TO: ALL HOLDERS OF RUDDER CONTROL FEEL AND TRIM OFFSET TORQUE TUBE ASSEMBLY
COMPONENT MAINTENANCE MANUAL 27-21-43

REVISION NO. 4 DATED MAR 01/00

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	Added 251T3210-18 Torque Tube Assembly per PRR B13204.
1	
TR & SB RECORD	
1	
302	
501	
REPAIR 3-1	
601	
REPAIR 4-1	
601	
704-705,716-719	
1003-1006,1010,	
1015-1017	
703	Edited without technical change.

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RUDDER CONTROL FEEL AND TRIM OFFSET TORQUE TUBE ASSEMBLY

PART NUMBERS 251T3210-3,-4,-5,-7,-8,-9 -11 THRU -15,-17,-18 015T0070-4,-5,-6

COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST

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BOEING
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MAINTENANCE MANUAL

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

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COMPONENT
MAINTENANCE MANUAL

TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL
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27-15			APR 10/84
27-11			OCT 10/84
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		PRR B11799-1	OCT 01/88
27-23			APR 01/92
		PRR B13204	MAR 01/00

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*710	MAR 01/00	01.101
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*[1] Special instructions not required. Use standard industry practices and information contained in 20-30-03.

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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.

Verification:

Disassembly	JUL 13/83
Assembly	JUL 13/83

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RUDDER CONTROL FEEL AND TRIM OFFSET TORQUE TUBE ASSEMBLY

DESCRIPTION AND OPERATION

1. The rudder control feel and trim offset torque tube assembly consists of an inner torque tube, offset torque tube, a feel cam assembly, and quadrant assembly. The offset torque tube assembly conveys the motion of the rudder control cables to the feel and centering mechanism. Rudder pedal feel is provided by a centering cam and roller.

2. Leading Particulars (Approximate)

   Length -- 16 inches
   Height -- 19 inches
   Width -- 13 inches
   Weight -- 6 pounds

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DISASSEMBLY

NOTE: 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.

1. Disassembly (IPL Fig. 1)

A. On 251T3210-3, -4, -5 and 015T0070-4, -5, -6 remove rivets (15, 16) and feel cam assembly (10).

NOTE: Do not remove rivets (30) or separate feel cams (25, 35).

B. On 251T3210-7, -8, -9, -11, -12, -13 remove rivets (150, 151) and feel cam assembly (145).

NOTE: Do not remove rivets (165) or separate feel cam rails (155) and feel cam bodies (160) unless necessary for repair or replacement.

C. On 251T3210-14, -15, -17 remove rivets (150, 152) and lockbolts (151B, 152A), collars (153) and filler (154), and feel cam assembly (145 or 147).

NOTE: Do not remove rivets (165) or separate feel cam rails (155) and feel cam bodies (160) unless necessary for repair or replacement.

D. Remove rivets (45, 47), bolt (42), collar (43), and quadrant assembly (40).

NOTE: Do not remove bushing (67, 55), spacers (60) and rivets (65) unless necessary for repair or replacement.

E. On assemblies with inner torque tube (95), remove rivets (68, 75, 77, 80) and separate offset torque tube (70) from inner torque tube (95). On 251T3210-4, -9, -13 and 015T0070-5 assemblies, remove rivets (105) and separate input crank (110), output crank (115), input-output crank (120), input crank (125) and mounting tube (130) from inner torque tube (135).

NOTE: Do not remove rivets (90A), nutplates (85) or bushings (140) unless necessary for repair or replacement.

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2. Disassembly (IPL FIg. 2)

A. On 251T3210-18 remove rivets (10) and bolts (15), collars (20) and fillers (25), and feel cam assembly (65).

NOTE: Do not remove rivets (75) or separate feel cam rails (70) and feel cam body (80) unless necessary for repair or replacement.

B. Remove rivets (5, 30, 35, 40) and separate offset torque tube (45) from inner torque tube (85).

NOTE: Do not remove rivets (55) or nutplates (60) unless necessary for repair or replacement.

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CHECK

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

2. Magnetic particle check per 20-20-01 -- Feel cams (25, 35, 155 IPL Fig. 1; 70, IPL Fig. 2).

3. Penetrant check per 20-20-02 -- Quadrants (50, IPL Fig. 1), offset torque tube (70, IPL Fig. 1; 50, IPL Fig. 2), input crank (110, IPL Fig. 1), output crank (115, IPL Fig. 1), input-output crank (120, IPL Fig. 1), input crank (125, IPL Fig. 1), mounting tube (130, IPL Fig. 1) and feel cam body (160, IPL Fig. 1; 80, IPL Fig. 2).

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REPAIR - GENERAL

1. Content

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

P/N	NAME	REPAIR
251T3213	FEEL CAM ASSEMBLY	1-1
251T3215	QUADRANT	2-1, 2-2
- -	MISC PARTS REFINISH	3-1
251T3249 251T3257	FEEL CAM ASSEMBLY	4-1

2. Standard Practices

A. Refer to the following standard practices as applicable, for details of procedures in individual repairs.

20-30-02 Stripping of Protective Finishes
20-30-03 General Cleaning Procedures
20-41-01 Decoding Table for Boeing Finish Codes
20-42-05 Bright Cadmium Plating
20-43-01 Chromic Acid Anodizing
20-50-03 Bearing Installation and Retention
20-50-12 Application of Adhesives

3. Materials

NOTE: Equivalent substitutes may be used.

A. Primer -- BMS 10-11, type 1 (Ref 20-60-02)

B. Sealant -- BMS 5-95 (Ref 20-60-04)

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4. Dimensioning Symbols

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

—	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
⊥ B 0.002	PERPENDICULAR TO B WITHIN 0.002
// A 0.002	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
⌒ A 0.006	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
⌓ A 0.020	SURFACES MUST LIE WITHIN PARALLEL BOUNDARIES 0.02 INCH APART AND EQUALLY DISPOSED ABOUT TRUE PROFILE
◎ C ∅ 0.0005	CONCENTRIC TO C WITHIN 0.0005 DIAMETER
⌯ A 0.010	SYMMETRICAL WITH A WITHIN 0.010
∠ A 0.005	ANGULAR TOLERANCE 0.005 WITH A
⌖ B ∅ 0.002 Ⓢ	LOCATED AT TRUE POSITION WITHIN 0.002 DIA RELATIVE TO DATUM B, REGARDLESS OF FEATURE SIZE
⊥ A ∅ 0.010 Ⓜ 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	EXACT DIMENSION IS 2.000
OR 2.000 BSC	

(NOTE THAT ⌓ A 0.020 MAY ALSO APPEAR AS ⌓ 0.020 A)

True Position Dimensioning Symbols
Figure 601

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FEEL CAM ASSEMBLY - REPAIR 1-1

251T3213-1, -3

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

1. Replacement

   NOTE: Do not disassemble feel cam assembly. Cam profile and mounting holes are machined after assembly, replace as an assembly.

2. Refinish

   A. Feel cam assembly (10, 10A, IPL FIg. 1) -- Cadmium plate and apply one coat of primer, BMS 10-11, type 1 (F-16.01) all over except on cam profile, 0.3745-0.3755 diameter hole, and mounting surface. Stylus cadmium plate (F-15.29) 2.001-2.0003 diameter mounting surface. Material: 15-5PH CRES or 17-4PH CRES.

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QUADRANT ASSEMBLY - REPAIR 2-1

251T3215-8, -10, -16, 18

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

1. Bushing Replacement (Fig. 601) (251T3215-8, -16)

   A. Remove bushing (55, IPL Fig. 1) from quadrant assembly (40A).

   B. Install new bushing per 20-50-03 except use BMS 5-95 sealant.

   C. Machine to dimension shown.

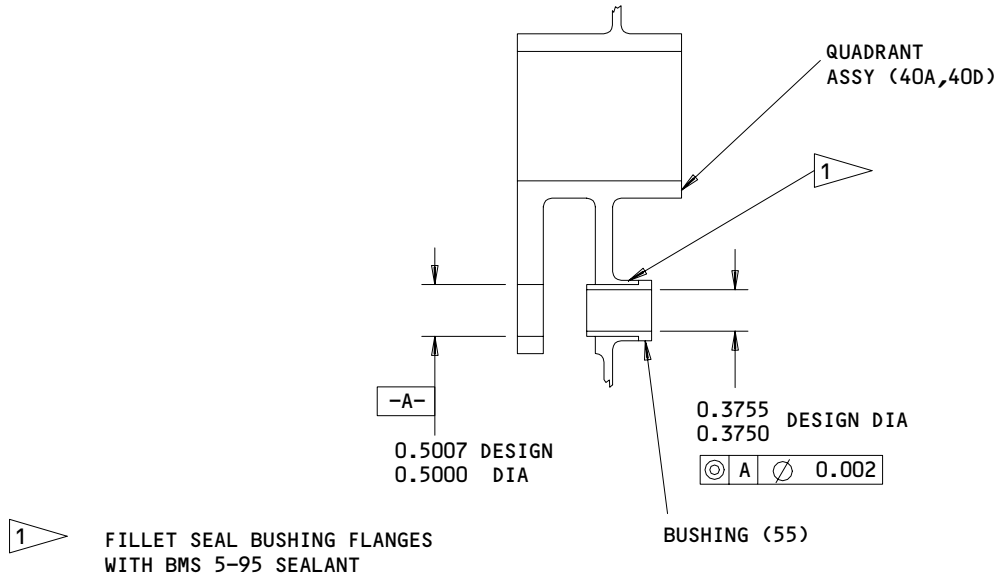
   D. Fillet seal bushing flanges with sealant, BMS 5-95.

2. Bushing Replacement (251T3215-10, -18)

   A. Remove bushings (67, IPL Fig. 1) from quadrant assembly (40).

   B. Install new bushing per 20-50-03 except use BMS 5-95 sealant.

   C. Fillet seal bushing flanges with sealant, BMS 5-95.



251T3215-8,-16
Quadrant Assembly - Bushing Replacement
Figure 601

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QUADRANT - REPAIR 2-2

251T3215-7, -9, -11, -13, -15, -17

NOTE: Repair consists of restoration of original finish. Refer to Refinish instructions and to REPAIR-GEN for list of applicable standard practices.

1. Plating Repair

   A. Anodize (F-17.05), followed by two coats of primer, BMS 10-11, type 1 (F-20.03). On 251T3215-7, -13 only, omit primer on ID of 0.375 and 0.500-inch diameter holes. Material: Al alloy.

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MISC PARTS REFINISH - REPAIR 3-1

1. Repair of parts listed in Fig. 601 consists of restoration of the original finish.

IPL FIG. & ITEM	MATERIAL	FINISH
Fig. 1		
Torque tube, offset (70)	Al alloy	Anodize (F-17.05), followed by two coats of primer, BMS 10-11, type 1 (F-20.03) except omit primer on ID of 0.2500, 0.3125, 0.3750, 0.4375, and 0.500-inch diameter holes.
Torque tube assy (100)	Al alloy	Apply chemical coat (F-17.10) on ID of 0.3125, 0.4375, and 0.500-inch diameter holes.
Crank, input (110) crank, output (115), crank, input-output (120) crank, input (125)	Al alloy	Chromic acid anodize (F-17.04), followed by two coats of primer, BMS 10-11, type 1 (F-20.03) except omit primer on ID of 0.2500 and 0.3750-inch diameter holes.
Mounting tube (130)	Al alloy	Chromic acid anodize (F-17.04), followed by two coats of primer, BMS 10-11, type 1 (F-20.03).
Fig. 2		
Filler (25), torque tube, inner (85)	Al alloy	Chromic acid anodize and apply BMS 10-11, type 1 primer (F-18.13).
Torque tube, offset (50)	Al alloy	Boric acid-sulfuric acid anodize or chromic acid anodize (F-17.31), followed by primer, BMS 10-11, type 1 (F-20.02).

Refinish Details
Figure 601

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FEEL CAM ASSEMBLY - REPAIR 4-1

251T3249-1
251T3257-1

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

1. Feel Cam Rail Replacement

   A. Remove feel cam rails (155, IPL FIg. 1; 70, IPL Fig. 2) from feel cam body (160, IPL Fig. 1; 80, IPL Fig. 2) by removing rivets (165, IPL Fig. 1; 75, IPL Fig. 2).

   B. Install new feel cam rails (155, IPL Fig. 1; 70, IPL Fig. 2) on feel cam body (160, IPL Fig. 1; 80, IPL Fig. 2) with rivets (165, IPL Fig. 1; 75, IPL Fig. 2).

2. Refinish

   A. Feel cam rails (155, IPL Fig. 1; 70, IPL Fig. 2) -- Cadmium plate and apply one coat of primer, BMS 10-11, type 1 (F-16.01) all over except on cam profile. Material: 15-5PH CRES or 17-4PH CRES.

   B. Feel cam body (160, IPL Fig. 1; 80, IPL Fig. 2) -- Chromic acid anodize (F-17.02) and apply one coat of primer, BMS 10-11, type 1 (F-20.02) all over except no primer in mounting holes. Chemical treat (17.10) mounting holes. Material: Al alloy.

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ASSEMBLY

1. Materials

NOTE: Equivalent substitutes may be used.

A. Primer -- BMS 10-11, type 1 (Ref 20-60-02)

B. Sealant -- BMS 5-95 (Ref 20-60-04)

2. Assembly of 251T3210-3, -5, 015T0070-4, -6 (IPL Fig. 1, Fig. 701)

NOTE: Seal all rivets with BMS 5-95 sealant.

A. If a new inner torque tube (95) is being installed, position inner torque tube (95) inside offset torque tube (70) and quadrant assembly (40) matching profiles of quadrant assembly (40) and inner torque tube (70) within 0.02 inch. Drill rivet holes thru inner torque tube (95) using existing holes of quadrant assembly (40) and offset torque tube (70). Separate parts (40, 70, 95) at this time.

B. If a new offset torque tube (70) or quadrant assembly (40) is being installed, use new inner torque tube (95) and position parts (40, 70, 95) as directed in paragraph 2.A. Drill rivet holes thru quadrant assembly (40), offset torque tube (70) and inner torque tube (95). Separate parts (40, 70, 95) at this time.

C. Apply a coat of wet BMS 5-95 sealant on OD of inner torque tube (95). Position parts (40, 70, 95) as shown (Fig. 701) and install quadrant assembly (40) with rivets (45, 47), bolt (42), and collar (43) and offset torque tube (70) with rivets (68, 75, 77, 80).

D. Deleted

E. Apply a coat of wet BMS 5-95 sealant on faying surface of feel cam assembly (10).

F. Install feel cam assembly (10) with rivets (15, 16).

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3. Assembly of 251T3210-4, 015T0070-5 (IPL Fig. 1, Fig. 701)

NOTE: Seal all rivets with BMS 5-95 sealant (F-19.27).

A. Assemble Torque Tube Assembly (100)

(1) If a new inner torque tube (135) or mounting tube (130) is being installed, position cranks (110, 115, 120, 125) and tubes (130, 135) as shown (Fig. 701) and drill rivet holes thru tubes (130, 135) using existing holes in cranks (110, 115, 120, 125). Separate parts (110 thru 135) at this time.

(2) If a new crank (110, 115, 120 or 125) is being installed, position parts (110 thru 135) as shown (Fig. 701). Use new tubes (130, 135). Drill rivet holes thru crank (110, 115, 120 or 125) and tubes (130, 135). Separate parts (110 thru 135) at this time.

(3) Apply a coat of wet BMS 5-95 sealant on all faying surfaces of mounting tube (130).

(4) Install cranks (110, 115, 120, 125) and tubes (130, 135) with rivets (105).

(5) If new cranks are being installed machine to dimensions shown (Fig. 701). Apply chemical coat F-17.10 after machining.

B. If a new torque tube assembly (100) or quadrant assembly (40) is being installed, position and drill rivet holes as shown (Fig. 701). Separate parts (40, 100) at this time.

C. Apply a coat of wet BMS 5-95 sealant on faying surface of quadrant assembly (40).

D. Install quadrant assembly (40) on torque tube assembly (100) with rivets (45, 47), bolt (42), and collar (43).

E. Deleted

F. Apply a coat of wet BMS 5-95 sealant on faying surface of feel cam assembly (10).

G. Install feel cam assembly (10) on torque tube assembly (100) with rivets (15, 16).

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4. Assembly of 251T3210-7, -8, -11, -12, -14, 15, -17 (IPL Fig. 1, Fig. 701)

NOTE: Seal all rivets with BMS 5-95 sealant (F-19.27).

A. If a new inner torque tube (95) is being installed, position inner torque tube (95) inside offset torque tube (70) and quadrant assembly (40) matching profiles of quadrant assembly (40) and inner torque tube (70) within 0.02 inch. Drill rivet holes thru inner torque tube (95) using existing holes of quadrant assembly (40) and offset torque tube (70). Separate parts (40, 70, 95) at this time.

B. If a new offset torque tube (70) or quadrant assembly (40) is being installed use new inner torque tube (95) and position parts (40, 70, 95) as directed in paragraph 2.A. Drill rivet holes thru quadrant assembly (40), offset torque tube (70) and inner torque tube (95). Separate parts (40, 70, 95) at this time.

C. Apply a coat of wet BMS 5-95 sealant on OD of inner torque tube (95). Position parts (40, 70, 95) as shown (Fig. 701) and install quadrant assembly (40) with rivets (45, 47), bolt (42), and collar (43), offset torque tube (70) with rivets (75, 77, 80) and feel cam positioning rivet (170) or rivets (142).

D. If a new feel cam assembly (145) is being installed position feel cam assembly (145) on parts assembled in paragraph 4.C. and drill rivet holes through offset torque tube assy (70) and inner torque tube (95). Separate parts (145, 70) at this time.

E. Apply a coat of wet BMS 5-95 sealant on faying surface of feel cam assembly (145).

F. Install feel cam assembly (145 or 147) with rivets (150, 151 or 152) and/or lockbolts (151B, 152A), collars (151C, 153) and filler (151D, 154).

5. Assembly of 251T3210-9, -13 (IPL Fig. 1, Fig. 701)

NOTE: Seal all rivets with BMS 5-95 sealant (F-19.27).

A. Assembly Torque Tube Assembly (100)

(1) If a new inner torque tube (135) or mounting tube (130) is being installed, position cranks (110, 115, 120, 125) and tubes (130, 135) as shown (Fig. 701) and drill rivet holes thru tubes (130, 135) using existing holes in cranks (110, 115, 120, 125). Separate parts (110 thru 135) at this time.

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(2) If a new crank (110, 115, 120 or 125) is being installed, position parts (110 thru 135) as shown (Fig. 701) use new tubes (130, 135). Drill rivet holes thru crank (110, 115, 120 or 125) and tubes 130, 135). Separate parts (110 thru 135) at this time.

(3) Apply a coat of wet BMS 5-95 sealant on all faying surfaces of mounting tube (130).

(4) Install cranks (110, 115, 120, 125) and tubes (130, 135) with rivets (105).

(5) Machine to dimensions shown (Fig. 701).

B. If a new torque tube assembly (100) or quadrant assembly (40) is being installed, position and drill rivet holes as shown (Fig. 701). Separate parts (40, 100) at this time:

C. Apply a coat of wet BMS 5-95 sealant on faying surface of quadrant assembly (40).

D. Install quadrant assembly (40) on torque tube assembly (100) with rivets (45, 47), bolt (42), and collar (43).

E. If a new feel cam assembly (145) is being installed, position feel cam assembly (145) on parts assembled in paragraph 4.D. and drill rivet holes through tubes (130, 135). Separate parts (145, 100) at this time.

F. Apply a coat of wet BMS 5-95 sealant on faying surface of feel cam assembly (145).

G. Install feel cam assembly (145) on torque tube assembly (100) with rivets (150).

6. Assembly of 251T3210-18 (IPL Fig. 2, Fig. 702)

NOTE: Seal all the rivets with BMS 5-95 sealant (F-19.27).

A. If a new inner torque tube (85) is to be installed, position the inner torque tube (85) inside the offset torque tube assembly (45) as shown in Fig. 701.

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B. Drill rivet holes thru the inner torque tube (85) using the existing holes of the offset torque tube (45).

C. Remove the inner torque tube from the offset torque tube.

D. If a new offset torque tube (45) is to be installed, use a new inner torque tube also (85). Position the inner torque tube in the offset torque tube as shown in Fig. 701.

E. Drill rivet holes and two holes 0.5000-0.5150 inch diameter thru the offset torque tube assembly (45) and inner torque tube (85) as shown in Fig. 701.

F. Apply chemical treat (F-17.10) then BMS 10-11, type 1 primer (F-20.02) to bare metal of the two holes 0.5000-0.5150 inch diameter.

G. Remove the inner torque tube from the offset torque tube.

H. Apply a coat of wet BMS 5-95 sealant on the OD of the inner torque tube (85) except in location shown in Fig. 701.

I. Position the inner torque tube (85) inside the offset torque tube assembly (70).

J. Install the rivets (5, 30, 35, 40) with BMS 5-95 sealant (F-19.27).

K. If a new feel cam assembly (65) is to be installed, position the feel cam assembly on parts assembled in par. 5.I.

L. Drill the rivet holes through the offset torque tube assembly (45) and the inner torque tube (85).

M. Separate the feel cam assembly (65) from the offset torque tube assembly.

N. Apply a coat of wet BMS 5-95 on faying surface of the feel cam assembly (65).

O. Install the feel cam assembly (65) with rivets (10), bolts (15), collars (20) and fillers (25).

7. Prepare and store component in accordance with standard industry practices.

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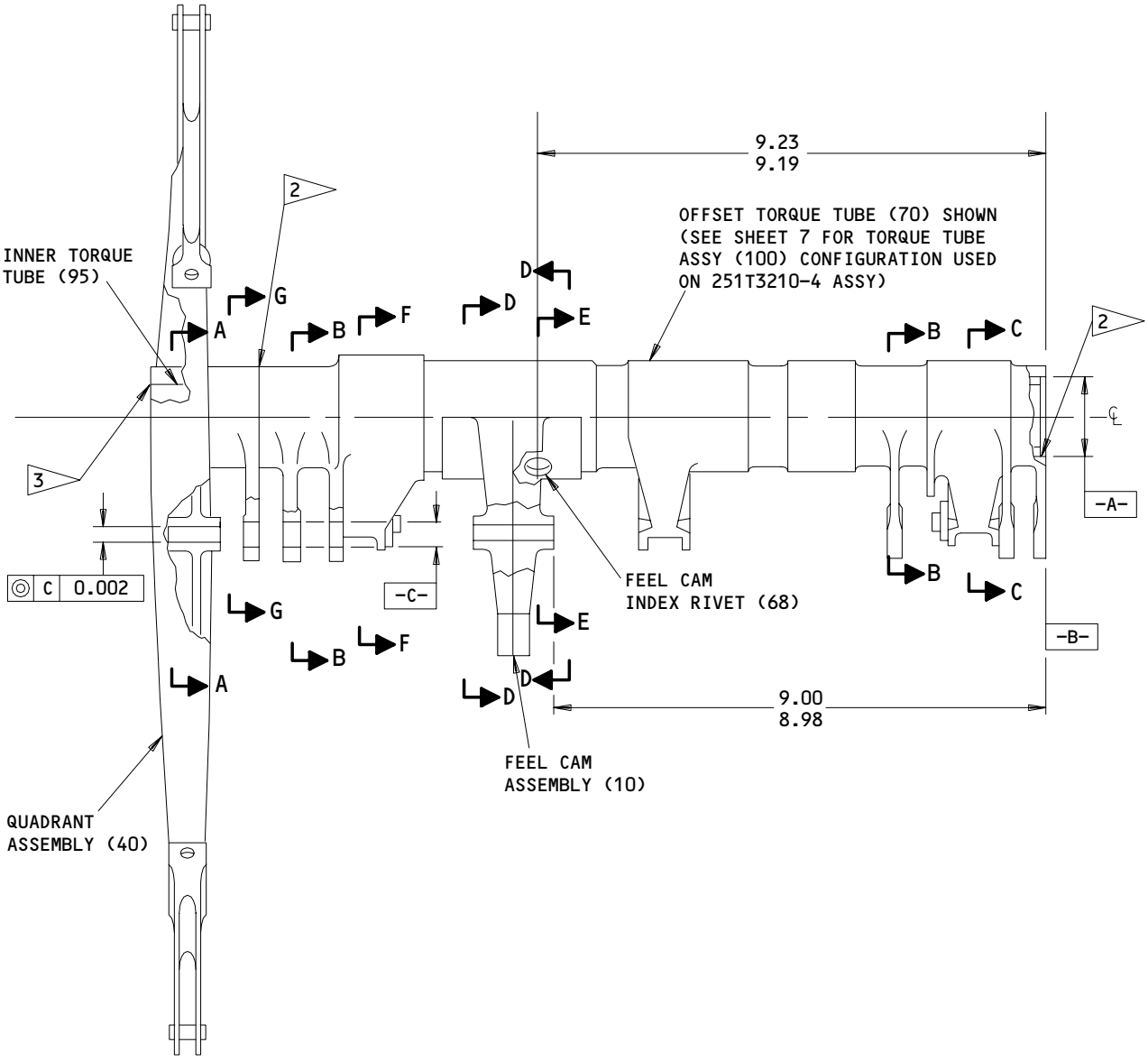

1 SEAL WITH BMS 5-95

2 FAY SEAL WITH BMS 5-95 WET SEALANT

3 MATCH PROFILES OF QUADRANT ASSEMBLY (40) AND INNER TORQUE TUBE (95) WITHIN 0.02

ALL DIMENSIONS ARE IN INCHES

251T3210-3,-4,-5 ASSY
015T0070-4,-5,-6 ASSY

Offset Torque Tube Assembly
Figure 701 (Sheet 1)

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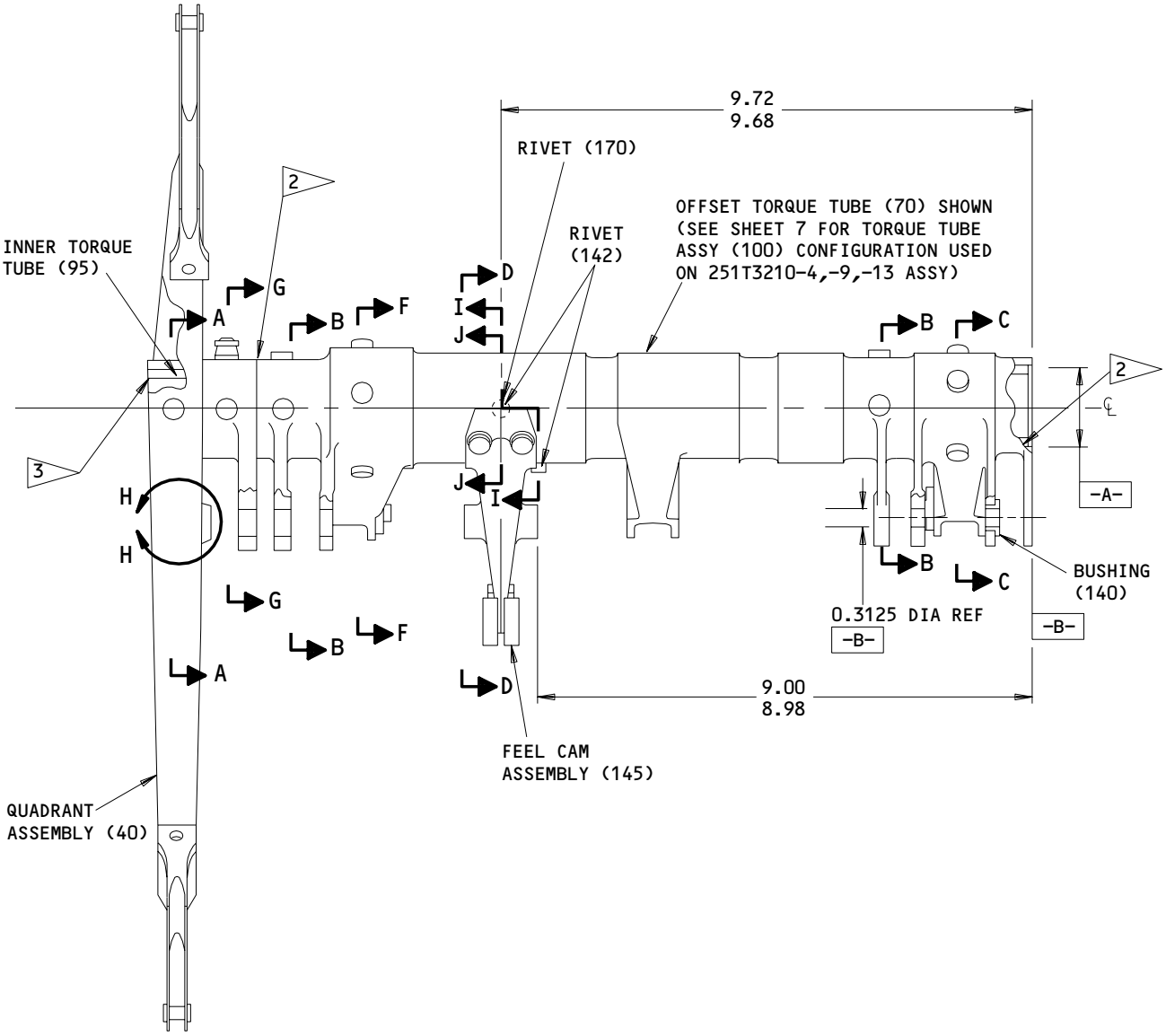

251T3210-7,-8,-11,-12,-14,-15,-17 ASSY

Offset Torque Tube Assembly
Figure 701 (Sheet 2)

119946

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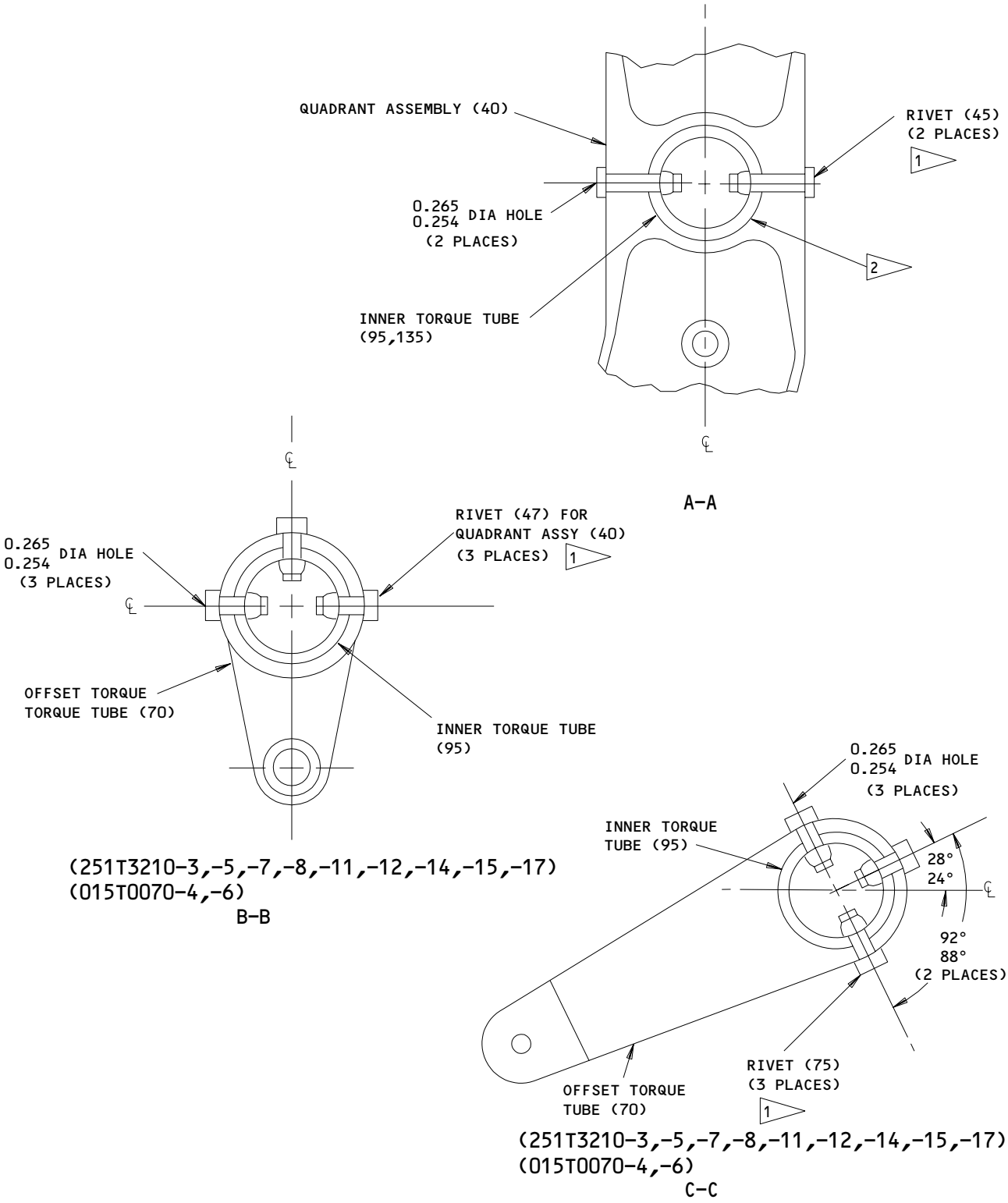

Offset Torque Tube Assembly
Figure 701 (Sheet 3)

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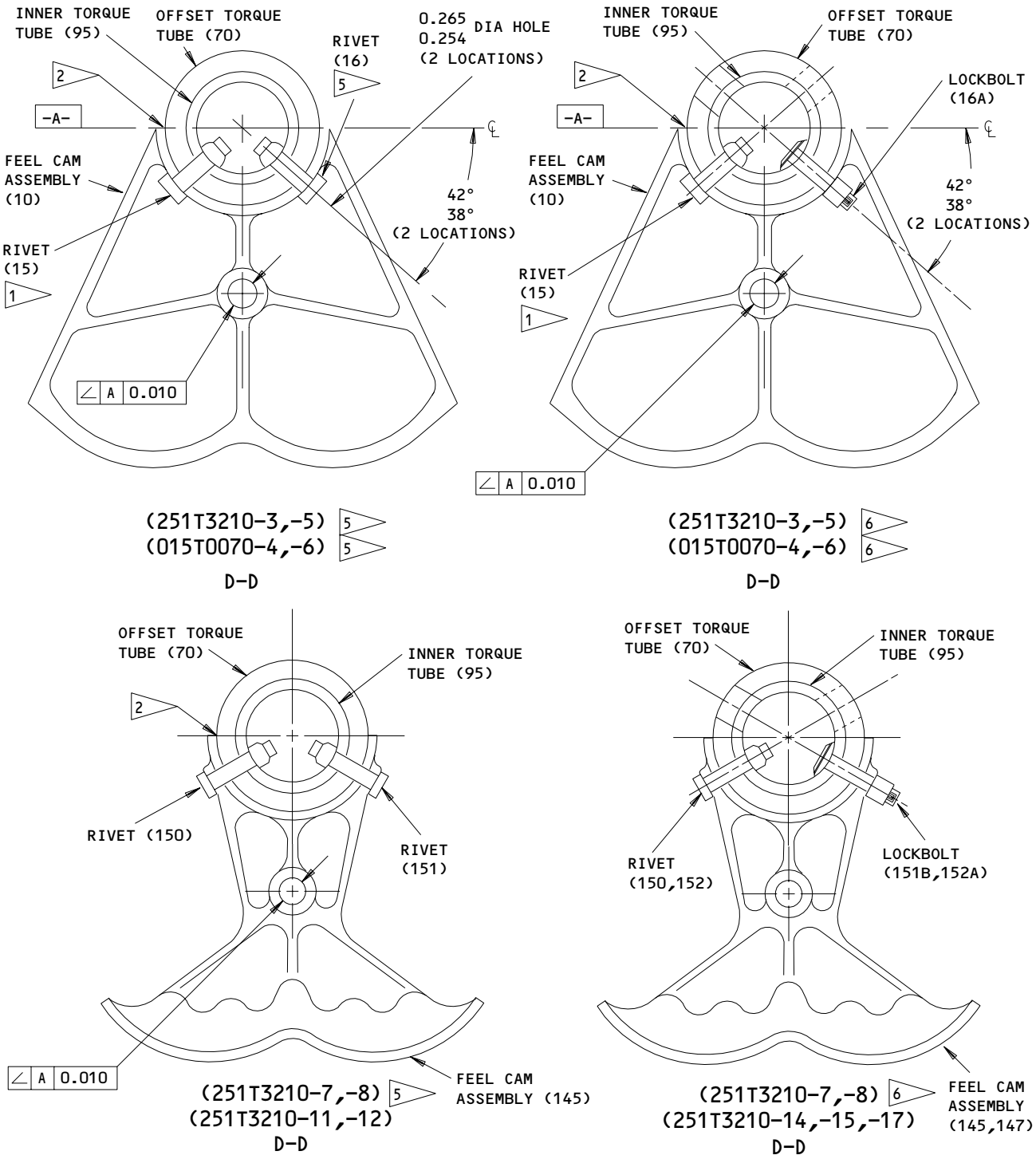

Offset Torque Tube Assembly
Figure 701 (Sheet 4)

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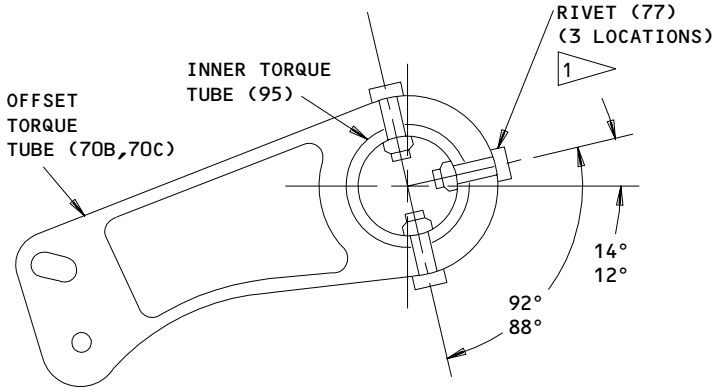
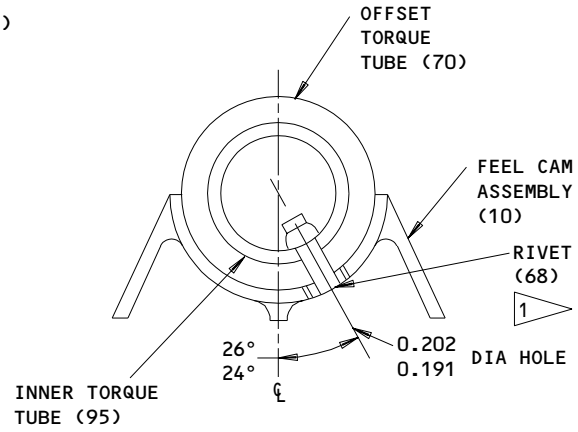


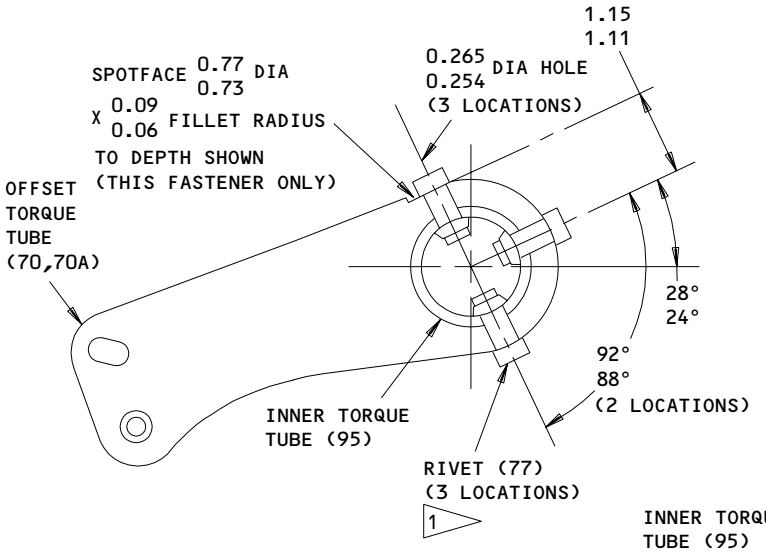
(251T3210-11,-12,-14,-15,-17)

F-F



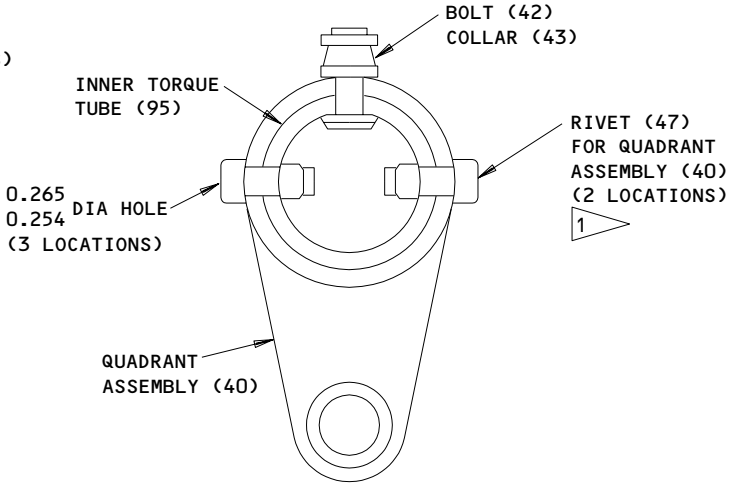
(251T3210-3,-4,-5)
(015T0070-4,-5,-6)

E-E



(251T3210-3,-5,-7,-8)
(015T0070-4,-6)

F-F



(251T3210-3,-5,-7,-8,-9,-11 THRU -15,-17)
(015T0070-4,-6)

G-G

Offset Torque Tube Assembly
Figure 701 (Sheet 5)

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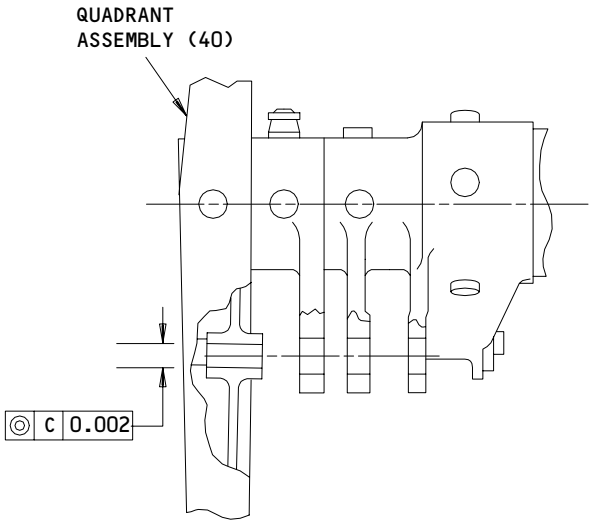
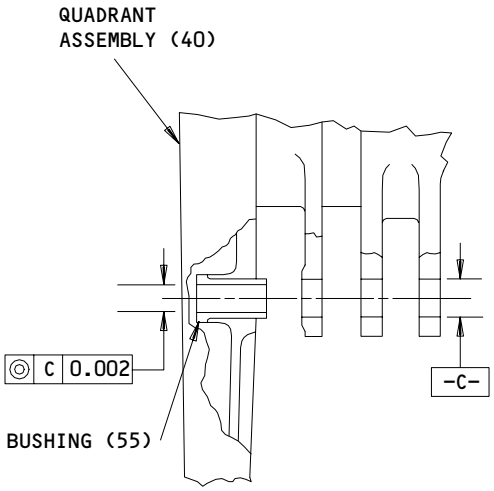
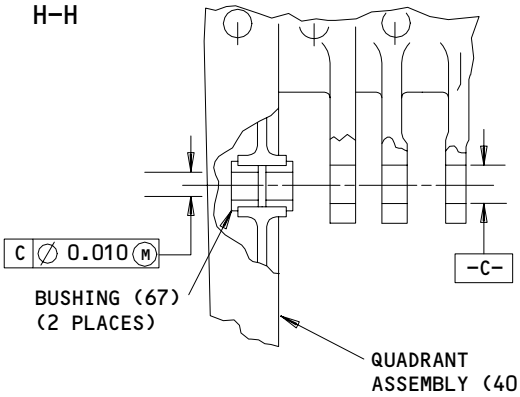


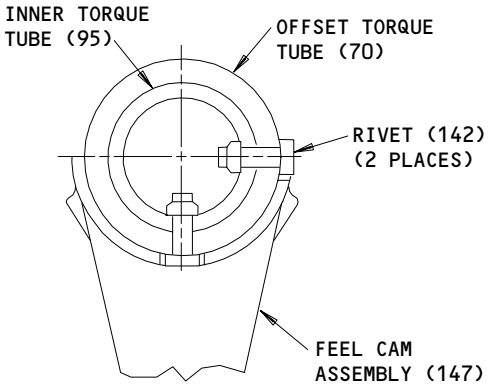
(251T3210-3,-8,-12,-15)
(015T0070-4)
H-H



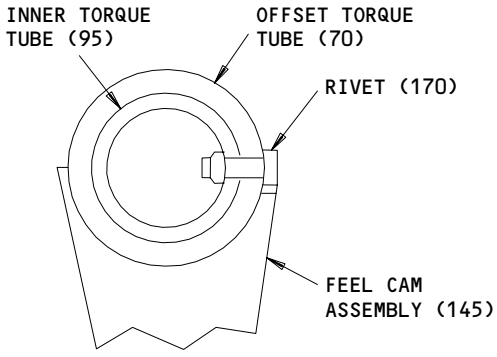
(251T3210-4,-9,-13)
(015T0070-5)
H-H



(251T3210-5,-7,-11,-14,-17)
(015T0070-6)
H-H



(251T3210-17)
I-I



(251T3210-7,-8,-11,-12,-14,-15)
J-J

Offset Torque Tube Assembly
Figure 701 (Sheet 6)

119949

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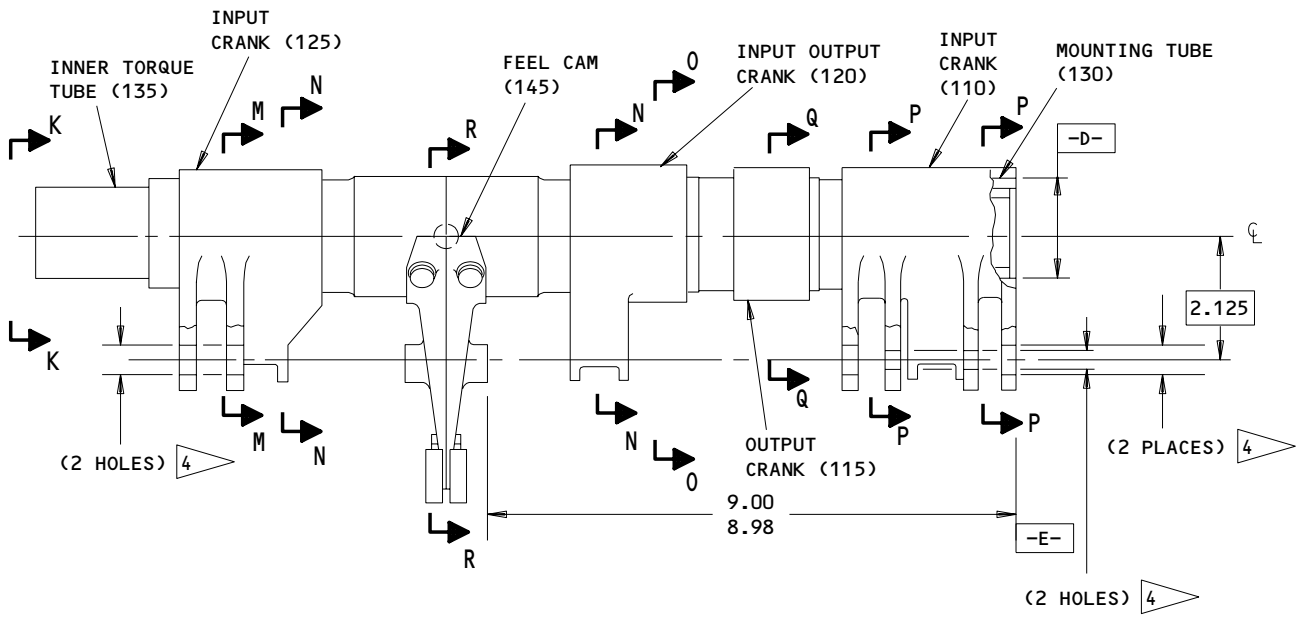
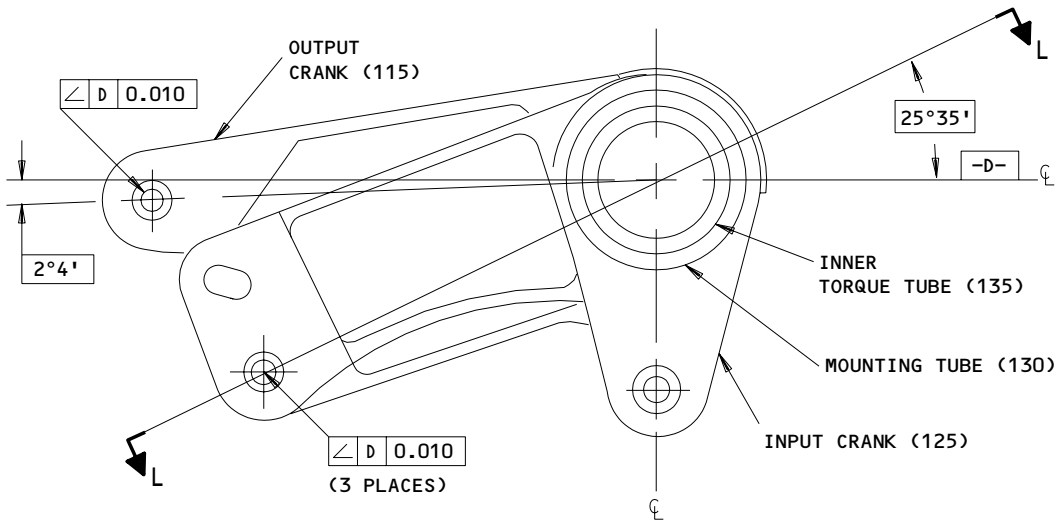


(251T3210-4,-9,-13)
(015T0070-5)
TORQUE TUBE ASSY (100)



(251T3210-4,-9,-13)
(015T0070-5)
K-K

ALL DIMENSIONS ARE IN INCHES

Offset Torque Tube Assembly
Figure 701 (Sheet 7)

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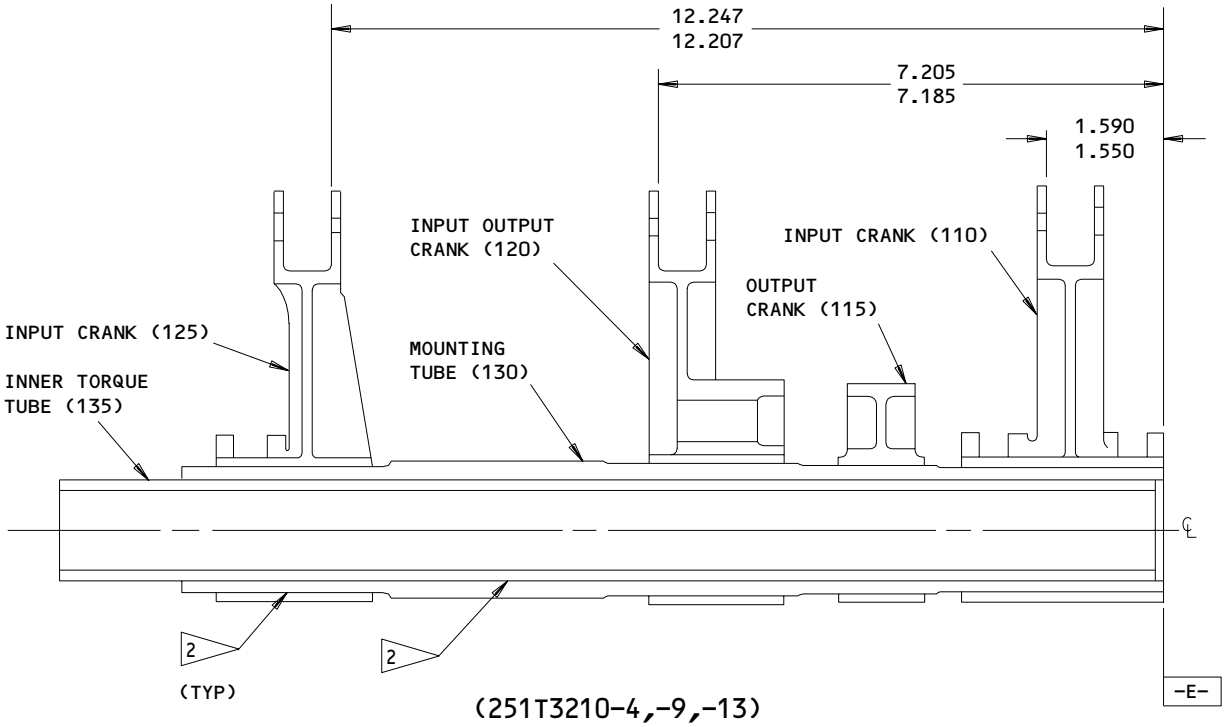
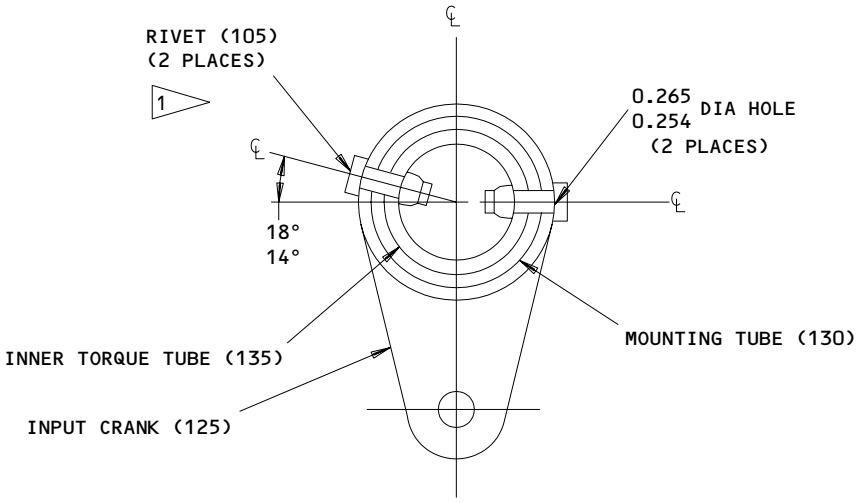


(251T3210-4,-9,-13)
(015T0070-5)

L-L



(251T3210-4,-9,-13)
(015T0070-5)

M-M

Offset Torque Tube Assembly
Figure 701 (Sheet 8)

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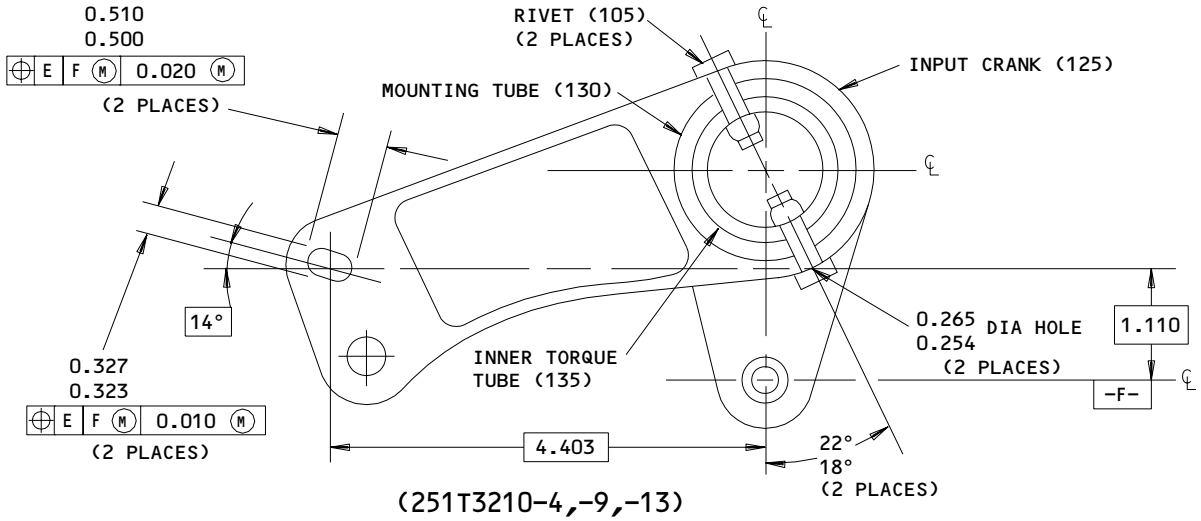
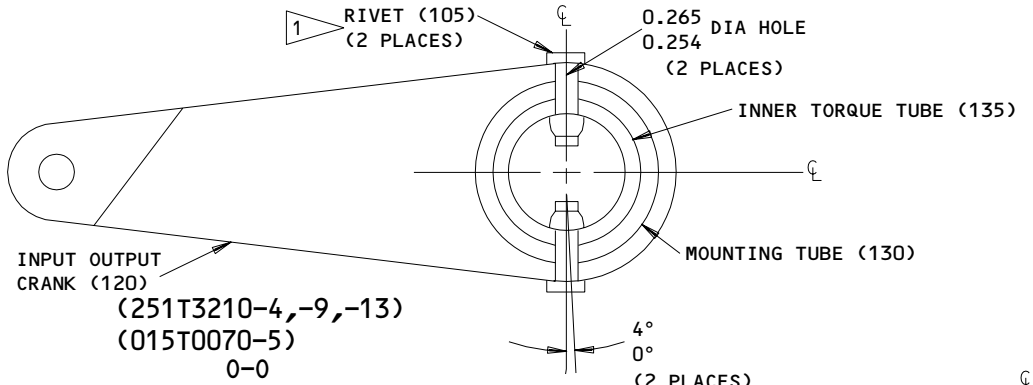
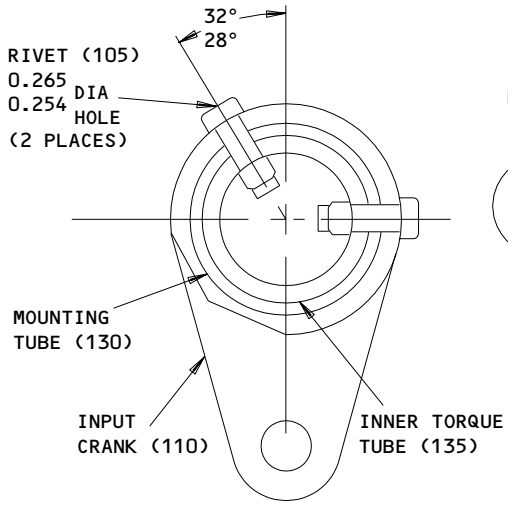


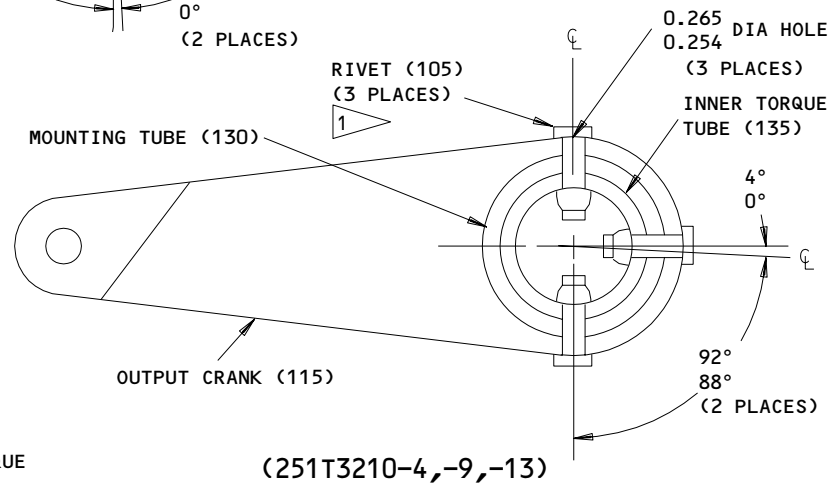
(251T3210-4,-9,-13)
(015T0070-5)
N-N



(251T3210-4,-9,-13)
(015T0070-5)
O-O



(251T3210-4,-9,-13)
(015T0070-5)
P-P



(251T3210-4,-9,-13)
(015T0070-5)
Q-Q

ALL DIMENSIONS ARE IN INCHES

Offset Torque Tube Assembly
Figure 701 (Sheet 9)

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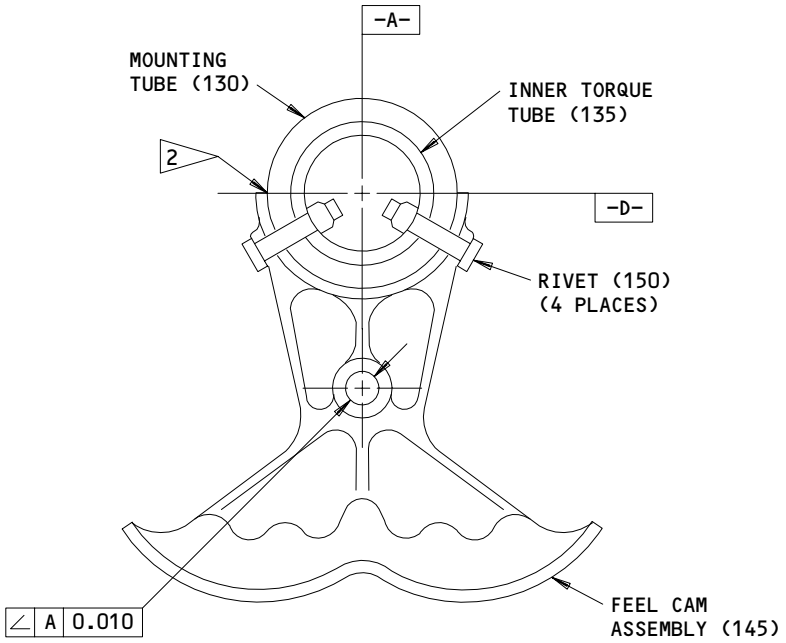

(251T3210-4,-9,-13)
(015T0070-5)
R-R

Offset Torque Tube Assembly
Figure 701 (Sheet 10)

119377

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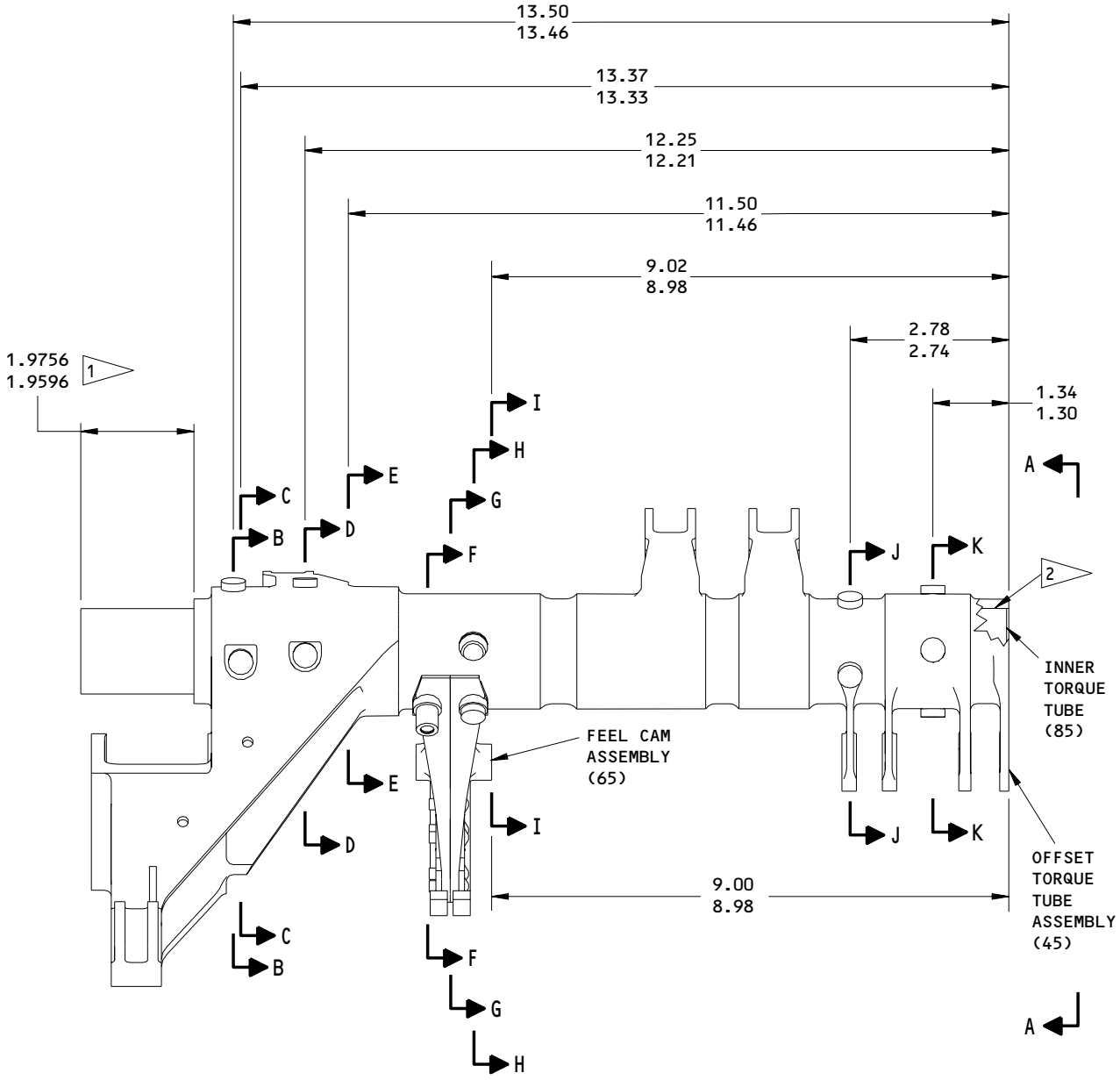

Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 702 (Sheet 1)

K88580

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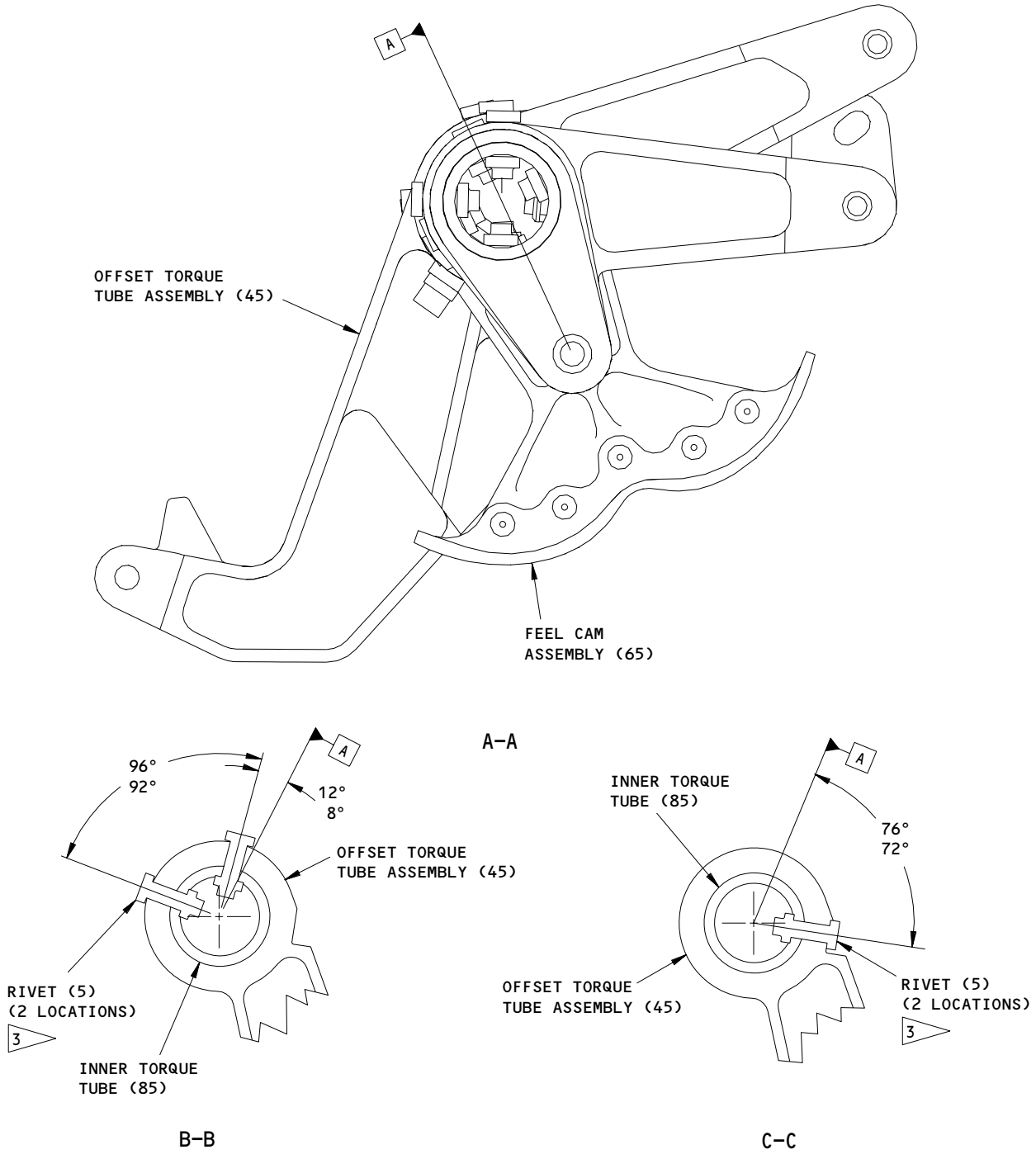

Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 702 (Sheet 2)

K88858

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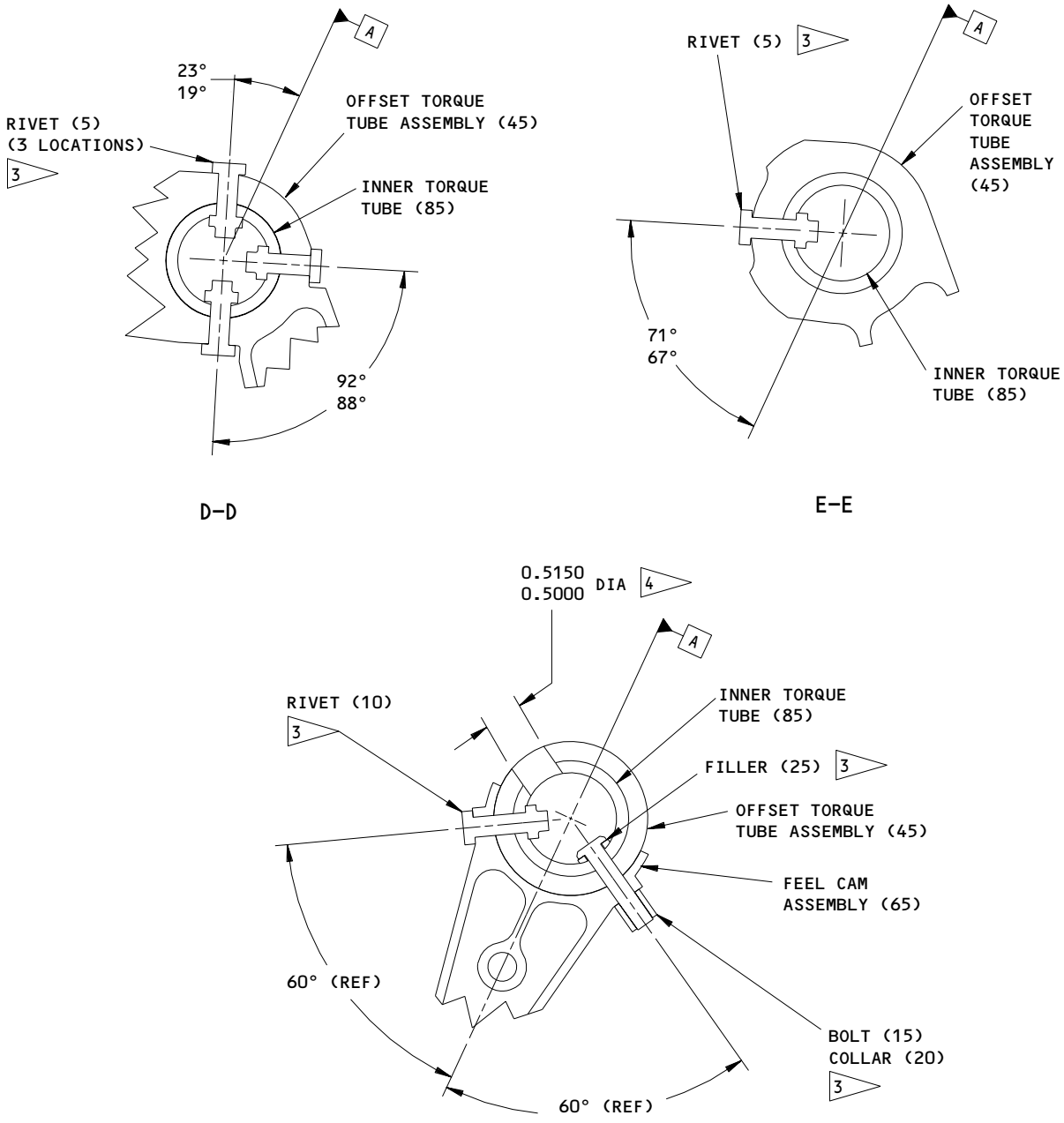

Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 702 (Sheet 3)

K88987

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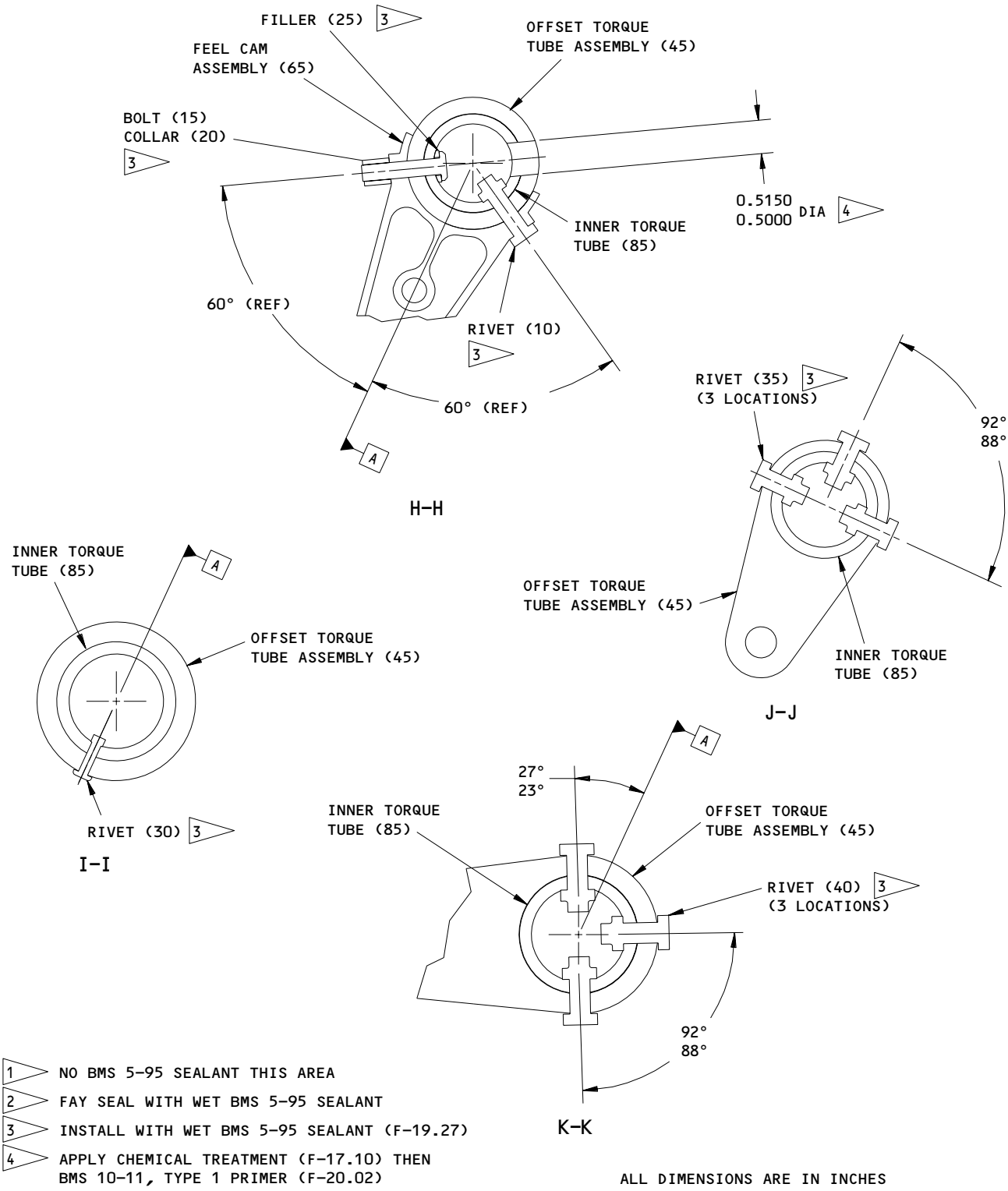

251T3210-18
Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 702 (Sheet 4)

K88992

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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

15653 KAYNAR MFG COMPANY INC KAYLOCK DIV
PO BOX 3001 800 SOUTH STATE COLLEGE BLVD
FULLERTON, CALIFORNIA 92634

22599 ESNA DIV OF AMERACE CORPORATION
16150 STAGG STREET
VAN NUYS, CALIFORNIA 91407

52828 REPUBLIC FASTENER MFG CORP
1300 RANCHO CONEJO BLVD
NEWBURY PARK, CALIFORNIA 91320

71087 BOOTS ACFT NUT DIV TOWNSEND CO SEE TEXTRON INC CHERRY FASTENER TOWNSEND DIV V11815

72962 ESNA DIV OF AMERACE CORP
2330 VAUXHALL ROAD
UNION, NEW JERSEY 07083

80539 SPS TECHNOLOGIES INC AEROSPACE PRODUCTS DIV
2701 SOUTH HARBOR BOULEVARD
SANTA ANA, CALIFORNIA 92702

92215 VOI-SHAN DIV OF VSI CORP
8463 HIGUERA STREET
CULVER CITY, CALIFORNIA 90230

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PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
BACB30FM8-5		1	42	1
BACB30NX8K12X		1	16A	2
		1	151B	2
		1	152C	2
BACB30UB8K12		1	152A	2
		1	152B	2
		2	15	2
BACC30BF8		1	153	2
		1	153A	2
		2	20	2
BACC30M8		1	43	1
BACC30X8		1	18	2
		1	151C	2
		1	153B	2
BACN10JN4		1	85	2
BACN10J4		2	60	2
BACR10BA3AD5		1	90	
BACR15BA()AD()C		2	55	4
BACR15BA3AD5		1	90A	4
BACR15DR4P7		1	142	2
		2	30	2
BACR15FT5KE		1	65	2
BRFM20A4		1	85	2
MF1000-4BAC		1	85	2
MS20615-5M		1	165	7
		2	75	7
MS20615-5M8		1	30	6
MS21141-0808P		1	15	2
		1	16	2
MS90354-0607		1	68	1
		1	170	1
MS90354-0805		1	47	2
		1	80	6
		2	35	3
MS90354-0807		1	75	3
		2	40	3
MS90354-0808		1	105	15
MS90354-0809		1	77	3
		2	5	7
MS90354-0811		1	45	2
		1	150	2
		1	151	2
		1	152	2
		1	151A	2
		2	10	2
NAS42DD5-18		1	60	2
NS103218-048		1	85	2

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PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
RMF9201M4		1	85	2
		1	85	2
T8124S4S		1	85	2
VN252A048		1	85	2
015T0070-4		1	1K	RF
015T0070-5		1	1L	RF
015T0070-6		1	1M	RF
251N3239-1		1	155	2
251N3241-1		1	160	2
		2	80	2
251N3258-1		1	155A	
251N3258-2		1	155B	
251T2125-4		1	140	1
251T3210-1		1	1	
251T3210-11		1	1H	RF
251T3210-12		1	1I	RF
251T3210-13		1	1J	RF
251T3210-14		1	1N	RF
251T3210-15		1	1P	RF
251T3210-16		1	154	2
		1	151D	2
		2	25	2
251T3210-17		1	1Q	RF
251T3210-18		1	1R	RF
		2	1A	RF
251T3210-2		1	1A	
251T3210-3		1	1B	RF
251T3210-4		1	1C	RF
251T3210-5		1	1D	RF
251T3210-7		1	1E	RF
251T3210-8		1	1F	RF
251T3210-9		1	1G	RF
251T3211-1		1	70	1
251T3211-3		1	70A	1
251T3211-4		1	70B	1
251T3211-5		1	70C	1
251T3211-6		2	45	1
251T3211-7		2	50	1
251T3212-1		1	95	1
		1	135	1
		2	85	1
251T3213-1		1	10	1
251T3213-3		1	10A	1
251T3214-1		1	25	1
251T3214-2		1	35	1
251T3214-5		1	25A	1
251T3214-6		1	35A	1

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PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
251T3215-10		1	40B	1
251T3215-11		1	50B	1
251T3215-13		1	50C	1
251T3215-14		1	40C	1
251T3215-15		1	50D	1
251T3215-16		1	40D	1
251T3215-17		1	50F	1
251T3215-18		1	40E	1
251T3215-6		1	40	1
251T3215-7		1	50	1
251T3215-8		1	40A	1
251T3215-9		1	50A	1
251T3227-1		1	55	1
251T3231-1		1	110	1
251T3231-2		1	110A	1
251T3232-1		1	115	1
251T3233-1		1	120	1
251T3234-1		1	125	1
251T3235-1		1	130	1
251T3236-1		1	100	1
251T3236-2		1	100A	1
251T3249-1		1	145	1
251T3257-1		1	147	1
		2	65	1
251T3258-1		1	155C	2
		2	70	2
251T3258-2		1	155D	2
		2	70A	2
251T3742-19		1	67	2
417T3210-16		1	19	2

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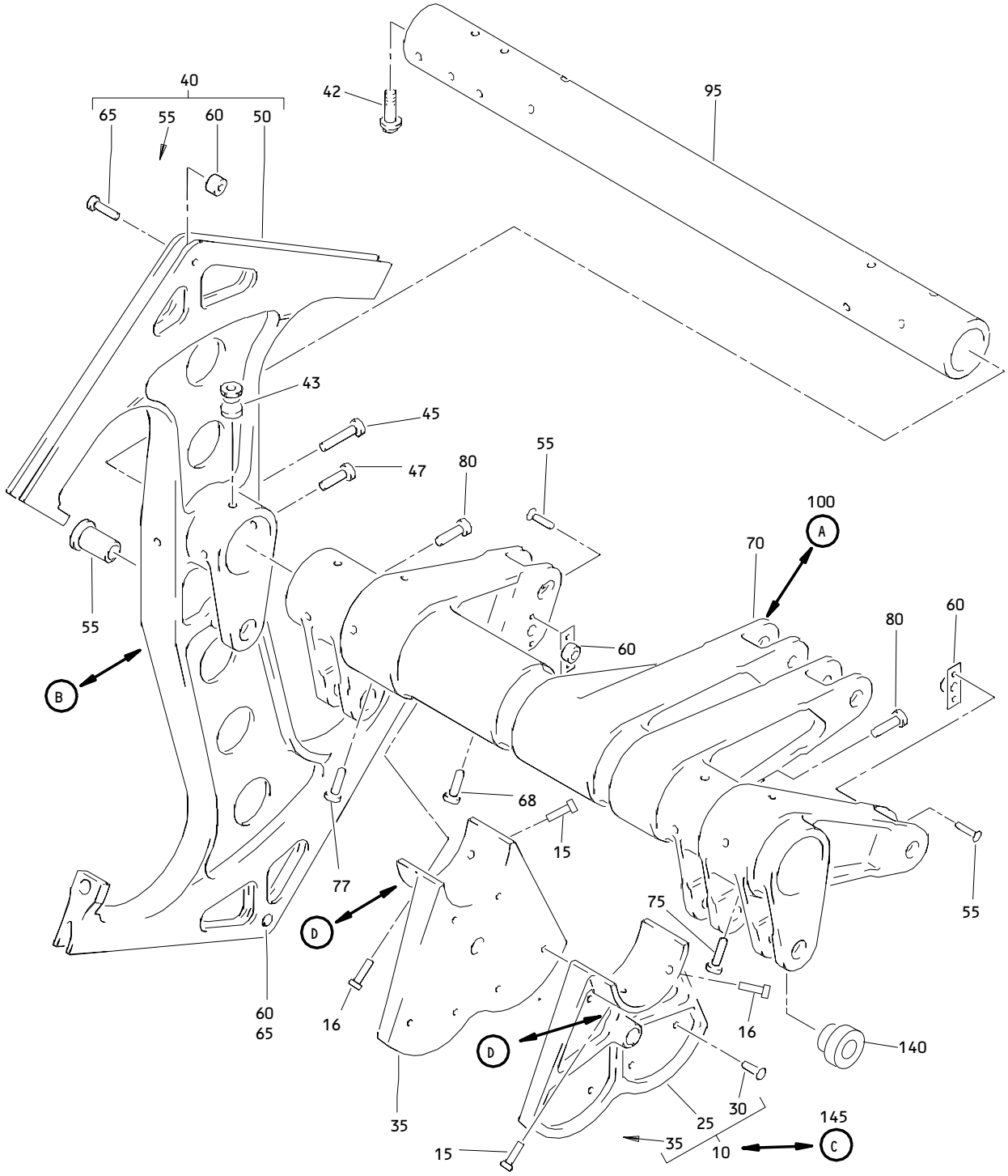

Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 1 (Sheet 1)

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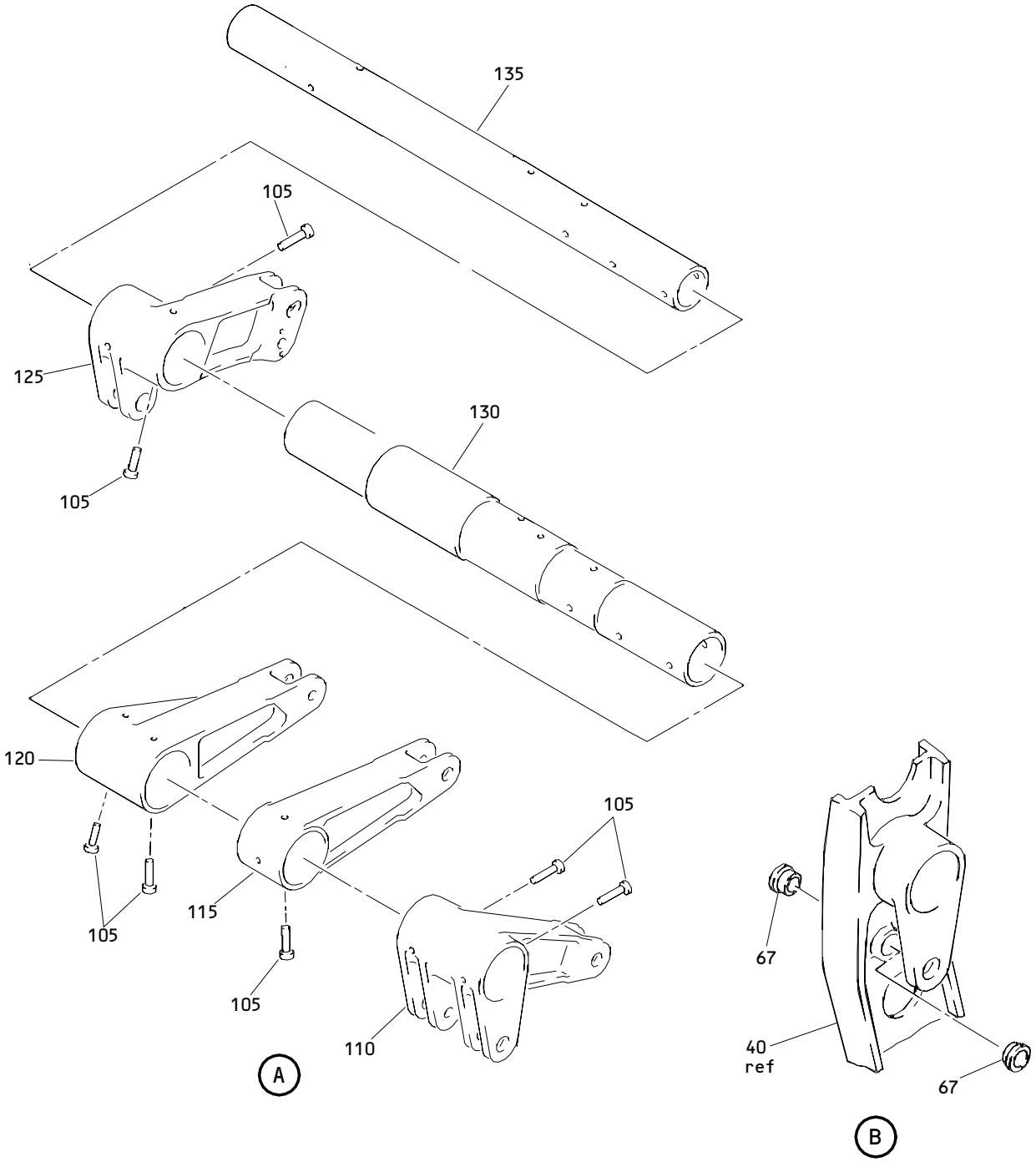

Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 1 (Sheet 2)

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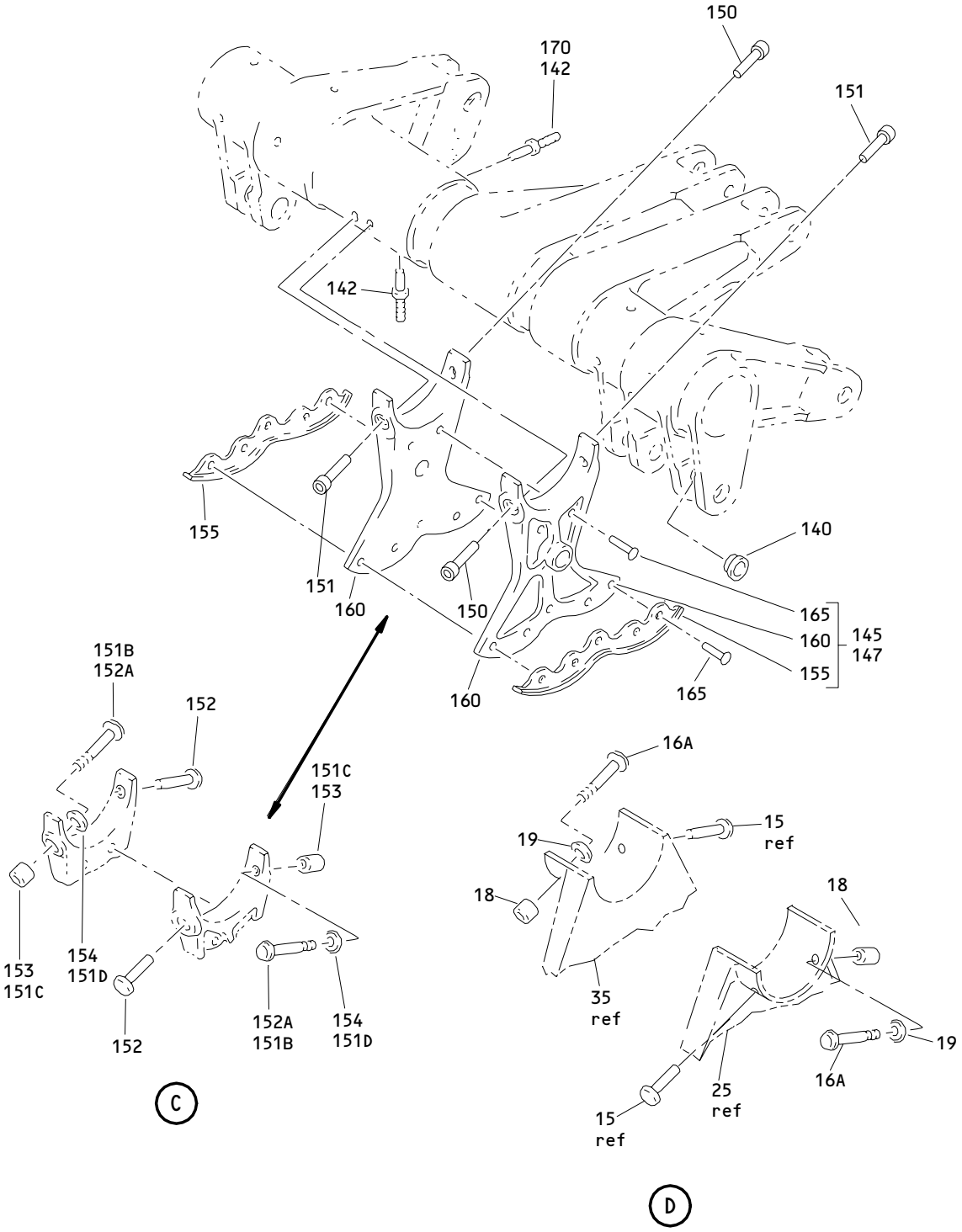

Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 1 (Sheet 3)

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
-1	251T3210-1		DELETED		
-1A	251T3210-2		DELETED		
-1B	251T3210-3		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (PRE SB 27-11, 27-15)	A	RF
-1C	251T3210-4		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (PRE SB 27-11, 27-15)	B	RF
-1D	251T3210-5		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (PRE SB 27-11, 27-15)	C	RF
-1E	251T3210-7		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-15) (PRE SB 27-11)	D	RF
-1F	251T3210-8		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-15) (PRE SB 27-11)	E	RF
-1G	251T3210-9		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-15) (PRE SB 27-11)	F	RF
-1H	251T3210-11		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-11) (PRE SB 27-73)	G	RF
-1I	251T3210-12		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-11) (PRE SB 27-73)	H	RF
-1J	251T3210-13		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-11)	I	RF
-1K	015T0070-4		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-11)	J	RF
-1L	015T0070-5		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-11)	K	RF

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
-1M	015T0070-6		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-11)	L	RF
-1N	251T3210-14		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-73)	M	RF
-1P	251T3210-15		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (POST SB 27-73)	N	RF
-1Q	251T3210-17		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM	O	RF
-1R	251T3210-18		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM (FOR DETAILS SEE FIG. 2)	P	RF
10	251T3213-1		.CAM ASSY-FEEL (OPT ITEM 10A)	ABC JKL	1
-10A	251T3213-3		.CAM ASSY-FEEL (OPT ITEM 10) ATTACHING PARTS	ABC JKL	1
15	MS21141-0808P		.RIVET	ABCJK L	2
16	MS21141-0808P		.RIVET (PRE SB 27-73)	ABCJK L	2
16A	BACB30NX8K12X		.BOLT (POST SB 27-73)	ACJL	2
18	BACC30X8		.COLLAR (POST SB 27-73)	ACJL	2
19	417T3210-16		.FILLER (POST SB 27-73) -------*-------	ACJL	2
25	251T3214-1		..CAM- *[1] (OPT ITEM 25A)		1
-25A	251T3214-5		..CAM- *[1] (OPT ITEM 25)		1
30	MS20615-5M8		..RIVET		6
35	251T3214-2		..CAM- *[1] (OPT ITEM 35A)		1
-35A	251T3214-6		..CAM- *[1] (OPT ITEM 35)		1
40	251T3215-6		.QUADRANT ASSY- (OPT ITEM 40A)	ABEF JK	1
-40A	251T3215-8		.QUADRANT ASSY- (OPT ITEM 40)	ABEF JK	1
-40B	251T3215-10		.QUADRANT ASSY	CDL	1

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
-40C	251T3215-14		.QUADRANT ASSY- (OPT ITEM 40D)	HIN	1
-40D	251T3215-16		.QUADRANT ASSY- (OPT ITEM 40C)	HIN	1
-40E	251T3215-18		.QUADRANT ASSY ATTACHING PARTS	GMO	1
42	BACB30FM8-5		.BOLT		1
43	BACC30M8		.COLLAR		1
45	MS90354-0811		.RIVET		2
47	MS90354-0805		.RIVET -------*-------		2
50	251T3215-7		..QUADRANT- (USED ON ITEM 40)		1
-50A	251T3215-9		..QUADRANT- (USED ON ITEM 40A)		1
-50B	251T3215-11		..QUADRANT (USED ON ITEM 40B)		1
-50C	251T3215-13		..QUADRANT- (USED ON ITEM 40C)		1
-50D	251T3215-15		..QUADRANT- (USED ON ITEM 40D)		1
-50F	251T3215-17		..QUADRANT (USED ON ITEM 40E)		1
55	251T3227-1		..BUSHING- (USED ON ITEM 40A AND 40D)		1
60	NAS42DD5-18		..SPACER		2
65	BACR15FT5KE		..RIVET		2
67	251T3742-19		.BUSHING	CDGLMO	2
68	MS90354-0607		.RIVET	ABCJKL	1
70	251T3211-1		.TUBE-OFFSET TORQUE	AEJ	1
-70A	251T3211-3		.TUBE-OFFSET TORQUE	CDL	1
-70B	251T3211-4		.TUBE-OFFSET TORQUE	GMO	1
-70C	251T3211-5		.TUBE-OFFSET TORQUE	HN	1

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
75	MS90354-0807		.RIVET	ACDEG HJLMN O	3
77	MS90354-0809		.RIVET	ACDEG HJLMN O	3
80	MS90354-0805		.RIVET		6
85	T8124S4S		.NUTPLATE- (V71087) (SPEC BACN10JN4) (OPT BRFM20A4 (V52828)) (OPT MF1000-4BAC (V15653)) (OPT NS103218-048 (V80539)) (OPT RMF9201M4 (V22599)) (OPT RMF9201M4 (V72962)) (OPT VN252A048 (V92215))		2
90	BACR10BA3AD5		.DELETED		
90A	BACR15BA3AD5		.RIVET		4
95	251T3212-1		.TUBE-INNER TORQUE	ACDE GHJL MNO	1
100	251T3236-1		.TUBE ASSY-TORQUE	BFK	1
-100A	251T3236-2		.TUBE ASSY-TORQUE	I	1
105	MS90354-0808		..RIVET	BFIK	15
110	251T3231-1		..CRANK-INPUT	BFK	1
-110A	251T3231-2		..CRANK-INPUT	I	1
115	251T3232-1		..CRANK-OUTPUT	BFIK	1
120	251T3233-1		..CRANK-INPUT OUTPUT	BFIK	1
125	251T3234-1		..CRANK-INPUT	BFIK	1
130	251T3235-1		..TUBE-MTG	BFIK	1
135	251T3212-1		..TUBE-INNER TORQUE	BFIK	1
140	251T2125-4		.BUSHING	G-NO	1
142	BACR15DR4P7		.RIVET	O	2
145	251T3249-1		.FEEL CAM ASSY-RUDDER CONT	D-IMN	1
147	251T3257-1		.FEEL CAM ASSY-RUDDER CONT ATTACHING PARTS	O	1

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
150	MS90354-0811		.RIVET	D-I	2
151	MS90354-0811		.RIVET	FGHI	2
-151A	MS90354-0811		.RIVET (PRE SB 27-73)	DE	2
151B	BACB30NX8K12X		.LOCKBOLT (POST SB 27-73)	DE	2
151C	BACC30X8		.COLLAR (POST SB 27-73)	DE	2
151D	251T3210-16		.FILLER (POST SB 27-73)	DE	2
152	MS90354-0811		.RIVET	MNO	2
152A	BACB30UB8K12		.LOCKBOLT	O	2
-152B	BACB30UB8K12		.LOCKBOLT (LIMITED)	MN	2
-152C	BACB30NX8K12X		.LOCKBOLT (LIMITED) (POST SB 27-73)	MN	2
153	BACC30BF8		.COLLAR	O	2
-153A	BACC30BF8		.COLLAR (LIMITED)	MN	2
-153B	BACC30X8		.COLLAR (LIMITED) (POST SB 27-73)	MN	2
154	251T3210-16		.FILLER -------*-------	MNO	2
155	251N3239-1		..RAIL-FEEL CAM	D-IMN	2
-155A	251N3258-1		DELETED		
-155B	251N3258-2		DELETED		
-155C	251T3258-1		..RAIL-FEEL CAM (OPT ITEM 155D)	O	2
-155D	251T3258-2		..RAIL-FEEL CAM (OPT ITEM 155C)	O	2
160	251N3241-1		..BODY-FEEL CAM	D-IMN O	2
165	MS20615-5M		..RIVET	D-IMN O	7
170	MS90354-0607		.RIVET	D-IMN	1

*[1] FEEL CAMS ARE ROUGH-MACHINED PARTS. CAM PROFILE AND MOUNTING HOLES ARE MACHINED AFTER ASSEMBLY.

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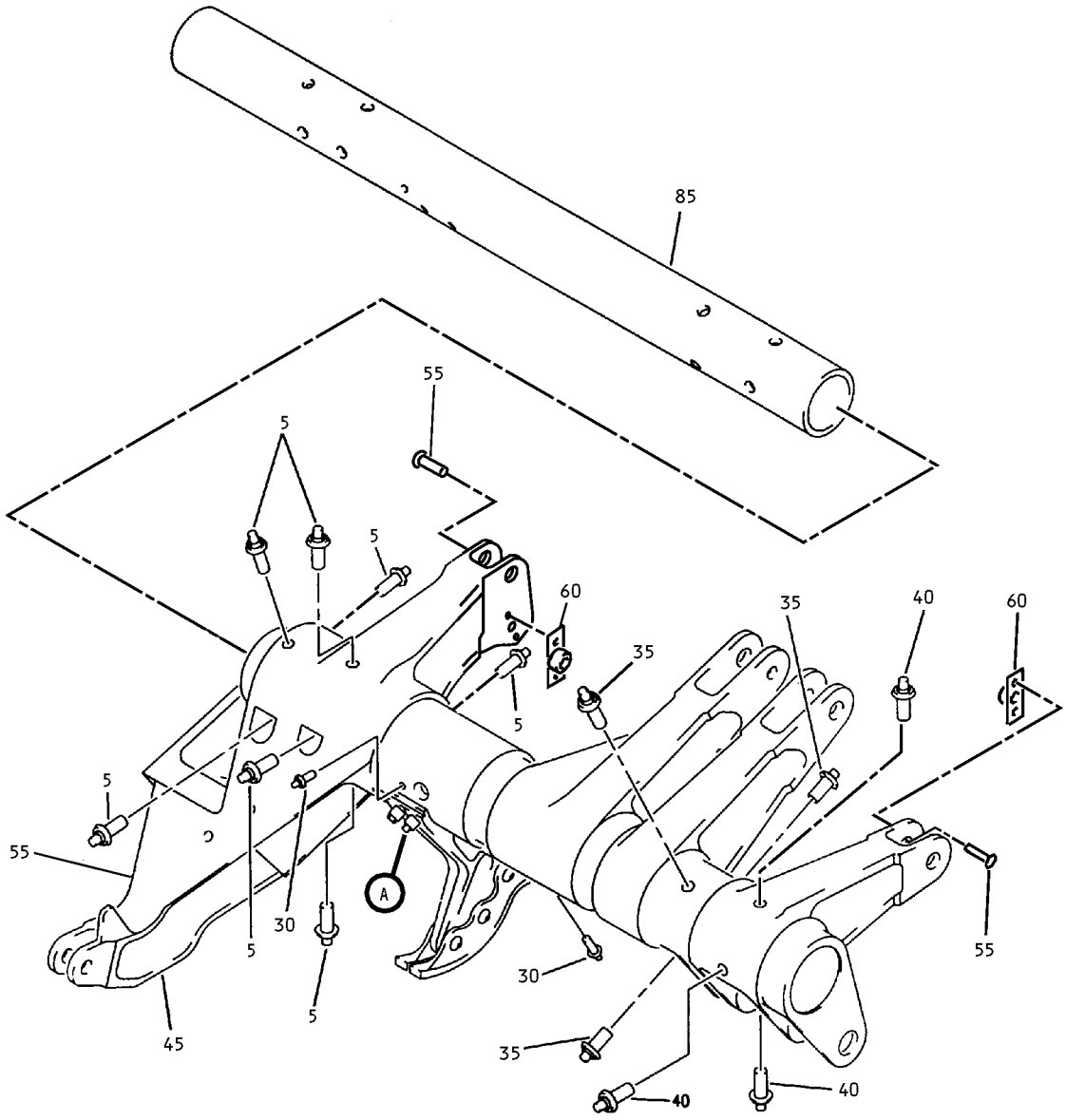

Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 2 (Sheet 1)

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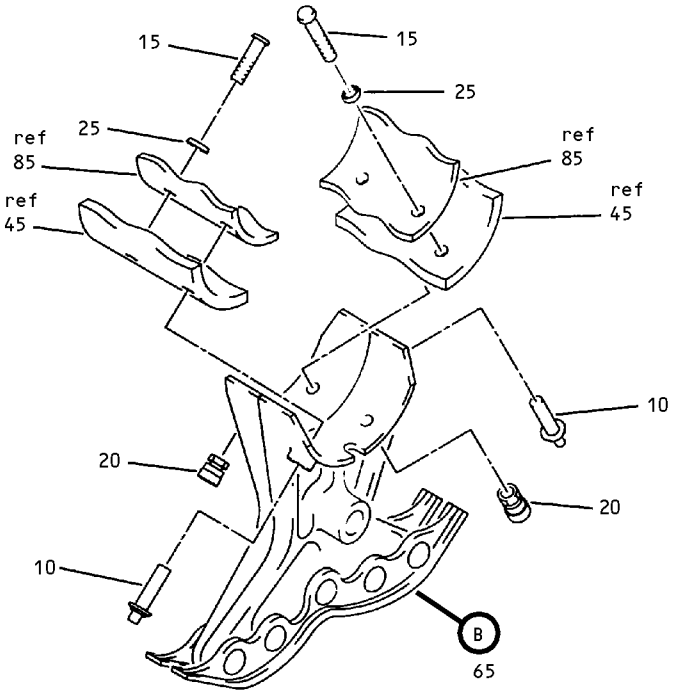
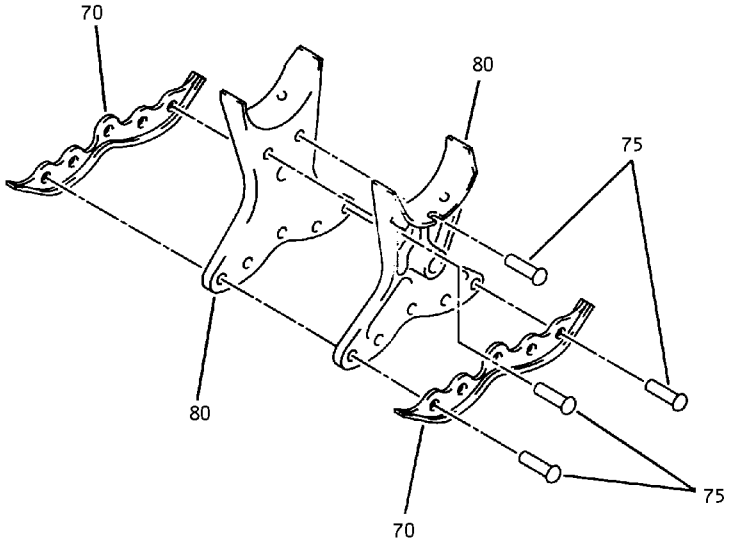


A



B

Rudder Control Feel and Trim Offset Torque Tube Assembly
Figure 2 (Sheet 2)

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
02-					
-1A	251T3210-18		OFFSET TORQUE TUBE ASSY-RUD CONT FEEL AND TRIM	P	RF
5	MS90354-0809		.RIVET	P	7
10	MS90354-0811		.RIVET	P	2
15	BACB30UB8K12		.BOLT	P	2
20	BACC30BF8		.COLLAR	P	2
25	251T3210-16		.FILLER-RADIUS	P	2
30	BACR15DR4P7		.RIVET	P	2
35	MS90354-0805		.RIVET	P	3
40	MS90354-0807		.RIVET	P	3
45	251T3211-6		.TUBE-OFFSET TORQUE ASSY	P	1
50	251T3211-7		..TUBE-OFFSET TORQUE		1
55	BACR15BA()AD()C		..RIVET		4
60	BACN10J4		..NUTPLATE		2
65	251T3257-1		.FEEL CAM ASSY-RUDDER	P	1
70	251T3258-1		..RAIL-FEEL CAM (OPT ITEM 70A)		2
-70A	251T3258-2		..RAIL-FEEL CAM (OPT ITEM 70)		2
75	MS20615-5M		..RIVET *[1]		7
80	251N3241-1		..BODY-FEEL CAM		2
85	251T3212-1		.TUBE-INNER TORQUE	P	1

*[1] SIZE AND LENGTH TO BE DETERMINED ON INSTALLATION.

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