TO: ALL HOLDERS OF NOSE WHEEL STEERING CYLINDER ASSEMBLY OVERHAUL MANUAL, 32-50-11

REVISION NO. 32, DATED NOV 1/07

HIGHLIGHTS

| DESCRIPTION OF CHANGE | TOPICS AFFECTED | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D&O | D/Assy | Cleaning | Insp/Chk | Repair | Assy | F/C | Test | T/Shooting | S/Tools | Storage | IPL | L/Overhaul |
| Added the aluminum alloy types of barrels 65-44711-1, -5, to tell them apart | | | | | X | | | | | | | | |

# NOSE WHEEL STEERING CYLINDER ASSEMBLY

# 32-50-11

BOEING P/N 65-44710-2 thru -9

AIRLINE P/N

THE FOLLOWING DIRECTIVES APPLY TO THIS SUBJECT:

| BOEING SERVICE BULLETIN | BOEING TEMPORARY REVISION | OTHER DIRECTIVES | DATE DIRECTIVE INCORPORATED INTO TEXT |
|---|---|---|---|
| | | PRR 30668 | Feb 15/69 |
| 32-1039 | | PRR 31782 | Jun 10/71 |
| | | PRR 31941 | Jun 10/71 |
| | | MC 3250MP3011 | Sep 1/96 |
| | | PRR 35005-153 | Sep 1/96 |
| | | 737-SL-29-037-A | Mar 1/01 |

LIST OF EFFECTIVE PAGES

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

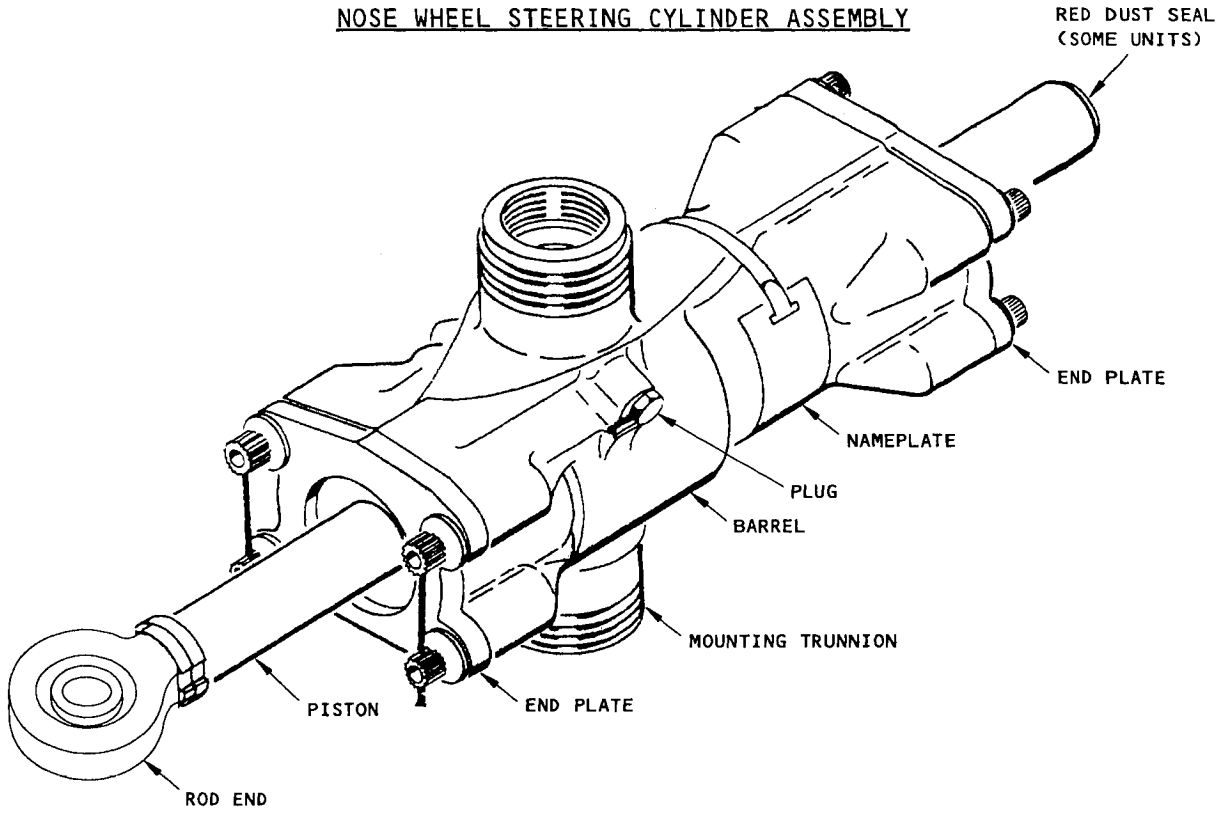
| | PAGE | DATE | PAGE | DATE | PAGE | DATE |
|---|---|---|---|---|---|---|
| | 32-50-11 | | 902 | BLANK | | |
| | T-1 | Nov 1/02 | 1001 | Sep 1/96 | | |
| | T-2 | BLANK | 1002 | BLANK | | |
| * | LEP-1 | Nov 1/07 | 1101 | Sep 1/96 | | |
| | LEP-2 | BLANK | 1102 | Jul 1/04 | | |
| | T/C-1 | Sep 1/96 | 1103 | Mar 1/01 | | |
| | T/C-2 | BLANK | 1104 | Mar 1/03 | | |
| | 1 | Jul 1/04 | 1105 | Mar 1/03 | | |
| | 2 | BLANK | 1106 | Mar 1/03 | | |
| | 101 | Mar 1/03 | | | | |
| | 102 | BLANK | | | | |
| | 301 | Sep 1/96 | | | | |
| | 302 | BLANK | | | | |
| | 401 | Sep 1/96 | | | | |
| | 402 | Nov 1/01 | | | | |
| | 403 | Mar 1/00 | | | | |
| | 404 | Nov 1/01 | | | | |
| | 405 | Mar 1/06 | | | | |
| | 406 | Sep 1/96 | | | | |
| | 407 | Nov 1/00 | | | | |
| | 408 | Sep 1/96 | | | | |
| | 408A | Jul 1/02 | | | | |
| | 408B | Jul 1/02 | | | | |
| | 408C | Nov 1/01 | | | | |
| | 408D | Mar 1/02 | | | | |
| * | 409 | Nov 1/07 | | | | |
| | 410 | Sep 1/96 | | | | |
| | 411 | Jul 1/02 | | | | |
| | 412 | Jul 1/02 | | | | |
| | 413 | Jun 1/97 | | | | |
| | 414 | Jun 1/97 | | | | |
| | 415 | Jul 1/04 | | | | |
| | 416 | BLANK | | | | |
| | 501 | Nov 1/06 | | | | |
| | 502 | Nov 1/06 | | | | |
| | 601 | Sep 1/96 | | | | |
| | 602 | Sep 1/96 | | | | |
| | 701 | Jul 1/01 | | | | |
| | 702 | Nov 1/01 | | | | |
| | 703 | Jul 1/04 | | | | |
| | 704 | BLANK | | | | |
| | 801 | Sep 1/96 | | | | |
| | 802 | BLANK | | | | |
| | 901 | Sep 1/96 | | | | |

TABLE OF CONTENTS



*[1] Special instructions are not necessary. Use standard industry practices and the instructions in SOPM 20-30-01 and 20-30-03.

NOSE WHEEL STEERING CYLINDER ASSEMBLY




Nose Wheel Steering Cylinder Assembly
Figure 1

## DESCRIPTION AND OPERATION

1. The nose wheel steering cylinder is a hydraulic actuator which includes a barrel with mounting trunnions and a piston. Hydraulic pressure extends and retracts the steering cylinder to adjust the direction of the nose wheel.

2. Leading Particulars (Approximate)

   Hydraulic Fluid -- BMS 3-11
   Operating Pressure -- 3000 psi
   Proof Pressure -- 4500 psi
   Length (between trunnion centerline and rod end bearing centerline)
      Extended -- 12.8 inches
      Retracted -- 6.0 inches
      Stroke -- 6.8 inches
      Weight -- 16 pounds

## DISASSEMBLY

1. Remove all lockwiring and port plugs, if installed.

2. Drain all hydraulic fluid from actuator assembly.

3. Bend up the tang of cup lockwasher (4, Fig. 1101) and remove rod end (1) with wrench F71313-11. Hold piston rod (17) with Allen adapter F80202-1 while you remove the rod end to help prevent damage. Remove cup lockwasher (4).

4. Remove bolts (24) and washers (25).

5. Remove end plates (5), seals (8), packings (9) (if applicable), scrapers (12), retainers (13) and bearings (14, 14A) (as applicable) from piston (17).

6. Remove backup rings (10) and packings (11) from bearings (14).

7. Pull out piston (17) from barrel (18) and remove cap ring (6) and packing (7). If applicable , remove the red dust seal (30) from the piston, because the Allen socket in the end of the piston must be used during assembly.

8. Remove plugs (21), backup rings (22) and packing (23) from barrel (18).

9. Remove plugs (26) and packings (27) from barrel (18).

10. Remove nameplate (28) and strap (29) from barrel (18).

INSPECTION/CHECK

1. Examine all parts for obvious defects by standard industry practices. Refer to Fits and Clearances for design dimensions and wear limits.

2. Magnetic particle examine rod end (3), end plate (5) and piston (17) per SOPM 20-20-01.

3. Penetrant examine barrel (20) per SOPM 20-20-02.

## REPAIR

1. Repair (Fig. 1101)

   A. Repair small defects by standard industry practices. Refer to Fits and Clearances for design dimensions and wear limits. Refer to SOPM 20-10-01, 20-10-02, and CMM 32-00-05 for repair of high strength steel parts.

   B. Piston (17) (Fig. 401)

      (1) Machine OD of seal retention area or rod surfaces as required, within repair limits to remove defects.

      (2) Shot peen as indicated.

      (3) Build up machined areas with chrome plate and grind to design dimensions and finish.

   C. Barrel (20) (Fig. 404)

      (1) Trunnion bearing area

         (a) Machine as required, within repair limits, to remove defects.

         (b) Build up with plasma flame spray BMS 10-67, Type 10 per SOPM 20-10-05.

         (c) Machine to design dimensions and finish.

         (d) Apply primer, BMS 10-11, Type 1 to entire area and wipe off while wet.

      (2) Relief groove at trunnion thread

         (a) Machine as required, within repair limits, to remove defects.

         (b) Restoration to design dimensions is not required. Refinish repaired surfaces. Apply primer per step (1)(d).

      (3) Threads for plug (26) -- Cut the threads larger as shown for the larger plug (26) and the related larger packing (27). Identify the barrel as necessary.

(4) Bore -- Installation of steel sleeve (20K)

NOTE: This repair is applicable only to 65-44711-5 barrels. It can be used if the worn bore is not larger than the bore repair limits. Barrels 65-44711-1 cannot be repaired by this method and thus must be replaced.

(a) Machine the bore oversize as shown. The bore can be machined to let you install the sleeve from the end shown, or from the opposite end.

(b) Hone the bore as indicated for an interference fit with sleeve (20K). Keep the barrel and the sleeve together as a matched set.

(c) Vapor degrease, alkaline or solvent clean the barrel (SOPM 20-30-03). Flush all passages to make sure all chips are removed.

(d) Penetrant examine the bore (SOPM 20-20-02).

(e) Chemical treat the machined surfaces (SOPM 20-43-03).

(f) Heat the barrel to 250 degrees and cool the sleeve to -65°F; then install the sleeve in the barrel. Make sure the sleeve flange is against the shoulder of the bore as shown.

(g) Let this assembly cool to room temperature. Then make a check of the bore dimensions and machine them as necessary to design dimensions and finish.

(h) Identify the parts with 65C31398-series part numbers as indicated in the parts list.

(5) Bore ends, for installation of larger bearings (14) 65C31398-3.

NOTE: This repair is applicable only to 65-44711-5 barrels. It can be used if the worn bore is not larger than the bore repair limits. Barrels 65-44711-1 cannot be repaired by this method and thus must be replaced.

(a) Machine the end bore(s) oversize as shown. Be careful to use the shorter depth if the flange of the bore sleeve is not at this end, or if there is no bore sleeve installed in this barrel.

(b) Penetrant examine (SOPM 20-20-02).

(c) Chemical treat the machined surfaces (SOPM 20-43-03).

(d) Include a note with the barrel to install the larger 65C31398-3 bearing (14) at the end(s) repaired by this procedure.

(6) 2.157-18UNS-3A Trunnion Threads

(a) Smoothly blend out as required to remove defects. Make the blends have a minimum width to depth ratio of 5. Do not blend deeper than 0.015 inch below the 2.0888 inch minor dia of this thread size. Keep the surface finish 63 microinches or smoother.

(b) Remove rough edges from the threads with the die for this thread size.

(c) Remove sharp edges to 0.003 minimum radius.

(d) Glass bead peen the threads and the blended areas per SOPM 20-10-03. Use 0.0165-0.0232 bead size and 0.004-0.007 A2 intensity.

(e) Penetrant examine per SOPM 20-20-02.

(f) Chemical treat per SOPM 20-43-03 or chromic acid anodize per SOPM 20-43-01.

(g) After this blend repair, there must be a minimum of three continuous complete threads. The three continuous complete threads must be within the innermost 9 threads on each side of the barrel. A complete thread is a thread which goes the full 360 degrees around the circumference.

D. Rod end (3) (Fig. 402)

(1) Machine bore as required, within repair limits, to remove defects.

(2) Shot peen as indicated.

(3) Build up machined surface with chrome plate and grind to design dimensions and finish.

E. End plate (5) (Fig. 408)

(1) Machine as required, within repair limits, to remove defects.

(2) Magnetic particle examine.

(3) Shot peen as indicated.

(4) Refinish as indicated.

2. Refinish (Fig. 1101)

NOTE: Refer to SOPM 20-30-02 for stripping of protective finishes and to SOPM 20-41-01 for explanation of F and SRF finish codes.

A. Rod end (3) -- Fig. 402

B. End plate (5) -- Fig. 408

C. Seal retainer (13) -- Fig. 403

D. Bearing (16) -- Fig. 407

E. Piston (17) -- Fig. 401

F. Barrel (20) -- Fig. 404

G. Nose Wheel Steering Cylinder Assy 65-44710-6 -- Fig. 406

3. Replacement (Fig. 1101)

   A. Replace O-rings (7, 9, 11, 23, 27), backup rings (10 and 22), scraper ring seal (12), seal (8), cup lockwasher (4), and cap ring (6) at each overhaul.

   B. Bearing (2) -- Apply a thin layer of grease to the OD of the replacement bearing and the ID of the terminal on rod end (3). Install the bearing and roller swage it Type 3 per SOPM 20-50-03.

   C. Bushing (15) -- Install by the shrink fit method and roller swage per SOPM 20-50-03 and as shown in Fig. 407.

   D. Nameplate (28) -- Steel stamp serial number and part number on the replacement nameplate. Bend the nameplate to fit the OD of the barrel. Install strap (29).

   E. Seal retainers (13) -- Replace if defective.

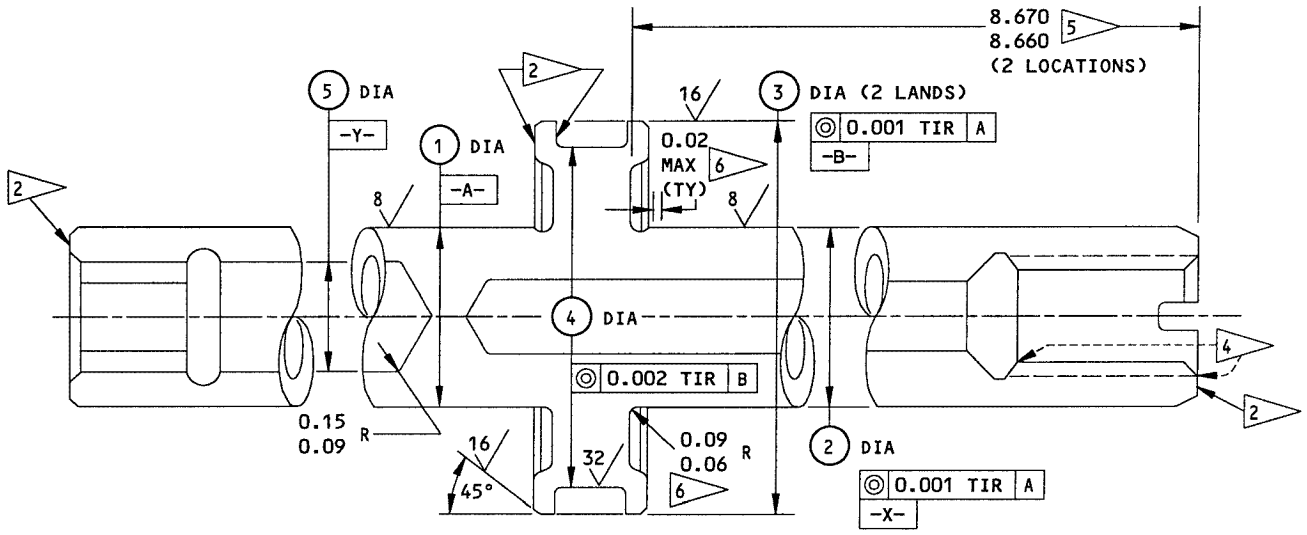
   F. Inserts (19) -- Remove the defective insert. Install a replacement insert with wet primer, BMS 10-11, type 1, 3/4 to 1 1/2 turns below surface. Remove tang.

4. Materials

   NOTE: Equivalent substitutes can be used.

   A. Primer -- BMS 10-11, Type 1 (SOPM 20-60-02)

   B. Grease -- BMS 3-33 or MIL-G-23827 (SOPM 20-60-03)




| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DESIGN DIM | 1.185<br>1.183 | 1.185<br>1.183 | 2.618<br>2.616 | 2.248<br>2.246 | 0.82<br>0.79 |
| REPAIR LIMIT | 1.163<br>1 | 1.163<br>1 | 2.596<br>1 | — | 0.938<br>7 |

REFINISH

CHROME PLATE (F-1.90, WHICH REPLACES F-1.842) DIAS -A-, -B-, -X-, AND CHAMFERS, 0.003-0.005 THICK, WITH PLATING RUNOUT AS SHOWN BY 2. PISTON 65-44712-1, CADMIUM PLATE AREA AS SHOWN BY 4. ON PISTON 65-44712-2, PASSIVATE (F-17.25, WHICH REPLACES F-17.09) OTHER AREAS.

ON PISTON 65-44712-1, ON OTHER INTERIOR SURFACES, APPLY PRIMER BMS 10-11, TYPE 1 (SRF-12.206) AND THEN (OPTIONAL) BMS 3-23 CORROSION PREVENTIVE COMPOUND.

ON PISTONS USED ON CYLINDER 65-44710-8, APPLY PRIMER BMS 10-11, TYPE 1 (F-20.03) AND ENAMEL BMS 10-11, TYPE 2 (F-21.03) TO THE DIA -Y- BORE.

1. LIMIT FOR CHROME PLATE BUILDUP (SOPM 20-42-03) AND GRIND TO DESIGN DIMENSIONS AND FINISH. PUT A CHROME PLATE RUNOUT AS SHOWN BY 2.
2. CHROME PLATE RUNOUT AREA
3. DELETED

REPAIR

REF 1 7

125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

SHOT PEEN: (SOPM 20-10-03) AREAS SHOWN BY 5 AND SURFACES TO BE CHROME PLATED

0.016-0.033 SHOT SIZE
0.015 A2 INTENSITY

MATERIAL: 65-44712-1: 4330M STEEL, 180-200 KSI
65-44712-2: 15-5PH CRES, 180-200 KSI

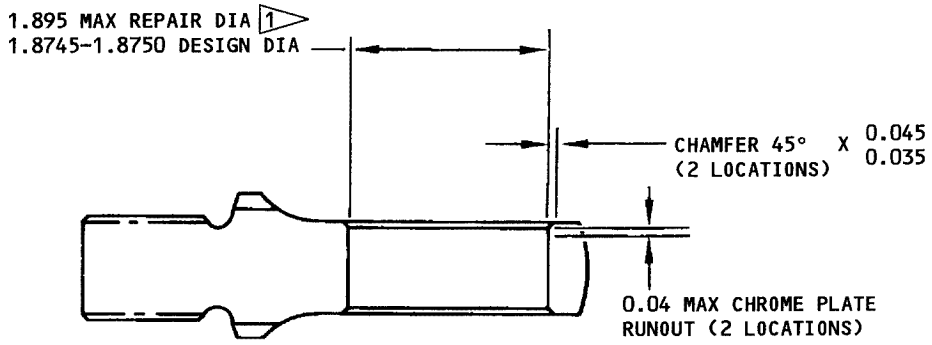
ALL DIMENSIONS ARE IN INCHES

4. ON PISTON 65-44712-1, CADMIUM PLATE (F-1.32, WHICH REPLACES F-1.1923), 0.0003-0.0005 THICK. PLATING RUNOUT CAN GO TO BORE.
5. SHOT PEEN THIS AREA OF THE OD AFTER MACHINING
6. NO PLATING THIS AREA
7. RESTORATION TO DESIGN DIMENSIONS NOT REQUIRED

PISTON (17)

Piston Repair and Refinish
Figure 401

F91786




REFINISH

CADMIUM PLATE (F-1.32, WHICH REPLACES F-1.1923) ALL OVER BUT NOT IN BORE FOR BEARING

1 LIMIT FOR CHROME PLATE BUILDUP (REF 20-42-03) AND GRIND TO DESIGN DIMENSIONS AND FINISH, WITH PLATING RUNOUT AS SHOWN

REPAIR

REF 1

125 ALL MACHINED SURFACES

BREAK SHARP EDGES 0.010-0.015R

SHOT PEEN: (REF 20-10-03)
0.016-0.039 SHOT SIZE
0.015 A2 INTENSITY

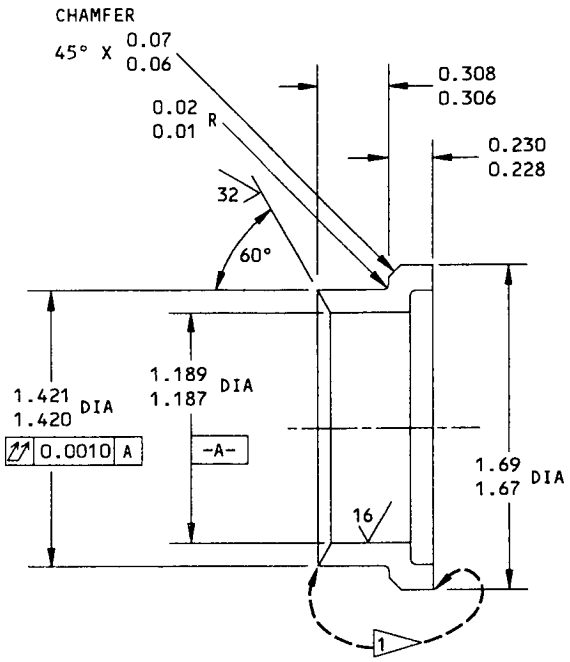
MATERIAL: 4330 STEEL, 180-200 KSI

ALL DIMENSIONS ARE IN INCHES

ROD END (3)

Rod End Repair and Refinish
Figure 402

F91793




REFINISH

CADMIUM PLATE AREAS SHOWN 1
NO FINISH ON OTHER AREAS.

1 CADMIUM PLATE (F-15.06), 0.0003-0.0005 THICK

REPAIR

(SAME AS REFINISH)

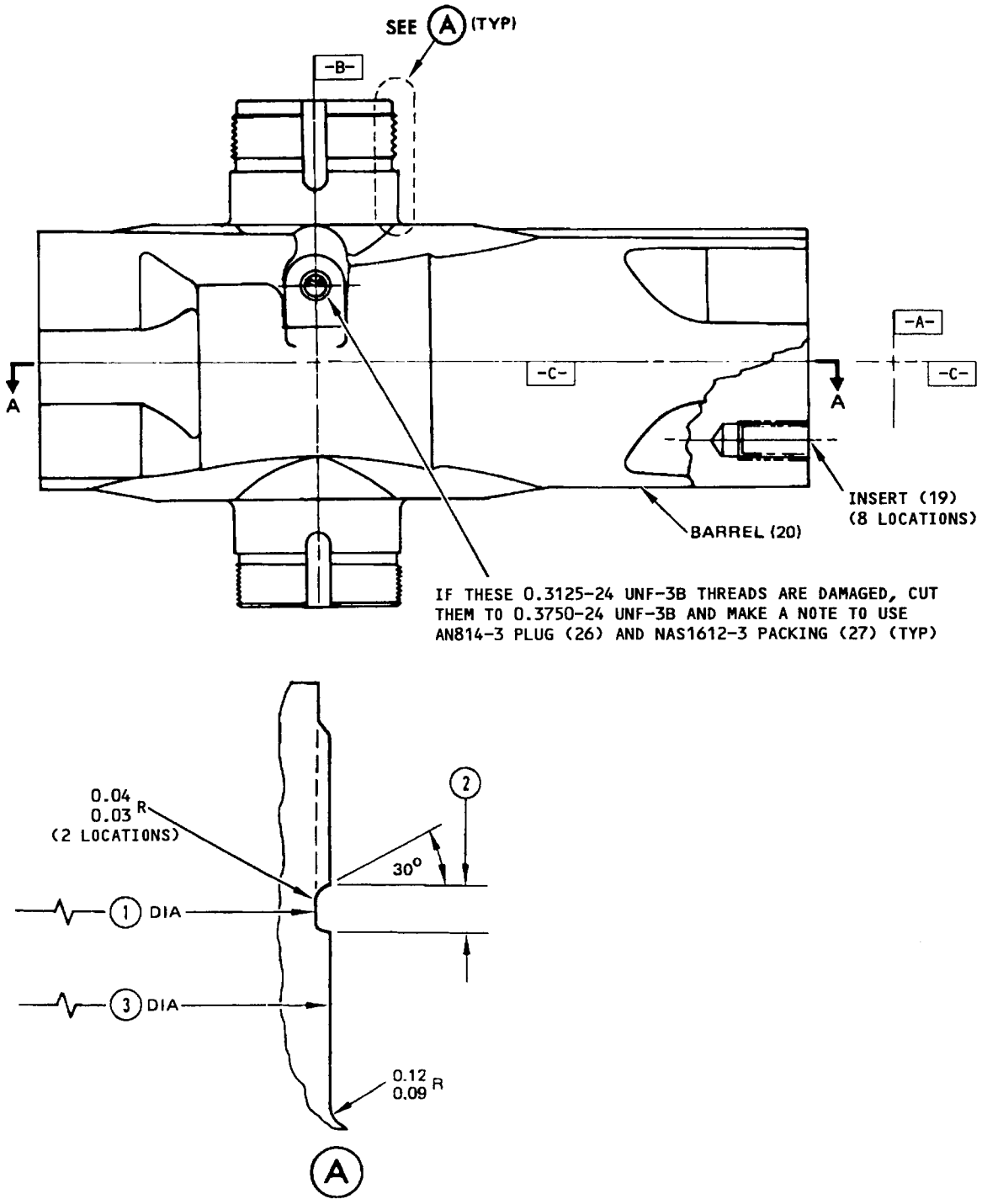
125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

MATERIAL: AL-NI-BRONZE PER AMS 4640

ALL DIMENSIONS ARE IN INCHES

SEAL RETAINER (13)

Seal Retainer Refinish
Figure 403

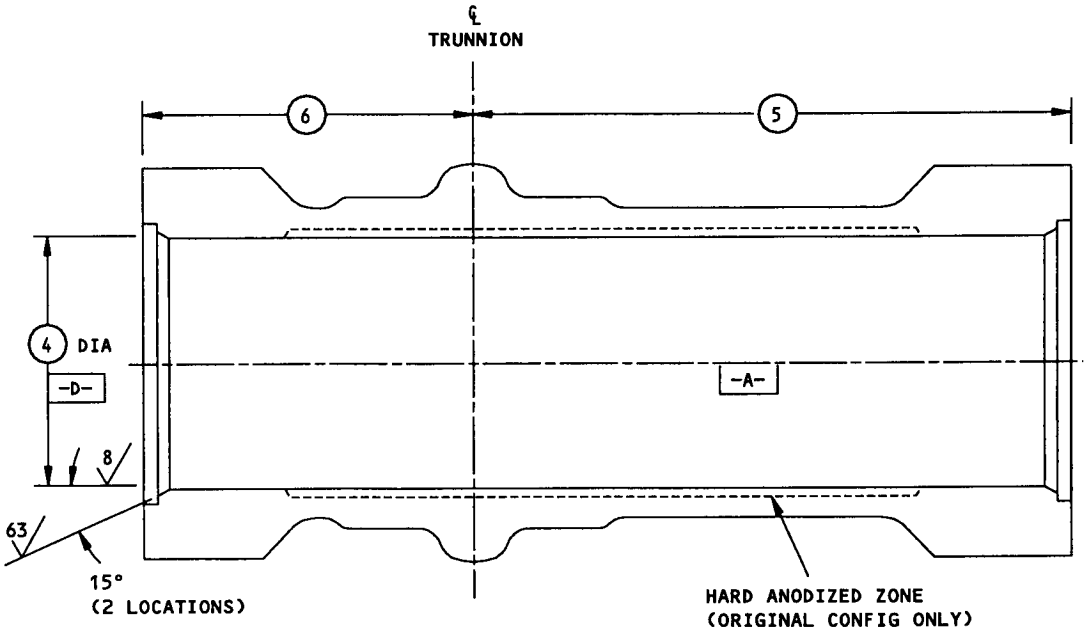



BARREL (18)

65-44711-1,-5

Barrel Repair and Refinish
Figure 404 (Sheet 1)

F91814

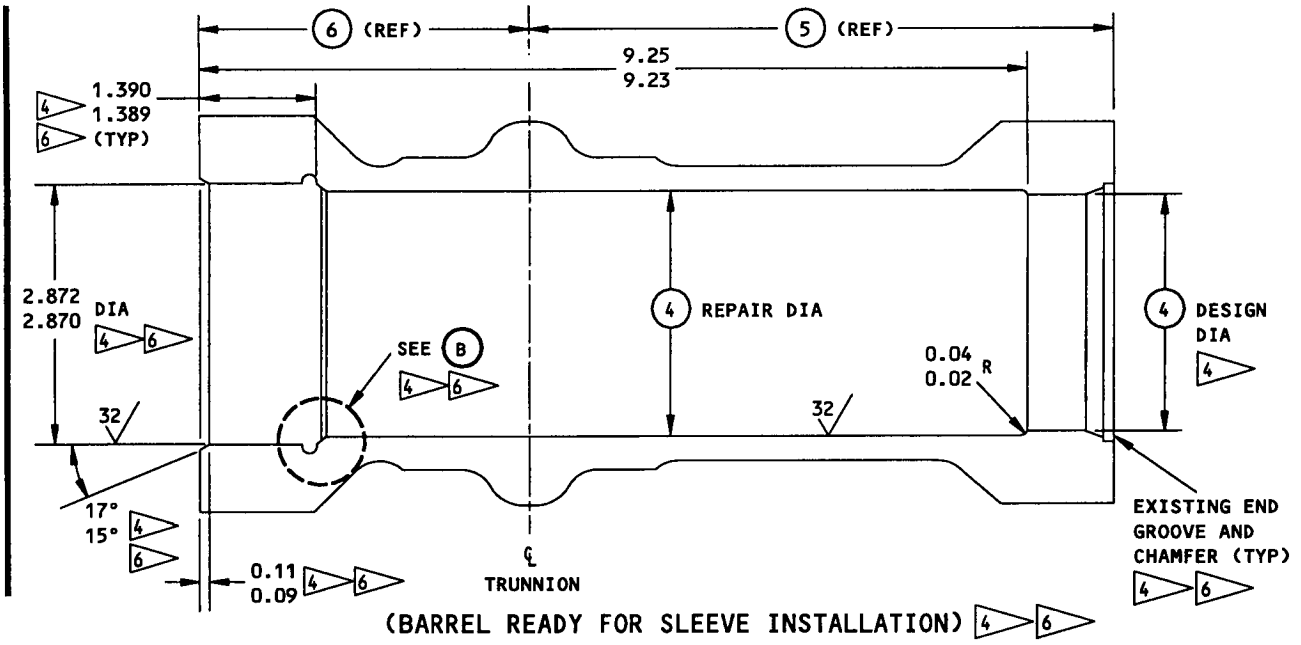



ORIGINAL CONFIGURATION
A-A

BARREL (18)

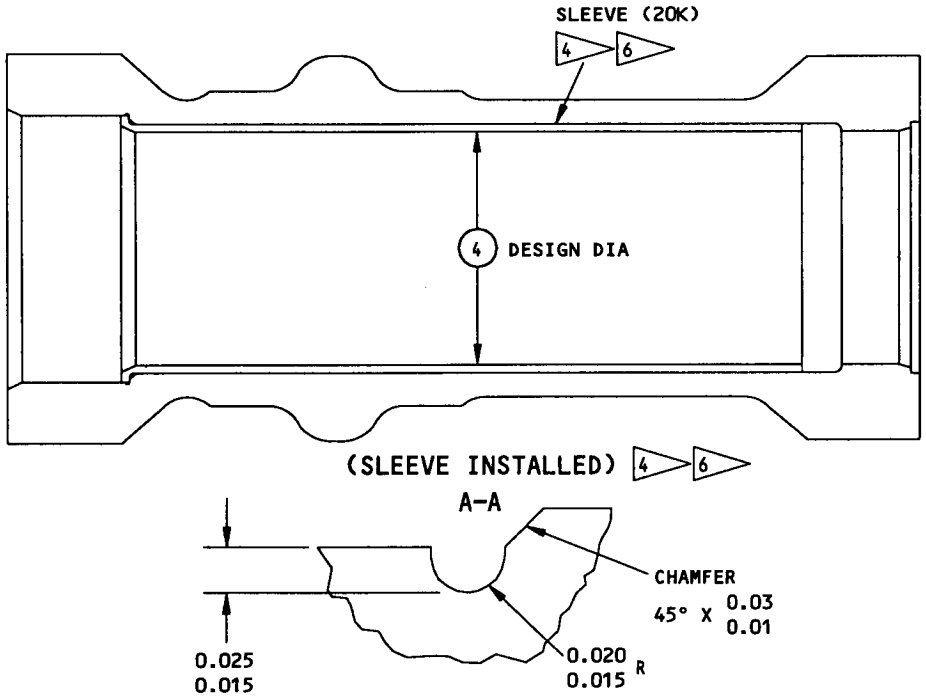
65-44711-1,-5

Barrel Repair and Refinish
Figure 404 (Sheet 2)




(BARREL READY FOR SLEEVE INSTALLATION) 4 6

A-A




(SLEEVE INSTALLED) 4 6

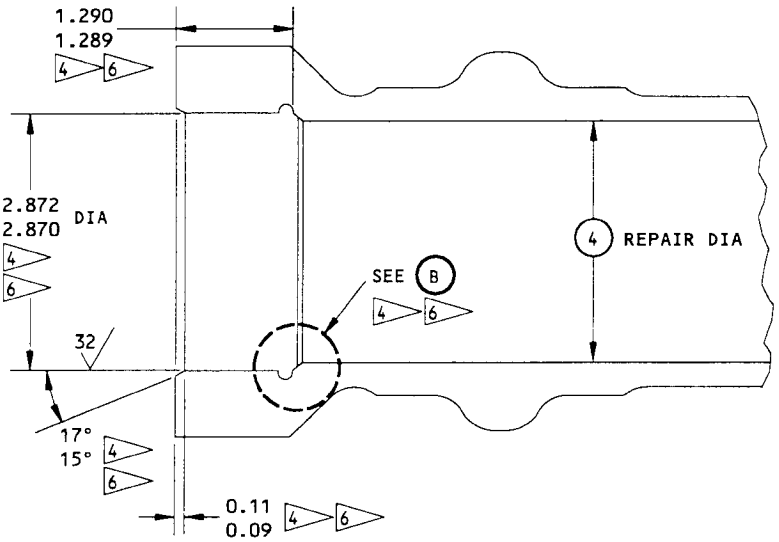
A-A

BARREL (18)

65-44711-5

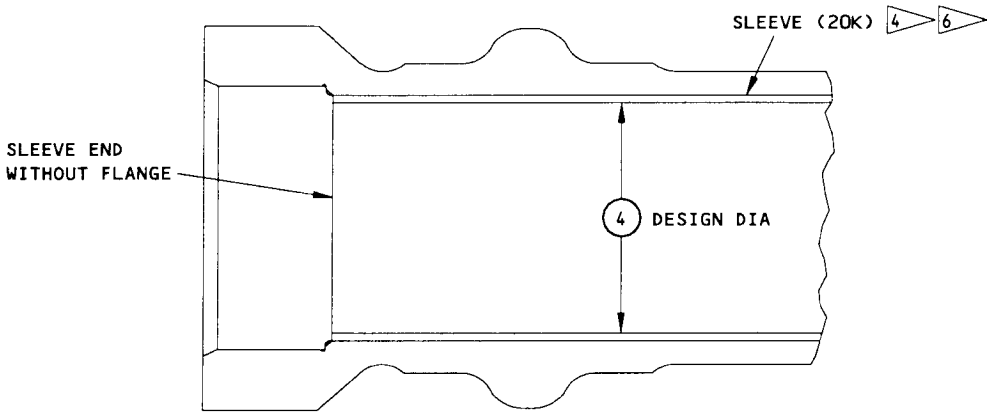
ALL DIMENSIONS ARE IN INCHES

Barrel Repair and Refinish
Figure 404 (Sheet 3)




(BARREL READY FOR LARGER BEARING INSTALLATION AT SLEEVE END WITHOUT FLANGE) 4 6

A-A




(SLEEVE INSTALLED) 4 6

A-A

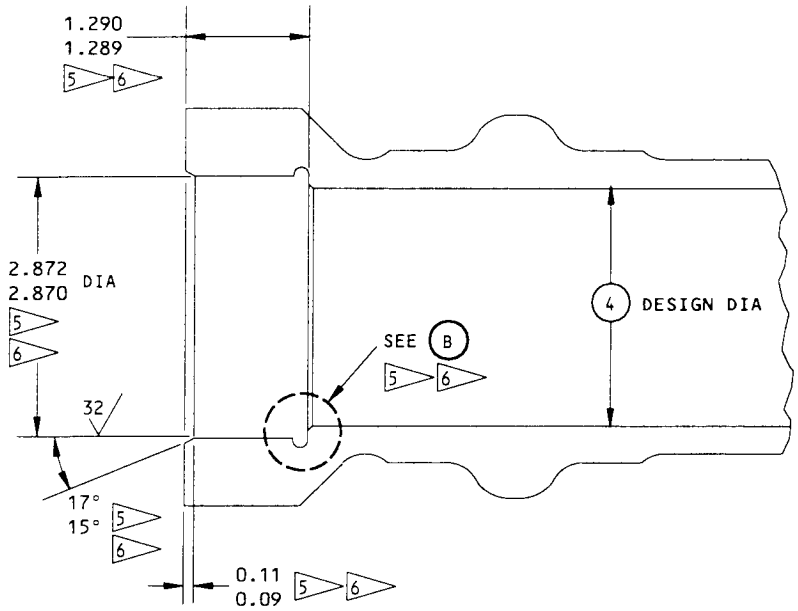
BARREL (18)

65-44711-5

ALL DIMENSIONS ARE IN INCHES

Barrel Repair and Refinish
Figure 404 (Sheet 4)

M17088




BARREL READY FOR OVERSIZE BEARING (14)
65C31398-3 INSTALLATION WITHOUT BORE SLEEVE 5 6
A-A

BARREL (18)
65-44711-5

ALL DIMENSIONS ARE IN INCHES

Barrel Repair and Refinish
Figure 404 (Sheet 5)

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| DESIGN DIM | 2.078<br>2.068 | 0.121<br>0.101 | 2.1992<br>2.1987 | 2.622<br>2.621 | 6.530<br>6.520 | 3.650<br>3.640 |
| REPAIR LIMIT | 2.000 ▷1 | 0.200 ▷1 | 2.1430 ▷2 | 2.741<br>2.740 ▷3 | 6.510 ▷1 | 3.630 ▷1 |

REFINISH

NO FINISH IN BORE

CHEMICAL TREAT OR CHROMIC ACID ANODIZE (F-2.22) OTHER SURFACES.

▷1 RESTORATION TO DESIGN DIM NOT REQUIRED.

▷2 LIMIT FOR BMS 10-67, TYPE 10 THERMAL SPRAY BUILDUP (SOPM 20-10-05) AND MACHINE TO DESIGN DIMENSIONS AND FINISH.

▷3 FOR 65-44711-5 ONLY, RANGE FOR INSTL OF STEEL SLEEVE (20K) TO MAKE THIS BARREL INTO THE 65C31398-2 CONFIG OF FIG. 405.

▷4 THE REPAIR SLEEVE IS SHOWN INSTALLED FROM THE END SHOWN, BUT AS AN ALTERNATIVE THE BORE CAN BE MACHINED TO LET IT BE INSTALLED FROM THE OTHER END.

▷5 THE BORE IS SHOWN REPAIRED AT THE END SHOWN, BUT AS AN ALTERNATIVE THE BORE CAN BE MACHINED TO LET THE OVERSIZE BEARING BE INSTALLED FROM THE OTHER END.

▷6 ANY OF THESE BORE END REPAIRS CAN BE DONE TO EITHER OR BOTH ENDS OF THE BORE.

REPAIR

REF ▷1 THRU ▷6

125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

MATERIAL:

65-44711-1: 7079-T611 AL ALLOY
65-44711-5: 7075-T73 AL ALLOY

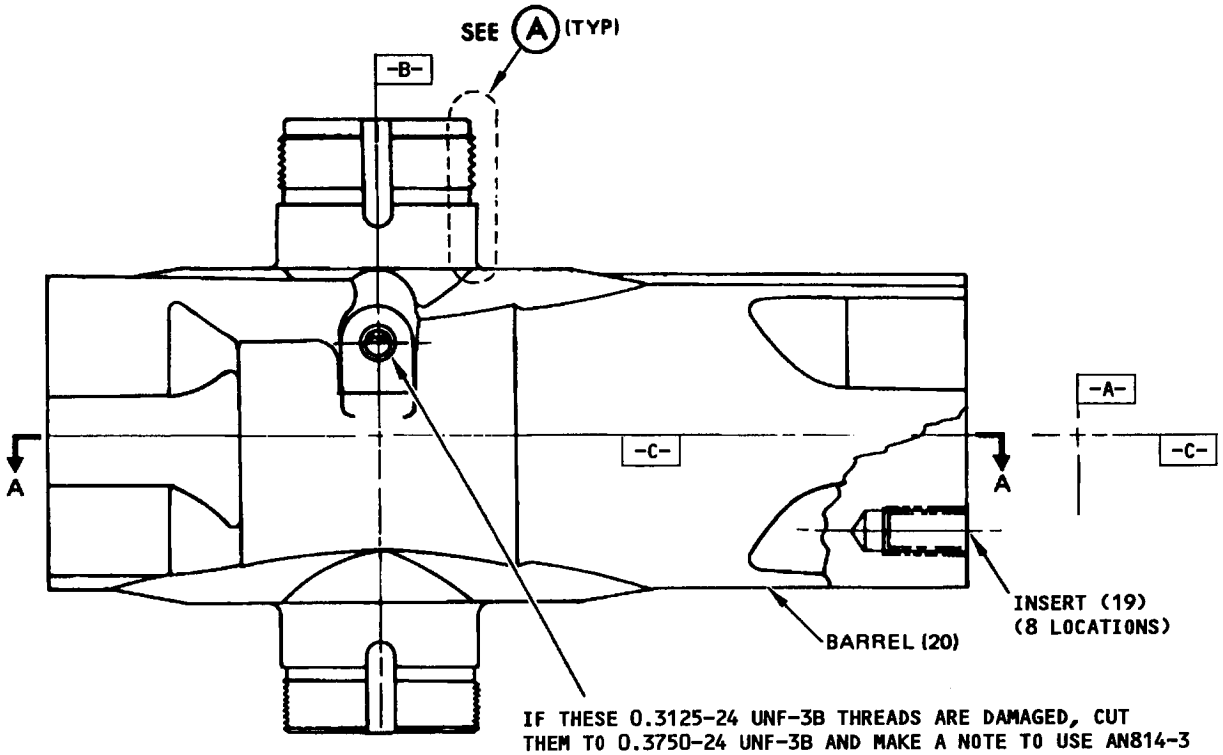
ALL DIMENSIONS ARE IN INCHES

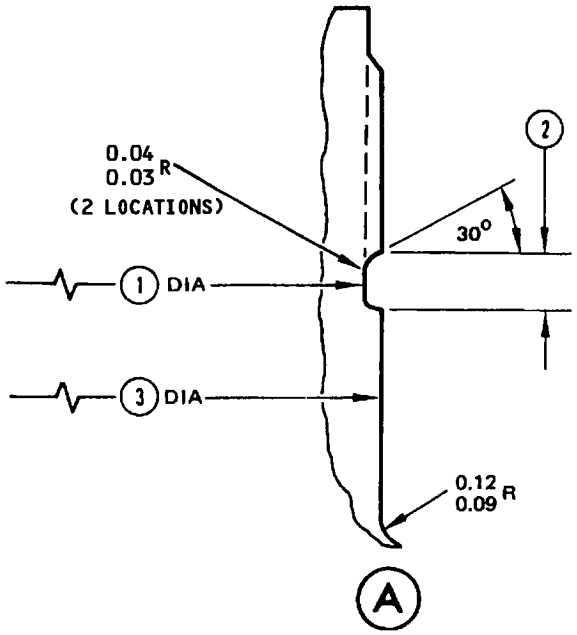
BARREL (18)

65-44711-1,-5

Barrel Repair and Refinish
Figure 404 (Sheet 6)

F91825



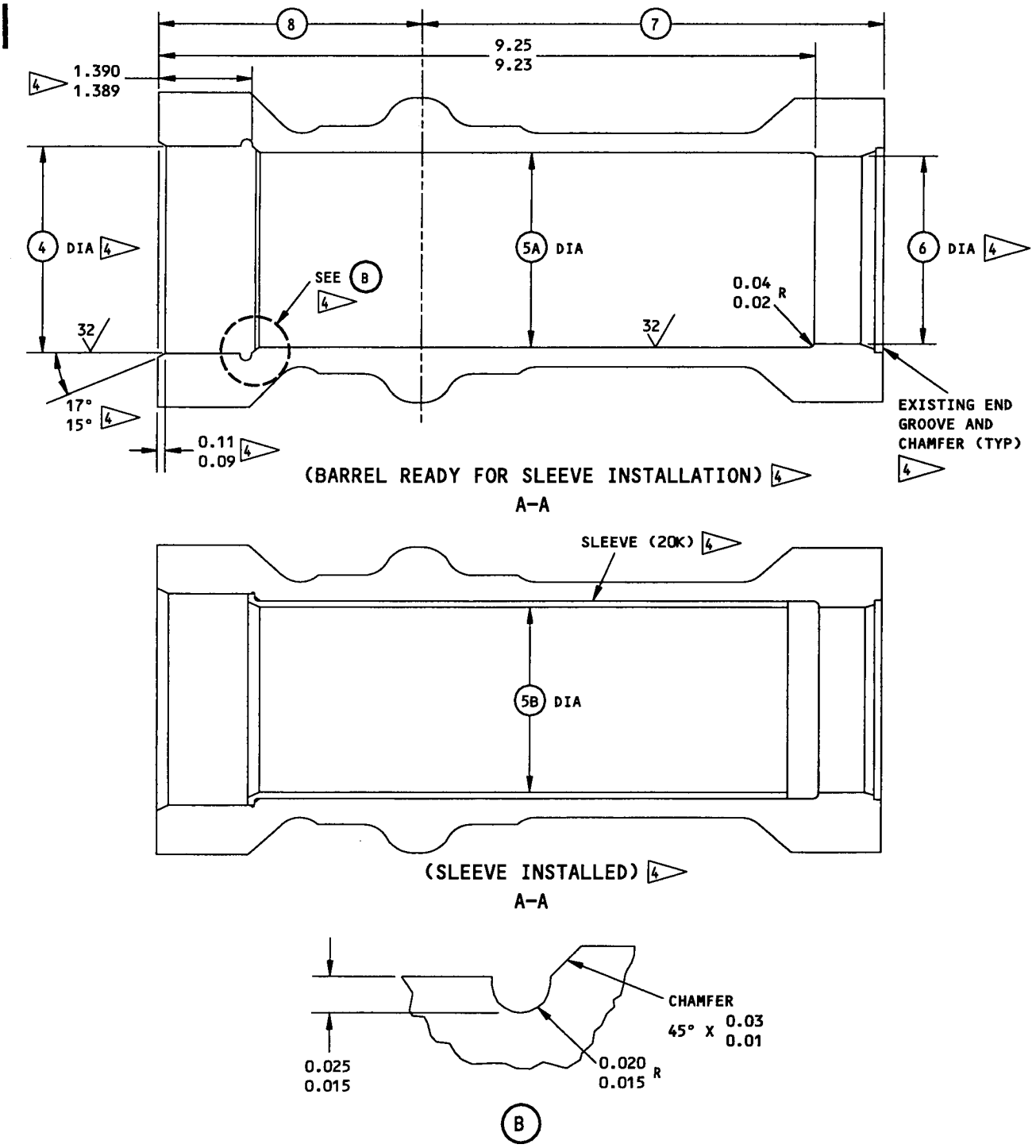




BARREL (18)

65C31398-2

Barrel Repair and Refinish
Figure 405 (Sheet 1)

F91830




Barrel Repair and Refinish
Figure 405 (Sheet 2)

| | (1) | (2) | (3) | (4) | (5A) | (5B) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|---|
| DESIGN DIM | 2.078<br>2.068 | 0.121<br>0.101 | 2.1992<br>2.1987 | 2.872<br>2.870 | 2.741<br>2.740 ▷1 | 2.622<br>2.621 | 2.622<br>2.621 | 6.530<br>6.520 | 3.650<br>3.640 |
| REPAIR LIMIT | 2.000 ▷2 | 0.200 ▷2 | 2.1430 ▷3 | — | — | — | — | 6.510 ▷2 | 3.610 ▷2 |

REFINISH

CHROMIC ACID ANODIZE (F-17.02)

▷1 HONE THIS DIMENSION TO GET A 0.0015-0.0020 INTERFERENCE FIT COMPARED TO ACTUAL OD OF SLEEVE (20K) TO BE INSTALLED. NOMINAL SLEEVE OD IS 2.7430-2.7435. AFTER HONING, KEEP THIS BARREL AND SLEEVE TOGETHER AS A MATCHED SET UNTIL YOU INSTALL THE SLEEVE IN THE BARREL.

▷2 RESTORATION TO DESIGN DIM NOT REQUIRED.

▷3 LIMIT FOR PLASMA FLAME SPRAY BUILDUP, BMS 10-67 TYPE 10 (SOPM 20-10-05) AND MACHINE TO DESIGN DIMENSIONS AND FINISH.

▷4 THE REPAIR SLEEVE (20K) IS SHOWN INSTALLED FROM THE END SHOWN, BUT AS AN ALTERNATIVE THE BORE CAN BE MACHINED TO LET IT BE INSTALLED FROM THE OTHER END.

REPAIR

REF ▷1 THRU ▷4

125√ ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

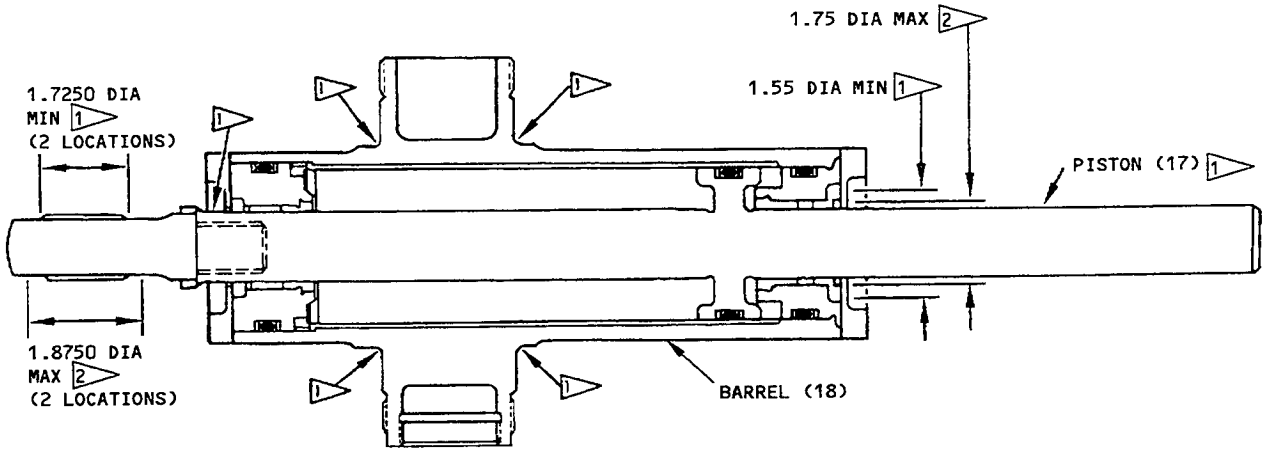
MATERIAL:
BARREL - AL ALLOY
SLEEVE - 4330M STEEL PER AMS 6411, 4130 SEAMLESS TUBE OR 4340 ROUND STEEL BAR (150-170 KSI)

ALL DIMENSIONS ARE IN INCHES

65C31398-2

Barrel Repair and Refinish
Figure 405 (Sheet 3)

G49762




REFINISH

ON EXTERIOR, APPLY PRIMER, BMS 10-11, TYPE 1 (F-20.03) AND THEN ENAMEL, BMS 10-11, TYPE 2 COLOR 702 WHITE GLOSS (F-21.03) UNLESS SHOWN BY 1 2

1 NO PRIMER OR ENAMEL

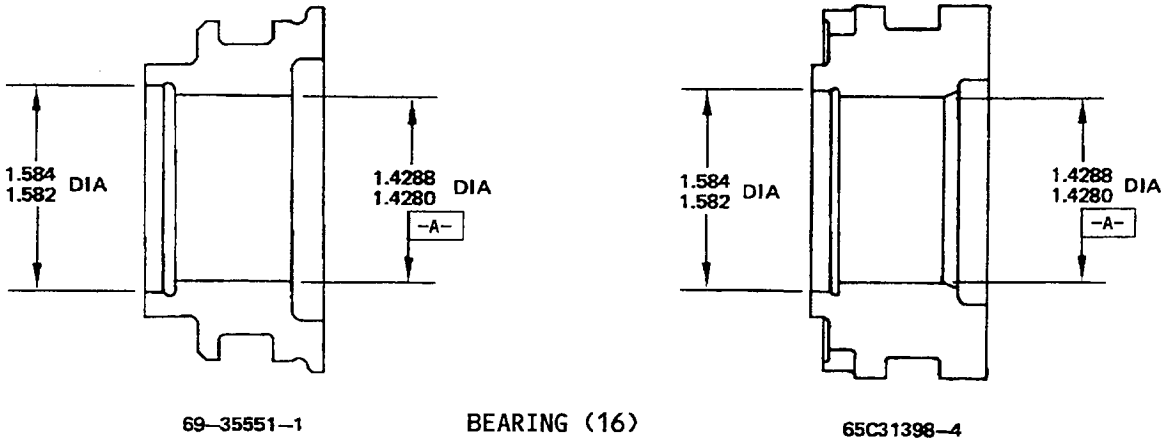
2 PRIMER/ENAMEL RUNOUT AREA

ITEM NUMBERS REFER TO FIG. 1101

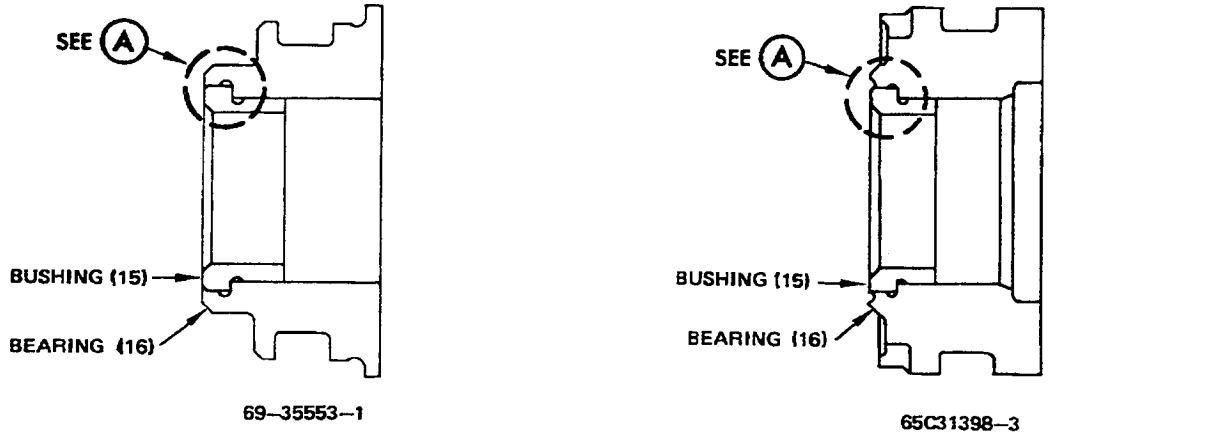
ALL DIMENSIONS ARE IN INCHES

65-44710-6

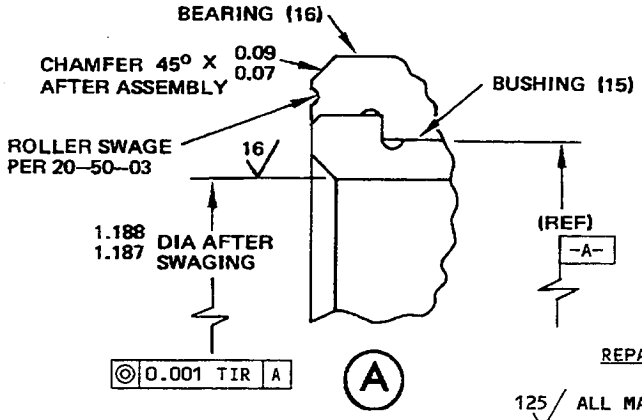
Cylinder Assembly Topcoat
Figure 406




69-35551-1 BEARING (16) 65C31398-4




69-35553-1 65C31398-3




REFINISH

BEARING 69-35551-1:
CHROMIC ACID ANODIZE (F-17.04)

BEARING 65C31398-4:
CHROMIC ACID ANODIZE (F-17.02)

REPAIR

125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

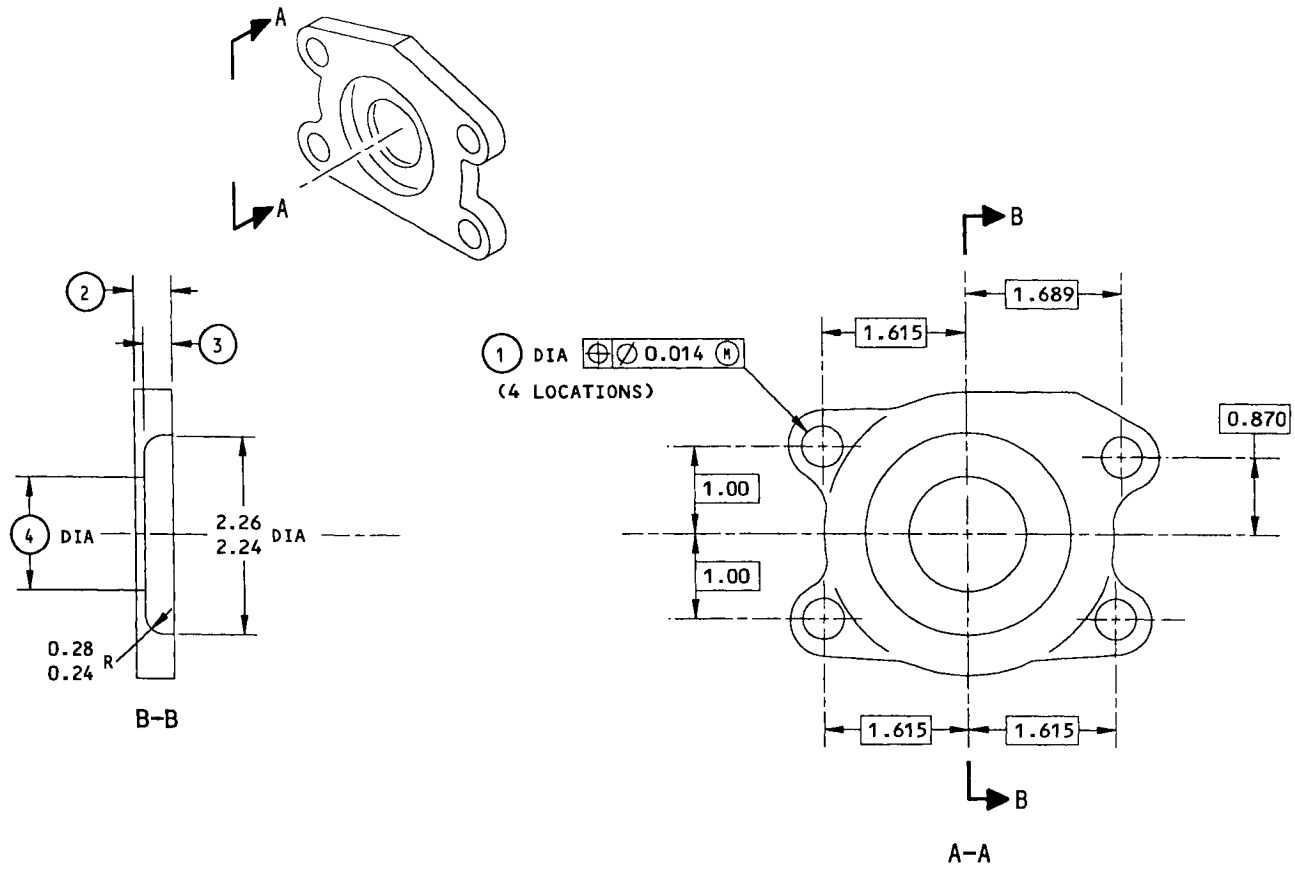
MATERIAL:
BUSHING (15) - AL-NI-BRZ PER AMS 4640
BEARING (16) - AL ALLOY

ITEM NUMBERS REFER TO FIG. 1101

ALL DIMENSIONS ARE IN INCHES

BEARING (14,14A)
Bearing Repair and Refinish
Figure 407

F91866




| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| DESIGN DIM | 0.479<br>0.467 | 0.430<br>0.420 | 0.33<br>0.31 | 1.29<br>1.28 |
| REPAIR LIMIT | --- | 0.405<br>1 | --- | --- |

**REFINISH**

CADMIUM PLATE (F-1.32)

1 RESTORATION TO DESIGN DIMENSIONS NOT REQUIRED

**REPAIR**

REF 1

125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

BREAK SHARP EDGES

SHOT PEEN (SOPM 20-10-03)
0.017-0.046 SHOT SIZE
0.005-0.010 A2 INTENSITY

MATERIAL: 4340 STEEL, 180-200 KSI

ALL DIMENSIONS ARE IN INCHES.

END PLATE (5)

End Plate Repair and Refinish
Figure 408

ASSEMBLY

1. Materials

   NOTE: Equivalent substitutes can be used.

   A. Hydraulic Fluid -- BMS 3-11 (SOPM 20-60-03)

   B. Assembly Lube -- MCS 352 (SOPM 20-60-03)

   C. Grease -- Batco 8401 No.1 or 2 (SOPM 20-60-03)

   D. Sealant -- Dow-Corning 30-121 Replacements (SOPM 20-60-04)

   E. Sealant -- BMS 5-45 (Replaces BMS 5-26) (SOPM 20-60-04)

2. Lubrication (Fig. 1101)

   A. Lightly lubricate applicable packings (7, 9, 11, 11A, 23, 27), backup rings (10, 22), footseal (8), cap ring (6), and scraper ring (12) with hydraulic fluid or assembly lube and install them wet.

   B. When you install rod end (3), apply a layer of Batco 8401 grease to the internal threads of piston (17) and fill thread relief cavity with Batco 8401 grease. Do not put grease on the rod end.

   C. When you install bolts (24), apply a layer of Batco 8401 grease to the internal threads of barrel (18), bolts (24) and washers (25).

3. Assembly (Fig. 1101)

   A. Install packings (23) with backup rings (22) on plugs (21). Install plugs (21) in barrel (18).

   B. Install cap ring (6) and packing (7) on piston (17).

   C. Install packings (11) and backup rings (10) on bearings (14).

   D. Push the assembled piston (17) unit into barrel (18).

   E. Apply Batco 8401 grease to the mating surfaces of retainer (13), bearing (14), and their surfaces which touch the barrel (18) and end plates (5).

   F. Push the assembled bearing (14) units into barrel (18). If applicable, install packings (9) over footseals (8). Push this combination, or seal assembly (8), onto piston (17) until against bushings (15). Install seal retainers (13) and scrapers (12).

   G. Install end plates (5) on piston (17) with bolts (24) and washers (25). Tighten bolts (24) to 430-540 lb-in.

   H. Put cup lockwasher (4) in position on rod end (1), and turn the rod end into piston (17). Hold piston (17) with Allen adapter F80202-1, and tighten rod end (3) with wrench F71313-11 to 2000-2500 lb-in.

I. With approximately a 0.18 inch square punch, locally bend the flange of cup lockwasher (4) into slot on rod end (1). Use a slot in rod end (1) that is farthest from the slot in piston (17). Make sure the bend is complete.

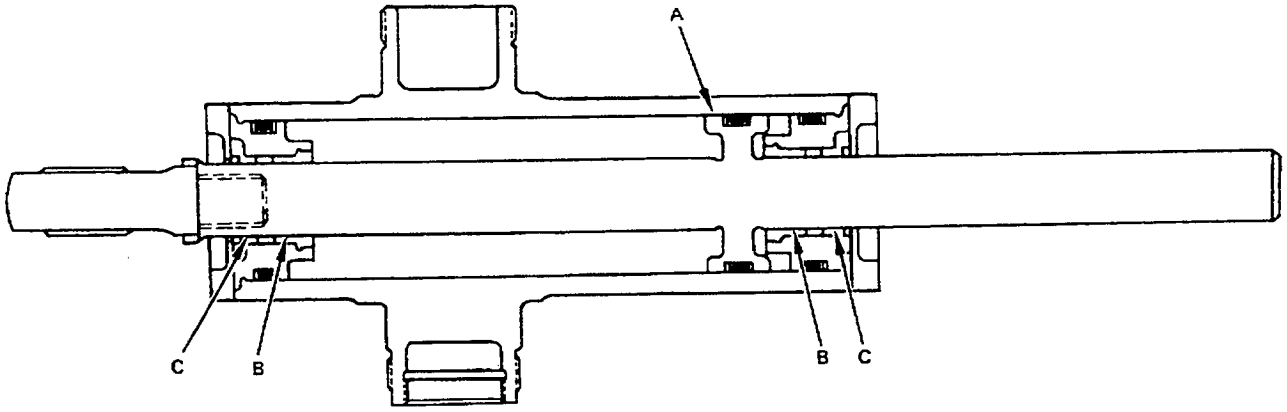
J. Apply a fillet of Dow Corning 30-121-replacement sealant on both sides of cup lockwasher and lockwasher tab groove area after you clean all surfaces to get the sealant.

K. Bend nameplate (28) to the curve of barrel (18) and tighten strap (29).

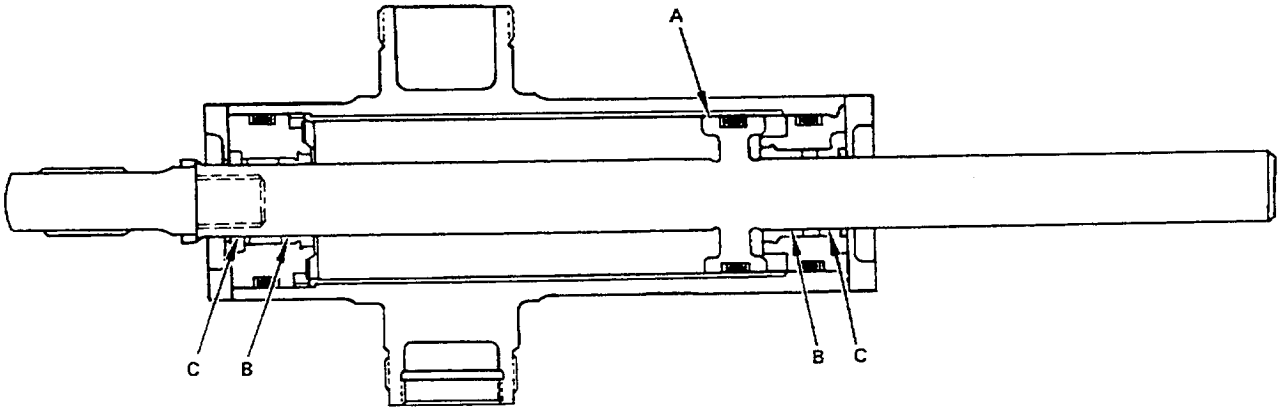
L. Slide packings (27) on plug (26) and screw this unit into barrel (18). These items will be removed for the test.

M. Do the test (Ref TESTING). After the test, lockwire bolts (24) in pairs, and plugs (26) to barrel (18), by the double twist method (SOPM 20-50-02).

N. On cylinder assemblies 65-44710-8, -9, install the red dust cap (30) in the end of the piston with wet BMS 5-45 sealant.




ORIGINAL CONFIG WITH 65-44711-() BARREL




REWORKED CONFIG WITH 65C31398-() BARREL

Fits and Clearances
Figure 601 (Sheet 1)

| Ref Letter Fig.601 | Mating Index No. Fig. 1101 | | Design Dimensions: Dimensions (inches) Min | Design Dimensions: Dimensions (inches) Max | Design Dimensions: Assembly Clearance (inch) Min | Design Dimensions: Assembly Clearance (inch) Max | Service Wear Limits: Dimension Limits (inches) Min | Service Wear Limits: Dimension Limits (inches) Max | Service Wear Limits: Maximum Allowable Clearance (inch) |
|---|---|---|---|---|---|---|---|---|---|
| A*[1] | ID | 20 | 2.621 | 2.622 | 0.003 | 0.006 | | 2.623 | 0.008 |
| | OD | 17 | 2.616 | 2.618 | | | 2.614 | | |
| A*[2] | ID | 20K | 2.621 | 2.622 | 0.003 | 0.006 | | | |
| | OD | 17 | 2.616 | 2.618 | | | | | |
| B | ID | 15 | 1.187 | 1.188 | 0.002 | 0.005 | | 1.192 | 0.007 |
| | OD | 17 | 1.183 | 1.185 | | | 1.181 | | |
| C | ID | 13 | 1.187 | 1.189 | 0.002 | 0.006 | | 1.193 | 0.008 |
| | OD | 17 | 1.183 | 1.185 | | | 1.181 | | |

*[1] CONFIG WITH 65-44711-() BARREL
*[2] CONFIG WITH 65C31398-() BARREL

Fits and Clearances
Figure 601 (Sheet 2)

| FOR TORQUE VALUES OF STANDARD FASTENERS, REFER TO 20-50-01 | | | |
|---|---|---|---|
| FIG. 1101 ITEM NO. | NAME | TORQUE POUND-INCHES | TORQUE POUND-FEET |
| 3 | Rod End | 2000-2500 | |
| 24 | Bolt | 430-540 | |

Torque Table
Figure 602

TESTING

1. Equipment

   A. Pressure source for BMS 3-11 hydraulic fluid.

      (1) Maximum flow rate of 4 gallons per minute

      (2) Controllable from 0-4500 psi.

   B. Pressure gage -- 0-10-psi

   C. Pressure gage -- 0-5000-psi

   D. 4-way valve and tubing

   E. Plug set F80056-1

2. Preparation (Fig. 701)

   A. Install plug set F80056-1 in barrel (18) as shown, with the two plugs and their packings to seal the retract and extend ports in the barrel. Connect the hydraulic pressure source.

   B. Remove plugs (26) from the barrel. Connect the hydraulic pressure source through the tubing connections of the test setup as shown.

   C. Fill the cylinder assembly with BMS 3-11 hydraulic fluid. Extend and retract the piston until all air bubbles are gone from the hydraulic fluid.

   D. Do the tests at room temperature and in the sequence given below.

WARNING: DO NOT OPERATE THE UNIT AT PROOF PRESSURE. DO NOT APPLY COMPRESSED AIR TO PORTS AT ANY TIME.

3. Operational Tests

   A. With the piston fully extended, apply a pressure of 2 psi to the extend port for a period of 2 minutes. There must be no external leakage.

   B. Do step A again but with a pressure of 4500 psi. There must be no external leakage.

   C. With piston fully retracted, apply a pressure of 2 psi to the retract port for a period of 2 minutes. There must be no external leakage.

   D. Do step C again but with a pressure of 4500 psi. There must be no external leakage.

E. Operate the unit at 3000 psi pressure through 25 full cycles. Leakage at rod seals must not be more than 2 drops at each seal.

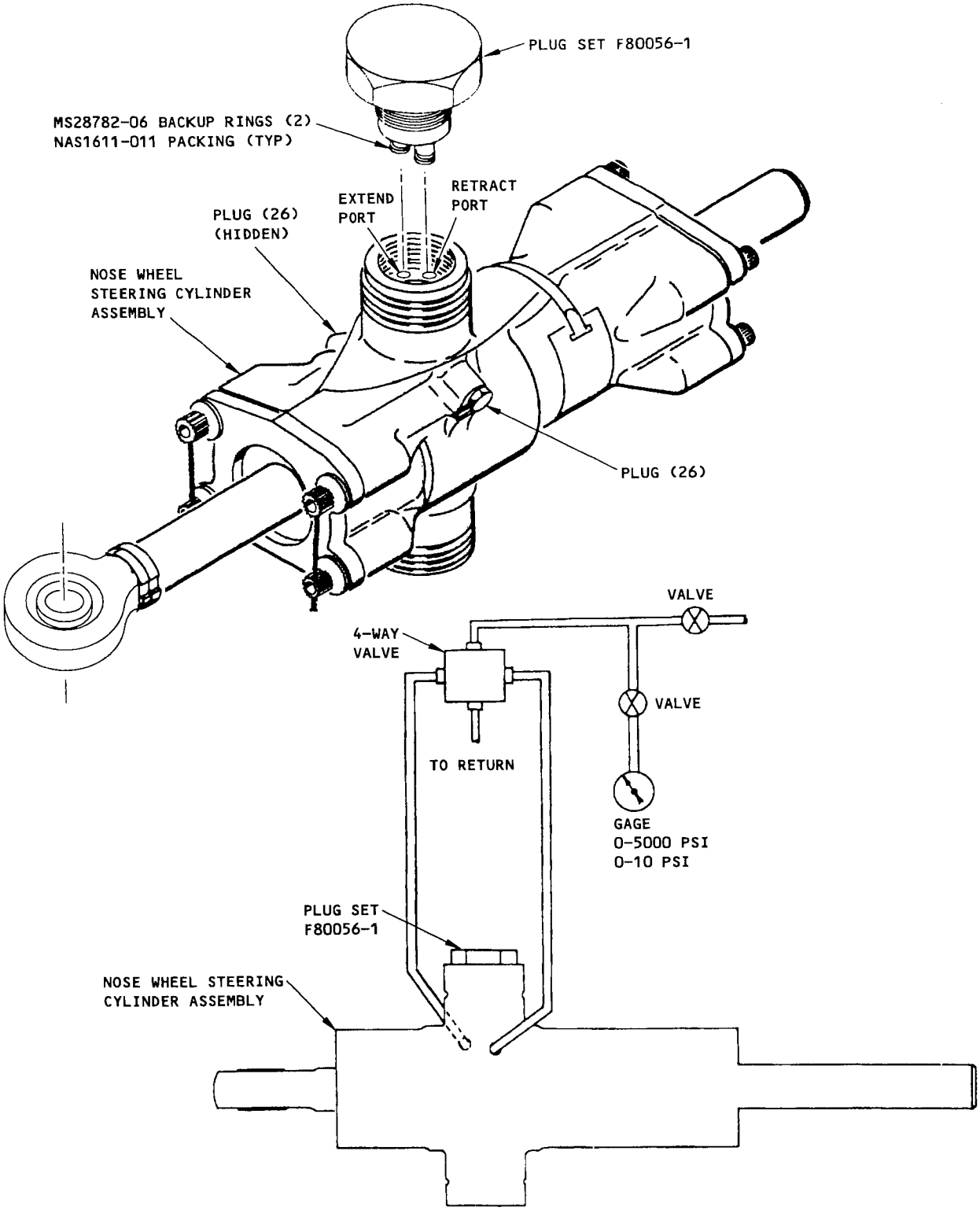
F. With the piston fully extended, apply a pressure of 3000 psi to the extend port. Leakage from retract port must not be more than 5 drops per minute.

G. With the piston fully retracted, apply a pressure of 3000 psi to the retract port. Leakage from extend port must not be more than 5 drops per minute.

H. Release the pressure from the extend and the retract ports. Operate the unit through one full cycle. The force necessary to do this must not be more than 100 pounds.

I. Remove the plug set. Install plugs (26) and packings (27).

J. Go back to Assembly step L for final assembly instructions.




Pressure Test Set-Up
Figure 701

TROUBLE SHOOTING

| Trouble | Possible Cause | Correction |
|---|---|---|
| External leakage | Defective or improperly installed seal (8) or packings (9, 11) | Disassemble, examine, and replace defective parts |
| Rough or irregular movement | Defective barrel (20), piston (17) or bearing (14) | Repair or replaces defective parts |
| | Dirt or something unwanted in barrel passages | Disassemble, examine, and clean |

## STORAGE INSTRUCTIONS

1. After testing is completed, put some hydraulic fluid, BMS 3-11 in the unit. It is not necessary to completely fill the unit.

2. Give the unit protection and put it away with standard industry practices and the instructions in SOPM 20-44-02 and 20-70-01.

## SPECIAL TOOLS, FIXTURES, AND EQUIPMENT

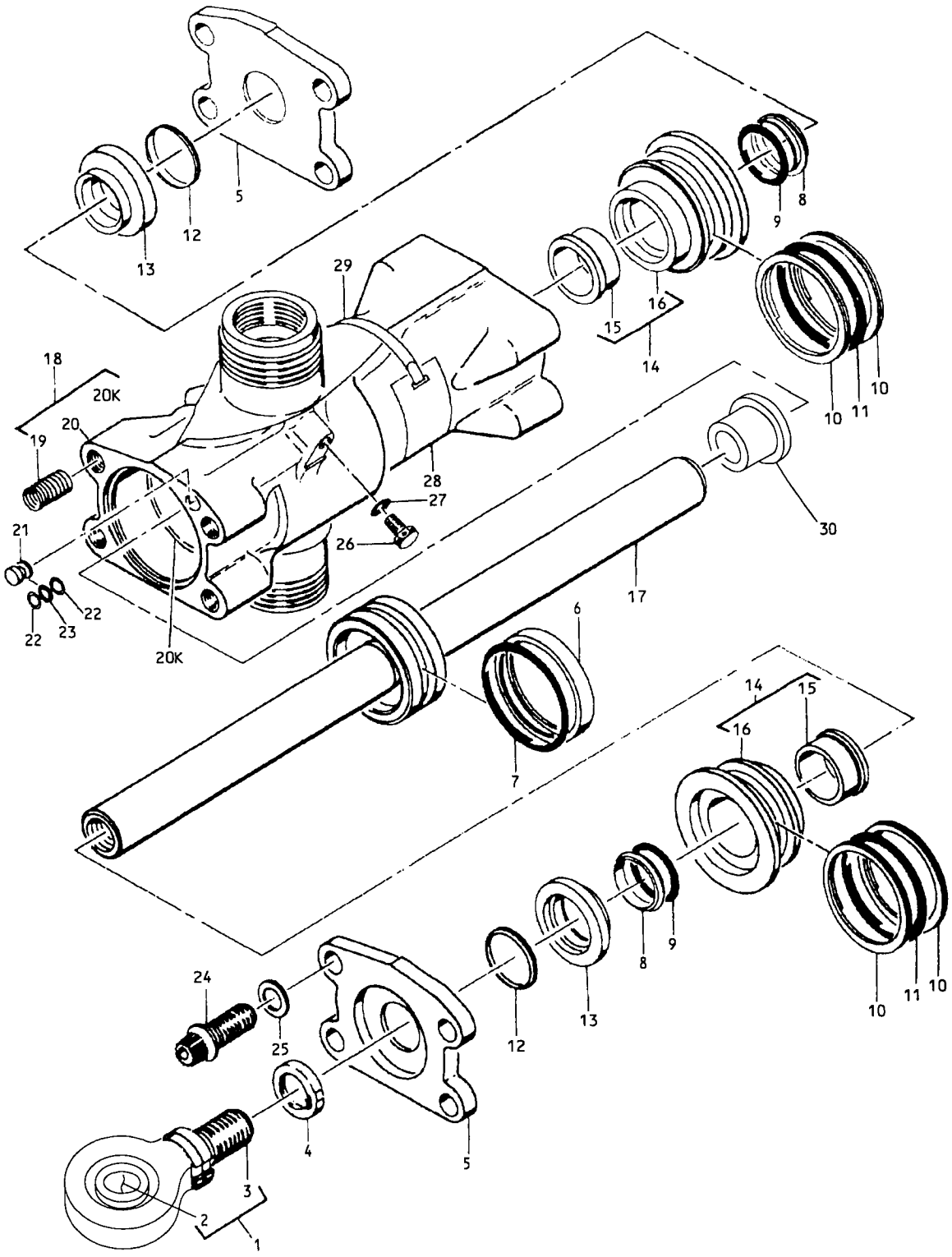
NOTE: Equivalent substitutes can be used. For equipment used during test, refer to TESTING.

1. F71313-11 -- Rod End Bearing Socket Wrench
2. F80056-1 -- Plug Set
3. F80202-1 -- Allen Adapter (Preferred to SE 32-7005)

ILLUSTRATED PARTS LIST

VENDORS

| | |
|---|---|
| V09455 | BFM TRANSPORT DYNAMICS CORP., P.O. BOX 1953, 3131 WEST SEGERSTROM AVE., SANTA ANA, CALIFORNIA 92702-1953 |
| V15860 | NEW HAMPSHIRE BALL BEARINGS, INC., ASTRO DIVISION, 155 LEXINGTON AVE, LACONIA, NEW HAMPSHIRE 03246-2937 |
| V21335 | TORRINGTON CO. FAFNIR BEARING DIVISION, 59 FIELD ST., TORRINGTON, CONNECTICUT 06790-4942 |
| V50294 | NEW HAMPSHIRE BALL BEARINGS, INC., 9730 INDEPEPENDENCE AVE., P.O. BOX 2515, CHATSWORTH, CALIFORNIA 91311-4323 |
| V72902 | GREENE TWEED AND CO., INC., 25 ENGERMAN AVE., DENTON, MARYLAND 21629 |
| V73134 | IMO INDUSTRIES INC., HEIM BEARINGS DIVISION, 60 ROUND HILL ROAD, P.O.BOX 430, FAIRFIELD, CONNECTICUT 06430-0430 |
| V77896 | REXNORD INC., BEARING OPERATION, 2400 CURTIS ST., DOWNERS GROVE, ILLINOIS 60515-4005 |
| V81376 | SOUTHWEST PRODUCTS CO., 2240 BUENA VISTA ST., P.O. BOX 2046, IRVINDALE, CALIFORNIA 91706 |
| V84955 | KAMAN AEROSPACE CORP., OLD WINDSOR ROAD, BLOOMFIELD, CONNECTICUT 06002 |
| V97613 | SARGENT TECHNOLOGIES, 1851 SOUTH PANTANO RD., TUCSON, ARIZONA 85710 |




Nose Wheel Steering Cylinder Assembly
Figure 1101

| FIG. & ITEM NO. | PART NO. | AIRLINE PART NUMBER | NOMENCLATURE 1 2 3 4 5 6 7 | USE CODE | QTY PER ASSY |
|---|---|---|---|---|---|
| 1101- | | | | | |
| | 65-44710-2 | | CYLINDER ASSY, NOSE WHEEL STEERING | A | RF |
| | 65-44710-3 | | CYLINDER ASSY, NOSE WHEEL STEERING | B | RF |
| | 65-44710-4 | | CYLINDER ASSY, NOSE WHEEL STEERING | C | RF |
| | 65-44710-5 | | CYLINDER ASSY, NOSE WHEEL STEERING | D | RF |
| | 65-44710-6 | | CYLINDER ASSY, NOSE WHEEL STEERING | E | RF |
| | 65-44710-7 | | CYLINDER ASSY, NOSE WHEEL STEERING | F | RF |
| | 65-44710-8 | | CYLINDER ASSY, NOSE WHEEL STEERING | G | RF |
| | 65-44710-9 | | CYLINDER ASSY, NOSE WHEEL STEERING | H | RF |
| 1 | 69-35517-1 | | . ROD END ASSY | AD | 1 |
| 1 | 69-35517-3 | | . ROD END ASSY | BCEG | 1 |
| 1 | 69-35517-4 | | . ROD END ASSY | FH | 1 |
| 2 | 76414 | | . . BEARING, V09455 (BOEING 10-60545-40)(USED ON 65-35517-1) | | 1 |
| 2 | NHL16V201 | | . . BEARING, V15860 (BOEING 10-60545-40)(USED ON 65-35517-1) | | 1 |
| 2 | ABWT16V102 | | . . BEARING, V50294 (BOEING 10-60545-40)(USED ON 65-35517-1 | | 1 |
| 2 | KSBN16-19 | | . . BEARING, V97613 (BOEING 10-60545-40)(USED ON 65-35512-1) | | 1 |
| 2 | WRG16-36BAC | | . . BEARING, V73134 (BOEING 10-60545-40)(USED ON 65-35517-1) | | 1 |
| 2 | 176399 | | . . BEARING, V09455 (BOEING 10-60545-163S)(USED ON 65-35517-3)(OPT TO 10-60545-163SA OR KSC135216B) | | 1 |
| 2 | NHSB16B202 | | . . BEARING, V15860 (BOEING 10-60545-163S)(USED ON 65-35517-3)(OPT TO 10-60545-163SA OR KSC135216B) | | 1 |
| 2 | SBS32ATC60-1 | | . . BEARING, V21335 (BOEING 10-60545-163S)(USED ON 65-35517-3)(OPT TO 10-60545-163SA OR KSC135216B) | | 1 |
| 2 | ABWT16V104 | | . . BEARING, V50294 (BOEING 10-60545-163S)(USED ON 65-35517-3)(OPT TO 10-60545-163SA OR KSC135216B) | | 1 |
| 2 | WRG16BAC | | . . BEARING, V73134 (BOEING 10-60545-163S)(USED ON 65-35517-3)(OPT TO 10-60545-163SA OR KSC135216B) | | 1 |
| 2 | YTA310 | | . . BEARING, V77896 (BOEING 10-60545-163S)(USED ON 65-35517-3)(OPT TO 10-60545-163SA OR KSC135216B) | | 1 |

| FIG. & ITEM NO. | PART NO. | AIRLINE PART NUMBER | NOMENCLATURE 1 2 3 4 5 6 7 | USE CODE | QTY PER ASSY |
|---|---|---|---|---|---|
| 1101-2 | BLFR16-172 | | . . BEARING, V81376 (BOEING 10-60545-163S)(USED ON 65-35517-3)(OPT TO 10-60545-163SA OR KSC135216B) | | 1 |
| 2 | KSBN16-38 | | . . BEARING, V97613 (BOEING 10-60545-163S)(USED ON 65-35517-3)(OPT TO 10-60545-163SA OR KSC135216B) | | 1 |
| 2 | KSC135216B | | . . BEARING, V84955 (OPT TO 10-60545-163S OR 10-60545-163SA)(USED ON 69-35517-3) | | 1 |
| 2 | ADSB16V202 | | . . BEARING, V09455 (PREF)(BOEING 10-60545-163SA)(PREF)(USED ON 69-35517-3) | | 1 |
| 2 | KSC135216B | | . . BEARING, V50632 (BOEING 10-60545-163SA)(OPT TO 10-60545-163) (USED ON 69-35517-3) | | 1 |
| 2 | WHT16V101 | | . . BEARING, V50294 (BOEING 10-60545-163SA)(OPT TO 10-60545-163 OR KSC135216B)(USED ON 69-35517-3) | | 1 |
| 2 | WRRG16BAC | | . . BEARING, V73134 (BOEING 10-60545-163SA)(OPT TO 10-60545-163 OR KSC135216B)(USED ON 69-35517-3) | | 1 |
| 2 | KSC135216B | | . . BEARING, V84955 (USED ON 69-35517-4) | | 1 |
| 3 | 69-35517-2 | | . . ROD END | | 1 |
| 4 | 66-12156-4 | | . LOCKWASHER, CUP | | 1 |
| 5 | 69-35560-1 | | . PLATE, END | | 2 |
| 6 | 7331MT952T | | . SEAL ASSY, V72902 (REPLS 69-54540-331) (USED WITH NAS1611-331) | | 1 |
| 6 | 69-54540-331 | | . RING, CAP (USED WITH NAS1611-331) (OPT TO 7331MT952T) | | 1 |
| 7 | NAS1611-331 | | . PACKING (USED WITH 69-54540-331) | | 1 |
| 8 | GTC5394-21700-952-0180 | | . SEAL ASSY, V72902 *[1] | | 2 |
| 8 | GTC5394C217 | | . SEAL ASSY, V72902 *[1] | | |
| 8 | GTC5394-21700A952 | | . SEAL ASSY, V72902 *[1] (PREF) | | |
| 8 | BACS11AA217A | | . FOOTSEAL (USED WITH NAS1611-217) *[1] | | 2 |
| 9 | NAS1611-217 | | . PACKING (USED WITH BACS11AA217A) | | 2 |
| 10 | MS28782-34 | | . RING, BACKUP (USED WITH EACH 69-35553-1 BEARING) | | 2 |
| 10 | MS28782-36 | | . RING, BACKUP (USED WITH EACH 65C31398-3 BEARING) | | 2 |

| FIG. & ITEM NO. | PART NO. | AIRLINE PART NUMBER | NOMENCLATURE 1 2 3 4 5 6 7 | USE CODE | QTY PER ASSY |
|---|---|---|---|---|---|
| 1101- | | | | | |
| 11 | NAS1611-331 | | . PACKING, O-RING (USED WITH EACH 69-35553-1 BEARING) | | 2 |
| 11 | NAS1611-333 | | . PACKING, O-RING (USED WITH EACH 65C31398-3 BEARING) | | 1 |
| 12 | BACS34A12A | | . SCRAPER | | 2 |
| 13 | 69-35569-1 | | . RETAINER | | 2 |
| 14 | 69-35553-1 | | . BEARING ASSY (USED WITH 65-44711-1, -5 BARREL) | | 2 |
| 14 | 69-35553-1 | | . BEARING ASSY (USED WITH 65C31398-2 BARREL) | | AR |
| 14 | 65C31398-3 | | . BEARING ASSY, OVERSIZE (USED WITH 65C31398-2 BARREL) | | AR |
| 15 | 69-35552-1 | | . . BUSHING | | 1 |
| 16 | 69-35551-1 | | . . BEARING (USED ON 69-35553-1) | | 1 |
| 16 | 65C31398-4 | | . . BEARING (USED ON 65C31398-3) | | 1 |
| 17 | 65-44712-1 | | . PISTON | ABD | 1 |
| 17 | 65-44712-1 | | . PISTON (OPT) | C-H | 1 |
| 17 | 65-44712-2 | | . PISTON | C-H | 1 |
| 18 | 65-44711-1 | | . BARREL ASSY | AB | 1 |
| 18 | 65-44711-5 | | . BARREL ASSY | C-H | 1 |
| 18 | 65C31398-1 | | DELETED | | |
| 18 | 65C31398-2 | | . BARREL ASSY (MADE FROM 65-4711-5) | C-H | 1 |
| 19 | MS21209F7-20 | | . . INSERT | | 8 |
| 20 | 65-44711-2 | | . . BARREL (USED ON 65-44711-1) | | 1 |
| 20 | 65-44711-6 | | . . BARREL (USED ON 65-44711-5) | | 1 |
| 20 | 65C31398-6 | | DELETED | | |
| 20 | 65C31398-7 | | . . BARREL (USED ON 65C31398-2) | | 1 |
| 20K | 65C31398-5 | | . . SLEEVE (USED ON 65C31398-2) | | 1 |
| 21 | 66-22722-1 | | . PLUG | | 2 |
| 22 | MS28782-6 | | . RING, BACKUP | | 4 |
| 23 | NAS1611-011 | | . PACKING, O-RING | | 2 |
| 24 | BACB30CW7H8 | | . BOLT | | 8 |
| 24 | BACB30US7K8H | | . BOLT (PREF)(OPT TO BACB30CW7H8) | CEFGH | 8 |
| 24 | BACB30CW7H8 | | . BOLT (OPT TO BACB30US7K8H) | CEFGH | 8 |
| 25 | MS20002C7 | | . WASHER | | 8 |
| 25 | AN960-716 | | . WASHER (OPT) | | 8 |
| 26 | AN814-2L | | . PLUG | | 2 |
| 26 | AN814-3L | | . PLUG (REPAIR PART) | | 2 |
| 27 | NAS1612-2 | | . PACKING, O-RING | | 2 |
| 27 | NAS1612-3 | | . PACKING, O-RING (USED WITH AN814-3L) | | 2 |
| 28 | BACN12A3LU | | . NAMEPLATE (OPT) | | 1 |
| 28 | BAC27DHY380 | | . MARKER (PREF) | | 1 |

| FIG. & ITEM NO. | PART NO. | AIRLINE PART NUMBER | NOMENCLATURE 1 2 3 4 5 6 7 | USE CODE | QTY PER ASSY |
|---|---|---|---|---|---|
| 1101-29 | 69-35587-8 | | . STRAP, NAMEPLATE | | 1 |
| 30 | MS90376-12R | | . CAP, DUST (RED) | GH | 1 |

*[1] THE ITEM 8 BACS11AA217A FOOTSEAL WITH ONE ITEM 9 NAS1617-217 PACKING IS OPTIONAL TO THE ITEM 8 GTC5394C217 SEAL, WHICH IS OPTIONAL TO THE ITEM 8 GTC5394-21700-952-0180 SEAL, WHICH IS OPTIONAL TO THE PREFERRED ITEM 8 GTC5394-21700A952 SEAL.