

 **BOEING**
COMPONENT
MAINTENANCE MANUAL

TO: ALL HOLDERS OF ELEVATOR ACTUATOR INPUT ROD ASSEMBLY COMPONENT MAINTENANCE
MANUAL 27-31-64

REVISION NO. 7 DATED MAR 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.

CONTENTS

1

101-102

703

702

DESCRIPTION OF CHANGE

Added TESTING & TROUBLE SHOOTING section per coord
sheet BE333-C03-031.

Added a warning note and updated the stroke range in
the assembly check procedure.

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HIGHLIGHTS

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ELEVATOR ACTUATOR INPUT ROD ASSEMBLY

PART NUMBER 252T2110-1,-3,-4

COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST

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TITLE PAGE

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REVISION RECORD

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

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



TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL
27-0052 27-0129		PRR B10435 PRR C12257	APR 10/82 OCT 10/85 JUL 01/88 MAR 01/01

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TR & SB RECORD

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 COMPONENT
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			501	JUL 10/83	01
			502	BLANK	
TITLE PAGE			REPAIR-GENERAL		
1	SEP 01/95	01.1	601	JUL 10/83	01
2	BLANK		602	BLANK	
REVISION RECORD			REPAIR 1-1		
1	OCT 10/85	01.101	601	JUL 10/83	01.1
2	BLANK		602	BLANK	
TR & SB RECORD			REPAIR 2-1		
1	MAR 01/01	01.1	601	SEP 01/95	01.1
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LIST OF EFFECTIVE PAGES			REPAIR 3-1		
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1	JUL 01/88	01.1	704	BLANK	
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DESCRIPTION & OPERATION			1001	JUL 10/83	01
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*102	MAR 01/05	01.1	1006	MAR 01/01	01.1
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* = REVISED, ADDED OR DELETED

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INTRODUCTION

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

This manual is divided into separate sections:

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

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

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

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

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

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

Verification:

Disassembly	Aug 16/82
Assembly	Aug 16/82

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INTRODUCTION

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ELEVATOR ACTUATOR INPUT ROD ASSEMBLY

DESCRIPTION AND OPERATION

1. The elevator actuator input rod assembly consists of a rod end assembly and a spring-loaded inner rod assembly inside a tube assembly. The rod assembly transmits the elevator control input to the elevator actuator.
2. Leading Particulars (Approximate)

Length -- 11 inches
Diameter -- 2 inches
Weight -- 1 pound

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DESCRIPTION & OPERATION

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TESTING AND TROUBLE SHOOTING1. General

- A. This procedure has the necessary data to do a test of the Elevator Actuator input rod assembly.
- B. Refer to the Standard Overhaul Practices Manual (SOPM) for details of the SOPM subjects identified in the procedure.
- C. Refer to IPL Fig. 1 for item numbers.

2. Testing and Fault Isolation

A. References

- (1) 27-31-64/301, Disassembly
- (2) 27-31-64/701, Assembly

B. Procedure for units in service

WARNING: DO NOT APPLY MORE THAN 100 LBS WHEN COMPRESSING AND EXTENDING THE ROD ASSY OR DAMAGE TO THE ROD ASSY MAY OCCUR.

- (1) Check that the initial breakout occurs at 52 ± 10 lbs from the unloaded length in both compression and tension. Breakout is defined as initial movement between the 252T2150 rod and the 252T2113 rod assy.
- (2) With the rod assy fully compressed and extended (bottomed out) the rod assy deflection shall be 1.25 ± 10 inches and the load shall be 82 ± 15 lbs. All operation shall be smooth and free from binding.
- (3) If the input control rod fails to meet either requirement above, it must be replaced or overhauled.

C. Procedure for units that have been overhauled or repaired.

WARNING: DO NOT APPLY MORE THAN 100 LBS WHEN COMPRESSING AND EXTENDING THE ROD ASSY OR DAMAGE TO THE ROD ASSY MAY OCCUR.

- (1) Check that initial breakout force is 46-58 lbs.
- (2) Check that force at full extension or compression is 73.8-90.2 lbs.
- (3) After check per step (1) and (2), check that no relative motion exists between tube assembly (20) and inner rod assembly (90) when 2 lbs. reversing load is applied.

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- (4) Check that the extension and compression strokes are both 1.20-1.30 inches.
- (5) All operations must be smooth and free of binding.

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TESTING & TROUBLE SHOOTING
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DISASSEMBLY

NOTE: Disassemble this component only as necessary to complete fault isolation, determine the serviceability of parts, perform required repairs, and restore the unit to serviceable condition.

1. Parts Replacement

NOTE: The following parts are recommended for replacement. Unless otherwise specified, actual replacement of parts may be based on in-service experience.

A. Rivets (25A, 25B, IPL Fig. 1)

2. Disassembly (IPL Fig. 1)

WARNING: USE EXTREME CARE WHEN REMOVING ROD END ASSEMBLY (40). INNER ROD ASSEMBLY (60) IS PRELOADED AND CAN PROPEL ROD END ASSEMBLY AT CONSIDERABLE FORCE AND SPEED.

A. Remove rivets (25A, 25B) and slowly ease rod end assembly (40) out of tube assembly (20).

NOTE: Do not disassemble rod end assembly (40) unless necessary for repair or replacement.

B. Slide inner rod assembly (60) out of tube assembly (20). Restrain inner rod assembly and loosen nut (5). Unscrew bearing (15) out of inner rod assembly and remove locking device (10) and nut from bearing.

NOTE: Do not disassemble tube assembly (20) unless necessary for repair or replacement.

WARNING: USE EXTREME CARE WHEN DISASSEMBLING INNER ROD ASSEMBLY (60). SPRING (85) IS COMPRESSED WITH CONSIDERABLE FORCE.

C. Restrain rod (90) and compress spring (85) with 80-85 lb force from slides (75A) end until slides (75A) can be removed from rod (90). Slowly ease tube (70) back to relieve spring compression and slide tube (70) off rod (90).

D. Remove spring (85), tube (65) and slides (80A) from rod (90).

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DISASSEMBLY

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CLEANING

1. Clean all parts except bearings (15, 50, IPL Fig. 1) using standard industry practices and information contained in 20-20-03.
2. Clean teflon-sealed bearings (15, 50) according to the manufacturer's instructions.

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CHECK

1. Check all parts for obvious defects in accordance with standard industry practices.
2. Magnetic particle check per 20-20-01 -- Spring (85, IPL Fig. 1).
3. Penetrant check per 20-20-02 -- Stop (30), tubes (35, 65, 70) and rods (55, 90).
4. Check spring (85).
 - A. Compress spring to 4.39-4.45 inches. Check that load is 46.8-57.2 lbs.
 - B. Compress spring to 3.14-3.20 inches. Check that load is 73.8-90.2 lbs.

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CHECK
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REPAIR – GENERAL1. Content

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

<u>P/N</u>	<u>NAME</u>	<u>REPAIR</u>
252T2112	ROD END	1-1
252T2113	TUBE	2-1
---	MISC. PARTS REFINISH	3-1

2. Standard Practices

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

20-30-02	Stripping of Protective Finishes
20-30-03	General Cleaning Procedures
20-41-01	Decoding Table for Boeing Finish Codes
20-43-01	Chromic Acid Anodizing

3. Materials

NOTE: Equivalent substitutes may be used.

- A. Sealant -- BMS 5-95 (Ref 20-60-04)
- B. Primer -- BMS 10-11, type 1 (Ref 20-60-03)

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REPAIR-GENERAL

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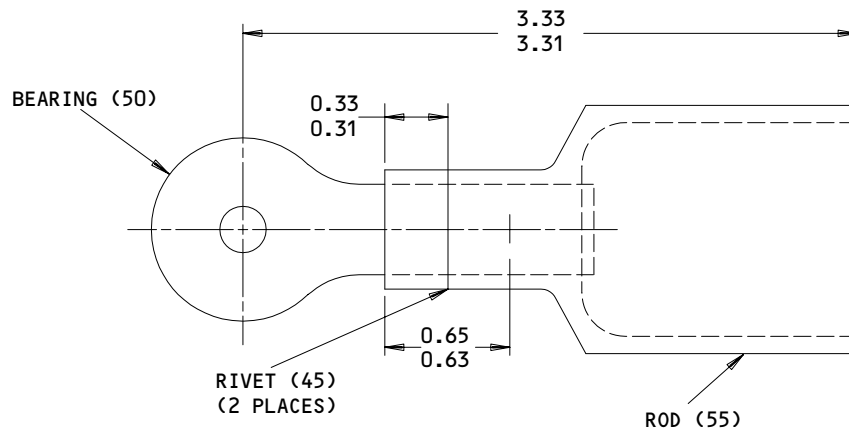
ROD END ASSEMBLY - REPAIR 1-1

252T2112-1

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

1. Parts Replacement (Fig. 601)

- A. Drill out rivets (45, IPL Fig. 1) and separate bearing (50) and rod end (55).
- B. Position bearing (50) on rod end (55) at dimension shown and drill 0.159-0.171 inch diameter rivet holes thru rod end and bearing. Remove parts, deburr and clean.
- C. Apply sealant to faying surfaces of rod end (55) and bearing (50) and install bearing on rod end and secure with rivets (45). Install rivets with sealant.



ALL DIMENSIONS ARE IN INCHES
 ITEM NUMBERS REFER TO IPL FIG. 1

Parts Replacement
 Figure 601

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REPAIR 1-1

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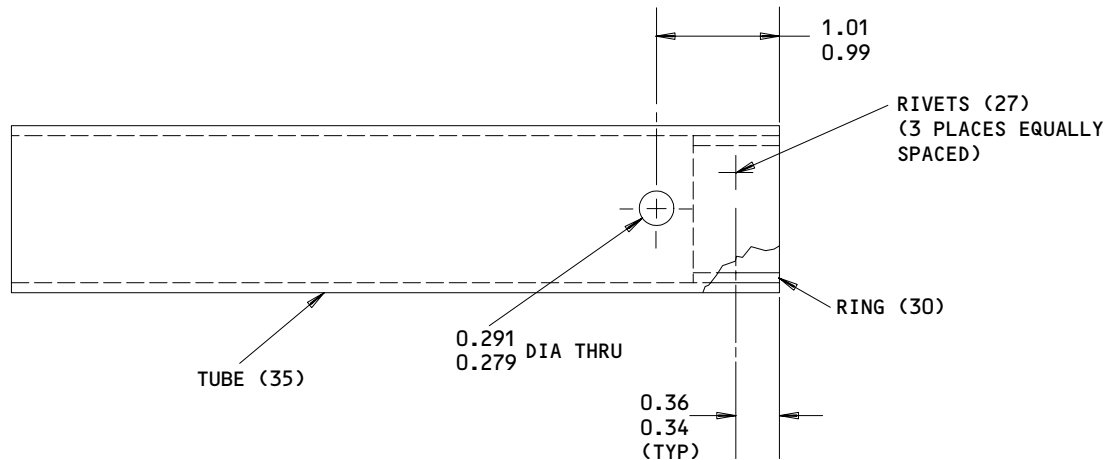
TUBE ASSEMBLY – REPAIR 2-1

252T2113-1

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

1. Parts Replacement (Fig. 601)

- A. Drill out rivets (27A) and remove stop ring (30) from tube (35).
- B. Position parts as shown and drill 0.159–0.171 inch diameter rivet holes thru tube (35) and stopring (30) at dimension shown. Remove parts and deburr holes.
- C. Install stop ring (30) in tube (35) and secure with rivets (27A). Install rivets with sealant.



ALL DIMENSIONS ARE IN INCHES
 ITEM NUMBERS REFER TO IPL FIG. 1

Parts Replacement
 Figure 601

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MISCELLANEOUS PARTS REFINISH – REPAIR 3-1

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

IPL FIG. & ITEM	MATERIAL	FINISH
<u>Fig. 1</u>		
Tube (20A)	A1 alloy	Chemical treat per MIL-C-5541 (colored film) on interior and exterior surfaces. Apply one coat BMS 10-11, type 1 (F-18.07).
Stop ring (30), tubes (65,70), rod (55)	A1 alloy	Chromic acid anodize and apply 1 coat of primer, BMS 10-11, type 1 (F-18.13) all over.
Tube (35)	A1 alloy	Chromic acid anodize (F-17.02) and apply BMS 10-11, type 1 primer (F-19.50) to interior surface. Apply BMS 10-11, type 1 primer (F-20.02) to exterior surface.
Spring (85)	17-7 PH CRES	Passivate (F-17.09)
Rod (90)	Al alloy	Chromic acid anodize and apply 1 coat of primer, BMS 10-11, type 1 (F-18.13) all over except omit primer on threads.

Refinish Details
Figure 601

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ASSEMBLY1. Materials

NOTE: Equivalent substitutes may be used.

A. Grease -- BMS 3-24 (Ref 20-60-03).

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

2. Assembly (IPL, Fig. 1, Fig. 701)

A. Assemble inner rod assembly (60)

(1) Lubricate tubes (65, 70), slides (75A, 80A), spring (85) and rod (90) with grease.

(2) Install slides (80A), tube (65), spring (85) on inner rod (90).

WARNING: USE CARE TO ASSEMBLE SLIDES (75A). SPRING (85) WILL BE COMPRESSED WITH 80-85 POUND FORCE.

(3) Install tube (70) on the free end of spring (85). Secure rod (90) at slides (80A) end and compress spring with 80-85 pound force applied to tube (70) until slides (75A) can be installed. Slowly release spring to allow tube (70) to seat on slides (75A).

B. Coat ID of tube assembly (20) with grease and slide inner rod assembly (60) inside tube assembly.

C. Install rod end assembly (40) on tube assembly (20). Apply 23.4-28.6 lbs compression axially on end of tube assembly reacted by rod end assembly. Drill 0.313-0.328 inch diameter clearance holes and 0.159-0.171 inch diameter rivet holes at position shown as applicable. One clearance hole must align with bore of bearing (50) within 10 degrees. Remove parts, deburr and clean thoroughly, then reassemble parts as applicable.

D. Squeeze drive rivets (25A) with manufactured heads on tube assembly (20). Install rivets (25A) with sealant. Install rivets (25B) with manufactured heads on tube assembly (20). Install rivets (25B) with sealant under the head of the rivet.

E. Coat threads on rod (90) and bearing (15) with grease and install nut (5) and locking device (10) on bearing (15).

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F. Thread bearing (15) on rod (90) and adjust so that distance between centerlines of bearings (15, 50) is 10.96–11.02 inches for assembly 252T2110-1 and 11.22–11.28 inches for assemblies 252T2110-3, -4. Tighten nut (5) to secure.

G. Assembly check

WARNING: DO NOT APPLY MORE THAN 100 LBS WHEN COMPRESSING AND EXTENDING THE ROD ASSY OR DAMAGE TO THE ROD ASSY MAY OCCUR.

- (1) Check that initial breakout force is 46–58 lbs.
- (2) Check that force at full extension or compression is 73.8–90.2 lbs.
- (3) After check per step (1) and (2), check that no relative motion exist tube assembly (20) and inner rod assembly (90) with 2 lbs. reversing load is applied.
- (4) Check that stroke is 1.20–1.30 inches both extension and compression.
- (5) All operations must be smooth and free of binding.

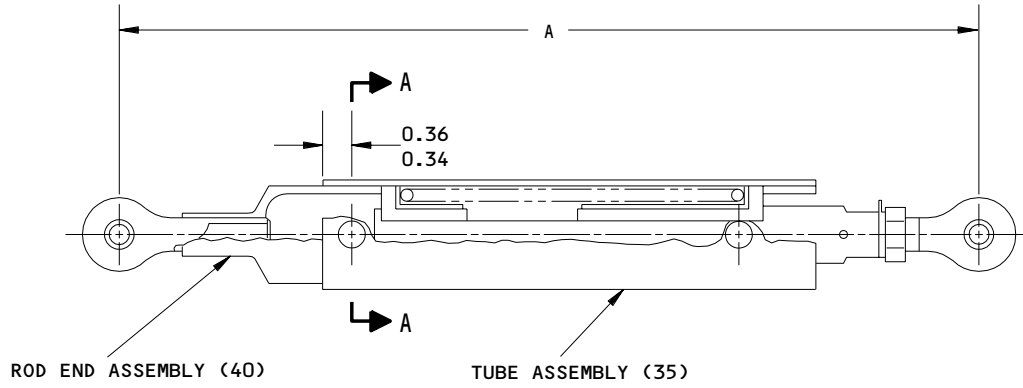
H. Tag part with the following note: CAUTION – THIS IS A PREADJUSTED ROD. DO NOT READJUST ROD LENGTH PRIOR TO SYSTEM RIGGING.

3. Use standard industry practices and information contained in 20-44-02 to store this component.

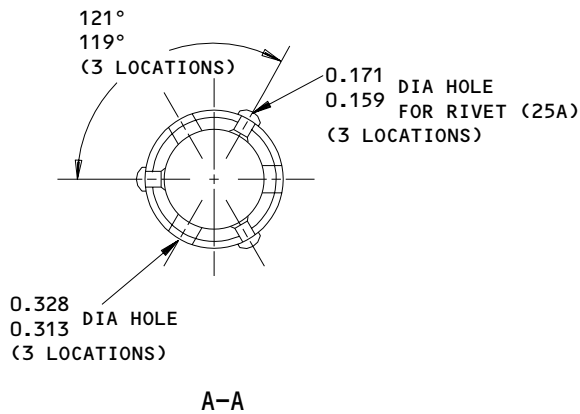
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ASSY	DIM A
-1	11.02 10.96
-3,-4	11.28 11.22



ITEM NUMBERS REFER TO IPL FIG. 1
 ALL DIMENSIONS ARE IN INCHES

Assembly Details
 Figure 701

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ASSEMBLY
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ILLUSTRATED PARTS LIST

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

2. Indentures show parts relationships as follows:

Assembly

Detail Parts for Assembly

Subassembly

Attaching Parts for Subassembly

Detail Parts for Subassembly

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

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

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

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

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

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

6. Parts Interchangeability

Optional
(OPT)

The parts are optional to and interchangeable with other parts having the same item number.

Supersedes, Superseded By
(SUPSDS, SUPSD BY)

The part supersedes and is not interchangeable with the original part.

Replaces, Replaced By
(REPLS, REPLD BY)

The part replaces and is interchangeable with, or is an alternate to, the original part.

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ILLUSTRATED PARTS LIST

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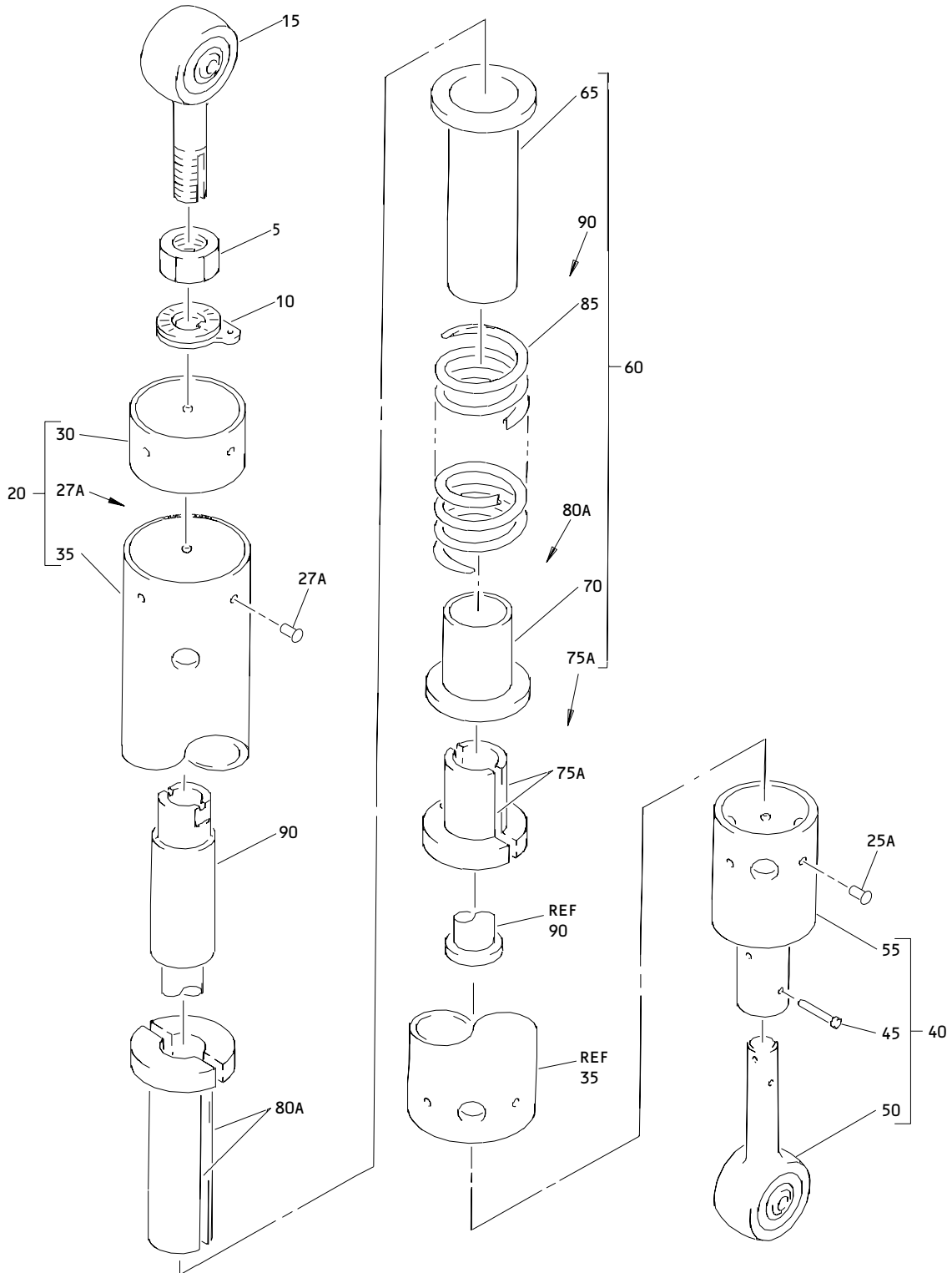
VENDORS

21335 TEXTRON INC FAFNIR BEARING DIVISION
 37 BOOTH STREET
 NEW BRITAIN, CONNECTICUT 06050

38443 TRW INC BEARING DIV
 402 CHANDLER STREET
 JAMESTOWN, NEW YORK 14701

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ILLUSTRATED PARTS LIST
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Elevator Actuator Input Rod Assembly
 Figure 1

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ILLUSTRATED PARTS LIST
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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01- -1	252T2110-1		ROD ASSY-ELEV ACTR INPUT (PRE SB 27-0052) (PRE SB 27-0129)	A	RF
-1A	252T2110-3		ROD ASSY-ELEV ACTR INPUT (POST SB 27-0052) (POST SB 27-0129)	B	RF
-1D	252T2110-4		ROD ASSY-ELEV ACTR INPUT	C	RF
5	NAS509-6		.NUT		1
10	NAS1193K6CP		.DEVICE-LOCKING		1
15	REP4M6-4FS428		.BEARING- (V21335) (SPEC BACB10AD5K) (OPT HHRE4MS6-1 (V38443)) (OPT REP4M6-4E9171B (V21335))	A	1
15A	REP4MS6-5FS428		.BEARING- (V21335) (SPEC BACB10AD12K) (OPT REP4MS6-5E9171B (V21335))	B,C	1
20	252T2113-1		.TUBE ASSY	A,B	1
20A	252T2113-3		.TUBE	C	1
25	BACR15CE5KE		ATTACHING PARTS DELETED		
25A	BACR15FT5KE2C		.RIVET (OPT ITEM 25B)		3
-25B	NAS1398D5A		.RIVET (OPT ITEM 25A) -----*		3
27	BACR15CE5KE		DELETED		
27A	BACR15FT5KE		..RIVET		3
30	252T2164-1		..RING-STOP	A,B	1
35	252T2113-2		..TUBE	A,B	1
40	252T2112-1		.ROD END ASSY-ELEV ACTR INPUT ROD		1
45	BACR15FT5KE		..RIVET		2
50	REP4H5-2FS436		..BEARING-ROD END (V21335) (SPEC BACB10AE9B) (OPT REP4H5-2 (V38443))		1

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FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
55	252T2112-2		..ROD		1
60	252T2110-2		.ROD ASSY-INNER	A,B	1
-60A	252T2110-5		.ROD ASSY-INNER	C	1
65	252T2164-2		..TUBE		1
70	252T2164-3		..TUBE		1
75	252T2153-1		DELETED		
75A	252T2153-3		..SLIDE		2
80	252T2153-2		DELETED		
80A	252T2153-4		..SLIDE		2
85	252T2136-1		..SPRING		1
90	252T2150-1		..ROD	A,B	1
-90A	252T2150-2		..ROD	C	1

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