

ROYAL CANADIAN AIR FORCE



HANDBOOK WITH PART LIST

MAIN LANDING GEAR SHOCK STRUT  
NUMBERS

404-188400-600 & 404-188400-601

(BEECH)

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

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# LIST OF RCAF REVISIONS

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Figure 1. Landing Gear Shock Strut



## PART 1

## DESCRIPTION

**PURPOSE OF ENGINEERING ORDER**

1 This handbook contains descriptive data and overhaul instructions with parts breakdown for the Main Landing Gear Shock Strut, Beech Part 404-188400-600 and 404-188400-601, manufactured by Beech Aircraft Corporation, Wichita, Kansas U. S. A.

**PURPOSE OF EQUIPMENT**

2 The purpose of the shock strut of this handbook is to absorb ground operational loads which would otherwise be transmitted to the airframe during landing, taxiing, and ground operations.

**GENERAL**

3 The shock strut is of the pneumatic-hydraulic type utilizing air and hydraulic fluid to absorb dynamic impact loads.

4 The hydraulic action of the shock strut is obtained from the resistance offered by the orifices during the forced oil flow of the compression and rebound strokes.

5 The pneumatic action of the shock strut is obtained from the compressible air cushion in the upper cavity of the cylinder. The shock absorbing capacity of the shock strut results from the combined hydraulic and pneumatic forces.

**OPERATION**

6 During the compression stroke while under dynamic load, the piston assembly is forced upward in the cylinder. This movement forces hydraulic fluid through the orifices of the inner cylinder and rebound control tubes and simultaneously compresses the air in the upper part of the cylinder. These two actions absorb the shock and the air under compression extends the shock strut to the static position in readiness for the next compression stroke.

7 The static position is the station maintained by the shock strut when at rest in three point attitude with a portion of the gross weight of the plane resting on the strut. The amount of air compressed in the upper part of the cylinder governs the static position.

8 The rebound stroke of the shock strut is dampened mainly by the hydraulic action of the rebound control tube and the extension stop. The rebound control tube acts as a valve in allowing or restricting forced fluid flow through the four orifices located in the rebound control tube fitting. The extension stop, operating as part of the piston assembly, is responsible for the valve-like action of the rebound control tube which has an up-and-down travel of .0625 of an inch. During the rebound stroke, the rebound control tube fitting is seated firmly down against the inner cylinder orifice plate, thereby checking fluid flow through the orifices and dampening the recoil momentum of the shock strut. During the compression stroke, the rebound control tube is forced to its upper limit of travel which allows

fluid flow through the orifices. These two movements, governed by the extension stop through a fluid medium, constitute the self-compensating rebound control action of the shock strut.

**DETAILED ASSEMBLY**

9 The major components of the main landing gear shock strut consist of a cylinder assembly, piston and fork assembly, and torque knees.

**CYLINDER ASSEMBLY**

(a) The cylinder assembly consists of a capped cylinder tube with component parts. The cylinder (30) is mounted in and brazed to the V brace (7) which supports the entire landing gear from the pivot points. The V brace pivot points facilitate attachment of the landing gear to the center section truss. Two lugs located at the lower aft portion of the V brace (7) serve as attaching points to the drag leg.

(b) The cap (3), attached to and sealing the end of cylinder (30) with the aid of gasket (4), has a threaded port in the center adapted for the valve assembly (2).

(c) The inner cylinder tube (5) and rebound control tube (6) have several orifices permitting internal forced oil flow for effective hydraulic action.

(d) The rebound control tube (6) has an up-and-down travel of .0625 of an inch inside the stationary inner cylinder (6). This allows the valve-like action of the rebound control tube. The orifice plate (14) is brazed to and forms a part of the inner cylinder (5) and the fitting (13) is secured likewise to the rebound control tube (6).

(e) The manganese bronze bearings (8) and (14) brazed to the wall of cylinder (30) provide bearing surfaces for the piston tube (11). The O ring (9) and packing (10) act as seals. The wiper ring (15) and scraper ring (16) locked in place by snap ring (17) keep the lower part of the piston tube (11) wiped clean of any grit harmful to internal bearing surfaces of the strut.

**PISTON AND FORK ASSEMBLY**

(a) The piston tube (11) is shrunk fitted into the fork (21) and secured with four bolts (22). The extension stop (18) is fastened to the internal tube support by nut (20) with seal ring (19) acting as a seal. The extension stop limits the travel of the shock strut. The dust shield (24) locked in place by snap ring (23) prevents any accumulation of foreign matter from entering the cavity which might cause corrosion. The fork (21) serves as a support for the wheel and brake assembly.

**TORQUE KNEES**

(a) The scissors-like torque knees, (26) and (28), attached together by bushing and bolt (18) are secured to the V brace (7) and fork (21) by pins (25) and (29).

The pins (25) and (29) are locked in position by bolts. The torque knees keep the piston and fork assembly

from rotating within the cylinder besides maintaining the proper alignment of the wheel.

TABLE 1  
LEADING PARTICULARS

Hydraulic Fluid Capacity of Shock Strut . . . . .	2.5 Quarts
Hydraulic Fluid Type . . . . .	Spec. 3-GP-26a
Rebound Control Tube Travel . . . . .	.0625

(Use upper and lower torque knee pin hole centers as check points for the following measurements.)

Extended Length of Shock Strut . . . . .	14.5156
Retracted Length . . . . .	4.4375
Stroke Length . . . . .	6.9375

## PART 2

## OVERHAUL INSTRUCTIONS

**SPECIAL TOOLS**

1 No special tools are required.

**DISASSEMBLY (See figure 2)**

2 To disassemble the shock strut, follow the instructions as noted:

**CAUTION**

Release air from shock strut before attempting disassembly.

(a) Deflate the shock strut by backing off valve assembly (2) allowing the compressed air to escape slowly.

**NOTE**

Do not deflate shock strut by depressing valve core as the sudden rush of high pressure air may damage the valve core seat.

(b) To drain fluid from strut, remove valve assembly (2) eight cap bolts (1), cap (3) and gasket (4), then invert strut and let set for complete drainage.

(c) Mount the strut in a suitable holding fixture or vise for disassembly.

(d) To remove torque knees, take out lock bolts securing pins (25) and (29) and then push or drive out pins.

(e) The torque knees are separated by the removal of bolt (27) with bushing.

(f) Remove snap ring (23) and dust shield (24) for access to extension stop nut (20).

(g) If necessary, insert a long shanked screw driver into slotted head of extension (18) to hold extension stop while nut (20) is being loosened.

(h) After removing nut (20), take out extension stop (18) and then remove seal ring (19) from the extension stop.

(j) Pull out the rebound control tube (6) and inner cylinder tube (5).

(k) Pull out piston tube (11) with fork (21) from cylinder (30).

(l) Remove the following parts in this order: snap ring (17), scraper ring (16), wiper ring (15), packing (10), and O ring (9).

(m) If necessary, remove four bolts (22) for disassembly of piston tube (11) from fork (21). A hydraulic press should be used to separate the piston

tube from the fork since the joint is preshrunk fit.

**NOTE**

It is not necessary to disassemble piston tube from fork except for a major repair or replacement.

**CLEANING**

3 Wash all component parts in an approved dry cleaning solvent and dry with compressed air.

**INSPECTION (See figure 2)**

4 Make the following inspection checks of all component parts:

(a) All parts should be visually inspected for obvious cracks.

(b) All parts of sufficient ferric content should be magnafluxed according to Specification MIL-I-6868.

(c) Check all plated and coated parts for bare metal exposure which would allow corrosion to take place.

(d) Inspect chrome plated area of piston tube (11), orifice plate (13), pins (25) and (29), and extension stop head (18) for chipped, scored, or galled condition.

(e) Examine the piston tube (11) and cylinder (30) for a bent or out-of-round condition.

(f) Check wiper ring (15), scraper ring (16), and snap ring (17) for evidence of scoring, deformation, or deterioration.

(g) Examine internal bearing surfaces of cylinder (30) for evidence of scratches, scores, and excessive wear.

(h) Check the clearance between piston tube (11) and inner cylinder orifice plate (13). The maximum diametral clearance between these parts is .025.

(i) Check the clearance between the stem of extension stop (18) and the inner cylinder orifice plate (13). The maximum diametral clearance between these parts is .026.

(j) Inspect pins (25) and (29) for proper fit and excessive wear. Check bolt (27) and bushing for wear.

(k) Examine V brace (7) and fork (21) for deep nicks and scratches.

(l) Check the shrunk fitted joint of the piston tube (11) and fork (21) to see that it retains a tight fit.

(m) Check all threaded parts for condition and cleanliness.

1. Bolt
2. Valve Assembly
3. Cap
4. Gasket
5. Inner Cylinder
6. Rebound Control Tube
7. V Brace
8. Bearing
9. O Ring
10. Packing
11. Piston Tube
12. Control Tube Fitting
13. Cylinder Orifice Plate
14. Bearing
15. Wiper Ring
16. Scraper Ring
17. Snap Ring
18. Extension Stop
19. Seal Ring
20. Nut
21. Fork
22. Bolt
23. Snap Ring
24. Shield
25. Bushing
26. Torque Knee
27. Bolt and Bushing
28. Torque Knee
29. Bushing
30. Cylinder

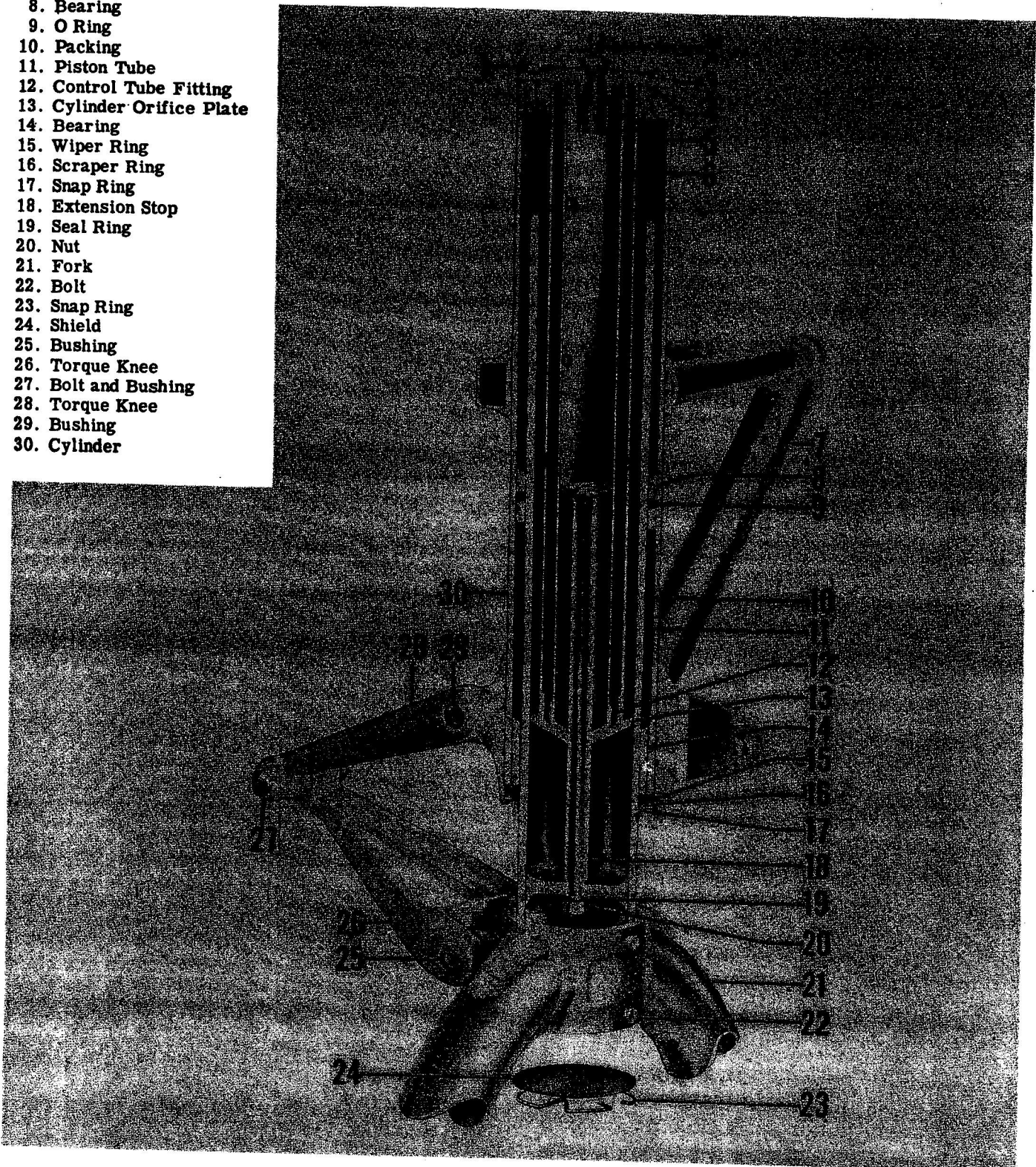


Figure 2. Cutaway View, Landing Gear Shock Strut

**REPAIR AND REPLACEMENT (See figure 2)**

5 All repairs requiring disassembly of shock strut must be accomplished at a designated overhaul station.

- (a) The O ring (9), seal ring (19) gasket (4), and packing (11) should be replaced during every overhaul.
- (b) Replace wiper ring (15), scraper ring (16), and snap ring (17) if they do not pass inspections checks.
- (c) If the chrome plated area of the piston tube (11), orifice plate (12), torque knee pins (25) and (29), or the extension stop head (18) is chipped, pitted, or galled, that part may be stripped and replated. Any part being replated should conform to Specification MIL-P-6871.
- (d) If the piston tube (11), bearings (8) and (14), rebound control tube (6), inner cylinder orifice plate (13) and the head of the extension stop (18) are worn beyond the permissible worn dimension, that part of assembly must be repaired or replaced.
- (e) Burrs and scratches on metal parts which do not impair the serviceability of a part should be smoothed over or removed. Crocus cloth and light oil may be used for the removal of burrs and scratches.

**NOTE**

Take care not to remove more material than necessary when grinding or working surfaces to remove burrs or scratches.

- (f) If the shrunk fitted joint between the piston tube (11) and fork (21) should be loose, both parts must be replaced as one unit.
- (g) Replace all threaded parts which are considered unserviceable or unrepairable.
- (h) Any parts revealing flaws after having been magnified, should be replaced.
- (i) Especial attention should be paid to any deep cuts or nicks found on the fork (21) cylinder (30), or V brace (7). If more than five scratches per square inch exceeding 1/32 inch in depth appear on any of the above parts, that part or assembly must definitely be replaced.

**NOTE**

Any repairs by welding of the heat treated and highly stressed parts of the shock strut is strictly prohibited.

- (j) Stud bolts which are stretched, loose, or have damaged threads, should be replaced by oversized bolts, if deemed necessary. Where the threads of the bolt hole have become damaged necessitating repair, they should be tapped for the next stepped oversized bolt.

**LUBRICATION**

6 The shock strut requires hydraulic fluid conforming to Specification 3-GP-26a.

- (a) If the shock strut is to be stored or shipped, all

exposed bearing surfaces should be coated with a rust preventive, Specification 3-GP-701. The shock strut should also be filled with an oil preservative, Specification MIL-O-6083A, prior to shipping or storing.

- (b) Immerse all internal parts in hydraulic fluid specified for the unit prior to reassembly.
- (c) Whenever the strut is overhauled and intended for storage, saturate the packing (10) with light oil, Specification MIL-O-6081A. This will prevent the packing from drying out and causing leakage when first put into service.

**REASSEMBLY (See figure 2)**

7 Reassemble the shock strut in accordance with the following instructions:

- (a) Place piston tube (11) and fork (21) in a suitable vise. Place snap ring (17), scraper ring (16), and wiper ring (15) in this order on piston tube (11) sliding them down to the fork (21).
- (b) After immersing O ring (9) and packing (10) in fluid specified for the shock strut, insert them in cylinder (30).

**NOTE**

Be sure to check if O ring and packing are seated properly before attempting to assemble piston in cylinder.

- (c) Assemble piston tube (11) in cylinder (30) by sliding piston tube into cylinder.
- (d) Insert the inner cylinder (5) into cylinder (30) followed by the rebound control tube (6) which fits down inside inner cylinder (5).
- (e) Slip seal ring (19) over threaded end of extension stop (18) into seat. Then insert extension stop (18) down through top of cylinder (30) and secure to piston tube support with nut (20).
- (f) Fit shield (24) in place and secure by inserting snap ring (23) into groove.
- (g) Immerse gasket (4) in hydraulic fluid and then place in seat. Assemble cap (3) and fasten with bolts (1).
- (h) Fasten torque knees (26) and (28) together with bolt and bushing (23).
- (i) Align fork (21) and cylinder (30) to facilitate assembly of torque knees (26) and (28).
- (j) Fit torque knees (26) and (28) into place and insert pins (25) and (29) locking them in place with bolts.

- (k) Screw valve assembly (2) into cap (3) and wire safety bolts (1) and valve assembly in accordance with EO 75-70-10.

**TEST PROCEDURE (See figure 2)**

- 8 After reassembly, the shock strut should be checked



for full travel limits and then given a fluid and air leak test.

(a) Check shock strut to see that it extends and collapses smoothly without binding up. Refer to Table 1 for specified travel limit measurements. If the piston tube (11) binds, the packing (10) or O ring (9) may not be seated properly. The shock strut must be disassembled to correct this trouble.

(b) To perform the leak tests, fill the shock strut with hydraulic fluid according to instructions on the placard of the strut.

(c) Inflate shock strut to 125 psi.

**NOTE**

Inflate shock strut slowly as the sudden expansion may damage the strut.

(d) Use soapy water around valve assembly (2) and cap (3) to check for air pressure leaks. Leave shock strut set for a period of time until reasonably sure

**NOTE**

Deflate shock strut when attempting to tighten threaded parts to correct fluid or air leaks.

**PART 3**  
**GROUP ASSEMBLY PART LIST**



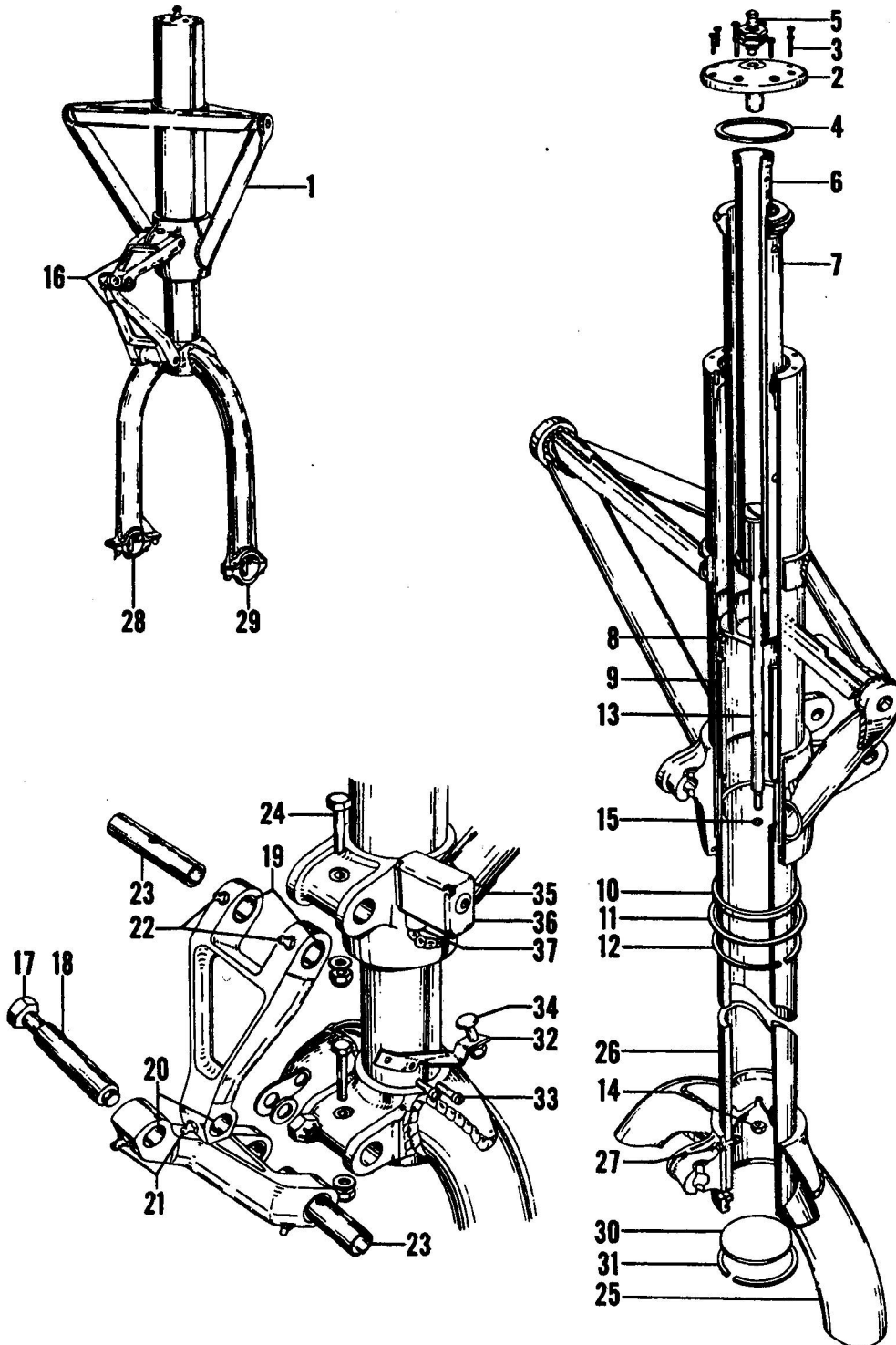


Figure 3. Exploded View, Landing Gear Shock Strut

GROUP - MAIN LANDING GEAR SHOCK STRUT  
 MAJOR ASSEMBLY - ABSORBER ASSEMBLY

FIG & INDEX NO.	PART NUMBER	1	2	3	4	5	6	USAGE CODE	UNITS PER ASSY.
3-	404-188400-600	Absorber Assembly - Landing gear shock LH							1
	404-188400-601	Absorber Assembly - Landing gear shock RH							1
- 1	404-188406	. Cylinder and Top Brace Assembly - Landing gear							1
- 2	404-188438	. Cap Assembly - Cylinder							1
		ATTACHING PARTS							
- 3	AN74-5	. Bolt							8
		-----*							
- 4	AN6230-12	. Gasket - Cap							1
- 5	AN6287-1	. Valve Assembly - High pressure							1
- 6	404-188717	. Control Assembly - Landing gear rebound							1
- 7	404-188433	. Cylinder Assembly - Landing gear inner							1
	112406	. Placard - Cylinder (RH only)							1
	404-180193	. Placard - Main landing gear shock strut LH							1
	404-180190	. Placard - Main landing gear shock strut RH							1
- 8	AN6227B-44	. Packing - O Ring Hydraulic							1
- 9	404-188400-2	. Pad - Felt							1
-10	114941	. Ring - Wiper							1
-11	111190-20	. Ring - Scraper							1
-12	111200-10	. Ring - Snap							1
-13	404-188415	. Stop - Landing gear extension							1
		ATTACHING PARTS							
-14	AN365-820	. Nut							1
		-----*							
-15	AN6227B-7	. O-Ring							1
-16	404-188412	. Knee Assembly - Landing gear torque							2
		ATTACHING PARTS							
-17	AN8-32(M)	. Bolt							1
	AN960-816	. Washer							1
	AN310-8	. Nut							1
	AN381-3-16	. Pin - Cotter							1
-18	188434-2	. Bushing - Torque knee							1
		-----*							
-19	404-188414	. Bushing - Torque knee							2
-20	404-188432	. Bushing - Torque knee							1
-21	AN944-101A	. Lubricator - Torque knee							1
-22	AN944-101	. Lubricator - Torque knee							2
-23	404-188413	. Pin - Torque knee							2
		ATTACHING PARTS							
-24	AN4-15A	. Bolt							1
	AN960-416	. Washer							1
	AN363-428	. Nut							1
		-----*							
	404-188402	. Piston and Fork Assembly - Landing gear LH							1
	404-188402-1	. Piston and Fork Assy - Landing gear RH							1
-25	404-188401	. Fork Assembly - Landing gear LH							1
	404-188401-1	. Fork Assembly - Landing gear RH							1
-26	404-188419	. Piston Assembly - Landing gear							1
		ATTACHING PARTS							
-27	AN4-10A	. Bolt							4
	AN960-416	. Washer							2
	108492-S-416-016	. Washer							2
	AN363-428	. Nut							4
	404-188462	. Stud - Axle bearing							2
	404-188442	. Stud - Axle bearing							2
-28	404-188402-2	. Cap - Axle bearing							1
		ATTACHING PARTS							
	404-188402-8	. Nut - Cap							2
		-----*							
-29	404-188402-4	. Cap - Axle bearing							1
		ATTACHING PARTS							
	404-188402-10	. Nut - Cap							2
		-----*							
-30	404-188456	. Seal - Fork assembly							1
-31	404-188455	. Ring - Seal retainer							1
-32	404-188558L	. Actuator Assembly - Safety switch LH							1
	404-188558R	. Actuator Assembly - Safety switch RH							1
		ATTACHING PARTS							
-33	AN503-8-6	. Screw							2
	AN960-8	. Washer							2
		-----*							
-34	404-188559	. Bolt - Safety switch actuator							1

## MAJOR ASSEMBLY - ABSORBER ASSEMBLY

## GROUP - MAIN LANDING GEAR SHOCK STRUT (cont)

FIG & INDEX NO.	PART NUMBER							USAGE CODE	UNITS PER ASSY.
3-35	404-188557L	1	2	3	4	5	6		
	404-188557R								
	AN4-7								1
	AN960-416								1
	AN310-4								1
	AN381-2-8								1
									1
-36	404-188556L								
	404-188556R								
-37	BZ-RQ-41								1
	AN502-6-4								1
	AN960-6								2
									2