TO: ALL HOLDERS OF ENGINE AND WING ANTI-ICE MODULE ASSEMBLY P5-11 OVERHAUL MANUAL, 30-12-02

REVISION NO. 6, DATED NOV 1/08

HIGHLIGHTS

DESCRIPTION OF CHANGE	TOPICS AFFECTED												
	D&O	D/Assy	Cleaning	Insp/Chk	Repair	Assy	F/C	Test	T/Shooting	S/Tools	Storage	IPL	L/Overhaul
Removed BAE Systems assemblies from manual	X				X			X	X			X	

ENGINE AND WING ANTI-ICE MODULE ASSEMBLY P5-11

30-12-02

BOEING P/N 69-68134-3, -4

AIRLINE P/N

THE FOLLOWING DIRECTIVES APPLY TO THIS SUBJECT:

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVES	DATE DIRECTIVE INCORPORATED INTO TEXT
		PRR 31253	Mar 10/70
		PRR 31396	Mar 10/70
31-1013		PRR 31396-1	Mar 10/70
		PRR 32406	Sep 25/74
		PRR 32407	Sep 25/74
		PRR 32373	Dec 25/74
71-1034		MC 3510-40K	Dec 25/75
71-1041		MC 3510-53K	Dec 25/75
24-1024		PRR 32615	Jul 5/77
30-1014		PRR 32615	Jul 5/77
34-1130		MC 3999-10K	Jan 5/83

LIST OF EFFECTIVE PAGES

* Indicates pages revised, added or deleted in latest revision
F Indicates foldout pages - print one side only

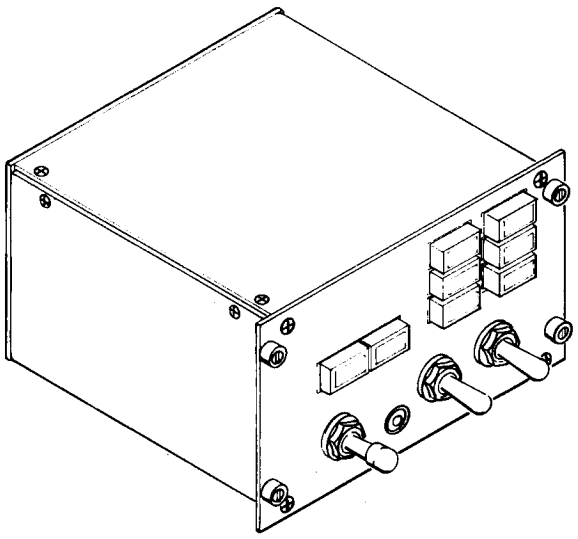
PAGE	DATE	PAGE	DATE	PAGE	DATE
30-12-02					
* T-1	Nov 1/08				
T-2	BLANK				
* LEP-1	Nov 1/08				
LEP-2	BLANK				
* T/C-1	Nov 1/08				
T/C-2	BLANK				
* 1	Nov 1/08				
* 2	Nov 1/08				
* 3	Nov 1/08				
* 4	Nov 1/08				
* 5	Nov 1/08				
* 6	Nov 1/08				
* 7	Nov 1/08				
8	BLANK				
* 401	Nov 1/08				
402	BLANK				
* 701	Nov 1/08				
* 702	Nov 1/08				
* 703	Nov 1/08				
* 704	Nov 1/08				
* 705	Nov 1/08				
706	BLANK				
* 801	Nov 1/08				
* 802	Nov 1/08				
803	BLANK				
* F 804	Nov 1/08				
* F 805	Nov 1/08				
806	BLANK				
807	BLANK				
* F 808	DELETED				
* F 809	DELETED				
810	BLANK				
* 1101	Nov 1/08				
* 1102	Nov 1/08				
* 1103	Nov 1/08				
* 1104	Nov 1/08				
* 1105	Nov 1/08				
1106	BLANK				
* 1107	DELETED				
* 1108	DELETED				
* 1109	DELETED				
* 1110	DELETED				
* 1111	DELETED				
* 1112	DELETED				

TABLE OF CONTENTS

*[1] Use applicable procedures in SOPM 20-11-04, OHM 31-10-01 and standard industry practices.

*[2] Special instructions not required.

ENGINE AND WING ANTI-ICE MODULE ASSEMBLY (P5-11)



Engine and Wing Anti-Ice Module Assembly (P5-11)
Figure 1

DESCRIPTION AND OPERATION

NOTE: For coverage of 69-37320-24,-25,-27,-31,-32,-33,-37,-39,-40,-41,-42,-60,-61,-62,-63,-64,-65,-66,-67,-68,-69, refer to BAE Systems Controls Inc., (V89954 BAE Systems Controls Inc., 600 Main St., Johnson City, NY 13790-1806) CMM 30-12-02.

1. Description

   A. The engine and wing anti-ice module assembly is in a case, containing connector mounted printed circuit assemblies, a control relay, switches, and indicator lights. All components are connected by wire bundle to receptacles at the back of the unit.

2. Operation

   A. The engine and wing anti-ice module assembly functions as a control module for the anti-ice system. The system controls the flow of bleed air from the engine compressors to the engine inlet and cowl and to the wing leading edges to provide thermal ice protection. Switches and indicator 1ights, on the module, control and indicate the position of electrically driven valves which control the flow of air. The indicator lights have a dual function of checking valve position-agreement with control switch position as well as indicating valve position.

B. The module assembly contains indicator light assemblies and switches as follows:

(1) Indicator Light Assemblies

L1 - ENG 1 LEFT VALVE OPEN
L2 - ENG 1 COWL VALVE OPEN
L3 - ENG 1 RIGHT VALVE OPEN
L4 - WING RIGHT VALVE OPEN
L6 - WING LEFT VALVE OPEN
L7 - ENG 2 LEFT VALVE OPEN
L8 - ENG 2 COWL VALVE OPEN
L9 - ENG 2 RIGHT VALVE OPEN

(2) Switches

S1 - ENG 1 ANTI-ICE CONTROL
S2 - ENG 2 ANTI-ICE CONTROL
S3 - WING ANTI-ICE CONTROL

3. Functional Description (See Schematic Diagram.)

A. Indicators and Associated Circuitry (Fig. 2 and 3)

(1) The indicators illuminate, dim or extinguish to indicate external valve positions.

NOTE: Circuitry for all indicators on the engine and wing anti-ice module assembly are functionally similar. Therefore, only the circuitry for indicator L9 will be discussed.

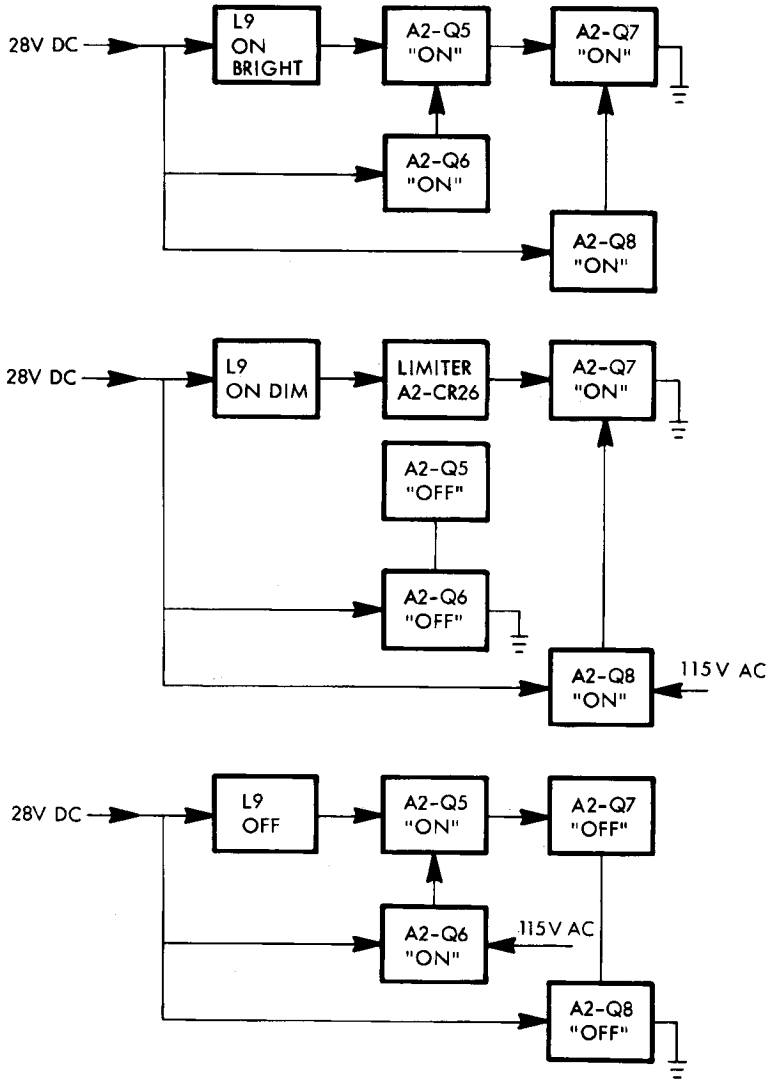
(2) If the external valve were disconnected, +28 volts dc applied to pin P2-17, and ground connected to pin P2-9, transistors A2-Q5, A2-Q6, A2-Q7, and A2-Q8 would be turned on. Indicator L9 is then grounded through transistors A2-Q5 and A2-Q7 and is illuminated bright.

(3) When the external valve is connected to pins P2-11 and P2-12 and is moving from open to closed or vice versa, indicator L9 is illuminated brightly. The circuit operates as indicated in paragraph B.(2) and in addition ac voltages are applied to pins P2-11 and P2-12 from the external valve motor.

(4) With switch S2 "ON" and the external valve fully open, 115 volts ac is applied at pin P2-12 and pin P2-11 is grounded through the valve motor. Transistors A2-Q6 and A2-Q5 are turned off and the indicator L9 ground path is through diode A2-CR26 and transistor A2-Q7. Diode A2-CR26 puts a voltage drop in the ground path reducing the voltage to indicator L9 causing it to illuminate dimly.

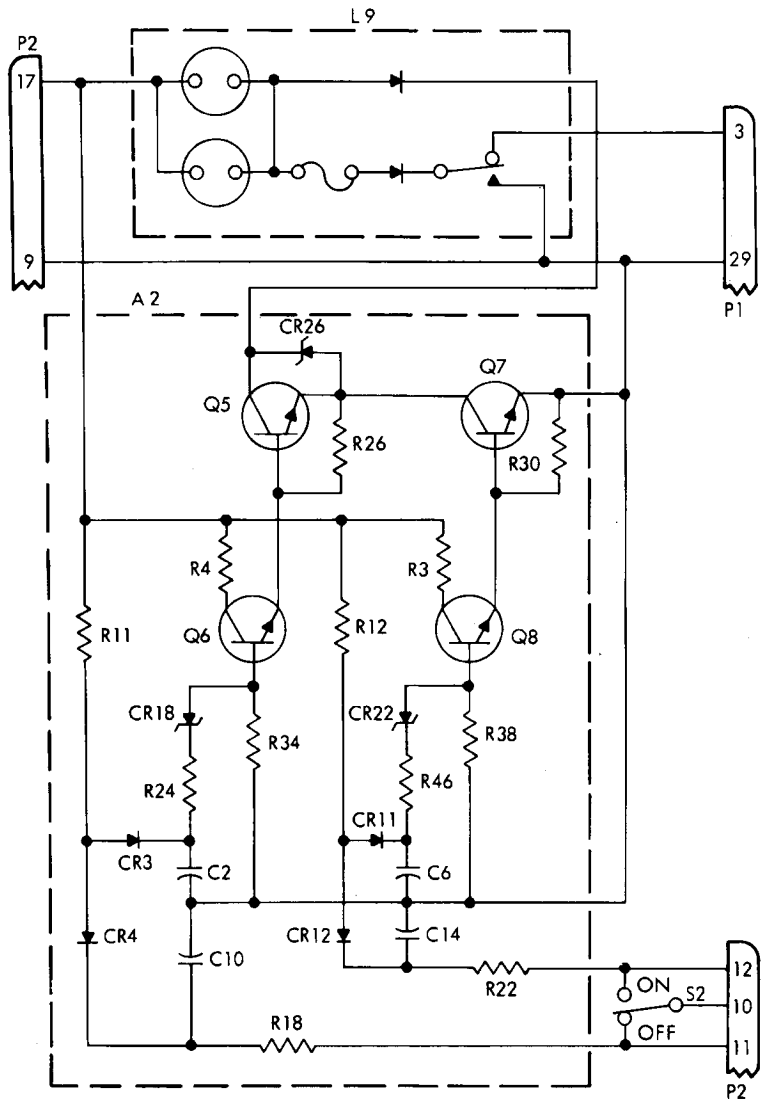
(5) With switch S2 "OFF" and the external valve fully closed, 115 volts ac is applied at pin P2-11 and pin P2-12 is grounded through the valve motor. Transistors A2-Q8 and A2-Q7 are turned off and indicator L9 is extinguished since its ground path through transistor A2-Q7 is broken.

(6) With +28 volts dc applied to pin P2-17 and pin P1-3 grounded, a current path is provided through a fuse, a diode, and normally closed contacts of a push-to-test switch to illuminate indicator L9. When pin P2-9 is grounded, and L9 pressed, a current path is provided through a fuse, a diode, and normally open contacts of a push-to-test switch.



Indicator and Associated Circuitry Block Diagram
Figure 2

1578326



Indicator and Associated Circuitry Schematic Diagram
Figure 3

1578333

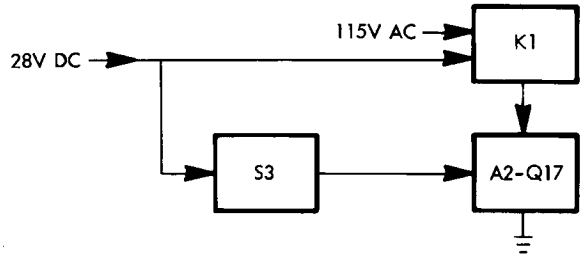
B. Wing Thermal Anti-Ice Switching Circuitry (See Figures 4 and 5.)

NOTE: Circuitry for the left wing thermal anti-ice switching and the right wing thermal anti-ice switching are functionally identical. Therefore, only the circuitry for the left wing thermal anti-ice switching will be described.

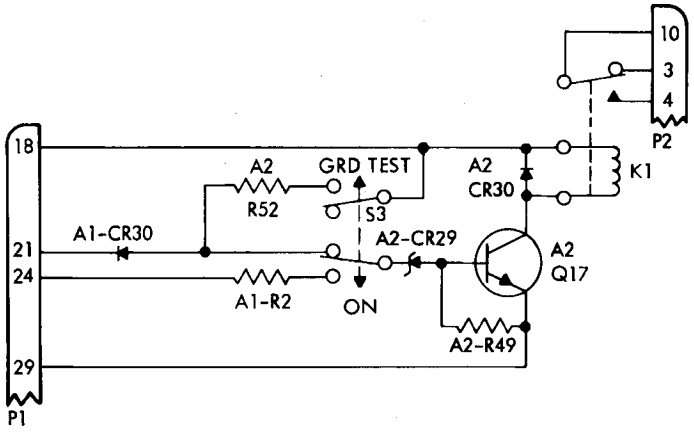
(1) With +28 volts dc applied to pins P1-24 and P1-18, ground connected to pin P1-29, and switch S3 set to "ON," transistor A2-Q17 is turned on providing a ground path for relay K1. Relay K11 is energized providing electrical continuity between pins P2-4 and P2-10.

(2) Setting switch S3 to "GRD TEST" and applying +28 volts dc to pin P1-18, with ground connected to pin P1-29, turns on transistor A2-Q17 and energizes relay K1.

(3) Setting switch S3 to "OFF" turns off transistor A2-Q17 and de-energizes relay K1, breaking electrical continuity between pins P2-4 and P2-10, providing electrical continuity between pins P2-3 and P2-10.



Wing Thermal Anti-Ice Switching Circuitry Block Diagram
Figure 4



Wing Thermal Anti-Ice Switching Circuitry Schematic Diagram
Figure 5

1576913

4. Leading Particulars

Length -- 7 inches (approximately)
Width -- 5-3/4 inches (approximately)
Height -- 3-1/2 inches (approximately)
Weight -- 4 pounds (approximately)
Operating Voltage -- 28 volts dc

REPAIR

1. All repair can be accomplished using standard industry practices and information contained in SOPM 20-11-04 or OHM 31-10-01 except as noted in paragraphs below:

   A. If printed circuit assembly connector keying plug (41, Fig. 1101) requires replacement, insert at connector position 25.

   B. When attaching base plate to standoffs with screws (21, Fig. 1101), or terminals (19) with screws (18), coat threaded areas with Loctite primer Grade T, and Nutlock Compound 74 (Loctite Corporation, 705 North Mountain Road, Newington, Connecticut 06111) per manufacturer's instructions.

TESTING

1. Test Equipment

   A. Power Supply -- 28-volt dc, 2 amperes

   B. Multimeter -- Simpson 260, or equivalent

   C. Test connectors with pigtail leads as follows:

      (1) BACC45FT18-31S (J1)

      (2) BACC45FT18-31S6 (J2)

2. Functional Test

Component	From (+)	To (-)	S1 OFF S2 OFF S3 OFF	S1 ON S2 ON S3 OFF
S1	P1-11	P1-12	Con	
S1	P1-11	P1-14	Con	
S1	P1-11	P1-16	Con	
K1	P1-11	P2-5	Con	
A1, A2	P1-29	P2-9	Con	
S2	P2-10	P2-11	Con	
S2	P2-10	P2-13	Con	
S2	P2-10	P2-15	Con	
K1	P2-10	P2-3	Con	
S1	P1-11	P1-13		Con
S1	P1-11	P1-15		Con
S1	P1-11	P1-17		Con
S2	P2-10	P2-16		Con
S2	P2-10	P2-14		Con
S2	P2-10	P2-12		Con
A2R50 (R1)	P2-28	P2-6	100k (± 10k)	
A2R51	P2-16	P2-27	100k (± 10k)	
A1R51	P1-10	P1-13	100k (± 10k)	
L10 (J10)	P2-1	Rim of light-plate connector	Con	
L10 (J10)	P2-2	Center conductor of light plate connector	Con	

Continuity and Resistance Checks
Figure 701

A. Connect test connectors J1 and J2 to module connectors P1 and P2. Identify and tag pigtail leads.

B. Verify continuity (Con) and resistance as specified in Figure 701.

C. Set switches S1, S2 and S3 to OFF.

D. Connect ground to pins P1-29 and P2-9.

E. Apply +28 volts dc to pin P1-18.

F. Verify indicators L1 through L4 and L6 illuminated, and indicators L7 through L9 extinguished.

G. Set switch S3 to GRD TEST and hold in position.

H. Verify continuity between pins P2-4 and P2-10 and between pins P1-11 and P2-6.

I. Apply +28 volts dc to pin P1-24.

J. Set switch S3 to ON.

K. Verify continuity between pins P2-4 and P2-10.

L. Set switch S3 to OFF.

M. Remove +28 volts dc from pins P1-18 and P1-24.

N. Connect ground to pin P2-9.

O. Apply +28 volts dc to pin P2-17.

P. Verify indicators L7, L8 and L9 illuminated, and indicators L1 through L4 and L6 extinguished.

Q. Apply +28 volts dc to pin P1-18.

R. Verify indicators L1 through L4 and L6 through L9 illuminated.

S. Connect ground to pins P1-13, P1-15, P1-17, P2-4, P2-6, P2-12, P2-14, and P2-16.

T. Verify indicators L1 through L4 and L6 through L9 extinguished.

U. Connect ground to pin P1-3.

V. Verify indicators L1 through L4 and L6 through L9 illuminated.

W. Disconnect pin P1-3 from ground.

X. Set switches to position listed, apply connections, and verify indicator conditions as specified in Fig. 702.

NOTE: Indicators are extinguished except as indicated.

Step	Connection Point	Connect	Disconnect	Component		Indicator Illuminated
				Number	Position	
1				L1	Pressed	L1
2				L1	Released	
3	P1-17		Ground	L1		L1
4	P1-16	Ground		L1		L1 *[1]
5	P1-16		Ground	L1		L1
6	P1-17	Ground				
7				L2	Pressed	L2
8				L2	Released	
9	P1-15		Ground	L2		L2
10	P1-14	Ground		L2		L2 *[1]
11	P1-14		Ground	L2		L2
12	P1-15	Ground				
13				L3	Pressed	L3
14				L3	Released	
15	P1-13		Ground	L3		L3
16	P1-12	Ground		L3		L3 *[1]
17	P1-12		Ground	L3		L3
18	P1-13	Ground				
19				L4	Pressed	L4
20				L4	Released	
21	P2-6		Ground	L4		L4
22	P2-5	Ground		L4		L4 *[1]
23	P2-5		Ground	L4		L4
24	P2-6	Ground				
25				L6	Pressed	L6
26				L6	Released	
27	P2-4		Ground	L6		L6
28	P2-3	Ground		L6		L6 *[1]
29	P2-3		Ground	L6		L6
30	P2-4	Ground				
31				L7	Pressed	L7
32				L7	Released	
33	P2-16		Ground	L7		L7
34	P2-15	Ground		L7		L7 *[1]
35	P2-15		Ground	L7		L7
36	P2-16	Ground				

*[1] Dim

Test Procedure
Figure 702 (Sheet 1)

Step	Connection Point	Connect	Disconnect	Component		Indicator Illuminated
				Number	Position	
37				L8	Pressed	L8
38				L8	Released	
39	P2-14		Ground	L8		L8
40	P2-13	Ground		L8		L8 *[1]
41	P2-13		Ground	L8		L8
42	P2-14	Ground				
43				L9	Pressed	L9
44				L9	Released	
45	P2-12		Ground	L9		L9
46	P2-11	Ground		L9		L9 *[1]
47	P2-11		Ground	L9		L9
48	P2-12	Ground				
49				S3	GRD TEST	L4, L6
50				S3	OFF	
51				S3	ON	L4, L6
52	P2-5	Ground				(L4 *[1])
53				S3	OFF	L6
54	P2-5		Ground			

*[1] Dim

Test Procedure
Figure 702 (Sheet 2)

Y. Test S1 thru S3 contacts per Fig. 703.

Switch	Measure Between Pins	Switch Setting		
		OFF	ON	GRD TEST
S1	P1-5 to P1-4	No Con	Con	
S2	P2-8 to P2-7	No Con	Con	
S3	P1-6 to P1-7	No Con	Con	No Con

Switch Tests
Figure 703

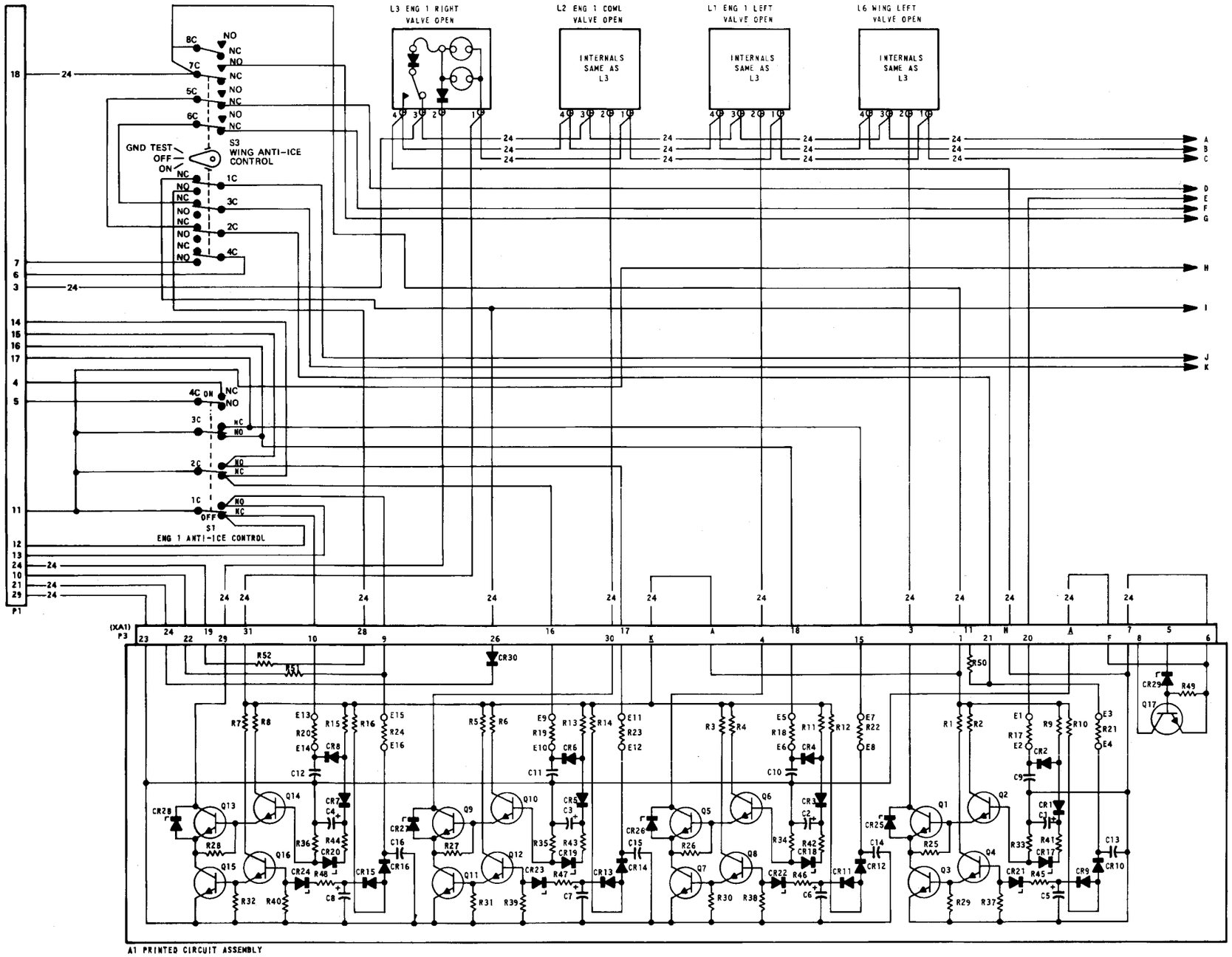
Z. Remove test connections.

TROUBLE SHOOTING

1. Trouble shooting is keyed to the steps of the test procedures. Paragraph and step references are to that portion of TESTING wherein the fault specified could occur. The presumption is made that when a fault indication is encountered, the results of all previous steps were normal. Check for defective wiring or connections before replacing components.

	Trouble	Possible Cause and Corrective Action
A.	Figure 701	Component listed in Figure 701
B.	Indicator L1 fails to illuminate, paragraph 3.F., 3.R. or Figure 702, step 3, 4 or 5	A1Q5, A1Q6, A1Q7, or A1Q8
C.	Indicator L2 fails to illuminate, paragraph 3.F., 3.R. or Figure 702, step 9, 10 or 11	A1Q9, A1Q10, A1Q11, or A1Q12
D.	Indicator L3 fails to illuminate, paragraph 3.F., 3.R. or Figure 702, step 15, 16 or 17	A1Q13, A1Q14, A1Q15, or A1Q16
E.	Indicator L4 fails to illuminate, paragraph 3.F., 3.R. or Figure 702, step 21, 22 or 23	A2Q1, A2Q2, A2Q3, or A2Q4
F.	Indicator L6 fails to illuminate, paragraph 3.F., 3.R. or Figure 702, step 27, 28 or 29	A1Q1, A1Q2, A1Q3, or A1Q4

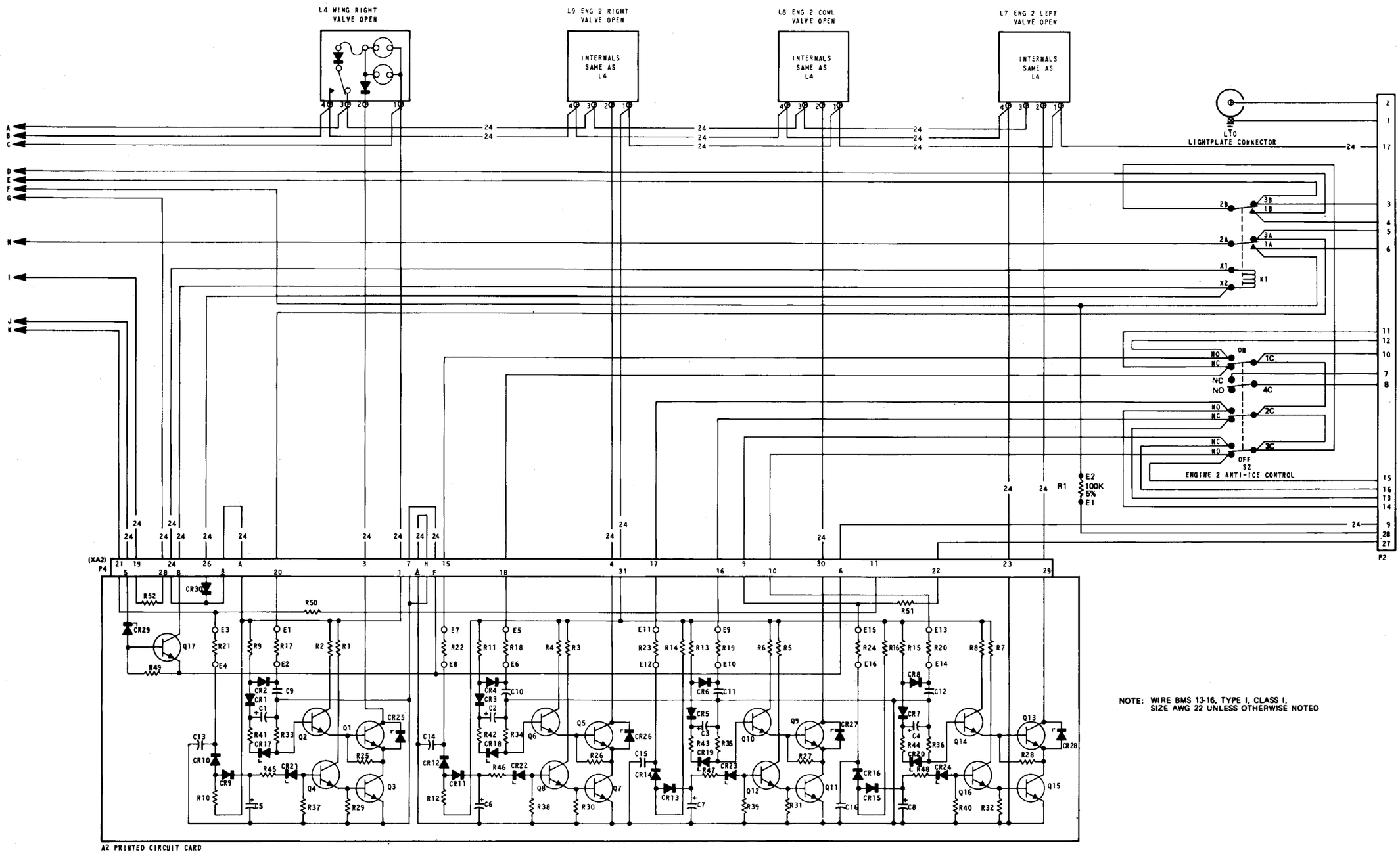
	Trouble	Possible Cause and Corrective Action
G.	Failure of continuity test, par. 3.H. or 3.K.	S3, K1 or A2Q17
H.	Indicator L7 fails to illuminate, par. 3.P., 3.R. or Fig. 702, step 33, 34 or 35	A2Q13, A2Q14, A2Q15, or A2Q16
I.	Indicator L8 fails to illuminate, par. 3.P., 3.R. or Fig. 702, step 39, 40 or 41	A2Q9, A2Q10, A2Q11, or A2Q12
J.	Indicator L9 fails to illuminate, par. 3.P., 3.R. or Fig. 702, step 45, 46 or 47	A2Q5, A2Q6, A2Q7, or A2Q8
K.	Indicator fails to illuminate, par. 3.V. or Fig. 702, step 1, 7, 13, 19, 25, 31, 37, or 43	Indicator not illuminated
L.	Indicators L4 and L6 fail to illuminate, Fig. 702, step 49 or 51	S3
M.	Indicator L4 fails to indicate as specified, Fig. 702 step 52	S3 wiring



69-68134-3, -4

Schematic Diagram
Figure 801 (Sheet 1)

M33234



NOTE: WIRE BMS 13-16, TYPE I, CLASS I, SIZE AWG 22 UNLESS OTHERWISE NOTED

69-68134-3, -4

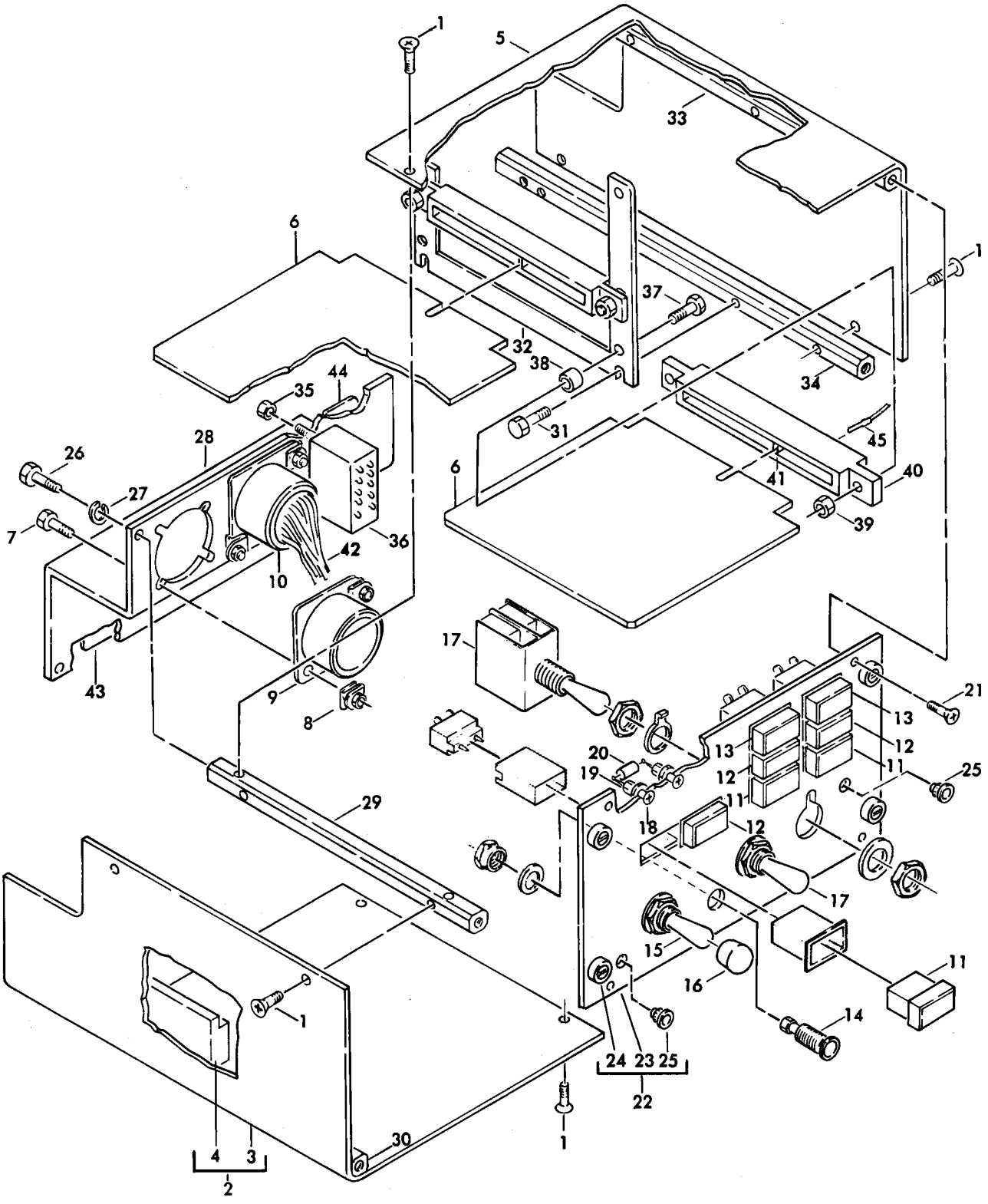
Schematic Diagram
Figure 801 (Sheet 2)

M33289

ILLUSTRATED PARTS LIST

FIG. 1101 REFERENCE DESIGNATION INDEX (SEE SCHEMATIC DIAGRAM)		
REFERENCE DESIGNATION	PART NUMBER	ITEM NO.
A1, A2	*69-60438-3	6
A1, A2	69-60438-1	6A
K1	*BACR13CF4	36
K1	JG2A	36
L1, L6, L7	318-630-1001-048	11
L1, L6, L7	319-619-1001-048	11
L2, L8	318-630-1001-050	13
L2, L8	319-619-1001-050	13
L3, L4, L9	318-630-1001-049	12
L3, L4, L9	319-619-1001-049	12
L10	138-102	14
L10	SCN001	14A
P1	BACC45FN18-31P	9
P2	BACC45FN18-31P6	10
P3, P4	582559-1	40
R1	RCR20G104JR	20
S1, S2	64AT11-3D	17
S3	68AT22-5	15
S3	A3-1114-02-1	15
XA1, XA2	582559-1	40

* PREFERRED PART



Engine and Wing Anti-Ice Module Assembly (P5-11)
Figure 1101

1578372

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101-					
	69-68134-3		MODULE ASSY, ENGINE AND WING ANTI-ICE (P5-11)(SB 71-1034, SB 71-1041) (SB 34-1130)	A	
	69-68134-4		MODULE ASSY, ENGINE AND WING ANTI-ICE (P5-11)(SB 71-1034)	B	
1	NAS514P440-4		. SCREW		8
2	69-60721-1		. COVER ASSY		1
3	69-60721-8		. . COVER		1
4	69-60721-9		. . FOAM		1
5	69-60721-2		. COVER		1
6	69-60438-3		. PRINTED CIRCUIT ASSY		2
6A	69-60438-1		. PRINTED CIRCUIT ASSY (OPT)		2
7	BACS12CB04-5		. SCREW		4
8	BACN10NW1		. NUT, CLIP, SELF-LOCKING		4
9	BACC45FN18-31P		. CONNECTOR		1
10	BACC45FN18-31P6		. CONNECTOR		1
11	318-630-1001-048		. INDICATOR LIGHT ASSY, V81590 (BOEING 10-61803-68)	A	3
11	319-619-1001-048		. INDICATOR LIGHT ASSY, V81590 (BOEING 10-61305-68)	B	3
12	318-630-1001-049		. INDICATOR LIGHT ASSY, V81590 (BOEING 10-61803-69)	A	3
12	319-619-1001-049		. INDICATOR LIGHT ASSY, V81590 (BOEING 10-61305-69)	B	3
13	318-630-1001-050		. INDICATOR LIGHT ASSY, V81590 (BOEING 10-61803-70)	A	2
13	319-619-1001-050		. INDICATOR LIGHT ASSY, V81590 (BOEING 10-61305-70)	B	3
14	138-102		. CONNECTOR, POWER, V26742		1
14A	SCN001		. CONNECTOR, POWER, V26742 (OPT)		1
15	68AT22-5		. SWITCH, V91929	B	1
15	A3-1114-02-1		. SWITCH, V81640 (OPT)	A	1
16	69-44578-2		. CAP		1
17	64AT11-3D		. SWITCH, V91929		2
18	NAS514P632-3		. SCREW		2
19	1411A		. TERMINAL, INSULATED, V88245		2
20	RCR20G104JR		. RESISTOR, 100K ±5%, 1/2 W		1
21	NAS514P632-5		. SCREW		4
22	69-37320-35		. BASEPLATE ASSY		1
23	BACP10U0337G		. . BASEPLATE		1
24	BACS21DD1G		. . STUD ASSY		4

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101-					
25	BACN10PA06-6		. NUT, PRESS, SELF-LOCKING		2
26	BACS12CB06-5		. SCREW		4
27	MS35338-41		. WASHER		4
28	69-60721-3		. BACKPLATE		1
29	69-37268-23		. STANDOFF		1
30	69-60721-5		. STANDOFF		1
31	BACS12CB04-4		. SCREW		3
32	69-60721-4		. SUPPORT		1
33	69-60721-7		. STANDOFF		1
34	69-60721-6		. STANDOFF		1
35	NAS679A06W		. NUT		2
36	BACR13CF4		. RELAY		1
36	JG2A		. RELAY, V58657 (OPT)		
37	BACS12CB06-14		. SCREW		4
38	NAS43DD1-17		. SPACER		4
39	NAS679A06W		. NUT		4
40	582559-1		. CONNECTOR, V00779		2
41	582507-1		. PLUG, KEYING, V00779		2
42	69-37320-34		. WIRE BUNDLE (MOD PER MC 3510-40K OR MC 3510-53K)		1
43	BAC27DCC233		. MARKER		1
44	BACM10L00-1CU		. MARKER		1
45	66143-2		. TERMINAL TAB, V00779		AR

VENDORS

V00779	TYCO ELECTRONICS CORP., 2800 FULLING MILL RD., BLDG-38, MIDDLETOWN, PENNSYLVANIA 17057-3142
V26742	METHODE ELECTRONICS, INC., 7401 W. WILSON AVE., HARWOOD HEIGHTS, FLORIDA 60706-4548
V58657	LEACH INTERNATIONAL CORPORATION, 6900 ORANGETHORPE AVE., BUENA PARK, CALIFORNIA 90620-1351
V81590	KORRY ELECTRONIC CO., 901 DEXTER AVE. N., SEATTLE, WASHINGTON 98109-3515
V81640	EATON CORP., DBA FLUID POWER DIV., 2250 WHITFIELD AVE., SARASOTA, FLORIDA 34243-3926
V91929	HONEYWELL INTERNATIONAL INC., 11 W. SPRING ST., FREEPORT, ILLINOIS 61032-4316