

TO: ALL HOLDERS OF LANDING GEAR HYDRAULIC TRANSFER CYLINDER ASSEMBLY OVERHAUL MANUAL, 32-40-01

REVISION NO. 20, DATED MAR 1/03

HIGHLIGHTS

DESCRIPTION OF CHANGE	TOPICS AFFECTED												
	D & O	D / A s s y	C l e a n i n g	I n s p / C h k	R e p a i r	A s s y	F / C	T e s t	T / S h o o t i n g	S / T o o l s	S t o r a g e	I P L	L / O v e r h a u l
Changed word "solvent" to "sealant" in Assembly step 7.C.						X							

Mar 1/03

32-40-01
HIGHLIGHTS
Page 1 of 1

LANDING GEAR HYDRAULIC TRANSFER CYLINDER ASSEMBLY

32-40-01

BOEING P/N 65-17832-2,-3
65-44690-4, -8, -10, -11, -15, -16
65-44897-2 thru -5
69-14106-1 thru -7
69-54600-1 thru -4
273A1301-1
273A2310-1

AIRLINE P/N

THE FOLLOWING DIRECTIVES APPLY TO THIS SUBJECT:

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVES	DATE DIRECTIVE INCORPORATED INTO TEXT
32-281		PRR 31284 PRR 32070-10 PRR 24442 PRR 32938 PRR 33969	Aug 15/69 May 10/72 Sep 5/87 Dec 5/83 Dec 5/85
32-1174		PRR 34036	Mar 5/87

Mar 1/01

32-40-01
Page T-1

LIST OF EFFECTIVE PAGES

* Indicates pages revised, added or deleted in latest revision

F Indicates foldout pages - print one side only

PAGE	DATE	PAGE	DATE	PAGE	DATE
32-40-01					
T-1	Mar 1/01				
T-2	BLANK				
* LEP-1	Mar 1/03				
LEP-2	BLANK				
T/C-1	Mar 1/99				
T/C-2	BLANK				
1	Mar 1/01				
2	BLANK				
101	Mar 1/01				
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1101	Mar 1/01				
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1103	Mar 1/01				
1104	Mar 1/01				
1105	Mar 1/01				
1106	BLANK				

Mar 1/03

32-40-01
Page LEP-1



TABLE OF CONTENTS

<u>Paragraph Title</u>	<u>Page</u>
Description and Operation	1
Disassembly.....	101
Cleaning.....	*[1]
Inspection/Check	301
Repair.....	401
Assembly.....	501
Fits and Clearances	601
Testing	701
Trouble Shooting.....	801
Storage Instructions.....	901
Special Tools, Fixtures and Equipment (not applicable)	
Illustrated Parts List	1101

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

LANDING GEAR HYDRAULIC TRANSFER CYLINDER ASSEMBLY

DESCRIPTION AND OPERATION

1. Description

- A. The landing gear transfer cylinder assembly has a cylinder or housing with end caps, with a free-floating piston inside. In some assemblies, piston stroke is damped at each end by concentric springs. The transfer cylinder is symmetrical and can be installed either way in the system.

2. Operation

- A. The transfer cylinder momentarily equalizes hydraulic pressure on either side of the landing gear actuator piston at the start of each extension cycle to remove the actuator force from the landing gear until the uplock is released. One end of the cylinder is connected to the down line, and the other end is connected to the up side of the landing gear actuator.
- B. When the landing gear control handle is moved to start gear extension, pressure goes to the down side of the landing gear actuator. The pressure also goes into the down side of the transfer cylinder and moves the piston. Piston movement sends pressure from the up side of the cylinder to the up side of the actuator. In transfer cylinders with springs, when the spring retainer touches bottom, the counter pressure decreases on the up side of the landing gear actuator. With the spring retainer at the bottom, the piston can move more, against the spring tension. This added piston movement absorbs pressure surges caused in the system by landing impacts.

3. Leading Particulars (Approximate)

Length -- 8-12 inches
Weight -- 6 pounds
Operating Medium -- Hydraulic fluid, BMS 3-11
Operating pressure -- 3000 psi
Proof pressure -- 5400 psi
Port size -- 2-16UN-3A thread for 3/8 inch OD tube

65-17832 69-14106
65-44690 69-54600
65-44897 273A1301
273A2310



DISASSEMBLY

NOTE: Item numbers refer to Fig. 1101, unless shown differently.

1. Remove the lockwire.
2. If installed, remove unions (1) and packings (2) (Fig. 1102) or unions (13) and packings (14).
3. Remove end caps (1) from the ends of the cylinder or housing (10).
4. Remove backup rings (2) and O-rings (3).
5. Remove piston (9) from cylinder or housing (10). If applicable, remove nuts (4), washers (4A), retainers (5) and inner and outer springs (6, 7).

NOTE: When you remove nut (4), spring (6) will have a load of approximately 10 pounds, and spring (7) will have a load of approximately 5 pounds.

6. Remove piston ring (8) or cap ring or seal (8A) and O-ring (8B) from piston (9).

65-17832 69-14106
65-44690 69-54600
65-44897 273A1301
273A2310



INSPECTION/CHECK

1. Examine all parts for defects by standard industry practices. Refer to Fits and Clearances for design dimensions and wear limits.
2. Penetrant examine aluminum 69-14169-1, -2, -3 end caps (1) and aluminum-nickel-bronze 69-31983-1 piston (9) per SOPM 20-20-02.
3. Magnetic particle examine steel 69-14169-4 end caps (1), steel 69-31983-2 piston (9), and cylinder or housing (10) per SOPM 20-20-01.
4. Make a load check of springs (6, 7) per Fig. 301.

Item No. Fig. (1101)	Approximate Free Length (Inches)	Test Length (Inches)	Load Limits (Pounds)
6	3.38	2.35	8.6 - 10.6
7	3.36	2.35	5.05 - 6.25

Spring Check Data
Figure 301

Mar 1/01

32-40-01
Page 301

REPAIR

1. Repair small defects by standard industry practices. Refer to Fits and Clearances for design dimensions and wear limits.
2. Cylinder (10) (Fig. 401).
 - A. Machine as required, within repair limits, to remove defects.
 - B. Shot peen as indicated.
 - C. Build up with chrome plate per SOPM 20-42-03 and grind to design dimensions and finish.

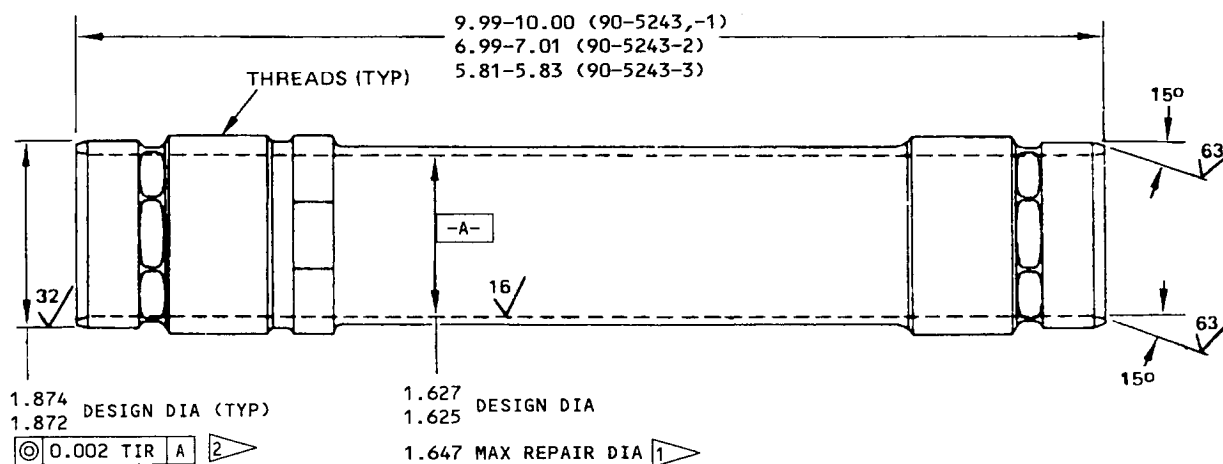
3. Refinish (Fig. 1101)

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

- A. End Cap (1) (69-14169-1, -2, -3) -- Chromic acid anodize (F-2.26) all over. Material: Al alloy.
- B. End Cap (1) (69-14169-4) -- Passivate (F-17.09) all over. Material: 15-5PH CRES, 180-200 ksi.
- C. Springs (6, 7) -- Passivate (F-8.07) all over. Material: 17-7PH CRES.
- D. Piston (9) (69-31983-1) -- No finish. Material: Al-Ni-Bronze per AMS 4640.
- E. Piston (9) (69-31983-2) -- Passivate (F-17.09). Material: 15-5PH CRES, 180-200 ksi.
- F. Cylinder (10) -- Fig. 401.
- G. Housing (10) -- Fig. 402.

4. Replacement (Fig. 1101)

- A. Replace backup rings (2), O-rings (3, 8B) and piston rings (8) or cap ring (8A) at each overhaul.
- B. Nameplate (11) -- Steel stamp the serial number and the assembly dash number on the replacement nameplate before installation.



REFINISH

CADMIUM PLATE (F-1.1929) EXTERIOR ONLY,
0.0003-0.0005 THICK

- 1 LIMIT FOR CHROME PLATE BUILDUP AND GRINDING
TO DESIGN DIMENSIONS AND FINISH
- 2 90-5243 ONLY (NOT 90-5243-1,-2,-3)

REPAIR

REF 1
125 ALL MACHINED SURFACES UNLESS SHOWN
DIFFERENTLY

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

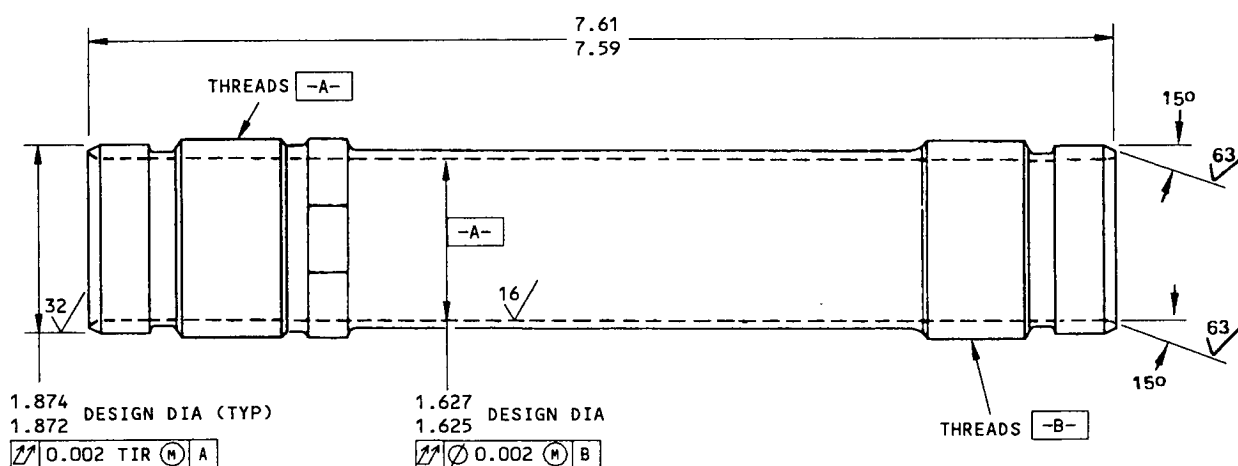
MATERIAL: 4340 STEEL (OPT 4130, 4135,
4140, 8630 STEEL), 150-170 KSI

ALL DIMENSIONS ARE IN INCHES

CYLINDER (10)
90-5243,-1,-2,-3

Cylinder Repair and Refinish
Figure 401

65-17832 69-14106
 65-44690 69-54600
 65-44897 273A1301
 273A2310



REFINISH

PASSIVATE (F-17.25, WHICH REPLACES F-17.09)
 APPLY BMS 3-8 SOLID FILM LUBRICANT (F-19.10)
 TO THREADS.

REPAIR

(SAME AS REFINISH)

125/ ALL MACHINED SURFACES UNLESS SHOWN
 DIFFERENTLY

SHOT PEEN: (SOPM 20-10-03)

0.017-0.046 SHOT SIZE

0.010 A2 INTENSITY

MATERIAL: 15-5PH CRES, 180-200 KSI

ALL DIMENSIONS ARE IN INCHES

HOUSING (10)
 273A2311-1
 Housing Repair and Refinish
 Figure 402

ASSEMBLY

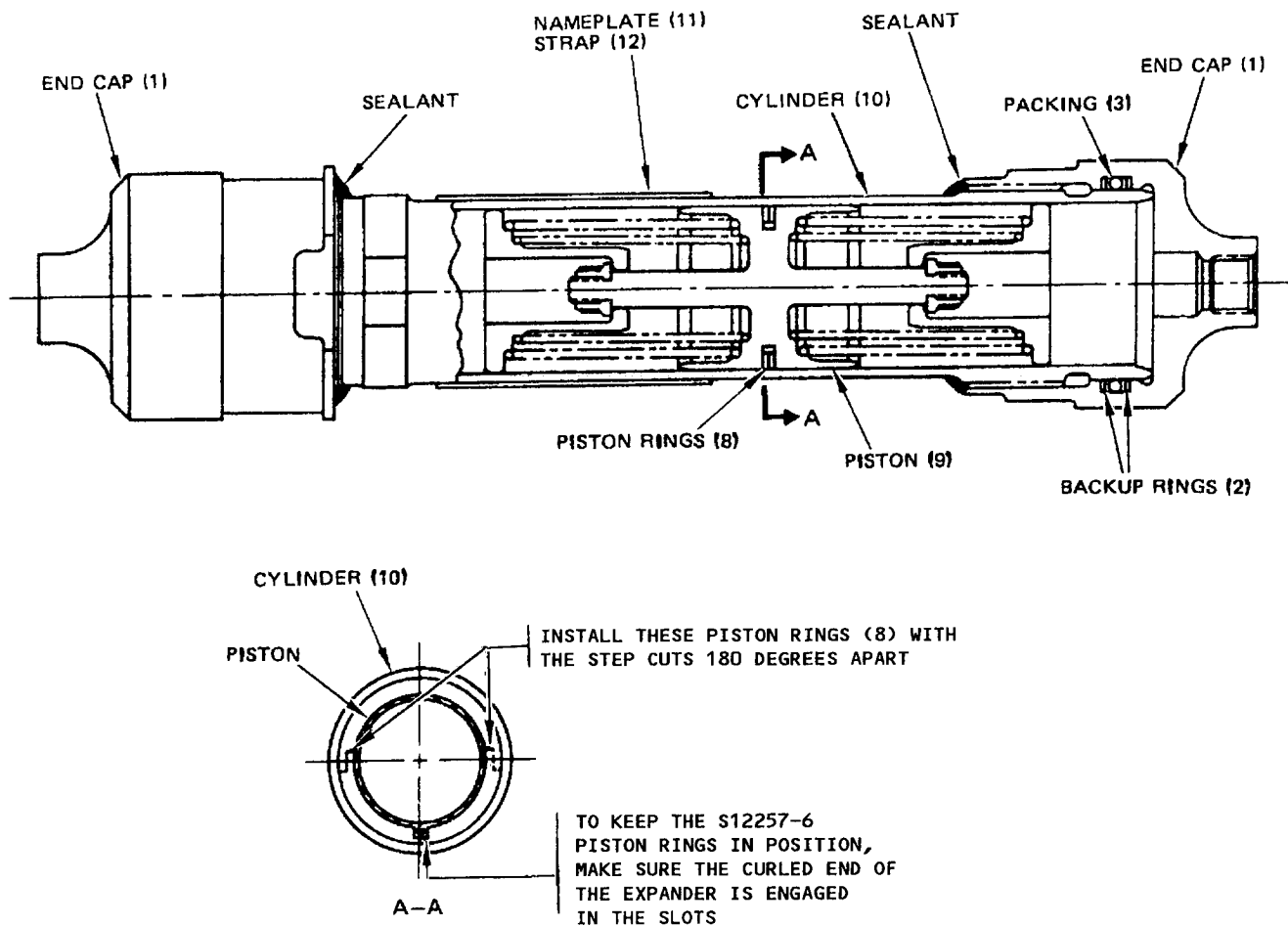
1. Lightly lubricate O-rings and backup rings with BMS 3-11 hydraulic fluid or assembly lube as parts are installed.
2. Install ring(s) or seal (8 or 8A) on piston (9) per Fig. 501. If applicable, install inner and outer springs (6, 7) on each end of piston (9) with retainer (5), washer (4A), and nut (4). Tighten nut (4) to 25-35 lb-in. more than the nut run-up torque.
3. Put assembled piston in cylinder or housing (10).
4. Install end caps (1) with parts (2, 3) in cylinder or housing (10):
 - A. All units but 273A2310-1:
 - (1) Install O-rings (3) and backup rings (2) in end caps (1).
 - (2) Start the threaded parts together to engage approximately 2 threads. Apply a thin layer of grease to exposed male (OD) threads, then continue to turn the parts together.
 - (3) Tighten end caps (1) to 600-750 lb-in.
 - B. 273A2310:
 - (1) Install O-rings (3) and backup rings (2) in end caps (1).
 - (2) Install the end caps on the housing and tighten them to 1300-1500 lb-in.
5. If removed, install nameplate (11) and strap (12) on cylinder or housing (10).
6. Lockwire end caps (1) to each other after installation of the nameplate, by the double twist method of SOPM 20-50-02.
7. Apply a bead of sealant to seal joints and splitlines between end caps (1) and cylinder or housing (10), as follows:
 - A. Wipe unwanted grease and lubricant from the unit with a clean cloth.
 - B. Clean the areas to get the sealant, with a clean cloth wet with solvent.

CAUTION: DO NOT SQUIRT OR APPLY LARGE AMOUNTS OF SOLVENT TO THE JOINTS.
 - C. Apply a bead of sealant to the joints and splitlines shown in Fig. 501.
 - D. Let the sealant cure for 48 hours.
 - E. Make sure the sealant is cured and that it is bonded to the surfaces.
8. Install the unions with their packings.

8. Materials

NOTE: Equivalent substitutes can be used.

- A. Hydraulic Fluid -- BMS 3-11 (Ref SOPM 20-60-03)
- B. Assembly Lube -- MCS 352 (Ref SOPM 20-60-03)
- C. Grease -- Batco 8401 #1 (#2 optional) (Ref SOPM 20-60-03)
- D. Sealant -- BMS 5-26, type 1, class B-1/2 (type 2, class B-2 optional) (Ref SOPM 20-60-04)
- E. Solvent -- Series 82 (Ref SOPM 20-30-82)

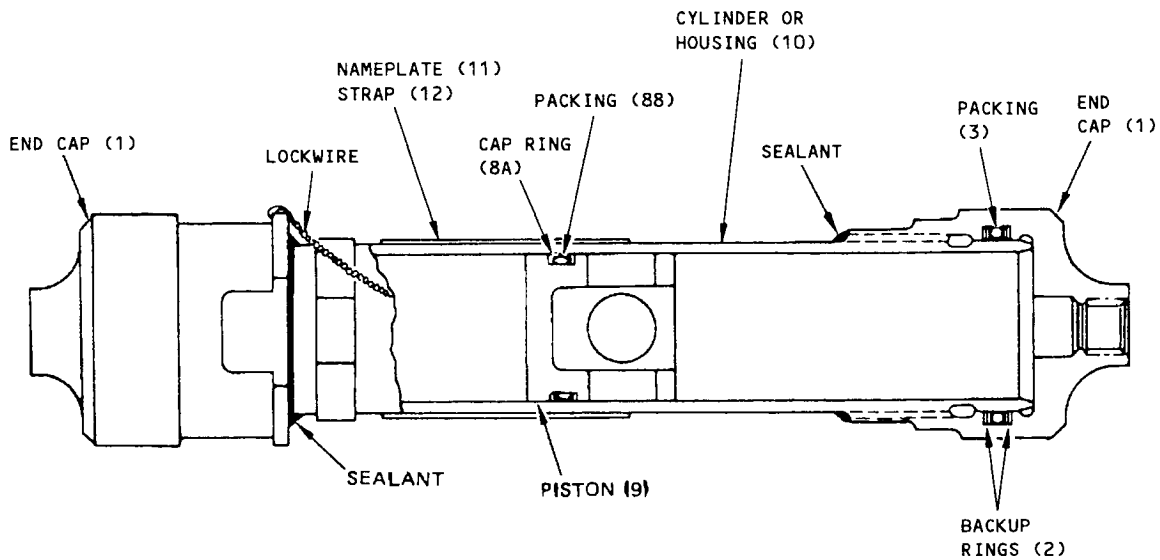


69-14106 SERIES

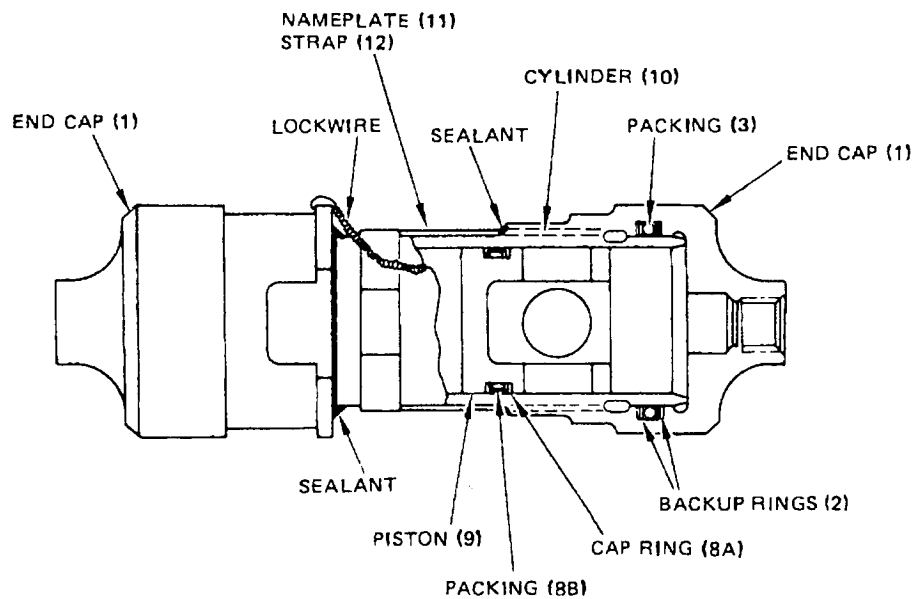
Assembly Details
Figure 501 (Sheet 1)

65-17832 69-14106
 65-44690 69-54600
 65-44897 273A1301
 273A2310

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69-54600-1,-2,-3
 273A2310-1



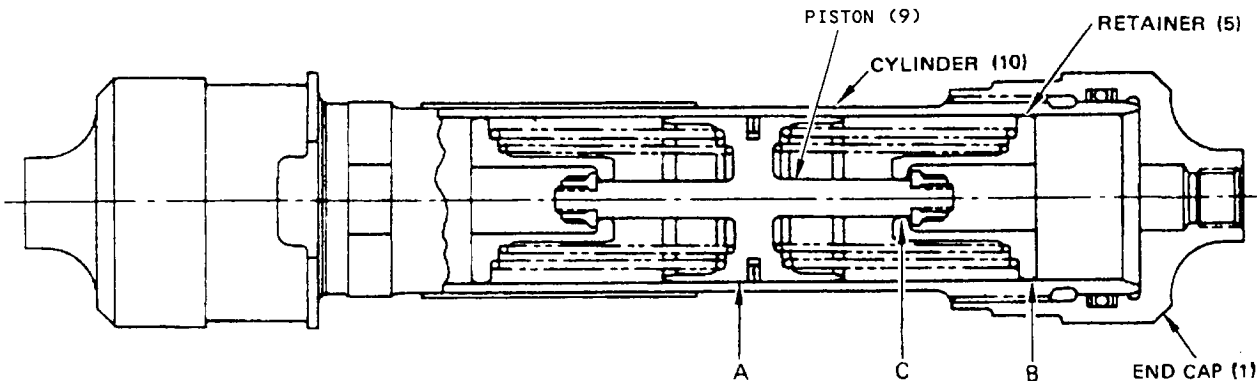
69-54600-4

ITEM NUMBERS REFER TO FIG. 1101

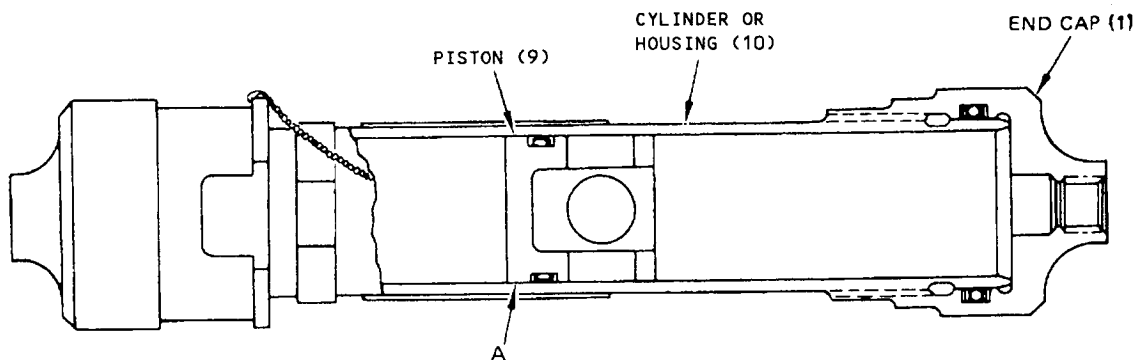
Assembly Details
 Figure 501 (Sheet 2)

65-17832 69-14106
 65-44690 69-54600
 65-44897 273A1301
 273A2310

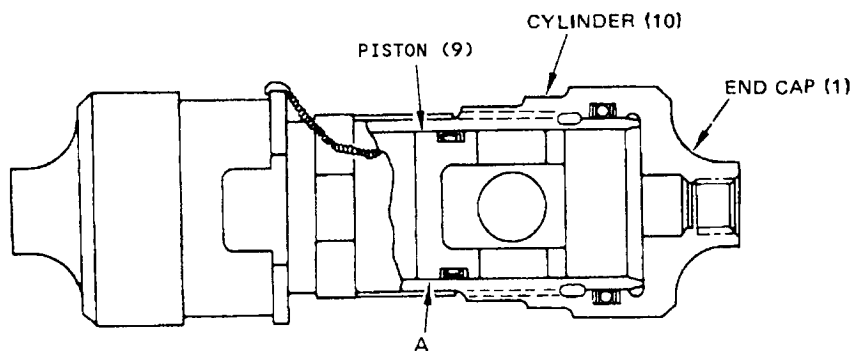
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FITS AND CLEARANCES



69-14106 SERIES



69-54600-1,-2,-3
 273A2310-1



69-54600-4

ITEM NUMBERS REFER TO FIG. 1101

Fits and Clearances
 Figure 601 (Sheet 1)

Ref Letter Fig. 601	Mating Item No. Fig. 1101	Design Dimensions				Service Wear Limits		
		Dimensions (inches)		Assembly Clearance (inch)		Dimension Limits (inch)		Maximum Allowable Clearance (inch)
		Min	Max	Min	Max	Min	Max	
A*[1]	ID 10	1.6250	1.6270	0.0030	0.0065	1.6190	1.6290	0.0085
	OD 9	1.6205	1.6220					
A*[2]	ID 10	1.6250	1.6270	0.0020	0.0060	1.6195	1.6290	0.0080
	OD 9	1.6210	1.6230					
B	ID 10	1.6250	1.6270	0.0100	0.0170	1.5990	1.6290	0.030
	OD 5	1.6100	1.6150					
C	ID 5	0.375	0.380	0.010	0.020	0.350	0.390	0.040
	OD 9	0.360	0.365					

- *[1] 69-14106- and 273A2310-series cylinders with 69-31983-series pistons
*[2] 69-54600-series cylinders with 69-54577-1 pistons

Fits and Clearances
Figure 601 (Sheet 2)

FOR TORQUE VALUES OF STANDARD FASTENERS REFER TO SOPM 20-50-01			
Item Number Fig. 1101	Name	Torque	
		Pound-Inches	Pound-Feet
1	End Cap	600-750 *[2]	
1	End Cap	1300-1500 *[3]	
4	Nut	25-35 *[1]	

- *[1] Run-up torque plus this value.
*[2] All but 273A2310-1 cylinder.
*[3] 273A2310-1 cylinder.

Torque Table
Figure 602

TESTING

1. Test Equipment

- A. Hydraulic test to supply hydraulic pressure up to 5400 psi.

2. Preparation for Test

- A. Do the test at room temperature.
- B. Install hydraulic fittings in the unit (Fig. 1102).
 - (1) Lubricate packings (2) and threads of unions (1) with hydraulic fluid BMS 3-11 or Assembly Lube MCS 352 before installation.
 - (2) Install packings (2) on unions (1) and install the unions in transfer cylinder assembly (3).
- C. Fill the unit with BMS 3-11 hydraulic fluid and bleed off all air.

WARNING: DO NOT APPLY COMPRESSED AIR TO THE PORTS. DO NOT OPERATE THE UNIT THROUGH ITS CYCLES AT PROOF PRESSURE.

3. Proof Pressure Test (All units but 273A2310-series)

- A. With the transfer cylinder on the hydraulic test stand, apply a proof pressure of 5400 psi to the two ends for 2 minutes. There must be no external leakage or permanent set.

4. Piston Leakage Test

- A. With the piston on one side or the other of the transfer cylinder, apply 3000 psi pressure to one port. Leakage from the opposite open port must be no more than 40 cc per minute for 69-14106 - series cylinders, and no more than three drops per minute for 69-54600- and 273A2310-series cylinders.

5. Proof Pressure Test (273A2310-series only)

- A. Connect the hydraulic test stand to the two ports.
- B. Bleed all air from the unit.
- C. Apply 2-5 psi pressure for 2 minutes. There must be no external fluid leakage.
- D. Increase the pressure to 4500 psi for 2 minutes. There must be no external leakage or permanent set.

6. Operational Test (All units but 273A2310-series)

- A. Put rods into the two ports.
- B. Move the piston from one end of the cylinder to the other through its working stroke. Make sure the piston is fully at the bottom, with one pair of springs (if applicable) compressed, at each end of the stroke. The stroke must be within the limits shown in Fig. 701. The piston must move freely.

NOTE: A force of approximately 33 pounds is necessary to move the piston to the bottom on 69-14106-series cylinders.

CYLINDER ASSEMBLY PART NUMBER	STROKE (Inches)
69-14106-1, -2, -5	6.54 - 6.94
69-14106-3, -4, -6, -7	3.54 - 3.94
69-54600-1, -2, -3	8.27 - 8.47
69-54600-4	4.09 - 4.29

Piston Stroke Limits
Figure 701

65-17832 69-14106
65-44690 69-54600
65-44897 273A1301
273A2310



TROUBLE SHOOTING

<u>Trouble</u>	<u>Possible Cause</u>	<u>Correction</u>
Too much leakage during proof pressure test	Defective backup rings (2), O-rings (3)	Disassemble and replace backup rings and O-rings
Piston (9) does not move freely	Unwanted matter or defective rings, piston, or cylinder or housing	Disassemble and examine. Clean, or replace as necessary.

65-17832 69-14106
65-44690 69-54600
65-44897 273A1301
273A2310



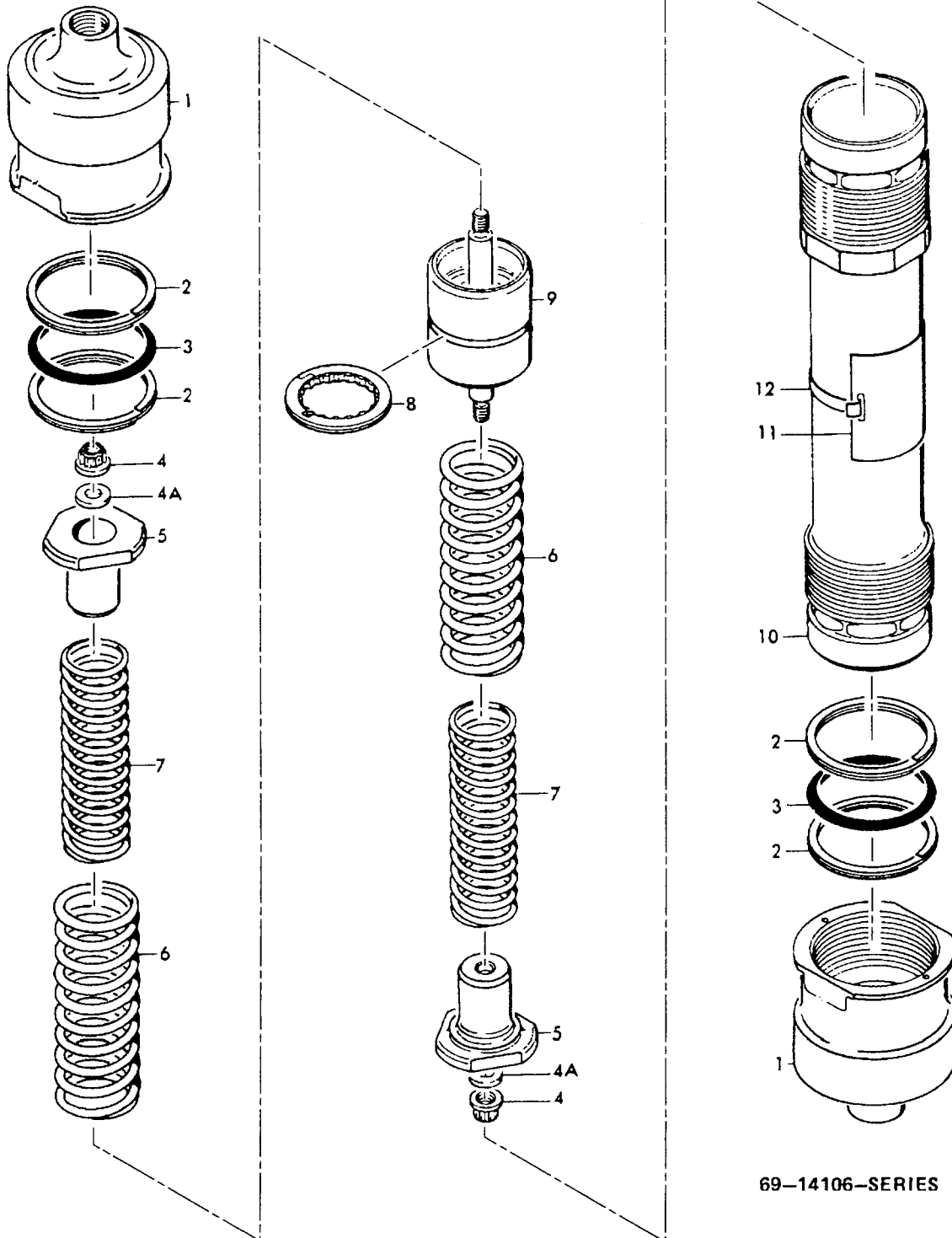
STORAGE INSTRUCTIONS

1. Partially fill the transfer cylinder with BMS 3-11 hydraulic fluid. Put plugs or caps on the fittings to prevent leakage or contamination during storage.
2. Give the unit protection and put it away by standard industry practices and the instructions in SOPM 20-44-02.

65-17832 69-14106
 65-44690 69-54600
 65-44897 273A1301
 273A2310

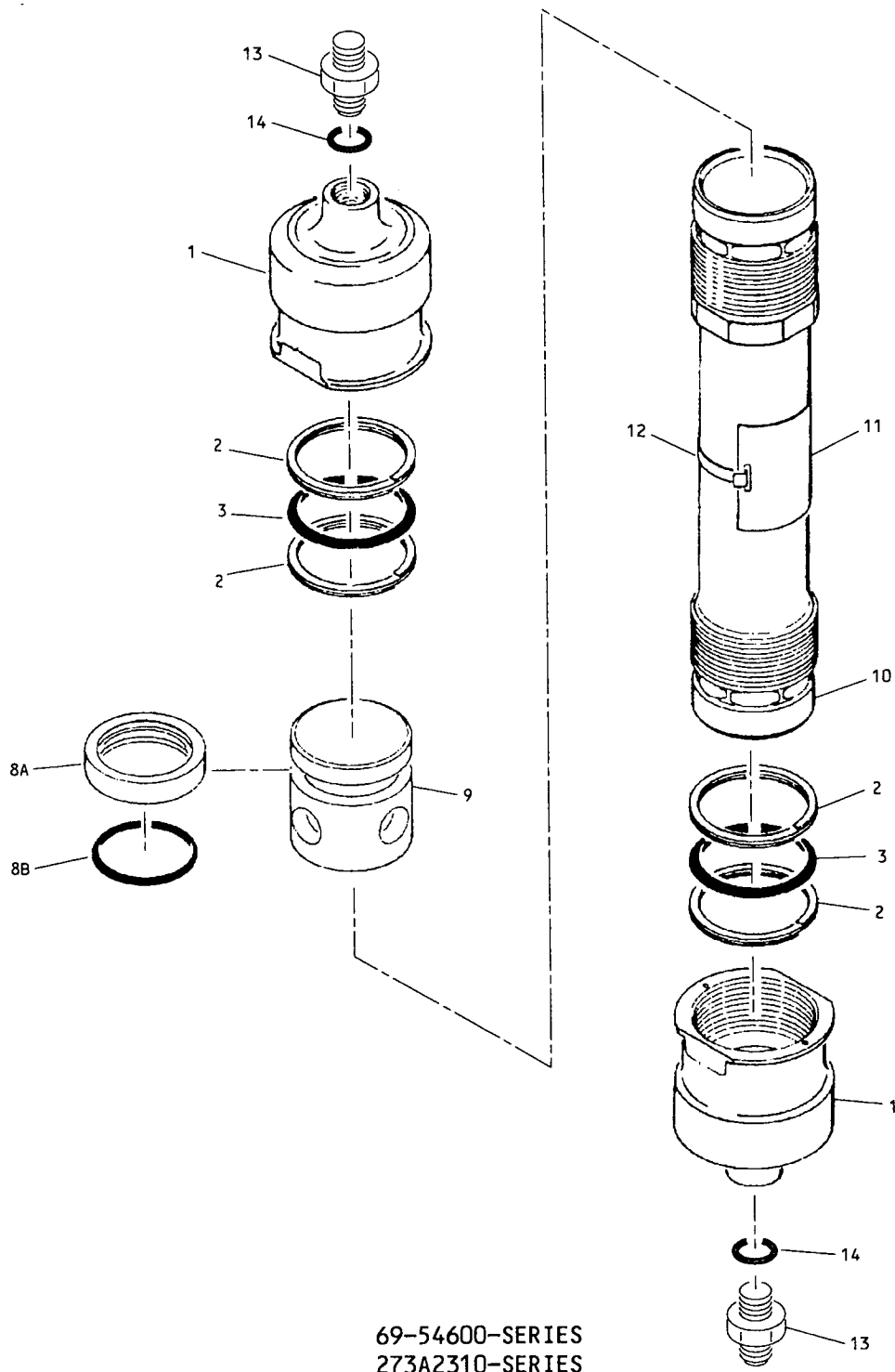
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ILLUSTRATED PARTS LIST



69-14106-SERIES

Landing Gear Hydraulic Transfer Cylinder Assembly
 Figure 1101 (Sheet 1)



Landing Gear Hydraulic Transfer Cylinder Assembly
Figure 1101 (Sheet 2)

65-17832 69-14106
65-44690 69-54600
65-44897 273A1301
273A2310

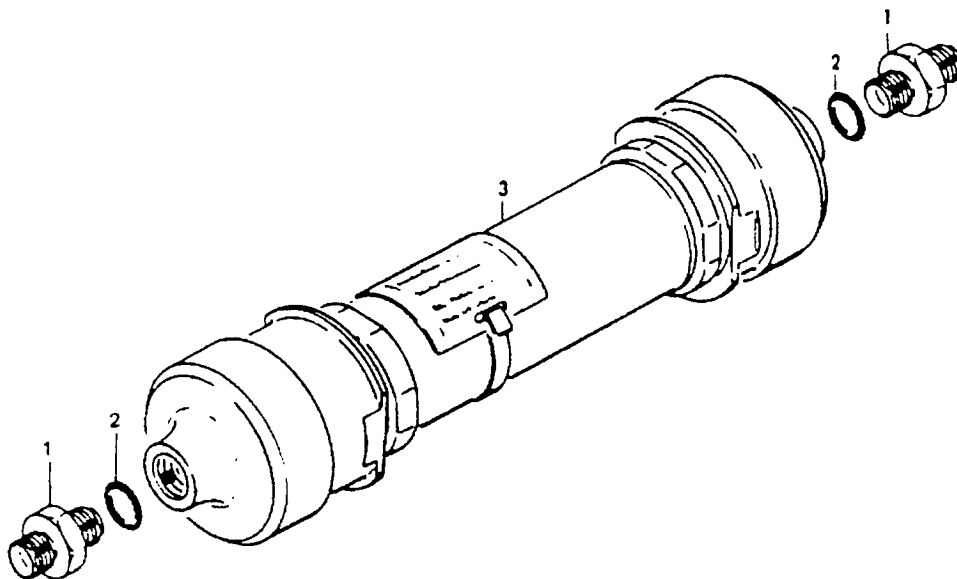
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FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101-	69-14106-1		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (PRE SB 32-281, 32-1174)	A	RF
	69-14106-2		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (PRE SB 32-1174)	B	RF
	69-14106-3		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (PRE SB 32-1174)	C	RF
	69-14106-4		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (PRE SB 32-1174)	D	RF
	69-14106-5		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (PRE SB 32-1174) (POST SB 32-281)	E	RF
	69-14106-6		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (PRE SB 32-1174)	F	RF
	69-14106-7		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (POST SB 32-1174)	G	RF
	69-54600-1		CYLINDER ASSY, MAIN GEAR HYDRAULIC TRANSFER	H	RF
	69-54600-2		CYLINDER ASSY, MAIN GEAR HYDRAULIC TRANSFER	I	RF
	69-54600-3		CYLINDER ASSY, MAIN GEAR HYDRAULIC TRANSFER	J	RF
	69-54600-4		CYLINDER ASSY, MAIN GEAR HYDRAULIC TRANSFER	K	RF
	273A2310-1		CYLINDER ASSY, MAIN GEAR HYDRAULIC TRANSFER	L	RF
1	69-14169-3		. END CAP (OPT TO 69-14169-1,-2)	A-DHI	2
1	69-14169-2		. END CAP (OPT TO 69-14169-1,-3)	A-DHI	2
1	69-14169-1		. END CAP (OPT TO 69-14169-2,-3)	A-DHI	2
1	69-14169-4		. END CAP	EFGJKL	1
2	MS28783-3		. BACKUP RING		4
3	NAS1611-225		. O-RING		2
4	BACN10GY4		. NUT	A-G	2
4	BACN10BX4		. NUT (OPT)	ABC	2
4A	AN960-416L		. WASHER (USED WITH BACN10GY4)	A-G	2
5	69-31981-2		. RETAINER, SPRING	A-G	2
5	69-31981-1		. RETAINER, SPRING (OPT)	ABCE	2
6	66-21729-1		. SPRING, OUTER	A-G	2
7	66-21730-1		. SPRING, INNER	A-G	2
8	S12257-26		. RING, PISTON, V97820	A-G	1
8A	69-54540-220		. RING, CAP	H-L	1
8A	S30662-3019		. SEAL, V97820	L	1
8B	NAS1611-220		. PACKING, O-RING	H-K	1
9	69-31983-1		. PISTON	A-F	1
9	69-31983-2		. PISTON (PREF)	A-F	1
9	69-31983-2		. PISTON	G	1
9	69-54577-1		. PISTON	H-L	1

Mar 1/01

32-40-01
Page 1103

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101-10	90-5243-1		. CYLINDER	ABEHIJ	1
10	90-5243		. CYLINDER (OPT TO 90-5243-1)	ABE	1
10	90-5243-2		. CYLINDER	CDFG	1
10	90-5243-3		. CYLINDER	K	1
10	273A2311-1		. HOUSING	L	1
11	BAC27DHY155		. NAMEPLATE	A-G	1
11	BAC27DHY132		. NAMEPLATE	HIJ	1
11	BAC27DHY0338		. NAMEPLATE	K	1
11	BAC27DHY365		. NAMEPLATE	L	1
12	69-35587-3		. STRAP		1
13	MS21902-6T		. UNION	L	2
14	NAS1612-6		. PACKING, O-RING	L	2



Landing Gear Hydraulic Transfer Cylinder Assembly
Figure 1102

65-17832 69-14106
65-44690 69-54600
65-44897 273A1301
273A2310

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FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE							USE CODE	QTY PER ASSY
			1	2	3	4	5	6	7		
1102-	65-17832-2		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (PRE SB 32-281)							A	RF
	65-17832-3		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER (POST SB 32-281)							B	RF
	65-44897-2		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER							C	RF
	65-44897-3		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER							D	RF
	65-44897-4		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER							E	RF
	65-44897-5		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER							F	RF
	65-44690-4		CYLINDER ASSY, MAIN GEAR HYDRAULIC TRANSFER							G	RF
	65-44690-8		CYLINDER ASSY, MAIN GEAR HYDAULIC TRANSFER							H	RF
	65-44690-10		CYLINDER ASSY, MAIN GEAR HYDAULIC TRANSFER							I	RF
	65-44690-11		CYLINDER ASSY, MAIN GEAR HYDAULIC TRANSFER							J	RF
	65-44690-15		CYLINDER ASSY, MAIN GEAR HYDAULIC TRANSFER							K	RF
	65-44690-16		CYLINDER ASSY, MAIN GEAR HYDAULIC TRANSFER							L	RF
	273A1301-1		CYLINDER ASSY, NOSE GEAR HYDRAULIC TRANSFER							M	RF
1	MS21902-6		. UNION							A-L	2
1	MS21902-6T		. UNION							M	2
2	NAS1612-6		. PACKING, O-RING								2
3	69-14106-1		. TRANSFER CYLINDER ASSY (FIG. 1101)							A	1
3	69-14106-2		. TRANSFER CYLINDER ASSY (FIG. 1101)							G	1
3	69-14106-3		. TRANSFER CYLINDER ASSY (FIG. 1101)							C	1
3	69-14106-4		. TRANSFER CYLINDER ASSY (FIG. 1101)							D	1
3	69-14106-5		. TRANSFER CYLINDER ASSY (FIG. 1101)							B	1
3	69-14106-6		. TRANSFER CYLINDER ASSY (FIG. 1101)							E	1
3	69-14106-7		. TRANSFER CYLINDER ASSY (FIG. 1101)							FM	1
3	69-54600-1		. TRANSFER CYLINDER ASSY (FIG. 1101)							H	1
3	69-54600-2		. TRANSFER CYLINDER ASSY (FIG. 1101)							I	1
3	69-54600-3		. TRANSFER CYLINDER ASSY (FIG. 1101)							J	1
3	69-54600-4		. TRANSFER CYLINDER ASSY (FIG. 1101)							KL	1

VENDORS

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Page 1105