TO: ALL HOLDERS OF CONTROL STAND AUTOTHROTTLE GEARBOX ASSEMBLY COMPONENT MAINTENANCE MANUAL 22-32-33

REVISION NO. 2 DATED JUL 01/05

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
101 901	Added test equipment J22004-67, -68 which supersede J22004-1, -54, and J22004-2, -55, respectively

BOEING

COMPONENT
MAINTENANCE MANUAL

CONTROL STAND AUTOTHROTTLE GEARBOX ASSEMBLY

PART NUMBERS 254W4140-1,-3

COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST

K63308

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

K63457

TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL

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REVISION RECORD		
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TR & SB RECORD		
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604	JUL 01/04	01.1

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*901	JUL 01/05	01.1
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ILLUSTRATED PARTS LIST		
1001	MAR 01/00	01
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1015	MAR 01/00	01
1016	MAR 01/00	01

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TABLE OF CONTENTS

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.

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:

CONTROL STAND AUTOTHROTTLE GEARBOX ASSEMBLY

DESCRIPTION AND OPERATION

1. Description

   A. The gearbox assembly has a drag brake assembly, a nitralloy input shaft, and a nitralloy servo worm contained in an aluminum alloy housing. The drag brake assembly has a set of steel friction discs, CRES shims, a spring, and a hub assembly attached with bolts to an Al-Ni-Brz worm gear.

2. Operation

   A. The gearbox transmits mechanical output from the autothrottle servo motors to the resolver assembly which move the throttles when the autothrottle is engaged. The drag brake assembly located in the gearbox assembly removes the loose feel at the throttles caused by the servo motor and the worm gear backlash.

3. Leading Particulars (Approximate)

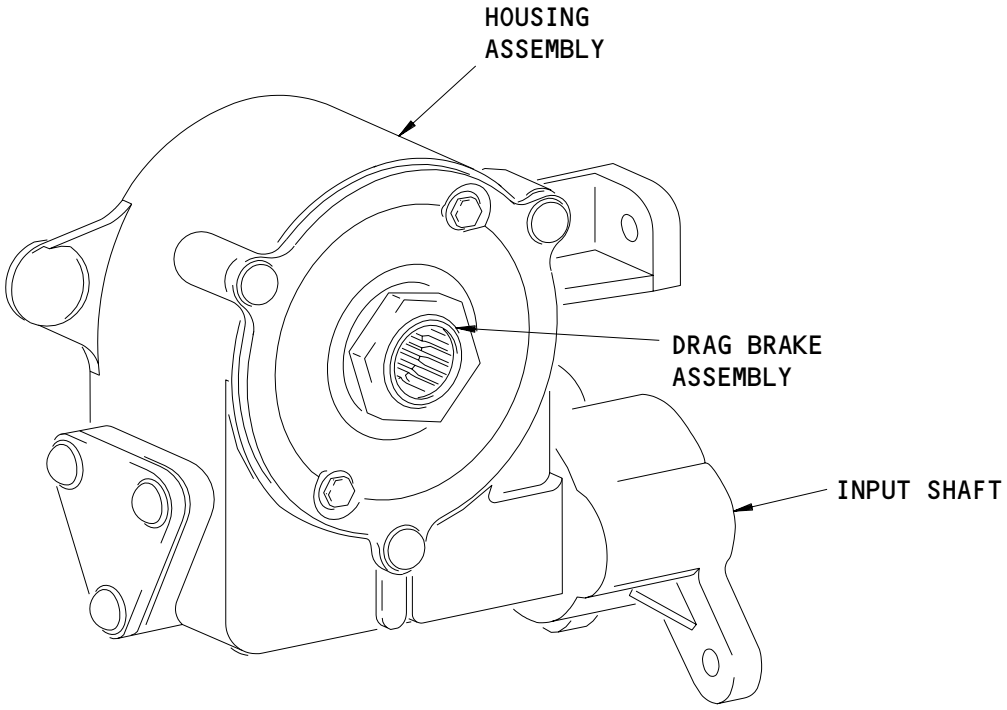
   A. Length -- 5 inches

   B. Width -- 2 inches

   C. Height -- 5 inches

   D. Weight -- 3 pounds

   E. Reduction Ration -- 367 to 1



Control Stand Autothrottle Gearbox Assembly
Figure 1

K63338

TESTING AND FAULT ISOLATION

1. General

   A. This procedure has the data necessary to do a test of the drag brake assembly and the autothrottle gearbox assembly after an overhaul.

      (1) Drag Brake Assembly Run-In Procedure

      (2) Drag Brake Assembly Acceptance Test

      (3) Autothrottle Gearbox Assembly Test

   B. Refer to the Standard Overhaul Practices Manual (SOPM) to find the details of the procedures.

   C. Refer to IPL Fig. 1 for item numbers.

2. Drag Brake Assembly Test

   A. Special Tools and Equipment

      NOTE: Equivalent equipment can be used.

      (1) J22002-1 -- Spline Wrench

      (2) J22004-67 -- Autothrottle Gearbox Brake Test Equipment (230 VAC, 50 Hz) (Supersedes J22004-1, -54)

      (3) J22004-68 -- Autothrottle Gearbox Brake Test Equipment (110 VAC, 60 Hz) (Supersedes J22004-2, -55)

   B. Standard Tools and Equipment

      NOTE: Equivalent equipment can be used.

      (1) Cooling Fan

   C. Consumable Material

      (1) D00013 Grease - MIL-PRF-23827 (SOPM 20-60-03)

D. References

(1) SOPM 20-30-03, General Cleaning Procedures

(2) SOPM 20-60-03, Lubricants

E. Procedure

(1) Prepare for Test

(a) Install the drag brake assembly (55) on the test fixture, or on an equivalent fixture that will tightly hold the friction disk assembly (80).

(b) Adjust the cooling fan as necessary to keep the drag brake assembly temperature at less than 200°F for the run-in procedure.

(2) Do the run-in test.

CAUTION: THE DRAG BRAKE ASSEMBLY (55) TEMPERATURE MUST NOT INCREASE TO MORE THAN 200°F DURING THE RUN-IN PROCEDURE.

(a) Use the spline wrench to turn the worm gear (160) clockwise at 50-100 RPM for 15 minutes.

NOTE: Make sure that the friction disk assembly (80) is held tightly and does not move.

(b) Continuously monitor for chatter. If there is chatter during the test, change the speed of the worm gear until it is gone.

(c) Do the run-in test again, but in the counterclockwise direction. This completes one run-in cycle.

(d) Do one more run-in cycle, for a total run-in time of one hour.

(e) After the run-in test is complete, do these steps:

1) Disassemble the drag brake assembly. Refer to the DISASSEMBLY section, 22-32-33/301.

2) Clean and remove the grease from the parts of the drag brake. Refer to SOPM 20-30-03.

3) Apply grease to the rollers and the worm gear, and assemble the brake assembly as shown in the ASSEMBLY section, 22-32-33/701.

(3) Adjust the drag brake assembly for 20-30 pound-inches of torque:

(a) Temporarily install the end cover assembly (40) on the drag brake assembly (55).

(b) Adjust the shim (135) thickness as necessary to get a friction torque of 20-30 pound-inches when the drag brake assembly is turned relative to the end cover assembly.

(4) Do the acceptance test.

NOTE: Do this test after the run-in test is complete.

(a) Install the drag brake assembly (55) on the test fixture.

(b) Make sure the worm gear (160) turns smoothly, freely, and continuously, without chatter or irregular movement.

(c) Turn the worm gear (160) at 2.0-3.0 RPM in one direction until the torque is stable, but not for more than 5 minutes. Record the direction that it turns, but do not record the torque value.

(d) When the torque is stable, record the torque for 30 seconds. Make sure the torque is 20-30 pound-inches.

(e) If the torque is not 20-30 pound-inches, adjust the shims (135) in the brake assembly, then do the test again.

(f) Do the test procedures again, but turn the worm gear in the opposite direction. Make sure that the stable torque value is 20-30 pound-inches.

(5) Do the autothrottle gearbox assembly test.

(a) Turn the input shaft (225) in one direction until the drag brake assembly turns a minimum of one full turn . The drag brake must operate smoothly.

NOTE: 367 full turns of the input shaft (225) will turn the drag brake assembly (55) one full turn.

(b) Measure the torque necessary to turn the input shaft (225), at four positions, 90 degrees apart. Make sure that the torque is not more than 3.8 ounce-inches at each position.

(c) Do steps (a) and (b) again, but turn the input shaft (225) in the opposite direction.

DISASSEMBLY

1. General

A. This procedure contains the data necessary to disassemble the control stand autothrottle gearbox assembly.

B. Disassemble this component sufficiently to isolate the defect, do the necessary repairs, and put the component back to a serviceable condition.

C. Refer to IPL Fig. 1 for item numbers.

2. Control Stand Autothrottle Gearbox Disassembly

A. Procedure

(1) Remove the pin (25), the nut (30) and the shim (35) from the drag brake assembly (55). Note the thickness of the shim (35) to help with assembly.

(2) Remove the ring (165) and the bearing (170) from the drag brake assembly (55).

(3) Remove the screws (5, 10) and the washers (15, 20).

(4) Remove the cover assembly (40) and the shim (35). Note the thickness of the shim (35) to help with assembly.

NOTE: Do not remove the bearing (45) from the cover (50) unless repair or replacement is necessary.

(5) Remove the drag brake assembly (55) from the housing assembly (240).

(6) Disassemble the drag brake assembly as follows:

(a) Remove the hub assembly (140) from the worm gear (160) by removing the bolts (145).

(b) Remove the friction disk (60), the skewed roller assemblies (65) and the friction disk assembly (80) from the hub assembly (140).

(c) Remove the plate (120), the springs (125), the spring seal (130) and the shim (135) from the hub assembly (140). Note the thickness of the shims (135) to help with assembly.

(7) Remove the screws (175) and the washers (180) to remove the end cap (185) and the shim (190). Note the thickness of the shim (190) to help with assembly.

(8) Remove the worm (195) and the bearing (200) that are attached to the worm, from the housing assembly (240). Remove the bearings (200) from the worm (195).

(9) Remove the screws (205), the retainer (230) and the pull-shaft assembly (210) out of the housing assembly (240). Remove the bearing (235) from the shaft assembly (210).

NOTE: Do not disassemble the shaft assembly (210) unless repair or replacement is necessary.

CLEANING

1. General

   A. This procedure has the data necessary to clean the control stand autothrottle gearbox assembly.

   B. Refer to the Standard Overhaul Practices Manual (SOPM) for the SOPM chapters identified in this procedure.

   C. Refer to IPL Fig. 1 for item numbers.

2. Autothrottle Gearbox Assembly Cleaning

   A. References

      (1) SOPM 20-30-03, General Cleaning Procedures

   B. Procedure

      (1) Use standard industry practices (SOPM 20-30-03) to clean all the parts, except bearings (45, 170, 200, 220, 235).

      (2) Use manufacturer's instructions to clean teflon sealed bearings (45, 170, 220, 235) and bearings (200).

CHECK

1. General

   A. This procedure has the data necessary to find defects in the material of specified parts.

   B. Refer to FITS AND CLEARANCES for the design dimension and wear limits.

   C. Refer to the Standard Overhaul Practices Manual (SOPM) for the SOPM chapters identified in this procedure.

   D. Refer to IPL Fig. 1 for item numbers.

2. Check

   A. References

      (1) SOPM 20-20-01, Magnetic Particle Inspection

      (2) SOPM 20-20-02, Penetrant Methods of Inspection

   B. Procedure

      (1) Use standard industry procedures to do a visual check of all the parts for defects.

      (2) Do a magnetic particle check (SOPM 20-20-01) of these parts:

         (a) Nut (30)

         (b) Worm (195)

         (c) Shaft (225)

      (3) Do a penetrant check (SOPM 20-20-02) of these parts:

         (a) Cover (50)

         (b) Spring Seat (130)

         (c) Hub (155)

         (d) Gear (160)

         (e) Cap (185)

(f) Retainer (230)

(g) Housing (255)

(4) Do a check of the skewed roller assembly (65):

(a) Rollers (70) must roll freely with light finger pressure.

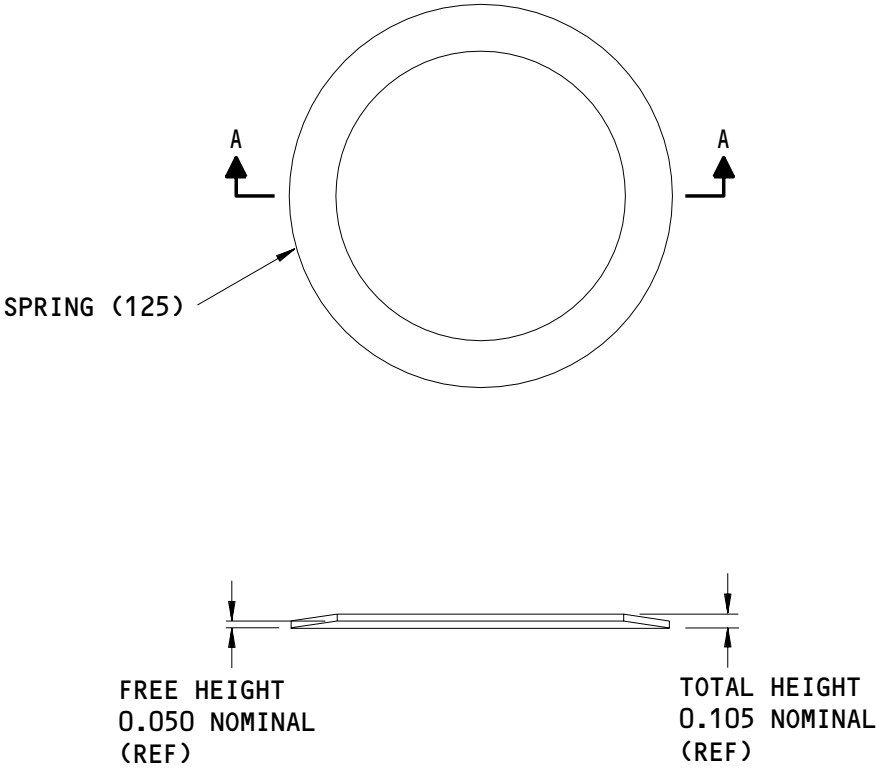
(5) Do a check of the spring (125) (Fig. 501):

(a) Do a check of the total height with zero load, as shown in Table 501.

(b) Compress the spring to the total heights shown in Table 501. Make sure that the applied loads are in the specified ranges.

ITEM NO. (IPL FIG. 1)	TOTAL HEIGHT (INCHES)	FREE HEIGHT (INCHES)	PERMITTED LOAD LIMIT (POUNDS)
125	0.105	0.050 (REF)	0.00 (REF)
	0.090		111-165
	0.070		201-302

Spring Check Data
Table 501



A–A

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

254W4146-1
Spring Check Details
Figure 501

REPAIR - GENERAL

1. General

A. Instructions for repair, refinish, and replacement of the specified subassembly parts are included in each REPAIR when applicable:

PART NUMBER	NAME	REPAIR
---	REFINISH OF OTHER PARTS	1-1
253T7114	SHAFT	2-1
253T7116	SHAFT, INPUT	2-2
253T7115	WORM, SERVO	3-1
253T7117	HOUSING	4-1
253T7118	CAP, END	5-1
254W4142	COVER, END	6-1, 6-2

—	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 THIS FEATURE 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 DATUM B WITHIN 0.002
[// | 0.002 | A]	PARALLEL TO DATUM 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 A
[⌓ | 0.020 | A]	SURFACES MUST LIE WITHIN PARALLEL BOUNDARIES 0.020 INCH APART AND EQUALLY DISPOSED ABOUT TRUE PROFILE
[◎ | ∅ 0.0005 | C]	CONCENTRIC TO DATUM C WITHIN 0.0005 DIAMETER
[⌯ | 0.010 | A]	SYMMETRICAL WITH DATUM A WITHIN 0.010
[∠ | 0.005 | A]	ANGULAR TOLERANCE 0.005 WITH DATUM 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 DATUM A, AND EXTENDING 0.510 INCH ABOVE DATUM A, MAXIMUM MATERIAL CONDITION
[2.000] OR 2.000 BSC	THEORETICALLY EXACT DIMENSION IS 2.000

True Position Dimensioning Symbols
Figure 601

K63345

REFINISH OF OTHER PARTS - REPAIR 1-1

1. General

   A. This repair gives the data that is necessary to refinish parts not given in the specified repairs.

   B. Refer to the Standard Overhaul Practices Manual (SOPM) for the standard practices shown in the repair.

   C. Refer to IPL Fig. 1 for item numbers.

2. Refinish of Other Parts

   A. General

      (1) Instructions for the repair of the parts shown in Table 601 are for repair of the initial finish.

   B. Consumable Materials

      NOTE: Equivalent material can be used.

      (1) C00259 Primer -- BMS 10-11, Type 1 (SOPM 20-60-02)

   C. References

      (1) SOPM 20-30-02, Stripping of Protective Finishes

      (2) SOPM 20-30-03, General Cleaning Procedures

      (3) SOPM 20-41-01, Decoding Table for Boeing Finish Codes

      (4) SOPM 20-41-02, Application of Chemical and Solvent Resistant Finishes

      (5) SOPM 20-42-05, Bright Cadmium Plating

      (6) SOPM 20-43-01, Chromic Acid Anodizing

      (7) SOPM 20-60-02, Finishing Materials

   D. Procedure

IPL FIG. & ITEM	MATERIAL	FINISH
IPL Fig. 1		
Ring (115)	301 or 302 CRES, 1/2 Hard	Cadmium plate (F-15.06) and apply BMS 10-11, Type 1 primer (F-20.w0f
Spring (125)	301, 302 CRES or 17-7PH CRES, 180-200 ksi	Cadmium plate (F-15.06).
Spring Seat (130)	Al Alloy	Chromic acid anodize or sulfuric acid anodize (F-17.05) all over.
Shim (135)	17-7PH CRES, 180-200 ksi	Cadmium plate (F-16.06).
Hub (155)	Al alloy	Hard anodize (F-17.06).

Refinish Details
Table 601

SHAFT ASSEMBLY - REPAIR 2-1

253T7114-2

1. General

   A. This repair gives the data that is necessary to replace the bearing (220) on the shaft assembly (210).

   B. Refer to the Standard Overhaul Practices Manual (SOPM) for the standard practices shown in the repair.

   C. Refer to IPL Fig. 1 for item numbers.

2. Bearing Replacement

   A. Consumable Materials

      NOTE: Equivalent material can be used.

      (1) D00013 Grease -- MIL-PRF-23827 (SOPM 20-60-03)

   B. References

      (1) SOPM 20-50-03, Bearing and Bushing Replacement

      (2) SOPM 20-60-03, Lubricants

   C. Procedure

      (1) Remove the staking ring (215) and the bearing (220) from the shaft (225).

      (2) Install the replacement bearing (220) (SOPM 20-50-03).

      (3) Install the staking ring (215) and anvil swage (SOPM 20-50-03) using the swaging tool, ST933-100-625.

INPUT SHAFT - REPAIR 2-2

253T7116-1

1. General

A. This repair gives the data that is necessary to repair and refinish the input shaft (225).

B. Refer to the Standard Overhaul Practices Manual (SOPM) for the standard practices shown in the repair.

C. Refer to the REPAIR - GENERAL (22-32-32/601, REPAIR - GENERAL) for the Standard True Position Dimensioning Symbols shown in the repair.

D. Refer to IPL Fig. 1 for item numbers.

E. General repair details:

(1) Material: Nitralloy 135

2. Input Shaft Repair

A. References

(1) SOPM 20-10-02, Machining of Alloy Steel

(2) SOPM 20-10-04, Grinding of Chrome Plated Parts

(3) SOPM 20-20-01, Magnetic Particle Inspection

(4) SOPM 20-42-03, Hard Chrome Plating

B. Procedure (Fig. 601)

(1) Repair the input shaft (225):

(a) Machine the worn or damaged input shaft (225) as necessary to remove defects, cracks and corrosion as shown in SOPM 20-10-02. Do not machine more than the repair limit.

(b) Do a magnetic particle check of the input shaft (225) as shown in SOPM 20-20-01.

(c) Chrome plate the input shaft (225), as shown in SOPM 20-42-03, to a maximum plate thickness of 0.015 inches.

(d) Machine grind the input shaft (225), as shown in SOPM 20-10-04, to the design diameter. See Fig. 601.

(e) Put a finish on the input shaft (225) as shown below.

3. Input Shaft Refinish

A. References

(1) SOPM 20-30-02, Stripping of Protective Finishes

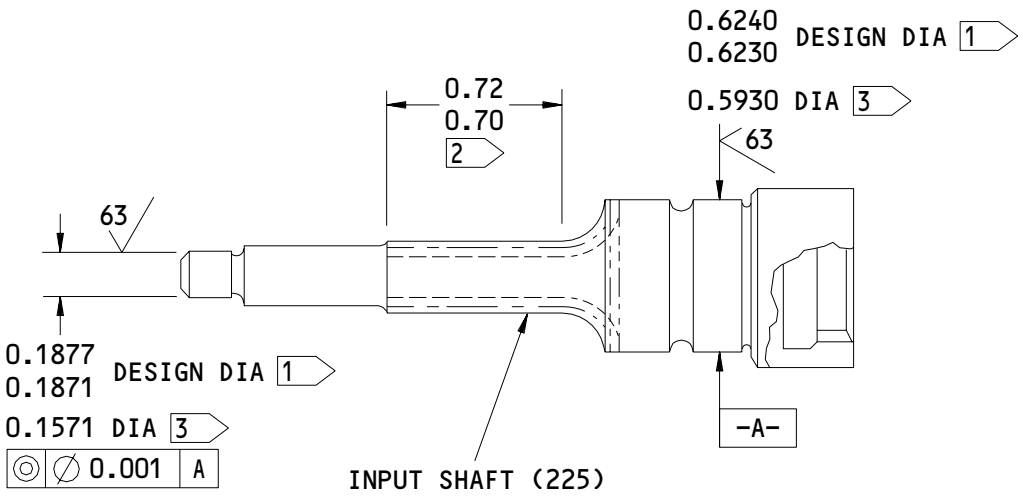
(2) SOPM 20-30-03, General Cleaning Procedures

(3) SOPM 20-41-01, Decoding Table for Boeing Finish Codes

(4) SOPM 20-42-05, Bright Cadmium Plating

B. Procedure (Fig. 601)

(a) Cadmium plate (F-15.02), 0.0002-0.0004 inch thick, as shown in Fig. 601.



1 DIMENSIONS APPLY AFTER PLATING

2 NITRIDE ONLY. NO PLATING THIS SURFACE

3 REPAIR LIMIT

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

253T7116-1
Input Shaft Repair
Figure 601

K63346

SERVO WORM - REPAIR 3-1

253T7115-1

1. General

A. This repair gives the data that is necessary to repair and refinish the servo worm (195).

B. Refer to the Standard Overhaul Practices Manual (SOPM) for the standard practices shown in the repair.

C. Refer to the REPAIR - GENERAL (22-32-32/601, REPAIR - GENERAL) for the standard true position dimensioning symbols shown in the repair.

D. General repair details:

(1) Material: Nitralloy 135

2. Servo Worm Repair

A. References

(1) SOPM 20-10-02, Machining of Alloy Steel

(2) SOPM 20-10-04, Grinding of Chrome Plated Parts

(3) SOPM 20-20-01, Magnetic Particle Inspection

(4) SOPM 20-42-03, Hard Chrome Plating.

B. Procedure (Fig. 601)

(1) Repair the servo worm (195):

(a) Machine the worn or damaged servo worm (195) as necessary to remove defects, cracks and corrosion as shown in SOPM 20-10-02. Do not machine more than the repair limit.

(b) Do a magnetic particle check of the servo worm (195) as shown in SOPM 20-20-01.

(c) Chrome plate the servo worm (195), as shown in SOPM 20-42-03, to a maximum plate thickness of 0.015 inches.

(d) Machine grind the servo worm (195), as shown in SOPM 20-10-04, to the design diameter. See Fig. 601.

(e) Put a finish on the servo worm (195) as shown below.

3. Servo Worm Refinish

A. References

(1) SOPM 20-30-02, Stripping of Protective Finishes

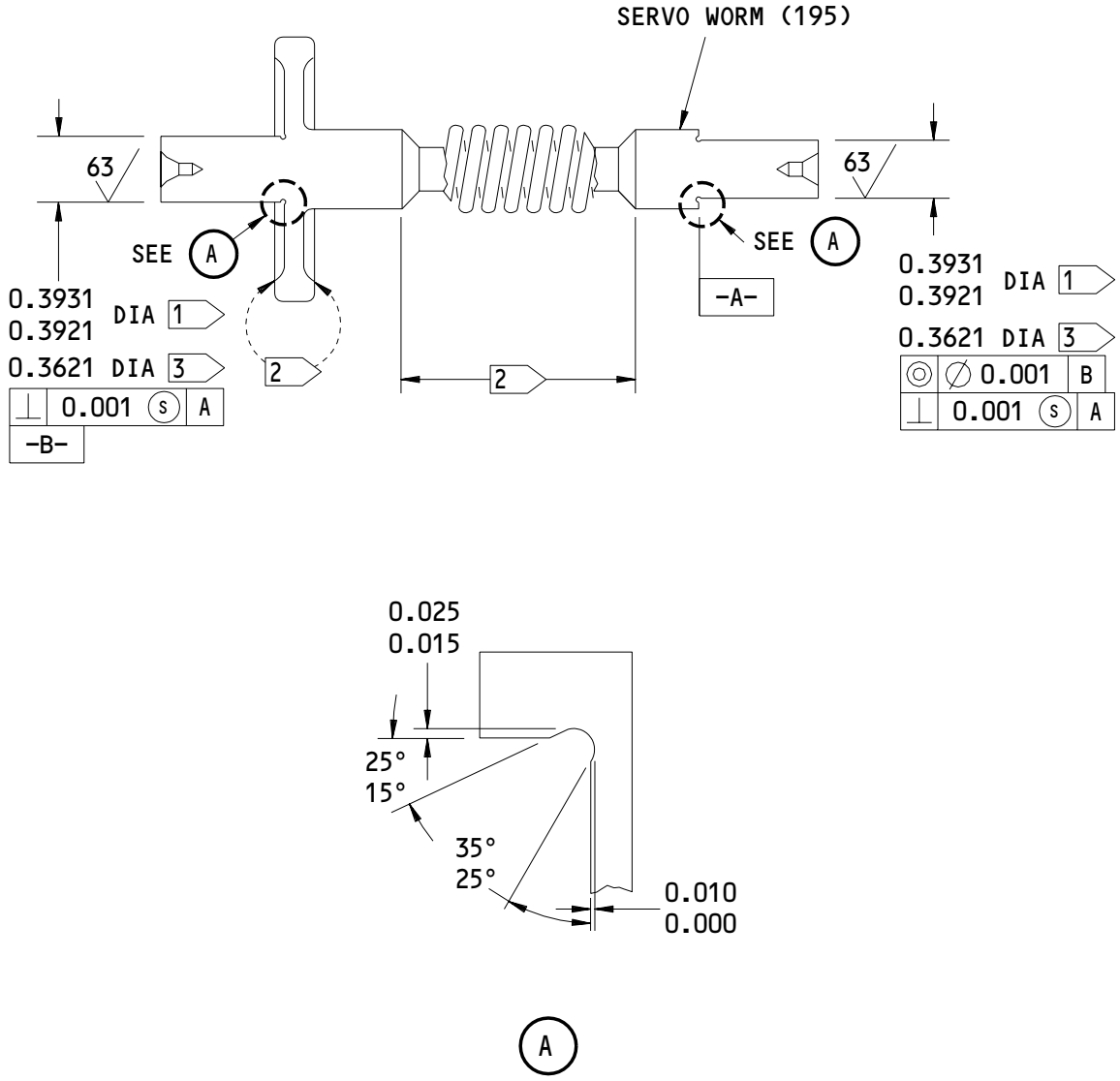
(2) SOPM 20-30-03, General Cleaning Procedures

(3) SOPM 20-41-01, Decoding Table for Boeing Finish Codes

(4) SOPM 20-42-05, Bright Cadmium Plating

B. Procedure (Fig. 601)

(a) Cadmium plate (F-15.02), 0.0002-0.003 inch thick, as shown in Fig. 601.



1 DIMENSIONS APPLY AFTER PLATING

2 NITRIDE ONLY, NO PLATING THIS SURFACE

3 REPAIR LIMIT

125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

253T7115-1
Servo Worm Repair
Figure 601

K63349

HOUSING - REPAIR 4-1

253T7117-1, -6

1. General

A. This repair gives the data that is necessary to repair and refinish the housing (255).

B. Refer to the Standard Overhaul Practices Manual (SOPM) for the standard practices shown in the repair.

C. Refer to the REPAIR - GENERAL (22-32-32/601, REPAIR - GENERAL) for the standard true position dimensioning symbols shown in the repair.

D. Refer to IPL Fig. 1 for item numbers.

E. General repair details:

(1) Material: Al alloy

2. Housing Repair

A. References

(1) SOPM 20-20-02, Penetrant Methods of Inspection

B. Procedure (Fig. 601)

(1) Repair the housing (255):

(a) Machine the worn or damaged housing (255) bearing holes as necessary to remove defects, cracks and corrosion. Do not machine more than the repair limit.

(b) Do a penetrant check of the housing (255) as shown in the SOPM 20-20-02.

(c) Hard anodize (F-17.06) the housing (255) bearing hole to a maximum thickness of 0.004 inches.

(d) Machine grind the housing (255) bearing holes to the design dimension. See Fig. 601.

3. Housing Refinish

A. Consumable Materials

NOTE: Equivalent material can be used.

(1) C00259 Primer -- BMS 10-11, Type 1 (SOPM 20-60-02)

B. References

(1) SOPM 20-30-02, Stripping of Protective Finishes

(2) SOPM 20-30-03, General Cleaning Procedures

(3) SOPM 20-41-01, Decoding Table for Boeing Finish Codes

(4) SOPM 20-41-02, Application of Chemical and Solvent Resistant Finishes

(5) SOPM 20-43-01, Chromic Acid Anodizing

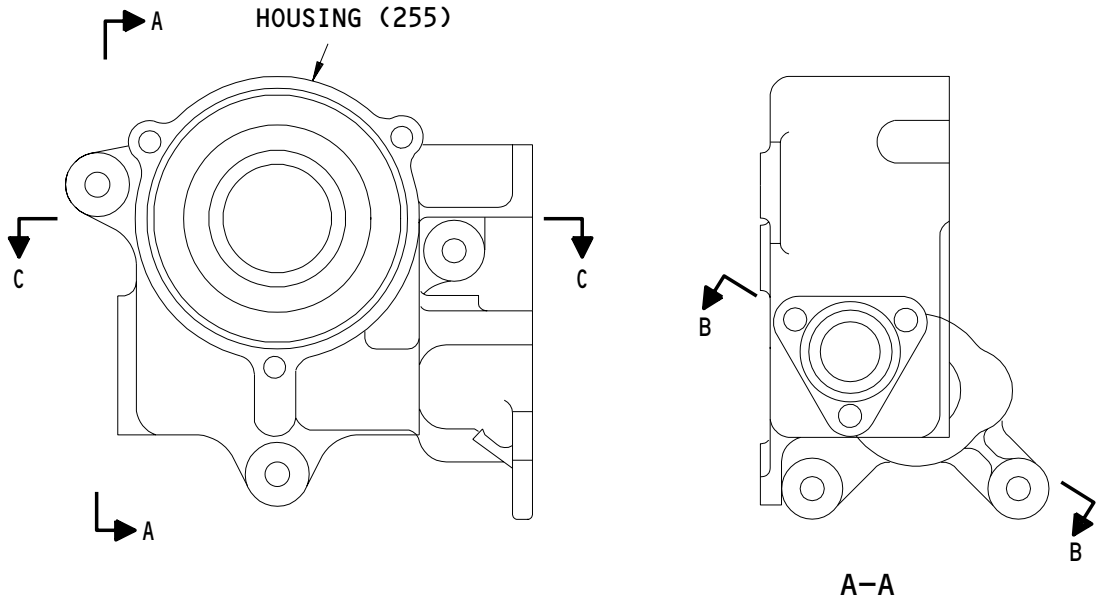
(6) SOPM 20-60-02, Finishing Materials

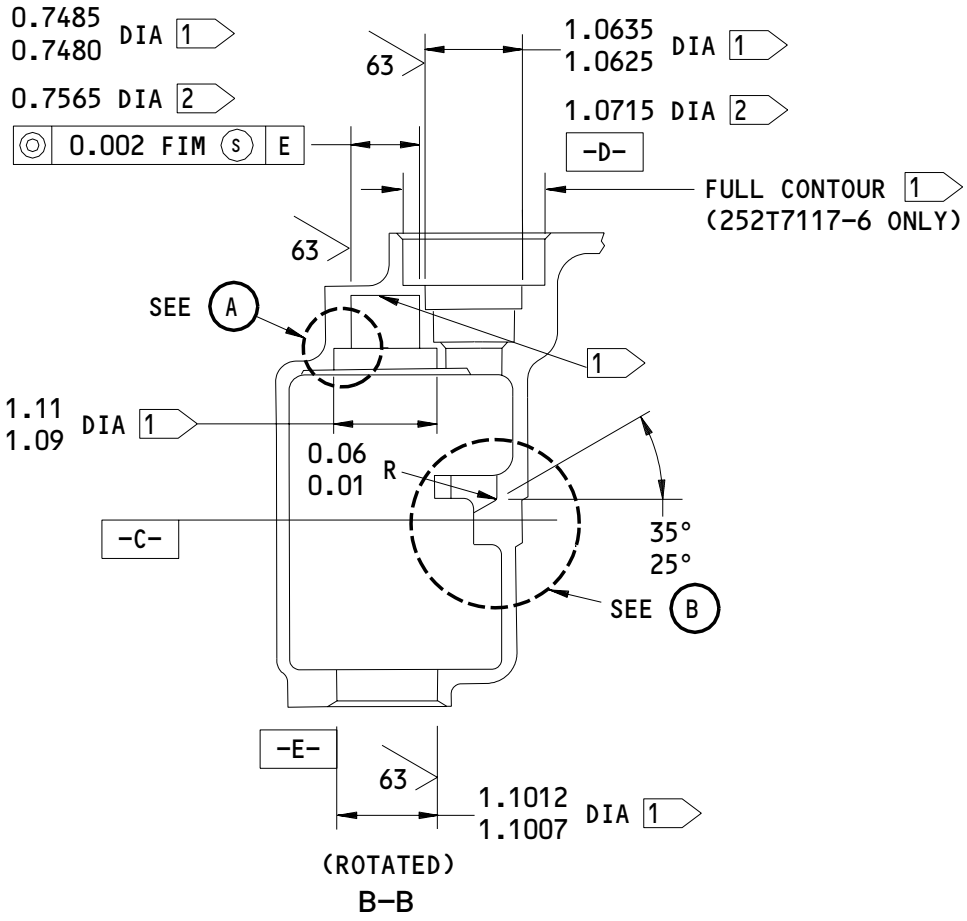
C. Procedure (Fig. 601)

(1) 253T7117-1 -- Chromic acid anodize or sulfuric acid anodize (F-17.05) all over.

(2) 253T7117-6 -- Boric acid-sulfuric acid anodize or chromic acid anodize (F-17.31) all over.

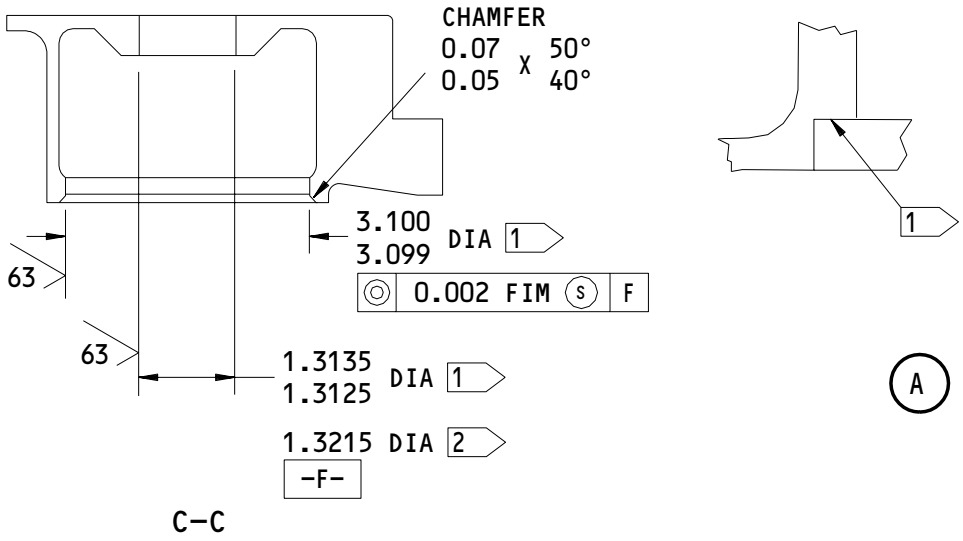
(3) Apply BMS 10-11, Type 1 primer (F-20.02) as shown in Fig. 601.

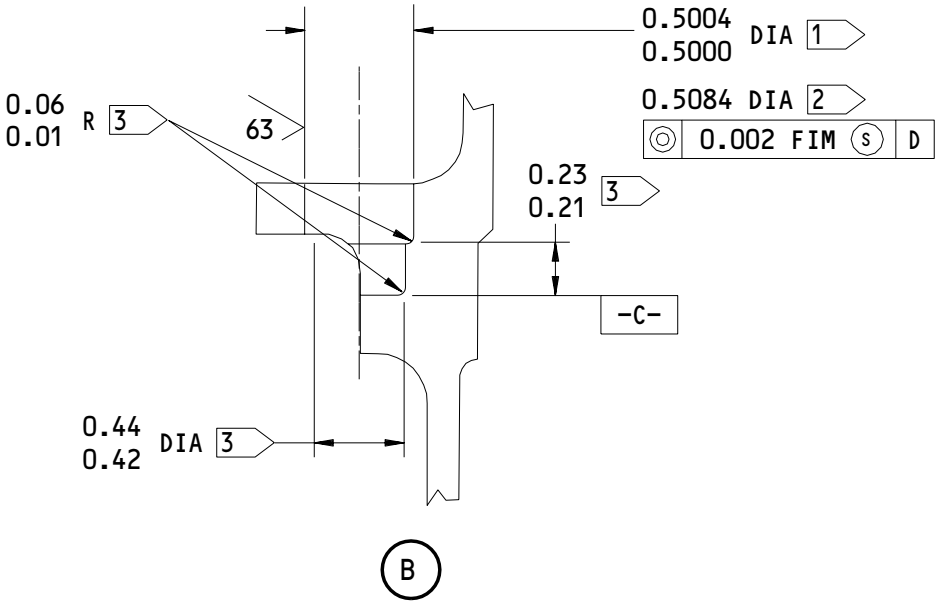




253T7117-1,-6
Housing Repair
Figure 601 (Sheet 1)

K63350





1 NO PRIMER ON THIS SURFACE

2 REPAIR LIMIT

3 OPTIONAL CONFIGURATION

125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

253T7117-1
Housing Repair
Figure 601 (Sheet 2)

K63351

END CAP - REPAIR 5-1

253T7118-1

1. General

A. This repair gives the data that is necessary to repair and refinish the end cap (185).

B. Refer to the Standard Overhaul Practices Manual (SOPM) for the standard practices shown in the repair.

C. Refer to the REPAIR - GENERAL (22-32-32/601, REPAIR - GENERAL) for the standard true position dimenioning symbols shown in the repair.

D. Refer to IPL Fig. 1 for item numbers.

E. General repair details:

(1) Material: Al alloy

2. End Cap Repair

A. References

(1) SOPM 20-20-02, Penetrant Methods of Inspection

(2) SOPM 20-41-01, Decoding Table for Boeing Finish Codes

B. Procedure (Fig. 601)

(1) Repair the end cap (185):

(a) Machine the worn or damaged end cap (185) bearing holes as necessary to remove defects, cracks and corrosion. Do not machine more than the repair limit.

(b) Do a penetrant check of the end cap (185) as shown in the SOPM 20-20-02.

(c) Hard anodize (F-17.06) the end cap (185) bearing hole to a maximum thickness of 0.004 inches.

(d) Machine grind the end cap (185) bearing holes to the design dimensions. See Fig. 601.

3. End Cap Refinish

A. Consumable Materials

(1) C00259 Primer -- BMS 10-11, Type 1 (SOPM 20-60-02)

B. References

(1) SOPM 20-30-02, Stripping of Protective Finishes

(2) SOPM 20-30-03, General Cleaning Procedures

(3) SOPM 20-41-01, Decoding Table for Boeing Finish Codes

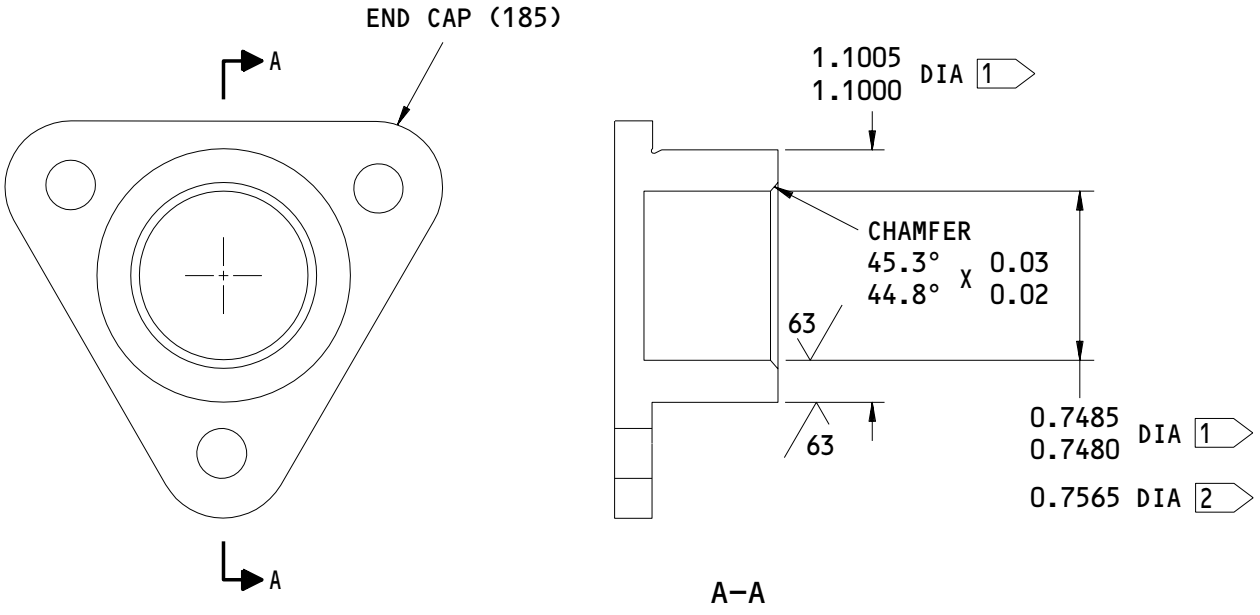
(4) SOPM 20-41-02, Application of Chemical and Solvent Resistant Finishes

(5) SOPM 20-43-01, Chromic Acid Anodizing

(6) SOPM 20-60-02, Finishing Materials

C. Procedure (Fig. 601)

(a) Chromic acid anodize and apply BMS 10-11, Type 1 primer (F-18.13) as shown in Fig. 601.



1 NO PRIMER IN THIS AREA

2 REPAIR LIMIT

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

253T7118–1
End Cap Repair
Figure 601

K63352

END COVER ASSEMBLY - REPAIR 6-1

254W4142-1

1. General

   A. This repair gives the data that is necessary to replace the bearing on the cover assembly (40).

   B. Refer to the Standard Overhaul Practices Manual (SOPM) for the standard practices shown in the repair.

   C. Refer to IPL Fig. 1 for item numbers.

2. Bearing Replacement

   A. References

      (1) SOPM 20-50-03, Bearing and Bushing Replacement

   B. Procedure

      (1) Remove the bearing (45) from the cover (50).

      (2) Install and roller swage (SOPM 20-50-03) the replacment bearing (45).

END COVER - REPAIR 6-2

254W4142-2

1. General

A. This repair gives the data that is necessary to repair and refinish the end cover (50).

B. Refer to the Standard Overhaul Practices Manual (SOPM) for the standard practices shown in the repair.

C. Refer to the REPAIR - GENERAL (22-32-32/601, REPAIR - GENERAL) for the standard true position dimensioning symbols shown in the repair.

D. Refer to IPL Fig. 1 for item numbers.

E. General repair details:

(1) Material: Al alloy

2. End Cover Repair

A. References

(1) SOPM 20-20-02, Penetrant Methods of Inspection

(2) SOPM 20-41-01, Decoding Table for Boeing Finish Codes

B. Procedure (Fig. 601)

(1) Repair the end cover (50):

(a) Machine the worn or damaged bearing hole as necessary to remove defects, cracks and corrosion. Do not machine more than the repair limit.

(b) Do a penetrant check of the end cover (50) as shown in SOPM 20-20-02.

(c) Hard anodize (F-17.06) the bearing hole to a maximum thickness of 0.004 inches.

(d) Machine grind the bearing hole to the design dimensions and finish shown in Fig. 601.

3. End Cover Refinish

A. Consumable Materials

(1) C00259 Primer -- BMS 10-11, Type 1 (SOPM 20-60-02)

B. References

(1) SOPM 20-30-02, Stripping of Protective Finishes

(2) SOPM 20-30-03, General Cleaning Procedures

(3) SOPM 20-41-01, Decoding Table for Boeing Finish Codes

(4) SOPM 20-41-02, Application of Chemical and Solvent Resistant Finishes

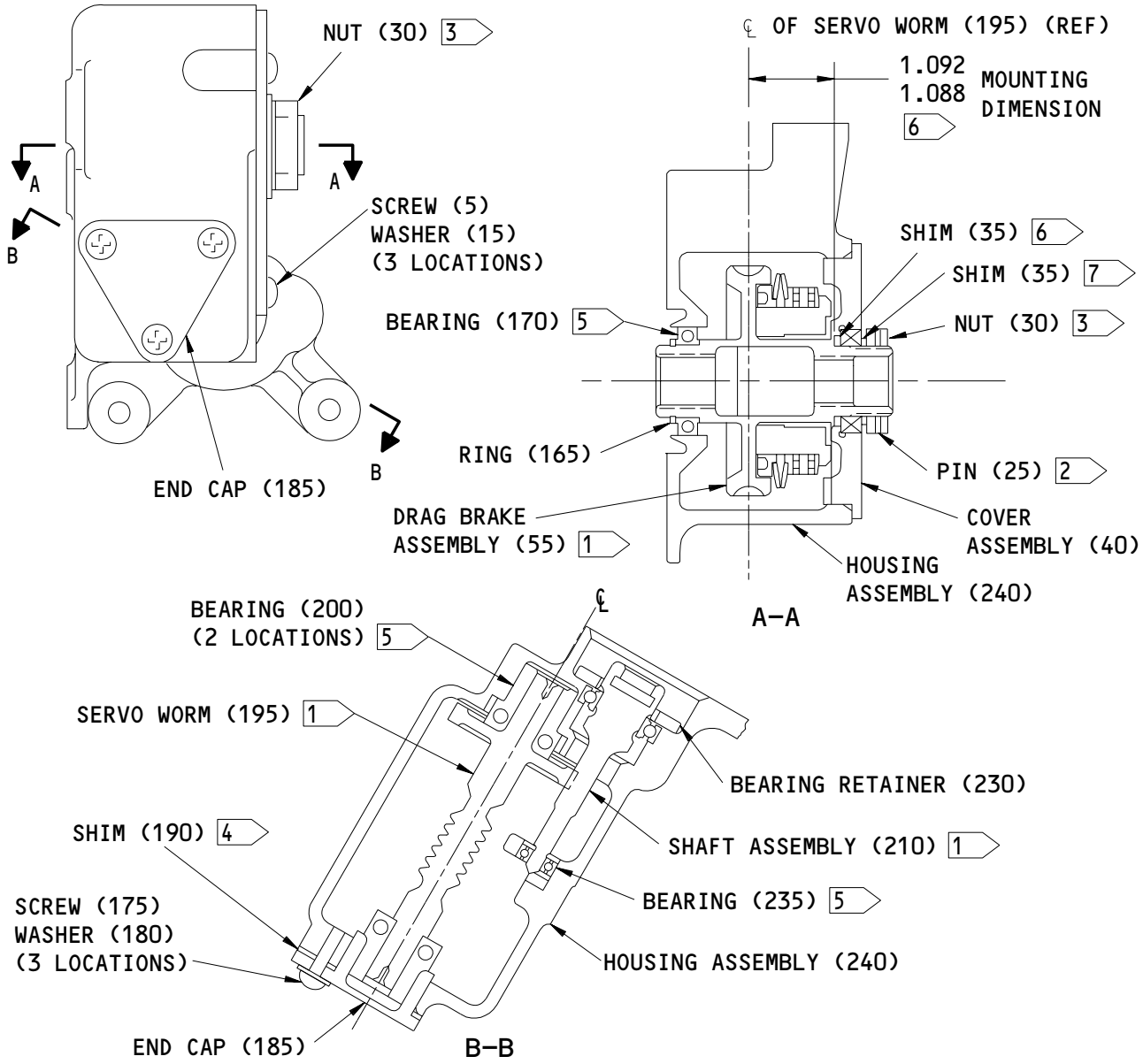
(5) SOPM 20-43-01, Chromic Acid Anodizing

(6) SOPM 20-60-02, Finishing Materials

C. Procedure (Fig. 601)

(a) Chromic acid anodize or sulfuric acid anodize (F-17.05) all over.

(b) Apply one layer of BMS 10-11, Type 1 primer (F-20.02) as shown in Fig. 601.



1 > APPLY A LARGE QUANTITY OF GREASE TO THE GEARS AND THE WORM

2 > POINT STAKE FLUSH TO 0.03 IN. BELOW NUT (30) WITH A SINGLE POINT STAKE ON THE EDGE OF THE HOLE.

3 > TIGHTEN NUT (30) TO 100–200 LB-IN.

4 > ADJUST THE SHIM THICKNESS SO AXIAL MOVEMENT OF THE WORM IS 0.0033 MAXIMUM

5 > INSTALL AS SHOWN IN SOPM 20-50-03.

6 > ADJUST THE SHIM THICKNESS TO PUT THE DRAG BRAKE ASSEMBLY AT THE MOUNTING DIMENSION

7 > ADJUST THE SHIM THICKNESS TO ALIGN THE HOLES IN THE NUT AND THE DRAG BRAKE ASSEMBLY

254W4142-2
End Cover Repair
Figure 601

K63353

ASSEMBLY

1. General

   A. This procedure contains the data necessary to assemble the control stand autothrottle gearbox assembly.

   B. Refer to the Standard Overhaul Practices Manual (SOPM) to find the SOPM chapters identified in this procedure.

   C. Refer to IPL Fig. 1 for item numbers.

2. Control Stand Autothrottle Gearbox Assembly

   A. Special Tools and Equipment

      NOTE: Equivalent equipment can be used.

      (1) Checking Fixture -- A22004-1

   B. Consumable Materials

      NOTE: Equivalent material can be used.

      (1) D00013 Grease -- MIL-PRF-23827 (SOPM 20-60-03)

   C. References

      (1) SOPM 20-50-03, Bearing and Bushing Replacement

      (2) SOPM 20-50-07, Lubrication

      (3) SOPM 20-60-03, Lubricants

   D. Procedure

      (1) Apply a large quantity of grease to all gear teeth and threads of the worm.

      (2) Install the bearing (235) on the shaft assembly (210) with grease, as shown in SOPM 20-50-03, and install the shaft assembly in the housing assembly (240).

      (3) Install the bearing retainer (230) on the housing assembly (240) and attach with the screws (205).

(4) Install the servo worm (195) as follows:

(a) Disassemble one bearing (200) into 3 pieces: a shaft race, balls with a retainer and a thrust race.

NOTE: If the bearing (200) cannot be disassembled, do not use this type of bearing. Some bearings with the same part number cannot be disassembled and will prevent the installation of the servo worm (195) in the housing assembly (240).

(b) Install the shaft race of the bearing (200) in the housing assembly (240) and install the thrust race and balls of the bearing (200) on the servo worm (195) with grease as shown in SOPM 20-50-03.

(c) Install the servo worm (195) in the shaft race of the bearing (200) in the housing assembly (240). Engage the spur gear teeth of the servo worm (195) and the shaft assembly (210).

(d) Install the other bearing (200) on the servo worm (195) with grease as shown in SOPM 20-50-03.

(e) Put the end cap (185) on the bearing (200) with grease, as shown in SOPM 20-50-03. Measure the clearance between the end cap (185) and the housing assembly (240) with a feeler gage.

(f) Remove the laminations on the shim (190) to adjust the thickness to the measured clearance.

(g) Install the shim (190) and the end cap (185) on the housing assembly (240) and attach them with the screws (175) and washers (180). Make sure that the axial movement of the servo worm (195) is not more than 0.0033 inch.

NOTE: Use the same shim thickness as noted during the disassembly. If the shim thickness is correct, more adjustment is not necessary.

(5) Assembly the drag brake assembly (55) as follows:

(a) Install the friction disk (60) on the hub assembly (140).

(b) Apply a large quantity of grease, as shown in SOPM 20-50-07, to the two sides of each skewed roller assembly (65).

(c) Install one skewed roller assembly (65), the friction disk assembly (80) and the other skewed roller assembly (65) on the hub assembly (140).

NOTE: Install the skewed roller assemblies (65) to turn in spirals in opposite directions related to each other.

(d) Install the plate (120), the two springs (125), the spring seat (130) and the shims (135) on the hub assembly (140).

NOTE: Use the same shim thickness as noted during the disassembly. The shim thickness is adjusted during the run-in and acceptance tests to set the friction torque of the drag brake. If the shim thickness is correct, more adjustment will not be necessary.

NOTE: Install the two springs (125) opposite to each other.

(e) Install the hub assembly (140) with the other parts on the worm gear (160) with the bolts (145).

(f) Tighten the bolts (145) to 15-20 pound-inches.

(g) Do the Run-in Procedure and the Acceptance Test for the drag brake assembly (55) (22-32-33/101, TESTING AND FAULT ISOLATION).

(6) Remove the laminations of the inner shim (35) as necessary to put the drag brake assembly (55) at the dimension shown in Fig. 701.

NOTE: Use the same shim thickness as noted during the disassembly. If the shim thickness is correct, more adjustment is not necessary.

NOTE: If the shim thickness is not known, use the checking fixture to find the thickness necessary to get the dimension shown in Fig. 701.

(7) Install the end cover assembly (40) on the drag brake assembly (55) with the screws (10), washers (20) and the inner shim (35).

(8) Tighten the screws (10) to 12-15 pound-inches.

(9) Install the drag brake assembly (55) and the end cover assembly (40) in the housing assembly (240) with the screws (5) and washers (15).

(10) Install the bearing (170) on the drag brake assembly (55) with grease (SOPM 20-50-03).

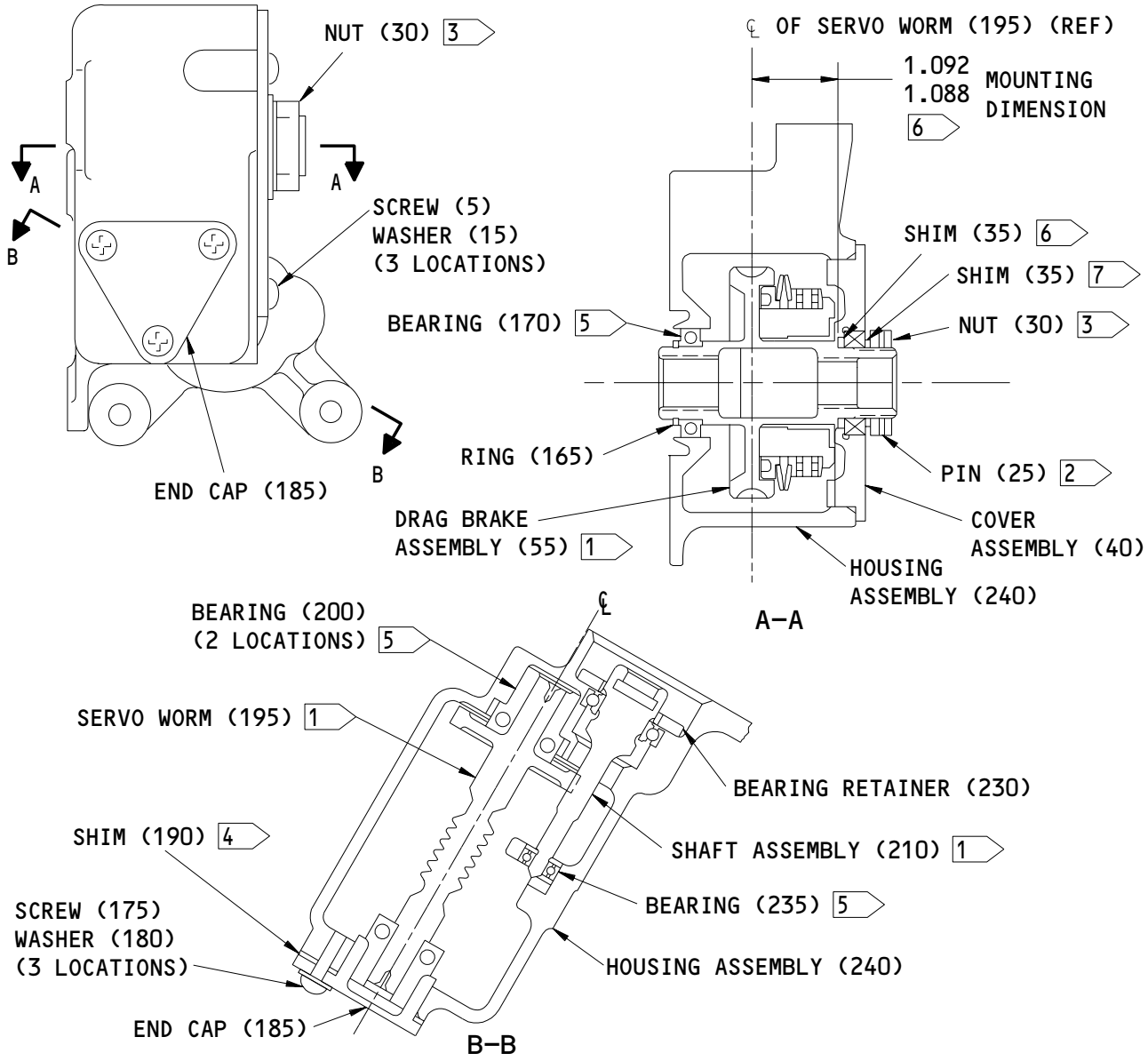
(11) Install the bearing retaining ring (165) on the drag brake assembly (55).

(12) Install the outer shim (35) and nut (30) on the drag brake assembly. Tighten the nut to 100-200 pound-inches.

NOTE: Use the same shim thickness as noted during the disassembly. If the shim thickness is correct, more adjustment will not be necessary.

(13) Adjust the thickness of the outer shim (35), if necessary to align the holes in the nut (30) with the holes in the drag brake assembly (55).

(14) Install the spring pin (25) so its end is flush to 0.03 inch below the surface of the nut (30). Make a single point stake on the edge of the hole to hold the spring pin.



1 APPLY A LARGE QUANTITY OF GREASE TO THE GEARS AND THE WORM

2 POINT STAKE FLUSH TO 0.03 IN. BELOW NUT (30) WITH A SINGLE POINT STAKE ON THE EDGE OF THE HOLE.

3 TIGHTEN NUT (30) TO 100–200 LB-IN.

4 ADJUST THE SHIM THICKNESS SO AXIAL MOVEMENT OF THE WORM IS 0.0033 MAXIMUM

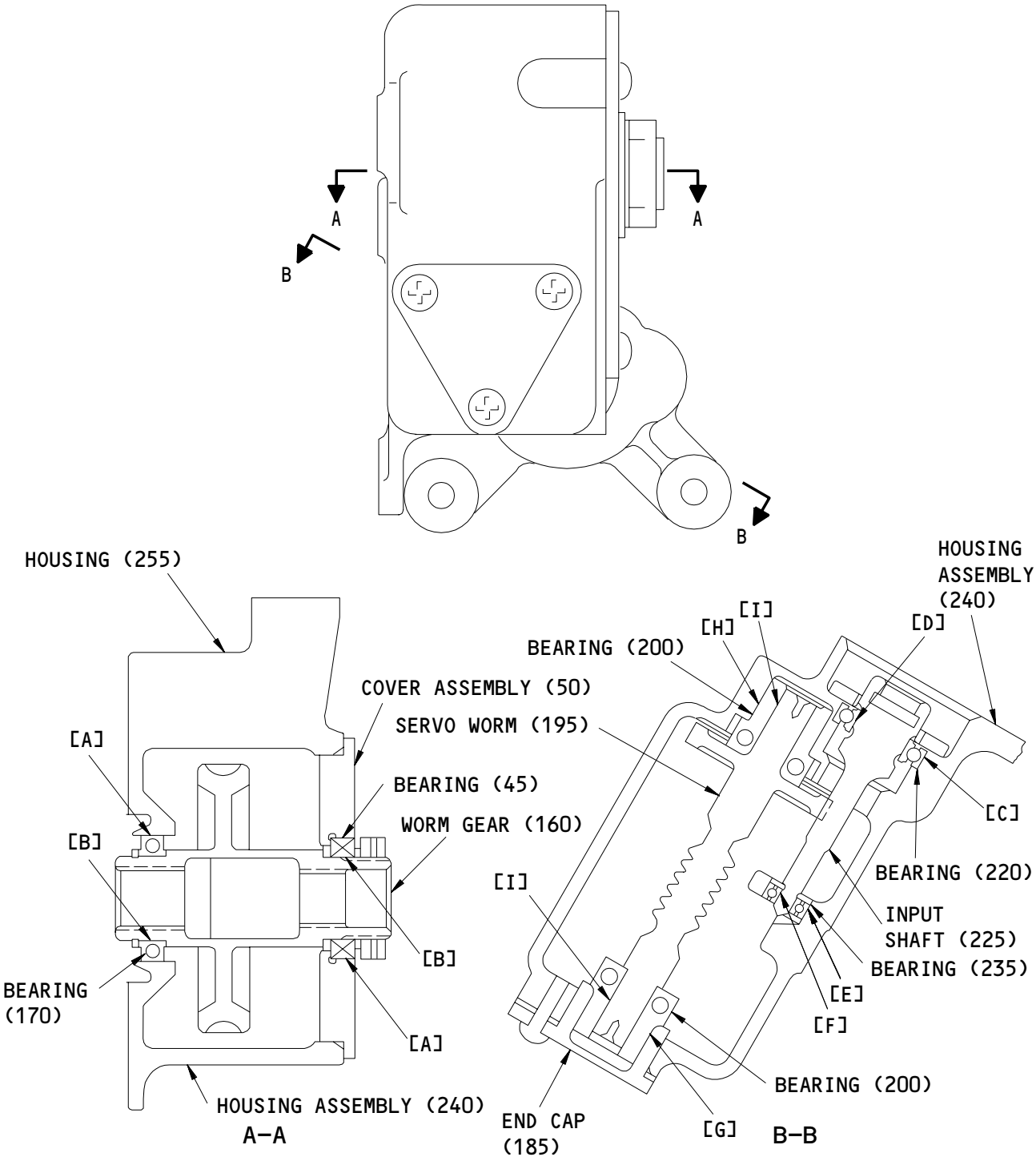
5 INSTALL AS SHOWN IN SOPM 20-50-03.

6 ADJUST THE SHIM THICKNESS TO PUT THE DRAG BRAKE ASSEMBLY AT THE MOUNTING DIMENSION

7 ADJUST THE SHIM THICKNESS TO ALIGN THE HOLES IN THE NUT AND THE DRAG BRAKE ASSEMBLY

Autothrottle Gearbox Assembly
Figure 701

K63354



Fits and Clearances
Figure 801 (Sheet 1)

K63356

REF LETTER	REF IPL FIG. 1, MATING ITEM NO.	DESIGN DIMENSION*				SERVICE WEAR LIMIT*		
		DIMENSION		ASSEMBLY CLEARANCE 1		DIMENSION		MAXIMUM CLEARANCE
		MIN	MAX	MIN	MAX	MIN	MAX	
[A]	ID 50,240	1.3125	1.3135	0.0000	0.0015		1.3161	0.0067
	OD 45,170	1.3120	1.3125			1.3094		
[B]	ID 45,170	0.8745	0.8750	0.0002	0.0012		0.8800	0.0112
	OD 160	0.8738	0.8743			0.8688		
[C]	ID 240	1.0625	1.0635	0.0000	0.0020		1.0661	0.0072
	OD 220	1.0615	1.0625			1.0589		
[D]	ID 220	0.6243	0.6257	0.0003	0.0027		0.6283	0.0072
	OD 225	0.6230	0.6240			0.6204		
[E]	ID 240	0.5000	0.5004	0.0000	0.0008		0.5030	0.0060
	OD 235	0.4996	0.5000			0.4970		
[F]	ID 235	0.1872	0.1875	-0.0005	0.0004		0.1901	0.0056
	OD 225	0.1871	0.1877			0.1845		
[G]	ID 185	0.7480	0.7485	0.0000	0.0009		0.7511	0.0051
	OD 200	0.7476	0.7480			0.7450		
[H]	ID 240	0.7480	0.7485	0.0000	0.0009		0.7511	0.0051
	OD 200	0.7476	0.7480			0.7450		
[I]	ID 200	0.3933	0.3937	0.0002	0.0016		0.3963	0.0068
	OD 195	0.3921	0.3931			0.3895		

* ALL DIMENSIONS ARE IN INCHES

1 NEGATIVE VALUES DENOTE INTERFERENCE FIT

Fits and Clearances
Figure 801 (Sheet 2)

K63368

REF IPL		NAME	TORQUE*	
FIG. NO.	ITEM NO.		POUND-INCHES	POUND-FEET
1	30	Nut	100-200	
1	10	Screw	12-15	
1	145	Bolt	15-20	

* REFER TO SOPM 20-50-01 FOR TORQUE VALUES OF STANDARD FASTENERS.

Torque Table
Figure 802

K63370

SPECIAL TOOLS, FIXTURES, AND EQUIPMENT

1. General

A. This a list of the special tools, fixtures, and equipment used in this manual.

B. Equivalent alternatives can be used.

(1) A22004-1 -- Checking Fixture

(2) J22002-1 -- Spline Wrench

(3) J22004-67 -- Autothrottle Gearbox Brake Test Equipment (230 VAC, 50 Hz) (Supersedes J22004-1, -54)

(4) J22004-68 -- Autothrottle Gearbox Brake Test Equipment (110 VAC, 60 Hz) (Supersedes J22004-2, -55)

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.

VENDORS

K8455 RHP BEARINGS PLC RHP AEROSPACE
OLDENDS LANE
STONEHOUSE GL10 3RM UK

S0352 NIPPON MINIATURE BEARING CO LTD
TOKYO, JAPAN

06144 INDUSTRIAL TECTONICS BEARING CORP
18301 SOUTH SANTA FE AVENUE
RANCO DOMINQUEZ, CALIFORNIA 90221

21335 TORRINGTON CO FAFNIR BEARING DIV
59 FIELD STREET
TORRINGTON, CONNECTICUT 06790-4942

21760 SCHATZ MANUFACTURING CO
FAIRVIEW AVENUE PO BOX 1191
POUGHKEEPSIE, NEW YORK 12601

27737 INA BEARING COMPANY INC
1 INA DRIVE
CHERAW, SOUTH CAROLINA 29520

29337 HOOVER GROUP INC BALL AND ROLLER DIV
2220 PENDLEY ROAD PO BOX 899
CUMMING, GEORGIA 30130-8671

30163 VALENTEC DAYRON INC
333 MAGUIRE BLVD PO BOX 140394
ORLANDO, FLORIDA 32814-0394

38443 MRC BEARINGS
402 CHANDLER STREET
JAMESTOWN, NEW YORK 14701-3802

40920 MPB MINIATURE PRECISION BEARING DIV
PRECISION PARK PO BOX 547
KEENE, NEW HAMPSHIRE 03431

43991 FAG BEARING INCORPORATED
118 HAMILTON AVENUE
STAMFORD, CONNECTICUT 06904

VENDORS

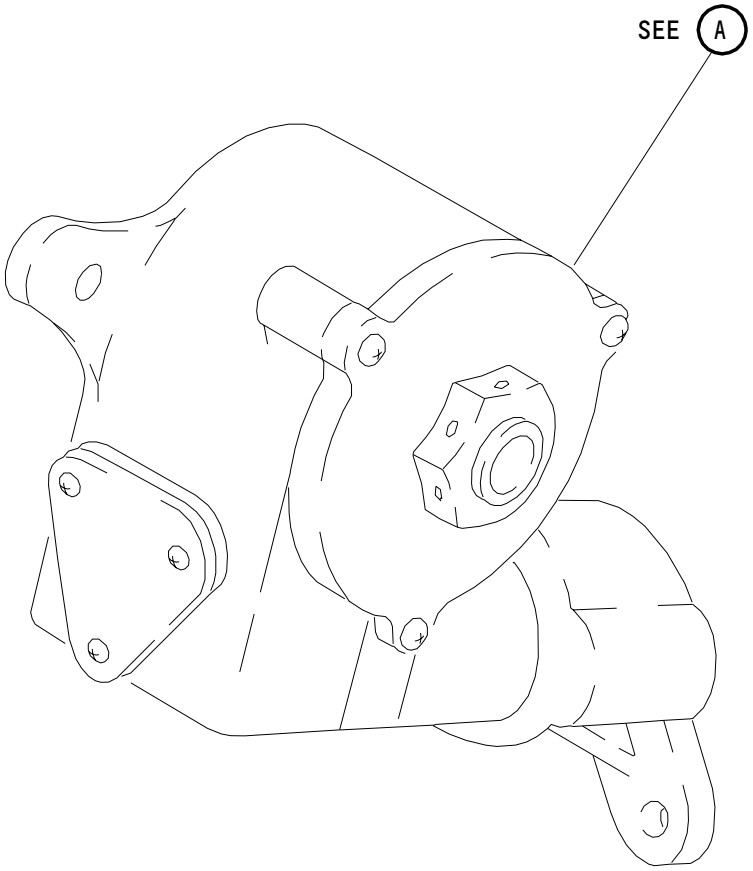
50294 NEW HAMPSHIRE BALL BEARINGS INC
9730 INDEPENDENCE AVENUE PO BOX 2515
CHATSWORTH, CALIFORNIA 91311-4323

83086 NEW HAMPSHIRE BALL BEARINGS, INCORPORATED
ROUTE 202
PETERBOROUGH, NEW HAMPSHIRE 03458

PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
BACB10AS14		1	45	1
		1	170	1
BACB10AT3MM		1	235	1
BACB10CF10PP		1	220	1
BACN10JP06ACD		1	110	2
BACR12Y75		1	215	1
BACS13W2CN3		1	245	2
BACS13W3CN4		1	250	6
B538-2TS		1	220	1
B538DD		1	220	1
B538DDFS101		1	220	1
B538DDFS428		1	220	1
B538FS101		1	220	1
B538SSG27		1	220	1
LLMB540		1	45	1
		1	170	1
LLR3N		1	235A	1
MB540-2TS		1	45	1
		1	170	1
MB540DD		1	45	1
		1	170	1
MB540DDFS428		1	45	1
		1	170	1
MB540DDG20		1	45	1
		1	170	1
MB540DDLY196		1	45	1
		1	170	1
MB540DDSD610		1	45	1
		1	170	1
MB540TT		1	45	1
		1	170	1
MB540ZZ		1	45A	1
		1	170A	1
MS16562-1		1	25	1
MS16624-1087		1	165	1
MS20615-4MP7		1	85A	2
MS206153MP3		1	105	4
MS21209C0815		1	150	4

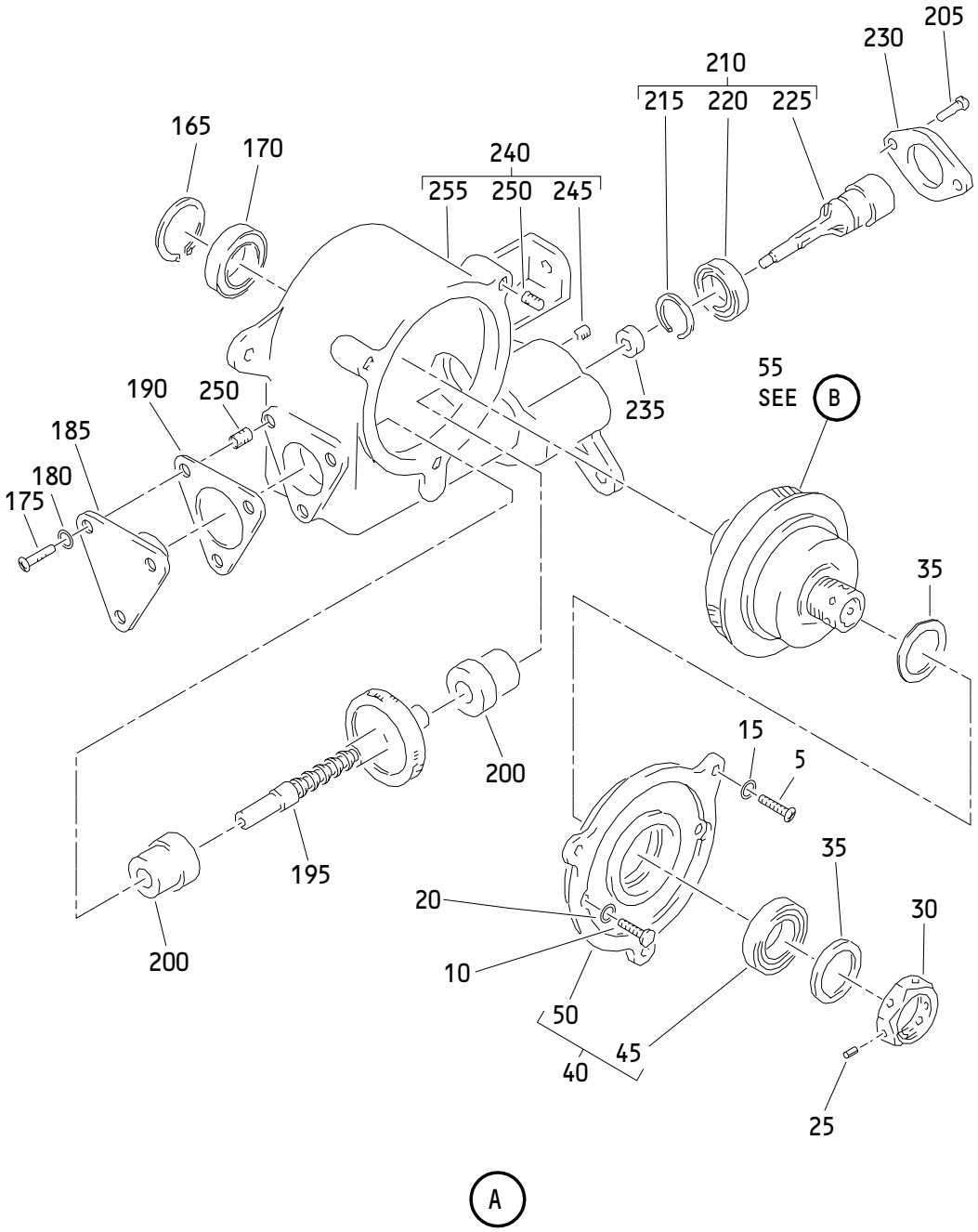
PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
MT340E		1	45	1
		1	170	1
NAS11352N08-8P		1	145	4
NAS1149DN632J		1	20	2
NAS1149D0332J		1	15	3
		1	180	3
NAS1801-06-13		1	10	2
NAS514P832-7P		1	205	2
NAS603-8P		1	5	3
		1	175	3
NAS620C5		1	90	4
NKX10ZTN		1	200	2
R3FF1L1-01		1	235	1
R3LL		1	235A	1
R3NFFM		1	235	1
R3PP		1	235	1
R3RRT1L1-01		1	235A	1
R3TT		1	235A	1
R3ZZ		1	235	1
T338E		1	220	1
253T7114-2		1	210	1
253T7115-1		1	195	1
253T7116-1		1	225	1
253T7117-1		1	255	1
253T7117-3		1	240	1
		1	240B	1
253T7117-5		1	240A	1
253T7117-6		1	255A	1
253T7118-1		1	185	1
253T7119-1		1	190	1
253T7120-1		1	230	1
254W4140-1		1	1A	RF
254W4140-2		1	55	1
254W4140-3		1	1B	RF
254W4140-4		1	55A	1
254W4141-1		1	160	1
254W4142-1		1	40	1
254W4142-2		1	50	1
254W4143-1		1	140	1
254W4143-2		1	155	1
254W4144-1		1	135	1
254W4144-2		1	135A	1

PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
254W4144-3		1	135B	1
254W4144-4		1	135C	1
254W4145-1		1	130	1
254W4146-1		1	125	2
254W4147-1		1	120	1
254W4147-2		1	120A	1
254W4148-1		1	80	1
254W4148-2		1	80A	1
254W4149-1		1	95	1
254W4149-2		1	95A	1
254W4150-1		1	100	1
254W4150-2		1	115	1
254W4151-1		1	60	1
254W4151-2		1	60A	1
254W4152-1		1	65	2
254W4152-2		1	75	2
254W4152-3		1	70	48
33KDD5FS160		1	235	1
33PP5FS428		1	235A	1
66-21146-1		1	35	2
66-22132-1		1	30	1
77R3		1	235	1



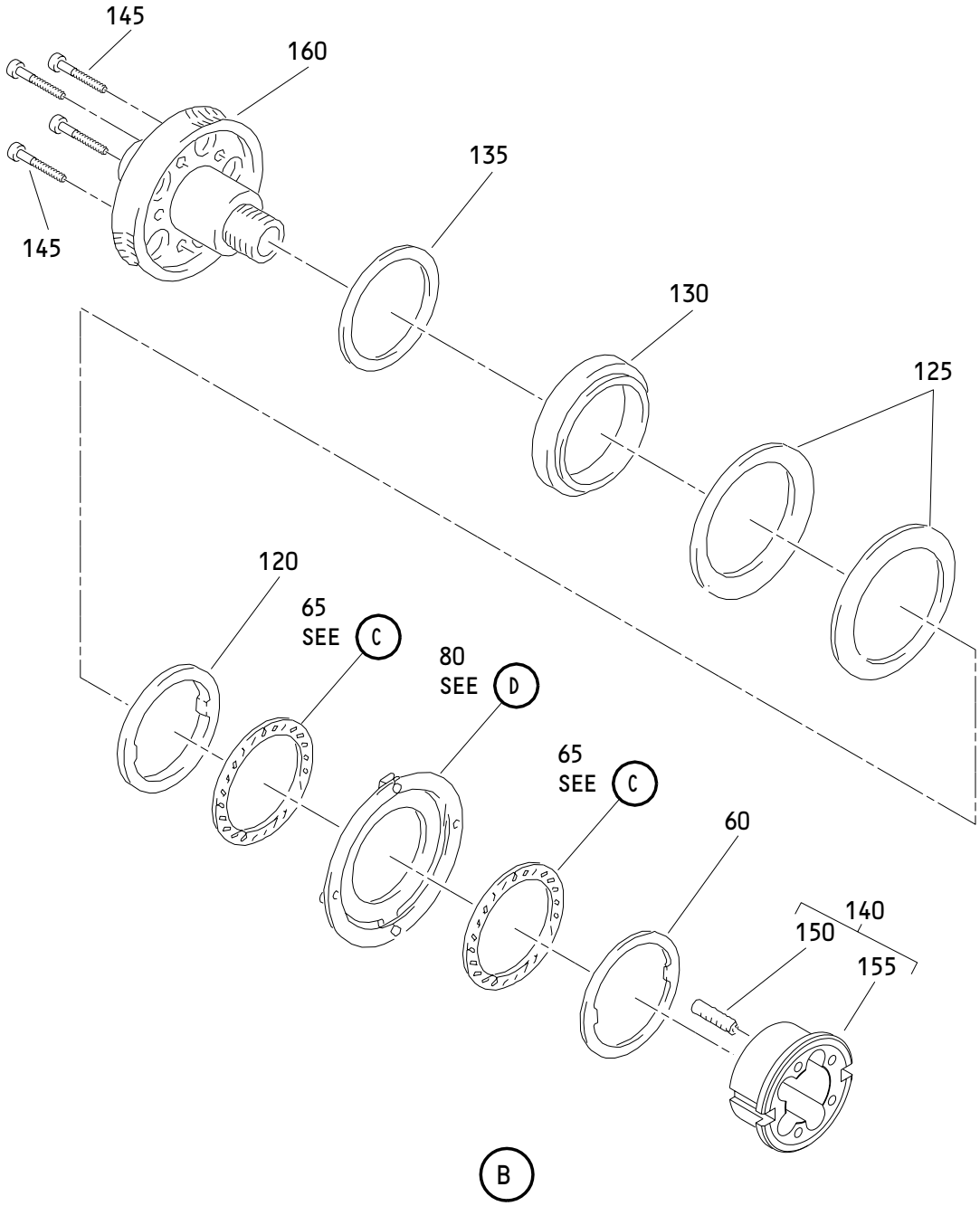
Control Stand Autothrottle Gearbox Assembly
Figure 1 (Sheet 1)

K63372



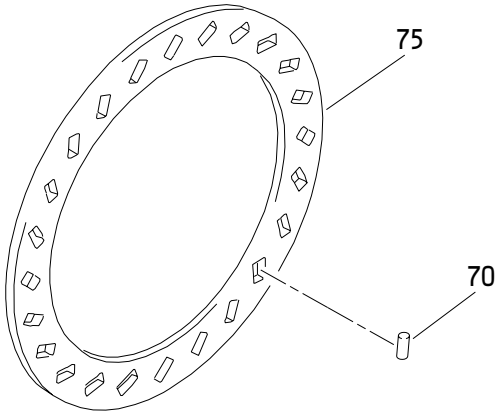
Control Stand Autothrottle Gearbox Assembly
Figure 1 (Sheet 2)

K63373

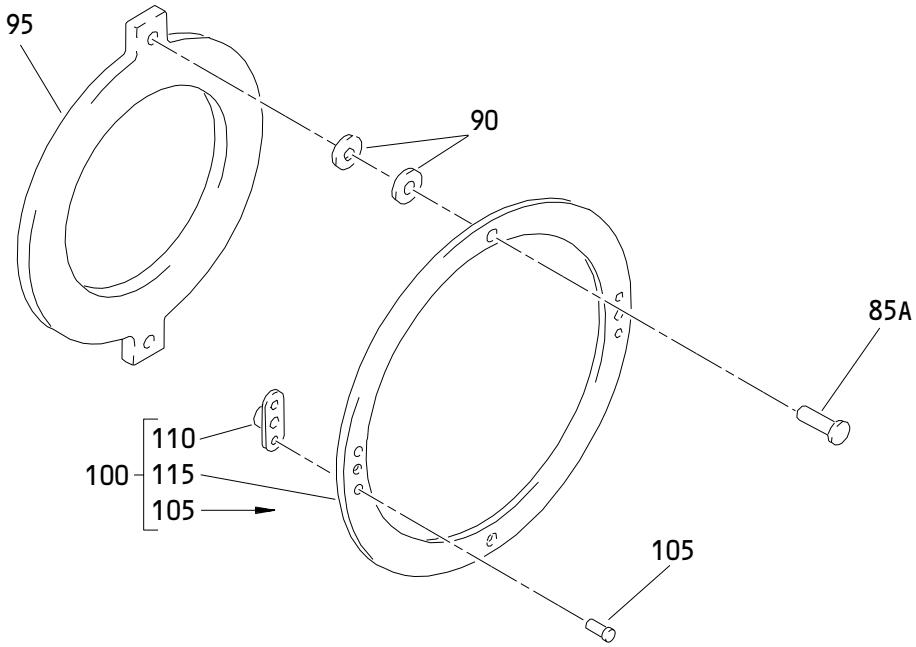


Control Stand Autothrottle Gearbox Assembly
Figure 1 (Sheet 3)

K63374



C



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Control Stand Autothrottle Gearbox Assembly
Figure 1 (Sheet 4)

K63375

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
-1A	254W4140-1		GEAR BOX ASSY-AUTOTHROTTLE, CONT. STAND	A	RF
-1B	254W4140-3		GEAR BOX ASSY-AUTOTHROTTLE, CONT. STAND	B	RF
5	NAS603-8P		.SCREW		3
10	NAS1801-06-13		.SCREW		2
15	NAS1149D0332J		.WASHER		3
20	NAS1149DN632J		.WASHER		2
25	MS16562-1		.PIN		1
30	66-22132-1		.NUT		1
35	66-21146-1		.SHIM		2
40	254W4142-1		.COVER ASSY-END		1
45	MB540DDSD610		..BEARING- (V83086) (SPEC BACB10AS14) (OPT LLMB540 (V38443)) (OPT MB540-2TS (V43991)) (OPT MB540DDFS428 (V21335)) (OPT MB540TT (V43991)) (OPT MB540DDG20 (V38443)) (OPT MT340E (VK8455)) (OPT MB540DDLY196 (V40920)) (OPT MB540DD (V06144)) (OPT ITEM 45A)		1
-45A	MB540ZZ		..BEARING- (V38443) (OPT ITEM 45)		1
50	254W4142-2		..COVER		1
55	254W4140-2		.BRAKE ASSY-DRAG	A	1

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
-55A	254W4140-4		.BRAKE ASSY-DRAG	B	1
60	254W4151-1		..DISK-FRICT	A	1
-60A	254W4151-2		..DISC-FRICT	B	1
65	254W4152-1		..ROLLER ASSY-SKEWED		2
70	254W4152-3		...ROLLER		24
75	254W4152-2		...CAGE		1
80	254W4148-1		..DISK ASSY-FRICT	A	1
-80A	254W4148-2		..DISC ASSY-FRICT	B	1
85	MS20615-4MP6		DELETED		
85A	MS20615-4MP7		...RIVET		2
90	NAS620C5		...WASHER		4
95	254W4149-1		...DISK	A	1
-95A	254W4149-2		...DISK	B	1
100	254W4150-1		...RING ASSY-FLEX		1
105	MS206153MP3		....RIVET- (SIZE DETERMINE ON INST)		4
110	BACN10JP06ACD		....NUTPLATE		2
115	254W4150-2		....RING		1
120	254W4147-1		..PLATE	A	1
-120A	254W4147-2		..PLATE	B	1
125	254W4146-1		..SPRING		2
130	254W4145-1		..SPRING SEAT		1
135	254W4144-1		..SHIM		AR
-135A	254W4144-2		..SHIM		AR
-135B	254W4144-3		..SHIM		AR
-135C	254W4144-4		..SHIM		AR
140	254W4143-1		..HUB ASSY ATTACHING PARTS		1
145	NAS11352N08-8P		..BOLT -------*-------		4

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
150	MS21209C0815		...INSERT		4
155	254W4143-2		...HUB		1
160	254W4141-1		..GEAR-WORM		1
165	MS16624-1087		.RING		1
170	MB540DDSD610		.BEARING- (V83086) (SPEC BACB10AS14) (OPT LLMB540 (V38443)) (OPT MB540-2TS (V43991)) (OPT MB540DDFS428 (V21335)) (OPT MB540TT (V43991)) (OPT MB540DDG20 (V38443)) (OPT MT340E (VK8455)) (OPT MB540DDLY196 (V40920)) (OPT MB540DD (V06144)) (OPT ITEM 170A)		1
-170A	MB540ZZ		.BEARING- (V38443) (OPT ITEM 170)		1
175	NAS603-8P		.SCREW		3
180	NAS1149D0332J		.WASHER		3
185	253T7118-1		.CAP-END		1
190	253T7119-1		.SHIM		1
195	253T7115-1		.WORM-SERVO		1
200	NKX10ZTN		.BEARING- (V27737)		2

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
205	NAS514P832-7P		.SCREW		2
210	253T7114-2		.SHAFT ASSY		1
215	BACR12Y75		..RING		1
220	B538FS101		..BEARING- (V06144) (SPEC BACB10CF10PP) (OPT B538DDFS101 (V06144)) (OPT T338E (VK8455)) (OPT B538SSG27 (V30163)) (OPT B538DDFS428 (V21335)) (OPT B538DD (V38443)) (OPT B538-2TS (V43991))		1
225	253T7116-1		..SHAFT-INPUT		1
230	253T7120-1		.RETAINER-BRG		1

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
235	33KDD5FS160		.BEARING- (V21335) (SPEC BACB10AT3MM) (OPT R3NFFM (V38443)) (OPT R3PP (V43991)) (OPT R3FF1L1-01 (V21760)) (OPT 77R3 (V29337)) (OPT R3ZZ (V50294)) (OPT R3ZZ (VS0352)) (OPT ITEMS 235A, 235B)		1
-235A	33PP5FS428		.BEARING- (V21335) (SPEC BACB10AT3PP) (OPT R3RRT1L1-01 (V21760)) (OPT R3TT (V43991)) (OPT LLR3N (V38443)) (OPT R3LL (V50294)) (OPT R3LL (VS0352)) (OPT ITEMS 235, 235B)		1
-235B	R3ZZ		.BEARING- (VS0352) (OPT ITEMS 235, 235A)		1
240	253T7117-3		.HOUSING ASSY- (OPT ITEM 240A)	B	1
-240A	253T7117-5		.HOUSING ASSY- (OPT ITEM 240)	B	1
-240B	253T7117-3		.HOUSING ASSY	A	1
245	BACS13W2CN3		..INSERT		2
250	BACS13W3CN4		..INSERT		6

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-255	253T7117-1		..HOUSING- (USED ON ITEMS 240, 240B)		1
-255A	253T7117-6		..HOUSING- (USED ON ITEM 240A)	B	1

- Item Not Illustrated