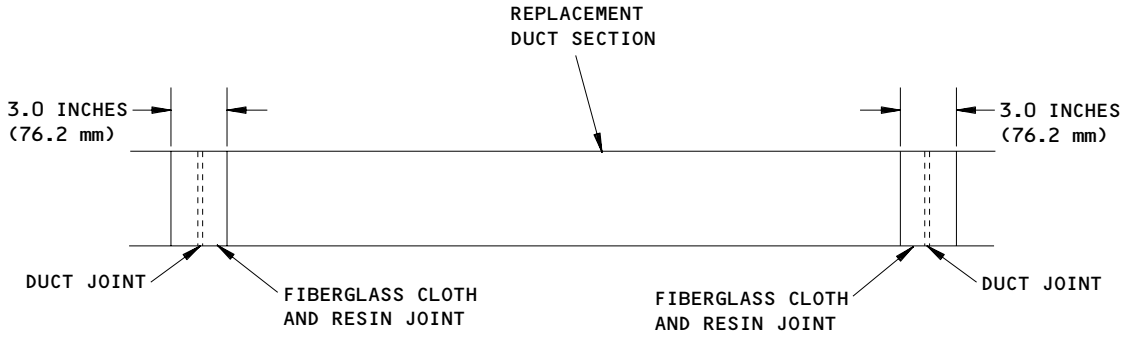


EXTERNAL PATCH – POLYURETHANE FOAM DUCT

Air Conditioning System Ducts Repair (Polyurethane Foam)
Figure 802 (Sheet 1)



STRUCTURAL REPAIR - POLYURETHANE FOAM DUCT



DUCT SECTION REPLACEMENT - POLYURETHANE FOAM DUCT

Air Conditioning System Ducts Repair (Polyurethane Foam)
Figure 802 (Sheet 2)

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TASK 21-23-01-308-056

5. Taped Joint Repair - Polyurethane Foam Duct (Fig. 802)

A. General

(1) This procedure gives instructions for the repair of the taped joint that connects sections of polyurethane foam air conditioning duct.

(2) This procedure may also be used to make a temporary repair to a damaged polyurethane foam air conditioning duct when time is not available to make a permanent repair or if the materials are not available to make a permanent repair. If a temporary repair is made, make the permanent repair as soon as possible.

B. Consumable Materials

(1) G00031 Cloth - Glass, Finished, For Resin Laminates minimum 0.007-inch thick, SAE-AMS-C-9084 (Supercedes MIL-C-9084)

(2) G50305 Sheeting - Plastic - polyethylene or vinyl, commercially available

(3) Resin - Fiberglass (two part resin system, resin and hardener)

(a) G50400 Resin - Fiberglass, BMS 8-201 Type IV (Supercedes BMS 8-201 Type II)

(b) G50399 Resin - Fiberglass, BMS 8-201 Type III (Supersedes BMS 8-201 Type I)

(c) G02137 Resin - Polyester, Hetron 92 (alternate)

NOTE: For the repair of fiberglass ducts only.

(4) Solvent

(a) B01027 Solvent - Butyl carbitol (alternative to B01011, Series 91 solvent)

(b) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)

(5) G00034 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper (Cheesecloth, Gauze)

(6) Squeegee - commercially available

C. References

(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-057

(1) Release the pressure from the pneumatic system (AMM 36-00-00/201).

NOTE: This will make sure that there is no airflow in the ducts when you do the repair.

S 868-058

(2) On the bleed air control module on the pilots' overhead panel, P5, put the pack control switches in the OFF position.

S 018-059
(3) Remove the applicable ceiling, sidewall, or floor panels to gain access to the damaged air conditioning duct joint.

S 018-060
(4) If insulation is installed on the duct, remove the insulation.

S 868-061
(5) Do these steps to prepare the damaged area of the duct.

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(a) Use the solvent and a wiping cloth to clean the damaged area.
(b) Sand the damaged area to remove any remaining adhesive and contamination.
(c) Use the solvent and a wiping cloth to clean the damaged area.

S 348-062
(6) Examine the end of each air conditioning duct for damage.

S 348-063
(7) If the duct lining is damaged so that the foam core of the duct shows, then do the Duct End Repair - Polyurethane Foam Duct procedure below.

S 348-064
(8) Cut a piece of the fiberglass cloth that is 3 inches wide and is long enough to wind around the duct a minimum of two times.

S 348-065
(9) Prepare the resin.

E. Repair the Taped Joint

S 348-066
(1) Apply resin to the duct ends.

S 348-067
(2) Let the resin partially dry until it is sticky.

S 348-068
(3) Press the duct ends together by aligning the installation checkmarks.

S 348-069
(4) Apply a thin, smooth layer of resin to the joint area a minimum of 2 inches wider than the duct joint.

S 348-070
(5) Apply resin to one side of the fiberglass cloth.

S 348-071
(6) Wind the fiberglass cloth around the duct joint a minimum of two times.

NOTE: Make sure the resin on the fiberglass cloth is in contact with the duct.

S 348-072
(7) Put a plastic sheet on the fiberglass cloth and press lightly with a squeegee or with your hand. Make the fiberglass cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-073
(8) Let the resin cure for 24 hours at room temperature.

F. Put the Airplane Back to Its Usual Condition

S 418-074
(1) If insulation was removed from the duct joint, install new insulation.

S 418-075
(2) Replace the panels or other airplane structure removed to gain access to the duct joint.

TASK 21-23-01-308-076

6. Duct End Repair - Polyurethane Foam Duct (Fig. 802)

A. General

(1) This procedure gives instructions for the repair of the end of a polyurethane foam air conditioning duct. This procedure is done if the lining that covers the polyurethane foam at the duct end is damaged and the polyurethane foam is exposed.

(2) This procedure may be required when doing the repair of a taped duct joint.

B. Consumable Materials

(1) G00034 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper (Cheesecloth, Gauze)

(2) G50305 Sheeting - Plastic - polyethylene or vinyl, commercially available

(3) Resin - Fiberglass (two part resin system, resin and hardener)

(a) G50400 Resin - Fiberglass, BMS 8-201 Type IV (Supercedes BMS 8-201 Type II)

(b) G50399 Resin - Fiberglass, BMS 8-201 Type III (Supersedes BMS 8-201 Type I)

(c) G02137 Resin - Polyester, Hetron 92 (alternate)

NOTE: For the repair of fiberglass ducts only.

(4) Solvent

(a) B01027 Solvent - Butyl carbitol (alternative to B01011, Series 91 solvent)

(b) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)

(5) G00034 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper (Cheesecloth, Gauze)

(6) Squeegee - commercially available

C. References

(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-077

(1) Release the pressure from the pneumatic system (AMM 36-00-00/201).

NOTE: This will make sure that there is no airflow in the ducts when you do the repair.

S 868-078

(2) On the bleed air control module on the pilots' overhead panel, P5, the pack control switches in the OFF position.

S 018-079

(3) Remove the applicable ceiling, sidewall, or floor panels to gain access to the damaged air conditioning duct.

S 018-080

(4) If insulation is installed on the duct joints, remove the insulation.

S 348-081

(5) Do these steps to prepare the damaged area of the duct.

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(a) Use the solvent and a wiping cloth to clean the damaged area.

NOTE: Clean the duct end area and the inside and outside of the duct a minimum of 1 inch from the duct end.

(b) Sand the damaged area to remove any remaining adhesive and contamination.
(c) Use the solvent and a wiping cloth to clean the damaged area.

S 348-082
(6) Prepare the fiberglass cloth.
(a) Cut a piece of fiberglass cloth the length of the outside circumference of the duct.
(b) The fiberglass cloth should have the width needed to overlap the duct end and the inside and outside of the duct a minimum of 1/2 inch.

S 348-083
(7) Prepare the resin.

E. Repair the Duct End

S 348-084
(1) Apply a thin, smooth layer of resin on the duct end and on the surface of the duct a minimum of 1/2 inch from the duct end.

S 348-085
(2) Wind the fiberglass cloth around the duct end so that is overlaps a minimum of 1/2 inch on both sides of the end.

S 348-086
(3) Soak the fiberglass cloth with the applicable resin.

S 348-087
(4) Put a piece of plastic sheet on the fiberglass cloth and press lightly with a squeegee or with your hand. Make the fiberglass cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-088
(5) Let the resin cure for 24 hours at room temperature.

S 348-089

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(6) Clean the area with a wiping cloth and solvent to remove unwanted resin.

F. Put the Airplane Back to Its Usual Condition

S 418-090
(1) If insulation was removed from the duct joint, install new insulation.

S 418-091
(2) Replace the panels or other airplane structure removed to gain access to the duct joint.

TASK 21-23-01-308-092

7. External Patch Repair - Polyurethane Foam Duct (Fig. 802)

A. General

(1) This procedure gives instructions for the repair of a polyurethane foam air conditioning duct if the damage is less than 1/4 inch deep less than 1 inch long and the inner lining is not damaged. If the damage is larger, do the Structural Repair - Polyurethane Foam Duct procedure below.

B. Consumable Materials

(1) G00031 Cloth - Glass, Finished, For Resin Laminates minimum 0.007-inch thick, SAE-AMS-C-9084 (Supercedes MIL-C-9084)

(2) G50305 Sheeting - Plastic - polyethylene or vinyl, commercially available
(3) Resin - Fiberglass (two part resin system, resin and hardener)
(a) G50400 Resin - Fiberglass, BMS 8-201 Type IV (Supercedes BMS 8-201 Type II)
(b) G50399 Resin - Fiberglass, BMS 8-201 Type III (Supersedes BMS 8-201 Type I)
(c) G02137 Resin - Polyester, Hetron 92 (alternate)

NOTE: For the repair of fiberglass ducts only.

(4) Solvent
(a) B01027 Solvent - Butyl carbitol (alternative to B01011, Series 91 solvent)
(b) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)
(5) G00034 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper (Cheesecloth, Gauze)
(6) Squeegee - commercially available

C. References
(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-093
(1) Release the pressure from the pneumatic system (AMM 36-00-00/201).

NOTE: This will make sure that there is no airflow in the ducts when you do the repair.

S 868-094
(2) On the bleed air control module on the pilots' overhead panel, P5, put the pack control switches in the OFF position.

S 018-095
(3) Remove the applicable ceiling, sidewall, or floor panels to gain access to the damaged air conditioning duct joint.

S 018-096
(4) If insulation is installed on the duct joint, remove the insulation.

S 348-097
(5) Examine the inner surface of the duct for damage.

S 348-098
(6) If the inner lining is damaged, then do the Duct Section Replacement - Polyurethane Foam Duct procedure below.

S 348-099
(7) Examine the damage to the duct. If the damage is more than 3 inches long or more than 5 square inches in area, do the Duct Section Replacement - Polyurethane Foam Duct procedure below.

S 348-100
(8) Do these steps to prepare the damaged area of the duct:

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(a) Use the solvent and a wiping cloth to clean the damaged area.
(b) Sand the damaged area to remove any remaining adhesive and contamination.
(c) Use the solvent and a wiping cloth to clean the damaged area.

S 348-101
(9) Prepare the fiberglass cloth.
(a) Cut two pieces of the fiberglass cloth 1/2 inch larger on all sides than the damaged area.
(b) Round the corners of the fiberglass cloth pieces.

S 348-102
(10) Prepare the resin.

E. Repair the Duct

S 348-103
(1) Apply a thin, smooth layer of resin to the duct where the fiberglass cloth will be applied.

NOTE: Make sure the area of the resin is larger than the size and shape of the fiberglass cloth.

S 348-104
(2) Put a piece of fiberglass cloth on the resin so that it extends beyond the damaged area a minimum of 1/2 inch to all sides.

S 348-105
(3) Soak the fiberglass cloth with the applicable resin.

S 348-106
(4) Put a piece of plastic sheet on the fiberglass cloth and press lightly with a squeegee or with your hand. Make the fiberglass cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-107
(5) Remove the plastic sheet from the fiberglass cloth and remove unwanted resin with a wiping cloth.

S 348-108
(6) Follow the same procedure to apply the second piece of the fiberglass cloth.

S 348-109
(7) Let the resin cure for 24 hours at room temperature.

S 348-110

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(8) Remove unwanted resin from the edges of the fiberglass cloth with a wiping cloth soaked with solvent.

F. Put the Airplane Back to Its Usual Condition

S 418-111
(1) If insulation was removed from the duct joint, install new insulation.

S 418-112
(2) Replace the panels or other airplane structure removed to gain access to the duct joint.

TASK 21-23-01-308-113

8. Structural Repair - Polyurethane Foam Duct (Fig. 802)

A. General

(1) This procedure gives instructions for making a structural repair to a polyurethane foam air conditioning duct. A structural repair replaces the polyurethane foam in the surface of the duct if the damage or deterioration to the polyurethane foam is greater than 1/4 inch deep and 1 inch long, but the inner lining is not damaged.

B. Consumable Materials

(1) G00031 Cloth - Glass, Finished, For Resin Laminates minimum 0.007-inch thick, SAE-AMS-C-9084 (Supercedes MIL-C-9084)

(2) G00077 Foam - Flame Retardant Rigid Urethane
(BMS 8-133 Type I Grade 20 Form A)
(3) G50305 Sheeting - Plastic - polyethylene or vinyl,
commercially available
(4) Resin - Fiberglass (two part resin system, resin and hardener)
(a) G50400 Resin - Fiberglass, BMS 8-201 Type IV
(Supercedes BMS 8-201 Type II)
(b) G50399 Resin - Fiberglass, BMS 8-201 Type III
(Supersedes BMS 8-201 Type I)
(c) G02137 Resin - Polyester, Hetron 92 (alternate)

NOTE: For the repair of fiberglass ducts only.

(5) A50042 Compound - Honeycomb Edge Filling and Potting
BMS 5-28, Type 19 (Epocast 1619A/B)
(6) Sandpaper - 320 grit - commercially available
(7) Solvent
(a) B01027 Solvent - Butyl carbitol (alternative to B01011,
Series 91 solvent)
(b) B01011 Solvent - Series 91, commercially available
(AMM 20-30-91/201)
(8) G00034 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper
(Cheesecloth, Gauze)
(9) Squeegee - commercially available

C. References
(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-114
(1) Release the pressure from the pneumatic system (AMM 36-00-00/201).

NOTE: This will make sure that there is no airflow in the ducts
when you do the repair.

S 868-115
(2) On the bleed air control module on the pilots' overhead panel, P5,
put the pack control switches in the OFF position.

S 018-116
(3) Remove the applicable ceiling, sidewall, or floor panels to gain
access to the damaged air conditioning duct joint.

S 018-117
(4) If insulation is installed on the duct joint, remove the insulation.

S 348-118
(5) Examine the inner surface of the duct for damage.

S 348-119
(6) If the inner lining is damaged, then do the Duct Section Replacement - Polyurethane Foam Duct procedure below.

S 348-120
(7) Examine the damage to the duct. If the damage is more than half the thickness of the foam duct material, then do the Duct Section Replacement - Polyurethane Foam Duct procedure below.

S 348-121
(8) Do these steps to prepare the air conditioning duct.
(a) Remove the damaged portion of the outer lining and the damaged foam material.

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(b) Use the solvent and a wiping cloth to clean the damaged area.
(c) Sand the duct outer surface a minimum of 2 inches from the edges of the damaged area to remove any remaining adhesive and contamination.
(d) Use the solvent and a wiping cloth to clean the damaged area.

S 348-122
(9) Cut a piece of the polyurethane foam to fit the area where the damaged foam was removed.

NOTE: Put the foam in the opening to make sure it is the correct size and shape.

S 348-123
(10) Prepare the fiberglass cloth.
(a) Cut two pieces of the fiberglass cloth 2 inches larger on all sides than the damaged area.
(b) Round the corners of the fiberglass cloth pieces.

S 348-124
(11) Prepare the potting compound.

E. Repair the Duct

S 348-125
(1) Apply the potting compound to the area where the polyurethane foam was removed.

S 348-126

(2) Put the piece of polyurethane foam in the area where the damaged foam was removed.

S 348-127

(3) Put a piece of plastic sheet on the piece of polyurethane foam and press on it to align the surface of the piece with the surface of the duct.

S 348-128

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(4) Remove any unwanted resin from the edges of the piece of polyurethane foam with a wiping cloth soaked with solvent.

S 348-129

(5) Leave the plastic sheet on the repair area and let the potting compound cure for 5 hours at 125°F. Apply heat with a heat gun, heat lamp or heating blanket.

S 348-130

(6) Remove the plastic sheet and smooth the surface of the foam with sandpaper.

S 348-131

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(7) Use the solvent and a wiping cloth to remove any dust from the duct.

S 348-132

(8) Prepare the applicable resin.

S 348-133
(9) Put a piece of the fiberglass cloth on the resin so that it extends beyond the damaged area a minimum of 2 inches on all sides.

S 348-134
(10) Soak the fiberglass cloth with the applicable resin.

S 348-135
(11) Put a piece of plastic sheet on the fiberglass cloth and press lightly with a squeegee or with your hand. Make the fiberglass cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-136
(12) Remove the plastic sheet from the fiberglass cloth and remove unwanted resin with a wiping cloth.

S 348-137
(13) Follow the same procedure to apply the second piece of the fiberglass cloth.

S 348-138
(14) Let the resin cure for 24 hours at room temperature.

S 348-139

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(15) Remove unwanted resin from the edges of the repaired area with a wiping cloth soaked with solvent.

F. Put the Airplane Back to Its Usual Condition

S 418-140
(1) If insulation was removed from the duct joint, install new insulation.

S 418-141
(2) Replace the panels or other airplane structure removed to gain access to the duct joint.

TASK 21-23-01-308-142

9. Inner Lining Repair - Polyurethane Foam Duct (Fig. 802)

A. General

(1) This procedure gives instructions for the repair of the inner lining on a polyurethane foam air conditioning duct. Use this procedure if the inner lining has peeled away from the duct but the polyurethane foam is not damaged.

(2) If the polyurethane foam is damaged, do the Duct Section Replacement - Polyurethane Foam procedure below.

B. Consumable Materials

(1) G00031 Cloth - Glass, Finished, For Resin Laminates minimum 0.007-inch thick, SAE-AMS-C-9084 (Supercedes MIL-C-9084)

(2) G50305 Sheeting - Plastic - polyethylene or vinyl, commercially available

(3) Resin - Fiberglass (two part resin system, resin and hardener)

(a) G50400 Resin - Fiberglass, BMS 8-201 Type IV (Supercedes BMS 8-201 Type II)

(b) G50399 Resin - Fiberglass, BMS 8-201 Type III (Supersedes BMS 8-201 Type I)

(c) G02137 Resin - Polyester, Hetron 92 (alternate)

NOTE: For the repair of fiberglass ducts only.

(4) Solvent

(a) B01027 Solvent - Butyl carbitol (alternative to B01011, Series 91 solvent)

(b) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)

(5) G00034 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper (Cheesecloth, Gauze)

(6) Squeegee - commercially available

C. References

(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-143

(1) Release the pressure from the pneumatic system (AMM 36-00-00/201).

NOTE: This will make sure that there is no airflow in the ducts when you do the repair.

S 868-144

(2) On the bleed air control module on the pilots' overhead panel, P5, put the pack control switches in the OFF position.

S 018-145

(3) Remove the applicable ceiling, sidewall, or floor panels to gain access to the damaged air conditioning duct.

S 018-146
(4) If insulation is installed on the duct joint, remove the insulation.

S 348-147
(5) Do these steps to prepare the damaged area of the duct.
(a) Cut away the inner lining that has peeled away from the foam. Do not damage the polyurethane foam.
(b) Examine the polyurethane foam for damage. If the polyurethane foam is damaged, then do the Duct Section Replacement - Polyurethane Foam Duct procedure below.

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(c) Use the solvent and a wiping cloth to clean the damaged area.
(d) Sand the duct joint area to remove any remaining adhesive and contamination.
(e) Use the solvent and a wiping cloth to clean the damaged area.

S 348-148
(6) Prepare the fiberglass cloth.
(a) Cut two pieces of the fiberglass cloth 1/2 inch larger on all sides than the damaged area.
(b) Round the corners of the fiberglass cloth pieces.

S 348-149
(7) Prepare the resin.

E. Repair the Inner Lining

S 348-150
(1) Apply a thin, smooth layer of the applicable resin to the damaged area of the duct.

NOTE: Make sure the area of the resin is larger than the size and shape of the fiberglass cloth.

S 348-151
(2) Put a piece of the fiberglass cloth on the resin so that it extends beyond the damaged area a minimum of 1/2 inch on all sides.

S 348-152
(3) Soak the fiberglass cloth with the applicable resin.

S 348-153
(4) Put a piece of plastic sheet on the fiberglass cloth and press lightly with a squeegee or with your hand. Make the fiberglass cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-154
(5) Remove the plastic sheet from the fiberglass cloth and remove unwanted resin with a wiping cloth.

S 348-155
(6) Follow the same procedure to apply the second piece of fiberglass cloth.

S 348-156
(7) Let the resin cure for 24 hours at room temperature.

S 348-157

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(8) Remove unwanted resin from the edges of the repaired area with a wiping cloth soaked with solvent.

F. Put the Airplane Back to Its Usual Condition

S 418-158
(1) Use the applicable procedure to return the duct to its usual condition.

S 418-159
(2) Replace the panels or other airplane structure removed to gain access to the duct.

TASK 21-23-01-308-160

10. Duct Section Replacement - Polyurethane Foam Duct (Fig. 802)

A. General

(1) This procedure gives instructions to replace a section of polyurethane foam air conditioning duct.

(2) If time or materials are not available to do this procedure, use the procedure to repair a taped duct joint to make a temporary repair. If a temporary repair is made, do this procedure as soon as possible to make a permanent repair.

B. Consumable Materials

(1) G00031 Cloth - Glass, Finished, For Resin Laminates minimum 0.007-inch thick, SAE-AMS-C-9084 (Supercedes MIL-C-9084)

(2) Polyurethane foam duct (to match duct)

(3) G50305 Sheeting - Plastic - polyethylene or vinyl, commercially available

(4) Resin - Fiberglass (two part resin system, resin and hardener)

(a) G50400 Resin - Fiberglass, BMS 8-201 Type IV (Supercedes BMS 8-201 Type II)

(b) G50399 Resin - Fiberglass, BMS 8-201 Type III (Supersedes BMS 8-201 Type I)

(c) G02137 Resin - Polyester, Hetron 92 (alternate)

NOTE: For the repair of fiberglass ducts only.

(5) Solvent

(a) B01027 Solvent - Butyl carbitol (alternative to B01011, Series 91 solvent)

(b) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)

(6) G00034 Cotton Wiper - BMS 15-5, Process Cleaning Absorbent Wiper (Cheesecloth, Gauze)

(7) Squeegee - commercially available

C. References

(1) AMM 36-00-00/201, Pneumatic - General

D. Prepare for the Repair

S 868-161

(1) Release the pressure from the pneumatic system (AMM 36-00-00/201).

NOTE: This will make sure that there is no airflow in the ducts when you do the repair.

S 868-162

(2) On the bleed air control module on the pilots' overhead panel, P5, put the pack control switches in the OFF position.

S 018-163
(3) Remove the applicable ceiling, sidewall, or floor panels to gain access to the damaged air conditioning duct.

S 018-164
(4) If insulation is installed on the duct joint, remove the insulation.

S 348-165
(5) Cut and remove the damaged section of polyurethane foam air conditioning duct. Cut the duct so the edges are straight and perpendicular to the circumference of the duct.

S 348-166
(6) Do these steps to prepare the damaged area of the duct.

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(a) Use the solvent and a wiping cloth to clean the damaged area.
(b) Sand the damaged area to remove any remaining adhesive and contamination.
(c) Use the solvent and a wiping cloth to clean the damaged area.

S 348-167
(7) Prepare a piece of polyurethane foam duct that matches the damaged duct and is the correct length to replace the damaged section of the duct.

NOTE: Cut the replacement section with clearance for the material that will be added by the duct end repair procedure.

S 348-168
(8) Do the Duct End Repair - Polyurethane Foam Duct procedure above for each end of the replacement duct section and for each end of the damaged duct.

S 348-169
(9) Cut two pieces of the fiberglass cloth 3 inches wide and long enough to wind around the duct a minimum of four times.

S 348-170

(10) Prepare the resin.

E. Repair the Taped Joint

S 348-171

(1) Apply resin to the duct ends. Let the resin partially dry until it is sticky. Press the duct ends together by aligning the installation checkmarks.

S 348-172

(2) Apply the applicable resin to the joint area a minimum of 2 inches on both sides of the joint.

S 348-173

(3) Apply the applicable resin to one side of the two pieces of the fiberglass cloth.

S 348-174

(4) Wind one piece of the fiberglass cloth around each duct joint a minimum of four times.

NOTE: Make sure the resin on the fiberglass cloth is in contact with the duct.

S 348-175

(5) Put a piece of plastic sheet on the joint and press it lightly with a squeegee or with your hand. Make the fiberglass cloth smooth from the center to the edges of the cloth to remove any bubbles or any wrinkles and to remove unwanted resin.

S 348-176

(6) Let the resin cure for 24 hours at room temperature.

S 348-177

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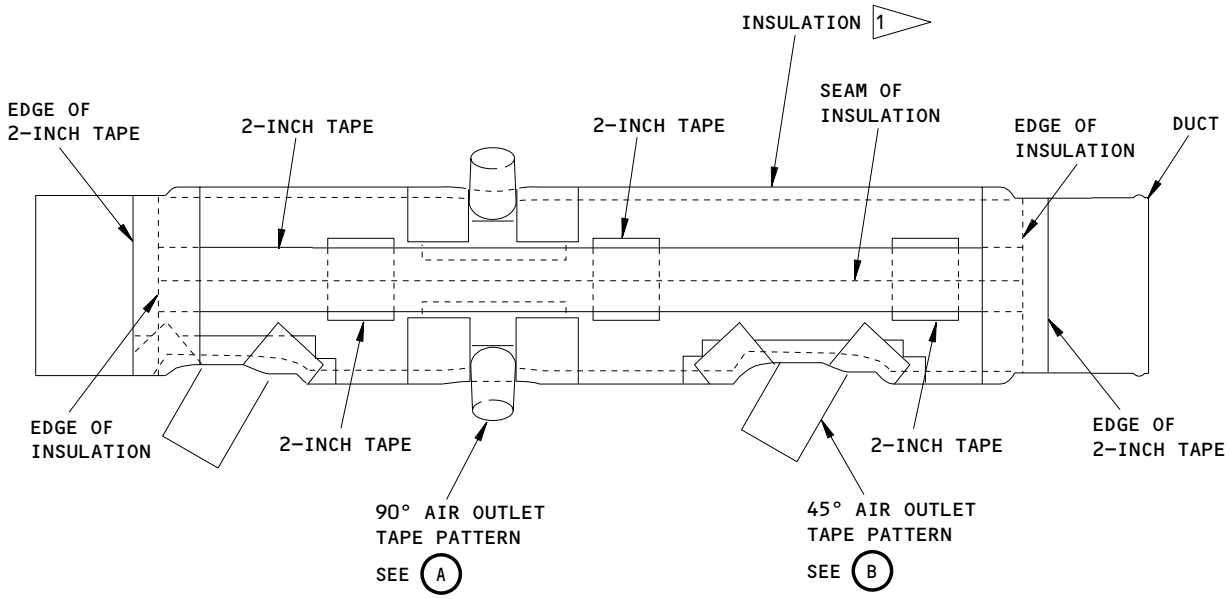
(7) Clean any unwanted resin from the joint areas with a wiping cloth and solvent.

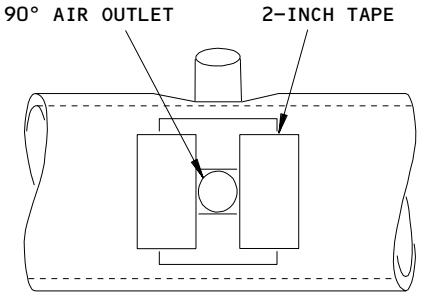
F. Put the Airplane Back to Its Usual Condition

S 418-178
(1) If insulation was removed from the duct, install new insulation.

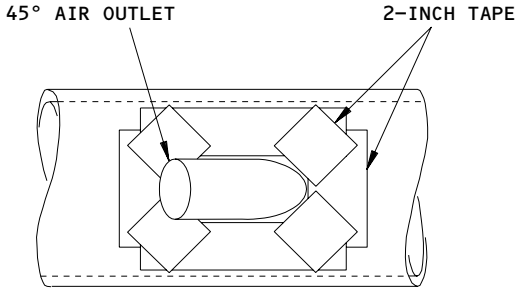
S 418-179
(2) Replace the panels or other airplane structure removed to gain access to the duct joint.



FOAM INSULATED DUCT
(EXAMPLE)



90° AIR OUTLET TAPE PATTERN
A



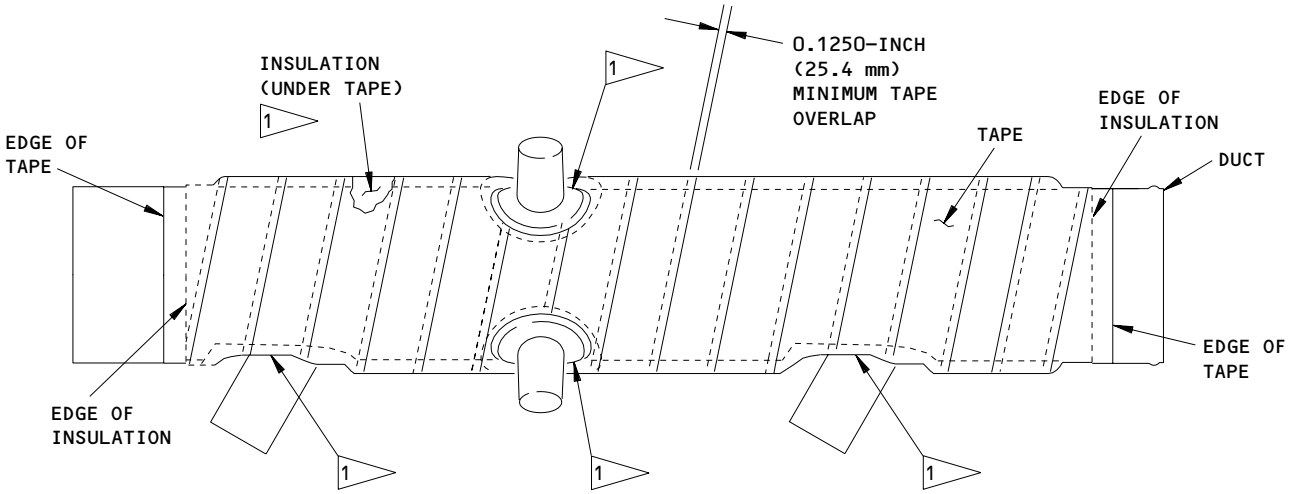
45° AIR OUTLET TAPE PATTERN
B

1 FOR INSULATION DAMAGE APPLY A MINIMUM 2-INCH X 2-INCH PATCH OF PRESSURE SENSITIVE ADHESIVE TAPE TO THE DAMAGED AREA. MAKE SURE YOU HAVE FULL COVERAGE OF THE DAMAGED OR TORN AREA WITH NO LESS THAN 1/2-INCH OVERLAP.

Foam Insulated Duct Repair
Figure 803

EFFECTIVITY
DUCTS INSULATED WITH MELAMINE FOAM;
DUCTS INSULATED WITH POLYIMIDE FOAM

L22485



REWORK POLYIMIDE FOAM INSULATED DUCT
(EXAMPLE)

NOTE:
- 2-INCH WIDE, 3-INCH WIDE OR 12-INCH WIDE TAPE (BMS 5-157 TYPE I, CLASS 1, GRADE B) MUST COVER 100% OF THE BROWN HYPALON INSULATION SURFACE.
- TAPE MAY BE INSTALLED SPIRAL WRAPPED AS SHOWN OR LENGTHWISE DOWN THE DUCT DEPENDING ON THE INSTALLERS PREFERENCE.
- SHOWN PATTERN IS FOR REFERENCE ONLY. TAPE MAY BE APPLIED IN ANY CONFIGURATION AS LONG AS COMPLETE BMS 8-300 COVERAGE IS OBTAINED.
- WIDER TAPE MAY BE CUT INTO NARROWER STRIPS OR ANY UNIQUE SHAPE IF DESIRED TO ASSIST IN OBTAINING COMPLETE BMS 8-300 COVERAGE.
- MAINTAIN MINIMUN 0.1250-INCH OVERLAP OF TAPE.
- AVOID COMPRESSION OF BMS 8-300 INSULATION.
- WRINKLES IN TAPE ARE ACCEPTABLE IF PINCHED TOGETHER AND CONTAIN NO VOIDS.
- COVERING OF EXISTING BMS 5-157 TAPE IS NOT REQUIRED.
- TAPE MAY BE APPLIED TO THE BLANKET PRIOR TO THE BLANKET INSTALLATION ON THE DUCT IF DESIRED BY THE INSTALLER.
- FOR BLANKETS INSTALLED ON DUCT JOINTS, TAPE MAY BE APPLIED TO THE BLANKET BEFORE OR AFTER THE BLANKET IS INSTALLED OVER THE DUCT JOINT. TAPE ORIENTATION IS OPTIONAL.

1 COVER ALL EXPOSED INSULATION (BMS 8-300 TYPE II, GRADE 5) WITH TAPE (BMS 5-157 TYPE I, CLASS 1, GRADE B). CUT TAPE AS REQUIRED TO FIT AROUND AIR OUTLETS, BRANCHES AND INSULATION VENT HOLES.

Rework Polyimide Foam Insulated Duct Repair
Figure 804

J75475

TASK 21-23-01-308-180

11. Foam Insulation Duct Repairs (Fig. 803, 804)

A. General

(1) This procedure has instructions to repair those air conditioning ducts insulated with either 'Melamine' foam or 'Polyimide' foam which is wrapped around the duct and secured with adhesive tape.

(2) Melamine foam insulation (BMS 8-385, Type IV, Grade 1) has a non-reinforced polyvinyl fluoride (PVF) 'Tedlar' film that is bonded to one side of the foam insulation and has a silver-gray color appearance.

(3) Polyimide foam insulation (BMS 8-300, Type II, Grade 5) has a reinforced elastomer 'Hypalon' film that is bonded to one side of the foam insulation and has a brown color appearance.

(4) Service Letter 757-SL-25-089-A discusses the new flammability requirement for thermal/acoustic insulation materials used on air distribution ducts. CFR 14 Part 121.312(e)(1) mandates that when thermal/acoustic insulation is installed in the fuselage as a 'replacement' after September 2,2005, the new insulation must meet the flame propagation test requirements of CFR 14 Part 25.856(a) if it is installed around air ducting.

(a) Polyimide foam insulation failed the flame propagation testing. Therefore, any replacement Polyimide foam insulation installed after September 2,2005, must be reworked to have 100% of the brown 'Hypalon' film covered with adhesive tape (BMS 5-157, Type I, Class 1, Grade B, Form 1, Composition MPVF) in order to comply with the flame propagation test requirements.

(b) Melamine foam insulation complies with the flame propagation test requirements and is the preferred foam insulation material for replacement.

(5) Existing insulation material can be removed and re-installed if it is not damaged. Replacement insulation material must meet the flame propagration test requirement.

(6) When insulation material is removed and re-installed, any existing tape that does not meet the flame propagation test requirement must be removed or completely covered with tape that does meet the requirement.

(7) The use of BMS 8-39 polyurethane foam insulation for repairs is 'not' permitted due to the degradation in flammability properties over time.

(8) This procedure has these repair instructions:

(a) Rework ducts insulated with polyimide foam (BMS 8-300, Type II)

(b) Replacement of Tape (Repair Method 1)

(c) Repair of cuts or tears in foam insulation (Repair Method 2)

(d) Replacement of foam insulation (Repair Method 3)

B. Consumable Materials
(1) Foam - Insulation
(a) G02470 Foam - Flexible Polyimide, BMS 8-300, Type II, Grade 5
(b) G50449 Foam - Flexible Melamine, BMS 8-385, Type IV, Grade 1
(2) Solvent
(a) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)
(3) Tape - Insulation
(a) G50327 Tape - Advanced Insulation Blanket, 2-inch, 3-inch, or 12-inch wide (BMS5-157, Type I, Class 1, Grade B, Form 1, Composition MPVF) (AMM 20-30-07/201)
1) E and H 743-MT
E and H Laminating, 138 Grand Street,
Paterson, NJ 07501

2) SF65003100
Bekaert Speciality Films LLC, 4540 Viewridge Ave.,
San Diego, CA 92123

3) Orcotape OT-157
Orcon Corporation, 1570 Atlantic Street,
Union City, CA 94587

(4) Wiping cloth, lint free - commercially available
C. Access
(1) Location Zones
200 Upper Half of Fuselage

D. Rework Ducts Insulated with Polyimide Foam (Fig. 804)

S 428-181
(1) Install new insulation tape (BMS 5-157, Type I, Class 1, Grade B, Form 1, Composition MPVF) to completely cover all exposed surfaces of the Polyimide foam insulation.
(a) 2-inch wide, 3-inch wide, or 12-inch wide insulation tape must cover 100% of the brown colored 'Hypalon' insulation surface.
(b) Cut the tape as required to fit around air outlets, branches and insulation vent holes.
(c) Tape may be installed spiral wrapped as shown or lengthwise down the duct depending on installers preference.
(d) Tape may be installed in any configuration as long as 100% complete coverage of the foam insulation is obtained.
(e) Wider tape may be cut into narrower strips or any unique shape if desired, to assist with complete foam insulation coverage.
(f) Maintain a minimum 1/8-inch (0.125O) overlap of tape.
(g) Avoid compression of the foam insulation.
(h) Wrinkles in the tape are acceptable if pinched together and contain no voids.

(i) Covering of existing insulation tape (BMS 5-157) is not required.
(j) Tape may be installed to the foam insulation prior to installation on the duct if desired by the installer.
(k) For foam insulation installed on ducts joints, tape may be applied to the foam insulation before or after the foam insulation is installed over the duct joint.
(l) Tape orientation is optional.

E. Tape Replacement (Repair Method 1)

S 028-182
(1) Remove the duct if needed for better access.

S 028-183
(2) Remove all loose or old tape from the insulation.

S 168-184

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(3) Use the solvent and a wiping cloth to clean the surface of the insulation where new adhesive tape will be installed.

S 428-185
(4) Install new insulation tape to hold the foam insulation to the duct as shown in Figure 803.
(a) Make sure the insulation tape overlaps all the edges and seams of the foam insulation by a minimum of 1-inch.

S 428-186
(5) Do the procedure above to rework the ducts insulated with the polyimide foam insulation.

S 428-187
(6) Re-install the duct (if removed).

F. Cuts or Tears in Foam Insulation (Repair Method 2)

S 028-188
(1) Remove the duct if needed for better access.

S 168-189

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(2) Use the solvent and a wiping cloth to clean the surface of the insulation around the damaged area.

S 428-190

(3) Apply a minimum 2-inch wide patch of insulation tape to completely cover the damaged area on the foam insulation, or replace the foam insulation.

(a) Make sure to apply a large enough patch to assure full coverage of the damaged area with a minimum 1/2-inch overlap.

S 428-191

(4) Do the procedure above to rework the ducts insulated with the polyimide foam insulation.

S 428-192

(5) Re-install the duct (if removed).

G. Foam Insulation Replacement (Repair Method 3)

S 028-193

(1) Remove the duct to permit removal of the insulation.

S 028-194

(2) Remove all tape and existing insulation from the duct.

S 428-195

(3) Install a new section of foam insulation around the duct:

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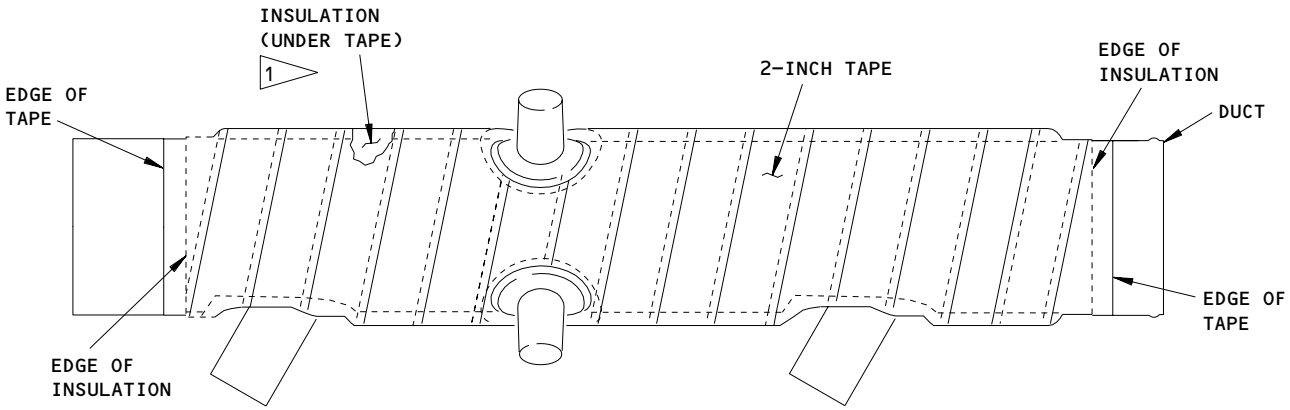
(a) Use the solvent and a wiping cloth to clean the outer surface of the insulation.

(b) Wrap the insulation around the duct.
(c) Install strips of 2-inch wide insulation tape to the edges and seams of the foam insulation as shown in Figure 803 to hold it to the duct.
(d) Make sure the insulation tape overlaps all the edges and seams of the foam insulation by a minimum of 1-inch.

S 428-196
(4) Do the procedure above to rework the ducts insulated with the polyimide foam insulation.

S 428-197
(5) Re-install the duct.



FIBERGLASS INSULATED DUCT
(EXAMPLE)

1 COVER ALL EXPOSED INSULATION WITH CARGO LINER JOINT SEALER TAPE. CUT TAPE AS REQUIRED TO FIT AROUND AIR OUTLETS.

Fiberglass Insulated Duct Repair
Figure 805

TASK 21-23-01-308-198

12. Fiberglass Insulated Duct Repair (Fig. 805)

A. General

(1) This procedure has instructions to repair those air conditioning ducts insulated with Fiberglass insulation (BMS 8-48) and a flame-resistant covering (BMS 8-142) which have been overwrapped with cargo liner joint sealing tape (BMS 5-146).

(2) This procedure has these repair instructions:

(a) Replacement of loose or old tape (Repair Method 1)

(b) Repair of cuts or tears in the flame-resistant covering and Fiberglass insulation (Repair Method 2)

(c) Replacement of the Fiberglass insulation (Repair Method 3)

B. Consumable Materials

(1) Solvent

(a) B01011 Solvent - Series 91, commercially available (AMM 20-30-91/201)

(2) Tape - Cargo Liner Joint Sealing

(a) G02361 Tape - Cargo Liner (BMS 5-146, Type 1, Class 1, Grade A)

(3) Wiping cloth, lint free - commercially available

C. Access

(1) Location Zones

200 Upper Half of Fuselage

D. Tape Replacement (Repair Method 1)

S 028-199

(1) Remove the duct if needed for better access.

S 028-200

(2) Remove all loose or old cargo liner joint sealing tape from the insulation/covering.

S 168-201

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(3) Use the solvent and a wiping cloth to clean the surface of the insulation/covering where new tape will be installed.

S 428-202

(4) Install new cargo liner joint sealing tape (BMS 5-146) to completely cover all of the insulation/covering as shown in Figure 804.
   (a) Use a continuous strip of tape to wrap around the insulation/covering and the duct.
   (b) Make sure the new tape overlaps the edges of the adjacent tape by a minimum of 1/8-inch.
   (c) Make sure the new tape overlaps onto the ends of the duct by a minimum of 1-inch.

S 428-203

(5) Re-install the duct (if removed).

E. Cuts or Tears in Fiberglass Insulation/Covering (Repair Method 2)

S 028-204

(1) Remove the duct if needed for better access.

S 168-205

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(2) Use the solvent and a wiping cloth to clean the surface of the insulation/covering around the damaged area.

S 428-206

(3) Apply a minimum 2-inch wide patch of cargo liner joint sealing tape (BMS 5-146) to completely cover the damaged area on the insulation/covering.
   (a) Make sure to apply a large enough patch to assure full coverage of the damaged area with a minimum 2-inch overlap.

S 428-207

(4) Re-install the duct (if removed).

F. Fiberglass Insulation Replacement (Repair Method 3)

S 028-208

(1) Remove the fiberglass insulation from the duct.

S 428-209

(2) Do the instructions in AMM TASK 21-23-01-308-180 to install new foam insulation (Repair Method 3) around the duct.

AIR CONDITIONING SYSTEM OUTLETS - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the air conditioning outlets, which are in the sidewall of the passenger compartment.

TASK 21-23-02-004-051

2. Remove the Sidewall Outlet (Fig. 401, 401A)
   A. References
      (1) AMM 24-22-00/201, Control (Supply Power)
      (2) AMM 25-28-02/401, Overhead Stowage Bin

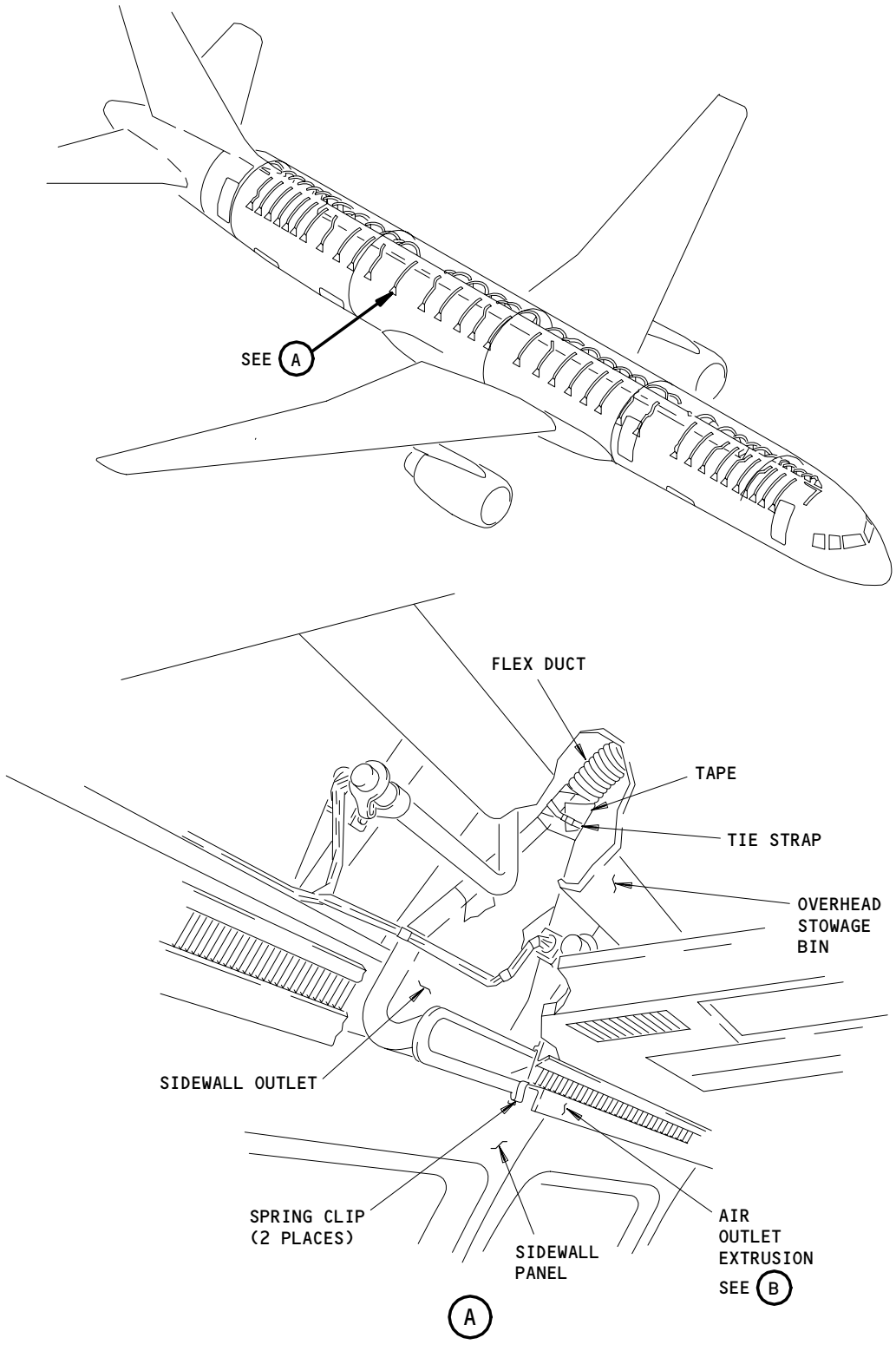
   B. Access
      (1) Location Zones
          221/222 Passenger cabin - section 41
          231/232 Passenger cabin - section 43
          241/242 Passenger cabin - section 44
          251/252 Passenger cabin - section 46
   C. Prepare for the Removal

      S 864-006
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-007
      (2) Push the L and R RECIRC FAN switch-lights, on the pilots overhead P5 panel, to the off position.
          (a) Make sure the INOP lights come on.
          (b) Put a DO-NOT-OPERATE tag on the switch-lights.

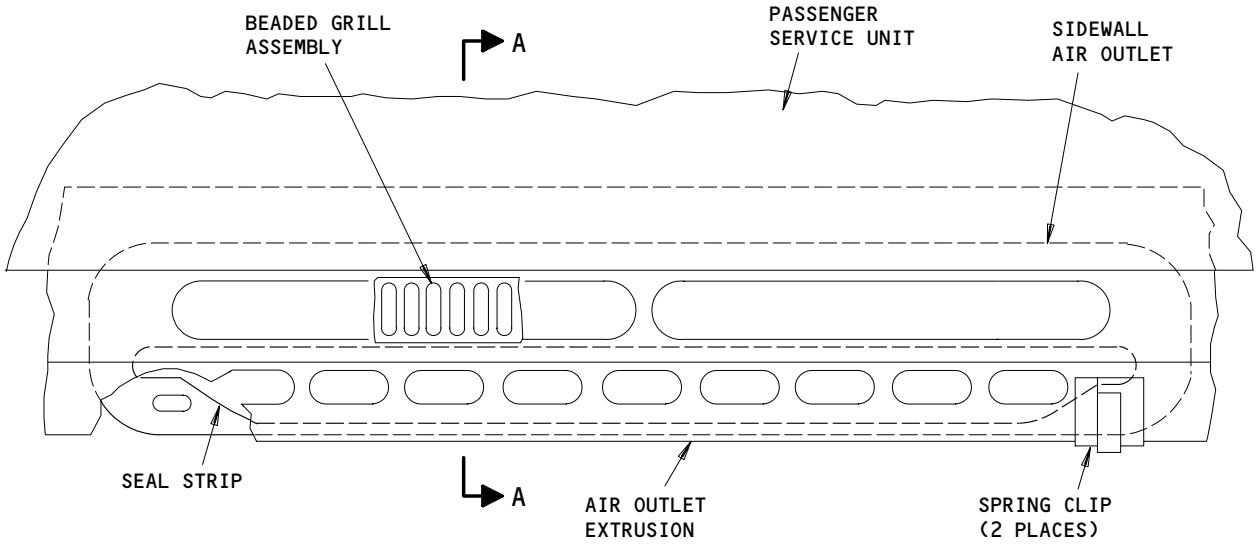
      S 864-008
      (3) Turn the L and R PACK selectors, on the P5 panel, to the OFF position.
          (a) Make sure the PACK OFF lights come on.
          (b) Put a DO-NOT-OPERATE tag on the selectors.

      S 014-009
      (4) Remove the applicable overhead stowage bin (AMM 25-28-02/401).



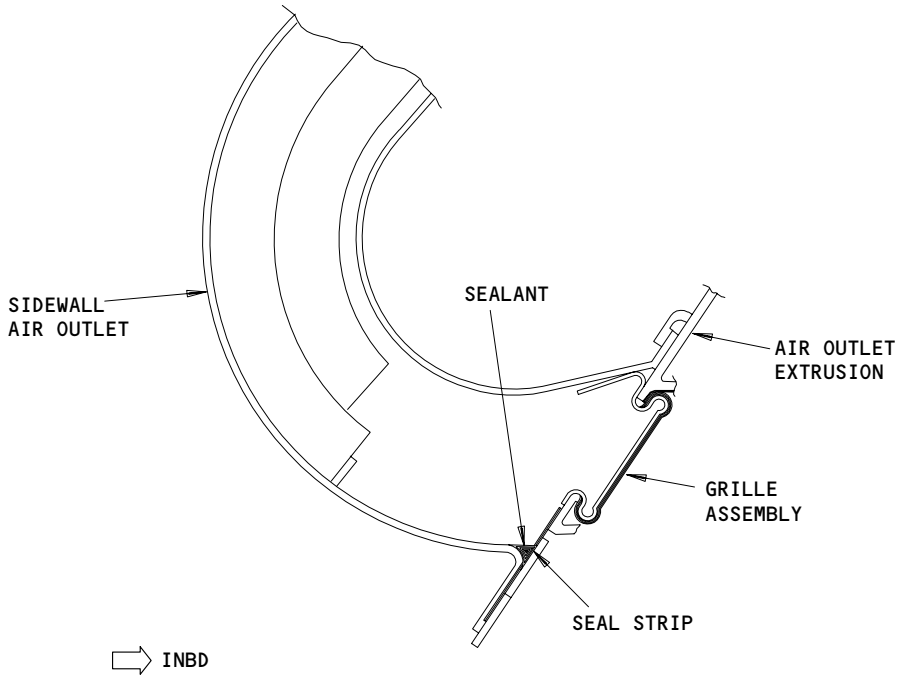
Air Conditioning System Outlets
Figure 401 (Sheet 1)

79568



AIR OUTLET
(VIEW LOOKING OUTBOARD)

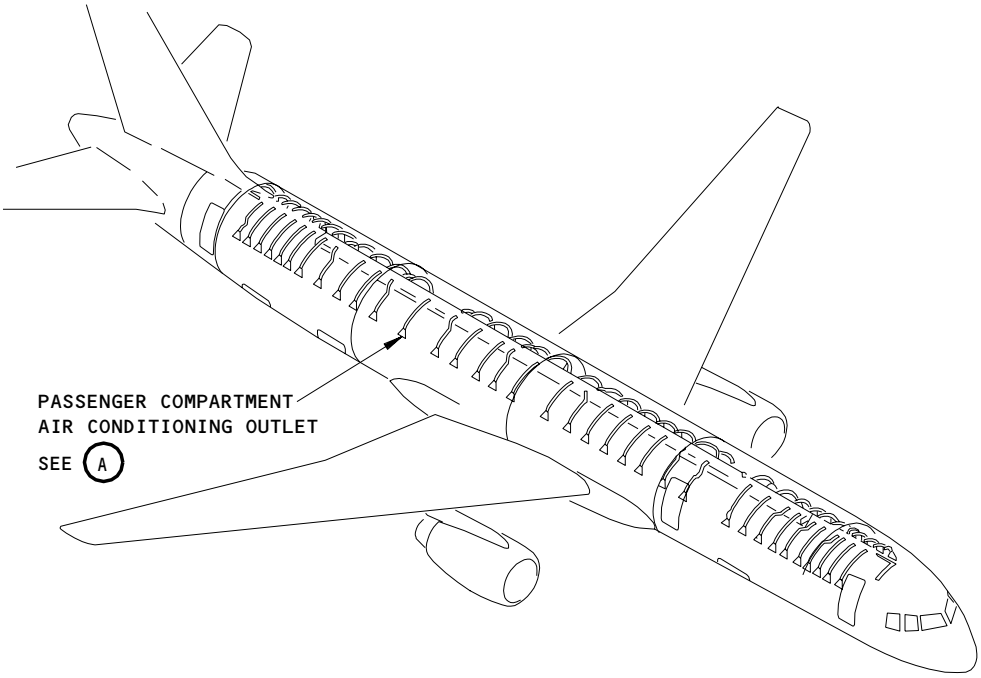
B

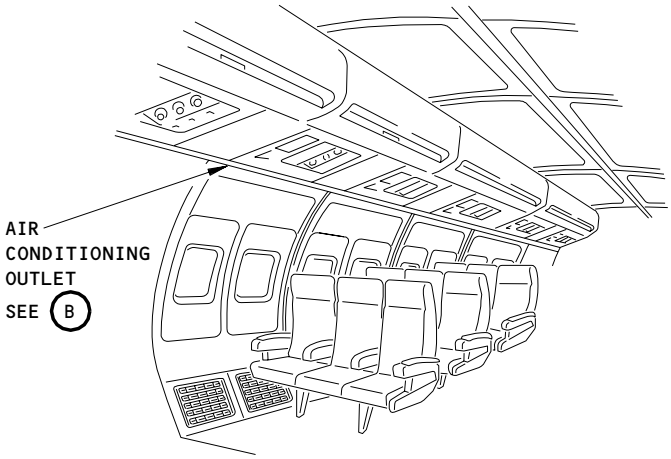


A–A

Air Conditioning System Outlets
Figure 401 (Sheet 2)

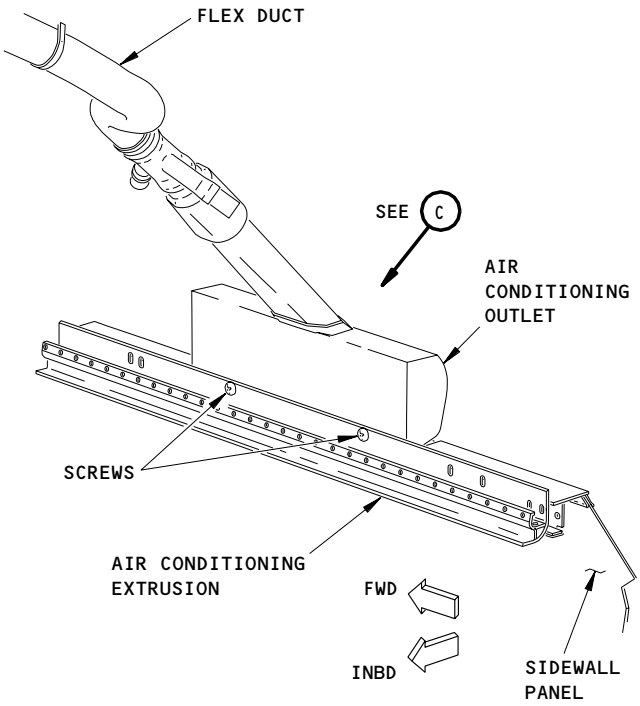
178526



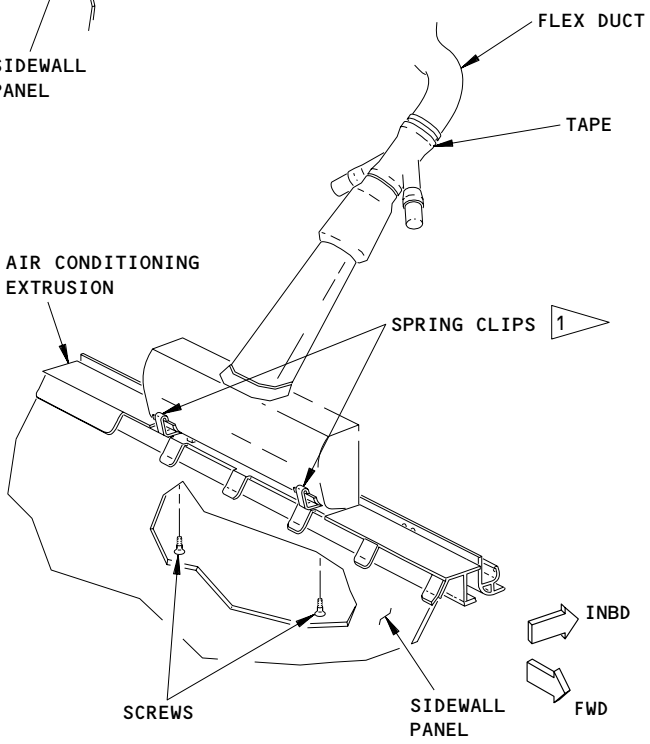


PASSENGER COMPARTMENT
AIR CONDITIONING OUTLET
(EXAMPLE)
A

Air Conditioning System Outlets
Figure 401A (Sheet 1)



AIR CONDITIONING OUTLET
(EXAMPLE)
B



AIR CONDITIONING OUTLET
(EXAMPLE)
C

1 INSTALLED ON SOME AIRPLANES

Air Conditioning System Outlets
Figure 401A (Sheet 2)

H63398

D. GUI 001-011;
Remove the Outlet

S 034-010
(1) Pull the grill assembly off of the air outlet extrusion.

S 034-011
(2) Remove the spring clips, which hold the lower end of the outlet to the air outlet extrusion.

S 034-012
(3) Remove the strap from the top end of the outlet.

S 034-013
(4) Remove the tape, which holds the top end of the outlet to the flex duct.

S 024-014
(5) Lower the outlet below the air outlet extrusion.

S 024-039
(6) Remove the outlet.

E. GUI 115-199;
Remove the Outlet

S 024-041
(1) Remove the tape from the joint between the outlet and the flex duct.

S 024-032
(2) If not already done, remove the tape that attaches the gasper hose, if installed, to the air outlet.

S 024-036
(3) Remove the two screws from the front of the outlet.

S 024-040
(4) Remove the two screws at the bottom rear of the outlet.

S 024-028
(5) Remove the air outlet from the air conditioning extrusion.

TASK 21-23-02-404-053

3. Install the Sidewall Outlet (Fig. 401, 401A)

A. Consumable Materials
(1) A00922 - Sealant - RTV133
(2) B00316 - Solvent - Aliphatic Naphtha, TT-N-95
(3) G00093 - Tape, G-565

B. References
(1) AMM 24-22-00/201, Control (Supply Power)
(2) AMM 25-28-02/401, Overhead Stowage Bin
(3) AMM 51-31-01/201, Seals and Sealing

C. Access
(1) Location Zones
221/222 Passenger cabin - section 41
231/232 Passenger cabin - section 43
241/242 Passenger cabin - section 44
251/252 Passenger cabin - section 46

D. GUI 001-011;
Install the Outlet

S 844-015
(1) Use a file to remove any burrs from the edges of the outlet.

S 424-016
(2) Put the outlet below the air outlet extrusion and lift it into position.

S 434-017
(3) Install the spring clips which hold the lower end of the outlet to the air outlet extrusion.

S 434-018
(4) Pull the flex duct on to the outlet, so it overlaps the outlet by 0.5 to 1 inch (13-25 mm).

S 164-019
(5) Use the solvent to clean the surfaces of the flex duct and the outlet which will have the tape on them.

S 434-020
(6) Install 2 layers of the tape to the center of the joint.
(a) Make sure the tape is smooth and tight.

S 434-021
(7) Install the strap on the top end of the outlet.

S 434-023
(8) Do the steps that follow:
(a) Put the seal strip through the opening in the air outlet extrusion and then between the sidewall outlet and the air outlet extrusion.
1) Make sure the seal strip is flat against the air outlet extrusion.
2) Make sure the top edge of the seal strip is approximately 0.1 inches (2 mm) below the opening of the air outlet extrusion.
3) Make sure the lower edge of the seal strip is above the spring clips.
4) If it is necessary, cut off the unwanted parts of the seal strip.
(b) Apply a continuous bead of the sealant to the joint between the sidewall outlet and the seal strip (AMM 51-31-01/201).

S 434-019
(9) Install the grill assembly.

E. GUI 115-199;
Install the Outlet

S 424-042
(1) Put the outlet into the air conditioning extrusion.

S 424-043
(2) Install the two screws at the front of the outlet and the two screws at the bottom rear of the outlet.

S 434-044
(3) Pull the flex duct onto the outlet, so it overlaps the outlet by 0.5 to 1 inch (13-25 mm).

S 164-045
(4) Use the solvent to clean the surfaces of the flex duct and the outlet which will have the tape on them.

S 434-046
(5) Install two layers of the tape to the center of the joint.
(a) Make sure the tape is smooth and tight.

F. Put the airplane back to its usual condition

S 414-004
(1) Install the overhead stowage bin (AMM 25-28-02/401).

S 864-003
(2) Remove DO-NOT-OPERATE tags from the L and R PACK selectors, on the P5 panel.

S 864-002
(3) Remove DO-NOT-OPERATE tags from the L and R RECIRC FAN switch-lights, on the P5 panel.

S 864-001
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

OVERHEAD AIR DISTRIBUTION RESTRICTOR - REMOVAL/INSTALLATION

1. General
   A. Restrictor plates are installed along the entire overhead distribution duct, except near the riser ducts. Each restrictor plate is approximately 4 feet (1.2 meters) long. This procedure has instructions to remove and install the restrictor plates.

TASK 21-23-03-004-011

2. Remove the Overhead Air Distribution Restrictor (Fig. 401)
   A. References
      (1) 25-22-01/401, Sculptured Ceiling Panels
   B. Access
      (1) Location Zones
          223/224 Area above passenger cabin ceiling - section 41
          233/234 Area above passenger cabin ceiling - section 43
          243/234 Area above passenger cabin ceiling - section 44
          253/254 Area above passenger cabin ceiling - section 46
   C. Remove the restrictor plate

      S 024-021
      (1) Remove the applicable sculptured ceiling panel (AMM 25-22-01/401).

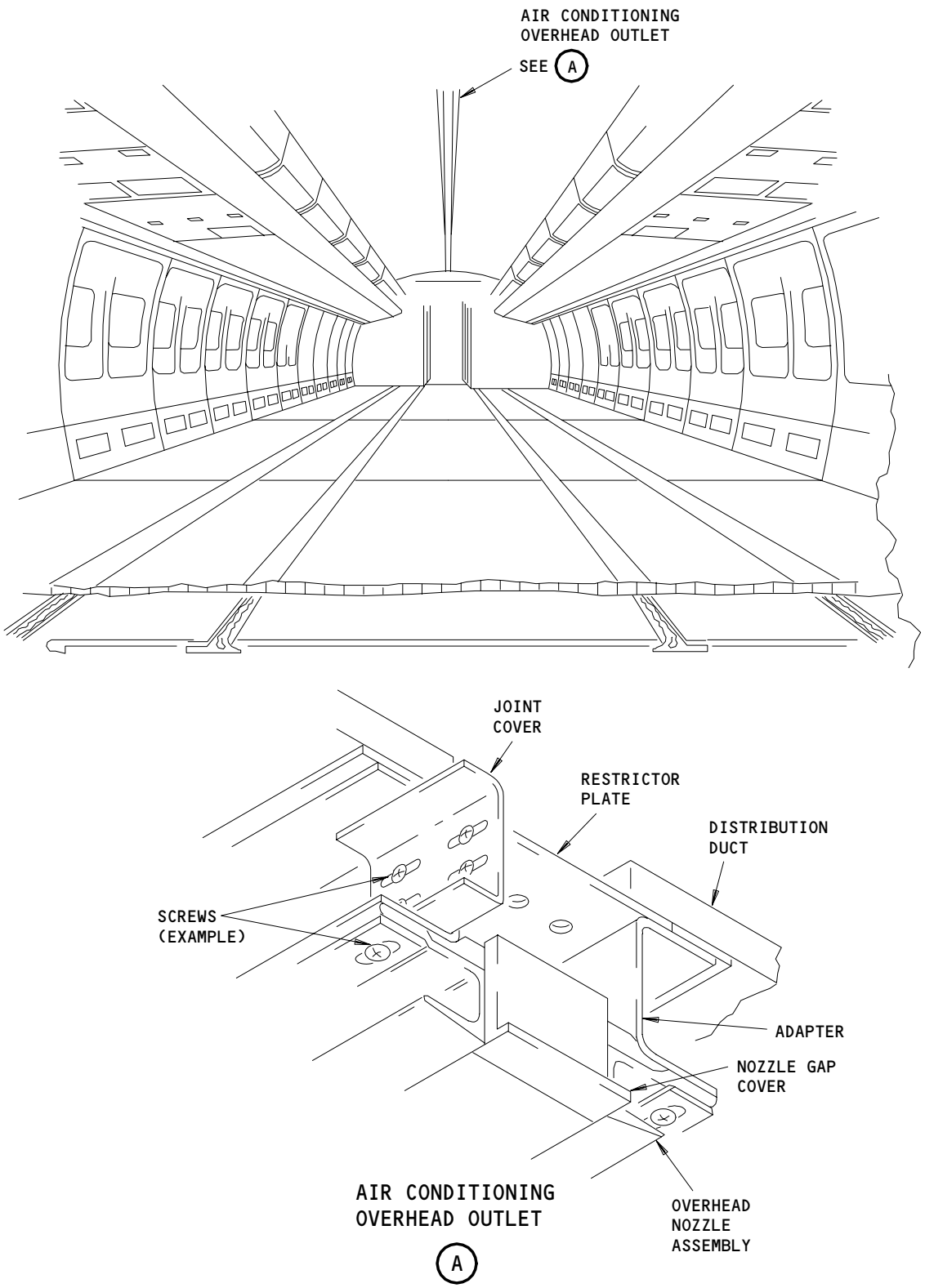
      S 034-005
      (2) Remove the applicable overhead nozzle assembly.
          (a) Remove the screws that hold the overhead nozzle assembly to the adapter.
          (b) Remove the nozzle gap cover on each end of the overhead nozzle assembly.

      S 024-022
      (3) Remove the applicable adapter.
          (a) Remove the screws that hold the joint cover to the adapter.
          (b) Remove the joint cover.
          (c) Remove the seal from the joint cover.
          (d) Remove the screws that hold the adapter to the overhead distribution duct.
          (e) Pull the adapter away from the overhead distribution duct.

      S 024-006
      (4) Remove the applicable restrictor plate.

TASK 21-23-03-404-015

3. Install the Overhead Air Distribution Restrictor (Fig. 401)
   A. Consumable Materials
      (1) B00369 - Solvent - Methyl Ethyl Ketone (MEK)
      (2) A00027 - Adhesive - BAC5010, Type 60
      (3) A00923 - Adhesive - BAC5010, Type 77 (Optional to Type 60)
      (4) G00004 - Tape - 3/4-inch wide, double back, (Optional to Type 60 adhesive)



Air Conditioning Restrictor Installation
Figure 401

B. References
(1) 25-22-01/401, Sculptured Ceiling Panels
C. Access
(1) Location Zones
223/224 Area above passenger cabin ceiling - section 41
233/234 Area above passenger cabin ceiling - section 43
243/234 Area above passenger cabin ceiling - section 44
253/254 Area above passenger cabin ceiling - section 46
D. Install the restrictor plate

S 114-017

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(1) Use isopropyl alcohol or ethyl alcohol to clean the mating surfaces of the overhead distribution duct and the adapter.

S 114-018
(2) Use isopropyl alcohol or ethyl alcohol to clean the surfaces of the joint cover.

S 424-008
(3) Put the restrictor plate in its position immediately below the overhead air distribution duct.
(a) If it is necessary, trim the restrictor plate to make sure there is not a gap at the ends of the restrictor plate.

S 434-009
(4) Put the adapter in its position immediately below the restrictor plate.
(a) Install the screws to hold the adapter to the overhead distribtion duct.
(b) Put the adhesive side of the seal against the joint cover.
(c) Put the joint cover in its position against the adapter.
(d) Install the screws to hold the joint cover to the adapter.

S 434-016
(5) Install the overhead nozzle assembly.
(a) Put the nozzle assembly in its position immediately below the adapter.
(b) Install the screws to hold the nozzle assembly to the adapter.

S 394-019

(6) Apply the adhesive or the tape along the entire edge of the adapter and the overhead distribution duct.

S 114-020

(7) Apply the adhesive over all the gaps and voids to make sure ther are no leaks in the adapter.

S 414-012

(8) Install the sculptured ceiling panel (AMM 25-22-01/401).

RETURN AIR GRILLS - MAINTENANCE PRACTICES

1. General
   A. This procedure has instructions to do the tasks that follow:
      (1) Remove the Return Air Grills
      (2) Install the Return Air Grills
      (3) Clean the Return Air Grills

TASK 21-23-05-002-001

2. Remove the Return Air Grills (Fig. 201)
   A. References
      (1) AMM 25-25-01/201, Passenger Seats
   B. Access
      (1) Location Zones

221/222	Passenger cabin - section 41
231/232	Passenger cabin - section 43
241/242	Passenger cabin - section 44
251/252	Passenger cabin - section 46

   C. Remove the Return Air Grills

S 012-002

      (1) If necessary, remove the passenger seats (AMM 25-25-01/201) to get access to the grills.

S 032-027

      (2) Do the steps that follow:
         (a) Remove the carpet riser that has the return air grill.
            1) Push the carpet riser up into the sidewall clip until the bottom carpet riser clip is above the crease beam.
            2) Pull the bottom of the carpet riser inboard over the crease beam.
            3) Pull the carpet riser down until it comes out of the sidewall clip.
         (b) Remove the screws in back of the carpet riser.

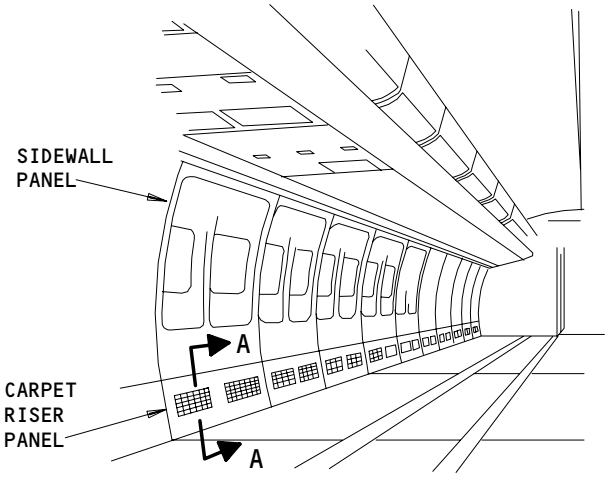
S 022-028

      (3) Remove the return air grill.

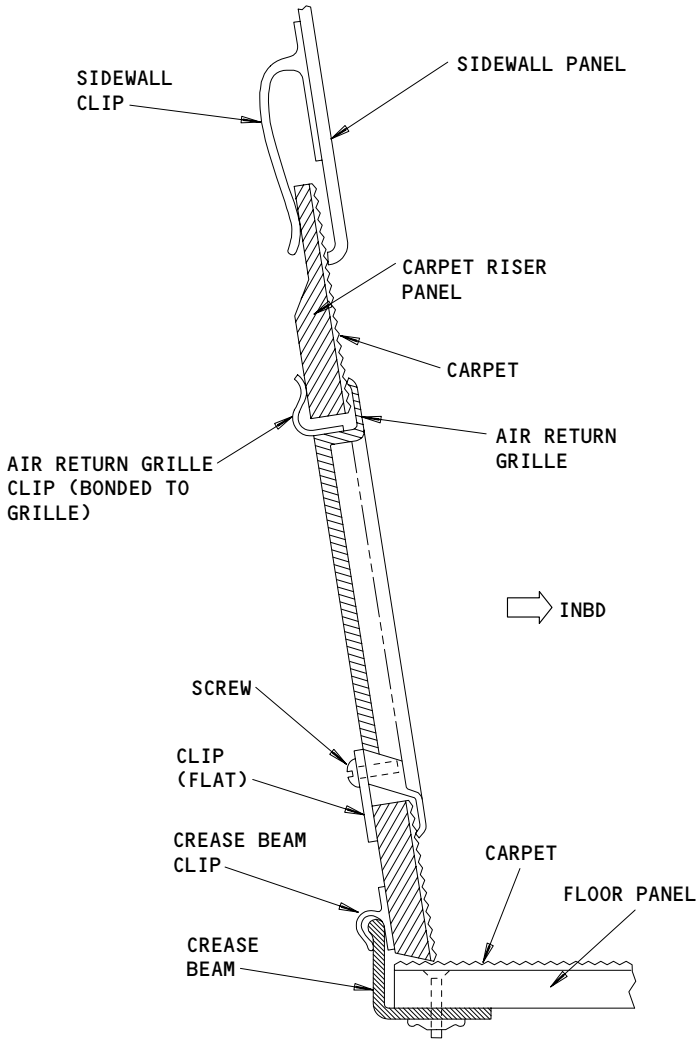
TASK 21-23-05-102-127

3. Clean the Return Air Grills (Fig. 201)
   A. Equipment
      (1) Vacuum Cleaner - commercially available
   B. Access
      (1) Location Zones

221/222	Passenger cabin - section 41
231/232	Passenger cabin - section 43
241/242	Passenger cabin - section 44
251/252	Passenger cabin - section 46



PASSENGER COMPT



CARPET RISER PANEL AND AIR GRILLE
A-A

Return Air Grilles Installation
Figure 201

C. Clean the return air grills.

S 022-128
(1) Remove the return air grill.

S 162-129
(2) Use the vacuum cleaner to remove the dust, lint, and other unwanted material from the grill.

S 162-130
(3) Use the vacuum cleaner to remove the dust, lint, or unwanted material from the airplane structure behind the return air grill.

S 422-131
(4) Install the return air grill.

TASK 21-23-05-402-030

4. Install the Return Air Grills (Fig. 201)

A. References
(1) AMM 25-25-01/201, Passenger Seats

B. Access
(1) Location Zones
221/222 Passenger cabin - section 41
231/232 Passenger cabin - section 43
241/242 Passenger cabin - section 44
251/252 Passenger cabin - section 46

C. Install the Return Air Grills

S 422-051
(1) Do the steps that follow:
(a) Install the return air grill into the carpet riser.
1) Attach the clip, on the top of the return air grill, onto the carpet riser.
2) Install two clips and screws into the back of the carpet riser, on the bottom of the grill.
(b) Install the carpet riser.
1) Push the top of the the carpet riser into the sidewall clip as far as possible.
2) Push the bottom of the carpet riser outboard, against the sidewall frame.
3) Push the carpet riser down, so that the carpet riser clip attaches to the crease beam.

S 412-052
(2) If applicable, install the passenger seats (AMM 25-25-01/201).

SIDEWALL RISER DUCT - REMOVAL/INSTALLATION

1. General
   A. Four riser ducts, two on each side of the airplane, are installed in the sidewalls of the passenger compartment. The forward riser ducts are between the fifth and sixth windows aft of the No. 2 passenger door. The aft riser ducts are between the sixth and seventh windows aft of the No. 2 passenger door.
   B. This procedure has instruction to remove and install the sidewall riser ducts.

TASK 21-23-06-004-001

2. Remove the Sidewall Riser Duct (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry, Service, Cargo, and Access Doors and Panels
      (2) AMM 21-23-02/401, Air Conditioning System Outlets
      (3) AMM 25-21-02/401, Sidewall Lining
      (4) AMM 25-25-01/201, Passenger Seats
      (5) AMM 25-28-02/401, Overhead Stowage Bin
   B. Access
      (1) Location Zones
          233/234 Passenger cabin - section 43
          243/244 Passenger cabin - section 44
   C. Prepare for the Removal

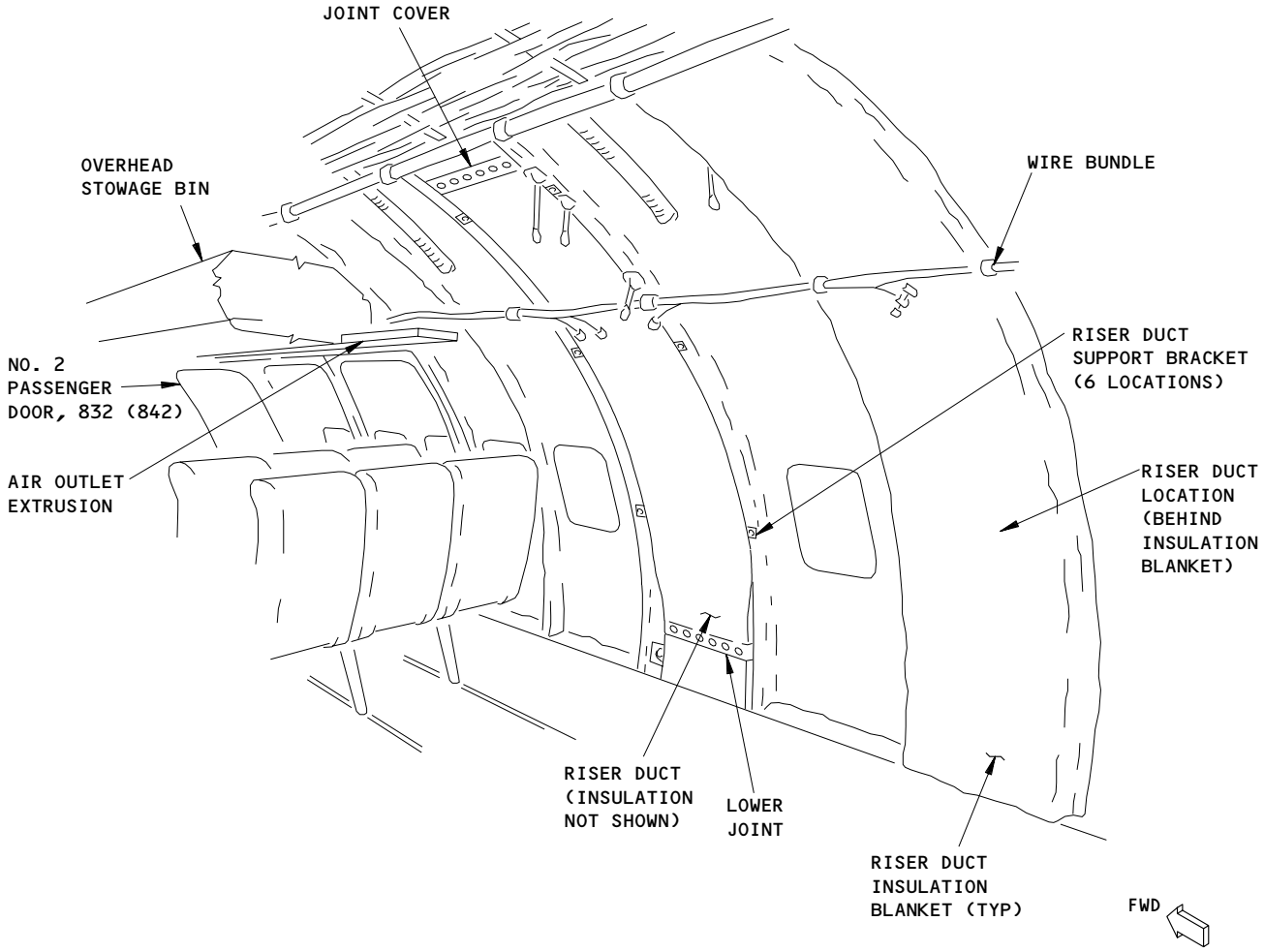
S 014-002
      (1) Remove the passenger seats (AMM 25-25-01/201) between the fourth and twelfth windows aft of the No. 2 passenger door, 832 or 842 (AMM 06-46-00/201).

S 014-003
      (2) Remove the sidewall linings (AMM 25-21-02/401) between the fourth and twelfth windows aft of the No. 2 passenger door, 832 or 842 (AMM 06-46-00/201).

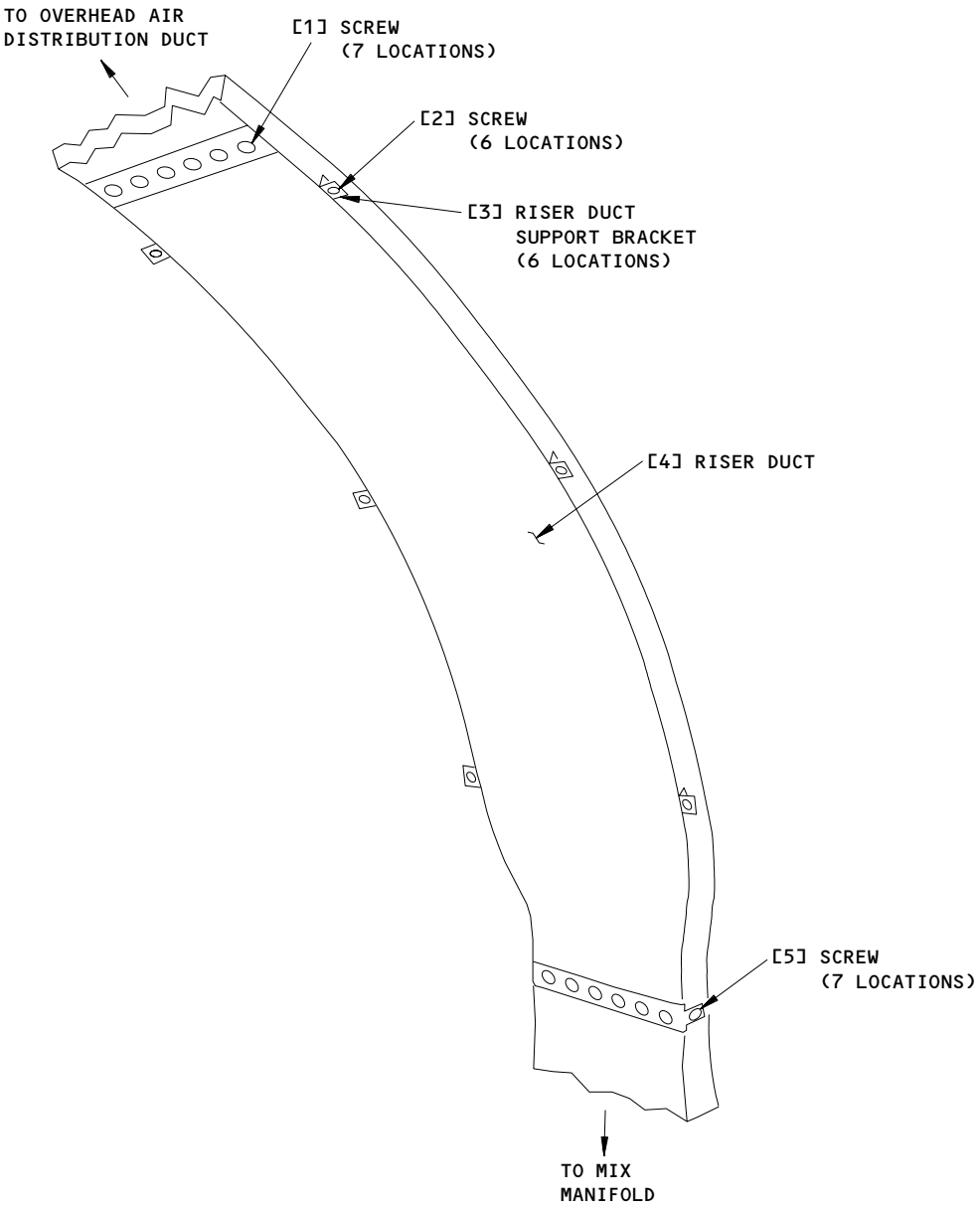
S 014-005
      (3) Remove the overhead stowage bins that are necessary to get access to the riser duct (AMM 25-28-02/401).

S 014-006
      (4) Remove the support clips for the wire bundles that are attached to the support brackets on the riser ducts.

S 014-007
      (5) Remove the outlets that are necessary to get access to the riser duct (AMM 21-23-02/401).



Air Conditioning Sidewall Riser Duct Installation
Figure 401 (Sheet 1)



Air Conditioning Sidewall Riser Duct Installation
Figure 401 (Sheet 2)

S 014-008
(6) Remove the section of the air outlet extrusion that is necessary to get access to the riser duct.
(a) Remove the bolts, washers, and nuts at the joints of the air outlet extrusion.
(b) Remove the screws that hold the air outlet extrusion in position.
(c) Remove the air outlet extrusion.

S 014-009
(7) Loosen the retainers that hold the insulation blanket around the riser duct.

S 014-010
(8) Remove the insulation.

D. Remove the Riser Duct

S 034-011
(1) Remove the screws from the lower joint of the riser duct, which is immediately above the floor.

S 034-012
(2) Remove the screws from the top joint of the riser duct, which is immediately below the control cables.
(a) Do not remove the cover, which is attached to the riser duct.

S 034-013
(3) Remove the screws that hold the riser duct to the support brackets.

S 034-014
(4) Disconnect the riser duct at the top and lower duct joints.
(a) Break the adhesive seals at the joints.
(b) Lift the riser duct to loosen the lower joint.
(c) Pull the lower part of the riser duct inboard and lower it near to the duct below it.
(d) Move the cover of the joint off of the overhead duct.

S 024-015
(5) Lift the riser duct up and out of the sidewall.

S 434-017
(6) Put a cover on the duct openings.

TASK 21-23-06-404-016

3. Install the Sidewall Riser Duct (Fig. 401)

A. Consumable Materials
(1) B00148 Solvent - Methyl Ethyl Ketone (MEK), TT-M-261
(2) A00027 - Adhesive - BAC 5010

B. References
(1) AMM 20-30-91/201, Airplane Structure Cleaning Solvents (Series 91)

(2) AMM 21-23-02/401, Air Conditioning System Outlets
(3) AMM 24-22-00/201, Control (Supply Power)
(4) AMM 25-21-02/401, Sidewall Lining
(5) AMM 25-25-01/201, Passenger Seats
(6) AMM 25-28-02/401, Overhead Stowage Bin

C. Access

(1) Location Zones

233/234 Passenger cabin - section 43
243/244 Passenger cabin - section 44

D. Install the Riser Duct

S 034-018

(1) Remove the covers from the duct openings.

S 424-019

(2) Put the riser duct into the sidewall, outboard of the wire bundles.

S 434-020

(3) Connect the riser duct, at the top and lower duct joints, to the adjacent ducts.

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(a) Use solvent, Series 91 (AMM 20-30-91/201) to clean the mating surfaces of the top and lower duct joints.
(b) Apply the adhesive to the mating surface of the lower joint.
(c) Put the riser duct into position above the lower joint.
(d) Move the cover for the top joint on to the overhead duct.
(e) Install the screws for the lower joint.
(f) Apply a continuous bead of the adhesive to the edge of the cover of the top joint.
(g) Install the screws for the cover of the top joint.

S 034-021

(4) Install the screws that hold the riser duct to the support brackets.

S 864-022

(5) Let the adhesive cure for at least 24 hours at 65 to 100°F (18-38°C) and a minimum of 20 percent relative humidity.

E. Do the Riser Duct Installation Test

S 864-023

(1) Supply electrical power (AMM 24-22-00/201).

S 864-024

(2) Push the L and R RECIRC FAN switch-lights, on the P5 panel, to the on position.
(a) Make sure the ON lights come on and the INOP lights go off.

S 214-026
(3) Feel for air leaks at the duct joints.
(a) Small leaks are permitted.
(b) You must repair the large leaks.

F. Put the airplane back to its usual condition.

S 414-027
(1) Install the insulation along the riser duct.

S 414-028
(2) Install the section of the air outlet extrusion that was removed (AMM 21-23-02/401).
(a) Put the section of the air outlet extrusion into position.
(b) Install the screws that hold the air outlet extrusion in position.
(c) Install the bolts, washers, and nuts at the joints of the air outlet extrusion.

S 414-029
(3) Install the support clips for the wire bundles to the support brackets.

S 414-030
(4) Install the sidewall lining (AMM 25-21-02/401).

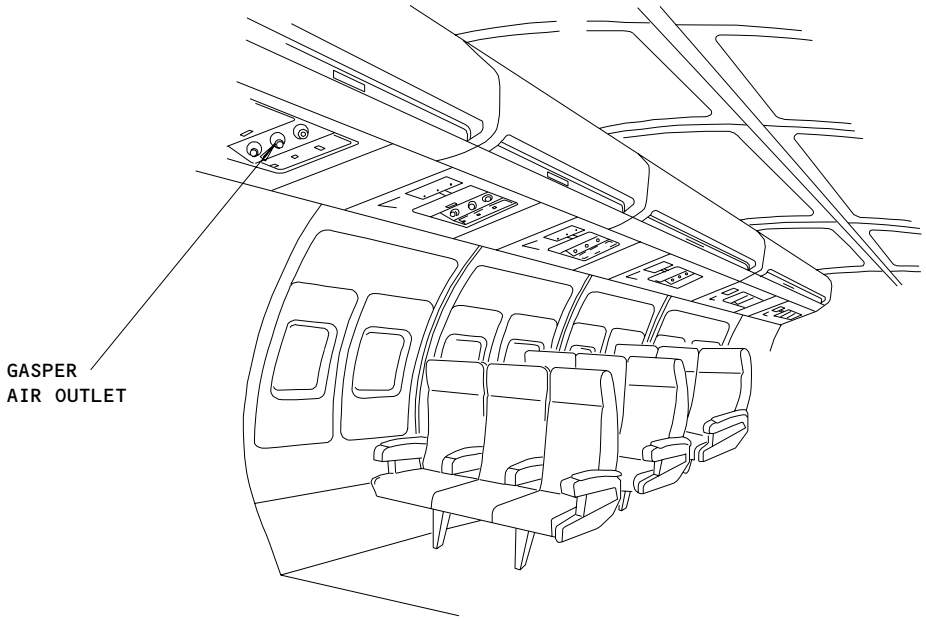
S 414-031
(5) Install the overhead stowage bins (AMM 25-28-02/401).

S 414-032
(6) Install the passenger seats (AMM 25-25-01/201).

S 864-033
(7) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

INDIVIDUAL (GASPER) AIR DISTRIBUTION SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The gasper air system provides conditioned air to a gasper outlet at each passenger and attendant's seat. The gasper ducting connects to the passenger and flight compartment conditioned air supply.
   B. Gasper air is fed from the sidewall distribution air ducts to individually controlled gasper air outlet valves mounted in all passenger, attendant, and lavatory service units. Branch fittings direct a portion of the sidewall distribution air through flexible hose to an air manifold mounted above the service unit. Gasper air outlets control the flow and direction of air.
2. Component Details
   A. Gasper Air Outlet Valve
      (1) The gasper air outlet valves mount in each PSU. The outlet valves may be adjusted manually to provide proper volume and airflow direction. Each outlet valve consists of a drilled ball within a socket and an adjustable valve to control airflow volume.

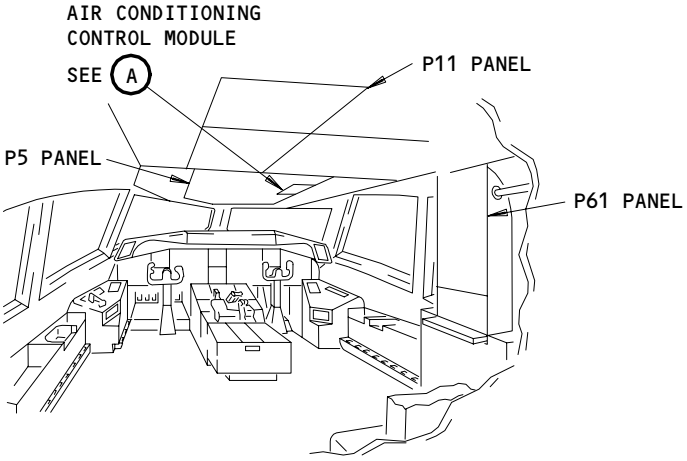


Individual (Gasper) Air Distribution System
Figure 1

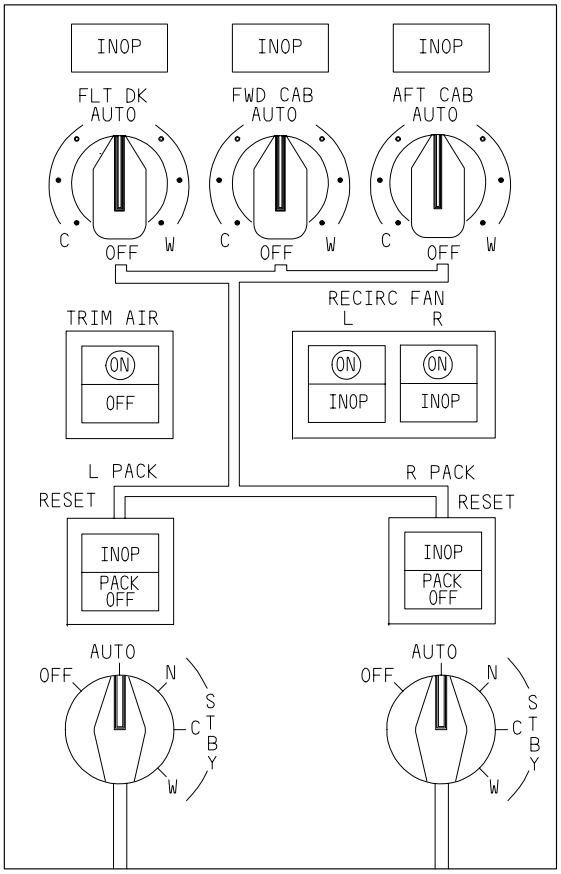
67117

RECIRCULATION SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The recirculation system consists of two separate systems. The left recirculation system provides draw-thru cooling for the forward exhaust Electrical/Electronic (E/E) equipment (AMM 21-58-00/001) cooling system. The right recirculation system provides recirculation of conditioned air for the passenger cabin.
   B. Recirculated air from both systems mixes with conditioned air from the cooling packs (AMM 21-51-00/001) in the mix manifold (AMM 21-21-00/001). The 50/50 mixture of fresh conditioned air and recirculated air is distributed through the passenger cabin. The use of recirculated air improves airflow without placing an undue load on the air supply source (AMM 36-10-00/001) or the cooling packs.
   C. Both recirculation systems contain a filter assembly, a recirculation check valve, a recirculation fan, and ducting.
   D. The right recirculation system draws air from the passenger cabin through the return air grilles, into the forward cargo compartment sidewalls. From there it is drawn into the filters and fan, to be blown through the check valves into the mix manifold.
   E. The left recirculation system provides draw-thru cooling of the main panels, overhead panels, weather radar, and the forward equipment. Air is drawn through the components and fan, to be blown through the check valve and filter, into the mix manifold.
2. Component Details
   A. Recirculation Air Fan
      (1) Physical Description
         (a) The right recirculation fan is a 14 pound, single stage vane-axial fan. It is located on the right side of the aft bulkhead in the forward cargo compartment. A twelve-bladed impeller is integrated into the motor by a common shaft. De-swirl vanes are attached to the fan case downstream of the impeller, and help cool the motor. The vanes channel the airflow into the ducting leading to the mix manifold.
         (b) The left recirculation fan is a 20 pound, single stage, mixed-flow fan, located in the left forward sidewall of the forward cargo compartment.
         (c) The left fan contains a de-swirl outlet assembly, an inlet assembly, a motor assembly, an end bell assembly, and an impeller. The twelve bladed impeller shares a common shaft with the motor. Airflow from the impeller cools the fan motor.
         (d) Both fans contain a thermal switch in the winding of each phase of the fan motors. The thermal switches provide overheat protection for the motors. Damage caused by foreign objects, reduced airflow, two-phasing, improper voltage, or bearing overheat causes the thermal switches to open when the fan reaches 350°F (177°C).
         (e) The recirculation fans both require 115v ac, 3 phase power, and are designed for continuous high speed operation.



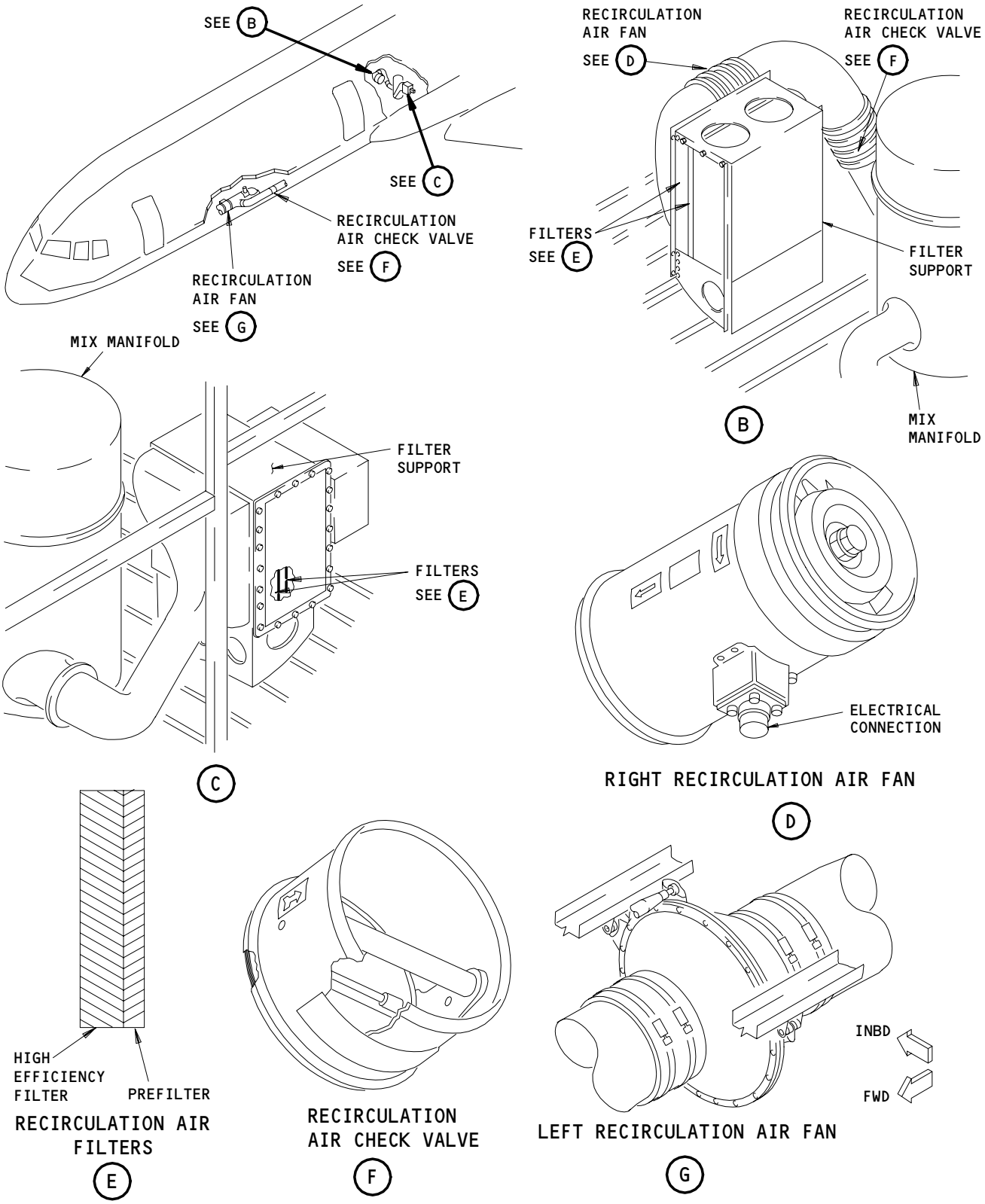
FLIGHT COMPT



AIR CONDITIONING CONTROL MODULE

A

Recirculation System
Figure 1 (Sheet 1)

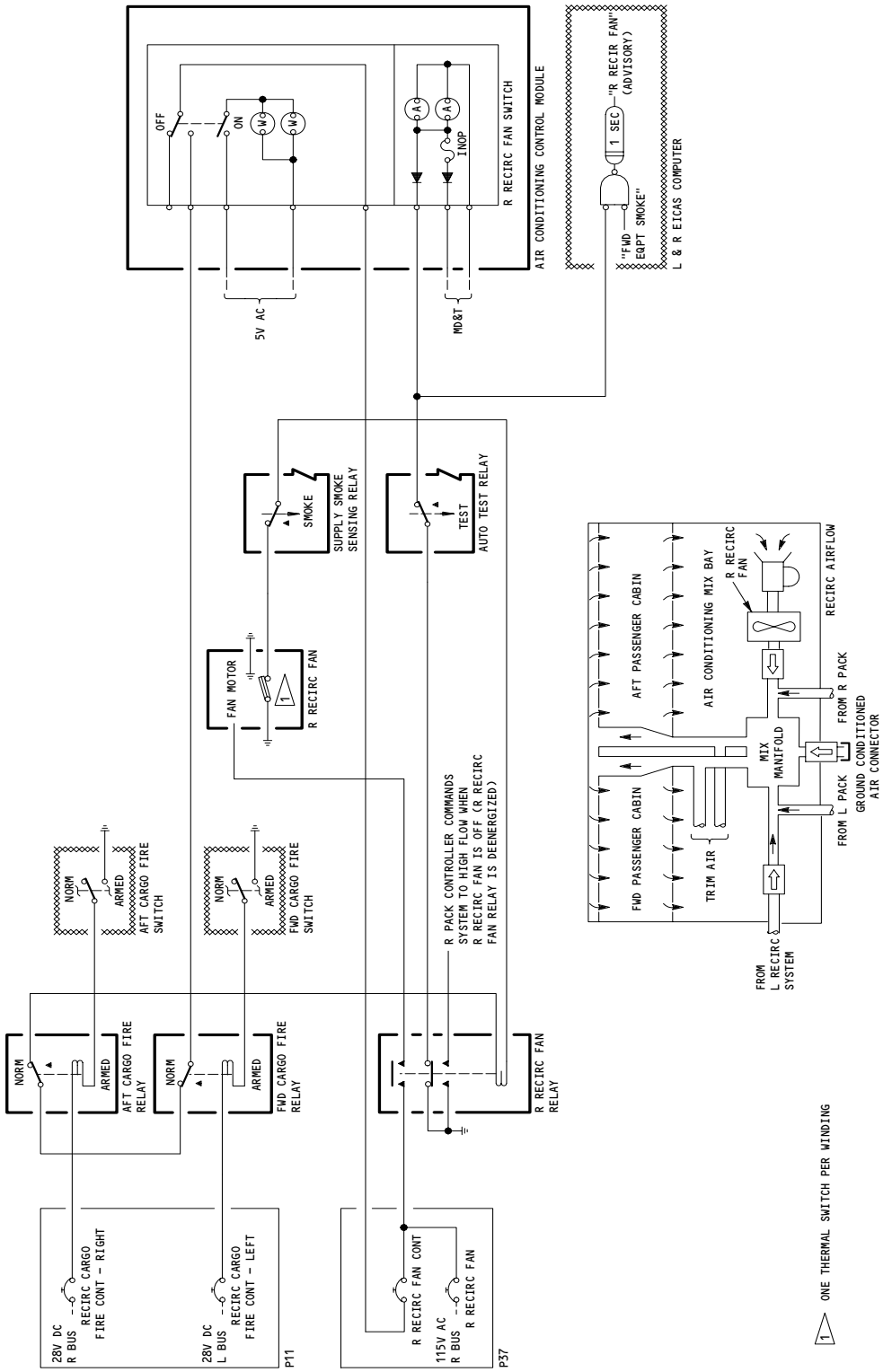


Recirculation System
Figure 1 (Sheet 2)

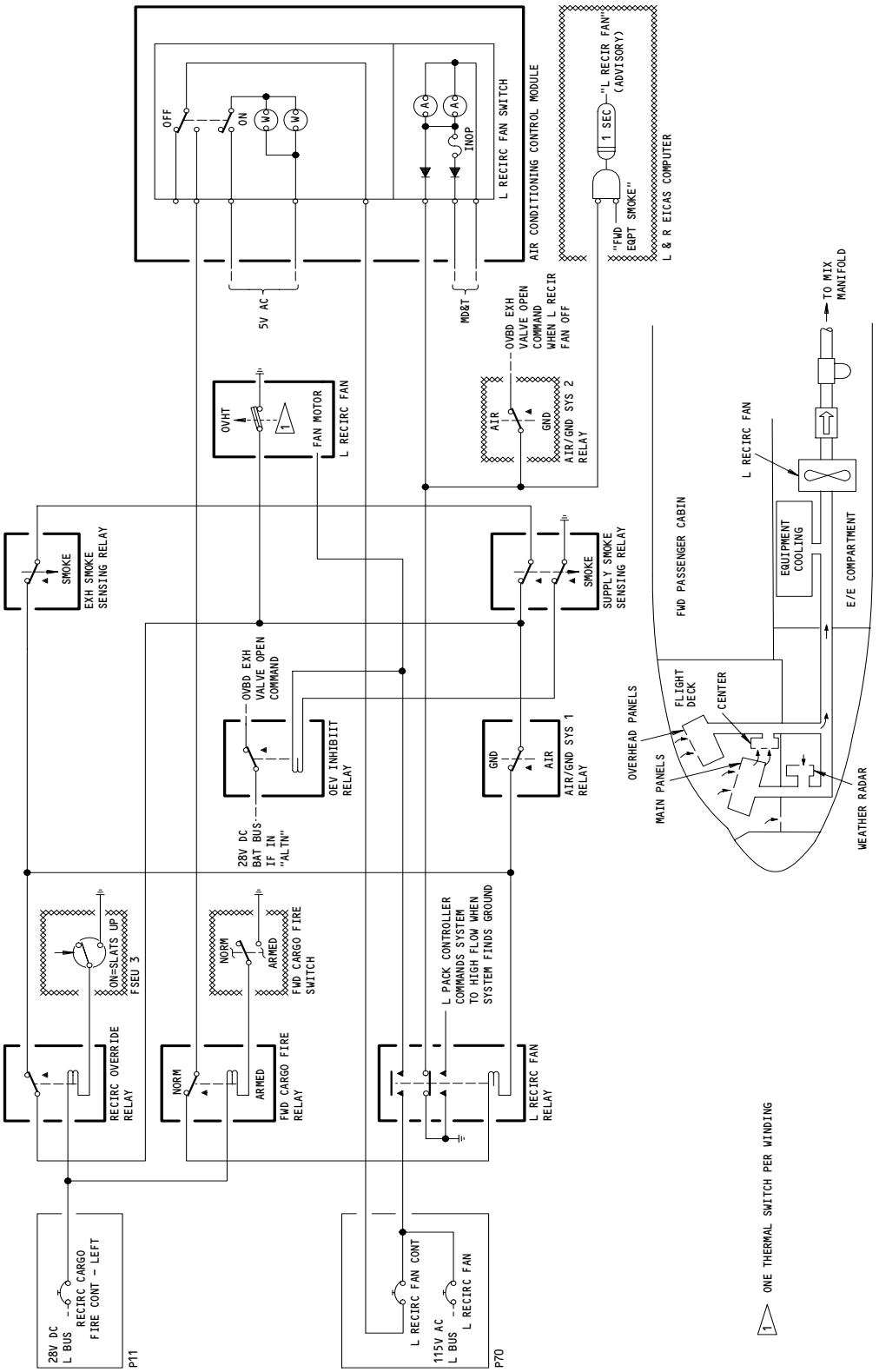
B. Recirculation Air Filters
(1) Physical Description
(a) A pre-filter and high efficiency particulate filter are both encased in an aluminum frame. The right recirculation filters mount to the right of the mix manifold at the rear of the forward cargo compartment, upstream of the fan. The left filter assembly mounts to the left and just upstream of the mix manifold.
1) Pre-filter
a) The pre-filter is a particulate filter. It contains an aluminum frame around a fiberglass pad. The 1.5 pound filter traps the largest of the contaminant particles. The pre-filter is rated at 1000 cpm airflow and has a minimum arrestance of 60%.
2) High Efficiency Particulate (HEP) Filter
a) The HEP filter is a glass filter with an aluminum frame. The 3 pound filter, rated at 1000 cpm airflow, has a minimum arrestance of 95% for smoke particles 0.3 microns or larger.

C. Recirculation Air Check Valve
(1) Physical Description
(a) A recirculation air check valve is located just downstream of each recirculation fan. The check valve is 7 inches in diameter and contains a seat/flapper assembly, centered and riveted into the check valve housing. The seat/flapper assembly contains two semi-circular flappers hinged about a central pin. A stop pin provides a limit to prevent over-travel of the flappers.
(2) Function
(a) Airflow, in the direction of the arrow on the valve housing, opens the flappers until they come in contact with the stop pin. Reverse airflow closes the check valve flappers against the seat. This action prevents air from passing back through the system, into the cargo compartment and forward equipment center.

3. Operation (Fig. 2 and 3)



Right Recirculation Fan Operation Schematic
Figure 2



Left Recirculation Fan Operation Schematic
Figure 3

A. Functional Description

(1) Right Recirculation Airflow

(a) Conditioned air from the passenger cabin is drawn through the return air grilles in the passenger cabin floor, into the sidewalls of the forward cargo compartment. The air is then drawn through the pre-filter and HEP filter. The filters clean the air of debris, smoke, and odors, before the air passes through the recirculation fan. The air is then blown through the right check valve and into the mix manifold.

(2) Left Recirculation Airflow

(a) Air is drawn from the flight deck, through the main panels, overhead panels, and the center aisle stand. This air is combined with air that is drawn through the weather radar and forward E/E racks. The air is then drawn through the left fan to be blown through the check valve and filter, into the mix manifold.

(3) In the mix manifold, air from the left and right recirculation systems is combined with fresh conditioned air from the cooling packs. This air is redistributed to the passenger cabin by way of overhead ducting.

B. Recirculation System Operation

(1) Right System

(a) The right recirculation fan runs when the Right Recirculation Fan Relay is energized. The relay is energized when the R RECIRC FAN switch/light is ON, the FWD and AFT CARGO FIRE switches are unarmed, the Forward Supply Smoke Relay is relaxed, and the Right Recirculation Fan Thermal Switches are closed. When these conditions are met, the fan relay energizes, providing 115v ac power through its contacts, to operate the right recirculation fan.

(b) When the right fan relay is relaxed, the right pack is commanded into high flow mode (AMM 21-51-00/001).

(2) Left System

(a) The left recirculation fan operates when the Left Recirculation Fan Relay is energized.

1) Left Recirculation Fan Operation on the Ground:

a) The fan relay is energized on the ground when the L RECIRC FAN switch/light is ON, the FWD CARGO FIRE switch is unarmed, and the Left Recirculation Fan Thermal Switches are closed.

2) Left Recirculation Fan Operation in the Air:

a) The fan relay is energized in the air when the L RECIRC FAN switch/light is ON, the FWD CARGO FIRE switch is unarmed, the slats are retracted, the Exhaust and Supply Smoke Sensing Relays are relaxed, no smoke is sensed in the forward supply equipment cooling system, and the Left Recirculation Fan Thermal Switches are closed.

b) If the slats are extended, the fan relay will be energized independent of the position of the exhaust and supply smoke sensing relays.

3) When the left fan relay is energized, 115v ac power is supplied for the operation of the left recirculation fan.
4) When the left recirculation fan relay is relaxed, the left pack is commanded into high flow mode (AMM 21-51-00/001). In addition, if the airplane is in the air, the overboard exhaust valve is commanded to SMOKE (AMM 21-58-00/001).

C. Control

(1) Two alternate action switch/lights, on the pilots' overhead P5 panel, control operation of the the recirculation air fans. A white ON light illuminates whenever the recirculation fan switch/light is selected ON, regardless of the operation of the fan. Depressing the switch/light again extinguishes the ON light.
(2) To operate the system:
(a) Provide electrical power (AMM 24-22-00/001).
(b) Check that L RECIRC FAN and R RECIRC FAN circuit breakers on overhead circuit breaker panel P11 are closed.
(c) Check that L RECIRC FAN and R RECIRC FAN circuit breakers on miscellaneous electrical equipment panels (P70 and P37) are closed.
(d) Press L RECIRC FAN and R RECIRC FAN switchlights to ON.
(3) Failure Indication:
(a) An amber INOP light illuminates and an EICAS advisory message L or R RECIR FAN appears for a faulty system as well as for the selection of the switch/light to the OFF position.

RECIRCULATION SYSTEM - ADJUSTMENT TEST

1. General
   A. This procedure has instructions to do the operational test of the recirculation system.

TASK 21-25-00-715-001

2. Recirculation System Operational Test (Fig. 501)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electric Power-Control
   B. Access
      (1) Location Zones
          121 Forward cargo compartment (Left)
          126 Area aft of forward cargo compartment (Right)
      (2) Access Panels
          193DL Conditioned Air Ground Service
   C. Prepare for the Test

      S 865-003
      (1) Supply electrical power (Ref 24-22-00).

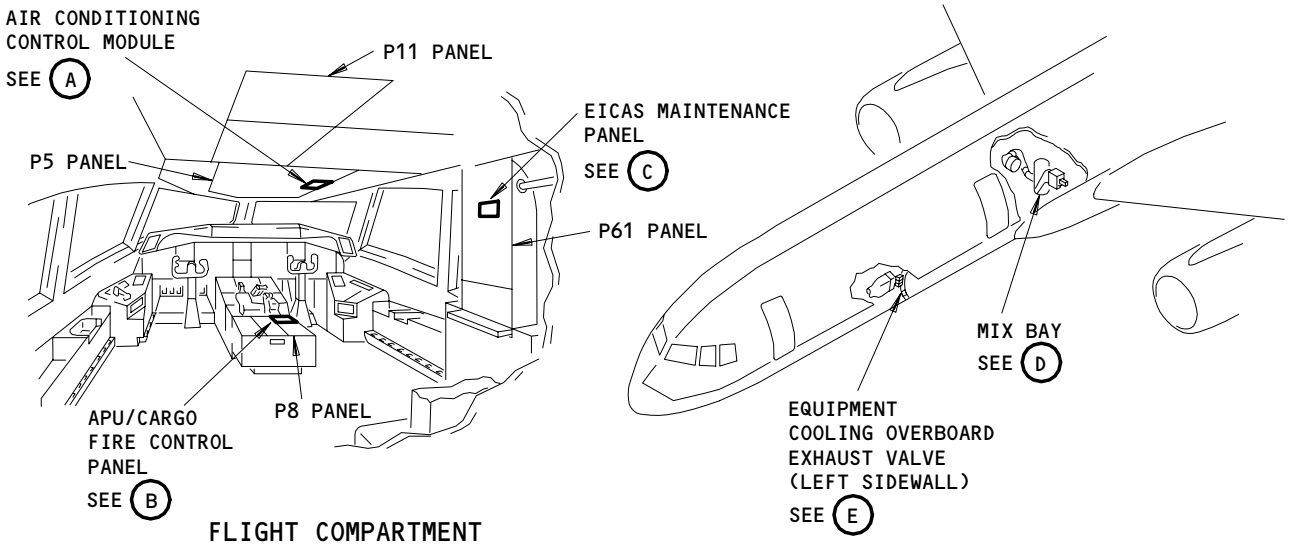
      S 865-002
      (2) Make sure these circuit breakers, on the pilot's overhead circuit breaker panel, P11, are closed:
          (a) EICAS circuit breakers (6 locations)
          (b) 11P14, RECIRC CARGO FIRE CONT LEFT
          (c) 11P23, RECIRC CARGO FIRE CONT RIGHT

      S 865-004
      (3) Make sure these circuit breakers, in the miscellaneous electrical equipment panel, P70, are closed:
          (a) 70B16, L RECIRC FAN CONT
          (b) 70C10, RECIRC FAN L

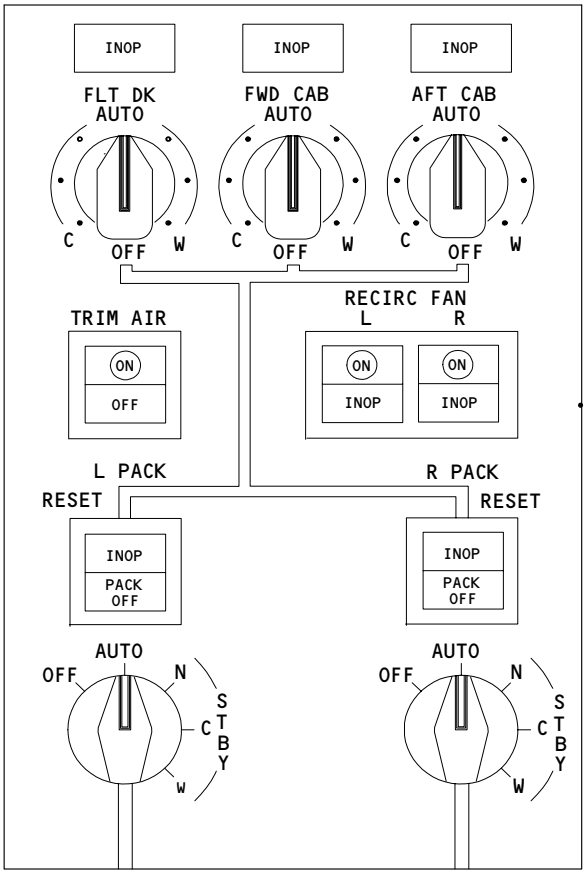
      S 865-005
      (4) Make sure these circuit breakers, in the miscellaneous electrical equipment panel, P37, are closed:
          (a) 37D7, R RECIRC FAN CONT
          (b) 37J5, RECIRC FAN R

      S 865-006
      (5) Push the L and R RECIRC FAN switch-lights, on the pilots' overhead panel, P5, to the off position.
          (a) Make sure the INOP lights come on.

      S 865-007
      (6) Turn the L and R PACK selectors, on the P5 panel, to the OFF position.
          (a) Make sure the PACK OFF lights come on.

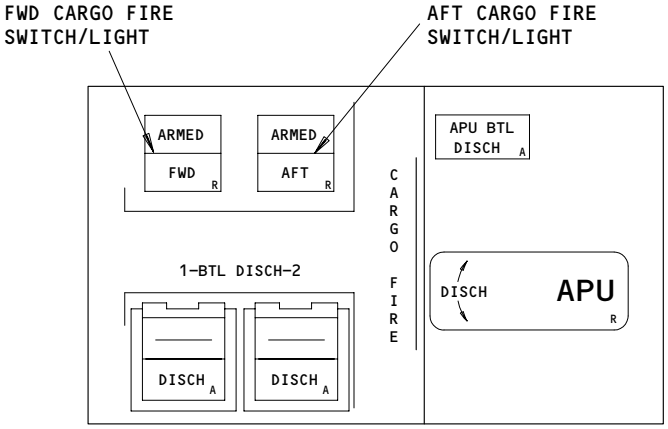


FLIGHT COMPARTMENT



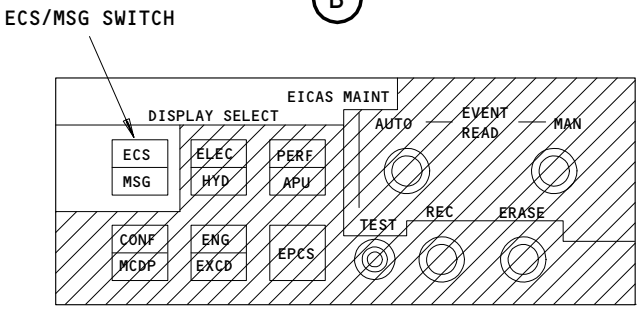
AIR CONDITIONING CONTROL PANEL

A



APU/CARGO FIRE CONTROL PANEL

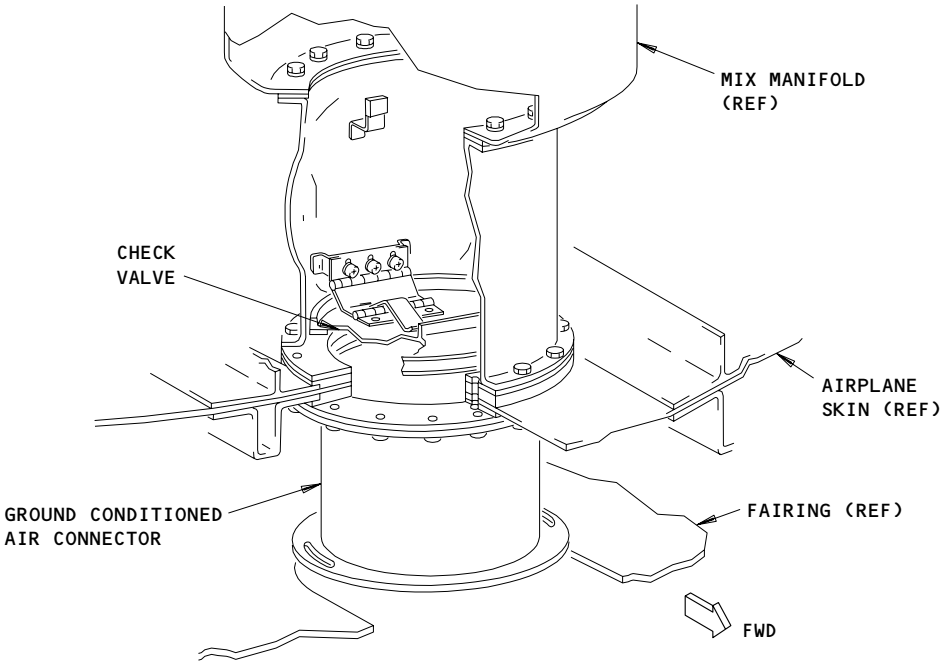
B



EICAS MAINTENANCE PANEL

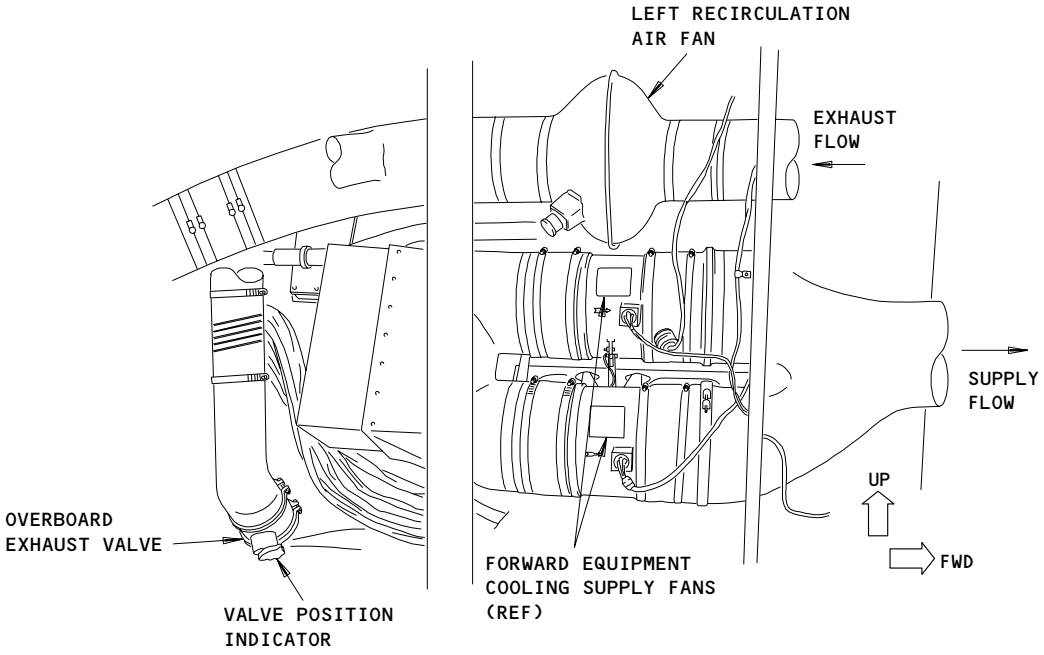
C

Recirculation System Adjustment Test
Figure 501 (Sheet 1)



GROUND CONDITIONED AIR CONNECTOR

D



FORWARD EQUIPMENT COOLING EQUIPMENT

E

Recirculation System Adjustment Test
Figure 501 (Sheet 2)

(b) Put a DO-NOT-OPERATE tag on the selectors.

D. Do the Test for the Left Recirculation System

S 865-008

CAUTION: IF THE LEFT RECIRC FAN IS ON BUT NO AIRFLOW IS FELT AT THE MIX MANIFOLD, IMMEDIATELY PUSH THE L RECIRC FAN SWITCH-LIGHT TO THE OFF POSITION. THIS WILL PREVENT DAMAGE TO THE FAN.

(1) Push the L RECIRC FAN switch-light, on the P5 panel, to the on position.
(a) Make sure the ON light comes on.

S 215-009
(2) Feel for the airflow at the overboard exhaust valve (Ref 21-58-05).

S 215-010
(3) Feel for the airflow in the mix manifold.
(a) Open the access panel for the ground connector, 193DL (Ref 06-41-00).
(b) Use your hand to push up and open the conditioned air check valve flapper (AMM 21-21-01/401).

NOTE: If the recirculation fan operates, airflow will exhaust out thru the check valve and the conditioned air ground connector. Normally, airflow from the recirculation fan will keep the check valve flapper closed and prevent airflow exhaust out thru the conditioned air ground connector.

(c) Feel for airflow from the mix manifold and recirculation fan.

S 865-011
(4) Open this circuit breaker, on the P70 panel:
(a) 70C10, RECIRC FAN L

S 215-012
(5) Make sure the L RECIRC FAN INOP light, on the P5 panel, comes on.

S 215-013
(6) Make sure the EICAS advisory message L RECIR FAN shows on the upper display.

S 865-014
(7) Close this circuit breaker, on the P70 panel:
(a) 70C10, RECIRC FAN L

S 215-015
(8) Make sure the L RECIRC FAN INOP light goes off.

S 215-016
(9) Make sure the EICAS advisory message L RECIR FAN does not show on the upper display.

S 865-017
(10) Push the L RECIRC FAN switch-light, on the P5 panel, to the off position.
(a) Make sure the INOP light comes on.

E. Do the Test for the Right Recirculation System

S 865-018

CAUTION: IF THE RIGHT RECIRC FAN IS ON, BUT NO AIRFLOW IS FELT AT THE PASSENGER CABIN OUTLET, IMMEDIATELY PUSH THE R RECIRC FAN SWITCH-LIGHT TO THE OFF POSITION. THIS WILL PREVENT DAMAGE TO THE FAN.

(1) Push the R RECIRC FAN switch-light, on the P5 panel, to the on position.
(a) Make sure the ON light comes on.

S 865-019
(2) Open this circuit breaker on the P37 panel:
(a) 37J5, RECIRC FAN R

S 215-020
(3) Make sure the R RECIRC FAN INOP light, on the P5 panel, comes on.

S 215-021
(4) Make sure the EICAS advisory message R RECIR FAN shows on the upper display.

S 865-022
(5) Close this circuit breaker on P37 panel:
(a) 37J5, RECIRC FAN R

S 215-023
(6) Make sure the R RECIRC FAN INOP light goes off.

S 215-024
(7) Make sure the EICAS advisory message R RECIR FAN does not show on the upper display.

S 215-025
(8) Feel for the airflow at an outlet in the passenger compartment.

S 865-026
(9) Push the R RECIRC FAN switch-light, on the P5 panel, to the off position.
(a) Make sure the INOP light comes on.

S 215-026
(10) Make sure the EICAS advisory message R RECIR FAN shows on the upper display.

F. Do the Test for the Cargo Fire Interface System

S 865-027
(1) Push the L and R RECIRC FAN switch-lights, on the pilots' overhead panel, P5, to the on position.
(a) Make sure the INOP lights go off.

S 865-028
(2) Push the FWD CARGO FIRE switch-light, on the pilots aft control stand panel, P8, to the ARMED position.
(a) Make sure the ARMED light comes on.
(b) Make sure the L and R RECIRC FAN INOP lights, on the P5 panel, both come on.

NOTE: Both the left and right recirc fans should be off.

S 865-030
(3) Push the FWD CARGO FIRE switch-light, on the P8 panel, to the usual position.
(a) Make sure the ARMED light goes off.
(b) Make sure the L and R RECIRC FAN INOP lights, on the P5 panel, both go off.

NOTE: Both the left and right recirc fans should be on.

S 865-032
(4) Push the AFT CARGO FIRE switch-light, on the P8 panel, to the ARMED position.
(a) Make sure the ARMED light comes on.
(b) 757-200 AIRPLANES;
Make sure the R RECIRC FAN INOP light, on the P5 panel, comes on while the L RECIRC FAN INOP light stays off.

NOTE: The right recirc fan should be off and the left recirc fan should still be on.

S 865-029
(5) Push the AFT CARGO FIRE switch-light, on the P8 panel, to the usual position.
(a) Make sure the ARMED light goes off.

(b) 757-200 AIRPLANES;
Make sure the R RECIRC FAN INOP light, on the P5 panel, goes off and the L RECIRC FAN INOP light is still off.

NOTE: Both the left and right recirc fans should be on.

G. Put the Airplane Back to Its Usual Condition

S 865-031
(1) Remove the DO-NOT-OPERATE tags from the L and R PACK selectors, on the P5 panel.

S 865-038
(2) Remove the electrical power, if it is not necessary (Ref 24-22-00).

CABIN AIR RECIRCULATION FAN - REMOVAL/INSTALLATION

1. General
   A. Two cabin-air recirculation-fans are used to supply air to the mix manifold. The right recirculation fan pulls air from the mix manifold bay. The left recirculation fan also pulls air from the electrical equipment system. The right recirculation fan is installed on the right side of the mix manifold. The left recirculation fan is installed in the forward end of the left side of the forward cargo compartment. This procedure has instructions to remove and install the left and right recirculation fans.

TASK 21-25-01-004-001

2. Remove the Recirculation Air Fans (Fig. 401)
   A. References
      (1) 24-22-00/201, Electric Power - Control
      (2) 25-50-02/401, Cargo Compartment Sidewall Linings
      (3) 52-34-00/201, No. 1 and 2 Cargo Doors - Maintenance Practices
   B. Access
      (1) Location Zones
          121 Forward Cargo Compartment (LH side)
          126 Area aft of the forward cargo compartment (RH side)
          821 Forward Cargo Door
      (2) Access Panels
          122JW Forward Cargo Compartment Aft Bulkhead, Right
          122KW Forward Cargo Compartment Aft Bulkhead, Right

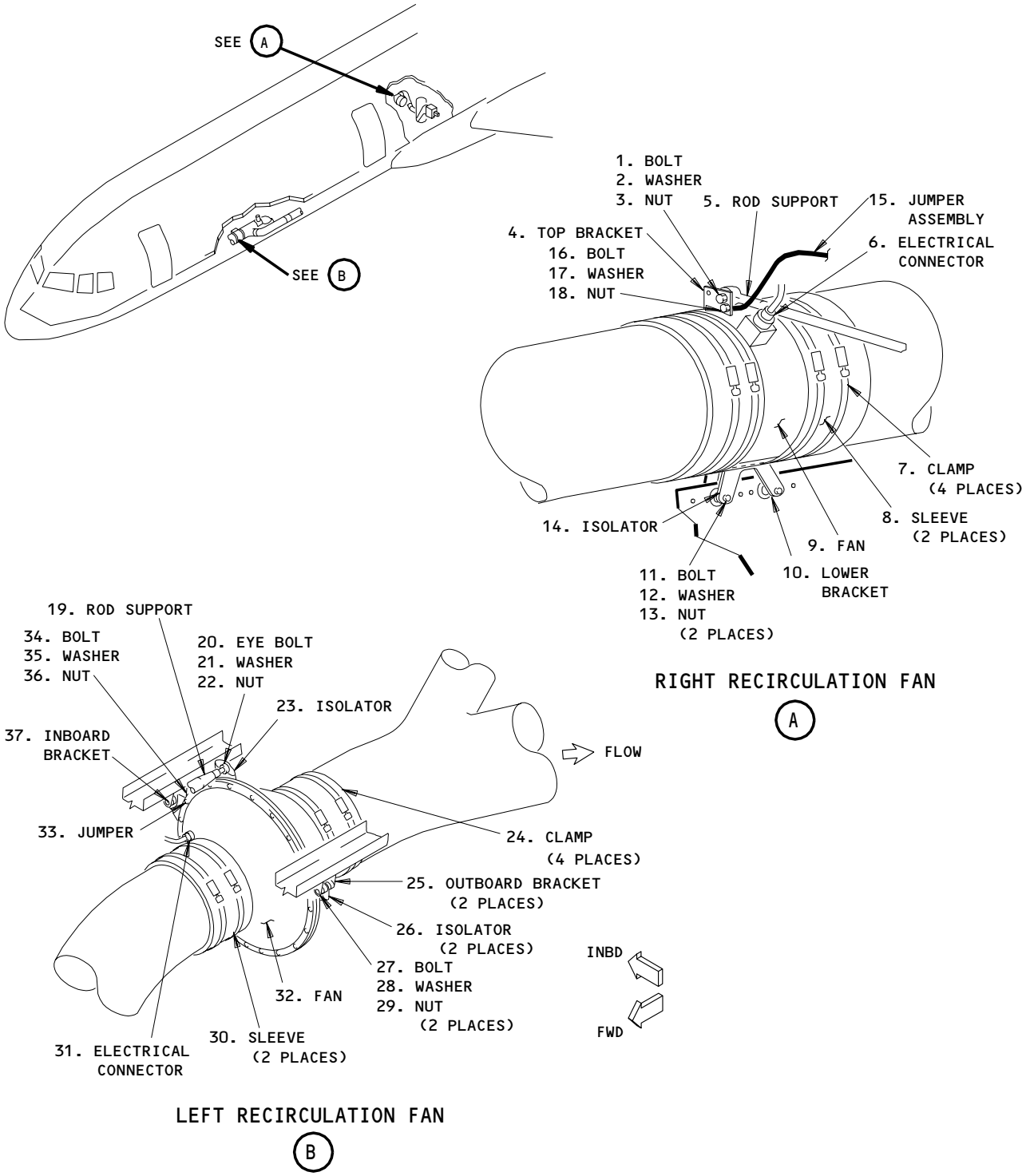
   C. Prepare for Removal

      S 864-002
      (1) Supply the electrical power (AMM 24-22-00/201).

      S 864-003
      (2) Push the applicable (L or R) RECIRC FAN switch/light, on the pilot's-overhead-control-panel P5, to the off position.
          (a) Make sure the INOP light comes on.
          (b) Put a DO-NOT-OPERATE identifier on the switch/light.

      S 864-005
      (3) To remove the right cabin air recirculation fan, open these circuit breakers and attach a DO-NOT-CLOSE identifier:
          (a) On the pilot's-overhead-circuit-breaker panel (P11):
              1) 11P23, RECIRC CARGO FIRE CONT RIGHT
          (b) On the miscellaneous-electrical-equipment panel (P37):
              1) 37J5, RECIRC FAN R

      S 864-006
      (4) To remove the left cabin air recirculation fan, open these circuit breakers and attach a DO-NOT-CLOSE identifier:
          (a) On the pilot's-overhead-circuit-breaker panel (P11):
              1) 11P14, RECIRC CARGO FIRE CONT LEFT



Cabin Air Recirculation Fan Installation
Figure 401

(b) On the miscellaneous-electrical-equipment panel (P70):
1) 70C10, RECIRC FAN L

S 014-008
(5) Open the No. 1 Cargo Door, 821 (Ref 52-34-00/201).

S 014-009
(6) To remove the left recirculation fan,
remove the sidewall panel on the left side of the forward cargo compartment, about 2 feet aft of the forward endliner (AMM 25-50-02/401).

S 014-011
(7) To remove the right recirculation fan,
remove the access panel(s), 122JW (122KW), from the right side of the aft bulkhead in the forward cargo compartment.

D. Remove the right recirculation air fan

S 034-013
(1) Remove the bolt (1), washer (2), and nut (3) that attach the top bracket (4) to the rod support (5).

S 034-012
(2) Remove the bolt (16), washers (17), and nut (18) that attach the jumper assembly (15) to the fan (9).

S 034-014
(3) Remove the bolts (11), washers (12), nuts (13), and isolators (14) that attach the lower fan bracket (10) to the fan support.

S 034-015
(4) Disconnect the electrical connector (6) from the fan (9).

S 034-016
(5) Remove the clamps (7) from each end of the fan (9).

S 034-017
(6) Pull the sleeves (8) away from the fan (9).

S 024-018
(7) Remove the fan (9).
(a) 757-300 AIRPLANES;
757-200 AIRPLANES WITH RECIRC FAN P/N 645507-2 (POST-SB 21-103 OR POST-SB 21-90);
Remove the orifice assembly (9A) from the recirc fan (9).

NOTE: The orifice assembly (9A) is bonded to the recirc fan (9). Keep the orifice assembly (9A) for later installation to a new recirc fan (9).

E. Remove the left recirculation air fan.

S 034-019
(1) Remove the eye-bolt (20), washer (21), nut (22), and isolator (23) that attaches the rod support (19) to the top of the fan (32).

S 034-020
(2) Remove the bolt (34), washers (35), and nut (36) that attach the jumper assembly (33) to the fan (32).

S 034-021
(3) Remove the bolts (27), washers (28), nuts (29), and isolators (26) that attach the fan (32) to the inboard and outboard fan brackets (37,25).

S 034-022
(4) Disconnect the electrical connector (31) from the fan (32).

S 034-023
(5) Remove the clamps (24) from each end of the fan (32).

S 034-024
(6) Pull the sleeves (30) away from the fan (32).

S 024-025
(7) Remove the fan (32).

TASK 21-25-01-404-026

3. Install the Cabin Air Recirculation Fans (Fig. 401)
A. Consumable Materials
(1) A00161 or A00323, Adhesive - BMS 5-25 Type 2, Grade 1 (BAC 5010 Type 54 or Type 44)

B. Parts

(1) For the right recirculation air fan:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	21-25-01	01	10
	2	Washer			20
	3	Nut			25
	6	Electrical Connector			505
	7	Clamp			125
	8	Sleeve			140
	9	Fan			150
	11	Bolt			110
	12	Washer			115
	13	Nut			120
	14	Isolator			170
	16	Bolt		10	237
	17	Washer			239
	18	Nut			242

(2) For the left recirculation air fan:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	20	Eye Bolt	21-58-06	05	15
	21	Washer			30
	22	Nut			40
	23	Isolator			65
	24	Clamp			120
	25	Outboard Bracket			85
	26	Isolator			65
	27	Bolt			70
	28	Washer			75
	29	Nut			80
	30	Sleeve			210
	31	Electrical Connector			305
	32	Fan			117
	34	Bolt			70
	35	Washer			75
	36	Nut			80
	37	Inboard Bracket			85

C. References
(1) AMM 21-20-01/401, Air Supply Flow Control Orifice
(2) 24-22-00/201, Electric Power - Control
(3) 25-50-02/401, Cargo Compartment Sidewall Linings
(4) 52-34-00/201, No. 1 and 2 Cargo Doors - Maintenance Practices

D. Access
(1) Location Zones
121 Forward Cargo Compartment (LH side)
126 Area aft of the forward cargo compartment (RH side)
821 Forward Cargo Door
(2) Access Panels
122JW Forward Cargo Compartment Aft Bulkhead, Right
122KW Forward Cargo Compartment Aft Bulkhead, Right

E. Install the right recirculation air fan.

S 394-115
(1) 757-300 AIRPLANES;
757-200 AIRPLANES WITH RECIRC FAN P/N 64550Z-2 (POST-SB 21-103 OR POST-SB 21-90);
Use some adhesive (BMS 5-25, Type 2, Grade 1) to bond the orifice assembly (9A) to the upstream air supply side of the recirc fan (9) (AMM 21-20-01/401).

NOTE: The identification tags on the orifice assembly (9A) must be straight, visible, and point aft on the recirc fan (9).

S 424-028
(2) Put the fan (9) into position in the duct so that the flow arrow on the fan points aft.

S 434-029
(3) Pull one sleeve (8) over each duct-fan joint.

S 434-030
(4) Install the bolt (1), washer (2), and nut (3) that attach the top fan bracket (4) to the rod support (5). Do not tighten.

S 434-031
(5) Install the bolts (11), washers (12), nuts (13), and isolators (14) that attach the lower fan bracket (10) to the fan support. Do not tighten.

S 434-032
(6) Install the bolt (16), washers (17), and nut (18) that attach the jumper assembly (15) to the fan (9).

S 434-033
(7) Tighten all the nuts.

S 434-034
(8) Install the clamps (7) on each end of the fan. Tighten the clamp screws to 20-25 pound inches.

S 424-113
(9) Reconnect the electrical connector (6) to the fan (9) so that the backshell connector faces aft and that the wire bundle does not touch any adjacent airplane structure.

F. Install the left recirculation air fan

S 424-035
(1) Put the fan (32) into position in the duct so that the flow arrow of the fan points aft.

S 434-036
(2) Pull one sleeve (30) over each duct-fan joint.

S 434-037
(3) Install the eye-bolt (20), washer (21), nut (22), and isolator (23) that attaches the rod support (19) to the top of the fan (32). Do not tighten.

S 434-038
(4) Install the bolts (27), washers (28), nuts (29), and isolators (26) that attach the fan (32) to the inboard and outboard fan brackets (37,25). Do not tighten.

S 434-039
(5) Install the bolt (34), washer (35), and nut (36) that attaches the jumper assembly (33) to the fan (32).

S 434-040
(6) Tighten all the nuts.

S 434-041
(7) Install the clamps (24) on each end of the fan. Tighten the clamp screws to 20-25 pound inches.

S 424-114
(8) Reconnect the electrical connector (31) to the fan (32) and make sure that the wire bundle does not touch any adjacent airplane structure.

G. Do the recirculation fan installation test

S 864-042
(1) If the right cabin air recirculation fan was installed, remove the DO-NOT-CLOSE identifier and close these circuit breakers:
(a) On the pilot's-overhead-circuit-breaker panel (P11):
1) 11P23, RECIRC CARGO FIRE CONT RIGHT

(b) On the miscellaneous-electrical-equipment-panel (P37):
1) 37J5, RECIRC FAN R

S 864-043
(2) If the left cabin air recirculation fan was installed, remove the DO-NOT-CLOSE identifier and close these circuit breakers:
(a) On the pilot's-overhead-circuit-breaker panel (P11):
1) 11P14, RECIRC CARGO FIRE CONT LEFT
(b) On the miscellaneous-electrical-equipment panel (P70):
1) 70C10, RECIRC FAN L

S 864-045
(3) Supply the electrical power (AMM 24-22-00/201).

S 864-046
(4) Push the applicable (L or R) RECIRC FAN switch/light, on the pilot's-overhead-control-panel P5, to the ON position.

S 714-048
(5) Listen for the fan to operate.

S 794-049
(6) Make sure that air does not leak from around the fan-duct joints.
(a) A small leak is permitted.
(b) You must repair a large leak.

H. Put the airplane back to its usual configuration

S 424-051
(1) If the right recirculation air fan was installed, install the access-panel(s), 122JW (122KW), in the forward cargo compartment.

S 424-057
(2) If the left recirculation air fan was installed, install the sidewall panel on the left side of the forward cargo compartment, about two (2) feet aft of the forward endliner (AMM 25-50-02/401).

S 424-052
(3) Close the No. 1 cargo door, 821 (Ref 06-46-00).

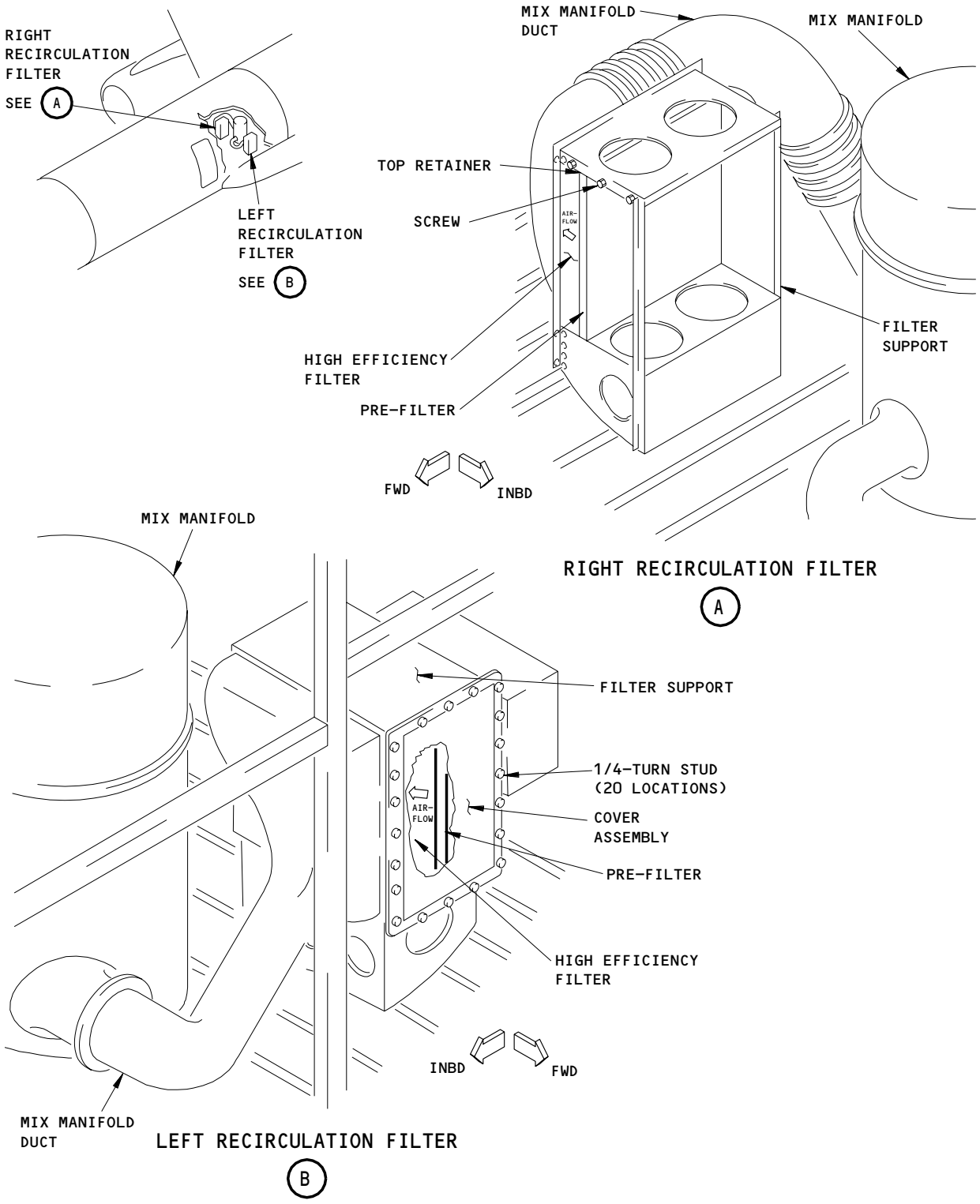
S 864-053
(4) Remove the electrical power if it is not necessary (AMM 24-22-00/201

RECIRCULATION AIR FILTER - REMOVAL/INSTALLATION

1. General
   A. The recirculation filters are used to remove particles and odors from the air. The filters are installed in two filter holders which are on the left and right side of the mix manifold. The mix manifold is in the aft end of the forward cargo compartment.
   B. This procedure contains the tasks that follow:
      (1) AIRPLANES WITH A SINGLE FILTER INSTALLATION;
          (a) Recirculation High-Efficiency (HEPA) Filter Removal
          (b) Recirculation High Efficiency (HEPA) Filter Installation
          (c) Recirculation High Efficiency Filter Installation
      (2) AIRPLANES WITH A TWO-PIECE FILTER INSTALLATION;
          (a) Recirculation Prefilter Removal
          (b) Recirculation Prefilter Installation
          (c) Recirculation High-Efficiency (HEPA) Filter Removal
          (d) Recirculation High-Efficiency (HEPA) Filter Installation

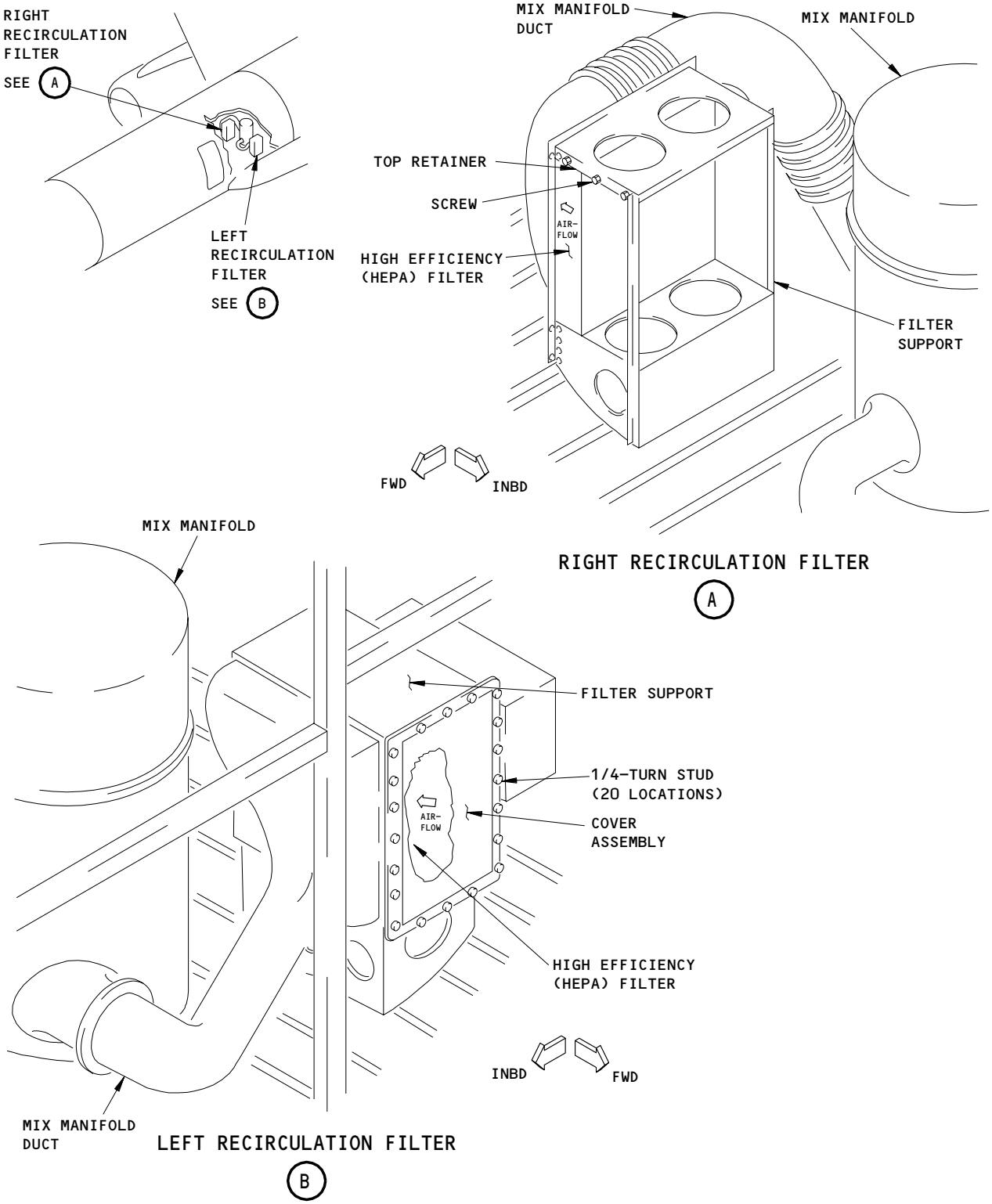
TASK 21-25-02-004-175

2. AIRPLANES WITH A SINGLE FILTER INSTALLATION;
   Recirculation High-Efficiency (HEPA) Filter Removal (Fig. 401)
   A. General
      (1) There is a filter holder on each side of the mix manifold. Each filter holder has this filter:
          (a) A High-Efficiency (HEPA) filter
   B. Equipment
      (1) Disposable plastic bags (38"x"42", 1-2mil, 40-42 gal)(or equivalent)
      (2) Personal protective equipment and clothing (PPE/PPC) (disposable) commercially available
          (a) Particulate Respirator (NIOSH 42 CFR 84 Class N95, N99, N100) - 3M Model 8210 (or equivalent)
          (b) Safety Goggles - 3M Model 1621 (or equivalent)
          (c) Latex or Nitrile Gloves - Kimberly-Clark KleenGuard, SafeSkin, or ShieldMaster models (or equivalent)
          (d) Coveralls with hood - Dupont 'Tyvek' style S1428 or 01414 (or equivalent)



Recirculation Air Filter
Figure 401 (Sheet 1)

M46308



Recirculation Air Filter
Figure 401 (Sheet 2)

M46344

C. References
(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) AMM 24-22-00/201, Electric Power Control
(3) AMM 25-50-03/401, Cargo Compartment-Bulkhead Lining

D. Access
(1) Location Zones
125 Area Aft of the forward cargo compartment (Left)
126 Area Aft of the forward cargo compartment (Right)

E. Prepare for Removal

S 864-164
(1) Supply electrical power (AMM 24-22-00/201).

S 864-165
(2) Turn on the L and R PACK selectors, on the overhead panel, P5, to the OFF position.
(a) Make sure the PACK OFF lights come on.
(b) Put DO-NOT-OPERATE tags on the selectors.

S 864-166
(3) Push the applicable (L or R) RECIRC FAN switch/lights, on the P5 panel, to the off position.
(a) Make sure the INOP light comes on.
(b) Put a DO-NOT-OPERATE tag on the RECIRC FAN switch/light.

S 014-167
(4) Open the No. 1 Cargo Door, 821 (AMM 06-46-00/201).

S 014-168
(5) To remove the left (right) recirculation high-efficiency (HEPA) filter, remove the left (right) recirculation filter access panel on the aft bulkhead of the forward cargo compartment (AMM 25-50-03/401).

F. Remove the Left Recirculation High-Efficiency (HEPA) filter

S 014-169
(1) Loosen the 1/4-turn studs on the cover of the forward face of the filter holder.

S 014-170

(2) Remove the cover.

S 024-213

WARNING: PUT ON THE PERSONAL PROTECTIVE EQUIPMENT BEFORE YOU TOUCH THE FILTER. THE FILTER REMOVES SMALL PARTICLES (SMOKE, DUST, LINT, FIBERS, POLLEN) AND INFECTIOUS MATERIALS (BACTERIA, VIRUSES, MOLD SPORES, FUNGI) FROM THE AIR WHICH CAN CAUSE ILLNESSES.

(3) Put on the personal protective equipment before you touch the filter.

S 024-214

WARNING: DO NOT LET THE FILTER TOUCH YOUR SKIN. DO NOT SHAKE OR HIT THE FILTER. DO NOT LET THE FILTER FALL. DO NOT USE COMPRESSED AIR TO CLEAN THE FILTER OR FILTER HOUSING. THIS CAN CAUSE THE INFECTIOUS MATERIAL TO BECOME AIRBORNE. DISCARD THE FILTER IN A DISPOSABLE PLASTIC BAG.

(4) Pull the high-efficiency (HEPA) filter out of the filter holder.

S 024-215

WARNING: PUT ALL THE AIR FILTERS THAT ARE REMOVED FROM THE AIRPLANE INTO DISPOSABLE PLASTIC BAGS. OBEY ALL OF THE AIRPLANE OPERATOR'S POLICIES, LOCAL HEALTH DEPARTMENT AND LAW ENFORCEMENT REGULATIONS FOR THE DISPOSAL OF THE MATERIAL.

(5) Put the filter(s) in disposable plastic bag(s) and discard in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 024-216

WARNING: DISCARD ALL PERSONAL PROTECTIVE EQUIPMENT AFTER YOU USE IT ONE TIME. DO NOT TRY TO CLEAN IT. DISCARD THE EQUIPMENT IN A DISPOSABLE PLASTIC BAG.

(6) Remove the personal protective equipment. Put the items in a disposable plastic bag and discard them in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 114-217

WARNING: CLEAN YOUR HANDS WITH SOAP AND RUNNING HOT WATER. DIRTY HANDS WITH CONTAMINATION CAN CAUSE DISEASE AND ILLNESSES.

(7) Clean your hands with soap and running hot water.

G. Remove the Right Recirculation High-Efficiency (HEPA) filter

S 014-172

(1) Remove the screws and washers from the forward face of the filter holder.

S 014-173

(2) Remove the top retainer.

S 024-218

WARNING: PUT ON THE PERSONAL PROTECTIVE EQUIPMENT BEFORE YOU TOUCH THE FILTER. THE FILTER REMOVES SMALL PARTICLES (SMOKE, DUST, LINT, FIBERS, POLLEN) AND INFECTIOUS MATERIALS (BACTERIA, VIRUSES, MOLD SPORES, FUNGI) FROM THE AIR WHICH CAN CAUSE ILLNESSES.

(3) Put on the personal protective equipment before you touch the filter.

S 024-219

WARNING: DO NOT LET THE FILTER TOUCH YOUR SKIN. DO NOT SHAKE OR HIT THE FILTER. DO NOT LET THE FILTER FALL. DO NOT USE COMPRESSED AIR TO CLEAN THE FILTER OR FILTER HOUSING. THIS CAN CAUSE THE INFECTIOUS MATERIAL TO BECOME AIRBORNE. DISCARD THE FILTER IN A DISPOSABLE PLASTIC BAG.

(4) Pull the high-efficiency (HEPA) filter out of the filter support.

S 024-220

WARNING: PUT ALL THE AIR FILTERS THAT ARE REMOVED FROM THE AIRPLANE INTO DISPOSABLE PLASTIC BAGS. OBEY ALL OF THE AIRPLANE OPERATER'S POLICIES, LOCAL HEALTH DEPARTMENT AND LAW ENFORCEMENT REGULATIONS FOR THE DISPOSAL OF THE MATERIAL.

(5) Put the filter(s) in disposable plastic bag(s) and discard in accordance with the airplane operator's, local health, safety and regulatory procedures for disposing of the material.

S 024-212

WARNING: DISCARD ALL PERSONAL PROTECTIVE EQUIPMENT AFTER YOU USE IT ONE TIME. DO NOT TRY TO CLEAN IT. DISCARD THE EQUIPMENT IN A DISPOSABLE PLASTIC BAG.

(6) Remove all the personal protective equipment. Put the items in a disposable plastic bag and discard them in accordance with the airplane operator's, local health, safety and regulatory procedures for disposing of the material.

S 114-221

WARNING: CLEAN YOUR HANDS WITH SOAP AND RUNNING HOT WATER. DIRTY HANDS WITH CONTAMINATION CAN CAUSE DISEASE AND ILLNESSES.

(7) Clean your hands with soap and running hot water.

TASK 21-25-02-404-174

3. AIRPLANES WITH A SINGLE FILTER INSTALLATION;
Recirculation High-Efficiency (HEPA) Filter Installation (Fig. 401)

A. General

(1) There is a filter holder on each side of the mix manifold. Each filter holder has this filter:

(a) A High-Efficiency (HEPA) filter

B. References

(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels

(2) AMM 24-22-00/201, Electric Power Control

(3) AMM 25-50-03/401, Cargo Compartment-Bulkhead Lining

C. Access

(1) Location Zones

125 Area Aft of the forward cargo compartment (Left)
126 Area Aft of the forward cargo compartment (Right)

D. Left Recirculation High-Efficiency (HEPA) Filter Installation

S 424-178

(1) Put the high-efficiency (HEPA) filter through the forward face of the filter holder.
(a) Push the filter inboard (to the mix manifold).

S 414-179

(2) Put the cover assembly on the filter holder.

S 414-180

(3) Tighten the 1/4-turn studs to hold the cover in position.

E. Right Recirculation High-Efficiency (HEPA) Filter Installation

S 424-189

(1) Put the high-efficiency (HEPA) filter through the forward face of the filter holder.
(a) Push the filter outboard (away from the mix manifold).

S 414-182

(2) Put the top retainer on the filter holder.

S 414-183

(3) Install washers and screws to hold the top retainer in position.

F. Put the Airplane Back to its Usual Condition

S 864-184

(1) Remove the DO-NOT-OPERATE tags from the L and R PACK selectors, on the P5 panel.

S 864-185

(2) Remove the DO-NOT-OPERATE tag from the applicable RECIRC FAN switch/light, on the P5 panel.

S 414-258

(3) Install the bulkhead lining (AMM 25-50-03/401) or the access panel that was removed.

S 414-186

(4) Install the left (right) recirculation filter access panel on the aft bulkhead of the forward cargo compartment (AMM 25-50-03/401).

S 414-187

(5) Close the No. 1 Cargo Door, 821 (AMM 06-46-00/201).

S 864-188

(6) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-25-02-004-082

4. AIRPLANES WITH A TWO-PIECE FILTER INSTALLATION;
Recirculation Prefilter Removal (Fig. 401)

A. General

(1) There is a filter holder on each side of the mix manifold. Each filter holder has these filters:

(a) A Prefilter

(b) A High-Efficiency (HEPA) filter

B. Equipment

(1) Disposable plastic bags (38"x42", 1-2mil, 40-42 gal)(or equivalent)

(2) Personal protective equipment and clothing (PPE/PPC) (disposable) commercially available

(a) Particulate Respirator (NIOSH 42 CFR 84 Class N95, N99, N100) - 3M Model 8210 (or equivalent)

(b) Safety Goggles - 3M Model 1621 (or equivalent)

(c) Latex or Nitrile Gloves - Kimberly-Clark KleenGuard, SafeSkin, or ShieldMaster models (or equivalent)

(d) Coveralls with hood - Dupont 'Tyvek' style S1428 or 01414 (or equivalent)

C. References

(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels

(2) AMM 24-22-00/201, Electric Power Control

(3) AMM 25-50-03/401, Cargo Compartment-Bulkhead Lining

D. Access

(1) Location Zones

125 Area aft of the forward cargo compartment (Left)

126 Area aft of the forward cargo compartment (Right)

E. Prepare for Removal

S 864-083
(1) Supply electrical power (AMM 24-22-00/201).

S 864-084
(2) Turn the L and R PACK selectors, on the overhead panel, P5, to the OFF position.
(a) Make sure the PACK OFF lights come on.
(b) Put DO-NOT-OPERATE tags on the selectors.

S 864-085
(3) Push the applicable (L or R) RECIRC FAN switch/lights, on the P5 panel, to the off position.
(a) Make sure the INOP light comes on.
(b) Put a DO-NOT-OPERATE tag on the RECIRC FAN switch/light.

S 014-086
(4) Open the No. 1 Cargo Door, 821 (AMM 06-46-00/201).

S 014-088
(5) To remove the left (right) recirculation prefilter, remove the left (right) recirculation filter access panel on the aft bulkhead of the forward cargo compartment (AMM 25-50-03/401).

F. Remove the Left Recirculation Prefilter

S 014-089
(1) Loosen the 1/4-turn studs on the cover of the forward face of the filter holder.

S 014-090
(2) Remove the cover.

S 024-222

WARNING: PUT ON THE PERSONAL PROTECTIVE EQUIPMENT BEFORE YOU TOUCH THE FILTER. THE FILTER REMOVES SMALL PARTICLES (SMOKE, DUST, LINT, FIBERS, POLLEN) AND INFECTIOUS MATERIALS (BACTERIA, VIRUSES, MOLD SPORES, FUNGI) FROM THE AIR WHICH CAN CAUSE ILLNESSES.

(3) Put on the personal protective equipment before you touch the filter.

S 024-223

WARNING: DO NOT LET THE FILTER TOUCH YOUR SKIN. DO NOT SHAKE OR HIT THE FILTER. DO NOT LET THE FILTER FALL. DO NOT USE COMPRESSED AIR TO CLEAN THE FILTER OR FILTER HOUSING. THIS CAN CAUSE THE INFECTIOUS MATERIAL TO BECOME AIRBORNE. DISCARD THE FILTER IN A DISPOSABLE PLASTIC BAG.

(4) Pull the prefilter out of the filter holder.

NOTE: The filter may be hard to move. It is held in position by springs which push the filter toward the mix manifold.

(a) To remove the prefilter media, do this step:
1) Twist the frame and remove the media.

S 024-225

WARNING: PUT ALL THE AIR FILTERS THAT ARE REMOVED FROM THE AIRPLANE INTO DISPOSABLE PLASTIC BAGS. OBEY ALL OF THE AIRPLANE OPERATOR'S POLICIES, LOCAL HEALTH DEPARTMENT AND LAW ENFORCEMENT REGULATIONS FOR THE DISPOSAL OF THE MATERIAL.

(5) Put the filter(s) in disposable plastic bag(s) and discard in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 024-226

WARNING: DISCARD ALL PERSONAL PROTECTIVE EQUIPMENT AFTER YOU USE IT ONE TIME. DO NOT TRY TO CLEAN IT. DISCARD THE EQUIPMENT IN A DISPOSABLE PLASTIC BAG.

(6) Remove the personal protective equipment. Put the items in a disposable plastic bag and discard them in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 114-228

WARNING: CLEAN YOUR HANDS WITH SOAP AND RUNNING HOT WATER. DIRTY HANDS WITH CONTAMINATION CAN CAUSE DISEASE AND ILLNESSES.

(7) Clean your hands with soap and running hot water.

G. Remove the Right Recirculation Prefilter

S 014-095

(1) Remove the screws and washers from the forward face of the filter holder.

S 014-096

(2) Remove the top retainer.

S 024-229

WARNING: PUT ON THE PERSONAL PROTECTIVE EQUIPMENT BEFORE YOU TOUCH THE FILTER. THE FILTER REMOVES SMALL PARTICLES (SMOKE, DUST, LINT, FIBERS, POLLEN) AND INFECTIOUS MATERIALS (BACTERIA, VIRUSES, MOLD SPORES, FUNGI) FROM THE AIR WHICH CAN CAUSE ILLNESSES.

(3) Put on the personal protective equipment before you touch the filter.

S 024-230

WARNING: DO NOT LET THE FILTER TOUCH YOUR SKIN. DO NOT SHAKE OR HIT THE FILTER. DO NOT LET THE FILTER FALL. DO NOT USE COMPRESSED AIR TO CLEAN THE FILTER OR FILTER HOUSING. THIS CAN CAUSE THE INFECTIOUS MATERIAL TO BECOME AIRBORNE. DISCARD THE FILTER IN A DISPOSABLE PLASTIC BAG.

(4) Pull the prefilter out of the filter support.

NOTE: The filter may be hard to move. It is held in position by springs which push the filter toward the mix manifold.

(a) To remove the prefilter media, do this step:
1) Twist the frame and remove the media.

S 024-231

WARNING: PUT ALL THE AIR FILTERS THAT ARE REMOVED FROM THE AIRPLANE INTO DISPOSABLE PLASTIC BAGS. OBEY ALL OF THE AIRPLANE OPERATOR'S POLICIES, LOCAL HEALTH DEPARTMENT, AND LAW ENFORCEMENT REGULATIONS FOR THE DISPOSAL OF THE MATERIAL.

(5) Put the filter(s) in disposable plastic bag(s) and discard in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 024-233

WARNING: DISCARD ALL PERSONAL PROTECTIVE EQUIPMENT AFTER YOU USE IT ONE TIME. DO NOT TRY TO CLEAN IT. DISCARD THE EQUIPMENT IN A DISPOSABLE PLASTIC BAG.

(6) Remove the personal protective equipment. Put the items in a disposable plastic bag and discard them in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 114-232

WARNING: CLEAN YOUR HANDS WITH SOAP AND RUNNING HOT WATER. DIRTY HANDS WITH CONTAMINATION CAN CAUSE DISEASE AND ILLNESSES.

(7) Clean your hands with soap and running hot water.

TASK 21-25-02-404-101

5. AIRPLANES WITH A TWO-PIECE FILTER INSTALLATION; Recirculation Prefilter Installation (Fig. 401)
   A. General
      (1) There is a filter holder on each side of the mix manifold. Each filter holder has these filters:
         (a) A Prefilter

(b) A High-Efficiency (HEPA) filter

B. References
(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) AMM 24-22-00/201, Electric Power Control
(3) AMM 25-50-03/401, Cargo Compartment-Bulkhead Lining

C. Access
(1) Location Zones
125 Area aft of the forward cargo compartment (Left)
126 Area aft of the forward cargo compartment (Right)

D. Install the Left Recirculation Prefilter

S 424-144
(1) If the filter media is removed from the prefilter, do these steps:

CAUTION: BE CAREFUL WHEN YOU INSTALL THE FILTER MEDIA. THE MEDIA CAN BE EASILY DAMAGED.

(a) Install the new media on the filter frame.
(b) Make sure the blue side of the media is on the upstream side of the filter.

NOTE: The upstream side of the filter is identified by an arrow found on the side of the filter.

S 424-105
(2) Push the prefilter through the forward face of the filter holder.
(a) Push the prefilter against the high efficiency filter.

S 414-106
(3) Put the cover assembly on the filter holder.

S 414-107
(4) Tighten the 1/4-turn studs (20 locations) to hold the cover in position.

E. Install the Right Recirculation Prefilter

S 434-145
(1) If the filter media is removed from the prefilter, do these steps:

CAUTION: BE CAREFUL WHEN YOU INSTALL THE FILTER MEDIA. THE MEDIA CAN BE EASILY DAMAGED.

(a) Install the new media on the filter frame.
(b) Make sure the blue side of the media is on the upstream side of the filter.

NOTE: The upstream side of the filter is identified by an arrow found on the side of the filter.

S 424-111
(2) Push the prefilter through the forward face of the filter holder.
(a) Push the prefilter against the high efficiency filter.

S 414-112
(3) Put the top retainer on the filter holder.

S 414-113
(4) Install washers and screws to hold the top retainer in position.

F. Put the Airplane Back to Its Usual Condition

S 864-114
(1) Remove the DO-NOT-OPERATE tags from L and R PACK selectors, on the P5 panel.

S 864-115
(2) Remove the DO-NOT-OPERATE tag from the applicable RECIRC FAN switch/light, on the P5 panel.

S 414-142
(3) Install the bulkhead lining (AMM 25-50-03/401) or the access panel that was removed.

S 414-138
(4) Install the left (right) recirculation filter access panel on the aft bulkhead of the forward cargo compartment (AMM 25-50-03/401).

S 414-139
(5) Close the No. 1 Cargo Door, 821 (AMM 06-46-00/201).

S 864-140
(6) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-25-02-004-001

6. AIRPLANES WITH A TWO-PIECE FILTER INSTALLATION;
Recirculation High-Efficiency (HEPA) Filter Removal (Fig. 401)

A. General
(1) There is a filter holder on each side of the mix manifold. The filters must be removed from the filter holder in this sequence:
(a) The Prefilter
(b) The High-Efficiency (HEPA) filter

B. Equipment
(1) Disposable plastic bags (38"x"42", 1-2mil, 40-42 gal)(or equivalent)
(2) Personal protective equipment and clothing (PPE/PPC) (disposable) commercially available
(a) Particulate Respirator (NIOSH 42 CFR 84 Class N95, N99, N100 3M Model 8210 (or equivalent)
(b) Safety Goggles - 3M Model 1621 (or equivalent)
(c) Latex or Nitrile Gloves - Kimberly-Clark KleenGuard, SafeSkin, or ShieldMaster models (or equivalent)
(d) Coveralls with hood - Dupont 'Tyvek' style S1428 or 01414 (or equivalent)

C. References
(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) AMM 24-22-00/201, Electric Power Control
(3) AMM 25-50-03/401, Cargo Compartment-Bulkhead Lining

D. Access
(1) Location Zones
125 Area aft of the forward cargo compartment (Left)
126 Area aft of the forward cargo compartment (Right)

E. Prepare for Removal

S 864-002
(1) Supply electrical power (AMM 24-22-00/201).

S 864-003
(2) Turn the L and R PACK selectors, on the overhead panel, P5, to the OFF position.
(a) Make sure the PACK OFF lights come on.
(b) Put DO-NOT-OPERATE tags on the selectors.

S 864-004
(3) Push the applicable (L or R) RECIRC FAN switch/lights, on the P5 panel, to the off position.
(a) Make sure the INOP light comes on.
(b) Put a DO-NOT-OPERATE tag on the RECIRC FAN switch/light.

S 014-005
(4) Open the No. 1 Cargo Door, 821 (AMM 06-46-00/201).

S 014-012
(5) To remove the left (right) recirculation filter, remove the left (right) recirculation filter access panel on the aft bulkhead of the forward cargo compartment (AMM 25-50-03/401).

F. Remove the Left Recirculation Filters

S 014-014
(1) Loosen the 1/4-turn studs on the cover of the forward face of the filter holder.

S 014-006
(2) Remove the cover.

S 024-224

WARNING: PUT ON THE PERSONAL PROTECTIVE EQUIPMENT BEFORE YOU TOUCH THE FILTER. THE FILTER REMOVES SMALL PARTICLES (SMOKE, DUST, LINT, FIBERS, POLLEN) AND INFECTIOUS MATERIALS (BACTERIA, VIRUSES, MOLD SPORES, FUNGI) FROM THE AIR WHICH CAN CAUSE ILLNESSES.

(3) Put on the personal protective equipment before you touch the filter.

S 024-235

WARNING: DO NOT LET THE FILTER TOUCH YOUR SKIN. DO NOT SHAKE OR HIT THE FILTER. DO NOT LET THE FILTER FALL. DO NOT USE COMPRESSED AIR TO CLEAN THE FILTER OR FILTER HOUSING. THIS CAN CAUSE THE INFECTIOUS MATERIAL TO BECOME AIRBORNE. DISCARD THE FILTER IN A DISPOSABLE PLASTIC BAG.

(4) Pull the prefilter out of the filter holder.

NOTE: The filter may be hard to move. It is held in position by springs which push the filter toward the mix manifold.

S 024-250

(5) Pull the high-efficiency (HEPA) filter out of the filter holder.

S 024-236

WARNING: PUT ALL THE AIR FILTERS THAT ARE REMOVED FROM THE AIRPLANE INTO DISPOSABLE PLASTIC BAGS. OBEY ALL OF THE AIRPLANE OPERATOR'S POLICIES, LOCAL HEALTH DEPARTMENT AND LAW ENFORCEMENT REGULATIONS FOR THE DISPOSAL OF THE MATERIAL.

(6) Put the filter(s) in disposable plastic bag(s) and discard in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 024-237

WARNING: DISCARD ALL PERSONAL PROTECTIVE EQUIPMENT AFTER YOU USE IT ONE TIME. DO NOT TRY TO CLEAN IT. DISCARD THE EQUIPMENT IN A DISPOSABLE PLASTIC BAG.

(7) Remove the personal protective equipment. Put the items in a disposable plastic bag and discard them in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 114-238

WARNING: CLEAN YOUR HANDS WITH SOAP AND RUNNING HOT WATER. DIRTY HANDS WITH CONTAMINATION CAN CAUSE DISEASE AND ILLNESSES.

(8) Clean your hands with soap and running hot water.

G. Remove the Right Recirculation Filters

S 014-036

(1) Remove the screws and washers from the forward face of the filter holder.

S 014-037

(2) Remove the top retainer.

S 024-239

WARNING: PUT ON THE PERSONAL PROTECTIVE EQUIPMENT BEFORE YOU TOUCH THE FILTER. THE FILTER REMOVES SMALL PARTICLES (SMOKE, DUST, LINT, FIBERS, POLLEN) AND INFECTIOUS MATERIALS (BACTERIA, VIRUSES, MOLD SPORES, FUNGI) FROM THE AIR WHICH CAN CAUSE ILLNESSES.

(3) Put on the personal protective equipment before you touch the filter.

S 024-240

WARNING: DO NOT LET THE FILTER TOUCH YOUR SKIN. DO NOT SHAKE OR HIT THE FILTER. DO NOT LET THE FILTER FALL. DO NOT USE COMPRESSED AIR TO CLEAN THE FILTER OR FILTER HOUSING. THIS CAN CAUSE THE INFECTIOUS MATERIAL TO BECOME AIRBORNE. DISCARD THE FILTER IN A DISPOSABLE PLASTIC BAG.

(4) Pull the high-efficiency (HEPA) filter out of the filter holder.

S 024-241

WARNING: PUT ON THE PERSONAL PROTECTIVE EQUIPMENT BEFORE YOU TOUCH THE FILTER. THE FILTER REMOVES SMALL PARTICLES (SMOKE, DUST, LINT, FIBERS, POLLEN) AND INFECTIOUS MATERIALS (BACTERIA, VIRUSES, MOLD SPORES, FUNGI) FROM THE AIR WHICH CAN CAUSE ILLNESSES.

(5) Put on the personal protective equipment before you touch the filter.

S 024-242

WARNING: DO NOT LET THE FILTER TOUCH YOUR SKIN. DO NOT SHAKE OR HIT THE FILTER. DO NOT LET THE FILTER FALL. DO NOT USE COMPRESSED AIR TO CLEAN THE FILTER OR FILTER HOUSING. THIS CAN CAUSE THE INFECTIOUS MATERIAL TO BECOME AIRBORNE. DISCARD THE FILTER IN A DISPOSABLE PLASTIC BAG.

(6) Pull the prefilter out of the filter support.

NOTE: The filter may be hard to move. It is held in position by springs which push the filter toward the mix manifold.

S 024-249

(7) Pull the high-efficiency (HEPA) filter out of the filter holder.

S 024-248

WARNING: PUT ALL THE AIR FILTERS THAT ARE REMOVED FROM THE AIRPLANE INTO DISPOSABLE PLASTIC BAGS. OBEY ALL OF THE AIRPLANE OPERATOR'S POLICIES, LOCAL HEALTH DEPARTMENT AND LAW ENFORCEMENT REGULATIONS FOR THE DISPOSAL OF THE MATERIAL.

(8) Put the filter(s) in disposable plastic bag(s) and discard in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 024-243

WARNING: DISCARD ALL PERSONAL PROTECTIVE EQUIPMENT AFTER YOU USE IT ONE TIME. DO NOT TRY TO CLEAN IT. DISCARD THE EQUIPMENT IN A DISPOSABLE PLASTIC BAG.

(9) Remove the personal protective equipment. put the items in a disposable plastic bag and discard them in accordance with the airplane operator's, local health, safety and regulatory procedures for the disposing of the material.

S 114-244

WARNING: CLEAN YOUR HANDS WITH SOAP AND RUNNING HOT WATER. DIRTY HANDS WITH CONTAMINATION CAN CAUSE DISEASE AND ILLNESSES.

(10) Clean your hands with soap and running hot water.

TASK 21-25-02-404-047

7. AIRPLANES WITH A TWO PIECE FILTER INSTALLATION;
Recirculation High-Efficiency Filter Installation (Fig. 401)

A. General

(1) There is a filter holder on each side of the mix manifold. The filters must be installed in the filter holders in this sequence:
(a) The high-efficiency (HEPA) filter
(b) The Prefilter.

B. References

(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) AMM 24-22-00/201, Electric Power Control
(3) AMM 25-50-03/401, Cargo Compartment-Bulkhead Lining

C. Access

(1) Location Zones
125 Area aft of the forward cargo compartment (Left)
126 Area aft of the forward cargo compartment (Right)

D. Install the Left Recirculation Filters

S 424-043
(1) Put the high-efficiency filter through the forward face of the filter holder.
(a) Push the filter inboard (to the mix manifold).

S 424-044
(2) Push the prefilter through the forward face of the filter holder.
(a) Push the filter against the high-efficiency filter.

S 414-045
(3) Put the cover assembly on the filter holder.

S 414-046
(4) Tighten the 1/4-turn studs (20 locations) to hold the cover in position.

E. Install the Right Recirculation Filters.

S 424-050
(1) Put the high efficiency filter through the forward face of the filter holder.
(a) Push the filter outboard (away from the mix manifold).

S 424-051
(2) Push the prefilter through the forward face of the filter holder.
(a) Push the filter against the high efficiency filter.

S 414-052
(3) Put the top retainer on the filter holder.

S 414-053
(4) Install washers and screws to hold the top retainer in position.

F. Put the Airplane Back to its Usual Condition

S 864-055
(1) Remove the DO-NOT-OPERATE tags from the L and R PACK selectors, on the P5 panel.

S 864-054
(2) Remove the DO-NOT-OPERATE tag from the applicable RECIRC FAN switch/light, on the P5 panel.

S 414-143
(3) Install the bulkhead lining (AMM 25-50-03/401) or the access panel that you removed.

S 414-080
(4) Install the access panel for the left (right) recirculation filter on the aft bulkhead of the forward cargo compartment (AMM 25-50-03/401).

S 414-079
(5) Close the No. 1 Cargo Door, 821 (AMM 06-46-00/201).

S 864-078
(6) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

RECIRCULATION AIR CHECK VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure has these tasks for the recirculation air check valve:
      (1) Recirculation Air Check Valve Removal
      (2) Recirculation Air Check Valve Installation
   B. The check valve for the left recirculation system is behind the left sidewall of the forward cargo compartment.
   C. The check valve for the right recirculation system is adjacent to the mix manifold at the aft end of the forward cargo compartment.

TASK 21-25-03-004-050

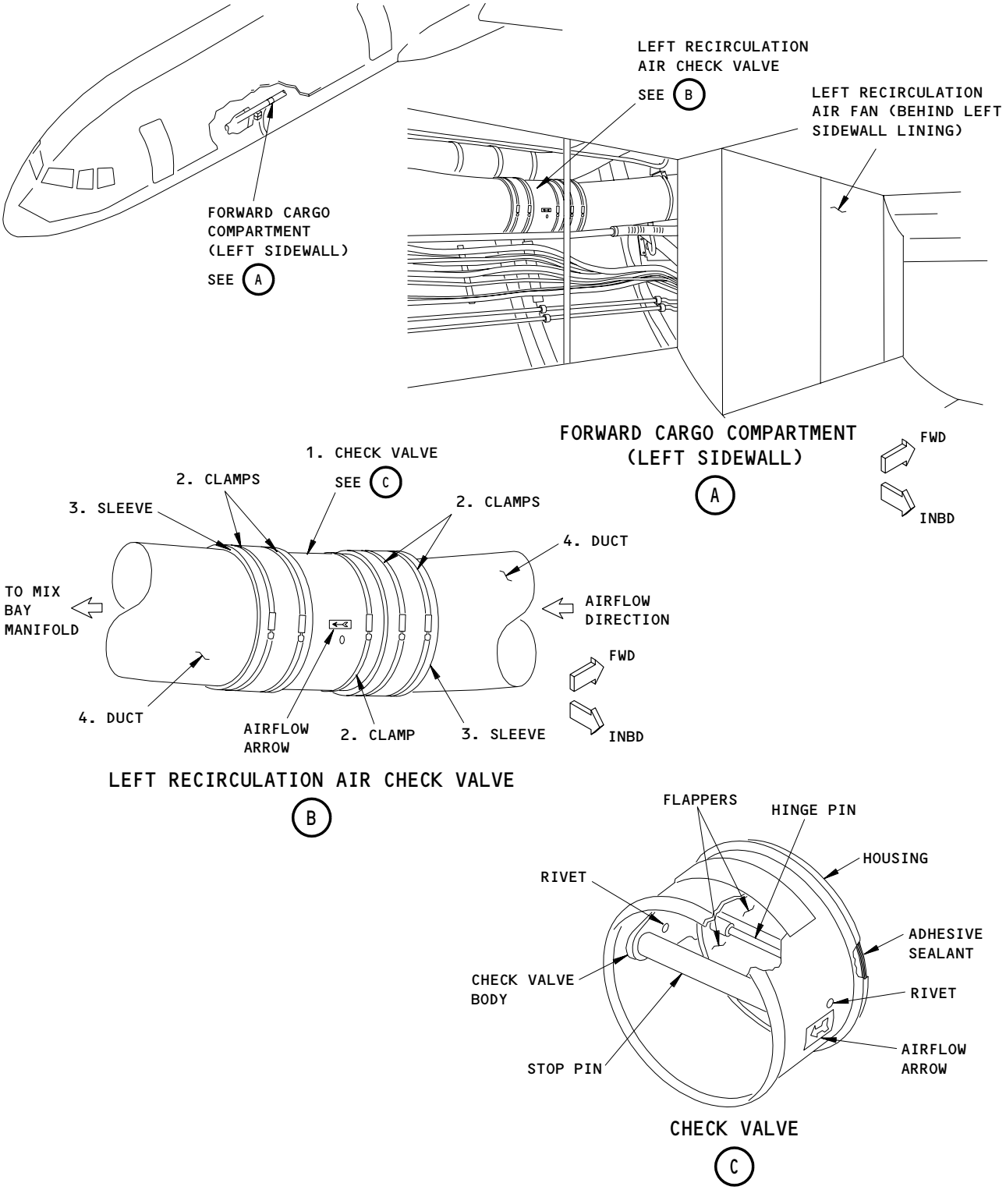
2. Recirculation Air Check Valve Removal (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electric Power Control
      (2) AMM 25-50-02/401, Sidewall Lining Panels
      (3) AMM 25-50-03/401, Bulkhead Lining
   B. Access
      (1) Location Zones
          121 Forward cargo compartment (Left)
          126 Area aft of forward cargo compartment (Right)

   C. Prepare for the Removal

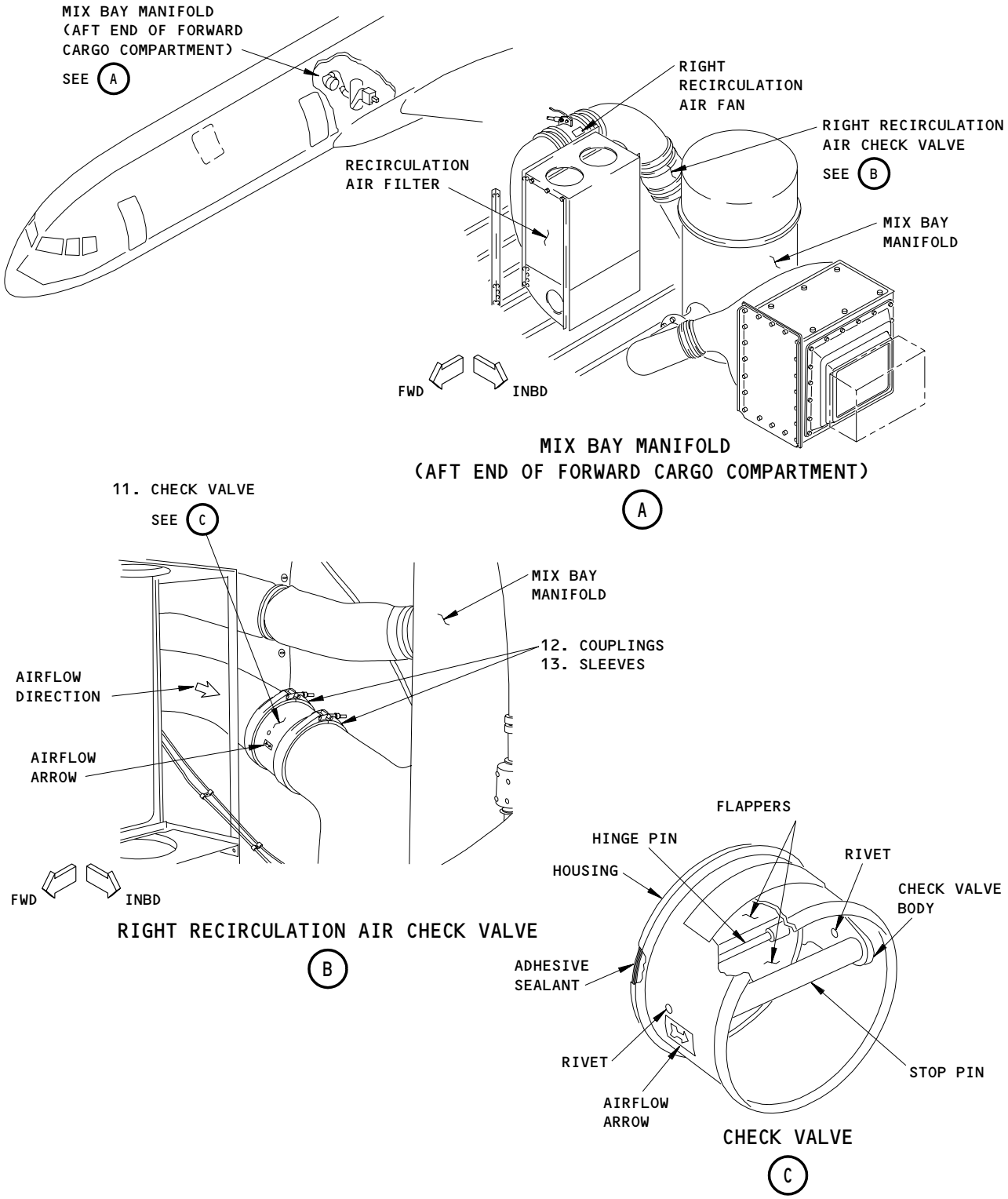
      S 864-051
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-052
      (2) Make sure the L and R PACK selectors, on the pilots P5 overhead panel, are set to the OFF position and attach DO-NOT-OPERATE tag.

      S 864-053
      (3) Make sure the L and R RECIRC FAN switch-lights, on the pilot's overhead P5 panel, are set to the off position (the ON lamp is off and the INOP lamp is illuminated), and attach DO-NOT-OPERATE tag.



Recirculation Air Check Valve Installation
Figure 401



Recirculation Air Check Valve Installation
Figure 401A

S 014-101
(4) Open the forward cargo compartment door.

D. Left Recirculation Air Check Valve Removal

S 014-088
(1) Get access to the left recirculation air check valve.
(a) Remove the left sidewall lining panel, approximately 5-6 feet (1.5-2.0 meters) aft of the forward end of the forward cargo compartment (AMM-25-50-02/401).
(b) Make sure the left recirculation fan is off.

S 034-061
(2) Remove the five (5) clamps from the check valve.

S 034-062
(3) Move the sleeves away from the check valve and onto the ducting.

S 344-063
(4) Remove the check valve.

S 434-064
(5) Put a cover on the duct openings.

E. Right Recirculation Air Check Valve Removal

S 014-055
(1) Get access to the right recirculation air check valve.
(a) Remove the bulkhead lining or the right access panel (if installed) at the aft end of the forward cargo compartment (AMM 25-50-03/401).
(b) Make sure the right recirculation fan is off.

S 024-057
(2) Remove both couplings from the check valve.

S 034-090
(3) Move both sleeves away from the check valve and onto the ducting.

S 024-059
(4) Remove the check valve.

S 434-060
(5) Put a cover on the duct openings.

TASK 21-25-03-404-069

3. Recirculation Air Check Valve Installation (Fig. 401)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Check Valve (Left)	21-25-05	01	100
401	1	Check Valve (Left)	21-25-05	02	100
401A	11	Check Valve (Right)	21-25-01	10A	110

B. References

(1) AMM 24-22-00/201, Electric Power Control
(2) AMM 25-50-02/401, Sidewall Lining Panels
(3) AMM 25-50-03/401, Bulkhead Lining

C. Access

(1) Location Zones
121 Forward cargo compartment (Left)
126 Area aft of forward cargo compartment (Right)

D. Left Recirculation Air Check Valve Installation

S 034-070
(1) Remove the covers from the duct openings.

S 424-077
(2) Put the check valve into position between both duct openings.
(a) Make sure the flow arrow on the check valve points aft to the mix bay manifold.
(b) Make sure the check valve hinge pin (shaft) is in a vertical orientation to permit free movement of the flappers.

S 424-073
(3) Move the sleeves onto the check valve.
(a) Make sure the sleeve overlaps each duct end by no more than 1.5 inches maximum.

S 414-074
(4) Install the clamps to the sleeves.
(a) Make sure each clamp is 0.25 inch from each end of the sleeve.
(b) Tighten each clamp 20-25 lb-inch (2.3-2.8 newton-meters).

S 424-100
(5) Install the clamp around the check valve.
(a) Tighten the clamp 8-12 lb-inch (0.9-1.3 newton-meters).

E. Right Recirculation Air Check Valve Installation

S 034-092
(1) Remove the covers from the duct openings.

S 424-093
(2) Put the check valve into position between both duct openings.
  (a) Make sure the flow arrow on the check valve points to the mix manifold.
  (b) Make sure the check valve hinge pin (shaft) is in a vertical orientation to permit free movement of the flappers.

S 424-094
(3) Move the sleeves onto the check valve.
  (a) Make sure each sleeve overlaps the check valve and each duct end.

S 434-072
(4) Install both couplings around the sleeves.
  (a) Make sure the coupling is seated evenly around the sleeve.
  (b) Tighten the T-bolt on each coupling 70-75 pound-inches (7.9-8.5 newton-meters).

F. Check Valve Post-Installation Leak Test

S 864-078
(1) Supply electrical power (AMM 24-22-00/201).

S 864-079
(2) Remove the DO-NOT-OPERATE tag and push the L (R) RECIRC FAN switch-light, on the pilot's overhead P5 panel, to the ON position.
  (a) Make sure the recirculation fan operates.

S 214-080
(3) Make sure there is no air leaks around the check valve.

G. Put the airplane back to its usual condition

S 864-104
(1) Push the RECIRC FAN switch-light to the off position.

S 864-083
(2) Remove the DO-NOT-OPERATE tag from the L and R PACK selectors, on the P5 panel.

S 414-105
(3) Reinstall the left sidewall lining in the forward cargo compartment (AMM 25-50-02/401).

S 414-106
(4) Install the bulkhead lining and access panel in the forward cargo compartment (AMM 25-50-03/401).

S 414-082
(5) Close the forward cargo compartment door.

S 864-084
(6) Remove the electrical power (AMM 24-22-00/201).

RECIRCULATION AIR CHECK VALVE - INSPECTION/CHECK

1. General
   A. This procedure has instructions to make sure the left and right recirculation check valves operate correctly and are not damaged or worn out.

TASK 21-25-03-206-001

2. Do the Recirculation Air Check Valve Inspection (Fig. 601)
   A. References
      (1) 21-25-03/401, Recirculation Air Check Valve
   B. Access
      (1) Location Zones
          121 Forward cargo compartment (Left)
          126 Area aft of the forward cargo compartment (Right)
   C. Examine the Recirculation Air Check Valve

S 026-002

(1) Remove the applicable (left or right) check valve (Ref 21-25-03).

S 216-004

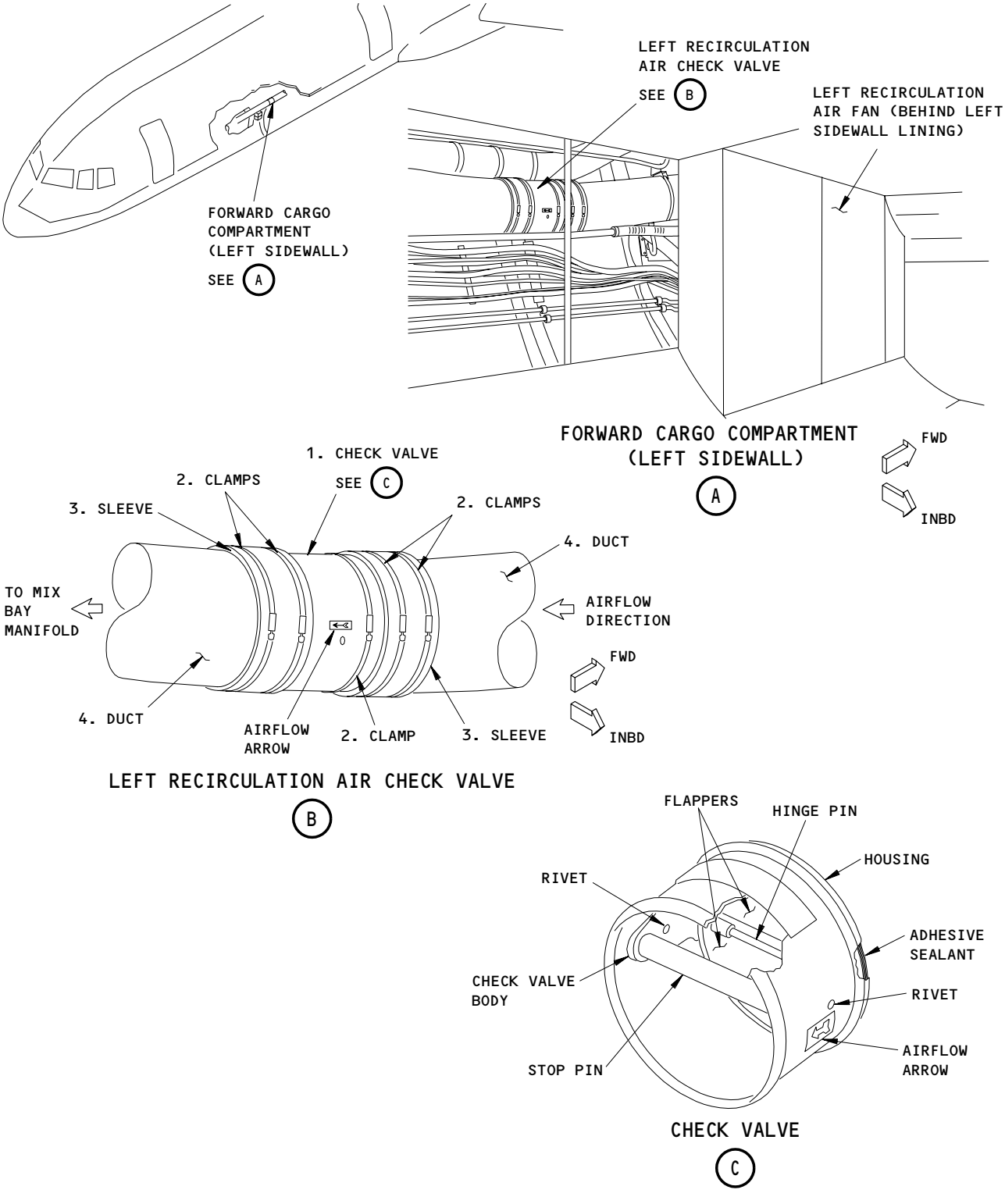
(2) Look for these conditions on the check valve:
   (a) A part of the check valve is not installed.
   (b) The housing is cracked or corroded.
   (c) The flappers do not move freely.
   (d) The area of the flapper that contacts the stop pin is less than .03 inches in thickness.
   (e) The surfaces beween the flapper and the housing has carbon deposits or is not equally worn.
   (f) The hinge pin can come out of the flappers or the housing.

S 906-005

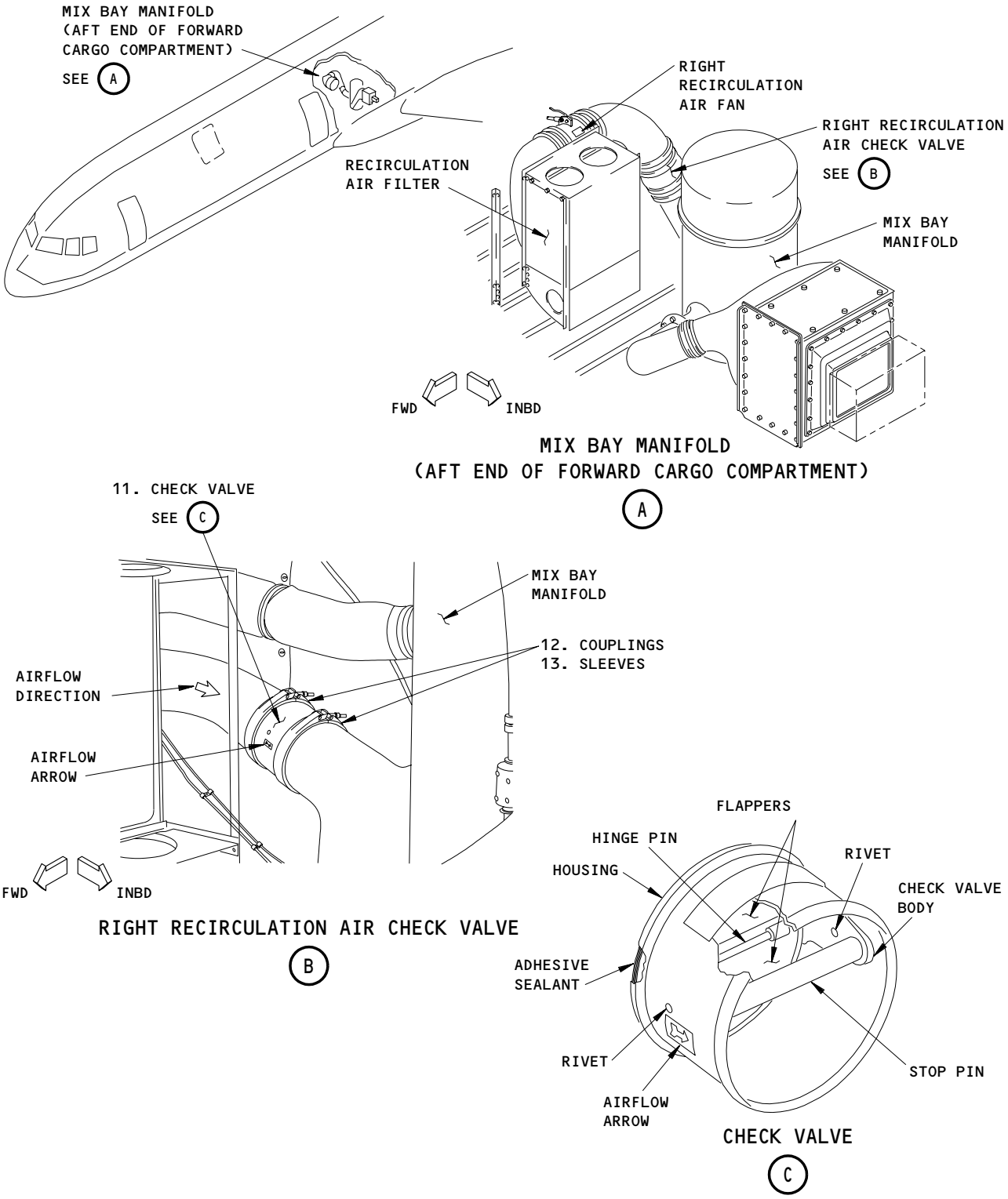
(3) If any of these conditions are found, then install a new check valve (Ref 21-25-03).

S 426-006

(4) If none of these conditions are found, then install the same check valve (Ref 21-25-03).



Recirculation Air Check Valve Inspection
Figure 601



Recirculation Air Check Valve Inspection
Figure 601A

VENTILATION SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The Aft Equipment/Lavatory/Galley Ventilation System provides cooling for the aft electrical/electronic (E/E) equipment center (AMM 21-58-00/001) and ventilation for the lavatories and galleys.
   B. The ventilation system consists of these components:
      (1) A galley ventilation filter in each galley
      (2) Two aft equipment/lavatory/galley vent fans
      (3) Two vent fan check valves.

          NOTE: Vent fans with the electrical connector installed on the top of the vent fan have an internal check valve which cannot be removed. Vent fans with the electrical connectors installed on the side of the vent fan have external check valves which can be removed.

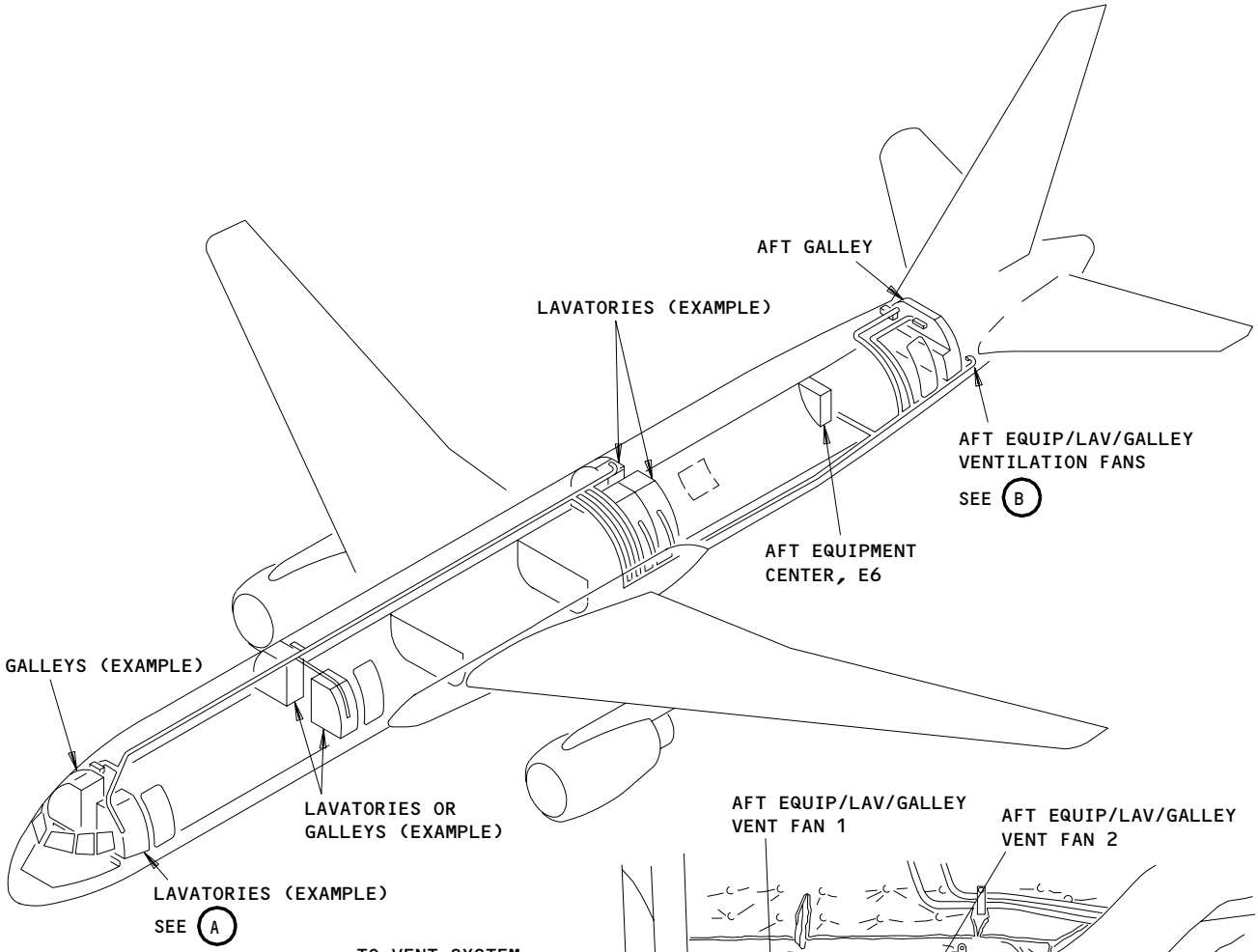
2. Component Details
   A. Aft Equipment/Lavatory/Galley Ventilation Fan
      (1) Physical Description
          (a) Two identical, redundant fans are located in the aft cargo compartment, just forward of the aft pressure bulkhead. The fans operate on 115v ac, 3 phase, 400Hz power.
          (b) The fans contain the components that follow:
              1) An electric motor.
              2) A thermal switch in each motor winding.

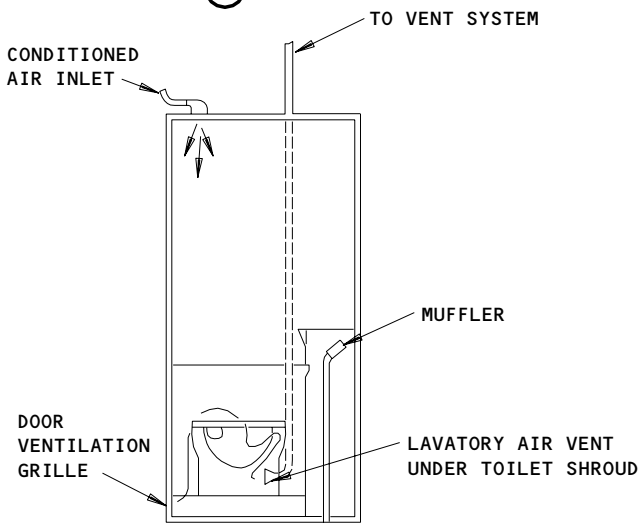
                 NOTE: The thermal switches open if a winding reaches 400°F (218°C). The thermal switch resets when the winding cools to 340°F (180°C).

              3) A single stage vane-axial blade.
              4) VENT FANS WITH THE ELECTRICAL CONNECTOR ON THE TOP OF THE FAN;
                 An internal check valve.

                 NOTE: The check valve prevents backflow through the valve.

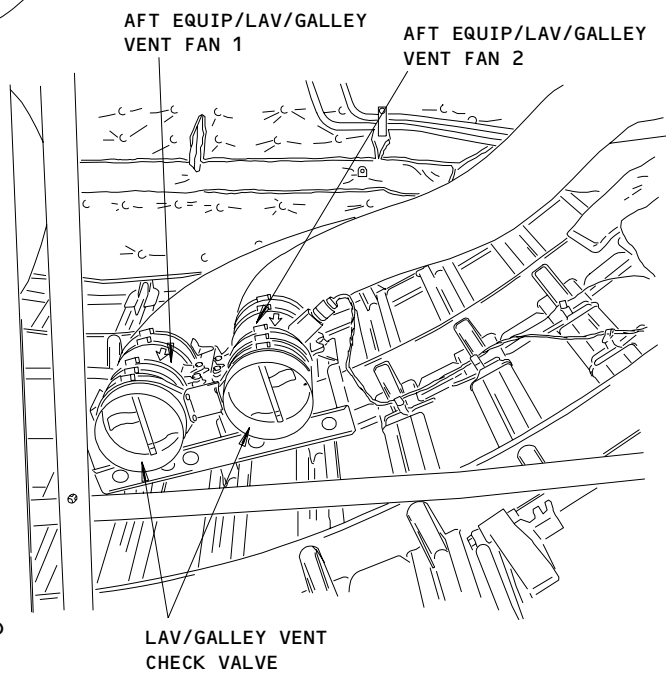
   B. GUI 001-006, 115;
      Fan Check Valve
      (1) Physical Description
          (a) A fan check valve is located just downstream of each aft equip/lav/galley vent fan. The valve consists of two semi-circular flapper doors attached to a centered hinge pin, and a torsional spring which closes the check valve.





LAVATORY VENTILATION

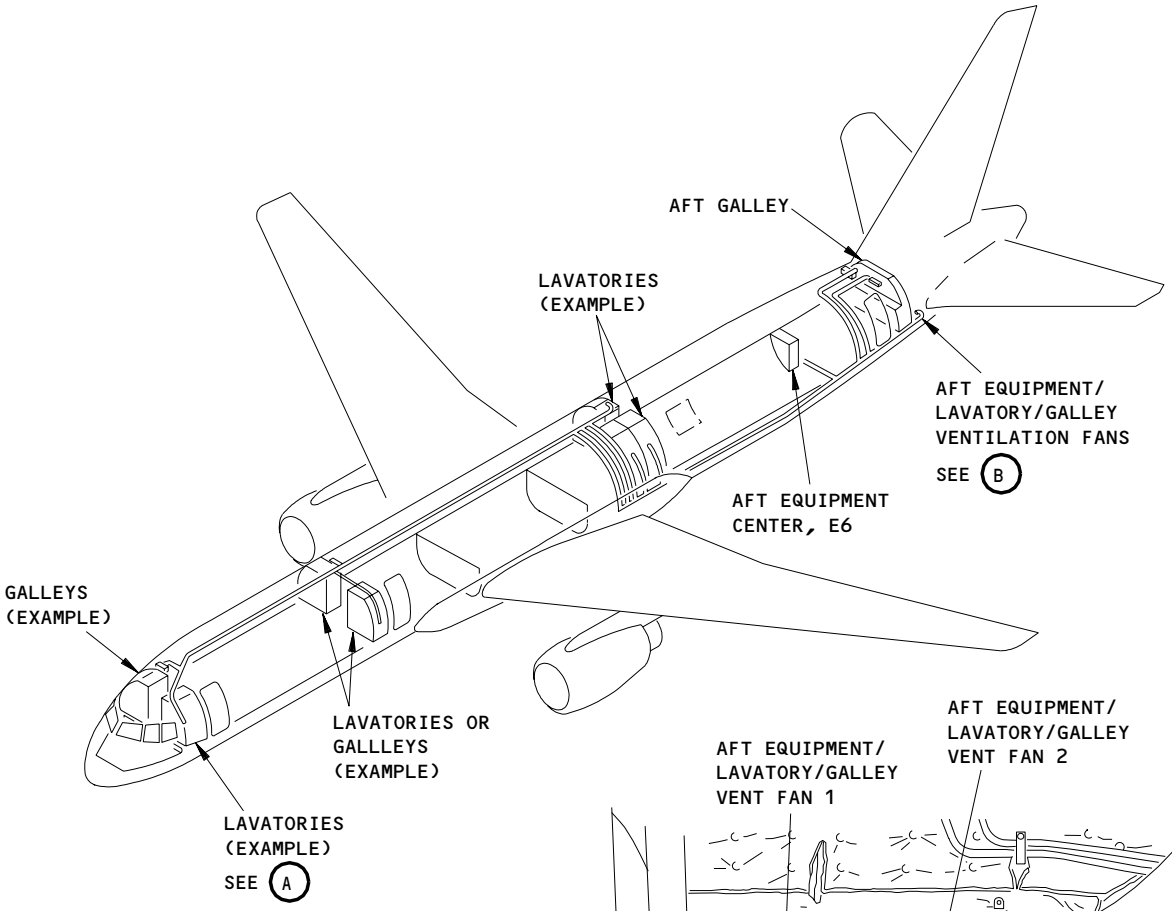
A

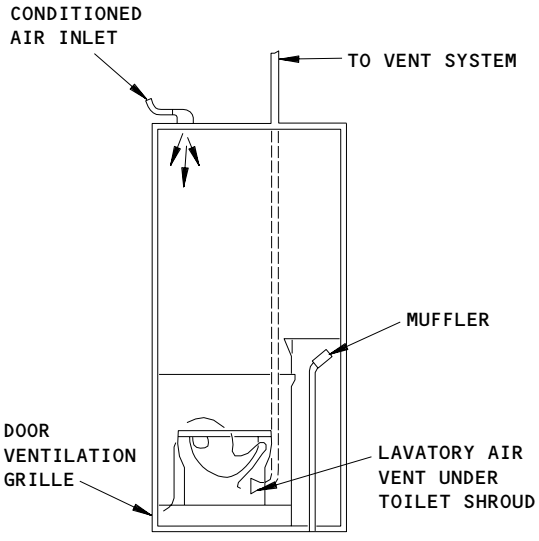


AFT EQUIP/LAV/GALLEY VENT FAN

B

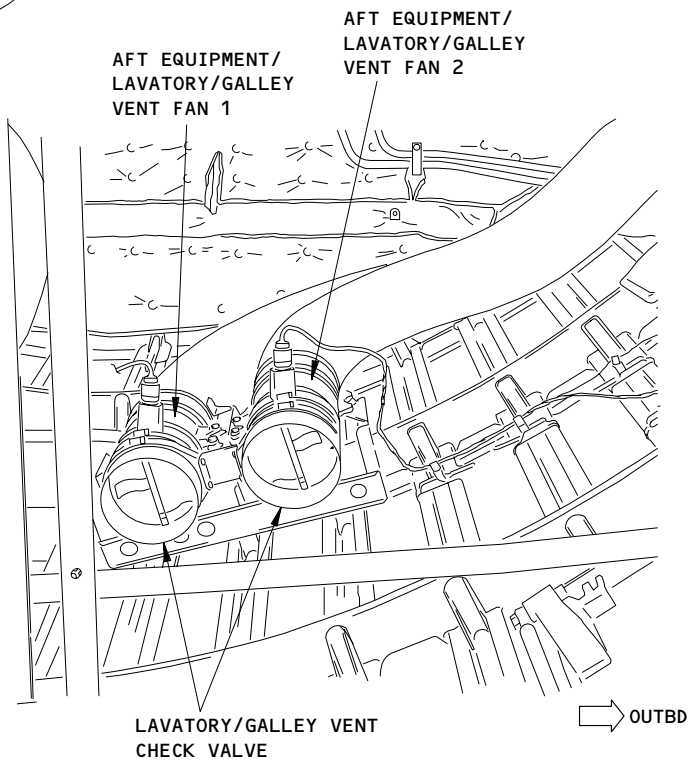
Ventilation System
Figure 1





LAVATORY VENTILATION

A



AFT EQUIPMENT/LAVATORY/GALLEY VENTILATION FANS
(VIEW IN THE AFT DIRECTION)

B

Ventilation System
Figure 1A

H52445

(2) Function

(a) Airflow, in the direction of an arrow on the body of the check valve, overcomes the spring force and drives the flappers open. A stop-pin limits the flapper door travel. Reverse airflow will aid the spring in closing the valve flappers, preventing backflow through the valve.

C. Galley Ventilation Filter

(1) Physical Description

(a) The galley ventilation filter press-fits into a ventilation inlet in each galley. The filter is made of open-weave fiberglass batting. The filter prevents foreign material from being drawn into the overhead ducting.

3. Operation (Fig 2)

A. Functional Description

(1) Normal Operation

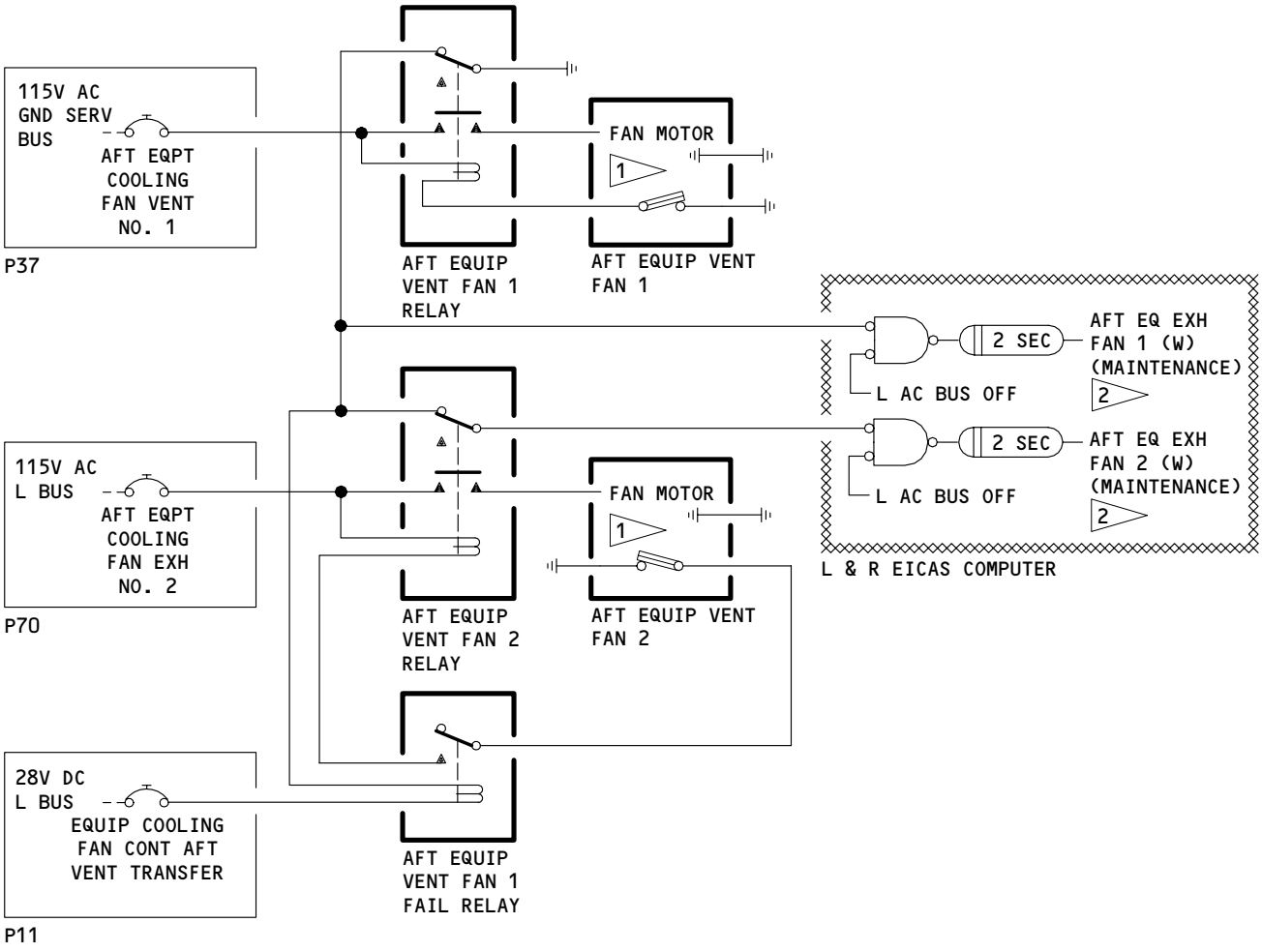
(a) The operating aft equip/lav/galley vent fan draws air out of the lavatories from beneath the toilet shroud, and out of the galleys through a ventilation filter, into the overhead ducting. The vent fan cools the E/E racks by a draw thru process. The air from all three areas is drawn to the check valve, where it is exhausted in the area of the outflow valve. The fan check valve prevents air from passing back through the non-operating fan.

(b) The Aft Equipment/Lavatory/Galley Ventilation Fan 1 is the primary fan. The Aft Equip/Lav/Galley Vent Fan 1 Relay is energized if the system finds a ground through the fan 1 thermal switches. The energized relay provides 115v ac power to fan 1.

(c) If fan 1 does not run, fan 2 will automatically provide back-up ventilation. The vent fan 2 relay is energized if the thermal switches are closed and the fan 1 fail relay finds a ground. The fan 1 fail relay finds a ground, common to both fans, if the fan 1 relay is relaxed. Once the vent fan 2 relay is energized, it supplies 115v ac power to operate fan 2.

(2) Failure Indication

(a) An EICAS maintenance message AFT EQ EXH FAN 1 will be displayed if fan 1 does not operate. An EICAS maintenance message AFT EQ EXH FAN 2 will be displayed when fan 2 fails to operate.



1 ONE SW PER WINDING
2 STORED IN NONVOLATILE MEMORY

Aft Equipment/Lavatory/Galley Ventilation Fans Schematic
Figure 2

216937

VENTILATION SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has instructions to do the operational test for the ventilation system. The ventilation system pulls air from the equipment cooling system, the lavatories, and the galleys, to the cabin pressure outflow valve.

TASK 21-26-00-705-013

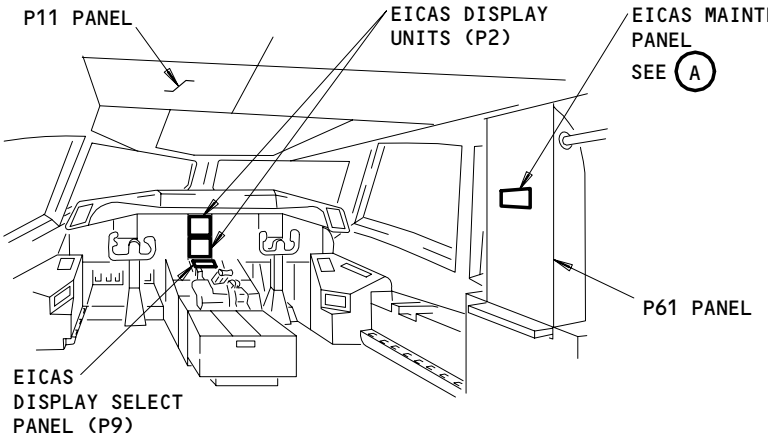
2. Operational Test - Ventilation System (Fig. 501)
   A. References
      (1) 06-41-00/201, Fuselage, Access Doors, and Panels
      (2) 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
      (3) 24-22-00/201, Electrical Power Control
      (4) 25-50-02/401, Cargo Compartment Sidewall Panels
      (5) 25-50-03/401, Bulkhead Lining
      (6) 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
   B. Prepare for the Test

      S 865-002
      (1) Supply the electrical power (Ref 24-22-00).

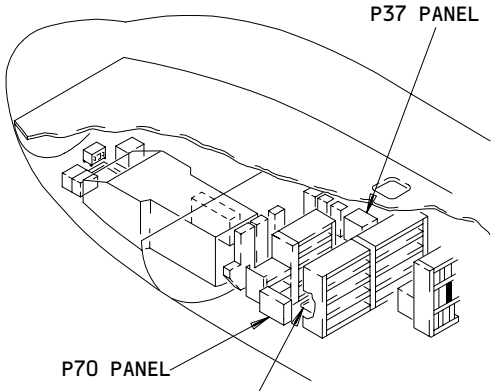
      S 865-003
      (2) Make sure these circuit breakers, on the overhead circuit breaker panel P11, are closed:
         (a) EICAS circuit breakers (5 places)
         (b) 11N11, EQUIP COOLING FAN CONT AFT EXH XFR

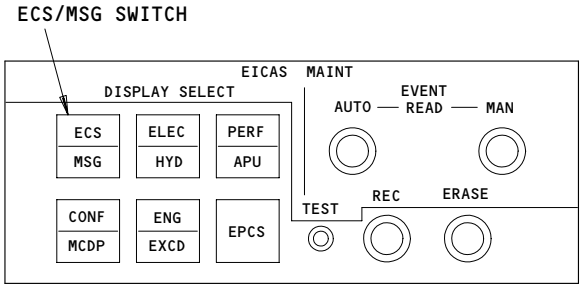
      S 015-004
      (3) Open the access door for the main equipment center, 119BL (Ref 06-41-00).

      S 865-005
      (4) Make sure these circuit breakers are closed:
         (a) On the right miscellaneous electrical equipment panel P37:
            1) 37D5, AFT EQPT COOLING FAN EXH NO. 1



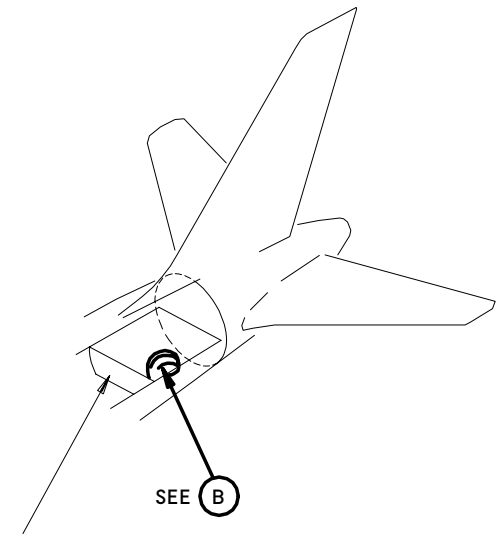
FLIGHT COMPT

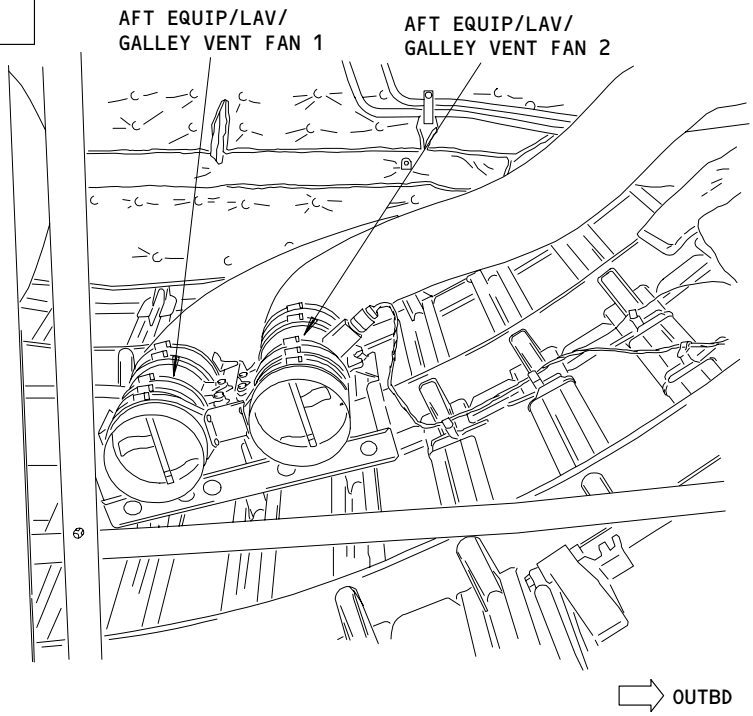




EICAS MAINTENANCE PANEL

A

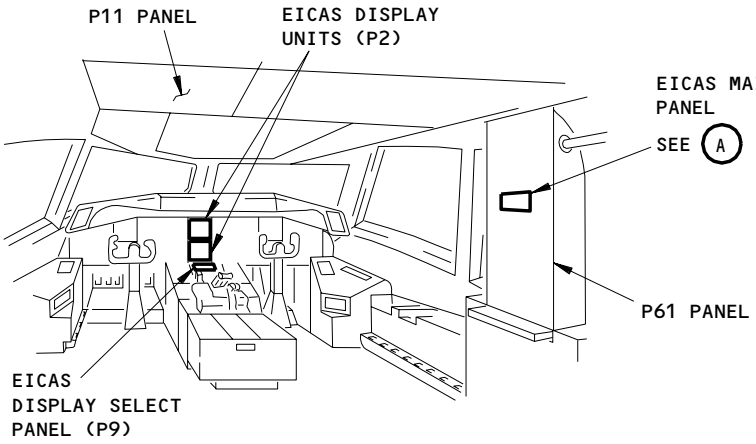




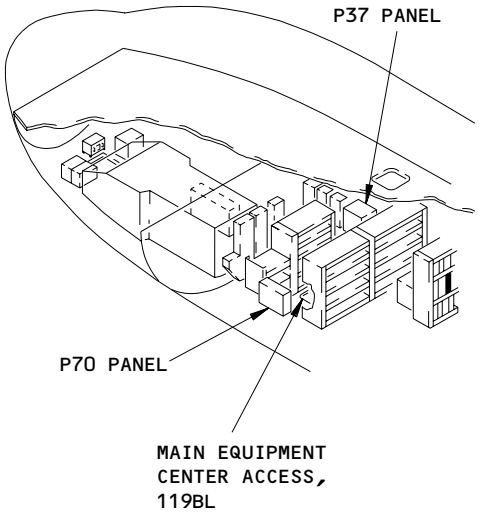
AFT EQUIP/LAV/GALLEY VENTILATION FANS
(VIEW LOOKING AFT)

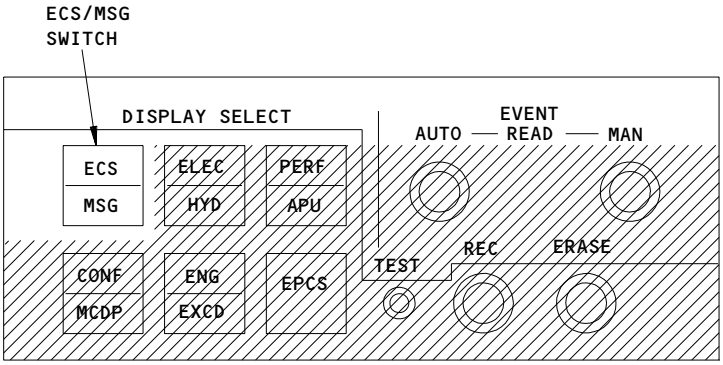
B

Ventilation System Test
Figure 501



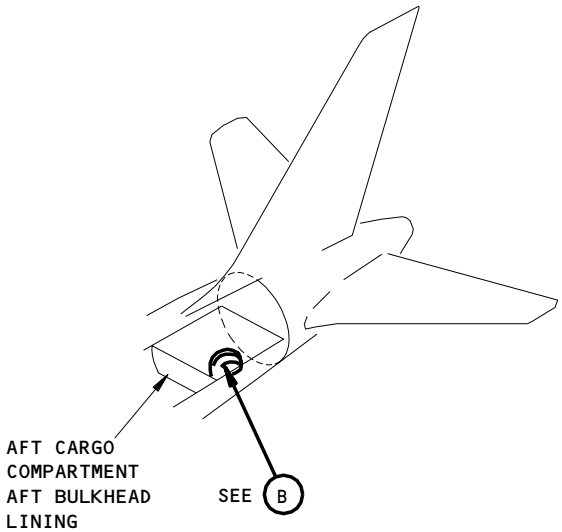
FLIGHT COMPARTMENT

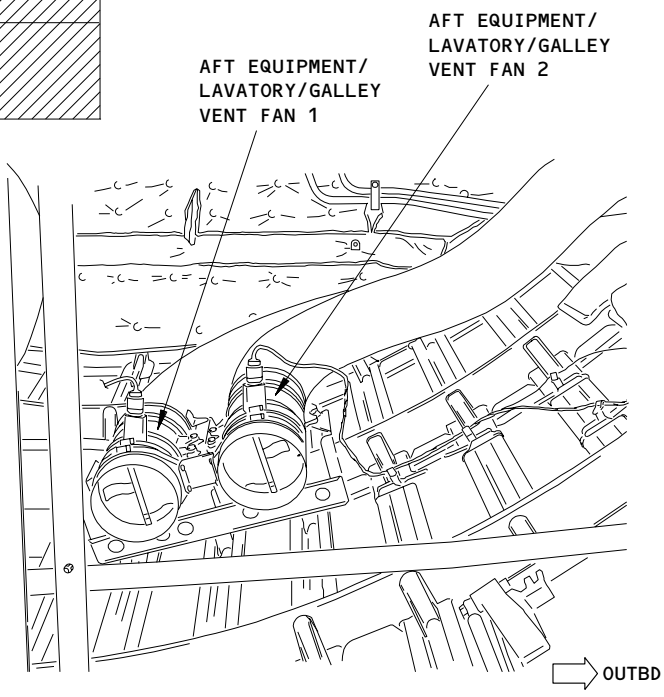




EICAS MAINTENANCE PANEL

A



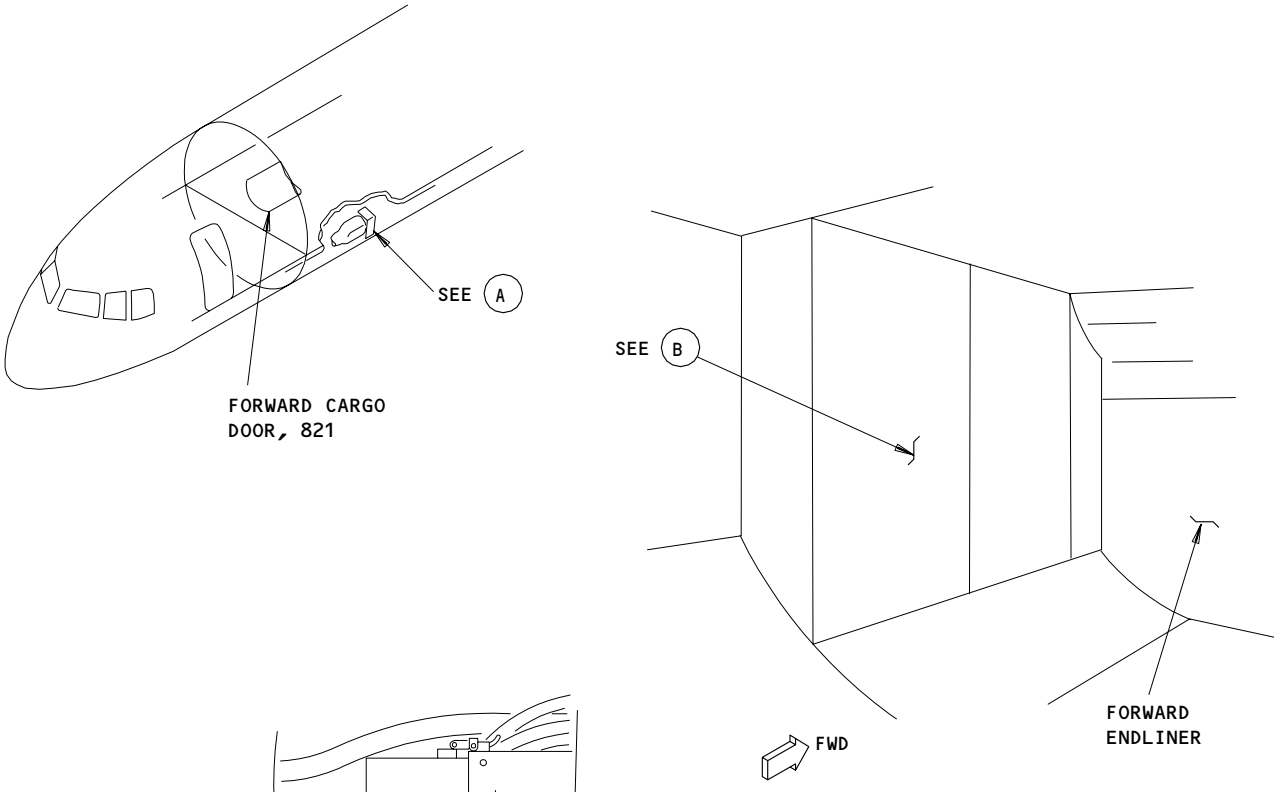


AFT EQUIPMENT/LAVATORY/GALLEY VENTILATION FANS
(VIEW IN THE AFT DIRECTION)

B

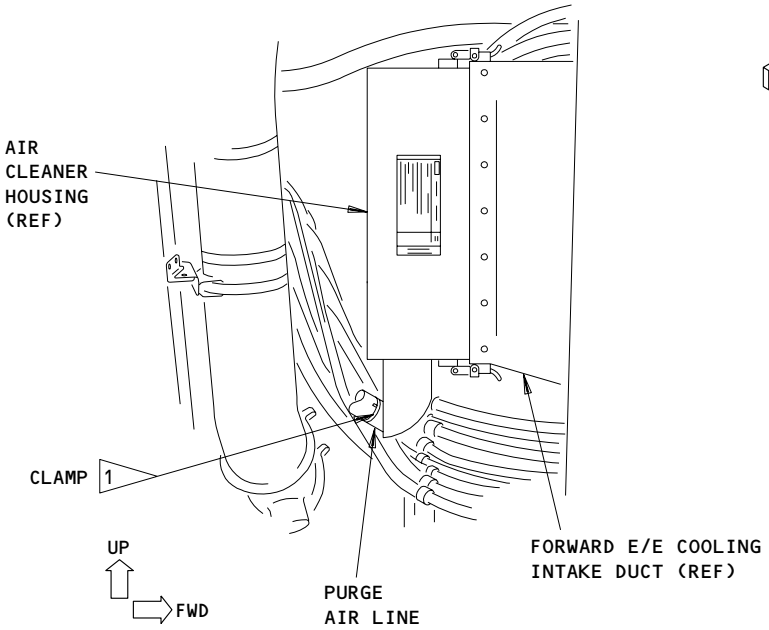
Ventilation System Test
Figure 501A

H52517



FORWARD CARGO COMPT

A

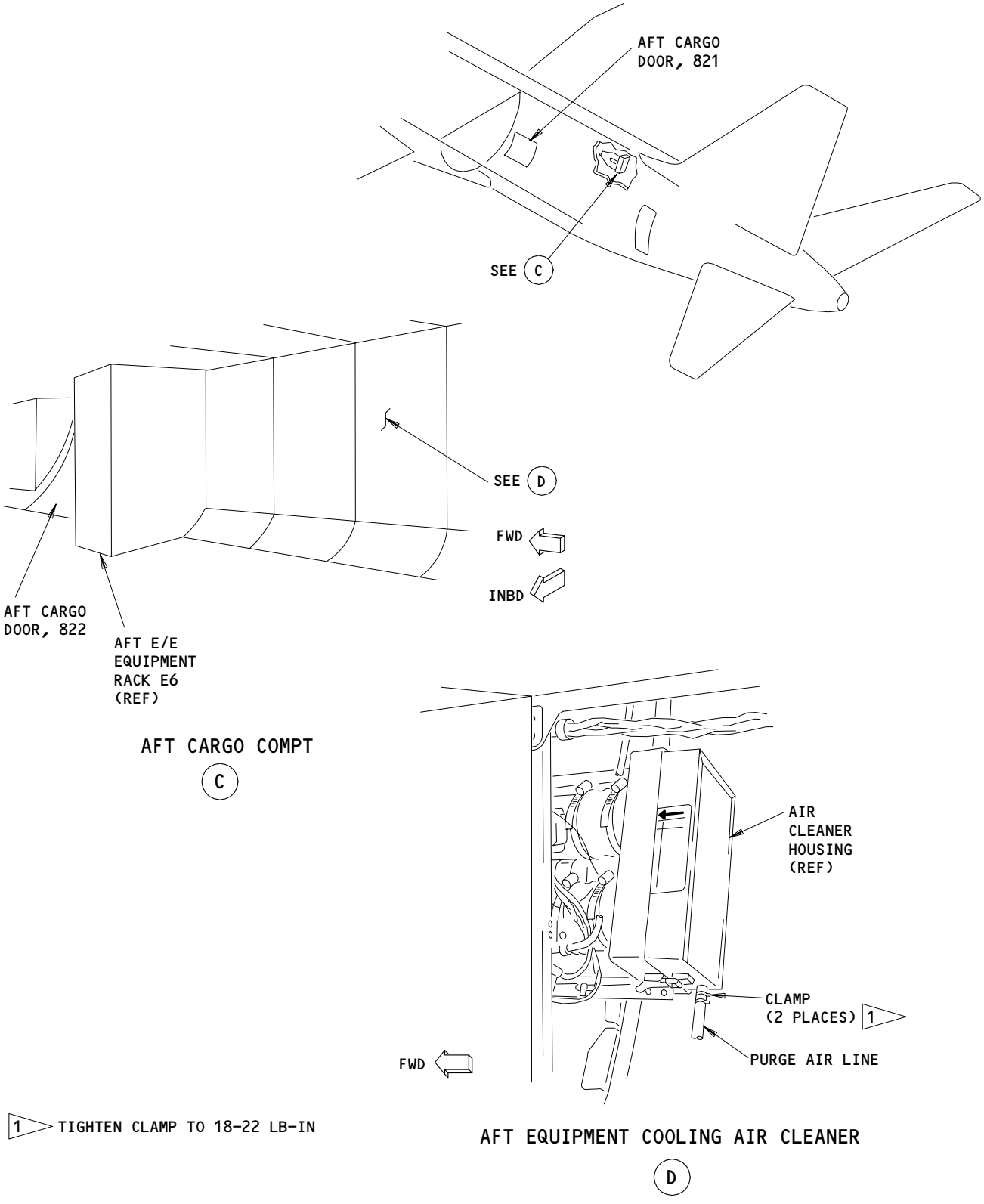


FORWARD EQUIPMENT COOLING AIR CLEANER

B

1 TIGHTEN CLAMP TO 18-22 LB-IN

Ventilation System Test
Figure 502 (Sheet 1)



Ventilation System Test
Figure 502 (Sheet 2)

(b) On the miscellaneous electrical equipment panel P70:
1) 70B2, AFT EQPT COOLING FAN EXH NO. 2

S 015-006
(5) Open the aft cargo door, 822 (Ref 06-46-00).

S 015-007
(6) Remove the aft bulkhead lining (AMM 25-50-03/401) from the bulk cargo compartment.

C. Operational Test Procedure

S 715-008
(1) Do the Ventilation System Operational Test.

CAUTION: IF THE VENT FAN 1 IS ON AND NO AIRFLOW IS FELT AT THE FAN 1 OUTLET, IMMEDIATELY OPEN THE CIRCUIT BREAKER 37D5, AFT EQPT COOLING FAN EXH 1, ON THE P37 PANEL. FAILURE TO OPEN THIS CIRCUIT BREAKER MAY CAUSE DAMAGE TO THE FAN.

(a) Make sure the vent fan 1 is on.
(b) Feel for airflow from the fan 1 outlet.
(c) Make sure the air does not flow into the fan 2 outlet.
(d) Do the EICAS Maintenance Message Erase procedure (AMM 31-41-00/201).
(e) Make sure these EICAS messages do not show on the lower display when the EICAS COMPUTER switch is in the L and R position.
1) AFT EQ EXH FAN 1
2) AFT EQ EXH FAN 2
(f) Open this circuit breaker on the P37 panel:
1) 37D5, AFT EQPT COOLING FAN EXH NO. 1
(g) Make sure the vent fan 1 goes off and vent fan 2 comes on.

CAUTION: IF THE VENT FAN 2 IS ON AND NO AIRFLOW IS FELT AT THE FAN 2 OUTLET, IMMEDIATELY OPEN THE CIRCUIT BREAKER 70B2, AFT EQPT COOLING FAN EXH 2, ON THE P70 PANEL. FAILURE TO OPEN THIS CIRCUIT BREAKER MAY CAUSE DAMAGE TO THE FAN.

(h) Feel for airflow from the fan 2 outlet.
(i) Make sure the air does not flow into the fan 1 outlet.
(j) Make sure the EICAS message AFT EQ EXH FAN 1 shows on the lower display with the EICAS COMPUTER select switch in the L and R positions.
(k) Open this circuit breaker on the P70 panel:
1) 70B2, AFT EQPT COOLING FAN EXH NO. 2
(l) Make sure the EICAS message AFT EQ EXH FAN 2 shows on the lower display with the EICAS COMPUTER select switch in the L and R positions.
(m) Close this circuit breaker on the P37 panel:
1) 37D5, AFT EQPT COOLING FAN EXH NO. 1
(n) Close this circuit breaker on the P70 panel:
1) 70B2, AFT EQPT COOLING FAN EXH NO. 2

(o) Do the EICAS Maintenance Message Erase procedure (AMM 31-41-00/201).

(p) Make sure these EICAS messages do not show on the lower display when the EICAS COMPUTER switch is in the L and R position.

1) AFT EQ EXH FAN 1

2) AFT EQ EXH FAN 2

D. Put the Airplane Back to Its Usual Condition

S 415-009

(1) Install the aft bulkhead lining in the bulk cargo compartment (AMM 25-50-03/401).

S 415-010

(2) Close the aft cargo door, 822 (Ref 06-46-00).

S 415-011

(3) Close the access door for the main equipment center, 119BL (Ref 06-41-00).

S 865-012

(4) Remove the electrical power if it is not necessary (Ref 24-22-00).

TASK 21-26-00-705-014

3. Lavatory/Galley Ventilation Health Check (Fig. 502)

A. General

(1) This task has the steps to determine if the lavatory and galley vents have an adequate flow rate. In normal operation, the lavatories have negative pressure relative to the passenger cabin. When the vents become clogged, the lavatory and galley air will not be discarded overboard.

B. Equipment

(1) Air Velocity Meter (10 to 1000 feet per minute range), TSI Velocicalc 8345 or 8350 (or equivalent)

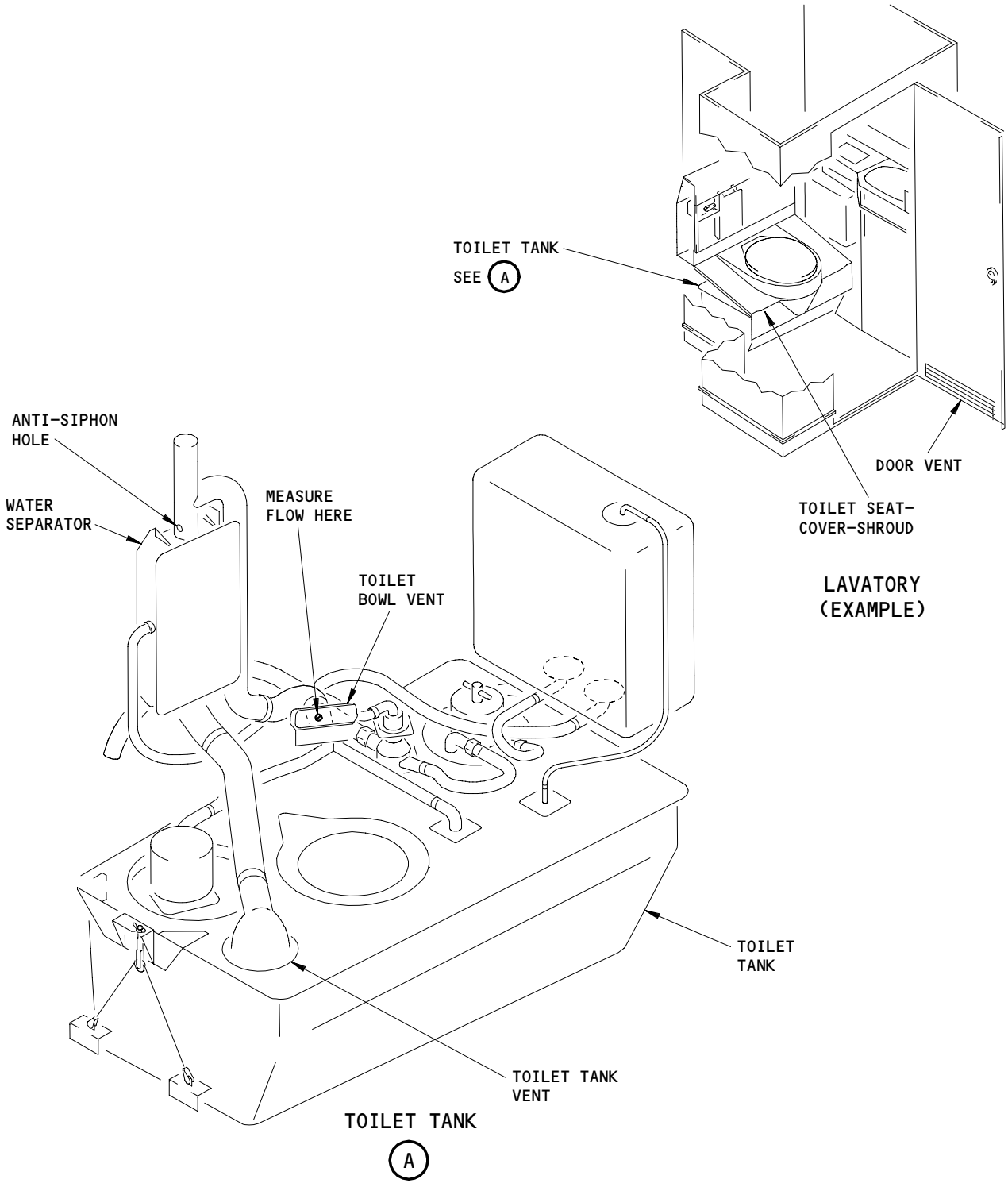
C. References

(1) AMM 06-41-00/201, Fuselage, Access Doors, and Panels

(2) AMM 21-26-03/401, Galley Ventilation Filter

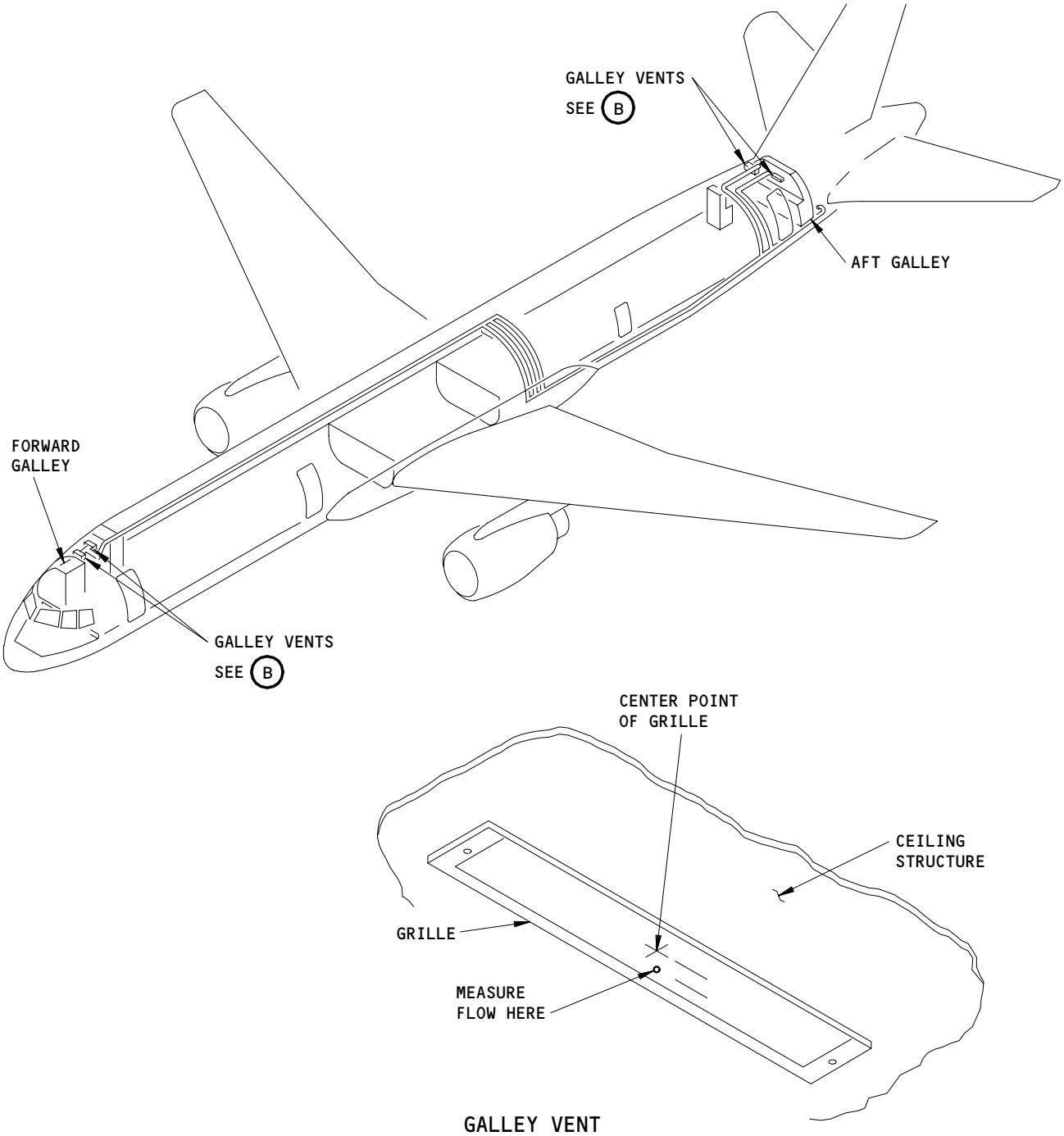
(3) AMM 24-22-00/201, Electrical Power Control

(4) AMM 38-32-01/401, Toilet Tank



NOTE: TOILET BOWL NOT SHOWN

Lavatory/Galley Ventilation Health Check
Figure 503 (Sheet 1)



GALLEY VENT
(EXAMPLE)

B

Lavatory/Galley Ventilation Health Check
Figure 503 (Sheet 2)

D. Access
(1) Location Zones
231 Passenger cabin - section 43 (LH side)
232 Passenger cabin - section 43 (RH side)
251 Passenger cabin - section 46 (LH side)
252 Passenger cabin - section 46 (RH side)
(2) Access Panel
119BL Main equipment center

E. Prepare for the Test

S 865-015
(1) Supply the electrical power (AMM 24-22-00/201).

S 015-016
(2) Open the access door for the main equipment center, 119BL (AMM 06-41-00/201).

S 865-017
(3) Make sure these circuit breakers are closed:
(a) On the overhead circuit breaker panel P11:
1) 11N10, EQUIP COOLING FAN CONT AFT EXH 1
2) 11N19, EQUIP COOLING FAN CONT AFT EXH 2
(b) On the right miscellaneous electrical equipment panel P37:
1) 37D5, AFT EQPT FANS EXH 2
(c) On the miscellaneous electrical equipment panel P70:
1) 70B2, AFT EQPT FANS EXH 1

S 215-018
(4) Make sure the ventilation fans are on.

NOTE: The ventilation exhaust air will come out of the outflow valve.

S 865-019
(5) Move the L and R RECIRC FAN switches on the air conditioning control panel, P5, to the ON position.

S 215-020
(6) Make sure no EICAS messages for the equipment cooling system show.

F. Lavatory Ventilation Health Check

S 215-035
(1) Make sure the lavatory door vents (Grille) are clean, not blocked, and not damaged to ensure proper airflow through the door vents.

S 715-021
(2) Put a piece of 4-inch by 4-inch piece of tissue paper against the vent on the lavatory door.

S 715-022

(3) If the air flow into the lavatory holds the tissue paper against the grille, then there is adequate ventilation.

S 715-023

(4) If the piece of tissue falls off the grille, then do the steps that follow:

(a) Remove the toilet shroud (AMM 38-32-01/401).

NOTE: You do not have to remove the toilet bowl to measure the air velocity at the toilet bowl vent.

(b) Make sure the vent lines are connected and are free of kinks.

(c) Make sure the antisiphon hole on the water separator is free of blockage.

(d) Measure the air velocity in the center of the bowl vent opening.

(e) If the airflow is 750 feet per minute, then the ventilation is adequate.

(f) If the airflow is less than 750 feet per minute, then there is a problem with the ventilation system.

(g) If there is a problem with the ventilation system, then do a check of the ventilation system as follows:

1) Make sure the hoses that connect the water separator to the bowl rim and tank are not blocked.

NOTE: Most of the ventilation air flows through the bowl vent.

2) Make sure the hose that connects the lavatory to the main ventilation duct is not kinked, blocked or disconnected.

3) Make sure the anti-siphon hole is not clogged.

4) Make sure the lavatory/galley vent fan operates correctly (AMM 21-26-00/501).

5) Make sure the main lavatory/galley ventilation duct is not broken and does not have blockage.

6) Make sure the check valve for the ventilation fan is not failed closed or failed open.

G. Galley Ventilation Health Check

S 715-024

(1) Hold the air velocity probe 0.5 inch below the center of the galley vent grilles.

(a) Make a record of the air velocity for each galley vent.

S 715-025

(2) If the velocity is 75 feet per minute, then there is adequate flow.

S 715-026

(3) If the air velocity is less than 75 feet per minute, then there is a problem with the ventilation system:

S 215-027

(4) If there is a problem with the ventilation system, then do a check of the ventilation system as follows:
   (a) Make sure the hose that connects the galley to the main ventilation duct is not kinked, blocked or disconnected.
   (b) Make sure the galley filter pad is not clogged.
      1) If the galley filter pad is clogged, then replace the pad (AMM 21-26-03/401).
   (c) Make sure the lavatory/galley vent fan operates correctly (AMM 21-26-00/501).
   (d) Make sure the main lavatory/galley ventilation duct is not broken or have blockage.
   (e) Make sure the check valve for the ventilation fan is not failed closed or failed open.

H. Put the Airplane Back to Its Usual Condition

S 415-028

(1) Close the access door for the main equipment center, 119BL (AMM 06-41-00/201).

S 865-029

(2) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

AFT EQUIPMENT VENTILATION FAN - REMOVAL AND INSTALLATION

1. General
   A. The aft equipment ventilation fans are installed aft of the bulk cargo compartment. The fans are interchangeable. The fans operate, one at a time, to draw air through the areas that follow:
      (1) The lavatories
      (2) The galleys
      (3) The aft electrical equipment center.

TASK 21-26-01-004-001

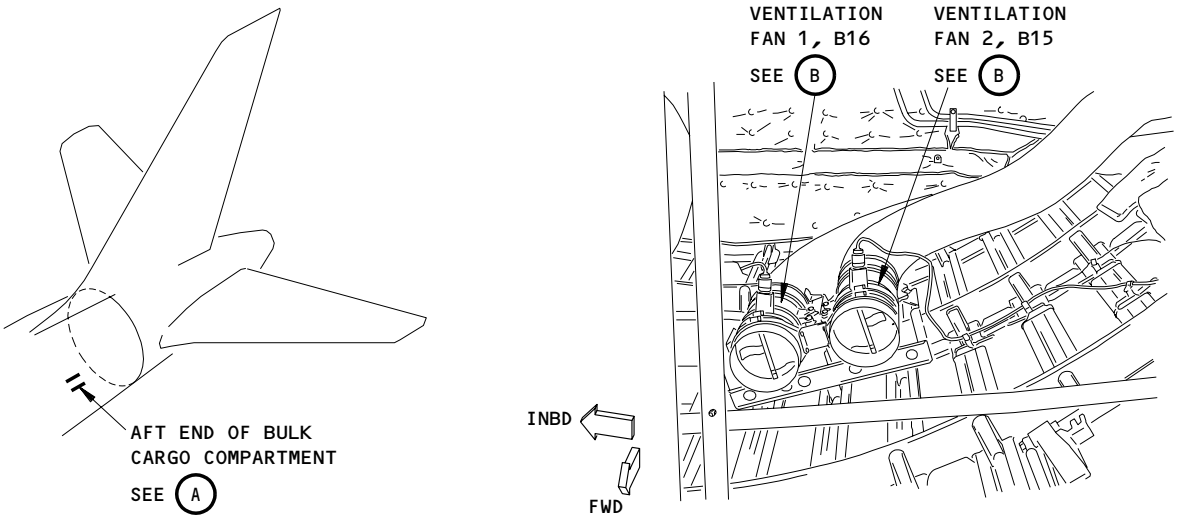
2. Remove the Aft Equipment Ventilation Fan (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry Service and Cargo Doors, Access Doors and Panels
      (2) AMM 25-50-03/401, Cargo Compartment Bulkhead Lining
   B. Access
      (1) Location Zones
          165 Area aft of bulk cargo compartment (Left)
   C. Prepare for the Removal

      S 864-002
      (1) Do the steps that follow to remove the No. 1 fan (4):
          (a) Open this circuit breaker and attach DO-NOT-CLOSE tag:
              1) On the right miscellaneous electrical equipment panel, P37:
                  a) 37D5, AFT EQPT COOLING FAN EXH NO. 1

      S 864-003
      (2) Do the steps that follow to remove the No. 2 fan (4):
          (a) Open these circuit breakers and attach DO-NOT-CLOSE tags:
              1) On the miscellaneous electrical equipment panel, P70:
                  a) 70B2, AFT EQPT COOLING FAN EXH NO. 2

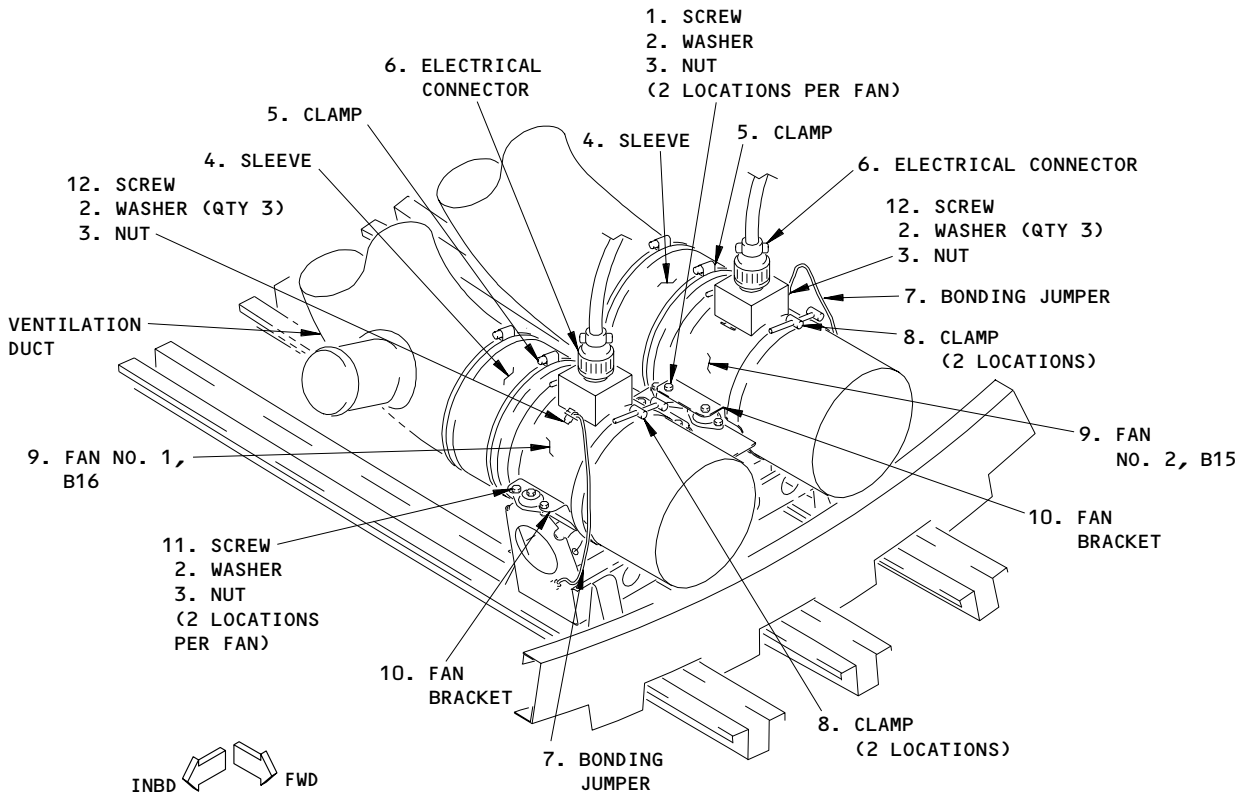
      S 014-004
      (3) Open the No. 2 cargo door, 822 (AMM 06-46-00/201).

      S 014-005
      (4) Remove the aft bulkhead lining in the bulk cargo compartment (AMM 25-50-03/401).



AFT END OF BULK CARGO COMPARTMENT

A

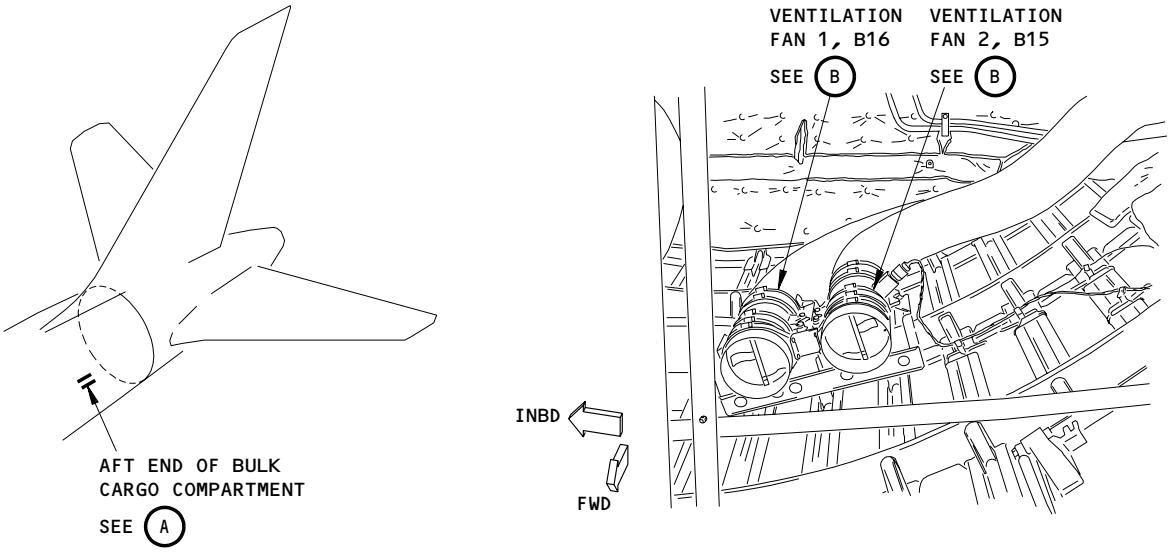


VENTILATION FANS

B

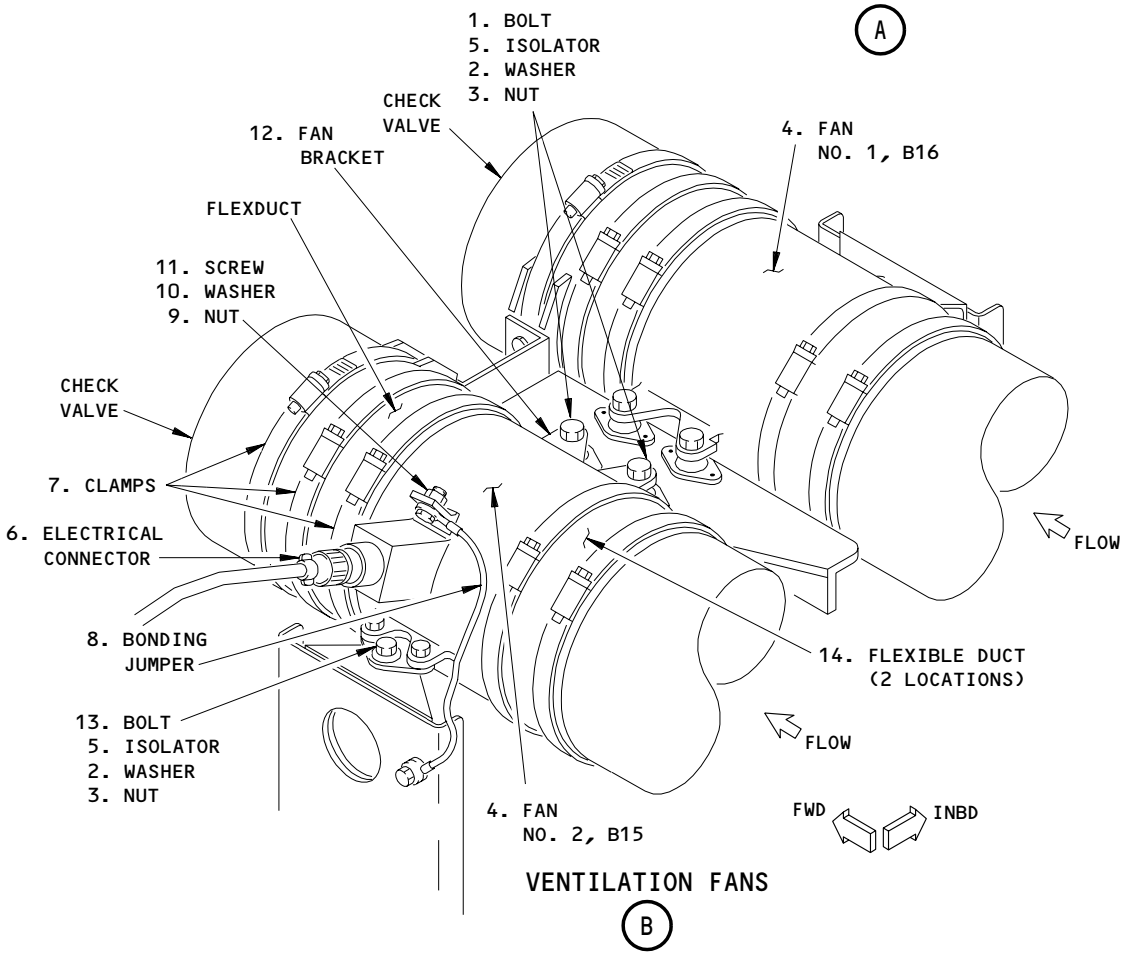
Aft Equipment Ventilation Fan Installation
Figure 401

C33094



AFT END OF BULK CARGO COMPARTMENT

A



VENTILATION FANS

B

Aft Equipment Ventilation Fan Installation
Figure 401A

D. GUI 001-006, 115;
Aft Equipment Ventilation Fan Removal (Fig. 401)

S 034-006
(1) Disconnect the electrical connector (6) from the fan.

S 034-007
(2) Remove the screw (11), washer (10), and nut (9) to disconnect the bonding jumper (8) from the fan.

S 034-008
(3) Remove the bolts (1, 13) that attach the fan brackets (12) to the support brackets.

S 034-009
(4) Remove the isolators (5) from the fan brackets (12).

S 034-010
(5) Remove the clamps (7) on the ends of the fan (4).

S 034-011
(6) Move the flexible duct away from the fan.

S 024-012
(7) Remove the fan (4).

S 434-013
(8) Put a cover on the duct opening.

E. GUI 007-114, 116-999;
Aft Equipment Ventilation Fan Removal (Fig. 401A)

S 034-035
(1) Disconnect the electrical connector (6) from the fan (9).

S 034-036
(2) Remove the screw (12), washers (2), and nut (3) to disconnect the bonding jumper (7) from the fan (9).

S 034-037
(3) Remove the screws (1, 11), washers (2), and nuts (3) from the fan brackets (10).

S 034-038
(4) Remove the clamps (5, 8) at the each end of the fan (9).

S 034-039
(5) Move the sleeve (4) away from the fan (9).

S 024-040
(6) Remove the fan (9).

S 434-041

(7) Put a cover on the duct opening.

TASK 21-26-01-404-014

3. Install the Aft Equipment Ventilation Fan (Fig. 401)

A. Consumable Materials

(1) A00247 - Sealant - Chromate, Type BMS 5-95, Type I, Class B-2

B. Parts

(1) GUI 001-006, 115;
Refer to the Illustrated Parts Catalog (IPC) for the part numbers and effectivities of items in the table that follows:

(2) Refer to the Illustrated Parts Catalog (IPC) for the part numbers and effectivities of items in the table that follows:

MM			IPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	1	Bolt	21-26-01	01	80
	2	Washer			85
	3	Nut			90
	4	Fan			100
	5	Isolator			95
	7	Clamp			35
	9	Nut			30
	10	Washer			25
	11	Screw			20
	13	Bolt			75

(3) GUI 007-114, 116-999;
Refer to the Illustrated Parts Catalog (IPC) for the part numbers and effectivities of items in the table that follows:

MM		NOMENCLATURE	IPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401A	1	Screw	21-26-01	04	15
	2	Washer			20
	3	Nut			25
	4	Sleeve			45
	5	Clamp			40
	8	Clamp			35
	9	Fan			60
	11	Screw			10
	12	Screw			5

C. References
(1) AMM 06-46-00/201, Entry Service and Cargo Doors, Access Doors and Panels
(2) AMM 20-10-21/401, Electrical Bonding
(3) AMM 24-22-00/201, Electric Power Control
(4) AMM 25-50-03/401, Cargo Compartment Bulkhead Lining
(5) AMM 51-31-01/201, Seals and Sealing

D. Access
(1) Location Zones
165 Area aft of bulk cargo compartment (Left)

E. GUI 001-006, 115;
Aft Equipment Ventilation Fan Installation (Fig. 401)

S 034-031
(1) Remove the cover from the duct openings.

S 034-032
(2) Make sure there is no unwanted material in the ducts.

S 424-015
(3) Put the fan (4) into position in the duct.
(a) On the side of the fan that is nearest to the other fan, make sure the isolators (5) are between the fan brackets (12).
(b) On the side of the fan that is farthest from the other fan, make sure the isolator (5) is below the fan bracket (12).

S 434-016
(4) Install the bolts (1, 13), washers (2), and nuts (3) that attach the fan brackets (12) to the support brackets (3 locations).
(a) Do not tighten the bolts.

S 434-017
(5) Move part of the flexible ducts on to the ends of the fan.

S 434-018
(6) Install the clamps on the ends of the fan.
(a) Do not tighten the clamps.

S 434-019
(7) Connect the electrical connector to the fan.

S 434-020
(8) Connect the bonding jumper to the fan.
(a) To connect the bonding jumper (8) to the No. 1 fan (4):
1) Attach the bonding jumper to the fan with a screw (11), washer (10), and nut (9).
(b) To connect the bonding jumper (8) to the No. 2 fan (4):
1) Use the cleaning method CM 1 (Ref 20-10-21) to clean the bonding jumper connection on the fan (4).
2) Attach the bonding jumper to the fan with a screw (11), washer (10), and nut (9).
3) Use the sealant to make a fillet seal all around the bonding jumper connection (Ref 51-31-01).

S 434-021
(9) Tighten the clamps (7) on the ends of the fan to 20-25 pound-inches.

S 434-022
(10) Tighten the nuts (3) that attach the fan (4) to the support brackets.

F. GUI 007-114, 116-999;
Install the Fan (Fig. 401A)

S 034-049
(1) Remove the cover from the duct opening.

S 214-050
(2) Make sure there is no unwanted material in the duct.

S 424-051
(3) Put the fan (9) into position on the support structure.

S 434-052
(4) Connect the sleeve (4) to the fan (9).

S 434-053
(5) Install the clamps (5, 8) at the each end of the fan (9).
(a) Tighten the clamp (5) to 13-18 pound-inches.
(b) Tighten the clamps (8) to 25-35 pound-inches.

S 434-054
(6) Install the screws (1, 11), washers (2), and nuts (3) to connect the fan brackets (10) to the support structure.

S 434-055
(7) Connect the bonding jumper (7) to the fan (9):
(a) Use the cleaning method CM 1 to clean the bonding jumper connection (AMM 20-10-21/401).
(b) Install the screw (12), washers (2), and nut (3) to connect the bonding jumper (7) to the fan (9).
(c) Use the sealant to make a fillet seal all around the bonding jumper connection (AMM 51-31-01/201).

S 434-056
(8) Connect the electrical connector (6) to the fan (9).

G. Do the installation test for the fans.

S 864-023
(1) Supply electrical power (Ref 24-22-00).

S 864-024
(2) If the No. 1 fan was installed, do the steps that follow:
(a) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
1) On the right miscellaneous electrical equipment panel, P37:
a) 37D5, AFT EQPT COOLING FAN EXH NO. 1

(b) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
1) On the miscellaneous electrical equipment panel, P70:
a) 70B2, AFT EQPT COOLING FAN EXH NO. 2
(c) Make sure the No. 1 fan is on.

S 864-025
(3) If the No. 2 fan was installed:
(a) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
1) On the miscellaneous electrical equipment panel, P70:
a) 70B2, AFT EQPT COOLING FAN EXH NO. 2
(b) Open these circuit breakers and attach DO-NOT-CLOSE tags:
1) On the right miscellaneous electrical equipment panel, P37:
a) 37D5, AFT EQPT COOLING FAN EXH NO. 1
(c) Make sure the No. 2 fan is on.

S 214-026
(4) Feel for airflow around the fan.
(a) A small leak is permitted.
(b) You must repair a large leak.

H. Put the airplane back to its usual condition.

S 864-033
(1) If the No. 1 fan was installed:
(a) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
1) On the miscellaneous electrical equipment panel, P70:
a) 70B2, AFT EQPT COOLING FAN EXH NO. 2

S 864-034
(2) If the No. 2 fan was installed:
(a) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
1) On the right miscellaneous electrical equipment panel, P37:
a) 37D5, AFT EQPT COOLING FAN EXH NO. 1

S 414-028
(3) Install the bulkhead lining in the aft end of the bulk cargo compartment (AMM 25-50-03/401).

S 414-029
(4) Close the No. 2 cargo door, 822 (AMM 06-46-00/201).

S 864-030
(5) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

VENTILATION CHECK VALVE - REMOVAL/INSTALLATION

1. General
   A. One check valve is installed forward of each aft equipment ventilation fan, aft of the bulk cargo compartment. The check valves make sure that the air does not flow in the opposite direction in the ventilation system.
   B. This procedure has instructions to remove and install the ventilation check valves.

TASK 21-26-02-004-001

2. Remove the Ventilation Check Valve (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
   B. Access
      (1) Location Zones
          165 Area aft of bulk cargo compartment (Left)
   C. Prepare for the Removal

      S 864-002
      (1) To remove the No. 1 check valve:
          (a) Do the steps that follow:
              1) Open this circuit breaker, on the right miscellaneous electrical equipment panel, P37, and attach a DO-NOT-CLOSE tag:
                 a) 37D5, AFT EQPT COOLING FAN EXH NO. 1

      S 864-003
      (2) To remove the No. 2 check valve:
          (a) Do the steps that follow:
              1) Open this circuit breaker, on the miscellaneous electrical equipment panel, P70, and attach a DO-NOT-CLOSE tag:
                 a) 70B2, AFT EQPT COOLING FAN EXH NO. 2

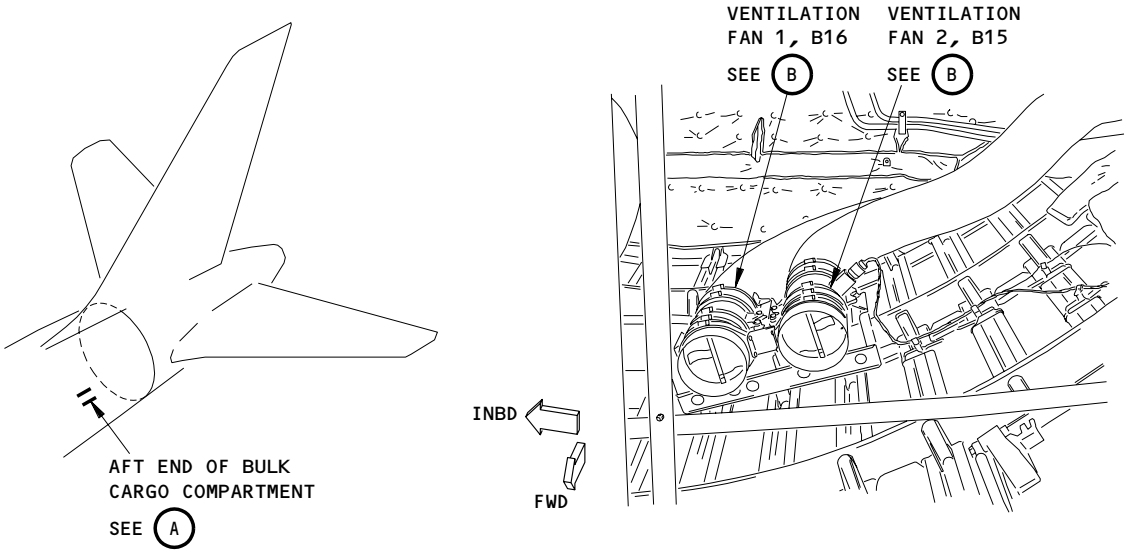
      S 014-004
      (3) Open the No. 2 cargo door, 822 (AMM 06-46-00/201).

      S 014-005
      (4) Remove the aft bulkhead in the bulk cargo compartment.
   D. Remove the check valve

      S 034-006
      (1) Remove the clamp from the support bracket.

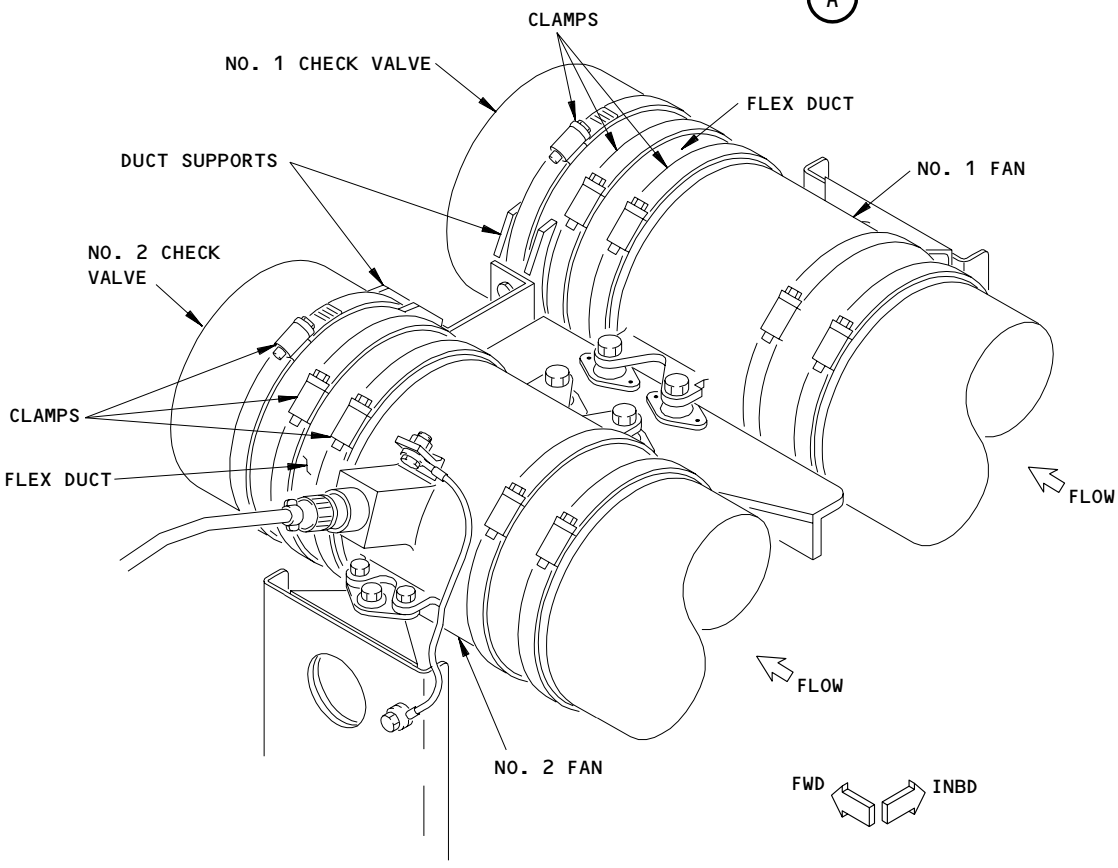
      S 034-007
      (2) Remove the clamp from the aft end of the check valve.

      S 034-008
      (3) Move the flexible duct away from the check valve.



AFT END OF BULK CARGO COMPARTMENT

A



VENTILATION FANS

B

Aft Equipment Ventilation Fans and Check Valves
Figure 401

S 024-009
(4) Remove the check valve.

S 434-010
(5) Put a cover on the duct opening.

TASK 21-26-02-404-011

3. Install the Ventilation Check Valve (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          165 Area aft of bulk cargo compartment (Left)
   C. Install the check valve

S 034-012
(1) Remove the cover from the duct opening.

S 034-013
(2) Make sure there is no unwanted material in the duct.

S 424-014
(3) Put the check valve in position in the duct.
   (a) Make sure the flow arrow points forward.
   (b) Make sure the shaft of the check valve is in a vertical position.

S 434-015
(4) Move part of the flexible duct on to the aft end of the check valve.

S 434-016
(5) Install the clamp on the aft end of the check valve.
   (a) Tighten the clamp to 20-25 pound inches.

S 434-017
(6) Install the clamp that holds the check valve to the support bracket.

   D. Do the installation test for the check valve

S 864-018
(1) Supply electrical power (AMM 24-22-00/201).

S 864-019
(2) If the No. 1 check valve was installed:
   (a) Do the steps that follow:
      1) Remove the DO-NOT-CLOSE tag and close this circuit breaker, on the right miscellaneous electrical equipment panel, P37:
         a) 37D5, AFT EQPT COOLING FAN EXH NO. 1

2) Open this circuit breaker, on the miscellaneous electrical equipment panel, P70, and attach a DO-NOT-CLOSE tag:
a) 70B2, AFT EQPT COOLING FAN EXH NO. 2

(b) Make sure the No. 1 fan comes on.

S 864-020

(3) If the No. 2 check valve was installed:

(a) Do the steps that follow:

1) Remove the DO-NOT-CLOSE tag and close this circuit breaker, on the miscellaneous electrical equipment panel, P70:
a) 70B2, AFT EQPT COOLING FAN EXH NO. 2

2) Open this circuit breaker, on the right miscellaneous electrical equipment panel, P37, and attach a DO-NOT-CLOSE tag:
a) 37D5, AFT EQPT COOLING FAN EXH NO. 1

(b) Make sure the No. 2 fan comes on.

S 214-021

(4) Feel for the airflow around the check valve.

(a) A small leak is permitted.

(b) You must repair a large leak.

E. Put the airplane back to its usual condition

S 864-026

(1) If the No. 1 check valve was installed:

(a) Do the steps that follow:

1) Remove the DO-NOT-CLOSE tag and close this circuit breaker, on the miscellaneous electrical equipment panel, P70:
a) 70B2, AFT EQPT COOLING FAN EXH NO. 2

S 864-027

(2) If the No. 2 check valve was installed:

(a) Do the steps that follow:

1) Remove the DO-NOT-CLOSE tag and close this circuit breaker, on the right miscellaneous electrical equipment panel, P37:
a) 37D5, AFT EQPT COOLING FAN EXH NO. 1

S 414-023

(3) Install the aft bulkhead in the bulk cargo compartment.

S 414-024
(4) Close the No. 2 cargo door, 822 (AMM 06-46-00/201).

S 864-025
(5) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

GALLEY VENTILATION FILTER - REMOVAL/INSTALLATION

1. General
   A. The galley ventilation filters are used to remove particles and odors from the galley areas. Air is pulled through the filters by the ventilation system. This procedure has instructions to remove and install all of the galley ventilation filters.
   B. One ventilation filter is installed for each galley area. The filters are in the ventilation inlet for that galley area. The filters are held in place by a plastic grille in the ceiling.

TASK 21-26-03-004-001

2. Remove the galley ventilation filter (Fig. 401)
   A. Access
      (1) Location Zones
          221 Passenger cabin - section 41 (LH side)
          251 Passenger cabin - section 46 (LH side)
          252 Passenger cabin - section 46 (RH side)
   B. Remove the galley ventilation filter.

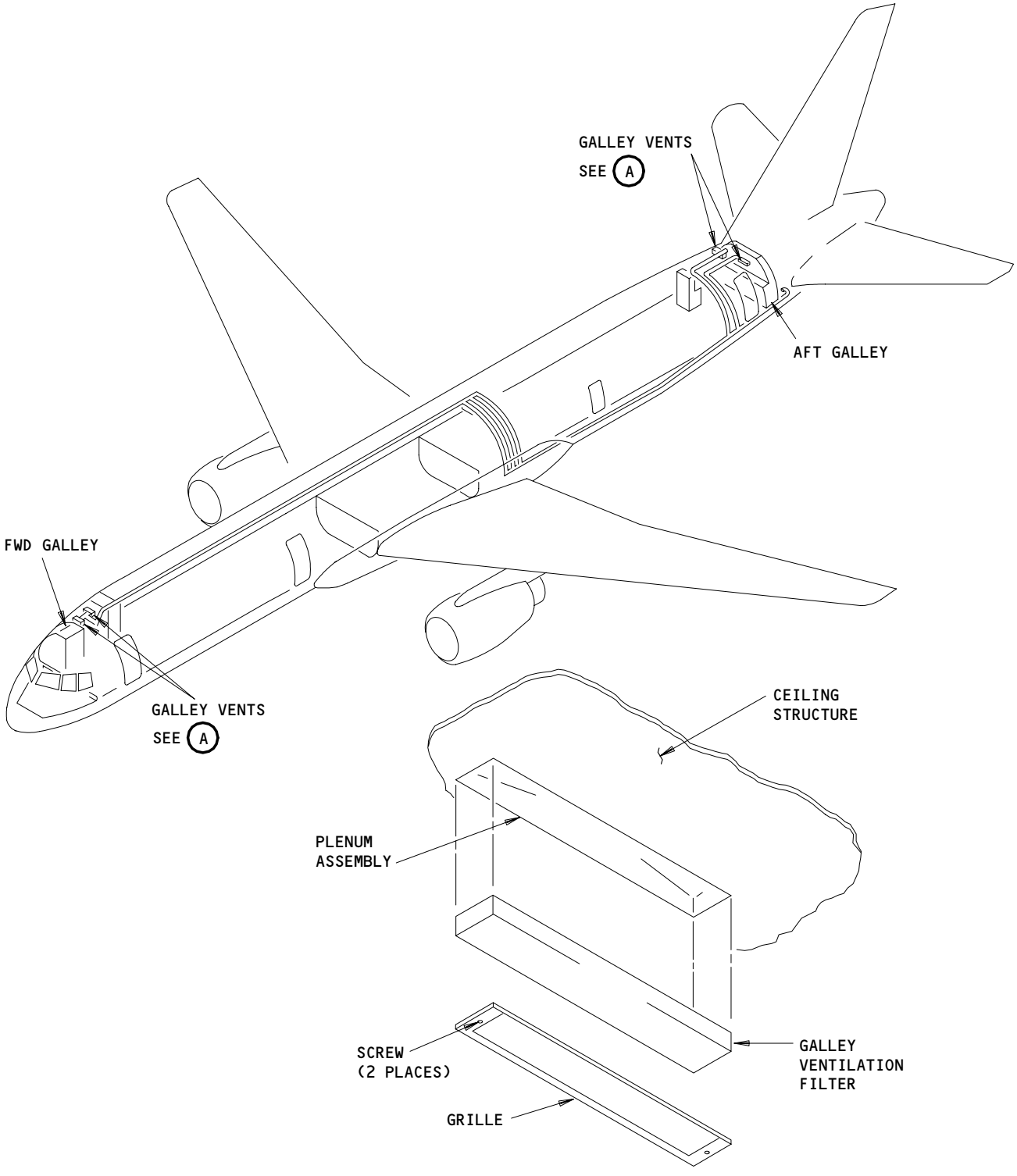
      S 014-009
      (1) Remove the galley-ventilation-filter grille in the ceiling of the galley area.
          (a) Remove the screws from the grille.
          (b) Remove the grille.

      S 024-004
      (2) Pull the filter out of the ventilation inlet.

TASK 21-26-03-404-010

3. Install the Galley Ventilation Filter (Fig. 401)

   A. Consumable Materials
      (1) G02041, Filter material, Fiberglass Sheet, AG-105 (optional, Frontline Blue, Type FG Dry)
          American Air Filter International
          215 Central Ave.
          Louisville, KY 40208-1406; Phone: 1-800-501-3146
   B. Access
      (1) Location Zones
          221 Passenger cabin - section 41 (LH side)
          251 Passenger cabin - section 46 (LH side)
          252 Passenger cabin - section 46 (RH side)



Galley Ventilation Filter Installation
Figure 401

C. Prepare for Installation

S 624-005
(1) Cut a new filter from the fiberglass filter material. Make sure that the new filter is the same size as the old filter.

S 164-011
(2) Clean the grille with soap and water.

D. Install the galley ventilation filter

S 424-006
(1) Put the new filter into the ventilation inlet.

NOTE: The filter material is two (2) inches thick, but compresses to one (1) inch when it is installed.

S 414-007
(2) Put the grille in position over the ventilation inlet.

S 414-008
(3) Install the screws to keep the grille in position.

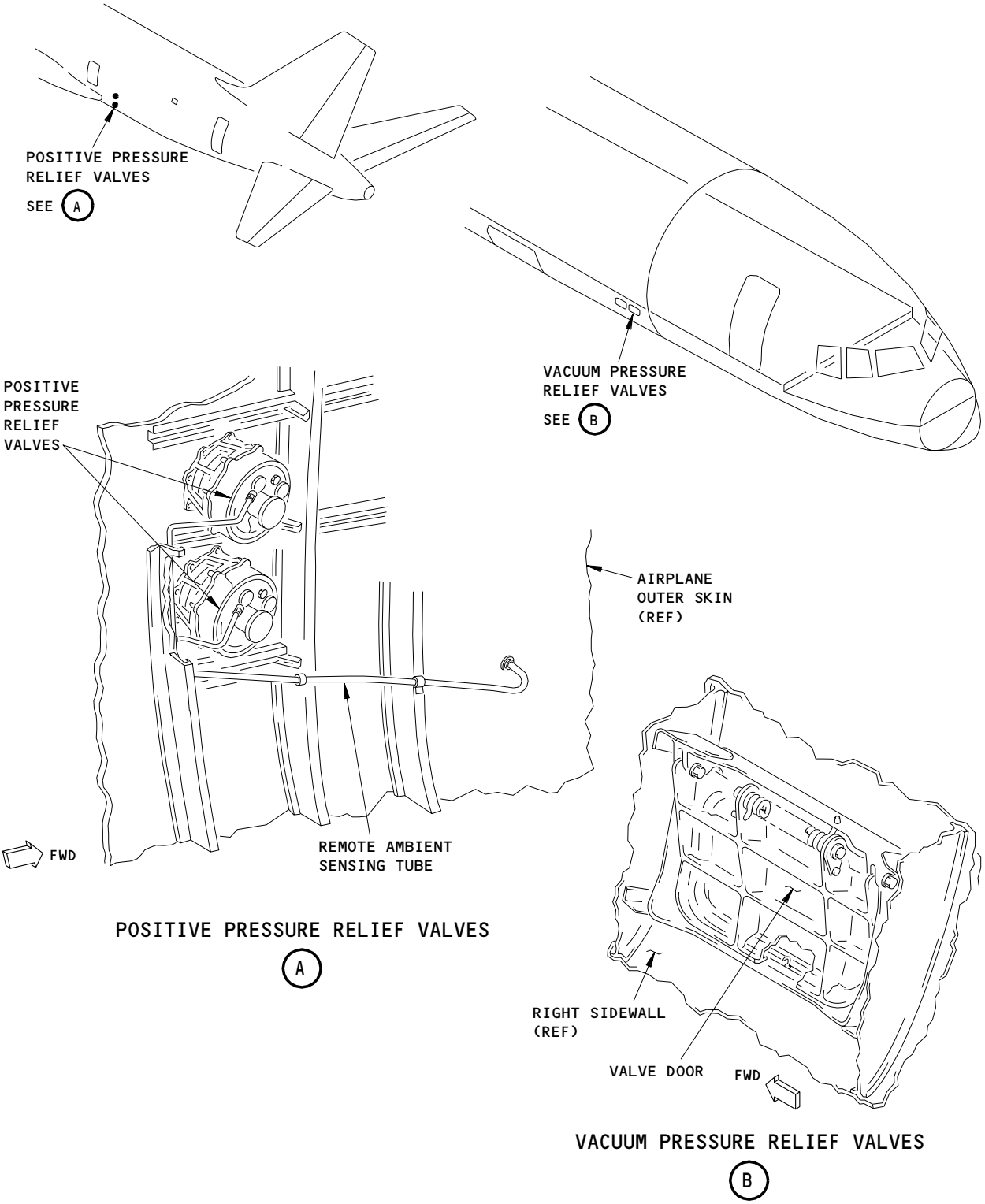
PRESSURIZATION

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
ACTUATOR - CABIN PRESSURE OUTFLOW VALVE, YBWM1	3	1	822, AFT CARGO COMPT, CABIN PRESS OUTFLOW VALVE, V15	21-31-04
CIRCUIT BREAKERS -	2		FLT COMPT, P11	
CABIN ALTITUDE CONTROL AUTO 1, C686		1	11N15	*
CABIN ALTITUDE CONTROL AUTO 2, C701		1	11N24	*
CABIN ALTITUDE CONTROL MANUAL, C683		1	11B14	*
CABIN ALTM, C4205		1	11B13	*
CABIN ALT/PRESS SELECT, C658		1	11B15	*
CABIN DIFF PRESS IND, C4206		1	11B12	*
COMPUTERS - (31-41-00/101)				
EICAS L, M10181				
EICAS R, M10182				
COMPUTERS - (34-12-00/601)				
AIR DATA L, M100				
AIR DATA R, M101				
CONTROLLERS - CABIN PRESSURE			821, FWD CARGO COMPT, E5 RACK	21-31-02
NO. 1, M118	2	1		
NO. 2, M119	2	1		
DIODE - R10315 [1]			119BL, MAIN EQPT CTR, P36	*
MICROSWITCH PACK - (22-32-00/101)				
AUTO THROTTLE, M966				
MODULE - HIGH ALTITUDE WARNING, M10756 [1]	2	1	FLT COMPT, P5	*
MODULE - PRESSURIZATION AND INDICATING WARNING, M19	2	1	FLT COMPT, P5	21-33-01
MOTOR - OUTFLOW VALVE ACTUATOR AC, YBWM2	3	2	822, AFT CARGO COMPT, CABIN PRESS OUTFLOW VALVE, V15	21-31-03
MOTOR - OUTFLOW VALVE ACTUATOR DC	3	1	822, AFT CARGO COMPT, CABIN PRESS OUTFLOW VALVE, V15	21-31-03
PANEL - DISCRETE WARNING DISPLAY, M779	2	1	FLT COMPT, P1	21-33-00
RELAYS - (31-01-36/101)				
HIGH ALT SEL/ENABLE, K10610 [1]				
HIGH ALT SEL/INOP, K10611 [1]				
SYS 1 AIR/GND, K10238				
RELAY - (31-01-37/101)				
SYS 2 AIR/GND, K207				
SELECTOR - CABIN PRESSURE, M13	2	1	FLT COMPT, P5	21-31-01
SENSOR - DIFFERENTIAL PRESSURE, TS5072	3	1	113AL, FWD EQUIP CTR	21-33-04
SWITCH - CABIN ALT WARNING, S431		1	119BL, MAIN EQUIP CTR, P36	*
SWITCH - CABIN HIGH ALT WARNING, S10553 [1]		1	119BL, MAIN EQUIP CTR, P36	*
SWITCH - THROTTLE POSITION, S17	2	1	113AL, FWD EQUIP CTR, MICRO-SWITCH PACK, M966	22-32-04
SWITCH - THROTTLE POSITION, S18	2	1	113AL, FWD EQUIP CTR, MICRO-SWITCH PACK, M966	22-32-04
SWITCH/LIGHT - HIGH ALT LANDING, YTLS1 [1]	2	1	FLT COMPT, P5, HIGH ALTITUDE WARNING MODULE, M10756	*
VALVE - CABIN PRESSURE OUTFLOW, V15	3	1	822, AFT CARGO COMPT	21-31-03
VALVE - POSITIVE PRESSURE RELIEF	1	2	822, AFT CARGO COMPT	21-32-01
VALVE - VACUUM PRESSURE RELIEF	1	2	119BL, MAIN EQUIP CTR	21-32-02

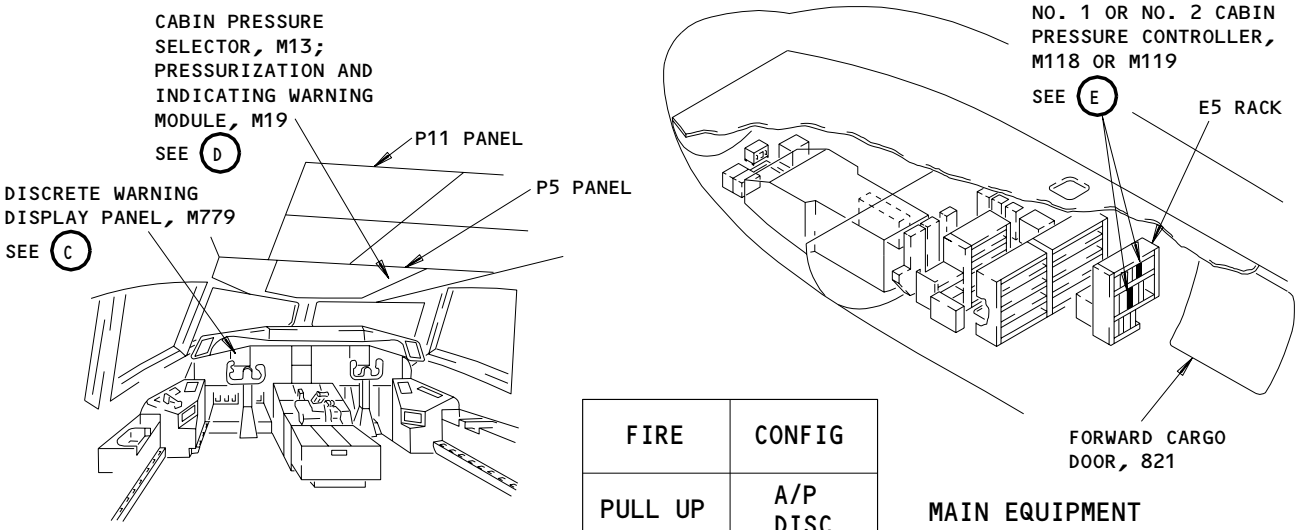
* SEE THE WDM EQUIPMENT LIST

[1] AIRPLANES WITH "HIGH ALT LDG" SWITCH ON THE P5 PANEL

Pressurization - Component Index
Figure 101



Pressurization – Component Location
Figure 102 (Sheet 1)



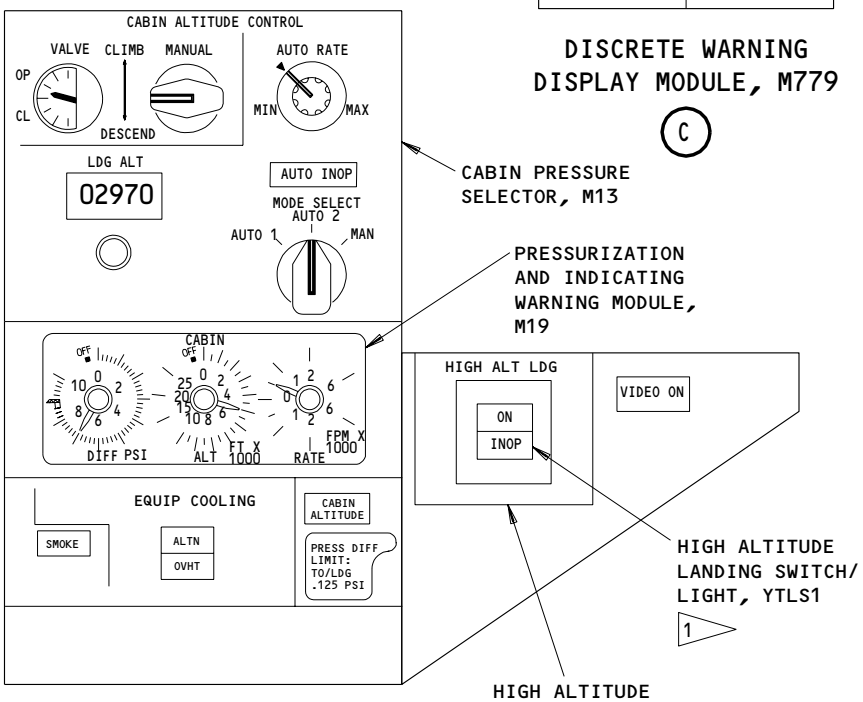
FLIGHT COMPARTMENT

MAIN EQUIPMENT CENTER

FIRE	CONFIG
PULL UP	A/P DISC
CABIN ALT	OVSPD

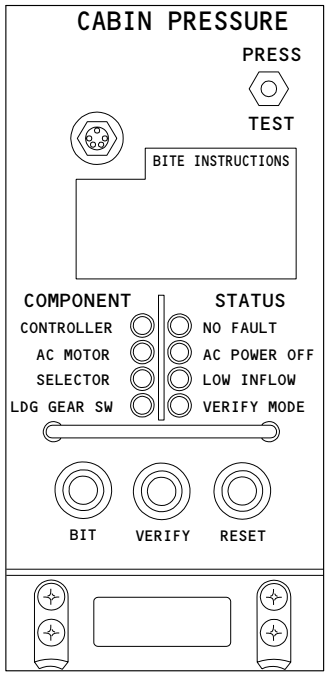
DISCRETE WARNING DISPLAY MODULE, M779

C



CABIN PRESSURE SELECTOR, M13; PRESSURIZATION AND INDICATING WARNING MODULE, M19

D



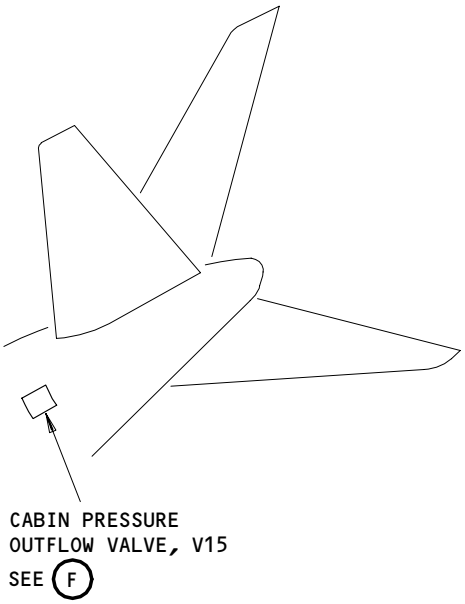
NO. 1 OR NO. 2 CABIN PRESSURE CONTROLLER, M118 OR M119

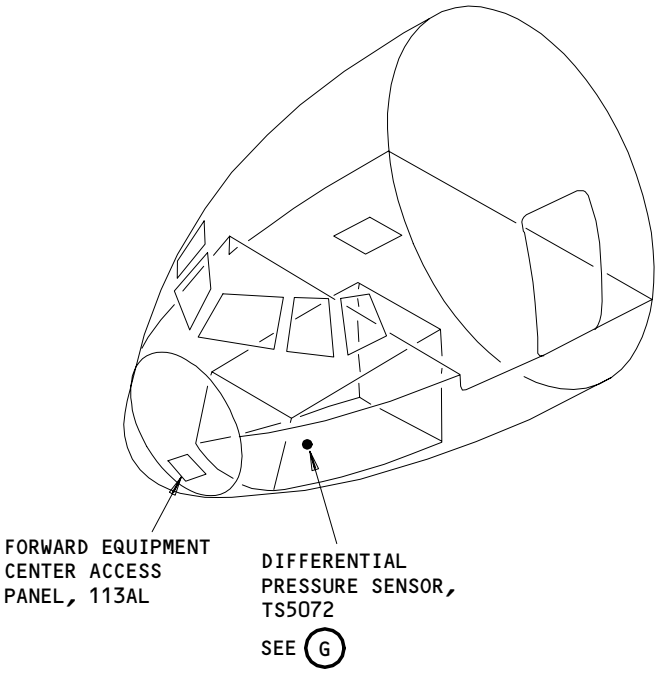
E

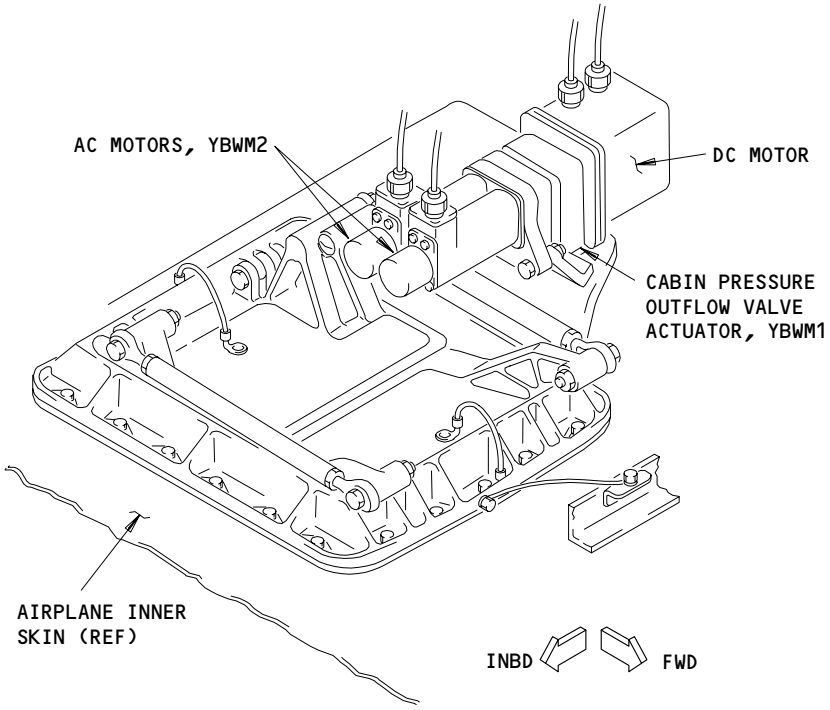
1 AIRPLANES WITH "HIGH ALT LDG" SWITCH ON THE P5 PANEL

Pressurization - Component Location
Figure 102 (Sheet 2)

A52867

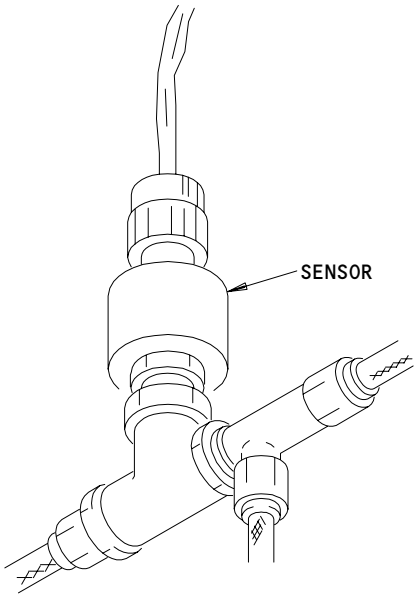






CABIN PRESSURE OUTFLOW VALVE, V15

(F)



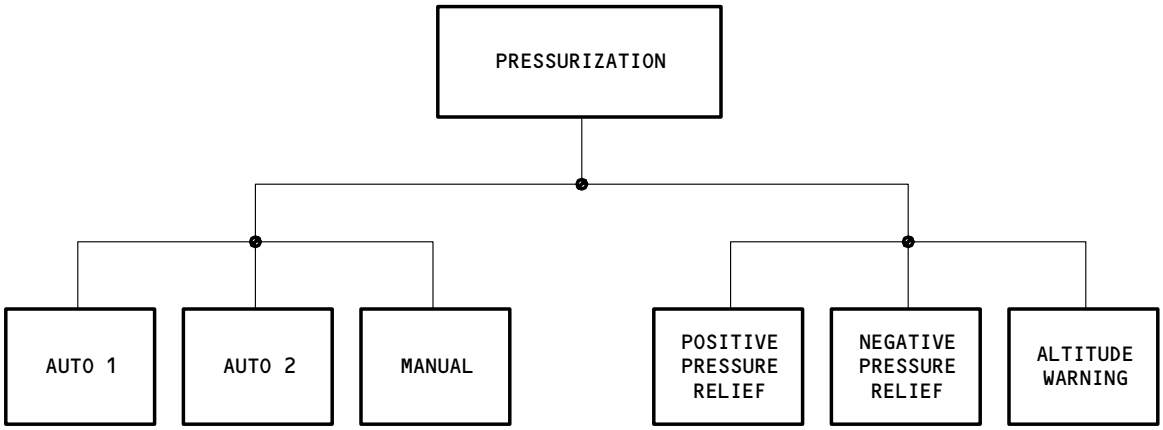
DIFFERENTIAL PRESSURE SENSOR, TS5072

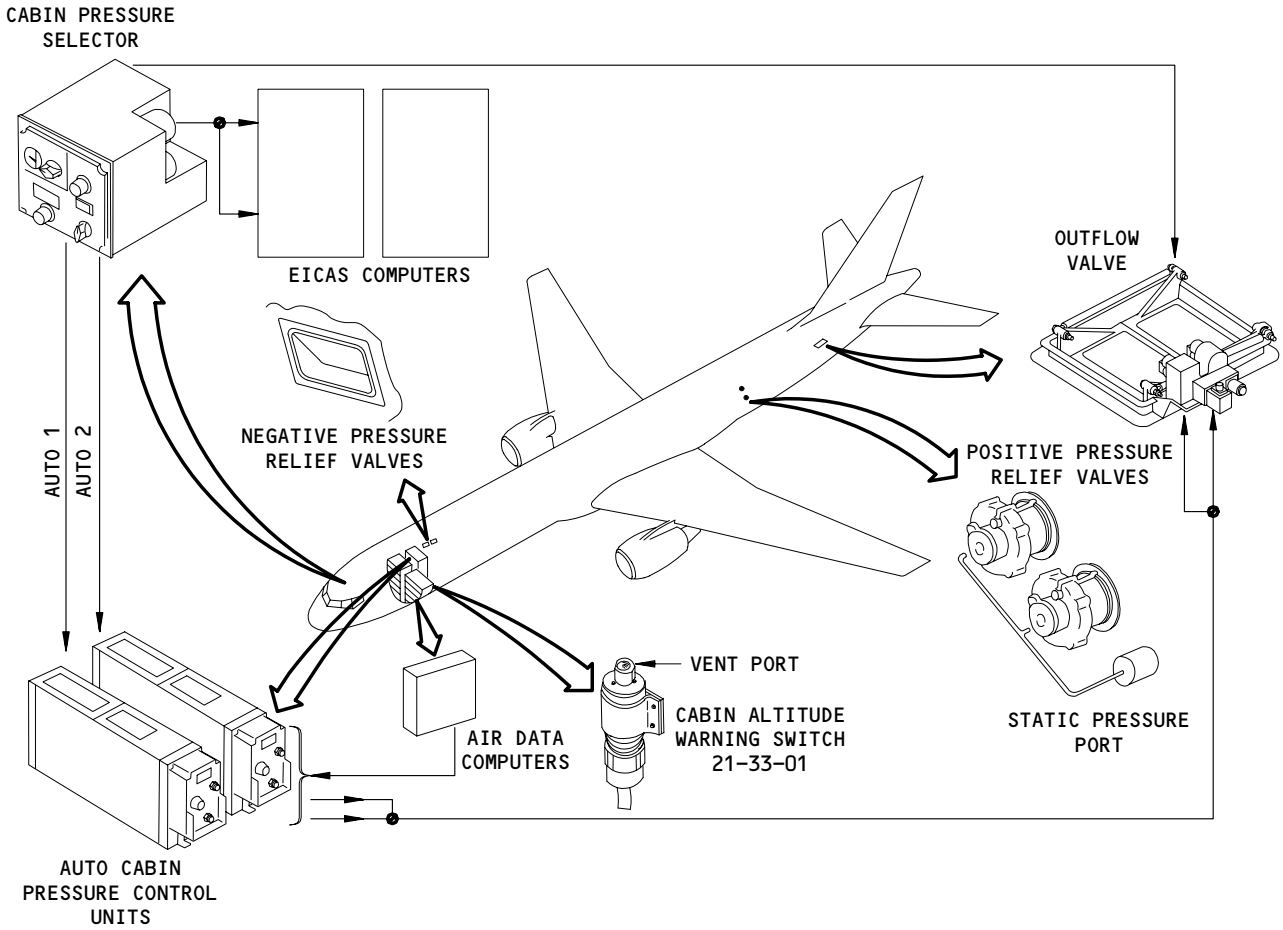
(G)

Pressurization - Component Location
Figure 102 (Sheet 3)

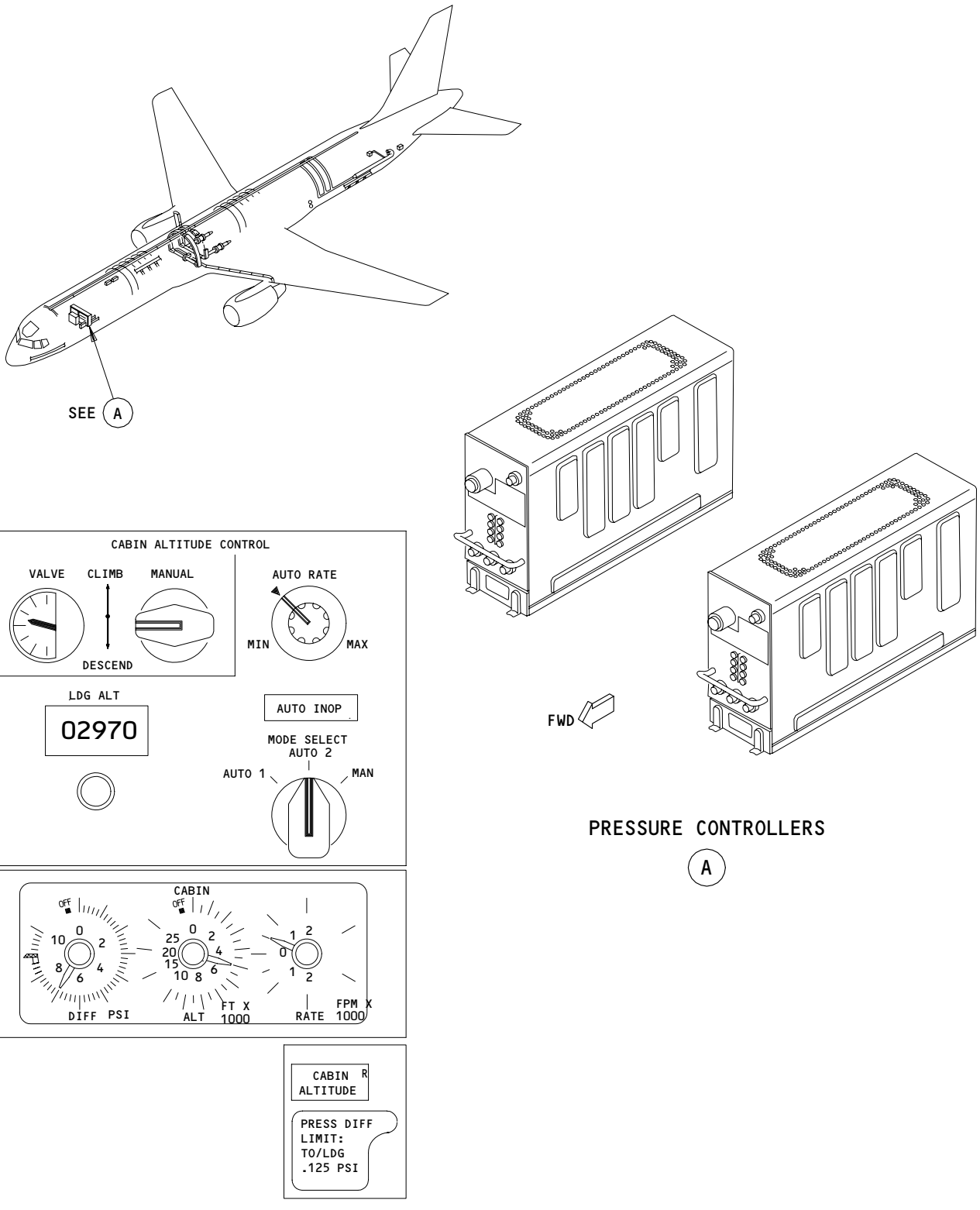
PRESSURIZATION CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The pressurization control system maintains a comfortable and safe cabin pressure, by controlling the rate of airflow from the cabin, in all flight modes. The air conditioning system provides air for pressurization (AMM 21-00-00/001).
   B. The system uses two modes of operation, automatic and manual. Positive-pressure-relief valves (AMM 21-32-00/001) and cargo vent doors (AMM 52-34-00/001) provide backup protection against overpressurization. Pressure indicators and altitude switches provide cabin pressure indication and warning (AMM 21-33-00/001).
   C. A selector panel, two automatic pressure controllers and an outflow valve provide system control. The selector panel supplies signals to the controller. The controller then opens or closes the outflow valve to maintain safe cabin pressures. The pressurization control system provides three independent control paths for the outflow valve. The controller's built in test function (BITE) provides system integrity checks.
2. Component Details
   A. Automatic Pressure Controller (Fig. 2)
      (1) Two identical automatic pressure controllers control airplane pressurization by modulating the outflow valve. One controller remains in a standby mode, monitoring system operation. The standby controller takes over system control if the selected controller fails. Both controllers receive identical signals. Each controller contains the sensory and electronic logic, and the control circuit for one outflow valve control channel. 115 Vac powers each E/E rack-mounted controller.
   B. Cabin Pressure Selector Panel
      (1) The pilots overhead panel (P5) contains the cabin pressure selector panel. The cabin pressure selector panel consists of a mode selector switch, autorate input selector, landing (field) altitude input selector, valve position indicator and manual momentary contact switch.
         (a) The mode selector switch allows selection of AUTO 1, AUTO 2 or MAN.
         (b) The autorate input selector allows the crew to select the rate of cabin pressurization. Range of selection is 50 to 2000 FPM for climb, and 30 to 1200 FPM for descent. The index position indicates 500 FPM climb and 300 FPM descent. The ratio of climb to descent is always 5 to 3.
         (c) The landing (field) altitude input selector allows landing altitude selection by the crew for controller information. Landing altitude range selection is -1000 to +14,000 ft.





Pressurization Control System
Figure 1



Automatic Pressure Controller and Cabin Pressure Selector Panel
Figure 2

(d) The valve position indicator shows outflow valve position. A momentary contact switch allows manual control of the outflow valve.

C. Outflow Valve (Fig. 3)

(1) The outflow valve is a double-door thrust-recovery type valve. The doors are aluminum with a Teflon coating to prevent binding and excessive friction. Connecting rods on each side of the valve frame link the forward and aft doors together. The valve controls the flow of cabin air overboard by modulating the valve doors. In the full open position the valve has an effective flow area of 108 sq in. The valve mounts on the left underside of the airplane immediately aft of the bulk cargo compartment.

D. Outflow Valve Actuator

(1) The outflow valve actuator mounts directly on the valve frame and drives both doors simultaneously through a control arm and linkage. The actuator consists of two identical 115-Vac 400-Hz motors, a 28 Vdc motor and a gearbox. The gearbox includes a feedback potentiometer and limit switches.

3. Operation

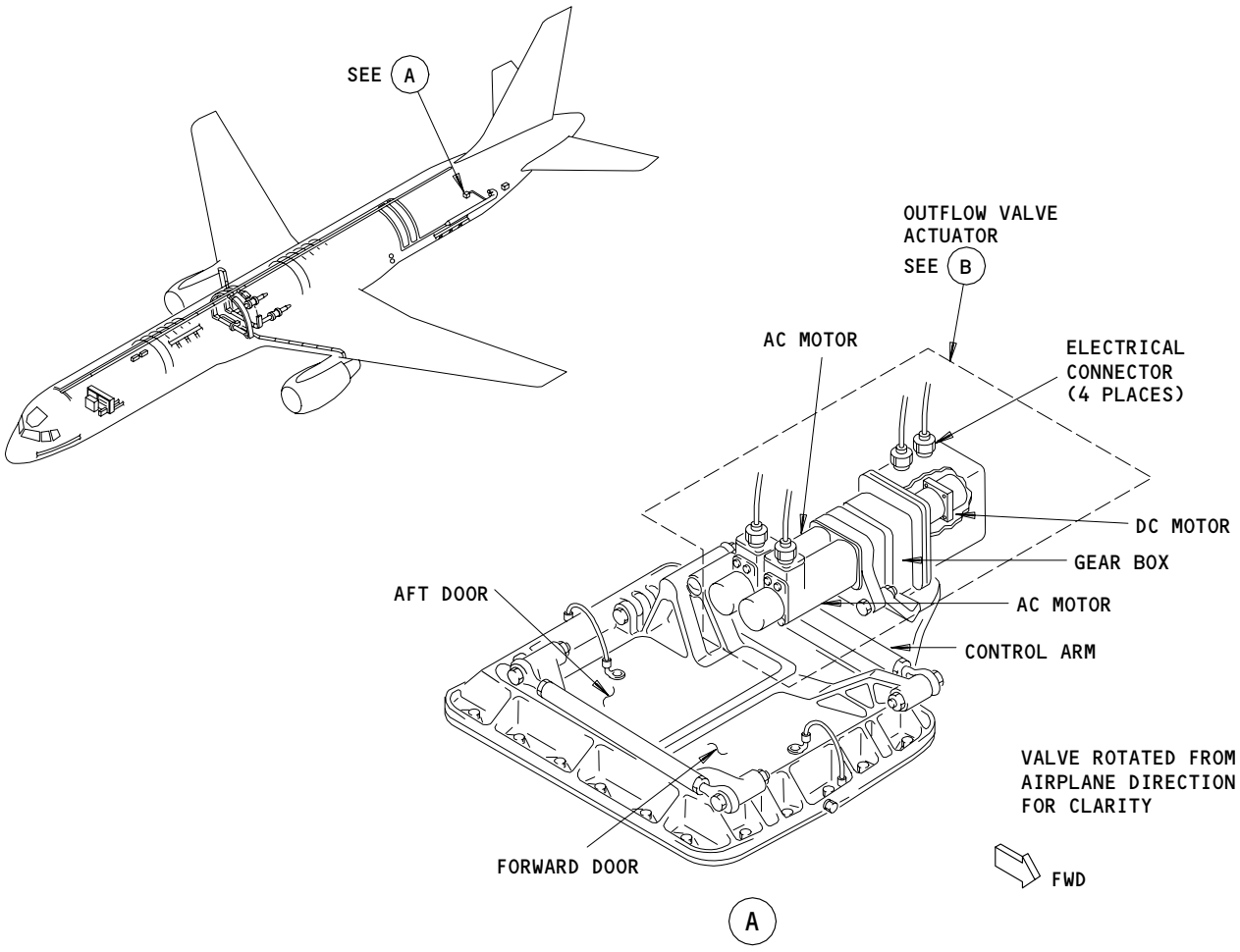
A. Functional Description

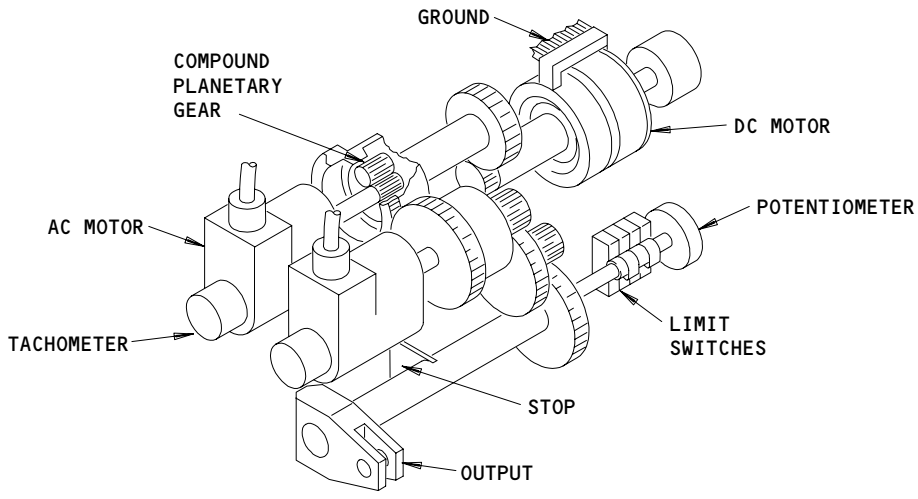
(1) Pressure Control System (Fig. 4)

(a) The pressure controller modulates the outflow valve to maintain the desired cabin pressure. Opening the valve allows more air to exhaust from the airplane. This reduces cabin pressure. Closing the valve increases cabin pressure. Modulating the valve between the full open and full close extremes, allows the desired cabin pressure to be maintained.

(b) Before takeoff the crew selects the desired automode, landing (field) altitude and the autorate. Placing the mode selector to AUTO 1 or AUTO 2 releases control of the pressurization system to the selected controller. The other controller goes into a standby mode and monitors the selected controller.

(c) The airplane's two air data computers (ADC) supply ambient pressure signals and barometric corrections to each pressure controller. The controller's integral pressure sensor measures cabin pressure.





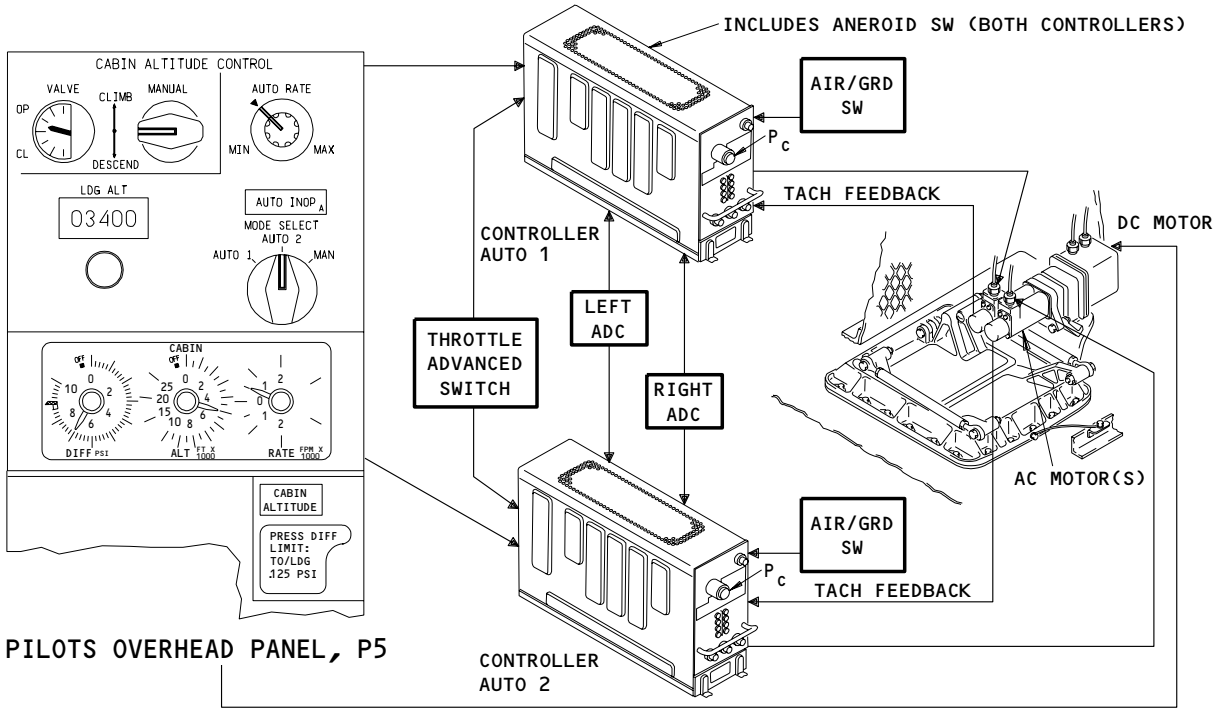
OUTFLOW VALVE ACTUATOR GEAR TRAIN

B

Cabin Pressure Outflow Valve
Figure 3

(d) A throttle advanced signal from the throttle microswitch pack assembly greater than 10.5-degrees from idle, puts the controller in the takeoff mode. At rotation the controller receives a signal from the air/ground relay, and enters the flight mode. Once in the flight mode, the controller creates a cabin pressure autoschedule. The autoschedule is the ideal cabin-to-ambient differential pressure for varying airplane altitudes. The selected landing altitude and the maximum cabin-to-ambient pressure ratio (delta P = 8.6 psi) limit the autoschedule.

(e) The error between the cabin pressure and the cabin pressure command determines the cabin pressure change command. The selected autorate limits the rate of change. In cruise, the cabin pressure follows the cabin pressure command.



Pressure Control System
Figure 4

(f) The controller positions the outflow valve to maintain the correct cabin pressure and rate of cabin pressure change. A tachometer on the outflow valve actuator provides a feedback signal to the controller. This improves the speed response of the actuator.

(g) GUI 001-003, 005, 007-011, 115;
If the cabin altitude reaches 11,000 ft, the controller automatically closes the outflow valve to increase cabin pressure.

(h) GUI 004, 006;
If the cabin altitude reaches 14,500 ft, the controller automatically closes the outflow valve to increase cabin pressure.

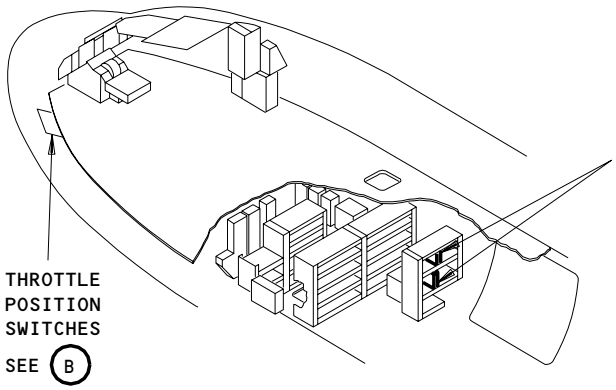
(i) The landing altitude initiate switch overrides the existing cabin altitude demand and sets it to the landing field altitude command. The cabin depressurizes at the full depressurization rate limit, until it reaches the landing altitude. The maximum cabin-to-ambient pressure ratio (P = 8.6 psi) limits the depressurization rate. The landing initiate function is used for rapid descent from cruise or flight from high to low altitudes.

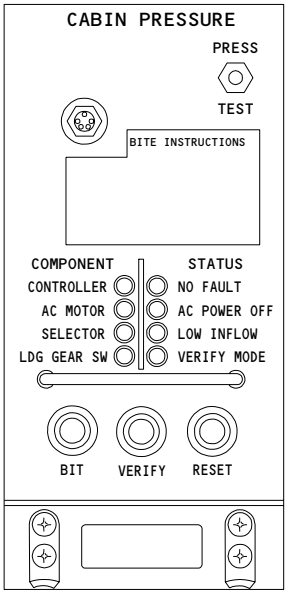
B. BITE (Fig. 5)

(1) Each controller includes built-in test circuitry to monitor system operation, detect critical faults, and identify the faulty line replaceable units (LRU's) by means of a fault display. The controller contains switches and indicator lamps on the controller face for initiating fault isolation, system checks and fault display.

(2) The PRESS TEST switch serves as a lamp-test function. When pressed, all fault indicator lamps come on. If no lights come on, this indicates no ac power to the controller, selector panel switch is not in the appropriate position, or a defective controller.

(3) When the BIT switch is pressed, the controller will display any faults previously recorded. If no faults are present, the NO FAULT lamp will come on for 30 seconds and then go out. If a fault exists in memory, the appropriate lamp will come on for 30 seconds and then go out.





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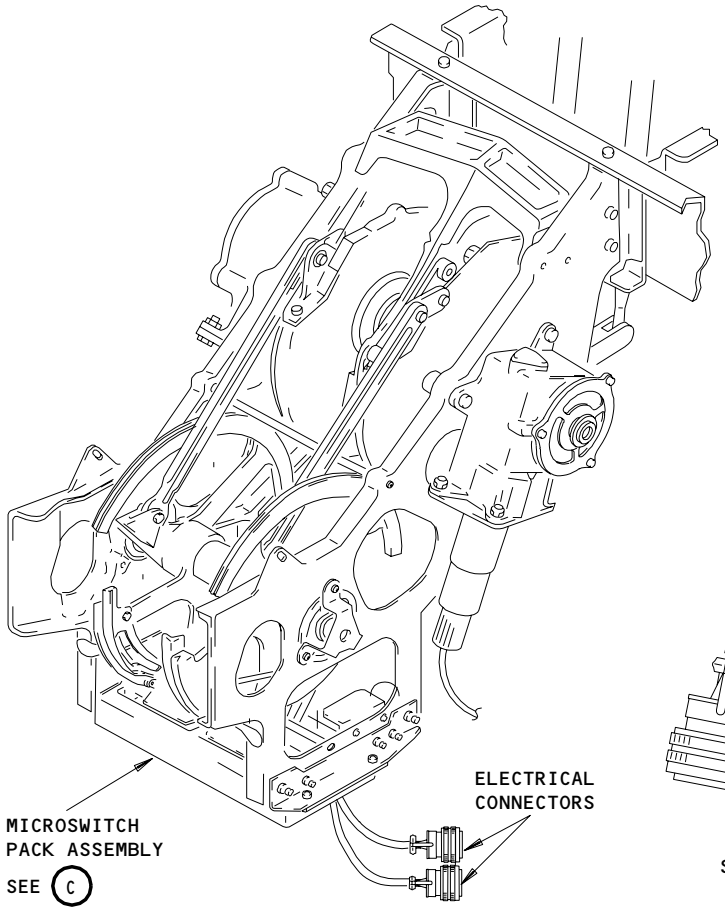
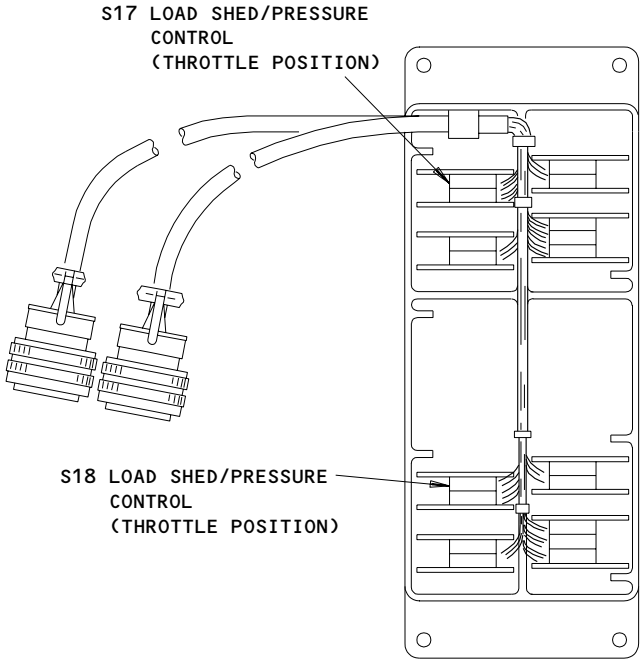


AUTOTHROTTLE DRIVE ASSEMBLY

B



C

Cabin Pressure Cont
Figure 5

(4) The VERIFY switch is used to determine if any faults still exist in the system. When the VERIFY switch is pressed on the selected controller, the VERIFY MODE lamp will light and remain on while the test is being preformed. If any faults are detected, the applicable fault light comes on for 30 seconds. If no faults are detected, the NO FAULT light comes on for 30 seconds. The faults in the verify selection are taken from a temporary memory. It is possible that an intermittent fault that occurred in flight, but no longer exists, would not show up in the verify mode. Pressing the BIT switch would display any intermittent fault. If the VERIFY switch is pressed on a nonselected controller, the VERIFY MODE light will flash. This indicates that the verify mode is not being performed. If the cabin pressure selector is moved from the correct to incorrect selection while the VERIFY MODE lamp is on, the test will be terminated. The VERIFY MODE lamp will go out. The VERIFY switch overrides the BIT switch.

(5) The RESET switch is used to erase the memory and set the controller in an operable mode. The switch must be pressed while the VERIFY MODE light is on. If the RESET switch is pressed before the VERIFY switch, nothing will occur.

C. Control

(1) Cabin Pressurization System - Automode (Fig. 6, 7)

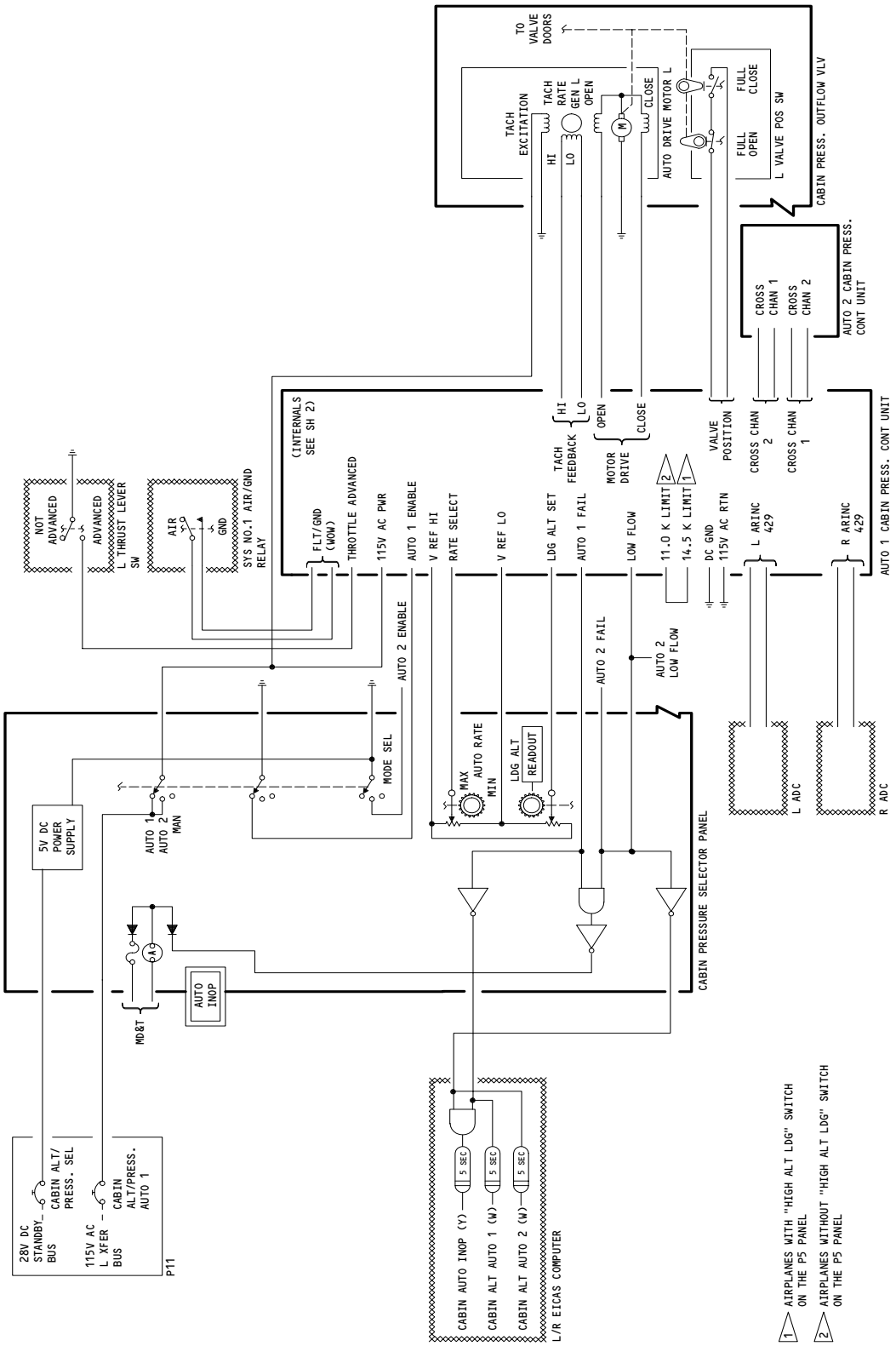
(a) 115 Vac powers both controllers, through the mode selector switch. Each controller is powered from independent sources.

(b) Each controller contains a central processing unit (CPU). The CPU provides two major functions. It receives signals from the ADC and selector panel, and constantly samples cabin pressure. The CPU also tests the entire controller system operation.

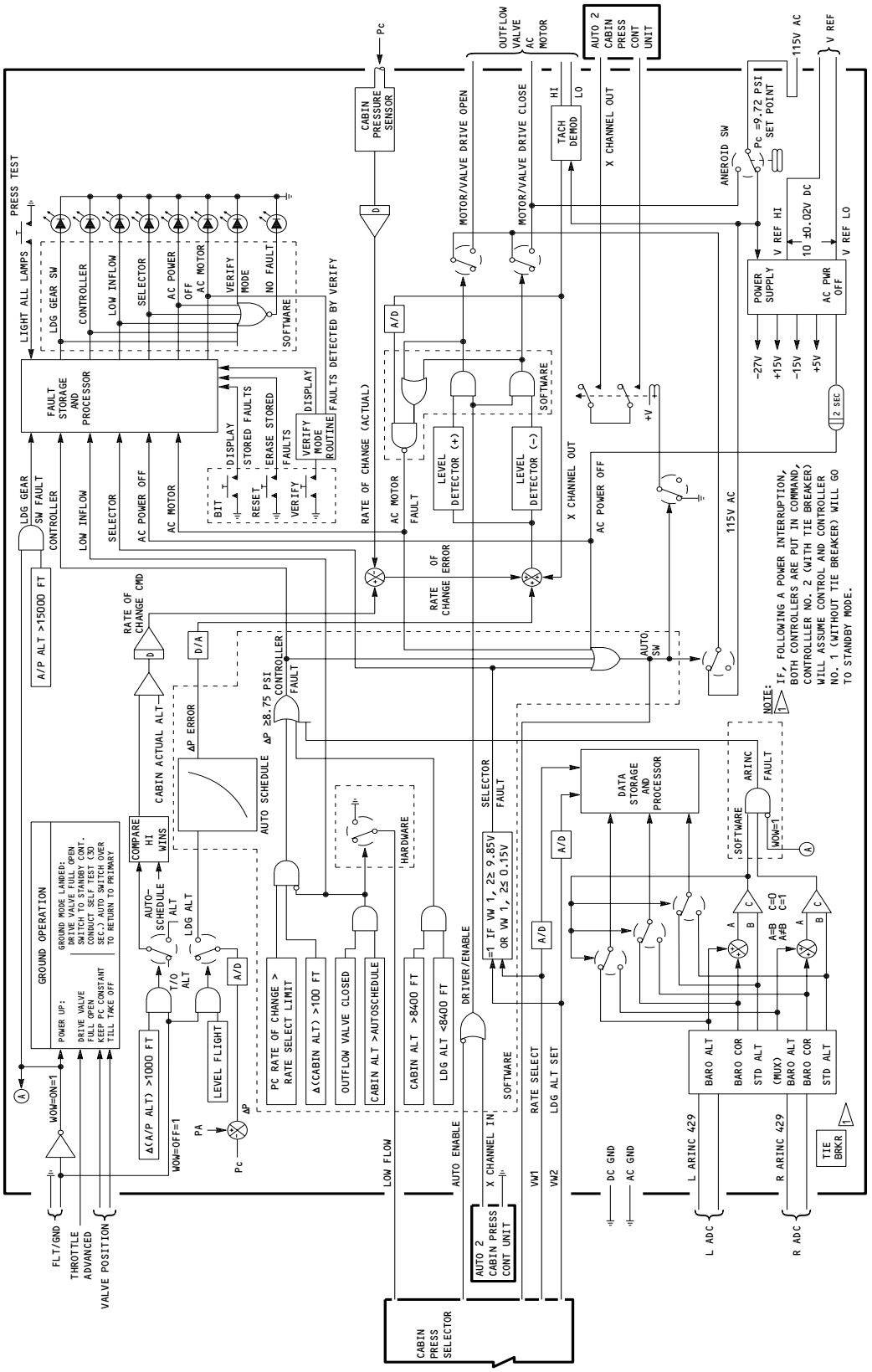
(c) An analog to digital converter (A/D) changes analog input signals to digital signals for CPU use. Analog inputs to the CPU through the A/D include selected autorate, selected landing field altitude, and cabin pressure signals. The ADC, air/ground relay and door status signals provide direct digital inputs to the CPU. The ADC provides ambient pressure and barometric correction signals. The air/ground signal determines the controller's mode of operation (ground mode, flight mode, etc.). Takeoff mode is initiated when the throttles are advanced.

NOTE: The captain's and first officer's primary altimeters supply barometric correction data to the cabin pressurization system for QNH airplanes. The captain's standby altimeter supplies barometric correction data to the cabin pressurization system for QFE airplanes.

(d) The CPU collects the above signals and determines cabin pressure. Maximum cabin-to-ambient differential pressure, selected landing (field) altitude pressure and the autoschedule, limit the cabin pressure.



Pressurization Control System Operation Schematic
Figure 6



Pressurization Control System Operation Schematic
Figure 7

(e) After determining existing cabin pressure, the CPU determines a cabin pressurization rate command. The cabin pressurization rate command depends on:
   1) The error between the cabin pressure and the selected autorate command (P = Pc Actual - Pc command).
   2) The selected autorate limit.
   3) The maximum cabin-to-ambient differential pressure.

(f) The CPU compares the cabin pressurization rate command with the cabin pressure. The difference produces a digital error signal. A digital to analog (D/A) converter changes the digital signal to an analog signal. The signal goes through the controller's motor drive logic and solid state relays. The relays energize the outflow valve actuator. The actuator controls the outflow valve. A tachometer monitors the actuator speed, and sends a feedback signal to the controller motor drive logic, to improve the speed response of the actuator.

(g) The CPU faults the controller and automatically switches control to the standby controller, if performance or signal faults exist. These faults are:
   1) Excess Cabin Rate: Excessive cabin rate exists when the controller detects a cabin rate of pressurization 200 FPM greater or less than the cabin rate limit command for a time period when the cabin altitude increases by 250 feet. The system switches to the standby controller. EICAS status and maintenance messages CABIN ALT AUTO 1, or CABIN ALT AUTO 2 are received.
   2) High Cabin Pressure: Automatic switchover occurs if the cabin-to-ambient differential pressure is greater than 8.75 psi. EICAS status and maintenance messages CABIN ALT AUTO 1 or CABIN ALT AUTO 2 are received.
   3) AC Power Loss: Loss of AC power for 2 seconds or longer causes automatic switchover to the standby controller. The CABIN ALT AUTO 1 or CABIN ALT AUTO 2 status and maintenance messages are received by EICAS. The selected controller takes control and the EICAS messages disappear when power is restored. The AUTO INOP light comes on and a level B EICAS message appears, CABIN AUTO INOP, if both controllers lose power. The AUTO INOP light and EICAS message remain on when the MAN mode is selected.
   4) If both main AC-power channels are lost, power will be supplied by the hydraulic motor-driven generator. Thus, the cabin pressure system will continue to operate automatically.

(h) If the selector panel, outflow valve actuator or selected controller have any faults, the standby controller takes control and the respective CABIN ALT AUTO 1, or CABIN ALT AUTO 2 status and maintenance messages are received.

(i) GUI 001-003, 005, 007-011, 115;
If the cabin altitude goes above 10,000 feet an EICAS warning message, CABIN ALTITUDE, is displayed (AMM 21-33-00/001).

(j) GUI 004, 006;
The EICAS warning message CABIN ALTITUDE will be displayed if one of these conditions occurs (AMM 21-33-00/001):

1) The high-altitude-landing switchlight is selected off and the cabin altitude goes above 10,000 feet.
2) The high-altitude-landing switchlight is selected ON and the cabin altitude goes above 14,500 feet.
3) The high-altitude-landing switchlight is selected off when the cabin altitude is above 10,000 feet and the cabin altitude goes below 10,000 feet and then again goes above 10,000 feet.

(2) Power Up (Fig. 8)

(a) With 115 Vac supplied to the airplane, the selected controller enters the standby mode and tests itself for faults. The controller reads the air/ground signal, establishes that the airplane is on the ground and enters the ground mode. If the controller receives conflicting air/ground status data, the EICAS status message AIR/GND DISAGREE will be displayed.

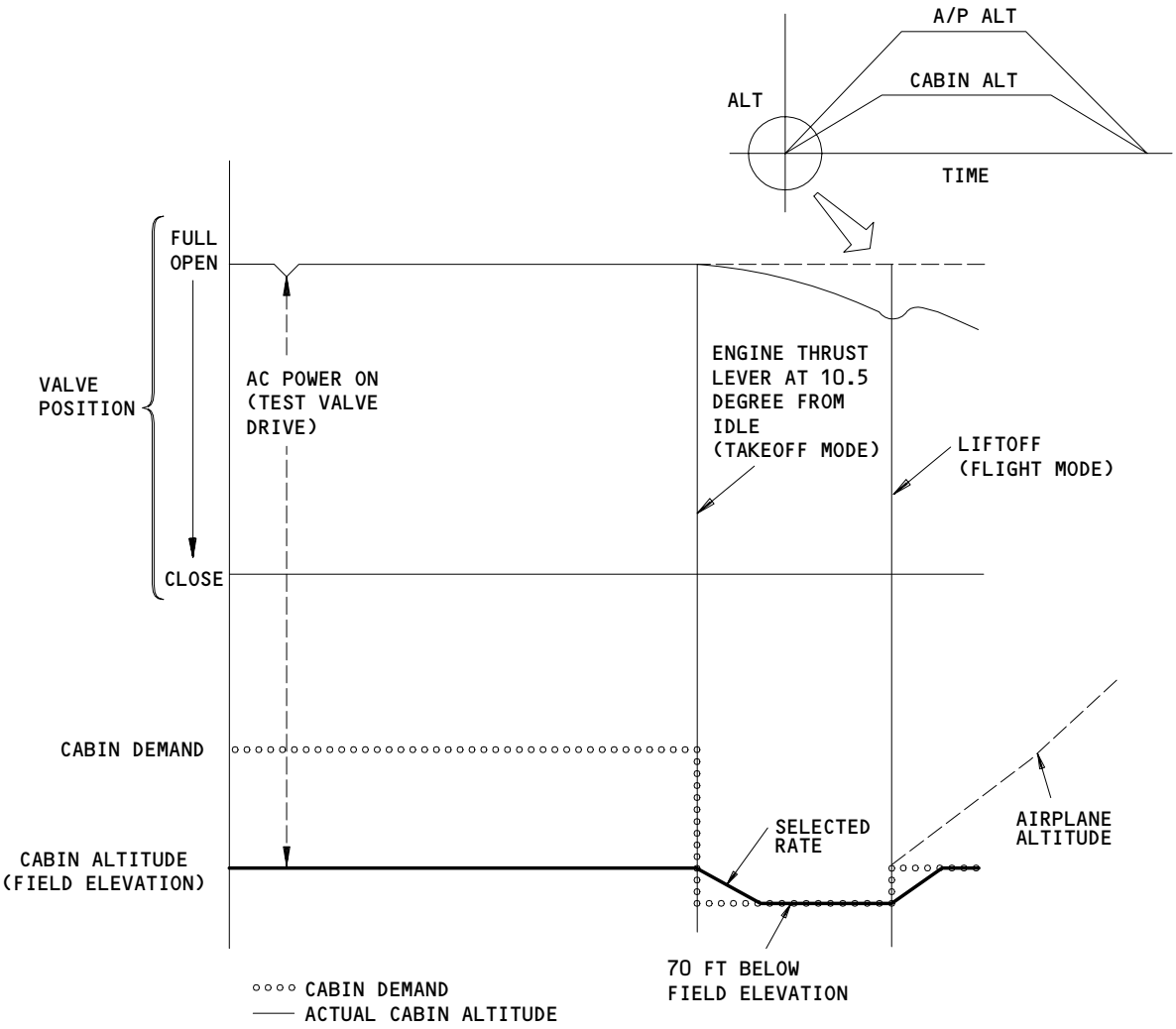
(3) Ground Mode

(a) In the ground mode, the controller drives the outflow valve to the full open position. This is done by setting a 15,000 ft cabin altitude demand (low pressure) and a 2000 FPM pressurization uprate limit. Three seconds after the outflow valve reaches full open, the controller removes the open drive command to prevent actuator heating. A throttle advance signal tells the controller to enter the takeoff mode.

(4) Takeoff Mode

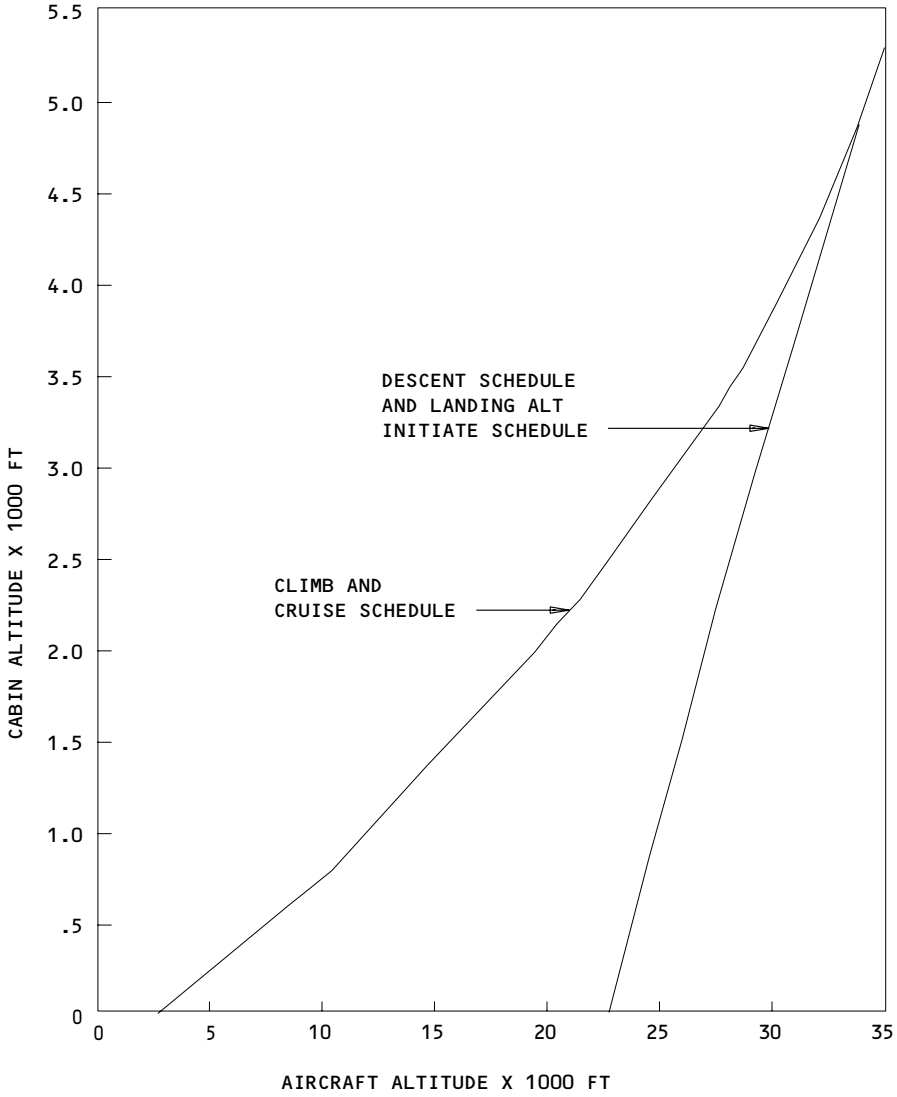
(a) When the throttle is advanced beyond 10.5°, the controller enters the takeoff mode. The controller stores the existing cabin pressure as the takeoff field command. The controller sets the cabin altitude 70 ft below the takeoff field command, and limits the cabin pressurization uprate to 50 FPM while the downrate limit is set at the selected rate limit. During the takeoff roll, the forward door of the outflow valve produces a depressurizing effect around the valve. The valve moves toward close. If positive pressure occurs around the valve because of rotation, the outflow valve moves toward open. At rotation the air/ground signal puts the controller in the flight mode.

NOTE: The throttle advance switches are part of the Autoflight Microswitch Pack. The microswitches are adjusted per instructions contained in Microswitch Pack Maintenance Practices (AMM 22-32-04/201).



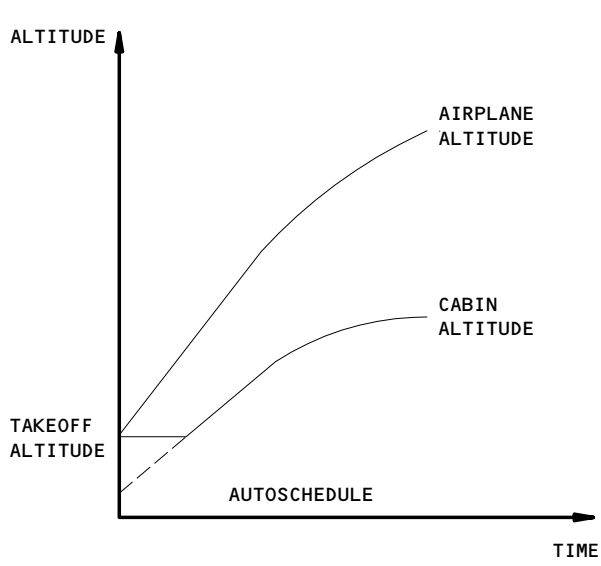
Ground and Takeoff Mode
Figure 8

(5) Autoschedule (Fig. 9)
  (a) The autoschedule is the desired cabin-to-ambient differential pressure, programmed into the controller, over different flight altitudes. The maximum cabin-to-ambient differential pressure is 8.6 psi under normal flight conditions. For normal airplane descent, cabin-to-ambient differential pressure is less than 8.6 psi. The selected rate of pressurization limits the rate of cabin pressure change.
(6) Climb - Automode (Fig. 10)
  (a) Typical takeoff - takeoff altitude lower than autoschedule cruise altitude.
    1) At rotation, the controller reads the ambient pressure and creates an autoschedule cabin altitude demand. The controller compares the takeoff field altitude with the autoschedule command, and sets the cabin altitude demand to the takeoff field altitude. The cabin holds this takeoff field altitude while the airplane climbs until the autoschedule command intersects the takeoff altitude. The cabin then follows the autoschedule to the cruise altitude.
  (b) Takeoff altitude higher than autoschedule cabin altitude.
    1) At rotation, the controller sets the cabin equal to the takeoff altitude. In this case, the takeoff altitude is so high that the autoschedule never reaches the takeoff altitude. Therefore, the cabin remains at the takeoff altitude throughout initial climb until cruise, or until the airplane starts its descent.
(7) Cruise - Automode
  (a) When airplane altitude does not change more than ±250 ft for 1 minute, the controller enters cruise logic. The autoschedule command is clamped (fixed) and remains unchanged until the airplane climbs or descends 500 feet. Four general cabin altitude profiles occur in cruise.
    1) Landing altitude above autoschedule but below takeoff altitude (Fig. 11, Detail A).
      a) At cruise clamp, the controller sets the cabin demand to the landing altitude (landing altitude is higher than autoschedule). The cabin depressurizes to the landing altitude pressure from the takeoff altitude pressure at the selected autorate limit.

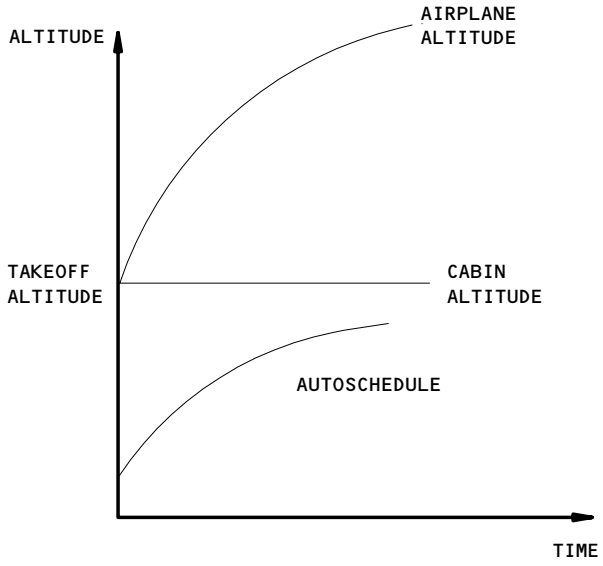


Autoschedule
Figure 9

2) Landing altitude below autoschedule with takeoff altitude above autoschedule (Fig. 11, Detail B).
   a) At cruise clamp, the controller sets the clamped autoschedule as the cabin demand (autoschedule higher than landing field). The cabin descends from the takeoff altitude pressure to the autoschedule at the selected rate limit.
3) Landing altitude above both takeoff and autoschedule altitude (Fig. 11, Detail C).
   a) At cruise clamp, the controller compares the clamp altitude with the selected landing altitude. Since the landing altitude is higher than the takeoff and autoschedule altitudes, the controller sets the cabin demand to the landing altitude. The cabin pressurizes to the landing altitude pressure, from the takeoff altitude pressure, at the rate of 1/2 the selected autorate limit.

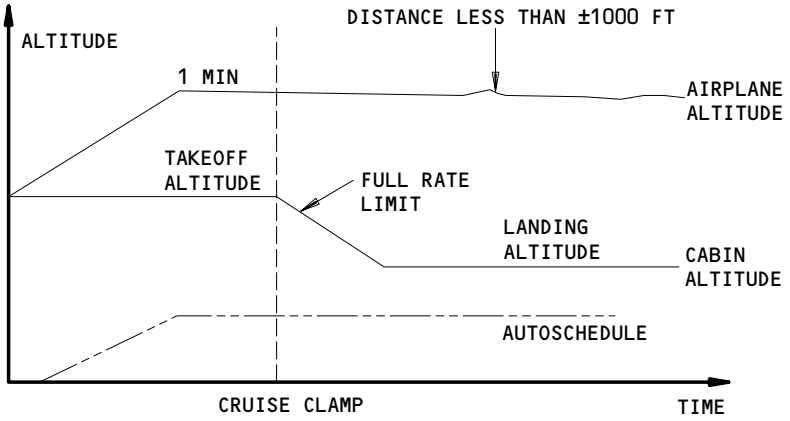


TYPICAL TAKEOFF



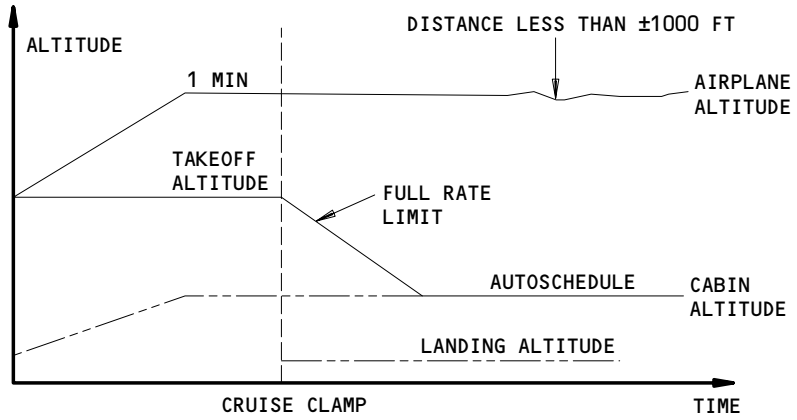
TAKEOFF ALTITUDE HIGHER THAN AUTOSCHEDULE CRUISE ALTITUDE

Initial Climb Flight Profiles
Figure 10



LANDING ALTITUDE ABOVE AUTOSCHEDULE
BUT BELOW TAKEOFF ALTITUDE

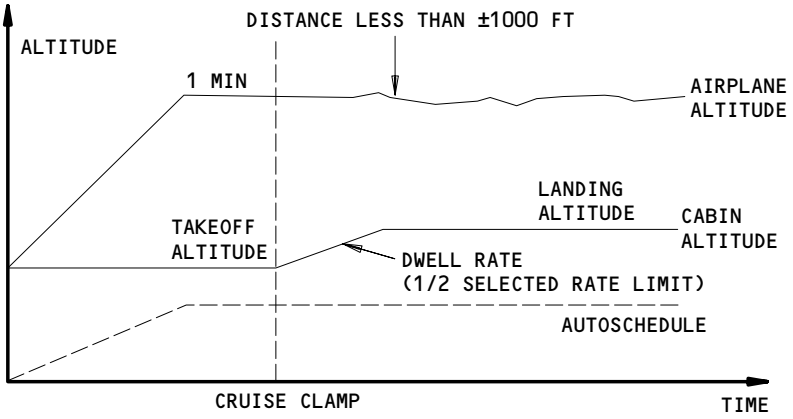
(A)



LANDING ALTITUDE BELOW AUTOSCHEDULE WITH
TAKEOFF ALTITUDE ABOVE AUTOSCHEDULE

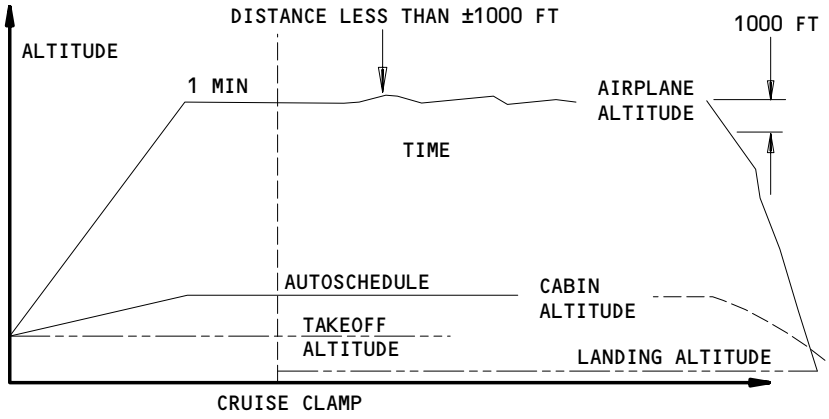
(B)

Cruise and Landing Flight Profile
Figure 11 (Sheet 1)



LANDING ALTITUDE ABOVE BOTH TAKEOFF
AND AUTOSCHEDULE ALTITUDES

(C)



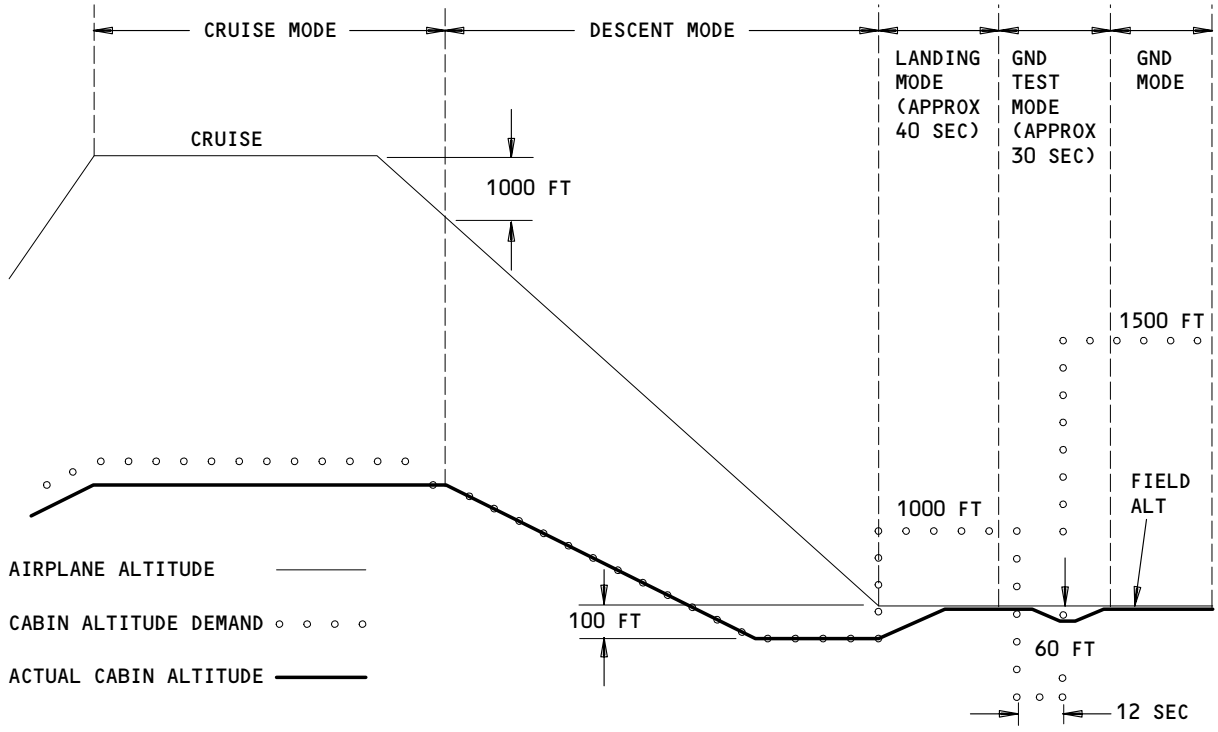
LANDING ALTITUDE AND TAKEOFF ALTITUDE
BOTH BELOW AUTOSCHEDULE (MOST TYPICAL IN U.S.)

(D)

Cruise and Landing Flight Profile
Figure 11 (Sheet 2)

4) Landing altitude and takeoff altitude below autoschedule (Fig. 11, Detail D).
   a) Before cruise clamp, the controller sets the cabin demand to the autoschedule (autoschedule higher than takeoff altitude). After cruise clamp, the cabin demand follows the autoschedule since the autoschedule is higher than the landing altitude. The cabin altitude becomes the clamped autoschedule and no uprate or downrate occurs when changing from climb to cruise logic.

(8) Descent - Automode (Fig. 12)
   (a) After detecting a 1000 foot airplane descent, the controller unclamps the autoschedule. The cabin pressure rate descends with the airplane descent schedule or at the selected autorate limit, whichever is less.
   (b) When the cabin reaches the landing altitude minus 100 ft, (the controller reads the landing (field) altitude as 100 ft below the actual landing altitude selected at the pressurization control panel), the cabin holds that altitude and waits for the airplane to touchdown.



Descent, Landing and Ground Test
Figure 12

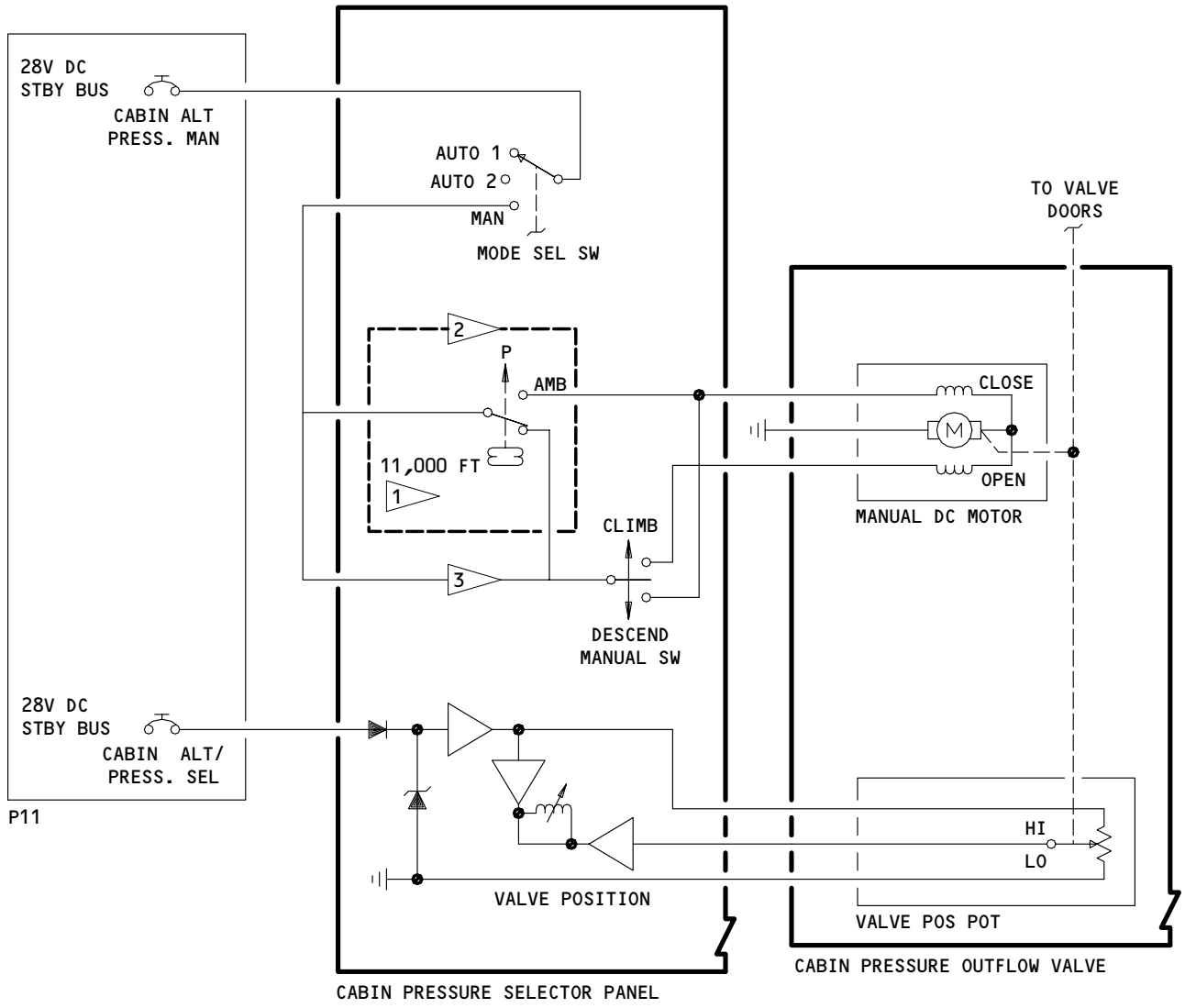
(9) Landing and Ground Test - Automode

(a) On-ground signals from the air/gnd relays put the controller in the landing mode. Conflicting air/ground inputs will signal EICAS to display the status message AIR/GND DISAGREE. In the landing mode, the cabin depressurizes at 500 FPM, by setting the cabin pressure demand 1000 ft above the selected landing (field) altitude. The system remains in the landing mode for 40 seconds to allow for complete thrust reversal and to allow the outflow valve to reach the full-open position. The selected controller then enters the ground test mode and relinquishes control to the standby controller for approximately 30 seconds. During this 30 second period, the selected controller determines if a critical fault has been registered in the EAROM, and if EAROM check is successful the controller resumes control and enters the ground mode. The standby controller enters the ground test mode during the same 30 second period that it assumed control from the selected controller and tests the entire system for faults. The outflow valve moves toward the close position 2 seconds after the standby controller enters the ground test mode. This regulates the cabin rate to 300 fpm for 12 seconds (equivalent to 60 ft altitude decrease). The system then returns to the ground mode. This drives and holds the outflow valve open. The standby controller then releases control of the system back to the selected controller.

(10) Manual Mode (Fig. 13)

(a) If both controllers fail, the cabin pressurization system can be manually controlled from the flight deck. Placing the mode selector switch to MAN allows a momentary contact switch to directly control the outflow valve. In the manual mode, the 28 vdc motor powers the outflow valve. The outflow valve position indicator monitors valve movement.

(b) Turning the momentary switch toward DESCEND closes the outflow valve and increases cabin pressure. Turning the switch toward CLIMB, opens the outflow valve and decreases cabin pressure. The manual control circuit is completed through one of the two absolute pressure switches that interrupts valve open drive signals and applies valve closed drive signals if cabin altitude exceeds 11,000 +/-500 feet. This switch setting is changed to 14,500 +/-500 feet by an external jumper wire for airplanes equipped for high altitude airport operations upto field elevations of 13,500 feet. This allows 28 vdc to flow to the close windings of the outflow valve motor and automatically closes the valve.



1 14,500 FT SWITCH FOR AIRPLANES WITH HIGH ALTITUDE AIRPORT CERTIFICATION

2 AIRPLANES WITH CABIN PRESSURE SELECTOR PANEL P/N S210T160-42,-52, OR -62

3 AIRPLANES WITH CABIN PRESSURE SELECTOR PANEL P/N S210T160-72

Manual Pressurization Operation Schematic
Figure 13

PRESSURIZATION CONTROL SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has these tests for the cabin preesure control system:
      (1) BITE Test - Automatic Cabin Pressure Controllers
      (2) Manual Mode Control Test - Cabin Pressure Control System
          (a) This procedure is for a scheduled maintenance task.
      (3) System Test - Pressurization Control System
          (a) Cabin Altitude Failure Indication Test
          (b) Air/Ground Disagree Test

TASK 21-31-00-705-085

2. BITE Test - Automatic Cabin Pressure Controllers
   A. General
      (1) This procedure performs a BITE test of the Auto 1 and Auto 2 cabin pressure controllers.
   B. References
      (1) AMM 06-46-00/201, Entry, Service, and Cargo Doors (Major Zone 800) Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power Control
      (3) AMM 32-09-02/201, Air/Ground Relay System
   C. Prepare for Test

S 865-088

(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

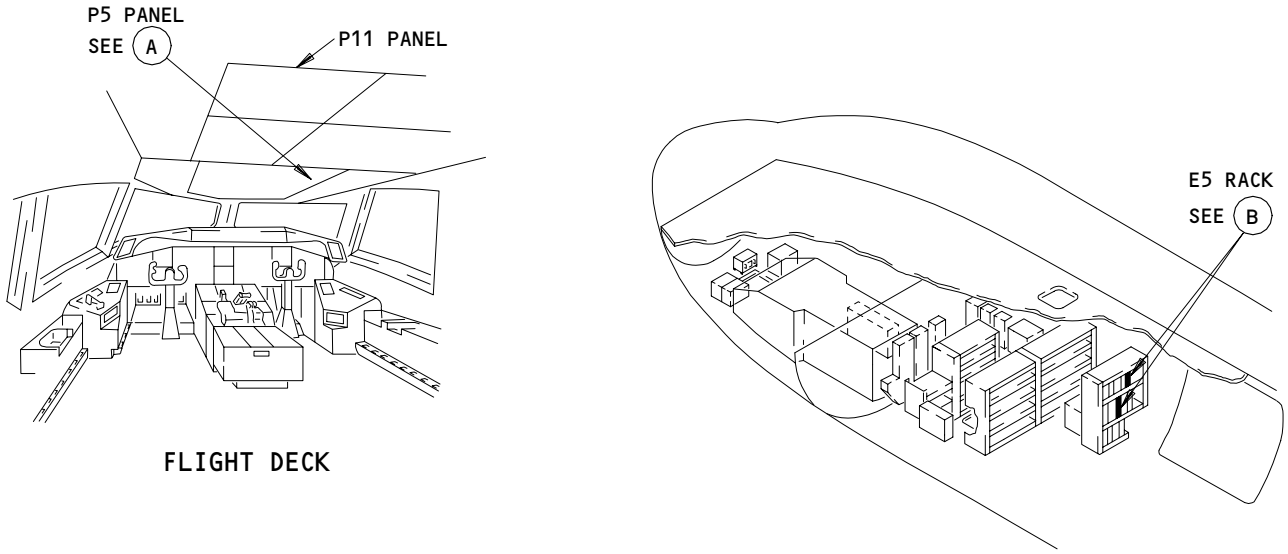
NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 865-067

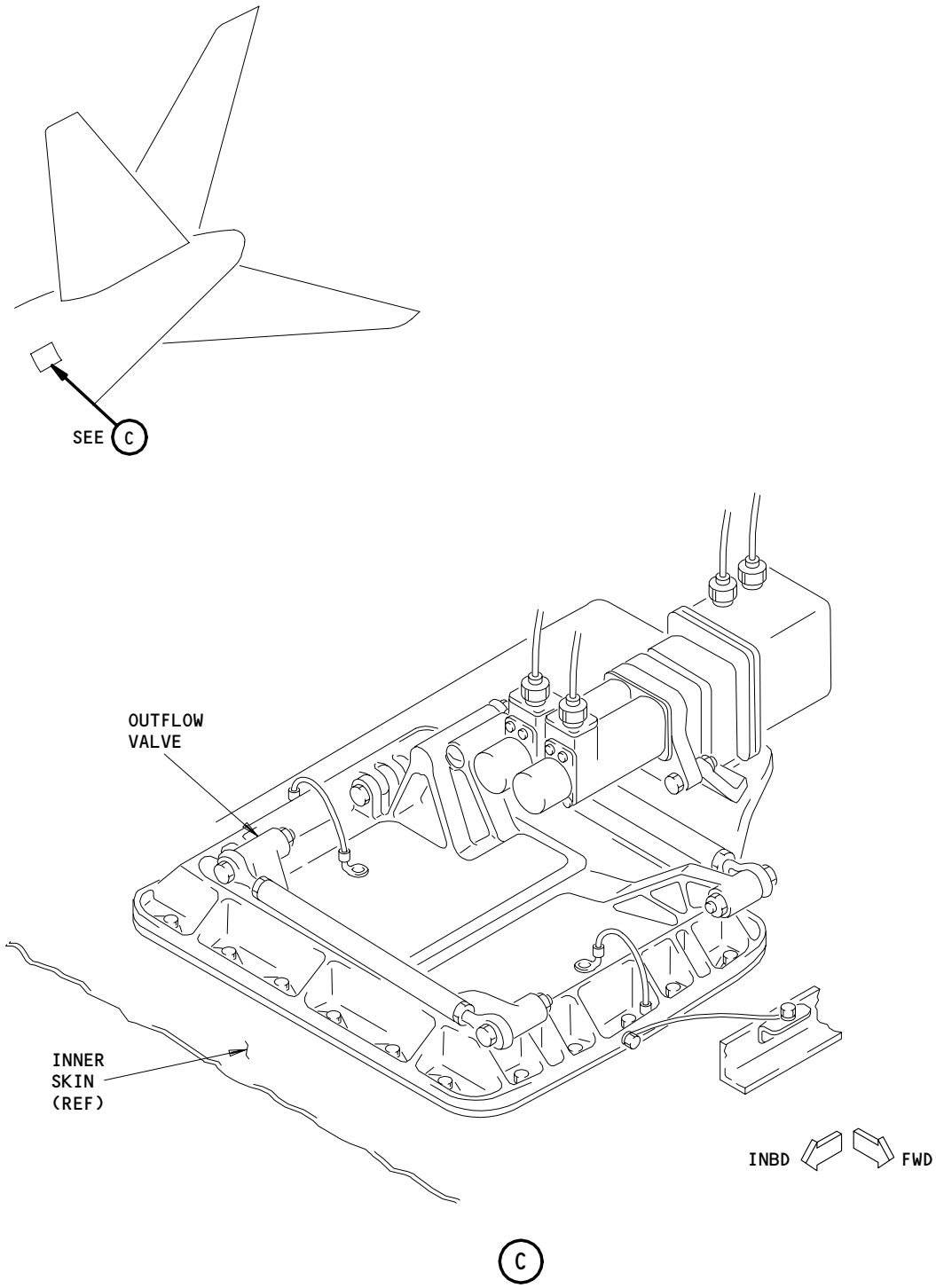
(2) Make sure that these circuit breakers, on the overhead circuit breaker panel, P11, are closed:
   (a) 11B14, CABIN ALTITUDE CONTROL MANUAL
   (b) 11B15, CABIN ALTITUDE CONTROL SELECT
   (c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
   (d) 11N24, CABIN ALTITUDE CONTROL AUTO 2
   (e) 11S15, AIR/GND SYS 1
   (f) 11S19, AIR/GND SYS 2

S 865-051

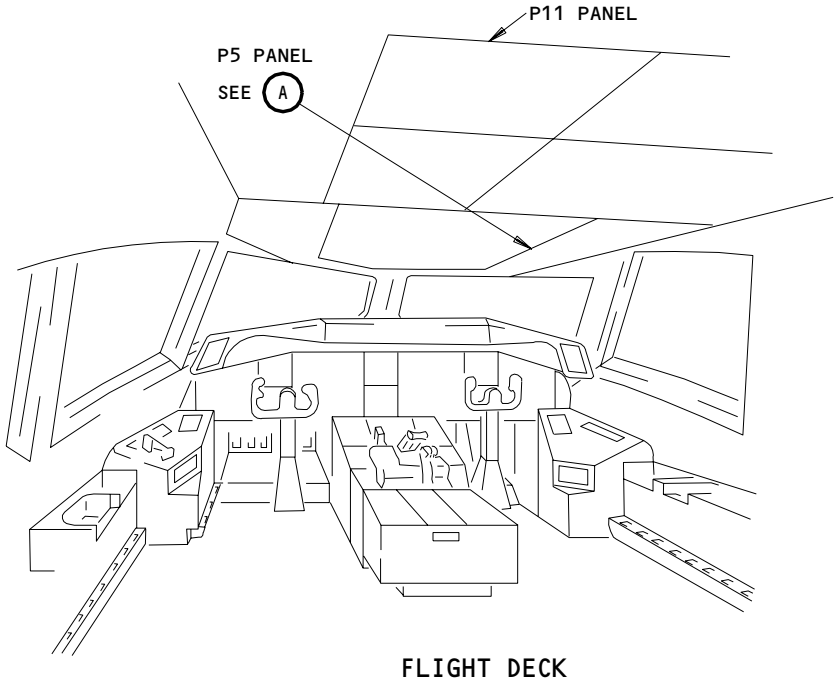
(3) Supply the electrical power (AMM 24-22-00/201).



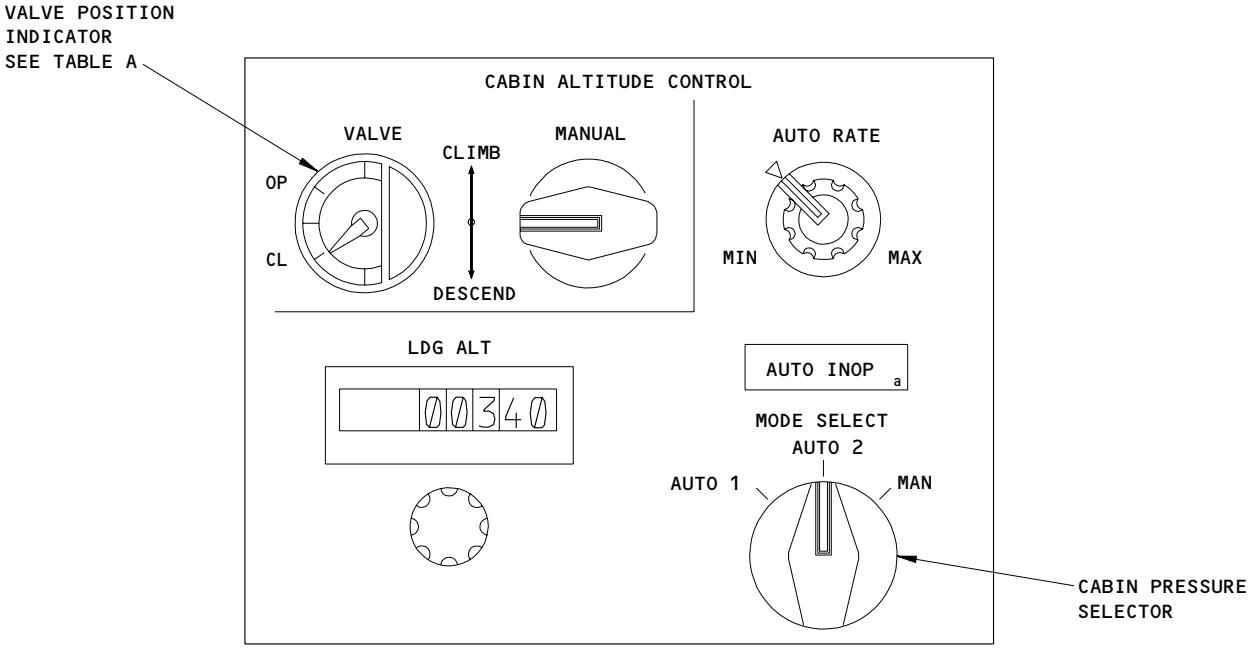
Pressurization System Test Components
Figure 501 (Sheet 1)



Pressurization System Test Components
Figure 501 (Sheet 2)



FLIGHT DECK



CABIN SELECTOR PANEL (EXAMPLE)

A

Valve Position Indications for Mixed Cabin Pressure Controller/
Outflow Valve Combinations
Figure 502 (Sheet 1)

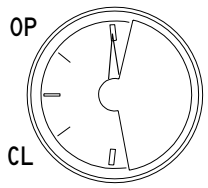
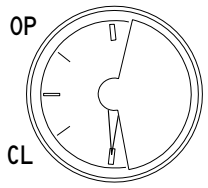
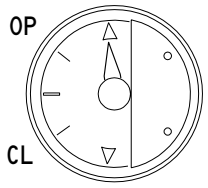
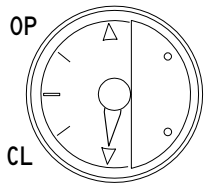
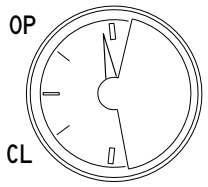
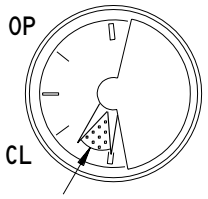
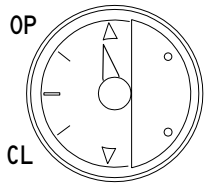
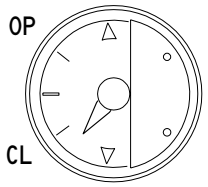
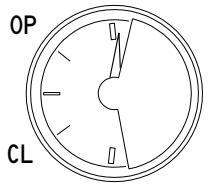
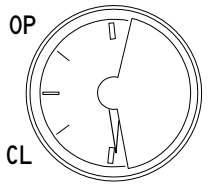
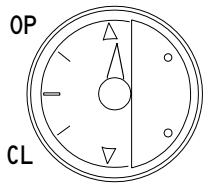
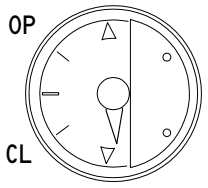
CABIN PRESSURE CONTROLLER/OUTFLOW VALVE COMBINATIONS	CABIN PRESSURE SELECTOR PANEL	VALVE POSITION INDICATOR	
		OPEN	CLOSED
S210T160-83, -113, -133 CPC S210T160-114 OFV	S210T160-42 S210T160-52 S210T160-62		
	S210T160-72		
S210T160-83, -113, -133 CPC S210T160-64, -74, -84, -94 OFV	S210T160-42 S210T160-52 S210T160-62		
	S210T160-72		
S210T160-63 CPC S210T160-93 CPC S210T160-114 OFV	S210T160-42 S210T160-52 S210T160-62		
	S210T160-72		

TABLE A

Valve Position Indications for Mixed Cabin Pressure Controller/
Outflow Valve Combinations
Figure 502 (Sheet 2)

S 865-084
(4) Make sure the airplane air/ground relay systems are set to the ground mode (AMM 32-09-02/201).

S 015-049
(5) Open the forward (No. 1) cargo door, 821 (AMM 06-46-00/201).

S 215-050
(6) Find the auto-1 and auto-2 cabin-pressure controllers in the E5 rack.

D. Built-In-Test Equipment (BITE) Test - Cabin Pressure Controller

NOTE: The cabin pressure controller does not know the difference between an LRU fault and a wiring fault. If the controller indicates an LRU fault, make sure the connector and the wiring is correct before you replace the LRU. This test is done on only one controller at a time.

S 745-083
(1) Do a BITE test of the Auto 1 (Auto 2) cabin pressure controller:
(a) Turn the MODE SELECT selector, on the overhead panel, P5, to the AUTO 1 (AUTO 2) position.
(b) Make sure the MODE SELECT selector, on the P5 panel, has been at AUTO 1 (AUTO 2) for at least two minutes, to let the system warm-up.
(c) Push the PRESS TEST button to test the fault lights (LEDs) on the front of the controller.
1) All fault lights (LEDs) on the front of the controller should come on when the PRESS TEST button is pushed.
2) If no fault lights (LEDs) come on when the PRESS TEST button is pushed, the controller has an internal failure.

NOTE: This indicates a failure of the power supply or CPU within the controller, assuming the system circuit breakers are closed and the MODE SELECT is set to the appropriate AUTO mode.

a) Replace the inoperative controller if necessary.
(d) Push the BIT button to interrogate the controller's fault memory.

NOTE: This will cause the CPU to look at the fault memory and display any faults previously recorded.

1) If no faults are present in the fault memory, the NO FAULT light (LED) will come on for 30 seconds and then go off.

2) If a fault exists in the fault memory, the appropriate LRU component fault light (LED) will come on for 15-30 seconds and then go out.

NOTE: Each time the BIT button is pushed, the appropriate LRU component fault light (LED) will be recalled for 15-30 seconds.

a) Replace the LRU component associated with the fault light (LED) that shows.

3) CONTROLLER P/N 2117388-11 (S21OT16-83) AND SUBSEQUENT; Push the PRESS TEST button within 15 seconds after you push the BIT button to display any faults from the previous flight legs.

NOTE: When the BIT button is pushed, the current flight leg fault data is displayed. Subsequent pushes of the PRESS TEST button within 15 seconds will display any faults from the previous flight legs.

WARNING: MAKE SURE THE CABIN PRESSURE OUTFLOW VALVE AREA IS CLEAR OF ALL PERSONS. WHEN THE VERIFY BUTTON IS PUSHED, THE OUTFLOW VALVE WILL MOVE AND COULD CAUSE INJURY TO PERSONS.

(e) Keep all persons and equipment clear of the outflow valve before you push the VERIFY button on the controller.

NOTE: The outflow valve will operate and move when the VERIFY button is pushed.

(f) Push the VERIFY button to test that the installation, operation and interfaces for a replacement LRU component is satisfactory.

1) The VERIFY MODE light will illuminate when the VERIFY button is pushed and will remain illuminated until the verification test is complete (approximately 10 seconds).

NOTE: The VERIFY MODE light will not illuminate and the verification test will not run if there is no weight-on-wheels signal (flight mode). The VERIFY MODE light will begin to flash if the MODE SELECT is not set to the correct AUTO position. The verification test will terminate and the VERIFY MODE light will extinguish if the MODE SELECT is moved from a correct selection to an incorrect selection while the VERIFY MODE light is on.

2) When the verfication test is complete, the VERIFY MODE light will go off, and if no faults were detected, the NO FAULT light will come on for about 30 seconds.

NOTE: If a fault is detected, the appropriate LRU component fault light (LED) will be illuminated.

(g) Erase a stored fault in the fault memory and reset the controller:

NOTE: CONTROLLER P/N 2117388-11 (S210T160-83) AND SUBSEQUENT; This will push the stored fault one place down in the memory fault stack.

1) Push the VERIFY button and make sure that the VERIFY MODE light and the appropriate LRU component fault light are on.
2) Push the RESET button while the VERIFY MODE light is on.

NOTE: When the RESET button is pushed, the LRU component fault light will go off after the erase procedure is completed in approximately 9 seconds, and then the NO FAULT light will come on for about 30 seconds and then go off. If the RESET button was pushed before the VERIFY button is pushed, no fault indications will show. If the stored fault was not erased, a hard failure still exists within the system.

(h) Do the BITE test for the Auto 2 (Auto 1) controller.

E. Put the Airplane Back to Its Usual Condition

S 415-061
(1) Close the E5 rack access panel.

S 415-062
(2) Close the No. 1 cargo door, 821 (AMM 06-46-00/201).

S 865-071
(3) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-31-00-715-001

3. Manual Mode Control Test - Cabin Pressure Control System (Figs. 501, 502)
   A. General
      (1) This procedure is for a scheduled maintenance task.
   B. References
      (1) AMM 24-22-00/201, Electrical Power Control
   C. Prepare for Test

S 865-086
(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 865-002
(2) Make sure that these circuit breakers, on the pilot's-overhead-circuit-breaker panel, P11, are closed:
(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2
(e) 11S15, AIR/GND SYS 1
(f) 11S19, AIR/GND SYS 2

S 865-005
(3) Supply the electrical power (AMM 24-22-00/201).

   D. Procedure

S 865-014
(1) Turn the MODE SELECT selector, on the pilot's overhead control panel, P5, to the MAN position.

S 865-015

(2) Turn and hold the MANUAL selector, on the P5 panel, to the DESCEND position.

(a) Make sure the VALVE position indicator moves to the CL position within twenty-five (25) seconds.

NOTE: Different part number combinations of the cabin pressure controller and the outflow valve installed on the aircraft can cause the VALVE position indicator needle to point differently at the "CL/OP" positions.

Refer to Figure 502 for the normal position of the VALVE position indicator needle at the "CL/OP" positions when different part number combinations of the cabin pressure controller and outflow valve are installed on the aircraft.

S 865-016

(3) Release the MANUAL selector.

(a) Make sure the cabin-pressure outflow-valve is fully closed.

S 865-017

(4) Turn and hold the MANUAL selector to the CLIMB position.

(a) Make sure the VALVE position indicator moves to within 2 - needle widths of the OP position within twenty-five (25) seconds.

NOTE: Different part number combinations of the cabin pressure controller and the outflow valve installed on the aircraft can cause the VALVE position indicator needle to point differently at the "CL/OP" positions.

Refer to Figure 502 for the normal position of the VALVE position indicator needle at the "CL/OP " positions when different part number combinations of the cabin pressure controller and outflow valve are installed on the aircraft.

S 865-018

(5) Release the MANUAL selector.

(a) Make sure the cabin-pressure outflow-valve is fully open.

S 865-019

(6) Turn the MODE SELECT selector, on the P5 panel, to the AUTO 1 or AUTO 2 position.

E. Put the Airplane Back to Its Usual Condition

S 415-082
(1) Close the main equipment center access door (AMM 06-41-00/201).

S 865-022
(2) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-31-00-735-023

4. System Test - Pressurization Control System

A. References
(1) AMM 06-41-00/201, Fuselage (Major Zone 100 and 200) Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service, and Cargo Doors (Major Zone 800) Access Doors and Panels
(3) AMM 24-22-00/201, Electrical Power Control
(4) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(5) AMM 31-41-00/201, Engine Indication and Crew Alerting System

B. Prepare for Test

S 865-087
(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 865-024
(2) Make sure that these circuit breakers are closed:
(a) On the overhead circuit breaker panel, P11:
1) 11B14, CABIN ALTITUDE CONTROL MANUAL
2) 11B15, CABIN ALTITUDE CONTROL SELECT
3) 11N15, CABIN ALTITUDE CONTROL AUTO 1
4) 11N24, CABIN ALTITUDE CONTROL AUTO 2
5) 11S15, AIR/GND SYS 1
6) 11S19, AIR/GND SYS 2

S 865-066
(3) Supply the electrical power (AMM 24-22-00/201).

S 745-074
(4) Do the BITE procedure on the auto-1 cabin pressure controller.

S 745-075
(5) Do the BITE procedure on the auto-2 cabin pressure controller.

C. Do the Cabin Altitude Failure Indication Test

S 865-025

(1) Make sure that these circuit breakers are closed:
  (a) On the overhead circuit breaker panel, P11:
    1) 11A32, INDICATOR LIGHTS 1
    2) 11P1, L IND LTS 1
    3) 11P29, R IND LTS 2
    4) EICAS circuit breakers (6 places)

S 865-026

(2) Turn the MODE SELECT selector, on the pilot's-overhead-control panel, P5, to the AUTO 2 position.

S 865-027

(3) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
  (a) On the P11 panel:
    1) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 865-028

(4) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.
  (a) With the EICAS computer switch, on the P9 panel, in the L or R position, make sure the EICAS status message CABIN ALT AUTO 2 does show on the lower display.

S 865-029

(5) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
  (a) On the P11 panel:
    1) 11N15, CABIN ALTITUDE CONTROL AUTO 1

S 735-030

(6) With the EICAS computer switch, on the P9 panel, in the L or R position, make sure the EICAS status message CABIN ALT AUTO 1 shows on the lower display.

S 865-076

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FOR THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(7) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-032

WARNING: OBEY THE PROCEDURE THAT PUTS THE AIRPLANE IN THE AIR MODE. IF YOU DO THE PROCEDURE INCORRECTLY, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(8) Put the air/ground relay system in the air mode (AMM 32-09-02/201).
  (a) Make sure the EICAS caution message CABIN AUTO INOP does show on the upper display.

    NOTE: The aural warning and the master caution lights will also come on.

  (b) Make sure the AUTO INOP light, on the P5 panel, comes on.

S 865-033
(9) Turn the MODE SELECT selector, on the P5 panel, to the AUTO 2 position.
  (a) Make sure the EICAS caution message CABIN AUTO INOP stays.
  (b) Make sure the AUTO INOP light stays on.

S 865-034
(10) Put the air/ground relay system back to the ground mode (AMM 32-09-02/201).

S 865-035
(11) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 865-036
(12) Remove the DO-NOT-CLOSE tags and close this circuit breaker:
  (a) On the P11 panel:
    1) 11N15, CABIN ALTITUDE CONTROL AUTO 1

S 735-037
(13) Make sure the AUTO INOP light, on the P5 panel, goes off.

S 735-038
(14) Make sure the EICAS status message CABIN ALT AUTO 1 does not show on the lower EICAS display.

S 735-039
(15) Make sure the EICAS caution message CABIN AUTO INOP does not show on the upper EICAS display.

S 865-040
(16) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
  (a) On the P11 panel:
    1) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 735-041
(17) Make sure the EICAS status message CABIN ALT AUTO 2 does not show on the lower display.

S 865-042
(18) Turn the MODE SELECT selector, on the P5 panel, to the MAN position.
(a) Make sure the AUTO INOP light, on the P5 panel, comes on.
(b) Make sure the EICAS caution message CABIN AUTO INOP does show on the upper display.

S 865-043
(19) Turn the MODE SELECT selector, on the P5 panel, to the AUTO 1 position.
(a) Make sure the AUTO INOP light, on the P5 panel, goes off.
(b) Make sure the EICAS caution message CABIN AUTO INOP does not show on the upper display.

S 865-046
(20) GUI 004, 006;
Make sure the ON light of the HIGH ALT LDG switchlight, on the P5 panel, is not on.

S 015-046
(21) Open the main-equipment-center access-door, 119BL (AMM 06-41-00/201) and find the P36 panel.

S 015-047

WARNING: BE VERY CAREFUL WHEN THE P36 PANEL DOOR IS OPEN. THE P36 PANEL HAS HIGH-VOLTAGE CIRCUITS THAT CAN CAUSE INJURY TO PERSONNEL.

(22) Open the door of left miscellaneous-electrical-equipment panel P36.

S 025-048
(23) Remove the electrical connector D3230 from the cabin-altitude-warning switch S431.

S 485-049
(24) Install a jumper wire between pin 1 and pin 2 of the electrical connector.
(a) Make sure the CABIN ALTITUDE light, on the P5 panel, comes on.
(b) Make sure the CABIN ALT light, on the main-instrument panel, P1, comes on.
(c) Make sure the EICAS caution message CABIN ALTITUDE does show on the upper display.

NOTE: The master warning lights and the aural warning siren will also come on.

S 085-050
(25) Remove the jumper from the cabin-altitude-warning switch S431 and the electrical connector.

S 425-051
(26) Install the electrical connector D3230 to the cabin-altitude-warning switch S431.
(a) Make sure the CABIN ALTITUDE light, on the P5 panel, goes off.
(b) Make sure the CABIN ALT light, on the P1 panel, goes off.
(c) Make sure the EICAS caution message CABIN ALTITUDE does not show on the upper display.

D. Do the air/ground disagree test

S 865-072
(1) Open these circuit breakers, on the P11 panel:
(a) 11C30, LANDING GEAR POSITION SYS 1
(b) 11S23, LANDING GEAR POSITION SYS 2

S 025-053
(2) Remove the sys-1-air/ground relay K10238 from the P36 panel.

S 865-068
(3) Close these circuit breakers on the P11 panel:
(a) 11C30, LANDING GEAR POSITION SYS 1
(b) 11S23, LANDING GEAR POSITION SYS 2

S 735-054
(4) Make sure the EICAS status message AIR/GND DISAGREE does show on the lower display.

S 865-055
(5) Open these circuit breakers on the P11 panel:
(a) 11C30, LANDING GEAR POSITION SYS 1
(b) 11S23, LANDING GEAR POSITION SYS 2

S 425-056
(6) Install the sys-1-air/ground relay K10238 to the P36 panel.

S 865-057
(7) Close these circuit breakers on the P11 panel:
(a) 11C30, LANDING GEAR POSITION SYS 1
(b) 11S23, LANDING GEAR POSITION SYS 2

S 865-058
(8) Do the Maintenance Message Erase procedure (AMM 31-41-00/201).
(a) Make sure the EICAS status message AIR/GND DISAGREE does not show on the lower display.

S 415-059
(9) Close the door on the P36 panel.

S 015-060

WARNING: BE VERY CAREFUL WHEN THE P37 PANEL DOOR IS OPEN. THE P37 PANEL HAS HIGH-VOLTAGE CIRCUITS THAT CAN CAUSE INJURY TO PERSONNEL.

(10) Open the door on the right-miscellaneous-electrical-equipment panel P37.

S 025-061

(11) Remove the sys-2-air/gnd relay K207 from the P37 panel.
  (a) Make sure the EICAS status message AIR/GND DISAGREE does show on the lower display.

S 425-062

(12) Install the sys-2-air/gnd relay K207 in the P37 panel.

S 865-070

(13) Do the Maintenance Message Erase procedure (AMM 31-41-00/201).
  (a) Make sure the EICAS status message AIR/GND DISAGREE does not show on the lower display.

E. Put the Airplane Back to Its Usual Condition

S 415-064

(1) Close the No. 1 cargo door, 821 (AMM 06-46-00/201).

S 865-078

(2) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

CABIN PRESSURE SELECTOR - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the cabin pressure selector. The second task is the installation of the cabin pressure selector.
   B. The cabin pressure selector contains controls and circuitry necessary for automatic or manual cabin pressure selection. The selector is in the pilot's overhead panel, P5.

TASK 21-31-01-004-001

2. Remove the Cabin Pressure Selector (Fig. 401)
   A. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41
   B. Procedure

      S 864-002
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11B14, CABIN ALTITUDE CONTROL MANUAL
          (b) 11B15, CABIN ALTITUDE CONTROL SELECT
          (c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
          (d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

      S 034-003
      (2) Loosen the 1/4-turn fasteners on the selector panel.

      S 034-004
      (3) Carefully move the cabin pressure selector out from the P5 panel.

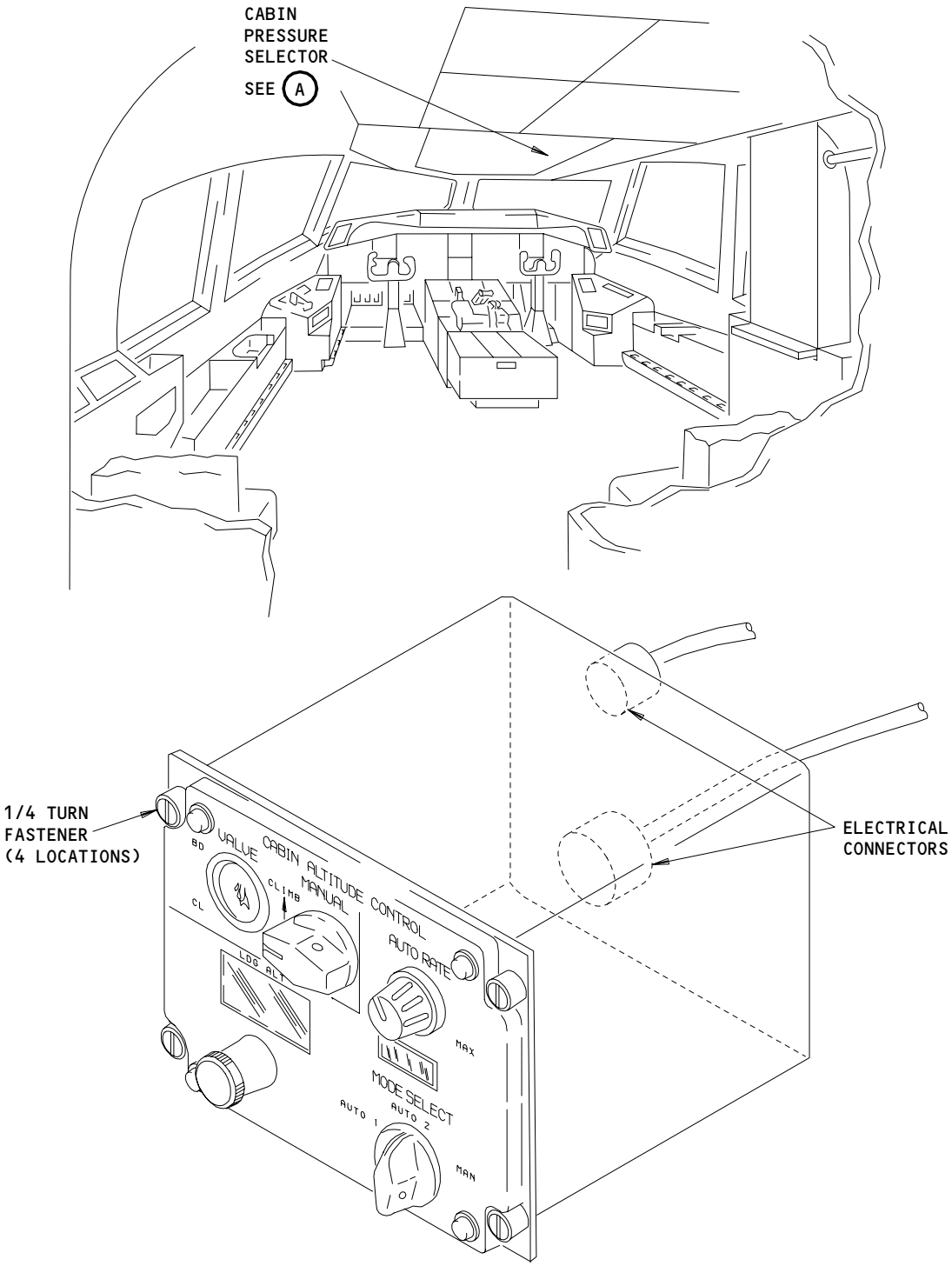
      S 024-013
      (4) Attach tags to identify each electrical connector to the correct location on the back of the cabin pressure selector.

      S 024-014
      (5) Remove the electrical connectors from the cabin pressure selector.

      S 024-006
      (6) Remove the cabin pressure selector.

TASK 21-31-01-404-007

3. Install the Cabin Pressure Selector (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels



A

Cabin Pressure Selector Installation
Figure 401

(2) AMM 21-31-02/401, Automatic Pressure Controller
(3) AMM 24-22-00/201, Electrical Power Control

B. Access

(1) Location Zones

211/212	Control Cabin - Section 41
821	Forward Cargo Door

C. Procedure

S 424-008

(1) Put the cabin pressure selector in position for installation.

S 434-015

CAUTION: BE SURE TO CONNECT THE ELECTRICAL CONNECTORS TO THEIR PROPER LOCATION ON THE CABIN PRESSURE SELECTOR PANEL. CROSS CONNECTION OF THE CONNECTORS CAN CAUSE THE AIRPLANE SYSTEM TO MALFUNCTION.

(2) Connect the electrical connectors to the cabin pressure selector.

S 424-010

(3) Carefully move the cabin pressure selector into the P5 panel.

S 434-011

(4) Tighten the 1/4-turn fasteners (4) on the selector panel.

D. Post-Installation Test

S 864-016

(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 864-009

(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:

(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 704-010

(3) Do a test of the cabin pressure selector.
(a) Supply electrical power (AMM 24-22-00/201).
(b) Set the CABIN ALTITUDE CONTROL MODE SEL switch to AUTO 1.
(c) Open the forward (No. 1) cargo door, 821 (AMM 06-46-00/201).

(d) Open the E5 rack access panel immediately forward of the cargo door and find the cabin pressure controllers.
(e) Before you use the cabin pressure controller BITE, wait a minimum of two minutes after you close the circuit breakers in the above steps.
(f) Push the PRESS/TEST button on the controller for a lamp check.
    1) Make sure all eight fault indicator lamps come on.
    2) If all the lamps do not come on, replace the controller (AMM 21-31-02/401).
(g) Push the VERIFY button and wait for the VERIFY MODE lamp to go off.
    1) If the SELECTOR fault lamp comes on, replace the cabin pressure selector.
(h) Close the E5 access panel and the forward cargo door, 821.
(i) Remove electrical power, if it is not necessary.

AUTOMATIC PRESSURE CONTROLLER - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the automatic pressure controller. The second task is the installation of the automatic pressure controller.
   B. The airplane's two automatic pressure controllers are the same. They are in the E5 electrical/electronics rack.

TASK 21-31-02-004-001

2. Remove the Automatic Pressure Controller (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41
          821 Forward Cargo Door
   C. Procedure

      S 864-002
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:

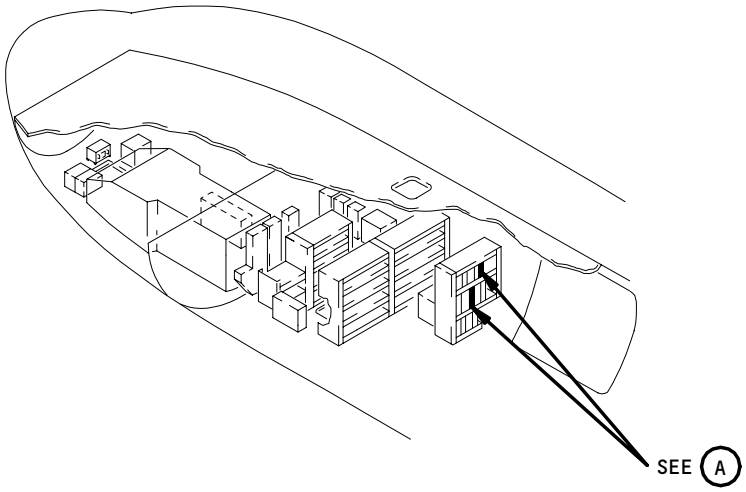
          (a) 11B15, CABIN ALTITUDE CONTROL SELECT
          (b) 11N15, CABIN ALTITUDE CONTROL AUTO 1
          (c) 11N24, CABIN ALTITUDE CONTROL AUTO 2

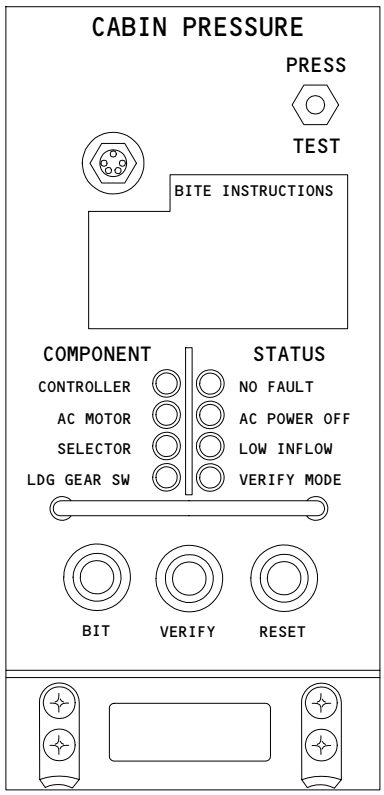
      S 014-003
      (2) Open the forward (No. 1) cargo door, 821, (AMM 06-41-00/201) and find the automatic pressure controller on the E5 rack.

      S 024-004
      (3) Remove the automatic pressure controller (AMM 20-10-01/401).

TASK 21-31-02-404-005

3. Install the Automatic Pressure Controller (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels





A

Automatic Pressure Controller Installation
Figure 401

(2) AMM 20-10-01/401, E/E Rack Mounted Components
(3) AMM 24-22-00/201, Electrical Power Control

B. Access
(1) Location Zones
211/212 Control Cabin - Section 41
821 Forward Cargo Door

C. Procedure

S 424-006
(1) Install the automatic pressure controller (AMM 20-10-01/401).

D. Post-Installation Test

S 864-012
(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 864-007
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11B15, CABIN ALTITUDE CONTROL SELECT
(b) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(c) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 704-008
(3) Do a test of the automatic pressure controller.
(a) Supply electrical power (AMM 24-22-00/201).
(b) Set the MODE SELECT switch on the pilot's overhead panel, P5, to AUTO 1 or AUTO 2.
(c) Wait approximately two minutes.
(d) Push the PRESS/TEST button on the installed automatic pressure controller.
1) Make sure all eight lights (seven red and one green) come on.

NOTE: Lights will stay on while you push the button.

(e) Push the VERIFY switch.
1) Make sure the VERIFY MODE lamp comes on and then goes out.
(f) Push the VERIFY switch again.
1) Push the RESET button while the VERIFY MODE lamp is on.

S 414-009
(4) Close the forward (No. 1) cargo door, 821 (AMM 06-41-00/201).

S 864-010

(5) Remove electrical power, if it is not necessary.

CABIN PRESSURE OUTFLOW VALVE - MAINTENANCE PRACTICES

1. General
   A. This procedure has instructions to do the tasks that follow:
      (1) Remove the Cabin Pressure Outflow Valve
      (2) Install the Cabin Pressure Outflow Valve
      (3) Clean the Cabin Pressure Outflow Valve
      (4) Do a Check of the Cabin Pressure Outflow Valve

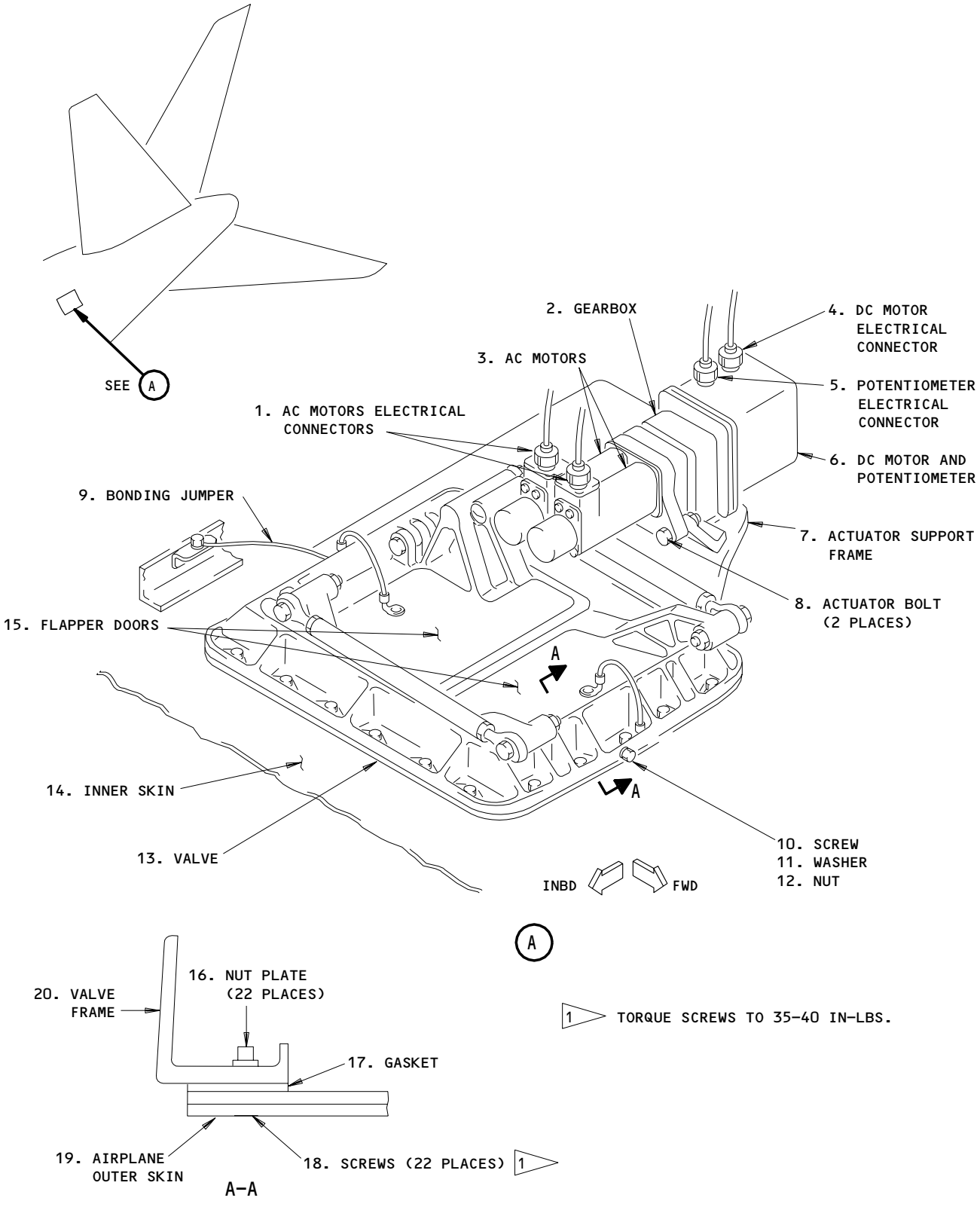
TASK 21-31-03-002-001

2. Remove the Cabin Pressure Outflow Valve (Fig. 201)
   A. General
      (1) You can remove the outflow valve through the aft end of the bulk cargo compartment or from the out side of the airplane. The valve is most easily removed through the cargo compartment. The procedure to remove the valve from the out side of the airplane is used when access through the bulk cargo compartment is not possible.
      (2) To remove the valve from the out side of the airplane, the valve must be in the closed position.
   B. References
      (1) AMM 24-22-00/201, Electric Power Control
      (2) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
      (3) AMM 25-50-03/401, Bulkhead Lining
   C. Access
      (1) Location Zones
          165 Area aft of bulk cargo compartment (Left)
   D. Prepare for the Removal

      S 862-002
      (1) Open these circuit breakers, on the overhead circuit breaker panel P11, and attach the DO-NOT-CLOSE tags:

          (a) 11B14, CABIN ALTITUDE CONTROL MANUAL
          (b) 11B15, CABIN ALTITUDE CONTROL SELECT
          (c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
          (d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

      S 012-003
      (2) If the outflow valve will be removed through the bulk cargo compartment, do the steps that follow:
          (a) Open the aft cargo door, 822 (AMM 06-46-00/201).



Cabin Pressure Outflow Valve Installation
Figure 201

(b) Remove the endliner at the aft end of the bulk cargo compartment (AMM 25-50-03/401).

S 862-004

(3) If you will remove the valve from the out side of the airplane, make sure that the valve is in the closed position.
(a) If the valve cannot be closed, you must remove the valve through the bulk cargo compartment.

E. Remove the outflow valve.

S 032-005

(1) Remove the screws (18) that are on the out side of the airplane.

S 032-006

(2) Disconnect the bonding jumper (9) from the valve (13).
(a) To access the bonding jumper from the out side the airplane, carefully push the forward edge of the valve (13) inboard.

S 032-007

(3) Disconnect the electrical connectors (1) from the valve motors (3). Identify the electrical connectors for installation.

S 022-008

(4) Remove the outflow valve (13).
(a) To remove the valve from the out side the airplane, turn the outflow valve assembly so that the actuator motor comes out first, with the valve diagonal to the skin opening.

S 032-009

(5) Remove the outflow valve gasket (17).

NOTE: You can use the gasket (17) again if it is not damaged.

TASK 21-31-03-402-010

3. Install the Cabin Pressure Outflow Valve (Fig. 201)

A. General
(1) You can install the outflow through the aft end of the bulk cargo compartment or from the out side of the airplane. The valve is most easily installed through the cargo compartment. The procedure to install the valve from the out side of the airplane is used when access through the bulk cargo compartment is not possible.
(2) To install the valve from the out side of the airplane, the valve must be in the closed position.

B. Consumable Materials
(1) C00259 - Primer, BMS 10-11, Type I
(2) G00508 - Corrosion Preventive Compound, MIL-C-11796 Class 3
(3) C00308 - Sealant, BMS 5-95

C. Parts
(1) Refer to IPC for part numbers and effectivities of items in following tables.

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
201	9	Jumper Assembly	21-31-03	01	10
	10	Screw			15
	11	Washer			20
	12	Nut			25
	13	Valve Assembly-Outflow			30
	17	Gasket			198
	18	Screw			31

D. References
(1) AMM 24-22-00/201, Electric Power Control
(2) AMM 20-10-21/401, Electrical Bonding
(3) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
(4) AMM 25-50-03/401, Bulkhead Lining

E. Access
(1) Location Zones
165 Area aft of bulk cargo compartment (Left)

F. Prepare for Outflow Valve Installation

S 212-049
(1) Make sure that the outflow valve flapper doors can move freely:
(a) Remove the cotter pin, nut, washers (qty 3), and bolt to disconnect the connecting rod from the actuator arm.
(b) Manually move the flapper doors to the fully open and fully closed positions, and make sure that the doors can move freely.
1) If the flapper doors do not move freely, replace the outflow valve with a serviceable outflow valve.

(c) Install the bolt, washers (qty 3), nut, and cotter pin to attach the connecting rod to the actuator arm.

G. Install the outflow valve.

S 432-011

(1) Install the gasket (17) in the outflow valve opening.

S 422-012

(2) Put the outflow valve (13) onto the gasket (17).
(a) To install the valve from the out side of the airplane, do the steps that follow:
1) Put the outflow valve through the skin opening and into the approximately installed position.
2) Slowly push the valve inward to get access to the electrical connectors and the bonding jumper.

S 432-013

(3) Install the electrical connectors (1) on the valve motors (3).

S 432-014

(4) Connect the bonding jumper (9) to the valve with a screw (10), washers (11), and a nut (12) (AMM 20-10-21/401).
(a) Fillet seal with the sealant all around the bonding jumper where it attaches to the airplane structure.

S 432-015

(5) Install the screws (18) from the out side of the airplane.
(a) Align the outflow valve holes with the fastener holes in the airplane skin.
(b) Apply primer to the fastener holes on the outside of the airplane. Let the primer dry.
(c) Apply the corrosion preventive compound to the fastener holes and immediately install the screws (18). Tighten the bolts to 35 - 40 pound-inches.

H. Do the outflow valve installation test.

S 862-050

(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 862-016

(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:

(a) 11B14, CABIN ALTITUDE CONTROL MANUAL

(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 862-017
(3) Supply electrical power (AMM 24-22-00/201).

S 862-018
(4) Put the MODE SELECT selector, on the pilots' overhead control panel, P5, to the MAN position.

S 862-019
(5) Turn and hold the MANUAL selector to the DESCEND position.
(a) Make sure the VALVE position indicator moves to the full-closed (CL) position within 30 seconds.

S 862-048
(6) Release the MANUAL selector.
(a) Make sure the cabin pressure outflow valve is fully closed.

S 862-021
(7) Put the MODE SELECT selector, on the P5 panel to the AUTO 1 position.
(a) Make sure the VALVE position indicator moves to the full-open (OP) position within 30 seconds.
(b) Make sure the cabin pressure outflow valve is fully open.

S 862-023
(8) Turn the MODE SELECT selector, on the P5 panel back to the MAN position.

S 862-024
(9) Turn and hold the MANUAL selector to the DESCEND position to close the valve.
(a) Make sure the VALVE position indicator moves to the full-closed (CL) position within 30 seconds.
(b) Make sure the cabin pressure outflow valve is fully closed.

S 862-026
(10) Put the MODE SELECT selector, on the P5 panel, to the AUTO 2 position.
(a) Make sure the VALVE position indicator moves to the full-open (OP) position within 30 seconds.
(b) Make sure the cabin pressure outflow valve is fully open.

I. Put the airplane back to its usual condition.

S 412-028
(1) If the valve was installed through the bulk cargo compartment, then do the steps that follow:
(a) Install the endliner on the aft end of the bulk cargo compartment (AMM 25-50-03/401).

(b) Close the aft cargo door, 823 (AMM 06-46-00/201).

S 862-029

(2) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-31-03-102-030

4. Clean the Cabin Pressure Outflow Valve (Fig. 201)

A. General

(1) You can clean the outflow valve through the aft end of the bulk cargo compartment or from the out side of the airplane. Access to the valve is most easily done from the out side of the airplane. However, to clean the valve from the out side of the airplane, the valve must be fully open.

B. Consumable Materials

(1) B50126 - Solvent, MIL-PRF-680
(2) G00268 - Brush, soft bristle paint
(3) E00015 - Cloth, lint free, clean

C. References

(1) AMM 06-46-00/201, Entry, Service, and Cargo Doors Access Doors and Panels
(2) AMM 24-22-00/201, Electrical Power Control
(3) AMM 25-50-03/401, Bulkhead Lining

D. Access

(1) Location Zones
165 Area aft of bulk cargo compartment (Left)

E. Prepare to clean.

S 862-031

(1) Open these circuit breakers, on the pilots' overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:

(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 012-032

(2) If you will clean the outflow valve from the bulk cargo compartment, do the steps that follow:
(a) Open the aft cargo door, 822 (AMM 06-46-00/201).
(b) Remove the endliner at the aft end of the bulk cargo compartment (AMM 25-50-03/401).

S 862-033

(3) If you will clean the valve from the out side of the airplane, make sure that the valve is in the open position.
(a) If the valve cannot be opened, you must clean it from the bulk cargo compartment.

F. Clean the outflow valve.

S 122-034

(1) Use the brush and the solvent to clean all of the outflow valve assembly.
   (a) Make sure the wiper seals on the sides, front, and rear of the valve door are clean. They must not have any gummy deposits and must be able to move easily within their retaining slots.

S 112-035

(2) Rub the door gates and the seals of the outflow valve with the solvent.

S 162-036

(3) Dry the outflow valve with the cloth.

G. Put the airplane back to its usual condition.

S 862-051

(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 412-037

(2) If the valve was cleaned from the bulk cargo compartment, do the steps that follow:
   (a) Install the endliner on the aft end of the bulk cargo compartment (AMM 25-50-03/401).
   (b) Close the aft cargo door, 822 (AMM 06-46-00/201).

S 862-046

(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:

   (a) 11B14, CABIN ALTITUDE CONTROL MANUAL
   (b) 11B15, CABIN ALTITUDE CONTROL SELECT
   (c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
   (d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

TASK 21-31-03-202-038

5. Do a Check of the Cabin Pressure Outflow Valve (Fig. 201)

A. General

(1) You can inspect the outflow valve from the aft end of the bulk cargo compartment or from the out side of the airplane. Access to the outflow valve is most easily done from the out side of the airplane. However, to inspect the valve from the out side of the airplane, the valve must be fully open.

B. References
(1) AMM 06-46-00/201, Entry, Service, and Cargo Doors Access Doors and Panels
(2) AMM 24-22-00/201, Electrical Power Control
(3) AMM 25-50-03/401, Bulkhead Lining

C. Access
(1) Location Zones
165 Area aft of bulk cargo compartment (Left)

D. Prepare to do the check.

S 862-039
(1) Open these circuit breakers, on the pilots' overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:

(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 012-040
(2) If the outflow valve will be inspected from the bulk cargo compartment, then do the steps that follow:
(a) Open the aft cargo door, 822 (AMM 06-46-00/201).
(b) Remove the endliner at the aft end of the bulk cargo compartment (AMM 25-50-03/401).

S 862-041
(3) If the valve will be inspected from the out side of the airplane, make sure that the valve is in the open position.
(a) If the valve cannot be opened, it must be inspected from the bulk cargo compartment.

E. Do a check of the outflow valve.

S 212-042
(1) Do these steps to make sure the outflow valve is serviceable:
(a) Make sure the gear box does not have a grease leak.
(b) Make sure the flapper doors and hinges do not have cracks or are not loose.
(c) Make sure the connecting rods and connecting rod bolts are not damaged, worn, or corroded.
(d) Make sure the teflon and butyl rubber seals are not damaged or worn and do not have any grease on them.
(e) Make sure the actuator is not loose.
(f) Make sure the outflow valve frame is not cracked.
(g) Make sure the outflow valve bolts are not loose.

(h) Make sure that the outflow valve flapper doors can move freely:
1) Remove the cotter pin, nut, washers (qty 3), and bolt to disconnect the connecting rod from the actuator arm.
2) Manually move the flapper doors to the fully open and fully closed positions, and make sure that the doors can move freely.
3) Install the bolt, washers (qty 3), nut, and cotter pin to attach the connecting rod to the actuator arm.

S 902-043
(2) If one or more of the above conditions exists, replace the outflow valve with a serviceable one.

F. Put the Airplane Back to Its Usual Condition

S 862-052
(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 412-044
(2) If the valve was inspected from the bulk cargo compartment, then do the steps that follow:
(a) Install the endliner on the aft end of the bulk cargo compartment (AMM 25-50-03/401).
(b) Close the aft cargo door, 822 (AMM 06-46-00/201).

S 862-047
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:

(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

CABIN PRESSURE OUTFLOW VALVE ACTUATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the actuator for the cabin pressure outflow valve. The second task is the installation of the actuator for the cabin pressure outflow valve.
   B. You can remove the actuator but not remove the cabin pressure outflow valve (AMM 21-31-03/201). The valve and actuator are aft of the bulk cargo compartment at approximately STA 1650 on the bottom left side of the airplane skin.

TASK 21-31-04-004-001

2. Remove the Cabin Pressure Outflow Valve Actuator (Fig. 401)

NOTE: You can get access to the actuator through the No. 2 cargo door, 822, or through the outflow valve doors. Only use the access through the outflow valve doors when it is not possible to get access through the bulk cargo compartment.

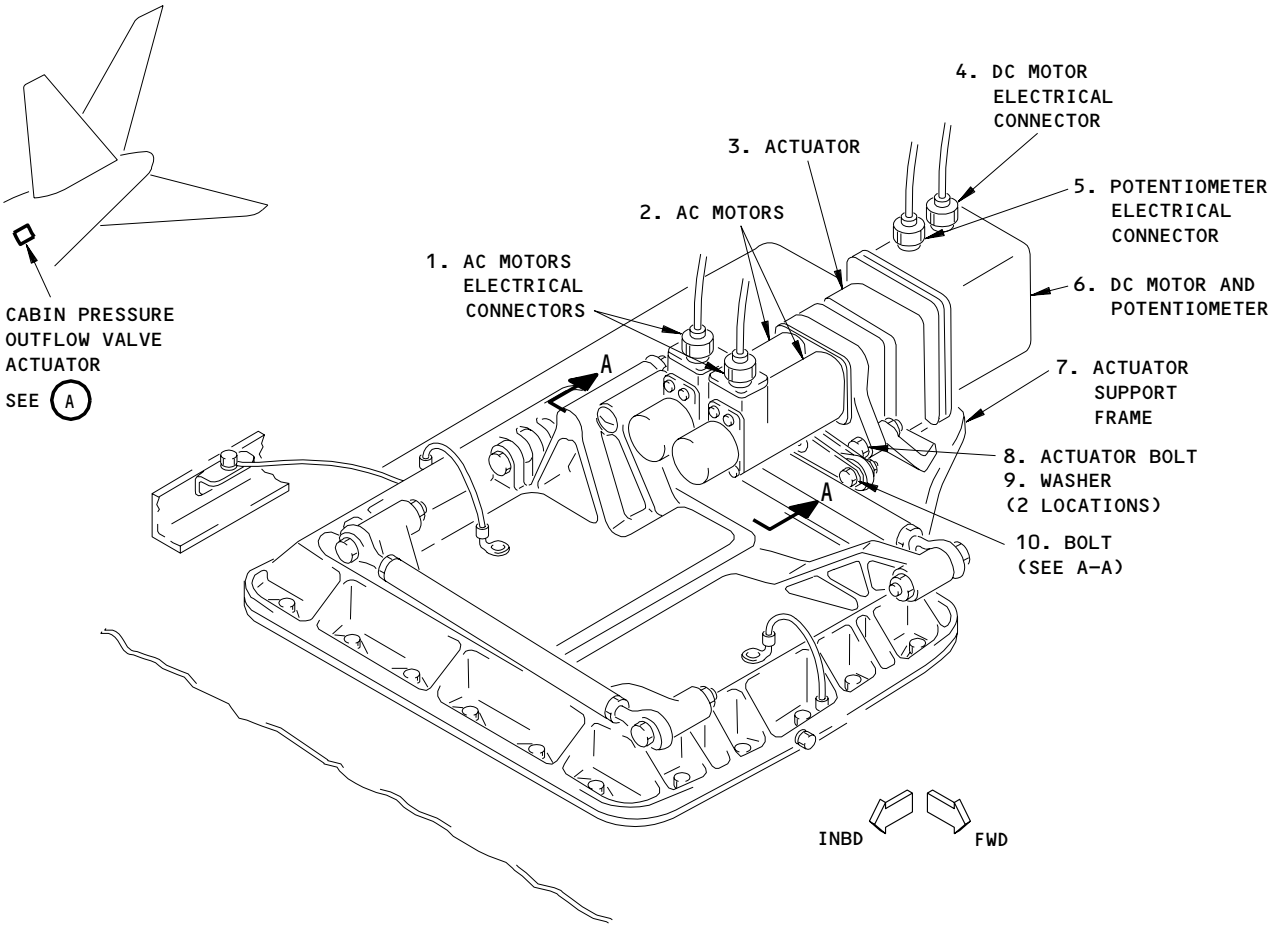
A. References
   (1) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
   (2) AMM 24-22-00/201, Electrical Power Control
   (3) AMM 25-50-03/401, Bulkhead Lining

B. Access
   (1) Location Zones
       153/154 Aft Cargo Compartment

C. Procedure

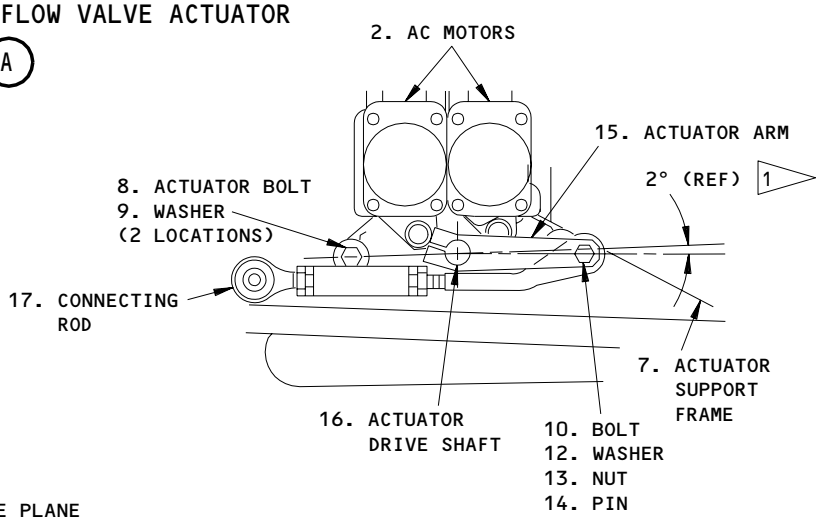
S 014-002
(1) If access is through the cargo compartment, do these steps:
   (a) Open the No. 2 cargo door, 822 (AMM 06-46-00/201).
   (b) Remove the aft endliner and find the cabin pressure outflow valve (AMM 25-50-03/401).

S 014-003
(2) If access is through the outflow valve doors, do these steps:
   (a) Set the CABIN ALTITUDE CONTROL MODE SELECT switch on the pilots overhead panel, P5, to MAN.
   (b) Turn the MANUAL selector to CLIMB until the outflow valve is fully open.



CABIN PRESSURE OUTFLOW VALVE ACTUATOR

A



A-A

1 THE ANGLE IS MEASURED BETWEEN THE PLANE THROUGH THE ACTUATOR BOLT CENTERLINES AND THE DOWN SLOPE OF THE CENTERLINE OF THE ACTUATOR ARM (VALVE FULLY CLOSED)

Cabin Pressure Outflow Valve Actuator Installation
Figure 401

S 864-005

WARNING: IF YOU USE THE ACCESS THROUGH THE CABIN PRESSURE OUTFLOW VALVE, MAKE SURE THE ELECTRICAL POWER IS OFF, THE CIRCUIT BREAKERS ARE OPEN, AND THE DO-NOT-CLOSE TAGS ARE ATTACHED. IF ELECTRICAL POWER IS SUPPLIED TO THE VALVE WHEN IT IS IN THE FULLY OPEN POSITION, THE VALVE WILL MOVE TO THE NOT FULLY OPEN POSITION. THE MOVEMENT OF THE VALVE CAN CAUSE INJURY TO PERSONS.

(3) Remove the electrical power (AMM 24-22-00/201).

S 864-004

(4) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:

(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 034-005

(5) Disconnect the electrical connectors (1, 4) on the manual DC and auto AC motors (6, 2).
(a) Put a tag on the AC motor electrical connectors (1) to identify them for installation.

S 034-006

(6) Disconnect the electrical connector (5) from the potentiometer (6).

S 034-007

(7) Remove the bolt (10), washer (12), nut (13), and pin (14) that connect the actuator arm (15) to the connecting rod (17).

S 024-008

(8) Remove the actuator bolts (8) and the actuator (3).

TASK 21-31-04-404-009

3. Install the Cabin Pressure Outflow Valve Actuator (Fig. 401)
A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	3	Actuator	21-31-03	01	40
	8	Actuator Bolt			45
	9	Washer			55
	10	Bolt			35
	12	Washer			37
	13	Nut			38
	14	Pin			33

B. References
(1) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
(2) AMM 21-31-03/201, Cabin Pressure Outflow Valve
(3) AMM 24-22-00/201, Electrical Power Control
(4) AMM 25-50-03/401, Bulkhead Lining

C. Access
(1) Location Zones
153/154 Aft Cargo Compartment

D. Prepare for Actuator Installation

S 214-020
(1) Make sure that the outflow valve flapper doors can move freely:
(a) Manually move the flapper doors to the fully open and fully closed positions, and make sure that the doors can move freely.
1) If the flapper doors do not move freely, replace the outflow valve with a serviceable outflow valve (AMM 21-31-03/201).

E. Actuator Installation

S 434-021
(1) Do these steps if the actuator crank arm prevents the installation of the forward bolt (8) to the actuator support frame.

NOTE: When the actuator crank arm is in the closed position (faces in forward direction), it can interfere with the installation of the forward bolt (8) to the actuator support frame.

(a) Remove the bolt that connects the actuator crank arm to the actuator spur gearshaft.

(b) Remove the actuator crank arm from the actuator spur gearshaft.
(c) Install the bolt (8) and washer (9) to the forward mounting lug on the actuator (3).
(d) Install the actuator crank arm to the actuator spur gearshaft.
(e) Install the bolt to attach the actuator crank arm to the actuator spur gearshaft.

S 424-010

(2) Put the actuator (3) against the actuator support frame (7) and install the actuator bolts (8), and washers (9).
(a) Tighten the actuator bolt (8) to 55-65 pound-inches. Increase torque as necessary to align the lockwire holes.
(b) Install the lockwire.

S 434-006

CAUTION: MAKE SURE THE HEAD OF BOLT (10) IS ON THE INBOARD SIDE. IF THE HEAD OF THE BOLT IS NOT ON THE INBOARD SIDE, THE PRESSURE OUTFLOW VALVE MAY NOT WORK.

(3) Align the actuator arm (15) with the connecting rod (17) and install the bolt (10), washer (12) and nut (13).
(a) Tighten the nut (13) to 17 pound-inches. Increase torque as necessary to align the cotter pin holes.
(b) Install the pin (14).

S 434-012

(4) Connect the AC and DC motor electrical connectors (1, 4).

S 434-013

(5) Connect the electrical connector (5) to the potentiometer (6).

F. Actuator Post-Installation Test

S 864-022

(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 864-014

(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 704-015
(3) Do a test of the outflow valve actuator.
(a) Supply electrical power (AMM 24-22-00/201).
(b) Set the CABIN ALTITUDE CONTROL MODE SELECT switch on the pilot's overhead panel, P5, to MAN.
(c) Turn and hold the CABIN ALTITUDE CONTROL MANUAL selector to DESCEND.
1) Make sure the VALVE position indicator moves to full-closed (CL) in the subsequent 30 seconds.
(d) Make sure the outflow valve is fully closed.
(e) If the outflow valve is not fully closed, adjust the actuator arm:
1) Loosen the nuts on the connecting rod and the rotating tube to engage with the actuator drive link as shown in Fig. 401.
(f) Set the CABIN ALTITUDE CONTROL MODE SELECT switch on the P5 panel to AUTO 1.
(g) Make sure the outflow valve moves to full-open (OP).
(h) Set the CABIN ALTITUDE CONTROL MODE SELECT switch on the P5 panel to MAN.
(i) Turn and hold the CABIN ALTITUDE CONTROL MANUAL selector to DESCEND.
1) Make sure the VALVE position indicator moves to full-closed (CL) in the subsequent 30 seconds.
(j) Make sure the outflow valve is closed.
(k) Set the CABIN ALTITUDE CONTROL MODE SELECT switch on the P5 panel to AUTO 2.
(l) Make sure the outflow valve moves to full open.

S 414-018
(4) Install the aft endliner, if applicable (AMM 25-50-03/401).

S 414-016
(5) Close the No. 2 cargo door, 822 (AMM 06-46-00/201) or the outflow valve doors.

S 864-017
(6) Remove electrical power, if it is not necessary.

OUTFLOW VALVE ACTUATOR AC MOTOR - REMOVAL/INSTALLATION

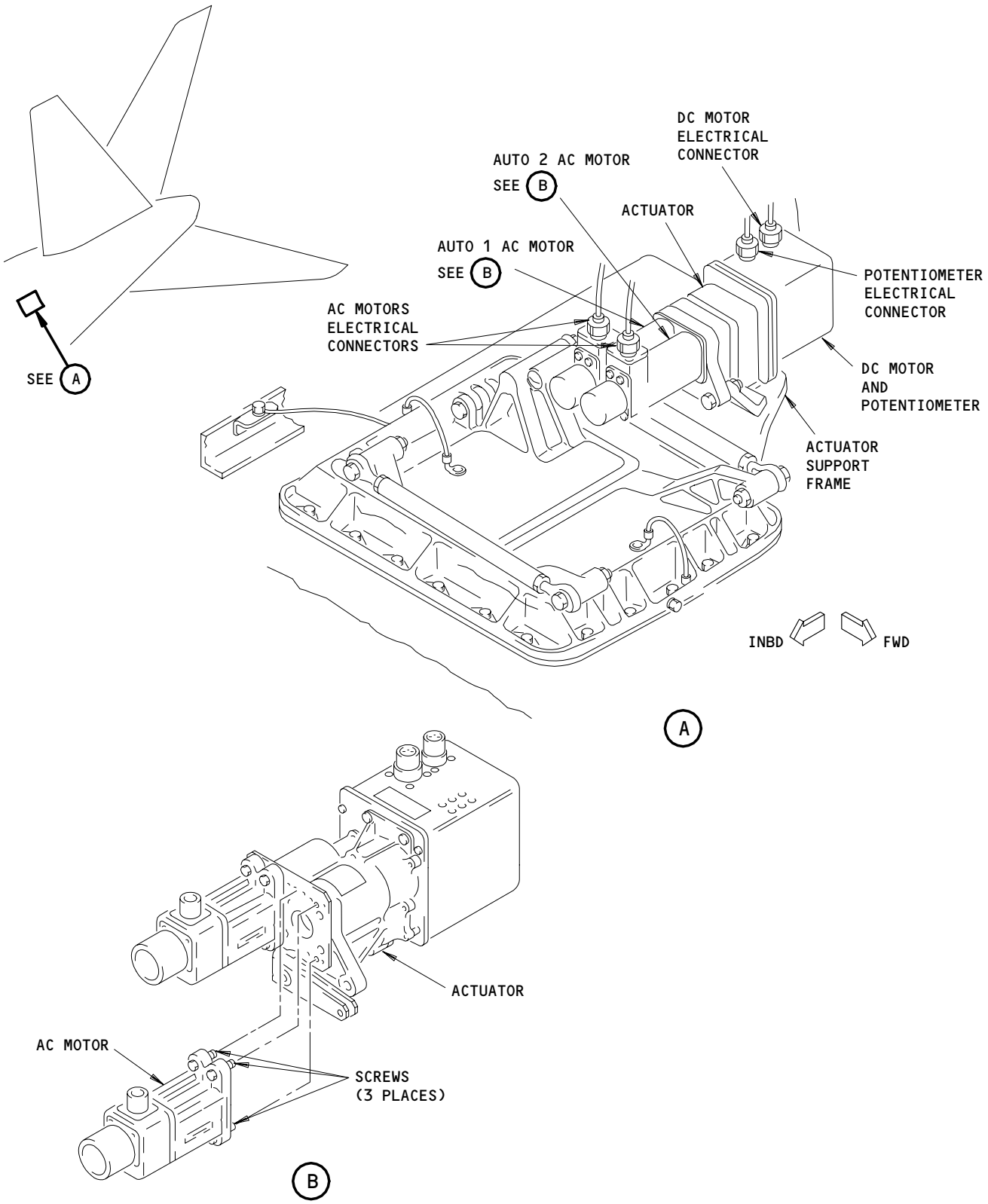
1. General
   A. This procedure has instructions to remove and install the actuator AC motors that are on the cabin pressure outflow valve. You can get access to the motors through the cabin pressure outflow valve or through the bulk cargo compartment. Only use the access through the cabin pressure outflow valve when it is not possible to get access through the bulk cargo compartment.

   TASK 21-31-05-004-001
2. Remove the Outflow Valve Actuator AC Motors (Fig. 401)
   A. References
      (1) AMM 06-46-00/201 Entry, Service, and Cargo Doors Access Doors and Panels
      (2) AMM 25-50-03/401, Bulkhead Lining
      (3) AMM 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          165 Area aft of bulk cargo compartment (Left)
   C. Prepare for the Removal

      S 014-009
      (1) If you will remove the motor from the bulk cargo compartment, do the steps that follow:
          (a) Open the aft cargo door, 822 (AMM 06-46-00/201)
          (b) Remove the aft endliner from the bulk cargo compartment (AMM 25-50-03/401).

      S 864-008
      (2) If you will remove the motor from the out side of the airplane and the outflow valve is not open, do the steps that follow:
          (a) Turn the MODE SELECT selector, on the pilots overhead control panel P5, to MAN.
          (b) Turn and hold the MANUAL selector, on the P5 panel, to CLIMB until the valve is fully open.

      S 864-007
      (3) Put a DO-NOT-OPERATE tag on the MODE SELECT selector, on the P5 panel.



Cabin Pressure Outflow Valve Actuator AC Motor Installation
Figure 401

S 864-018

WARNING: IF YOU USE THE ACCESS THROUGH THE CABIN PRESSURE OUTFLOW VALVE, MAKE SURE THE ELECTRICAL POWER IS OFF, THE CIRCUIT BREAKERS ARE OPEN, AND THE DO-NOT-CLOSE TAGS ARE ATTACHED. IF ELECTRICAL POWER IS SUPPLIED TO THE VALVE WHEN IT IS IN THE FULLY OPEN POSITION, THE VALVE WILL MOVE TO THE NOT FULLY OPEN POSITION. THE MOVEMENT OF THE VALVE CAN CAUSE INJURY TO PERSONS.

(4) Remove the electrical power (AMM 24-22-00/201).

S 864-006

(5) Open these circuit breakers, on the overhead circuit breaker panel P11, and attach the DO-NOT-CLOSE tags:
(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 034-005

(6) Disconnect the electrical connector from the applicable (No. 1 or No. 2) AC motor.
(a) If you will remove both AC motors, put an identification tag on the electrical connectors.

S 034-004

(7) Loosen the screws on the AC motor.

S 024-003

(8) Remove the AC motor.

TASK 21-31-05-404-002

3. Install the Outflow Valve Actuator AC Motor (Fig. 401)

A. References
(1) AMM 06-46-00/201 Entry, Service, and Cargo Doors Access Doors and Panels
(2) AMM 25-50-03/401, Bulkhead Lining
(3) AMM 24-22-00/201, Electrical Power Control

B. Access
(1) Location Zones
165 Area aft of bulk cargo compartment (Left)

C. Install the AC motor.

S 424-017

(1) Put the AC motor into position against the outflow valve.

S 434-016

(2) Install the screws in the AC motor.

S 434-015
(3) Connect the electrical connector to the AC motor.

D. Do the AC motor installation test.

S 864-020
(1) Make sure that all persons, clothing and loose materials are kept clear of the outflow valve, actuator crank arm, push rods, and flapper doors before electrical power is supplied to the outflow valve actuator.

NOTE: The outflow valve actuator will begin to operate and move when electrical power is supplied.

S 864-014
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers, on the P11 panel:
(a) 11B14, CABIN ALTITUDE CONTROL MANUAL
(b) 11B15, CABIN ALTITUDE CONTROL SELECT
(c) 11N15, CABIN ALTITUDE CONTROL AUTO 1
(d) 11N24, CABIN ALTITUDE CONTROL AUTO 2

S 864-013
(3) Supply the electrical power (AMM 24-22-00/201)

S 714-012
(4) Do the AC motor installation test procedure.
(a) Remove the DO-NOT-OPERATE tag and turn the MODE SELECT selector, on the P5 panel, to MAN.
(b) Turn and hold the MANUAL selector, on the P5 panel, to DESCEND until the outflow valve is fully closed.
(c) Turn the MODE SELECT selector, on the P5 panel, to AUTO 1.
1) Make sure the outflow valve moves to the full open position.
(d) Turn the MODE SELECT selector, on the pilots P5 panel, to MAN.
(e) Turn and hold the MANUAL selector, on the P5 panel, to DESCEND until the valve is fully closed.
(f) Turn the MODE SELECT selector, on the P5 panel, to AUTO 2.
1) Make sure the outflow valve moves to the full open position.

E. Put the airplane back to its usual condition.

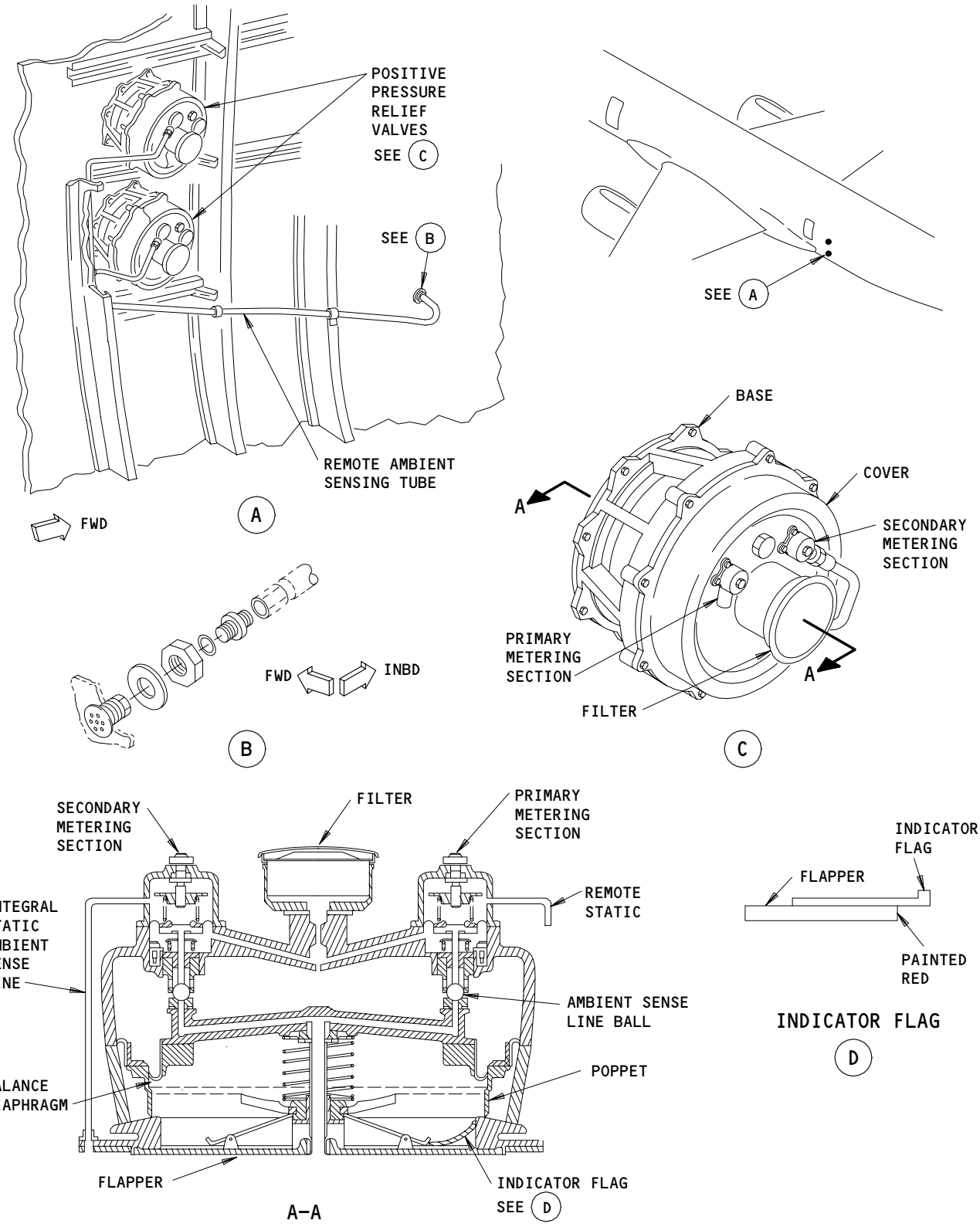
S 414-011
(1) If you installed the AC motor from the bulk cargo compartment, do the steps that follow:
(a) Install the aft endliner in the bulk cargo compartment (AMM 25-50-03/401).
(b) Close the aft cargo door, 822 (AMM 06-46-00/201).

S 864-010

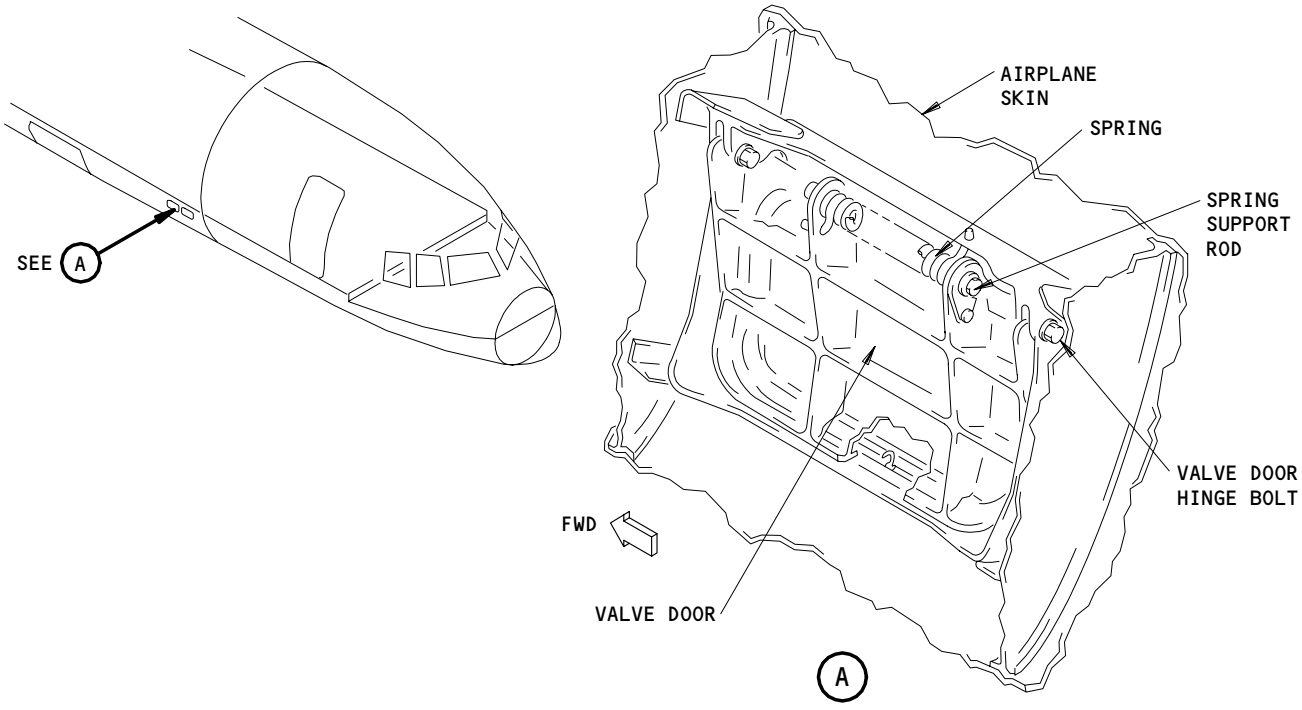
(2) Remove the electrical power if it is no longer neccessary (AMM 24-22-00/201).

PRESSURE RELIEF VALVES - DESCRIPTION AND OPERATION

1. General
   A. The pressurization relief valves provide cabin pressure relief from extreme cabin-to-ambient differential pressure, if the pressurization system malfunctions (AMM 21-31-00/001), or in the event of a rapid emergency airplane descent.
   B. Two positive pressure relief valves act independently of each other to prevent excessive positive cabin-to-ambient differential pressure by opening at 8.95 psi differential. The valves are mounted flush with the airplane skin, aft of the left wing-to-body fairing.
   C. Two vacuum relief valves act independently of each other to prevent negative cabin-to-ambient differential pressure from exceeding 0.75 psi by opening at 0.3 psi differential. The valves are mounted flush with the airplane skin on the right hand side, forward of the No. 1 cargo door.
2. Component Details
   A. Positive Pressure Relief Valve (Fig. 1)
      (1) The positive pressure relief valve is a pneumatically-operated poppet valve. The valve mounts directly on the fuselage skin aft of the left wing-to-body fairing. The valve discharges cabin air directly overboard when high cabin-to-ambient differential pressures exist. The relief valve limits the cabin-to-ambient differential pressure by controlling airflow through the poppet. The relief valve's head pressure (same as cabin pressure) controls poppet motion. Airflow through a metering section controls the head pressure. When the differential pressure sensed by the metering section approaches 8.95 psi, the metering pin lifts off its seat, releasing head pressure overboard through a dump tube. This opens the valve to reduce cabin pressure.
      (2) The valve uses two control metering sections. The primary metering section uses a remote ambient sense line and limits the differential pressure to 8.95 psi. The secondary metering section (backup control) uses an integral ambient sense tube. This section limits the differential pressure to 9.42 psi.
      (3) At a cabin-to-ambient differential pressure of 8.95 psi or higher, the head pressure is vented overboard allowing cabin pressure to force the poppet open. This vents cabin air overboard. An indicator flag on each of the valve flappers holds the flappers from going completely closed. The outside edges of the flappers are painted red and give visual indication that the valve has opened. Pulling the flappers open from outside the airplane and tucking the flag back into the valve resets visual indication of valve operation.
   B. Vacuum Relief Valve (Fig. 2)
      (1) Two vacuum relief valves, located in the forward fuselage skin, provide negative pressure relief. The valves are spring-loaded closed flapper type doors. Negative pressure of -0.3 psi on the valve opens the door inward allowing air into the cargo compartment.



Positive Pressure Relief Valve
Figure 1



Vacuum Pressure Relief Valve
Figure 2

POSITIVE PRESSURE RELIEF VALVE - MAINTENANCE PRACTICES

1. General
   A. This procedure has instructions to do the tasks that follow:
      (1) Remove the Positive Pressure Relief Valves
      (2) Install the Positive Pressure Relief Valve
      (3) Replace the Relief Valve Filter
      (4) Positive Pressure Relief Valve Indicator Flag Reset
      (5) Positive Pressure Relief Valve Test with Boeing Test Equip A21010-57

   TASK 21-32-01-002-001
2. Remove the Positive Pressure Relief Valve (Fig. 201)
   A. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
      (2) AMM 25-50-02/401, Sidewall Lining
   B. Access
      (1) Location Zone
          153 Aft cargo compartment (Left)
   C. Prepare for the Removal

      S 012-002
      (1) Open the aft cargo door, 822 (AMM 06-46-00/201).

      S 012-003
      (2) Remove the left sidewall lining (STA 1400-1410) that is 20 feet aft of the forward bulkhead of the aft cargo compartment (AMM 25-50-02/401).

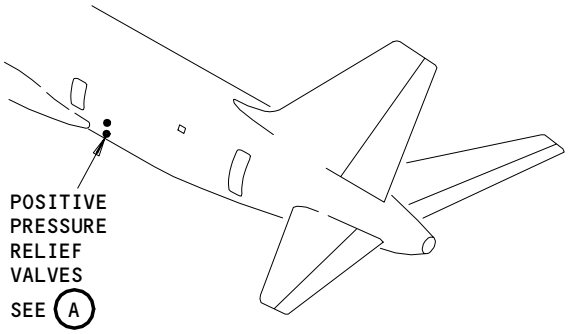
      S 012-004
      (3) Remove the duct(s) that are neccessary to get access to the relief valves.
   D. Remove the relief valve.

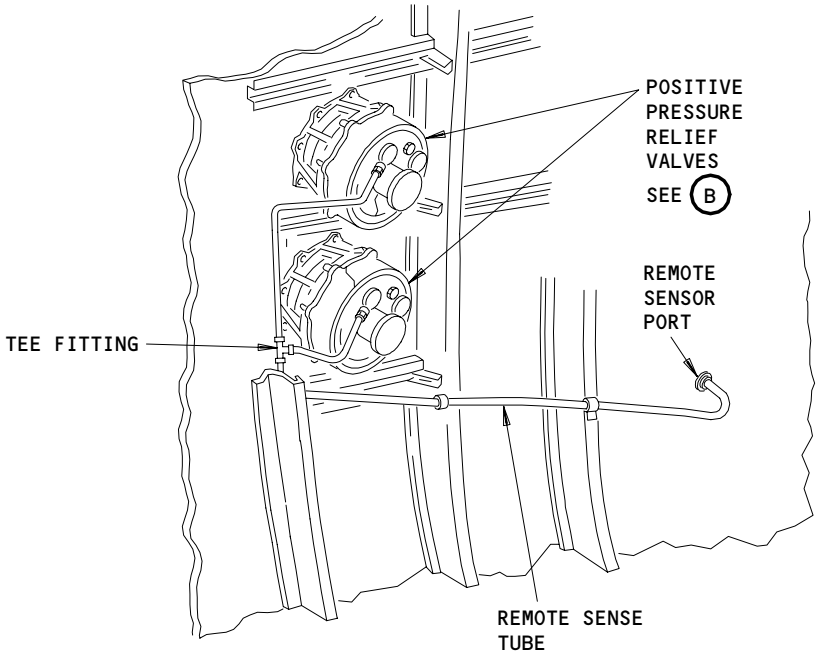
      S 032-005
      (1) Disconnect the remote sense tube from the valve at the primary metering section.
          (a) Put a cap on the remote sense tube.

      S 032-006
      (2) Remove the valve screws from the airplane skin.

      S 022-007
      (3) Remove the relief valve.

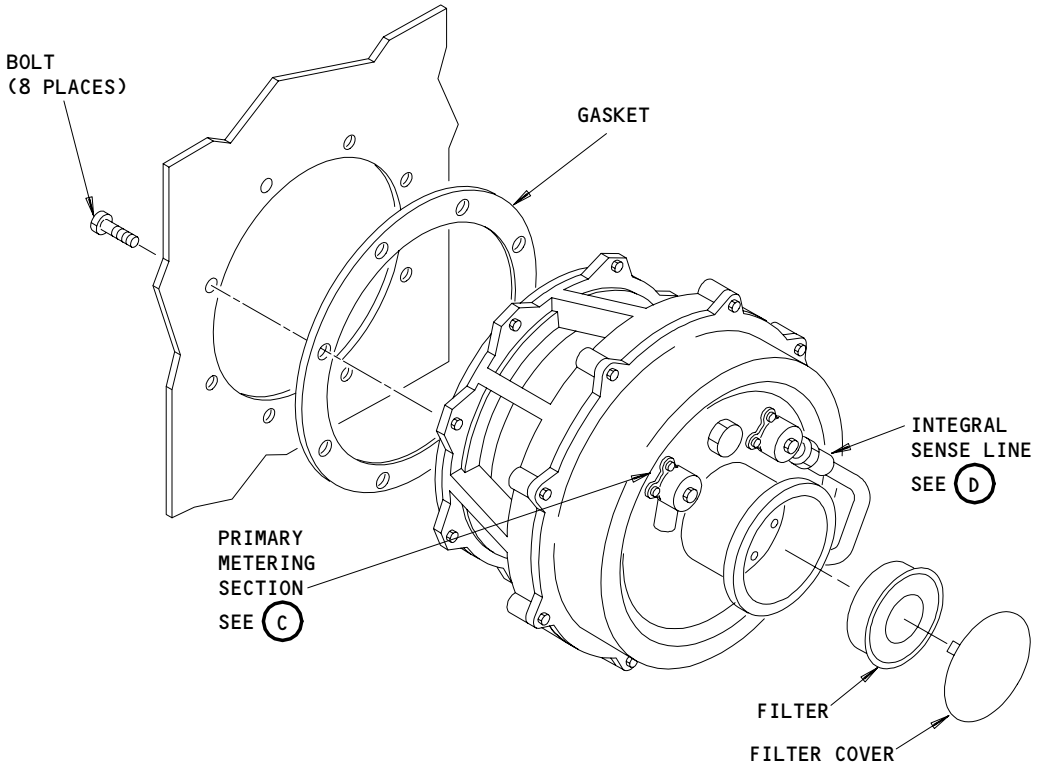
      S 032-008
      (4) Remove the gasket from the valve.





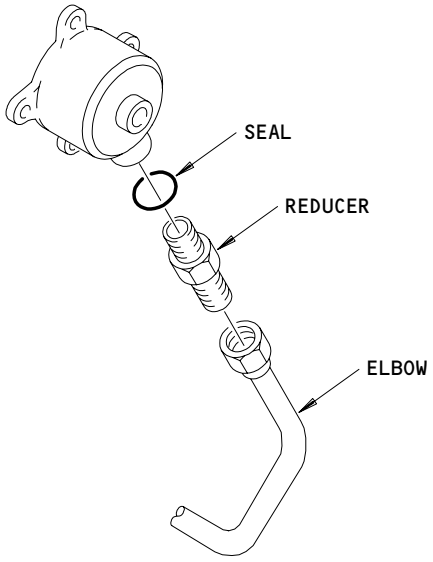
POSITIVE PRESSURE RELIEF VALVES
A

Positive Pressure Relief Valve Maintenance Practices
Figure 201 (Sheet 1)



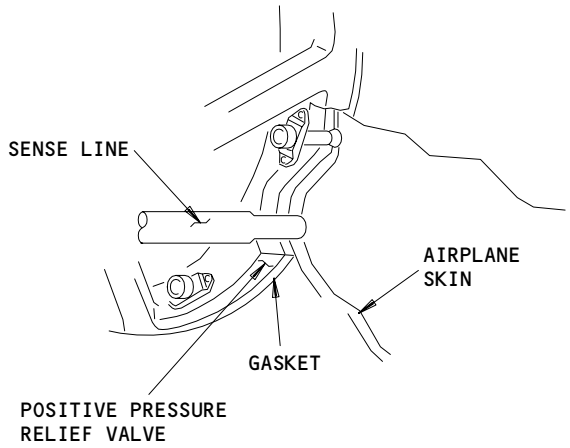
POSITIVE PRESSURE RELIEF VALVE

B



PRIMARY METERING SECTION

C



INTEGRAL SENSE LINE

D

Positive Pressure Relief Valve Maintenance Practices
Figure 201 (Sheet 2)

TASK 21-32-01-402-009

3. Install the Positive Pressure Relief Valve (Fig. 201)

A. Consumable Materials

(1) C00259 - Primer BMS 10-11, Type I
(2) B00316 - Solvent - Aliphatic Naphtha, TT-N-95
(3) C00584 - Primer BMS 10-79, Type II
(4) A00247 - Sealant Chromate Type BMS 5-95
(5) C00033 - Enamel BMS 10-60, Type II, Grey Gloss, Boeing Color 707
(6) G00507 - Lintfree Cloth, commercially available

B. References

(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) AMM 25-50-02/401, Sidewall Lining

C. Access

(1) Location Zone
153 Aft cargo compartment (Left)

D. Install the relief valve.

S 162-010

(1) Use the solvent to remove the old sealant from the airplane skin. Do not use too much solvent.

S 162-011

(2) Use a lintfree cloth to make the airplane skin clean and dry.

S 392-037

(3) Apply the sealant to the smooth side of the gasket.

S 422-012

(4) Put a new gasket and the relief valve into position against the airplane skin.
(a) Make sure the holes in the valve and the gasket align with the holes in the airplane skin.

S 432-013

CAUTION: DO NOT GET ANY SEALANT INTO THE INTEGRAL SENSE TUBE. IF ANY SEALANT GETS INTO THE INTEGRAL SENSE TUBE, IT COULD CAUSE THE POSITIVE PRESSURE RELIEF VALVE TO FAIL.

(5) Install the screws into the airplane skin.
(a) Apply sealant to each screw before you install it.
(b) Tighten each screw to 35 pound-inches

S 822-014

(6) If the end of the integral sense tube is more than .02 inches past the airplane skin, then do the steps that follow:

CAUTION: DO NOT DAMAGE THE AIRPLANE SKIN OR LET PARTICLES GET INTO THE INTEGRAL SENSE TUBE. IF PARTICLES GET INTO THE TUBE, IT COULD CAUSE THE RELIEF VALVE TO FAIL.

(a) Grind off the end of the tube until it is less or equal to .02 inches past the airplane skin.
(b) Restore the chamfer to the end of the tube.
(c) Do these steps to the inner and outer surface of the last 0.3 inches of the tube:
1) Use the solvent to clean the tube.
2) Apply one coat of the type I primer.
3) Apply one coat of the type II primer to the outer surface.
4) Apply one coat of the enamel to the outer surface.

S 032-015
(7) Remove the cap from the remote sense tube.

S 432-016

CAUTION: DO NOT TWIST OR KINK THE SENSE TUBE WHEN THE NUT IS INSTALLED. A DAMAGED SENSE TUBE COULD CAUSE THE VALVE TO FAIL.

(8) Connect the remote sense tube to the valve at the primary metering section.

S 822-022
(9) Make sure the remote sense tube is at a 3-degree or greater slope towards the remote sensor port.

S 712-049
(10) Do this task: Static System Leak Check - Positive Pressure Relief Valve (AMM 21-32-01/201).

NOTE: This leak check will determine if there is air leakage at the connection of the remote ambient sense tube to the positive pressure relief valve, and in the remote ambient sense tubes between the static pressure port and the positive pressure relief valves.

E. Put the airplane back to its usual condition.

S 412-018
(1) Install the duct(s) that were removed to get access to the valves.

S 412-019
(2) Install the left sidewall lining in the aft cargo compartment (AMM 25-50-02/401).

S 412-020
(3) Close the aft cargo door, 822 (AMM 06-46-00/201).

TASK 21-32-01-702-050

4. Static System Leak Check - Positive Pressure Relief Valve

A. General

(1) This procedure does a leak check of the static system for the positive pressure relief valve.

(2) This procedure will determine if there is air leakage in the remote ambient sense tubes between the remote static pressure port and the positive pressure relief valves.

(3) If you replaced both positive pressure relief valves with two new valves which were successfully tested off-aircraft in the shop, you can use this procedure as an alternate test to the Positive Pressure Relief Valve - System Test in AMM 21-32-01/201.

B. Equipment

(1) 33410MC-125-4 Adapter - Static Port, or equivalent

NOTE: The adapter is included with the Vacuum Tank - Positive Pressure Relief Valve Test Equipment, A21010.

(2) Tester - Pitot/Static, or equivalent vacuum source

C. Access

(1) Location Zones
153 Aft Cargo Compartment (left)

D. Procedure

S 212-051
(1) Make sure the static pressure port is free of blockage or contamination.

S 482-052
(2) Connect the static port adapter to the static pressure port.

S 482-053
(3) Connect the pitot/static tester (or equivalent vacuum source) to the static port adapter.

S 862-054
(4) Supply a 4 psig vacuum to the static system.

S 862-055
(5) Isolate the vacuum.

S 982-056
(6) Make a record of the initial pressure.

S 982-057
(7) After 1 minute make a record of the final pressure.

S 782-058
(8) Make sure that the leakage rate (initial pressure minus final pressure per minute) is less than 0.1 psi over a 1 minute period.

S 782-059
(9) If the leakage rate is more than 0.1 psi, find and repair the leak then do the leak check again.

S 862-060
(10) Put the static system back to ambient pressure.

S 082-061
(11) Disconnect the pitot/static tester from the static port adapter.

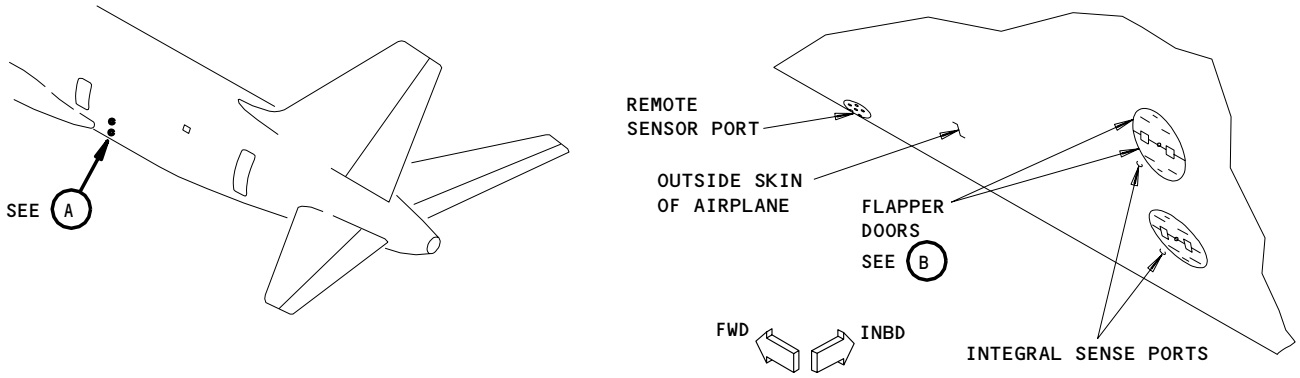
S 082-062
(12) Disconnect the static port adapter from the static pressure port.

TASK 21-32-01-902-021

5. Replace the Relief Valve Filter (Fig. 201)

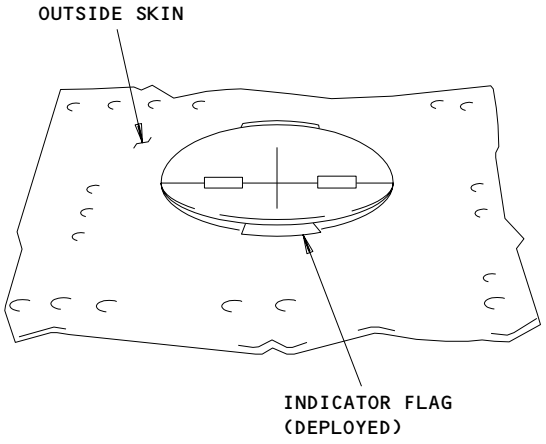
A. References

(1) AMM 06-46-00/201 Entry, Service and Cargo Door Access Doors and Panels



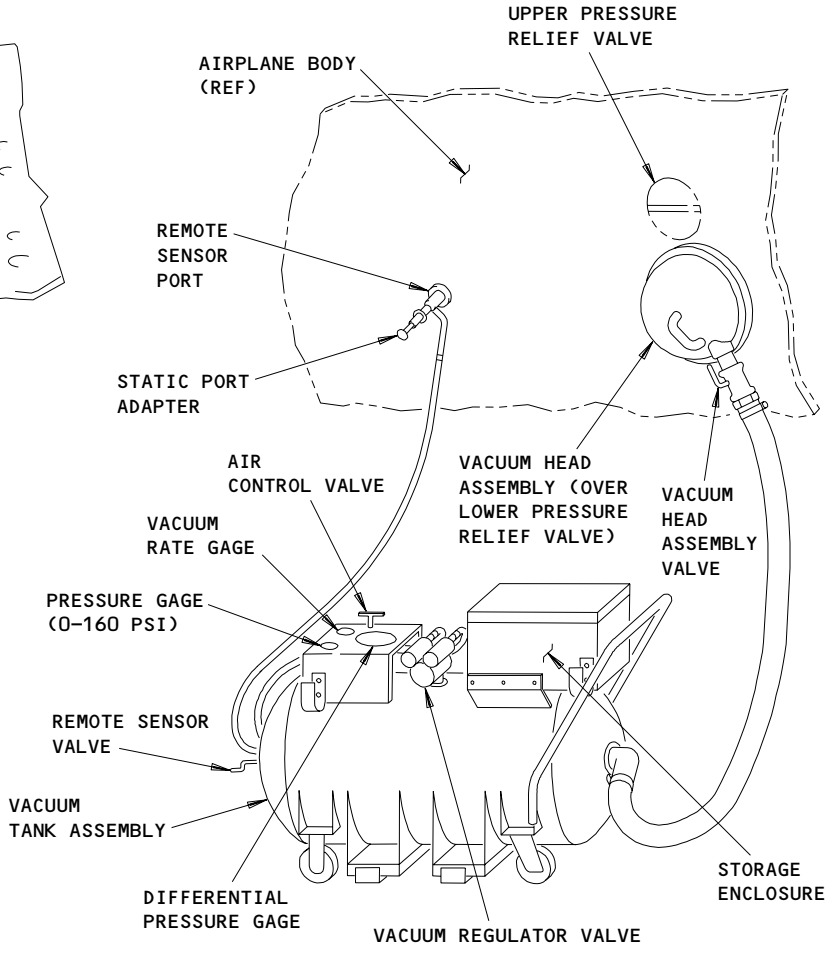
POSITIVE PRESSURE RELIEF VALVES

A



FLAPPER DOORS

B



A21010 VACUUM TANK - PRESSURE RELIEF VALVE TEST

Positive Pressure Relief Valve Test Setup
Figure 202

(2) AMM 25-50-02/401, Sidewall Lining Panels

B. Access

(1) Location Zone

153 Aft cargo compartment (Left)

C. Prepare for the Removal/Installation

S 012-027

(1) Open the aft cargo door, 822 (AMM 06-46-00/201).

S 012-028

(2) Remove the left sidewall lining that is 6 feet aft of the forward bulkhead of the aft cargo compartment (AMM 25-50-02/401).

S 012-029

(3) Remove the duct(s) necessary to get access to the relief valve filters.

D. Remove the relief valve filters.

S 032-030

(1) Pull the filter cover off of the valve.

S 022-031

(2) Pull the filter out of the valve.

E. Install the relief valve filter

S 422-032

(1) Put the filter into the relief valve.

S 432-033

(2) Push the filter cover onto the relief valve until it snaps into position.

F. Put the airplane back to its usual condition.

S 412-026

(1) Install the duct(s) that were removed to get access to the filters.

S 412-025

(2) Install the left sidewall lining in the aft cargo compartment (AMM 25-50-02/401).

S 412-024
(3) Close the aft cargo door, 822 (AMM 06-46-00/201).

TASK 21-32-01-902-091

6. Positive Pressure Relief Valve Indicator Flag Reset (Fig. 202)
   A. General
      (1) This procedure gives instructions to reset the indicator flag and close the flappers when a positive pressure relief valve has opened.
   B. Indicator Flag Reset

S 212-092
(1) Locate the pressure relief valve that is open (Fig. 202).

NOTE: You can see the red indicator flag if the valve is open.

S 982-093
(2) Pull the flapper open.

S 982-094
(3) Push the indicator flag into the valve.

S 982-095
(4) Close the flapper.

TASK 21-32-01-702-038

7. Positive Pressure Relief Valve Test (Boeing Test Equip A21010-57) (Fig. 202)
   A. Equipment
      (1) Vacuum Tank - Pressure Relief Valve Test Equipment, A21010-70 (Recommended)
      (2) Vacuum Tank - Pressure Relief Valve Test Equipment, A21010-69,-57 (Alternative)
      (3) Air compressor or air source - capable of 60-80 psi. at 22 scfm, commercially available
   B. Access
      (1) Location Zone
          153 Aft cargo compartment (Left)

NOTE: The relief valves are installed on the airplane skin. This test can only be done from outside the airplane.

C. Do the relief valve test.

NOTE: This test can only be done on one valve at a time. Do the test on the upper relief valve, then do the test again on the lower relief valve.

S 482-034

(1) Connect the test equipment to the applicable (upper or lower) relief valve.
   (a) Make sure all the valves on the test equipment are closed.
   (b) Connect the air pressure source to the quick-disconnect air connection on the vacuum tank assembly.
   (c) Make sure the vacuum regulator valve on the vacuum tank assembly is turned fully clockwise.
   (d) Adjust the air control valve until the indication on the pressure gage is 70 (+10/-10) psi.
   (e) Adjust the vacuum regulator valve until the differential pressure is approximately 2.0 psi.

      NOTE: Turn the vacuum regulator valve counter-clockwise to increase the vacuum (differential pressure). The arrow on the vacuum regulator valve indicates an increase of pressure not vacuum.

   (f) Install the static port adapter to the remote sensor port on the airplane fuselage.
      1) Make sure the plunger is in the center hole of the port and that the adapter is over all of the port.
   (g) Open the remote sensor valve to the static port adapter.

   CAUTION: HOLD THE VACUUM HEAD ASSEMBLY AGAINST THE AIRPLANE FUSELAGE AS YOU DO THE TEST. THE VACUUM HEAD CAN BE DAMAGED IF IT FALLS TO THE GROUND WHEN THERE IS NO VACUUM.

   (h) Put and hold the vacuum head assembly over the applicable relief valve and open the vacuum head assembly valve.
      1) Make sure the vacuum head assembly is sealed to the airplane skin.

S 732-035

(2) Do the remote sensor test.

CAUTION: DO NOT INCREASE THE VACUUM FASTER THAN THE RATES SHOWN. IF YOU INCREASE THE VACUUM FASTER YOU CAN CAUSE DAMAGE TO THE RATE GUAGE ON THE VACUUM TANK.

(a) Adjust the vacuum regulator valve to increase the differential pressure at these rates:
1) When the differential pressure is less than 8.70 psig (17.71 in-Hg), apply the vacuum at a rate not greater than 5.00 psig/min (10.18 in-Hg/min).
2) When the differential pressure is 8.70-9.10 psig, (17.71-18.53 in-Hg), apply the vacuum at a rate not greater than 2.00 psig/min (4.07 in-Hg/min).

(b) Monitor closely the needle position on the differential pressure gage to confirm the crackpoint pressure of the pressure relief valve occurs at a differential pressure of 8.95 ±0.15 psig (18.22 ±0.31 in-Hg).

NOTE: The crackpoint pressure of the valve occurs when the needle on the differential pressure gage stops increasing, then suddenly decreases slightly, and then increases slightly again and then stabilizes. It is not necessary for the pressure relief valve to actuate to the full open position (poppet action).

The crackpoint pressure of the valve occurs when sufficient differential pressure causes the valve poppet to move away from the valve seat. Valve operation can be observed from inside the airplane by removing a section of the left sidewall lining in the aft cargo compartment.

(c) If the pressure relief valve cracks opens at a differential pressure more than 9.10 psig (18.53 in-Hg), make sure that there are no leaks at any of the tubing connections on the vacuum tank assembly.
(d) Adjust the vacuum regulator valve until the differential pressure is approximately 2.0 psig (4.07 in-Hg) at a rate not more than 4.0 psig/min (8.14 in-Hg).

S 732-036
(3) Do the integral sensor test.
(a) Close the remote sensor valve.
(b) Adjust the vacuum regulator valve to increase the differential pressure at the rates that follow:
1) When the differential pressure is 0 - 9.00 psig (0-18.33 in-Hg), apply the vacuum at a rate not more than 5.00 psig/min (10.18 in-Hg).
2) When the differential pressure is 9.00 - 9.62 psig (18.33-19.59 in-Hg), apply the vacuum at a rate not more than 2.00 psig/min (4.07 in-Hg/min).

(c) Monitor closely the needle position on the differential pressure gage to confirm the crackpoint pressure of the pressure relief valve occurs at a differential pressure of 9.42 ±0.20 psig (19.18 ±0.41 in-Hg).

NOTE: The crackpoint pressure of the valve occurs when the needle on the differential pressure gage stops increasing, then suddenly decreases slightly, and then increases slightly again and then stabilizes. It is not necessary for the pressure relief valve to actuate to the full open position (poppet action).

The crackpoint pressure of the valve occurs when sufficient differential pressure causes the valve poppet to move away from the valve seat. Valve operation can be observed from inside the airplane by removing a section of the left sidewall lining in the aft cargo compartment.

(d) If the pressure relief valve cracks opens at a differential pressure more than 9.62 psig (19.59 in-Hg), make sure there are no leaks at any of the tubing connections on the vacuum tank assembly.

S 862-036

(4) Adjust the vacuum regulator valve until the differential pressure is approximately 2.0 psig (4.07 in-Hg) at a rate not more than 4.0 psig/min (8.14 in-Hg/min).

S 482-026

(5) Close the vacuum head assembly valve and remove the vacuum head assembly.

S 862-034

(6) Adjust the vacuum regulator valve fully clockwise and reduce the differential pressure to zero psi.

S 732-027

(7) Do the Remote Sensor Test and the Integral Sensor Test for the other positive pressure relief valve.

D. Put the airplane back to its usual condition.

S 082-024

(1) Remove the test equipment from the airplane.

S 862-025

(2) Close the flapper door on the relief valves.

TASK 21-32-01-702-076

8. Positive Pressure Relief Valve Test (Alternate Test) (Fig. 202)

A. General

(1) This procedure has instructions to do an alternate positive pressure relief valve test which is for airplanes at high altitude airports (field elevation higher than 8500 feet/2600 meters above mean sea level). There are two parts to this test:
   (a) The Remote Sensor test
   (b) The Integral Sensor Test

(2) This alternate test pressurizes the cabin on the ground and special safety precautions need to be followed to prevent injuries to personnel or damage to equipment. While performing this procedure it is necessary that the following conditions are met:
   (a) Do not exceed a maximum of 4.0 psi cabin pressure as indicated on airplane's integrated cabin pressure indicator (P5 panel).
   (b) When personnel are on-board the airplane, do not pressurize at more than 1,000 fpm (0.5 psi/min) to protect the ears of the personnel.
   (c) Minimize the number of personnel aboard the airplane.

B. Equipment

(1) Vacuum Tank - Pressure Relief Valve Test Equipment, A21010-70 (Recommended)

(2) Vacuum Tank - Pressure Relief Valve Test Equipment, A21010-69,-57 (Alternative)

(3) Air compressor or air source - capable of 60-80 psi. at 22 scfm, commercially available

C. References

(1) AMM 05-51-24/201, Excessive Cabin Pressure Leakage

D. Access

(1) Location Zone
   153 Aft cargo compartment (Left)

NOTE: The relief valves are installed on the airplane skin. This test can only be done from outside the airplane.

E. Positive Pressure Relief Valve Test

NOTE: Each valve must be tested separately.

S 212-088

(1) Make sure there is no blockage or unwanted materials at these locations on the fuselage skin by the positive pressure relief valves:
   (a) The static pressure port (adjacent to the relief valves)
   (b) The integral ambient sense tube opening (adjacent to each relief valve)

S 482-079

(2) Connect the test equipment to the applicable (upper or lower) relief valve.
   (a) Make sure all the valves on the test equipment are closed.
   (b) Connect the air pressure source to the quick-disconnect air connection on the vacuum tank assembly.
   (c) Make sure the vacuum regulator valve on the vacuum tank assembly is turned fully clockwise.
   (d) Adjust the air control valve until the indication on the pressure gage is 70 (+10/-10) psi.
   (e) Adjust the vacuum regulator valve until the differential pressure is approximately 2.0 psi.

       NOTE: Turn the vacuum regulator valve counter-clockwise to increase the vacuum (differential pressure). The arrow on the vacuum regulator valve indicates an increase of pressure not vacuum.

   (f) Install the static port adapter to the remote sensor port on the airplane fuselage.
      1) Make sure the plunger is in the center hole of the port and that the adapter is over all of the port.
   (g) Open the remote sensor valve to the static port adapter.

   CAUTION: HOLD THE VACUUM HEAD ASSEMBLY AGAINST THE AIRPLANE FUSELAGE AS YOU DO THE TEST. THE VACUUM HEAD CAN BE DAMAGED IF IT FALLS TO THE GROUND WHEN THERE IS NO VACUUM.

   (h) Put and hold the vacuum head assembly over the applicable relief valve and open the vacuum head assembly valve.
      1) Make sure the vacuum head assembly is sealed to the airplane skin.

S 862-089

(3) Do these instructions to pressurize the cabin on the ground:
   (a) Do the steps in the task for the Excessive Cabin Pressure Leakage test to pressurize the cabin (AMM 05-51-24/201).
   (b) Do not exceed a maximum of 4.0 psi cabin pressure as indicated on airplane's integrated cabin pressure indicator (P5 panel).
   (c) When personnel are on-board the airplane, do not pressurize at a rate of more than 1,000 fpm (0.5 psi/min) to protect the ears of the personnel.
   (d) Minimize the number of personnel aboard the airplane.

S 732-080

(4) Do the remote sensor test.

CAUTION: DO NOT INCREASE THE VACUUM FASTER THAN THE RATES SHOWN. IF YOU INCREASE THE VACUUM FASTER YOU CAN CAUSE DAMAGE TO THE RATE GUAGE ON THE VACUUM TANK.

(a) Adjust the vacuum regulator valve to increase the differential pressure at these rates:
1) When the differential pressure is less than 8.70 psig (17.71 in-Hg), apply the vacuum at a rate not greater than 5.00 psig/min (10.18 in-Hg/min).
2) When the differential pressure is 8.70-9.10 psig, (17.71-18.53 in-Hg), apply the vacuum at a rate not greater than 2.00 psig/min (4.07 in-Hg/min).

(b) Monitor closely the needle position on the differential pressure gage to confirm the crackpoint pressure of the pressure relief valve occurs at a differential pressure of 8.95 ±0.15 psig (18.22 ±0.31 in-Hg).

NOTE: The crackpoint pressure of the valve occurs when the needle on the differential pressure gage stops increasing, then suddenly decreases slightly, and then increases slightly again and then stabilizes. It is not necessary for the pressure relief valve to actuate to the full open position (poppet action).

The crackpoint pressure of the valve occurs when sufficient differential pressure causes the valve poppet to move away from the valve seat. Valve operation can be observed from inside the airplane by removing a section of the left sidewall lining in the aft cargo compartment.

(c) If the pressure relief valve cracks open at a differential pressure more than 9.10 psig (18.53 in-Hg), make sure that there are no leaks at any of the tubing connections on the vacuum tank assembly.

(d) Adjust the vacuum regulator valve until the differential pressure is approximately 2.0 psig (4.07 in-Hg) at a rate not more than 4.0 psig/min (8.14 in-Hg).

S 732-081

(5) Do the integral sensor test.
(a) Close the remote sensor valve.
(b) Adjust the vacuum regulator valve to increase the differential pressure at the rates that follow:
1) When the differential pressure is 0 - 9.00 psig (0-18.33 in-Hg), apply the vacuum at a rate not more than 5.00 psig/min (10.18 in-Hg).
2) When the differential pressure is 9.00 - 9.62 psig (18.33-19.59 in-Hg), apply the vacuum at a rate not more than 2.00 psig/min (4.07 in-Hg/min).

(c) Monitor closely the needle position on the differential pressure gage to confirm the crackpoint pressure of the pressure relief valve occurs at a differential pressure of 9.42 ±0.20 psig (19.18 ±0.41 in-Hg).

NOTE: The crackpoint pressure of the valve occurs when the needle on the differential pressure gage stops increasing, then suddenly decreases slightly, and then increases slightly again and then stabilizes. It is not necessary for the pressure relief valve to actuate to the full open position (poppet action).

The crackpoint pressure of the valve occurs when sufficient differential pressure causes the valve poppet to move away from the valve seat. Valve operation can be observed from inside the airplane by removing a section of the left sidewall lining in the aft cargo compartment.

(d) If the pressure relief valve cracks open at a differential pressure more than 9.62 psig (19.59 in-Hg), make sure there are no leaks at any of the tubing connections on the vacuum tank assembly.

S 862-082

(6) Adjust the vacuum regulator valve until the differential pressure is approximately 2.0 psig (4.07 in-Hg) at a rate not more than 4.0 psig/min (8.14 in-Hg/min).

S 482-083

(7) Close the vacuum head assembly valve and remove the vacuum head assembly.

S 862-084

(8) Adjust the vacuum regulator valve fully clockwise and reduce the differential pressure to zero psi.

S 732-085

(9) Do the Remote Sensor Test and the Integral Sensor Test for the other positive pressure relief valve.

F. Put the airplane back to its usual condition.

S 862-090

(1) Do the steps in the task for Excessive Cabin Pressure Leakage test to depressurize the cabin to ambient pressure (AMM 05-51-24/201).

S 082-086

(2) Remove the test equipment from the airplane.

S 862-087

(3) Close the flapper door on the relief valves.

VACUUM RELIEF VALVE - MAINTENANCE PRACTICES

1. General
   A. Two vacuum pressure relief valves are installed in the airplane skin on the right side of the main equipment bay. This procedure has instructions to remove, install, and test the vacuum pressure relief valves.

TASK 21-32-02-002-001

2. Remove the Relief Valve (Fig. 201)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          120 Main equipment center (Right)
   C. Prepare for the Removal

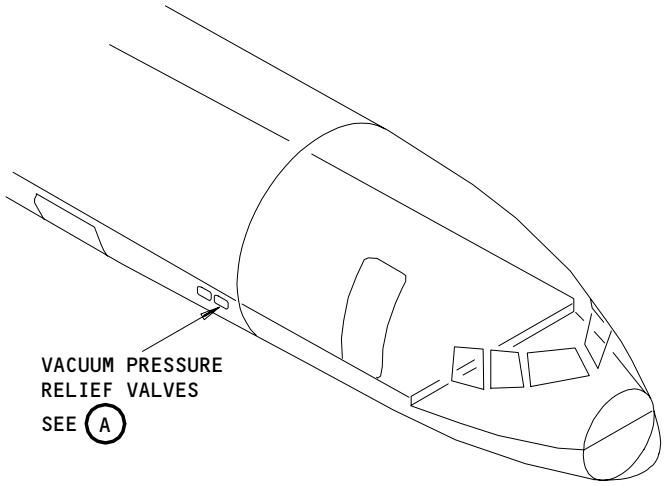
      S 012-002
      (1) Open the access door, 119BL, for the main equipment center (AMM 06-41-00/201).

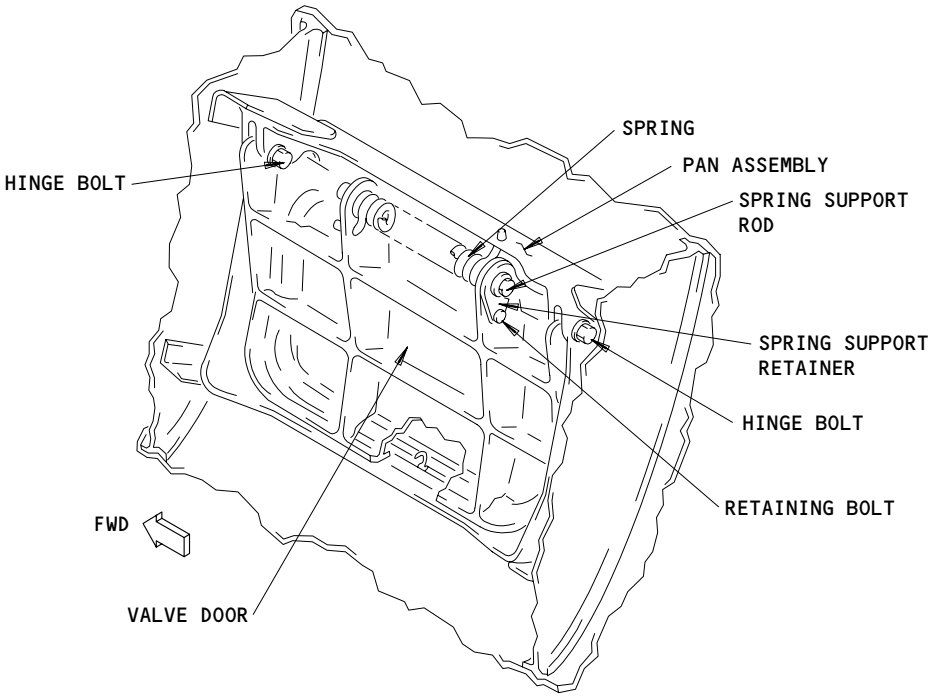
      S 012-003
      (2) Remove the applicable sidewall panel on the right side of the main equipment center.
   D. Remove the Valve.

      S 032-004

      CAUTION: WHEN YOU REMOVE THE SPRING OR A PART THAT LETS THE SPRING UNWIND, HOLD THE SPRING TIGHTLY SO IT DOES NOT SNAP OUT OF ITS POSITION. IF THE SPRING SNAPS OUT OF POSITION, IT COULD CAUSE INJURY TO PERSONS.

      (1) Remove the two hinge bolts as follows:
          (a) Remove the cotter pins from the nuts.





VACUUM PRESSURE RELIEF VALVE

A

Vacuum Relief Valve Installation
Figure 201

(b) Remove the nuts, washers and bolts.
(c) Remove the bushings.

S 032-005
(2) Remove the end of the spring from the pan assembly.

S 032-006
(3) Slowly let the spring unwind until it rests against the valve door.

S 022-007
(4) Remove the valve door from the airplane skin.

S 032-008
(5) Remove the seal from the pan assembly.

S 032-009
(6) Remove the spring from the valve door.
(a) Remove the retaining bolt.
(b) Remove the spring support retainer.
(c) Hold the spring tightly and remove the spring support rod.
(d) Remove the spring from the valve door and let it unwind slowly.

TASK 21-32-02-402-008

3. Install the Relief Valve (Fig. 201)

A. Consumable Materials
(1) A00247 - Sealant, BMS 5-95, Type B

B. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels

C. Access
(1) Location Zones
120 Main equipment center (Right)

D. Install the Valve

S 432-009
(1) Put the spring onto the valve door.
(a) Put the spring onto the support rod.
(b) Wind the spring approximately 235°.
(c) Put the end of the spring into the hole in the valve door.
(d) Let the other end of the spring rest against the valve door.
(e) Put the spring support retainer into position.
(f) Install the retaining bolt, the washer, and the nut.

S 432-010
(2) Put a new seal into the pan assembly.

S 422-011
(3) Install the valve door into the pan assembly:
(a) Put the valve door into position in the pan assembly.
(b) Put the end of the spring into the hole in the pan assembly.

(c) Install the two hinge bolts as follows:
1) Install the bushings.
2) Install the bolts, washers and nuts.
3) Align the nuts as necessary and install the cotter pins.

S 432-012

(4) From the out side of the airplane, apply the sealant if there is any clearance between the pan assembly and the airplane skin.

S 712-013

(5) Push on the valve door to make sure it moves smoothly through the full travel of the door.

E. Put the Airplane Back to Its Usual Condition

S 412-014

(1) Install the sidewall panel in the main equipment center.

S 412-015

(2) Close the access door, 119BL, to the main equipment center (AMM 06-41-00/201).

TASK 21-32-02-732-016

4. Do the Vacuum Pressure Relief Valve Test

A. Equipment

(1) Push-type spring scale, range 0 to 20 lbs, commercially available.

B. Do the Relief Valve Test

S 482-018

(1) Put the spring scale against the out side of the valve door so it is in the center of the door and 3.65 inches above the bottom edge of the door.

S 732-017

WARNING: WHEN YOU PUSH ON THE DOOR, MAKE SURE THE SPRING SCALE IS VERTICAL TO THE DOOR DURING THE FULL TRAVEL OF THE DOOR. IF THE SPRING SCALE IS NOT VERTICAL TO THE DOOR, IT COULD SLIP OFF THE DOOR AND CAUSE INJURY TO PERSONS.

(2) Push the door with the spring scale so that there is a one-inch clearance at the bottom edge of the door.

S 732-019

(3) Make sure the scale shows a force of 11.5 ±1.5 pounds.

S 732-020

(4) Push the door with the spring scale until the door is 0.10 ±0.08 inches from the door stop (65° open).

S 732-025

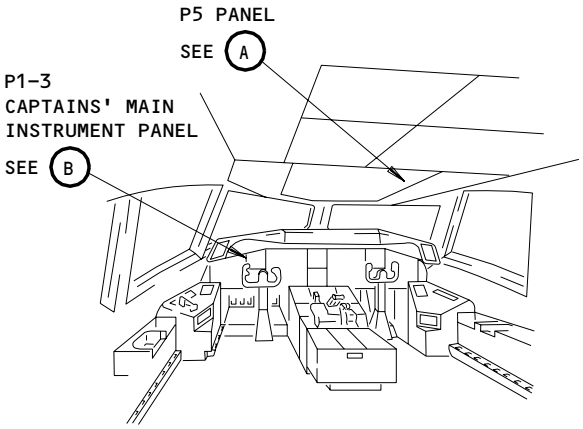
(5) Make sure the scale shows a force of 16.0 ±2.0 pounds.

S 082-026
(6) Slowly remove the spring scale from the valve door.

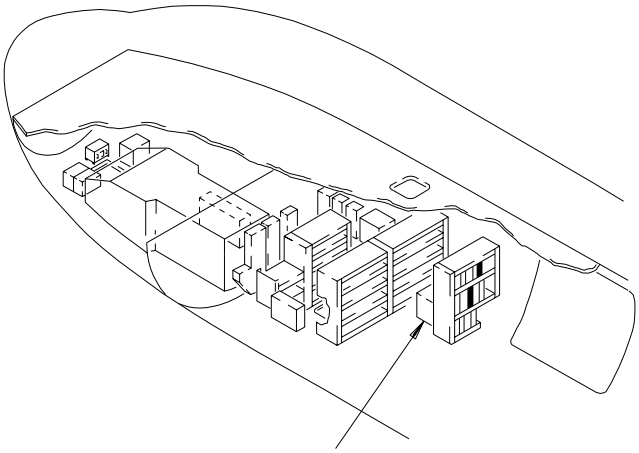
S 212-024
(7) Make sure the valve door fits tightly against the airplane skin.

PRESSURIZATION INDICATION AND WARNING SYSTEM - DESCRIPTION AND OPERATION

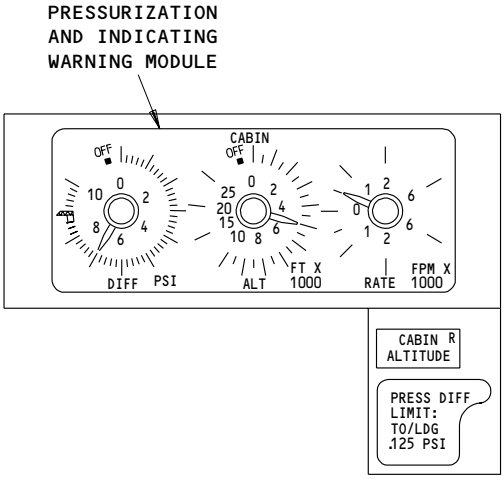
1. General (Fig. 1)
   A. The Pressurization Indicating and Warning System provides visual and aural warning if the pressurization control system fails (AMM 21-31-00/001).
   B. Too high of a cabin altitude (low cabin pressure) can cause injury to passengers and damage to the airplane structure. Cabin altitude gets sensed by an aneroid capsule within an altitude switch installed in the P36 electrical equipment panel. When the cabin altitude gets too high, the altitude switch will actuate and cause an aural warning siren to sound in the flight deck, the EICAS Warning message CABIN ALTITUDE to show on the EICAS display, and the warning light CABIN ALTITUDE to illuminsate on the Equipment Cooling module (P5 panel) and the warning light CABIN ALT to illuminate on the Discrete Warning Display module (P1-3 panel) in the flight deck.
   C. Three pressure indicators in the flight deck, show cabin-to-ambient differential pressure, cabin altitude, and cabin pressure rate of climb or descent.
2. Component Details
   A. Altitude Switch
      (1) GUI 001-003, 005, 007-011, 115;
      The altitude switch is an aneroid type switch installed on the left miscellaneous electrical equipment panel, P36. As cabin altitude increases the aneroid expands. At 10,000 feet cabin altitude the aneroid closes a warning switch completing the warning circuit.
   B. Differential Pressure Sensor
      (1) The differential pressure sensor (also called the static pressure sensor) is located on the left side of the forward equipment bay. An alternate static system (AMM 34-11-00/001) provides ambient pressure signals to the sensor. The cabin pressure is sensed directly by the sensor. The sensor compares the ambient pressure to the cabin pressure, converts the pressure difference to an electrical signal and sends it to the CABIN DIFF gage.
   C. Pressurization and Indication Warning Module
      (1) The pressurization and indication warning module is located on the pilots overhead panel (P5). It consists of three pressure gages which provide the cabin pressure indication. The CABIN DIFF gage receives signals from the differential pressure sensor and displays the cabin-to-outside differential pressure. The CABIN ALT gage receives cabin pressure signals through an open port in the indicator case and displays the pressure as the equivalent altitude. The indicator shows positive cabin altitude from 0 to 25,000 ft. and airplane altitudes below sea level, reaching a lower limit at the gage's OFF peg. The CABIN RATE gage receives cabin pressure signals through an open port in the indicator case. The gage displays the rate of cabin pressure change as a function of time for airplane altitudes of -24,000 ft. and above.
3. Operation



FLIGHT COMPARTMENT



MAIN EQUIPMENT CENTER



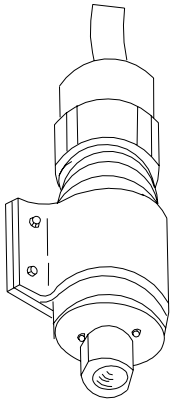
OVERHEAD PANEL

A

FIRE	CONFIG
PULL UP	A/P DISC
CABIN ALT	OVSPD

DISCRETE WARNING
DISPLAY PANEL

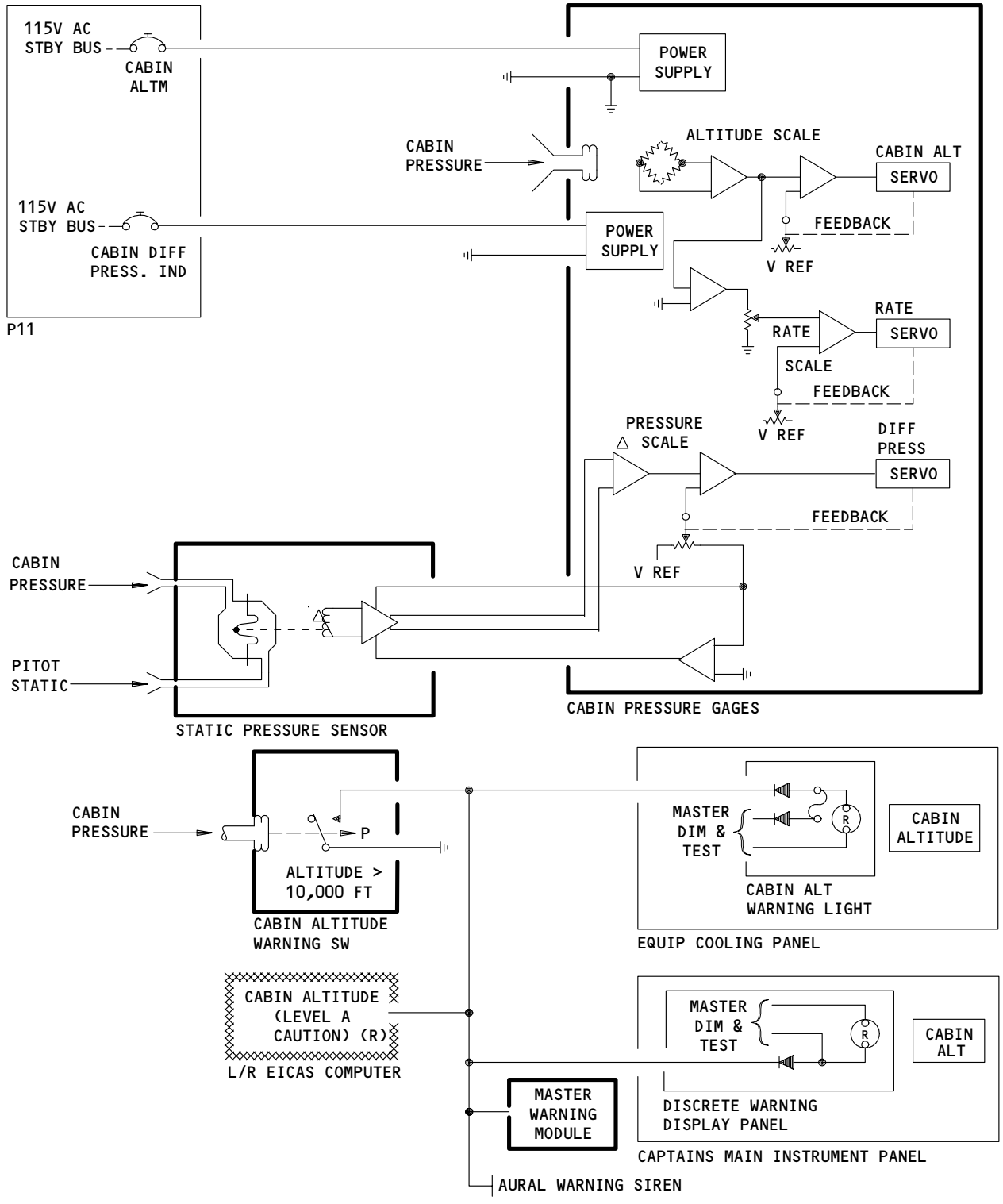
B



CABIN ALTITUDE
WARNING SWITCH

C

Pressurization Indicating and Warning System
Figure 1



Cabin Pressure Indication and Warning System
Figure 2

A. Altitude Warning System

(1) If the cabin altitude climbs to 10,000 feet, the altitude switch closes, which supplies a ground to cause the high-cabin-altitude-warning signals to occur. If the cabin altitude goes below 10,000 feet, the altitude switch opens and the high-cabin-altitude-warning signals will go off. The high-cabin-altitude-warning signals are:

(a) The CABIN ALTITUDE light on the P5 panel comes on.

(b) The CABIN ALT light on the captains instrument P1 panel comes on.

(c) A level A EICAS message, CABIN ALTITUDE, appears.

(d) The aural warning siren sounds.

NOTE: The aural warning siren can be silenced by pressing the Master-Warning-and-Caution switch/light.

CABIN PRESSURE INDICATION AND WARNING SYSTEM - ADJUSTMENT/TEST

TASK 21-33-00-735-001

1. System Test - Cabin Pressure Indication and Warning System

A. General

(1) This procedure has instructions to do a test of the cabin pressure warning system and the cabin pressure indication system.

B. Equipment

(1) Pitot-Static Tester, commercially available
(2) Portable pressure vacuum pump, commercially available
(3) End fitting - compatible with MS 33649-4 female thread on the altitude Warning Switch and test tubing.

C. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 24-22-00/201, Electrical Power Control
(3) AMM 34-11-00/201, Pitot-Static System

D. Access

(1) Location Zone
119 Main Equipment Center (Left)
(2) Access Panels
119BL Main equipment center access door

E. Prepare for the Test

S 865-002

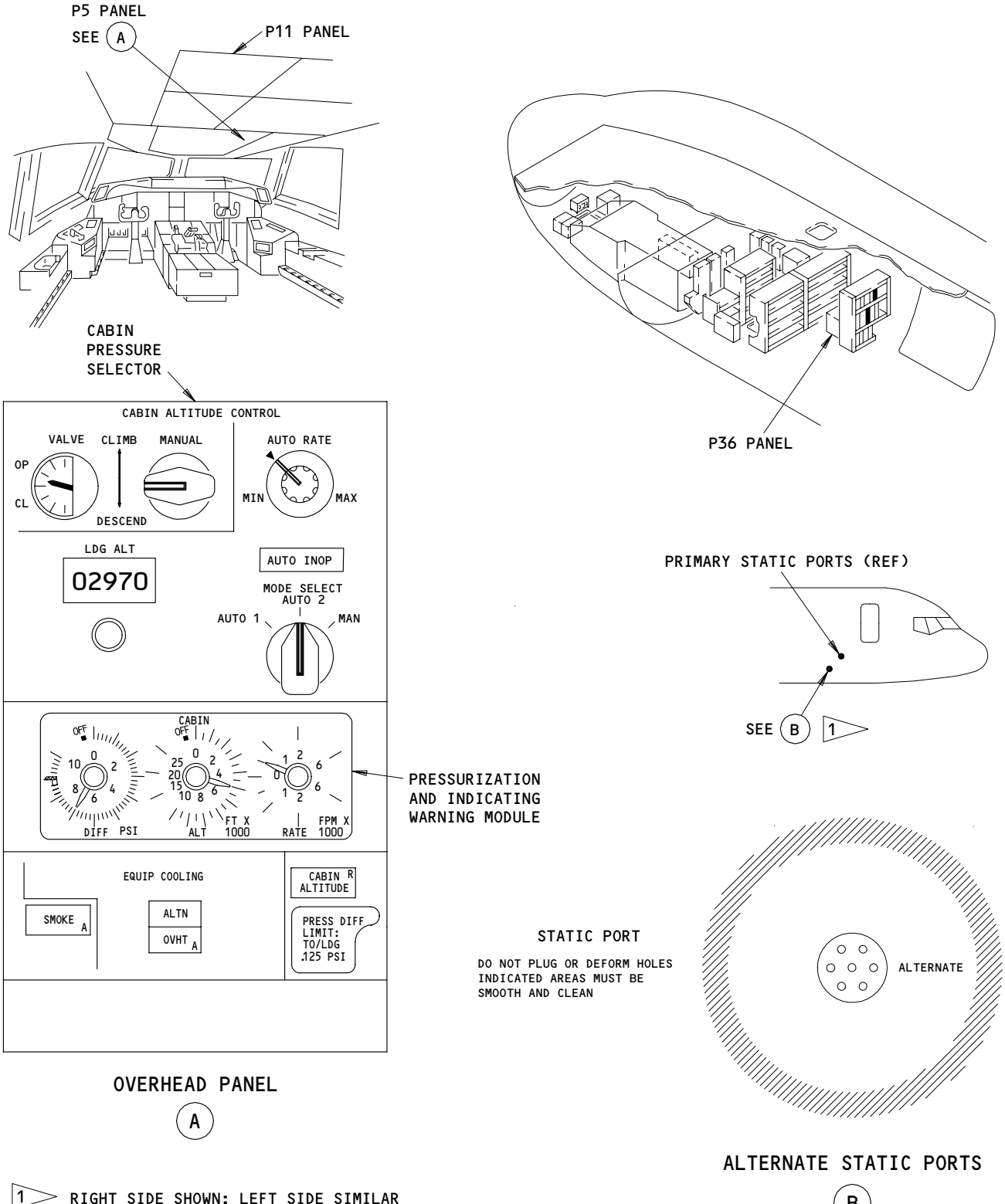
(1) Supply electrical power (AMM 24-22-00/201)

S 865-003

(2) Make sure these circuit breakers, on the overhead circuit breaker panel P11, are closed:
(a) 11A32, INDICATOR LIGHTS 1
(b) 11P1, L IND LTS 1
(c) 11P29, R IND LTS 2
(d) 11S15, AIR/GND SYS 1
(e) 11S19, AIR/GND SYS 2

S 015-004

(3) Open the access door, 119BL, to the main equipment center (AMM 06-41-00/201)



Pressurization Indicating and Warning System Adjustment Test
Figure 501

F. Do the Cabin Pressure Warning Test

S 735-007

(1) Do the Cabin Altitude Warning Switch Test

(a) Find the altitude warning switch, S431, in the P36 panel.

(b) Connect the vacuum pump to the altitude warning switch.

(c) Slowly supply vacuum pressure to increase the altitude (decrease absolute pressure) at a rate not greater than 4,000 ft/min (656 mm Hg/min), until the cabin altitude warning switch actuates and causes these indications to occur:

1) The aural warning siren comes on.

2) The two WARNING lights, on the pilots' lightshield, come on.

3) The CABIN ALT light, on the pilots' center instrument panel P1-3, comes on.

4) The CABIN ALTITUDE light, on the P5 panel, comes on.

5) The EICAS advisory message CABIN ALTITUDE shows on the display.

(d) Make sure the cabin altitude warning switch actuated at an altitude of 10,000 ±300 ft (523 ±6 mm Hg).

(e) Slowly reduce vacuum pressure to decrease the altitude (increase absolute pressure) at a rate not greater than 4,000 ft/min (656 mm Hg/min), until the cabin altitude warning switch deactuates and causes these indications to occur:

1) The aural warning siren goes off.

2) The two WARNING lights, on the pilots' lightshield, go off.

3) The CABIN ALT light, on the P1-3 panel, goes off.

4) The CABIN ALTITUDE light, on the P5 panel, goes off.

5) The EICAS advisory message CABIN ALTITUDE does not show on the display.

(f) Make sure the cabin altitude warning switch deactuated at an altitude of 8,500 ±500 ft (554 ±11 mm Hg).

(g) Reduce vacuum pressure to ambient and remove the vacuum pump from the altitude warning switch.

G. Do the Cabin Pressure Indication System Test

S 735-008

(1) Do the cabin altimeter test

(a) Open this circuit breaker, on the overhead circuit breaker panel P11:
1) 11B13, CABIN ALTM

(b) Make sure the needle, on the cabin altitude indicator, on the pilot's overhead panel P5, aligns with the OFF mark on the indicator face.

(c) Close this circuit breaker, on the P11 panel:
1) 11B13, CABIN ALTM

(d) Turn the BARO knob, on the standby altimeter on pilot's center instrument panel P1, set the internal barometer to 29.92 in. Hg.

(e) Make sure the CABIN ALT indicator, on the P5 panel, shows the same altitude (±125 feet) as the standby altimeter, on the P1 panel.

S 735-009

(2) Do the cabin differential pressure indicator test

(a) Open this circuit breaker, on the P11 panel:
1) 11B12, CABIN DIFF PRESS IND

(b) Make sure the needle on the CABIN DIFF indicator, on the P5 panel, points to the OFF mark.

(c) Close this circuit breaker, on the P11 panel:
1) 11B12, CABIN DIFF PRESS IND

(d) Make sure the needle on the CABIN DIFF indicator, on the P5 panel, points to 0 ±0.15 psi.

WARNING: MAKE SURE THE PROCEDURE TO APPLY THE VACUUM TO THE ALTERNATE STATIC SYSTEM IS DONE CORRECTLY. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR IF THE PROCEDURE IS NOT DONE CORRECTLY.

(e) Attach the pitot-static tester to the alternate static pressure system (AMM 34-11-00/201).
(f) Increase the vacuum on the alternate static pressure system at a rate no greater than 5000 ft/min (AMM 34-11-00/201). Increase the vacuum until the airspeed indicator on the pitot-static tester shows 345 knots.
(g) Make sure the needle on the CABIN DIFF indicator points to 3.0 ±0.15 psi.
(h) Decrease the vacuum to the ambient altitude at a rate no greater than 5000 ft/min.
(i) Remove the pitot-static tester from the static pressure system.

H. Put the airplane back to its usual condition

S 415-013
(1) Close the access door, 119BL, to the main equipment center (AMM 06-41-00/201).

S 865-012
(2) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

PRESSURIZATION AND INDICATION WARNING MODULE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the pressurization and indication warning module. The second task is the installation of the pressurization and indication warning module.
   B. In this procedure, the pressurization and indication warning module is referred to as the warning module. The warning module is on the pilot's overhead panel, P5.
   C. The warning module shows the cabin-to-ambient differential pressure, the cabin altitude, and the rate of increase or decrease of the cabin pressure.

TASK 21-33-01-004-001

2. Remove the Pressurization and Indication Warning Module
   A. References
      (1) 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Procedure

      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Open these circuit breakers on the overhead panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11B12, CABIN DIFF PRESS IND
          (b) 11B13, CABIN ALTM

      S 034-004
      (3) Loosen the 1/4-turn fasteners from the warning module.

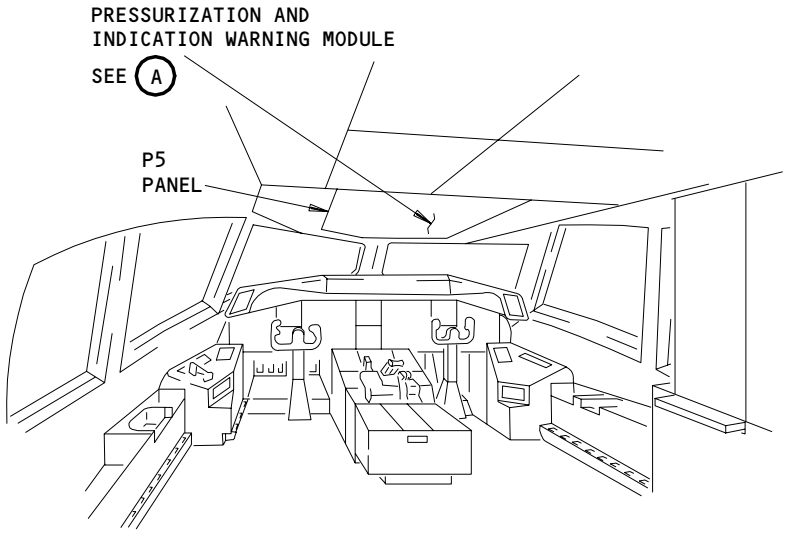
      S 024-006
      (4) Remove the warning module from the panel.

      S 034-005
      (5) Disconnect the two electrical connectors from the warning module.

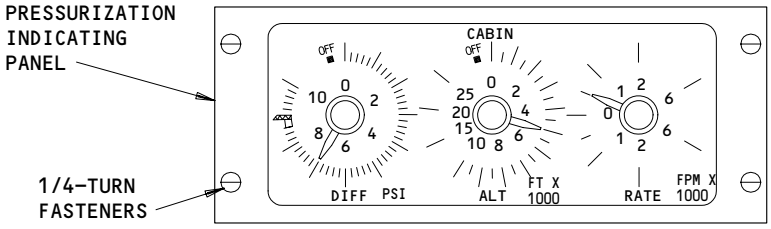
      S 434-007
      (6) Put a plug on the cabin pressure port to keep out unwanted objects.

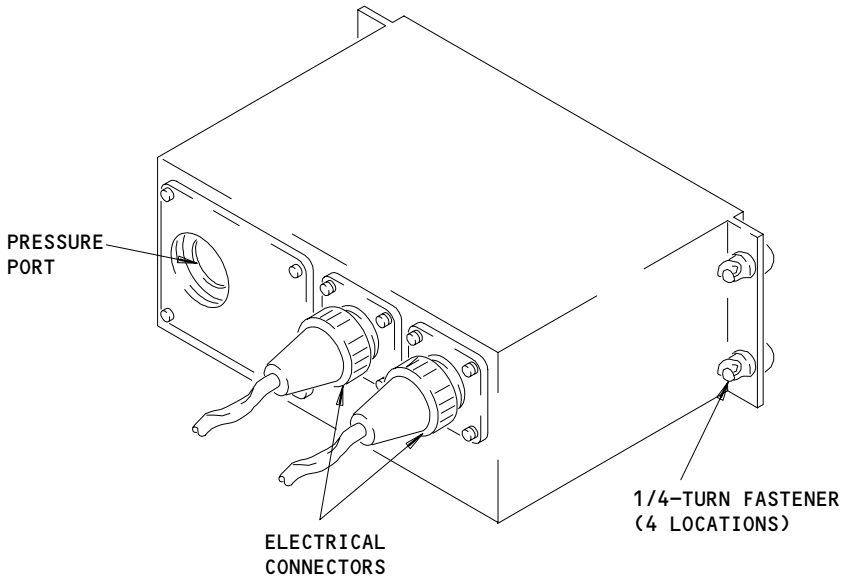
TASK 21-33-01-404-008

3. Install the Pressurization and Indication Warning Module
   A. References
      (1) 24-22-00/201, Electrical Power Control



FLIGHT DECK





PRESSURIZATION AND INDICATION WARNING MODULE

(A)

Pressurization and Indication Warning Module Installation
Figure 401

B. Access
(1) Location Zones
211/212 Control Cabin - Section 41

C. Procedure

S 034-009

CAUTION: MAKE SURE THE DIFFERENTIAL PRESSURE SENSOR AND THE PRESSURIZATION AND INDICATION WARNING MODULE ARE CORRECT TO USE TOGETHER. LOOK AT THE ILLUSTRATED PARTS CATALOG TO MAKE SURE YOU HAVE THE CORRECT PART NUMBER EFFECTIVITY FOR THE TWO COMPONENTS WHEN YOU REPLACE EITHER COMPONENT. IF THE TWO COMPONENTS ARE NOT CORRECT, AN INCORRECT INDICATION WILL OCCUR.

(1) Remove the cabin pressure port plug from the warning module.

S 434-010
(2) Connect the two electrical connectors to the warning module.

S 424-011
(3) Put the warning module in the P5 panel.

S 434-012
(4) Tighten the 1/4-turn fasteners.

S 214-013
(5) Make sure the cabin altimeter needle is aligned with OFF.

S 214-014
(6) Make sure the differential pressure needle is aligned with OFF.

S 864-015
(7) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11B12, CABIN DIFF PRESS IND
(b) 11B13, CABIN ALTM

S 214-017
(8) Make sure the cabin altimeter needle points to field elevation ± 125 feet.

S 214-018
(9) Make sure the differential pressure needle points to 0 ±0.15 psi.

S 214-019
(10) Remove electrical power, if it is not necessary (Ref 24-22-01).

DIFFERENTIAL PRESSURE SENSOR - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the differential pressure sensor. The second task is the installation of the differential pressure sensor.
   B. The differential pressure sensor changes the ambient pressure signals from the alternate static system into electrical signals for the differential pressure indicator. The sensor is on the left side of the forward equipment bay and it is connected to the pitot static tubing.

TASK 21-33-04-004-001

2. Remove the Differential Pressure Sensor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          113 Forward Equipment Center

      (2) Access Panel
          113AL Forward Equipment Center Access Panel

   C. Procedure

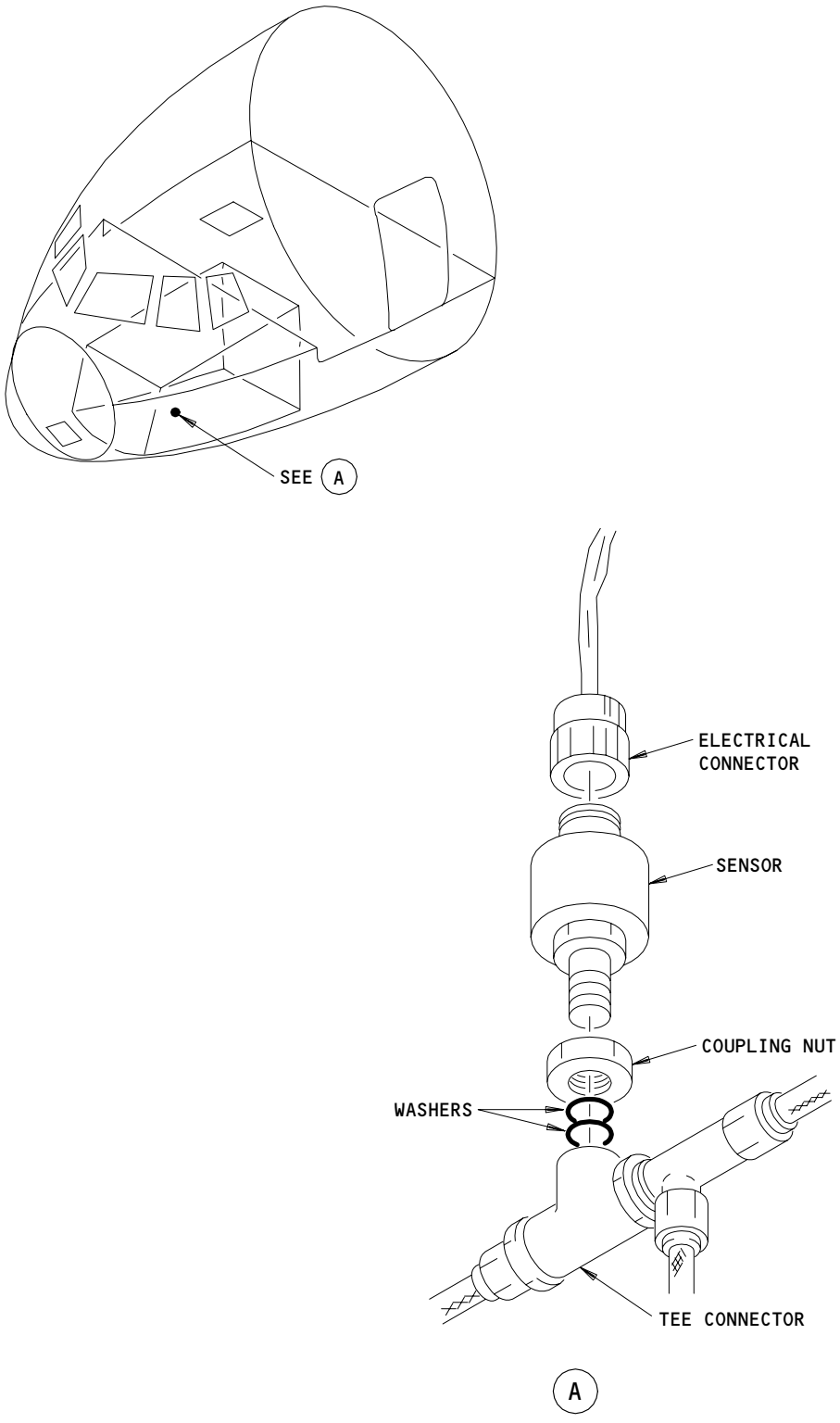
      S 864-002
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11B12, CABIN DIFF PRESS IND
          (b) 11B13, CABIN ALTM

      S 014-003
      (2) Open the forward equipment center access panel (113AL) and find the differential pressure sensor (Ref 06-41-00).

      S 034-004
      (3) Disconnect the electrical connector from the differential pressure sensor.

      S 034-005
      (4) Loosen the coupling nut from the tee connector.

      S 034-006
      (5) Remove the coupling nut from the sensor.



Differential Pressure Sensor Installation
Figure 401

S 024-007

(6) Remove the differential pressure sensor from the tee connector.

TASK 21-33-04-404-008

3. Install the Differential Pressure Sensor (Fig. 401)

A. References

(1) 06-41-00/201, Fuselage Access Doors and Panels

(2) 24-22-00/201, Electrical Power-Control

B. Access

(1) Location Zones

113 Forward Equipment Center

(2) Access Panel

113AL Forward Equipment Center Access Panel

C. Procedure

S 424-009

CAUTION: MAKE SURE THE DIFFERENTIAL PRESSURE SENSOR AND THE PRESSURIZATION AND INDICATION WARNING MODULE ARE CORRECT TO USE TOGETHER. LOOK AT THE ILLUSTRATED PARTS CATALOG TO MAKE SURE YOU HAVE THE CORRECT PART NUMBER EFFECTIVITY FOR THE TWO COMPONENTS WHEN YOU REPLACE A COMPONENT. IF THE COMPONENTS ARE NOT CORRECT, AN INCORRECT INDICATION CAN OCCUR.

(1) Install the differential pressure sensor on the tee connector.

S 434-010

(2) Install the washers and coupling nut on the differential pressure sensor. Tighten against the tee connector.

S 434-011

(3) Install the electrical connector on the differential pressure sensor.

S 864-012
(4) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11B12, CABIN DIFF PRESS IND
(b) 11B13, CABIN ALTM

S 864-013
(5) Supply electrical power (Ref 24-22-00)

S 214-014
(6) Make sure the differential pressure indicator moved from OFF to approximately 0.

NOTE: The differential pressure indicator is on the pressurization indication and warning module on the P5 panel.

S 414-015
(7) Close the forward equipment center access panel (113AL).

S 864-016
(8) Remove electrical power, if it is not necessary.

CABIN ALTITUDE WARNING SWITCH - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the cabin altitude warning switch. The second task is the installation of the cabin altitude warning switch.
   B. Some airplanes have an additional high cabin altitude warning switch installed. The procedure for the removal and installation of the high cabin altitude warning switch is the same as the procedure for the removal and installation of the cabin altitude warning switch.

TASK 21-33-05-004-018

2. Cabin Altitude Warning Switch Removal (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          119 Main Equipment Center, Left
          120 Main Equipment Center, Right

   C. Procedure

      S 864-019
      (1) Open the E/E bay access door 119AL (AMM 06-41-00).

      S 024-020
      (2) Find the cabin altitude warning switch on the left miscellaneous electrical equipment panel, P36.

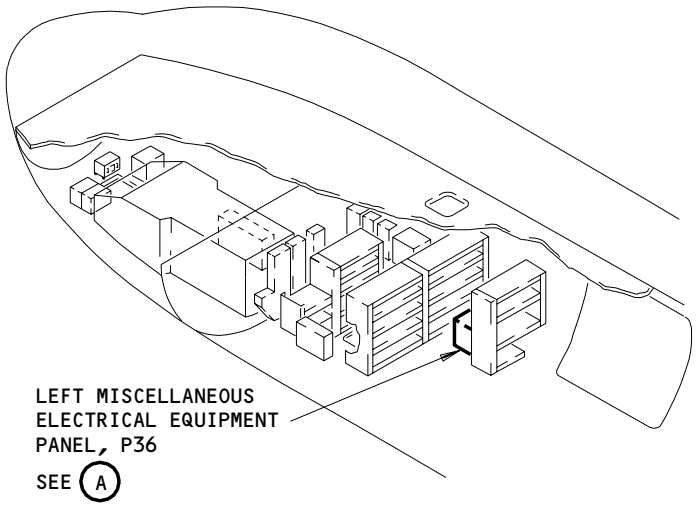
      S 024-021
      (3) Disconnect the electrical connector.

      S 024-022
      (4) Remove the bolts, washers, and nuts which attach the switch to the panel.

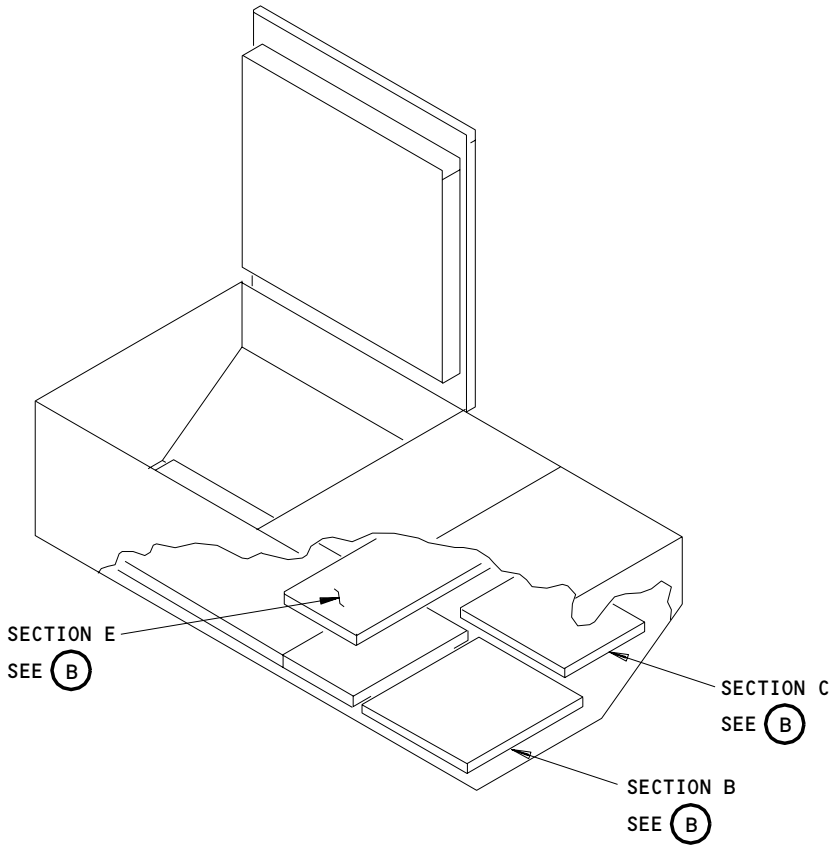
      S 024-023
      (5) Remove the switch and it's support bracket.

TASK 21-33-05-404-024

3. Cabin Altitude Warning Switch Installation (Fig. 401).
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          119 Main Equipment Center, Left
          120 Main Equipment Center, Right



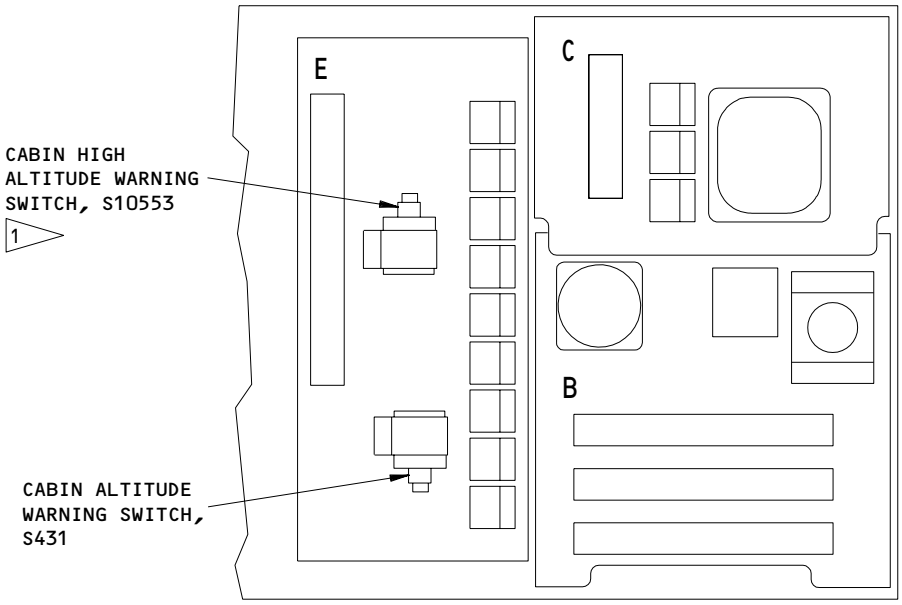
MAIN EQUIPMENT CENTER



LEFT MISCELLANEOUS ELECTRICAL EQUIPMENT PANEL, P36

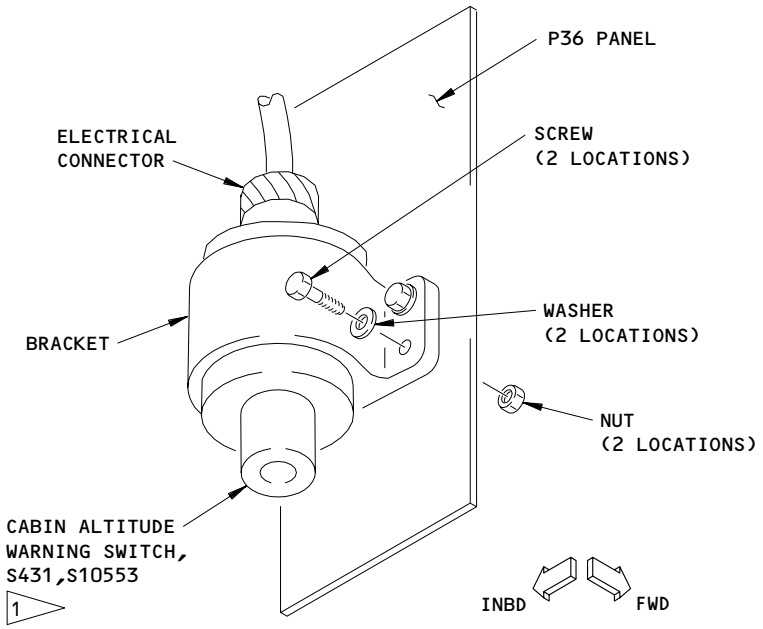
A

Cabin Altitude Warning Switch - Removal/Installation
Figure 401 (Sheet 1)



P36 PANEL SECTIONS B, C AND E (LOWER RIGHT)

B



CABIN ALTITUDE WARNING SWITCH

C

1 AIRPLANES WITH CABIN HIGH ALTITUDE WARNING SWITCH

Cabin Altitude Warning Switch - Removal/Installation
Figure 401 (Sheet 2)

C. Procedure

S 864-029
(1) Open the E/E bay access door 119AL (AMM 06-41-00).

S 424-028
(2) Put the switch and it's support bracket against the mounting holes on the P36 panel.

S 424-027
(3) Install the switch and it's support bracket to the structure with bolts, washers, and nuts.
(a) Make sure the support bracket for the cabin altitude warning switch is not too tight. The switch can be damaged if the bracket is too tight.

S 424-026
(4) Install the electrical connector.

S 864-025
(5) Close the E/E bay access door 119AL (AMM 06-41-00).

HEATING

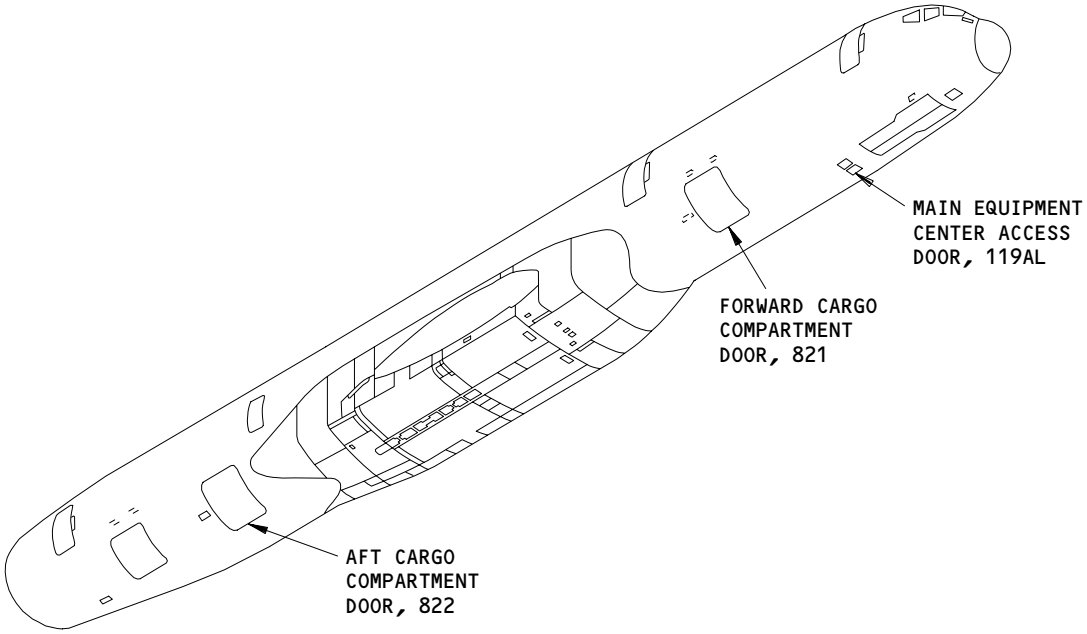
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER –			FLT COMPT, P11	
CARGO HEATER AFT, C4071		1	11N18	*
CARGO HEATER FAN FWD, C4059		1	11N17	*
FAN CONT AFT CARGO, C4072		1	11N22	*
CIRCUIT BREAKER –			119BL, MAIN EQUIP CTR, P37	
AFT CARGO FAN, C3010		1	37C2	*
HEATERS F/O AUX HI, C699		1	37F4	*
HEATERS F/O AUX LO, C700		1	37F3	*
CIRCUIT BREAKER –			P70	
AFT CARGO HTR, C3009		1	70C8	*
CAPT AUX HTR HI, C662		1	70A6	*
CAPT AUX HTR LO, C663		1	70A5	*
FWD CARGO FAN, C3002		1	70B8	*
FAN – AFT CARGO HEATING FLOW		1	822, AFT CARGO COMPT	21-44-06
FAN – FWD CARGO HEATING FLOW		1	821, FWD CARGO COMPT	21-43-04
FILTER – AFT CARGO HEAT INLET GRILL		2	822, AFT CARGO COMPT	21-44-06
FILTER – FWD CARGO HEAT INLET GRILL		2	821, FWD CARGO COMPT	21-43-04
HEATER – AFT CARGO		1	822, AFT CARGO COMPT	21-44-05
HEATER – FOOT ELECTRIC SURFACE		4	FLT COMPT	21-45-01
HEATER – SHOULDER AIR SUPPLY		2	FLT COMPT	21-45-02
MODULE – APU/CARGO FIRE CONTROL, M10444		1	FLT COMPT, P8	*
RELAY – (FIM 21-40-00/101				
AFT CARGO FAN CURRENT SENSE, K10598 1		1	119BL, MAIN EQUIP CTR, P37	
FWD CARGO FAN CURRENT SENSE, K10597 1		1	119BL, MAIN EQUIP CTR, P70	
RELAY – (FIM 31-01-36/101)				
AIR/GND SYS 1, K145				
RELAY – (FIM 31-01-37/101)				
AFT CARGO FAN, K10084				
AIR/GND SYS 2, K205				
ON DROP OUT T/D, K10164				
RELAY – (FIM 31-01-70/101)				
AFT CARGO HTR, K10083				
FWD CARGO FAN, K10057				
SENSOR – (FIM 21-40-00/101				
AFT CARGO FAN CURRENT, TS5044 2		1	119BL, MAIN EQUIP CTR, P37	21-44-09
FWD CARGO FAN CURRENT, TS5018 2		1	119BL, MAIN EQUIP CTR, P70	21-43-07
SWITCH – AFT CARGO TEMPERATURE THERMAL		1	822, AFT CARGO COMPT	21-44-07
SWITCH – FWD CARGO TEMPERATURE THERMAL		1	821, FWD CARGO COMPT	21-43-05
SWITCH/LIGHT – AFT CARGO, YQPS2		1	FLT COMPT, P8, APU/CARGO FIRE M10444	*
SWITCH/LIGHT – FWD CARGO, YQPS1		1	FLT COMPT, P8, APU/CARGO FIRE M10444	*

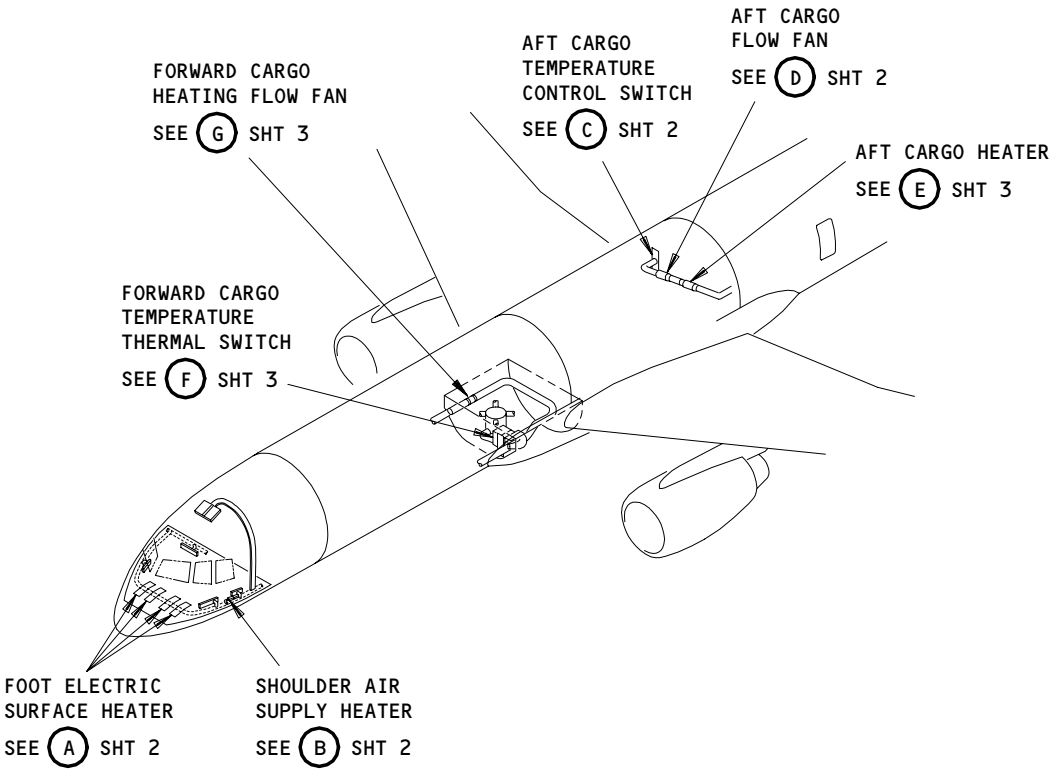
* SEE THE WDM EQUIPMENT LIST

1 NOT ON ALL AIRPLANES – ALTERNATE TO CARGO FAN CURRENT SENSOR

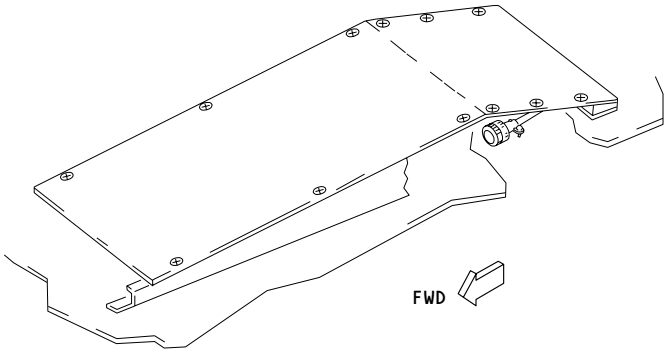
2 NOT ON ALL AIRPLANES – ALTERNATE TO CARGO FAN CURRENT SENSE RELAY

Heating – Component Index
Figure 101



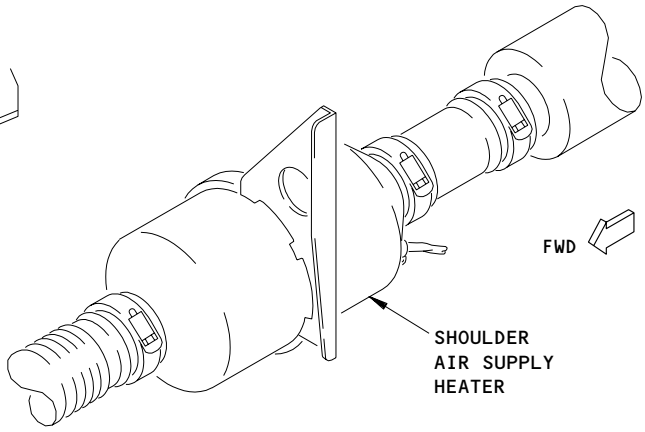


Heating - Component Location
Figure 102 (Sheet 1)



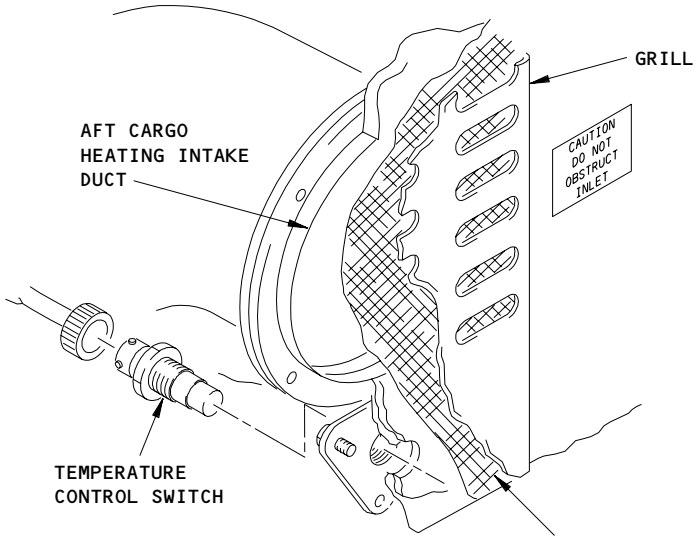
FOOT ELECTRIC SURFACE HEATER

A



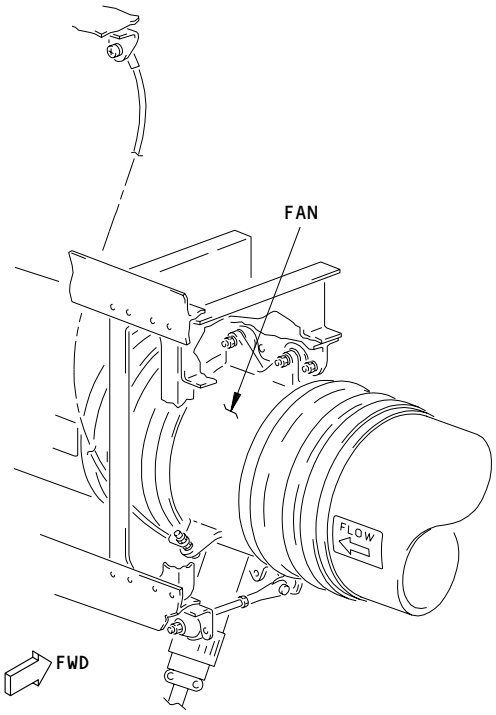
SHOULDER AIR SUPPLY HEATER

B



AFT CARGO TEMPERATURE
CONTROL SWITCH

C

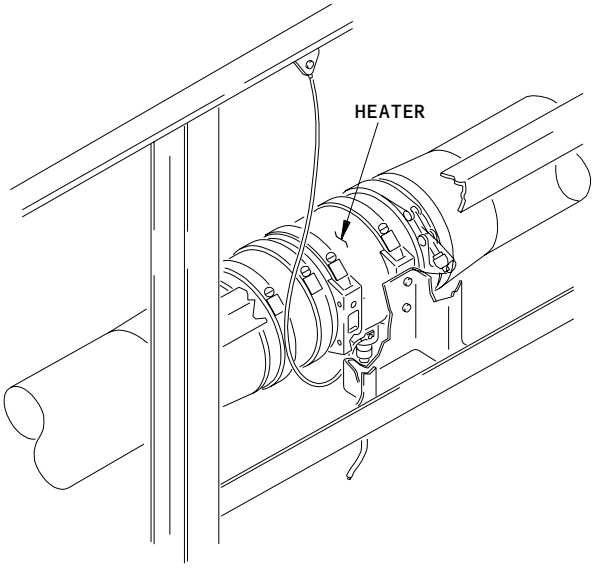


AFT CARGO FLOW FAN

D

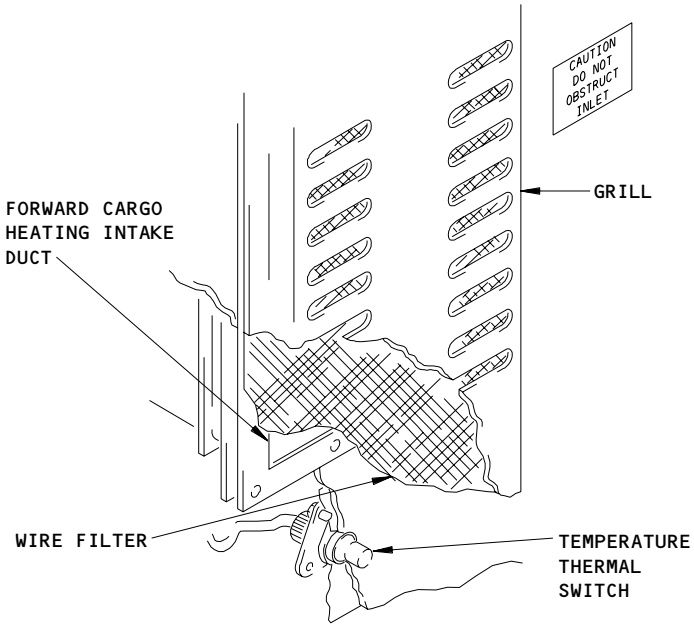
Heating – Component Location (Details from Sht 1)
Figure 102 (Sheet 2)

277642



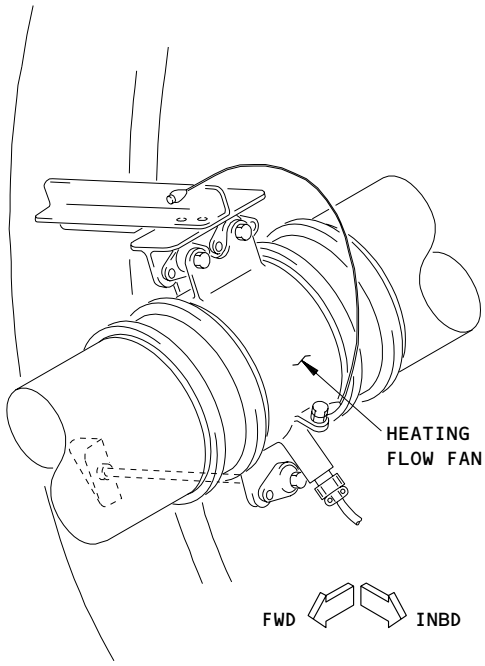
AFT CARGO HEATER

E



FORWARD CARGO TEMPERATURE THERMAL SWITCH

F



FORWARD CARGO HEATING FLOW FAN

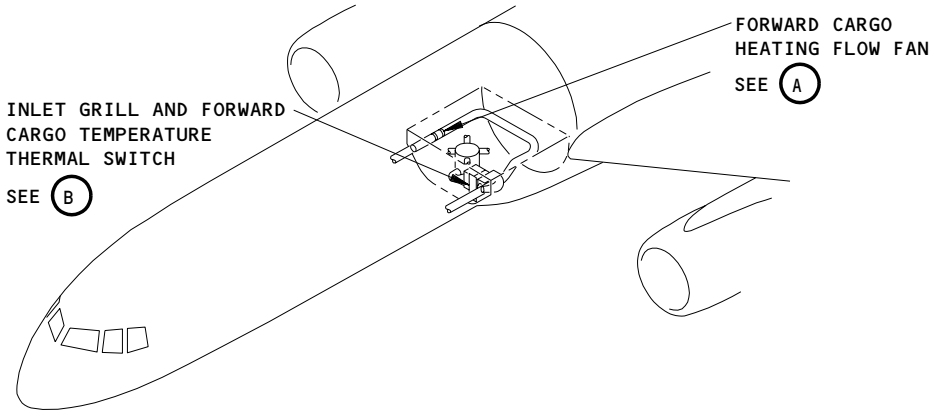
G

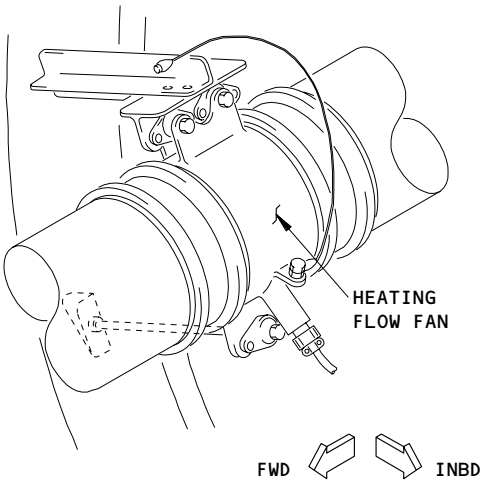
Heating – Component Location (Details from Sht 1)
Figure 102 (Sheet 3)

FORWARD CARGO COMPARTMENT HEATING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The forward cargo heating system recirculates cargo compartment air through a fan. Heat is picked up from the fan before the air is recirculated back into the cargo compartment. A thermal switch controls fan operation.
2. Component Details (Fig. 1)
   A. Forward Cargo Heating Flow Fan
      (1) Description
         (a) The axial flow fan is a single stage vaneaxial fan integrating the motor into the fan to provide simplicity of design and construction and to optimize unit life and reliability.
         (b) The forward cargo heating flow fan is located behind the FWD cargo compartment aft endliner in the mix manifold bay.
         (c) The fan consists of a single cast aluminum alloy housing containing a single cast unit impeller and an end bell (both of aluminum alloy), two sealed ball bearings, and the stator assembly and rotor.
         (d) The fan housing contains an inner housing which encases the stator assembly and rotor. Vanes are integrally cast between the outer and inner housings. The vanes optimize low noise levels, provide structural support, and transfer heat from the motor to the airflow and outer housing for motor cooling.
         (e) The drive motor is a three-phase, squirrel-cage type induction machine. Three miniature indirect-acting thermostats, which serve as thermal protective devices, are connected in series, one located over a coil in each phase.

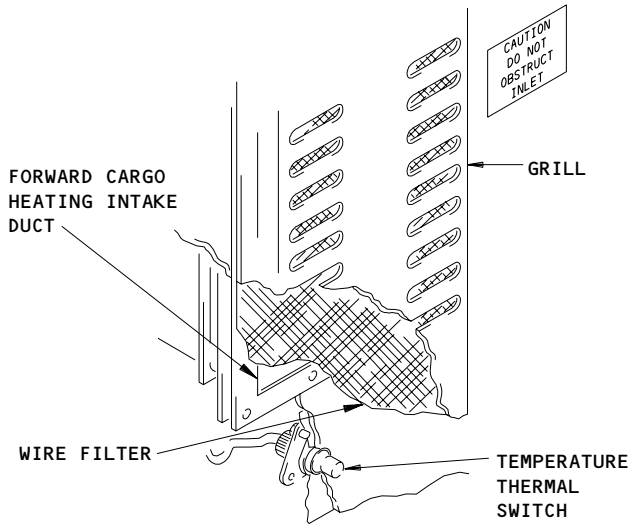
      (2) Operation
         (a) The axial flow fan operates at a high shaft speed when supplied with aircraft electric power. The fan impeller drives air through the fan assembly. If the temperature of a winding reaches 400°F (204°C), the thermal switch on that winding de-energizes the fan power relay, removing power from the fan. If the cargo compartment ambient temperature is below 50°F (10°C), the EICAS status and maintenance message FWD CARGO FAN will be displayed. When the fan temperature decreases to 340°F (171°C), the thermal switch resets, allowing the fan to restart if the cargo compartment ambient temperature is below 50°F (10°C).





FORWARD CARGO HEATING FLOW FAN

A



INLET GRILL AND
FORWARD CARGO TEMPERATURE
THERMAL SWITCH

B

Forward Cargo Compartment Heating System
Figure 1

B. Forward Cargo Temperature Thermal Switch

(1) The Cargo Compartment Temperature Thermal switch provides temperature sensing and heating fan control. The switch closes whenever cargo compartment temperature falls below 50°F (10°C) providing power to the heating flow fan. The switch opens when cargo compartment temperature reaches 70°F (21°C).

(2) The thermal switch is located in the mix bay compartment, mounted on the cargo compartment left side aft endliner panel.

C. Forward Cargo Fan Current Sensor or Current Sense Relay

(1) AIRPLANES WITH THE FWD CARGO FAN CURRENT SENSOR;
A fan current sensor is located on the left miscellaneous electrical panel, P34. The current sensor is part of the forward cargo heating indication system. The current sensor detects if the fan has electrical power. If the fan has a failure, the current sensor will provide a ground to the EICAS computers and the FWD CARGO FAN message will show.

(2) AIRPLANES WITH THE FWD CARGO FAN SENSE RELAY;
A current sense relay is located on the left miscellaneous electrical panel, P34. The relay is part of the forward cargo heating indication system. The relay detects if the fan has electrical power. If the fan has a failure, the relay will provide a ground to the EICAS computers and the FWD CARGO FAN message will show.

D. Forward Cargo Heating Inlet Grill

(1) The grill in the aft of the forward cargo compartment covers the inlet to the forward cargo heating system. The grill includes a wire filter to keep dirt and debris out of the heat fan.

3. Operation (Fig. 2)

A. Functional Description

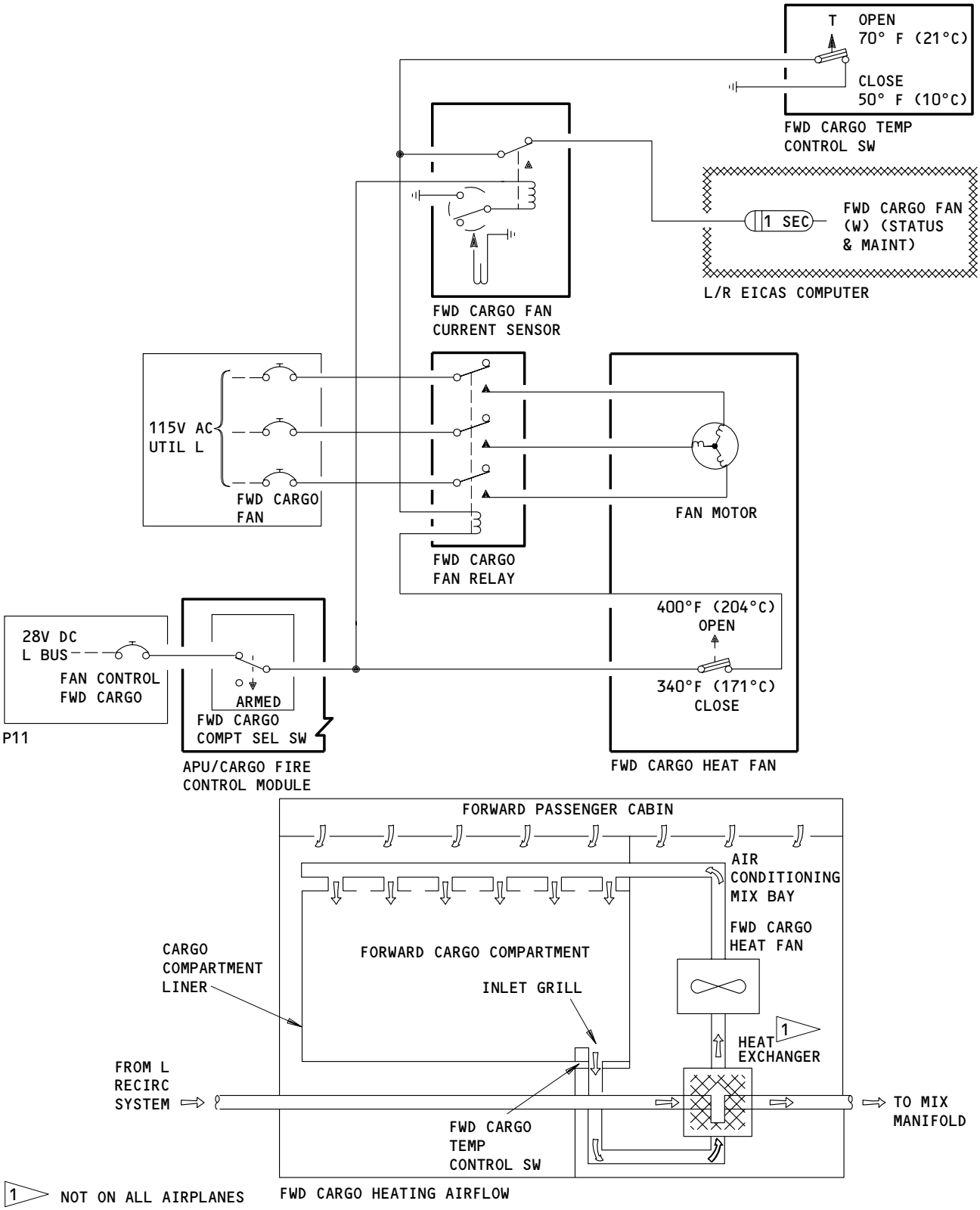
(1) The forward cargo compartment heating system draws air from the cargo compartment, warms the air with a heating flow fan then returns the warm air into the cargo compartment.

(2) If the cargo compartment temperature falls below 50°F (10°C), the forward cargo compartment temperature thermal switch closes. This energizes the forward cargo fan relay providing power to the forward cargo heating flow fan. The fan draws cool air from the cargo compartment. This air then passes through the heating flow fan which warms the air and exhausts it back into the cargo compartment.

(3) When the cargo compartment temperature reaches 70°F (21°C), the forward cargo compartment temperature thermal switch opens, interrupting power to the heating flow fan.

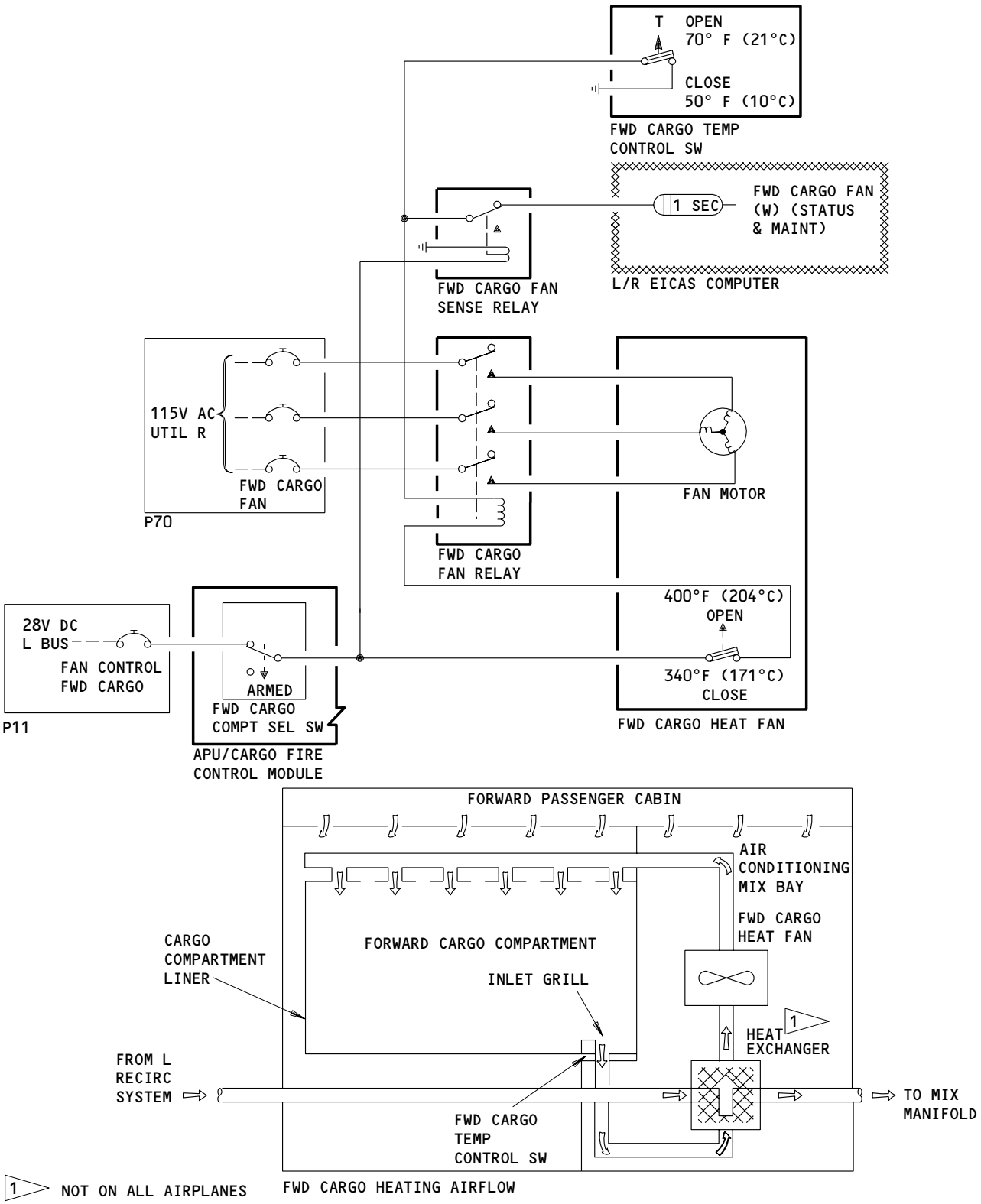
(4) If the forward cargo compartment heating flow fan does not operate when the temperature thermal switch closes, the forward cargo fan current sensor (or current sense relay) provides a ground through the thermal temperature switch for EICAS. This displays the EICAS status and maintenance message FWD CARGO FAN.

(5) If the forward cargo compartment fire switch on the aft pilot's control stand P8 panel is ARMED, all power is interrupted to the heating flow fan.



Forward Cargo Heating System Schematic
Figure 2 (Sheet 1)

G21986



Forward Cargo Heating System Schematic
Figure 2 (Sheet 2)

EFFECTIVITY
AIRPLANES WITH FORWARD CARGO FAN CURRENT SENSE RELAY

G22342

B. Control

(1) The forward cargo compartment heating system is a self controlled system requiring no pilot or mechanic action to place it into operation.

FORWARD CARGO COMPARTMENT HEATING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks. The first task is an operational test of the heating system in the forward cargo compartment. The second task is a system test of the heating system in the forward cargo compartment.
   B. The heating system in the forward cargo compartment uses a thermal switch temperature control. When the temperature in the forward cargo compartment is less than 50°F (10°), the switch closes and sends a signal to a relay. The relay controls the heater fan. When the temperature in the forward cargo compartment is 70°F (21°C), the switch disconnects the circuit to the forward cargo compartment fan relay. This stops the heat supply to the compartment.

TASK 21-43-00-715-002

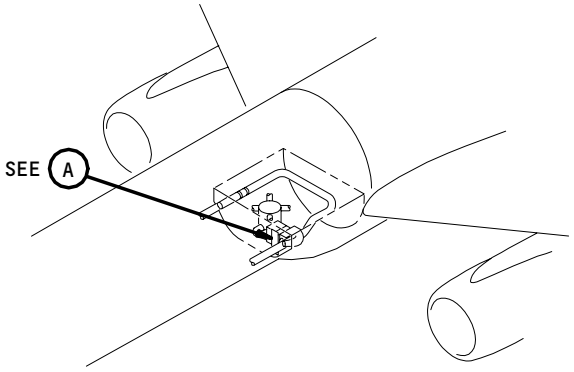
2. Operational Test - Forward Cargo Compartment Heating System
   A. General
      (1) This test makes sure the fan and temperature control switch operate correctly.
   B. Equipment
      (1) Cooling source - ice pack - commercially available
      (2) Thermometer - range 0 to 120°F (0 to 49°C) - commercially available
   C. References
      (1) AMM 24-22-00/201, Electrical Power Control
   D. Access
      (1) Location Zones
          121/122 Forward Cargo Compartment
          211 212 Control Cabin - Section 41

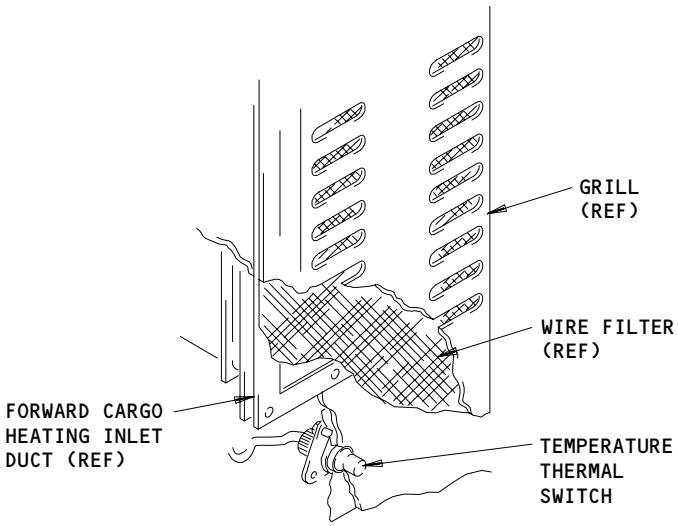
   E. Procedure

      S 865-003
      (1) Supply electrical power (AMM 24-22-00/201).

      S 865-004
      (2) Make sure these circuit breakers on the pilot's overhead circuit breaker panel, P11, are closed:
          (a) 11N1, INSTRUMENT AND PANEL AISLE STAND
          (b) 11N17, CARGO HEATER FAN FWD
          (c) 11S15, AIR/GND SYS 1
          (d) 11S19, AIR/GND SYS 2

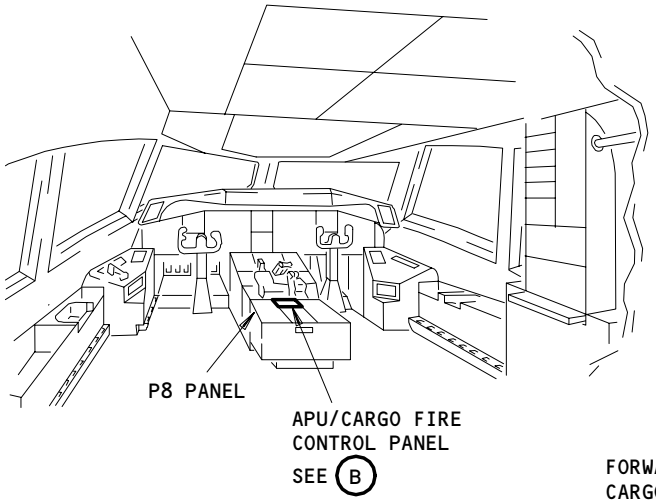
      S 865-006
      (3) Make sure this circuit breaker on the miscellaneous electrical equipment panel, P70, is closed:
          (a) 70B8, FWD CARGO FAN



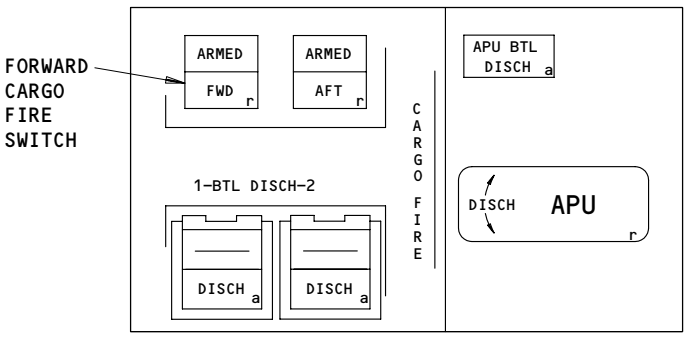


FORWARD CARGO TEMPERATURE
THERMAL SWITCH

A



FLT COMPT



APU/CARGO FIRE CONTROL PANEL

B

Forward Cargo Compartment Heating Test Components
Figure 501

334857

S 865-007

(4) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
(a) 6H5, FIRE EXTINGUISHING CARGO BTL 1
(b) 6H6, FIRE EXTINGUISHING CARGO BTL 2

S 215-008

(5) Make sure the FWD CARGO FIRE switch on the aft pilot's control stand, P8, is in the usual position (ARMED light off).

S 715-010

(6) If the ambient temperature in the cargo compartment is less than 50°F (10°C):
(a) Make sure the cargo compartment heating fan operates and pulls air into the inlet.

S 715-071

(7) If the ambient temperature in the cargo compartment is more than 50°F (10°C):
(a) Use the cooling source to decrease the temperature at the temperature control switch.
(b) Make sure the forward cargo compartment heating fan starts and pulls air into the inlet.

S 865-011

(8) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
(a) 6H5, FIRE EXTINGUISHING CARGO BTL 1
(b) 6H6, FIRE EXTINGUISHING CARGO BTL 2

S 865-012

(9) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

TASK 21-43-00-735-013

3. System Test - Forward Cargo Compartment Heating System

A. Equipment
(1) Heating source - hand-held hair blow dryer - commercially available
(2) Cooling source - ice pack - commercially available
(3) Thermometer, range 0 to 120°F (0 to 49°C) - commercially available

B. References
(1) AMM 06-46-00/201 Entry Service and Cargo Doors
(2) AMM 24-22-00/201, Electrical Power Control

C. Access
(1) Location Zones
121/122 Forward Cargo Compartment
211 212 Control Cabin - Section 41

D. Heating System Test

S 865-014
(1) Supply electrical power (AMM 24-22-00/201).

S 865-015
(2) Make sure these circuit breakers on the pilot's overhead circuit breaker panel, P11, are closed:
(a) 11N1, INSTRUMENT AND PANEL AISLE STAND
(b) 11N17, CARGO HEATER FAN FWD
(c) 11S15, AIR/GND SYS 1
(d) 11S19, AIR/GND SYS 2
(e) EICAS circuit breakers (5 locations)

S 865-017
(3) Make sure this circuit breaker on the miscellaneous electrical equipment panel, P70, is closed:
(a) 70B8, FWD CARGO FAN

S 865-018
(4) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
(a) 6H5, FIRE EXTINGUISHING CARGO BTL 1
(b) 6H6, FIRE EXTINGUISHING CARGO BTL 2

S 865-019
(5) Push the FWD CARGO FIRE switch on the aft pilot's control stand, P8, to the usual position (ARMED light off).

S 735-021
(6) Use the heat source to increase the temperature at the temperature control switch.
(a) Make sure the forward cargo compartment heating fan does not operate.

S 735-022
(7) Use the cooling source to decrease the temperature at the temperature control switch.
(a) Make sure the forward cargo compartment heating fan starts and pulls air into the fan inlet.

S 215-023
(8) Make sure all the joints and ducting to and from the fan are tight.
(a) To make sure you cannot feel air leakage, put your hand 2 inches from the joints and ducting.

S 735-024
(9) Make sure the air blows out from each vent nozzle.

S 865-025
(10) Set the EICAS COMPUTER switch on the EICAS pilots display to LEFT.

S 865-026
(11) Open this circuit breaker on the miscellaneous electrical equipment panel, P7O, and attach a DO-NOT-CLOSE tag:
(a) 7OB8, FWD CARGO FAN

S 215-028
(12) Make sure the forward cargo fan stops.

S 215-029
(13) Push the STATUS button on the EICAS pilot's display.
(a) Make sure the EICAS status message, FWD CARGO FAN, shows on the bottom display.

S 215-030
(14) Push the ECS/MSG button on the right EICAS display panel, P61.
(a) Make sure the EICAS maintenance message, FWD CARGO FAN, shows on the bottom display.

S 865-031
(15) Put the EICAS COMPUTER switch on the P61 panel to RIGHT.

S 215-032
(16) Push the AUTO READ button then the ERASE button on the EICAS display P61 panel for approximately 3 seconds each.

NOTE: Make sure the parking brake is on.

(a) Make sure the EICAS maintenance message, FWD CARGO FAN, shows on the bottom display.

S 865-033
(17) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P70 panel:
(a) 70B8, FWD CARGO FAN

S 215-035
(18) Make sure the forward cargo fan starts.

S 215-036
(19) Push the AUTO READ button then the ERASE button on the EICAS maintenance panel for approximately 3 seconds each.

NOTE: Make sure the parking brake is on.

(a) Make sure the EICAS maintenance message, FWD CARGO FAN, does not show on the bottom display.

S 865-037
(20) Push the FWD CARGO FIRE switch on the P8 stand to the ARMED position (ARMED light on).

S 215-039
(21) Make sure the forward cargo fan stops.

S 215-040
(22) Push the FWD CARGO FIRE switch to the usual position (ARMED light off).
(a) Make sure the fan starts.

S 805-042
(23) Remove the cooling source.

S 215-001
(24) Use the heat source to increase the temperature at the temperature control switch.
(a) Make sure the fan stops.

S 865-043
(25) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
(a) 6H5, FIRE EXTINGUISHING CARGO BTL 1
(b) 6H6, FIRE EXTINGUISHING CARGO BTL 2

E. Test - Temperature Control Thermal Switch

S 015-044
(1) Open the Cargo Door No. 1 (AMM 06-46-00/201).

S 015-045
(2) Remove the endliner at the aft end of the cargo compartment.

S 805-046
(3) Find the thermal switch on the bulkhead immediately below the heating intake duct.

S 735-047
(4) Use the cooling source to decrease the temperature of the switch to 50°F (10°C) minimum.

S 885-073
(5) Make sure the heating fan operates.

S 215-048
(6) Use the heat source to increase the temperature of the switch to 70°F (21°C) maximum.

S 885-074
(7) Make sure the heating fan stops after approximately 20 seconds.

S 415-050
(8) Install the cargo compartment endliner.

S 415-051
(9) Close the Cargo Door No. 1 (AMM 06-46-00/201).

S 865-052
(10) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

FORWARD CARGO HEATING FLOW FAN - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task in the removal of the forward cargo heating flow fan. The second task is the installation of the forward cargo heating flow fan.
   B. A forward cargo heating fan pulls the cargo compartment air through the cargo heat duct to supply heat to the cargo compartment. The fan is in the mix manifold bay area on the right side adjacent to the airplane skin.

TASK 21-43-04-004-001

2. Remove the Forward Cargo Heating Flow Fan (Fig. 401)
   A. References
      (1) 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
      (3) 25-50-03/401, Bulkhead Lining Panels
   B. Access
      (1) Location Zones
          125/126 Area Aft of Forward Cargo Compartment

   C. Procedure

      S 864-002
      (1) Open this circuit breaker on the miscellaneous relay panel, P70, and attach a DO-NOT-CLOSE tag:
          (a) 70B8, FWD CARGO FAN

      S 864-004
      (2) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11N17, CARGO HEATER FAN FWD

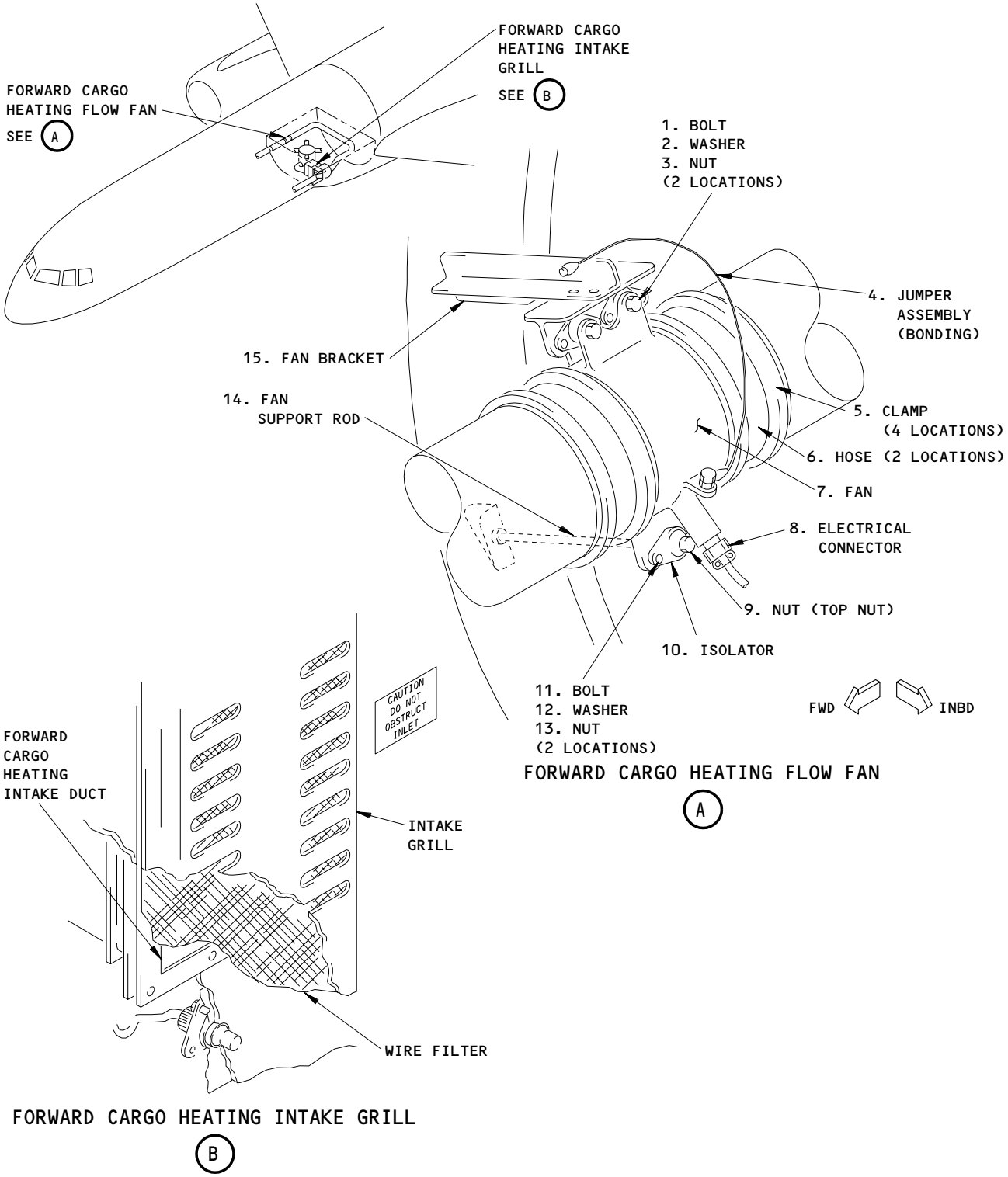
      S 014-005
      (3) Open the No. 1 Cargo Door (821) (Ref 06-46-00).

      S 014-006
      (4) To get access to the heating flow fan, remove the right bulkhead lining panel at the aft end of the forward cargo compartment (AMM 25-50-03/401).

      S 034-031
      (5) Disconnect the electrical connector (8) from the fan (7).

      S 034-007
      (6) Disconnect the bonding jumper assembly (4) from the fan.

      S 034-008
      (7) Remove the clamps (5) (4 locations).



Forward Cargo Heating Flow Fan Installation
Figure 401

S 034-009
(8) Move the hose (6) (2 locations) away from fan (7).

S 034-010
(9) Remove the bolts (1) from the isolators (9) in the top fan bracket (15) (2 locations).

S 034-011
(10) Disconnect the fan (7) at the lower bracket.
(a) Remove the top nut (9) from the fan support rod (14).
(b) Remove the bolts (11) (2 locations) that connect the isolator (10) to the fan bracket.
(c) Remove the isolator (10).

S 024-012
(11) Remove the fan (7).

TASK 21-43-04-404-013

3. Install the Forward Cargo Heating Flow Fan (Fig. 401)
A. Equipment
(1) Cooling Source - ice pack, Commercially available
(2) Thermometer - hand-held type, range 40-80°F (0-30°C), Commercially available.
(3) Vacuum - Commercially available.
B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	21-43-03	02	45
	2	Washer			60
	3	Nut			70
	4	Jumper Assembly			15
	5	Clamp			155
	6	Hose			120
	7	Fan			95
	9	Nut			85
	10	Isolator			80
	11	Bolt			55
	12	Washer			60
	13	Nut			70

C. References
(1) 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) 24-22-00/201, Electric Power Control
(3) 25-50-03/401, Bulkhead Lining Panels

D. Access
(1) Location Zones
125/126 Area Aft of Forward Cargo Compartment

E. Procedure

S 424-014
(1) Put the fan (7) in position.

S 434-015
(2) Install the bolt (1), washer (2), and nut (3) (2 locations) in the top fan bracket (15).

S 434-016
(3) To install the isolator (10) on the lower fan bracket, install the bolt (11), washer (12), and nut (13) (2 locations).

S 434-017
(4) Install the nut (9) on the rod (14).

NOTE: The nut makes an interface with the isolator.

S 434-018
(5) Connect the electrical connector (8) to the fan (7).

S 434-019
(6) Connect the bonding jumper assembly (4) to the fan (7). Install the bolt, washer, and nut.

S 434-020
(7) Install the hose (6) (2 locations).

S 434-021
(8) Install the clamps (5) (4 locations).

S 414-022
(9) Install the bulkhead lining panel (AMM 25-50-03/401).

S 864-023
(10) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P70 panel:
(a) 70B8, FWD CARGO FAN

S 864-025
(11) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11N17, CARGO HEATER FAN FWD

S 144-027
(12) Clean the forward cargo heating intake grill.
(a) Remove the intake grill.
(b) Vacuum the front and back sides of the intake grill to remove all of the dirt and debris.
(c) Install the intake grill.

S 704-028
(13) Do a test of the fan.
(a) Supply electrical power (AMM 24-22-00/201).

NOTE: The forward cargo temperature thermal switch automatically starts and stops the forward cargo heating flow fan.

(b) If the ambient temperature in the cargo compartment is less than 50°F (10°C):
1) Listen for fan noise to make sure the flow fan operates.
(c) If the ambient temperature in the cargo compartment is more than 50°F (10°C):
1) Use the cooling source to decrease the temperature at the temperature control switch.

2) Listen for fan noise to make sure the flow fan operates.

S 414-029

(14) Close the No. 1 Cargo Door (821) (AMM 06-46-00/201).

S 864-030

(15) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

FORWARD CARGO TEMPERATURE CONTROL SWITCH - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the forward cargo temperature control switch. The second task is the installation of the forward cargo temperature control switch.
   B. The temperature control switch for the forward cargo compartment is in the mix manifold bay. The switch is on the bulkhead immediately forward of the heat exchanger. When the cargo compartment temperature is less than 50°F (10°C), the switch closes and sends a signal to the heating flow fan. When the cargo compartment temperature becomes 70°F (21°C), the switch stops the power to the fan.

TASK 21-43-05-004-001

2. Remove the Forward Cargo Temperature Control Switch (Fig. 401)

   A. References
      (1) 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
      (3) 25-50-03/401, Bulkhead Lining Panels
   B. Access
      (1) Location Zones
          125/126 Area Aft of Forward Cargo Compartment approximately 255 inches aft of Forward Cargo Compartment Door Centerline and 40 inches left of Airplane Centerline.

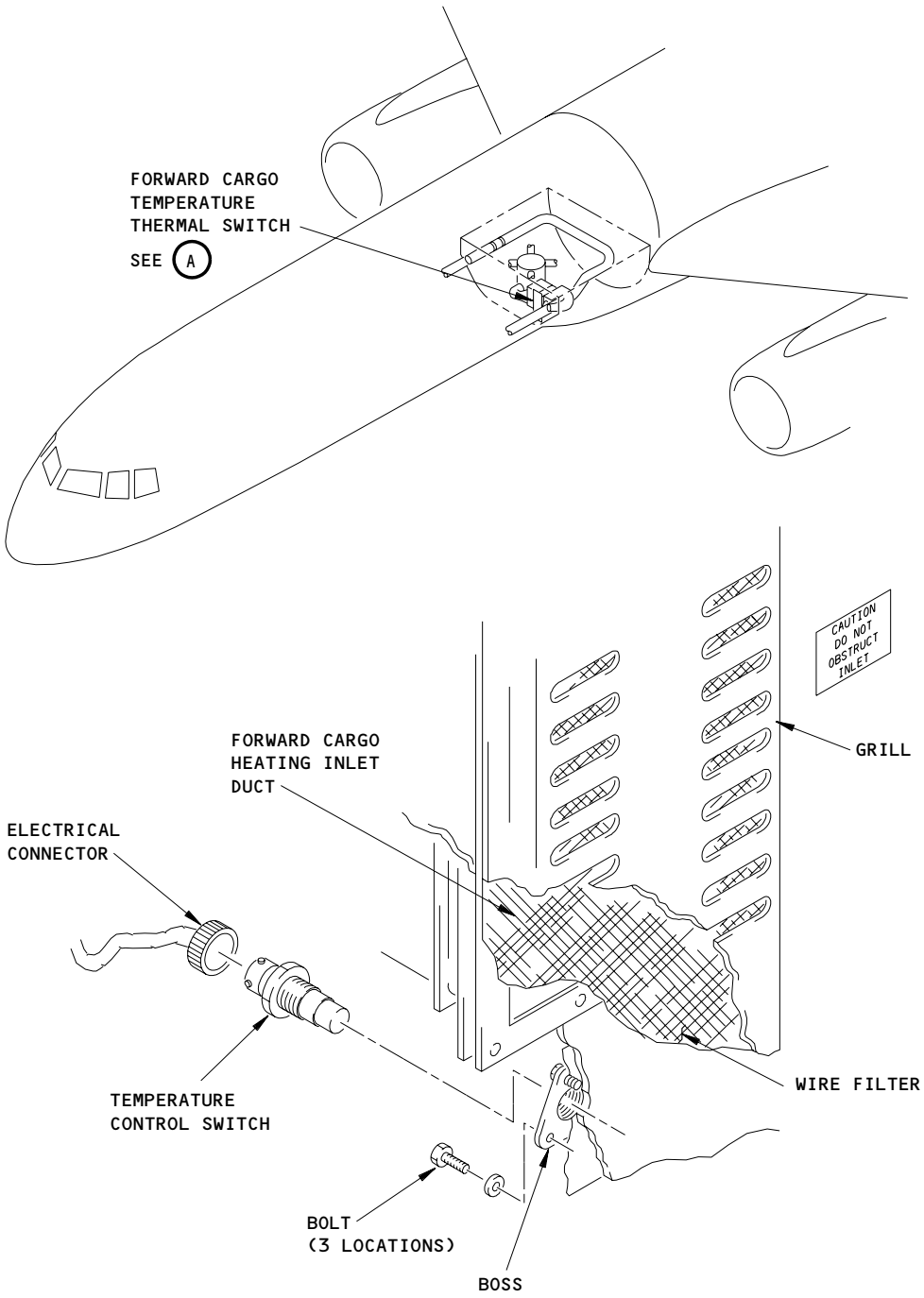
   C. Procedure

      S 864-002
      (1) Open this circuit breaker on the miscellaneous electrical equipment panel (P70) and attach a DO-NOT-CLOSE tag:
          (a) 70B8, FWD CARGO FAN

      S 864-004
      (2) Open this circuit breaker on the overhead circuit breaker panel (P11) and attach a DO-NOT-CLOSE tag:
          (a) 11N17, CARGO HEATER FAN FWD

      S 014-005
      (3) Open the cargo compartment door No. 1 (821) and find the temperature control switch (Ref 06-46-00).

          NOTE: The switch is behind a grill on the left aft endliner panel.



FORWARD CARGO TEMPERATURE
THERMAL SWITCH
A

Forward Cargo Compartment Temperature Control Switch Installation
Figure 401

S 014-006
(4) Remove the left recirculation filter access panel from the aft bulkhead of the forward cargo compartment.

NOTE: It is possible you will have to disconnect the forward cargo heating duct grille from the aft bulkhead lining.

S 014-026
(5) If necessary for access to the temperature control switch, remove the aft bulkhead lining (AMM 25-50-03/401).

S 034-007
(6) Disconnect the electrical connector from the temperature control switch.

S 024-008
(7) Remove the temperature control switch from the boss.

TASK 21-43-05-404-009

3. Install the Forward Cargo Temperature Control Switch (Fig. 401)

A. Equipment
(1) Heating Source - hand-held blow dryer, commercially available.
(2) Cooling Source - ice pack, commercially available.
(3) Thermometer - hand-held type, range 40-80°F (0-30°C) commercially available.

B. References
(1) 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) 24-22-00/201, Electric Power Control
(3) 25-50-03/401, Bulkhead Lining Panels

C. Access
(1) Location Zones
125/126 Area Aft of Forward Cargo Compartment

D. Procedure

S 424-010
(1) Install the temperature control switch into the boss. Tighten.

S 434-011
(2) Install the electrical connector to the temperature control switch.

S 414-021
(3) If removed, install the left bulkhead panel at the aft end of the forward cargo compartment (AMM 25-50-03/401) and connect the heating duct intake.

S 414-012
(4) Install the left recirculation filter access panel.

S 864-013
(5) Remove the DO-NOT-CLOSE tag and close this circuit breaker on P70 panel:
(a) 70B8, FWD CARGO FAN

S 864-015
(6) Remove the DO-NOT-CLOSE tag and close this circuit breaker on P11 panel:
(a) 11N17, CARGO HEATER FAN FWD

S 704-030
(7) Do a test of the forward cargo temperature control switch.
(a) Supply electrical power (AMM 24-22-00/201).

NOTE: The forward cargo temperature control switch measures cargo compartment temperature. When the cargo compartment is more than 50°F (10°C) the switch closes and sends a signal to the forward cargo heating flow fan. When the cargo compartment temperature becomes 70°F (21°C) the switch stops the power to the fan.

(b) If the ambient temperature in the cargo compartment is less than 50°F (10°C):
1) Make sure the cargo heating flow fan operates.
2) Use the heating source to increase the temperature at the temperature control.
3) Make sure the cargo heating fan stops.

(c) If the ambient temperature in the cargo compartment is more than 50°F (10°C):
1) Use the cooling source to decrease the temperature at the temperature control switch.
2) Make sure the cargo heating flow fan operates.

S 414-019
(8) Close the No. 1 Cargo Door (821) (AMM 06-46-00/201).

S 864-020
(9) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

FORWARD CARGO FAN CURRENT SENSOR - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the forward cargo fan current sensor. The second task is the installation of the forward cargo fan current sensor.
   B. The forward cargo fan current sensor is in the miscellaneous electrical equipment panel, P70.

TASK 21-43-07-004-001

2. Remove the Forward Cargo Fan Current Sensor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power - Control
      (3) 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center

      (2) Access Panel
          119BL E/E Access Door

   C. Procedure

      S 864-002

      WARNING: DO NOT OPEN THE ELECTRICAL EQUIPMENT PANEL DOORS WHEN THE POWER IS ON. FIRE OR INJURY CAN OCCUR.

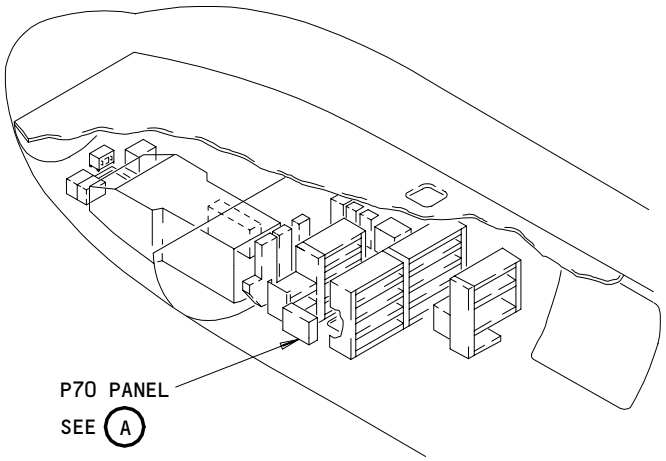
      WARNING: REFER TO AMM 27-61-00/201 AND DO THE SPOILER/SPEEDBRAKE DEACTIVATION PROCEDURE. ACCIDENTAL SPOILER MOVEMENT CAN CAUSE INJURY OR DAMAGE.

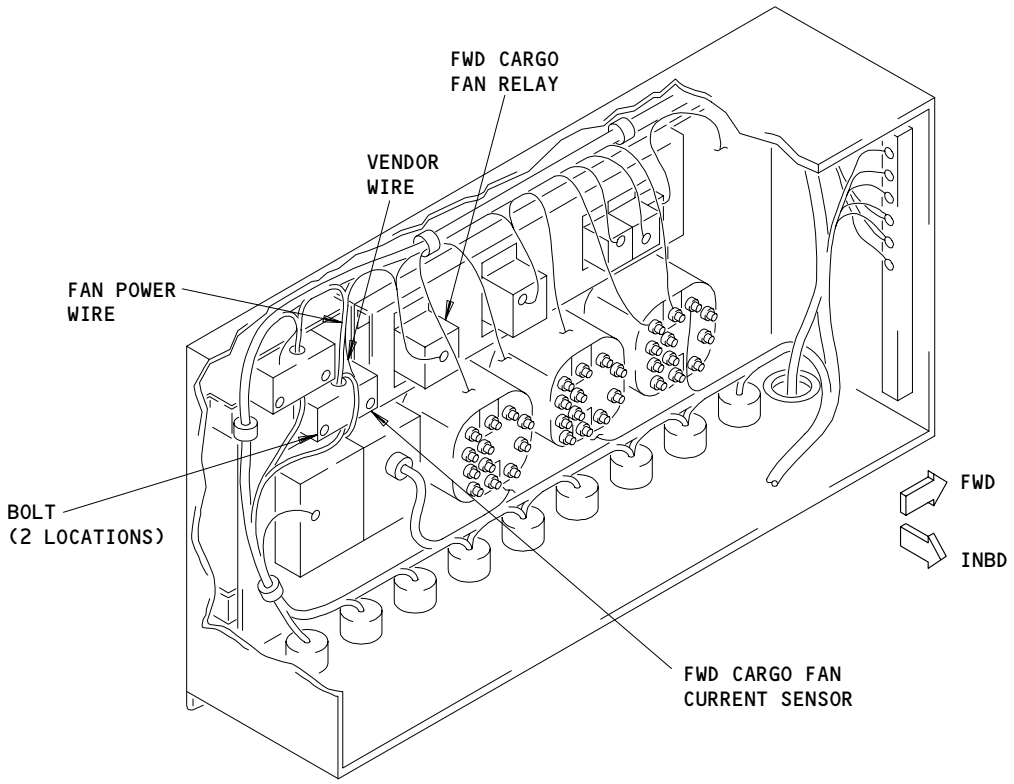
      (1) Do the spoiler/speedbrake deactivation procedure (Ref 27-61-00).

      S 864-019
      (2) Remove electrical power from the airplane (Ref 24-22-00).

      S 014-003
      (3) Open the E/E access door (119BL) and find the miscellaneous electrical equipment panel, (Ref 06-41-00).

      S 014-005
      (4) Open the doors of the miscellaneous electrical equipment panel.





MISC ELEC EQUIP PANEL, P70

A

Forward Cargo Fan Current Sensor Installation
Figure 401

98948

S 034-007
(5) To remove the fan power wire through the current sensor, do the applicable step:
(a) Remove the wire from terminal C1 of the FWD CARGO FAN RELAY and put a tag on the wire to identify it for installation. Remove the wrap from the wire bundle as necessary and pull through the hole in current sensor.
(b) Cut the wire on one side of the hole in the current sensor and put a tag on the wire to identify it for installation.

S 034-008
(6) Cut the vendor wire from the current sensor and put a tag on the wire to identify it for installation.

S 024-009
(7) Remove the bolts and the sensor.

TASK 21-43-07-404-010
3. Install the Forward Cargo Fan Current Sensor (Fig. 401)
A. Equipment
(1) Cooling source - ice pack, commercially available
(2) Heating source - hand-held blow dryer, Commercially available
(3) Thermometer - hand-held type for ranges 40-80°F, Commercially available
B. References
(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 24-22-00/201, Electrical Power - Control
(3) 27-61-00/201, Spoiler/Speedbrake Control System
C. Access
(1) Location Zones
119/120 Main Equipment Center

(2) Access Panel
119BL E/E Access Door

D. Procedure

S 424-011
(1) Put the sensor in position and install the bolts (2 locations).

S 434-012
(2) To install the fan power wire through the current sensor, do the applicable step:
(a) Put the wire through the hole in the current sensor two times. Attach the wire to terminal C1 of the FWD CARGO FAN RELAY. Put a wrap on the wire bundle as necessary.

(b) Put the wire through the current sensor two times and put the wire ends together with a splice.

S 434-013

(3) Install the vendor wire to the current sensor with a splice.

S 414-014

(4) Close the doors of the miscellaneous electrical equipment panel.

S 414-016

(5) Close the E/E access door 119BL (Ref 06-41-00).

S 704-017

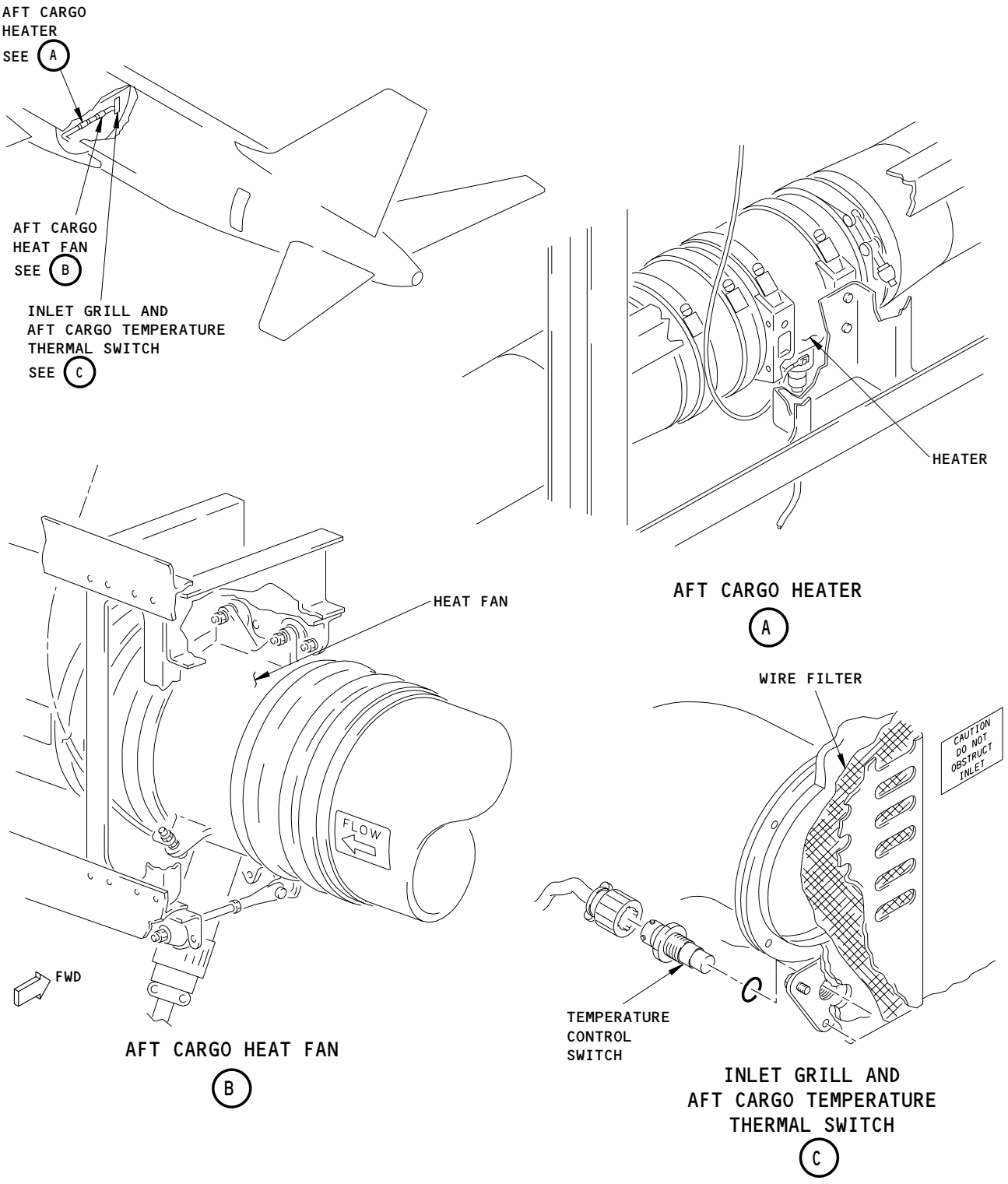
(6) Do a test of the forward cargo fan current sensor.
   (a) Supply electrical power (AMM 24-22-00/201).
   (b) Put the APU and FIRE CONTROL forward compartment arming switch on the pilot's control stand, P8, in the unarmed position.
   (c) If the ambient temperature in the cargo compartment is more than 50 degrees F (10 degrees C), decrease the temperature at the temperature control switch with the cooling source.
   (d) Listen for fan noise to make sure the fan operates.
   (e) Use the heating source to increase the temperature at the temperature control switch.
   (f) Make sure the fan stops.

S 864-018

(7) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

AFT CARGO COMPARTMENT HEATING SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. Aft cargo heating is provided by recirculating the aft cargo compartment air by a fan and passing the air through an electrical heater before returning to the aft cargo distribution system. Operation of the fan and heater is automatic with both selected ON/OFF in response to a signal from a remotely located temperature switch. Heater element and duct overheat protection are provided and are integral with the heater.
2. Component Details
   A. Aft Cargo Heater
      (1) The heater is an electrical resistance type, which heats air forced past heat exchange surfaces. The heater operates on 200 Vac nominal supply voltage.
      (2) The heater is installed in line with a 6 inch O/D duct in a pressurized area. The unit is capable of heating aft cargo compartment air under any ground or flight condition. The outside surface of the heater will not exceed 185°F at normal operating conditions.
      (3) An overtemperature switch senses the temperature of the heat exchanger surface. The switch opens at a temperature that limits the heat exchanger surface temperature to 400°F maximum steady state and 450°F transient overshoots. The switch will shut off the fan when these temperatures are reached.
      (4) An overtemperature switch, downstream of the heater, senses duct air temperature. The switch opens when the air temperature is equal to or in excess of 185°F.
   B. Aft Cargo Heating Flow Fan
      (1) Physical Description
         (a) The axial flow fan is a single stage vaneaxial fan that integrates the motor into the fan. The fan's simple design provides ease of construction and optimizes unit life and reliability.
         (b) The axial flow fan consists of a single cast aluminum alloy housing containing an impeller and an end bell (both of aluminum alloy, two sealed ball bearings, and the stator assembly and rotor.
         (c) The fan housing contains an inner housing which encases the stator assembly and rotor. Vanes are integrally cast between the outer and inner housings. The vanes optimize low noise levels, provide structural support, and transfer heat from the motor to the airflow and outer housing for motor cooling.



Aft Cargo Heating Components
Figure 1

(d) The drive motor is a three-phase, squirrel cage type induction machine. Electromagnetic circuitry is used to reduce noise generated by electrical field saturation. The stator assembly consists of epoxy and mechanically bonded silicon steel laminations on which a three-phase, four-pole winding is distributed into 36 slots. The special bonding of the laminations prevents stator teeth vibration at line frequency or any harmonic. All 12 coils in each phase are continuously wound with no intercoil connections. Magnet wires terminate in silver-brazed connections to the leadwires.

(e) Three miniature indirect-acting thermostats, which serve as thermal protective devices, are connected in series, one located over a coil in each phase.

(f) The rotor consists of a silicon steel lamination core with copper rotor bars and end rings cast in place.

(2) Operation

(a) The axial flow fan is designed to operate at a nominal shaft speed of 11,500 revolutions per minute when supplied with aircraft electric power through the fan-mounted electrical connector. Current from the electrical connector is conducted through the leadwires to the stator assembly. The stator assembly induces the rotor to rotate, turning the impeller. The impeller causes air to flow through the axial flow fan. If the temperature of a winding reaches 400°F, an internal thermal switch deactivates the fan relay, shutting the fan off. When the winding temperature decreases to 340°F, the thermal switch resets, restoring the fan.

C. Aft Cargo Temperature Control Switch

(1) The temperature control consists of a temperature sensor/switch which senses the cargo compartment temperatures. Whenever the cargo compartment is below 50°F the switch closes and a signal is sent to the fan and heater. When the cargo compartment air temperature reaches 70°F the switch interrupts power to the heater and fan.

D. Aft Cargo Fan Current Sensor or Current Sense Relay

(1) AIRPLANES WITH THE AFT CARGO FAN CURRENT SENSOR;
A fan current sensor is located on the right miscellaneous electrical panel, P37. The current sensor detects if the fan has electrical power. If the fan has a failure, the current sensor will provide a ground to the EICAS computers and the AFT CARGO FAN message will show.

(2) AIRPLANES WITH THE AFT CARGO FAN CURRENT SENSE RELAY;
A fan current sense relay is located on the right miscellaneous electrical panel, P37. The relay detects if the fan has electrical power. If the fan has a failure, the relay will provide a ground to the EICAS computers and the AFT CARGO FAN message will show.

E. Aft Cargo Heating Inlet Grill

(1) The grill in the front of the aft cargo compartment covers the inlet of the aft cargo heating system. It includes a wire filter to keep dirt and debris out of the aft cargo heater and the flow fan.

3. Operation (Fig. 2)

A. Aft Cargo Heating

(1) The aft cargo heating system is a self-contained system. The system uses a thermal switch for compartment temperature control and internal temperature sensors to prevent heater overheat.

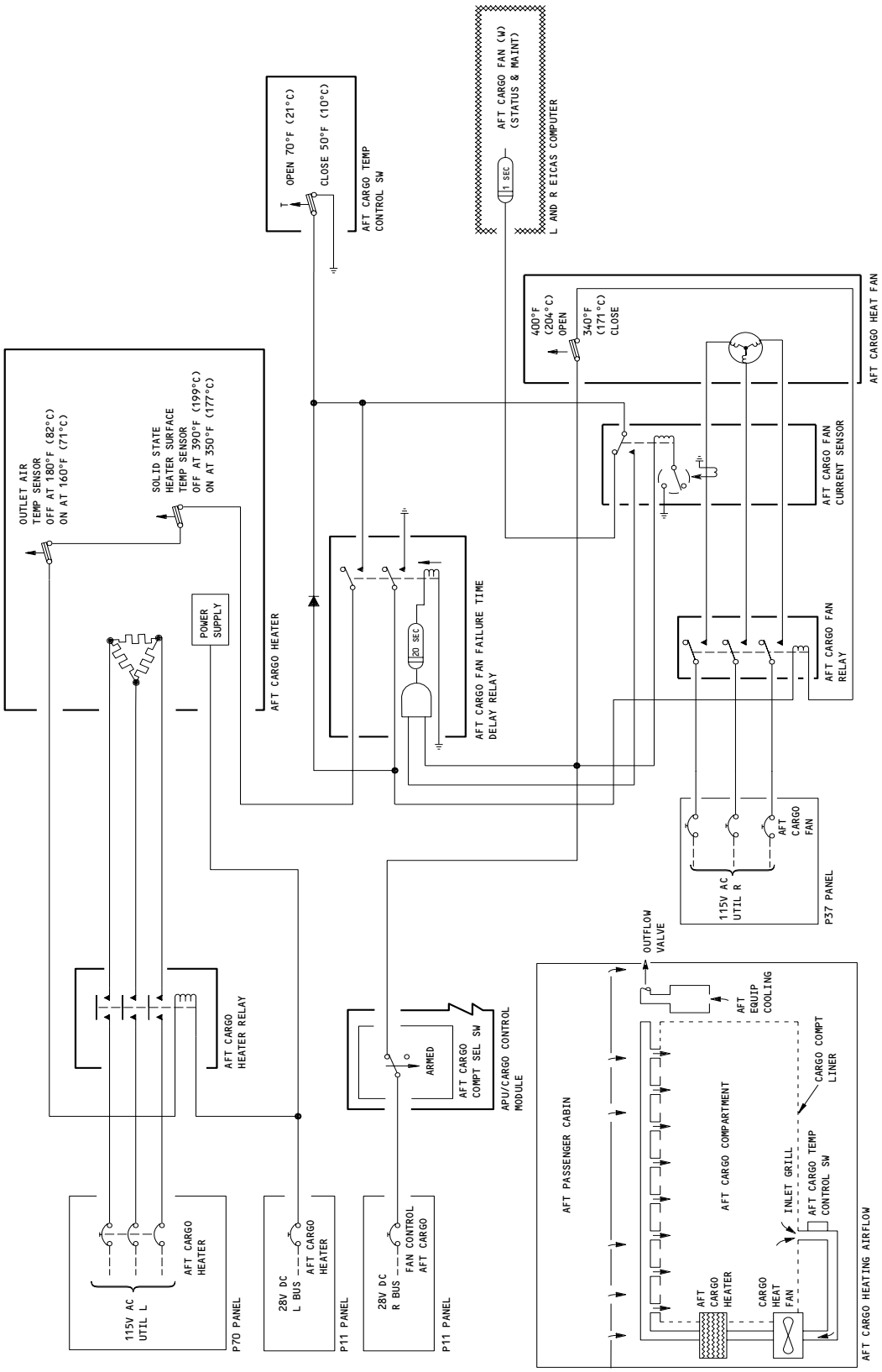
(2) If the cargo compartment temperature switch falls below 50°F (10°C) the temperature control switch closes, energizing the aft cargo fan relay and the aft cargo heater relay. The aft cargo heater heats the air. The aft cargo heat fan circulates air thru the heater and into the aft cargo compartment.

(3) If the Cargo Compartment Switch reaches 70°F (21°C) the temperature control switch opens. The aft cargo heater shuts off immediately. The aft cargo heating fan stays on for 20 seconds and then shuts off.

(4) If heater surface temperature exceeds 390°F (199°C) or if heater outlet temperature exceeds 180°F (82.2°C) the heater is de-energized. The heater is re-energized when surface temperature drops below 350°F (177°C) and heater outlet temperature drops below 160°F (71.1°C).

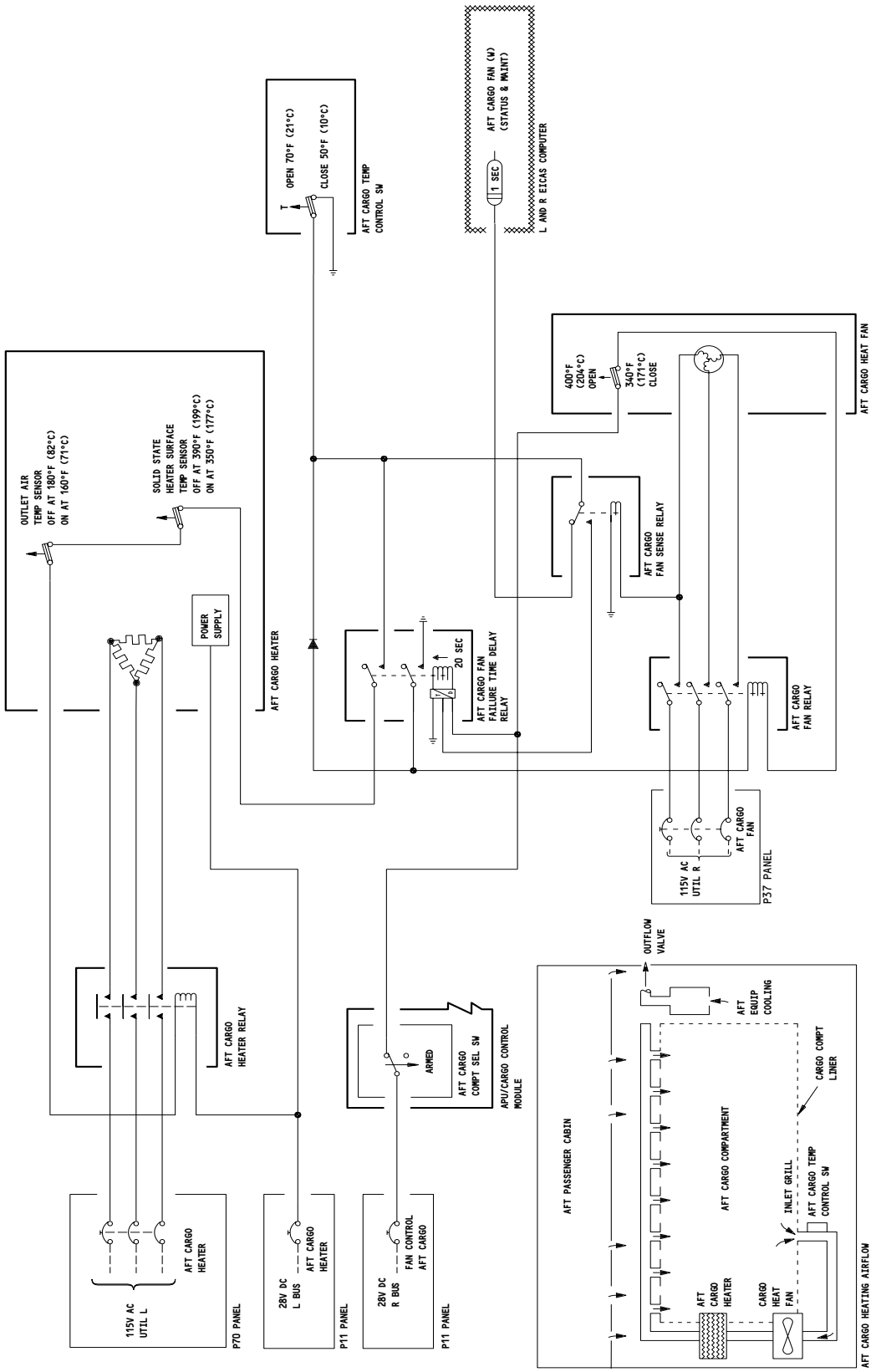
(5) If the heating flow fan motor temperature reaches 400°F (204°C), the fan relay is deactivated and the fan and the heater shut off.

(6) An EICAS status and maintenance message AFT CARGO FAN will appear when the temperature control switch is closed and the heating flow fan is not operating.



Aft Cargo Heating System Schematic
Figure 2 (Sheet 1)

620728



Aft Cargo Heating System Schematic
Figure 2 (Sheet 2)

620758

AFT CARGO COMPARTMENT HEATING SYSTEM - ADJUSTMENT/TEST

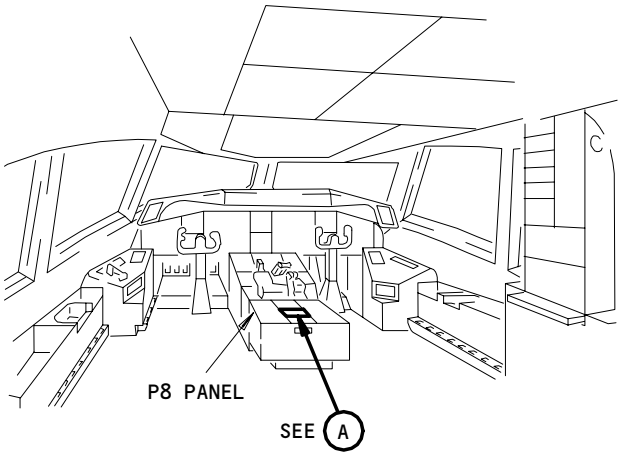
1. General
   A. This procedure contains two tasks. The first task is an operational test of the aft cargo compartment heating system. The second task is a system test of the aft cargo compartment heating system.
   B. The aft cargo compartment heating system includes a fan, an electric heater, ducting and outlets, controls (temperature switch, fire control module, relays, and current sensor), and EICAS displays.

TASK 21-44-00-715-001

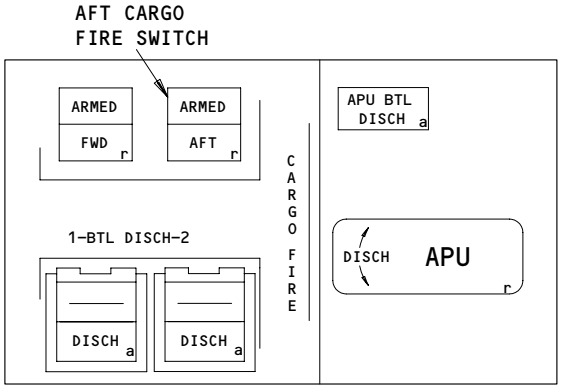
2. Operational Test - Aft Cargo Compartment Heating System
   A. General
      (1) When the cargo compartment temperature is less than 50°F (10°C) the temperature control switch closes. This sends a signal to the relays that control the fan and heater. When the compartment temperature is 70°F (21°C) the switch opens the circuit to the cargo compartment relays. After a 20-second time delay, the fan relay stops the heat supply to the cargo compartment.
   B. Equipment
      (1) Cooling source - ice pack - commercially available.
      (2) Thermometer, 0 to 100°F (0 to 49°C), commercially available.
   C. References
      (1) 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
      (2) 24-22-00/201, Electric Power-Control
   D. Access
      (1) Location Zone
          822 Left Cargo Compartment Door
   E. Test - Aft Cargo Compartment Heating System (Fig. 501)

      S 865-002
      (1) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
          (a) 11N1, INSTRUMENT AND PANEL AISLE STAND
          (b) 11N18, CARGO HEAT AFT
          (c) 11N22, CARGO HEAT FAN AFT
          (d) 11S15, AIR/GND SYS 1
          (e) 11S19, AIR/GND SYS 2
          (f) EICAS circuit breakers (5 locations)

      S 865-004
      (2) Make sure this circuit breaker on the miscellaneous electrical equipment panel, P70, is closed:
          (a) 70C8, AFT CARGO HTR

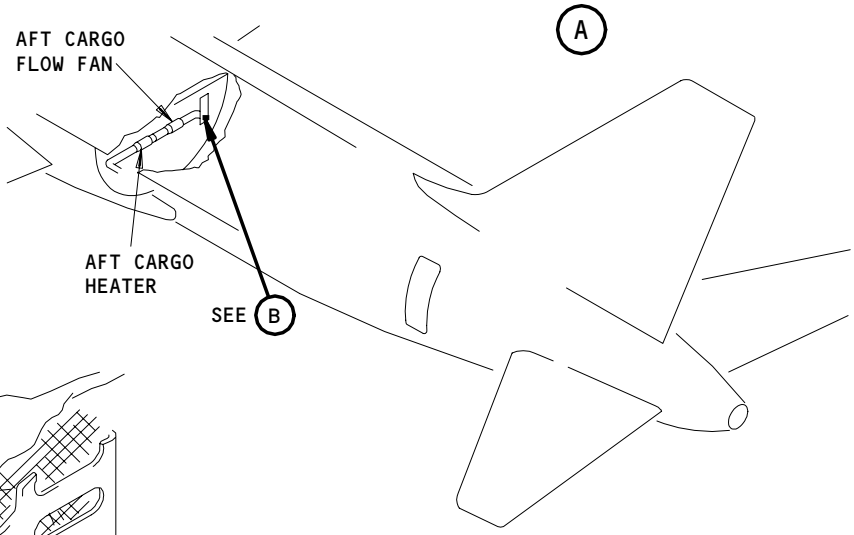


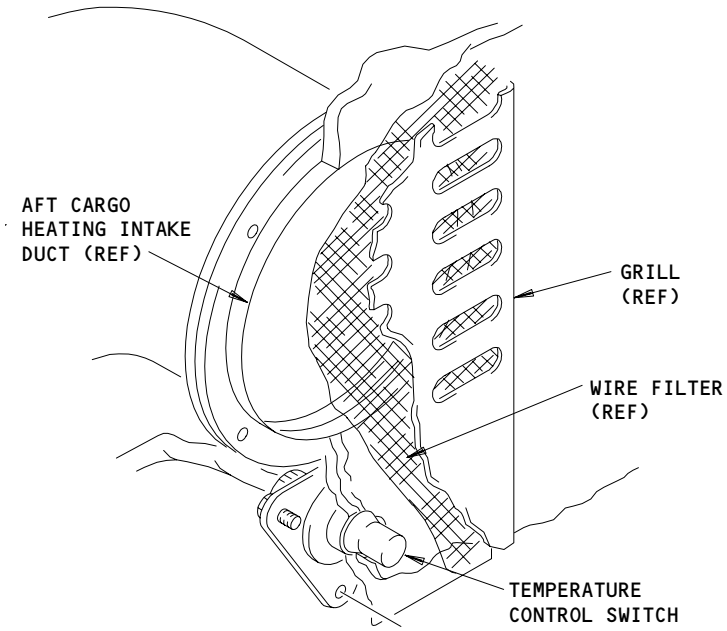
FLT COMPT



APU/CARGO FIRE CONTROL PANEL

A





AFT CARGO TEMPERATURE
CONTROL SWITCH

B

Aft Cargo Compartment Heating System Test Components
Figure 501

S 865-005
(3) Make sure this circuit breaker on the right miscellaneous electrical equipment panel, P37, is closed:
(a) 37C2, AFT CARGO FAN

S 865-006
(4) Supply electrical power (Ref 24-22-00).

S 015-007
(5) Open the left cargo compartment door 822 (Ref 06-46-00) and find the aft cargo heater, fan, and temperature control switch.

S 885-105
(6) If the aft cargo fan is not in operation, do these steps to make the fan operate:
(a) Decrease the temperature of the temperature control switch with the cooling source until the aft cargo fan operates.
(b) Remove the cooling source.
(c) Make sure air goes into the inlet grille.

S 865-009
(7) Push the AFT CARGO FIRE switch-light on the aft pilot's control stand, P8, to the ARMED position (ARMED light on).

S 215-011
(8) Make sure the fan and heater do not operate.

S 865-014
(9) Push the AFT CARGO FIRE switch-light on the P8 stand to the usual position (ARMED light off).

S 215-106
(10) Make sure the fan starts.

S 215-108

WARNING: DO NOT PUT YOUR HAND CLOSE TO THE FAN. FEEL FOR AIR MOVEMENT AT THE NOZZLES. IF YOUR HAND TOUCHES THE FAN BLADES, IT WILL CAUSE INJURY.

(11) Make sure the air goes in the correct direction into the inlet grille.

S 215-018
(12) Make sure warm air comes out of each vent nozzle.

S 415-020
(13) Close the aft cargo compartment door, 822.

S 865-021
(14) Remove electric power, if it is not necessary.

S 715-113
(15) Do the task: Aft Cargo Heater Operational Check.

TASK 21-44-00-715-111

3. Aft Cargo Heater Operational Check (Fig. 501)
   A. Equipment
      (1) Cooling source - ice pack - commercially available.
      (2) Thermometer, 0 to 100°F (0 to 49°C), commercially available.
   B. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power-Control
   C. Access
      (1) Location Zone
          822 Left Cargo Compartment Door
   D. Procedure

S 865-022
(1) Supply electrical power (AMM 24-22-00/201).

S 015-023
(2) Open the No. 2 Cargo Door (AMM 06-46-00/201).

S 805-024
(3) Find the temperature control switch behind the aft cargo heating intake grill on the forward partition.

S 885-025
(4) Use the ice pack to decrease the temperature of the temperature control switch to 50°F (10°C) minimum.

S 215-026
(5) Make sure air goes into the heating intake.

S 215-109

WARNING: DO NOT PUT YOUR HAND CLOSE TO THE FAN. FEEL FOR AIR MOVEMENT AT THE NOZZLES. IF YOUR HAND TOUCHES THE FAN BLADES, IT WILL CAUSE INJURY.

(6) Make sure warm air comes out of the heating vent nozzles.

S 885-028
(7) Remove the ice pack.

S 415-029
(8) Close the No. 2 Cargo Door.

S 865-030
(9) Remove electrical power, if it is not necessary.

TASK 21-44-00-735-031

4. System Test - Aft Cargo Compartment Heating System

A. General
(1) When the cargo compartment temperature is less than 50°F (10°C), the temperature control switch closes. This sends a signal to the relays that control the fan and heater. The fan removes cold air from the cargo compartment and pushes it through a series of eleven nozzles. When the cargo compartment temperature is 70°F (21°C), the switch opens the circuit to the cargo compartment heater relay. After a 20-second time delay, the fan relay stops the heat supply to the compartment.

B. Equipment
(1) Thermometer - range 0 to 120°F (0 to 49°C) - commercially available.
(2) Heating Source - hand-held blow dryer - commercially available.
(3) Cooling source - ice pack - commercially available.

C. References
(1) 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) 24-22-00/201, Electric Power-Control

D. Access
(1) Location Zone
822 Left Cargo Compartment Door

E. Test - Aft Cargo Compartment Heating System (Fig. 501)

S 865-032
(1) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11N1, INSTRUMENT AND PANEL AISLE STAND
(b) 11N18, CARGO HEAT AFT
(c) 11S15, AIR/GND SYS 1
(d) 11S19, AIR/GND SYS 2
(e) 11N22, CARGO HEAT FAN AFT
(f) EICAS circuit breakers (5 locations)

S 865-033
(2) Make sure this circuit breaker on the right miscellaneous electrical equipment panel, P37, is closed:
(a) 37C2, AFT CARGO FAN

S 865-035
(3) Supply electrical power (Ref 24-22-00).

S 865-034
(4) Push the AFT CARGO FIRE switch-light on the aft pilot's control stand, P8, to the ARMED position (ARMED light on).

S 015-037
(5) Open the aft cargo compartment door 822 (Ref 06-46-00) and find the aft cargo heater, fan, and temperature control switch.

S 885-039
(6) Measure the temperature near the aft cargo temperature control switch.

S 885-040
(7) If the temperature is less than 70°F (21°C), increase the temperature of the temperature control switch to 70°F (+/- 1°F) or above .

S 215-041

CAUTION: OPEN THE AFT CARGO HTR (70C8) C/B IN THE P70 PANEL IMMEDIATELY IF THE HEATER IS ENERGIZED AND THE FAN DOES NOT OPERATE. THE TEMPERATURE OF THE HEATER SHELL CAN BECOME HOT BEFORE THE SURFACE TEMPERATURE PROTECTION STARTS. THE DUCT AIR TEMPERATURE CAN BECOME 180°F (82.2°C) AND CAUSE DAMAGE.

(8) Make sure the fan and heater do not operate.

S 885-042
(9) Decrease the temperature of the temperature control switch to maintain a temperature of 50°F (+/- 1°F) or lower.

S 865-043
(10) Push the AFT CARGO FIRE switch-light on the P8 stand to the usual position (ARMED light off).

S 215-110

WARNING: DO NOT PUT YOUR HAND CLOSE TO THE FAN. FEEL FOR AIR MOVEMENT AT THE NOZZLES. IF YOUR HAND TOUCHES THE FAN BLADES, IT WILL CAUSE INJURY.

(11) Make sure the fan starts and moves in the correct direction.

NOTE: Air will go into the inlet grille.

S 215-046
(12) Make sure all the joints and ducting to and from the fan are tight.
(a) To make sure you cannot feel air, hold your hand 2 inches from joints and ducting.

S 215-047
(13) Make sure warm air comes out of the eleven vent nozzles.

S 865-048
(14) Put the EICAS COMPUTER switch on the pilot's display to the LEFT position.

S 865-049
(15) Open this circuit breaker on the P37 panel:
(a) 37C2, AFT CARGO FAN

S 215-050
(16) Make sure the fan stops and the heater does not have electrical power.

S 215-052
(17) Push the STATUS key on the EICAS pilot's display.
(a) Make sure the EICAS status message, AFT CARGO FAN, shows on the bottom EICAS display.

S 215-053
(18) Push the ECS/MSG key on the EICAS maintenance panel.
(a) Make sure the EICAS maintenance message, AFT CARGO FAN, shows on the bottom EICAS display.

S 865-054
(19) Put the EICAS COMPUTER switch on the EICAS pilot's display to RIGHT.

S 865-055
(20) Push the AUTO READ button on the EICAS maintenance panel.

S 865-103
(21) Push the ERASE button on the EICAS maintenance panel.
(a) Make sure the EICAS maintenance message, AFT CARGO FAN, stays on the bottom EICAS display .

S 865-056
(22) Close this circuit breaker on the P37 panel:
(a) 37C2, AFT CARGO FAN

S 215-057
(23) Make sure the fan starts and the heater has electrical power.

S 865-059
(24) Push the AUTO READ button on the EICAS maintenance panel.

S 865-104
(25) Push the ERASE button on the EICAS maintenance panel.
(a) Make sure the EICAS maintenance message, AFT CARGO FAN, goes off.

S 215-060
(26) Push the AFT CARGO FIRE switch-light on the P8 stand to the ARMED position (ARMED light on).
(a) Make sure the fan stops and the heater does not have electrical power.

S 215-062
(27) Push the AFT CARGO FIRE switch-light on the P8 stand to the usual position (ARMED light off).
(a) Make sure the fan starts and the heater has electrical power.

S 805-064
(28) Measure the temperature of the air that comes from a nozzle.

S 885-065
(29) Increase the temperature of the temperature control switch to 70°F (21°C) maximum.

S 215-066
(30) Make sure the temperature that comes from the nozzle decreases and the fan stops after approximately 20 seconds.

S 885-068
(31) Remove the heat source.

S 415-069
(32) Close the aft cargo compartment door, 822.

S 865-070
(33) Remove electrical power, if it is not necessary.

S 715-115
(34) Do the task: Aft Cargo Temperature Control Switch Check.

TASK 21-44-00-715-112

5. Aft Cargo Temperature Control Switch Check (Fig 501)
   A. General
      (1) When the cargo compartment temperature is less than 50°F (10°C), the temperature control switch closes. This sends a signal to the relays that control the fan and heater. The fan removes cold air from the cargo compartment and pushes it through a series of eleven nozzles. When the cargo compartment temperature is 70°F (21°C), the switch opens the circuit to the cargo compartment heater relay. After a 20-second time delay, the fan relay stops the heat supply to the compartment.
      (2) Thermometer - range 0 to 120°F (0 to 49°C) - commercially available.
      (3) Heating Source - hand-held blow dryer - commercially available.
      (4) Cooling source - ice pack - commercially available.
   B. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power-Control
   C. Access
      (1) Location Zone
          822 Left Cargo Compartment Door
   D. Procedure

S 865-071
(1) Supply electrical power.

S 015-072
(2) Open the No. 2 Cargo Door.

S 805-073
(3) Find the Temperature Control Switch behind the aft cargo heating intake grill on the forward partition.

S 885-074
(4) Use the ice pack to decrease the temperature of the switch to 50°F (10°C) minimum.

S 805-075
(5) Listen to make sure the aft cargo flow fan operates.

S 885-076
(6) Use the heat source to increase the temperature of the switch to 70°F (21°C) maximum.

S 805-077
(7) Listen to make sure the flow fan stops after approximately 20 seconds.

S 885-078
(8) Remove the heat source.

S 415-079
(9) Close the No. 2 Cargo Door

S 865-080
(10) Remove electrical power, if it is not necessary.

AFT CARGO HEATER - MAINTENANCE PRACTICES

1. General
   A. This procedure contains four tasks. The first task is the removal of the aft cargo heater. The second task is the installation of the aft cargo heater. The third task is an inspection of the aft cargo heater. The fourth task is to clean the aft cargo heater.
   B. The aft cargo heater is in the aft cargo compartment immediately aft of the forward partition. The aft cargo heater increases the temperature of the airflow in the aft cargo compartment.

TASK 21-44-05-002-001

2. Remove the Aft Cargo Heater
   A. References
      (1) AMM 06-46-00/201, Entry, Service, and Cargo Doors, Access Doors and Panels
   B. Access
      (1) Location Zones
          153/154 Aft Cargo Compartment

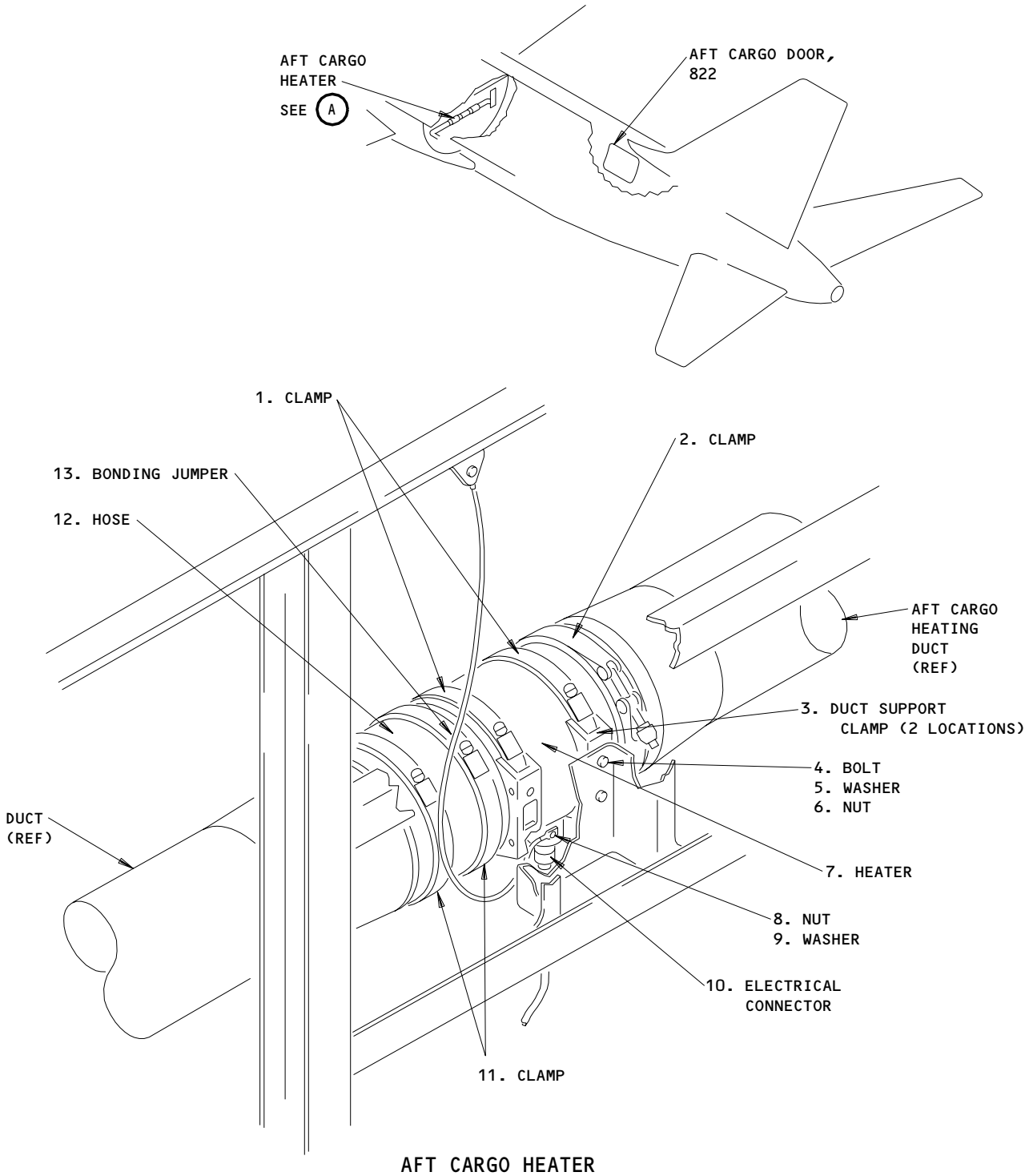
   C. Procedure (Fig. 201)

      S 862-002
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11N18, CARGO HEAT AFT
          (b) 11N22, CARGO HEAT FAN AFT

      S 862-003
      (2) Open this circuit breaker on the miscellaneous electrical equipment panel, P70, and attach a DO-NOT-CLOSE tag:
          (a) 70C8, AFT CARGO HTR

      S 012-004
      (3) Open the No. 2 Cargo Door (822) (AMM 06-46-00/201).

      S 012-005
      (4) Remove the left bulkhead lining to get access to the cargo heater (AMM 25-50-03/401).



AFT CARGO HEATER

A

Aft Cargo Heater - Installation
Figure 201

S 032-006
(5) Remove the electrical connector (10) from the heater (7).

S 032-007
(6) Disconnect the bonding jumper from the heater (7).

S 032-008
(7) Remove the clamps (2 and 11) in three locations.

S 032-009
(8) Move the hose (12) away from the heater (7) on the left side of heater.

S 032-010
(9) Disconnect the duct support clamps (3) from the heater (7).

S 022-011
(10) Remove the heater (7).

TASK 21-44-05-402-012

3. Install the Aft Cargo Heater (Fig. 201)

A. Equipment

(1) Cooling source - ice pack, commercially available

B. Parts

MM		NOMENCLATURE	IPC		
FIG	ITEM		SUBJECT	FIG	ITEM
201	1	Clamp	21-44-05	01	105
	2	Clamp			100
	3	Duct Support Clamp			148
	7	Heater			145
	8	Nut			45
	9	Washer			35
	11	Clamp			110
	12	Hose			115

C. References
(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(2) AMM 24-22-00/201, Electric Power Control
(3) AMM 25-50-03/401, Bulkhead Lining

D. Access
(1) Location Zones
153/154 Aft Cargo Compartment

E. Procedure

S 422-013
(1) Align the aft cargo heater (7) with the aft cargo heating duct.

S 432-014
(2) Connect the duct support clamps (3) in two locations. Do not tighten.

S 432-015
(3) Install the clamp (2) between the duct and the heater on the right side.

S 432-016
(4) Install the hose (12) at the left intersection of the heater (7) and duct and install clamps (11) in two locations.
(a) Tighten all the clamps (2, 3, 11).

S 432-017
(5) Connect the bonding jumper to the cargo heater (7).

S 432-018
(6) Install the electrical connector (10).

S 412-019
(7) Install the bulkhead lining (AMM 25-50-03/401).

S 862-020
(8) Remove the DO-NOT-CLOSE tag and close these circuit breakers on the overhead circuit breaker panel, P11:
(a) 11N18, CARGO HEAT AFT
(b) 11N22, CARGO HEAT FAN AFT

S 862-021
(9) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P70 panel:
(a) 70C8, AFT CARGO HTR

S 862-022
(10) Supply electrical power (AMM 24-22-00/201).

NOTE: The fan operates automatically. A signal from the forward thermal temperature sensor switch controls the fan.

S 712-023
(11) Make sure the cargo heating flow fan operates.
(a) If the fan does not operate, apply the cooling source to the cargo compartment thermal temperature switch until the fan starts.

S 212-024
(12) While the fan operates, make sure the air that comes from the heater outlets is warm.

S 412-025
(13) Close the No. 2 cargo door (822) (AMM 06-46-00/201).

S 862-026
(14) Remove electrical power, if it is not necessary.

TASK 21-44-05-212-027
4. Inspect the Aft Cargo Heater
A. Procedure

S 022-028
(1) Remove the aft cargo heater.

S 212-029
(2) Visually examine the aft cargo heater for dust, dirt, debris, and grease.

S 212-030
(3) Visually examine the exchanger fins for dirt and debris.

S 422-031
(4) Install the aft cargo heater.

TASK 21-44-05-112-032

5. Clean the Aft Cargo Heater

A. Consumable Materials

(1) B00600 Cleaning Solvent - Isopropyl Alcohol, commercially available

B. Equipment

(1) Vacuum - commercially available

C. Procedure

S 022-048

WARNING: BE VERY CAREFUL WHEN YOU REMOVE THE HEATER. IF THE HEATER HOUSING IS HOT, IT CAN BURN YOU.

(1) Remove the aft cargo heater.

S 162-034

(2) Remove dust, lint, and debris with compressed air.

S 112-035

CAUTION: DO NOT PUT THE HEATER INTO THE CLEANING SOLVENT. DO NOT USE WATER-BASED SOLVENTS TO CLEAN THE HEATER. DAMAGE TO THE ELECTRICAL HEATING ELEMENT CAN OCCUR.

(3) To remove film, apply solvent with a spray container.

S 802-036

(4) Let the air dry the aft cargo heater.

S 422-037

(5) Install the aft cargo heater.

S 142-039

(6) Clean the aft cargo heating inlet grill as follows:

(a) Remove the inlet grill.

(b) Vacuum the front and back side of the grill to remove all of the dirt and debris.

(c) Install the inlet grill.

AFT CARGO HEATING FLOW FAN - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the aft cargo heating flow fan. The second task is the installation of the aft cargo heating flow fan.
   B. The aft cargo heating flow fan is immediately aft of the aft cargo compartment forward partition. The fan pushes air through the cargo heating ducts.

TASK 21-44-06-004-001

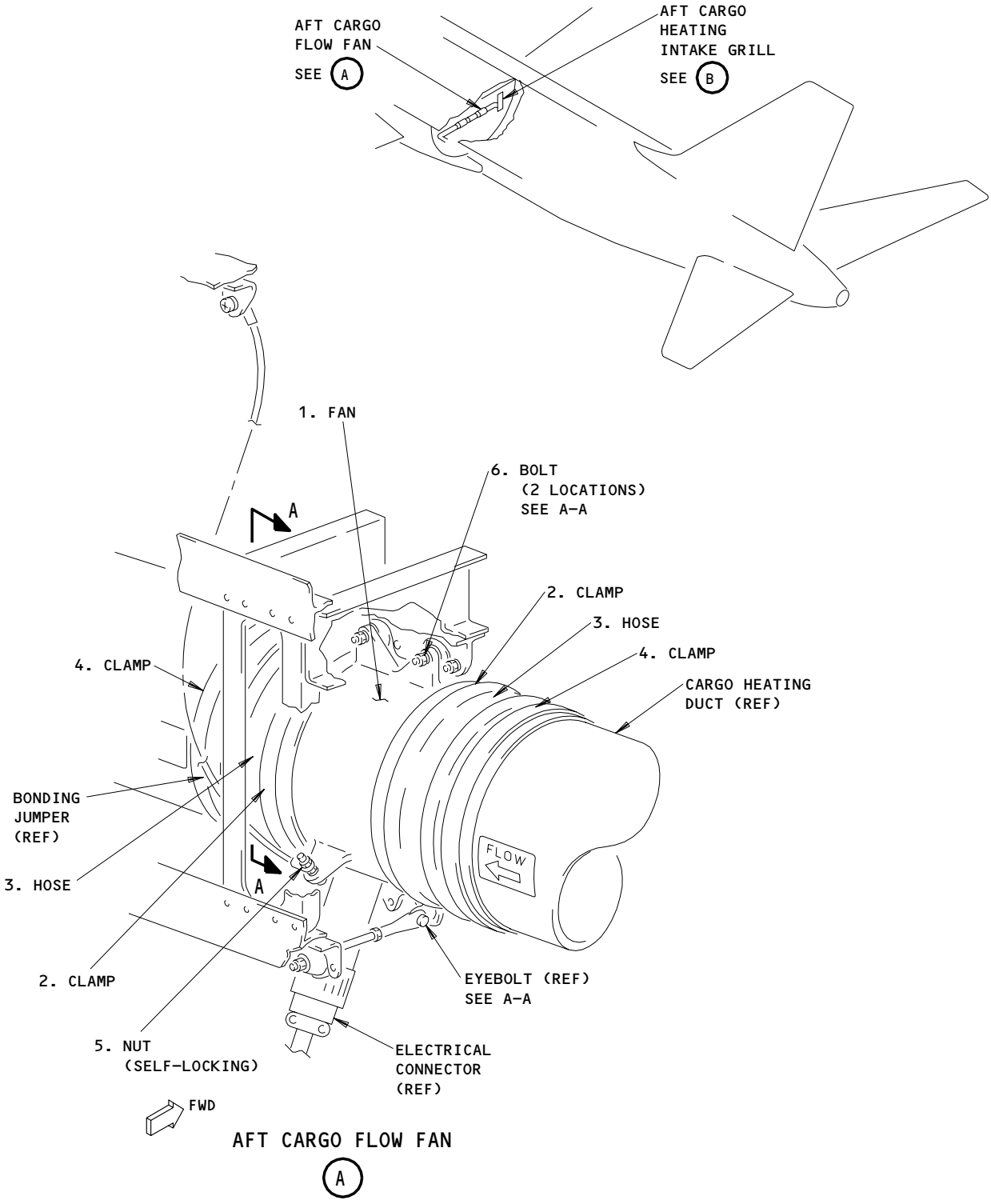
2. Remove the Aft Cargo Heating Flow Fan (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry, Service, and Cargo Doors, Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power Control
      (3) AMM 25-50-03/401, Bulkhead Lining Panels
   B. Access
      (1) Location Zones
          153/154 Aft Cargo Compartment

   C. Procedure

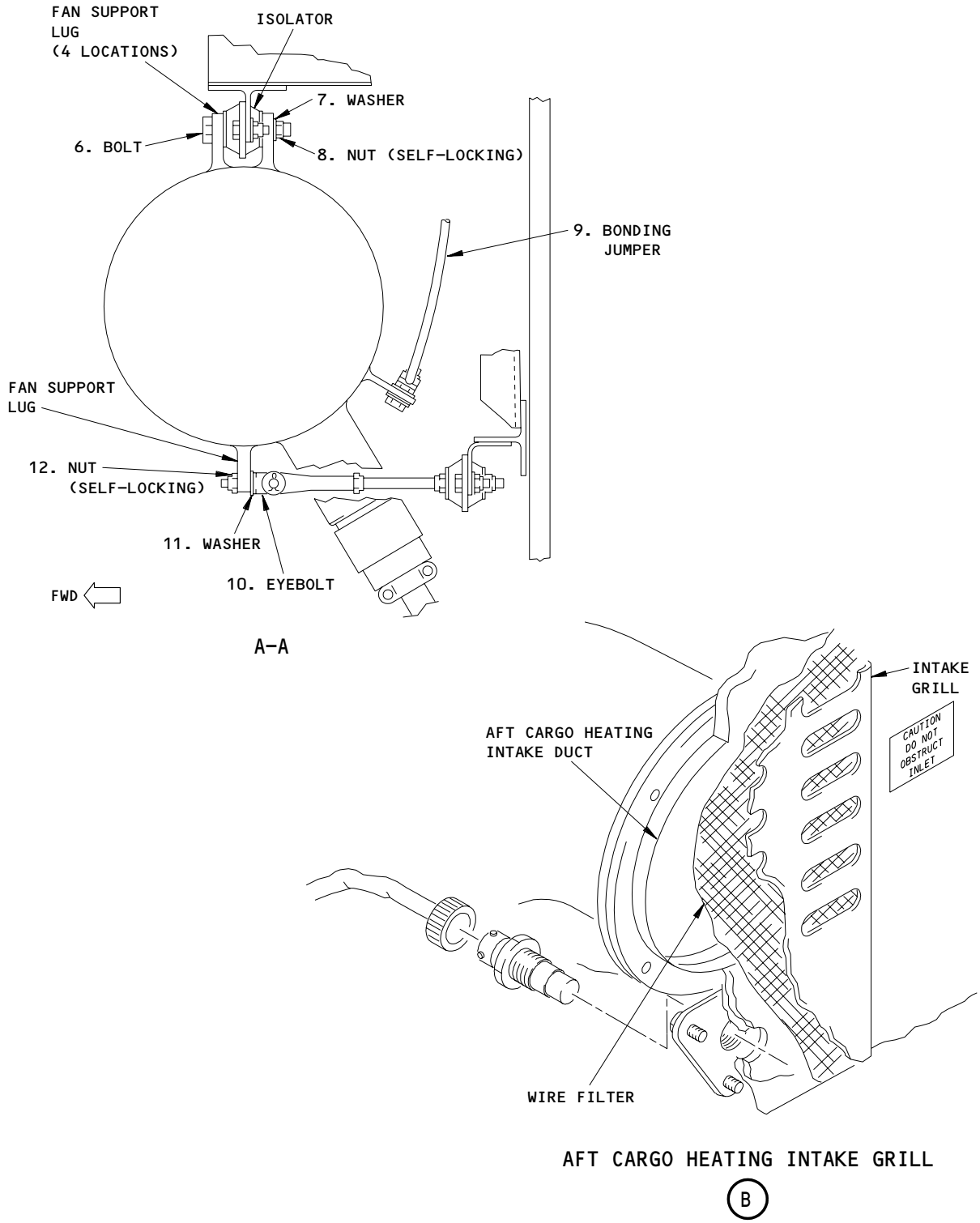
      S 864-002
      (1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11N22, CARGO HEAT FAN AFT

      S 864-003
      (2) Open this circuit breaker on the right miscellaneous electrical equipment panel, P37, and attach a DO-NOT-CLOSE tag:
          (a) 37C2, AFT CARGO FAN

      S 014-004
      (3) Open the cargo door No. 2 (822) and find the aft cargo heating flow fan (AMM 06-46-00/201).



Aft Cargo Heating Flow Fan - Installation
Figure 401 (Sheet 1)



Aft Cargo Heating Flow Fan Installation
Figure 401 (Sheet 2)

S 014-005
(4) Remove the center bulkhead lining to get access to the fan (AMM 25-50-03/401).

S 034-006
(5) Remove the electrical connector from the heat fan (1).

S 034-007
(6) Remove the nut (5) and bonding jumper (9) from the fan (1).

S 034-008
(7) Remove the clamps (2 and 4) in four locations.

S 034-009
(8) Move the hose (3) in two locations away from the fan (1).

S 034-010
(9) Remove the bolts (6) from the isolators at the top fan support lugs.

S 034-011
(10) Remove the nut (12) that attaches the lower fan support lug to the eyebolt (10).
(a) Remove the eyebolt washer (11) and keep it.

S 024-012
(11) Remove the fan (1).

TASK 21-44-06-404-013

3. Install the Aft Cargo Heating Flow Fan (Fig. 401)
A. Equipment
(1) Cooling source - ice pack, commercially available
(2) Thermometer - hand held type, commercially available, range 40-80°F

(3) Vacuum - commercially available

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Fan	21-44-05	01	135
401	1	Fan	21-44-05	02	100
401	1	Fan	21-44-05	03	155
401	1	Fan	21-44-05	04	225
401	1	Fan	21-44-05	05	170

C. References

(1) AMM 06-46-00/201, Entry, Service, and Cargo Doors, Access Doors and Panels

(2) AMM 24-22-00/201, Electric Power Control

(3) AMM 25-50-03/401, Bulkhead Lining Panels

D. Access

(1) Location Zones

153/154 Aft Cargo Compartment

E. Procedure

S 424-014

(1) Align the fan (1) with the cargo heating duct.

S 434-015

(2) Install the bolts (6), washers (7), and nuts (8) in the top fan support lugs.

S 434-016

(3) Install the nut (12) and washer (11) on the eyebolt at the lower fan support lug.

S 434-017
(4) Put the hoses (3) in two locations on the fan-duct connection.

S 434-018
(5) Install the clamps (2 and 4) in four locations. Tighten.

S 434-019
(6) Install the nut (5) that connects the bonding jumper (9) to the fan (1).

S 434-020
(7) Connect the electrical connector to the fan.

S 414-021
(8) Install the bulkhead lining (AMM 25-50-03/401).

S 864-022
(9) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
(a) 11N22, CARGO HEAT FAN AFT

S 864-023
(10) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the right miscellaneous electrical equipment panel, P37:
(a) 37C2, AFT CARGO FAN

S 144-025
(11) Clean the aft cargo heating intake grill as follows:
(a) Remove the intake grill.
(b) Vacuum the front and back side of the grill to remove all of the dirt and debris.
(c) Install the intake grill.

S 704-026
(12) Do a test of the aft cargo heating flow fan.
(a) Supply electrical power (AMM 24-22-00/201).

NOTE: The aft cargo heating flow fan operates automatically. A signal from a temperature switch puts the fan on or off.

(b) Listen to make sure the fan operates.
1) If the ambient temperature in the cargo compartment is more than 50°F, apply the cooling source to the temperature thermal switch for the cargo compartment. Decrease the switch temperature until the fan operates.

S 414-027
(13) Close the No. 2 Cargo Door (822) (AMM 06-46-00/201).

S 864-028
(14) Remove electrical power, if it is not necessary.

AFT CARGO TEMPERATURE CONTROL SWITCH - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the aft cargo temperature control switch. The second task is the installation of the aft cargo temperature control switch.
   B. The aft cargo temperature control switch is on the forward wall of the aft cargo compartment on the panel behind the heating duct inlet grill. When the cargo compartment temperature is less than 50°F the control switch closes and sends a signal to the aft cargo heating fan. When the cargo compartment temperature is 70°F the control switch stops power to the aft cargo heating fan.

TASK 21-44-07-004-001

2. Remove the Aft Cargo Temperature Control Switch (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
   B. Access
      (1) Location Zones
          153/154 Aft Cargo Compartment

   C. Procedure

      S 864-002
      (1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11N22, CARGO HEAT FAN AFT

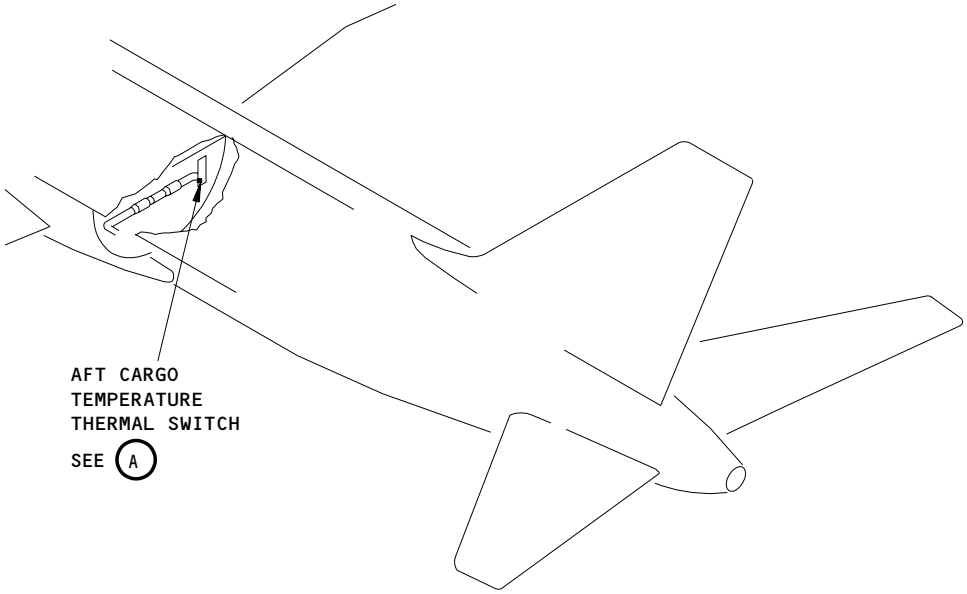
      S 864-003
      (2) Open this circuit breaker on the right miscellaneous electrical equipment panel, P37, and attach a DO-NOT-CLOSE tag:
          (a) 37C2, AFT CARGO FAN

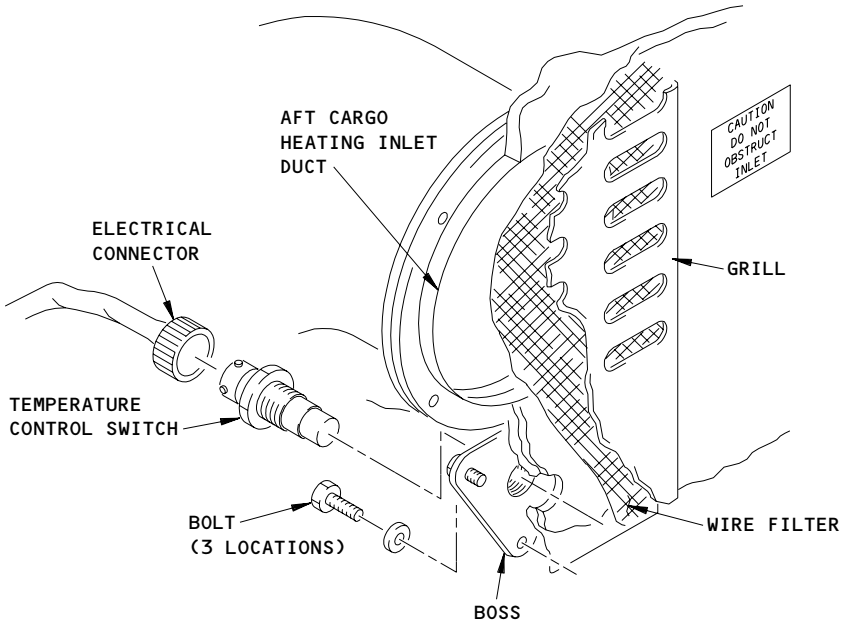
      S 014-004
      (3) Open the cargo compartment door No. 2 (822) (AMM 06-46-00/201).

      S 014-005
      (4) Remove the right bulkhead lining panel on the forward bulkhead to get access to the control switch (AMM 25-50-03/401).

      S 034-006
      (5) Disconnect the electrical connector from the control switch.

      S 024-007
      (6) Remove the control switch from the boss.





AFT CARGO TEMPERATURE
THERMAL SWITCH
A

Aft Cargo Compartment Temperature Control Switch Installation
Figure 401

TASK 21-44-07-404-008

3. Install the Aft Cargo Temperature Control Switch (Fig. 401)

A. Equipment

(1) Heating Source - hand-held blow dryer, commercially available

(2) Cooling Source - ice pack, commercially available

(3) Thermometer - hand-held type, commercially available, for ranges 40°F to 80°F

B. References

(1) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels

(2) AMM 24-22-00/201, Electrical Power - Control

(3) AMM 25-50-03/401, Bulkhead Lining Panels

C. Access

(1) Location Zones

153/154 Aft Cargo Compartment

D. Procedure

S 424-009

(1) Put the control switch into the boss. Tighten.

S 434-010

(2) Install the electrical connector to the control switch.

S 414-011

(3) Install the bulkhead lining panel (AMM 25-50-03/401).

S 864-012

(4) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:

(a) 11N22, CARGO HEAT FAN AFT

S 864-013

(5) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:

(a) 37C2, AFT CARGO FAN

S 864-014

(6) Supply electrical power (AMM 24-22-00/201).

NOTE: The aft cargo temperature control switch measures the cargo compartment temperature. When the cargo compartment temperature is less than 50°F the control switch closes and sends a signal to the aft cargo heating flow fan. When the cargo compartment temperature is 70°F the switch stops power to the fan.

S 214-015
(7) If the ambient temperature in the cargo compartment is less than 50°F (10°C), do these steps:
(a) Make sure the cargo heating flow fan operates.
(b) Use the heating source to increase the temperature of the control switch to 70°F (21°C) maximum.
(c) Make sure the cargo heating flow fan stops.

S 214-016
(8) If the ambient temperature in the cargo compartment is more than 70°F (21°C), do these steps:
(a) Use the cooling source to decrease the temperature of the control switch to 70°F (21°C) maximum.
(b) Make sure the cargo heating flow fan operates.

S 414-017
(9) Close the No. 2 cargo door (822) (AMM 06-46-00/201).

S 864-018
(10) Remove electrical power, if it is not necessary.

AFT CARGO FAN CURRENT SENSOR - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the aft cargo fan current sensor. The second task is the installation of the aft cargo fan current sensor.
   B. The aft cargo fan current sensor is in the miscellaneous electrical equipment panel, P37.

TASK 21-44-09-004-001

2. Remove the Aft Cargo Fan Current Sensor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power - Control
      (3) 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center

   C. Procedure

      S 864-010

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY OR DAMAGE.

      (1) Do the deactivation procedure for the spoilers (Ref 27-61-00) or move all persons and equipment away from the spoilers.

      S 864-002

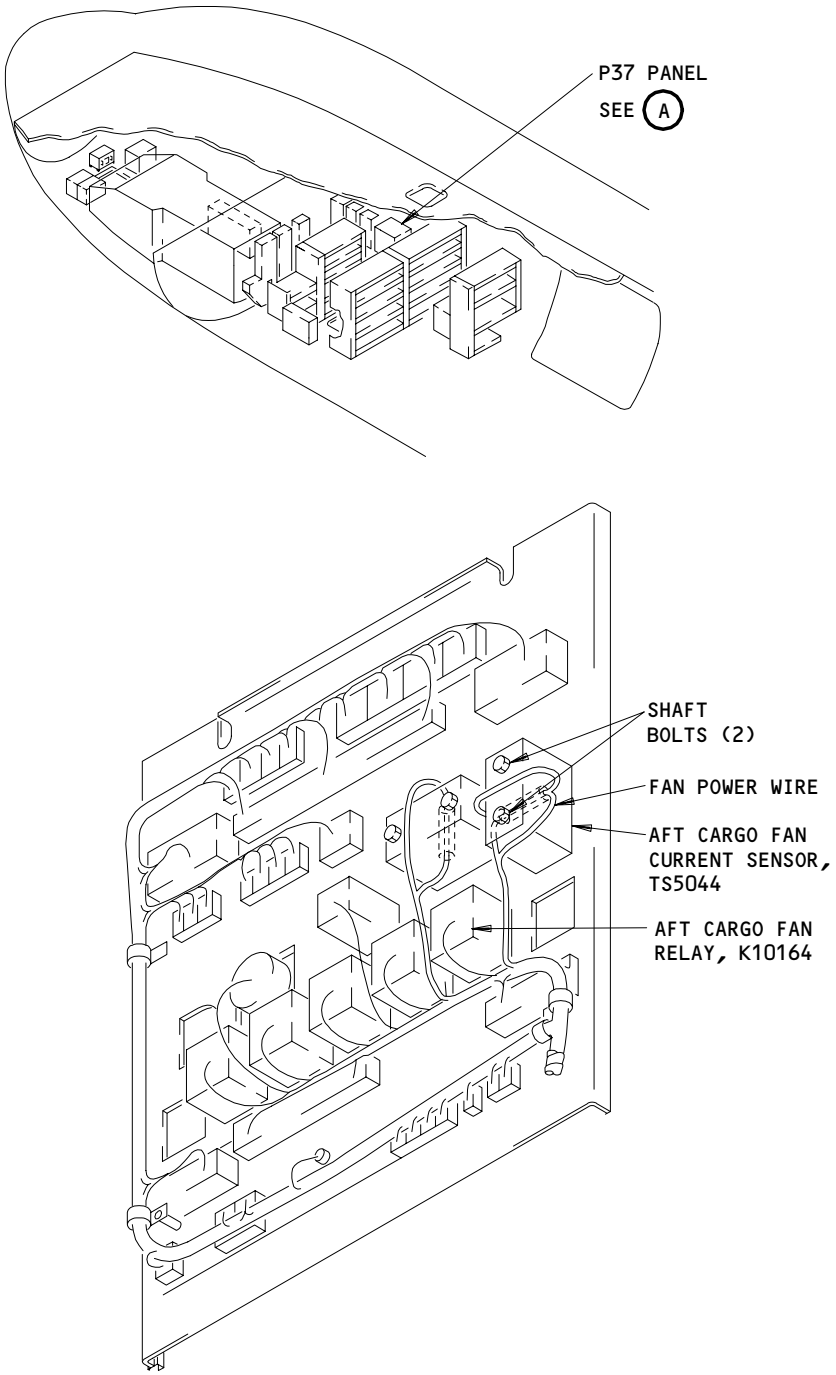
      WARNING: DO NOT OPEN THE ELECTRICAL EQUIPMENT PANEL DOORS WHEN THE POWER IS ON. FIRE OR INJURY CAN OCCUR.

      (2) Remove electrical power from the airplane (Ref 24-22-00).

      S 014-003
      (3) Open the E/E access door (119BL) and find the miscellaneous electrical equipment panel, P37 (Ref 06-41-00)

      S 014-004
      (4) Open the doors of the miscellaneous electrical equipment panel, P37.

      S 034-005
      (5) Remove the fan power wire from the current sensor with one of these steps:
          (a) Remove the wire from terminal A1 of the AFT CARGO FAN RELAY and put a tag on the wire to identify it for installation. Remove the wrap on the wire bundle as necessary. Pull the wire through the hole in the current sensor.



"B" PLATE – P37 PANEL

A

Aft Cargo Fan Current Sensor Installation
Figure 401

98954

(b) Cut the wire on one side of the hole in the current sensor and put a tag on the wire to identify it for installation.

S 034-006

(6) Cut the vendor wire from the current sensor and put a tag on the wire to identify it for installation.

S 024-007

(7) Remove the bolts and remove the current sensor.

TASK 21-44-09-404-008

3. Install the Aft Cargo Fan Current Sensor (Fig. 401)

A. Equipment

(1) Cooling source - ice pack, commercially available

(2) Heating source - hand-held blow dryer, commercially available

(3) Thermometer - hand-held type for ranges 40-80°F - commercially available

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels

(2) 24-22-00/201, Electrical Power - Control

C. Access

(1) Location Zones

119/120 Main Equipment Center

D. Procedure

S 424-009

(1) Put the current sensor in position and install the bolts (2 locations).

S 434-010

(2) Install the fan power wire through the current sensor with one of these steps:

(a) Put the wire two times through the hole in the current sensor, then attach the wire to terminal A1 of the AFT CARGO FAN RELAY. Put a wrap on the wire bundle as necessary.

(b) Put the wire two times through the current sensor and put the wire ends together with a splice.

S 434-011

(3) Install the vendor wire to the current sensor with a splice.

S 414-012

(4) Close the doors of the miscellaneous electrical equipment panel.

S 414-013

(5) Close the E/E access door 119BL (Ref 06-41-00).

S 704-014

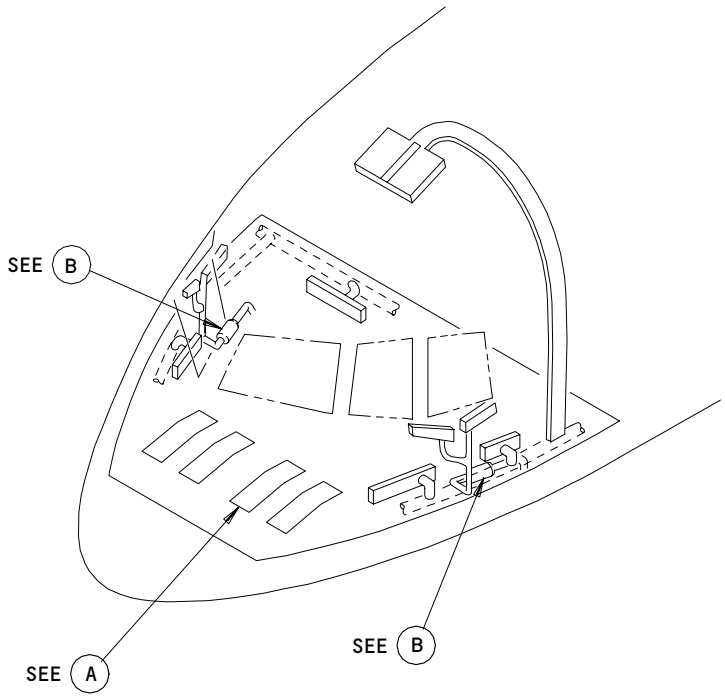
(6) Do a test of the aft cargo fan current sensor.
  (a) Supply electrical power (Ref 24-22-00).
  (b) Put the APU AND CARGO FIRE CONTROL switch on the pilot's control stand, P8, in the unarmed position.
  (c) If cargo compartment temperature is more than 50°F, use the cooling source to decrease the temperature of the aft cargo temperature control switch.
  (d) To make sure the fan operates, listen for fan noise.
  (e) Use the heating source to increase the temperature of the aft cargo temperature control switch to more than 70°F.
  (f) Make sure the fan continues to operate for about 20 seconds, then stops.

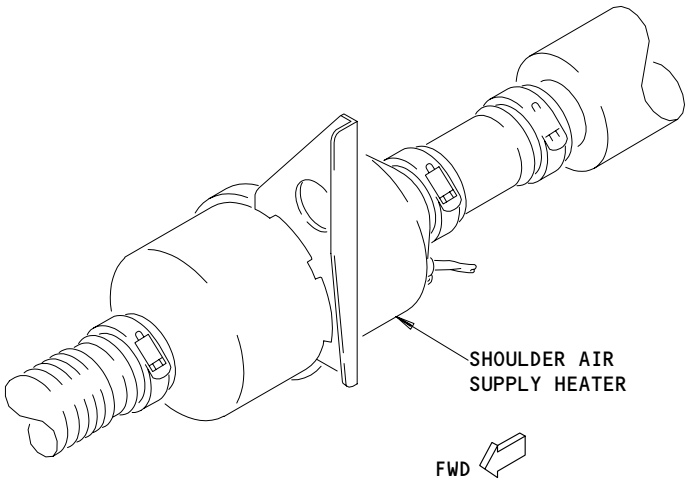
S 864-015

(7) Remove electrical power, if it is not necessary.

SUPPLEMENTAL HEATING SYSTEM - DESCRIPTION AND OPERATION

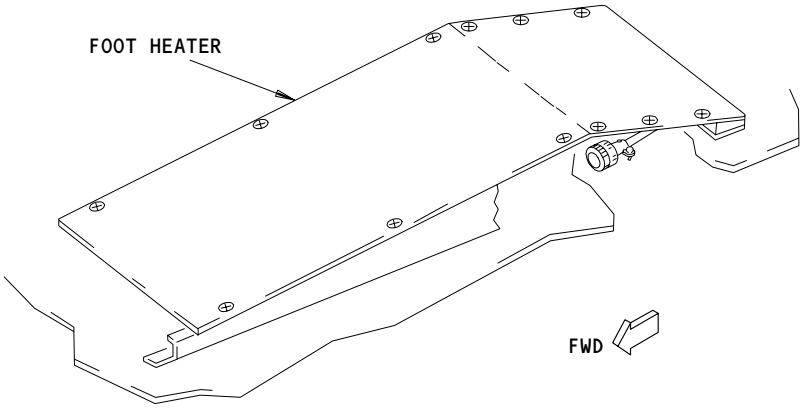
1. General
   A. The supplemental heating system consists of four foot electric surface heaters and two shoulder air supply heaters that are located in the flight deck.
2. Component Details (Fig. 1)
   A. Foot Electric Surface Heaters
      (1) Physical Description
         (a) Electric foot warmers are installed in the airplane cockpit, for the convenience of the pilot and co-pilot.
         (b) The foot heater may be operated at 115 or 200 Vac. The surface temperature is thermostatically controlled at 60° ±10°F.
         (c) Another thermostat is used as a safety factor to control the over temperature cut-off at 150°F. maximum.
      (2) Operation
         (a) The foot warmer is energized by 115/200 Vac, 400 Hz input voltage applied between pins 1 and 2 of connector (J1). Thermostat TC1 controls the temperature of heater HR1 at 60°F. The TC2 is a safety device to control the over temperature cut-off at 150°F. maximum.
   B. Shoulder Air Supply Heater
      (1) A shoulder air supply heater supplies heated air to the captain's shoulder area. An identical heater is provided for the first officer. Each heater mounts in the sidewall conditioned air distribution duct immediately below the flight deck floor. The shoulder air supply heater is a dual range electrical element heater. The heater operates on low range using 115 Vac or on high using 200 Vac. An integral heating control thermostat monitors heater coil temperature and opens at 150°F interrupting current flow to the coil. A backup safety thermostat opens at 250°F.
3. Operation (Fig. 2)
   A. Individual heaters provide heated air to captain's and first officer's shoulder areas and surface heat to the foot area. Switches on the captain's fwd aux panel (P13) provide individual control for the captain's foot and shoulder heaters. Similar switches on the first officer's fwd aux panel (P14) provide control for the first officer's heaters. Each switch is a three positon toggle switch with OFF, LOW and HI control positions. Each air supply heater operates in a similar manner.





SHOULDER AIR SUPPLY HEATER

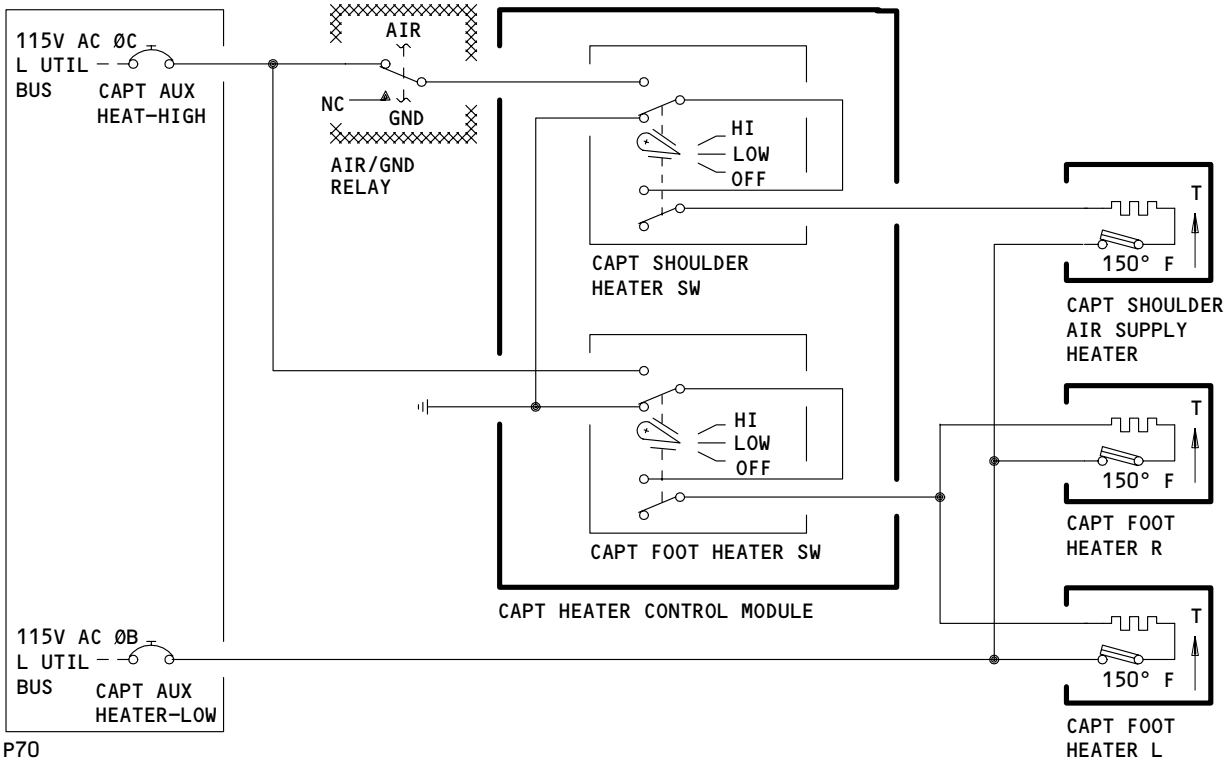
B



FOOT ELECTRIC SURFACE HEATER

A

Supplemental Heating Components
Figure 1



CAPT SUPPLEMENTAL HEATING SYSTEM
(F/O SUPPLEMENTAL HEATING SYSTEM SIMILIAR)

Supplemental Heating System Schematic
Figure 2

SUPPLEMENTAL HEATING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure contains one task. The task is a system test of the supplemental heating system.

   TASK 21-45-00-735-001

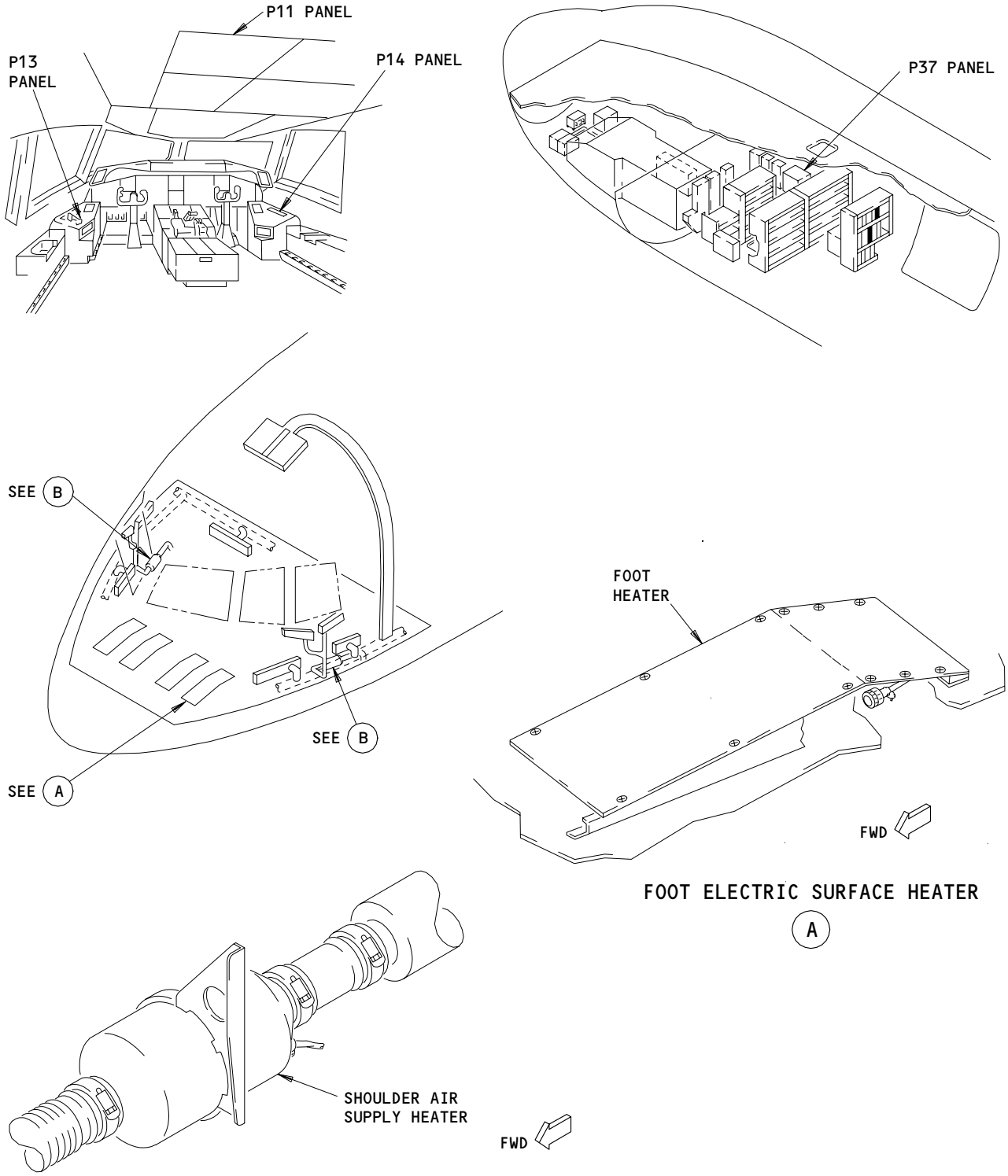
2. System Test - Supplemental Heating System
   A. General
      (1) This test does a check of the flight deck supplemental heating system. This system includes left and right foot heaters and a shoulder heater for each crew member. The foot heaters are on the floor and are conduction heaters that are electrically heated. The shoulder heaters are forced air convection heaters that are electrically heated. All the heaters are controlled by switches on the captain's or first officer's auxiliary panel. Each switch has an OFF, LOW, and HIGH position. The foot heaters operate fully on the ground and in flight. The shoulder heaters operate in the LOW position only while on the ground.
   B. Equipment
      (1) Temperature sensing pads - range 0 to 120°F (0 to 49°C) - commercially available
      (2) Temperature sensor - range 0 to 120°F (0 to 49°C) - commercially available
      (3) Cooling source - ice pack - commercially available
   C. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 27-61-00/201, Spoiler/Speedbrake Control System
      (3) 32-09-02/201, Air/Ground Relays
      (4) 36-00-00/201, Pneumatic - General
   D. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   E. Procedure

      S 865-004
      (1) Supply electrical power (AMM 24-22-00/201).

      S 865-005
      (2) Put the flight officer's shoulder heater switch, S1, and foot heater switch, S2, to OFF.

          NOTE: The switches are on the flight officer's auxiliary instrument panel, P14.



FOOT ELECTRIC SURFACE HEATER

A

SHOULDER AIR SUPPLY HEATER

B

Supplemental Heating System Adjustment Test
Figure 501

S 865-006

(3) Put the captain's shoulder heater switch, S1, and foot heater switch, S2, to OFF.

NOTE: The switches are on the captains's auxiliary instrument panel, P13.

S 215-007

(4) Push the L and R RECIRC FAN switch-lights on the overhead panel, P5, to ON.
(a) Make sure the INOP lights do not come on.

S 735-009

(5) Do a test of the shoulder heater:
(a) Make sure these circuit breakers on the right miscellaneous electrical equipment panel, P37, are closed:
1) 37F4, HEATERS F/O AUX HI
2) 37F3, HEATERS F/O AUX LO
(b) Make sure these circuit breakers on the P70 panel are closed:
1) 70A6, CAPT AUX HTR HI
2) 70A5, CAPT AUX HTR LO
(c) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
1) 11S15, LANDING GEAR AIR/GND SYS 1
2) 11S19, LANDING GEAR AIR/GND SYS 2
(d) Put the flight officer's shoulder heater switch on the P14 panel to HIGH.
1) Make sure the air temperature that comes from the shoulder heating nozzle does not increase during the subsequent two minutes.
(e) Put the flight officer's shoulder heater switch S1 on the P14 panel to LOW.
1) Make sure the air temperature that comes from the shoulder heating nozzle increases during the subsequent two minutes.
(f) Do the last four steps for the captain's shoulder heater with the switch on the P13 panel.

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY OR DAMAGE.

(g) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

CAUTION: OBEY THE STEPS IN THE PROCEDURE FOR FLIGHT MODE SIMULATION. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(h) Simulate the system No. 1 and 2 air/ground relays in the flight mode (AMM 32-09-02/201).

CAUTION: DO THE SHOULDER HEATER TEST IN THE SUBSEQUENT TEN MINUTES TO MAKE SURE THAT THE SYSTEM DOES NOT BECOME TOO HOT.

(i) Do these steps in the subsequent 10 minutes:
  1) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 and P70 panels:
    a) 37F4, HEATERS F/O AUX
    b) 70A6, CAPT AUX HTR HI
  2) Put the flight officer's shoulder heater switch on the P14 panel to HIGH.
    a) Make sure the temperature increases during the subsequent two minutes.
  3) Put the flight officer's shoulder heater switch to OFF.
  4) Do the last three steps for the captain's shoulder heater with the switch on the P13 panel.
(j) Put the airplane back to the ground mode (Ref 32-09-02).
(k) Put the L and R RECIRC FAN switch-lights on the P5 panel to the off position.

S 735-010

(6) Do a test of the foot heater:
  (a) Put an ice pack on the aft part of the flight officer's foot heater.
    1) Make sure the temperature of foot heater is less than 45°F (7.2°C).
    2) Remove the ice pack.
  (b) Put the flight officer's foot heater switch on the P14 panel to LOW.
    1) Make sure the two flight officer's foot heaters become warm.
  (c) Put the flight officer's foot heater switch to HIGH.
    1) Make sure the two flight officer's foot heaters continue to supply heat and increase in temperature.
  (d) Put the flight officer's foot heater switch to OFF.
  (e) Do the foot heater test for the captain's foot heater with the switch on the P13 panel.

S 865-012

(7) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

FOOT ELECTRIC SURFACE HEATERS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the foot electric heaters. The second task is the installation of the foot electric surface heaters.
   B. Four foot heaters are in the forward part of the flight deck floor. A left and right foot heater for the captain are on the left side of the airplane. A left and right foot heater for the first officer are on the right side of the airplane.

TASK 21-45-01-004-001

2. Remove the Foot Electric Surface Heaters (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Procedure

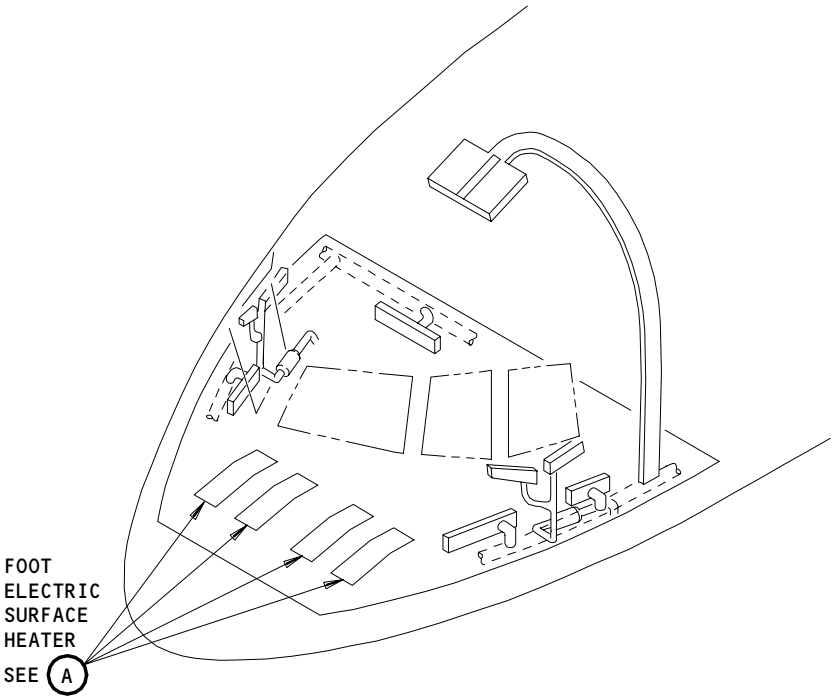
      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

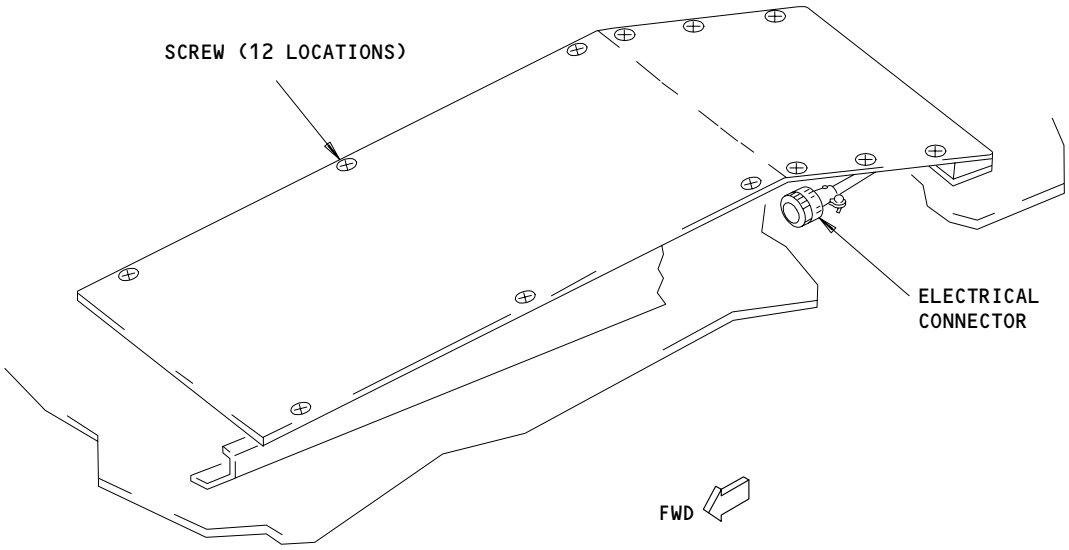
      S 864-004
      (2) Put the applicable first officer's or captain's foot heater selector to OFF.

      NOTE: The first officer's foot heater selector is on the F/O auxiliary instrument forward panel, P14. The captain's foot heater selector is on the captain's auxiliary instrument forward panel, P13.

      S 864-005
      (3) For removal of the first officer's foot heaters, open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
          (a) 37F4, HEATERS F/O AUX HI
          (b) 37F3, HEATERS F/O AUX LO

      S 864-006
      (4) For removal of the captain's foot heaters, open these circuit breakers on the relay panel, P70, and attach DO-NOT-CLOSE tags:
          (a) 70A5, CAPT AUX HTR LO
          (b) 70A6, CAPT AUX HTR HI





FOOT ELECTRIC SURFACE HEATER

A

Foot Electric Heaters - Installation
Figure 401

S 804-008

WARNING: BE CAREFUL WHEN YOU TOUCH THE HEATER. IF IT IS HOT, IT WILL BURN YOU.

(5) Find the foot heaters in the forward part of the flight deck floor.

S 034-009

(6) Remove the screws that hold the heater plate to the foot well.

S 024-010

(7) Disconnect the electrical connector from the foot heater and remove the foot heater.

TASK 21-45-01-404-011

3. Install the Foot Electric Surface Heater (Fig. 401)

A. References

(1) AMM 24-22-00/201, Electrical Power Control

B. Access

(1) Location Zones

211/212 Control Cabin - Section 41

C. Procedure

S 434-012

(1) Connect the electrical connector to the foot heater.

S 424-013

(2) Put the foot heater in position and attach with screws.

S 864-014

(3) For installation of the first officer's foot heater, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 panel:
(a) 37F4, HEATERS F/O AUX HI
(b) 37F3, HEATERS F/O AUX LO

S 864-015

(4) For installation of the captain's foot heater, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P70 panel:
(a) 70A5, CAPT AUX HTR LO
(b) 70A6, CAPT AUX HTR HI

S 864-017

(5) Put the applicable first officer's or captain's foot heater selector on the P14 or P13 panel to LO.

S 714-018

(6) Make sure the foot heater becomes warm.

NOTE: The surface temperature stays at 60±10 F.

S 864-019

(7) Put the applicable first officer's or captain's heater selector on the P14 or P13 to OFF.

S 864-021

(8) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

SHOULDER AIR SUPPLY HEATER - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the shoulder air supply heater. The second task is the installation of the shoulder air supply heater.
   B. Two shoulder heaters, one for the first officer and one for the captain, are installed on the ducts under the cabin floor. The heaters make the air warm before it is supplied to the flight deck. The captain's shoulder heater is on the left side of the plane and the first officer's is on the right side.

TASK 21-45-02-004-001

2. Remove the Shoulder Air Supply Heater (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
      (3) 36-00-00/201, Pneumatic General
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Procedure

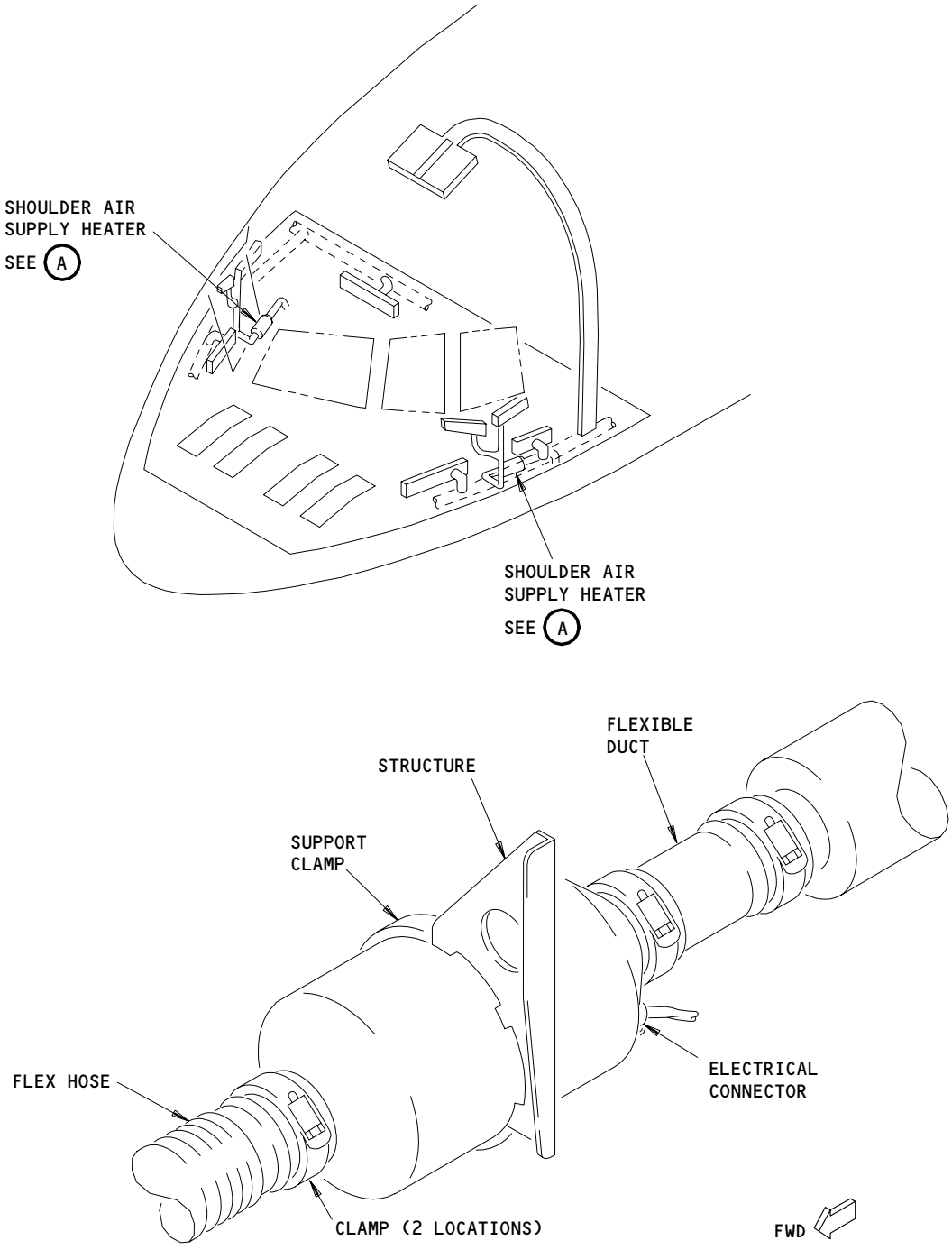
      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201)

      S 864-003
      (2) For removal of the captain's shoulder heater, set the captain's shoulder heater selector on the captain's auxiliary instrument forward panel, P13, to OFF.

      S 864-004
      (3) For removal of the first officer's shoulder heater, set the first officer's heater selector on the first officer's instrument forward panel, P14, to OFF.

      S 864-005
      (4) Put the left and right pack control selector on the pilot's overhead panel, P5, to OFF and attach a DO-NOT-OPERATE tag.

      S 864-006
      (5) For the removal of the captain's shoulder heater, open these circuit breakers on relay panel, P70, and attach DO-NOT-CLOSE tags:
          (a) 70A5, CAPT AUX HTR LO
          (b) 70A6, CAPT AUX HTR HI



SHOULDER AIR SUPPLY HEATER
(A)

Shoulder Air Supply Heater - Installation
Figure 401

S 864-008
(6) For removal of the first officer's shoulder heater, open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
(a) 37F4, HEATERS F/O AUX HI
(b) 37F3, HEATERS F/O AUX LO

S 014-009
(7) Open the applicable access door (116AR, 115AL or 113AL) and find the shoulder heater (AMM 06-41-00/201).

S 034-010
(8) Disconnect the electrical connector.

S 034-011
(9) Loosen the middle support clamp that attaches the shoulder heater to the structure.

S 034-012
(10) Remove the two clamps that attach the shoulder heater to the duct.

S 034-013
(11) Move the sleeve and flexible duct away from the shoulder heater.

S 024-014
(12) Remove the shoulder heater

TASK 21-45-02-404-015
3. Install the Shoulder Air Supply Heater (Fig. 401)
A. References
(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 24-22-00/201, Electric Power Control
(3) 36-00-00/201, Pneumatic General
B. Access
(1) Location Zones
211/212 Control Cabin - Section 41

C. Procedure

S 424-016
(1) To put the shoulder heater in position, move it through the support clamp.

S 414-028
(2) Put the flexible duct and sleeve on the heater exit and inlet.

NOTE: Do not let the flex hose and sleeve make an overlap on the duct end of more than 1.5 inch.

S 414-029
(3) Install the clamps and tighten to 18-22 pound-inches.

NOTE: Install the clamps .25 inch from the end of the flex hose or sleeve.

S 864-017
(4) For installation of the captain's shoulder heater, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P70 panel:
(a) 70A5, CAPT AUX HTR LO
(b) 70A6, CAPT AUX HTR HI

S 864-019
(5) For installation of the first officer's shoulder heater, remove the DO-NOT-CLOSE tags and close these circuit breakers on the right P37 panel:
(a) 37F4, HEATERS F/O AUX HI
(b) 37F3, HEATERS F/O AUX LO

S 704-020
(6) Do a test of the shoulder heater:
(a) Supply electrical power (AMM 24-22-00/201).
(b) Supply pneumatic power (AMM 36-00-00/201).
(c) Remove the DO-NOT-OPERATE tag and put the left or right pack control selector on the P5 panel in AUTO.

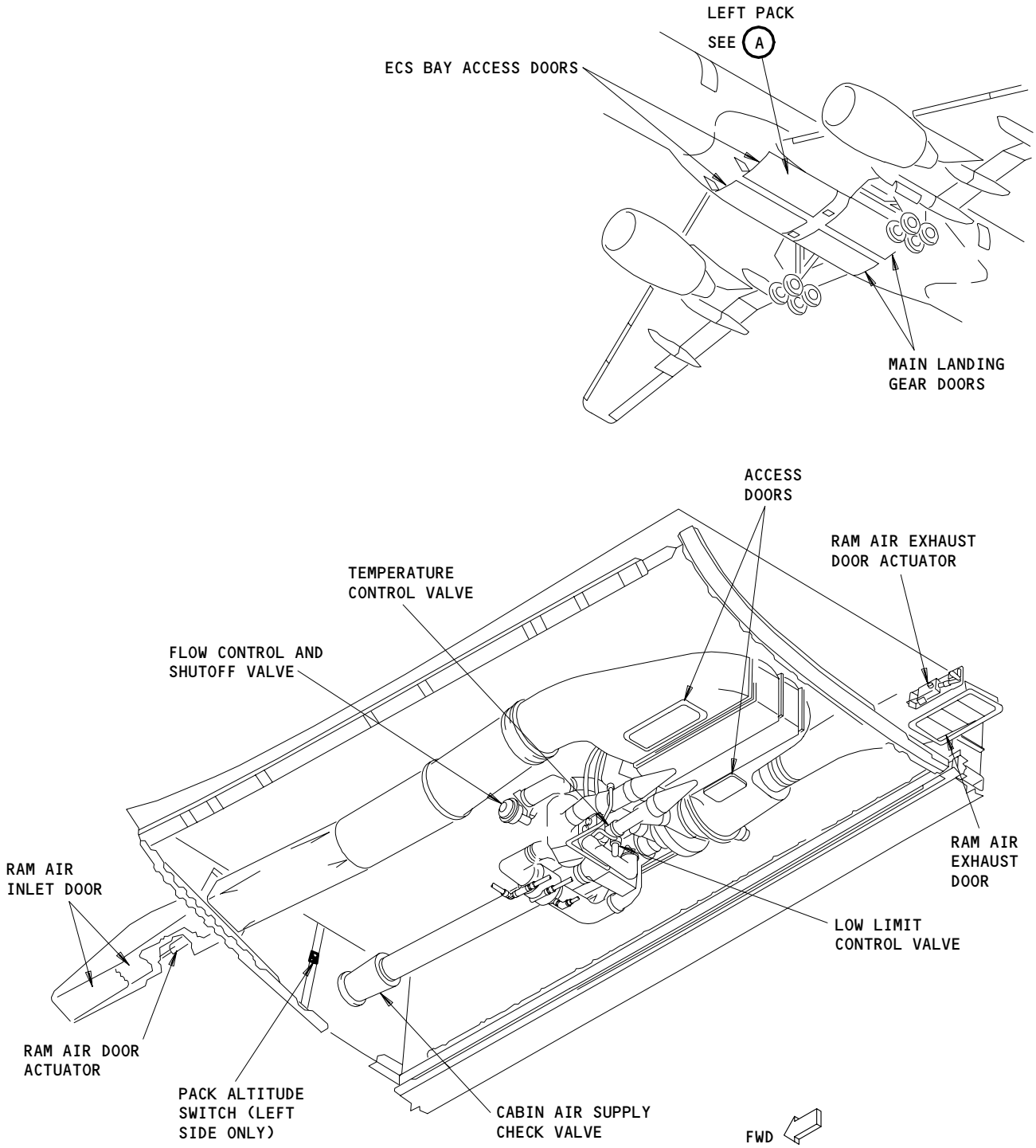
(d) Put the applicable heater selector in LOW.
(e) Make sure warm air comes out of the correct shoulder outlet.
(f) Put the applicable heater selector to OFF.
(g) Put the applicable left or right pack control selectors on panel P5 to OFF.
(h) Remove pneumatic power (AMM 36-00-00/201).

S 864-021
(7) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

S 414-022
(8) Close the applicable access door (116AR, 115AL, or 113AL).

COOLING PACK SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1, 2)
   A. The cooling pack system is used to decrease the temperature of a supply of air. The output of the cooling pack system is cold air. This cold air is supplied to all of the necessary airplane compartments by the conditioned-air-distribution systems (AMM 21-00-00/001).
   B. Other systems are necessary for the cooling pack system to operate. The cooling pack system uses a supply of air from the pneumatic system (AMM 36-00-00/001). This is hot air from the engines, the APU, or a ground air source. The cooling pack system also uses a supply of air from the ram air system (AMM 21-53-00/001). This is cold air which does not enter the air cooling packs. It is used to decrease the temperature of the air in two of the heat exchangers in each air cooling pack. The temperature control system (AMM 21-61-00/001) sends a signal for the necessary output of the cooling pack system.
   C. The cooling pack system is made of these components:
      (1) Two air cooling packs, that each has these components:
         (a) A primary heat exchanger
         (b) A secondary heat exchanger
         (c) An air cycle machine (which has a turbine, a compressor, and a fan)
         (d) A split-duct water separator
         (e) A reheater
         (f) A condensor
         (g) A water extractor
         (h) A low-limit control valve
         (i) A temperature control valve
         (j) A compressor-outlet overheat switch
         (k) Two compressor-outlet temperature sensors
         (l) Two pack temperature sensors
         (m) A plenum/diffuser assembly.
      (2) Two automatic pack-temperature controllers
      (3) One standby pack-temperature controller
      (4) Two flow control cards
      (5) Two flow-control-and-shutoff valves
      (6) Two pack-outlet overheat switches
      (7) Two cabin-air-supply check valves
      (8) Two altitude switches.



LEFT PACK SHOWN
(RIGHT PACK SIMILAR)

A

Cooling Pack
Figure 1

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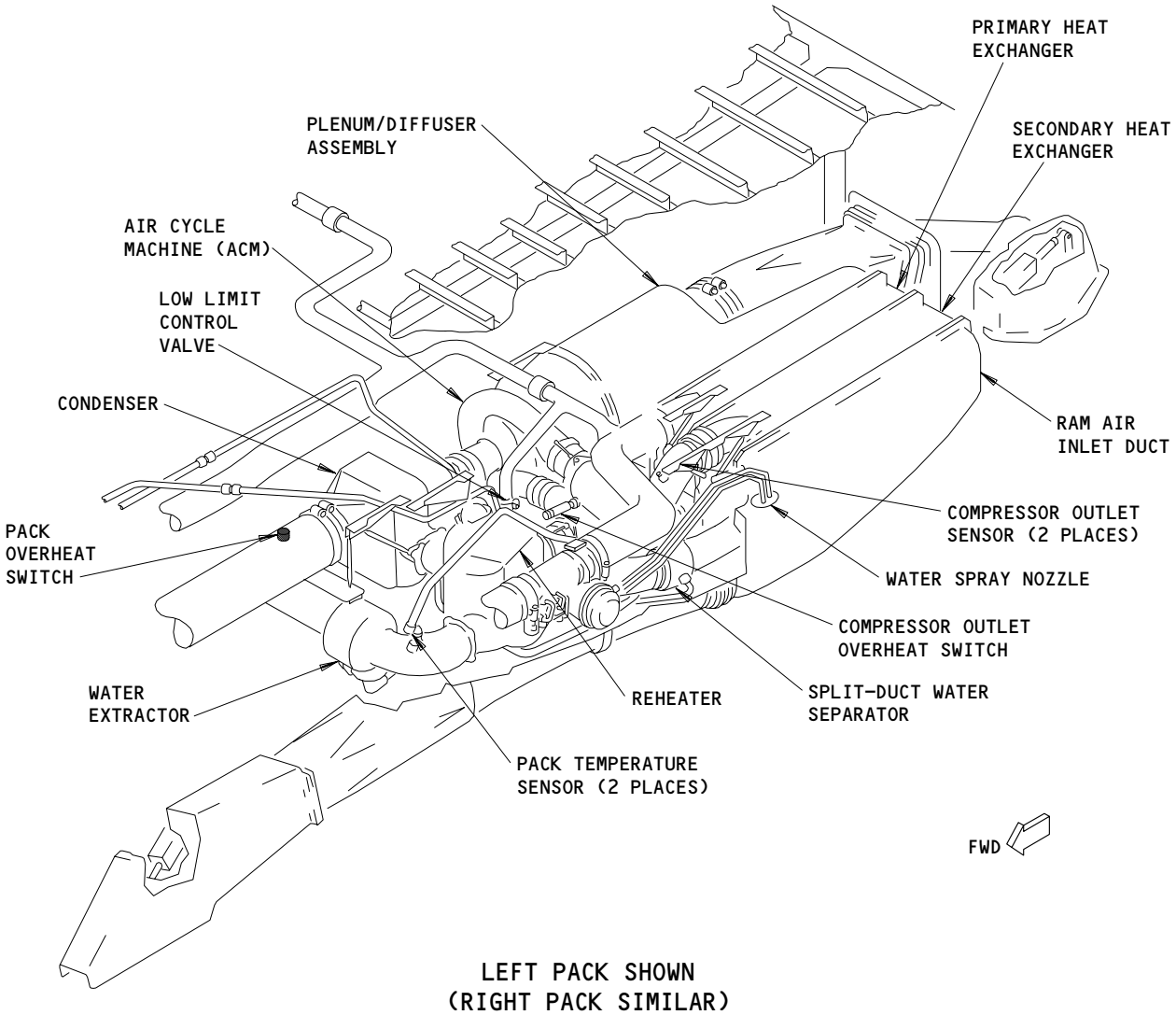


LEFT PACK SHOWN
(RIGHT PACK SIMILAR)

Cooling Pack Components
Figure 2

D. Most of the components in the cooling pack system are interchangeable between the left and right systems. The only component that is not interchangeable is the standby pack temperature controller, because there is only one of them on the airplane.

E. The air cooling packs are installed in the left and right environmental control system (ECS) bays. The ECS bays are under the airplane wings, immediately forward of the main landing-gear wheel wells.

2. Component Details

A. Flow Control and Shutoff Valve (Fig. 3, 4)

(1) The flow-control-and-shutoff valve lets a controlled amount of air flow from the pneumatic system into the air cooling pack. There are two valves, one for each air cooling pack. Each valve is installed forward and outboard of its air cooling pack.

(2) The flow-control-and-shutoff valve lets air into the air cooling pack at two different flow rates. Usually, each valve lets approximately 72 pounds (24 cubic meters) per minute of air into each pack. In the "high flow mode", this rate increases to between 105 pounds (39 cubic meters) and 117 pounds (44 cubic meters) per minute. This is a 65 percent increase for the cooling pack. It also means that one cooling pack can supply about 80 percent of the air that is usually supplied by two cooling packs.

(3) The flow-control-and-shutoff valve is a venturi-type, butterfly valve. It is electrically controlled and pneumatically operated. It is approximately 4 inches in diameter, 14 inches in length, and weighs 10.5 pounds.

(4) A description of the flow-control-and-shutoff-valve components:

(a) The valve flow section

1) The valve flow section is a venturi-type tube assembly. A butterfly plate, attached to a shaft, is in the assembly. The valve flow section measures 4 inches in diameter and 14.25 inches long. All other valve components are attached to the valve flow section.

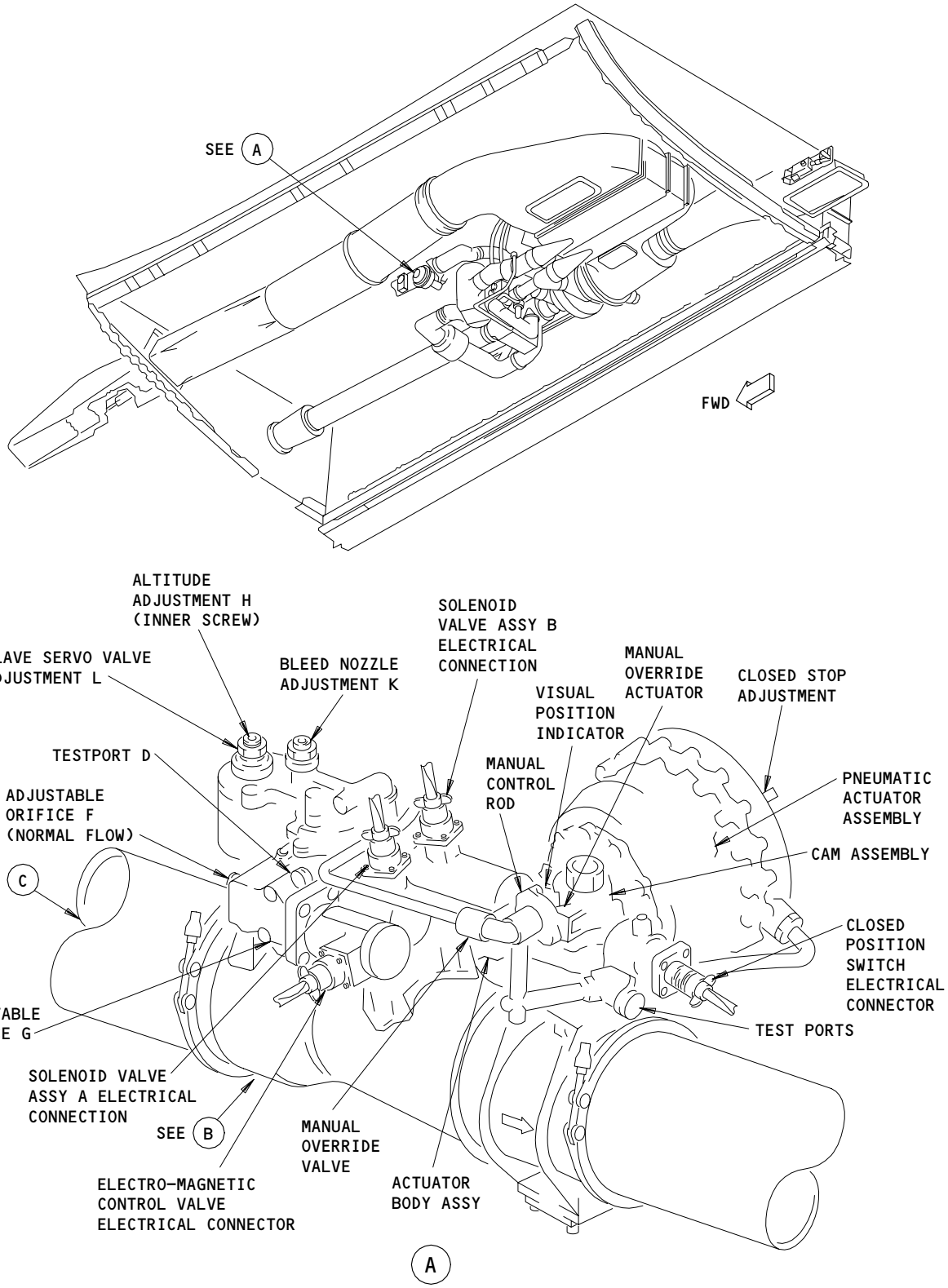
(b) The mechanical-manual-override valve

1) The mechanical-manual-override valve supplies a way for the flow control valve to be manually closed. It has two valve seats, a ball, and a manual override actuator.

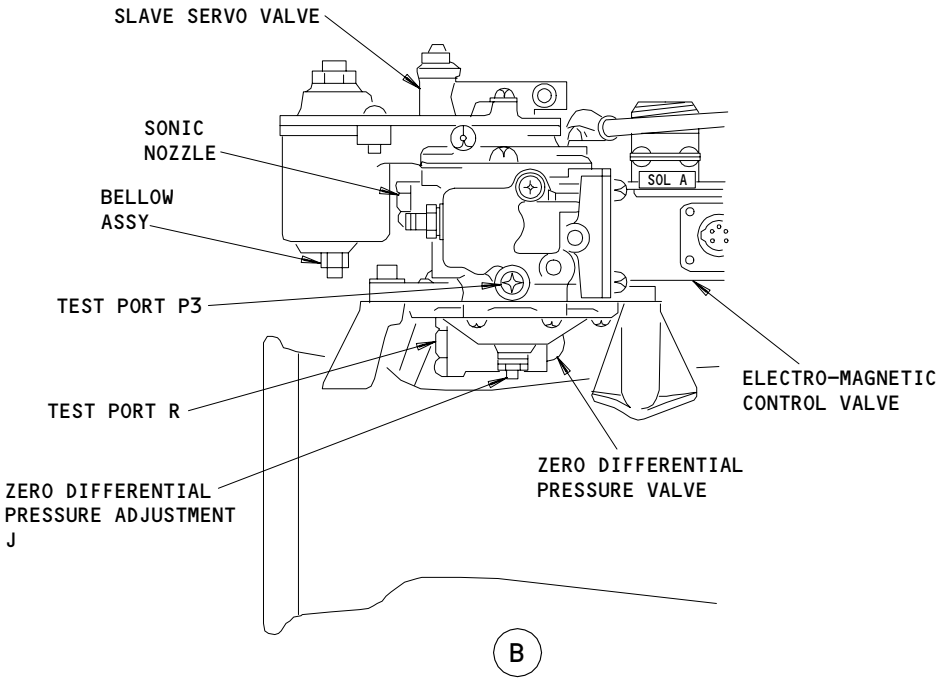
(c) The pneumatic actuator

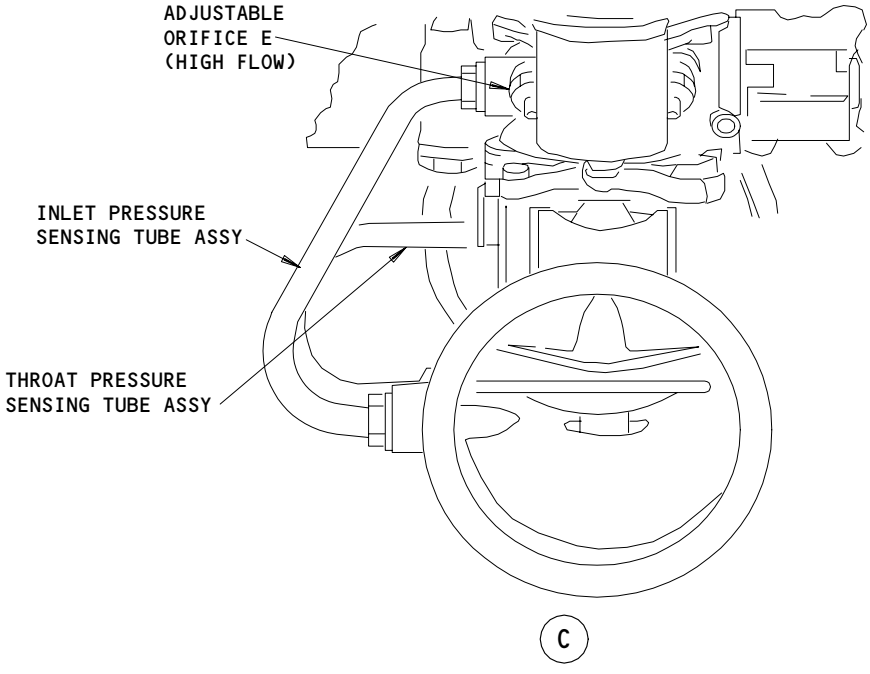
1) The pneumatic actuator is the mechanism that controls the butterfly plate in the valve flow section. The pneumatic actuator has an actuator housing assembly and an actuator linkage assembly.

2) The actuator housing includes an actuator diaphragm that divides the pneumatic actuator into two chambers. Chamber N bleeds to the mechanical manual override valve. The ambient-pressure-sensing chamber bleeds to ambient. The ambient-pressure-sensing chamber has a spring to push the actuator diaphragm against the chamber N.

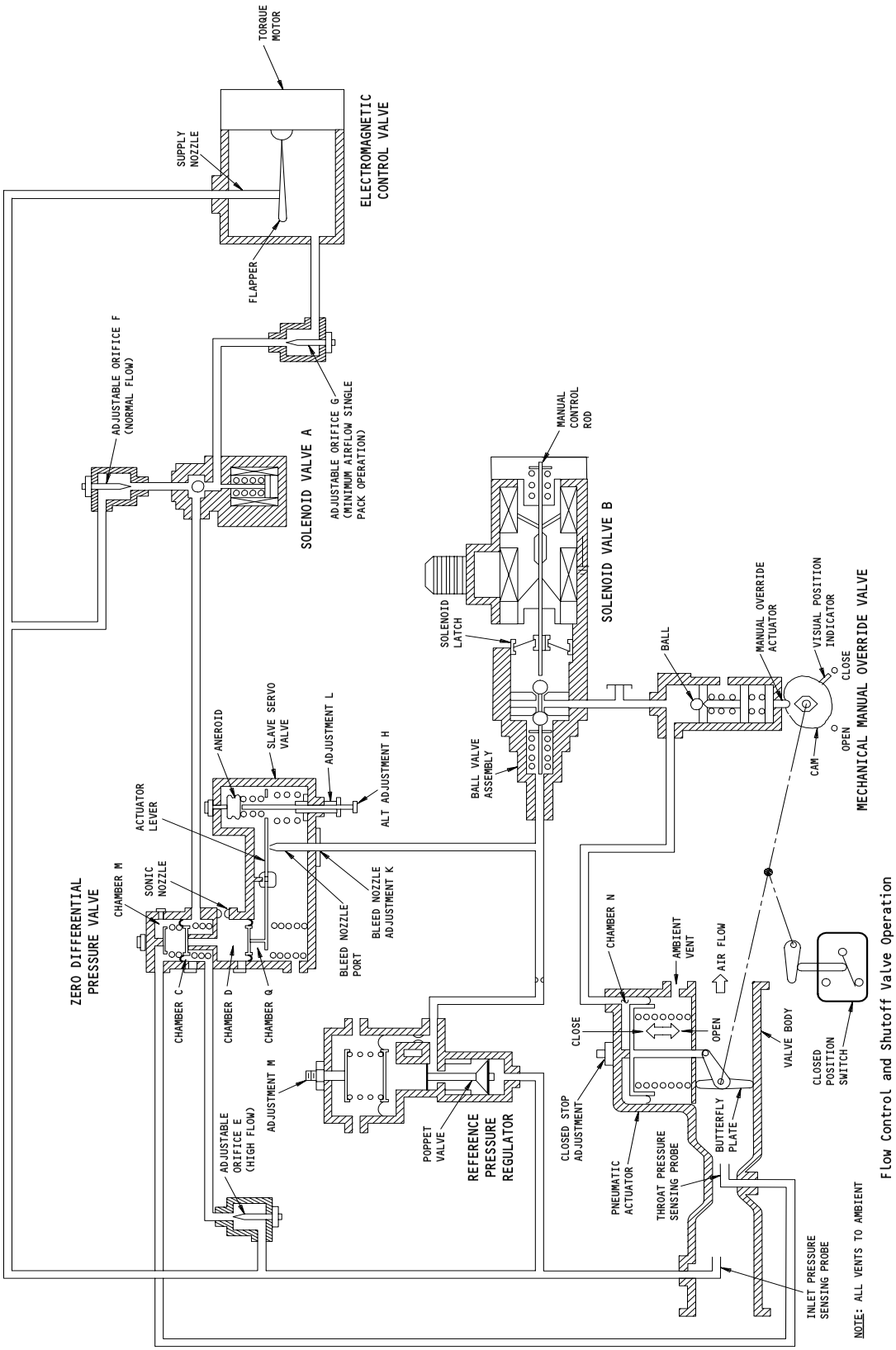


Flow Control and Shutoff Valve
Figure 3 (Sheet 1)





Flow Control and Shutoff Valve
Figure 3 (Sheet 2)



Flow Control and Shutoff Valve Operation
Figure 4

205994

3) The actuator linkage assembly has an actuator arm and a connecting link. They connect the actuator diaphragm to the butterfly shaft. Movement of the actuator diaphragm causes the butterfly shaft to turn.

(d) The closed-position-switch assembly

1) The closed position switch assembly is in the pneumatic actuator. It is attached to the side of the actuator housing assembly. The switch is closed by the actuator arm when the butterfly plate is closed.

(e) The visual position indicator

1) The visual position indicator is a pin connected to the butterfly shaft assembly. The pin turns toward the words OPEN or CLOSED, which are on the upper bearing cover.

(f) The zero-differential-pressure valve

1) The zero-differential-pressure valve has a servo cover assembly, a diaphragm assembly, a poppet valve, a valve seat, two springs, and a servo housing assembly. The poppet valve and the valve seat are used to adjust the valve. The springs push against the diaphragm assembly in opposite directions. The diaphragm assembly divides the zero-differential-pressure valve into two chambers. Chamber M bleeds to the throat-pressure-sensing probe. Chamber C bleeds to the adjustable orifice E and the solenoid assembly A. If the pressure in chamber C becomes too great, it bleeds into chamber D of the slave servo valve.

(g) The slave servo valve

1) The slave servo valve has a pressure sensor assembly, an actuator lever assembly, two springs, and a bleed nozzle port. The actuator lever assembly includes a diaphragm that divides the slave servo valve into two chambers. Chamber D bleeds to chamber C and to ambient. Chamber Q bleeds to ambient and through the bleed nozzle port, if it is open. The bleed nozzle port bleeds to the solenoid-B-inlet connection. The two springs push on opposite ends of the lever to balance the actuator lever assembly.

2) The pressure sensor assembly has an aneroid and a spring that push against the actuator lever assembly. (An aneroid is a sealed, flexible container that becomes larger or smaller in relation to the adjacent air pressure). When the aneroid expands, the actuator lever assembly is pushed against the bleed nozzle port. Thus, the port will be closed.
3) The slave servo valve also has an altitude adjustment H, a slave servo valve adjustment L, and a bleed nozzle adjustment K.

(h) The electro-magnetic-control valve
1) The electro-magnetic-control valve has a torque motor, a flapper, a supply nozzle port, and a control-pressure-nozzle port. When the torque motor is energized, it moves the flapper against the supply nozzle port. Thus, the port is closed. The supply nozzle port bleeds to the inlet-pressure-sense probe. The control-pressure-nozzle port bleeds to the adjustable orifice G.

(i) The solenoid valves (A and B)
1) The solenoid valve assembly A has a solenoid and a ball valve assembly. The solenoid has an electro-magnetic coil, an armature, an actuator rod, and a spring. The armature is attached to the actuator rod, which can push the ball in the ball valve assembly. The actuator rod pushes the ball when the solenoid is energized. When the solenoid is not energized, The spring pushes on the actuator rod to keep it away from the ball.
2) The ball valve assembly has two seats and a ball. The ball valve assembly bleeds to the adjustable orifice F, the adjustable orifice G, and chamber C of the zero-differential-pressure valve.
3) The solenoid valve assembly B is a momentarily controlled solenoid. The solenoid has two electro-magnetic coils and armatures, with opposite forces. The armatures are attached to the manual control rod. The manual control rod moves manually or automatically when a three second electrical pulse gives the solenoid a signal. The adjustable latch assembly holds the manual control rod in the last set position. The ball valve assembly has a spring-loaded seated-ball valve, two seats, and a ball. The ball valve assembly bleeds to the solenoid-B-inlet connection, ambient, and the mechanical- manual-override valve.

(j) The sensing-probe-and-tube assemblies
1) The inlet-pressure-sensing probe is installed in the inlet portion of the valve flow section. It is connected to the reference pressure regulator and the slave servo valve by tube assemblies. Internal connections of the slave servo valve connects the tube assembly to the adjustable orifices and the electro-magnetic-control valve.

2) The throat-pressure-sensing probe is installed in the throat of the venturi in the valve flow section. It is connected to chamber M of the zero-differential-pressure valve by a tube assembly.

(k) The reference pressure regulator

1) The reference pressure regulator has a regulator diaphragm, a poppet valve, a poppet valve guide, and the adjustment M. The regulator diaphragm divides the reference pressure regulator into two chambers. The ajustment chamber bleeds to ambient. The poppet valve chamber bleeds to the bleed nozzle port and to the sloenoid valve assembly B. A spring in the adjustment chamber pushes against the regulator diaphragm.

(l) The preset adjustable orifices (E, F, and G)

1) Each adjustable orifice has two bleed ports and a bleed control pin. The bleed control pin can be adjusted to open or close the orifice.

2) The adjustable orifice E bleeds to the inlet-pressure-sense probe and to chamber C of the zero-differential-pressure valve.

3) The adjustable orifice F bleeds to the inlet-pressure-sense probe and to the solenoid valve assembly A.

4) The adjustable orifice G bleeds to the electro-magnetic-control valve and to the solenoid valve assembly A.

(5) The function of the flow-control-and shutoff valve:

(a) The position of the flow-control-and-shutoff valve is controlled by the pneumatic actuator. When the pressure of air in chamber N of the pneumatic actuator becomes great enough, the flow-control-and-shutoff valve opens. The pressure of air in chamber N comes from the inlet-pressure-sensing probe. The amount of air that flows from the inlet-pressure-sensing probe to chamber N controls the position of the flow-control-and-shutoff valve.

(b) The flow-control-and-shutoff valve has two air flow modes: the normal flow mode and the high flow mode. The air flow rate can also change because of changes in the altitude, changes in the electro-magnetic-control-valve current, and manual operations. Here is a description of how the flow-control-and-shutoff valve controls all the air flow rates.

(c) The normal flow mode

1) The flow-control-and-shutoff valve will open to the normal-flow-mode position when solenoid B is open and solenoid A is closed. Solenoid B opens when it is momentarily energized or it is manually opened (see the manual mode paragraph). When solenoid B is energized, the manual control rod pushes the ball in the ball valve assembly. This lets air flow through the ball valve assembly of solenoid B.

2) The electrical current necessary to energize solenoid A and solenoid B is supplied by the applicable (left or right) flow control card. The flow control card supplies 28v dc to the electromagnetic coil of the solenoid.
3) Solenoid A is closed when it is not energized. When solenoid A is closed, air can flow through the ball valve assembly and into chamber C of the zero-differential-pressure valve.
4) With solenoid B open, air from the solenoid-B-inlet connection can flow to the mechanical-manual-override valve. If the mechanical-manual-override valve is open, the air will flow into chamber N of the pneumatic actuator. The pressure of air in chamber N causes the butterfly plate to open.
5) The pressure difference in the zero-differential-pressure valve controls how far the butterfly plate will open. When the pressure in chamber C is greater than the pressure in chamber M, the diaphragm will move off of the plate valve. This lets the air from chamber C flow into chamber D. The pressure in chamber D pushes against the actuator lever assembly in the slave servo valve. This causes the lever to move off of the bleed nozzle port. Thus, air from the solenoid-B-inlet connection can flow through the bleed nozzle port to chamber Q. Chamber Q lets the air bleed to ambient. This means that there is less air pressure to flow through solenoid B and into the pneumatic actuator. Thus, the butterfly plate will not open as much.
6) The pressure in chamber M is supplied by the throat-pressure-sensing-probe. As the butterfly plate opens, the pressure in the throat, and in chamber M, decreases. Thus, the diaphragm moves off of the plate valve to let air from chamber C flow into chamber D.
7) The pressure in chamber C is supplied by the inlet pressure sensing probe. However, the amount of pressure supplied to chamber C is controlled by the adjustable orifices. Usually, the pressure is supplied through the adjustable orifices E and F. But the pressure changes when these orifices are closed or other orifices are opened.
8) When the throat pressure decreases, the inlet pressure also decreases a specified amount. Because the inlet pressure is a proportion of the throat pressure, the differential pressure between chamber M and chamber C does not change frequently. Thus, the butterfly plate will not have to make as many movements.

(d) The high flow mode
1) The flow-control-and-shutoff valve will go to the high flow mode when the solenoid B is open and solenoid A is open. The solenoid B must always be open for the flow-control-and-shutoff valve to be open. If solenoid B is closed, the valve will be closed.

2) Solenoid A is open when it is energized. When solenoid A is energized, it moves the actuator rod to move the ball in the ball valve assembly.
3) When the ball in the ball valve assembly is moved, it closes the bleed port from the adjustable orifice F. Then the only air that is supplied to chamber C, is the air through orifice E. Thus, the pressure in chamber C is decreased. With the pressure in chamber C decreased, the bleed nozzle port will stay closed longer and the butterfly plate will open more.
4) Also, the air flow rate in the high flow mode can be adjusted by the supply bleed nozzle (see the electro-magnetic-control valve paragraph).

(e) Changes in the altitude
1) The altitude is sensed by the pressure sensor in the slave servo valve. As the altitude increases, the aneroid expands. As the aneroid expands, it increases the pressure of the spring on the actuator lever assembly. However, the pressure in chamber Q decreases. Thus, when the altitude is below 22,000 feet, an altitude change will not change the force on the actuator lever assembly.
2) When the altitude is greater than 22,000 feet, the aneroid comes against the altitude adjustment H. Thus, the aneroid cannot expand any more. But the pressure in chamber Q continues to decrease. This lets the pressure in chamber D move the actuator lever assembly to open the bleed nozzle port. As the bleed nozzle port opens, the pressure in the pneumatic actuator decreases and the butterfly plate becomes less open. Thus, the air flow rate changes so that the mass of the air will be decreased but the volume will stay the same.

(f) Changes in the electro-magnetic-control-valve current
1) Changes in the electro-magnetic-control-valve current will only change the air flow rate when the flow-control-and-shutoff valve is in the high flow mode.
2) The applicable (left or right) automatic-pack-temperature controller supplies the electrical current to the torque motor of the electro-magnetic-control valve. The torque motor controls a flapper which closes the supply nozzle port. When 28v dc power is supplied to the torque motor, the flapper closes the supply nozzle port. As the current decreases, the torque motor moves the flapper away from the supply nozzle. This opens the supply nozzle to let air flow through the adjustable orifice G to solenoid A. If solenoid A is open (the high flow mode) the air can flow into chamber C. As the supply nozzle opens more, the pressure in chamber C will increase more. As the pressure in chamber C increases, the butterfly plate becomes less open.

(g) The closed mode

1) The flow-control-and-shutoff valve will be closed when the solenoid B is closed. The solenoid B is closed when it is momentarily energized to the closed position and it is not manually opened. When solenoid B is closed, the manual control rod is moved so that the ball valve assembly can seat. This closes the bleed port to the solenoid-B-inlet connection so that no air can enter the ball valve assembly Thus, no air can flow to the pneumatic actuator and the butterfly plate closes.

(h) The manual mode

1) If an electrical failure occurs, the valve can be manually operated. When the manual control rod in solenoid B is manually pushed in, solenoid B is open. The valve will operate in the normal flow mode. Solenoid B will stay open until the manual control rod is electrically or manually moved to the closed postion.

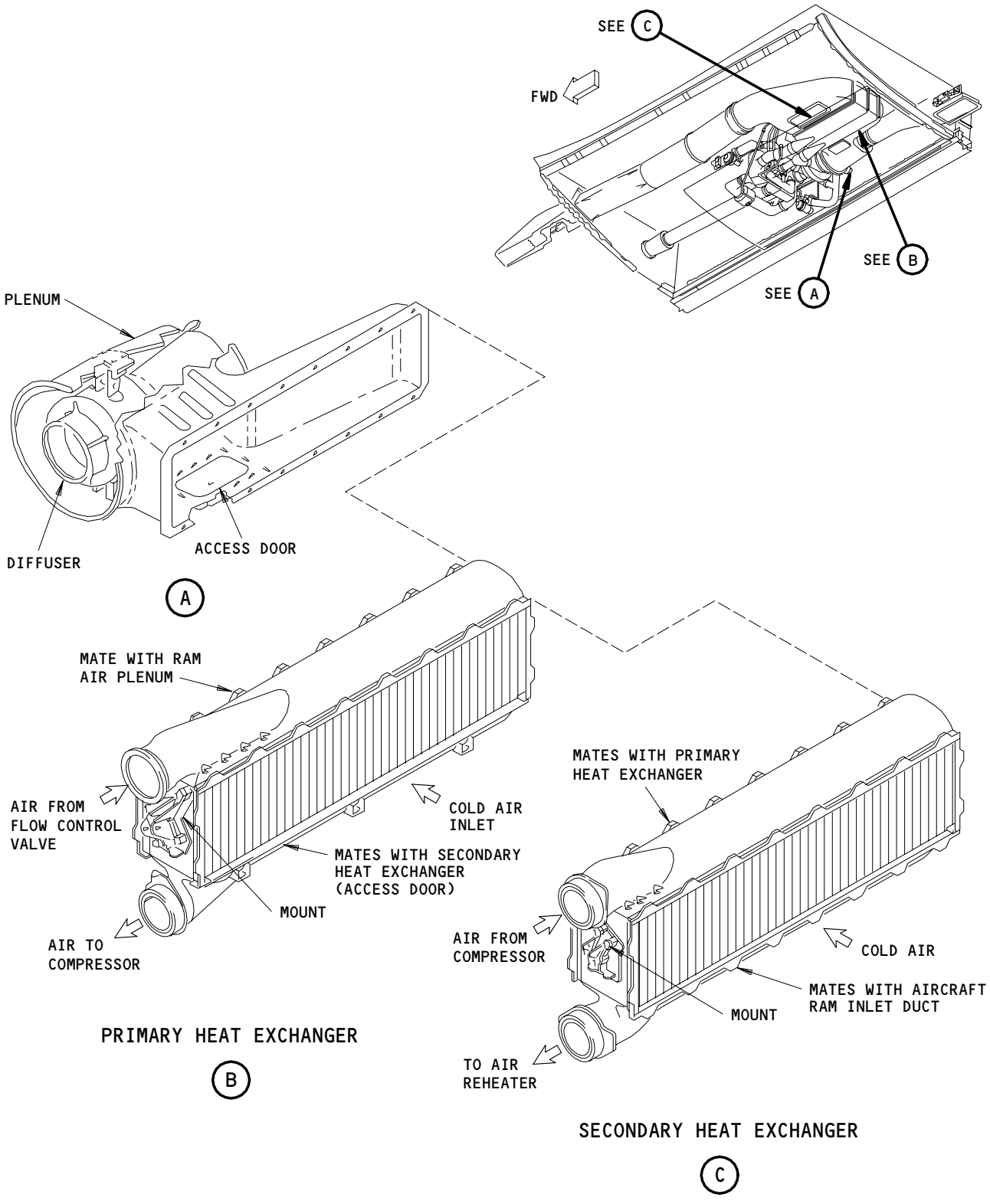
2) If a pneumatic failure occurs, the valve may be manually closed. When the cam in the mechanical manual override valve is moved to the closed position, it moves the actuator rod. The actuator rod moves the ball in the ball valve assembly. When the ball is moved, it closes the bleed port to solenoid B and opens the bleed port to ambient. Thus, the air in the pneumatic actuator bleeds to ambient and the butterfly plate closes.

3) The cam must be manually moved to the open position before the valve can be operated again. The position of the cam is shown by the visual position indicator.

B. Primary Heat Exchanger (Fig. 5)

(1) Description

(a) The primary heat exchanger is a plate-fin, single-pass, cross-flow, air-to-air heat exchanger. The core, which is a plate-fin heat-transfer matrix, is brazed together as a unit. The housing assembly is welded to the core. The housing assembly has bolt holes to connect the primary heat exchanger to the secondary heat exchanger and the plenum/ diffuser assembly. All the parts of the heat exchanger are made of aluminum alloys.



Heat Exchangers and Plenum/Diffuser Assembly
Figure 5

(2) Function

(a) Hot air from the flow-control-and-shutoff valve enters the top of the primary heat exchanger. It flows first to the aft end of the heat exchanger. Then it flows forward, through some of S-turns, to the heat exchanger outlet. Cold air flows at a right angle to the hot air. The air temperatures change as the heat transmits through the thin plate fins.

(b) An access door on each side of the heat exchanger supplies an access to clean it.

C. Secondary Heat Exchanger (Fig. 5)

(1) The secondary heat exchanger is almost the same as the primary heat exchanger. One difference is that the secondary heat exchanger is wider. Also, it has a heavy fin on the cold air inlet side, to prevent damage from hail. Hot air for the secondary heat exchanger comes from the compressor outlet on the air cycle machine.

D. Plenum/Diffuser Assembly (Fig. 5)

(1) Description

(a) The plenum/diffuser assembly has two main parts; the plenum and the diffuser. The diffuser, which is the inner part, is made of aluminum alloy and some insulation. The fan in the air cycle machine and a space around the fan are in the diffuser. The plenum, which is the outer part, is made of fiberglass. An access door in the plenum supplies access to clean the primary heat exchanger.

(2) Function

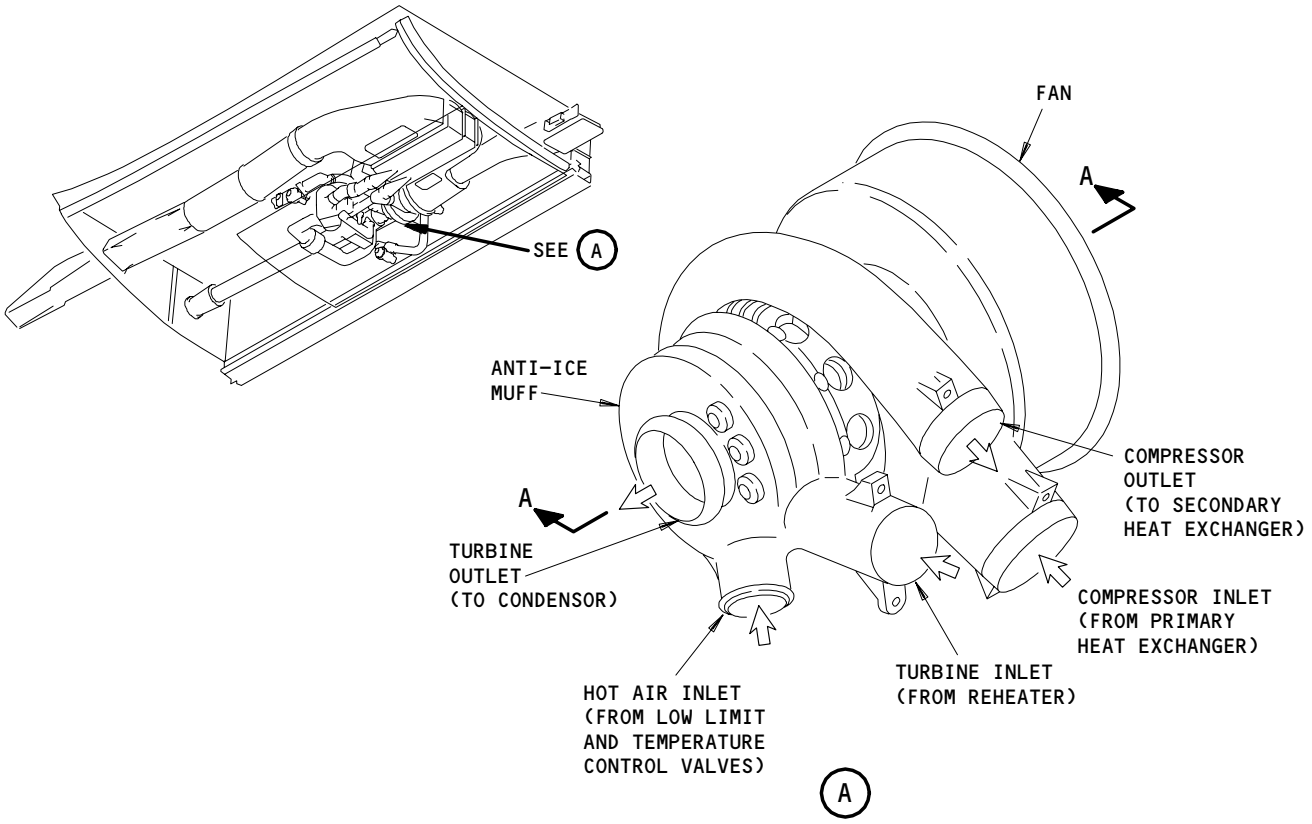
(a) The plenum/diffuser assembly connects the air cycle machine, the primary heat exchanger, and the ram air outlet duct. It lets air flow from the primary heat exchanger outlet to the ram air outlet door. The plenum makes the air from the primary-heat-exchanger outlet flow to the diffuser inlet. The air-cycle-machine fan blows air through the diffuser to the ram air exhaust duct. The space around the fan, when necessary, lets more air flow through the diffuser. The plenum and the space are made so that air cannot recirculate back into the plenum.

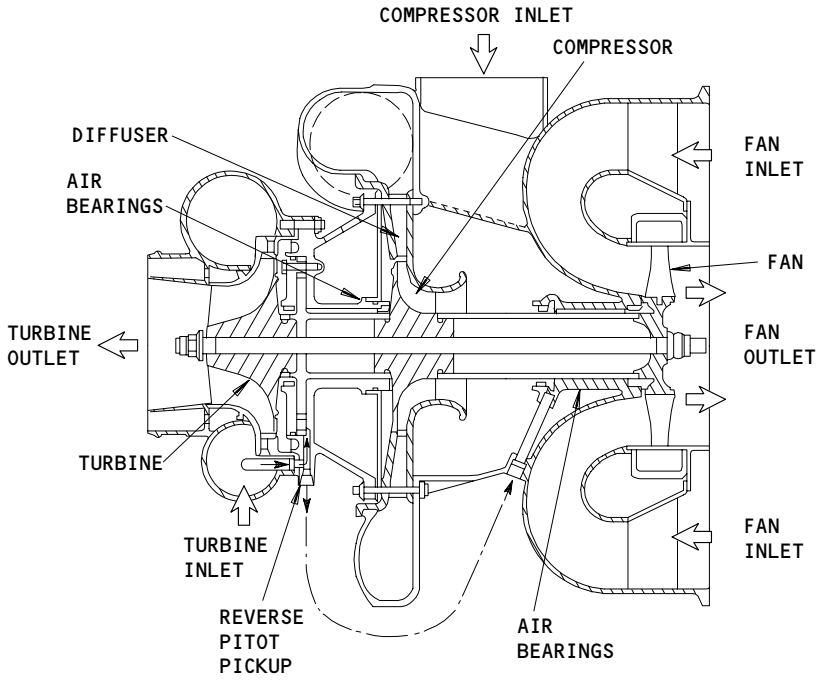
E. Air Cycle Machine (Fig. 6)

(1) Description

(a) The air cycle machine is divided into three parts; a fan, a compressor, and a turbine. Each part has a different impeller. There is a compressor impeller, a radial-inflow turbine impeller, and an axial-flow fan impeller. All three impellers are attached to the same shaft.

(b) The shaft is held in its position by three air bearings. A double-acting thrust air bearing controls the axial loads of the shaft. It is between the turbine and the compressor. Two journal air bearings control the radial loads of the shaft. One is between the turbine and the compressor. The other is between the compressor and the fan. Maintenance of the air bearings is not neccesary. Air is supplied by the turbine inlet assembly to pressurize and to decrease the temperature of the bearings.





A-A

Air Cycle Machine
Figure 6

(c) Each part of the air cycle machine has its own air inlet and outlet. The turbine also has an extra inlet and three tubes connected to it.

(2) Function

(a) The air-cycle-machine fan is used to draw air through the primary and secondary heat exchangers. When the airplane is in flight, air flows through the heat exchangers because the ram air inlet door is open. When the airplane is not in flight, air will only flow through the heat exchangers when the fan pulls it through.

(b) The air-cycle-machine compressor increases the temperature and the pressure of air from the primary heat exchanger. The outlet from the compressor flows through a water-removal process. The water is removed more easily because of the high air pressure.

(c) The air-cycle-machine turbine causes the shaft to turn. The turbine decreases the temperature and the pressure of the air. The low temperature at the turbine outlet may cause ice on the turbine outlet. To prevent ice or to decrease the air temperature in the cooling pack, hot air is supplied to the turbine outlet. The supply of hot air is controlled by the low-limit-control valve and the temperature control valve.

(d) One of the tubes connected to the turbine also supplies hot air from the compressor outlet. The second tube supplies the turbine outlet pressure to the low limit control valve. The third tube supplies cold air to the water extractor inlet.

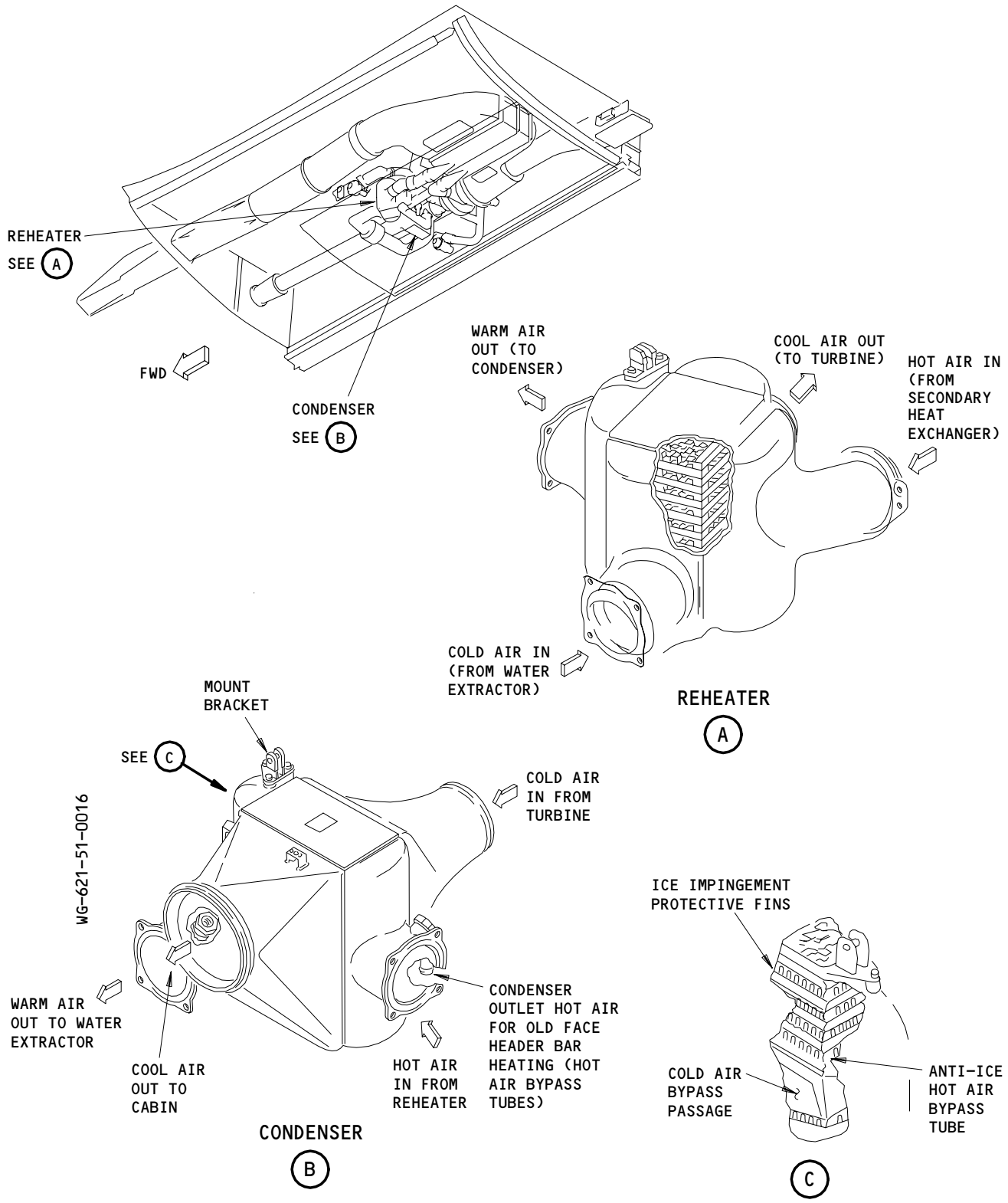
F. Reheater (Fig. 7)

(1) Description

(a) The reheater is a plate-fin, single-pass, cross-flow, air-to-air heat exchanger. The plate-fins are at right angles to each other. The core, which is a plate-fin heat transfer matrix, is brazed together as a unit. The housing assembly is welded to the core. All the parts of the reheater are made of aluminum alloys.

(2) Function

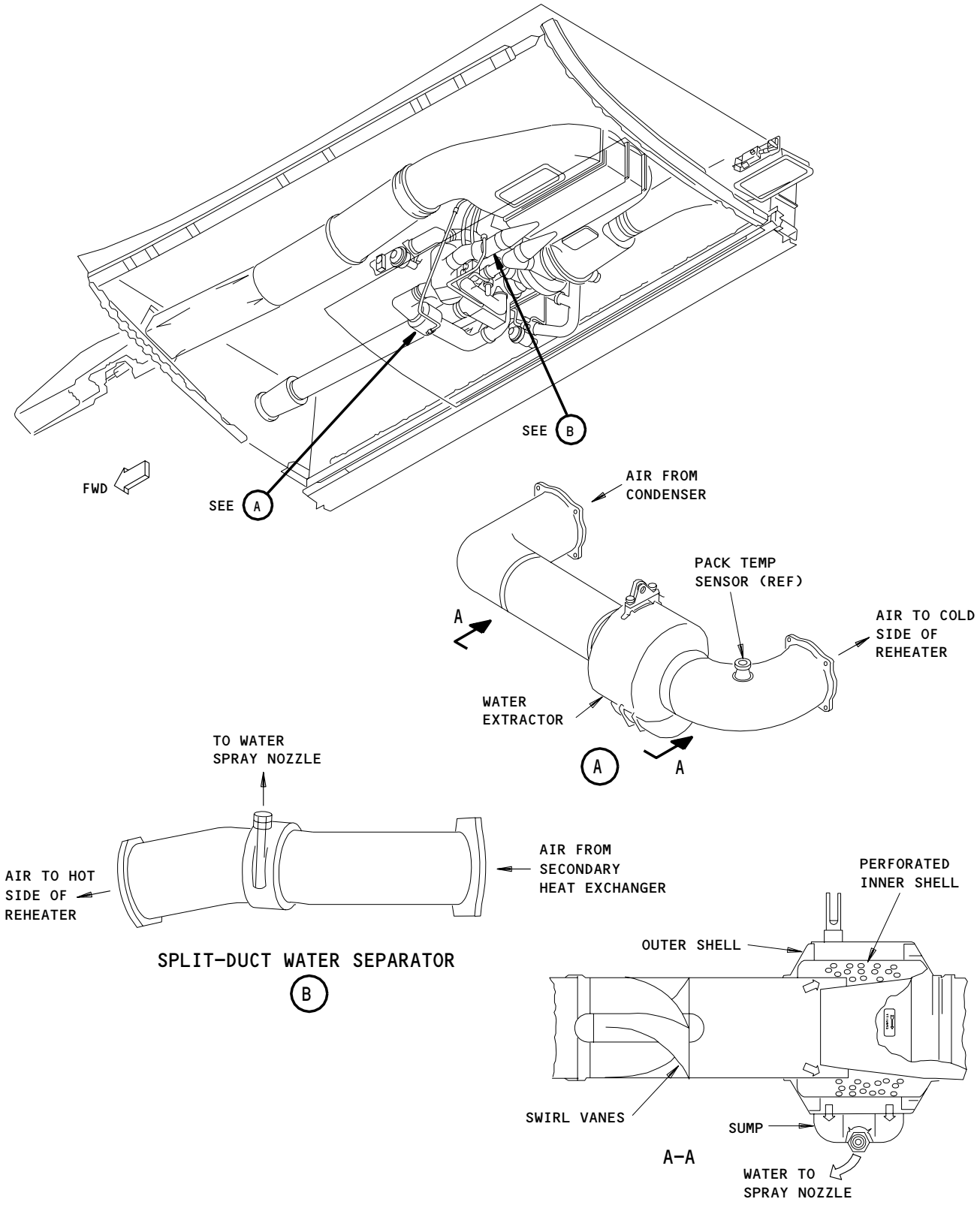
(a) The reheater decreases the air that flows from the secondary heat exchanger to the condensor. It also increases the temperature of the air that flows from the water extractor to the turbine. The temperatures are changed in the reheater as the heat of the air is transmitted through the thin plate-fins.



Reheater and Condenser
Figure 7

G. Condenser (Fig. 7)
  (1) Description
    (a) The condenser is a plate-fin, single-pass, cross-flow, air-to-air heat exchanger. The core has two heat transfer matrices, which are separated by a space. The cold air side of the core also has tubes of hot air. Each heat transfer matrix is brazed together as a unit. The housing assembly has two inlets and two outlets. It also has two tubes connected to it. The housing assembly is welded to the core. All the parts of the condensor are made of aluminum alloys.
  (2) Function
    (a) The condensor changes the temperature of two supplies of air. The heat of the air supplies is transmitted through the thin plate-fins.
      1) The temperature of the air that flows from the reheater to the water extractor is decreased. This causes the water in the air to condense so it can be easily removed in the water extractor.
      2) The temperature of the air that flows from the turbine outlet to the pack outlet is increased. This causes the air to be above the temperature that would make ice.
    (b) One of the tubes is connected to the hot air inlet of the condensor. The tube supplies hot air from the compressor outlet to the hot air tubes on the cold air side of the condensor. The hot air tubes prevent ice on the cold air inlet of the condensor.
    (c) The other tube is connected to the cold air outlet of the condensor. This tube supplies air pressure to the low-limit-control valve.

H. Water Extractor (Fig. 8)
  (1) Description
    (a) The water extractor has two main parts; the inlet duct and the collector. The inlet duct has a set of helical vanes, brazed to the inner wall of the duct. The helical vanes do not move. The collector has a perforated inner shell, an outer shell, and a sump. The collector isolates the water from the air and collects the water in the sump. Two tubes are connected to the outer shell. A drain tube is connected to the sump. All of the parts of the water extractor are made of aluminum alloys.



Water Extractor
Figure 8

(2) Function

(a) The air from the condensor has many small droplets of water. As the air flows into the water extractor, the helical vanes cause the air to turn. As the air turns, the centrifugal force pushes the water out to the duct wall (the water is pushed farther out than the air because the water is heavier). In the collector part of the water extractor, the inner shell isolates the air/water near the duct wall. The air can flow through the perforations in the inner shell, but the water cannot. Thus, the water flows through the outer shell and into the sump.

(b) The water in the sump then flows to the water spray nozzle of the ram air cooling system. If the sump becomes full, the water flows overboard through one of the ports to the outer shell. The other port connected to the outer shell supplies water to the sump from the split-duct water separator.

I. Split-Duct Water Separator (Fig. 8)

(1) The split-duct water separator removes water from the air that flows from the secondary heat exchanger to the reheater. The water that collects in the split-duct water separator is supplied to the sump in the water extractor.

J. Low Limit Control Valve (Fig. 9)

(1) The low-limit-control valve controls the flow of hot air from the primary heat exchanger inlet to the air-cycle-machine turbine outlet. Air that flows through the low limit valve does not go through the air cycle machine. This air is used to prevent ice in the turbine outlet and to prevent an overheat condition of the air cycle machine.

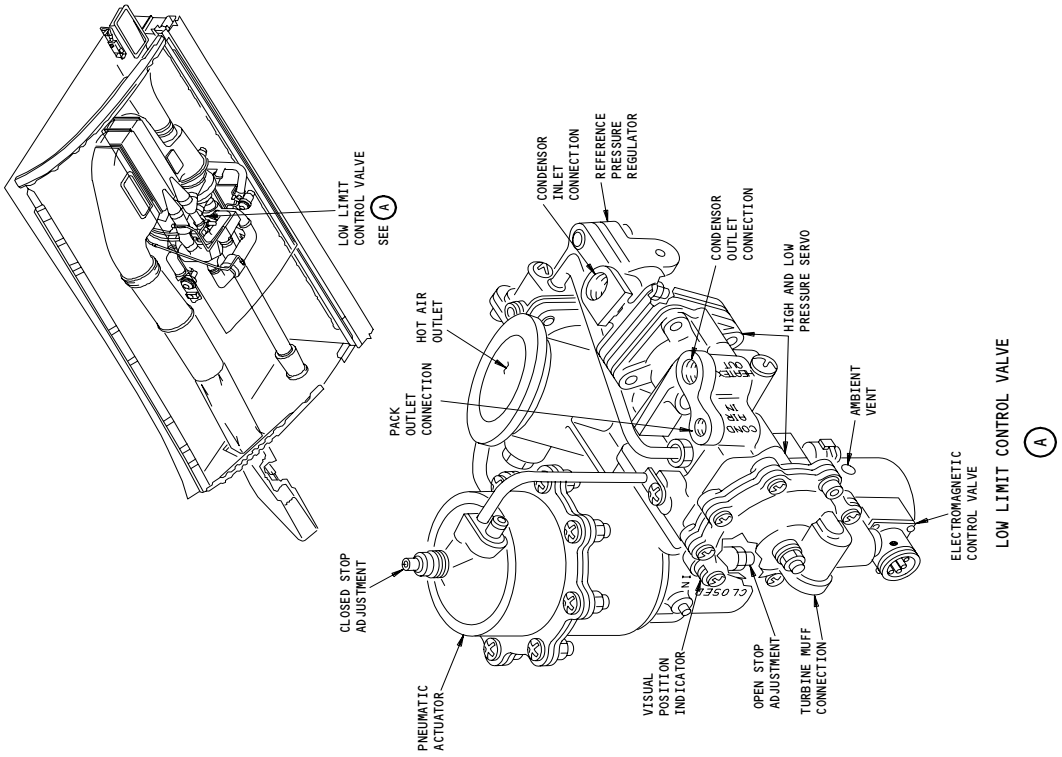
(2) The low-limit-control valve is a 2-inch diameter, pneumatically-control, butterfly valve. It has two differential pressure servo assemblies, an electromagnetic control valve, a pneumatic actuator, a reference pressure regulator, a valve flow section, and a valve position indicator.

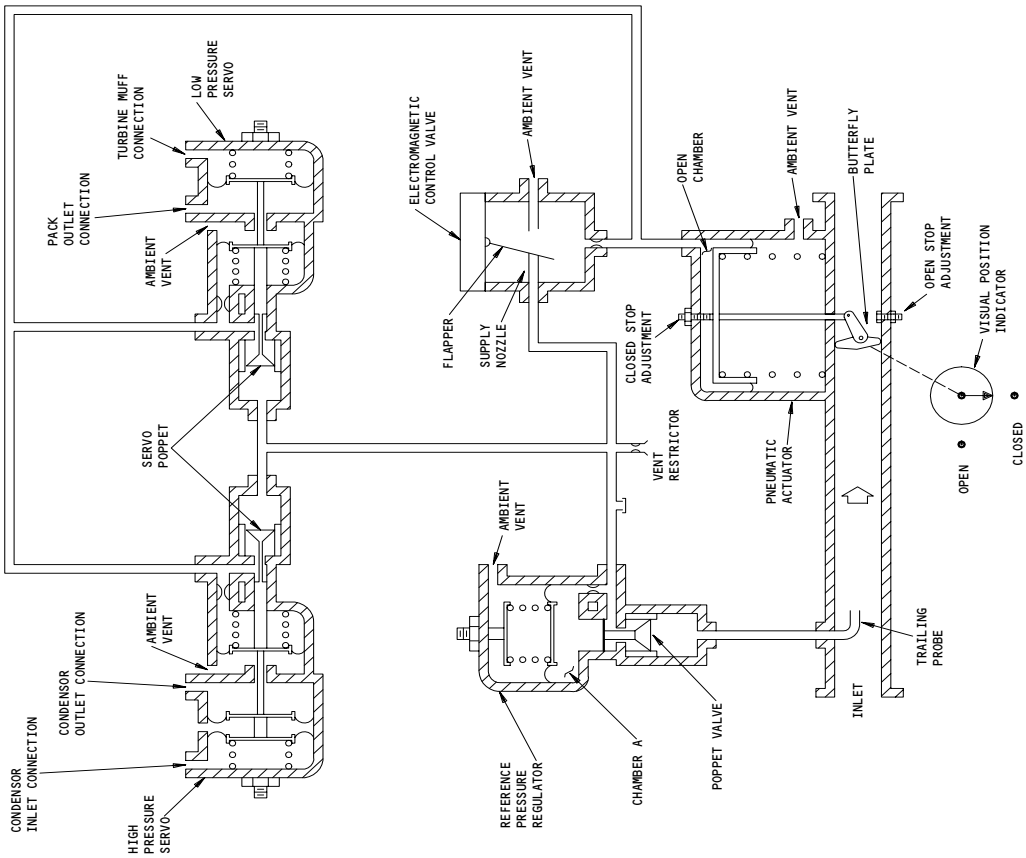
(3) Description

(a) The high differential pressure servo assembly

1) The high differential pressure servo assembly is divided into three parts; the poppet valve assembly, the pressure regulator assembly, and the air inlet assembly. The three parts are connected by an actuator rod.

a) The poppet valve assembly has a valve and a valve seat. The valve is attached to the actuator rod. The poppet valve assembly bleeds to the vent restrictor connection and the pressure regulator assembly.





Low Limit Control Valve
Figure 9

b) The pressure regulator assembly has a diaphragm, a spring, and two other bleed ports. The diaphragm is attached to the actuator rod. The diaphragm divides the pressure regulator assembly into two chambers. One chamber bleeds to ambient. The other chamber, which has the spring, bleeds to the pneumatic actuator.

c) The air inlet assembly has two tube connections, two diaphragms, and a spring. The diaphragms, which are attached to the actuator rod, divide the air inlet assembly into three chambers. One chamber, which has the spring, bleeds to the condensor inlet tube. The middle chamber bleeds to ambient. The third chamber bleeds to the condensor outlet tube.

(b) The low pressure differential servo assembly

1) The low-pressure-differential-servo assembly is almost the same as the high-differential-pressure-servo assembly. The only difference is that the middle chamber of the air inlet assembly is not installed. Also, the air inlet assembly bleeds to the turbine muff and to the pack outlet.

(c) Electro-magnetic-control valve

1) The electro-magnetic-control valve has a torque motor, a flapper, a supply nozzle port, a control nozzle port, and a outlet port. The supply nozzle port bleeds to the vent connection. The control nozzle port bleeds to ambient. The outlet port bleeds to the pneumatic actuator. When the torque motor is off, the flapper pushes against the supply nozzle port. When the torque motor is energized, it moves the flapper against the control nozzle port. Thus, the supply nozzle port will open and the control nozzle port will close.

(d) Reference Pressure Regulator

1) The reference pressure regulator has a regulator diaphragm, a poppet valve, and an adjustment. The regulator diaphragm divides the reference pressure regulator into two chambers. One chamber, with the spring and the adjustment, bleeds to ambient. The other chamber bleeds to the vent connection and the poppet valve. The poppet valve bleeds to the inlet-pressure-sensing probe.

(e) Pneumatic Actuator

1) The pneumatic actuator is the mechanism that controls the butterfly plate in the valve flow section. The pneumatic actuator has an actuator housing assembly and an actuator linkage assembly.

2) The actuator housing includes an actuator diaphram that divides the pneumatic actuator into two chambers. The open chamber bleeds to the electro-magnetic-control valve and the two differntial-pressure-servo assemblies. The other chamber, with the spring, bleeds to ambient. The closed stop adjustment controls how far the spring can push the diaphragm.

3) The actuator linkage assembly has an actuator arm and a connecting link. They connect the diaphragm to the butterfly shaft. Movement of the actuator diaphragm causes the butterfly shaft to turn.

(f) The Valve Flow Section

1) The valve flow section is a 2-inch diameter straight tube. It has the inlet pressure sensing probe, the butterfly plate, the butterfly shaft, and the open stop adjustment. The butterfly plate has a ring that seals against the valve body when the butterfly plate is closed. The butterfly plate is bolted to the butterfly shaft. The butterfly shaft turns on two annular ball bearings in the valve body. The open stop adjustment controls how far the butterfly plate can turn.

(g) The Visual Position Indicator

1) The visual position indicator is a red groove on the end of the butterfly shaft. As the butterfly shaft turns, the groove moves to the words OPEN or CLOSED, on the outside of the pneumatic actuator housing assembly.

(4) Function

(a) The position of the low-limit-control valve is controlled by the pneumatic actuator. When the pressure of air in the open chamber of the pneumatic actuator is sufficient, the low-limit-control valve opens. The pressure of air comes from the inlet-pressure-sensing probe. The amount of air that flows from the inlet-pressure-sensing probe to the open chamber controls the position of the low-limit-control valve.

(b) The reference pressure regulator keeps a constant air pressure at the vent connection. When the poppet valve is open, air from the inlet-pressure-sensing probe flows into chamber A or to the vent connection. As the inlet pressure increases, the pressure in chamber A increases until the regulator poppet valve closes. The air in chamber A slowly flows through the restrictor in the vent connection, and the regulator poppet valve opens again.

(c) The vent connection is connected to the high and low-differential-pressure-servo assemblies, the electro-magnetic-control valve, the reference pressure regulator, and to ambient.

(d) Ice in the condensor causes one of the servo assemblies to open when it blocks the air that flows through the condensor. Thus, the pressure upstream of the ice increases and the pressure downstream of the ice decreases. The pressures upstream and downstream of the ice are transmitted to the inlet chambers of the servo assemblies. If the upstream pressure is sufficient, it pushs the actuator rod and open the poppet valve. Thus, air flows from the vent connection, through the poppet valve, to the open chamber of the pneumatic actuator. This causes the low-limit-control valve to open so that hot air can flow to the turbine outlet to melt the ice.

1) The condensor inlet is the upstream pressure and the condensor outlet is the downstream pressure for the high-differential-pressure-servo assembly. The turbine outlet is the upstream pressure and the pack outlet is the downstream pressure for the low-differential-pressure-servo assembly. Ice between the upstream and the downstream pressures will cause the applicable servo assembly to open.

(e) The standby-pack-temperature controller or the applicable (left or right) automatic-pack-temperature controller supplies the electrical current to the torque motor of the electro-magnetic-control valve. The electrical current causes the torque motor to move the flapper away from the supply nozzle port. When the supply nozzle port is open, air flows from the vent connection to the open chamber of the pneumatic actuator. Thus, the low-limit-control valve opens to let air flow around the air cycle machine. The smaller amount of air in the air cycle machine causes it to operate more slowly, so that the compressor outlet temperature is decreased.

K. Temperature Control Valve (Fig. 10)

(1) The temperature control valve is used to control the temperature of the air-cycle-machine-compressor outlet. To do this, it controls the amount of air that flows through the air cycle machine. If more air flows through the temperature control valve, then less air flows through the air cycle machine. The less air that flows through the air cycle machine, the slower it operates. Thus, the temperature at the compressor outlet decreases.

(2) The temperature control valve is a 3-inch diameter, electrically controlled and operated, butterfly-type valve. It has a rotary electromechanical actuator, a valve flow section, and a linear variable resistor assembly.

(3) Description

(a) The rotary electromechanical actuator controls the position of the temperature control valve. It has an electric motor, a manual override, two limit switches, a capacitor, an output shaft, and a visual position indicator.

1) The electric motor is connected to the output shaft through a reduction gear, two worm gears, the sector gear, and a slip clutch. The electric motor is a dual-coil type so it can turn the output shaft in both directions. The electric motor uses 115v ac, 400 Hz, single phase power.

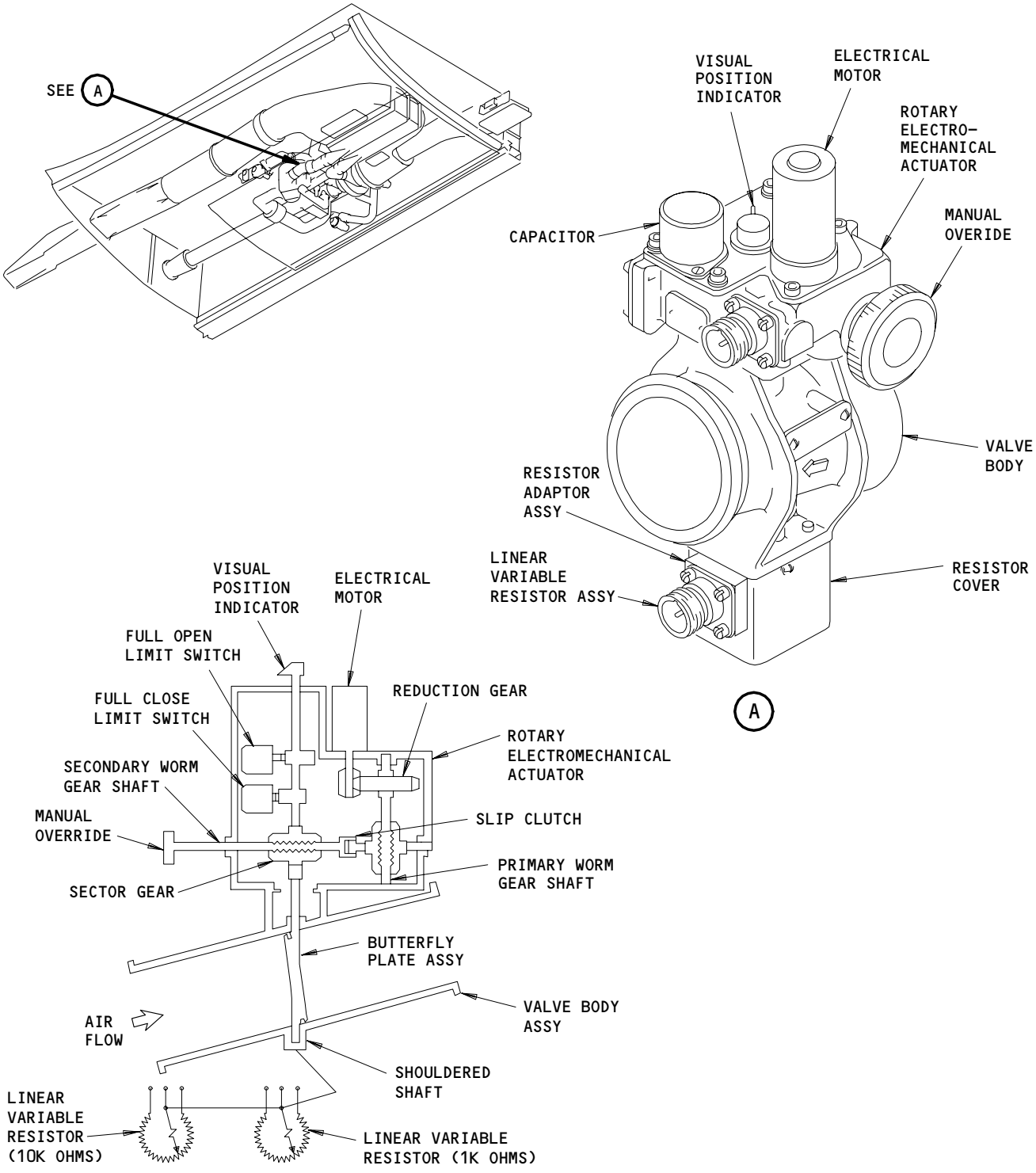
2) The manual override is connected to the output shaft by one of the worm gears and the sector gear.

3) The capacitor supplies more power to the electric motor when it starts to move.

4) The output shaft has two cams, which move the limit switches when the shaft turns.

5) The visual position indicator is a pointer attached to the end of the output shaft. As the shaft turns, the pointer moves to the words OPEN or CLOSED, on the cover of the rotary electromechanical actuator.

(b) The valve flow section has a butterfly plate, and a butterfly shaft. The butterfly plate has two piston rings to seal against the valve flow body when it closes. It is attached to the butterfly shaft by a bolt. The butterfly shaft is attached to the output shaft of the rotary actuator. The butterfly shaft turns on two annular ball bearings in the valve body.



Temperature Control Valve
Figure 10

(c) The linear variable resistor assembly has a wiper arm, a 1K ohm linear variable resistor, and a 10K ohm linear variable resistor. The wiper arm is attached to the butterfly shaft.

(4) Function

(a) When power is supplied to the electric motor, it turns the gears, which turns the output shaft. The output shaft turns the butterfly shaft. The butterfly shaft turns the butterfly plate, the visual position indicator, and the wiper arm of the linear variable resistor assembly. The 1K ohm resistor supplies a position signal to the EICAS computers. The 10K ohm resistor supplies a position signal to the automatic pack temperature controller.

(b) When the butterfly plate is in the full open or the full closed position, the cams on the output shaft will close the applicable limit switch. When the limit switch is closed, it sends a position signal to the automatic-pack-temperature controller. Then the automatic-pack-temperature controller stops the supply of power to the temperature control valve.

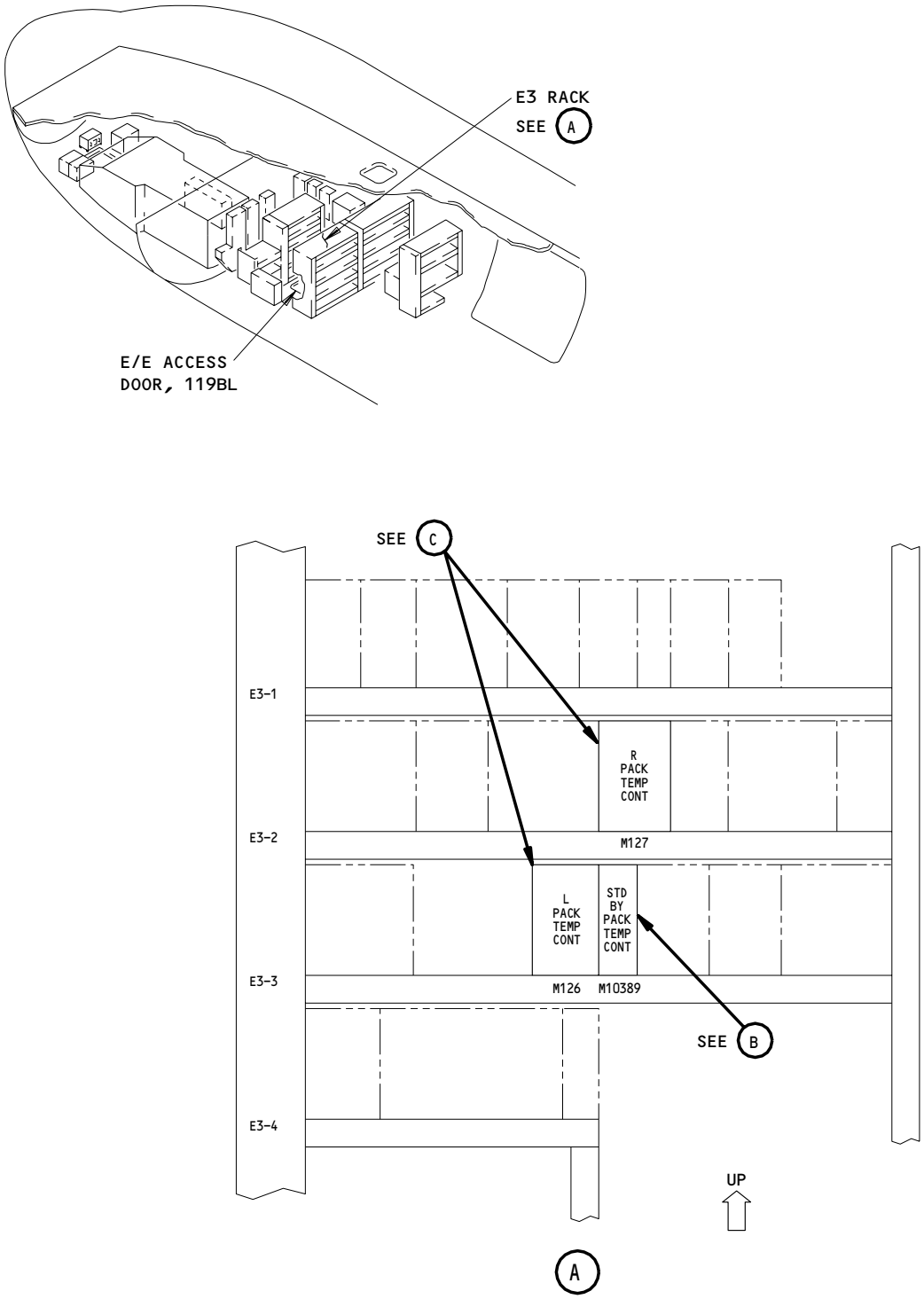
(c) If the supply of power is stopped, the slip clutch holds the butterfly plate in its last set position. If power is supplied again, the butterfly plate can turn again.

(d) The valve can open or close manually. When the manual override knob is turned, the clutch lets the output shaft turn. Again, the clutch holds the butterfly plate in the set position.

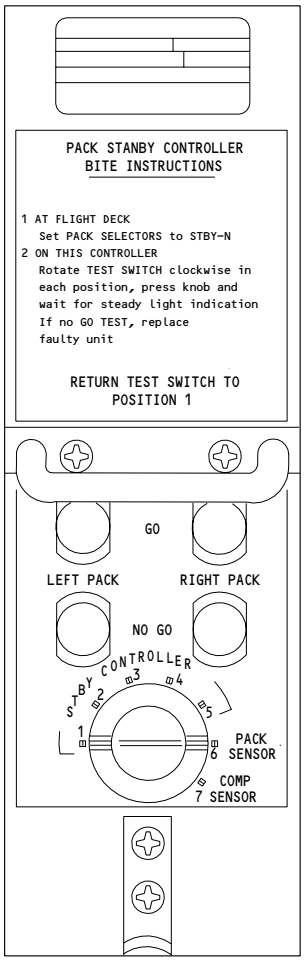
L. Automatic-Pack-Temperature Controller (Fig. 10A)

(1) Two interchangeable automatic-pack-temperature controllers are used to control the air cooling packs. One controls the right cooling pack system and the other controls the left cooling pack system. The automatic-pack-temperature controller is a box that has a microprocessor. The microprocessor controls the air-cooling-pack-outlet temperature and monitors the system for failures. The front panel of the controller has lamps to show if a failure occurs. The front panel also has switches and instructions to do the built-in test equipment (BITE).

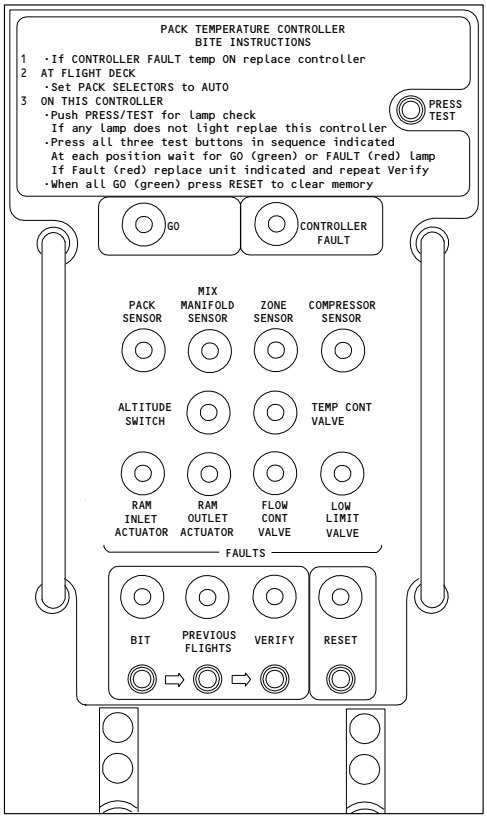
(2) The automatic pack temperature controllers are in the E3 rack of the main equipment center.



Pack Temperature Controllers
Figure 10A (Sheet 1)



B



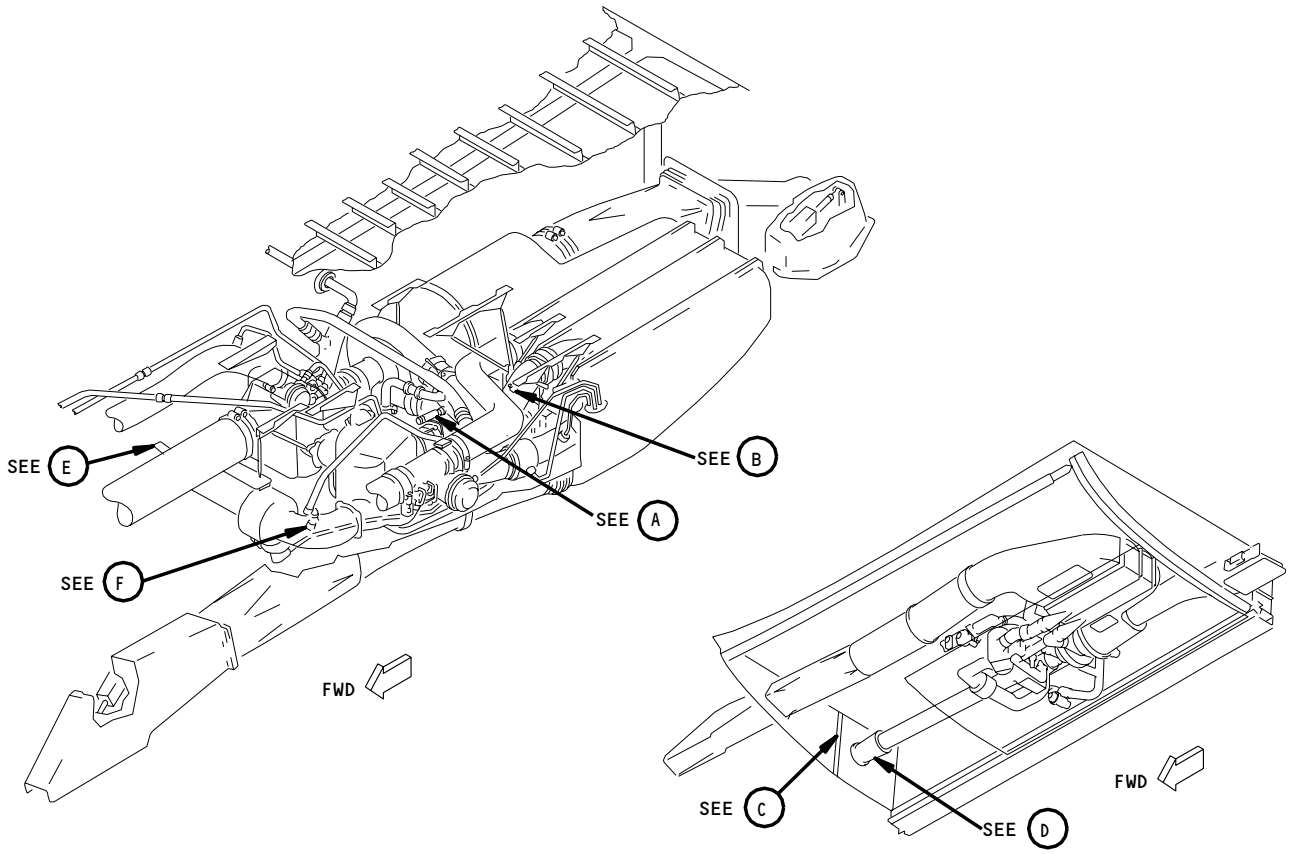
C

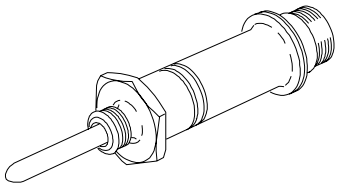
Pack Temperature Controllers
Figure 10A (Sheet 2)

(3) Each automatic-pack-temperature controller controls these components for each air cooling pack:
(a) The temperature control valve
(b) The ram-air-inlet-door and the ram-air-exhaust-door actuators of the ram-air-cooling system (Ref 21-53-00)
(c) The torque motor of the flow-control-and-shutoff valve
(d) The low-limit-control valve, when the system is not in the STBY-N mode.

M. Standby-Pack-Temperature Controller (Fig. 10A)
(1) The standby-pack-temperature-controller is a box which has two microprocessors. Each microprocessor controls the left or the right air cooling pack. They only operate when the applicable cooling pack system is in the STBY-N mode. The microprocessors also monitor parts of the cooling pack system for failures. The front panel of the standby pack temperature controller has lights that come on when a failure occurs. It also has switches and instructions to do BITE.
(2) In the STBY-N mode, the standby-pack-temperature controller controls the low-limit-control valve. The position of the low-limit-control valve controls how fast the air cycle machine turns. The speed of the air cycle machine controls the compressor outlet temperature and the air-cooling-pack-outlet temperature.
(3) The BITE function of the standby-pack-temperature controller monitors parts of the cooling pack system for failures. It does not store the failures. It only does a go/no-go test of the controller circuit functions and the applicable sensors.

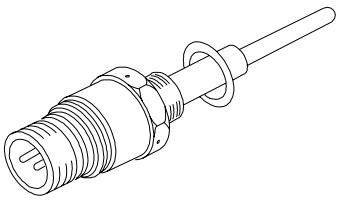
N. Pack Temperature Sensor (Fig. 11)
(1) For each air cooling pack, two pack temperature sensors supply a resistive signal of the temperature at their positions. One pack temperature sensor sends a signal to the standby-pack-temperature controller. The other pack temperature sensor sends a signal to the applicable (left or right) automatic-pack-temperature controller. The pack temperature sensors are installed on the outlet of the water extractor.
(2) Each pack temperature sensor has two series-connected glass-sealed thermisters in a stainless steel probe. The electrical resistance of the thermister changes as an inverse, non-linear function of the temperature.





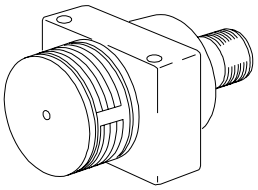
COMPRESSOR OUTLET OVERHEAT SWITCH

A



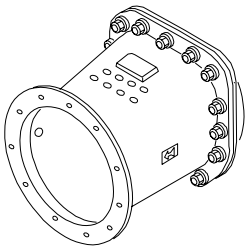
COMPRESSOR OUTLET SENSOR

B



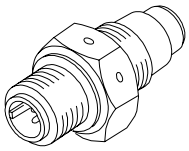
ALTITUDE SWITCH

C



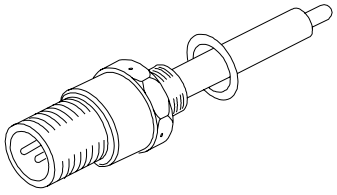
CABIN AIR SUPPLY CHECK VALVE

D



PACK OVERHEAT SWITCH

E



PACK TEMPERATURE SENSOR

F

Cooling Pack Components
Figure 11

(3) The automatic-pack-temperature controller compares the the pack demand signal (from the zone temperature controller) with the pack temperature sensor signal. The difference between the signals is the pack error. Then it uses the pack error to control the positions of the ram air door actuators and the temperature control valve. The standby-pack-temperature controller compares the pack temperature sensor signal to a value of 40°F (4°C) to get the pack error. Then it uses the pack error to control the position of the low-limit-control valve.

O. Altitude Switches (Fig. 11)

(1) Each altitude switch sends a signal to the applicable (left or right) automatic pack temperature controllers. The controllers change the minimum temperature limits of the air cooling packs to make allowance for the altitude. The switches are installed in the forward end of the left ECS bay, to the left of the cabin air supply check valve.

(2) The altitude switch is a pressure sensing aneroid with a single-pull double-throw electrical switch. A bleed port lets air enter the altitude switch housing assembly. As the pressure in the housing assembly decreases, the aneroid expands and pushes against the electrical switch. At an altitude of 31,000 feet, the aneroid closes the electrical switch.

(3) When the altitude switch closes, the automatic-pack-temperature controller changes the limit of the air cooling pack temperature from 35°F (1.7°C) to 0°F (-18°C). At low altitude the 35°F (1.7°C) temperature limit is used to prevent ice at the condenser and the water extractor.

P. Compressor Outlet Temperature Sensor (Fig. 11)

(1) For each air cooling pack, two compressor-outlet-temperature sensors supply a resisitive signal of the temperature at their position. One sensor sends a signal to the automatic-pack-temperature controller. The other sensor sends a signal to the standby-pack-temperature controller. The sensors are installed adjacent to each other, at the air-cycle-machine-compressor outlet.

(2) Each sensor has a platinum element which is hermetically sealed in a stainless probe. The electrical resistance of the platinum element changes as a direct and linear function of the temperature. The automatic-pack-temperature controller uses the signal to control the position of the temperature control valve. The standby pack temperature controller uses the signal to position the low-limit-control valve. The position of these two valves controls the compressor outlet temperature.

Q. Compressor Outlet Overheat Switch (Fig. 11)
   (1) In each air cooling pack, a compressor-outlet-overheat switch is installed at the air-cycle-machine-compressor outlet. The switch is a thermal protective device. When it closes, it sends a signal to the flow control card that an overheat condition has occurred. The switch closes when the temperature is greater than 490°F (254°C). The switch opens again when the temperature is less than 450°F (232°C).

R. Pack Outlet Overheat Switch (Fig. 11)
   (1) The pack-outlet-overheat switch is at the condenser outlet. The switch is a thermal protective device. When the pack outlet becomes too hot, the switch sends a signal to the flow control card. The switch closes when the temperature is greater than 190°F (88°C). The switch opens again when the temperature is less than 160°F (71°C).
   (2) The pack-outlet-overheat switch has a temperature-sensitive element with a bimetallic, snap-acting disc. As the temperature of the element increases, the metals of the disc are expanded. At a specified temperature, the disc moves suddenly to its opposite shape. This causes the switch to close.

S. Cabin Air Supply Check Valve (Fig. 11)
   (1) The cabin-air-supply-check valve prevents the flow of air from the mix manifold into the air cooling packs. The check valve has a spring, a flapper plate, and a stop. The top of the flapper plate is attached by a horizontal hinge to the inside of the check valve. The spring is installed on the hinge to push against the flapper plate. A stop is installed on the top of the check valve to limit how far the flapper can move.
   (2) When no air is in the system, the spring keeps the flapper plate closed. When the air flows from the air cooling pack to the mix manifold, it pushes the flapper plate open. The air cannot flow in the opposite direction because the flapper plate can only move in the one direction. Thus, the check valve prevents the flow of air from the mix manifold to the air cooling pack.

T. Flow Control Card (Fig. 11A)
   (1) The flow control card is in the P50 card file in the main equipment bay. The card controls the position of the flow-control-and-shutoff valve. It also controls the indications that show when an overheat condition occurs.

3. Operation

A. Functional Description (Fig. 11B, 12)

(1) The cooling pack system puts out a specified amount of air at a specified temperature. The Functional Description of the cooling pack system is divided into three parts:

(a) The Air Cooling Pack Operation tells what happens to the air as it flows through the air cooling pack.

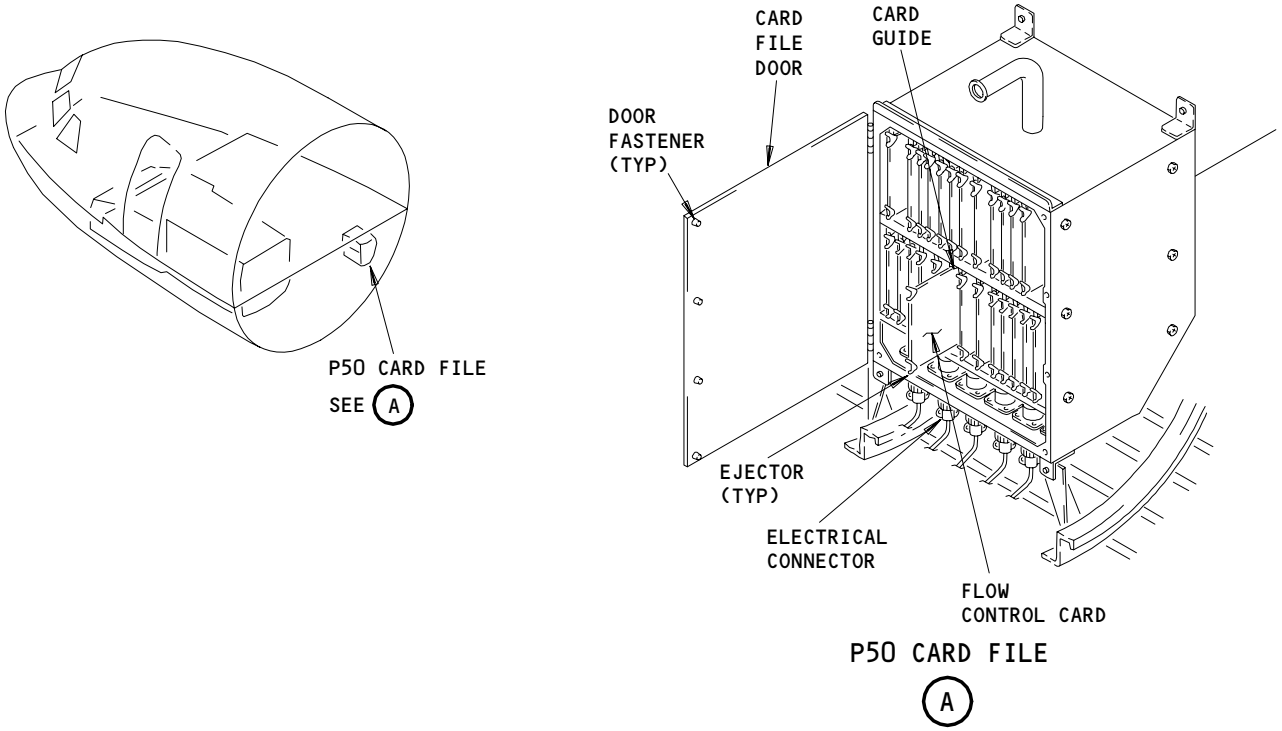
(b) The Pack Flow Control tells how the cooling pack system gets the necessary amount of air from the air cooling pack.

(c) The Pack Temperature Control tells how the cooling pack system gets the necessary air temperature from the air cooling pack.

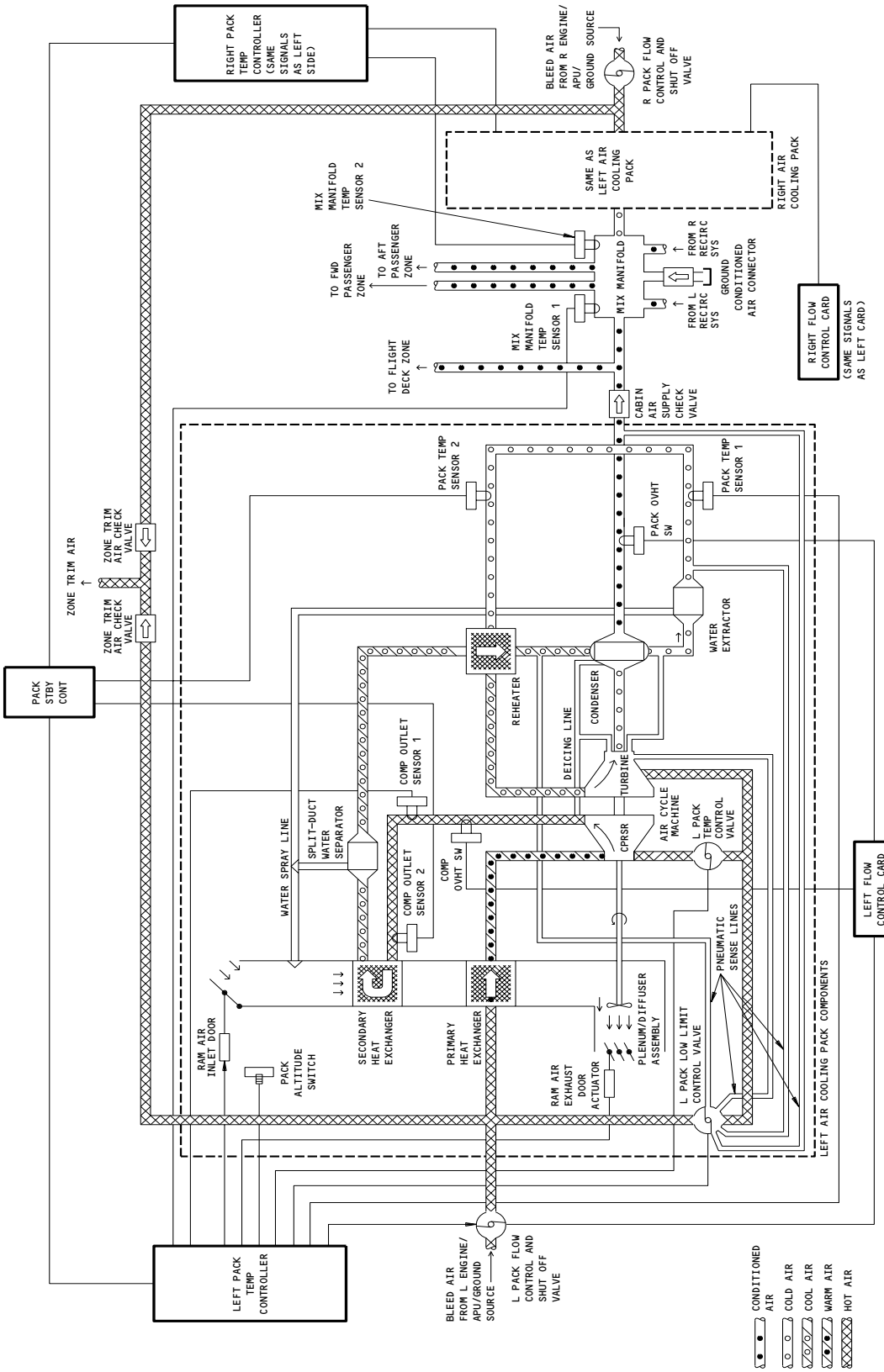
(2) The Air Cooling Pack Operation (Fig. 12)

(a) The air cooling pack is pneumatically operated. It operates only when a supply of air goes into it. The flow-control-and-shutoff valve lets air enter the air cooling pack. Thus, when the flow-control-and-shutoff valve is open, the air cooling pack is ON. When the flow-control-and-shutoff valve is closed, the air cooling pack is OFF.

(b) Air from the flow-control-and-shutoff valve first flows into the primary heat exchanger. The primary heat exchanger causes the air temperature to decrease. Then the pressure and the temperature of the air is increased as it flows through the air-cycle-machine compressor. The secondary heat exchanger again causes the air temperature to decrease.



Flow Control Card
Figure 11A



Cooling Pack System Schematic
Figure 11B

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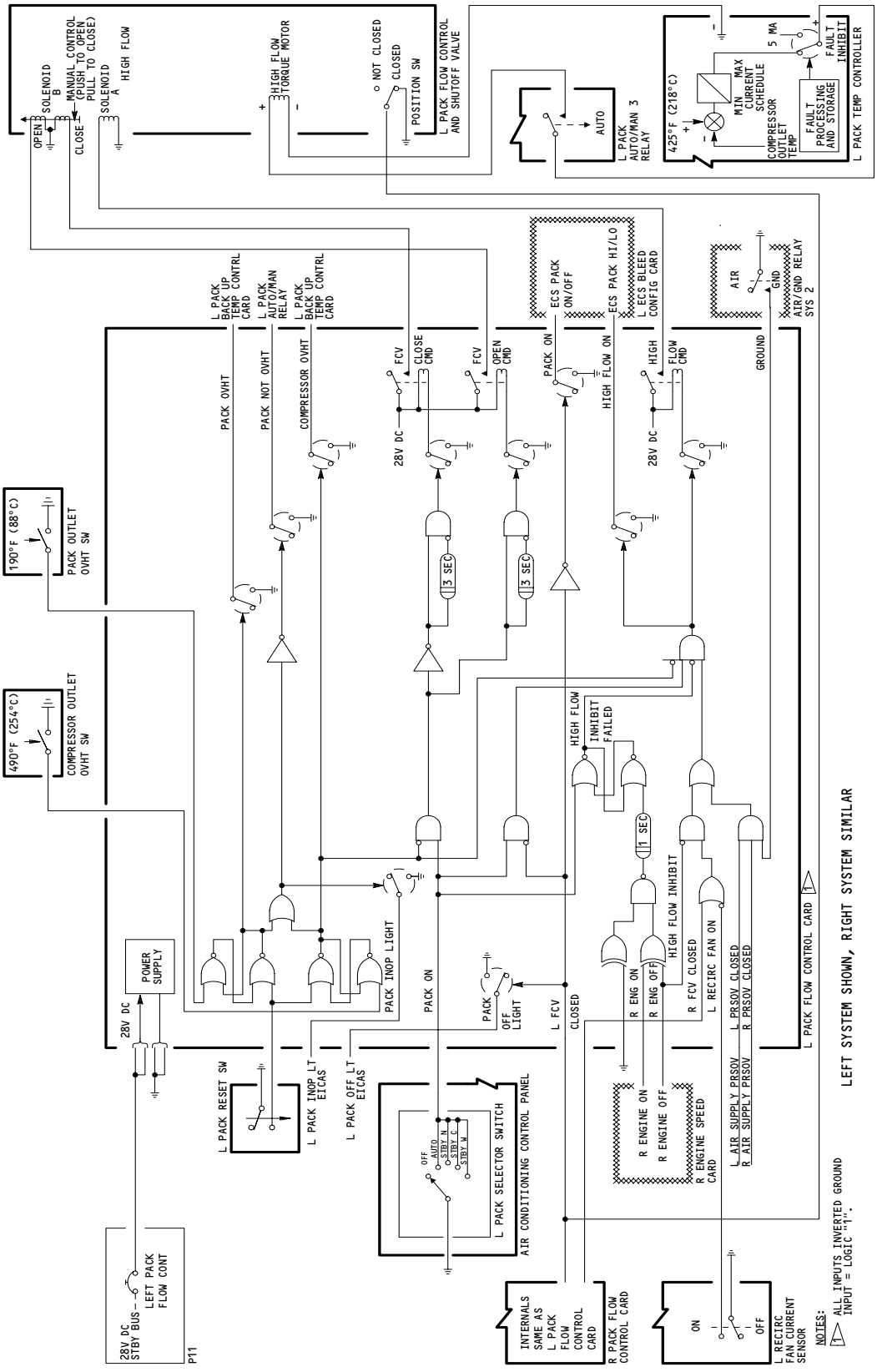


Pack Flow Control Operation Schematic
Figure 12

(c) Then the water is removed from the air. The split-duct water-separator removes an initial amount of water as the air moves from the secondary heat exchanger. Then the air flows through the reheater and the condensor, which both cause the air temperature to decrease. The low temperature of the air causes water drops. Subsequently, as the air flows through the water extractor, the water extractor removes the water. The water extractor puts the water in the ram air system or lets it flow overboard.

(d) After the water is removed from the air, the air flows the other direction through the reheater. This causes the temperature to increase before it goes into the air-cycle-machine turbine.

(e) The air-cycle-machine turbine decreases the pressure and the temperature of the air. The energy from the expanded air makes the air cycle machine operate. Subsequently, the air again flows through the condensor. This causes the air temperature to increase as it goes from the air cooling pack.

(f) The low-limit-control valve and the temperature control valve lets some of the air go around the air cycle machine. This hot air flows to the turbine outlet to prevent ice. Also, because a smaller amount of air flows through the air cycle machine, the speed of the air cycle machine decreases. This causes the compressor outlet temperature to decrease and the air-cooling-pack-outlet temperature to increase.

(g) Small amounts of air flow through the tubes in the air cooling pack. This air has special uses. Some tubes supply air to the low-limit-control valve to cause it to open or close. Some air goes from the secondary heat exchanger through a tube to get water from the water extractor. Also, some air goes from the compressor flows to the condensor and the turbine outlet to prevent ice.

(3) The Pack Flow Control

(a) The amount of air that flows through the air cooling pack is controlled by the flow control cards. Each flow control card controls one flow-control-and-shutoff valve. The flow-control-and-shutoff valves permit a controlled amount of air into each air cooling pack.

(b) The flow-control-and-shutoff valves open when the L or R PACK selector, on the pilot's overhead panel P5, is not in the OFF position. The selector sends a signal to the flow control card to open the flow-control-and-shutoff valve. The flow control card causes the flow-control-and-shutoff valves to go into the normal flow mode or the high flow mode.

(c) When the L or R PACK control selector is not in the OFF position, the flow control card supplies a momentary current of 28v dc to solenoid B of the flow-control-and-shutoff valve. This current opens solenoid B so that the valve will open pneumatically. Thus, the valve operates in the normal flow mode. When the PACK control selector is put to OFF, the flow control card supplies a momentary current of 28v dc to the close side of solenoid B. This closes solenoid B, which causes the valve to close.

(d) When the flow control card sends 28V DC power to the high flow solenoid (solenoid A), the solenoid is energized. If solenoid A and solenoid B are energized at the same time, then the valve will move to the high flow mode position.

Do the following steps to enable high flow with either the engines as the pneumatic supply or with the APU or a ground source as the pneumatic supply:

(e) With the engines providing the pneumatic supply, the flow control card automatically sends the power to enable high flow when all of these conditions occur:
1) The PACK control selector is in AUTO or STBY.
2) The opposite side engine is on.
3) An overheat condition does not occur.
4) The high flow inhibit circuit has not failed.
5) One of these conditions occurs:
a) The recirculation fan on the same side as the flow-control-and-shutoff valve is off.
b) The flow-control-and-shutoff valve for the other pack is closed.

(f) With the APU or a ground air source providing the pneumatic supply, the flow control card automatically sends the power to enable high flow when all of these conditions occur:
1) The PACK control selector is in AUTO or STBY.
2) An overheat condition does not occur.
3) The high flow inhibit circuit has not failed.
4) This condition does not occur:
a) If the airplane is on the ground, the left and right engine pressure regulating and shutoff valves (PRSOV) are closed.

(g) The high-flow-inhibit circuit fails when the engine speed card sends the "engine-on" signal and the "engine-off" signal, at the same time. To reset the flow control card after a high-flow-inhibit-circuit failure, turn the PACK control selector to OFF and then back to AUTO or STBY.

(h) A compressor overheat condition occurs when the compressor discharge temperature is more than 490°F (254°C). At 490°F (254°C), the compressor outlet overheat switch closes and sends an overheat signal to the flow control card. Also at 490°F(254°C), the compressor outlet sensor sends an overheat signal through the pack temperature controller to the flow control card. The flow control card then latches in the overheat position and causes the following conditions to occur:
1) The flow-control-and-shutoff valve closes.
2) The PACK OFF and INOP lights, on the P5 panel, come on.
3) The advisory messages L (R) PACK OFF and L (R) PACK TEMP show on the EICAS display.
4) The AUTO/MANUAL relays are not energized (this prevents control of the air cooling pack by the automatic-pack-temperature controller).
5) The backup-temperature-control card causes the air cooling pack to go to the cool mode (the ram air doors and the temperature control valve open).

(i) A pack overheat condition occurs when the pack discharge temperature is more than 190°F (88°C). At 190°F (88°C), the pack overheat switch closes and sends an overheat signal to the flow control card. The flow control card then latches in the overheat position and causes the following conditions to occur:
1) The backup temperature control card causes the pack to go the the full cold mode (the ram air doors fully open and the temperature control valve closes).
2) The AUTO/MANUAL relays are not energized (this prevents control of the air cooling pack by the automatic-pack-temperature controller).
3) The INOP light, on the P5 panel, comes on.
4) The advisory messages L (R) PACK TEMP show on the EICAS display.

(j) The air cooling packs operate as usual when the temperature switches are open and the RESET switch, on the P5 panel, is pushed.

(4) The Pack Temperature Control (Fig. 13, 14, 15, 16)

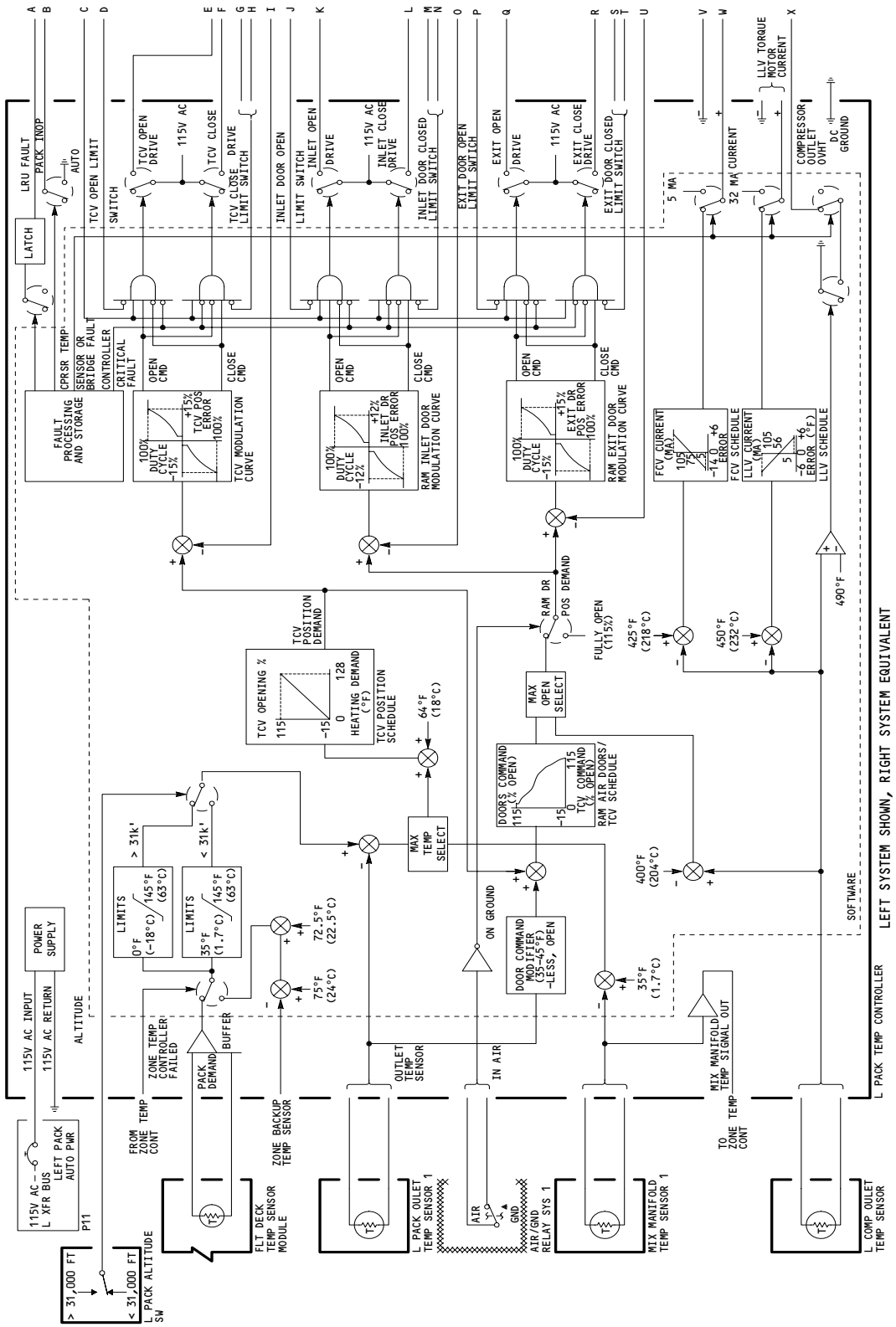
(a) The air-cooling-pack-outlet temperature is controlled by the automatic-pack-temperature controllers, the standby-pack-temperature controller, or the backup-temperature-control cards (AMM 21-53-00/001). Each component controls the air cooling packs for a different temperature mode. The temperature mode is controlled by the position of the L and R PACK selectors, on the P5 panel (the L and R PACK selectors can be in different temperature modes at the same time). The temperature modes are AUTO, STBY-N, STBY-W, STBY-C, and OFF.

(b) The AUTO mode.

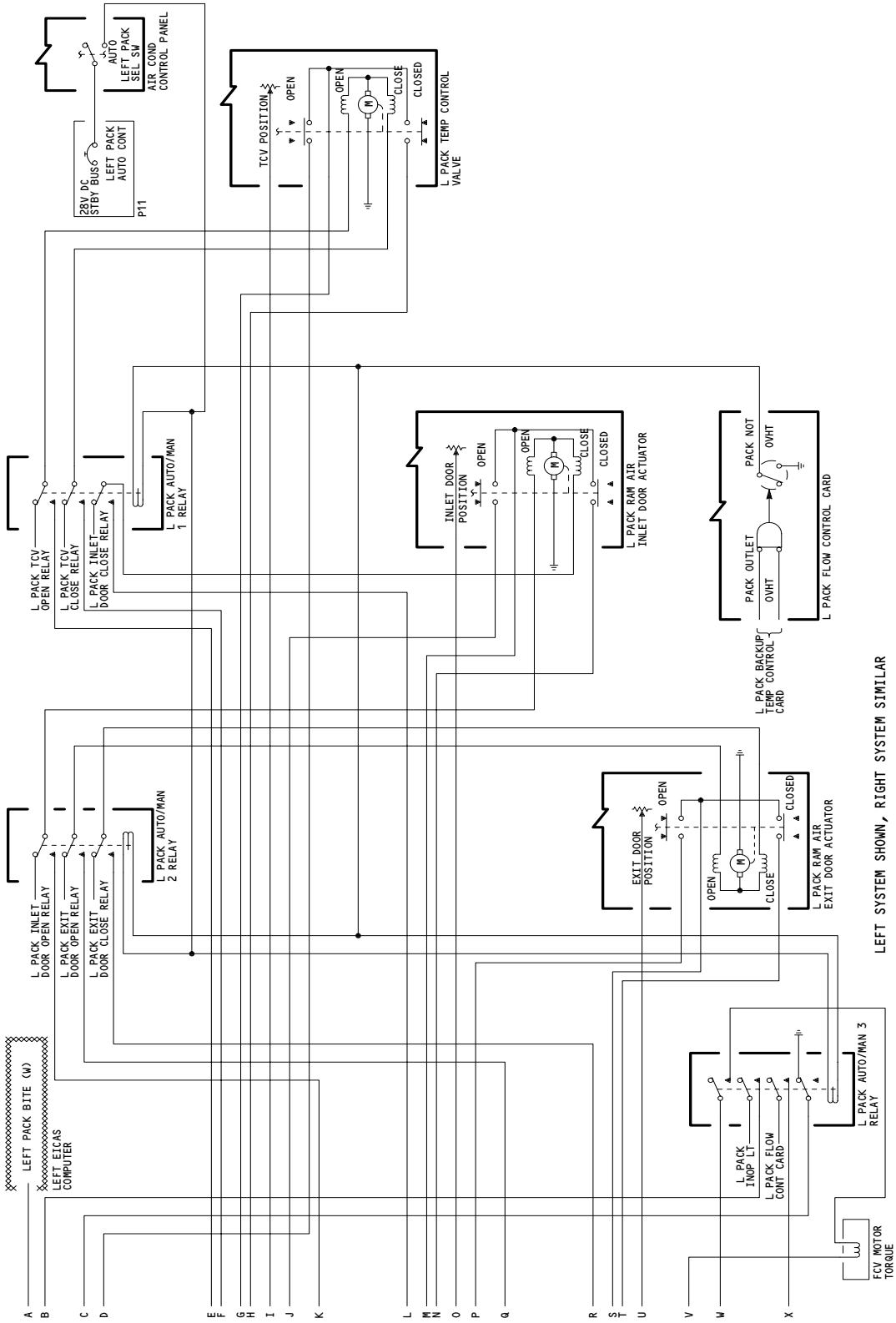
1) In the AUTO mode, the automatic-pack-temperature-controllers control the air cooling packs. 115v ac power is always supplied to each controller. When the L or R PACK selector is in AUTO, 28v dc is supplied to energize the left or right AUTO/MANUAL relays (the ground is supplied in the flow control cards when an overheat condition does not occur). The controller sends signals through the AUTO/MANUAL relays to control the position of the ram air doors and the temperature control valve. Also, because the low-limit-control valve relay is not energized, the controller can send signals to the low-limit-control valve.

2) The necessary air-cooling-pack-outlet temperature is sent as a signal to the automatic pack temperature controller by the zone temperature controller (AMM 21-61-00/001). This is the pack demand signal. The automatic-pack-temperature controller compares the pack demand signal to the pack-temperature-sensor signal. The difference between the signals causes an error. The error controls the signal that is sent to the ram air door actuators and the temperature control valve.

3) The positions of the ram air doors and the temperature control valve are controlled by a program. From the 70 percent to 100 percent cooling demand, the ram air doors are fully open and the temperature control valve is fully closed. From 70 percent to 1 percent cooling demand, the ram air doors move to closed and the temperature control valve moves to open. At 0 percent cooling demand, the ram air doors are fully closed and the temperature control valve is fully open.

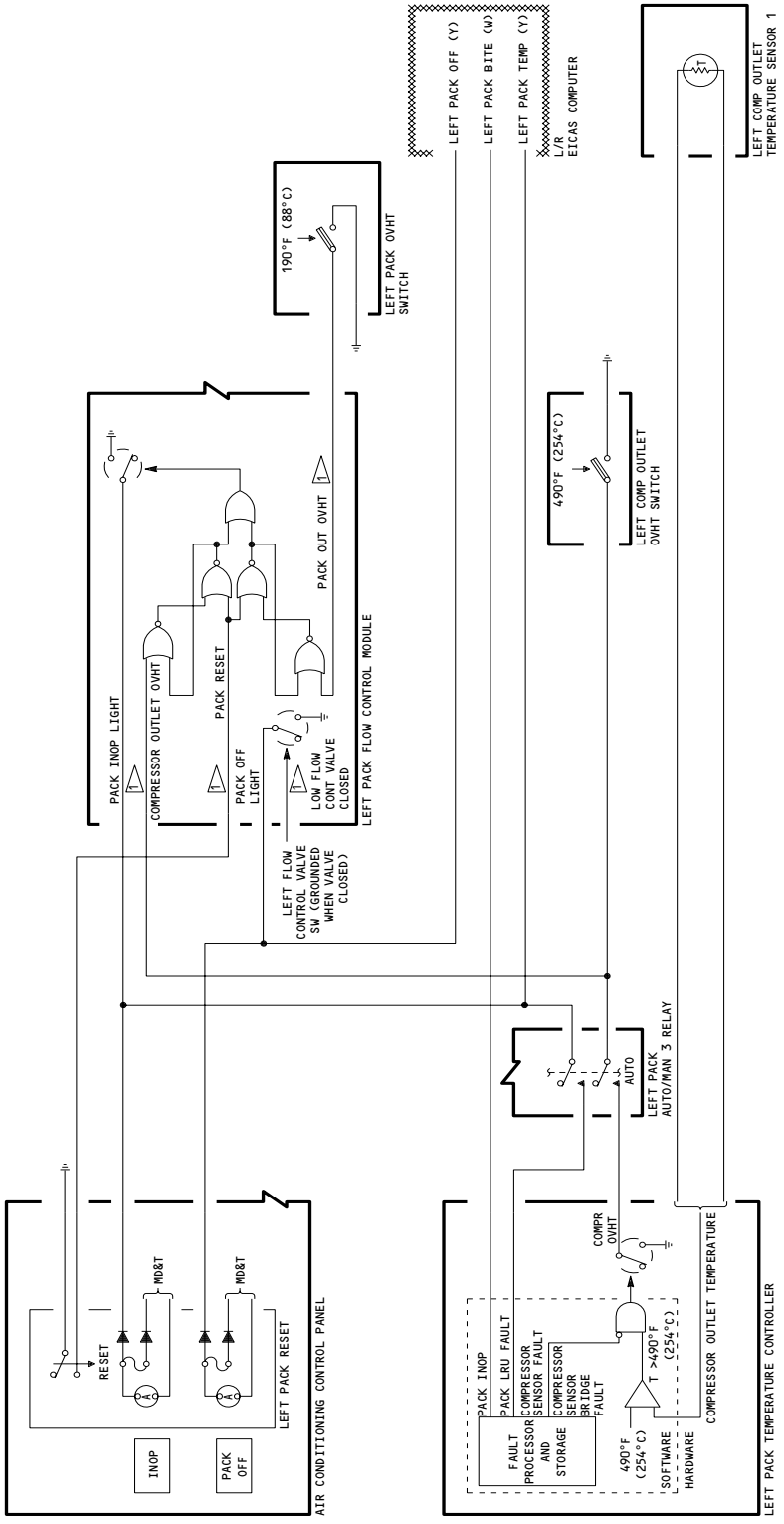


Pack Auto Control Operation
Figure 13 (Sheet 1)



LEFT SYSTEM SHOWN, RIGHT SYSTEM SIMILAR

Pack Auto Control Operation
Figure 13 (Sheet 2)



NOTES:
1. INPUT INVERTED - GROUNDED
   INPUT = LOGIC "1"

LEFT SYSTEM SHOWN, RIGHT SYSTEM SIMILAR

Pack Auto Control Protection Schematic
Figure 14

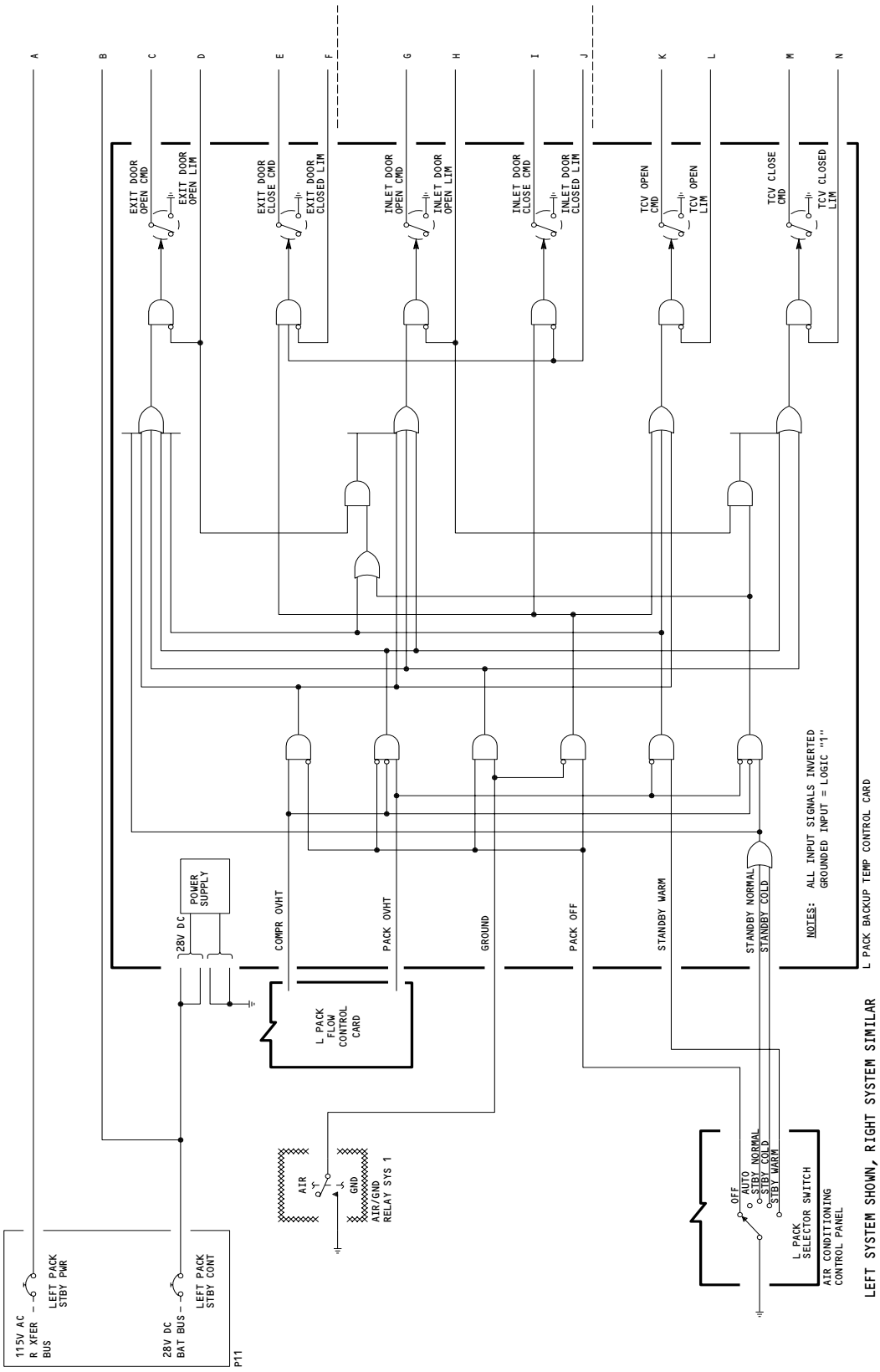
89272

4) When the airplane is on the ground, the ram air doors stay fully open. The temperature control valve position changes to control the air-cooling-pack-outlet temperature.
5) The compressor outlet temperature sensor supplies input to the controller to prevent an overheat condition. The temperature sensor sends signals at temperatures of 400°F (204°C), 425°F (218°C), 450°F (232°C), and 490°F (254°C).
   a) At 400°F (204°C), the controller causes the ram air doors to open.
   b) At 425°F (218°C), the controller decreases the current to the torque motor of the flow-control-and-shutoff valve. This causes the valve to close, if the valve is in the high flow mode.
   c) At 450°F (232°C), the controller increases current to electromagnetic control valve in the low limit valve. This opens the valve.
   d) At 490°F (254°C), controller signals the flow control card to command the flow control and shutoff valve closed.
6) The pack temperature sensor supplies input to the controller to keep the water separator temperature between 145°F (63°C) and 35°F (1.7°C) (0°F [-18°C] min above 31,000 feet). The controller changes the positions of the ram air doors and the temperature control valve to stay between these limits.

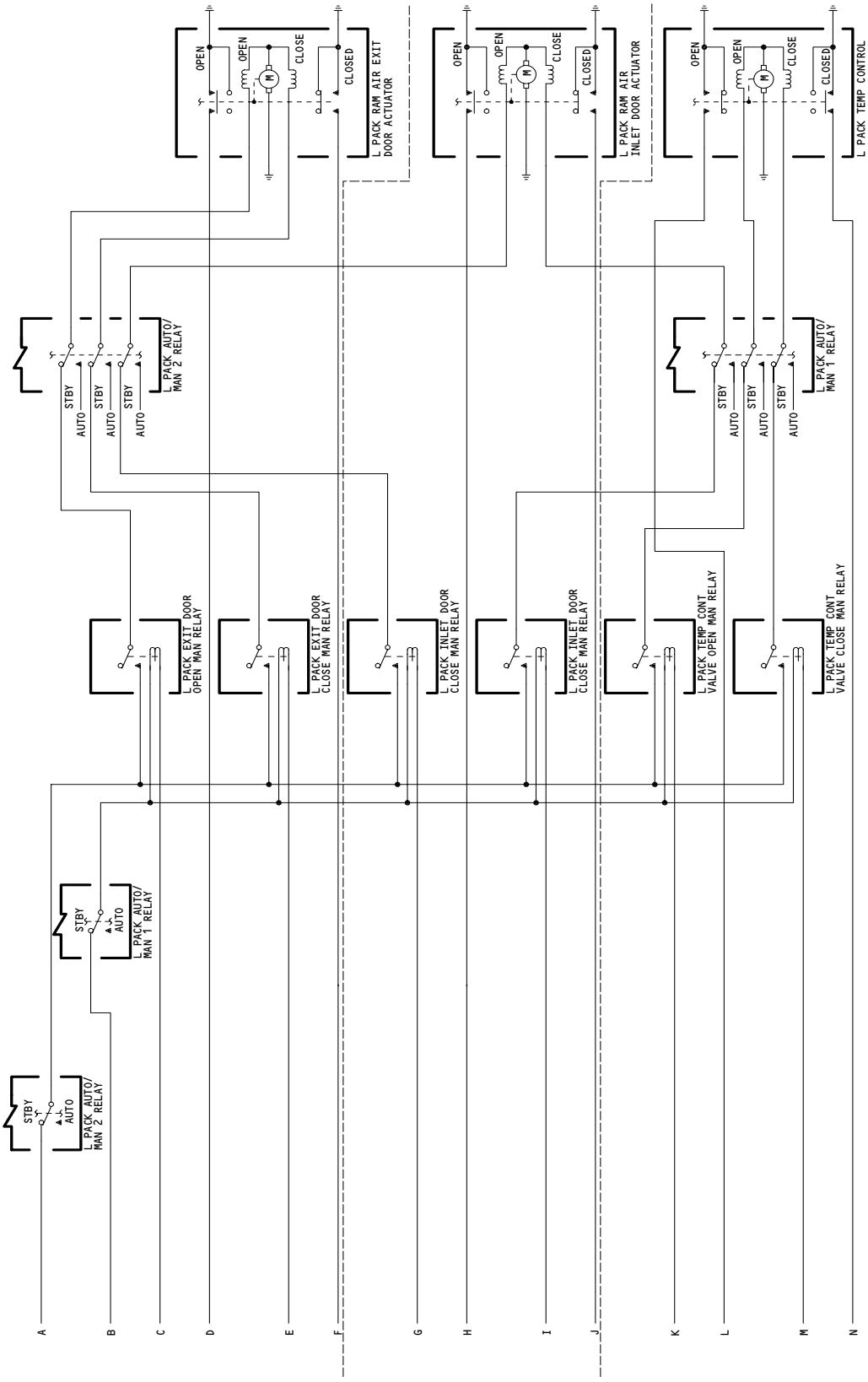
   NOTE: The PACK OUT temperature as shown on the EICAS display can be lower than the water separator temperature.

7) The altitude switch supplies input to the controller to change the lower water separator temperature limit from 35°F (1.7°C) to 0°F (-18°C). The controller closes at 31,000 feet. This sends a signal to the controller to change the limit.

(c) The STBY-N mode
1) In the STBY-N mode, the backup-temperature-control card (AMM 21-53-00/001) and the standby-pack-temperature-controller controls the air cooling packs. When the L or R PACK selector is in STBY-N, the AUTO/MANUAL relays are not energized. This lets 115v ac power flow to the controller. It also supplies 28v dc to energize the low-limit-control- valve-control relay (ground is supplied in the backup- temperature-control card). The controller sends an open or a close signal through the control relay to the low-limit- control valve. The backup-temperature-control card causes the ram air doors to be fully open and the temperature control valve to be fully closed. Also, no current is supplied to the torque motor of the flow-control-and- shutoff valve.

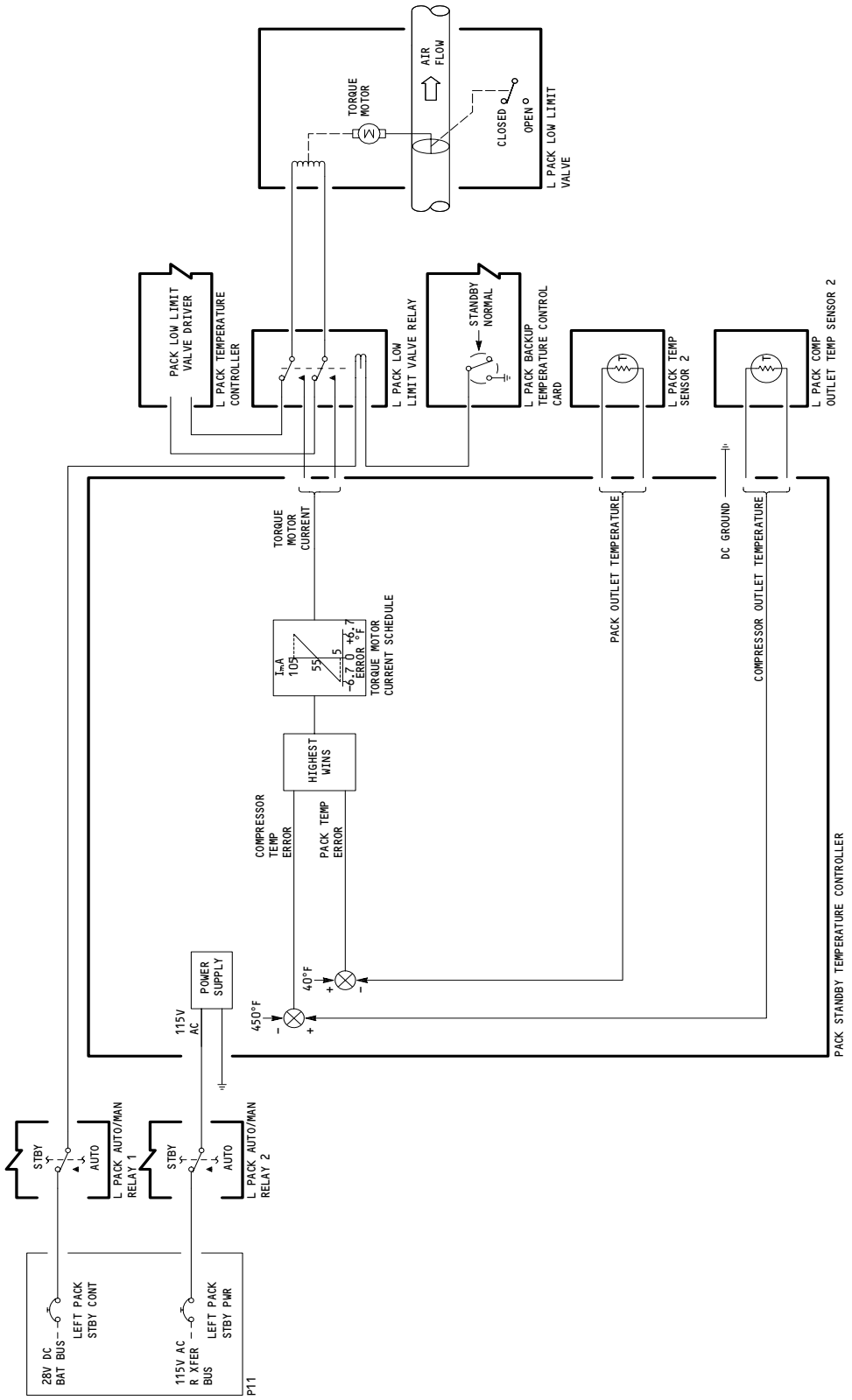


Pack Standby Control Operation
Figure 15 (Sheet 1)



LEFT SYSTEM SHOWN, RIGHT SYSTEM SIMILAR

Pack Standby Control Operation
Figure 15 (Sheet 2)



LEFT SYSTEM SHOWN, RIGHT SYSTEM SIMILAR

Pack Low Limit Valve Standby Control
Figure 16

2) The demand signals for the standby-pack-temperature controller are programmed to be 40°F (4.5°C) (for the pack temperature) and 450°F (232°C) (for the compressor outlet temperature). The controller compares the temperature sensor signals to the set demand signals. The difference of the signals causes two error signals. The greatest error signal controls the position of the low limit control valve.

(d) The STBY-W mode

1) In the STBY-W mode, the backup-temperature-control card (AMM 21-53-00/001) controls the air cooling packs. 28v dc is always supplied to the backup-temperature-control card. When the L or R PACK selector is in STBY-W, the AUTO/MANUAL relays are not energized. This lets the card send signals through the AUTO/MANUAL relays to the ram air doors and the temperature control valve.

2) In the STBY-W mode, the backup-temperature-control card causes the ram air doors and the temperature control valve to be fully open. The low-limit-control valve stays closed unless it is pneumatically opened.

(e) The STBY-C mode

1) In the STBY-C mode, the backup-temperature-control card (AMM 21-53-00/001) controls the air cooling packs. 28v dc is always supplied to the backup-temperature-control card. When the L or R PACK selector is in STBY-C, the AUTO/MANUAL relays are not energized. This lets the card send signals through the AUTO/MANUAL relays to the ram air doors and the temperature control valve.

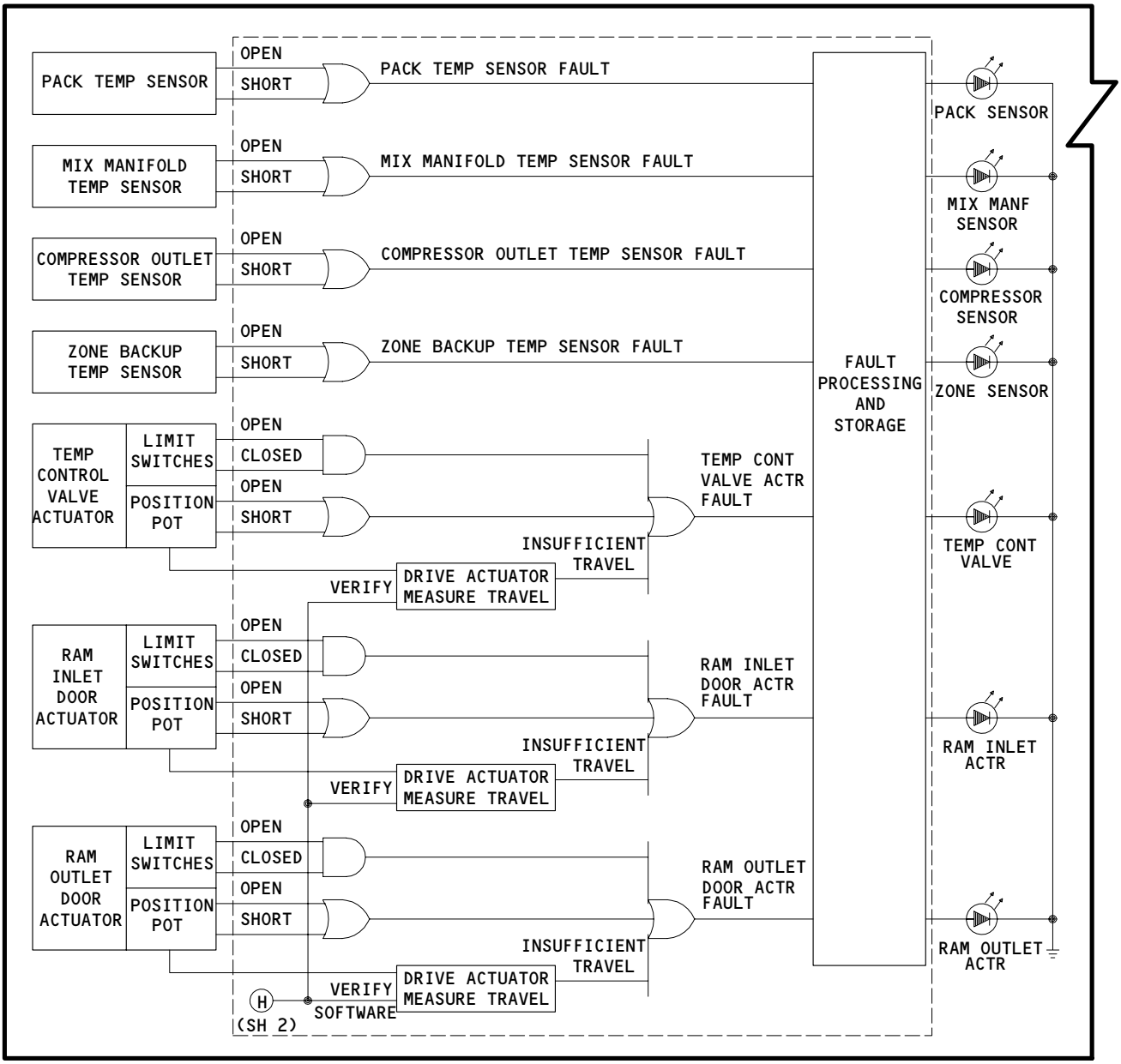
2) In the STBY-C mode, the backup-temperature-control card causes the ram air doors to be fully open and the temperature control valve to be fully closed. The low-limit-control valve stays closed unless it is pneumatically opened.

(f) The OFF mode.

1) When the L or R PACK selector is OFF, the ram air inlet doors and the temperature control valve is controlled by the air/ground relays. When the airplane is on the ground, the ram air doors will be fully open and the temperature control valve will be fully closed. When the airplane is in the air, the ram air doors will be fully closed and the temperature control valve will be fully open. The low-limit-control valve will stay closed unless it is pneumatically opened.

2) Whenever the left or right flow control valve is closed, the applicable (L or R) PACK OFF light, on the P5 panel, will come on and the EICAS message L or R PACK OFF will be shown on the upper display.

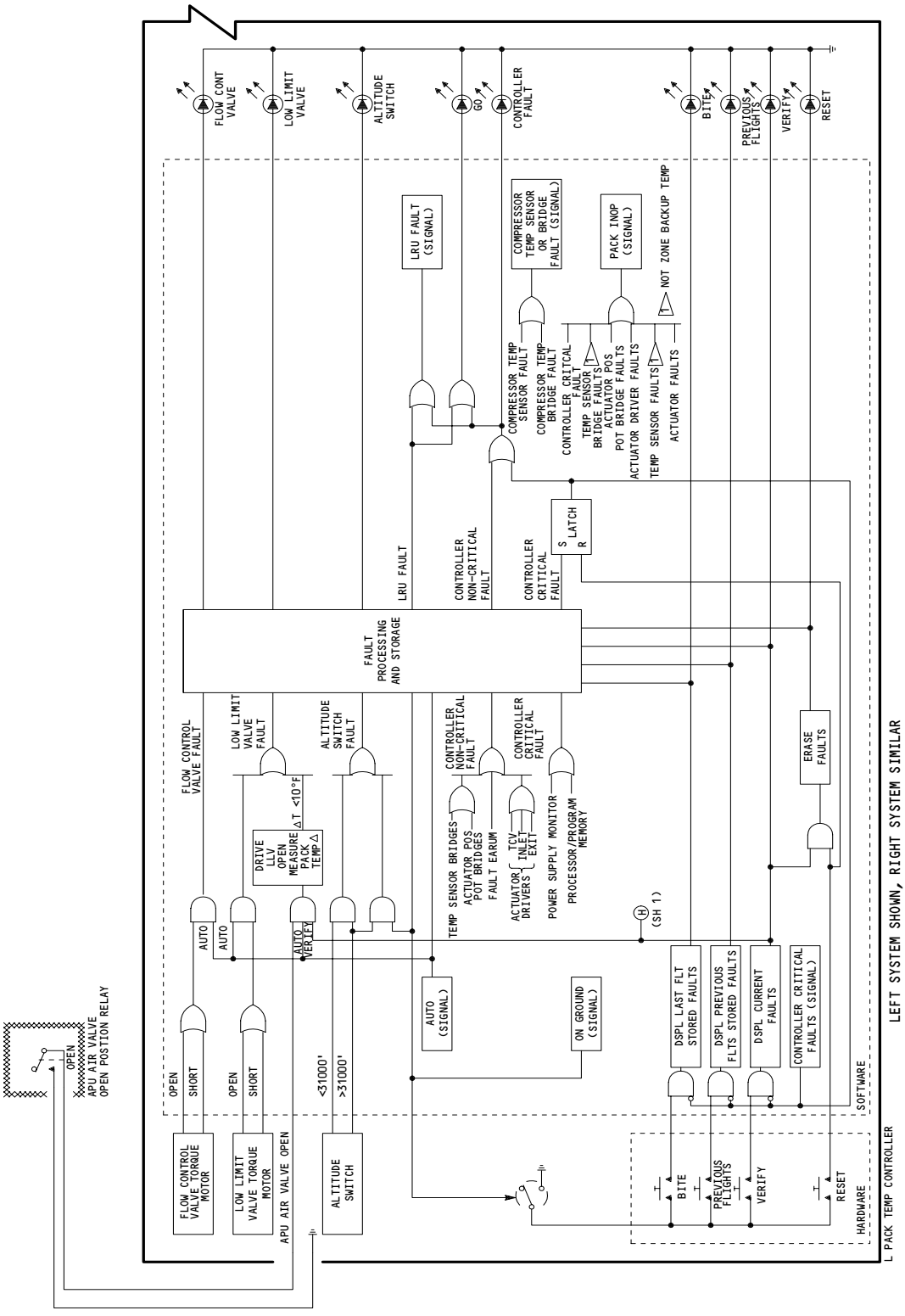
B. Built-In-Test Equipment (BITE) (Fig. 17)



L PACK TEMP CONTROLLER

LEFT SYSTEM SHOWN, RIGHT SYSTEM SIMILAR

Pack Bite Operation
Figure 17 (Sheet 1)



LEFT SYSTEM SHOWN, RIGHT SYSTEM SIMILAR

Pack Bite Operation
Figure 17 (Sheet 2)

(1) The automatic-pack-temperature controllers contain some built-in-test-equipment (BITE). The BITE monitors the cooling pack system for failures when the electrical power is on. It also stores the failure conditions for up to ten flights. BITE tests are used for maintenance to examine the BITE for failures. The BITE looks for two types of failures, critical and non-critical.
   (a) A critical failure is any major failure of the controller. When a critical failure occurs the fault relay latches, the CONTROLLER FAULT light comes on, and power is not supplied to the components which the controller controls. A critical failure occurs when one of these conditions occurs:
      1) The watchdog timer senses that the software program execution does not progress in the correct sequence and time.
      2) The internal power supply regulator fails.
      3) The analog-to-digital input converter fails.
      4) The read access memory (RAM) location fails.
   (b) A non-critical failure is any partial failure of the controller or a component that is tested by the BITE. When a non-critical failure occurs, the controller continues to operate without the use of the failed part. The non-critical failure will be stored in the EAROM memory and can be recalled by the BITE test.

(2) The BITE test will show which component has failed. The controllers have switches, lights, and instructions to do the BITE test.
   (a) The switches on the automatic-pack-temperature controllers are used to do the BITE test. With no critical failure, any switch except RESET can be pushed or canceled at any time. The light above the switch comes on when the switch is in operation. The light and the switch operation will go off if another switch is not pushed within 30 seconds (90 seconds for the VERIFY switch). If another switch is pushed, the previous switch operation is canceled. Here is a list of the switches and their function:
      1) The PRESS/TEST switch causes all of the controller lights to come on. This makes sure that all the lights work and power is applied correctly.
      2) The BIT switch indicates any components that failed in the last flight or on the ground.
      3) The PREVIOUS FLIGHTS switch indicates any components that failed in the previous nine flights.
      4) The VERIFY switch does a check to make sure that no components are presently failed. If a component is failed at this time, the appropriate fault light will come on.
      5) The RESET switch only operates when the VERIFY switch is pushed and the GO light is on. It will erase all the faults in the memory and unlatch the fault relay.

(b) The lights on the automatic-pack-temperature controller are used to show which component has failed. The lights will come on when the BIT, the PREVIOUS FLIGHTS, or the VERIFY switch is pushed. Here is a list of the lights and what type of failure can cause them to come on:

NOTE: The failure could also be caused by an aircraft wiring problem between the controller and the appropriate component.

1) The GO light comes on when a switch is pushed and no failure has occurred.
2) The CONTROLLER FAULT light comes on when a critical failure occurs.

NOTE: When the CONTROLLER FAULT light is on, the other fault lights will not come on.

3) The PACK SENSOR, the MIX MANF SENSOR, the ZONE SENSOR, or the COMPRESSOR SENSOR light comes on when a short or open circuit occurs in the sensor.
4) The ALTITUDE SWITCH light comes on when a pressure capsule switch or a electrical switch failure occurs.
5) The RAM INLET ACTR, the RAM OUTLET ACTR, the LOW LIMIT VALVE, or the TEMP CONT VALVE light comes on when an open limit switch circuit, an open feedback potentiometer circuit, or a mechanical failure occurs.
6) The FLOW CONT VALVE light comes on if the torque motor in the valve is open or shorted.

(c) Do the automatic-pack-temperature controller BITE test:
1) Supply the electrical power.
2) Put the applicable (L or R) PACK control selector, on the pilot's overhead P5 panel, to AUTO.
3) Put all three zone temperature control selectors, on the P5 panel, to AUTO.
4) Make sure the CONTROLLER FAULT light, on the automatic-pack-temperature controller, is off.
5) Push the PRESS/TEST button, on the controller. Make sure that all the lights come on.
6) Push the BIT button, on the controller. Make sure the GO light comes on within 30 seconds.
7) Push the PREVIOUS FLIGHTS button, on the controller. Make sure the GO light comes on within 30 seconds.
8) While the VERIFY and the GO lights are on, push the RESET button.

(3) The standby-pack-temperature controller also contains some built-in-test-equipment (BITE). It operates the same as the automatic-pack-temperature controller's BITE, except that it does not store the failures in memory. It has switches, lights, and instructions to do the BITE test.

(a) The switch on the standby-pack-temperature controller has seven positions to test the components or the different operations of the controller. When the switch is pushed, a light will show the condition of the selected component for each air cooling pack. The GO light means there is not a failure. The NO GO light means that the selected component is failed. Here is a list what the controller monitors for each position of the switch:

1) Position 1 - the controller's power supply and bridge reference.
2) Position 2 - the maximum compressor temperature output current.
3) Position 3 - the maximum cooling pack temperature output current.
4) Position 4 - the minimum output current.
5) Position 5 - the 50 percent output current.
6) Position 6 - the standby-pack-temperature sensor for a shorted or open circuit, or an aircraft wiring problem.
7) Position 7 - the standby-compressor-outlet-temperature sensor for a shorted or open circuit, or an aircraft wiring problem.

(b) Do the standby pack temperature controller BITE test.

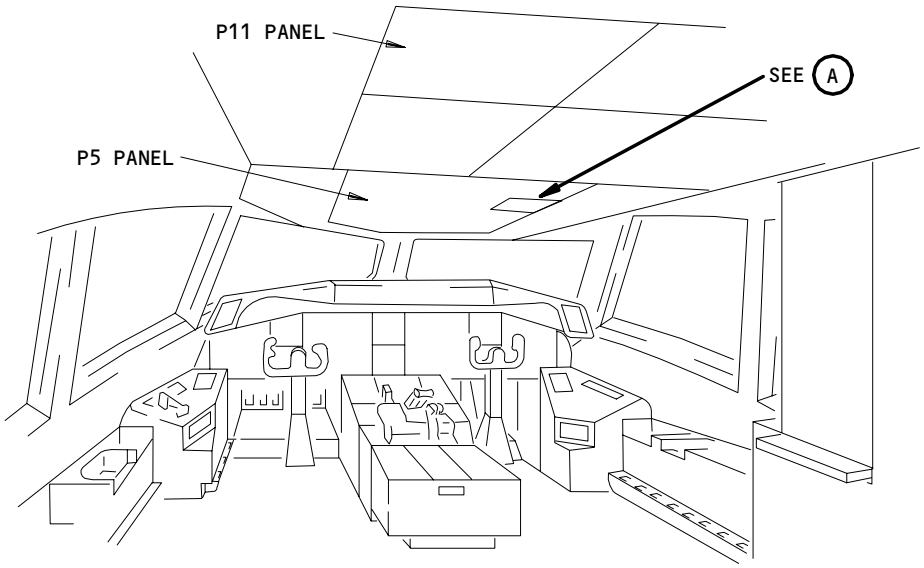
1) Supply the electric power.
2) Put the applicable (L or R) PACK control selectors, on the P5 panel, to STBY-N.
3) Push all of the GO and the NO GO lights, on the controller. Make sure each one of them come on.
4) Turn the test switch, on the controller, to position 1.
5) Push the test switch. Make sure the GO light comes on.
6) Do the two steps before this one for the test positions 2 through 7.

C. Control (Fig. 18)

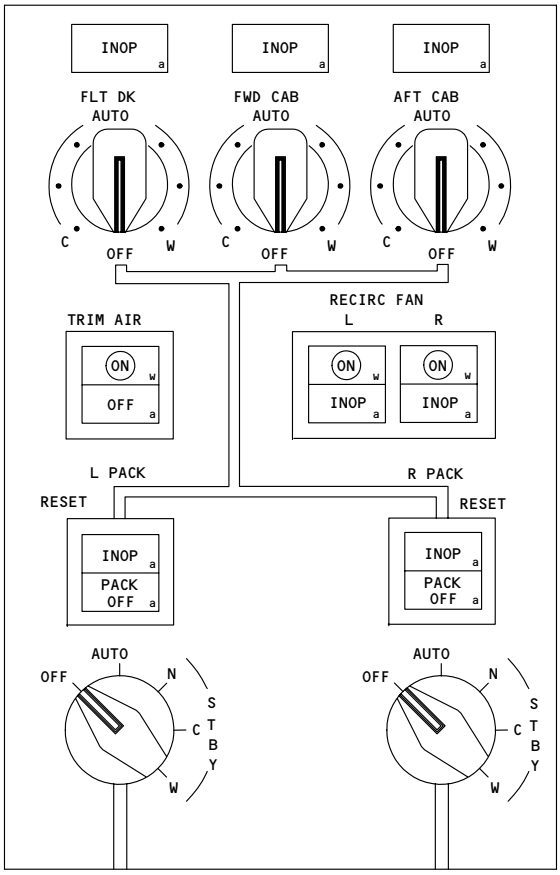
(1) To put the cooling pack system into operation, do these steps:

(a) Make sure these circuit breakers, on the pilot's-overhead-circuit-breaker panel P11, are closed:

1) LEFT PACK AUTO POWER
2) LEFT PACK STANDBY POWER
3) LEFT PACK AUTO CONT
4) LEFT PACK STANDBY CONT
5) LEFT PACK FLOW CONT
6) RIGHT PACK AUTO POWER
7) RIGHT PACK STANDBY POWER
8) RIGHT PACK AUTO CONT
9) RIGHT PACK STANDBY CONT
10) RIGHT PACK FLOW CONT



FLT COMPT



AIR CONDITIONING CONTROL MODULE

A

Cooling Pack Control
Figure 18

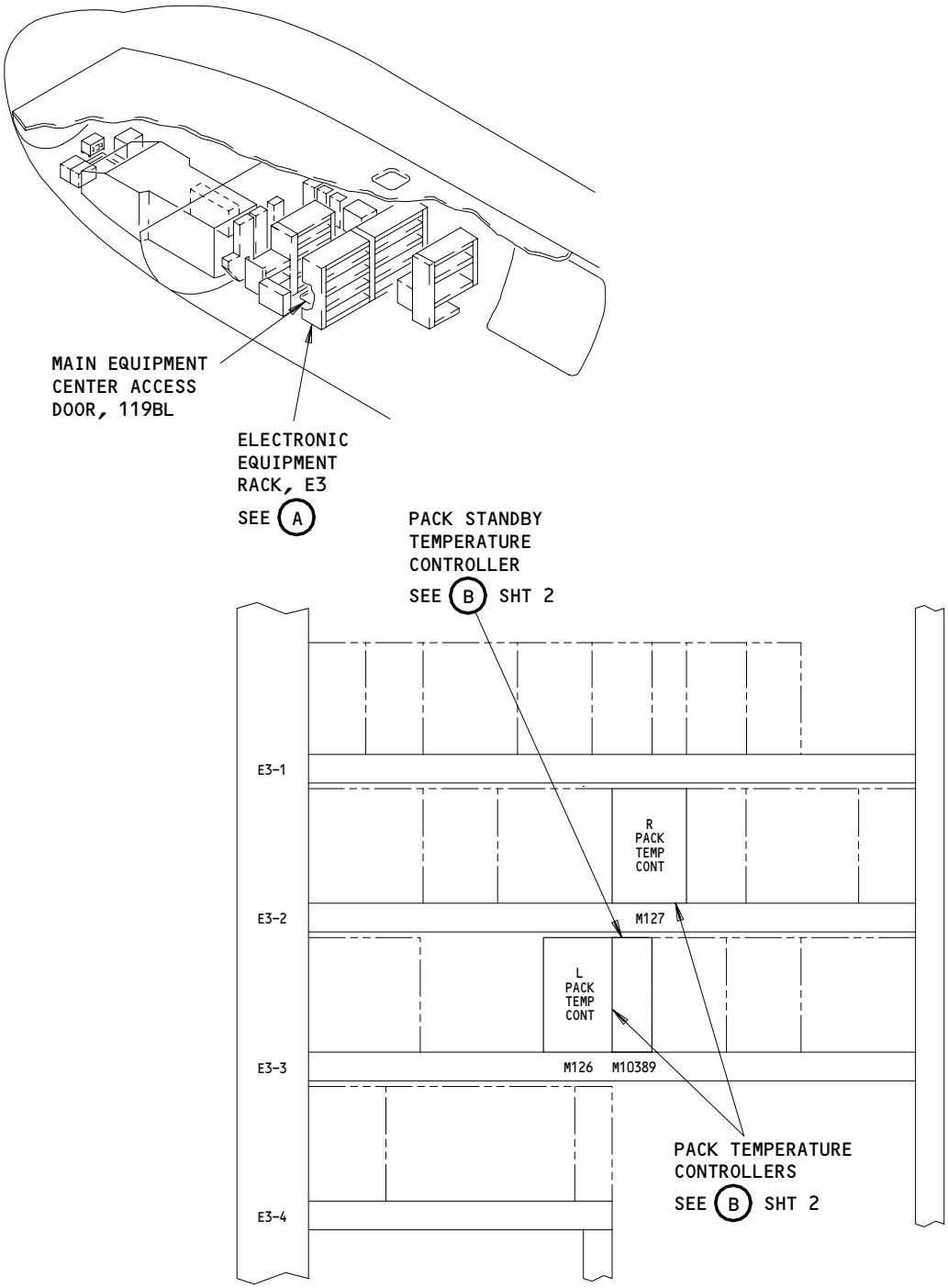
(b) Supply the electrical power (AMM 24-22-00/001).
(c) Supply the pneumatic power (AMM 36-00-00/001).
(d) Push the ECS/MSG button on the EICAS MAINT module on the pilot's-right-side panel P61.
    1) Make sure the maintenance messages L or R PACK BITE are not shown on the EICAS display.
    2) Make sure the advisory messages L and R PACK OFF are shown on the EICAS display.
(e) Put the L and R PACK control selectors, on the P5 panel, to AUTO.
    1) Make sure the PACK OFF lights and the INOP lights, on the L and R PACK switch/lights, are not on.
    2) Make sure the advisory messages L and R PACK OFF are not shown on the EICAS display.
    3) Make sure the maintenance messages L or R PACK BITE are not shown on the EICAS display.

COOLING PACK

COMPONENT	QTY	ACCESS/AREA	REFERENCE
CARD - FLOW CONTROL	2	119BL, MAIN EQUIP CTR, P50	21-51-09
CIRCUIT BREAKERS	1	FLT COMPT, P11	
CONT - AIR COND PACK LEFT STBY, C4037	1	11A26	*
CONT - AIR COND PARK LEFT AUTO, C702	1	11A13	*
CONT - AIR COND PACK LEFT FLOW, C653	1	11A14	*
CONT - AIR COND PACK RIGHT AUTO, C703	1	11A28	*
CONT - AIR COND PACK RIGHT FLOW, C704	1	11A29	*
CONT - AIR COND PACK RIGHT STBY, C4039	1	11A15	*
PWR - LEFT PACK AUTO, C673	1	11M11	*
PWR - LEFT PACK STANDBY, C4036	1	11M24	*
PWR - RIGHT PACK AUTO, C674	1	11M19	*
PWR - RIGHT PACK STANDBY, C4038	1	11M15	*
CONDENSER	2	193HL, 194ER	21-51-10
CONTROLLER - PACK STANDBY	1	119BL, MAIN EQUIP CTR, E3	21-51-14
CONTROLLER - PACK TEMPERATURE	2	119BL, MAIN EQUIP CTR, E3	21-51-14
EXCHANGER - HEAT	4	193HL, 194ER	21-51-02
EXTRACTOR - WATER	2	193HL, 194ER	21-51-04
FAN/AIR PLENUM/DIFFUSER	2	193HL, 194ER	21-51-16
MACHINE - AIR CYCLE	2	193HL, 194ER	21-51-03
REHEATER - PACK	2	193HL, 194ER	21-51-07
RELAYS - (REF 31-01-36, FIG. 101)			
L PACK AUTO/MAN 3, K10315	1		*
L PACK AUTO/MAN 2, K58	1		*
L PACK AUTO/MAN 1, K57	1		*
L PACK EXIT DOOR OPEN MAN, K59	1		*
L PACK EXIT DOOR CLOSE MAN, K60	1		*
L PACK INLET DOOR OPEN MAN, K61	1		*
L PACK INLET DOOR CLOSE MAN, K62	1		*
L PACK TEMP CONT VALVE OPEN MAN, K63	1		*
L PACK TEMP CONT VALVE OPEN MAN, K64	1		*
L PACK LOW LIMIT VALVE, K10317	1		*
RELAYS - (REF 31-01-37, FIG. 101)			
R PACK AUTO/MAN 3, K10316	1		*
R PACK AUTO/MAN 2, K50	1		*
R PACK AUTO/MAN 1, K49	1		*
R PACK EXIT DOOR OPEN MAN, K51	1		*
R PACK EXIT DOOR CLOSE MAN, K52	1		*
R PACK INLET DOOR OPEN MAN, K53	1		*
R PACK INLET DOOR CLOSE MAN, K54	1		*
R PACK TEMP CONT VALVE OPEN MAN, K55	1		*
R PACK TEMP CONT VALVE CLOSE MAN, K56	1		*
R PACK LOW LIMIT VALVE, K10318	1		*
SENSOR - COMPRESSOR OUTLET	2	193HL, 194ER	25-51-06
SENSOR - PACK TEMPERATURE	2	193HL, 194ER	21-51-08
SWITCH - ALTITUDE	1	193HL	21-51-17
SWITCH - COMPRESSOR OUTLET OVERHEAT	2	193HL, 194ER	21-51-05
SWITCH - PACK OVERHEAT	2	193HL, 194ER	21-51-18
VALVE - CABIN AIR SUPPLY CHECK	2	193HL, 194ER	21-51-15
VALVE - FLOW CONTROL AND SHUTOFF	2	193HL, 194ER	21-51-01
VALVE - PACK LOW LIMIT CONTROL	2	193HL, 194ER	21-51-11
VALVE - PACK TEMPERATURE CONTROL	2	193HL, 194ER	21-51-12

* SEE WM EQUIPMENT LIST

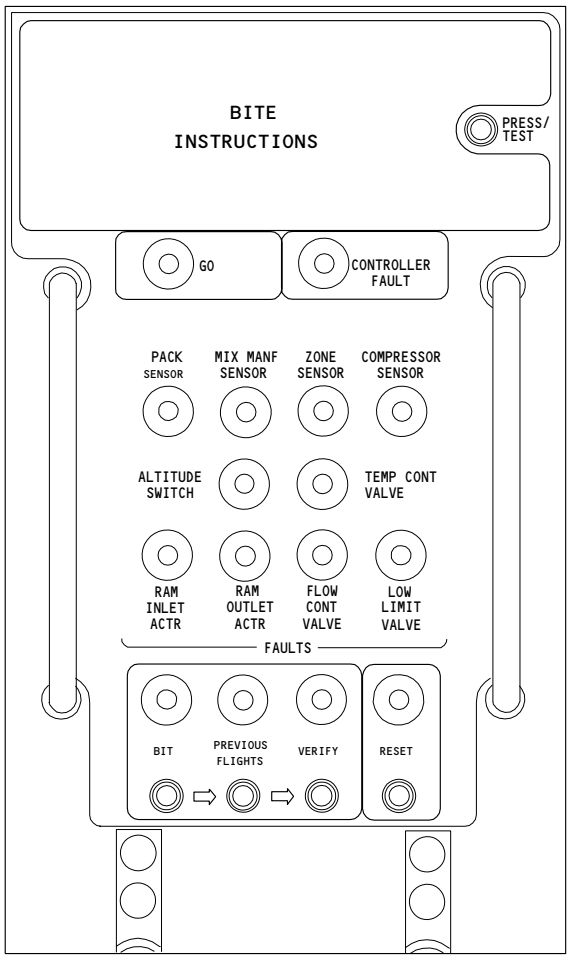
Component Index
Figure 101



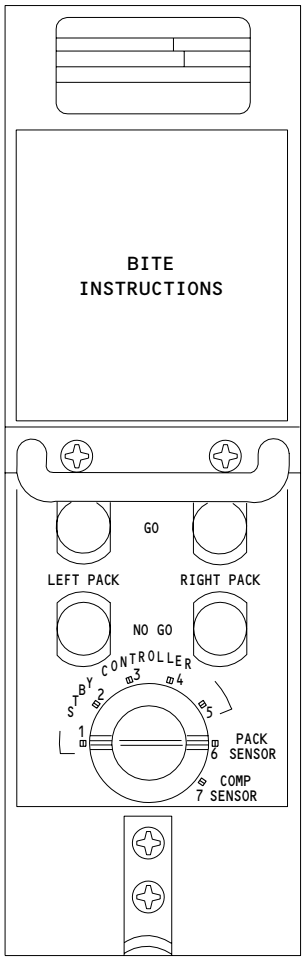
ELECTRONIC EQUIPMENT RACK, E3
(VIEW IN THE AFT DIRECTION)

A

Cooling Pack - Component Location
Figure 102 (Sheet 1)



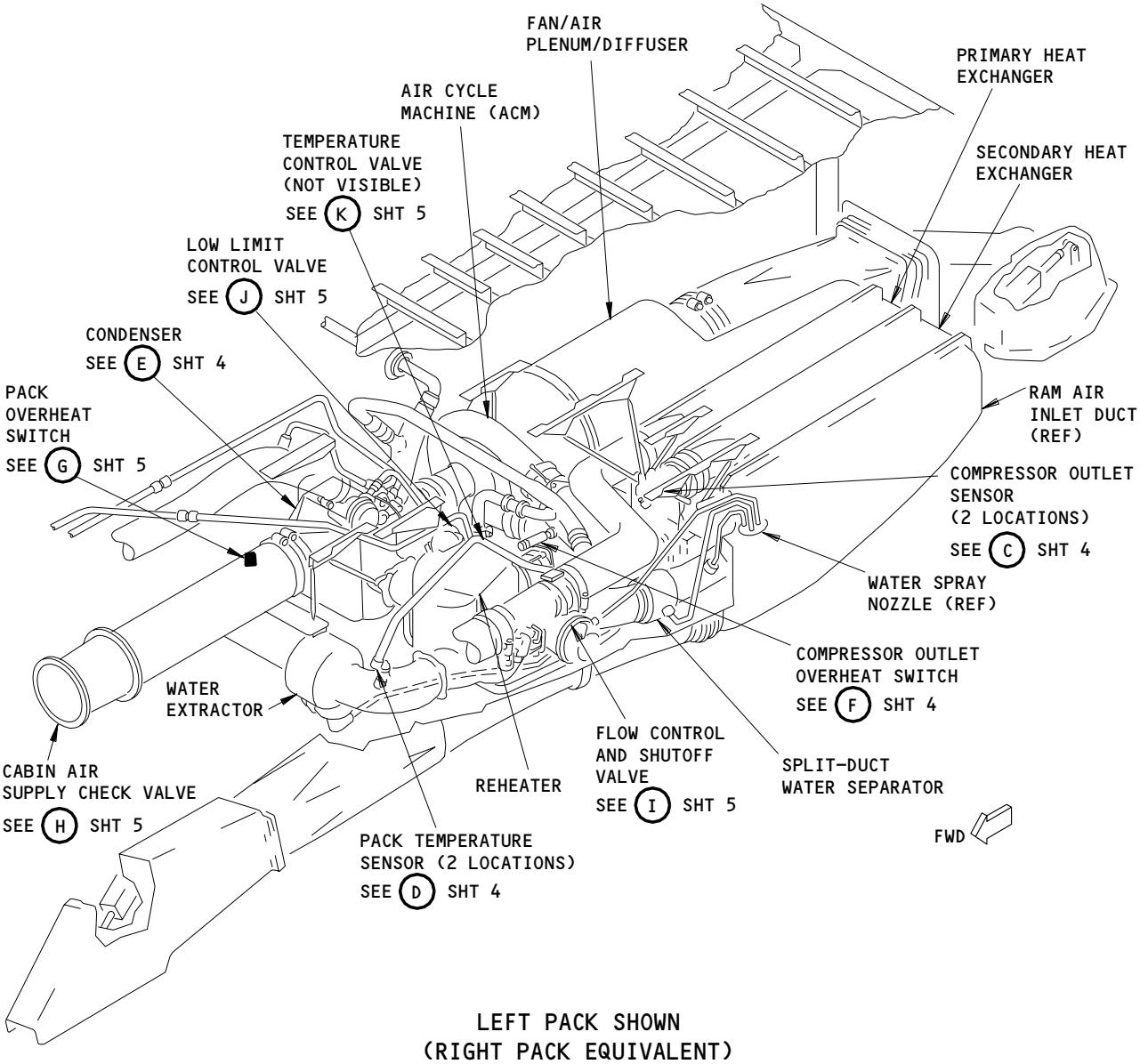
PACK TEMPERATURE
CONTROLLER



PACK STANDBY TEMPERATURE
CONTROLLER

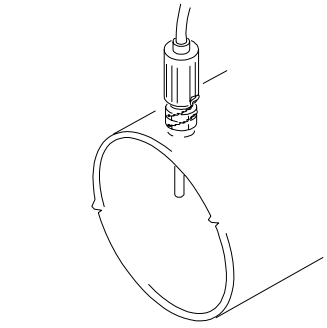
B

Cooling Pack - Component Location
Figure 102 (Sheet 2)



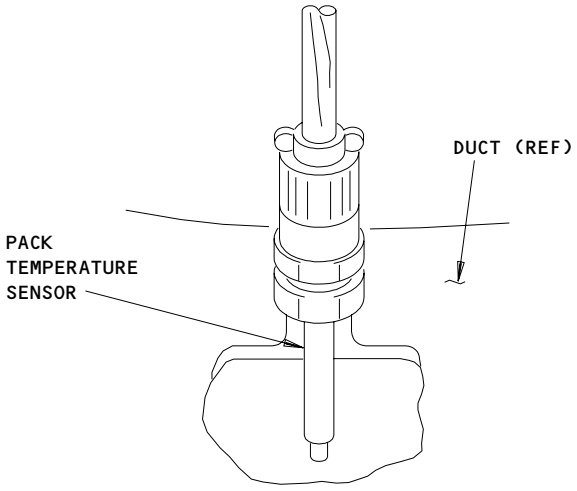
LEFT PACK SHOWN
(RIGHT PACK EQUIVALENT)

Cooling Pack - Component Location
Figure 102 (Sheet 3)

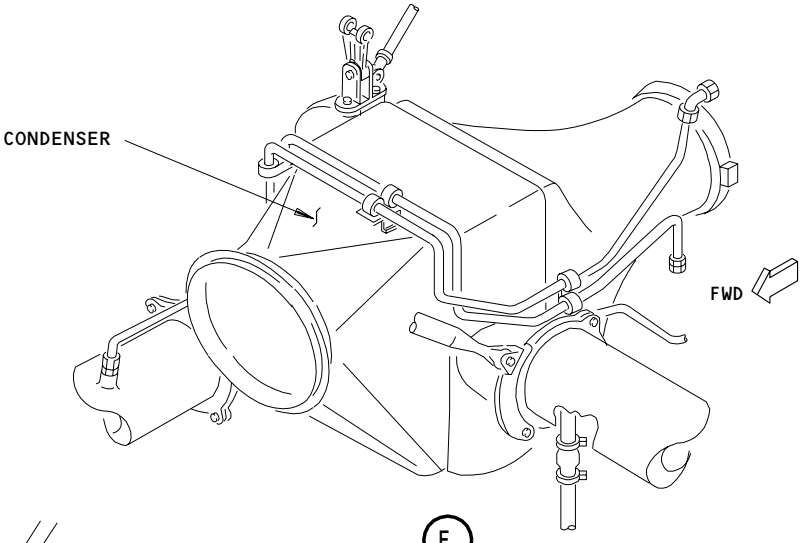


COMPRESSOR OUTLET SENSOR

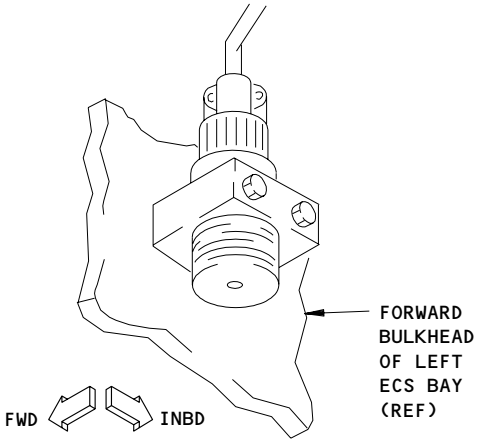
C



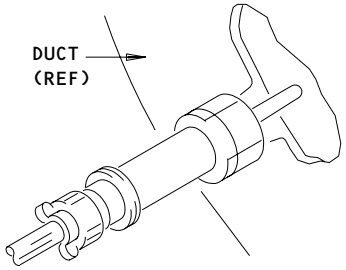
D



E



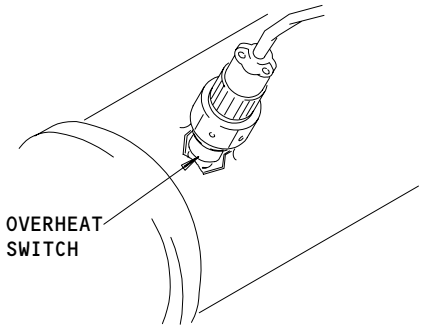
ALTITUDE SWITCH



COMPRESSOR OUTLET OVERHEAT SWITCH

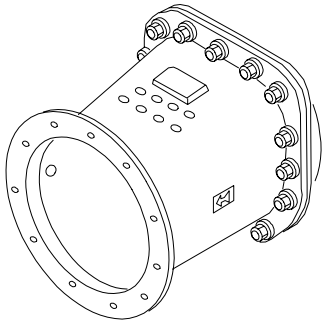
F

Cooling pack – Component Location (Details from Sht 3)
Figure 102 (Sheet 4)



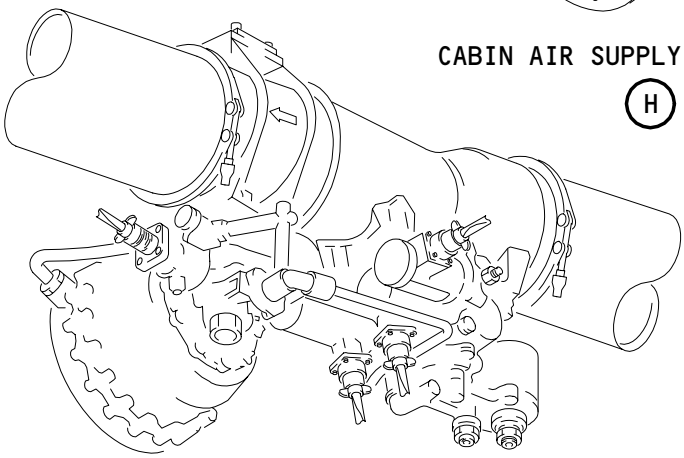
PACK OVERHEAT SWITCH

(G)



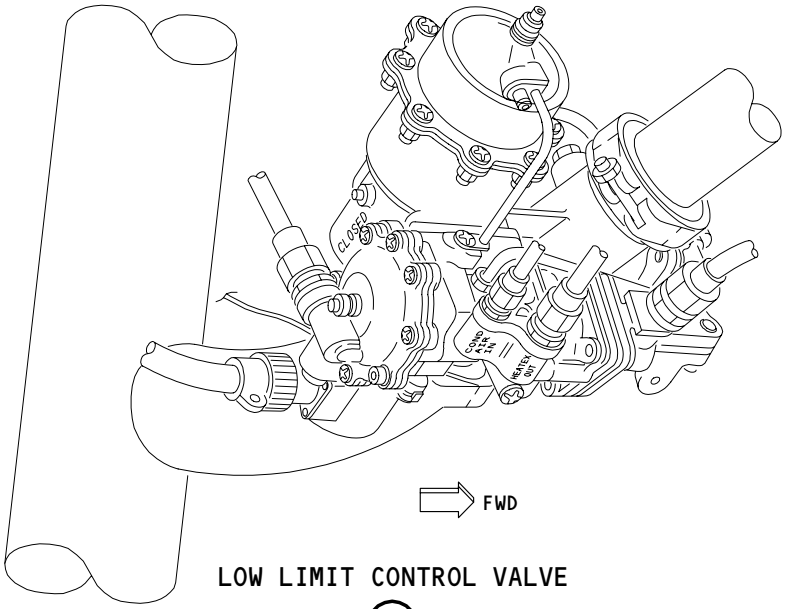
CABIN AIR SUPPLY CHECK VALVE

(H)



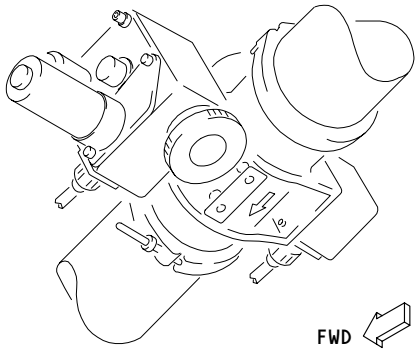
FLOW CONTROL AND SHUTOFF VALVE

(I)



LOW LIMIT CONTROL VALVE

(J)



TEMPERATURE CONTROL VALVE

(K)

Cooling Pack - Component Location (Details from Sht 3)
Figure 102 (Sheet 5)

COOLING PACK SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure supplies instructions to do the operational test and the system test for the cooling pack system.

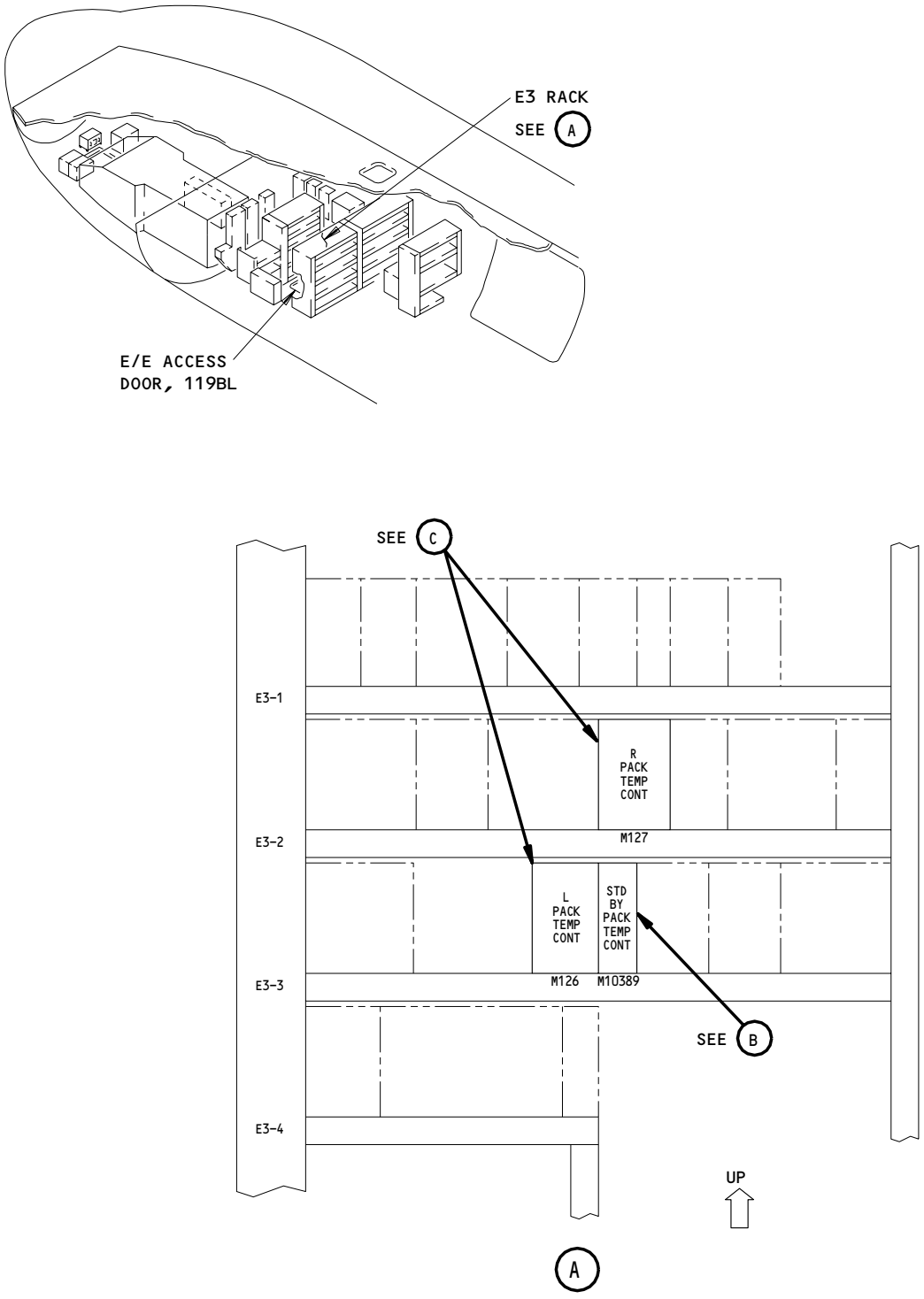
TASK 21-51-00-745-159

2. BITE Tests - Pack Temperature and Pack Standby Controllers
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 06-46-00/201, Entry, Service and Cargo Doors
      (3) AMM 24-22-00/201, Electric Power - Control
      (4) AMM 36-00-00/201, Pneumatic - General
   B. Access
      (1) Location Zones
          119 Main equipment center
      (2) Access Panels
          119BL Main equipment center access door
          313AL APU/ECS Pneumatic Duct access door
   C. Prepare for the Test

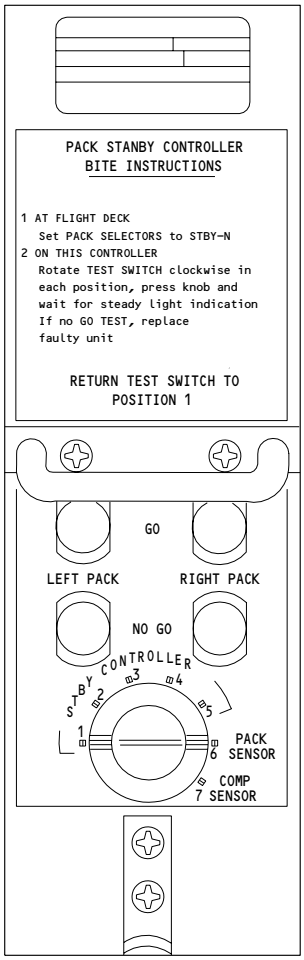
      S 865-002
      (1) Make sure these circuit breakers are closed:
          (a) Overhead Circuit Breaker Panel, P11:
              1) 11A13, AIR COND PACK LEFT AUTO CONT
              2) 11A14, AIR COND PACK LEFT FLOW CONT
              3) 11A15, AIR COND RIGHT STANDBY CONT
              4) 11A26, AIR COND PACK LEFT STBY CONT
              5) 11A28, AIR COND PACK RIGHT AUTO CONT
              6) 11A29, AIR COND PACK RIGHT FLOW CONT
              7) 11M11, LEFT PACK AUTO POWER
              8) 11M15, RIGHT PACK STANDBY POWER
              9) 11M19, RIGHT PACK AUTO POWER
              10) 11M24, LEFT PACK STANDBY POWER

      S 865-019
      (2) Supply electrical power (AMM 24-22-00/201).

      S 865-385
      (3) Make sure the pneumatic duct pressure is zero (AMM 36-00-00/201).

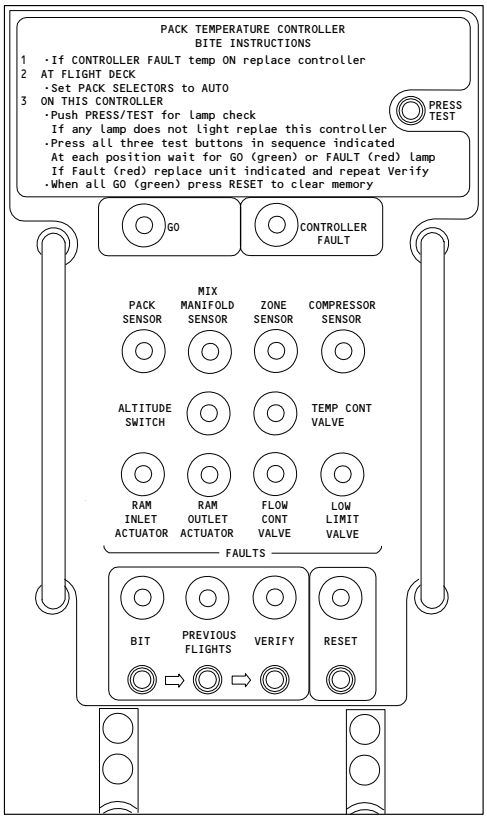


Pack Temperature Controllers
Figure 501 (Sheet 1)



PACK STANDBY TEMPERATURE CONTROLLER

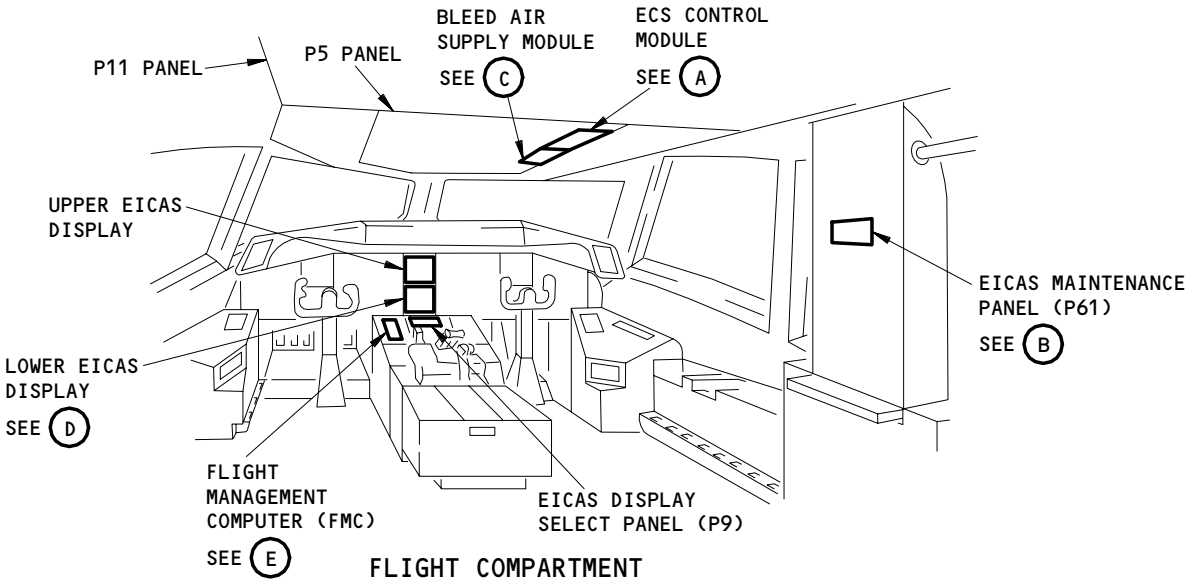
B



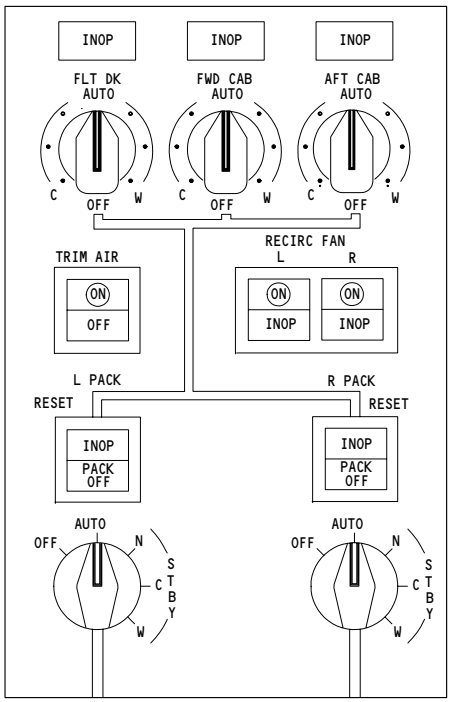
PACK TEMPERATURE CONTROLLER

C

Pack Temperature Controllers
Figure 501 (Sheet 2)

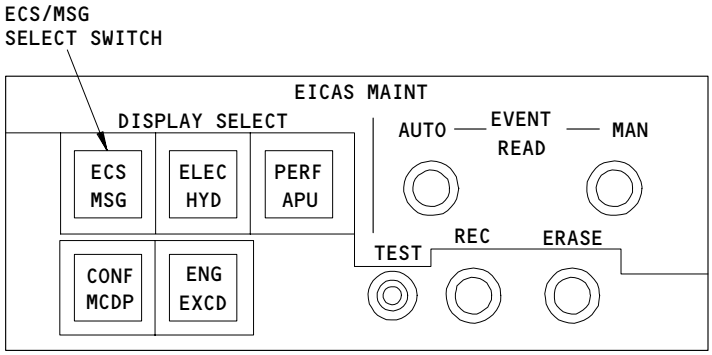


FLIGHT COMPARTMENT



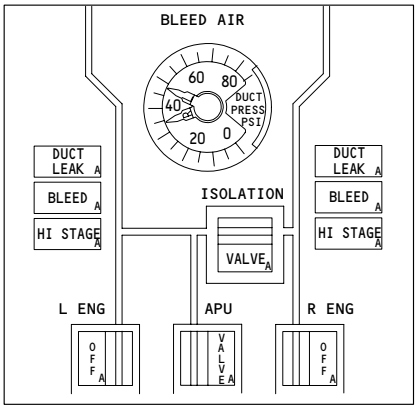
ECS CONTROL MODULE

A



EICAS MAINTENANCE PANEL

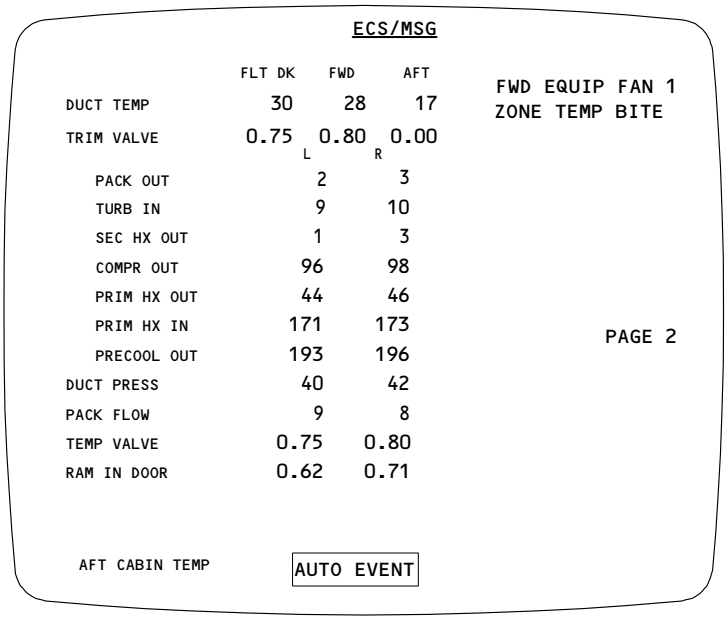
B



BLEED AIR SUPPLY MODULE

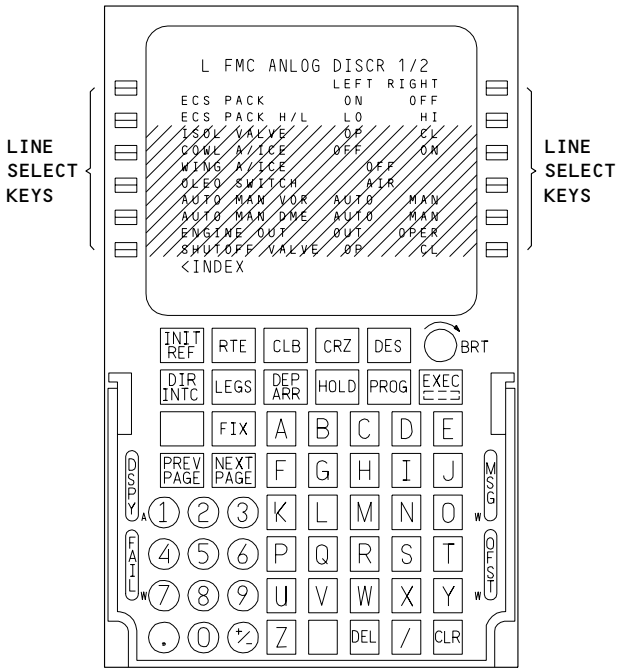
C

Bleed Air, ECS and EICAS Modules
Figure 502 (Sheet 1)



ECS MAINTENANCE PAGE

D



FLIGHT MANAGEMENT COMPUTER (FMC)

E

Bleed Air, ECS and EICAS Modules
Figure 502 (Sheet 2)

S 715-519
(4) Turn the L (R) Pack Selector, on the P5 panel, to OFF.
(a) Make sure the L (R) PACK OFF light comes on.

S 015-035
(5) Open the access door for the main equipment center, 119BL (AMM 06-41-00/201).
(a) Find the pack temperature controllers on the E3 rack in the main equipment center.

D. Left (Right) Pack Temperature Controller BITE Test:

NOTE: This test electrically checks the pack controller, pack temperature sensor, compressor outlet sensor, mix manifold sensor, zone backup sensor, altitude switch, temperature control valve, ram air inlet actuator, ram air exhaust actuator, low limit valve and flow control and shutoff valve.

NOTE: This test can be done on only one controller at a time. Do the test on the left pack controller then do the test for the right pack controller. The data in parentheses is for the test of the right pack controller.

S 865-518
(1) Set the L (R) pack selectors to AUTO.

S 745-275
(2) Make sure the CONTROLLER FAULT light, on the front panel of the pack temperature controller is off.
(a) If the CONTROLLER FAULT light is on, there is a problem with the pack temperature controller.

NOTE: A short circuit in the wiring for the ram air door actuators or the temperature control valve can cause the pack temperature controller to blow a fuse. If the pack temperature controller has a blow fuse, then the controller fault light will show.

S 745-276

(3) Push the PRESS/TEST button.
  (a) Make sure all of the lights on the controller face come on.

S 745-277

(4) Push the BIT button.
  (a) Make sure the BIT light comes on for 25 to 35 seconds.
  (b) Make sure the GO light comes on and that none of the fault (red) lights come on.

NOTE: A GO light indicates that there are no controller faults and there were no faults detected the last time the pack was operated.

S 745-278

(5) Push the PREVIOUS FLIGHTS button.
  (a) Make sure the PREVIOUS FLIGHTS light comes on for 25 to 35 seconds.
  (b) Make sure the GO light comes on and that none of the fault (red) lights come on.

NOTE: A GO light indicates that were no faults detected during the last nine flights.

S 745-209

WARNING: MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE RAM-AIR INLET DOOR AND THE RAM-AIR OUTLET DOOR. WHEN YOU PUSH THE "VERIFY" BUTTON, THESE COMPONENTS WILL MOVE AND COULD CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(6) Push the VERIFY button.
  (a) Make sure the VERIFY light comes on for 85 to 95 seconds.
  (b) Make sure the GO light comes on and that none of the fault (red) lights come on.

S 745-210
(7) Push the RESET button while the VERIFY and GO lights are still on.
  (a) Make sure the RESET light comes on for 6 to 10 seconds and the VERIFY and GO lights go off.

S 865-620
(8) Supply pneumatic power with the APU (AMM 36-00-00/201) or do the following steps if you use a ground air source:
  (a) Open this circuit breaker on the P11 overhead equipment panel, and attach a DO-NOT-CLOSE tag:
    1) 11Q22, APU BLEED PWR
  (b) Open the APU/ECS Pneumatic Duct access door, 313AL, to get access to the APU shutoff valve.
  (c) Put the APU shutoff valve to the locked OPEN position.
    1) Pull out the APU shutoff valve manual override control knob and move the override lever to the OPEN position.
    2) Turn the manual override control knob 90-degrees until the crosspin engages the detent in the locked OPEN position.
  (d) Supply pneumatic power with a ground air source (AMM 36-00-00/201)

S 745-618
(9) Push the VERIFY button again to do an operational check of the low limit valve.

  NOTE: When pneumatic power is supplied, the PTC performs a dynamic test of the low limit valve when the VERIFY button is pressed. Pneumatic power must be supplied (APU bleed valve open) and the opposite pack must be off. The dynamic test can take up to three minutes to complete.

  (a) Make sure the VERIFY light comes on.
  (b) Make sure the green GO light comes on within three minutes.

S 745-621
(10) Push the RESET button while the VERIFY and GO lights are still on.
  (a) Make sure the RESET light comes on for 6 to 10 seconds and the VERIFY and GO lights go off.

S 745-211
(11) Do the BITE test on the other pack temperature controller.

S 865-761
(12) Remove the pneumatic power (AMM 36-00-00/201) and do the following if you used a ground air source:
(a) Return the APU shutoff valve to the unlocked CLOSED position.
1) Pull out the APU shutoff valve manual override control knob and move the override lever to the CLOSED position.
2) Turn the manual override control knob 90-degrees until the crosspin engages the detent in the unlocked CLOSED position.
(b) Close the APU/ECS Pneumatic Duct access door, 313AL.
(c) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
1) 11Q22, APU BLEED PWR

E. Pack Standby Temperature Controller BITE Test:

NOTE: This test electrically tests the standby pack controller, standby temperature sensor, and standby compressor outlet sensor.

S 865-762
(1) Remove pneumatic power (AMM 36-00-00/201).

S 865-193
(2) Move the L and R PACK selectors on the P5 panel, to STBY-N.

S 745-212
(3) Do these steps for all seven (7) positions of the test selector on the pack standby controller:

NOTE: Position "1" through position "5" detects internal faults in the standby pack temperature controller. These faults include power supply problems and current output problems.

Position "6" detects out of range faults in the pack temperature sensor.

Position "7" detects out of range faults in the compressor discharge temperature sensor.

(a) Turn the test selector to the applicable position.
(b) Push the test selector.
(c) Make sure the GO lights come on.
(d) If a NO-GO light comes on, then replace the applicable unit.

S 745-213
(4) Turn the test selector to position 1.

F. Put the airplane back to its usual position:

S 415-192

(1) Close the access door for the main equipment center, 119BL (AMM 06-41-00/201).

S 865-160

(2) Move the L and R PACK selectors on the P5 panel to OFF.
(a) Make sure the L (R) PACK OFF light comes on.

S 865-161

(3) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-51-00-715-158

3. Operational Test - Pack Temperature Control (Fig. 501, 502)

A. General

(1) This task has the steps to make sure the ram air doors and the temperature control valve operate correctly.

B. References

(1) AMM 24-22-00/201, Electric Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbreak Control System
(3) AMM 32-09-02/201, Air/Ground Relays

C. Prepare for the test:

S 865-400

(1) Make sure these circuit breakers are closed:
(a) Overhead Circuit Breaker Panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A14, AIR COND PACK LEFT FLOW CONT
3) 11A15, AIR COND RIGHT STANDBY CONT
4) 11A26, AIR COND PACK LEFT STBY CONT
5) 11A28, AIR COND PACK RIGHT AUTO CONT
6) 11A29, AIR COND PACK RIGHT FLOW CONT
7) 11M11, LEFT PACK AUTO POWER
8) 11M15, RIGHT PACK STANDBY POWER
9) 11M19, RIGHT PACK AUTO POWER
10) 11M24, LEFT PACK STANDBY POWER

S 865-214

(2) Supply electrical power (AMM 24-22-00/201).

D. Procedure

S 865-194

(1) Push the ECS MSG switch on the P61 panel.

S 865-195
(2) Turn the L and R PACK selectors on the P5 overhead panel to the STBY-N position.

S 715-196
(3) Make sure these L and R values show on the ECS maintenance page: #

NOTE: The ram air inlet door will not open until the ram air outlet door is fully open.

(a) RAM IN DOOR 0.00 - 0.05 (door open)
(b) AIRPLANES WITH THE RAM OUT DOOR INDICATION ON EICAS;
RAM OUT DOOR 0.00 - 0.05 (door open)
(c) TEMP VALVE 0.00 - 0.05 (valve closed)

S 865-197
(4) Turn the L and R PACK selectors on the P5 panel to the STBY-C position.

S 715-198
(5) Make sure these L and R values show on the ECS maintenance page:
(a) RAM IN DOOR 0.00 - 0.05 (door open)
(b) AIRPLANES WITH THE RAM OUT DOOR INDICATION ON EICAS;
RAM OUT DOOR 0.00 - 0.05 (door open)
(c) TEMP VALVE 0.00 - 0.05 (valve closed)

S 865-199
(6) Turn the L and R PACK selectors, on the P5 panel, to OFF.
(a) Make sure the PACK OFF lights come on.

S 715-200
(7) Make sure these L and R values show on the ECS maintenance page:
(a) RAM IN DOOR 0.00 - 0.05 (door open)
(b) AIRPLANES WITH THE RAM OUT DOOR INDICATION ON EICAS;
RAM OUT DOOR 0.00 - 0.05 (door open)
(c) TEMP VALVE 0.00 - 0.05 (valve closed)

S 865-201

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the control surfaces.

S 865-202

WARNING: OBEY THE PROCEDURE THAT PUTS THE AIRPLANE IN THE AIR MODE. IF YOU DO THE PROCEDURE INCORRECTLY, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING: MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE RAM-AIR INLET DOOR AND THE RAM-AIR OUTLET DOOR. THE DOORS CAN MOVE WHEN THE AIRPLANE IS IN THE AIR MODE.

(9) Put the air/ground relay system in the air mode (AMM 32-09-02/201).

S 715-203

(10) Make sure these L and R values show on the ECS maintenance page:

NOTE: The ram air outlet door will not close until the ram air inlet door is fully closed.

(a) RAM IN DOOR 0.95 - 1.00 (door closed)
(b) AIRPLANES WITH THE RAM OUT DOOR INDICATION ON EICAS;
RAM OUT DOOR 0.95 - 1.00 (door closed)
(c) TEMP VALVE 0.95 - 1.00 (valve open)

S 865-412

(11) Put the air/ground relay system back to the ground mode (AMM 32-09-02/201).

S 715-205

(12) Make sure the left and right ram-air inlet and exit doors move to the open position.

S 715-577

(13) Make sure these L and R values show on the ECS maintenance page:
(a) RAM IN DOOR 0.00 - 0.05 (door open)
(b) AIRPLANES WITH THE RAM OUT DOOR INDICATION ON EICAS;
RAM OUT DOOR 0.00 - 0.05 (door open)
(c) TEMP VALVE 0.00 - 0.05 (valve closed)

E. Put the airplane back to its usual condition:

S 865-206

(1) Do the activation procedure for the spoilers (AMM 27-61-00/201) if you did the deactivation procedure.

S 865-414

(2) Remove the electrical power if it is not necessary (AMM 24-22-00/201),

TASK 21-51-00-715-345

4. Operational Test - Pack High Flow Inhibit (Fig. 502, 503)

A. General

(1) This procedure does a test of the pack high flow inhibits. In normal operation, the flow control and shutoff valve (FCV) will be in the high flow position when the APU is the pneumatic source and the airplane is on the ground. When the airplane is in the air and the engines are the pneumatic source, the FCV is normally in the low flow position. Under certain conditions, the FCV will be commanded to the high flow position.

B. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 24-22-00/201, Electric Power - General
(3) AMM 27-61-00/201, Spoiler/Speedbreak Control System
(4) AMM 32-09-02/201, Air/Ground Relays
(5) AMM 36-00-00/201, Pneumatic General
(6) AMM 77-12-03/201, Engines Speed Cards

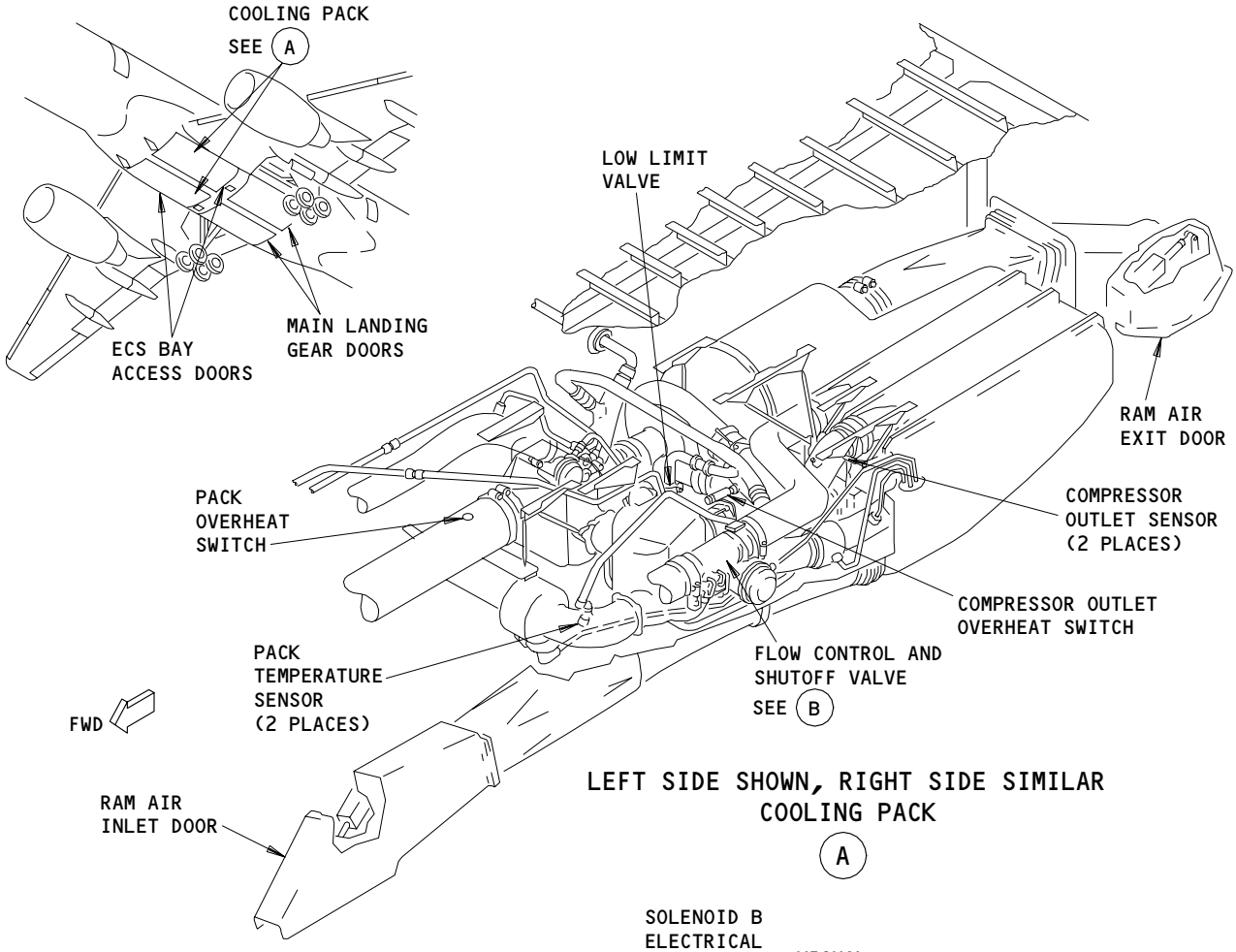
C. Access

(1) Location Zones
135/136 Environmental control system bay
(2) Access Panels
193HL/194HR Environmental control system bay doors

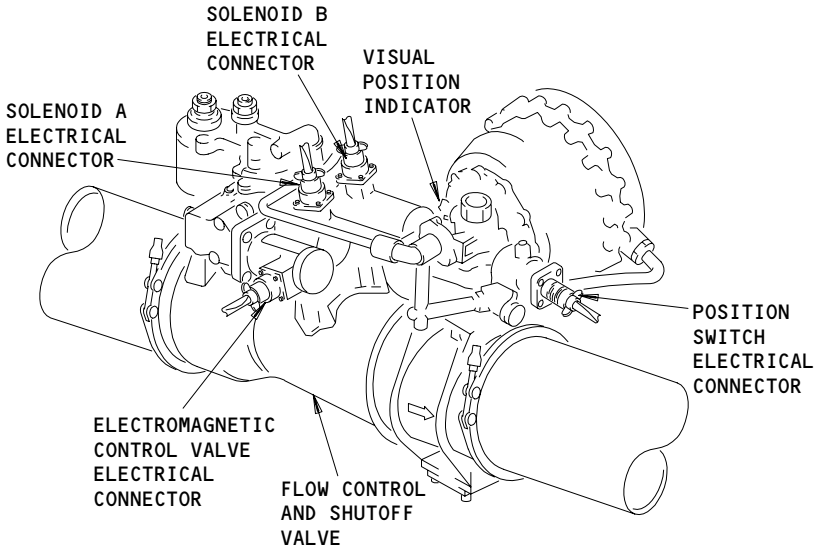
D. Prepare for the test

S 865-422

(1) Make sure these circuit breakers are closed:
(a) Overhead Circuit Breaker Panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A14, AIR COND PACK LEFT FLOW CONT
3) 11A15, AIR COND RIGHT STANDBY CONT
4) 11A26, AIR COND PACK LEFT STBY CONT
5) 11A28, AIR COND PACK RIGHT AUTO CONT
6) 11A29, AIR COND PACK RIGHT FLOW CONT
7) 11M11, LEFT PACK AUTO POWER



LEFT SIDE SHOWN, RIGHT SIDE SIMILAR
COOLING PACK
A



LEFT SIDE SHOWN, RIGHT SIDE SIMILAR
B

Cooling System Components
Figure 503

8) 11M15, RIGHT PACK STANDBY POWER
9) 11M19, RIGHT PACK AUTO POWER
10) 11M24, LEFT PACK STANDBY POWER

S 865-247
(2) Use an external power source or use two or more internal power sources (L IDG, R IDG, and APU) to supply the electrical power (AMM 24-22-00/201).

NOTE: If only one internal power source is used, the utility busses will shed when flight mode is simulated. The recirculation fans will shut down.

S 865-754
(3) Make sure the air/ground relay system in the ground mode (AMM 32-09-02/201).

S 865-753
(4) Make sure the L ENG and R ENG bleed switches, on the engine bleed air control panel (P5 panel), are selected OFF.

S 865-248
(5) Supply pneumatic power with the APU or a ground air source (AMM 36-00-00/201).

S 865-250
(6) Push the L and R RECIRC FAN switch-lights, on the overhead control panel, P5, to ON.
(a) Make sure the ON light comes on.

S 865-251
(7) Turn the L and R PACK selectors, on the P5 panel, to the AUTO position.

S 715-252
(8) Use the Left or Right Flight Management Computer (FMC) Control Display Unit (CDU), on the P9 panel, to view the ECS PACK H/L indications for the LEFT and RIGHT pack flow modes that show on the FMC ANALOG DISCR page 1 (AMM 34-61-00/001):
(a) Push the INIT/REF function mode key on the FMC CDU to view the INIT/REF INDEX page 1.

(b) Push the MAINT > line select key on the FMC CDU to view the MAINTENANCE INDEX page 1.
(c) Push the < DISCRETES line select key on the FMC CDU to view the FMC ANALOG DISCR page 1.
(d) Find the ECS PACK H/L indications for the LEFT and RIGHT pack flow modes on the FMC ANALOG DISCR page 1.
(e) Make sure the LEFT and RIGHT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 both show HI (High flow).

S 015-253

(9) Open the left/right ECS access doors, 193HL and 194ER, to get access to left/right pack FCVs (AMM 06-41-00/201).

S 715-751

(10) Make sure the visual position indicators on the left pack FCV and the right pack FCV have moved counter-clockwise away from the closed position towards OPEN (High flow) position.

S 865-452

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILER PANELS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(11) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoiler panels.

S 865-255

WARNING: OBEY THE PROCEDURE THAT PUTS THE AIRPLANE IN THE AIR MODE. IF YOU DO THE PROCEDURE INCORRECTLY, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Put the air/ground relay system in the air mode (AMM 32-09-02/201).

S 715-752

(13) Make sure the LEFT and RIGHT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 now show LO (Low flow).

S 715-744

(14) Make sure the left and right pack FCVs are partially open, then make a temporary mark on the visual position indicator of the left pack FCV and the right pack FCV to identify it's Low Flow mode position.

S 715-746

(15) Make sure the visual position indicator of the left and right pack FCVs are still both in the Low Flow mode position.

E. Left Pack Flow Control Valve (FCV) High Flow Inhibit Test

S 865-702

(1) AIRPLANES WITH RB211 ENGINES;
Simulate an engine run for the right engine (AMM 77-12-03/201).
(a) ENGINE SPEED CARDS WITH A TEST JACK (P/N S283N901);
Make sure the jumper test wire is connected between test point J1, on the front of the right engine speed card and the airplane ground.
1) Make sure the LEFT and RIGHT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 still both show LO (Low flow).
2) Make sure the visual position indicator of the left and right pack FCVs are still both in the Low Flow mode position.
(b) ENGINE SPEED CARDS WITH A TEST SWITCH (P/N 285N0200);
Make sure to move the test switch on the front of the right engine speed card to the TEST position.
1) Make sure the LEFT and RIGHT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 still both show LO (Low flow).
2) Make sure the visual position indicator of the left and right pack FCVs are still both in the Low Flow mode position.

S 715-704

(2) Turn the R PACK selector, on the P5 panel, to the OFF position.

NOTE: This will check the left pack FCV moves to High Flow mode.

(a) Make sure the R PACK OFF light comes on.
(b) Make sure the LEFT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows HI (High flow).
(c) Make sure the visual position indicator on the left pack FCV moves counterclockwise away from the temporary mark towards OPEN (High flow).

S 715-733

(3) AIRPLANES WITH RB211 ENGINES;
Remove the engine run simulation on right engine (AMM 77-12-03/201).

NOTE: This will check the left pack FCV moves to Low Flow mode.

(a) ENGINE SPEED CARDS WITH A TEST JACK (P/N S283N901);
Remove the jumper test wire from the right engine speed card and the airplane ground (engines off).
1) Make sure the LEFT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows LO (Low flow).
2) Make sure the visual position indicator on the left pack FCV moves clockwise to the temporary mark (Low flow).

(b) ENGINE SPEED CARDS WITH A TEST SWITCH (P/N 285N0200);
Move the right engine speed card switch back to the NORMAL position (engines off).
1) Make sure the LEFT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows LO (Low flow).
2) Make sure the visual position indicator on the left pack FCV moves clockwise to the temporary mark (Low flow).

S 715-735

(4) AIRPLANES WITH RB211 ENGINES;
Simulate an engine run for the right engine (AMM 77-12-03/201).

NOTE: This will check the left pack FCV moves to High Flow mode.

(a) ENGINE SPEED CARDS WITH A TEST JACK (P/N S283N901);
Make sure the jumper test wire is connected between test point J1, on the front of the right engine speed card and the airplane ground.
1) Make sure the LEFT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows HI (High flow).
2) Make sure the visual position indicator on the left pack FCV moves couterclockwise away from the temporary mark towards OPEN (High flow).

(b) ENGINE SPEED CARDS WITH A TEST SWITCH (P/N 285N0200);
Make sure to move the test switch on the front of the right engine speed card to the TEST position.
1) Make sure the LEFT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows HI (High flow).
2) Make sure the visual position indicator on the left pack FCV moves couterclockwise away from the temporary mark towards OPEN (High flow).

S 715-711

(5) Turn the R PACK selector, on the P5 panel, to the AUTO position.

NOTE: This will check the left pack FCV moves to Low Flow mode.

(a) Make sure the R PACK OFF light goes off.
(b) Make sure the LEFT and RIGHT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 both show LO (Low flow).
(c) Make sure the visual position indicator on the left pack FCV and right pack FCV both moved clockwise to the temporary mark (Low flow).

S 715-712

(6) Push the L RECIRC FAN switch-light to OFF.

NOTE: This will check the left pack FCV moves to High Flow mode.

(a) Make sure the L RECIRC FAN INOP light comes on.
(b) Make sure the LEFT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows HI (High flow).
(c) Make sure the visual position indicator on the left pack FCV moves couterclockwise away from the temporary mark towards OPEN (High flow).

S 715-714

(7) Push the L RECIRC FAN switch-light to ON.

NOTE: This will check the left pack FCV moves to Low Flow mode.

(a) Make sure the L RECIRC FAN INOP light goes off.
(b) Make sure the LEFT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows LO (Low flow).
(c) Make sure the visual position indicator on the left pack FCV moves clockwise to the temporary mark (Low flow).

S 715-737

(8) AIRPLANES WITH RB211 ENGINES;
Remove the engine run simulation on right engine (AMM 77-12-03/201).
(a) Make sure the LEFT and RIGHT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 still both show LO (Low flow).

(b) Make sure the visual position indicator of the left and right pack FCVs are still both in the Low Flow mode position.

F. Right Pack Flow Control Valve (FCV) High Flow Inhibit Test

S 865-717

(1) AIRPLANES WITH RB211 ENGINES;
Simulate an engine run for the left engine (AMM 77-12-03/201).
(a) ENGINE SPEED CARDS WITH A TEST JACK (P/N S283N901);
Make sure the jumper test wire is connected between test point J1, on the front of the left engine speed card and the airplane ground.
1) Make sure the RIGHT and LEFT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 still both show LO (Low flow).
2) Make sure the visual position indicator of the right and left pack FCVs are still both in the Low Flow mode position.
(b) ENGINE SPEED CARDS WITH A TEST SWITCH (P/N 285N0200);
Make sure to put the channel 1 switch on the left engine speed card to the TEST position.
1) Make sure the RIGHT and LEFT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 still both show LO (Low flow).
2) Make sure the visual position indicator of the right and left pack FCVs are still both in the Low Flow mode position.

S 715-719

(2) Turn the L PACK selector, on the P5 panel, to the OFF position.

NOTE: This will check the right pack FCV moves to High Flow mode.

(a) Make sure the L PACK OFF light comes on.
(b) Make sure the RIGHT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows HI (High flow).
(c) Make sure the visual position indicator on the right pack FCV moves counterclockwise away from the temporary mark towards OPEN (High flow).

S 715-739

(3) AIRPLANES WITH RB211 ENGINES;
Remove the engine run simulation on left engine (AMM 77-12-03/201).

NOTE: This will check the right pack FCV moves to Low Flow mode.

(a) ENGINE SPEED CARDS WITH A TEST JACK (P/N S283N901);
Remove the jumper test wire from the left engine speed card and the airplane ground (engines off).
1) Make sure the RIGHT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows LO (Low flow).
2) Make sure the visual position indicator on the right pack FCV moves clockwise to the temporary mark (Low flow).

(b) ENGINE SPEED CARDS WITH A TEST SWITCH (P/N 285N0200);
Move the left engine speed card switch back to the NORMAL position (engines off).
1) Make sure the RIGHT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows LO (Low flow).
2) Make sure the visual position indicator on the right pack FCV moves clockwise to the temporary mark (Low flow).

S 715-741

(4) AIRPLANES WITH RB211 ENGINES;
Simulate an engine run for the left engine (AMM 77-12-03/201).

NOTE: This will check the right pack FCV moves to High Flow mode.

(a) ENGINE SPEED CARDS WITH A TEST JACK (P/N S283N901);
Make sure the jumper test wire is connected between test point J1, on the front of the left engine speed card and the airplane ground.
1) Make sure the RIGHT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows HI (High flow).
2) Make sure the visual position indicator on the right pack FCV moves couterclockwise away from the temporary mark towards OPEN (High flow).

(b) ENGINE SPEED CARDS WITH A TEST SWITCH (P/N 285N0200);
Make sure to move the test switch on the front of the left engine speed card to the TEST position.
1) Make sure the RIGHT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows HI (High flow).
2) Make sure the visual position indicator on the right pack FCV moves couterclockwise away from the temporary mark towards OPEN (High flow).

S 715-726

(5) Turn the L PACK selector, on the P5 panel, to the AUTO position.

NOTE: This will check the right pack FCV moves to Low Flow mode.

(a) Make sure the L PACK OFF light goes off.
(b) Make sure the RIGHT and LEFT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 both show LO (Low flow).
(c) Make sure the visual position indicator on the right pack FCV and the left pack FCV both moved clockwise to the temporary mark (Low flow).

S 715-727
(6) Push the R RECIRC FAN switch-light to OFF.

NOTE: This will check the right pack FCV moves to High Flow mode.

(a) Make sure the R RECIRC FAN INOP light comes on.
(b) Make sure the RIGHT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows HI (High flow).
(c) Make sure the visual position indicator on the right pack FCV moves couterclockwise away from the temporary mark towards OPEN (High flow).

S 715-730
(7) Push the R RECIRC FAN switch-light to ON.

NOTE: This will check the right pack FCV moves to Low Flow mode.

(a) Make sure the R RECIRC FAN INOP light goes off.
(b) Make sure the RIGHT ECS PACK H/L entry on the FMC ANALOG DISCR page 1 shows LO (Low flow).
(c) Make sure the visual position indicator on the right pack FCV moves clockwise to the temporary mark (Low flow).

S 865-743
(8) AIRPLANES WITH RB211 ENGINES;
Remove the engine run simulation on left engine (AMM 77-12-03/201).
(a) Make sure the RIGHT and LEFT ECS PACK H/L entries on the FMC ANALOG DISCR page 1 still both show LO (Low flow).
(b) Make sure the visual position indicator of the right and left pack FCVs are still both in the Low Flow mode position.

G. Put the airplane back to its usual condition

S 865-262
(1) Put the air/ground relay sytem back to the ground mode (AMM 32-09-02/201).

S 865-410
(2) Turn the L and R PACK selectors, on the P5 panel, to the OFF position.
(a) Make sure the left and right pack FCVs are closed.

S 865-269
(3) Push the L and R RECIRC FAN switch-lights to OFF.

S 865-270
(4) Close the main equipment center access door, 119AL (AMM 06-41-00/201).

S 865-271
(5) Remove the pneumatic power if it is no longer necessary (AMM 36-00-00/201).

S 865-272
(6) Remove the electrical power if it is no longer necessary (AMM 24-22-00/201).

TASK 21-51-00-715-340

5. Pack Temperature Sensor Test

A. Equipment
(1) Decade resistance box, 2 required, commercially available
(2) 80 ohm resistance source, commercially available
(3) DC Voltmeter, 0-30 v dc, commercially available

B. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service and Cargo Doors
(3) AMM 24-22-00/201, Electric Power - Control
(4) AMM 36-00-00/201, Pneumatic - General

C. Access
(1) Location Zones
119 Main equipment center
135/136 Environmental control system bay
(2) Access Panels
193HL/194HR Environmental control system bay doors
119BL Main equipment center access door

D. Prepare for the Test

S 865-357
(1) Make sure these circuit breakers are closed:
(a) Overhead Circuit Breaker Panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT

2) 11A14, AIR COND PACK LEFT FLOW CONT
3) 11A15, AIR COND RIGHT STANDBY CONT
4) 11A26, AIR COND PACK LEFT STBY CONT
5) 11A28, AIR COND PACK RIGHT AUTO CONT
6) 11A29, AIR COND PACK RIGHT FLOW CONT
7) 11M11, LEFT PACK AUTO POWER
8) 11M15, RIGHT PACK STANDBY POWER
9) 11M19, RIGHT PACK AUTO POWER
10) 11M24, LEFT PACK STANDBY POWER

S 865-338
(2) Supply electrical power (AMM 24-22-00/201).

S 865-337
(3) Push the ECS/MSG switch on the EICAS maintenance panel, P61.

NOTE: This will show the ECS maintenance page on the bottom EICAS display.

S 015-341
(4) Open the ECS access doors, 193HL/194ER (AMM 06-41-00/201).

E. Procedure

NOTE: This test can only be done on one pack at a time. Do the test on the left pack, then do the test on the right pack. The steps in parentheses are for the test on the right pack.

S 035-295
(1) Disconnect the electrical connector from the No. 1 compressor outlet temperature sensor on the left (right) pack.

S 435-296
(2) Connect the decade resistance box to the electrical connector of the No. 1 compressor outlet temperature sensor.
(a) Set the decade resistance box to 500 ohms.

S 035-297
(3) Disconnect the electrical connector from low limit valve of the left (right) pack.
(a) Connect 80 ohms resistance to pins 1 and 3 of the electrical connector for the low limit valve.
(b) Connect the DC Voltmeter also to pin 1(-) and pin 3(+) of the electrical connector for the low limit valve.

S 715-299
(4) Turn the L (R) PACK selector, on the P5 panel, to AUTO.
(a) Make sure the voltmeter shows 0 vdc.

S 715-300
(5) Slowly increase the decade box resistance to 1000 ohms.
(a) Look at the ECS maintenance page.
1) Make sure the L (R) TEMP VALVE indication, on the EICAS lower display, increases to 0.95 - 1.0.
2) Make sure the L (R) PACK INOP light comes on.
(b) Make sure L (R) PACK TEMP shows on the top EICAS display.
(c) Make sure the voltmeter shows 8-10 vdc.

S 715-301
(6) Push and hold the L (R) PACK RESET button-light, on the P5 panel, for 3 seconds.
(a) Make sure the L (R) PACK INOP light stays on.
(b) Make sure L (R) PACK TEMP shows on the top EICAS display.

S 865-302
(7) Turn the L (R) PACK selector, on the P5 panel, to STBY-N.

S 715-402
(8) Push and hold the L (R) PACK RESET button-light, on the P5 panel, for 3 seconds.
(a) Make sure the L (R) PACK INOP light goes off.

(b) Make sure L (R) PACK TEMP does not show on the top EICAS display.
(c) Make sure the L (R) TEMP VALVE indication, on the ECS maintenance page, decreases to less than 0.06.

S 715-401
(9) Decrease the decade box resistance to 500 ohms.

S 715-304
(10) Turn the L (R) PACK selector, on the P5 panel, to AUTO.

S 035-305
(11) Disconnect the decade box from the electrical connector of the No. 1 compressor outlet temperature sensor of the left (right) pack.
(a) Make sure the L (R) PACK INOP light, on the P5 panel, comes on.
(b) Turn the COMPUTER selector, on the forward electrical control stand P9, to L.
(c) Make sure L (R) PACK TEMP shows on the top EICAS display.
(d) Make sure L (R) PACK BITE shows on the bottom EICAS display.

S 715-306
(12) Turn the COMPUTER selector, on the P9 panel, to R.
(a) Make sure L (R) PACK BITE and L (R) PACK TEMP show on the top EICAS display.

S 715-307
(13) Turn the L (R) PACK selector, on the P5 panel, to STBY-N.
(a) Make sure the L (R) PACK INOP light goes off.
(b) Make sure L (R) PACK TEMP does not show on the top EICAS display.

S 715-308
(14) Turn the L (R) PACK selector, on the P5 panel, to AUTO.
(a) Make sure the L (R) PACK INOP light comes on.
(b) Make sure L (R) PACK TEMP shows on the top EICAS display.

S 435-309
(15) Connect the electrical connector to the No. 1 compressor outlet temperature sensor on the left (right) pack.
(a) Make sure the L (R) PACK INOP light goes off.
(b) Make sure L (R) PACK TEMP does not show on the top EICAS display.

S 745-310
(16) Push the VERIFY and the RESET buttons on the face of the left (right) pack temperature controller.

NOTE: This will erase the failure from the BITE memory.

(a) Make sure L (R) PACK BITE does not show on the bottom EICAS display.

S 715-311
(17) Turn the L (R) PACK selector, on the P5 panel, to OFF.

S 035-322
(18) Disconnect the electrical connector from the No. 2 (standby) compressor outlet temperature sensor of the left (right) pack.

S 435-323
(19) Connect the No. 1 decade box to the electrical connector of the No. 2 (standby) compressor outlet temperature sensor.
(a) Set the resistance of the No. 1 decade box to 500 ohms.

S 035-324
(20) Disconnect the electrical connector from left (right) pack temperature sensor No. 2.

S 435-325
(21) Connect the No. 2 decade box to the electrical connector of left (right) pack temperature sensor No. 2.
(a) Set the resistance of the No. 2 decade box to 3000 ohms.

S 715-327
(22) Turn the L (R) PACK selector, on the P5 panel, to STBY-N.
(a) Make sure the L (R) RAM IN DOOR indication on the ECS maintenance page is less than 0.06.
(b) Make sure the L (R) TEMP VALVE indication on the ECS maintenance page is less than 0.06.
(c) Make sure the voltmeter shows 0 vdc.

S 715-328
(23) Slowly increase the resistance of the No. 1 decade box to 1000 ohms.
(a) Make sure the voltmeter shows 8-10 vdc.

S 715-329
(24) Slowly decrease the resistance of the No. 1 decade box to 500 ohms.
(a) Make sure the voltmeter shows 0 vdc.

S 715-330
(25) Slowly increase the resistance of the No. 2 decade box to 8000 ohms.
(a) Make sure the voltmeter reads 8-10 vdc.

S 715-331
(26) Slowly decrease the resistance of the No. 2 decade box to 3000 ohms or less.
(a) Make sure the voltmeter reads 0 vdc.

S 715-332
(27) Turn the L (R) PACK selector, on the P5 panel, to OFF.

S 035-333
(28) Disconnect the decade boxes from the applicable electrical connecters.

S 035-334
(29) Disconnect the DC Voltmeter and the 80 ohm resistor from the electrical connector for the low limit valve.

S 435-335

(30) Connect the electrical connectors to compressor outlet temperature sensor No. 2, the low limit valve, and pack temperature sensor No. 2.

S 735-140

(31) Do the Temperature Sensors Test for the right pack.

F. Put the Airplane Back to its Usual Condition

S 415-139

(1) Close the left (right) ECS access door, 193HL.

S 865-343

(2) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-51-00-705-184

6. Pack/Zone System Health Check

A. General

(1) This task has the steps to do a health check for the pack and the trim air system.

(2) A health check gives a quick indication that the system operates correctly.

B. References

(1) AMM 21-51-00/501, Operational Test - Cooling Pack System

(2) AMM 21-61-00/501, Operational Test - Primary (Zone) Temperature Control System

(3) AMM 24-22-00/201, Electrical Power - Control

(4) AMM 27-61-00/201, Spoiler/Speedbrake Control System

(5) AMM 32-09-02/201, Air/Ground Relays

(6) AMM 36-00-00/201, Pneumatics - General

(7) AMM 49-11-00/201, Auxiliary Power Unit

(8) AMM 49-61-05/201, APU Control Unit (ECU)

C. Access

(1) Location Zones

135/136 Environmental control system (ECS) bay

211/212 Control cabin

(2) Access Doors
193HL Environmental control system bay (left)
194ER Environmental control system bay (right)

D. Prepare for the Test

S 865-403
(1) Supply electrical power (AMM 24-22-00/201).

S 865-405
(2) Make sure all circuit breakers for the air conditioning system are closed.

S 865-407
(3) Set these switches and selectors on the air conditioning control panel, P5:
(a) Make sure the TRIM AIR switch is OFF.
1) Make sure the INOP lights for all three zones are on.
(b) Make sure the L (R) pack selectors are OFF.
1) Make sure the L (R) PACK OFF lights are on.

S 865-189
(4) Make sure the pneumatic power is off (AMM 36-00-00/201).
(a) Make sure the L (R) DUCT PRESS gage on the P5 panel shows less than 5.0 psi.

S 865-190
(5) Make sure the BLEED AIR L ENG and BLEED AIR R ENG switches on the P5 panel are OFF.

S 745-191
(6) Do the BITE tests for these components:
(a) Pack temperature controller (AMM 21-51-00/501)
(b) Standby temperature controller (AMM 21-51-00/501).
(c) Zone temperature controller (AMM 21-61-00/501).
(d) APU ECU (AMM 49-11-00/501).

S 015-265
(7) Make sure the EICAS computer select knob on the EICAS display select panel, P9, is in the AUTO position.

S 865-192
(8) Push the AUTO switch on the EICAS maintenance panel, P61.

S 215-193
(9) Push the ECS/MSG switch on the EICAS maintenance panel, P61.
  (a) Look at the L PACK OUT and the R PACK OUT temperatures on the ECS maintenance page.
  (b) The difference between the L PACK OUT and the R PACK OUT temperatures must be less than 2 deg. C (5 deg. F).

S 975-194
(10) Make a measurement of the temperature in all three zones near the zone temperature sensors.

S 975-195
(11) Compare the temperatures you measured in each zone to the temperatures displayed on the temperature control panel, P5.
  (a) The difference between the measured temperatures and the temperatures displayed on the P5 panel must be less than +/- 6 deg. C (+/- 11 deg. F).

    NOTE: This steps makes sure the zone temperature sensors are accurate.

S 975-196
(12) Make a record of the ambient temperature.

  NOTE: You can get the ambient temperature from the control tower, automated transcribed information service (ATIS) or from an independent measurement.

S 975-197

(13) Compare the ambient temperature to the DUCT TEMP (FLT DK, FWD, and AFT) display on the ECS maintenance page.

(a) The difference between the ambient temperature and the DUCT TEMP display for each zone must be within +/- 6 deg. C (+/- 11 deg. F).

NOTE: This step makes sure the duct temperature sensors are accurate.

The difference between the ambient temperature and the duct temperature can be more than 6 deg. C (11 deg. F) if the air conditioning system was operated in the last 3 hours.

S 215-198

(14) Make sure the ECS maintenance page has these indications:

(a) L (R) TEMP VALVE is less than 0.07.

NOTE: This indicates that the left (right) temperature control valves are closed (less than 7% open).

(b) L (R) RAM IN DOOR is less than 0.07.

NOTE: This indicates that the left (right) ram air inlet door is open (less than 7% closed).

(c) TRIM VALVES (FLT DK, FWD, and AFT) are less than 0.07.

NOTE: This indicates that the trim air modulating valves are closed (less than 7% open).

S 865-409

(15) Set these switches and selectors on the air conditioning control panel, P5:

(a) Set the L (R) RECIRC FAN switches to ON.

(b) Set the temperature selectors (FLT DK, FWD CAB, and AFT CAB) on the P5 panel to AUTO C (8:00 o'clock position).

S 215-201

(16) Look at the position indicators on the left and right low limit valves.
(a) Make sure the low limit valves are closed.

S 215-202

(17) Look at the position indicators on the left and right flow control valves.
(a) Make sure the flow control valves are closed.

S 975-203

(18) Measure the air velocity at the inlet grille to the temperature sensors for the flight deck, the forward zone, and the aft zone.

NOTE: If you do not have an air velocity meter, then you can use a 4 inch x 4 inch single ply tissue. If the inlet grille can hold the tissue, then the air flow is acceptable.

(a) If the air velocity is less than 150 feet/minute, then do these steps:
1) Make sure the fan for the temperature sensor module operates.
2) Make sure the inlet filter is not clogged.

S 865-411

(19) Set the ISOLATION VALVE switch on the P5 panel to ON.

S 865-205

(20) Start and operate the APU (AMM 49-11-00/201) or supply pneumatic power with a ground source (36-00-00/201).

S 865-413

(21) Set the APU BLEED AIR switch to ON.

S 215-206
(22) Make sure the L (R) DUCT PRESS gage on the P5 panel shows the pressure increases to 35 +/- 5 psi.

S 865-415
(23) Move the TRIM AIR switch on the P5 overhead panel to ON.
(a) Make sure the zone INOP lights on the P5 panel go off.

S 045-209

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN MOVE QUICKLY AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(24) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the control surfaces.

S 865-210

WARNING: OBEY THE PROCEDURE THAT PUTS THE AIRPLANE IN THE AIR MODE. IF YOU DO THE PROCEDURE INCORRECTLY, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(25) Put the air/ground relay system in the air mode (AMM 32-09-02/201).

S 715-211
(26) Move the L (R) pack selector on the P5 panel to AUTO.
(a) Make sure the L (R) PACK OFF light on the P5 panel goes off.
(b) Look at the L (R) PACK OUT temperature on the ECS maintenance page.
1) Make sure the temperature decreases.

S 215-212
(27) Look at the position indicator on the flow control valve.
(a) Make sure the valve moves to the open position.

S 215-213
(28) Make sure there is air flow at the ram air exhaust.

E. Flight Deck Zone (AUTO Mode)

S 715-214
(1) Move the FLT DK temperature selector on the P5 panel to AUTO W (4:00 position).
(a) The FLT DECK DUCT TEMP display will increase, but will not exceed 77 deg. C (170 deg. F).
(b) The FLT DECK TRIM VALVE display on the ECS maintenance page will show the trim air modulating valve move to the open position (0.90-1.00).

S 865-417
(2) Move the FLT DK temperature selector on the air conditioning control panel, P5 to the OFF position.
(a) The FLT DK INOP light will come on.
(b) The FLT DECK TRIM VALVE display on the ECS maintenance page will show the trim air modulating valve move to the closed position (0.00-0.07).

F. Forward Zone (Auto Mode)

S 715-216
(1) Move the FWD CAB temperature selector on the air conditioning control panel, P5 panel to AUTO W (4:00 position).
(a) The FWD DUCT TEMP display on the ECS maintenance page will increase, but will not exceed 77 deg. C (170 deg. F).
(b) The FWD TRIM VALVE display on the ECS maintenance page will show the trim air modulating valve move to the open position (0.90-1.00).

S 715-217
(2) Move the FWD CAB temperature selector to the OFF position.
(a) The FWD CAB INOP light will come on.

(b) The FWD TRIM VALVE display on the ECS maintenance page will show the trim air modulating valve move to the closed position (0.00-0.07).

G. AFT Zone (Auto Mode)

S 715-218

(1) Move the Aft CAB temperature selector on the air conditioning control panel, P5 panel to AUTO W (4:00 position).
(a) The AFT DUCT TEMP display on the ECS maintenance page will increase, but will not exceed 77 deg. C (170 deg. F).
(b) The AFT TRIM VALVE display will show the trim air modulating valve move to the open position (0.90-1.00).

S 715-219

(2) Move the AFT CAB temperature selector to the OFF position.
(a) The AFT CAB INOP light will come on.
(b) The AFT ZONE TRIM VALVE display on the ECS maintenance page will show the trim air modulating valve move to the closed position (0.00-0.07).

H. Standby Mode Test

S 865-617

(1) Put the air/ground relay system in the ground mode (AMM 32-09-02/201).

S 715-220

(2) Move the L (R) PACK selector on the air conditioning control panel, P5 to STBY C.
(a) Look at the ECS maintenance page.
1) The RAM IN DOOR display will show the ram air doors fully open (0.00-0.07).
2) The L (R) TEMP VALVE display will show that the temperature control valve is fully closed (0.0-0.05).

S 715-221

(3) Move the L (R) PACK selector on the P5 panel to STBY W.
(a) Look at the ECS maintenance page.
1) The L (R) RAM IN DOOR display will show that the ram air doors are fully open (0.00-0.07).

2) The L (R) TEMP VALVE display will show the pack temperature control valve open (0.95-1.00).
3) The L (R) PACK OUT display will show that the temperature increases.

S 715-222

(4) Move the L (R) PACK selector on the P5 panel to STBY N.
(a) Look at the ECS maintenance page.
1) The L (R) RAM IN DOOR display will show that the ram air doors are fully open (0.00-0.07).
2) The L (R) TEMP VALVE display will show that the temperature control valve is fully closed (0.0-0.05).
(b) Look at the position indicator on the low limit valve.
1) Make sure the low limit valve moves to the open position.
2) If the low limit valve is still closed after 10 minutes, then do these steps:
a) Move the L (R) PACK selector to AUTO.
b) Push the BIT VERIFY button on the pack temperature controller in the E3 rack.
c) The low limit valve will move to the open position.
d) The LOW LIMIT VALVE light on the pack temperature controller comes on.
e) If the LOW LIMIT light is on, push the RESET button on the L (R) pack temperature controller.

S 865-419

(5) Move the L (R) PACK temperature selector to the OFF position.

I. Put the airplane back to its usual condition:

S 865-421

(1) Shut down the APU (AMM 49-11-00/201) or remove the ground pneumatic air (AMM 36-00-00/201) if it is not necessary.

S 865-423

(2) Put the air/ground relay system back to the ground mode as required (AMM 32-09-02/201).

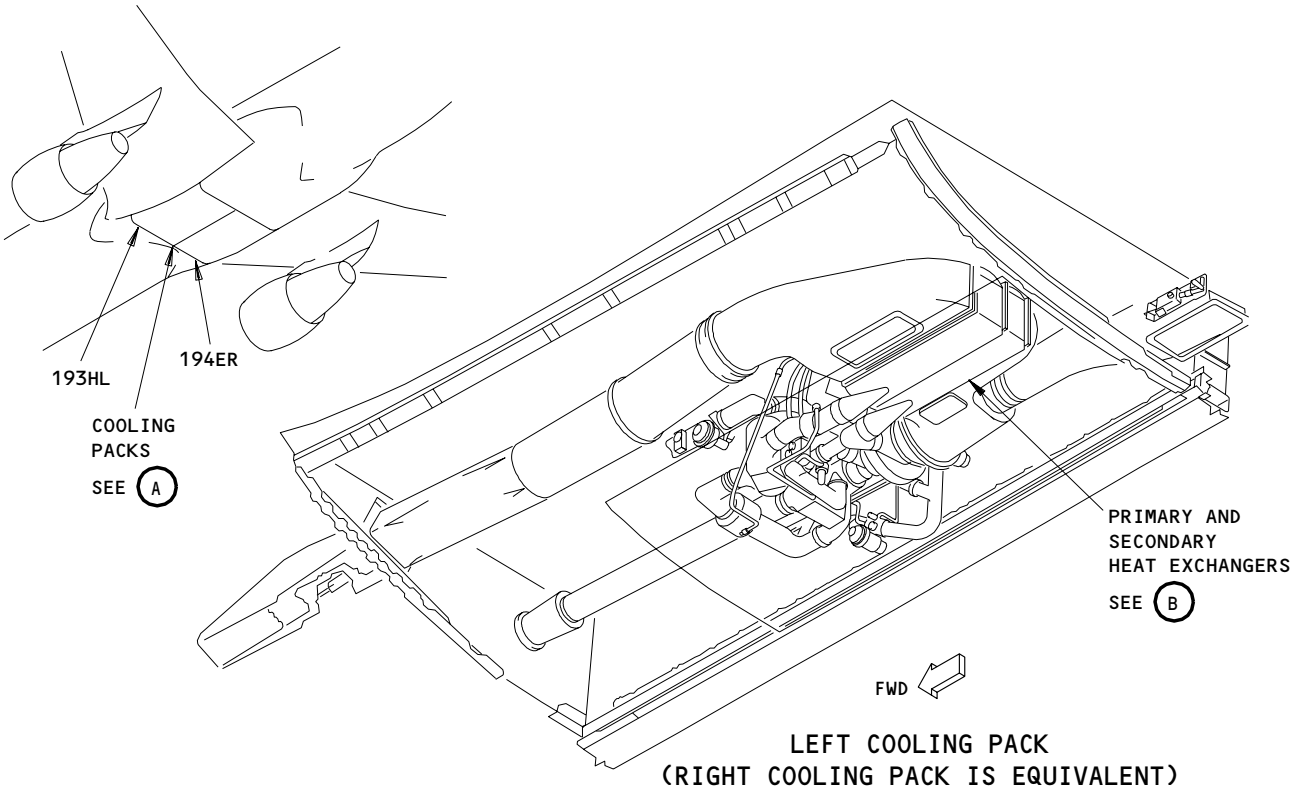
S 445-226
(3) Do the activation procedure for the spoilers (AMM 27-61-00/201) if you did the deactivation procedure.

S 865-425
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-51-00-705-264

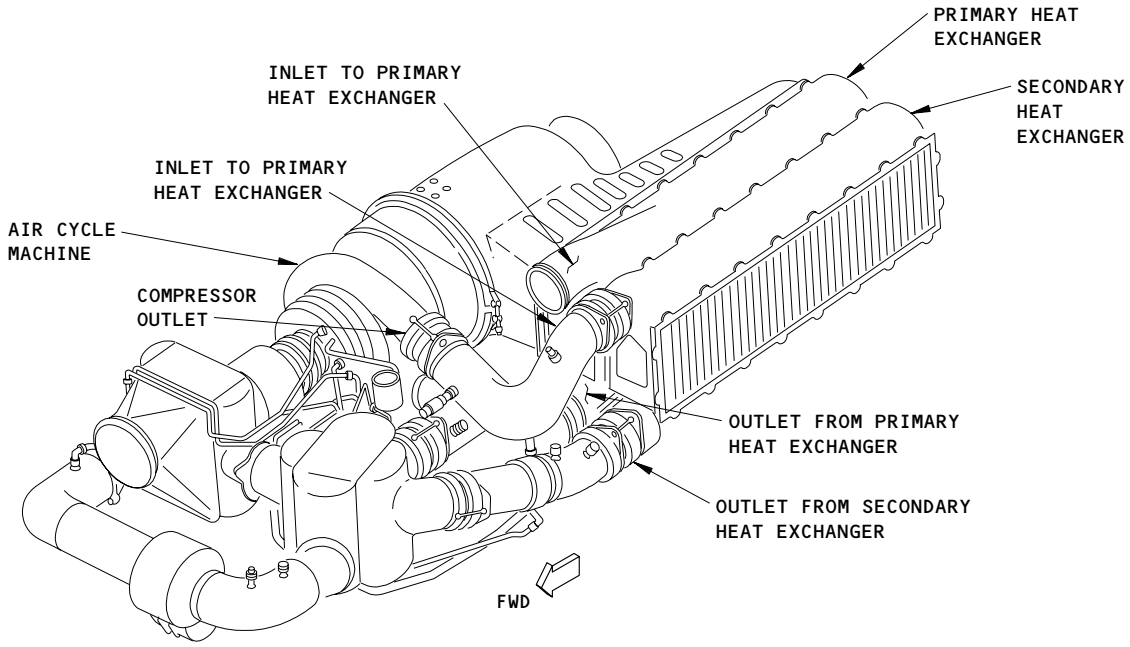
7. Heat Exchanger Test (Fig. 504)
   A. General
      (1) This procedure has the steps to do a health check for the primary and secondary heat exchangers.
      (2) A health check gives a quick indication that the system operates correctly.
   B. Special Tools and Equipment
      (1) Thermocouple Probe - P/N 98220K, Omega Technologies, Stamford, CT 06907
   C. References
      (1) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
      (2) AMM 21-51-00/501, Operational Test - Cooling Pack System
      (3) AMM 21-61-00/501, Operational Test - Primary (Zone) Temperature Control System
      (4) AMM 24-22-00/201, Electrical Power - General
      (5) AMM 27-61-00/201, Spoiler/Speedbrake Control System
      (6) AMM 32-09-02/201, Air/Ground Relays
      (7) AMM 49-11-00/201, Auxiliary Power Unit
      (8) AMM 49-61-05/201, APU Control Unit (ECU)
      (9) AMM 77-12-03/401, Engine Speed Card
   D. Access
      (1) Location Zones
          135/136 Environmental control system (ECS) bay
          211/212 Control cabin
      (2) Access Doors
          193HL Environmental control system bay (left)
          194ER Environmental control system bay (right)
   E. Prepare for the Test

S 865-427
(1) Supply electrical power (AMM 24-22-00/201).



LEFT COOLING PACK
(RIGHT COOLING PACK IS EQUIVALENT)

A



PRIMARY AND SECONDARY HEAT EXCHANGERS

B

Primary and Secondary Heat Exchanger Test
Figure 504

S 865-429
(2) Make sure all circuit breakers for the air conditioning system are closed.

S 865-431
(3) Make sure the BLEED AIR L ENG and BLEED AIR R ENG switches on the P5 panel are OFF.

S 745-231
(4) Do the BITE tests for these components:
(a) Pack temperature controller (AMM 21-51-00/501)
(b) Standby temperature controller (AMM 21-51-00/501).
(c) Zone temperature controller (AMM 21-61-00/501).
(d) APU ECU (AMM 49-11-00/501).

S 015-232
(5) Open the left (right) air conditioning bay doors.

S 865-433
(6) Push the AUTO switch on the EICAS maintenance panel, P61.

S 865-435
(7) Push the ECS/MSG switch on the EICAS maintenance panel, P61.

S 865-437
(8) Set the L (R) RECIRC FAN switches to ON.

S 865-439
(9) Set the temperature selectors (FLT DK, FWD CAB, and AFT CAB) on the P5 panel to AUTO (8:00 o'clock position).

S 865-441
(10) Set the ISOLATION VALVE switch on the P5 panel to ON.

S 865-443
(11) Start and operate the APU (AMM 49-11-00/201).

S 865-445
(12) Set the APU BLEED AIR switch to ON.

S 215-240
(13) Make sure the L (R) DUCT PRESS gage on the P5 panel shows the pressure increases to 35 +/- 5 psi.

S 045-241

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN MOVE QUICKLY AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPEMENT.

(14) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the control surfaces.

S 865-447

WARNING: OBEY THE PROCEDURE THAT PUTS THE AIRPLANE IN THE AIR MODE. IF YOU DO THE PROCEDURE INCORRECTLY, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(15) Put the air/ground relay system in the air mode (AMM 32-09-02/201).

S 865-449

(16) Make sure the TRIM AIR switch on the P5 panel is OFF.

F. Heat Exchanger Test

S 715-243

(1) Move the L (R) pack selector to STBY C.
   (a) Look at the L (R) TEMP VALVE display on the ECS maintenance page.
   (b) Make sure the TEMP VALVE display shows that the temperature control valve is closed (0.00-0.05).

S 865-696

(2) Do the "Engine Running Simulation" procedure for the right engine speed card (AMM 77-12-01/201).

NOTE: This will inhibit the left pack from the high flow mode schedule.

NOTE: Do the above step for the left engine speed card when you do the test for the right side heat exchangers.

S 865-697

(3) Do these steps on the Flight Management Computer (FMC) to bring up the ANALOG DISCR page 1/2.

NOTE: The FMC will be used to view the ECS PACK H/L indication. The ECS PACK H/L indication shows the pack flow mode (high flow or low flow).

(a) Push the function mode key UNIT REF, just below the FMC.

(b) Push the line select key adjacent to the INDEX prompt shown on the FMC.
(c) Push the line select key adjacent to the MAINT prompt shown on the FMC.
(d) Push the line select key adjacent to the DISCRETES prompt shown on the FMC.
(e) Use the ECS PACK H/L (high flow/low flow) line entry on the ANALOG DISCR page in place of the PACK FLOW indications on EICAS.
(f) Make sure the LEFT and RIGHT ECS PACK H/L entries on the ANALOG DISCR page show LO (low flow).

S 975-247
(4) AIRPLANES WITH THE PRIMARY HEAT EXCHANGER TEMPERATURE DISPLAY;
Make a record of the PRIM HX IN display on the ECS maintenance page as T1.

S 975-506
(5) AIRPLANES WITHOUT THE PRIMARY HEAT EXCHANGER TEMPERATURE DISPLAY;
Measure the surface temperature of the inlet duct for the primary heat exchanger.
(a) Make a record of the primary heat exchanger inlet temperature as T1.

S 975-248
(6) AIRPLANES WITH THE PRIMARY HEAT EXCHANGER OUTLET TEMPERATURE DISPLAY;
Make a record of the PRIM HX OUT display on the ECS maintenance page as T2.

S 975-507
(7) AIRPLANES WITHOUT THE PRIMARY HEAT EXCHANGER OUTLET TEMPERATURE DISPLAY;
Measure the surface temperature of the outlet duct for the primary heat exchanger.
(a) Make a record of the primary heat exchanger outlet temperature as T2.

S 975-249
(8) If the difference between T1 and T2 is more than 22 deg. C (40 deg. F), then the primary heat exchanger is OK.

S 715-250
(9) If the difference between T1 and T2 is less than 22 deg. C (40 deg. F), then do this step:

(a) Replace the primary heat exchanger (AMM 21-51-02/401).

S 975-262
(10) AIRPLANES WITH THE COMPRESSOR OUTLET TEMPERATURE DISPLAY;
Make a record of the COMP OUT display on the ECS maintenance page as T3.

S 975-508
(11) AIRPLANES WITHOUT THE COMPRESSOR OUTLET TEMPERATURE DISPLAY;
Measure the surface temperature of the inlet duct for the secondary heat exchanger.
(a) Make a record of the secondary heat exchanger inlet temperature as T3.

S 975-251
(12) AIRPLANES WITH THE SECONDARY HEAT EXCHANGER OUTLET TEMPERATURE DISPLAY;
Make a record of the SEC HX OUT display on the ECS maintenance page as T4.

S 975-509
(13) AIRPLANES WITHOUT THE SECONDARY HEAT EXCHANGER OUTLET TEMPERATURE DISPLAY;
Measure the surface temperature of the outlet duct for the secondary heat exchanger.
(a) Make a record of the secondary heat exchanger outlet temperature as T4.

S 975-252
(14) If the difference between T3 and T4 is less than 125 deg. C (225 deg. F), then the secondary heat exchanger is OK.

S 975-253
(15) If the difference between T3 and T4 is more than 125 deg. C (225 deg. F), then do the applicable step:

NOTE: The primary and secondary heat exchangers are in series. If the difference between T3 and T4 is more than 125 deg C (225 deg F) then the system performance is degraded.

(a) Clean the secondary exchanger (AMM 21-51-02/701).

(b) Do the test of the heat exchanger again.
(c) If the retest of the cleaned heat exchanger is still unsatisfactory, then replace the secondary heat exchanger (AMM 21-51-00/501).

S 865-451
(16) Move the L (R) pack selector on the P5 panel to the OFF position.

S 425-256

CAUTION: DO NOT TOUCH THE ENGINE SPEED CARD BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE ENGINE SPEED CARD.

(17) Before you touch the engine speed card, do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 425-255
(18) Put the engine speed cards back to their normal condition (AMM 77-12-01/201).

G. Put the Airplane Back to its Usual Condition

S 865-453
(1) Set the APU BLEED switch on the P5 panel to OFF.

S 865-455
(2) Do the APU shutdown procedure (AMM 49-11-00/201).

S 865-457
(3) Put the air/ground relay system back to the ground mode (AMM 32-09-02/201).

S 445-260
(4) Do the activation procedure for the spoilers (AMM 27-61-00/201).

S 865-261
(5) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-51-00-755-622

8. Single Pack Pressurization Confidence Check (Fig. 505, 506, 507)

A. General

(1) This procedure is based on Service Letter 757-SL-21-055 which will verify the ability of the airplane systems to provide cabin pressure on a single air conditioning pack by checking the ability of the bleed systems to provide the pneumatic demand, checking the air conditioning pack air flow rates, and checking the cabin leakage. The single pack pressurization confidence check procedure consists primarily of these four test phases:
Phase I - Pack heat exchanger efficiency check
Phase II - Pneumatic system pressure and temperature control check
Phase III - Pack flow control valve check
Phase IV - Cabin leakage check per AMM 05-51-24/201

(2) This confidence check consists of four ground procedures to ensure the airplane systems will pressurize the cabin in flight. Phase I uses the APU as the bleed source for operating each pack in a specified condition to check the heat exchanger efficiency. Phase II monitors the pneumatic system pressures and temperatures to ensure proper pneumatic system operation. Phase III uses cabin pressure rate of climb to determine pack airflow rate. Phase IV measures the cabin pressure rate of decay with no air inflow to quantify the cabin leakage. Data collection sheets are supplied in Figure 505 to record data for each procedure. Make copies of these sheets and fill them out as you take measurements. If the collected data do not match the minimum system performance data described in the Figure 506, guidance for resolving the problem is provided in Figure 507. Troubleshooting Information.

B. Equipment

(1) Hand-held Thermometer, 0° to 400° F, Accuracy ± 5° F
(-18° to 204° C, Accuracy ± 3° C)

C. References

(1) AMM 05-51-24/201, Excessive Cabin Pressure Leakage
(2) AMM 21-51-00/501, Operational Test - Cooling Pack System
(3) AMM 24-22-00/201, Electrical Power - Control
(4) AMM 36-00-00/201, Pneumatics - General
(5) AMM 36-11-00/501, Air Supply Distribution System
(6) AMM 49-11-00/201, Auxiliary Power Unit
(7) AMM 49-61-05/201, APU Control Unit (ECU)
(8) AMM 71-00-00/201, Power Plant

D. Access

(1) Location Zones
135/136 Environmental control system (ECS) bay

(2) Access Doors
193HL Environmental control system bay (left)
194ER Environmental control system bay (right)

E. Phase I. Pack Heat Exchanger Efficiency Check

S 715-660

(1) Use the APU to supply pneumatic pressure (isolation valve OPEN).

S 715-661
(2) Operate the left pack in STBY C (right pack OFF).

S 715-662
(3) Verify the left pack temperature control valve is closed (read from the EICAS ECS maintenance page).

S 975-627
(4) Record the primary heat exchanger IN (T1) and OUT (T2) temperatures from the EICAS ECS maintenance page on the data collection sheet in Figure 505.

NOTE: If the airplane does not have this option, the temperatures may be measured directly from the pack ducts with a suitable hand-held thermometer, 0° to 400° F, Accuracy ± 5° F (-18° to 204° C, Accuracy ± 3° C)

S 975-628
(5) Record the compressor OUT (T3) and secondary heat exchanger OUT (T4) temperatures from the EICAS ECS maintenance page on the data collection sheet.

NOTE: If the airplane does not have this option, the temperatures may be measured directly from the pack ducts with a suitable hand-held thermometer, 0° to 400° F, Accuracy ± 5° F (-18° to 204° C, Accuracy ± 3° C)

S 715-663
(6) Operate the right pack in STBY C (left pack OFF).

S 715-664
(7) Verify the right pack temperature control valve is closed (read from the EICAS ECS maintenance page).

S 975-631
(8) Record the primary heat exchanger IN (T1) and OUT (T2) temperatures from the EICAS ECS maintenance page on the data collection sheet.

NOTE: If the airplane does not have this option, the temperatures may be measured directly from the pack ducts with a suitable hand-held thermometer, 0° to 400° F, Accuracy ± 5° F (-18° to 204° C, Accuracy ± 3° C)

S 975-632
(9) Record the compressor OUT (T3) and secondary heat exchanger OUT (T4) temperatures from the EICAS ECS maintenance page on the data collection sheet.

NOTE: If the airplane does not have this option, the temperatures may be measured directly from the pack ducts with a suitable hand-held thermometer, 0° to 400° F, Accuracy ± 5° F (-18° to 204° C, Accuracy 3° C)

S 975-633
(10) The temperature drop across the primary heat exchanger (T1-T2) should be greater than or equal to the temperature rise across the pack compressor plus 20° F (7° C).

Formula
(T1-T2) > or = (T3-T2) + 20° F (7° C)

S 975-634
(11) The temperature drop across the secondary heat exchanger (T3-T4) should be greater than or equal to one half the temperature drop across the primary heat exchanger.

Formula
(T3-T4) > or = (T1-T2) divided by 2

F. Phase II. Precooler Efficiency Check

S 715-665
(1) Start the left and right engines (AMM 71-00-00/201).

S 865-827
(2) Configure the airplane as follows:

Outflow Valve;	OPEN
Right Engine;	ON
Right Bleed;	ON
Right Pack;	ON
Right Recirc;	ON
APU Bleed;	OFF
Left Engine;	ON
Left Bleed;	ON
Left Pack;	ON
Left Recirc;	ON
Isolation Valve;	CLOSED

S 715-651
(3) Monitor the pack flow control valve position on the FMS maintenance page by selecting INDEX, MAINT, DISCRETE, DISPLAY and reading the PACK HI/LOW message.

S 715-828
(4) Make sure that the pack valves are in LOW flow.

S 715-652
(5) Select the right pack OFF.

S 715-653
(6) Verify the left pack valve switches to HI flow.

S 715-654
(7) Select the right pack AUTO.

S 715-655
(8) Verify the left pack valve switches to LOW flow.

S 715-656
(9) Select the left pack OFF.

S 715-657
(10) Verify the right pack valve switches to HI flow.

S 715-658
(11) Select the left pack to AUTO.

S 715-659
(12) Verify the right pack valve switches to LOW flow.

S 715-649
(13) Check the pressure and temperature control features of the left pneumatic supply system.
(a) Configure the airplane as follows:

Outflow Valve;	OPEN
Right Engine;	ON
Right Bleed;	OFF
Right Pack;	ON
Right Recirc;	ON
APU Bleed;	OFF
Left Engine;	ON
Left Bleed;	ON
Left Pack;	ON
Left REcirc;	ON
Isolation Valve;	OPEN

(b) Slowly increase the left engine power.
(c) Monitor the duct pressure and precooler OUT temperature on the EICAS ECS maintenance page until pneumatic crossover is observed (AMM 36-11-00/501).
1) Make sure that the pressure stays between the specified values (AMM 36-11-00/501).
2) Make sure that the precooler OUT temperature is less than 450° F (232° C) at crossover to low stage bleed.
(d) Slowly reduce the left engine power to IDLE.

S 715-666
(14) Check the pressure and temperature control features of the right pneumatic supply system.
(a) Configure the airplane as follows:

Outflow Valve;	OPEN
Right Engine;	ON
Right Bleed;	ON
Right Pack;	ON
Right Recirc;	ON
APU Bleed;	OFF
Left Engine;	ON
Left Bleed;	OFF
Left Pack;	ON
Left REcirc;	ON
Isolation Valve;	OPEN

(b) Slowly increase the right engine power.
(c) Monitor the duct pressure and precooler OUT temperature on the EICAS ECS maintenance page until pneumatic crossover occurs (AMM 36-11-00/501).
1) Make sure that the pressure stays between the specified values (AMM 36-11-00/501).
2) Make sure that the precooler OUT temperature is less than 450° F (232° C) at crossover to low stage bleed.
(d) Slowly reduce the right engine power to IDLE.

G. Phase III. Pack Flow Rate Check

S 865-691
(1) Prepare the airplane for the Excessive Cabin Pressure Leakage Test. (AMM 05-51-24/201)

S 865-669
(2) Configure the airplane as follows:

Right Engine;	ON
Right Bleed;	ON
Right Pack;	ON
Right Recirc;	ON
APU Bleed;	OFF
Left Engine;	ON
Left Bleed;	ON
Left Pack;	ON
Left REcirc;	ON
Isolation Valve;	CLOSED

S 785-680
(3) With the engines in IDLE, slowly close the outflow valve in MANUAL mode and pressurize the cabin to 3.0 PSID.

S 785-681
(4) As the cabin pressure approaches 3.0 PSID, select the right pack OFF.

S 785-682
(5) Slowly increase the left engine power to provide approximately 30 PSIG duct pressure.

S 975-672
(6) Monitor and record the cabin rate of climb as the cabin pressure approaches 4.0 PSID.

S 865-683
(7) Decrease the left engine to IDLE and select the left pack to OFF.

S 795-674
(8) Bleed the cabin pressure down to 3.5 PSID.

S 785-684
(9) Select the right pack ON and manually increase the right engine power to obtain approximately 30 PSIG duct pressure.

S 975-676
(10) Monitor and record the cabin rate of climb as the cabin pressure increases to 4.0PSID.

S 865-685
(11) Select the right pack OFF.

S 865-686
(12) Reduce the right engine power to IDLE.

H. Phase IV. Cabin Leakage Check

S 795-687
(1) Perform a cabin leakage check from 4.0 to 2.5 PSID. (AMM 05-51-24/201)

S 975-688
(2) Record the cabin pressure and descent rate at 20 second intervals on the data collection sheet.

S 795-689
(3) Continue depressurizing the cabin to zero PSID.

S 865-690
(4) Return the airplane to normal configuration.

I. Summary

S 815-692
(1) After completing the four phases of the Single Pack Pressurization Confidence Check, compare the recorded information with the data in Figure 506. Minimum System Performance. If the recorded data are within limits, there is a high degree of confidence that the cabin pressure can be maintained at cruise (FL350) on a single pack. If a problem exists, refer to Figure 507. Troubleshooting Information to determine the condition of the airplane systems and what action is recommended.

AIRPLANE: _____ DATE: _____

HOURS: _____ CYCLES: _____

PRE-CHECK INSPECTION

GENERAL CONDITION OF DOOR SEALS:

- PASSENGER ENTRY: _____
- SERVICE: _____
- CARGO: _____

OBVIOUS SIGNS OF CABIN LEAKAGE FROM OUTSIDE THE AIRPLANE: _____

_____

_____

PHASE I - PACK HEAT EXCHANGER EFFICIENCY CHECK

DUCT: _____ AMBIENT TEMPERATURE: _____

PRESSURE: _____

PACK	PRIMARY HX IN TEMP (T1)	PRIMARY HX OUT TEMP (T2)	COMPRESSOR OUT TEMP (T3)	SECONDARY HX OUT TEMP (T4)	T1-T2	T3-T2	T3-T4
LEFT							
RIGHT							

PHASE II - PRECOOLER EFFICIENCY CHECK

BLEED SOURCE	PACK FLOW	POWER SETTING	AMBIENT TEMPERATURE	DUCT PRESSURE	PRECOOLER OUT TEMPERATURE
LEFT	LOW (RECIRC "ON")				
RIGHT	LOW (RECIRC "ON")				

Data Collection Sheets
Figure 505 (Sheet 1)

W20604

PHASE III – PACK FLOW RATE CHECK

BLEED SOURCE	PACK	POWER SETTING	DUCT PRESSURE	CABIN RATE OF CLIMB APPROACHING 4.0 PSID
LEFT	LEFT			
RIGHT	RIGHT			

PHASE IV – CABIN LEAKAGE CHECK

CABIN TEMPERATURE:

TIME (SECONDS)	CABIN PRESSURE (PSID)	CABIN RATE OF CHANGE
0	4.0 PSID	
20		
40		
60		
80		
100		
120		
140		
160		
180		
200		
220		
240		

Data Collection Sheets
Figure 505 (Sheet 2)

W20195

SYSTEM	757-200	757-300
PACK PRIMARY HEAT EXCHANGER EFFICIENCY	PRIMARY HEAT EXCHANGER PERFORMANCE: • ΔT PRIMARY IS AT LEAST 20 DEGREES F GREATER THAN ΔT ACROSS THE COMPRESSOR. T1-T2≥T3-T2+20°F	PRIMARY HEAT EXCHANGER PERFORMANCE: • ΔT PRIMARY IS AT LEAST 20 DEGREES F GREATER THAN ΔT ACROSS THE COMPRESSOR T1-T2≥T3-T2+20°F
PACK SECONDARY HEAT EXCHANGER EFFICIENCY	SECONDARY HEAT EXCHANGER PERFORMANCE: • ΔT SECONDARY Hx IS AT LEAST 50% ΔT PRIMARY Hx. T3-T4≥0.5(T1-T2)	SECONDARY HEAT EXCHANGER PERFORMANCE: • ΔT SECONDARY Hx IS AT LEAST 50% ΔT PRIMARY Hx. T3-T4≥0.5(T1-T2)
PNEUMATIC SYSTEM CONTROL	PRESSURE: • WITHIN AMM 36-11-00/501, FIG. 502. PRECOOLER OUT TEMPERATURE: • LESS THAN 450°F (232°C) AT CROSSOVER TO LOW STAGE BLEED.	PRESSURE: • WITHIN AMM 36-11-00/501, FIG. 502. PRECOOLER OUT TEMPERATURE: • LESS THAN 450°F (232°C) AT CROSSOVER TO LOW STAGE BLEED.
SINGLE PACK - LOW FLOW MODE	AT A CABIN DIFFERENTIAL OF 4.0 PSID, THE CABIN RATE OF CLIMB SHOULD BE -200 FEET/MINUTE OR GREATER (CABIN PRESSURIZING) WITH THE PNEUMATIC SUPPLY PRESSURE AT 30 PSI OR GREATER.	AT A CABIN DIFFERENTIAL OF 4.0 PSID, THE CABIN RATE OF CLIMB SHOULD BE -200 FEET/MINUTE OR GREATER (CABIN PRESSURIZING) WITH THE PNEUMATIC SUPPLY PRESSURE AT 30 PSI OR GREATER.
CABIN LEAKAGE RATE	TAKES 160 SECONDS OR MORE FOR THE CABIN PRESSURE TO BLEED DOWN FROM 4.0 PSID TO 2.5 PSID.	TAKES 180 SECONDS OR MORE FOR THE CABIN PRESSURE TO BLEED DOWN FROM 4.0 PSID TO 2.5 PSID.

757-200/300 Minimum System Performance
Figure 506

SYSTEM	MINIMUM REQUIREMENT	REQUIREMENT SATISFIED	
		YES	NO
SINGLE PACK – LOW FLOW MODE	757-200; MINIMUM CABIN RATE OF CLIMB IS -200 FEET/MINUTE AT 4.0 PSID. 757-300; MINIMUM CABIN RATE OF CLIMB IS -200 FEET/MINUTE AT 4.0 PSID	CONFIDENCE IS HIGH THAT THE AIRPLANE WILL MAINTAIN PRESSURE WITH SINGLE PACK IN ALL FLOW MODES WHILE IN CRUISE.	IS CABIN LEAKAGE ACCEPTABLE? YES – REPLACE THE PACK FLOW CONTROL AND SHUTOFF VALVE (AMM 21-51-01/201). NO – REPAIR AIR LEAKS AS REQUIRED.
AIRPLANE/STRUCTURE LEAKAGE	757-200; LEAK DOWN FROM 4.0 TO 2.5 PSID IS EQUAL TO OR GREATER THAN 160 SECONDS. 757-300 LEAK DOWN FROM 4.0 TO 2.5 PSID IS EQUAL TO OR GREATER THAN 180 SECONDS.	CABIN LEAKAGE IS ACCEPTABLE. OPERATORS MAY WISH TO CONSIDER CONDUCTING LEAKAGE TEST ON A C-CHECK INTERVAL TO ESTABLISH LEAKAGE PERFORMANCE DATA (AMM 05-51-24/201).	INSPECT AND REPAIR ANY AIR LEAKS AS NOTED ON THE "DATA" SHEET. SPECIFICALLY; DOORS AND HATCHES – MISSING OR TORN SEALS, POOR CONTACT BETWEEN SEALS AND AIRPLANE STRUCTURE, INSPECT SEALING COMPOUND AREAS AND REPAIR DOOR SEALS PER AMM 52-09-01/601. • OVERBOARD EQUIPMENT COOLING VALVE – TEST PER AMM 21-58-05/401. • BILGE DRAINS – SHOULD CLOSE AT APPROXIMATELY 2.0 PSID. SIGNIFICANT LEAKS AT PRESSURE RELIEF VALVES, OUTFLOW VALVE, FLIGHT DECK WINDOWS AND WATER SERVICE PANEL SHOULD BE RESOLVED AS REQUIRED.
ENGINE BLEED DUCT PRESSURE	DUCT PRESSURE SHOULD BE WITHIN VALUES SHOWN IN AMM 36-11-00/501, FIG. 502.	BLEED SYSTEM IS WILL MAINTAIN PROPER PNEUMATIC PRESSURE.	CONSIDER ACCOMPLISHING THE ENGINE BLEED AIR DISTRUBUTION SYSTEM ADJUSTMENT/TEST PER AMM 36-11-00/501 TO HELP IMPROVE PERFORMANCE. REFERENCE: • AMM 36-11-07/501, HPSOV AND PILOT CHECK • AMM 36-11-09/501, PRSOV AND PILOT CHECK • AMM 36-11-16/501, FAN AIR MOD VALVE CHECK.

Trourbleshooting Information
Figure 507 (Sheet 1)

SYSTEM	MINIMUM REQUIREMENT	REQUIREMENT SATISFIED	
		YES	NO
PRECOOLER OUT TEMPERATURE	LESS THAN 450°F (232°C) AT CROSSOVER TO LOW STAGE BLEED.	BLEED SYSTEM WILL MAINTAIN PROPER PNEUMATIC TEMPERATURE.	CONSIDER ACCOMPLISHING THE FAN AIR MODULATION VALVE SYSTEM ADJUSTMENT/TEST PER AMM 36-11-16/501, TO HELP IMPROVE PERFORMANCE.
CABIN PRESSURIZATION CONTROL SYSTEM	SUCCESSFUL COMPLETION OF PHASE I, II AND II TEST AND CABIN PRESSURE CAN BE MAINTAINED.	HIGH DEGREE OF CONFIDENCE THAT CABIN PRESSURE CAN BE MAINTAINED WITH A SIGNLE PACK OPERATING.	CONSIDER ACCOMPLISHING CABIN PRESSURIZATION SYSTEM TEST PER AMM 21-31-00/501.
PACK HEAT EXCHANGER EFFICIENCY:			
PRIMARY	ΔT PRIMARY IS 20 DEGREES F GREATER THAN THE ΔT ACROSS THE PACK COMPRESSOR.	HIGH DEGREE OF CONFIDENCE THE PACK WILL NOT TRIP DUE TO A HIGH COMPRESSOR OUT TEMPERATURE.	REPLACE THE PRIMARY HEAT EXCHANGER PER AMM 21-51-02/401.
SECONDARY	ΔT SECONDARY IS AT LEAST 50% OF THE ΔT PRIMARY.	HIGH DEGREE OF CONFIDENCE THE PACK WILL NOT TRIP DUE TO HIGH PACK OUT TEMPERATURE.	CLEAN THE SECONDARY HEAT EXCHANGER PER AMM 21-51-02/701 OR REPLACE THE SECONDARY HEAT EXCHANGER PER AMM 21-51-02/401.

Trourbleshooting Information
Figure 507 (Sheet 2)

BLEED SYSTEM DATA COLLECTION SHEET						
	TIME	ALTITUDE	ENGINE POWER SETTING	LEFT DUCT PRESSURE	RIGHT DUCT PRESSURE	BLEED, ECS, WING ANTI-ICE OR ENGINE ANTI-ICE CONFIGURATION
TAKEOFF						
CLIMB						
CRUISE						
DESCENT						
COMMENT						
TAXI						

In-Flight Bleed System Data Collection Sheet
(This is for reference only to aid in troubleshooting)

Troubleshooting Information
Figure 507 (Sheet 3)

W21343

COOLING PACK SYSTEM - INSPECTION/CHECK

1. General
   A. This procedure has instructions to visually examine the cooling packs.

   TASK 21-51-00-216-001

2. Do a Check of the Cooling Packs
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 21-51-01/201, Flow Control and Shutoff Valve
      (3) 21-51-02/601, Heat Exchangers
      (4) 21-51-03/401, Air Cycle Machine
      (5) 21-51-04/401, Water Extractor
      (6) 21-51-05/401, Compressor Outlet Overheat Switch
      (7) 21-51-06/401, Compressor Outlet Sensor
      (8) 21-51-07/401, Pack Reheater
      (9) 21-51-08/401, Pack Temperature Sensor
      (10) 21-51-10/401, Condenser
      (11) 21-51-11/201, Pack Low Limit Control Valve
      (12) 21-51-12/401, Pack Temperature Control Valve
      (13) 21-51-15/401, Cabin Air Supply Check Valve
      (14) 21-51-21/401, Split-duct Water Separator
   B. Access
      (1) Location Zones
         135/136 Environmental control system (ECS) bay
      (2) Access Doors
         193HL Environmental control system bay (Left)
         194ER Environmental control system bay (Right)
   C. Prepare for the Check

      S 866-002
      (1) Supply electrical power (Ref 24-22-00).

      S 866-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
         (a) Make sure the PACK OFF light comes on.

(b) Put a DO-NOT-OPERATE tag on the selector.

S 016-004

(3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

D. Examine the cooling pack

S 216-005

(1) Examine the cooling pack components (the air cycle machine , the reheater, the condensor, the water extractor, and the split-duct water separator) for the conditions that follow:
(a) Make sure the supports and the attached components are tightly connected.
(b) Make sure there are no cracks.
(c) Make sure there is no corrosion.
(d) Make sure there are no signs of a leak.

S 966-006

(2) Replace the component or repair the connections, if it is necessary (Ref 21-51-03, 21-51-04, 21-51-07, 21-51-10, 21-51-21).

S 216-007

(3) Examine the temperature switches and sensors (the compressor outlet overheat switch, the compressor outlet sensor, and the pack temperature sensor) for the conditions that follow:
(a) Make sure there are no signs of a leak.
(b) Make sure the electrical connectors are tightly connected.
(c) Make sure the lockwires are tightly connected and are strong.

S 966-008

(4) Replace the packing, tighten the electrical connector, or replace the lockwire if it is necessary (Ref 21-51-05, 21-51-06, 21-51-08).

S 216-009

(5) Examine the valves (the flow control and shutoff valve, low limit control valve, the temperature control valve, and the cabin air supply check valve) for the conditions that follow:
(a) Make sure the couplings are tightly connected.
(b) Make sure there are no cracks.

(c) Make sure there is no corrosion.
(d) Make sure there are no signs of a leak in the valve or the pneumatic lines.
(e) Make sure the electrical connectors are tightly connected.
(f) Make sure the bonding jumpers are tightly connected.

S 966-010
(6) Replace the valves or repair the connections, if it is necessary (Ref 21-51-01, 21-51-11, 21-51-12, 21-51-15).

S 216-011
(7) Examine the primary and secondary heat exchangers for the conditions that follow:
(a) Make sure there are no cracks.
(b) Make sure there is no corrosion.
(c) Make sure there are no large dents or bulges.
(d) Make sure the nuts and bolts that are attached to the heat exchangers are tight.
(e) Make sure there are no signs of a leak.

S 966-012
(8) Tighten the nuts and bolts or replace the heat exchangers, if it is necessary (Ref 21-51-02).

S 216-013
(9) Examine the ducts and the pneumatic lines for the conditions that follow:
(a) Make sure there are no signs of a leak.
(b) Make sure there are no cracks or dents.
(c) Make sure no damage is done to the duct flanges.
(d) On the duct connections that have a restraint cable:
1) Make sure the bonding jumpers are tightly connected.
2) Make sure the restraint cables are tight and strong.
3) Make sure the distance between the duct flanges is not more than 2.65 inches.
(e) Make sure there are no cracks or damage in the hoses for the pneumatic lines.

S 966-014
(10) Replace or repair the ducts or pneumatic lines, if it is necessary.

E. Put the airplane back to its usual condition

S 416-015
(1) Close the left or right ECS access door, 193HL or 194ER (Ref 06-41-00).

S 866-016
(2) Remove the DO-NOT-OPERATE tag from the L or R PACK selector, on the P5 panel.

S 866-017

(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

FLOW CONTROL AND SHUTOFF VALVE - MAINTENANCE PRACTICES

1. General
   A. This procedure has instructions to remove and install the flow control valve.

TASK 21-51-01-002-001

2. Remove the Flow Control and Shutoff Valve (Fig. 201)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 21-51-14/501, Pack Temperature Controller.
      (3) AMM 24-22-00/201, Electrical Power Control.
      (4) AMM 36-00-00/201, Pneumatic - General.
   B. Access
      (1) Location Zones
          135/136 Environmental control system (ECS) bay
      (2) Access Panels
          193HL Environmental control system bay
          194ER Environmental control system bay
   C. Prepare for the Removal

      S 862-002
      (1) Supply electrical power (AMM 24-22-00/201).

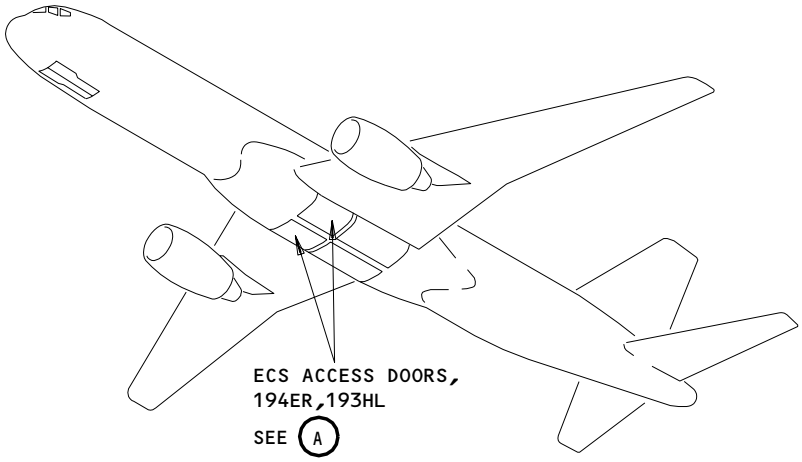
      S 862-003

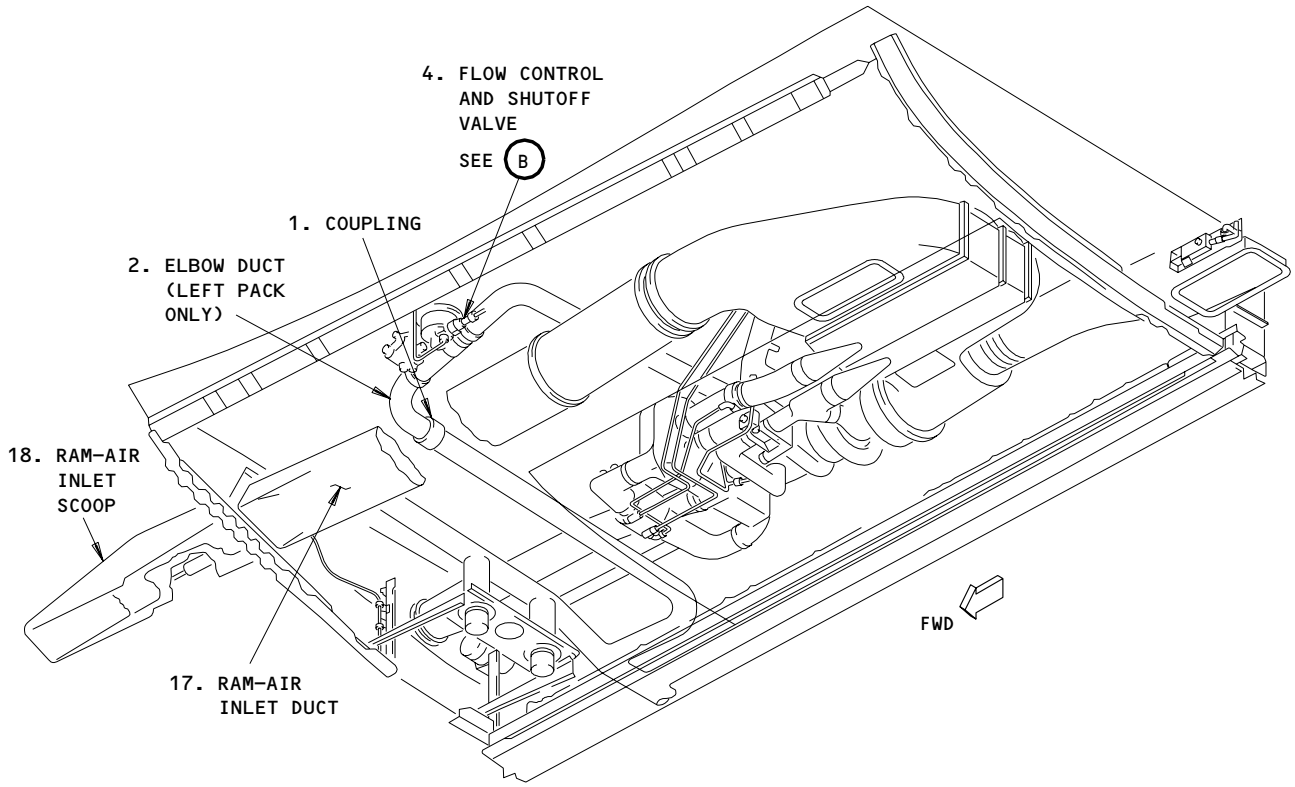
      WARNING: MAKE SURE THE PNEUMATIC POWER IS REMOVED FROM THE AIRPLANE AND THERE IS NO PRESSURE IN THE AIR SUPPLY DUCTS. IF THERE IS PRESSURE IN THE AIR SUPPLY DUCTS WHEN THE FLOW CONTROL AND SHUTOFF VALVE IS REMOVED, INJURY TO PERSONS OR DAMAGE TO THE EQUIPMENT CAN OCCUR.

      (2) Remove the pneumatic power (AMM 36-00-00/201).

      S 862-004
      (3) To remove the left flow control and shutoff valve:
          (a) Open these circuit breakers and attach DO-NOT-CLOSE tags:
              1) On the overhead circuit breaker panel, P11:
                  a) 11A14, AIR COND PACK LEFT FLOW CONT
          (b) Open the left ECS access door, 193HL (AMM 06-41-00/201).

      S 862-005
      (4) To remove the right flow control and shutoff valve.
          (a) Open these circuit breakers and attach DO-NOT-CLOSE tags:
              1) On the overhead circuit breaker panel, P11:
                  a) 11A29, AIR COND PACK RIGHT FLOW CONT

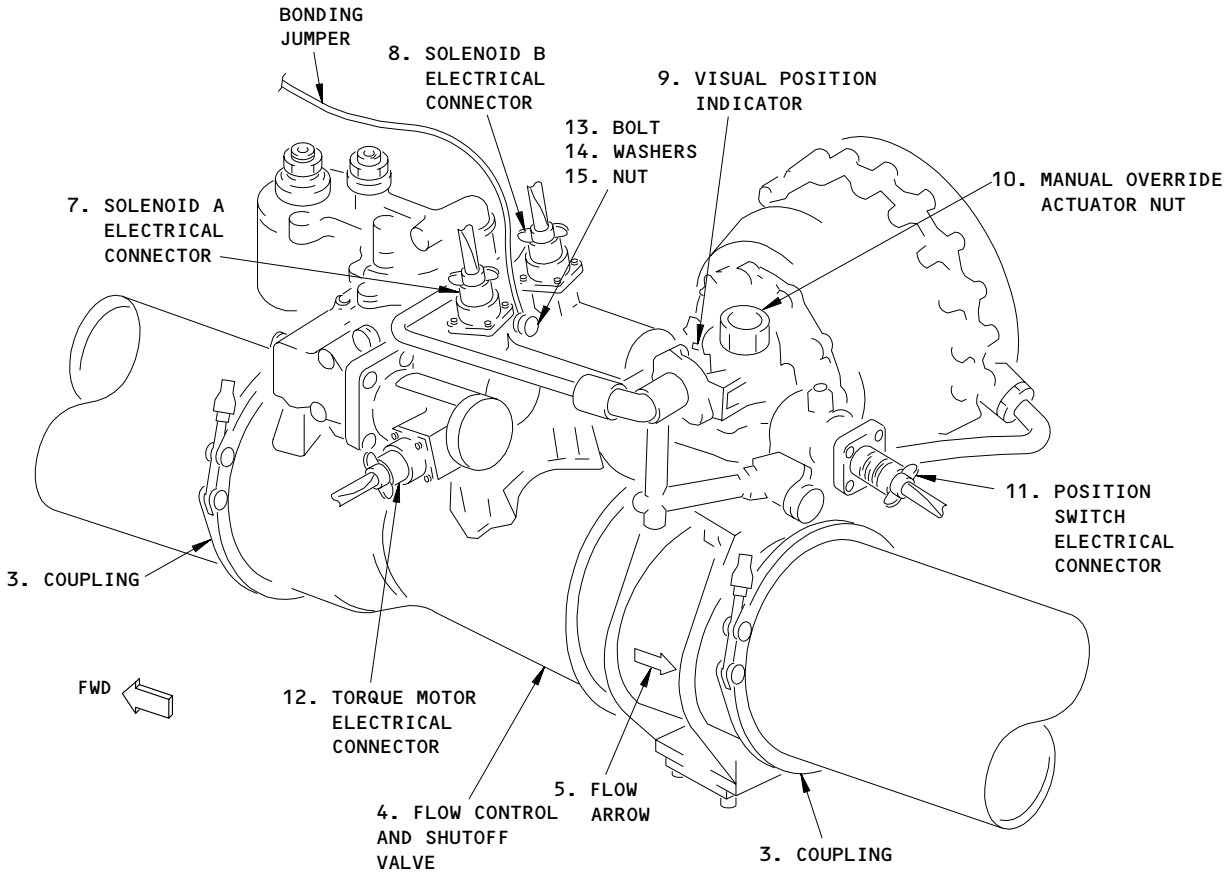




LEFT PACK SHOWN
(RIGHT PACK ALMOST THE SAME)

A

Flow Control and Shutoff Valve Installation
Figure 201 (Sheet 1)



FLOW CONTROL AND SHUTOFF VALVE
(LEFT SIDE IS SHOWN, RIGHT SIDE IS OPPOSITE)

B

Flow Control and Shutoff Valve Installation
Figure 201 (Sheet 2)

(b) Open the right ECS access door, 194ER (Ref 06-41-00).

D. Remove the valve

S 032-006

(1) Disconnect the electrical connector (7) from the solenoid A of the valve.

S 032-007

(2) Disconnect the electrical connector (8) from the solenoid B of the valve.

S 032-009

(3) Disconnect the electrical connector, (12) from the torque motor of the valve.

S 032-010

(4) Disconnect the electrical connector (11) from the position switch of the valve.

S 032-011

(5) Disconnect the bonding jumpers from the valve.

S 032-012

(6) On the left valve (4), do the steps that follow:
(a) Remove the duct couplings (1) from the elbow duct (2) that is forward of the valve.
(b) Remove the elbow duct (2).

S 032-013

(7) Remove the couplings (3) on each end of the valve.

S 022-014

(8) To remove the right valve (4),
carefully lower the valve out of the ECS bay.

S 022-015

(9) To remove the left valve (4), do the steps that follow:
(a) Carefully move the valve (4) forward, along the top, outboard side of the ram-air inlet duct (17).
(b) Move the valve (4) inboard, above the top of the ram-air inlet scoop (18).
(c) Lower the valve (4) on the inboard side of the ram-air inlet duct (17).

S 432-016

(10) Put a cover on the duct openings.

TASK 21-51-01-402-017

3. Install the Flow Control and Shutoff Valve (Fig. 201)

A. Parts

(1) Refer to the Illustrated Parts Catalog (IPC) for the part numbers and the effectivities of the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
201	1	Coupling	21-51-01	01	20
	2	Elbow Duct			165
	3	Coupling			20
	4	Flow Control and Shutoff Valve			212

B. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 21-51-14/501, Pack Temperature Controller.
(3) AMM 24-22-00/201, Electrical Power Control.
(4) AMM 36-00-00/201, Pneumatic - General.
(5) SWPM 20-20-00, Electrical Bonds and Grounds

C. Access

(1) Location Zones
135/136 Environmental control system (ECS) bay
(2) Access Panels
193HL Environmental control system bay
194ER Environmental control system bay

D. Install the valve

S 032-018
(1) Remove the covers from the duct openings.

S 162-019
(2) Make sure the flanges on the ducts and the valve are clean.

S 422-026
(3) To install the right valve (4), put the valve in the duct with the flow arrow pointed aft.

S 422-027
(4) To install the left valve (4), do the steps that follow:
(a) Lift the valve (4) into the ECS bay, near the top, inboard side of the ram-air inlet duct (17).
(b) Make sure the flow arrow on the valve is pointed aft.
(c) Move the valve (4) above the forward end of the ram-air inlet scoop (18) to the outboard side of the ram-air inlet duct.
(d) Carefully move the valve (4) aft along the top, outboard side of the ram-air inlet duct (17).

(e) Put the valve (4) into the pneumatic duct.
(f) Put the elbow duct (2) into position, forward of the valve (4).
(g) Install the couplings (1) on the forward end of the elbow duct (2).

S 432-022
(5) Install the couplings (3) at each end of the valve.
(a) Tighten the coupling nuts to 50 pound-inches.

S 432-023
(6) Install the bonding jumpers to the valve (SWPM 20-20-00).

S 432-024
(7) On the left flow control and shutoff valve, install the electrical connectors to the valve.
(a) The electrical connector (11), D1930, to the position switch.
(b) The electrical connector (12), D4128, to the torque motor.
(c) The electrical connector (7), D1926, to the solenoid A.
(d) The electrical connector (8), D1928, to the solenoid B.

S 432-025
(8) On the right flow control and shutoff valve, install the electrical connectors to the valve.
(a) The electrical connector (11), D1936, to the position switch.
(b) The electrical connector (12), D4236, to the torque motor.
(c) The electrical connector (7), D1932, to the solenoid A.
(d) The electrical connector (8), D1934, to the solenoid B.

E. Do the installation test for the flow control and shutoff valve.

S 862-028
(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11A14, AIR COND PACK LEFT FLOW CONT
2) 11A29, AIR COND PACK RIGHT FLOW CONT

S 862-029
(2) Supply pneumatic power (AMM 36-00-00/201).

S 862-030
(3) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the AUTO position.
(a) Make sure the PACK OFF light goes off.
(b) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 712-031
(4) Make sure the EICAS message, L or R PACK BITE, does not show on the bottom display.

S 712-032
(5) Make sure the EICAS indication, L or R PACK FLOW, shows a flow rate.

S 792-033
(6) Feel for leaks around the flow control and shutoff valve.
(a) Small leaks are permitted.
(b) You must repair a large leak.

F. Put the airplane back to its usual condition

S 862-034
(1) Turn the applicable (L or R) PACK selector, on the P5 panel, to the OFF position.
(a) Make sure the PACK OFF light comes on.

S 862-035
(2) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 412-036
(3) Close the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 862-037
(4) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

FLOW CONTROL AND SHUTOFF VALVE - CLEANING/PAINTING

1. General
   A. This procedure has instructions to clean the flow control and shutoff valve.

TASK 21-51-01-107-001

2. Flow Control and Shutoff Valve - Cleaning
   A. Equipment
      (1) Compressed Air, Range 0 to 5 psig - commercially available.
      (2) Spray Gun, to apply the cleaning compound - commercially available
   B. Consumable Materials
      (1) B00347 - Cleaning compound, MIL-C-81302
   C. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power Control
      (3) 36-00-00/201, Pneumatic - General
   D. Access
      (1) Location Zones
          135/136 Environmental control system (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems bay
   E. Prepare to clean.

      S 867-002
      (1) Supply electrical power (Ref 24-22-00).

      S 867-003
      (2) Remove the pneumatic power (AMM 36-00-00/201).

      S 867-004
      (3) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

S 867-085
(4) Open these circuit breakers and attach DO-NOT-CLOSE tags:
(a) On the overhead circuit breaker panel, P11:
1) 11A14, AIR COND PACK LEFT FLOW CONT
2) 11A29, AIR COND PACK RIGHT FLOW CONT
3) 11M11, LEFT PACK AUTO POWER
4) 11M19, RIGHT PACK AUTO POWER

S 017-006
(5) Open the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

F. Clean the flow control and shutoff valve.

S 117-007

WARNING: DO NOT GET THE CLEANING COMPOUND IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE COMPOUND. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE THE COMPOUND. KEEP THE COMPOUND AWAY FROM SPARKS, FLAME AND HEAT. THE COMPOUND IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Use a spray gun to apply the cleaning compound to the valve.

S 167-008
(2) Blow the compressed air on the valve until it is dry.
(a) Make sure the air pressure is not more than 5 psig.

G. Put the airplane back to its usual condition

S 417-009
(1) Close the applicable ECS access door, 193HL and 194ER (AMM 06-41-00/201).

S 867-096
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11A14, AIR COND PACK LEFT FLOW CONT
2) 11A29, AIR COND PACK RIGHT FLOW CONT
3) 11M11, LEFT PACK AUTO POWER
4) 11M19, RIGHT PACK AUTO POWER

S 867-011
(3) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 867-012
(4) Remove the electrical power, if it is not necessary (Ref 24-22-00).

HEAT EXCHANGERS - REMOVAL/INSTALLATION

1. General
   A. The heat exchanger and plenum assembly includes the primary and secondary heat exchangers and the plenum. It is installed in the aft section of the air cooling pack. The air cooling pack is installed in the Environmental Control System (ECS) bay, immediately in front of the wheel wells for the main landing gear.
   B. The heat exchanger and plenum assembly must be removed from the airplane as a unit. After you remove the assembly from the airplane, then you can disconnect the heat exchangers from the plenum. This procedure has instructions to remove and install the heat exchanger and plenum assembly.

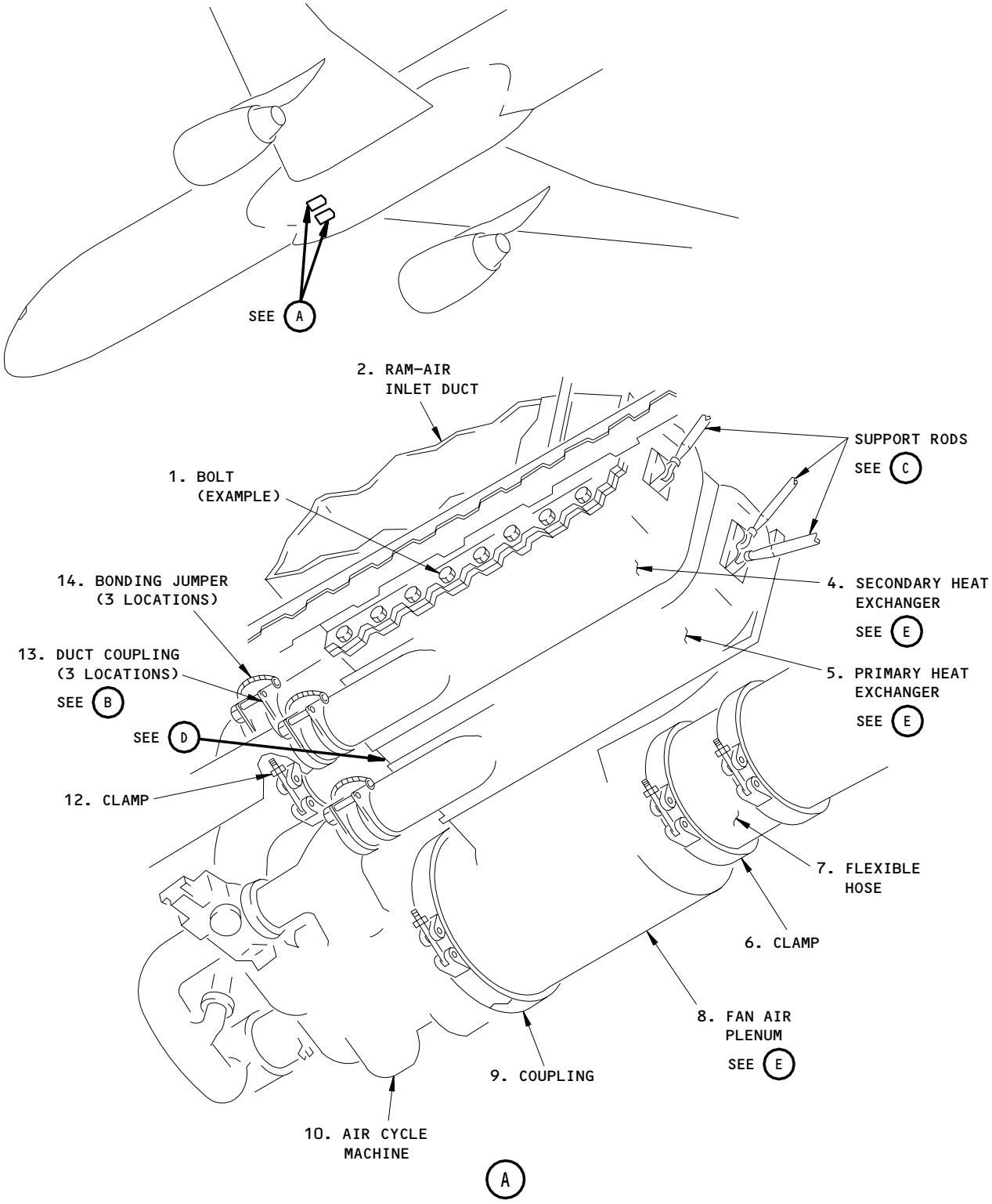
TASK 21-51-02-004-001

2. Remove the Heat Exchanger and Plenum Assembly (Fig. 401)
   A. Equipment
      (1) Hoist Adaptor - A21001-44, A21001-45

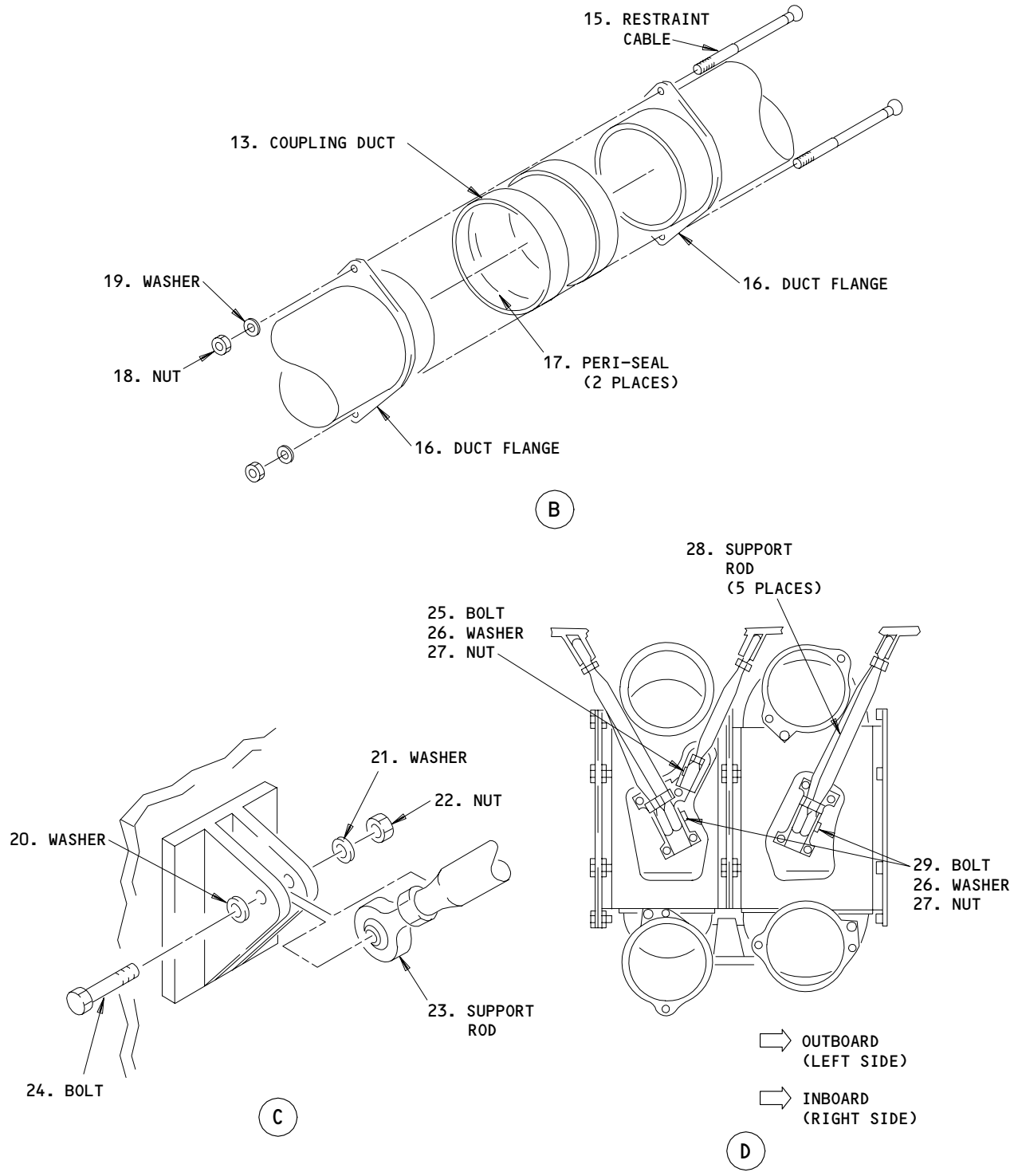
          NOTE: The -44 hoist adapter is used with a customer supplied jack. The -45 hoist adapter is used with a A71015-87 accessory lift fixture.

      (2) Transmission Jack
          (a) Gray Professional Service Equipment
              Model HTJ-1000
              3501 S. Leonard Road
              St./Joseph, MO 64503
          (b) Clore Automotive
              Model W93724
              Sales and Customer Service Center
              6690 Shady Oak Road
              Eden Prairie, MN 55344
          (c) Blackhawk, model 67554, General Service Equip Div. Applied Power Inc., P.O. Box 27207, Milwaukee, Wisc 53227
          (d) Hein-Werner, model 64, part no. 62005, 1200 National Ave, Waukesha, Wisc 53186
   B. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
      (3) 36-00-00/201, Pneumatic - General
   C. Access
      (1) Location Zones
          135/136 Environmental control system bay
      (2) Access Panels
          193HL/194ER ECS components
   D. Prepare for the Removal

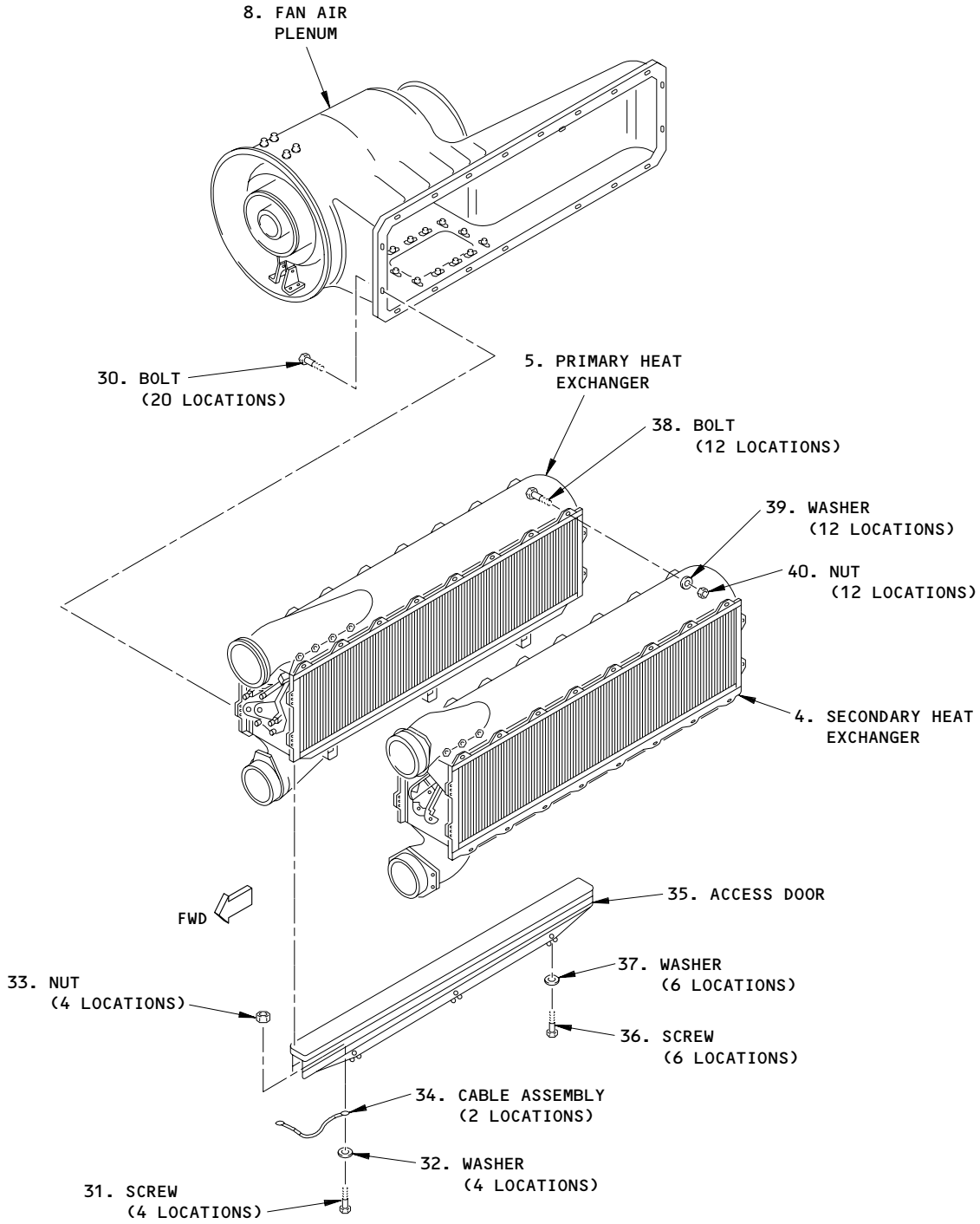
          S 864-002
      (1) Supply electrical power (Ref 24-22-00).



Heat Exchangers Installation
Figure 401 (Sheet 1)



Heat Exchangers Installation
Figure 401 (Sheet 2)



FAN AIR PLENUM AND HEAT EXCHANGERS

E

Heat Exchangers Installation
Figure 401 (Sheet 3)

S 864-003

(2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
   (a) Make sure the PACK OFF light comes on.
   (b) Put a DO-NOT-OPERATE tag on the selector.

S 864-042

(3) Open and attach a DO-NOT-CLOSE tag to these circuit breakers on the overhead circuit breaker panel, P11:
   (a) For the left heat exchanger and plenum assembly:
      1) 11A13, LEFT PACK AUTO CONT
      2) 11A14, LEFT PACK FLOW CONT
      3) 11A26, AIR COND PACK LEFT STBY CONT
      4) 11M11, LEFT PACK AUTO PWR
      5) 11M24, LEFT PACK STANDBY PWR
   (b) For the right heat exchanger and plenum assembly:
      1) 11A15, RIGHT PACK STANDBY CONT
      2) 11A28, RIGHT PACK AUTO CONT
      3) 11A29, RIGHT PACK FLOW CONT
      4) 11M15, RIGHT PACK STANDBY PWR
      5) 11M19, RIGHT PACK AUTO PWR

S 014-004

(4) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00) to find the heat exchangers.

E. Remove the Heat Exchanger and Plenum Assembly.

S 034-005

(1) Disconnect the two lower ducts on the forward end of the heat exchangers (4, 5).
   (a) Remove the bonding jumpers (14) from the coupling ducts (13).
   (b) Remove the locknuts (18) from the restraint cables (15) that hold the coupling ducts (13).
   (c) Remove the coupling ducts (13) and the seal (17) from the lower ducts.

S 034-006

(2) Disconnect the top duct on the forward end of the secondary heat exchanger (4).
   (a) Remove the bonding jumpers (14) from the coupling ducts (13).
   (b) Remove the locknuts (18) from the restraint cables (15) that hold the coupling duct (13).
   (c) Remove the coupling duct (13) and the seal (17) from the top ducts.

S 034-007

(3) Remove the clamp (12) from the top duct on the forward end of the primary heat exchanger (5).

S 494-008
(4) Put the hoist adaptor on the transmission jack.

S 494-009
(5) Put the transmission jack in position so that it holds the heat exchanger and plenum assembly.

NOTE: The hoist adapter goes between the heat exchangers.

S 034-011
(6) Remove the coupling (9) on the forward end of the plenum (8).

S 034-012
(7) Remove the clamp (6) on the aft end of the plenum (8).

S 034-013
(8) Remove the bolts (1) that hold the secondary heat exchanger (4) to the ram-air inlet duct (2).

S 034-014
(9) Remove the bolts (25, 29) from the support rods (28) on the forward end of the heat exchangers (4, 5).

S 034-015
(10) Remove the bolts (24) from the support rods (3) on the aft end of the heat exchangers (4, 5).

S 034-016
(11) Move the support rods (3, 28) away from the heat exchangers.

S 024-017
(12) Carefully lower the heat exchanger and plenum assembly.

S 024-018
(13) To remove the heat exchangers (4, 5) from the plenum (8), remove the bolts (30) between the primary heat exchanger (5) and the plenum (8).

S 024-038

(14) To remove the primary heat exchanger (5) from the secondary heat exchanger (4), do the steps that follow:

(a) Remove the screws (31), washers (32), and nuts (33) to remove the cable assemblies (34) from the access door (35) that is between the primary (5) and secondary heat exchanger (4).

(b) Remove the screws (36) and washers (37) from the access door (35).

(c) Remove the access door (35).

(d) Remove the bolts (38), washers (39), and nuts (40) that attach the primary heat exchanger (5) to the secondary heat exchanger (4).

(e) Remove the primary heat exchanger (5).

TASK 21-51-02-404-019

3. Install the Heat Exchanger and Plenum Assembly (Fig. 401)

A. Equipment

(1) Hoist Adaptor - A21001-44, A21001-45

NOTE: The -44 hoist adapter is used with a customer supplied jack. The -45 hoist adapter is used with a A71015-87 accessory lift fixture.

(2) Transmission Jack

(a) Gray Professional Service Equipment
Model HTJ-1000
3501 S. Leonard Road
St. Joseph, MO 64503

(b) Clore Automotive
Model W93724
Sales and Customer Service Center
6690 Shady Oak Road
Eden Prairie, MN 55344

(c) Blackhawk, model 67554, General Service Equip Div. Applied Power Inc., P.O. Box 27207, Milwaukee, Wisc 53227

(d) Hein-Werner, model 64, part no. 62005, 1200 National Ave, Waukesha, Wisc 53186

B. Consumables

(1) D00006, Never-Seez, Pure Nickel Speicial, NSBT-8N
(High temperature anti-seize compound)

C. Parts

(1) Refer to the Illustrated Parts Catalog (IPC) for the part numbers and the effectivities of the items in the table that follows:

MM			IPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	4	Secondary Heat Exchanger	21-51-02	01	150
	5	Primary Heat Exchanger			70
	8	Fan Air Plenum	21-51-16	01	70
	9	Coupling	21-51-03	01	50
	12	Coupling	21-51-01	01	20
				02	30
	13	Duct Coupling	21-51-52	01	140
	15	Restraint Cable			240
	17	Peri-Seal			145
	18	Nut			250
	19	Washer			245

D. References
(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 24-22-00/201, Electric Power Control
(3) 36-00-00/201, Pneumatic - General

E. Access
(1) Location Zones
135/136 Environmental control system bay
(2) Access Panels
193HL/194ER ECS components

F. Install the Heat Exchanger and Plenum Assembly

S 434-039
(1) If the primary heat exchanger (5) was removed from the secondary heat exchanger (4), do the steps that follow:
(a) Make sure the gaskets on the primary heat exchanger (5) and the secondary heat exchanger (4) are serviceable.

(b) Install the bolts (38), washers (39), and nuts (40) to connect the primary heat exchanger (5) to the secondary heat exchanger (4).
1) Make sure that the primary heat exchanger (5) aligns with the secondary heat exchanger (4).
(c) Install screws (36) and washers (37) to attach the access door (35) to the primary heat exchanger (5) and the secondary heat exchanger (4).
(d) Install the screws (31), washers (32), and nuts (33) to connect the cable assemblies (34) to the access door (35) and the secondary heat exchanger (4).

S 424-011
(2) If the heat exchangers (4, 5) are disconnected from the plenum (8), do the steps that follow:
(a) Put the plenum next to the primary heat exchanger.
(b) Install the bolts to hold the plenum to the primary heat exchanger.

S 494-012
(3) Put the hoist adapter on the transmission jack.

S 494-013
(4) Put the heat exchanger and plenum assembly on the hoist adaptor.

NOTE: The hoist adapter goes between the heat exchangers.

S 424-015
(5) Use the transmission jack to lift the heat exchanger and plenum assembly into position in the air cooling pack.

S 434-017
(6) Put the forward and aft support rods (3, 28) in the brackets on the forward and aft end of the heat exchangers (4, 5).

S 434-018
(7) Install the bolts (24, 25, 29), washers (20, 21, 26), and nuts (22, 27) to the hold the support rods to the brackets..

S 434-019
(8) Install the clamp (9) on the forward end of the plenum (8).

S 434-020
(9) Move part of the flexible hose (7) on to the aft end of the plenum (8).

S 434-021
(10) Install the clamps (6) on the aft end of the plenum (8).

S 434-022
(11) Install the bolts (1) that connect the secondary heat exchanger (4) to the ram-air inlet duct (2).

S 434-023
(12) Install the clamp (12) to the top duct on the forward end of the primary heat exchanger (5).

S 434-024
(13) Install the coupling ducts (13) to the other three ducts on the forward end of the heat exchangers (4, 5).
(a) Apply a thin layer of the anti-seize compound to the threads of the restraint cables (15).
(b) Install the restraint cables (15), washers (19), nuts (18) and new peri-seals (17).
(c) Tighten the restraint cables so that the load on each cable is the same.
(d) Make sure the distance between the duct flanges is less than 2.65 inches (67 mm).
(e) Attach a bonding jumper (14) to each coupling duct (13).

G. Do the installation test for the heat exchanger and plenum assembly.

S 864-050
(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel, P11:
(a) For the left heat exchanger and plenum assembly:
1) 11A13, LEFT PACK AUTO CONT

2) 11A14, LEFT PACK FLOW CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
4) 11M11, LEFT PACK AUTO PWR
5) 11M24, LEFT PACK STANDBY PWR

(b) For the right heat exchanger and plenum assembly:
1) 11A15, RIGHT PACK STANDBY CONT
2) 11A28, RIGHT PACK AUTO CONT
3) 11A29, RIGHT PACK FLOW CONT
4) 11M15, RIGHT PACK STANDBY PWR
5) 11M19, RIGHT PACK AUTO PWR

S 864-025
(2) Supply electrical power (Ref 24-22-00).

S 864-026
(3) Supply pneumatic power (AMM 36-00-00/201).

S 864-027
(4) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.
(a) Turn the selector to the AUTO position.
(b) Make sure the PACK OFF light goes off.

S 214-028
(5) Feel for the airflow around the heat exchanger and plenum assembly.
(a) A small leak is permitted.
(b) You must repair a large leak.

H. Put the airplane back to its usual condition.

S 094-029
(1) Remove the hoist adapter and transmission jack from the heat exchanger and plenum assembly.

S 414-035
(2) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-031

(3) Turn the applicable PACK selector, on the P5 panel, to the OFF position.

S 864-033

(4) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 864-034

(5) Remove the electrical power, if it is not necessary (Ref 24-22-00).

HEAT EXCHANGERS - INSPECTION/CHECK

1. General
   A. This procedure has instructions to examine the heat exchangers to make sure they are clean and are not damaged.

TASK 21-51-02-206-001

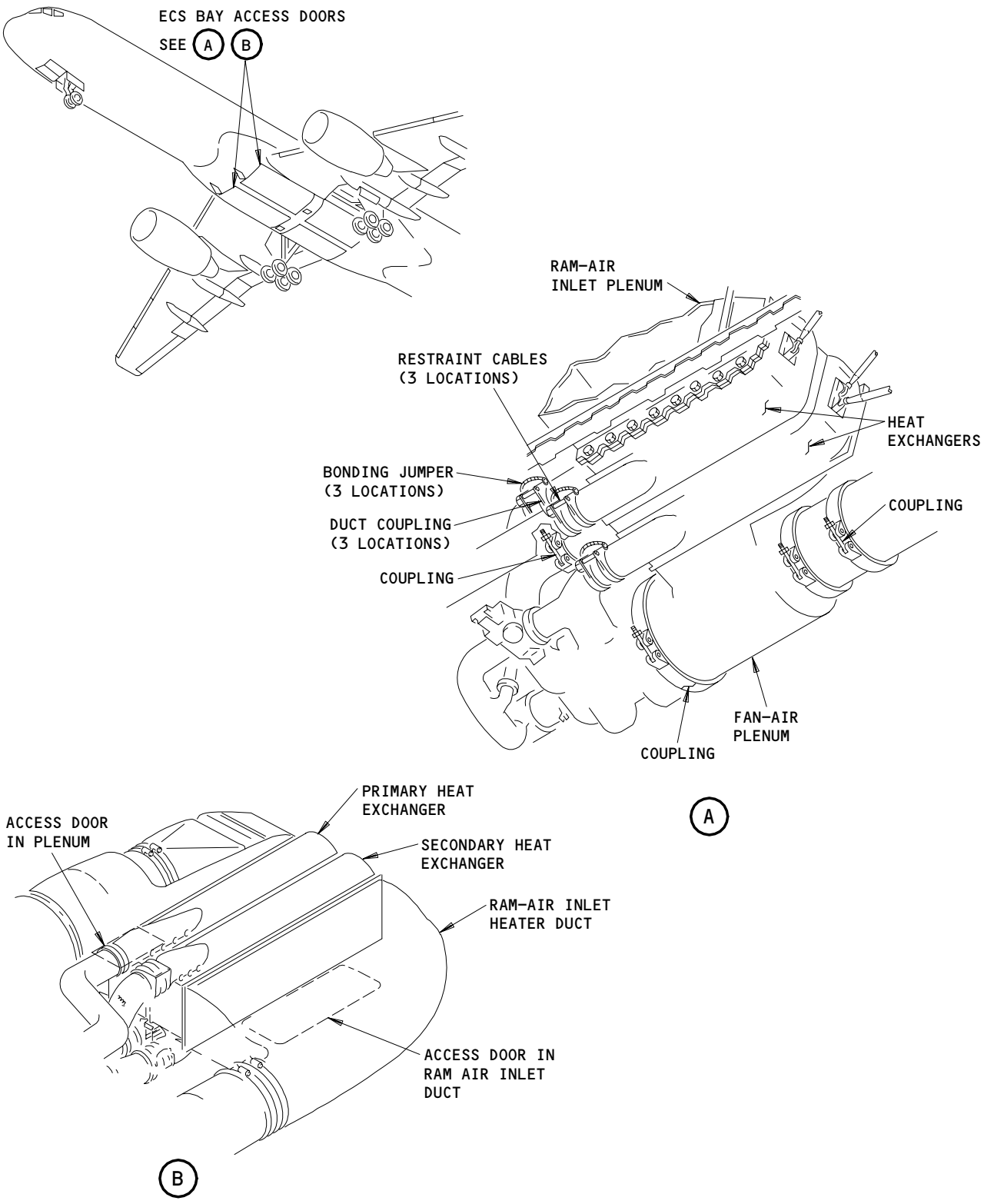
2. Do a Check of the Secondary and Primary Heat Exchangers (Fig. 601)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 21-51-02/401, Heat Exchangers - Removal/Installation
      (3) 21-51-02/701, Heat Exchangers - Cleaning/Painting
   B. Access
      (1) Location Zones
          135/136 Environmental control systems bay
      (2) Access Panels
          193HL/194ER ECS components
   C. Prepare for the Inspection

      S 866-002
      (1) Supply electrical power (Ref 24-22-00)

      S 866-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 016-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00) to find the heat exchangers.
   D. Do the Inspection

      S 216-005
      (1) Make sure the mounting brackets and the support rods are not loose.



Heat Exchangers Inspection Check
Figure 601

S 216-015
(2) Make sure the mounting brackets and the support rods do not have a crack in them.

S 216-006
(3) Tighten the bolts in the support rods.

S 216-007
(4) Look for the dents, cracks and holes on the outer surface and the flanges of the heat exchangers.
    (a) If the damage causes the airflow to be decreased or if there is a leak, replace the heat exchangers (Ref 21-51-02/401).

S 216-008
(5) Look for damage or signs of a leak at the coupling ducts.
    (a) If a leak has occurred, align and tighten the couplings.

S 216-009
(6) Examine the restraint cables and the bonding jumpers.
    (a) Replace the restraint cables and the bonding jumpers that are damaged.
    (b) Tighten the restraint cables if they are loose or if the distance between the flanges is larger than 2.65 inches (67 mm).
    (c) Tighten the bolts for the bonding jumpers.

S 216-010
(7) Open the access door in the ram-air inlet duct.
    (a) Look at the secondary heat exchanger to make sure it is clean and none of the fins are bent.
        1) If the heat exchanger has contamination in it, clean it (Ref 21-51-02/701)
        2) If the fins are bent, repair them (Ref 21-51-02/701).

S 216-011
(8) Open the access door in the fan plenum.
    (a) Look at the primary heat exchanger to make sure it is clean and none of the fins are bent.
        1) If the heat exchanger has contamination in it, clean it (Ref 21-51-02/701)

2) If the fins are bent, repair them (Ref 21-51-02/701).

E. Put the airplane back to its usual condition.

S 416-017

(1) Close the access door in the ram-air inlet duct.

S 416-018

(2) Close the access door in the fan plenum.

S 416-012

(3) Close the applicable ECS access door, 193HL or 194ER (Ref 06-41-00).

S 866-013

(4) Remove the DO-NOT-OPERATE tag from the applicable PACK selector, on the P5 panel.

S 866-014

(5) Remove the electrical power, if it is not necessary (Ref 24-22-00).

HEAT EXCHANGERS - CLEANING/PAINTING

1. General
   A. This procedure contains these tasks:
      (1) Clean the primary heat exchanger.
      (2) Clean the secondary heat exchanger
   B. The primary heat exchanger has fragile fins and must be removed from the airplane to be cleaned to avoid damage to the fins. The secondary heat exchanger and primary heat exhanger are removed as a part of the heat exchanger and plenum assembly.
   C. The secondary heat exchanger can be cleaned on or off the airplane.

TASK 21-51-02-107-051

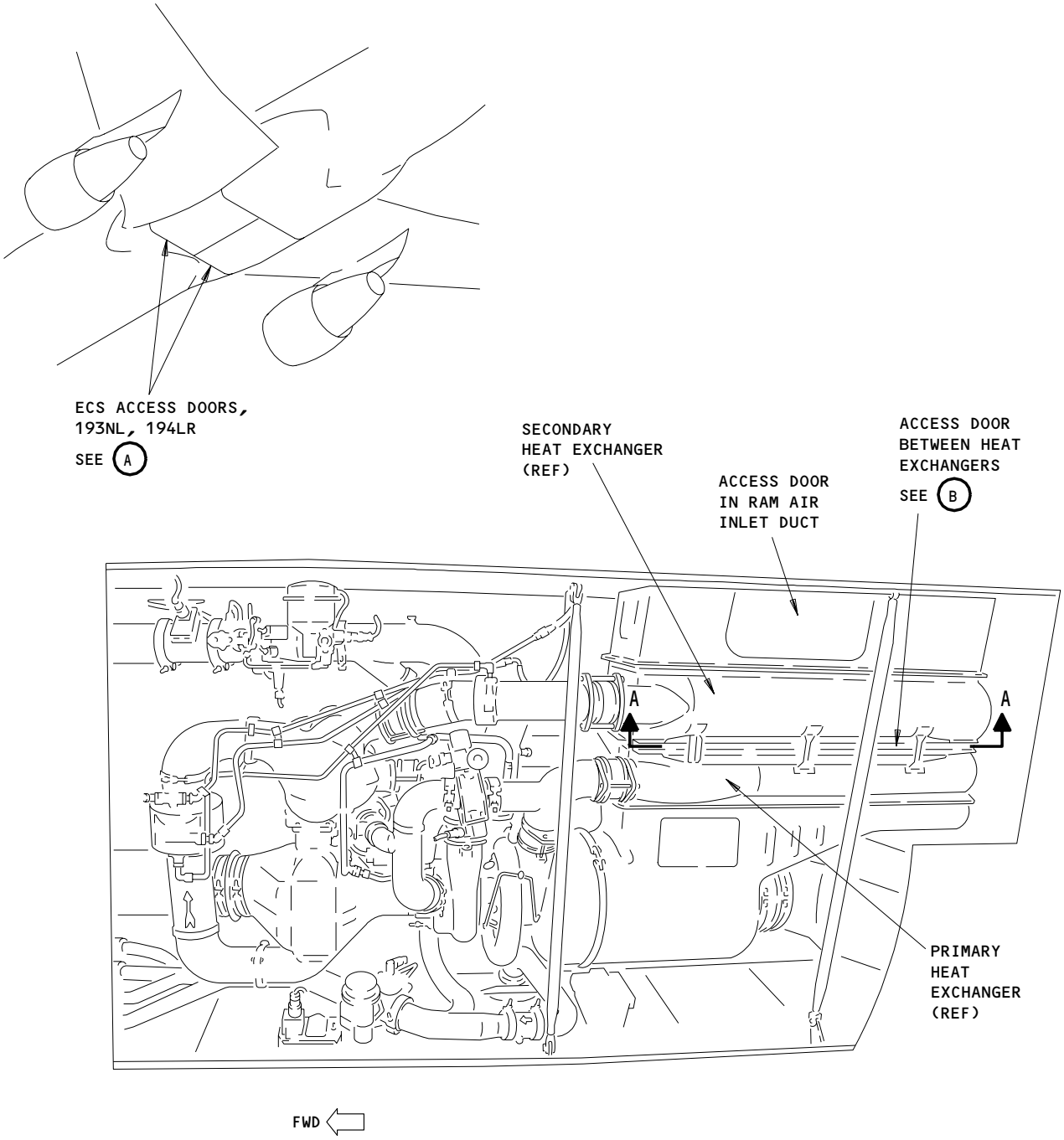
2. Clean the Primary and Secondary Heat Exchangers Off-Aircraft (Fig. 701)
   A. General
   B. References
      (1) AMM 21-51-02/401, Heat Exchangers
   C. Prepare to Clean the Heat Exchangers

      S 027-052
      (1) Remove the heat exchanger and plenum assembly (AMM 21-51-02/401).

      S 027-054
      (2) Remove the primary heat exchanger from the secondary heat exchanger (AMM 21-51-02/401).
   D. Clean the Heat Exchangers

      S 027-053
      (1) Return the primary heat exchanger and secondary heat exchanger, if dirty, to the shop to be cleaned off-aircraft.
   E. Put the airplane back to its usual condition.

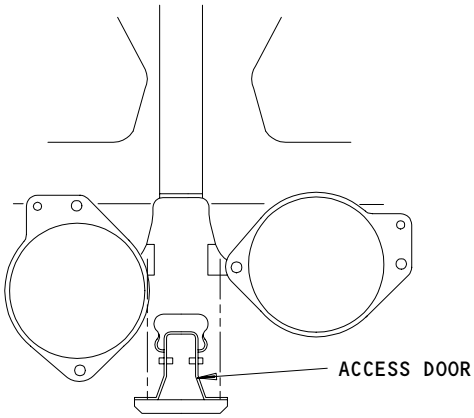
      S 427-055
      (1) Install the primary heat exchanger on to the secondary heat exchanger (AMM 21-51-02/401).



LEFT COOLING PACK
(RIGHT COOLING PACK EQUIVALENT)

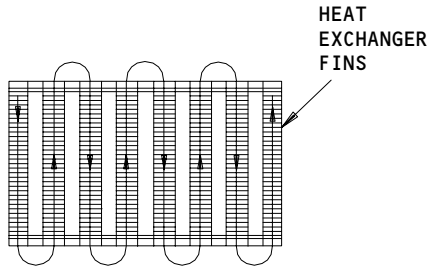
(A)

Heat Exchangers Cleaning
Figure 701 (Sheet 1)

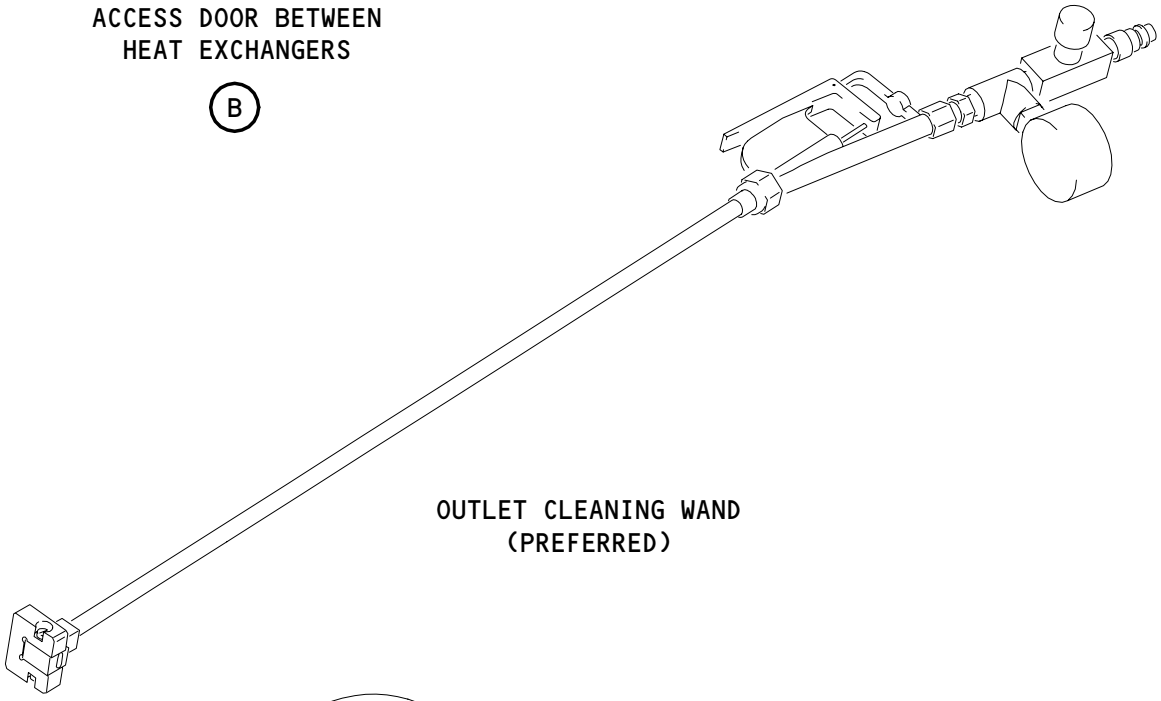


ACCESS DOOR BETWEEN
HEAT EXCHANGERS

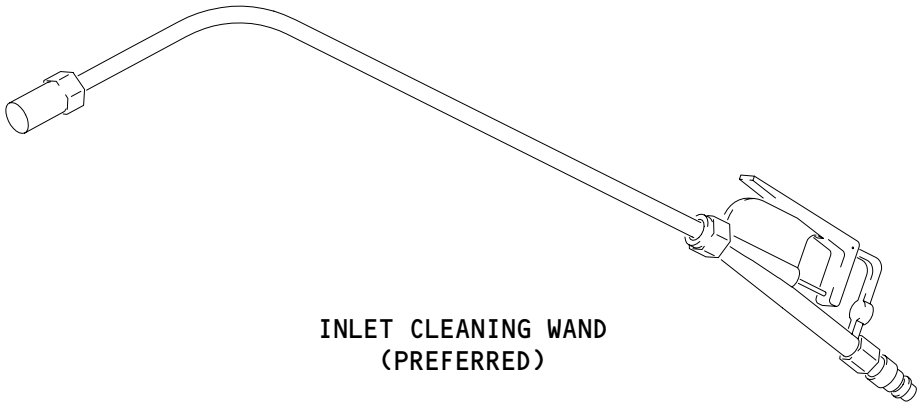
B



SUGGESTED CLEANING PATH
(SIDE VIEW OF HEAT EXCHANGER FINS)
A–A



OUTLET CLEANING WAND
(PREFERRED)



INLET CLEANING WAND
(PREFERRED)

Heat Exchangers Cleaning
Figure 701 (Sheet 2)

S 427-056

(2) Install the heat exchanger and plenum assembly (AMM 21-51-02/401).

TASK 21-51-02-107-001

3. Clean the Secondary Heat Exchanger On-Aircraft (Fig. 701)

A. General

(1) This procedure uses compressed air to clean the secondary heat exchanger. You can use this procedure to remove dirt, sand and/or gravel from the secondary heat exchanger.

B. Equipment

(1) Cleaning Wand Equipment - Heat Exchanger, B21005-1 (alternate), B21005-10 (preferred)
   (a) Cleaning Wand - Inlet, B21005-3 (preferred)
   (b) Cleaning Wand - Outlet, B21005-2 (alternate), B21005-11 (preferred)

(2) Air compressor (80 to 100 psi) commercially available

(3) Spray gun (alternate) - commercially available

(4) Spray Nozzle, 9702A-10-TM-9502 (alternate), Spray Systems Co., Wheaton, IL

(5) Steam Cleaner, 80 to 100 psi (alternate) - commercially available

C. Consumable Materials

(1) B50126 - Solvent, MIL-PRF-680

NOTE: The solvent is used for the alternate cleaning procedure.

D. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels

E. Access

(1) Location Zones
   135/136 Environmental Control Systems (ECS) Bay

(2) Access Panels
   193HL/194ER ECS Bay Access Doors

F. Prepare to Clean the Secondary Heat Exchanger

S 867-050

CAUTION: DO NOT USE THIS PROCEDURE TO CLEAN THE PRIMARY HEAT EXCHANGER. DAMAGE TO THE PRIMARY HEAT EXCHANGER CORE FINS WILL OCCUR. IF THE PRIMARY HEAT EXCHANGER NEEDS TO BE CLEANED, YOU MUST REMOVE THE PRIMARY HEAT EXCHANGER FROM THE AIRPLANE AND CLEAN IT PER THE VENDOR COMPONENT MAINTENANCE MANUAL.

(1) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
   (a) Make sure the PACK OFF light is on.

(b) Put a DO-NOT-OPERATE tag on the selector.

S 017-020

(2) Open the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 017-021

(3) Remove the access door that is found in the ram air inlet duct.

S 017-022

(4) Remove the access door that is found between the primary heat exchanger and the secondary heat exchanger.

G. Clean the Secondary Heat Exchanger (preferred)

S 117-047

CAUTION: DO NOT USE THIS PROCEDURE TO CLEAN THE PRIMARY HEAT EXCHANGER. DAMAGE TO THE PRIMARY HEAT EXCHANGER CORE FINS WILL OCCUR. IF THE PRIMARY HEAT EXCHANGER NEEDS TO BE CLEANED, YOU MUST REMOVE THE PRIMARY HEAT EXCHANGER FROM THE AIRPLANE AND CLEAN IT PER THE VENDOR COMPONENT MAINTENANCE MANUAL.

(1) Do these steps to clean the secondary heat exchanger:
(a) Attach the outlet cleaning wand to the compressed air source.

CAUTION: MAKE SURE THE AIR PRESSURE GAGE DOES NOT MEASURE MORE THAN 80 PSI DURING OPERATION OF THE TOOL. IF THE AIR PRESSURE GAGE MEASURES MORE THAN 80 PSI, THE CORE FINS OF THE HEAT EXCHANGER CAN BE DAMAGED.

(b) Use the outlet cleaning wand to blow air at the outlet side of the secondary heat exchanger.

NOTE: Make sure the air pressure gage on the cleaning wand does not measure more than 80 Psi during operation of the tool. Also, follow the suggested cleaning path shown in Fig. 701.

(c) Attach the inlet cleaning wand to the compressed air source.

CAUTION: THE CORE FINS OF THE HEAT EXCHANGER ARE EASILY DAMAGED. DO NOT PUT THE TIP OF THE INLET CLEANING WAND INTO THE HAIL SCREEN OF THE HEAT EXCHANGER. IF THE CORE FINS ARE DAMAGED, THE HEAT EXCHANGER WILL NOT OPERATE CORRECTLY.

(d) Use the inlet cleaning wand to blow air at the inlet side of the secondary heat exchanger.

NOTE: Quickly move the cleaning wand back and forth and side to side. This helps to loosen any dirt, sand and/or gravel that may be stuck. Also, follow the suggested cleaning path in Fig. 701.

(e) Attach the outlet cleaning wand to the compressed air source.

CAUTION: MAKE SURE THE AIR PRESSURE GAGE DOES NOT MEASURE MORE THAN 80 PSI DURING OPERATION OF THE TOOL. IF THE AIR PRESSURE GAGE MEASURES MORE THAN 80 PSI, THE CORE FINS OF THE HEAT EXCHANGER CAN BE DAMAGED.

(f) Use the outlet cleaning wand to blow air at the outlet side of the secondary heat exchanger.

NOTE: Make sure the air pressure gage on the cleaning wand does not measure more than 80 Psi during operation of the tool. Also, follow the suggested cleaning path shown in Fig. 701.

(g) Do the above steps again as necessary until the secondary heat exchanger is clean.

NOTE: To determine if the heat exchanger is clean, put your hand on the opposite side of the heat exchanger that is being cleaned. While you blow air through the fins of the heat exchanger, feel for sand and/or gravel that exits the other side. If you do not feel any sand and/or gravel, the heat exchanger is clean.

(h) Make sure you remove any loose dirt, sand and/or gravel from the ram air inlet, and from between the heat exchangers.

H. Clean the Secondary Heat Exchanger (alternate)

NOTE: The equipment used in this procedure can cause the core fins on the outlet side of the secondary heat exchanger to bend. Use a mirror and a flashlight during this procedure to see if the core fins become bent. Do not continue to use this procedure if the core fins become bent or if the secondary heat exchanger is not fully cleaned with this procedure. Use the preferred procedure for cleaning the secondary heat exchanger or remove the secondary heat exchanger and send it to the shop to be cleaned off-aircraft.

S 117-030

WARNING: DO NOT BREATHE THE FUMES FROM THE SOLVENT AND DO NOT LET THE SOLVENT TOUCH YOUR SKIN. KEEP THE SOLVENT AWAY FROM FLAMES, HEAT, OR SPARKS. THE SOLVENT IS POISONOUS AND FLAMMABLE, AND CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) If you use solvent to clean the heat exchanger, do the steps that follow:
(a) Attach the spray gun and the solvent to the air compressor.
(b) Attach the spray nozzle to the spray gun.

S 497-025

(2) If you use steam to clean the heat exchanger, do this step:
(a) Attach the spray nozzle to the steam cleaner.

S 147-048

CAUTION: DO NOT USE THIS PROCEDURE TO CLEAN THE PRIMARY HEAT EXCHANGER. DAMAGE TO THE PRIMARY HEAT EXCHANGER CORE FINS WILL OCCUR. IF THE PRIMARY HEAT EXCHANGER NEEDS TO BE CLEANED, YOU MUST REMOVE THE PRIMARY HEAT EXCHANGER FROM THE AIRPLANE AND CLEAN IT PER THE VENDOR COMPONENT MAINTENANCE MANUAL.

(3) Do these steps to clean the heat exchanger:

CAUTION: DO NOT RUB OR TOUCH THE CORE FINS WHEN YOU CLEAN THE HEAT EXCHANGER. THE CORE FINS CAN BE DAMAGED EASILY. IF THE CORE FINS ARE DAMAGED, THE HEAT EXCHANGER WILL NOT OPERATE CORRECTLY.

(a) Put the air nozzle through the access opening between the heat exchangers.
    1) Blow air through the secondary heat exchanger (back flush).
(b) Put the spray nozzle through the access opening in the ram air inlet duct.
    1) Move the spray nozzle in the direction of the cleaning path shown in Figure 701, to clean the secondary heat exchanger.
(c) Put the air nozzle through the access opening in the ram air inlet duct.
    1) Blow air through the secondary heat exchanger until it is dry.

I. Put the airplane back to its usual condition.

S 417-026
(1) Install the access door in the ram air inlet duct.

S 417-027
(2) Install the access door that goes between the heat exchangers.

S 417-028
(3) Close the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 867-029
(4) Remove the DO-NOT-OPERATE tag from the L and R PACK selectors, on the P5 panel.

AIR CYCLE MACHINE - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the air cycle machine (ACM). One ACM is installed in each air cooling pack. The ACM has three parts: the fan, the turbine, and the compressor.

TASK 21-51-03-004-001

2. Remove the Air Cycle Machine (Fig. 401)
   A. Equipment
      (1) Hoist Adaptor - A21001-44, A21001-45

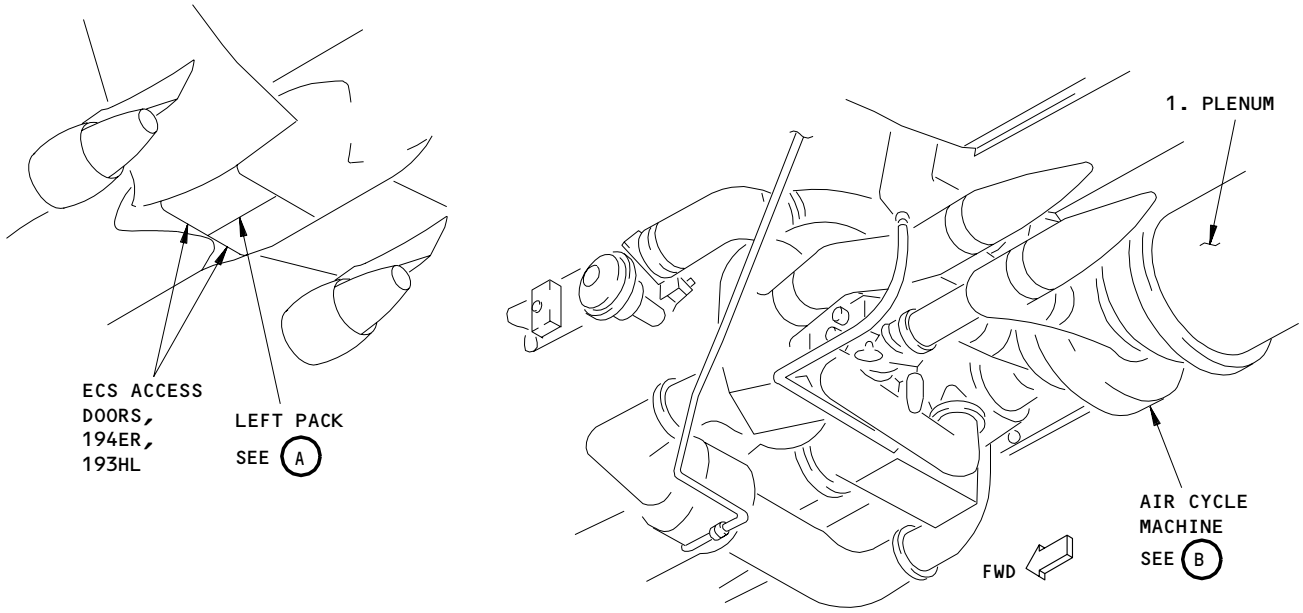
          NOTE: The -44 hoist adapter is used with a customer supplied jack. The -45 hoist adapter is used with a A71015-87 accessory lift fixture.

      (2) Transmission Jack
          (a) Hein Werner (Model 64 part No. 62005) Hein Werner Corp., 1200 National Avenue, Waukesha, Wisc 53186
          (b) Blackhawk, model 67554, General Service Equip Div., Applied Power Inc., P.O. Box 27207, Milwaukee, Wisc 53227
   B. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power Control
      (3) AMM 36-00-00/201, Pneumatic General
   C. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems bay
   D. Prepare for the Removal

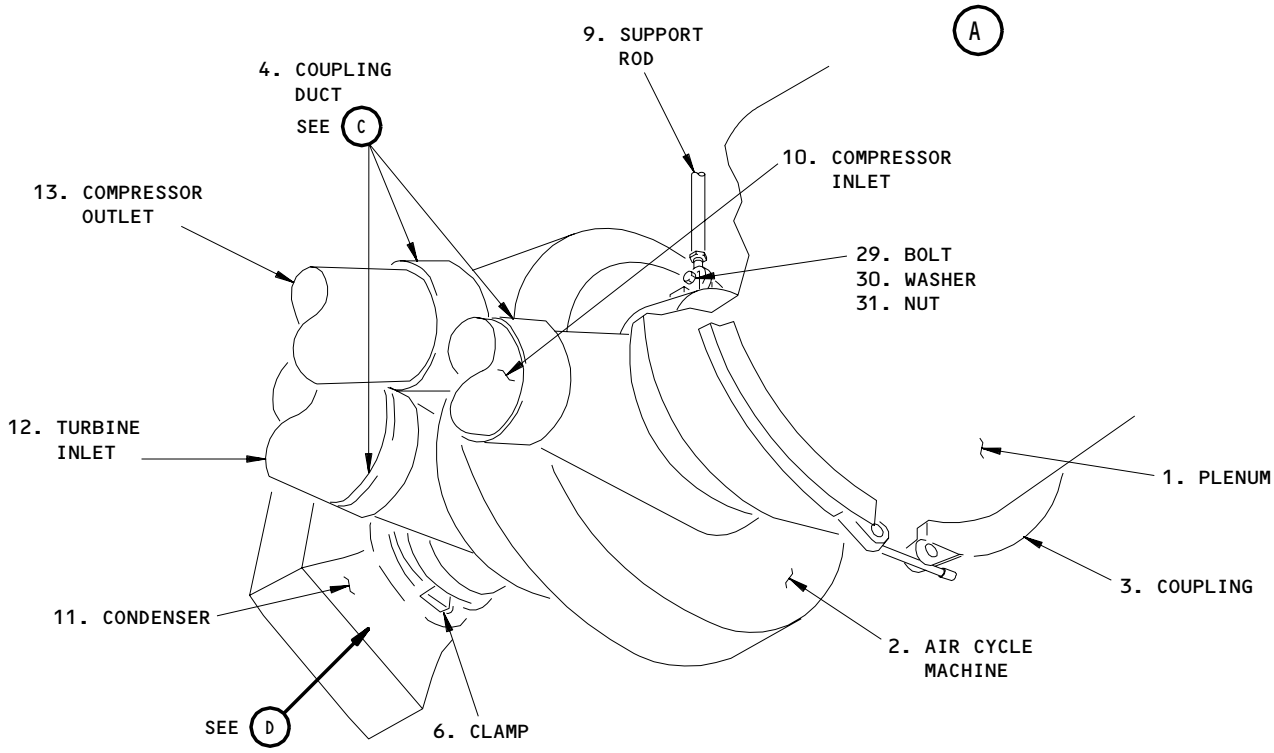
      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 014-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

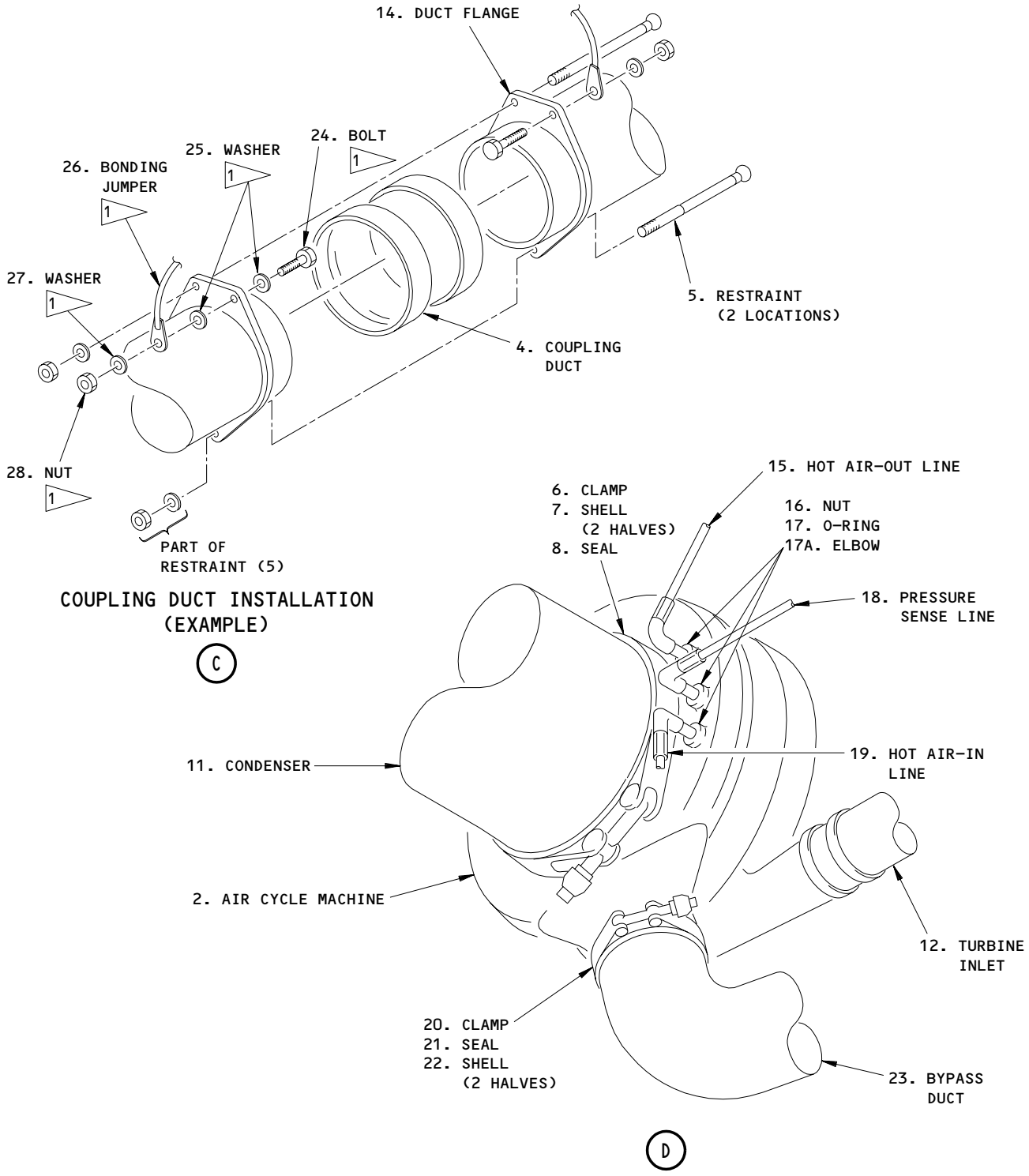


LEFT PACK
(RIGHT PACK IS EQUIVALENT)
A



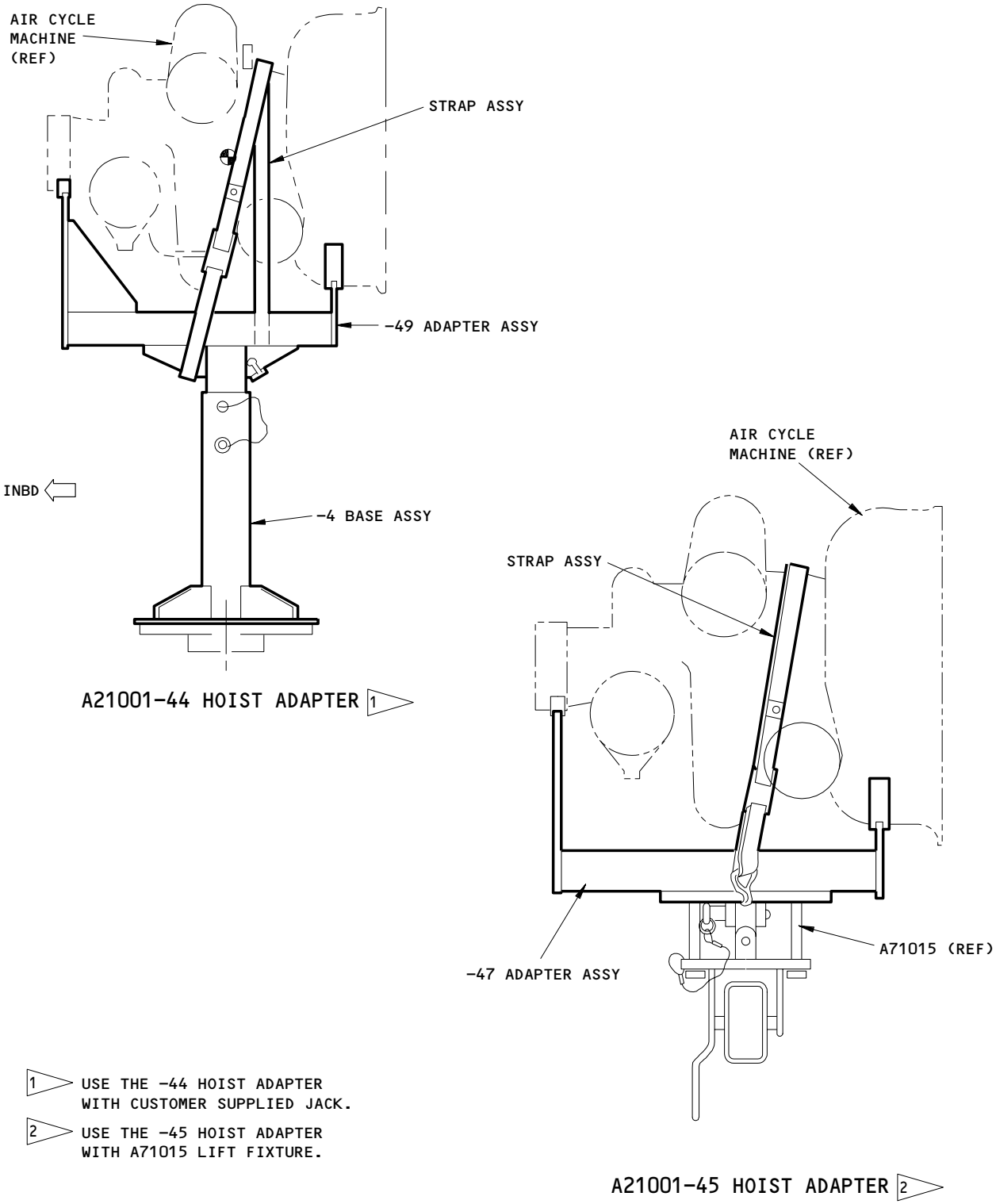
AIR CYCLE MACHINE
B

Air Cycle Machine Installation
Figure 401 (Sheet 1)



COUPLING DUCT INSTALLATION (EXAMPLE)

Air Cycle Machine Installation
Figure 401 (Sheet 2)



Air Conditioning Pack Hoist Adapter
Figure 402

S 094-005
(4) Put the hoist adapter and the transmission jack below the air cooling pack, in the position shown in Figure 402.

S 094-006
(5) Extend the hoist adapter until it holds the weight of the air cycle machine.

E. Remove the Air Cycle Machine

S 034-007
(1) Disconnect the pressure sense line (18) and the hot air lines (15, 19) from the air cycle machine (2).

S 034-008
(2) Remove the clamp (6) and the half shells (7) that are between the air cycle machine (2) and the condenser (11).

S 034-009
(3) Move the seal (8) on the condenser duct (11).

S 034-010
(4) Remove the restraints (5) from the coupling ducts (4) at the compressor outlet (13), the compressor inlet (10), and the turbine inlet (12).

S 034-011
(5) Remove the bonding jumper (26) from the coupling duct (4) at the turbine outlet (12).

S 034-012
(6) Remove the clamp (20), the shell (22), and the seal (21) from the bypass duct (23).

S 034-013
(7) Remove the coupling (3) that is between the air cycle machine (2) and the plenum (1).

S 034-014
(8) Disconnect the support rod (9) from the air cycle machine (2).

S 034-015
(9) Remove the coupling ducts (4) from the air cycle machine (2).

S 024-016
(10) Lower the air cycle machine (2) from the air cooling pack.

S 434-017
(11) Put a cover on the duct openings.

F. If you removed the Air Cycle Machine because it will not turn, you can try to repair it with these steps:

NOTE: Contamination of the ACM turbine thrust bearing can cause the ACM impeller shaft to stop or not to turn freely. This procedure will make sure that the ACM impeller shaft can turn freely. If the ACM impeller does not turn freely, it must be replaced.

S 824-050

(1) Put the ACM in a horizontal position.

S 984-051

(2) Torque the impeller shaft (at the turbine end of the ACM) in the clockwise direction to see if the impeller shaft turns.
   (a) Make sure that the breakaway torque value to turn the impeller shaft is less than 90 pound-inches.

S 984-053

CAUTION: DO NOT TURN THE IMPELLER SHAFT MORE THAN TWO ROTATIONS. IF YOU CONTINUE TO TURN THE IMPELLER SHAFT YOU CAN CAUSE DAMAGE TO THE BEARINGS.

(3) Make sure that you can continue to turn the impeller shaft at a torque value that is less than 35 pound-inches.

NOTE: The ACM must be replaced if the torque value at which the impeller shaft continues to turn is more than 35 pound-inches.

NOTE: Check the ACM rotor for ice impingement damage and replace the ACM if necessary. Do the test of the water extraction system and turbine anti-ice system.

G. Cooling Pack Water Removal/Ice Protection Test

NOTE: Do this test if you could not repair the ACM with the above torqueing procedure. If the water extraction system or the turbine anti-ice system has a problem, then a new ACM can fail when ice develops on the turbine. This test makes sure the water extraction system and the turbine anti-ice system are OK before a new ACM is installed.

S 214-054

(1) Make sure the outer side of the reheater does not have any bulges or damage.

NOTE: If the reheater has more than 3000 hours and is not P/N 194274-4 (or -3 Series 3), it is recommended that you rework the reheater per Allied-Signal SB 194274-21-2475.

(a) Replace the reheater if it is damaged (AMM 21-51-07/401).

S 174-055

(2) Do these steps to make sure the sense lines which follow do not have any blockage in them:

(a) Disconnect the hot air-in line at the compressor discharge duct and at the turbine anti-ice muff.

(b) Disconnect the hot air-out line at the turbine anti-ice muff and at the downstream (low-pressure) side of the condenser.

(c) Disconnect the following sense lines from the low limit valve:

1) The turbine muff sense line
2) The pack outlet sense line
3) The condenser outlet sense line
4) The condenser inlet sense line.

(d) Blow compressed air through each of the sense lines to remove any blockage in them.

(e) Re-connect each of the sense lines.

TASK 21-51-03-404-018

3. Install the Air Cycle Machine (Fig. 401)

A. Equipment

(1) Hoist Adaptor - A21001-44, A21001-45

NOTE: The -44 hoist adapter is used with a customer supplied jack. The -45 hoist adapter is used with a A71015-87 accessory lift fixture.

(2) Transmission jack

(a) Hein Werner (Model 64 part No. 62005) Hein Werner Corp., 1200 National Avenue, Waukesha, Wisc 53186

(b) Blackhawk, model 67554, General Service Equip Div., Applied Power Inc., P.O. Box 27207, Milwaukee, Wisc 53227

B. Consumables
(1) D00386, Anti-seize compound, MIL-L-23398
C. Parts
(1) Refer to the Illustrated Parts Catalog (IPC) for the part numbers and the effectivities of the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	Air Cycle Machine	21-51-03	01	55
	3	Coupling			50
	4	Coupling Duct	21-51-52	01	140
	5	Restraint			240
	6	Clamp	21-51-10	01	50
	7	Shell			55
	8	Seal			60

D. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 21-51-11/201, Pack Low Limit Valve
(3) AMM 24-22-00/201, Electrical Power Control
(4) AMM 36-00-00/201, Pneumatic General
E. Access
(1) Location Zones
135/136 Environmental control systems (ECS) bay
(2) Access Panels
193HL/194ER Environmental control systems bay
F. Install the Air Cycle Machine

S 034-019
(1) Remove the covers from the duct openings.

S 424-020
(2) Use the hoist adapter to lift the air cycle machine (2) into position in the air cooling pack.
(a) Make sure the air cycle machine (2) aligns with the ducts in the air cooling pack.

S 434-021
(3) Attach the support rod (9) to the air cycle machine (2) with the bolt (29), washer (30), and nut (31).

S 434-041
(4) Put the coupling ducts (4) into their positions in the compressor inlet (10), the compressor outlet (13), and the turbine inlet (12).

S 434-022
(5) Install the coupling (3) between the air cycle machine (2) and the plenum (1).
(a) Tighten the coupling to 40-60 pound-inches.

S 434-023
(6) Move the seal (8) into its position between the air cycle machine (2) and the condenser (11).

S 434-024
(7) Install the half shells (7) and the clamp (6) to hold the seal (8) in its position.

S 434-025
(8) Disconnect the air cycle machine (2) from the hoist adapter.

S 434-026
(9) Remove the hoist adapter from the ECS bay.

S 434-027
(10) Move the seal (21) into its position at the bypass duct (23).

S 434-028
(11) Install the half shells (22) and the clamp (20) to hold the seal (21) in its position.

S 644-082
(12) Apply a thin layer of the anti-seize compound MIL-L-23398 to the threads of the elbow fittings (17A).

S 434-029
(13) Install the elbow fittings (17A), nuts (16) and new O-rings (17) on the pressure sense line (18) and the hot air lines (15, 19).

S 434-030
(14) Connect the pressure sense line (18) and the hot air lines (15, 19) to the air cycle machine (2).

DATA SHEET

DATE: _____
AIRCRAFT: _____

REHEATER & WATER EXTRACTOR

REHEATER APPARENT CONDITION: _____

WATER EXTRACTOR CONDITION: _____

LOW LIMIT CONTROL VALVE

LOW SIDE DELTA PRESSURE CHECK (TURBINE MUFF-CHECK VALVE)
CRACK PRESSURE: _____ IN H2O (22-27.7 ACCEPTABLE)
FULL OPEN PRESSURE: _____ IN H2O (77-95 ACCEPTABLE)

HIGH SIDE DELTA PRESSURE CHECK (CONDENSOR IN-CONDENSOR OUT)
CRACK PRESSURE: _____ IN HG (5.1-9.2 ACCEPTABLE)
FULL OPEN PRESSURE: _____ IN HG (19.4-27.5 ACCEPTABLE)

SYSTEM TEST-OPERATIONAL

AMBIENT CONDITIONS
OUTSIDE TEMPERATURE: _____
DEW POINT TEMPERATURE: _____
HUMIDITY: _____

ECS/MSG
RECORD 15 MINUTES AFTER SELECTING FWD ZONE TO MAX COLD AND ALL OTHER ZONES OFF.

NOTE: NUMBER OF AVAILABLE EICAS READINGS DEPENDS ON A/C OPTIONS.

	FLT DK	FWD	AFT
DUCT TEMP	_____	_____	_____
TRIM VALVE	_____	_____	_____

	LEFT	RIGHT
PACK OUT	_____	_____
TURB IN	_____	_____
SEC HX OUT	_____	_____
CMPR OUT	_____	_____
PRIM HX OUT	_____	_____
PRIM HX IN	_____	_____
DUCT PRESS	_____	_____
PACK FLOW	_____	_____
TEMP VALVE	_____	_____
RAM IN DOOR	_____	_____
RAM OUT DOOR	_____	_____

MAINTENANCE MESSAGES: (if any)

Cooling Pack Water Removal/Ice Protection Test
Figure 403

S 434-031
(15) Align the duct couplings on the compressor inlet (10), the compressor outlet (13), and the turbine inlet (12).

S 644-083
(16) Apply a thin layer of the anti-seize compound to the threads of the restraints (5).

S 424-084
(17) Install the restraints (5) on the duct couplings (4) at the compressor inlet (10), the compressor outlet (13), and the turbine inlet (12).

CAUTION: MAKE SURE THE DISTANCE BETWEEN THE DUCT FLANGES IS LESS THAN 2.65 INCHES. IF THE DISTANCE IS MORE THAN 2.65 INCHES, THE PACK COULD LEAK AND CAUSE DAMAGE TO THE EQUIPMENT.

(a) Tighten the restraints until they are not loose.

S 434-033
(18) Attach the bonding jumpers to the turbine inlet (12) with a bolt (24), washers (25, 27), and nut (28).

G. Cooling Pack Water Removal/Ice Protection Test

NOTE: Do this test if you could not repair the ACM with the above torqueing procedure in the removal task. This test makes sure the water extraction system operates corectly. If the water extraction system does not operate correctly, the turbine can develop ice. If the turbine develops ice, the bearings in the ACM can fail.

S 014-061
(1) Remove the access panels on the bottom of the left and right ram air ducts which are adjacent to the heat exchangers.

S 864-056
(2) Use the APU to supply pneumatic power to the air conditioning packs.

S 864-057
(3) Put the left and right pack selector switches in the AUTO position.
(a) Make sure the PACK OFF light goes off.

S 864-059
(4) Put the TRIM AIR switch to the ON position.

S 864-060
(5) Put all zone temperature selectors in the auto full cold position.

S 864-070
(6) Push the left and right Recirculation Fan pushbuttons to the ON position.

S 214-062
(7) Use a flashlight and look at the water spray pattern from the spray nozzle in each ram inlet system.

NOTE: The quantity of the water is a function of the air humidity and the pack air flow.

(a) Make sure the water spray pattern from each spray nozzle is approximately the same.
(b) Make sure the water sprays are approximately circular and not a jet blast.
(c) If the water sprays are not satisfactory, examine these parts for leakage or blockage:
1) The water extractor
2) The water spray nozzle
3) The water spray lines

S 794-064
(8) Put your hand 1 foot from the interfaces between the ACM and the pack ducts to feel for air leakage.
(a) Make sure that you do not feel leakage.

S 794-065
(9) Feel for air leakage at these lines:
(a) The hot air-in line from the compressor discharge duct to the turbine anti-ice muff.
(b) The hot air-out line from the turbine anti-ice muff to downstream of the condenser.
(c) These sense lines from the low limit valve:
1) The turbine muff sense line
2) The pack outlet sense line
3) The condenser outlet sense line
4) The condenser inlet sense line.

S 864-063
(10) Put the applicable pack selector switch to STBY-N position for the ACM which you replaced.

S 214-066
(11) Make sure that the applicable pack temperature control valve closes.

S 214-067
(12) Make sure that the applicable pack low limit valve moves away from the closed position.
(a) If the pack low limit valve does not move, do these steps:
1) Do the Standby Pack Controller BITE Procedure.

2) Put the applicable pack selector switch to the AUTO position.
3) Push the VERIFY button on the applicable Pack Temperature Controller.
4) Make sure that the applicable pack low limit valve moves to the open position.
5) If the valve moves, but the LOW LIMIT VALVE light comes on on the Pack Temperature Controller, then push RESET to clear.
6) If the LOW LIMIT VALVE light comes back on, replace the low limit valve (AMM 21-51-11/201).

S 864-068
(13) Put the applicable pack selector switch to the STBY-C position.

S 214-069
(14) Make sure that the applicable pack low limit valve moves to the open position after approximately 5-20 minutes.

S 964-074
(15) If the applicable pack low limit valve does not move, replace the low limit valve (AMM 21-51-11/201).

S 044-075
(16) Turn the left and right pack selectors to OFF.

H. Cooling Pack Water Removal/Ice Protection Test (Optional) (Fig. 403)

NOTE: Do this test if the previous test did not find the cause of the problem or did not solve the problem. This test is written for the left pack. Do the steps in parenthesis to do the test on the right pack.

S 974-042
(1) Make a record of the data from this test on a data sheet similar to Figure 403.

NOTE: Figure 403 can be used to make sure the ACM operates correctly and to identify the unserviceable components.

S 864-043
(2) Supply the electrical power (AMM 24-22-00/201).

S 864-044
(3) Remove the DO-NOT-OPERATE tags from the L and R PACK selectors, on the P5 panel.
(a) Turn the L (R) PACK selector to the AUTO position.
(b) Put the TRIM AIR switch to the ON position.
(c) Put all zone temperature selectors in the auto full cold position.

(d) Push the left and right Recirculation Fan pushbuttons to the ON position.
(e) Make sure the PACK OFF light goes off.

S 744-045
(4) Do the BITE test on the left (right) pack temperature controller (AMM 21-51-00/501).
(a) Replace the applicable component, if a failure has occurred.

S 214-046
(5) Examine the water extractor and the reheater.
(a) Remove the water extractor (AMM 21-51-04/401).
(b) Use a mirror and a flashlight to make sure the vane end cap is on the water extractor.
(c) Look at the inlet of the reheater to make sure the fins do not have any damage or corrosion and the side plate is not separated.

NOTE: It is permitted for the fins to have dark soot on them.

(d) Make sure the outer side of the reheater does not have any bulges or damage.

NOTE: If the reheater has over 3000 hours and is not P/N 194274-4 (or -3 Series 3), it is recommended that you rework the reheater per Allied-Signal SB 194274-21-2475.

(e) Install the water extractor (AMM 21-51-04/401).

S 734-047
(6) Examine the low limit valve.
(a) Supply pneumatic power (AMM 36-00-00/201).
(b) Push the VERIFY switch on the left (right) pack temperature controller.
(c) Make sure the position indicator on the low limit valve moves.
(d) Do the Low Limit Valve Differential Pressure Check (Ref 21-51-11).
(e) Do the Low Limit Valve Leak Check (AMM 21-51-11/201).

S 734-048
(7) Examine the pack operation.
(a) On the P5 panel, do the steps that follow:
1) Turn the R (L) PACK selector to the AUTO position.
2) Push the L and R RECIRC FAN switch-lights to the ON positions.
3) Push the TRIM AIR switch-light to the on position.
4) Turn all the zone temperature selectors to the fully warm (W) positions.
5) Wait for five (5) minutes or until all the zone temperatures are at 75 °F, whichever is longer.

6) Turn the FWD zone temperature selector to the fully cold (C) position.
7) Turn all the other zone temperature selectors to the OFF positions.

(b) Wait for 15 minutes.
(c) Make a record of these ambient temperatures:
1) Temperature
2) Dew Point Temperature
3) Humidity
(d) Make a record of these pack conditions from the EICAS display:

NOTE: For comparisons between airplanes in an operator's fleet, the packs must have a similar temperature demand and pneumatic supply pressure. The packs are very sensitive because of the many sensors used to control them. Thus, even with the same temperature demand and pneumatic supply pressure, each pack will be slightly different.

NOTE: If the packs run for more than 15 minutes, they may begin to move off the full cold mode. When this occurs, you will begin to see the pack outlet temperature begin to increase. If the pack outlet temperature increases more than 10 °F, then you must start the test again.

NOTE: Some airplanes do not show all of the indications that follow. Make a record of the indications that show on the EICAS display.

1) FLT DECK DUCT TEMP
2) FWD DUCT TEMP
3) AFT DUCT TEMP
4) FLT DECK TRIM VALVE
5) FWD TRIM VALVE
6) AFT TRIM VALVE
7) L and R PACK OUT
8) L and R TURB IN
9) L and R SEC HX OUT
10) L and R CMPR OUT
11) L and R PRIM HX OUT
12) L and R PRIM HX IN
13) L and R DUCT PRESS
14) L and R PACK FLOW
15) L and R TEMP VALVE
16) L and R RAM IN DOOR
17) L and R RAM OUT DOOR
18) Maintenance messages that show.

(e) Remove the access panel on the bottom of the Ram Air Duct which is just upstream of the heat exchangers.

(f) Look forward through the access hole with a flashlight.
(g) Look at the pattern of the water from the water spray nozzle in each ram inlet system.

NOTE: The quantity of the water is a function of the air humidity and the pack air flow.

(h) Make sure the water pattern from each spray nozzle is similar.
(i) If you think that one of the spray nozzles is blocked, do the steps that follow:
1) Replace the water spray nozzle (AMM 21-53-05/401).
2) Remove the water lines.
3) Blow air through the water lines to make sure they are not blocked.
4) Examine the water line ports to make sure they are not blocked.
5) Install the water lines.

I. Put the airplane back to its usual condition

S 864-039
(1) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 414-076
(2) Install the access panels on the bottom of the ram air ducts, if they were removed.

S 414-038
(3) Close the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 864-040
(4) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

WATER EXTRACTOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the water extractors. One water extractor is installed in each air cooling pack.
   B. The water extractor is welded to the ducts on each end of it. Thus, the water extractor and the ducts are removed and installed as a unit.

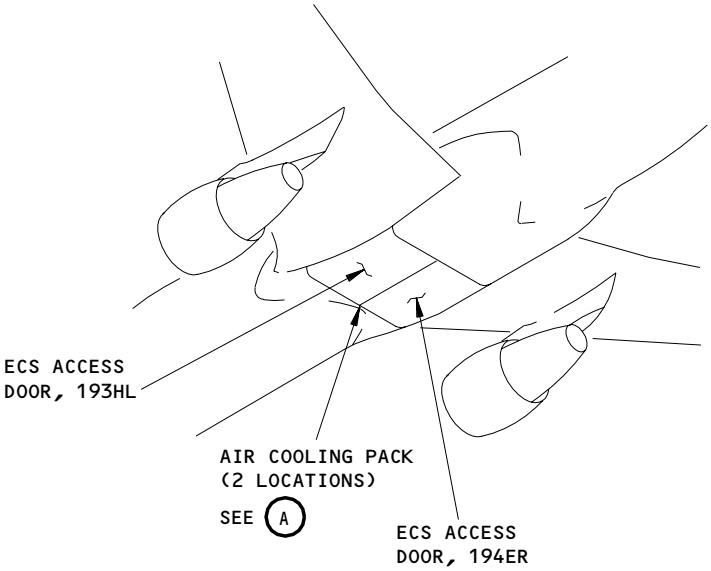
TASK 21-51-04-004-001

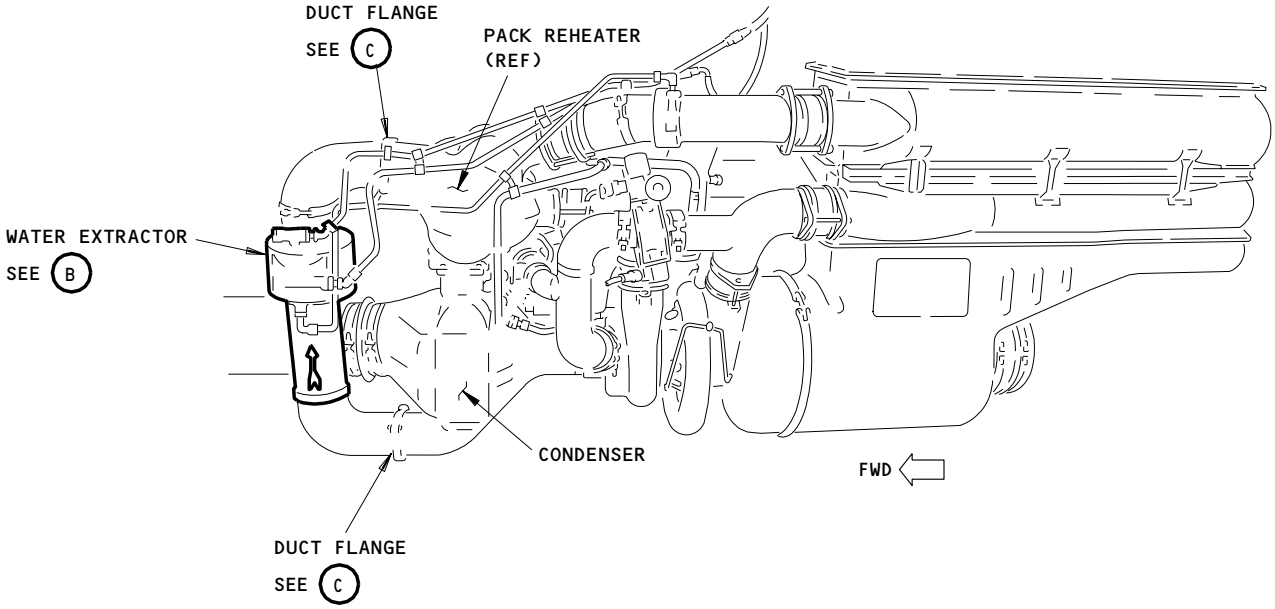
2. Remove the Water Extractor (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 21-51-08/401, Pack Temperature Sensor
      (3) AMM 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems bay
   C. Prepare for the Removal

S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

S 864-003
      (2) To remove the left pack water extractor:
          (a) Turn the L PACK selector, on the pilot's overhead panel, P5, to the OFF position.
              1) Make sure the PACK OFF light comes on.
              2) Put a DO-NOT-OPERATE tag on the selector.
          (b) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
              1) On the overhead circuit breaker panel, P11:
                  a) 11A14, AIR COND PACK LEFT FLOW CONT
          (c) Open the left ECS access door, 193HL (Ref 06-41-00).

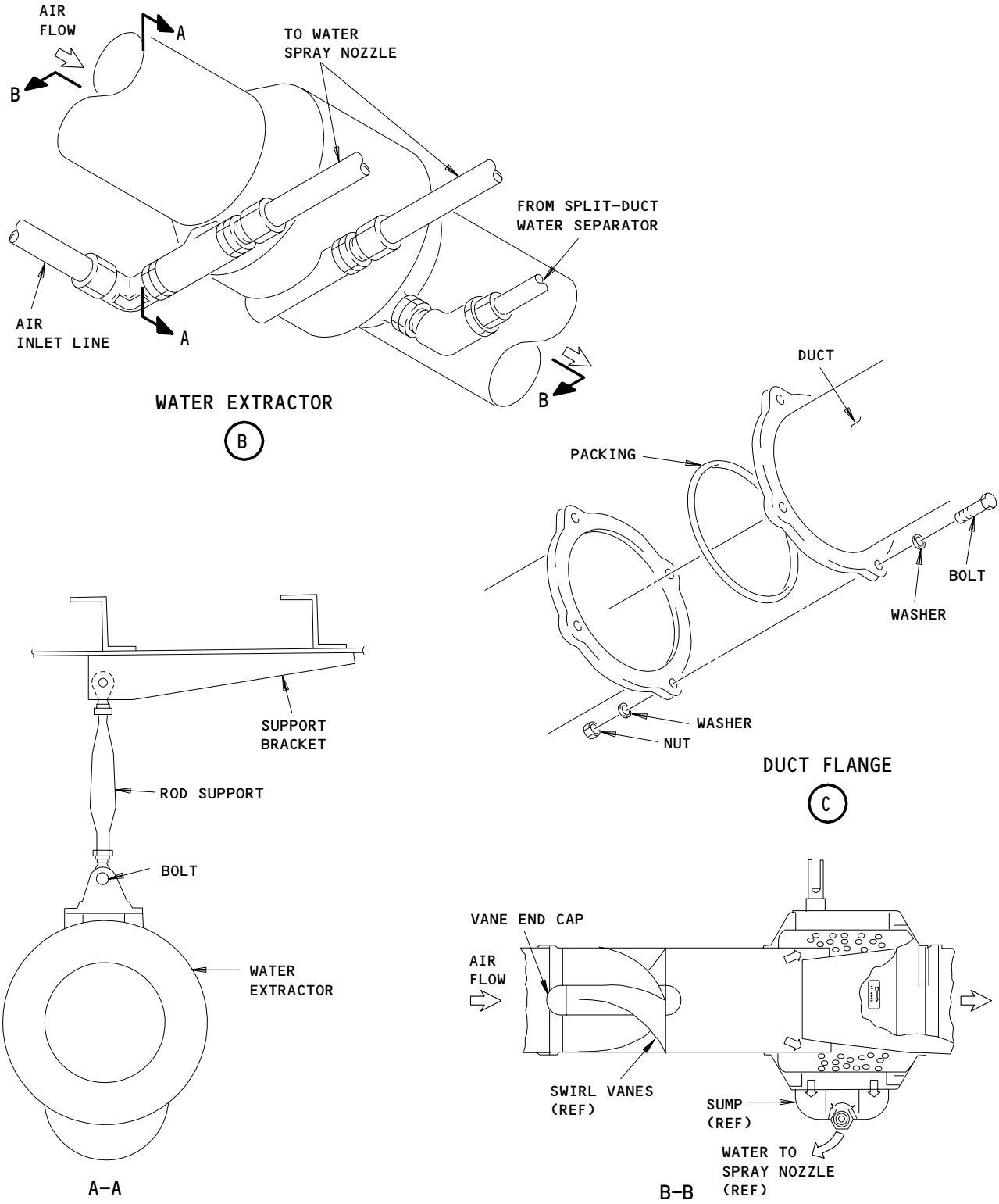
S 864-004
      (3) To remove the right pack water extractor:
          (a) Turn the R PACK selector, on the pilot's overhead panel, P5, to the OFF position.
              1) Make sure the PACK OFF light comes on.
              2) Put a DO-NOT-OPERATE tag on the selector.





AIR COOLING PACK
(LEFT PACK SHOWN, RIGHT PACK SIMILAR)
A

Water Extractor Installation
Figure 401 (Sheet 1)



Water Extractor Installation
Figure 401 (Sheet 2)

(b) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
1) On the overhead circuit breaker panel, P11:
a) 11A29, AIR COND PACK RIGHT FLOW CONT
(c) Open the right ECS access door, 194ER (AMM 06-41-00/201).

D. Remove the water extractor

S 034-005
(1) Disconnect the water lines and the air lines from the water extractor.

S 034-006
(2) Remove the pack temperature sensor (AMM 21-51-08/401).

S 034-007
(3) Disconnect the support rod from the bracket on the water extractor.

S 034-008
(4) Remove the bolts, nuts, and washers from the flanges that attach the water extractor to the condenser and the reheater.

S 024-009
(5) Remove the water extractor.

S 034-010
(6) Remove the packing from the flanges.

S 434-011
(7) Put a cover on the duct openings.

S 214-029
(8) Make sure that the vane end cap is on the water extractor.
(a) Examine the reheater for damage with a flashlight and mirror if the vane end cap is missing.

TASK 21-51-04-404-012

3. Install the Water Extractor (Fig. 401)

A. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 21-51-08/401, Pack Temperature Sensor
(3) AMM 24-22-00/201, Electric Power Control
(4) AMM 36-00-00/201, Pneumatic General

B. Access
(1) Location Zones
135/136 Environmental control systems (ECS) bay
(2) Access Panels
193HL/194ER Environmental control systems bay

C. Install the water extractor

S 034-013
(1) Remove the covers from the duct openings.

S 434-014
(2) Install new packings in the flanges of the water extractor.

S 424-015
(3) Put the water extractor into its position between the condenser and the reheater.

S 434-016
(4) Install the bolts, washers, and nuts into the flanges to hold the water extractor to the condensor and the reheater.

S 434-017
(5) Attach the support rod to the bracket on the water extractor.

S 434-018
(6) Install the pack temperature sensor (AMM 21-51-08/401).

S 434-019
(7) Connect the water lines and the air lines to the water extractor.

D. Do the installation test for the water extractor.

S 864-020
(1) Supply electrical power (AMM 24-22-00/201).

S 864-021
(2) Supply pneumatic power (AMM 36-00-00/201).

S 864-022
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11A14, AIR COND PACK LEFT FLOW CONT
2) 11A29, AIR COND PACK RIGHT FLOW CONT

S 864-023
(4) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.
(a) Turn the selector to the AUTO position.

(b) Make sure the PACK OFF light goes off.

S 794-024

(5) Feel for leaks around the water extractor connections.
(a) Small leaks are permitted.
(b) You must repair a large leak.

E. Put the airplane back to its usual condition

S 864-025

(1) Turn the applicable (L or R) PACK selector, on the P5 panel, to the OFF position.

S 414-026

(2) Close the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 864-027

(3) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 864-028

(4) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

COMPRESSOR OUTLET OVERHEAT SWITCH - REMOVAL/INSTALLATION

1. General
   A. The compressor outlet overheat switch attaches to the duct between the air cycle machine and the secondary heat exchanger.

TASK 21-51-05-004-002

2. Remove Compressor Outlet Overheat Switch (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          135 Environmental Control System Bay (Left)
          136 Environmental Control System Bay (Right)

      (2) Access Panels
          193HL ECS Access Door (Left)
          194ER ECS Access Door (Right)

   C. Prepare for Removal

      S 864-003
      (1) Open the applicable left or right circuit breaker and attach a DO-NOT-CLOSE tag.
          (a) On the overhead circuit breaker panel, P11:
              1) 11A13, AIR COND PACK LEFT AUTO CONT
              2) 11A28, AIR COND PACK RIGHT AUTO CONT

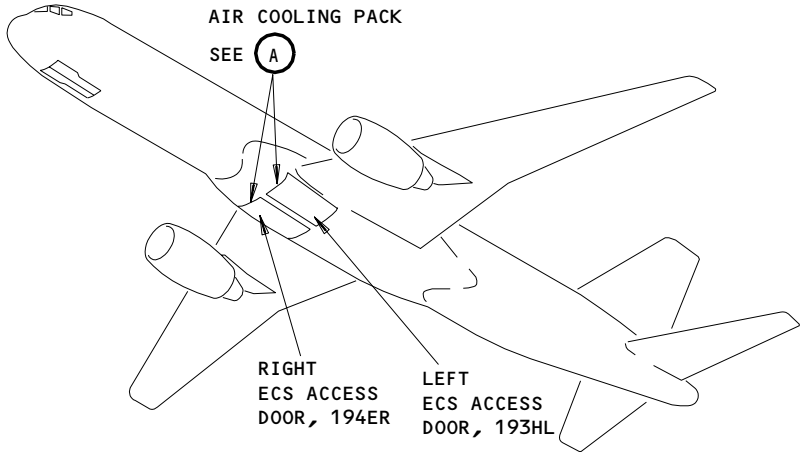
      S 014-004
      (2) Open the applicable left or right ECS access door, 193HL or 194ER, and find the applicable compressor outlet overheat switch (AMM 06-41-00/201).
   D. Remove the Compressor Outlet Overheat Switch

      S 024-005
      (1) Disconnect the electrical connector from the switch.

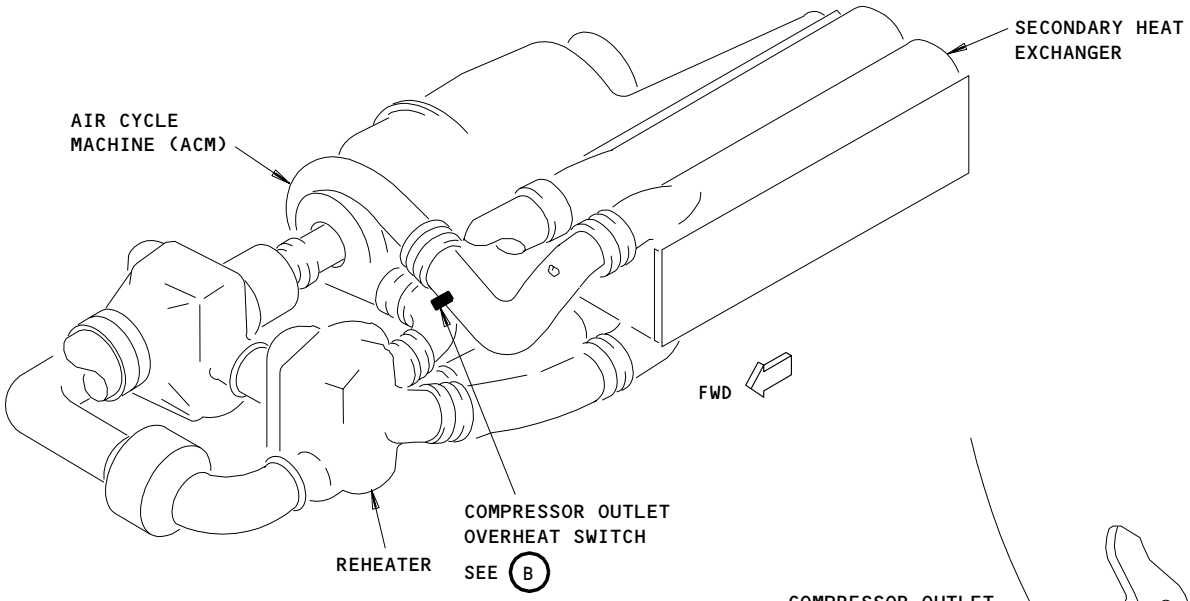
      S 024-021

      CAUTION: USE TWO WRENCHES TO REMOVE THE SWITCH FROM THE BOSS. YOU CAN CAUSE DAMAGE TO THE DUCT IF YOU DO NOT USE TWO WRENCHES.

      (2) Remove the lockwire and remove the switch from the boss.

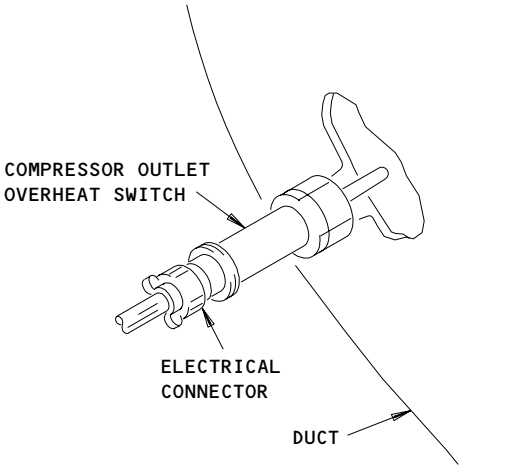


ECS BAY ACCESS



LEFT AIR COOLING PACK SHOWN
(RIGHT AIR COOLING PACK IS ALMOST THE SAME)

A



COMPRESSOR OUTLET OVERHEAT SWITCH

B

Compressor Outlet Overheat Switch Installation
Figure 401

S 034-018
(3) Remove and discard the packing.

S 864-007
(4) Put a plug in the the boss to keep unwanted materials out of the boss.

TASK 21-51-05-404-008

3. Install the Compressor Outlet Overheat Switch (Fig. 401)

A. Consumable Materials

(1) D00006, Never-Seez, Pure Nickel Special, NSBT-8N (High temperature anti-seize compound)

(2) C00852 - Antiseize Compound, Molybdenum Disulfide-Petrolatum, MIL-PRF-83483 (preferred)

B. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 20-10-23/401, Standard Practices - Lockwires
(3) AMM 24-22-00/201, Electrical Power Control
(4) AMM 36-00-00/201, Pneumatic - General

C. Access

(1) Location Zones
135 Environmental Control System Bay (Left)
136 Environmental Control System Bay (Right)

(2) Access Panels
193HL ECS Access Door (Left)
194ER ECS Access Door (Right)

D. Install the Compressor Outlet Overheat Switch

S 864-009
(1) Remove the plug from the boss.

S 864-010
(2) Make sure the mating surfaces of the boss and the switch nut are clean to a permit electrical ground.

S 864-011
(3) Apply a thin layer of anti-sieze compound to the threads of the switch.

S 424-022

CAUTION: USE TWO WRENCHES TO INSTALL THE SWITCH IN THE BOSS. DAMAGE TO THE DUCT CAN OCCUR IF YOU DO NOT USE TWO WRENCHES.

(4) Install the switch, with new packing, into the compressor discharge duct.

S 434-019
(5) Tighten the switch to a torque value of 210-240 pound-inches and install a lockwire (AMM 20-10-23/401).

S 424-025
(6) Install the electrical connector on the switch.

S 864-014
(7) Remove the DO-NOT-CLOSE tag and close the applicable left or right circuit breaker:
(a) On the overhead circuit breaker panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A28, AIR COND PACK RIGHT AUTO CONT

S 714-015
(8) Test the Compressor Outlet Overheat Switch
(a) Supply electrical power (AMM 24-22-00/201).
(b) Supply pneumatic power (AMM 36-00-00/201).
(c) Put the applicable L or R PACK control selector on the pilots overhead panel, P5, to the AUTO position.
(d) Make sure the PACK OFF light is not on.
(e) Examine the overheat switch for leakage.
1) Small leakage is permitted.
2) Large leakage must be repaired. To repair install sensor again .

S 414-016
(9) Close the applicable left or right ECS access door, 193HL or 194ER, (AMM 06-41-00/201).

E. Put the Airplane Back to Its Usual Condition

S 864-023
(1) Remove the pneumatic power if it is not necessary (AMM 36-00-00/201).

S 864-017
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

COMPRESSOR OUTLET OVERHEAT SWITCH - ADJUSTMENT/TEST

1. General
   A. This procedure contains one task. This task is a test of the overheat switch for the compressor outlet. Calibration of the overheat switch must be done off of the airplane.

   TASK 21-51-05-735-001

2. Compressor Outlet Overheat Switch Test
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          135 Environmental Control System Bay (Left)
          136 Environmental Control System Bay (Right)

      (2) Access Panels
          193HL ECS Access Door (Left)
          194ER ECS Access Door (Right)

   C. Prepare For System Test

      S 015-002
      (1) Open the left or right ECS access door, 193HL or 194ER, (Ref 06-41-00) and find the compressor outlet overheat switch.

      S 865-003
      (2) Supply electrical power (Ref 24-22-00).

      S 215-004
      (3) Make sure the EICAS circuit breakers (5 locations) on the overhead circuit breaker panel, P11, are closed.
   D. Do the Left (Right) Pack Compressor Outlet Test for the Overheat Switch

      S 865-012
      (1) Turn the L (R) PACK selector on the overhead panel, P5, to the STBY-N or STBY-C position.
          (a) Make sure the position indicator on the left (right) pack temperature control valve moves to the CLOSE position.

      S 035-011
      (2) Remove the electrical connector from the compressor outlet overheat switch.

      S 865-006
      (3) Connect a jumper between Pin No. 1 and 2 of the overheat switch electrical connector.
          (a) Make sure the applicable PACK OFF and INOP light comes on, on the P5 panel.
          (b) Make sure the ram air inlet and exhaust doors stay open.

(c) Make sure the position indicator on the left (right) pack temperature control valve moves to the OPEN position.
(d) Make sure the solenoid B on the flow control valve operates.

NOTE: You will hear a click if the solenoid operates correctly.

(e) Make sure the EICAS messages, L (R) PACK TEMP and L (R) PACK OFF, show on the top EICAS display.

S 865-007
(4) Remove the jumper and connect the electrical connector to the overheat switch.

S 865-008
(5) Push the applicable L (R) PACK RESET switch on the P5 panel.
(a) Make sure PACK INOP Light on the P5 panel goes off.
(b) Make sure the solenoid plunger B, on the flow control valve is in the ON or open position.
(c) Make sure the EICAS message, L (R) PACK TEMP, does not show on the bottom display.

E. Put the Airplane Back to Its Usual Condition

S 415-009
(1) Close the applicable left or right ECS access doors, 193HL or 194ER (Ref 06-41-00).

S 865-013
(2) Turn the applicable L (R) PACK selector to the OFF position.

S 865-010
(3) Remove the electrical power if it is not necessary (Ref 24-22-00).

COMPRESSOR OUTLET SENSOR - REMOVAL/INSTALLATION

1. General
   A. The compressor outlet sensor gives a signal to the pack temperature controllers which limits the compressor discharge temperature. There are two sensors on each pack. One gives signals to the pack temperature controller and the other to the pack standby controller. You can find the sensors on a duct between the air cycle machine and the secondary heat exchanger.

TASK 21-51-06-004-001

2. Remove the Compressor Outlet Sensor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          135 Environmental Control System Bay (Left)
          136 Environmental Control System Bay (Right)

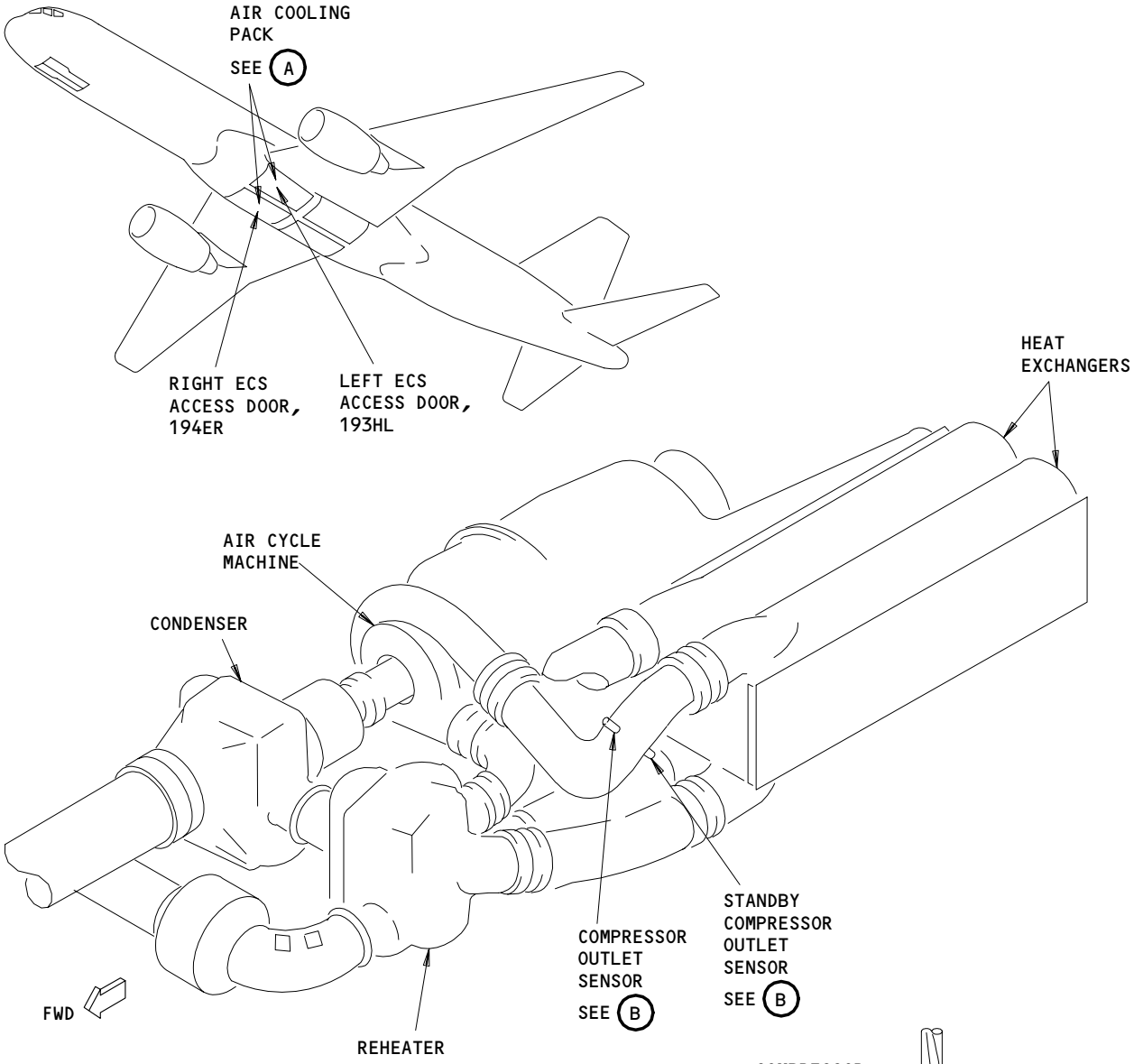
      (2) Access Panels
          193HL ECS Access Door (Left)
          194ER ECS Access Door (Right)

   C. Prepare for Removal

      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

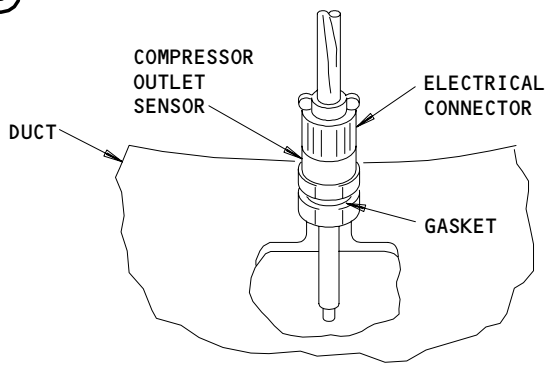
      S 864-003
      (2) Put the applicable L or R PACK control selector on the overhead panel, P5, to the OFF position.

      S 214-059
      (3) Make sure the PACK OFF light comes on.



LEFT AIR COOLING PACK SHOWN
(RIGHT AIR COOLING PACK IS ALMOST THE SAME)

A



COMPRESSOR OUTLET SENSOR

B

Compressor Outlet Sensor
Figure 401

S 864-098

(4) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
   (a) For the compressor outlet sensor on the left pack:
      1) 11A13, AIR COND PACK LEFT AUTO CONT
      2) 11M11, LEFT PACK AUTO POWER
   (b) For the compressor outlet sensor on the right pack:
      1) 11A28, AIR COND PACK RIGHT AUTO CONT
      2) 11M19, RIGHT PACK AUTO POWER
   (c) For the standby compressor outlet sensor on the left pack:
      1) 11A26, AIR COND PACK LEFT STBY CONT
      2) 11M24, LEFT PACK STANDBY POWER
   (d) For the standby compressor outlet sensor on the right pack:
      1) 11A15, AIR COND PACK RIGHT STBY CONT
      2) 11M15, RIGHT PACK STANDBY POWER

D. Remove the Compressor Outlet Sensor

S 014-024

(1) Open the applicable left or right ECS access door, 193HL or 194ER (Ref 06-41-00).

S 034-025

(2) Disconnect the electrical connector from the compressor outlet sensor.

S 024-060

CAUTION: USE TWO WRENCHES TO REMOVE THE COMPRESSOR OUTLET SENSOR FROM THE BOSS. DAMAGE TO THE DUCT COULD OCCUR IF YOU DO NOT USE TWO WRENCHES.

(3) Remove the compressor outlet sensor from the boss.

S 034-026

(4) Remove the O-ring.

S 434-027

(5) Install a plug in the boss.

TASK 21-51-06-404-028

3. Install Compressor Outlet Sensor (Fig. 401)

A. Consumable Materials

(1) D00006 - Never-Seez, Pure Nickel Special, NSBT-8N (High temperature anti-seize compound)

(2) C00852 - Antiseize Compound, Molybdenum Disulfide-Petrolatum, MIL-PRF-83483 (preferred)

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 20-10-19/401, O-rings
(3) 20-10-23/401, Lockwire
(4) 21-51-14/501, Pack Temperature Controller
(5) 24-22-00/201, Electrical Power - Control

C. Access

(1) Location Zones

135 Environmental Control System Bay (Left)
136 Environmental Control System Bay (Right)

(2) Access Panels

193HL ECS Access Door (Left)
194ER ECS Access Door (Right)

D. Install the Compressor Outlet Sensor

S 094-029

(1) Remove the plug from the boss.

S 864-030

(2) Make sure the aligned surfaces of the boss and the sensor nut are clean to permit an electrical ground.

S 434-031

(3) Apply a thin quantity of antisieze compound to the threads of the sensor.

S 424-061

CAUTION: USE TWO WRENCHES TO INSTALL THE COMPRESSOR OUTLET SENSOR IN THE BOSS. DAMAGE TO THE DUCT CAN OCCUR IF YOU DO NOT USE TWO WRENCHES.

(4) With a new O-ring, install the compressor outlet sensor in the boss (Ref 20-10-19).

S 434-062

(5) Tighten the hexnut on the compressor outlet sensor to a torque value of 210-240 pound inches.

S 424-078
(6) Install the lockwire on the hexnut (Ref 20-10-23).

S 434-034
(7) Connect the electrical connector to the compressor outlet sensor.

S 864-099
(8) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) For the compressor outlet sensor on the left pack:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11M11, LEFT PACK AUTO POWER
(b) For the compressor outlet sensor on the right pack:
1) 11A28, AIR COND PACK RIGHT AUTO CONT
2) 11M19, RIGHT PACK AUTO POWER
(c) For the standby compressor outlet sensor on the left pack:
1) 11A26, AIR COND PACK LEFT STBY CONT
2) 11M24, LEFT PACK STANDBY POWER
(d) For the standby compressor outlet sensor on the right pack:
1) 11A15, AIR COND PACK RIGHT STBY CONT
2) 11M15, RIGHT PACK STANDBY POWER

S 744-054
(9) Do applicable controller BITE test (Ref 21-51-14).

S 414-055
(10) Close the applicable left or right ECS access door, 193HL or 194ER (Ref 06-41-00).

E. Put the Airplane Back to Its Usual Condition

S 864-056
(1) Remove the electrical power if it is not necessary (Ref 24-22-00).

COMPRESSOR OUTLET SENSOR - INSPECTION/CHECK

1. General
   A. This procedure has one task. It is a check of the Compressor Outlet Sensors for accurate resistance.
   B. There are four Compressor Outlet Sensors.
      (1) There is a main sensor and a standby sensor in the right pack.
      (2) There is a main sensor and a standby sensor in the left pack.

TASK 21-51-06-706-011

2. Compressor Outlet Sensor Resistance Check (Fig. 601)
   A. General
      (1) This procedure does a check of the calibration of the sensor while the sensor is installed in the pack. Because you can not find the temperature of the sensor accurately while it is installed in the pack, this check is for system troubleshooting only.
   B. Equipment
      (1) Digital Multimeter, High Impedence (alternative)

          NOTE: The digital multimeter must be specifically selected to minimize self-heating of the sensor element. The instrument must limit the current through the sensor to less than 100 microamperes. If you use resistance measuring instruments without this current-limiting feature you will get an error in resistance value due to self-heating of the sensor element.

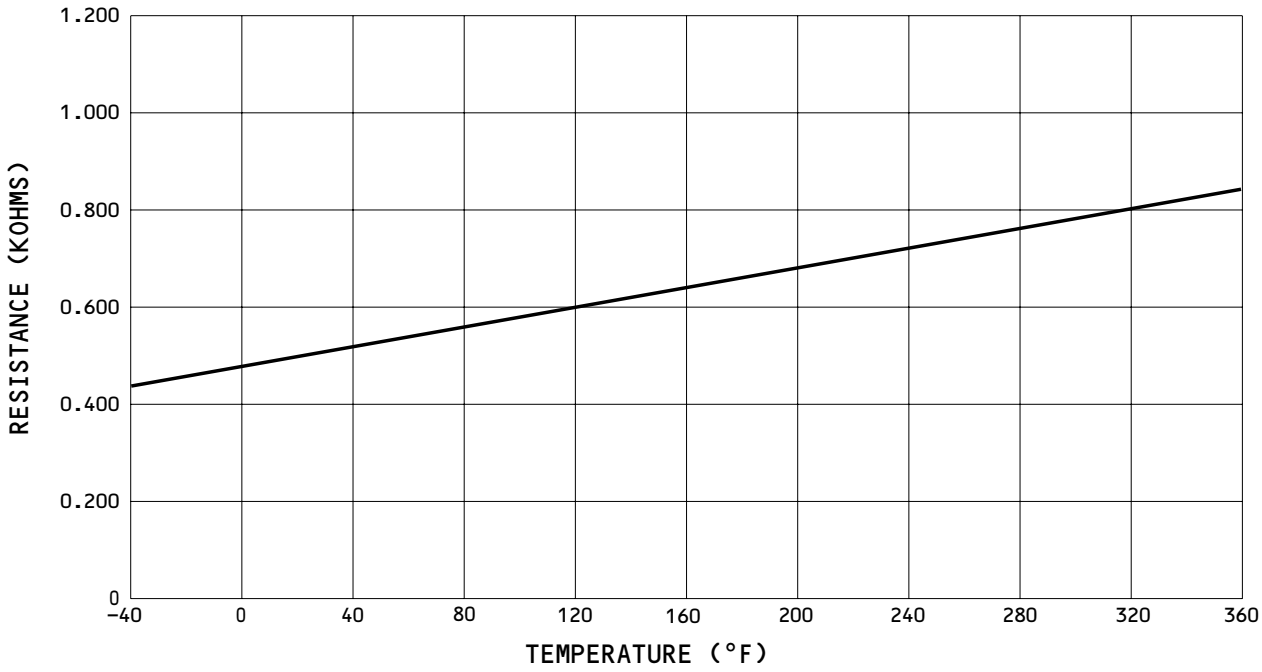
      (2) Digital Multimeter, Hewlett Packard Model 3465A (alternative)
      (3) Thermometer (capable of measuring temperature in degrees F to an accuracy of plus or minus 1 degree F from -40 to 140 degrees F)
   C. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 21-51-14/401, Pack Temperature Controller
   D. Access
      (1) Location Zones

119/120	Main Equipment Center
135	Environmental Control System Bay (Left)
136	Environmental Control System Bay (Right)

      (2) Access Panels

193HL	ECS Access Door (Left)
194ER	ECS Access Door (Right)
119BL	Main Equipment Center Access Door

°F	OHMS
-40	418-424
-20	440-446
0	462-468
20	484-490
40	506-511
60	528-533
80	549-555
100	571-576
120	592-598
140	614-619
160	635-640
180	657-662
200	678-683
220	699-704
240	720-725
260	741-746
280	762-767
300	783-788
320	803-809
340	824-829



COMPRESSOR OUTLET TEMPERATURE SENSOR
RESISTANCE VS TEMPERATURE GRAPH

Compressor Outlet Temperature Sensor - Temperature and Resistance Data
Figure 601

E. Prepare for the Resistance Check

S 886-001
(1) Make sure the pack has been off for 20 minutes or until the pack has cooled to ambient temperature.

S 016-002
(2) To do the check of the L(R) Compressor Outlet Sensor.
Remove the L(R) Pack Temperature Controller (AMM 21-51-14/401).

S 016-003
(3) To do the check of the L(R) Standby Compressor Outlet Sensor:
Remove the Standby Pack Temperature Controller (AMM 21-51-14/401).

S 016-004
(4) Open the applicable left or right ECS access door, 193HL or 194ER (AMM 06-41-00/201).

F. Do the Resistance Check of the Compressor Outlet Sensors

S 226-005
(1) Go to the ECS bay and measure the ambient temperature near the Compressor Outlet Sensors.

S 976-006
(2) Make a record of the temperature.

S 486-002
(3) To do the check of the L(R) Compressor Outlet Sensor:
Connect the digital multimeter between pins AD4 and AD5 on the airplane shelf connector, D2964 (D3026), for the L(R) Pack Temperature Controller.

S 486-003
(4) To do the test of the L(R) Standby Compressor Outlet Sensor:
Connect the digital multimeter between pins AA10 (BA10) and AB10 (BB10) on the airplane shelf connector, D4130, for the Standby Pack Temperature Controller.

S 766-004
(5) Make a record of the resistance in Ohms that you measure.

S 976-005
(6) Find the temperature on Figure 601 that is nearest to the temperature that you wrote down.

S 976-012
(7) Compare the permitted range of resistance for that temperature to the resistance you wrote down.

S 906-007
(8) If the resistance is out of range, replace the sensor (AMM 21-51-06/401).

G. Put the Airplane Back to Its Usual Condition

S 416-008
(1) If you did the check of the L(R) Compressor Outlet Sensor, install the L(R) Pack Temperature Controller (AMM 21-51-14/401).

S 416-009
(2) If you did the check of the L(R) Standby Compressor Outlet Sensor, install the Standby Pack Temperature Controller (AMM 21-51-14/401).

S 416-010
(3) Close the applicable left or right ECS access door, 193HL or 194ER (AMM 06-41-00/201).

PACK REHEATER - REMOVAL/INSTALLATION

1. General
   A. This procedure contains the removal and installation tasks for the pack reheater. The pack reheater is found in the air cooling pack just left of the condenser.

   TASK 21-51-07-004-001

2. Remove Pack Reheater (Fig. 401)
   A. Equipment
      (1) Hoist Adaptor - A21001-44, A21001-45

          NOTE: The -44 hoist adapter is used with a customer supplied jack. The -45 hoist adapter is used with a A71015-87 accessory lift fixture.

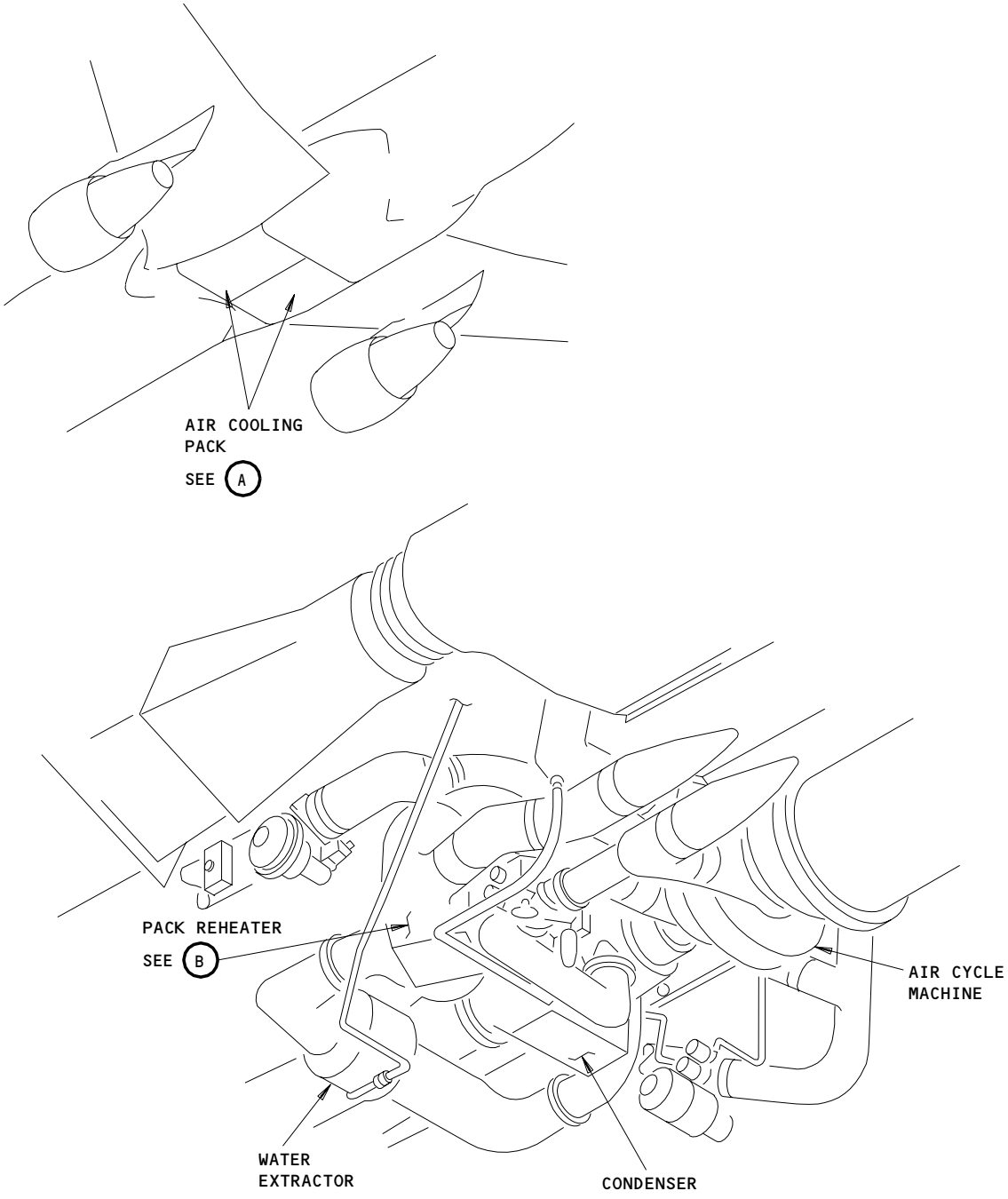
      (2) Transmission Jack
          (a) Blackhawk, model 67554, General Service Equip Div., Applied Power Inc., P.O. Box 27207, Milwaukee, Wisc 53227
          (b) Hein-Werner, model 64, part no. 62005, 1200 National Ave., Waukesha, Wisc 53186
   B. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
   C. Access
      (1) Location Zones
          135 Environmental Control System Bay (Left)
          136 Environmental Control System Bay (Right)

      (2) Access Panel
          193HL ECS Access Door (Left)
          194ER ECS Access Door (Right)

   D. Prepare for Removal

      S 864-031
      (1) Supply electrical power (Ref 24-22-00).

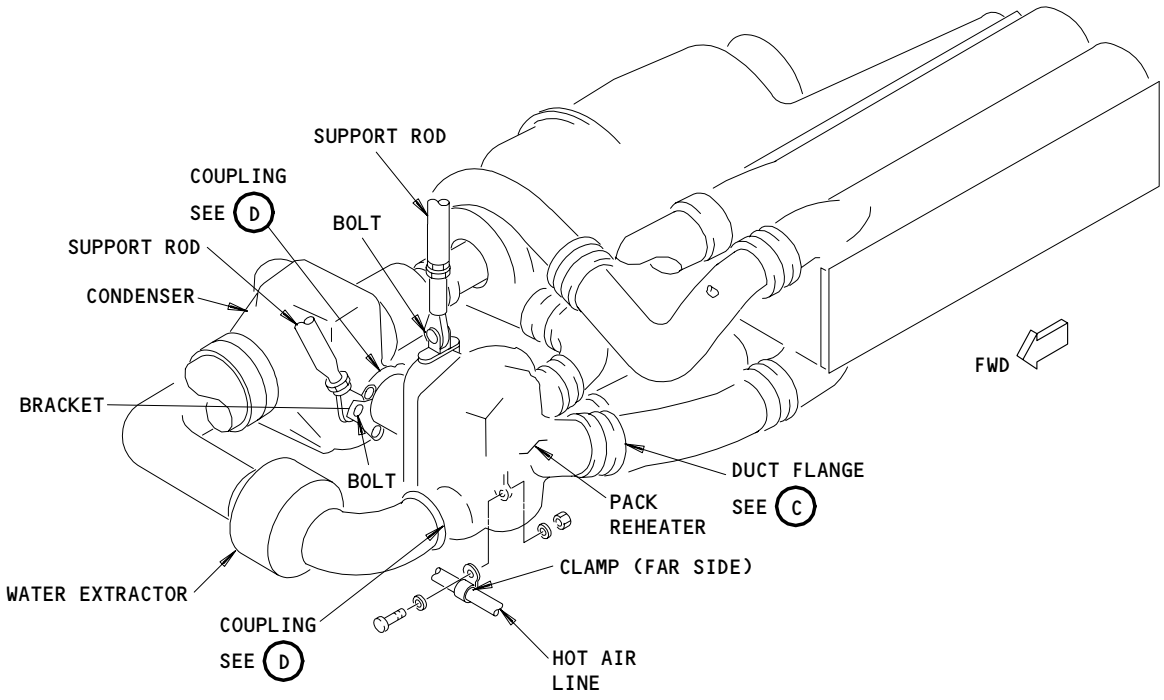
      S 864-032
      (2) Turn the L or the R PACK control selector on the overhead panel, P5, to the OFF position.



LEFT AIR COOLING PACK SHOWN
(RIGHT AIR COOLING PACK IS ALMOST THE SAME)

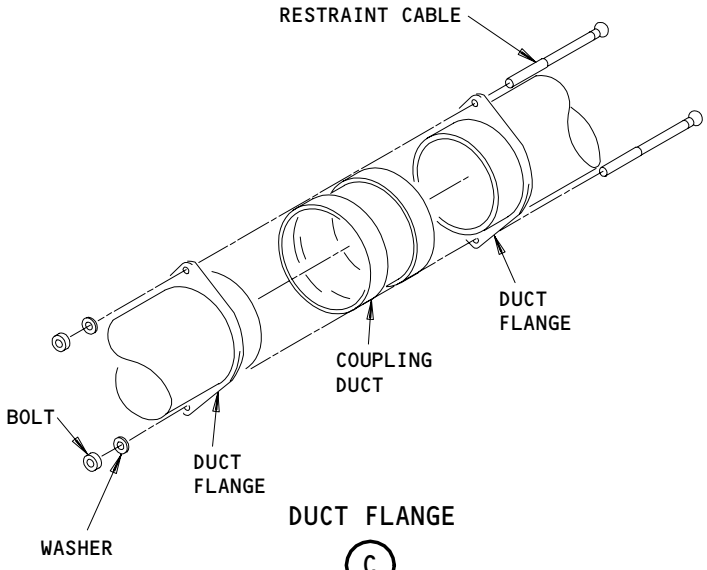
A

Pack Reheater
Figure 401 (Sheet 1)



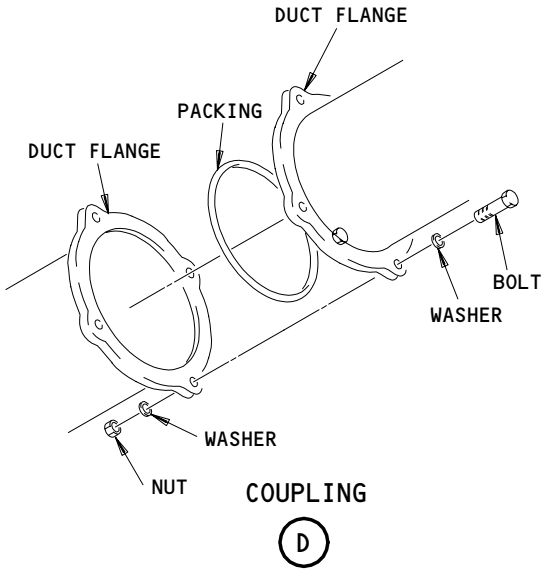
PACK REHEATER

B



DUCT FLANGE

C



COUPLING

D

Pack Reheater
Figure 401 (Sheet 2)

S 214-033
(3) Make sure the PACK OFF light comes on.

S 864-034
(4) Put a DO-NOT-OPERATE tag on the selector.

S 014-003
(5) Open the left or right ECS access door, 193HL or 194ER, and find the pack reheater (Ref 06-41-00).

E. Remove the Pack Reheater

S 494-035

CAUTION: WHEN YOU REMOVE THE REHEATER THE CONDENSER MUST BE PUT ON A JACK. IF YOU DO NOT PUT THE CONDENSER ON A JACK, DAMAGE TO ATTACH POINTS AND DUCTS COULD OCCUR.

(1) Use the air conditioning pack hoist (A21001) and a wooden block to hold the condenser.

S 034-005
(2) Remove the restraint cables and the bonding jumpers from duct flanges.

S 034-006
(3) Remove the clamp that attaches the hot air line to the pack reheater.

S 034-007
(4) Remove the support rod from reheater/condenser flange.

S 034-008
(5) Remove the bolts and packing from the water extractor duct flange.

S 034-009
(6) Remove the bolts and packing from the condenser inlet flange.

S 034-010
(7) Remove the bracket that attaches the support rod to the flange.

S 034-011
(8) Remove the support rod from the bracket on top of the pack reheater.

S 024-012
(9) Carefully remove the reheater away from all the connect points.

NOTE: Move the coupling ducts off the ports.

S 864-013
(10) Cover the duct openings to keep unwanted material out of ducts.

TASK 21-51-07-404-014

3. Install the Pack Reheater (Fig. 401)

A. Equipment

(1) Hoist Adaptor - A21001-44, A21001-45

NOTE: The -44 hoist adapter is used with a customer supplied jack. The -45 hoist adapter is used with a A71015-87 accessory lift fixture.

(2) Transmission Jack

(a) Blackhawk, model 67554, General Service Equip Div., Applied Power Inc., P.O. Box 27207, Milwaukee, Wisc 53227

(b) Hein-Werner, model 64, part no. 62005, 1200 National Ave., Waukesha, Wisc 53186

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 24-22-00/201, Electric Power Control
(3) 36-00-00/201, Pneumatic-General

C. Access

(1) Location Zones

135 Environmental Control System Bay (Left)
136 Environmental Control System Bay (Right)

(2) Access Panel

193HL ECS Access Door (Left)
194ER ECS Access Door (Right)

D. Install the Pack Reheater

S 094-015
(1) Remove the covers on the duct openings.

S 424-036
(2) Carefully align the pack reheater to align with all the connect points.

S 434-017
(3) Attach the support rod to the bracket on top of the pack reheater.

S 434-018
(4) Install the packing on the condenser inlet flange and the water extractor duct flange.

S 824-037
(5) Align the bracket with the reheater flange.

S 434-019
(6) Install the bolts, washers, and nuts at the condenser inlet flange connection.

S 434-020
(7) Install the bolts, washers and nuts at the water extractor duct connection.

S 434-021
(8) Attach the support rod to the bracket on the reheater flange.

S 434-022
(9) Install the hot air line support clamp to the pack reheater.

S 434-023
(10) Move the coupling ducts on the reheater ports.

S 434-024
(11) Install the bonding jumpers at the heat exchanger and the turbine duct flanges.

S 434-025
(12) Install the restraint cable between the duct flanges.

S 824-038
(13) Tighten the restraint cables a sufficient quantity to give equal tension in each cable.

S 094-026
(14) Remove the hoist adaptor, transmission jack, and wooden block.

S 714-027
(15) Examine the pack reheater for leakage.
  (a) Supply pneumatic power (AMM 36-00-00/201).
  (b) Remove the DO-NOT-OPERATE tag from the selector.
  (c) Turn the L or the R PACK control selector on the P5 panel to the AUTO position.
  (d) Make sure the PACK OFF light goes off.
  (e) Examine the duct flanges and the connection points at the pack reheater for leakage.

    NOTE: Symmetrical leakage is acceptable. Too much leakage or leakage that is not symmetrical must be repaired by adjustment of the coupling connection.

E. Put the Airplane Back to Its Usual Condition

S 864-039
(1) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 864-029
(2) Remove electrical power if it is not necessary (Ref 24-22-00).

S 414-030
(3) Close the applicable left or right ECS access door, 193HL or 194ER (Ref 06-41-00).

PACK TEMPERATURE SENSOR - REMOVAL/INSTALLATION

1. General
   A. Two pack temperature sensors on each air conditioning pack outlet give temperature signals to the pack and pack standby controllers. The pack temperature sensors are installed in the water extractor outlet, forward of the reheater. Sensor number 1 supplies a signal to the pack temperature controller. Sensor number 2 supplies a signal to the pack standby controller.

   TASK 21-51-08-004-001
2. Remove the Pack Temperature Sensor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          135 Environmental Control System Bay (Left)
          136 Environmental Control System Bay (Right)

      (2) Access Panels
          193HL ECS Access Door (Left)
          194ER ECS Access Door (Right)

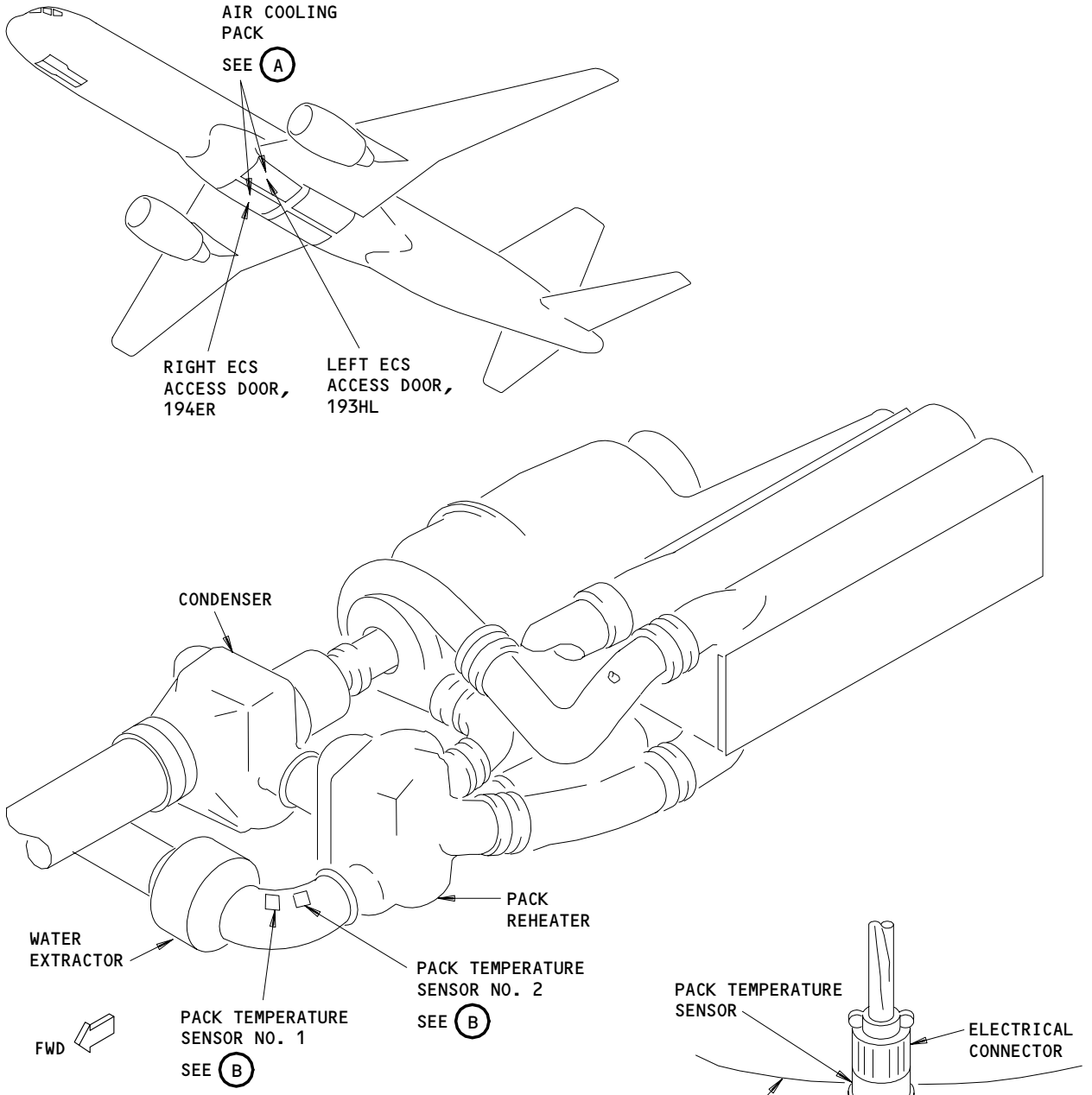
   C. Prepare for Removal

      S 864-002
      (1) Put the applicable L or R PACK control selector on the overhead panel, P5, to the OFF position.

      S 214-055
      (2) Make sure the PACK OFF light comes on.

      S 864-056
      (3) Attach a DO-NOT-CLOSE tag to the selector.

      S 864-090
      (4) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) To remove the right pack temperature sensor:
              1) 11A28, AIR COND PACK RIGHT AUTO CONT



LEFT AIR COOLING PACK SHOWN
(RIGHT AIR COOLING PACK IS ALMOST THE SAME)

A

PACK TEMPERATURE SENSOR NO. 1 OR 2

B

Pack Temperature Sensor
Figure 401

2) 11M19, RIGHT PACK AUTO POWER

(b) To remove the left pack temperature sensor:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11M11, LEFT PACK AUTO POWER

(c) To remove the right pack standby temperature sensor:
1) 11A15, AIR COND PACK RIGHT STBY CONT

(d) To remove the left pack standby temperature sensor:
1) 11A26, AIR COND PACK LEFT STBY CONT
2) 11M24, LEFT PACK STANDBY POWER

S 014-024

(5) Open the applicable left or right ECS access door, 193HL or 194ER, and find the applicable pack temperature sensor (Ref 06-41-00).

D. Remove the Pack Temperature Sensor

S 034-025

(1) Disconnect the electrical connector from the pack temperature sensor.

S 024-057

CAUTION: USE TWO WRENCHES TO REMOVE THE PACK TEMPERATURE FROM THE BOSS. DAMAGE TO DUCT COULD OCCUR IF YOU DO NOT USE TWO WRENCHES.

(2) Remove the pack temperature sensor from the boss.

S 034-027

(3) Remove the O-ring.

TASK 21-51-08-404-028

3. Install the Pack Temperature Sensor (Fig. 401)

A. Consumable Materials

(1) D00386 Anti-seize Compound - MIL-L-23398 (AMM 20-30-04/201)

(2) D00006 Anti-seize Compound - EASE-OFF 990
(Optional to MIL-L-23398)

(3) D00006 Antiseize Compound - Never-Seez (Optional to MIL-L-23398).

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 20-10-23/401, Lockwire
(3) 21-51-14/501, Pack Temperature Controller

C. Access

(1) Location Zones

135 Environmental Control System Bay (Left)
136 Environmental Control System Bay (Right)

(2) Access Panels

193HL ECS Access Door (Left)
194ER ECS Access Door (Right)

D. Install the Pack Temperature Sensor

S 864-029

(1) Make sure the mating surfaces of the boss and the nut of the pack temperature sensor are clean to permit an electrical ground.

S 434-030

(2) Apply a thin layer of anti-sieze compound to the threads of the pack temperature sensor.

S 424-058

CAUTION: USE TWO WRENCHES TO INSTALL THE PACK TEMPERATURE SENSOR ON THE BOSS. DAMAGE TO THE DUCT CAN OCCUR IF YOU DO NOT USE TWO WRENCHES.

(3) With a new O-ring, install the pack temperature sensor in the boss.
(a) Tighten the hexnut on the compressor outlet sensor to a torque value of 210-240 pound inches.

S 434-059

(4) Install the lockwire on pack temperature sensor (Ref 20-10-23).

S 434-032

(5) Install the electrical connector on the pack temperature sensor.

S 434-060

(6) Install the lockwire on the electrical connector (Ref 20-10-23).

S 864-091

(7) Remove the DO-NOT-CLOSE tag and close these circuit breakers on the P11 panel:

(a) If the right pack temperature sensor is installed:

1) 11A28, AIR COND PACK RIGHT AUTO CONT

2) 11M19, RIGHT PACK AUTO POWER

(b) If the left pack temperature sensor is installed:

1) 11A13, AIR COND PACK LEFT AUTO CONT

2) 11M11, LEFT PACK AUTO POWER

(c) If the right pack standby temperature sensor is installed:

1) 11A15, AIR COND PACK RIGHT STBY CONT

2) 11M15, RIGHT PACK STANDBY POWER

(d) If the left pack standby temperature sensor is installed:

1) 11A26, AIR COND PACK LEFT STBY CONT

2) 11M24, LEFT PACK STANDBY POWER

S 714-061

(8) Do a test of the pack temperature sensor.

(a) If a pack temperature sensor is installed, do the BITE test for the pack temperature controller on the applicable (left or right) pack temperature controller (Ref 21-51-14).

1) Make sure that the PACK SENSOR fault indicator light does not come on.

(b) If a pack standby temperature sensor is installed, do the BITE test for the pack standby controller (Ref 21-51-14).

1) Make sure the NO GO light does not come on for position 6.

E. Put the Airplane Back to Its Usual Condition

S 414-054

(1) Close the applicable left or right ECS access door, 193HL or 194ER (Ref 06-41-00).

PACK TEMPERATURE SENSOR - INSPECTION/CHECK

1. General
   A. This procedure has one task. It is a check of the Pack Temperature Sensors for accurate resistance.
   B. Two pack temperature sensors on each air conditioning pack outlet give temperature signals to the pack temperature controllers and pack standby controller. The pack temperature sensors are installed in the water extractor outlet, forward of the reheater. Sensor number 1 supplies a signal to the pack temperature controller. Sensor number 2 supplies a signal to the pack standby controller.

TASK 21-51-08-706-022

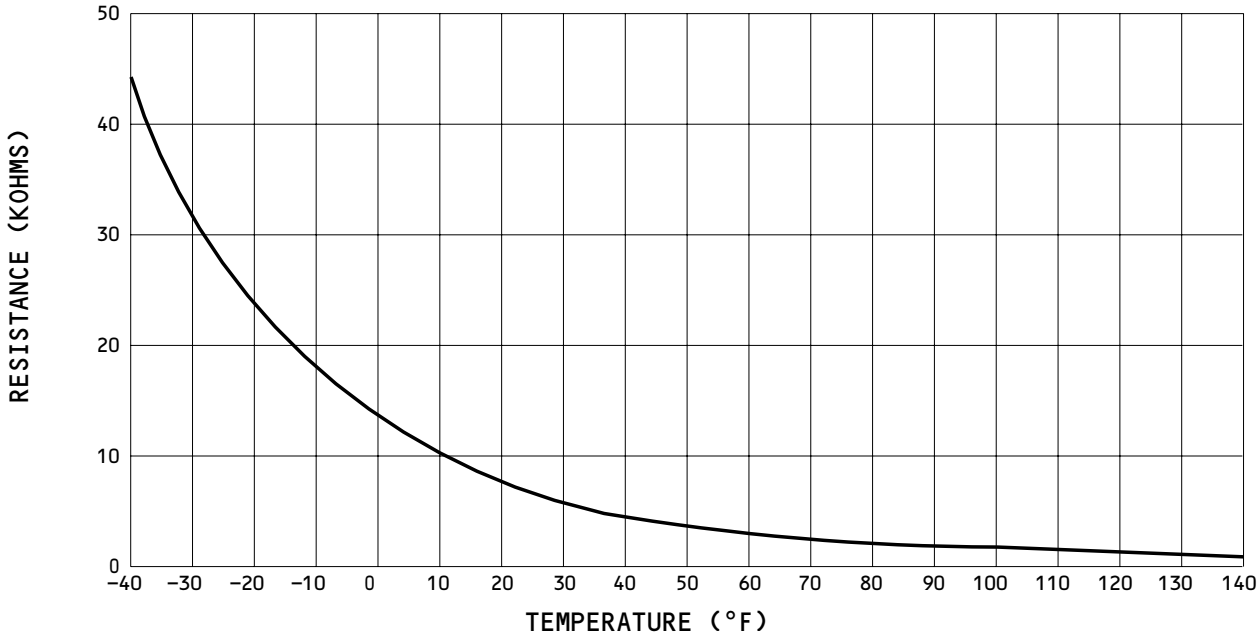
2. Pack Temperature Sensor Resistance Check
   A. General
      (1) This procedure is a check of the calibration of the sensor while the sensor is installed in the pack. Because you can not find the temperature of the sensor accurately while it is installed in the pack, this check is for system troubleshooting only.
   B. Equipment
      (1) Digital Multimeter, High Impedence (alternative)

          NOTE: The digital multimeter must be specifically selected to minimize self-heating of the sensor element. The instrument must limit the current through the sensor to less than 100 microamperes. If you use resistance measuring instruments without this current-limiting feature you will get an error in resistance value due to self-heating of the sensor element.

      (2) Digital Multimeter, Hewlett Packard Model 3465A (alternative)
      (3) Thermometer (capable of measuring temperature in degrees F to an accuracy of plus or minus 1 degree F from -40 to 140 degrees F)
   C. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 21-51-14/401, Pack Temperature Controller
   D. Access
      (1) Location Zones
          135 Environmental Control System Bay (Left)
          136 Environmental Control System Bay (Right)
          119/120 Main Equipment Center

°F	OHMS
-40	43030-45210
-35	36690-38550
-30	31360-32960
-25	26930-28230
-20	23140-24260
-15	19940-20900
-10	17220-18050
-5	14890-15580
0	12950-13550
5	11310-11780
10	9870-10290
15	8640-9000
20	7520-7900
25	6660-6940
30	5870-6120
35	5180-5400
40	4580-4770
45	4060-4230
50	3600-3750

°F	OHMS
55	3200-3340
60	2850-2980
65	2550-2660
70	2290-2390
75	2040-2130
80	1830-1920
85	1650-1730
90	1480-1560
95	1340-1400
100	1210-1270
105	1100-1150
110	990-1040
115	900-950
120	820-860
125	740-790
130	680-720
135	620-660
140	560-600



PACK TEMPERATURE SENSOR
RESISTANCE VS TEMPERATURE GRAPH

Pack Temperature Sensor - Temperature and Resistance Data
Figure 601

(2) Access Panels

193HL	ECS Access Door (Left)
194ER	ECS Access Door (Right)
119BL	Main Equipment Center Access Door

E. Prepare for the Resistance Check

S 886-001
(1) Make sure the pack has been off for 20 minutes or until at ambient temperature.

S 016-002
(2) To do the check of the L(R) Pack Temperature Sensor, remove the L(R) Pack Temperature Controller (AMM 21-51-14/401).

S 016-003
(3) To do the check of the L(R) Standby Pack Temperature Sensor, remove the Standby Pack Temperature Controller (AMM 21-51-14/401).

S 016-004
(4) Open the applicable left or right ECS access door, 193HL or 194ER (AMM 06-41-00/201).

F. Do the Check of the Pack Temperature Sensors

S 226-005
(1) Go to the ECS bay and measure the ambient temperature adjacent to the Pack Temperature Sensors.

S 976-006
(2) Write down the temperature.

S 486-007
(3) To do the check of the L(R) Pack Temperature Sensor, connect the digital multimeter between pins AA4 and AA5 on the airplane shelf connector, D2964 (D3026), for the L(R) Pack Temperature Controller.

S 486-008
(4) To do the check of the L(R) Standby Pack Temperature Sensor, connect the digital multimeter between pins AA9 (BA9) and AB9 (BB9) on the airplane shelf connector, D4130, for the Standby Pack Temperature Controller.

S 766-009
(5) Write down the resistance in Ohms that you measure.

S 976-010
(6) Find the temperature on Figure 601 that is nearest to the temperature that you wrote down.

S 976-011
(7) Compare the permitted range of resistance for that temperature to the resistance you wrote down.

S 906-012
(8) If the resistance is out of range, replace the sensor (AMM 21-51-08/401).

G. Put the Airplane Back to Its Usual Condition

S 416-013
(1) If you did the check of the L(R) Pack Temperature Sensor, install the L(R) Pack Temperature Controller (AMM 21-51-14/401).

S 416-014
(2) If you did the check of the L(R) Standby Pack Temperature Sensor, install the Standby Pack Temperature Controller (AMM 21-51-14/401).

S 416-015
(3) Close the applicable left or right ECS access door, 193HL or 194ER (AMM 06-41-00/201).

FLOW CONTROL CARD ASSEMBLY - REMOVAL/INSTALLATION

1. General
   A. The flow control card assembly supplies power and logic to operate the flow control and shutoff valve. The flow control cards are installed in the P50 card file.

TASK 21-51-09-004-001

2. Remove the Flow Control Card (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-01/401, E/E Rack-Mounted Components
      (3) 20-41-01/201, Electrostatic Discharge Sensitive Devices
   B. Access
      (1) Location Zone
          119 Main Equipment Center (Left)

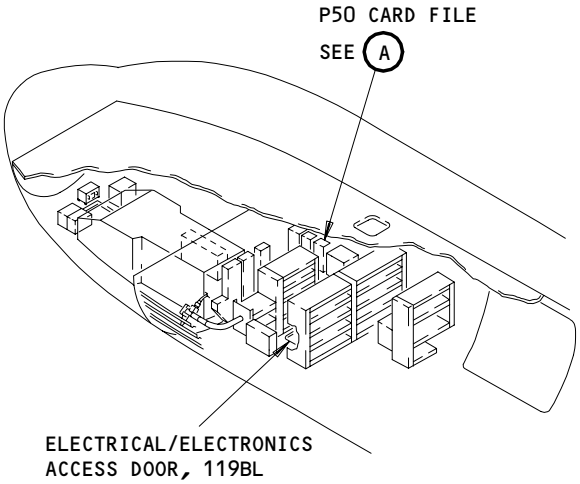
      (2) Access Panel
          119BL Electrical/Electronics Access Door

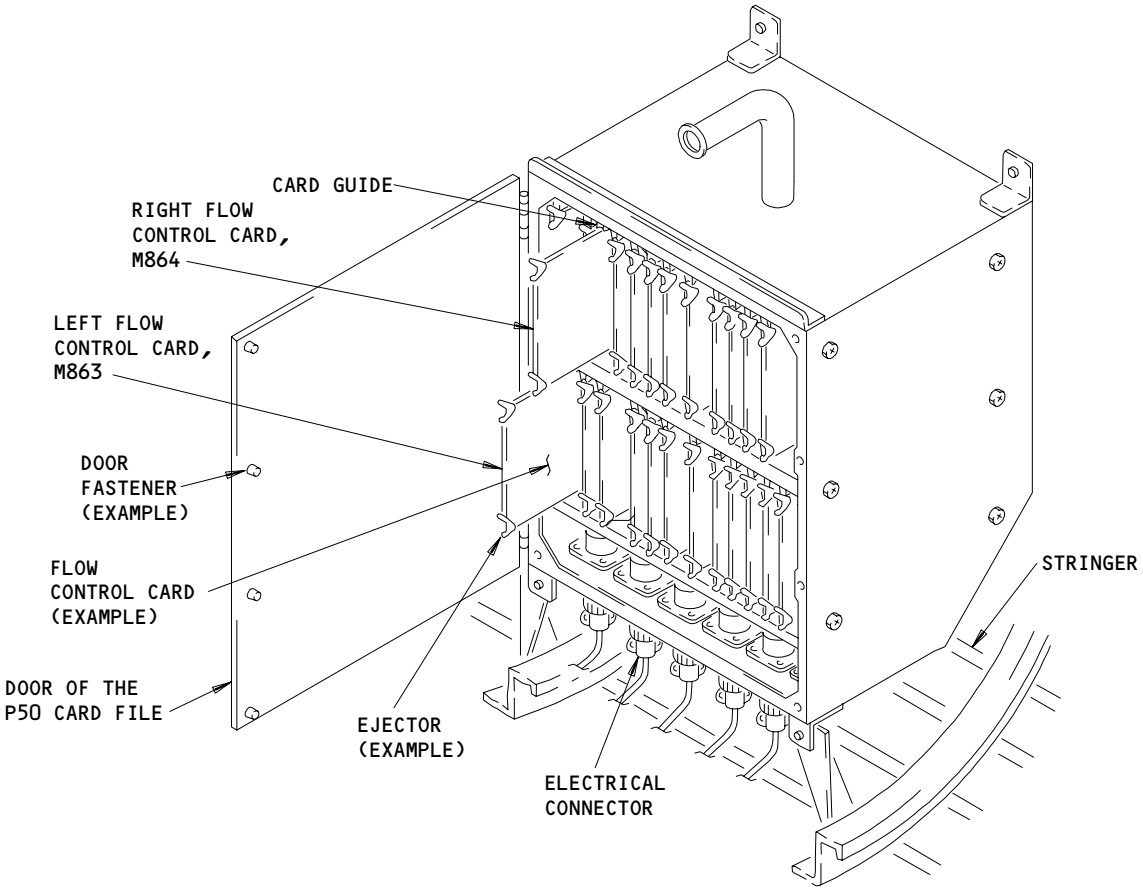
   C. Remove the Flow Control Card

      S 034-002
      (1) For removal of the left flow control card:
          (a) Put the L PACK control selector on the overhead panel, P5, to the OFF position.
              1) Make sure the PACK OFF light comes on.
              2) Attach a DO-NOT-OPERATE tag to the selector.
          (b) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
              1) 11A14, AIR COND PACK LEFT FLOW CONT

      S 034-003
      (2) For removal of the right flow control card:
          (a) Put the R PACK control selector on the overhead panel, P5, to the OFF position.
              1) Make sure the PACK OFF light comes on.
              2) Attach a DO-NOT-OPERATE tag to the selector.
          (b) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
              1) 11A29, AIR COND PACK RIGHT FLOW CONT

      S 014-004
      (3) Open the electrical/electonics access door, 119BL, and find the P50 card file (Ref 06-41-00).
          (a) The card number for the left flow control card is M863.
          (b) The card number for the right flow control card is M864.





P50 CARD FILE
A

Flow Control Card Installation
Figure 401

S 914-015

CAUTION: DO NOT TOUCH THE FLOW CONTROL CARD BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE FLOW CONTROL CARD.

(4) Do the procedure for devices that are sensitive to electrostatic discharge (Ref 20-41-01).

S 024-016

(5) Remove the flow control card (Ref 20-10-01).

TASK 21-51-09-404-006

3. Install the Flow Control Card (Fig. 401)

A. References

(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 20-10-01/401, E/E Rack-Mounted Components
(3) 20-41-01/201, Electrostatic Discharge Sensitive Devices
(4) 24-22-00/201, Electric Power Control
(5) 36-00-00/201, Pneumatic General

B. Access

(1) Location Zone
119 Main Equipment Center (Left)

(2) Access Panel
119BL Electrical/Electronics Access Door

C. Install the Flow Control Card

S 914-017

CAUTION: DO NOT TOUCH THE FLOW CONTROL CARD BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE FLOW CONTROL CARD.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (Ref 20-41-01).

S 424-007

(2) Install the flow control card (Ref 20-10-01).

S 414-008

(3) Close the door of the P50 card file.

S 424-009

(4) For installation of the left flow control card:
(a) Remove the DO-NOT-OPERATE tag from the L PACK CONTROL selector on the P5 panel.

(b) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
1) 11A14, AIR COND PACK LEFT FLOW CONT

S 424-010
(5) For installation of the right flow control card:
(a) Remove the DO-NOT-OPERATE tag from the R PACK CONTROL selector on the P5 panel.
(b) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
1) 11A29, AIR COND PACK RIGHT FLOW CONT

S 734-011
(6) Test the flow control card assembly.
(a) Supply electric power (Ref 24-22-00).
(b) Supply pneumatic power (AMM 36-00-00/201).
(c) Turn the R or the L PACK control selector to AUTO on the P5 panel.
(d) Make sure the PACK OFF light goes off.
(e) Turn the R or the L PACK control selector to OFF on the P5 panel.
(f) Make sure the PACK OFF light comes on.

D. Put the Airplane Back to Its Usual Condition

S 864-012
(1) Remove the pneumatic power if it is not necessary (AMM 36-00-00/201).

S 864-013
(2) Remove the electric power if it is not necessary (Ref 24-22-00).

S 864-014
(3) Close the electrical/electronics access door, 119BL (Ref 06-41-00).

CONDENSER - REMOVAL/INSTALLATION

1. General
   A. This procedure contains the removal and installation tasks for the condenser. The condenser is in the air cooling pack, to the right of the reheater and aft of the water extractor.

TASK 21-51-10-004-032

2. Remove the Condenser (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          135 Environmental Control System Bay (Left)
          136 Environmental Control System Bay (Right)

      (2) Access Panels
          193HL ECS Access Door (Left)
          194ER ECS Access Door (Right)

   C. Prepare for Removal

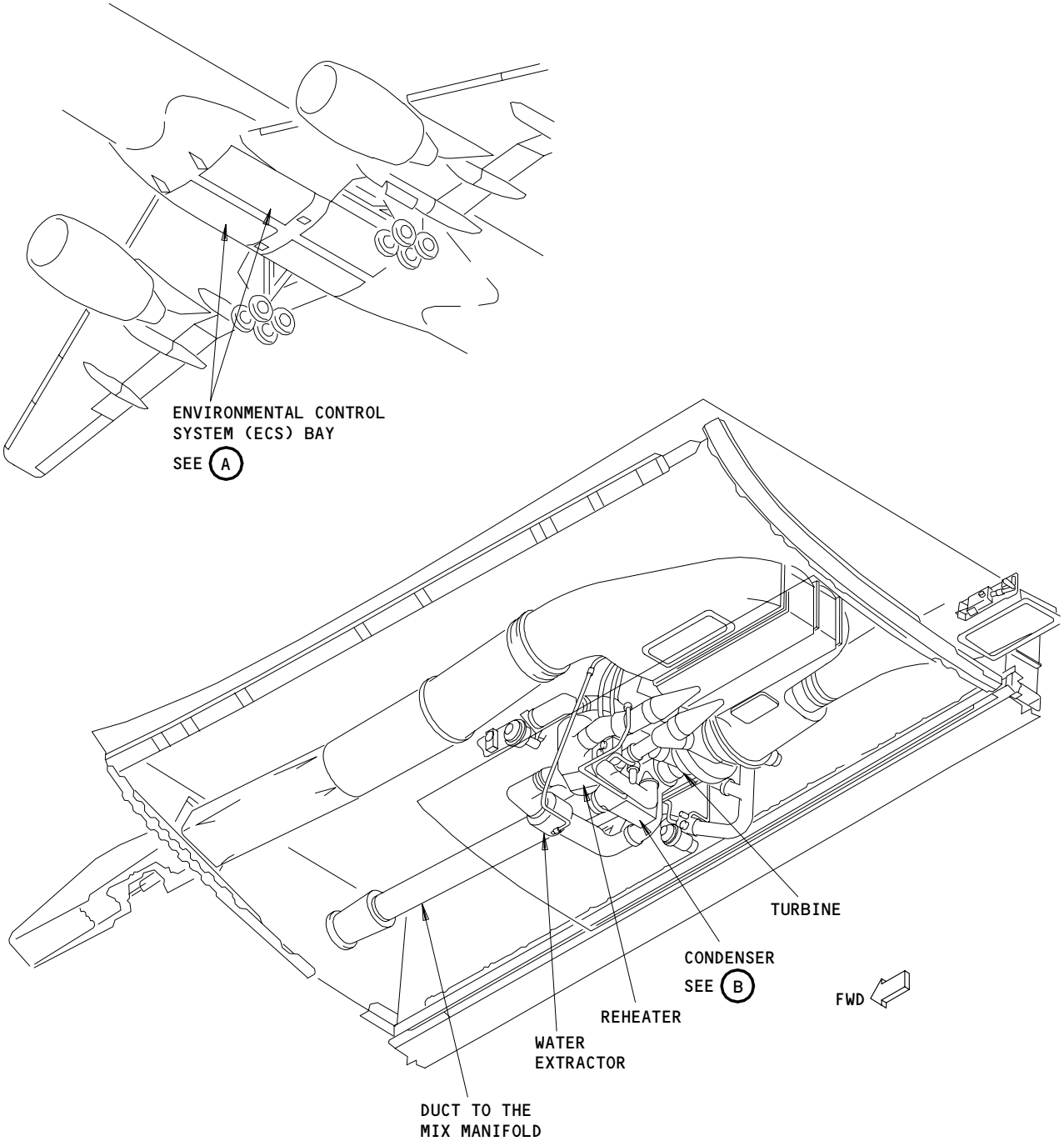
      S 864-033
      (1) Supply electrical power (Ref 24-22-00).

      S 864-034
      (2) Put the L or the R PACK control selector on the overhead panel, P5, to the OFF position.

      S 214-035
      (3) Make sure the PACK OFF light comes on.

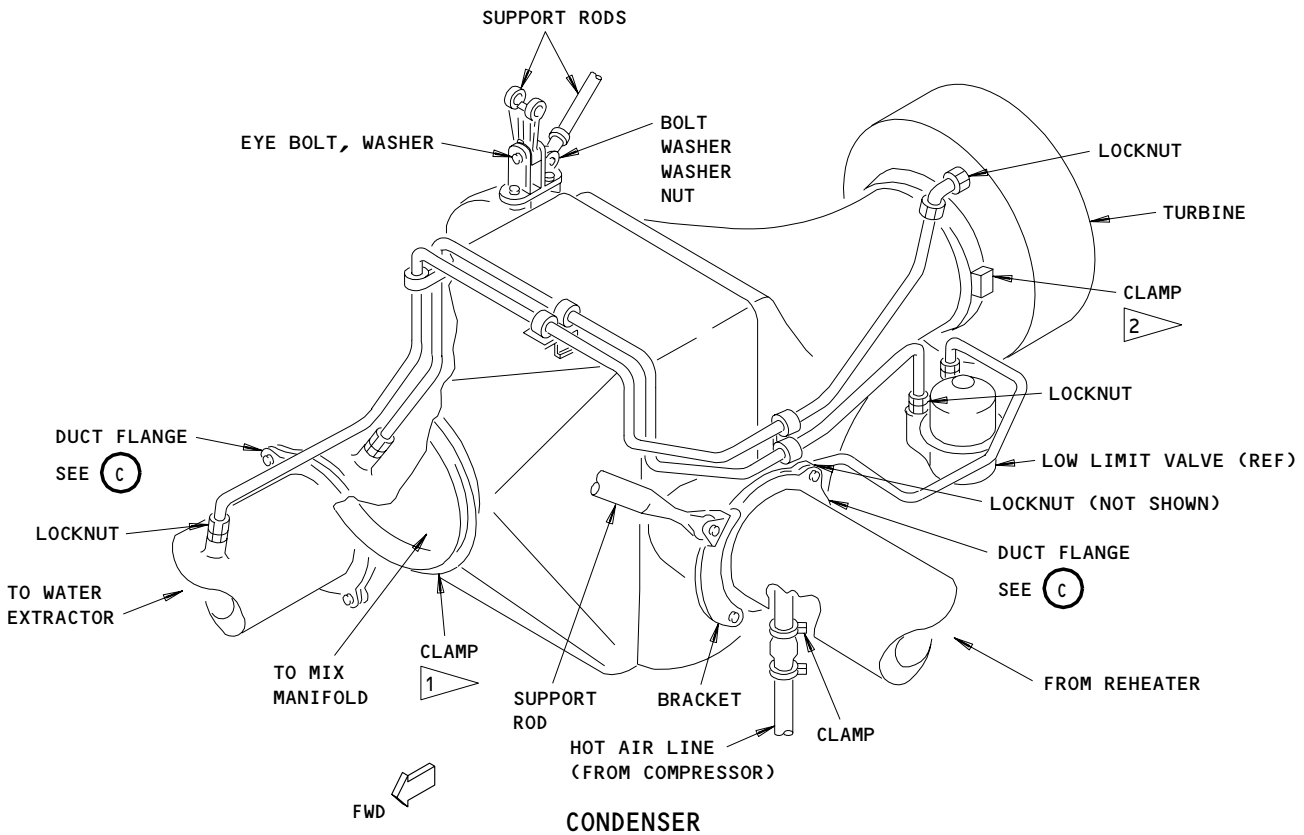
      S 864-036
      (4) Install a DO-NOT-OPERATE tag on the left or right pack control selector.

      S 014-001
      (5) Open the applicable left or right ECS access door, 193HL or 194ER, and find the condenser (Ref 06-41-00).



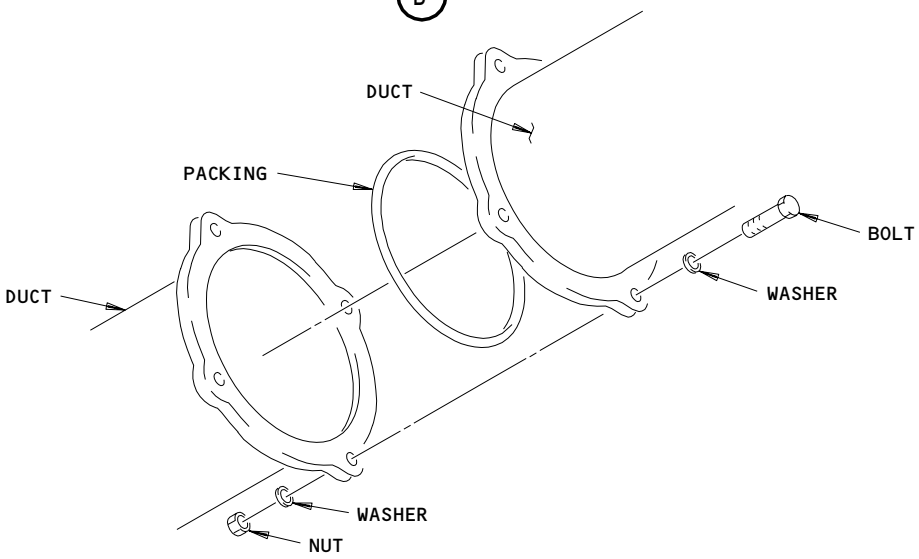
ENVIRONMENTAL CONTROL SYSTEM (ECS) BAY
(LEFT SIDE SHOWN, RIGHT SIDE IS ALMOST THE SAME)
A

Condenser Installation
Figure 401 (Sheet 1)



CONDENSER

B



DUCT FLANGE (TYP)

C

1 TIGHTEN THE CLAMP TO 70-90 POUND-INCHES

2 TIGHTEN THE CLAMP TO 35-45 POUND-INCHES

Condenser Installation
Figure 401 (Sheet 2)

D. Remove the Condenser

S 034-002
(1) Loosen the locknuts (4 locations) and disconnect the pneumatic sense lines.

S 034-013
(2) Remove the clamp from the hot air line.

S 034-012
(3) Remove the clamp which connects the condenser to the turbine.

S 034-011
(4) Loosen the clamp which connects the condenser to the mix manifold duct.

S 034-037
(5) Move the rubber sleeve away from the condenser.

S 034-010
(6) Remove the four bolts from the duct flange between the condenser and the water extractor.

S 034-009
(7) Remove the four bolts from the duct flange between the condenser and the reheater.

NOTE: Leave the support rod and bracket attached to the flange.

S 034-008
(8) Remove the eye bolt from the mounting bracket on top of the condenser.

S 034-007
(9) Remove the bolt from the mounting bracket on top of the condenser.

S 024-006
(10) Carefully lower the condenser away from all the connect points.

S 034-005
(11) Remove the packing from the duct flanges.

S 494-004
(12) Put covers on the duct openings to keep unwanted materials out of the ducts.

TASK 21-51-10-404-003

3. Install the Condenser (Fig. 401)
A. References
(1) 06-41-00/201, Fuselage Access Doors and Panels

(2) 24-22-00/201, Electric Power Control
(3) 36-00-00/201, Pneumatic General

B. Access

(1) Location Zones
135 Environmental Control System Bay (Left)
136 Environmental Control System Bay (Right)

(2) Access Panels
193HL ECS Access Door (Left)
194ER ECS Access Door (Right)

C. Install the Condenser

S 094-014
(1) Remove the covers from the duct openings.

S 424-015
(2) Carefully install the condenser to align all the connect points.

S 434-016
(3) Use the eye bolt and washer to attach the support rod to the mounting bracket on the top of the condenser.

S 434-017
(4) Use the bolt, washer, washer, and nut to attach the support rod to the mounting bracket on the top of the condenser.

S 434-018
(5) Install the clamp to connect the condenser to the turbine.

S 434-038
(6) Tighten the clamp to 35-45 pound-inches.

S 434-019
(7) Move the rubber sleeve from the mix manifold duct over the condenser outlet.

S 434-020
(8) Install the clamp to the connection.

S 434-039
(9) Tighten the clamp as shown in Fig. 401.

S 434-021
(10) Install the packing in the duct flange between the condenser and the water extractor.

S 434-022
(11) Install the four bolts, washers, and nuts at the flange.

S 434-023
(12) Install the packing in the duct flange between the condenser and the reheater.

S 434-024
(13) Install the four bolts, washers, and nuts at the flange.

S 434-025
(14) Tighten the locknuts (4 locations) to connect the pneumatic sense lines.

S 434-026
(15) Install the clamp to connect the hot air line.

S 734-027
(16) Examine the condenser for leakage.
  (a) Supply electrical power (Ref 24-22-00).
  (b) Supply pneumatic power (AMM 36-00-00/201).
  (c) Remove the DO-NOT-OPERATE tag from the L or the R PACK control selector on the P5 panel.
  (d) Turn the L or R PACK control selector to the AUTO position.
  (e) Make sure the PACK OFF light goes off.
  (f) Feel for airflow around the duct flanges of the condenser.
    1) A small leak is permitted.
    2) You must repair a large leak.
  (g) Make sure the connections of the pneumatic sense lines do not leak.
    1) Apply a solution of soapy water to the four connections of the pneumatic sense lines.

2) If a bubble appears, repair the connection.

S 864-028

(17) Put the L or the R PACK control selector on the P5 panel to the OFF position.

S 214-040

(18) Make sure the PACK OFF light comes on.

D. Put the Airplane Back to Its Usual Condition

S 864-029

(1) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 864-030

(2) Close the applicable left or right ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-031

(3) Remove the electrical power if it is not necessary (Ref 24-22-00).

LOW LIMIT VALVE - MAINTENANCE PRACTICES

1. General
   A. One low limit valve is installed in each air cooling pack. The low limit valve controls the flow of warm air to the turbine outlet of the air cycle machine. The warm air prevents ice at the pack outlet. This procedure has instructions to do the tasks that follow:
      (1) Remove the Low Limit Valve
      (2) Install the Low Limit Valve
      (3) Do the Low Limit Valve Differential Pressure Test
      (4) Do the Low Limit Valve Leak Test

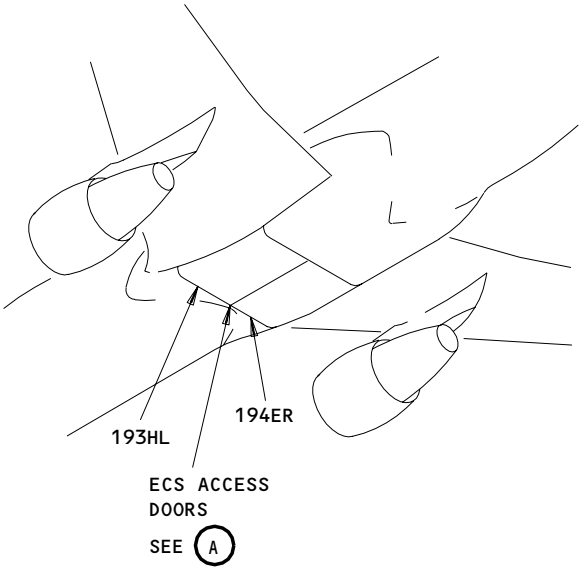
TASK 21-51-11-002-001

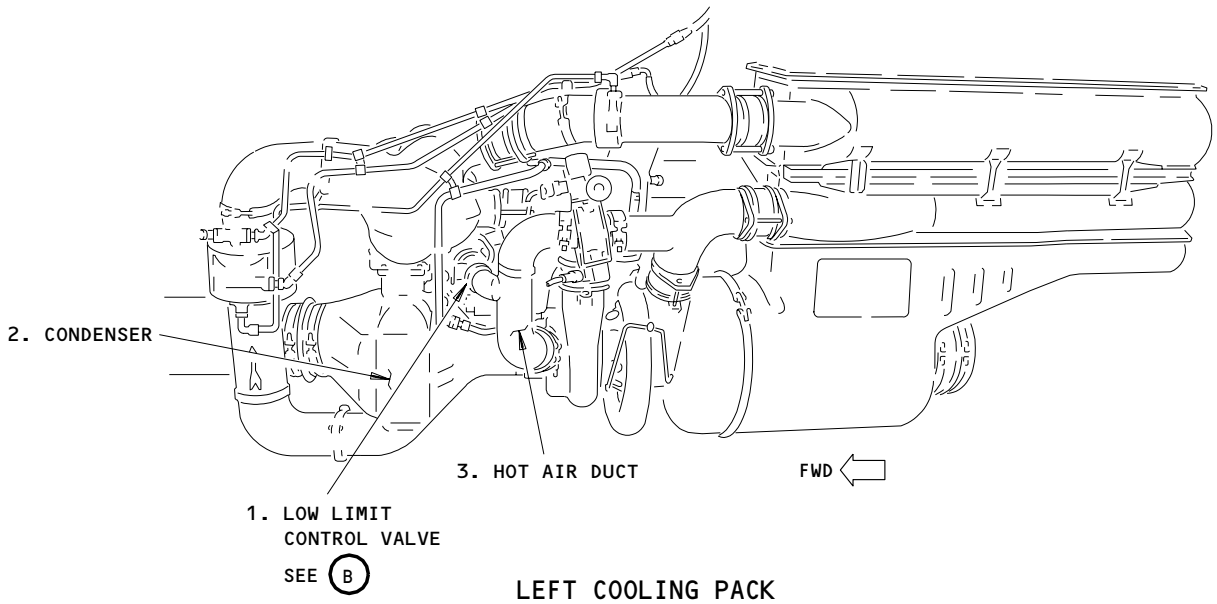
2. Remove the Low Limit Valve (Fig. 201)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems bay
   C. Prepare for the Removal

      S 862-002
      (1) Supply electrical power (AMM 24-22-00/201).

      S 862-003
      (2) To remove the left low limit valve:
          (a) Turn the L PACK selector, on the pilot's overhead panel, P5, to the OFF position.
              1) Make sure the PACK OFF light comes on.
              2) Put a DO-NOT-OPERATE tag on the selector.
          (b) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
              1) On the overhead circuit breaker panel, P11:
                  a) 11M11, LEFT PACK AUTO POWER
          (c) Open the left ECS access door, 193HL (AMM 06-41-00/201).

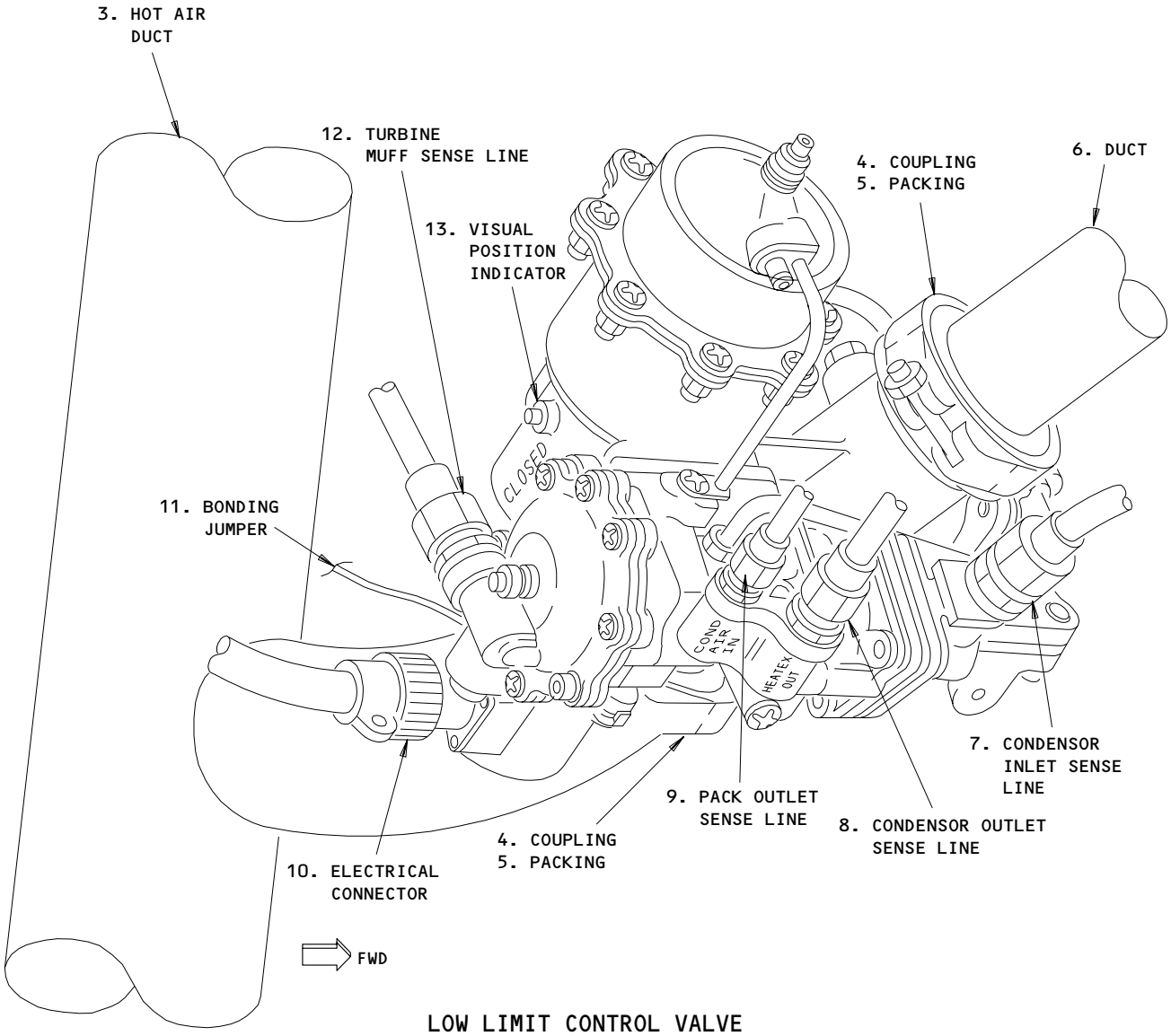
      S 862-004
      (3) To remove the right low limit valve:
          (a) Turn the R PACK selector, on the pilot's overhead panel, P5, to the OFF position.
              1) Make sure the PACK OFF light comes on.
              2) Put a DO-NOT-OPERATE tag on the selector.





LEFT COOLING PACK
(RIGHT COOLING PACK SIMILAR)

Pack Low Limit Control Valve Installation
Figure 201 (Sheet 1)



LOW LIMIT CONTROL VALVE

B

Pack Low Limit Control Valve Installation
Figure 201 (Sheet 2)

(b) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
1) On the overhead circuit breaker panel, P11:
a) 11M19, RIGHT PACK AUTO POWER
(c) Open the right ECS access door, 194ER (AMM 06-41-00/201).

D. Remove the Valve

S 032-012
(1) Disconnect the electrical connector (10) from the valve (1).

S 032-013
(2) Disconnect the bonding jumper (11) from the valve (1).

S 032-014
(3) Disconnect the four pressure sense lines (7, 8, 9, 12) from the valve (1).

S 032-015
(4) Remove the couplings (4) at each end of the valve (1).

S 022-009
(5) Remove the valve (1) from the air cooling pack.

S 432-010
(6) Put a cover on the duct openings.

TASK 21-51-11-402-011

3. Install the Low Limit Valve (Fig. 201)

A. Parts
(1) Refer to the Airplane Illustrated Parts Catalog (AIPC) for the part numbers and the effectivities for the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
201	1	Low Limit Valve	21-51-11	01	60
	4	Coupling			50
	5	Packing			55

B. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 24-22-00/201, Electrical Power Control
(3) AMM 21-51-14/501, Pack Temperature Controller

C. Access
(1) Location Zones
135/136 Environmental control systems (ECS) bay
(2) Access Panels
193HL/194ER Environmental control systems bay

D. Install the Valve

S 032-016
(1) Remove the covers from the duct openings.

S 422-017
(2) Put the valve (1) into its position above the hot air duct (6).
(a) Make sure the flow arrow on the valve points down.
(b) Make sure you can easily get access to the connections of the pressure sense lines.

S 432-018
(3) Install a new packing (5) in each coupling (4).

S 432-019
(4) Install a coupling (4) on each end of the valve (1).
(a) Tighten the coupling nuts to 35-45 pound-inches.

S 432-020
(5) Connect the bonding jumper (11) to the valve (1).

S 432-021
(6) Connect the four pressure sense lines (7, 8, 9, 12) to the valve (1).

S 432-022
(7) Connect the electrical connector (10) to the valve (1).

E. Do the installation test for the low limit valve

S 862-051
(1) Supply electrical power (AMM 24-22-00/201).

S 862-072
(2) Supply pneumatic power with the APU (AMM 36-00-00/201).

S 862-023
(3) Remove the DO-NOT-CLOSE tag and close the applicable (left or right system) circuit breaker:
(a) On the overhead circuit breaker panel, P11:
1) 11M11, LEFT PACK AUTO POWER

2) 11M19, RIGHT PACK AUTO POWER

S 742-024

(4) Do the BITE test on the applicable (left or right) pack temperature controller (AMM 21-51-14/501).
   (a) Make sure the fault light for the LOW LIMIT VALVE does not come on when you push the VERIFY button.

F. Put the airplane back to its usual condition

S 412-025

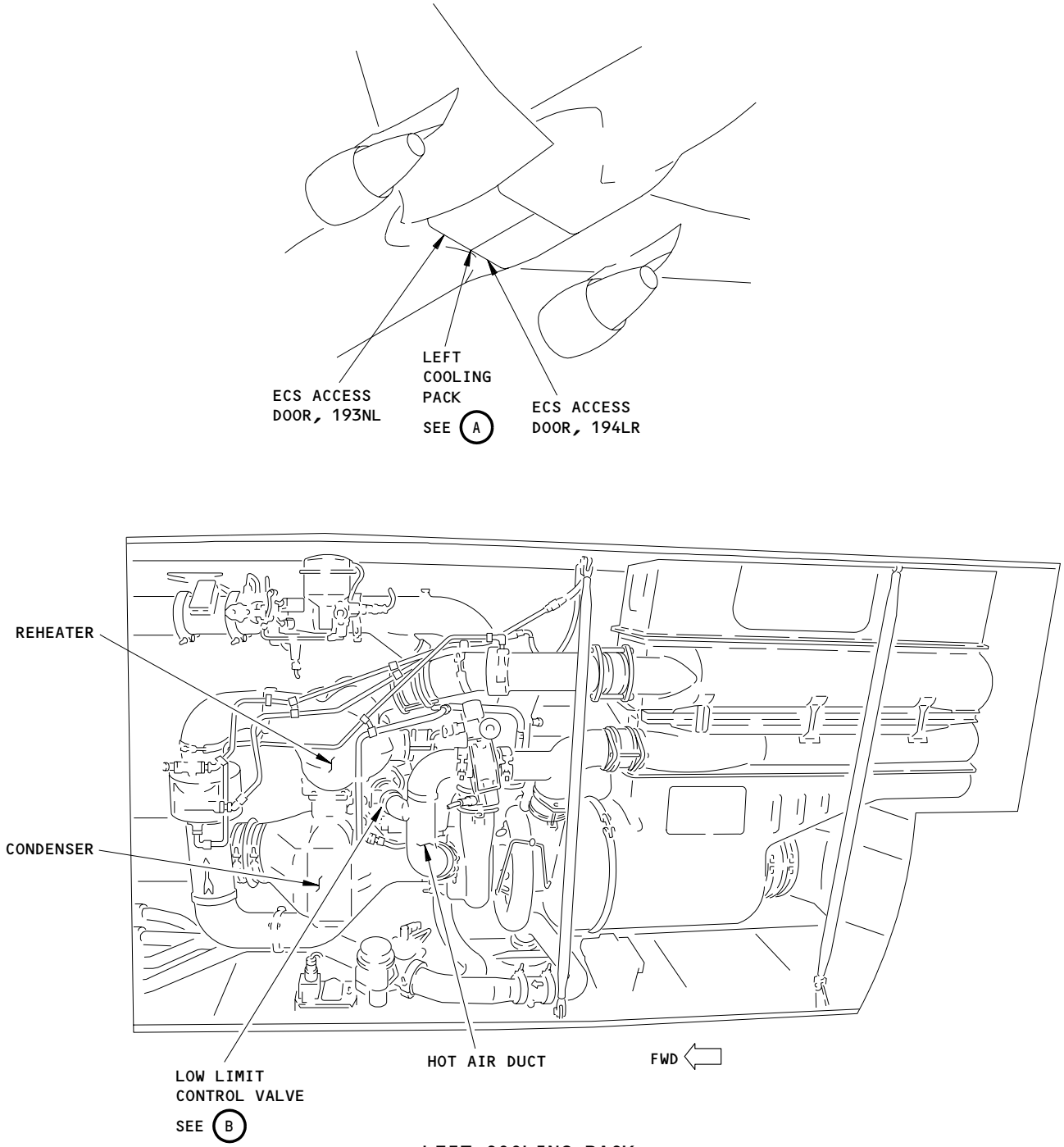
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 862-026

(2) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

S 862-073

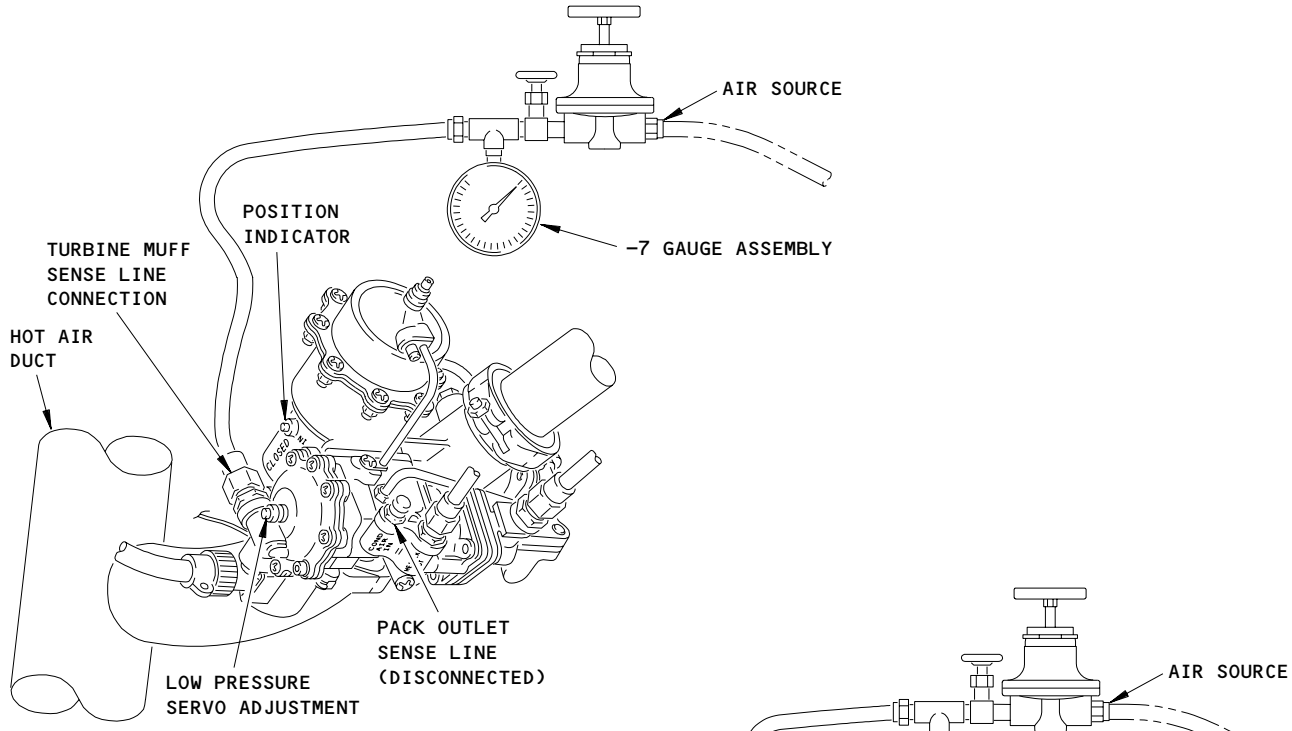
(3) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).



LEFT COOLING PACK
(RIGHT COOLING PACK IS EQUIVALENT)

A

Low Limit Control Valve – Low and High Pressure Servo Test
Figure 202 (Sheet 1)



LOW LIMIT CONTROL VALVE TEST EQUIPMENT, A21011
(LOW PRESSURE SERVO TEST)

B

HIGH PRESSURE
SERVO ADJUSTMENT

C

LOW LIMIT CONTROL VALVE TEST EQUIPMENT, A21011
(HIGH PRESSURE SERVO TEST)

B

Low Limit Control Valve - Low and High Pressure Servo Test
Figure 202 (Sheet 2)

TASK 21-51-11-782-027

4. Low Limit Valve Operational Test/Pneumatic Check (Fig. 202)

A. Equipment

(1) Portable bottle pressure source - commercially available

(2) A21011-7, -8, Low Limit Valve - Test Equipment (recommended)

NOTE: The following pressure gages are optional equipment to the gages included in the A21011 test equipment.

(a) Pressure gage, 0 to 27.5 In-Hg (13.5 PSI) range and minimum accuracy of 0.5% - commercially available (optional)

(b) Pressure gage, 0 to 95 In-H20 (3.43 PSI) range and minimum accuracy of 0.5% - commercially available (optional)

(c) Pressure gages, 0 to 100 kPa (14.5 PSI) range and minimum accuracy of +/- 0.25% of full scale displacement - commercially available (optional)

B. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels

(2) AMM 24-22-00/201, Electrical Power Control

(3) AMM 36-00-00/201, Pneumatics - General

C. Access

(1) Location Zones

135/136 Environmental control systems (ECS) bay

(2) Access Panels

193HL/194ER Environmental control systems bay

D. Prepare for the Test

S 862-028

(1) Supply electrical power (AMM 24-22-00/201).

S 862-029

(2) Supply pneumatic power (AMM 36-00-00/201).

S 862-030

(3) Make sure the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, is in the OFF position.

(a) Make sure the PACK OFF light is on.

S 012-031

(4) Open the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

E. Low Limit Valve Torque Motor Test

S 712-052

(1) Operate the air conditioning pack with the applicable PACK selector in the AUTO position (AMM 21-00-00/201).

S 212-053
(2) Look at the position indicator on the low limit valve.

NOTE: The position indicator should show the low limit valve in the closed position.

S 712-058
(3) Remove the electrical connector from the applicable (left or right) pack temperature sensor, TS5132 or TS5134.

S 712-054
(4) Move the applicable PACK selector to the STBY-N position.

S 212-055
(5) Make sure the position indicator for the low limit valve starts to move to the open position.

NOTE: It can take 5 minutes before the low limit valve starts to open. When the system is in the standby normal mode, the low limit valve is used to keep the pack outlet temperature at 40 deg. F until the compressor discharge temperature reaches 450 deg. F. When the compressor discharge temperature reaches 450 deg. F, the low limit valve will modulate to keep the compressor discharge temperature at 450 deg. F.

(a) If the low limit valve does not start to open after 5 minutes, then there is a problem with the torque motor circuit.

S 712-066
(6) Attach the electrical connector to the applicable (left or right) pack temperature sensor, TS5132 or TS5134.

S 712-056
(7) Move the applicable PACK selector back to the AUTO position, and shut down the air conditioning pack (AMM 21-00-00/201).

F. Low Limit Valve Pneumatic Check

S 782-074
(1) Do the low pressure servo test:

WARNING: DO NOT TOUCH THE HOT AIR DUCT. WHEN THE PACK IS ON, THE TEMPERATURE OF THE DUCT CAN CAUSE AN INJURY.

(a) Disconnect the turbine muffler (TURB MUFF) sense line and the pack outlet (COND AIR IN) sense line from the low limit valve.
(b) Use the A21011-7 Low Limit Valve - Test Equipment, or equivalent to connect the source of air and the pressure gage to the turbine muff sense line connection (Fig. 202).

(c) Turn the applicable (L or R) PACK selector, on the P5 panel, to the AUTO position.
1) Make sure the PACK OFF light goes off.

CAUTION: DO NOT APPLY A PRESSURE OF MORE THAN 7.00 IN-Hg (95 IN-H2O; 23.6 KPa). A PRESSURE LARGER THAN THIS CAN CAUSE DAMAGE TO THE VALVE.

(d) Slowly increase the pressure at the turbine muff connection.
(e) Look at or feel the position indicator on the valve

NOTE: To see the position indicator, it may be necessary to use a flashlight or some other light source. The valve position is shown by the direction of a small, red groove on the position indicator.

(f) Make sure the valve starts to open when the pressure is at 1.69-1.84 In-Hg (23-25 In-H2O; 5.7-6.2 kPa).
(g) Make sure the valve is fully open when the pressure is at 6.12-6.56 In-Hg (83-89 In-H2O; 20.7-22.1 kPa).

NOTE: The valve is fully open when the butterfly position is a minimum of 70-degrees from full closed.

(h) If the valve does not open correctly, do the steps that follow:
1) Feel for a leak around at the mating surface of the cover assembly of the valve.
2) Turn the low pressure servo adjustment on the valve.

NOTE: If you turn the low pressure servo adjustment in a clockwise direction, it will increase the pressure to the valve.

(i) Slowly decrease the pressure at the turbine muff connection to 0.00 In-Hg (0.0 In-H2O; 0.0 kPa).
(j) Make sure the valve is fully closed.
(k) Disconnect the A21011-7 Low Limit Valve-Test Equipment, and source of air from the turbine muff sense line connection.
(l) If the valve did not operate correctly, replace the valve.
(m) If the valve did operate correctly, then do the steps that follow:
1) Connect the turbine muff sense-line to the low limit valve.
2) Connect the pack outlet sense-line (COND AIR IN) to the low limit valve.
(n) Turn the applicable (L or R) PACK selector, on the P5 panel, to the OFF position.
1) Make sure the PACK OFF light comes on.

S 782-075
(2) Do the high pressure servo test

WARNING: DO NOT TOUCH THE HOT AIR DUCT. WHEN THE PACK IS ON, THE TEMPERATURE OF THE DUCT CAN CAUSE AN INJURY.

(a) Disconnect the condensor inlet sense-line (HEAT EX IN) from the valve.
(b) Disconnect the condensor outlet sense-line (HEAT EX OUT) from the valve.
(c) Use the A21011-8 Low Limit Valve - Test Equipment, or equivalent to connect the source of air and the pressure gage to the condensor inlet sense line connection (Fig. 202).
(d) Turn the applicable (L or R) PACK selector, on the P5 panel, to the AUTO position.
1) Make sure the PACK OFF light goes off.

CAUTION: DO NOT APPLY A PRESSURE MORE THAN 27.5 IN-Hg (373.2 IN-H20; 93.1 KPa). A PRESSURE LARGER THAN THIS CAN CAUSE DAMAGE TO THE VALVE.

(e) Slowly increase the pressure at the condensor inlet connection.
(f) Look at or feel the position indicator on the valve

NOTE: To see the position indicator, it may be necessary to use a flashlight or some other light source. The valve position is shown by the direction of a small, red groove on the position indicator.

(g) Make sure the valve starts to open when the pressure is at 6.1-8.1 In-Hg (82.8-109.9 In-H20; 20.6-27.4 kPa).
(h) Make sure the valve is fully open when the pressure is at 21.4-25.4 In-Hg (290.4-344.7 In-H20; 72.3-85.8 kPa).
(i) If the valve does not open correctly, do the steps that follow:
1) Feel for a leak at the mating surface of the cover assembly of the valve.
2) Turn the high pressure servo adjustment on the valve.
(j) Slowly decrease the pressure at the condensor inlet connection to 0.0 In-Hg (0.0 In-H20; 0.0 kPa).
(k) Make sure the valve is fully closed.
(l) Disconnect the A21011-8 Low Limit Valve-Test Equipment, and source of air from the condensor inlet sense line connection.
(m) If the valve did not operate correctly, replace the valve.
(n) If the valve did operate correctly, do the steps that follow:
1) Connect the condensor inlet sense-line (HEAT EX IN) to the valve.
2) Connect the condensor outlet sense-line (HEAT EX OUT) to the valve.

G. Put the airplane back to its usual condition

S 412-034
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 862-035
(2) Turn the applicable (L or R) PACK selector, on the P5 panel, to the OFF position.

S 862-036
(3) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 862-037
(4) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

TASK 21-51-11-792-038

5. Do the Low Limit Valve Leak Test (Fig. 201)

A. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
(3) AMM 24-22-00/201, Electrical Power Control

B. Prepare for the Test

S 862-039
(1) Supply electrical power (AMM 24-22-00/201).

S 862-040
(2) Supply pneumatic power (AMM 36-00-00/201).

S 862-041
(3) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the AUTO position.
(a) Make sure the PACK OFF light goes off.

S 012-042
(4) Open the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

C. Do the Test

S 792-047
(1) Apply the solution to these connections on the low limit valve:
(a) The Pack Outlet (COND AIR CV) Connection
(b) The Turbine Muff (TURB MUFF) Connection
(c) The Condensor Outlet (HEAT EX OUT) Connection
(d) The Condensor Inlet (HEAT EX IN) Connection

S 362-048
(2) If it makes and breaks a bubble, you must repair the connection.

D. Put the airplane back to its usual condition

S 412-043
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 862-044
(2) Turn the applicable (L or R) PACK selector, on the P5 panel, to the OFF position.

S 862-045
(3) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 862-046
(4) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

PACK TEMPERATURE CONTROL VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the temperature control valves. One temperature control valve is installed in each air cooling pack.

TASK 21-51-12-004-001

2. Remove the Temperature Control Valve (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems bay
   C. Prepare for the Removal

S 864-002

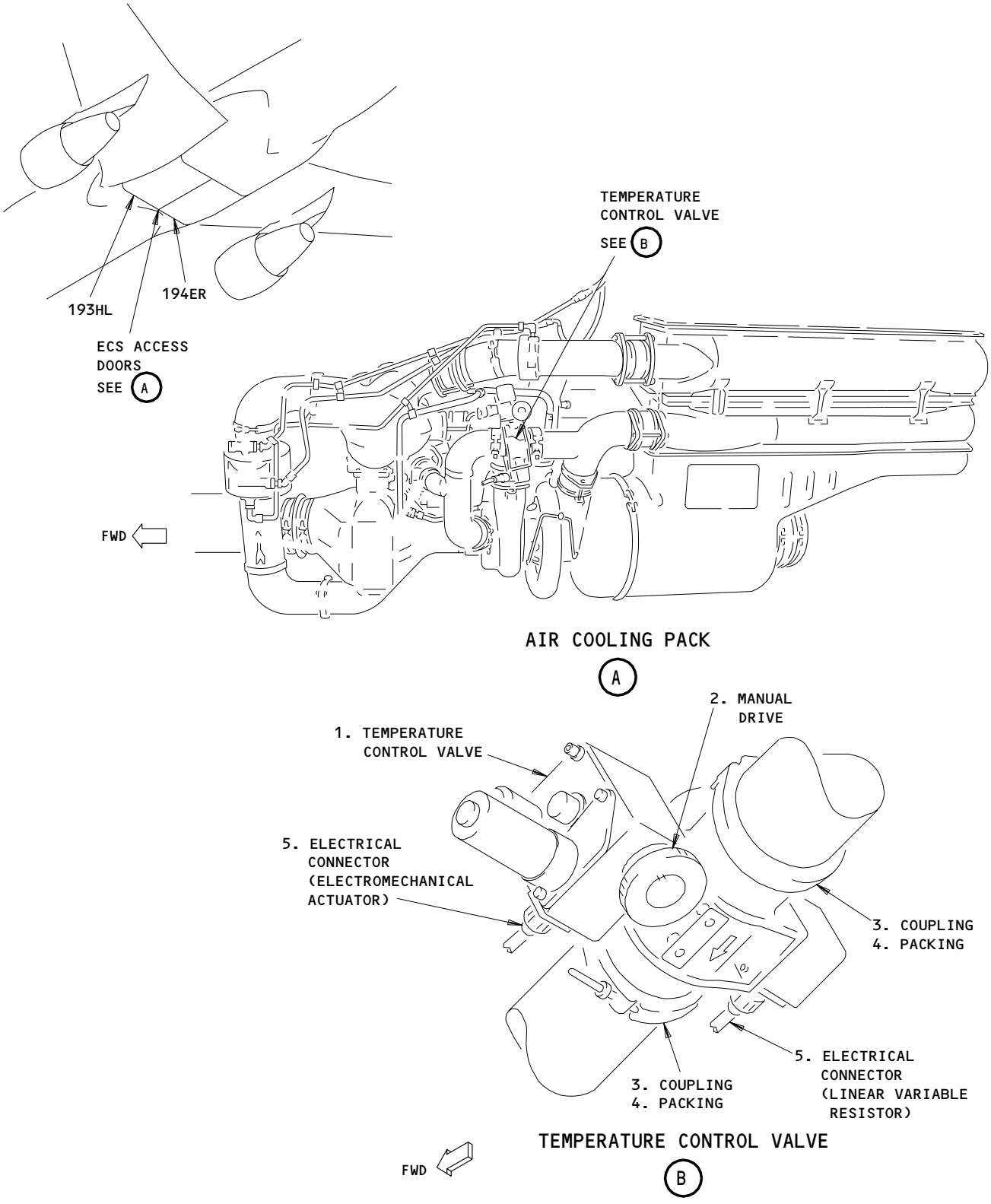
(1) Supply electrical power (AMM 24-22-00/201).

S 864-003

(2) To remove the left temperature control valve:
    (a) Turn the L PACK selector, on the pilot's overhead P5 panel, to the OFF position.
        1) Make sure the PACK OFF light comes on.
        2) Put a DO-NOT-OPERATE tag on the selector.
    (b) Open these circuit breakers and attach DO-NOT-CLOSE tags:
        1) On the overhead circuit breaker panel, P11:
            a) 11A13, AIR COND PACK LEFT AUTO CONT
            b) 11A26, AIR COND PACK LEFT STBY CONT
            c) 11M11, LEFT PACK AUTO POWER
            d) 11M24, LEFT PACK STANDBY POWER
    (c) Open the left ECS access door, 193HL (AMM 06-41-00/201).

S 864-004

(3) To remove the right temperature control valve:
    (a) Turn the R PACK selector, on the pilot's overhead P5 panel, to the OFF position.
        1) Make sure the PACK OFF light comes on.
        2) Put a DO-NOT-OPERATE tag on the selector.
    (b) Open these circuit breakers and attach DO-NOT-CLOSE tags:
        1) On the overhead ciruit breaker panel, P11:
            a) 11A15, AIR COND RIGHT STANDBY CONT
            b) 11A28, AIR COND PACK RIGHT AUTO CONT



Temperature Control Valve Installation
Figure 401

c) 11M15, RIGHT PACK STANDBY POWER
d) 11M19, RIGHT PACK AUTO POWER

(c) Open the right ECS access door, 194ER (AMM 06-41-00/201).

D. Remove the Valve

S 034-005
(1) Disconnect the electrical connectors (4, 5) from the valve.

S 034-006
(2) Disconnect the bonding jumper from the valve (1).

S 034-007
(3) Remove the couplings (3) on each end of the valve (1).

S 024-008
(4) Remove the valve (1) from the air cooling pack.

S 434-009
(5) Put a cover on the duct openings.

TASK 21-51-12-404-010

3. Install the Temperature Control Valve (Fig. 401)

A. Parts

(1) Refer to the Airplane Illustrated Parts Catalog (AIPC) for the part numbers and effectivities of the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Pack Temperature Control Valve	21-52-01	10	245
	3	Coupling			235
	4	Packing			240

B. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 21-51-14/501, Pack Temperature Controller
(3) AMM 24-22-00/201, Electric Power Control
(4) AMM 36-00-00/201, Pneumatic - General

C. Access

(1) Location Zones
135/136 Environmental control systems (ECS) bay
(2) Access Panels
193HL/194ER Environmental control systems bay

D. Install the Valve

S 034-011
(1) Remove the covers from the duct openings.

S 424-012
(2) Put the valve (1) into its position in the air cooling pack.
(a) Make sure the flow arrow on the valve points forward.

S 434-013
(3) Install a new packing (4) in each coupling (3).

S 434-014
(4) Install a coupling (3) on each end of the valve (1).

S 434-015
(5) Connect the bonding jumper to the valve (1).

S 434-016
(6) On the left valve (1), connect these electrical connectors (4, 5).
(a) The electrical connector D2946 to the linear variable resistor.
(b) The electrical connector D2962 to the electro-mechanical actuator.

S 434-029
(7) On the right valve (1), connect these electrical connectors (4, 5).
(a) The electrical connector D3004 to the linear variable resistor.
(b) The electrical connector D3014 to the electro-mechanical actuator.

E. Do the installation test for the temperature control valve.

S 864-017
(1) If the left temperature control valve was installed, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A26, AIR COND PACK LEFT STBY CONT
3) 11M11, LEFT PACK AUTO POWER
4) 11M24, LEFT PACK STANDBY POWER

S 864-018
(2) If the right temperature control valve was installed, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11A15, AIR COND RIGHT STANDBY CONT
2) 11A28, AIR COND PACK RIGHT AUTO CONT
3) 11M15, RIGHT PACK STANDBY POWER
4) 11M19, RIGHT PACK AUTO POWER

S 864-019
(3) Supply electric power (AMM 24-22-00/201).

S 864-020
(4) Supply pneumatic power (AMM 36-00-00/201).

S 864-021
(5) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.
(a) Turn the selector to the STBY-W position.

S 214-022
(6) Make sure the position indicator on the valve is in the OPEN position.

S 794-023
(7) Feel for leaks around the valve.
(a) Small leaks are permitted.
(b) You must repair a large leak.

S 864-024
(8) Turn the applicable (L or R) PACK selector, on the P5 panel, to the OFF position.

S 214-025
(9) Make sure the position indicator on the valve is in the CLOSED position.

F. Put the airplane back to its usual condition

S 414-026
(1) Close the applicable ECS door, 193HL or 194ER (AMM 06-41-00/201).

S 864-027
(2) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 864-028
(3) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

PACK TEMPERATURE CONTROLLER - REMOVAL/INSTALLATION

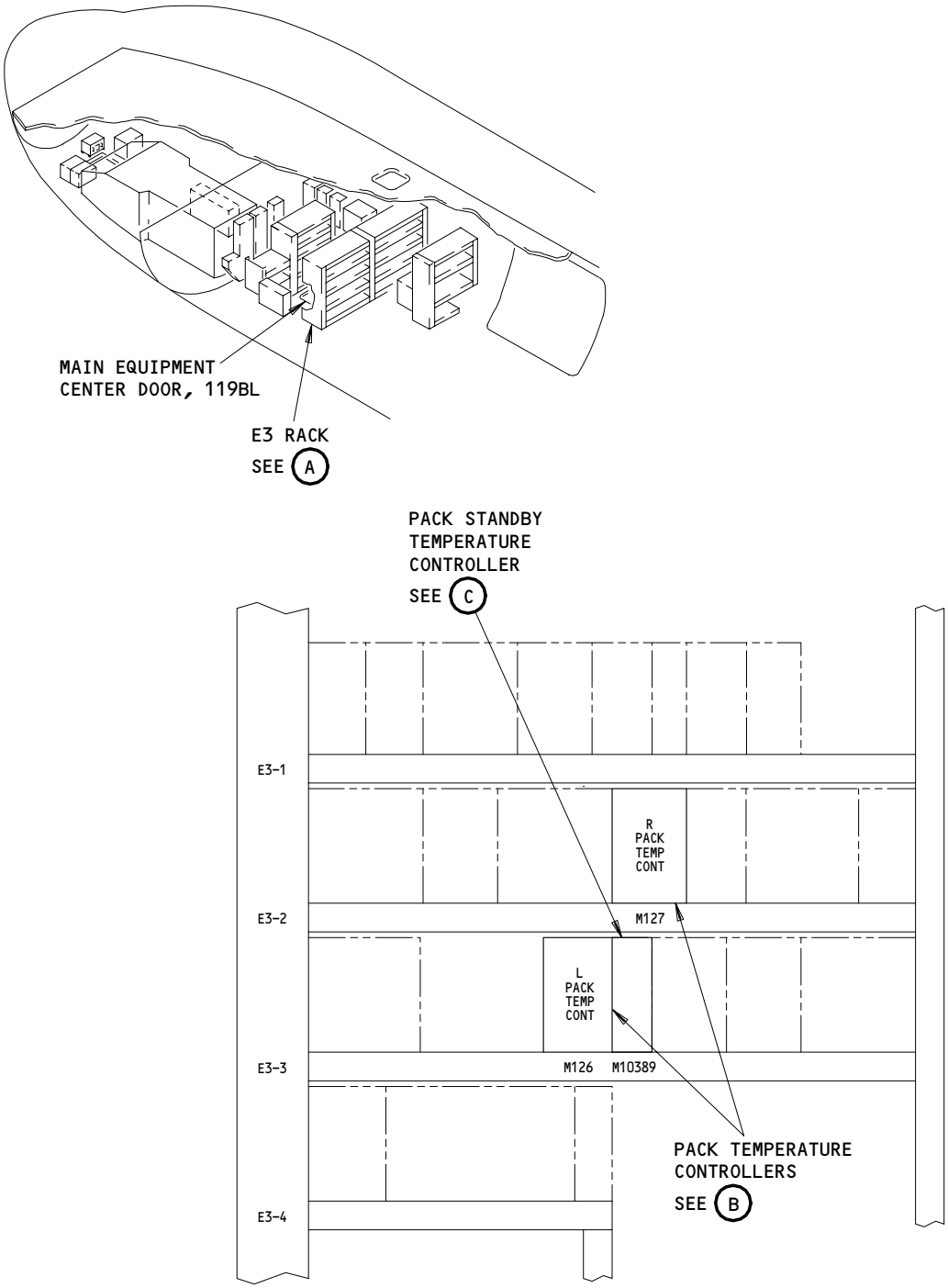
1. General
   A. This procedure has instructions to remove and install the pack temperature controllers.
   B. Three pack temperature controllers (left, right, and standby) are installed in the main equipment center, on the E3-2 and E3-3 shelves. The controllers are used to control the temperature and monitor the failures of the air cooling packs.

TASK 21-51-14-004-001

2. Remove the Pack Temperature Controller (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors, and Panels
      (2) AMM 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zones
          119/120 Main equipment center
      (2) Access Panels
          119BL Main equipment center access door
   C. Prepare for the Removal

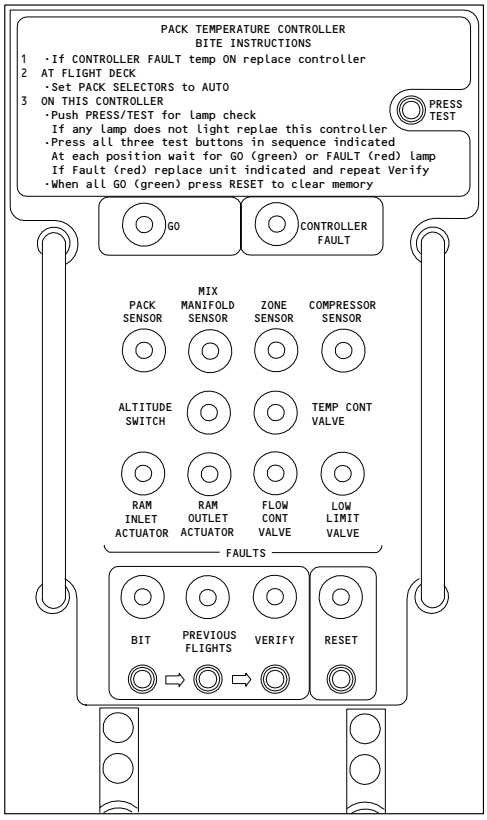
      S 864-122
      (1) Open and attach a DO-NOT-CLOSE tag to these circuit breakers, on the overhead circuit breaker panel, P11:
          (a) To remove the left pack temperature controller:
              1) 11A13, AIR COND PACK LEFT AUTO CONT
              2) 11M11, LEFT PACK AUTO POWER
          (b) To remove the right pack temperature controller:
              1) 11A28, AIR COND PACK RIGHT AUTO CONT
              2) 11M19, RIGHT PACK AUTO POWER
          (c) To remove the pack standby controller:
              1) 11A15, AIR COND PACK RIGHT STANDBY CONT
              2) 11A26, AIR COND PACK LEFT STBY CONT
              3) 11M15, RIGHT PACK STANDBY POWER
              4) 11M24, LEFT PACK STANDBY POWER

      S 014-039
      (2) Open the access door for the main equipment center, 119BL (AMM 06-41-00/201).



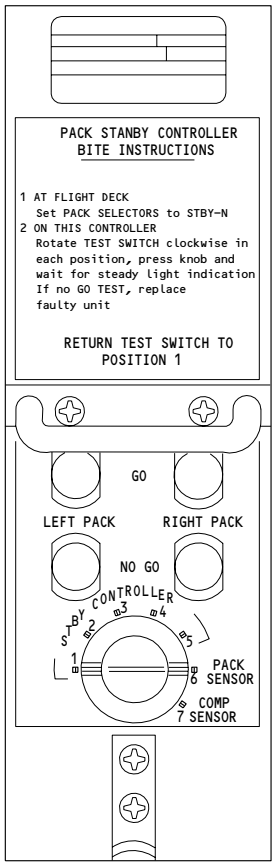
E3 RACK
(VIEW LOOKING AFT)
A

Pack Temperature Controller Installation
Figure 401 (Sheet 1)



PACK TEMPERATURE CONTROLLER

B



PACK STANDBY
TEMPERATURE CONTROLLER

C

Pack Temperature Controller Installation
Figure 401 (Sheet 2)

D. Remove the Controller

S 024-040

(1) Remove the pack temperature controller (AMM 20-10-01/401).

TASK 21-51-14-404-041

3. Install the Pack Temperature Controller (Fig. 401)

A. References

(1) AMM 06-41-00/201, Fuselage Access Doors, and Panels
(2) AMM 20-10-01/401, E/E Rack Mounted Components
(3) AMM 21-51-14/501, Pack Temperature Controller

B. Access

(1) Location Zones
119/120 Main equipment center
(2) Access Panels
119BL Main equipment center access door

C. Install the Controller

S 424-042

(1) Put the pack temperature controller into the applicable rack location (Ref 20-10-01).

D. Do the installation test for the pack temperature controller

S 864-126

(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers, on the P11 panel:
(a) If the left pack temperature controller was installed:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11M11, LEFT PACK AUTO POWER
(b) If the right pack temperature controller was installed:
1) 11A28, AIR COND PACK RIGHT AUTO CONT
2) 11M19, RIGHT PACK AUTO POWER
(c) If the pack standby controller was installed:
1) 11A15, AIR COND PACK RIGHT STANDBY CONT
2) 11A26, AIR COND PACK LEFT STBY CONT

3) 11M15, RIGHT PACK STANDBY POWER
4) 11M24, LEFT PACK STANDBY POWER

S 744-102
(2) If a pack temperature controller is installed from another airplane, do the steps that follow to clear the non-volatile memory in the pack temperature controller.

NOTE: If you install a pack temperature controller from a different airplane, you must reset the controller to clear the "PREVIOUS FLIGHTS" and the "BIT" memory.

WARNING: MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE RAM-AIR INLET DOOR AND THE RAM-AIR OUTLET DOOR (IF INSTALLED). WHEN YOU PUSH THE "VERIFY" SWITCH, THESE COMPONENTS WILL MOVE AND COULD CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(a) Push the VERIFY switch on the pack temperature controller.
(b) Make sure the green GO light comes on.
(c) Push the RESET switch on the controller.

S 744-062
(3) Do the BITE test on the applicable controller (AMM 21-51-14/501)

E. Put the Airplane Back to its Usual Condition

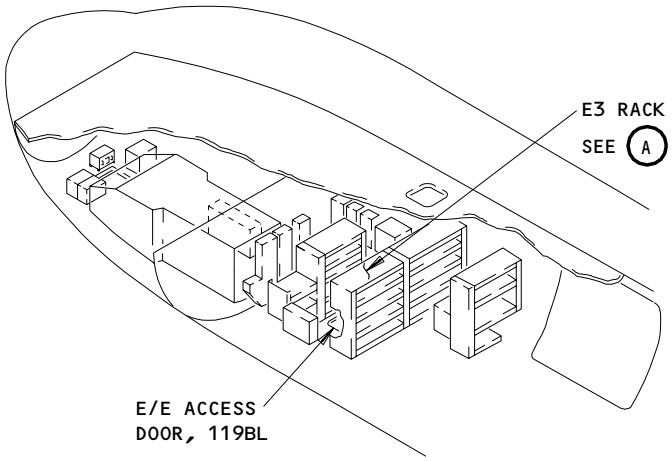
S 414-081
(1) Close the access door for the main equipment center, 119BL (AMM 06-41-00/201).

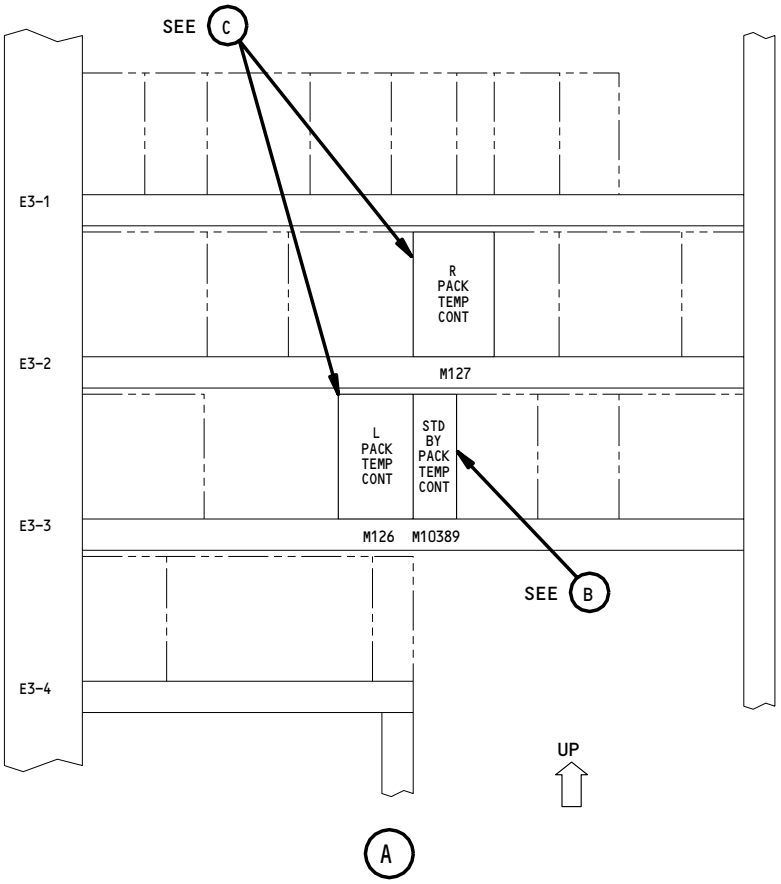
PACK TEMPERATURE CONTROLLER - ADJUSTMENT/TEST

1. General
   A. This procedure has instructions to do the BITE test on the pack temperature controllers and the pack standby controller.

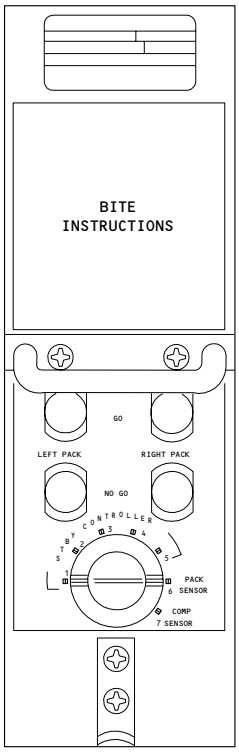
TASK 21-51-14-745-001

2. Do the Pack Temperature Controller BITE Test (Fig. 501)
   A. General
      (1) The Built-In-Test Equipment (BITE) in each pack temperature controller monitors and does a test of the components in the air cooling packs. The right pack temperature controller monitors the components in the right air cooling pack. The left pack temperature controller monitors the components in the left air cooling pack.
      (2) The pack temperature controllers monitor and do an electrical test on these components:
         (a) The pack temperature controller.
         (b) The auto pack temperature sensor.
         (c) The auto compressor outlet temperature sensor.
         (d) The mix manifold temperature sensor.
         (e) The zone temperature sensor.
         (f) The altitude switch.
         (g) The torque motor of the flow control valve.
      (3) The pack temperature controllers monitor and do an operational test on these components:
         (a) The temperature control valve.
         (b) The low limit valve.
         (c) The ram-air inlet actuator.
         (d) The ram-air outlet actuator.
      (4) The BITE does not know the difference between a component failure and a wiring failure. Make sure the circuit is correct and the connector is in good condition before you replace a component.
   B. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power Control



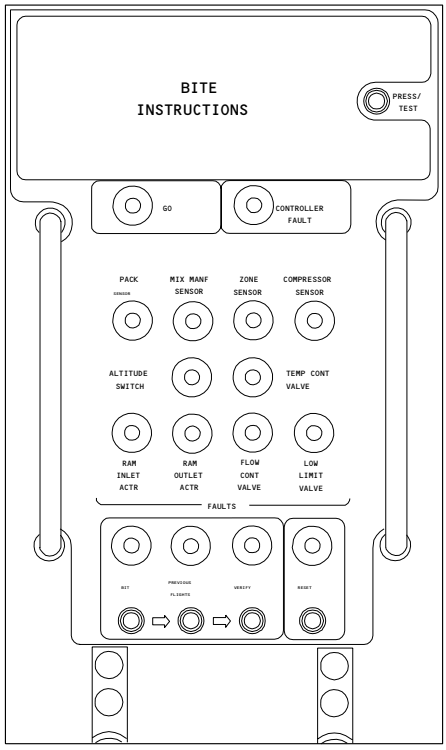


Pack Temperature Controller Test
Figure 501 (Sheet 1)



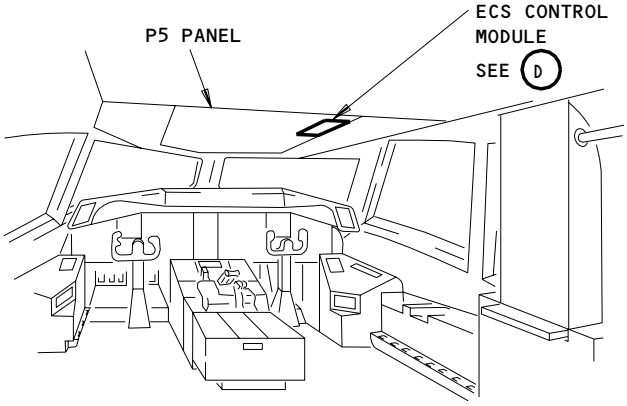
PACK STANDBY TEMPERATURE CONTROLLER

B

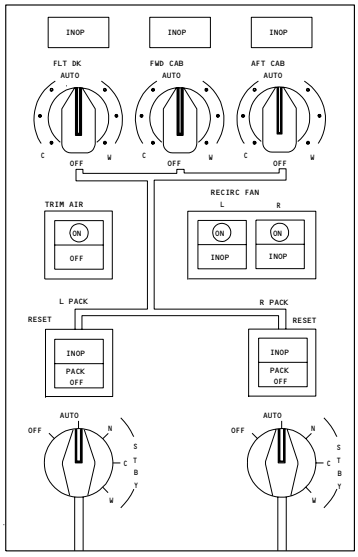


PACK TEMPERATURE CONTROLLER

C



FLIGHT DECK



ECS CONTROL MODULE, M10193

D

Pack Temperature Controller Test
Figure 501 (Sheet 2)

(3) AMM 36-00-00/201, Pneumatic - General

C. Access

(1) Location Zones

119/120 Main equipment center

(2) Access Panels

119BL Main equipment center access door

D. Prepare for the Test

S 865-002

(1) Supply electrical power (AMM 24-22-00/201).

S 865-102

(2) Supply pneumatic power with the APU (AMM 36-00-00/201).

S 865-003

(3) Make sure these circuit breakers are closed:

(a) On the overhead circuit breaker panel, P11:

1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A15, AIR COND RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT
5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 865-004

(4) Do the steps that follow, on the pilot's overhead panel, P5:

(a) Turn the three zone temperature selectors to the warm end of the AUTO range (between the 12:00 o'clock and the 4:00 o'clock positions).

(b) Push the TRIM AIR switch-light to the on position (the ON light is on).

(c) Push the L and R RECIRC FAN switch-lights to the on positions (the ON lights are on).

(d) Turn the L and R PACK selectors to the AUTO positions (the PACK OFF lights are off).

S 015-023

(5) Open the access door for the main equipment center, 119BL (AMM 06-41-00/201).

E. Do the pack temperature controller BITE test.

NOTE: You cannot do the BITE test on the left and right pack temperature controller at the same time. You can only do the BITE test on one pack temperature controller at a time.

S 745-024

(1) Do the steps that follow, on the front panel of the applicable (left or right) pack temperature controller:

(a) Make sure the CONTROLLER FAULT light is not on.

1) If the CONTROLLER FAULT light is on, there is a problem with the pack temperature controller.

NOTE: A short circuit in the wiring for the ram air door actuators or the temperature control valve can cause the pack temperature controller to blow a fuse. If the pack temperature controller has a blown fuse, the CONTROLLER light will be on.

(b) Push the PRESS/TEST button.

1) Make sure all the indicator lights on the controller face come on.
2) If one of the indicator lights does not come on, replace the controller.

(c) Push the BIT button.

1) Make sure the BIT light comes on.
2) Make sure the green GO lamp comes on in less than 30 seconds.
3) If a fault indicator light comes on, replace the applicable component.

NOTE: Before you replace the component, make sure there is power at the electrical connector and that the connection of the electrical connector is good.

(d) Push the PREVIOUS FLIGHTS button.

1) Make sure the PREVIOUS FLIGHTS light comes on.
2) Make sure the green GO lamp comes on in less than 30 seconds.
3) If a fault indicator light comes on, replace the applicable component.

WARNING: MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE RAM-AIR INLET DOOR, THE RAM-AIR OUTLET DOOR, THE TEMPERATURE CONTROL VALVE, AND THE LOW LIMIT CONTROL VALVE. WHEN YOU PUSH THE VERIFY BUTTON, THESE COMPONENTS WILL MOVE AND COULD CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(e) Push the VERIFY button to perform an operational test of the components described in Step 2.A.(3).

NOTE: When APU pneumatic power is supplied, the PTC performs a dynamic test of the low limit valve when the VERIFY button is pressed. Pneumatic power must be supplied (APU bleed valve oepn) and the opposite pack must be off. The dynamic test can take up to three minutes to complete.

1) Make sure the VERIFY light comes on.
2) Make sure the green GO light comes on within three minutes.
3) If a fault indicator light comes on, replace the applicable component.

(f) Push the RESET button while the VERIFY light and the GO light are on.
1) Make sure the RESET light comes on for 6 to 10 seconds.

(g) Remove pneumatic power (AMM 36-00-00/201).

(h) Push the VERIFY button without pneumatic power applied to perform an electrical test of the components described in Step 2.A.(2).
1) Make sure the VERIFY light comes on.
2) Make sure the green GO light comes on in less than 30 seconds.
3) If a fault indicator light comes on, replace the applicable component.

(i) Push the RESET button while the VERIFY light and the GO light are on.
1) Make sure the RESET light comes on for 6 to 10 seconds.

F. Put the airplane back to its usual condition

S 415-043

(1) Close the access door for the main equipment center, 119BL (AMM 06-41-00/201).

S 865-044

(2) Do the steps that follow, on the P5 panel:
(a) Turn the L and R PACK selector to the OFF positions.
(b) Push the TRIM AIR switch-light to the off position.
(c) Push the L and R RECIRC FAN switch-lights to the off positions.
(d) Turn the zone temperature selectors to the OFF positions.

S 865-045
(3) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

S 865-101
(4) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

TASK 21-51-14-745-046

3. Do the Pack Standby Controller BITE Test (Fig. 501)

A. General

(1) The pack standby controller has two Built In Test Equipment (BITE) systems. Each BITE is dedicated to one (the left or right) of the air cooling packs. The BITEs monitor and do an electrical test for these components in each air cooling pack:
(a) The pack standby controller.
(b) The standby pack temperature sensor.
(c) The standby compressor outlet temperature sensor.
(2) The BITE does not know the difference between a component failure and a wiring failure. Make sure the circuit is correct and the connector is in good condition before you replace a component.

B. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 24-22-00/201, Electrical Power Control

C. Access

(1) Location Zones
119/120 Main equipment center
(2) Access Panels
119BL Main equipment center access door

D. Prepare for the Test

S 865-047
(1) Supply electrical power (AMM 24-22-00/201).

S 865-048
(2) Make sure these circuit breakers are closed:
(a) On the overhead circuit breaker panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT

2) 11A15, AIR COND RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT
5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 865-049

(3) Do the steps that follow, on the pilot's overhead panel, P5:
(a) Turn the three zone temperature selectors to the warm end of the AUTO range (between the 12:00 o'clock and the 4:00 o'clock positions).
(b) Turn the L and R PACK selectors to the STBY-N positions.
(c) Push the L and R RECIRC FAN switch-lights to the on positions (the ON lights are on).
(d) Push the TRIM AIR switch-light to the on position (the ON light is on).

S 015-068

(4) Open the access door for the main equipment center, 119BL (AMM 06-41-00/201).

E. Do the Pack Standby Controller BITE Test.

S 745-069

(1) Do these steps, on the front panel of the pack standby controller:
(a) Push the applicable (left or right) GO and NO GO lights on the controller.
1) Make sure each light comes on when you push it.
2) If one of the lights does not come on, replace the controller.
(b) Do these steps for all seven (7) positions of the applicable (left or right) test switch on the pack standby controller:
1) Turn the test switch to the applicable position.
2) Push the test switch.
3) Make sure the left and right GO lights come on.
4) If one of the NO-GO lights come on, replace the applicable component.

NOTE: Before you replace the component, make sure there is power at the electrical connector and that the connection of the electrical connector is good.

F. Put the airplane back to its usual condition

S 415-088

(1) Close the access door for the main equipment center, 119BL (AMM 06-41-00/201).

S 865-089

(2) Do these steps, on the P5 panel:
  (a) Turn the L and R PACK selectors to the OFF positions.
  (b) Push the L and R RECIRC FAN switch-lights to the off positions.
  (c) Push the TRIM AIR switch-light to the off position.
  (d) Turn the zone temperature selectors to the OFF positions.

S 865-090

(3) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

CABIN AIR SUPPLY CHECK VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the check valves for the cabin air supply. Each air cooling pack has one check valve, which is installed at the pack outlet, forward of the air cooling packs.

   TASK 21-51-15-004-001

2. Remove the Cabin Air Supply Check Valve (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control system access doors
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light goes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 014-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Check Valve

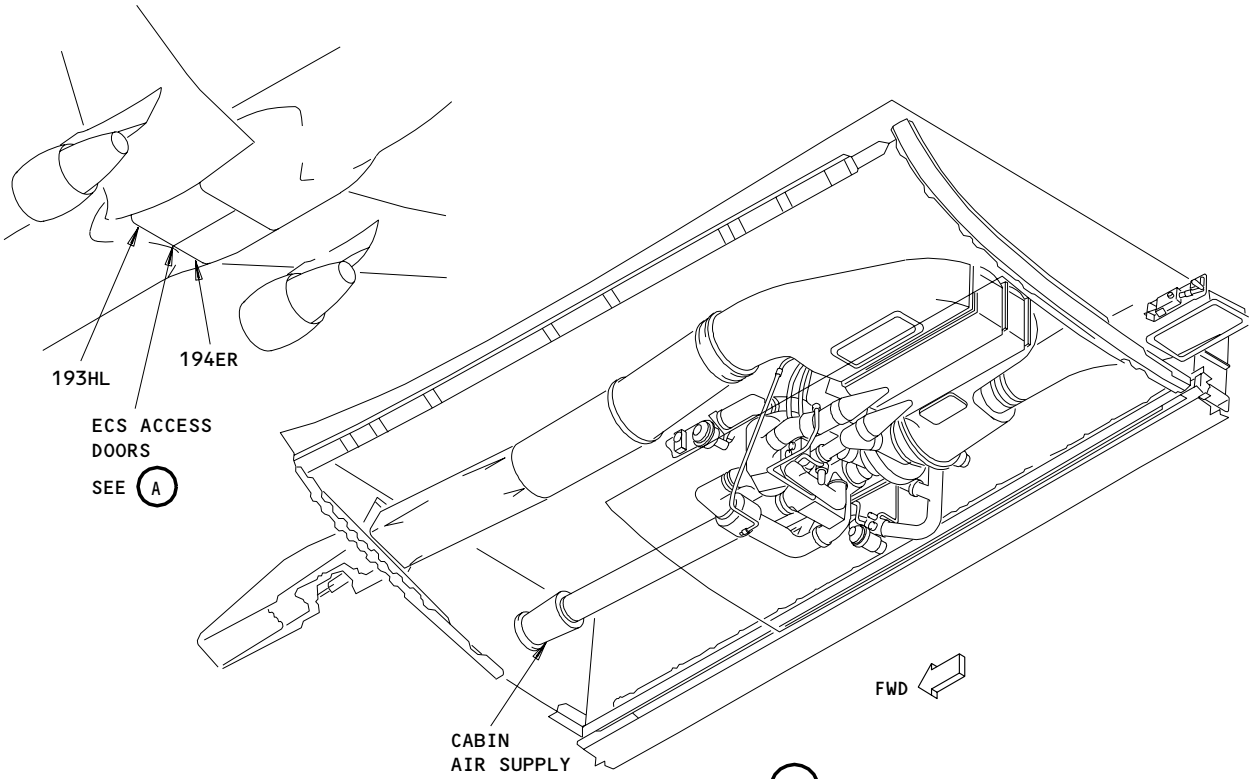
      S 034-005
      (1) Disconnect the pressure sense line (3) from the check valve (2).

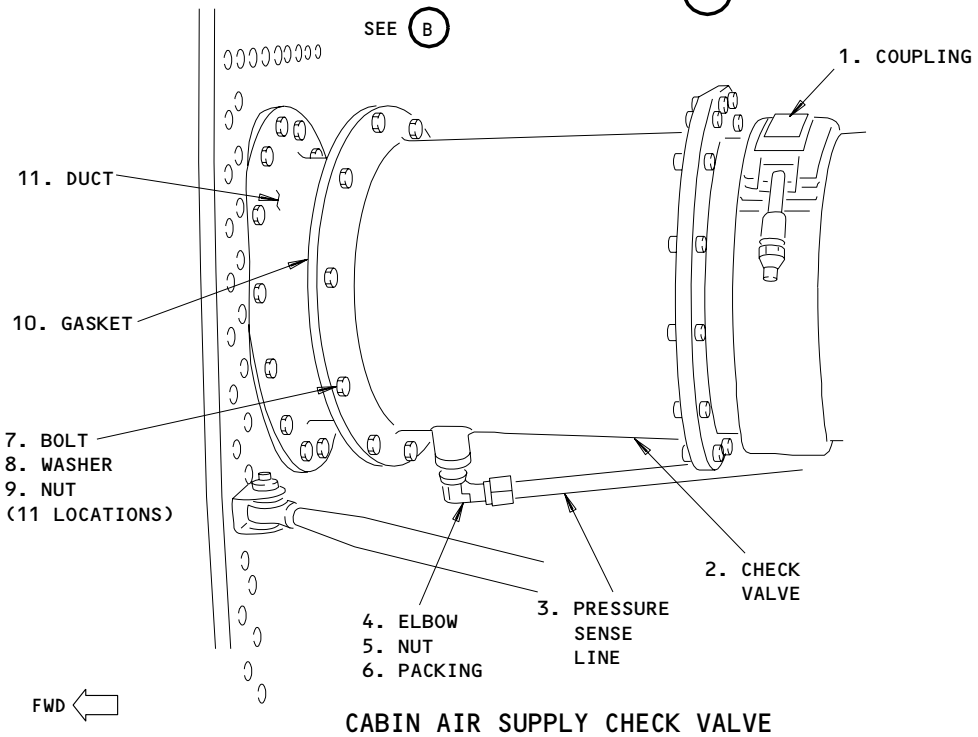
      S 034-006
      (2) Remove the elbow (4), nut (5) and packing (6) from the valve.

      S 034-007
      (3) Remove the coupling (1) from the aft side of check valve (2).

      S 034-008
      (4) Remove the bolts (7) at the front end of the check valve.

      S 024-009
      (5) Remove the check valve (2).





CABIN AIR SUPPLY CHECK VALVE

B

Cabin Air Supply Check Valve Installation
Figure 401

S 034-013
(6) Remove the gasket (10) from the flange at the front of the check valve.

S 434-012
(7) Put a cover on the duct openings.

TASK 21-51-15-404-011

3. Install the Cabin Air Supply Check Valve (Fig. 401)
   A. Parts
      (1) Refer to the Illustrated Parts Catalog (IPC) to find the part numbers and the effectivities of the items in the table that follows:

MM			IPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	1	Coupling	21-51-15	01	145
	2	Cabin Air Supply Check Valve			120
	4	Elbow	21-52-01	01	710
	5	Nut			715
	6	Packing			720
	7	Bolt	21-51-15	01	95
	8	Washer			100
	9	Nut			105
	10	Gasket			110

   B. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
      (3) 36-00-00/201, Pneumatic-General
   C. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access doors
   D. Install the Check Valve

S 034-014
(1) Remove the covers from the duct openings.

S 434-015
(2) Put a new gasket (10) into the flange at the front of the check valve (2).

S 424-016
(3) Put the check valve (2) into its position, with the flow arrow pointed forward.

S 434-017
(4) Install the bolts (7), washers (8), and nuts (9) into the flange at the front end of the check valve.

S 434-018
(5) Install the coupling (1) on the aft end of the check valve (2).

S 434-019
(6) Install the elbow (4), new packing (6), and nut (5) to the check valve.

S 434-020
(7) Connect the pressure sense line (3) to the check valve.

E. Do the installation test for the check valve

S 864-021
(1) Supply electrical power (Ref 24-22-00).

S 864-022
(2) Supply pneumatic power (AMM 36-00-00/201).

S 864-023
(3) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.
(a) Turn the selector to the AUTO position.
(b) Make sure the PACK OFF light goes off.

S 794-024
(4) Feel for leaks around the check valve.
(a) Small leaks are permitted.

(b) You must repair a large leak.

F. Put the airplane back to its usual condition

S 414-025

(1) Close the applicable (left or right) ECS access doors, 193HL or 194ER (Ref 06-41-00).

S 864-026

(2) Turn the applicable (L or R) PACK selector, on the P5 panel, to the OFF position.

S 864-027

(3) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 864-028

(4) Remove the electrical power, if it is not necessary (Ref 24-22-00).

CABIN AIR SUPPLY CHECK VALVE - INSPECTION/CHECK

1. General
   A. This procedure has instructions to examine the cabin supply check valve to make sure it operates correctly.

TASK 21-51-15-216-001

2. Examine the Cabin Air Supply Check Valve (Fig. 601)
   A. References
      (1) 21-51-15/401, Cabin Air Supply Check Valve
   B. Prepare to examine the check valve.

S 026-002

(1) Remove the cabin air supply check valve (AMM 21-51-15/401).

S 226-003

(2) Examine the check valve for these conditions:
   (a) Make sure there are no missing parts on the check valve.
   (b) Make sure the check valve parts have no cracks.
   (c) Make sure the check valve parts have no corrosion.
   (d) Make sure there are no signs of leaks when the check valve flapper is in the closed position.
      1) Make sure the mating surfaces of the check valve flapper and the check valve body are symmetrically worn.
      2) Make sure there are no carbon particles near the mating surfaces of the check valve flapper and the check valve body.
   (e) Make sure the thickness of the check valve flapper where it contacts the flapper stop is more than 0.055-inches (1.4-millimeters).
   (f) Make sure the check valve flapper moves smoothly and easily.

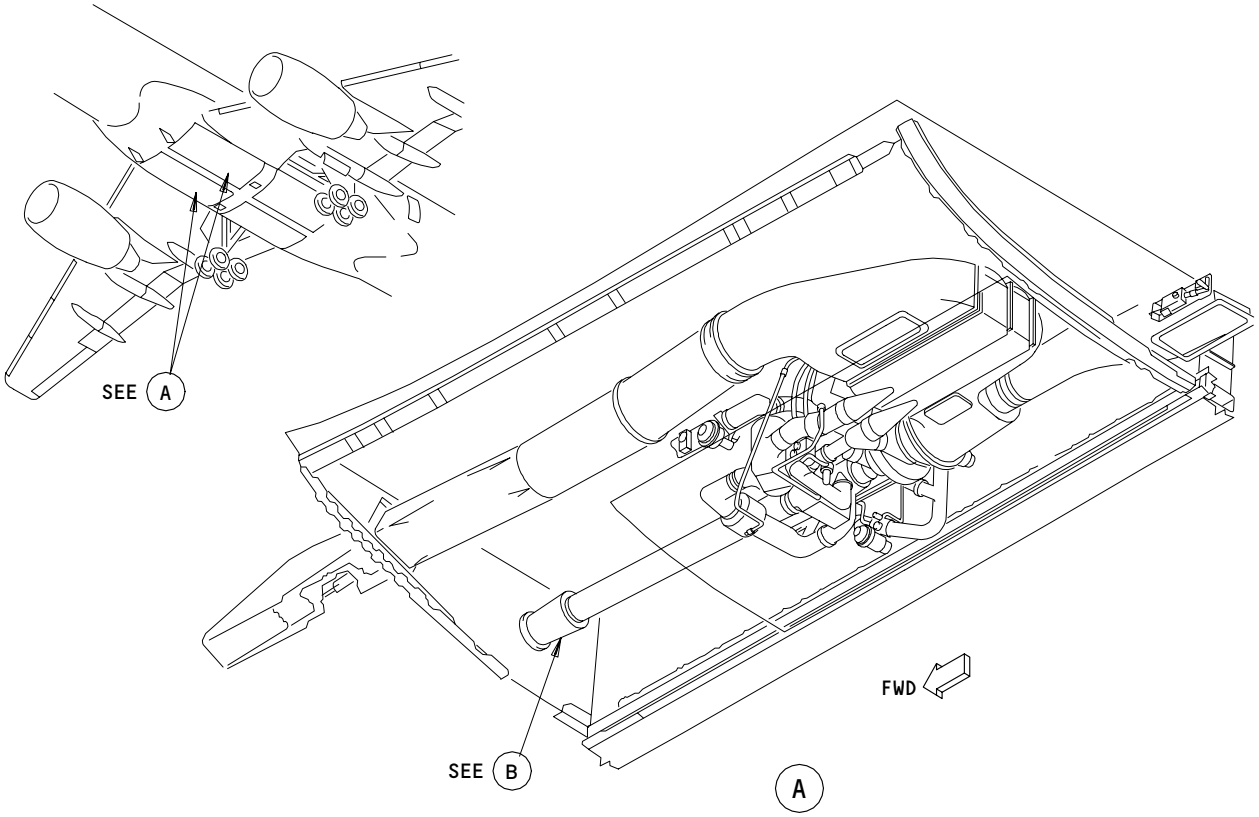
S 966-007

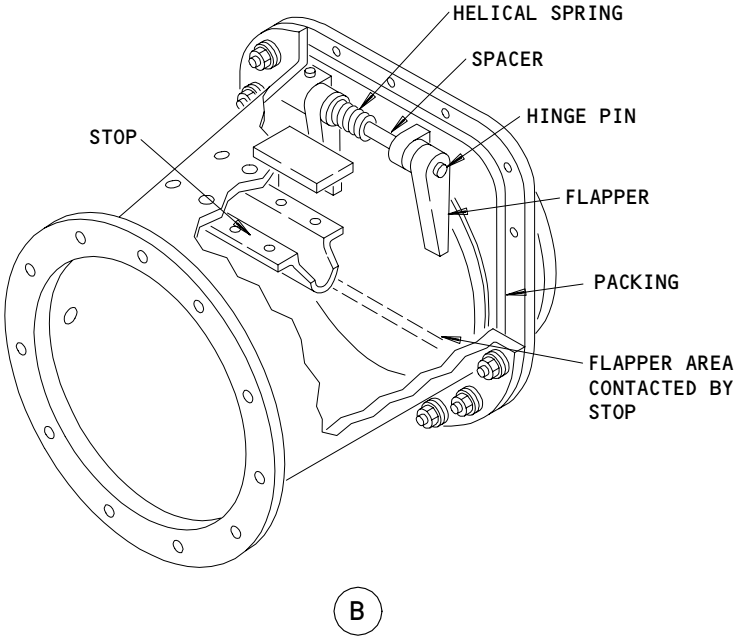
(3) Replace the check valve with a serviceable check valve if any of the above conditions are not met (AMM 21-51-15/401).

   C. Put the airplane back to its usual condition

S 426-008

(1) Install the check valve for the cabin air supply (AMM 21-51-15/401).





Cabin Air Supply Check Valve
Figure 601

PLENUM/DIFFUSER ASSEMBLY - REMOVAL/INSTALLATION

1. General
   A. One plenum/diffuser assembly is installed in each air cooling pack. The assembly is attached to the primary and secondary heat exchangers. To remove the assembly, you must first remove the assembly and the heat exchangers as a unit from the air cooling packs. This procedure has instructions to remove and install the plenum/diffuser assemblies.

TASK 21-51-16-004-001

2. Remove the Plenum/Diffuser Assembly (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 21-51-02/401, Heat Exchangers
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access doors
   C. Prepare for the Removal

      S 014-006
      (1) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Assembly

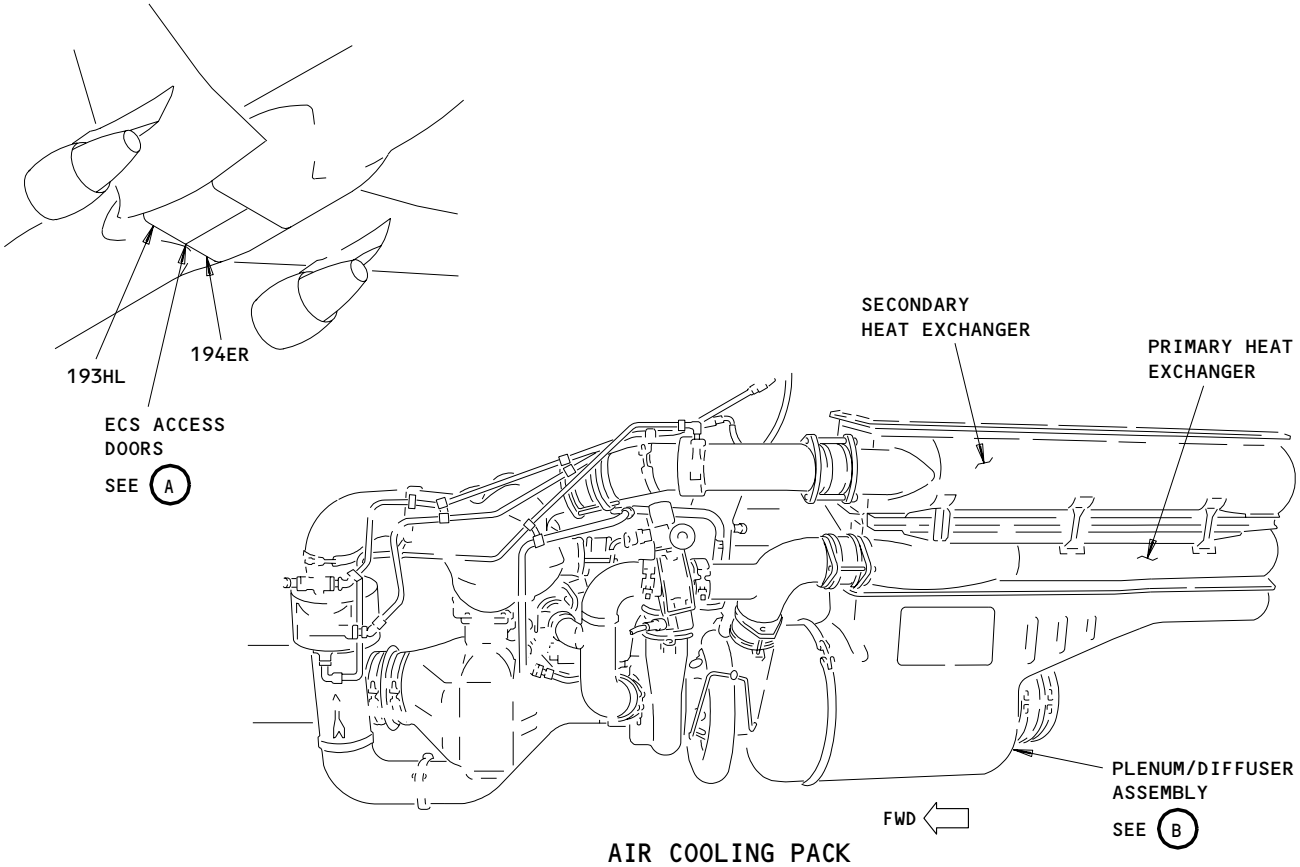
      S 034-002
      (1) Remove the heat exhangers and the plenum/diffuser assembly, as a unit, from the air cooling pack (Ref 21-51-02).

      S 034-003
      (2) Remove the bolts that hold the assembly to the primary heat exchanger.

      S 024-004
      (3) Remove the assembly from the primary heat exchanger.

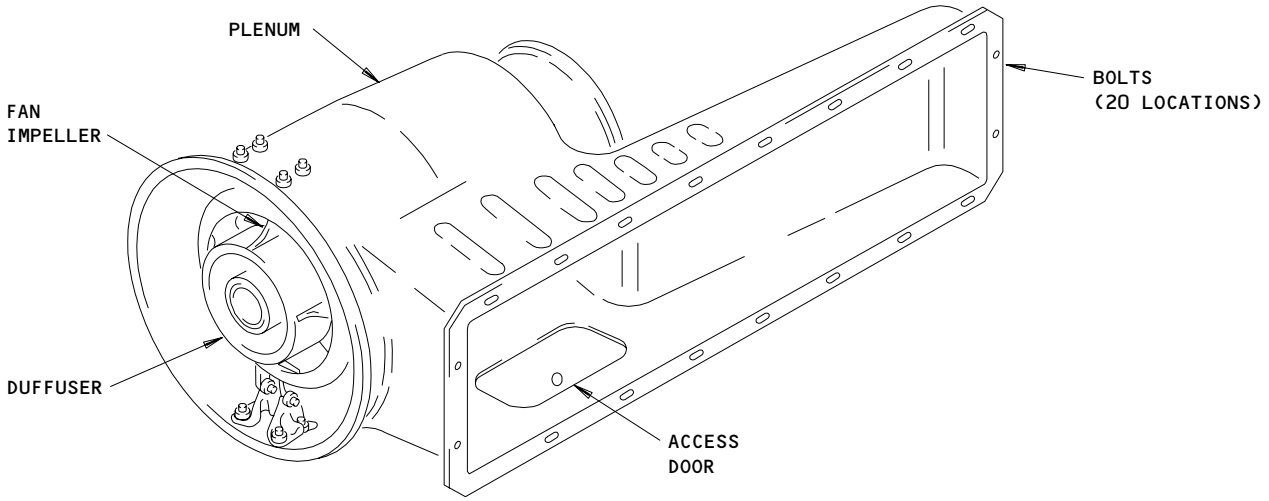
TASK 21-51-16-404-005

3. Install the Plenum/Diffuser Assembly (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels



AIR COOLING PACK

A



PLENUM/DIFFUSER ASSEMBLY

B

Plenum/Diffuser Assembly Installation
Figure 401

(2) 21-51-02/401, Heat Exchangers

B. Access

(1) Location Zones

135/136 Environmental control systems (ECS) bay

(2) Access Panels

193HL/194ER Environmental control systems access doors

C. Install the Assembly

S 424-007

(1) Put the assembly against the primary heat exchanger.

S 434-008

(2) Install the bolts that hold the assembly to the primary heat exchanger.

S 434-009

(3) Install the heat exchanger and the plenum/diffuser assembly, as a unit, into the air cooling pack (Ref 21-51-02).

D. Put the airplane back to its usual condition

S 414-010

(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

ALTITUDE SWITCH - REMOVAL/INSTALLATION

1. General
   A. Two altitude switches are installed on the the body-to-wing fairing, forward of the left air cooling pack. One switch is for the right air cooling pack. The other switch is for the left air cooling pack. This procedure has instructions to remove and install the altitude switches.

TASK 21-51-17-004-003

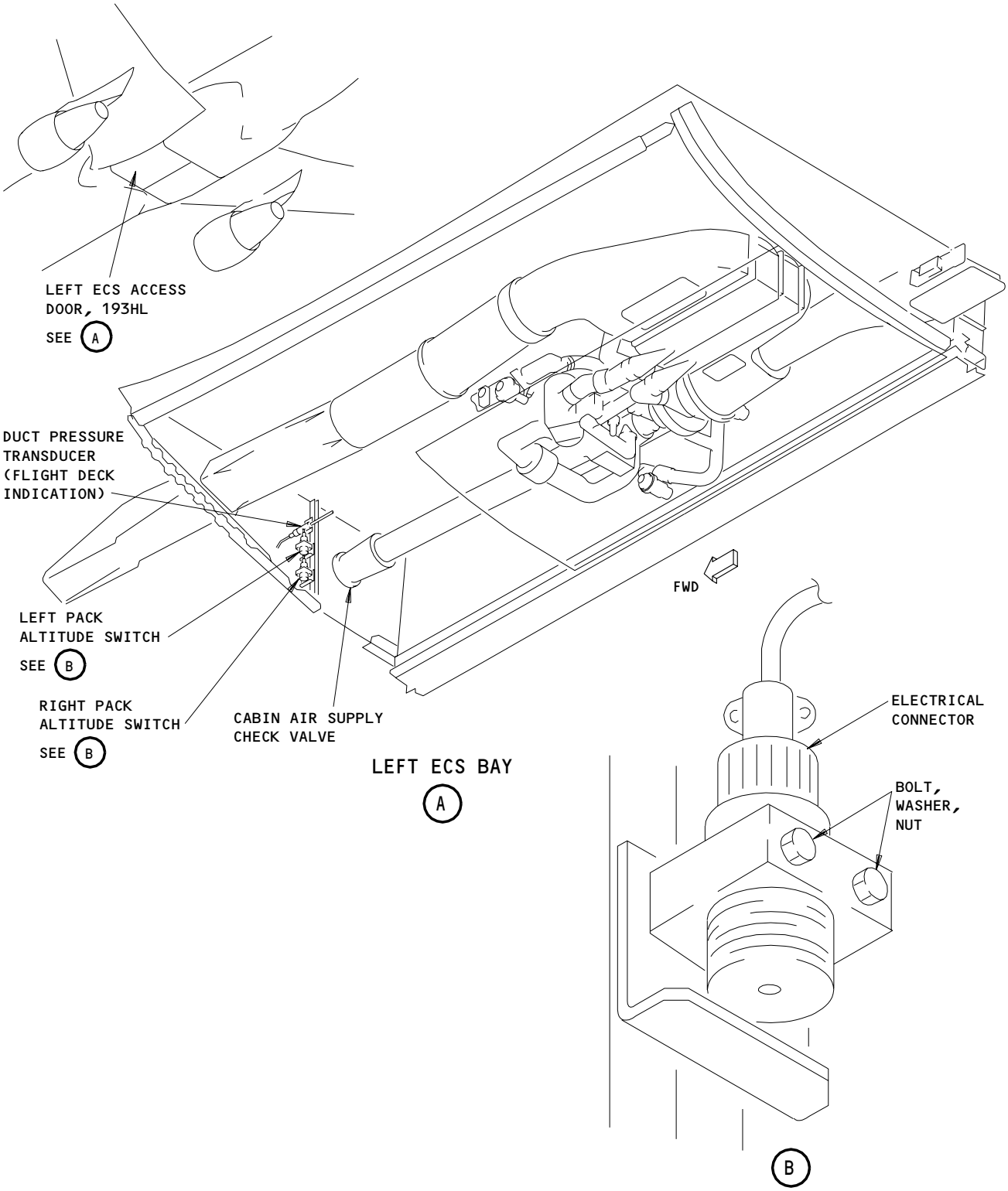
2. Remove the Altitude Switch (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          135 Environmental control systems (ECS) bay (Left)
      (2) Access Panels
          193HL Environmental control systems bay (Left)
   C. Prepare for the Removal

S 864-087
      (1) Open and attach a DO-NOT-CLOSE tag to these circuit breakers, on the overhead circuit breaker panel, P11:
          (a) To remove the left altitude switch:
              1) 11A13, AIR COND PACK LEFT AUTO CONT
              2) 11M11, LEFT PACK AUTO POWER
          (b) To remove the right altitude switch:
              1) 11A28, AIR COND PACK RIGHT AUTO CONT
              2) 11M19, RIGHT PACK AUTO POWER

S 014-023
      (2) Open the left ECS access door, 193HL (Ref 06-41-00).
   D. Remove the Altitude Switch

S 034-024
      (1) Disconnect the electrical connector from the switch.

S 034-025
      (2) Remove the bolts that hold the switch to the airplane structure.



Altitude Switch Installation
Figure 401

S 024-026
(3) Remove the switch.

TASK 21-51-17-404-027

3. Install the Altitude Switch (Fig. 401)

A. References
(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 21-51-14/501, Pack Temperature Controller
(3) 24-22-00/201, Electrical Power Control

B. Access
(1) Location Zones
135 Environmental control systems (ECS) bay (Left)
(2) Access Panels
193HL Environmental control systems bay (Left)

C. Install the Altitude Switch

S 424-028
(1) Put the switch into its position, against the airplane structure in the left ECS bay.

S 434-029
(2) Install the bolts, washers, and nuts to hold the switch in position.

S 434-030
(3) Connect the electrical connector to the switch.

D. Do the installation test for the altitude switch

S 864-051
(1) Supply electrical power (Ref 24-22-00).

S 864-090
(2) Remove the DO-NOT-CLOSE tag and close these circuit breakers, on the overhead circuit breaker panel, P11:
(a) If the left altitude switch was installed:
1) 11A13, AIR COND PACK LEFT AUTO CONT

2) 11M11, LEFT PACK AUTO POWER
(b) If the right altitude switch was installed:
1) 11A28, AIR COND PACK RIGHT AUTO CONT
2) 11M19, RIGHT PACK AUTO POWER

S 794-001
(3) Do the pack temperature controller BITE test (Ref 21-51-14/501).
(a) Make sure the fault indicator light for the ALTITUDE SWITCH does not come on.

E. Put the airplane back to its usual condition

S 414-002
(1) Close the left ECS access door, 193HL (Ref 06-41-00).

S 864-050
(2) Remove the electrical power, if it is not necessary (Ref 24-22-00).

PACK OVERHEAT SWITCH - REMOVAL/INSTALLATION

1. General
   A. One pack overheat switch is installed at the condenser outlet of each air cooling pack. This procedure has instructions to remove and install the pack overheat switches.

TASK 21-51-18-004-001

2. Remove the Pack Overheat Switch (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   C. Prepare for the Removal

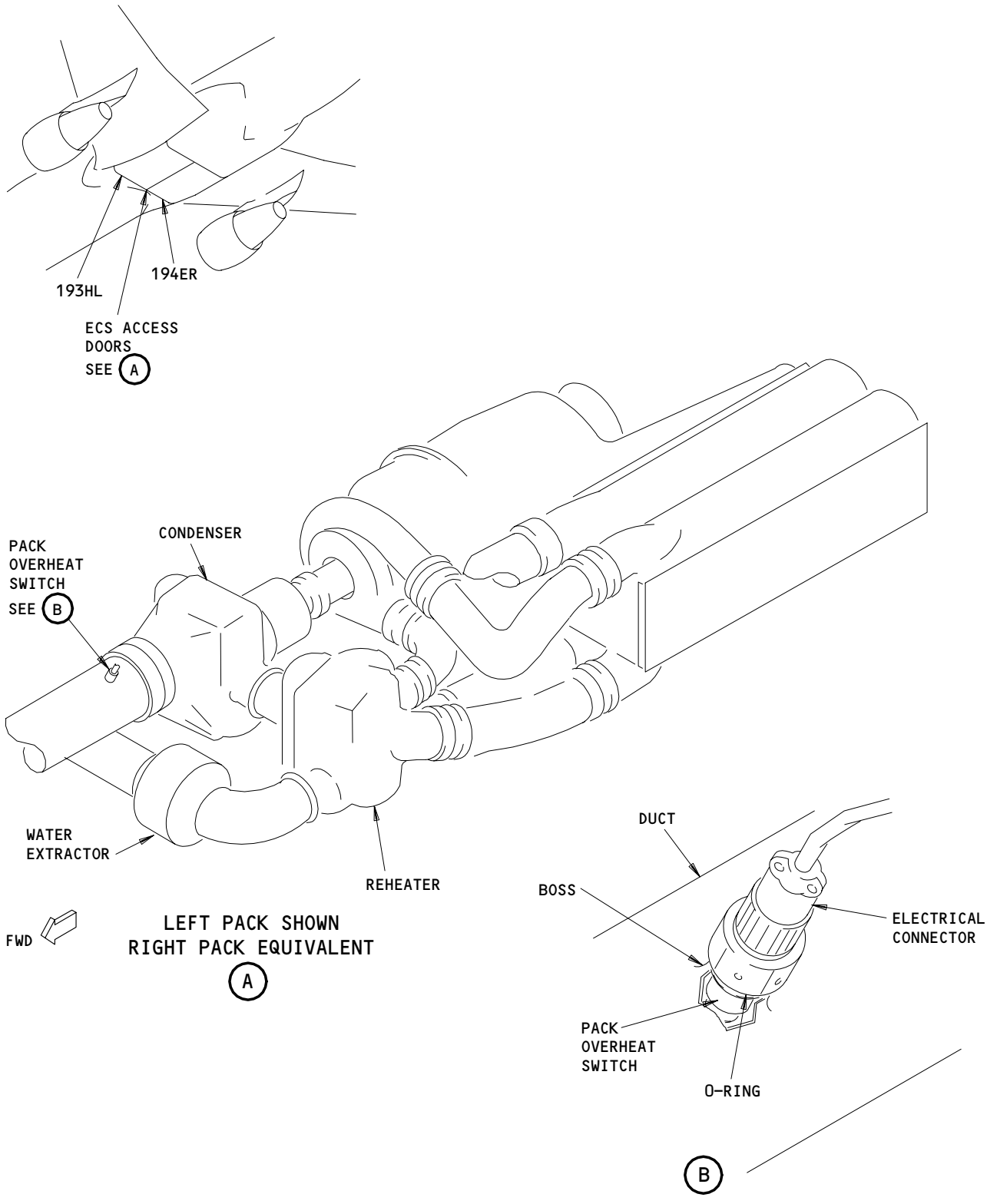
      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-022
      (2) Make sure the L and R PACK selectors, on the P5 pilot's overhead panel, are set to the OFF position, and attach a DO-NOT-OPERATE tag.

      S 864-041
      (3) Open these circuit breakers, on the P11 overhead circuit breaker panel, and attach a DO-NOT-CLOSE tag:
          (a) 11A14, AIR COND PACK LEFT FLOW CONT
          (b) 11A29, AIR COND PACK RIGHT FLOW CONT

      S 014-023
      (4) To get access to the left (right) pack overheat switch, open the left (right) ECS access door, 193HL (194ER) (AMM 06-41-00/201).
   D. Remove the Switch

      S 034-005
      (1) Disconnect the electrical connector from the switch.



Pack Overheat Switch Installation
Figure 401

S 024-006

CAUTION: USE TWO WRENCHES TO REMOVE THE SWITCH. IF YOU ONLY USE ONE WRENCH TO REMOVE THE SWITCH, DAMAGE TO THE DUCT CAN OCCUR.

(2) Use two wrenches to remove the switch.

NOTE: Use one wrench to hold the boss. Use the other wrench to turn the switch.

S 434-007

(3) Put a cover on the duct opening.

TASK 21-51-18-404-008

3. Install the Pack Overheat Switch (Fig. 401)

A. Consumable Materials

(1) D00386 - Anti-seize Compound, MIL-L-23398

(2) D00006 - Anti-seize Compound, EASE-OFF 990 (Optional to MIL-L-23398)

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels

C. Access

(1) Location Zones

135/136 Environmental control systems (ECS) bay

(2) Access Panels

193HL/194ER Environmental control systems access door

D. Install the Switch

S 034-009

(1) Remove the cover from the duct opening.

S 434-014

(2) Install a new O-ring on the switch.

S 164-011
(3) Make sure the mating surfaces of the boss and the switch nut are clean, to allow for electrical ground.

S 644-012
(4) Apply a thin layer of the anti-sieze compound to the threads of the switch.

S 424-013

CAUTION: USE TWO WRENCHES TO INSTALL THE SWITCH. IF YOU ONLY USE ONE WRENCH, DAMAGE TO THE DUCT CAN OCCUR.

(5) Install the switch into the duct boss.

NOTE: Use one wrench to hold the boss. Use the other wrench to turn the switch.

(a) Tighten the switch to a torque value of 210-240 pound-inches.

S 434-015
(6) Put a lockwire on the switch.

S 434-016
(7) Connect the electrical connector to the switch.

E. Put the airplane back to its usual condition

S 864-074
(1) Remove the DO-NOT-CLOSE tag and close these circuit breakers, on the P11 panel:
(a) 11A14, AIR COND PACK LEFT FLOW CONT
(b) 11A29, AIR COND PACK RIGHT FLOW CONT

S 864-019
(2) Remove the DO-NOT-OPERATE tag from the L (R) PACK selector, on the P5 panel.

S 414-020

(3) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

PACK OVERHEAT SWITCH - ADJUSTMENT/TEST

1. General
   A. This procedure has instructions to do a test of the circuit for the pack overheat switch.

TASK 21-51-18-715-001

2. Pack Overheat Switch Test (Fig. 501)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems bay
   C. Prepare for the Test

      S 865-002
      (1) Supply electrical power (Ref 24-22-00).

      S 865-037
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the AUTO position.

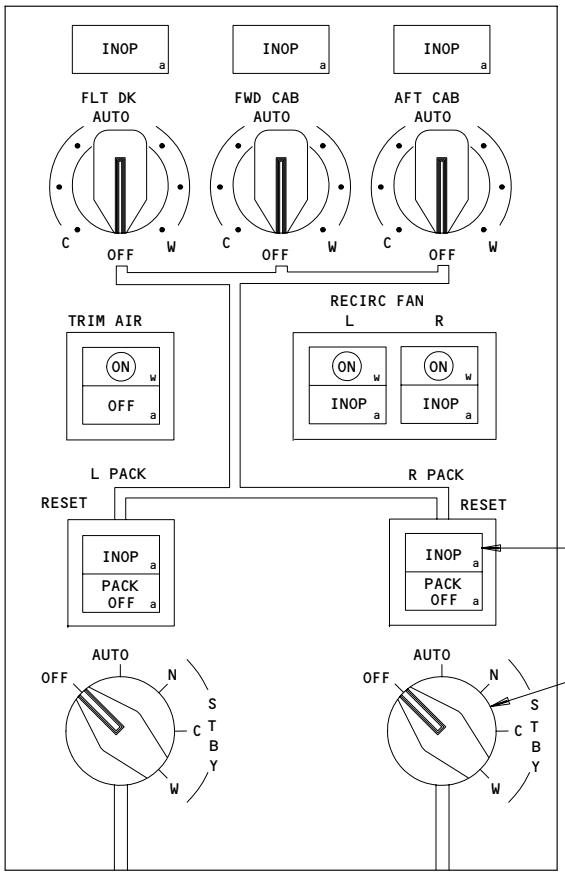
      S 865-038
      (3) Make sure the EICAS circuit breakers on the overhead circuit breaker panel, P5, are closed.

      S 865-004
      (4) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.

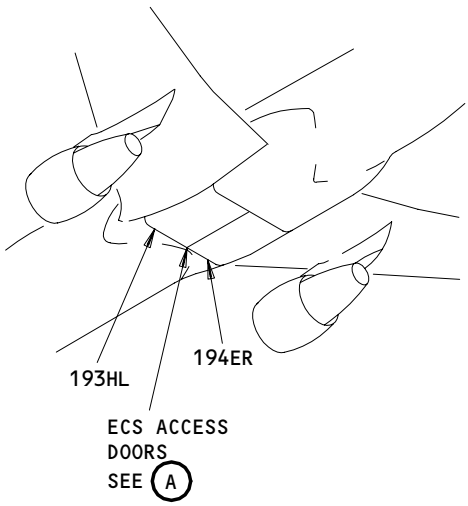
      S 015-040
      (5) Open the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).
   D. Do the Test

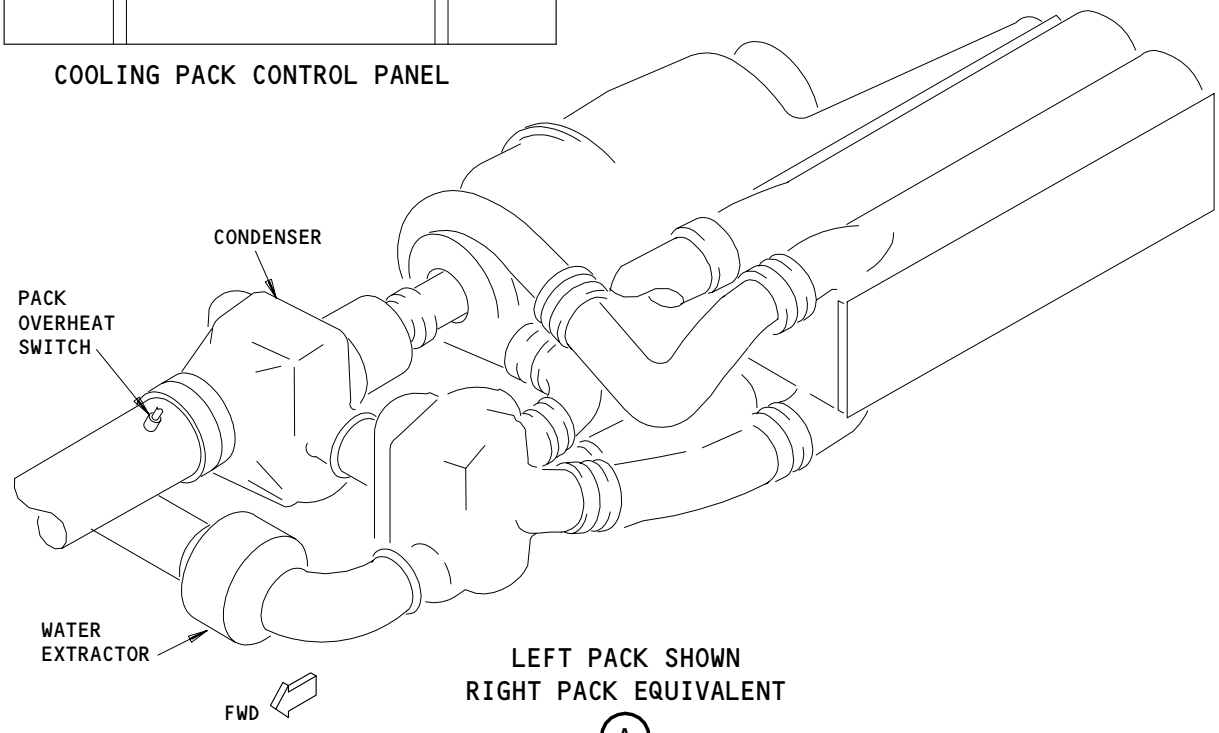
      NOTE: To do the test for the left pack overheat switch, ignore the data that is in the parentheses. To do the test for the right pack overheat switch, use the data that is in the parentheses.

      S 035-006
      (1) Disconnect the electrical connector from the left (right) pack overheat switch.



COOLING PACK CONTROL PANEL





LEFT PACK SHOWN
RIGHT PACK EQUIVALENT

A

Pack Overheat Switch
Figure 501

S 435-007
(2) Install a jumper between the pin 1 and the pin 2 of the electrical connector.
(a) Make sure the L (R) PACK INOP light on the P5 panel comes on.
(b) Make sure the EICAS message, L (R) PACK TEMP, shows on the top display.
(c) Make sure these values show on the bottom EICAS display:
1) L (R) TEMP VALVE is between 0.00 and 0.05.
2) L (R) RAM IN DOOR is between 0.00 and 0.05.

S 035-013
(3) Remove the jumper from the electrical connector.

S 435-014
(4) Connect the electrical wire to the left (right) pack overheat switch.

S 865-039
(5) Push the L (R) PACK RESET switch-light on the P5 panel.
(a) Make sure the L (R) PACK INOP light, on the P5 panel, goes off.

E. Put the airplane back to its usual condition.

S 865-018
(1) Turn the L (R) PACK selector, on the P5 panel, to the OFF position.

S 415-019
(2) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 865-020
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

SPLIT-DUCT WATER SEPARATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the split-duct water separator. One water separator is installed in each air cooling pack.

   TASK 21-51-21-004-001

2. Remove the Split-duct Water Separator (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 21-52-05/401, Secondary Heat Exchanger Outlet Temperature Bulb
      (3) 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Turn the appplicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

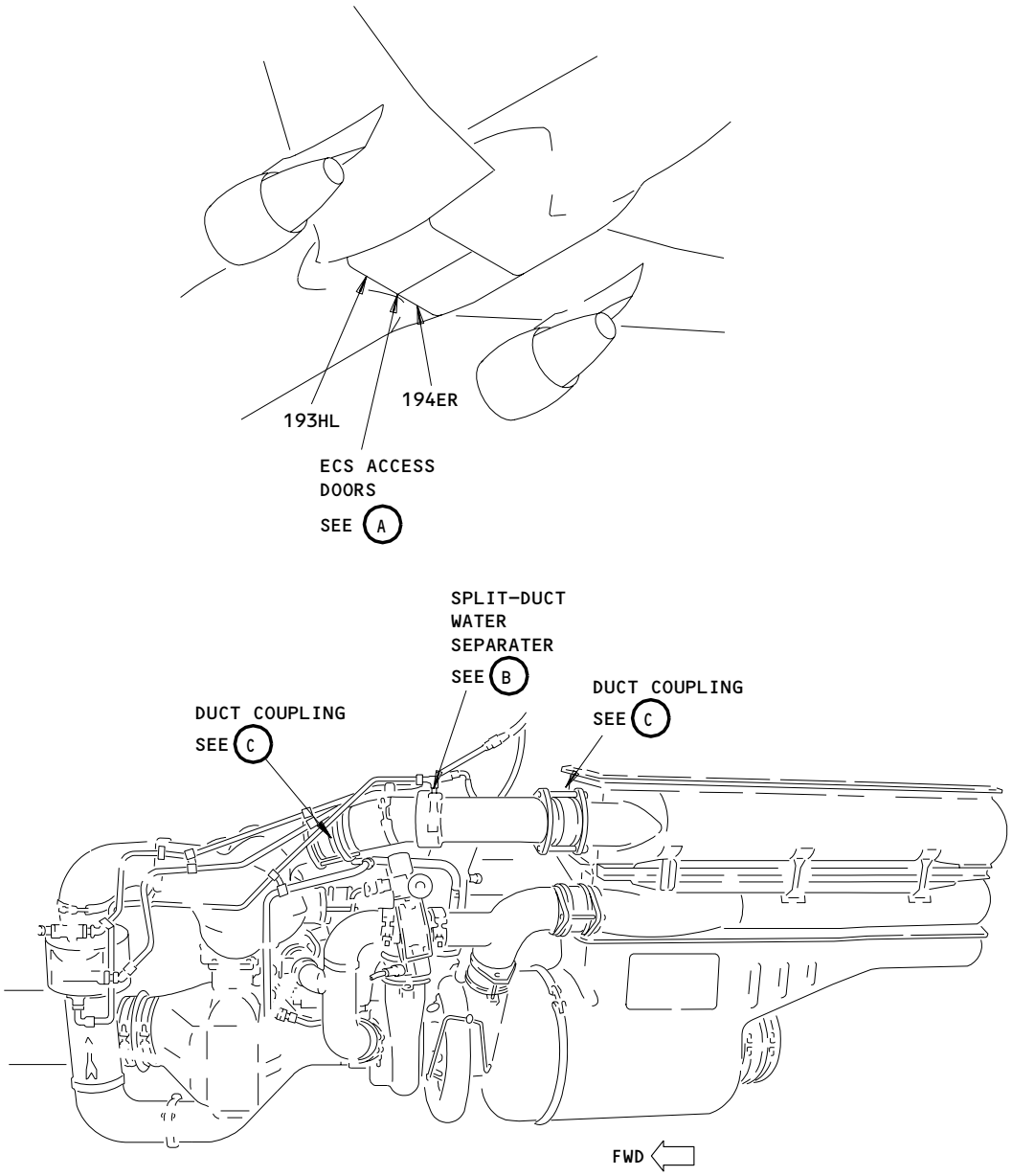
      S 014-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Water Separator

      S 034-033
      (1) Disconnect the electrical connector from the temperature sensor for the secondary heat exchanger, if it is installed.

      S 034-006
      (2) Disconnect the water drain line from the water separator.

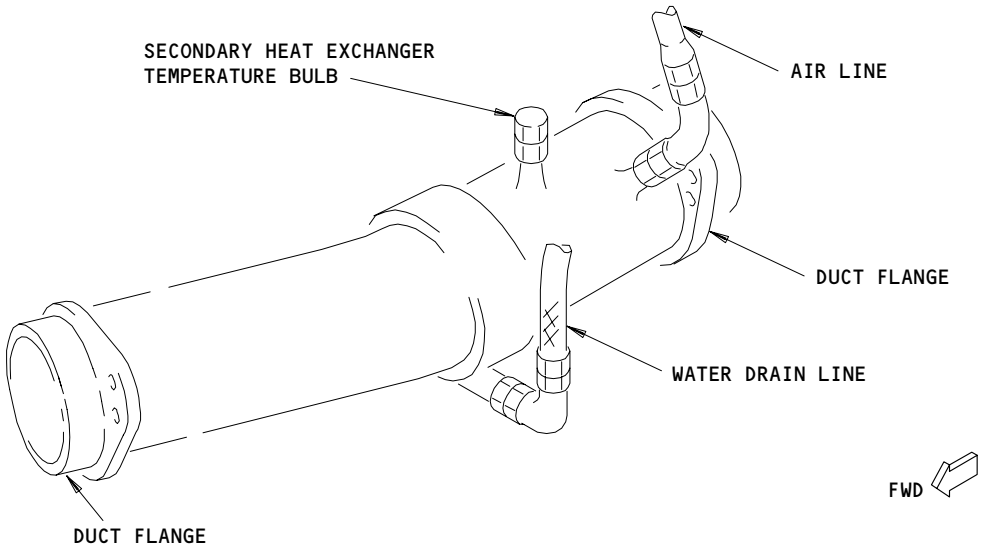
      S 034-007
      (3) Disconnect the air line from the water separator.

      S 034-008
      (4) Remove the duct couplings on each end of the water separator.
          (a) Disconnect the bonding jumpers from the duct flanges.
          (b) Remove the restraint cables from the duct flanges.



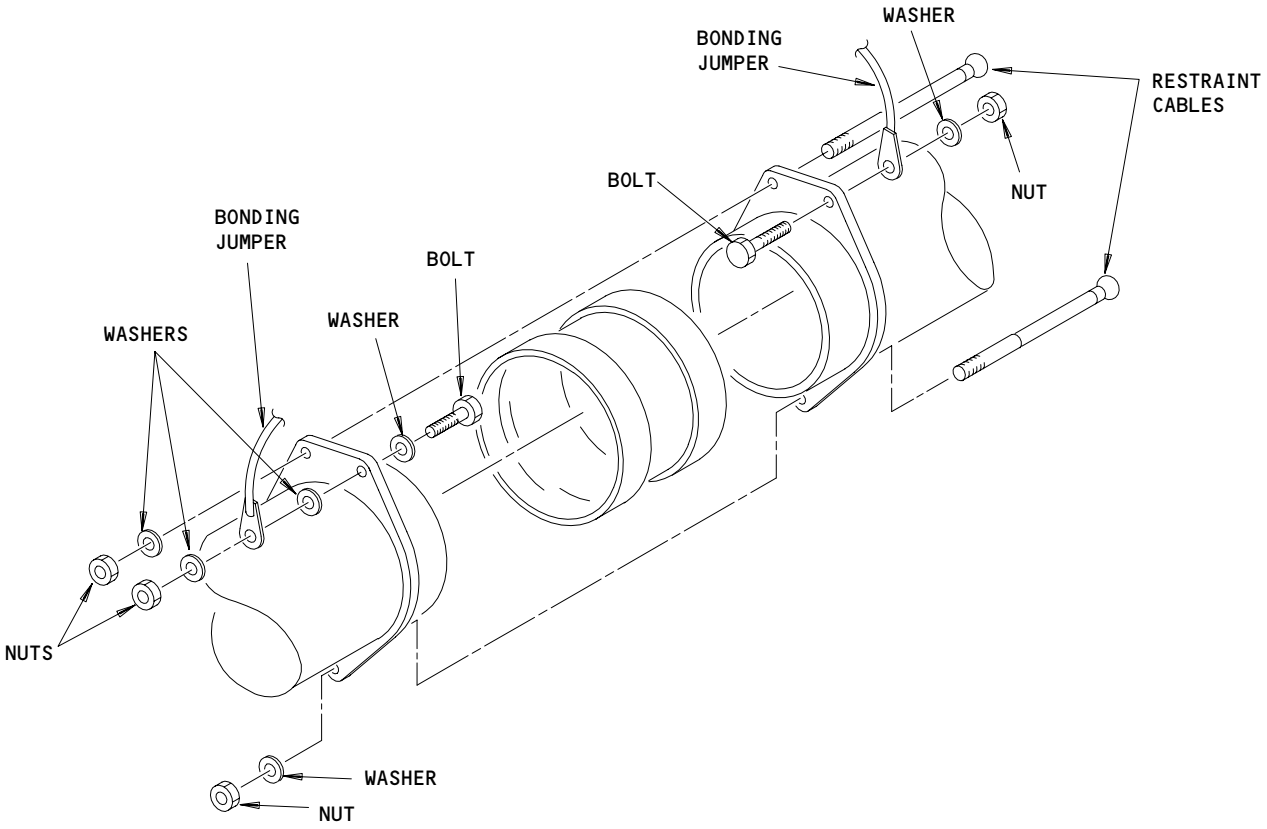
LEFT COOLING PACK
(RIGHT COOLING PACK EQUIVALENT)
A

Split–Duct Water Separator Installation
Figure 401 (Sheet 1)



SPLIT-DUCT WATER SEPARATOR

(B)



DUCT COUPLING

(C)

Split Duct Water Separator Installation
Figure 401 (Sheet 2)

(c) Remove the duct couplings.

S 024-010

(5) Remove the water separator.

S 034-035

(6) If it is installed, remove the temperature sensor for the secondary heat exchanger (AMM 21-52-05/401).

S 434-012

(7) Put a cover on the duct openings.

TASK 21-51-21-404-013

3. Install the Split-duct Water Separator (Fig. 401)

A. References

(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 21-52-05/401, Secondary Heat Exchanger Outlet Temperature Bulb
(3) 24-22-00/201, Electrical Power - Control
(4) 36-00-00/201, Pneumatic - General

B. Access

(1) Location Zones
135/136 Environmental control systems (ECS) bay
(2) Access Panels
193HL/194ER Environmental control systems access door

C. Install the Water Separator

S 434-036

(1) If it is necessary, install the temperature sensor for the secondary heat exchanger (AMM 21-52-05/401).

S 434-032

(2) Put new seals into the duct couplings.

S 034-014

(3) Remove the covers from the duct openings.
(a) Make sure there is no unwanted material in the ducts.

S 424-015

(4) Put the water separator into its position, between the secondary heat exchanger and the reheater.

S 434-016

(5) Install the couplings at each end of the water separator.
(a) Put the duct couplings into their positions.
(b) Install, but do not tighten, the restraint cables into the duct flanges.
(c) Connect the bonding jumpers to the duct flanges.

S 434-018

(6) Connect the water drain line to the water separator.

S 434-019
(7) Connect the air line to the water separator.

S 434-020
(8) Tighten the restraint cables until they are not loose.
(a) Make sure the distance between the flanges is not more than 2.65 inches.

S 434-037
(9) Connect the electrical connector to the temperature sensor for the secondary heat exchanger, if it is installed.

D. Do the installation test for the water separator

S 864-023
(1) Supply electrical power (Ref 24-22-00).

S 864-024
(2) Supply pneumatic power (AMM 36-00-00/201).

S 864-025
(3) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.
(a) Turn the selector to the AUTO position.
(b) Make sure the PACK OFF light goes off.

S 794-026
(4) Feel for leaks around the water separator.
(a) Small leaks are permitted.
(b) You must repair a large leak.

E. Put the airplane back to its usual condition

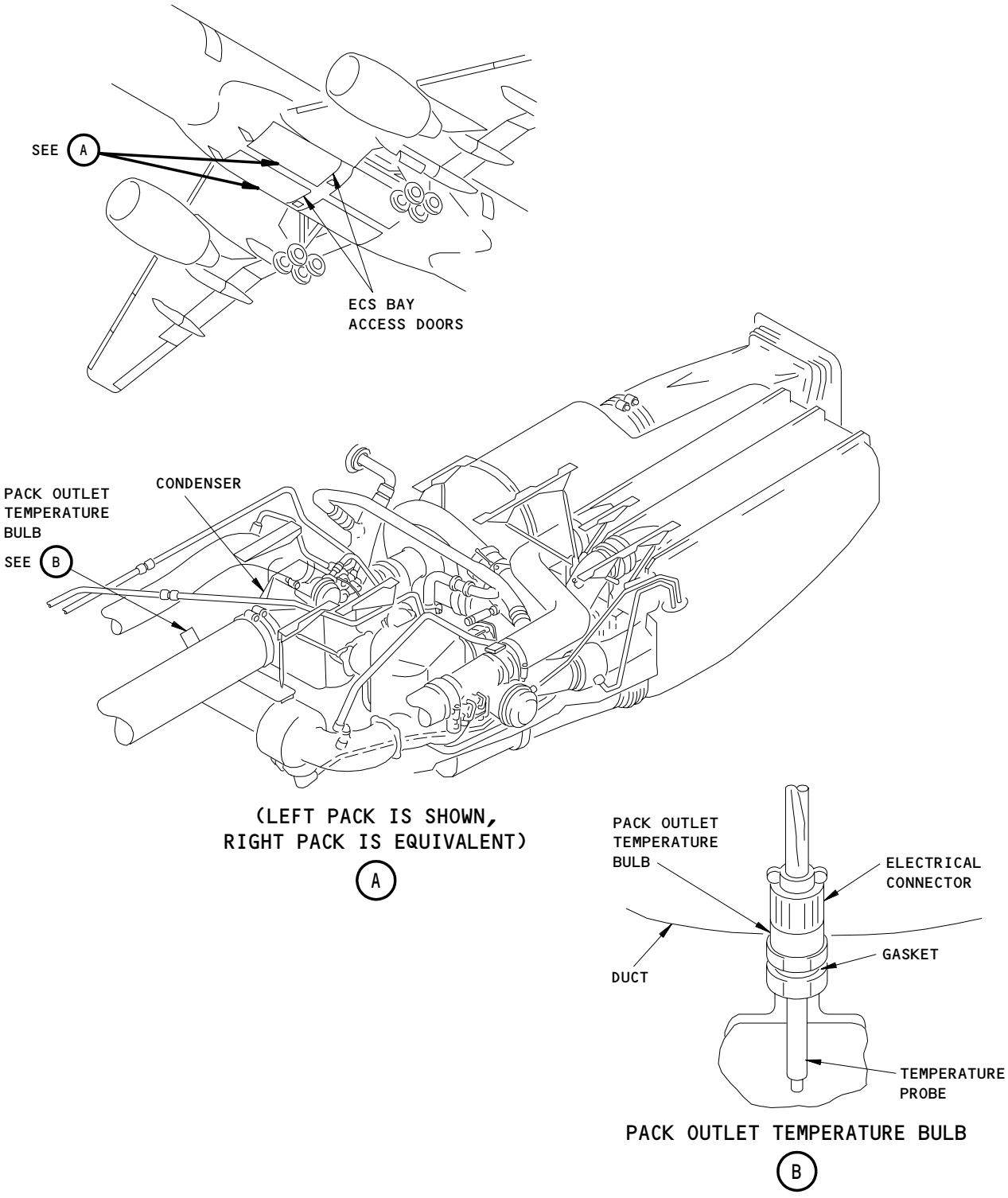
S 414-027
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-028
(2) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

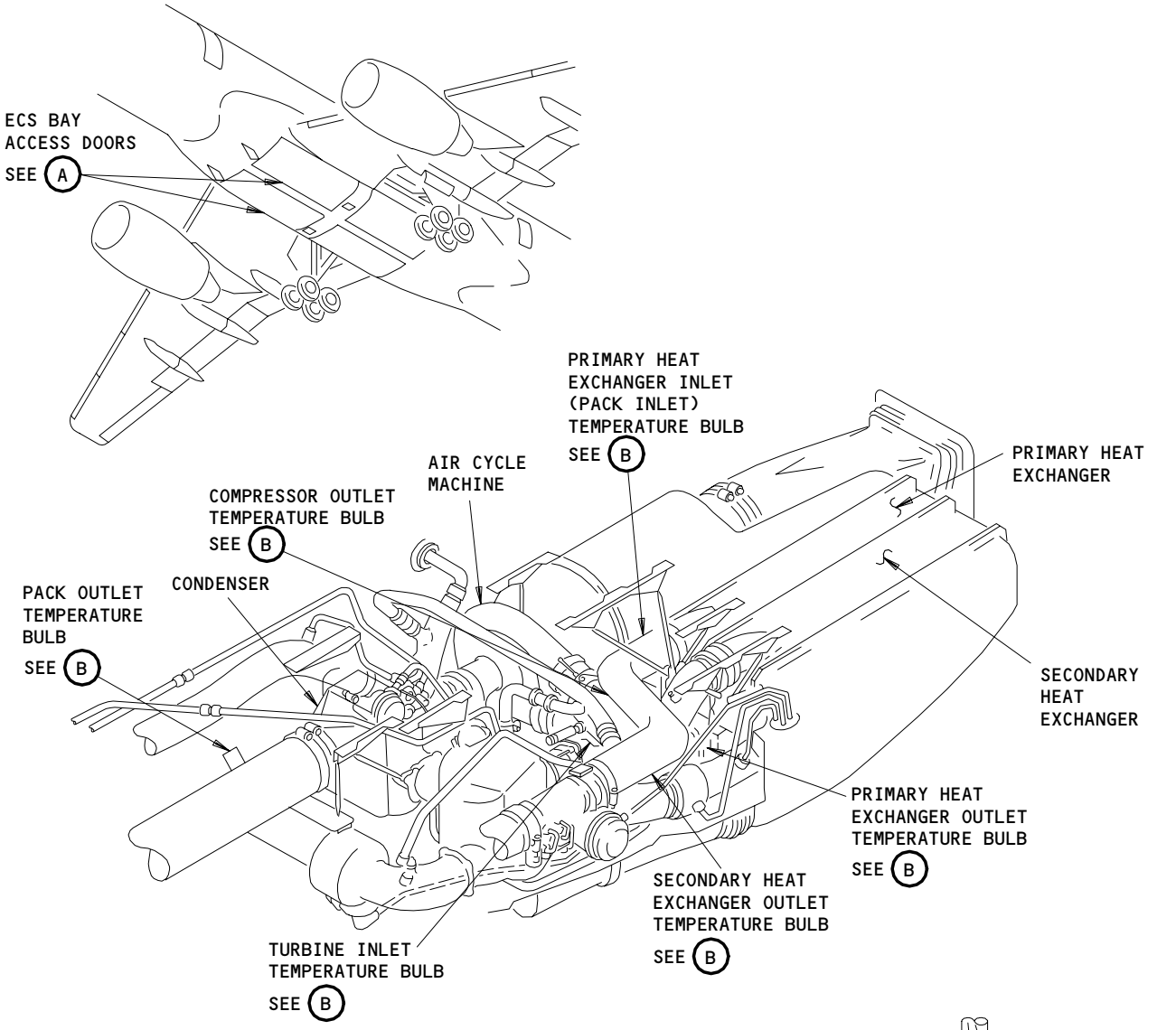
S 864-029
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

COOLING PACK TEMPERATURE INDICATION - DESCRIPTION AND OPERATION

1. General
   A. GUI 115;
      The cooling pack temperature indication system provides pack outlet temperature and pack inlet flow information to the Engine Indicating and Crew Alerting System (EICAS) for display in the flight compartment (on the ground only).
   B. GUI 001-099;
      The cooling pack temperature indication system provides pack outlet temperature, primary heat exchanger inlet and outlet temperatures, compressor outlet temperature, secondary heat exchanger temperature, turbine inlet temperature, and pack inlet flow information to the Engine Indicating and Crew Alerting System (EICAS) for display in the flight compartment (on the ground only).
   C. Temperature bulbs located on the cooling packs provide EICAS with current operating temperatures. Pack flow sensors, upstream of each pack inlet, provide input to a flow processor unit which calculates air flow rate. An input from the flow processor is then provided to EICAS.
2. Component Details
   A. Pack Temperature Bulbs (Fig. 1)
      (1) Each temperature bulb is a resistance type probe extending into the duct. The electrical resistance of the temperature probe varies directly with the sensed airflow temperature. Each cooling pack consists of the following temperature bulbs monitoring temperature at the indicated locations:
         (a) Pack Outlet Temperature Bulb downstream of the condenser.
         (b) GUI 001-099;
            Locations:
            1) Primary Heat Exchanger Inlet (Pack Inlet) Temperature Bulb upstream of the primary heat exchanger inlet.
            2) Primary heat Exchanger Outlet Temperature Bulb downstream of the primary heat exchanger outlet.
            3) Compressor Outlet Temperature Bulb upstream of the secondary heat exchanger inlet.
            4) Secondary Heat Exchanger Outlet Temperature Bulb downstream of the secondary heat exchanger.



Pack Temperature Bulbs
Figure 1



Pack Temperature Bulbs
Figure 1A

A14748

5) Turbine Inlet Temperature Bulb upstream of the air cycle machine turbine inlet.

B. Pack Flow Sensor (Fig. 2)

(1) The pack flow sensor senses pneumatic air flow into the air cooling pack. There are two sensors, one for each pack, located as follows:

(a) GUI 001-008, 115;
One pack flow sensor is installed four inches upstream of each flow control and shutoff valve.

(b) GUI 009-099;
The flow sensor for the right pack is approximately four inches upstream of the flow control and shutoff valve. The flow sensor for the left pack is approximately twenty eight inches upstream of the flow control and shutoff valve.

(2) Each sensor consists of a duct probe, integral electrical connector and mounting hardware. The probes contain an electrical resistance heater and a bridgestone electrical circuit. Sensed changes in temperature causes changes in the current flow across the bridgestone circuit. The signals generated are used by the flow processor unit to calculate flow rate.

C. Pack Flow Processor (Fig. 3)

(1) The flow processor takes the signals from each pack flow sensor and calculates the volume rate of flow for each pack. The processor is a microprocessor control unit located in the E/E compartment E4 rack.

3. Operation

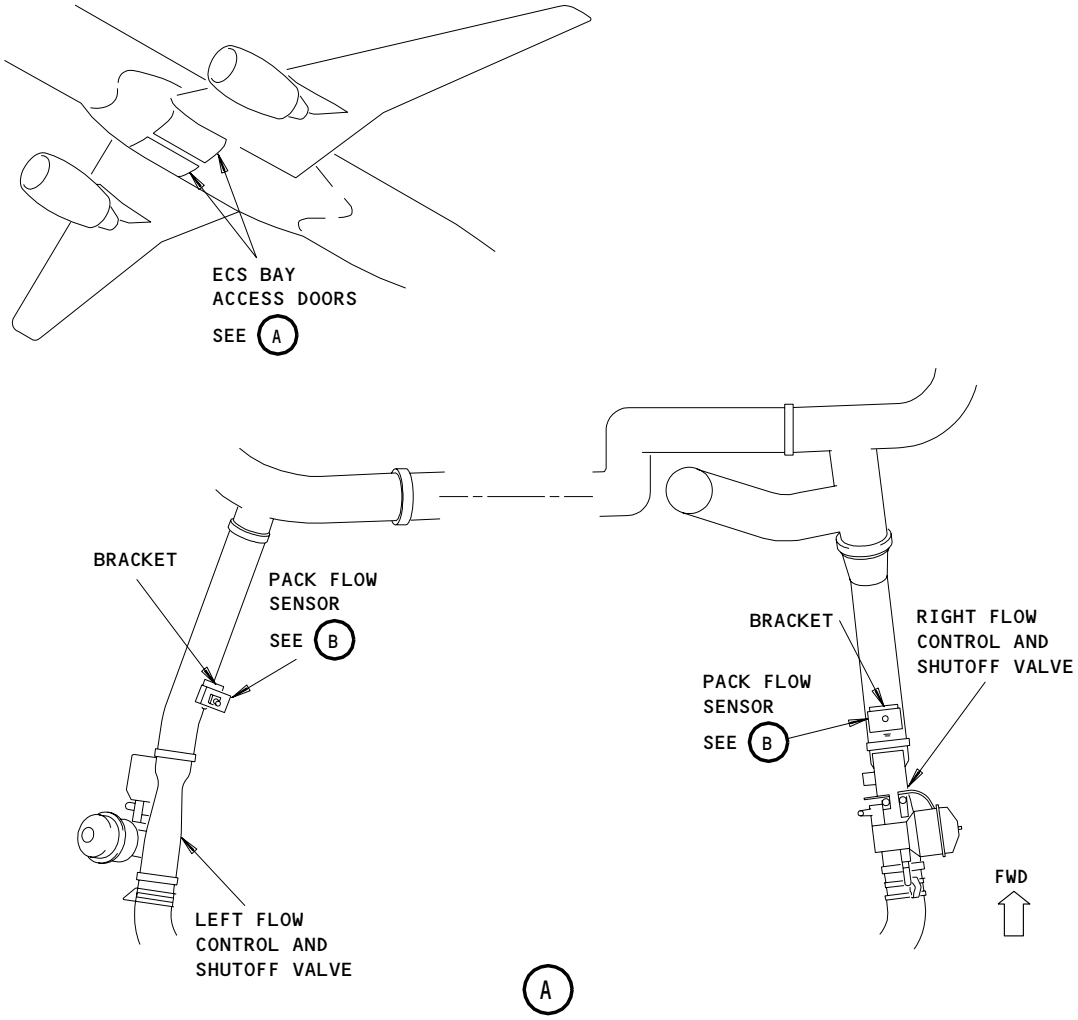
A. Pack Temperature Indication (Fig. 4)

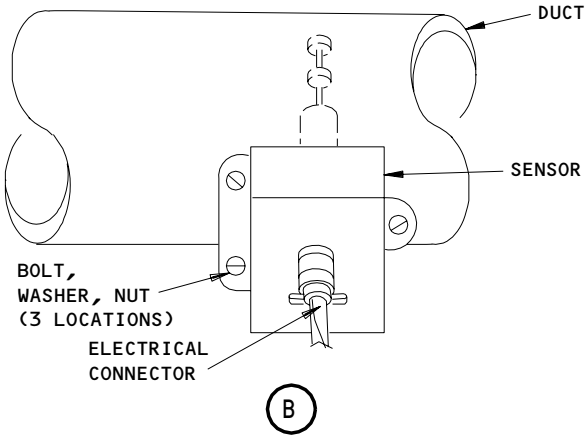
(1) The pack temperature bulbs operate on 28v dc power. They sense the temperatures at various locations in the packs and send a signal to EICAS. The temperature bulbs on the left pack sends inputs to the left EICAS computer and the bulbs on the right pack sends inputs to the right EICAS computer. The information is shared by both computers through the cross-talk bus.

(2) GUI 115;
Pressing the EICAS MAINT ECS MSG button on the right side P61 panel will display L and R PACK OUT temperature in degrees Centigrade on the pilot's center display P2 panel lower CRT screen.

(3) GUI 001-099;
Pressing the EICAS MAINT ECS/MSG button on the right side P61 panel will display the following temperatures in degrees Centigrade on the pilot's center display P2 panel lower CRT screen:

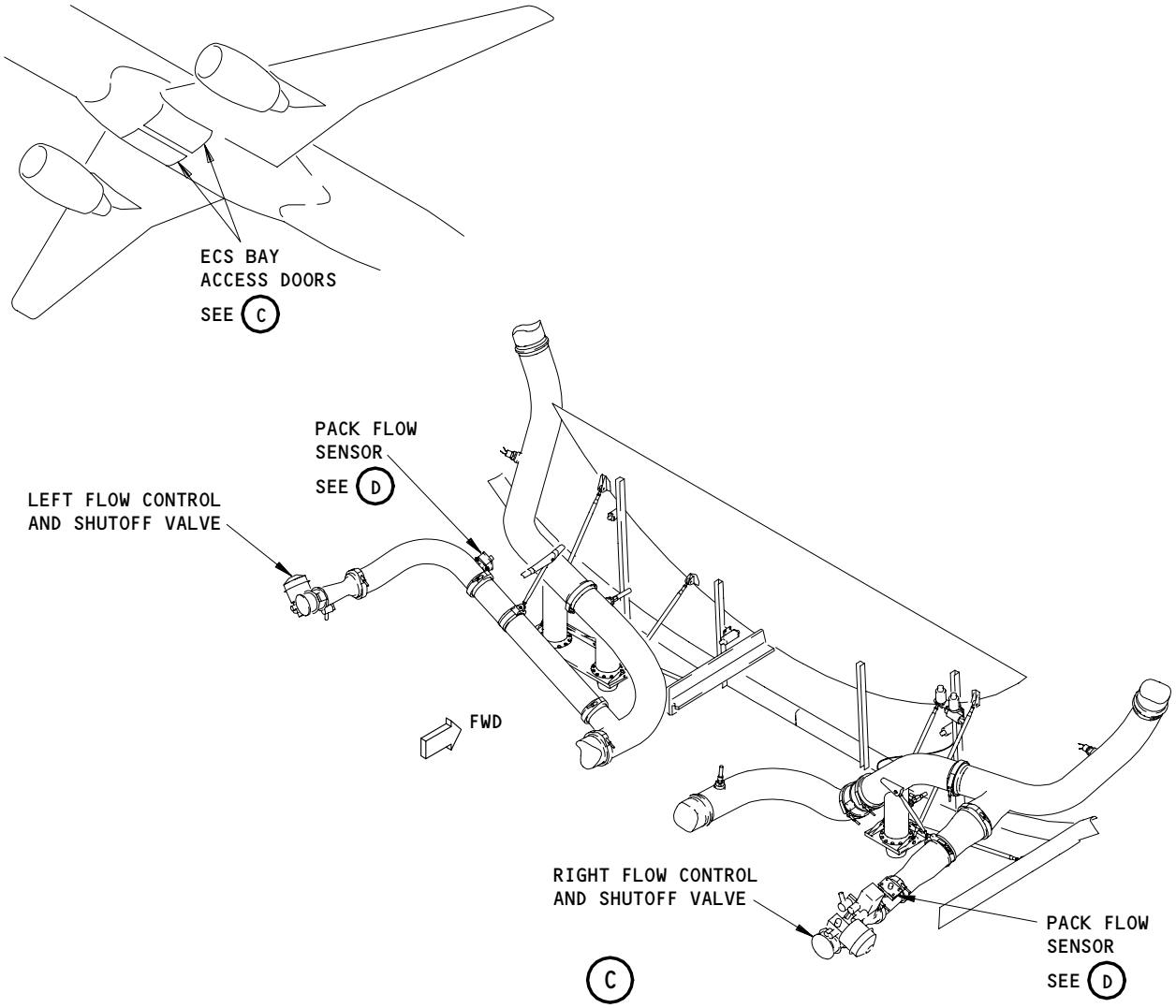
(a) L or R TURB IN
(b) L or R PACK OUT
(c) L or R SEC HX OUT
(d) L or R COMPR OUT

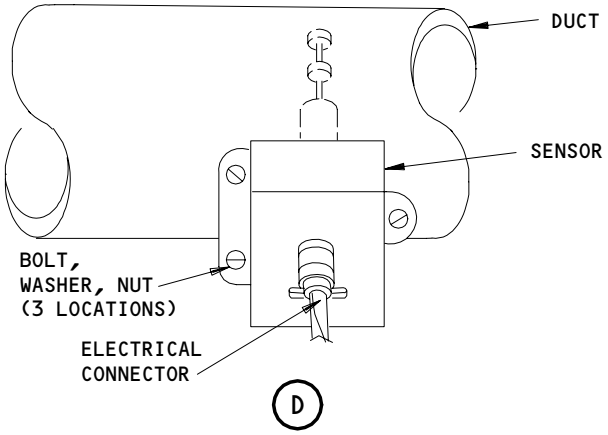




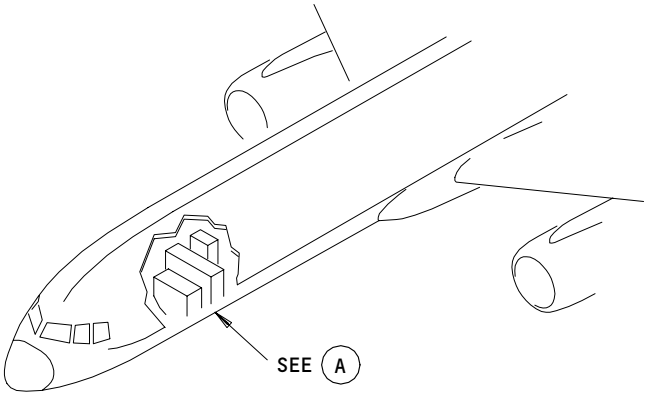
Pack Flow Sensor
Figure 2 (Sheet 1)

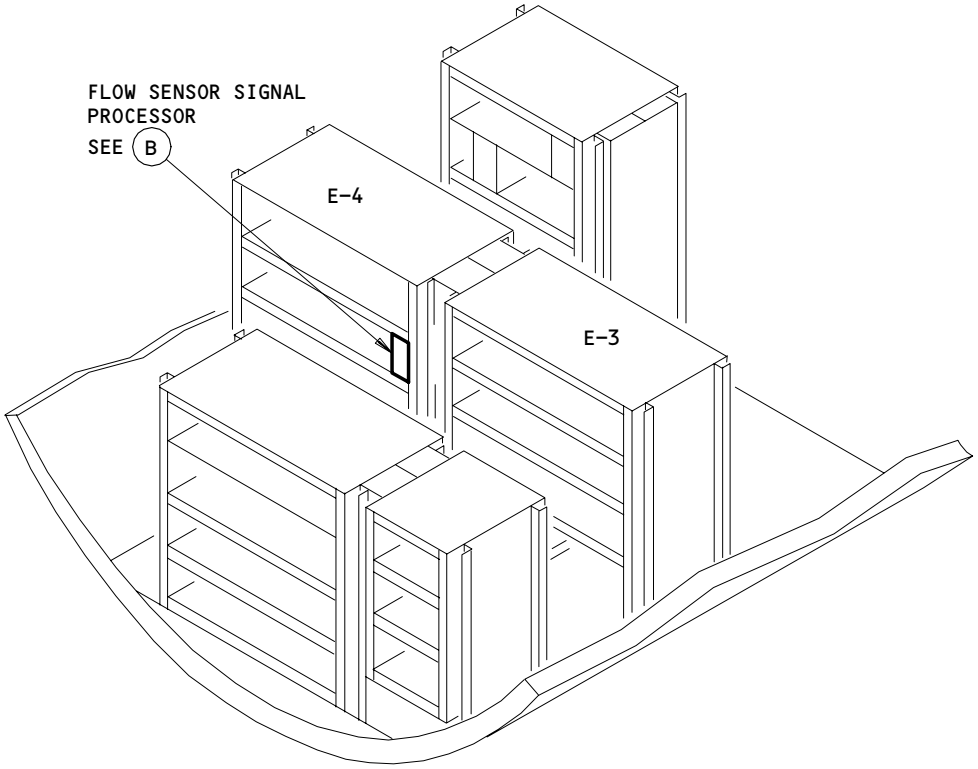
C33628

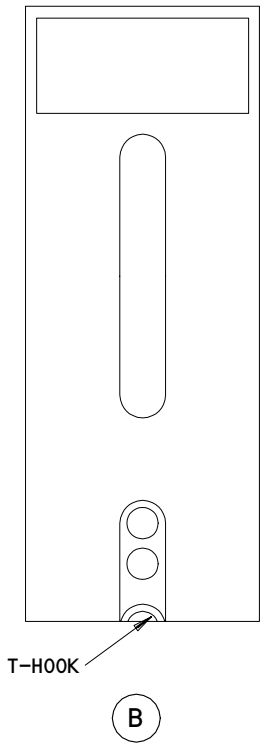




Pack Flow Sensor
Figure 2 (Sheet 2)



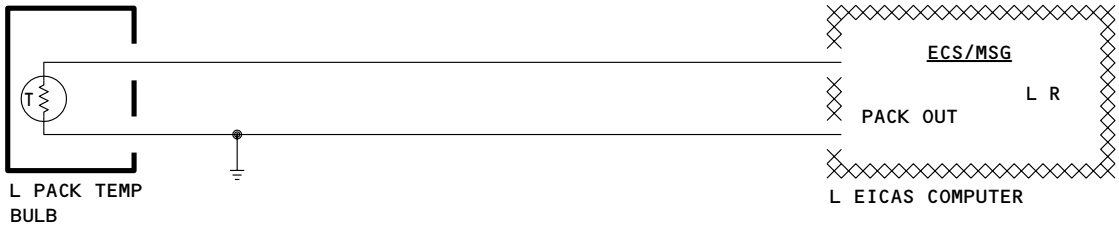




Flow Sensor Processor
Figure 3

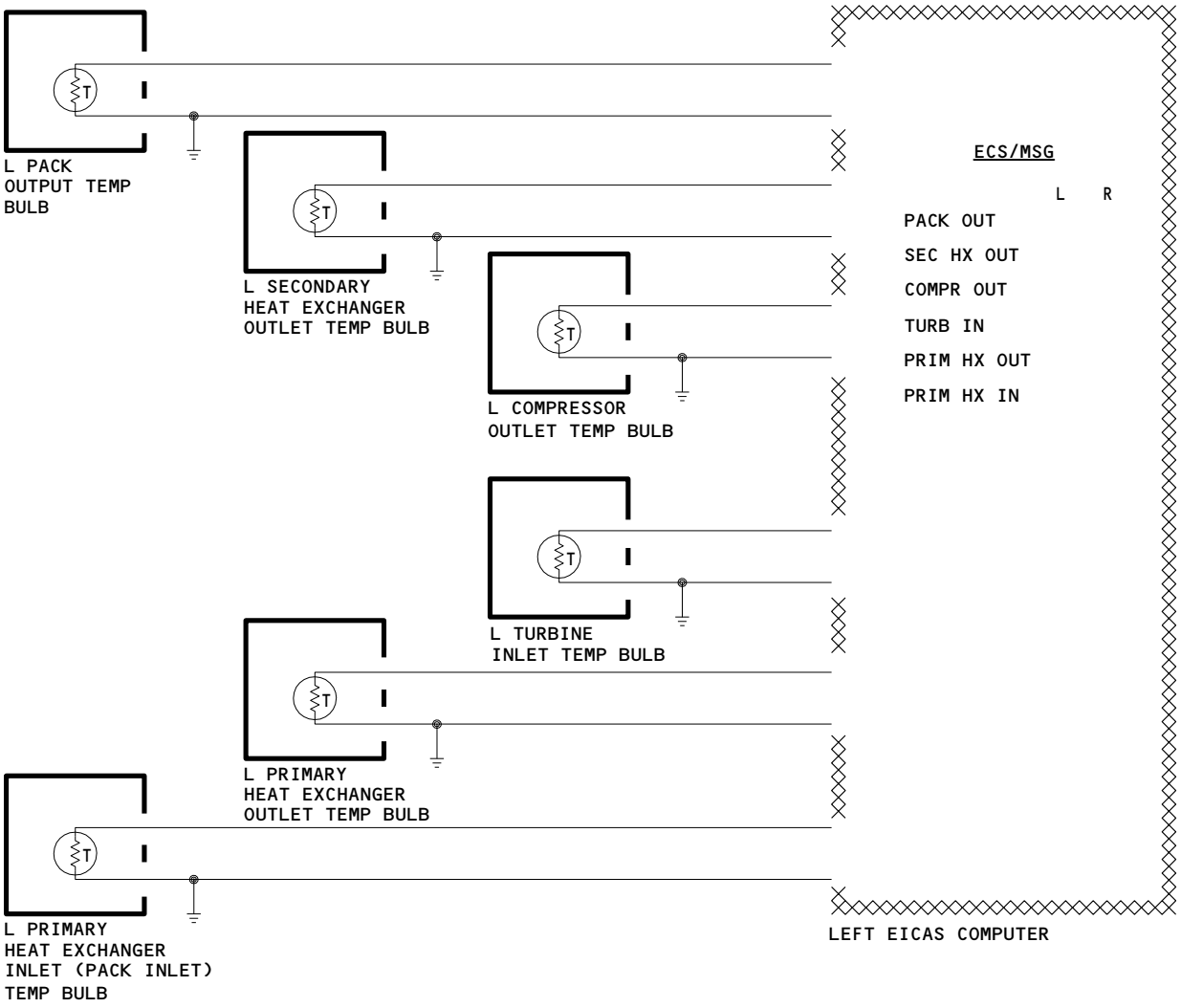
(e) L or R PRIM HX OUT
(f) L or R PRIM HX IN

B. Pack Flow Indication (Fig. 5)
(1) The pack flow indication system measures the amount of supply air entering the air cooling packs. The system uses 115 Vac power supplied to the flow processor. The processor provides power to the pack flow sensor.
(2) The flow sensor provides signals to the processor. The processor calculates air flow rate on a continuing real time basis.
(3) Press the EICAS MAINT ECS/MSG button on the P61 panel to display the L and R PACK FLOW values on the P2 panel lower CRT screen. The PACK FLOW values are shown in cubic meters per minute (CMM).



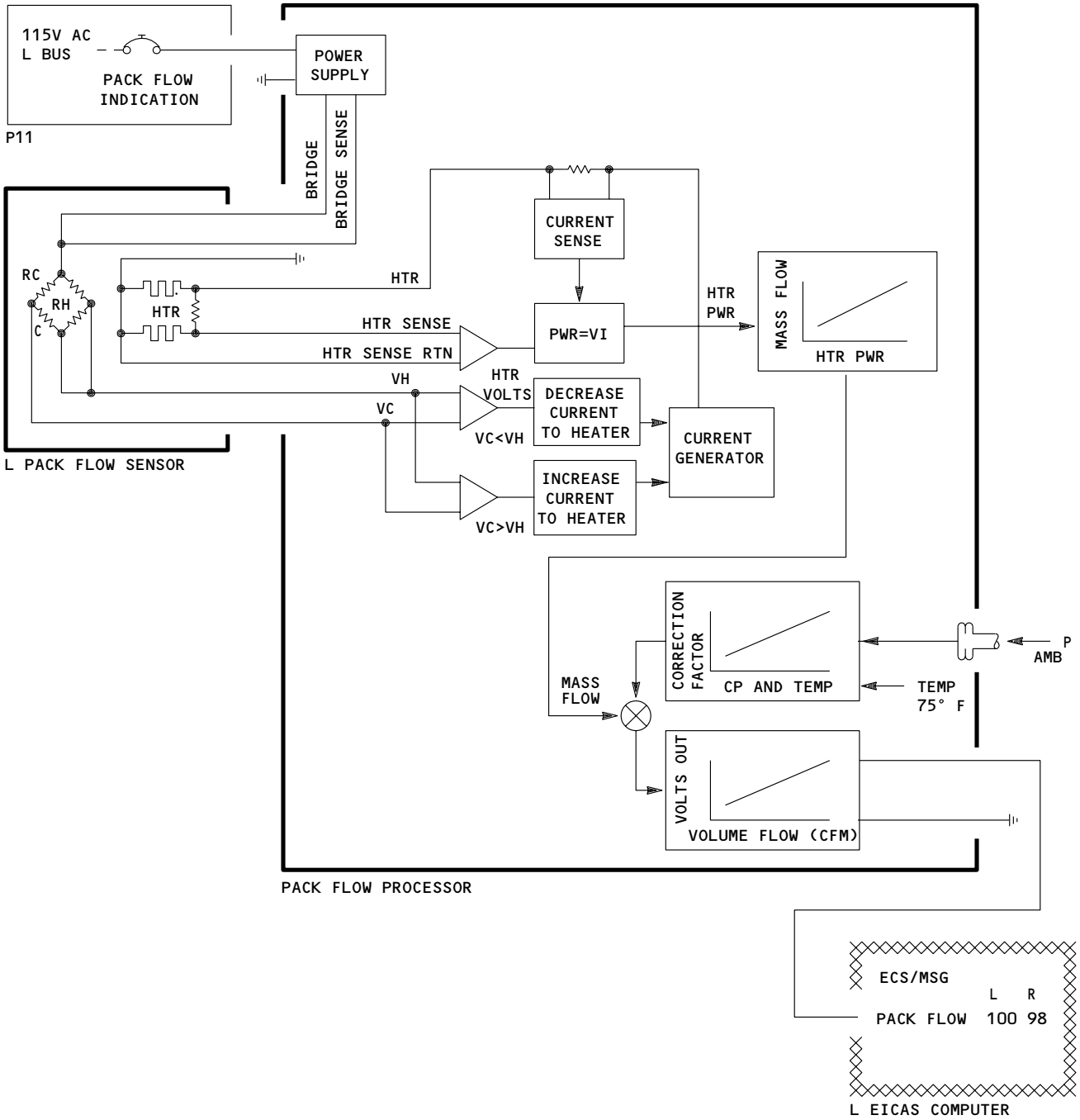
NOTE: LEFT SYSTEM IS SHOWN, RIGHT SYSTEM IS EQUIVALENT EXCEPT THAT RIGHT SYSTEM SENSORS PROVIDE INPUT TO RIGHT EICAS COMPUTER AND INFORMATION FROM BOTH COMPUTERS SHARED THROUGH THE CROSS-TALK BUS.

Pack Temperature Indication Schematic
Figure 4



NOTE: LEFT SYSTEM SHOWN, RIGHT SYSTEM SIMILAR EXCEPT THAT RIGHT SYSTEM SENSORS PROVIDE INPUT TO RIGHT EICAS COMPUTER AND INFORMATION FROM BOTH COMPUTERS SHARED THROUGH THE CROSS-TALK BUS.

Pack Temperature Indication Schematic
Figure 4A



LEFT SYSTEM SHOWN – RIGHT SYSTEM SIMILAR

Pack Flow Indication Schematic
Figure 5

PACK TEMPERATURE INDICATION

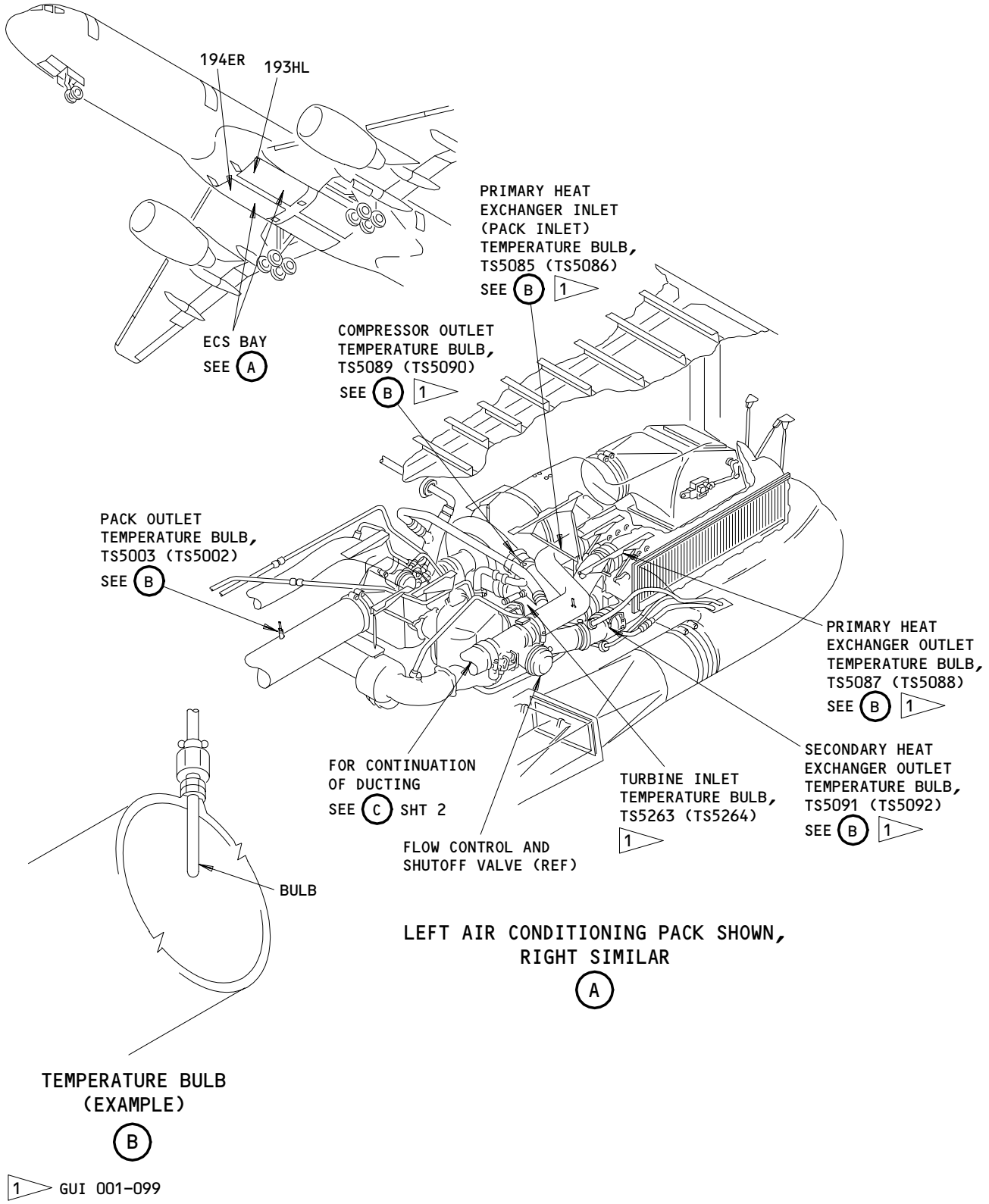
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
BULB - COMPRESSOR OUTLET TEMPERATURE 1				21-52-01
LEFT PACK, TS5089	1	1	193HL	
RIGHT PACK, TS5090		1	194ER	
BULB - PACK OUTLET TEMPERATURE				21-52-06
LEFT PACK, TS5002	1	1	193HL	
RIGHT PACK, TS5003		1	194ER	
BULB - PRIMARY HEAT EXCHANGER INLET (PACK INLET) TEMPERATURE 1				21-52-10
LEFT PACK, TS5085	1	1	193HL	
RIGHT PACK, TS5086		1	194ER	
BULB - PRIMARY HEAT EXCHANGER OUTLET 1				21-52-09
LEFT PACK, TS5087	1	1	193HL	
RIGHT PACK, TS5088		1	194ER	
BULB - SECONDARY HEAT EXCHANGER OUTLET 1				21-52-05
LEFT PACK, TS5091	1	1	193HL	
RIGHT PACK, TS5092		1	194ER	
BULB - TURBINE INLET TEMPERATURE 1				21-52-07
LEFT PACK, TS5263	1	1	193HL	
RIGHT PACK, TS5264		1	194ER	
CIRCUIT BREAKERS	3		FLT COMPT, P11 PANEL	
PACK FLOW IND, C709		1	11M17	*
PROCESSOR - PACK FLOW SENSOR SIGNAL, M916	3	1	119BL, MAIN EQUIP CTR, E4-2	21-52-04
SENSOR - PACK FLOW				21-52-03
LEFT PACK, TS285	2	1	193HL	
RIGHT PACK, TS286	2	1	194ER	

* SEE THE WDM EQUIPMENT LIST

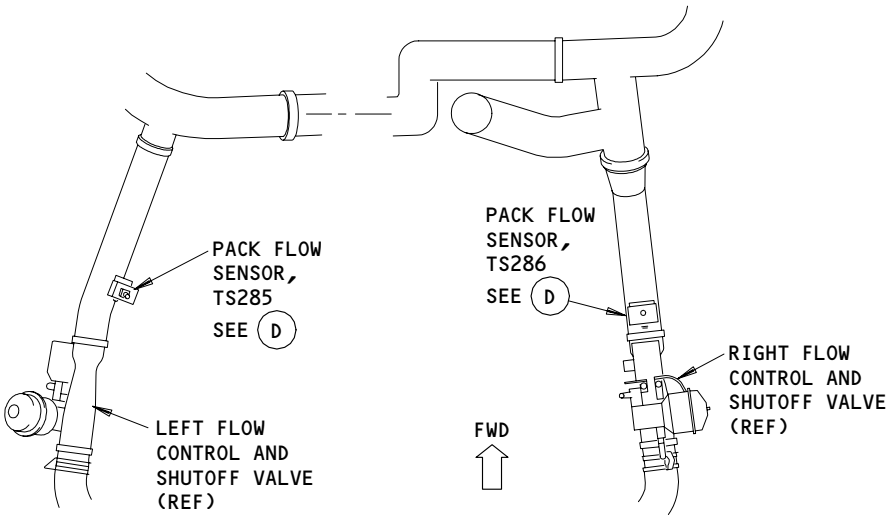
1 GUI 001-099

Pack Temperature Indication - Component Index
Figure 101

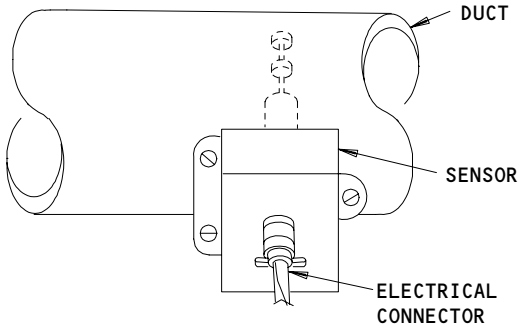
C72131



Pack Temperature Indication - Component Location
Figure 102 (Sheet 1)



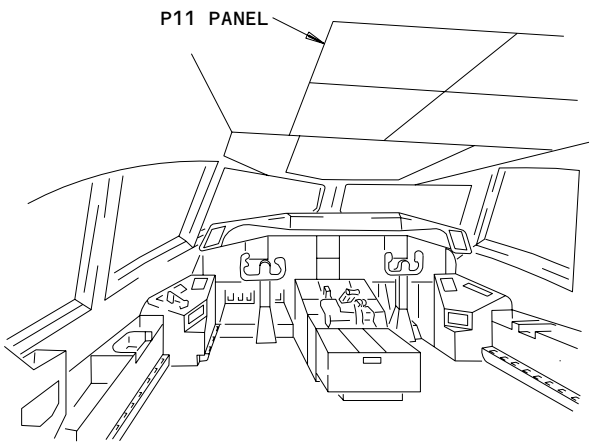
C



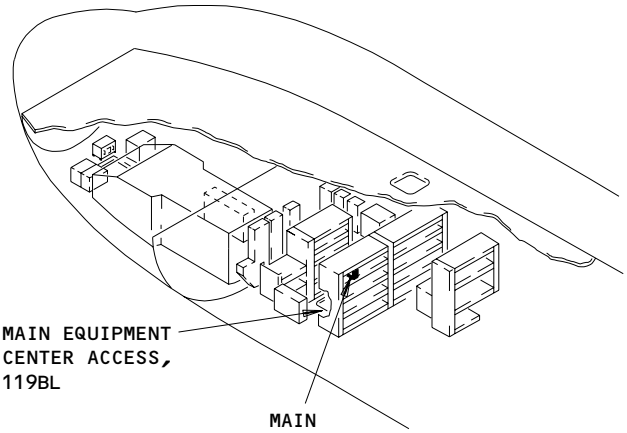
PACK FLOW SENSOR, TS285 (TS286)

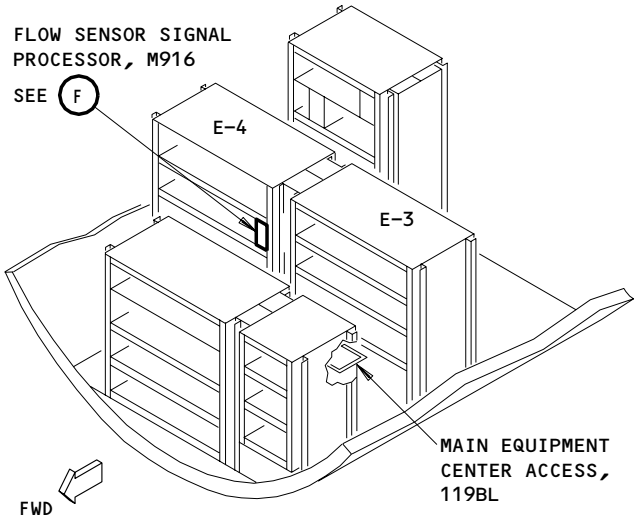
D

Component Location
Figure 102 (Sheet 2)



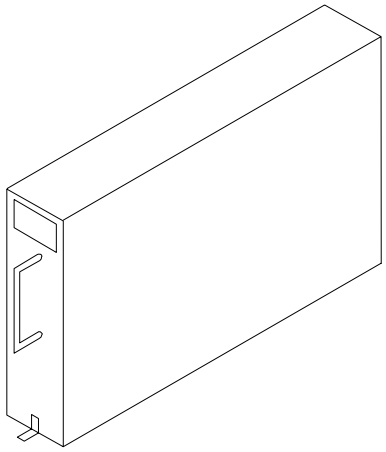
FLIGHT COMPARTMENT





MAIN EQUIPMENT CENTER

(E)



FLOW SENSOR SIGNAL PROCESSOR, M916

(F)

Component Location
Figure 102 (Sheet 3)

COOLING PACK TEMPERATURE INDICATION SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has instructions to do an operational test of the temperature sensors and the flow sensors in the air cooling packs.

TASK 21-52-00-715-001

2. Operational Test - Pack Temperature Indication System (Fig. 501)
   A. References
      (1) AMM 24-22-00/201, Electric Power Control
      (2) AMM 36-00-00/201, Pneumatic - General
   B. Prepare for the Test

S 865-015

      (1) Supply electrical power (AMM 24-22-00/201).

S 865-016

      (2) Make sure these circuit breakers are closed:
         (a) On the overhead circuit breaker panel, P11:
            1) 11A13, AIR COND PACK LEFT AUTO CONT
            2) 11A14, AIR COND PACK LEFT FLOW CONT
            3) 11A28, AIR COND PACK RIGHT AUTO CONT
            4) 11A29, AIR COND PACK RIGHT FLOW CONT
            5) 11M11, LEFT PACK AUTO POWER
            6) AIRPLANES PRE-SB 21-66 (PRE-PRR 54658);
               11M17, PACK FLOW IND
            7) 11M19, RIGHT PACK AUTO POWER

S 865-002

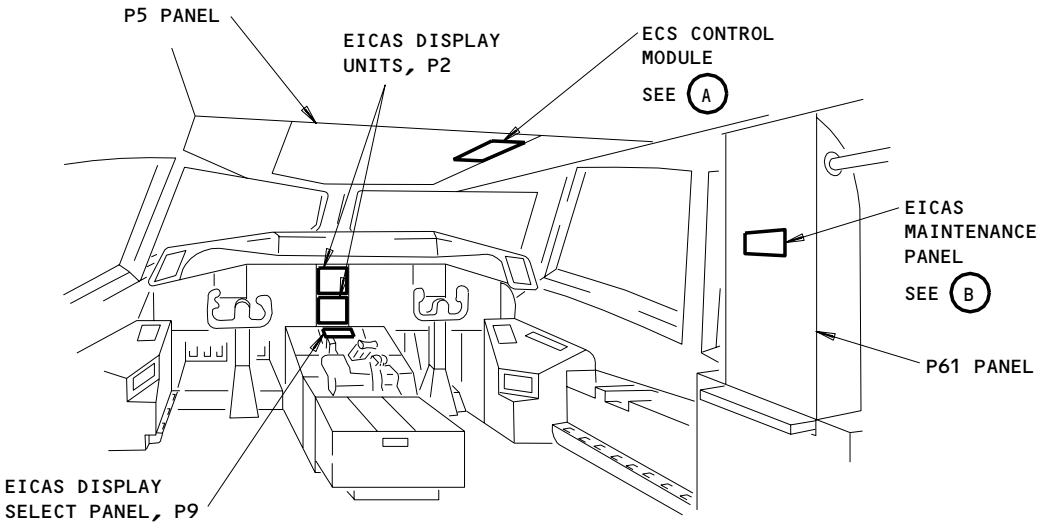
      (3) Turn the L and R PACK selectors, on the pilot's overhead panel, P5, to the OFF position.
         (a) Make sure the PACK OFF light comes on.

S 865-003

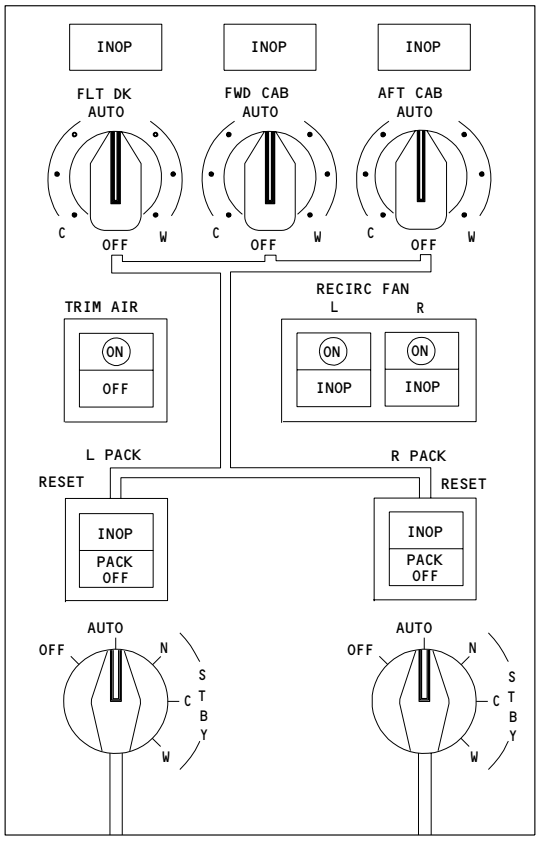
      (4) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.
   C. Do the Test Procedure

S 215-004

      (1) Make sure these temperature indications, on the EICAS display, are approximately the same as the ambient temperature, in degrees Celsius:
         (a) PACK OUT (L & R)

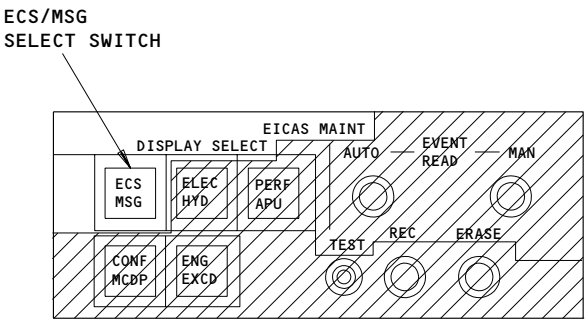


FLIGHT COMPARTMENT



ECS CONTROL MODULE

A



EICAS MAINTENANCE PANEL

B

Pack Indication Test
Figure 501

(b) GUI 001-099;
Temperature Indications:
1) SEC HX OUT (L & R)
2) COMPR OUT (L & R)
3) PRIM HX OUT (L & R)
4) PRIM HX IN (L & R)
5) TURB IN (L & R)

S 865-008
(2) Supply pneumatic power (AMM 36-00-00/201).

S 865-009
(3) Turn the L and R PACK selectors, on the P5 panel, to the AUTO positions.
(a) Make sure the PACK OFF lights go off.

S 215-010
(4) Make sure the L and R PACK FLOW indications, on the EICAS display, increase.

S 215-011
(5) Make sure the temperature indications, on the EICAS display, change.

D. Put the airplane back to its usual condition

S 865-012
(1) Turn the L and R PACK selectors, on the P5 panel, to the OFF positions.

S 865-013
(2) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 865-014
(3) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

COMPRESSOR OUTLET TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the temperature bulb for the compressor outlet. The temperature bulb is installed between the secondary heat exchanger and the air cycle machine (ACM).

TASK 21-52-01-004-001

2. Remove the Compressor Outlet Temperature Bulb (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-23/401, Lockwires
      (3) 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental Control System Bay

      (2) Access Panels
          193HL/194ER ECS Access Door

   C. Prepare for the Removal

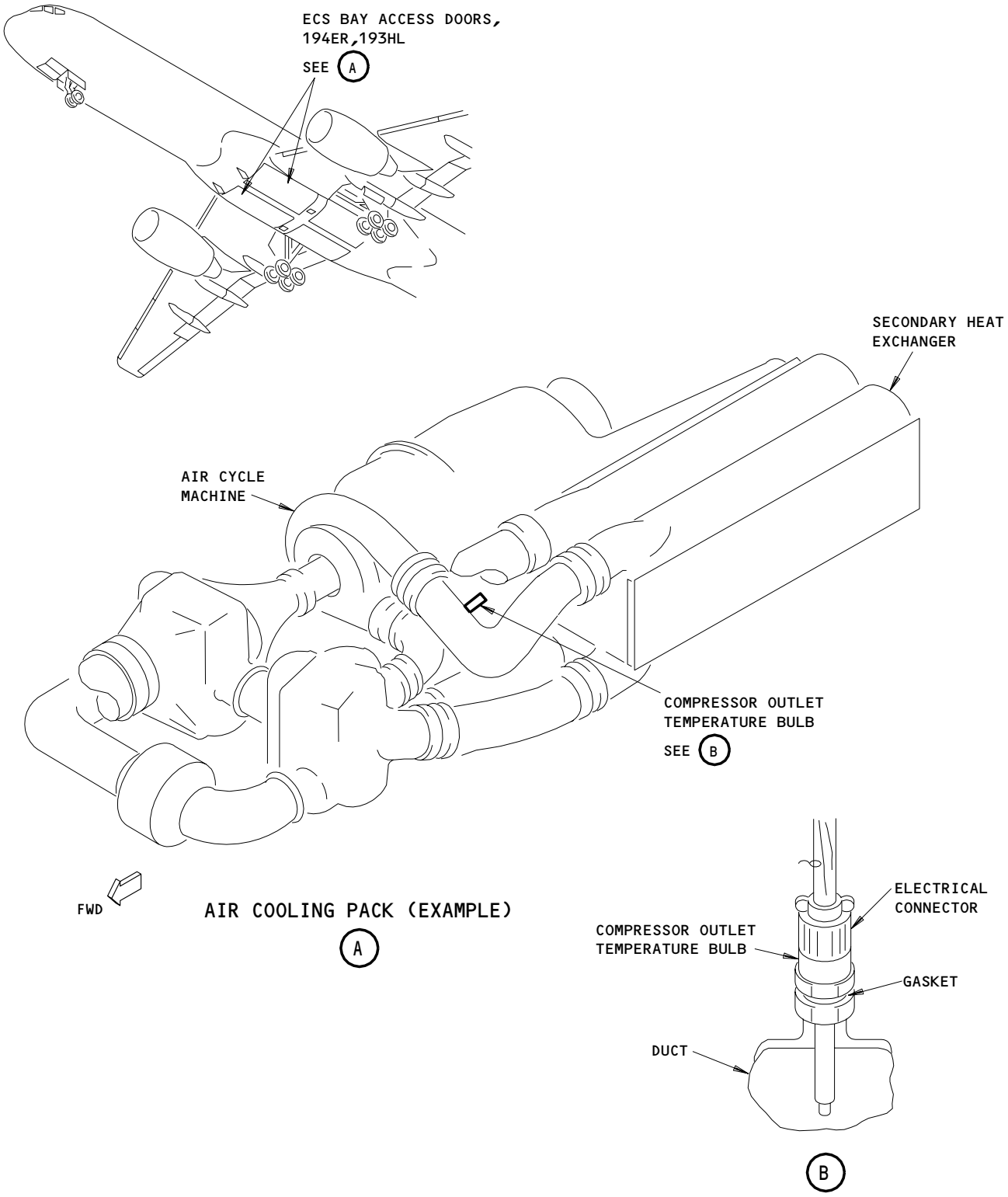
      S 864-021
      (1) Supply electrical power (Ref 24-22-00).

      S 864-022
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure that the PACK OFF light comes on.
          (b) Attach a DO-NOT-OPERATE tag to the selector.

      S 014-023
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Temperature Bulb

      S 034-002
      (1) Disconnect the electrical connector from the temperature bulb.

      S 034-024
      (2) Remove the lockwire that holds the temperature bulb (Ref 20-10-23).



Compressor Outlet Temperature Bulb
Figure 401

42191

S 024-003

CAUTION: USE TWO WRENCHES TO REMOVE THE BULB FROM THE BOSS. IF YOU USE ONLY ONE WRENCH TO REMOVE THE BULB, DAMAGE TO THE DUCT CAN OCCUR.

(3) Use two wrenches to remove the temperature bulb.

NOTE: Use one wrench to hold the boss. Use the other wrench to turn the temperature bulb.

S 034-004

(4) Remove the gasket from the temperature bulb.

S 434-005

(5) Install a plug into the boss.

TASK 21-52-01-404-006

3. Install the Compressor Outlet Temperature Bulb (Fig. 401)

A. Consumable Materials

(1) D00386 Antiseize Compound - MIL-L-23398

(2) D00006 Antiseize Compound - EASE OFF 990 (Optional to MIL-L-23398)

(3) D00006 Antiseize Compound - Never-Seez (Optional to MIL-L-23398).

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels

(2) 20-10-23/401, Lockwires

(3) 24-22-00/201, Electrical Power Control

C. Access

(1) Location Zones

135/136 Environmental Control System Bay

(2) Access Panels

193HL/194ER ECS Access Door

D. Install the Temperature Bulb

S 034-007

(1) Remove the plug from the boss.

S 434-025

(2) Install a new gasket on the temperature bulb.

S 164-008

(3) Clean the mating surfaces of the boss and the temperature bulb, to make sure the bulb has an electrical ground.

S 624-009
(4) Apply a thin layer of the antiseize compound to the threads of the temperature bulb.

S 424-010

CAUTION: USE TWO WRENCHES TO INSTALL THE BULB IN THE BOSS. IF YOU USE ONLY ONE WRENCH TO INSTALL THE BULB, DAMAGE TO THE DUCT CAN OCCUR.

(5) Install the temperature bulb into the boss.
(a) Tighten the bulb to a torque value of 210-240 pound inches.

S 434-012
(6) Install a lockwire on the temperature bulb (Ref 20-10-23).

S 434-013
(7) Install the electrical connector to the temperature bulb.

E. Do the Installation Test for the Temperature Bulb

S 864-020
(1) Make sure the five EICAS circuit breakers, on the overhead circuit breaker panel, P11, are closed.

S 864-019
(2) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 214-018
(3) Make sure the applicable (L or R) COMPR OUT indication, on the bottom EICAS display, shows approximately the same as the ambient temperature.

F. Put the airplane back to its usual condition

S 414-017
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-016
(2) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-015
(3) Remove electrical power, if it is not necessary (Ref 24-22-00).

PACK FLOW SENSOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the pack flow sensor. The sensors are installed as follows:
      (1) GUI 001-008, 115;
      (2) GUI 009-099;
      The flow sensor for the right pack is approximately four inches upstream of the flow control and shutoff valve. The flow sensor for the left pack is approximately twenty eight inches upstream of the flow control and shutoff valve.

TASK 21-52-03-004-001

2. Remove the Pack Flow Sensor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power Control
      (3) 36-00-00/201, Pneumatic - General
   B. Access
      (1) Location Zones
          135/136 Environmental Control System Bay

      (2) Access Panels
          193HL/194ER ECS Access Door

   C. Prepare for the Removal

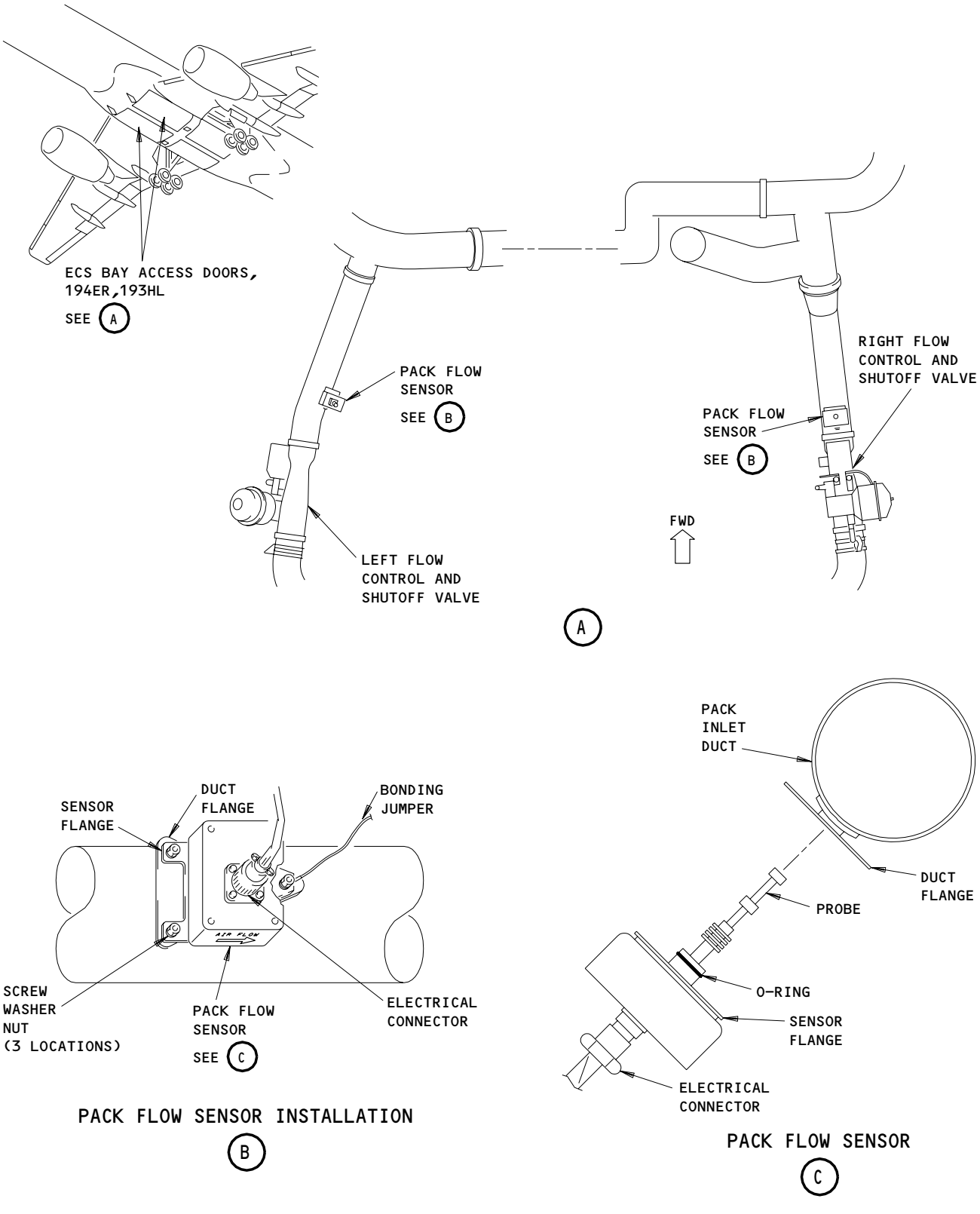
      S 864-002
      (1) Supply the electrical power (Ref 24-22-00).

      S 864-003
      (2) Remove the pneumatic power (AMM 36-00-00/201).

      S 864-004
      (3) Open and attach a DO-NOT-CLOSE tag to this circuit breaker, on the overhead circuit breaker panel, P11:
          (a) 11M17, PACK FLOW IND

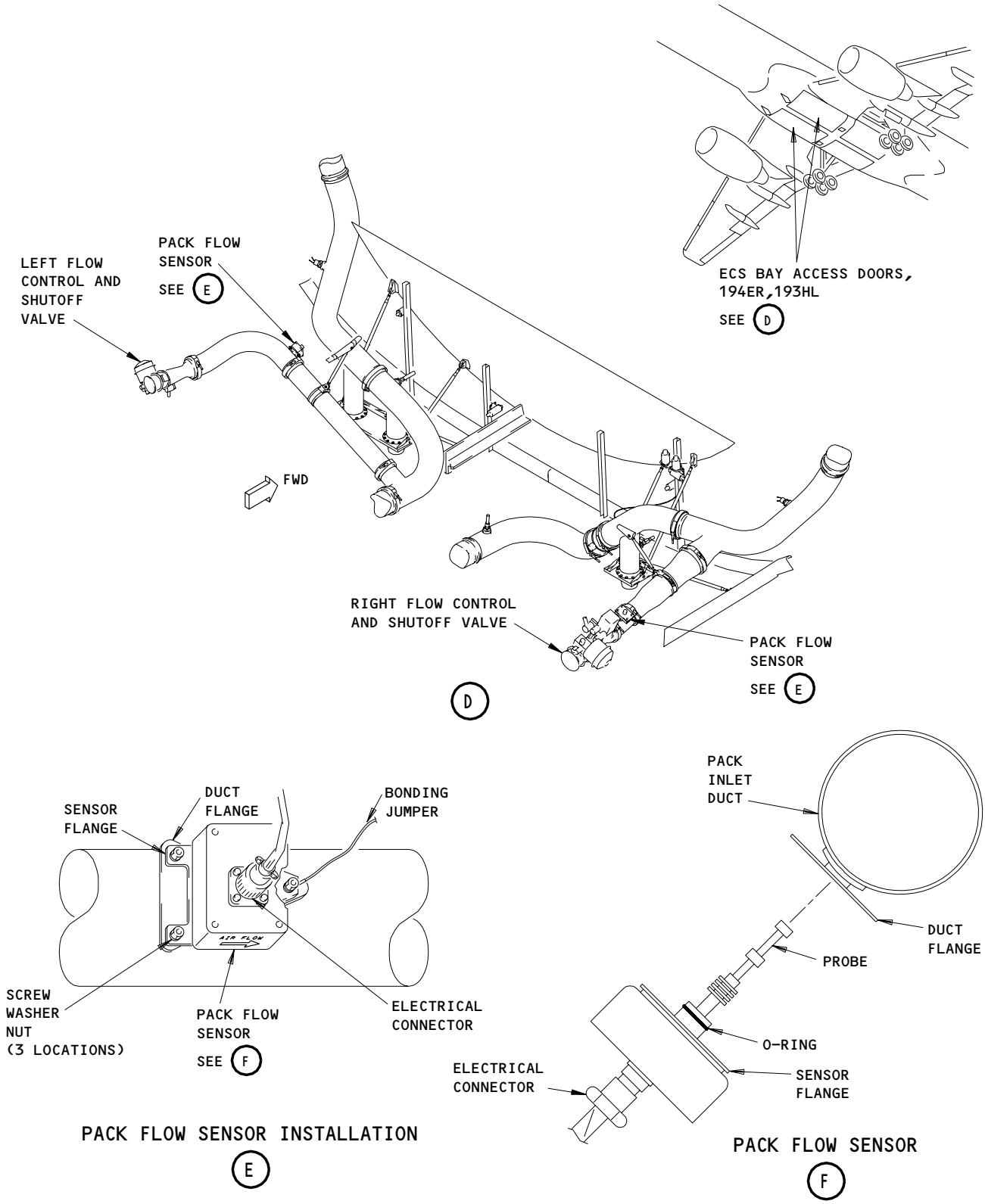
      S 014-005
      (4) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Sensor

      S 034-006
      (1) Disconnect the electrical connector from the sensor.



Pack Flow Sensor Installation
Figure 401 (Sheet 1)

C33643



Pack Flow Sensor Installation
Figure 401 (Sheet 2)

C33619

S 034-007
(2) Remove the screws, nuts, and washers that hold the sensor to the support bracket.

S 024-008
(3) Remove the pack flow sensor.

TASK 21-52-03-404-009

3. Install the Pack Flow Sensor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 36-00-00/201, Pneumatic - General
   B. Access
      (1) Location Zones
          135/136 Environmental Control System Bay

      (2) Access Panels
          193HL/194ER ECS Access Door

   C. Install the Sensor

      S 434-010
      (1) Put the sensor into its position on the duct.

      S 434-011
      (2) Install the screws, washers and nuts that hold the sensor to the support bracket.

      S 434-012
      (3) Connect the electrical connector to the sensor.
   D. Do the Installation Test for the Pack Flow Sensor

      S 864-013
      (1) Remove the DO-NOT-CLOSE tag and close this circuit breaker, on the P11 panel:
      (a) 11M17, PACK FLOW IND

      S 864-014
      (2) Supply the pneumatic power (AMM 36-00-00/201).

      S 864-015
      (3) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the AUTO position.
      (a) Make sure the PACK OFF light goes off.

      S 864-017
      (4) Make sure the five EICAS circuit breakers, on the P11 panel, are closed.

S 864-018
(5) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 214-019
(6) Make sure the applicable (L or R) PACK FLOW indication, on the bottom EICAS display, shows a positive flow rate.

E. Put the airplane back to its usual condition

S 864-020
(1) Turn the applicable (L or R) PACK selector, on the P5 panel, to OFF.
(a) Make sure the PACK OFF light comes on.

S 414-022
(2) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-023
(3) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 864-024
(4) Remove the electrical power, if it is not necessary (Ref 24-22-00).

FLOW SENSOR SIGNAL PROCESSOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the signal processor for the pack flow sensor. The signal processor (M916) is installed on the E4-2 shelf of the main equipment center.

TASK 21-52-04-004-001

2. Remove the Flow Sensor Signal Processor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zones
          119/120 Main equipment center

      (2) Access Panels
          119BL Main equipment center access door

   C. Prepare for the Removal

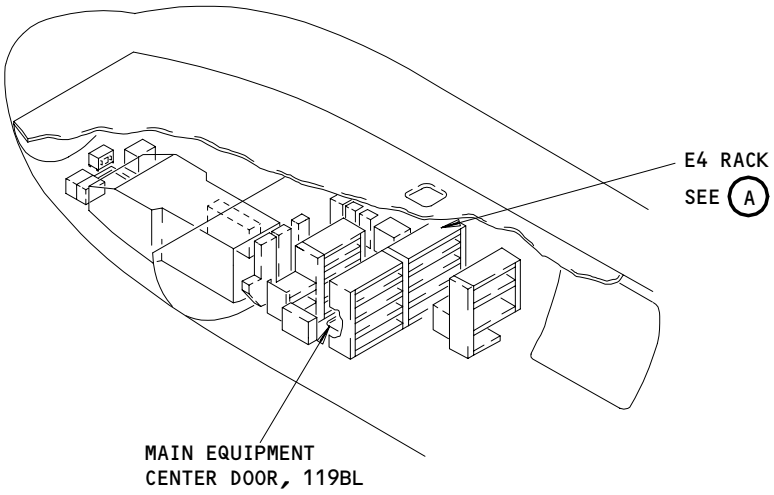
      S 864-002
      (1) Open and attach a DO-NOT-CLOSE tag to this circuit breaker, on the overhead circuit breaker panel, P11:
          (a) 11M17, PACK FLOW IND

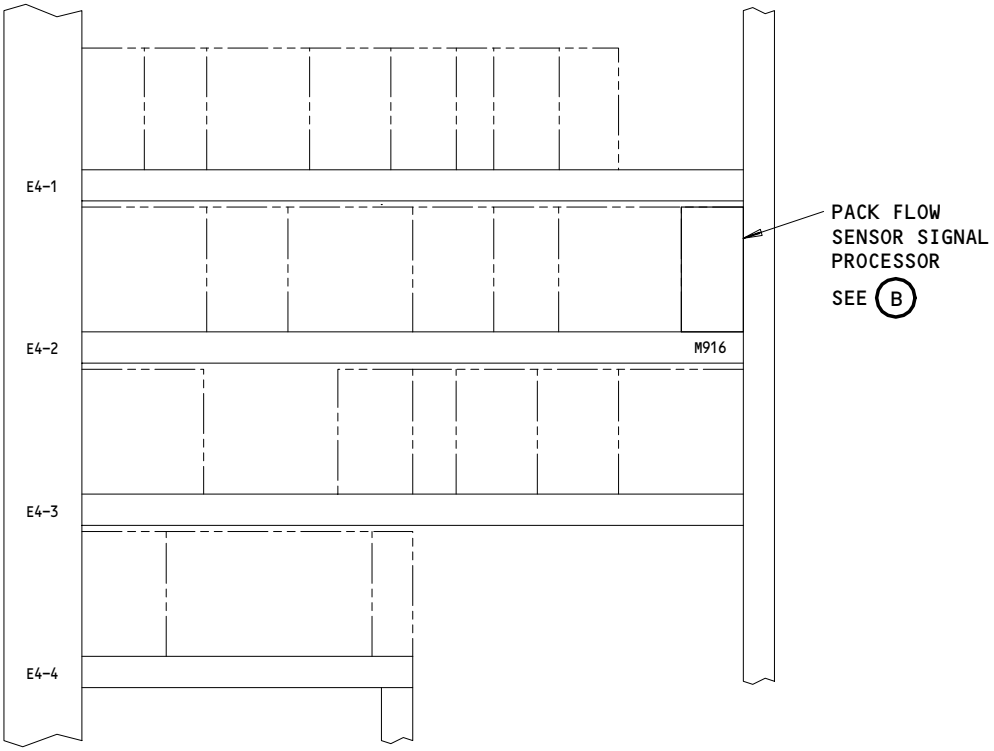
      S 014-003
      (2) Open the access door for the main equipment center, 119BL (Ref 06-41-00).
   D. Remove the Processor

      S 024-004
      (1) Remove the flow signal processor (Ref 20-10-01).

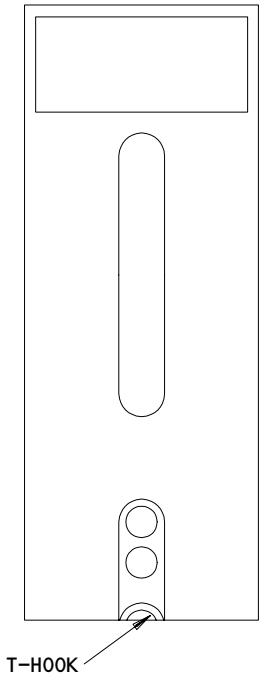
TASK 21-52-04-404-005

3. Install the Flow Sensor Signal Processor (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-01/401, E/E Rack Mounted Components





E4 RACK
(VIEW IN THE AFT DIRECTION)
A



SIGNAL PROCESSOR
B

Pack Flow Sensor Signal Processor Installation
Figure 401

(3) 24-22-00/201, Electrical Power Control
(4) 36-00-00/201, Pneumatic - General

B. Access
(1) Location Zones
119/120 Main equipment center

(2) Access Panels
119BL Main equipment center access door

C. Install the Processor

S 424-006
(1) Install the flow signal processor (Ref 20-10-01).

D. Do the Installation Test for the Processor

S 864-007
(1) Remove the DO-NOT-CLOSE tag and close this circuit breaker, on the P11 panel:
(a) 11M17, PACK FLOW IND

S 864-009
(2) Supply the electrical power (Ref 24-22-00).

S 864-013
(3) Supply the pneumatic power (AMM 36-00-00/201).

S 864-015
(4) Turn the L and R PACK selectors, on the pilot's overhead P5 panel, to the AUTO position.
(a) Make sure the PACK OFF lights go off.

S 864-016
(5) Make sure the five EICAS circuit breakers, on the P11 panel, are closed.

S 864-017
(6) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 214-018
(7) Make sure the L and R PACK FLOW indications, on the bottom EICAS display, are positive and approximately the same.

S 864-019
(8) Turn the L and R PACK selectors, on the P5 panel, to the OFF positions.
(a) Make sure the PACK OFF lights come on.

S 214-020
(9) Make sure the L and R PACK FLOW indications, on the bottom EICAS display, decrease to zero.

E. Put the Airplane Back to Its Usual Condition

S 414-014
(1) Close the access door for the main equipment center, 119BL (Ref 06-41-00).

S 864-010
(2) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 864-012
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

SECONDARY HEAT EXCHANGER OUTLET TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the temperature bulb at the secondary heat exchanger outlet of each air cooling pack. The temperature bulb is installed between the secondary heat exchanger outlet and the split-duct water separator.

TASK 21-52-05-004-001

2. Remove the Secondary Heat Exchanger Outlet Temperature Bulb (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-23/401, Lockwires
      (3) 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   C. Prepare for the Removal

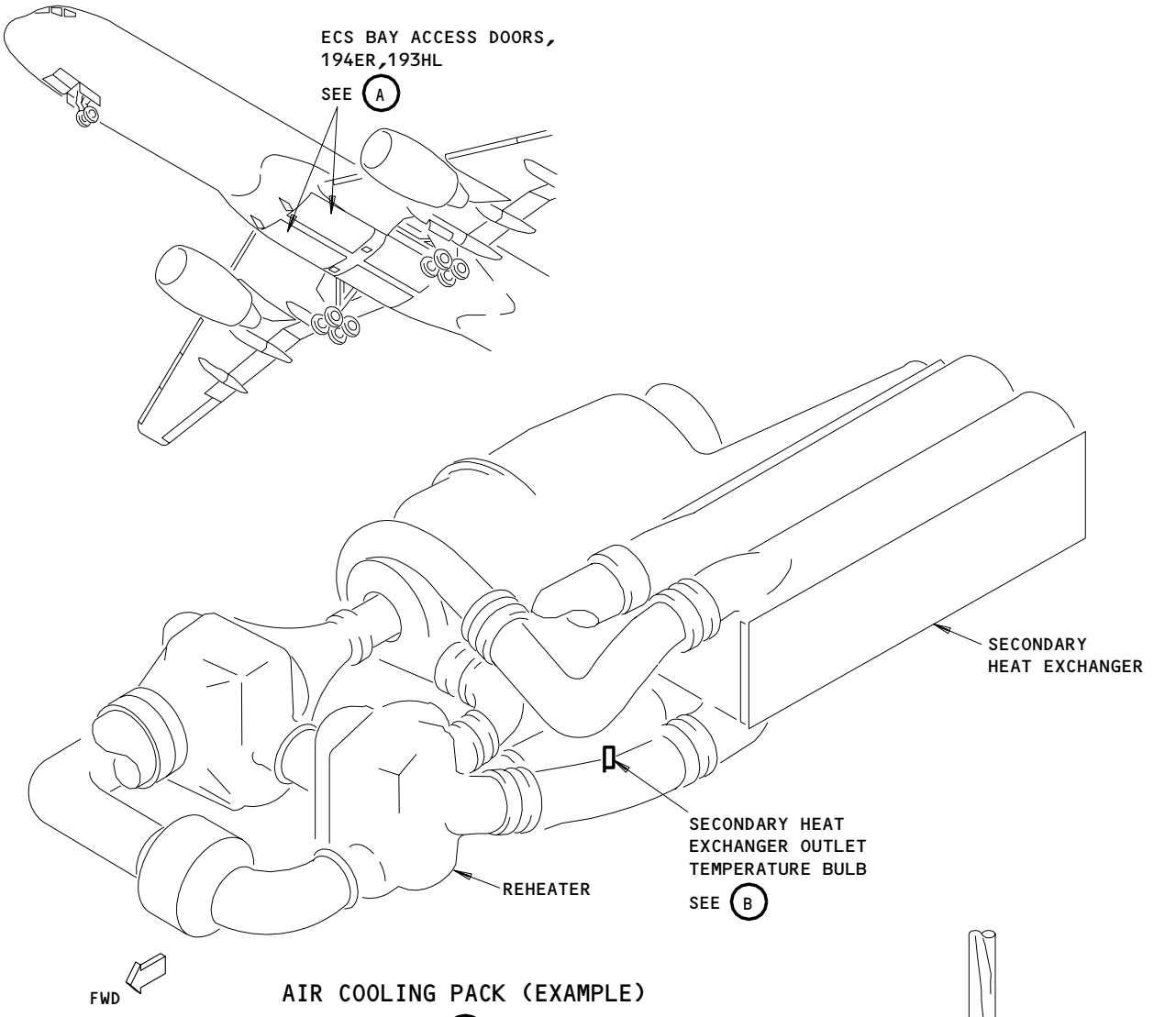
      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 014-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Temperature Bulb

      S 034-005
      (1) Disconnect the electrical connector from the temperature bulb.

      S 034-006
      (2) Remove the lockwire that holds the temperature bulb (Ref 20-10-23).



Secondary Heat Exchanger Outlet Temperature Bulb Installation
Figure 401

42363

S 024-007

CAUTION: USE TWO WRENCHES TO REMOVE THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO REMOVE THE TEMPERATURE BULB, YOU COULD CAUSE DAMAGE TO THE DUCT.

(3) Use two wrenches to remove the temperature bulb.

NOTE: Use one wrench to hold the boss. Use the other wrench to turn the temperature bulb.

S 034-008

(4) Remove the gasket from the temperature bulb.

S 434-009

(5) Install a plug into the boss.

TASK 21-52-05-404-010

3. Install the Secondary Heat Exchanger Outlet Temperature Bulb (Fig. 401)

A. Consumable Materials

(1) D00386 - Antiseize Compound, MIL-L-23398

(2) D00006 - Antiseize Compound, EASE-OFF 990
(Optional to MIL-L-23398)

(3) D00006 Antiseize Compound - Never-Seez
(Optional to MIL-L-23398).

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels

(2) 20-10-23/401, Lockwires

(3) 24-22-00/201, Electrical Power Control

C. Access

(1) Location Zones
135/136 Environmental control systems (ECS) bay

(2) Access Panels
193HL/194ER Environmental control systems access door

D. Install the Temperature Bulb

S 034-011

(1) Remove the plug from the boss.

S 434-012

(2) Install a new gasket on the temperature bulb.

S 164-013

(3) Clean the mating surfaces of the boss and the temperature bulb, to make sure the bulb has an electrical ground.

S 644-014

(4) Apply a thin layer of the antiseize compound to the threads of the temperature bulb.

S 424-015

CAUTION: USE TWO WRENCHES TO INSTALL THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO INSTALL THE TEMPERATURE BULB, YOU COULD CAUSE DAMAGE TO THE DUCT.

(5) Install the temperature bulb into the boss.
(a) Tighten the bulb to a torque value of 210-240 pound inches.

S 434-016
(6) Put a lockwire on the temperature bulb (Ref 20-10-23).

S 434-017
(7) Connect the electrical connector to the temperature bulb.

E. Do the Installation test for the Temperature Bulb

S 864-018
(1) Make sure the five (5) EICAS circuit breakers, on the overhead circuit breaker panel, P11, are closed.

S 864-019
(2) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 214-020
(3) Make sure the applicable (L or R) SEC HX OUT indication, on the bottom EICAS display, shows approximately the same as the ambient temperature.

F. Put the airplane back to its usual condition

S 414-021
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-022
(2) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-023
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

PACK OUTLET TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the temperature bulb at the pack outlet of each air cooling pack. The temperature bulb is installed forward of the condenser.

TASK 21-52-06-004-001

2. Remove the Pack Outlet Temperature Bulb (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 014-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Temperature Bulb

      S 034-005
      (1) Disconnect the electrical connector from the temperature bulb.

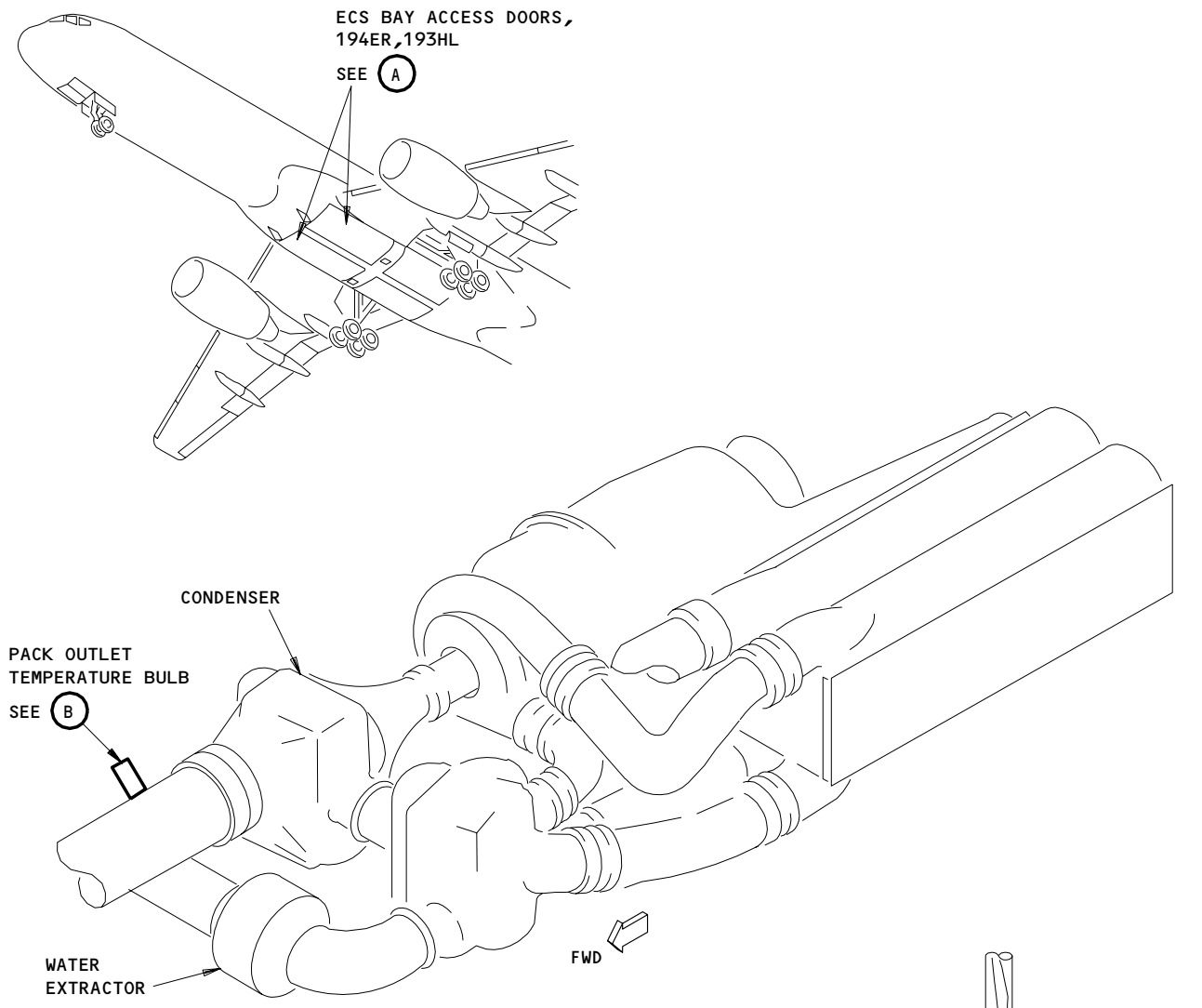
      S 034-006
      (2) Remove the lockwire that holds the temperature bulb (Ref 20-10-23).

      S 024-007

      CAUTION: USE TWO WRENCHES TO REMOVE THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO REMOVE THE TEMPERATURE BULB, DAMAGE TO THE DUCT CAN OCCUR.

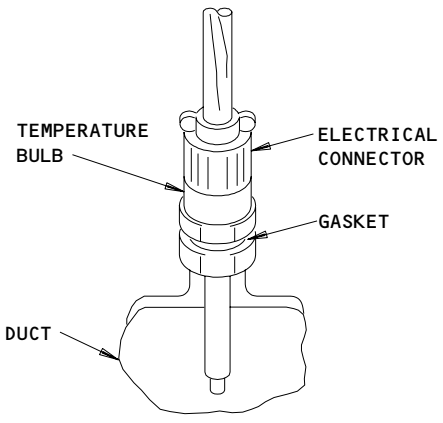
      (3) Use two wrenches to remove the temperature bulb.

          NOTE: Use one wrench to hold the boss. Use the other wrench to turn the temperature bulb.



AIR COOLING PACK (EXAMPLE)

A



PACK OUTLET
TEMPERATURE BULB

B

Pack Outlet Temperature Bulb Installation
Figure 401

S 034-008
(4) Remove the gasket from the temperature bulb.

S 434-009
(5) Install a plug into the boss.

TASK 21-52-06-404-010

3. Install the Pack Outlet Temperature Bulb (Fig. 401)
   A. Consumable Materials
      (1) D00386 - Antiseize Compound, MIL-L-23398
      (2) D00006 - Antiseize Compound, EASE-OFF 990
          (Optional to MIL-L-23398)
      (3) D00006 - Antiseize Compound - Never-Seez
          (Optional to MIL-L-23398).
   B. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electrical Power Control
   C. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   D. Install the Temperature Bulb

S 034-011
(1) Remove the plug from the boss.

S 434-012
(2) Install a new gasket on the temperature bulb.

S 164-013
(3) Clean the mating surfaces of the boss and the temperature bulb, to make sure the bulb has an electrical ground.

S 644-014
(4) Apply a thin layer of the antiseize compound to the threads of the temperature bulb.

S 424-015

CAUTION: USE TWO WRENCHES TO INSTALL THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO INSTALL THE TEMPERATURE BULB, DAMAGE TO THE DUCT CAN OCCUR.

(5) Install the temperature bulb into the boss.
   (a) Tighten the hexnut on the bulb to a torque value of 210-240 pound inches.

S 434-016
(6) Install a lockwire on the temperature bulb.

S 434-017
(7) Connect the electrical connector to the temperature bulb.

E. Do the Installation test for the Temperature Bulb

S 864-018
(1) Make sure the five EICAS circuit breakers, on the overhead circuit breaker panel, P11, are closed.

S 864-019
(2) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 214-020
(3) Make sure the applicable (L or R) PACK OUT indication, on the bottom EICAS display, shows approximately the same as the ambient temperature.

F. Put the airplane back to its usual condition

S 414-021
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-022
(2) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-023
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

TURBINE INLET TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the temperature bulb at the turbine inlet of each air cooling pack. The temperature bulb is installed between the reheater and the air cycle machine (ACM).

TASK 21-52-07-004-001

2. Remove the Turbine Inlet Temperature Bulb (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-23/401, Lockwires
      (3) 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 014-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Temperature Bulb

      S 034-005
      (1) Disconnect the electrical connector from the temperature bulb.

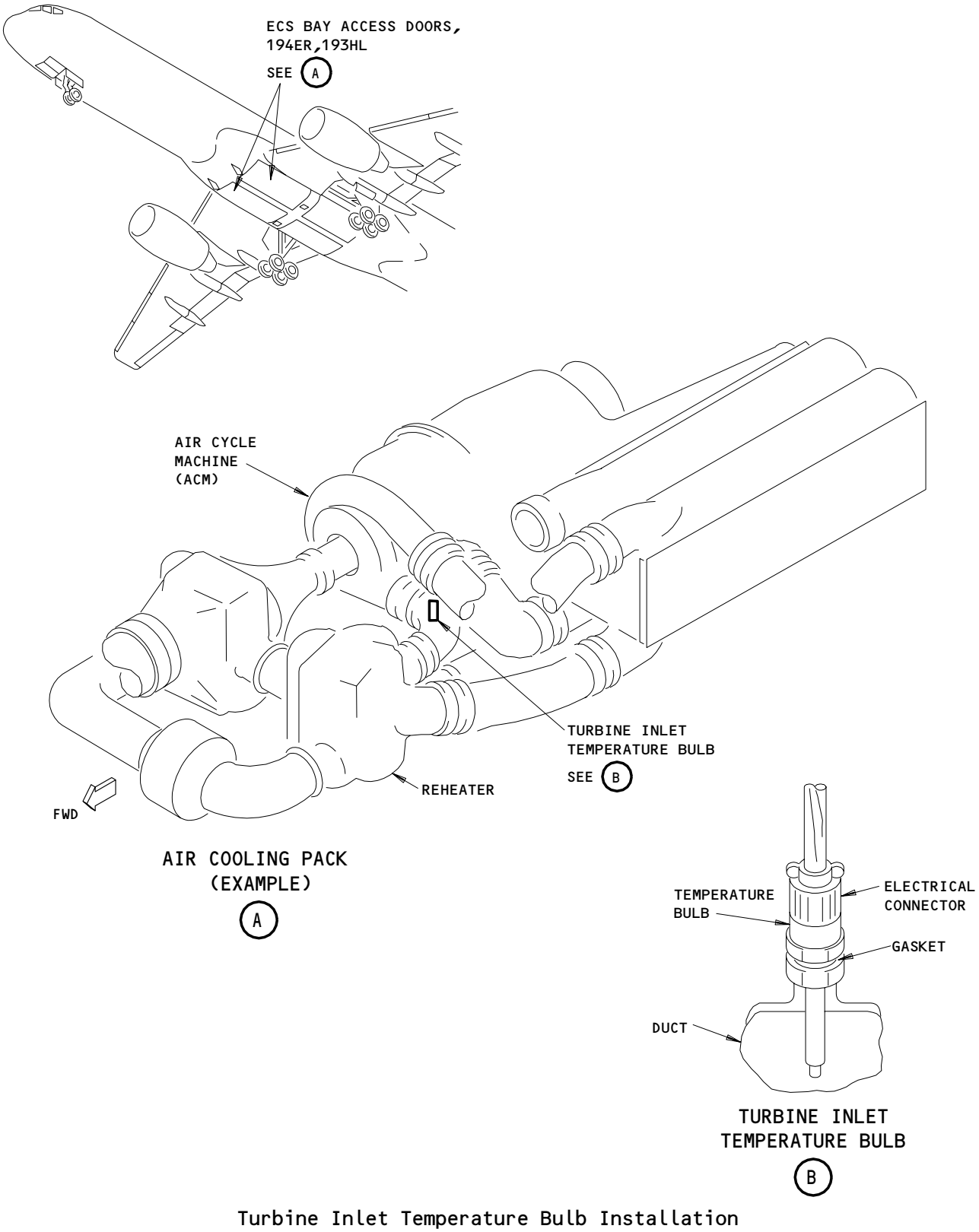
      S 034-006
      (2) Remove the lockwire that holds the temperature bulb (Ref 20-10-23).

      S 024-007

      CAUTION: USE TWO WRENCHES TO REMOVE THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO REMOVE THE TEMPERATURE BULB, YOU COULD CAUSE DAMAGE TO THE DUCT.

      (3) Use two wrenches to remove the temperature bulb.

          NOTE: Use one wrench to hold the boss. Use the other wrench to turn the temperature bulb.



Turbine Inlet Temperature Bulb Installation
Figure 401

S 034-008
(4) Remove the gasket from the temperature bulb.

S 434-009
(5) Install a plug into the boss.

TASK 21-52-07-404-010

3. Install the Turbine Inlet Temperature Bulb (Fig. 401)
   A. Consumable Materials
      (1) D00386 - Antiseize Compound, MIL-L-23398
      (2) D00006 - Antiseize Compound, EASE-OFF 990
          (Optional to MIL-L-23398)
      (3) D00006 - Antiseize Compound - Never-Seez
          (Optional to MIL-L-23398).
   B. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-23/401, Lockwires
      (3) 24-22-00/201, Electrical Power Control
   C. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   D. Install the Temperature Bulb

S 034-011
(1) Remove the plug from the boss.

S 434-012
(2) Install a new gasket on the temperature bulb.

S 164-013
(3) Clean the mating surfaces of the boss and the temperature bulb, to make sure the bulb has an electrical ground.

S 644-018
(4) Apply a thin layer of the antiseize compound to the threads of the temperature bulb.

S 424-019

CAUTION: USE TWO WRENCHES TO INSTALL THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO INSTALL THE TEMPERATURE BULB, YOU COULD CAUSE DAMAGE TO THE DUCT.

(5) Install the temperature bulb into the boss.
   (a) Tighten the hexnut on the bulb to a torque value of 210-240 pound inches.

S 434-020
(6) Put a lockwire on the temperature bulb (Ref 20-10-23).

S 434-017
(7) Connect the electrical connector to the temperature bulb.

E. Do the Installation test for the Temperature Bulb

S 864-021
(1) Make sure the five (5) EICAS circuit breakers, on the overhead circuit breaker panel, P11, are closed.

S 864-022
(2) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 214-023
(3) Make sure the applicable (L or R) TURB IN indication, on the bottom EICAS display, shows approximately the same as the ambient temperature.

F. Put the airplane back to its usual condition

S 414-024
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-025
(2) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-026
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

PRIMARY HEAT EXCHANGER OUTLET TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the temperature bulb at the primary heat exchanger outlet of each air cooling pack. The temperature bulb is installed between the primary heat exchanger and the air cycle machine (ACM).

   TASK 21-52-09-004-001

2. Remove the Primary Heat Exchanger Outlet Temperature Bulb (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-23/401, Lockwires
      (3) 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   C. Prepare for the Removal

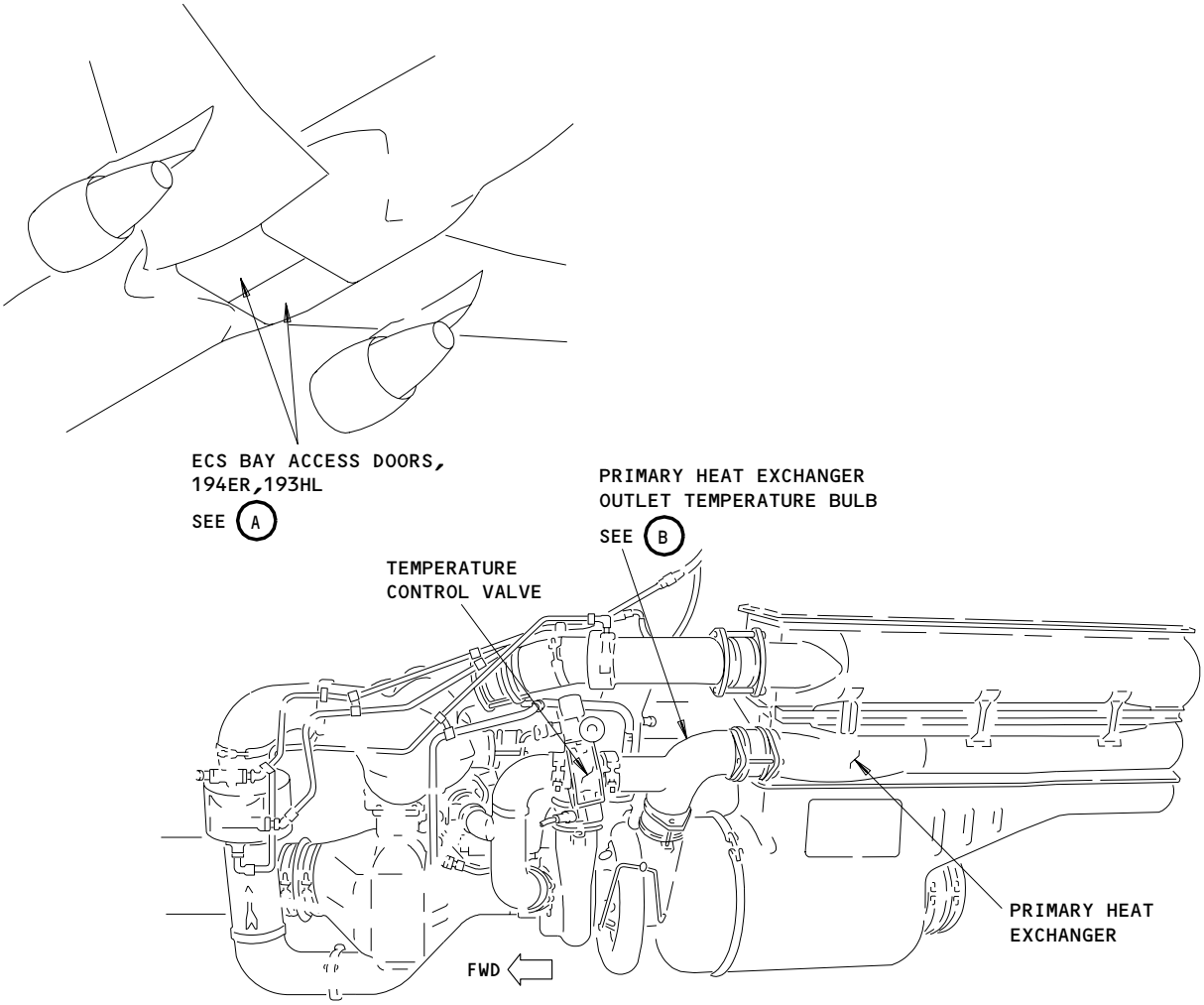
      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 014-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Temperature Bulb

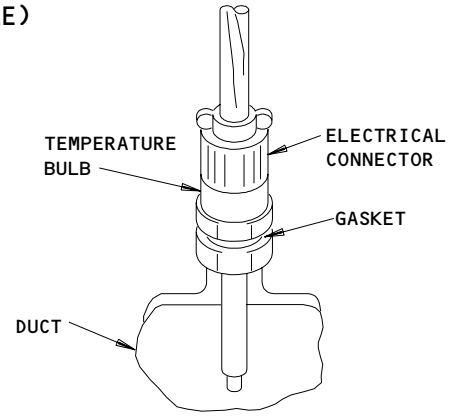
      S 034-005
      (1) Disconnect the electrical connector from the temperature bulb.

      S 034-006
      (2) Remove the lockwire that holds the temperature bulb (Ref 20-10-23).



AIR COOLING PACK (EXAMPLE)

A



PRIMARY HEAT EXCHANGER
OUTLET TEMPERATURE BULB

B

Primary Heat Exchanger Outlet Temperature Bulb
Figure 401

S 024-007

CAUTION: USE TWO WRENCHES TO REMOVE THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO REMOVE THE TEMPERATURE BULB, YOU COULD CAUSE DAMAGE TO THE DUCT.

(3) Use two wrenches to remove the temperature bulb.

NOTE: Use one wrench to hold the boss. Use the other wrench to turn the temperature bulb.

S 034-008

(4) Remove the gasket from the temperature bulb.

S 434-009

(5) Install a plug into the boss.

TASK 21-52-09-404-010

3. Install the Primary Heat Exchanger Outlet Temperature Bulb (Fig. 401)

A. Consumable Materials

(1) D00386 - Antiseize Compound, MIL-L-23398

(2) D00006 - Antiseize Compound, EASE-OFF 990
(Optional to MIL-L-23398)

(3) D00006 - Antiseize Compound - Never-Seez
(Optional to MIL-L-23398).

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels

(2) 20-10-23/401, Lockwires

(3) 24-22-00/201, Electrical Power Control

C. Access

(1) Location Zones
135/136 Environmental control systems (ECS) bay

(2) Access Panels
193HL/194ER Environmental control systems access door

D. Install the Temperature Bulb

S 034-011

(1) Remove the plug from the boss.

S 434-012

(2) Install a new gasket on the temperature bulb.

S 164-014

(3) Clean the mating surfaces of the boss and the temperature bulb, to make sure the bulb has an electrical ground.

S 644-016

(4) Apply a thin layer of the antiseize compound to the threads of the temperature bulb.

S 424-017

CAUTION: USE TWO WRENCHES TO INSTALL THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO INSTALL THE TEMPERATURE BULB, YOU COULD CAUSE DAMAGE TO THE DUCT.

(5) Install the temperature bulb into the boss.
  (a) Tighten the hexnut on the bulb to a torque value of 210-240 pound inches.

S 434-018
(6) Put a lockwire on the temperature bulb (Ref 20-10-23).

S 434-019
(7) Connect the electrical connector to the temperature bulb.

E. Do the Installation test for the Temperature Bulb

S 864-020
(1) Make sure the five (5) EICAS circuit breakers, on the overhead circuit breaker panel, P11, are closed.

S 864-021
(2) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 214-022
(3) Make sure the applicable (L or R) PRIM HX OUT indication, on the bottom EICAS display, shows approximately the same as the ambient temperature.

F. Put the airplane back to its usual condition

S 414-023
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-024
(2) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-025
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

PRIMARY HEAT EXCHANGER INLET (PACK INLET) TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the temperature bulb at the primary heat exchanger inlet of each air cooling pack. The temperature bulb is installed between the primary heat exchanger and the flow control and shutoff valve.

TASK 21-52-10-004-001

2. Remove the Primary Heat Exchanger Inlet Temperature Bulb (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-23/401, Lockwires
      (3) 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   C. Prepare for the Removal

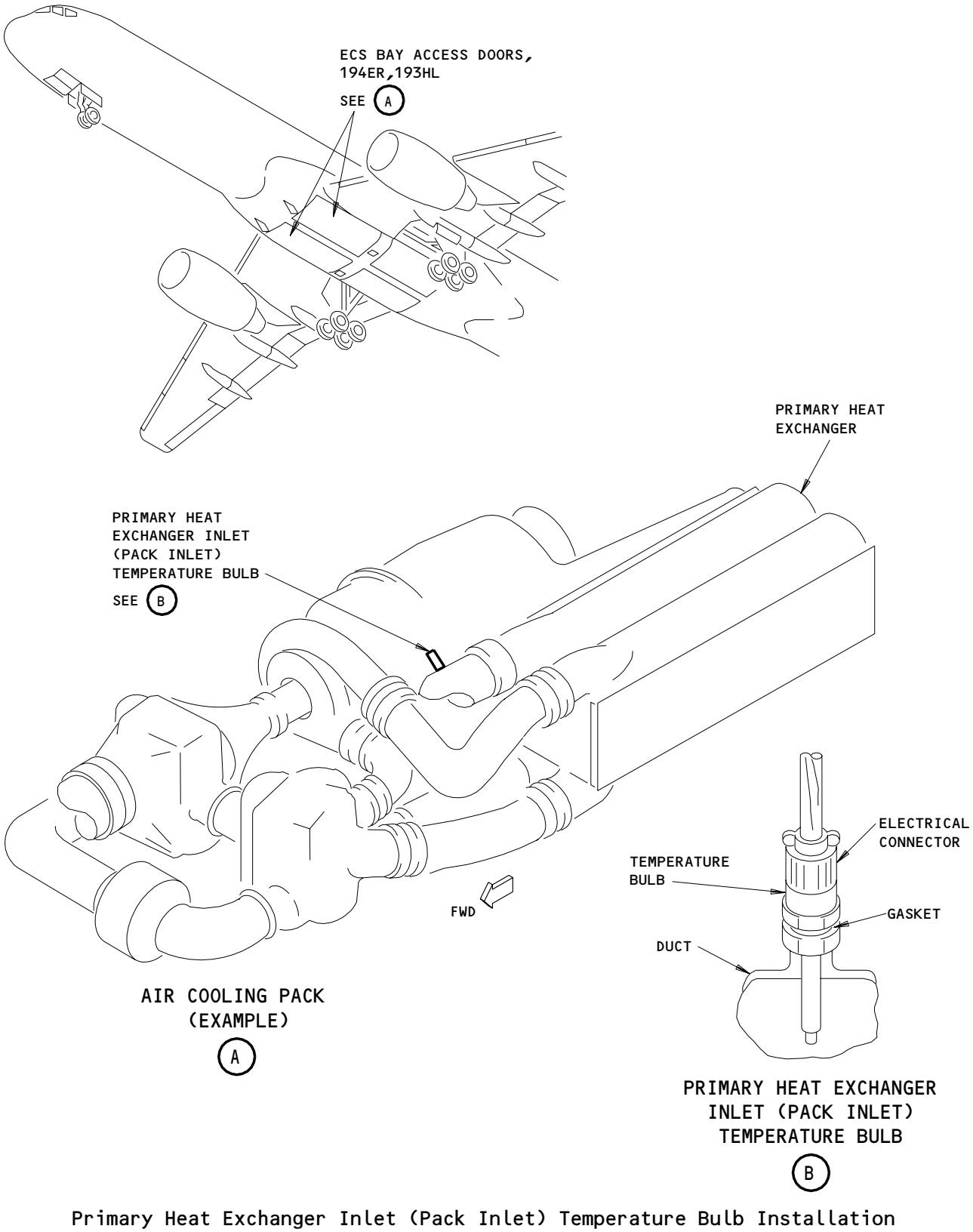
      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 014-004
      (3) Open the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).
   D. Remove the Temperature Bulb

      S 034-005
      (1) Disconnect the electrical connector from the temperature bulb.

      S 034-006
      (2) Remove the lockwire that holds the temperature bulb (Ref 20-10-23).



Primary Heat Exchanger Inlet (Pack Inlet) Temperature Bulb Installation
Figure 401

S 024-007

CAUTION: USE TWO WRENCHES TO REMOVE THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO REMOVE THE TEMPERATURE BULB, YOU COULD CAUSE DAMAGE TO THE DUCT.

(3) Use two wrenches to remove the temperature bulb.

NOTE: Use one wrench to hold the boss. Use the other wrench to turn the temperature bulb.

S 034-008

(4) Remove the gasket from the temperature bulb.

S 434-009

(5) Install a plug into the boss.

TASK 21-52-10-404-010

3. Install the Primary Heat Exchanger Inlet Temperature Bulb (Fig. 401)

A. Consumable Materials

(1) D00386 - Antiseize Compound, MIL-L-23398

(2) D00006 - Antiseize Compound, EASE-OFF 990
(Optional to MIL-L-23398)

(3) D00006 - Antiseize Compound - Never-Seez
(Optional to MIL-L-23398).

B. References

(1) 06-41-00/201, Fuselage Access Doors and Panels

(2) 20-10-23/401, Lockwires

(3) 24-22-00/201, Electrical Power Control

C. Access

(1) Location Zones
135/136 Environmental control systems (ECS) bay

(2) Access Panels
193HL/194ER Environmental control systems access door

D. Install the Temperature Bulb

S 034-011

(1) Remove the plug from the boss.

S 434-012

(2) Install a new gasket on the temperature bulb.

S 164-013

(3) Clean the mating surfaces of the boss and the temperature bulb, to make sure the bulb has an electrical ground.

S 644-014

(4) Apply a thin layer of the antiseize compound to the threads of the temperature bulb.

S 424-016

CAUTION: USE TWO WRENCHES TO INSTALL THE TEMPERATURE BULB. IF YOU ONLY USE ONE WRENCH TO INSTALL THE TEMPERATURE BULB, YOU COULD CAUSE DAMAGE TO THE DUCT.

(5) Install the temperature bulb into the boss.
  (a) Tighten the hex nut on the bulb to a torque value of 300 (±15) inch-pounds.

S 434-017
(6) Put a lockwire on the temperature bulb (Ref 20-10-23).

S 434-018
(7) Connect the electrical connector to the temperature bulb.

E. Do the Installation test for the Temperature Bulb

S 864-019
(1) Make sure the five (5) EICAS circuit breakers, on the overhead circuit breaker panel, P11, are closed.

S 864-020
(2) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

S 214-021
(3) Make sure the applicable (L or R) PRIM HX IN indication, on the bottom EICAS display, shows approximately the same as the ambient temperature.

F. Put the airplane back to its usual condition

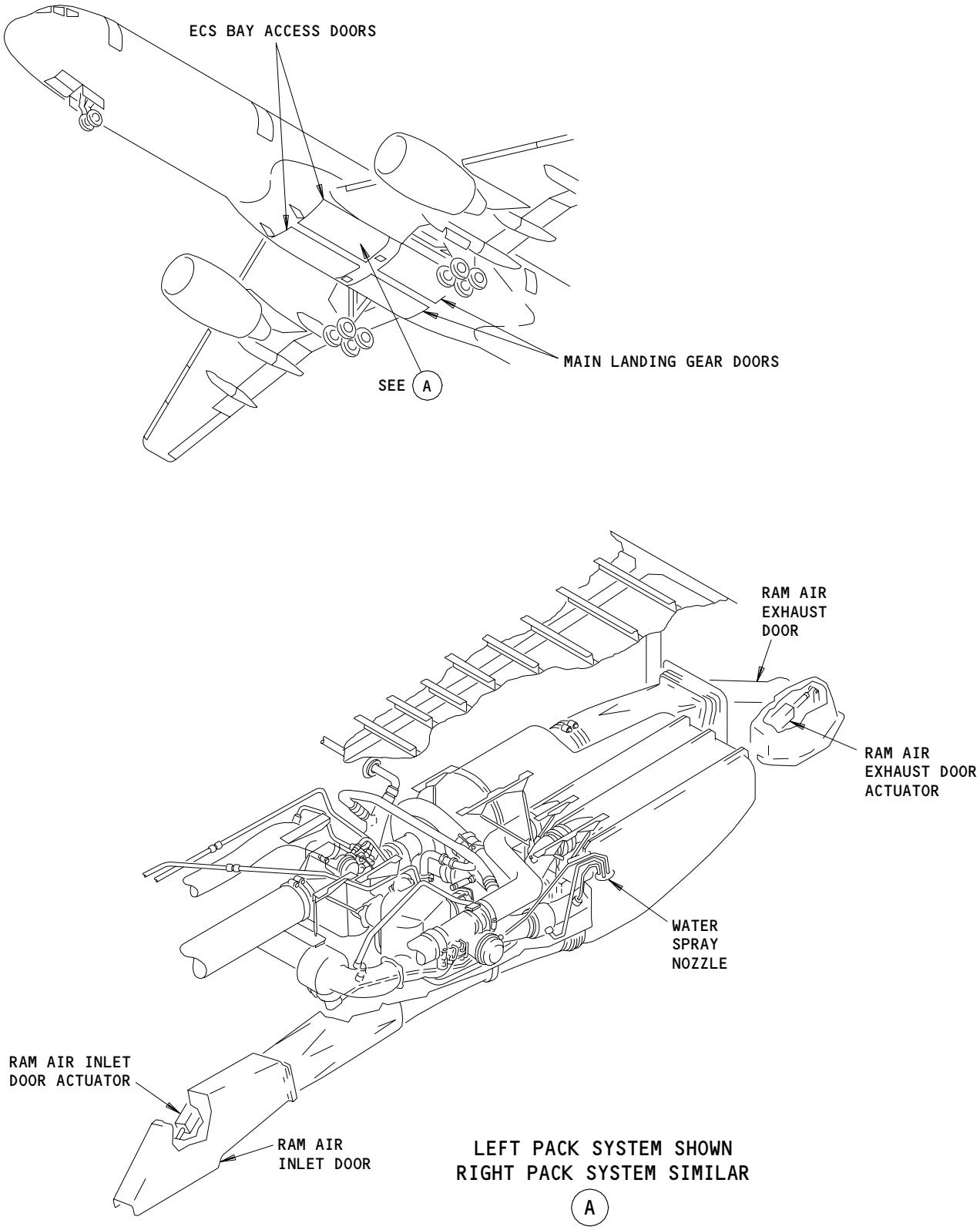
S 414-022
(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 864-023
(2) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-024
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

RAM AIR SYSTEM - DESCRIPTION AND OPERATION

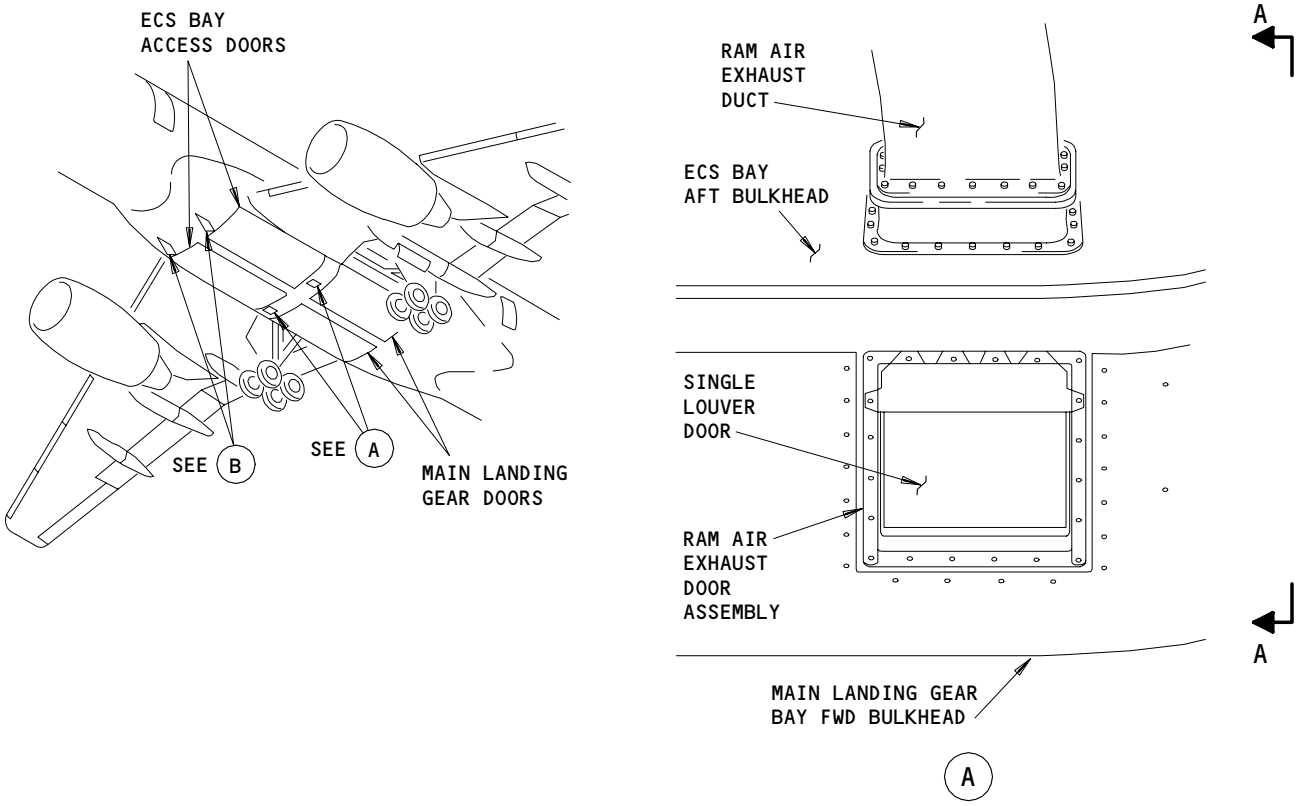
1. General (Fig. 1)
   A. The ram air system provides cooling for the cooling pack system (AMM 21-51-00/001), which controls the temperature of conditioned air as required for use in the zone temperature control system (AMM 21-61-00/001).
   B. The ram air system is an integral part of each cooling pack. Each ram air system consists of a ram air inlet door assembly, ram air exhaust door assembly, water spray nozzle, and temperature control card.
   C. Cooling ram air enters through the ram air inlet door. In flight, ambient air pressure aided by the air cycle machine fan provides flow through the system. On the ground, the fan provides all the airflow. After entering the system, ram air passes through the primary and secondary heat exchangers where it provides a heat sink for cooling pack supply air. Cooling ram air continues out of the airplane through the ram air exhaust door.
   D. Two vortex generators are installed ahead of the right-hand ram air inlet door assembly. The vortex generators increase air flow through right-hand heat exchangers.
   E. A water spray nozzle located on the ram air inlet duct sprays water extracted from cooling pack supply air, into the ram air inlet ducting. The water extractor (AMM 21-51-00/001) removes water from the cooling pack supply air. A drain line from the water extractor to the nozzle transports the water to the inlet plenum. The water spray nozzle breaks the water up into a fine mist and sprays it into the cooling ram air. The mist evaporates, cooling the ram air. This increases the efficiency of the ram air system.
   F. The pack temperature controller controls the movement of the ram air inlet and exhaust doors when the system is in the AUTO mode and no overheat condition exists in the pack. The temperature control card controls the movement of the ram air inlet and exhaust doors when the system is in the STBY mode. The pack control selector on the P5 panel allows mode selection. If an overheat condition exists, the ram air doors are commanded open by the temperature control card in auto or standby mode.
2. Component Details
   A. Ram Air Inlet Door (Fig. 2)

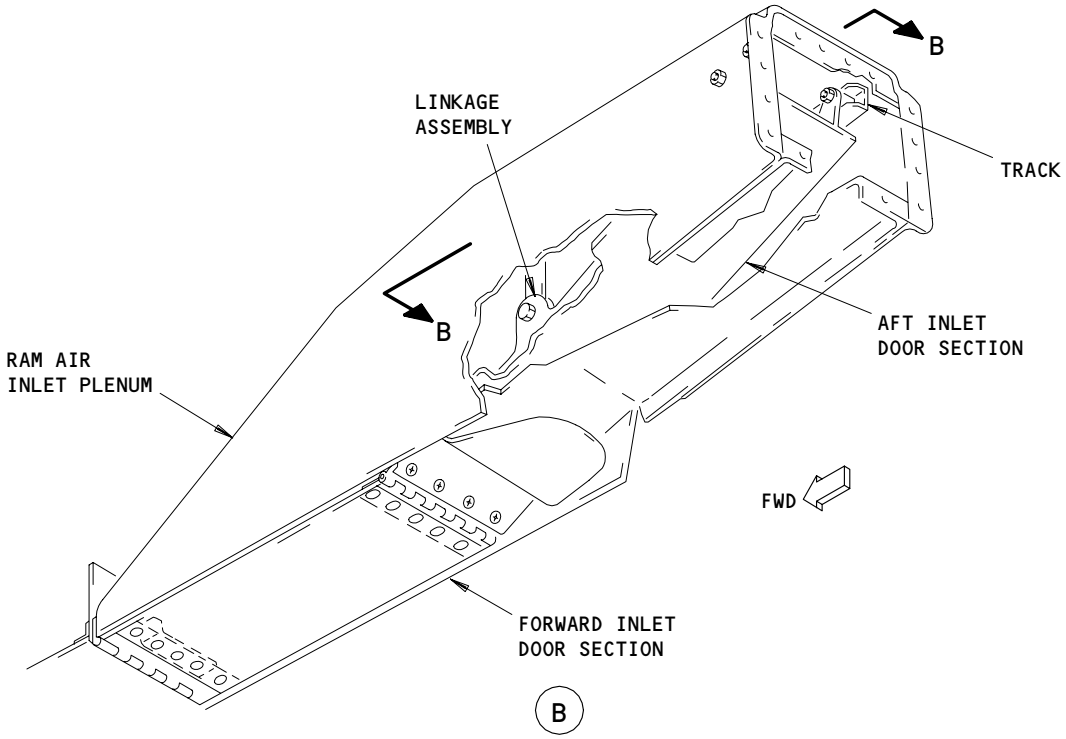


LEFT PACK SYSTEM SHOWN
RIGHT PACK SYSTEM SIMILAR

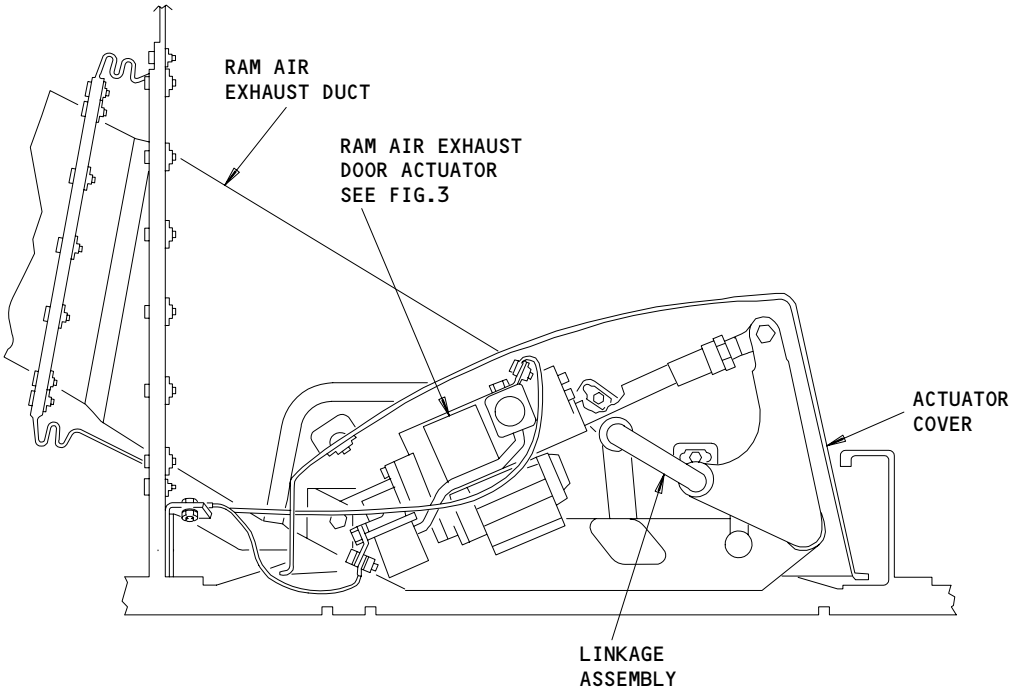
A

Ram Air System
Figure 1

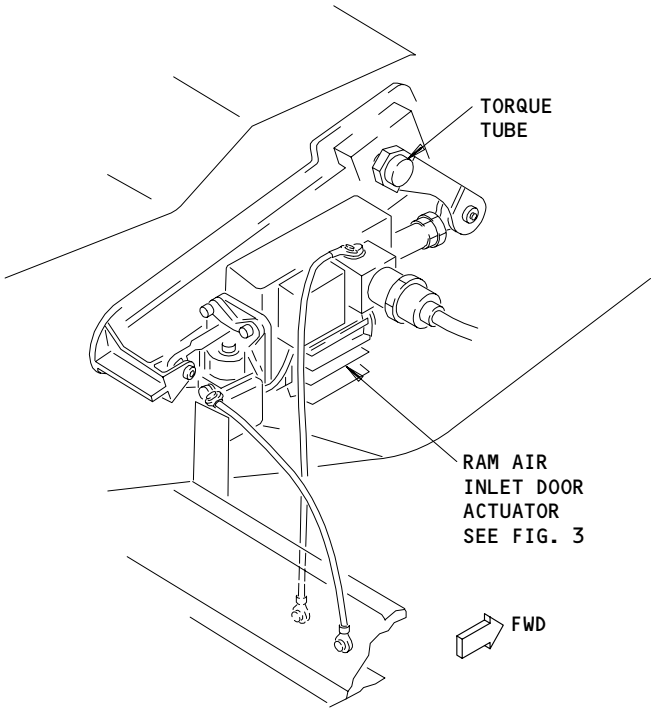




Ram Air Inlet and Exhaust Doors
Figure 2 (Sheet 1)



A–A



B–B

Ram Air Inlet and Exhaust Door
Figure 2 (Sheet 2)

(1) The ram air inlet door consists of fwd and aft composite sections, hinged together. A hinge attaches the fwd portion of the door to the ram air inlet plenum. A slide block in a track that is attached to the plenum attaches the aft end of the door to the plenum. A link assembly connects the door to a torque tube. The ram air inlet door actuator controls the rotation of the torque tube. When the actuator retracts, the torque tube rotates. This causes the link assembly to rotate about the torque tube. The door slides back in its track. This allows air to enter the system. Extension of the actuator closes the door.

B. Ram Air Exhaust Door (Fig. 2)

(1) The ram air exhaust door consists of an integral aluminum door assembly mounted to the ram air exhaust duct. The assembly consists of a housing, a single door louver, a link assembly and torque tube. The link assembly connects the door louver to the torque tube. The ram air exhaust door actuator rotates the torque tube causing the door louver to open or close.

(2) When the exhaust door actuator retracts, the torque tube rotates. The link assembly rotates about the torque tube driving the door open. This allow ram air to exit the air conditioning pack to ambient. Similarly, extension of the actuator closes the door.

C. Ram Air Door Actuator (Fig. 3)

(1) The ram air actuator is a linear electromechanical actuator. The actuator converts electrical energy into controlled, reversible, linear mechanical movement. The actuator consists of an aluminum alloy housing assembly; a single phase, 115 Vac, 400 Hz motor; gear reduction system; jackscrew; potentiometer; capacitor; extend and retract limit switches; and an electrical connector.

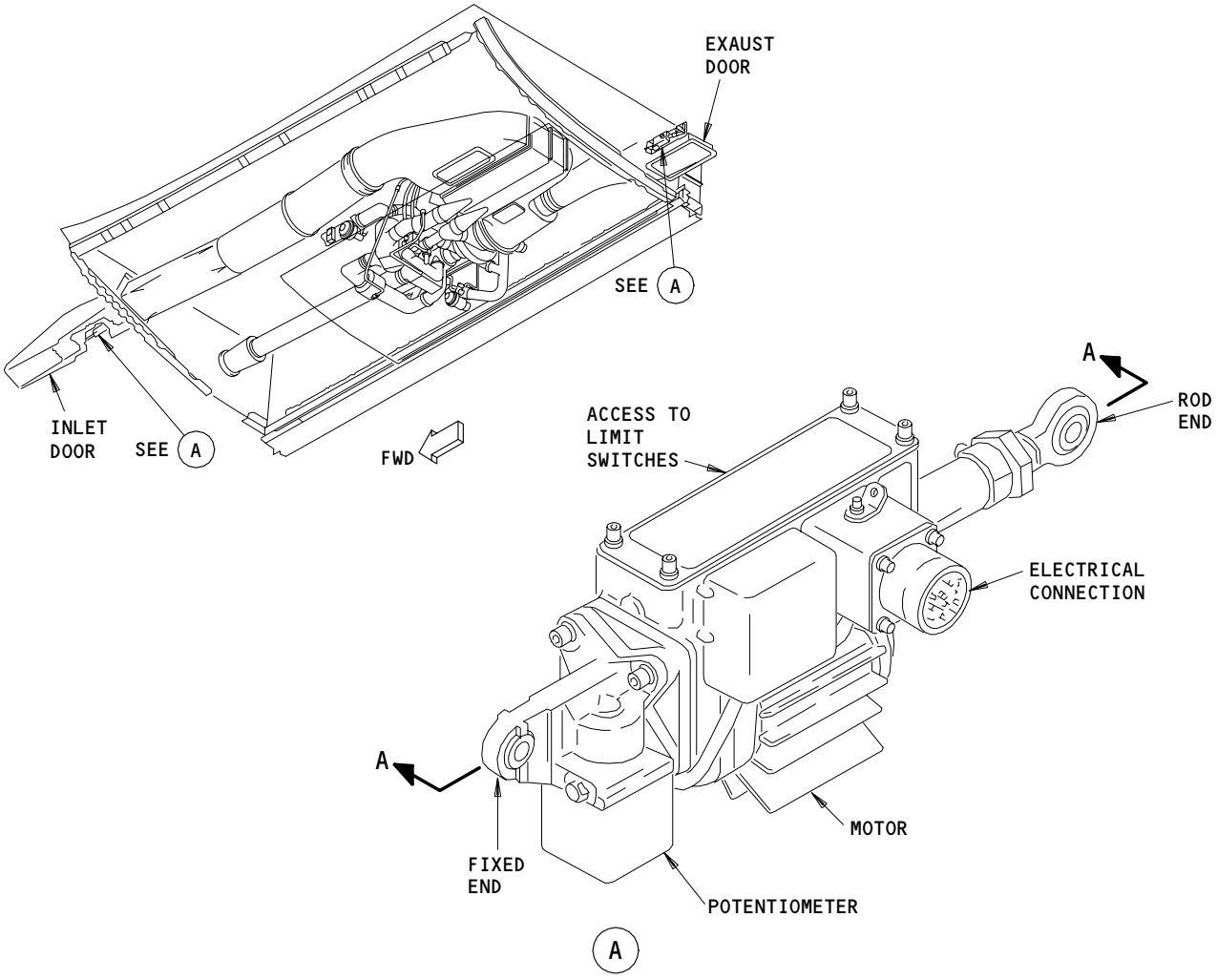
(2) The actuator operates by applying electrical power to the motor. The rotary motion of the splined motor shaft is transmitted through reduction gears to the jackscrew. The rotating jackscrew either extends or retracts the actuator. The limit switches are actuated by the cam system which is driven directly by the main drive portion of the jackscrew. A worm gear at the end of the jackscrew rotates a potentiometer to provide an electrical signal indicating actuator position.

D. Temperature Control Card (Fig. 4)

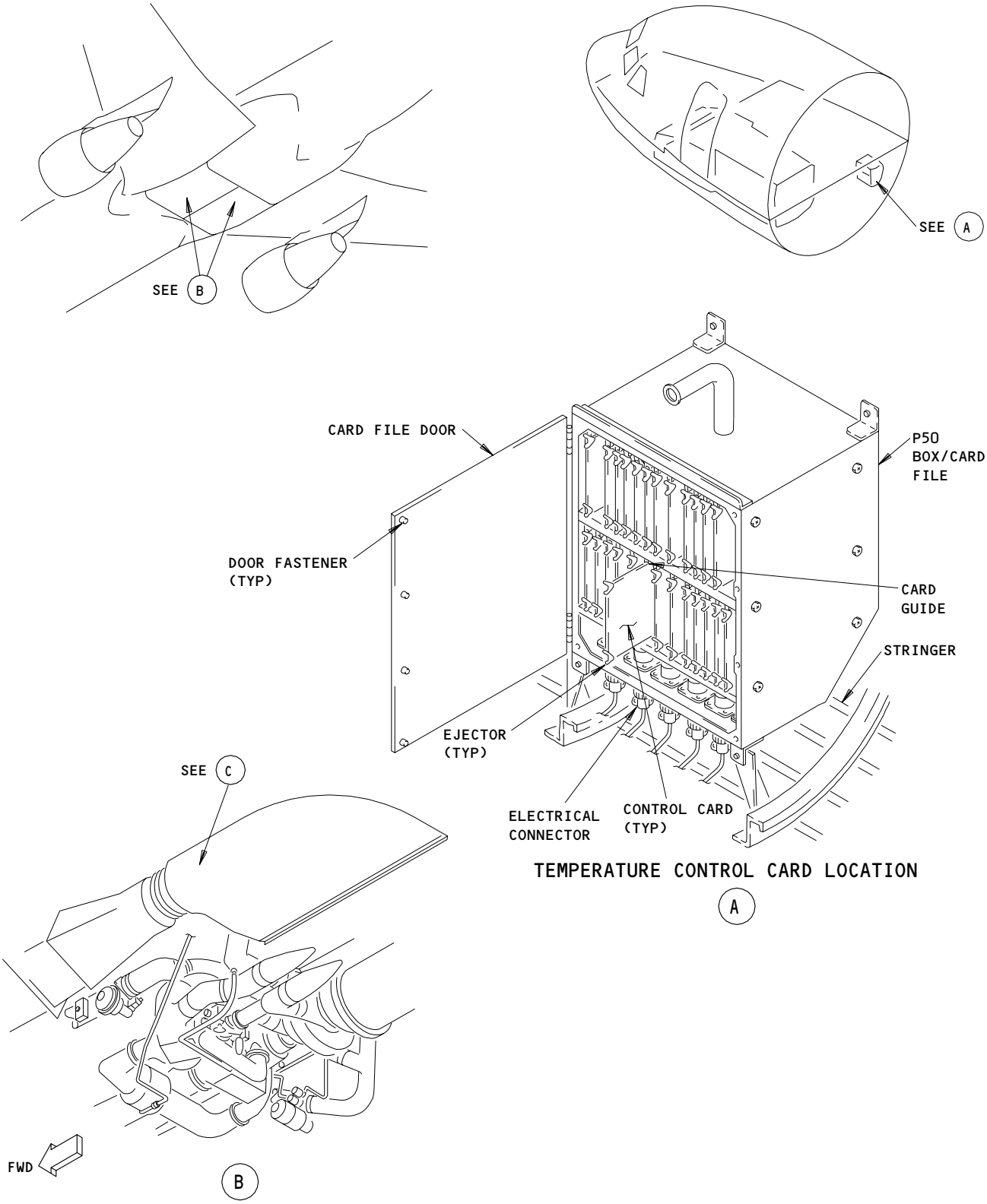
(1) The temperature control card is a printed circuit card located in the electrical/electronics bay. The card mounts in the P50 panel. It controls the ram air inlet door, ram air exhaust door, and pack temperature control valve when the system is in STBY mode or when an overheat condition exists in the cooling pack.

E. Water Spray Nozzle

(1) The water spray nozzle consists of a strut assembly and a nozzle assembly. The strut assembly consists of three aluminum tubes brazed into cast aluminum plates. The nozzle assembly consists of two nozzle heads screwed into a base that is attached to one of the strut plates. Three ports are provided on the strut mounting plate for connecting air/water lines from the cooling pack.



Ram Air Door Actuator
Figure 3



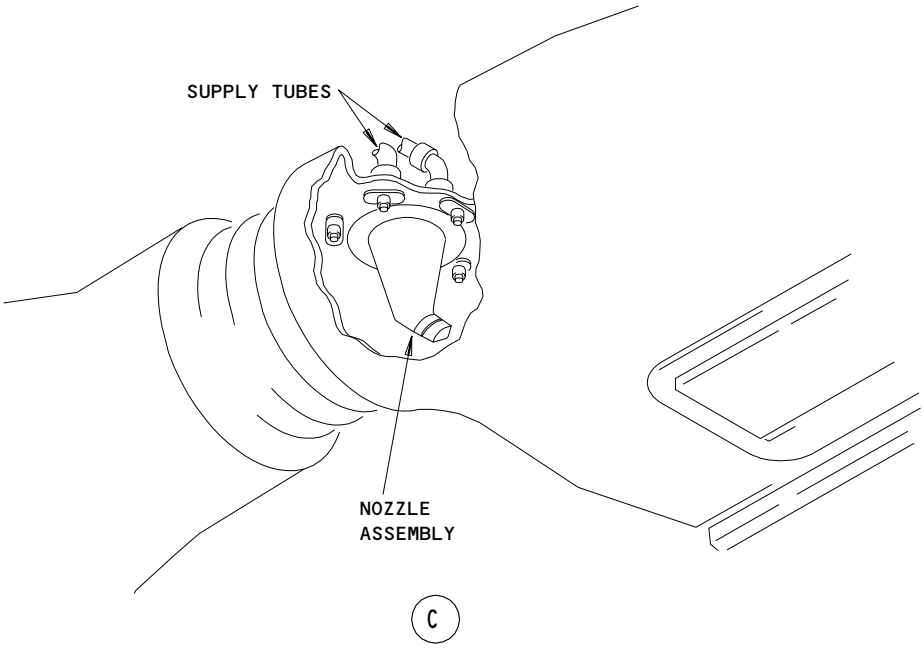
Temperature Control Card and Water Spray Nozzle
Figure 4 (Sheet 1)

(2) The dual nozzles spray water extracted from two locations on the cooling pack. The water is atomized by action of air pressure when air and water are mixed in the passages of each nozzle head. One nozzle head receives water from the water extractor sump. The other nozzle receives water and air from an overflow tee on the water extractor.

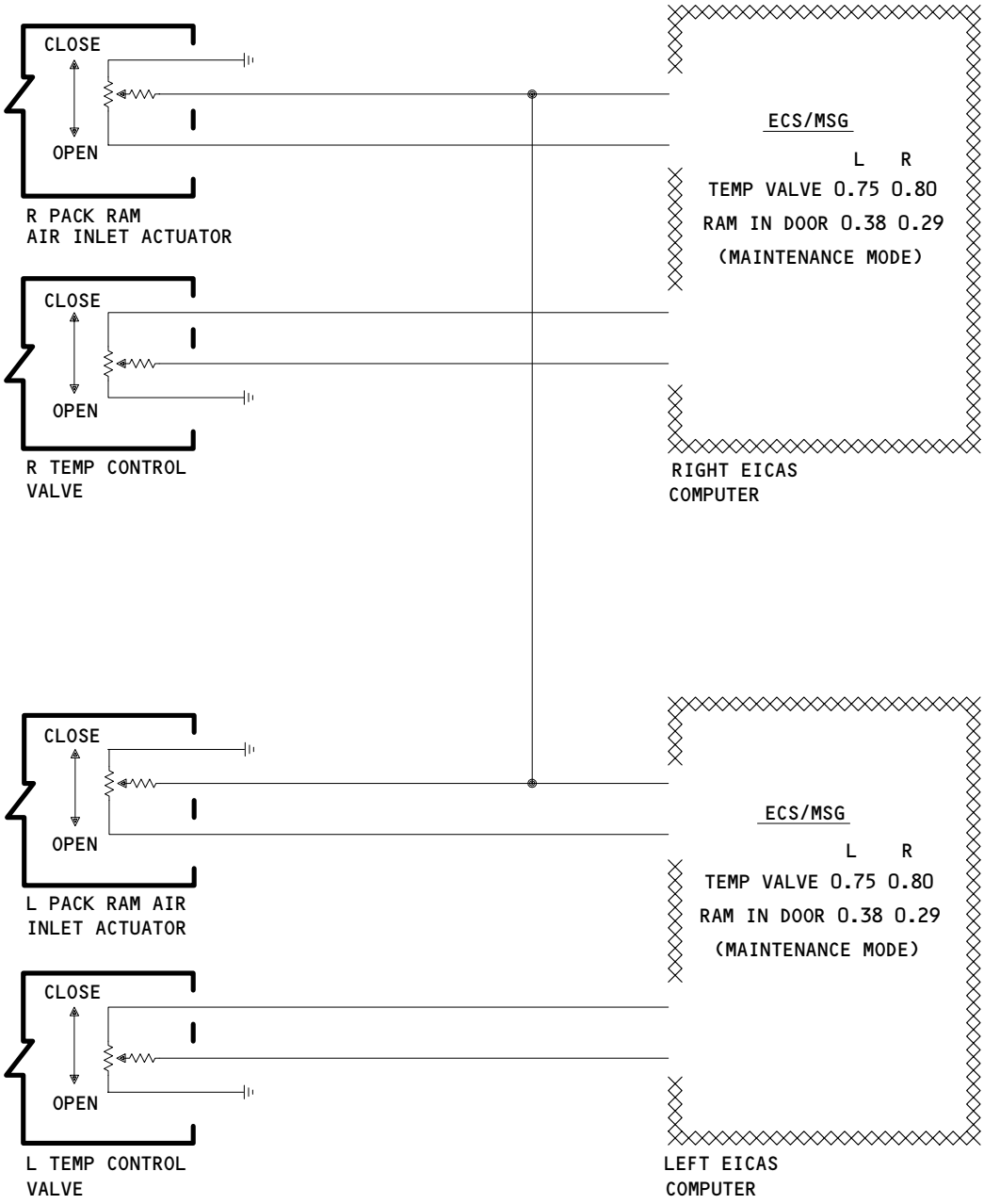
3. Operation

A. The ram air system operates as an integral part of the air cooling pack. For ram air system operation, see air cooling pack operation (AMM 21-51-00/001).

B. EICAS provides display of ram air inlet door position. Door position indication is available only on the ground, by calling up EICAS Maintenance Page (AMM 31-41-00/001). EICAS displays inlet door position in percent closed, ranging from 0.00 (full open) to 1.00 (full closed).



Temperature Control Card and Water Spray Nozzle
Figure 4 (Sheet 2)

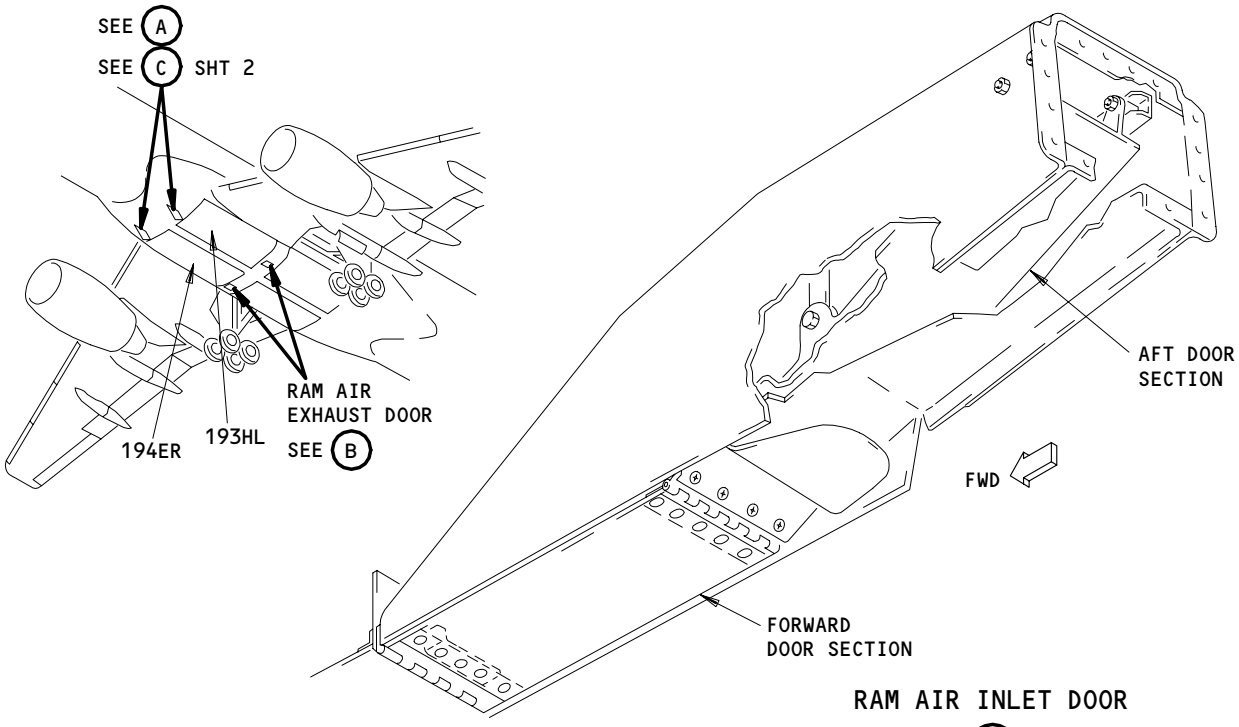


Ram Air Door Position Indication Schematic
Figure 5

RAM AIR SYSTEM

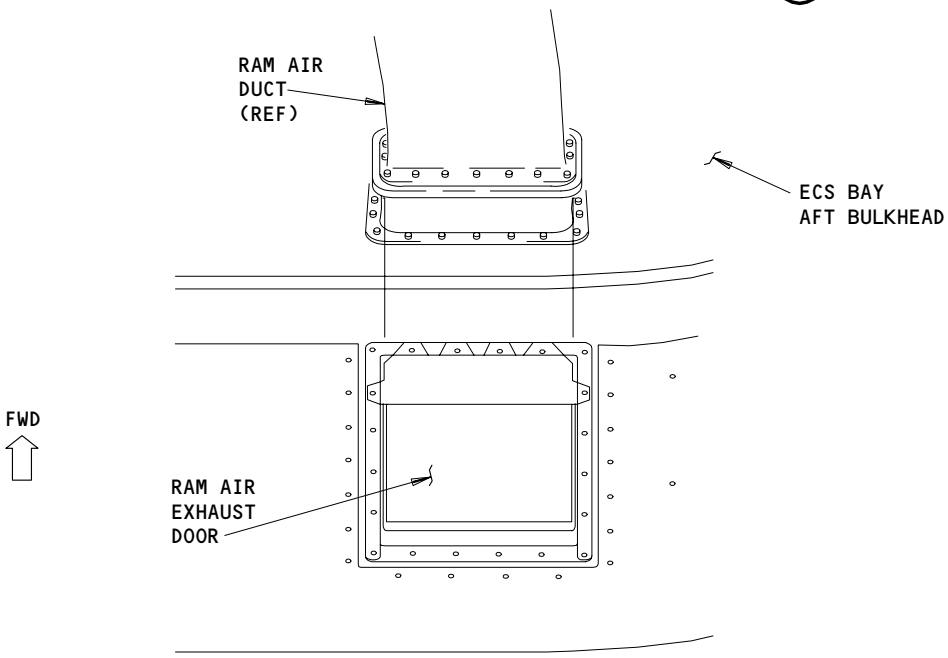
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ACTUATOR - RAM AIR EXHAUST DOOR	2	2	193HL,194ER	21-53-04
ACTUATOR - RAM AIR INLET DOOR	2	2	193BL,194BR	21-53-03
CARD - TEMPERATURE CONTROL, M10403,M10404	2	2	119BL,P50	21-53-06
DOOR - RAM AIR EXHAUST	1	2	193HL,194ER	21-53-02
DOOR - RAM AIR INLET	1	2	193HL,194ER	21-53-01
NOZZLE - WATER SPRAY	2	2	193HL,194ER	21-53-05

Ram Air System - Component Index
Figure 101



RAM AIR INLET DOOR

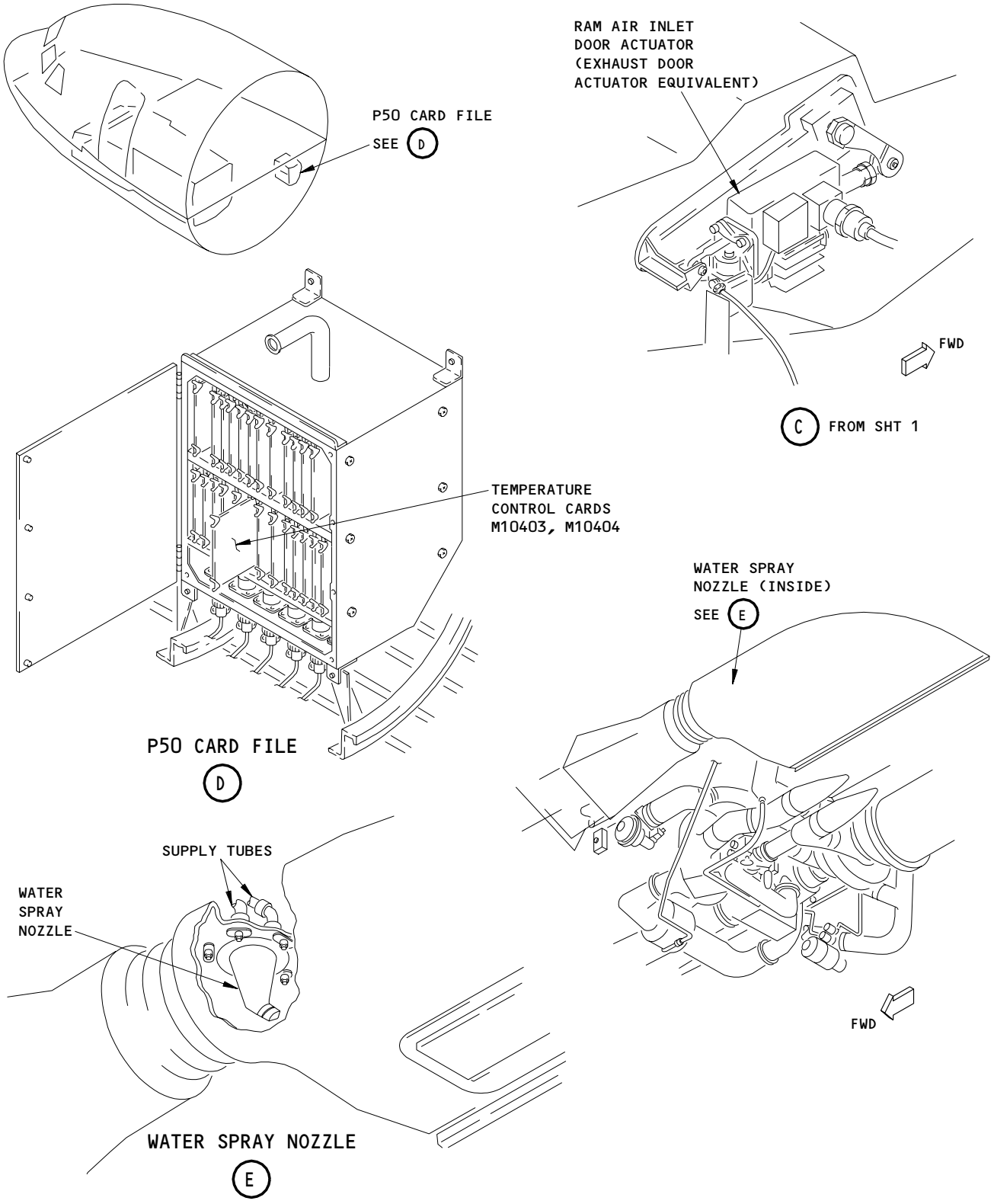
A



RAM AIR EXHAUST DOOR

B

Ram Air System - Component Location
Figure 102 (Sheet 1)



Ram Air System - Component Location
Figure 102 (Sheet 2)

RAM-AIR SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has instructions on how to do the tasks that follow:
      (1) The Operational Test - Ram-Air System
      (2) Adjust the Actuators of the Ram-Air Doors
      (3) The System Test - Ram-Air System

TASK 21-53-00-715-001

2. Operational Test - Ram-Air System
   A. References
      (1) AMM 21-51-14/501, Pack Temperature Controller
   B. Do the Test

      S 745-002
      (1) Do the BITE test on the applicable (left or right) pack temperature controller (AMM 21-51-14/501).

TASK 21-53-00-825-003

3. Adjust the Actuators of the Ram-Air Doors (Fig. 501)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 20-10-23/401, Lockwires
      (3) AMM 24-22-00/201, Electrical Power Control
      (4) AMM 32-00-15/201, Landing Gear Door Ground Operations and Locking
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
          143/144 Main landing gear (MLG) wheel well
      (2) Access Panels
          193BL/193BR Ram-Air Inlet Door Actuator access door.
   C. Prepare to Adjust the Actuators

      S 865-004
      (1) Supply electrical power (AMM 24-22-00/201).

      S 865-005
      (2) Turn the L and R PACK selectors, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF lights come on.

(b) Put a DO-NOT-OPERATE tag on the selectors.

S 015-006

(3) To get access to the actuators for the ram-air inlet doors, open the applicable (left or right) access door, 193BL or 194BR (AMM 06-41-00/201).

S 015-007

(4) To get access to the actuator for the ram-air exhaust doors, do the steps that follow:

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT AROUND THE MAIN LANDING GEAR BEFORE YOU OPEN THE DOORS. THE DOORS OPEN QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(a) Open and lock the applicable (left or right) main landing gear door (AMM 32-00-15/201).
(b) Remove the cover from the actuator of the ram-air exhaust door.

D. Adjust the Actuators

S 215-008

(1) Make sure the ram-air doors are in the fully open positions (the actuators are fully retracted).

S 825-009

(2) Do the steps that follow to adjust the applicable actuator:
(a) Remove the bolt that holds the actuator rod to the bellcrank.
(b) Remove the lockwire from the locknut on the end of the actuator rod (AMM 20-10-23/401).
(c) Loosen the locknut on the end of the actuator rod.
(d) Extend or retract the actuator to 11.10 +/- 0.03 inches (281.9 +/- 0.7 mm).
1) Measure the actuator from the center of the bolt on one end to the center of the bolt on the other end.
(e) Make sure you can see, through the inspection hole in the actuator rod, the threads on the end of the actuator rod.
(f) Tighten the locknut at the end of the actuator rod.
(g) Install a lockwire on the locknut (AMM 20-10-23/401).
(h) Install the bolt, washers, and nut to connect the actuator rod to the bellcrank.

E. Put the airplane back to its usual condition

S 415-010

(1) If you adjusted the actuator for the ram-air exhaust door, do the steps that follow:
(a) Put the cover on the actuator.

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT AROUND THE MAIN LANDING GEAR BEFORE YOU CLOSE THE DOORS. THE DOORS CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(b) Close the main landing gear doors (AMM 32-00-15/201).

S 415-011

(2) If you adjusted the actuator for the ram-air inlet doors, close the applicable (left or right) access door, 193BL or 194BR (AMM 06-41-00/201).

S 865-012

(3) Remove the DO-NOT-OPERATE tag from the L and R PACK selectors, on the P5 panel.

S 865-013

(4) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

TASK 21-53-00-735-014

4. System Test - Ram-Air System (Fig. 501, 502)

A. References

(1) AMM 24-22-00/201, Electrical Power Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(3) AMM 32-09-02/201, Air/Ground Relays
(4) AMM 36-00-00/201, Pneumatic - General

B. Access

(1) Location Zones

135/136 Environmental control systems (ECS) bay
143/144 Main landing gear (MLG) wheel well

(2) Access Panels

193BL/193BR Ram-Air Inlet Door Actuator access door.

C. Prepare for the Test

S 865-015

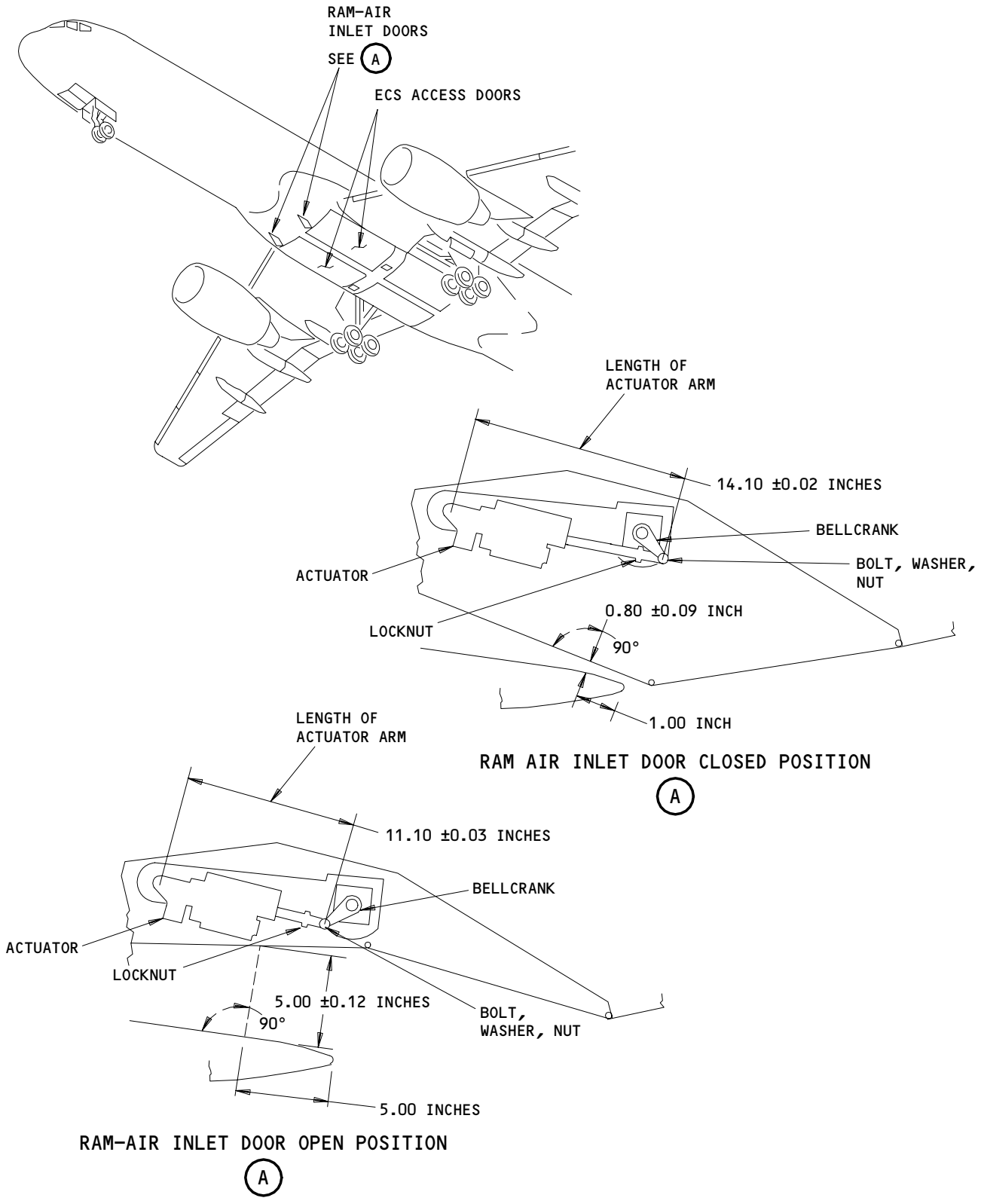
(1) Supply electrical power (AMM 24-22-00/201).

S 865-016

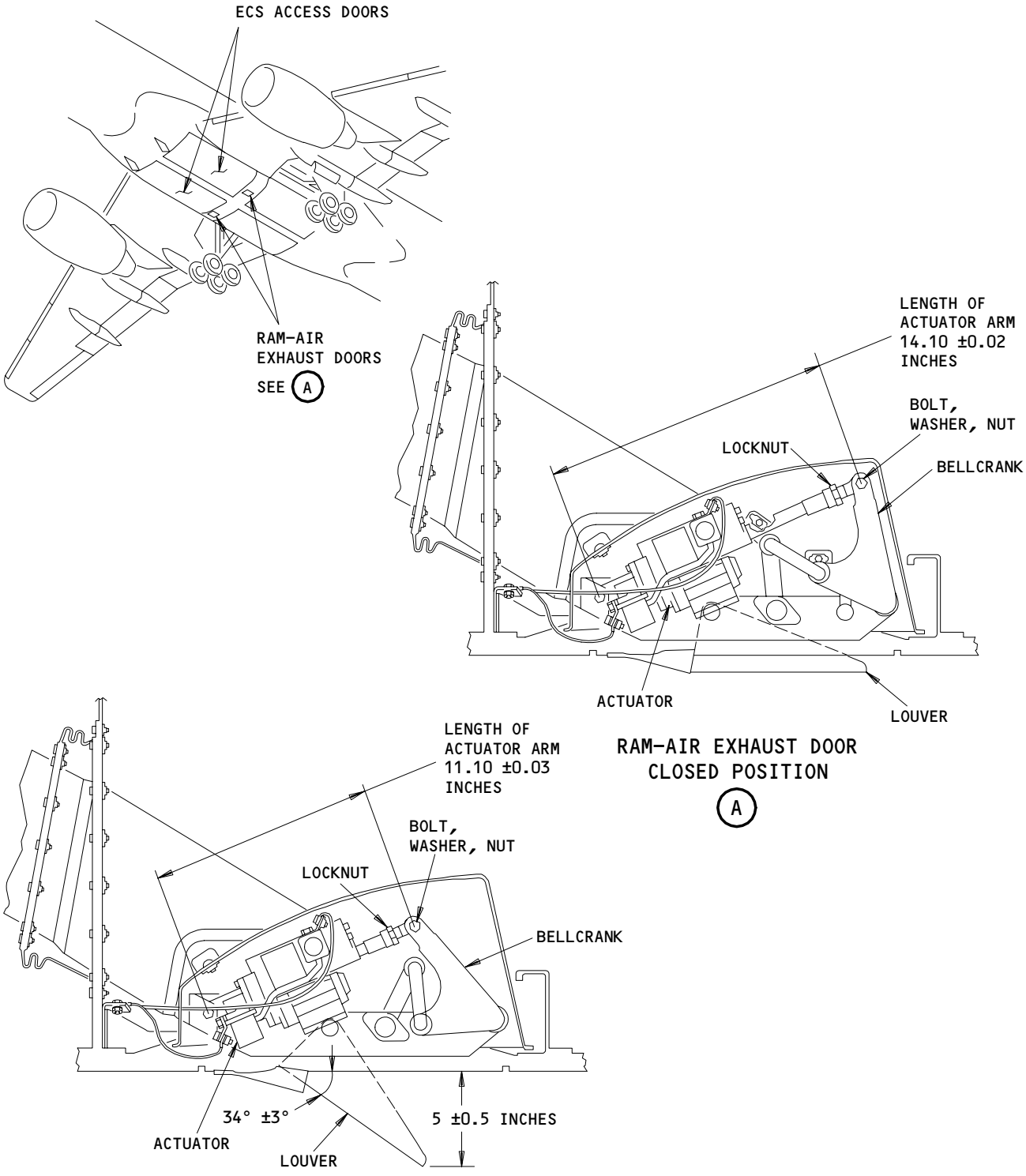
(2) Remove the pneumatic power (AMM 36-00-00/201).

S 865-017

(3) Make sure these circuit breakers are closed:
(a) On the overhead circuit breaker panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT



Ram-Air Inlet Door Adjustment
Figure 501



Ram-Air Exhaust Door Adjustment
Figure 502

2) 11A15, AIR COND PACK RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT
5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 865-018
(4) Push the ECS MSG switch on the EICAS MAINT panel, on the right side panel, P61.

D. Do the Test

S 215-020
(1) Make sure all the ram-air doors are in the fully open positions.

S 225-021
(2) Measure the openings of the ram-air inlet doors.
(a) Measure the inner wall of the ram-air inlet, at the position 5.0 inches (127 mm) aft of the bottom of the inlet.
(b) Make sure the opening is 5.00 +/- 0.12 inches (127.0 +/- 3.0 mm).

S 225-022
(3) Measure the openings of the ram-air exhaust doors.
(a) Measure the angle of the louver and height of the opening.
1) Put a straight edge against the inner side of the exhaust opening, in a longitudinal direction.
2) Make sure the angle between the straight edge and the louver is 34 +/- 3 degrees.
3) Make sure the distance between the end of the louver and the top of the opening is 5.0 +/- 0.5 inches (127 +/- 13 mm).

S 825-023
(4) If a dimension is not at the specified length, adjust the actuator of the applicable ram-air door.

S 215-024
(5) Make sure the EICAS indication, L and R RAM IN DOOR, is approximately 0.0.

S 865-026
(6) Remove the DO-NOT-OPERATE tag from the L and R PACK selectors, on the P5 panel.
(a) Turn the selectors to the STBY-N positions.

S 215-027
(7) Make sure all the ram-air doors stay in the open positions.

S 865-028
(8) Turn the L and R PACK selectors, on the P5 panel, to the OFF positions.
(a) Put a DO-NOT-OPERATE tag on the selectors.

S 865-029

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO THE EQUIPMENT.

(9) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all person and equiment away from the spoilers.

S 865-030

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION PROCEDURE CORRECTLY. IF YOU DO NOT DO THE PROCEDURE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(10) Do the Flight Mode Simulation procedure for the No. 1 and the No. 2 air/ground systems (AMM 32-09-02/201).

S 215-031
(11) Make sure all the ram-air doors move to the fully closed positions.

NOTE: The ram-air inlet doors close in approximately 30 seconds. The ram-air exhaust doors do not move until the inlet doors are fully closed.

S 225-032
(12) Measure the openings of the ram-air inlet doors.
(a) Make sure the opening of the ram-air inlet, measured from the front of the duct to the door, is 0.80 +/- 0.09 inches.

S 215-037
(13) Make sure the EICAS indications, L and R RAM IN DOOR, are approximately 1.0.

S 865-038
(14) Turn the L and R PACK selectors, on the P5 panel, to the STBY-N positions.

S 215-039
(15) Make sure all the ram-air doors move to the open positions.

S 215-040
(16) Make sure the EICAS indications, L and R RAM IN DOOR, are approximately 0.0.

S 865-042
(17) Turn the L and R PACK selectors, on the P5 panel, to the OFF positions.

S 865-043
(18) Put the airplane back to the ground mode (AMM 32-09-02/201).

S 865-044
(19) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

S 215-045
(20) Make sure the left and right ram-air exhaust doors stay in the open positions.

RAM AIR INLET DOOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the ram-air inlet doors.
   B. One ram-air inlet door is installed forward of each air cooling pack. The ram-air inlet doors are made of two parts; a forward section and an aft section.
   C. The ram-air inlet doors are on the outer side of the airplane. To remove or install the ram-air inlet doors it is not necessary to open an access panel or door.

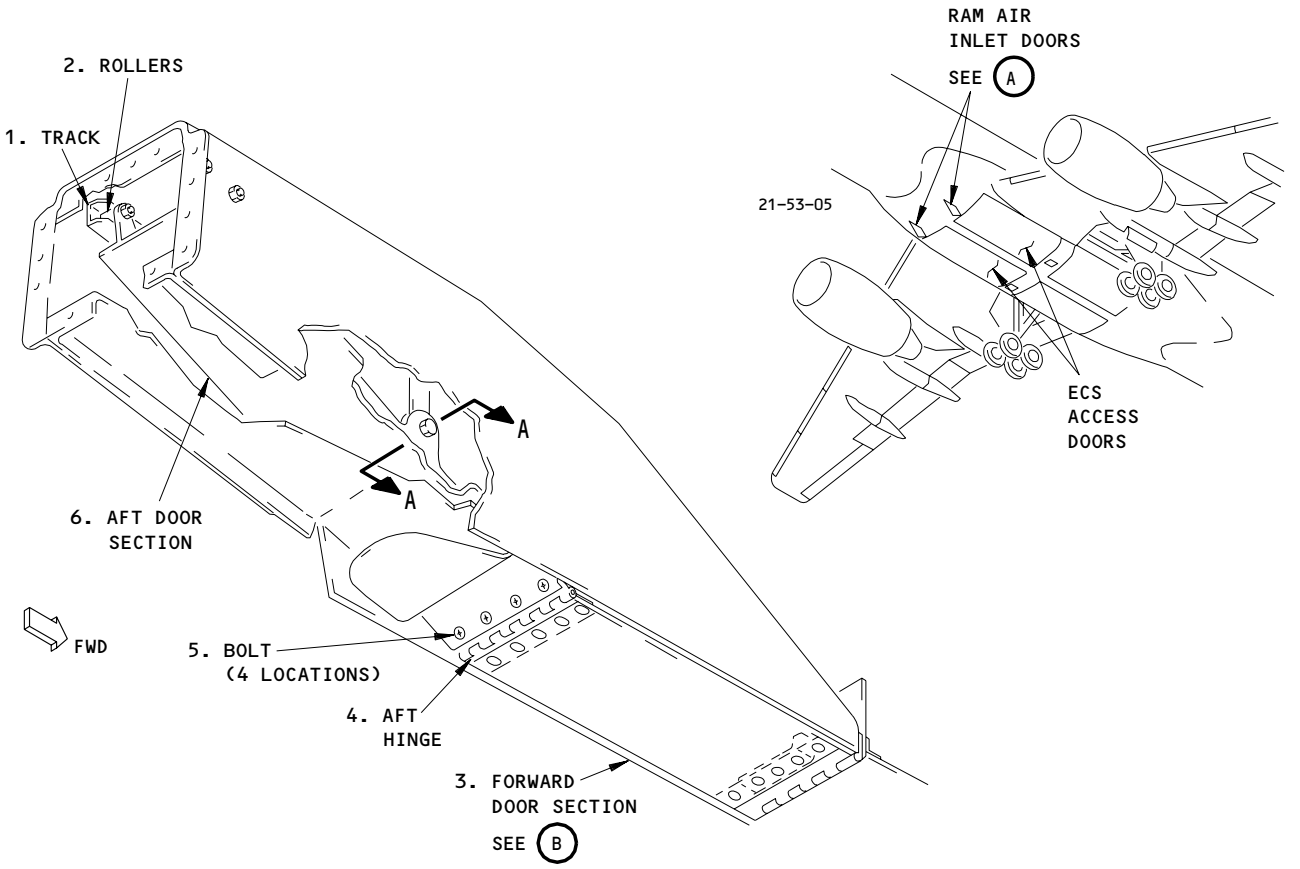
TASK 21-53-01-004-001

2. Remove the Ram-Air Inlet Door (Fig. 401)
   A. References
      (1) AMM 21-51-02/601, Heat Exchangers
      (2) AMM 21-53-00/501, Ram-Air System
      (3) AMM 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 864-004
      (3) Open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) On the overhead circuit breaker panel, P11:
              1) 11A13, AIR COND PACK LEFT AUTO CONT



Ram Air Inlet Door Installation
Figure 401

2) 11A15, AIR COND PACK RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT
5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

D. Procedure - Remove the ram-air inlet door

S 034-005
(1) Remove the bolts (5) from the aft hinge (4) to disconnect the forward section from the aft section of the inlet door.

S 034-006
(2) Disconnect the bonding jumper (7) from the forward section (3) of the inlet door.

S 034-007
(3) Remove the bolts (9) from the forward hinge (8).

S 024-008
(4) Remove the forward section (8) of the inlet door.

S 034-009
(5) Remove the bolt (15) from the connector rod (13) at the aft section (6) of the inlet door.

S 024-010
(6) Remove the aft section (6) of the inlet door.

S 214-011
(7) Examine the rubber seals (18) around the edges of the forward and aft door sections:
(a) If part of the rubber seal is missing, examine the inlet side of the heat exchangers for the missing rubber seal which could cause damage to the heat exchanger (AMM 21-51-02/601), then replace the missing rubber seal.

S 434-027
(8) Put a cover on the ram-air inlet.

TASK 21-53-01-404-013

3. Install the Ram-Air Inlet Door (Fig. 401)

A. Parts
(1) Refer to the Illustrated Parts Catalog (IPC) for the part numbers and the effectivities of the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	3	Forward Section	21-53-01	01	225
	5	Bolt			220
	6	Aft Section			355
	9	Bolt			230
	10	Screw			25
	11	Washer			30
	12	Nut			35
	14	Washer			170
	15	Bolt			165
	16	Nut			180

B. References
(1) AMM 21-53-00/501, Ram Air System
(2) AMM 24-22-00/201, Electric Power Control

C. Access
(1) Location Zones
135/136 Environmental control systems (ECS) bay

D. Install the Inlet Door

S 034-028
(1) Remove the cover from the ram-air inlet.
(a) Make sure there is no unwanted material in the ram-air inlet duct.

S 034-014
(2) If it is necessary, remove the bolt (5) from the aft hinge (4), to disconnect the forward and the aft sections of the inlet door.

S 424-015
(3) Put the aft section (6) of the inlet door into its position.
(a) Make sure the rollers (2) go into the door track (1).

S 434-016
(4) Put the connector rod (13) into the bracket on the aft section (6) of the inlet door.

S 434-017
(5) Install the bolt (15), washers (14, 17), and nut (16) into the connector rod (13).

S 424-018
(6) Put the forward section (3) of the inlet door into its position against the forward hinge (8).

S 434-019
(7) Install the bolts (9) into the forward hinge (8).

S 434-020
(8) Connect the bonding jumper (7) to the forward section (8) with the screw (10), washer (11), and nut (12).

S 434-021
(9) Install the bolts (5) into the aft hinge (4).

E. Do the installation test for the inlet door.

S 864-022
(1) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-023
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A15, AIR COND PACK RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT

5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 734-024
(3) Do the System Test on the ram-air inlet door (AMM 21-53-00/501).

F. Put the airplane back to its usual condition

S 864-025
(1) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

RAM AIR EXHAUST DOOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the ram-air exhaust doors. One door is installed aft of each air cooling pack.

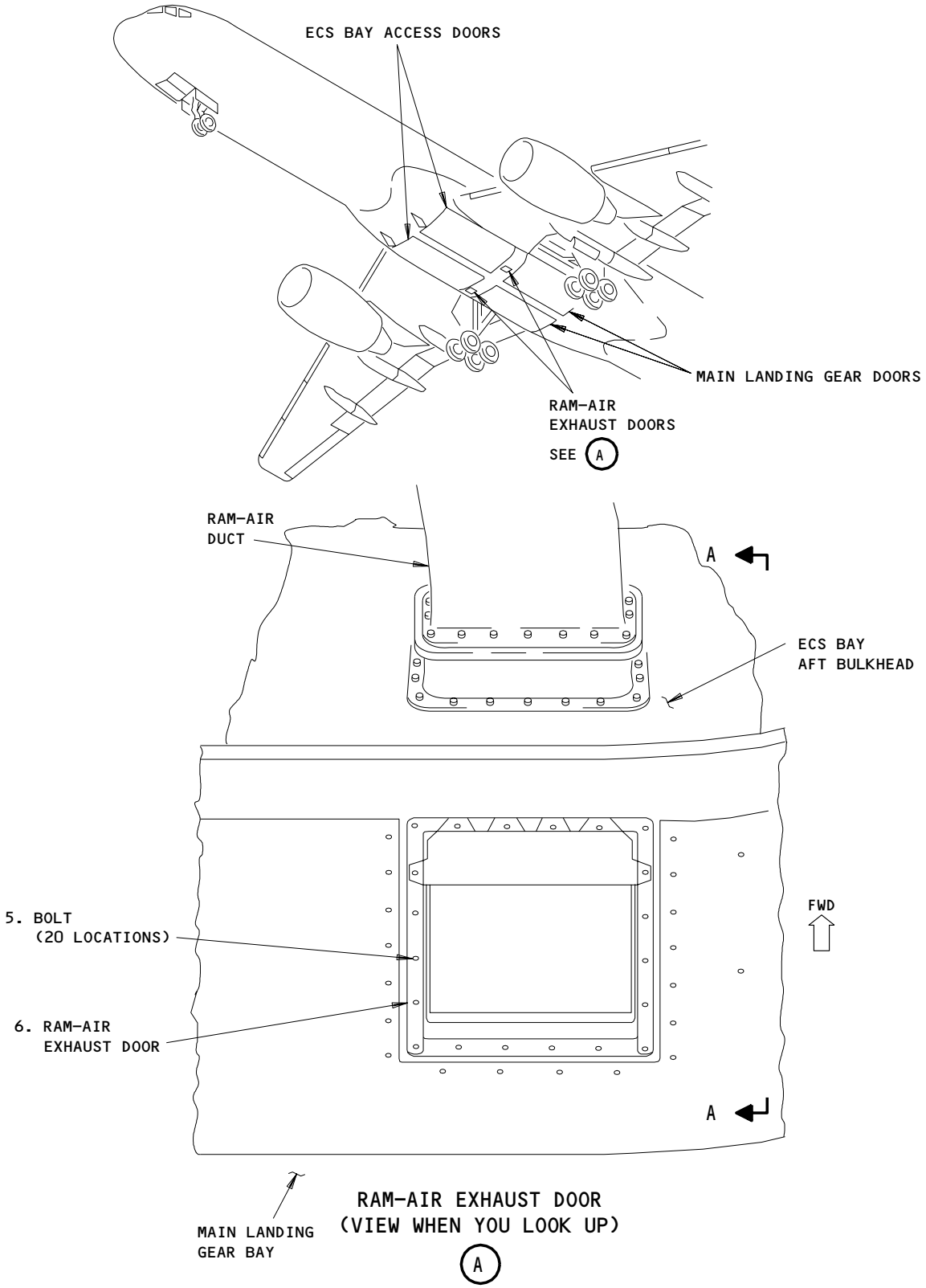
TASK 21-53-02-004-001

2. Remove the Ram-Air Exhaust Door (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels.
      (2) AMM 21-53-04/401, Ram Air Exhaust Door Actuator.
      (3) AMM 24-22-00/201, Electrical Power Control.
      (4) AMM 32-00-15/201, Landing Gear Door Ground Operations and Locking Procedure
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
          143/144 Main landing gear (MLG) wheel well
      (2) Access Panels
          193HL/194ER Environmental control systems bay access door
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF Light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 864-004
      (3) Open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) On the overhead circuit breaker panel, P11:
              1) 11A13, AIR COND PACK LEFT AUTO CONT



Ram-Air Exhaust Door Installation
Figure 401 (Sheet 1)

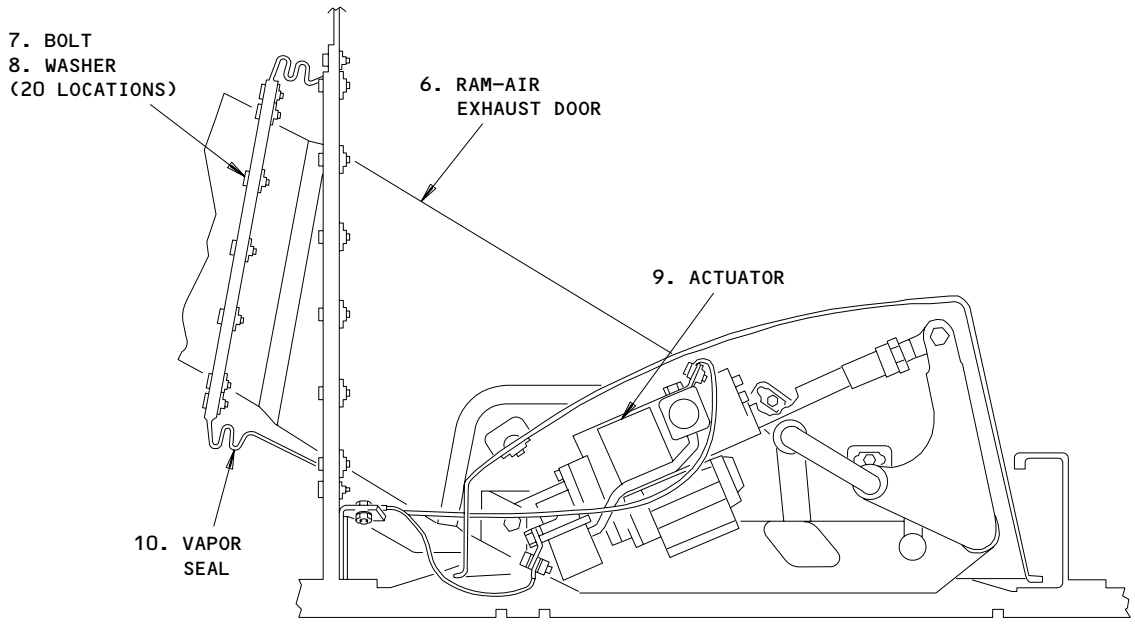
2) 11A15, AIR COND PACK RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
or
11A27, AIR COND PACK L STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT
5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 014-005

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT AROUND THE MAIN LANDING GEAR BEFORE YOU CLOSE THE DOORS. THE DOORS CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Open and lock the applicable (left or right) main landing gear door (AMM 32-00-15/201).

NOTE: The doors for the nose and the main landing gear will open at the same time.



A-A

Ram-Air Exhaust Door Installation
Figure 401 (Sheet 2)

S 014-006
(5) Open the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

D. Remove the Door

S 034-007
(1) Remove the actuator from the ram-air exhaust door (AMM 21-53-04/401).

S 034-008
(2) Remove the bolts (7) from the forward end of the vapor seal (10).

S 034-009
(3) Remove the bolts (5) from the airplane skin.

S 024-010
(4) Lift the ram-air exhaust door (6) up and out of the wheel well of the main landing gear.

TASK 21-53-02-404-011

3. Install the Ram-Air Exhaust Door (Fig. 401)

A. Parts

(1) Refer to the Illustrated Parts Catalog (IPC) for the part numbers and the effectivities of the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	5	Bolt	21-53-02	01	75
	6	Ram Air Exhaust Assembly			85
	7	Bolt			20

B. References

(1) AMM 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels.
(2) AMM 21-53-00/501, Ram Air System
(3) AMM 21-53-04/401, Ram Air Exhaust Door Actuator.
(4) AMM 24-22-00/201, Electrical Power Control.
(5) AMM 32-00-15/201, Landing Gear Door Ground Operations and Locking Procedure

C. Access

(1) Location Zones
135/136 Environmental control systems (ECS) bay
143/144 MLG wheel well
(2) Access Panels
193HL/194ER Environmental control systems bay access door

D. Install the Door Assembly

S 424-012

(1) Put the ram-air exhaust door assembly (6) into its position.
    (a) Align the assembly with the vapor seal and with the bolt holes in the airplane skin.

S 434-013

(2) Install the bolts (7) and the washers (8) into the vapor seal (10).

S 434-014

(3) Install the bolts (5) into the airplane skin.

S 434-015

(4) Install the actuator of the ram-air exhaust door (Ref 21-53-04).

E. Do the installation test for the ram-air exhaust door

S 864-016

(1) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-017

(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
    (a) On the overhead circuit breaker panel, P11:
        1) 11A13, AIR COND PACK LEFT AUTO CONT
        2) 11A15, AIR COND PACK RIGHT STANDBY CONT
        3) 11A26, AIR COND PACK LEFT STBY CONT
           or
           11A27, AIR COND PACK L STBY CONT
        4) 11A28, AIR COND PACK RIGHT AUTO CONT
        5) 11M11, LEFT PACK AUTO POWER
        6) 11M15, RIGHT PACK STANDBY POWER
        7) 11M19, RIGHT PACK AUTO POWER
        8) 11M24, LEFT PACK STANDBY POWER

S 734-018

(3) Do the System Test for the ram-air exhaust doors (AMM 21-53-00/501).

F. Put the airplane back to its usual condition

S 414-019

(1) Close the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

S 414-020

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT AROUND THE MAIN LANDING GEAR BEFORE YOU CLOSE THE DOORS. THE DOORS CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Remove the door locks and close the applicable (left or right) main landing gear door (AMM 32-00-15/201).

S 864-021

(3) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

RAM-AIR INLET DOOR ACTUATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the actuators for the ram-air inlet doors. One ram-air inlet door is installed forward of each air cooling pack. One actuator is attached to the right side of each ram-air inlet door.

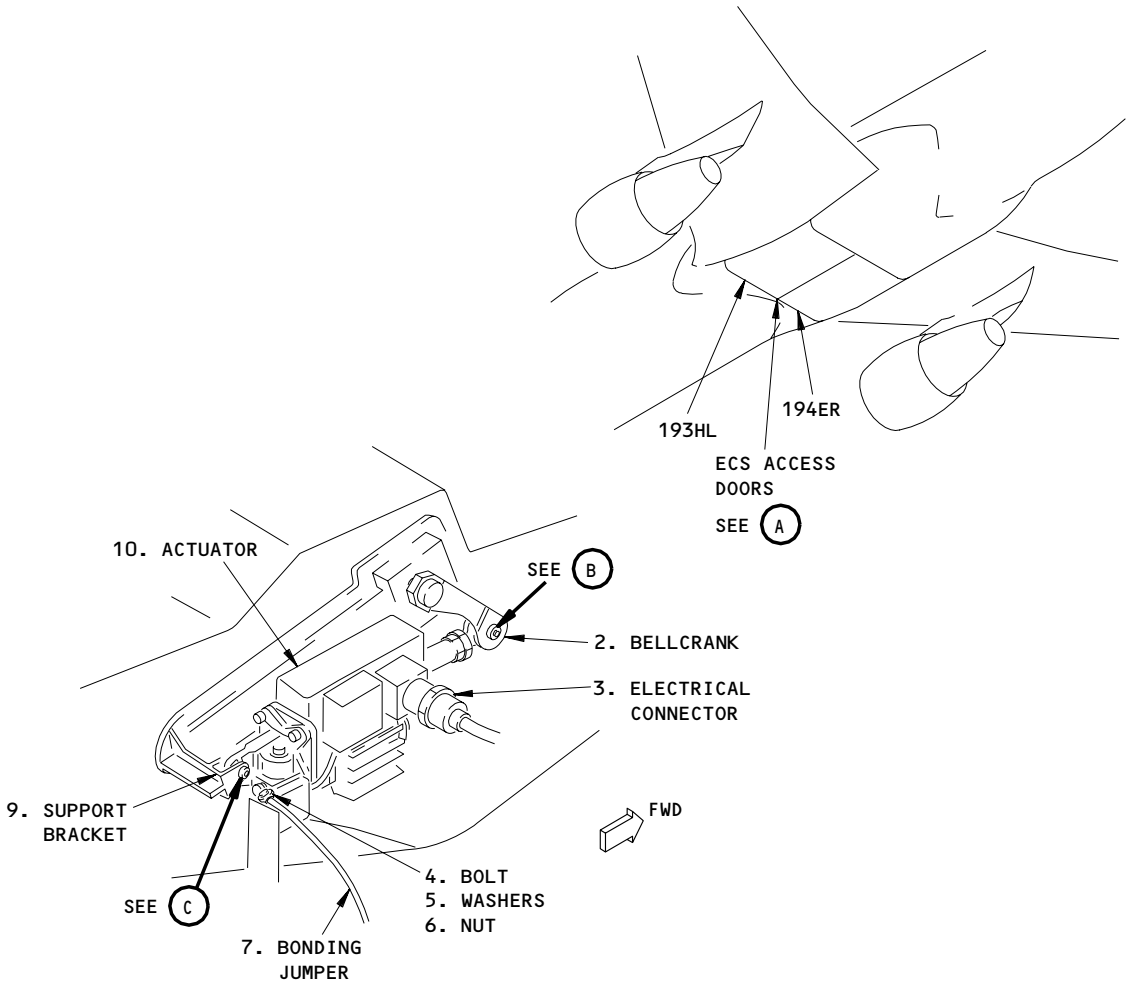
   TASK 21-53-03-004-001

2. Remove the Ram-Air Inlet Door Actuator (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193BL/194BR Ram-air inlet door access door
   C. Prepare for the Removal

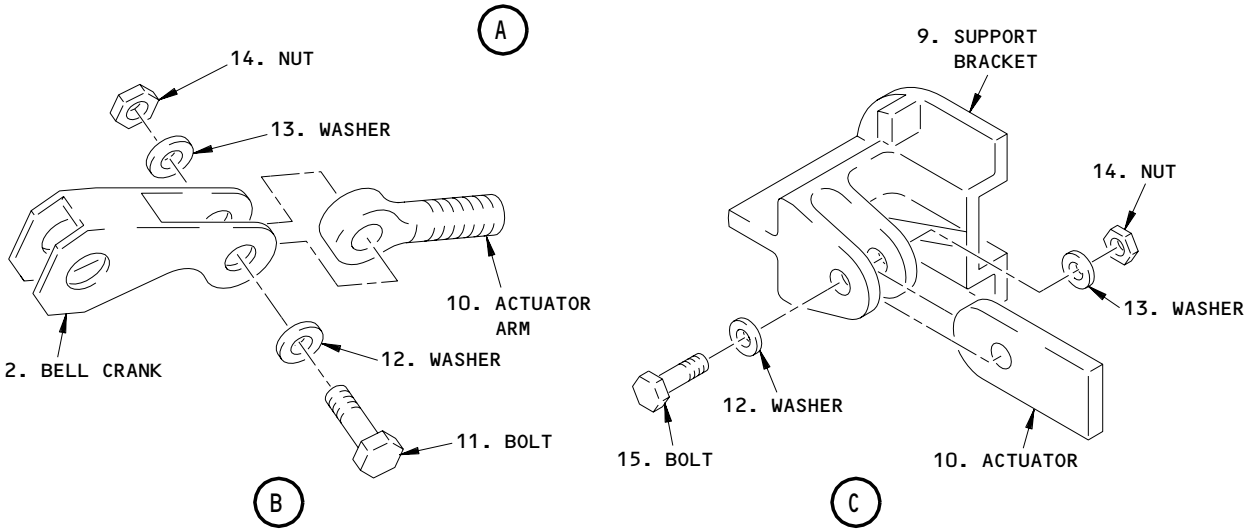
      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 864-023
      (3) Open the applicable left or right circuit breakers and attach DO-NOT-CLOSE tags:
          (a) On the overhead circuit breaker panel, P11:
              1) 11A13, AIR COND PACK LEFT AUTO CONT



RAM-AIR INLET DOOR ACTUATOR



Ram-Air Inlet Door Actuator Installation
Figure 401

2) 11A15, AIR COND PACK RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT
5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 014-005
(4) Open the applicable (left or right) access door for the ram-air inlet, 193BL or 194BR (AMM 06-41-00/201).

D. Procedure - Remove the Actuator

S 034-006
(1) Disconnect the electrical connector (3) from the actuator (10).

S 034-007
(2) Disconnect the bonding jumper (7) from the actuator (10).

S 034-008
(3) Remove the bolt (11) from the bellcrank (2).

S 034-009
(4) Remove the bolt (15) from the support bracket (9).

S 024-010
(5) Remove the actuator (10).

TASK 21-53-03-404-011

3. Install the Ram-Air Inlet Door Actuator (Fig. 401)

A. Parts

(1) Refer to the Illustrated Parts Catalog (IPC) for the part numbers and the effectivities of the items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	4	Bolt	21-53-01	01	45
	5	Washer			50
	6	Nut			55
	10	Actuator			140
	11	Bolt			100
	12	Washer			110
	13	Washer			115
	14	Nut			120
	15	Bolt			105

B. References
(1) AMM 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels
(2) AMM 21-53-00/501, Ram Air System
(3) AMM 24-22-00/201, Electrical Power Control

C. Access
(1) Location Zones
135/136 Environmental control systems (ECS) bay
(2) Access Panels
193BL/194BR Ram-air inlet door access door

D. Install the Actuator

S 424-012
(1) Put the aft end of the actuator (10) into the support bracket (9).

S 434-013
(2) Install the bolt (15), washer (16), washer (17) and nut (18) into the support bracket.

NOTE: Put the countersunk side of the washer (12) against the bolt (15).

S 424-014
(3) Put the forward end of the actuator (10) into the bellcrank (2).

S 434-015
(4) Install the bolt (11), washer (12), washer (13) and nut (14) into the bellcrank.

S 434-016
(5) Use the bolts (4), washers (5), and nuts (6) to connect the bonding jumpers (7) to the actuator (10).

S 434-017
(6) Connect the electrical connector (3) to the actuator (10).

E. Do the Installation Test for the Actuator

S 864-018
(1) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-019

(2) Remove the DO-NOT-CLOSE tags and close the applicable (left or right system) circuit breakers:

(a) On the overhead circuit breaker panel, P11:

1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A15, AIR COND PACK RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT
5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 734-020

(3) Do the System Test for the ram-air inlet door (AMM 21-53-00/501).

F. Put the airplane back to its usual condition

S 414-021

(1) Close the applicable (left or right) access door for the ram-air inlet, 193BL or 194BR (AMM 06-41-00/201).

S 864-022

(2) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

RAM AIR EXHAUST DOOR ACTUATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the actuators for the ram-air exhaust doors. One exhaust door is installed aft of each air cooling pack. One actuator is attached to the left side of each exhaust door.

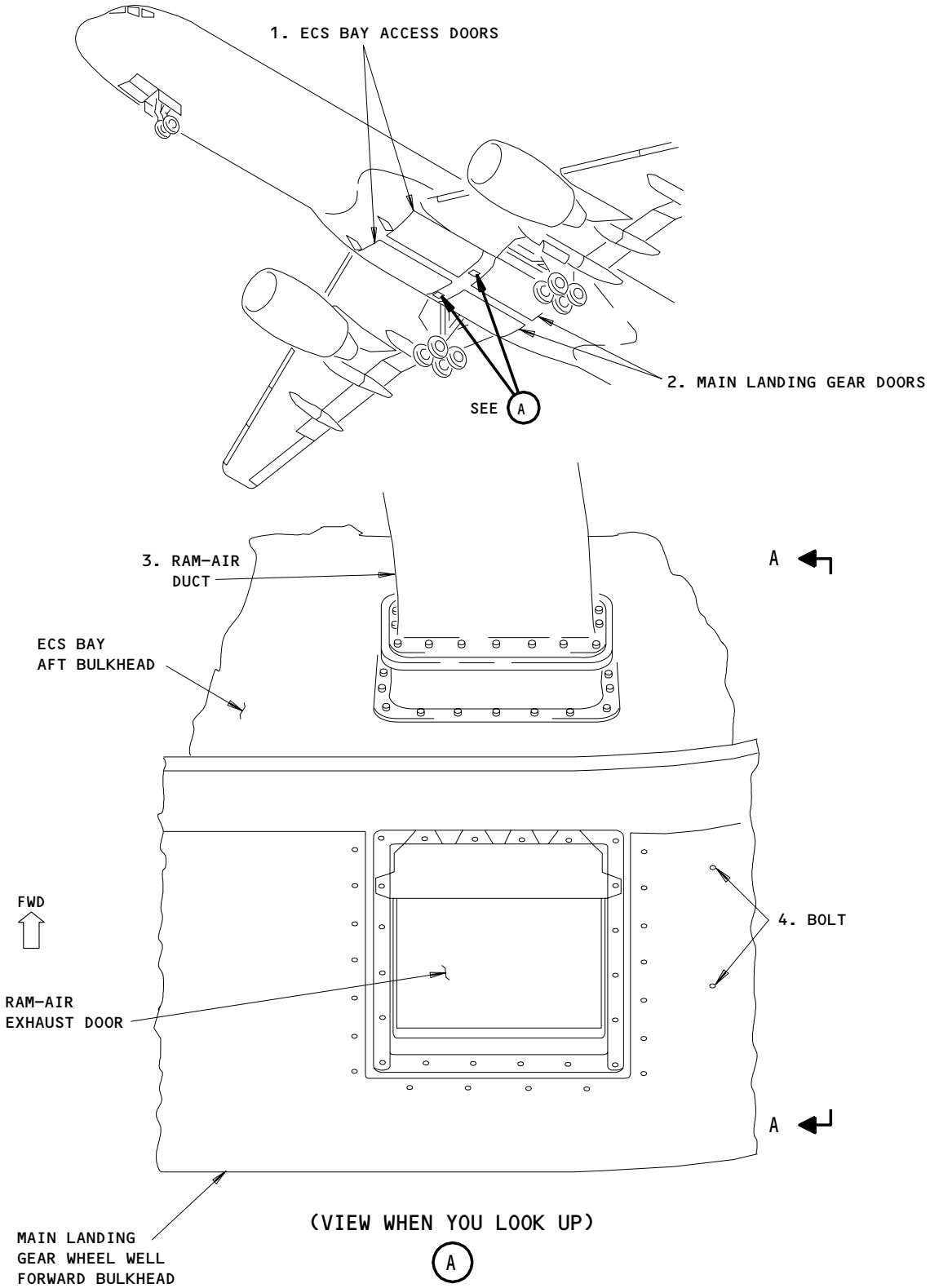
TASK 21-53-04-004-001

2. Remove the Ram-Air Exhaust Door Actuator (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power Control
      (2) AMM 32-00-15/201, Landing Gear Door Ground Operations and Locking Procedure
   B. Access
      (1) Location Zones
          143/144 Main landing gear (MLG) wheel well
   C. Prepare for the Removal

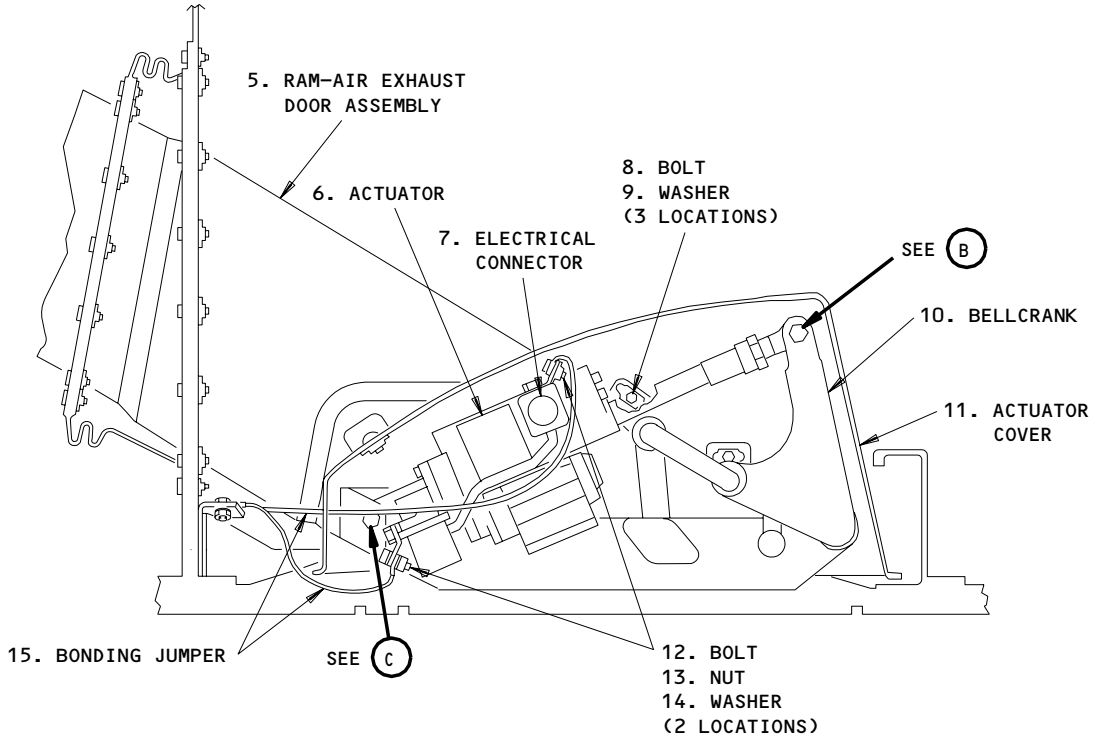
      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

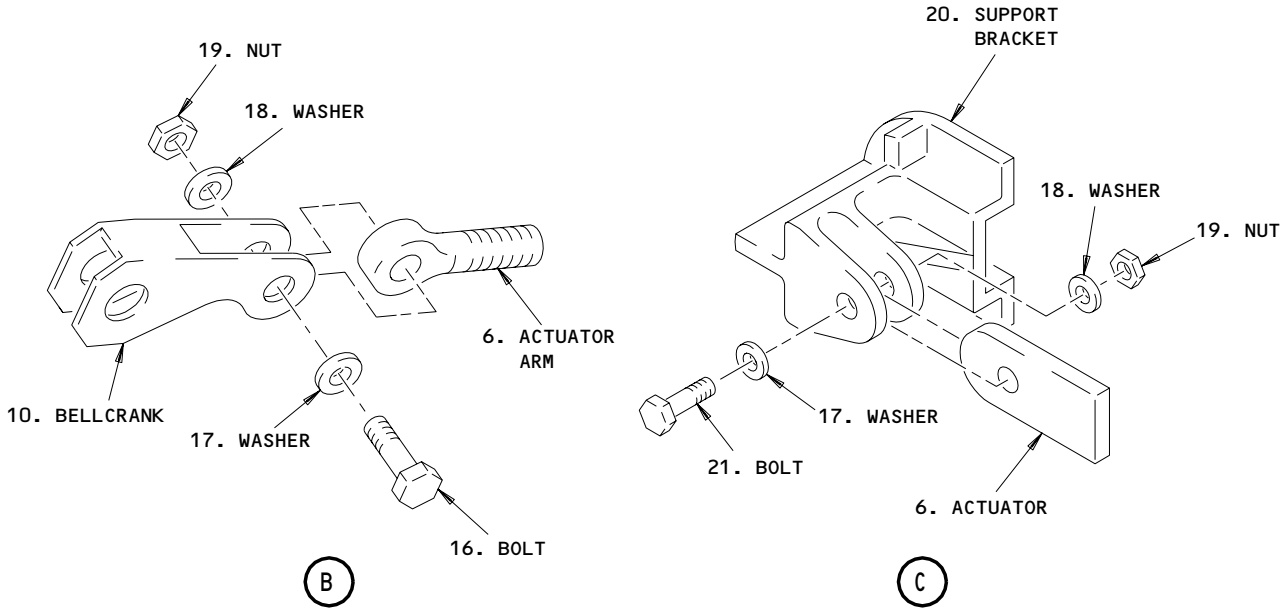
      S 864-004
      (3) Open the applicable (left or right system) circuit breakers and attach DO-NOT-CLOSE tags:
          (a) On the overhead circuit breaker panel, P11:
              1) 11A13, AIR COND PACK LEFT AUTO CONT
              2) 11A15, AIR COND PACK RIGHT STANDBY CONT
              3) 11A26, AIR COND PACK LEFT STBY CONT
                 or
                 11A27, AIR COND PACK L STBY CONT



Ram-Air Exhaust Door Actuator Installation
Figure 401 (Sheet 1)



A-A



Ram-Air Exhaust Door Actuator Installation
Figure 401 (Sheet 2)

4) 11A28, AIR COND PACK RIGHT AUTO CONT
5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 014-005

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT AROUND THE MAIN LANDING GEAR BEFORE YOU CLOSE THE DOORS. THE DOORS CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Open and lock the applicable (left or right) main landing gear door (Ref 32-00-15/201).

NOTE: The nose and main landing gear doors will open at the same time.

D. Remove the Actuator

S 034-006
(1) Remove the cover (11) from the actuator (6).
(a) Remove the bolts (4) that hold the cover (11) to the airplane skin.
(b) Remove the bolts (8) that hold the cover (11) to the ram-air exhaust door (5).
(c) Remove the cover (11) from the actuator (6).

S 034-007
(2) Disconnect the electrical connector (7) from the actuator (6).

S 034-008
(3) Disconnect the bonding jumpers (15) from the actuator (6).

S 034-009
(4) Remove the bolt (16) from the bellcrank (10).

S 034-010
(5) Remove the bolt (21) from the support bracket (20).

S 024-011
(6) Remove the actuator (6).

TASK 21-53-04-404-012
3. Install the Ram-Air Exhaust Door Actuator (Fig. 401)
A. Parts
(1) Refer to the Illustrated Parts Catalog (IPC) for the part numbers and the effectivities of the items in the table that follows.

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	4	Bolt	21-53-02	01	75
	6	Actuator			190
	8	Bolt			25
	9	Washer			30
	11	Cover			35
	12	Bolt			50
	13	Nut			60
	14	Washer			55
	16	Bolt			170
	17	Washer			175
	18	Washer			180
	19	Nut			185
	21	Bolt			165

B. References
(1) AMM 21-53-00/501, Ram Air System
(2) AMM 24-22-00/201, Electrical Power Control
(3) AMM 32-00-15/201, Landing Gear Door Ground Operations and Locking Procedure

C. Access
(1) Location Zones
143/144 MLG wheel well

D. Procedure - Install the Actuator

S 424-013
(1) Put the forward end of the actuator (6) into the support bracket (20).

S 434-014
(2) Install the bolt (21), washer (17), washer (18), and nut (19) into the support bracket (20).

S 424-015
(3) Put the aft end of the actuator (6) into the bellcrank (10).

S 434-016
(4) Install the bolt (16), washer (17), washer (18), and nut (19) into the bellcrank (10).

S 434-017
(5) Use the bolts (12), nuts (13), and washers (14) to connect the bonding jumpers (15) to the actuator (6).

S 434-018
(6) Connect the electrical connector (7) to the actuator (6).

S 434-019
(7) Install the actuator cover (11).
(a) Put the cover (11) into its position.
(b) Install the bolts (8) and washers (9) that hold the cover (11) to ram-air exhaust door (5).
(c) Install the bolts (4) that hold the cover (11) to the airplane skin.

E. Procedure - Do the installation test for the actuator

S 864-020
(1) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-021
(2) Remove the DO-NOT-CLOSE tags and close the applicable (left or right system) circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A15, AIR COND PACK RIGHT STANDBY CONT
3) 11A26, AIR COND PACK LEFT STBY CONT
or
11A27, AIR COND PACK L STBY CONT
4) 11A28, AIR COND PACK RIGHT AUTO CONT

5) 11M11, LEFT PACK AUTO POWER
6) 11M15, RIGHT PACK STANDBY POWER
7) 11M19, RIGHT PACK AUTO POWER
8) 11M24, LEFT PACK STANDBY POWER

S 734-022

(3) Do the System Test for the ram-air exhaust door (AMM 21-53-00/501).

F. Put the airplane back to its usual condition

S 414-023

WARNING: MAKE SURE THERE ARE NO PERSONS OR EQUIPMENT AROUND THE MAIN LANDING GEAR BEFORE YOU CLOSE THE DOORS. THE DOORS CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Remove the door locks and close the applicable (left or right) main landing gear door (AMM 32-00-15/201).

S 864-024

(2) Remove the electrical power, if it is not necessary (AMM 24-22-00/201).

WATER SPRAY NOZZLE - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the water spray nozzle. One water spray nozzle is installed in each ram-air inlet duct, near the inlet of the secondary heat exchanger.

TASK 21-53-05-004-001

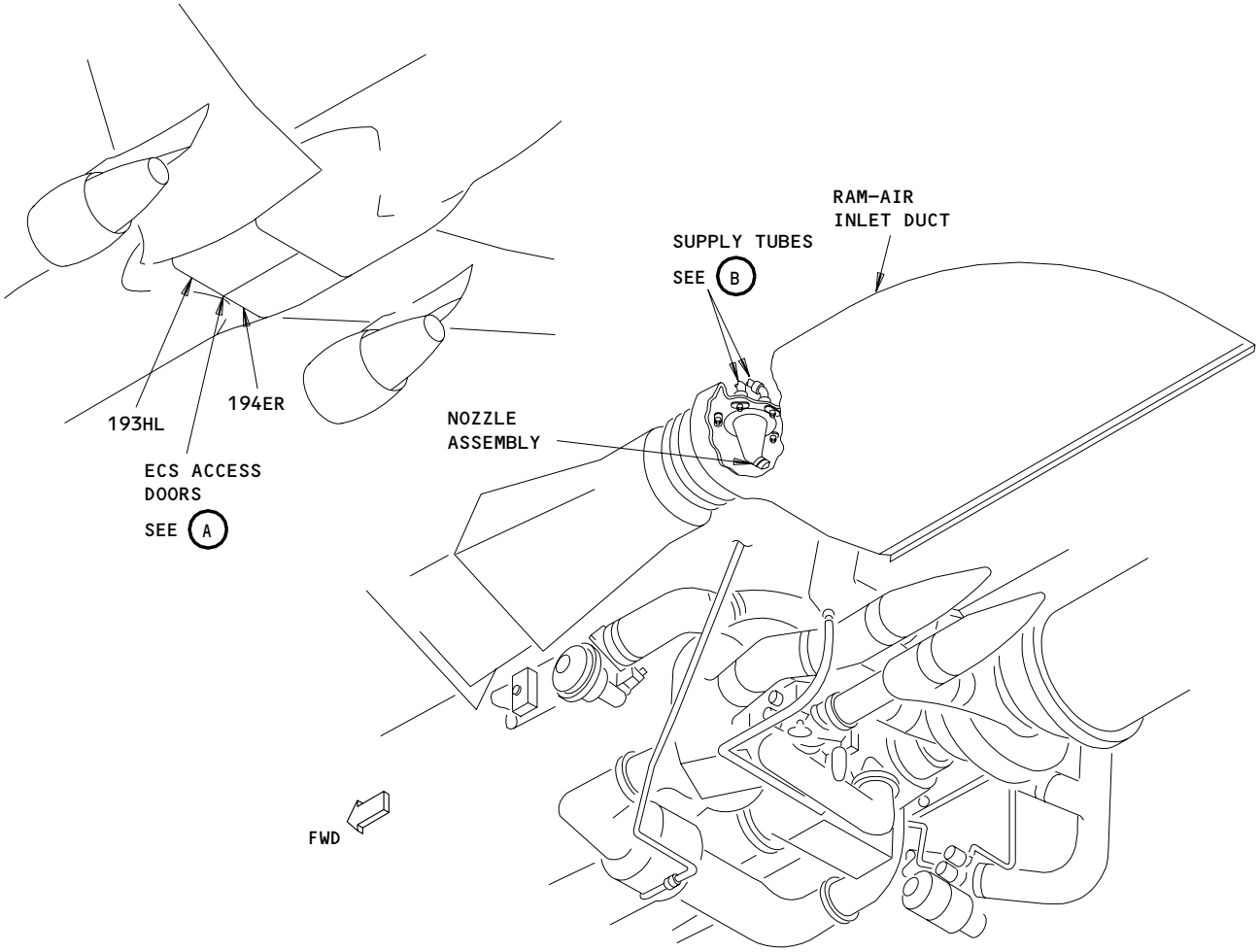
2. Remove the Water Spray Nozzle (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems access door
   C. Prepare for the Removal

      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

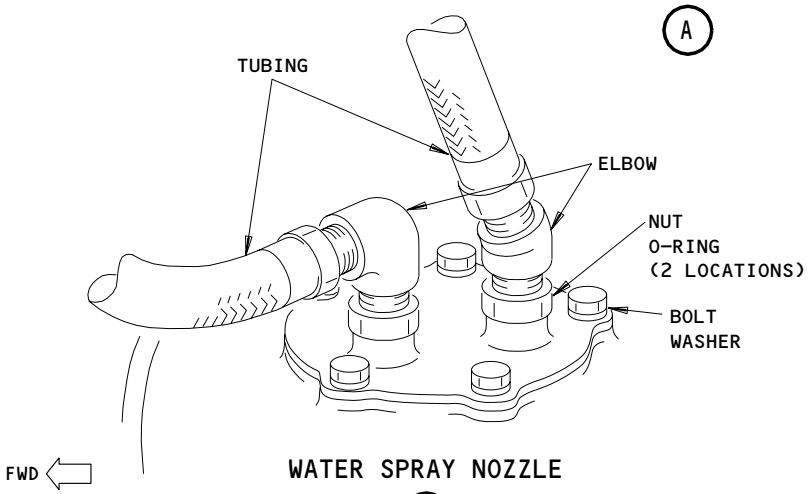
      S 864-088
      (3) Open and attach a DO-NOT-CLOSE tag to these circuit breakers on the P11 overhead circuit breaker panel:
          (a) To remove the water spray nozzle from the left ram-air inlet duct:
              1) 11A13, AIR COND PACK LEFT AUTO CONT
              2) 11A14, AIR COND PACK LEFT FLOW CONT
              3) 11M11, LEFT PACK AUTO POWER
          (b) To remove the water spray nozzle from the right ram-air inlet duct:
              1) 11A28, AIR COND PACK RIGHT AUTO CONT
              2) 11A29, AIR COND PACK RIGHT FLOW CONT
              3) 11M19, RIGHT PACK AUTO POWER

      S 014-024
      (4) Open the applicable (left or right) ECS door, 193HL or 194ER (Ref 06-41-00).



AIR COOLING PACK

A



WATER SPRAY NOZZLE

B

Water Spray Nozzle Installation
Figure 401

D. Procedure - Remove the Nozzle

S 034-025
(1) Disconnect the tubes from the elbows on the water spray nozzle.

S 434-063
(2) Put a tag on the tubes to show their correct installation.

S 034-034
(3) Remove the bolts from the water spray nozzle.

S 024-033
(4) Remove the water spray nozzle.

S 034-032
(5) Remove the elbows from the water spray nozzle.

S 434-030
(6) Put a cover on the duct opening.

TASK 21-53-05-404-031

3. Install the Water Spray Nozzle (Fig. 401)

A. References
(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 24-22-00/201, Electric Power Control

B. Access
(1) Location Zones
135/136 Environmental control systems (ECS) bay
(2) Access Panels
193HL/194ER Environmental control systems access door

C. Procedure - Install the Nozzle

S 034-035
(1) Remove the cover from the duct opening.
(a) Make sure there is no unwanted material in the duct.

S 434-036
(2) Install the elbows on the water spray nozzle.

S 424-037
(3) Put the water spray nozzle into its position in the ram-air inlet duct.

S 434-038
(4) Install the bolts and washers to hold the water spray nozzle to the duct.

S 434-039
(5) Connect the tubes to the elbows on the water spray nozzle.

S 414-062
(6) Close the applicable (left or right) ECS door, 193HL or 194ER (Ref 06-41-00).

S 864-089
(7) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead circuit breaker panel:
(a) If the left water spray nozzle was installed:
1) 11A13, AIR COND PACK LEFT AUTO CONT
2) 11A14, AIR COND PACK LEFT FLOW CONT
3) 11M11, LEFT PACK AUTO POWER
(b) If the right water spray nozzle was installed:
1) 11A28, AIR COND PACK RIGHT AUTO CONT
2) 11A29, AIR COND PACK RIGHT FLOW CONT
3) 11M19, RIGHT PACK AUTO POWER

S 864-060
(8) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-061
(9) Remove the electrical power, if it is not necessary (Ref 24-22-00).

WATER SPRAY NOZZLE - INSPECTION/CHECK

1. General
   A. This procedure has instructions to do a check of the water spray nozzle and water spray lines of each pack. If these components have blockage, the Air Cycle Machine can get ice.

   TASK 21-53-05-006-001

2. Water Spray Nozzle Check (Fig. 601)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 21-51-04/401, Water Extractor
      (3) 21-51-21/401, Split-Duct Water Separator
      (4) 24-22-00/201, Electrical Power Control
      (5) 36-00-00/201, Pneumatic General
   B. Access
      (1) Location Zones
          135/136 Environmental control systems (ECS) bay
      (2) Access Panels
          193HL/194ER Environmental control systems bay
   C. Spray Nozzle System Inspection

      S 016-074
      (1) Open the applicable (left or right) ECS access door, 193HL or 194ER (AMM 06-41-00/201).

      S 866-071
      (2) Supply electrical power (AMM 24-22-00/201).

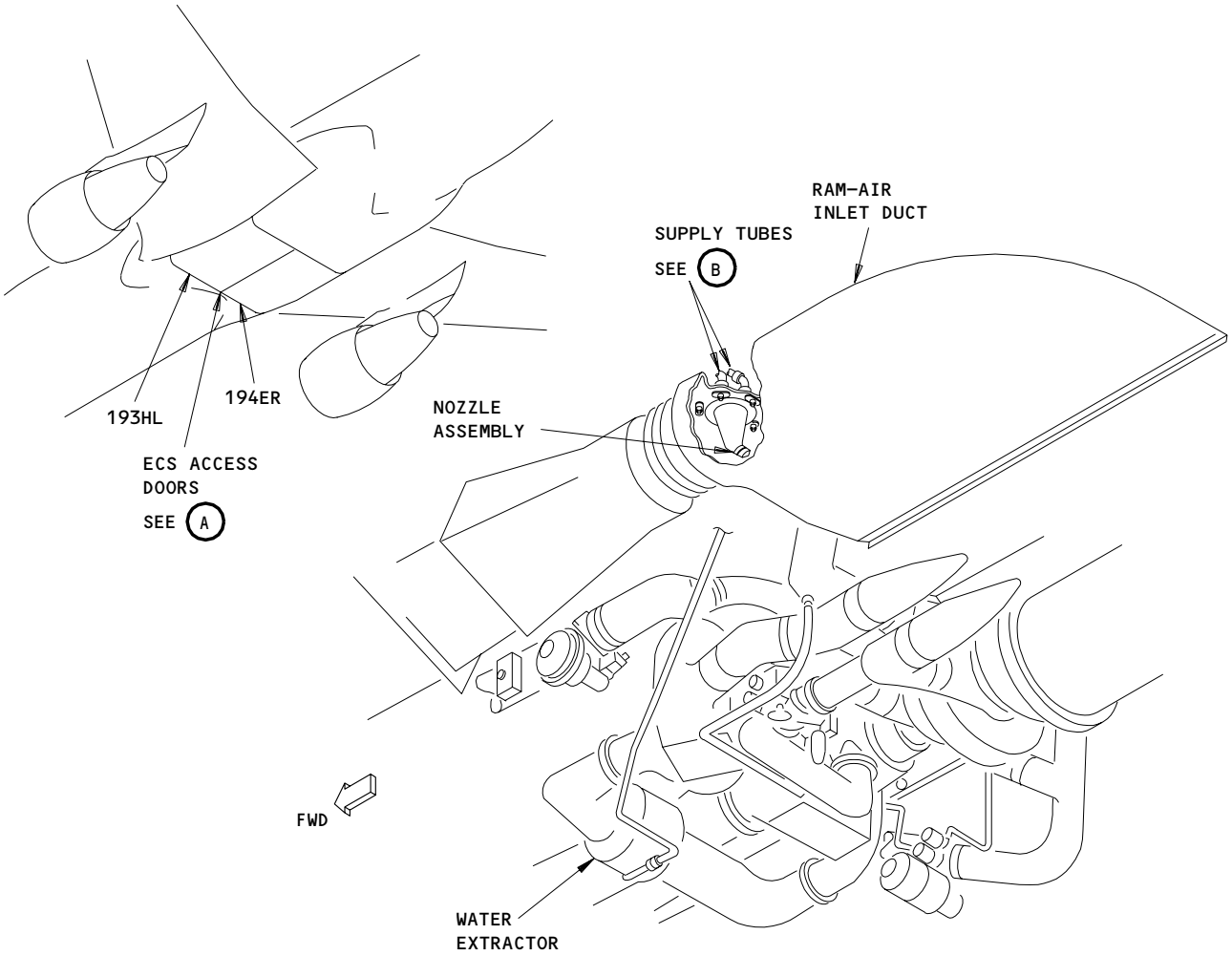
      S 866-040
      (3) Use the APU to supply pneumatic power to the air conditioning packs (AMM 36-00-00/201).

      S 866-041
      (4) Put the left and right pack selector switches in the AUTO position.
          (a) Make sure that the PACK OFF light goes off.

      S 866-042
      (5) Put the TRIM AIR switch to the ON position.

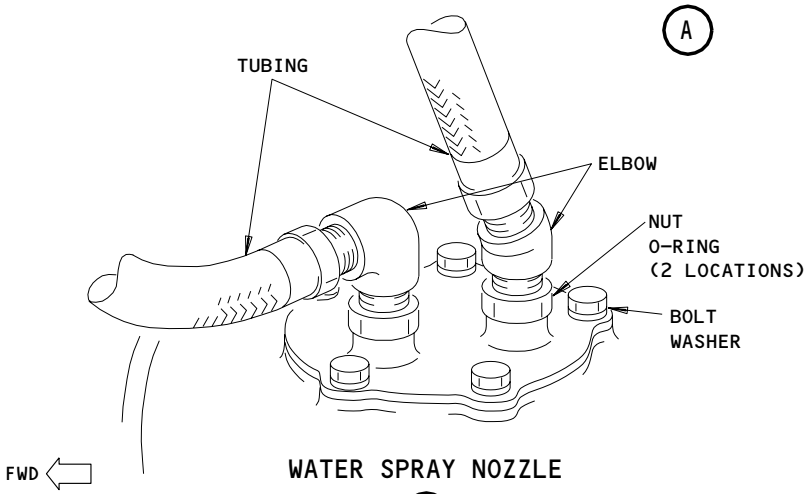
      S 866-043
      (6) Put all zone temperature selectors in the AUTO-C (full cold) position.

      S 016-044
      (7) Remove the access panel on the bottom of the Ram Air Ducts which are upstream of the heat exchangers.



AIR COOLING PACK

A



WATER SPRAY NOZZLE

B

Water Spray System
Figure 601

S 216-045
(8) Use a flashlight and look at the water spray pattern from the spray nozzle in each ram inlet system.

NOTE: The quantity of the water is a function of the air humidity and the pack air flow.

(a) Make sure the water spray pattern from each spray nozzle is approximately the same.
(b) Make sure the water sprays are approximately circular and are continuous.
(c) If the water sprays are not satisfactory, examine these parts for leakage or blockage:
1) The water extractor (AMM 21-51-04/401)
2) The water spray nozzle
3) The air and water supply lines from the water extractor to the water spray nozzle

S 866-064
(9) Put the left and right pack selector switches in the OFF position.

S 016-065
(10) Remove the line at the bottom (the sump) of each water extractor that comes from the split-duct water separator (AMM 21-51-21/401).

S 866-066
(11) Put the left and right pack selector switches in the AUTO position.
(a) Make sure that the PACK OFF light goes off.

S 216-067
(12) Feel for air or water to come out of the line that you disconnected.

S 216-068
(13) Feel for air or water to come out of the hole in the water extractor where you removed the line.

S 216-069
(14) If there is no air or water, examine these parts for leakage or blockage:
(a) The water extractor
(b) The split-duct water separator
(c) The line from the split-duct water separator to the water extractor

D. Put the airplane back to its usual condition

S 866-070
(1) Put the left and right pack selector switches in the OFF position.

S 866-072
(2) Put the TRIM AIR switch in the OFF position.

S 416-063
(3) Put the access panel back on the bottom of the Ram Air Duct.

S 416-060
(4) Close the applicable (left or right) ECS access door, 193HL or 194ER (Ref 06-41-00).

S 866-061
(5) Remove the pneumatic power, if it is not necessary (AMM 36-00-00/201).

S 866-062
(6) Remove the electrical power, if it is not necessary (Ref 24-22-00).

TEMPERATURE CONTROL CARD ASSEMBLY - REMOVAL/INSTALLATION

1. General
   A. This procedure has instructions to remove and install the temperature control cards. The cards are installed in the electrical systems cardfile panel, P50, in the main equipment center. The number of the right card is M10404. The number of the left card is M10403.

TASK 21-53-06-004-002

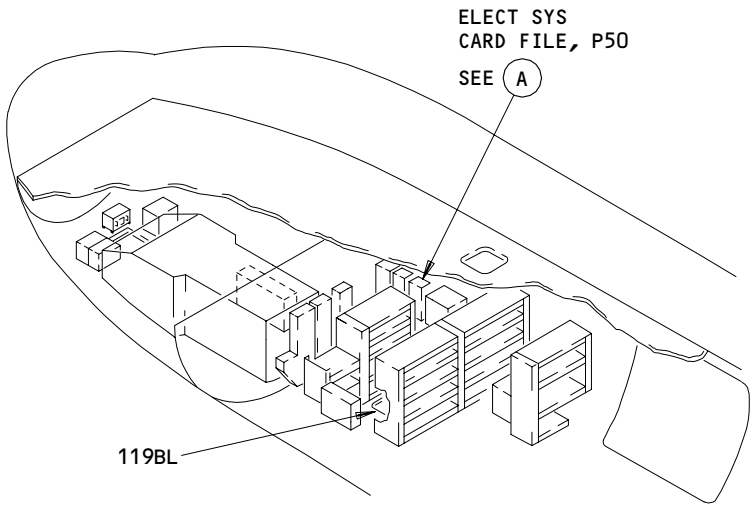
2. Remove the Temperature Control Card Assembly (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 20-10-01/401, E/E Rack Mounted Components
      (3) 20-41-01/201 Electro-Static Sensitive Devices.
      (4) 24-22-00/201 Electric Power Control
      (5) 27-61-00/201, Spoiler/Speedbrake Control System
      (6) 32-09-02/201, Air/Ground Relays
   B. Access
      (1) Location Zone
          120 Main equipment center (Right)
      (2) Access Panel
          119BL Main equipment center access door
   C. Prepare for the Removal

      S 864-003
      (1) Supply electrical power (Ref 24-22-00).

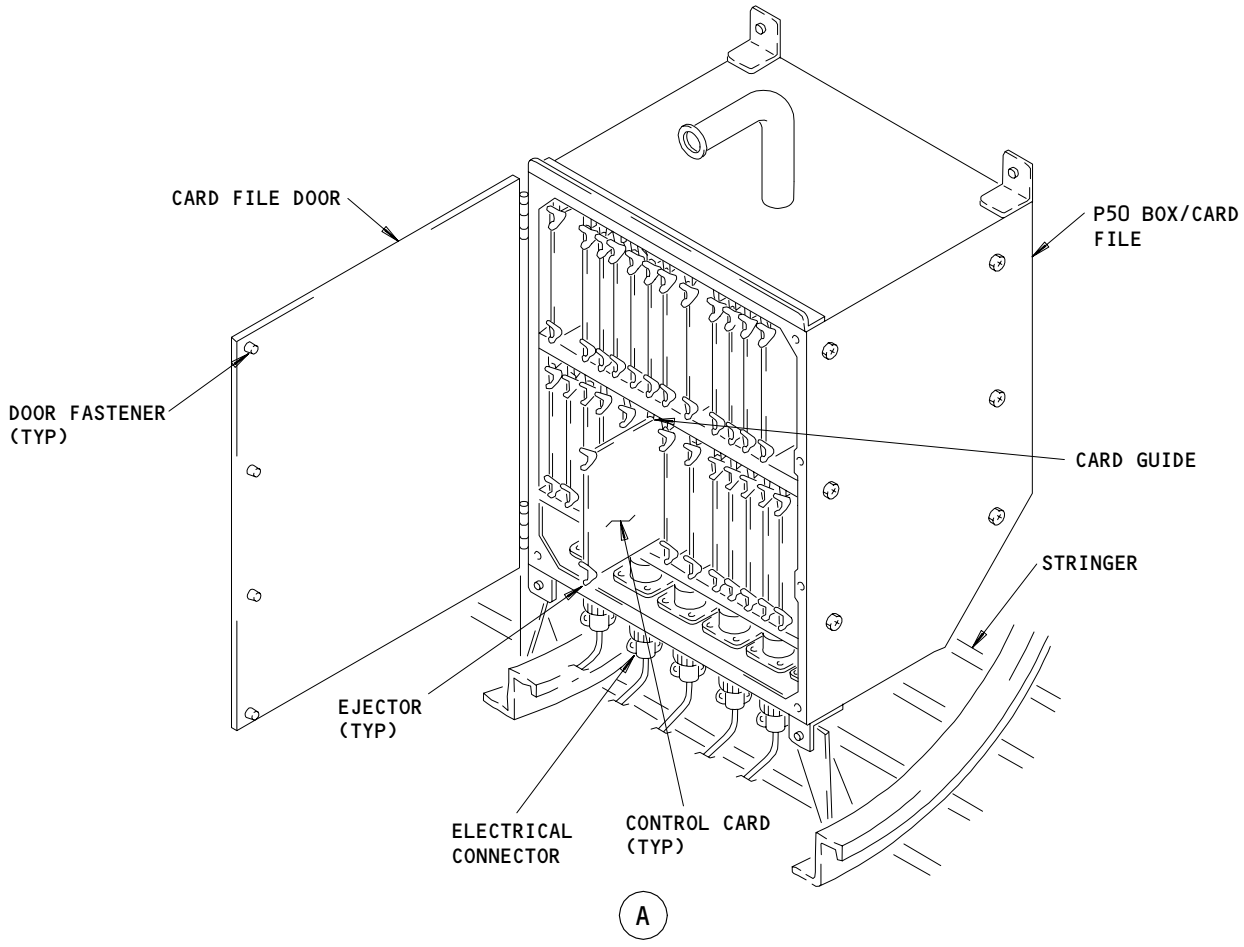
      S 864-004
      (2) Turn the applicable (L or R) PACK selector, on the pilot's overhead panel, P5, to the OFF position.
          (a) Make sure the PACK OFF light comes on.
          (b) Put a DO-NOT-OPERATE tag on the selector.

      S 864-095
      (3) Open and attach a DO-NOT-CLOSE tag to these circuit breakers, on the overhead circuit breaker panel, P11:
          (a) To remove the left temperature control card:
              1) 11A14, AIR COND PACK LEFT FLOW CONT
              2) 11A26, AIR COND PACK LEFT STBY CONT
              3) 11M24, LEFT PACK STANDBY POWER
          (b) To remove the right temperature control card:
              1) 11A15, AIR COND PACK RIGHT STANDBY CONT
              2) 11A29, AIR COND PACK RIGHT FLOW CONT
              3) 11M15, RIGHT PACK STANDBY POWER

      S 014-025
      (4) Open the access door for the main equipment center, 119BL (Ref 06-41-00).



MAIN EQUIP CTR



Temperature Control Card Installation
Figure 401

D. Procedure - Remove the Control Card

S 014-026

(1) Open the door of the electrical systems cardfile panel, P50.

S 914-001

CAUTION: DO NOT TOUCH THE CONTROL CARD BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE CONTROL CARD.

(2) Do the procedure for devices that are sensitive to electrostatic discharge (Ref 20-41-01).

S 024-027

(3) Remove the applicable (left or right) temperature control card from the P50 panel (Ref 20-10-01).

TASK 21-53-06-404-028

3. Install the Temperature Control Card Assembly (Fig. 401)

A. References

(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 20-10-01/401, E/E Rack Mounted Components
(3) 20-41-01/201 Electro-Static Sensitive Devices.
(4) 24-22-00/201 Electric Power Control
(5) 27-61-00/201, Spoiler/Speedbrake Control System
(6) 32-09-02/201, Air/Ground Relays

B. Access

(1) Location Zone
120 Main equipment center (Right)
(2) Access Panel
119BL Main equipment center access door

C. Procedure - Install the Control Card

S 914-029

CAUTION: DO NOT TOUCH THE CONTROL CARD BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE CONTROL CARD.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (Ref 20-41-01).

S 424-030

(2) Install the temperature control card into the P50 panel (Ref 20-10-01).

S 414-031

(3) Close the door to the P50 panel.

D. Do the Installation Test for the Temperature Control Card

S 864-098

(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers, on the overhead circuit breaker panel, P11:
   (a) If the left temperature control card was installed:
      1) 11A14, AIR COND PACK LEFT FLOW CONT
      2) 11A26, AIR COND PACK LEFT STBY CONT
      3) 11M24, LEFT PACK STANDBY POWER
   (b) If the right temperature control card was installed:
      1) 11A15, AIR COND PACK RIGHT STANDBY CONT
      2) 11A29, AIR COND PACK RIGHT FLOW CONT
      3) 11M15, RIGHT PACK STANDBY POWER

S 864-051

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do the deactivation procedure for the spoilers (Ref 27-61-00) or move all persons and equipment away from the spoilers.

S 864-052

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION PROCEDURE CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(3) Do the Flight Mode Simulation procedure for the No. 1 or No. 2 air/ground system (Ref 32-09-02).

NOTE: The No. 1 air/ground system is for the left temperature control card. The No. 2 air/ground system is for the right temperature control card.

S 214-053
(4) Make sure the applicable (left or right) ram-air doors move to the closed positions.

NOTE: The ram-air doors need approximately 30 seconds to move to their new positions.

S 864-054
(5) Put the airplane back to the ground mode (Ref 32-09-02).

S 214-055
(6) Make sure the applicable (left or right) ram-air doors move to the open positions.

E. Put the airplane back to its usual condition

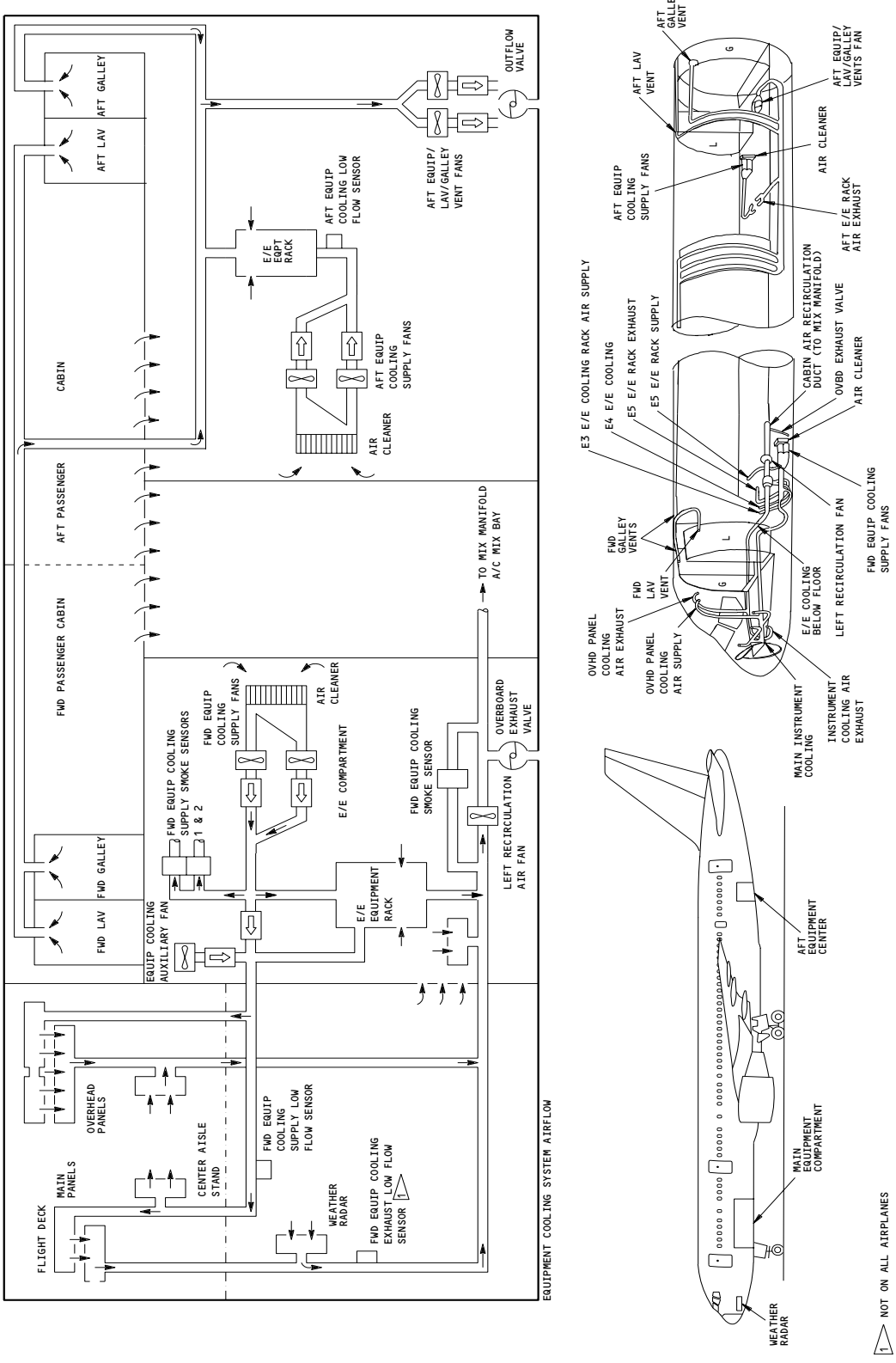
S 414-056
(1) Close the access door for the main equipment center, 119BL (Ref 06-41-00).

S 864-058
(2) Remove the DO-NOT-OPERATE tag from the applicable (L or R) PACK selector, on the P5 panel.

S 864-057
(3) Remove the electrical power, if it is not necessary (Ref 24-22-00).

EQUIPMENT COOLING SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. Two E/E (electrical/electronic) equipment cooling systems provide forced air cooling to the E/E equipment. The forward system cools the forward equipment racks, main panels, overhead panels, and weather radar. The aft system cools the aft equipment racks.
   B. Equipment Cooling System
      (1) The system is designed for automatic operation requiring minimum crew attention.
      (2) Equipment cooling is provided either by directing supply air through the equipment ("blow thru") or by drawing air through the same equipment ("draw thru"). In the forward supply system, "blow thru" is accomplished by one of the two equipment cooling supply fans blowing air from the forward cargo compartment sidewall area thru the main equipment center and flight deck instruments. In the forward exhaust system, "draw thru" is accomplished by using the left cabin air recirculation fan (AMM 21-25-00/001) to draw air thru the main equipment center. In the aft supply system, "blow thru" is accomplished by one of the two aft equipment supply fans blowing exhausted passenger conditioned air from the aft cargo compartment thru the aft eqpuipment racks. The aft exhaust system utilizes the aft equipment/lavatory/galley ventilation fans (AMM 21-26-00/001) to draw air thru the aft equipment racks.
      (3) Cooling air flows to the equipment rack electronics boxes through holes in metering plates located directly under each unit. Some of the holes in the metering plates are blocked with rubber plugs depending on the cooling air requirements of each unit. A decal is mounted on the equipment rack showing which holes are to remain open.
      (4) After cooling the equipment, the air flows into the main E/E exhaust duct. In the forward system, the air is ducted to the ECS mix manifold or exhausted overboard. The aft system exhausts thru the aft equipment/lavatory/galley ventilation ducting to eventually be exhausted overboard.
      (5) Low flow sensors are located in the supply and exhaust ducting.
      (6) Smoke sensors are located in the forward E/E cooling supply and exhaust ducting with smoke clearance being achieved by exhausting the air overboard.
      (7) An automatic test circuit checks the proper operation of both the forward and aft equipment cooling systems. The test is performed at the termination of every flight following engine shutdown.
      (8) The automatic test can be re-initiated manually with both engines shutdown. The manual test is activated by an EQUIP COOL TEST switch located on the right sidewall panel P61.

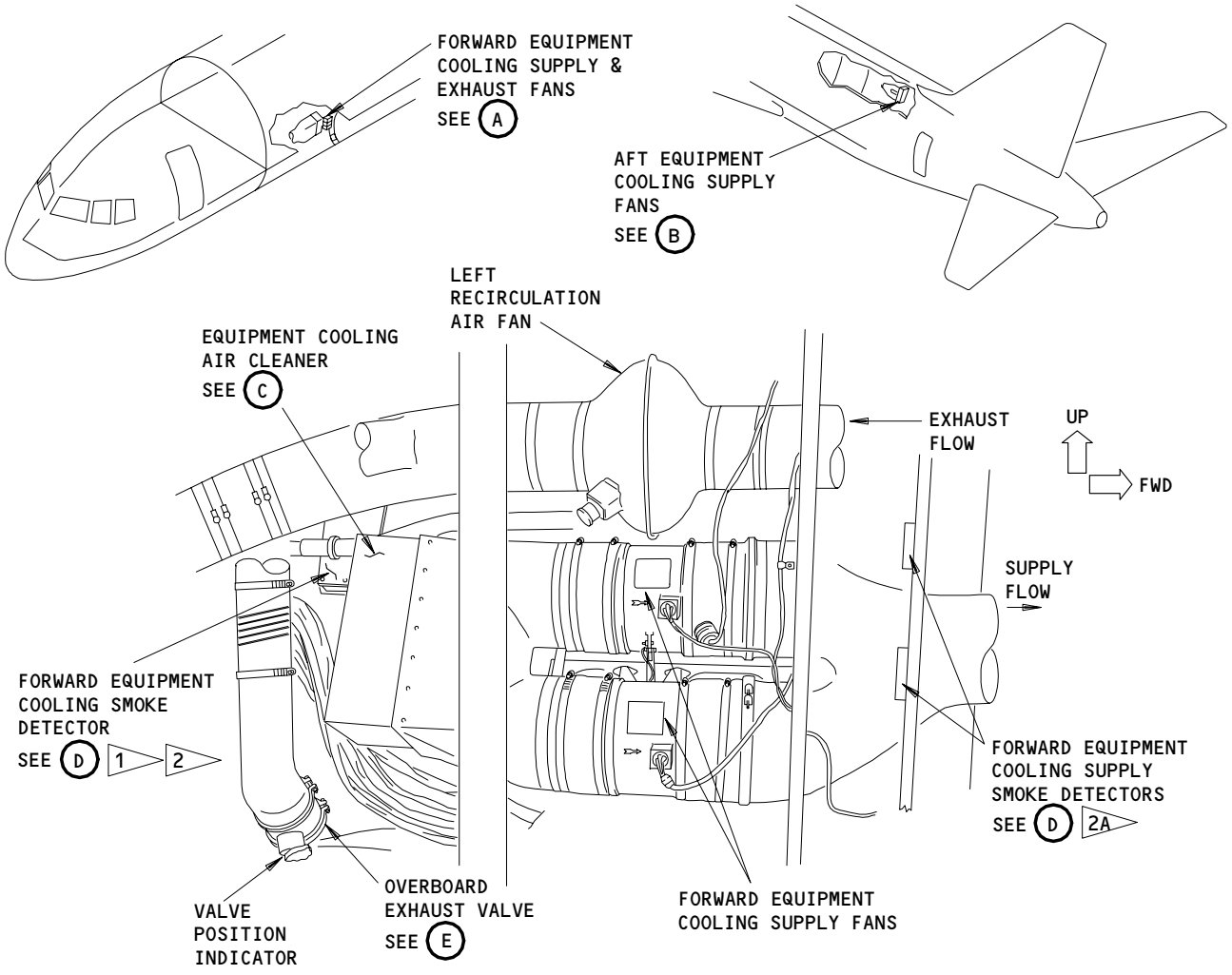


Equipment Cooling - Simplified Flow Diagram
Figure 1

A72257

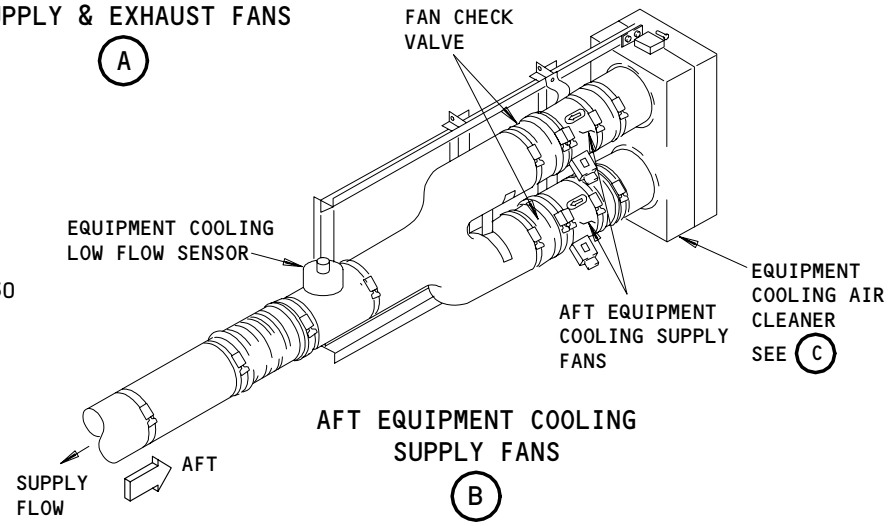
C. High ambient temperatures reduce the efficiency of the cooling system. In order to assure adequate cooling at ambient temperatures above 94°F (34°C) the following conditions must be satisfied if electrical power is supplied to the airplane for longer than 20 min.
   (1) At ambient temperatures from 94 to 105°F (34 to 40°C), one forward and one aft entry door on opposite sides of the airplane must be open or at least one air conditioning pack must be operating.
   (2) At ambient temperatures from 106 to 120°F (41 to 49°C), at least one air conditioning pack must be operating.
   (3) At ambient temperatures above 120°F (49°C), both air conditioning packs must be operating.

2. Component Details (Fig. 2)
   A. Fan Check Valve
      (1) Physical Description
         (a) A check valve is installed in the cooling air supply duct downstream of each supply fan.
         (b) Each valve contains two spring-loaded closed flappers enclosed in a housing.
      (2) Function
         (a) The valve opens in the normal flow direction at a maximum differential pressure of 0.5 inches of water. When the differential pressure is less than 0.5 inches of water, the spring-loaded valves close to prevent flow in the opposite direction of normal flow.
   B. Overboard Exhaust Valve
      (1) Physical Description
         (a) The overboard exhaust valve is located in the forward cargo compartment on the left side of the airplane about 3 feet (1 meter) aft of the forward endliner. The valve permits cooling air and smoke from the E/E cooling system to be exhausted from the airplane.
         (b) The valve consists of a spring-controlled, butterfly-type airfoil valve and a three-position electrical actuator. Only two control positions, NORMAL and SMOKE, are used for E/E cooling system control. The DITCH position is not used.
      (2) Function
         (a) In operation, the valve actuator is commanded to either NORMAL or SMOKE. When the valve actuator is in NORMAL, the valve flapper is spring-loaded open. The flapper is aerodynamically shaped to "fly shut" when the differential pressure between the interior and exterior surfaces of the overboard exhaust valve is greater than 2.8 psi. When the valve actuator is commanded to SMOKE, the valve flapper is driven partially open to exhaust equipment cooling air overboard.
         (b) Limit switches within the valve assembly provide signals for position indication.



FORWARD EQUIPMENT COOLING SUPPLY & EXHAUST FANS

A



AFT EQUIPMENT COOLING SUPPLY FANS

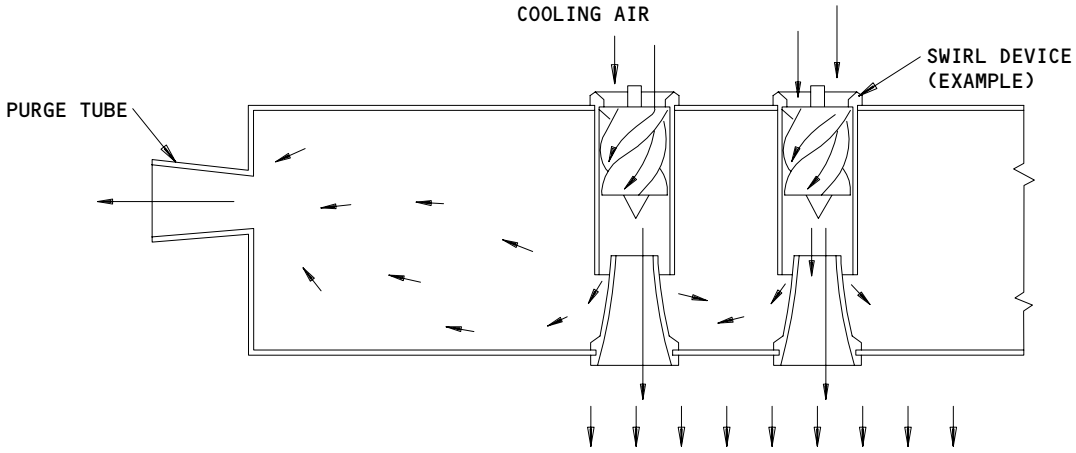
B

1 ON AIRPLANES WITHOUT SB 21-50 FORWARD EXHAUST AND SUPPLY SMOKE DETECTORS

2 ON AIRPLANES WITH SB 21-50 FORWARD EXHAUST SMOKE DETECTOR

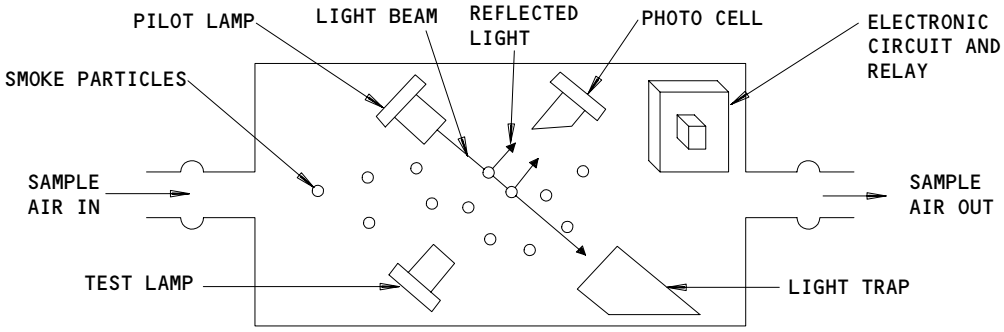
2A AIRPLANES WITH SB 21-50

Equipment Cooling System Components
Figure 2 (Sheet 1)



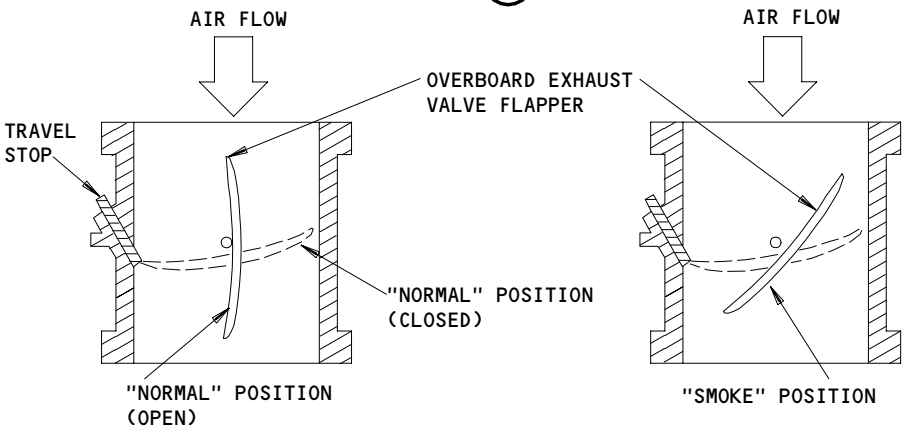
AIR CLEANER OPERATION

C



SMOKE SENSOR OPERATION

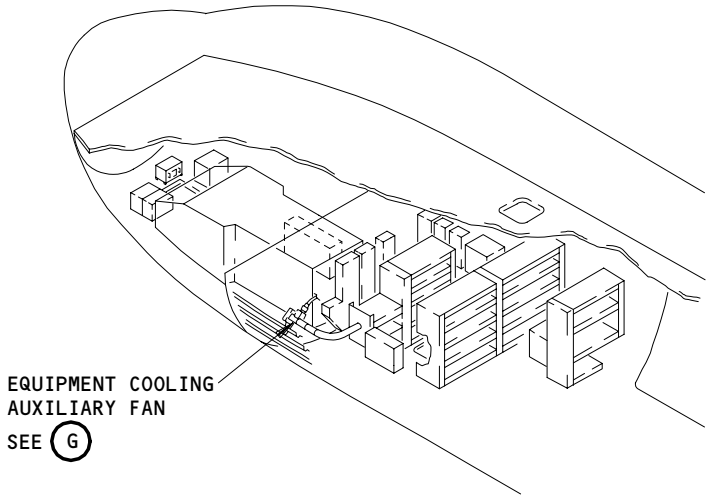
D

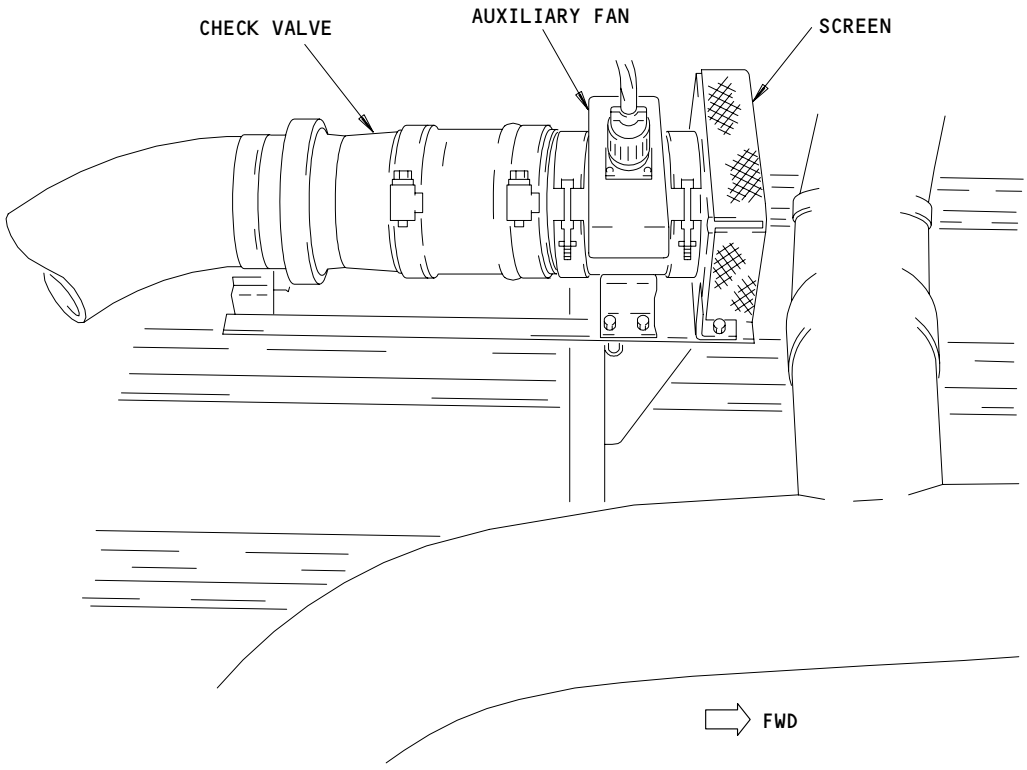


OVERBOARD EXHAUST VALVE

E

Equipment Cooling System Components
Figure 2 (Sheet 2)





EQUIPMENT COOLING AUXILIARY FAN

G

Equipment Cooling System Components
Figure 2 (Sheet 3)

C. Equipment Cooling Air Fan
   (1) Physical Description
      (a) Both forward E/E equipment cooling supply fans are located along the left forward sidewall of the forward cargo compartment about 2 feet (0.7 meters) aft of the forward endliner. Both aft E/E equipment cooling supply fans are located along the right sidewall aft of the aft cargo door.
      (b) The auxiliary equipment cooling fan is located forward of the E1 rack in the main equipment center.
      (c) The forward and aft equipment cooling fans are single stage vaneaxial fans integrating the motor into the fan.
      (d) The fan contains an inner housing which encases the three-phase motor. The rotating impeller pushes air over the motor housing and through de-swirl vanes before exiting the fan.
      (e) Three thermal switches are provided in the power windings of each fan to provide fan overheat protection. The switches open the fan power relay circuit, interrupting power to the fan when temperature in a winding reaches 400°F (204°C) for the forward supply fans, and 160°F (71°C) for the aft supply fans.

D. Equipment Cooling Air Filter
   (1) Physical Description
      (a) The equipment cooling air filter removes airborne dust particles and lint greater than 400 microns in size. The filters are located upstream of the forward and aft equipment cooling supply fans.

E. Equipment Cooling Low Flow Sensor
   (1) Three low flow sensors: a forward equipment supply sensor (found in the supply duct to the main panels), a forward equipment exhaust sensor (if installed, found in exhaust duct from the main panels) and an aft equipment cooling sensor (found in the supply duct to the aft E/E equipment rack) sense low flow and enable indication of inadequate cooling airflow. Each sensor contains a probe-like element with a self-heating thermistor. Airflow through the ducts cool the heated probe. Low airflow in the duct cannot sufficiently cool the heated probe and implies inadequate cooling of the E/E racks. When insufficient cooling airflow exists, the low flow sensor closes, which supplies a ground for low flow indication.
   (2) The low flow sensors contain a test circuit. When a ground signal is provided to the test terminal, a switch within the sensor closes to provide an alternate means of activating the low flow alarm output.

F. Equipment Cooling Smoke Sensor
   (1) There are two smoke sensors on the forward E/E cooling system supply duct (located downstream of the forward supply fans), one sensor on the forward E/E cooling exhaust duct (located upstream of the left recirculation fan).

(2) The forward exhaust detector is located just aft of the forward equipment cooling air cleaner. The forward supply detectors are located forward of the equipment cooling supply fans on the bulkhead lining support.

(3) Each sensor consists of an inlet duct, an exhaust duct, a light source, a light trap, a photo diode, and a test LED. The sensor's light source sends a concentrated beam of light into the light trap. The light beam passes through airflow bled from the cooling ducts and channeled through the sensor. Smoke particles entering the sensor cause the beam of light to scatter and hit the photo diode. The photo diode's electrical resistance decreases with light, providing a ground for EICAS and the SMOKE light.

(4) Each smoke detector contains a test circuit. When a ground signal is provided at the test terminal, the test LED illuminates which shines directly on the photo diode. The test LED is wired in series with the light source to test sensor continuity. If the sensor tests good, the alarm circuit is energized and the sensor behaves as if smoke has been sensed.

(5) Because the smoke detector is very sensitive to the amount of light in the detector, the correct lamp must be used in the detector. If the incorrect lamp is used, then the detector will not be able to sense a smoke condition.

3. Operation

A. Functional Description

(1) Equipment Cooling System Normal Operation

(a) In the forward system, air from the passenger cabin vents through the return air grilles to below the passenger cabin floor. The operating forward equipment cooling supply fan (B10 or B11) draws in some of this air through the equipment cooling air filter. Pushed by the operating forward supply fan (B10 or B11) (or auxiliary fan (B10133) if installed), the cooling air passes through a check valve and is then blown through the main equipment rack and flight deck instrument panels. The air directed to the flight deck instruments passes through the overhead panels, main panels, center aisle stand, and then exhausts into the flight deck compartment. Air is drawn from the flight deck through the main panels and joins with air drawn through the airplane's weather radar. This air then combines with air from the main equipment rack. The combined flow then passes through the left recirculation fan (B13), left recirculation filter, check valve, and into the mix manifold.

(b) In the aft system, the operating aft equipment cooling supply fan (B10061 or B10062) draws in air exiting the aft passenger cabin. Similar to the forward E/E cooling system, the air is drawn through an air filter by the supply fan and pushed through a check valve and then to the aft equipment rack. Air exhausting from the aft equipment rack joins air vented from the lavatories and galleys and then passes through the operating aft equipment/lavatory/galley ventilation fan (AMM 21-26-00/001). From the ventilation fan, the air passes through a check valve and exhausts near the cabin pressure outflow valve.

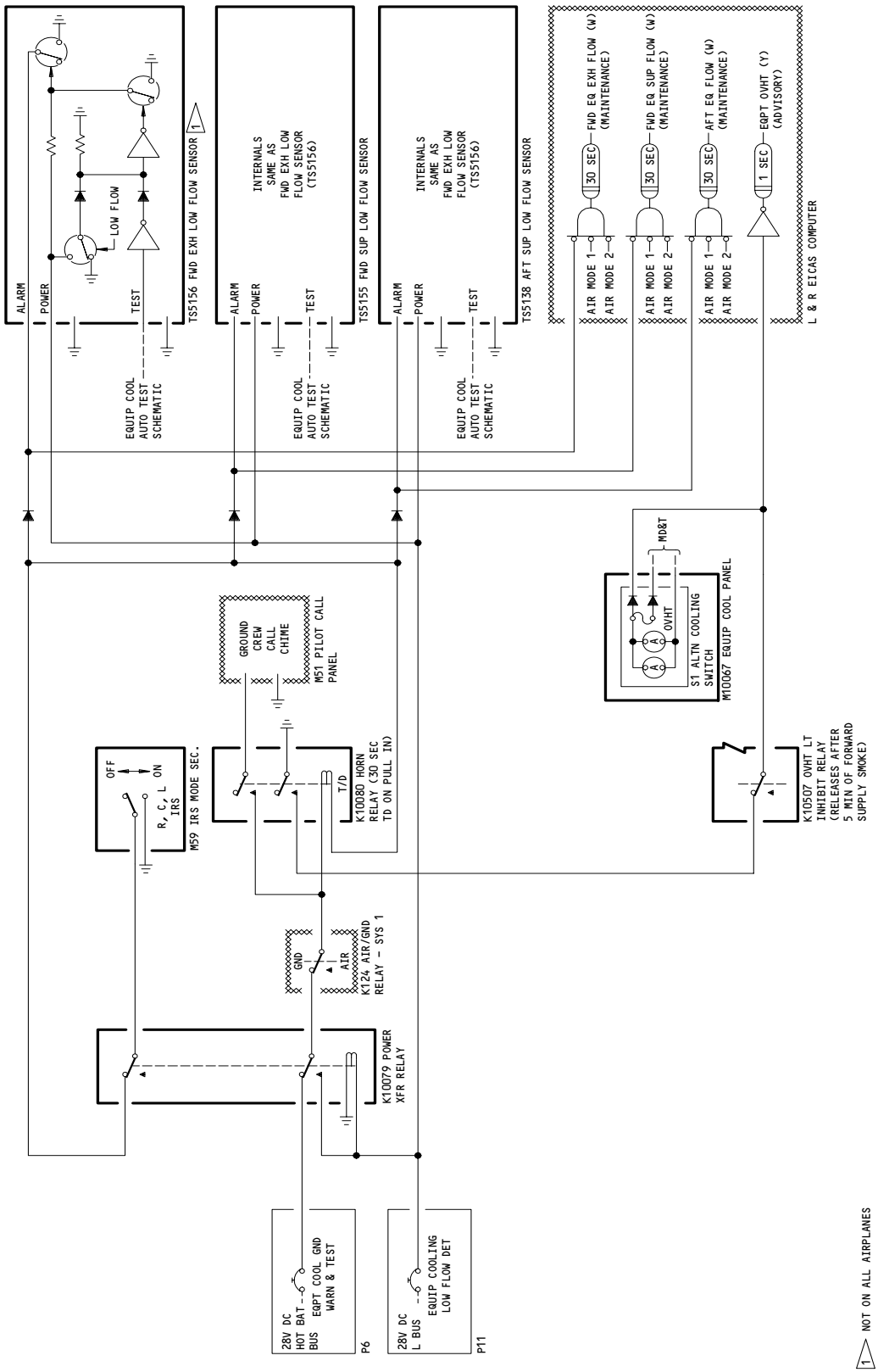
(2) Equipment Cooling Low Flow Failure Indication (Fig. 3)

(a) There are three low flow sensors in the equipment cooling system. The sensors provide low airflow (inadequate cooling) warning when the airplane is on the ground. The indication circuit contains a 30 second time delay to eliminate spurious low flow indication. All three low flow circuits operate similarly.

(b) A restrictor is installed in the aft supply duct where the low flow dectector is installed. The restrictor is a rubber sheet bonded to the inside of the duct. The rubber sheet reduces the diameter of the duct. this will increase the air speed across the detector element and reduce the chances of false low flow indications.

(c) If a low flow sensor detects a low flow condition, the sensor provides a ground for the "alarm" circuit. The sensor ground energizes a horn relay (K10080) which, after a 30 second time delay, energizes the ground crew call warning chime in the nose gear wheel well , illuminates the OVHT light on the P5 panel, and displays EICAS advisory message EQPT OVHT. The sensor ground also causes a low flow maintenance message to be stored in EICAS memory after a 30 second time delay. Storage of any low flow maintenance message in EICAS memory causes EICAS to display EQPT CLG FLOW status message.

(d) If the forward equipment supply low flow sensor (TS5155) detects a low flow condition for at least 30 seconds while the airplane is on the ground, the EICAS maintenance message FWD EQ SUP FLOW will be stored in EICAS memory.



Equipment Cooling Low Flow Schematic
Figure 3

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(e) AIRPLANES WITH THE FORWARD EXHAUST LOW FLOW SENSOR;
If the forward equipment exhaust low flow sensor (TS5156) detects a low flow condition for at least 30 seconds while the airplane is on the ground, the EICAS maintenance message FWD EQ EXH FLOW will be stored in EICAS memory.

(f) If the aft equipment cooling low flow sensor (TS5138) detects a low flow condition for at least 30 seconds while the airplane is on the ground, the EICAS maintenance message AFT EQ FLOW will be stored in EICAS memory.

(3) Equipment Cooling - Smoke Detection and Clearance (Fig. 4)

(a) Equipment Cooling Smoke Sensor

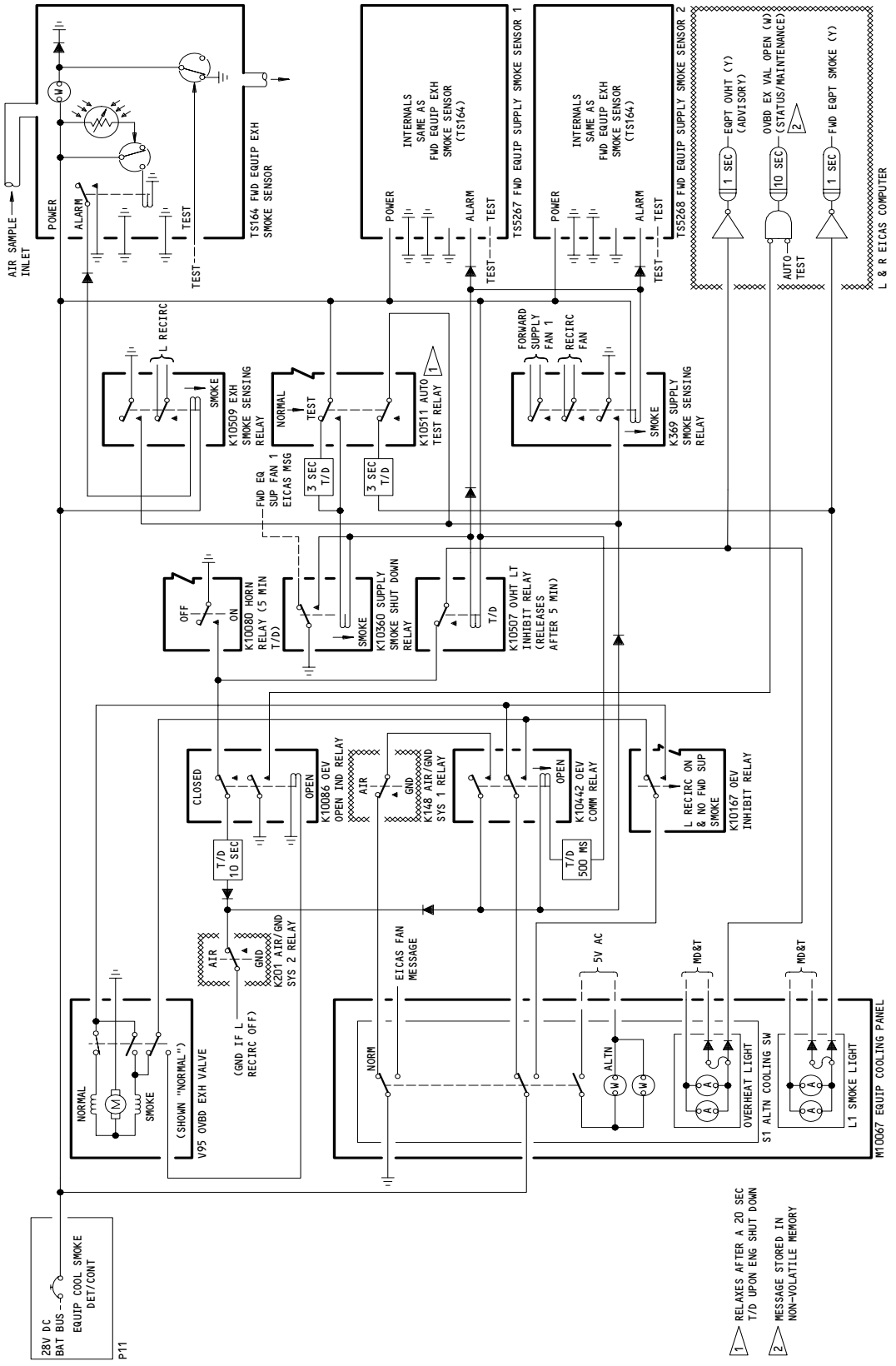
1) The forward equipment cooling smoke sensors (TS5267 and TS5268) operate independently so that either sensor detecting smoke initiates smoke clearance action and indication.

2) When a forward equipment cooling supply smoke sensor (TS5267 or TS5268) detects smoke it provides a ground for the smoke indications. The sensor ground causes the Supply Smoke Shut Down Relay (K10360) to energize and latch, the Ovht Light Inhibit Relay (K10507) to energize for 5 minutes of detected smoke, and the Supply Smoke Sensing Relay (K369) to energize. The following occur:

a) Forward supply fan 1 (B10) shuts down and fan 2 (B11) is inhibited from starting. The EICAS maintenance message FWD EQ SUP FAN 1 is inhibited. If on the ground, a low flow condition exists. The appropriate low flow indicatons appear. If the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN, forward supply fan 2 (B11) is commanded to run.

b) Right recirculation air fan (B14) shuts down and the R RECIRC FAN INOP light on the P5 panel illuminates. EICAS advisory message R RECIR FAN is inhibited. The right pack is commanded to go into the high flow mode (AMM 21-51-00/001).

c) SMOKE light on the P5 panel illuminates and EICAS advisory message FWD EQPT SMOKE displays after a 3 second time delay.



Equipment Cooling Smoke Clearance Schematic
Figure 4

d) If smoke is sensed for more than 5 minutes, the OVHT light on the P5 panel illuminates and EICAS advisory message EQPT OVHT displays. If the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN, the OVHT light and EICAS message extinguish.
e) If on the ground, the overboard exhaust valve actuator (V95) is commanded to SMOKE and the EICAS status and maintenance message OVBD EX VAL OPEN will be displayed and stored in EICAS memory. When smoke is no longer detected, the valve actuator will be commanded to NORMAL.
f) If in the air, the overboard exhaust valve actuator (V95) is commanded to SMOKE and latched in that position until landing; or the smoke condition no longer exists and the EQUIP COOLING ALTN switch/light on the P5 panel is cycled. The EICAS status and maintenance message OVBD EX VAL OPEN will be displayed and stored in EICAS memory whenever the valve actuator is in SMOKE.
g) If in the air with slats retracted, the left recirculation air fan (B13) shuts down and the L RECIRC FAN INOP light on the P5 panel illuminates. EICAS advisory message L RECIR FAN is inhibited. The left pack is commanded to go into the high flow mode (AMM 21-51-00/001).

3) When a forward equipment cooling supply smoke sensor no longer senses smoke, the Supply Smoke Sensing Relay (K369) relaxes to cause smoke indications to disappear and to restart the recirculation fans (B13 and B14). The Ovht Light Inhibit Relay (K10507) relaxes after 5 minutes, or when the Supply Smoke Shut Down Relay (K10360) relaxes. The Supply Smoke Shut Down Relay (K10360) relaxes the next time an automatic test is initiated to enable the forward supply fan 1 (B10) to operate.
4) When the forward equipment cooling exhaust smoke sensor (TS164) detects smoke it provides a ground for smoke indications. The sensor ground causes the Exhaust Smoke Sensing Relay (K10509) to energize and the following occur:
a) SMOKE light on the P5 panel illuminates and EICAS advisory message FWD EQPT SMOKE displays after a 3 second time delay.
b) If on the ground, the overboard exhaust valve actuator (V95) is commanded to SMOKE and the EICAS status and maintenance message OVBD EX VAL OPEN is displayed and stored in EICAS memory. When smoke is no longer detected, the valve actuator will be commanded to NORMAL.

c) If in the air, the overboard exhaust valve actuator (V95) is commanded to SMOKE and latched until landing or the smoke condition no longer exists and the EQUIP COOLING ALTN switch/light on the P5 panel is cycled. The EICAS status and maintenance message OVBD EX VAL OPEN will be displayed and stored in EICAS memory whenever the valve actuator is in SMOKE.

d) If in the air with slats retracted, the left recirculation air fan (B13) shuts down and the L RECIRC INOP light on the P5 panel illuminates. EICAS advisory message L RECIR FAN is inhibited. The left pack is commanded to go into the high flow mode (AMM 21-51-00/001).

(b) Equipment Cooling Overboard Exhaust Valve

1) When a forward equipment cooling smoke sensor detects smoke, the Overboard Exhaust Valve Command Relay (K10442) energizes, commanding the Overboard Exhaust Valve Actuator (V95) to SMOKE. The EICAS status and maintenance message OVBD EX VAL OPEN is displayed and stored in EICAS memory whenever the valve actuator is in SMOKE. If in the air, the overboard exhaust valve is latched to SMOKE until ground mode, or the smoke condition no longer exists and the EQUIP COOLING ALTN switch/light on the P5 panel is cycled.

2) In flight, the Overboard Exhaust Valve Command Relay (K10442) is energized and latched whenever the left recirculation air fan is off. If the overboard exhaust valve actuator (V95) moves to SMOKE, the EICAS status and maintenance message OVBD EX VAL OPEN will be displayed and stored in EICAS memory.

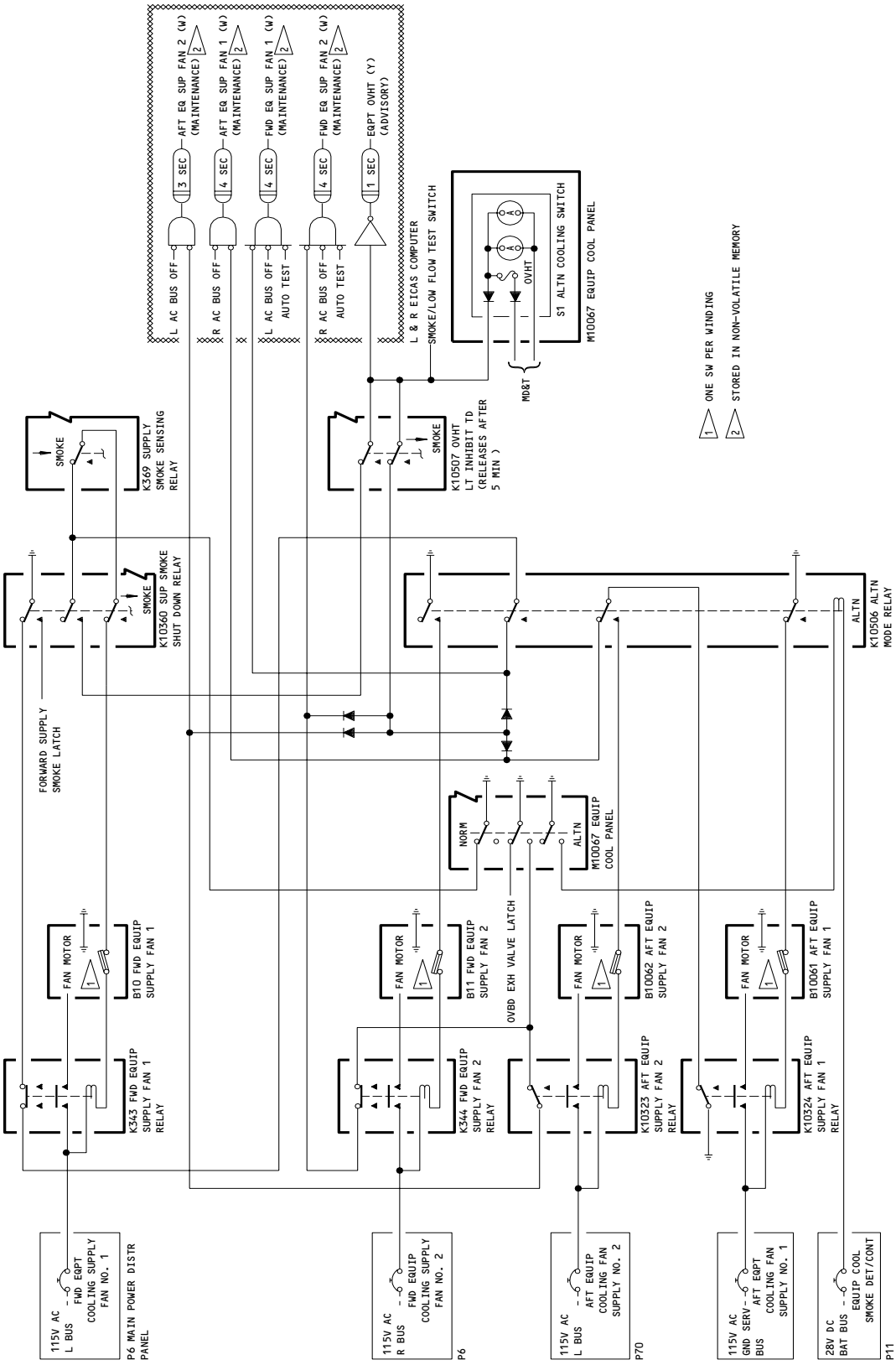
3) If the overboard exhaust valve actuator (V95) does not move to SMOKE within 10 seconds, the equipment cooling OVHT light on the P5 panel comes on and EICAS advisory message EQPT OVHT is displayed. Pressing the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN will provide a secondary control path to command the overboard exhaust valve actuator (V95) to SMOKE.

(4) Forward Equipment Cooling Supply Fans (Fig. 5)

(a) Forward equipment cooling supply fan 1 (B10) is the primary fan and operates under normal circumstances.

1) Fan 1 (B10) runs whenever the Forward Equip Supply Fan 1 Relay (K343) is energized. The fan 1 relay (K343) energizes if no forward supply smoke is sensed, the EQUIP COOLING ALTN switch/light on the P5 panel is relaxed, and the fan thermal switches are closed.

2) If fan 1 (B10) does not run, the OVHT light on the P5 panel illuminates, EICAS advisory message EQPT OVHT is displayed, EICAS maintenance message FWD EQ SUP FAN 1 is stored in EICAS memory, and EICAS status message EQPT CLG FAN is displayed.



Equipment Cooling Supply Fans Schematic
Figure 5

218354

3) If a smoke condition is sensed by a forward equipment cooling supply smoke sensor (TS5267 or TS5268), power is removed from fan 1 (B10). Fan 1 (B10) is latched off until the smoke condition no longer exists and an automatic test is initiated. The OVHT light and EICAS message EQPT OVHT are inhibited for 5 minutes and the FWD EQ SUP FAN 1 EICAS message is inhibited. If on the ground, a low flow condition exists. The appropriate low flow indications will appear. If the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN, forward supply fan 2 (B11) will be commanded to run.

(b) Forward equipment cooling supply fan 2 (B11) is the backup fan and runs only when commanded ON by pressing the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN.

1) Fan 2 (B11) will run only when the Forward Equip Supply Fan 2 Relay (K344) is energized. The fan 2 relay (K344) will energize if the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN and the fan thermal switches are closed.

2) If fan 2 (B11) does not run, the OVHT light on the P5 panel illuminates, EICAS advisory message EQPT OVHT is displayed, EICAS maintenance message FWD EQ SUP FAN 2 is stored in EICAS memory, and EICAS status message EQPT CLG FAN is displayed.

3) If a smoke condition is sensed by a forward equipment cooling smoke sensor (TS164, TS5267, or TS5268), fan 2 (B11) is not inhibited from running. If the EQUIP COOLING ALTN switch/light is pressed to ALTN, fan 2 (B11) will be commanded to run.

(c) During the Equipment Cooling System Automatic Test, power is interrupted to the primary supply fan for a 20 second smoke shutdown test. At the completion of this shutdown test, power is restored to fan 1 (B10).

(5) Aft Equipment Cooling Supply Fans (Fig. 5)

(a) Aft equipment cooling supply fan 1 (B10061) is the primary fan and operates under normal circumstances.

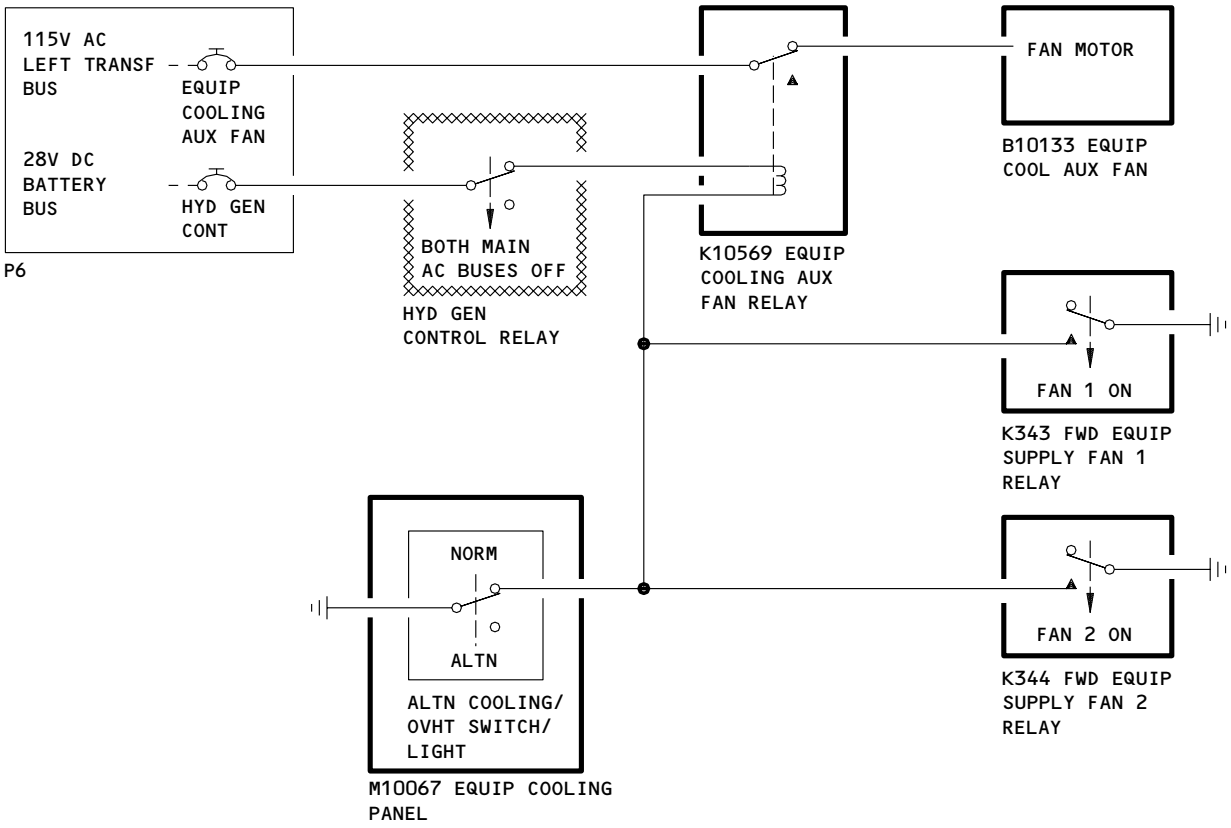
1) Fan 1 (B10061) runs whenever the Aft Equip Supply Fan 1 Relay (K10324) is energized. The fan 1 relay (K10324) energizes if the EQUIP COOLING ALTN switch/light on the P5 panel is relaxed, and the fan thermal switches are closed.

2) If fan 1 (B10061) does not run, the OVHT light on the P5 panel illuminates, EICAS advisory message EQPT OVHT is displayed, EICAS maintenance message AFT EQ SUP FAN 1 is stored in EICAS memory, and EICAS status message EQPT CLG FAN is displayed.

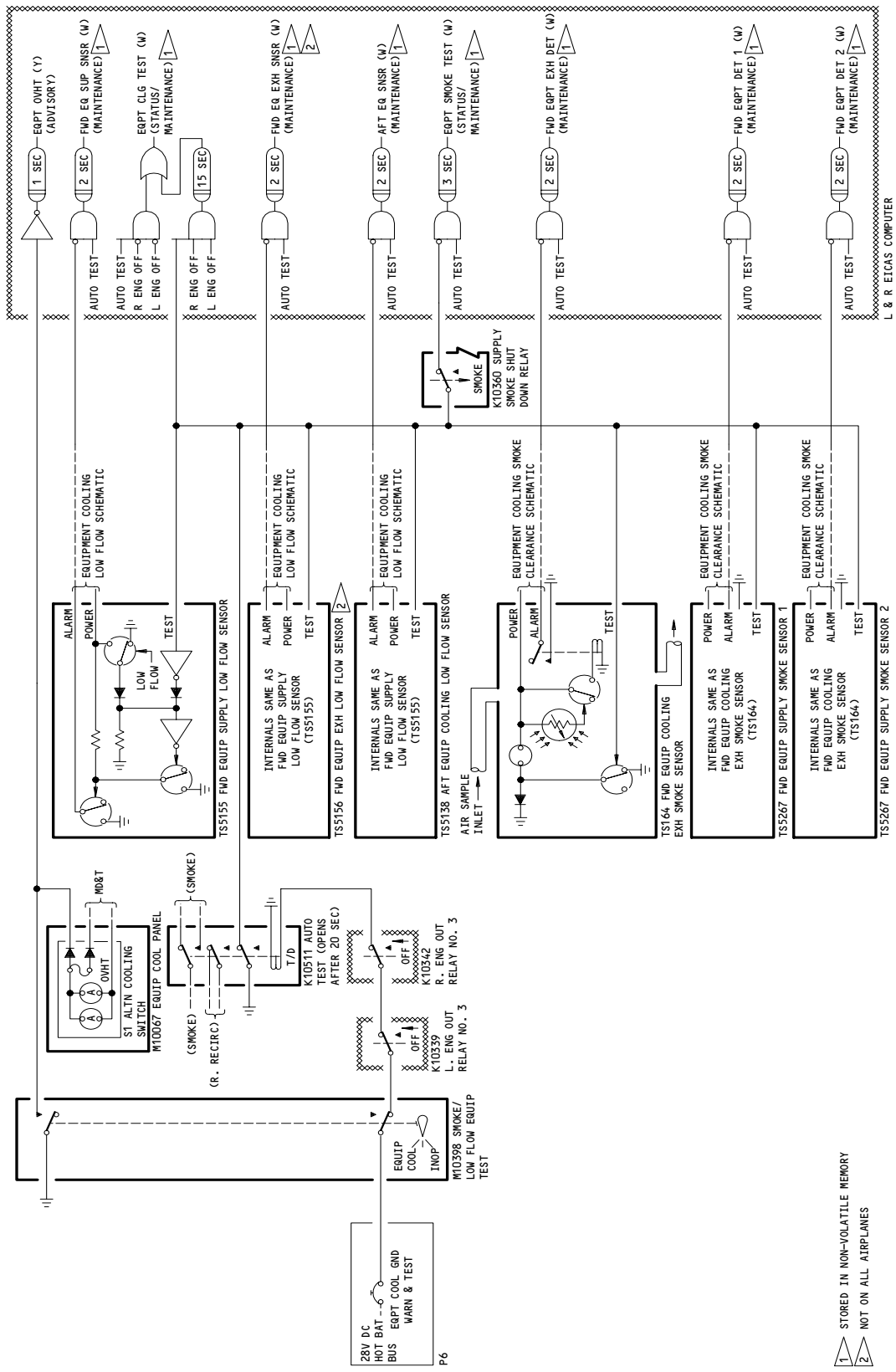
(b) Aft equipment cooling supply fan 2 (B10062) is the backup fan and runs only when commanded to by pressing the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN.
1) Fan 2 (B10062) runs only when the Aft Equip Supply Fan 2 Relay (K10323) is energized. The fan 2 relay (K10323) energizes if the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN, the fan thermal switches are closed, and aft supply fan 1 (B10061) is off.
2) If fan 2 (B10061) does not run, the OVHT light on the P5 panel illuminates, EICAS advisory message EQPT OVHT is displayed, EICAS maintenance message AFT EQ SUP FAN 2 is stored in EICAS memory, and EICAS status message EQPT CLG FAN is displayed.

(6) Equipment Cooling Auxiliary Fan (Fig. 5A)
(a) The equipment cooling auxiliary fan (B10133) is installed to provide backup cooling for the forward supply system.
(b) Power flows through the Equip Cooling Aux Fan Relay (K10569) to operate the auxiliary fan (B10133) whenever the relay (K10569) is relaxed. The relay (K10569) is relaxed when both main AC buses are off or when the Fwd Equip Supply Fan 1 Relay and Fan 2 Relay (K343 and K344) are relaxed and the alternate cooling switch/light on the P5 panel is pressed to ALTN.
(c) The auxiliary fan is located downstream of the forward supply fans. A check valve prevents reverse airflow through the inoperative forward supply fans. The auxiliary fan provides cooling through the forward equipment cooling system ducting.

(7) Automatic Testing of Equipment Cooling System (Fig. 6)
(a) Upon shutdown of both engines, the equipment cooling system starts an automatic test. The forward supply, forward exhaust, and aft supply system functions tested are listed below. A detailed description of each test follows:
1) Forward Supply System
a) Low flow sensor.
b) Smoke sensors and warning system.
2) Forward Exhaust System
a) Low flow sensor (if installed).
b) Smoke sensor and warning system.
c) Overboard exhaust valve actuator and control circuit.
3) Aft Supply System
a) Low flow sensor.



Equipment Cooling Auxiliary Fan Schematic
Figure 5A



Equipment Cooling Automatic Test Schematic
Figure 6

(b) The automatic test begins when both engines are shut off. The test lasts for 20 seconds. A "test underway" signal is provided to EICAS throughout the test. If this signal is not received by EICAS after a suitable delay, status and maintenance message EQPT CLG TEST is displayed and stored in EICAS memory. The message is also displayed if the "test underway" signal exists while one or both engines are running. EICAS monitors the system during automatic testing and displays the appropriate status and maintenance messages if incorrect responses are received. Satisfactory completion of an automatic test is indicated by the absence of EICAS equipment cooling system messages.

(c) The equipment cooling system undergoes an automatic test whenever the Auto Test Relay (K10511) is energized. The test relay (K10511) is energized for only 20 seconds after both engines are shutdown, as sensed by the L Engine Out Relay (K10339) and the R Engine Out Relay (K10342), and the EQUIP COOL TEST switch on the P61 panel is relaxed.

(d) Automatic Test Sequence - Forward Supply System

1) A low flow test signal is sent through the energized contacts of the test relay (K10511) to the forward supply low flow sensor (TS5155). If the sensor is good, a low flow indication is sent to EICAS. If the signal does not appear, EICAS displays the status message EQPT CLG SENSOR and the maintenance message FWD EQ SUP SNSR is stored in EICAS memory.

2) During the 20 seconds the test relay (K10511) is energized, a ground signal is sent to the forward supply smoke sensors' 1 (TS5267) and 2 (TS5268) test terminal. If a sensor tests good, it sends an alarm signal to EICAS. If EICAS does not receive the signal, the maintenance message FWD EQPT DET 1 and/or FWD EQPT DET 2 is stored in EICAS memory. If the Supply Smoke Shut Down Relay (K10360) fails to energize, the EICAS status and maintenance message EQPT SMOKE TEST is displayed and stored. Due to the sensed smoke condition for 20 seconds, the right recirculation fan (B14) and forward supply fan 1 (B10) are shutdown. EICAS messages R RECIR FAN and FWD EQ SUP FAN 1 are inhibited.

(e) Automatic Test Sequence - Forward Exhaust System

1) AIRPLANES WITH THE FORWARD EXHAUST LOW FLOW SENSOR;
The forward exhaust low flow sensor (TS5156) is tested and monitored during the 20 second test period in the same way as the forward supply low flow sensor. The EICAS status message EQPT CLG SENSOR is shown and FWD EQ EXH SNSR maintenance message is stored in EICAS memory.

2) During the 20 seconds the test relay (K10511) is energized, a ground signal is sent to the forward exhaust smoke sensors' (TS164) test terminal. If the sensor tests good, it sends an alarm signal to EICAS. If EICAS does not receive the signal, the maintenance message FWD EQPT EXH DET is stored in EICAS memory.

3) Due to the simulated smoke condition for 20 seconds, the overboard exhaust valve actuator (V95) is commanded to SMOKE. The EICAS status and maintenance message OVBD EX VAL OPEN is inhibited. If the overboard exhaust valve actuator (V95) does not move to SMOKE, EICAS will display and store the status and maintenance message OVBD EX VAL TEST.

(f) Automatic Test Sequence - Aft Supply System

1) A ground signal is sent through the energized contacts of the test relay (K10511) to send a low flow test signal to the aft low flow sensor (TS5138). If the sensor is good, a low flow indication is sent to EICAS. If the signal does not appear, EICAS displays the status message EQPT CLG SENSOR and the maintenance message AFT EQ SNSR is stored in EICAS memory.

(g) Automatic Test Completion

1) 20 seconds after the test relay (K10511) energizes it relaxes, removing the ground test signal from the low flow and smoke sensors. Forward supply fan 1 (B10) restarts, right recirculation air fan (B14) restarts, and overboard exhaust valve actuator (V95) is commanded to NORMAL.

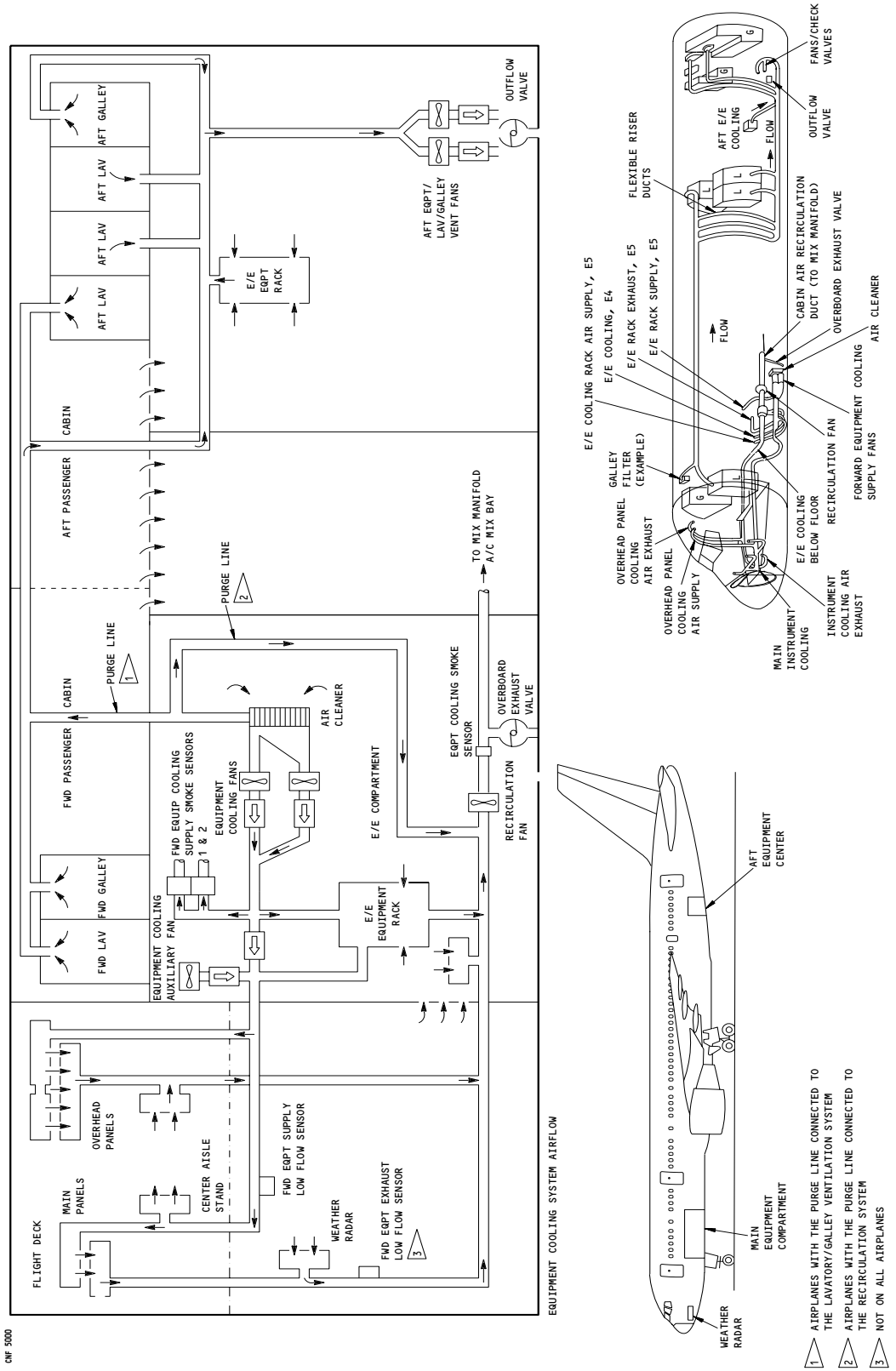
(8) Manual Testing of Equipment Cooling System

(a) The EQUIP COOL TEST switch on the P61 panel provides a means of manually starting the automatic test of the equipment cooling system.

(b) When the EQUIP COOL TEST switch on the P61 panel is held to EQUIP COOL, power is removed from the Auto Test Relay (K10511). The OVHT light on the P5 panel illuminates and the EICAS advisory message EQPT OVHT displays after a 1-second time delay. When the test switch is released, the OVHT light extinguishes and the test relay (K10511) is energized (if both engines are off). This starts the automatic test. A lack of EICAS fault messages after 20 seconds indicates successful completion of the test.

EQUIPMENT COOLING SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The E/E (electrical/electronic) equipment cooling system provide forced air cooling to the E/E equipment. The forward system cools the forward equipment racks, main panels, overhead panels, and weather radar.
   B. The aft electrical equipment racks are cooled using aft cargo compartment air drawn thru the racks by the Equipment/Lavatory/Galley Vent Fans.
   C. Equipment Cooling System
      (1) The system is designed for automatic operation requiring minimum crew attention.
      (2) Equipment cooling is provided either by directing supply air through the equipment ("blow through") or by drawing air through the same equipment ("draw through"). In the forward supply system, "blow through" is accomplished by one of the two equipment cooling supply fans blowing air from the forward cargo compartment sidewall area through the main equipment center and flight deck instruments. In the forward exhaust system, "draw through" is accomplished by using the left cabin air recirculation fan (AMM 21-25-00/001) to draw air through the main equipment center. The aft exhaust system uses the aft equipment/lavatory/galley ventilation fans (AMM 21-26-00/001) to draw air through the aft equipment racks.
      (3) Cooling air flows to the equipment rack electronics boxes through holes in metering plates located directly under each unit. Some of the holes in the metering plates are blocked with rubber plugs depending on the cooling air requirements of each unit. A decal is mounted on the equipment rack showing which holes are to remain open.
      (4) After cooling the equipment, the air flows into the main E/E exhaust duct. In the forward system, the air is ducted to the ECS mix manifold or exhausted overboard. The aft system exhausts thru the aft equipment/lavatory/galley ventilation ducting to eventually be exhausted overboard.
      (5) Low flow sensors are located in the forward supply and (if installed) exhaust ducting.
      (6) Smoke sensors are located in the forward E/E cooling supply and exhaust ducting with smoke clearance being achieved by exhausting the air overboard.
      (7) An automatic test circuit checks the proper operation of both the forward and aft equipment cooling systems. The test is performed at the termination of every flight following engine shutdown.
      (8) The automatic test can be re-initiated manually with both engines shutdown. The manual test is activated by an EQUIP COOL TEST switch located on the right sidewall panel P61.

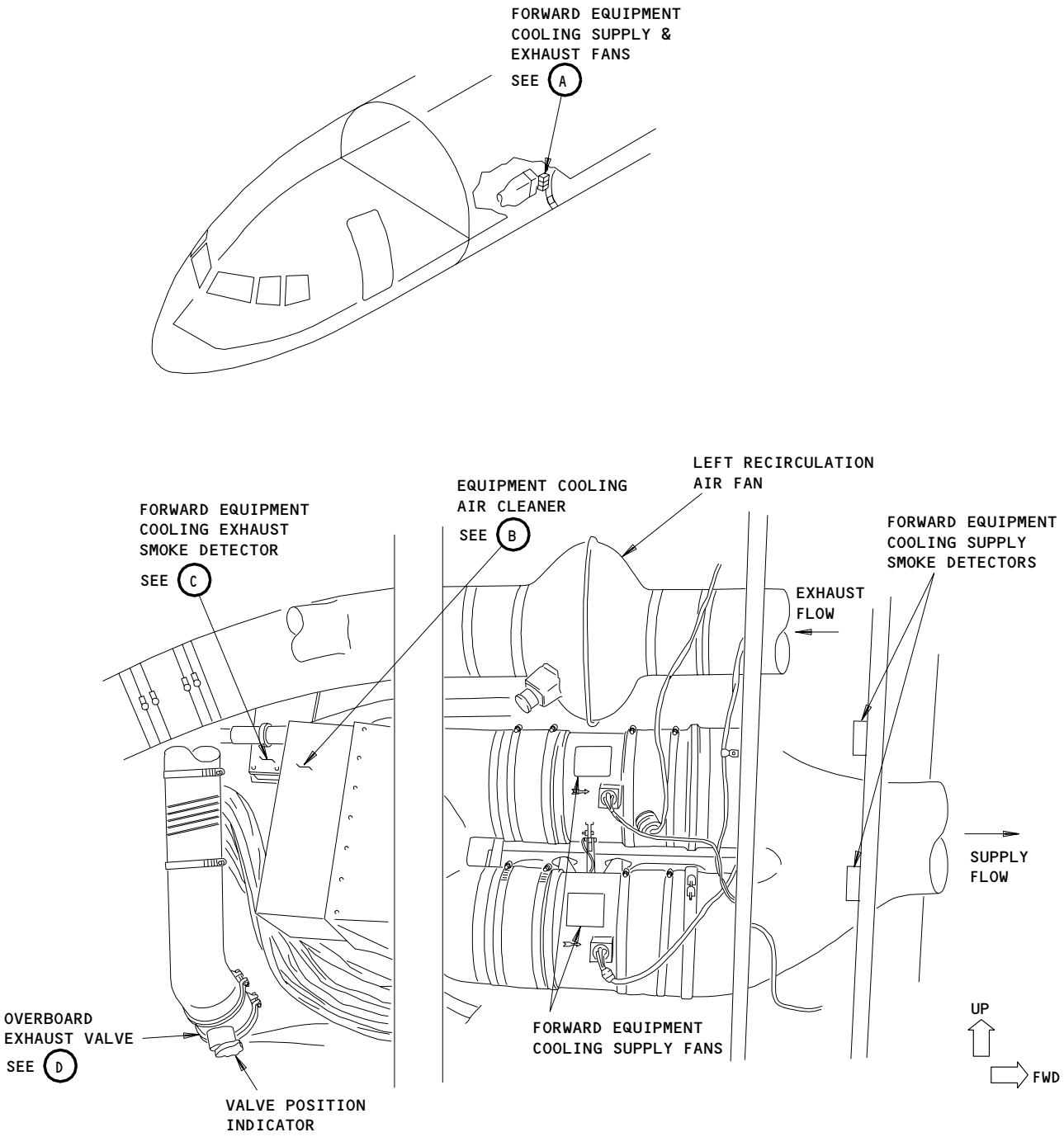


Equipment Cooling - Simplified Flow Diagram
Figure 1

K77932

D. High ambient temperatures reduce the efficiency of the cooling system. In order to assure adequate cooling at ambient temperatures above 34°C the following conditions must be satisfied if electrical power is supplied to the airplane for longer than 20 min.
   (1) At ambient temperatures from 34 to 40°C, one forward and one aft entry door on opposite sides of the airplane must be open or at least one air conditioning pack must be operating.
   (2) At ambient temperatures from 41 to 49°C, at least one air conditioning pack must be operating.
   (3) At ambient temperatures above 49°C, both air conditioning packs must be operating.

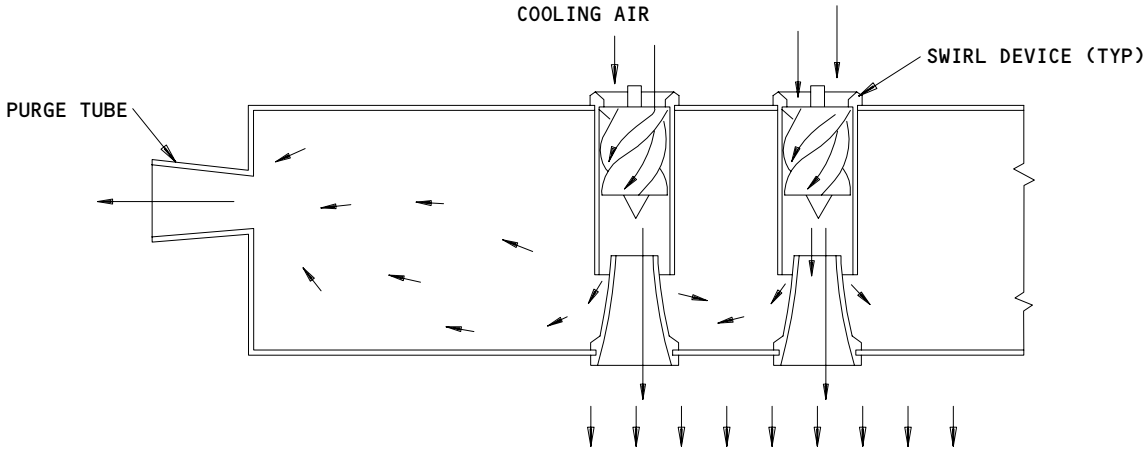
2. Component Details (Fig. 2)
   A. Fan Check Valve
      (1) Physical Description
         (a) A check valve is installed in the cooling air supply duct downstream of each supply fan.
         (b) Each valve contains two spring-loaded closed flappers enclosed in a housing.
      (2) Function
         (a) The valve opens in the normal flow direction at a maximum differential pressure of 0.5 inches of water. When the differential pressure is less than 0.5 inches of water, the spring-loaded valve closes to prevent flow in the opposite direction of normal flow.
   B. Overboard Exhaust Valve
      (1) Physical Description
         (a) The overboard exhaust valve is located in the forward cargo compartment on the left side of the airplane about 3 feet (1 meter) aft of the forward endliner. The valve permits cooling air and smoke from the E/E cooling system to be exhausted from the airplane.
         (b) The valve consists of a spring-controlled, butterfly-type airfoil valve and a three-position electrical actuator. Only two control positions, NORMAL and SMOKE, are used for E/E cooling system control. The DITCH position is not used.
      (2) Function
         (a) In operation, the valve actuator is commanded to either NORMAL or SMOKE. When the valve actuator is in NORMAL, the valve flapper is spring-loaded open. The flapper is aerodynamically shaped to "fly shut" when the differential pressure between the interior and exterior surfaces of the overboard exhaust valve is greater than 2.8 psi. When the valve actuator is commanded to SMOKE, the valve flapper is driven partially open to exhaust equipment cooling air overboard.
         (b) Limit switches within the valve assembly provide signals for position indication.



FORWARD EQUIPMENT COOLING SUPPLY AND EXHAUST FANS

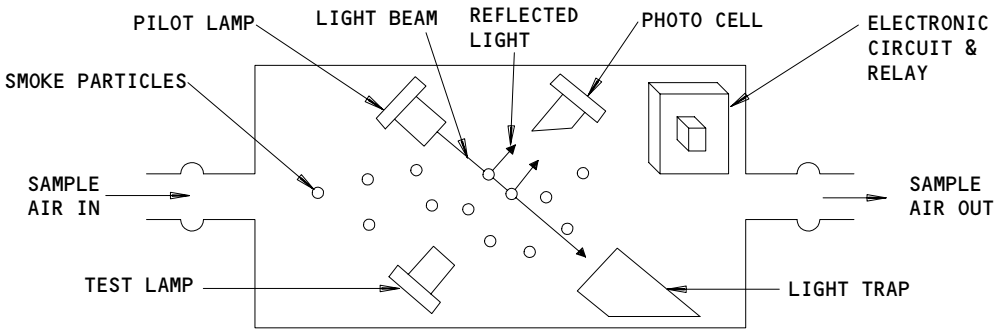
A

Equipment Cooling System Components
Figure 2 (Sheet 1)



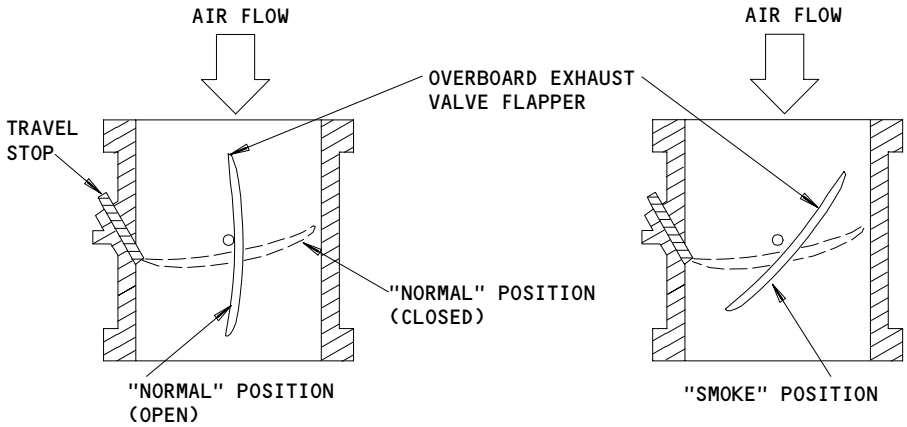
AIR CLEANER OPERATION

B



SMOKE SENSOR OPERATION

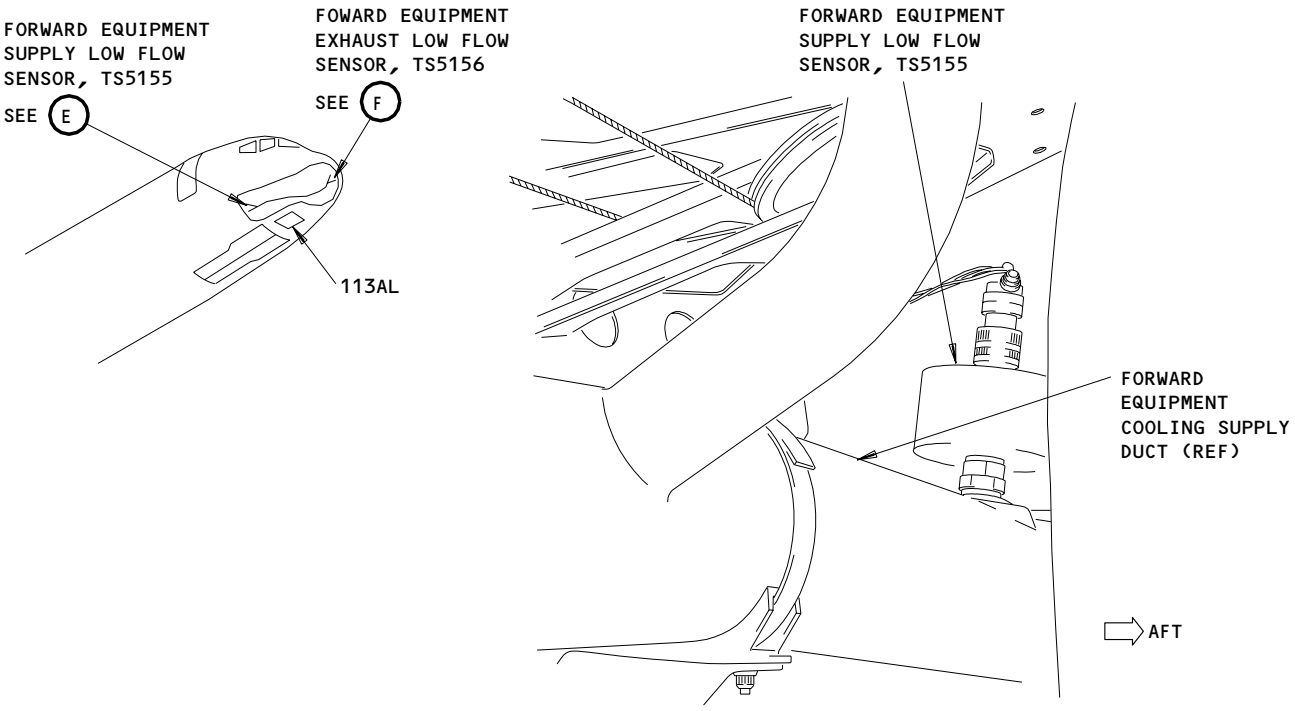
C



OVERBOARD EXHAUST VALVE

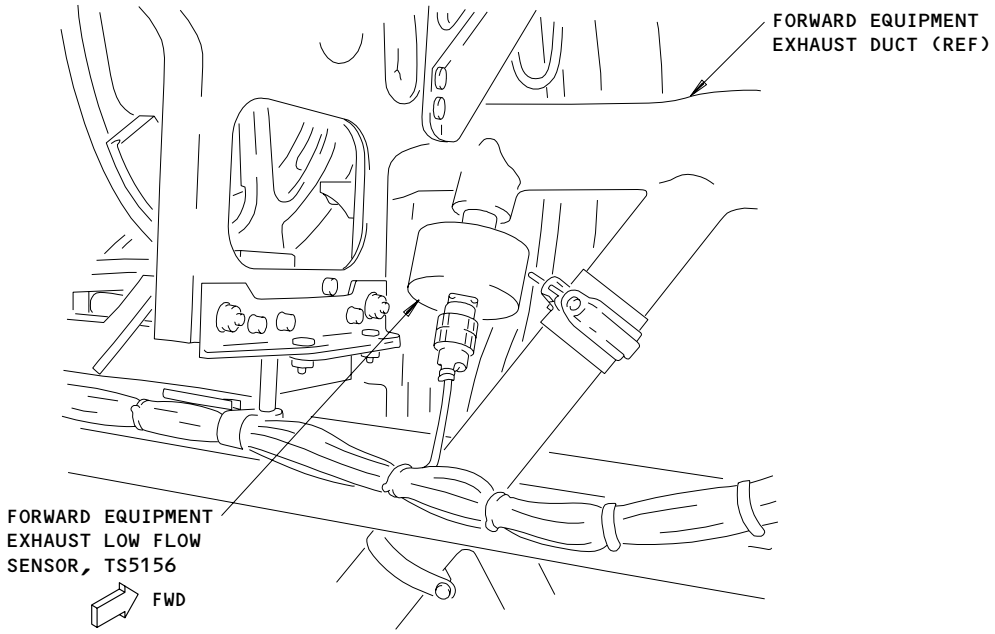
D

Equipment Cooling System Components
Figure 2 (Sheet 2)



FORWARD EQUIPMENT SUPPLY LOW FLOW SENSOR, TS5155

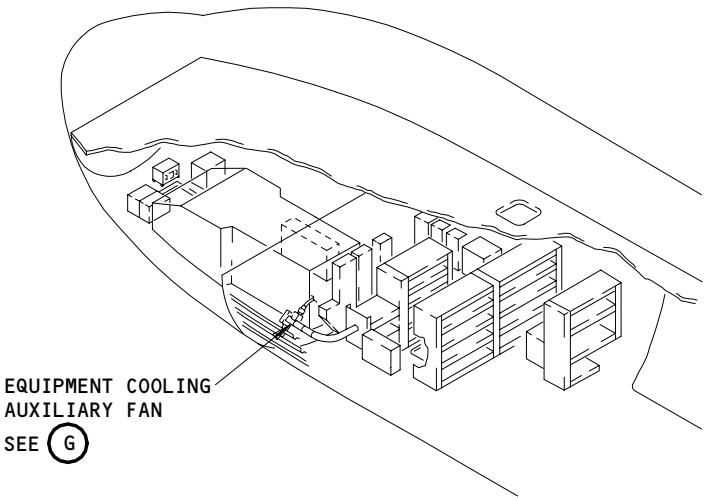
E

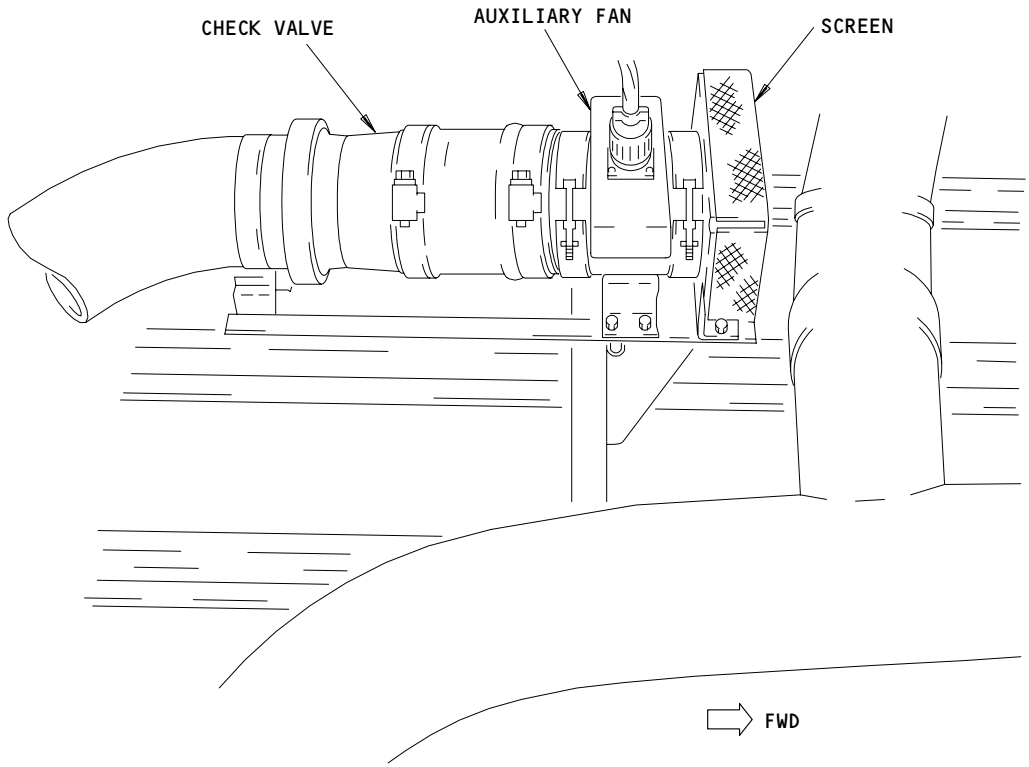


FORWARD EQUIPMENT EXHAUST LOW FLOW SENSOR, TS5156
(NOT INSTALLED ON ALL AIRPLANES)

F

Equipment Cooling System Components
Figure 2 (Sheet 3)

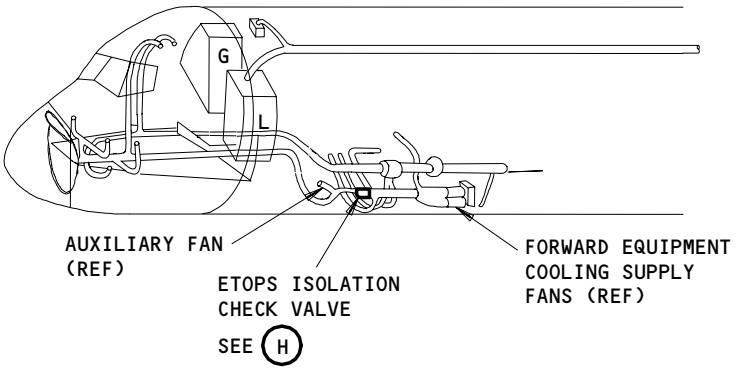


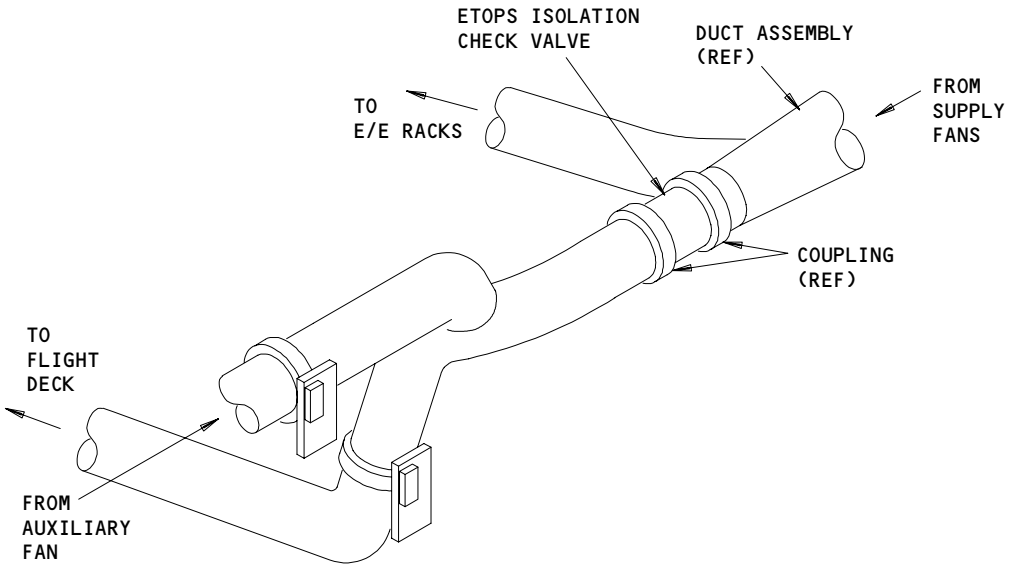


EQUIPMENT COOLING AUXILIARY FAN

G

Equipment Cooling System Components
Figure 2 (Sheet 4)





ETOPS ISOLATION CHECK VALVE

H

Equipment Cooling System Components
Figure 2 (Sheet 5)

C. Equipment Cooling Air Fan

(1) Physical Description

(a) Both E/E equipment cooling supply fans are located along the left forward sidewall of the forward cargo compartment about 2 feet (0.7 meters) aft of the forward endliner.

(b) The auxiliary-equipment-cooling fan is located forward of the E1 rack in the main equipment center.

(c) The equipment cooling supply fans are single stage vaneaxial fans integrating the motor into the fan.

(d) The fan contains an inner housing which encases the three-phase motor. The rotating impeller pushes air over the motor housing and through de-swirl vanes before exiting the fan.

(e) Three thermal switches are provided in the power windings of each fan to provide fan overheat protection. The switches open the fan power relay circuit, interrupting power to the fan when temperature in a winding reaches 400°F (204°C).

D. Equipment Cooling Air Cleaner

(1) Physical Description

(a) The equipment cooling air cleaner is a centrifugal swirl device, using inertia to separate particulate matter from the E/E cooling air. As the air flowing through the air cleaner is swirled, foreign material is thrown to the outside of the flow and purged to the aft equipment/lavatory/galley ventilation system ducting. The air cleaners are located upstream of the equipment cooling supply fans.

E. Equipment Cooling Low Flow Sensor

(1) Two low flow sensors: a forward equipment supply sensor (found in the supply duct to the main panels) and a forward equipment exhaust sensor (if installed, found in exhaust duct from the main panels), sense low flow and enable indication of inadequate cooling airflow. Each sensor contains a probe-like element with a self-heating thermistor. Airflow through the ducts cools the heated probe. Low airflow in the duct cannot sufficiently cool the heated probe and implies inadequate cooling of the E/E racks. When insufficient cooling airflow exists, the low flow sensor closes, which supplies a ground for low flow indication.

(2) The low flow sensors contain a test circuit. When a ground signal is provided to the test terminal, a switch within the sensor closes to provide an alternate means of activating the low flow alarm output.

F. Equipment Cooling Smoke Sensor

(1) There are two smoke sensors on the forward E/E cooling system supply duct (located downstream of the supply fans), and one sensor on the forward E/E cooling exhaust duct (located upstream of the left recirculation fan).

(2) The forward exhaust detector is located just aft of the forward equipment-cooling-air cleaner. The forward supply detectors are located forward of the equipment-cooling-supply fans on the bulkhead lining support.

(3) Each sensor consists of an inlet duct, an exhaust duct, a light source, a light trap, a photo diode, and a test LED. The sensor's light source sends a concentrated beam of light into the light trap. The light beam passes through airflow bled from the cooling ducts and channeled through the sensor. Smoke particles entering the sensor cause the beam of light to scatter and hit the photo diode. The photo diode's electrical resistance decreases with light, providing a ground for EICAS and the SMOKE light.

(4) Each smoke detector contains a test circuit. When a ground signal is provided at the test terminal, the test LED illuminates which shines directly on the photo diode. The test LED is wired in series with the light source to test sensor continuity. If the sensor tests good, the alarm circuit is energized and the sensor behaves as if smoke has been sensed.

(5) Because the smoke detector is very sensitive to the amount of light in the detector, the correct lamp must be used in the detector. If the incorrect lamp is used, then the detector will not be able to sense a smoke condition.

3. Operation

A. Functional Description

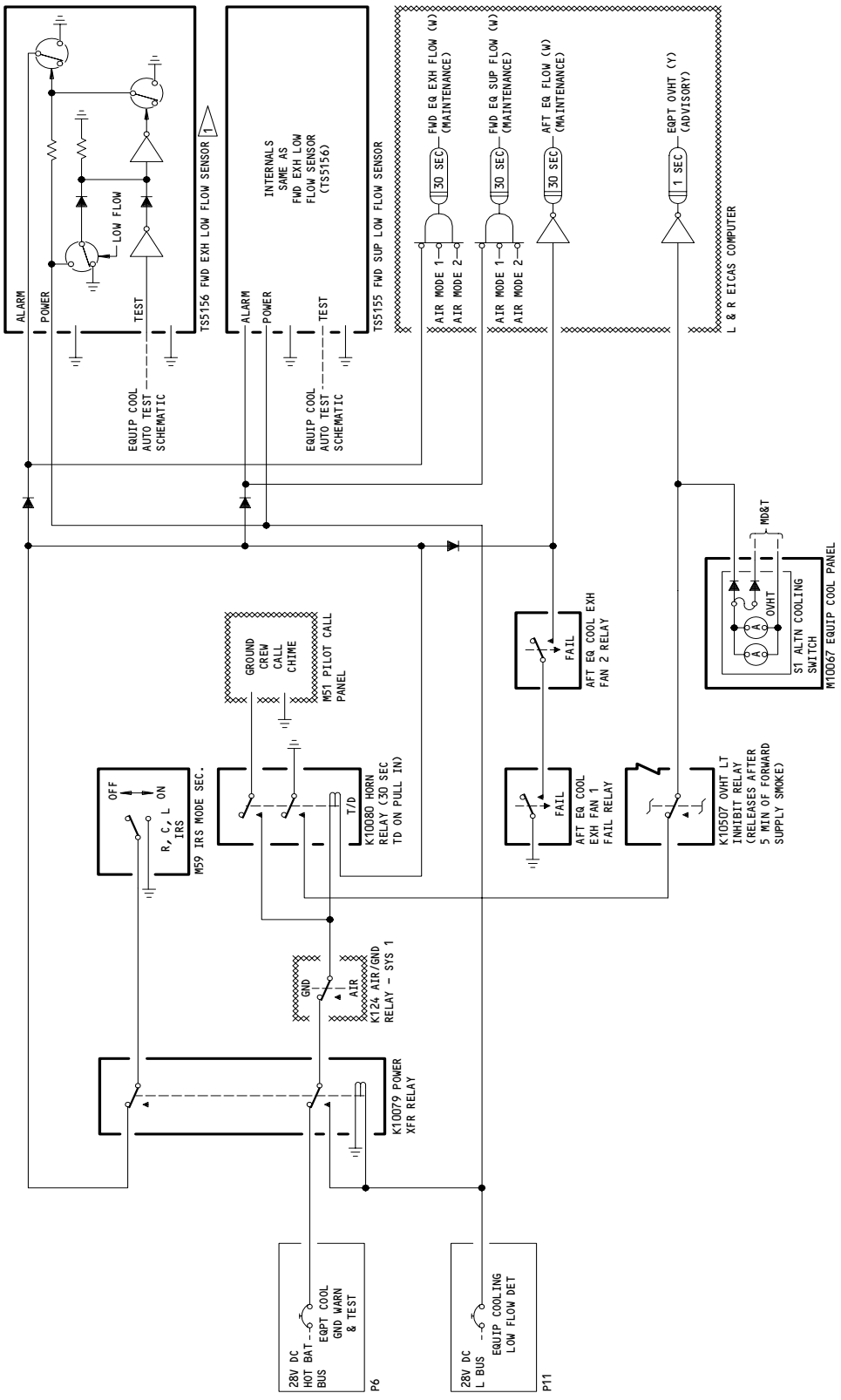
(1) Equipment Cooling System Normal Operation

(a) In the forward equipment racks, air from the passenger cabin vents through the return air grilles to below the passenger cabin floor. The operating equipment cooling supply fan (B10 or B11) draws in some of this air through the equipment cooling air cleaner. Pushed by the operating forward supply fan (B10 or B11) (or auxiliary fan (B10133) if installed), the cooling air passes through a check valve and is then blown through the main equipment rack and flight deck instrument panels. The air directed to the flight deck instruments passes through the overhead panels, main panels, center aisle stand, and then exhausts into the flight deck compartment. Air is drawn from the flight deck through the main panels and joins with air drawn through the airplane's weather radar. This air then combines with air from the main equipment rack. The combined flow then passes through the left recirculation fan (B13), left recirculation filter, check valve, and into the mix manifold.

(b) In the aft equipment racks , the operating equipment/lavatory/galley vent fan (B15 or B16) draws in air exiting the aft passenger cabin through the aft equipment rack which joins air vented from the lavatories and galleys and then passes through the operating aft equipment/lavatory/galley ventilation fan (AMM 21-26-00/001). From the ventilation fan, the air passes through a check valve and exhausts near the cabin pressure outflow valve.

(2) Equipment Cooling Low Flow Failure Indication (Fig. 3)

(a) There are two low flow sensors in the equipment cooling system. The sensors provide low airflow (inadequate cooling) warning when the airplane is on the ground. The indication circuit contains a 30 second time delay to eliminate spurious low flow indication. Both low flow circuits operate similarly.



Equipment Cooling Low Flow Schematic
Figure 3

(b) If a low flow sensor detects a low flow condition, the sensor provides a ground for the "alarm" circuit. The sensor ground energizes a horn relay (K10080) which, after a 30 second time delay, energizes the ground crew call warning chime in the nose gear wheel well , illuminates the OVHT light on the P5 panel, and displays EICAS advisory message EQPT OVHT. The sensor ground also causes a low flow maintenance message to be stored in EICAS memory after a 30 second time delay. Storage of any low flow maintenance message in EICAS memory causes EICAS to display EQPT CLG FLOW status message.

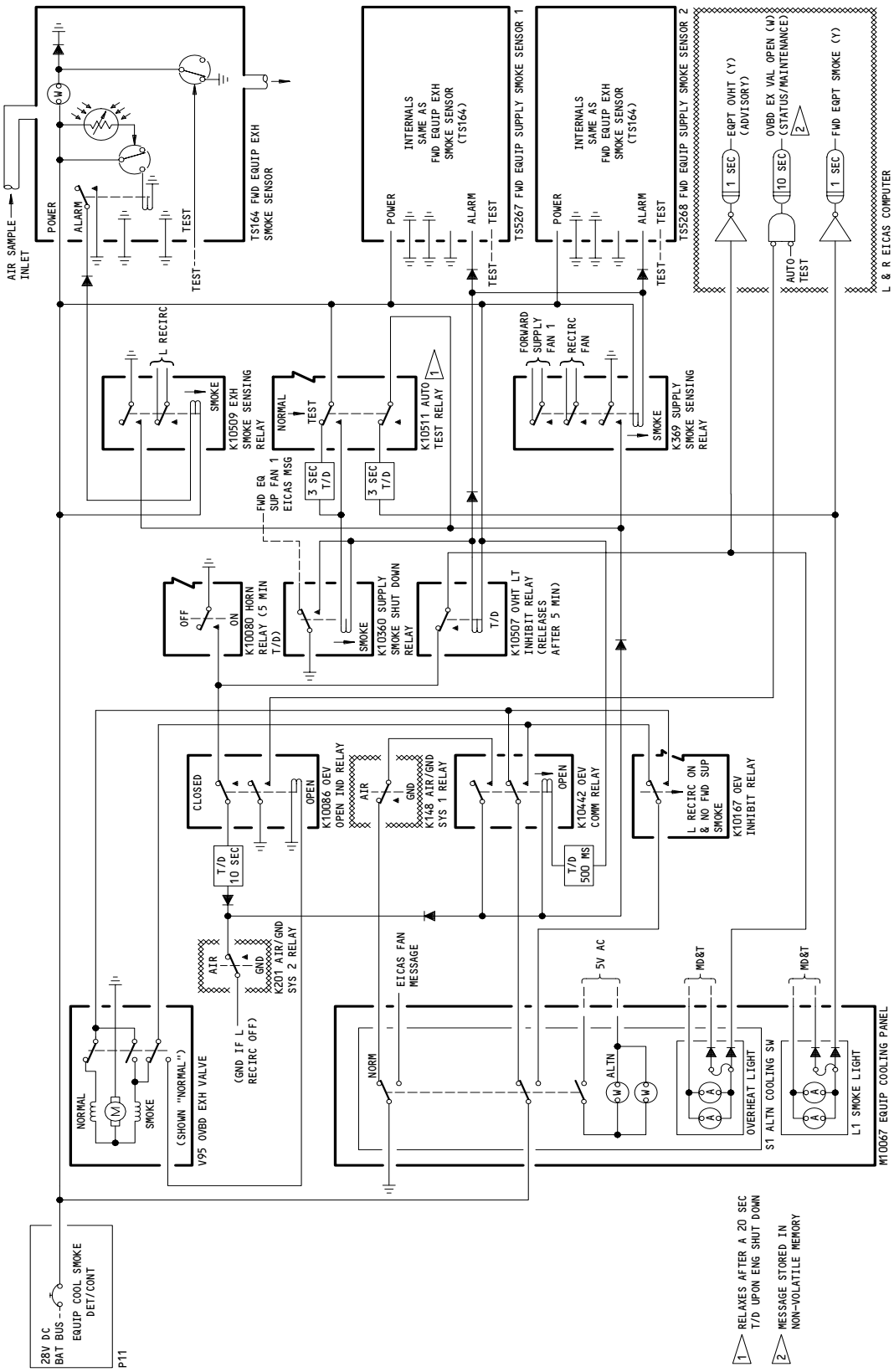
(c) If the equipment cooling supply low flow sensor (TS5155) detects a low flow condition for at least 30 seconds while the airplane is on the ground, the EICAS maintenance message FWD EQ SUP FLOW will be stored in EICAS memory.

(d) AIRPLANES WITH THE FORWARD EXHAUST LOW FLOW SENSOR;
If the forward equipment cooling exhaust low flow sensor (TS5156) detects a low flow condition for at least 30 seconds while the airplane is on the ground, the EICAS maintenance message FWD EQ EXH FLOW will be stored in EICAS memory.

(e) If the aft equipment exhaust fans (both fan 1 and fan 2) do not operate, these indications will come on:
1) The EICAS message EQPT OVRHT will come on
2) The OVERHEAT light on the pilots' overhead P5 panel will illuminate
3) The EICAS message AFT EQ FLOW will come on
4) The ground crew call warning chime will come on.

(3) Equipment Cooling - Smoke Detection and Clearance (Fig. 4)

(a) Equipment Cooling Smoke Sensor
1) The forward equipment cooling smoke sensors (TS5267 and TS5268) operate independently so that either sensor detecting smoke initiates smoke clearance action and indication.
2) When a forward equipment cooling supply smoke sensor (TS5267 or TS5268) detects smoke it provides a ground for the smoke indications. The sensor ground causes the Supply Smoke Shut Down Relay (K10360) to energize and latch, the Ovht Light Inhibit Relay (K10507) to energize for 5 minutes of detected smoke, and the Supply Smoke Sensing Relay (K369) to energize. The following occur:
a) Supply fan 1 (B10) shuts down and fan 2 (B11) is inhibited from starting. The EICAS maintenance message FWD EQ SUP FAN 1 is inhibited. If on the ground, a low flow condition exists. The appropriate low flow indicatons appear. If the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN, forward supply fan 2 (B11) is commanded to run.



Equipment Cooling Smoke Clearance Schematic
Figure 4

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b) Right recirculation air fan (B14) shuts down and the R RECIRC FAN INOP light on the P5 panel illuminates. EICAS advisory message R RECIR FAN is inhibited. The right pack is commanded to go into the high flow mode (AMM 21-51-00/001).
c) SMOKE light on the P5 panel illuminates and EICAS advisory message FWD EQPT SMOKE displays after a 3 second time delay.
d) If smoke is sensed for more than 5 minutes, the OVHT light on the P5 panel illuminates and EICAS advisory message EQPT OVHT displays. If the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN, the OVHT light and EICAS message extinguish.
e) If on the ground, the overboard exhaust valve actuator (V95) is commanded to SMOKE and the EICAS status and maintenance message OVBD EX VAL OPEN will be displayed and stored in EICAS memory. When smoke is no longer detected, the valve actuator will be commanded to NORMAL.
f) If in the air, the overboard exhaust valve actuator (V95) is commanded to SMOKE and latched in that position until landing; or the smoke condition no longer exists and the EQUIP COOLING ALTN switch/light on the P5 panel is cycled. The EICAS status and maintenance message OVBD EX VAL OPEN will be displayed and stored in EICAS memory whenever the valve actuator is in SMOKE.
g) If in the air with slats retracted, the left recirculation air fan (B13) shuts down and the L RECIRC FAN INOP light on the P5 panel illuminates. EICAS advisory message L RECIR FAN is inhibited. The left pack is commanded to go into the high flow mode (Ref 21-51-00).

3) When an equipment cooling supply smoke sensor no longer senses smoke, the Supply Smoke Sensing Relay (K369) relaxes to cause smoke indications to disappear and to restart the recirculation fans (B13 and B14). The Ovht Light Inhibit Relay (K10507) relaxes after 5 minutes or when the Supply Smoke Shut Down Relay (K10360) relaxes. The Supply Smoke Shut Down Relay (K10360) relaxes the next time an automatic test is initiated to enable supply fan 1 (B10) to operate.
4) When the equipment cooling exhaust smoke sensor (TS164) detects smoke it provides a ground for smoke indications. The sensor ground causes the Exhaust Smoke Sensing Relay (K10509) to energize and the following occur:
a) SMOKE light on the P5 panel illuminates and EICAS advisory message FWD EQPT SMOKE displays after a 3 second time delay.

b) If on the ground, the overboard exhaust valve actuator (V95) is commanded to SMOKE and the EICAS status and maintenance message OVBD EX VAL OPEN is displayed and stored in EICAS memory. When smoke is no longer detected, the valve actuator will be commanded to NORMAL.

c) If in the air, the overboard exhaust valve actuator (V95) is commanded to SMOKE and latched until landing or the smoke condition no longer exists and the EQUIP COOLING ALTN switch/light on the P5 panel is cycled. The EICAS status and maintenance message OVBD EX VAL OPEN will be displayed and stored in EICAS memory whenever the valve actuator is in SMOKE.

d) If in the air with slats retracted, the left recirculation air fan (B13) shuts down and the L RECIRC INOP light on the P5 panel illuminates. EICAS advisory message L RECIR FAN is inhibited. The left pack is commanded to go into the high flow mode (AMM 21-51-00/001).

(b) Equipment Cooling Overboard Exhaust Valve

1) When an equipment cooling smoke sensor detects smoke, the Overboard Exhaust Valve Command Relay (K10442) energizes, commanding the Overboard Exhaust Valve Actuator (V95) to SMOKE. The EICAS status and maintenance message OVBD EX VAL OPEN is displayed and stored in EICAS memory whenever the valve actuator is in SMOKE. If in the air, the overboard exhaust valve is latched to SMOKE until ground mode, or the smoke condition no longer exists and the EQUIP COOLING ALTN switch/light on the P5 panel is cycled.

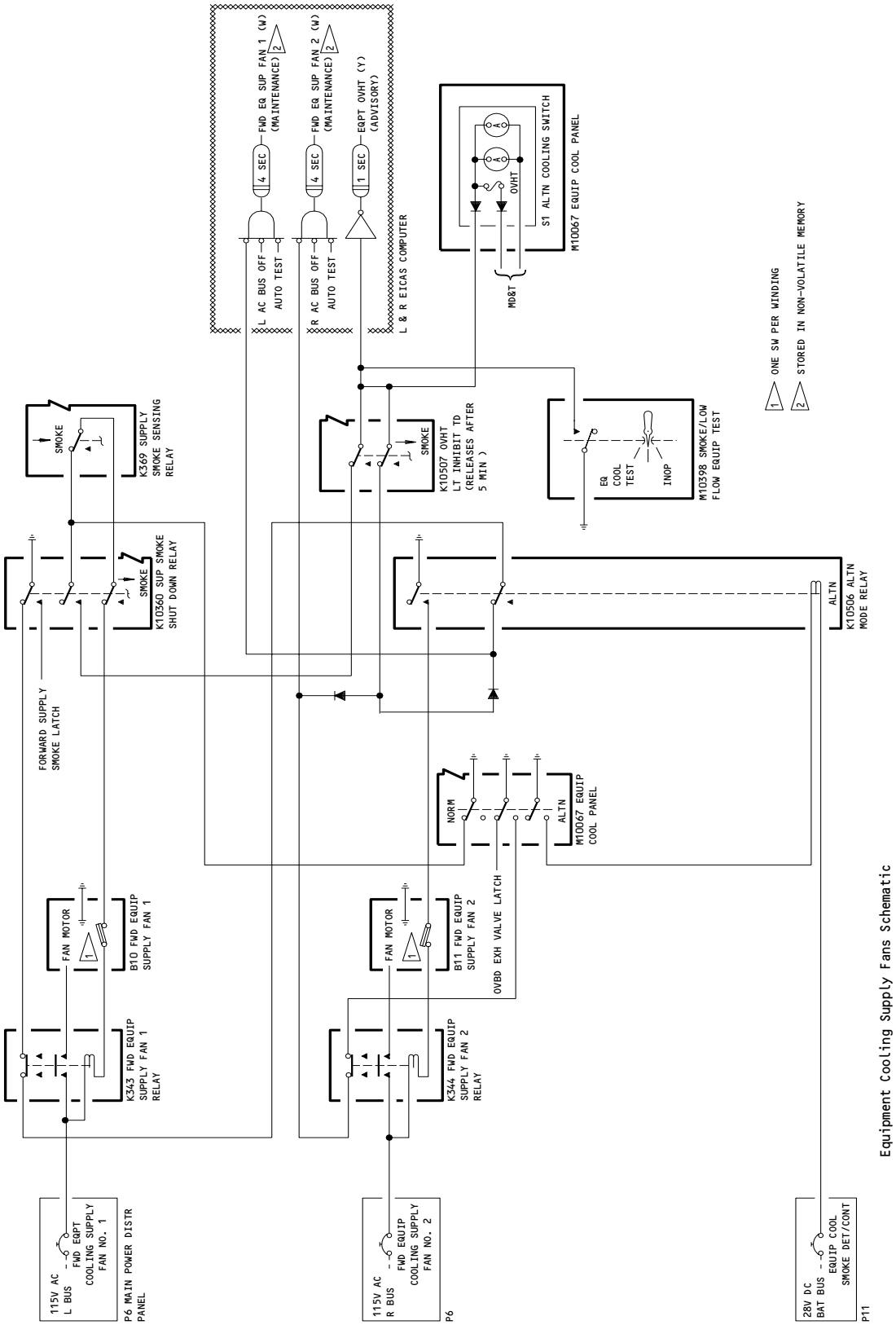
2) In flight, the Overboard Exhaust Valve Command Relay (K10442) is energized and latched whenever the left recirculation air fan is off. If the overboard exhaust valve actuator (V95) moves to SMOKE, the EICAS status and maintenance message OVBD EX VAL OPEN will be displayed and stored in EICAS memory.

3) If the overboard exhaust valve actuator (V95) does not move to SMOKE within 10 seconds, the equipment cooling OVHT light on the P5 panel comes on and EICAS advisory message EQPT OVHT is displayed. Pressing the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN will provide a secondary control path to command the overboard exhaust valve actuator (V95) to SMOKE.

(4) Equipment Cooling Supply Fans (Fig. 5)

(a) Equipment cooling supply fan 1 (B10) is the primary fan and operates under normal circumstances.

1) Fan 1 (B10) runs whenever the Forward Equip Supply Fan 1 Relay (K343) is energized. The fan 1 relay (K343) energizes if no forward supply smoke is sensed, the EQUIP COOLING ALTN switch/light on the P5 panel is relaxed, and the fan thermal switches are closed.



Equipment Cooling Supply Fans Schematic
Figure 5

264292

2) If fan 1 (B10) does not run, the OVHT light on the P5 panel illuminates, EICAS advisory message EQPT OVHT is displayed, EICAS maintenance message FWD EQ SUP FAN 1 is stored in EICAS memory, and EICAS status message EQPT CLG FAN is displayed.

3) If a smoke condition is sensed by a equipment cooling supply smoke sensor (TS5267 or TS5268), power is removed from fan 1 (B10). Fan 1 (B10) is latched off until the smoke condition no longer exists and an automatic test is initiated. The OVHT light and EICAS message EQPT OVHT are inhibited for 5 minutes and the FWD EQ SUP FAN 1 EICAS message is inhibited. If on the ground, a low flow condition exists. The appropriate low flow indications will appear. If the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN, supply fan 2 (B11) will be commanded to run.

(b) Equipment cooling supply fan 2 (B11) is the backup fan and runs only when commanded ON by pressing the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN.

1) Fan 2 (B11) will run only when the Forward Equip Supply Fan 2 Relay (K344) is energized. The fan 2 relay (K344) will energize if the EQUIP COOLING ALTN switch/light on the P5 panel is pressed to ALTN and the fan thermal switches are closed.

2) If fan 2 (B11) does not run, the OVHT light on the P5 panel illuminates, EICAS advisory message EQPT OVHT is displayed, EICAS maintenance message FWD EQ SUP FAN 2 is stored in EICAS memory, and EICAS status message EQPT CLG FAN is displayed.

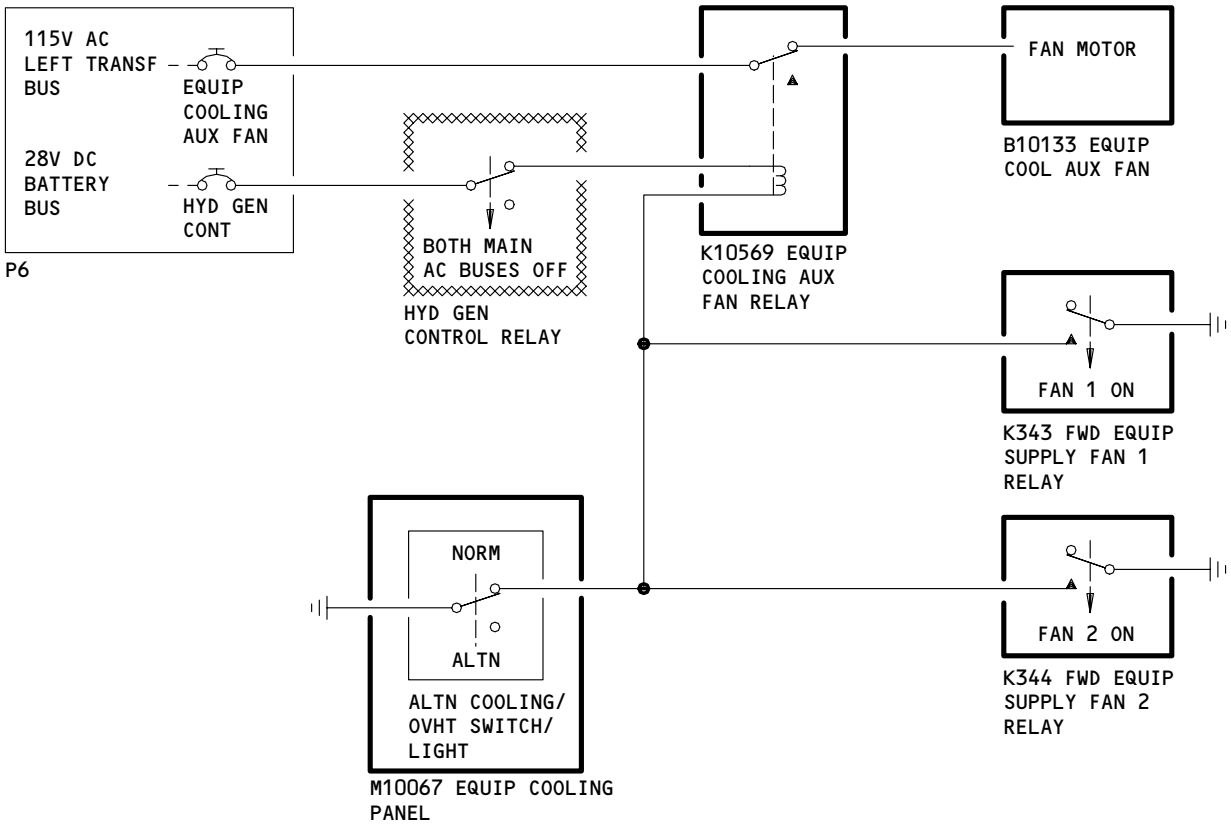
3) If a smoke condition is sensed by a equipment cooling smoke sensor (TS164, TS5267, or TS5268), fan 2 (B11) is not inhibited from running. If the EQUIP COOLING ALTN switch/light is pressed to ALTN, fan 2 (B11) will be commanded to run.

(c) During the Equipment Cooling System Automatic Test, power is interrupted to the primary supply fan for a 20 second smoke shutdown test. At the completion of this shutdown test, power is restored to fan 1 (B10).

(5) Equipment Cooling Auxiliary Fan (Fig. 5A)

(a) The equipment cooling auxiliary fan (B10133) provides backup cooling for the forward supply system.

(b) Power flows through the Equip Cooling Aux Fan Relay (K10569) to operate the auxiliary fan (B10133) whenever the relay (K10569) is relaxed. The relay (K10569) is relaxed when both main AC buses are off or when the Fwd Equip Supply Fan 1 Relay and Fan 2 Relay (K343 and K344) are relaxed and the alternate cooling switch/light on the P5 panel is pressed to ALTN.



Equipment Cooling Auxiliary Fan Schematic
Figure 5A

(c) The auxiliary fan is located downstream of the forward supply fans. The ETOPS Isolation check valve prevents reverse airflow through the inoperative forward supply fans. The auxiliary fan provides cooling through the forward equipment cooling system ducting.

(6) Automatic Testing of Equipment Cooling System (Fig. 6)

(a) Upon shutdown of both engines, the equipment cooling system initiates an automatic test. The forward supply and forward exhaust system functions tested are listed below. A detailed description of each test follows:

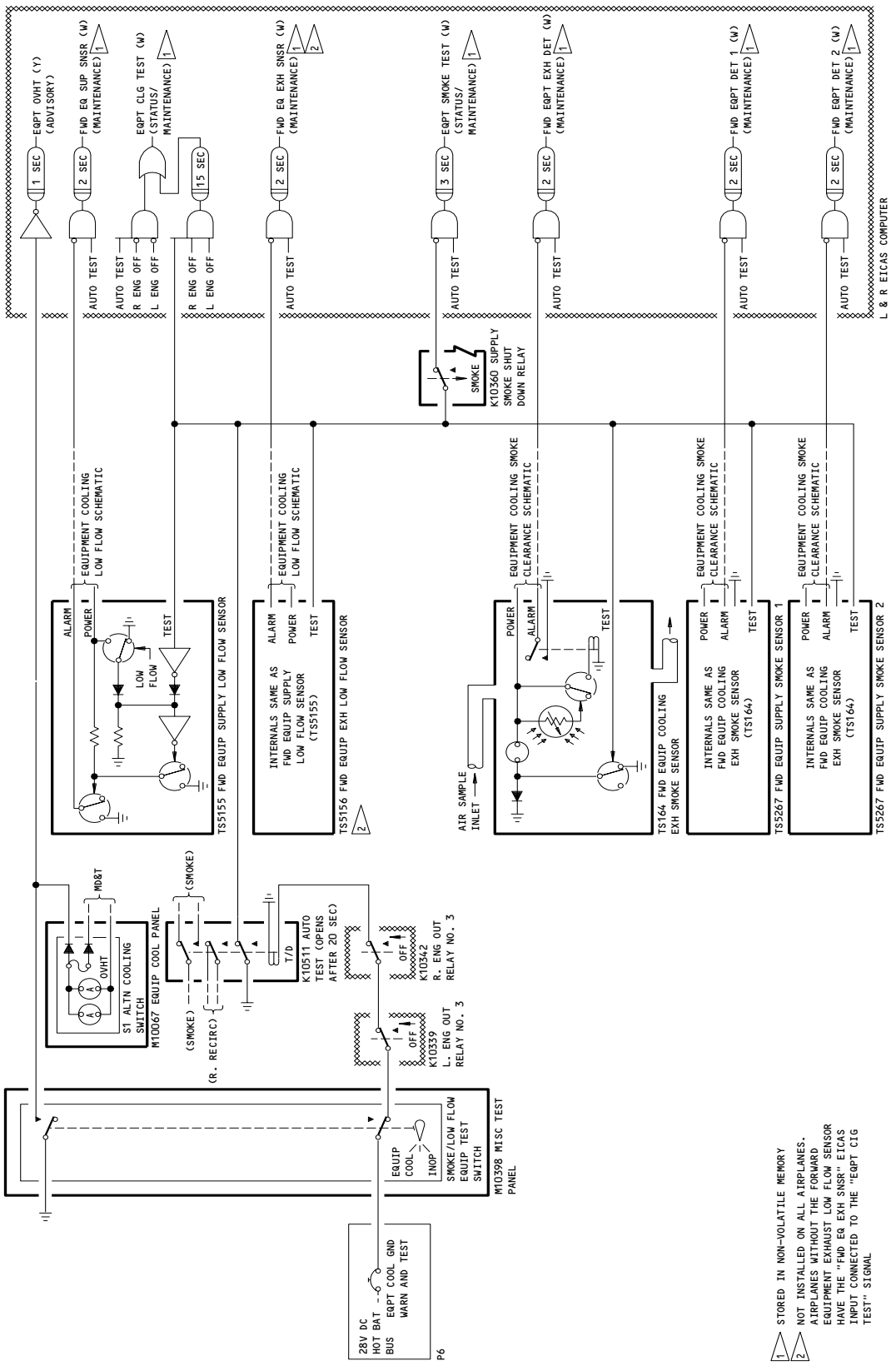
1) Forward Supply System
   a) Low flow sensor.
   b) Smoke sensors and warning system.
2) Forward Exhaust System
   a) Low flow sensor (if installed).
   b) Smoke sensor and warning system.
   c) Overboard exhaust valve actuator and control circuit.

(b) The automatic test begins when both engines are shut off. The test lasts for 20 seconds. A "test underway" signal is provided to EICAS throughout the test. If this signal is not received by EICAS after a suitable delay, status and maintenance message EQPT CLG TEST is displayed and stored in EICAS memory. The message is also displayed if the "test underway" signal exists while one or both engines are running. EICAS monitors the system during automatic testing and displays the appropriate status and maintenance messages if incorrect responses are received. Satisfactory completion of an automatic test is indicated by the absence of EICAS equipment cooling system messages.

(c) The equipment cooling system undergoes an automatic test whenever the Auto Test Relay (K10511) is energized. The test relay (K10511) is energized for only 20 seconds after both engines are shutdown, as sensed by the L Engine Out Relay (K10339) and the R Engine Out Relay (K10342), and the EQUIP COOL TEST switch on the P61 panel is relaxed.

(d) Automatic Test Sequence - Forward Supply System

1) A low flow test signal is sent through the energized contacts of the test relay (K10511) to the forward supply low flow sensor (TS5155). If the sensor is good, a low flow indication is sent to EICAS. If the signal does not appear, EICAS displays the status message EQPT CLG SENSOR and the maintenance message FWD EQ SUP SNSR is stored in EICAS memory.



Equipment Cooling Automatic Test Schematic
Figure 6

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2) During the 20 seconds the test relay (K10511) is energized, a ground signal is sent to the forward supply smoke sensors' 1 (TS5267) and 2 (TS5268) test terminal. If a sensor tests good, it sends an alarm signal to EICAS. If EICAS does not receive the signal, the maintenance message FWD EQPT DET 1 and/or FWD EQPT DET 2 is stored in EICAS memory. If the Supply Smoke Shut Down Relay (K10360) fails to energize, the EICAS status and maintenance message EQPT SMOKE TEST is displayed and stored. Due to the sensed smoke condition for 20 seconds, the right recirculation fan (B14) and forward supply fan 1 (B10) are shutdown. EICAS messages R RECIR FAN and FWD EQ SUP FAN 1 are inhibited.

(e) Automatic Test Sequence - Forward Exhaust System

1) AIRPLANES WITH THE FORWARD EXHAUST LOW FLOW SENSOR;
The forward exhaust low flow sensor (TS5156) is tested and monitored during the 20 second test period in the same way as the forward supply low flow sensor. The EICAS status message EQPT CLG SENSOR is shown and FWD EQ EXH SNSR maintenance message is stored in EICAS memory.

2) During the 20 seconds the test relay (K10511) is energized, a ground signal is sent to the forward exhaust smoke sensors' (TS164) test terminal. If the sensor tests good, it sends an alarm signal to EICAS. If EICAS does not receive the signal, the maintenance message FWD EQPT EXH DET is stored in EICAS memory.

3) Due to the simulated smoke condition for 20 seconds, the overboard exhaust valve actuator (V95) is commanded to SMOKE. The EICAS status and maintenance message OVBD EX VAL OPEN is inhibited. If the overboard exhaust valve actuator (V95) does not move to SMOKE, EICAS will display and store the status and maintenance message OVBD EX VAL TEST.

(f) Automatic Test Completion

1) 20 seconds after the test relay (K10511) energizes it relaxes, removing the ground test signal from the low flow and smoke sensors. Forward supply fan 1 (B10) restarts, right recirculation air fan (B14) restarts, and overboard exhaust valve actuator (V95) is commanded to NORMAL.

(7) Manual Testing of Equipment Cooling System

(a) The EQUIP COOL TEST switch on the P61 panel provides a means of manually initiating the automatic test of the equipment cooling system.

(b) When the EQUIP COOL TEST switch on the P61 panel is held to EQUIP COOL, power is removed from the Auto Test Relay (K10511). The OVHT light on the P5 panel illuminates and the EICAS advisory message EQPT OVHT displays after a 1-second time delay. When the test switch is released, the OVHT light extinguishes and the test relay (K10511) is energized (if both engines are off) to reinitiate the automatic test. A lack of EICAS fault messages after 20 seconds indicates successful completion of the test.

EQUIPMENT COOLING

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER –	1		FLT COMPT, P6	
EQPT COOL GND WARN AND TEST, C4070		1	6D6	*
EQUIP COOL SUPPLY FAN 1, C331		1	6F17	*
EQUIP COOL SUPPLY FAN 2, C332		1	6F23	*
EQUIP COOLING AUX FAN, C3044		1	6D17	*
CIRCUIT BREAKER –	1		FLT COMPT, P11	
EQUIP COOLING FAN CONT AFT EXH XFER, C705		1	11N11	*
EQUIP COOLING LOW FLOW DET, C4069		1	11N13	*
EQUIP COOLING SMOKE DET CONT, C4085		1	11C20	*
RECIRC CARGO FIRE CONT LEFT, C660		1	11P14	*
CIRCUIT BREAKER –			119BL, MAIN EQUIP CTR, P37	
AFT EQPT COOLING FAN EXH NO. 1, C333		1	37D5	*
AFT EQPT COOLING FAN SPLY NO. 1, C3029		1	37D2	*
CIRCUIT BREAKER –			119BL, MAIN EQUIP CTR, P70	
AFT EQPT COOLING FAN EXH NO. 2, C334		1	70B2	*
AFT EQPT COOLING FAN SPLY NO. 2, C3028		1	70B5	*
RECIRC FAN LEFT, C336		1	70C10	*
LEFT RECIRC FAN CONT, C4373		1	70B16	*
CLEANER – EQUIPMENT COOLING AIR, AFT	4	1	822, AFT CARGO COMPT	21-58-21
CLEANER – EQUIPMENT COOLING AIR, FWD	3	1	821, FWD CARGO COMPT	21-58-21
COMPUTER – (FIM 31-41-00/101)				
EICAS LEFT, M10181				
EICAS RIGHT, M10182				
DIODE – (FIM 31-01-36/101)				
R10044,R10096,R10171,R10172,R10173,R10174, R10180,R10181,R10204,R10218,R10221,R10223, R10227,R10230,R10235				
DIODE – (FIM 31-01-37/101)				
R10074,R10179,R10224,R10225,R10226				
FAN – AFT EQUIP COOLING SUPPLY 1, B10061	4	1	822, AFT CARGO COMPT	21-58-21
FAN – AFT EQUIP COOLING SUPPLY 2, B10062	4	1	822, AFT CARGO COMPT	21-58-10
FAN – AFT EQUIP/LAV/GALLEY VENT 1, B16	5	1	822, AFT CARGO COMPT	21-26-01
FAN – AFT EQUIP/LAV/GALLEY VENT 2, B15	5	1	822, AFT CARGO COMPT	21-26-01
FAN – EQUIP COOLING AUXILIARY, B10133	5	1	119BL, MAIN EQUIP CTR	21-58-22
FAN – FWD EQUIP COOLING SUPPLY 1, B10	3	1	821, FWD CARGO COMPT	21-58-06
FAN – FWD EQUIP COOLING SUPPLY 2, B11	3	1	821, FWD CARGO COMPT	21-58-06
FAN – LEFT RECIRCULATION AIR, B13	3	1	821, FWD CARGO COMPT	21-25-01
FILTER – LEFT RECIRCULATION AIR	4	2	821, FWD CARGO COMPT	21-25-02
LIGHT – SMOKE, YNML1	1	1	FLT COMPT, P5 EQUIP COOLING PANEL, M10067	*
MODULE – (FIM 27-51-00/101)				
FSEU3, M10333				
PANEL – AIR CONDITIONING CONTROL, M10193	1	1	FLT COMPT, P5	
PANEL – (FIM 26-22-00/101)				
APU/CARGO FIRE CONTROL, M10444				
PANEL – EQUIP COOLING, M10067	1	1	FLT COMPT, P5	
PANEL – (FIM 34-21-00/101)				
IRS MODE SEL, M59				
PANEL – MISC TEST, M10399	1	1	FLT COMPT, P61	
PANEL – (FIM 23-42-00/101)				
PILOT CALL, M51				

* SEE THE WDM EQUIPMENT LIST

Equipment Cooling – Component Index
Figure 101 (Sheet 1)

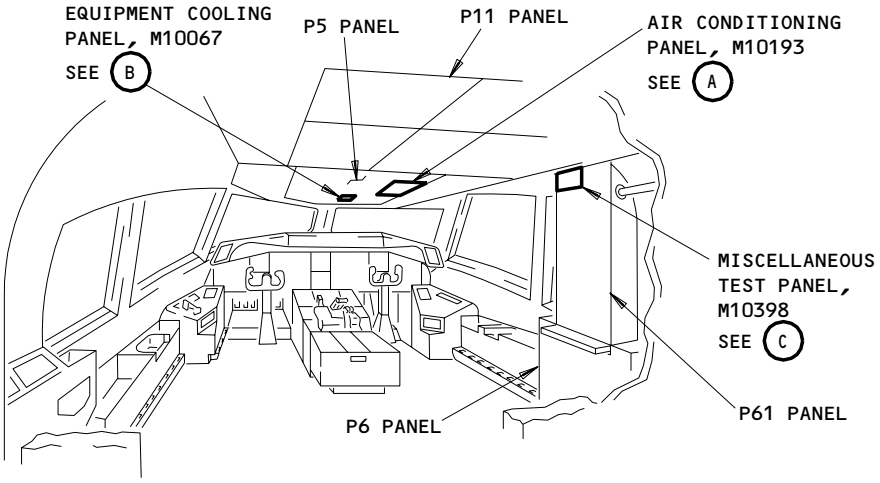
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
RELAYS - (FIM 31-01-36/101)				
AFT EQUIP COOL SUPPLY FAN 1, K10323				
AFT EQUIP/LAV/GALLEY VENT FAN 1, K347				
AIR/GND SYS NO. 1, K124				
AIR/GND SYS NO. 1, K148				
ALTN MODE, K10506				
AUTO TEST, K10511				
EXHAUST SMOKE SENSING, K10509				
FWD EQUIP SUPPLY FAN 1, K343				
HORN, K10080				
OEV INHIBIT, K10167				
OVBD EXH VLV, K10442				
OVHT LT INHIBIT, K10507				
PWR XFR, K10079				
RECIRC OVERRIDE, K10497				
SUPPLY SMOKE SENSING, K369				
SUPPLY SMOKE SHUT DOWN, K10360				
RELAYS - (FIM 31-01-37/101)				
AFT EQUIP COOLING SUPPLY FAN 2, K10324				
AFT EQUIP EXH FAN 1, FAIL, K10322				
AFT EQUIP/LAV/GALLEY VENT FAN 2, K346				
AIR/GND SYS NO. 2, K201				
EQUIP COOL AUX FAN, K10569				
FWD CARGO FIRE, K10432				
FWD EQUIP COOLING SUPPLY FAN 2, K344				
LEFT ENG OUT NO. 3, K10339				
OEV OPEN IND, K10086				
RIGHT ENG OUT NO. 3, K10342				
RELAYS - (FIM 31-01-70/101)				
LEFT RECIRC FAN, K415				
SENSOR - AFT EQUIP COOLING LOW FLOW, TS5138	4	1	822, AFT CARGO COMPT	21-58-17
SENSOR - FWD EQUIP EXH LOW FLOW, TS5156 1	2	1	113AL, FWD ACCESS DOOR	21-58-17
SENSOR - FWD EQUIP EXH SMOKE, TS164	3	1	821, FWD CARGO COMPT	21-58-19
SENSOR - FWD EQUIP SUPPLY LOW FLOW, TS5155	2	1	113AL, FWD ACCESS DOOR	21-58-17
SENSOR - FWD EQUIP SUPPLY SMOKE 1, TS5267	3	1	821, FWD CARGO COMPT	21-58-19
SENSOR - FWD EQUIP SUPPLY SMOKE 2, TS5268	3	1	821, FWD CARGO COMPT	21-58-19
SWITCH - SMOKE/LOW FLOW TEST, YPHS9	1	1	FLT COMPT, P61, MISC TEST PNL, M10398	*
SWITCH/LIGHT - ALTERNATE COOLING/OVHT, YNMS1	1	1	FLT COMPT, P5, EQUIP COOLING PANEL, M10067	*
SWITCH/LIGHT - LEFT RECIRC FAN, YNRS1	1	1	FLT COMPT, P5, AIR CONDITIONING CONT PANEL, M10193	*
TIME DELAY - (FIM 31-01-36/101)				
OEV POWER RESET, M10689				
SMOKE AUTO TEST RESET, M10691				
SMOKE LIGHT, M10690				
TIME DELAY - (FIM 31-01-37/101)				
OEV DRIVE, M10688				
VALVE - (FIM 21-20-00/101)				
AFT EQUIP/LAV/GALLEY VENT CHECK				
VALVE - AFT SUPPLY FAN CHECK	4	2	822, AFT CARGO COMPT	21-58-02
VALVE - AUXILIARY FAN CHECK	5	1	119BL, MAIN EQUIP CTR	21-58-02
VALVE - FORWARD SUPPLY FAN CHECK	3	2	821, FWD CARGO COMPT	21-58-02
VALVE - (FIM 21-20-00/101)				
LEFT RECIRCULATION AIR CHECK				
VALVE - OVERBOARD EXHAUST, V95	3	1	821, FWD CARGO COMPT	21-58-05

* SEE THE WDM EQUIPMENT LIST

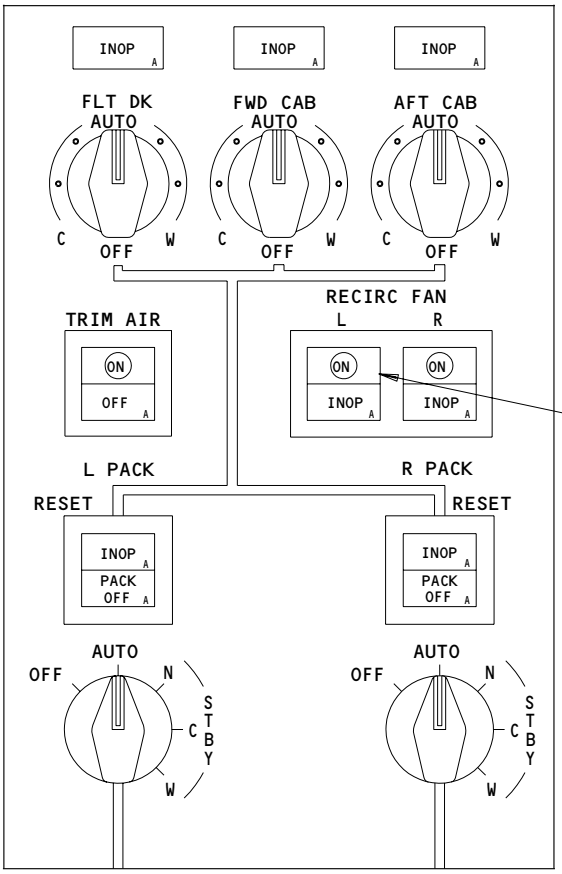
1 NOT INSTALLED ON ALL AIRPLANES

Equipment Cooling - Component Index
Figure 101 (Sheet 2)

K78496

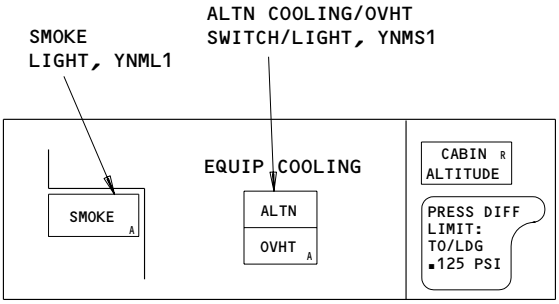


FLIGHT COMPARTMENT



AIR CONDITIONING PANEL, M10193

C

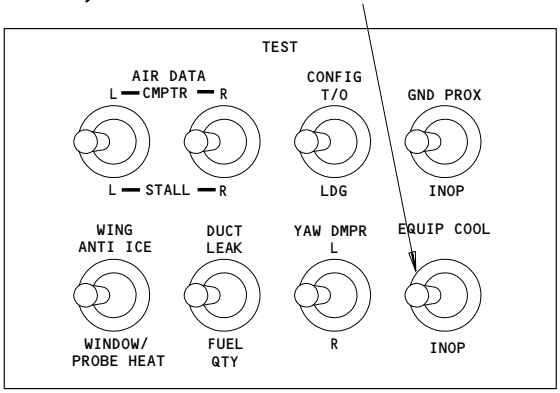


EQUIPMENT COOLING PANEL, M10067

B

LEFT RECIRCULATION FAN SWITCH/LIGHT, YNRS1

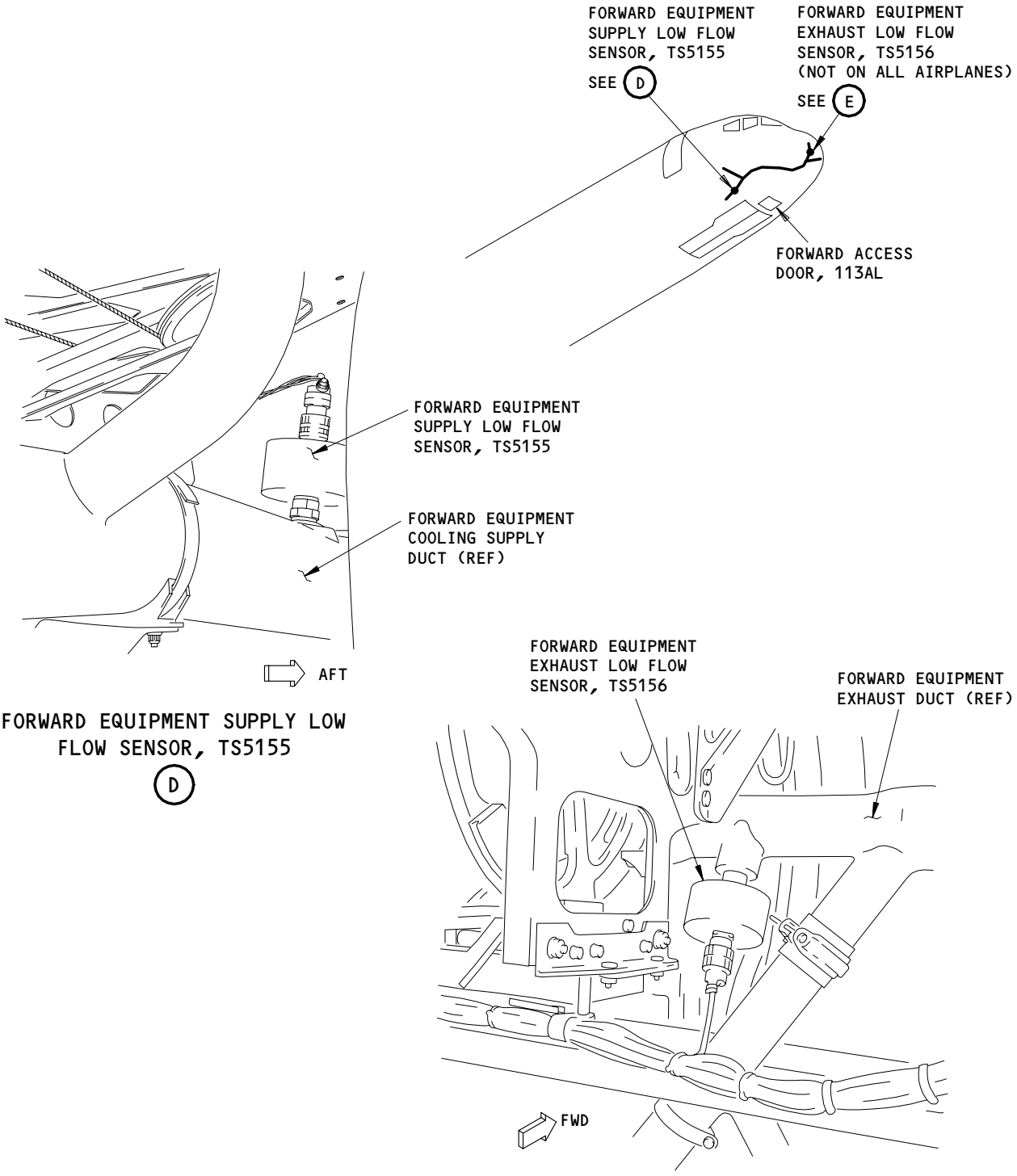
SMOKE/LOW FLOW TEST SWITCH, YPHS9



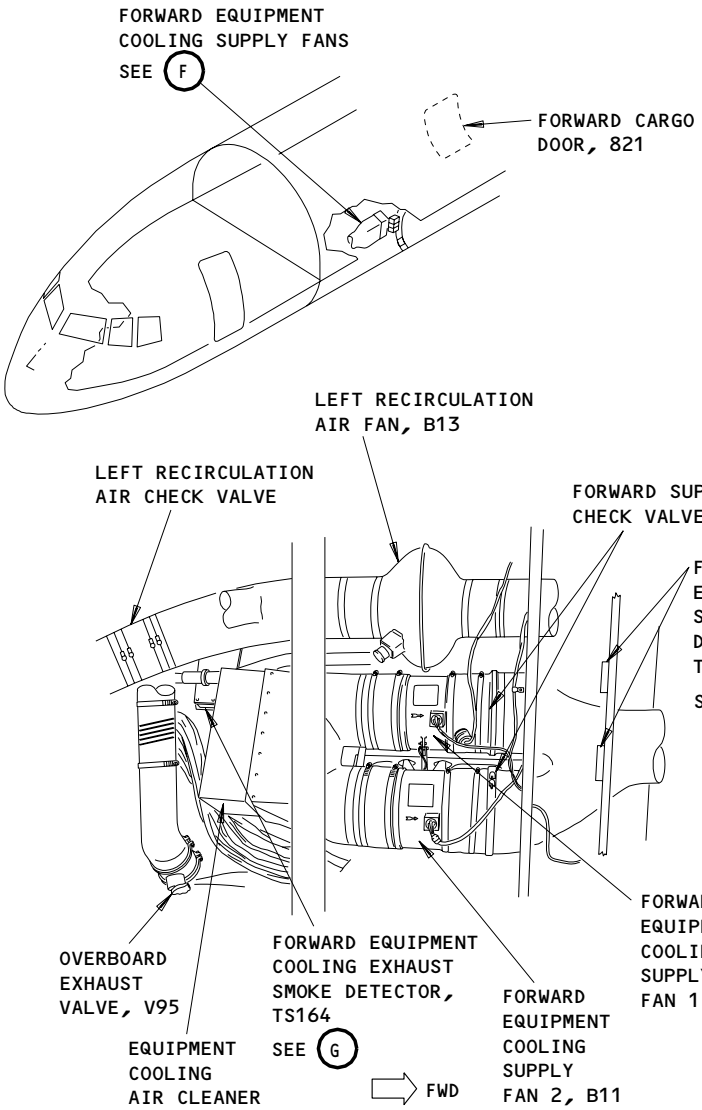
MISCELLANEOUS TEST PANEL, M10398

C

Equipment Cooling - Component Location
Figure 102 (Sheet 1)

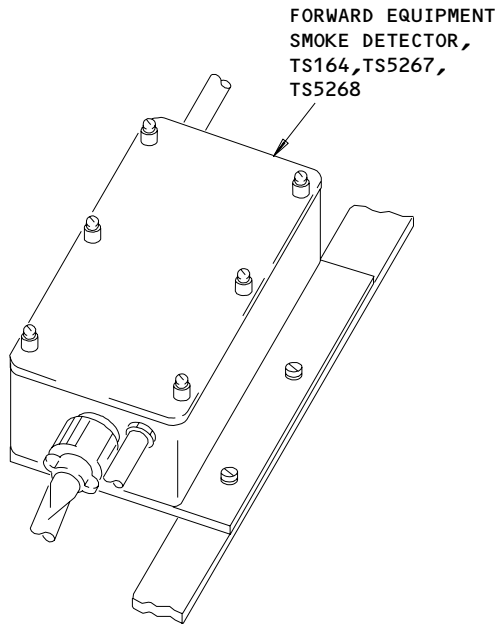


Equipment Cooling - Component Location
Figure 102 (Sheet 2)



FORWARD EQUIPMENT COOLING SUPPLY FANS

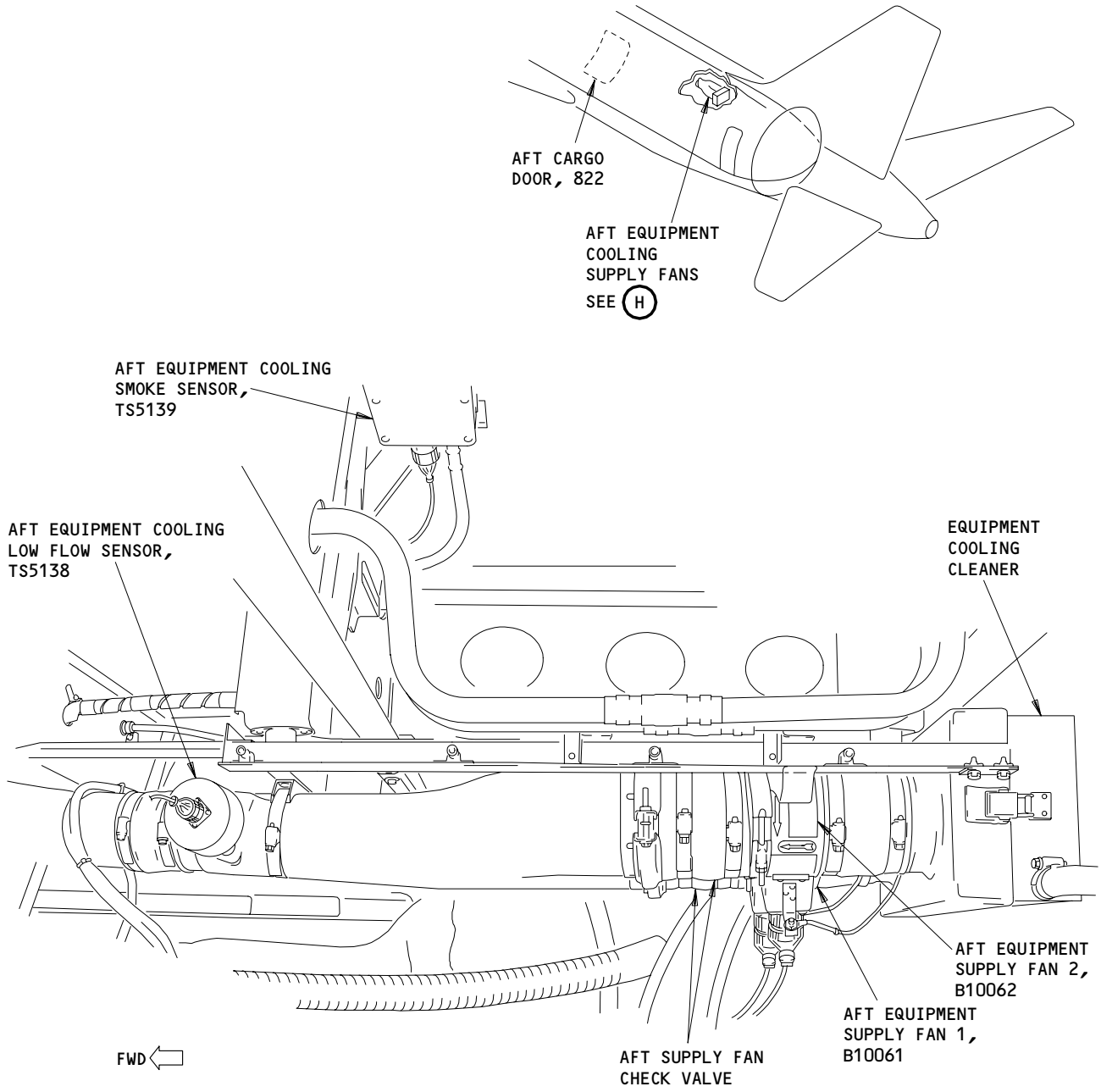
F



FORWARD EQUIPMENT COOLING SMOKE DETECTOR
(EXAMPLE)

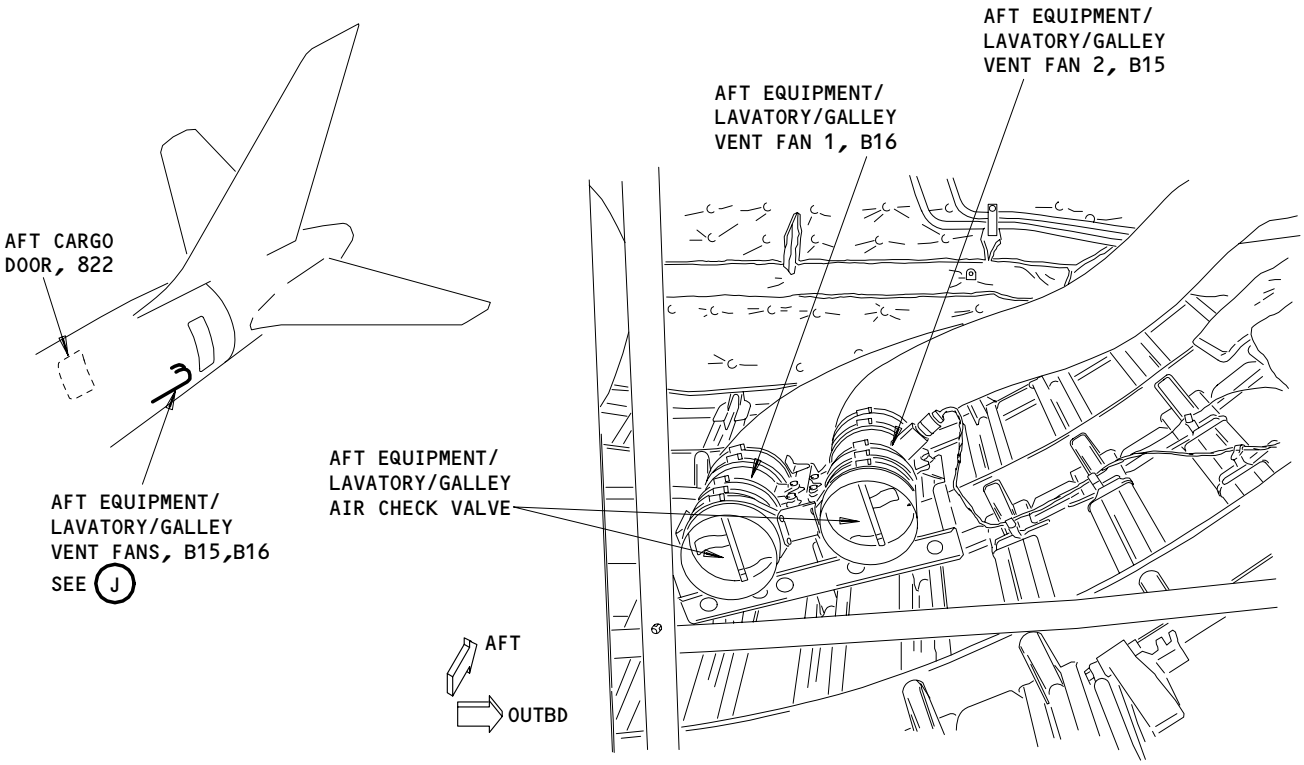
G

Equipment Cooling - Component Location
Figure 102 (Sheet 3)



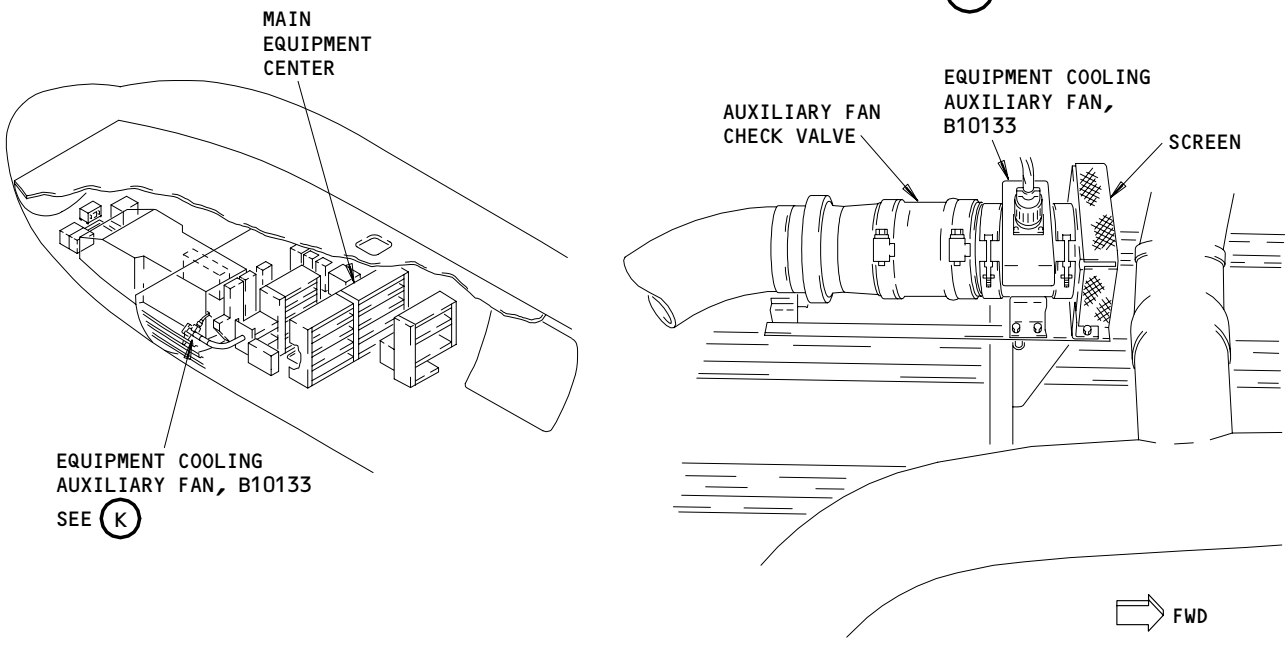
AFT EQUIPMENT COOLING SUPPLY FANS
H

Equipment Cooling – Component Location
Figure 102 (Sheet 4)



AFT EQUIPMENT/LAVATORY/GALLEY VENT FANS

J



EQUIPMENT COOLING AUXILIARY FAN

K

Equipment Cooling - Component Location
Figure 102 (Sheet 5)

EQUIPMENT COOLING

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER –	1		FLT COMPT, P6	
EQPT COOL GND WARN AND TEST, C4070		1	6D6	*
EQUIP COOLING AUX FAN, C3044		1	6D17	*
EQUIP COOL SUPPLY FAN 1, C331		1	6F17	*
EQUIP COOL SUPPLY FAN 2, C332		1	6F23	*
CIRCUIT BREAKER –	1		FLT COMPT, P11	
EQUIP COOLING FAN CONT AFT EXH XFER, C705		1	11N11	*
EQUIP COOLING LOW FLOW DET, C4069		1	11N13	*
EQUIP COOLING SMOKE DET CONT, C4085		1	11C20	*
RECIRC CARGO FIRE CONT LEFT, C660		1	11P14	*
CIRCUIT BREAKER –			119BL, MAIN EQUIP CTR, P37	
AFT EQPT COOLING FAN EXH NO. 1, C333		1	37D5	*
CIRCUIT BREAKER –			119BL, MAIN EQUIP CTR, P70	
AFT EQPT COOLING FAN EXH NO. 2, C334		1	70B2	*
RECIRC FAN LEFT, C336		1	70C10	*
LEFT RECIRC FAN CONT, C4373		1	70B16	*
CLEANER – EQUIPMENT COOLING AIR, FWD	3	1	821, FWD CARGO COMPT	21-58-21
COMPUTER – (FIM 31-41-00/101)				
EICAS LEFT, M10181				
EICAS RIGHT, M10182				
DIODE – (FIM 31-01-36/101)				
R10044,R10096,R10171,R10172,R10173,R10174, R10180,R10181,R10204,R10218,R10221,R10223, R10230				
DIODE – (FIM 31-01-37/101)				
R10074,R10179,R10224,R10225,R10226				
FAN – AFT EQUIP/LAV/GALLEY VENT 1, B16	4	1	822, AFT CARGO COMPT	21-26-01
FAN – AFT EQUIP/LAV/GALLEY VENT 2, B15	4	1	822, AFT CARGO COMPT	21-26-01
FAN – EQUIP COOLING AUXILIARY FAN, B10133	5	1	119BL, MAIN EQUIP CTR	21-58-22
FAN – FWD EQUIP COOLING SUPPLY 1, B10	3	1	821, FWD CARGO COMPT	21-58-06
FAN – FWD EQUIP COOLING SUPPLY 2, B11	3	1	821, FWD CARGO COMPT	21-58-06
FAN – LEFT RECIRCULATION AIR, B13	3	1	821, FWD CARGO COMPT	21-25-01
FILTER – LEFT RECIRCULATION AIR	4	2	821, FWD CARGO COMPT	21-25-02
LIGHT – SMOKE, YNML1	1	1	FLT COMPT, P5 EQUIP COOLING PANEL, M10067	
MODULE – (FIM 27-51-00/101)				
FSEU3, M10333				
PANEL – AIR CONDITIONING CONTROL, M10193	1	1	FLT COMPT, P5	*
PANEL – (FIM 26-22-00/101)				
APU/CARGO FIRE CONTROL, M10444				
PANEL – EQUIP COOLING, M10067	1	1	FLT COMPT, P5	
PANEL – (FIM 34-21-00/101)				
IRS MODE SELECT, M59				
PANEL – MISC TEST, M10399	1	1	FLT COMPT, P61	

* SEE THE WDM EQUIPMENT LIST

Equipment Cooling – Component Index
Figure 101 (Sheet 1)

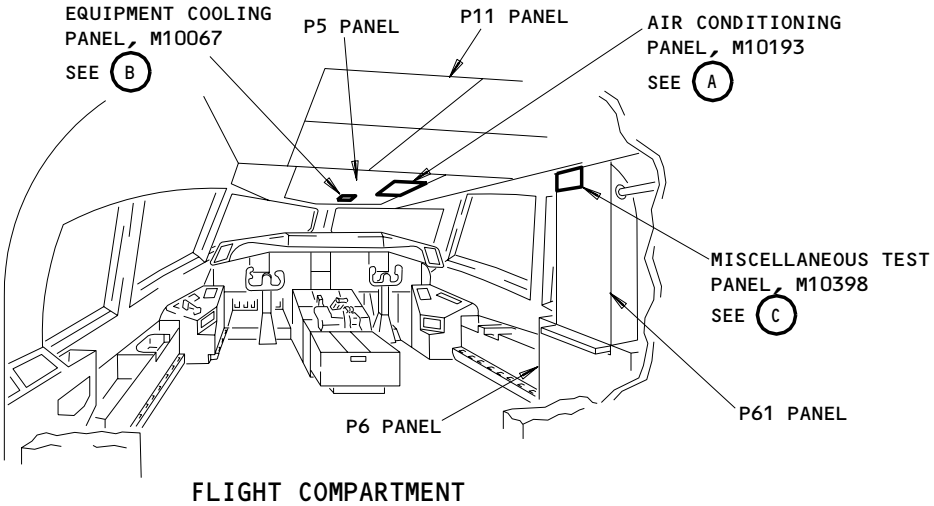
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
PANEL - (23-42-00/101)				
PILOT CALL, M51				
RELAY - (31-01-36/101)				
AFT EQUIP/LAV/GALLEY VENT FAN 1, K347				
AIR/GND SYS NO. 1, K124				
AIR/GND SYS NO. 1, K148				
ALTN MODE, K10506				
AUTO TEST, K10511				
EXHAUST SMOKE SENSING, K10509				
FWD EQUIP SUPPLY FAN 1, K343				
HORN, K10080				
OEV INHIBIT, K10167				
OVBD EXH VLV, K10442				
OVHT LT INHIBIT, K10507				
PWR XFR, K10079				
RECIRC OVERRIDE, K10497				
SUPPLY SMOKE SENSING, K369				
SUPPLY SMOKE SHUT DOWN, K10360				
RELAY - (31-01-37/101)				
AFT EQUIP EXH FAN 1, FAIL, K10322				
AFT EQUIP/LAV/GALLEY VENT FAN 2, K346				
AIR/GND SYS NO. 2, K201				
EQUIP COOL AUX FAN, K10569 1				
FWD CARGO FIRE, K10432				
FWD EQUIP COOLING SUPPLY FAN 2, K344				
LEFT ENG OUT NO. 3, K10339				
OEV OPEN IND, K10086				
RIGHT ENG OUT NO. 3, K10342				
RELAY - (31-01-70/101)				
LEFT RECIRC FAN, K415				
SENSOR - FWD EQUIP EXH LOW FLOW, TS5156 2	2	1	113AL, FWD ACCESS DOOR	21-58-17
SENSOR - FWD EQUIP EXH SMOKE, TS164	3	1	821, FWD CARGO COMPT	21-58-19
SENSOR - FWD EQUIP SUPPLY LOW FLOW, TS5155	2	1	113AL, FWD ACCESS DOOR	21-58-17
SENSOR - FWD EQUIP SUPPLY SMOKE 1, TS5267	3	1	821, FWD CARGO COMPT	21-58-19
SENSOR - FWD EQUIP SUPPLY SMOKE 2, TS5268	3	1	821, FWD CARGO COMPT	21-58-19
SWITCH - SMOKE/LOW FLOW TEST, YPHS9	1	1	FLT COMPT, P61, MISC TEST PNL, M10398	*
SWITCH/LIGHT - ALTERNATE COOLING/OVHT, YNMS1	1	1	FLT COMPT, P5, EQUIP COOLING PANEL, M10067	*
SWITCH/LIGHT - LEFT RECIRC FAN, YNRS1	1	1	FLT COMPT, P5, AIR CONDITIONING CONT PANEL, M10193	*
TIME DELAY - (31-01-36/101)				
OEV POWER RESET, M10689				
SMOKE AUTO TEST RESET, M10691				
SMOKE LIGHT, M10690				
TIME DELAY - (FIM 31-01-37/101)				
OEV DRIVE, M10688				
VALVE - (21-20-00/101)				
AFT EQUIP/LAV/GALLEY VENT CHECK				
LEFT RECIRCULATION AIR CHECK				
VALVE - AUXILIARY FAN CHECK 1	5	1	119BL, MAIN EQUIP CTR	
VALVE - ETOPS ISOLATION CHECK 1	6	1	119BL, MAIN EQUIP CTR	
VALVE - FORWARD SUPPLY FAN CHECK	3	2	821, FWD CARGO COMPT	21-58-02
VALVE - OVERBOARD EXHAUST, V95	3	1	821, FWD CARGO COMPT	21-58-05

* SEE THE WDM EQUIPMENT LIST

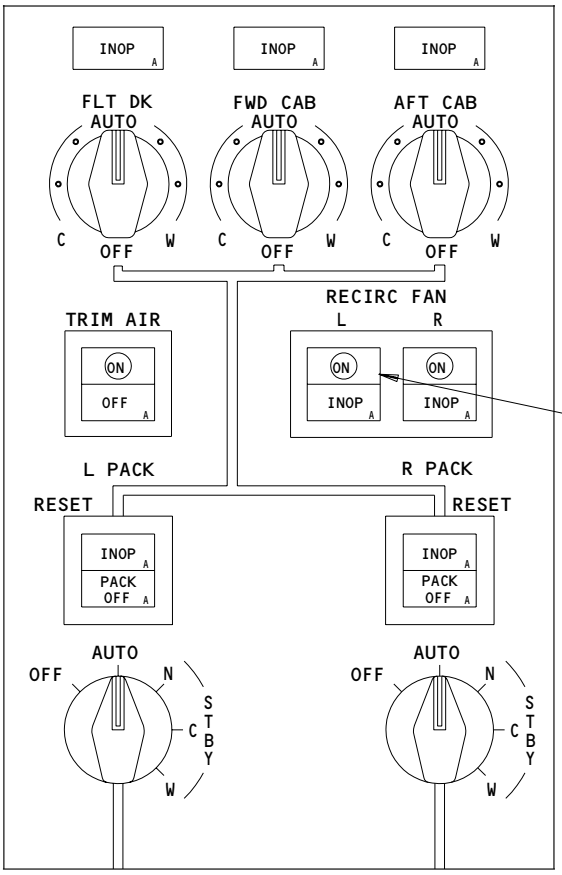
2 NOT INSTALLED ON ALL AIRPLANES

Equipment Cooling - Component Index
Figure 101 (Sheet 2)

K78592

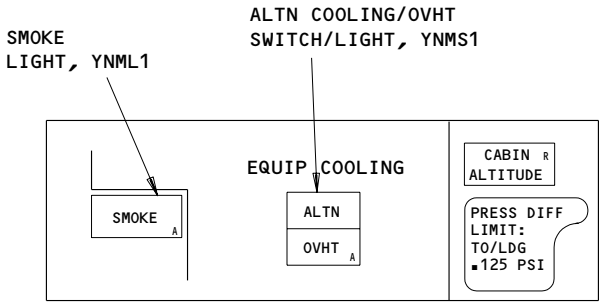


FLIGHT COMPARTMENT



AIR CONDITIONING PANEL, M10193

A

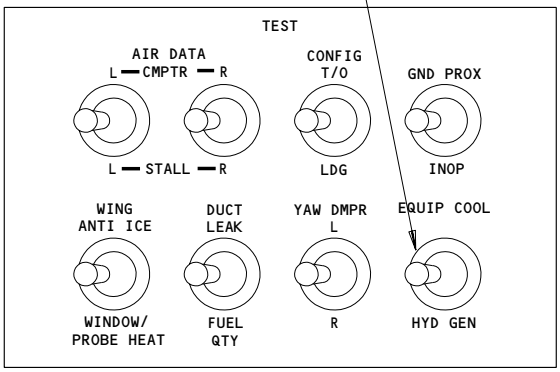


EQUIPMENT COOLING PANEL, M10067

B

LEFT RECIRCULATION
FAN SWITCH/LIGHT,
YNRS1

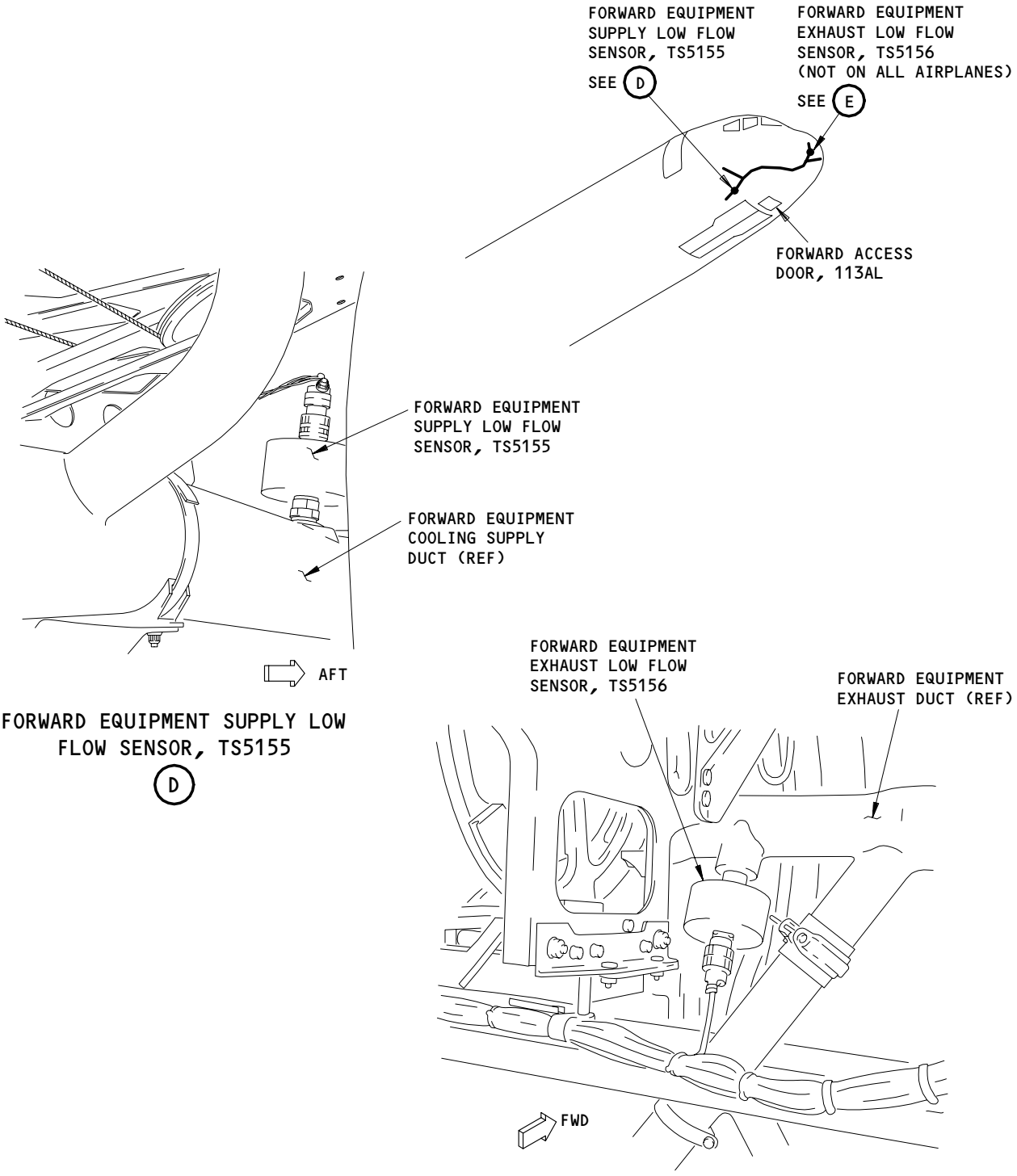
SMOKE/LOW FLOW
TEST SWITCH, YPHS9



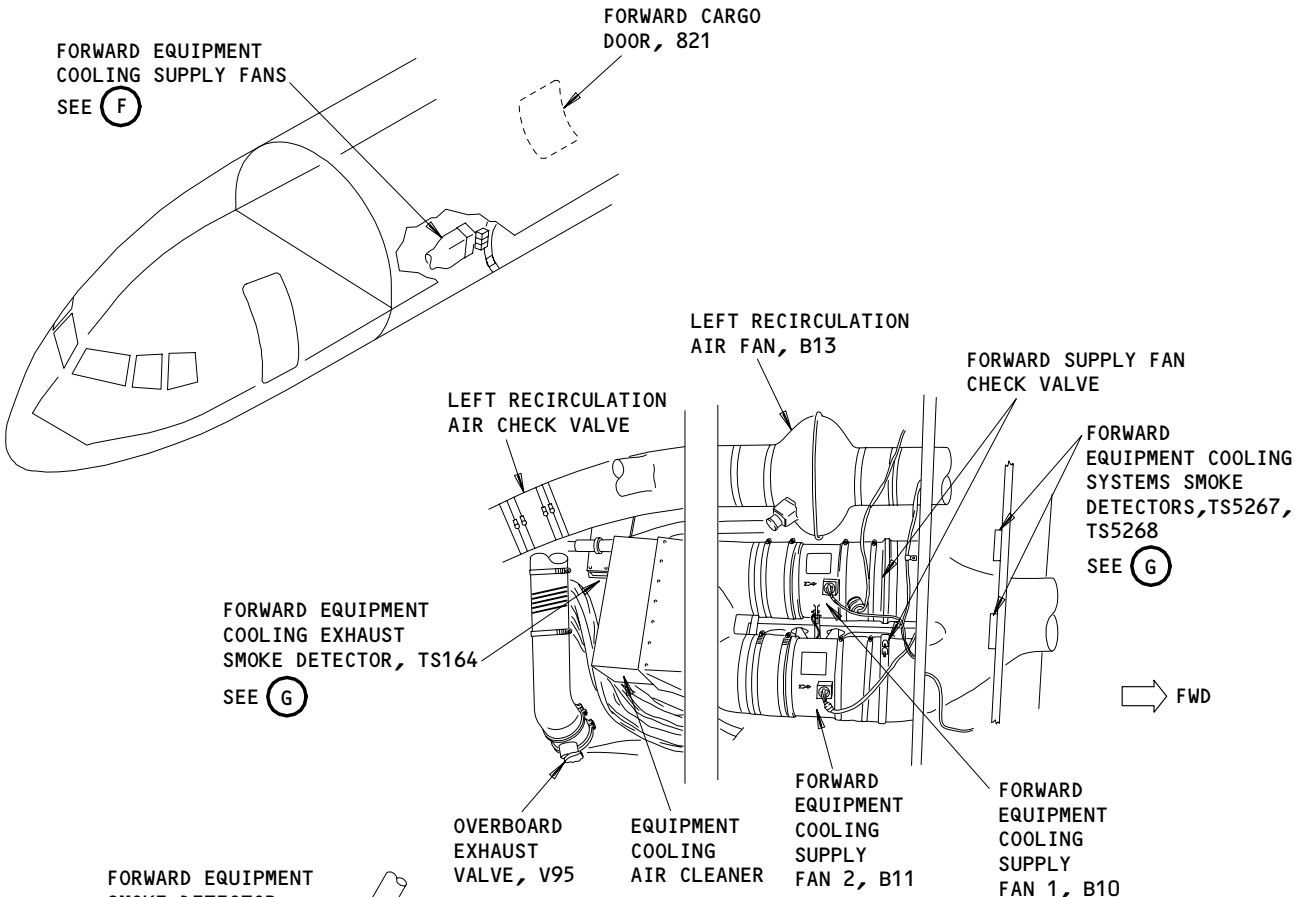
MISCELLANEOUS TEST PANEL, M10398

C

Equipment Cooling - Component Location
Figure 102 (Sheet 1)

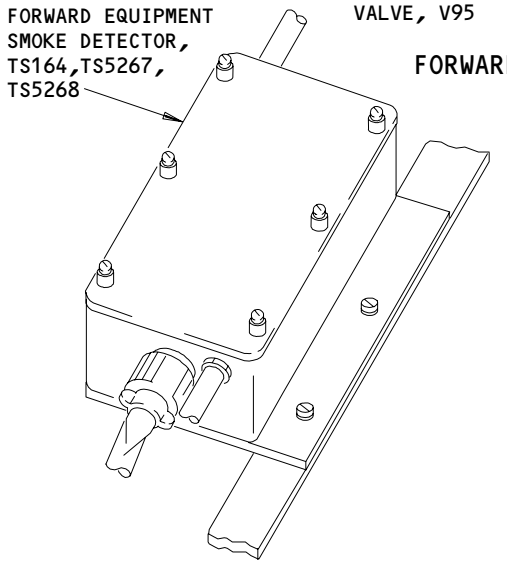


Equipment Cooling - Component Location
Figure 102 (Sheet 2)



FORWARD EQUIPMENT COOLING SUPPLY FANS

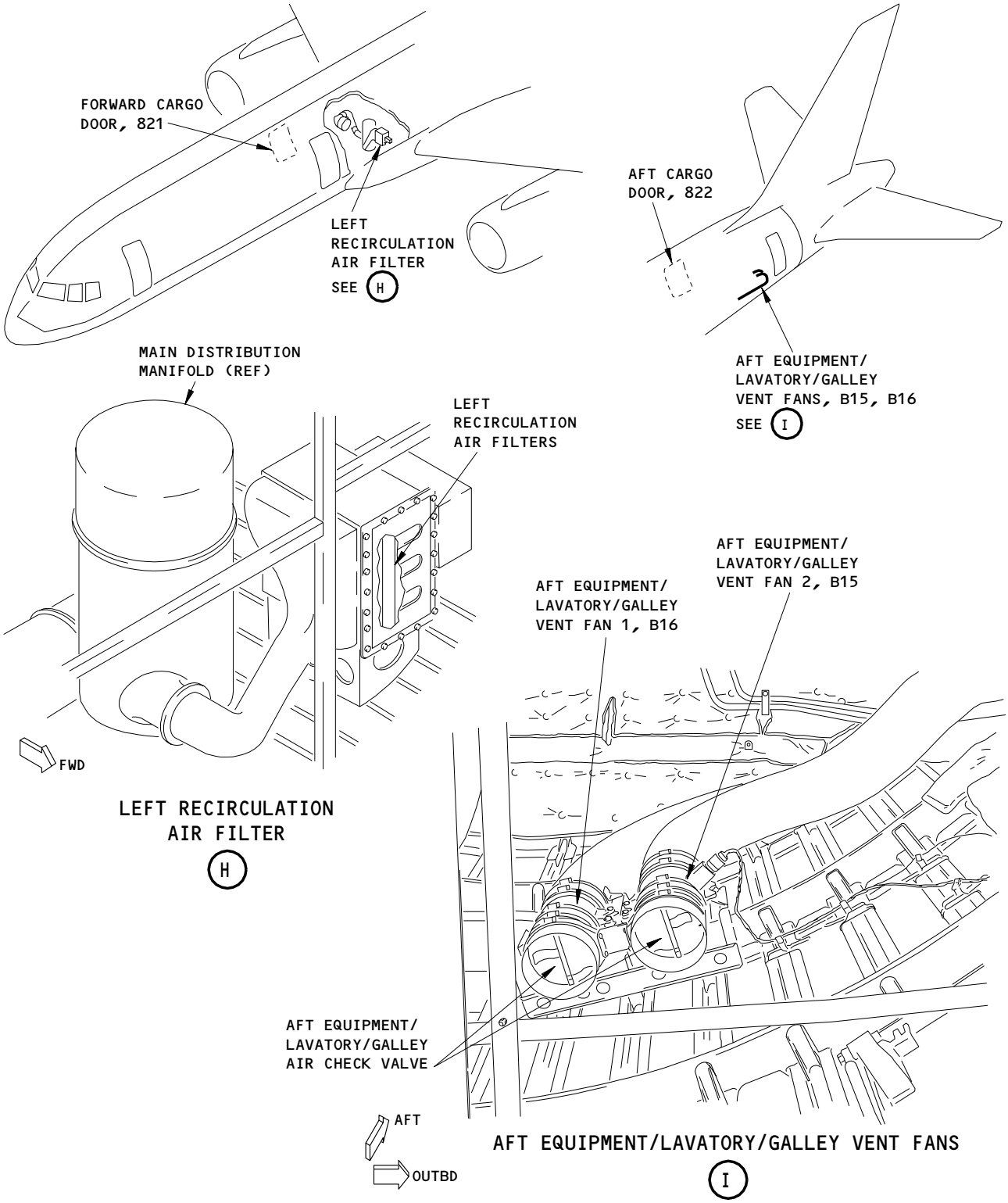
F



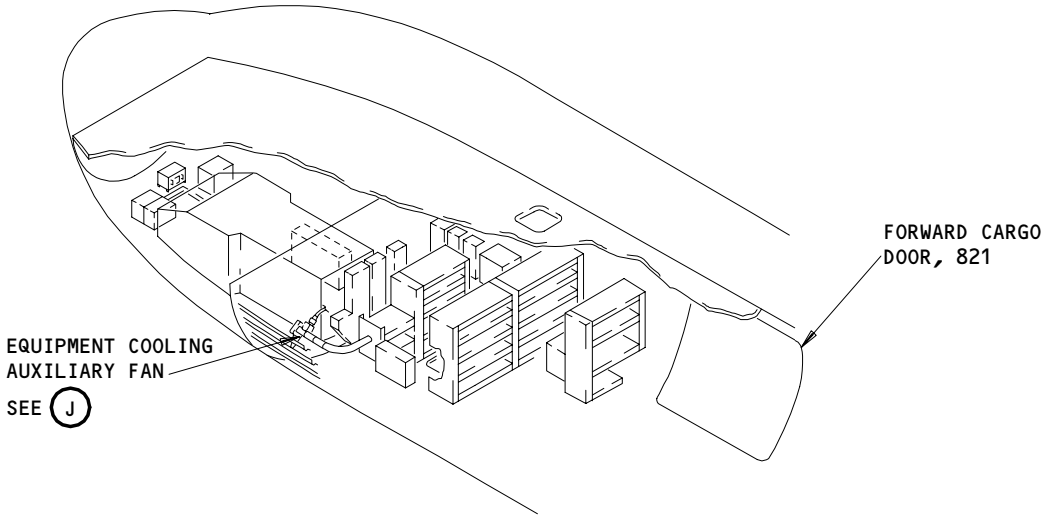
FORWARD EQUIPMENT COOLING
SMOKE DETECTOR
(EXAMPLE)

G

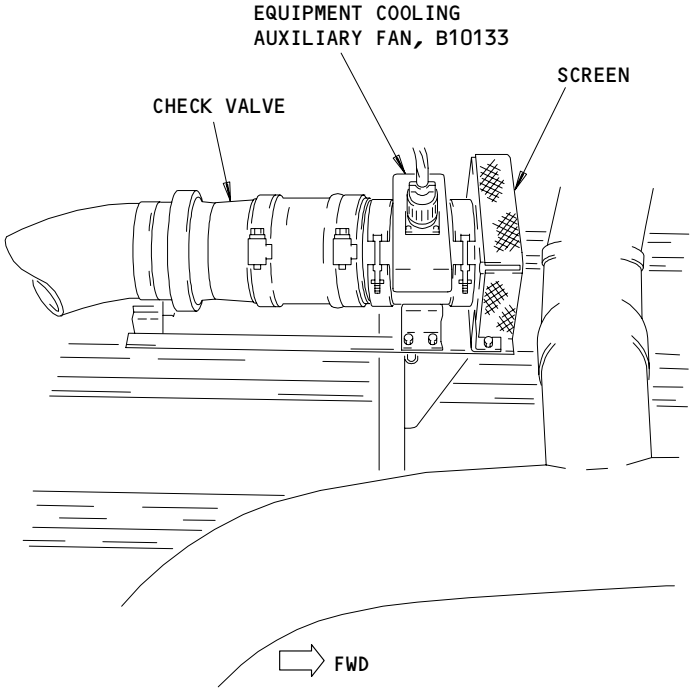
Equipment Cooling - Component Location
Figure 102 (Sheet 3)



Equipment Cooling - Component Location
Figure 102 (Sheet 4)



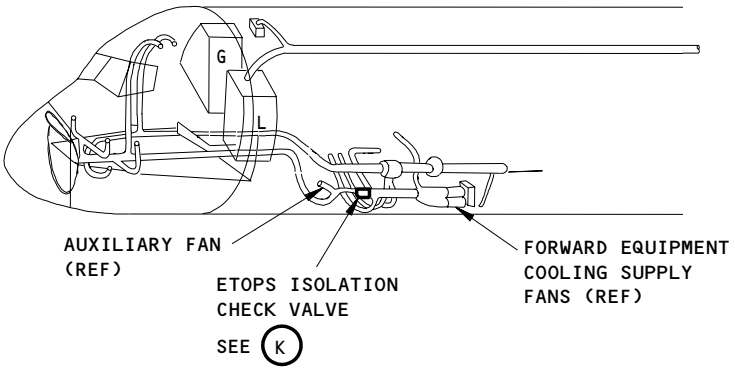
MAIN EQUIPMENT CENTER

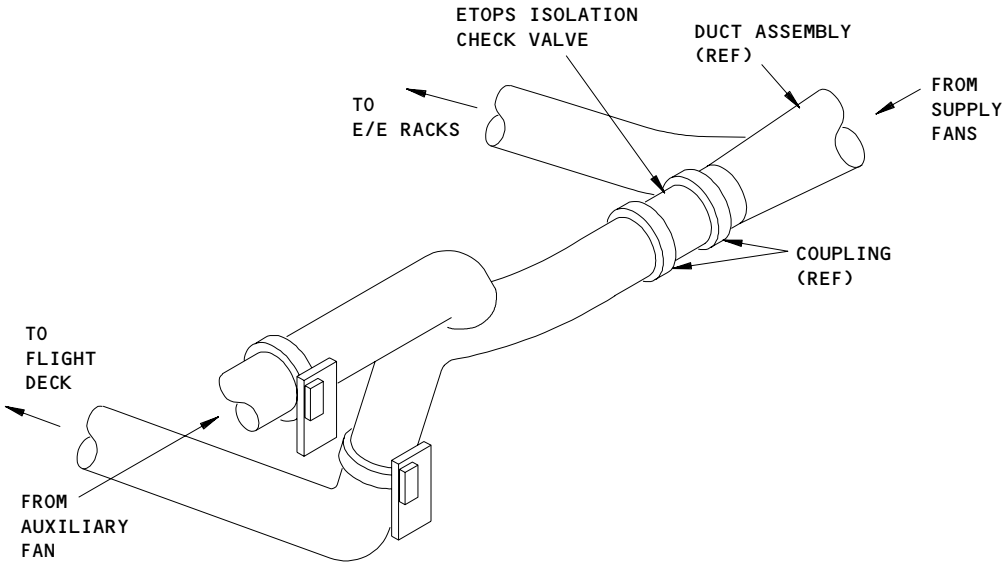


EQUIPMENT COOLING AUXILIARY FAN

J

Equipment Cooling – Component Location
Figure 102 (Sheet 5)





ETOPS ISOLATION CHECK VALVE

K

Equipment Cooling – Component Location
Figure 102 (Sheet 6)

EQUIPMENT COOLING SYSTEM - MAINTENANCE PRACTICES

1. General
   A. This procedure contains these tasks:
      (1) Equipment Cooling for High Ambient Temperature or High Altitudes
      (2) Equipment Cooling Rack Pressure Check
      (3) Equipment Cooling Rack Balancing Procedure

TASK 21-58-00-712-004

2. Equipment Cooling for High Ambient Temperatures or High Altitudes
   A. General
      (1) This procedure has the conditions necessary for the operation of the equipment cooling when the ambient air temperature is above 93 degrees F (34 degrees C) and the airplane is electrically powered for more than 20 minutes on the ground. This procedure also provides information for operation of the equipment at high airfield altitudes.
   B. References
      (1) AMM 06-46-00/201, Entry, Service, and Cargo Doors
      (2) AMM 21-00-00/201, Air Conditioning
   C. Access
      (1) Location Zones
          830 Upper Half of Fuselage (LH Side)
          840 Upper Half of Fuselage (RH Side)

   D. The Procedure

      S 882-001
      (1) Do the steps that follow when the ambient air temperature is 93°F to 104°F (34°C to 40°C):
          (a) Open one left or the right main entry door (831 or 841) and the aft service door on the opposite side (846 or 836) (AMM 06-46-00/201), or,
          (b) Operate one air conditioning pack or the same capacity ground cooling (AMM 21-00-00/201).

              NOTE: For airfield altitudes above 6000 feet it may be necessary to operate one or both air conditioning packs to make sure the EQPT CLG OVHT EICAS message does not show.

      S 882-002
      (2) Do the steps that follow when the ambient air temperature is 105°F to 120°F (40°C to 49°C):
          (a) Operate one air conditioning pack or the same capacity ground cooling (AMM 21-00-00/201).

S 882-003

(3) Do the steps that follow when the ambient air temperature is more than 120°F (49°C):

(a) Operate two air conditioning packs or the same capacity ground cooling.

NOTE: For airfield altitudes above 6000 feet it may be necessary to operate one or both air conditioning packs to make sure the EQPT CLG OVHT EICAS message does not show.

TASK 21-58-00-782-023

3. Equipment Cooling Rack Pressure Test

A. General

(1) Some shelves on some rack configurations do not have electronic equipment that is forced air cooled. The pressure in these shelves may be zero.

B. Equipment

(1) Netech Digimano 2000 Precision Pressure/Vacuum Meter
Model No. 220-02PSI
Netech Corporation
60 Bethpage Drive
Hicksville, NY 11801

(2) A-302 Static Pressure Probe
Dwyer Instruments, Inc.
Michigan City, IN 46360

(3) Plastic tubing - 1/8-inch ID, approximately 6 feet

C. Access

(1) Location Zones
117 Main Equipment Center, Left
118 Main Equipment Center, Right

D. References

(1) AMM 21-58-00/201, Equipment Cooling Maintenance Practices

E. Procedure

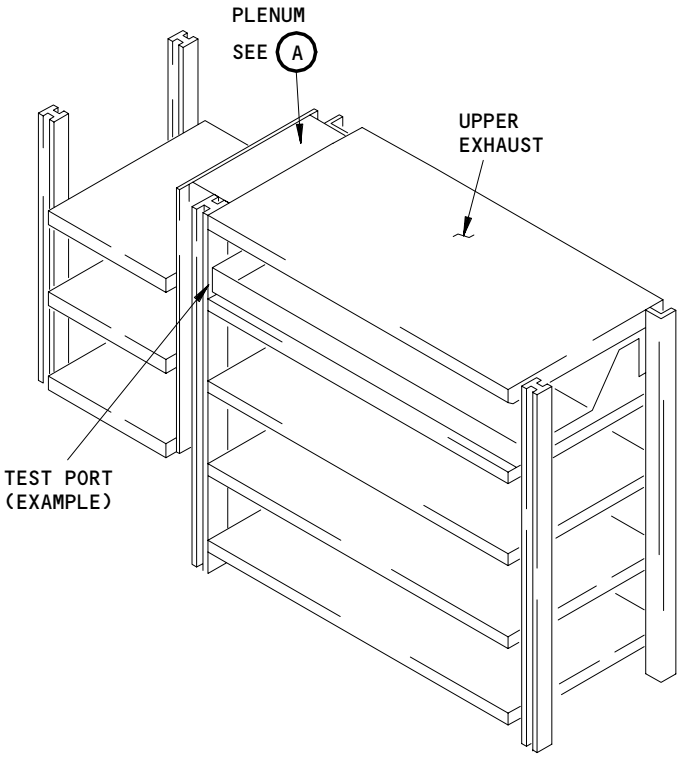
S 862-024

(1) Make sure the EICAS message EQPT CLG FAN does not show.

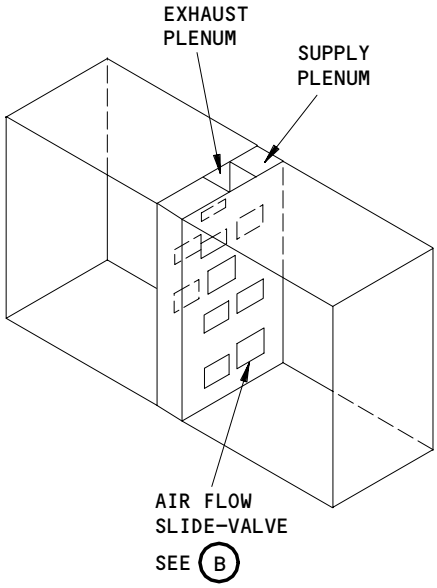
S 782-025

(2) Do these steps to check the pressures at the E1, E2, E3, E4, E5, and E6 (if installed) racks:

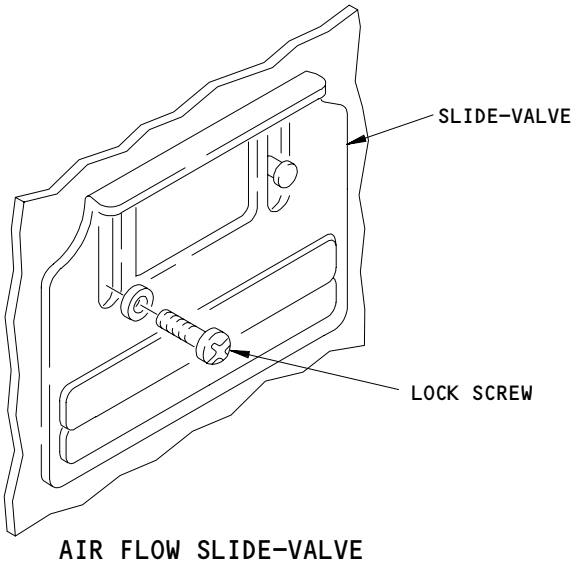
(a) Insert the pressure probe into the test port found on the front of each shelf.



E/E RACK
(EXAMPLE)

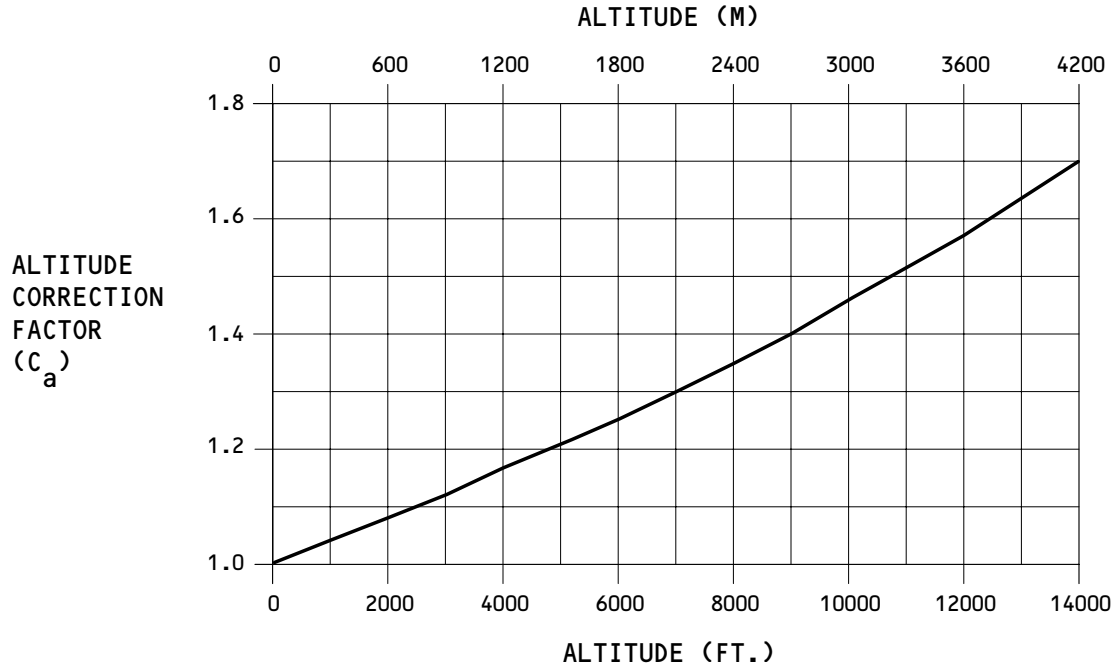


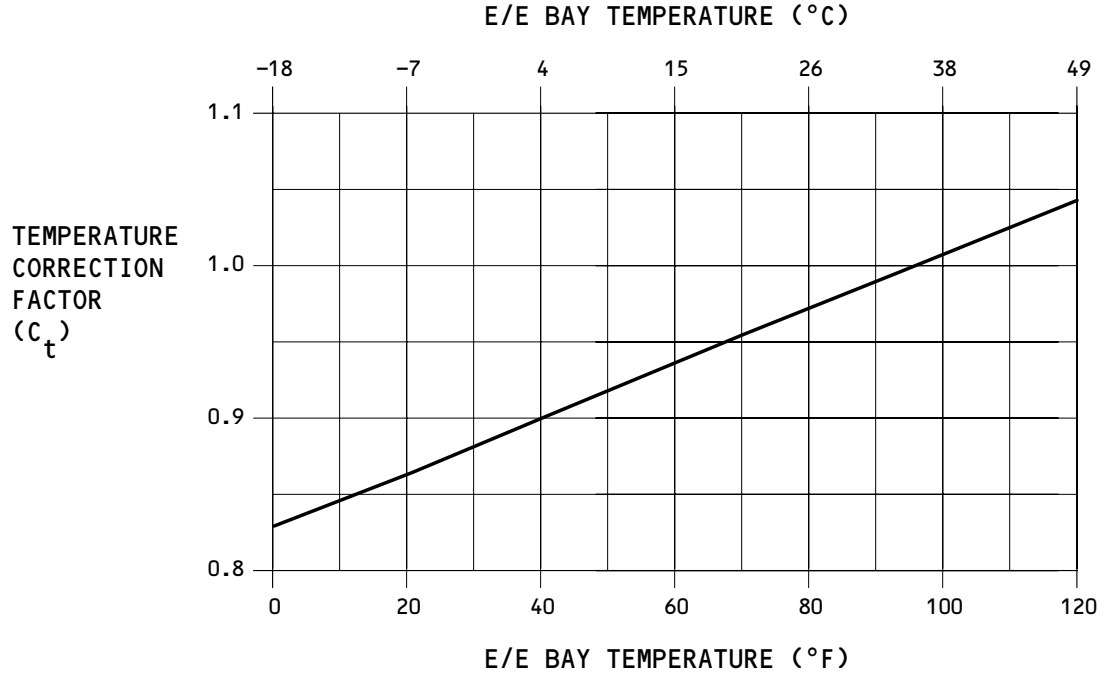
PLENUM
A



AIR FLOW SLIDE-VALVE
B

Equipment Cooling Rack Balancing Procedure
Figure 201





TEMPERATURE AND ALTITUDE CORRECTION FACTORS

NOTE: CORRECTED PRESSURE = C_a x C_t x MEASURED PRESSURE.

Equipment Cooling Rack Balancing Procedure
Figure 202

(b) For the E1, E2, E3, E4, and E5 racks:
If the measured pressure at each shelf is less than 2.0 inches of water, then do the Equipment Cooling Rack Balancing Procedure (AMM 21-58-00/201).

NOTE: Pressure readings are affected by extreme heat, cold and altitude. If any of these conditions exist, use Fig. 201 to correct the shelf pressure. A corrected shelf pressure of 2.0 inches of water or more indicates an acceptable cooling airflow.

(c) For the E6 rack (if installed):
If the measured vaccuum at each shelf is less than 2.0 inches of water, then do the Equipment Cooling Rack Balancing Procedure (AMM 21-58-00/201).

NOTE: Use Fig. 202 to correct the shelf pressure if necessary.

TASK 21-58-00-782-026

4. Equipment Cooling Rack Balancing Procedure

A. General

(1) This procedure should be used to balance the applicable electronic equipment rack shelves if insufficient cooling exists.

B. Equipment

(1) Pressure Meter and Static Pressure Probe capable of measuring pressures between 0.0 and 10.0 inches of water.

C. Access

(1) Location Zones
117 Main Equipment Center, Left
118 Main Equipment Center, Right

D. Procedure

S 862-027

(1) Make sure the EICAS message EQPT CLG FAN does not show.

S 012-028

(2) Get access to the air supply slide valve that supplies the cooling air to the applicable shelf.

NOTE: You may have to remove the electronic unit adjacent to the rack plenum to get access to the air supply slide-valve. The air supply slide-valve is the widest of the two valves.

S 022-036

(3) Loosen the lock screw that keeps the valve plate in its position.

S 782-030
(4) Slide the valve plate up until there is a pressure of at least 2.0 inches of water for the applicable shelf.

NOTE: Pressure readings are affected by extreme heat, cold and altitude. If any of these conditions exist, use Fig. 201 to correct the shelf pressure. A corrected shelf pressure of 2.0 inches of water or more incicates and acceptable cooling airflow.

(a) If you are not able to obtain a pressure of at least 2.0 inches of water for the applicable shelf, do these steps:
1) Get access to the air supply slide-valve for the shelf that has the greatest shelf pressure.
2) Loosen the lock screw that keeps the valve plate in its position.
3) Adjust the valve plate until there is 2.0 inches of water.
4) Tighten the lock screw.

S 422-031
(5) Tighten the lock screw.

S 412-032
(6) Install the electrical unit(s) that were removed, if applicable.

S 782-033
(7) Do a check of all the shelf pressures in the applicable rack.

S 782-034
(8) If each shelf in the applicable rack has a shelf pressure of at least 2.0 inches of water, then the rack is balanced.

S 782-035
(9) If a shelf in the applicable rack has a shelf pressure less than 2.0 inches of water, then repeat this procedure until each shelf has a shelf pressure of at least 2.0 inches of water.

EQUIPMENT COOLING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This section has procedures for an operational test and a system test.

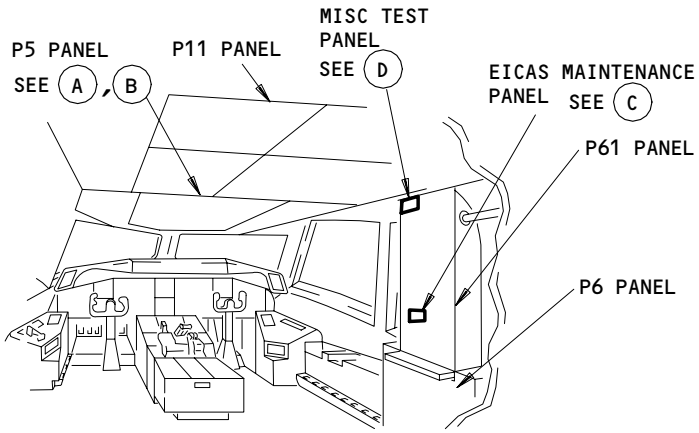
   TASK 21-58-00-715-001-003
2. Operational Test - Equipment Cooling System
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power - Control
      (3) AMM 31-41-00/201, Engine Indiciation and Crew Alerting System.
   B. Access
      (1) Location Zone
          821 No. 1 Cargo Door

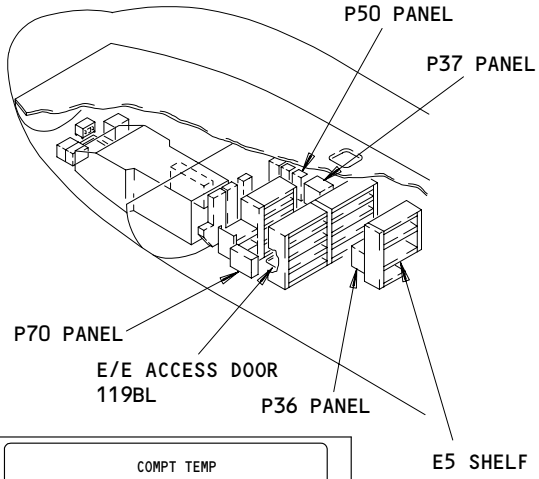
   C. Prepare for a Test

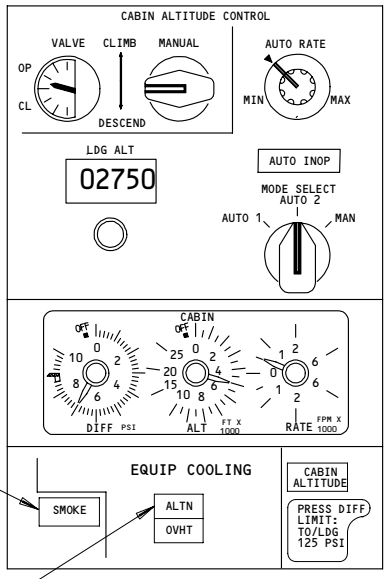
      S 865-002-003
      (1) Supply the electrical power (AMM 24-22-00/201).

      S 015-003-003
      (2) Open the E/E access door, 119BL (AMM 06-41-00/201).

      S 865-004-003
      (3) Make sure these circuit breakers are closed:
          (a) On the main power distribution panel, P6:
              1) 6D06, EQUIP COOL GND WARN AND TEST
              2) 6F17, EQUIP COOL SUPPLY FAN 1
              3) 6F23, EQUIP COOL SUPPLY FAN 2
          (b) On the overhead circuit breaker panel, P11:
              1) 11A32, INDICATOR LIGHTS 1
              2) 11A33, INDICATOR LIGHTS 2
              3) 11B31, ENGINES SPEED CARD LEFT
              4) 11B32, ENGINES SPEED CARD RIGHT
              5) 11C20, EQUIP COOLING SMOKE DET CONT





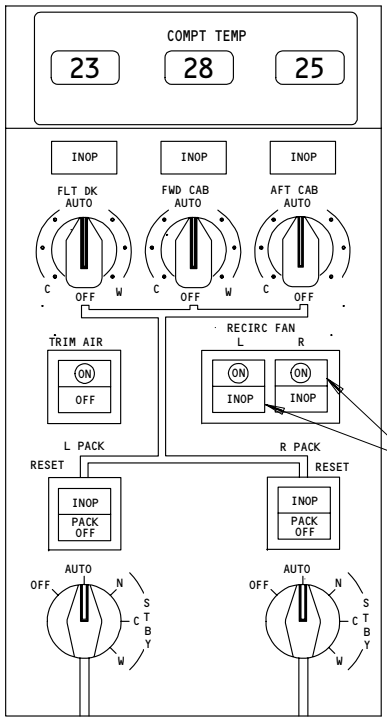


EQUIP COOLING SMOKE LIGHT

EQUIP COOLING ALTN SWITCH/LIGHT

EQUIP COOLING PANEL

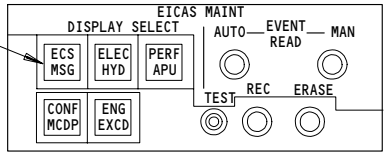
A



RECIRC FAN SWITCH/LIGHT

AIR CONDITIONING CONTROL PANEL

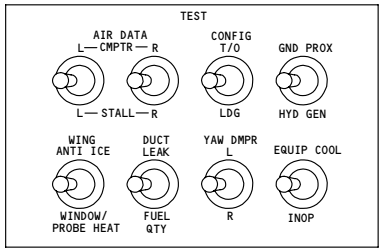
B



ECS/MSG PUSHBUTTON

EICAS MAINTENANCE PANEL

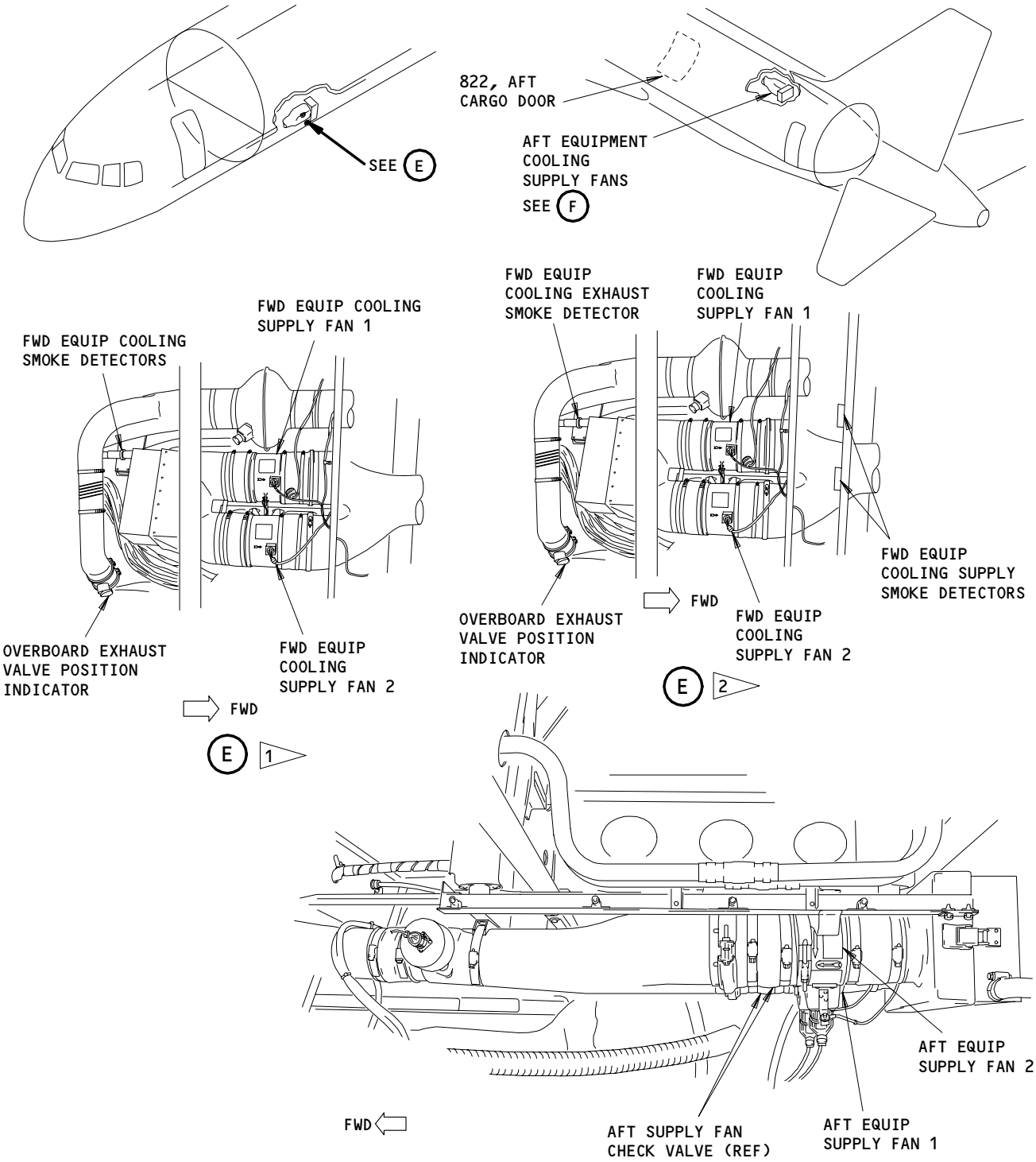
C



MISC TEST PANEL

D

Equipment Cooling System Adjustment Test
Figure 501 (Sheet 1)



1 AIRPLANES WITHOUT SB 21-50

2 AIRPLANES WITH SB 21-50

AFT EQUIPMENT COOLING SUPPLY FANS

F

Equipment Cooling System Adjustment Test
Figure 501 (Sheet 2)

334931

6) 11JO2, EICAS CMPTR LEFT
7) 11JO3, EICAS UPPER DISPLAY
8) 11J29, EICAS CMPTR RIGHT
9) 11J3O, EICAS LOWER DISPLAY
10) 11J32, EICAS DISPLAY SELECT
11) 11NO4, INSTRUMENT AND PANEL OVHD
12) 11N13, EQUIP COOLING LOW FLOW DET
13) 11PO1, L IND LTS 1
14) 11P14, RECIRC CARGO FIRE CONT LEFT
15) 11P23, RECIRC CARGO FIRE CONT RIGHT
16) 11P29, R IND LTS 2
17) 11S15, AIR GND SYS 1
18) 11S19, AIR GND SYS 2

(c) On the right miscellaneous electrical equipment panel, P37:
1) 37DO2, AFT EQPT COOLING FAN SPLY NO. 1
2) 37DO7, R RECIRC FAN CONT
3) 37JO5, RECIRC FAN R

(d) On the miscellaneous electrical equipment panel, P7O:
1) 7OBO5, AFT EQPT COOLING FAN SPLY NO. 2
2) 7OB16, L RECIRC FAN CONT
3) 7OC1O, RECIRC FAN L

S 865-005-003

(4) Push the L and R RECIRC FAN switch-lights on the overhead panel, P5, to ON.

S 865-267-003

(5) Make sure that the EQUIP COOLING ALTN switch-light on the P5 panel is in the normal position.

S 865-243-003

(6) Make sure the ALTN light is off.

D. Do a Test of the Forward Equipment Supply Fans (Fig. 5O1)

S 715-007-003

(1) Do the Prepare for Test procedure.

S 865-008-003

(2) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the overhead circuit breaker panel, P11:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-009-003

(3) Do the EICAS maintenance message erase procedure (AMM 31-41-OO/201).

S 865-010-003

(4) Push the ECS/MSG pushbutton on the EICAS maintenance panel on the P61 panel.

S 865-011-003
(5) Make sure that the EICAS maintenance messages, FWD EQ SUP FAN 1 and FWD EQ SUP FAN 2, do not show.

S 865-012-003
(6) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
  (a) On the main power distribution panel, P6:
    1) 6F17, EQUIP COOL SUPPLY FAN 1

S 865-244-003
(7) Make sure these conditions occur:
  (a) The EICAS maintenance message, FWD EQ SUP FAN 1, shows.
  (b) The OVHT light on the P5 panel comes on.

S 865-013-003
(8) Push the EQUIP COOLING ALTN switch on the P5 panel to ALTN.

S 865-014-003
(9) Make sure that the OVHT light on the P5 panel goes off.

S 865-015-003
(10) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
  (a) On the main power distribution panel, P6:
    1) 6F23, EQUIP COOL SUPPLY FAN 2

S 865-246-003
(11) Make sure these conditions occur:
  (a) The EICAS maintenance message, FWD EQ SUP FAN 2, shows.
  (b) The OVHT light on the P5 panel comes on.

S 865-016-003
(12) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
  (a) On the main power distribution panel, P6:
    1) 6F17, EQUIP COOL SUPPLY FAN 1
    2) 6F23, EQUIP COOL SUPPLY FAN 2

S 865-017-003
(13) Push the EQUIP COOLING ALTN switch-light on the P5 panel to the usual position.

S 865-245-003
(14) Make sure the ALTN light is off.

S 865-018-003
(15) Make sure that the OVHT light on the P5 panel goes off.

S 865-019-003
(16) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-020-003
(17) Make sure that the EICAS maintenance messages, FWD EQ SUP FAN 1 and FWD EQ SUP FAN 2, do not show.

S 865-021-003
(18) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) On the overhead circuit breaker panel, P11:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 415-022-003
(19) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-023-003
(20) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

E. Do a Test of the Aft Equipment Supply Fans (Fig. 501)

S 715-024-003
(1) Do the Prepare for Test procedure.

S 865-025-003
(2) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the overhead circuit breaker panel, P11:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-026-003
(3) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-027-003
(4) Push the ECS/MSG pushbutton on EICAS maintenance panel on the P61 panel.

S 865-028-003
(5) Make sure that the EICAS maintenance messages, AFT EQ SUP FAN 1 and AFT EQ SUP FAN 2, do not show.

S 865-257-003
(6) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the right miscellaneous electrical equipment panel, P37:
1) 37D2, AFT EQPT COOLING FAN SPLY NO. 1

S 865-247-003
(7) Make sure these conditions occur:
(a) The EICAS maintenance message, AFT EQ SUP FAN 1, shows.
(b) The OVHT light on the P5 panel shows.

S 865-030-003
(8) Put the EQUIP COOLING ALTN switch-light on P5 panel to ALTN.

S 865-031-003
(9) Make sure the OVHT light on the P5 panel goes off.

S 865-032-003
(10) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
  (a) On the miscellaneous electrical equipment panel, P70:
    1) 70B5, EQPT COOLING SPLY FAN NO. 2

S 865-248-003
(11) Make sure these conditions occur:
  (a) Make sure the EICAS maintenance message, AFT EQ SUP FAN 2, shows.
  (b) Make sure the OVHT light on the P5 panel comes on.

S 865-240-003
(12) Remove the do not close tag and close this circuit breaker:
  (a) On the P37 panel:
    1) 37D2, AFT EQPT COOLING FAN SPLY NO. 1

S 865-033-003
(13) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
  (a) On the P70 panel:
    1) 70B5, AFT EQPT COOLING FAN SPLY NO. 2

S 865-034-003
(14) Push the EQUIP COOLING ALTN switch-light on the P5 panel to the usual position.

S 865-268-003
(15) Make sure the ALTN light goes off.

S 865-035-003
(16) Make sure that the OVHT light on the P5 panel goes off.

S 865-036-003
(17) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-037-003
(18) Make sure that the EICAS maintenance messages, AFT EQ SUP FAN 1 and AFT EQ SUP FAN 2, do not show.

S 865-038-003
(19) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
  (a) On the P11 panel:
    1) 11N13, EQUIP COOLING LOW FLOW DET

S 415-039-003
(20) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-040-003
(21) Remove electrical power if it is not necessary (AMM 24-22-00/201).

F. Do a Test of the Overboard Exhaust Valve

S 715-041-003
(1) Do the Prepare for Test procedure.

S 865-269-003
(2) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-270-003
(3) Push the ECS/MSG pushbutton on EICAS maintenance panel on the P61 panel.

S 725-249-003
(4) Hold EQUIP COOL TEST switch on the P61 panel to EQUIP COOL for 5 seconds.

S 725-250-003
(5) Make sure that the OVHT light on the P5 panel comes on.

S 725-251-003
(6) Release the test switch.

S 865-271-003
(7) Make sure the OVHT light on the P5 panel goes off.

S 865-272-003
(8) After 30 seconds, make sure the EICAS maintenance message, OVBD EX VAL TEST, does not show.

S 715-241-003
(9) Do a test of the overboard exhaust valve with the ALTN switch-light.
  (a) Push the L RECIRC FAN switch-light on the P5 panel to the off position.
  (b) Make sure the EICAS status and maintenance message, OVBD EX VAL OPEN, does not show.
  (c) Push the EQUIP COOLING ALTN switch-light on the P5 panel to ALTN.
  (d) Make sure the EICAS status and maintenance message, OVBD EX VAL OPEN, shows after 10 seconds.
  (e) Push the L RECIRC FAN switch-light on the P5 panel to ON.
  (f) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).
  (g) Make sure the EICAS status and maintenance message, OVBD EX VAL OPEN, does not show.
  (h) Push the EQUIP COOLING ALTN switch-light on the P5 panel to the usual position.
  (i) Make sure the ALTN light goes off.

S 415-042-003
(10) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-043-003
(11) Remove electrical power if it is not necessary (AMM 24-22-00/201).

G. Test of the E/E Cooling Smoke/Low Flow Manual Test Mode

S 715-044-003
(1) Do the Prepare for Test procedure.

S 865-045-003
(2) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-046-003
(3) Push the ECS/MSG pushbutton on the EICAS maintenance panel on the P61 panel.

S 865-047-003
(4) Hold the EQUIP COOL TEST switch on the P61 panel to EQUIP COOL.

S 865-048-003
(5) Make sure the EICAS advisory message, EQPT OVHT, shows.

S 865-049-003
(6) Make sure the OVHT light on the P5 panel is on.

S 865-050-003
(7) Release the EQUIP COOL TEST switch.

S 865-051-003
(8) 20 seconds after you release the test switch, make sure these EICAS messages do not show:
(a) FWD EQPT DET 1
(b) FWD EQPT DET 2
(c) FWD EQPT EXH DET
(d) EQPT SMOKE TEST
(e) FWD EQ SUP SNSR
(f) FWD EQ EXH SNSR
(g) AFT EQ SNSR
(h) OVBD EX VAL TEST
(i) EQPT CLG TEST

S 415-052-003
(9) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-053-003
(10) Remove electrical power if it is not necessary (AMM 24-22-00/201).

H. Test of the Ground Crew Call Horn (Low Flow Condition)

S 865-054-003
(1) Supply electrical power (AMM 24-22-00/201).

S 865-055-003
(2) Make sure this circuit breaker is closed:
(a) On the panel P11:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-056-003
(3) Push the L RECIRC FAN switch-light on the P5 panel to the off position.

S 865-057-003
(4) Make sure the ground crew call horn comes on after approximately 30 seconds.

S 865-058-003
(5) Push the L RECIRC FAN switch-light to the ON position.

S 865-059-003
(6) Make sure the ground crew call horn stops.

S 865-060-003
(7) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-061-003
(8) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-58-00-735-062-003

3. System Test - Equipment Cooling System

A. Equipment
(1) Smoke generating source

B. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(3) AMM 24-22-00/201, Electric Power - Control
(4) AMM 25-50-01/401, Cargo Compartment Ceiling Lining
(5) AMM 25-50-02/401, Cargo Compartment Sidewall Lining
(6) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(7) AMM 27-81-00/201, Leading Edge Slat System
(8) AMM 31-41-00/201, Engine Indication and Crew Alerting System
(9) AMM 32-09-02/201, Air/Ground Relays
(10) AMM 77-12-03/201, Engine Speed Cards

C. Access
(1) Location Zone
821 No. 1 Cargo Door

D. Prepare for a Test

S 865-063-003
(1) Supply the electrical power (AMM 24-22-00/201).

S 865-064-003
(2) Open the E/E access door, 119BL (AMM 06-41-00/201).

S 865-065-003
(3) Make sure the slats are retracted (AMM 27-81-00/201).

S 865-066-003
(4) Make sure these circuit breakers are closed:
(a) On the main power distribution panel, P6:
1) 6D06, EQPT COOL GND WARN AND TEST
2) 6F17, EQUIP COOL SUPPLY FAN 1
3) 6F23, EQUIP COOL SUPPLY FAN 2
(b) On the overhead circuit breaker panel, P11:
1) 11A32, INDICATOR LIGHTS 1
2) 11A33, INDICATOR LIGHTS 2
3) 11B31, ENGINES SPEED CARD LEFT
4) 11B32, ENGINES SPEED CARD RIGHT
5) 11C20, EQUIP COOLING SMOKE DET CONT
6) 11J02, EICAS CMPTR LEFT
7) 11J03, EICAS UPPER DISPLAY
8) 11J29, EICAS CMPTR RIGHT
9) 11J30, EICAS LOWER DISPLAY
10) 11J32, EICAS DISPLAY SELECT
11) 11N04, INSTRUMENT AND PANEL OVHD
12) 11N13, EQUIP COOLING LOW FLOW DET
13) 11P01, L IND LTS 1
14) 11P14, RECIRC CARGO FIRE CONT LEFT
15) 11P23, RECIRC CARGO FIRE CONT RIGHT
16) 11P29, R IND LTS 2
17) 11S15, AIR GND SYS 1

18) 11S19, AIR GND SYS 2
(c) On the right miscellaneous electrical equipment panel, P37:
1) 37D02, AFT EQPT COOLING FAN SPLY NO. 1
2) 37D07, R RECIRC FAN CONT
3) 37J05, R RECIRC FAN
(d) On the miscellaneous electrical equipment panel, P70:
1) 70B05, AFT EQPT COOLING FAN SPLY NO. 2
2) 70B16, L RECIRC FAN CONT
3) 70C10, L RECIRC FAN

S 865-067-003
(5) Make sure the L and R RECIRC FAN switch-lights on the pilots' overhead P5 panel are ON.

S 865-068-003
(6) Make sure the EQUIP COOLING ALTN switch-light on the P5 panel is in the normal position.

S 865-273-003
(7) Make sure the ALTN light is off.

E. Test of the Forward Equipment Cooling Supply Fan Normal/Alternalte Mode

S 865-069-003
(1) Do the Prepare for Test procedure.

S 865-070-003
(2) Open the No. 1 cargo door (AMM 06-46-00/201).

S 715-252-003
(3) Find the supply fans behind the forward cargo compartment sidewall lining (AMM 25-50-02/401).

S 865-253-003
(4) Make sure these conditions occur:
(a) The forward equipment supply fan 1 operates and air flows into the fan 1 inlet.
(b) The forward equipment supply fan 2 does not operate air does not flow from the fan 2 inlet.

S 865-071-003
(5) Make sure the OVHT light on the P5 panel is off.

S 865-072-003
(6) Make sure the EICAS advisory message, EQPT OVHT, does not show.

S 865-073-003
(7) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-074-003
(8) Push the ECS/MSG pushbutton on the EICAS maintenance panel on the P61 panel.

S 865-075-003
(9) Make sure these EICAS maintenance messages do not show on the display:
(a) FWD EQ SUP FAN 1
(b) FWD EQ SUP FAN 2
(c) FWD EQ SUP FLOW

S 865-076-003
(10) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the P6 panel:
1) 6F17, EQUIP COOL SUPPLY FAN

S 865-077-003
(11) Make sure the OVHT light on the P5 panel is on and the EICAS advisory message, EQPT OVHT, shows.

S 865-078-003
(12) After 30 seconds, make sure that you hear the ground crew call horn.

S 865-079-003
(13) Make sure the EICAS maintenance messages, FWD EQ SUP FAN 1 and FWD EQ SUP FLOW, shows.

S 865-080-003
(14) Push the EQUIP COOLING ALTN switch-light on the P5 panel to ALTN.

S 865-081-003
(15) Make sure the forward equipment cooling supply fan 2 starts and the OVHT light on the P5 panel goes off.

S 865-082-003
(16) Make sure the ground crew call horn stops.

S 865-083-003
(17) Make sure the EICAS maintenance message, FWD EQ SUP FLOW, does not show.

S 865-084-003
(18) Remove the DO-NOT-CLOSE tag and open this circuit breaker:
(a) On the P6 panel:
1) 6F23, EQUIP COOL SUPPLY FAN 2

S 865-085-003
(19) Make sure the OVHT light on the P5 panel is on and the EICAS advisory message, EQPT OVHT, shows.

S 865-086-003
(20) Do the steps that follow for airplanes with hydraulic motor-driven generators:
(a) Make sure the forward supply auxiliary fan operates.

NOTE: During this step it is possible that the ground crew call horn will come on. This usually occurs during one of these conditions:
- The ambient temperature is high
- The airport is at a high altitude.

(b) Make sure that the EICAS maintenance message, FWD EQ SUP FAN 2, shows.
(c) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
1) On the P6, panel:
a) 6D17, EQUIP COOL AUX FAN
(d) After 30 seconds, make sure that you hear the ground crew call horn.
(e) Make sure that the EICAS maintenance message, FWD EQ SUP FLOW, shows.
(f) Remove the DO-NOT-CLOSE tag and close the circuit breaker:
1) On the P6 panel:
a) 6D17, EQUIP COOL AUX FAN
(g) Make sure the ground crew call horn stops.

S 865-087-003
(21) Do the steps that follow for airplanes without the hydraulic motor-driven generators:
(a) Make sure that the EICAS maintenance message, FWD EQ SUP FAN 2, shows.
(b) After 30 seconds, make sure you hear the ground crew call horn.

S 865-088-003
(22) Make sure that EICAS maintenance message, FWD EQ SUP FAN 2, shows.

S 865-089-003
(23) After 30 seconds, make sure you hear the sound from ground crew call horn.

S 865-090-003
(24) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the P11 panel:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-091-003
(25) Make sure the OVHT light on the P5 panel stays on.

S 865-092-003
(26) Make sure the ground crew call horn stops.

S 865-093-003
(27) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) On the P6 panel:
1) 6F23, EQUIP COOL SUPPLY FAN 2

S 865-094-003
(28) Make sure the OVHT light on the P5 panel goes off.

S 865-095-003
(29) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) On the P6 panel:
1) 6F17, EQUIP COOL SUPPLY FAN 1

S 865-258-003
(30) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) On the P11 panel:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-096-003
(31) Push the EQUIP COOLING ALTN switch-light on the P5 panel to the usual position.

S 725-254-003
(32) Make sure the ALTN light is off.

S 865-097-003
(33) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-098-003
(34) Make sure these EICAS maintenance messages do not show:
(a) FWD EQ SUP FAN 1
(b) FWD EQ SUP FAN 2
(c) FWD EQ SUP FLOW

S 865-099-003
(35) Install the forward cargo sidewall lining that was removed (AMM 25-50-02/401).

S 415-100-003
(36) Close the No. 1 cargo door (AMM 06-46-00/201).

S 415-101-003
(37) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-102-003
(38) Remove electrical power if it is not necessary (AMM 24-22-00/201).

F. Test of the Aft Equipment Cooling Supply Fan Normal/Alternalte Mode

S 865-103-003
(1) Do the Prepare for Test procedure.

S 015-304-003
(2) Open the aft cargo door (AMM 06-46-00/201).

S 015-105-003
(3) Find the aft equipment supply fans behind right aft cargo compartment ceiling lining 18 feet (6 meters) aft of the cargo door (AMM 25-50-01/401).

S 725-255-003
(4) Make sure these conditions occur:
  (a) The aft equipment supply fan 1 operates and air flows into the fan 1 inlet.
  (b) The aft equipment supply fan 2 does not operate.

NOTE: Air does not flow from fan 2 inlet.

S 865-106-003
(5) Make sure that the OVHT light on the P5 panel is off.

S 865-107-003
(6) Make sure that the EICAS advisory message, EQPT OVHT, does not show.

S 865-242-003
(7) Push the ECS/MSG pushbutton on the EICAS maintenance panel on the P61 panel.

S 865-108-003
(8) Make sure these EICAS maintenance messages do not show:
  (a) AFT EQ FLOW
  (b) AFT EQ SUP FAN 1
  (c) AFT EQ SUP FAN 2

S 865-109-003
(9) Open these circuit breakers and attach DO-NOT-CLOSE tags:
  (a) On the P6 panel:
    1) 6D06, EQPT COOL GND WARN AND TEST
  (b) On the P11 panel:
    1) 11N13, EQUIP COOLING LOW FLOW DET
  (c) On the P37 panel:
    1) 37D02, AFT EQPT COOLING FAN SPLY NO. 1

S 865-112-003
(10) Make sure the OVHT light on the P5 panel comes on and the EICAS advisory message, EQPT OVHT, shows.

S 865-113-003
(11) Make sure the EICAS maintenance message, AFT EQ SUP FAN 1, shows.

S 865-114-003
(12) Push the EQUIP COOLING ALTN switch-light on the P5 panel to ALTN.

S 865-115-003
(13) Make sure the aft equipment cooling supply fan 2 operates and the OVHT light on the P5 panel goes off.

S 865-116-003
(14) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the P70 panel:
1) 70B05, AFT EQPT COOLING FAN SPLY NO. 2

S 865-117-003
(15) Make sure the OVHT light on the P5 panel comes on and the EICAS advisory message, EQPT OVHT, shows.

S 865-118-003
(16) Make sure the EICAS maintenance message, AFT EQ SUP FAN 2, shows.

S 865-119-003
(17) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P6 panel:
1) 6D06, EQPT COOL GND WARN AND TEST
(b) On the P11 panel:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-121-003
(18) After 30 seconds, make sure you hear the ground crew call horn.

S 865-122-003
(19) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P37 panel:
1) 37D02, AFT EQPT COOLING FAN SPLY NO. 1
(b) On the P70 panel:
1) 70B05, AFT EQPT COOLING FAN SPLY NO. 2

S 865-274-003
(20) Make sure the ground crew call horn stops.

S 865-124-003
(21) Push the EQUIP COOLING ALTN switch-light on the P5 panel to the usual position.

S 865-125-003
(22) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-126-003
(23) Make sure these EICAS maintenance messages do not show:
(a) AFT EQ SUP FAN 1
(b) AFT EQ SUP FAN 2
(c) AFT EQ FLOW

S 415-128-003
(24) Install the aft cargo compartment ceiling lining that was removed (AMM 25-50-01/401).

S 415-129-003
(25) Close the aft cargo door (AMM 06-46-00/201).

S 415-130-003
(26) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-131-003
(27) Remove electrical power if it is not necessary (AMM 24-22-00/201).

G. Test of the Overboard Exhaust Valve Normal/Alternate Mode

S 865-132-003
(1) Do the Prepare for Test procedure.

S 015-133-003
(2) Open the No. 1 cargo door (AMM 06-46-00/201).

S 015-310-003
(3) Find the overboard exhaust valve behind forward cargo compartment sidewall lining (AMM 25-50-02/401).

S 865-134-003
(4) Push the EQUIP COOLING ALTN switch-light on the P5 panel to ALTN.

S 865-135-003
(5) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-136-003
(6) Push the ECS/MSG pushbutton on EICAS maintenance panel on P61 panel.

S 865-137-003
(7) Make sure these EICAS maintenance messages do not show:
(a) FWD EQ EXH FLOW
(b) OVBD EX VAL TEST
(c) OVBD EX VAL OPEN

S 865-138-003
(8) Make sure the EICAS advisory messages, L RECIR FAN and R RECIR FAN, do not show.

S 865-139-003
(9) Push the EQUIP COOLING ALTN switch-light on the P5 panel to the usual position.

S 865-275-003
(10) Make sure the ALTN light is not on.

S 865-276-003

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(11) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-277-003

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Do the Flight Mode Simulation Deactivation Instructions procedure (AMM 32-09-02/201).

S 865-305-003

(13) Open these circuit breakers and attach DO-NOT-CLOSE tags:
  (a) On the P11 panel:
    1) 11S19, AIR GND SYS 2

      NOTE: The EICAS status and maintenance message AIR/GND DISAGREE will be on the display.

    2) 11C20, EQUIP COOLING SMOKE DET CONT

S 865-141-003

(14) Push the L and R RECIRC FAN switch-light on the P5 panel to off position.

S 865-142-003

(15) Make sure the INOP light is on.

S 865-143-003

(16) After 10 seconds, make sure the OVHT light on the P5 panel comes on and EICAS advisory message EQPT OVHT is on the display.

S 865-144-003

(17) After an additional 20 seconds, make sure the EICAS status message, EQPT CLG FLOW, is on the display.

S 865-145-003

(18) Make sure that the ground crew call horn does 'not' sound in the nose gear wheel well.

S 865-146-003

(19) Push R RECIRC FAN switch/light on P5 panel to ON.

S 865-308-003

(20) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
  (a) On the P11 panel:
    1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-148-003
(21) Make sure the L, C, and R IRS selector switch on the P5 panel are in OFF.

S 865-149-003
(22) Make sure the EICAS status message, EQPT CLG FLOW, is not on the display.

S 865-150-003
(23) Make sure that you do not hear the sound from the ground crew call horn.

S 865-151-003
(24) Push the EQUIP COOLING ALTN switch-light on the P5 panel to ALTN.

S 865-152-003
(25) Put the deactivated systems to normal (AMM 32-09-02/201).

S 865-306-003
(26) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P11 panel:
1) 11S19, AIR GND SYS 2
2) 11C20, EQUIP COOLING SMOKE DET CONT

S 865-154-003
(27) After 15 seconds, make sure the EICAS status and maintenance message, OVBD EX VAL OPEN, is on the display.

S 865-155-003
(28) Make sure the OVHT light on the P5 panel is off and EICAS advisory message, EQPT OVHT, is not on the display.

S 865-156-003
(29) Push the EQUIP COOLING ALTN switch-light on the P5 panel to a normal position.

S 865-311-003
(30) Make sure the ALTN light is off.

S 865-157-003
(31) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-158-003
(32) Make sure the EICAS status and maintenance message, OVBD EX VAL OPEN, is not on the display.

S 865-278-003

WARNING: DO THE DEACTIVAITON PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(33) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-279-003

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(34) Do the Flight Mode Simulation Deactivation Instructions procedures (AMM 32-09-02/201).

S 865-307-003
(35) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P11 panel:
1) 11S15, AIR GND SYS 1
2) 11S19, AIR GND SYS 2

S 865-159-003
(36) After 10 seconds, make sure the EICAS status message, OVBD EX VAL OPEN, shows.

S 865-160-003
(37) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) On the P11 panel:
1) 11S19, AIR GND SYS 2

S 865-161-003
(38) Make sure the overboard exhaust valve stays in SMOKE.

NOTE: Only the overboard exhaust valve actuator will move. The valve flapper is closed by differential pressure. On the ground, the valve flapper is spring loaded open.

S 865-162-003
(39) Put the deactivated systems to normal (AMM 32-09-02/201).

S 865-309-003
(40) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) On the P11 panel:
1) 11S15, AIR GND SYS 1

S 865-163-003
(41) Install the forward cargo compartment sidewall lining that was removed (AMM 25-50-02/401).

S 415-164-003
(42) Close the No. 1 cargo door (AMM 06-46-00/201).

S 415-165-003
(43) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-166-003
(44) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-167-003
(45) Make sure the EICAS status and maintenance message, OVBD EX VAL OPEN, does not show.

S 865-168-003
(46) Push the L RECIRC FAN switch/light on the P5 panel to ON.

S 865-169-003
(47) Remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) On the P11 panel:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-170-003
(48) Remove electrical power if it is not necessary (AMM 24-22-00/201).

H. Test of the Smoke Sensing Mode

S 865-171-003
(1) Do the Prepare for Test procedure.

S 865-312-003
(2) Open these circuit breakers and attach DO-NOT-CLOSE tags:
(a) On the P11 panel:
1) 11G21, FLAP SLAT UNIT 3 POWER
2) 11G22, FLAP SLAT ELEC UNIT 3 CONT
3) 11G23, FLAP SLAT ELEC UNIT 3 SENSOR

S 865-173-003
(3) Make sure the FWD and AFT CARGO FIRE switch-lights on the P8 panel are in unarmed position.

S 865-174-003
(4) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 035-175-003
(5) Disconnect the electrical connector D3260B from FSEU-3 module on E5 shelf.
(a) Connect the pin A10 to a ground.

S 865-280-003

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(6) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-281-003

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(7) Do the flight mode simulation system No. 1 and 2 air/ground system (AMM 32-09-02/201).

S 015-176-003
(8) Open the No. 1 cargo door (821) (AMM 06-46-00/201).

S 015-313-003
(9) Find the forward equipment supply smoke sensors 1 and 2, and forward equipment supply fans behind forward cargo compartment sidewall lining (AMM 25-50-02/401).

S 035-177-003
(10) Disconnect the electrical connector D5632 from the forward supply smoke sensor 1.

S 035-178-003
(11) Disconnect the forward supply smoke sensor 2 smoke inlet tube from the forward supply duct.

S 865-179-003
(12) Put smoke into the smoke sensor 2 inlet tube.

S 865-180-003
(13) Within 10 seconds, make sure the SMOKE light on the P5 panel comes on.

S 865-181-003
(14) Make sure the EICAS advisory message, FWD EQPT SMOKE, shows.

S 865-182-003
(15) Make sure the L and R RECIRC FAN INOP lights on the P5 panel show.

S 865-183-003
(16) Make sure the forward supply fans 1 and 2 do not operate.

S 865-184-003
(17) Remove the smoke input from the smoke sensor 2.

S 865-185-003
(18) Make sure the left and right recirculation fans start when the SMOKE light on the P5 panel goes off.

S 865-186-003
(19) After 5 minutes, make sure the OVHT light on the P5 panel comes on.

S 865-187-003
(20) Make sure the EICAS status message, EQPT CLG FAN, shows.

S 865-188-003
(21) Push the EQUIP COOLING ALTN switch-light on the P5 panel to ALTN.

S 865-189-003
(22) Make sure the OVHT light on the P5 panel goes off.

S 865-190-003
(23) Connect the electrical connector D5632 to the smoke sensor 1.

S 865-191-003
(24) Disconnect the electrical connector D5634 from the supply smoke sensor 2.

S 865-192-003
(25) Remove the jumper from pin A10 of the FSEU-3 module electrical connector D32608.

S 865-193-003
(26) Connect the forward supply smoke sensor 2 inlet tube to the forward supply duct.

S 865-194-003
(27) Disconnect the supply smoke sensor 1 inlet tube from the forward supply duct.

S 865-195-003
(28) Put smoke into the supply smoke sensor 1 inlet tube.

S 865-196-003
(29) Within 10 seconds, make sure the SMOKE light on the P5 panel comes on.

S 865-197-003
(30) Make sure the L RECIRC FAN INOP light goes is off.

S 025-198-003
(31) Remove the smoke input from the supply smoke sensor 1.

S 865-199-003
(32) Make sure the right recirculation fan starts when the SMOKE light on the P5 panel goes off.

S 435-200-003
(33) Connect the smoke sensor 1 inlet tube to the forward supply duct.

S 435-201-003
(34) Connect the electrical connector D5634 to the supply smoke sensor 2.

S 435-202-003
(35) Connect pin A10 of connector D3260B of FSEU-3 module on the E5 shelf to a ground.

S 865-203-003
(36) Put the EQUIP COOLING ALTN switch/light on P5 panel to a normal position.

S 865-282-003
(37) Make sure the ALTN light is off.

S 865-204-003
(38) Make sure the OVHT light on the P5 panel comes on.

S 865-205-003
(39) Disconnect the forward exhaust smoke sensor smoke inlet tube from the forward exhaust duct.

S 865-206-003
(40) Put smoke into the exhaust smoke sensor smoke inlet tube.

S 865-207-003
(41) Within 10 seconds, make sure the SMOKE light on the P5 panel comes on.

S 865-208-003
(42) Make sure the EICAS advisory message, FWD EQPT SMOKE, shows.

S 865-209-003
(43) Make sure the L RECIRC FAN INOP light on the P5 panel shows.

S 865-210-003
(44) Remove the smoke input from the exhaust smoke sensor.

S 865-211-003
(45) Connect the exhaust smoke sensor smoke inlet tube to the exhaust duct.

S 865-212-003
(46) Make sure the SMOKE light on the P5 panel is off.

S 865-213-003
(47) Put the system 1 and 2 air/ground relays to ground mode (AMM 32-09-02/201).

S 025-214-003
(48) Remove the jumper from pin A10 of FSEU-3 module connector D3260B on the E5 shelf.

S 435-283-003
(49) Connect the D3260B to the FSEU-3 module.

S 415-215-003
(50) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 415-216-003
(51) Install cargo compartment sidewall lining that was removed (AMM 25-50-02/401).

S 415-217-003
(52) Close the No. 1 cargo door (821) (AMM 06-46-00/201).

S 865-218-003
(53) Open and close this circuit breaker:
(a) On the P11 panel:
1) 11C20, EQUIP COOLING SMOKE DET CONT

S 865-219-003
(54) Remove electrical power if it is not necessary (AMM 24-22-00/201).

I. Test of the Automatic/Manual Test Mode

S 725-220-003
(1) Do the Prepare for Test procedure.

S 865-221-003
(2) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-222-003
(3) Push the ECS/MSG pushbutton on EICAS maintenance panel on the P61 panel.

S 865-256-003
(4) Make sure these EICAS maintenance messages do not show:
  (a) FWD EQ SUP FAN 1
  (b) FWD EQ SUP FAN 2
  (c) FWD EQ SUP FLOW
  (d) FWD EQ EXH FLOW
  (e) EQPT CLG TEST
  (f) EQPT SMOKE TEST
  (g) FWD EQ SUP SNSR
  (h) FWD EQ EXH SNSR
  (i) OVBD EX VAL OPEN
  (j) OVBD EX VAL TEST
  (k) FWD EQPT DET 1
  (l) FWD EQPT DET 2
  (m) FWD EQPT EXH DET
  (n) AFT EQ SUP FAN 1
  (o) AFT EQ SUP FAN 2
  (p) AFT EQ SNSR
  (q) AFT EQ FLOW

S 865-223-003
(5) Hold the EQUIP COOL TEST switch on P61 panel to EQUIP COOL.

S 865-224-003
(6) Make sure the OVHT light on the P5 panel comes on.

S 865-225-003
(7) Make sure the advisory message, EQPT OVHT, shows.

S 865-226-003
(8) Release the EQUIP COOL TEST switch.

S 865-227-003
(9) Make sure the OVHT light on the P5 panel goes off.

S 865-228-003
(10) Make sure the EICAS advisory messages, L RECIR FAN and R RECIR FAN, do not show:

S 865-229-003
(11) After 20 seconds, make sure these maintenance messages do not show:
  (a) FWD EQ SUP FAN 1
  (b) FWD EQ SUP FAN 2

(c) FWD EQ SUP FLOW
(d) FWD EQ EXH FLOW
(e) EQPT CLG TEST
(f) EQPT SMOKE TEST
(g) FWD EQ SUP SNSR
(h) FWD EQ EXH SNSR
(i) OVBD EX VAL OPEN
(j) OVBD EX VAL TEST
(k) FWD EQPT DET 1
(l) FWD EQPT DET 2
(m) FWD EQPT EXH DET
(n) AFT EQ SUP FAN 1
(o) AFT EQ SUP FAN 2
(p) AFT EQ SNSR
(q) AFT EQ FLOW

S 725-230-003
(12) Do a test of the Ground Crew Call Horn (Low Flow Condition).
(a) Make sure this circuit breaker is closed:
1) On the P11 panel:
a) 11N13, EQUIP COOLING LOW FLOW DET
(b) Push the L RECIRC FAN switch/light on the P5 panel to the OFF position.
(c) Make sure the ground crew call horn comes on after approximately 30 seconds.
(d) Push the L RECIRC FAN switch/light to the ON position.
(e) Make sure the ground crew call horn stops.
(f) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 015-231-003
(13) Open the No. 1 cargo door (AMM 06-46-00/201).

S 015-314-003
(14) Find the forward equipment supply smoke sensors 1 and 2 behind the forward cargo compartment sidewall lining (AMM 25-50-02/401).

S 035-232-003
(15) Disconnect the electrical connectors D5632 and D5634 from the forward supply smoke sensors 1 and 2.

S 435-233-003
(16) Install a jumper between pin J1 on the left engine speed card in the P50 panel and a ground (AMM 77-12-03/201) for 10 seconds, then remove the jumper.

S 865-234-003
(17) After 20 seconds, make sure these EICAS maintenance messages show:
(a) EQPT SMOKE TEST
(b) FWD EQPT DET 1
(c) FWD EQPT DET 2

S 415-235-003
(18) Connect the electrical connectors D5632 and D5634 to the forward supply smoke sensors 1 and 2.

J. Test of the ETOPS Check Valve and ETOPS Isolation Check Valve

S 865-286-003
(1) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the P11 panel:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-259-003
(2) Make sure this circuit breaker is closed:
(a) On the P6 panel:
1) 6D17, EQUIP COOL AUX FAN

S 865-260-003
(3) Put the EQUIP COOLING switch on the overhead panel, P5, to the ALTERNATE position.

S 865-261-003
(4) Open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the P6 panel:
1) 6F23, FWD EQUIP COOLING SUPPLY FAN NO. 2

S 865-329-003
(5) Make sure these indications show:
(a) The EICAS maintenance message FWD EQ SUP FAN 2 shows.
(b) The OVHT light on the P5 panel shows.

S 715-262-003
(6) Make sure the Forward Supply Auxiliary fan operates.

S 785-263-003
(7) Install the static pressure probe into the pressure sense port on the E2-1 Equipment Cooling Shelf.

S 785-264-003
(8) Make sure that the pressure is a minimum of 1.2 inches of water

S 785-265-003
(9) Install the probe into the pressure sense port on the E2-2 Equipment Cooling Shelf.

S 785-266-003
(10) Make sure that the pressure is not more than 0.1 inch of water.

S 865-284-003
(11) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P6 panel:
1) 6F23, FWD EQUIP COOLING SUPPLY FAN NO. 2
(b) On the P11 panel:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-330-003
(12) Make sure that the OVHT light on the P5 panel goes off.

S 865-285-003
(13) Put the EQUIP COOLING switch on the overhead panel, P5, to the NORM position.

S 865-331-003
(14) Make sure the ALTN light goes off.

S 865-332-003
(15) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-333-003
(16) Make sure these EICAS maintenance messages are not shown:
(a) FWD EQ SUP FAN 2
(b) FWD EQ SUP FLOW

K. Put the Airplane Back to Its Usual Condition

S 415-236-003
(1) Install the forward cargo compartment sidewall lining previously removed (AMM 25-50-02/401).

S 415-237-003
(2) Close the No. 1 cargo door (AMM 06-46-00/201).

S 415-238-003
(3) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-239-003
(4) Remove electrical power if it is not necessary.

TASK 21-58-00-705-288-003

4. Operational Check of Equipment Cooling ETOPS Check Valves

A. Equipment
(1) Manometer (capable of measuring 4 inches water-vacuum)
(2) 1/8-inch diameter static pressure probe
(a) P/N A-302
Dwyer Instruments Inc.
Michigan City, IN 46360
Phone: 219-879-8000
Fax: 219-872-9057

(3) Plastic tubing, 1/8-inch ID, approximately 6 feet

B. References

(1) AMM 06-41-00/201, Fuselage Acess Doors and Panels

(2) AMM 24-22-00/201, Electric Power Control

C. Access

(1) Location Zone

821 No. 1 Cargo Door

D. Procedure

S 865-289-003

(1) Supply electrical power (AMM 24-22-00/201).

S 015-290-003

(2) Open the E/E access door, 119BL (AMM 06-41-00/201).

S 865-291-003

(3) Open this circuit breaker and attach a DO-NOT-CLOSE tag:

(a) On the overhead circuit breaker panel, P11:

1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-292-003

(4) Make sure this circuit breaker is closed:

(a) On the main power distribution panel, P6:

1) 6D17, EQUIP COOL AUX FAN

S 865-293-003

(5) Put the EQUIP COOLING switch on the overhead panel, P5, to the ALTERNATE position.

S 865-294-003

(6) Open this circuit breaker and attach a DO-NOT-CLOSE tag:

(a) On the P6 panel:

1) 6F23, FWD EQUIP COOLING SUPPLY FAN NO. 2

S 865-334-003

(7) Make sure these indications show:

(a) The EICAS maintenance message FWD EQ SUP FAN 2 shows.

(b) The OVHT light on the P5 panel shows.

S 715-295-003
(8) Make sure the Forward Supply Auxiliary fan operates.

S 785-296-003
(9) Install the static pressure probe into the pressure sense port on the E2-1 Equipment Cooling Shelf.

S 785-297-003
(10) Make sure that the pressure is a minimum of 1.2 inches of water

S 785-298-003
(11) Install the probe into the pressure sense port on the E2-2 Equipment Cooling Shelf.

S 785-299-003
(12) Make sure that the pressure is not more than 0.1 inch of water.

S 865-300-003
(13) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P6 panel:
1) 6F23, FWD EQUIP COOLING SUPPLY FAN NO. 2
(b) On the P11 panel:
1) 11N13, EQUIP COOLING LOW FLOW DET

S 865-335-003
(14) Make sure that the OVHT light on the P5 panel goes off.

S 865-301-003
(15) Put the EQUIP COOLING switch on the overhead panel, P5, to the NORM position.

S 865-336-003
(16) Make sure the ALTN light goes off.

S 865-337-003
(17) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-338-003
(18) Make sure these EICAS maintenance messages are not shown:
(a) FWD EQ SUP FAN 2
(b) FWD EQ SUP FLOW

E. Put the Airplane Back to Its Usual Condition

S 415-302-003
(1) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-303-003
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

EQUIPMENT COOLING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This section has procedures for an operational test and a system test.

   TASK 21-58-00-715-001-004
2. Operational Test - Equipment Cooling System
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power - Control
      (3) AMM 25-50-03/401, Bulkhead Lining
      (4) AMM 25-50-02/401, Cargo Compartment Sidewall
      (5) AMM 31-41-00/201, Engine Indication and Crew Alerting System
   B. Access
      (1) Location Zone
          119BL E/E Access Door
          821 No. 1 Cargo Door
          822 No. 2 Cargo Door

   C. Prepare for a Test

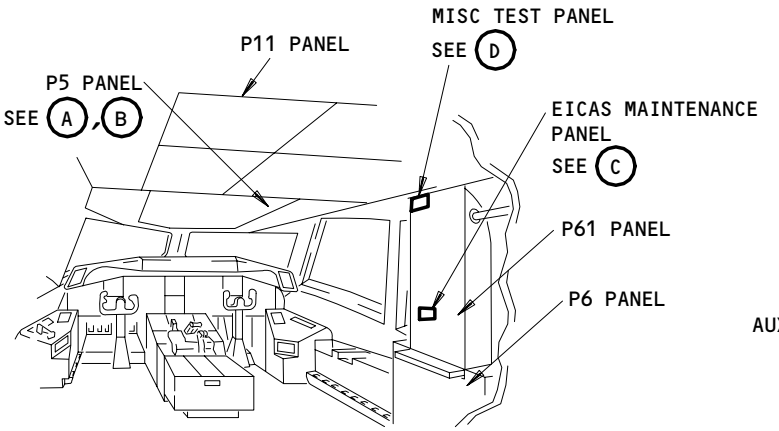
      S 865-002-004
      (1) Supply the electrical power (AMM 24-22-00/201).

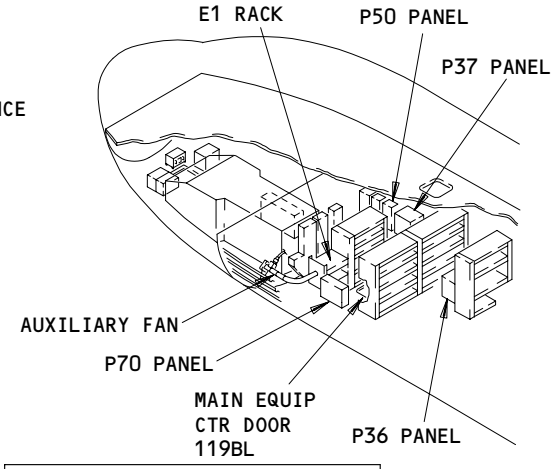
      S 015-003-004
      (2) Open the E/E access door 119BL (AMM 06-41-00/201).

      S 865-004-004
      (3) Make sure these circuit breakers on the main power distribution panel, P6, are closed:
          (a) 6C3, HYD GEN CONT
          (b) 6D6, EQUIP COOL GND WARN AND TEST
          (c) 6D17, EQUIP COOL AUX FAN
          (d) 6F17, EQUIP COOL SUPPLY FAN 1
          (e) 6F23, EQUIP COOL SUPPLY FAN 2

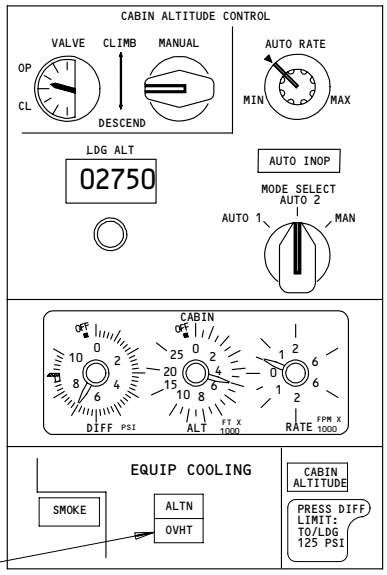
      S 865-005-004
      (4) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:

          (a) 11A32, INDICATOR LIGHTS 1
          (b) 11A33, INDICATOR LIGHTS 2
          (c) 11B31, ENGINES SPEED CARD LEFT



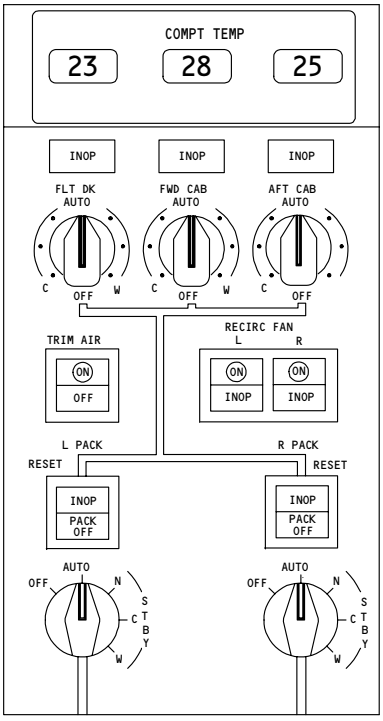


FLT COMPT



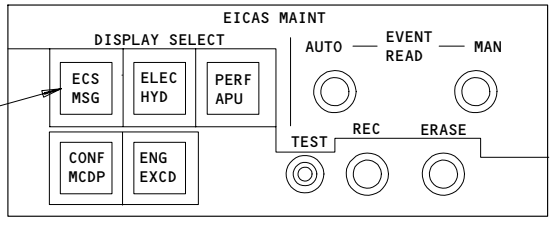
EQUIP COOLING PANEL

A



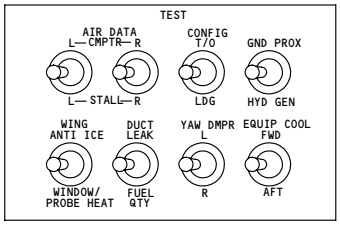
AIR CONDITIONING CONTROL PANEL

B



EICAS MAINTENANCE PANEL

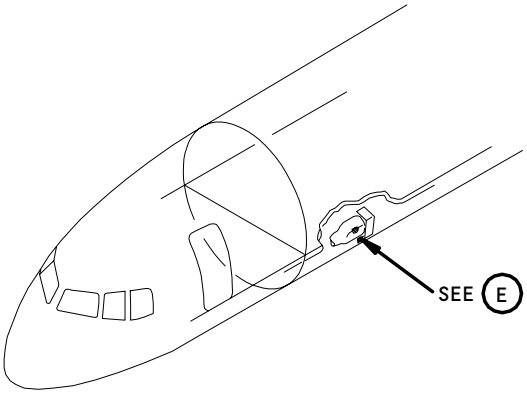
C

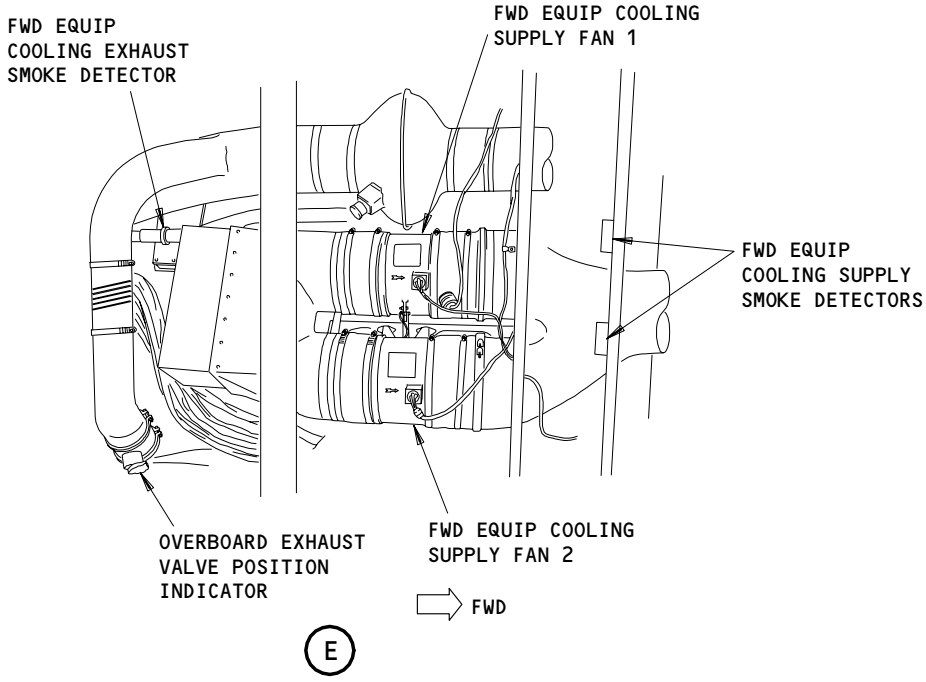


MISC TEST PANEL

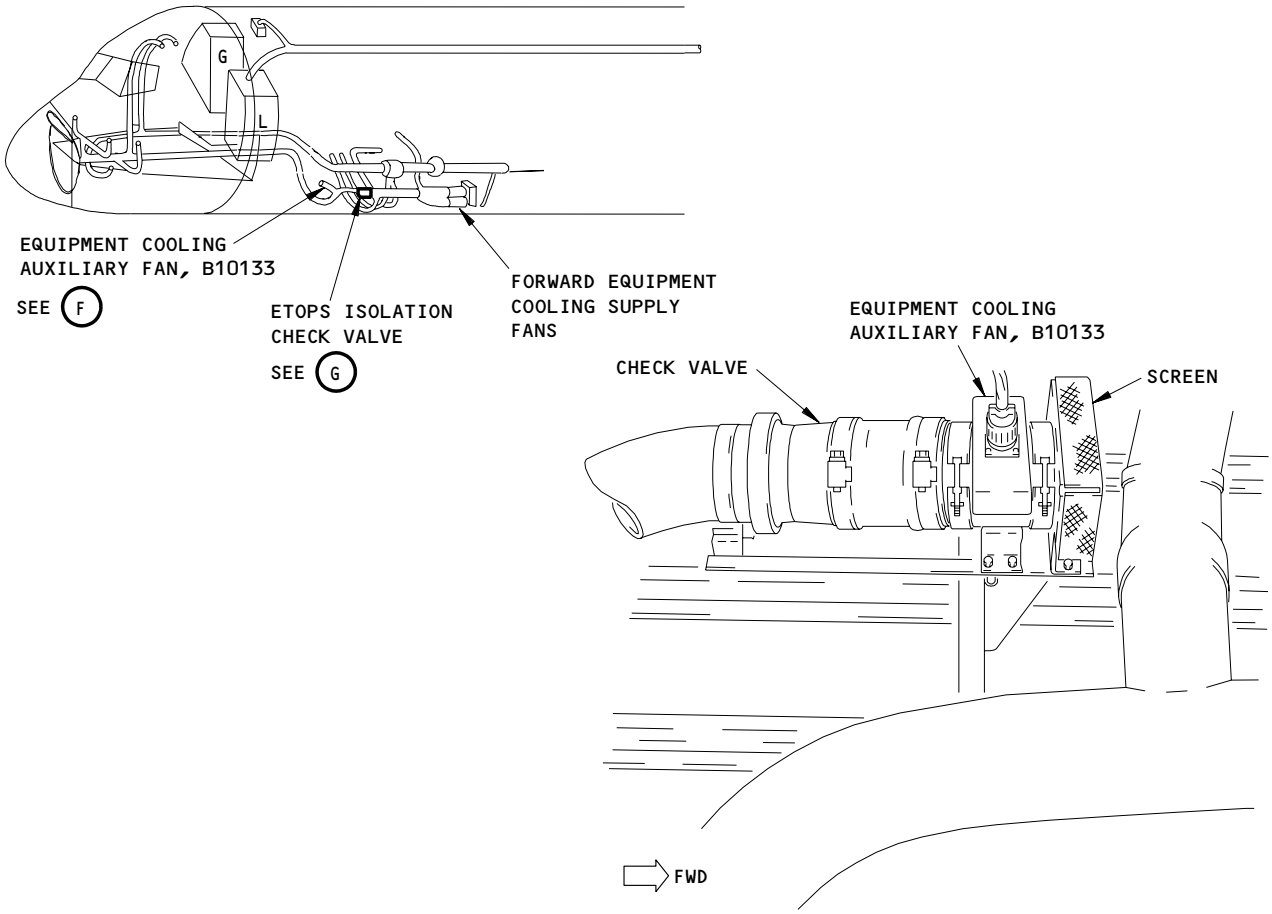
D

Equipment Cooling System Adjustment Test
Figure 501 (Sheet 1)



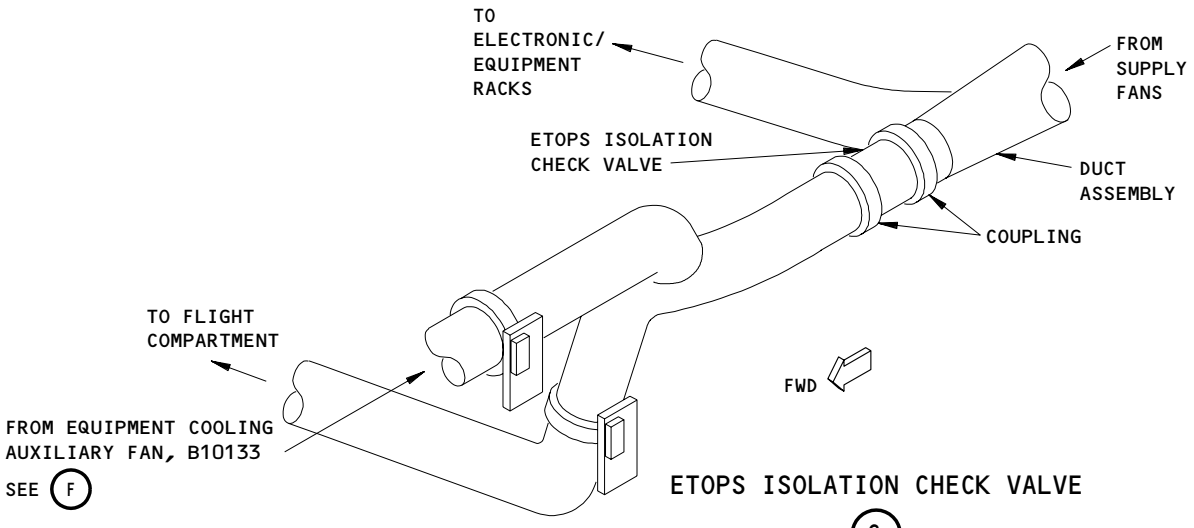


Equipment Cooling System Adjustment Test
Figure 501 (Sheet 2)



EQUIPMENT COOLING AUXILIARY FAN, B10133

F



ETOPS ISOLATION CHECK VALVE

G

Equipment Cooling System Adjustment/Test
Figure 501 (Sheet 3)

(d) 11B32, ENGINES SPEED CARD RIGHT
(e) 11C20, EQUIP COOLING SMOKE DET CONT
(f) 11J2, EICAS CMPTR LEFT
(g) 11J3, EICAS UPPER DISPLAY
(h) 11J29, EICAS CMPTR RIGHT
(i) 11J30 EICAS LOWER DISPLAY
(j) 11J32, EICAS DISPLAY SELECT
(k) 11N4, INSTRUMENT AND PANEL OVHD
(l) 11N11, EQUIP COOLING CONT AFT EXH XFR
(m) 11N13, EQUIP COOLING LOW FLOW DET
(n) 11P1, L IND LTS 1
(o) 11P14, RECIRC CARGO FIRE CONT LEFT
(p) 11P23, RECIRC CARGO FIRE CONT RIGHT
(q) 11P29, R IND LTS 2
(r) 11R6, L AC BUS SENSE RELAY
(s) 11R29, R AC BUS SENSE RELAY
(t) 11S15, AIR GND SYS 1
(u) 11S19, AIR GND SYS 2

S 865-006-004

(5) Make sure these circuit breakers on the right miscellaneous electrical equipment panel, P37, are closed:

(a) 37D5, AFT EQ EXH FAN 1
(b) 37D7, R RECIRC FAN CONT
(c) 37J5, RECIRC FAN R

S 865-007-004

(6) Make sure these circuit breakers on the miscellaneous electrical equipment panel, P70, are closed:

(a) 70B2, AFT EQ EXH FAN 2
(b) 70B16, L RECIRC FAN CONT
(c) 70C10, RECIRC FAN L

S 865-008-004

(7) Push the L and R RECIRC FAN switch-lights on the pilot's overhead panel P5 to ON.

S 865-009-004

(8) Make sure the EQUIP COOLING ALTN switch/light on the P5 panel is in the out position (ALTN light is off).

D. Do a Test of the Forward Equipment Supply Fans and Auxiliary Fan (Fig. 501)

S 715-010-004

(1) Do the "Prepare for Test" procedure.

S 865-011-004
(2) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 865-012-004
(3) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-013-004
(4) Push the ECS/MSG switch on the EICAS maintenance panel on the P61 panel.

S 865-014-004
(5) Make sure the EICAS maintenance messages FWD EQ SUP FAN 1 and FWD EQ SUP FAN 2 do not show.

S 865-015-004
(6) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6F17, EQUIP COOLING SUPPLY FAN 1

S 865-016-004
(7) Make sure these conditions occur:
(a) The EICAS maintenance message FWD EQ SUP FAN 1 shows.
(b) The OVHT light on P5 panel is on.

S 865-017-004
(8) Push the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN.

S 865-018-004
(9) Make sure the OVHT light on the P5 panel is off.

S 865-019-004
(10) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6F23, EQUIP COOLING SUPPLY FAN 2

S 865-020-004
(11) Make sure these conditions occur:
(a) The EICAS maintenance message FWD EQ SUP FAN 2 shows.
(b) The OVHT light on the P5 panel comes on.

S 725-283-004
(12) Do a Test of the Auxiliary Fan:
(a) Find the auxiliary fan in the main equipment center between the E1 rack and the P34 panel along the sidewall.
(b) Make sure the auxiliary fan operates.
(c) Close this P6 panel circuit breaker:
1) 6F23, EQUIP COOLING SUPPLY FAN 2
(d) Make sure the auxiliary fan does not operate.

(e) Close this P6 panel circuit breaker:
1) 6F17, EQUIP COOLING SUPPLY FAN 1
(f) Push EQUIP COOLING ALTN/OVHT switch-light on the P5 panel to the normal (relaxed) position.
(g) Open this P6 panel circuit breaker:
1) 6C3, HYD GEN CONT
(h) Make sure the auxiliary fan operates.
(i) Close this P6 panel circuit breaker:
1) 6C3, HYD GEN CONT
(j) Make sure the auxiliary fan does not operate.

S 865-024-004
(13) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-025-004
(14) Make sure the EICAS maintenance messages FWD EQ SUP FAN 1 and FWD EQ SUP FAN 2 do not show.

S 865-026-004
(15) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 415-027-004
(16) Close the E/E access door 119BL (AMM 06-41-00/201).

S 865-028-004
(17) Remove electrical power if it is not necessary (AMM 24-22-00/201).

E. Do a Test of the Aft Equipment Rack Cooling System

S 015-029-004
(1) Open the aft cargo door (822) (AMM 06-46-00/201).

S 015-030-004
(2) Remove the aft bulkhead lining (AMM 25-50-03/401).

S 035-263-004
(3) Find the aft equipment/lavatory/galley vent fans left of the airplane centerline.

S 865-031-004
(4) Make sure the equipment/lavatory/galley vent fan 1 (B16) (FAN 1) operates.

S 865-032-004
(5) Open this circuit breaker on the right miscellaneous electrical equipment panel, P37, and attach a DO-NOT-CLOSE tags:
(a) 37D5, AFT EQ EXH FAN 1

S 865-033-004
(6) Make sure the FAN 1 stops and the equipment/lavatory/galley vent fan 2 (B15) (FAN 2) starts.

S 865-034-004
(7) Make sure the FAN 2 does not flow into the FAN 1.

S 865-035-004
(8) Make sure the EICAS maintenance message AFT EQ EXH FAN 1 shows on the lower EICAS screen.

S 865-036-004
(9) Open this circuit breaker on the P70 panel and attach a DO-NOT-CLOSE tag:
(a) 70B2, AFT EQ EXH FAN 2

S 865-037-004
(10) Make sure the FAN 2 stops.

S 865-038-004
(11) Make sure the EICAS maintenance message AFT EQ FAN 2 shows on the lower EICAS screen.

S 865-039-004
(12) Close this circuit breaker on the P70 panel and remove the DO-NOT-CLOSE tags:
(a) 70B2, AFT EQ EXH FAN 2

S 865-040-004
(13) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37D5, AFT EQ EXH FAN 1

S 415-041-004
(14) Install the aft cargo compartment sidewall lining (AMM 25-50-02/201).

S 415-042-004
(15) Close the aft cargo door (822) (AMM 06-46-00/201).

S 865-043-004
(16) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-044-004
(17) Remove electrical power if it is not necessary (AMM 24-22-00/201).

F. Do a Test of the Overboard Exhaust Valve

S 715-045-004
(1) Do the "Prepare for Test" procedure.

S 865-046-004
(2) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-047-004
(3) Push the ECS/MSG switch on the EICAS maintenance panel on the P61 panel.

S 865-048-004
(4) Hold the EQUIP COOL TEST switch on the P61 panel to EQUIP COOL for 5 seconds.

S 865-265-004
(5) Make sure the OVHT light on the P5 panel comes on.

S 865-264-004
(6) Release the test switch

S 865-049-004
(7) Make sure the OVHT light on the P5 panel is off.

S 865-050-004
(8) After 30 seconds, make sure the EICAS maintenance message OVBD EX VAL TEST does not show.

S 715-051-004
(9) Do a Test of the overboard exhaust valve with the ALTN switch/light.
  (a) Push the L RECIRC FAN switch/light on the P5 panel to the off position.
  (b) Make sure the EICAS status and maintenance message OVBD EX VAL OPEN does not show.
  (c) Push the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN.
  (d) Make sure the EICAS status and maintenance message OVBD EX VAL OPEN shows after 10 seconds.
  (e) Push the L RECIRC FAN switch/light on the P5 panel to ON.
  (f) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).
  (g) Make sure the EICAS status and maintenance message OVBD EX VAL OPEN does not show.
  (h) Push the EQUIP COOLING ALTN switch-light on the P5 panel to the usual position (ALTN light is off).

S 415-052-004
(10) Close the E/E access door 119BL (AMM 06-41-00/201).

S 865-053-004
(11) Remove electrical power if it is not necessary (AMM 24-22-00/201).

G. Do a Test of the E/E Cooling Smoke/Low Flow Manual Test Mode

S 715-054-004
(1) Do the "Prepare for Test" procedure.

S 865-055-004
(2) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-056-004
(3) Push the ECS/MSG pushbutton on EICAS maintenance panel on the P61 panel.

S 865-057-004
(4) Hold the EQUIP COOL TEST switch on the P61 panel to EQUIP COOL.

S 865-058-004
(5) Make sure the EICAS advisory message EQPT OVHT shows.

S 865-059-004
(6) Make sure the OVHT light on the P5 panel is on.

S 865-060-004
(7) Release the EQUIP COOL TEST switch.

S 865-061-004
(8) Make sure these EICAS maintenance messages do not show 20 seconds after you release the test switch:
(a) FWD EQPT DET 1
(b) FWD EQPT DET 2
(c) FWD EQPT EXH DET
(d) EQPT SMOKE TEST
(e) FWD EQ SUP SNSR
(f) FWD EQ EXH SNSR
(g) OVBD EX VAL TEST
(h) EQPT CLG TEST

S 415-288-004
(9) Close the E/E access door 119BL (AMM 06-41-00/201).

S 865-289-004
(10) Remove electrical power if it is not necessary (AMM 24-22-00/201).

H. Do a Ground Crew Call Horn Test (Low Flow Condition)

S 865-062-004
(1) Supply electrical power (AMM 24-22-00/201).

S 865-063-004
(2) Make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 865-064-004
(3) Push the L RECIRC FAN switch/light on the P5 panel to the OFF position.

S 865-065-004
(4) Make sure the ground crew call horn, in the nose gear wheel well, operates after approximately 30 seconds.

S 865-066-004
(5) Push L RECIRC FAN switch/light to the ON position.

S 865-067-004
(6) Make sure the ground crew call horn stops.

S 865-068-004
(7) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-069-004
(8) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-58-00-725-070-004

3. System Test - Equipment Cooling System

A. Equipment
(1) Smoke generating source
(2) Manometer (that can measure 4 inches water-vacuum)
(3) 1/8 inch diameter static pressure probe

B. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service and Cargo Doors, Access Doors and Panels
(3) AMM 24-22-00/201, Electric Power - Control
(4) AMM 25-50-02/401, Cargo Compartment Sidewall Lining
(5) AMM 25-50-03/401, Cargo Compartment Bulkhead Lining
(6) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(7) AMM 27-81-00/201, Leading Edge Slat System
(8) AMM 31-41-00/201, Engine Indication and Crew Alerting System
(9) AMM 32-09-02/201, Air/Ground Relays
(10) AMM 77-12-01/201, Engine Speed Cards

C. Access
(1) Location Zone
821 No. 1 Cargo Door

D. Prepare for Test

S 865-071-004
(1) Supply the electrical power (AMM 24-22-00/201).

S 015-072-004
(2) Open the E/E access door 119BL (AMM 06-41-00/201).

S 865-073-004
(3) Make sure the slats are retracted (AMM 27-81-00/201).

S 865-074-004
(4) Make sure these circuit breakers on the main power distribution panel, P6, are closed:
(a) 6C3, HYD GEN CONT
(b) 6D6, EQPT COOL GND WARN AND TEST
(c) 6F17, EQUIP COOL SUPPLY FAN 1
(d) 6F23, EQUIP COOL SUPPLY FAN 2

S 865-075-004
(5) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11A32, INDICATOR LIGHTS 1
(b) 11A33, INDICATOR LIGHTS 2
(c) 11B31, ENGINES SPEED CARD LEFT
(d) 11B32, ENGINES SPEED CARD RIGHT
(e) 11C20, EQUIP COOLING SMOKE DET CONT
(f) 11J2, EICAS CMPTR LEFT
(g) 11J3, EICAS UPPER DISPLAY
(h) 11J29, EICAS CMPTR RIGHT
(i) 11J30, EICAS LOWER DISPLAY
(j) 11J32, EICAS DISPLAY SELECT
(k) 11N4, INSTRUMENT AND PANEL OVHD
(l) 11N13, EQUIP COOLING LOW FLOW DET
(m) 11P1, L IND LTS 1
(n) 11P14, RECIRC CARGO FIRE CONT LEFT
(o) 11P29, R IND LTS 2
(p) 11P32, RECIRC CARGO FIRE CONT RIGHT
(q) 11S15, AIR GND SYS 1
(r) 11S19, AIR GND SYS 2

S 865-076-004
(6) Make sure these circuit breakers on the right miscellaneous electrical equipment panel, P37, are closed:
(a) 37D2, AFT EQ EXH FAN 1
(b) 37D7, R RECIRC FAN CONT
(c) 37J5, R RECIRC FAN

S 865-077-004
(7) Make sure these circuit breakers on the miscellaneous electrical equipment panel, P70, are closed:
(a) 70B5, AFT EQ EXH FAN 2
(b) 70B16, L RECIRC FAN CONT
(c) 70C10, L RECIRC FAN

S 865-248-004
(8) Make sure the L and R RECIRC FAN switch-lights on the pilots' overhead P5 panel are ON.

S 865-249-004
(9) Make sure the EQUIP COOLING ALTN switch/light on the P5 panel is in the out position (ALTN light is off).

E. Do a Test of the Forward Equipment Cooling Supply Fan Normal/Alternate Mode

S 725-078-004
(1) Do the "Prepare for Test" Procedure

S 015-079-004
(2) Open the No. 1 cargo door (821) (AMM 06-46-00/201) and find the forward equipment supply fans behind the forward cargo compartment sidewall lining (AMM 25-50-02/401).

S 865-266-004
(3) Make sure these conditions occur:
(a) The forward equipment supply fan 1 operates and air flows into the fan 1 inlet.
(b) The Forward equipment supply fan 2 does not operate and air does not flow from the fan 2 inlet.

S 865-080-004
(4) Make sure the OVHT light on the P5 panel is off.

S 865-081-004
(5) Make sure the EICAS advisory message EQPT OVHT does not show.

S 865-082-004
(6) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-083-004
(7) Push the ECS/MSG pushbutton on the EICAS maintenance panel on the P61 panel.

S 865-250-004
(8) Make sure these EICAS maintenance messages do not show:
(a) FWD EQ SUP FAN 1
(b) FWD EQ SUP FAN 2
(c) FWD EQ SUP FLOW

S 865-084-004
(9) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6F17, EQUIP COOL SUPPLY FAN 1

S 865-085-004
(10) Make sure the OVHT light on the P5 panel comes on and the EICAS advisory message EQPT OVHT shows.

S 865-086-004
(11) After 30 seconds, make sure you hear the sound from the ground crew call horn in the nose gear wheel well.

S 865-087-004
(12) Make sure the EICAS maintenance messages FWD EQ SUP FAN 1 and FWD EQ SUP FLOW show.

S 865-088-004
(13) Push the EQUIP COOLING ALTN switch-light on the P5 panel to ALTN.

S 865-089-004
(14) Make sure the supply fan 2 starts and the OVHT light on P5 panel is off.

S 865-090-004
(15) Make sure the ground crew call horn stops.

S 865-091-004
(16) Make sure the EICAS maintenance message FWD EQ SUP FLOW does not show.

S 865-092-004
(17) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6F23, EQUIP COOL SUPPLY FAN 2

S 865-099-004
(18) Make sure the OVHT light on the P5 panel comes on and the EICAS advisory message EQPT OVHT shows.

S 865-100-004
(19) Make sure the EICAS maintenance message FWD EQ SUP FAN 2 shows.

S 865-101-004
(20) After 30 seconds, make sure that you hear the ground crew call horn.

S 865-102-004
(21) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 865-103-004
(22) Make sure the OVHT light on the P5 panel stays on.

S 865-104-004
(23) Make sure the ground crew call horn stops.

S 865-110-004
(24) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6F23, EQUIP COOL SUPPLY FAN 2

S 865-111-004
(25) Make sure the OVHT light on the P5 panel is off.

S 865-112-004
(26) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6F17, EQUIP COOL SUPPLY FAN 1

S 865-113-004
(27) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 865-114-004
(28) Push the EQUIP COOLING ALTN switch-light on the P5 panel to the normal position (ALTN light is off).

S 865-115-004
(29) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-116-004
(30) Make sure these EICAS maintenance messages do not show:
(a) FWD EQ SUP FAN 1
(b) FWD EQ SUP FAN 2
(c) FWD EQ SUP FLOW

S 415-117-004
(31) Install the forward cargo sidewall lining that was removed (AMM 25-50-02/401).

S 415-118-004
(32) Close the No. 1 cargo door (821) (AMM 06-46-00/201).

S 415-119-004
(33) Close the E/E access door 119BL (AMM 06-41-00/201).

S 865-120-004
(34) Remove electrical power if it is not necessary (AMM 24-22-00/201).

F. Do a Test of the Aft Equipment Cooling Exhaust System

S 725-121-004
(1) Do the "Prepare for Test" procedure.

S 015-122-004
(2) Open the aft cargo door (822) (AMM 06-46-00/201).

S 015-123-004
(3) Remove the aft bulkhead lining (AMM 25-50-03/401).

S 015-124-004
(4) Find the aft equipment-lavatory-galley-ventilation fans, left of the airplane centerline.

S 715-125-004
(5) Make sure these conditions occur:
(a) The aft equipment vent fan 1 operates.
(b) The aft equipment vent fan 2 does not operate.
(c) The advisory message EQPT OVHT does not show on the upper EICAS display.

S 725-126-004
(6) Measure the pressure at the E6 rack shelves as follows:
(a) Put the static pressure probe into the E6-1 rack sensing port.
(b) Connect a manometer to the static pressure probe.
(c) Make sure the vacuum pulls a minimum pressure of 2 inches of water.
(d) Remove the static pressure probe from the E6-1 rack.
(e) Put the static pressure probe into the E6-2 rack sensing port.
(f) Make sure the vacuum pulls a minimum pressure of 2 inches of water.
(g) Remove the static pressure probe from the E6-2 rack.

S 865-127-004
(7) Make sure these messages are not on the lower EICAS display:
(a) AFT EQ FLOW
(b) AFT EQ EXH FAN 1
(c) AFT EQ EXH FAN 2

S 865-251-004
(8) Open this circuit breaker on the right miscellaneous electrical equipment panel, P37, and attach a DO-NOT-CLOSE tag:
(a) 37D5, AFT EQ EXH FAN 1

S 865-128-004
(9) Make sure that fan 1 stops and fan 2 starts.

S 865-129-004
(10) Make sure that the maintenance message AFT EQ EXH FAN 1 is shown on the lower EICAS display.

S 865-130-004
(11) Open this circuit breaker on the P70 panel and attach a DO-NOT-CLOSE tag:
(a) 70B2, AFT EQ EXH FAN 2

S 865-131-004
(12) Make sure that the fan 2 stops.

S 865-132-004
(13) Make sure that the OVHT light comes on in five seconds or less.

S 865-133-004
(14) Make sure that the advisory message EQPT OVHT is shown on the upper EICAS display.

S 865-134-004
(15) Make sure these maintenance messages are shown on the lower EICAS display:
(a) AFT EQ FLOW
(b) AFT EQ EXH FAN 1
(c) AFT EQ EXH FAN 2

S 865-135-004
(16) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P7O panel:
(a) 7OB2, AFT EQ EXH FAN 2

S 865-136-004
(17) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37:
(a) 37D5, AFT EQ EXH FAN 1

S 415-137-004
(18) Install the aft cargo compartment bulkhead lining (AMM 25-5O-O2/401).

S 415-138-004
(19) Close the aft cargo door (822) (AMM O6-46-OO/201).

S 415-139-004
(20) Close the E/E access door (119BL) (AMM O6-41-OO/201).

S 865-140-004
(21) Remove electrical power if it is not necessary (AMM 24-22-OO/201).

G. Do a Test of the Overboard Exhaust Valve Normal/Alternate Mode

S 865-252-004
(1) Do the "Prepare for Test" Procedure

S O15-253-004
(2) Open the No. 1 cargo door (AMM O6-46-OO/201).

S 7O5-267-004
(3) Find the overboard exhaust valve behind the forward cargo compartment sidewall lining (AMM 25-5O-O2/401).

S 865-254-004

(4) Push the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN.

S 865-255-004

(5) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-256-004

(6) Push the ECS/MSG pushbutton on the EICAS maintenance panel on the P61 panel.

S 865-257-004

(7) Make sure these EICAS maintenance messages do not show:
(a) FWD EQ EXH FLOW
(b) OVBD EX VAL TEST
(c) OVBD EX VAL OPEN

S 865-258-004

(8) Make sure the EICAS advisory messages L RECIR FAN and R RECIR FAN do not show.

S 865-259-004

(9) Push the EQUIP COOLING ALTN switch/light on the P5 panel to the normal position (ALTN light is off).

S 865-246-004

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(10) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-247-004

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(11) Do the "Flight Mode Simulation Deactivation Instructions" procedure (AMM 32-09-02/201). Open AIR GND SYS 2 (11S19) circuit breaker on P11 panel.

NOTE: EICAS status and maintenance message AIR/GND DISAGREE will be displayed.

S 865-141-004
(12) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C20, EQUIP COOLING SMOKE DET CONT

S 865-142-004
(13) Push the L and R RECIRC FAN switch/light on the P5 panel to the OFF position.

S 865-268-004
(14) Make sure the INOP light is on.

S 865-143-004
(15) After 10 seconds, make sure the OVHT light on the P5 panel comes on and the EICAS advisory message EQPT OVHT shows.

S 865-144-004
(16) After 20 seconds, make sure the EICAS status message EQPT CLG FLOW shows.

S 865-145-004
(17) Make sure that the ground crew call horn does 'not' sound in the nose gear wheel well.

S 865-146-004
(18) Push the R RECIRC FAN switch/light on the P5 panel to ON.

S 865-147-004
(19) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 865-148-004
(20) Make sure the L, C, and R IRS selector switch on the P5 panel is in the OFF position.

S 865-149-004
(21) Make sure the EICAS status message EQPT CLG FLOW does not show.

S 865-150-004
(22) Make sure the ground crew call horn does 'not' sound.

S 865-151-004
(23) Make sure the EQUIP COOLING ALTN switch/light on the P5 panel is in the ALTN position.

S 865-152-004
(24) Put the deactivated systems to normal (AMM 32-09-02/201).

S 865-153-004
(25) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11S19, AIR GND SYS 2

S 865-154-004
(26) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11C20, EQUIP COOLING SMOKE DET CONT

S 865-155-004
(27) After 15 seconds, make sure the EICAS status and maintenance message OVBD EX VAL OPEN shows.

S 865-156-004
(28) Make sure the OVHT light on the P5 panel is off and the EICAS advisory message EQPT OVHT does not show.

S 865-157-004
(29) Push the EQUIP COOLING ALTN switch/light on the P5 panel to the usual position.

S 865-158-004
(30) Make sure the ALTN light is off.

S 865-159-004
(31) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-160-004
(32) Make sure the EICAS status and maintenance message OVBD EX VAL OPEN does not show.

S 865-161-004

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(33) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-162-004

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(34) Do the "Flight Mode Simulation Deactivation Instructions" procedures (AMM 32-09-02/201).

S 865-163-004
(35) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11S15, AIR GND SYS 1
(b) 11S19, AIR GND SYS 2

S 865-164-004
(36) After 10 seconds, make sure the EICAS status message OVBD EX VAL OPEN shows.

S 865-165-004
(37) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11S19, AIR GND SYS 2

S 865-166-004
(38) Make sure the overboard exhaust valve stays in the SMOKE position

NOTE: Only the overboard exhaust valve actuator will move. The valve flapper is closed by differential pressure. On the ground, the valve flapper is spring loaded open.

S 865-167-004
(39) Put the deactivated systems to normal (AMM 32-09-02/201).

S 865-168-004
(40) Remove the DO-NOT-CLOSE tags and close this circuit breaker on the P11 panel:
(a) 11S15, AIR GND SYS 1

S 415-169-004
(41) Install forward cargo compartment sidewall lining that was removed (AMM 25-50-02/401).

S 415-170-004
(42) Close the No. 1 cargo door (AMM 06-46-00/201).

S 415-171-004
(43) Close the E/E access door 119BL (AMM 06-41-00/201).

S 865-172-004
(44) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-173-004
(45) Make sure the EICAS status and maintenance message OVBD EX VAL OPEN does not show.

S 865-174-004
(46) Push the L RECIRC FAN switch/light on P5 panel to ON.

S 865-175-004

(47) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 865-176-004

(48) Remove electrical power if it is not necessary (AMM 24-22-00/201).

H. Do a Test of the Smoke Sensing Mode

S 715-177-004

(1) Do the "Prepare for Test" procedure.

S 865-178-004

(2) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11G21, FLAP SLAT ELEC UNIT 3 POWER
(b) 11G22, FLAP SLAT ELEC UNIT 3 CONT
(c) 11G23, FLAP SLAT ELEC UNIT 3 SENSOR

S 865-179-004

(3) Make sure the FWD and AFT CARGO FIRE switch/lights on the P8 panel are in the unarmed position.

S 865-180-004

(4) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-181-004

(5) Disconnect the electrical connector D3260B from FSAM (FSEU-3) module on E5 shelf.

S 765-269-004

(6) Install a jumper between pin A10 and a ground.

S 865-260-004

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(7) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-261-004

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(8) Do the flight mode simulation procedure for the No. 1 and 2 air/ground system (AMM 32-09-02/201).

S 015-182-004

(9) Open the No. 1 cargo door (AMM 06-46-00/201).

S 705-270-004

(10) Find the forward equipment supply smoke sensors 1 and 2, and the forward equipment supply fans behind the forward cargo compartment sidewall lining (AMM 25-50-02/401).

S 035-183-004

(11) Disconnect the electrical connector D5632 from the forward supply smoke sensor 1.

S 035-184-004

(12) Disconnect the forward supply smoke sensor 2 smoke inlet tube from the forward supply duct.

S 865-185-004

(13) Put smoke into the supply smoke sensor 2 smoke inlet tube.

S 865-186-004

(14) Make sure the SMOKE light on the P5 panel comes on in less than 10 seconds.

S 865-187-004

(15) Make sure the EICAS advisory message FWD EQPT SMOKE shows.

S 865-188-004

(16) Make sure the L and R RECIRC FAN INOP lights on the P5 panel are on.

S 865-189-004

(17) Make sure the supply fans 1 and 2 do not operate.

S 865-190-004

(18) Remove the smoke input from the forward supply smoke sensor 2.

S 865-191-004

(19) Make sure the left and right recirculation fans start when the SMOKE light on the P5 panel is off.

S 865-192-004

(20) After 5 minutes, make sure the OVHT light on the P5 panel comes on.

S 865-193-004
(21) Make sure the EICAS status message EQPT CLG FAN does not show.

S 865-194-004
(22) Push the EQUIP COOLING ALTN switch/light on the P5 panel to ALTN.

S 865-195-004
(23) Make sure the OVHT light on the P5 panel is off.

S 865-196-004
(24) Connect the electrical connector D5632 to the forward supply smoke sensor 1.

S 865-197-004
(25) Disconnect the electrical connector D5634 from the forward supply smoke sensor 2.

S 865-198-004
(26) Remove the jumper from pin A10 of FSAM (FSEU-3) module connector D3260B.

S 865-199-004
(27) Connect the supply smoke sensor 2 inlet tube to the forward supply duct.

S 865-200-004
(28) Disconnect the supply smoke sensor 1 inlet tube from the forward supply duct.

S 865-201-004
(29) Put smoke into the supply smoke sensor 1 inlet tube.

S 865-202-004
(30) Make sure the SMOKE light on the P5 panel comes on in less than 10 seconds.

S 865-203-004
(31) Make sure the L RECIRC FAN INOP light does not show.

S 865-204-004
(32) Remove the smoke input from the forward supply smoke sensor 1.

S 865-205-004
(33) Make sure the right recirculation fan starts when the SMOKE light on the P5 panel goes off.

S 865-206-004
(34) Connect the forward supply smoke sensor 1 smoke inlet tube to the forward supply duct.

S 865-207-004
(35) Connect the electrical connector D5634 to the forward supply smoke sensor 2.

S 865-208-004
(36) Install a jumper between pin A10 of the electrical connector D3260B of the FSAM (FSEU-3) module on the E5 shelf and a ground.

S 865-209-004
(37) Push the EQUIP COOLING ALTN switch/light on the P5 panel to the usual position.

S 865-271-004
(38) Make sure the ALTN light is off.

S 865-210-004
(39) Make sure the OVHT light on the P5 panel comes on.

S 865-211-004
(40) Disconnect the exhaust smoke sensor inlet tube from the forward exhaust duct.

S 865-212-004
(41) Put smoke into the exhaust smoke sensor smoke inlet tube.

S 865-213-004
(42) Make sure the SMOKE light on the P5 panel comes on in less than 10 seconds.

S 865-214-004
(43) Make sure the EICAS advisory message FWD EQPT SMOKE shows.

S 865-215-004
(44) Make sure the L RECIRC FAN INOP light on the P5 panel shows.

S 865-216-004
(45) Remove the smoke input from the forward exhaust smoke sensor.

S 865-217-004
(46) Connect the forward exhaust smoke sensor smoke inlet tube to the forward exhaust duct.

S 865-218-004
(47) Make sure the SMOKE light on the P5 panel goes off.

S 865-219-004
(48) Put the system 1 and 2 air/ground relays to the ground mode (Ref 32-09-02).

S 865-220-004
(49) Remove the jumper from pin A10 of the electrical connector and connect D32608 to the FSAM (FSEU-3) module.

S 415-221-004
(50) Close the E/E access door 119BL (AMM 06-41-00/201).

S 415-222-004
(51) Install the forward cargo compartment sidewall lining that was removed (AMM 25-50-02/401).

S 415-223-004
(52) Close the No. 1 cargo door (AMM 06-46-00/201).

S 865-284-004
(53) Remove the DO-NOT-CLOSE tag and close the P11 panel circuit breakers that follow:
(a) 11G21, FLAP SLAT ELEC UNIT 3 POWER
(b) 11G22, FLAP SLAT ELEC UNIT 3 CONT
(c) 11G23, FLAP SLAT ELEC UNIT 3 SENSOR

S 865-224-004
(54) Open and close this circuit breaker on the overhead circuit breaker panel, P11:
(a) 11C20, EQUIP COOLING SMOKE DET CONT

S 865-225-004
(55) Remove electrical power if it is not necessary (AMM 24-22-00/201).

I. Do a Test of the Automatic/Manual Test Mode

S 715-226-004
(1) Do the Prepare for Test procedure.

S 865-227-004
(2) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-228-004
(3) Push the ECS/MSG pushbutton on the EICAS maintenance panel on the P61 panel.

S 865-262-004
(4) Make sure that these maintenance messages do not show:
(a) FWD EQ SUP FAN 1
(b) FWD EQ SUP FAN 2
(c) FWD EQ SUP FLOW
(d) FWD EQ EXH FLOW
(e) EQPT CLG TEST
(f) EQPT SMOKE TEST
(g) FWD EQ SUP SNSR
(h) FWD EQ EXH SNSR

(i) OVBD EX VAL OPEN
(j) OVBD EX VAL TEST
(k) FWD EQPT DET 1
(l) FWD EQPT DET 2
(m) FWD EQPT EXH DET

S 865-229-004
(5) Hold the EQUIP COOL TEST switch on the P61 panel to EQUIP COOL.

S 865-230-004
(6) Make sure the OVHT light on the P5 panel is on.

S 865-231-004
(7) Make sure the EICAS advisory message EQPT OVHT shows.

S 865-232-004
(8) Release the EQUIP COOL TEST switch.

S 865-233-004
(9) Make sure the OVHT light on the P5 panel goes off.

S 865-234-004
(10) Make sure the EICAS advisory messages L RECIR FAN and R RECIR FAN do not show.

S 865-235-004
(11) After 20 seconds, make sure these maintenance messages do not show:
(a) FWD EQ SUP FAN 1
(b) FWD EQ SUP FAN 2
(c) FWD EQ SUP FLOW
(d) FWD EQ EXH FLOW
(e) EQPT CLG TEST
(f) EQPT SMOKE TEST
(g) FWD EQ SUP SNSR
(h) FWD EQ EXH SNSR
(i) OVBD EX VAL OPEN
(j) OVBD EX VAL TEST
(k) FWD EQPT DET 1
(l) FWD EQPT DET 2
(m) FWD EQPT EXH DET

S 715-236-004
(12) Do a Test of the Ground Crew Call Horn (Low Flow Condition)
(a) Make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
1) 11N13, EQUIP COOLING LOW FLOW DET
(b) Push the L RECIRC FAN switch/light on the P5 panel to the OFF position.
(c) Make sure the ground crew call horn, in the nose gear wheel well, operates after approximately 30 seconds.
(d) Push the L RECIRC FAN switch/light to the ON position.

(e) Make sure the ground crew call horn stops.
(f) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 015-272-004
(13) Open the No. 1 cargo door (AMM 06-46-00/201).

S 015-237-004
(14) Find the forward equipment supply smoke sensors 1 and 2 behind the forward cargo compartment sidewall lining (AMM 25-50-02/401).

S 035-238-004
(15) Disconnect the connectors D5632 and D5634 from the forward supply smoke sensors 1 and 2.

S 435-239-004
(16) Connect pin J1 on the left engine speed card in the P50 panel to a ground (AMM 77-12-01/201) for 10 seconds, then remove the jumper.

S 865-240-004
(17) After 20 seconds, make sure these EICAS maintenance messages show:
(a) EQPT SMOKE TEST
(b) FWD EQPT DET 1
(c) FWD EQPT DET 2

S 865-241-004
(18) Connect the electrical connectors D5632 and D5634 to the forward supply smoke sensors 1 and 2.

J. Do a Test of the ETOPS Check Valve and the ETOPS Isolation Check Valve

S 865-287-004
(1) Open this circuit breaker on the P11 circuit breaker and attach a DO-NOT-CLOSE tag:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 865-273-004
(2) Make sure this circuit breaker on the main power distribution panel, P6, is closed:
(a) 6D17, EQUIP COOL AUX FAN

S 865-274-004
(3) Put the EQUIP COOLING switch on the pilot's overhead panel, P5, to the ALTERNATE position.

S 865-275-004
(4) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6F23, FWD EQUIP COOLING SUPPLY FAN NO. 2

S 865-343-004
(5) Make sure these indications show:
(a) The EICAS maintenance message FWD EQ SUP FAN 2 shows.
(b) The OVHT light on the P5 panel shows.

S 715-276-004
(6) Make sure the Forward Supply Auxiliary fan operates.

S 785-277-004
(7) Install the static pressure probe into the pressure sense port on the E2-1 Equipment Cooling Shelf.

S 785-278-004
(8) Make sure that the pressure is a minimum of 1.2 inches of water

S 785-279-004
(9) Install the probe into the pressure sense port on the E2-2 Equipment Cooling Shelf.

S 785-280-004
(10) Make sure that the pressure is not more than 0.1 inches of water.

S 865-286-004
(11) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) 6F23, FWD EQUIP COOLING SUPPLY FAN NO. 2
(b) 11N13, EQUIP COOLING LOW FLOW DET

S 865-344-004
(12) Make sure that the OVHT light on the P5 panel goes off.

S 865-285-004
(13) Put the EQUIP COOLING switch on the pilot's overhead panel, P5, to the NORM position.

S 865-345-004
(14) Make sure the ALTN light goes off.

S 865-346-004
(15) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-347-004
(16) Make sure these EICAS maintenance messages are not shown:
(a) FWD EQ SUP FAN 2
(b) FWD EQ SUP FLOW

K. Put the Airplane Back to Its Usual Condition

S 415-242-004
(1) Install the forward cargo compartment sidewall lining that was removed (AMM 25-50-02/401).

S 415-243-004
(2) Close the No. 1 cargo door (AMM 06-46-00/201).

S 415-244-004
(3) Close the E/E access door 119BL (AMM 06-41-00/201).

TASK 21-58-00-705-296-004

4. Operational Check of Equipment Cooling ETOPS Check Valves

A. Equipment

(1) Manometer (capable of measuring 4 inches water-vacuum)
(2) 1/8-inch diameter static pressure probe
(a) P/N A-302
Dwyer Instruments Inc.
Michigan City, IN 46360
Phone: 219-879-8000
Fax: 219-872-9057
(3) Plastic tubing, 1/8-inch ID, approximately 6 feet

B. References

(1) AMM 06-41-00/201, Fuselage Acess Doors and Panels
(2) AMM 24-22-00/201, Electric Power Control

C. Access

(1) Location Zone
821 No. 1 Cargo Door

D. Procedure

S 865-297-004
(1) Supply electrical power (AMM 24-22-00/201).

S 015-298-004
(2) Open the E/E access door, 119BL (AMM 06-41-00/201).

S 865-299-004
(3) Open this circuit breaker on the P11 circuit breaker and attach a DO-NOT-CLOSE tag:
(a) 11N13, EQUIP COOLING LOW FLOW DET

S 865-300-004
(4) Make sure this circuit breaker on the main power distribution panel, P6, is closed:
(a) 6D17, EQUIP COOL AUX FAN

S 865-301-004
(5) Put the EQUIP COOLING switch on the pilot's overhead panel, P5, to the ALTERNATE position.

S 865-302-004
(6) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6F23, FWD EQUIP COOLING SUPPLY FAN NO. 2

S 865-348-004
(7) Make sure these indications show:
(a) The EICAS maintenance message FWD EQ SUP FAN 2 shows.
(b) The OVHT light on the P5 panel shows.

S 715-303-004
(8) Make sure the Forward Supply Auxiliary fan operates.

S 785-304-004
(9) Install the static pressure probe into the pressure sense port on the E2-1 Equipment Cooling Shelf.

S 785-305-004
(10) Make sure that the pressure is a minimum of 1.2 inches of water

S 785-306-004
(11) Install the probe into the pressure sense port on the E2-2 Equipment Cooling Shelf.

S 785-307-004
(12) Make sure that the pressure is not more than 0.1 inches of water.

S 865-308-004
(13) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) 6F23, FWD EQUIP COOLING SUPPLY FAN NO. 2
(b) 11N13, EQUIP COOLING LOW FLOW DET

S 865-309-004
(14) Put the EQUIP COOLING switch on the pilot's overhead panel, P5, to the NORM position.

S 865-350-004
(15) Make sure the ALTN light goes off.

S 865-351-004
(16) Do the EICAS maintenance message erase procedure (AMM 31-41-00/201).

S 865-352-004
(17) Make sure these EICAS maintenance messages are not shown:
(a) FWD EQ SUP FAN 2
(b) FWD EQ SUP FLOW

E. Put the Airplane Back to Its Usual Condition

S 415-310-004
(1) Close the E/E access door, 119BL (AMM 06-41-00/201).

S 865-311-004
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

EQUIPMENT COOLING SYSTEM - CLEANING/PAINTING

1. General
   A. This procedure has the following task for the equipment cooling system:
      (1) Equipment Cooling System Cleaning

   TASK 21-58-00-107-042

2. Equipment Cooling System Cleaning
   A. General
      (1) Over time, normal airplane operations can result in the accumulation of dust and lint behind the left (right) sidewall areas in the forward (aft) cargo compartment near the air inlet of the equipment cooling system ducting. Without periodic cleaning and maintenance, this dust and lint can enter the equipment cooling system ducting and get distributed downstream to the flight deck avionics display units and other electronic equipment on the E/E racks. A build-up of contaminants in the equipment cooling system can cause blockages and reduce system cooling capability which can cause the display units and electronic equipment to overheat and result in reduced reliability and increased failure rates of the equipment (Service Letter 757-SL-21-058).
      (2) To prevent the entry and distribution of contaminants or foreign object debris (FOD) to the flight deck display units and electronic equipment, an air filtration system (barrier air filter, centrisep air cleaner, or FOD screen) is installed in the equipment cooling system ducting immediately upstream of the supply fans.
         (a) A barrier air filter or a centrisep air cleaner is installed upstream of the equipment cooling system supply fans to separate particulates out of the air stream prior to entering the system ducting (Service Letter 757-SL-21-047).
         (b) ETOPS AIRPLANES;
         A FOD screen is installed upstream of the 'auxiliary' equipment cooling system supply fan to protect the fan impellers and prevent entry of debris or contaminants into the system ducting.
         (c) If the sidewall areas have a substantial accumulation of dust and debris, the equipment cooling system may not be able to prevent the downstream contamination of the flight deck display units and electronic equipment. The cooling air inlet screens on the flight deck display units and electronic equipment can become clogged with the contaminants which reduces cooling capability and can cause overheating and failure of the equipment.
   B. References
      (1) AMM 20-10-01/401, E/E Rack-Mounted Components

(2) AMM 20-60-02/201, Cleaning to Remove Combustible Material Around Wiring
(3) AMM 20-60-06/201, Electronic Line Replaceable Unit Cleaning
(4) AMM 21-20-01/401, Air Supply Flow Control Orifice
(5) AMM 21-20-01/601, Air Supply Flow Control Orifice
(6) AMM 21-23-05/201, Return Air Grilles
(7) AMM 21-25-01/401, Cabin Air Recirculation Fan
(8) AMM 21-26-00/501, Ventilation System
(9) AMM 21-58-06/401, Equipment Cooling Air Fan
(10) AMM 21-58-10/401, Aft Equipment Cooling Supply Fan
(11) AMM 21-58-17/201, Equipment Cooling Low Flow Detectors
(12) AMM 21-58-19/201, Equipment Cooling Smoke Detector (Sensor)
(13) AMM 21-58-21/201, Equipment Cooling Air Cleaner
(14) AMM 21-58-22/401, Equipment Cooling Auxiliary Fan
(15) AMM 24-22-00/201, Manual Control (Supply Power)
(16) AMM 25-50-02/401, Cargo Compartment Sidewall Linings
(17) AMM 52-34-00/201, No. 1 and 2 Cargo Doors

C. Access

(1) Location Zones

119	Main Equipment Center (Left)
121	Forward Cargo Compartment (Left)
162	Bulk Cargo Compartment (Right)
221	Passenger/Main Cabin - Section 41, (Left)
252	Passenger/Main Cabin - Section 46, (Right)

(2) Access Panels

119BL	Main Equipment Center Access Door
821	Forward Cargo Compartment Door
822	Aft Cargo Compartment Door

D. Prepare for Cleaning

S 867-043
(1) Supply electrical power (AMM 24-22-00/201).

S 017-044
(2) Get access to the 'forward'equipment cooling system components in the forward cargo compartment:
(a) Open the forward cargo compartment door, 821 (AMM 52-34-00/201).
(b) Remove the left sidewall linings aft of the forward endwall to get access to the equipment cooling system air inlet and components (AMM 25-50-02/401).

S 017-038
(3) ETOPS AIRPLANES;
Get access to the 'auxiliary' equipment cooling system components in the main equipment center:
(a) Open the main equipment center access door, 119BL.
(b) Locate the 'auxiliary' equipment cooling system air inlet and components along the left sidewall area (approx. STA410).

S 017-039
(4) AIRPLANES WITH 'AFT' EQUIPMENT COOLING SYSTEM;
Get access to the 'aft' equipment cooling system components in the bulk cargo compartment:
(a) Open the aft cargo compartment door, 822 (AMM 52-34-00/201).
(b) Remove the right sidewall linings aft of the door opening to get access to the equipment cooling system air inlet and components (AMM 25-50-02/401).

S 867-045
(5) Remove electrical power (AMM 24-22-00/201).

E. Equipment Cooling System Cleaning

S 167-046
(1) Inspect and clean the sidewall areas near and around the equipment cooling supply air inlet to remove any foreign object debris, accumulated dust or contaminants.
(a) Use a vacuum or cloth to clean the cargo insulation blankets.
(b) Clean and remove any combustible material around the electrical wiring (AMM 20-60-02/201).

S 167-047
(2) Clean the equipment cooling system components to remove any foreign object debris, accumulated dust or contaminants.
(a) AIRPLANES WITH BARRIER AIR FILTER;
Replace the barrier air filter (AMM 21-58-07/401).
(b) AIRPLANES WITH CENTRISEP AIR CLEANER;
Clean/replace the centrisep air cleaner (AMM 21-58-21/201).
(c) Inspect and clean the 'forward' equipment cooling system supply fans as required per supplier CMM, and replace the fans if necessary (AMM 21-58-06/401).
(d) Inspect and clean the 'left' cabin air recirculation fan (EE exhaust) as required per supplier CMM, and replace the fan if necessary (AMM 21-25-01/401).
(e) ETOPS AIRPLANES;
Inspect and clean the FOD screen upstream of the 'auxiliary' equipment cooling fan (AMM 21-58-22/401).

(f) ETOPS AIRPLANES;
Inspect and clean the 'auxiliary' equipment cooling supply fan as required per supplier CMM, and replace the fan if necessary (AMM 21-58-22/401).
(g) AIRPLANES WITH 'AFT' EQUIPMENT COOLING SYSTEM;
Inspect and clean the 'aft' equipment cooling system supply fans as required per supplier CMM, and replace the fans if necessary (AMM 21-58-11/401).
(h) Inspect and clean the low flow detectors (AMM 21-58-17/201).
(i) Inspect and clean the smoke detectors (sensors) and tubing (AMM 21-58-19/201).

S 167-048
(3) Inspect and clean the main cabin return air grilles between STA300 to STA600 (left sidewall) to remove any foreign object debris, accumulated dust or contaminants (AMM 21-23-05/201).
(a) Make sure to clean sidewall areas behind the return air grilles to remove any foreign object debris, accumulated dust or contaminants.

S 167-049
(4) AIRPLANES WITH 'AFT' EQUIPMENT COOLING SYSTEM;
Inspect and clean the main cabin return air grilles between STA1500 to STA1620 (right sidewall) to remove any foreign object debris, accumulated dust or contaminants (AMM 21-23-05/201).
(a) Make sure to clean sidewall areas behind the return air grilles to remove any foreign object debris, accumulated dust or contaminants.

S 167-050
(5) Inspect and clean the E/E equipment racks (shelves and trays) to remove any foreign object debris, accumulated dust or contaminants.
(a) Remove the electronic equipment (LRU) from the E/E rack (AMM 20-10-01/401).
1) Install protective caps/plugs to the LRU pin connectors to prevent pin contamination from dust and FOD which could cause potential shorting between pins when LRU is re-installed.
2) Clean the electronic equipment (LRU) (AMM 20-60-06/201).
(b) Use a temporary covering over the cooling duct metering plates at each electronic equipment (LRU) slot on the E/E rack to prevent the entry of loosened contaminants into the E/E cooling plenum which could cause a blockage or reduce cooling capability.

(c) Use a vacuum or a soft, lint-free cloth to clean the surfaces of the E/E rack shelves and trays to remove any foreign object debris, accumulated dust or contaminants.
(d) Remove the temporary covering from the cooling duct metering plates.
1) Make sure the metering plates are positioned correctly to ensure proper LRU cooling.
(e) Remove the protective caps/plugs from the electroncic equipment (LRU) pin connectors.
(f) Re-install the electronic equipment (LRU) to the E/E rack (AMM 20-10-01/401).

S 167-051
(6) Inspect and clean the cooling air inlet screens of the flight deck display units and electronic equipment to remove any foreign object debris, accumulated dust or contaminants.

S 167-052
(7) Inspect and clean the duct orifices (airflow restrictors) installed in the equipment cooling system ducting and flight deck air distribution ducting to remove any foreign object debris, accumulated dust or contaminants (AMM 21-20-01/401 and AMM 21-20-01/601).

F. Post-Cleaning Check

S 427-053
(1) Make sure all flight deck display units, electronic equipment and equipment cooling system components have been re-installed.

S 867-054
(2) Supply electrical power (AMM 24-22-00/201).

S 717-055
(3) Let the equipment cooling system operate to purge any residual contamination from the airstream that might have been loosened during cleaning.

S 167-056
(4) Repeat the cleaning instructions if necessary.

S 717-041
(5) Do a health check of the lavatory/galley ventilation system to ensure there is sufficient cooling capability for the aft E/E equipment rack and electrical equipment (AMM 21-26-00/501).

G. Return the Airplane to Normal Configuration

S 417-057
(1) Re-install the cargo sidewall linings (AMM 21-50-02/401).

S 417-058
(2) Close the cargo compartment door (AMM 52-34-00/201).

S 867-059
(3) Remove electrical power if no longer required (AMM 24-22-00/201).

EQUIPMENT COOLING FAN CHECK VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure has tasks for the removal and installation of these components:
      (1) Check valve for the forward E/E equipment cooling supply fan
      (2) Check valve for the E/E equipment cooling auxiliary fan
      (3) ETOPS isolation check valve
   B. The equipment cooling fan check valves are installed in the ducts next to the forward and auxiliary equipment cooling supply fans.
   C. The ETOPS isolation check valve is installed in the duct between the auxiliary fan and the ducts to the E/E racks.

TASK 21-58-02-004-001

2. Check Valve Removal (Forward E/E Equipment Cooling Supply Fan) (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Passenger Doors, Emergency Exit and Cargo Doors
      (2) AMM 25-50-02/401, Cargo Compartment Sidewall Linings
   B. Access
      (1) Location Zone
          100 Lower Half of Fuselage

   C. For the removal of the check valve(s) for the forward equipment cooling fan, do the steps that follow:

      S 864-065
      (1) Remove the electrical power from the airplane (AMM 24-22-00/201).

      S 014-066
      (2) Open the No. 1 Cargo Door, 821 (AMM 06-46-00/201).

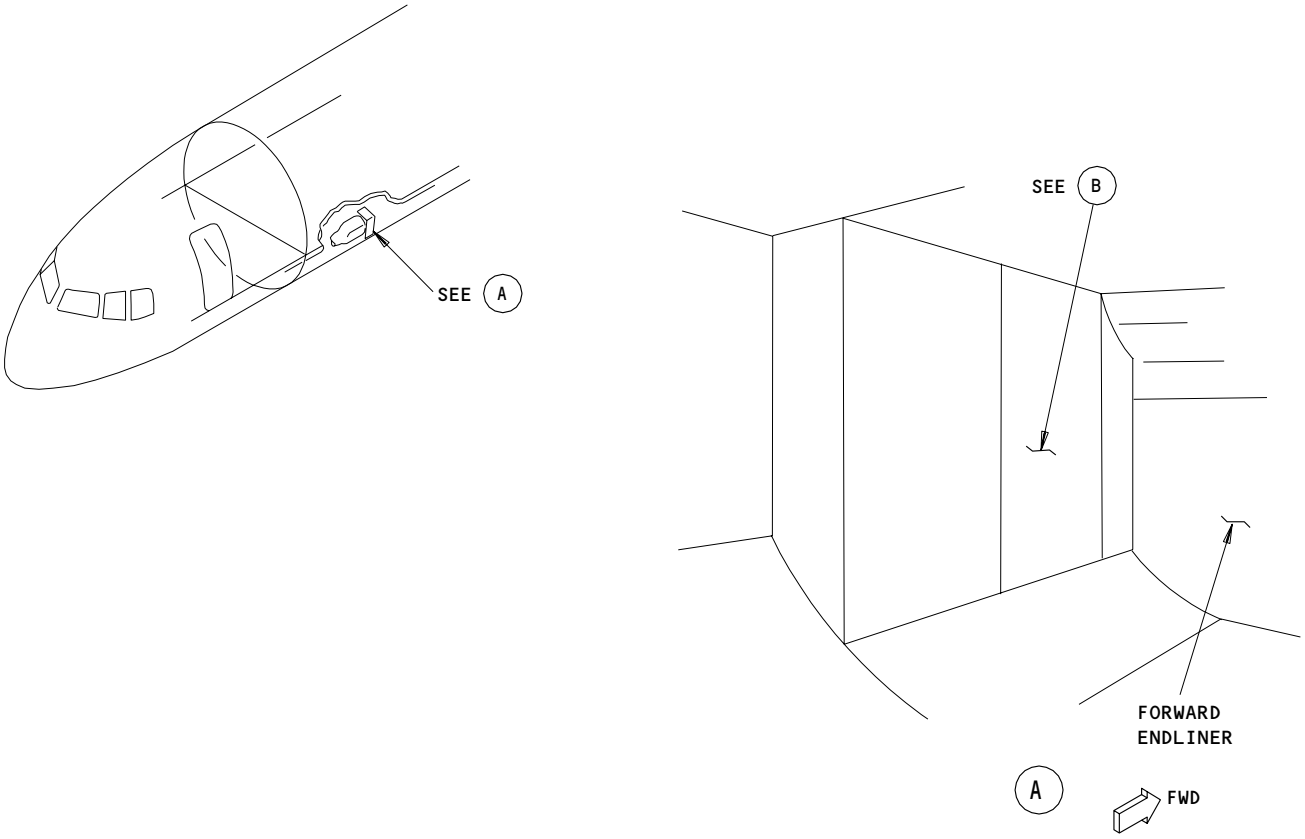
      S 014-067
      (3) Remove the left-cargo-sidewall lining approximately four feet aft of the forward endliner panel (AMM 25-50-02/401).

      S 014-068
      (4) Find the check valve to be removed.

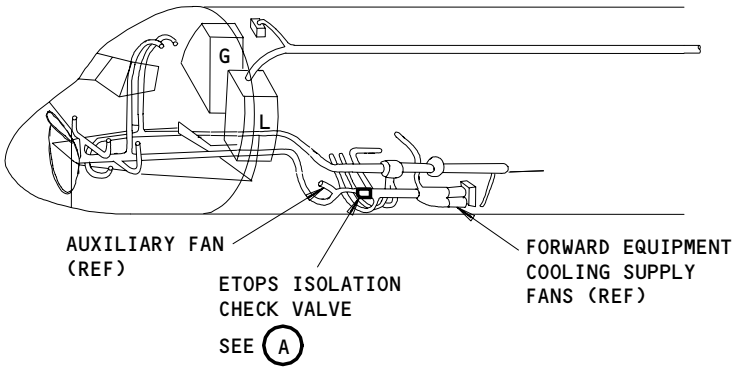
      S 024-069
      (5) Remove the clamps (3 locations) on both ends of the check valve.

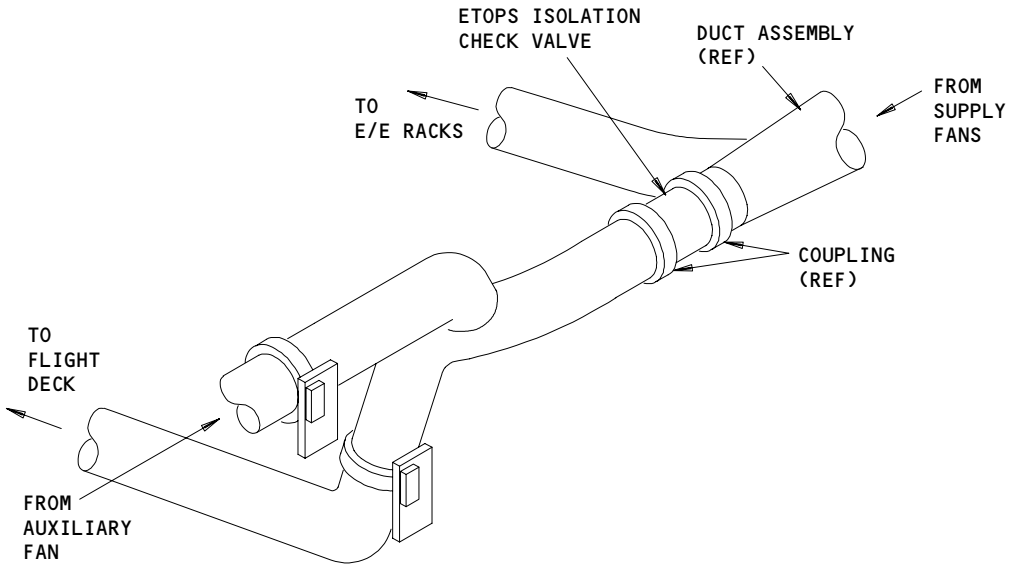
      S 024-070
      (6) Remove the flex duct.

      S 024-071
      (7) Remove the check valve.



Equipment Cooling Fan Check Valve Installation
Figure 401

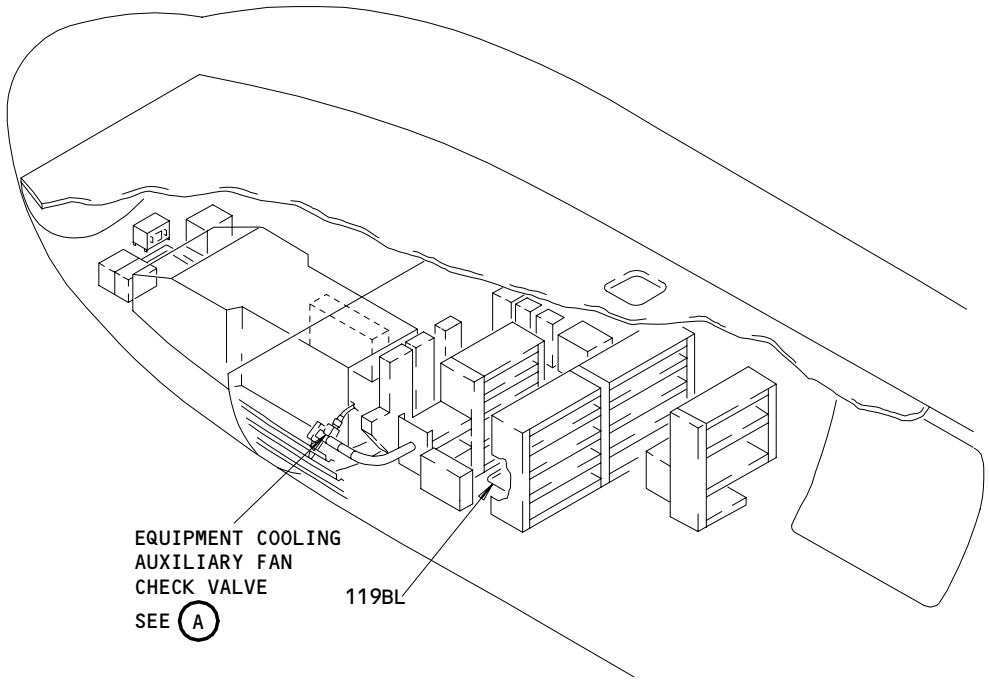


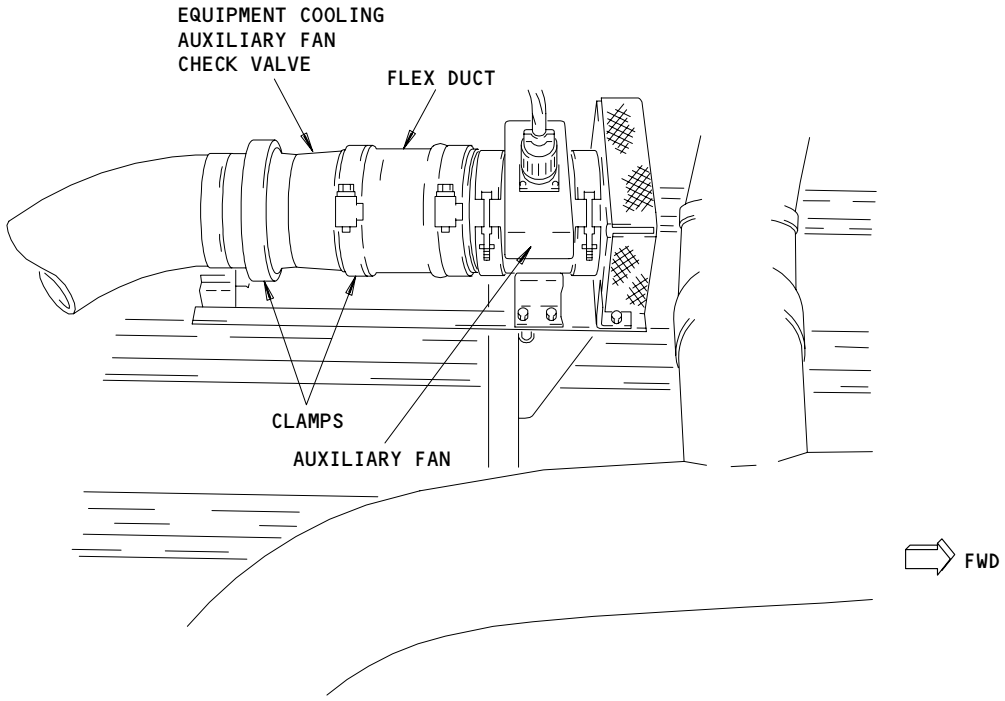


ETOPS ISOLATION CHECK VALVE

A

ETOPS Isolation Check Valve
Figure 401A





EQUIPMENT COOLING AUXILIARY FAN
CHECK VALVE
A

Equipment Cooling Auxiliary Fan Check Valve Installation
Figure 402

TASK 21-58-02-004-087

3. Check Valve Removal (E/E Equipment Cooling Auxiliary Fan)

A. References

(1) AMM 06-41-00/201. Fuselage Access Door and Panels

B. Access

(1) Location Zone

100 Lower Half of Fuselage

C. Do these steps to remove the check valve for the E/E equipment cooling auxiliary fan:

S 864-088

(1) Remove the electrical power from the airplane (AMM 24-22-00/201).

S 024-089

(2) Open the electrical-electronics bay access door 119BL (AMM 06-41-00/201).

S 024-036

(3) The equipment cooling auxiliary fan and check valve are on the left sidewall of the airplane 7 feet (2 meters) forward of the forward cargo compartment endliner.

S 024-037

(4) Remove the clamp that holds the check valve to the rigid duct.

S 024-038

(5) Remove the clamp that holds the flex duct to the check valve.

S 024-039

(6) Remove the flex duct from the check valve.

S 024-040

(7) Remove the check valve.

TASK 21-58-02-004-095

4. ETOPS Isolation Check Valve Removal

A. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels

B. Access
(1) Location Zone
100 Lower Half of Fuselage

C. Do these steps to remove the ETOPS isolation check valve:

S 864-057
(1) Remove the electrical power from the airplane (AMM 24-22-00/201).

S 014-058
(2) Open the electrical-electronics bay access door, 119BL (AMM 06-41-00/201).

S 214-059
(3) Get access to the check valve on the left sidewall of the airplane 6 feet (2 meters) forward of the forward cargo compartment endliner.

S 034-060
(4) Remove the clamps that hold the check valve to the rigid duct.

S 024-061
(5) Remove the check valve.

TASK 21-58-02-404-005

5. Check Valve Installation (Forward E/E Equipment Cooling Supply Fan)

A. References
(1) AMM 06-46-00/201, Passenger Doors, Emergency Exit and Cargo Doors
(2) AMM 25-50-01/401, Cargo Compartment Ceiling Lining
(3) AMM 25-50-02/401, Cargo Compartment Sidewall Linings

B. Access
(1) Location Zone
100 Lower Half of Fuselage

C. Do these steps to install the check valve for the forward E/E equipment cooling supply fan:

S 414-042
(1) Put the check valve in line, with the flapper hinge pin in the vertical position.

S 424-043
(2) Install the flex duct over the valve and duct ends.

S 424-044
(3) Install the couplings but do not tighten them.

NOTE: Flex duct is to overlap the duct end by 1.5 inches max. Clamps to be installed .25 inches from end of sleeves.

S 434-090
(4) Tighten the couplings.

S 414-173
(5) Install the left-cargo-sidewall lining that was removed (AMM 25-50-02/401).

S 414-174
(6) Close the No./1 cargo door, 821.

TASK 21-58-02-404-109

6. Check Valve Installation (E/E Cooling Auxiliary Supply Fan)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 25-50-02/401, Cargo Compartment Sidewall Linings
   B. Access
      (1) Location Zone
          100 Lower Half of Fuselage

   C. Do these steps to install the check valve for the E/E equipment cooling auxiliary fan:

      S 414-051
      (1) Put the check valve in-line with the flapper hinge pin in the vertical position.

      S 424-052
      (2) Install the flex duct over the valve and the duct ends.

      S 424-053
      (3) Install the coupling that holds the check valve to the rigid duct.

      S 434-054
      (4) Tighten the couplings on both ends of the check valve.

TASK 21-58-02-404-111

7. ETOPS Isolation Check Valve Installation
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zone
          100 Lower Half of Fuselage
   C. Do these steps to install the ETOPS isolation check valve:

      S 424-062
      (1) Put the check valve in-line with the flapper hinge pin in the vertical position.

      S 434-063
      (2) Install the coupling that holds the check valve to the rigid duct.

      S 434-064
      (3) Tighten the couplings on both ends of the check valve.

EQUIPMENT COOLING OVERBOARD EXHAUST VALVE - REMOVAL/INSTALLATION

TASK 21-58-05-014-001

1. Remove Equipment Cooling Overboard Exhaust Valve (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry Service and Cargo Doors, Access Doors and Panels
      (2) AMM 25-50-02/401, Cargo Compartment Sidewall Lining
   B. Access
      (1) Location Zone
          821 Lower Half of Fuselage
   C. Procedure

      S 864-002
      (1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tag:
          (a) 11C20, EQUIP COOLING SMOKE DET CONT

      S 014-003
      (2) Open the No. 1 Cargo Door (821) (AMM 06-46-00/201).

      S 014-004
      (3) Remove the left cargo compartment sidewall lining 4 feet aft of forward endwall and find the overboard exhaust valve (1) (AMM 25-50-02/401).

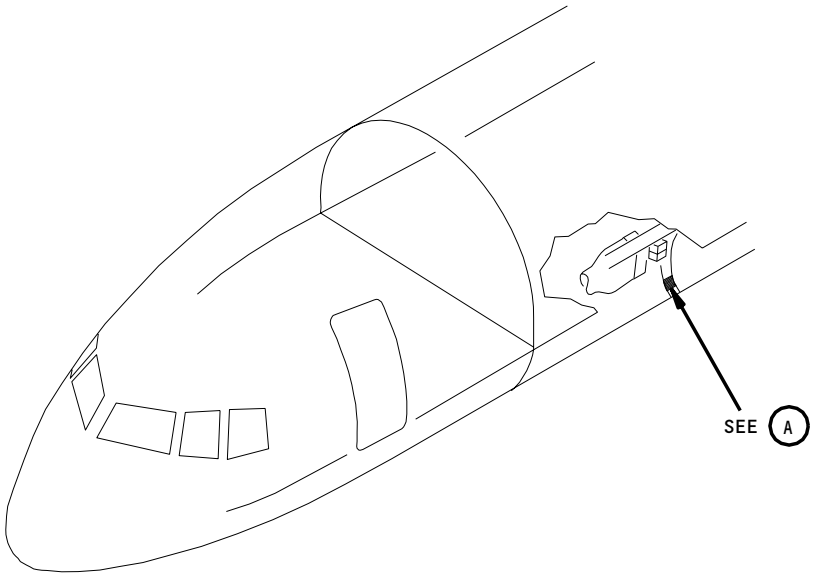
      S 034-005
      (4) Disconnect the electrical connector (2) from the valve actuator (3).

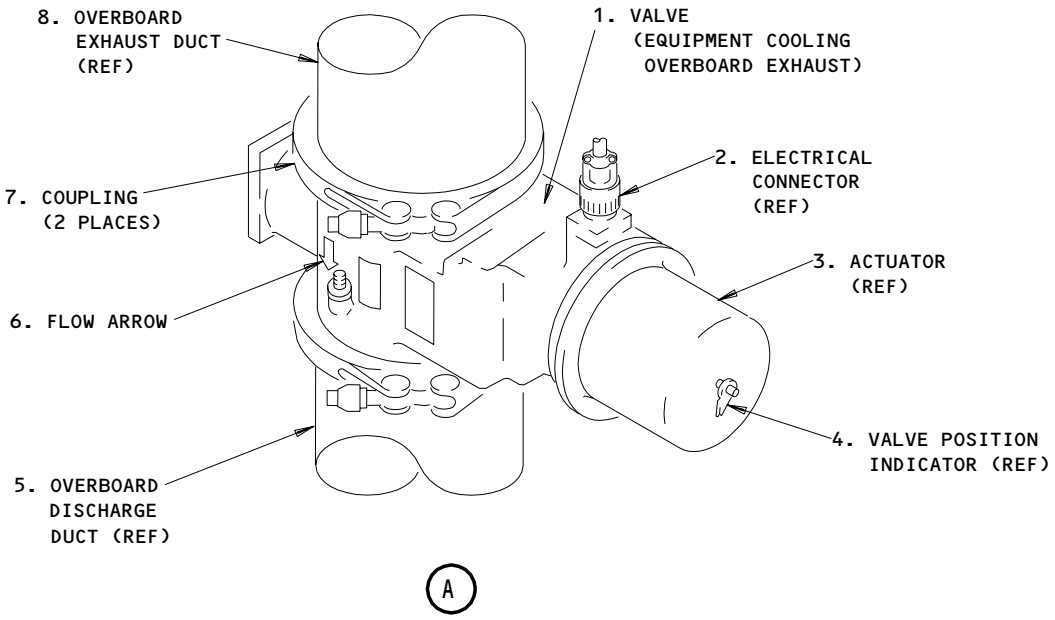
      S 034-006
      (5) Remove the couplings (7) located between valve (1) and ducts (5 and 8).

      S 024-007
      (6) Remove the overboard exhaust valve (1).

TASK 21-58-05-414-008

2. Install Equipment Cooling Overboard Exhaust Valve (Fig. 401)
   A. Parts





Equipment Cooling Overboard Exhaust Valve Installation
Figure 401

MM			IPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	1	Valve (Equipment Cooling Overboard Exhaust)	21-58-06	05	195
	7	Coupling			190

B. References
(1) AMM 25-50-02/401, Cargo Compartment Sidewall Lining
(2) AMM 24-22-00/201, Electric Power Control

C. Access
(1) Location Zone
100 Lower Half of Fuselage

D. Procedure

S 424-009
(1) Position the valve (1) between ducts (5 and 8) with the flow arrow (6) in the downward position.

S 424-010
(2) Put the valve actuator (3) in the slanted upward and outward position.

S 434-011
(3) Install the couplings (7) between the valve (1) and the ducts (5 and 8).

S 434-012
(4) Tighten the nut to 25-30 pound-inches.

S 434-013
(5) Connect the electrical connector (2) to the valve actuator (3).

S 864-014
(6) Remove DO-NOT-CLOSE tag and close the P11 panel circuit breaker:
(a) 11C20, EQUIP COOLING SMOKE DET CONT

S 864-015
(7) Supply electrical power (AMM 24-22-00/201).

S 864-016
(8) Push the ECS/MSG pushbutton on the right side panel, P61.

S 714-030
(9) Hold the EQUIP COOL TEST switch on the P61 panel to EQUIP COOL.

NOTE: THE OVERBOARD EXHAUST VALVE IS SPRING LOADED OPEN ON THE GROUND. ONLY THE ACTUATOR WILL MOVE, THE FLAPPERS WILL NOT MOVE.

S 714-031
(10) Make sure that the OVHT light on the P5 panel illuminates.

S 714-032
(11) Release the test switch.

S 714-036
(12) Wait 30 seconds. Make sure the EICAS maintenance message OVBD EXH VAL TEST does not show on the display.

S 414-037
(13) Install the cargo compartment sidewall lining (AMM 25-50-02/401).

S 414-038
(14) Close the No. 1 Cargo Door (821).

S 864-039
(15) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

EQUIPMENT COOLING AIR FAN - REMOVAL/INSTALLATION

1. General
   A. A primary and a secondary fan are installed in the forward cooling air supply duct. The forward equipment cooling air fans are in the left forward sidewall of the forward cargo compartment.

TASK 21-58-06-014-001

2. Remove Equipment Cooling Air Fan (Fig. 401)
   A. References
      (1) 06-46-00/201, Entry Service and Cargo Doors, Access Door and Panels
      (2) 24-22-00/201, Electrical Power Control
      (3) 25-50-02/401, Cargo Compartment Sidewall Linings
   B. Access
      (1) Location Zone
          821 Lower Half of Fuselage

   C. Procedure

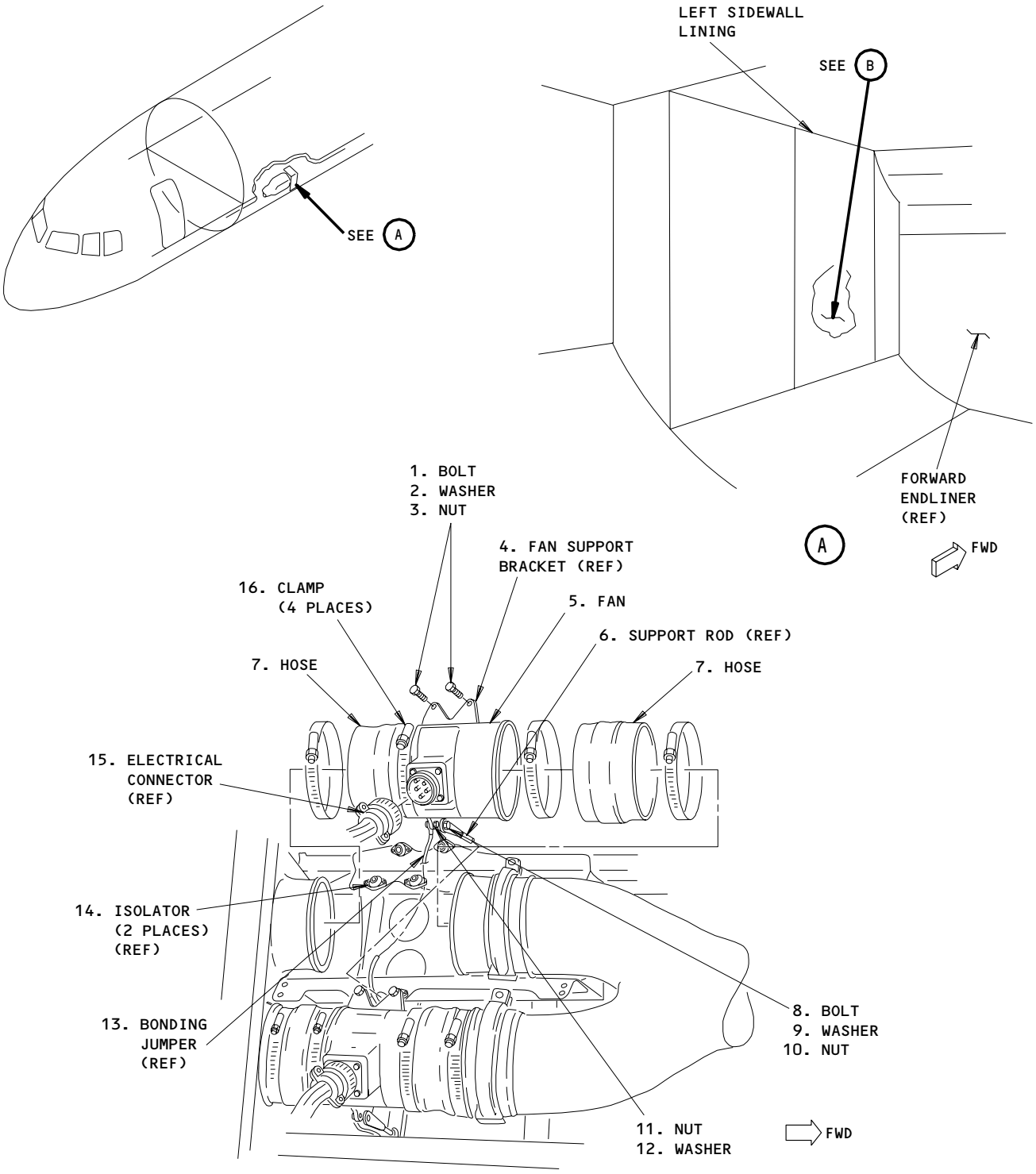
      S 044-058
      (1) Remove electrical power (AMM 24-22-00/201).

      S 864-002
      (2) For removal of the equipment cooling fan 1, open this circuit breaker on the main power distribution panel and attach DO-NOT-CLOSE tag:
      (a) 6F17, EQUIP COOL SUPPLY FAN 1

      S 864-053
      (3) For removal of equipment cooling fan 2, open this circuit breaker on the main power distribution panel and attach DO-NOT-CLOSE tag:
      (a) 6F23, EQUIP COOL SUPPLY FAN 2

      S 014-003
      (4) Open the No. 1 Cargo Door (821) (Ref 06-46-00).

      S 014-004
      (5) Remove the left sidewall lining (AMM 25-50-02/401) located about 2 feet (0.7 meters) aft of the forward endliner. Find the supply air fans (5).



Equipment Cooling Air Fan - Installation
Figure 401

S 034-005
(6) Disconnect the electrical connector (15) from the fan (5).

S 034-006
(7) Remove the clamps (16) in four places.

S 034-008
(8) Remove the coupling hoses (7).

S 034-009
(9) Remove the bolts (1) that attach the fan support brackets (4) to the isolators (14).

S 034-010
(10) Remove the nut (11) and the washer (12) and disconnect the bonding jumper (13).

S 034-011
(11) Remove the bolt (8) that attaches the support rod (6) to the fan (5).

S 024-012
(12) Remove the fan (5).

TASK 21-58-06-414-007

3. Install Equipment Cooling Air Fan (Fig. 401)
   A. Equipment
      (1) Jumper Test Wire, B21003-1
   B. Parts

MM		NOMENCLATURE	IPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	21-58-06	02	135
	2	Washer			140
	3	Nut			145
	5	Fan			250
	7	Hose			220
	8	Bolt			50
	9	Washer			60
	10	Nut			70
	11	Nut			35
	12	Washer			20
	16	Clamp			225

C. References
(1) 24-22-00/201, Electric Power Control
D. Procedure

S 424-013
(1) Put the fan (5) in-line and loosely install the coupling hoses (7) and the clamps (16).

NOTE: Make sure the coupling hose (7) is put over the duct end 1.5 inch maximum. The clamps (16) are to be installed .25 inches from the end of the sleeve.

S 434-014
(2) Install the bolt (1), the washers (2) and the nuts (3) that attach the fan support bracket (4) to the isolator (14). Do not tighten.

S 434-015
(3) Install the bolt (8), the washer (9) and the nut (10) to support the rod (6). Do not tighten.

S 434-016

CAUTION: MAKE SURE YOU USE THE TORQUE WRENCH CORRECTLY. DO NOT TIGHTEN GREATER THAN THE PERMITTED TORQUE VALUE. A TORQUE VALUE MORE THAN THE LIMIT MAY DAMAGE THE FAN HOUSING AND CAUSE FAN FAILURE.

(4) Tighten clamps (16) on hoses (7) to 20-25 pound-inches.

S 434-017
(5) Tighten all the support bracket and the support rod fasteners (1 and 8).

S 434-018
(6) Install the bonding jumper (13), the nut (11), and the washer (12).

S 434-019
(7) Install the electrical connector (15).

S 864-020
(8) For installation of equipment cooling fan 1, remove the DO-NOT-CLOSE tag and close this P6 panel circuit breaker:
(a) 6F17, EQUIP COOL SUPPLY FAN 1

S 864-021
(9) For installation of equipment cooling fan 2, remove DO-NOT-CLOSE tag and close this P6 panel circuit breaker:
(a) 6F23, EQUIP COOL SUPPLY FAN 2

E. Prepare to test the fans.

S 014-059
(1) Open the No. 1 Cargo Door (821) (AMM 06-46-00/201).

S 014-060
(2) Remove the left sidewall lining (AMM 25-50-02/401) located about 2 feet (0.7 meters) aft of the forward endliner. Find the supply air fans.

S 864-061
(3) Supply electrical power (AMM 24-22-00/201).

F. To test fan 1, do the steps that follow:

S 714-034
(1) Push and release the EQUIP COOLING ALTN switchlight on the P5 panel. Make sure the ALTN light goes off.

S 714-035
(2) Listen to the fan noise to make sure the fan operates.

G. To test fan 2, do the step that follows:

S 714-050
(1) Push and release the EQUIP COOLING ALTN switchlight on the P5 panel. Make sure the ALTN light comes on.

S 714-051
(2) Listen to the fan noise to make sure the fan operates.

S 714-052
(3) Push and release the EQUIP COOLING ALTN switchlight on the P5 panel. Make sure the ALTN light goes off.

H. Put the airplane back to its usual condition.

S 414-054
(1) Install the left cargo compartment sidewall lining (AMM 25-50-02/401).

S 414-055
(2) Close the No. 1 cargo door (821).

S 864-056
(3) Remove electrical power if it is not necessary (Ref 24-22-00).

AFT EQUIPMENT COOLING SUPPLY FAN - REMOVAL/INSTALLATION

1. General
   A. The aft equipment cooling supply fans are in the aft cargo compartment, on the compartment ceiling approximately 18 feet aft of cargo door.

TASK 21-58-10-024-001

2. Remove Aft Equipment Cooling Supply Fan (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
      (2) AMM 25-50-01/401, Cargo Compartment Ceiling Linings

   B. Access
      (1) Location Zones
          162 Bulk Cargo Compartment, Right

      (2) Access Panels
          822 No. 2 Cargo Door
          823 No. 3 Cargo Door (If Installed)

   C. Procedure to remove the supply fan.

      S 864-010
      (1) For the removal of aft equipment cooling supply fan 1, open this right miscellaneous relay panel P37 circuit breaker and attach DO-NOT-CLOSE tags:
          (a) 37D2, AFT EQPT COOLING FAN SPLY NO. 1

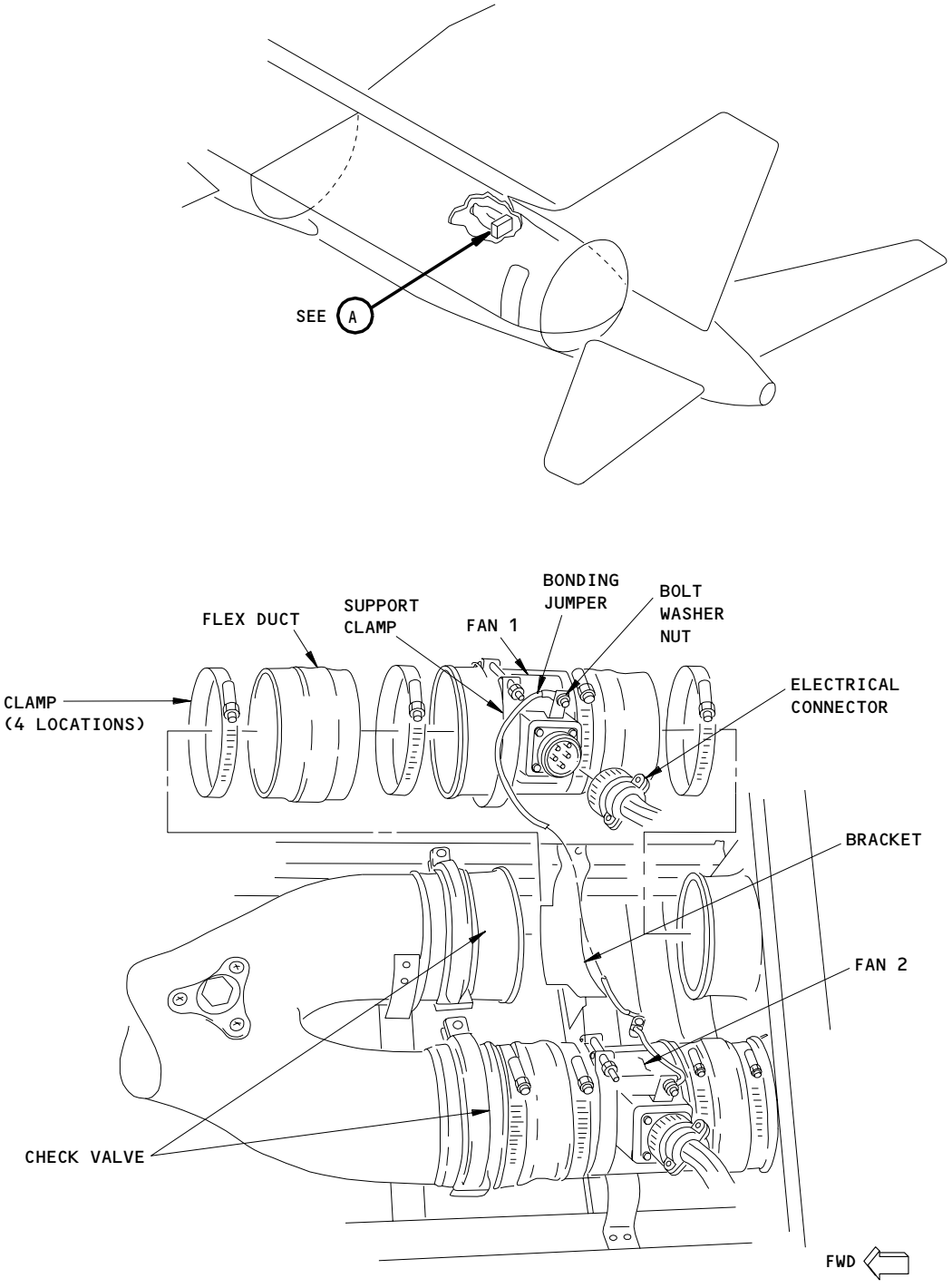
      S 864-020
      (2) For removal of aft equipment cooling supply fan 2, open this miscellaneous electrical equipment panel P70 circuit breaker and attach DO-NOT-CLOSE tags:
          (a) 70B5, AFT EQPT COOLING FAN SPLY NO. 2

      S 014-167
      (3) Open the No. 2 Cargo Door 822 or if installed No. 3 Cargo Door 823 (AMM 06-46-00/201).

      S 014-023
      (4) Find the cooling fans on compartment ceiling behind the cargo compartment ceiling lining (AMM 25-50-01/401) approximately 4 feet to the right of airplane centerline.

      S 034-024
      (5) Remove the electrical connector from fan.

      S 034-025
      (6) Remove the bonding jumper from fan.



Aft Equipment Cooling Fan Installation
Figure 401

S 034-026
(7) Loosen the sleeve clamps (4 places).

S 034-027
(8) Remove sleeves and sleeve clamps.

S 034-028
(9) Remove the fan support clamp.

S 024-029
(10) Remove the fan.

TASK 21-58-10-424-030

3. Install Aft Equipment Cooling Supply Fan (Fig. 401)

A. Parts
(1) Jumper Test Wire, B21003-1

B. References
(1) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
(2) AMM 24-22-00/201, Electric Power Control
(3) AMM 25-50-01/401, Cargo Compartment Ceiling Linings

(4) AMM 31-41-00/201, EICAS
(5) AMM 77-12-03/201, Engine Speed Cards

C. Access
(1) Location Zones
162 Bulk Cargo Compartment, Right

(2) Access Panels
822 No. 2 Cargo Door
823 No. 3 Cargo Door (If Installed)

D. Procedure for the Installation of Supply Fan

S 434-031
(1) Make sure the check valve flappers will move freely to the fully open and fully closed positions and do not touch the duct.

S 434-032
(2) If the flappers touch the duct or if they do not move freely, do the steps that follow:
(a) Loosen the clamp that holds the check valve to the rigid duct section.
(b) Align check valve with the rigid duct section so that the valve flappers are free to move and the flappers do not touch the duct.
(c) Tighten the clamp between the check valve and rigid duct section.

(d) Make sure the check valve flappers still move freely and do not touch the duct.

S 434-033

(3) Put the fan in the frame and install the fan support clamp.

S 434-116

CAUTION: MAKE SURE YOU USE THE TORQUE WRENCH CORRECTLY. DO NOT TIGHTEN GREATER THAN THE PERMITTED TORQUE VALUE. A TORQUE VALUE MORE THAN THE LIMIT WILL DAMAGE THE FAN HOUSING AND CAUSE FAN FAILURE.

(4) Install sleeves and sleeve clamps.

S 434-035

(5) Tighten to 18-22 lb-in.

NOTE: Sleeve is to overlap duct and 1.5 inch max. Clamps to be installed 0.25 inch from end of sleeve. Fan support clamp may be loosened to adjust the fan position if necessary. Tighten fan support bracket after adjustment.

S 434-118

(6) Install the bonding jumper bolt, nut and washer.

S 434-036

(7) Install the electrical connector to fan.

S 864-122

(8) For installation of aft equipment cooling supply fan 1, remove DO-NOT-CLOSE tag and close the P37 panel circuit breaker:
(a) 37D2, AFT EQPT COOLING FAN SPLY NO. 1

S 864-055

(9) For installation of aft equipment cooling supply fan 2, remove DO-NOT-CLOSE tag and close this P70 panel circuit breaker:
(a) 70B5, AFT EQPT COOLING FAN SPLY NO. 2

E. To test fan 1, do the steps that follow:

S 864-067

(1) Supply electrical power (AMM 24-22-00/201).

S 864-081
(2) Make sure the EQUIP COOLING ALTN switch-light on P5 panel is not energized (ALTN light extinguished).

S 714-083
(3) Listen to the fan noise and make sure the fan operates.

F. To test fan 2, do the steps that follow:

S 864-093
(1) Supply the electrical power (AMM 24-22-00/201).

S 864-107
(2) Push the EQUIP COOLING ALTN switch-light on P5 panel to ALTN.

S 714-108
(3) Listen to the fan noise to make sure the fan operates.

S 864-109
(4) Push the EQUIP COOLING ALTN switch-light on the P5 panel.

G. Put the Airplane Back to Its Usual Condition

S 864-111
(1) Do the EICAS Erase Procedure (AMM 31-41-00/201).

S 414-113
(2) Install the cargo ceiling lining that was removed (AMM 25-50-01/401).

S 414-168
(3) Close the No. 2 Cargo Door 822 or if installed No. 3 Cargo Door 823 (AMM 06-46-00/201).

S 864-115
(4) Remove the electrical power if it is not necessary.

EQUIPMENT COOLING LOW FLOW SENSORS - MAINTENANCE PRACTICES

1. General
   A. This procedure has these tasks:
      (1) Equipment Cooling Low Flow Sensor Removal
      (2) Equipment Cooling Low Flow Sensor Cleaning
      (3) Equipment Cooling Low Flow Sensor Installation

   TASK 21-58-17-002-103

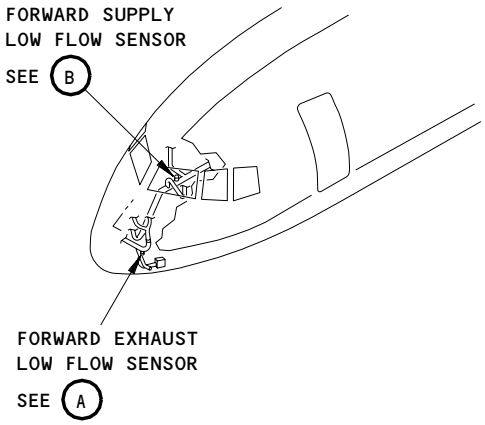
2. Equipment Cooling Low Flow Sensor Removal (Fig. 201)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 06-46-00/201, Entry, Service, and Cargo Doors
      (3) AMM 25-50-02/401, Cargo Compartment Sidewall Linings
      (4) AMM 32-00-15/201, Landing Gear Door Locks
      (5) AMM 32-00-20/201, Landing Gear Downlocks
   B. Access
      (1) Location Zones (PASSENGER AIRPLANES)
          114 Area forward of NLG wheel well, right
          116 NLG wheel well, right
          162 Bulk Cargo Compartment, Right

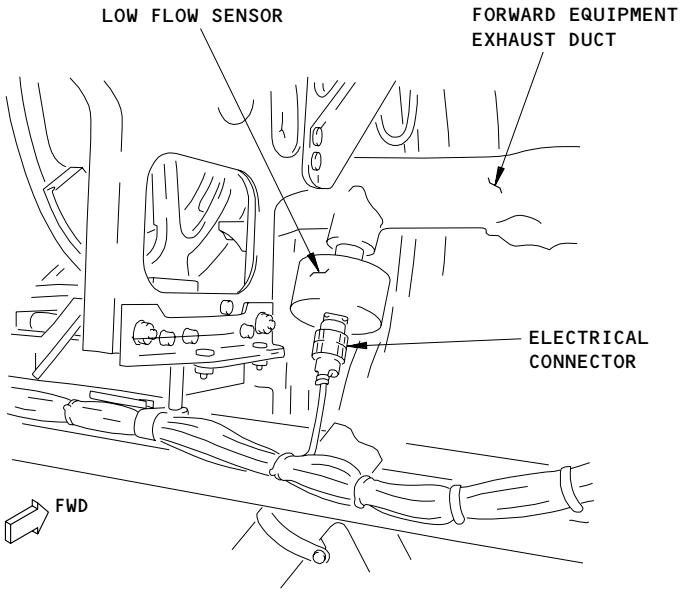
      (2) Access Panels (PASSENGER AIRPLANES)
          113AL Flight/Landing Gear/ Engine Control Components
          116AR NLG Control Components, ECS Control Valve
          822 No. 2 Cargo Door
          823 No. 3 Cargo Door (If Installed)

   C. Prepare for Removal

      S 862-002
      (1) Open this circuit breaker on the main distribution panel P6 and attach a DO-NOT-CLOSE tag:
          (a) 6D6, EQUIP COOL GND WARN AND TEST

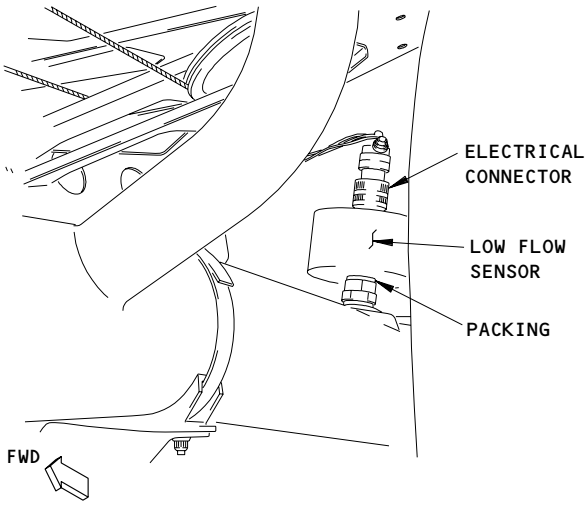
      S 862-003
      (2) Open this circuit breaker on the overhead panel P11 and attach a DO-NOT-CLOSE tag:
          (a) 11N13, EQUIP COOLING LOW FLOW DET





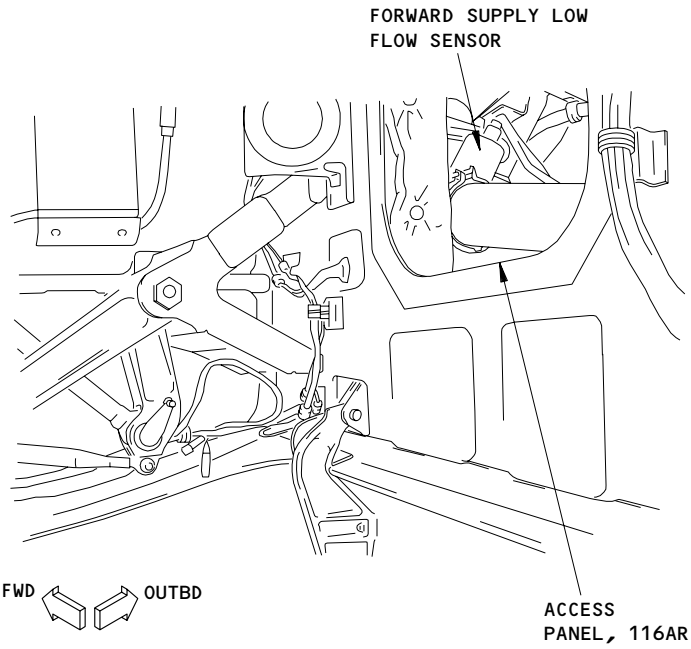
FORWARD EXHAUST LOW FLOW SENSOR

A 1



FORWARD SUPPLY LOW FLOW SENSOR
(RECOMMENDED ACCESS THROUGH
ACCESS DOOR, 113AL)

B



FORWARD SUPPLY LOW FLOW SENSOR
(OPTIONAL ACCESS THROUGH
NOSE GEAR WHEEL WELL)

B

1 NOT INSTALLED ON ALL AIRPLANES

Equipment Cooling Low Flow Sensor Installation
Figure 201

S 012-101

(3) Get access to the equipment cooling low flow sensors:

(a) For the forward supply low flow sensor, TS5155, open the forward equipment access door 113AL (AMM 06-41-00/201) or do the following steps for optional access through the 116AR access panel:

1) Make sure the landing gear downlocks are installed (AMM 32-00-20/201).

2) Make sure the wheel chocks are installed.

WARNING: USE THE PROCEDURE IN AMM 32-00-15 TO OPEN THE DOORS AND INSTALL THE DOOR LOCKS. THE DOORS OPEN AND CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

3) Open the nose landing gear doors and install the door locks (AMM 32-00-15/201).

4) Remove the access panel 116AR located on the right sidewall of the nose gear wheel well (AMM 06-41-00/201).

(b) PASSENGER AIRPLANES PRE-SB 21-0061;
For the forward exhaust low flow sensor, TS5156, open the forward equipment access door 113AL (AMM 06-41-00/201).

(c) For the aft supply low flow sensor, TS5138, open the No. 2 cargo door 822 or if installed No. 3 cargo door 823 (AMM 06-46-00/201), then remove the right sidewall panel(s) aft of the No. 2 cargo door 822 (AMM 25-50-02/401).

D. Low Flow Sensor Removal

S 862-018

(1) Remove the electrical connector from sensor.

S 022-019

(2) Remove the sensor.

S 022-020

(3) Remove the packing.

TASK 21-58-17-102-076

3. Equipment Cooling Low Flow Sensor Cleaning

A. Equipment

(1) Soft Cloth

B. Consumable Materials

(1) Use one of these:

(a) Isopropyl Alcohol, Commercially Available

(b) Dishwashing Soap, Commercially Available

C. Access

(1) Location Zones (PASSENGER AIRPLANES)

114 Area forward of NLG wheel well, right
116 NLG wheel well, right
162 Bulk Cargo Compartment, Right

(2) Access Panels (PASSENGER AIRPLANES)

113AL Flight/Landing Gear/ Engine Control Components
116AR NLG Control Components, ECS Control Valve
822 No. 2 Cargo Door
823 No. 3 Cargo Door (If Installed)

D. Procedure

S 022-085

CAUTION: MAKE SURE THAT YOU ARE CAREFUL WITH THE SENSOR. ROUGH MOVEMENT WILL CAUSE DAMAGE TO THE SENSOR.

(1) Remove the equipment cooling low flow sensor (AMM 21-58-17/201).

S 112-086

CAUTION: DO NOT USE ROUGH OR METAL TOOLS TO CLEAN THE SENSOR. THESE TOOLS CAN CAUSE DAMAGE TO THE SENSOR.

(2) Clean the probe end of the low flow sensor with a soft cloth and water, isopropyl alcohol, or dishwashing soap.

S 422-080

(3) Install the equipment cooling low flow sensor (AMM 21-58-17/201).

TASK 21-58-17-402-102

4. Equipment Cooling Low Flow Sensor Installation (Fig. 201)

A. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service, and Cargo Doors
(3) AMM 24-22-00/201, Electric Power Control
(4) AMM 25-50-02/401, Cargo Compartment Sidewall Linings
(5) AMM 32-00-15/201, Landing Gear Door Locks
(6) AMM 32-00-20/201, Landing Gear Downlocks

B. Access

(1) Location Zones (PASSENGER AIRPLANES)

114	Area forward of NLG wheel well, right
116	NLG wheel well, right
162	Bulk Cargo Compartment, Right

(2) Access Panels (PASSENGER AIRPLANES)

113AL	Flight/Landing Gear/ Engine Control Components
116AR	NLG Control Components, ECS Control Valve
822	No. 2 Cargo Door
823	No. 3 Cargo Door (If Installed)

C. Install the Low Flow Sensor

S 432-021

(1) Use the new packing.

S 432-022

(2) Screw the low flow sensor into the duct.

S 432-023

(3) Tighten and lockwire.

S 432-024

(4) Install the electrical connector.

D. Prepare for post-installation test

S 862-025

(1) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6D6, EQUIP COOL GND WARN AND TEST

S 862-026

(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11N13, EQUIP COOLING LOW FLOW DET

E. Do a test of the equipment cooling low flow sensors

S 862-062

(1) Supply the electrical power (Ref 24-22-00).

S 862-063
(2) Push the ECS/MSG pushbutton on the EICAS maintenance panel on P61 panel.

S 862-064
(3) Hold the EQUIP COOL TEST switch on the P61 panel to EQUIP COOL. Make sure the OVHT light on the P5 panel comes on. Release the test switch.

S 862-082
(4) After 20 seconds, make sure the maintenance messages that follow are not shown:
(a) For the forward supply low flow sensor,
FWD EQ SUP SNSR
(b) For the forward exhaust low flow sensor (if installed),
FWD EQ EXH SNSR

F. Put the airplane back to its usual configuration

S 412-065
(1) Close the access door.

S 422-067
(2) If access door 116AR was removed to get into the forward supply low flow sensor, install O-ring, seal washer, flat washer, and bolt.
(a) Tighten bolts to 50-70 pound-inches.

S 412-068
(3) Remove the nose gear door locks (Ref 32-00-15/201).

S 412-069
(4) Close the nose landing gear doors if opened.

S 862-070
(5) Remove electrical power if it is not necessary.

EQUIPMENT COOLING SMOKE DETECTOR - MAINTENANCE PRACTICES

1. General
   A. This procedure has these tasks:
      (1) Forward equipment cooling smoke detector removal
      (2) Forward equipment cooling smoke detector cleaning
      (3) Forward equipment cooling smoke detector installation
      (4) AIRPLANES WITH SMOKE DETECTORS PART NUMBER 2156-204A; Smoke detector lamp replacement
      (5) Forward equipment cooling smoke detector operational test

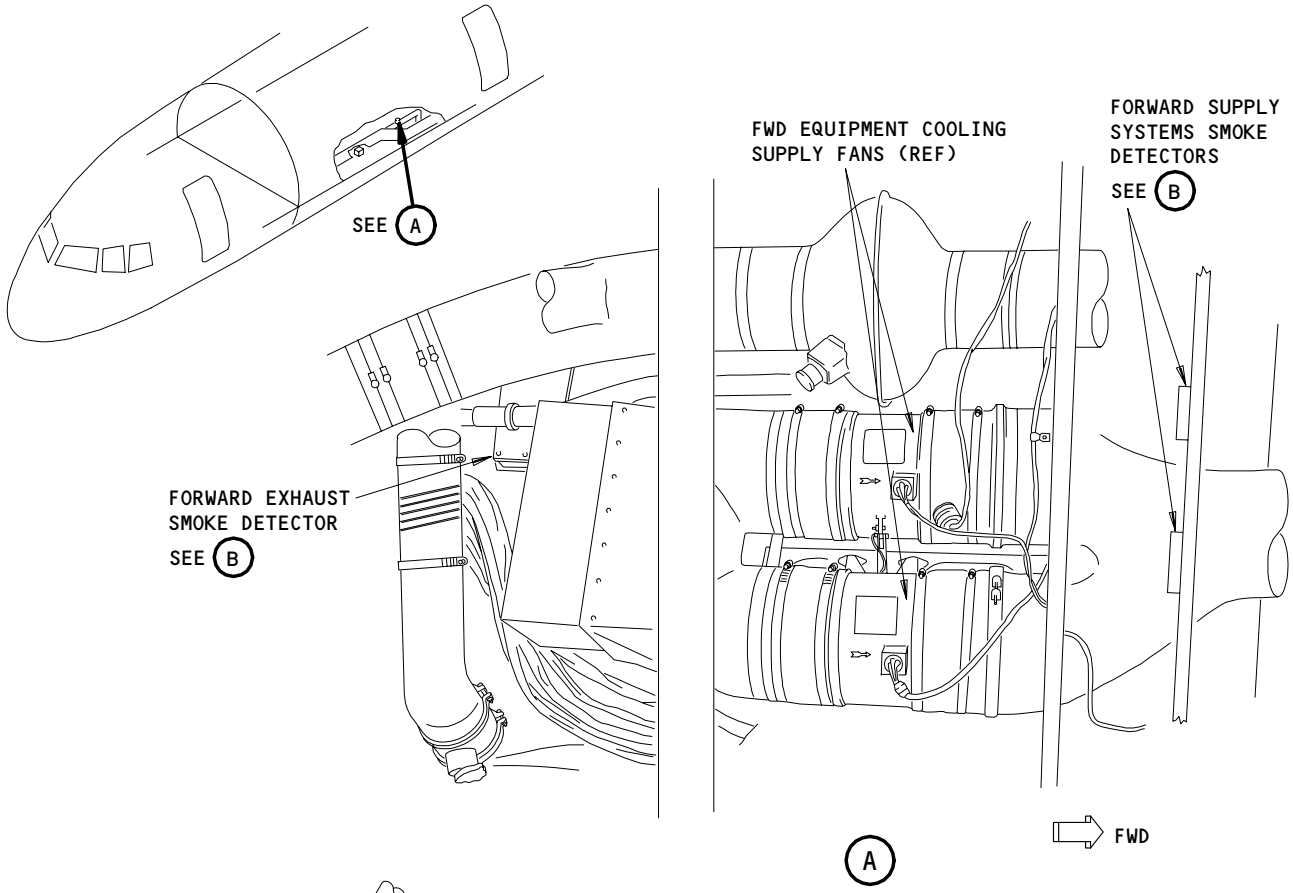
   TASK 21-58-19-022-076

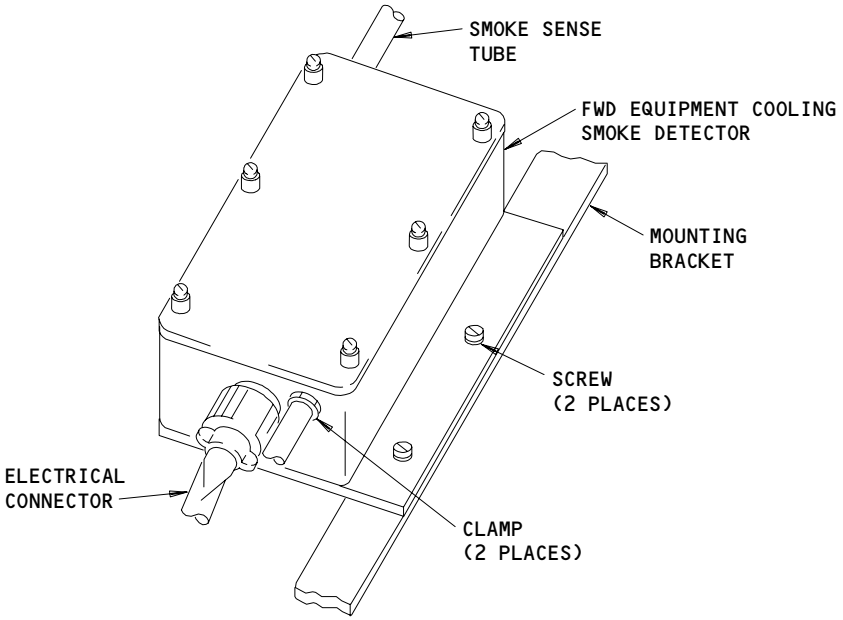
2. Forward Equipment Cooling Smoke Detectors Removal (Fig. 201)
   A. References
      (1) AMM 06-46-00/201, Entry, Service, and Cargo Doors Access Doors and Panels
      (2) AMM 25-50-02/401, Cargo Compartment Sidewall Linings
   B. Access
      (1) Location Zone
          821 No. 1 Cargo Door

   C. Prepare for the Removal

      S 862-048
      (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) On the overhead circuit breaker panel, P11:
              1) 11C20, EQUIP COOLING SMOKE DET CONT

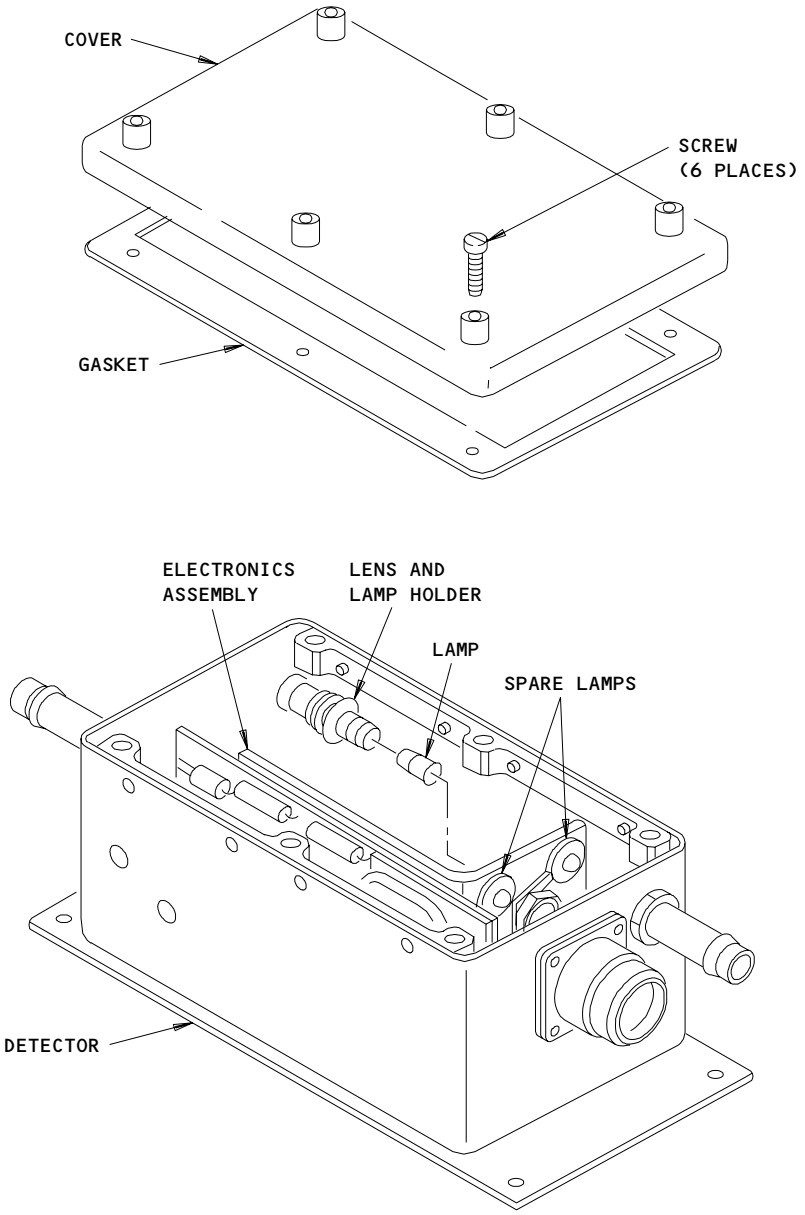
      S 012-106
      (2) Do the steps that follow to get access to the forward supply smoke sensors:
          (a) Open the No. 1 cargo door (821) (AMM 06-46-00/201).
          (b) Remove the left sidewall liner next to forward endliner (AMM 25-50-02/401).
          (c) Find the supply smoke detectors forward of the supply fans.





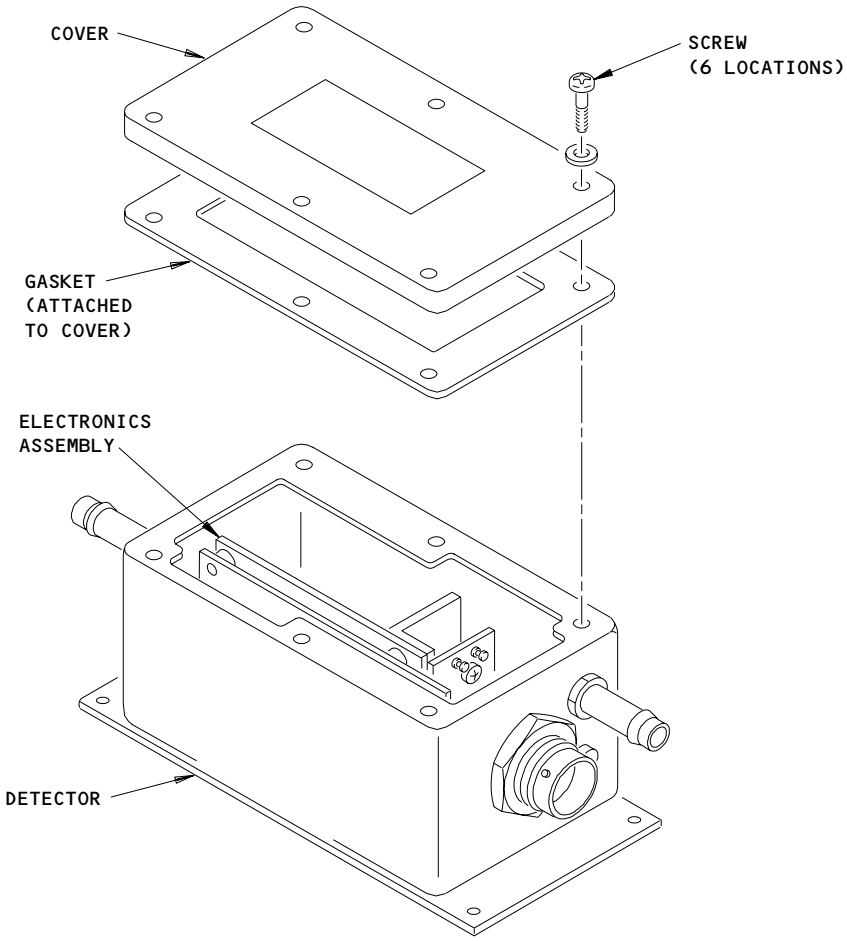
FORWARD SMOKE DETECTOR (TYP)
B

Forward Equipment Cooling Smoke Detector Installation
Figure 201



EQUIPMENT COOLING SMOKE DETECTOR

Equipment Cooling Smoke Detector Lamp Installation/Cleaning
Figure 202



EQUIPMENT COOLING SMOKE DETECTOR

Equipment Cooling Smoke Detector Cleaning
Figure 202A

S 012-108

(3) Do the steps that follow to get access to the forward exhaust smoke sensor:

(a) Remove the left sidewall lining found 4 feet (1.3 meters) aft of forward endliner (AMM 25-50-02/401).

1) Find the equipment cooling exhaust smoke detectors aft of the supply fans.

D. Procedure

S 022-007

(1) Do the steps that follow to remove the smoke detector:

(a) Disconnect the electrical connector from the smoke detector.

(b) Remove the clamps from the smoke sense tubes.

(c) Disconnect the sense tubes.

(d) Remove the four screws that hold the smoke detector to the bracket.

(e) Remove the smoke detector.

TASK 21-58-19-102-034

3. Forward Equipment Cooling Smoke Detector Cleaning

A. Equipment

(1) Dry, clean, compressed air source (15 psig).

(2) Brush - Soft Bristle

B. Consumable Materials

(1) B00130 Solvent - Isopropyl Alcohol (Commercially Available)

C. Reference

(1) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices

D. Access

(1) Location Zone

821 No. 1 Cargo Door

E. Procedure

S 912-032

CAUTION: AIRPLANES WITH SMOKE DETECTORS PART NUMBER 2156-604; DO NOT TOUCH THE SMOKE DETECTOR BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE SMOKE DETECTOR.

(1) Before you touch the smoke detector, do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 022-109
(2) Do this task: Forward Equipment Cooling Smoke Detector Removal.

S 022-053
(3) Remove six screws from the detector cover.

S 012-035
(4) Remove the detector cover and gasket.

S 162-037
(5) Use the compressed air source at a pressure that is less than 15 psig to blow air into the detector to remove the dust and debris.

S 112-038
(6) Use the isopropyl alcohol and the brush to remove unwanted material from the inside of the detector.

S 712-039
(7) Make sure the inside of the detector does not have shiny surfaces.
(a) Replace the smoke detector if the inside has shiny surfaces.

S 432-040
(8) Put the gasket and cover on the detector.

S 432-042
(9) Install the six screws to hold the cover onto the detector.
(a) Tighten the screws.

NOTE: The detector cover must be air tight.

S 422-043
(10) Do this task: Forward Equipment Cooling Smoke Detector Installation.

TASK 21-58-19-402-046

4. Forward Equipment Cooling Smoke Detector Installation

A. References
(1) AMM 06-46-00/201, Entry, Service, and Cargo Doors Access Doors and Panels
(2) AMM 25-50-02/401, Cargo Compartment Sidewall Linings

B. Access
(1) Location Zone
821 No. 1 Cargo Door

C. Procedure

S 422-008
(1) Do the steps that follow to install the smoke detector.
(a) Put the smoke detector against mounting bracket.
(b) Install the screws that attach the smoke detector to the bracket.
1) Tighten the screws.
(c) Install clamps that connect the smoke sense tubes to the smoke detector.
(d) Connect the electrical connector to the smoke detector.
1) For the Forward Supply Smoke Detector 1 (TS5267), make sure you use connector D5632.
2) For the Forward Supply Smoke Detector 2 (TS5268), make sure you use connector D5634.
3) For the Forward Exhaust Smoke Detector (TSO164), make sure you use connector D580.

S 712-009
(2) Do this task: Forward Equipment Cooling Smoke Detector Operational Test.

D. Put the Airplane Back to Its Usual Condition

S 412-010
(1) Install the sidewall liners that you removed (AMM 25-50-02/401).

S 412-011
(2) Close the forward cargo door, 821 (AMM 06-46-00/201).

S 862-013
(3) Remove the electrical power if it is not necessary.

TASK 21-58-19-902-011

5. AIRPLANES WITH SMOKE DETECTOR PART NUMBER 2156-204A;
The Smoke Detector Lamp Replacement (Fig. 202)
A. Reference
(1) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
B. Access
(1) Location Zone
821 No. 1 Cargo Door

C. Smoke Detector Lamp Removal

S 022-044
(1) Do this task: Forward Equipment Cooling Smoke Detector Removal.

S 022-013
(2) Do the steps that follow to remove the lamp:
(a) Remove six screws from detector cover.
(b) Remove the detector cover and gasket.
(c) Do this task: Forward Equipment Cooling Smoke Detector Cleaning.
(d) Remove the lamp and the lens holder from the detector.
(e) Remove lamp from lamp and lens holder.

D. Smoke Detector Lamp Installation

S 422-078

CAUTION: REPLACE LAMP WITH CM382AS10, CM382AS15, GI382AS10 OR GI382AS15 14V LAMP ONLY. INSTALLATION OF OTHER LAMPS WILL CAUSE THE SMOKE DETECTORS TO NOT OPERATE CORRECTLY.

(1) Do the steps that follow to install the lamp:
(a) Install lamp into the lamp and lens holder.
(b) Install the lamp and lens holder into the detector.
(c) Put the gasket and cover on the detector.
(d) Install the six screws to hold the cover on the detector. Tighten screws.

NOTE: The detector cover must be air tight.

S 422-047
(2) Do this task: Forward Equipment Cooling Smoke Detector Installation.

TASK 21-58-19-712-033

6. Forward Equipment Cooling Smoke Detector Operational Test

A. Reference
(1) AMM 24-22-00/201, Electric Power Control

B. Access
(1) Location Zones
211 Control Cabin Left
212 Control Cabin Right

C. Procedure

S 862-083
(1) Remove the DO-NOT-CLOSE tags and close this circuit breaker:
(a) On the P11 panel:
1) 11C20, EQUIP COOLING SMOKE DET CONT

S 712-072
(2) Do a test of the forward smoke detectors:
(a) Supply the electrical power (AMM 24-22-00/201).
(b) Make sure that the main power distribution panel (P6) circuit breaker that follows is closed:
1) 6D6, EQPT COOL GND WARN AND TEST
(c) Push the ECS/MSG pushbutton on EICAS maintenance panel on P61 panel.
(d) Hold the EQUIP COOL TEST switch on P61 panel to EQUIP COOL or FWD.

NOTE: This test can take up to 5 minutes.

(e) Make sure the OVHT light on the P5 panel comes on.
(f) Make sure the EICAS advisory message EQUIP OVHT shows.
(g) Release the EQUIP COOL TEST switch.
1) Wait 20 seconds.
(h) Make sure that these EICAS maintenance messages do not show:
1) For forward supply smoke detector 1,
FWD EQPT DET 1
2) For forward supply smoke detector 2,
FWD EQPT DET 2
3) For forward exhaust smoke detector,
FWD EQ EXH DET
4) EQPT SMOKE TEST
5) FWD EQ SUP SNSR
6) FWD EQ EXH SNSR
7) FLT DK SUP SNSR
8) OVBD EX VAL TEST

D. Put the Airplane Back to Its Usual Condition

S 412-052
(1) Close the forward cargo door, 821 (AMM 06-46-00/201).

S 862-054
(2) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

EQUIPMENT COOLING AIR CLEANER - MAINTENANCE PRACTICES

1. General
   A. The forward equipment cooling air cleaner is in the forward cargo compartment. The air cleaner removes dust particles from the E/E cooling air.
   B. This procedure has four tasks:
      (1) Remove the Air Cleaner
      (2) Clean the Air Cleaner
      (3) Install the Air Cleaner
      (4) AIRPLANES WITH SL 21-35;
          Purge Line Air Flow Test - Forward Equipment Cooling Air Cleaner

TASK 21-58-21-002-001

2. Remove the Forward Equipment Cooling Air Cleaner (Fig. 201)
   A. References
      (1) AMM 06-46-00/201, Entry, Service, and Cargo Doors Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power - Control
      (3) AMM 25-50-02/401, Cargo Compartment Sidewall Linings
   B. Access
      (1) Location Zone
          121 Forward Cargo Compartment (Left)

   C. Prepare for removal.

      S 012-139
      (1) Open the No. 1 Cargo Door (AMM 06-46-00/201).

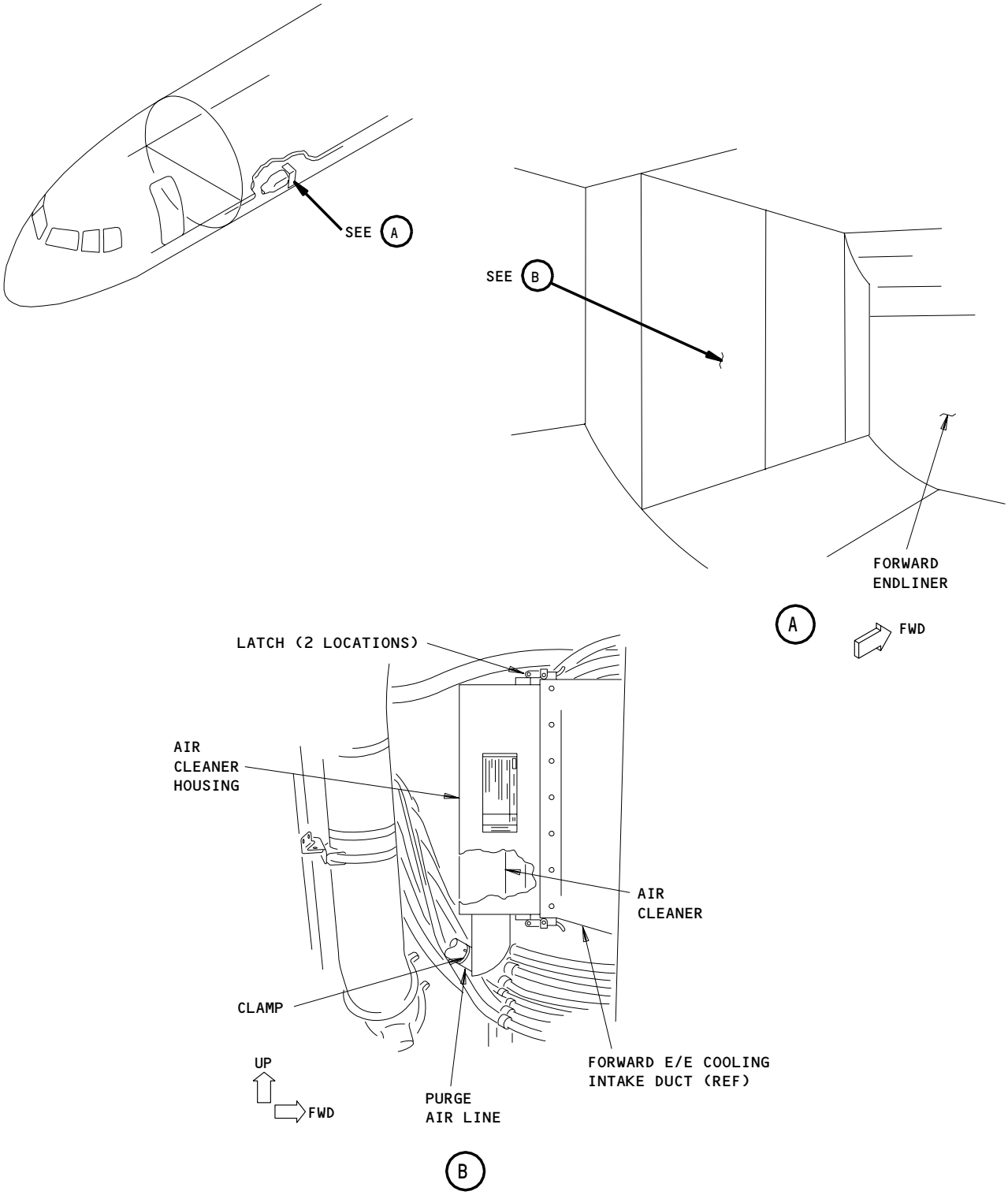
      S 862-003
      (2) Remove the electrical power from the airplane (AMM 24-22-00/201).

      S 022-004
      (3) Remove the third sidewall lining behind the cargo compartment (AMM 25-50-02/401).
   D. Remove the Equipment Cooling Air Cleaner (Fig. 201)

      S 022-005
      (1) Loosen the clamp and remove the purge air line from the air cleaner.

      S 012-006
      (2) Open the air cleaner housing.

      S 022-007
      (3) Remove the latches on the top and the bottom of the unit.



Forward Equipment Cooling Air Cleaner Installation
Figure 201

S 022-008
(4) Remove the air cleaner.

TASK 21-58-21-142-142

3. Clean Equipment Cooling Air Cleaner

A. General
(1) There are two procedures you can use to clean the air cleaner.
(a) The first procedure removes most of the loose dirt and other unwanted materials.
(b) The second procedure cleans the air cleaner fully, but special equipment and materials are necessary.

B. Equipment
(1) Vacuum cleaner - commercially available
(2) Dryer - Oven, capable of 140° F (60° C) (for procedure 2)
(3) Bath - Parts, sufficient in size to soak the air cleaner, and capable of 100 degrees F(38 degrees C) to 130 degrees F (54 degrees C) (for procedure 2)

C. Consumable Materials
(1) Use one of these:
(a) B00615, Degreaser - Solvent Emulsion, NEUGENIC 4177 (for procedure 2)
(b) Dishwashing Soap, Commercially Available (for procedure 2)

D. Clean the Air Cleaner (procedure 1)

S 022-143
(1) Do the task that removes the air cleaner.

S 142-145
(2) Use a vacuum cleaner to remove the unwanted material out of the swirl devices or use compressed air to remove the material.

S 142-146
(3) Clean the inside and the outside of the air cleaner with soap and water. Remove the unwanted material with water.

S 142-147
(4) Dry the air cleaner fully with compressed air until you can not see any water.

S 422-148
(5) Do the task that installs the air cleaner.

E. Clean the Air Cleaner (procedure 2)

S 002-149
(1) Do the task that removes the air cleaner.

S 162-150
(2) Use the vacuum cleaner or use compressed air to remove unwanted material from the swirl devices and the plenum.

S 162-151
(3) Clean the air cleaner with one of the following three methods:
(a) (Method 1) Soak the air cleaner in the cleaning solution at 100 degrees F (38 degrees C) to 130 degrees F (54 degrees C) for one hour.
1) Shake and flush the air cleaner in the cleaning solution bath.
2) Loosen and remove the remaining unwanted material with a brush.
(b) (Method 2) Clean the air cleaner with steam.
(c) (Method 3) Apply high pressure hot water and detergent to the air cleaner with a spray gun.

S 162-152
(4) Apply pressurized water to the air cleaner with a spray gun.

S 162-153
(5) Dry the air cleaner with compressed air.
(a) Dry the air cleaner in an oven at 140° F (60° C) for one hour if the air cleaner is not fully dry after you use the compressed air.

S 402-154
(6) Do the task that installs the air cleaner.

TASK 21-58-21-402-124
4. Install the Forward Equipment Cooling Air Cleaner (Fig. 201)
A. References
(1) AMM 06-46-00/201, Entry, Service, and Cargo Doors Access Doors and Panels
(2) AMM 24-22-00/201, Electric Power - Control

(3) AMM 25-50-02/401, Cargo Compartment Sidewall Linings

B. Access

(1) Location Zone

121 Forward Cargo Compartment (Left)

C. Procedure.

S 412-009

(1) Put the air cleaner in the air cleaner housing.

S 412-010

(2) Close the air cleaner housing latches.

S 422-011

(3) Attach the purge air line to the air cleaner with a clamp.

S 422-012

(4) Tighten the clamp to 13-18 pound-inches (1.5-2.0 newton-meters).

S 862-014

(5) Supply electrical power (AMM 24-22-00/201).

S 712-112

(6) Make sure that one equipment cooling supply fan operates.

S 722-015

(7) Do a check for leaks around the air cleaner:

(a) Small leaks are permitted.

(b) You must repair large leaks.

D. Put the airplane back to its usual condition.

S 422-016

(1) Install the sidewall lining (AMM 25-50-02/401).

S 412-017

(2) Close the Forward cargo door.

S 862-018
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-58-21-702-192
5. AIRPLANES WITH SL 21-35;
Purge Line Air Flow Test - Forward Equipment Cooling Air Cleaner (Fig. 202)
A. General
(1) This test is to see if the air flow in the purge line is sufficient to pull the dirt and particles out of the air cleaner.
(2) If there is not sufficient purge air flow, the air cleaner will become dirty more frequently.
(3) If there is not sufficient purge air flow, make sure the aft lav/galley/vent fan operates (AMM 21-26-00/501), and that there is no blockage or leaks in the ducts.

NOTE: If the aft lav/galley/vent fan operates at full capacity and the ducts have no leaks or blockage and there is not sufficient purge air flow, incorporation of SB 21-56 is recommended.

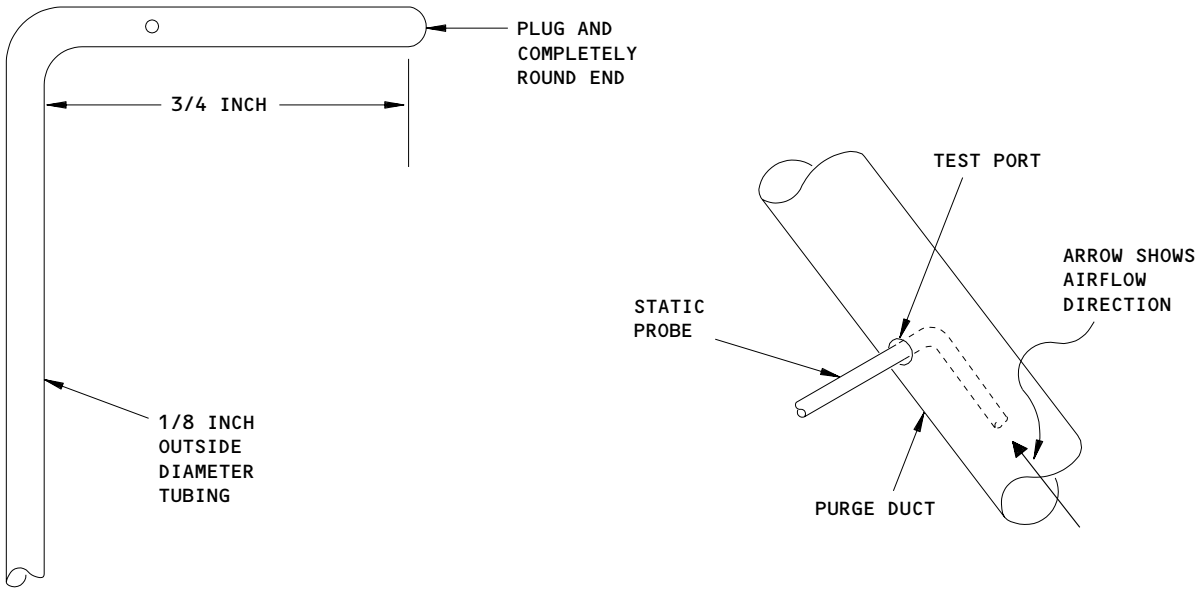
B. Equipment
(1) Static probe
(2) Vacuum gage capable of measuring up to five inches of water with an accuracy of 0.10 inches of water.
C. References
(1) AMM 06-46-00/201, Entry, Service, and Cargo Doors Access Doors and Panels
(2) AMM 21-26-00/501, Ventilation System
(3) AMM 24-22-00/201, Electric Power - Control
(4) AMM 25-50-02/401, Cargo Compartment Sidewall Linings
D. Access
(1) Location Zone
121 Forward Cargo Compartment (Left)

E. Prepare for the test.

S 862-179
(1) Supply electrical power (AMM 24-22-00/201).

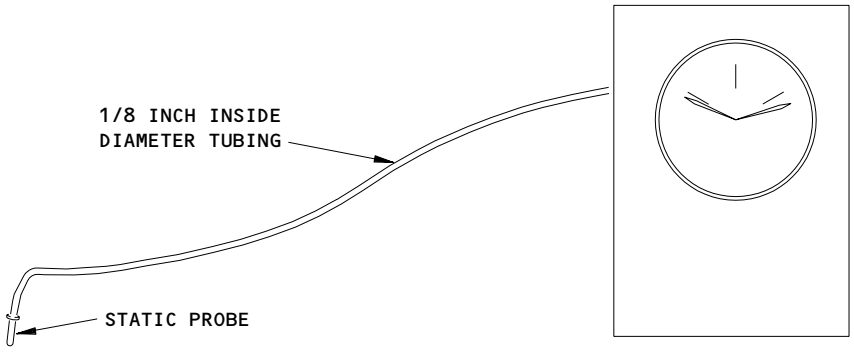
S 012-180
(2) Open the No. 1 cargo door (AMM 06-46-00/201).

S 022-181
(3) Remove the third sidewall lining behind the cargo compartment (AMM 25-50-02/401).



STATIC PROBE

NOTE: ALWAYS INSERT PROBE INTO DUCT WITH PROBE TIP FACING UPSTREAM. VARY PROBE POSITION SLIGHTLY IN ALL DIRECTIONS TO GET THE MAXIMUM PRESSURE READINGS (SMALLEST NEGATIVE PRESSURE).



VACUUM GAGE

NOTE: THE PRESSURE GAGE SHOULD ALWAYS BE HELD IN A VERTICAL POSITION.

Static Pressure Probe and Measurement Methods
Figure 202

S 212-185
(4) Find the test port in the purge duct which is approximately one inch downstream of the air cleaner.

S 012-186
(5) Remove the cover on the test port.

F. Do the Test

S 482-187
(1) Connect the test probe to the vacuum gage.

S 482-188
(2) Put the probe through the test port, pointed upstream towards the air cleaner.

S 482-189
(3) Turn the probe until the gauge reads the highest value.

S 222-190
(4) Make sure the pressure is 2.0 inches of water or more.

G. Put the Airplane Back to Its Usual Condition

S 412-191
(1) Put the cover back on the test port.

S 422-182
(2) Install the sidewall lining (AMM 25-50-02/401).

S 412-183
(3) Close the Forward cargo door (AMM 06-46-00/201).

S 862-184
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

EQUIPMENT COOLING AUXILIARY FAN - REMOVAL/INSTALLATION

1. General
   A. The auxiliary fan provides supplemental airflow to the forward equipment cooling system. The equipment cooling auxiliary fan is located in the main equipment center, 7 feet (2 meters) forward of the forward cargo compartment endliner.

TASK 21-58-22-014-001

2. Remove the Equipment Cooling Auxiliary Fan (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zone
          100 Lower Half of Fuselage

   C. Procedure for the Removal of Auxilary Fan

      S 864-002
      (1) Open this circuit breaker on the power distribution panel P6:
          (a) 6D17, EQUIP COOL AUX FAN

      S 014-003
      (2) Open the electrical-electronics bay access door 119BL (Ref 06-41-00) and find the auxiliary fan.

      S 034-004
      (3) Disconnect the electrical connector from the fan.

      S 034-005
      (4) Remove the bolts that holds the screen in place and remove the screen.

      S 034-006
      (5) Remove the clamps that hold the fan support assembly.

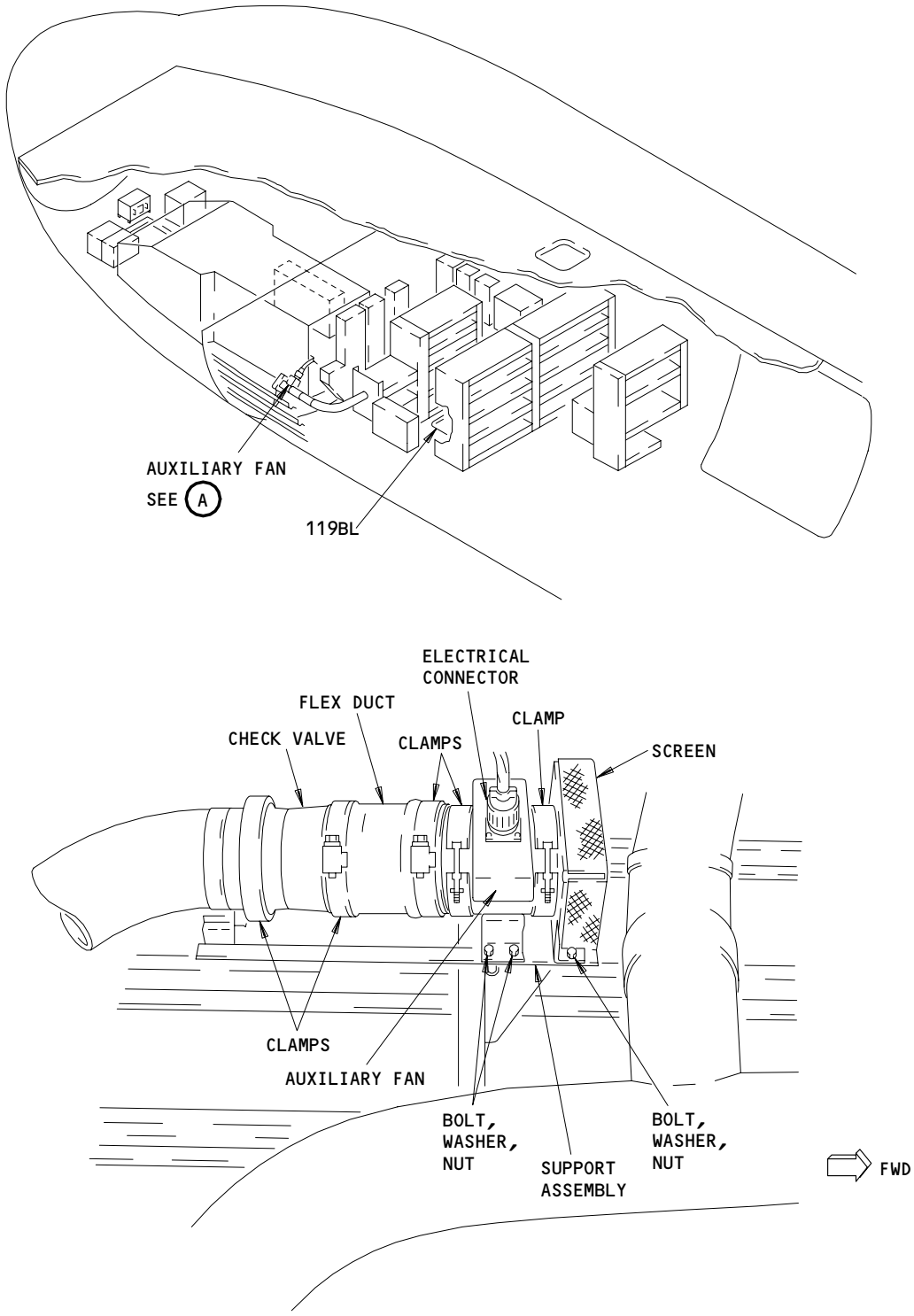
      S 034-007
      (6) Remove the clamp that holds the flex duct to the fan.

      S 034-008
      (7) Remove the bolt, washer, and nut holding the fan to the support assembly.

      S 024-009
      (8) Remove the fan.

TASK 21-58-22-414-010

3. Install Equipment Cooling Auxiliary Fan (Fig. 401)
   A. References
      (1) 24-22-00/201, Electrical Power Control



AUXILIARY FAN
A

Equipment Cooling Auxiliary Fan Installation
Figure 401

(2) 31-41-00/201, EICAS

B. Access

(1) Location Zone

100 Lower Half of Fuselage

C. Procedure for the Installation of Auxilary Fan

S 424-011

(1) Put the fan on support assembly and install bolts, washers, and nuts that hold the fan to support assembly.

S 434-012

(2) Install the clamps that hold the fan to support assembly.

S 434-029

(3) Tighten the clamps to 20-25 lb-in.

S 434-013

(4) Install the clamp holding flex duct to fan. Tighten clamps per Fig. 401.

S 434-014

(5) Put the screen in place and install bolts, washers, and nuts that hold the screen to support assembly.

S 434-015

(6) Connect the electrical connector to the fan.

S 864-033

(7) Close this circuit breaker on the P6 power distribution panel:

(a) 6D17, EQUIP COOL AUX FAN

D. Put the Airplane Back to its Usual Condition.

S 864-027

(1) Close the electrical-electronics bay access door 119BL (Ref 06-41-00).

S 864-028

(2) Remove electrical power if it is not necessary.

TASK 21-58-22-704-026

4. Do a Test of the Auxiliary Fan.

A. References

(1) 24-22-00/201, Electrical Power Control

(2) 31-41-00/201, EICAS

B. Access

(1) Location Zone

100 Lower Half of Fuselage

C. Procedure

S 864-016

(1) Supply the electrical power to left and/or right main AC bus(es) (Ref 24-22-00).

S 864-017

(2) Open these circuit breakers on the power distribution panel P6:
(a) 6F17, EQUIP COOL SUPPLY FAN 1
(b) 6F23, EQUIP COOL SUPPLY FAN 2

S 864-018

(3) Make sure this circuit breaker on the P6 panel is closed:
(a) 6D17, EQUIP COOL AUX FAN

S 714-019

(4) Push the EQUIP COOL ALTN switch/light on the P5 panel to ALTN.

S 714-020

(5) Listen to the fan noise to make sure the fan operates.

S 864-021

(6) Close these circuit breakers on the P6 panel:
(a) 6F17, EQUIP COOL SUPPLY FAN 1
(b) 6F23, EQUIP COOL SUPPLY FAN 2

S 714-022

(7) Push the EQUIP COOL ALTN switch-light on the P5 panel to the usual position.

S 714-023

(8) Erase the FWD EQ SUP FAN 1 and FWD EQ SUP FAN 2 EICAS maintenance messages (AMM 31-41-00/201).

S 414-024

(9) Close the electrical-electronics bay access door 119BL (Ref 06-41-00).

S 864-025

(10) Remove electrical power if it is not necessary.

TEMPERATURE CONTROL

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
BULB – ZONE DUCT TEMPERATURE				
FLIGHT COMPARTMENT ZONE, TS184	4	1	119BL, MAIN EQUIP CTR, LEFT SIDEWALL	21-65-04
FORWARD ZONE, TS185	4	1	SCULPTURED CEILING PANEL	21-65-04
AFT ZONE, TS186	4	1	SCULPTURED CEILING PANEL	21-65-04
BULB – ZONE TEMPERATURE				
FLIGHT COMPARTMENT ZONE, YRUTS02	5	1	CEILING PANEL, FLIGHT COMPARTMENT ZONE TEMPERATURE SENSOR MODULE, M10452	21-65-02
FORWARD ZONE, YRWTS02	5	1	STOWAGE BIN BULLNOSE, FORWARD ZONE TEMPERATURE SENSOR MODULE, M10025	21-65-02
AFT ZONE, YRVTS02	5	1	STOWAGE BIN BULLNOSE, AFT ZONE TEMPERATURE SENSOR MODULE, M10024	21-65-02
CIRCUIT BREAKERS –	1		FLT COMPT, P11	
CABIN TRIM AIR, C670		1	11P15	*
CABIN ZONE CNTLR, C667		1	11P16	*
ZONE DUCT OVHT/INOP AFT, C4031		1	11P27	*
ZONE DUCT OVHT/INOP FLT DK, C4029		1	11P25	*
ZONE DUCT OVHT/INOP FWD, C4030		1	11P26	*
ZONE TEMP CONT VLV CL AFT, C4186		1	11N27	*
ZONE TEMP CONT VLV CL FLT DK, C4184		1	11N25	*
ZONE TEMP CONT VLV CL FWD, C4185		1	11N26	*
ZONE TEMP IND, C4019		1	11P17	*
COMPUTER – (REF 31-41-00, FIG. 101)				
EICAS LEFT, M10181				
EICAS RIGHT, M10182				
CONTROLLER – (REF 21-51-00, FIG. 101)				
LEFT PACK TEMP, M126				
RIGHT PACK TEMP, M127				
CONTROLLER – ZONE TEMPERATURE, M195	1	1	119BL, MAIN EQUIP CTR, E3-3	21-61-03
FAN – ZONE TEMPERATURE SENSOR				
FLIGHT COMPARTMENT ZONE, YRUM001	5	1	CEILING PANEL, FLIGHT COMPARTMENT ZONE TEMPERATURE SENSOR MODULE, M10452	21-61-09
FORWARD ZONE, YRWM001	5	1	STOWAGE BIN BULLNOSE, FORWARD ZONE TEMPERATURE SENSOR MODULE, M10025	21-61-09
AFT ZONE, YRVM001	5	1	STOWAGE BIN BULLNOSE, AFT ZONE TEMPERATURE SENSOR MODULE, M10024	21-61-09
INDICATOR – COMPARTMENT TEMPERATURE, M10078	1		FLT COMPT, P5	21-65-01
LIGHTS – AFT ZONE INOP, YNRL3	1	1	FLT COMPT, P5, AIR COND MODULE, M10193	*
LIGHTS – FLIGHT COMPARTMENT ZONE INOP, YNRL1	1	1	FLT COMPT, P5, AIR COND MODULE, M10193	*
LIGHTS – FORWARD ZONE INOP, YNRL2	1	1	FLT COMPT, P5, AIR COND MODULE, M10193	*

* SEE THE WDM EQUIPMENT LIST

Temperature Control – Component Index
Figure 101 (Sheet 1)

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
MODULE – AIR CONDITIONING CONTROL, M10193	1	1	FLT COMPT P5	*
MODULE – ZONE TEMPERATURE SENSOR				
FLIGHT COMPARTMENT ZONE, M10452	4	1	FLT COMPT, CEILING PANEL	*
FORWARD ZONE, M10025	4	1	PASS COMPT, STOWAGE BIN BULLNOSE	*
AFT ZONE, M10024	4	1	PASS COMPT, STOWAGE BIN BULLNOSE	*
MUFFLER – TRIM AIR	6	2	821, FWD CARGO COMPT, AFT LINING, MIX BAY	21-61-12
PANEL – (REF 31-41-00, FIG. 101)				
EICAS MAINTENANCE, M10372				
RELAY – (REF 31-01-36, FIG. 101)				
AIR/GND SYS 1, K141				
RELAYS – (REF 31-01-37, FIG. 101)				
AFT ZONE AUTO/OFF, K10313				
AFT ZONE DUCT OVHT, K240				
AFT ZONE INOP, K10364				
FLT DK ZONE AUTO/OFF, K10311				
FLT DK ZONE DUCT OVHT, K238				
FLT DK ZONE INOP, K10362				
FWD ZONE AUTO/OFF, K10312				
FWD ZONE DUCT OVHT, K239				
FWD ZONE INOP, K10363				
SELECTOR – ZONE TEMPERATURE			FLT COMPT P5, AIR COND MODULE, M10193	
FLIGHT COMPARTMENT ZONE, YNRS6	1	1		21-61-04
FORWARD ZONE, YNRS7	1	1		21-61-04
AFT ZONE, YNRS8	1	1		21-61-04
SENSOR – DUCT AIR TEMPERATURE				
FLIGHT COMPARTMENT ZONE, TS175	4	1	119BL, MAIN EQUIP CTR, LEFT SIDEWALL	21-61-02
FORWARD ZONE, TS177	4	1	SCULPTURED CEILING PANEL	21-61-02
AFT ZONE, TS179	4	1	SCULPTURED CEILING PANEL	21-61-02
MIX MANIFOLD 1, TS200	4	1	821, FWD CARGO COMPT, AFT LINING, MIX MANIFOLD	21-61-02
MIX MANIFOLD 2, TS201	4	1	821, FWD CARGO COMPT, AFT LINING, MIX MANIFOLD	21-61-02
SENSOR – ZONE TEMPERATURE				
FLIGHT COMPARTMENT ZONE, YRUTS01	5	1	CEILING PANEL, FLIGHT COMPARTMENT ZONE TEMPERATURE SENSOR MODULE, M10452	21-61-08
FORWARD ZONE, YRWTS01	5	1	STOWAGE BIN BULLNOSE, FORWARD ZONE TEMPERATURE SENSOR MODULE, M10025	21-61-08
AFT ZONE, YRVTS01	5	1	STOWAGE BIN BULLNOSE, AFT ZONE TEMPERATURE SENSOR MODULE, M10024	21-61-08
SWITCH – ZONE DUCT OVHT				
FLIGHT COMPARTMENT ZONE, S21	4	1	119BL, LEFT SIDEWALL	21-61-01
FORWARD ZONE, S22	4	1	SCULPTURED CEILING PANEL	21-61-01
AFT ZONE, S23	4	1	SCULPTURED CEILING PANEL	21-61-01

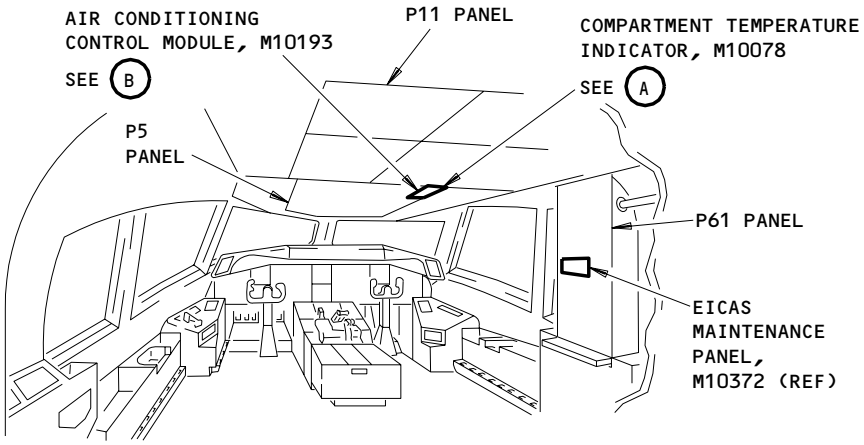
* SEE THE WDM EQUIPMENT LIST

Temperature Control – Component Index
Figure 101 (Sheet 2)

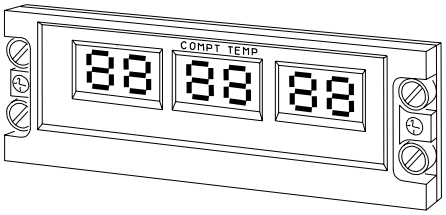
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
SWITCH-LIGHT - TRIM AIR, YNRS3	1	1	FLT COMPT, P5, AIR COND MODULE M10193	21-61-01
UNIT - (REF 49-61-00, FIG. 101)				
APU CONTROL, M206				
VALVE - TRIM AIR MODULATING				
FLIGHT COMPARTMENT ZONE, V1	3	1	821, FWD CARGO COMPT, AFT LINING	21-61-07
FORWARD ZONE, V2	3	1	821, FWD CARGO COMPT, AFT LINING	21-61-07
AFT ZONE, V3	3	1	821, FWD CARGO COMPT, AFT LINING	21-61-07
VALVE - TRIM AIR PRESSURE REGULATING, V4	2	1	193HL, LEFT ECS BAY	21-61-06
VALVE - LEFT TRIM AIR SUPPLY CHECK	2	1	193HL, LEFT ECS BAY	21-61-05
VALVE - RIGHT TRIM AIR SUPPLY CHECK	2	1	194ER, RIGHT ECS BAY	21-61-05

* SEE THE WDM EQUIPMENT LIST

Temperature Control - Component Index
Figure 101 (Sheet 3)

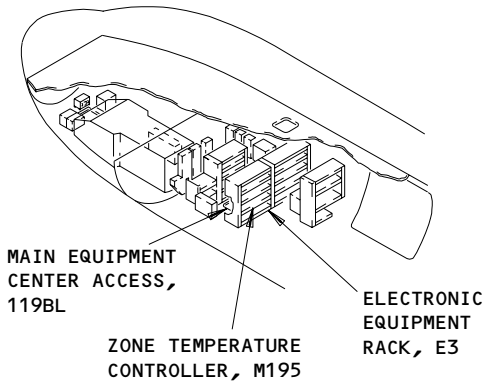


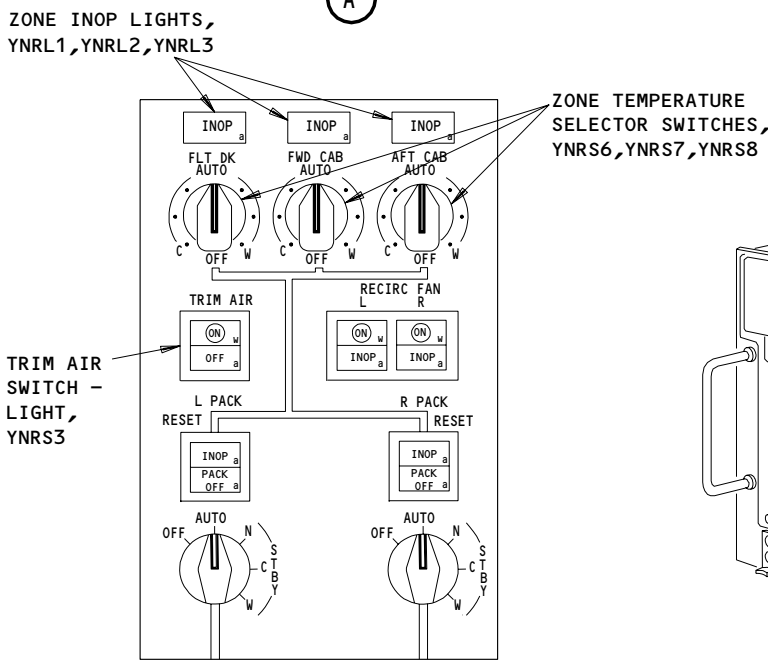
FLIGHT COMPARTMENT



COMPARTMENT TEMPERATURE
INDICATOR, M10078

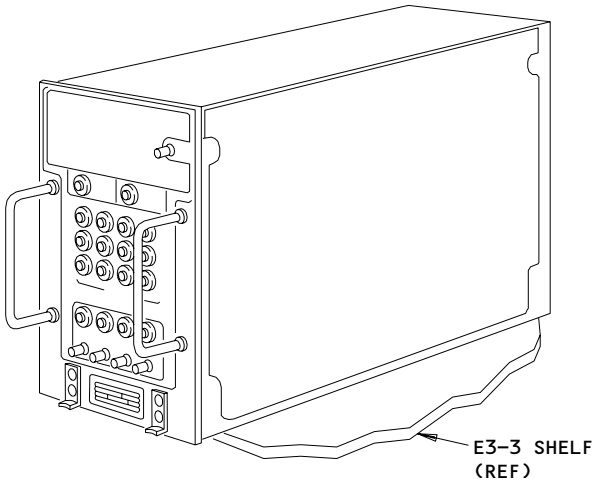
A





AIR CONDITIONING CONTROL MODULE, M10193

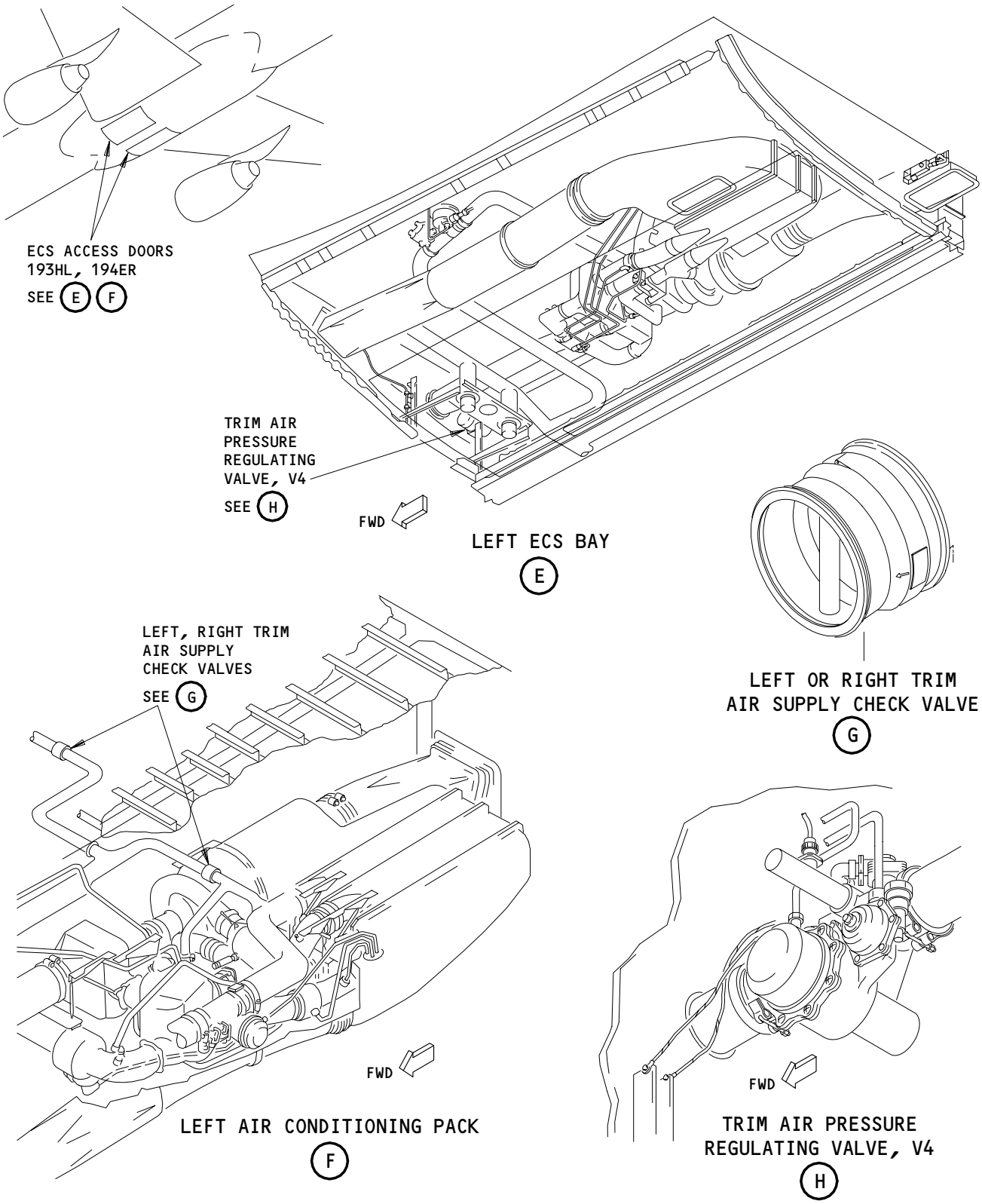
B



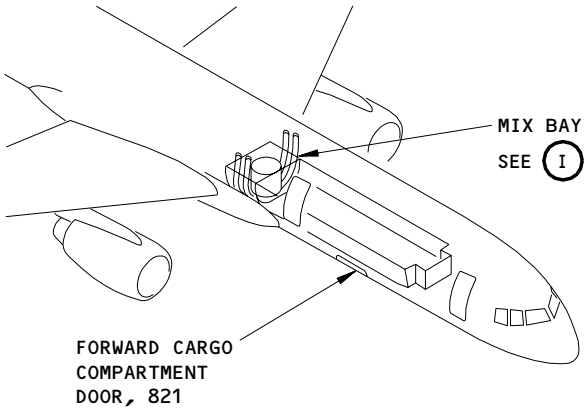
ZONE TEMPERATURE CONTROLLER, M195

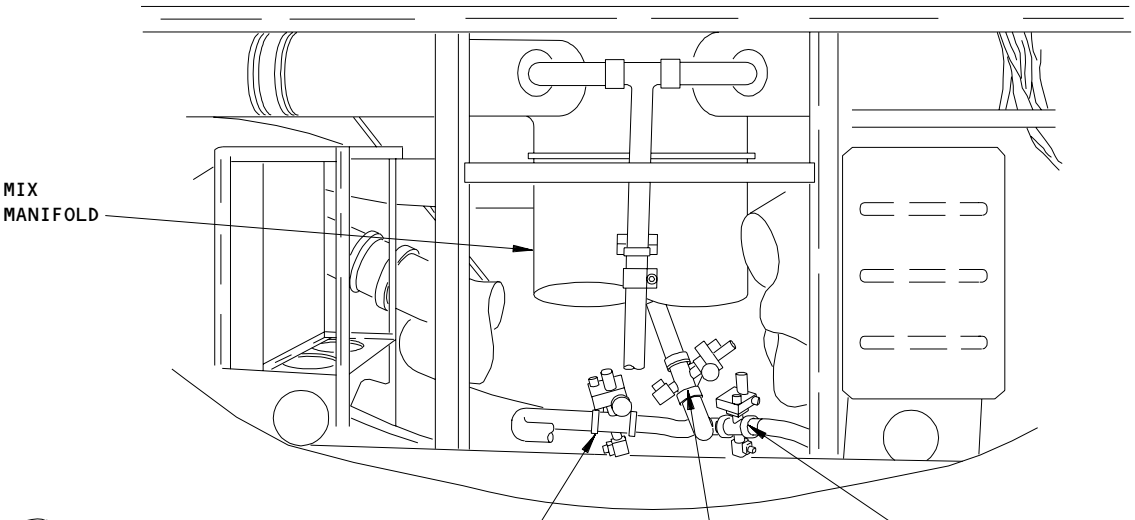
C

Temperature Indication – Component Location
Figure 102 (Sheet 1)

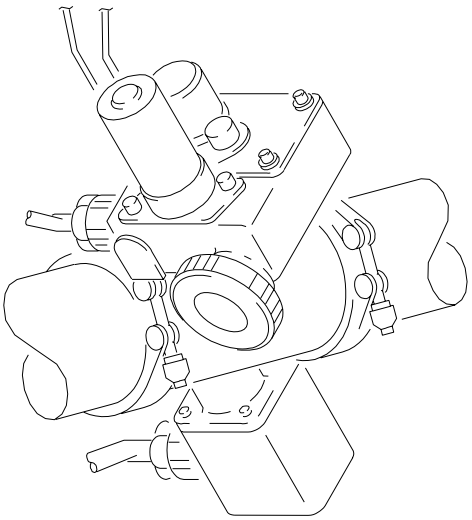


Temperature Indication - Component Location
Figure 102 (Sheet 2)



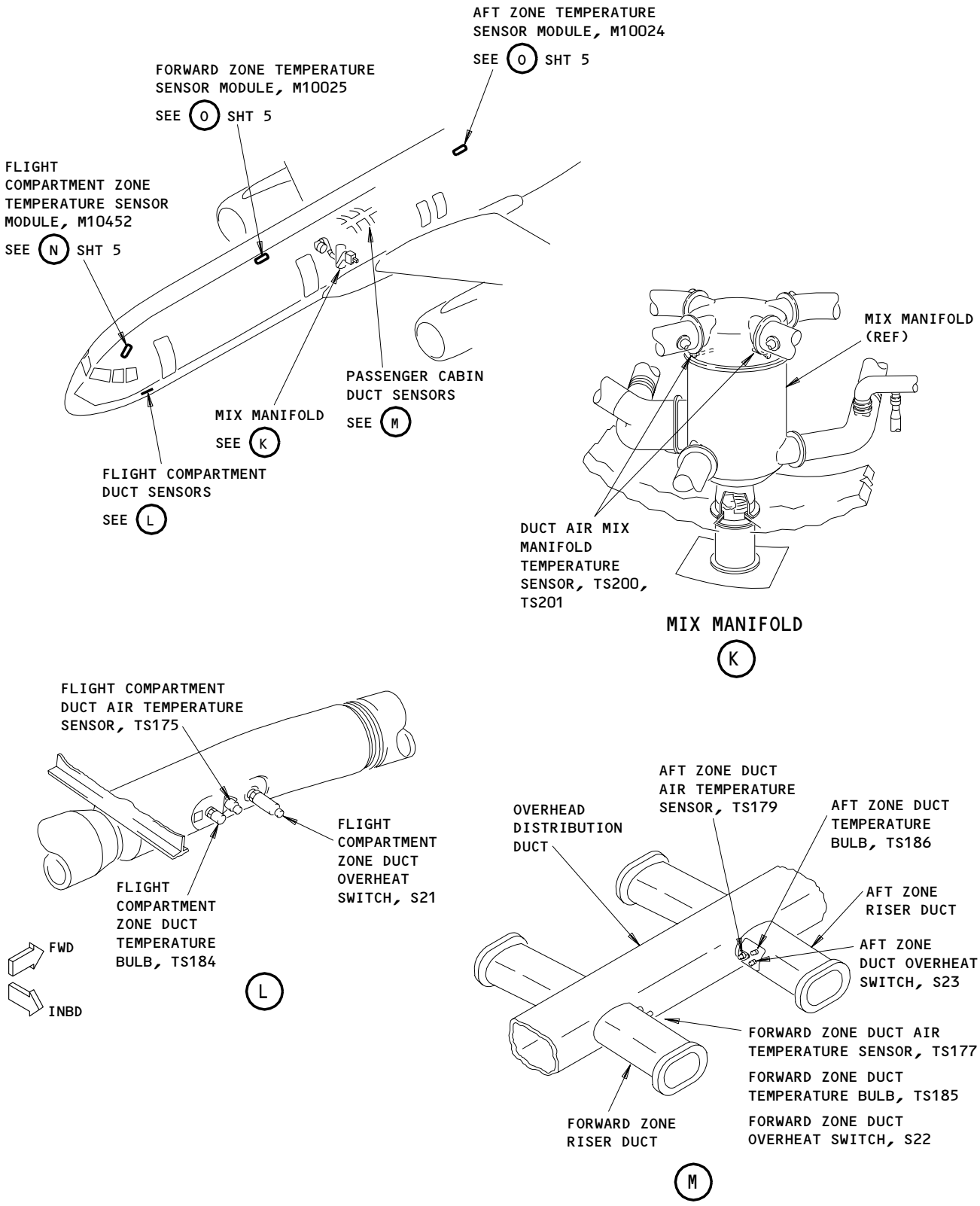


MIX BAY
(VIEW IN THE AFT DIRECTION)
(I)



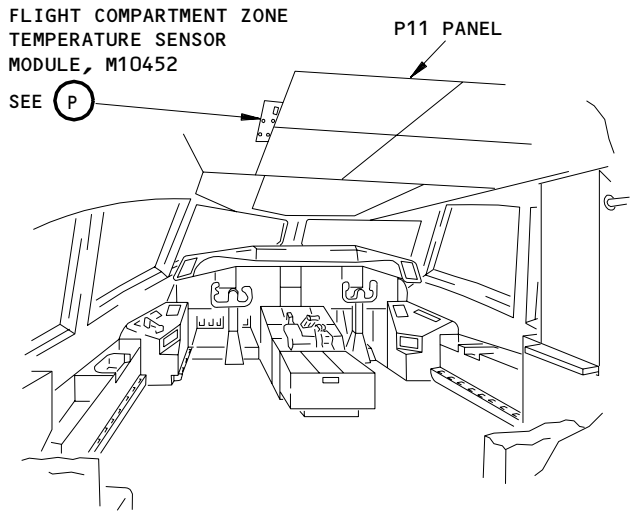
TRIM AIR MODULATING
VALVE, V1,V2,V3
(J)

Temperature Indication - Component Location
Figure 102 (Sheet 3)



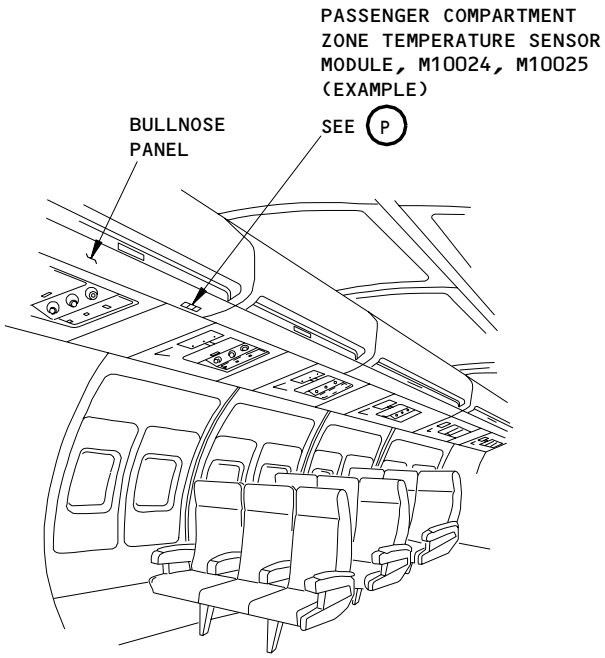
Temperature Indication - Component Location
Figure 102 (Sheet 4)

187443



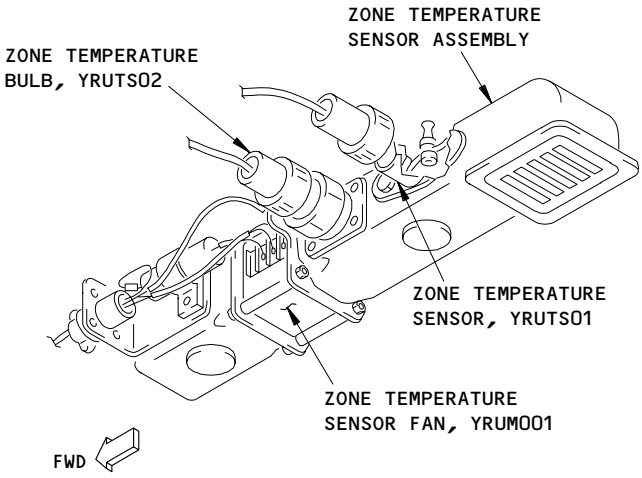
FLIGHT COMPARTMENT

(N) FROM SHT 4



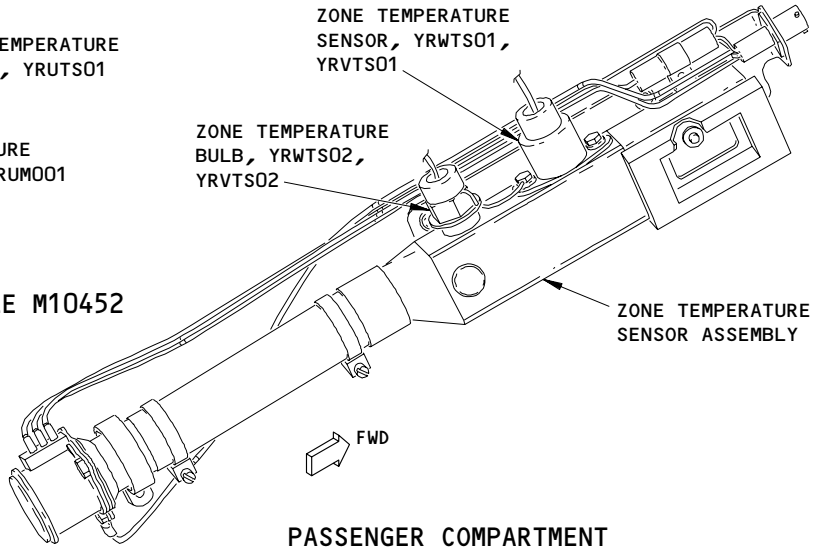
PASSENGER COMPARTMENT

(O) FROM SHT 4



FLIGHT COMPARTMENT
ZONE TEMPERATURE SENSOR MODULE M10452

(P)

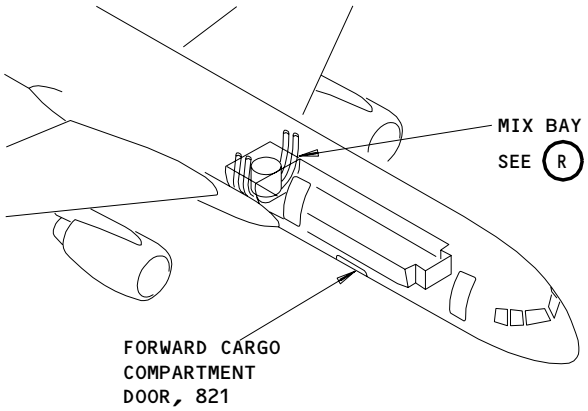


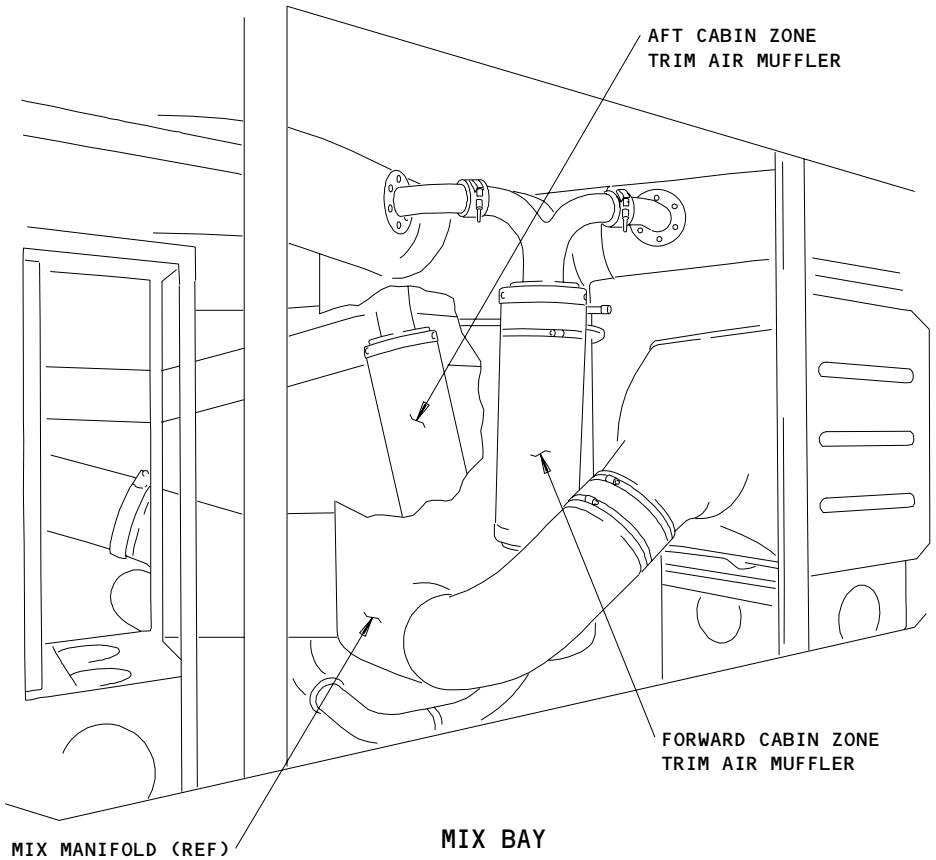
PASSENGER COMPARTMENT
ZONE TEMPERATURE SENSOR MODULE, M10024,M10025 (EXAMPLE)

(P)

Temperature Indication - Component Location
Figure 102 (Sheet 5)

H54844



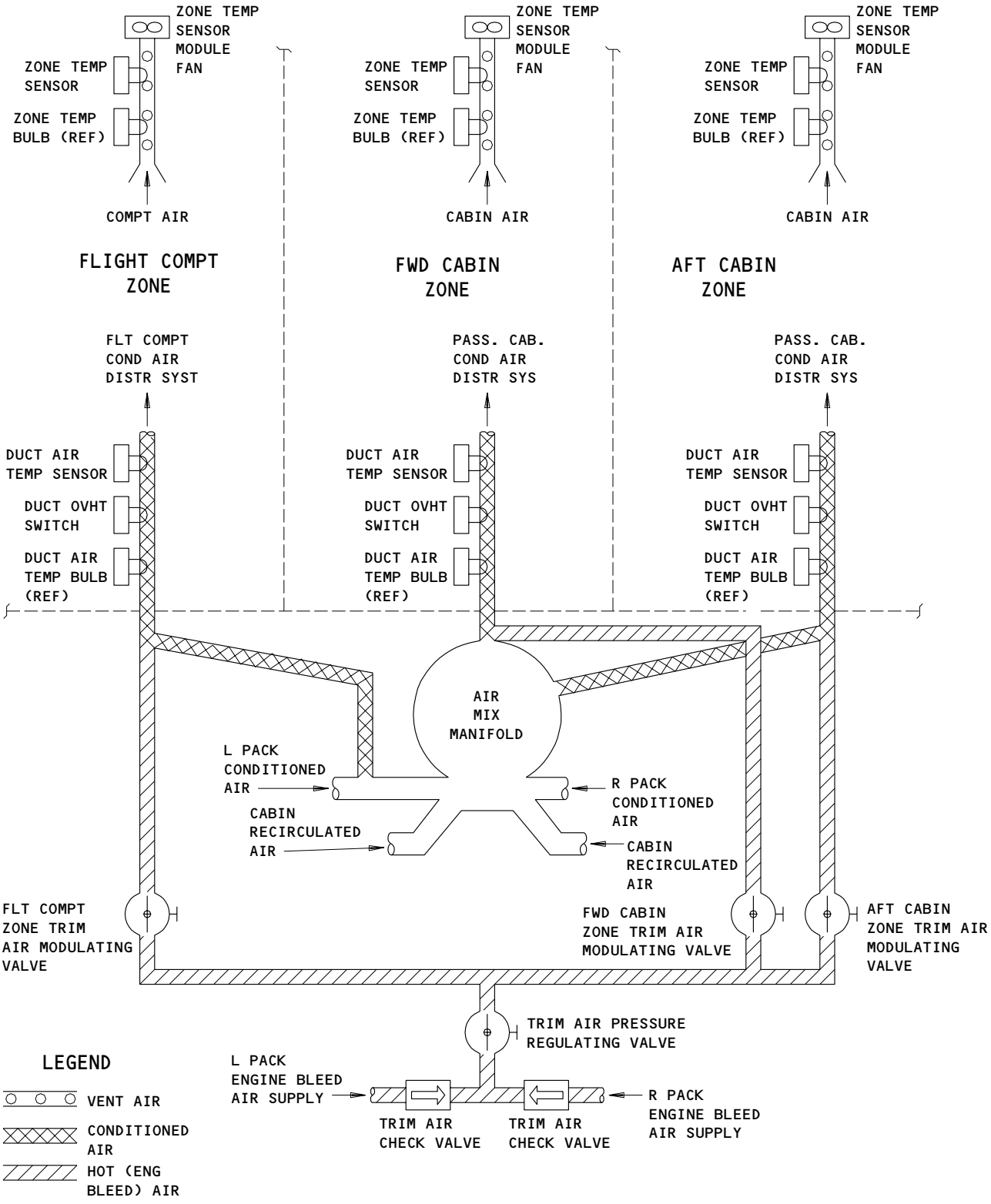


MIX BAY
(VIEW IN THE AFT DIRECTION)
R

Temperature Indication - Component Location
Figure 102 (Sheet 6)

PRIMARY (ZONE) TEMPERATURE CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The primary (zone) temperature control system controls the temperature of the air given to each cabin zone (AMM 21-22-00/001, 21-23-00/001). The system uses a mixture of warm pneumatic air and cool air from the air cooling packs (AMM 21-51-00/001). This will give satisfactory air temperature for the passenger and crew.
      (1) The primary (zone) temperature control system includes the components that follow:
         (a) One zone temperature controller
         (b) Three trim air modulating valves
         (c) Two check valves for the trim air supply
         (d) One pressure regulating valve for the trim air supply
         (e) Three zone temperature sensors
         (f) Three duct overheat switches
         (g) Five duct temperature sensors
         (h) Temperature selector switches for three zones
         (i) Three amber INOP warning lights.
      (2) The temperature of the conditioned air is controlled with the trim air from the downstream side of the flow control and shutoff valve (AMM 21-51-00/001). A mixture of trim air, cooling pack air (AMM 21-51-00/001) and recirculation air (AMM 21-25-00/001) are used to supply the necessary air temperature. The air temperature can be controlled for each cabin zone; the flight compartment, forward passenger cabin, and aft passenger cabin.
      (3) The zone temperature controller uses an input temperature from each zone to operate the temperature control system automatically. This input temperature gives the necessary demand to the controller for an increase or decrease in temperature for each zone. The controller uses the demand signal to operate the three modulating valves. The modulating valves controls the mixture of warm air and cool air that is supplied to each zone.
      (4) The primary (zone) temperature indication system (AMM 21-65-00/001) supplies a visual indication of the temperature control system.
      (5) Three modulating valves for the trim air supply are installed in the trim air ducts for each zone, downstream of the pressure regulating valve. The modulating valve positions are electrically adjusted. These valves supply the necessary air temperature to the flight compartment, the forward passenger zone, or the aft passenger zone.
      (6) Two trim air mufflers are installed in the trim air ducts for the passenger cabin zone, downstream of the modulating valves. The mufflers decrease the noise of the conditioned air that is supplied to the two passenger cabin zones.
      (7) The temperature control system contains two check valves for the trim air supply. The check valves are installed in the trim air ducts for each zone. The check valves will not let trim air go into the pack inlet if the air cooling pack stops.



Primary (Zone) Temperature Control System
Figure 1

(8) The pressure regulating valve for the trim air system controls the pressure of the pneumatic system air that is supplied to the modulating valves. A TRIM AIR switch-light on the pilot's overhead panel, P5, controls the valve position.

(9) A duct overheat switch is installed in the duct that goes to each cabin zone. The overheat switch operates as a thermal protective device and closes the applicable modulating valve if the zone duct temperature increases more than 190°F.

(10) There are five duct air temperature sensors. The sensors get input of the temperature of the supply air that goes into the zone ducts and the two mix manifold outlets. The sensors also supply inputs to the zone controller and pack controllers.

(11) There is one temperature sensor for each of the three cabin zones. Each sensor sends a temperature signal to the zone temperature controller. The temperature sensor for the flight compartment also sends a temperature signal to the left pack temperature controller. The temperature sensor for the forward zone also sends a temperature signal to the right pack temperature controller (AMM 21-51-00/001).

(12) There is one temperature selector switch for each cabin zone, installed on the pilots' overhead panel, P5. These switches permit the selection of the AUTO control of the temperature control system.

2. Component Details

A. Zone Temperature Sensors (Fig. 2)

(1) Description

(a) The zone temperature sensors are dual element sensors. Each element has two glass sealed thermistors connected in series and are fully sealed in a stainless steel probe-type housing.

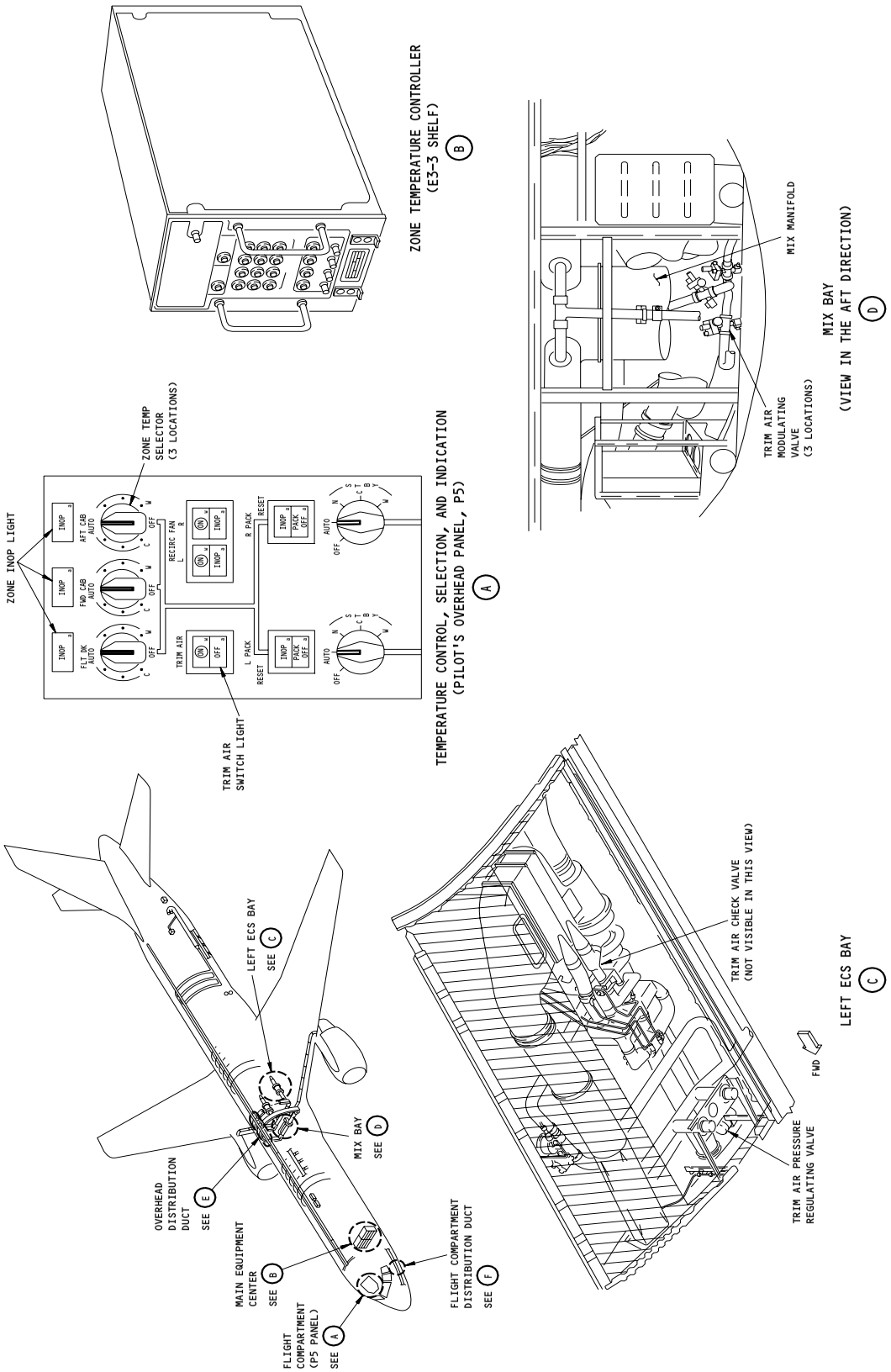
(2) Function

(a) The temperature sensor measures the air temperature for each cabin zone. The thermistor operates at low current levels to keep to a minimum the temperature changes because of the effect of internal sensor heat. The resistance in each thermistor increases when the input temperature decreases and the resistance decreases when the input temperature increases. The input temperature is sent electrically to the zone temperature controller and to the pack temperature controllers (AMM 21-51-00/001).

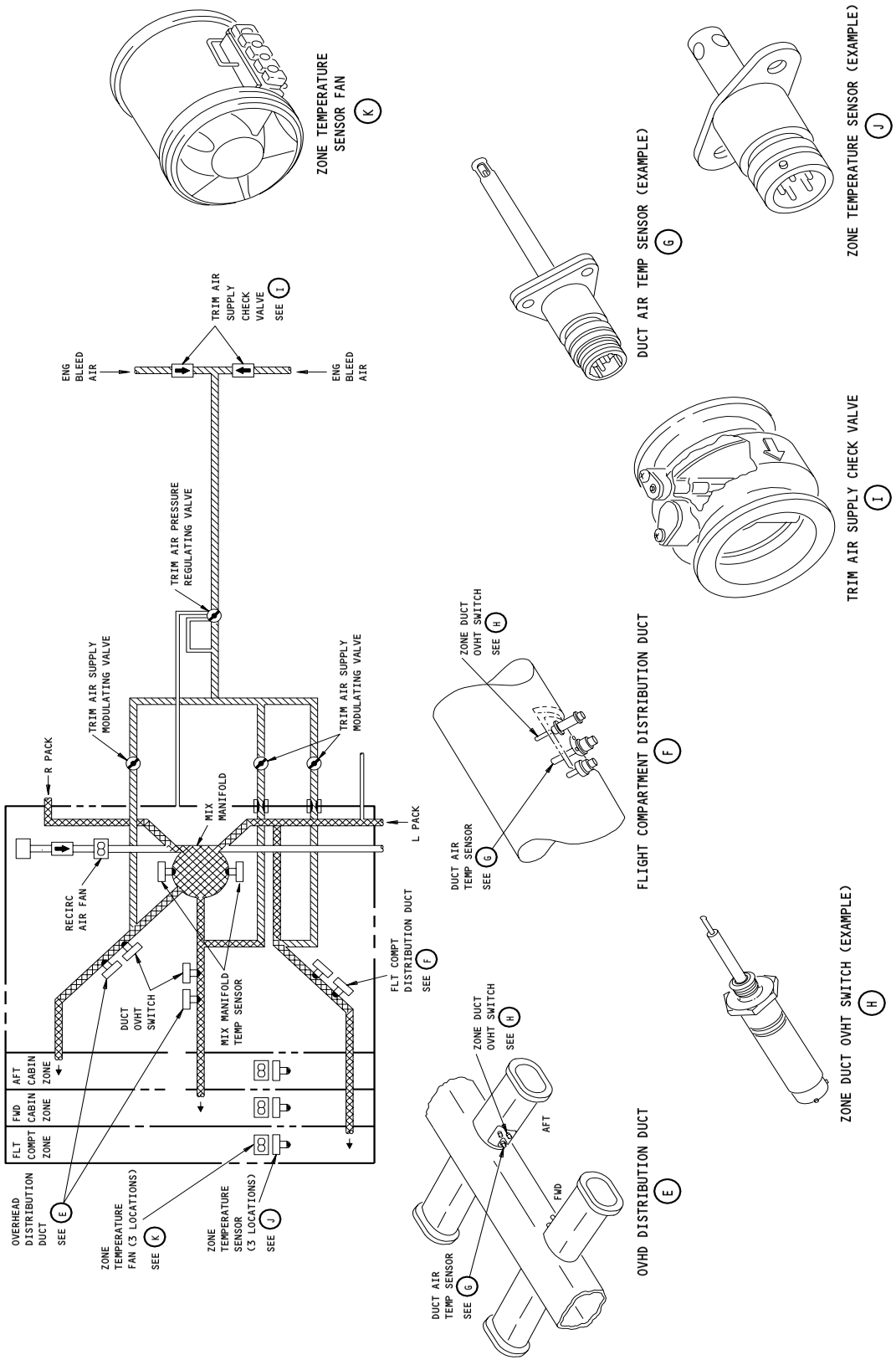
B. Duct Temperature Sensors (Fig. 2)

(1) Description

(a) The duct temperature sensors are one element sensors that have two thermistors that are glass sealed and connected in series. The thermistors are sealed in a probe-type housing with an electrical connector that is part of the thermistor and housing. The sensor is installed on a three-hole flange with a gasket. The sensor has a temperature control range of 35°F (1.7°C) to 180°F (82°C) and an operating temperature range of -65°F (-54°C) to 350°F (177°C).



Primary (Zone) Temperature Control System Components
Figure 2 (Sheet 1)



Primary (Zone) Temperature Control Components
Figure 2 (Sheet 2)

69001

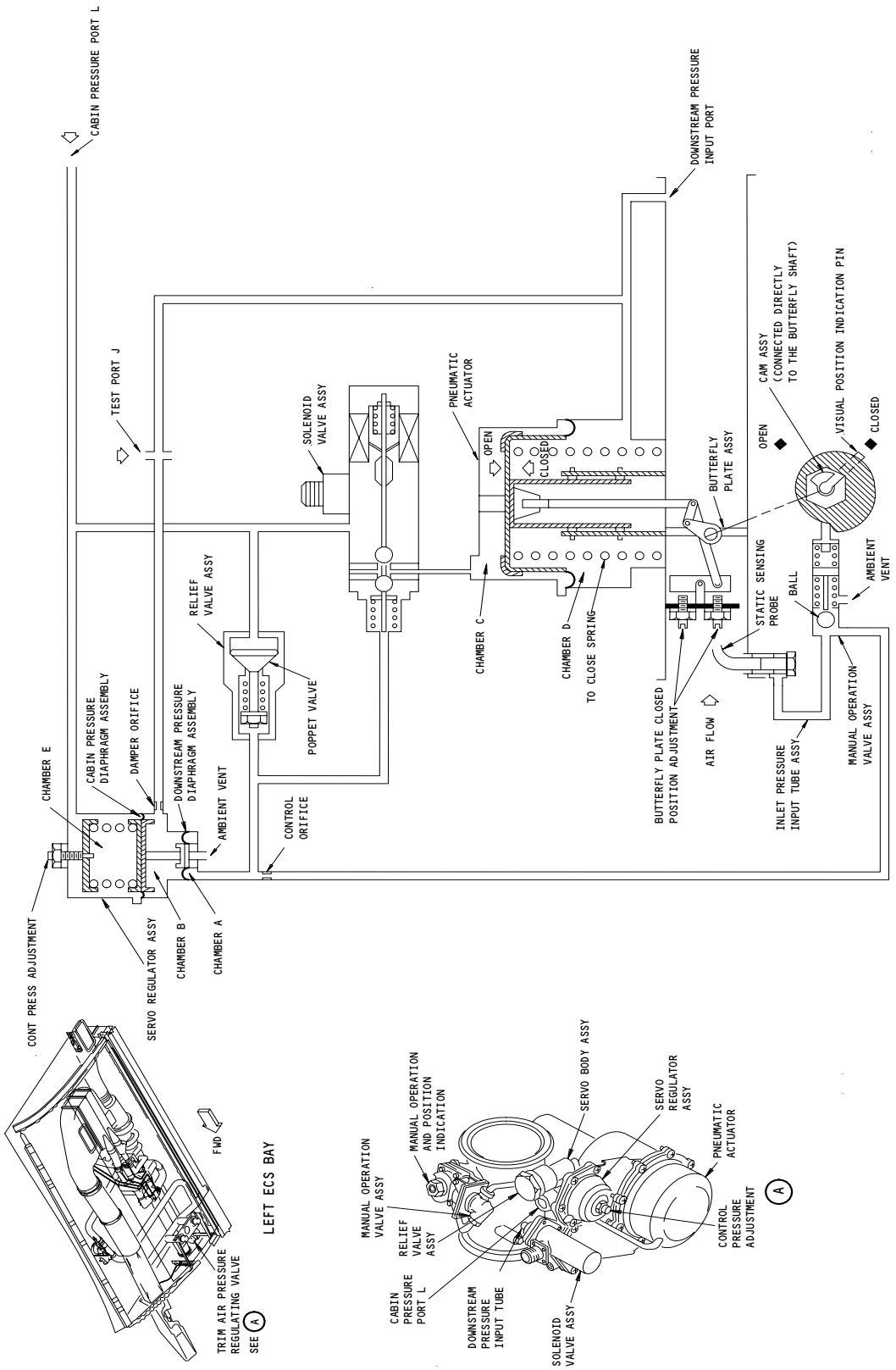
(2) Function
(a) Duct Temperature Sensors for the Zone Inlet
1) A duct temperature sensor is installed in the inlet duct for each cabin zone. Each sensor supplies a temperature signal to the zone temperature controller.
(b) Duct Temperature Sensors for the Mix Manifold
1) Two duct temperature sensors are installed on the mix manifold. Each sensor supplies a temperature signal to a pack temperature controller.

C. Duct Overheat Switches (Fig. 2)
(1) Description
(a) The zone duct overheat switch includes a liquid-filled probe, a housing, and an electrical connector. The housing includes a diaphragm welded to the housing, a spring and retainer, and a switch. The spring holds the diaphragm and the retainer prevents too much extension of the spring.
(2) Function
(a) As the duct temperature increases, the pressure in the probe will increase in proportion to the increased temperature because of the expanded liquid. The diaphragm feels the pressure increase and at 190°F (88°C) the pressure is larger than the spring force and the switch will operate. When the temperature decreases to 160°F (71°C), the spring goes back suddenly. The switch will operate when the duct temperature increases. The switch will operate the circuitry to close the applicable modulating valve. This will also cause a yellow INOP light on the pilot's overhead panel, P5, to come on.

D. Check Valves for the Trim Air Supply (Fig. 2)
(1) Description
(a) The check valve for the trim air supply includes two semicircular flappers connected to a pin that goes through the center of the valve housing. The flappers are vertical to the valve housing axis. The flappers, pin, and flapper stop pin are installed in the one-piece valve housing. A flow arrow, on the side of the valve housing, shows the direction of the correct airflow.
(2) Function
(a) The flow of air in the direction of the flow arrow will open the flappers until they touch the stop pin. The opposite flow of air will close the flappers. When the valve is closed, it prevents the flow of air in the opposite direction.

E. Zone Temperature Selectors (Fig. 2)
(1) Description
(a) Each zone temperature selector has a selector shaft at one end of the housing. A knob and a twelve-pin connector are installed on opposite ends of the selector shaft. A name plate and a wire diagram label are attached to the housing. The selector includes a potentiometer, switches, and a cam assembly.
(2) Function
(a) Turn the temperature selector switch to get the AUTO or OFF temperature control mode. In the AUTO mode, turn the knob between C and W to select the temperature between 65°F (18°C) and 85°F (29°C).

F. Pressure Regulating Valve for the Trim Air System (Fig. 3)
(1) Description
(a) The pressure regulating valve for the trim air system is a three-inch diameter butterfly valve. The valve is electrically controlled and pneumatically operated. The valve includes the components that follow:
1) Servo regulator assembly
2) Solenoid valve assembly
3) Relief valve assembly
4) Pneumatic actuator
5) Valve flow section
6) Manual operation assembly.
(b) The servo regulator assembly includes a servo cover, two air diaphragms installed on a valve seat, and a housing. The diaphragms divide the assembly into three chambers. One chamber receives cabin pressure, a second chamber receives downstream pressure, and the third chamber receives supply pressure for the servo regulator assembly. A spring retainer controls pressure adjustment.
(c) The solenoid valve assembly includes a solenoid and a ball valve. The relief valve assembly has a closed poppet valve which has a load on it caused by a spring.
(d) The pneumatic actuator includes a cover, a spring, a diaphragm which divides the actuator into two chambers, an actuator linkage, and a housing. The diaphragm is closed because of spring force. The diaphragm is attached with bolts to the linkage which is attached to the butterfly plate.



Trim Air Pressure Regulating Valve
Figure 3

86689

(e) The valve flow section has a butterfly plate which is attached to a shaft in the housing.

(f) The manual operation assembly includes a ball valve, an operator, and a cam. The operator includes a rod that touches the ball part of the ball valve. The rod has a load on it caused by a spring. This load is applied against a cam on the end of the butterfly shaft. A pin is attached to the cam and gives the position of the valve.

(2) Function

(a) Apply 28 v dc power to the valve-open coil to open the ball valve for the solenoid valve assembly. In the servo regulator assembly, the chamber E pressure is equal to the cabin pressure plus the spring force. The chamber E pressure is opposite to the downstream pressure plus the upstream pressure. If the chamber E pressure is larger, the upstream air goes through the open ball valve. The upstream air then goes to the open side of the pneumatic actuator.

(b) The pressure in chamber C of the pneumatic actuator is opposite to the downstream pressure plus the spring force. If the chamber C pressure is larger, the actuator linkage opens the butterfly plate. The butterfly plate then adjusts to keep a constant downstream pressure. The solenoid latch holds the solenoid in position when power is removed.

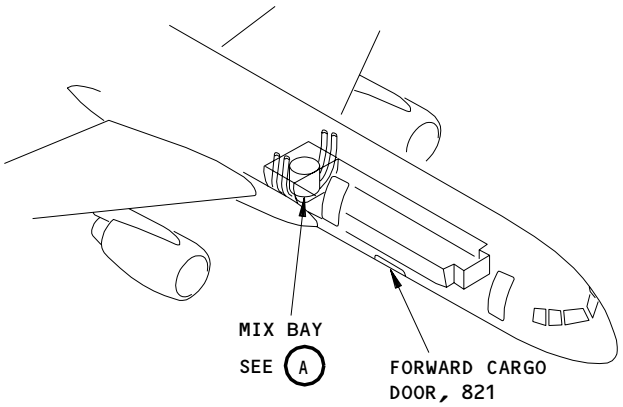
(c) If the smaller diaphragm in the servo regulator assembly becomes defective, the downstream pressure will control at a lower pressure. If the larger diaphragm becomes defective, the servo regulator valve will control at a higher pressure. If the two diaphragms become defective, the relief assembly poppet valve will open when the upstream pressure is larger than the chamber E pressure. This will keep to a limit the control pressure and prevent the rupture of the actuator diaphragm assembly.

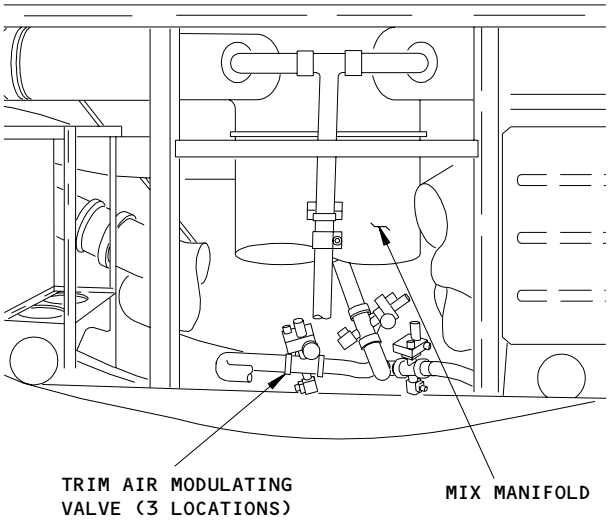
(d) Apply 28 v dc power to the valve closed coil, in the solenoid valve assembly, to put the ball valve in the closed position. The opening chamber of the pneumatic actuator will open to the cabin pressure port and the butterfly plate will close. The solenoid latch holds the solenoid in position when power is removed.

(e) The valve can be manually opened if the cam is turned counterclockwise (CCW). The cam can be locked with a lockwire, to keep the valve in this position. Turn the cam CCW to set the ball in the manual operator valve assembly. This will send the upstream air to the servo regulator assembly.

(f) The valve can be manually closed by if the cam is turned clockwise (CW). The cam must be locked with a lockwire to keep the valve in this position. Turn the cam CW to set the ball in the opposite position as that to manually open the valve. The upsteam air will bleed to ambient.

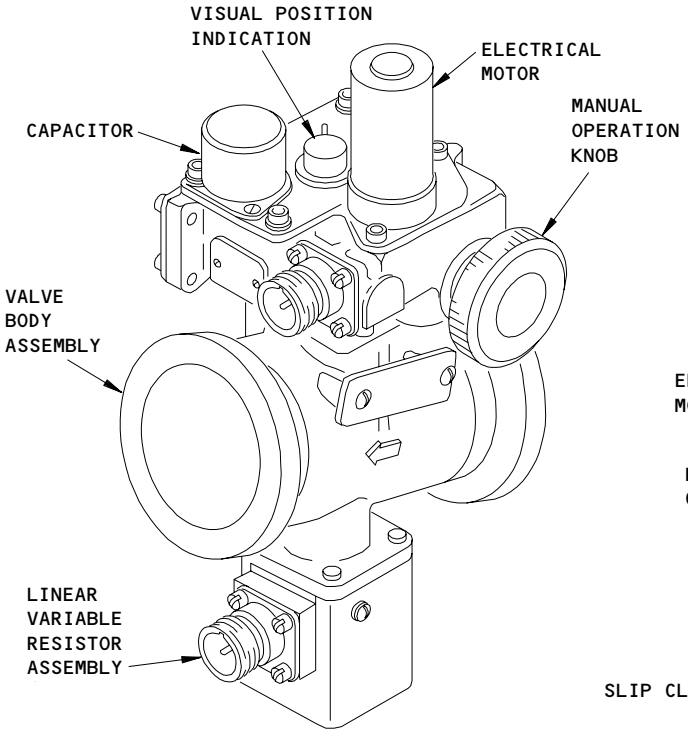
G. The Modulating Valve for the Trim Air (Fig. 4)



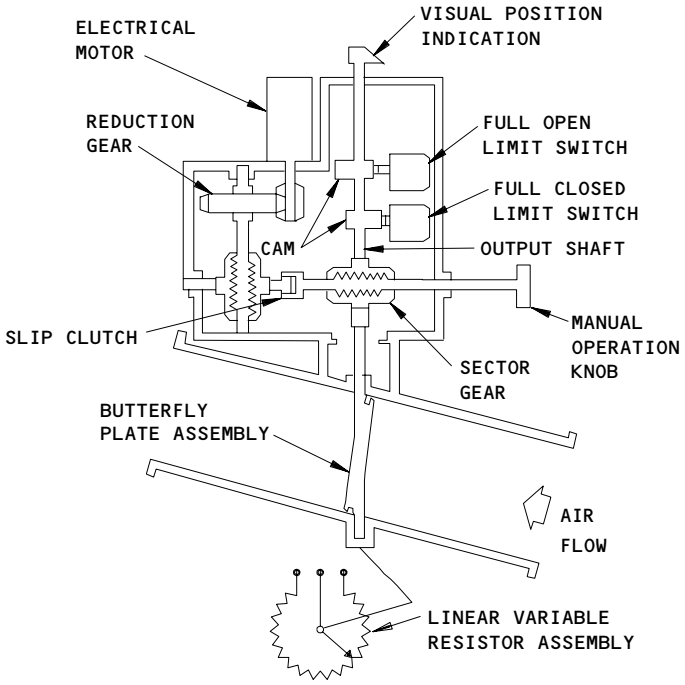


MIX BAY
(VIEW IN THE AFT DIRECTION)

A



B

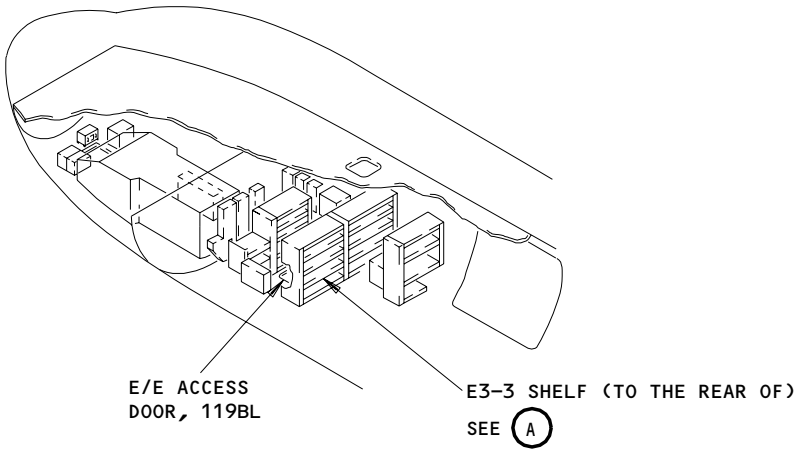


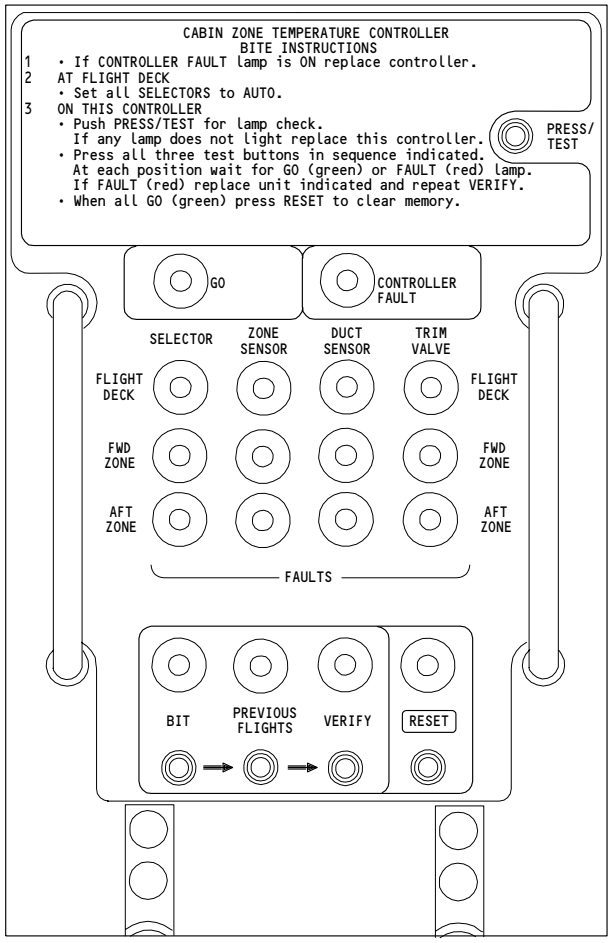
Trim Air Modulating Valve
Figure 4

(1) Description
  (a) The modulating valve is a 1.75 inch diameter, electrically operated valve. The modulating valve includes an actuator, a valve flow section, and a linear variable resistor in a housing. The actuator is attached with bolts to the valve flow section and includes the components that follow:
    1) Connector
    2) Two limit switches
    3) Motor
    4) Position indicator
    5) Manual operator.
  (b) The position indicator has a pointer attached to the end of an output shaft. The manual operator has a knob connected to the secondary worm gear shaft.
  (c) The valve flow section includes a valve housing, a butterfly plate, and a butterfly shaft. The butterfly plate is installed in the valve housing. The butterfly plate is installed with bolts to the butterfly shaft. One end of the butterfly shaft attaches to the actuator output shaft.
  (d) The linear variable resistor is installed on the resistor adaptor. The resistor has a wiper arm which engages a slot in the butterfly shaft.

(2) Function
  (a) The modulating valve motor uses 115v ac, 400-Hz, single phase power to operate the valve. When this power is applied to the open side of the valve motor, the motor moves a primary worm gear shaft through a reduction gear. The secondary worm gear shaft moves the sector gear and the output shaft. The output shaft turns the butterfly plate and the position indicator CW to open the valve. The output shaft turns until the cam causes the limit switch for the fully open position to operate. The cam also permits the limit switch for the fully closed position to reset.
  (b) The butterfly shaft will turn the wiper arm of the linear variable resistor. This will give an output signal that is in proportion to the butterfly plate position. A slip clutch will hold the butterfly plate in position if power is removed.
  (c) When power is applied to close the valve the butterfly plate moves in the CCW direction. The power will also cause the cam to operate the limit switch to the fully closed position. The cam will also set the limit switch to the fully open position when power is supplied to open the valve.
  (d) The valve may be manually opened or closed when the manual operate is turned CW to open and CCW to close. When the manual operate is turned it causes the clutch to slip and turns the secondary worm gear shaft. The secondary worm gear shaft turns the butterfly shaft to open or close the butterfly plate.

H. Zone Temperature Controller (Fig. 5)



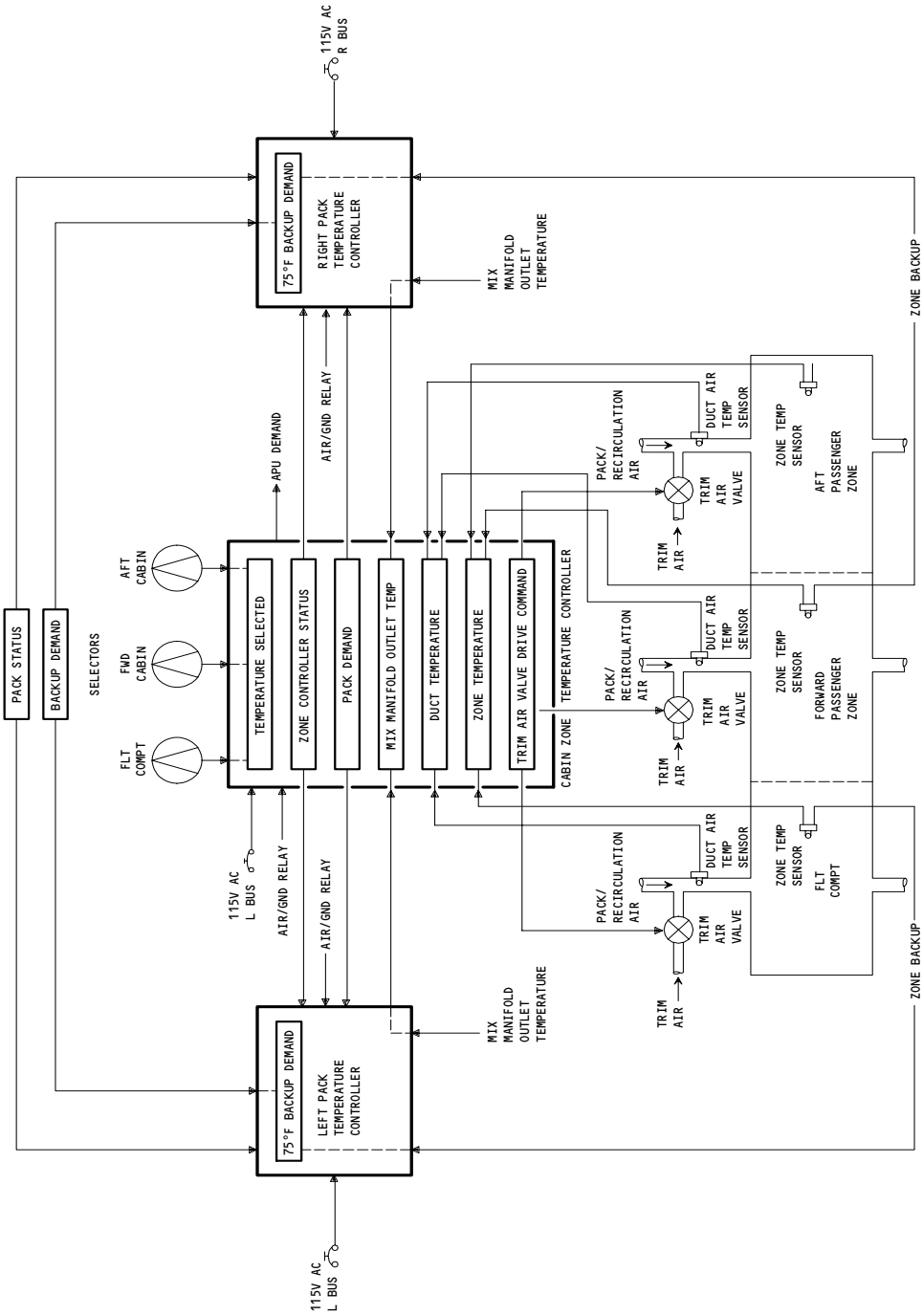


(A)

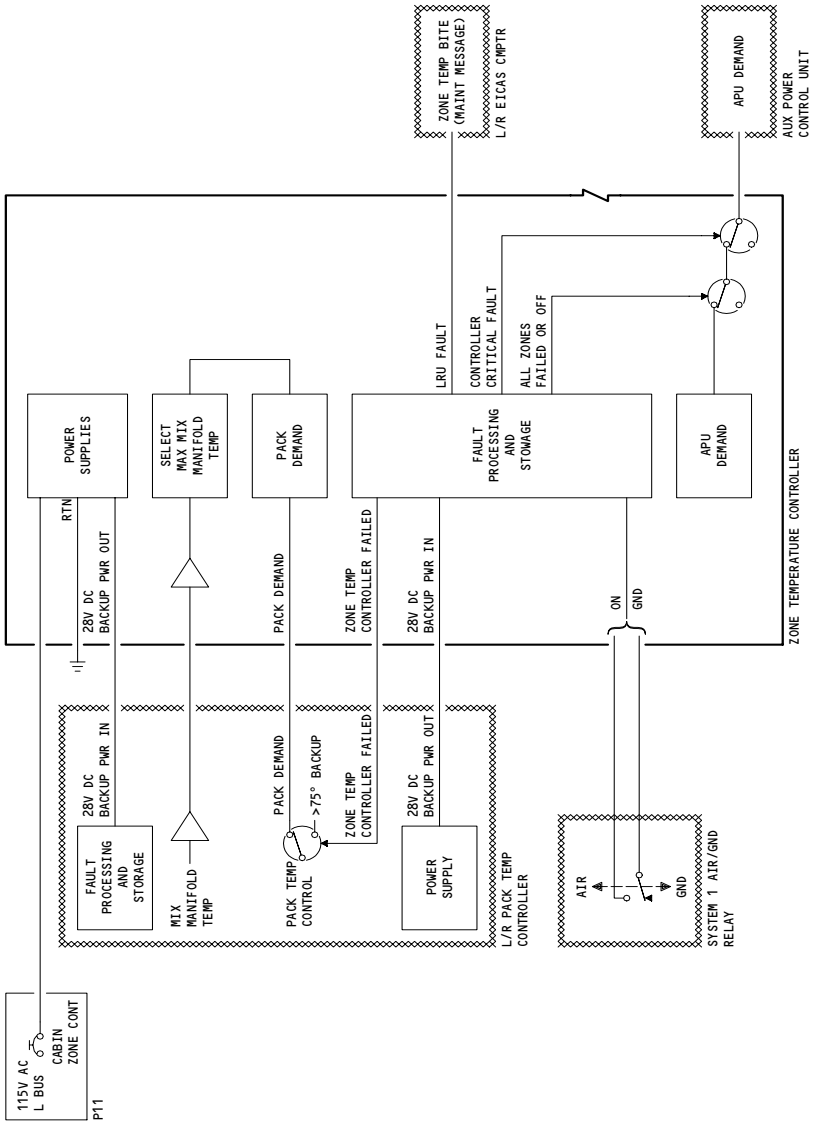
Zone Temperature Controller
Figure 5

(1) Description
(a) The zone temperature controller is a microcomputer that contains all of the built-in-test-equipment (BITE) switches, fault indication lights, and BITE instructions. Two handles at the front of the controller help in the removal/installation. Three posts in the 125-pin connector, at the rear of the controller, are in a different position. This will prevent the installation of the controller at the incorrect location. Nine circuit cards on a primary circuit board contain the circuits for the controller.
(2) Function
(a) The zone temperature controller controls the temperature with the AUTO adjustment of the temperature selector switches.
(b) The controller also automatically and continuously monitors faults and supplies manual operation of the BITE. These controls supply the indication of internal controller failures and can isolate and monitor the failure of line replaceable units (LRUs). Red lights show defective LRUs during a BITE check. An internal memory supplies on-line BITE data. The BITE will monitor and keep LRU faults for 10 flights.

3. Operation
A. Functional Description (Fig. 6)
(1) System Temperature Integration
(a) Pack Demand
1) The zone temperature controller calculates a temperature demand signal for the pack. The demand signal is calculated when the controller compares the inputs of the temperature selector switch for the zone and the zone temperature sensor. The zone temperature controller finds the lowest of the three temperature inputs and sends that signal to the pack temperature controllers as pack demand. The pack demand is the signal from the controller that will change the output of the pack.
2) The pack temperature controllers also receive the temperature inputs from the air temperature sensors in the mix manifold duct. These temperature inputs are then sent to the zone temperature controller. The zone controller finds the lowest of the two mix manifold temperature signals. The lowest signal is used as a reset temperature for the pack demand signal. This lowest temperature corrects the pack demand signal to include the effect of recirculated air mixed with conditioned air from the air conditioning packs.



System Temperature Integration
Figure 6 (Sheet 1)



System Temperature Integration
Figure 6 (Sheet 2)

3) The pack demand is set to a new valve until the mix manifold temperature is the same as the zone with the highest temperature. The zone temperature controller then closes the modulating valve for the coolest zone and adjusts the modulating valves for the other two zones. This will supply the necessary zone inlet temperatures.

(b) Alternate Temperature Control

1) The pack demand signal is gone when there is a zone controller failure or all temperature selector switches are out of the AUTO position. When the pack demand signal is gone, the pack controllers are set to a 75°F (24°C) alternative mode.

2) In the alternative mode the system is set to a two zone control operation. This causes the input from the forward zone to control the right pack and the input from the flight compartment to control the left pack. An alternative signal in the zone temperature sensor supplies applicable pack controllers with the flight compartment or forward zone temperature. Each pack controller uses its alternative sensor. An alternative pack command is supplied to compare the sensor value with the set value of 75°F (24°C).

(c) APU Output Control

1) The zone controller also supplies a command to the Auxiliary Power Unit (APU) to control the quantity of bleed air to the packs during ground operation. The APU controller uses this command for the supply temperature to give the APU output. The input signal will stay at a minimum until the pack and trim controls give the maximum available heat or cooling. The APU command signal increases with larger demand to give the necessary output.

(2) Zone Temperature Control (Fig. 7)

(a) Auto Mode

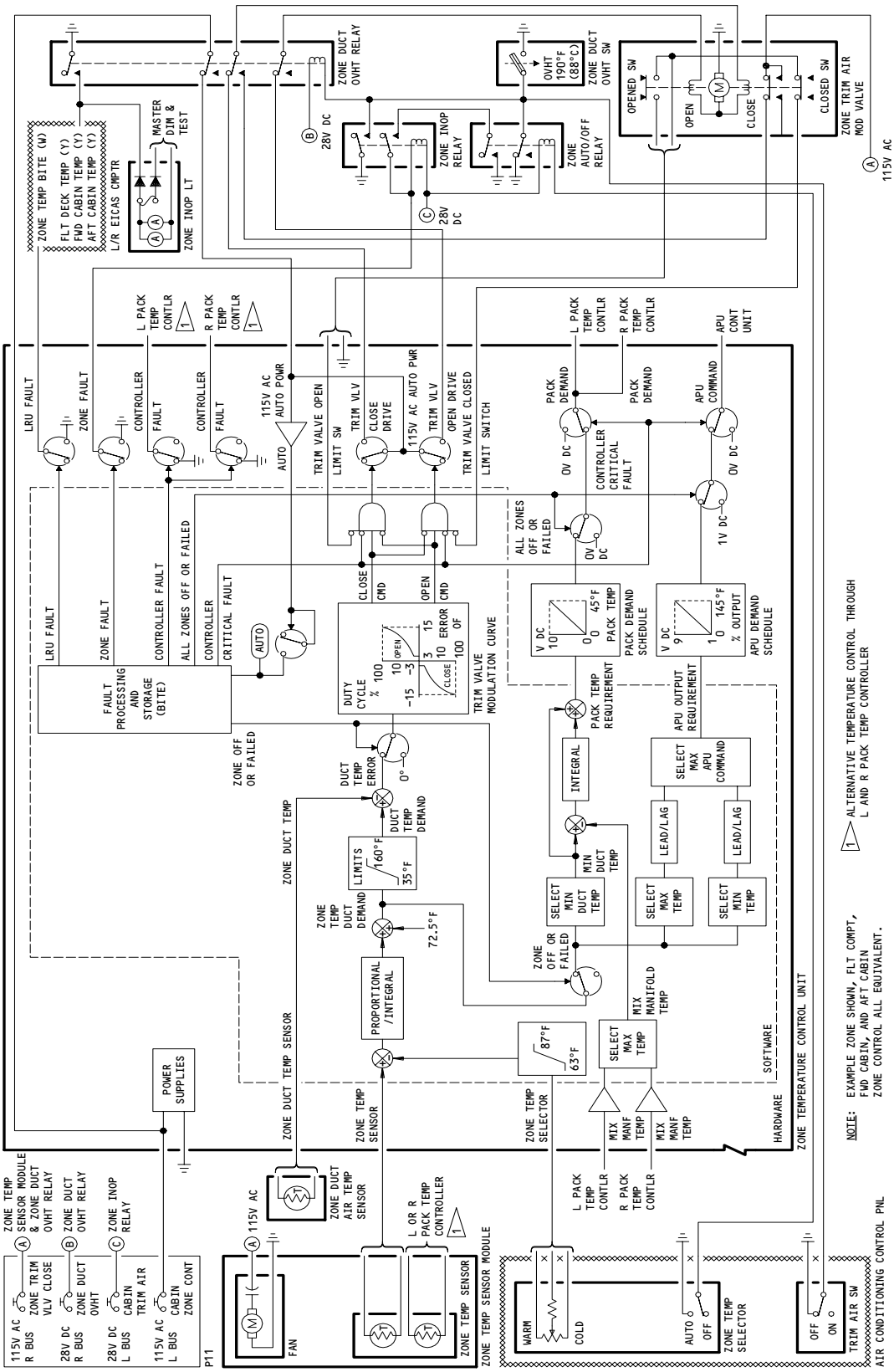
1) The zone temperature controller operates with 115v ac power. Automatic temperature control is supplied when these conditions occur:

a) The temperature selector switches for all three zones are in the AUTO position.

b) The selector switch for the pack mode is in the AUTO position

c) The TRIM AIR switch-light is ON.

2) The AUTO input controls the temperature between 65°F (18°C) and 85°F (29°C).



Zone Temperature Control Schematic
Figure 7

3) During correct automatic mode operation, the zone temperature controller adjusts the modulating valve for the applicable zone. The controller adjusts the modulating valve to supply the conditioned air from a correct mixture of the mix manifold air and the trim air supply. This mixture of air will supply the necessary air temperature in each cabin zone. The temperature selector switch for each zone has many different positions to get automatic temperature control. These positions can be the AUTO (12 o'clock position), AUTO W, AUTO C or in between the AUTO W and AUTO C positions.
4) The AUTO position sends a temperature signal equivalent to 75°F (24°C) to the zone temperature controller to supply a pack or an APU demand signal. The AUTO W position sends a temperature signal to the controller that is equivalent to 85°F (29°C). The AUTO C position sends a temperature signal to the controller that is equivalent to 65°F (18°C).
5) In a condition that is too hot (190°F, 88°C), the applicable flight compartment, forward, or aft zone duct overheat relay energizes. The energized overheat relay does not permit the zone temperature controller to adjust the modulating valves. The relay closes the valves with 28v dc.
6) The overheat relay causes the INOP light on the pilot's overhead panel, P5, to come on for the applicable zone. The EICAS will also show the FLT DECK TEMP, FWD CABIN TEMP or AFT CABIN TEMP level C display messages. These EICAS messages are auto events for the environmental control systems (ECS) (AMM 31-41-00/001). An overheat relay does not permit the zone temperature controller to monitor the applicable zone's temperature control components.
7) An INOP condition can also occur. An INOP condition shows a failure is in a control circuit for the cabin zone. The zone temperature controller will find the failure.
8) An INOP condition also removes the temperature input signal, for the applicable zone, from the pack and APU circuits. The zone temperature controller supplies a ground to permit the INOP light to come on. This will also cause the EICAS messages, FLT DECK TEMP, FWD CABIN TEMP, or AFT CABIN TEMP, to be shown. The duct overheat relay for the forward or aft zone also energizes which will close the applicable modulating valve with 28v dc. The zone temperature controller will monitor the LRUs for the applicable zone.

(b) Off Mode

1) The off mode does not permit the trim air into the applicable zone. Through the flight compartment, forward or aft zone overheat relay the modulating valves are closed with 28v dc. The zone temperature selector, in the OFF position, will cause the INOP light for that zone to come on. The EICAS messages, FLT DECK TEMP, FWD CABIN TEMP, or AFT CABIN TEMP, will also come on for that zone. These EICAS messages are ECS auto events (AMM 31-41-00/001). In the off mode, the zone temperature controller will not monitor the components for that zone.

(3) Trim Air Pressure Regulation (Fig. 8)

(a) Trim air goes through the flow control and shutoff valves (AMM 21-51-00/001). The trim air will then push open the check valves for the trim air supply. The air then flows to the pressure regulating valve. The pressure regulating valve controls the pressure of the trim air to 4 psi above the cabin pressure. Keep the trim air pressure to a limit to decrease the noise of the air that goes through the modulating valves and their duct.

(b) The TRIM AIR switch-light on the P5 panel, controls the pressure regulating valve. The regulating valve operates with 28v dc power. Push the switch-light to the on position to open the valve. Push the switch-light to the off position to keep 28v dc power away from the valve. With the switch-light in the off position the valve closes and the yellow OFF part of the switch-light comes on. The level C message, TRIM AIR, is also shown on the EICAS display.

B. Built-In-Test Equipment (BITE) (Fig. 9)

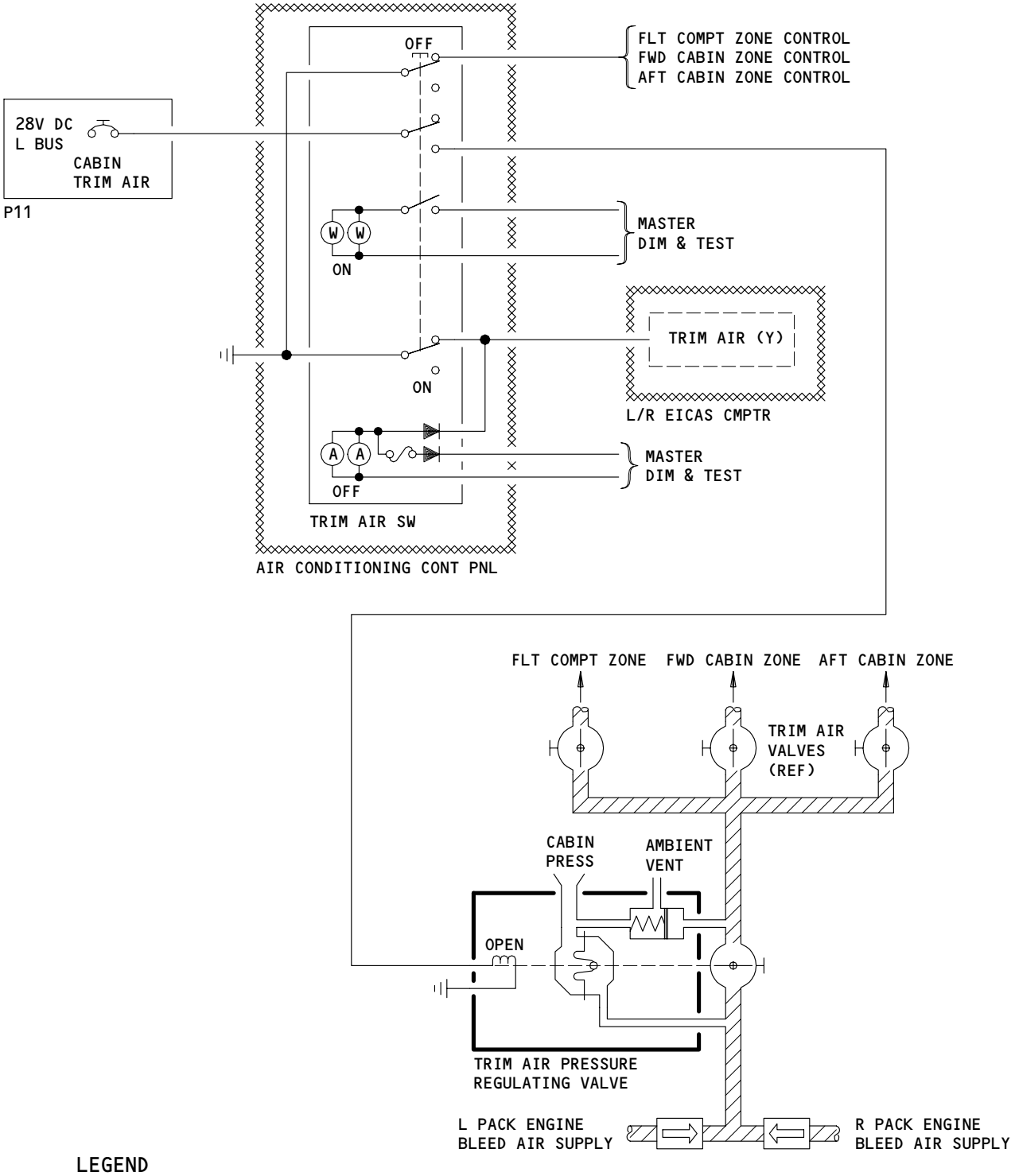
(1) The zone temperature controller contains the BITE. The BITE will monitor with an automatic and continuous mode and a manual mode. The BITE will supply the indication of an internal controller fault and faults with the LRUs in the temperature control system.

(2) An internal memory keeps the LRU fault data. Only the faults kept in the memory until the time of a cabin control circuit or temperature controller failure will stay in the memory. All the faults monitored in the same circuit or in the controller are stopped. When the temperature selector switch for a zone is out of the AUTO position, the controller does not monitor that zone.

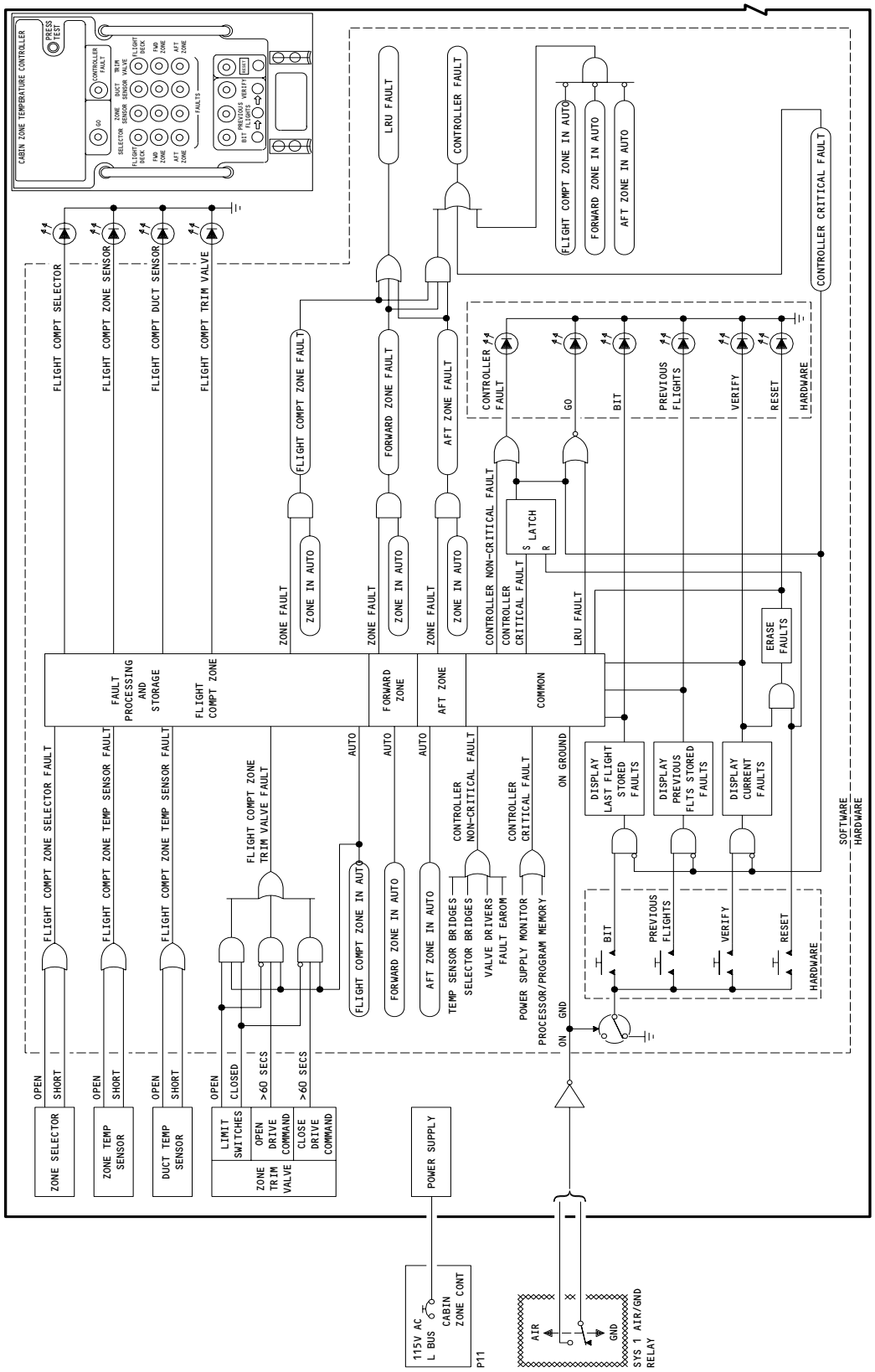
(3) The BITE is used as follows:

(a) Look at the front panel of the zone temperature controller. Make sure the CONTROLLER FAULT light is off. If the light is on, push the RESET switch. If the light comes on again, replace the controller. If the light did not come on initially, or after the RESET switch was pushed, do step b.

(b) Turn the temperature selector switches for the three zones, on the pilot's overhead panel, P5, to the AUTO position. Push the PRESS/TEST switch on the controller. Make sure that all 14 indication lights come on. If a light does not come on, replace the controller and start the sequence again. If all lights come on, do step c.



Trim Air Pressure Regulation Schematic
Figure 8



Zone Temperature Controller Bite
Figure 9

(c) Push the BIT switch on the controller. Make sure the green GO light comes on in 30 seconds. If the green GO light does not come on, a red light will come on and show which component is defective. If a red light comes on replace the component. If the green GO light came on initially or a defective component was replaced, do step d.

(d) Push the PREVIOUS FLIGHTS switch. Look for the green GO light to come on in 30 seconds. If the green GO light does not come on, replace the defective component shown by the red light. If the green GO light came on initially or a defective component was replaced, do step e.

(e) Push the VERIFY switch. Look for the green GO light to come on in 30 seconds. If the green GO light does not come on, replace the defective component shown by the red light. If the green GO light came on initially or a defective component was replaced, do step f.

(f) Push the RESET switch. The test is completed.

(4) An internal fault indication in the zone temperature controller can also occur from fault signals that are not internal to the controller. These signals are sent to the controller from component wiring that is external to the controller. A short to ground in the wiring from these external components will cause a fault indication. Do a check of the wiring if the internal fault indication(s) continues after the controller is replaced.

C. Control

(1) Supply electrical power (AMM 24-22-00/001).

(2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:

(a) ZONE CNTLR

(b) CABIN TRIM AIR

(c) ZONE TEMP CONT VLV CL FLT DK

(d) ZONE TEMP CONT VLV CL FWD

(e) ZONE TEMP CONT VLV CL AFT

(3) Put the temperature selector switches for the three zones, on the P5 panel, to the AUTO position.

PRIMARY (ZONE) TEMPERATURE CONTROL SYSTEM - ADJUSTMENT/TEST

1. General
   A. The procedure that follows has two parts. The first part is an operational test that makes sure the system is serviceable. The second part is a system test that makes sure the system operates correctly and is in specification. The operational test does not have as much detail as the system test.

TASK 21-61-00-705-001

2. Operational Test - Primary (Zone) Temperature Control System (Fig. 501)
   A. General
      (1) The primary (zone) temperature control system operates in the automatic mode for each zone. The operational test uses the built-in-test equipment (BITE) in the zone temperature controller. The operational test uses the BITE to make sure that each component in the system operates in the automatic mode.
   B. References
      (1) AMM 06-41-00/201, Fuselage Access Doors, and Panels
      (2) AMM 06-46-00/201, Entry, Service and Cargo Doors
      (3) AMM 24-22-00/201, Electric Power - Control
      (4) AMM 21-61-03/401, Zone Temperature Controller
   C. Access
      (1) Location Zones
          119 Main Equipment Center (Left)

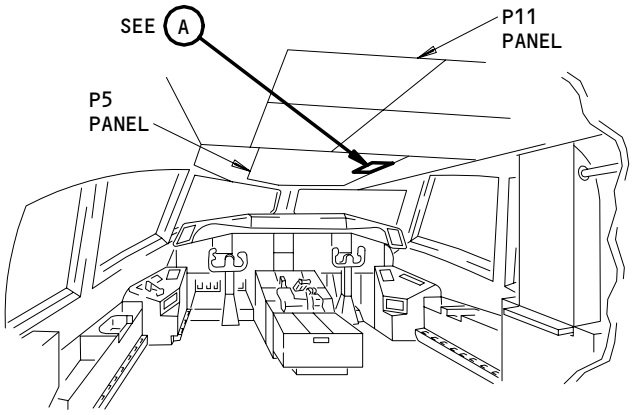
      (2) Access Panel
          119BL Main Equipment Center Access Door

   D. Prepare For Operational Test

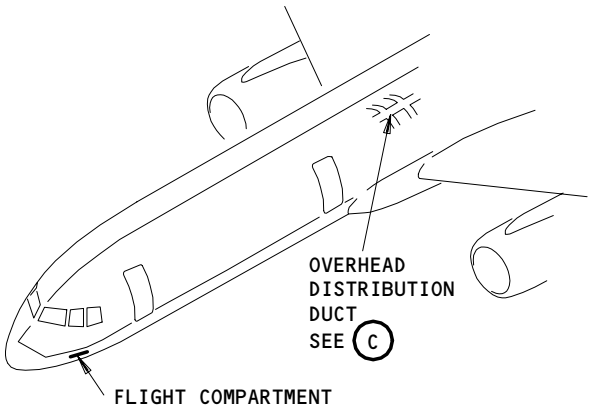
      S 865-003
      (1) Supply electrical power (AMM 24-22-00/201).

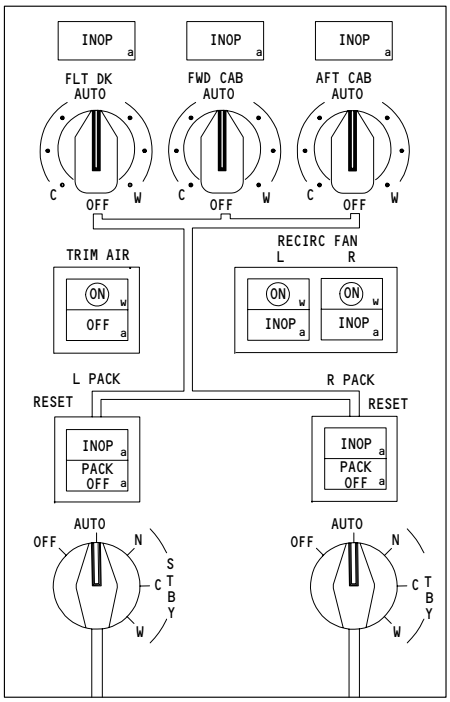
      S 865-004
      (2) Make sure these circuit breakers on the overhead circuit-breaker panel, P11, are closed:
          (a) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
          (b) 11N26, ZONE TEMP CONT VLV CLOSE FWD
          (c) 11N27, ZONE TEMP CONT VLV CLOSE AFT
          (d) 11P15, CABIN TRIM AIR
          (e) 11P16, CABIN ZONE CONT
          (f) 11P17, CABIN ZONE TEMP IND
          (g) 11P25, ZONE DUCT OVHT/INOP FLT DK
          (h) 11P26, ZONE DUCT OVHT/INOP FWD
          (i) 11P27, ZONE DUCT OVHT/INOP AFT

      S 015-016
      (3) Open the main equipment center door, 119BL (AMM 06-41-00/201). Find the zone temperature controller on the E3 rack.
          (a) Find the zone temperature controller on the E3 rack.



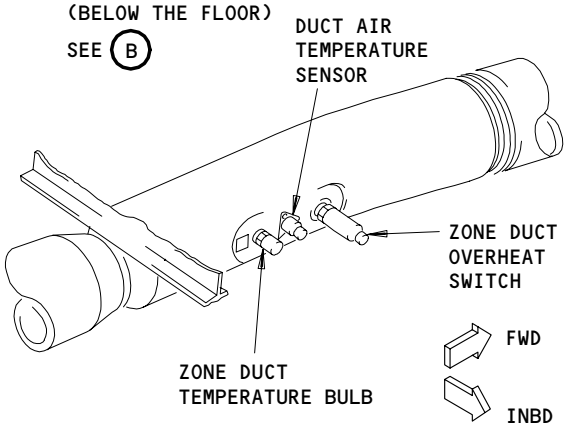
FLIGHT COMPARTMENT





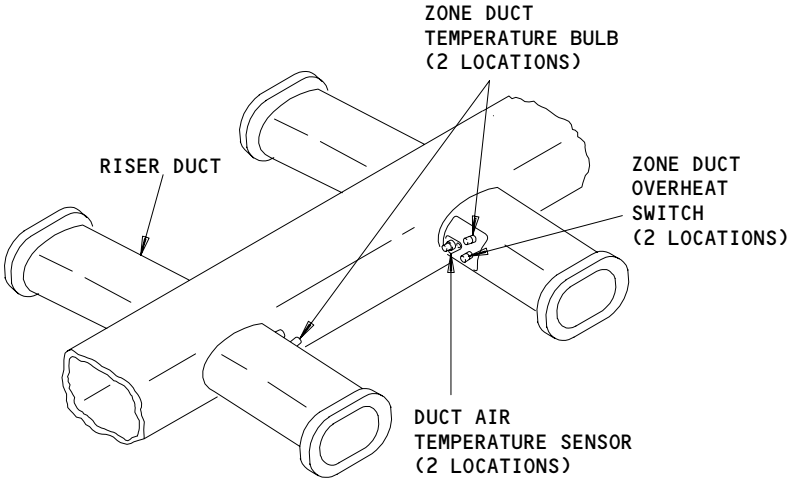
AIR CONDITIONING CONTROL MODULE

A



FLIGHT COMPARTMENT DISTRIBUTION DUCT

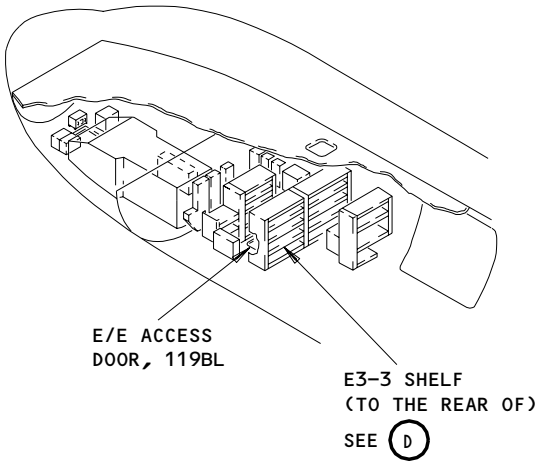
B

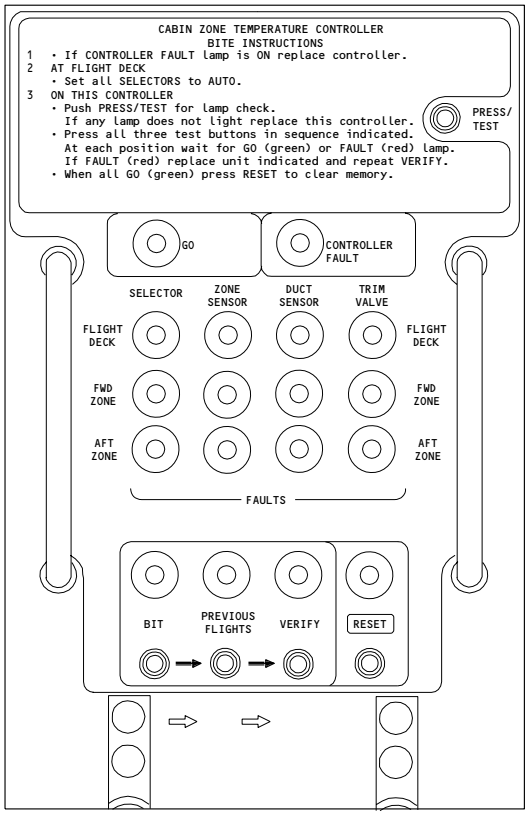


OVERHEAD DISTRIBUTION DUCT

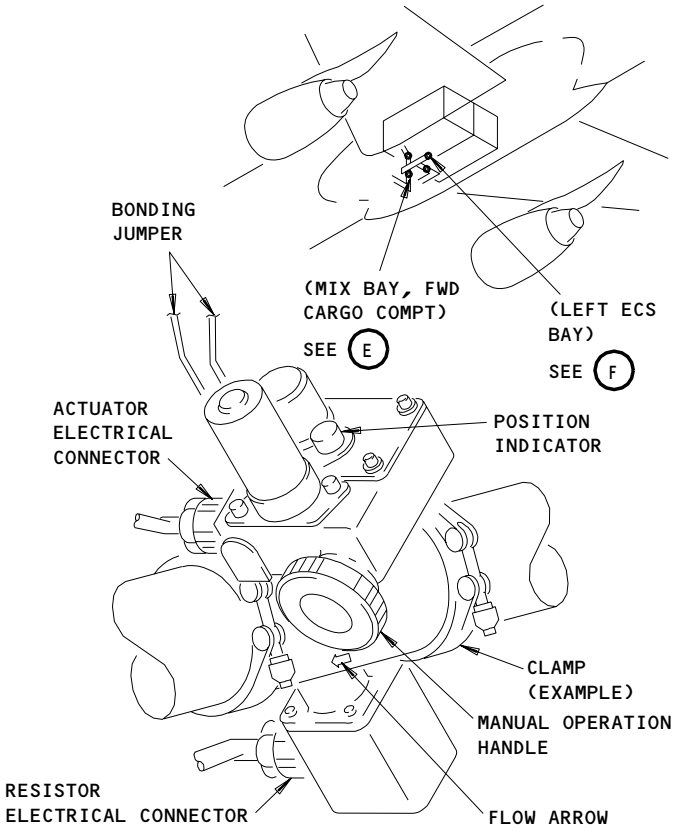
C

Primary (Zone) Temperature Control System Adjustment Test
Figure 501 (Sheet 1)

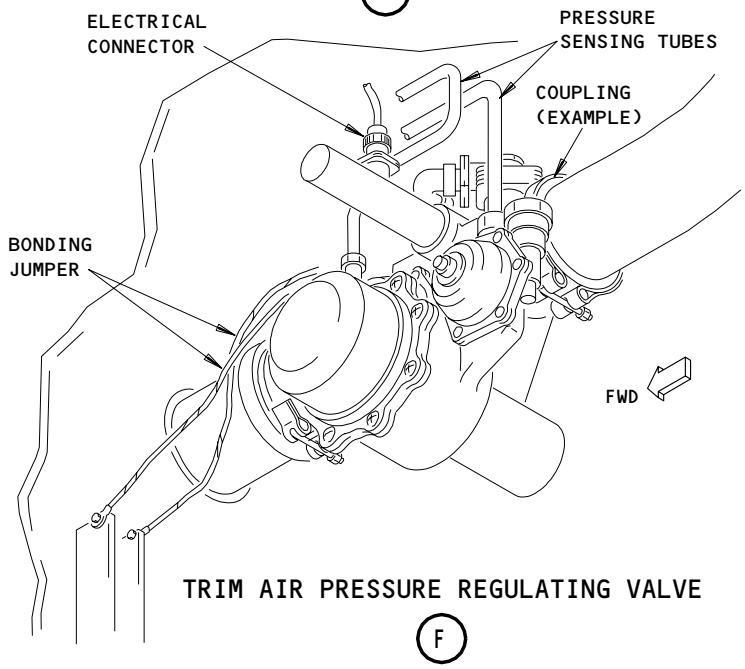




ZONE TEMPERATURE CONTROLLER
(E3-3 SHELF)
(D)



TRIM AIR MODULATING VALVE
(E)



TRIM AIR PRESSURE REGULATING VALVE
(F)

Primary (Zone) Temperature Control System Adjustment Test
Figure 501 (Sheet 2)

E. Do the Primary (Zone) Temperature Control System Test

S 745-017

(1) Follow the instructions on the top front face of the zone temperature controller to do the test.

NOTE: The BITE does not show you if it is an LRU fault or an airplane wiring fault. If a fault light(s) come on, make sure that the correct power is available. Also, make sure the pins are correctly engaged at the identified LRU electrical connector before replacement.

(a) Put the temperature selector switches for all three zones in the AUTO position.
(b) Put the L and R PACK selector switches, on the pilot's overhead panel, P5, to the AUTO position.
(c) Push the TRIM AIR switch-light on the P5 panel to the ON position.
1) Make sure that the ON light comes on.
(d) Look at the front panel of the zone temperature controller.
1) Make sure the CONTROLLER fault light is off.
2) If the CONTROLLER FAULT light is on, there is a problem with zone temperature controller.

NOTE: A short circuit in the wiring for the trim air modulating valves can cause the zone temperature controller to blow a fuse. If the zone temperature controller has a blown fuse, the CONTROLLER fault light will show.

(e) Push the PRESS/TEST switch.
1) Make sure that all indicator lights on the zone temperature controller come on.
(f) Push the BIT switch on the zone temperature controller.
1) A red indicator light comes on if a fault occurred on the last flight.
2) If no red indicator lights come on, wait until the green GO light comes on.
(g) Push the PREVIOUS FLIGHTS switch.
1) A red indicator light comes on if a fault occurred in the last nine flights.
2) If no red indicator lights come on, wait until the green GO light comes on.
(h) Push the VERIFY switch on the zone temperature controller. Make sure that the GO light and VERIFY lights come on. If faults are shown, replace the component, then do the test again.
(i) Push the RESET switch on the zone temperature controller while the GO and VERIFY lights are still on.
(j) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.

(k) Turn the temperature selector switch, on the P5 panel, to the Cool position and then to the Warm position. Do this for the flight compartment, forward zone and aft zone.
1) Make sure the EICAS indication for the TRIM VALVE open position decreases then increases for each zone modulating valve.

F. Put the Airplane Back to Its Usual Condition

S 415-057
(1) Close the access door for the main equipment center (119BL).

S 865-058
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 21-61-00-705-029

3. System Test - Primary (Zone) Temperature Control System (Fig. 501)

A. General
(1) The system test that follows makes sure that the primary (Zone) temperature control system operates correctly and is in specification.

B. Equipment
(1) DC Voltmeter (Range 0-30 v dc), Commercially Available

C. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service, and Cargo Doors, Access Doors and Panels
(3) AMM 21-61-03/401, Zone Temperature Controller
(4) AMM 24-22-00/201, Electric Power - Control
(5) AMM 25-50-03/401, Bulkhead Lining Panels
(6) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(7) AMM 32-09-02/201, Air Ground Relays
(8) AMM 36-00-00/201, Pneumatic-General

D. Access
(1) Location Zones

119	Main Equipment Center (Left)
125/126	Area Aft of Forward Cargo Compartment
135	Environmental Control System Bay (Left)
233/234	Area Above Passenger Cabin Ceiling - Section 43

(2) Access Panels

119BL	Main Equipment Center Access Door
193HL	Environmental Control System Access Door

E. Prepare For System Test

S 865-031
(1) Supply electrical power (AMM 24-22-00/201).

S 865-032

(2) Make sure these circuit breakers on the overhead circuit-breaker panel, P11, are closed:
(a) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
(b) 11N26, ZONE TEMP CONT VLV CLOSE FWD
(c) 11N27, ZONE TEMP CONT VLV CLOSE AFT
(d) 11P15, CABIN TRIM AIR
(e) 11P16, CABIN ZONE CONT
(f) 11P17, CABIN ZONE TEMP IND
(g) 11P25, ZONE DUCT OVHT/INOP FLT DK
(h) 11P26, ZONE DUCT OVHT/INOP FWD
(i) 11P27, ZONE DUCT OVHT/INOP AFT

S 015-044

(3) Open the main equipment center door, 119BL (AMM 06-41-00/201). Find the zone temperature controller on the E3 rack.
(a) Find the zone temperature controller on the E3 rack.

F. Do the Zone Temperature Controller System Test

S 745-045

(1) Continue the test with the instructions on the top front face of the zone temperature controller.

NOTE: The BITE does not show you if the fault is an LRU fault or an airplane wiring fault. Thus, if a fault light(s) come on, make sure that the correct power is available. Also make sure the pins are correctly engaged at the identified LRU electrical connector before replacement.

(a) Put the L and R PACK selectors, on the pilot's overhead panel, P5, to the AUTO position.
(b) Push the TRIM AIR switch-light on the P5 panel to the ON position.
1) Make sure that the ON light comes on.
(c) Make sure that the CONTROLLER FAULT light is off, on the front panel of the zone temperature controller. If the CONTROLLER FAULT light is on, push the RESET switch. If the CONTROLLER FAULT light comes on again, replace the zone temperature controller (AMM 21-61-03/401) and do this step again.
(d) Put the temperature selector switches for all three zones in the AUTO position.
(e) Push the PRESS/TEST switch.
1) Make sure that all the indicator lights on the zone temperature controller come on.
(f) Push the BIT switch on the zone temperature controller.
1) If a red indicator light comes on, a fault occurred on the last flight.
2) If no red indicator lights come on, stop until the green GO light comes on.

(g) Push the PREVIOUS FLIGHTS switch.
1) A red indicator light comes on if a fault occurred in the last nine flights.
2) If no red indicator lights come on, stop until the green GO light comes on.
(h) Push the VERIFY switch on the zone temperature controller. Make sure that the GO light and VERIFY lights come on. If a fault is shown, replace the indicated component, then do the test again.
(i) Push the RESET switch on the zone temperature controller while the GO and VERIFY lights are still on.
(j) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.
(k) Turn the temperature selector switch, on P5 panel, to the Cool position and then to the Warm position. Do this for the flight compartment, forward zone, and aft zone.
1) Make sure the EICAS indication for the TRIM VALVE position will decrease then increase in the open direction. Do this for the modulating valve in each zone.

G. Do the Trim Air Modulating Valves System Test

S 865-046
(1) Supply pneumatic power (AMM 36-00-00/201).

S 865-047
(2) Put the temperature selector switches for all three zones, on the P5 panel, to the AUTO position (12:00 o'clock position).

S 215-048
(3) Push the TRIM AIR switch-light on the P5 panel to the OFF position.
(a) Make sure that the OFF light comes on.

S 865-049
(4) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.

S 215-050
(5) Make sure that all 3 zone INOP lights on the P5 panel are on.

S 215-051
(6) Look for the messages that follow on the EICAS display:
(a) FLT DECK TEMP
(b) FWD CABIN TEMP
(c) AFT CABIN TEMP
(d) TRIM AIR

S 015-061
(7) Open the No. 1 cargo door, 821 (AMM 06-46-00/201).

S 015-063
(8) Remove the bulkhead lining panel at the aft end of the forward cargo compartment (AMM 25-50-03/401).
  (a) Find the modulating valves for the trim air system.

S 215-054
(9) Make sure that all three modulating valves are closed.
  (a) Look to see that the position indicator on the valve shows closed.

S 215-055
(10) Make sure the TRIM VALVE position indications, on the EICAS display, show 0.00 to 0.05 for all three valves.

S 215-056
(11) Push the TRIM AIR switch-light on the P5 panel to the ON position.
  (a) Make sure that the ON light comes on.

S 215-057
(12) Make sure these EICAS messages do not show on the top display:
  (a) FLT DECK TEMP
  (b) FWD CABIN TEMP
  (c) AFT CABIN TEMP
  (d) TRIM AIR

S 215-058
(13) Make sure the flight compartment or passenger compartment ambient temperatures are below 80°F (27°C). If the ambient temperature is above 80°F (27°C) put an ice bag on the grill at the sensor's air inlet. This will cool the applicable zone temperature sensor.
  (a) Put the temperature selector switches for all three zones to the AUTO W position.
  (b) Make sure that all three modulating valves open between 20 and 30 seconds.
  (c) Make sure that all three TRIM VALVE indications on the EICAS display increase to between 0.90 and 1.00.

S 215-059
(14) Put the temperature selector switch for the FLT DK Zone, on the P5 panel, to the OFF position.
  (a) Make sure that the FLT DK INOP light comes on.

S 215-060
(15) Make sure this EICAS message, FLT DECK TEMP, shows on the top display.

S 215-061
(16) Make sure that the modulating valve for the flight compartment closes.
  (a) Look to see that the position at the valve shows closed.

S 215-062
(17) Make sure the FLT DK TRIM VALVE position indication, on the EICAS display, decreases to between 0.00 and 0.05.

S 215-063
(18) Put the temperature selector switch for the FWD CAB Zone, on the P5 panel, to the OFF position.
(a) Make sure that the FWD CAB INOP light comes on.

S 215-064
(19) Make sure this EICAS message, FWD CAB TEMP, shows on the top display.

S 215-148
(20) Make sure that the modulating valve for the forward zone closes.
(a) Look to see that the position at the valve shows closed.

S 215-149
(21) Make sure the FWD TRIM VALVE position indication, on the EICAS display, decreases to between 0.00 and 0.05.

S 215-067
(22) Put the temperature selector switch for the AFT CAB Zone, on the P5 panel, to the OFF position.
(a) Make sure that the AFT CAB INOP light comes on.

S 215-068
(23) Make sure this EICAS message, AFT CAB TEMP, shows on the top display.

S 215-069
(24) Make sure that the modulating valve for the aft cabin closes.
(a) Look to see that the position at the valve shows closed.

S 215-070
(25) Make sure the AFT TRIM VALVE position indication, on the EICAS display, decreases to between 0.00 and 0.05.

S 215-071
(26) Put the temperature selector switches for all three zones, on the P5 panel, to the AUTO position.
(a) Make sure that the zone INOP lights go out.
(b) Make sure that the EICAS messages do not show.

H. Do the Duct Overheat Switch and Duct Temperature Sensor System Test

S 015-072
(1) Open the access door for the main equipment center 119BL (AMM 06-41-00/201).
  (a) Find the duct overheat switch and the duct temperature sensor for the flight compartment. They can be found on the left side wall near the aft end of the nose wheel well.

S 035-073
(2) Disconnect the electrical connector from the duct overheat switch for the flight compartment.

S 485-074
(3) Connect a jumper between pins 1 and 2 of the electrical connector.

S 215-075
(4) Make sure the FLT DK INOP light on the P5 panel comes on.

S 085-076
(5) Remove the jumper.

S 215-077
(6) Install the electrical connector on the duct overheat switch for the flight compartment.
  (a) Make sure the FLT DK INOP light on the P5 panel goes out.

S 215-078
(7) Disconnect the electrical connector from the duct temperature sensor for the flight compartment.
  (a) Make sure the FLT DK INOP light comes on.

S 215-079
(8) Make sure this EICAS message, ZONE TEMP BITE, shows on the bottom display.

S 215-080
(9) Make sure the FLT DK TRIM VALVE position indication, on the EICAS display, decreases to between 0.00 to 0.05.

S 215-081
(10) Install the electrical connector to the duct temperature sensor for the flight compartment.
  (a) Make sure the FLT DK INOP light on the P5 panel stays on.
  (b) Make sure the EICAS message, ZONE TEMP BITE, shows on the bottom display.

S 015-082
(11) Open the sculptured ceiling panel, approximately six windows aft of the No. 2 passenger door.
(a) Find the duct overheat switches and duct temperature sensors for the passenger cabin zone.

S 035-084
(12) Disconnect the electrical connector from the duct overheat switch in the forward zone.

S 485-085
(13) Connect a jumper between pins 1 and 2 of the electrical connector.

S 215-086
(14) Make sure the FWD CAB INOP light on the P5 panel comes on.

S 085-087
(15) Remove the jumper.

S 215-088
(16) Install the electrical connector on the duct overheat switch for the forward zone.
(a) Make sure the FWD CAB INOP light on the P5 panel comes on.

S 215-089
(17) Disconnect the electrical connector from the duct temperature sensor for the forward cabin zone.
(a) Make sure the FWD CAB INOP light on the P5 panel comes on.

S 215-090
(18) Make sure the FWD TRIM VALVE position indication on the EICAS display is between 0.00 to 0.05.

S 215-091
(19) Install the electrical connector to the duct temperature sensor for the forward cabin zone.
(a) Make sure the FWD CAB INOP light on the P5 panel stays on.

S 035-092
(20) Disconnect the electrical connector from the duct overheat switch for the aft cabin zone.

S 485-093
(21) Connect a jumper between pins 1 and 2 of the electrical connector.

S 215-094
(22) Make sure the AFT CAB INOP light on the P5 panel comes on.

S 085-095
(23) Remove the jumper.

S 215-096
(24) Install the electrical connector on the duct overheat switch for the aft cabin zone.
(a) Make sure the AFT CAB INOP light on the P5 panel goes out.

S 215-097
(25) Disconnect the electrical connector from the duct temperature sensor for the aft zone.
(a) Make sure the AFT CAB INOP light comes on.

S 215-098
(26) Make sure the AFT TRIM VALVE position indication, on the EICAS display, is between 0.00 to 0.05.

S 215-099
(27) Install the electrical connector to the duct temperature sensor for the aft zone.
(a) Make sure the AFT CAB INOP light on the P5 panel stays on.

S 865-100
(28) Push the VERIFY, then the RESET button on the Zone Temperature Controller, to remove the fault indications.

S 215-101
(29) Put the temperature selector switches for all three zones, on the P5 panel, to the AUTO position.
(a) Make sure that all three Zone INOP lights go out.

S 045-059

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(30) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-060

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(31) Do the Flight Mode Simulation procedure for the No. 1 and 2 air/ground system (AMM 32-09-02/201).

S 215-102
(32) Push the BIT switch on the zone temperature controller.
(a) Make sure the BIT light does not come on.

S 865-133
(33) Put the airplane back to the ground mode (AMM 32-09-02/201).

S 445-134
(34) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

I. Do the Trim Air Pressure Regulating Valve System Test

S 015-103
(1) Open the left ECS access door, 193HL (AMM 06-41-00/201).
(a) Find the pressure regulating valve for the trim air system.

S 035-104
(2) Disconnect the electrical connector from the pressure regulating valve.

S 485-105
(3) Connect a dc Voltmeter between pins 1(+) and 3(-) of the electrical connector.

S 215-106
(4) Make sure the voltage between pins 1 and 3 of the electrical connector, for the pressure regulating valve, is 28 v dc.

S 215-107
(5) Push the TRIM AIR switch-light on the P5 panel to the OFF position.
(a) Make sure the TRIM AIR OFF light comes on.

S 215-108
(6) Make sure the voltage between pins 1 and 3 of the electrical connector for the pressure regulating valve decreases to zero.

S 865-109
(7) Put the temperature selector switches for all three zones, on the P5 panel, to the OFF position.

S 085-130
(8) Remove the dc Voltmeter.

S 435-110
(9) Install the electrical connector to the pressure regulating valve.

J. Put the Airplane Back to Its Usual Condition

S 415-111
(1) Install the sculptured ceiling panel.

S 415-112
(2) Install the bulkhead lining panel at the aft end of the forward cargo compartment (AMM 25-50-03/401).

S 415-113
(3) Close the access door for the main equipment center, 119BL.

S 415-114
(4) Close the No. 1 cargo door, 821.

S 415-115
(5) Close the left ECS access door, 193HL.

S 415-127
(6) Close the access door for the main equipment center, 119BL.

S 865-128
(7) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 865-129
(8) Remove electrical power if it is not necessary (AMM 24-22-00/201).

ZONE DUCT OVERHEAT SWITCH - REMOVAL/INSTALLATION

1. General
   A. A duct overheat switch is installed in the air supply duct for each zone. The duct overheat switch for the flight compartment zone is installed below the floor near the left side airplane skin. The duct overheat switches for the forward and aft zones are installed above the passenger compartment ceiling. The switches can be found in the riser ducts, on the left side of the overhead distribution manifold.

TASK 21-61-01-004-001

2. Remove the Zone Duct Overheat Switch (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zone
          211 Control Cabin - Section 41 (Left)

          233 Area Above Passenger Cabin Ceiling - Section 43 (Left)

      (2) Access Panel
          119BL Main Equipment Center Access Door

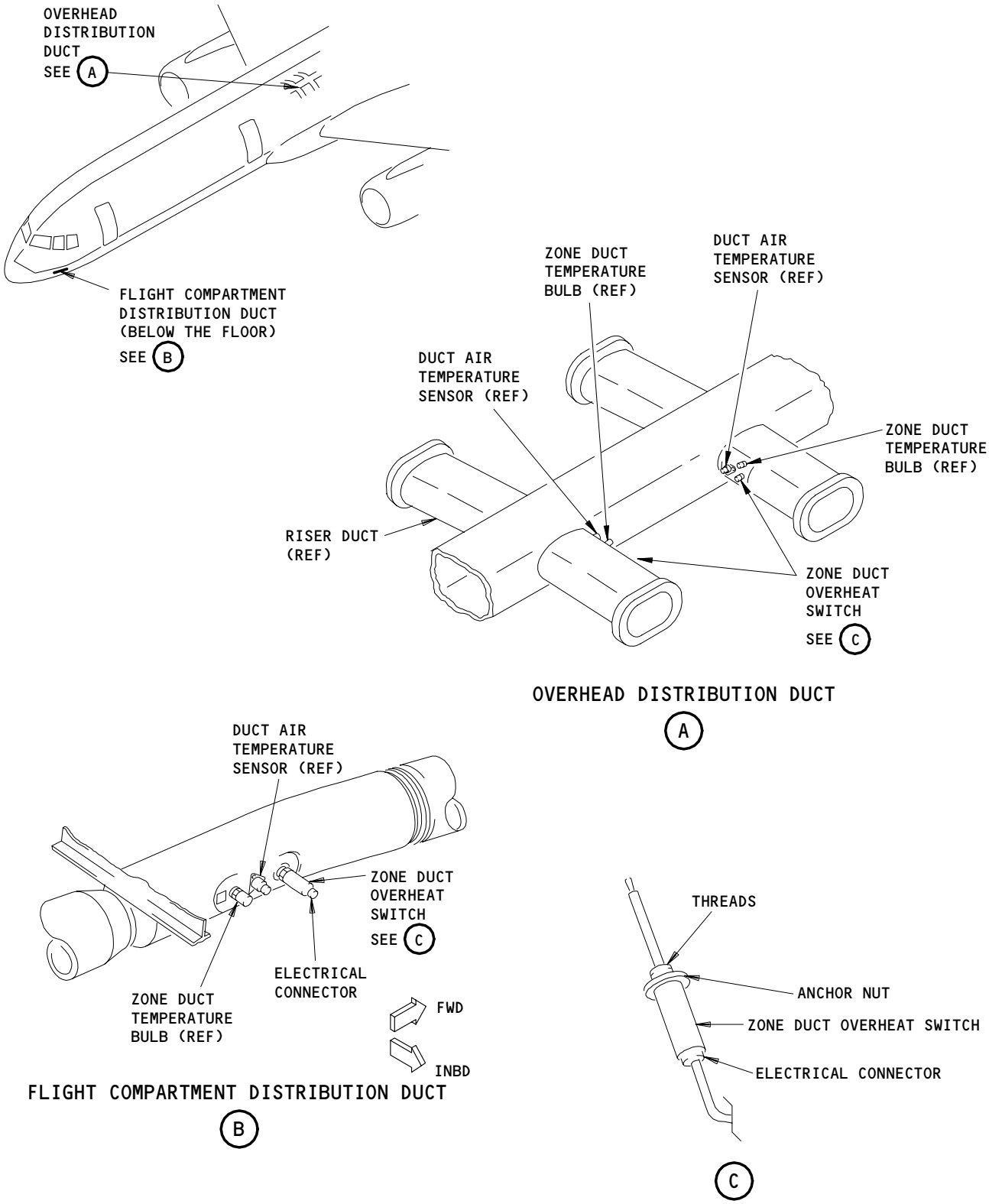
   C. Prepare for Removal

      S 864-002
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-003
      (2) Push the L and R RECIRC FAN switch-lights, on the pilot's overhead panel, P5, to the off position.
          (a) Attach DO-NOT-OPERATE tags on the two switch-lights.

      S 864-005
      (3) Put the two control selector switches for the air conditioning pack, on the P5 panel, to the OFF position.
          (a) Attach DO-NOT-OPERATE tags to the two selector switches.

      S 864-006
      (4) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) The duct overhead switch in the flight compartment:
              1) 11P25, ZONE DUCT OVHT/INOP FLT DK
          (b) The duct overheat switch in the forward zone:
              1) 11P26, ZONE DUCT OVHT/INOP FWD
          (c) The duct overhead switch in the aft zone:
              1) 11P27, ZONE DUCT OVHT/INOP AFT



Zone Duct Overheat Switch - Installation
Figure 401

S 014-007
(5) Open the access door for the main equipment center, 119BL (AMM 06-41-00/201) to remove the overheat switch in the flight compartment.
(a) Find the switch on the left side of the distribution duct for the flight compartment. The duct can be found near the aft end of the nose wheel well.

S 014-008
(6) Open the sculptured ceiling panel, approximately six windows aft of the No. 2 passenger door, to remove the overheat switches in the passenger compartment.
(a) Find the switch in the riser duct on the left side, near the intersection with the overhead distribution duct.

D. Remove the Switch

S 034-010
(1) Disconnect the electrical connector from the switch.

S 024-011
(2) Remove the switch from the anchor nut in the duct.

S 494-012
(3) Put a cover on the duct hole to keep out unwanted objects.

TASK 21-61-01-414-013

3. Install the Zone Duct Overheat Switch (Fig. 401)

A. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 20-10-23/401, Standard Practices - Lockwire
(3) AMM 24-22-00/201, Electric Power Control

B. Access
(1) Location Zones
211 Control Cabin - Section 41 (Left)

233 Area Above Passenger Cabin Ceiling - Section 43 (Left)

(2) Access Panel
119BL Main Equipment Center Access Door

C. Procedure

S 094-014
(1) Remove the cover on the duct hole.

S 424-015
(2) Install the switch into the anchor nut.

S 434-023
(3) Tighten the switch.

S 434-024
(4) Install the lockwire on the switch (AMM 20-10-23/401).

S 434-017
(5) Install the electrical connector to the switch.

S 864-018
(6) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) The duct overheat switch in the flight compartment:
1) 11P25, ZONE DUCT OVHT/INOP F/D
(b) The duct overheat switch in the forward zone:
1) 11P26, ZONE DUCT OVHT/INOP FWD
(c) The duct overheat switch in the aft zone:
1) 11P27, ZONE DUCT OVHT/INOP AFT

D. Put the Airplane Back to Its Usual Condition

S 864-019
(1) Remove the DO-NOT-OPERATE tags from the control selector switches on the air conditioning pack.

S 864-025
(2) AIRPLANES WITH PASSENGER CONFIGURATION;
Remove the DO-NOT-OPERATE tags from the RECIRC FAN switch-lights.

S 414-020
(3) Close the access door for the main equipment center, 119BL (AMM 06-41-00/201).

S 414-021
(4) Close the applicable ceiling panel for the duct overheat switch in the forward or aft zone.

S 864-022
(5) Remove electrical power if it is not necessary (AMM 24-22-00/201).

ZONE DUCT OVERHEAT SWITCH - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks. One task tests the circuits for the zone duct overheat switch. The other task is for scheduled maintenance and tests the circuits and the zone duct overheat switch.

TASK 21-61-01-705-010

2. Zone Duct Overheat Switch System Test (Fig. 501)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power - Control
      (3) AMM 25-22-01/401, Sculptured Ceiling Panels
   B. Prepare for the System Test

      S 865-011
      (1) Supply electrical power (AMM 24-22-00/201).

      S 865-012
      (2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
         (a) 11P25, ZONE DUCT OVHT/INOP FLT DK
         (b) 11P26, ZONE DUCT OVHT/INOP FWD
         (c) 11P27, ZONE DUCT OVHT/INOP AFT

      S 865-038
      (3) Put the Trim Air Switch to the ON position.

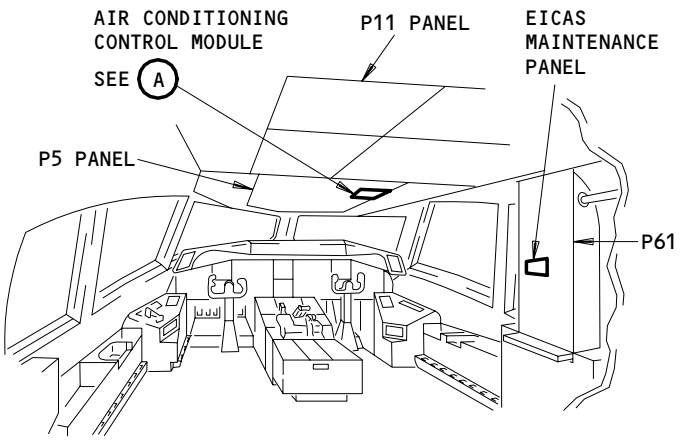
      S 865-039
      (4) Put all three Zone Temp Selectors to the AUTO position.

      S 015-019
      (5) Open the left side ceiling panel approximately six windows aft of the No. 2 passenger door (AMM 25-22-01/401).
   C. Flight Deck Zone Duct Overheat Switch Test

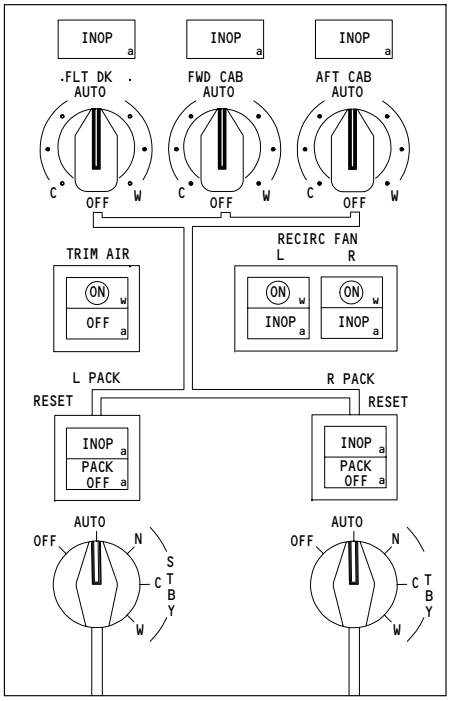
      S 015-013
      (1) Open the main equipment center access door 119BL (AMM 06-41-00/201).

      S 015-014
      (2) Find the switch on the flight deck distribution duct on the left sidewall near the aft end of the nose wheel well.

      S 035-015
      (3) Disconnect the electrical connector from the flight compartment zone duct overheat switch.

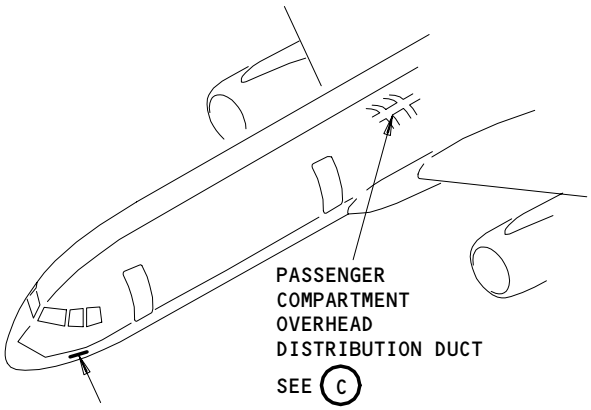


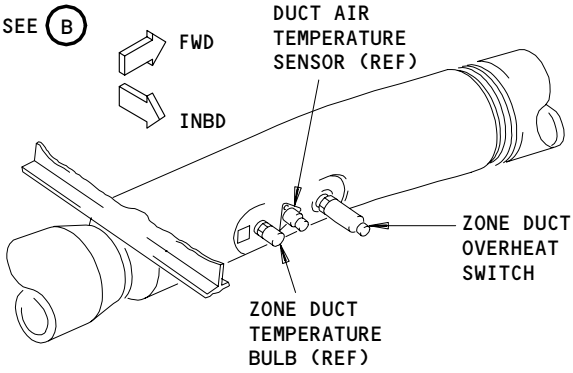
FLIGHT COMPARTMENT



AIR CONDITIONING CONTROL MODULE

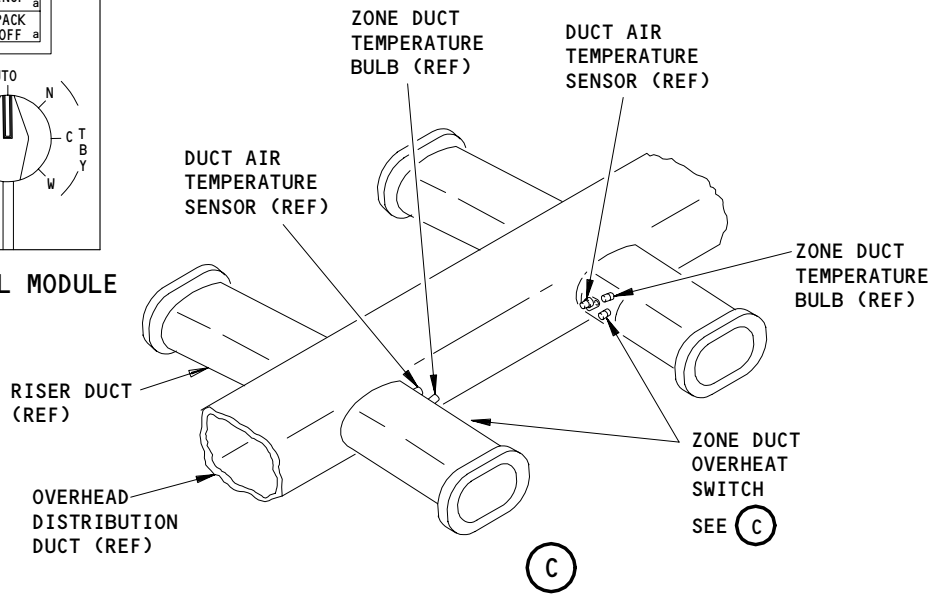
A





FLIGHT COMPARTMENT DISTRIBUTION DUCT

B



C

Zone Duct Overheat Switch Adjustment Test
Figure 501

88665

S 495-007
(4) Make a connection bwtween pins 1 and 2 of the electrical connector.

S 865-016
(5) Make sure the FLT DK INOP light on the P5 panel comes on.

S 215-035
(6) Make sure the EICAS message, FLT DECK TEMP, shows.

S 095-017
(7) Remove the connection between pins 1 and 2.

S 435-002
(8) Install the electrical connector on the flight deck zone duct overheat switch.

S 865-001
(9) Make sure the FLT DK INOP light on the P5 panel goes out.

S 415-018
(10) Close the access door 119BL.

D. Forward-Zone-Duct-Overheat Switch Test

S 035-021
(1) Disconnect the electrical connector from the forward-zone-duct-overheat switch.

S 495-008
(2) Make a connection between pins 1 and 2 of the electrical connector.

S 865-022
(3) Make sure the FWD CAB INOP light on P5 panel comes on.

S 215-036
(4) Make sure the EICAS message, FWD CABIN TEMP, shows.

S 095-023
(5) Remove the connection between pins 1 and 2.

S 435-003
(6) Install the electrical connector on the forward zone duct overheat switch.

S 865-004
(7) Make sure the FWD CAB INOP light on the P5 panel goes out.

E. Aft Zone Duct Overheat Switch Test

S 035-024
(1) Disconnect the electrical connector from the aft-zone-duct-overheat switch.

S 495-009
(2) Make a connection between pins 1 and 2 of the electrical connector.

S 865-025
(3) Make sure the AFT CAB INOP light on the P5 panel comes on.

S 215-037
(4) Make sure the EICAS message, AFT CABIN TEMP, shows.

S 095-026
(5) Remove the connection between pins 1 and 2.

S 435-005
(6) Install the electrical connector on the aft zone duct overheat switch.

S 865-006
(7) Make sure the AFT CAB INOP light on the P5 panel goes out.

S 405-027
(8) Close the ceiling panel (AMM 25-22-01/401).

S 865-029
(9) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

TASK 21-61-01-705-128

3. Zone Duct Overheat Switch Test (Fig. 501)
   A. General
      (1) This procedure contains two scheduled maintenance tasks.
         (a) One task tests the circuits for the zone duct overheat switch.

         (b) One task tests the zone duct overheat switch.

   B. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power - Control
      (3) AMM 25-22-01/401, Sculptured Ceiling Panels
   C. Prepare for the Test

      S 865-068
      (1) Supply electrical power (AMM 24-22-00/201).

S 865-069
(2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11P25, ZONE DUCT OVHT/INOP FLT DK
(b) 11P26, ZONE DUCT OVHT/INOP FWD
(c) 11P27, ZONE DUCT OVHT/INOP AFT

S 865-070
(3) Put the Trim Air Switch to the ON position.

S 865-071
(4) Put all three Zone Temp Selectors to the AUTO position.

S 015-072
(5) Open the left side ceiling panel approximately six windows aft of the No. 2 passenger door (AMM 25-22-01/401).

D. Flight Deck Zone Duct Overheat Switch Test

S 015-073
(1) Open the main equipment center access door 119BL (AMM 06-41-00/201).

S 015-074
(2) Find the switch on the flight deck distribution duct on the left sidewall near the aft end of the nose wheel well.

S 025-076
(3) Disconnect the electrical connector from the flight compartment zone duct overheat switch.

S 025-077
(4) Do these steps to remove the switch:
(a) Remove the switch from the anchor nut in the duct.
(b) Put a cover on the duct hole to keep out unwanted material.

S 705-078
(5) Send the overheat switch to the shop and do a check of the overheat switch's response at the required actuation/closing temperature, reset/opening temperature, and proof temperature.
(a) Replace the overheat switch if it does not respond correctly.

S 765-079
(6) Make a connection between pins 1 and 2 of the electrical connector.

S 865-080
(7) Make sure the FLT DK INOP light on the P5 panel comes on.

S 215-081
(8) Make sure the EICAS message, FLT DECK TEMP, shows.

S 095-082
(9) Remove the connection between pins 1 and 2.

S 425-083
(10) Do these steps to install the switch:
(a) Remove the cover on the duct hole.
(b) Install the switch into the anchor nut.
(c) Tighten the switch.

S 425-084
(11) Install the electrical connector on the flight deck zone duct overheat switch.

S 865-085
(12) Make sure the FLT DK INOP light on the P5 panel goes out.

S 415-086
(13) Close the access door 119BL.

E. Forward-Zone-Duct-Overheat Switch Test

S 025-087
(1) Disconnect the electrical connector from the forward-zone-duct-overheat switch.

S 025-088
(2) Do these steps to remove the switch:
(a) Remove the switch from the anchor nut in the duct.
(b) Put a cover on the duct hole to keep out unwanted objects.

S 705-089
(3) Send the overheat switch to the shop and do a check of the overheat switch's response at the required actuation/closing temperature, reset/opening temperature, and proof temperature.
(a) Replace the overheat switch if it does not respond correctly.

S 765-090
(4) Make a connection between pins 1 and 2 of the electrical connector.

S 865-091
(5) Make sure the FWD CAB INOP light on P5 panel comes on.

S 215-092
(6) Make sure the EICAS message, FWD CABIN TEMP, shows.

S 095-093
(7) Remove the connection between pins 1 and 2.

S 425-094
(8) Do these steps to install the switch:
(a) Remove the cover on the duct hole.
(b) Install the switch into the anchor nut.
(c) Tighten the switch.
(d) Install the lockwire on the switch.

S 425-095
(9) Install the electrical connector on the forward zone duct overheat switch.

S 865-096
(10) Make sure the FWD CAB INOP light on the P5 panel goes out.

F. Aft Zone Duct Overheat Switch Test

S 025-097
(1) Disconnect the electrical connector from the aft-zone-duct-overheat switch.

S 025-098
(2) Do these steps to remove the switch:
(a) Remove the switch from the anchor nut in the duct.
(b) Put a cover on the duct hole to keep out unwanted objects.

S 705-099
(3) Send the overheat switch to the shop and do a check of the overheat switch's response at the required actuation/closing temperature, reset/opening temperature, and proof temperature.
(a) Replace the overheat switch if it does not respond correctly.

S 765-100
(4) Make a connection between pins 1 and 2 of the electrical connector.

S 865-101
(5) Make sure the AFT CAB INOP light on the P5 panel comes on.

S 215-102
(6) Make sure the EICAS message, AFT CABIN TEMP, shows.

S 095-103
(7) Remove the connection between pins 1 and 2.

S 425-104
(8) Do these steps to install the switch:
(a) Remove the cover on the duct hole.
(b) Install the switch into the anchor nut.
(c) Tighten the switch.
(d) Install the lockwire on the switch.

S 425-105
(9) Install the electrical connector on the aft zone duct overheat switch.

S 865-106
(10) Make sure the AFT CAB INOP light on the P5 panel goes out.

S 415-107
(11) Close the ceiling panel (AMM 25-22-01/401).

S 865-108
(12) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

DUCT AIR TEMPERATURE SENSOR - REMOVAL/INSTALLATION

1. General
   A. A duct air temperature sensor is installed in each of the three cabin zone air supply ducts. The flight-compartment-zone-duct-air-temperature sensor is installed below the floor along the left side airplane skin, near the aft end of the nose wheel well. The other two zone duct air temperature sensors are found above the passenger compartment ceiling on the riser ducts. They are installed on the left side of the main-overhead-distribution manifold, approximately six windows aft of the No. 2 passenger door.
   B. Two more duct air temperature sensors are installed on the mix manifold in the aft end of the forward cargo compartment. The removal/installation procedure is the same for all sensors but does not include the same access location.

TASK 21-61-02-004-002

2. Remove the Duct Air Temperature Sensor (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
      (3) AMM 24-22-00/201, Electric Power Control
      (4) AMM 25-50-03/401, Bulkhead Lining Panels
   B. Access
      (1) Location Zones

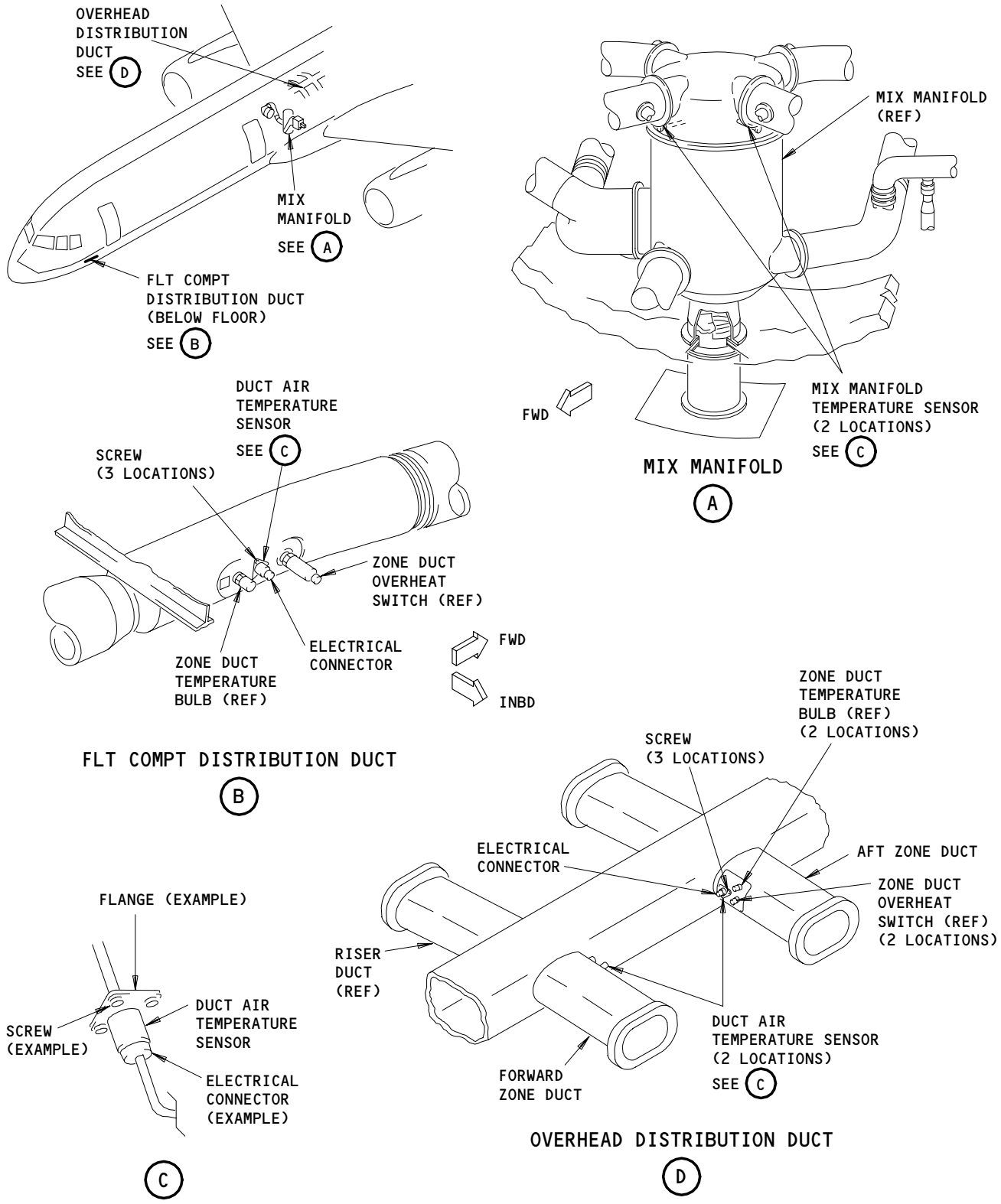
119/120	Main Equipment Center
122	Forward Cargo Compartment (Right)
233/234	Area Above Passenger Cabin Ceiling - Section 43

      (2) Access Panels

119BL	Main Equipment Center Access Door

   C. Prepare for Removal

      S 864-003
      (1) Supply electrical power (AMM 24-22-00/201).



Duct Air Temperature Sensor - Installation
Figure 401

S 864-004
(2) Push the L and R RECIRC FAN switchlights on the pilot's overhead panel, P5, to the ON position.

S 864-006
(3) Put the two air conditioning pack control switches on the P5 panel in the OFF position. Attach DO-NOT-OPERATE tags to the two switches.

S 864-050
(4) To remove the duct temperature sensors, open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the overhead circuit breaker panel, P11:
1) 11P16, CABIN ZONE CONT

S 864-045
(5) For the duct air temperature sensor on the left mix-manifold, open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the overhead circuit breaker panel, P11:
1) 11M11, LEFT PACK AUTO PWR

S 864-053
(6) For the duct air temperature sensor on the right mix manifold, open this circuit breaker and attach a DO-NOT-CLOSE tag:
(a) On the overhead circuit breaker panel, P11:
1) 11M19, RIGHT PACK AUTO PWR

S 014-008
(7) For the duct air temperature sensor in the flight compartment, open the main equipment center access door 119BL (AMM 06-41-00/201).

S 014-009
(8) For the duct air temperature sensor in the forward or aft passenger cabin, open the ceiling panel approximately six windows aft of the No.2 passenger door.

S 014-011
(9) For the temperature sensors in the mix manifold, open the forward cargo door 821 (AMM 06-46-00/201).

S 014-046
(10) Remove the bulkhead lining panels at the aft end of the forward cargo compartment (AMM 25-50-03/401).

D. Procedure

S 034-012
(1) Disconnect the electrical connector from the temperature sensor.

S 034-013
(2) Remove the screws that hold the sensor in the mix manifold or the duct.

S 024-001
(3) Remove the sensor.

S 864-014
(4) Put a cover on the duct hole to keep out unwanted objects.

TASK 21-61-02-404-015

3. Install the Duct Air Temperature Sensor (Fig. 401)

A. References
(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
(3) AMM 21-51-14/501, Pack Temperature Controller
(4) AMM 21-61-00/501, Primary (zone) Temperature Control System
(5) AMM 24-22-00/201, Electric Power Control
(6) AMM 25-50-03/401, Bulkhead Lining Panels

B. Access
(1) Location Zones
119/120 Main Equipment Center
122 Forward Cargo Compartment (Right)
233/234 Area Above Passenger Cabin Ceiling - Section 43

(2) Access Panels
119BL Main Equipment Center Access Door

C. Procedure

S 014-016
(1) Remove the cover installed on the duct.

S 424-017
(2) Put the sensor into the duct or the mix manifold and align the flange holes.

S 434-032
(3) Install and tighten the screws to a torque value of 300 +/- 15 inch-pounds.

S 414-019
(4) Attach the electrical connector to the sensor.

S 864-020
(5) For the duct air temperature sensors, remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) On the overhead circuit breaker panel, P11:
1) 11P16, CABIN ZONE CONT

S 864-047
(6) For the duct air temperature sensor on the left mix manifold, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11M11, LEFT PACK AUTO PWR

S 864-058
(7) For the duct air temperature sensor on the right mix manifold, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the overhead circuit breaker panel, P11:
1) 11M19, RIGHT PACK AUTO PWR

S 794-021
(8) Do a test of the sensor flange for air leakage.
(a) Leakage along a large area is permitted.
(b) Leakage from a small area must be repaired by flange alignment.

S 744-030
(9) For the duct temperature sensors, do the zone temperature controller BITE test (AMM 21-61-00/501).
(a) Make sure the applicable DUCT SENSOR fault light does not come on.

S 744-022
(10) For the mix manifold temperature sensors, do the applicable (left or right) pack temperature controller BITE test (AMM 21-51-14/501).
(a) Make sure the MIX MANIFOLD SENSOR fault light does not come on.

D. Put the Airplane Back to Its Usual Condition

S 414-025
(1) For the mix manifold sensor, install the bulkhead lining panels (AMM 25-50-03/401).##
(a) Close the forward cargo door 821 (Ref 06-46-00).

S 414-027
(2) For the flight deck duct air temperature sensor, close the main equipment center access door 119BL (AMM 06-41-00/201).

S 414-028
(3) For the forward or aft duct air temperature sensor, close the applicable ceiling panel.

S 864-031
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

DUCT AIR TEMPERATURE SENSOR - INSPECTION/CHECK

1. General
   A. This procedure has one task. It is a check of the Duct Temperature Sensors for accurate resistance.
   B. There are five Duct Temperature Sensors.
      (1) Three Duct Temperature Sensors are in the cabin:
         (a) One is in the flight compartment
         (b) One is in the forward passenger cabin
         (c) One is in the aft passenger cabin.
      (2) Two Duct Temperature Sensors are in the mix manifold in the aft end of the forward cargo compartment.

TASK 21-61-02-706-027

2. Duct Air Temperature Sensor Resistance Check
   A. General
      (1) This procedure does a check of the calibration of the sensor while the sensor is installed in the airplane. Because you can not find the temperature of the sensor accurately while it is installed in the duct, this test is for system troubleshooting only.
   B. Equipment
      (1) Digital Multimeter, High Impedence (alternative)

         NOTE: The digital multimeter must be specifically selected to minimize self-heating of the sensor element. The instrument must limit the current through the sensor to less than 100 microamperes. If you use resistance measuring instruments without this current-limiting feature you will get an error in resistance value due to self-heating of the sensor element.

      (2) Digital Multimeter, Hewlett Packard Model 3465A (alternative)
      (3) Thermometer (capable of measuring temperature in degrees F to an accuracy of plus or minus 1 degree F from -40 to 140 degrees F)
   C. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors Access Doors and Panels
      (2) AMM 21-51-14/401, Pack Temperature Controller
      (3) AMM 21-61-03/401, Zone Temperature Controller
      (4) AMM 25-50-03/401, Bulkhead Lining Panels
   D. Access
      (1) Location Zones

119/120	Main Equipment Center
122	Forward Cargo Compartment (Right)
233/234	Area Above Passenger Cabin Ceiling - Section 43

(2) Access Panels
119BL Main equipment center access door

E. Prepare for the Resistance Check

S 886-001
(1) Make sure the pack has been off for 20 minutes or until it has reached ambient temperature.

S 016-002
(2) To do the test of one of the cabin Duct Temperature Sensors:
(a) Remove the Zone Temperature Controller (AMM 21-61-03/401).
(b) To do the test for the forward or aft cabin Duct Temperature Sensor, open the ceiling panel approximately six windows aft of the No.2 passenger door.

S 016-003
(3) To do the test of the forward (aft) mix manifold Duct Temperature Sensors,
(a) Remove the L(R) Pack Temperature Controller (AMM 21-51-14/401).
(b) Open the forward cargo door 821 (AMM 06-46-00/201).
(c) Remove the bulkhead lining panels at the aft end of the forward cargo compartment (AMM 25-50-03/401).

F. Do the Test of the Duct Air Temperature Sensors

S 226-019
(1) To do the test for the flight compartment Duct Temperature Sensor, measure the temperature in the flight compartment.

S 226-005
(2) To do the test for any other Duct Temperature Sensor, measure the temperature adjacent to the Duct Temperature Sensor.

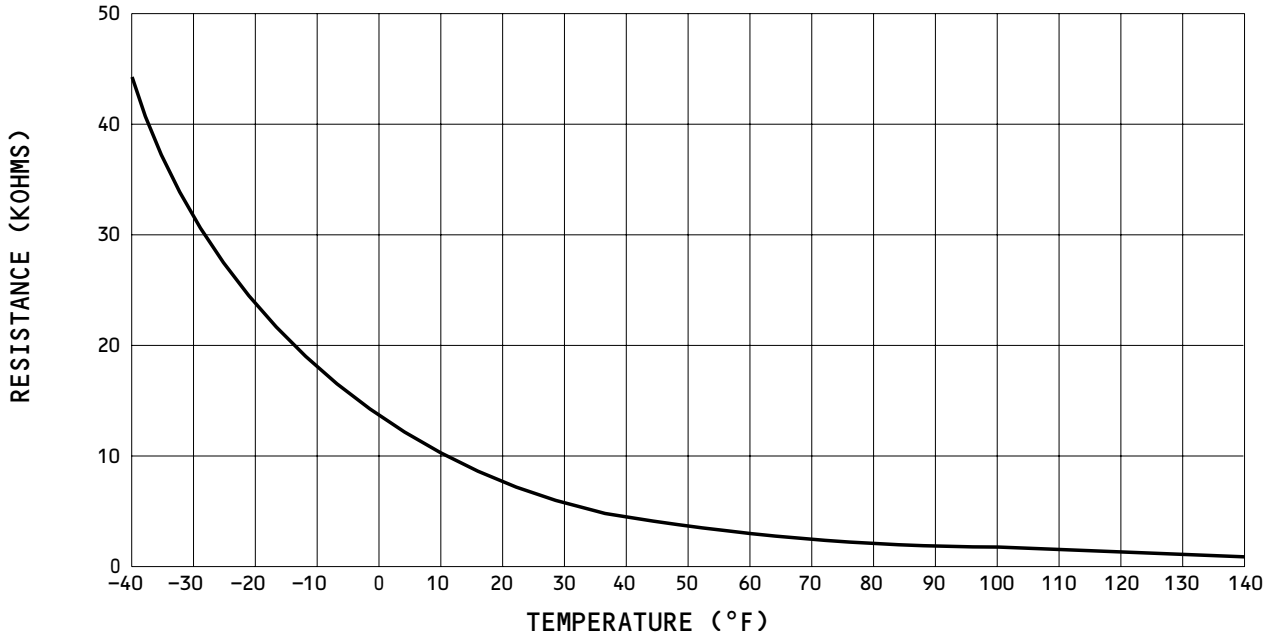
S 976-006
(3) Write down the temperature.

S 486-007
(4) To do the test of the Flight Compartment Duct Temperature Sensor, connect the digital multimeter between pins AA6 and AA7 on the airplane shelf connector (D2558) for the Zone Temperature Controller.

S 486-008
(5) To do the test of the Forward Zone Duct Temperature Sensor, connect the digital multimeter between pins AB6 and AB7 on the airplane shelf connector (D2558) for the Zone Temperature Controller.

°F	OHMS
-40	43030-45210
-35	36690-38550
-30	31360-32960
-25	26930-28230
-20	23140-24260
-15	19940-20900
-10	17220-18050
-5	14890-15580
0	12950-13550
5	11310-11780
10	9870-10290
15	8640-9000
20	7520-7900
25	6660-6940
30	5870-6120
35	5180-5400
40	4580-4770
45	4060-4230
50	3600-3750

°F	OHMS
55	3200-3340
60	2850-2980
65	2550-2660
70	2290-2390
75	2040-2130
80	1830-1920
85	1650-1730
90	1480-1560
95	1340-1400
100	1210-1270
105	1100-1150
110	990-1040
115	900-950
120	820-860
125	740-790
130	680-720
135	620-660
140	560-600



DUCT TEMPERATURE SENSOR
RESISTANCE VS TEMPERATURE GRAPH

Duct Temperature Sensor - Temperature and Resistance Data
Figure 601

S 486-023
(6) To do the test of the Aft Zone Duct Temperature Sensor, connect the digital multimeter between pins AC6 and AC7 on the airplane shelf connector (D2558) for the Zone Temperature Controller.

S 486-024
(7) To do the test of the Forward Zone Mix Manifold Duct Temperature Sensor, connect the digital multimeter between pins AB4 and AB5 on the airplane shelf connector (D2964) for the Left Pack Temperature Controller.

S 486-030
(8) To do the test of the Aft Zone Mix Manifold Duct Temperature Sensor, connect the digital multimeter between pins AB4 and AB5 on the airplane shelf connector (D3026) for the Right Pack Temperature Controller.

S 766-009
(9) Write down the resistance in Ohms that you measure.

S 976-010
(10) Find the temperature on Figure 601 that is nearest to the temperature that you wrote down.

S 976-011
(11) Compare the permitted range of resistance for that temperature to the resistance you wrote down.

S 906-012
(12) If the resistance is out of range, replace the sensor (AMM 21-61-02/401).

G. Put the Airplane Back to Its Usual Condition

S 416-014
(1) Install the Zone Temperature Controller (AMM 21-61-03/401) or the L(R) Pack Temperature Controller (AMM 21-51-14/401).

S 416-015
(2) Close the ceiling panel that you opened.

S 416-020
(3) Install the bulkhead lining panels that you removed (AMM 25-50-03/401).

S 416-021

(4) Close the forward cargo door (821) if you opened it (AMM 06-46-00/201).

ZONE TEMPERATURE CONTROLLER - REMOVAL/INSTALLATION

1. General
   A. The zone temperature controller is installed in the E3 rack of the main equipment center. The zone controller operates the zone temperature control system in the AUTO mode.

TASK 21-61-03-004-001

2. Remove the Zone Temperature Controller (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors, and Panels
      (2) AMM 06-46-00/201, Entry, Service and Cargo Doors
      (3) AMM 20-10-01/401, Standard Practices - E/E Rack Mounted Components
   B. Access
      (1) Location Zones
          120 Main Equipment Center (Right)

      (2) Access Panel
          119BL Equipment Center Access Door

   C. Prepare for Removal

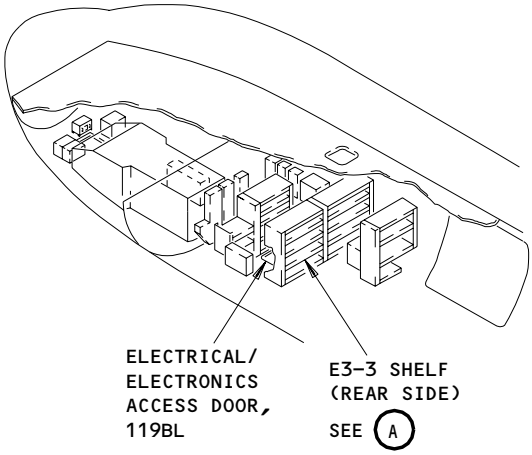
      S 864-002
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11P16, CABIN ZONE CONT

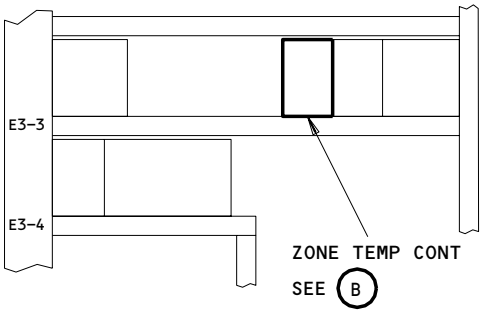
      S 014-013
      (2) Open the main equipment center door, 119BL (AMM 06-41-00/201), and find the zone temperature controller.
   D. Procedure

      S 024-015
      (1) Remove the zone temperature controller (AMM 20-10-01/401).

TASK 21-61-03-404-016

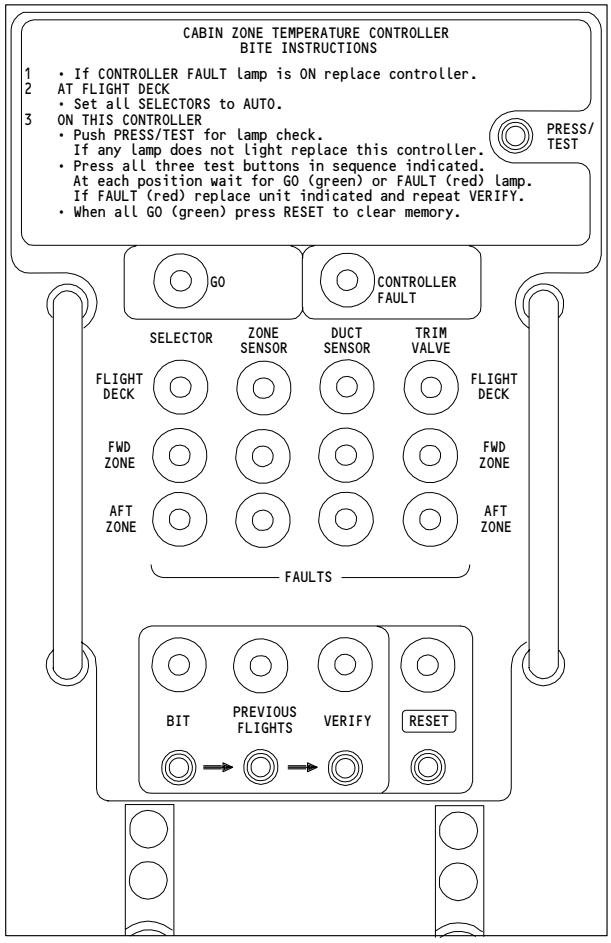
3. Install the Zone Temperature Controller (Fig. 401)
   A. References
      (1) AMM 06-46-00/201, Entry, Service and Cargo Doors





MAIN EQUIPMENT CENTER, E3-3 SHELF

A



B

Zone Temperature Controller Installation
Figure 401

(2) AMM 20-10-01/401, Standard Practices - EE Rack Mounted Components
(3) AMM 24-22-00/201, Electric Power Control

B. Access

(1) Location Zones
120 Main Equipment Center (Right)

(2) Access Panel
119BL Main Equipment Center Access Door

C. Procedure

S 424-017
(1) Install the zone temperature controller (AMM 20-10-01/401).

S 864-018
(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11P16, CABIN ZONE CONT

S 864-019
(3) Supply electrical power (AMM 24-22-00/201).

S 864-020
(4) Push the controller LAMP TEST switch. Make sure that all the indication lights come on and go off when the switch is released.

S 864-038
(5) If a zone temperature controller is installed from another airplane, do the steps that follow to clear the non-volatile memory in the zone temperature controller.

NOTE: If you install a zone temperature controller from a different airplane, you must reset the controller to clear the "PREVIOUS FLIGHTS" and "BIT" memory.

(a) Push the VERIFY switch on the controller.
(b) Make sure the green GO light comes on.
(c) Push the RESET switch on the controller.

D. Put the Airplane Back to its Usual Condition

S 414-031
(1) Close the main equipment center door (119BL).

S 864-033
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

ZONE TEMPERATURE SELECTOR - REMOVAL/INSTALLATION

1. General
   A. Three cabin zone temperature selectors are found on the temperature control panel of the pilot's overhead panel, P5. Removal/installation procedures are the same for all three selectors.

TASK 21-61-04-004-005

2. Remove the Zone Temperature Selectors (Fig. 401)
   A. Access
      (1) Location Zone
          212 Control Cabin (Right)

   B. Prepare for Removal

      S 864-006
      (1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11P15, CABIN TRIM AIR

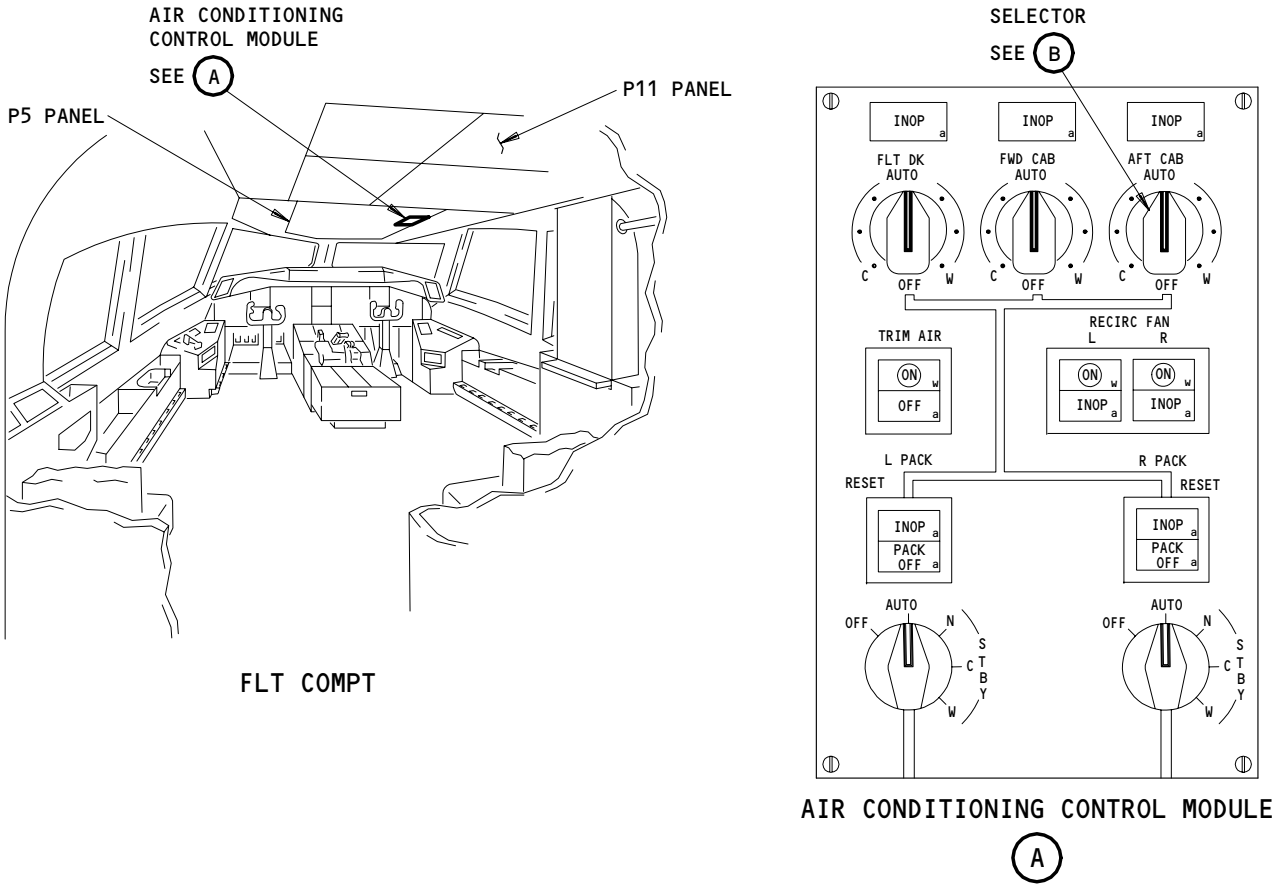
   C. Procedure

      S 034-007
      (1) Loosen the set screws from the zone temperature selector knob and pull the knob off of the shaft.

      S 034-008
      (2) Loosen the four 1/4 turn fasteners on the temperature control panel. Pull the panel out to a workable position. Do not disconnect any wiring.

      S 034-009
      (3) Disconnect the electrical connector from the applicable temperature selector.

      S 034-010
      (4) Remove the retaining nut and washer from the shaft.



Cabin Zone Temperature Selector Installation
Figure 401

S 024-001
(5) Remove the selector from behind the control panel.

S 034-019
(6) Remove the O-ring from between the control panel and the selector.

TASK 21-61-04-404-011

3. Install the Zone Temperature Selector

A. References

(1) 21-61-00/501, Primary (zone) Temperature Control System
(2) 24-22-00/201, Electric Power Control

B. Access

(1) Location Zone
212 Control Cabin (Right)

C. Procedure

S 434-012
(1) Put a new O-ring between the temperature selector and the rear of the temperature control panel.

S 424-003
(2) Put the shaft of the selector through the hole in the panel.

S 824-004
(3) Align the selector with the alignment pin on the panel.

S 434-013
(4) Install the washer and tighten the retaining nut onto the shaft.

S 434-014
(5) Install the electrical connector to the temperature selector.

S 414-015
(6) Place the temperature control panel into the P5 panel and tighten the 1/4-turn fasteners.

S 414-016
(7) Move the selector knob onto the selector shaft. Permit some clearance between the knob and the panel to turn the knob. Tighten the set screws (2 places).

S 864-017
(8) Remove the DO-NOT-CLOSE tag and close the circuit breaker on the P11 panel:
(a) 11P15, CABIN TRIM AIR

S 744-018
(9) Do the BITE test on the zone temperature controller (Ref 21-61-00, Operational Test).
(a) Make sure that the SELECTOR failure light does not come on during the BITE VERIFY test.

TRIM AIR SUPPLY CHECK VALVE - REMOVAL/INSTALLATION

1. General
   A. The two trim air supply check valves are found in the Environmental Control System (ECS) bay. The valves are installed above and inboard of the middle of the air conditioning packs. The valves control the hot air that goes into the trim air supply duct from one or two packs.

TASK 21-61-05-004-002

2. Remove the Trim Air Supply Check Valve (Fig. 401)
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electric Power Control
   B. Access
      (1) Location Zone
          135/136 Environmental Control System Bay

      (2) Access Panels
          193HL/194ER ECS Components Access Door

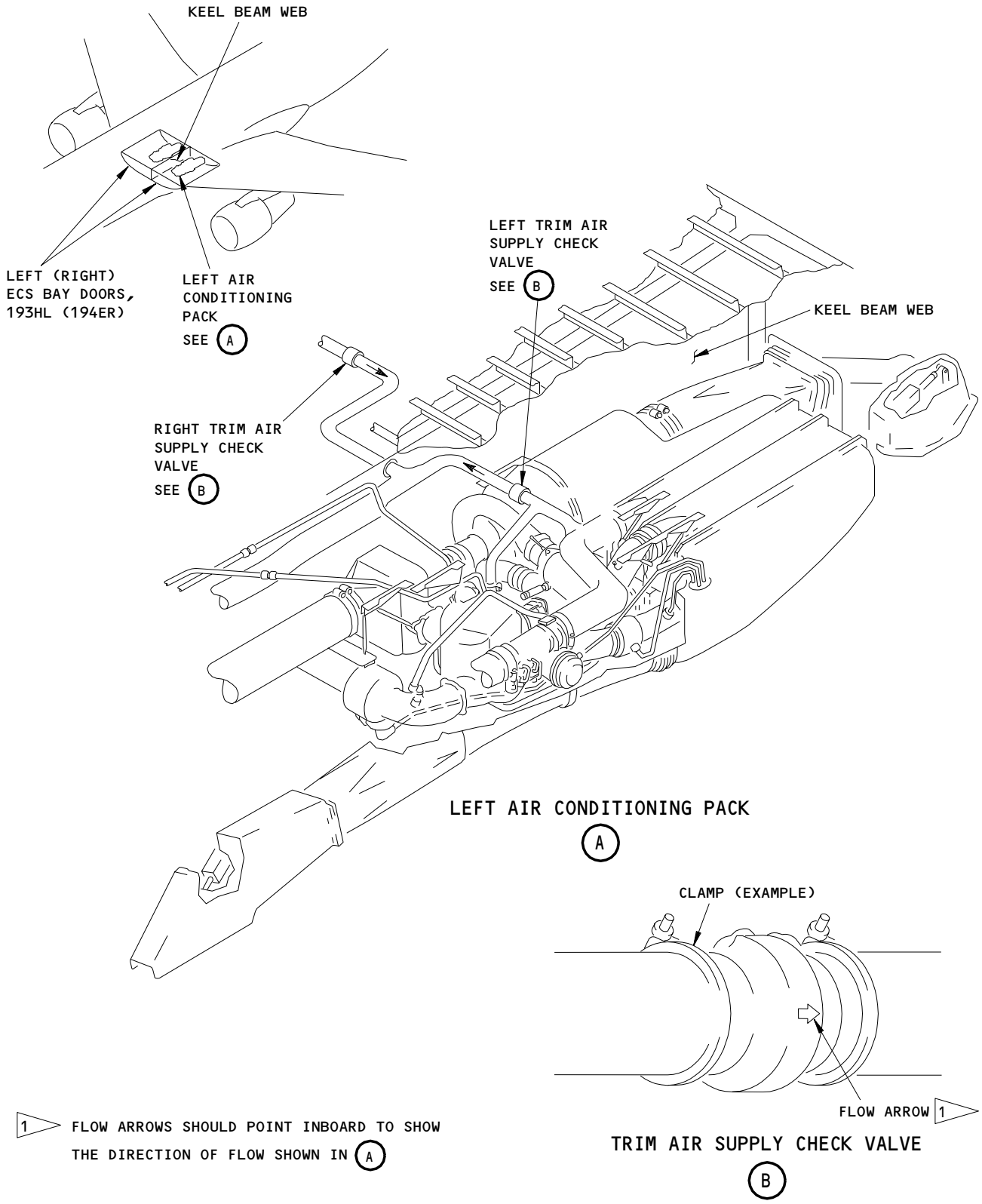
   C. Prepare for Removal

      S 864-003
      (1) Supply electrical power (AMM 24-22-00/201).

      S 864-004
      (2) Put the L and R PACK control selectors on the pilot's overhead panel, P5, to the OFF position. Make sure the PACK OFF light comes on. Attach DO-NOT-OPERATE tag.

      S 014-021
      (3) Open the ECS access door, 193HL for the left pack or 194ER for the right pack, and find the check valve in the trim air supply. (AMM 06-41-00/201).
   D. Remove the Check Valve for the Trim Air Supply

      S 034-007
      (1) Loosen the clamps and move them away from the valve.



Trim Air Supply Check Valve – Installation
Figure 401

S 024-001
(2) Remove the valve.

TASK 21-61-05-404-023

3. Install the Trim Air Supply Check Valve (Fig. 401)

A. References
(1) AMM 36-00-00/201, Pneumatic General
(2) AMM 24-22-00/201, Electric Power Control
(3) AMM 06-41-00/201, Fuselage Access Doors and Panels

B. Access
(1) Location Zone
135/136 Environmental Control System Bay

(2) Access Panels
193HL/194ER ECS Components Access Door

C. Procedure to Install the Trim Air Supply Check Valve

S 424-009
(1) Install the trim air supply check valve with the flow arrow pointed inboard.

NOTE: Make sure you install the valve with the flapper hinge pin as vertical as possible. It may be necessary to install the valve with the hinge pin less than vertical on the left pack due to interference with the air cycle machine.

S 434-012
(2) Install the clamps for the flange on each side of the valve and tighten to 45 pound-inches.

D. Trim Air Check Valve Leak Test

S 864-013
(1) Supply pneumatic power (AMM 36-00-00/201).

S 864-014
(2) Put the L and R PACK control selectors on the pilot's overhead panel, P5, to the AUTO position.

S 794-015
(3) Do a leak test of the connections.
(a) Small leakage is satisfactory.

(b) Repair large leakage with joint or coupling adjustment.

E. Put the Airplane Back to Its Usual Condition

S 864-016

(1) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 864-017

(2) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

S 864-018

(3) Close the ECS access door 193HL or 194ER (AMM 06-41-00/201).

TRIM AIR SUPPLY CHECK VALVE - INSPECTION/CHECK

TASK 21-61-05-206-000

1. Inspection - Trim Air Supply Check Valve (Fig. 601)
   A. References
      (1) 21-61-05/401, Trim Air Supply Check Valves
   B. Prepare for the Inspection.

      S 026-001
      (1) Remove the trim air supply check valve (Ref 21-61-05).
   C. Do the Trim Air Supply Check Valve Inspection

      S 216-003
      (1) Make sure the valve housing is not cracked or corroded.

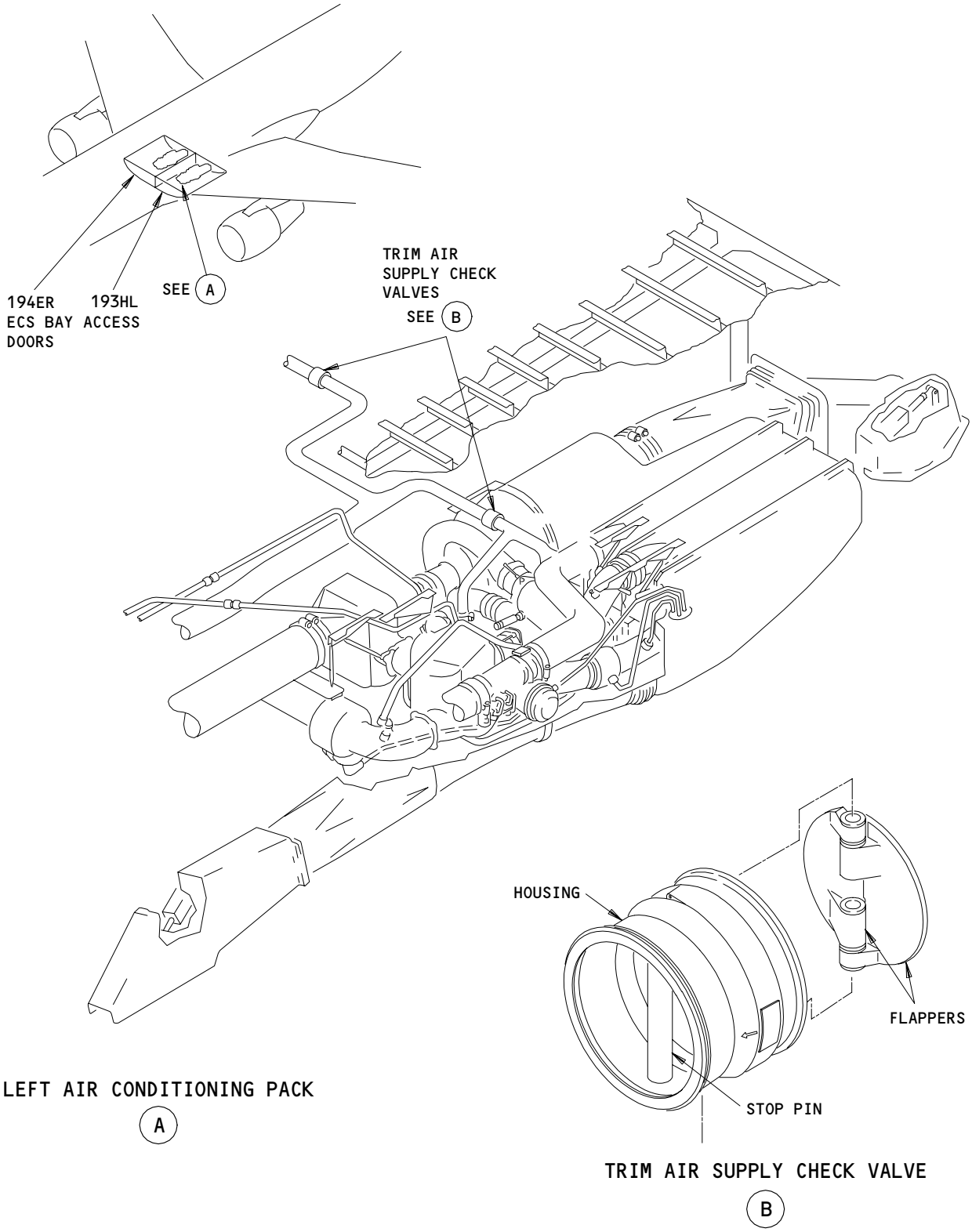
      S 716-004
      (2) Manually open and close the valve flappers. Make sure the flappers move freely.

      S 716-005
      (3) Make sure the flappers touch equally with the valve housing in the closed position.

      S 216-006
      (4) Open the flappers and make sure the surfaces of the valve housing and flappers that touch are not damaged and show no signs of leakage.

      S 216-007
      (5) Make sure the flappers are not bent or cracked.

      S 426-008
      (6) Install the trim air supply check valve (Ref 21-61-05).



LEFT AIR CONDITIONING PACK
A

TRIM AIR SUPPLY CHECK VALVE
B

Trim Air Supply Check Valve
Figure 601

TRIM AIR PRESSURE REGULATING VALVE - REMOVAL/INSTALLATION

1. General
   A. The trim air pressure regulating valve is found at the forward end of the Equipment Control System (ECS) bay. The valve is installed one foot to the left of airplane centerline and approximately one foot up from the bottom of the ECS bay. The trim air pressure regulating valve permits hot air to be used in the fwd, aft and flight compartments of the airplane.

TASK 21-61-06-004-001

2. Remove Trim Air Pressure Regulating Valve (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
      (2) 06-46-00/201, Entry, Service, and Cargo Doors
      (3) 24-22-00/201, Electric Power Control
      (4) 25-50-03/401, Bulkhead Lining
      (5) WDM 21-20-00, Electrical Bonds and Grounds
   B. Access
      (1) Location Zones
          121/122 Forward Cargo Compartment
          135/136 Environmental Control System Bay

      (2) Access Panel
          193HL ECS Components Access Door

   C. Prepare for Removal

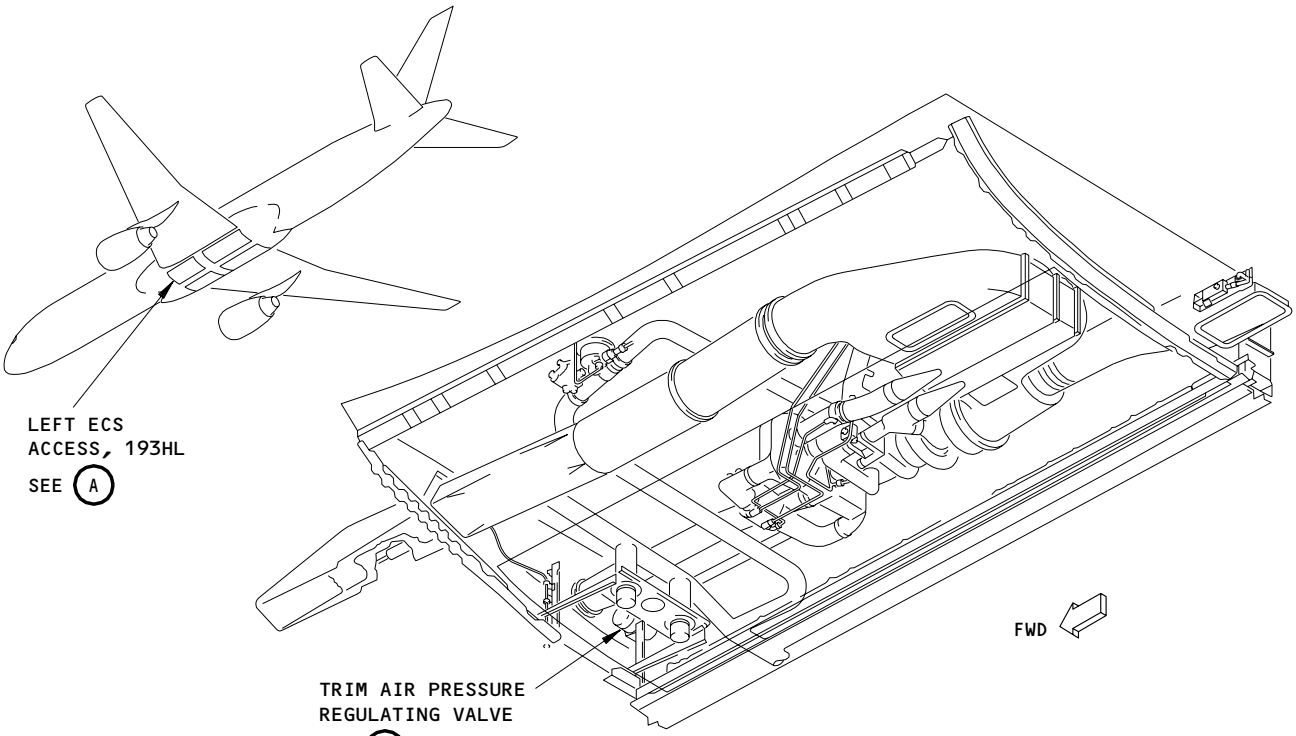
      S 864-002
      (1) Supply electrical power (Ref 24-22-00).

      S 864-003
      (2) Put the L and R PACK control selectors on the pilots overhead panel, P5, to the OFF position. Make sure the L and R PACK OFF lights come on. Attach a DO-NOT-OPERATE tag on the two pack selectors.

      S 864-004
      (3) Push the TRIM AIR switchlight on the P5 panel to the ON position. Make sure the ON light comes on.

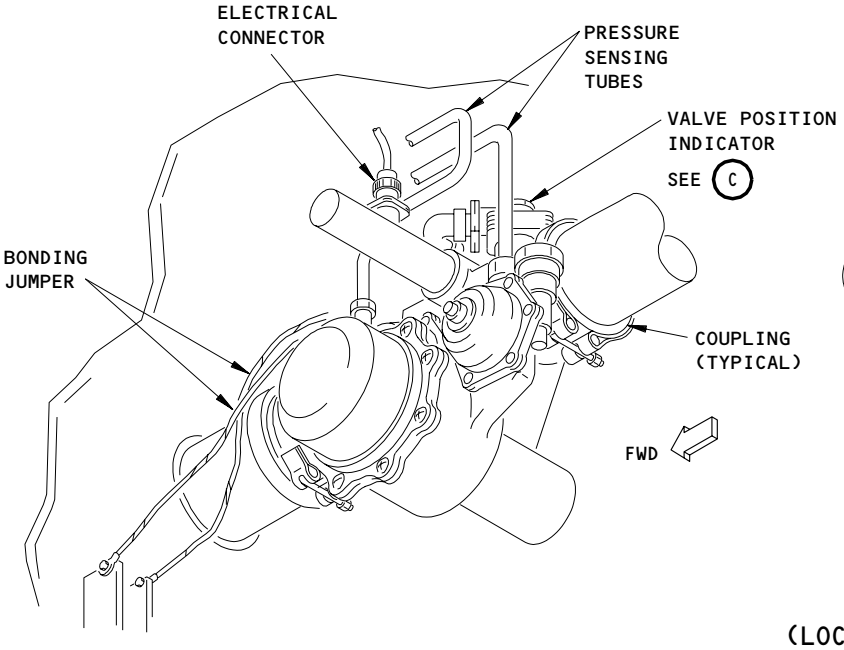
      S 864-005
      (4) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tag:
          (a) 11P15, CABIN TRIM AIR

      S 014-006
      (5) Open the No. 1 cargo door 821 (Ref 06-46-00).



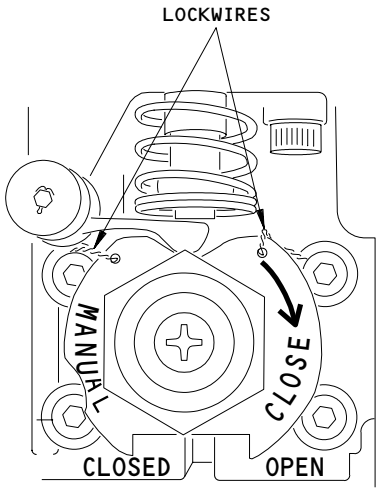
LEFT ECS BAY

A



TRIM AIR PRESSURE REGULATING VALVE

B



VALVE POSITION INDICATOR
(LOCKWIRED IN THE OPEN POSITION)

C

Trim Air Pressure Regulating Valve - Installation
Figure 401

S 014-007
(6) Remove the bulkhead lining panel at the aft end of the forward cargo compartment (AMM 25-50-03/401). Find the trim air modulating valves.

S 864-008
(7) Turn the modulating valve override handle on any valve clockwise, until the visual position indicator shows the valve is OPEN.

S 014-009
(8) Open the left ECS door 193HL (Ref 06-41-00). Find the trim air pressure regulating valve.

D. Procedure

S 034-010
(1) Disconnect the pressure sensing tubes at the regulating valve pressure ports.

S 034-011
(2) Disconnect the electrical connector from the valve.

S 034-012
(3) Disconnect the bonding jumpers at the valve.

S 034-013
(4) Loosen the couplings and move them along the duct away from the valve.

S 024-033
(5) Remove the pressure regulating valve.

S 494-014
(6) Put a cover over the ducts to keep out unwanted objects.

TASK 21-61-06-404-015

3. Install the Trim Air Pressure Regulating Valve (Fig. 401)

A. Access

(1) Location Zones

121/122 Forward Cargo Compartment
135/136 Environmental Control System Bay

(2) Access Panel

193HL ECS Components Access Door

B. Procedure

S 094-016
(1) Remove the covers installed over the ducts.

S 214-037
(2) Inspect the valve position indicator on the trim air pressure regulator valve to ensure it is lockwired in the OPEN position.

S 424-017
(3) Install and align the valve in the duct. Move the couplings into position and tighten the coupling nut to 50 in-lbs.

S 434-018
(4) Attach the electrical connector to the valve.

S 434-019
(5) Install the bonding jumpers to the valve (SWPM 20-20-00).

S 434-020
(6) Attach the pressure sensing tubes to the valve ports.

S 864-021
(7) Close this circuit breaker on the P11 panel and remove the DO-NOT-CLOSE tag.
(a) 11P15, CABIN TRIM AIR

S 864-022
(8) Remove the DO-NOT-OPERATE tag from the TRIM AIR switchlight on the P5 panel.

S 204-023
(9) Make sure all the trim air modulating valves are closed.

S 864-024
(10) Remove the DO-NOT-OPERATE tags from the L and R PACK selectors. Place one of the two L or R PACK selector in AUTO. Make sure the PACK OFF light goes out.

S 864-025
(11) Supply pneumatic power (AMM 36-00-00/201).

S 794-026
(12) Do a leak test of the pressure regulating valve at the flange and sensing tube connections.
(a) Leakage along a large area is satisfactory.
(b) Leakage from a small area must be repaired by joint or coupling adjustment.

S 714-027
(13) Do an operational test of the trim air pressure regulating valve.
(a) Put the TRIM AIR switchlight on the P5 panel to the OFF position.
(b) Make sure the ON light for the TRIM AIR switchlight goes out.

C. Put the Airplane Back to Its Usual Condition

S 414-028
(1) Close the ECS door 193HL (Ref 06-41-00).

S 414-029
(2) Install the bulkhead lining panel at the aft end of the forward cargo compartment (AMM 25-50-03/401).

S 414-030
(3) Close the No. 1 cargo door 821 (Ref 06-46-00).

S 864-031
(4) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 864-032
(5) Remove electrical power if it is not necessary (Ref 24-22-00).

TRIM AIR MODULATING VALVE - REMOVAL/INSTALLATION

1. General
   A. Three modulating valves for the trim air system are installed in the mix bay at the aft end of the forward cargo compartment. The valves control the flow of hot air to their related zones: flight deck, forward cabin, and aft cabin. The removal and installation for each valve is the same.

TASK 21-61-07-004-003

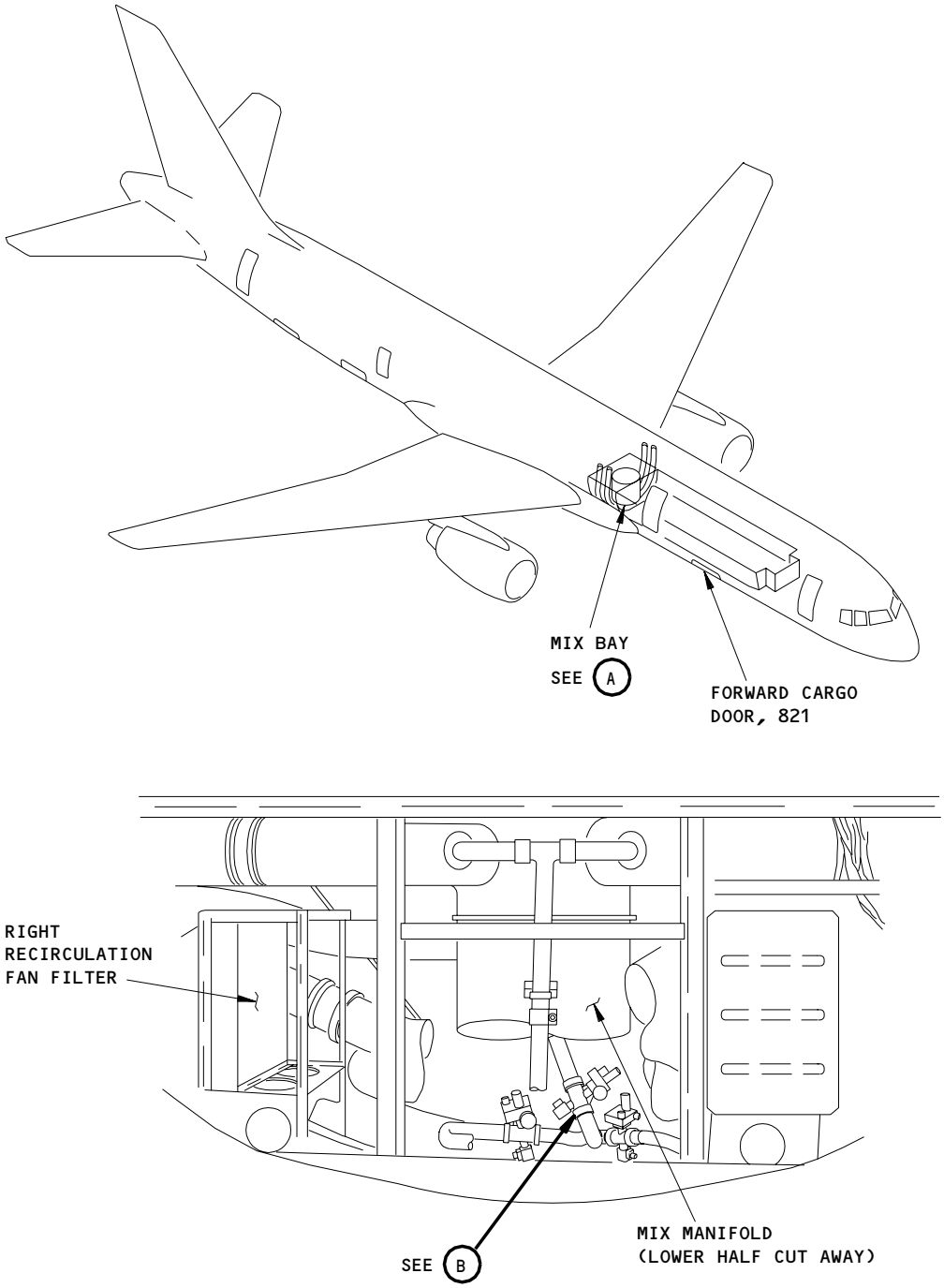
2. Remove the Trim Air Modulating Valve (Fig. 401)
   A. References
      (1) 06-46-00/201, Entry, Service, and Cargo Doors, Access Doors and Panels
      (2) 24-22-00/201, Electric Power - Control
      (3) 25-50-03/401, Bulkhead Lining Panels
   B. Access
      (1) Location Zones
          121/122 Forward Cargo Compartment

   C. Prepare for Removal

      S 864-004
      (1) Supply electrical power (Ref 24-22-00).

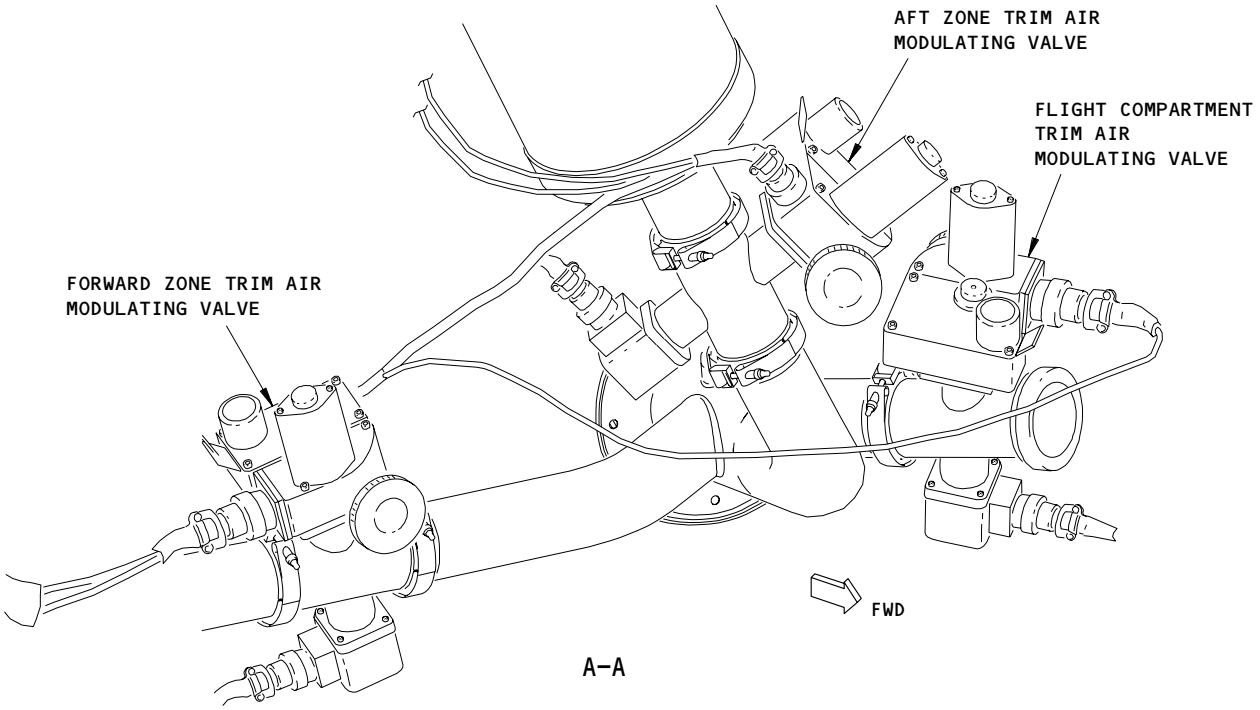
      S 864-005
      (2) Put the L and R PACK control selectors on the pilot's ovhd panel, P5, in the OFF position. Attach DO-NOT-OPERATE tags on the two pack control selectors. Make sure the PACK OFF lights come on.

      S 864-006
      (3) Open these circuit breakers on the overhead circuit breaker panel and attach DO-NOT-CLOSE tags:
          (a) 11P16, CABIN ZONE CONT
          (b) For the flight deck trim air modulating valve:
              1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
          (c) For the fwd zone trim air modulating valve:
              1) 11N26, ZONE TEMP CONT VLV CLOSE FWD

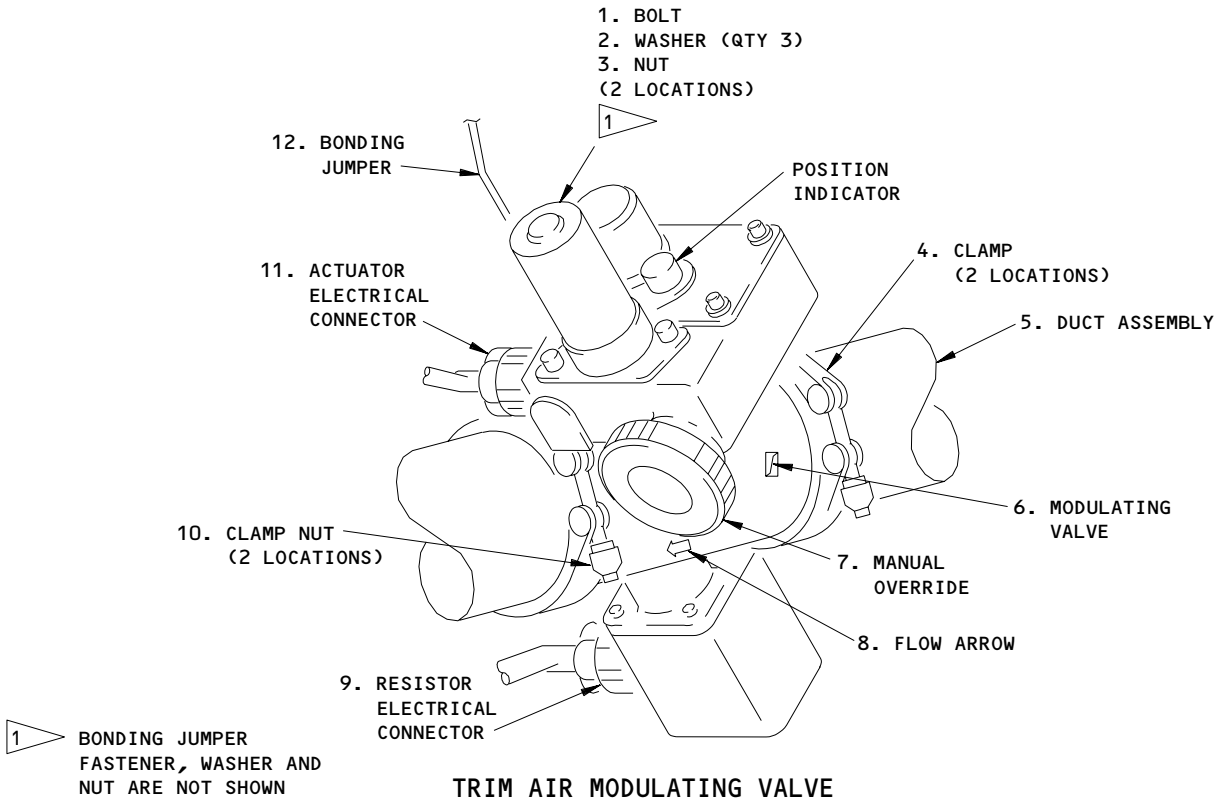


MIX BAY
(VIEW IN THE AFT DIRECTION)
A

Trim Air Modulating Valve - Removal/Installation
Figure 401 (Sheet 1)



A-A



TRIM AIR MODULATING VALVE

B

Trim Air Modulating Valve - Installation
Figure 401 (Sheet 2)

(d) For the aft zone trim air modulating valve:
1) 11N27, ZONE TEMP CONT VLV CLOSE AFT

S 014-007
(4) Open the No. 1 cargo door (821) (Ref 06-46-00).

S 014-008
(5) Remove the bulkhead lining panel at the aft end of the forward cargo compartment (AMM 25-50-03/401).). Find the trim air modulating valve.

S 864-009
(6) Turn the valve manual override (7) until the visual position indicator on the valve (6) shows OPEN.

D. Procedure

S 034-010
(1) Disconnect the electrical connectors (9, 11) from the valve (6).

S 034-011
(2) Remove the bolt (1), washer (2), and nut (3) and disconnect the bonding jumper (12) from the valve (6).

S 034-012
(3) Loosen the clamps (4) on the two sides and move the clamps away from the valve (6).

S 024-001
(4) Remove the valve (6).

S 494-013
(5) Put a cover over the ducts to keep out unwanted objects.

TASK 21-61-07-404-014

3. Install the Trim Air Modulating Valve (Fig. 401)

A. Parts

MM		NOMENCLATURE	IPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	21-61-07	01	100
	2	Washer			105
	3	Nut			110
	4	Clamp			255
	6	Modulating Valve			120

B. References
(1) 06-46-00/201, Entry, Service, and Cargo Doors, Access Doors and Panels
(2) 24-22-00/201, Electric Power - Control
(3) 25-50-03/401, Bulkhead Lining Panels
(4) 36-00-00/201, Pneumatic General

C. Access
(1) Location Zones
121/122 Forward Cargo Compartment

D. Procedure

S 094-015
(1) Remove the covers over the ducts.

S 424-016
(2) Install the modulating valve (6) into the duct and make sure the flow arrow (8) points in the direction of the air flow, away from the air distribution duct.

S 434-002
(3) Move the clamps into position and tighten the nuts to 65 to 70 pound-inches.

S 434-017
(4) Attach the bonding jumper (12) to the valve (6).

S 434-018
(5) Connect the electrical connectors (9, 11) to the valve (6).

S 864-019
(6) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11P16, CABIN ZONE CONT
(b) For the flight deck valve:
1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK

(c) For the fwd zone valve:
1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
(d) For the aft zone valve:
1) 11N27, ZONE TEMP CONT VLV CLOSE AFT

S 864-020
(7) Supply pneumatic power (AMM 36-00-00/201).

S 864-021
(8) Remove the DO-NOT-OPERATE tags from the pack control selectors and put the L and R PACK control selectors on the P5 panel in the AUTO position.

S 864-033
(9) Put the applicable zone temperature selector on the P5 panel to the OFF position.

S 864-034
(10) Make sure the trim air modulating valve position indicator shows CLOSED.

S 864-022
(11) Put the applicable zone temperature selector on the P5 panel to the AUTO WARM position.

S 864-023
(12) Make sure the trim air modulating valve position indicator shows OPEN.

S 794-024
(13) Do a leak test of the valve.
(a) Leakage that cannot be felt 12 inches away from the leak source is satisfactory.
(b) Leakage that can be felt 12 inches away from the leak source must be repaired by joint or clamp adjustment.

E. Put the Airplane Back to Its Usual Condition

S 864-025
(1) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 414-026
(2) Install the bulkhead lining panel (AMM 25-50-03/401).

S 414-027
(3) Close the No. 1 cargo door (821).

S 864-028

(4) Remove electrical power if it is not necessary (Ref 24-22-00).

ZONE TEMPERATURE SENSORS - REMOVAL/INSTALLATION

1. General
   A. Three zone temperature sensors supply signals to the zone temperature controller for temperature control of each cabin zone. The flight compartment zone temperature sensor is installed behind a ceiling panel immediately to the left of the overhead circuit breaker panel, P11. The forward and aft cabin zone temperature sensors are installed above the right side bullnose panels. The bullnose panels are found directly below the overhead stowage bins.
      (1) To find the forward and aft cabin zone temperature sensors, look at the bottom of the right bullnose panels for the inlet filter cover.

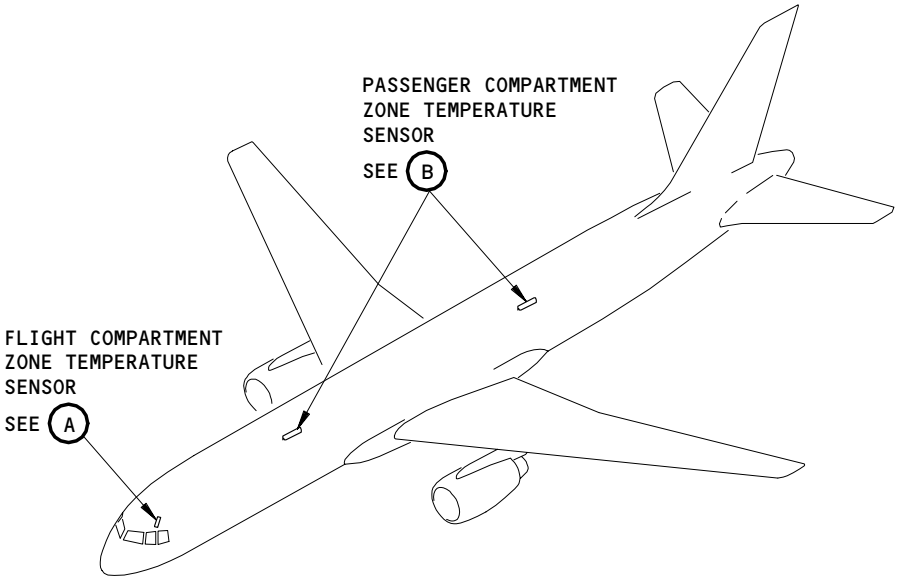
TASK 21-61-08-004-002

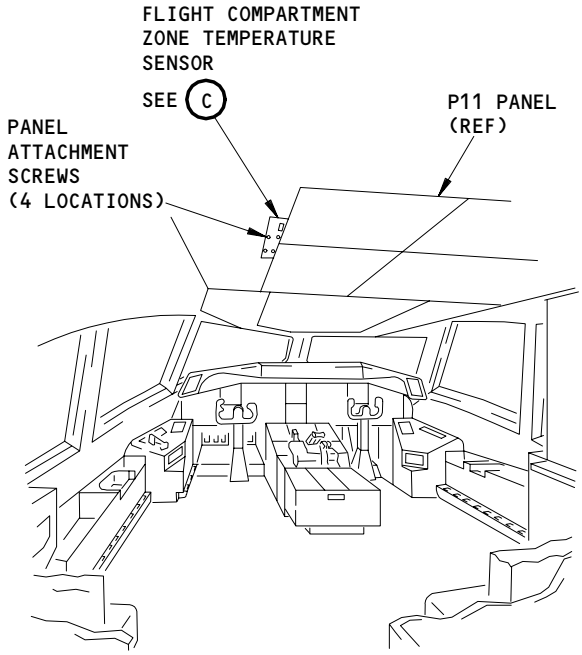
2. Remove the Zone Temperature Sensor (Fig. 401)
   A. References
      (1) 25-23-01/401, Passenger Service Units
   B. Access
      (1) Location Zones
          211 Control Cabin - Section 41 (Left)
          232 Passenger Cabin - Section 43 (Right)
          252 Passenger Cabin - Section 46 (Right)

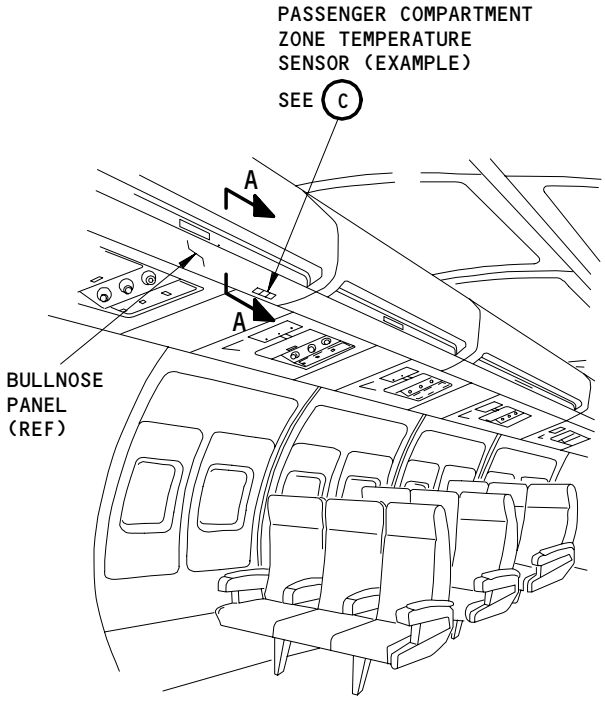
   C. Prepare for Removal

      S 864-003
      (1) Put the left and right air conditioning pack selectors on the pilot's overhead panel, P5, to the OFF position. Make sure the L and R PACK OFF lights come on. Attach a DO-NOT-OPERATE tag on the two pack selectors.

      S 864-004
      (2) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) For flight compartment sensor removal:
              1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
              2) 11P25, ZONE DUCT OVHT/INOP FLT DK
          (b) For forward cabin sensor removal:
              1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
              2) 11P26, ZONE DUCT OVHT/INOP FWD
          (c) For aft cabin sensor removal:
              1) 11N27, ZONE TEMP CONT VLV CLOSE AFT
              2) 11P27, ZONE DUCT OVHT/INOP AFT







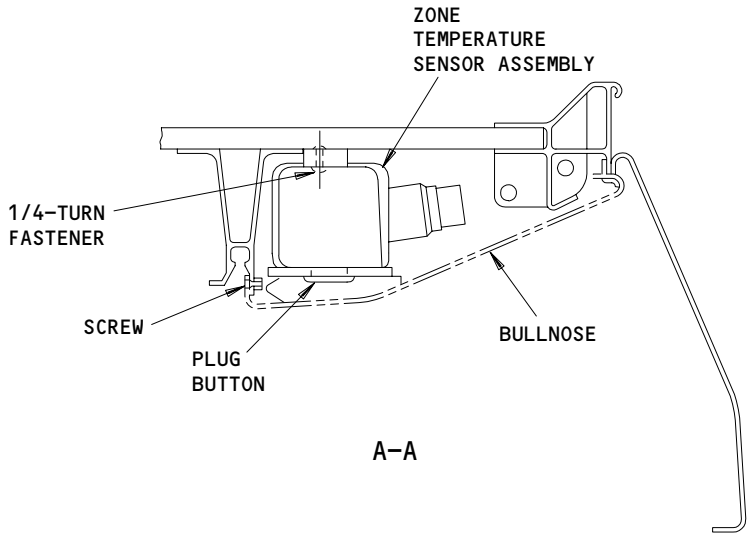
FLIGHT COMPARTMENT

A

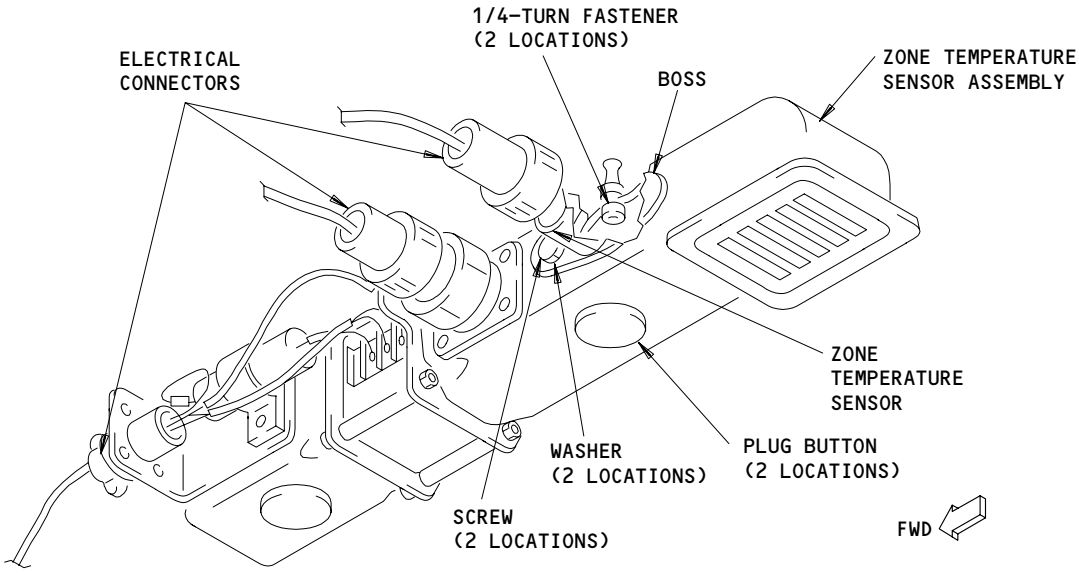
PASSENGER COMPARTMENT

B

Zone Temperature Sensor Installation
Figure 401 (Sheet 1)



A–A

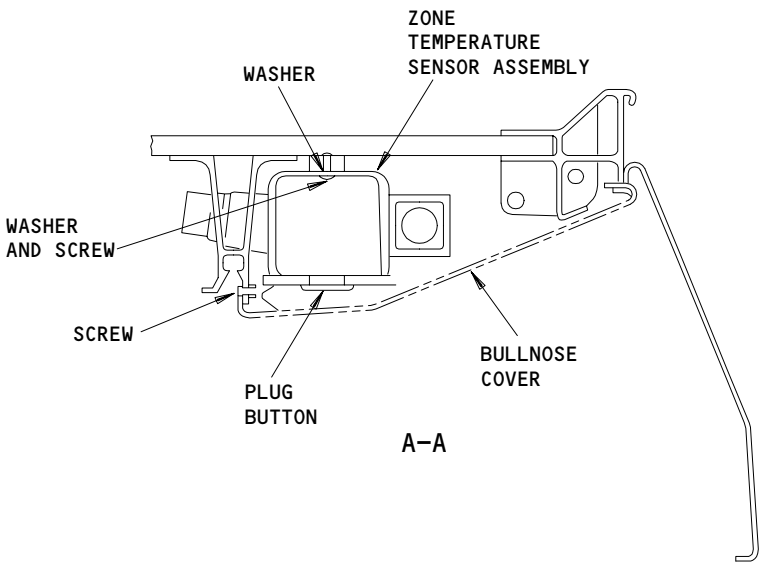


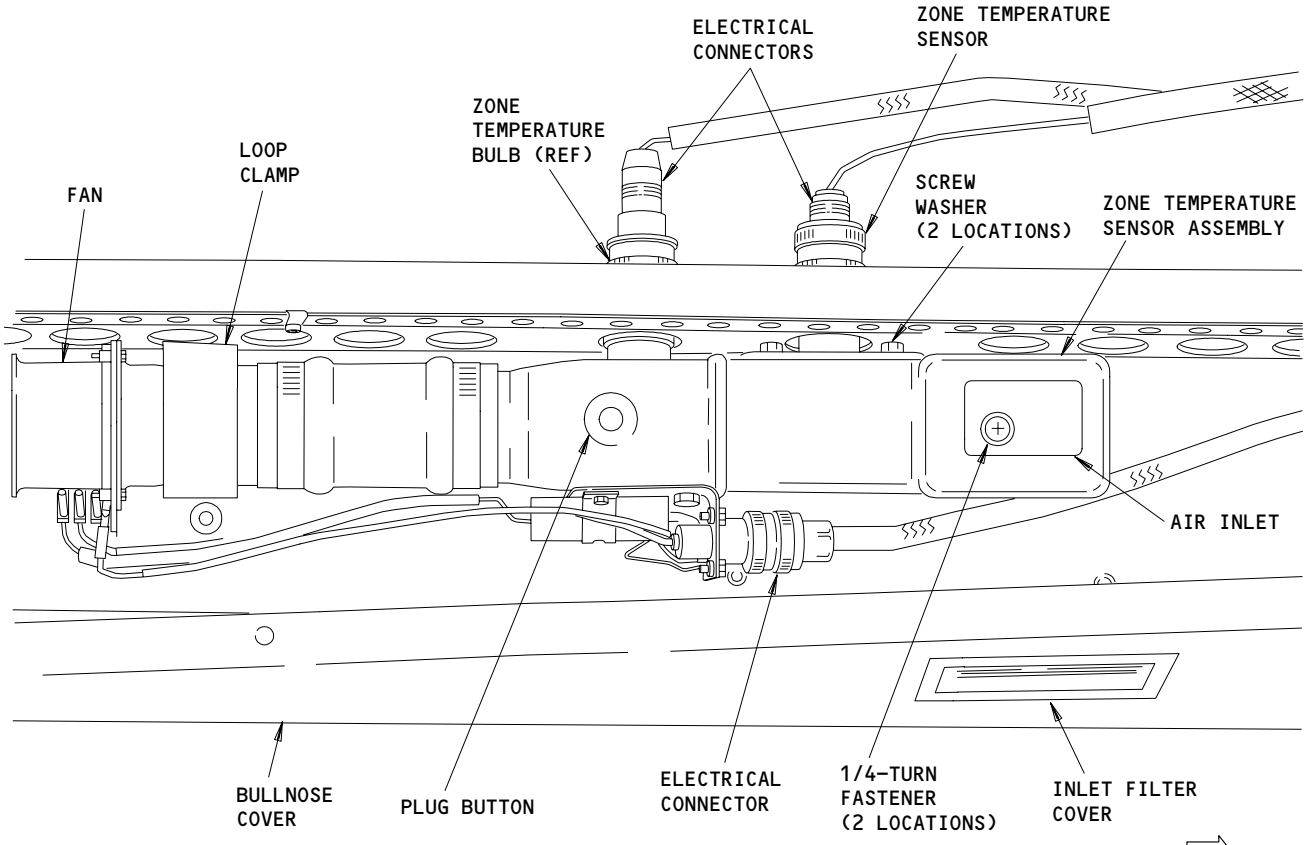
ZONE TEMPERATURE SENSOR ASSEMBLY

(C)

Zone Temperature Sensor Installation
Figure 401 (Sheet 2)

28377





ZONE TEMPERATURE SENSOR ASSEMBLY
(THE BULLNOSE AREA, WHEN YOU LOOK UP)

(C)

Zone Temperature Sensor Installation
Figure 401 (Sheet 3)

277443

S 014-005
(3) To remove the flight compartment sensor, remove the ceiling panel immediately to the left of the overhead circuit breaker panel, P11, for the flight compartment sensor.

S 014-006
(4) To remove the forward or aft cabin sensor, lower the right side passenger service unit which is next to the inlet filter cover (AMM 25-23-01/401).

D. Remove the Flight Compartment Sensor

S 034-012
(1) Remove the two plug buttons which will give access to the two 1/4-turn fasteners.

S 034-013
(2) Turn the 1/4-turn fasteners counterclockwise to loosen the temperature sensor assembly.

E. Remove the Forward and Aft Passenger Cabin Sensor

S 014-047
(1) Remove the screws on the outboard side of the bullnose and open the bullnose panel.

S 024-173
(2) Remove the plug button near the middle of the temperature sensor assembly.

S 034-015
(3) Through the air inlet and the plug button holes, remove one screw and two washers from each location.

S 034-016
(4) Remove the screw, washer, and spacer from the loop clamp near the aft end of the temperature sensor assembly.

F. Procedure

S 034-022
(1) Lower the temperature sensor assembly to get access to the electrical connectors.

S 034-023
(2) Disconnect the three electrical connectors and remove the temperature sensor assembly.

S 024-024
(3) Remove the screws and the washers and remove the temperature sensor from the temperature sensor assembly.

TASK 21-61-08-404-025

3. Install the Zone Temperature Sensor (Fig. 401)

A. References
(1) 21-61-00/501, Primary (zone) Temperature Control System
(2) 24-22-00/201, Electric Power - Control
(3) 25-23-01/401, Passenger Service Units

B. Access
(1) Location Zones
211 Control Cabin - Section 41 (Left)
232 Passenger Cabin - Section 43 (Right)
252 Passenger Cabin - Section 46 (Right)

C. Procedure to Install the Flight Compartment Sensor

S 434-028
(1) Put the temperature sensor assembly on the shock supports and attach the assembly with the two 1/4-turn fasteners.

S 414-029
(2) Install the two plug buttons in the access holes of the temperature sensor assembly.

D. Procedure to Install the Forward and Aft Passenger Cabin Temperature Sensor

S 864-052
(1) Put the temperature sensor on the boss of the temperature sensor assembly.

S 434-064
(2) Install the washers and screws and tighten to a torque value of 225 +/- 15 inch-pounds.

S 434-053
(3) Connect the three electrical connectors to the temperature sensor assembly.

S 434-030
(4) Install a loop clamp around the aft end of the temperature sensor assembly.

S 434-031
(5) Put the temperature sensor assembly in the bullnose.

S 434-032
(6) Install a washer, screw, and spacer in the loop clamp to hold the temperature sensor assembly in position.

S 434-033
(7) Install two washers on the top side of the temperature sensor assembly. Install one washer near the middle of the assembly and one washer near the forward end of the assembly.

S 434-034
(8) Through the plug button and the air inlet holes, install a washer and a screw in each location.

S 414-035
(9) Install the plug button.

S 414-203
(10) Lift the passenger service unit into its closed position (AMM 25-23-01/401).

S 864-048
(11) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
  (a) For flight deck zone temperature sensor installation:
    1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
    2) 11P25, ZONE DUCT OVHT/INOP FLT DK
  (b) For forward cabin zone temperature sensor installation:
    1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
    2) 11P26, ZONE DUCT OVHT/INOP FWD
  (c) For aft cabin zone temperature sensor installation:
    1) 11N27, ZONE TEMP CONT VLV CLOSE AFT
    2) 11P27, ZONE DUCT OVHT/INOP AFT

S 864-049
(12) Remove the DO-NOT-OPERATE tags from the two pack selectors on the P5 panel.

E. Do a test of the zone temperature sensor

S 864-050
(1) Supply electrical power (Ref 24-22-00).

S 864-051
(2) Listen for the zone temperature sensor fan operation at the applicable zone temperature sensor assembly.

S 864-054
(3) Make sure that the compartment temperature indicator, found on the P5 panel, displays the approximate ambient compartment temperature.

S 744-053
(4) Do the zone temperature controller BITE test (Ref 21-61-00/501, Operational Test).
(a) Make sure that the ZONE SENSOR fault light is off during the BITE VERIFY test.

F. Put the Airplane Back to Its Usual Condition

S 414-054
(1) Install the ceiling panel immediately to the left of the P11 panel for the flight deck sensor.

S 414-055
(2) Close the bullnose panel and install the screws on the outboard side of bullnose for the forward or aft cabin zone sensor.

S 414-091
(3) Close the passenger service unit for the forward or aft cabin zone sensor (AMM 25-23-01 401).

S 414-067
(4) Install the ceiling panel in the Door 2 area.

S 864-057
(5) Put the L and R Pack Selectors on the P5 panel to the OFF position.

S 864-058
(6) Remove electrical power if it is not necessary (Ref 24-22-00).

ZONE TEMPERATURE SENSORS - INSPECTION/CHECK

1. General
   A. This procedure has one task. It is a check of the Zone Temperature Sensors for accurate resistance.
   B. There are three Zone Temperature Sensors:
      (1) One is in the flight compartment
      (2) One is in the forward passenger cabin
      (3) One is in the aft passenger cabin.
   C. The flight compartment and forward zone sensors have two elements, a main element and a backup element.

TASK 21-61-08-706-016

2. Zone Temperature Sensor Resistance Check (Fig. 601)
   A. General
      (1) This procedure does a check of the calibration of the sensor while the sensor is installed in the airplane. Because you can not find the temperature of the sensor accurately while it is installed in the airplane, this test is for system troubleshooting only.
   B. Equipment
      (1) Digital Multimeter, High Input Impedance (alternative)

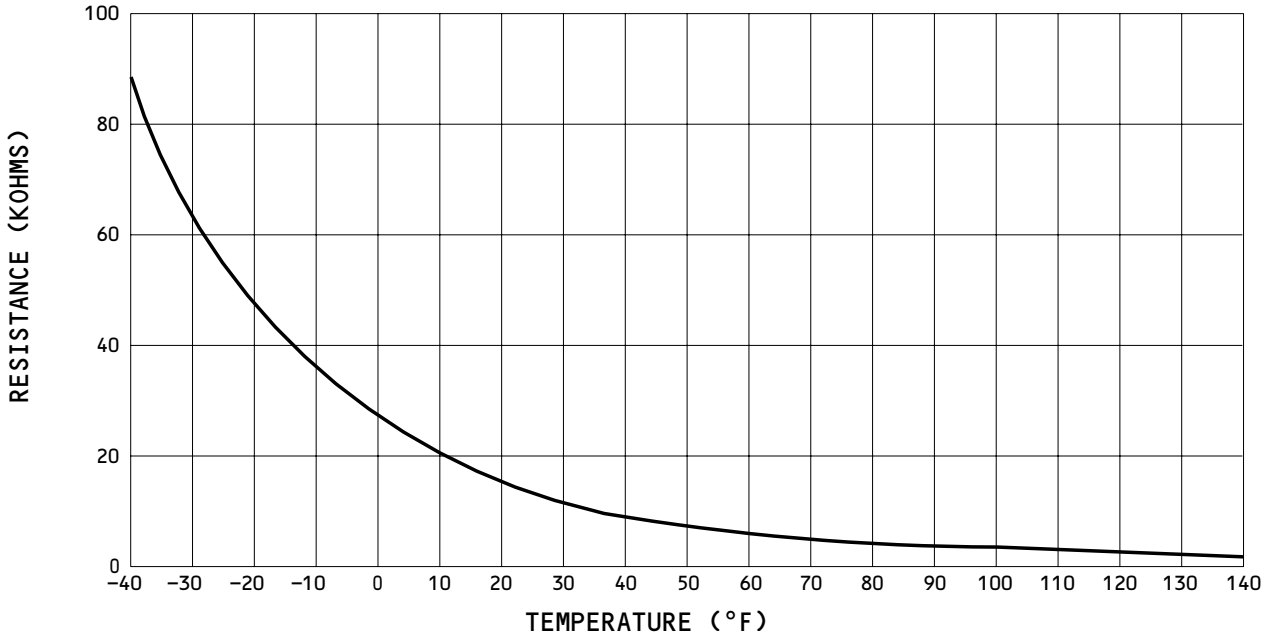
          NOTE: The digital multimeter must be specifically selected to minimize self-heating of the sensor element. The instrument must limit the current through the sensor to less than 100 microamperes. If you use resistance measuring instruments without this current-limiting feature you will get an error in resistance value due to self-heating of the sensor element.

      (2) Digital Multimeter, Hewlett Packard Model 3465A (alternative)
      (3) Thermometer (capable of measuring temperature in degrees F to an accuracy of plus or minus 1 degree F from -40 to 140 degrees F)
   C. References
      (1) AMM 21-51-14/401, Pack Temperature Controller
      (2) AMM 21-61-03/401, Zone Temperature Controller
      (3) AMM 21-61-08/401, Zone Temperature Sensors
   D. Access
      (1) Location Zones
          211 Control Cabin - Section 41 (Left)
          232 Passenger Cabin - Section 43 (Right)
          252 Passenger Cabin - Section 46 (Right)
          119/120 Main equipment center
          or
          153 Aft cargo compartment (Left)

°F	OHMS
-40	87350-89130
-35	74480-76000
-30	63670-64970
-25	54600-55720
-20	46920-47880
-15	40430-41250
-10	34910-35630
-5	30160-30780
0	26240-26780
5	22850-23320
10	19950-20370
15	17460-17820
20	15310-15630
25	13460-13750
30	11860-12110
35	10470-10690
40	9250-9450
45	8200-8380
50	7270-7430

°F	OHMS
55	6470-6610
60	5770-5900
65	5150-5270
70	4610-4710
75	4130-4220
80	3710-3790
85	3330-3410
90	3000-3070
95	2710-2780
100	2450-2510
105	2220-2270
110	2010-2060
115	1830-1870
120	1660-1700
125	1510-1550
130	1380-1410
135	1260-1290
140	1150-1180
145	1050-1080

MAIN ELEMENT



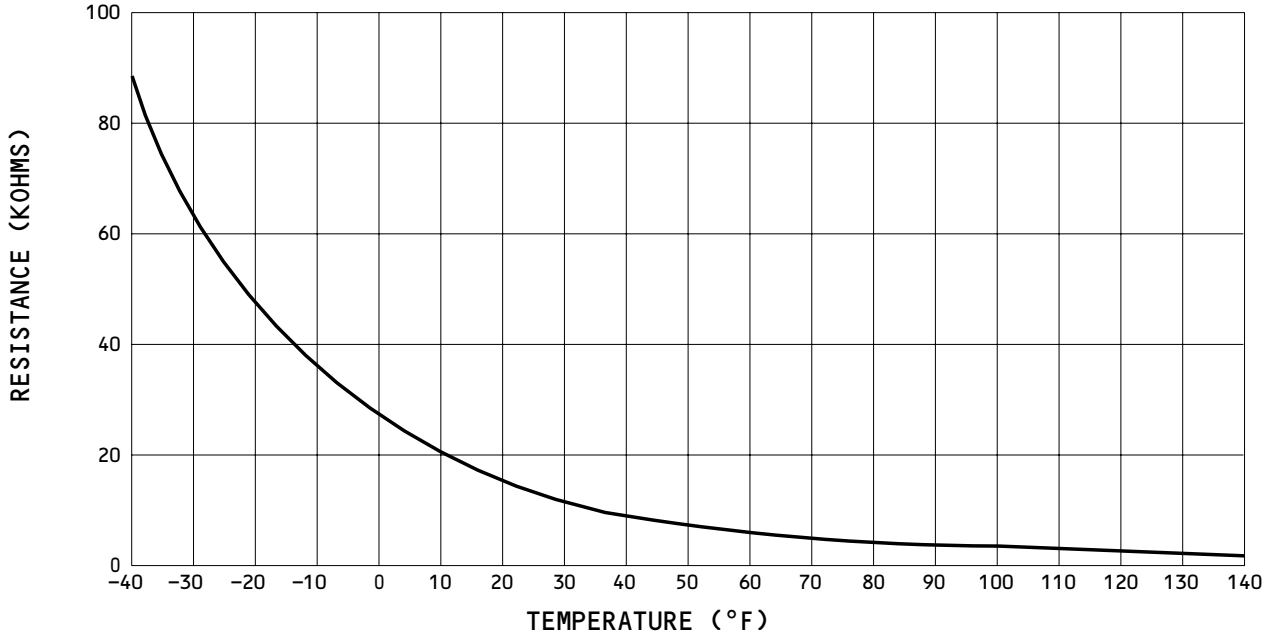
ZONE TEMPERATURE SENSOR
RESISTANCE VS TEMPERATURE GRAPH

Zone Temperature Sensor - Temperature and Resistance Data
Figure 601 (Sheet 1)

°F	OHMS
-40	85850-90630
-35	73200-77280
-30	62580-66060
-25	53670-56650
-20	46120-48680
-15	39730-41950
-10	34310-36230
-5	29640-31300
0	25790-27230
5	22460-23720
10	19610-20710
15	17160-18120
20	15050-15890
25	13230-13980
30	11660-12310
35	10290-10870
40	9090-9610
45	8060-8520
50	7150-7560

°F	OHMS
55	6360-6720
60	5670-5990
65	5060-5350
70	4530-4790
75	4060-4290
80	3640-3860
85	3280-3470
90	2950-3130
95	2660-2820
100	2410-2550
105	2180-2310
110	1980-2100
115	1790-1900
120	1630-1730
125	1480-1580
130	1350-1440
135	1240-1310
140	1130-1200
145	1030-1100

BACKUP ELEMENT



ZONE TEMPERATURE SENSOR
RESISTANCE VS TEMPERATURE GRAPH

Zone Temperature Sensor - Temperature and Resistance Data
Figure 601 (Sheet 2)

(2) Access Panels
119BL Main equipment center access door

E. Prepare for the Resistance Check

S 016-002
(1) Remove the Zone Temperature Controller (AMM 21-61-03/401).

S 016-003
(2) To do the check of the flight deck (forward zone) sensor, remove the L(R) Pack Temperature Controller (AMM 21-51-14/401).

F. Do the Test of the Zone Temperature Sensors

S 226-005
(1) Measure the temperature in the zone.

S 976-006
(2) Write down the temperature.

S 486-007
(3) To do the check of the flight deck Zone Temperature Sensor, Main Element, connect the digital multimeter between pins AA4 and AA5 on the airplane shelf connector (D2558) for the Zone Temperature Controller.

S 486-018
(4) To do the check of the flight deck Zone Temperature Sensor, Backup Element, connect the digital multimeter between pins AC4 and AC5 on the airplane shelf connector (D2964) for the Left Pack Temperature Controller.

S 486-019
(5) To do the check of the forward Zone Temperature Sensor, Main Element, connect the digital multimeter between pins AB4 and AB5 on the airplane shelf connector (D2558) for the Zone Temperature Controller.

S 486-020
(6) To do the check of the forward Zone Temperature Sensor, Backup Element, connect the digital multimeter between pins AC4 and AC5 on the airplane shelf connector (D3026) for the Right Pack Temperature Controller.

S 486-017

(7) To do the check of the aft Zone Temperature Sensor, connect the digital multimeter between pins AC4 and AC5 on the airplane shelf connector (D2558) for the Zone Temperature Controller.

S 766-009

(8) Write down the resistance in Ohms that you measure.

S 976-010

(9) Find the temperature on Figure 601 (for a main element) or 602 (for a backup element) that is closest to the temperature that you wrote down.

S 976-011

(10) Compare the permitted range of resistance for that temperature to the resistance you wrote down.

S 906-012

(11) If the resistance is out of range, replace the sensor (AMM 21-61-08/401).

G. Put the Airplane Back to Its Usual Condition

S 416-013

(1) Install the Controller that you removed (AMM 21-51-14/401) or (AMM 21-61-03/401).

ZONE TEMPERATURE SENSOR FAN - REMOVAL/INSTALLATION

1. General
   A. Three zone temperature sensor fans pull cabin air around the zone temperature sensors in the sensor assembly duct. One fan is installed in the flight deck ceiling. Two fans are installed in the passenger compartment above the right side bullnose panels directly below the overhead stowage bins.

TASK 21-61-09-004-001

2. Remove the Zone Temperature Sensor Fan (Fig. 401)
   A. References
      (1) 25-23-01/401, Passenger Service Units.
   B. Access
      (1) Location Zones
          211 Control cabin - section 41 (Left)
          234 Area above passenger cabin ceiling - section 43 (Right)
          254 Area above passenger cabin ceiling - section 46 (Right)
   C. Prepare for Removal

S 864-002

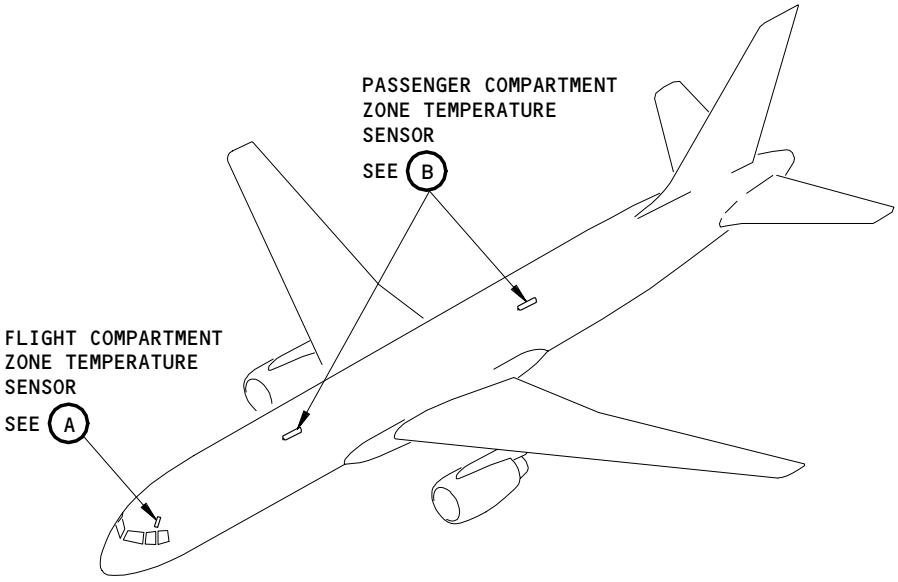
(1) Put the L and R PACK selectors on the pilot's overhead panel, P5, to the OFF position.
   (a) Make sure the L and R PACK OFF lights come on.
   (b) Put DO-NOT-OPERATE tags on the two pack selectors.

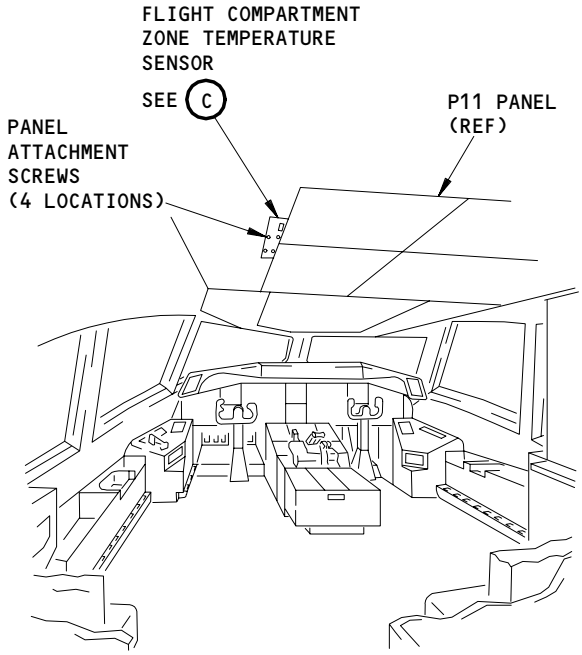
S 864-003

(2) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
   (a) For the flight deck zone fan (9) removal:
      1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
      2) 11P25, ZONE DUCT OVHT/INOP FLT DK
   (b) For the forward cabin zone fan (9) removal:
      1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
      2) 11P26, ZONE DUCT OVHT/INOP FWD
   (c) For the aft cabin zone fan (9) removal:
      1) 11N27, ZONE TEMP CONT VLV CLOSE AFT
      2) 11P27, ZONE DUCT OVHT/INOP AFT

S 014-004

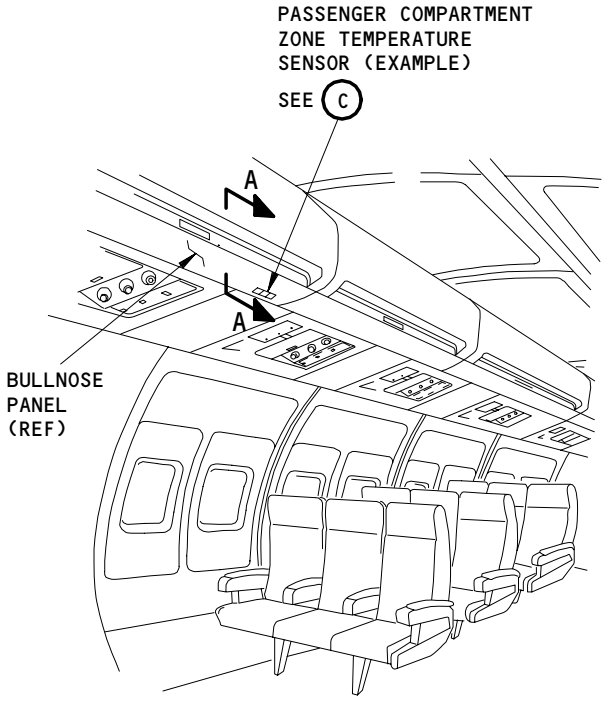
(3) To remove the flight deck fan (9), open the ceiling panel immediately left of the P11 panel.
   (a) Find the temperature sensor assembly (4).





FLIGHT COMPARTMENT

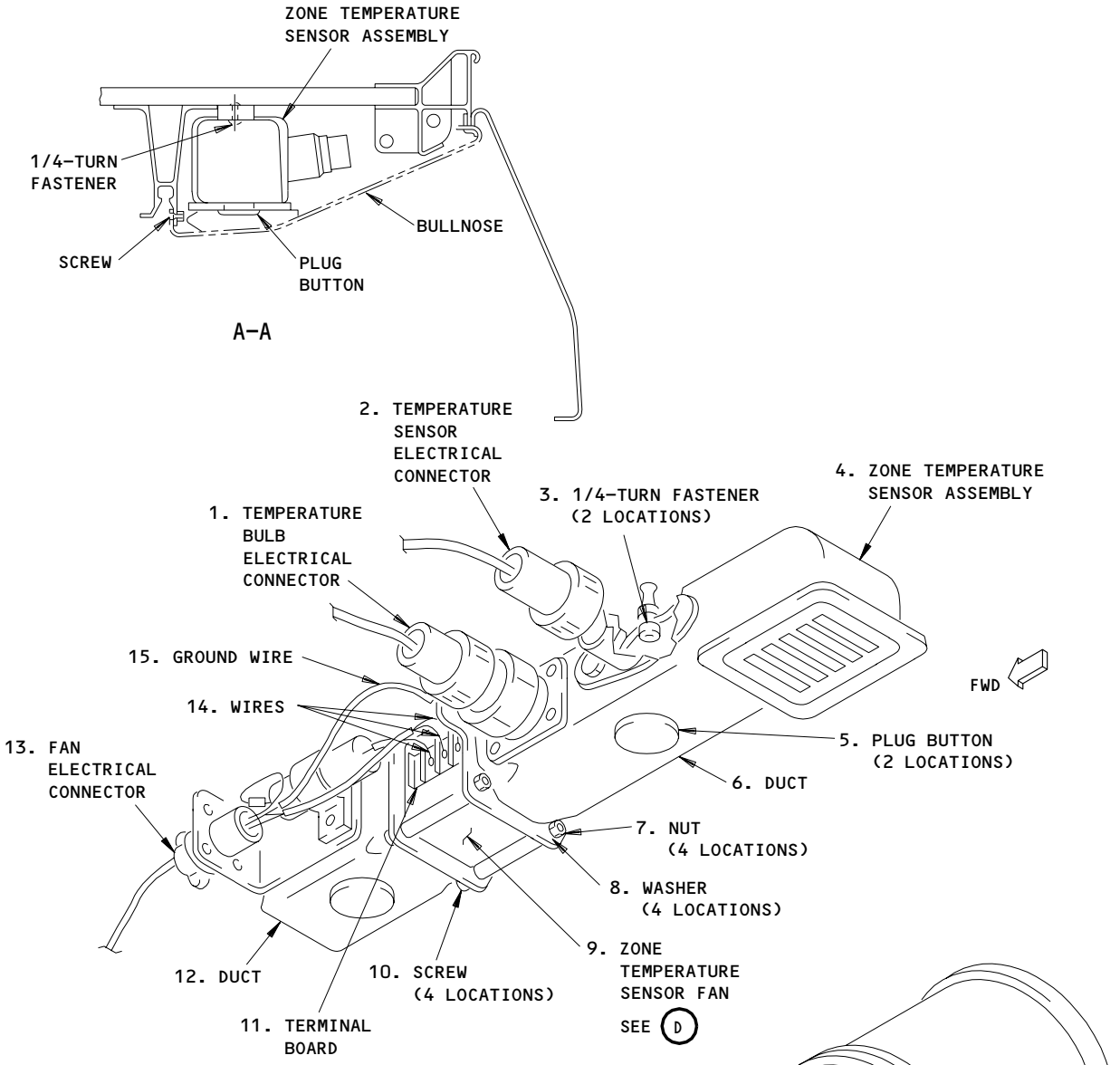
A



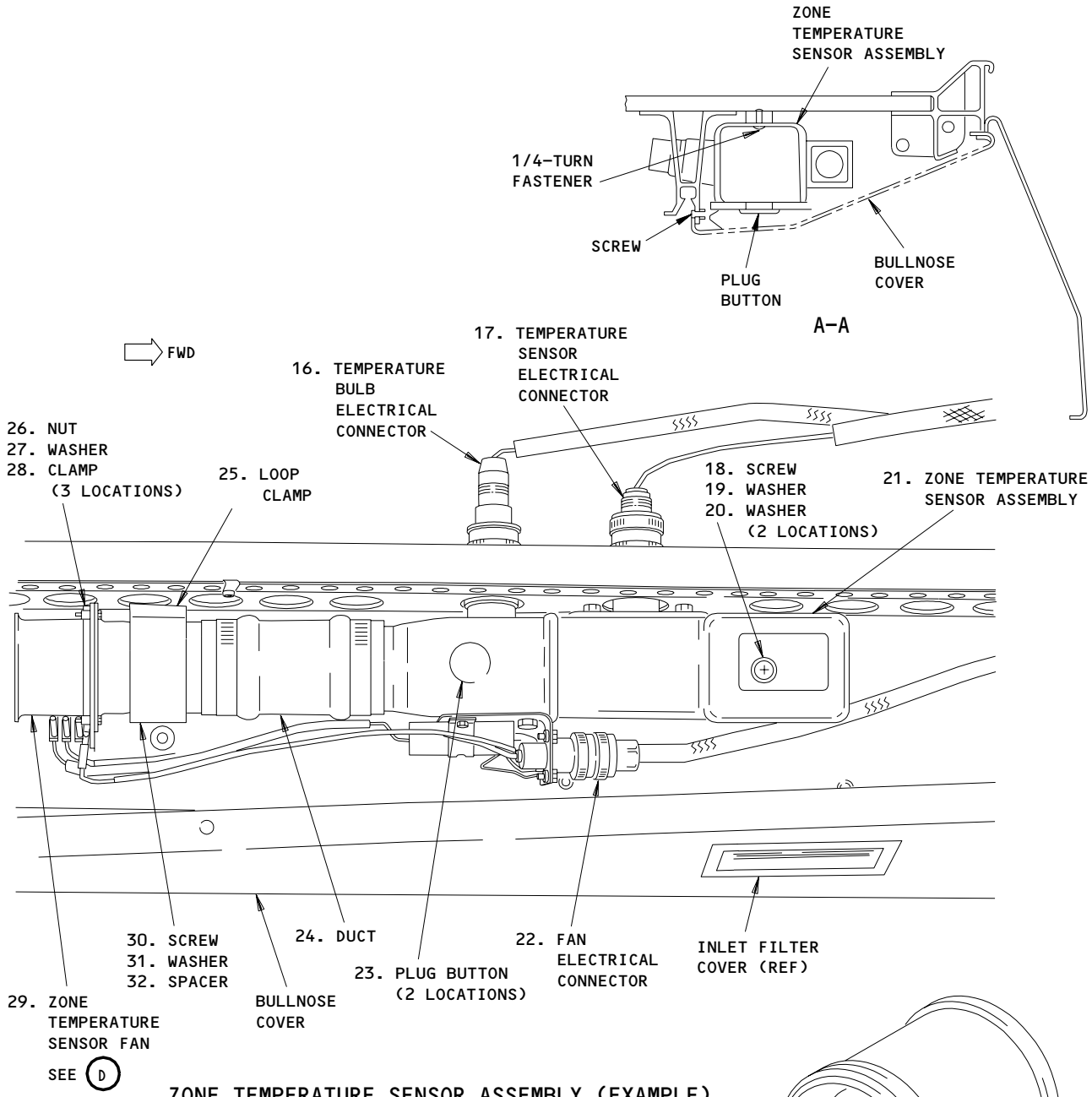
PASSENGER COMPARTMENT

B

Zone Temperature Sensor Fan Installation
Figure 401 (Sheet 1)

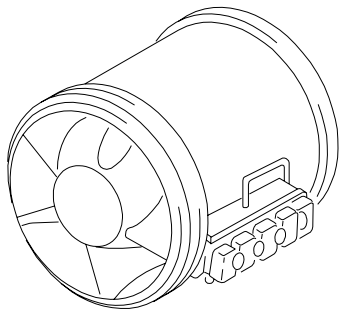


Zone Temperature Sensor Fan Installation
Figure 401 (Sheet 2)



ZONE TEMPERATURE SENSOR ASSEMBLY (EXAMPLE)
(VIEW UP INTO THE BULLNOSE AREA)

(C)



ZONE TEMPERATURE SENSOR FAN

(D)

Zone Temperature Sensor Fan Installation
Figure 401 (Sheet 3)

S 214-050
(4) To find the forward or aft zone temperature sensors, look at the bottom of the right bullnose panels for the inlet filter cover.

S 014-051
(5) Lower the right side passenger service unit which is next to the inlet filter cover (AMM 25-23-01/401).

S 014-095
(6) Remove the screws on the outboard side of the bullnose and open the bullnose panel.

D. Remove the Flight Compartment Fan (Fig. 401):

S 014-014
(1) Remove the two plug buttons (5) to get access to the two 1/4-turn fasteners (3).

S 034-015
(2) Turn the 1/4-turn fasteners (3) counterclockwise to loosen the temperature sensor assembly (4).

S 014-016
(3) Lower the temperature sensor assembly (4) to get access to the electrical connectors (1, 2, 13).

S 034-017
(4) Disconnect the electrical connectors (1, 2, 13) and remove the temperature sensor assembly (4).

S 034-018
(5) Remove the wires (14) from the terminal board (11) on the fan. Do not remove the ground wire (15).

NOTE: Put a tag on the wires before they are removed to make sure they will be correctly installed.

S 034-019
(6) Remove the nuts (7), washers (8) and screws (10) from the fan.

S 024-020
(7) Remove the fan (9).

E. Remove the Forward or Aft Cabin Fan (See Fig. 401):

S 014-023
(1) Remove the plug button (23) near the middle of the temperature sensor assembly (21).

S 034-024
(2) Remove one screw (18) and two washers (19, 20) from each location through the air inlet and the plug button holes.

S 034-025
(3) Remove the screw (30), washer (31), and spacer (32) from the loop clamp (25) near the aft end of the temperature sensor assembly (21).

S 014-026
(4) Lower the temperature sensor assembly (21) to get access to the electrical connectors (16, 17, 22).

S 034-027
(5) Disconnect the electrical connectors (16, 17, 22) and remove the temperature sensor assembly (21).

S 034-028
(6) Remove the wires from the terminal board on the fan. Do not remove the ground wire.

NOTE: Put a tag on the wires before they are removed to make sure they will be correctly installed.

S 034-029
(7) Remove the screws (26), washers (27) and clamps (28) from the fan (29).

S 024-030
(8) Remove the fan (29).

TASK 21-61-09-404-044

3. Install Zone Temperature Sensor Fan (Fig. 401)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	3	Stud	21-61-08	01	170
	4	Sensor Assembly			30
	5	Button			185
	7	Nut			130
	8	Washer			125
	9	Fan			135
	10	Screw			120

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	18	Screw	21-61-08	01	26
	19	Washer			28
	20	Washer			29
	23	Plug Button			185
	25	Loop Clamp			30
	26	Screw			275
	27	Washer			280
	28	Clamp			285
	29	Fan			290
	30	Screw			27
	31	Washer			28
	32	Spacer			31

B. References

(1) 21-61-00/501, Primary (zone) Temperature Control System
(2) 25-23-01/401, Passenger Service Units
(3) 24-22-00/201, Electric Power Control

C. Access

(1) Location Zones

211 Control cabin - section 41 (Left)
234 Area above passenger cabin ceiling - section 43 (Right)
254 Area above passenger cabin ceiling - section 46 (Right)

D. Procedure to Install the Flight Compartment Fan (Fig. 401).

S 424-051
(1) Put the fan (9) into the duct and install the screws (10), washers (8), nuts (7).

NOTE: Make sure the metal flange, with the ground wire (15) installed, is in position before the screws, washers and nuts are installed.

S 434-052
(2) Tighten the screws and nuts.

S 434-053
(3) Install the three wires (14) from the connector to the terminal board (11).

S 434-054
(4) Connect the three electrical connectors (1, 2, 13) to the temperature sensor assembly (4).

S 434-055
(5) Put the temperature sensor assembly (4) on the shock supports and tighten the two 1/4-turn fasteners (3).

S 414-056
(6) Install the two plug buttons (5) in the access holes of the temperature sensor assembly (4).

E. Procedure to Install the Forward or Aft Cabin Fan (See Fig. 401)

S 424-057
(1) Put the fan (29) in aft end of the temperature sensor assembly (21) and install the screws (26), washers (27), and clamps (28).

NOTE: Make sure the metal flange, with the ground wire installed, is in position before the screws, washers and clamps are installed.

S 434-058
(2) Tighten the screws and clamps.

S 434-059
(3) Install the three wires from the fan electrical connector (22) to the terminal board.

S 434-060
(4) Connect the three electrical connectors (16, 17, 22) to the temperature sensor assembly (21).

S 434-061
(5) Install a loop clamp (25) around the aft end of the temperature sensor assembly.

S 434-062
(6) Install a spacer (32), washer (31), and screw (30) in the loop clamp (25).

S 414-063
(7) Put the temperature sensor assembly in position in the bullnose.

S 434-064
(8) Tighten the screw (30) in the loop clamp (25) to hold the temperature sensor assembly in position.

S 434-065
(9) Install the two washers (19) on the top side of the temperature sensor assembly (21). Put one washer near the middle and the other washer near the forward end of the assembly.

S 434-066
(10) Install a washer (20) and screw (18) in each location through the air inlet and the plug button holes.

S 414-067
(11) Install the plug button (23).

S 864-085
(12) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) For the flight compartment fan (9) installation:
1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK

2) 11P25, ZONE DUCT OVHT/INOP FLT DK

(b) For the forward cabin fan (9) installation:

1) 11N26, ZONE TEMP CONT VLV CLOSE FWD

2) 11P26, ZONE DUCT OVHT/INOP FWD

(c) For the aft cabin fan (9) installation:

1) 11N27, ZONE TEMP CONT VLV CLOSE AFT

2) 11P27, ZONE DUCT OVHT/INOP AFT

S 864-086

(13) Supply electrical power (Ref 24-22-00).

S 714-087

(14) Do a check for fan operation and listen for fan noise.

S 744-088

(15) Perform the Zone Temperature Controller BITE procedure (Ref 21-61-00).

S 864-089

(16) Make sure the COMPT TEMP indicator on the P5 panel shows the approximate ambient temperature for the applicable zone.

S 864-090

(17) Remove the DO-NOT-OPERATE tags from the two pack selectors on the P5 panel.

F. Put the Airplane Back to Its Usual Condition

S 414-091

(1) Install the ceiling panel immediately left of the P11 panel for the flight compartment fan.

S 414-122

(2) Install the bullnose panel and install the screws on the outboard side of bullnose for the forward or aft cabin fan.

S 414-093

(3) Close the passenger service unit (AMM 25-23-01/401) for the forward or aft cabin fan.

S 864-094

(4) Remove electrical power, if it is not necessary (Ref 24-22-00).

ZONE TEMPERATURE SENSOR FAN - INSPECTION/CHECK

1. General
   A. There are three zone temperature sensor fans, one in each zone:
      (1) The Flight Compartment Zone
      (2) The Forward Zone
      (3) The Aft Zone

TASK 21-61-09-206-001

2. Zone Temperature Sensor Fan Operational Check
   A. References
      (1) AMM 21-61-09/401, Zone Temperature Sensor Fan
      (2) AMM 21-61-11/401, Zone Temperature Sensor Filter
      (3) AMM 24-22-00/201, Control
   B. Access
      (1) Location Zones
          211 Control Cabin - Section 41 (Left)
          234 Area above Passenger Cabin Ceiling - Section 43 (Right)
          254 Area above Passenger Cabin Ceiling - Section 46 (Right)
   C. Prepare for the Check

S 866-002

(1) Put the L and R PACK selectors on the overhead panel, P5, to the AUTO position.
    (a) Make sure the L and R PACK OFF lights go off.

S 866-003

(2) For the flight compartment zone fan, make sure these circuit breakers are closed:
    (a) On the overhead circuit breaker panel, P11:
        1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
        2) 11P25, ZONE DUCT OVHT/INOP FLT DK

S 866-094

(3) For the forward zone fan, make sure these circuit breakers are closed:
    (a) On the overhead circuit breaker panel, P11:
        1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
        2) 11P26, ZONE DUCT OVHT/INOP FWD

S 866-095

(4) For the aft zone fan, make sure these circuit breakers are closed:
    (a) On the overhead circuit breaker panel, P11:
        1) 11N27, ZONE TEMP CONT VLV CLOSE AFT
        2) 11P27, ZONE DUCT OVHT/INOP AFT

S 016-004
(5) To find the flight compartment fan, look for the inlet filter cover immediately left of the P11 panel.

S 216-005
(6) To find the forward or aft zone fans, look at the bottom of the right bullnose panels for the inlet filter cover.

D. Do an Operational Check of the Zone Temperature Sensor Fan

S 866-087
(1) Supply electrical power (AMM 24-22-00/201).

S 756-087
(2) Put your ear adjacent to the fan inlet and listen for fan noise.

S 716-088
(3) Put a tissue paper against the inlet.

S 716-089
(4) Make sure the fan has sufficient suction to hold the tissue paper against the inlet.
(a) If the fan does not have sufficient suction, replace the zone temperature sensor filter (AMM 21-61-11/401).
(b) If the problem continues, replace the fan (AMM 21-61-09/401).

E. Put the Airplane Back to Its Usual Condition

S 866-096
(1) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

ZONE TEMPERATURE SENSOR FILTER - REMOVAL/INSTALLATION

1. General
   A. Three zone temperature sensor assemblies monitor cabin air temperature. The assemblies are found in the flight compartment, forward cabin, and aft cabin. Each sensor assembly uses a fan to pull air through the zone temperature sensor filter. Each filter is installed behind a screen.

TASK 21-61-11-004-001

2. Remove the Zone Temperature Sensor Filter (Fig. 401)
   A. Equipment
      (1) Blunt-ended metal rod, approximately 1/16 inch in diameter and 2-5 inches in length, commercially available.
   B. Access
      (1) Location Zones
          211 Control cabin - section 41 (Left)
          232 Passenger cabin - section 43 (Right)
          252 Passenger cabin - section 46 (Right)
   C. Prepare for Removal

S 864-002

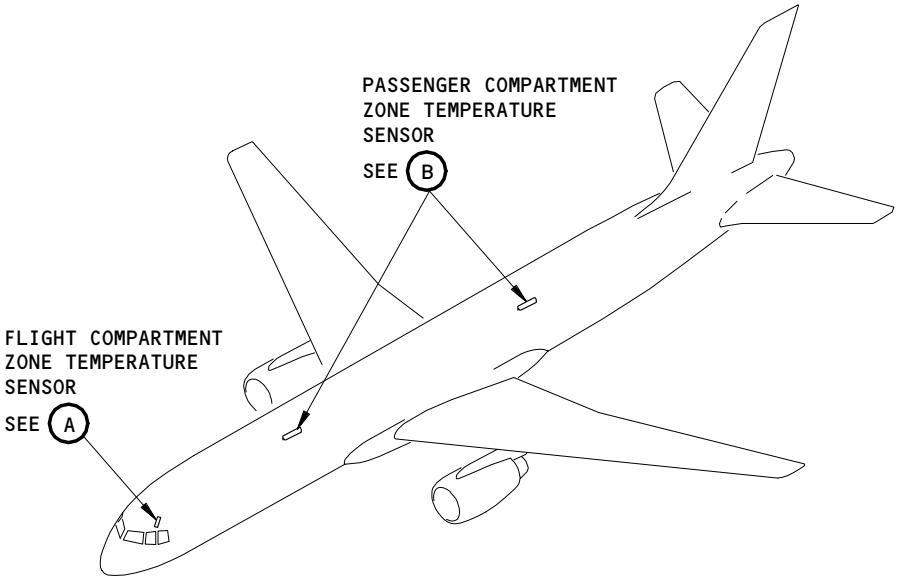
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and DO-NOT-CLOSE tags:
          (a) For the filter in the flight compartment:
              1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
          (b) For the filter in the forward cabin:
              1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
          (c) For the filter in the aft cabin:
              1) 11N27, ZONE TEMP CONT VLV CLOSE AFT

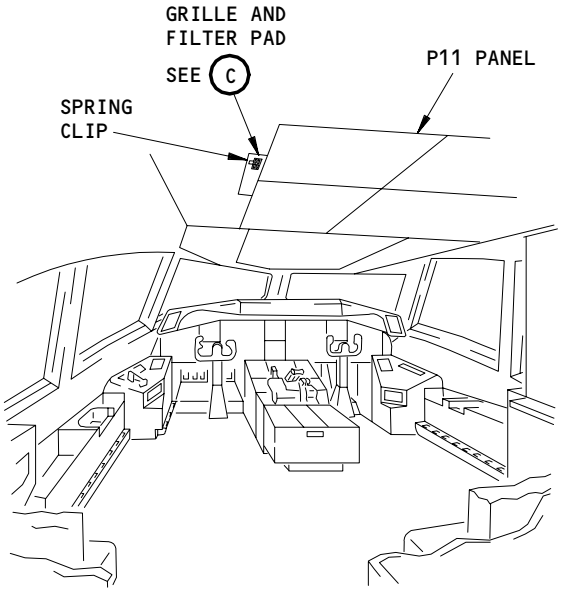
S 864-003

      (2) Find the flight compartment filter behind the zone temperature sensor inlet grille on the flight compartment ceiling. The grille is installed immediately left of the overhead circuit breaker panel, P11.

S 214-004

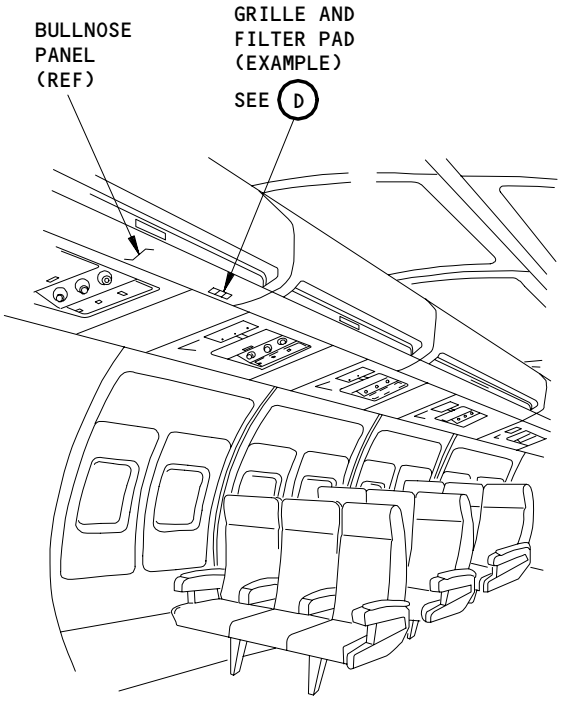
      (3) To find the forward or aft cabin filter, look at the bottom of the right bullnose panels for the inlet grille.





FLIGHT COMPARTMENT

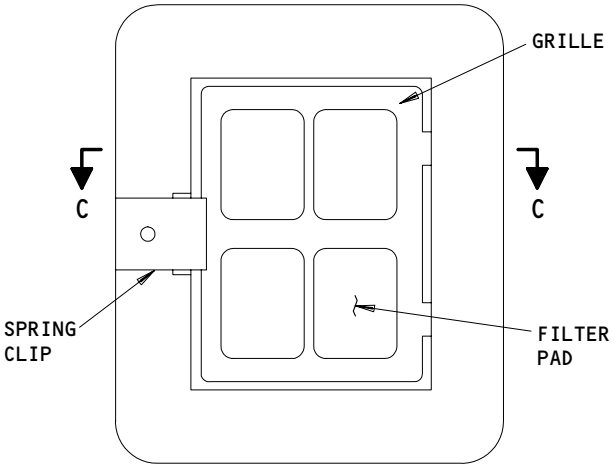
A



PASSENGER COMPARTMENT

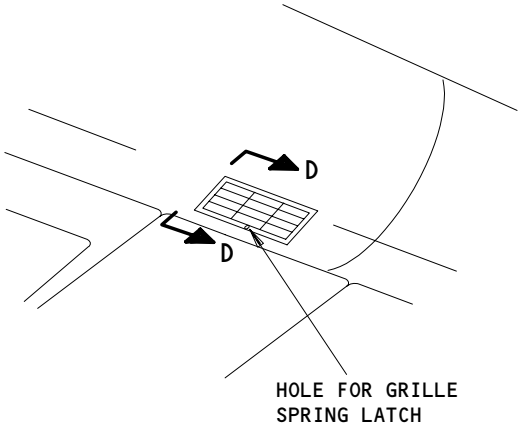
B

Zone Temperature Sensor Filter Installation
Figure 401 (Sheet 1)



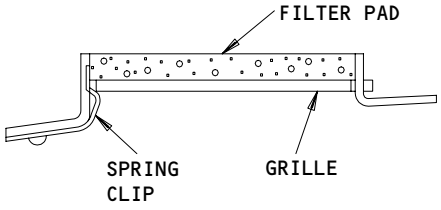
FLT COMPT GRILLE AND FILTER PAD

C

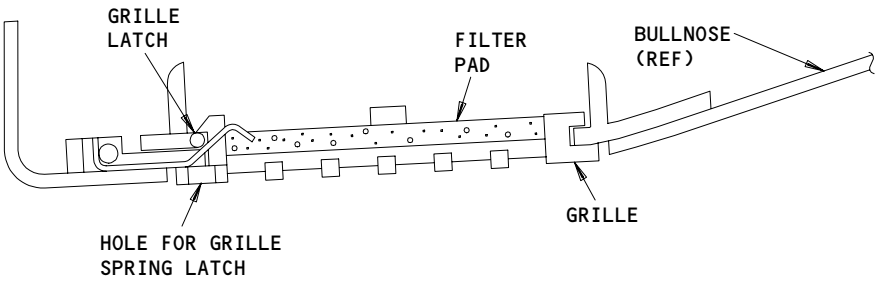


PASSENGER COMPT GRILLE AND FILTER PAD

D



C–C



D–D

Zone Temperature Sensor Filter Installation
Figure 401 (Sheet 2)

D. Remove the forward or aft zone temperature sensor filter

S 034-009

(1) Put the metal rod into the hole at edge of the sensor inlet grille to open the grille. Apply pressure to the rod until the grille releases.

S 024-021

CAUTION: DO NOT PRY OR APPLY TOO MUCH FORCE TO REMOVE THE GRILLE. DAMAGE TO THE GRILLE OR THE BULLNOSE CAN RESULT.

(2) Remove the grille and filter (Ref Fig. 401, Sheet 2)

E. Remove the flight compartment zone temperature sensor filter:

S 034-011

(1) Push the spring clip to open the grille.

S 024-012

(2) Remove the grille and filter.

TASK 21-61-11-404-022

3. Install the Zone Temperature Sensor Filter (Fig. 401)

A. Consumable Materials

(1) Filter Material - Foamex Filter Foam, 3/16 inch thickness, porosity grade 45 PPI, color - grey, Foamex International Inc., 1000 Columbia Ave., Linwood, PA 19061

B. Access

(1) Location Zones

211 Control cabin - section 41 (Left)
234 Area above passenger cabin ceiling - section 43 (Right)
254 Area above passenger cabin ceiling - section 46 (Right)

C. Procedure

S 864-014

(1) Cut the new filter from the foam filter material. Make sure the new filter has the same dimensions as the filter that is replaced.

NOTE: Flight compartment filter dimensions - 1.5 X 1.9 inches. Passenger compartment filter dimensions - 1.3 X 2.8 inches.

S 424-015

(2) Put the filter in the grille.

S 414-019
(3) Install the edge of the grille that is opposite to the spring latch.

S 414-020
(4) Push the other edge until the grille clicks into position.

D. Put the Airplane Back to Its Usual Condition

S 864-016
(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) For the filter in the flight compartment:
1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
(b) For forward cabin zone temperature sensor filter:
1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
(c) For aft cabin zone temperature sensor filter:
1) 11N27, ZONE TEMP CONT VLV CLOSE AFT

S 214-017
(2) Do a visual check, through the grille, to make sure the filter is in the correct position.

S 214-018
(3) Make sure no clearance is found between the edges of the filter and the grille.

TRIM AIR MUFFLER - REMOVAL/INSTALLATION

1. General
   A. Two trim air mufflers are installed in the mix bay at the aft end of the forward cargo compartment. The mufflers are part of the duct assemblies. The mufflers are attached to the forward and aft cabin zone trim air modulating valves.
   B. The mufflers decrease the noise level of the conditioned air that is sent into the two cabin temperature zones.
   C. The removal/installation procedure for each muffler is almost the same.

TASK 21-61-12-004-003

2. Remove the Trim Air Muffler (Fig. 401)
   A. References
      (1) 06-46-00/201, Entry, Service, and Cargo Doors, Access Doors and Panels
      (2) 24-22-00/201, Electric Power - Control
      (3) 25-50-03/401, Bulkhead Lining Panels
   B. Access
      (1) Location Zones
          121/122 Forward Cargo Compartment (Left)

   C. Prepare for Removal.

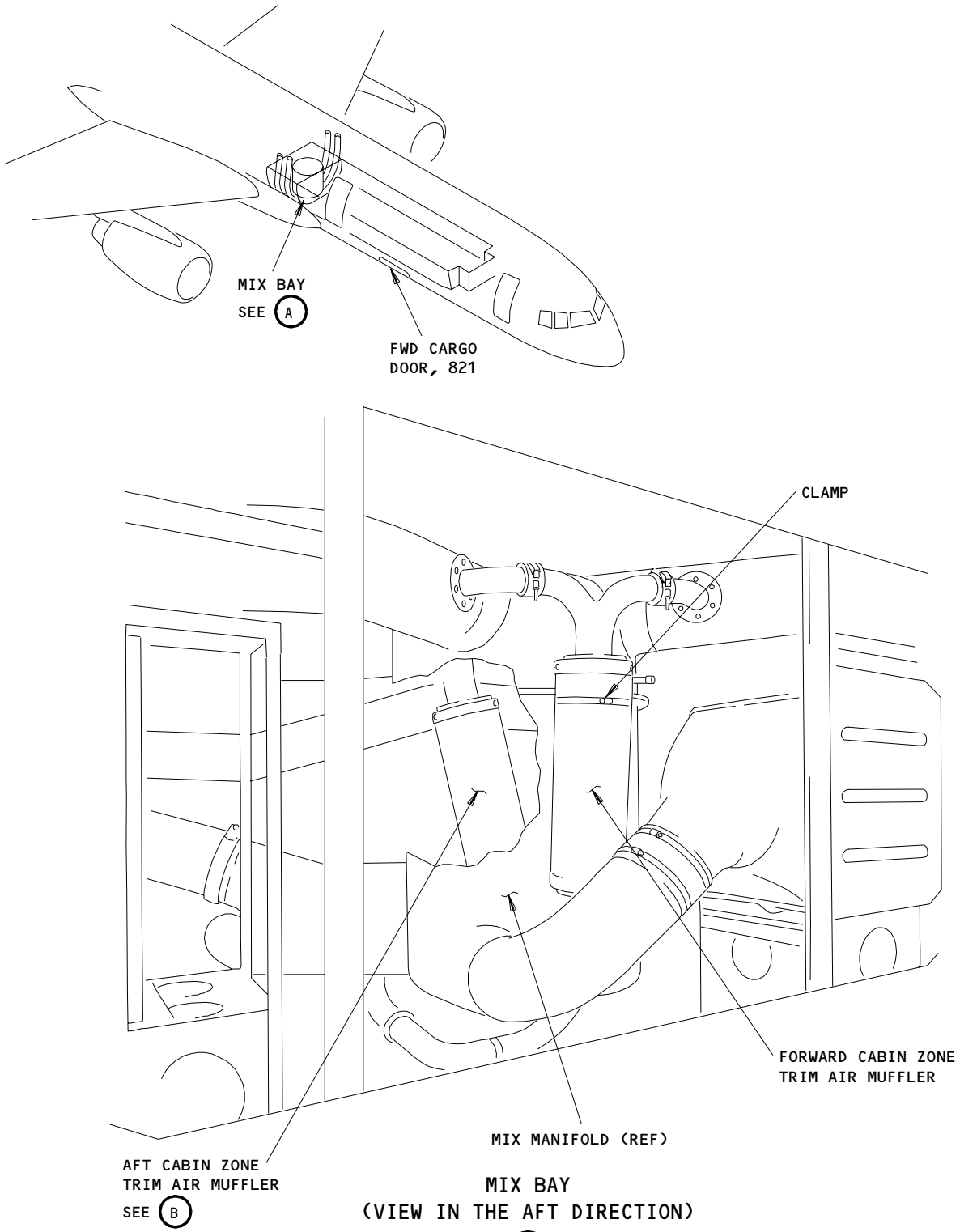
      S 864-004
      (1) Supply electrical power (Ref 24-22-00).

      S 864-005
      (2) Put the L and R PACK control selectors on the pilot's overhead panel, P5, in the OFF position. Make sure that the PACK OFF lights come on.

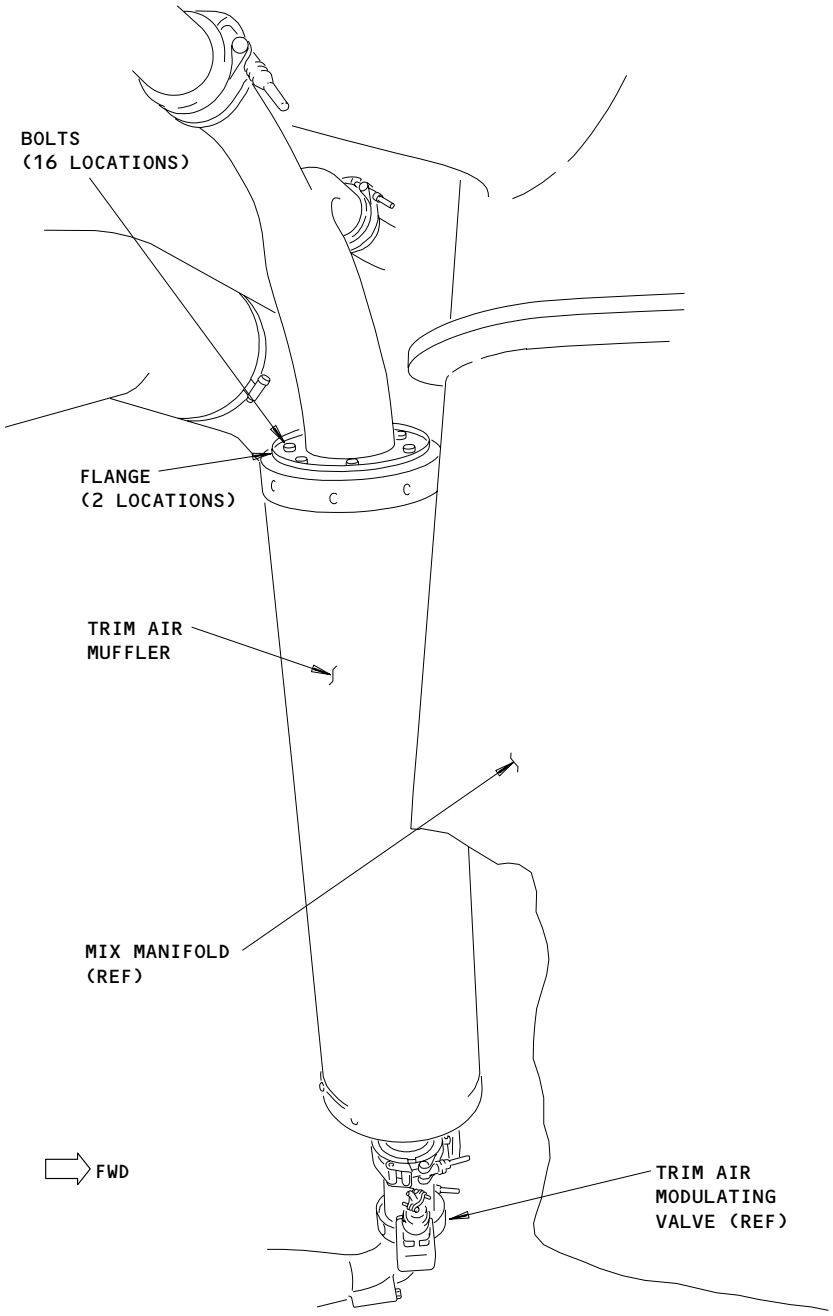
      S 864-001
      (3) Attach a DO-NOT-OPERATE tag on the two pack control selectors.

      S 014-006
      (4) Open the No. 1 cargo door (821) (Ref 06-46-00).

      S 014-007
      (5) Remove the bulkhead lining panel at the aft end of the forward cargo compartment (AMM 25-50-03/401). Find the trim air muffler to be removed.



Trim Air Muffler Installation
Figure 401 (Sheet 1)



AFT CABIN ZONE
TRIM AIR MUFFLER
B

Trim Air Muffler Installation
Figure 401 (Sheet 2)

D. Procedure

S 034-011

CAUTION: SUPPORT THE MUFFLER DURING DISCONNECTION TO PREVENT DAMAGE TO THE MUFFLER AND THE DUCTS.

(1) Remove the bolts from the flanges on the two sides of the muffler.

S 034-009

(2) Remove the clamp that holds the muffler to the air-mixing manifold, for the forward muffler.

S 024-010

(3) Remove the muffler assembly.

S 494-011

(4) Put a cover over the ducts to keep out unwanted objects.

TASK 21-61-12-404-026

3. Install the Muffler (Fig. 401)

A. References

(1) 24-22-00/201, Electric Power - Control
(2) 25-50-03/401, Bulkhead Lining Panels
(3) 36-00-00/201, Pneumatic General

B. Access

(1) Location Zones
121/122 Forward Cargo Compartment

C. Procedure

S 094-013

(1) Remove the covers over the ducts.

S 424-014

(2) Install and align the muffler assembly between the ducts. Make sure the gaskets are installed at each end.

S 434-016

(3) Install the clamp that holds the muffler assembly to the air-mixing manifold for the forward muffler. Tighten the clamp.

S 864-017

(4) Supply electrical power (Ref 24-22-00).

S 864-018
(5) Supply pneumatic power (AMM 36-00-00/201).

S 864-019
(6) Remove the DO-NOT-OPERATE tags from the pack control selectors. Put the L and R PACK control selectors on the P5 panel in the AUTO position.

S 864-020
(7) Put the applicable zone temperature selector switch on the P5 panel to the AUTO WARM position.

S 794-021
(8) Do a leak test for the duct connections.
(a) Small leaks are satisfactory.
(b) Large leaks must be repaired by gasket replacement.

D. Put the Airplane Back to Its Usual Condition

S 864-022
(1) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 414-023
(2) Install the bulkhead lining panel (AMM 25-50-03/401).

S 414-024
(3) Close the No. 1 cargo door (821).

S 864-025
(4) Remove electrical power if it is not necessary (Ref 24-22-00).

ZONE TEMPERATURE SENSOR PLENUM AND FILTER - CLEANING

1. General
   A. This procedure explains how to clean the zone temperature sensor filter and plenum in the forward cabin, aft cabin, and flight compartment.

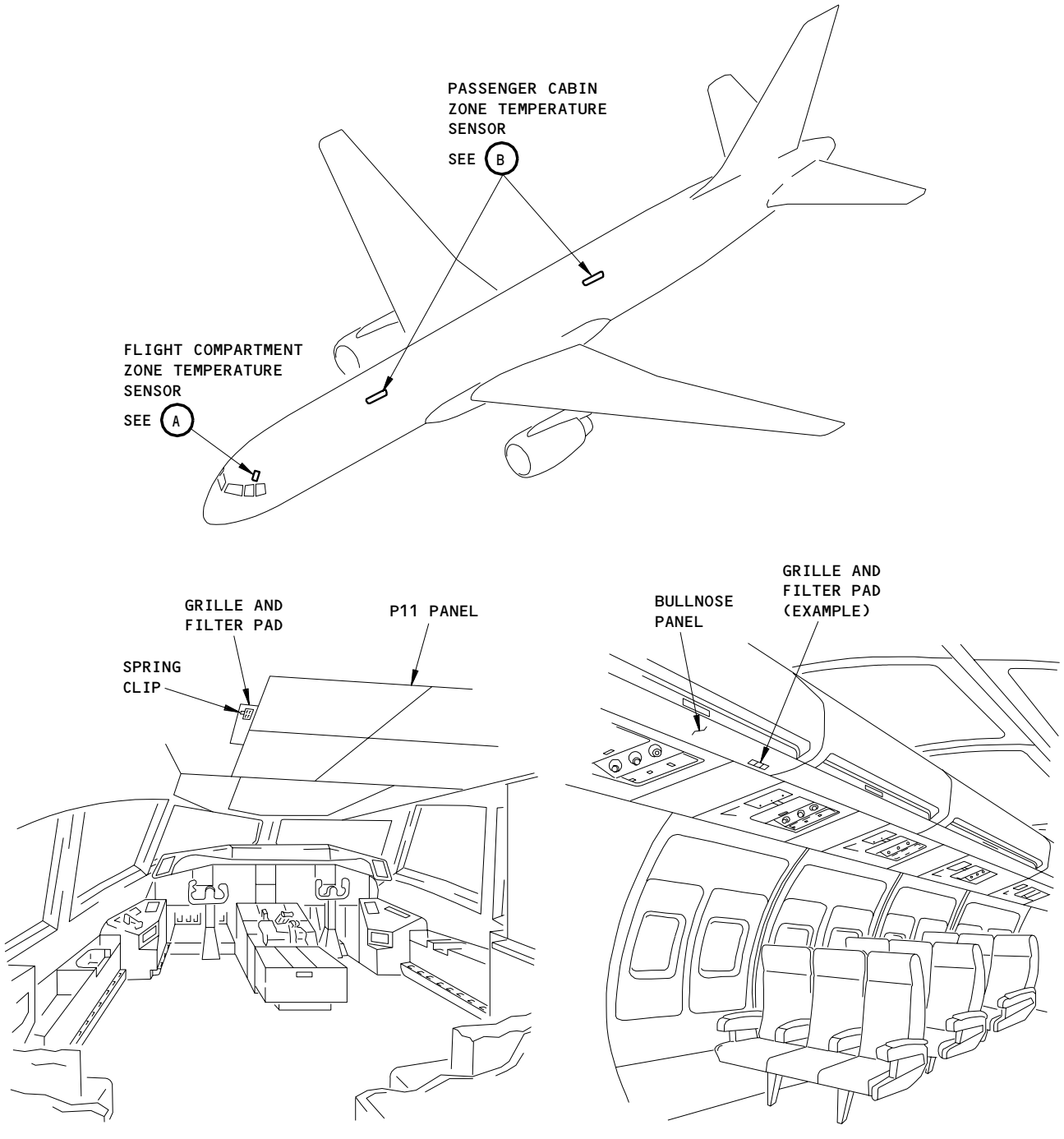
   TASK 21-61-13-147-001

2. Clean the Components (Fig. 701)
   A. Standard Tools and Equipment
      (1) Vacuum Cleaner - commercially available
      (2) Soft bristle brush with flexible handle - commercially available
   B. Consumable Materials
      (1) Filter Material - Foamex Filter Foam, 3/16 inch
      (2) Detergents (AMM 20-30-02/201)
         (a) BOO541 - General purpose detergent (commercially available) - dilute as required with water.
      (3) Cloth - clean, dry, lint-free
   C. References
      (1) AMM 21-61-11/401, Zone Temperature Sensor Filter - Removal/Installation
      (2) AMM 21-61-08/401, Zone Temperature Sensors - Removal/Installation
   D. Access
      (1) Location Zones
         (a) 211 - Flight Compartment - section 41 (left)
         (b) 232 - Area above passenger cabin ceiling - section 43 (right)
         (c) 252 - Aft Passenger Cabin - section 46 (right)
   E. Preparation

      S 867-003
      (1) Open these circuit breakers on the P11 overhead circuit breaker panel and attach DO-NOT-CLOSE tags:
         (a) 11N24, ZONE TEMP CONT VLV CL FLT DK
         (b) 11N25, ZONE TEMP CONT VLV CL FWD
         (c) 11N27, ZONE TEMP CONT VLV CL AFT
   F. Cleaning

      S 017-005
      (1) Locate the zone temperature sensor inlet grilles in the flight compartment, forward cabin, and aft cabin.

      S 027-010
      (2) Remove the zone temperature sensor filters from the grilles. (AMM 21-61-11/401)



Zone Temperature Sensor Plenum and Filter Location
Figure 701

S 167-011

CAUTION: BE CAREFUL NOT TO DAMAGE OR DISLODGE THE INSULATION INSIDE THE PLENUM WHEN CLEANING OR VACUUMING.

(3) Clean the plenums.
  (a) Extend the soft-bristled brush as far as possible into the plenums to break loose debris.
  (b) Use the vacuum cleaner to remove the unwanted materials from the plenums.

S 117-012
(4) Clean the zone temperature sensor filters.
  (a) Use detergent diluted with water to clean the filters.
  (b) Flush the filters with clean water.
  (c) Dry the filters with a clean cloth or compressed air.

NOTE: Replace the filter if necessary. Use the old filter as a template to make the new filter.

S 117-013
(5) Clean the zone temperature sensor inlet grilles.
  (a) Use detergent diluted with water and a clean cloth to clean the zone temperature sensor inlet grilles.
  (b) Flush the grilles with clean water.
  (c) Dry the grilles with a clean cloth.
  (d) Replace any broken grilles.

S 427-014
(6) Install the zone temperature sensor filters in the grilles. (AMM 21-61-11/401)

S 417-015
(7) Install the zone temperature sensor inlet grilles in the forward cabin, aft cabin, and flight compartment.

S 217-020
(8) Do a visual check through the zone temperature sensor inlet grilles to make sure the filters are in the correct position.

S 217-021
(9) Make sure there is no clearance between the edges of the filters and the grilles.

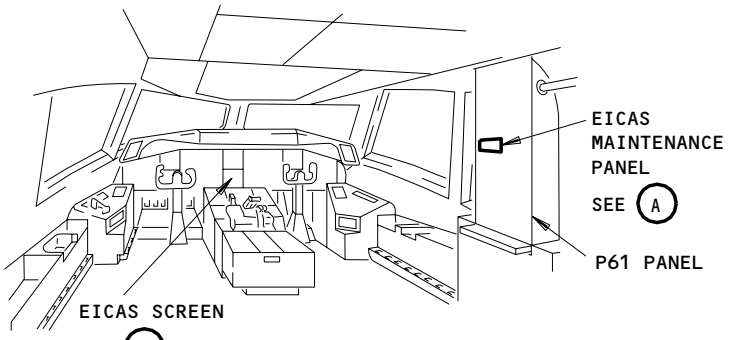
G. Put the Airplane Back to Its Usual Condition

S 867-022

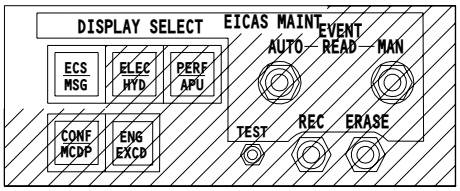
(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead circuit breaker panel:
(a) 11N24, ZONE TEMP CONT VLV CL FLT DK
(b) 11N25, ZONE TEMP CONT VLV CL FWD
(c) 11N27, ZONE TEMP CONT VLV CL AFT

VALVE POSITION INDICATION SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The modulating valves for the trim air system are used to supply warm air to the air conditioning system. This warm air will be mixed with conditioned air. This mixture of air will then be used to get the necessary air temperature for each zone.
   B. The ESC/MSG page on the EICAS display shows the modulating valve positions for the flight compartment, forward zone, and aft zone. The display gives the position for each valve. The range of positions goes from 0.00 (full closed) to 1.00 (full open). These positions can be shown only when the airplane is on the ground (AMM 31-41-00/001).
   C. Potentiometers on the modulating valves supply the EICAS computers with the signals of the modulating valve position. The potentiometers are connected to the shaft of the butterfly plate.
   D. Push the ECS MSG switch, when the airplane is on the ground, to get the modulating valve position.
   E. A visual position indicator is installed on the valve. The valve position indicator is connected to the same shaft as the potentiometers. The indicator makes sure the EICAS valve position is correct.
2. Operation (Fig. 2)
   A. The EICAS computer supplies a voltage of 3 to 5v dc to the valve position potentiometer. The EICAS computer gets a return voltage signal from the valve. The EICAS computer uses this voltage signal to show the valve position as percent the valve is open.
   B. The modulating valves for the flight compartment and forward zone give their signals to the left EICAS computer. The modulating valve for the aft zone gives its signal to the right EICAS computer. The data is used by the two computers through the crosstalk bus.
3. Control
   A. Supply electrical power (AMM 24-22-00/001).
   B. Make sure the EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.
   C. Push the ECS MSG switch on the EICAS MAINT module. Look at the EICAS display for the modulating valve position.

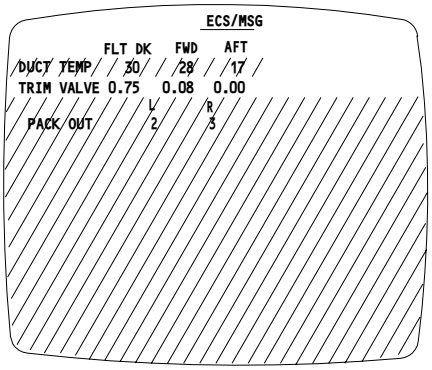


FLIGHT COMPARTMENT



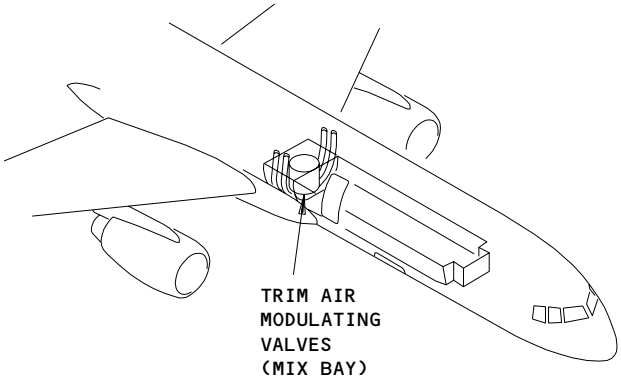
EICAS MAINTENANCE PANEL

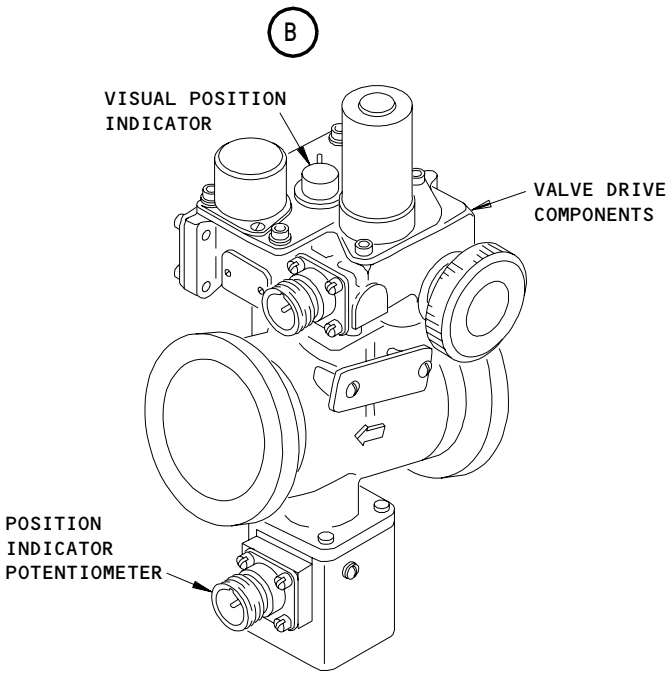
A

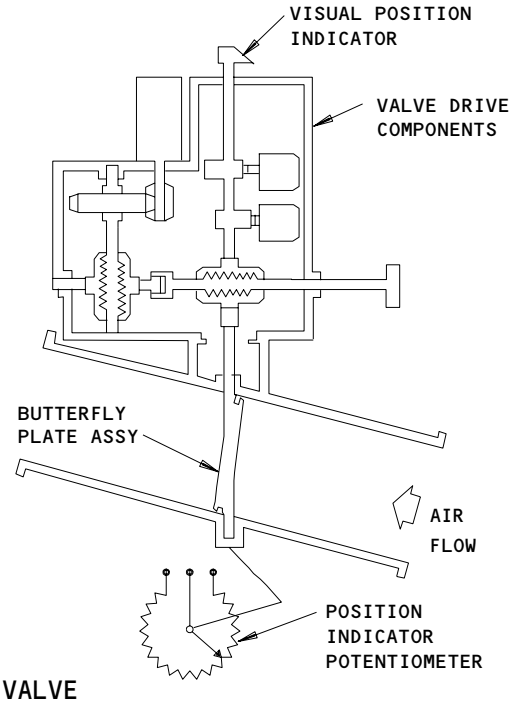


EICAS SCREEN

B



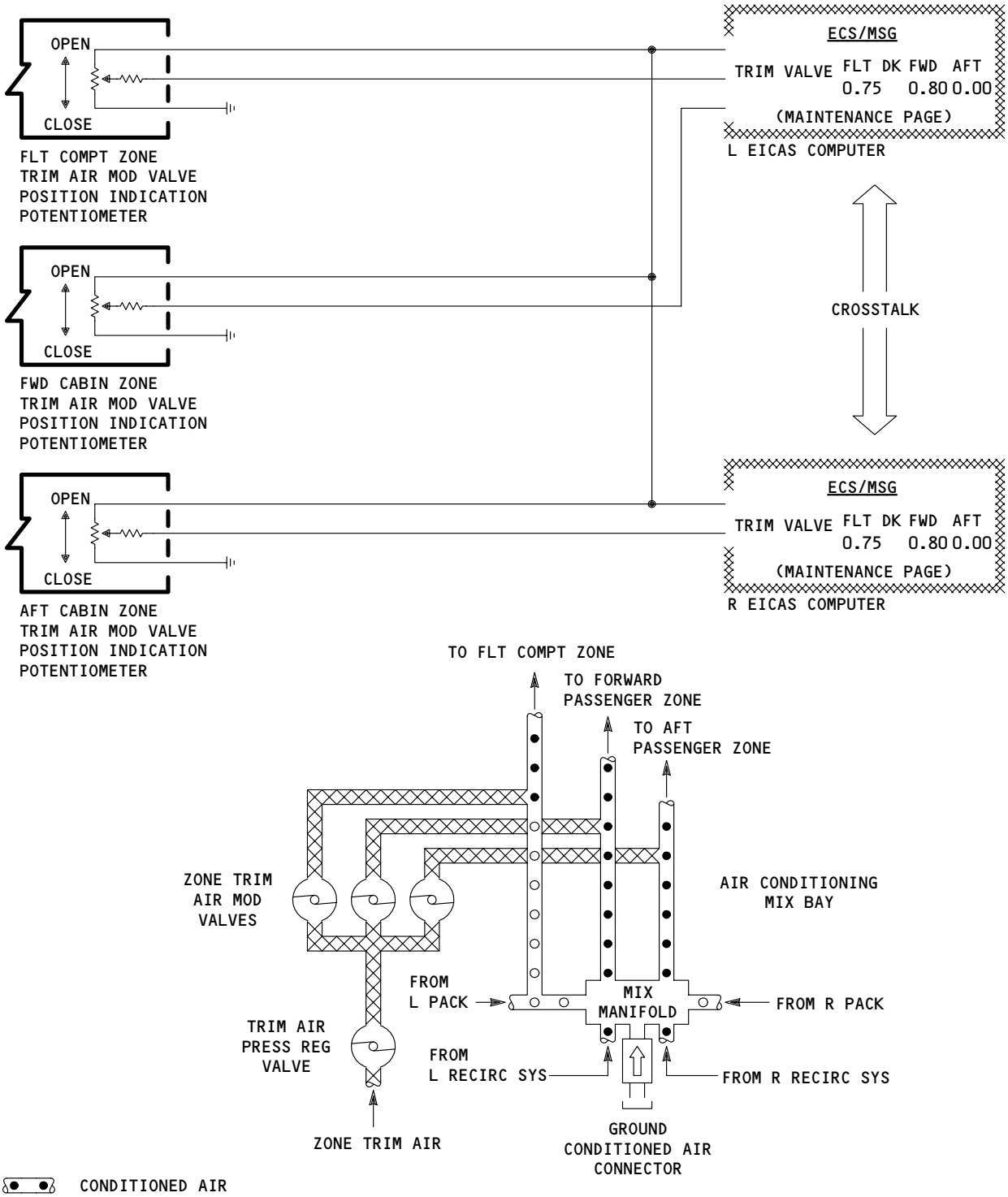




TRIM AIR MODULATING VALVE

C

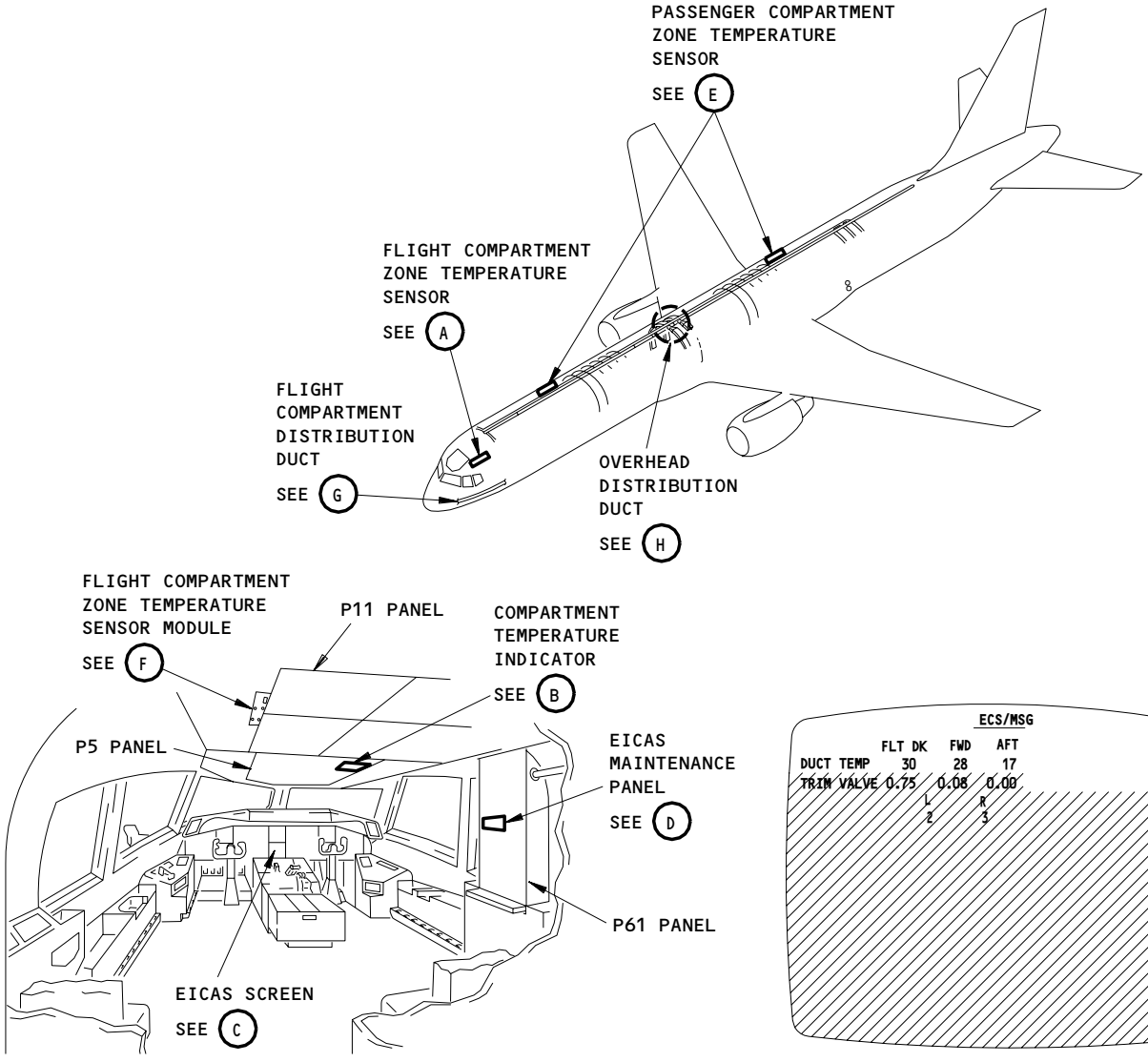
Zone Trim Valve Position Indicating System
Figure 1



Zone Trim Valve Position Indication System Schematic
Figure 2

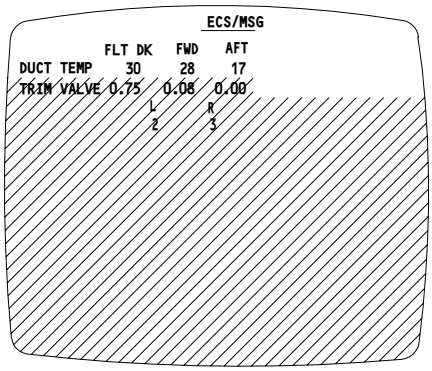
CABIN (ZONE) TEMPERATURE INDICATION SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The temperature indication system for the passenger cabin (zone) gives a temperature display for the three zones. These zones include the flight compartment, forward cabin, and aft cabin. The temperature control system for the primary (zone) controls the temperature in all three zones (AMM 21-61-00/001).
   B. Cabin (Zone) Temperature Indication System
      (1) The indication system includes the components that follow:
         (a) A compartment temperature indicator
         (b) Three zone temperature bulbs,
         (c) Three duct temperature bulbs
         (d) The Engine Indication and Crew Alerting system (EICAS) (AMM 31-41-00/001) maintenance display
      (2) The compartment temperature indicators monitor the operation of the temperature control system for the primary zone.
      (3) The compartment temperature indicator shows compartment temperatures for the three zones on three liquid crystal displays. The compartment temperature indicator has a display range of 1 - 99°F.
      (4) The lower EICAS display shows the zone duct temperature when the airplane is on the ground. Push the ECS MSG switch on the EICAS maintenance panel to show the temperatures for the flight deck zone duct, the forward cabin zone duct, the mid cabin zone duct and the aft cabin zone duct.
      (5) Three temperature bulbs in the temperature sensor modules for the forward, mid and aft passenger cabin zones send electrical signals to the compartment temperature indicator on the pilot's P5 overhead panel. Four temperature sensors in the ducts for the flight deck zone, the forward cabin zone, the mid cabin zone and the aft cabin zone send elctrical signals to the left and right EICAS computers. The strength of the electrical signals from the bulbs/sensors change because of changes in the temperatures being monitored.
2. Operation (Fig. 2)
   A. Temperature Indication
      (1) The compartment temperature indicator operates with twenty-eight volt dc power. The indicator sends a reference voltage through each zone temperature bulb. The resistance through each temperature bulb changes with temperature and the signal is sent back to the indicator. The voltage level that goes back to the indicator will give a temperature output that agrees with the actual compartment temperature.
      (2) The EICAS computers send a reference voltage to each zone temperature bulb. The resistance through each temperature bulb changes with temperature and the signal is sent back to the computer. Push the ECS MSG switch to show the maintenance page for the environmental control system. The zone temperature is shown for each cabin zone.



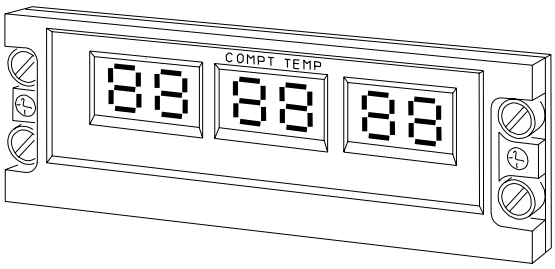
FLIGHT COMPARTMENT

A



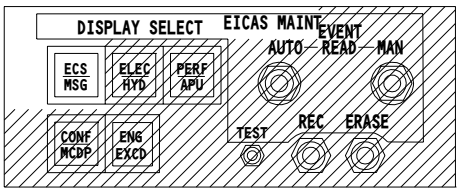
EICAS SCREEN

C



COMPARTMENT TEMPERATURE INDICATOR

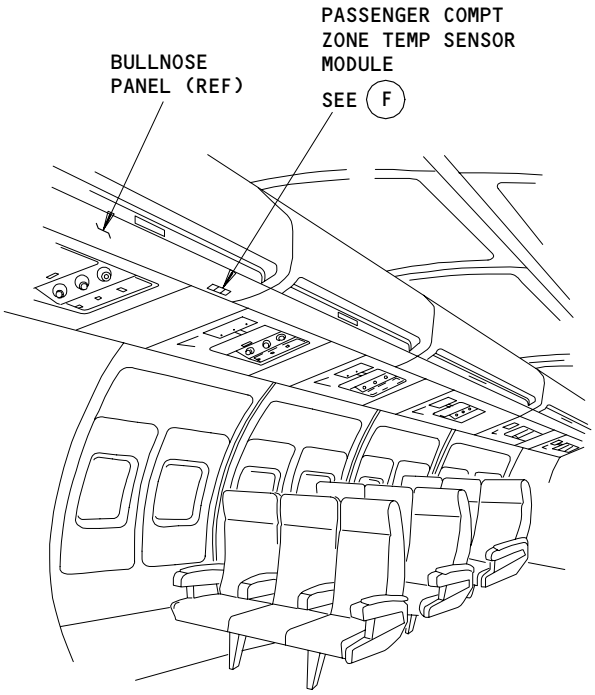
B



EICAS MAINTENANCE PANEL

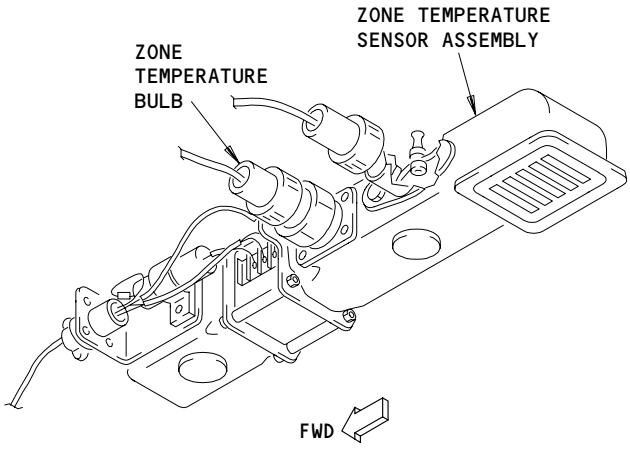
D

Cabin (Zone) Temperature Indication System Components
Figure 1 (Sheet 1)



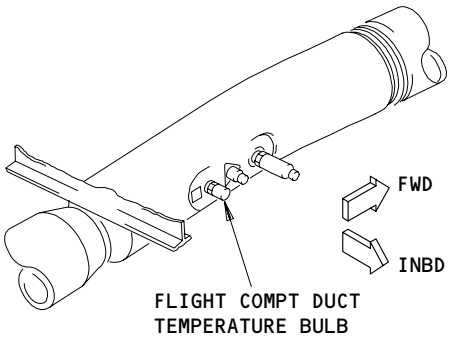
PASSENGER COMPT

E



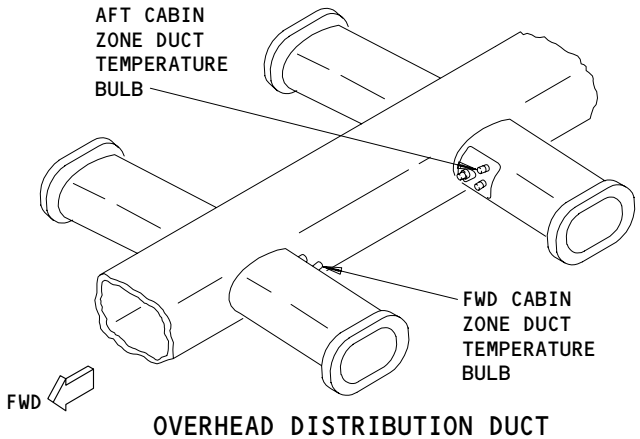
ZONE TEMPERATURE SENSOR MODULE

F



FLT COMPT DISTRIBUTION DUCT

G

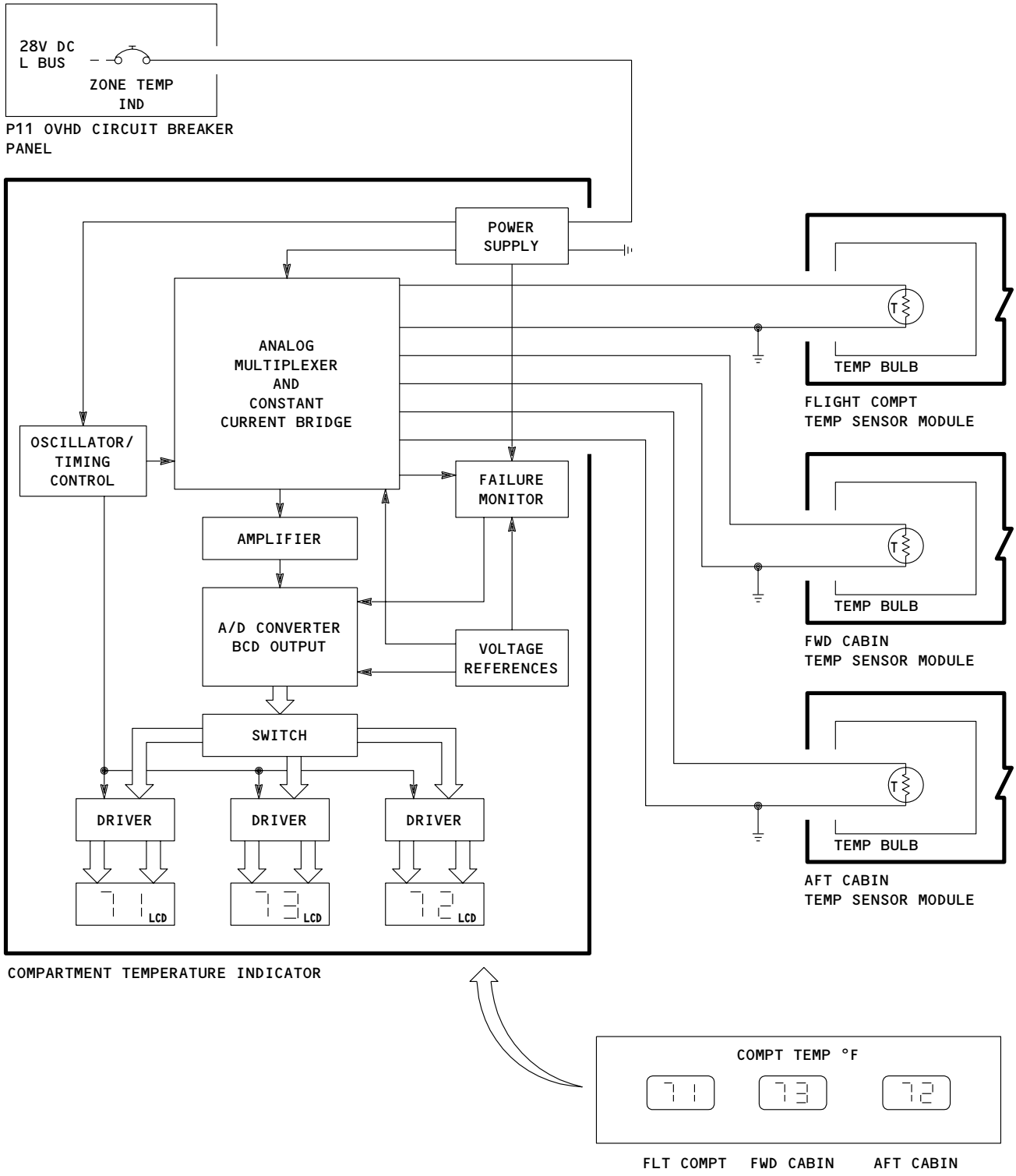


OVERHEAD DISTRIBUTION DUCT

H

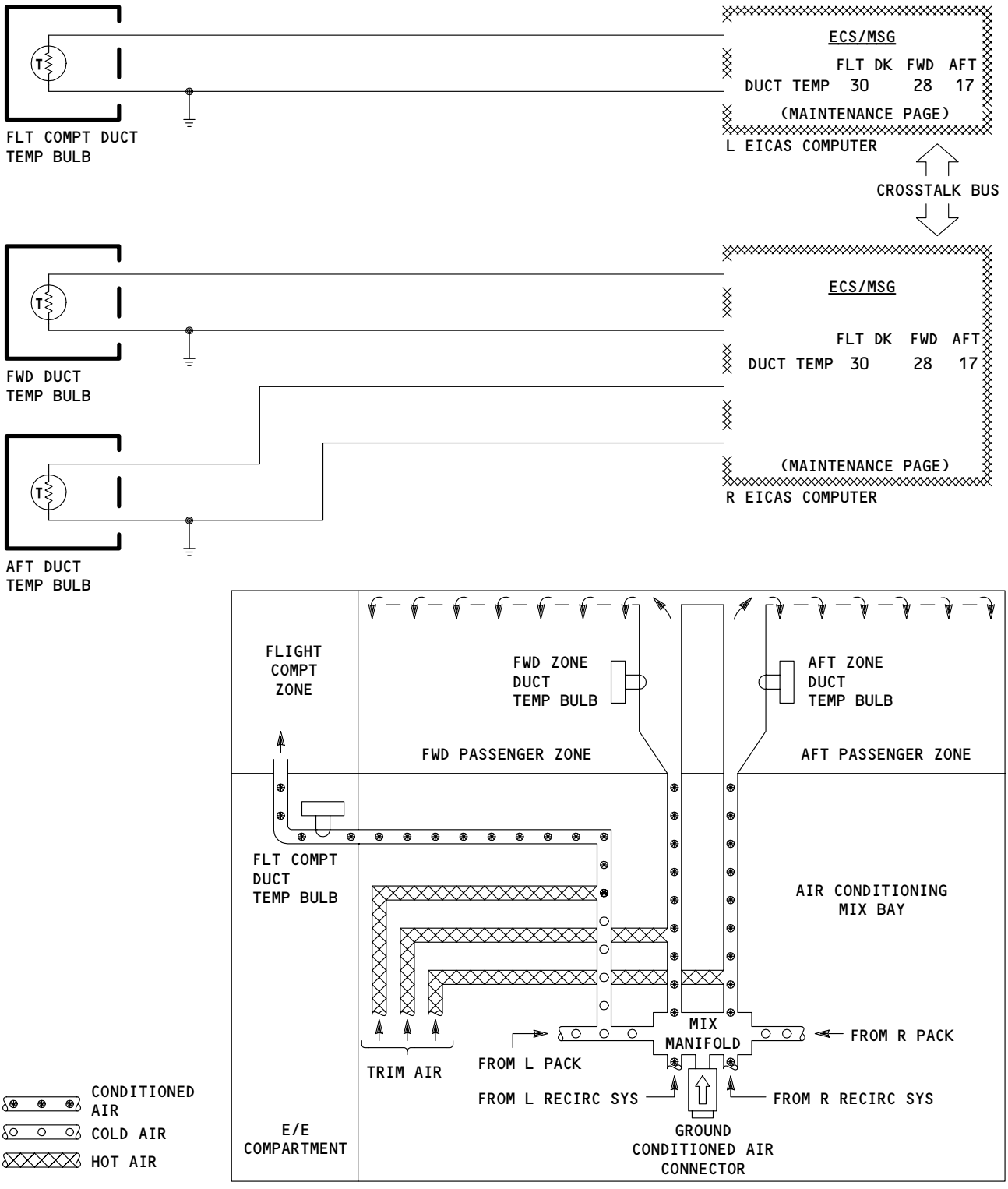
Cabin (Zone) Temperature Indication System Components
Figure 1 (Sheet 2)

COMPARTMENT TEMPERATURE INDICATION



Cabin (Zone) Temperature Indication System Operation
Figure 2 (Sheet 1)

ZONE DUCT TEMPERATURE INDICATION



Cabin (Zone) Temperature Indication System Operation
Figure 2 (Sheet 2)

CABIN (ZONE) TEMPERATURE INDICATION SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure will do a test of the temperature indication system for the three zones.

TASK 21-65-00-705-001

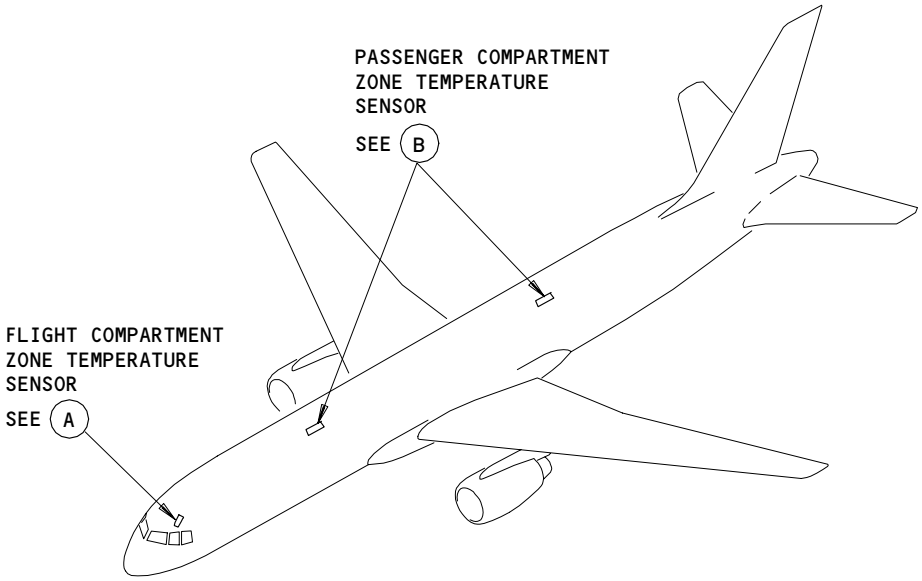
2. System Test - Cabin (Zone) Temperature Indication System
   A. Equipment
      (1) Thermometer, commercially available
      (2) Low heat source, commercially available
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
   C. Access
      (1) Location Zone
          211 Control Cabin - Section 41 (Left)
          232 Passenger Cabin - Section 43 (Right)
          252 Passenger Cabin - Section 46 (Right)

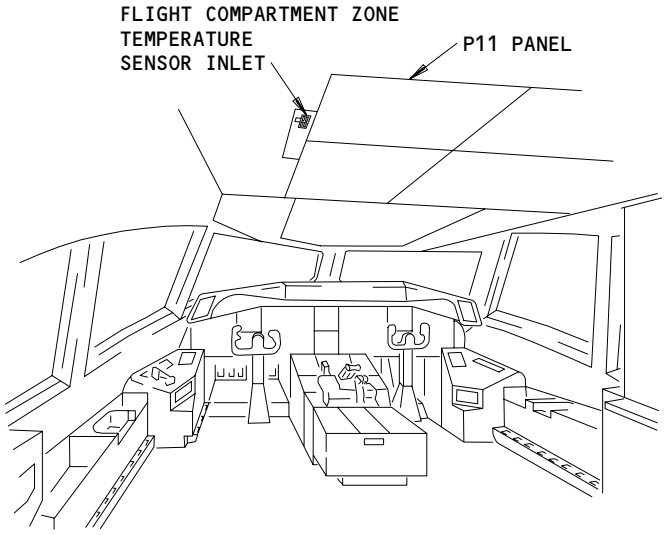
   D. Prepare for System Test

      S 865-002
      (1) Make sure these circuit breakers on the overhead circuit breaker panel, P11 are closed:
          (a) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
          (b) 11N26, ZONE TEMP CONT VLV CLOSE FWD
          (c) 11N27, ZONE TEMP CONT VLV CLOSE AFT
          (d) 11P17, CABIN ZONE TEMP IND
   E. Do the Cabin Zone Temperature Sensor Test

      S 865-003
      (1) Supply electrical power (AMM 24-22-00/201).

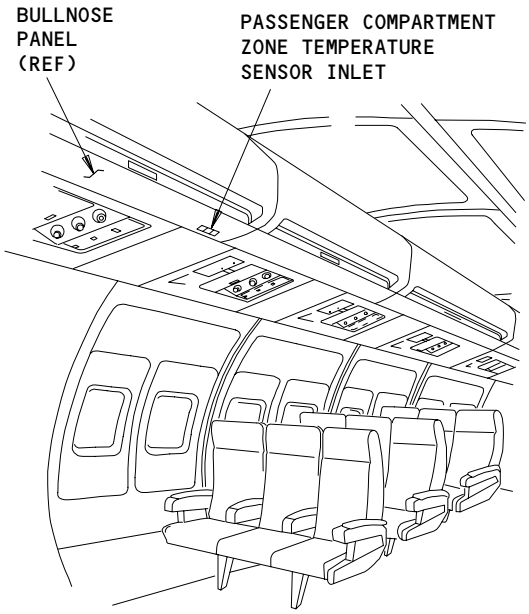
      S 735-004
      (2) Hold the thermometer approximately two feet from the flight compartment, the forward zone, and the aft zone temperature sensors.
          (a) The flight compartment sensor is installed in the ceiling, immediately left of the overhead circuit breaker panel, P11.





FLIGHT COMPARTMENT

A



PASSENGER COMPARTMENT

B

Cabin Temperature Indication Test
Figure 501

(b) To find the forward or aft cabin zone temperature sensors, look at the bottom of the right bullnose panels for the inlet cover.

S 215-005

(3) Look at the applicable COMPT TEMP indication on the pilots' overhead panel, P5.
   (a) Make sure the COMPT TEMP indication shows a difference of less than 2.0°F of the measured temperature.

S 735-009

(4) Hold a low heat source at the inlet for each zone temperature sensor.

S 735-010

(5) Make sure the applicable COMPT TEMP indication on the P5 panel increases.

S 865-011

(6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

COMPARTMENT TEMPERATURE INDICATOR - REMOVAL/INSTALLATION

1. General
   A. The compartment temperature indicator is installed in the pilot's overhead panel, P5. The indicator displays the flight deck, forward, and aft cabin air temperatures.

TASK 21-65-01-004-001

2. Remove the Compartment Temperature Indicator (Fig. 401)
   A. Access
      (1) Location Zone
          212 Control Cabin Section 41 (Right)

   B. Procedure

      S 864-002
      (1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tag:
          (a) 11P17, CABIN ZONE TEMP IND

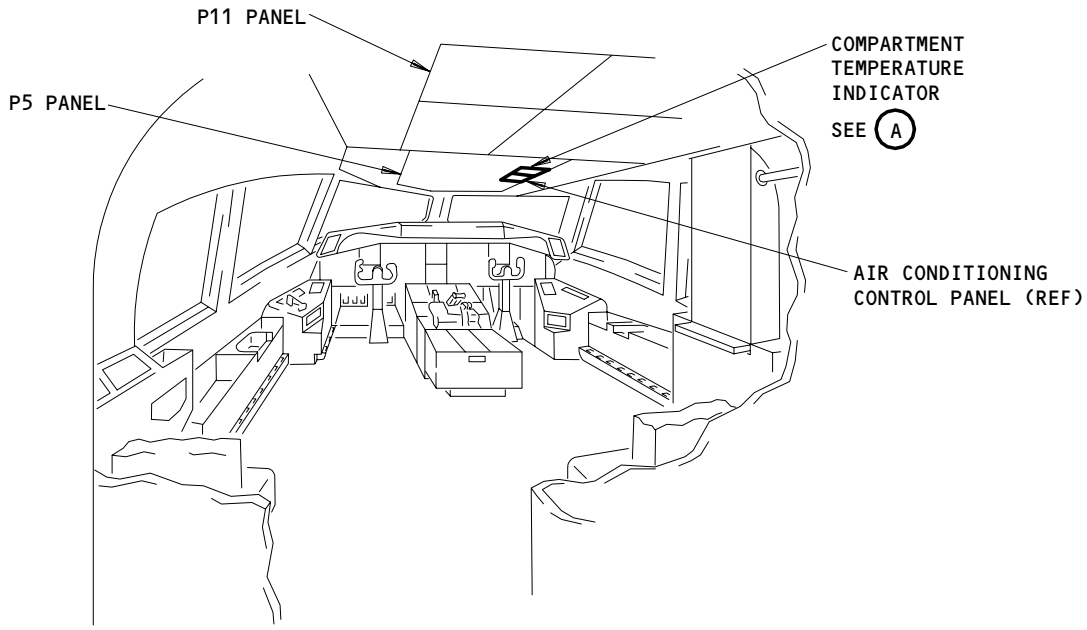
      S 014-003
      (2) Loosen the 1/4-turn fasteners for the temperature indicator on the P5 panel. Carefully pull the indicator out of the panel to give access to the electrical connector on the rear side.

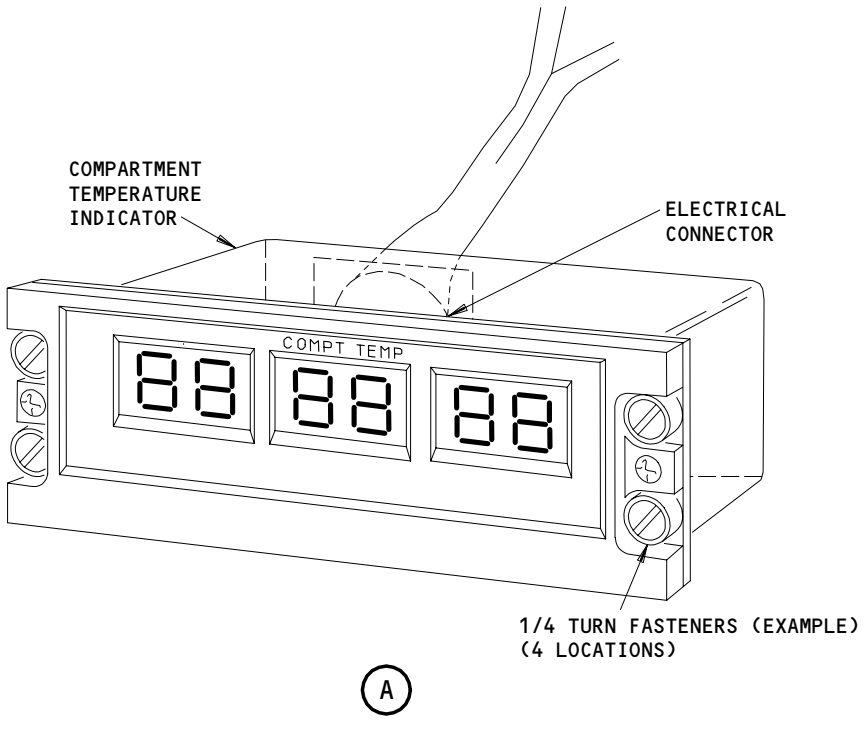
      S 034-004
      (3) Disconnect the electrical connector from the temperature indicator.

      S 024-005
      (4) Remove the temperature indicator.

TASK 21-65-01-404-006

3. Install the Compartment Temperature Indicator (Fig. 401)
   A. References
      (1) 24-22-00/201, Electric Power Control





Compartment Temperature Indicator Installation
Figure 401

B. Access
(1) Location Zone
212 Control Cabin - Section 41 (Right)

C. Procedure

S 434-007
(1) Install the electrical connector to the temperature indicator.

S 424-008
(2) Carefully install the temperature indicator into the P5 panel.

S 434-009
(3) Tighten the 1/4-turn fasteners.

S 864-010
(4) Remove the DO-NOT-CLOSE tag and close the circuit breaker on the P11 panel.
(a) 11P17, CABIN ZONE TEMP IND

S 864-011
(5) Supply electrical power (Ref 24-22-00).

S 864-012
(6) Make sure none of the liquid crystal displays for the compartment temperature are blank, or read "00" or "99".

D. Put the Airplane Back to Its Usual Condition

S 864-013
(1) Remove electrical power if it is not necessary (Ref 24-22-00).

ZONE TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. The temperature bulb for the flight compartment zone is installed in the flight compartment ceiling, inboard of the left No. 3 window.
   B. The temperature bulbs for the forward and aft zones are in the zone temperature sensor assemblies.
      (1) The zone temperature sensor assemblies are behind the inlet grill which you can see on the bottom of the right bullnose panels.

TASK 21-65-02-004-001

2. Remove the Zone Temperature Bulb (Fig. 401)
   A. References
      (1) AMM 25-23-01/401, Passenger Service Units.
   B. Access
      (1) Location Zones
          211 Control cabin - section 41 (Left)
          232 Passenger cabin - section 41 (Right)
          252 Passenger cabin - section 46 (Right)
   C. Prepare for Removal

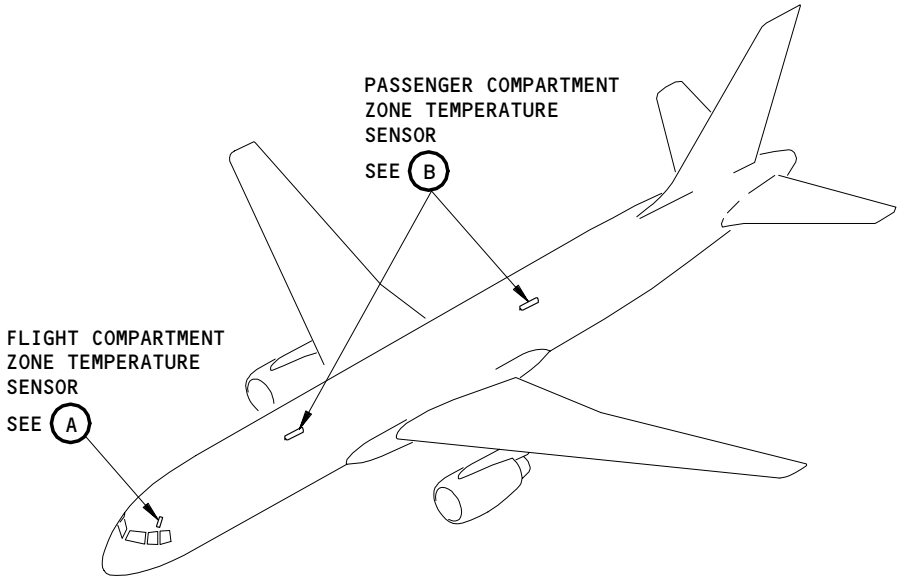
S 864-002
      (1) Put the left and right air-conditioning-pack selector switches on the pilot's overhead panel, P5, to the OFF position. Make sure the L and R PACK OFF lights come on. Attach DO-NOT-OPERATE tags on the two switches.

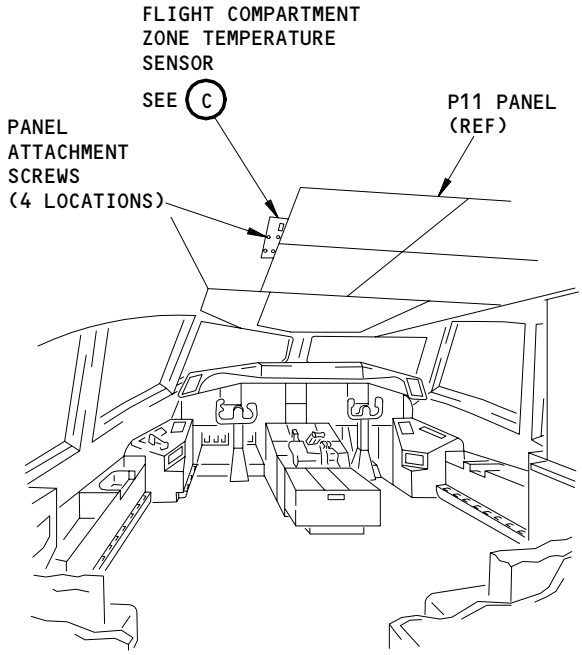
S 864-054
      (2) Push the L and R RECIRC FAN switchlights on the P5 panel to the off position. Make sure the INOP light comes on. Attach DO-NOT-OPERATE tags on the two switchlights.

S 864-003
      (3) For the flight compartment bulb, open these circuit breakers and attach DO-NOT-OPERATE tags:
          (a) On the overhead circuit breaker panel, P11:
              1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
              2) 11P25, ZONE DUCT OVHT/INOP FLT DK

S 864-028
      (4) For the forward cabin bulb, open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) On the overhead circuit breaker panel, P11:
              1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
              2) 11P26, ZONE DUCT OVHT/INOP FWD

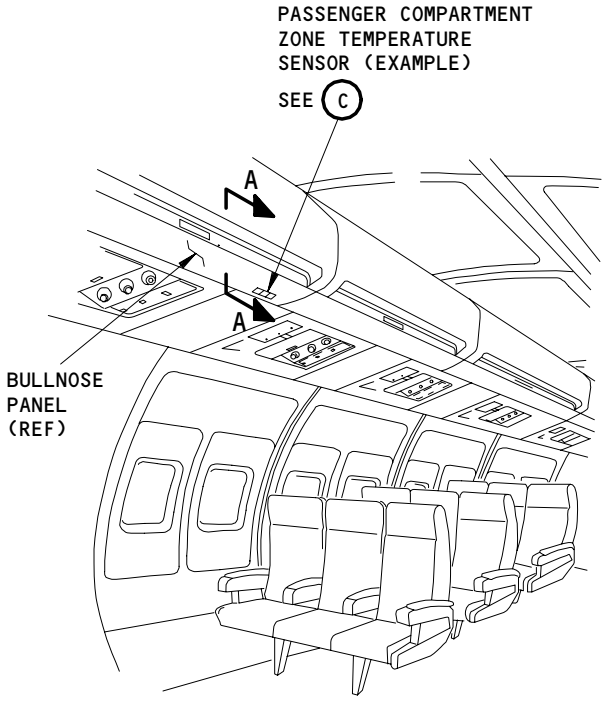
S 864-062
      (5) For the aft cabin bulb, open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) On the overhead circuit breaker panel, P11:
              1) 11N27, ZONE TEMP CONT VLV CLOSE AFT





FLIGHT COMPARTMENT

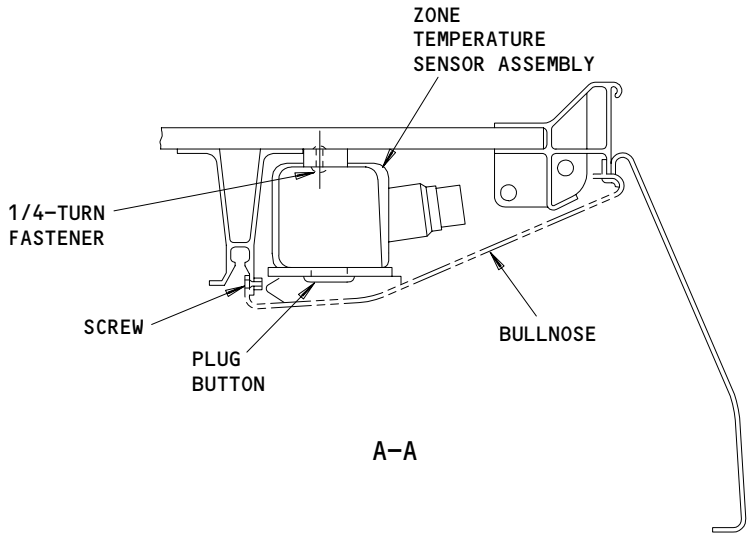
A

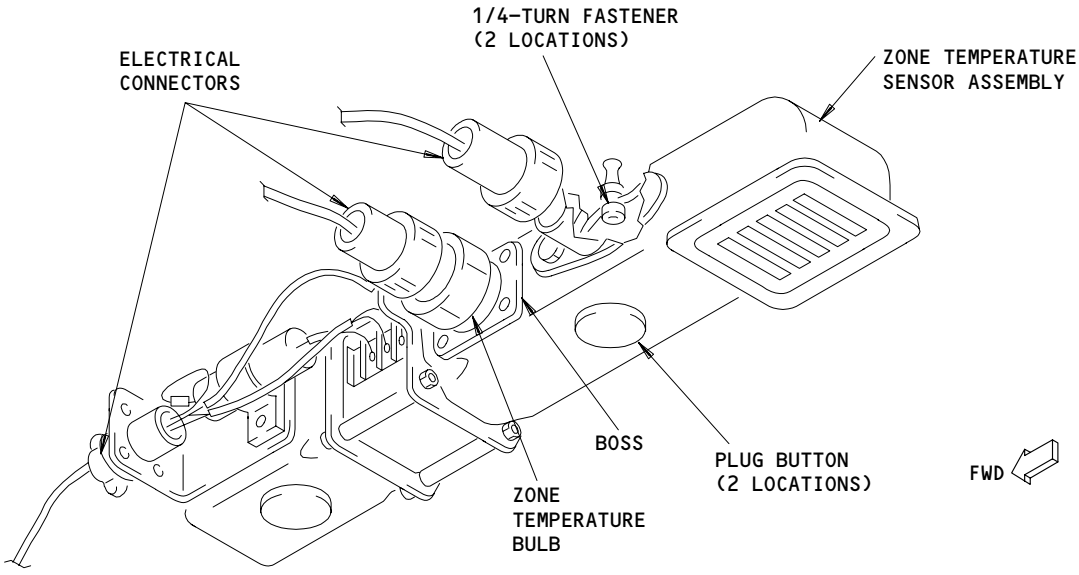


PASSENGER COMPARTMENT

B

Zone Temperature Bulb Installation
Figure 401 (Sheet 1)





ZONE TEMPERATURE SENSOR ASSEMBLY (EXAMPLE)

(C)

Zone Temperature Bulb Installation
Figure 401 (Sheet 2)

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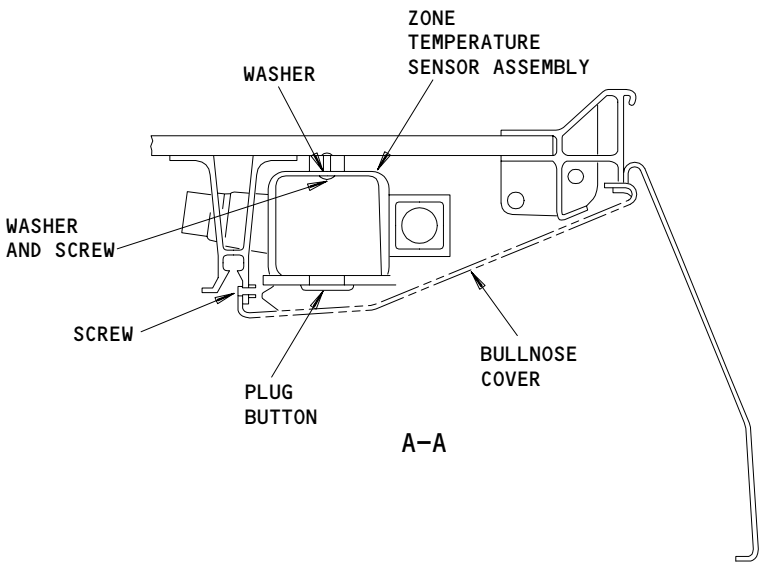
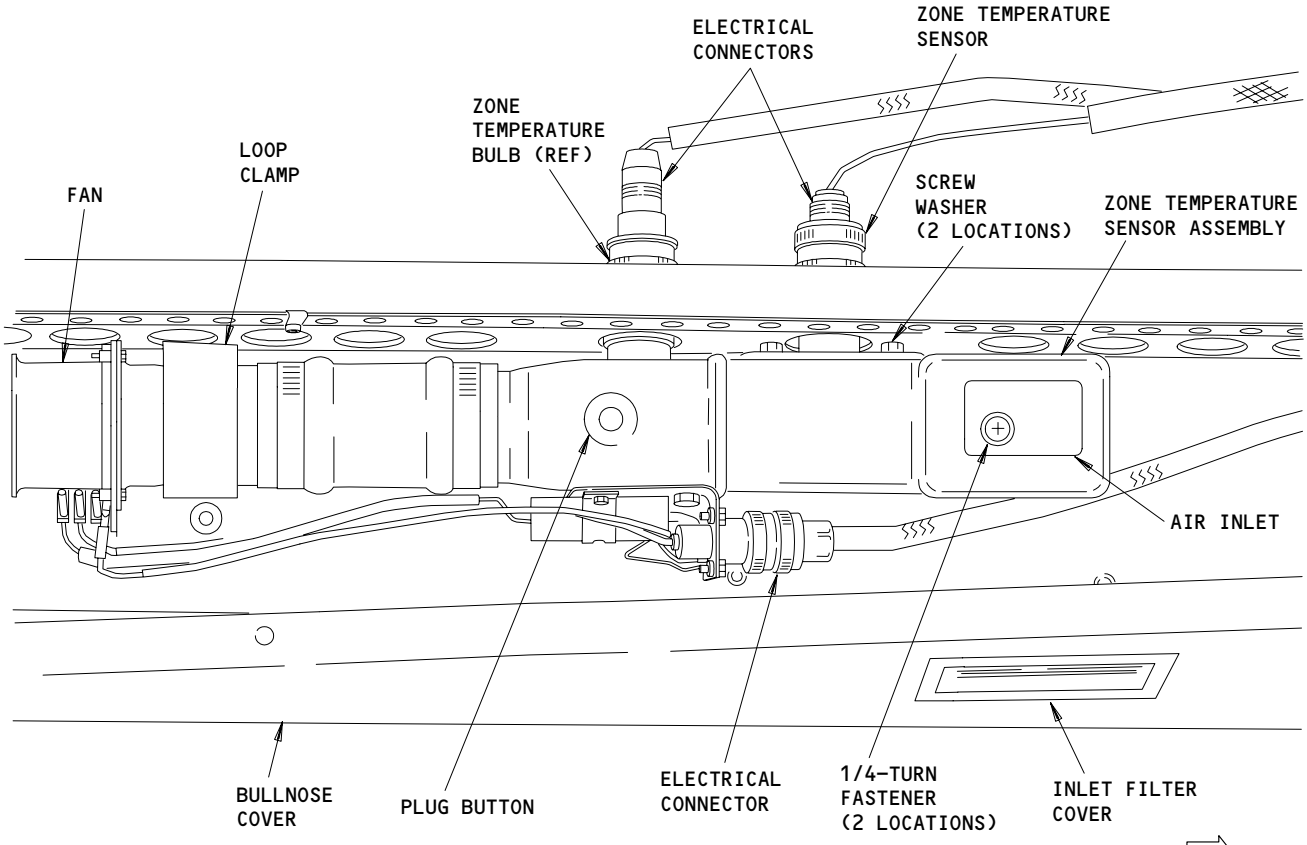




ZONE TEMPERATURE SENSOR ASSEMBLY (EXAMPLE)
(VIEW UP INTO THE BULLNOSE AREA)

C

Zone Temperature Bulb Installation
Figure 401 (Sheet 3)

277438

2) 11P27, ZONE DUCT OVHT/INOP AFT

S 014-004
(6) Remove the ceiling panel immediately left of the P11 panel to find the flight compartment bulb.

S 214-026
(7) To find the forward or aft zone temperature bulb, look at the bottom of the right bullnose panels for the inlet grille.

S 014-005
(8) Lower the right side passenger service unit (PSU) which is next to the inlet grille (AMM 25-23-01/401).

S 014-025
(9) Remove the bullnose panel.

D. Remove the Flight Compartment Bulb

S 014-013
(1) Remove the two plug buttons which give access to the two 1/4-turn fasteners.

S 034-014
(2) Turn the 1/4-turn fasteners counterclockwise to loosen the temperature sensor assembly.

S 014-055
(3) Lower the temperature sensor assembly to get access to the electrical connectors.

S 034-056
(4) Disconnect the electrical connectors (3 places) and remove the temperature sensor assembly.

S 024-057
(5) Loosen and remove the temperature bulb from the temperature sensor assembly.

E. Remove the Forward or Aft Cabin Bulbs

S 014-015
(1) Remove the plug button near the middle of the temperature sensor assembly.

S 034-016
(2) Remove one screw and two washers from each location through the air inlet and the plug button holes.

S 034-017
(3) Remove the screw, washer, and spacer from the loop clamp near the aft end of the temperature sensor assembly.

S 014-023
(4) Lower the temperature sensor assembly to get access to the electrical connectors.

S 034-024
(5) Disconnect the electrical connectors (3 places) and remove the temperature sensor assembly.

S 024-025
(6) Loosen and remove the temperature bulb from the temperature sensor assembly.

TASK 21-65-02-404-026

3. Install the Zone Temperature Bulb (Fig. 401)

A. Equipment
(1) Hand held thermometer - commercially available

B. References
(1) AMM 25-23-01/401, Passenger Service Units.
(2) AMM 24-22-00/201, Electric Power Control.
(3) AMM 21-61-00/501, Primary (Zone) Temperature Control System

C. Access
(1) Location Zones
211 Control cabin - section 41 (Left)
232 Passenger cabin - section 41 (Right)
252 Passenger cabin - section 46 (Right)

D. Procedure

S 864-063
(1) Install an O-ring on the bulb.

NOTE: The replacement bulb may be supplied with a copper asbestos gasket. Replacement of the gasket with an O-ring is recommended.

S 424-028
(2) Install and lockwire the bulb into the boss on the temperature sensor assembly.

S 434-029
(3) Connect the electrical connectors (3 places) to the temperature sensor assembly.

E. Procedure to Install the Flight Compartment Bulb

S 434-032
(1) Install the temperature sensor assembly on the shock supports and attach the assembly with the two 1/4-turn fasteners.

S 414-033
(2) Install the two plug buttons in the access holes of the temperature sensor assembly.

F. Procedure to Install the Forward or Aft Cabin Bulb

S 434-034
(1) Install a loop clamp around the aft end of the temperature sensor assembly.

S 434-035
(2) Put the temperature sensor assembly in position in the bullnose.

S 434-036
(3) Install a washer, screw, and spacer in the loop clamp to hold the temperature sensor assembly in position.

S 434-037
(4) Install two washers on the top side of the temperature sensor assembly. Install one washer near the middle and the other washer near the forward end of the assembly.

S 434-038
(5) Install a washer and screw in each location through the air inlet and the plug button hole.

S 414-039
(6) Install the plug button.

S 864-042
(7) For the flight deck temperature bulb, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P11 panel:
1) 11N25, ZONE TEMP CONT VLV CLOSE FLT DK
2) 11P25, ZONE DUCT OVHT/INOP FLT DK

S 864-029
(8) For the forward cabin bulb, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P11 panel:
1) 11N26, ZONE TEMP CONT VLV CLOSE FWD
2) 11P26, ZONE DUCT OVHT/INOP FWD

S 864-030
(9) For the aft cabin bulb, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) On the P11 panel:
1) 11N27, ZONE TEMP CONT VLV CLOSE AFT
2) 11P27, ZONE DUCT OVHT/INOP AFT

G. Do a test of the zone temperature bulb.

S 864-043
(1) Supply electrical power (AMM 24-22-00/201).

S 714-044
(2) Listen for the zone sensor fan operation at the installed temperature sensor assembly.

S 744-045
(3) Do the Zone Temperature Controller BITE test (AMM 21-61-00/501) and make sure the ZONE SENSOR fault light does not come on.

S 714-047
(4) Hold the thermometer near the installed zone temperature sensor assembly inlet. Make sure the thermometer temperature is within two degrees of the applicable zone COMPT TEMP indication in the flight compartment.

H. Put the Airplane Back to Its Usual Condition

S 414-050
(1) Install the flight compartment bulb ceiling panel.

S 414-052
(2) Install the forward and aft cabin bulb bullnose panels.

S 414-051
(3) Install the forward and aft cabin PSU (AMM 25-23-01/401).

S 864-053
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

DUCT TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. A duct temperature bulb is installed in each of the three cabin air supply ducts which go to the three cabin zones. The bulbs supply the duct temperature for indication on the EICAS display. The flight compartment temperature bulb is installed below the flight compartment deck floor near the left side airplane skin. The forward and aft cabin bulbs are installed on the left riser ducts near the main overhead distribution duct.

TASK 21-65-04-004-001

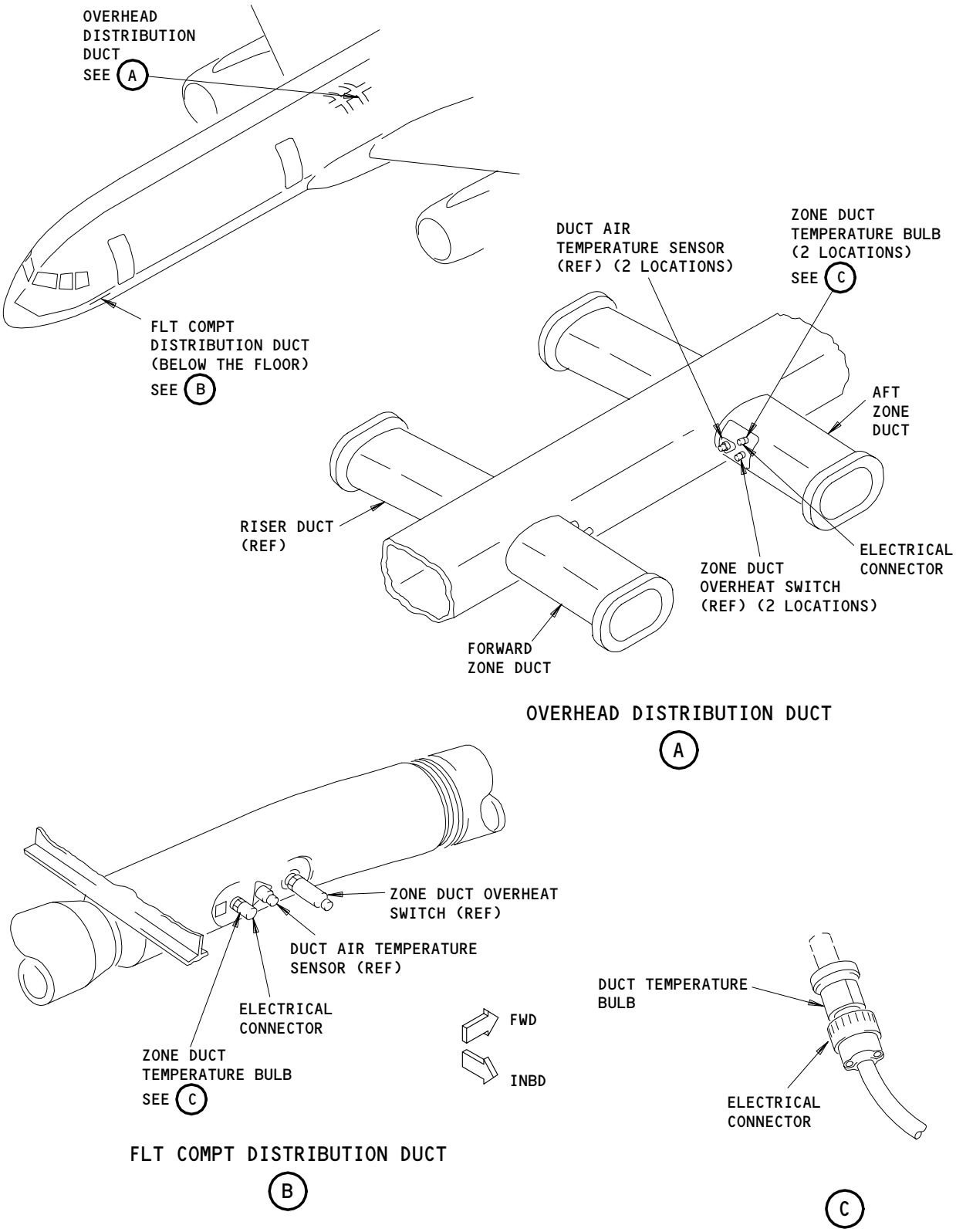
2. Remove Duct Temperature Bulb (Fig. 401)
   A. References
      (1) 06-41-00/201, Fuselage Access Doors and Panels
   B. Access
      (1) Location Zones
          211 Control cabin - section 41 (Left)
          232/234 Area above passenger cabin ceiling - section 43
      (2) Access Panels
          119BL Main Equipment Center access door
   C. Prepare for Removal

S 864-003
(1) Push the two RECIRC FAN switchlights on the pilot's overhead panel, P5, to the off position. Attach DO-NOT-OPERATE tags to the two switchlights.

S 864-005
(2) Put the two air-conditioning-pack on the P5 panel to the OFF position. Attach DO-NOT-OPERATE tag to the two selectors.

S 014-006
(3) To get access to the bulb in the flight compartment open the main equipment center access door 119BL (Ref 06-41-00). Find the bulb on the distribution duct near the aft end of the nose wheel well along the left side airplane skin.

S 014-007
(4) To find the bulb in the forward and aft cabin open the sculptured ceiling panel approximately six windows aft of the No.2 passenger door.



Zone Duct Temperature Bulb - Installation
Figure 401

D. Remove the Duct Temperature Bulb

S 034-009
(1) Disconnect the electrical connector from the bulb.

S 024-010
(2) Remove the bulb from duct.

S 864-011
(3) Put a cover on the duct hole to keep out unwanted objects.

TASK 21-65-04-404-002

3. Install Duct Temperature Bulb (Fig. 401)

A. References
(1) 06-41-00/201, Fuselage Access Doors and Panels
(2) 36-00-00/201, Pneumatic - General
(3) 24-22-00/201, Electric Power Control

B. Access
(1) Location Zones
211 Control cabin - section 41 (Left)
232/234 Area above passenger cabin ceiling - section 43
(2) Access Panels
119BL Main Equipment Center access door

C. Procedure

S 864-012
(1) Remove the duct covers.

S 424-013
(2) Install the bulb into duct.

S 434-029
(3) Tighten the bulb to a torque value of 300 +/- 15 inch-pounds and lockwire in place.

S 434-014
(4) Install the electrical connector to the bulb.

S 864-015
(5) Supply electrical power (Ref 24-22-00).

S 864-016
(6) Make sure the EICAS circuit breakers (5 locations) on the overhead circuit breaker panel, P11, are closed.

S 864-017
(7) Push the ECS/MSG switch on the EICAS MAINT module of the right side panel, P61. Make sure the DUCT TEMP indication on the ECS/MSG display of the pilot's center instrument panel, P2, is approximately ambient temperature.

S 864-018
(8) Supply pneumatic power (AMM 36-00-00/201).

S 864-019
(9) Put the zone temperature selector for the installed temperature bulb to the AUTO/W position.

S 864-020
(10) Remove the DO-NOT-OPERATE tags from the air-conditioning-pack control selectors on the P5 panel. Put the two selectors in the AUTO position. Make sure the PACK OFF lights go out.

S 724-021
(11) Make sure the DUCT TEMP indication for each installed temperature bulb shows an increase in temperature.

S 864-022
(12) Remove the DO-NOT-OPERATE tags from the RECIRC FAN switchlights on the P5 panel.

S 864-024
(13) Put the two air-conditioning-pack control selectors on the P5 panel to the OFF position. Make sure the PACK OFF lights come on.

S 864-025
(14) Put the zone temperature selector to the AUTO position.

D. Put the Airplane Back to Its Usual Condition

S 414-026
(1) Close the main equipment center access door in the flight compartment (Ref 06-41-00/201).

S 414-030
(2) Install the ceiling panel in the forward and aft cabins.

S 864-027
(3) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 864-028
(4) Remove electrical power if it is not necessary (Ref 24-22-00).