COMPONENT MAINTENANCE MANUAL WITH ILLUSTRATED PARTS LIST

AILERON/ELEVATOR POWER CONTROL UNIT ASSEMBLY

PART NUMBER 251A2160–2

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COMPONENT MAINTENANCE MANUAL

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To: All holders of AILERON/ELEVATOR POWER CONTROL UNIT ASSEMBLY 27-09-23.

Attached is the current revision to this COMPONENT MAINTENANCE MANUAL

The COMPONENT MAINTENANCE MANUAL is furnished either as a printed manual, on microfilm, or digital products, or any combination of the three. This revision replaces all previous microfilm cartridges or digital products. All microfilm and digital products are reissued with all obsolete data deleted and all updated pages added.

For printed manuals, changes are indicated on the List of Effective Pages (LEP). The pages which are revised will be identified on the LEP by an R (Revised), A (Added), O (Overflow, i.e. changes to the document structure and/or page layout), or D (Deleted). Each page in the LEP is identified by Chapter-Section-Subject number, page number and page date.

Pages replaced or made obsolete by this revision should be removed and destroyed.

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COMPONENT MAINTENANCE MANUAL

Location of Change	Description of Change
27-09-23	
ASSEMBLY	Changed the data in the Consumable Materials list.
SPECIAL TOOLS FIXTURES AND EQUIPMENT	Changed the data in the Tool Supplier Information table.
	Added the Commercial Tools table.

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A = Added, R = Revised, D = Deleted, O = Overflow

Subject/Page	Date	Subject/Page	Date	Subject/Page	Date
27-09-23 SPECIAL TOOLS, FIXTURES, AND EQUIPMENT					
R 901	Jul 01/2009				
902	BLANK				
27-09-23 ILLUSTRATED PARTS LIST					
1001	Nov 01/2008				
1002	Jul 01/2006				
1003	Jul 01/2006				
1004	Mar 01/2006				
1005	Mar 01/2006				
1006	Mar 01/2006				
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1010	Mar 01/2006				
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TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL
		PRR 38041	SEP 01/97
		PRR 38191	SEP 01/97

All revisions to this manual will be accompanied by transmittal sheet bearing the revision number. Enter the revision number in numerical order, together with the revision date, the date filed and the initials of the person filing.

Revision		Filed		Revision		Filed	
Number	Date	Date	Initials	Number	Date	Date	Initials

Revision		Filed		Revision		Filed	
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All temporary revisions to this manual will be accompanied by a cover sheet bearing the temporary revision number. Enter the temporary revision number in numerical order, together with the temporary revision date, the date the temporary revision is inserted and the initials of the person filing.
When the temporary revision is incorporated or cancelled, and the pages are removed, enter the date the pages are removed and the initials of the person who removed the temporary revision.

Temporary Revision		Inserted		Removed	
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Temporary Revision		Inserted		Removed	
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INTRODUCTION

1. General

A. The instructions in this manual supply the data necessary to do the maintenance functions together with the test, fault isolation, repair, and replacement of the defective parts.

B. This manual is divided into different parts:

(1) Title Page

(2) Transmittal Letter

(3) Highlights

(4) List of Effective Pages

(5) Table of Contents

(6) Temporary Revision & Service Bulletin Record

(7) Record of Revisions

(8) Record of Temporary Revisions

(9) Introduction

(10) Procedures & IPL Sections

C. Components that can be repaired have a different repair number for each specified repair. To find the repair number location of a component, look in the Repair-General procedure at the beginning of the REPAIR section. The Repair-General procedure also has an explanation of the True Position Dimension symbols used.

D. All dimensions, measures, quantities and weights included are in English units. When metric equivalents are given they will be in the parentheses that follow the English units.

E. The introduction to the Illustrated Parts List (IPL) shows how the IPL data is used.

F. Design changes, optional parts, configuration differences and Service Bulletin modifications may cause different part numbers. These part numbers are identified in the IPL with an alphabetical letter which is added to the end of the basic item number. This new item number is referred to as an alpha-variant. Throughout the manual, IPL basic item number references also apply to alpha-variants unless shown differently.

G. The tool reference numbers found in the individual procedures and in the Special Tools, Fixtures, and Equipment section are used to identify if a tool is a standard tool (STD-XXXX), a commercial tool (COM-XXXX), or a Special Tool (SPL-XXXX). This reference number is also used to distinguish between tools with similar names in the same procedure. These reference numbers are for use in the documentation only. They are not to be used for ordering tools.

AILERON/ELEVATOR POWER CONTROL UNIT ASSEMBLY - DESCRIPTION AND OPERATION

1. Description

A. The aileron/elevator power control unit (CPU) assembly is used to set the position of the aileron and elevators. The aileron/elevator PCU assembly has a rod-end assembly, end fitting assembly, piston, crank assembly, manifold assembly, servo assembly, valve assembly, and a filter.

The PCUs are installed on the rear spar assembly of the aileron control and on the torque tubes of the elevator control.

2. Operation

A. The aileron/elevator power control units (PCU) are used to operate the ailerons and elevators. One pair of PCUs actuates the ailerons and one pair actuates the elevators. Hydraulic system A supplies power to one PCU and hydraulic system B supplies the other. Either PCU can operate both ailerons and elevators to provide roll and pitch control. There is manual reversion for ailerons and elevators with both hydraulic systems A and B off.

B. The pilot input to the PCUs is from the control wheels through a cable system. Movement of the PCUs operates a wing cable system which sets the position of the ailerons. A mechanical feel system with a centering cam, roller and spring provides control wheel feel force for the pilots.

C. The pilot input is from the control columns through a dual cable system and an input torque tube. An output torque tube connects both PCUs to both elevators. A hydraulic feel system supplies control column forces proportional to airspeed and stabilizer position. An elevator feel computer gets input of airspeed and stabilizer position and provides the applicable feel force.

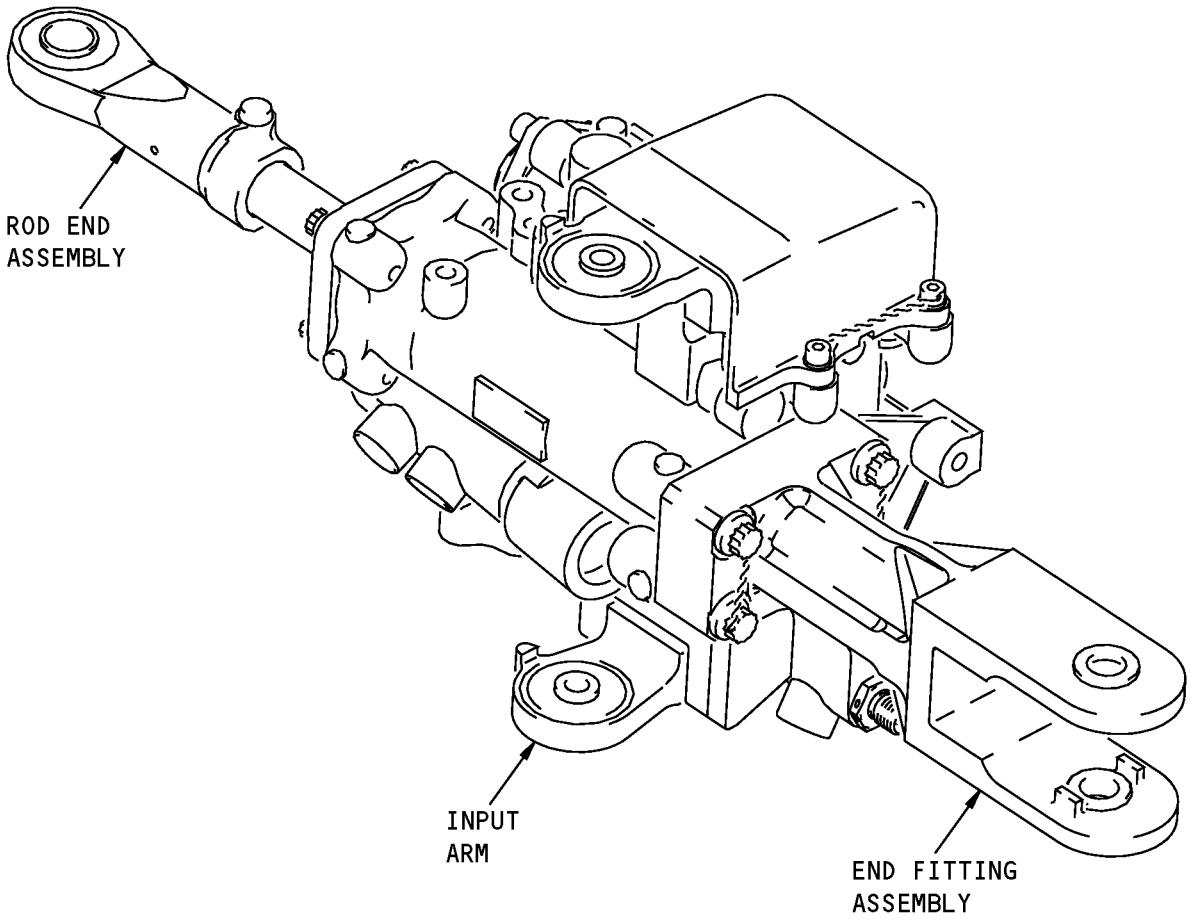
3. Leading Particulars (Approximate)

A. Length – 23 inches (extended) 20 inches (retracted)

B. Width – 8 inches

C. Height – 6 inches

D. Weight – 12.9 pounds (dry) 13.1 pounds (filled with hydraulic fluid)



Aileron/Elevator Power Control Unit (PCU) Assembly
Figure 1

TESTING AND FAULT ISOLATION

1. General

A. This procedure has the data necessary to do a test of the mechanism after an overhaul or for fault isolation.

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

C. Refer to IPL Figure 1 for item numbers.

2. Testing and Fault Isolation

A. Tools/Equipment

NOTE: Equivalent substitutes may be used.

Reference	Description
SPL-5349	X-Y Recorder/Plotter (Part #: 925E, Supplier: 60795)
SPL-5676	Fixture - Test (Part #: 251A2160TF2-1001, Supplier: 82106)
SPL-5681	Fixture - Control Valve Flow Grind (Part #: 251A2170TF1-1001, Supplier: 82106)

B. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
D00153	Fluid - Hydraulic, Erosion Arresting, Fire Resistant	BMS3-11 Type IV (interchange˜able & intermixable with Type V)
G01505	Lockwire - Safety And Lock	NASM20995

C. References

Reference	Title
SOPM 20-50-02	INSTALLATION OF SAFETYING DEVICES
SOPM 20-60-03	LUBRICANTS
SOPM 20-60-04	MISCELLANEOUS MATERIALS

D. Procedure

WARNING: REMOVE ALL AIR FROM THE COMPONENTS BEFORE YOU DO THESE TESTS. BLEED THE AIR FROM THE FLUID AND KEEP THE TEST UNIT FULL DURING ALL OF THE TESTS. DO NOT APPLY COMPRESSED AIR TO THE PORTS DURING THE TESTS.

(1) Do the following tests for the PCU Assembly:

NOTE: Hydraulic test stand which can supply fluid, D00153 BMS 3-11 hydraulic fluid at a minimum of 5 gpm is required.

NOTE: For lubricants, refer to SOPM 20-60-03. For miscellaneous materials, refer to SOPM 20-60-04. For disassembly, refer to DISASSEMBLY. For assembly, refer to ASSEMBLY.

(a) Install the PCU assembly on the PCU Assembly test fixture, SPL-5676. See TESTING AND FAULT ISOLATION, Figure 101. A similar fixture may be used.

(b) Cycle and bleed the PCU Assembly:

1) Open the return port and slowly apply 800-1000 psi to the pressure port and manually cycle the PCU full stroke several times to remove air.

2) Make sure the PCU operates normally.

3) Slowly increase pressure to 2900-3100 psi, and cycle the PCU until all of the air is removed.

(c) Do a system proof pressure test:

CAUTION: DO NOT ACTUATE THE PCU DURING THE APPLICATION OF PROOF PRESSURE.

1) Entended Position

a) Open the return port and apply 3000 psi to the pressure port.

b) Move the input point to the extended, hardover position and hold.

c) Increase the pressure to 4500 psi and hold for 2 minutes.

d) Examine the PCU assembly. There must be no leakage or permanent set.

e) Reduce the pressure to 1-5 psi and hold for 2 minutes.

f) Examine the PCU assembly. There must be no leakage or permanent set.

(d) Do a return system proof pressure test:

1) Cap the return port with a 4000 psi range pressure gage and hold the input point at rig neutral.

2) Apply 3000 psi to the pressure port until the return gage reads 3000 psi and hold for 2 minutes.

3) Examine the PCU assembly. There must be no leakage or permanent set.

4) Reduce the pressure to 1-5 psi and hold for 2 minutes.

5) Examine the PCU assembly. There must be no leakage or permanent set.

(e) Do a bypass valve actuation and deactuation pressure test:

1) Apply 3000 psi to the pressure port and position the PCU and input arms at the full retract position.

2) Reduce the pressure to 100 psi.

3) Move the input arms in the extend position and hold, slowly raise the pressure until movement of the piston is observed.

4) Record the pressure as the bypass valve "closing" pressure.

5) Make sure the "closing" pressure is less than 460 psid.

6) While the piston rod is moving, slowly reduce the inlet pressure until the piston rod movement stops.

7) Record the pressure as the bypass valve "opening" pressure.

8) Make sure the "opening" pressure is greater than 200 psid.

(f) Do an external leakage test:

1) Apply 3000 psi to the pressure port and 50 psi to the return port.

NOTE: For the next step, a full stroke is defined as actuator travel from the rig neutral to full extend to full retract and return to rig neutral.

2) Cycle the PCU 100 times (minimum) full stroke cycles while measuring leakage at each end gland seal and each input arm shaft seal.

3) Make sure the leakage is less than 1 drop per 25 cycles for each end gland seal and 1 drop per 100 cycles at each input arm shaft seal.

4) Make sure there is no evidence of binding or chattering during the cycling.

(g) Do an internal leakage test:

1) Do a neutral position test:

a) With the input arms at the rig neutral position and the return port open, apply 3000 psi to the pressure port.

b) Allow the flow from the return post to stabilize.

c) Measure and record the flow.

d) Make sure the return flow is less than 300 cc/min.

2) Do a hardover position test:

a) Extend position:

<1> With the return port open, apply 3000 psi to the pressure port.

<2> Move the input arms in the extend position and hold.

<3> Allow the flow from the return port to stabilize.

<4> Measure and record the flow.

<5> Make sure the return flow is 600-1000 cc/min in each position.

b) Retract position:

<1> With the return port open, apply 3000 psi to the pressure port.

<2> Move the input arms in the retract position and hold.

<3> Allow the flow from the return port to stabilize.

<4> Measure and record the flow.

<5> Make sure the return flow is 600-1000 cc/min in each position.

3) Do a neutral position test:

a) With the input point at the rig neutral position, apply 3000 psi to the pressure port.

b) Make sure the distance between the actuator bearing centerlines is 18.070-19.050 inches.

(h) Do a clearance check:

1) Extend position:

a) Apply 3000 psi to the pressure port and 50 psi to the return port.

b) Command the piston rod to the extreme extend stroke and continue in the extend position until the input arms bottom on the manifold stops.

c) Make sure there is no binding or interference throughout the entire stroke.

2) Retract position:

a) Apply 3000 psi to the pressure port and 50 psi to the return port.

b) Command the piston rod to the extreme retract stroke and continue in the retract position until the input arms bottom on the manifold stops.

c) Make sure there is no binding or interference throughout the entire stroke.

(i) Do a linkage breakout friction test:

1) Apply 3000 psi to the pressure port and 50 psi to the return port.

2) Cycle the input arms once from stop to stop and center.

3) Hold for 5 seconds (maximum).

4) Measure the input force required to start extension.

5) Make sure the force is less than 16 ounces.

6) Return the input arms to the neutral position.

7) Measure the input force required to start retraction.

8) Make sure the force is less than 16 ounces.

(j) Do an input arm position, travel and force test:

NOTE: Unless otherwise specified the input arm referred to in the following tests is the lower input arm (175), the upper arm (195) shall be allowed to move freely.

1) Position test:

a) Apply 3000 psi to the pressure port and slowly move the input arm to initiate extension, then slowly return the input arm toward retract until the output stops.

b) Record the input arm position.

c) Apply 3000 psi to the pressure and slowly move the input arm to initiate retraction, then slowly return the input arm toward extend until the output stops.

d) Record the input arm position.

NOTE: The band between the positions determined above represents the "deadband". The mid position of the deadband is the input arm position at servo valve null.

e) Make sure the servo valve null is within +/- 0.010 inches of rig neutral (see TESTING AND FAULT ISOLATION, Figure 101).

2) Input arm travel and force (normal operation):
   a) Extend position:
      <1> Restrain the rod end and clevis end and move both input arms from the rig neutral position in the extend position.
      <2> Measure and record the combined force required to move both input arms to a position just prior to engaging the secondary slide.
      <3> Make sure the force required to move both input arms to a position just prior to engaging the secondary slide does not exceed 4.0 lb.
      <4> Measure and record the combined force required to move both input arms to a position just prior to contacting the manifold stops.
      <5> Make sure the force required to move both input arms to a position just prior to contacting the manifold stops does not exceed 8.0 lb.
      <6> Measure and record each input arm travel (at the center of the input bearing) from the rig neutral position to contacting the manifold stops.
      <7> Make sure the input arm travel is 0.145-0.160 inches.
   b) Retract position:
      <1> Restrain the rod end and clevis end and move both input arms from the rig neutral position in the retract position.
      <2> Measure and record the combined force required to move both input arms to a position just prior to engaging the secondary slide.
      <3> Make sure the force required to move both input arms to a position just prior to engaging the secondary slide does not exceed 4.0 lb.
      <4> Measure and record the combined force required to move both input arms to a position just prior to contacting the manifold stops.
      <5> Make sure the force required to move both input arms to a position just prior to contacting the manifold stops does not exceed 8.0 lb.
      <6> Measure and record each input arm travel (at the center of the input bearing) from the rig neutral position to contacting the manifold stops
      <7> Make sure the input arm travel is 0.145-0.160 inches.
3) Input arm force (jammed operation):
   a) Move the input arms in the extend position until the manifold stops are contacted.
   b) Restrain the upper input arm and record the force required to move the lower input arm in the retract position until the manifold stop is contacted.
   c) Make sure the force to move the lower input arm in the retract position is 45-60 lb. at the center of the input bearing.
   d) Move the upper input arm in the retract position until the manifold stops are contacted and move the lower input arm in the extend position until the manifoldstops are contacted.
   e) Restrain the upper input arm and record the force required to move the lower input arm in the retract position until the manifold stop is contacted.

f) Make sure the force to move the lower input arm in the retract position is 45-60 lb. at the center of the input bearing.

(k) Do a cylinder friction test:

1) Fix the rod end and depressurize the pressure and return ports.

NOTE: Full stroke includes the snubbing areas (0.350 inches from full extend and retract).

2) Apply force to the input arms parallel to the axis of the actuator. Slowly cycle the PCU full stroke in each position and measure the input force.

3) Make sure the breakaway and running force between the snubbing areas is less than 20 lb. in each position.

4) Make sure the running force within the snubbing areas does not exceed 60 lb.

(l) Do a PCU output rate and snubbing test:

1) Apply 3000 psi to the pressure port and 50 psi to the return port.

2) Move the pilot input point from the full extend position to the full retract position at a rate fast enough to saturate the servo valve while recording pistonvelocity versus piston position.

3) Make sure the saturated main piston velocity meets the requirements of TESTING AND FAULT ISOLATION, Figure 102.

4) Move the pilot input point from the full retract to the full extend position at a rate fast enough to saturate the Dual Concentric Servo Valve.

5) Make sure the saturated main piston velocity meets the requirements of TESTING AND FAULT ISOLATION, Figure 102.

(m) Do a threshold and hysteresis test:

1) Apply 3000 psi to the pressure port with the input arms near the rig neutral position.

2) Apply 3000 psi to the pressure port with the input arms near the rig neutral position.

3) Record the input arm position.

4) Slowly move the input arm in the retract position until the manifold has moved 0.005 inches in the opposite direction (overshoot is not allowed).

5) Record the input arm position.

NOTE: The difference in input arm position minus 0.010 inches is the threshold.

6) Make sure the threshold is less than 0.002 inches.

7) Return the input arm to its original position relative to the manifold.

8) Record the change in position of the manifold relative to the fixture from when the input arm was in the original position (this value is the hysteresis).

9) Make sure the hysteresis is less than 0.012 inches.

(2) Do the following tests for the servo assembly (285):

(a) Install the servo assembly (285) on the control valve assembly test Fixture, SPL-5681. See TESTING AND FAULT ISOLATION, Figure 103. A similar fixture may be used.

(b) Do a visual check of the servo assembly (285) for defects.

(c) Do a Pressure System Proof Pressure Test

1) Put the slide (290) at center.
2) Plug the cylinder ports.
3) Open the return port.
4) Apply 4500 psi to the pressure port and hold the pressure for two minutes.
5) Examine the servo valve assembly (285). There must be no external leakage or permanent set.
6) Reduce the pressure to 1-5 psi and hold for 2 minutes.
7) Examine the servo valve assembly (285). There must be no external leakage or permanent set.

(d) Do a Return System Proof Pressure Test

1) Put the slide (290) at the center.
2) Plug the cylinder ports.
3) Put a pressure gauge on the return port. Use a pressure gauge with a 4000 psi range. Plug the cylinder ports.
4) Apply 3000 psi to the pressure port and hold for 2 minutes after the pressure gauge indicates 3000 psi.
5) Examine the servo valve assembly (285). There must be no external leakage or permanent set.
6) Reduce the pressure to 1-5 psi and hold for 2 minutes.
7) Examine the servo valve assembly (285). There must be no external leakage or permanent set.

(e) Do a Null Pressure Measurement Test

1) Plug the cylinder ports with pressure transducers or pressure gauges.
2) Apply 3000 psi to the pressure port.
3) Adjust the slide (290) until the pressure gauge of C-exit equals that of C-return. The pressure must be 1000-2000 psi.
4) Record the position of the slide (290).
5) The hydraulic neutral position of the slide (290) must be ± 0.0004 inch of the center of the slide (295) deadband.

(f) Do a Primary Slide Pressure Gain Test

1) Plug the cylinder ports with pressure transducers.
2) Apply 3000 psi to the pressure port.
3) Stroke the slide (290) ± 0.005 inch from the hydraulic null position.
4) Record the cylinder pressure versus the position of the slide on a X-Y recorder/plotter, SPL-5349.

NOTE: The plot must comply with TESTING AND FAULT ISOLATION, Figure 104 slide travel for

a pressure differential pressure change of -2000 psi to 2000 psi must not be more than 0.0016 inches as shown in TESTING AND FAULT ISOLATION, Figure 104.

(g) Do a Secondary Slide Pressure Gain Test

1) Set up as in Return System Proof Pressure

2) Keep the slide (290) fixed tot he slide (295) at the neutral position.

3) Apply 3000 psi to the pressure port.

4) Stroke the slide (295) from internal stop to internal stop. See TESTING AND FAULT ISOLATION, Figure 105.

5) Record the cylinder pressure versus the position of the slide (295) on a X-Y recorder/plotter, SPL-5349.

6) The differential pressure of the cylinder ports must increase to 3000 psi in less than 0.015 inch of hydraulic neutral and remain constant for the remainder of the stroke.

(h) Do a Looped Cylinder Port Pressure Test

1) Connect the cylinder ports together with a pressure transducer installed between the cylinder ports.

2) Stroke the slides (290, 295) ± 0.056 inch from the hydraulic null position.

3) Record the cylinder pressure versus the position of the slide on a X-Y recorder/plotter, SPL-5349.

NOTE: The plot must comply with TESTING AND FAULT ISOLATION, Figure 105, except that the

the recorded pressure must not change more than 300 psi from the recorded null pressure in Pressure System Proof Pressure

(i) No-Load Flow Gain and Slide (290) Underlaps

1) Apply 3000 psi to the pressure port.

2) Stroke the slides (290, 295) 0.05 inch from the hydraulic null position.

3) Record the pressure versus the displacement of the slide on a X-Y recorder/plotter, SPL-5349.

NOTE: The plot must comply with TESTING AND FAULT ISOLATION, Figure 105.

4) Increase the gain of the record instrument.

5) Record the flow versus the slide displacement for primary slide displacement of ± 0.005 inch from the hydraulic null position.

NOTE: The plot must comply with TESTING AND FAULT ISOLATION, Figure 105.

6) Calculate and record the primary slide underlaps from the expanded null plot taken above. The primary slide underlaps must be 0.0005-0.0015 inches.

(j) Do a Primary slide Flow Forces Test

1) Interconnect the cylinder ports.

2) Apply 3000 psi to the pressure port.

3) Record the maximum force required to move the slide (290) from hydraulic neutral to slide (295) engagement in each direction. The maximum force must not be more than 24 ounces.

(k) Do an Internal Leakage - Neutral Leakage Test

1) Put the slide (290) at the hydraulic neutral position.

2) Apply 3000 psi to the pressure port.

3) Measure and record the flow from the return port. The return flow must not be more than 150 cc/minute.

(l) Do an Internal Leakage - Hardover Leakage Test

1) Apply 3000 psi to the pressure port.

2) Put the slides (290, 295) 0.056 inch from the hydraulic neutral position in the extend position.

3) Measure and record the flow from the return port. The return flow must not be more than 100 cc/minute.

4) Put the slides (290, 295) 0.056 inch from the hydraulic neutral position in the retract position.

5) Measure and record the flow from the return port. The return flow must not be more than 100 cc/minute.

(m) Do a Stroke Test

1) Apply approximately 20 pounds to the centerline of the slide (295) in the extend position.

2) Measure and record the position relative to the hydraulic neutral position.

3) Apply approximately 20 pounds to the centerline of the slide (295) in the retract position.

4) Measure and record the position relative to the hydraulic neutral position.

5) The slide travel must be 0.029-0.045 inch.

(n) Do a Residual Pressure Test

1) Plug the cylinder ports with pressure transducers.

2) Apply 3000 psi to the pressure port.

3) Stroke the slide (290) in the extend position until the slide (295) in contacted.

4) Fix the slide (290) relative to the slide (295) and stroke the slide (295) in the retract position until the internal stops are contacted.

5) Apply a 75-pound force to the slide (295).

6) Record the cylinder pressure and the return flow.

7) Repeat the test with the slide (290) in the retract position and the slide (295) in the extend position.

8) Record the cylinder pressure and the return flow. The differential pressure between the C-exit and C-return must not be more than 750 psi.

(3) Do a test on the valve assembly (445):

(a) Install the valve assembly (445) on the fixture. See TESTING AND FAULT ISOLATION, Figure 106. A similar fixture may be used.

(b) Do a Proof Pressure Test

1) Plug the P-out, C-1, and C-2 ports.

2) Open the return port.

3) Apply 4500 psi at the P-in port. Hold the pressure for two minutes.

4) Examine the bypass valve assembly (445). There must be no permanent set. The leakage from the return port must not be more than 1 drop/minute.

(c) Do a Bypass Flow Test

1) Apply 250 psi to the C-2 port.

2) Record the flow from the C-1 port. The flow must be 1.14-1.45 GPM.

(d) Do a Bypass Valve shuttle and Reset Pressure Test

1) Apply 250 psi to the C-2 port.

2) Slowly increase the pressure at the P-in port.

3) Record the pressure at which the valve shuttles to a non-bypassing position. The valve shuttle is indicated by the shut-off of the flow from the C-1 port. The valve shuttle pressure must be 400-500 psi.

4) Slowly increase the pressure at the P-in port to 3000 psi. Hold for five seconds minimum.

5) Slowly reduce the pressure at the P-in port to 200 psi.

6) Record the flow from C-1 port. The flow from the C-1 port must be at least 50% of the flow recorded in Bypass Flow.

(e) Do a Leakage Test

1) Apply 3000 psi to the P-in and C-2 ports.

2) Measure and record the leakage at the return port. The leakage must not be more than 1 cc/minute.

3) Decrease the pressure at C-2 port to zero psi.

4) Record the leakage at the C-1 port. The leakage at the C-1 port must not be more than 15 cc/minute.

(f) Do a Bleed Flow Test

1) Apply 3000 psi to the P-in port.

2) Apply 50 psi to the return port.

3) Apply 1500 psi at the C-1 port.

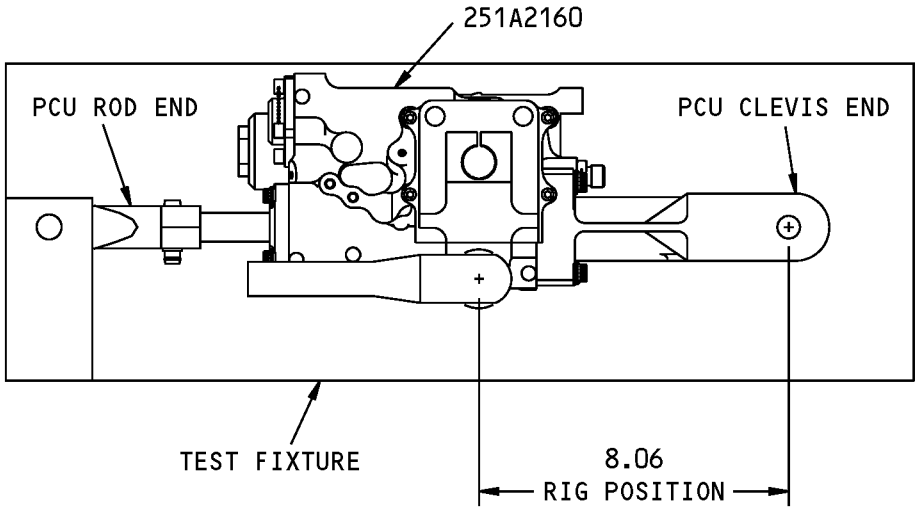
4) Record the flow from C-2. The bleed flow must be 390-590 cc/minute.

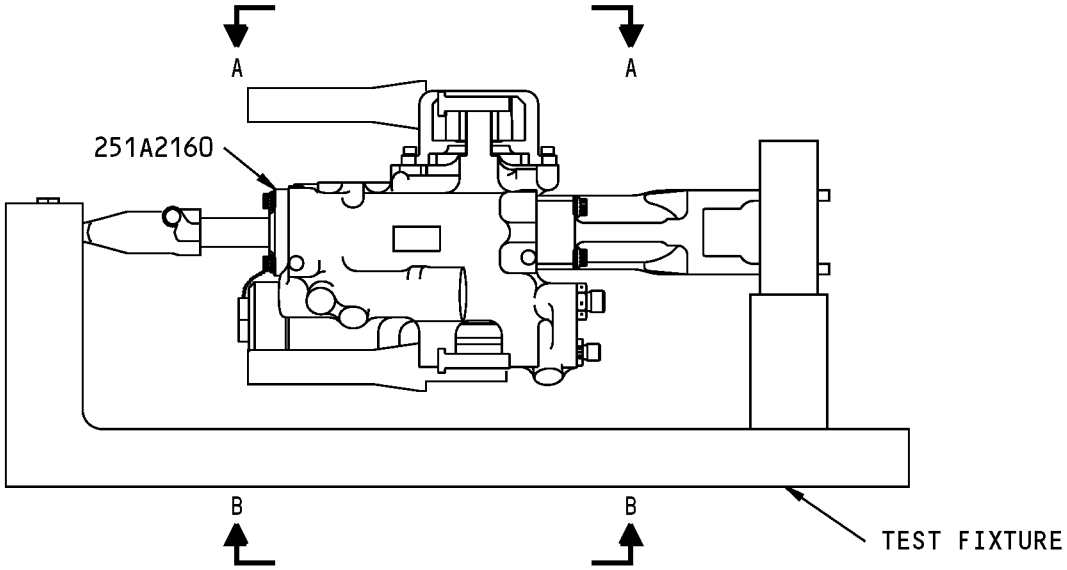
E. Post-test Procedure

(1) Examine all the ports of the aileron elevator PCU assembly.

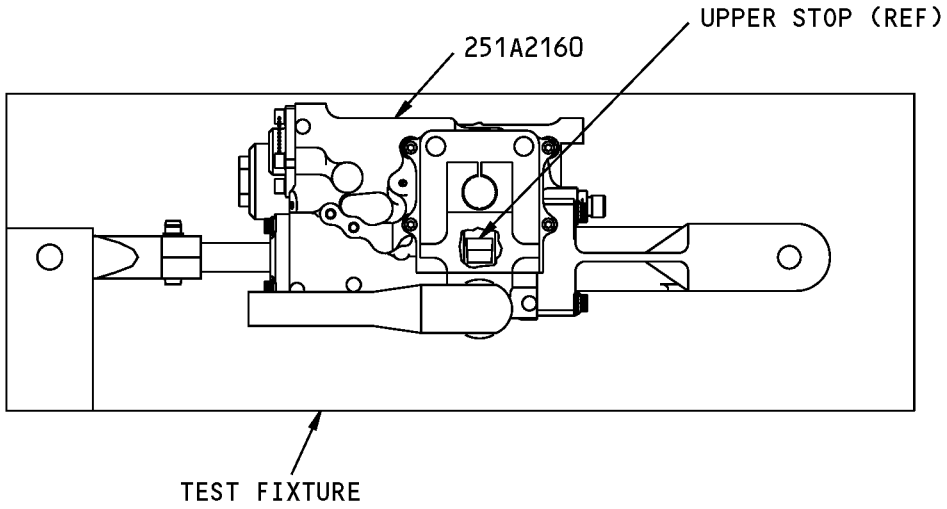
(2) If necessary, apply corrosion protection to the unit. Refer to ASSEMBLY.

(3) If necessary, install lockwire, G01505on the unit. Refer to ASSEMBLY (SOPM 20-50-02).

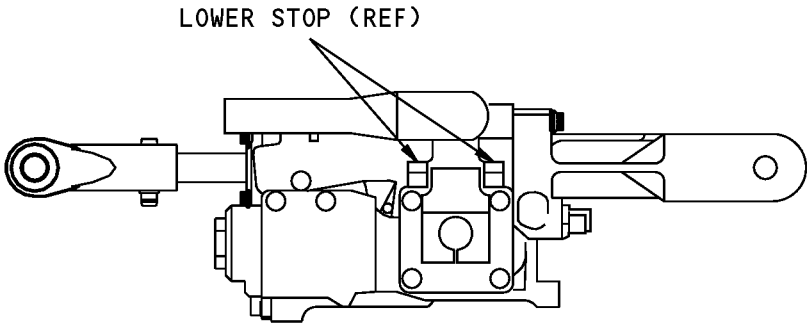




Aileron/Elevator PCU Assembly Test Fixture
Figure 101 (Sheet 1 of 2)

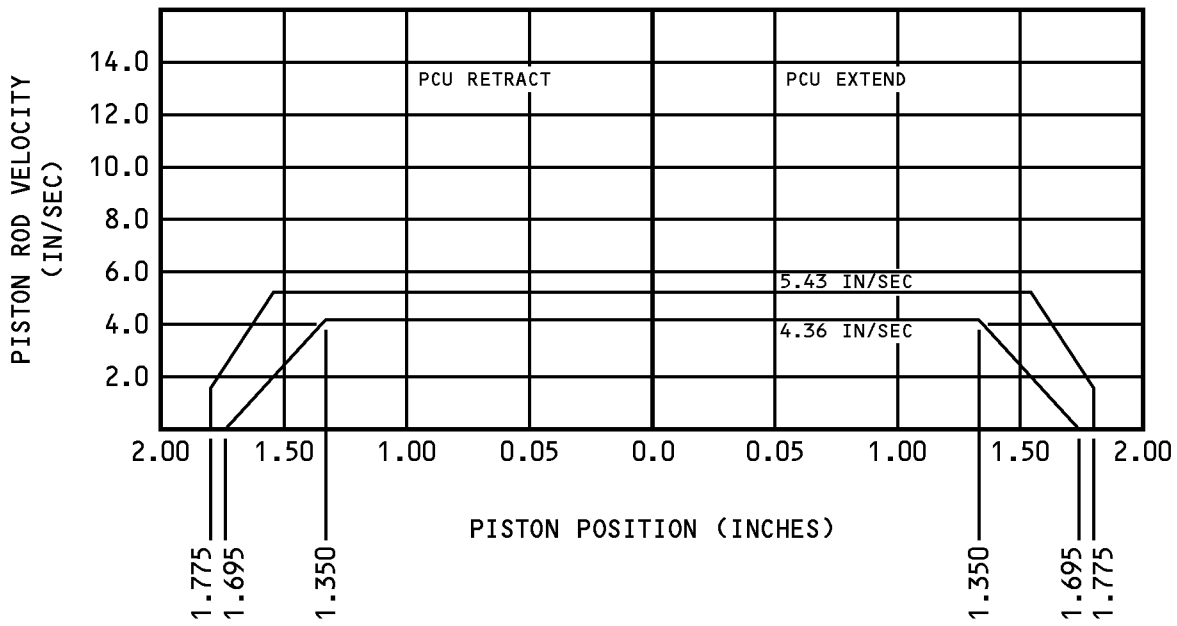


A-A



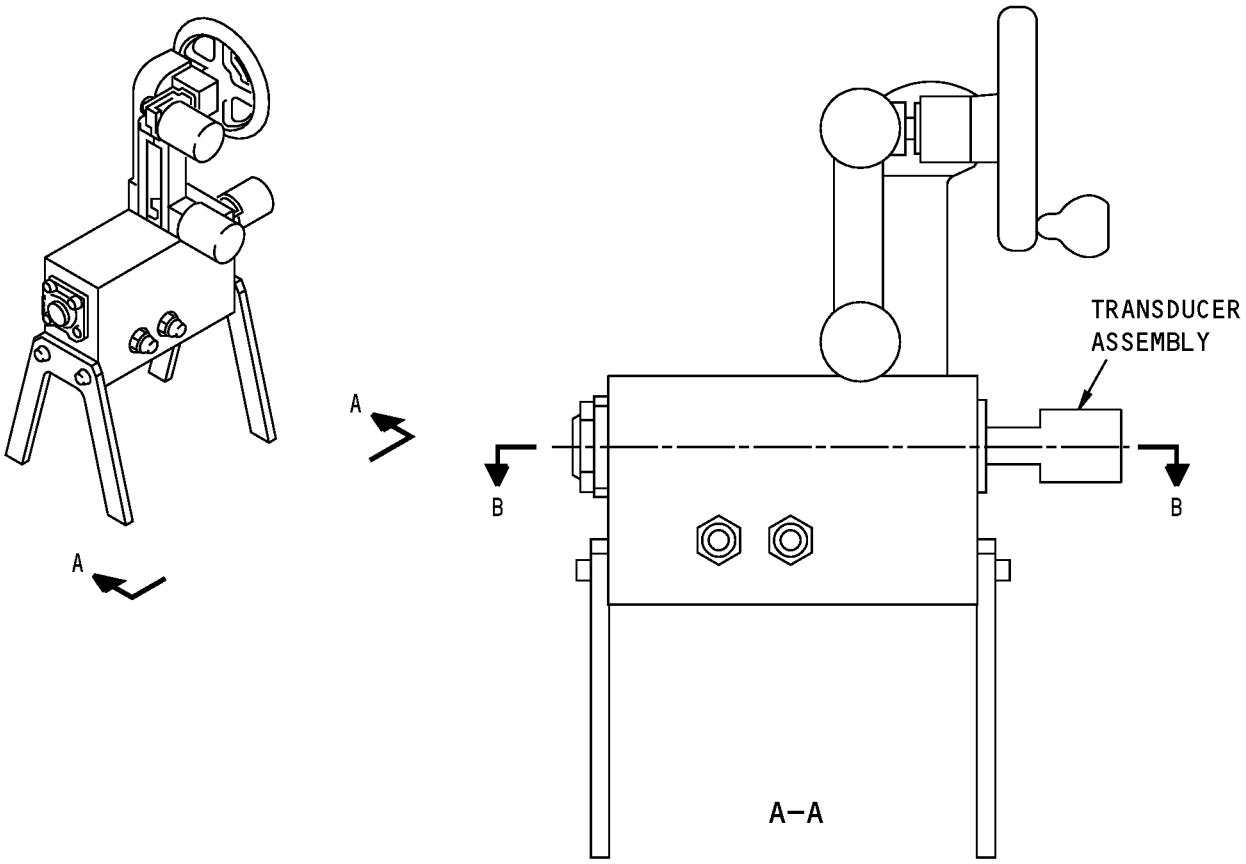
B-B

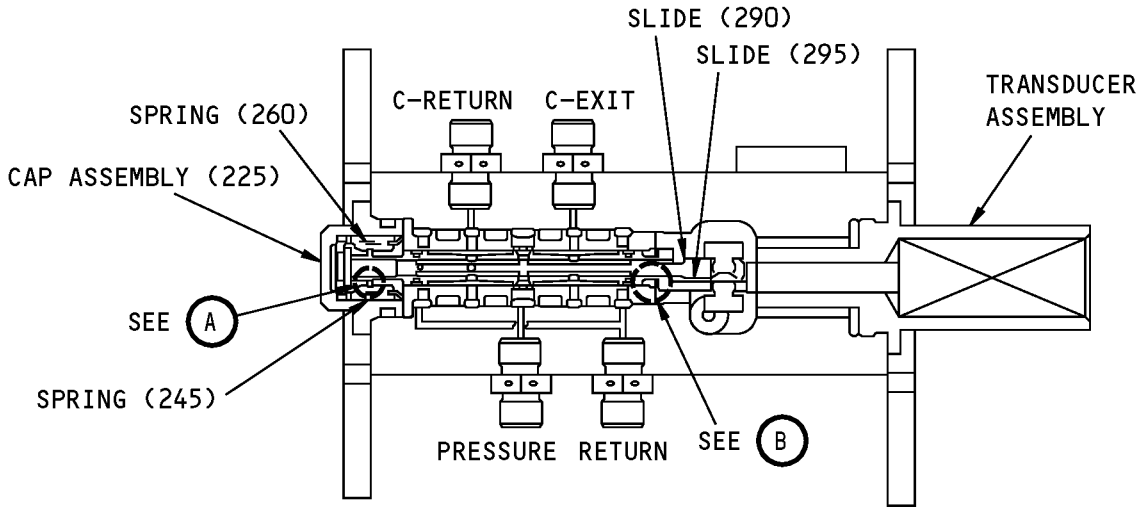
Aileron/Elevator PCU Assembly Test Fixture
Figure 101 (Sheet 2 of 2)



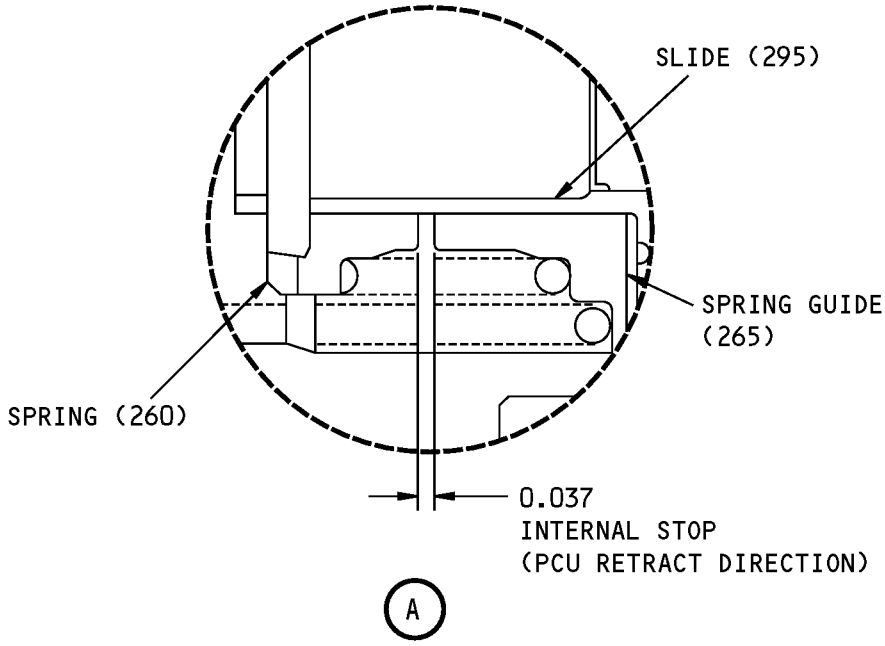
K27949 S0004991277_V2

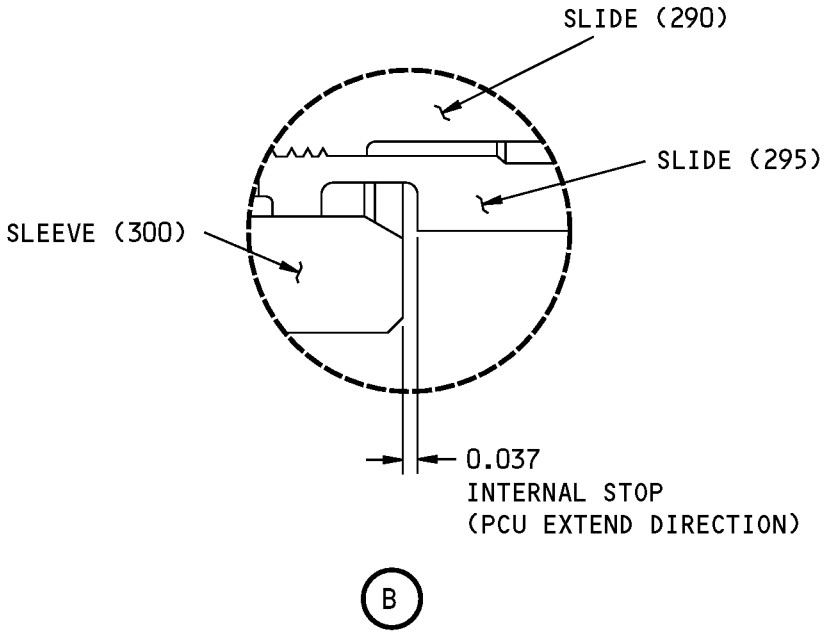
PCU Velocity and Snubbing Requirements
Figure 102





Aileron/Elevator Control Valve Assembly Test Fixture
Figure 103 (Sheet 1 of 2)

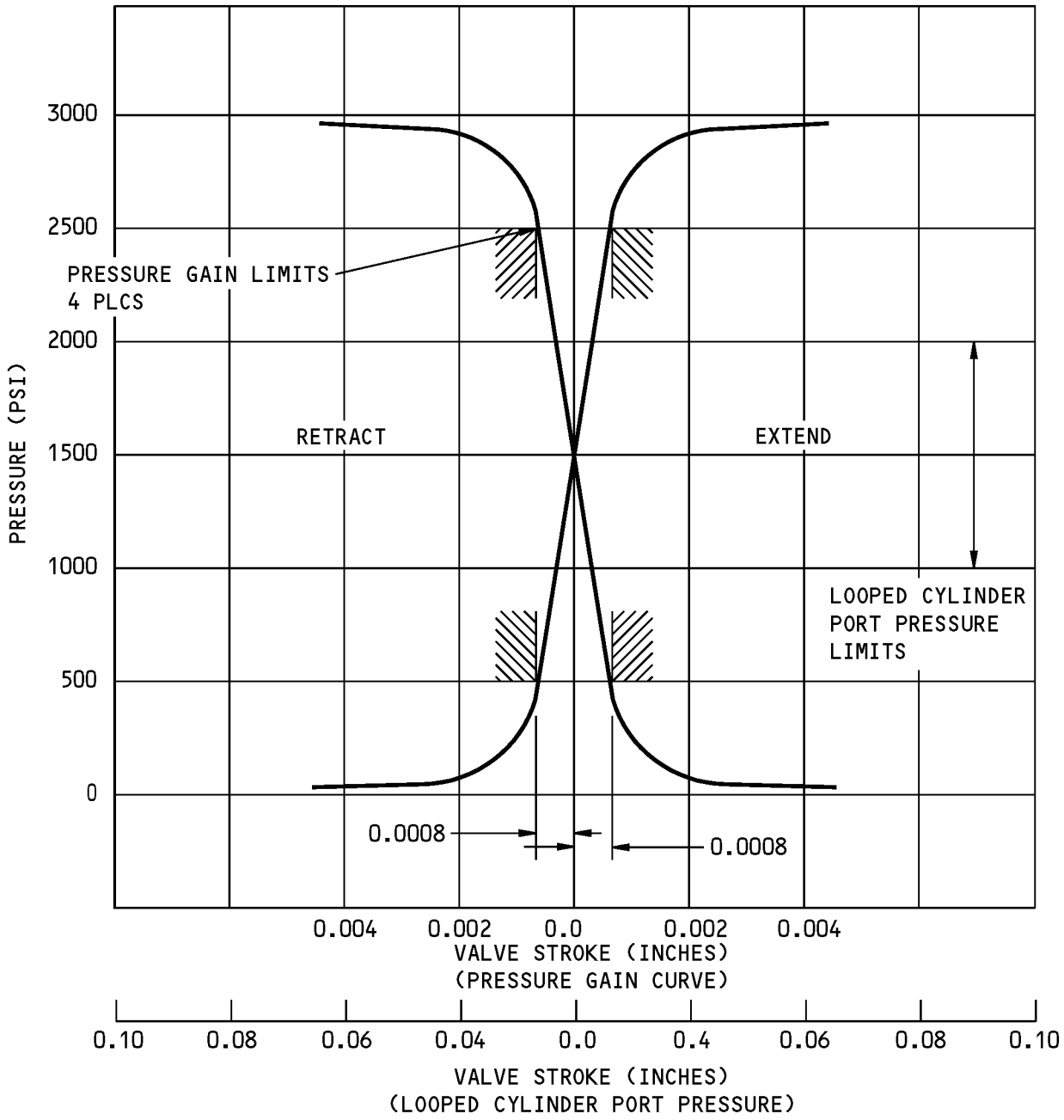




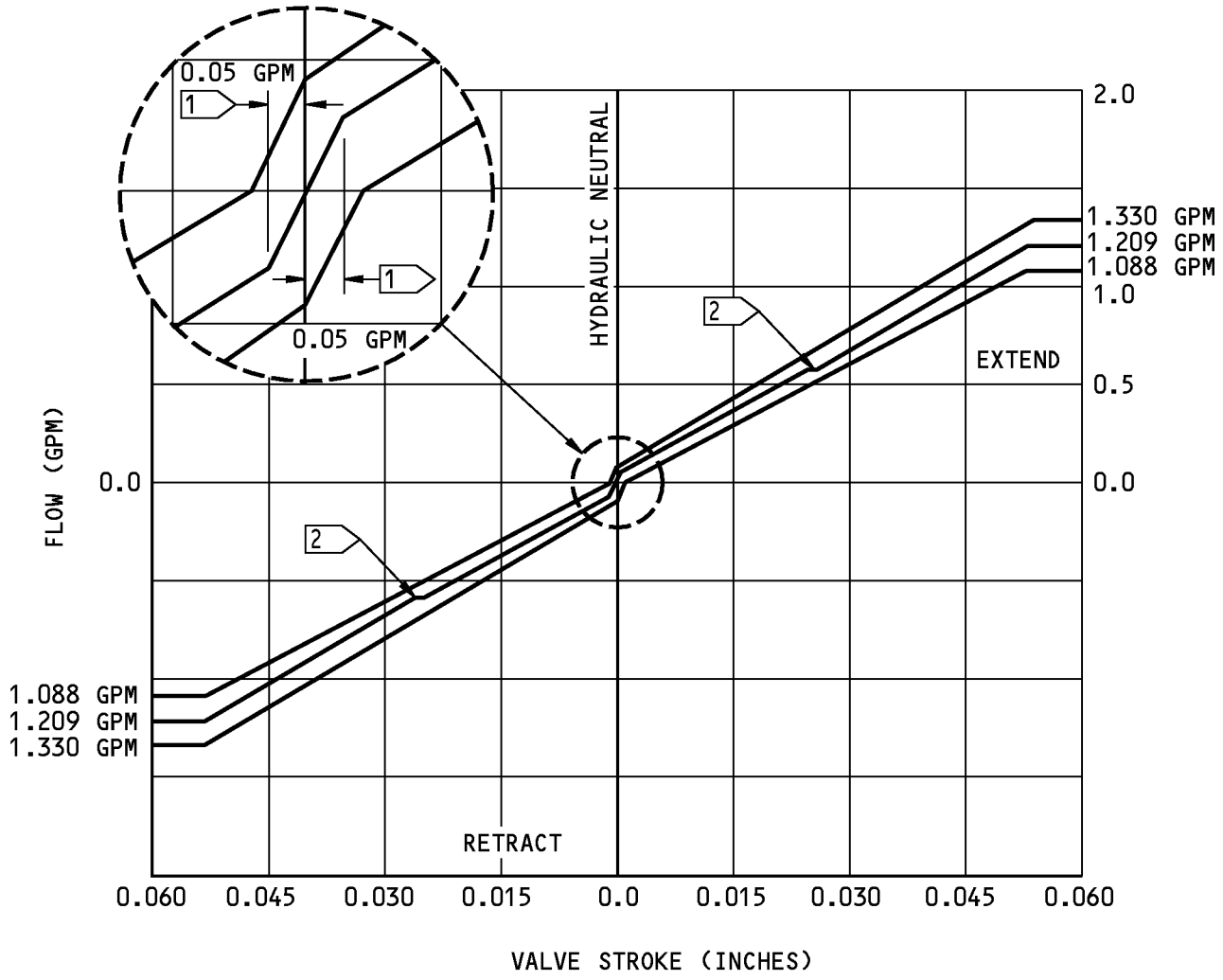
ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

Aileron/Elevator Control Valve Assembly Test Fixture
Figure 103 (Sheet 2 of 2)



Blocked Port Pressure Gain
Figure 104

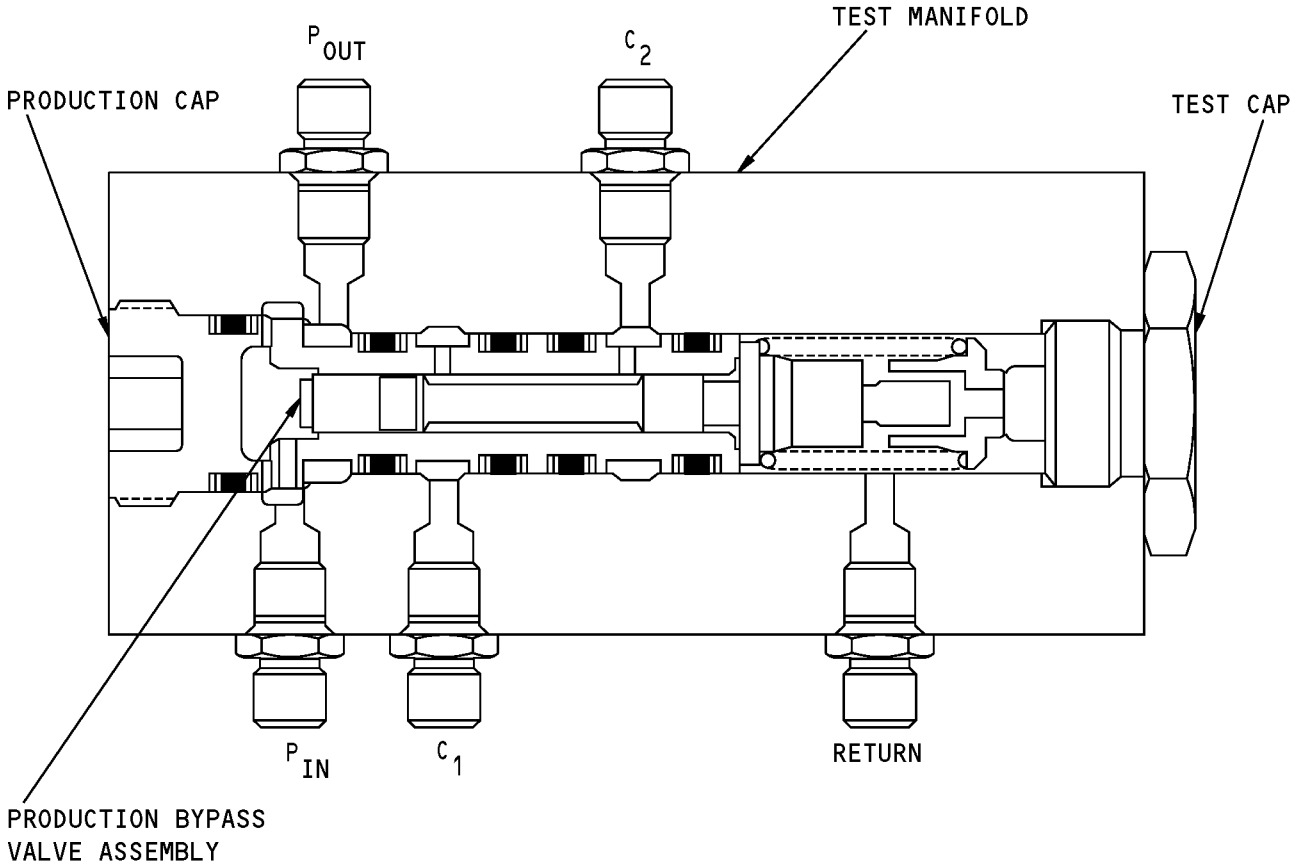


1 > UNDERLAP MUST BE 0.0002-0.0008 INCHES.

2 > "FLAT" CONSISTS OF SLIDE (290) OVERTRAVEL AND SLIDE (295) OVERLAP. SLIDE (295) OVERLAP MUST BE 0.0005-0.0015 INCHES.

H01912 S0004991281_V2

No-Load Flow Gain
Figure 105



Bypass Valve Test Fixture
Figure 106

DISASSEMBLY

1. General

A. This procedure has the data necessary to disassemble the aileron elevator power control unit (PCU) assembly (1A).

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

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

D. Refer to IPL Figure 1 for item numbers.

E. Drain the hydraulic fluid from the component.

2. Disassembly

A. References

Reference	Title
SOPM 20-50-03	BEARING AND BUSHING REPLACEMENT

B. Parts Replacement

NOTE: The parts which follow are recommended for replacement. Unless a procedure tells you to replace a part, replacement is optional.

(1) Packings (105, 115, 240, 275, 310, 320, 350, 375, 390, 405, 420, 430)

(2) Seals (110, 135E)

(3) Rings (120, 130, 280, 395A, 410, 425, 435) Shim (355)

(4) Shim (355)

(5) Filter (400)

C. Procedure

(1) Use standard industry procedures and the steps shown below to disassemble this component.

(2) Remove the rod end assembly (35) from the manifold assembly (460A):

(a) Remove the corrosion protection sealant around the base of the rod end assembly (35).

(b) Loosen the bolt (20) and collar (30).

(c) Turn and remove the rod end assembly (35) from the piston (140B).

(3) Remove the end fitting assembly (60) from the manifold assembly (460A):

(a) Remove the bolts (50) and washers (55) from the end fitting assembly (60).

(b) Remove the end fitting assembly (60) from the manifold assembly (460A).

(4) Remove the crank assembly (170A) from the manifold assembly (460A):

(a) Cut and remove the lockwires from the screws (5).

(b) Remove screws (5) and washers (10) and then the cover (15) from the manifold assembly (460A).

(c) Remove the nuts (155), washers (150), and bolts (145) from the input arms (175, 195).

(d) Pull the input arm (175) from the crank (180).

(e) Pull the input arm (195) from the crank (190).

(f) Remove the crank (180) from the manifold assembly (460A).

1) Remove the sealant around the screw (335).

2) Remove the screw (335) and washer (340) from the crank (190).

3) Remove the pin (345) from the crank (190).

4) Remove the bolts (325) and washers (330) from the bearing cap (370).

5) Pull the bearing cap (370) from the manifold assembly (460A).

NOTE: Do not remove the bearings (360, 380) from the bearing cap (370) unless the bearings are loose or damaged, and replacement is necessary (SOPM 20-50-03).

6) Pull the crank (180) from the crank (190) and slide (290).

NOTE: Pull the crank (180) straight out to avoid possible damage to the slide (290).

(g) Remove the crank (190) from the manifold assembly (460A):

1) Remove the bolts (325) and washers (330) from the bearing cap (370).

2) Pull the bearing cap (370) from the manifold assembly (460A).

NOTE: Do not remove the bearings (360, 380) from the bearing cap (370) unless the bearings are loose or damaged, and replacement is necessary. (SOPM 20-50-03).

3) Pull the crank (190) from the slide (295).

NOTE: Pull the crank (190) straight out to avoid possible damage to the slide (295).

(5) Remove the servo assembly (285) from the manifold assembly (460A):

NOTE: The crank assembly (170A) must be removed before you can remove the servo assembly (285). See instruction shown above.

CAUTION: THE CAP ASSEMBLY (225) IS SPRING LOADED. REMOVE THE CAP ASSEMBLY (225) WITH CARE.

(a) Remove the screws (215) and washers (220) from the cap assembly (225).

(b) Remove the cap assembly (225) from the manifold assembly (460A).

NOTE: Do not disassembly the cap assembly (225) unless the seat (230) or cap (235) is damaged, and replacement is necessary.

CLEANING

1. General

A. This procedure has the data necessary to clean the aileron/elevator - power control unit (PCU) assembly (1A).

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

C. Refer to IPL Figure 1 for item numbers.

2. Cleaning

A. References

Reference	Title
SOPM 20-30-01	CLEANING AND RELUBRICATING BEARINGS
SOPM 20-30-03	GENERAL CLEANING PROCEDURES

B. Procedure

(1) Clean the bearings (40, 125, 205, 360, 380) as specified in SOPM 20-30-01.

(2) Use standard industry procedures and refer to SOPM 20-30-03 to clean all parts.

CHECK

1. General

A. This procedure has the data necessary to find defects in the material of the 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 subjects identified in this procedure.

D. Refer to IPL Figure 1 for item numbers.

2. Check

A. References

Reference	Title
SOPM 20-20-01	MAGNETIC PARTICLE INSPECTION
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. Do the penetrant or magnetic particle check if the visual check shows possible damage or if you suspect possible damage on the parts listed below:

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

(a) Rod end (45)

(b) Flange end (90)

(c) Retainer (100)

(d) Piston (140)

(e) Crank (180, 190)

(f) Ball (185)

(g) Seat (230)

(h) Spring (245, 260)

(i) Guide (255, 265)

(j) Slide (290, 295)

(k) Sleeve (300, 500)

(l) Stop (505)

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

(a) Fitting (75)

(b) Arm (175, 195)

(c) Retainer (200, 385)

(d) Cap (235, 370)

(4) Do a check of the spring (245) as follows:

(a) Free length: 1.26-1.28 inch

(b) Minimum check load: 7.47-9.13 pounds at 0.78-0.80 inch

(c) Maximum check load: 8.46-10.34 pounds at 0.72-0.74 inch

(d) Maximum solid height: 0.64 inch

(e) Compression rate: 15.6-19.00 pounds per inch

(f) Outside diameter of spring coils: 0.91 maximum

(g) Inside diameter of spring coils: 0.74 inch minimum

(5) Do a check of the spring (260) as follows:

(a) Free length: 0.98-1.00 inch

(b) Minimum check load: 8.29-8.31 pounds at 0.50-0.52 inch

(c) Maximum check load: 9.00-11.00 pounds at 0.40-0.42 inch

(d) Maximum solid height: 0.34 inch

(e) Compression rate: 17.39-17.41 pounds per inch

(f) Outside diameter of spring coils: 0.68 maximum

(g) Inside diameter of spring coils: 0.535-0.555 inch

REPAIR

1. General

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

Table 601:

PART NUMBER	NAME	REPAIR
—	REFINISH OF OTHER PARTS	1-1
65-44834	ROD END ASSEMBLY	2-1, 2-2
251A2152	END FITTING ASSEMBLY	3-1, 3-2
251A2160	AILERON/ELEVATOR CPU ASSEMBLY	4-1, 4-2
251A2161	CRANK ASSEMBLY	5-1
251A2165 251A2166	INPUT ARM	5-2
251A2167	CRANK	5-3
251A2168	CRANK	5-4
251A2162	MANIFOLD ASSEMBLY	6-1, 6-2

2. Dimensioning Symbols

A. Standard True Position Dimensioning Symbols used in the applicable repair procedures are shown in REPAIR-GENERAL, Figure 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 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

REFINISH OF OTHER PARTS - REPAIR 1-1

1. General

A. This procedure has the data necessary to refinish the parts which are not given in the specified repairs.

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

C. Refer to IPL Figure 1 for item numbers.

2. Refinish of Other Parts

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
C00259	Primer - Chemical And Solvent Resistant Finish, Epoxy Resin	BMS10-11, Type I

B. References

Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES
SOPM 20-60-02	FINISHING MATERIALS

C. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02 For decoding table for Boeing finish code, refer to SOPM 20-41-01. For finishing materials, refer to SOPM 20-60-02.

(1) Instructions for the repair of the parts listed in REPAIR 1-1, Table 601 are for repair of the initial finish.

Table 601: Refinish Details

IPL FIG. & ITEM	MATERIAL	FINISH
IPL Fig. 1		
Flange (90)	4330M Heat treat 180-200 ksi	Cadmium plate (F-15.06).
Retainer (100)	15-5PH Heat treat 180-200 ksi	Passivate (F-17.25) all over. Cadmium plate (F-16.06) all over except on the inside diameter of the retainer.
Retainer (200)	303SE CRES	Cadmium plate (F-15.06).
Cap (370)	Aluminum alloy	Sulfuric acid anodize (F-17.03).
Retainer (385)	Aluminum alloy	Chromic acid anodize (F-17.02) or (F-17.04). Optional - On the outside of retainer from the hex nut to the threads but not including the threads: Apply primer, C00259 (F-20.02) primer (F-20.02).
Sleeve (500)	4330 or 4130	Cadmium plate ((F-15.02).

Table 601: Refinish Details (Continued)

IPL FIG. & ITEM	MATERIAL	FINISH
Stop (505)	15-5PH CRES Heat treat 150- 170 ksi	Passivate (F-17.13)

ROD END ASSEMBLY - REPAIR 2-1

65-44834–1

1. General

A. This procedure has the data necessary to repair and refinish the rod end assembly (35).

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

C. Refer to IPL Figure 1 for item numbers,

2. Bearing Replacement

A. References

Reference	Title
SOPM 20-50-03	BEARING AND BUSHING REPLACEMENT

B. Procedure

(1) Remove the damaged bearing (40) from the rod end (45).

(2) Install the new bearing (40) on the rod end (45) and roller swage (SOPM 20-50-03).

3. Pin Replacement

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
A00247	Sealant - Pressure And Environmental - Chromate Type	BMS 5-95

B. References

Reference	Title
SOPM 20-60-04	MISCELLANEOUS MATERIALS

C. Procedure

NOTE: For miscellaneous materials, refer to SOPM 20-60-04.

(1) Remove the damaged pin (65) from the fitting (75).

(2) Install the new pin (65) on the fitting with sealant, A00247.

ROD END - REPAIR 2-2

65-44834–2

1. General

A. This procedure has the data necessary to repair and refinish the rod end (45).

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

C. Refer to REPAIR-GENERAL, Figure 601 shown in the repair.

D. Refer to IPL Figure 1 for item numbers.

E. General repair details:

(1) Material: 17-4PH CRES

(2) Heat Treat: 180-200 ksi

2. Rod End Refinish

A. References

Reference	Title
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES

B. Procedure

NOTE: For decoding table for Boeing finish codes, refer to SOPM 20-41-01.

(1) Prepare and passivate (F-8.01) the rod end (45).

END FITTING ASSEMBLY - REPAIR 3-1

251A2152–1

1. General

A. This procedure has the data necessary to repair and refinish the end fitting assembly (60).

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

C. Refer to REPAIR-GENERAL, Figure 601 shown in the repair.

D. Refer to IPL Figure 1 for item numbers.

2. Bushing Replacement

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
A00247	Sealant - Pressure And Environmental - Chromate Type	BMS 5-95

B. References

Reference	Title
SOPM 20-50-03	BEARING AND BUSHING REPLACEMENT
SOPM 20-60-04	MISCELLANEOUS MATERIALS

C. Procedure

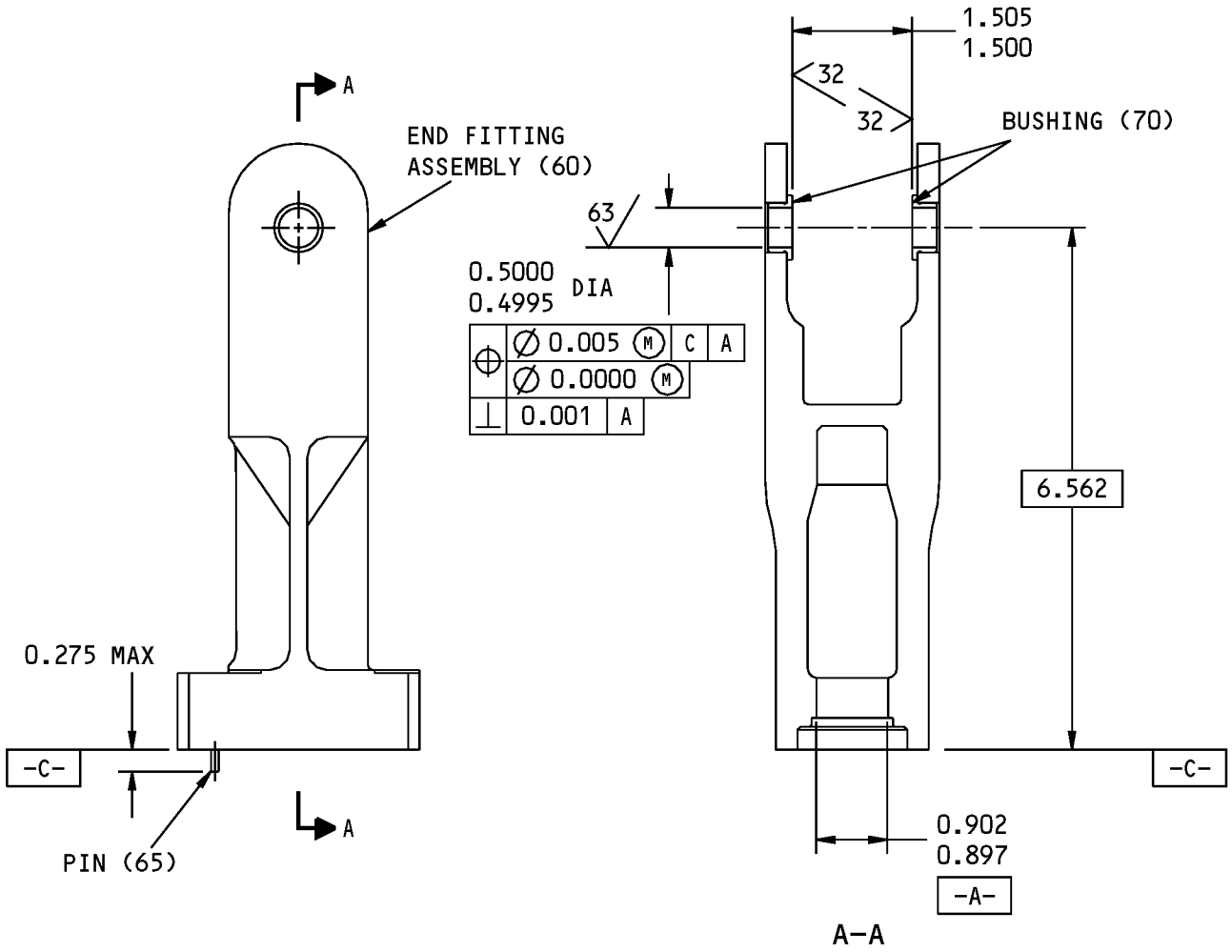
NOTE: for miscellaneous materials, refer to SOPM 20-60-04

(1) Remove the damaged bushing (70) from the fitting (75).

(2) Install the new bushing (70) on the fitting (75) with sealant, A00247. Use the shrink fit method (SOPM 20-50-03).

(3) Ream the inside diameter of the new bushing (70) to the dimensions shown in REPAIR 3-1, Figure 601.

(4) Break all sharp edges.



125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

BREAK ALL SHARP EDGES 0.06

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

251A2152-1 End Fitting Assembly Repair
Figure 601

FITTING - REPAIR 3-2

251A2152–2

1. General

A. This procedure has the data necessary to repair and refinish the fitting (75).

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

C. Refer to REPAIR-GENERAL, Figure 601 shown in the repair.

D. Refer to IPL Figure 1 for item numbers.

E. General repair details:

(1) Material: Aluminum alloy

2. Fitting Refinish

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
C00259	Primer - Chemical And Solvent Resistant Finish, Epoxy Resin	BMS10-11, Type I

B. References

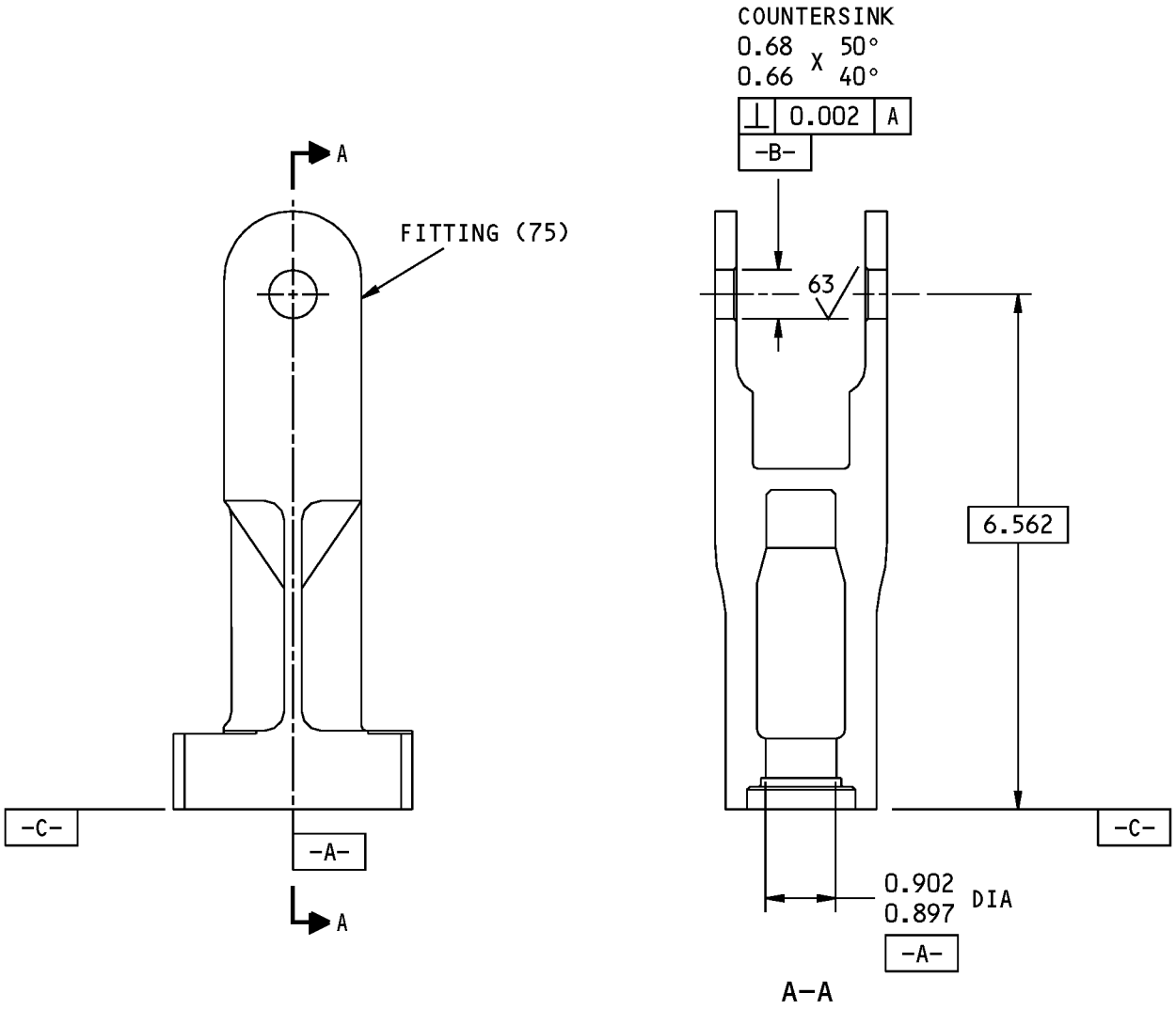
Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES
SOPM 20-60-02	FINISHING MATERIALS

C. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01. for finishing materials, refer to SOPM 20-60-02.

(1) Boric acid-sulfuric acid anodize or chromic acid anodize (F-17.35) the fitting (75).

(2) Apply primer, C00259 (F-20.02) on the exterior surface only. No primer, C00259 in holes, ports or bores.



125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

BREAK ALL SHARP EDGES 0.06

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

251A2152-2 Fitting Repair
Figure 601

POWER CONTROL UNIT AILERON/ELEVATOR ASSEMBLY - REPAIR 4-1

251A2160–2

1. General

A. This procedure has the data necessary to repair and refinish the power control unit - aileron/elevator assembly (1A).

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

C. Refer to REPAIR-GENERAL, Figure 601 shown in the repair.

D. Refer to IPL Figure 1 for item numbers,

2. Nameplate Replacement

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
A00551	Sealant - Fuel Tank	BAC5010, Type 44 (BMS5-44, BMS5-45)

B. References

Reference	Title
SOPM 20-30-03	GENERAL CLEANING PROCEDURES
SOPM 20-50-10	APPLICATION OF STENCILS, INSIGNIA, SILK SCREEN, PART NUMBERING AND IDENTIFICATION MARKINGS
SOPM 20-60-04	MISCELLANEOUS MATERIALS

C. Procedure

NOTE: For miscellaneous materials, refer to SOPM 20-60-04.

(1) Remove the damaged nameplate (515) from the manifold (510).

(2) Clean (SOPM 20-30-03) the surface of the manifold (510)

(3) Steel stamp (SOPM 20-50-10) the assembly dash number and the serial number on the new nameplate (515).

(4) Rubber stamp (SOPM 20-50-10, code RH) the performance acceptance approval on the new nameplate (515).

(5) Bend the new nameplate to the contour of the manifold (510).

(6) Apply sealant, A00551 to the back of the new nameplate (515) to get 100 percent fay surface seal.

(7) Install the new nameplate (515) on the manifold (510).

3. Bearing and Retainer Replacement

A. References

Reference	Title
SOPM 20-50-03	BEARING AND BUSHING REPLACEMENT
SOPM 20-50-19	GENERAL SEALING

B. Parts Replacement

NOTE: The parts specified below are recommended for replacement.

(1) Packings (105, 115).

(2) Seals (110).

(3) Rings (120).

C. Procedure

NOTE: For general sealing, refer to SOPM 20-50-19.

(1) Replace the bearing (125) near the end fitting assembly (60) side:

(a) If you need to remove the end fitting assembly (60) from the manifold assembly (460A), see the DISASSEMBLY section for instruction.

(b) Remove the piston rod scrapper (95A) from the piston (140B).

(c) Remove the retainer (100) from the piston (140B). If the retainer (100) is damaged, replace it with a new retainer (100).

(d) Remove the foot seal - seal assembly (110) and the two packings (105) from the damaged bearing (125).

(e) Remove the damaged bearing (125) from the piston (140B).

(f) Remove the packing (115), rings (120), and ring (130) from the damaged bearing (125).

(g) Install the new bearing (125) on the piston (140B) (SOPM 20-50-03).

(h) Install the packing (105) then the foot seal - seal assembly (110) in the new bushing (125).

(i) Install the retainer (100) on the piston (140B).

(j) Install the piston rod scrapper (95A) on the piston (140B).

(k) If you do not need to repair the piston (140B) or replace other parts installed on the piston (140B), see the ASSEMBLY section for instruction on how to install the end fitting assembly (60) on the manifold assembly (460A).

Otherwise, see the next steps.

(2) Replace the bearing (125) near the rod end assembly (35) side:

(a) If you need to remove the rod end assembly (35) from the manifold assembly (460A), see the DISASSEMBLY section for instruction.

(b) Remove the bolts (80) and washers (85) from the flange end (90).

(c) Remove the flange end (90) from the manifold assembly (460A).

(d) Remove the piston rod scrapper (95A) from the piston (140B).

(e) Remove the retainer (100) from the piston (140B). If the retainer (100) is damaged, replace it with a new retainer (100).

(f) Remove the foot seal - seal assembly (110) and the two packings (105) from the damaged bearing (125).

(g) Remove the damaged bearing (125) from the piston (140B).

(h) Remove the packing (115), rings (120), and ring (130) from the damaged bearing (125).

(i) Install the new bearing (125) on the piston (140B) (SOPM 20-50-03).

(j) Install the packing (105) then the foot seal - seal assembly (110) in the new bushing (125).

(k) Install the retainer (100) on the piston (140B).

(l) Install the piston rod scrapper (95A) on the piston (140B).

(m) Install the rod end assembly (35) on the manifold assembly (460A). See the ASSEMBLY section for instruction.

4. Filter Replacement

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
A00247	Sealant - Pressure And Environmental - Chromate Type	BMS 5-95
A00551	Sealant - Fuel Tank	BAC5010, Type 44 (BMS5-44, BMS5-45)
A50103	Sealant - Pressure And Environmental-Chromate, Type II, Class B-2	BMS 5-95, Type II Class B-2

B. References

Reference	Title
SOPM 20-50-19	GENERAL SEALING
SOPM 20-60-04	MISCELLANEOUS MATERIALS

C. Procedure

NOTE: For general sealing, refer to SOPM 20-50-19. For miscellaneous materials, refer to SOPM 20-60-04.

(1) Remove the sealant around the retainer (385).

(2) Remove the retainer (385) from the manifold assembly (460A).

(3) Remove the old filter (400) from the manifold assembly (460A).

(4) It is recommended that you replace the packing (390): Remove the packing (390) and rings (395B) from the retainer (385).

(5) Install the new packing (390) and rings (395B) on the retainer (385).

(6) It is recommended that you replace the packing (405): Remove the packing (405) and rings (405) from the old filter (400).

(7) Install the new packing (405) and rings (405) on the new filter (400).

(8) Install the new filter (400) in the manifold assembly (460A).

(9) Install the retainer (385) on the manifold assembly (460A).

(10) Torque the retainer to 200-225 pound-inches.

(11) Apply a bead of sealant around the retainer (385). The approved sealants are:

Preferred sealant: BMS 5-95, class B-1/2, Pressure and Environment Sealant - Chromate type, sealant, A00247.

BMS 5-95, Type II, Class B-2, sealant, A50103.

Optional sealant: BMS 5-45, sealant, A00551 (BMS 5-26 , type II, class B-2, Integrated Fuel Tank Sealant).

(12) Allow the sealant to cure for 48 hours.

(13) Make sure that the sealant has cured and bonded to all surfaces.

CRANK ASSEMBLY - REPAIR 5-1

251A2161–3, –4

1. General

A. This procedure has the data necessary to repair and refinish the crank assembly (170A).

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

C. Refer to IPL Figure 1 for item numbers.

2. Bearing Replacement

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
C00259	Primer - Chemical And Solvent Resistant Finish, Epoxy Resin	BMS10-11, Type I

B. References

Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES
SOPM 20-50-03	BEARING AND BUSHING REPLACEMENT
SOPM 20-60-02	FINISHING MATERIALS

C. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01. For finishing materials, refer to SOPM 20-60-02.

(1) Remove the damaged bearing (205) and retainer (200) from the input arm (175, 195).

(2) Apply primer, C00259 on the inside diameter of the hole.

(3) Install the retainer (200) and the new bearing (205) on the input arm (175, 195). Anvil swage (SOPM 20-50-03) both ends of the retainer (200).

INPUT ARM - REPAIR 5-2

251A2165–1, –2, 251A2166–1, –2

1. General

A. This procedure has the data necessary to repair and refinish the input arm (175, 195).

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

C. Refer to IPL Figure 1 for item numbers.

D. General repair details:

(1) Material: Aluminum Alloy

2. Input Arm Refinsih

A. References

Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES

B. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For the decoding table for Boeing finish codes, refer to SOPM 20-41-01.

(1) Boric acid-sulfuric acid anodize or chromic acid anodize (F-17.35) the input arm (175, 195).

CRANK - REPAIR 5-3

251A2167–1, –2

1. General

A. This procedure has the data necessary to repair and refinish the crank (180).

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

C. Refer to REPAIR-GENERAL, Figure 601 shown in the repair.

D. Refer to IPL Figure 1 for item numbers.

E. General repair details:

(1) Material: 4330M Steel

2. Crank Refinish

A. References

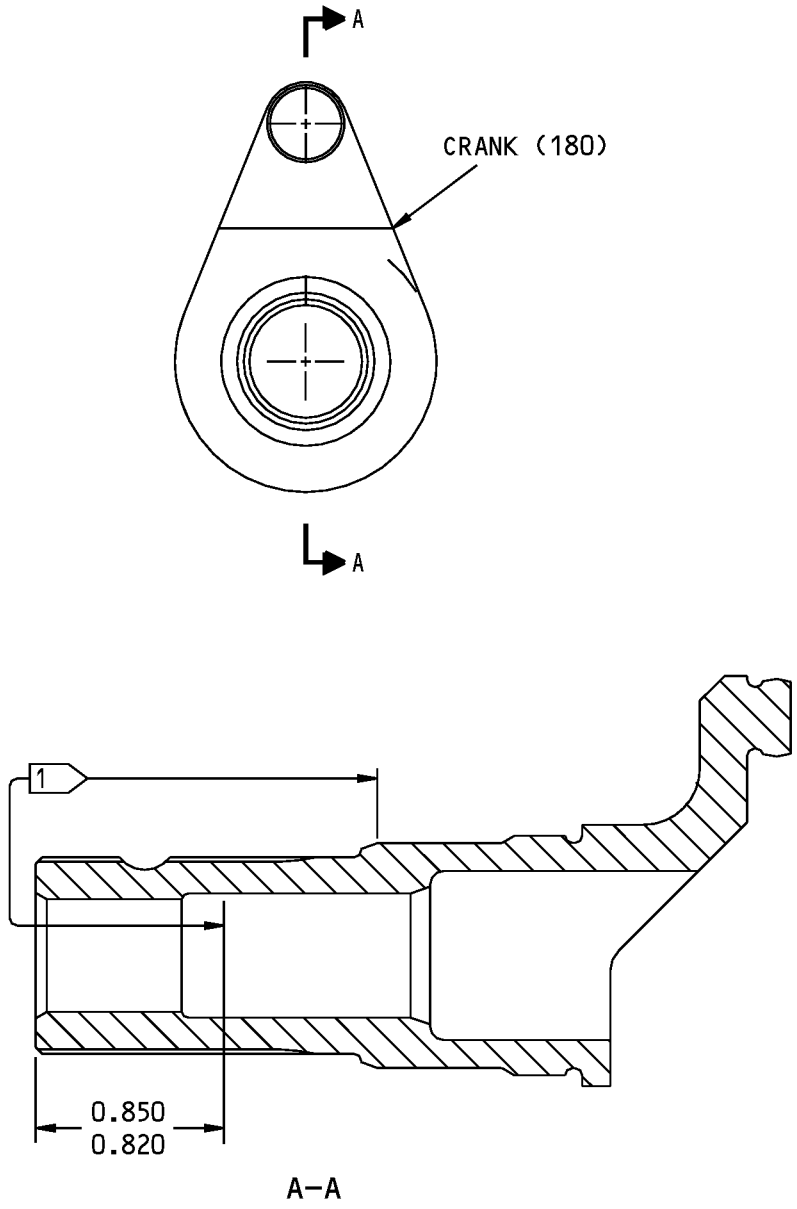
Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES

B. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01.

(1) For crank (180), on area indicated by flagnote 1 of REPAIR 5-3, Figure 601: Cadmium plate 0.0003-0.0005 inch thick (F-15.36).

(2) For crank (180A), on area indicated by flagnote 1 of REPAIR 5-3, Figure 602: Cadmium plate (F-16.06).



1 F-15.36

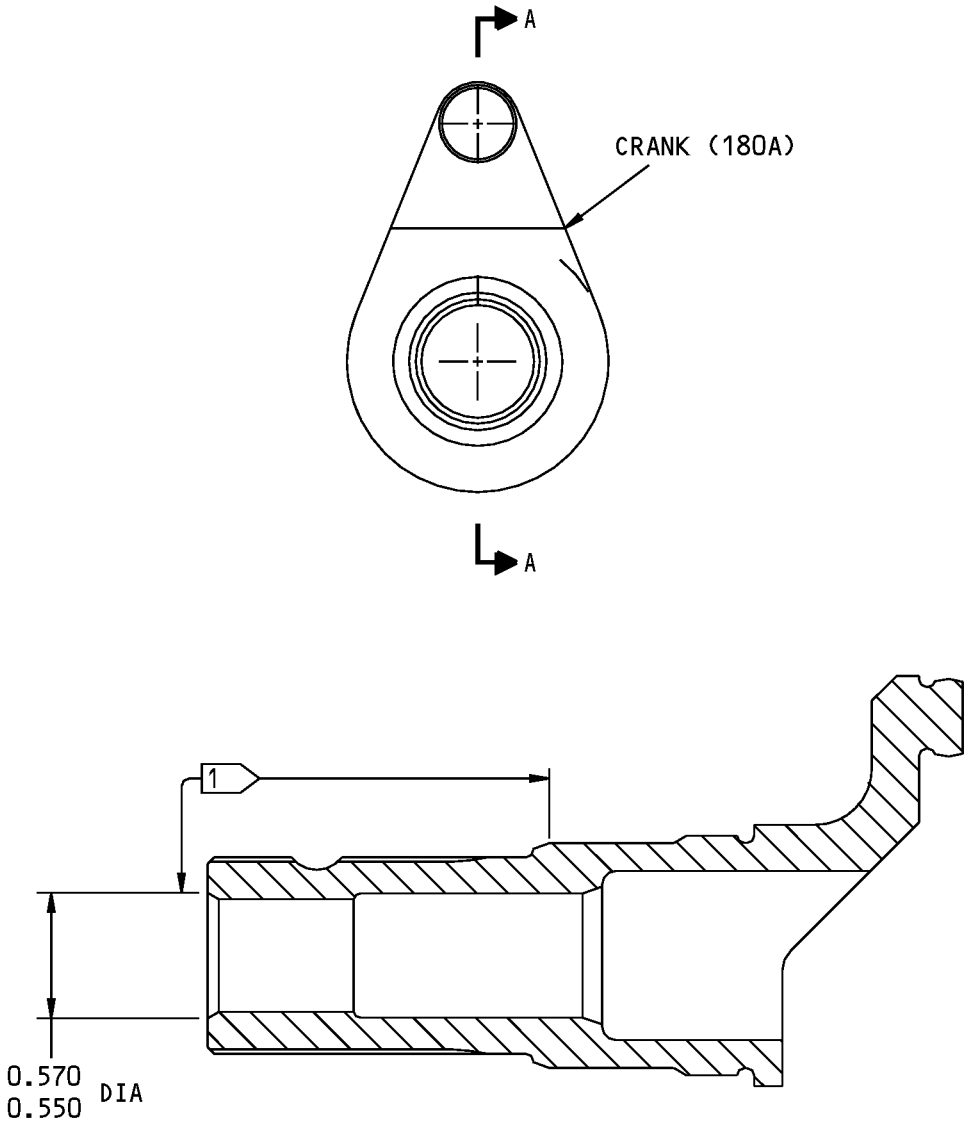
125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

BREAK ALL SHARP EDGES 0.005-0.010

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

251A2167-1 Crank Repair
Figure 601



1 F-16.06

125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

BREAK ALL SHARP EDGES 0.005-0.010

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

251A2167-2 Crank Repair
Figure 602

CRANK - REPAIR 5-4

251A2168–2, –3

1. General

A. This procedure has the data necessary to repair and refinish the crank (190).

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

C. Refer to REPAIR-GENERAL, Figure 601 shown in the repair.

D. Refer to IPL Figure 1 for item numbers.

E. General repair details:

(1) Material: 4330M Steel

2. Crank Refinish

A. References

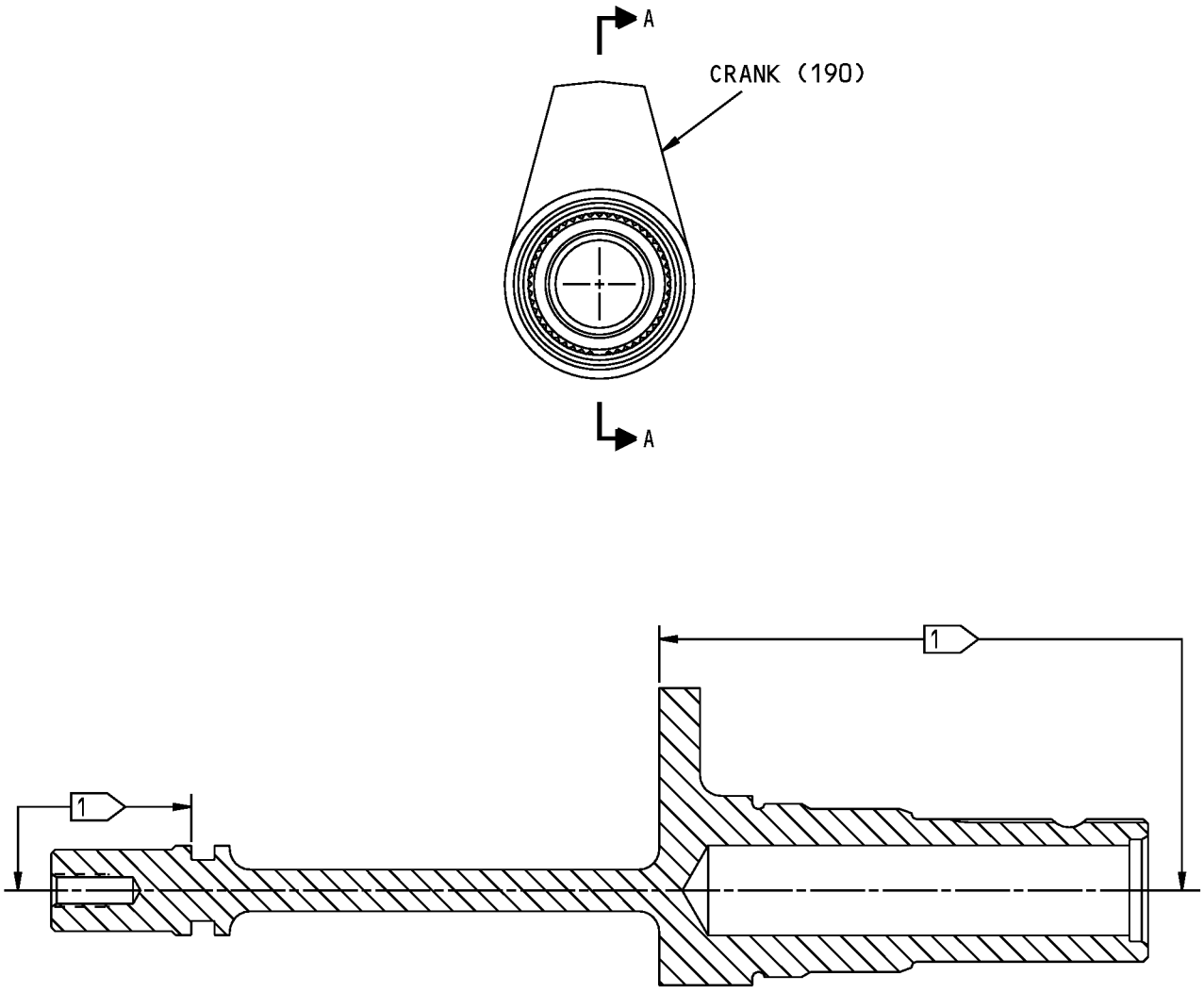
Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES

B. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01.

(1) For crank (190), on area indicated by flagnote 1 of REPAIR 5-4, Figure 601 and all internal surfaces: Cadmium plate 0.0003-0.0005 inch thick (F-15.36).

(2) For crank (190A), on area indicated by flagnote 1 of REPAIR 5-4, Figure 602: Cadmium plate (F-16.06).



1 F–15.36

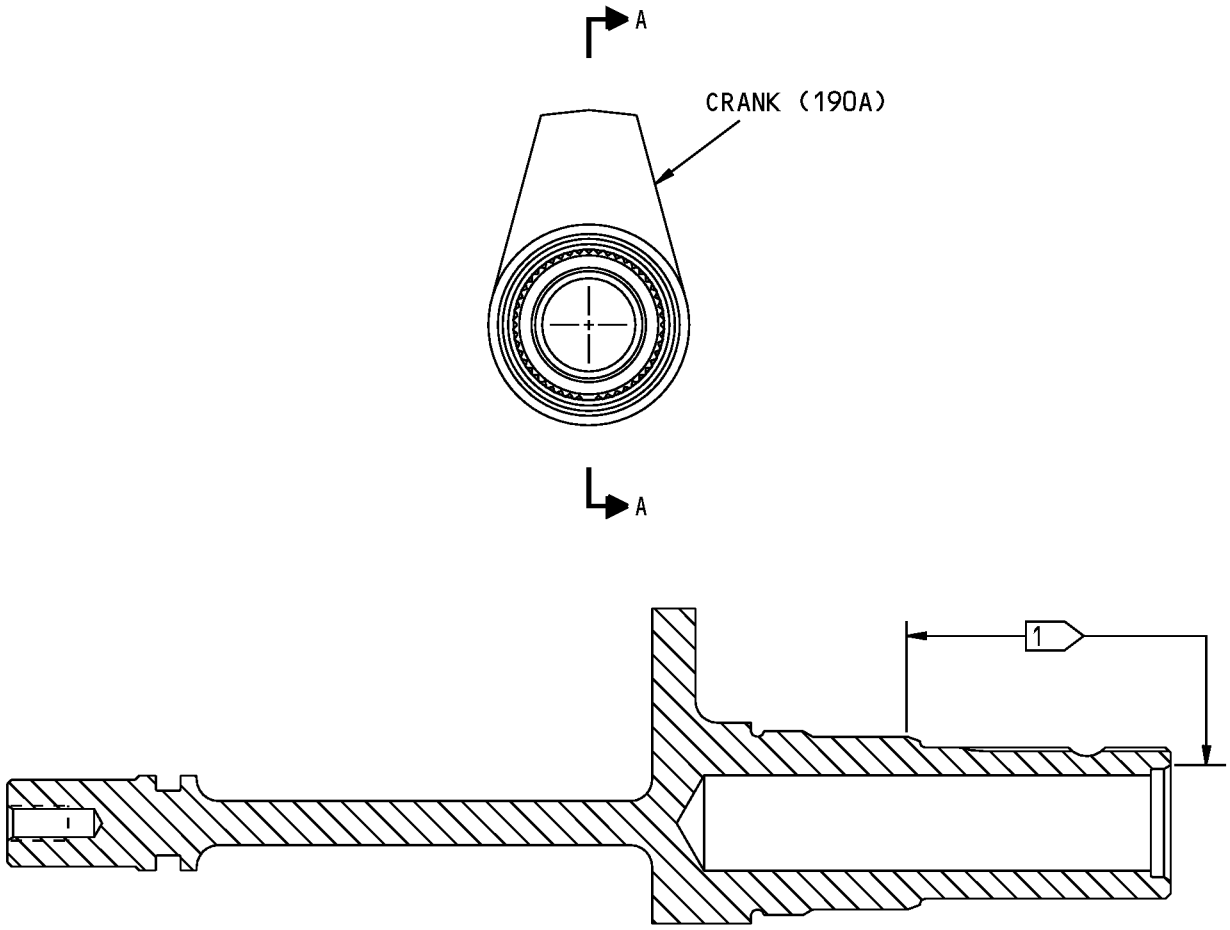
125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

BREAK ALL SHARP EDGES 0.005–0.010

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

251A2168-2 Crank Repair
Figure 601



A–A

1 F-16.06

125 ALL MACHINED SURFACES UNLESS SHOWN DIFFERENTLY

BREAK ALL SHARP EDGES 0.005–0.010

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

251A2168-3 Crank Repair
Figure 602

CRANK - REPAIR 5-5

251A2167–1, –2

1. General

A. This procedure has the data necessary to repair and refinish the fitting (75).

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

C. Refer to IPL Figure 1 for item numbers.

D. General repair details:

(1) Material: 303SE CRES

2. Retainer Refinish

A. References

Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES

B. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01.

(1) Cadmium plate (F-15.06) the retainer (200).

3. Input Arm Refinish

A. References

Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES

B. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01.

(1) Boric acid-sulfuric acid anodize or chromic acid anodize (F-17.35) the input arm (175, 195).

MANIFOLD ASSEMBLY - REPAIR 6-1

251A2162–5

1. General

A. This procedure has the data necessary to repair and refinish the manifold assembly (460A)

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

C. Refer to IPL Figure 1 for item numbers.

2. Pin Replacement

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
C00259	Primer - Chemical And Solvent Resistant Finish, Epoxy Resin	BMS10-11, Type I

B. References

Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES
SOPM 20-60-02	FINISHING MATERIALS

C. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01. For finishing materials, refer to SOPM 20-60-02.

(1) Remove the damaged pin (490, 495) from the manifold (510A).

(2) Apply primer, C00259 (F-20.04) to all areas of the hole for the pin (490, 495). Do the next step immediately.

(3) Install the new pin (490, 495) on the manifold (510A). The pin must be no more than 0.024 inch above the surface.

3. Insert Replacement

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
C00259	Primer - Chemical And Solvent Resistant Finish, Epoxy Resin	BMS10-11, Type I

B. References

Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES

Reference	Title
SOPM 20-60-02	FINISHING MATERIALS

C. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01. For finishing materials, refer to SOPM 20-60-02.

(1) Remove the damaged insert (465, 470, 485) from the manifold (510A).

(2) Apply primer, C00259 (F-20.04) to all areas of the hole for the insert (465, 470, 485). Do the next step immediately.

(3) Install the new insert (465, 470, 485) on the manifold (510A).

MANIFOLD - REPAIR 6-2

251A2162–4

1. General

A. This procedure has the data necessary to repair and refinish the manifold (510A).

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

C. Refer to IPL Figure 1 for item numbers.

D. General repair details:

(1) Material: Aluminum alloy

2. Manifold Refinish

A. References

Reference	Title
SOPM 20-30-02	STRIPPING OF PROTECTIVE FINISHES
SOPM 20-41-01	DECODING TABLE FOR BOEING FINISH CODES

B. Procedure

NOTE: For stripping of protective finishes, refer to SOPM 20-30-02. For decoding table for Boeing finish codes, refer to SOPM 20-41-01.

(1) Boric acid-sulfuric acid anodize or chromic acid anodize (F-17.35) the manifold (510A).

ASSEMBLY

1. General

A. This procedure has the data necessary to assemble the aileron elevator - power control unit (PCU) assembly.

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

C. Refer to IPL Figure 1 for item numbers.

2. Assembly

A. Consumable Materials

NOTE: Equivalent substitutes may be used.

Reference	Description	Specification
A00247	Sealant - Pressure And Environmental - Chromate Type	BMS 5-95
A00551	Sealant - Fuel Tank	BAC5010, Type 44 (BMS5-44, BMS5-45)
A50103	Sealant - Pressure And Environmental-Chromate, Type II, Class B-2	BMS 5-95, Type II Class B-2
C50056	Compound - Nondrying Resin Mix Corrosion Inhibiting Material	BMS 3-27
D50090	Hydraulic Fluid - Petroleum Base NATO H-515 PETROLEUM BASE AIRCRAFT HYDRAULIC FLUID	MIL-PRF-5606H (NATO H-515)
G50347	Lockwire - Nickel-copper, 0.032 inch diameter	NASM20995N˜ C32

B. References

Reference	Title
SOPM 20-50-01	BOLT AND NUT INSTALLATION
SOPM 20-50-02	INSTALLATION OF SAFETYING DEVICES
SOPM 20-60-02	FINISHING MATERIALS
SOPM 20-60-04	MISCELLANEOUS MATERIALS

C. Procedure

NOTE: For bolt and nut Installation, refer to SOPM 20-50-01. for finishing materials, refer to SOPM 20-60-02. For miscellaneous materials, refer to SOPM 20-60-04.

CAUTION: DO NOT PUT THE UNIT IN A CLAMPING DEVICE. IT CAN BE DAMAGED.

(1) Lubricate the packings, backup rings, and seals with hydraulic fluid, D50090 or assembly lube before you install the parts.

(2) Use standard industry procedures and the steps shown below to assemble this component.

(3) Install the rod end assembly (35) on the manifold assembly (460A):

(a) Install the bolt (20) and washer (25) on the rod end assembly (35). Don't tighten the bolt (20).

(b) Install the rod end assembly (35) on the piston (140B). Loosen the bolt (20) if necessary.

(c) Torque the rod end assembly (35) to 162-200 pound-inches.

(d) Tighten the bolt (20).

(e) Apply a bead of sealant around the rod end assembly (35). The approved sealants are:

Preferred sealant: BMS 5-95, class B-1/2, Pressure and Environment Sealant - Chromate type, sealant, A00247.

BMS 5-95, type II, class B-2. sealant, A50103

Optional sealant: BMS 5-45, sealant, A00551 (replaces BMS 5-26, type II, class B-2, Integrated Fuel Tank Sealant).

(f) Allow the sealant to cure for 48 hours.

(g) Make sure that the sealant has cured and bonded to all surfaces.

(4) Install the end fitting assembly (60) on the manifold assembly (460A):

(a) Align the pin (65) and the roll pin (494) with holes and install the end fitting assembly (60) on the manifold assembly (460A) with washers (55) and bolts (50).

(b) Torque the bolts (50) to 190-200 pound-inches.

(5) Install the crank assembly (170A) on the manifold assembly (460A):

(a) Install the crank (190) on the manifold assembly (460A):

1) Install the crank (190) in the manifold assembly (460A). Make sure the ball (185) is properly engaged with the slide (295).

2) Install the bearing cap (370) on the crank (190) with bolts (325) and washers (330).

3) Torque the bolts (325) to 80-100 pound-inches.

4) Install lockwire, G50347 on the two bolts (325) toward the rod end assembly (35) and the two bolts (325) toward the end fitting assembly (60). Use the double-twist method (SOPM 20-50-02).

(b) Install the crank (180) on the manifold assembly (460A):

1) Install the crank (180) on the crank (190). Make sure the ball of the crank (180) is properly engaged with the slide (290).

2) Install the bearing cap (370) on the crank (180).

3) Torque the bolts (160) to 80-100 pound-inches.

4) Install lockwire, G50347 on the two bolts (160) toward the rod end assembly (35) and the two bolts (160) toward the end fitting assembly (60). Use the double-twist method (SOPM 20-50-02).

(c) Install the input arm (175) on the crank (180):

1) Install the shim (355) on the crank (190).

2) Install the input arm (175) on the crank (190). Loosen the nut (155) if necessary.

3) Install the pin (345) in the slot between the crank (180) and crank (190).

4) Install the screw (335) and washer (340) on the end of crank (190). Use compound, C50056 when you install the screw (335).

5) Torque the screw (335) to 40-50 pound-inches.

6) Apply compound, C50056 around the screw (335) and washer (340). Make sure the compound, C50056 completely covers the washer (340) and pin (345A).

7) Torque the nut (155) to 90-100 pound-inches.

(d) Install the input arm (195) on the crank (190):

1) Install the shim (355) on the crank (190).

2) Install the input arm (195) on the crank (190). Loosen the nut (155) if necessary.

3) Torque the nut (155) to 90-100 pound-inches

FITS AND CLEARANCES

REF IPL		NAME	TORQUE*	
FIG. NO.	ITEM NO.		POUND-INCHES	POUND-FEET
1	5	Screw	40-50	
1	35	Rod End Assembly	162-200	
1	50	Bolt	190-200	
1	155	Nut	90-100	
1	160	Bolt	80-100	
1	215	Screw	50-70	
1	325	Bolt	80-100	
1	335	Screw	40-50	
1	385	Retainer	200-225	

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

Torque Table
Figure 801

SPECIAL TOOLS, FIXTURES, AND EQUIPMENT

1. General

A. This section lists the special tools, fixtures, and equipment necessary for maintenance.

NOTE: Equivalent substitutes may be used.

Special Tools

Reference	Description	Part Number	Supplier
SPL-5349	X-Y Recorder/Plotter	925E	60795
SPL-5676	Fixture - Test	251A2160TF2-1001	82106
SPL-5681	Fixture - Control Valve Flow Grind	251A2170TF1-1001	82106

Tool Supplier Information

CAGE Code	Supplier Name	Supplier Address
60795	ALLEN DATAGRAPH INC.	2 INDUSTRIAL WAY SALEM, NH 03079-2837 Telephone: (603) 893-1983 Facsimile: (603) 893-9042
82106	PARKER-HANNIFIN CORP. - CONTROL SYSTEMS DIV.	14300 ALTON PKWY IRVINE, CA 92618 Telephone: 949-833-3000 www.parker.com

ILLUSTRATED PARTS LIST

1. Introduction

A. The Illustrated Parts List (IPL) contains an illustration and a list of component parts you can repair or replace. The Illustrated Parts Catalog (IPC) shows how to use the Boeing part number system.

B. This shows how parts are related: The relation of each item to its next higher assembly (NHA) is shown in the NOMENCLATURE column. Use the indenture system that follows:

1 2 3 4 5 6 7

. Assembly

. Attaching parts for assembly

. . Detail parts for assembly

. . Subassembly

. . Attaching parts for subassembly

. . . Detail parts for subassembly

. . . Sub-subassembly

. . . Attaching parts for subassembly

. . . . . Details parts for sub-subassembly

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

C. Each top assembly is given one use code letter (A, B, C, etc.) in the USAGE CODE column. All subsequent component parts in the list can have one or more of the use code letters to show effectivity to top assemblies. A component part without a use code applies to all top assemblies.

D. An alphabetical letter is added after the item number for optional parts, parts changed by a Service Bulletin, configuration differences (except left-handed and right-handed parts), last engineering releases, and parts added between item numbers in a sequence. The alphabetical letter will not be shown on the illustration for equivalent parts of the same part number.

E. Color-coded parts are identified with a single digit alpha following the dash number or with ''SP'' suffix. If the ''SP'' suffix is used, it represents consolidation of all color codes applicable for a given usage which are not separately listed. Orders for color-coded parts should include the registry number of the airplane for which the parts are ordered.

F. If a part number is 15 characters long but will not fit in the part number column, the part number will be displayed with a ''~'' at the end of the line and will be continued on the next line. The ''~'' denotes that the part number continues on the next line.

G. Parts changed by a Service Bulletin are shown by PRE SB XXXX and POST SB XXXX added to the NOMENCLATURE column.

(1) When a new top assembly is added by a Service Bulletin, PRE SB XXXX and POST SB XXXX will be added at the top assembly level only. The configuration differences at the detail part level are shown by use code letters.

(2) When the top assembly part number is not changed by the Service Bulletin, PRE SB XXXX and POST SB XXXX will be added at the detail level.

H. Interchangeable Parts

Optional (OPT)	The part is optional to and interchangeable with other parts that have the same item number.
Replaces, Replaced by and not interchangeable with (REPLACES, REPLACED BY AND NOT INTCHG/W)	The part replaces and is not interchangeable with the initial part.
Replaces, Replaced by (REPLACES, REPLACED BY)	The part replaces and is interchangeable with, or is an alternative to, the initial part.

VENDOR CODES

Code	Name
02107	FLOUROCARBON CO OHIO DIV DOVER, OHIO 44622 CANCELLED NO REPLACEMENT FORMERLY SPARTA MANUFACTURING CO
05228	PTI TECHNOLOGIES INC 501 DEL NORTE BLVD OXNARD, CALIFORNIA 93030-7983 FORMERLY PUROLATOR TECH; PTI TECH; TEXTRON FILTRATION SYS; FORMERLY IN NEWBURY PARK, CA
06144	INDUSTRIAL TECTONICS BEARING CORP 18301 SOUTH SANTA FE AVENUE RANCHO DOMINGUEZ, CALIFORNIA 90221 FORMERLY IN COMPTON, CALIFORNIA
07128	TETRAFLUOR INC 2051 EAST MAPLE AVENUE EL SEGUNDO, CALIFORNIA 90245-5009 FORMERLY ROYAL IND TETRAFLUOR DIV V0667B ENGLEWOOD CALIF
11815	CHERRY AEROSPACE FASTENERS DIV OF TEXTRON 1224 EAST WARNER AVENUE PO BOX 2157 SANTA ANA, CALIFORNIA 92707-0157 FORMERLY IN LOS ANGELES, CALIF , FORMERLY CHERRY FASTENERS TOWNSEND DIV OF TEXTRON INC V71087
14818	PUROFLOW INC 16559 SATICOY ST VAN NUYS, CALIFORNIA 91406 FORMERLY AEROSPACE COMPONENTS CORP

Code	Name
17446	HUCK INTL INC AEROSPACE FASTENER DIV 900 WATSON CENTER ROAD CARSON, CALIFORNIA 90745-4201 FORMERLY V32134 REXNORD INC; FORMERLY V97928 HUCK INTL
18350	PALL AEROPOWER CORP 5775 RIO VISTA DR CLEARWATER, FLORIDA 33760-3114 FORMERLY V01414; FORMERLY AIRCRAFT POROUS MEDIA INC FORMERLY IN PINELLAS PARK, FL; FORMERLY V60047; FORMERLY MECTRON IND V10989
21335	TIMKEN US CORPORATION DIV FAFNIR 336 MECHANIC STREET LEBANON, NH 03766-0267 FORMERLY FAFNIR BRG AND TEXTRON INC FAFNIR DIV IN NEW BRITAIN, CONNECTICUT ; FORMERLY TORRINGTON CO THE SPECIAL PRODUCTS DIV SUB OF THE INGERSOLL-RAND CO V8D210 FORMERLY TORRINGTON CO FAFNIR BEARING DIV IN TORRINGTON, CT
21550	Replaced: [V21550] BRUNSWICK CORP by Code: Name and Address below 05CK7: WINTEC LLC 1681 MCGAW AVE IRVINE, CALIFORNIA 92614-5631 FORMERLY V21550 BRUNSWICK CORP WINTER TECHNECTICS DIV
26303	GREENE TWEED IND INC ADVANTEC DIV 7101 PATTERSON DRIVE PO BOX 5037 GARDEN GROVE, CALIFORNIA 92645-5037 FORMERLY OHIO AIRCRAFT SUPPLIES INC IN INGLEWOOD, CALIFORNIA FORMERLY ADVANTEC DIV OF IFP INC, LOS ANGELES, CA V5P801
26879	CORONADO MFG INC 11069 PENROSE AVENUE SUN VALLEY, CALIFORNIA 90352-2722 FORMERLY CORONADO PLASTICS INC IN BURBANK, CALIFORNIA
38443	MRC BEARINGS 402 CHANDLER STREET JAMESTOWN, NEW YORK 14701-3802 FORMERLY MARLIN-ROCKWELL CORP DIV TRW AND TRW INC

Code	Name
40920	MPB MINIATURE PRECISION BEARING DIV PRECISION PARK PO BOX 547 KEENE, NEW HAMPSHIRE 03431 FORMERLY MPB CORP AND MINIATURE BRG DIV MPB CORP
43991	FAG BEARING INCORPORATED 118 HAMILTON AVENUE STAMFORD, CONNECTICUT 06904 FORMERLY NORMA-HOFFMAN BEARING CORPORATION FORMERLY NORMA FAG BEARINGS CORPORATION
59211	PARKER-HANNIFIN CORP PARKER BERTA SERVICES LOGISTICS DIV 16666 VON KARMON AVENUE IRVINE, CALIFORNIA 92606 FORMERLY PARKER HANNIFIN CORP SERVICES LOGISTICS DIV
72902	Replaced: [V72902] PALMETTO INC SEE GREEN TWEED & CO V5F573 by Code: Name and Address below 5F573: GREENE TWEED AND CO INC 2075 DETWILER RD P.O. BOX 305 KULPSVILLE, PENNSYLVANIA 19443-0305
83086	NEW HAMPSHIRE BALL BEARING, INC HITECH DIVISION 172 JAFFREY ROAD PETERBOROUGH, NEW HAMPSHIRE 03458
92003	PARKER-HANNIFIN CORPORATION 14300 ALTON PKWY IRVINE, CALIFORNIA 92618 FORMERLY PARKER AIRCRAFT V02689;FORMERLY SCHULZ TOOL & MFG V82267; FORMERLY PARKER-BERTEA AEROSPACE GROUP
92555	LEE COMPANY 2 PETTIPAUG ROAD PO BOX 424 WESTBROOK, CONNECTICUT 06498-1543
94878	RAYBESTOS-MANHATTAN INC PACIFIC COAST DIV FULLERTON, CALIFORNIA 92631 BUSINESS DISCONTINUED

Code	Name
97820	BUSAK AND SHAMBAN INC BEARING DIV 711 MITCHELL ROAD PO BOX 665 NEWBURY PARK, CALIFORNIA 91320-2214 FORMERLY IN CULVER CITY, CALIF; FORMERLY SHAMBAN W S & CO
K8455	RHP BEARINGS PLC RHP AEROSPACE OLDENDS LANE STONEHOUSE GL10 3RM UK

NUMERICAL INDEX

PART NUMBER	AIRLINE PART NUMBER	FIGURE	ITEM	UNITS PER ASSEMBLY
10-60808-2		1	400A	1
10-60808-4		1	400	1
11-10107		1	400B	1
21-10033		1	400A	1
21-11176		1	400	1
		1	400A	1
2100-113		1	435	8
2100-116		1	410	2
		1	425	2
2100-211		1	280	8
2100-218		1	120	4
2100-223		1	395B	2
251A2151-2		1	140B	1
251A2152-1		1	60	1
251A2152-2		1	75	1
251A2153-1		1	90	1
251A2154-1		1	70	2
251A2156-1		1	500	1
251A2157-1		1	100	2
251A2160-2		1	1B	RF
251A2161-3		1	170A	1
251A2161-4		1	170B	1
251A2162-4		1	510A	1
251A2162-5		1	460A	1
251A2163-1		1	445	1
251A2165-1		1	175A	1
251A2165-2		1	175	1
251A2166-1		1	195A	1
251A2166-2		1	195	1
251A2167-1		1	180	1
251A2167-2		1	180A	1
251A2168-2		1	190	1
251A2168-3		1	190A	1
251A2169-1		1	185	1

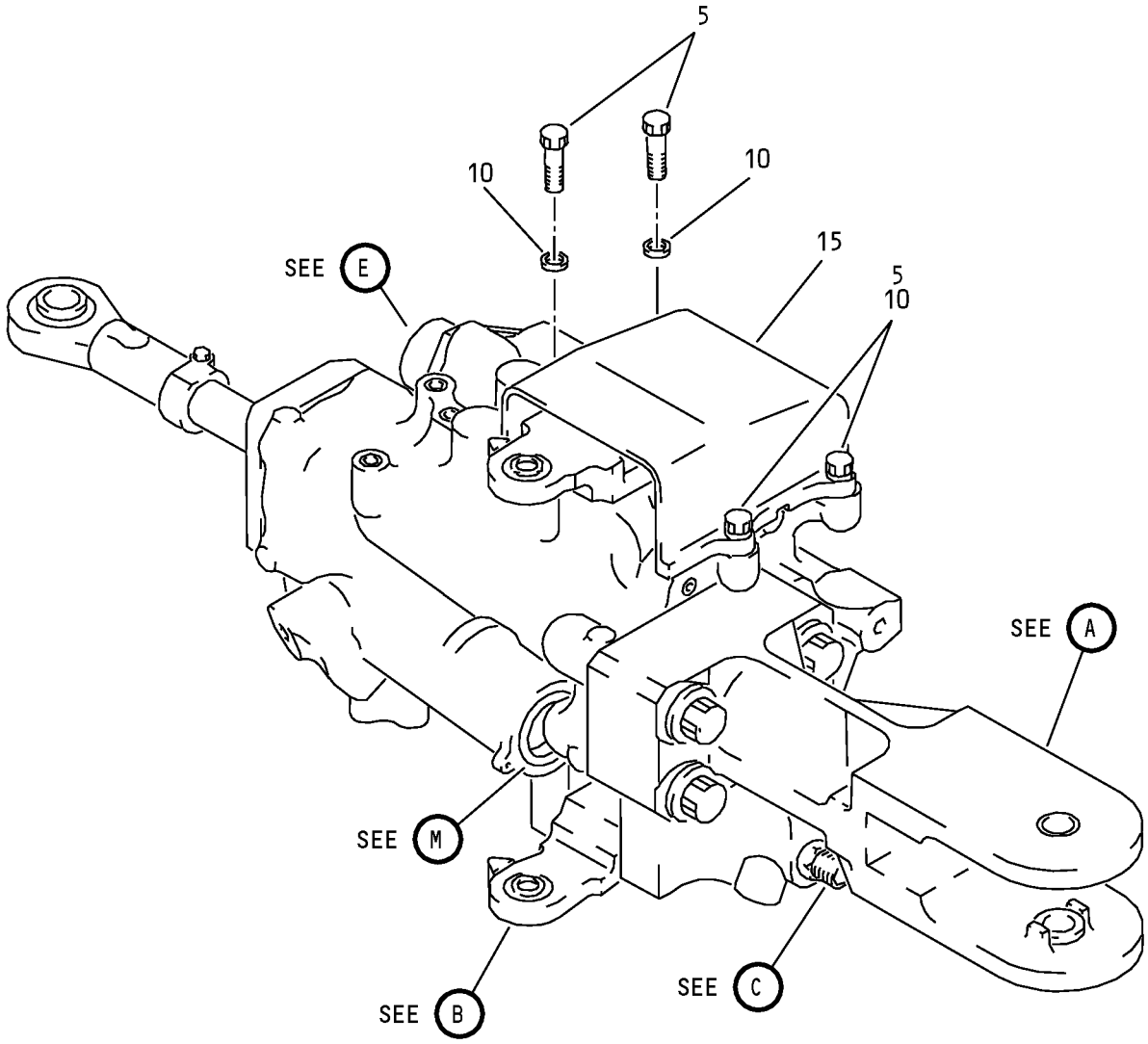
PART NUMBER	AIRLINE PART NUMBER	FIGURE	ITEM	UNITS PER ASSEMBLY
251A2170-1		1	285	1
251A2171-1		1	225	1
251A2171-2		1	235	1
251A2172-1		1	300	1
251A2173-1		1	295	1
251A2174-1		1	290	1
251A2175-1		1	255	1
251A2176-1		1	265	1
251A2177-1		1	450	1
251A2178-1		1	370	2
251A2179-1		1	230	1
251A2180-1		1	200	2
251A2181-1		1	15	1
251A2182-1		1	505	1
2LPYEU8-19		1	20	1
		1	20	1
381588-1		1	200A	2
381701		1	515A	1
4228-633		1	400B	1
4245-502		1	400	1
		1	400A	1
60754-3		1	415	1
60B80034-2		1	400B	1
65-44834-1		1	35	1
65-44834-2		1	45	1
66-22798-1		1	355	2
68062		1	440	1
68063		1	455	1
69-35687-1		1	125	2
69-35689-1		1	385	1
69-35774-1		1	245	1
69-35775-1		1	260	1
712B5MRL952N		1	130	2
7500272		1	400	1
		1	400A	1

PART NUMBER	AIRLINE PART NUMBER	FIGURE	ITEM	UNITS PER ASSEMBLY
7553575		1	400B	1
AC4638E3		1	400A	1
AC4638E31		1	400	1
AC8818E2		1	400B	1
ACMB540DDA3908		1	360	2
ACMB540DDLY196		1	360A	2
ACMB540DDP28LY1		1	360	2
ACMKSP5A3908		1	205	2
AMB541DDLY196		1	380A	2
BAC27DCT623		1	515	1
BACB10AS17		1	380	2
BACB10FP5		1	205	2
BACB10FU14R		1	360	2
BACB30DX8A19U		1	20	1
BACB30LE4HK4		1	160	4
		1	325	4
BACB30LE4HK5		1	80	4
BACB30LE5HK14		1	50	4
BACN10JC4CD		1	155	2
BACP20AX15D		1	475	11
BACP20AX15DP		1	480	11
BACR12BM113		1	435	8
BACR12BM116		1	410	2
		1	425	2
BACR12BM211		1	280	8
BACR12BM218		1	120	4
BACR12BM223		1	395B	2
BACW10BN3SP		1	340	1
BACW10BP4CD		1	85	4
		1	165	4
		1	330	4
BACW10BP5CD		1	55	4
C11236-113B		1	435	8
C11236-116B		1	410	2
		1	425	2

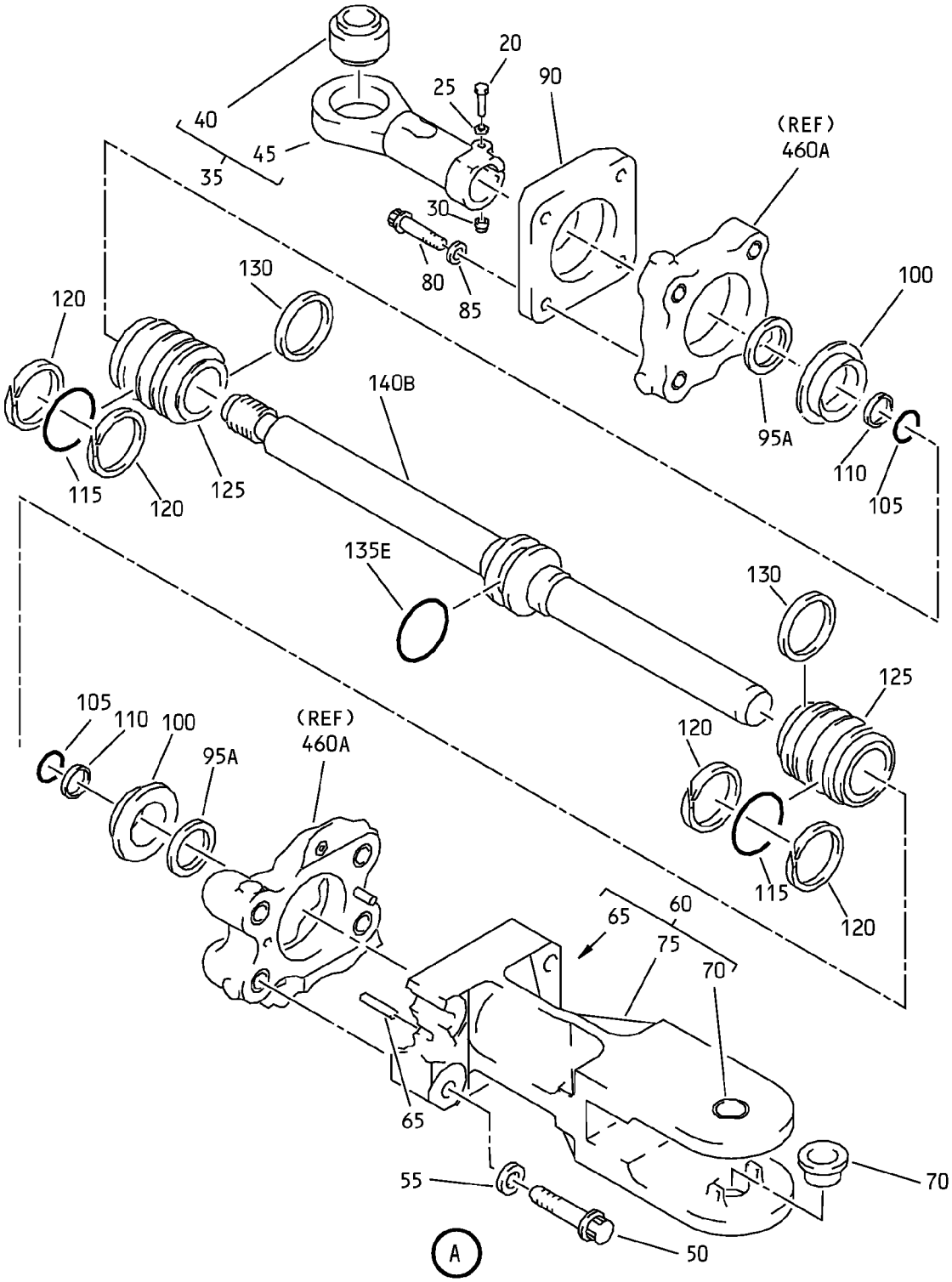
PART NUMBER	AIRLINE PART NUMBER	FIGURE	ITEM	UNITS PER ASSEMBLY
C11236-211B		1	280	8
C11236-218B		1	120	4
C11236-223B		1	395B	2
LLMB541		1	380	2
MB541-2TS		1	380	2
MB541DD		1	380	2
MB541DDFS428		1	380	2
MB541DDG20		1	380	2
MB541DDLY196		1	380	2
MB541DDSD610		1	380	2
MB541TT		1	380	2
MS14101-10		1	40	1
MS16556-634		1	490	2
MS16562-213		1	495	1
MS16562-25		1	65	1
MS21209F1-15P		1	470	10
MS21209F4-15P		1	465	16
MS21209F5-15P		1	485	4
MS21232-10		1	40A	1
MS21902-4T		1	315	1
MS21902D6		1	305	1
MS51838-26		1	250	1
MS9380-8		1	210	1
MT341E		1	380	2
NAS1080R08		1	30	1
NAS1149E0432P		1	150	4
		1	220	4
NAS1149E0463P		1	25	1
NAS1351N3H10P		1	5	4
NAS1351N3H6P		1	335	1
NAS1351N4H10P		1	215	4
NAS1351N4H32P		1	145	2
NAS1611-110		1	350	1
NAS1611-113		1	430	4
NAS1611-116		1	405	1

PART NUMBER	AIRLINE PART NUMBER	FIGURE	ITEM	UNITS PER ASSEMBLY
		1	420	1
NAS1611-210		1	105	2
NAS1611-211		1	275	4
NAS1611-216		1	240	1
NAS1611-218		1	115	2
NAS1611-223		1	390	1
NAS1611-328		1	375	2
NAS1612-4		1	320	1
NAS1612-6		1	310	1
NAS607-2-4		1	345	1
NAS620C10L		1	10	4
PLGA1876010		1	480	11
PLGA1877010		1	475	11
RMR12BM113		1	435	8
RMR12BM116		1	410	2
		1	425	2
RMR12BM211		1	280	8
RMR12BM218		1	120	4
RMR12BM223		1	395B	2
S12766-116		1	410A	2
		1	425A	1
S12766-218		1	120A	4
S12766-223		1	395A	2
S30294-113-1		1	435	8
S30294-116-1		1	410	2
		1	425	2
S30294-211-1		1	280	8
S30294-218-1		1	120	4
S30294-223-1		1	395B	2
S32152-215-5PHK		1	135E	1
S33121-210H5		1	110	2
S33865-5H5		1	95A	2
S33865-5H5N		1	95B	2
S34712-214H5		1	365	2
SSMKSP5SD705		1	205	2

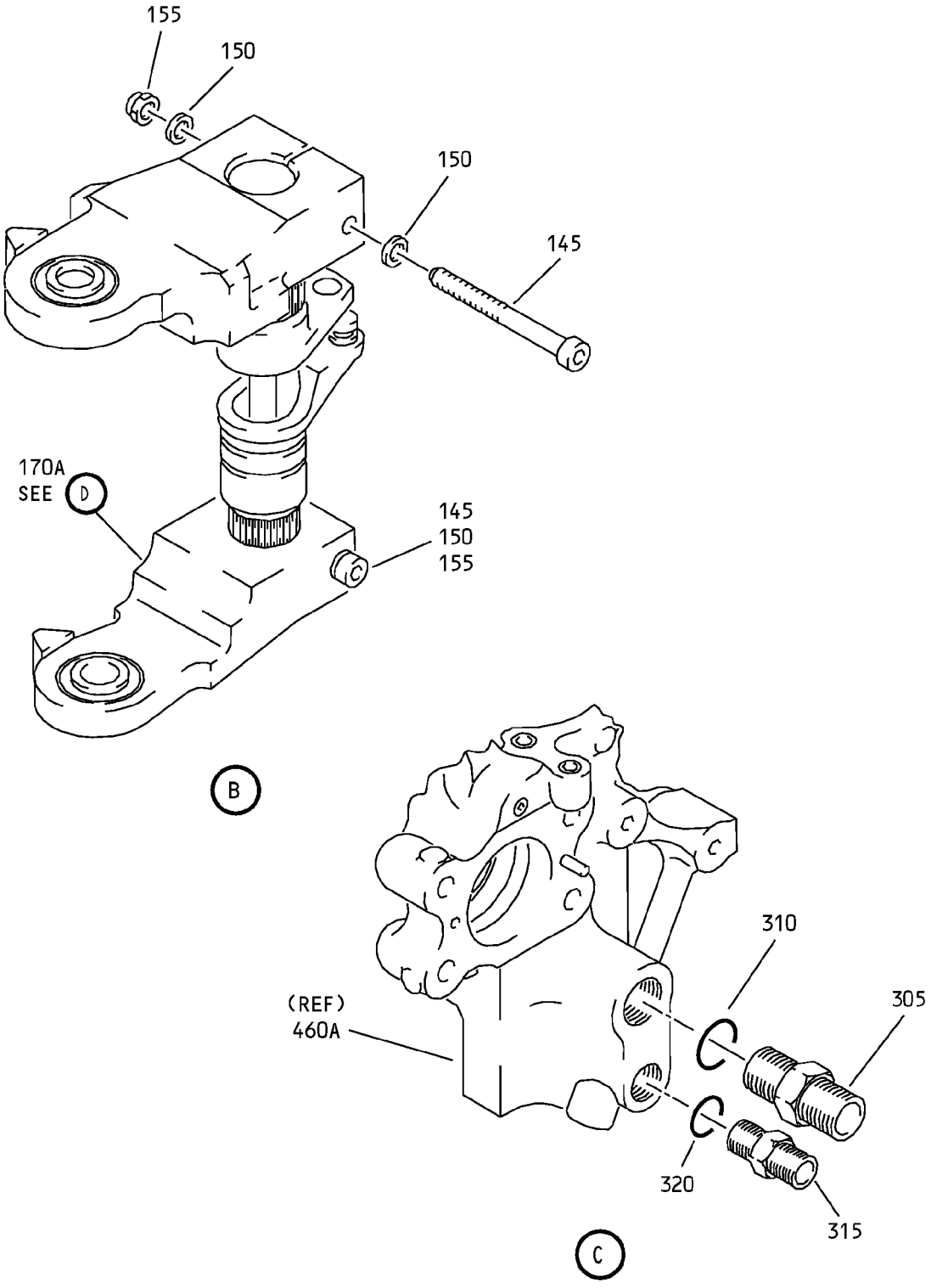
PART NUMBER	AIRLINE PART NUMBER	FIGURE	ITEM	UNITS PER ASSEMBLY
STF800-113		1	435	8
STF800-116		1	410	2
		1	425	2
STF800-211		1	280	8
STF800-218		1	120	4
STF800-223		1	395B	2
TF450-113A		1	435	8
TF450-116A		1	410	2
		1	425	2
TF450-211A		1	280	8
TF450-218A		1	120	4
TF450-223A		1	395B	2
W1235-014		1	270	1



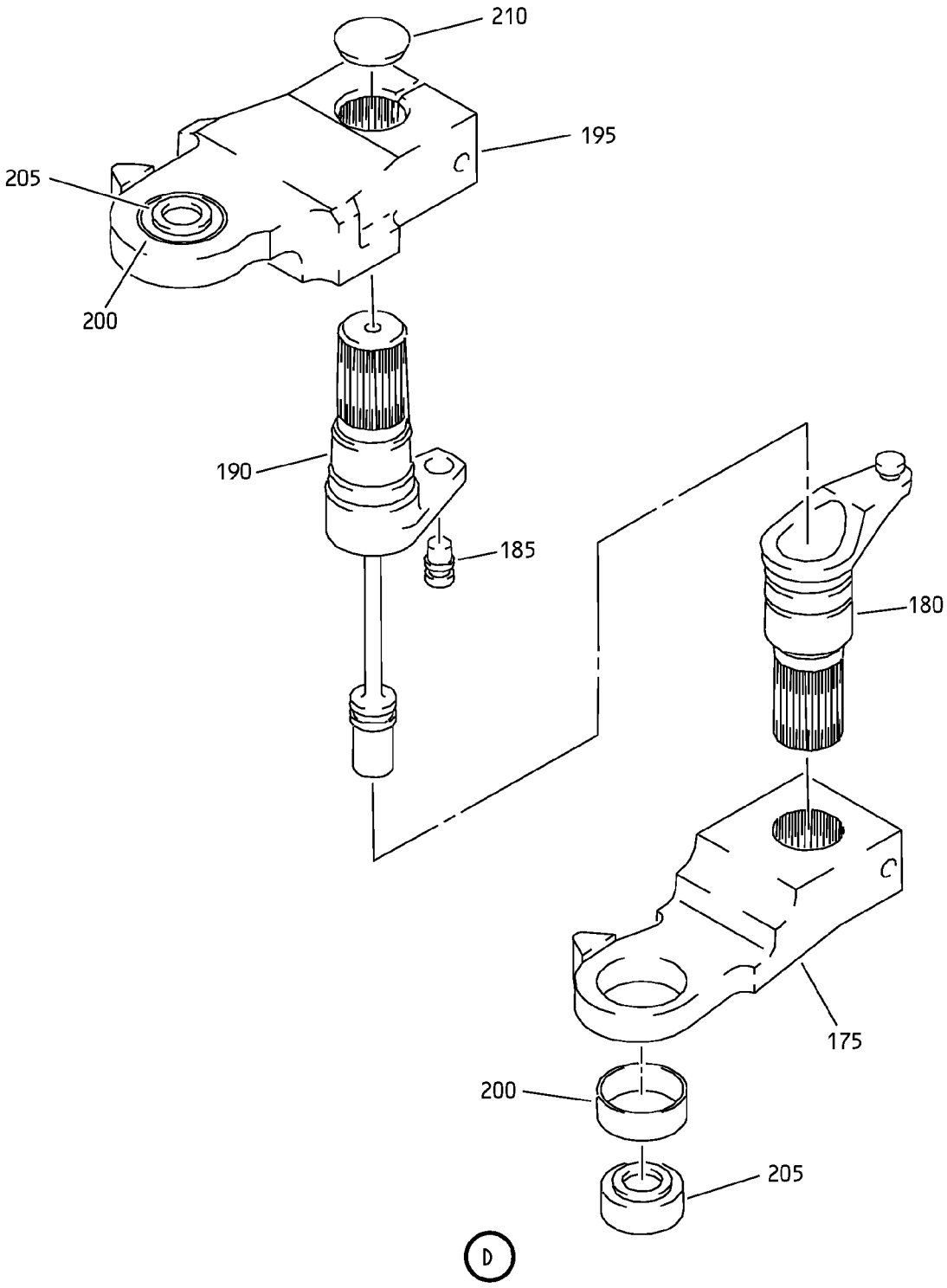
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 1 of 12)



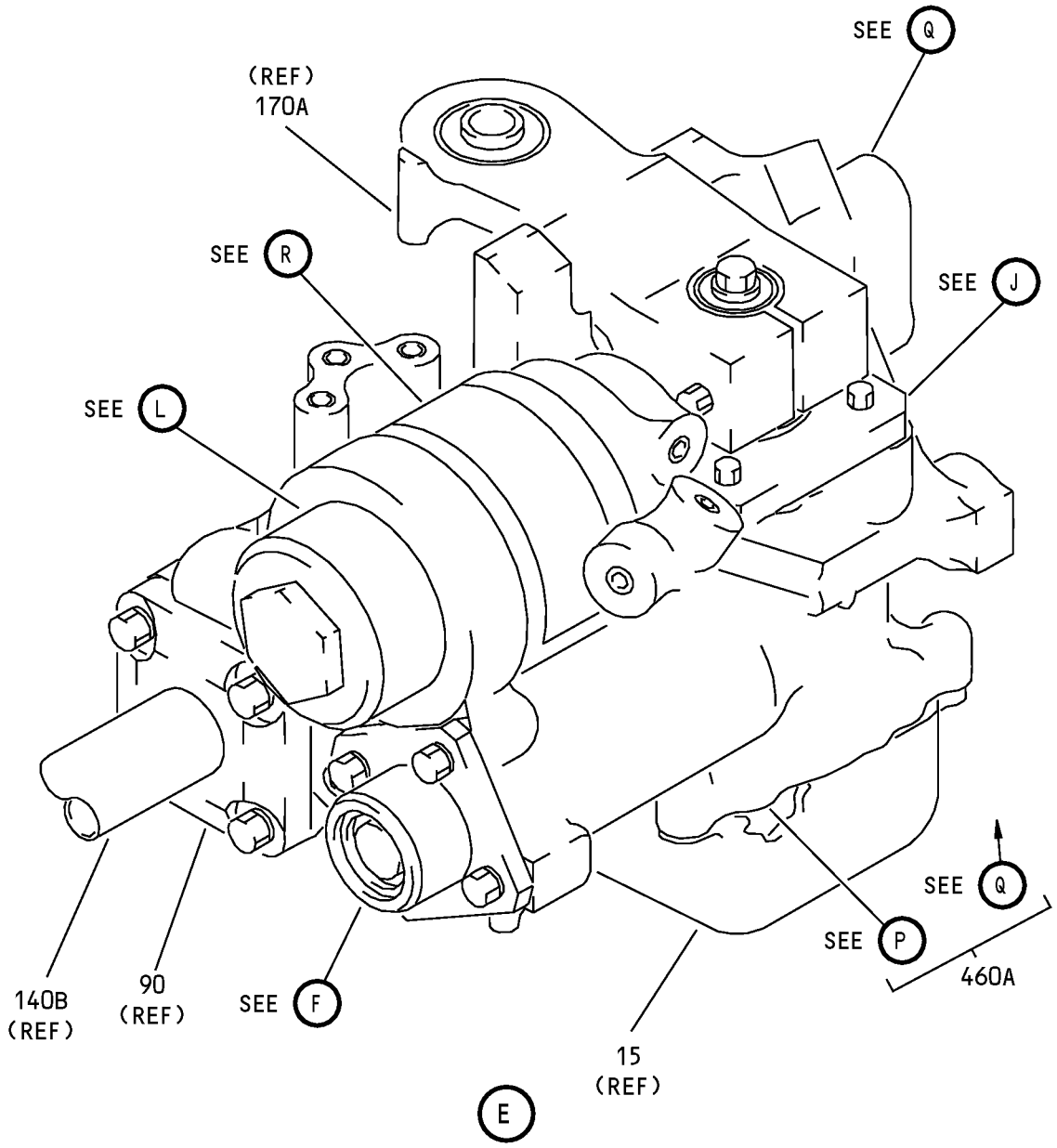
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 2 of 12)



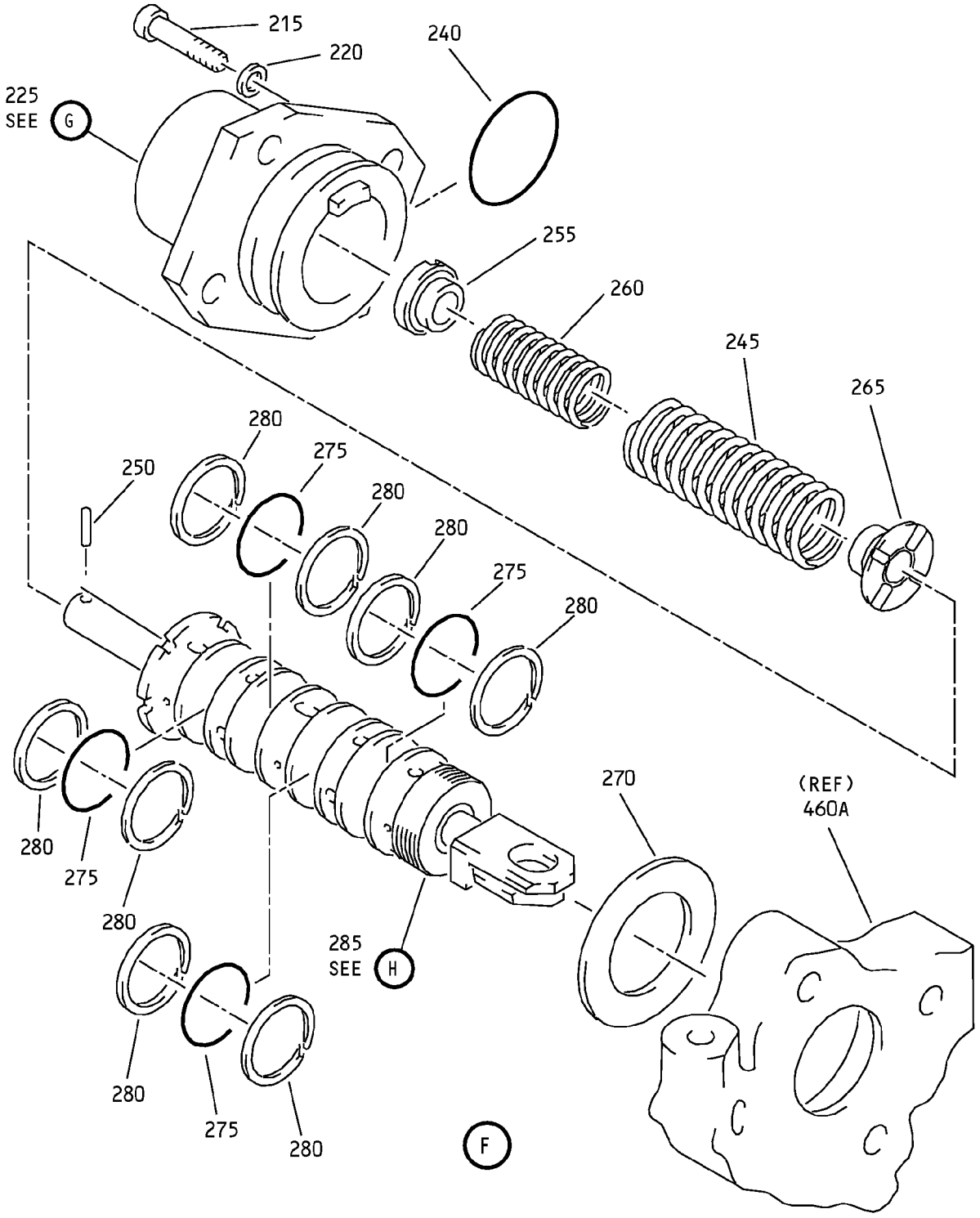
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 3 of 12)



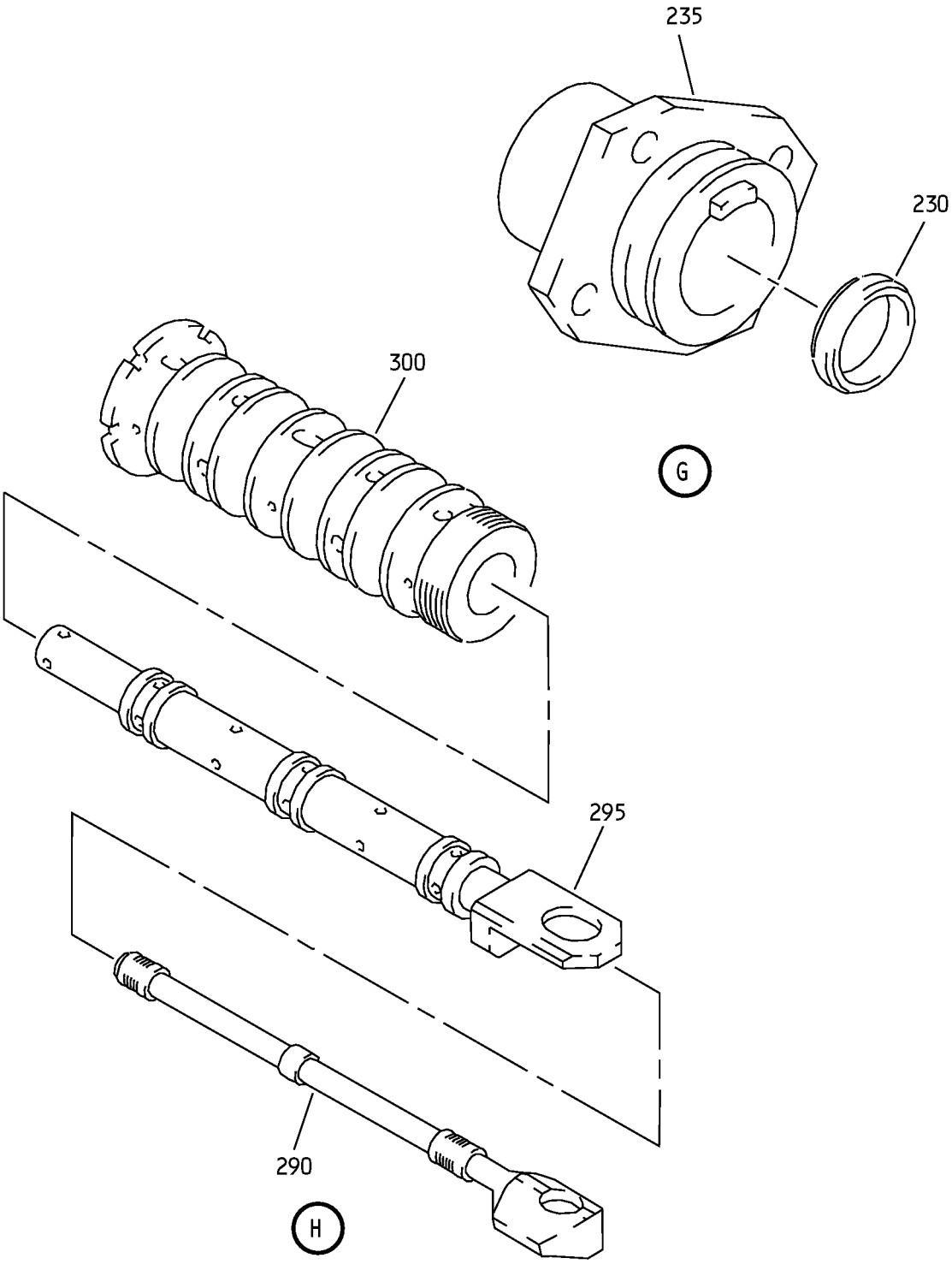
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 4 of 12)



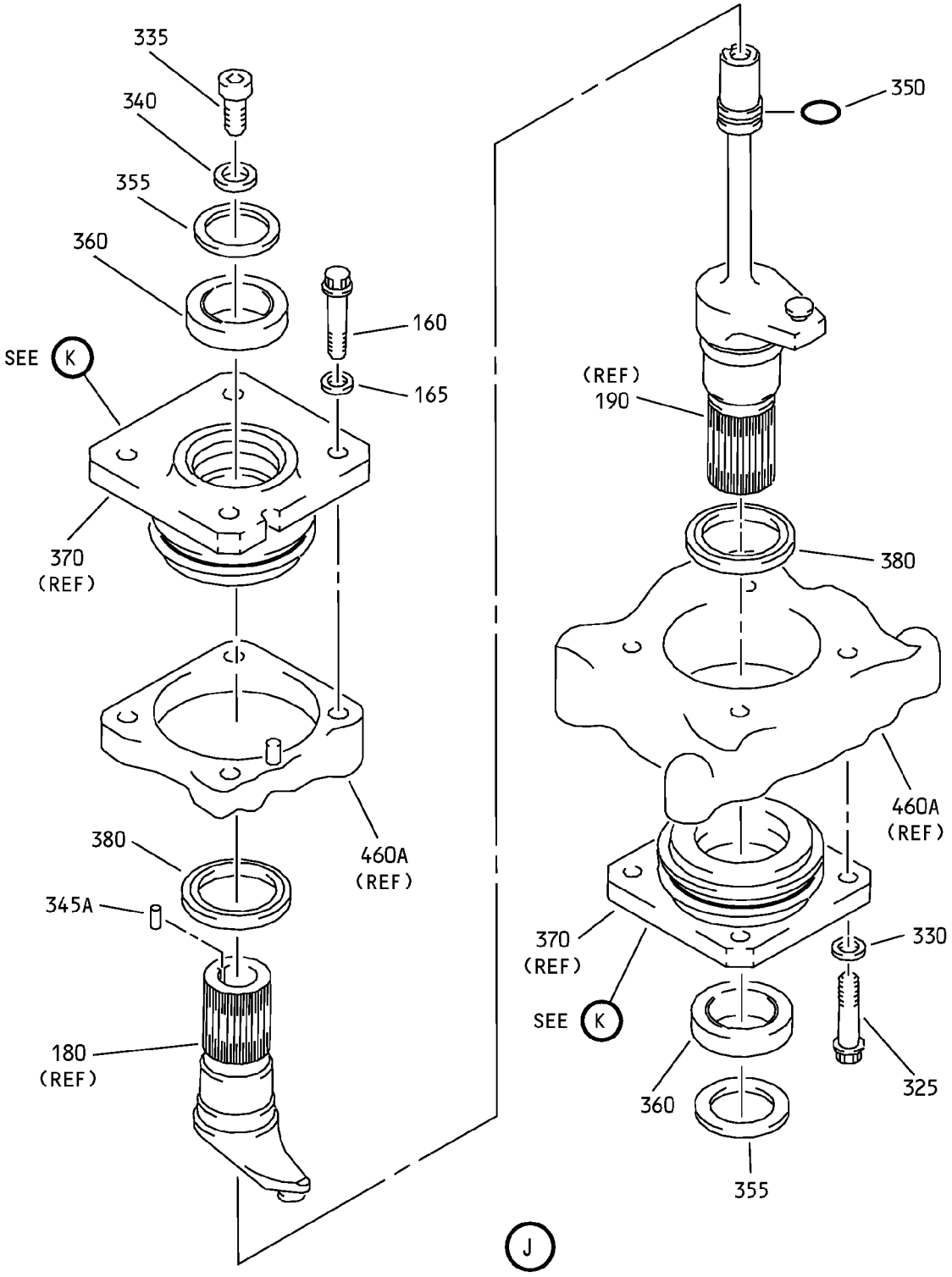
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 5 of 12)



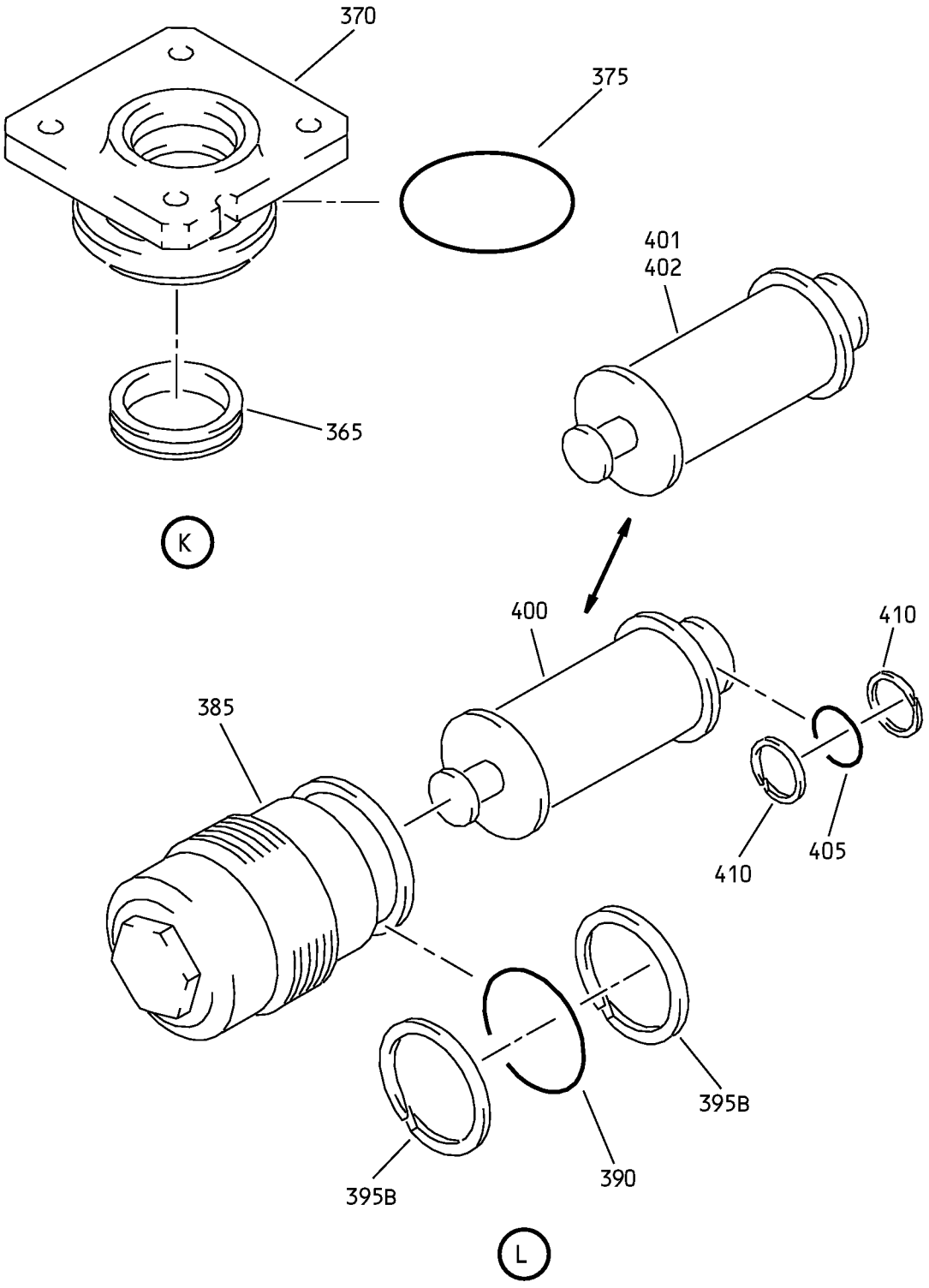
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 6 of 12)



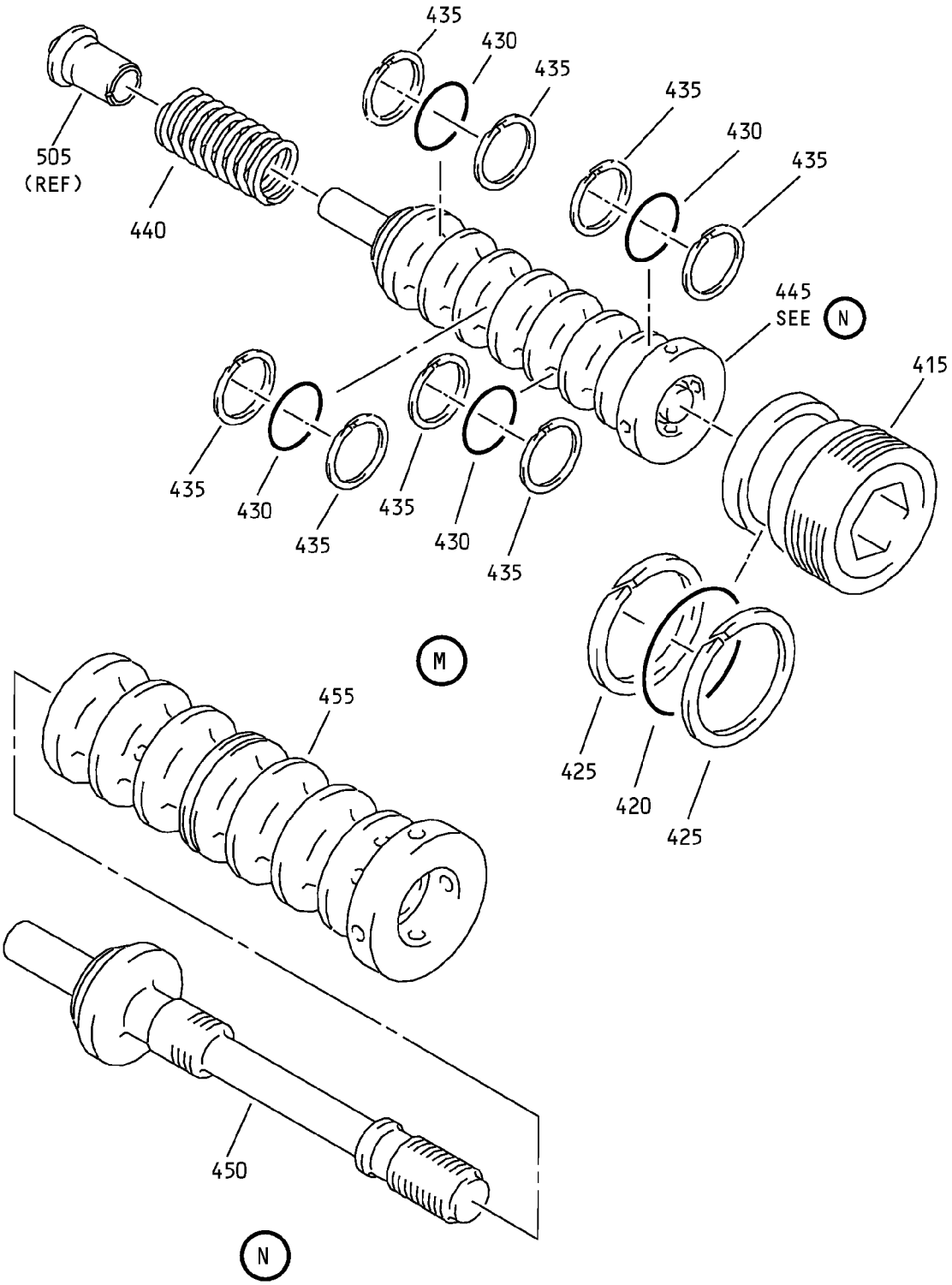
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 7 of 12)



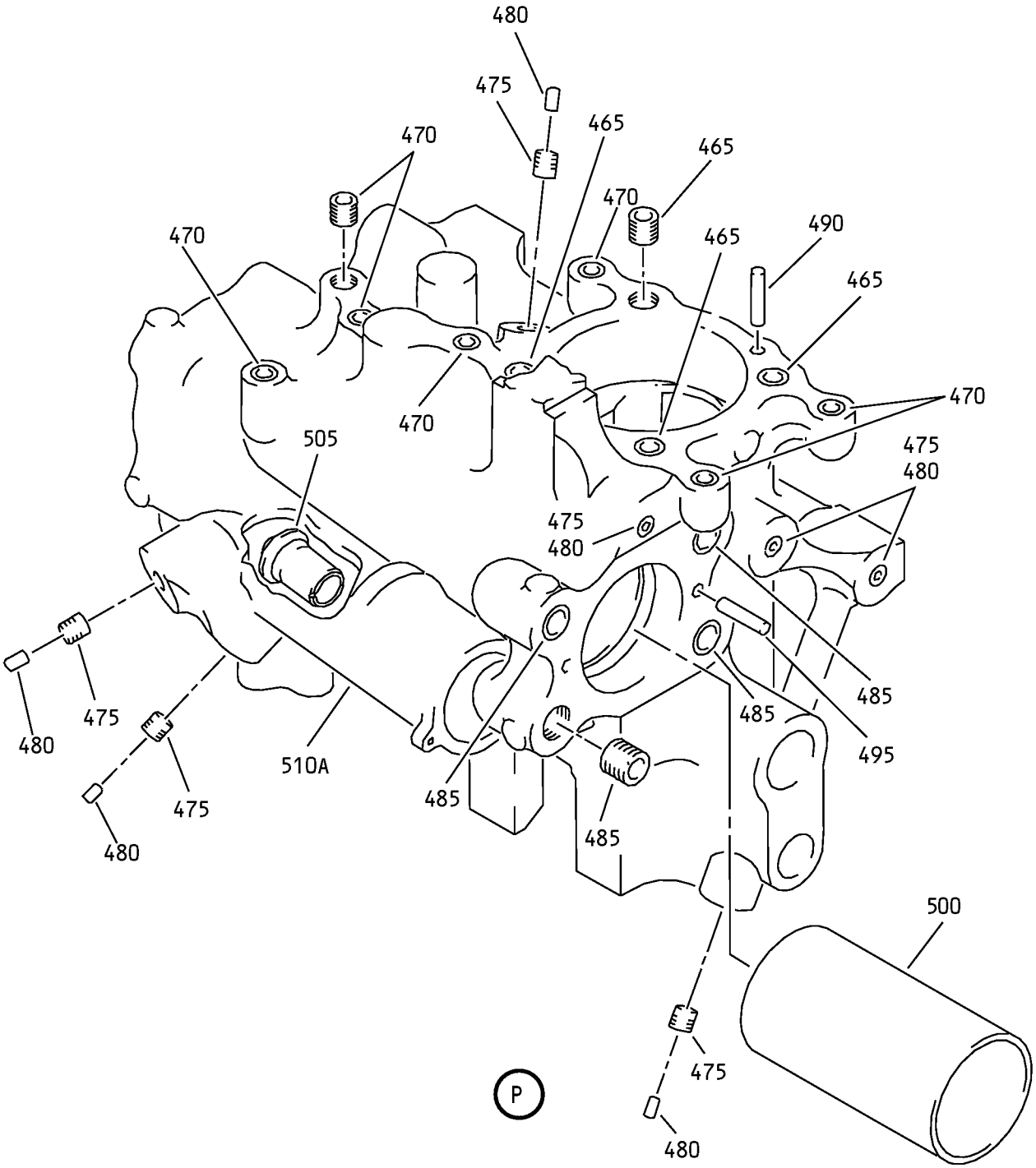
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 8 of 12)



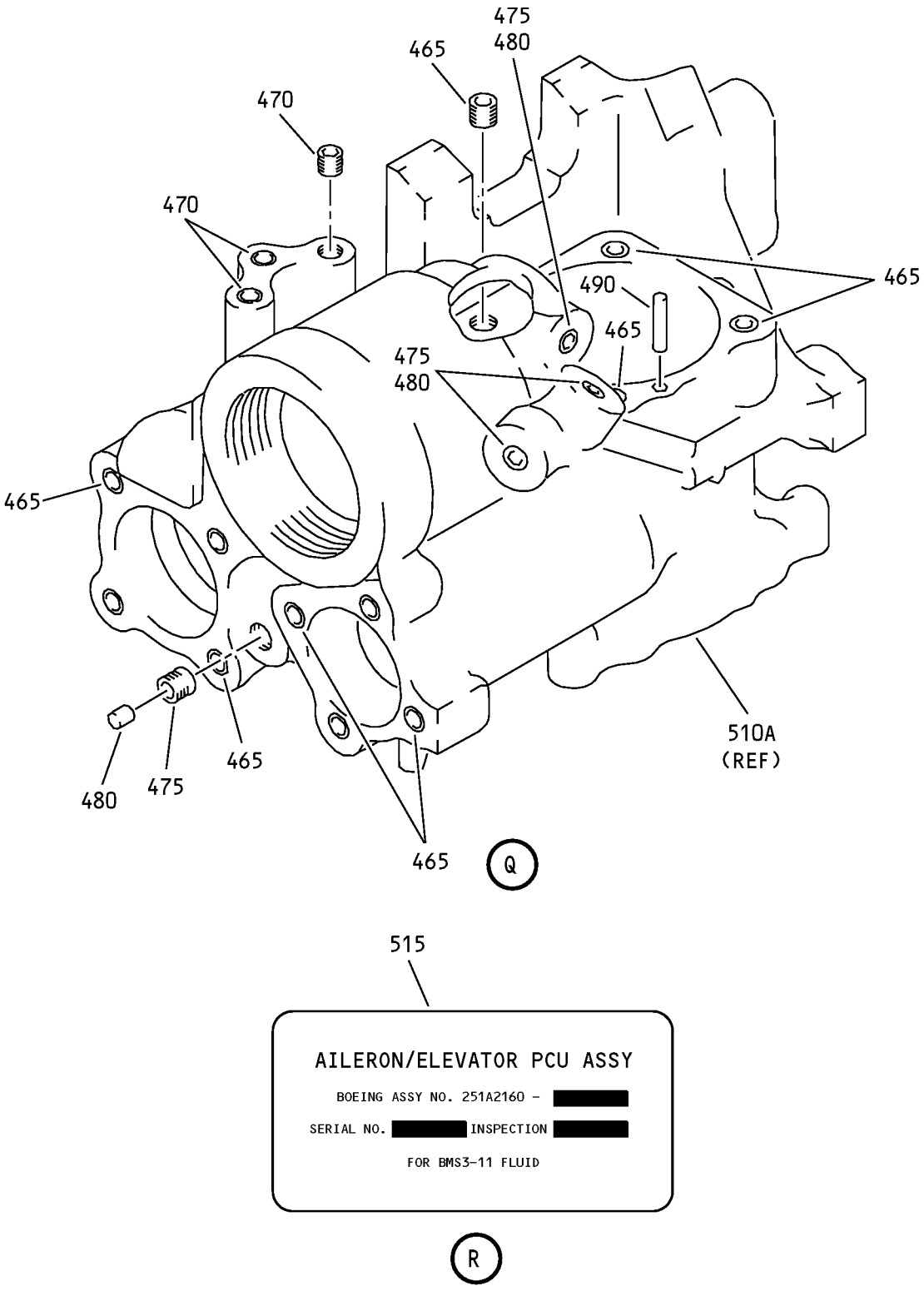
Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 9 of 12)



Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 10 of 12)



Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 11 of 12)



Aileron/Elevator Power Control Unit Assembly
IPL Figure 1 (Sheet 12 of 12)

FIG/ ITEM	PART NUMBER	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1–					
–1A	251A2160-1		DELETED		
–1B	251A2160-2		PCU ASSY-ELEVATOR/AILERON		RF
5	NAS1351N3H10P		. SCREW		4
10	NAS620C10L		. WASHER		4
15	251A2181-1		. COVER		1
20	2LPYEU8-19		. BOLT (V17446) (SPEC BACB30DX8A19U) (OPT 2LPYEU8-19 (V11815))		1
25	NAS1149E0463P		. WASHER		1
30	NAS1080R08		. COLLAR		1
35	65-44834-1		. END ASSY-ROD		1
40	MS14101-10		. . BEARING (OPT ITEM 40A)		1
–40A	MS21232-10		. . BEARING (OPT ITEM 40)		1
45	65-44834-2		. . ROD END		1
50	BACB30LE5HK14		. BOLT		4
55	BACW10BP5CD		. WASHER		4
60	251A2152-1		. FITTING ASSY-END		1
65	MS16562-25		. . PIN		1
70	251A2154-1		. . BUSHING		2
75	251A2152-2		. . FITTING		1
80	BACB30LE4HK5		. BOLT		4
85	BACW10BP4CD		. WASHER		4
90	251A2153-1		. FLANGE END		1
95	S33865-5H5		DELETED		
95A	S33865-5H5		. SCRAPPER-PISTON ROD (V97820) (OPT ITEM 95B)		2
–95B	S33865-5H5N		. SCRAPPER-PISTON ROD (V97820) (OPT ITEM 95A)		2
100	251A2157-1		. RETAINER		2

–Item not Illustrated

FIG/ ITEM	PART NUMBER	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1–					
105	NAS1611-210		. PACKING		2
110	S33121-210H5		. SEAL ASSY-FOOT SEAL (V97820)		2
115	NAS1611-218		. PACKING		2
120	C11236-218B		. RING (V26879) (SPEC BACR12BM218) (OPT RMR12BM218 (V94878)) (OPT STF800-218 (V02107)) (OPT S30294-218-1 (V97820)) (OPT TF450-218A (V07128)) (OPT 2100-218 (V26303)) (OPT ITEM 120A)		4
–120A	S12766-218		. RING (OPT ITEM 120)		4
125	69-35687-1		. BEARING		2
130	712B5MRL952N		. RING-GTL (V72902)		2
135	S32152-215-5PHK		DELETED		
–135A	S33709-215H5		DELETED		
–135B	S34582-215H5		DELETED		
–135C	S30852-215H5N		DELETED		
–135D	S33157-215-5		DELETED		
135E	S32152-215-5PHK		. SEAL (V97820)		1
140	251A2151-2		DELETED		
–140A	251A2151-1		DELETED		
140B	251A2151-2		. PISTON		1
145	NAS1351N4H32P		. SCREW		2
150	NAS1149E0432P		. WASHER		4
155	BACN10JC4CD		. NUT		2
160	BACB30LE4HK4		. BOLT		4
165	BACW10BP4CD		. WASHER		4
170	251A2161-2		DELETED		
170A	251A2161-3		. CRANK ASSY (OPT ITEM 170B)		1

–Item not Illustrated

FIG/ ITEM	PART NUMBER	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1–					
–170B	251A2161-4		. CRANK ASSY (OPT ITEM 170A)		1
175	251A2165-2		. . ARM-INPUT (OPT ITEM 175A)		1
–175A	251A2165-1		. . ARM-INPUT (OPT ITEM 175)		1
180	251A2167-1		. . CRANK (USED ON ITEMS 170A)		1
–180A	251A2167-2		. . CRANK (USED ON ITEM 170C)		1
185	251A2169-1		. . BALL		1
190	251A2168-2		. . CRANK (USED ON ITEMS 170,170A)		1
–190A	251A2168-3		. . CRANK (USED ON ITEM 170B)		1
195	251A2166-2		. . ARM-INPUT (OPT ITEM 195A)		1
–195A	251A2166-1		. . ARM-INPUT (OPT ITEM 195)		1
200	251A2180-1		. . RETAINER (OPT ITEM 200A)		2
–200A	381588-1		. . RETAINER (OPT ITEM 200)		2
205	ACMKSP5A3908		. . BEARING (V21335) (SPEC BACB10FP5) (OPT SSMKSP5SD705 (V83086))		2
210	MS9380-8		. . PLUG		1
215	NAS1351N4H10P		. SCREW		4
220	NAS1149E0432P		. WASHER		4
225	251A2171-1		. CAP ASSY		1
230	251A2179-1		. . SEAT		1
235	251A2171-2		. . CAP		1
240	NAS1611-216		. PACKING		1
245	69-35774-1		. SPRING		1
250	MS51838-26		. PIN		1

–Item not Illustrated

FIG/ ITEM	PART NUMBER	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1–					
255	251A2175-1		. GUIDE-SPRING		1
260	69-35775-1		. SPRING		1
265	251A2176-1		. GUIDE-SPRING		1
270	W1235-014		. WASHER-WAVE (V92003)		1
275	NAS1611-211		. PACKING		4
280	C11236-211B		. RING (V26879) (SPEC BACR12BM211) (OPT RMR12BM211 (V94878)) (OPT STF800-211 (V02107)) (OPT S30294-211-1 (V97820)) (OPT TF450-211A (V07128)) (OPT 2100-211 (V26303))		8
285	251A2170-1		. SERVO ASSY		1
290	251A2174-1		. . SLIDE		1
295	251A2173-1		. . SLIDE		1
300	251A2172-1		. . SLEEVE		1
305	MS21902D6		. UNION		1
310	NAS1612-6		. PACKING		1
315	MS21902-4T		. UNION		1
320	NAS1612-4		. PACKING		1
325	BACB30LE4HK4		. BOLT		4
330	BACW10BP4CD		. WASHER		4
335	NAS1351N3H6P		. SCREW		1
340	BACW10BN3SP		. WASHER		1
345	NAS607-2-4		. PIN		1
350	NAS1611-110		. PACKING		1
355	66-22798-1		. SHIM		2
360	ACMB540DDA3908		. BEARING (V21335) (SPEC BACB10FU14R) (OPT ACMB540DDP28LY1 (V40920)) (OPT ITEM 360A)		2

–Item not Illustrated

FIG/ ITEM	PART NUMBER	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1–					
–360A	ACMB540DDLY196		. BEARING (V40920) (OPT ITEM 360)		2
365	S34712-214H5		. SEAL-PLUS (V97820)		2
370	251A2178-1		. CAP-BEARING		2
375	NAS1611-328		. PACKING		2
380	MB541DDSD610		. BEARING (V83086) (SPEC BACB10AS17) (OPT LLMB541 (V38443)) (OPT MB541-2TS (V43991)) (OPT MB541DDFS428 (V21335)) (OPT MB541TT (V43991)) (OPT MB541DDG20 (V38443)) (OPT MT341E (VK8455)) (OPT MB541DDLY196 (V40920)) (OPT MB541DD (V06144)) (OPT ITEM 380A)		2
–380A	AMB541DDLY196		. BEARING (V40920) (OPT ITEM 380)		2
385	69-35689-1		. RETAINER		1
390	NAS1611-223		. PACKING		1
395	BACR12BM233		DELETED		
–395A	S12766-223		. RING (V97820) (OPT ITEM 395B)		2
395B	C11236-223B		. RING (V26879) (SPEC BACR12BM223) (OPT RMR12BM223 (V94878)) (OPT STF800-223 (V02107)) (OPT S30294-223-1 (V97820)) (OPT TF450-223A (V07128)) (OPT 2100-223 (V26303)) (OPT ITEM 395A)		2

–Item not Illustrated

FIG/ ITEM	PART NUMBER	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1–					
400	AC4638E31		. FILTER (V18350) (SPEC 10-60808-4) (OPT ITEM 400A, 400B) (OPT 21-11176 (V05228)) (OPT 4245-502 (V21550)) (OPT 7500272 (V05228))		1
–400A	AC4638E3		. FILTER (V18350) (SPEC 10-60808-2) (OPT ITEM 400, 400B) (OPT 21-10033 (V05228)) (OPT 21-11176 (V05228)) (OPT 4245-502 (V21550)) (OPT 7500272 (V05228))		1
–400B	11-10107		. FILTER (V14818) (SPEC 60B80034-2) (OPT ITEM 400, 400A) (OPT 4228-633 (V21550)) (OPT 7553575 (V05228)) (OPT AC8818E2 (V18350))		1
405	NAS1611-116		. PACKING		1
410	C11236-116B		. RING (V26879) (SPEC BACR12BM116) (OPT RMR12BM116 (V94878)) (OPT STF800-116 (V02107)) (OPT S30294-116-1 (V97820)) (OPT TF450-116A (V07128)) (OPT 2100-116 (V26303)) (OPT ITEM 410A)		2
–410A	S12766-116		. RING (V97820) (OPT ITEM 410)		2
415	60754-3		. CAP (V92003)		1
420	NAS1611-116		. PACKING		1

–Item not Illustrated

FIG/ ITEM	PART NUMBER	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1–					
425	C11236-116B		. RING (V26879) (SPEC BACR12BM116) (OPT RMR12BM116 (V94878)) (OPT STF800-116 (V02107)) (OPT S30294-116-1 (V97820)) (OPT TF450-116A (V07128)) (OPT 2100-116 (V26303)) (OPT ITEM 425A)		2
–425A	S12766-116		. RING (V97820) (OPT ITEM 425)		1
430	NAS1611-113		. PACKING		4
435	C11236-113B		. RING (V26879) (SPEC BACR12BM113) (OPT RMR12BM113 (V94878)) (OPT STF800-113 (V02107)) (OPT S30294-113-1 (V97820)) (OPT TF450-113A (V07128)) (OPT 2100-113 (V26303))		8
440	68062		. SPRING (V92003)		1
445	251A2163-1		. VALVE ASSY		1
450	251A2177-1		. . SLIDE		1
455	68063		. . SLEEVE (V59211)		1
460	251A2162-1		DELETED		
460A	251A2162-5		. MANIFOLD ASSY		1
465	MS21209F4-15P		. . INSERT		16
470	MS21209F1-15P		. . INSERT		10
475	PLGA1877010		. . PLUG (V92555) (SPEC BACP20AX15D)		11
480	PLGA1876010		. . PIN (V92555) (SPEC BACP20AX15DP)		11
485	MS21209F5-15P		. . INSERT		4
490	MS16556-634		. . PIN		2

–Item not Illustrated

FIG/ ITEM	PART NUMBER	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1–					
495	MS16562-213		. . PIN-ROLL		1
500	251A2156-1		. . SLEEVE-STEEL		1
505	251A2182-1		. . STOP		1
510	251A2162-2		DELETED		
510A	251A2162-4		. . MANIFOLD		1
515	BAC27DCT623		. NAMEPLATE (OPT ITEM 515A)		1
–515A	381701		. NAMEPLATE (V59211) (OPT ITEM 515)		1

–Item not Illustrated