TO: ALL HOLDERS OF PRIMARY EXHAUST SLEEVE (CF6-80A, JT9D-7R & PW4000 ENGINES)
COMPONENT MAINTENANCE MANUAL 78-11-06

REVISION NO. 14 DATED NOV 01/03

HIGHLIGHTS

Pages which have been added or revised are outlined below together with the highlights of the revision. Remove and insert the affected pages as listed and enter Revision No. and date on the Record of Revision Sheet.

CHAPTER/SECTION AND PAGE NO.	DESCRIPTION OF CHANGE
TITLE PAGE 1	Deleted primary exhaust sleeve assembly, P/N 314T1310-3 to correspond with production drawing.
REPAIR 1-1 601,603-605	
REPAIR 2-1 601	Added applicability of P/N 314T3310-7, -9, -10 to Repair 2-1.

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MAINTENANCE MANUAL

PRIMARY EXHAUST SLEEVE ASSEMBLY (CF6-80A, JT9D-7R & PW4000 ENGINES)

PART NUMBERS 015T0180-16
314T1310-1, -2
314T3310-1 THRU -3,-5,-6,-7, -9,-10

COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST

109122

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REVISION RECORD

- Retain this record in front of manual. On receipt of revision, insert revised pages in the manual, and enter revision number, date inserted and initial.

REVISION NUMBER	REVISION DATE	DATE FILED	BY	REVISION NUMBER	REVISION DATE	DATE FILED	BY

109123

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TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL
		PRR C122203	JUL 10/85
		PRR B11284	JUL 10/85
767-71-21		PRR B11284-1	APR 10/86
		PRR B11915	OCT 01/91
		PRR 80451-59	OCT 01/91
767-71-21R1			DEC 01/94

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*1	NOV 01/03	01.1
2	BLANK	
REVISION RECORD		
1	JAN 10/84	01
2	BLANK	
TR & SB RECORD		
1	DEC 01/94	01.1
2	BLANK	
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REPAIR-GENERAL		
601	JUL 10/87	01.1
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603	DEC 01/94	01.1
604	BLANK	
REPAIR 1-1		
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602	OCT 01/89	01.101
*603	NOV 01/03	01.1
*604	NOV 01/03	01.1
*605	NOV 01/03	01.1
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607	APR 10/86	01.101
608	OCT 01/89	01.1
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602	JAN 10/84	01
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604	JAN 10/84	01
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615	OCT 01/91	01.101
616	OCT 01/91	01.101
617	OCT 01/91	01.101
618	OCT 01/91	01.101
619	OCT 01/91	01.101
620	OCT 01/91	01.101
621	OCT 01/91	01.101
622	OCT 01/91	01.101
623	OCT 01/91	01.101
624	OCT 01/91	01.101
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PAGE	DATE	CODE
REPAIR 2-1		CONT.
627	OCT 01/91	01.101
628	OCT 01/91	01.101
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ILLUSTRATED PARTS LIST		
1001	JAN 10/84	01
1002	MAR 01/03	01.1
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1004	MAR 01/03	01.1
1005	MAR 01/03	01.1
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1007	MAR 01/03	01.1
1008	MAR 01/03	01.1
1009	MAR 01/03	01.1
1010	MAR 01/03	01.1
1011	MAR 01/03	01.1
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1013	MAR 01/03	01.1
1014	MAR 01/03	01.1
1015	MAR 01/03	01.1
1016	MAR 01/03	01.1
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1019	MAR 01/03	01.1
1020	MAR 01/03	01.1

PAGE	DATE	CODE

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TABLE OF CONTENTS

*[1] Special instructions not required. Use standard industry practices.

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INTRODUCTION

The instructions in this manual provide the information necessary to perform maintenance functions ranging from simple checks and replacement to complete shop-type repair.

This manual is divided into separate sections:

1. Title Page
2. Record of Revisions
3. Temporary Revision & Service Bulletin Record
4. List of Effective Pages
5. Table of Contents
6. Introduction
7. Procedures & IPL Sections

Refer to the Table of Contents for the page location of applicable sections. An asterisked flagnote *[ ] in place of the page number indicates that no special instructions are provided since the function can be performed using standard industry practices.

The beginning of the REPAIR section includes a list of the separate repairs, a list of applicable standard Boeing practices, and an explanation of the True Position Dimensioning symbols used.

An explanation of the use of the Illustrated Parts List is provided in the Introduction to that section.

All weights and measurements used in the manual are in English units, unless otherwise stated. When metric equivalents are given they will be in parentheses following the English units.

Design changes, optional parts, configuration differences and Service Bulletin modifications create alternate part numbers. These are identified in the Illustrated Parts List (IPL) by adding an alphabetical character to the basic item number. The resulting item number is called an alpha-variant. Throughout the manual, IPL basic item number references also apply to alpha-variants unless otherwise indicated.

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CF6-80A, JT9D-7R & PW4000 ENGINES PRIMARY EXHAUST SLEEVE ASSEMBLIES

DESCRIPTION AND OPERATION

1. Description

   A. The primary exhaust sleeve assembly consists of inner and outersleeve assemblies riveted together at the aft end. The inner sleeve assembly is made from honeycomb sandwich panels, TRE 3300 (soundwich), and the outer sleeve assembly is of TRE 3200 (Tre-Metal). The outer sleeve assembly includes a seal member mounted at the top, and number of rub strips riveted to outside diameter.

2. Operation

   A. The primary exhaust sleeve assembly together with the plug assembly is used to control primary exhaust nozzle area and provide a path for smooth expansion of the power plant exhaust gas.

3. Leading Particulars (approximate)

   A. 314T1310 (CF6-80A engine)
      Length -- 50 inches
      Diameter -- 35-55 inches
      Weight -- 168 pounds

   B. 314T3310 (JT9D-7R & PW4000 engines)
      Length -- 56 inches
      Diameter -- 36-62
      Weight -- 189 pounds

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DISASSEMBLY

1. Use standard industry practices, disassemble this component only as necessary to complete fault isolation, determine the serviceability of parts, perform required repairs, and restore the unit to serviceable condition.

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CLEANING

1. Use standard industry practices for cleaning of all parts except inner sleeve assembly which contains perforated honeycomb inner skin panels.

2. Clean inner sleeve assembly as follows:

   A. Remove dry flaking contaminants with compressed air operated vacuum.

   B. Spray waterbase alkaline cleaning solution, 1 volume Kelite 28 mixed with 4 volumes water or an equivalent solution per "Manual Emulsion Cleaning" in 20-30-03, at 300 psi and 120°F for approximately 2 minutes.

   C. Rinse unit with warm water (approximately 150°F) for 10-15 minutes.

   D. Dry in warm air (approximately 150°F) for 30 minutes.

   CAUTION: TO PREVENT HONEYCOMB CELL CONTAMINATION, DO NOT FILL CELLS WITH SOLUTION UNLESS PART IS RINSED AND DRIED PER STEPS 2.C. & 2.D.

   E. Fill honeycomb cells with cleaning solution by immersing unit in clean solution for 20-30 minutes.

   F. Repeat steps 2.C. and 2.D.

   G. Remove remaining contaminants by swabbing with cleaning solvent, BMS 11-7, and immersing unit in same solvent for 5 minutes.

   H. Repeat steps 2.C. and 2.D.

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CHECK

1. Check all parts for obvious defects in accordance with standard industry practices.

2. Check inner and outer sleeve assemblies for contour defects, cuts, holes, punctures, cracks, and skin to core delaminations. Delamination can be detected by tapping skin with coin edge or similar object, a change in tone will be noted over delaminated area.

3. Penetrant check inner and outer sleeve assemblies and welds per 20-20-02. On perforated inner sleeve assembly, use swab method rather than immersion, this will keep absorption of penetrant developer in honeycomb cells to minimum. Clean sleeve assembly after penetrant check per instructions listed in cleaning section.

4. Refer to the applicable 747 or 767 Chapter 54 Structural Repair Manual for allowable damage and repair data.

5. Check primary exhaust nozzle throat and exit diameter as per Fig. 501.

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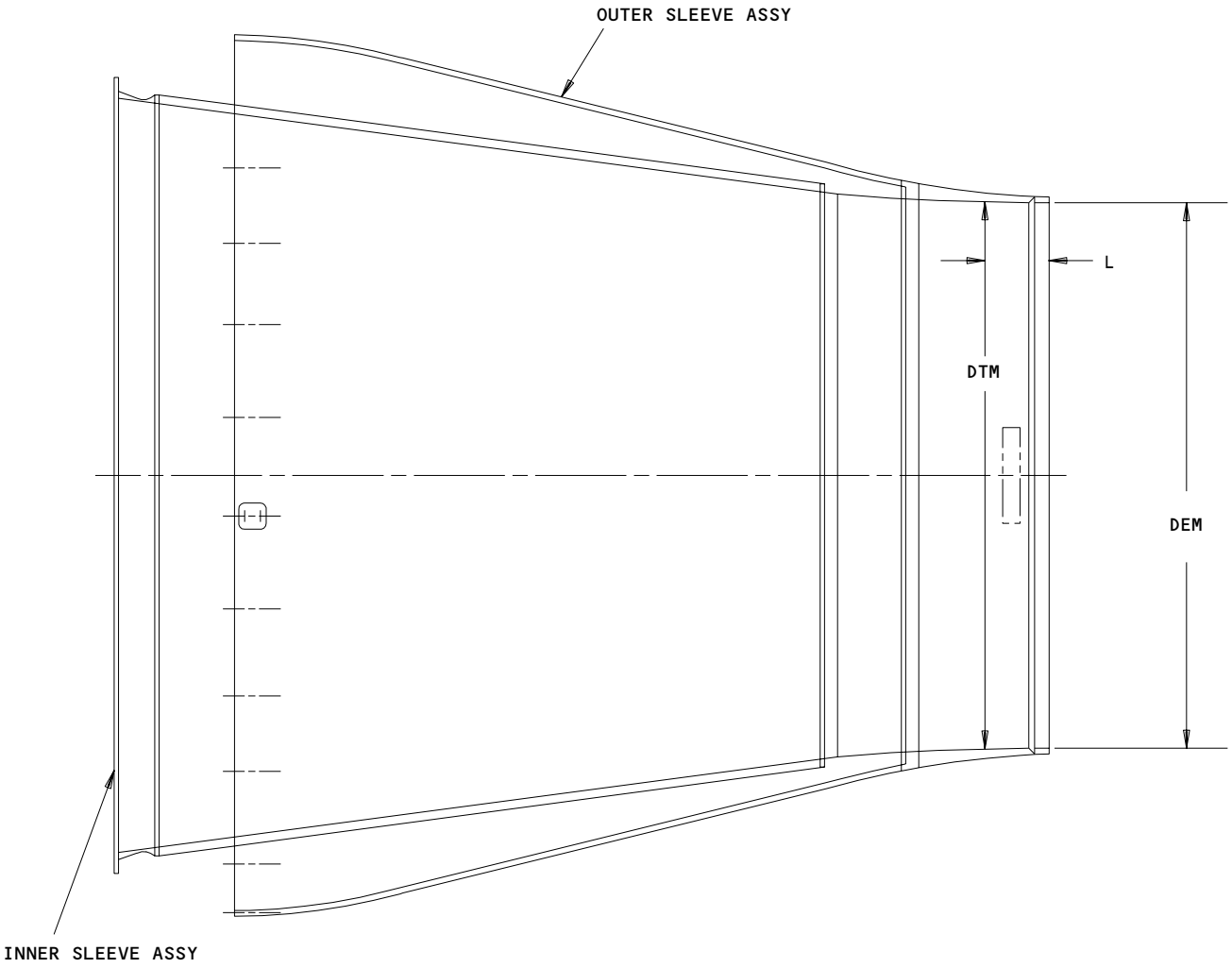

CHECK

ENSURE THAT $\left(\frac{DEM}{DTM}\right)^2$ IS WITHIN LIMITS SPECIFIED IN FOLLOWING TABLE

PART NUMBER	L	$\left(\frac{DEM}{DTM}\right)^2$
314T1310	4.102	1.018–1.026
314T3310	4.982	1.020–1.027

DTM = AVERAGE THROAT INSIDE DIAMETER MEASURED AT 8 EQUALLY SPACED CIRCUMFERENTIAL LOCATIONS

DEM = AVERAGE EXIT INSIDE DIAMETER MEASURED AT 8 EQUALLY SPACED CIRCUMFERENTIAL LOCATIONS

ALL DIMENSIONS ARE IN INCHES

Exhaust Nozzle Diameter Check
Figure 501

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REPAIR - GENERAL

1. Contents

A. Repair, refinish and replacement procedures are included in separate repair sections as follows:

P/N	NAME	REPAIR
314T1315	OUTER SLEEVE ASSY (CF6-80A)	1-1
314T3314	OUTER SLEEVE ASSY (JT9D-7R & PW4000)	1-1
314T1310	PRIMARY EXHAUST SLEEVE ASSY (CF6-80A)	2-1
314T3310	PRIMARY EXHAUST SLEEVE ASSY (JT9D-7R & PW4000)	2-1

2. Standard Practices and References

A. Refer to the following standard practices, and references as applicable.

(1) Standard Practices

20-10-05	Application and Finishing of Plasma Flame Sprayed Coatings
20-30-02	Stripping of Protective Finishes
20-30-03	General Cleaning Procedures
20-42-06	Silver Plating
20-44-02	Temporary Protective Coatings

(2) References

BAC5915	Boeing Process Specification for Radiographic Inspection
BAC5975	Boeing Process Specification for Fusion Welding of Metals

3. Materials

NOTE: Equivalent substitutes may be used.

A. Abrasive Paper -- Silicon-Carbide, 240 grit

B. Solvent -- TT-M-261, or JIS-K-1524 (MEK) (Ref 20-60-01)

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C. Solvent -- TT-M-268, or JIS-K-8903 (MIBK) (Ref 20-60-01)

D. Solvent -- Alkaline cleaner, Kelite 28 (Ref 20-60-01)

E. Solvent -- O-A-51, or JIS-K-1503, Grade 1 (Acetone) (Ref 20-60-01)

F. Tape -- Masking (Ref 20-60-04)

G. Weld Filler Wire -- WPH 15-7MO per AMS 5813 (Optional: WPH 15-7MO per AMS 5812

H. Compound -- Rust protective, Rust Veto 377 (Ref 20-60-03)

4. Dimensioning Symbols

A. Standard True Position Dimensioning Symbols used in app.icable repair procedures are shown in Fig. 601.

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⏤	STRAIGHTNESS
▱	FLATNESS
⊥	PERPENDICULARITY (OR SQUARENESS)
//	PARALLELISM
○	ROUNDNESS
⌭	CYLINDRICITY
⌒	PROFILE OF A LINE
⌓	PROFILE OF A SURFACE
◎	CONCENTRICITY
⌯	SYMMETRY
∠	ANGULARITY
↗	RUNOUT
⌰	TOTAL RUNOUT
⌴	COUNTERBORE OR SPOTFACE
⌵	COUNTERSINK

⌖	THEORETICAL EXACT POSITION OF A FEATURE (TRUE POSITION)
∅	DIAMETER
S ∅	SPHERICAL DIAMETER
R	RADIUS
SR	SPHERICAL RADIUS
()	REFERENCE
BASIC (BSC) OR [DIM]	A THEORETICALLY EXACT DIMENSION USED TO DESCRIBE SIZE, SHAPE OR LOCATION OF A FEATURE FROM WHICH PERMISSIBLE VARIATIONS ARE ESTABLISHED BY TOLERANCES ON OTHER DIMENSIONS OR NOTES.
[-A-]	DATUM
Ⓜ	MAXIMUM MATERIAL CONDITION (MMC)
Ⓛ	LEAST MATERIAL CONDITION (LMC)
Ⓢ	REGARDLESS OF FEATURE SIZE (RFS)
Ⓟ	PROJECTED TOLERANCE ZONE
FIM	FULL INDICATOR MOVEMENT

EXAMPLES

[⏤ | 0.002]	STRAIGHT WITHIN 0.002
[⊥ | 0.002 | B]	PERPENDICULAR TO B WITHIN 0.002
[// | 0.002 | A]	PARALLEL TO A WITHIN 0.002
[○ | 0.002]	ROUND WITHIN 0.002
[⌭ | 0.010]	CYLINDRICAL SURFACE MUST LIE BETWEEN TWO CONCENTRIC CYLINDERS, ONE OF WHICH HAS A RADIUS 0.010 INCH GREATER THAN THE OTHER
[⌒ | 0.006 | A]	EACH LINE ELEMENT OF THE SURFACE AT ANY CROSS SECTION MUST LIE BETWEEN TWO PROFILE BOUNDARIES 0.006 INCH APART RELATIVE TO DATUM PLANE A
[⌓ | 0.020 | A]	SURFACES MUST LIE WITHIN PARALLEL BOUNDARIES 0.02 INCH APART AND EQUALLY DISPOSED ABOUT TRUE PROFILE

[◎ | ∅ 0.0005 | C]	CONCENTRIC TO C WITHIN 0.0005 DIAMETER
[⌯ | 0.010 | A]	SYMMETRICAL WITH A WITHIN 0.010
[∠ | 0.005 | A]	ANGULAR TOLERANCE 0.005 WITH A
[⌖ | ∅ 0.002 Ⓢ | B]	LOCATED AT TRUE POSITION WITHIN 0.002 DIA RELATIVE TO DATUM B, REGARDLESS OF FEATURE SIZE
[⊥ | ∅ 0.010 Ⓜ | A] [0.510 Ⓟ]	AXIS IS TOTALLY WITHIN A CYLINDER OF 0.010-INCH DIAMETER, PERPENDICULAR TO, AND EXTENDING 0.510-INCH ABOVE, DATUM A, MAXIMUM MATERIAL CONDITION
[2.000] OR 2.000 BSC	THEORETICALLY EXACT DIMENSION IS 2.000

NOTE: DATUM MAY APPEAR AT EITHER SIDE OF TOLERANCE FRAME [0.020 | A] [A | 0.020]

True Position Dimensioning Symbols
Figure 601

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OUTER SLEEVE ASSEMBLY - REPAIR 1-1

314T1315-1, -19, -36, -43
314T3314-1, -18, -34, -41

NOTE: Refer to REPAIR 2-1 for weld repair procedures of outer sleeve assembly, and REPAIR-GEN for list of applicable standard practices.

1. Rub Strip and Seal Member Replacement

A. 314T1315 outer sleeve assembly (IPL Fig. 1)

(1) Replace rub strips (55, 57, 75) and rub pads (70A, 72) if damaged or if wear exceeds the limits shown in Fig. 603.

(2) Remove rub strips (55, 57, 75), rub pads (70A, 72) and seal member (35) by removing rivets (20, 40, 60, 62) and washers (25, 45, 65, 67) from weldment (80).

NOTE: Note location and use of shims (90) under rub strips (75) to facilitate reinstallation of rub strips.

(3) Locate new rub strips (75) on weldment (80) per Fig. 601. Use a single shim (90) under rub strip (75) as required to obtain specified concentricity.

(4) Secure rub strips (55, 57, 75), rub pads (70A, 72) and seal member (35) on weldment (80) using rivets (20, 40, 60, 62) and washers (25, 45, 65, 67).

B. 314T3314 Outer Sleeve Assembly (IPL Fig. 2)

(1) Replace rub strips (55, 57, 95) and rub pads (70A, 70G, 72, 72G, 75, 77) if damaged or if wear exceeds the limits shown in Fig. 603.

(2) Remove rub strips (55, 57, 95), rub pads (70A, 70G, 72, 72G, 75, 77) and seal member (35) by removing rivets (20, 40, 60, 60A, 62, 80), and washers (25, 45, 65, 67, 85) from weld assembly (100).

NOTE: Note location and use of shims (110) under rub strips (95) to facilitate reinstallation of rub strips.

(3) Locate new rub pads (70A, 70G, 72, 72G, 75, 77) or rub strips (55, 57, 95) on weld assembly (100) per Fig. 601. Use a single shim (110) under rub strips (95) as required to obtain necessary concentricity.

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CAUTION: DO NOT INTERMIX ROUND RUB STRIPS (95) WITH RECTANGULAR RUB PADS (75).

(4) Secure rub strips (55, 57, 95) or rub pads (70A, 70G, 72, 72G, 75, 77) and seal member (35) on weld assembly (100) using rivets (20, 40, 60, 60A, 62, 80), and washers (25, 45, 65, 67, 85).

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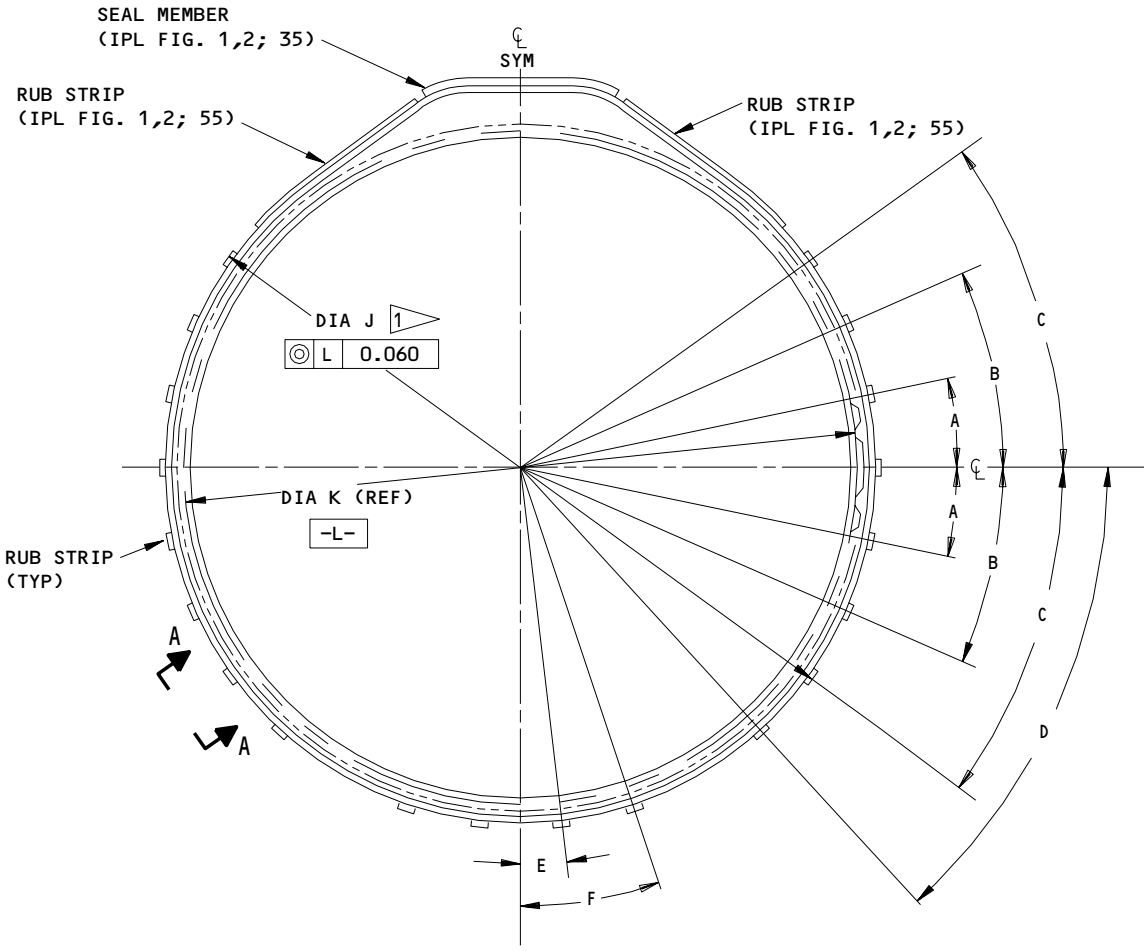

PART NUMBER	A	B	C	D	E	F	J	K
314T1315-1,-19	11°15'	22°30'	33°45'	45°	7°30'	22°30'	52.016 BASIC	50.22 BASIC
314T3314-1,-18	11°	22°30'	33°	45°	10°	27°	57.194 BASIC	52.800 BASIC

314T1315-1,-19
314T3314-1,-18

314T1315-1,-19,-36,-43
314T3314-1,-18,-34,-41,-59,-62
Rub Pad Replacement
Figure 601 (Sheet 1)

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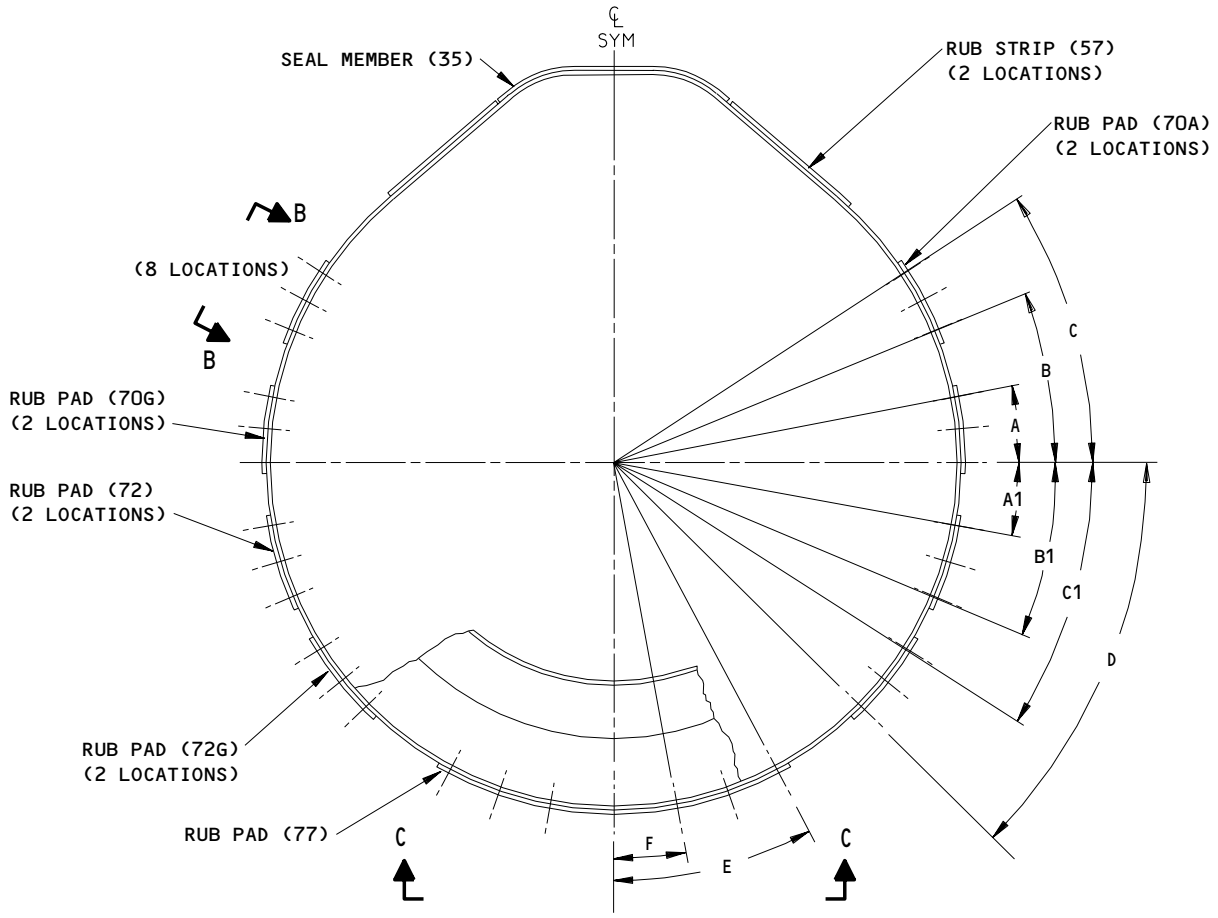

PART NUMBER	A	A1	B	B1	C	C1	D	E	F
314T1315-36,-43 314T1314-34,-41,-59	11°	11°	22°30'	22°30'	33°	33°	45°	27°	10°
314T3314-62	12°	10°45'	21°30'	22°45'	33°30'	33°	45°	27°	10°

314T1315-36,-43
314T3314-34,-41,-59,-62

314T1315-1,-19,-36,-43
314T3314-1,-18,-34,-41,-59,-62
Rub Pad Replacement
Figure 601 (Sheet 2)

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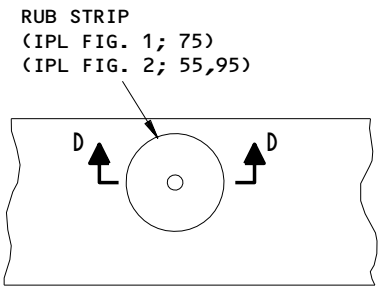
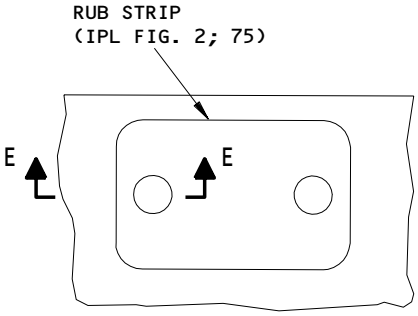
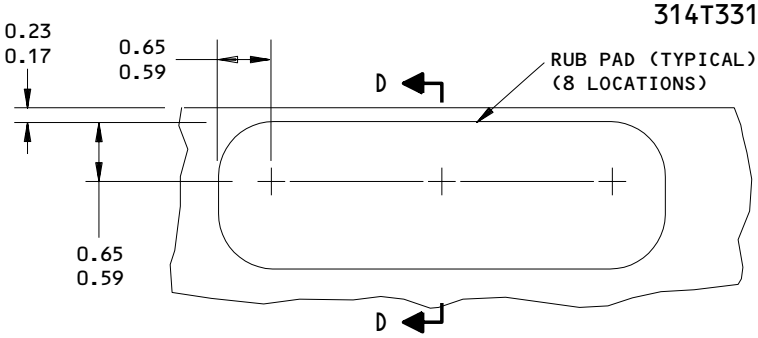


314T1315-1,-19

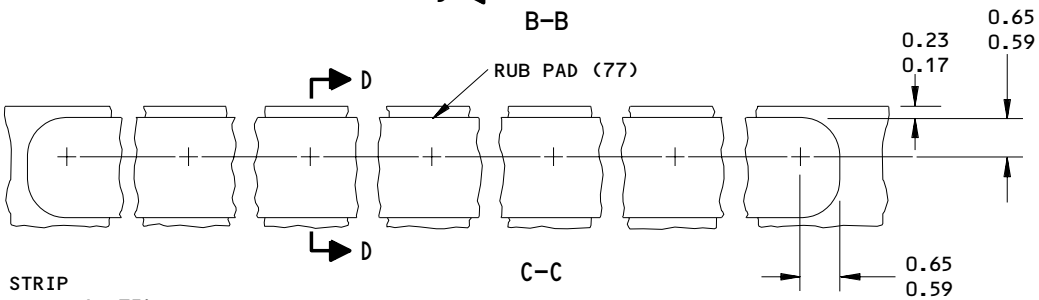


314T3314-1,-18

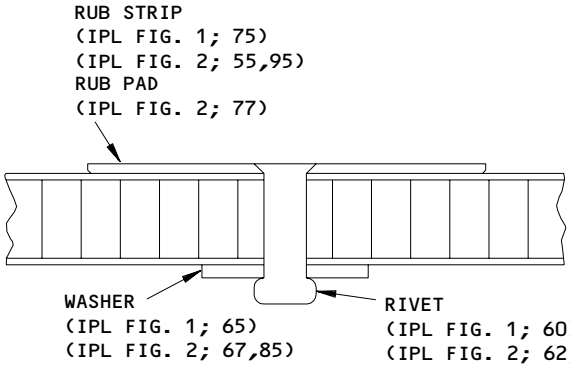
A-A



B-B

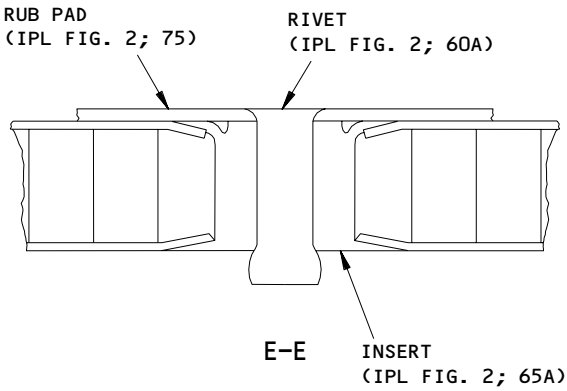


C-C



RUB PAD CROSS SECTION
(TYPICAL)

D-D



E-E

1 A SINGLE 0.03 THICK SHIM 314T1315-29 OR 314T3314-27 MAY BE USED UNDER EACH PAD AS REQUIRED TO ATTAIN CONCENTRICITY

ALL DIMENSIONS ARE IN INCHES

ANGULAR TOLERANCES ±30'

314T1315-1,-19,-36,-43
314T3314-1,-18,-34,-41,-59,-62
Rub Pad Replacement
Figure 601 (Sheet 3)

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2. Refinish

A. Rub pads and rub strips (55, 55A, 57, 57A, 70A, 70B, 72, 72A, and 75, IPL Fig. 1; 55, 55A, 57, 70A, 70G, 72, 72G, 75, 77, and 95, IPL Fig. 2).

(1) Apply 0.003-0.006 inch thick tungsten carbide flame spray BMS 10-67, type 1, to outer surfaces per 20-10-05 except use Desoto high temperature polyurethane primer (F-19.43) instead of BMS 10-11. Obtain surface texture of 32 microinches.

Materials: Items 55, 75 IPL Fig. 1 and Item 95, IPL Fig. 2 -- 301 CRES (Inconel 718 optional)

Item 55A, IPL Fig. 1 and 2 -- 321 or 347 CRES

Items 55, 75, IPL Fig. 2 -- Haynes alloy 25 (Inconel 718 optional)

Items 57, 57A, 70A, 70B, 72, 72A, IPL Fig. 1 and 57, 70A, 70G, 72, 72G, 77, IPL Fig. 2 -- 17-7PH CRES, 150-170 ksi.

B. Seal Member (35, IPL Figs. 1 and 2) -- (Fig. 602)

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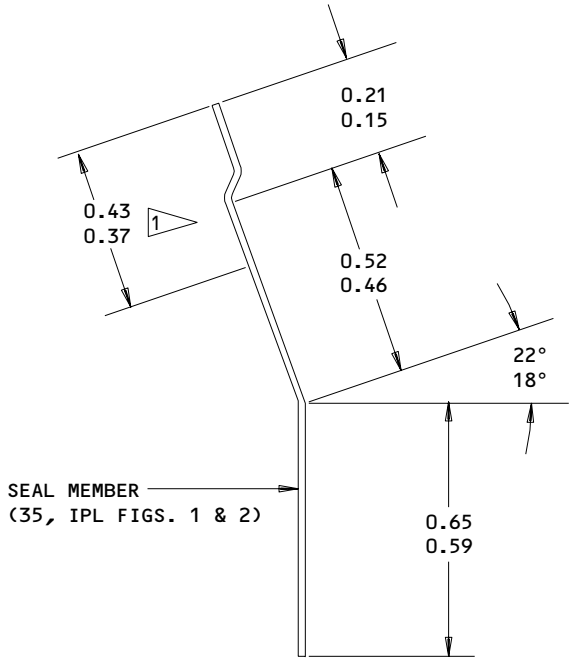

REFINISH

1. SILVER PLATE 0.001–0.002 INCH THICK PER 20–42–06 AREA DESIGNATED BY 1. OVERRUN OF PLATING ON ALL SURFACES IS PERMISSIBLE.

2. OPTIONAL REFINISH –– COPPER PLASMA FLAME SPRAY 0.012–0.014 INCH THICK PER 20–10–05 AREA DESIGNATED BY 1.

MATERIAL: HAYNES ALLOY 25 OR INCONEL 718, 180–200 KSI

ALL DIMENSIONS ARE IN INCHES

314T3316–5, –8
Seal Member Refinish
Figure 602

109127

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IPL FIG. & ITEM NO.	DESIGN THICKNESS	MINIMUM THICKNESS
FIG. 1		
RUB STRIP (55)	0.063	0.0567
RUB STRIP (55A,57,57A)	0.040	0.0360
RUB STRIP (75)	0.032	
RUB PAD (70A,70B,72,72A)	0.040	0.0360
FIG. 2		
RUB STRIP (55)	0.063	0.0567
RUB STRIP (55A,57)	0.040	0.0360
RUB STRIP (95)	0.032	0.0288
RUB PAD (70A,70G,72,72G,75,77)	0.040	0.0360

Rub Strip and Rub Pad Wear Limits
Figure 603

681639

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PRIMARY EXHAUST SLEEVE ASSEMBLY - REPAIR 2-1

314T1310-1, -2
314T3310-1, -2, -3, -5 THRU -7, -9, -10

NOTE: Refer to REPAIR-GEN for list of applicable standard practices.

CAUTION: IF REPAIR OF CRACKS IN INNER FACE SHEET REQUIRES DISASSEMBLY OF INNER/OUTER SLEEVE, CONTACT THE BOEING COMPANY. INNER AND OUTER SLEEVES MAY BE DISTORTED AND MAKE FASTENER AND ALIGHMENT DIFFICULT DURING ASSEMBLY. OUTER SLEEVE REWORK BY THE VENDOR IS ADVISED.

1. General Weld Repair Procedures

A. All repair welds must be performed by a highly skilled welder.

B. All repair welds must be accomplished using manual gas tungsten arc weld process (GTAW) or (TIG) using argon gas shielding.

C. Lengths of filler wire to be used shall be cleaned by wiping with MIBK, MEK, or acetone.

D. Oxidized filler wire ends from previous use shall be cut off and discarded.

E. Weld Operation

(1) Locate chill blocks as required.

(2) Use minimum amount of filler metal that will provide minimum size weld bead consistent with full weld penetration.

(3) Use minimum weld energy input.

NOTE: Use scrap pieces of material for trial test if available. Excessive amounts of weld filler metal or excessive weld energy input (including excessive number of weld passes) can cause large areas of overheating, skin burn through, panel distortion, and large areas of annealing, or dimpling.

CAUTION: CARE MUST BE EXERCISED WHEN WELDING PRIMARY EXHAUST SYSTEM SKINS BECAUSE OF THIN SKIN GAGE (0.012-0.018 inch). STRIKING ARC ON CHILL BLOCKS INSTEAD OF SKINS IS RECOMMENDED.

(4) Fill weld crack stop holes or perforated holes in acoustic skin which intersect with repair joint or which will intersect with weld bead before making continuous joint (crack) weld.

(5) Tack weld to hold skin alignment if required, then weld as a continuous weld pass to complete required weld.

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(6) Make full penetration (100%) butt weld.

(7) Install weld plug or tension pins per Fig. 601.

(8) After weld repair has been determined to be acceptable, weld shut any purge hole that has been drilled.

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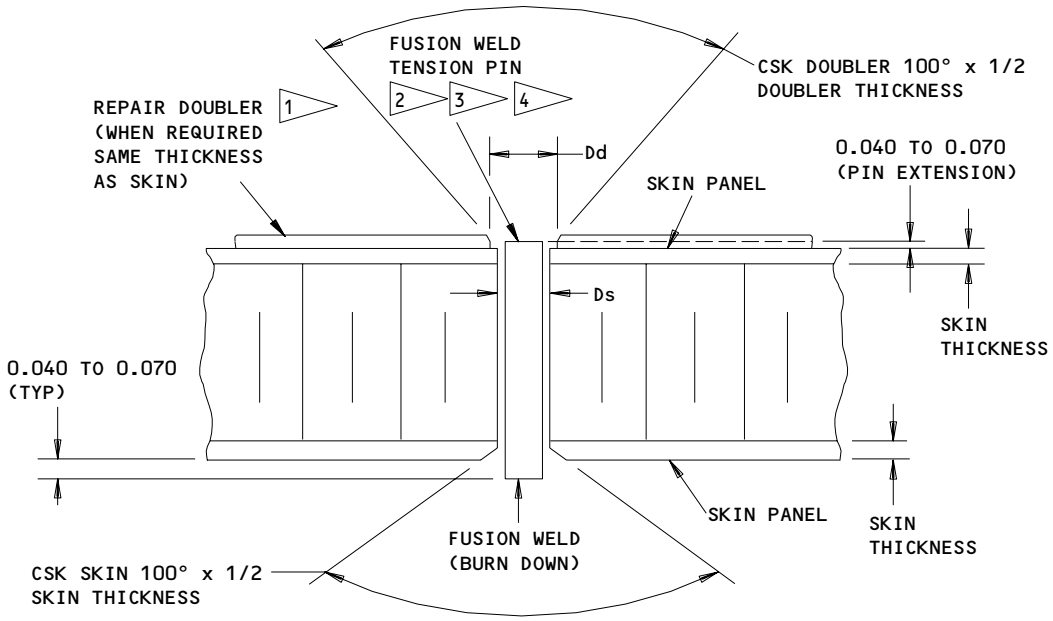

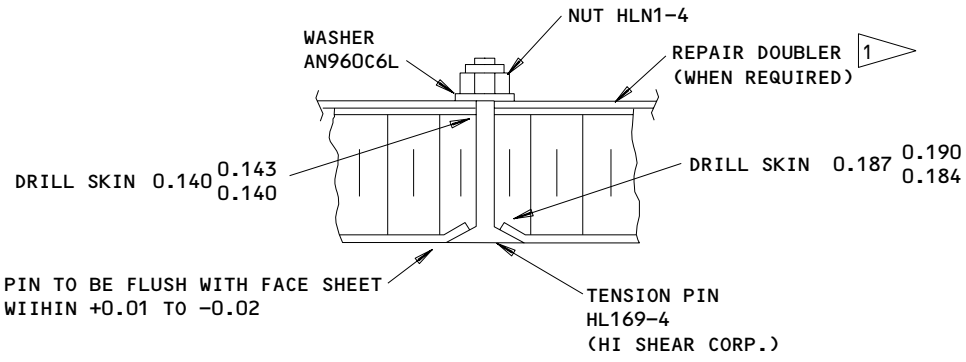

ALTERNATIVE
(USE WHEN NOT ACCESSIBLE TO WELD)

LEGEND

Dd (DIAMETER OF HOLE IN DOUBLER): 0.100 TO 0.110 INCH
Ds (DIAMETER OF HOLE THROUGH SKIN PANELS): 0.050 TO 0.054

1 PH15-7MO, SHEET

2 PH15-7MO, AMS 5813 WIRE, 0.045 DIAMETER

3 USE WPH15-7MO PER AMS 5813 WELDING WIRE
(OPTION: WPH15-7MO PER AMS 5812 WELDING WIRE)

4 OBTAIN 100% SKIN PENETRATION

ALL DIMENSIONS ARE IN INCHES

Repair Welding Details
Figure 601 (Sheet 1)

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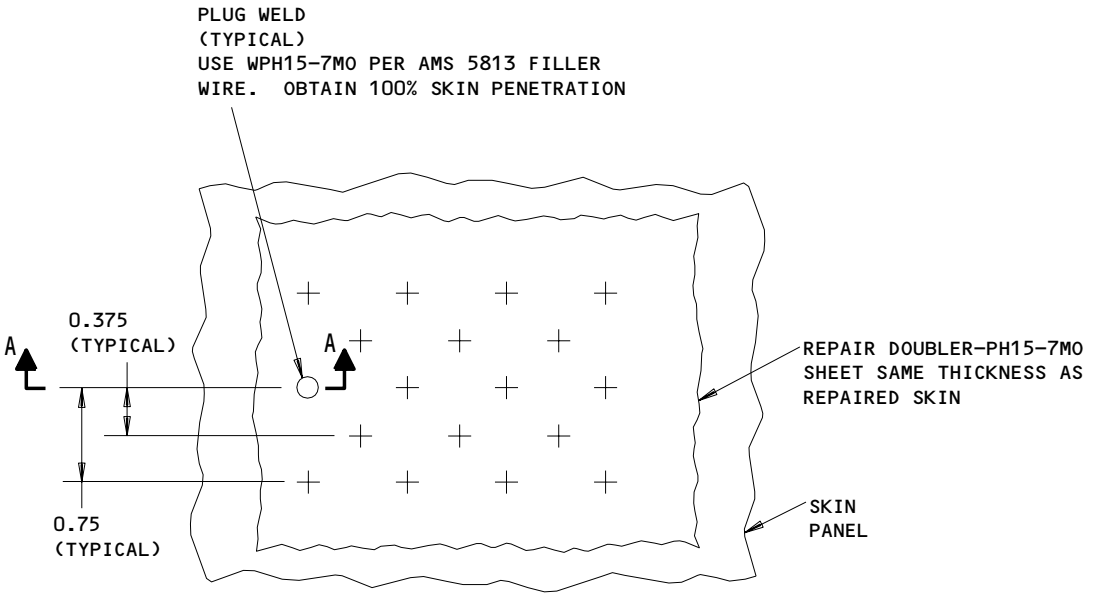

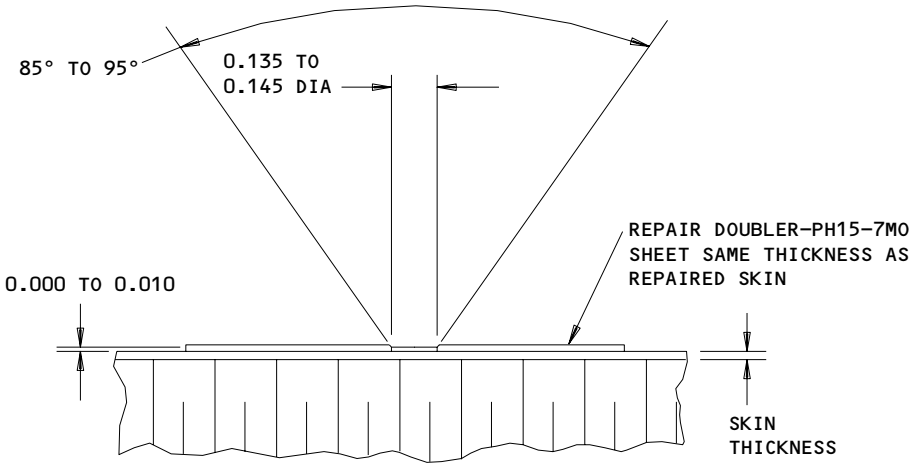

A-A

ALL DIMENSIONS ARE IN INCHES

TYPICAL WELD PLUG

Repair Welding Details
Figure 601 (Sheet 2)

109574

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F. Dressing of Repair Welds

(1) Grind completed weld within -0.000 to +0.003 inch of surrounding surface with a surface finish equivalent to 32 microinches or better.

G. Examination of Repair Welds

(1) Visually check affected area after welding with 10 power magnification and a strong light. If visual examination discloses a suspected defect, penetrant check weld per 20-20-02 for verification.

(2) The following criteria should be used for weld evaluation.

(a) Cracks are not acceptable.

(b) Lack of fusion is not acceptable.

(c) Weld undercuts are not acceptable.

(d) Porosity and inclusions exceeding 0.020 inch are not acceptable.

(e) Porosity and inclusions not exceeding 0.020 inch that show sharp terminations are not acceptable.

2. Pre-weld Preparation

A. Cleaning

(1) Clean area for a distance of at least one inch on each side of damage area to be weld repaired, including exposed core which can be cleaned through the cracks, punctures, or inner skin perforations, using an approved carbon/soot remover.

(2) Remove loose exhaust deposits by wiping surface with MEK, MIBK, or acetone.

(3) Remove surface discoloration for a distance of at least one inch from defect area by lightly dry-abrading with 240 grit or finer silicon-carbide paper.

NOTE: Remove the colored oxide film to expose bare parent metal. Wire brushing only polishes the oxide film but does not remove it.

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(4) Spot clean as necessary. Success of a weld repair is dependent on degree of cleanliness achieved prior to welding.

B. Purging (Fig. 602)

(1) Purging is used to provide adequate protection of underbead (root side) weld area from contamination (oxidation). Method of purging is dependent on location and type of repair. Purge gas can be supplied to weld area by use of purge box or drilling purge holes in structure.

(2) Use argon gas for purging. Flow rates and time are specified in each individual repair.

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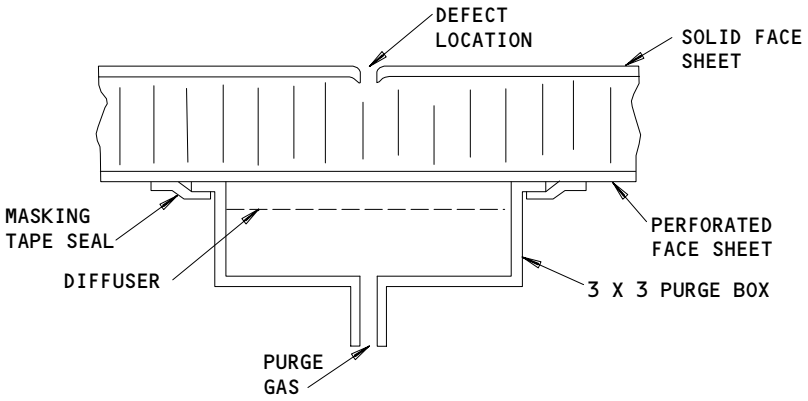
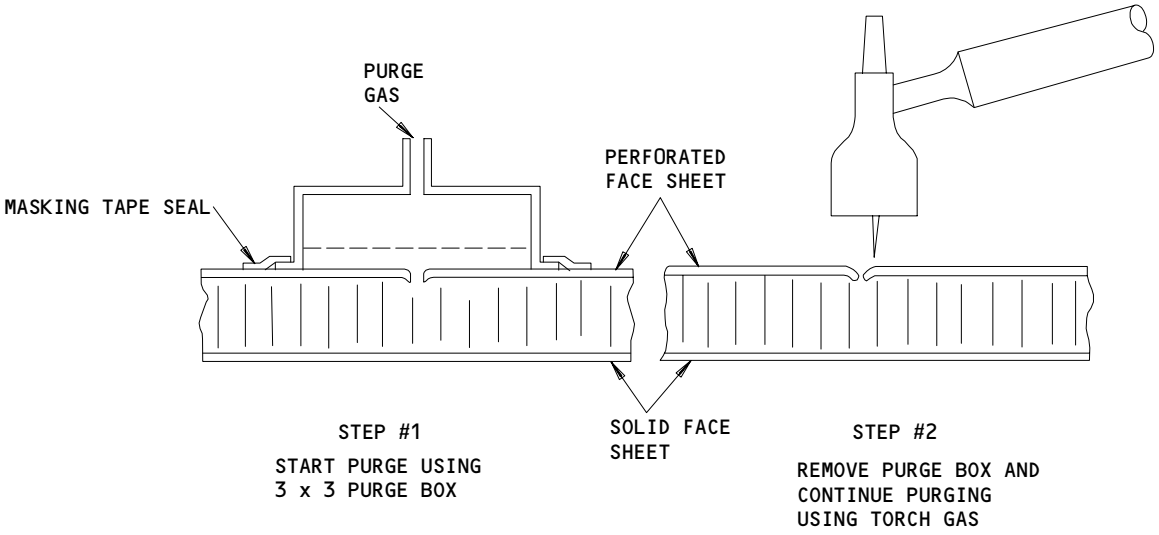


PURGE SETUP FOR REPAIR
WELD IN SOLID FACE SHEET



PURGE SETUP FOR REPAIR WELD
IN PERFORATED FACE SHEET

Purging Details
Figure 602

109575

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C. Grounding

(1) Ground panel to be repaired to prevent arcing on face sheets and minimize resistance heating of the core foil.

(2) Attach ground attachment to the affected area face sheet and as close to weld area as possible.

D. Weld Tooling (Fig. 603)

(1) Copper chill blocks should be used where possible to reduce distortion and minimize the heated area.

NOTE: The primary exhaust sleeve assembly has been heat treated during manufacture and it is important to minimize the heated area during welding to reduce the amount of annealing.

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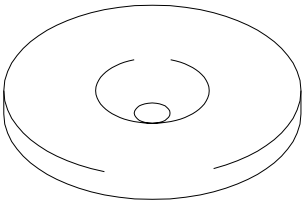

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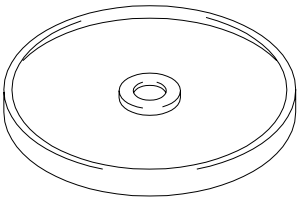

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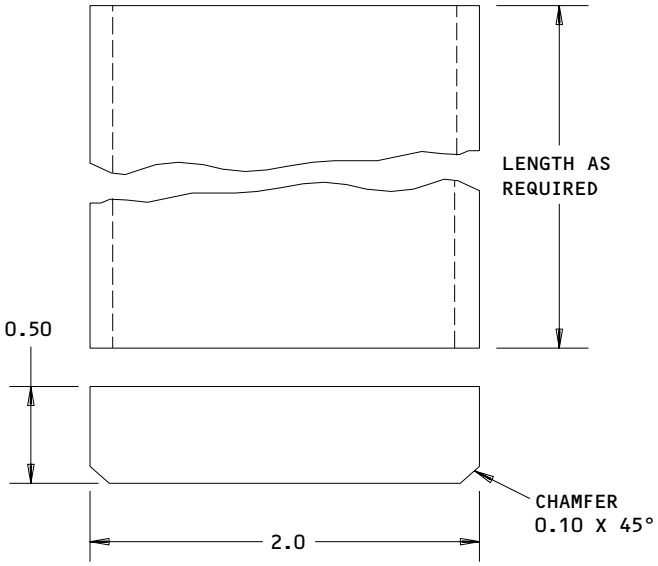
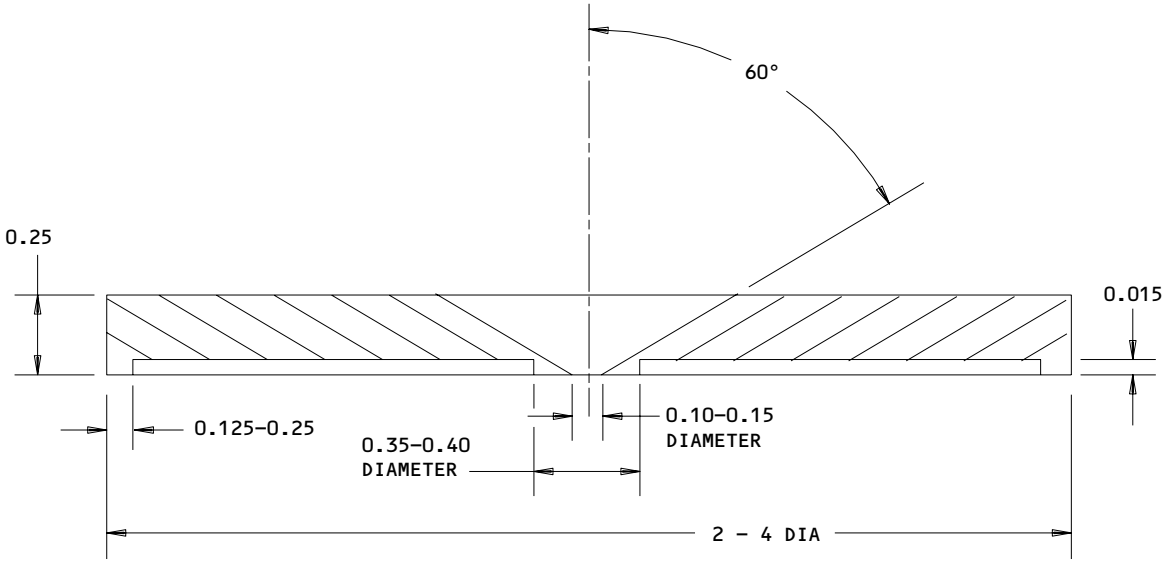


TYPICAL COPPER CHILL BLOCK



SCHEMATIC ILLUSTRATION OF TYPICAL COPPER CHILL TOOLING CONFIGURATIONS
FOR WELDING SMALL DEFECTS, TENSION PIN, AND PLUG WELDING

ALL DIMENSIONS ARE IN INCHES

Copper Chill Tooling Details
Figure 603

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E. Crack Damage Preparations

(1) Clean crack damage per para. 2.A.

(2) Drill 0.0625 inch diameter crack stop holes at crack ends.

NOTE: Stop holes are not required when crack terminates at perforation.

(3) Make "V" - groove cut along crack to approximately one-half the material thickness.

(4) Flood the crack and adjacent area with MEK, MIK, or acetone. Vigorously clean area with a wire brush to remove contaminates and carbon soot residue.

F. Damage Analysis

(1) Determine type and extent of damage per Fig. 604. Refer to appropriate repair section for specific repair procedure.

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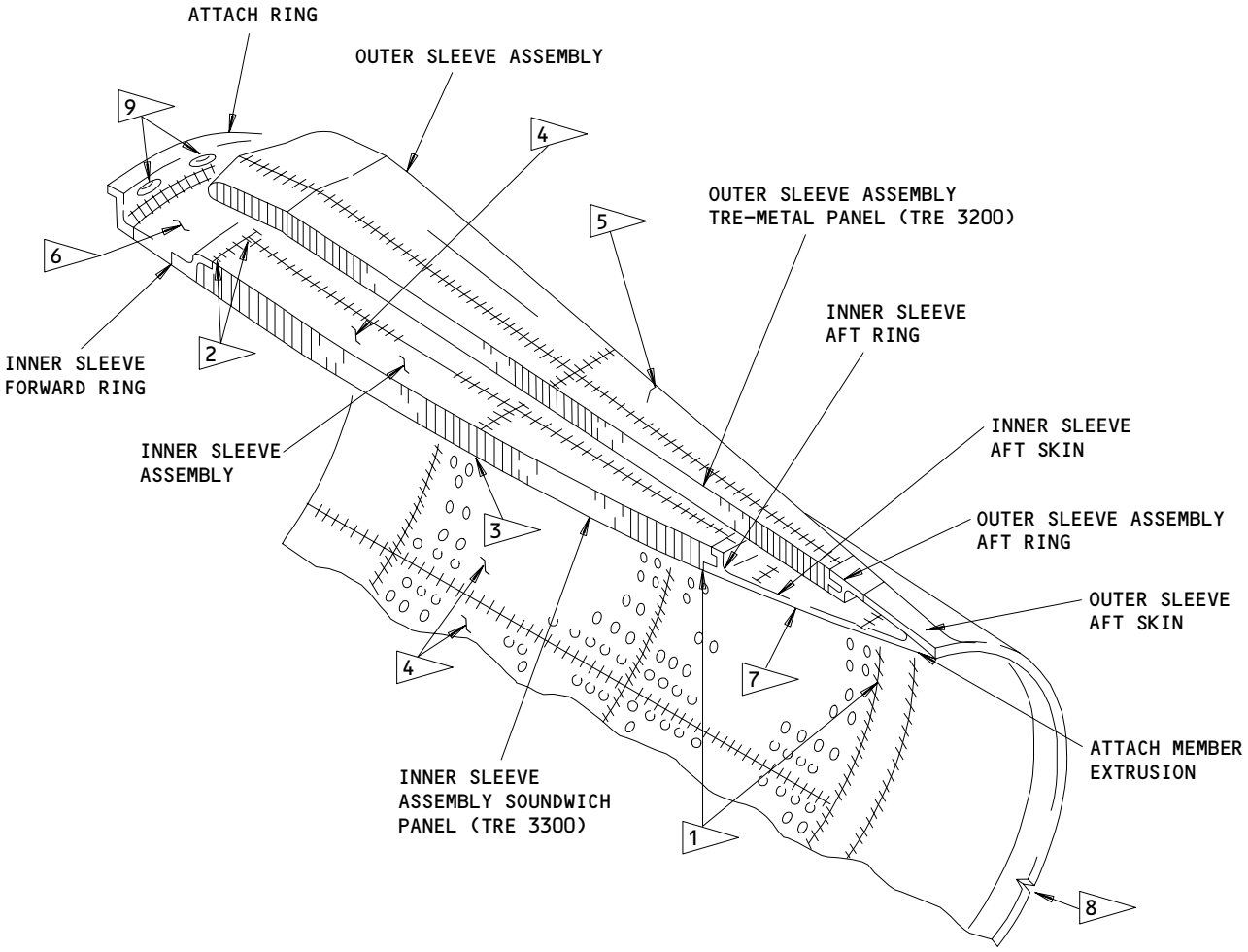

Typical Primary Exhaust Sleeve Damage and Weld Repair
Figure 604 (Sheet 1)

109577

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DAMAGE		REPAIR	
POTENTIAL REPAIR LOCATIONS	TYPE OF DAMAGE	ALLOWABLE REPAIR SIZE	INSTRUCTIONS PARAGRAPH
1 CIRCUMFERENTIAL WELDS–PERFORATED PANEL SKIN OF INNER SLEEVE TO INNER AFT RING	CIRCUMFERENTIAL CRACKS IN PERFORATED SKIN ADJACENT TO EXISTING WELD	---	3
2 CIRCUMFERENTIAL WELDS–SOLID PANEL SKINS TO INNER FORWARD RING	CIRCUMFERENTIAL CRACKS IN SOLID SKIN ADJACENT TO WELD	---	3
3 CIRCUMFERENTIAL AND LONGITUDINAL WELDS PERFORATED SKIN, PANEL TO PANEL WELDS	LONGITUDINAL CRACKS IN PERFORATED SKIN ADJACENT TO EXISTING PANEL TO PANEL WELDS	---	4
4 DAMAGE TO INNER SLEEVE TRE–SOUNDWICH PANEL	PERFORATED SKIN TO CORE PANEL DELAMINATION	---	5
	LARGE CUTS OR HOLES IN PERFORATED SKIN AND CORE	MAX 25 SQ. IN. AND 8 IN. MAX DIMENSION	6
	CRACKS IN PERFORATED AND SOLID SKINS NOT ADJACENT TO EXISTING WELDS	8 IN. MAX LENGTH, MAX ACCUMULATION IN BOTH SKINS OF 11 IN. LENGTH	6,9
	CIRCULAR DENTS IN SOLID SKIN	1 IN. MAX DIA	7
	HOLES OR PUNCTURES IN SOLID SKIN	1 IN. MAX LENGTH	8
	SKIN DELAMINATION AND THERMAL BUCKLE IN SOLID SKIN	---	10
5 DAMAGE TO OUTER SLEEVE TRE–METAL PANEL	CIRCULAR DENTS IN SOLID SKIN	1 IN. MAX DIA	7
	HOLES OR PUNCTURES IN SOLID SKIN	1 IN. MAX LENGTH	8
	SKIN DELAMINATION AND THERMAL BUCKLE IN SOLID SKIN	---	10
	CRACKS IN SOLID SKIN NOT ADJACENT TO PANEL WELDS	8 IN. MAX LENGTH, MAX ACCUMULATION IN BOTH SKINS OF 11 IN. LENGTH	9
	LONGITUDINAL CRACKS FROM PANEL LEADING EDGE	8 IN. MAX LENGTH, MAX ACCUMULATION IN BOTH SKINS OF 11 IN. LENGTH	13
6 CRACK IN ATTACH RING	CRACKS IN SOLID SKIN	0.125 IN. MAX LENGTH AND 2.0 IN. MAX ACCUM.	9
7 CRACK IN AFT SKIN OF INNER SLEEVE	CRACKS IN SOLID SKIN NOT ADJACENT TO EXISTING WELDS	6 IN. MAX LENGTH	9
8 NICK OR GOUGE IN EDGE OF ATTACH MEMBER EXTRUSION OR EDGE OF AFT SKIN OF OUTER SLEEVE	NICK OR GOUGE THAT COULD INITIATE A CRACK	0.125 IN. MAX LENGTH AND 2.0 IN. MAX ACCUM.	11
9 ELONGATION OR CRACK IN BOLT HOLES IN INNER SLEEVE ASSEMBLY	ELONGATED/CRACKED BOLT HOLES	---	12

Typical Primary Exhaust Sleeve Damage and Weld Repair
Figure 604 (Sheet 2)

970298

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3. Repair of Circumferential Cracks in Perforated or Solid Skin Adjacent to Existing Weld (Fig. 605)

A. Repair Preparation

(1) Clean crack area per para. 2.A.

(2) Drill crack stop holes and make "V" - groove per para. 2.E.(2), and 2.E.(3).

(3) Mask surface of perforated skin for a width of 4 inches minimum from weld bead around the entire circumference except for the immediate area around the damage per Fig. 605.

(4) Mask periphery of weld repair area so that heat from weld will not burn the masking tape.

NOTE: Burning masking tape contaminates the shielding gas and may affect the weld quality.

(5) Drill 0.125 inch diameter purge gas hole as shown in Fig. 605.

(6) Install copper chill blocks.

(7) Purge weld area thoroughly with argon gas at 10-15 cfh for 30 minutes prior to welding. Continue purging during welding and until weld cools.

B. Weld Operation

(1) Weld per para. 1 and Fig. 605.

C. Post-Weld Operation

(1) Dress weld per para. 1.F.

(2) Examine weld per para. 1.G.

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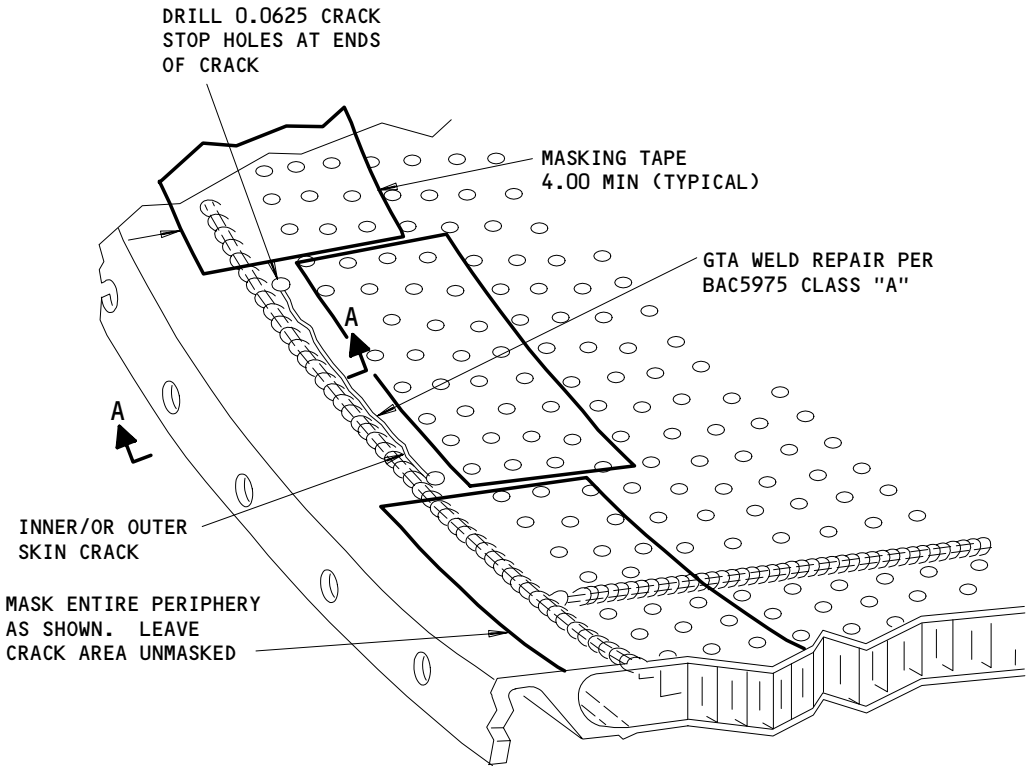

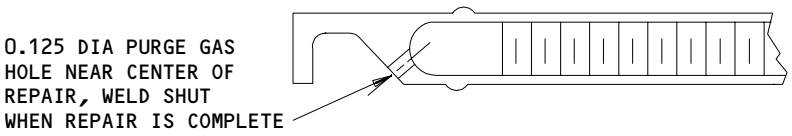

A-A

CIRCUMFERENTIAL CRACKS ADJACENT TO EXISTING WELDS

ALL DIMENSIONS ARE IN INCHES

Weld Repair
Figure 605

109578

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4. Longitudinal Cracks Adjacent to Existing Welds (Perforated Skin, Panel to Panel Welds) (Fig. 606)

A. Repair Preparation

(1) Clean crack area per para. 2.A.

(2) Drill crack stop holes and make "V" - groove in crack per para. 2.E.(2).

(3) Mask surface of perforated area for a width of 4 inches minimum from the original weld for the entire length (circumference) of the weld joint per Fig. 606.

(4) Mask periphery of weld repair area so that heat from weld will not burn the masking tape.

NOTE: Burning masking tape contaminates the shielding gas and may affect the weld quality.

(5) Drill 0.125 inch diameter purge gas hole on side of shear strip where crack is located as shown in Fig. 606.

(6) Install copper chill blocks.

(7) Purge thoroughly with argon gas at 10-15 cfh for 30 minutes prior to welding. Continue purging during welding and until weld cools.

B. Weld Operation

(1) Weld per para. 1 and Fig. 606.

(2) Refer to Fig. 606 if a piece of skin is missing.

(3) Grind and examine repair welds per para. 1.F. & 1.G.

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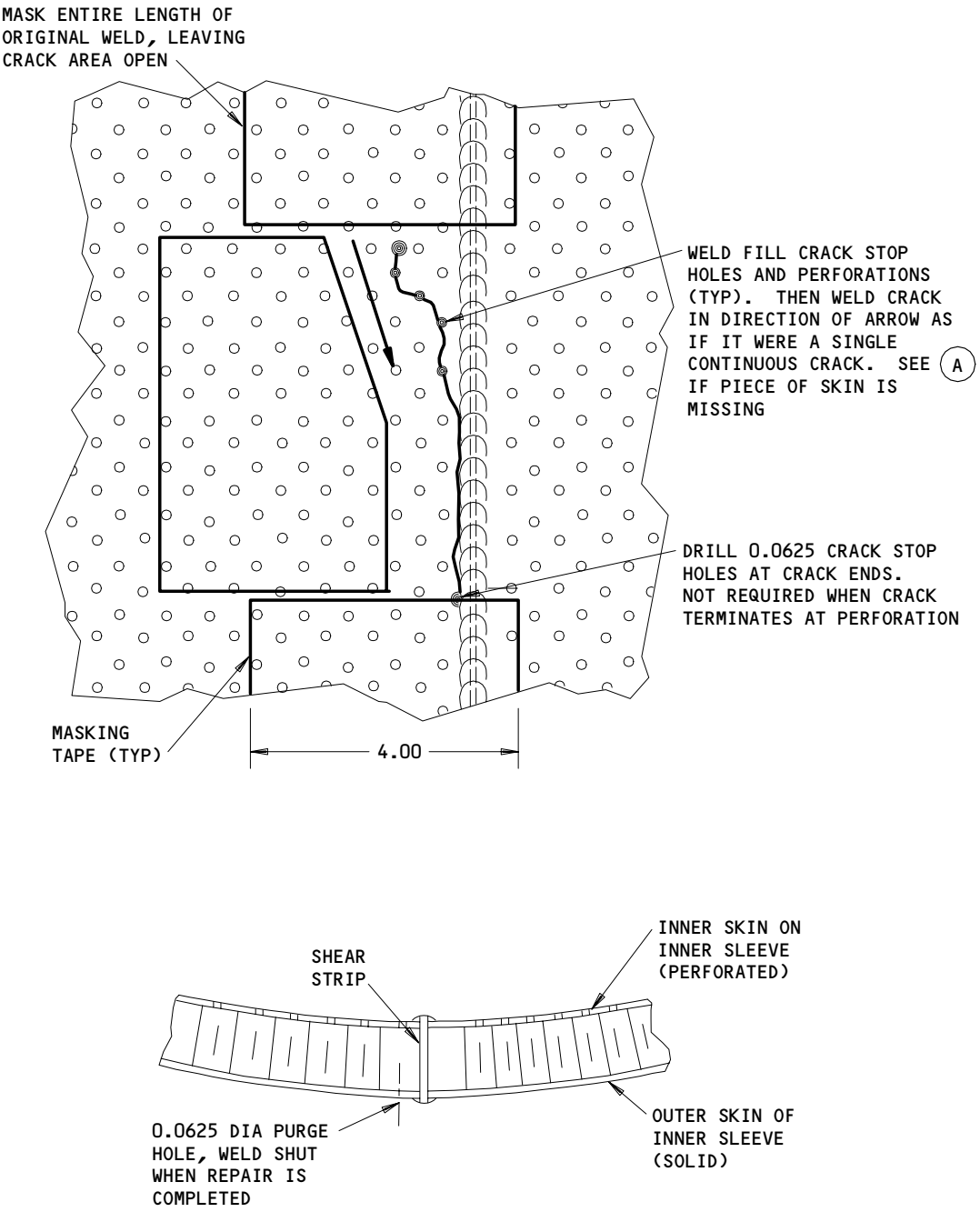

LONGITUDINAL CRACKS ADJACENT TO EXISTING WELDS – PERFORATED SKIN

ALL DIMENSIONS ARE IN INCHES

Weld Repair
Figure 606 (Sheet 1)

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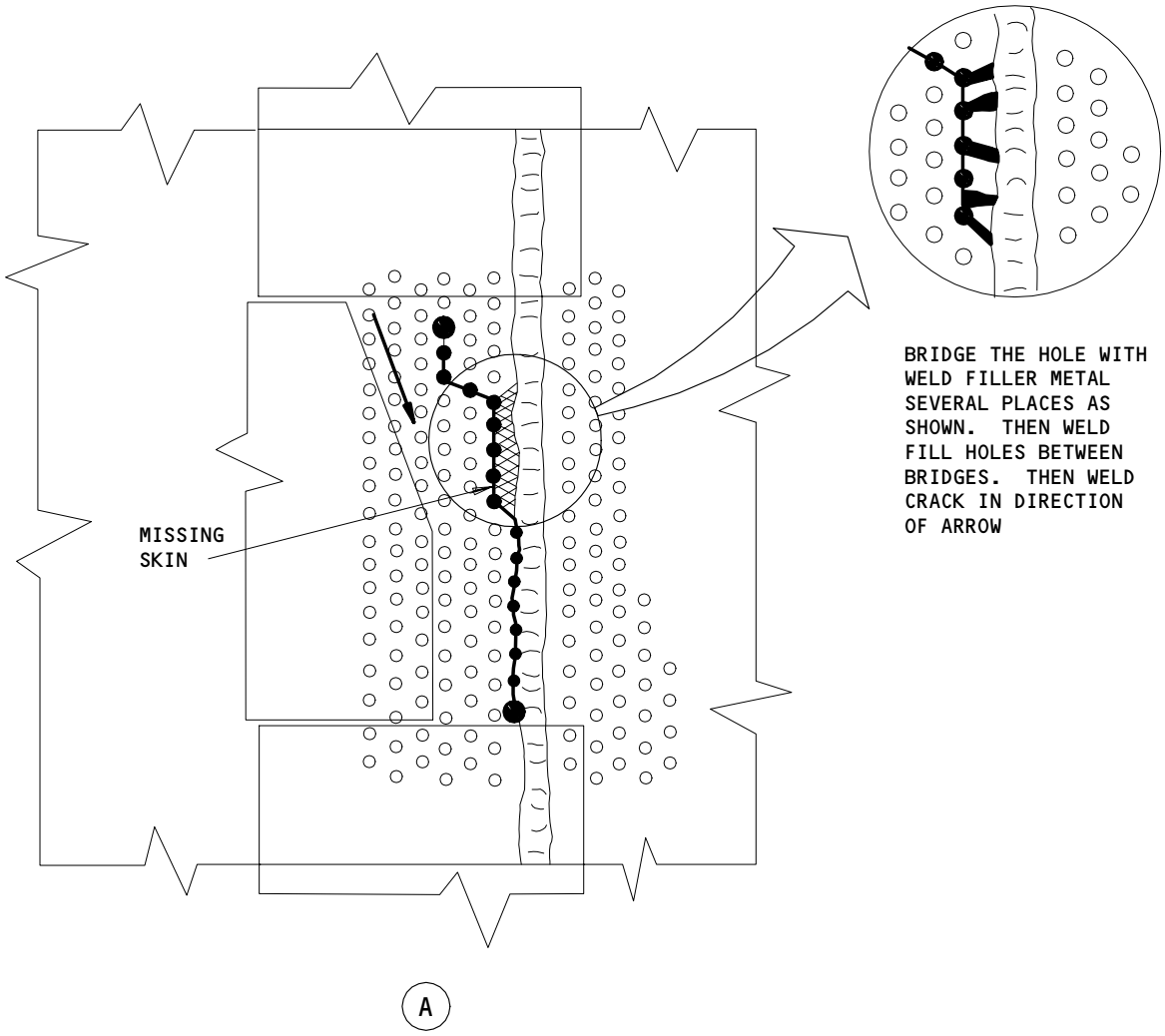

LONGITUDINAL CRACKS ADJACENT TO EXISTING WELDS – PERFORATED SKIN
(PIECE OF SKIN MISSING)

Weld Repair
Figure 606 (Sheet 2)

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5. Skin to Core Panel Delamination (Fig. 607)

A. Repair Preparation

(1) Clean both upper and lower skins in area of delamination per para. 2.A.

(2) Drill tension pin holes and prepare panel for tension pin weld installation according to Fig. 601. Where welded tension pins cannot be installed, use bolted tension pins and nuts as an alternative. Locate holes at approximately 0.75 inch spacing over the delaminated area and at approximately 1.25 inch spacing around the delaminated area. Use inner skin perforations as a guide for drilling.

(3) Cut tension pins from 0.045 inch diameter, WPH15-7M0 filler wire as shown in Fig. 601, and 607.

(4) Place copper chill blocks and tooling around defect area and tension pins.

(5) Purge during welding of tension pins as follows:

(a) Welding on solid face sheets.

1) The rootside of the repair weld shall be protected from contamination by purging through the perforated face with a 3 by 3 purge box using argon gas as shown in Fig. 602. Purging shall be done for a minimum of three minutes prior to welding, during welding, and approximately one-half minute after welding using an argon flow rate of 40 cfh.

(b) Welding on perforated face sheets.

1) The repair area shall be purged through the perforated sheet using the 3 by 3 purge box as shown in Fig. 602. Purge for a minimum of three minutes using an argon flow rate of 40 cfh.

2) Prior to welding, remove purge box and continue purging with the welding torch using a number 10 torch cup for an additional 2 minutes. Continue purging after welding until weld cools.

B. Weld Operation

(1) Weld pin ends to skin pressing skin against core per para. 1. or install bolts being careful not to crush core (Fig. 601).

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C. Post Weld Operation

(1) Dress pin welds per para. 1.F.

(2) Examine weld per para. 1.G.

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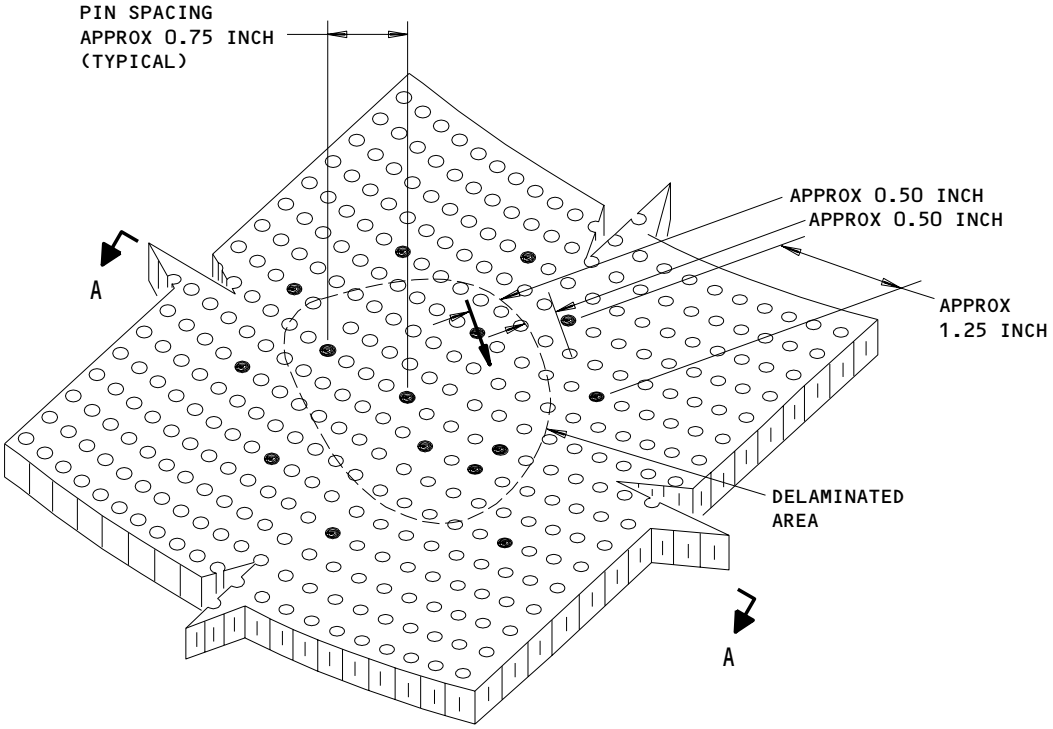

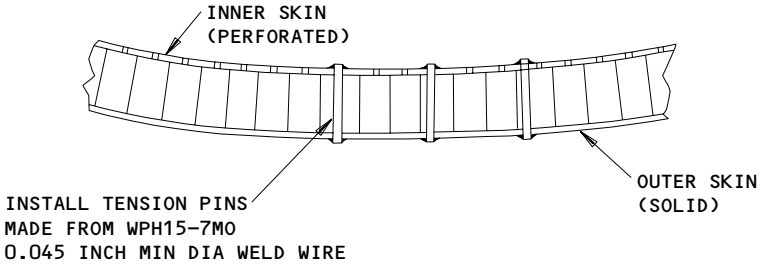

A-A

DELAMINATED SKIN REPAIR

Weld Repair
Figure 607

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6. Large Cuts or Holes in Perforated Skin and Core (Not to Exceed 25 sq. in. and 8 inches Maximum Dimension) (Fig. 608)

A. Repair Preparation

(1) Trim out damaged skin and core remnants to unaffected area per Fig. 608.

(2) Cut out and fit a replacement plug from a section of a scrapped panel, consisting of same inner and outer skin with core. Crush plug core as required to achieve skin alignment for butt welding. Push core back 0.10 inches from weld line on both repair plug and damaged assembly (Fig. 608).

(3) Clean weld area on plug and damaged assembly per para. 2.A.

(4) Fit plug in position and tack weld plug in place.

(5) Install copper chill blocks.

(6) Purge through the perforated skin in two stages as follows:

(a) The plug area shall be purged by using a 3 by 3 purge box as shown in Fig. 602. Purge for a minimum of 3 minutes using an argon flow rate of 40 cfh.

(b) Prior to welding, remove the purge box and continue purging with the welding torch using a number 10 torch cup for an additional 2 minutes. Continue purging after welding until weld cools.

B. Weld Operation

(1) Butt weld entire joint per para. 1.

C. Post-Weld Operation

(1) Dress weld per para. 1.F.

(2) Examine weld per para. 1.G.

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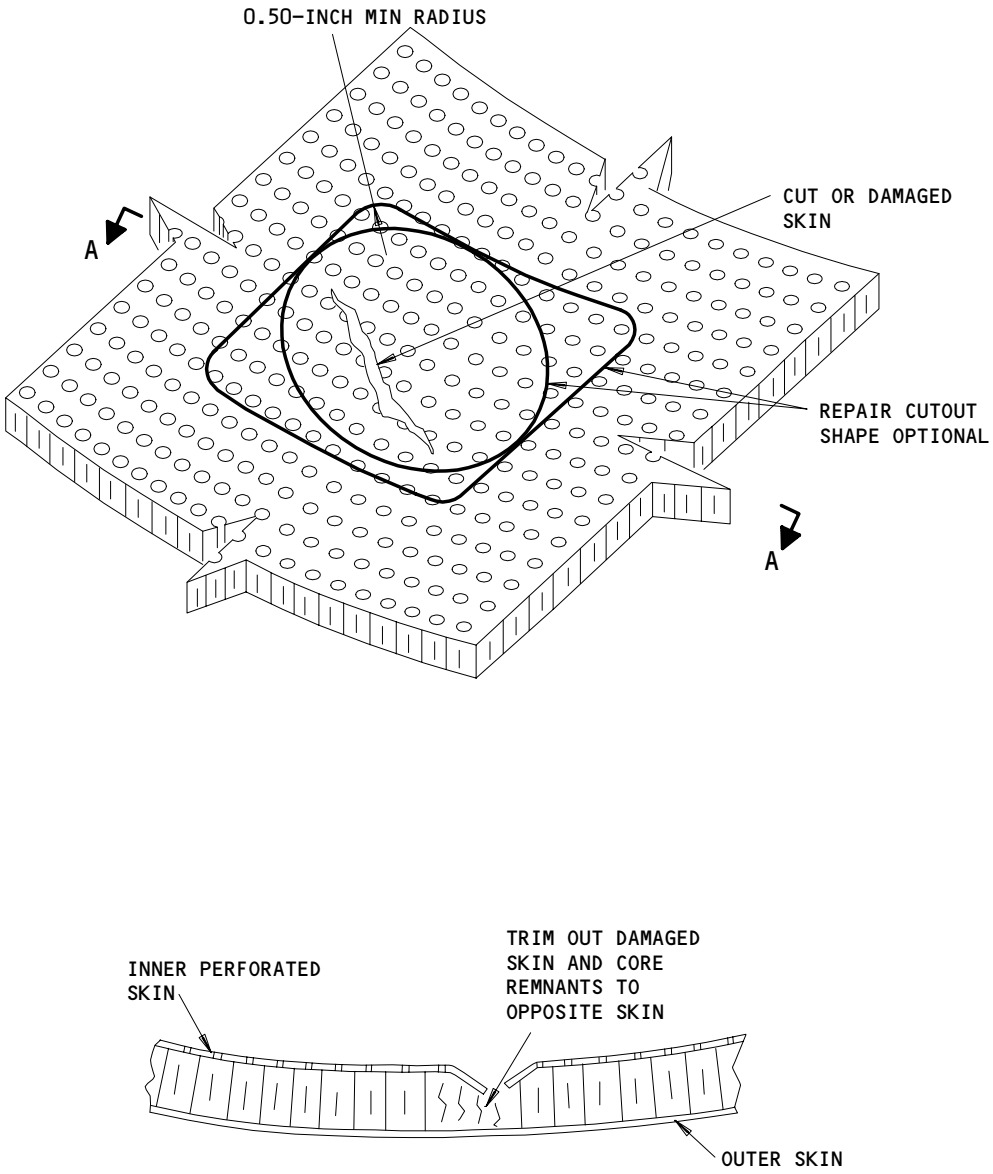

CUT OR DAMAGED PERFORATED SKIN REPAIR (PREPARATION)

Weld Repair
Figure 608 (Sheet 1)

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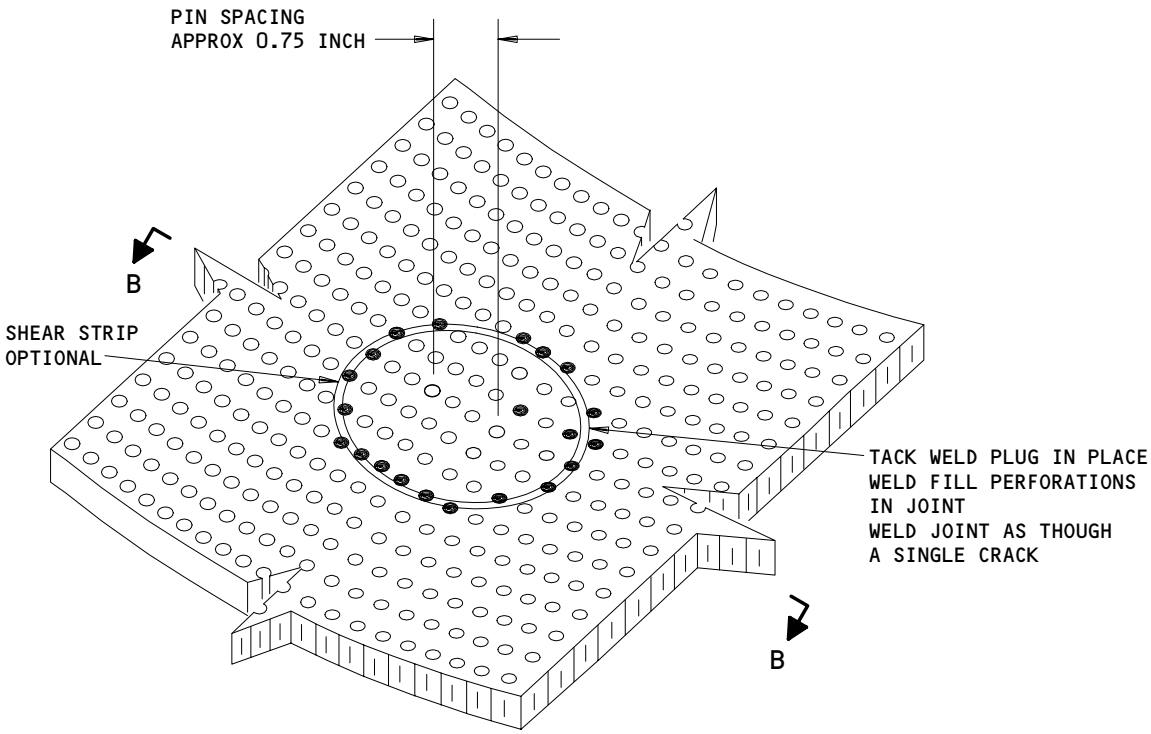

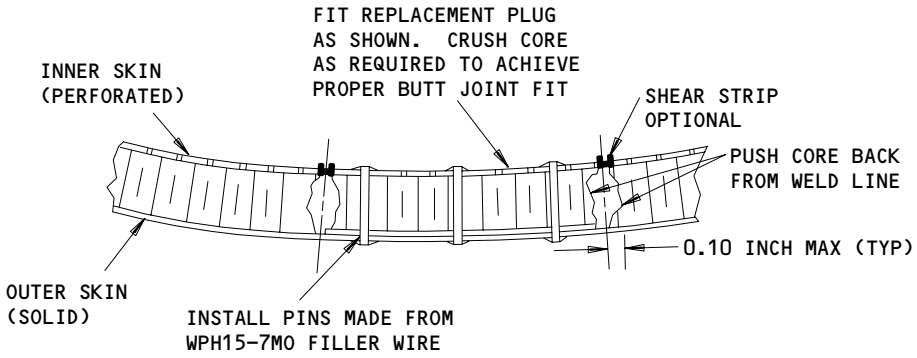

B-B

CUT OR DAMAGED PERFORATED SKIN REPAIR

Weld Repair
Figure 608 (Sheet 2)

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7. Circular Dents Up to One Inch Diameter in Solid Skin (Fig. 609)

A. Repair Preparation

(1) Fabricate washer from PH15-7M0 material of required thickness. Drill plug hole in center and grind to conform to the shape of the dent as shown in Fig. 609.

(2) Clean dent area per para. 2.A.

(3) Examine for cracks. If a crack appears, drill crack stop holes and make "V"-groove in crack per para. 2.E.(3).

(4) Install copper chill blocks.

(5) Purge through perforated face in area of dent with a 3 by 3 purge box, using argon gas as shown in Fig. 602. Purging shall be done for a minimum of three minutes prior to welding, during welding, and approximately one-half minute after welding using an argon flow rate of 40 cfh.

B. Weld Operation

(1) If crack in dent area exists, weld crack per para. 1.

(2) Dress weld bead so washer will properly mate with dent.

(3) Weld center and periphery of washer per para. 1.

C. Post-Weld Operation

(1) Dress welds and washers per para. 1.F. to be flush with skin contour.

(2) Examine weld per para. 1.G.

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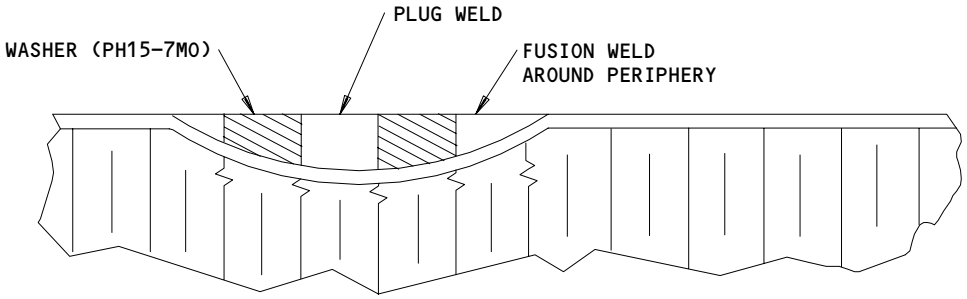

CIRCULAR DENT REPAIR IN SOLID SKIN

CLEAN AND POLISH AREA WITH CLEAN CORROSION RESISTANT STEEL WIRE BRUSH OR NO. 600 ABRASIVE PAPER. EXAMINE FOR CRACKS. IF A CRACK APPEARS, REPAIR PER PAR. 7. ADD A SPACER WASHER TO FILL DENT DEPRESSION. WELD CENTER OF WASHER THROUGH HOLE IN CENTER. WELD AROUND PERIPHERY OF WASHER. GRIND FLUSH TO SURFACE REQUIREMENTS OF PAR. 1.F. INSPECT FOR CRACKS PER PAR. 1.G.

CIRCULAR DENT REPAIR

Weld Repair
Figure 609

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8. Repair of Holes or Punctures Up to One Inch Maximum Length of Solid Skin (Fig. 610)

A. Repair Preparation

(1) Fabricate repair doubler from 0.012 inch thick, (or same thickness as skin) PH15-7M0 material to fit over defect. Doubler shall be at least twice the length and width of defect area per Fig. 601.

(2) Drill plug weld holes through doubler per Fig. 601 and hole pattern shown in Fig. 610.

(3) Clean area and doubler per par. 2.A.

(4) Install copper chill blocks.

(5) Purge through perforated face in area of damage with a 3 by 3 purge box, using argon gas as shown in Fig. 602. Purging shall be done for a minimum of three minutes prior to welding, during welding, and approximately one-half minute after welding using an argon flow rate of 40 cfh.

B. Weld Operation

(1) Weld repair doubler per para. 1.E. plug weld doubler per Fig. 601.

C. Post-Weld Operation

(1) Dress welds per par. 1.F.

(2) Examine welds per par. 1.G.

9. Repair of cracks Up to Six Inch Length in Solid Skin, Not Adjacent to Panel Welds (Fig. 610)

A. Repair Preparation

(1) Fabricate repair doubler from 0.012 inch (or skin thickness) PH15-7M0 sheet to fit over crack. Doubler shall extend a minimum of one inch beyond crack in all directions.

(2) Drill plug weld holes through doubler per Fig. 601 using hole pattern shown in Fig. 610.

(3) Clean damaged area and doubler per par. 2.A.

(4) Install copper chill blocks.

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(5) Purge through perforated face in area of the damage with a 3 by 3 purge box using argon gas as shown in Fig. 602. Purging shall be done for a minimum of three minutes prior to welding, during welding, and approximately one-half minute after welding, using an argon flow rate of 40 cfh.

B. Weld Operation

(1) Weld repair crack per par. 1.

(2) Dress (grind) weld bead flush to skin and inspect weld per para. 1.F. & 1.G. before welding doubler.

(3) Weld doubler over crack per para 1. and plug weld per Fig. 601.

C. Post-Weld Operation

(1) Dress welds per par. 1.F.

(2) Examine welds per par. 1.G.

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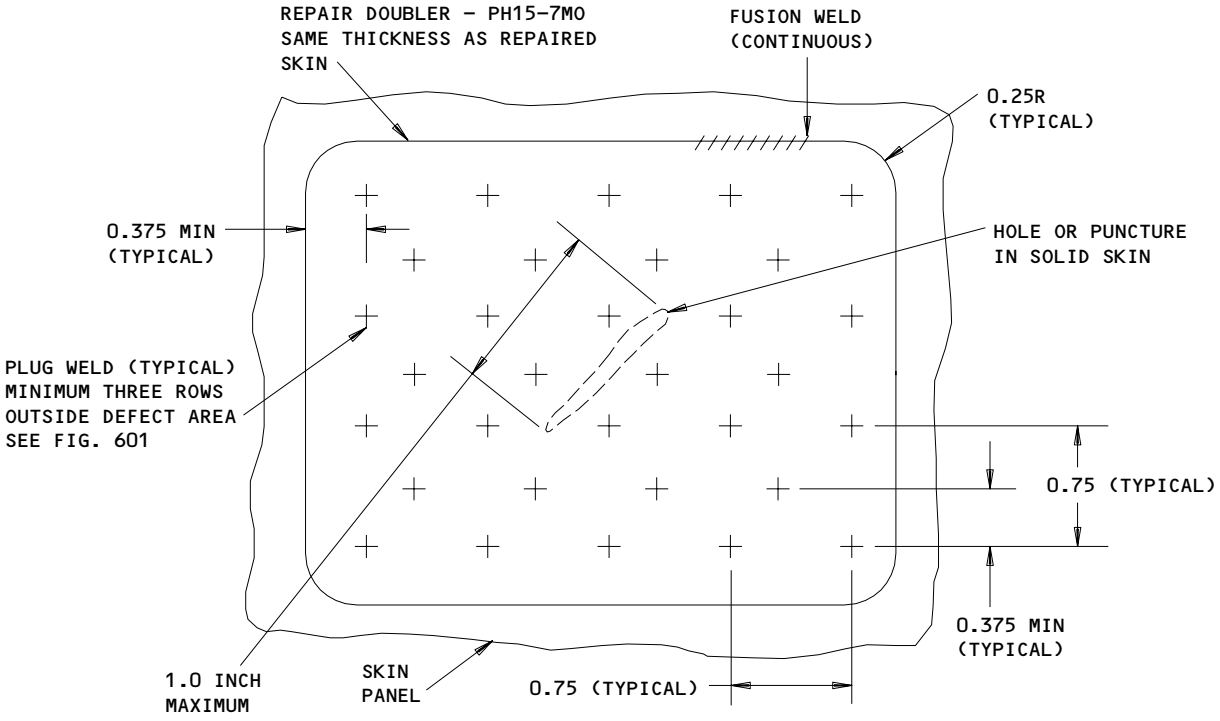
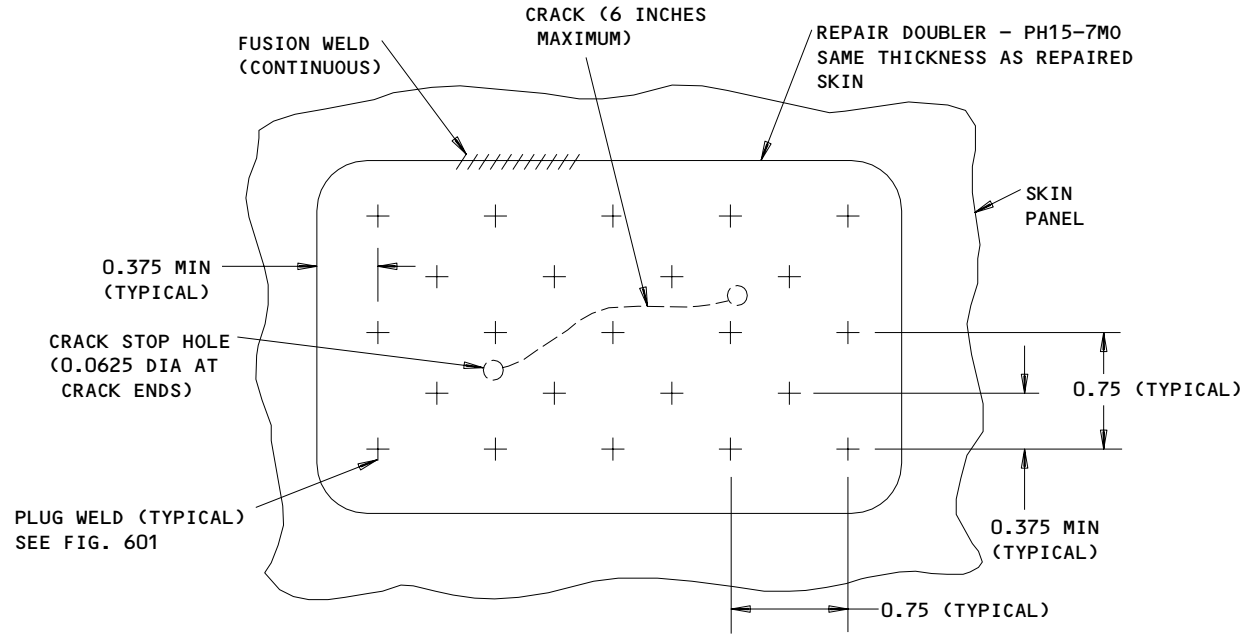


REPAIR OF HOLE OR PUNCTURE IN SOLID SKIN



REPAIR OF 2– TO 6–INCH CRACK IN SOLID SKIN

DAMAGED SKIN REPAIR

ALL DIMENSIONS ARE IN INCHES

Weld Repair
Figure 610

109696

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10. Repair of Skin Delamination and Thermal Buckle in Solid Skin (Fig. 611)

A. Repair Preparation

(1) Clean area per para. 2.A.

(2) Tap test around buckle to outline skin delamination area.

(3) Slit buckle down centerline and drill 0.0625 inch stop holes at ends of slit.

(4) Push slit edges down against core and tack weld edge to skin.

(5) Fabricate repair doubler from 0.012 inch (or skin thickness) PH15-7M0 sheet to fit over delaminated area. Doubler shall extend at least one inch beyond skin delamination in all directions.

(6) Install copper chill blocks.

(7) Purge through the perforated face with argon gas in the area of the damage using a 3 by 3 purge box as shown in Fig. 602. Purging shall be done for a minimum of three minutes prior to welding, during welding, and approximately one-half minute after welding using an argon flow rate of 40 cfh.

B. Weld Operation

(1) Weld slit per para. 1.

(2) Grind weld flush to skin.

(3) Fusion weld repair doubler over delaminated area per para. 1.

(4) Install and weld tension pins according to Fig. 601 and using the hole pattern of Fig. 611.

C. Post-Weld Operation

(1) Dress pin welds per para. 1.F.

(2) Examine welds per para. 1.G.

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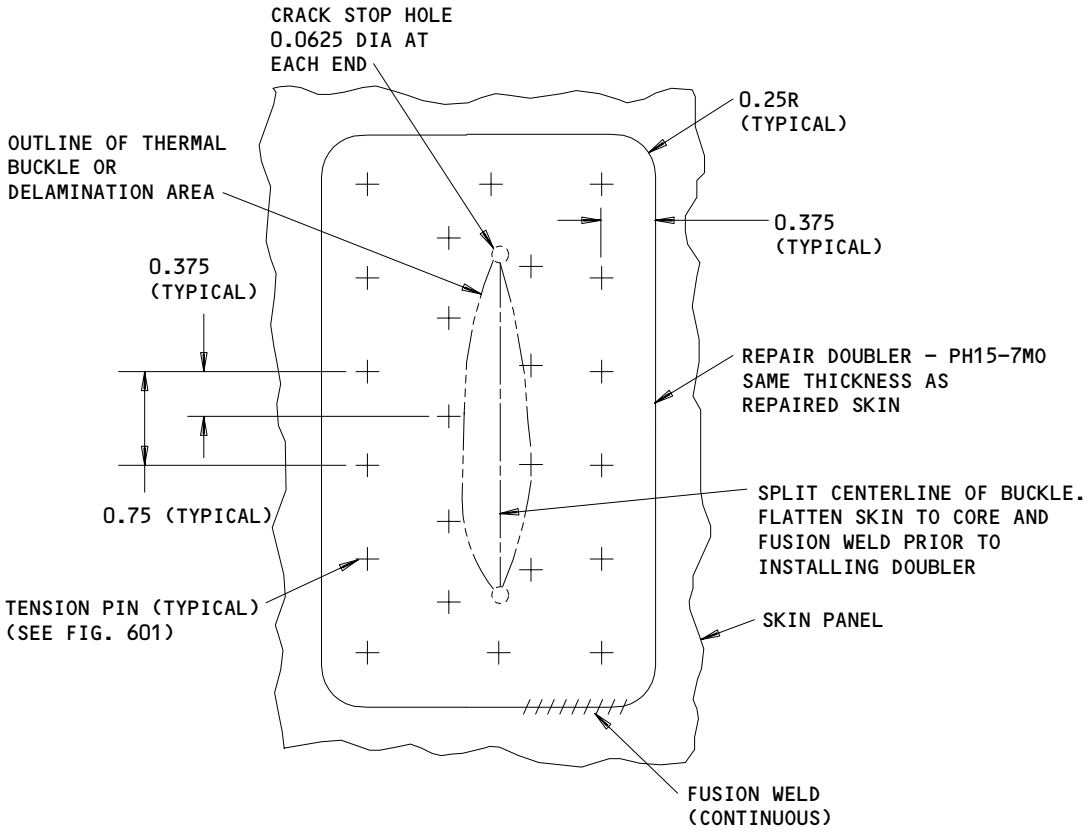

REPAIR OF SKIN DELAMINATION OR BUCKLE IN SOLID SKIN

DAMAGED SKIN REPAIR

ALL DIMENSIONS ARE IN INCHES

Weld Repair
Figure 611

109698

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11. Repair of Damaged Sleeve Assembly Trailing Edge (Potential Crack From Nick or Gouge) (Fig. 612)

A. Repair Preparation

(1) Clean damaged area per par. 2.A.

(2) Inspect for cracks.

(a) If a crack exists, hand work to remove all indication of the crack. If required, prepare crack per par. 2.E.

(b) If no crack exists, smooth out nick and sharp edge.

(c) Clamp copper chill blocks.

B. Weld Operation

(1) Fill nick or gouge area with weld per par. 1.

C. Post-Weld Operation

(1) Dress repair weld per par. 1.F.

(2) Examine weld per par. 1.G.

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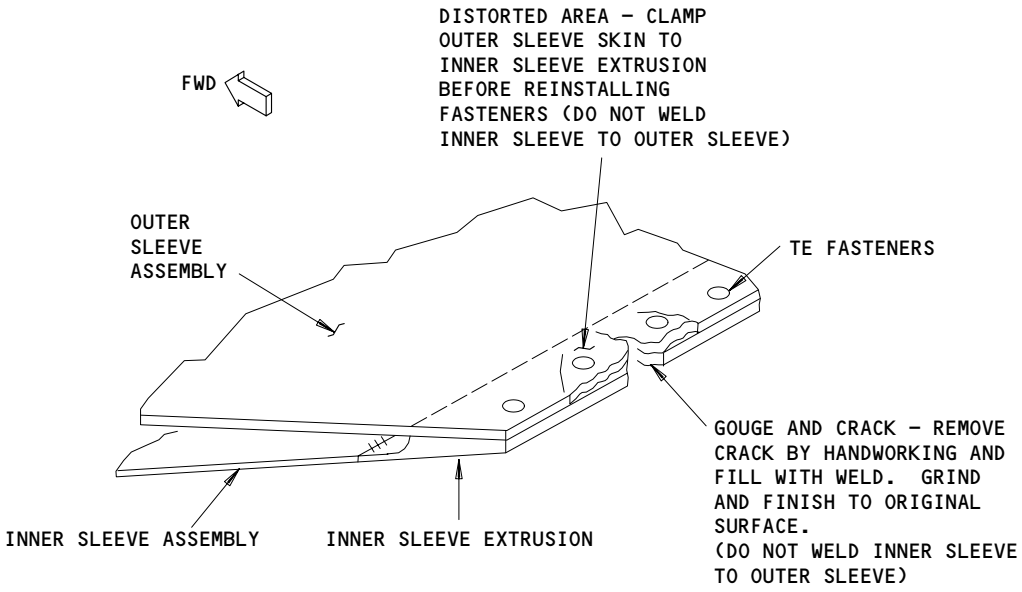

DAMAGED TRAILING EDGE SLEEVE ASSEMBLY

Weld Repair
Figure 612

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12. Repair of Elongated or Cracked Bolt Holes in Inner Sleeve Assembly (Fig. 613)

A. Repair Preparation

(1) Clean crack and hole area per para. 2.A.

(2) Clamp copper chill blocks under and around hole area to prevent buckling.

B. Weld Operation

(1) For small cracks with no hole elongation, weld crack only per para. 1. Do not fill bolt hole.

(2) For large crack with hole elongation, weld crack and fill bolt hole per para. 1.

C. Post-Weld Operation

(1) Dress repair welds per para. 1.F.

(2) Clean the area and re-drill hole per Fig. 613.

(3) Examine weld per para. 1.G.

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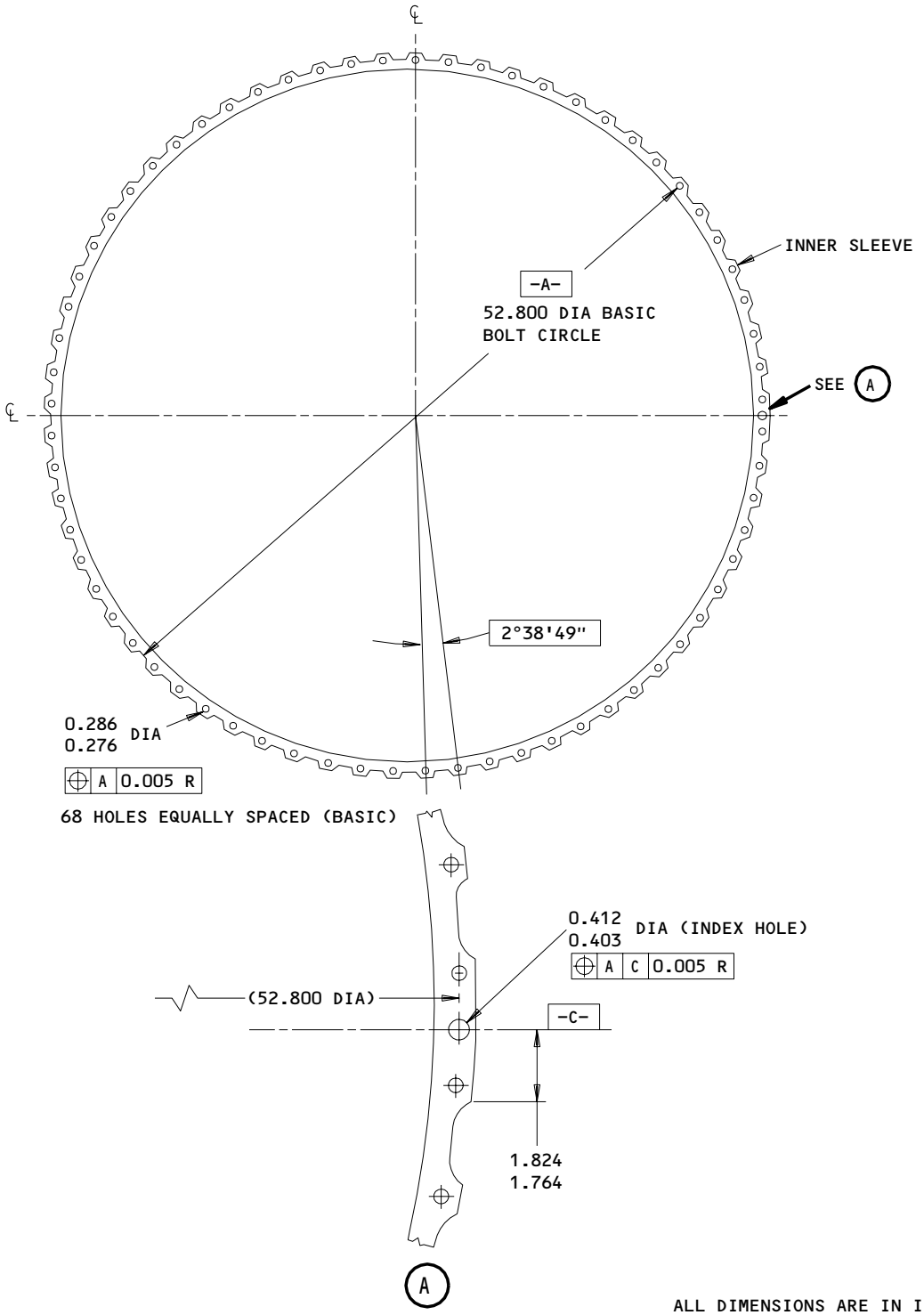

ALL DIMENSIONS ARE IN INCHES

314T3311
INNER SLEEVE ASSY (JT9D-7R AND PW4000)

Bolt Hole Repair
Figure 613 (Sheet 1)

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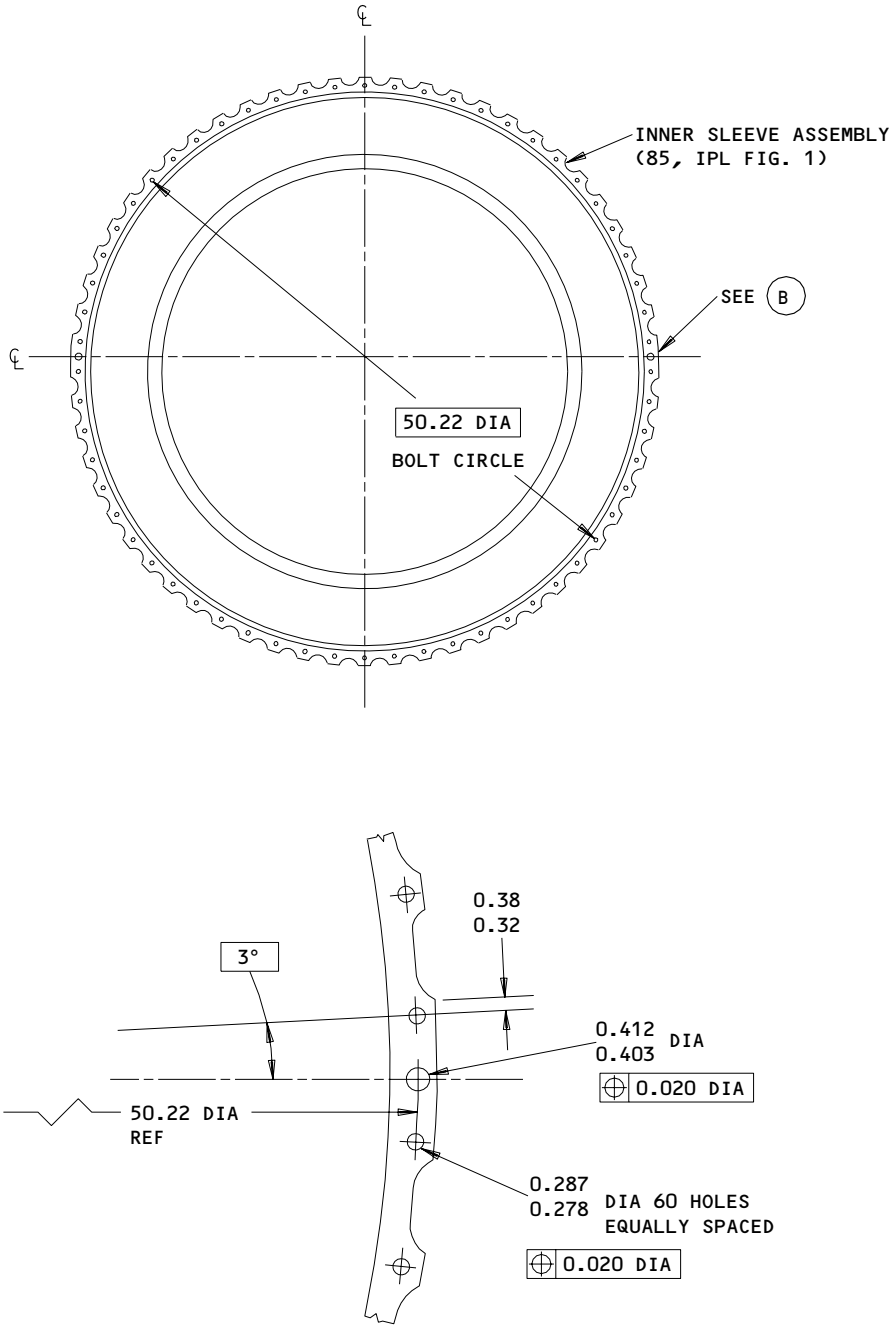

ALL DIMENSIONS ARE IN INCHES

314T1311
INNER SLEEVE ASSY (CF6-80A)

Bolt Hole Repair
Figure 613 (Sheet 2)

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13. Repair of Longitudinal Cracks in the Outer Sleeve (Fig. 614)

IF DAMAGE EXCEEDS THE ALLOWABLE LIMITS (FIG. 614), REPAIR AS FOLLOWS:

A. Repair Preparation

(1) Clean crack per par. 2.A.

(2) Drill 0.125-inch stop holes at the ends of the crack(s).

(3) Make "V" - groove cut along crack to approximately one-half the material thickness.

(4) Flood the crack and adjacent area with MEK, MIK, or acetone. Vigourously clean area with a wire brush to remove contaminates and carbon soot residue.

(5) Install copper chill blocks.

B. Weld Operation

(1) Weld per par. 1 and Fig. 614.

(2) Fusion weld crack from the outer sleeve forward edge to the stop holes.

(3) Grind the fusion and burn-down welds (Fig. 614) so that the repair doubler (Fig. 614) will fit smoothly on the sleeve face-sheet. Use care not to grind into the base metal.

(4) For cracks that run underneath a rub-pad, choose a repair doubler thickness so that the new doubler will also function as a rub pad. Otherwise, use a doubler thickness of 0.020-inch. Make doubler large enough to accommodate at least two rows of tension pin fusion welds on all sides of the crack. Remove all nicks and burrs.

(5) Form repair doubler(s) to the required contour. Install doubler with tension pin fusion welds per Fig. 601. Make a continuous fusion weld around the periphery of the doubler.

C. Post-Weld Operation

(1) Grind completed welds to within 0.003-inch of surrounding surface with a surface finish equivalent to 125 mirco-inches or better. Do not grind into base metal.

(2) Examine weld per par. 1.G.

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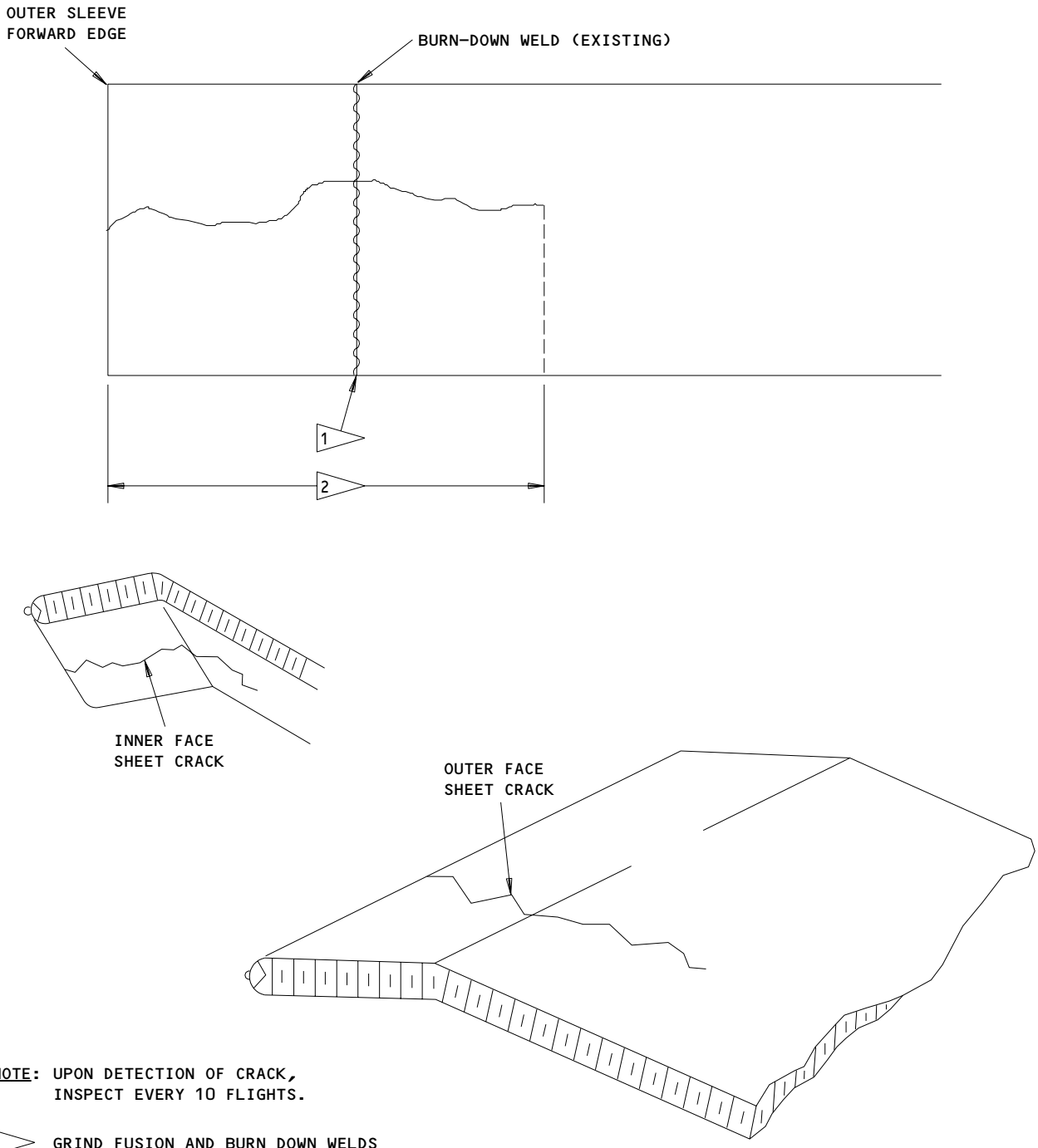

NOTE: UPON DETECTION OF CRACK, INSPECT EVERY 10 FLIGHTS.

1 GRIND FUSION AND BURN DOWN WELDS TO A 125 SURFACE FINISH

2 CRACKS UP TO 5.0 INCHES IN LENGTH ARE ALLOWED BUT MUST BE SEPARATED BY A DISTANCE OF AT LEAST THREE TIMES THE CRACK LENGTH

Weld Repair
Figure 614 (Sheet 1)

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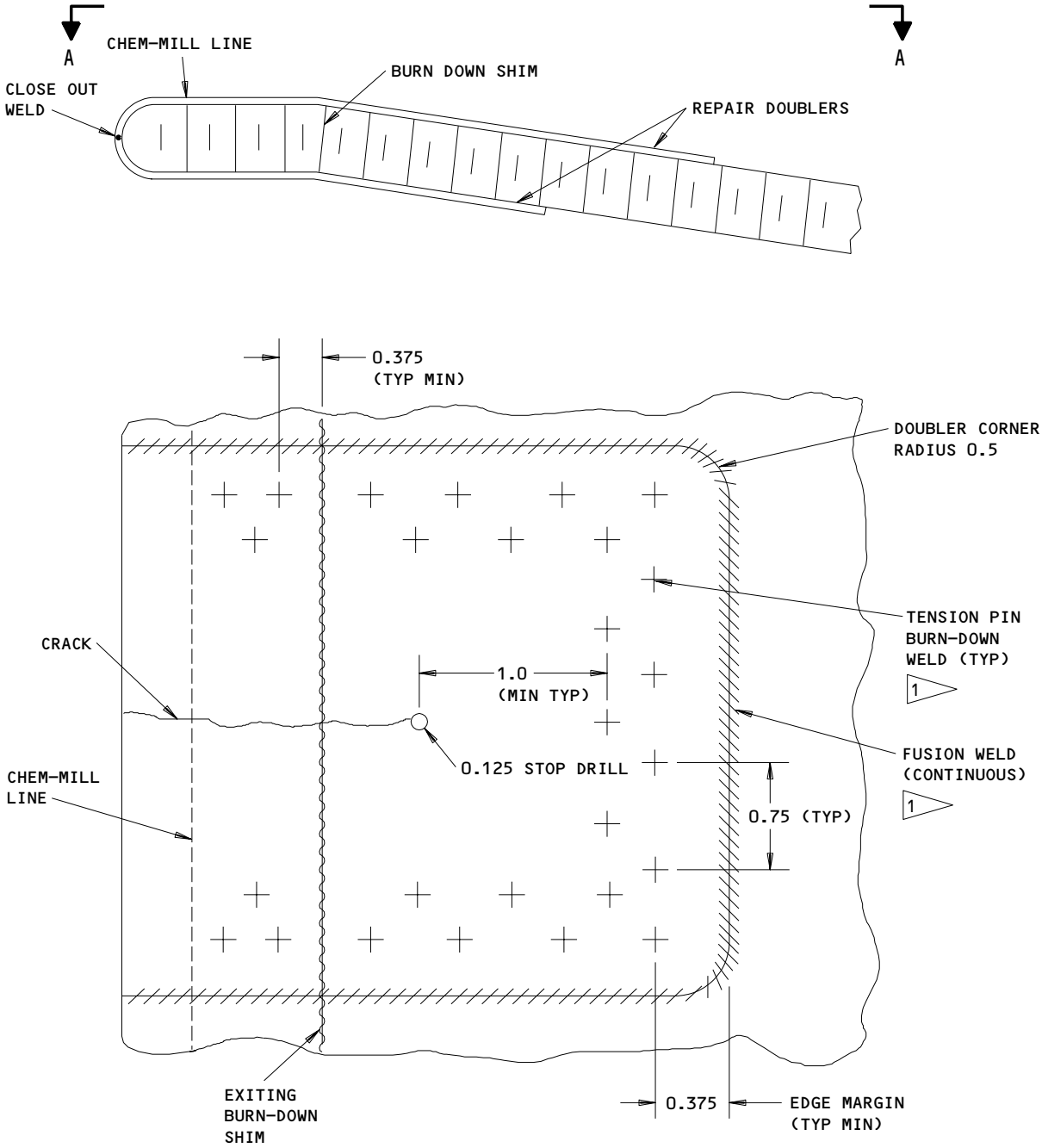

REPAIR OF LONGITUDINAL CRACKS IN THE OUTER SLEEVE

A-A

1 GRIND FUSION AND BURN-DOWN WELDS TO A 125 SURFACE FINISH

ALL DIMENSIONS ARE IN INCHES

Weld Repair
Figure 614 (Sheet 2)

656813

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14. Refinish

A. After completion of repairs, apply temporary protective finish to inside surface of inner sleeve and outside surface of outer sleeve per 20-44-02, except use Rust Veto 377.

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ILLUSTRATED PARTS LIST

1. This section lists and illustrates replaceable or repairable component parts. The Illustrated Parts Catalog contains a complete explanation of the Boeing part numbering system.

2. Indentures show parts relationships as follows:

    Assembly
      Detail Parts for Assembly
      Subassembly
      Attaching Parts for Subassembly
        Detail Parts for Subassembly

    Detail Installation Parts (Included only if installation parts may be returned to shop as part of assembly)

3. One use code letter (A, B, C, etc.) is assigned in the EFF CODE column for each variation of top assembly. All listed parts are used on all top assemblies except when limitations are shown by use code letter opposite individual part entries.

4. Letter suffixes (alpha-variants) are added to item numbers for optional parts, Service Bulletin modification parts, configuration differences (Except left- and right-hand parts), product improvement parts, and parts added between two sequential item numbers. The alpha-variant is not shown on illustrations when appearance and location of all variants of the part is the same.

5. Service Bulletin modifications are shown by the notations PRE SB XXXX and POST SB XXXX.

    A. When a new top assembly part number is assigned by Service Bulletin, the notations appear at the top assembly level only. The configuration differences at detail part level are then shown by use code letter.

    B. When the top assembly part number is not changed by the Service Bulletin, the notations appear at the detail part level.

6. Parts Interchangeability

Optional (OPT)	The parts are optional to and interchangeable with other parts having the same item number.
Supersedes, Superseded By (SUPSDS, SUPSD BY)	The part supersedes and is not interchangeable with the original part.
Replaces, Replaced By (REPLS, REPLD BY)	The part replaces and is interchangeable with, or is an alternate to, the original part.

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VENDORS

05693 CHERRY/TEXTRON INC CHERRY COMMERCIAL FASTENERS PROD DIV
1224 EAST WARNER STREET PO BOX 2157
SANTA ANA, CALIFORNIA 92707-3149
FORMERLY TOWNSEND CO CHERRY RIVET DIV AND TEXTRON INC
CHERRY FASTENERS UNIT

80539 SPS TECHNOLOGIES INC AEROSPACE PRODUCTS DIV
2701 SOUTH HARBOR BOULEVARD PO BOX 1259
SANTA ANA, CALIFORNIA 92702-1259
FORMERLY NUTT-SHEL DIV OF SPC WESTERN CO V80539
AND STANDARD PRESSED STEEL WESTERN DIV V17279

92526 ASTECH MANUFACTURING INC.
3030 RED HILL AVENUE
SANTA ANA, CALIFORNIA 92705-5823
FORMERLY ADVANCED STRUCTURES & TECH INC; FOSTER JOHN L
MFG CO & STRESSKIN PROD CO; ASTECH TM DIV OF TOOL
RESEARCH AND ENGRG CORP

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PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
CR2839-4-5		1	20	13
		2	20	14
		2	27	14
CR3552-4-6		1	40	22
		1	60	20
		1	62	31
		2	40	24
		2	60	40
		2	62	31
		2	80	20
NAS1198-4-8		2	20A	14
		2	27A	14
NAS1200-6-7		2	5B	75
TRE9104C4R274		2	25A	14
		2	28A	14
		2	65A	40
TRE9401C4-040		1	25	13
		1	45	22
		1	65	20
		1	67	31
		2	25	14
		2	28	14
		2	45	24
		2	65	40
		2	67	31
		2	85	20
015T0180-16		1	5F	RF
		2	1F	RF
015T0184-8		1	15B	1
122578-4-8		2	60A	40
122578-5-7		1	10A	75
		2	5A	75

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PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
314T1310-1		1	1	RF
314T1311-1		1	85	1
314T1315-1		1	15	1
314T1315-18		1	75	20
		2	95	20
314T1315-19		1	15A	1
314T1315-2		1	80	1
314T1315-20		1	80A	1
314T1315-29		1	90	22
314T1315-31		1	55	2
314T1315-34		1	55A	2
314T1315-35		1	80B	1
314T1315-36		1	17A	1
314T1315-37		1	57	2
314T1315-38		1	72	1
314T1315-39		1	70A	8
314T1315-40		1	57A	2
314T1315-41		1	72A	1
314T1315-42		1	70B	8
314T1315-43		1	17C	1
314T3310-1		1	5	RF
		2	1	RF
314T3310-10		1	5J	RF
		2	1J	RF
314T3310-2		1	5A	RF
		2	1A	RF
314T3310-3		1	5B	RF
		2	1B	RF
314T3310-5		1	5D	RF
		2	1D	RF
314T3310-6		1	5E	RF
		2	1E	RF

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PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
314T3310-7		1	5G	RF
		2	1G	RF
314T3310-9		1	5H	RF
		2	1H	RF
314T3311-1		2	105	1
314T3311-5		2	107	1
314T3314-1		2	10	1
314T3314-17		2	75	20
314T3314-18		2	10A	1
314T3314-19		2	100A	1
314T3314-2		2	100	1
314T3314-27		2	110	13
314T3314-30		2	55	2
314T3314-32		2	55A	2
314T3314-33		2	100B	1
314T3314-34		2	12	1
314T3314-35		2	57	2
314T3314-36		2	77	1
314T3314-37		2	70A	2
314T3314-38		2	70G	2
314T3314-39		2	72	2
314T3314-40		2	70B	2
		2	72A	2
314T3314-41		2	12A	1
314T3314-42		2	100C	1
314T3314-52		2	100D	1
314T3314-59		2	12B	1
314T3314-60		2	26A	14
314T3314-61		2	26	14
314T3314-62		2	12C	1
314T3316-5		2	35	1
314T3316-8		1	35	1
314T3316-9		2	35A	1
314T3317-1		2	15	1
314T3317-2		2	15A	1

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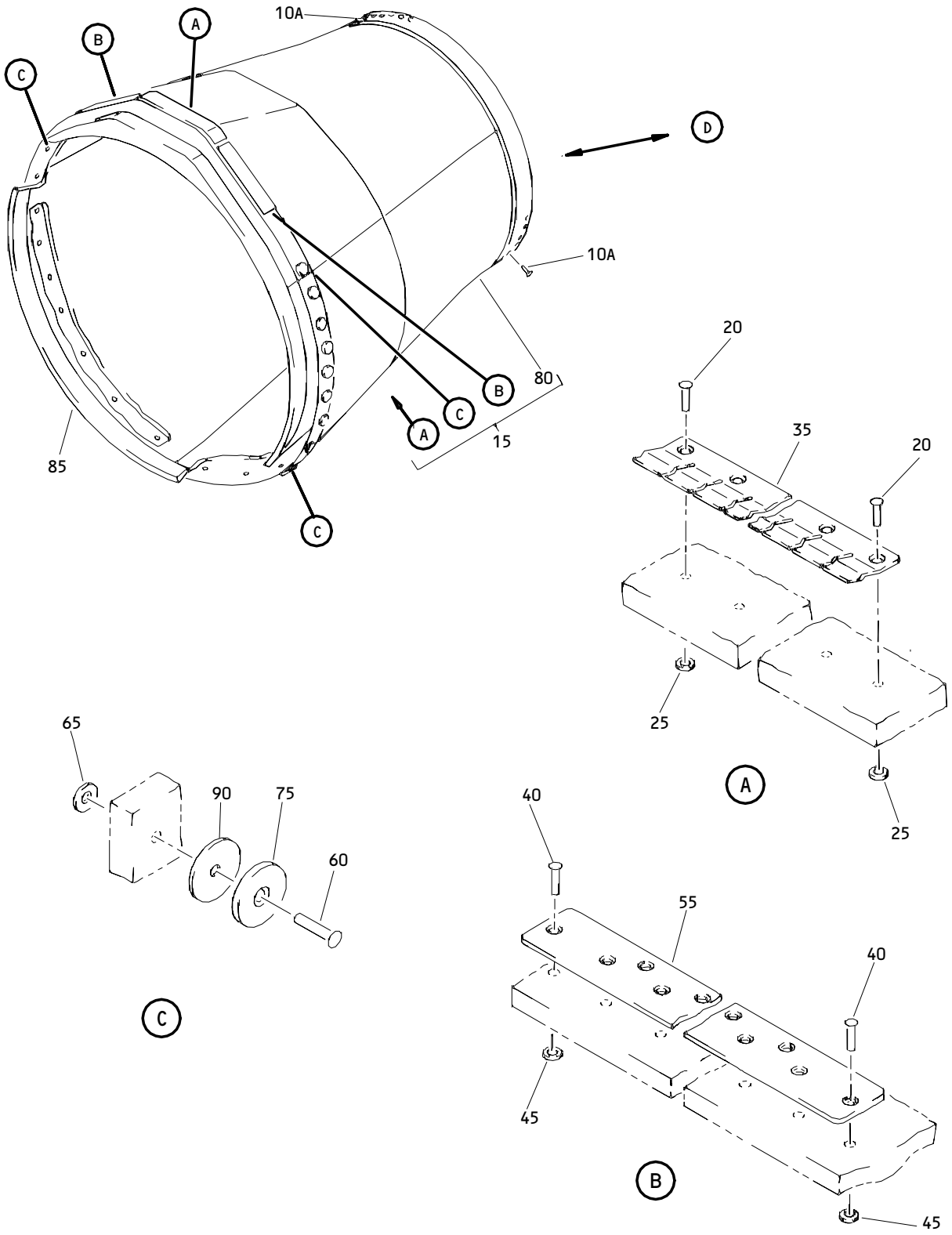

CF6-80A Engine Primary Exhaust Sleeve Assembly
Figure 1 (Sheet 1)

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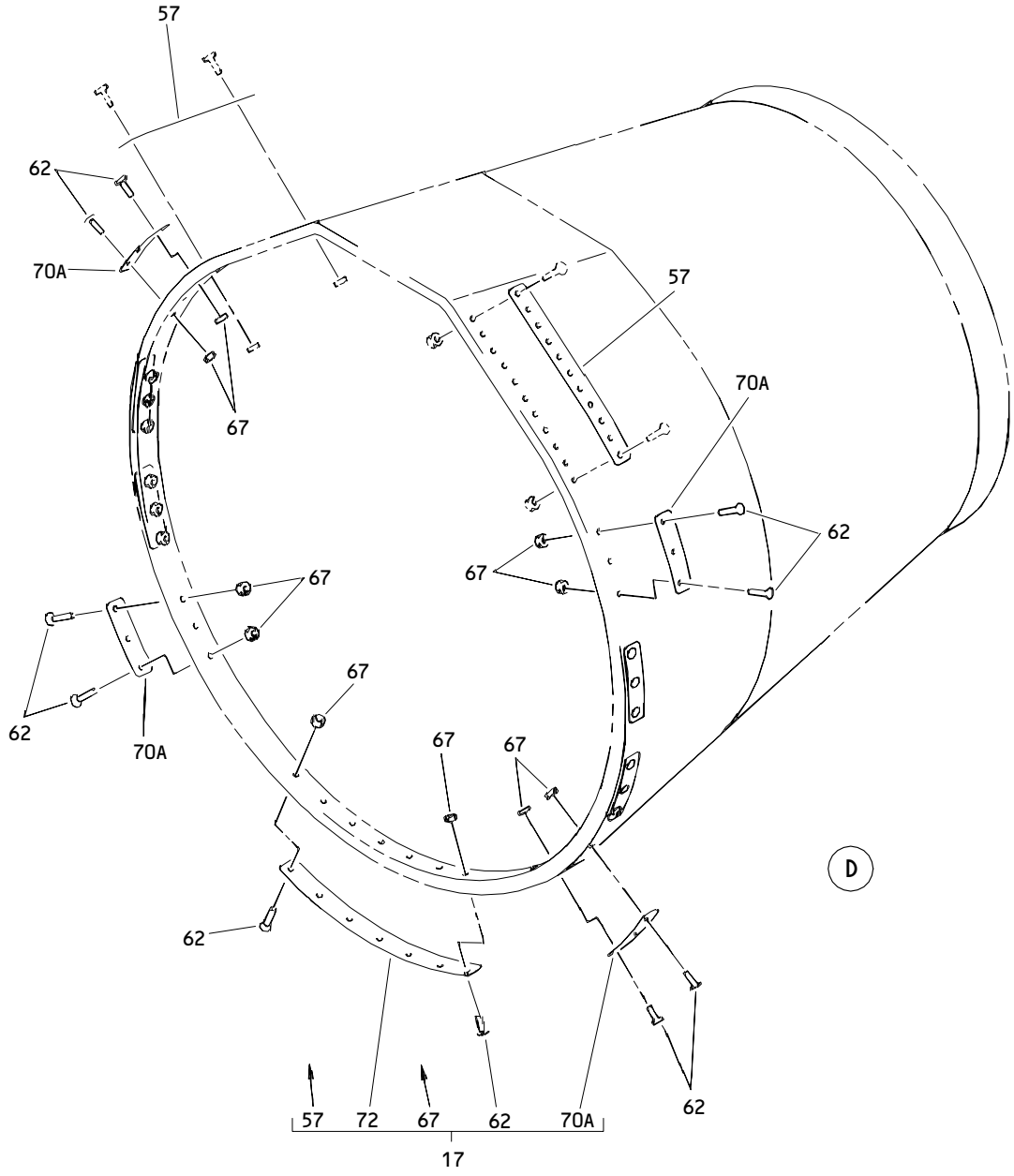

CF6-80A Engine Primary Exhaust Sleeve Assembly
Figure 1 (Sheet 2)

U1615

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	FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
	01-					
	-1	314T1310-1		SLEEVE ASSY-CF6-80A ENG PRIMARY EXH (PRE SB 767-71-0021)	A	RF
	-1A	314T1310-2		SLEEVE ASSY-CF6-80A ENG PRIMARY EXH (POST SB 767-71-0021)	D	RF
	-1B	314T1310-3		DELETED		
	-5	314T3310-1		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (PRE SB 767-71-0021) (FOR DETAILS SEE FIG. 2)	B	RF
	-5A	314T3310-2		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (PRE SB 767-71-0021) (FOR DETAILS SEE FIG. 2)	C	RF
	-5B	314T3310-3		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (POST SB 767-71-0021) (FOR DETAILS SEE FIG. 2)	E	RF
	-5C	314T3310-4		DELETED		
	-5D	314T3310-5		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (FOR DETAILS SEE FIG. 2)	G	RF
	-5E	314T3310-6		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (FOR DETAILS SEE FIG. 2)	H	RF
R	-5F	015T0180-16		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (POST SB 767-71-0021) (FOR DETAILS SEE FIG. 2)	J	RF
R	-5G	314T3310-7		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (FOR DETAILS SEE FIG. 2)	K	RF
R	-5H	314T3310-9		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (FOR DETAILS SEE FIG. 2)	L	RF
R	-5J	314T3310-10		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (FOR DETAILS SEE FIG. 2)	M	RF

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	FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
	01-					
	10	122578-5-6		DELETED		
	10A	122578-5-7		.RIVET- (V80539)	A,D	75
	15	314T1315-1		.SLEEVE ASSY-OUTER (OPT ITEM 15A) (PRE SB 767-71-0021)	A	1
	-15A	314T1315-19		.SLEEVE ASSY-OUTER (OPT ITEM 15) (PRE SB 767-71-0021)	A	1
R	-15B	015T0184-8		.SLEEVE ASSY-OUTER (POST SB 767-71-0021)	A	1
R	-15C	015T0184-9		.SLEEVE ASSY-OUTER (POST SB 767-71-0021)	A	1
	17	314T1315-17		DELETED		
	17A	314T1315-36		.SLEEVE ASSY-OUTER (OPT ITEM 17C)	D	1
	-17B	314T1315-44		DELETED		
	-17C	314T1315-43		.SLEEVE ASSY-OUTER (OPT ITEM 17A)	D	1
	20	CR2839-4-5		..RIVET- (V05693)	A,D	13
	25	TRE9401C4-040		..WASHER- (V92526)	A,D	13
	30	314T1315-33		DELETED		
	35	314T3316-8		..SEAL MEMBER	A,D	1
	40	CR3552-4-6		..RIVET- (V05693)	A,D	22
	45	TRE9401C4-040		..WASHER- (V92526)	A,D	22

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
50	314T1315-32		DELETED		
55	314T1315-31		..STRIP-RUB (OPT ITEM 55A)	A	2
-55A	314T1315-34		..STRIP-RUB (OPT ITEM 55)	A	2
57	314T1315-37		..STRIP-RUB (USED ON ITEM 17A)	D	2
-57A	314T1315-40		..STRIP-RUB (USED ON ITEM 17C)	D	2
60	CR3552-4-6		..RIVET- (V05693)	A	20
62	CR3552-4-6		..RIVET- (V05693)	D	31
65	TRE9401C4-040		..WASHER- (V92526)	A	20
67	TRE9401C4-040		..WASHER- (V92526)	D	31
70	314T1315-29		DELETED		
70A	314T1315-39		..STRIP-RUB (USED ON ITEM 17A)	D	8
-70B	314T1315-42		..STRIP-RUB (USED ON ITEM 17C)	D	8
72	314T1315-38		..STRIP-RUB (USED ON ITEM 17A)	D	1
-72A	314T1315-41		..STRIP-RUB (USED ON ITEM 17C)	D	1
75	314T1315-18		..STRIP-RUB	A	20
80	314T1315-2		..WELDMENT- (USED ON ITEMS 15, 17C)	A,D	1
-80A	314T1315-20		..WELDMENT ASSY- (OPT ITEM 80B) (USED ON ITEM 15A)	A,D	1
-80B	314T1315-35		..WELDMENT ASSY- (OPT ITEM 80A) (USED ON ITEM 15A)	A,D	1
-80C	314T1315-45		DELETED		
85	314T1311-1		.SLEEVE ASSY-INNER	A,D	1
90	314T1315-29		.SHIM	A,D	AR

- Item Not Illustrated

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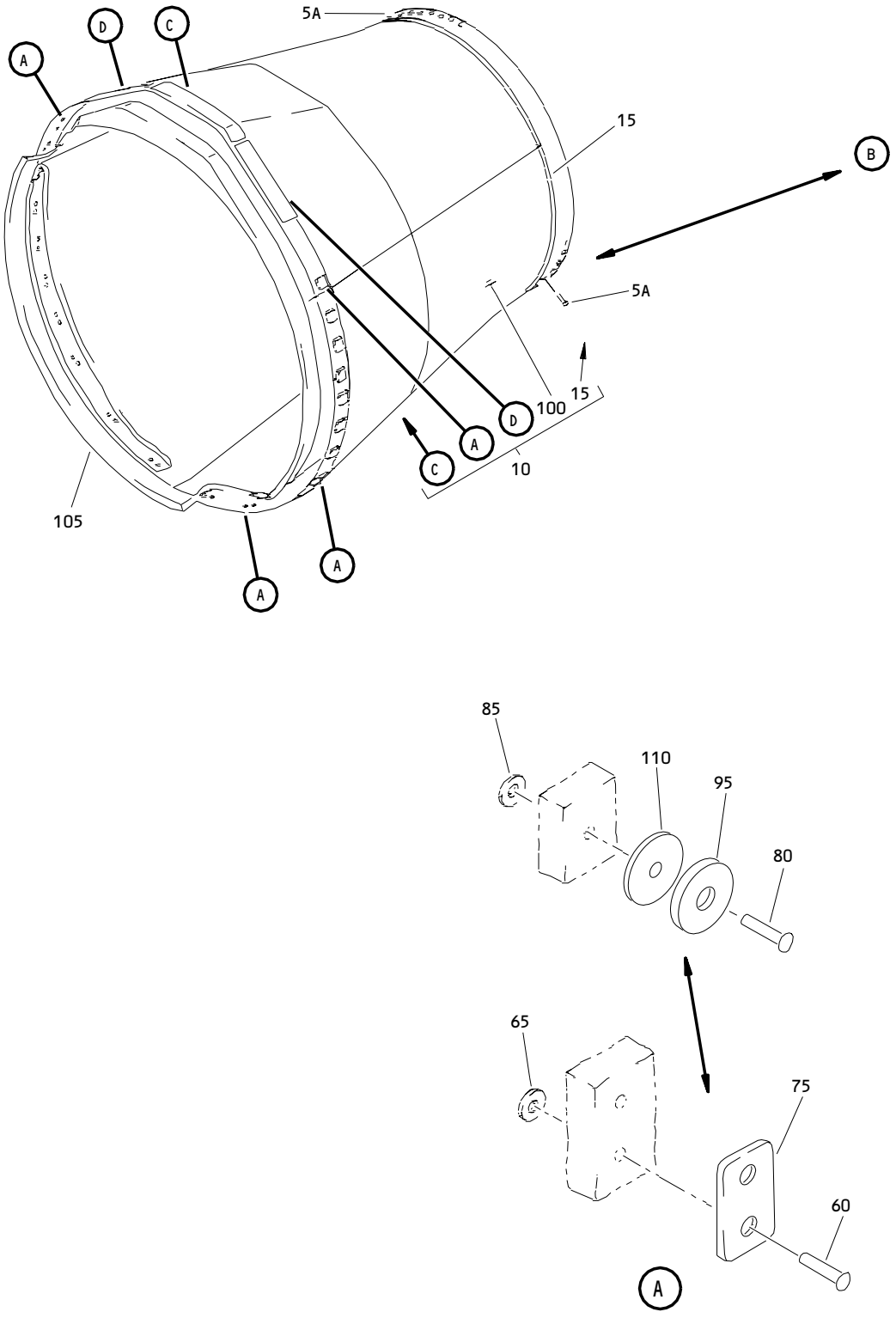

JT9D-7R Engine Primary Exhaust Sleeve Assembly
Figure 2 (Sheet 1)

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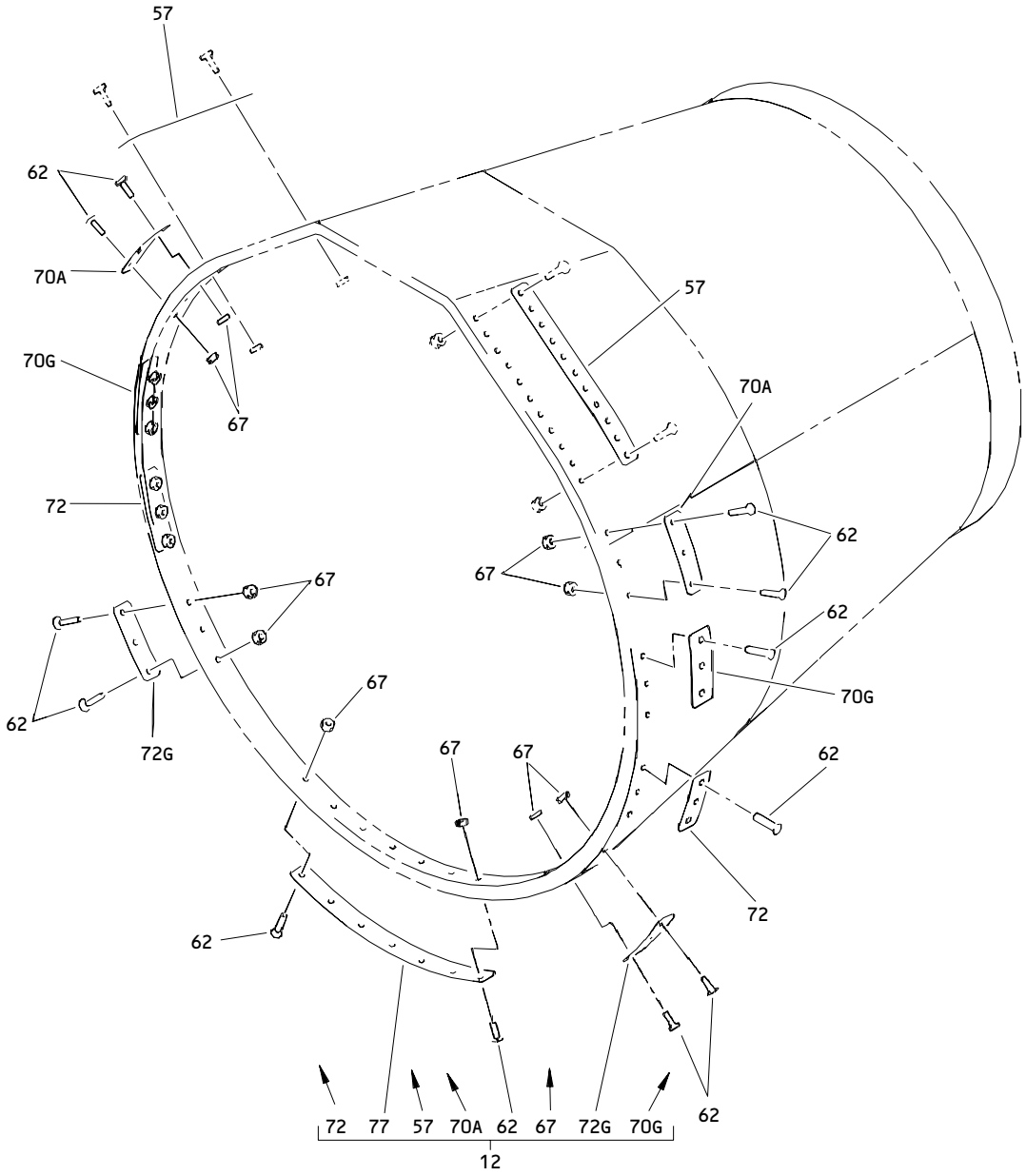

JT9D-7R Engine Primary Exhaust Sleeve Assembly
Figure 2 (Sheet 2)

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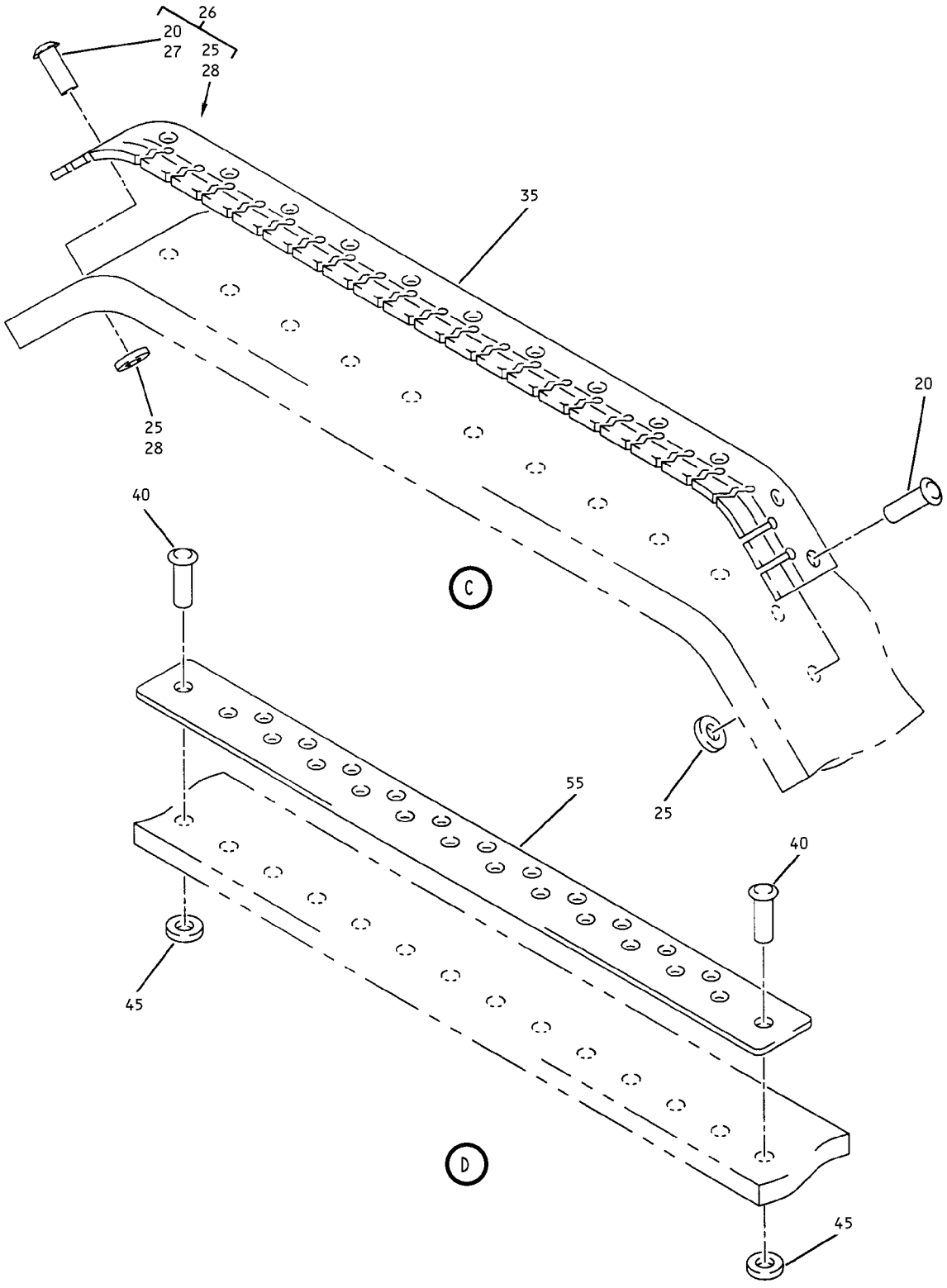

JT9D-7R Engine Primary Exhaust Sleeve Assembly
Figure 2 (Sheet 3)

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	FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
	02-					
	-1	314T3310-1		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (PRE SB 767-71-0021)	B	RF
	-1A	314T3310-2		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (PRE SB 767-71-0021)	C	RF
	-1B	314T3310-3		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (POST SB 767-71-0021)	E	RF
	-1C	314T3310-4		DELETED		
	-1D	314T3310-5		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH	G	RF
	-1E	314T3310-6		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH	H	RF
R	-1F	015T0180-16		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH (POST SB 767-71-0021)	J	RF
R	-1G	314T3310-7		SLEEVE ASSY-JT9D-7R ENG PRIMARY EXH	K	RF
R	-1H	314T3310-9		SLEEVE ASSY-JT9D-7R PRIMARY EXH	L	RF
R	-1J	314T3310-10		SLEEVE ASSY-JT9D-7R PRIMARY EXH	M	RF
	5	122578-5-6		DELETED		
	5A	122578-5-7		.RIVET- (V80539)	B,C,E ,G-L	75
R	-5B	NAS1200-6-7		.RIVET	M	75
	10	314T3314-1		.SLEEVE ASSY-OUTER (OPT ITEM 10A)	B,C,J	1
	-10A	314T3314-18		.SLEEVE ASSY-OUTER (OPT ITEM 10) (PRE SB 767-71-0021)	B,C,J	1
	12	314T3314-34		.SLEEVE ASSY-OUTER (POST SB 767-71-0021)	E	1
	-12A	314T3314-41		.SLEEVE ASSY-OUTER	G,H	1
R	-12B	314T3314-59		.SLEEVE ASSY-OUTER	K	1
R	-12C	314T3314-62		.SLEEVE ASSY-OUTER	L,M	1
	15	314T3317-1		..RING-AFT (USED ON ITEM 10)	B,C,J	1
	-15A	314T3317-2		..RING-AFT (USED ON ITEMS 10A, 12, 12A, 12B, 12C)	B,C,E ,G-M	1

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	FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
	02-20	CR2839-4-5		..RIVET- (V05693) (ITEM 20A (QTY 14) PLUS ITEM 25A (QTY 14) OPT TO ITEM 20 (QTY 14) PLUS ITEM 25 (QTY 14)) (USED ON ITEMS 10, 10A)	B,C,E,G-J	14
	-20A	NAS1198-4-8		..RIVET- (ITEM 20A (QTY 14) PLUS ITEM 25A (QTY 14) OPT TO ITEM 20 (QTY 14) PLUS ITEM 25 (QTY 14)) (USED ON ITEMS 10, 10A)	B,C,E,G-J	14
	25	TRE9401C4-040		..WASHER- (V92526) (ITEM 20A (QTY 14) PLUS ITEM 25A (QTY 14) OPT TO ITEM 20 (QTY 14) PLUS ITEM 25 (QTY 14)) (USED ON ITEMS 10, 10A)	B,C,E,G-J	14
	-25A	TRE9104C4R274		..INSERT- (V92526) (ITEM 20A (QTY 14) PLUS ITEM 25A (QTY 14) OPT TO ITEM 20 (QTY 14) PLUS ITEM 25 (QTY 14)) (USED ON ITEMS 10, 10A)	B,C,E,G-J	14
R	26	314T3314-61		..KIT ASSY- (OPT ITEM 26A) (USED ON ITEMS 12, 12A, 12B, 12C)	K-M	14
R	-26A	314T3314-60		..KIT ASSY- (OPT ITEM 26) (USED ON ITEMS 12, 12A, 12B, 12C)	E,G,H,K-M	14
R	27	CR2839-4-5		...RIVET- (V05693) (USED ON ITEM 26)	E,G,H,K-M	1
R	-27A	NAS1198-4-8		...RIVET- (USED ON ITEM 26A)	E,G,H,K-M	1
R	28	TRE9401C4-040		...WASHER- (V92526) (USED ON ITEM 26)	E,G,H,K-M	1

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	FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
R	02- -28A	TRE9104C4R274		...INSERT- (V92526) (USED ON ITEM 26A)	E,G,H ,K-M	1
	30	314T3314-27		DELETED		
	35	314T3316-5		..SEAL MEMBER- (OPT ITEM 035A)	B,C,E ,G-M	1
R	-35A	314T3316-9		..SEAL MEMBER- (OPT ITEM 035)	B,C,E ,G-M	1
	40	CR3552-4-6		..RIVET- (V05693)	B,C,E ,G-M	24
	45	TRE9401C4-040		..WASHER- (V92526)	B,C,E ,G-M	24
	50	314T3314-31		DELETED		
	55	314T3314-30		..STRIP-RUB (OPT ITEM 55A) (USED ON ITEMS 10, 10A)	B,C,J	2
	-55A	314T3314-32		..STRIP-RUB (OPT ITEM 55) (USED ON ITEMS 10, 10A)	B,C,J	2
	57	314T3314-35		..STRIP-RUB (USED ON ITEMS 12, 12A, 12B, 12C)	E,G,H ,K-M	2
R	60	CR3552-4-6		..RIVET- (314T3314-17 USED WITH 122578-4-8 AND TRE9104CR274 OR 314T3314-17 USED WITH CR3552-4-6 AND TRE9401C4-040 ARE OPTIONAL TO 314T1315-18 USED WITH CR3552-4-6 AND TRE9401C4-040. DO NOT INTERMIX 314T1315-18 WITH 314T3314-17) (V05693) (USED ON ITEMS 10, 10A) (USED WITH ITEM 65)	B,C,J	40

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	FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
R	02- -60A	122578-4-8		..RIVET- (314T3314-17 USED WITH 122578-4-8 AND TRE9104CR274 OR 314T3314-17 USED WITH CR3552-4-6 AND TRE9401C4-040 ARE OPTIONAL TO 314T1315-18 USED WITH CR3552-4-6 AND TRE9401C4-040. DO NOT INTERMIX 314T1315-18 WITH 314T3314-17) (V80539) (USED ON ITEMS 10, 10A) (USED WITH ITEM 65A)	B,C,J	40
	62	CR3552-4-6		..RIVET- (V05693) (USED ON ITEMS 12, 12A, 12B, 12C)	E,G,H,K-M	31
R	65	TRE9401C4-040		..WASHER- (314T3314-17 USED WITH 122578-4-8 AND TRE9104CR274 OR 314T3314-17 USED WITH CR3552-4-6 AND TRE9401C4-040 ARE OPTIONAL TO 314T1315-18 USED WITH CR3552-4-6 AND TRE9401C4-040. DO NOT INTERMIX 314T1315-18 WITH 314T3314-17) (V92526) (USED ON ITEMS 10, 10A) (USED WITH ITEM 60)	B,C,J	40

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	FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
R	02- -65A	TRE9104C4R274		..INSERT- (314T3314-17 USED WITH 122578-4-8 AND TRE9104CR274 OR 314T3314-17 USED WITH CR3552-4-6 AND TRE9401C4-040 ARE OPTIONAL TO 314T1315-18 USED WITH CR3552-4-6 AND TRE9401C4-040. DO NOT INTERMIX 314T1315-18 WITH 314T3314-17) (V92526) (USED ON ITEMS 10, 10A) (USED WITH ITEM 60A)	B,C,J	40
	67	TRE9401C4-040		..WASHER- (V92526) (USED ON ITEMS 12, 12A, 12B, 12C)	E,G,H,K-M	31
	70	314T3314-29		DELETED		
	70A	314T3314-37		..STRIP-RUB (USED ON ITEMS 12, 12A, 12B)	E,G,H,K	2
R	-70B	314T3314-40		..STRIP-RUB	L,M	2
	70G	314T3314-38		..STRIP-RUB (USED ON ITEMS 12, 12A, 12B)	E,G,H,K	2
R	-70H	314T3314-40		..STRIP-PAD	L,M	2
	72	314T3314-39		..STRIP-RUB (USED ON ITEMS 12, 12A, 12B)	E,G,H,K	2
R	-72A	314T3314-40		..STRIP-RUB	L,M	2
	72G	314T3314-40		..STRIP-RUB (USED ON ITEMS 12, 12A, 12B, 12C)	E,G,H,K-M	2

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
02-					
75	314T3314-17		..PAD- (OPT ITEM 95) (USED ON ITEMS 10, 10A)	B,C,J	20
77	314T3314-36		..STRIP-RUB (USED ON ITEMS 12, 12A, 12B, 12C)	E,G,H ,K-M	1
80	CR3552-4-6		..RIVET- (V05693) (USED ON ITEMS 10, 10A) (USED WITH ITEM 95)	B,C,J	20
85	TRE9401C4-040		..WASHER- (V92526) (USED ON ITEMS 10, 10A) (USED WITH ITEM 95)	B,C,J	20
90	314T1315-29		DELETED		
95	314T1315-18		..STRIP-RUB (OPT ITEM 75) (USED ON ITEMS 10, 10A)	B,C,J	20
100	314T3314-2		..WELD ASSY- (USED ON ITEM 10)	B,C,J	1
-100A	314T3314-19		..WELD ASSY- (OPT ITEM 100B) (USED ON ITEMS 10A, 12)	B,C,E ,J	1
-100B	314T3314-33		..WELD ASSY- (OPT ITEM 100A) (USED ON ITEMS 10A, 12)	B,C,E ,J	1
-100C	314T3314-42		..WELD ASSY	G,H	1
R -100D	314T3314-52		..WELD ASSY	K-M	1
105	314T3311-1		.SLEEVE ASSY-INNER	B,E,G ,K-M	1
-107	314T3311-5		.SLEEVE ASSY-INNER	C,G,J	1
110	314T3314-27		.SHIM	B,C,E ,G-M	AR

- Item Not Illustrated

DELETED 122578-4-8 AND TRE9104CR274 OR 314T3314-17 USED WITH CR3552-4-6 AND TRE9401C4-040 ARE OPTIONAL TO 314T1315-18 USED WITH CR3552-4-6 AND TRE9401C4-040. DO NOT INTERMIX 314T1315-18 WITH 314T3314-17

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