

MODEL R182 & TR182 SERIES SERVICE MANUAL

SECTION 5

LANDING GEAR, BRAKES AND HYDRAULIC SYSTEM

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

TABLE OF CONTENTS

Page No. Aerofiche/ Manual

LANDING GEAR RETRACTION

SYSTEM	2A5/5-3
Description	2A5/5-3
Trouble Shooting	2A7/5-4A
Power Pack	2A18/5-12
Description	2A18/5-12
Removal	2A18/5-12
Disassembly	
(Thru 1978 Models)	2A21/5-15
Inspection	
(Thru 1978 Models)	2A22/5-16
Reassembly	
(Thru 1978 Models)	2A22/5-16
Disassembly (Beginning with	
1979 Models)	2A23/5-17
Inspection (Beginning with	
1979 Models)	2A24/5-18
Reassembly (Beginning with	
1979 Models)	2A24/5-18
Installation	2B3/5-19
Primary Thermal Relief	
Valve Assemblies	2B3/5-19
Description	2B3/5-19
Removal	2B3/5-19
Disassembly	2B3/5-19
Inspection	2B4/5-20
Assembly Adjustment	2B4/5-20
Installation	2B7/5-23
Pressure Switch	2B7/5-23
Description	2B7/5-23
Removal Installation	2B8/5-24
Disassembly (Thru	
R18201541)	2B8/5-24
Inspection Repair (Thru	
R18201541)	2B8/5-24
Reassembly (Thru	
R18201541)	2B9/5-25

Adjustment (Thru	
R18201541)	2B10/5-26
Disassembly (Beginning	
with R18201542)	2B10/5-26
Inspection/Repair (Begin-	
ning with R18201542)	2B11/5-27
Reassembly (Beginning	
with R18201542)	2B11/5-27
Adjustment (Beginning	
with R18201542)	2B13/5-28A
Hydraulic System Leak	
Check	2B17/5-31
Emergency Hand Pump	2B18/5-32
Description	2B18/5-32
Removal/Installation	2B18/5-32
Disassembly	2B18/5-32
Inspection and Repair	2B19/5-33
Reassembly	2B19/5-33
Landing Gear Selector Valve ..	2B19/5-33
Description	2B19/5-33
Removal/Installation	2B19/5-33
Disassembly/Reassembly	2B22/5-36
Inspection and Repair	2B22/5-36
Rigging Throttle-Operated Gear	
Warning Horn Microswitch ..	2B22/5-36
Rigging Flap-Operated Gear	
Warning System	2C3/5-41
MAIN LANDING GEAR	2C3/5-41
Description	2C3/5-41
Trouble Shooting	2C5/5-43
Removal	2C5/5-43
Installation	2C6/5-44
Rigging (Thru R1820655)	2C6/5-44
Rigging (Beginning with	
R1820656)	2C9/5-46A
Main Wheel Tire Assembly	2C11/5-47
Description	2C11/5-47

MODEL R182 AND TR182 SERVICE MANUAL

Removal	2C11 5-47	Nose Gear Downlock	
Disassembly	2C12 5-48	Mechanism	2D13 5-69
Inspection and Repair	2C12 5-48	Description	2D13 5-69
Reassembly	2C12 5-48	Removal, Installation	
Balancing	2C13 5-49	Rigging	2D13 5-69
Installation	2C13 5-49	Nose Gear Actuator	2D13 5-69
Alignment	2C13 5-49	Description	2D13 5-69
Main Wheel and Axle	2C14 5-50	Removal	2D13 5-69
Removal	2C14 5-50	Disassembly	2D13 5-69
Installation	2C14 5-50	Inspection/Repair	2D13 5-69
Main Gear Actuator	2C14 5-50	Assembly	2D15 5-71
Removal	2C14 5-50	Installation	2D16 5-72
Disassembly	2C18 5-54	Nose Gear Doors	
Inspection	2C18 5-54	(Thru R18201798)	2D16 5-72
Parts Repair/Replacement	2C18 5-54	Description	2D17 5-72A
Reassembly	2C18 5-54	Removal and Installation	
Installation	2C19 5-55	(Thru R18201798)	2D17 5-72A
Main Gear Pivot Assembly	2C19 5-55	Nose Gear Doors (Beginning	
Removal	2C19 5-55	(with R18201799)	2D17 5-72A
Inspection/Repair	2C19 5-55	Description	2D17 5-72A
Installation	2C20 5-56	Removal (Beginning with	
Gear Position Indicator		R18201799)	2D17 5-72A
Switches	2C20 5-56	Installation (Beginning	
Description	2C20 5-56	with R18201799)	2D17 5-72A
Main Gear Downlock		Nose Wheel Steering System	2D18 5-72B
Actuator	2C20 5-56	Description	2D18 5-72B
Description	2C20 5-56	Steering Bungee Assembly	2D18 5-72B
Removal	2C23 5-59	Description	2D18 5-72B
Disassembly	2C23 5-59	Removal (Thru R18201798)	2D18 5-72B
Inspection	2C23 5-59	Installation (Thru	
Reassembly	2C23 5-59	R18201798)	2D18 5-72B
Main Gear Strut Step	2C24 5-60	Removal (Beginning with	
Description	2C24 5-60	R18201799)	2D18 5-72B
Removal	2C24 5-60	Installation (Beginning	
Installation	2C24 5-60	with R18201799)	2D22 5-74
NOSE GEAR SYSTEM	2D1 5-60A	Removal and Installation	
Description	2D1 5-60A	of Nose Wheel Steering	
Operation	2D1 5-60A	System Components	2D22 5-74
Trouble Shooting	2D1 5-60A	Rigging Nose Wheel	
Removal/Installation	2D2 5-60B	Steering System	2D22 5-74
Disassembly	2D2 5-60B	Nose Wheel and Tire	2D22 5-74
Inspection and Repair	2D7 5-65	Description	2D22 5-74
Reassembly	2D7 5-65	Removal/Installation	2E2 5-78
Shimmy Damper	2D7 5-65	Disassembly (Cleveland)	2E2 5-78
Description	2D7 5-65	Inspection/Repair	
Removal	2D7 5-65	(Cleveland)	2E2 5-78
Disassembly	2D11 5-67	Reassembly (Cleveland)	2E2 5-78
Inspection and Repair	2D11 5-67	Disassembly (McCauley)	2E3 5-79
Reassembly	2D11 5-67	Inspection/Repair	
Torque Links	2D11 5-67	(McCauley)	2E3 5-79
Squat Switch	2D11 5-67	Reassembly (McCauley)	2E4 5-80
Description	2D11 5-67	Balancing	2E4 5-80
Removal	2D12 5-68	Nose Gear Rigging	
Installation	2D12 5-68	(Thru R18201798)	2E4 5-80

MODEL R182 AND TR182 SERVICE MANUAL

Nose Gear Rigging (Beginning with R18201798)	2E9 5-85	Reassembly (Beginning with 1979 Models)	2E14 5-90
BRAKE SYSTEM	2E9 5-85	Installation	2E14 5-90
Description	2E9 5-85	Hydraulic Brake Lines	2E14 5-90
Trouble Shooting	2E10 5-86	Description	2E14 5-90
Master Cylinder	2E11 5-87	Wheel Brake Assemblies	2E14 5-90
Description	2E11 5-87	Description	2E14 5-90
Removal	2E11 5-87	Removal	2E14 5-90
Disassembly (Thru 1978 Models)	2E11 5-87	Disassembly	2E14 5-90
Inspection/Repair (Thru 1978 Models)	2E11 5-87	Inspection/Repair	2E15 5-91
Reassembly (Thru 1978 Models)	2E11 5-87	Reassembly	2E15 5-91
Disassembly (Beginning with 1979 Models)	2E14 5-90	Installation	2E15 5-91
Inspection/Repair (Beginning with 1979 Models)	2E14 5-90	Checking Lining Wear	2E15 5-91
		Brake Installation	2E16 5-92
		Bleeding	2E16 5-92
		Parking Brake System	2E16 5-92
		Description	2E16 5-92
		Removal/Installation	2E16 5-92
		Inspection/Repair	2E17 5-93

5-1. LANDING GEAR RETRACTION SYSTEM.

- 5-2. DESCRIPTION. Retraction and extension of the landing gear is accomplished by a hydraulically-powered system, integrated with electrical circuits which help control and indicate gear position. Retraction and extension of the landing gear incorporates a nose gear actuator and two main gear actuators which control the main gear struts through a sector gear arrangement. The nose gear doors are mechanically-operated. The doors are closed with the gear retracted and are open with the landing gear extended. The main gears have no doors. Hydraulic fluid is supplied to the landing gear actuating cylinders by an electrically-powered power pack assembly, located in the cabin, forward of the center console. The hydraulic reservoir is an integral part of the power pack assembly. Gear selection is accomplished manually by moving a gear selector handle, located immediately left of center, in the switch panel. It is necessary to pull out on the gear selector to move the handle up or down. For emergency extension of the gear, the selector handle must be in the DOWN position be-

MODEL R182 AND TR182 SERVICE MANUAL

fore the hand pump will energize the system. A pressure switch is mounted on the pump body. This switch opens the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 psi. The pressure switch will continue to hold the electrical circuit open until pressure in the system drops to approximately 1000 psi. This will occur whether the gear selector handle is in either the UP or DOWN position. During a normal cycle, landing gear extended and locked can be detected by illumination of the gear DOWN indicator (green) light, indication of gear retracted is provided by illumination of the UP indicator (amber) light. The nose gear squat switch, actuated by the nose gear, electrically averts inadvertent retraction whenever the nose gear strut is compressed by weight of the aircraft. Beginning with 1983 models, the UP indicator (amber) light is replaced with a GEAR UNSAFE indicator (red) light. The GEAR UNSAFE (red) light is on anytime the gear is in transit (retract or extend), or whenever system pressure drops below 1000 psi with the safety (squat) switch closed.

NOTE

It is possible to have the red and green lights on momentarily at the same time after the completion of the extend cycle, or when rotating during takeoff. However, if both stay on after the completion of the extend cycle, or if the red light stays on longer than 5 to 7 seconds during retract cycle, a malfunction has occurred.

5-3. TROUBLE SHOOTING -- LANDING GEAR RETRACTION SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING GEAR FAILS TO RETRACT.	Gear pump circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Landing gear circuit breaker open.	Reset circuit breaker. Determine cause of blown circuit breaker.
	Hydraulic pump motor circuit wires disconnected or broken.	Repair or replace wiring.
	Nose gear squat switch inoperative.	Install new switch.
	Pressure switch defective.	Install new switch.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Hydraulic pump motor grounded.	Check for ground.
	Hydraulic pump motor defective.	Replace motor.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid. (Refer to Section 2.)
GEAR RETRACTION OR EXTENSION EXTREMELY SLOW.	Battery low or dead.	Check battery condition. Install new battery.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid. (Refer to Section 2.)
	Restriction in hydraulic system.	Isolate and remove restrictions.
PUMP MOTOR STOPS BEFORE GEAR IS RETRACTED.	Gear pump circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Landing gear circuit breaker open.	Reset circuit breaker. Determine cause of blown circuit breaker.
	Pressure switch out of adjustment.	Remove, adjust, or install new switch.

MODEL R182 AND TR182 SERVICE MANUAL

5-3. TROUBLE SHOOTING -- LANDING GEAR RETRACTION SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP MOTOR STOPS BEFORE GEAR IS RETRACTED (Cont).	Restriction in hydraulic system, allowing pressure to build up and shut off pump motor before gear is retracted.	Isolate and determine cause. Remove restriction.
PUMP MOTOR STOPS BEFORE GEAR IS EXTENDED.	Gear pump circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Landing gear circuit breaker open.	Reset circuit breaker. Determine cause of blown circuit breaker.
PUMP MOTOR CONTINUES TO RUN AFTER GEAR IS FULLY RETRACTED OR EXTENDED.	Pressure switch defective.	Install new switch.
	Pressure switch out of adjustment.	Remove, adjust, or install new switch.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Internal leakage in system.	Check gear actuators for internal leakage. Repair or install new actuators.
	External system leakage.	Check all lines and hose for leakage. Repair or install new parts.
	Power pack relief valve(s) out of adjustment.	Disassemble and repair or replace valve(s).
	Hydraulic motor solenoid defective.	Install new solenoid.
PUMP MOTOR CYCLES EXCESSIVELY AFTER GEAR IS RETRACTED.	Pressure switch out of adjustment.	Remove, adjust, or install new switch.
	Internal leakage in system.	Check gear actuators for internal leakage. Repair or install new actuators.
	External system leakage.	Check all lines and hose for leakage. Repair or install new parts.

MODEL R182 AND TR182 SERVICE MANUAL

5-3. TROUBLE SHOOTING -- LANDING GEAR RETRACTION SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GEAR DOES NOT FULLY RETRACT, BUT PUMP MOTOR CONTINUES TO RUN.	Internal leakage in system.	Check gear actuators for internal leakage. Repair or install new actuators.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid. (Refer to Section 2.)
LANDING GEAR FAILS TO EXTEND.	Battery low or dead.	Check battery condition. Install new battery.
	Gear pump circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Landing gear circuit breaker open.	Reset circuit breaker. Determine cause of blown circuit breaker.
	Hydraulic pump motor circuit wires disconnected or broken.	Repair or replace wiring.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Hydraulic pump motor shorted to ground.	Check ground.
	Hydraulic pump motor defective.	Replace motor.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid. (Refer to Section 2.)
	Nose gear contacts stop bolts	Adjust stop bolts to obtain 0.050" clearance. (Refer to paragraphs 5-134 and 5-135.)

MODEL R182 AND TR182 SERVICE MANUAL

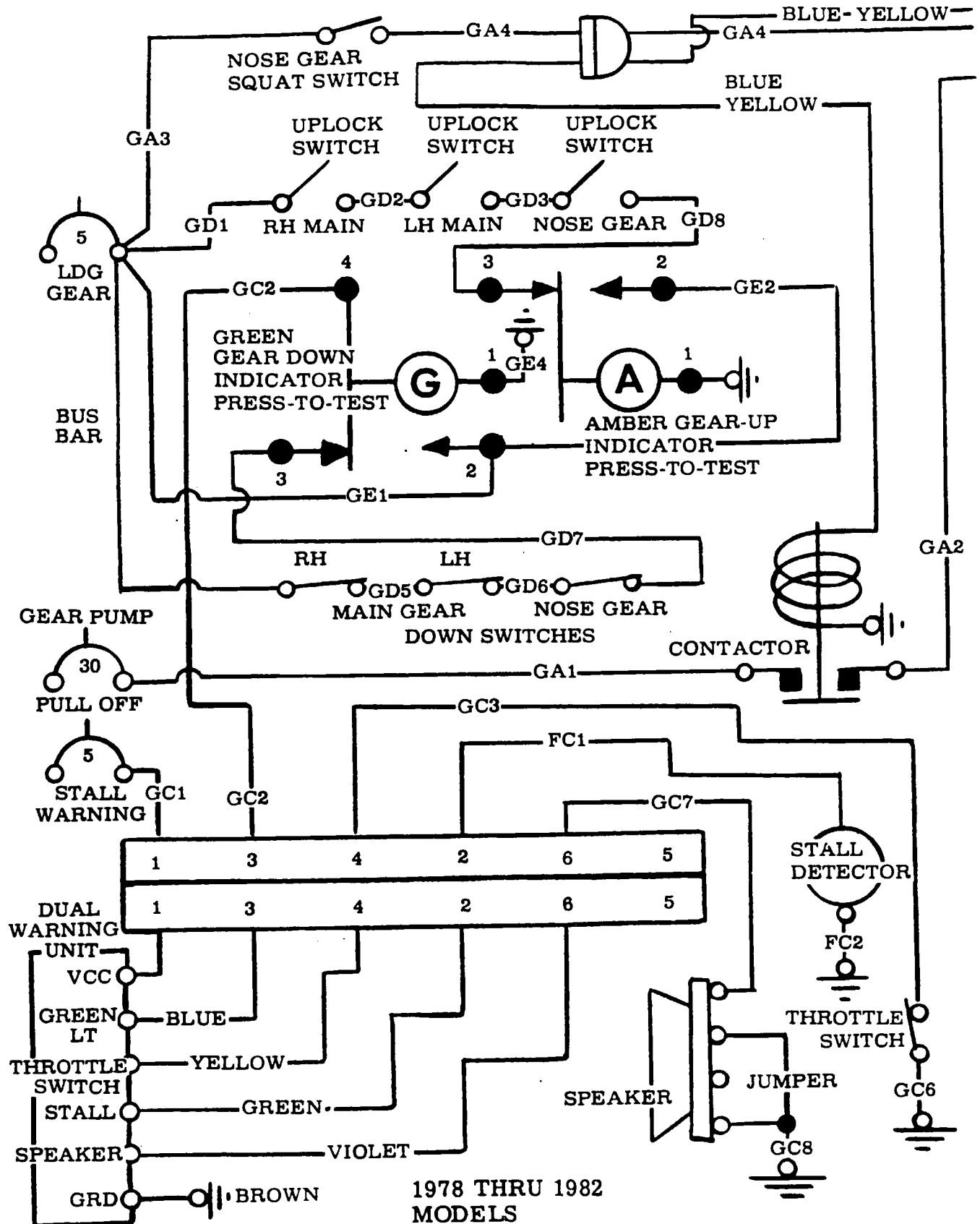


Figure 5-1. Landing Gear System Schematic (Sheet 1 of 3)



MODEL R182 AND TR182 SERVICE MANUAL

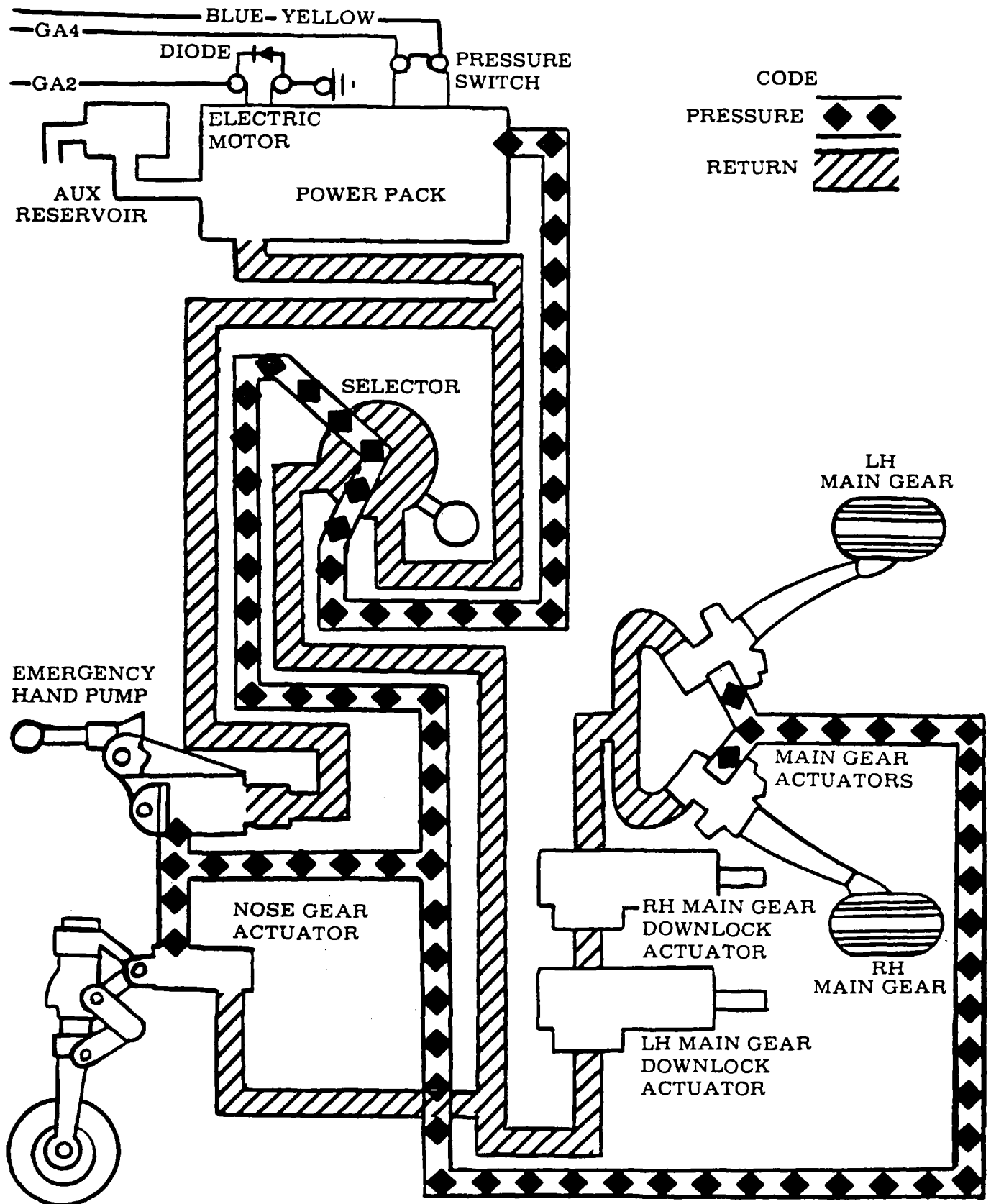
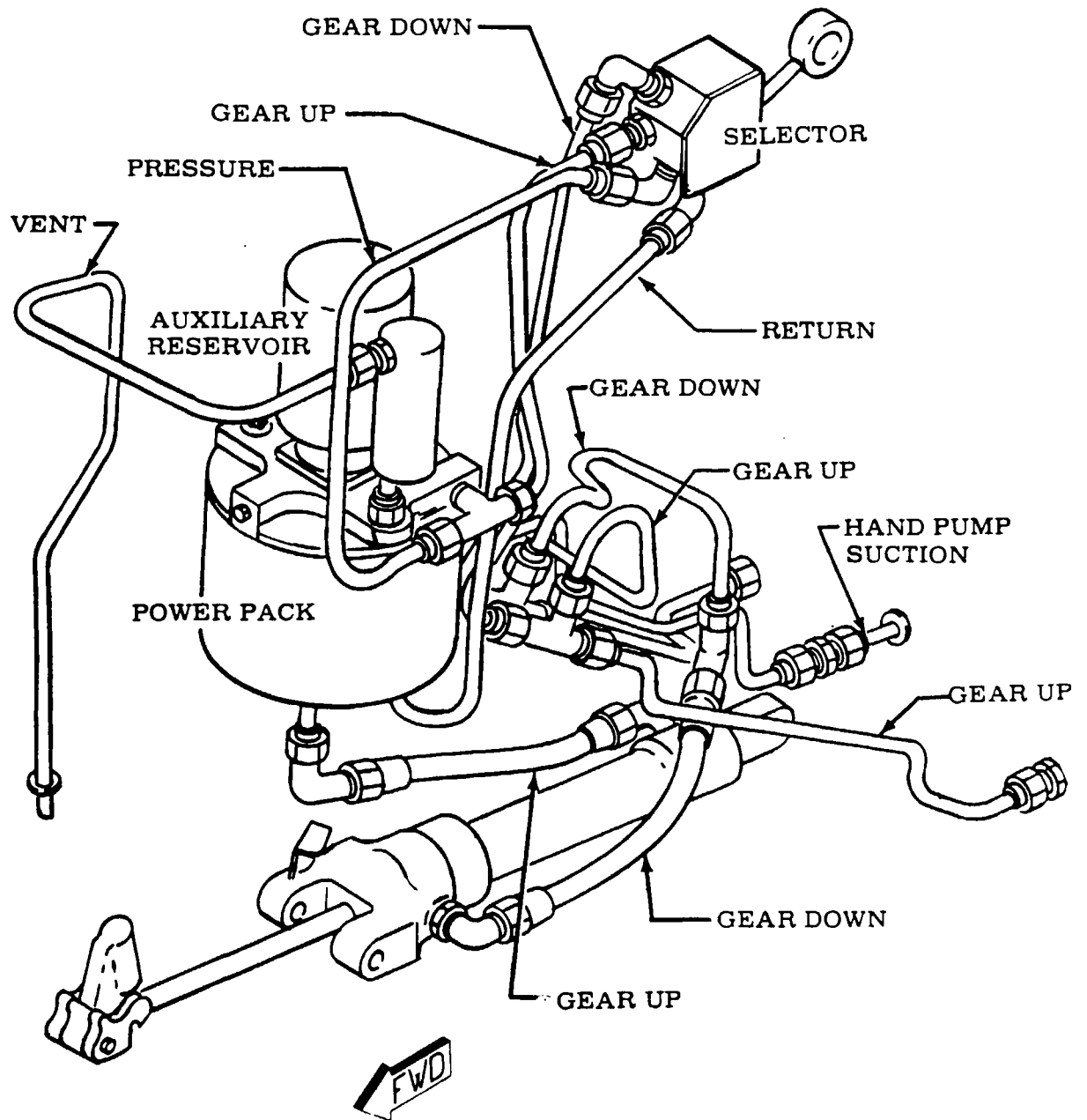


Figure 5-1. Landing Gear System Schematic (Sheet 3 of 3)

MODEL R182 AND TR182 SERVICE MANUAL



THRU 1978 MODELS

Figure 5-2. Landing Gear System Component Locator (Sheet 1 of 3)

MODEL R182 AND TR182 SERVICE MANUAL

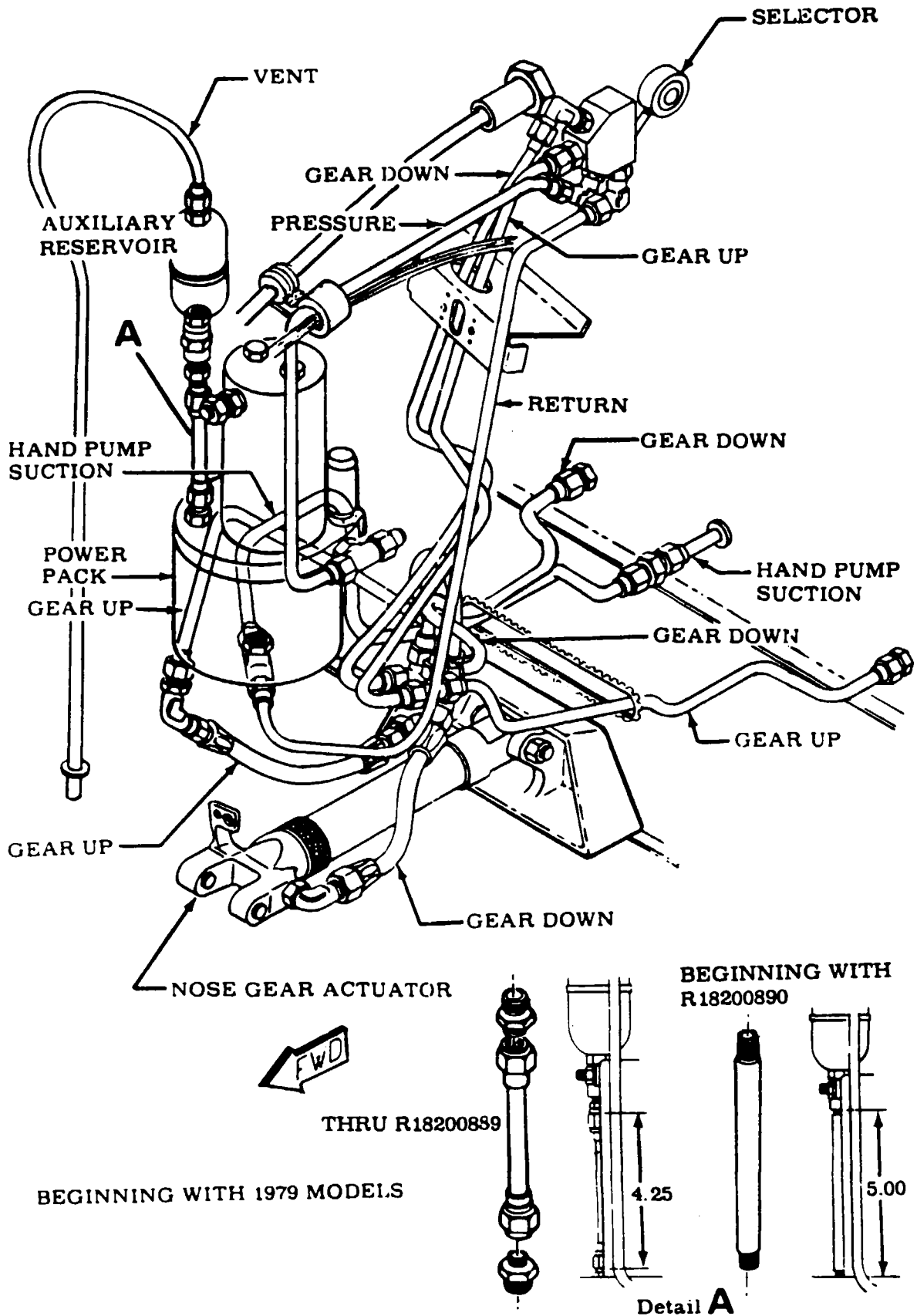


Figure 5-2. Landing Gear System Component Locator (Sheet 2 of 3)

MODEL R182 AND TR182 SERVICE MANUAL

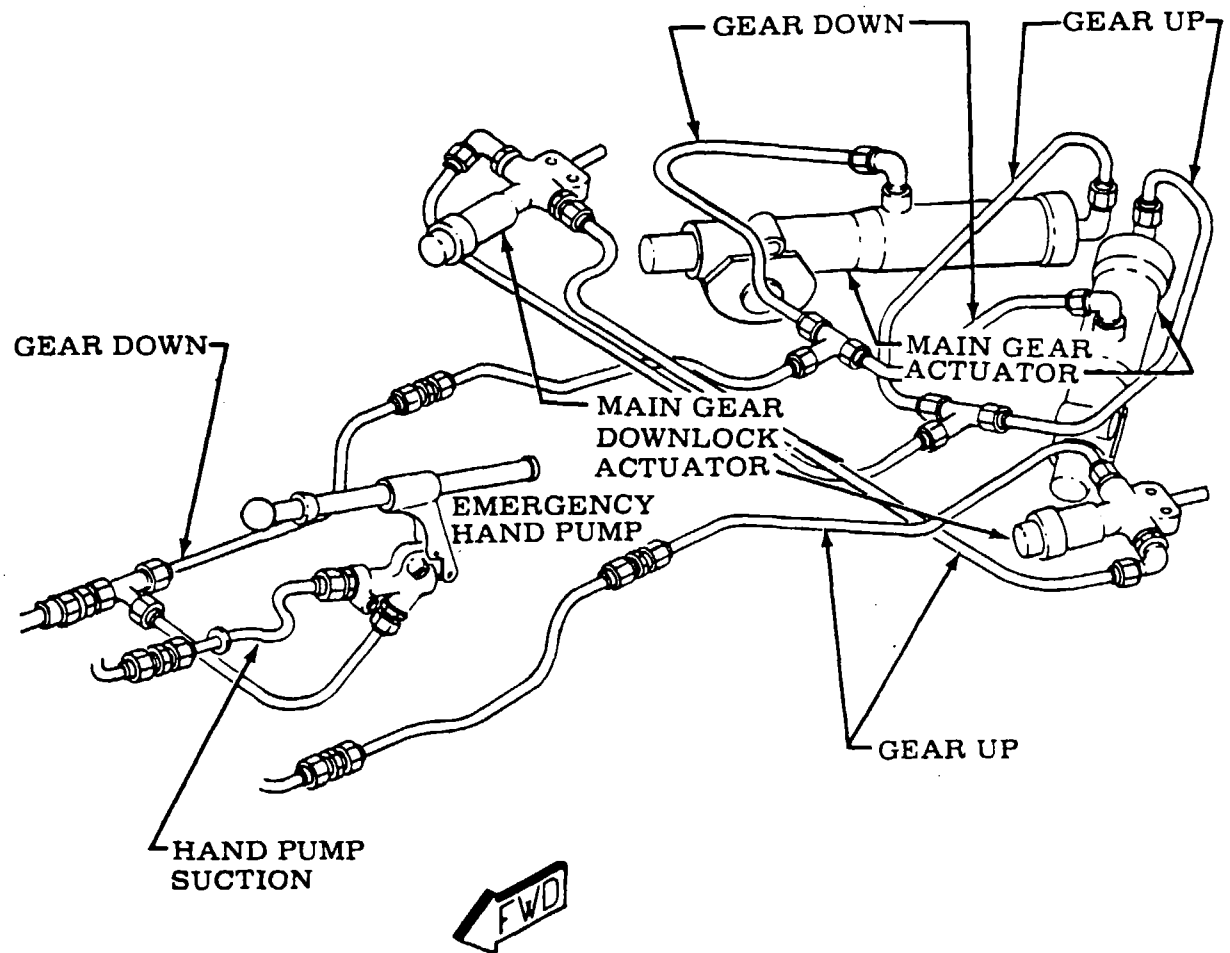


Figure 5-2. Landing Gear System Component Locator (Sheet 3 of 3)

MODEL R182 AND TR182 SERVICE MANUAL

- 5-4. **POWER PACK.** (See figure 5-3.)
- 5-5. **DESCRIPTION.** The power pack assembly, located in the cabin, forward of the center console, is a multi-purpose unit. It contains a hydraulic reservoir, valves, an electrically driven motor and the pump. An emergency hand pump, located between the pilot and copilot seats, uses reservoir fluid to permit extension of the landing gear.
- 5-6. **REMOVAL.** (See figure 5-2.)
- Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
 - Relieve pressure in system by moving gear position selector handle to up position and back to down position.

NOTE

As hydraulic lines are disconnected or removed, plug or cap all openings to prevent entry of foreign material into the lines or fittings.

CAUTION

The power pack reservoir must be drained to prevent any large amount of hydraulic fluid from spilling into the cabin area. To accomplish this, peel carpeting back from work area and spread a large absorbent drip cloth below power pack. Remove the cap from the tee fitting located on the side of the power pack body. Attach a flexible line to the tee fitting and place the other end of the line in a container of at least 1 gallon capacity. Pump fluid from reservoir using emergency hand pump. Remove line and replace cap.

NOTE

Ensure that the master switch is in the OFF position before disconnecting electrical leads.

CAUTION

A small diode assembly wire spans across the positive and negative posts on the motor. It is very important that this diode assembly, if removed or being replaced, be installed on the motor with the marking band of the diode toward the positive post. (See figure 5-3.)

- Pull control wheel all the way aft and secure in this position.
- Move left seat to full aft position and spread a drip cloth beneath the power pack.
- Disconnect ground wire and solenoid wire from top of motor. Disconnect two pressure switch wires at splice connector. Tag all wires so they may be installed in the same location.
- Disconnect vent line from top of reservoir. Disconnect pressure line from tee fitting on power pack body. Disconnect two return lines from tee fitting in bottom of reservoir. Cap or plug all openings and lines.



MODEL R182 AND TR182 SERVICE MANUAL

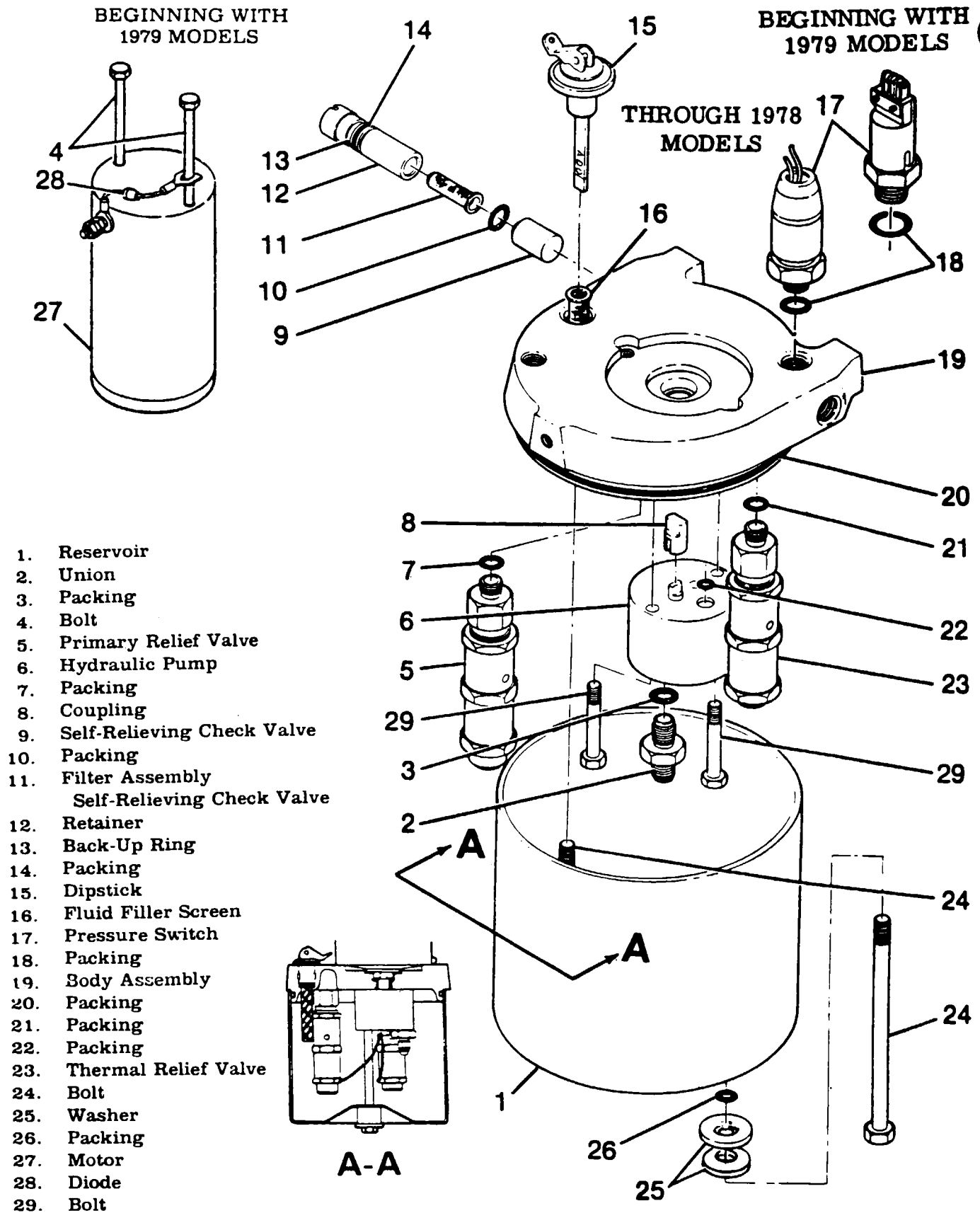


Figure 5-3. Hydraulic Power Pack Assembly (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

- g. Remove two bolts, attaching power pack to console assembly, from aft side of power pack body. Remove four screws, attaching forward power pack support to firewall, and remove power pack, with support attached. Work over left-hand rudder pedals.

5-7. DISASSEMBLY (THRU 1978 MODELS.) (See figure 5-3, sheet 1 of 2.)

- a. Remove retaining ring (42) and screen assembly (41) from reservoir assembly (40).
- b. Remove nut (45), washer (44) and packing (43) from attaching stud and remove reservoir (40) from power pack body (22).

NOTE

If reservoir will not disengage from power pack body, install a capped fitting in the pressure and return openings of the power pack assembly and attach air hose to vent fitting at top of reservoir assembly (4). Apply air pressure (not to exceed 15 psi, reservoir proof pressure), and remove reservoir. A strap clamp is not recommended, as clamp may damage reservoir.

- c. Remove packing (23) from power pack body (22).

NOTE

Disassembly of primary and thermal relief valve assemblies (38) & (39) is normally not required. Refer to paragraphs for specific instructions regarding relief valves. Before removal, tag each relief valve "primary" or "thermal" to insure correct installation. Refer to view C-C.

- d. Cut safety wire and remove relief valve assemblies and spacer tube (25) from power pack body (22).
- e. Remove reservoir assembly (4), union (3), packing (2) and screen assembly (1) from power pack body (22).
- f. Remove dipstick (13) and fluid filler screen (5) from power pack body (22).
- g. Remove retainer (12), filter assembly (9), packing (7), self-relieving check valve (6) and spacer (8) from power pack body (22).

NOTE

If spacer (8) and/or self-relieving check valve (6) will not fall from hole in power pack, place a drift or punch made of soft material into the pressure opening of the power pack body and tap spacer from power pack body.

- h. Remove pressure switch (19) and packing (20) from power pack body (22).
- i. Remove three bolts holding motor and pump assembly to body and remove motor (16), coupling (15), and pump assembly (14) from power pack body (22).

MODEL R182 AND TR182 SERVICE MANUAL

NOTE

The suction screen assembly (24) need not be removed from power pack body (22) for cleaning or inspection. However, if suction screen is damaged or permanently clogged, it should be removed as outlined in step "j" of this paragraph, observing the following caution.

CAUTION

Use extreme caution in removing suction screen assembly (24). Damage to screen assembly or clearance between screen assembly and power pack body (22) will cause slow gear retraction.

- j. Working through center hole in top of power pack body (22), use a drift or punch made of soft material to tap suction screen assembly (24) from power pack body (22).

5-8. INSPECTION. (THRU 1978 MODELS.) (See figure 5-3, sheet 1 of 2.)

- a. Wash all parts in cleaning solvent (Federal Specification P-S-611, or equivalent) and dry with filtered air.
- b. Inspect all threaded surfaces for serviceable condition and cleanliness.
- c. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear.
- d. Check to ensure that all screens are completely clean and undamaged. Refer to Note and Caution preceding step "j" of the preceding paragraph for important information regarding removal of suction screen assembly (24).

5-9. REASSEMBLY. (THRU 1978 MODELS.) (See figure 5-3, sheet 1 of 2.)

NOTE

Use all new packings and back up rings when reassembling power pack. Assemble parts, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow Corning DC-7. Do not use DC-7 on surfaces to be painted.

- a. If suction screen assembly (24) was removed, press a new suction screen assembly into power pack body (22), observing the following caution.

CAUTION

Use extreme caution when installing suction screen assembly (24) power pack into body (22). Damage to screen assembly or clearance between screen assembly and body will result in slow gear retraction. Refer to view A-A for correct pressed height dimension of suction screen assembly.

- b. Using new packings (17) and back-up rings (18), install pump assembly (14) into power pack body (22) being careful to match the painted alignment marks on pump and body.

MODEL R182 AND TR182 SERVICE MANUAL

- c. Install coupling (15) on pump shaft and position motor (16) on pump assembly being careful to ensure that coupling (15) is properly engaged, and painted alignment mark matches with those on pump and body.
- d. Install and tighten three bolts and washers connecting motor (16), pump assembly (14) and power pack body (22).
- e. Using new packing (20) install and tighten pressure switch (19) onto power pack body (22).
- f. Using new packings (7) and (10) and back-up ring (11), install and tighten spacer (8), self-relieving check valve (6) and retainer (12) into power pack body (22).
- g. Install and tighten relief valve assemblies (38) and (39) onto power pack body (22) with packing (21).
- h. Install fluid filler screen (5) and dipstick (13) into power pack body (22).
- i. Using new packing (2), install screen assembly (1), union (3) and reservoir assembly (4) onto power pack body (22).
- j. Slide spacer tube (25), then washer onto body center stud. Loop safety wire through jam-nuts on relief valves as shown, then tie off to spacer tube (25). Refer to view AA.
- k. Install screen assembly (41) and retaining ring (42) into reservoir (40).

CAUTION

It is very important that the relief valve safety wire does not get between spacer tube (25) and power pack body (22) during installation of reservoir (40). Refer to view A-A.

- 1. Using new packings (23) & (43) install and tighten reservoir (40), washer (44) and nut (45) onto power pack body (22).

5-10. DISASSEMBLY. (Beginning with 1979 MODELS.) (See figure 5-3, sheet 2 of 2.)

- a. Remove bolts (24), washers (25) and packing (26) from reservoir (1).
- b. Remove reservoir (1) from body assembly (19).

NOTE

If reservoir will not disengage from body, install a capped fitting in the pressure and return openings of the power pack assembly and attach an air hose to vent fitting at top of body assembly (19). Apply air pressure (not to exceed 15 psi, reservoir proof pressure), and remove reservoir. A strap clamp is not recommended as clamp may damage reservoir.

- c. Remove packing (20) from body assembly (19).

NOTE

Disassembly of primary and thermal relief valves (5) and (23) is normally not required. Refer to applicable paragraphs for specific instructions regarding relief valves. Before removal, tag each relief valve (primary) or (thermal) to ensure correct reinstallation.

- d. Cut safety wire and remove primary and thermal relief valve assemblies (5) and (23) from body assembly (19). Remove packings (7) and (21) from relief valves.
- e. Remove dipstick (15) and screen (16) from body assembly (19).

MODEL R182 AND TR182 SERVICE MANUAL

- f. Remove retainer (12), filter assembly self-relieving check valve (11), back-up ring (13), packing (14), packing (10) and self-relieving check valve (9) from body assembly (19).

NOTE

If self-relieving check valve (9) will not fall from hole in body assembly, place a drift or punch made of soft material into the pressure opening of body assembly and tap spacer from body.

- g. Remove pressure switch (17) and packing (18) from body assembly (19).
 - h. Remove bolts (29) attaching hydraulic pump (6) to body assembly (19), and remove pump and coupling (8) from body assembly. Remove union (2) from pump, and remove packings (3) and (22).
 - * i. Cut safety wire and remove bolts (29) attaching hydraulic pump (6) to body assembly (19), remove pump and coupling (8) from body assembly, and remove packing (22).
 - j. Cut safety wire and remove bolts (4) from motor (27); remove motor from body assembly (19).
- 5-11. INSPECTION. (Beginning with 1979 MODELS.) (See figure 5-3, sheet 2 of 2.)
- a. Wash all parts in cleaning solvent (Federal Specification P-S-611, or equivalent) and dry with filtered air.
 - b. Inspect all threaded surfaces for serviceable condition and cleanliness.
 - c. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear.
 - d. Clean to ensure that all screens and filters are completely clean and undamaged.
- 5-12. REASSEMBLY. (Beginning with 1979 MODELS.) (See figure 5-3, sheet 2 of 2.)

NOTE

Use all new packings and back-up rings when reassembling power pack. Assemble parts, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow Corning DC-7. Do not use DC-7 on surfaces to be painted.

- a. Using new packings (22), install hydraulic pump (6) and coupling (8) into body assembly (19) with bolts (29). Install union (2) and packing (3) in pump. Torque bolts (29) evenly to 30 pound-inches.
- * b. Using new packing (22), install hydraulic pump (6) and coupling (8) into body assembly (19) with bolts (29). Torque bolts (29) evenly to 30 pound-inches and safety-wire bolts.
- c. Install motor (27) on top of body assembly (19) after aligning coupling (8) to match mating connection in motor (27). Secure motor to body with bolts. Safety-wire bolts.

MODEL R182 AND TR182 SERVICE MANUAL

- d. Install new packing (18), install and tighten pressure switch (17) onto body assembly (19).
- e. Using new back-up ring (13) and packings (14) and (10), install and tighten self-relieving check valve (9), filter assembly self-relieving check valve (11), and retainer (12) into body (19).
- f. Install primary and thermal relief valve assemblies (5) and (23), along with packings (7) and (21) onto body assembly (19). Safety-wire relief valves as shown in View A-A.

CAUTION

Ensure that relief valves are installed in their correct location.

- g. Install fluid filler screen (16) and dipstick (15) into body assembly (19).

● SERIAL R182 R18200001 THRU R18201816
TR182 R18200584 THRU R18201816

* SERIAL R182 & TR182 R18201817 & ON

MODEL R182 AND TR182 SERVICE MANUAL

- h. Using new packing (20), washers (25), and packing (26), install and tighten reservoir (1) onto body assembly (19). Torque bolts (24) evenly to 30-35 inch-pounds.

5-13. INSTALLATION.

- a. Place power pack, with forward support attached, in aircraft. Attach forward support to firewall with four screws.
- b. Attach power pack to center console with two bolts at aft side of power pack.

NOTE

Ensure that master switch is in OFF position before connecting electrical leads to power pack assembly.

CAUTION

A small diode assembly wire spans across the positive and negative posts on the motor. It is very important that this diode assembly, if removed or being replaced, be installed on the motor with the marking band of the diode toward the positive post. Refer to view B-B on sheet 1.

- c. Ensure that diode assembly wire is correctly installed on motor and connect ground wire and solenoid wire to motor.
- d. Connect two pressure switch wires at splice connectors, being careful to match tags on wires.
- e. Remove caps or plugs, and connect two return lines to tee fitting at bottom of reservoir. Connect pressure line to tee fitting on left-hand side of power pack body. Connect vent line to fitting at top of reservoir.

5-14. PRIMARY AND THERMAL RELIEF VALVE ASSEMBLIES. (See figure 5-3.)

5-15. DESCRIPTION. The primary relief valve, located between the check valve and pump, serves to limit the amount of pressure which can be generated by the pump. The thermal relief valve, located on the system side of the check valve, serves to limit the system pressure. System pressure can increase due to thermal expansion. Both valves are identical, the only difference being the pressure setting.

5-16. REMOVAL. (See figure 5-3, sheet 2 of 2.)

- a. Cut safety wire and remove relief valve assemblies from body assembly (19).

5-17. DISASSEMBLY. (See figure 5-3, sheet 1 of 2.)

NOTE

Relief valve assemblies are preset by the factory and normally will not require disassembly. Refer to note following step (g) in paragraph 5-19 to determine if disassembly or adjustment is necessary.

MODEL R182 AND TR182 SERVICE MANUAL

- a. Remove jam nut (32) and adjustment screw (37) from housing (33).
 - b. Remove spring (36), guide (35), balls (30) and piston (34) from housing (33).
 - c. Loosen jam nut (31) and remove adapter (26) from housing (33).
 - d. Remove poppet (28) and orifice (27) from adapter (26).
- 5-18. **INSPECTION.** (See figure 5-3, sheet 1 of 2.)
- a. Wash all parts in cleaning solvent (Federal Specification P-S-611 or equivalent) and dry with filtered air.
 - b. Inspect all threaded surfaces for serviceable condition and cleanliness.
 - c. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear.
- 5-19. **ASSEMBLY AND ADJUSTMENT.** (See figure 5-3, sheet 1 of 2.)

NOTE

Use all new packings and back up rings during reassembly. Assemble parts, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow Corning DC-7.

- a. Install orifice (27) and poppet (28) into adapter (26). (New packing (29) must be installed on poppet.)
- b. Install jam nut (31) and housing (33) on adapter (26).
- c. Tighten adapter (26) into housing (33) and torque to 100-150 lb-in.
- d. Tighten jam nut (31) against housing (33) and torque to 100-150 lb-in.
- e. Install one ball (30) into housing (33), so that it rests on poppet (28). Install piston (34) into housing (33), then install remaining ball (30) into end of piston (34).
- f. Insert guide (35) and spring (36) into housing (33) making sure that balls (30) and piston (34) remain in correct position.
- g. Turn adjustment screw (37) into housing (33) until it just contacts spring (36), then turn in one additional turn. Start jam nut (32) onto adjustment screw (37) and snug against housing (33).

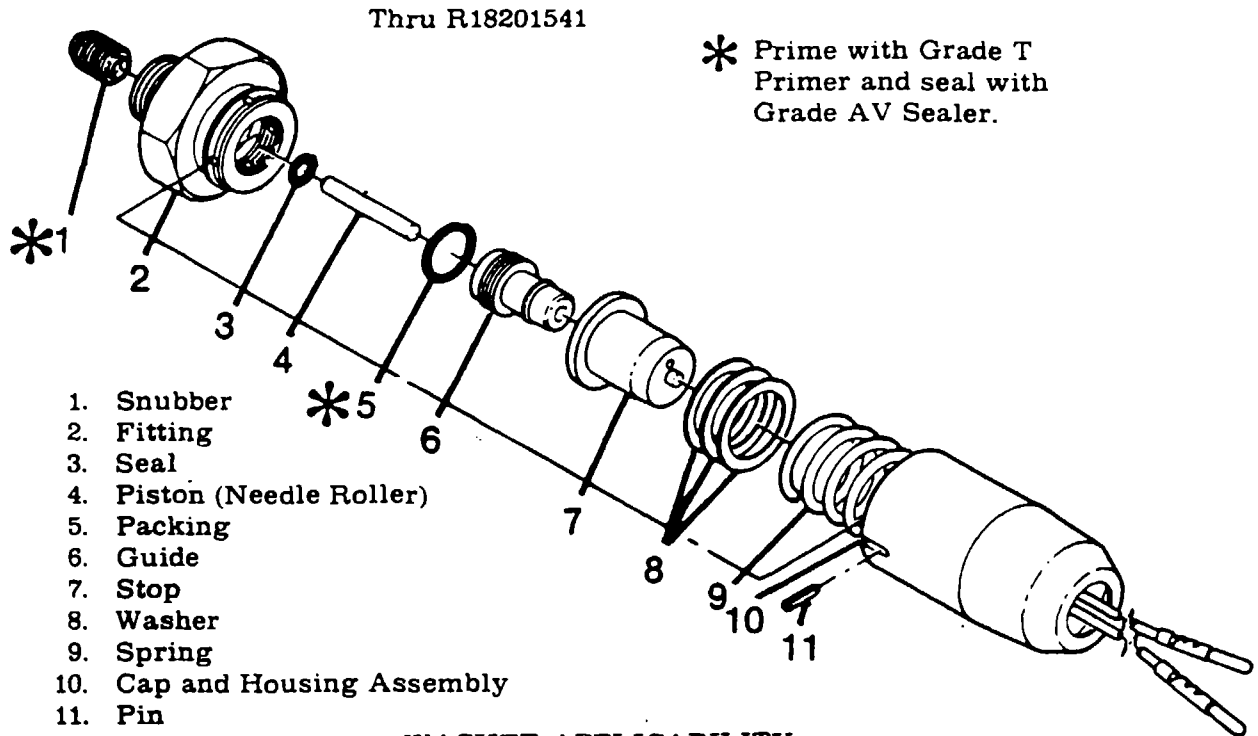
THERMAL RELIEF VALVE

Open 2250 PSI Maximum
Reset 1500 PSI Minimum
(no leakage)

PRIMARY RELIEF VALVE

Open 1800 +00 -50 PSI
Reset 1300 PSI Minimum
(no leakage)

MODEL R182 AND TR182 SERVICE MANUAL



WASHER APPLICABILITY			
WASHER PART NO.	THICKNESS	MATERIAL	EFFECT IN PRESSURE (PSI)
S1358-3	.014	"MYLAR" POLYESTER FILM (TYPE A)	55
S1358-5	.005	"MYLAR" POLYESTER FILM (TYPE A)	20

Figure 5-4. Pressure Switch (Sheet 1 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

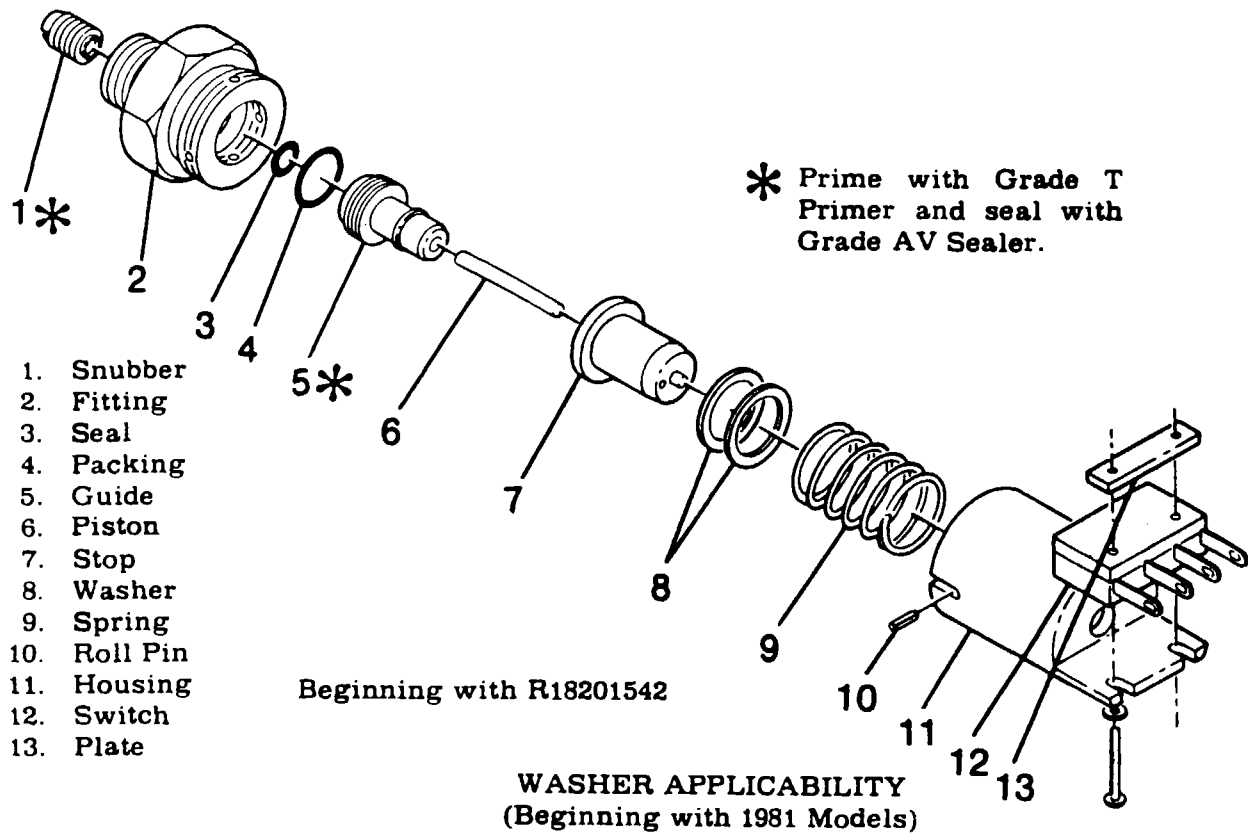


Figure 5-4 . Pressure Switch (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

NOTE

To determine if disassembly or adjustment is necessary, the relief valves can be bench-tested. The thermal relief valve can be tested with a hand pump, connected to a hydraulic reservoir, a pressure gage with 2500 psi capacity and a hose with appropriate fittings, connected from the hand pump to the fitting on the thermal relief valve. The thermal relief valve shall be set not to open in excess of 2250 psi. If adjustment of thermal relief valve is necessary, loosen jam-nut (32) and turn adjustment screw (37) in to increase pressure; back adjustment screw out to decrease pressure. Tighten jam-nut (32) against housing (33) and torque jam-nut from 100 to 150 lb. in. Recheck pressure adjustments. Testing the primary relief valve will require a hydraulic pump with a flow rate of 0.5 to 0.7 gal.-per-min., connected to a hydraulic reservoir, a pressure gage with 2500 psi capacity and a hose with appropriate fittings, connected from the hydraulic pump to the fitting on the primary relief valve. Adequate precautions should be taken to recover hydraulic fluid which will be expelled from the primary relief valve while under pressure. The primary relief valve shall be set to open at 1800, + 0, -50 psi. If adjustment of primary relief valve is necessary, loosen jam-nut (32) and turn adjustment screw (37) in to increase pressure; back adjustment screw out to decrease pressure. Tighten jam-nut (32) against housing (33) and torque jam-nut from 100 to 150 lb. in. Recheck pressure adjustments.

5-20. INSTALLATION. (See figure 5-3.)

- a. Install primary and thermal relief valve assemblies along with packings onto body assembly

CAUTION

Ensure that primary and thermal relief valves are installed in their correct locations and that valves are properly safetied. Refer to view A-A in appropriate illustration. Make sure applicable illustration is used for power pack being installed

5-21. PRESSURE SWITCH.

- 5-22. DESCRIPTION. A pressure switch is located in the cover of the power pack. The switch opens the electrical circuit to the pump solenoid when the pressure in the system increases to approximately 1500 psi. The pressure switch will continue to hold the electrical circuit open until pressure in the system drops to approximately 1000 psi, at which time the pump will again operate to build up pressure to approximately 1500 psi, regardless of gear selector handle position.

MODEL R182 AND TR182 SERVICE MANUAL

5-23. REMOVAL AND INSTALLATION.

- a. Move left seat to full aft position and spread a drip cloth beneath the power pack.
- b. Assure that master switch is off, and disconnect wires from pressure switch.
- c. Disconnect pressure switch from power pack.
- d. Reverse the preceding steps to install pressure switch.

5-24. DISASSEMBLY. (Thru R18201541.) (See figure 5-4, sheet 1 of 2.)

- a. Remove pin (11).
- b. Unscrew cap and housing assembly (10) from fitting (2).
- c. Remove spring (9).
- d. Remove washers (8) from flange of stop (7).

NOTE

Chart in figure 5-4, sheet 1 of 2, lists washers (8) by part number, thickness and effect on operating pressure (psi).

- e. Unscrew guide (6) from fitting (2).

CAUTION

Do not damage lip of guide (6). Guide threads and threads of fitting (2) are primed with Loctite Grade T Primer and sealed with Loctite Grade AV Sealer.

- f. Remove piston (4).
- g. Remove seal (3) and packing (5).
- h. Remove snubber (1) from fitting (2).

CAUTION

Threads of snubber (1) and fitting (2) are primed with Loctite Grade T Primer and sealed with Loctite Grade AV Sealer.

5-25. INSPECTION AND REPAIR. (Thru R18201541.) (See figure 5-4, sheet 1 of 2.)

- a. Clean sealant from threads of snubber (1), fitting (2) and guide (6) with wire brush.
- b. Clean all parts with cleaning solvent (Federal Specification P-S-661, or equivalent) and dry thoroughly.
- c. Discard seal (3) and packing (5) and replace with new parts.
- d. Inspect all pressure switch parts for scratches, scores, chips, cracks and indications of wear.
- e. All damaged parts shall be replaced with new parts.

NOTE

Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in hydraulic systems. Carefulness and proper handling of parts to prevent damage must be observed at all times.

- f. Snubber (1) can be cleaned with solvent, then blown out with high pressure compressed air.
- g. Assure that .062 vent hole is open in stop (7).

MODEL R182 AND TR182 SERVICE MANUAL

5-26. REASSEMBLY. (Thru R18201541.) (See figure 5-4, sheet 1 of 2.)

- a. Prime threads of snubber (1) and internal threads of fitting (2) with Loctite Grade T Primer and apply Loctite Grade AV Sealer to threads of snubber (1). Install snubber (1) into fitting (2) and tighten with slotted screwdriver.

NOTE

Lubricate new seals and packing, guide (excluding threads), piston, stop and spring with Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7. Do not use DC-7 on surfaces to be painted.

- b. Install packing (5) in fitting (2).
- c. Lubricate packing seal (3) and install in guide (6)
- d. Lubricate guide (6) (excluding threads). Prime threads of guide and internal threads of fitting (2) with Loctite Grade T Primer and apply Loctite Grade AV Sealer to threads of guide (6). Install guide (6) into fitting (2) and finger-tighten.

NOTE

It is possible to assemble, fill and test the pressure switch in the aircraft. This can be accomplished by the installation of test gage in the test fitting located on the side of the power pack and pumping the emergency hand pump. Master switch MUST be OFF and selector handle in down position.

- e. After installing test fitting and assuring that sealant in fitting (2) is dry, screw fitting assembly into power pack body.
- f. Pump emergency hand pump just enough for fluid to seep from top of guide (6). (Refer to Section 2.)
- g. Lubricate piston (4) and insert piston (4) into hole in guide (6).
- h. Lubricate stop (7) and install over guide (6).
- i. Install exact number and thickness of washers removed.

NOTE

If same number of washers (8) are installed as were removed, pressure should not require readjustment. If readjustment is necessary, a chart of washer part numbers, thickness and effect in pressure adjustment is shown in figure 5-4, sheet 1 of 2.

- j. Lubricate spring (9) and install over washers (8).
- k. Screw cap and housing assembly (10) on fitting (2).
- l. Check fluid level in power pack reservoir. (Refer to Section 2 of this manual.)

MODEL R182 AND TR182 SERVICE MANUAL

5-27. ADJUSTMENT. (Thru R18201541.) (See figure 5-4, sheet 1 of 2.)

- a. Jack aircraft.
- b. Screw cap and housing assembly (10) on fitting (2) enough to bottom piston (4) out in stop (7).
- c. Turn cap and piston assembly (10) back from full thread engagement one turn, plus 0, minus one-fourth turn to locate hole in fitting (2) in slot in skirt of cap and housing assembly (10).
- d. Attach electrical connections to pressure switch and attach external power source.
- e. Turn on master switch.
- f. Pump hand pump to obtain 1500 psi on test gage.
- g. The switch should open the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 psi.
- h. If switch opens electrical circuit to solenoid prematurely, disassemble pressure switch down to washers (8) and add washers (8) shims as necessary to obtain desired pressure; repeat steps (b) and (c).

NOTE

The chart in the figure 5-4, sheet 1 of 2, lists washers by part number, thickness and the effect in psi each washer will have on switch operation.

If switch opens electrical circuit to solenoid later than 1500±50 psi, disassemble pressure switch down to washers (8) and remove washers (8) as necessary to obtain desired pressure; repeat steps (b) and (c).

- i. If switch opens electrical circuit to solenoid later than 1500±50 psi, disassemble pressure switch down to washers (8) and remove washers (8) as necessary to obtain desired pressure; repeat steps (b) and (c).
- j. After final pressure adjustment, install pin (11) in slot of cap and housing assembly (10).
- k. Turn off master switch.

5-28. DISASSEMBLY. (Beginning with R18201542.) (See figure 5-4, sheet 2 of 2.)

- a. Remove roll pin (10).
- b. Unscrew housing (11) from fitting (2).
- c. Remove spring (9).
- d. Remove washers (8) from flange of stop (7).

NOTE

Chart in figure 5-4, sheet 2 of 2, lists washers by part number, thickness and effect on operating pressure (psi).

- e. Unscrew guide (5) from fitting (2).

NOTE

Do not damage lip of guide (5). Guide threads and threads of fitting (2) are primed with Loctite Grade T Primer and sealed with Loctite Grade AV Sealer.

MODEL R182 AND TR182 SERVICE MANUAL

- f. Remove piston (6).
- g. Remove seal (3) and packing (4).
- h. Remove snubber (1) from fitting (2).

NOTE

Threads of snubber (1) and fitting (2) are primed with Loctite Grade T Primer and sealed with Loctite Grade AV Sealer.

- 5-29. INSPECTION AND REPAIR. (Beginning with R18201542.) (See figure 5-4, sheet 2 of 2.)
- a. Clean sealant from threads of snubber (1), fitting (2) and guide (5) with wire brush.
 - b. Clean all parts with cleaning solvent (Federal Specification P-S-661, or equivalent, and dry thoroughly.
 - c. Discard seal (3) and packing (4), and replace with new parts.
 - d. Inspect all pressure switch parts for scratches, scores, chips, cracks and indications of wear.
 - e. All damaged parts will be replaced with new parts.

NOTE

Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in hydraulic systems. Carefulness and proper handling of parts to prevent damage must be observed at all times.

- f. Snubber (1) can be cleaned with solvent, then blown out with high pressure compressed air.
 - g. Assure that 0.062-inch vent hole is open in stop (7).
- 5-30. REASSEMBLY. (Beginning with R18201542.) (See figure 5-4, sheet 2 of 2.)
- a. Prime threads of snubber (1) and internal threads of fitting (2) with Loctite Grade T Primer and apply Grade AV Sealer to threads of snubber (1). Install snubber (1) into fitting (2) and tighten with slotted screwdriver.

NOTE

Lubricate new seals and packing, guide (excluding threads), piston, stop and spring with Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow Corning DC-7. Do not use DC-7 on surfaces to be painted.

- b. Install packing (4) in fitting (2).
- c. Lubricate seal (3) and install in guide (5).
- d. Lubricate guide (5) (excluding threads). Prime threads of guide and internal threads of fitting (2) with Loctite Grade T Primer and apply Loctite Grade AV Sealer to threads of guide (5). Install guide (5) into fitting (2), and finger-tighten.

MODEL R182 AND TR182 SERVICE MANUAL

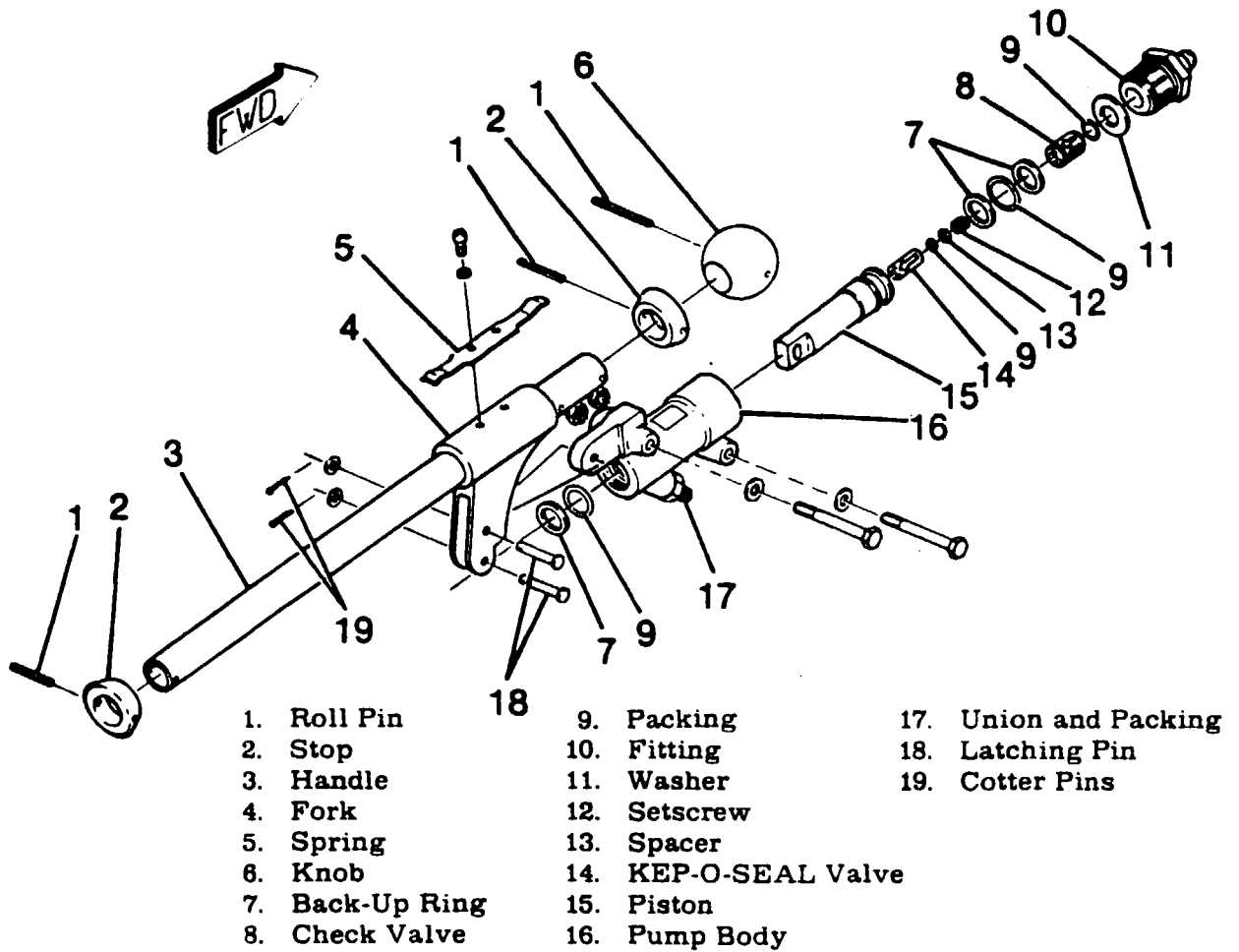


Figure 5-5. Emergency Hand Pump Disassembly

MODEL R182 & TR182 SERIES SERVICE MANUAL

NOTE

It is possible to assemble, fill and test the pressure switch in the aircraft. This can be accomplished by the installation of a test gage in the capped port of the tee fitting on the right-hand side of the power pack and pumping the emergency hand pump, Master switch MUST be OFF and gear selector handle must be in DOWN position.

- e. After installing test fitting and assuring that sealant in fitting (2) is dry, screw fitting and assembly into power pack body.
- f. Pump emergency hand pump just enough for fluid to seep from top of guide (5). (Refer to Section 2 of this manual.)
- g. Lubricate and insert piston (6) into hole in guide (5).
- h. Lubricate stop (7) and install over guide (5).
- i. Install exact number and thickness of washers (8) removed.

NOTE

If same number of washers (8) are installed as were removed, pressure should not require readjustment. If readjustment is necessary, a chart of washer part numbers, thickness and effect in pressure adjustment is shown in the figure 5-4, sheet 2 of 2.

- j. Lubricate spring (9) and install over washers (8).
- k. Screw housing (11) on fitting (2).
- l. Check fluid level in power pack reservoir. (Refer to Section 2 of this manual.)
- m. Refer to paragraph 5-31A for Inspection/Check of Pressure Switch.

5-31. ADJUSTMENT. (Beginning with R18201542.) (See figure 5-4, sheet 2 of 2.)

- a. Jack aircraft as outlined in Section 2 of this manual.
- b. Screw housing (11) on fitting (2), enough to bottom piston (6) out in stop (7).
- c. Turn housing (11) back from full thread engagement one turn, plus 0, minus one-fourth turn to locate hole in fitting (2) in slot in skirt of housing assembly (11).
- d. Attach electrical connections to pressure switch and attach external power source.
- e. Turn master switch ON.
- f. Pump emergency hand pump to obtain 1500 psi, ± 50 psi.
- g. The switch should open the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 psi, ± 50 psi.
- h. If switch opens electrical circuit prematurely, disassemble pressure switch down to washers (8) and add washers (8) as necessary to obtain desired pressure; repeat steps "b" and "c".
- i. If switch opens electrical circuit later than 1500 psi, ± 50 psi, disassemble pressure switch down to washers (8) and remove washers (8) as necessary to obtain desired pressure; repeat steps "b" and "c".
- j. After final pressure adjustment, install (10) in slot of housing (11).
- k. Turn master switch OFF.

NOTE

The chart in the figure 5-4, sheet 2 of 2, lists washers by part number, thickness and the effect in psi each washer will have on switch operation.

MODEL R182 & TR182 SERIES SERVICE MANUAL

5-31A. INSPECTION/CHECK OF POWERPACK

NOTE

Checks are to be performed with external power set at 28.5 volts.

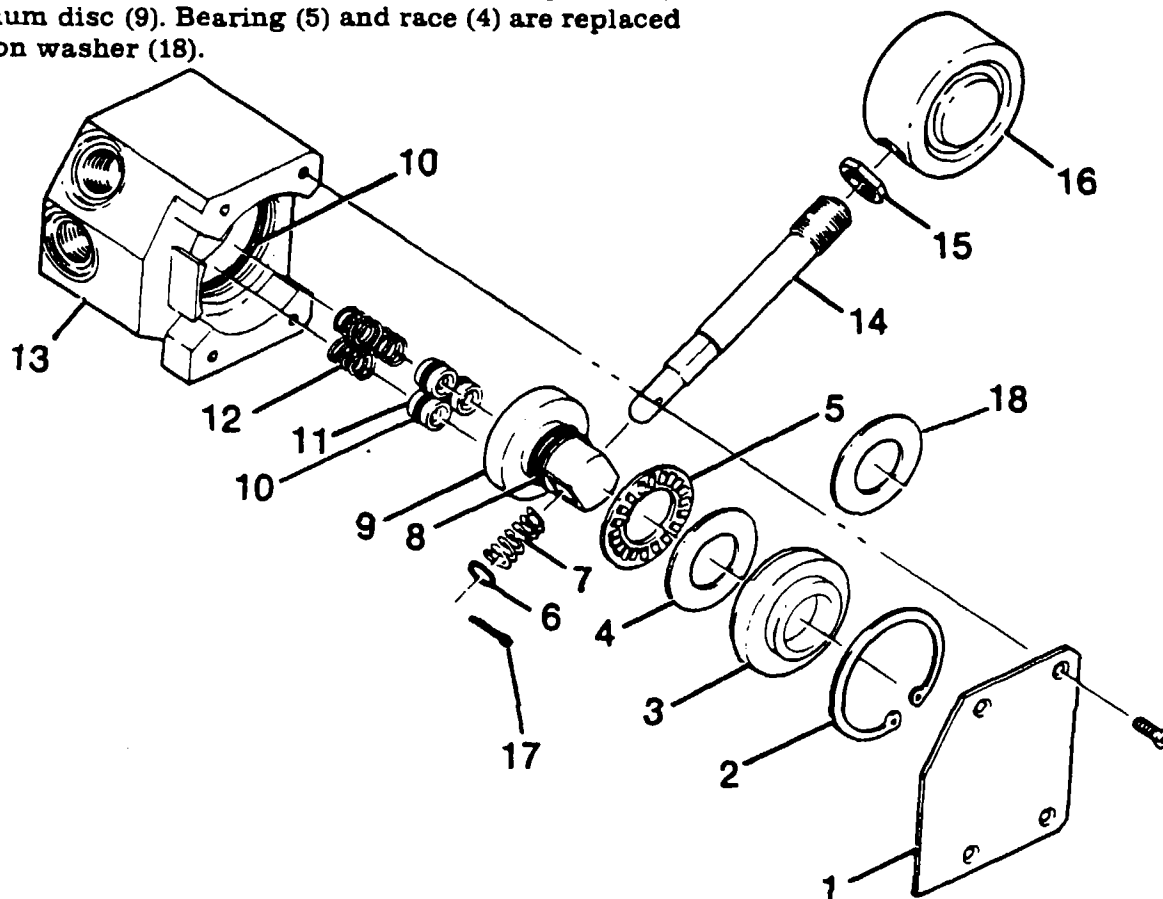
NOTE

The first three steps in the following inspections are typical.

- a. Inspection of Primary Relief Valve.
 1. Jack aircraft in accordance with the procedures in Section 2 of this manual.
 2. Install a pressure gage at tee fitting on the right side of powerpack.
 3. Disengage landing gear circuit breaker.
 4. Select landing gear handle to the down position.
 5. Install an 18 gauge jumper wire on bus side of primary relief valve contactor to the small terminal on pump motor contactor.
 6. Engage landing gear circuit breaker.
 7. Verify powerpack operates.
 8. Monitor pressure; primary relief valve should open at 1800 psi, ± 50 psi.
 9. Disengage landing gear circuit breaker.
 10. Remove jumper wire.
 11. Remove pressure from system.
 12. Remove pressure gage.
 13. Engage landing gear circuit breaker.
 14. Return system to original configuration.
- b. Inspection of Thermal Relief Valve.
 1. Jack aircraft in accordance with the procedures in Section 2 of this manual.
 2. Install a pressure gage at tee fitting on the right side of powerpack.
 3. Disengage landing gear circuit breaker.
 4. Select landing gear handle to the down position.
 5. Extend emergency gear pump handle.
 6. Pump emergency handle.
 7. Monitor pressure; thermal relief valve should open at 2200 psi, ± 50 psi.
 8. Remove pressure from system.
 9. Remove pressure gage.
 10. Engage landing gear circuit breaker.
 11. Return system to original configuration.
- c. Inspection of the Pressure Switch.
 1. Jack aircraft in accordance with the procedures in Section 2 of this manual.
 2. Install a pressure gage at tee fitting on the right side of powerpack.
 3. Disengage landing gear circuit breaker.
 4. Select landing gear up and down several times to relieve pressure in landing gear system.
 5. Select landing gear handle to the up position.
 6. Engage the landing gear circuit breaker.
 7. AFTER cycle is complete, check pressure. Pressure should be 1500 psi.

MODEL R182 AND TR182 SERVICE MANUAL

Beginning with R18201468, steel disc (9) is replaced by aluminum disc (9). Bearing (5) and race (4) are replaced by teflon washer (18).



- | | |
|-------------------|-------------------|
| 1. Cover | 10. Packing |
| 2. Retaining Ring | 11. Pucks |
| 3. Cap | 12. Spring |
| 4. Bearing Race | 13. Body Assembly |
| 5. Thrust Bearing | 14. Rod |
| 6. Washer | 15. Nut |
| 7. Spring | 16. Knob |
| 8. Packing | 17. Cotter Pin |
| 9. Disc | 18. Teflon Washer |

Figure 5-6. Landing Gear Position Selector Valve

MODEL R182 AND TR182 SERVICE MANUAL

LOOKING INBOARD AND FORWARD
FROM LEFT SIDE OF FIREWALL

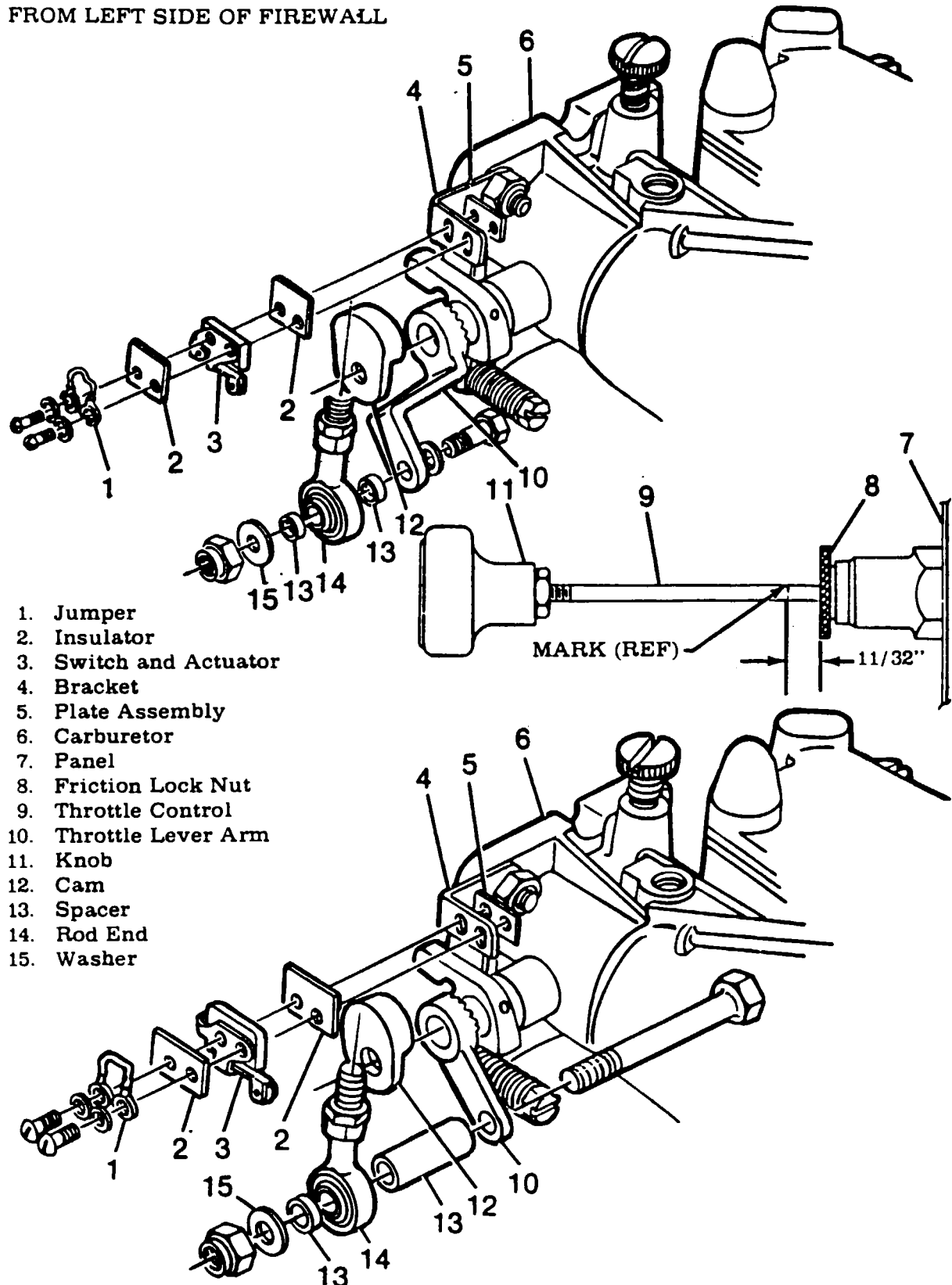


Figure 5-7. Rigging Throttle-Operated Gear Warning Horn Microswitch

MODEL R182 & TR182 SERIES SERVICE MANUAL

8. Select landing gear handle to the down position.
9. AFTER cycle is complete, check pressure. Pressure should be 1500 psi.
10. Remove pressure from system.
11. Remove pressure gage.
12. Return system to original configuration.

5-32. HYDRAULIC SYSTEM LEAK CHECK.

- a. Jack aircraft in accordance with the procedures in Section 2 of this manual.
- b. To relieve system pressure pull the GEAR PUMP circuit breaker to OFF and move the gear selector handle to UP and back to the DOWN position.
- c. Install a 0-2000 PSI gage at the service tee on the right-hand side of the power pack.
- d. Push the GEAR PUMP circuit breaker to the ON position, turn ON the master switch and move the gear selector handle to the UP position.
- e. Monitor pressure gage after retraction cycle is complete for pressure bleed down.
- f. If bleed down occurs, it can be an internal or external leak anywhere in the system.

NOTE

When any line is disconnected be prepared for fluid leakage.

- g. Disconnect the return line from the gear selector. If fluid comes from the selector, the internal leak is in the system.
- h. If no leak-by is found, it can be assumed there is an internal leak in the powerpack. If leak is found, proceed to step "j". Reconnect the return line.
- i. Powerpack internal leakage can only be attributed to a bad thermal relief valve, check valve or check valve O-ring. There isn't any way to isolate part that is leaking, so first replace the check valve O-ring, check valve and then thermal relief valve. Repeat leak test after replacement of each part to ensure leak correction.
- j. Remove gear DOWN line from the selector. If fluid comes from the line, one or more of the gear actuators is leaking. To locate the leaking actuator, disconnect the return line from each actuator, the leaking actuator will have fluid draining from the actuator port. Following the appropriate paragraphs in this section remove, overhaul and reinstall the actuator.
- k. Reconnect gear down line to the selector.
- l. Recheck all lines that were disconnected for security.
- m. Lower the landing gear. Following the procedures in step "b", relieve the system pressure.
- n. Remove the pressure gage from the service tee.
- o. In accordance with the procedures in Section 2 of this manual, replenish the power pack reservoir with MIL-H-5606 hydraulic fluid and bleed the system.
- p. Remove aircraft from jacks.

MODEL R182 AND TR182 SERVICE MANUAL

- 5-33. EMERGENCY HAND PUMP. (See figure 5-5.)
- 5-34. DESCRIPTION. The emergency hand pump is mounted below the floor between the pilot and copilot seats. The pump handle extends into the cabin and is enclosed by a hinged cover. The pump supplies a flow of pressurized hydraulic fluid to extend the landing gear in the event of normal hydraulic pump failure.
- 5-35. REMOVAL AND INSTALLATION.
- Remove seats as required for access.
 - Remove screws attaching cover over hand pump and remove cover.
 - Peel back carpet as required for access to pump mounting bolts.
 - Wedge cloth under hydraulic fittings to absorb fluid, then disconnect the two hydraulic lines and plug or cap open fittings to prevent entry of foreign material.
 - Remove two bolts, washers and nuts securing pump to mounting bracket.
 - Work pump from aircraft.
 - Install hand pump by reversing the preceding steps, bleeding lines and pump as lines are connected.
 - Fill reservoir as required.
- 5-36. DISASSEMBLY. (See figure 5-5.)

NOTE

After emergency hand pump has been removed from aircraft and ports are capped or plugged, spray with cleaning solvent (Federal Specification P-S-611, or equivalent) to remove all accumulated dust or dirt. Dry with filtered compressed air.

- Remove handle (3) by removing latching pins (18) after removing cotter pins (19).
- Remove fitting (10) from pump body (16).
- Push piston (15) from pump body (16).
- Remove retaining ring from end fitting (10) to remove valve assemblies (8) and (14).
- Remove and discard all packings and back-up rings.

MODEL R182 AND TR182 SERVICE MANUAL

5-37. INSPECTION AND REPAIR.

- a. Inspect seating surfaces of valves.
- b. Inspect piston for scores, burrs or scratches which could cut packings. This is a major cause of external and internal leakage. The piston may be polished with extremely fine emery paper. Never use paper coarser than No. 600 to remove scratches or burns. If defects do not polish out, replace piston.

NOTE

Lubricate new seals and packings with Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7. Do not use DC-7 on surfaces to be painted.

- 5-38. REASSEMBLY. (See figure 5-5.) Assemble the emergency hand pump, using the figure as a guide. Also, for detailed instructions, reverse the procedures outlined in paragraph 5-35. During assembly prime parts with Primer T. Fill first three threads of fitting (10) with Loctite Hydraulic Sealant. Install fitting in pump body (16), and allow parts to set up for one hour at 72°F. Pump should be held vertically, with fitting (10) at top during setting up of sealant.

- 5-39. LANDING GEAR SELECTOR VALVE. (See figure 5-6.)

- 5-40. DESCRIPTION. A mechanical gear position selector valve is located in the switch panel. The pilot shuttles the valve mechanically when he changes gear handle position. The handle must be pulled out prior to selecting gear position. Moving the selector rod opens and closes ports in the valve, enabling fluid under pressure to flow to the various system components to retract or extend the landing gear.

- 5-41. REMOVAL AND INSTALLATION. (See figure 5-6.)

- a. Loosen nut (15) and remove knob (16).

CAUTION

As hydraulic lines are disconnected, fluid will leak. Precautions must be taken to prevent excessive leakage, such as spreading drip cloths under fittings and capping lines and fittings.

MODEL R182 AND TR182 SERVICE MANUAL

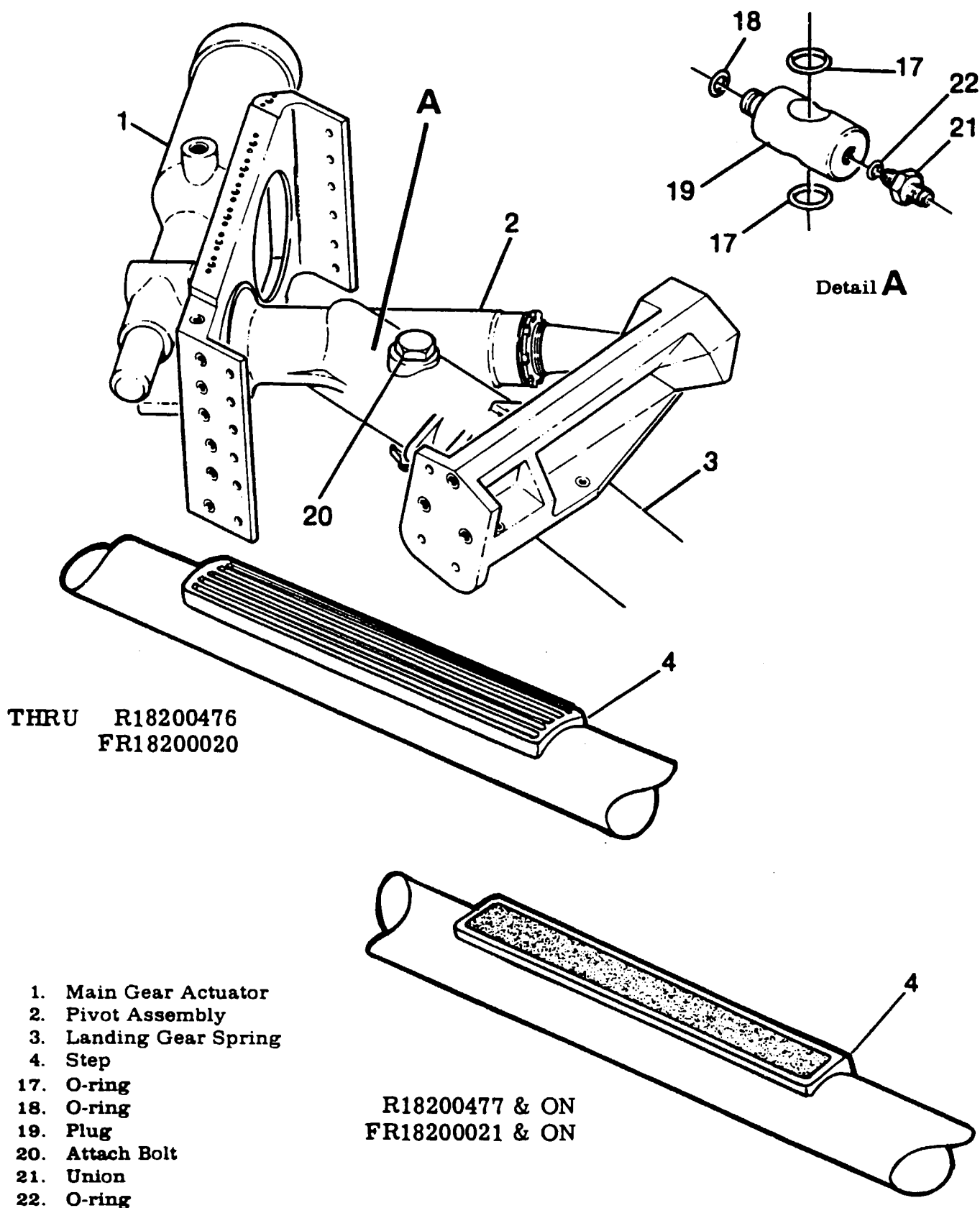


Figure 5-8. Main Landing Gear (Sheet 1 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

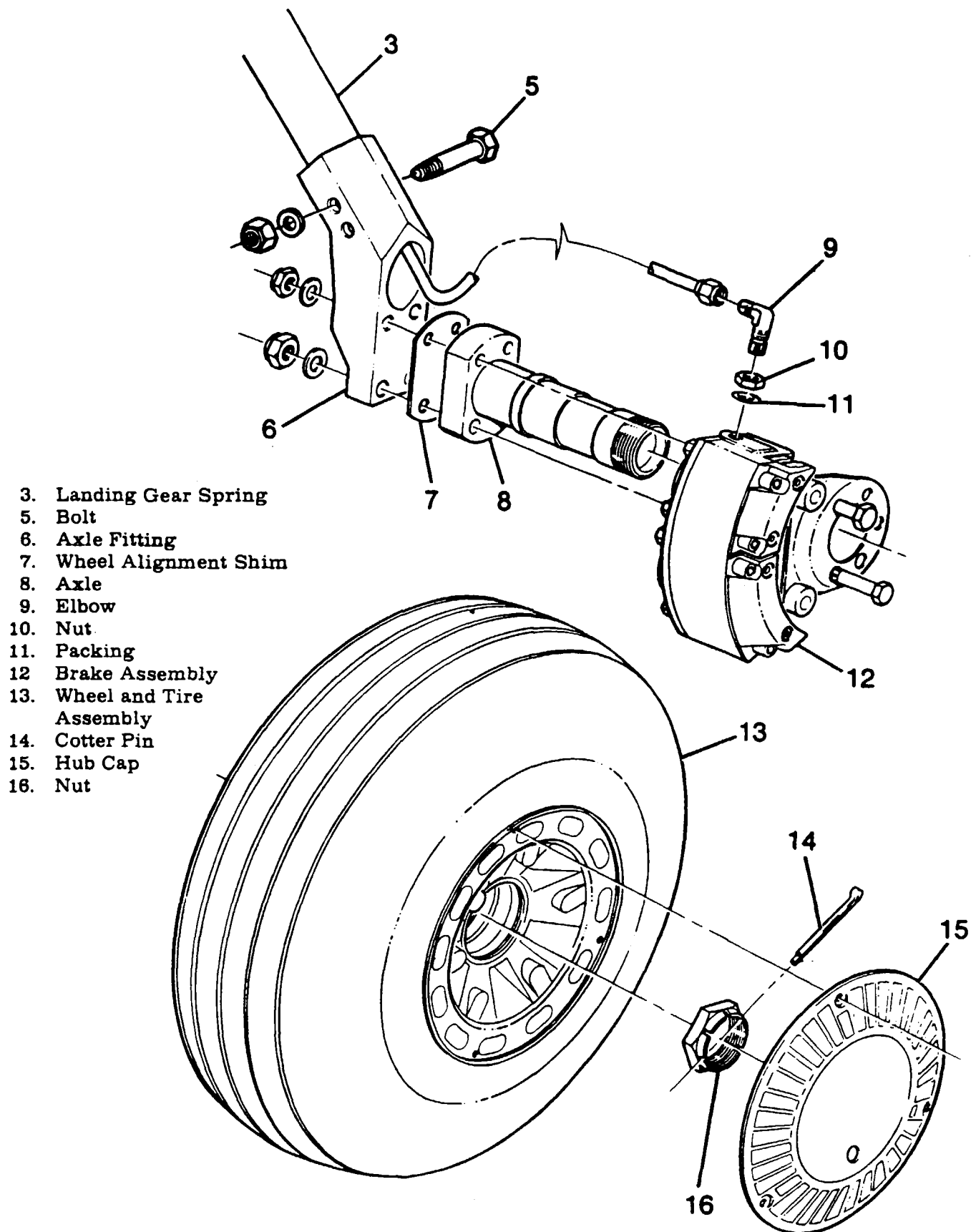


Figure 5-8. Main Landing Gear (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

- b. Disconnect four hydraulic lines routed to valve.
 - c. Remove screws attaching valve to instrument panel.
 - d. Remove selector valve.
 - e. Reverse preceding steps to install gear selector valve.
- 5-42. **DISASSEMBLY AND REASSEMBLY.** (See figure 5-6.)
- a. Remove cover (1), retaining ring (2), cap (3), bearing race (4) and thrust bearing (5).
 - b. Remove cotter pin, (17), washer (6) and spring (7).
 - c. Pull rod (14) from disc (9); remove disc (9).
 - d. Remove pucks (11) and springs (12).
 - e. Reverse preceding steps for reassembly.
- 5-43. **INSPECTION AND REPAIR.** (See figure 5-6.) Replace packing (8) and (10). Check valve for wear, foreign or abrasive materials. Thru Serial R18201460, disc (9) may be refaced (lapped) if worn or abraded. Beginning with Serial R18201461, disc (9) is aluminum and should not be refaced. Check rollers in thrust bearings (5).
- 5-44. **RIGGING THROTTLE-OPERATED GEAR WARNING HORN MICROSWITCH.** (See figure 5-7.)
- a. Jack aircraft in accordance with procedures outlined in Section 2.
 - b. Remove upper left engine cowling.
 - c. Turn master switch ON and retract landing gear; turn master switch OFF.
 - d. Close throttle control at panel (PULL FULL OUT.)

NOTE

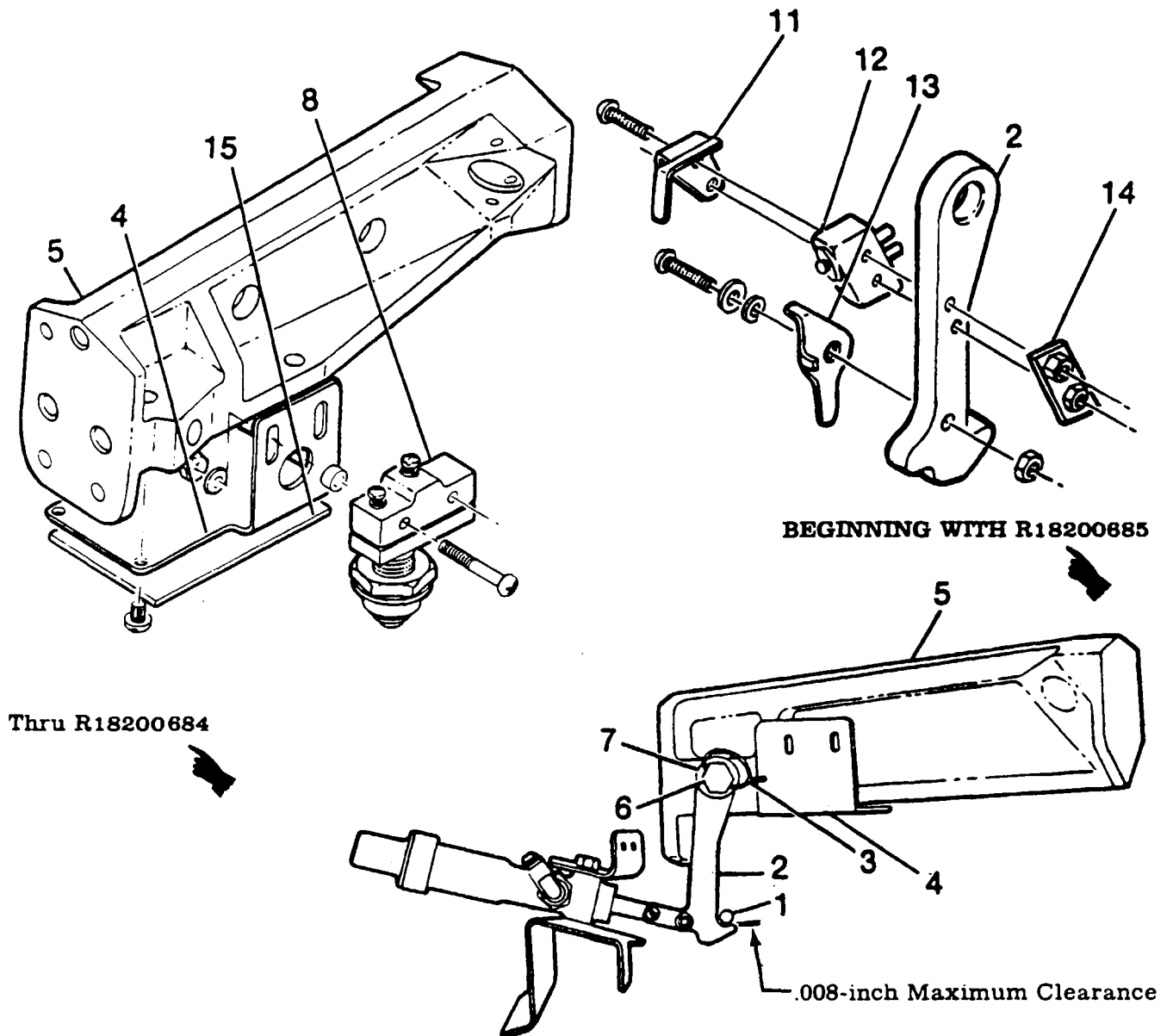
Assure that throttle friction locknut is snug but still will allow throttle to move.

- e. Mark throttle control (9) 11/32-inch aft of friction locknut (8).
- f. At engine, loosen screws attaching switch (3) to bracket. Raise switch to approximate middle of slots in bracket; tighten screws.
- g. Loosen nut attaching cam (12). Rotate cam to cause switch to actuate just as switch roller breaks over peak of cam. Tighten cam-attach nut.
- h. Open throttle (PUSH FULL-IN) and turn master switch ON.
- i. Pull throttle OUT to mark; gear warning horn should sound.
- j. Readjust if necessary.
- k. Extend landing gear, turn master switch OFF and lower aircraft; install engine cowling.
- l. Test fly aircraft. At approximately 2500 feet pressure altitude, close throttle to mark on control. Warning horn should sound and manifold pressure gage should indicate 11.5 to 12.5 inches of mercury.

NOTE

If manifold pressure gage does not indicate 11.5 to 12.5 inches of mercury at mark on throttle control (9), erase mark and mark correctly upon closing throttle at 11.5 to 12.5 inches of mercury in flight. Upon landing readjust microswitch in bracket slots or rotate cam as necessary to cause switch to actuate as roller breaks over peak of cam.

MODEL R182 AND TR182 SERVICE MANUAL



1. Pivot Lock Pin
2. Downlock Hook
3. Safety Wire
4. Downstop Backing Plate
5. Bulkhead Forging
6. Pivot Bolt
7. Adjustment Cam
11. Actuator
12. Switch
13. Actuator
14. Switch Plate
15. Downstop Pad

Figure 5-9. Main Landing Gear Rigging (Sheet 1 of 4)

MODEL R182 AND TR182 SERVICE MANUAL

- Solvent wipe both surfaces, prime metal with urethane primer for MIL-C-8514C. Bond with EC-2216 (3M Company) or equivalent.

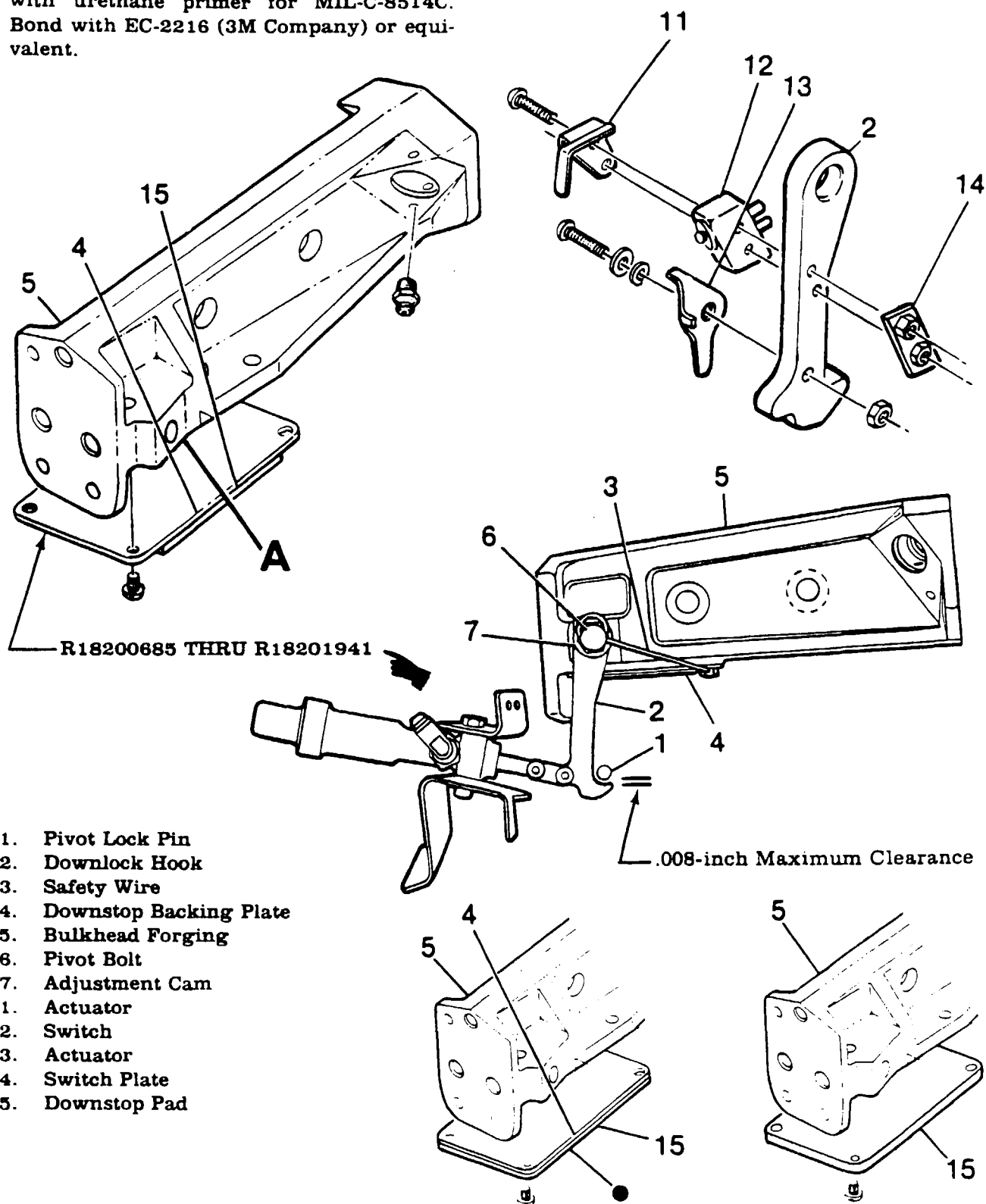
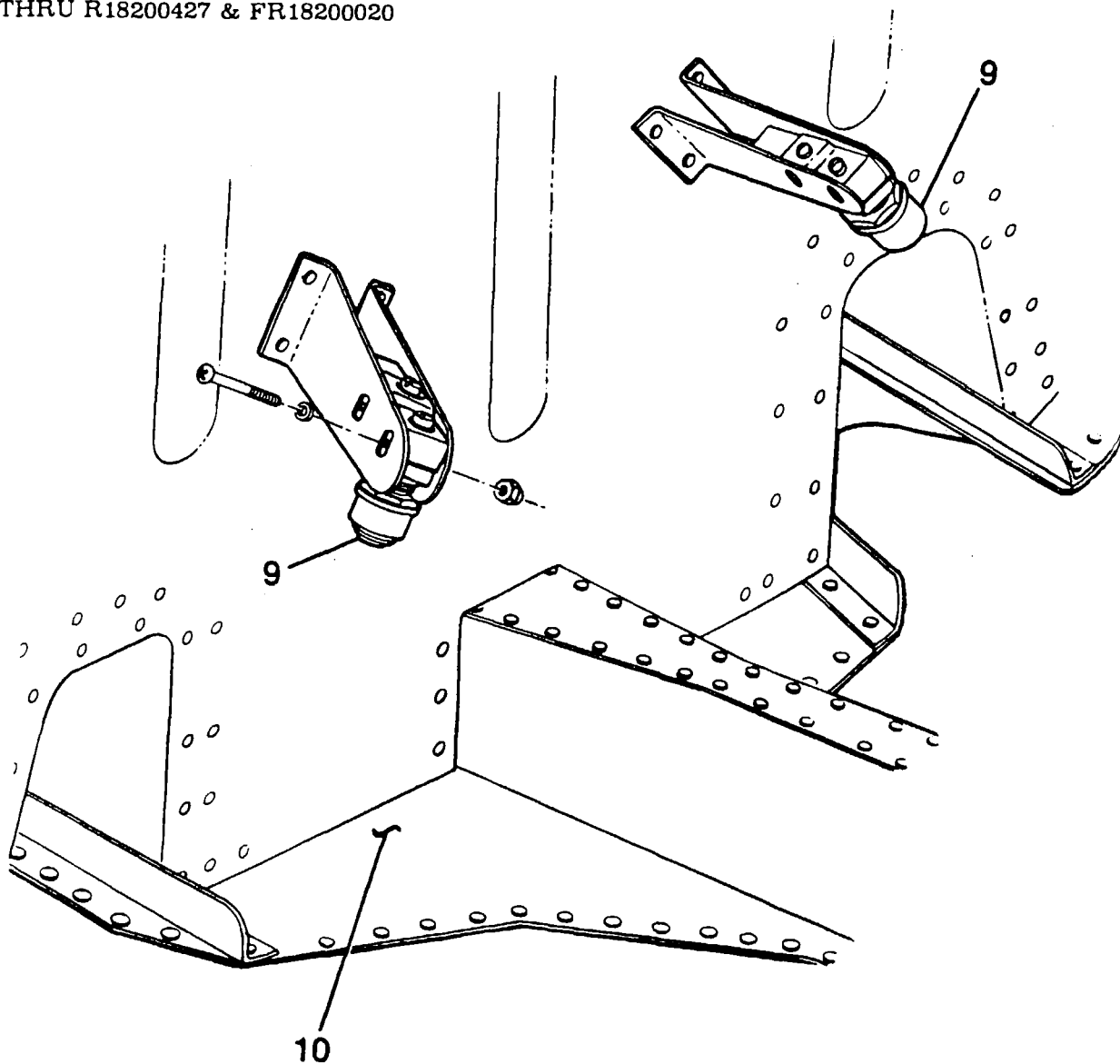


Figure 5-9. Main Landing Gear Rigging (Sheet 2 of 4)

MODEL R182 AND TR182 SERVICE MANUAL

THRU R18200427 & FR18200020

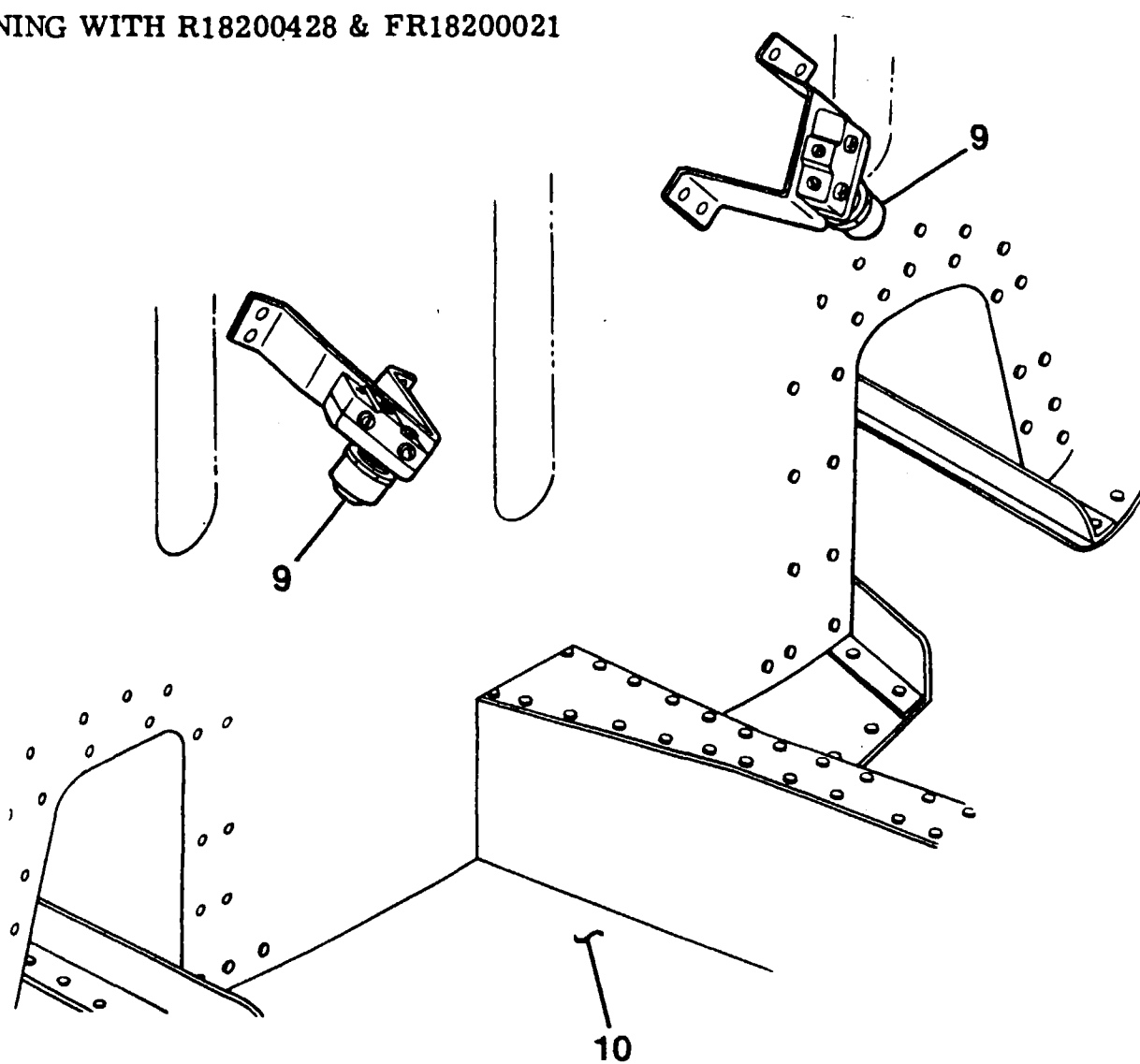


- 9. Uplock Indicator Switch
- 10. Aft Main Wheel Well

Figure 5-9. Main Landing Gear Rigging (Sheet 3 of 4)

MODEL R182 AND TR182 SERVICE MANUAL

BEGINNING WITH R18200428 & FR18200021



- 9. Uplock Indicator Switch
- 10. Aft Main Wheel Well

Figure 5-9. Main Landing Gear Rigging (Sheet 4 of 4)

MODEL R182 AND TR182 SERVICE MANUAL

- m. Test fly aircraft and recheck adjustment.

5-45. RIGGING FLAP OPERATED GEAR WARNING SYSTEM.

NOTE

Throttle operated gear warning system, flap control system and flap follow-up system must be rigged in accordance with procedures outlined in Sections 5 and 7 before rigging of flap warning system can be accomplished.

- a. The gear warning switch is located forward of the flap control lever behind the instrument panel.
- b. Loosen screws attaching gear warning microswitch in slots of mounting bracket.
- c. Mount an inclinometer on one flap and set to 0° (flaps full UP). Turn master switch ON and move flap selector lever to obtain 23° flap deflection.

NOTE

An inclinometer for measuring control surfaces travel is available from the Cessna Supply Division.

- d. Rotate microswitch in slots of mounting bracket until switch contacts are just closed, and tighten switch mounting screws.
- e. Move flap selector lever to 0° position (flaps full UP).
- f. Move flap lever to 30° position and horn should not sound. Move flap selector handle back to 0° position.
- g. With throttle full FORWARD, push landing gear DOWN press-to-test button, and move flap selector handle to 30° position; horn should sound as flaps extend past 23°. Move flap selector handle back to 20° position, and horn should not sound.
- h. Readjust switch as necessary to cause horn to sound when flaps reach 23° when press-to-test button is pushed.
- i. Turn master switch OFF, remove inclinometer, reinstall headliner.

5-46. MAIN LANDING GEAR.

- 5-47. DESCRIPTION. The tubular main gear struts rotate aft and inboard to stow the main wheels beneath the baggage compartment. The main gear utilizes hydraulic pressure for positive uplock and mechanical downlocks. Main gear uplock pressure is maintained automatically by the pump assembly. Rotation of the gear to extend or retract the struts is achieved through pivot assemblies which are in turn bolted through a splined shaft, to the hydraulic rotary actuators.

CAUTION

Use of recapped tires or new tires not listed on the airplane equipment list are not authorized due to possible interference between the tire and structure when landing gear is in the retracted position.

MODEL R182 AND TR182 SERVICE MANUAL

McCAULEY WHEEL AND BRAKE

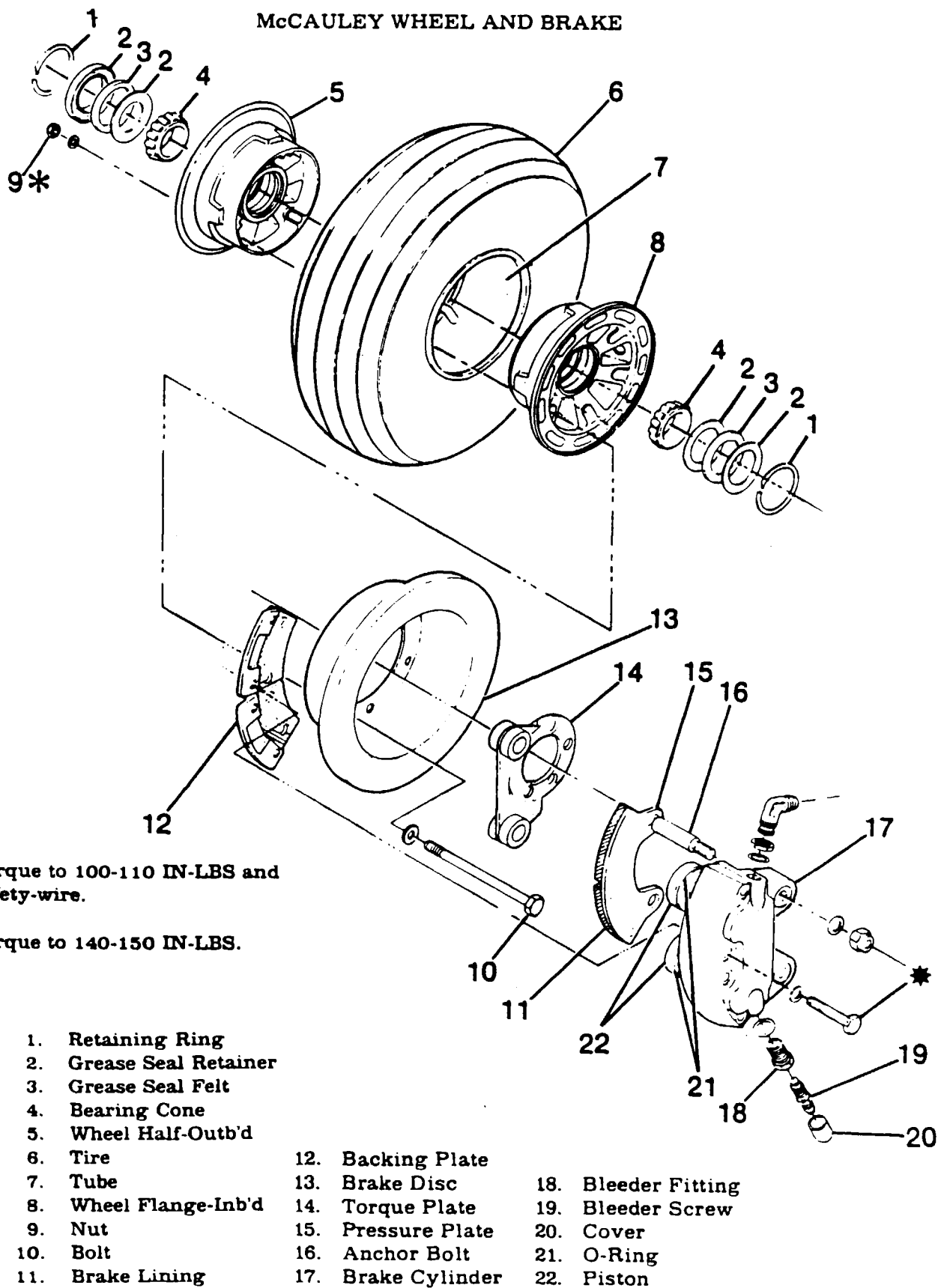


Figure 5-10. Main Wheel and Brake

MODEL R182 AND TR182 SERVICE MANUAL

5-48. TROUBLE SHOOTING -- MAIN LANDING GEAR.

TROUBLE	PROBABLE CAUSE	REMEDY
AIRCRAFT LEANS TO ONE SIDE.	Incorrect tire inflation.	Inflate to correct pressure.
	Sprung main gear strut.	Remove and replace strut.
	Bent axle.	Install new axle.
UNEVEN OR EXCESSIVE TIRE WEAR.	Incorrect tire inflation.	Inflate to correct pressure.
	Wheels out of alignment.	Align wheels.
	Wheels out of balance.	Balance wheels.
	Sprung main gear strut.	Replace strut.
	Bent axle.	Replace axle.
	Dragging brakes.	Jack wheel and check brake.
	Wheel bearings not adjusted properly.	Tighten axle nut properly.

5-49. REMOVAL. (See figure 5-8.)

- Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
- Bleed fluid from brake line at wheel brake cylinder.
- Turn master switch off; move gear position selector valve to up position then turn master switch on until main gear down locks disengage. Turn master switch off and pull gear pump circuit breaker to ensure that pump cannot be actuated accidentally. Place gear position selector handle in a neutral position so that gear rotates freely.

NOTE

If the pump motor cannot be used to unlock the main gear because of an opening in the hydraulic system, the spring-loaded main gear down locks can be manually unlocked by pushing them forward until the main gear is rotated past.

WARNING

It is advisable to have an assistant hold the gear strut up while the locks are pushed forward to prevent the strut from rotating suddenly, possibly causing personal injury. Ensure that master switch is "off" and pump motor circuit breaker is pulled.

MODEL R182 AND TR182 SERVICE MANUAL

- d. Remove strut-attaching bolt (20) and work strut (3) and plug (19) from pivot.
- e. Disconnect brake line from union (21) and cap plug (19), union (21), and brake line.
- f. Remove O-rings (17), (18), and (22) from plug (19) and union (21), and clean plug (19) and strut (3).

5-50. MAIN GEAR STRUT INSTALLATION. (See figure 5-8.)

- a. Lubricate new O-rings (17), (18), and (22), plug (19), and end of strut (3) with Petroleum VV-P-236, hydraulic fluid MIL-L-5606, or Dow Corning DC-7 (keep DC-7 away from areas to be painted) before installation.
- b. Remove cap and plug from union (21) and brake line, attach brake line to union, and work plug (19) and strut (3) into pivot (2).

NOTE

When installing a new pivot (2), burnishing the 2.100-inch I.D. bore may be required to facilitate assembly of the landing gear strut (3).

- c. Align hole in plug (19) and holes in pivot (2) using special tool No. SE 934.

NOTE

Special tool No. SE 934 is available from the Cessna Supply Division. This tool is designed to install the strut attaching bolt (20) without damaging the O-rings (17).

- d. Install strut-attaching bolt (20) by pushing SE 934 tool through aligned holes of strut (3) and plug (19) with threaded end of strut-attaching bolt (20). Install washer and nut and tighten nut on strut-attaching bolt.
- e. Fill and bleed brake system in accordance with paragraph 5-159 of this section.
- f. Rig landing gear in accordance with paragraph 5-51 of this section.

5-51. MAIN GEAR RIGGING. (Thru R18200655.) (See figure 5-9.)

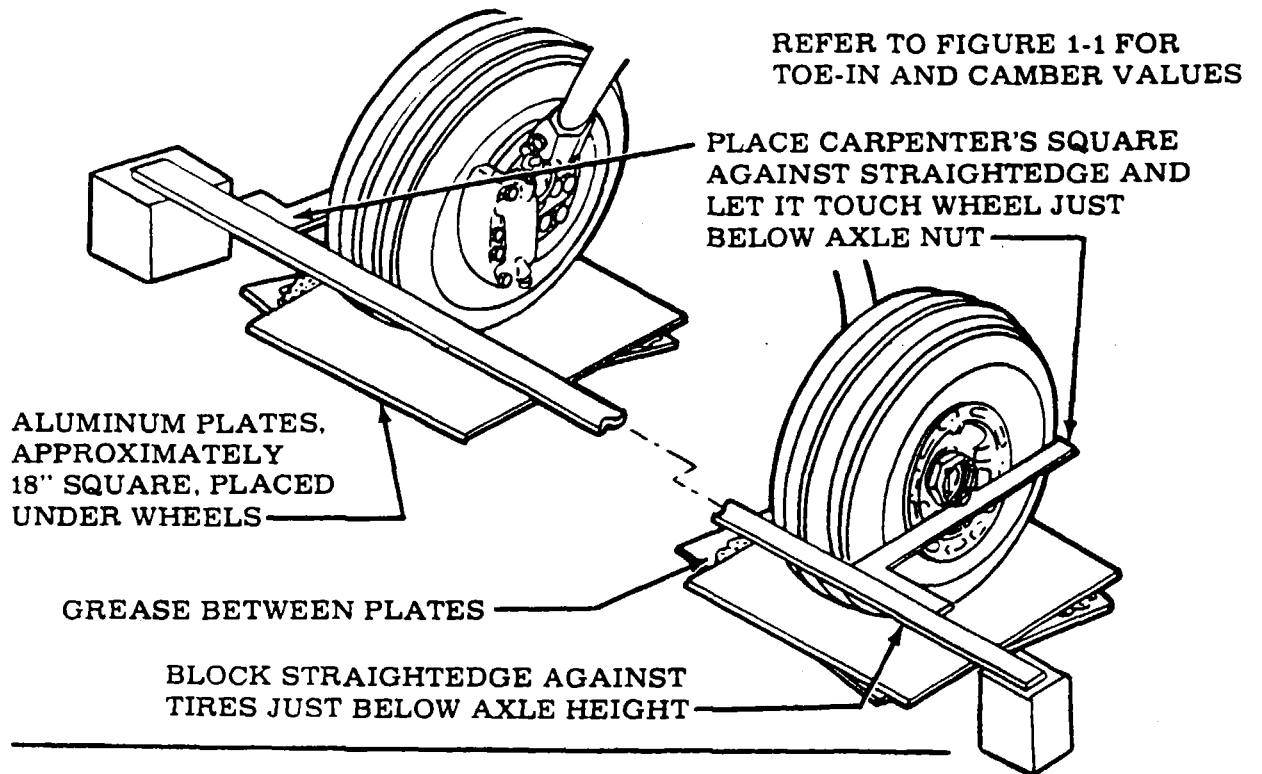
- a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
- b. Move seats to forward position and peel back carpet as necessary to uncover access panels above main gear pivot assemblies.

WARNING

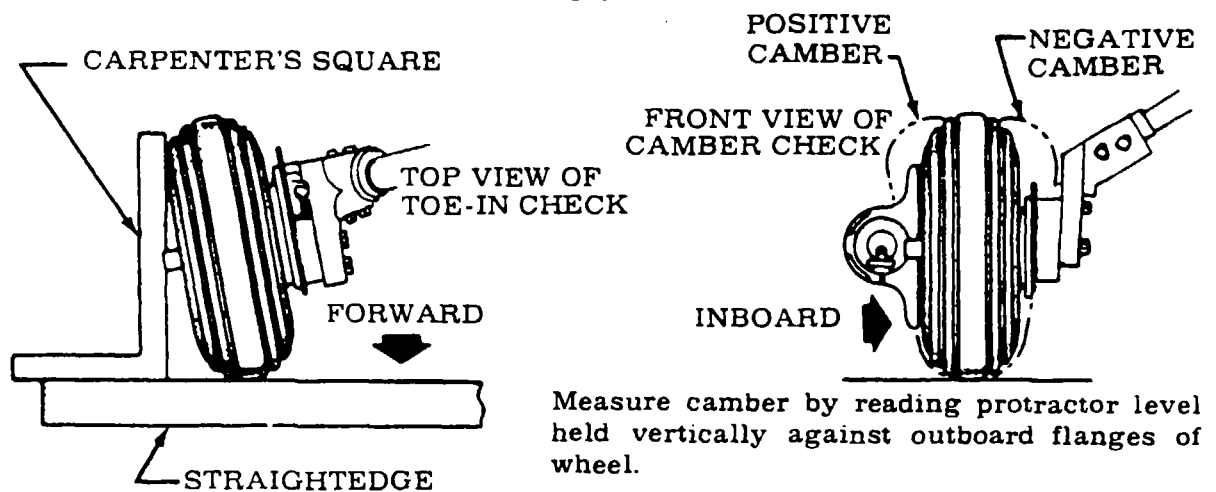
Turn master switch OFF and pull gear pump circuit breaker to prevent accidental extension or retraction of the landing gear whenever work is being performed in the wheel well or pivot area.

- c. Check clearance between latch (2) and pivot lock pin (1) with gear in down and locked position. Clearance must not exceed .008-inch.
- d. If adjustment of latch is necessary, work through access opening and remove safety wire (3). Loosen latch pivot bolt (6) and turn cam (7) until clearance is within tolerance, tighten bolt (6).
- e. Insert a .025-inch shim between pivot and support pad (4).

MODEL R182 AND TR182 SERVICE MANUAL



Measure toe-in at edges of wheel flange. Difference in measurements is toe-in for one wheel.



NOTE

Refer to Section 1 for toe-in and camber tolerances. Setting toe-in and camber within these tolerances while the cabin and fuel tanks are empty will give approximately zero toe-in camber at gross weight. Ideal setting is zero toe-in and zero camber at normal operating weight. Therefore, if normally operated at less than gross weight and abnormal tire wear occurs, realign the wheels to attain the ideal setting for the load conditions under which the airplane normally operates. Refer to the following page for shims available and their usage. Always use the least number of shims possible to obtain the desired result.

Figure 5-11. Main Wheel Alignment (Sheet 1 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

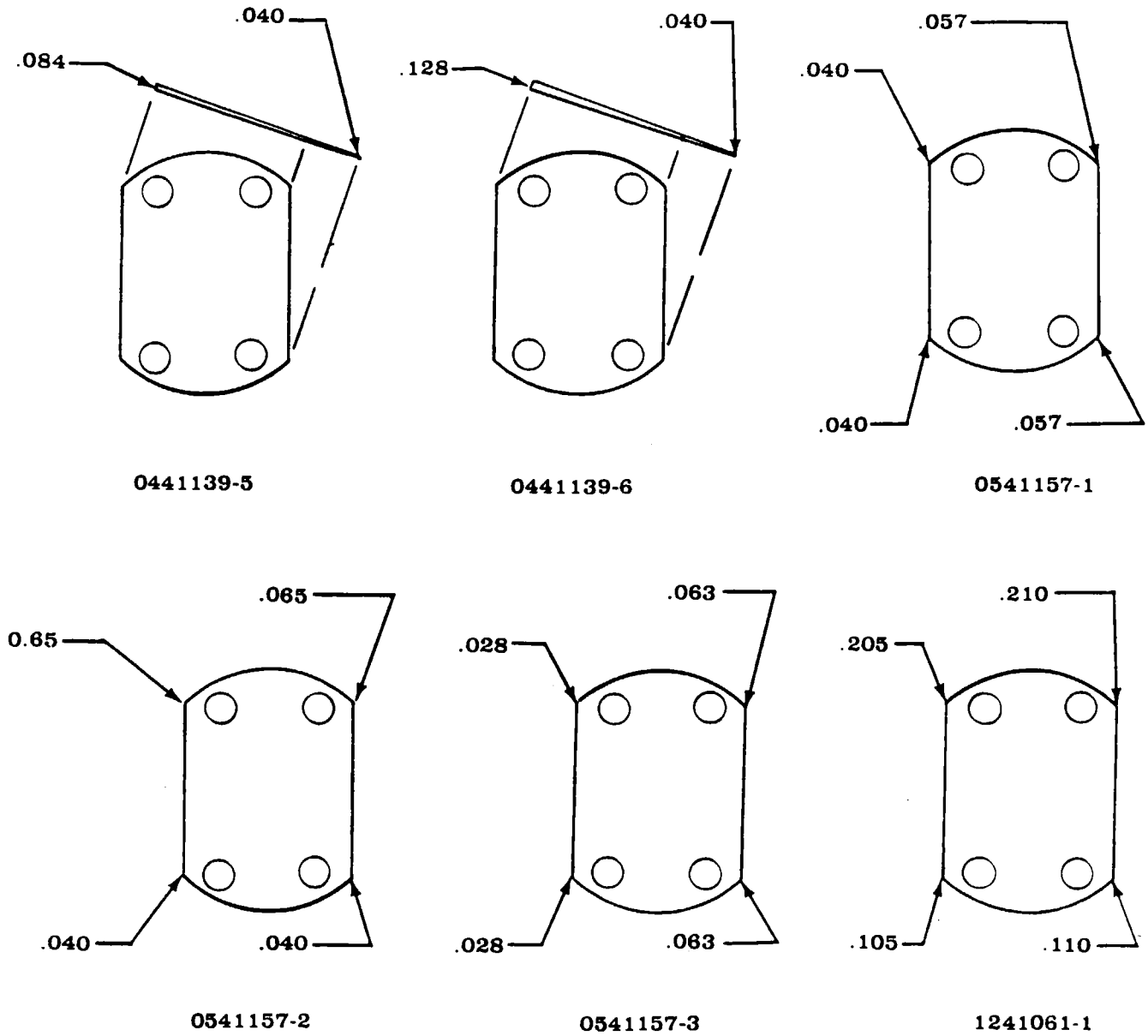


Figure 5-11. Main Wheel Alignment (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

WARNING

Stay clear of main gear when making the following checks.

- f. Place gear position selector handle in DOWN position and reset gear pump circuit breaker. Turn master switch ON and allow gear to rotate to full down position, leaving master switch ON.
 - g. With shim in place, latch (2) should not engage pin (1) and switch (8) should be open (light off).
 - h. With gear in DOWN and locked position with no shim, indicator switch (8) should be closed (light on). Adjustment can be made by moving the switch up or down in the slotted holes in the mounting bracket.
 - i. Place gear position selector handle in UP position and allow gear to retract to UP position.
 - j. Check that gear up indicator switches are closed (light on), and some free-travel exists on switch plunger (plunger not bottomed out). Adjust switch position as necessary.
 - k. Lower gear, turn master switch OFF, replace panels, carpeting and items removed for access. Move seats back to original positions.
 - l. Remove aircraft from jacks.
- 5-52. MAIN GEAR RIGGING. (See figure 5-9, sheet 2.) (Beginning with R18200685.)
- a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
 - b. Move seats to forward position and peel back carpet as necessary to uncover access panels above main gear pivot assemblies.

WARNING

Turn master switch OFF and pull gear pump circuit breaker to prevent accidental extension or retraction of the landing gear whenever work is being performed in the wheel well or pivot area.

MODEL R182 AND TR182 SERVICE MANUAL

- c. Check clearance between downlock hook (2) and pivot lock pin (1) with gear in down and locked position. Clearance must not exceed .008-inch.
- d. If adjustment of hook is necessary, work through access opening and remove safety wire (3). Loosen hook pivot bolt (6) and turn cam (7) until clearance is within tolerance; tighten bolt (6).
- e. Insert a .025-inch (SE997-1 or -2) shim between pivot (33), Figure 5-12, sheet 2) and support pad (4).

WARNING

Stay clear of main gear when making the following checks.

- f. Place gear position selector handle in DOWN position and reset gear pump circuit breaker. Turn master switch ON and allow gear to rotate to full down position, leaving master switch ON.
- g. With SE997-1 or -2 shim in place, hook (2) should not engage pin (1) and light should be OFF.
- h. With gear in DOWN and locked position with no shim, light should be ON.

NOTE

No switch adjustment is necessary.

- i. Place gear position selector handle in UP position and allow gear to retract to UP position.
- j. Check that gear up indicator switches are closed (light on thru 1982 Models) or (light off 1983 and on Models), and some free-travel exists on switch plunger (plunger not bottomed out). Adjust position as necessary.
- k. Lower gear, turn master switch OFF, replace panels, carpeting and items removed for access. Move seats to original positions.
- l. Remove aircraft from jacks.

5-53. MAIN WHEEL AND TIRE ASSEMBLY.

5-54. DESCRIPTION. This airplane is equipped with two-piece McCauley wheel and tire assemblies.

5-55. REMOVAL.

NOTE

It is not necessary to remove the main wheel to reline the brakes or remove brake parts, other than the brake disc of the torque plate.

- a. Using an individual jack pad, jack the wheel as outlined in Section 2.
- b. Remove hub cap.
- c. Remove cotter pin and axle nut.
- d. Remove bolts and washers attaching back plate to brake assembly and remove back plate.
- e. Pull wheel assembly from axle.

MODEL R182 AND TR182 SERVICE MANUAL

- 5-56. **DISASSEMBLY.** (With hub and capscrews.) (See figure 5-10.)
- Remove valve core and deflate tire and tube. Breaker tire beads loose from wheel flanges.

WARNING

Injury can result from attempting to remove wheel flanges with the tire and tube inflated. Avoid damaging wheel flanges when breaking tire beads loose. A scratch, gouge or nick in wheel flanges could cause wheel failure.

- Remove capscrews and washers.
- Separate wheel flanges from wheel hub. Retain spacers between wheel flanges and wheel hub.
- Remove wheel hub from tire and tube.
- Remove retainer rings, grease seal retainers, grease seal felts and bearing cones from wheel hub.

NOTE

The bearing cups are a press fit in the wheel hub and should not be removed unless a new part is to be installed. To remove the bearing cup, heat wheel hub in boiling water for 30 minutes, or in an oven not to exceed 121°C (250°F). Using an arbor press, if available, press out bearing cup and press in new bearing cup while wheel hub is still hot.

- 5-57. **INSPECTION AND REPAIR.** (With hub and capscrews.) (See figure 5-10.)
- Clean all metal parts, grease seal felts and spacers in cleaning solvent and dry thoroughly.
 - Inspect wheel flanges and wheel hub for cracks. Discard cracked wheel flanges or hub and install new parts. Sand out nicks, gouges and corroded areas. When protective coating has been removed, clean the area thoroughly; prime with zinc chromate, and paint with aluminum lacquer.
 - Inspect brakes and discs per paragraph 5-154.
 - Carefully inspect bearing cones and cups for damage and discoloration. After cleaning, pack bearing cones with clean aircraft wheel bearing grease (refer to Section 2) before installing in wheel hub.

- 5-58. **REASSEMBLY.** (With hub and capscrews.) (See figure 5-10.)
- Place wheel hub in tire and tube with tube inflation stem in cutout of wheel hub.
 - Place spacer and wheel flange on inboard side of wheel hub (opposite of tube inflation stem), then place washer under head of each capscrew and start capscrews into wheel hub threads.
 - Place spacer and wheel flange on other side and align valve stem in cutout in wheel flange.
 - Place washer under head of each capscrew and start capscrews into wheel hub threads.

MODEL R182 AND TR182 SERVICE MANUAL

CAUTION

Be sure that spacers and wheel flanges are seated on flange of wheel hub. Uneven or improper torque of capscrews can cause failure of capscrews, with resultant wheel failure.

- e. Tighten capscrews evenly and torque to 190-200 lb. in.
- f. Clean and pack bearing cones with clean aircraft wheel bearing grease. (Refer to Section 2 for grease type.)
- g. Assemble bearing cones, grease seal felts and retainers into wheel hub.

CAUTION

Grease seal retainer (outboard) and grease seal retainers (inboard) are not interchangeable. The wheel hub will not mount on the axle if these parts are reversed.

Grease seal retainer (outboard), grease seal felt (outboard) and grease seal retainer (outboard) are to be assembled in the hub on the side of the valve stem seat.

- h. Inflate tire to seat tire beads, then adjust to correct tire pressure specified in figure 1-1 of this manual.

5-59. **BALANCING.** Since uneven tire wear is usually caused by wheel unbalance, replacing the tire will probably correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The light-weight point of the tire is marked with a red dot on the tire sidewall and the heavy-weight point of the tube is marked with a contrasting color line (usually near the inflation valve stem). When installing a new tire, place these marks adjacent to each other. If a wheel becomes unbalanced during service, it may be statically balanced. Wheel balancing equipment is available from Cessna Supply Division.

5-60. **INSTALLATION.**

- a. Position wheel assembly on axle.
- b. Install axle nut and tighten until a slight bearing drag is obvious when the wheel is rotated. Back off nut to nearest castellation and install cotter pin.
- c. Place brake back plate in position and secure with washers and bolts. Torque brake back plate bolts to 100-110 inch-pounds and safety-wire.
- d. Install hub cap.

5-61. **ALIGNMENT.** Correct main wheel alignment is obtained through the use of tapered shims between the gear strut fitting and the flange of the axle. See figure 5-11 for procedures to be used in checking wheel alignment. Wheel shims and the corrections imposed on the wheel by various shims are listed in the illustrations.

NOTE

Failure to obtain acceptable wheel alignment through the use of the shims, indicates a deformed main gear strut or a bent axle.

MODEL R182 AND TR182 SERVICE MANUAL

5-62. MAIN WHEEL AND AXLE.

5-63. REMOVAL. (See figure 5-8.)

- a. Using an individual jack pad, jack the wheel as outlined in Section 2.
- b. Remove wheel assembly in accordance with procedures outlined in paragraph 5-55.
- c. Drain brake line at brake assembly (12). Cap or plug open fittings to prevent entry of foreign material.
- d. Disconnect brake line from elbow (9) in brake assembly. Cap or plug line and elbow (9).
- e. Remove nuts, washers and bolts securing axle, brake torque plate, brake line bracket and wheel alignment shims.

NOTE

When removing axle from strut fitting, note number and position of the wheel alignment shims. Mark these shims or tape them together carefully so they can be reinstalled in exactly the same position to ensure that wheel alignment is not disturbed.

5-64. INSTALLATION.

- a. Place axle, alignment shims, brake line bracket and brake torque plate in position. Make sure wheel alignment shims and brake line bracket are in their original positions. Insert bushings in brake torque plate and install bolts, washers and nuts securing components to strut fitting.
- b. Connect hydraulic brake line to fitting at brake line bracket.

CAUTION

Correct clocking of the brake line elbow on the wheel brake cylinder is very important in order to avoid interference with aircraft structure during retraction of the gear.

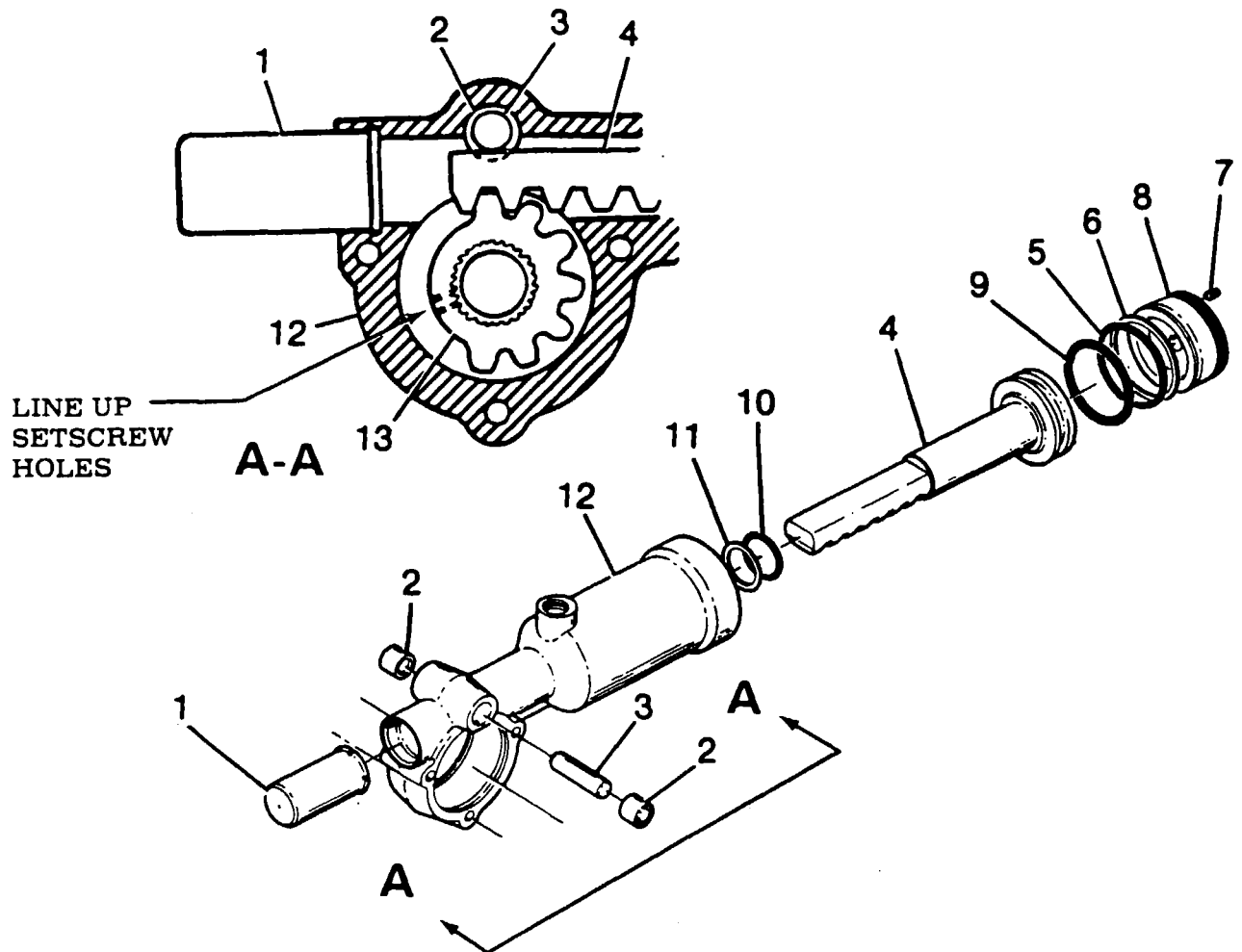
- c. Install wheel assembly in accordance with procedures outlined in paragraph 5-60.
- d. Connect hydraulic brake line to elbow on brake cylinder.
- e. Fill and bleed affected brake system in accordance with procedures outlined in paragraph 5-170.
- f. Lower aircraft and check main wheel alignment.

5-65. MAIN GEAR ACTUATOR.

5-66. REMOVAL. (See figure 5-12.)

- a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
- b. Remove seats and peel back carpet as necessary to gain access to center access plate above actuators; remove access plate.
- c. Pull gear pump circuit breaker.
- d. Disconnect and drain hydraulic brake line at wheel brake cylinder.
- e. Disconnect and cap or plug all hydraulic lines at actuator.

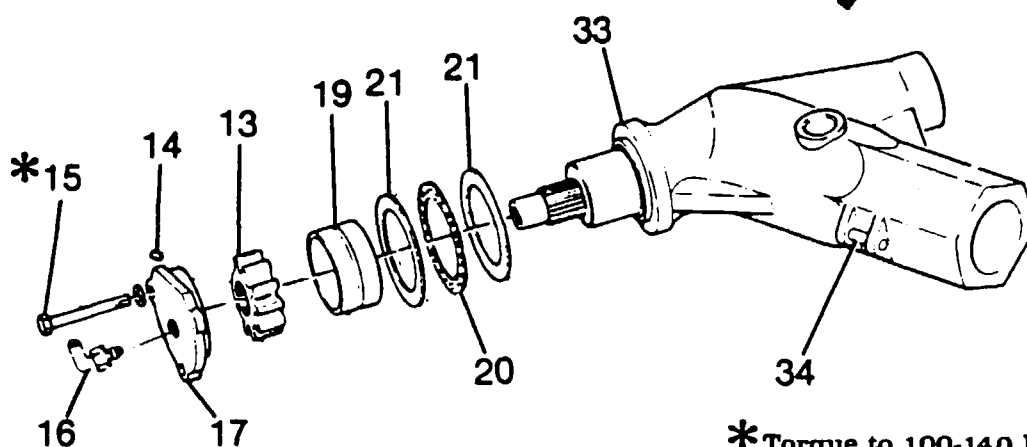
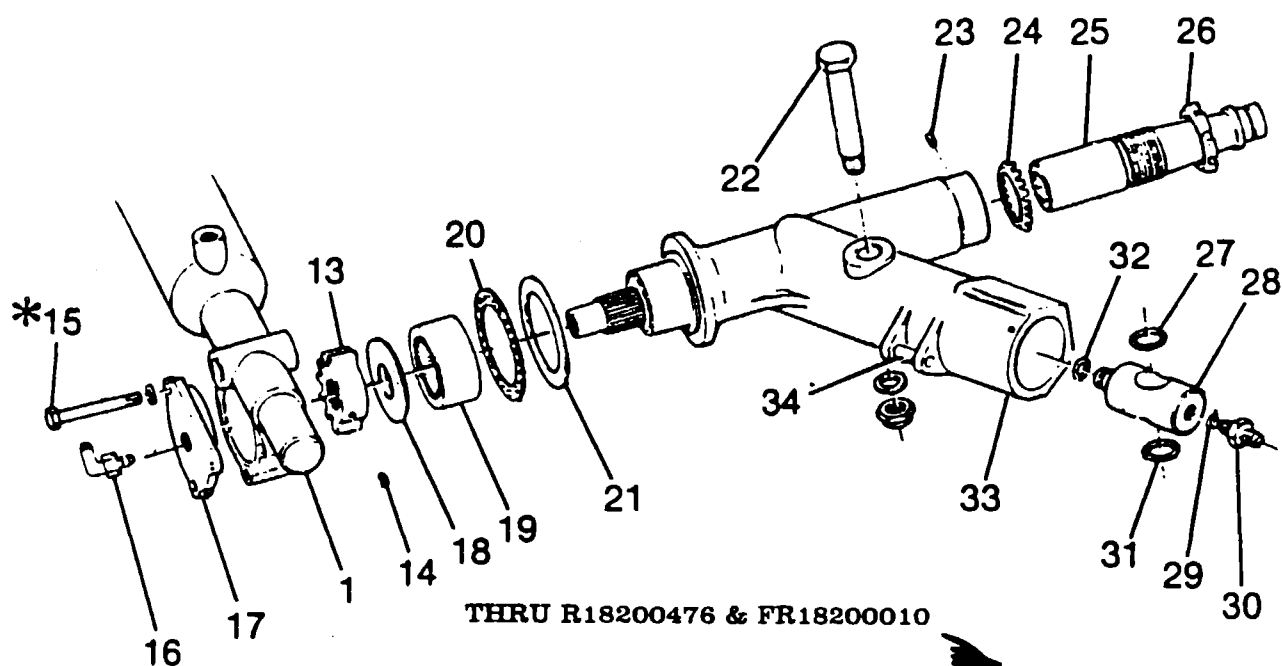
MODEL R182 AND TR182 SERVICE MANUAL



1. End Cap
2. Bearing
3. Roller
4. Piston/Rack
5. Packing
6. Back-up Ring
7. Setscrew
8. End Gland
9. Packing
10. Packing
11. Back-up Ring
12. Actuator
13. Sector Gear

Figure 5-12. Main Gear Actuator and Pivot Assembly (Sheet 1 of 3)

MODEL R182 AND TR182 SERVICE MANUAL



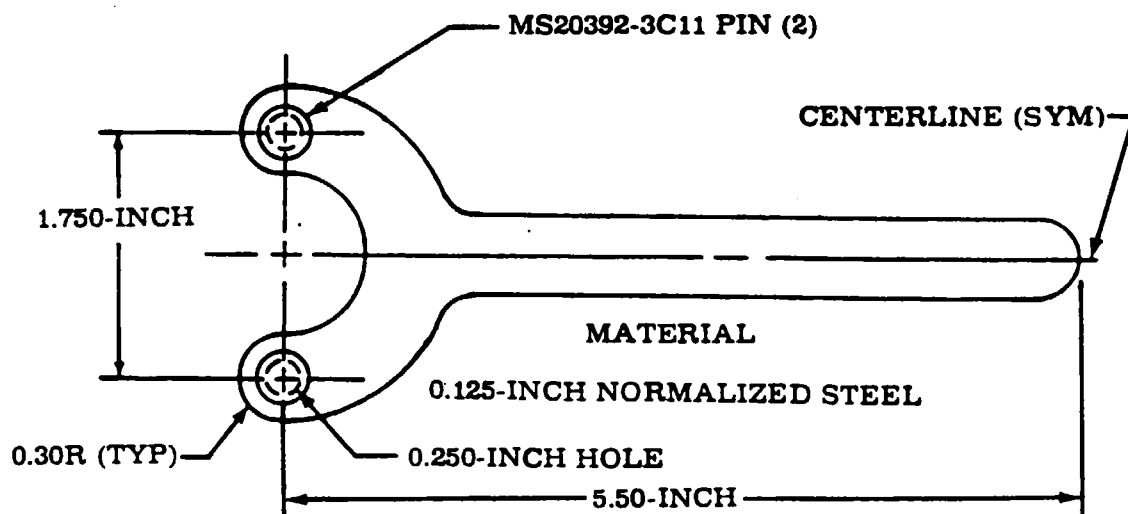
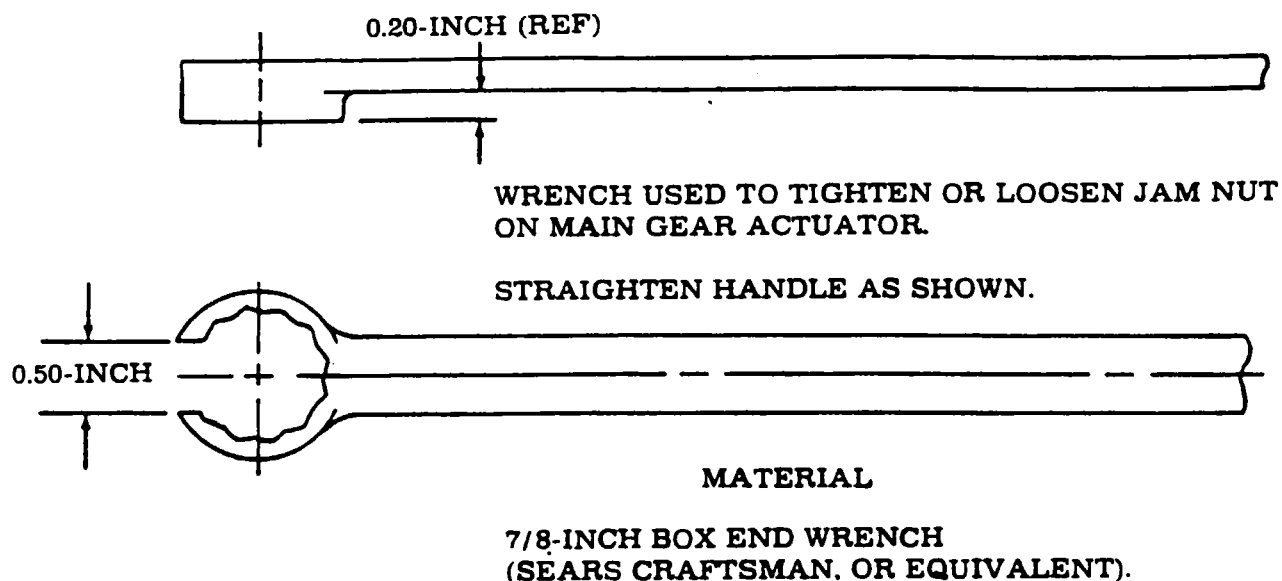
*Torque to 100-140 IN-LBS and safety-wire.

BEGINNING WITH R18200477 & FR18200011

- | | | |
|--------------------|--------------------|------------------|
| 1. End Cap | 20. Thrust Bearing | 27. Packing |
| 13. Sector Gear | 21. Race | 28. Plug |
| 14. Setscrew | 22. Strut Bolt | 29. Packing |
| 15. Actuator Bolt | 23. Setscrew | 30. Union |
| 16. Swivel Fitting | 24. Lockwasher | 31. Packing |
| 17. Cap | 25. Shaft | 32. Packing |
| 18. Seal | 26. Jam Nut | 33. Pivot |
| 19. Bearing | | 34. Downlock Pin |

Figure 5-12. Main Gear Actuator and Pivot Assembly (Sheet 2 of 3)

MODEL R182 AND TR182 SERVICE MANUAL



WRENCH USED TO INSTALL OR REMOVE END GLAND ON MAIN GEAR ACTUATOR.

INSERT PINS THROUGH HOLES IN WRENCH AND TORCH BRAZE, USING BRAZING ROD (SIL-BOND 45, UNITED WIRE AND SUPPLY) OR EQUIVALENT.

TORCH BRAZING-Flux joint and filler material thoroughly. Filler material may be either pre-positioned or hand-fed. The torch shall be adjusted for a non-oxidizing flame, and manipulated in such a manner as to braze in the direction the flame is pointing. This will tend to prevent flux inclusion and entrapment of foreign particles. After the assembly has solidified, the excess flux shall be removed with hot water (180°F, approximately).

Figure 5-12. Main Gear Actuator and Pivot Assembly (Sheet 3 of 3)

MODEL R182 AND TR182 SERVICE MANUAL

NOTE

On airplane serials R18200001 thru R18202039 should looseness of the actuator be detected, AN175H22A bolts may be installed.

- f. Remove bolts attaching cap (17) and actuator (12) to bulkhead forging. Remove actuator from aircraft.

5-67. DISASSEMBLY. (See figure 5-12.)

Leading particulars of the actuator are as follows:

Cylinder Bore Diameter . . . 2.250 in.
Piston Rod Diameter998 in.
Piston Stroke 2.970 in.

- a. Remove setscrew (7) and remove end gland (8) by unscrewing from actuator body (12).
- b. Remove end cap (1) from end of actuator.
- c. Using a small rod, push piston/rack (4) from actuator body. Unless defective, do not remove nameplate, bearing (2) or roller (3).
- d. Remove packing (10) and back-up ring (11) from actuator body (12). Discard packing (10).
- e. Remove packing (5) and back-ring (6) from end gland (8). Discard packing (5).
- f. Remove and discard packing (9) from piston/rack (4).

5-68. INSPECTION.

- a. Thoroughly clean all parts in cleaning solvent (Federal Specification PS-661, or equivalent).
- b. Inspect all threaded surfaces for cleanliness, cracks and wear.
- c. Inspect end cap (1) and cap (17), swivel fitting (16), piston/rack (4), roller (3), if removed, and actuator body (12) for cracks, chips, scratches, scoring, wear or surface irregularities which may affect their function or the overall operation of the actuator.
- d. Inspect bearings (2), if removed, for freedom of motion, scores, scratches or Brinell marks.

5-69. PARTS REPAIR/REPLACEMENT. Repair of small parts of the main landing gear actuator is impractical. Replace all defective parts. Minor scratches or score marks may be removed by polishing with abrasive crocus cloth (Federal Specification P-C-458), providing their removal does not affect operation of the unit. during assembly, install all new packings.

5-70. REASSEMBLY. (See figure 5-12.)

NOTE

Use MIL-G-21164C lubricant on roller (3) and bearings (2), if removed.

- a. If bearings (2) and roller (3) were removed, press one bearing into actuator body until it is flush. Install roller and press second bearing in place to hold roller. Use care to prevent damage to bearings or roller.
- b. Install back-up ring (11) and packing (10) in actuator body bore. Install new packing (9) on piston/rack (4). (See figure 5-12 Section A-A.)

MODEL R182 AND TR182 SERVICE MANUAL

NOTE

Assemble new packings, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7.

- c. Slide piston/rack (4) into cylinder body.

NOTE

Lubricate piston/rack gears with MIL-G-21164C lubricant. Apply lubricant sparingly. Over-greasing might cause contamination of hydraulic cylinder assembly with grease which might work past packing.

- d. Install back-up ring (6) and new packing (5) on end gland (8).
- e. Install end gland (8) in actuator body (12), and tighten until end of gland is flush with end of actuator body. Install and tighten setscrew (7).
- f. Install end cap (1) at end of actuator assembly.

5-71. INSTALLATION. (See figure 5-12.)

- a. With main landing gear in the down and locked position, install actuator and onto bulkhead forging so that piston rack gear and sector gear engage as shown in Section A-A of the figure.
- b. Lubricate swivel fitting (16) with MIL-G-21164C lubricant and bolt actuator and cap (17) to bulkhead forging. Torque actuator bolts (15) 100 to 140 lb-in. and safety-wire.
- c. Connect all hydraulic lines to their source location. Lubricate threads with Petrolatum. Install new safety wire on swivel fitting at actuator.
- d. Connect brake line at wheel cylinder. Fill and bleed brake system in accordance with instructions in applicable paragraph in this section.
- e. Rig landing gear in accordance with procedures outlined in applicable paragraph in this section.
- f. Remove aircraft from jacks and install access covers, carpeting and seats removed for access.

5-72. MAIN PIVOT ASSEMBLY.

5-73. REMOVAL. (Refer to figure 5-12.)

- a. Remove strut from pivot assembly in accordance with procedures outlined in applicable paragraph of this section.
- c. Remove setscrew (14) from sector gear (13).
- d. Bend tangs of lockwasher (24) from notches in jam nut (26) and completely unscrew jam nut from threaded area of shaft (25).
- e. Push shaft (25) into pivot (33) and pull pivot (33) free of bearing (19).

5-74. INSPECTION AND REPAIR. (See figure 5-12.)

- a. Thoroughly clean all parts in cleaning solvent (Federal Specification PS-661 or equivalent.)
- b. Inspect all parts for indications of damage, cracks, or excessive wear and replace as necessary.
- c. Inspect outboard pivot bushing and bearing (19) (pressed into bulkhead of forgings in aircraft) for damage and excessive wear. Replace bushing or bearing as required.

NOTE

The outboard pivot bushing is locked into the bulkhead forging by a setscrew located above the bushing. This

MODEL R182 AND TR182 SERVICE MANUAL

setscrew must be turned out several turns before the bushing can be removed.

- 5-75. **INSTALLATION.** (See figure 5-12.)
- Lubricate all bushings and bearings with MIL-G-21164C grease. Slide shaft (25) into pivot (33).
 - Install pivot, with thrust bearing (20) and race (21) installed, into inboard bearing in bulkhead forging. Pull shaft (25) from pivot (33) and install lockwasher (24) and jam nut (26) on shaft (25).
 - Insert end of shaft (25) into outboard bushing in bulkhead forging. Hand tighten nut to remove all end play and safety in place by bending corresponding tang of lockwasher (24) washer into notch of nut (26). Pivot must rotate freely.
 - Install seal (18) and sector gear (13) on inboard end of pivot (33) so that the alignment marks on pivot (33) and sector gear (13) are matched as shown in figure 5-12 Section View A-A.
 - Install setscrew (14) into sector gear (13) with Loctite 242 locking compound. Ensure that setscrew (14) enters keyway on pivot (33) and tighten screw.
- 5-76. **GEAR POSITION INDICATOR SWITCHES.**
- 5-77. **DESCRIPTION.** (See figure 5-9.) (Thru R18200655.) The gear down indicator switches are located on the inboard side of the outboard pivot support bulkhead forgings and are accessible through access panels in the floorboard. Beginning with R18200656, the switches are attached to the downlock hooks, which are attached to the outboard pivot support bulkhead forgings. The gear up indicator switches are located on the forward bulkhead of the main gear wheelwell and are accessible through the wheelwell openings. See "Main Gear Rigging" paragraph for adjustment instructions. The switches attached to the downlock hooks are non-adjustable.
- 5-78. **MAIN GEAR DOWNLOCK ACTUATOR.** (See figure 5-13.)
- 5-79. **DESCRIPTION.** The main gear downlock actuator consists of a piston/rod and a ball and seat priority valve. The body has two separate hydraulic chambers. Internal springs hold the piston/rod in the extended position (locked) at all times except when the gear position handle is placed in the up position and the system is pressurized, fluid, entering the actuator during the gear up cycle, is blocked by the ball and seat and forced to flow into the piston chamber, causing the piston to move, pulling the rod into the actuator body. As the rod moves, it draws the latch away from the downlock pin, unlocking the gear. When the rod is retracted into the actuator body, a raised portion of the rod forces a small ball to push the larger valve ball away from the seat and allows fluid to flow through the downlock actuator to the main landing gear actuator. When the landing gear position selector handle is placed in the down position, fluid flow is reversed and unaffected by the ball and seat. Internal spring pressure forces the piston to move causing the rod to extend, placing the latch or hook in the locked position. As the landing gear pivot assembly rotates to the down position, the lock pin strikes the angled bottom of the latch or hook, forcing the latch or hook to move away until the lock pin clears the latch or hook. Internal spring pressure on the piston/rod causes the latch to snap back to the locked position as the pin clears the latch.

MODEL R182 AND TR182 SERVICE MANUAL

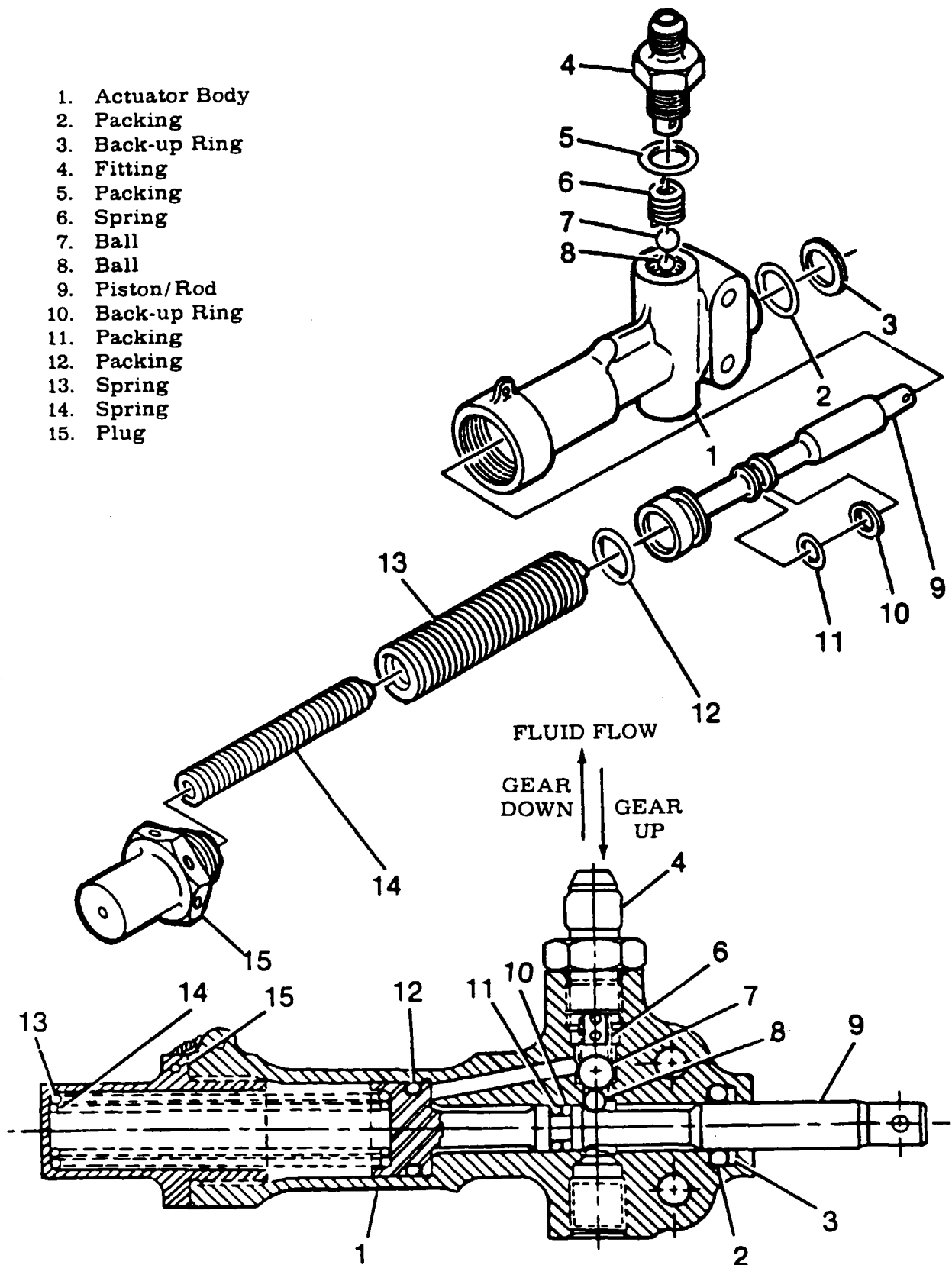
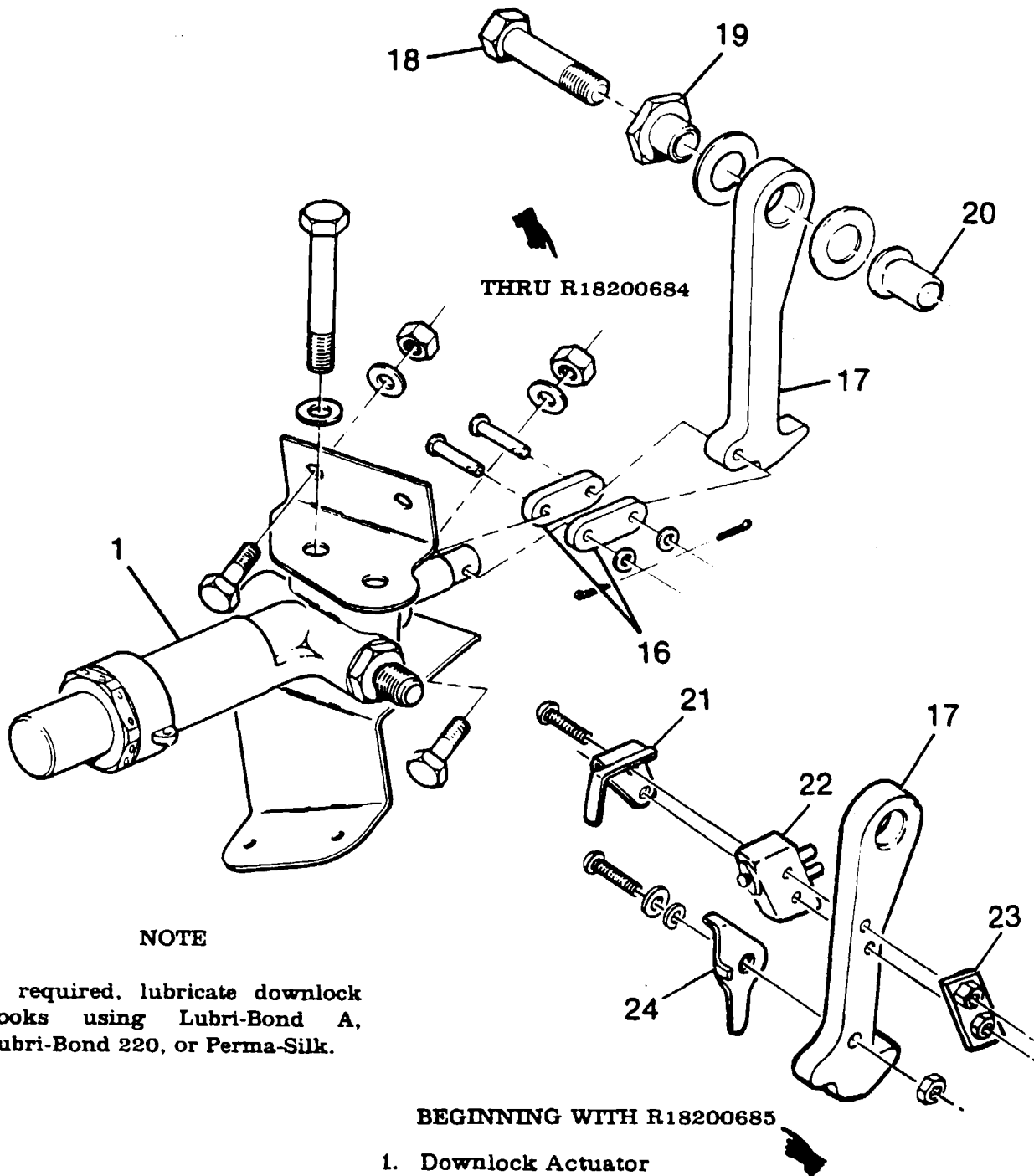


Figure 5-13. Main Gear Downlock Actuator (Sheet 1 of 2)

MODEL R182 AND TR182 SERVICE MANUAL



1. Downlock Actuator
16. Hook Link
17. Downlock Hook
18. Bolt
19. Bushing
20. Bushing
21. Actuator
22. Switch
23. Plate
24. Actuator

Figure 5-13. Main Gear Downlock Actuator (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

5-80. REMOVAL. (See figure 5-13.)

- a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
- b. Place master switch in OFF position and move gear position handle to UP position.
- c. Turn master switch on and allow gear to retract halfway. Turn master switch off and pull gear pump circuit breaker to prevent accidental activation of the pump.
- d. Move seat to forward position and peel back carpet as necessary to uncover access panel above actuator; remove panel.
- e. Remove cotter pin and clevis pin from downlock hook (17).
- f. Remove two bolts attaching actuator to mounting brackets.
- g. Remove and cap or plug hydraulic lines from actuator.
- h. Reverse procedure to install actuator.

5-81. DISASSEMBLY. (See figure 5-13.)

NOTE

Leading particulars of the actuators are as follows:

Cylinder Bore Diameter	0.749 \pm .002,-.000 in.
Piston Diameter	0.747 \pm .000,-.001 in.
Stroke (to unseat valve)	0.719 \pm .031 in.

- a. Remove fitting (4), spring (6) and balls (7) and (8).
- b. Cut safety wire and unscrew end plug (15) from actuator body (1).
- c. Remove springs (13) and (14) and push piston/rod (9) from actuator body (1).
- d. Remove and discard all packings and back-up rings.

5-82. INSPECTION. (See figure 5-13.)

- a. Inspect all threaded surfaces for cleanliness and for freedom of cracks and excessive wear.
- b. Inspect spring (6) for evidence of breaks and distortion.
- c. Inspect inner and outer springs (13) and (14) for evidence of breaks and distortion.
- d. Inspect fitting (4), piston rod (9), actuator body (1), balls (7) and (8) ball seats for cracks, scratches, scoring, wear or surface irregularities which might affect their function or the overall function of the unit.
- e. Repair of most parts of the downlock actuator is impractical. Replace defective parts. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification PC-458), providing their removal does not affect operation of the unit.

5-83. REASSEMBLY. (See figure 5-13.)

NOTE

Install all new packings and (12) back-up rings during reassembly of the actuator.

- a. Install new packings (11) and (12) back-up ring (10) in grooves of piston/ rod (9).
- b. Install new packing (2), back-up ring (3) in grooves of actuator body (1).
- c. Slide piston rod into actuator body (1). Use care to prevent damage to packing (2) and back-up ring (3).
- d. Insert springs (13) and (14), then install and safety wire end plug(15) to actuator body.
- e. Insert balls (8) and (7) and spring (6) in actuator body (1).
- f. Install new packing (5) on fitting (4). Install and tighten fitting.

MODEL R182 AND TR182 SERVICE MANUAL

- e. Insert balls (8) and (7) and spring (6) in barrel and valve body.
- f. Install new packing (5) on fitting (4). Install and tighten fitting.

5-84. MAIN GEAR STRUT STEP.

- 5-85. DESCRIPTION. Thru Serials R18200476 and FR18200020, the step is constructed of Uralite 3121 polyurethane casting, with treads cast into the step. Beginning with Serials R18200477 and FR18200021, the step is constructed of Uralite 3121 polyurethane casting, with a molded depression area, located in the top of the step containing a replaceable tread. To replace a step tread, remove old tread with a sharp knife, clean pad with a 50-50 mixture of toluene and methylene chloride, and cement new tread to pad with EC-776 or EC-847 cement (3M Company).

5-86. REMOVAL. (See figure 5-8.)

NOTE

The step is bonded to the landing gear strut with Uralite 3121 bonding material.

- a. Using a heat gun, heat step at a temperature of 200° to 250°F, until step material becomes pliable.
- b. Using a sharp knife, remove step material down to the metal strut.
- c. Clean off remaining step material with a wire wheel and sandpaper. Leave surface slightly rough or abraded. Clean oil and grease from strut with solvent, wipe off excess solvent with a dry cloth and let surface dry.
- d. Apply Zinc Chromate Primer - green or yellow to cleaned area on strut. Dry film thickness to be .0003 to .0005 inch.

5-87. INSTALLATION. (Refer to figure 5-8.)

- a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
- b. Mark position of removed step so new step will be installed in approximately the same position on the strut.
- c. Check that bonding surfaces are clean and dry.
- d. Mix adhesive (Uralite 3121), in accordance with manufacturer's direction. Note pot life.
- e. Spread a coat of mixed adhesive on bonding surfaces of strut and step; install step on strut.

MODEL R182 AND TR182 SERVICE MANUAL

NOTE

Top of strut should be parallel to the ground ($\pm 5^\circ$) when gear is in down position.

- f. Cycle landing gear to check clearance of step in tunnel.
- g. Form a small fillet of adhesive at all edges of bonding surfaces. Remove excess adhesive.
- h. Remove aircraft from jacks.
- i. Allow adhesive to thoroughly cure according to manufacturer's recommendations before flexing gear spring or applying loads to step.
- j. Paint gear spring strut and step after curing is completed.

5-88. NOSE GEAR SYSTEM.

5-89. DESCRIPTION. The nose gear consists of a pneudraulic shock assembly, mounted in a trunnion assembly, a steering arm and bungee, shimmy dampener, nose wheel, tire and tube, hub cap, bearings, seals and a double-acting hydraulic actuator for extension and retraction. A claw-like hook on the actuator serves as a downlock for the nose gear. Stop bolts, located in the lower aft well, prevent inadvertent nose gear collapse.

5-90. OPERATION. The nose gear shock strut is pivoted just forward of the firewall. Retraction and extension of the nose gear is accomplished by a double-acting hydraulic cylinder, the forward edge of which contains the nose gear downlock. Initial action of the cylinder disengages the downlock before retraction begins. As the strut moves into the gear well, the forward side of the nose gear fork boss contacts the door close mechanism and pulls the nose door closed. The nose gear is held in the up position by hydraulic pressure.

5-91. TROUBLE SHOOTING - NOSE GEAR SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
FLUID LEAKAGE FROM STRUT.	Defective strut seals.	Install new seals.
STRUT LOSES AIR PRESSURE.	Defective strut seals.	Install new seals.
	Defective or loose air filler valve.	Check gasket; tighten or replace valve.
EXCESSIVE TIRE WEAR.	Loose torque links.	Add shim washers; replace links.
NOSE WHEEL SHIMMY (Also refer to Service Information Letter SE84-21.)	Loose or worn nose wheel steering linkage.	Tighten loose linkage or replace defective parts.
	Shimmy damper need fluid.	Service in accordance with Section 2.
	Defective shimmy damper.	Repair or replace shimmy damper.

MODEL R182 AND TR182 SERVICE MANUAL

- 5-92. **REMOVAL AND INSTALLATION OF NOSE GEAR STRUT ASSEMBLY.** (See figure 5-14.)
- a. Jack aircraft or weight down tail in accordance with procedures outlined in Section 2 of this manual.

WARNING

Turn master switch off and pull gear pump circuit breaker when working in wheel well area.

- b. Disconnect electrical leads from squat switch on upper torque link and tag for identification.
 - c. Remove access panel aft of gear well to provide access to actuator.
 - d. Remove bolt attaching actuator to trunnion, being careful to contain the washers and other downlock components normally held by the attaching bolt.
 - e. Remove steering rod attach bolt and bellcrank pivot bolt.
 - f. Remove trunnion pivot bolts and remove strut from aircraft.
 - g. Reverse procedure to install strut assembly.
- 5-93. **DISASSEMBLY OF NOSE GEAR STRUT.** (See figure 5-15.)
- a. Bleed pressure from strut through valve (9).
 - b. Remove shimmy damper (4, figure 5-14) from strut.
 - c. Remove torque links (29).
 - d. Remove steering bellcrank (11), collar (10) and valve (9) from top of strut assembly.
 - e. Remove flat lock ring (15) and collar (10) from lower end of barrel (14).
 - f. Remove wire lock ring (15) from inside groove at lower end of barrel (14). A small hole is drilled through the outer barrel to aid in the removal of the lock ring.

MODEL R182 AND TR182 SERVICE MANUAL

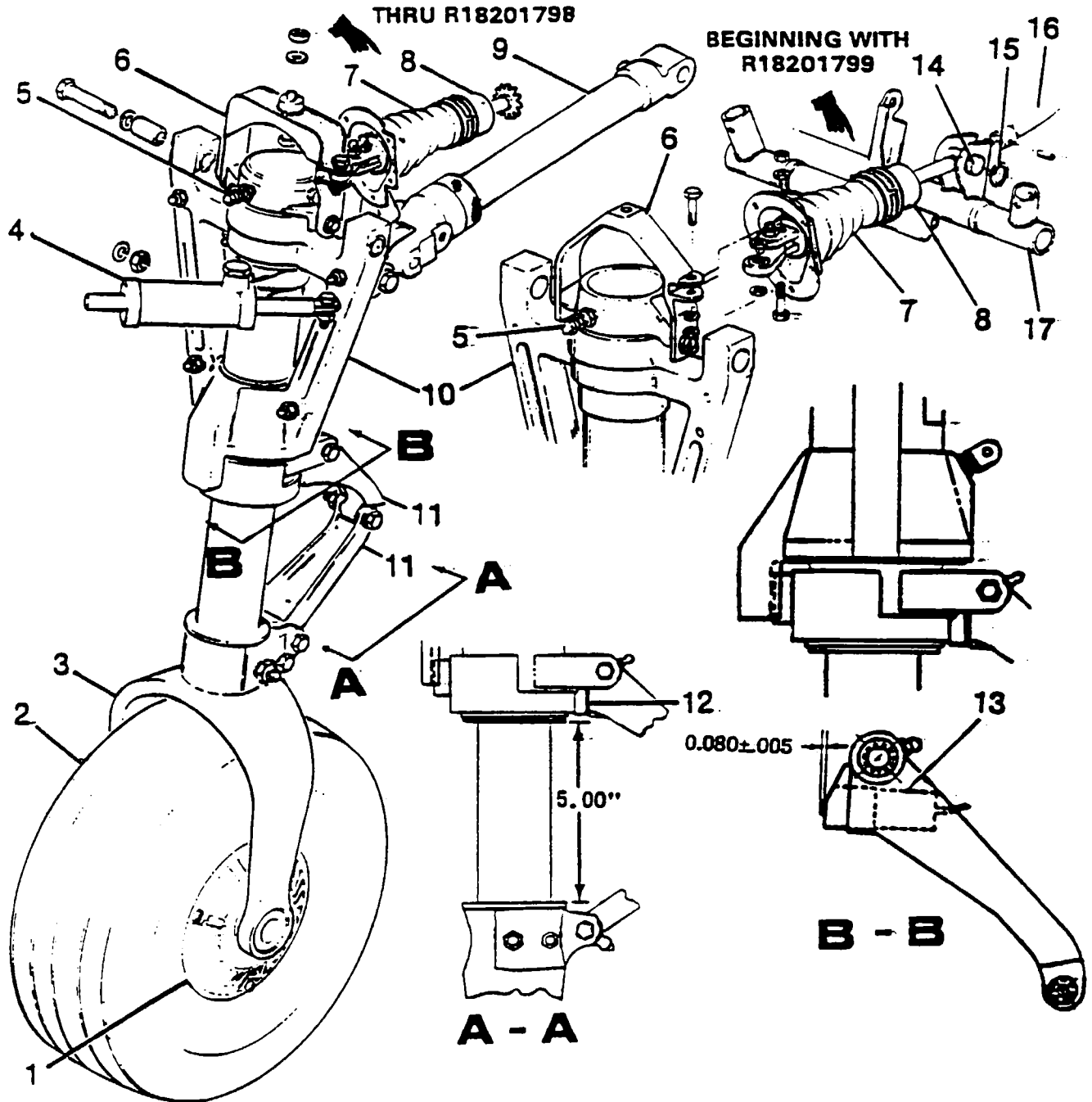
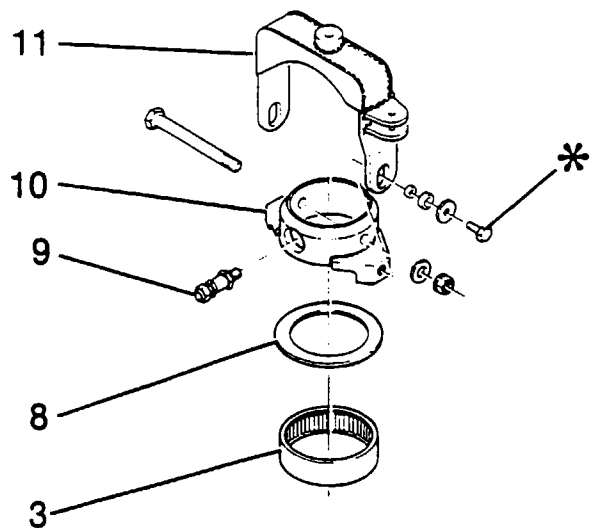
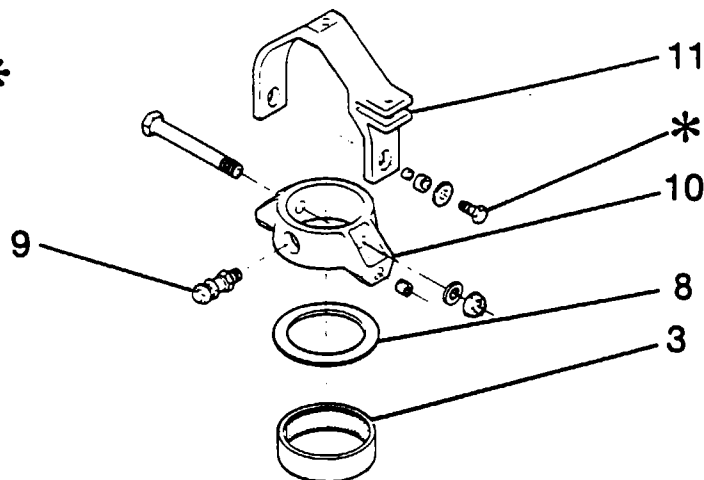


Figure 5-14. Nose Gear Assembly

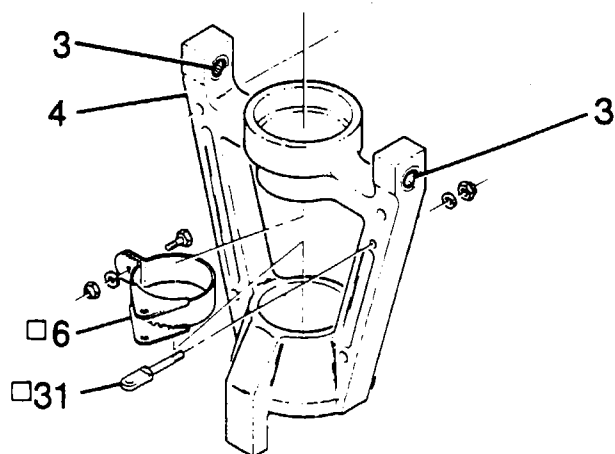
MODEL R182 AND TR182 SERVICE MANUAL



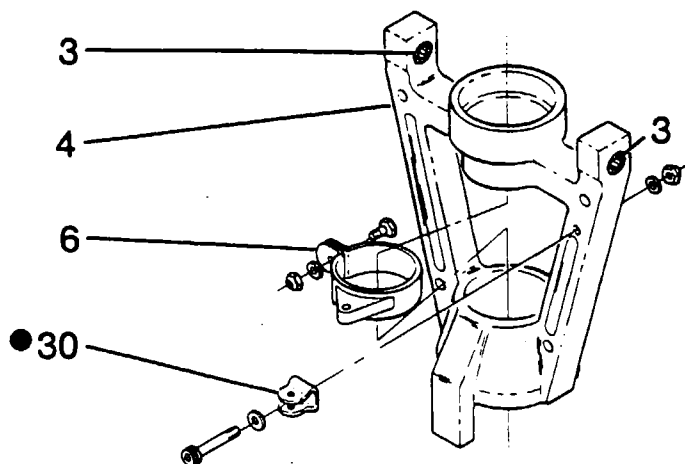
R18200001 THRU R18201798
FR18200001 THRU FR18200070



R18201799 & ON



□ R18200001 THRU R18200710
FR18200001 THRU FR18200045



● R18200711 THRU R18201276
FR18200046 THRU FR18200055

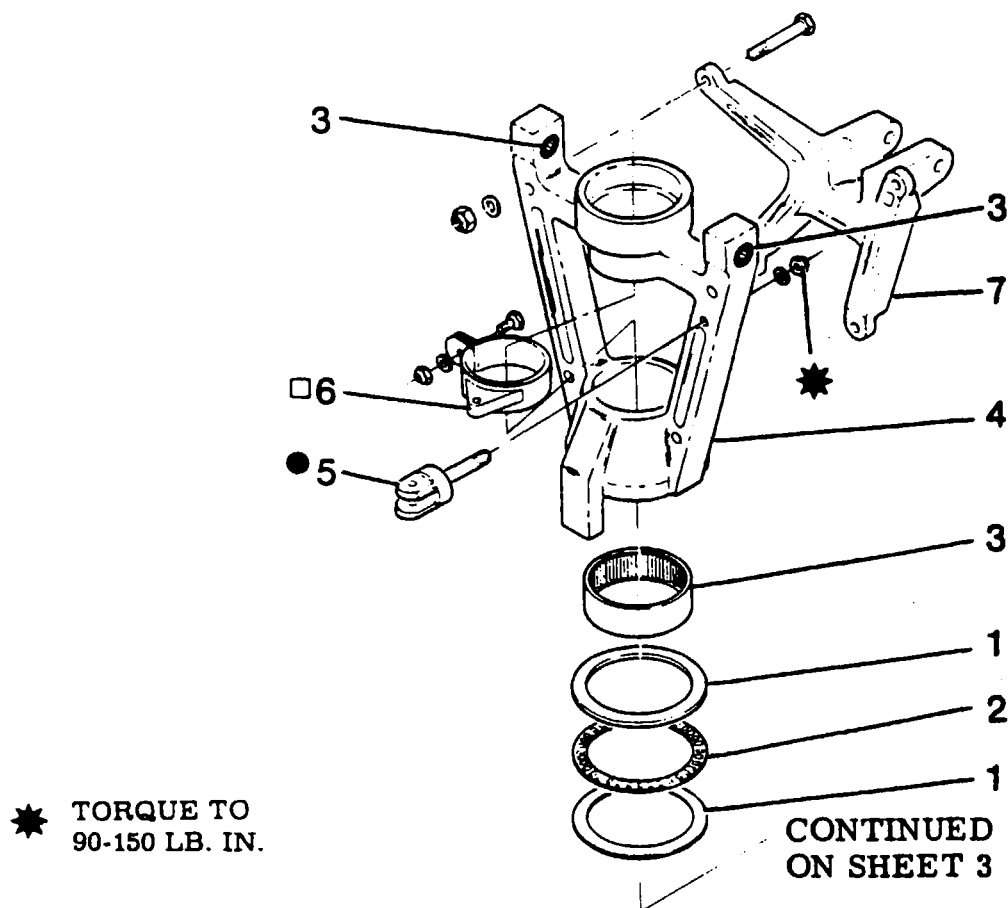
* Seal bolt thread with Loctite 271, Loctite Catalog No. 87, or STA-LOK Catalog No. 800. Beginning with Serial R18200001 and FR18200001.

- 3. Bearing
- 4. Trunnion
- 6. Shimmy Damper Attach Clamp
- 8. Washer
- 9. Valve

- 10. Collar
- 11. Steering Bellcrank
- 30. Shimmy Damper Bracket
- 31. Shimmy Damper Attach Eyebolt

Figure 5-15. Nose Gear Strut (Sheet 1 of 3)

MODEL R182 AND TR182 SERVICE MANUAL



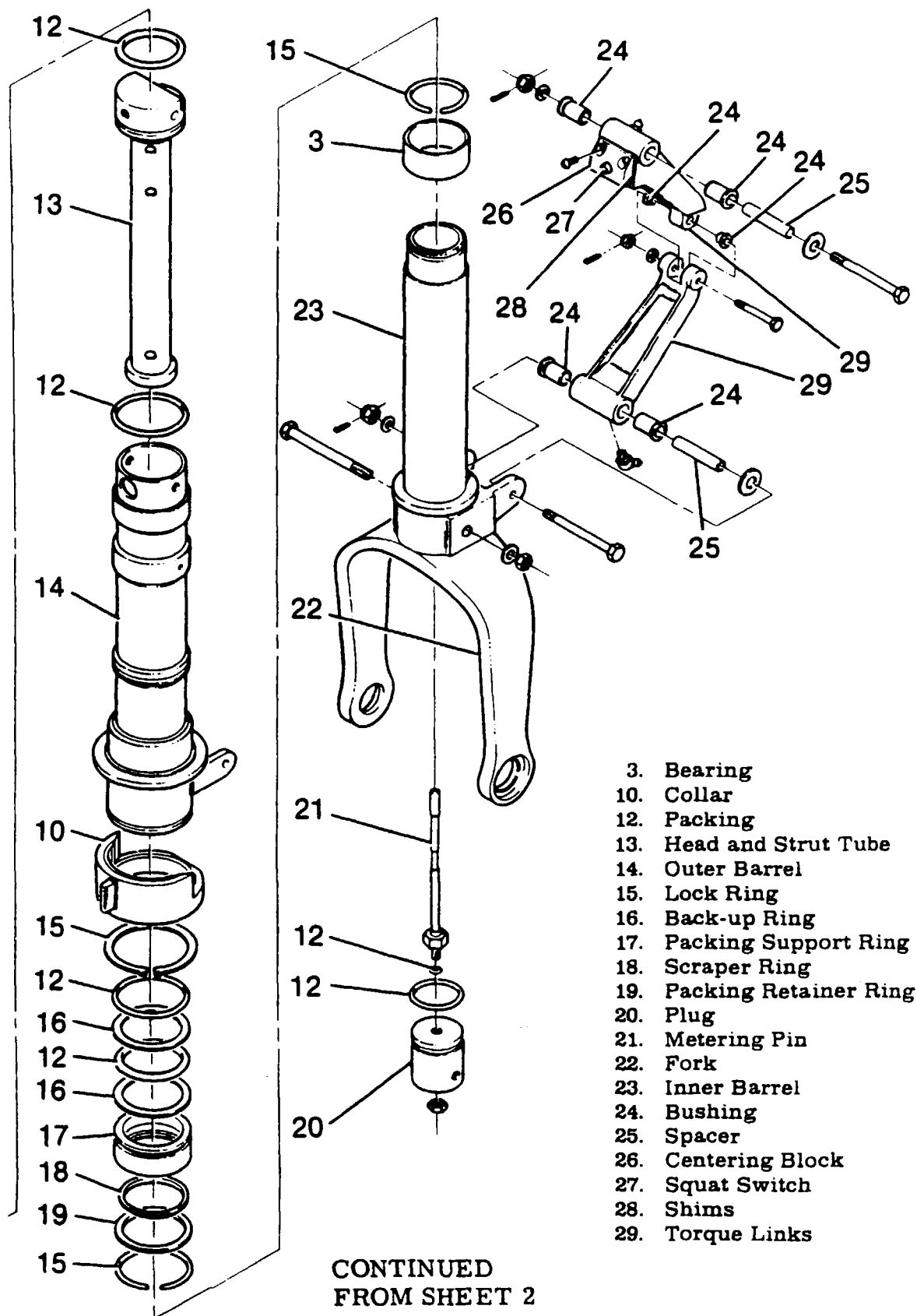
□ R18200711 & ON
FR18200046 THRU FR18200070

● R18201277 & ON
FR18200056 THRU FR18200070

1. Race
2. Thrust Bearing
3. Bearing
4. Trunnion
5. Shimmy Damper Attach
Clevis
6. Shimmy Damper Attach
Clamp
7. Actuator Attach Fitting

Figure 5-15. Nose Gear Strut (Sheet 2 of 3)

MODEL R182 AND TR182 SERVICE MANUAL



CONTINUED
FROM SHEET 2

Figure 5-15. Nose Gear Strut (Sheet 3 of 3)

MODEL R182 AND TR182 SERVICE MANUAL

- g. Pull inner barrel (23) from outer barrel (14) and drain hydraulic fluid from inner barrel.
- h. Remove wire lock ring (15) from groove at upper end of inner barrel (23) and remove bearing (3) and packing support ring (17) from inner barrel (23).
- i. Remove plug (20) and metering pin (21) from inner barrel (23) by removing bolt through fork (22) inner barrel (23) and plug (20). Remove metering pin (21) from plug (20).

5-94. INSPECTION AND REPAIR. (See figure 5-15.)

- a. Thoroughly clean all parts in cleaning solvent, and examine parts carefully.
- b. Install all new packings and back-up rings.
- c. Sharp metal edges should be smoothed with No. 400 emery paper, then thoroughly cleaned with solvent.
- d. If outer barrel (14) was removed from trunnion (4), lubricate needle bearings in accordance with the lubrication chart in Section 2 of this manual.
- e. Lubricate all packings and back-up rings, and all other internal parts with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7 during reassembly.

5-95. REASSEMBLY. (See figure 5-15.)

- a. Lubricate and install all new packings and back-up rings.
- b. Lubricate bearings as required with MIL-G-23827A grease or equivalent.
- c. Reassemble strut using reverse procedure of disassembly instructions outlined in paragraph 5-93.

NOTE

Do not overtighten nut at clamp (6) to cause excessive bending of clamp ears. Lubricate outer surface of strut tube (13), packing (12) and lock ring (15) with a protective film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7. Tighten nut on bolt attaching upper and lower torque links (29) snug, plus one additional castellation.

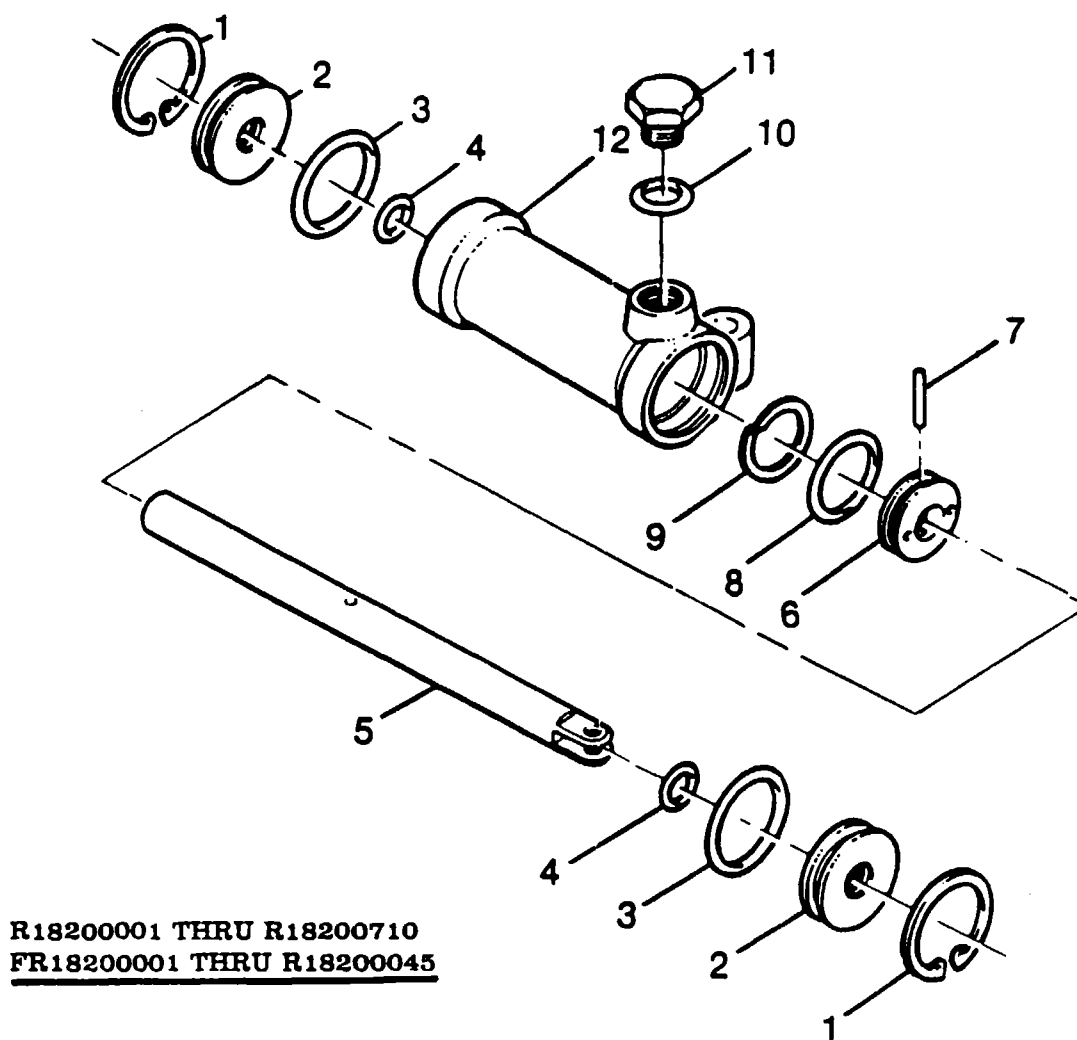
5-96. SHIMMY DAMPER. (See figure 5-16.)

5-97. DESCRIPTION. The shimmy damper is a self-contained hydraulic cylinder which acts as a restrictor. When the steering system reacts too rapidly, the shimmy damper maintains pressure against the steering arm by means of a piston which permits a restricted flow of hydraulic fluid from either end of the cylinder to the other through an orifice in the piston.

5-98. REMOVAL. (See figure 5-14.)

- a. Remove setscrew and bracket, eyebolt or clevis bolt securing shimmy damper to trunnion.
- b. Remove bolt attaching damper to bracket on nose gear strut.
- c. Remove shimmy damper from aircraft.

MODEL R182 AND TR182 SERVICE MANUAL

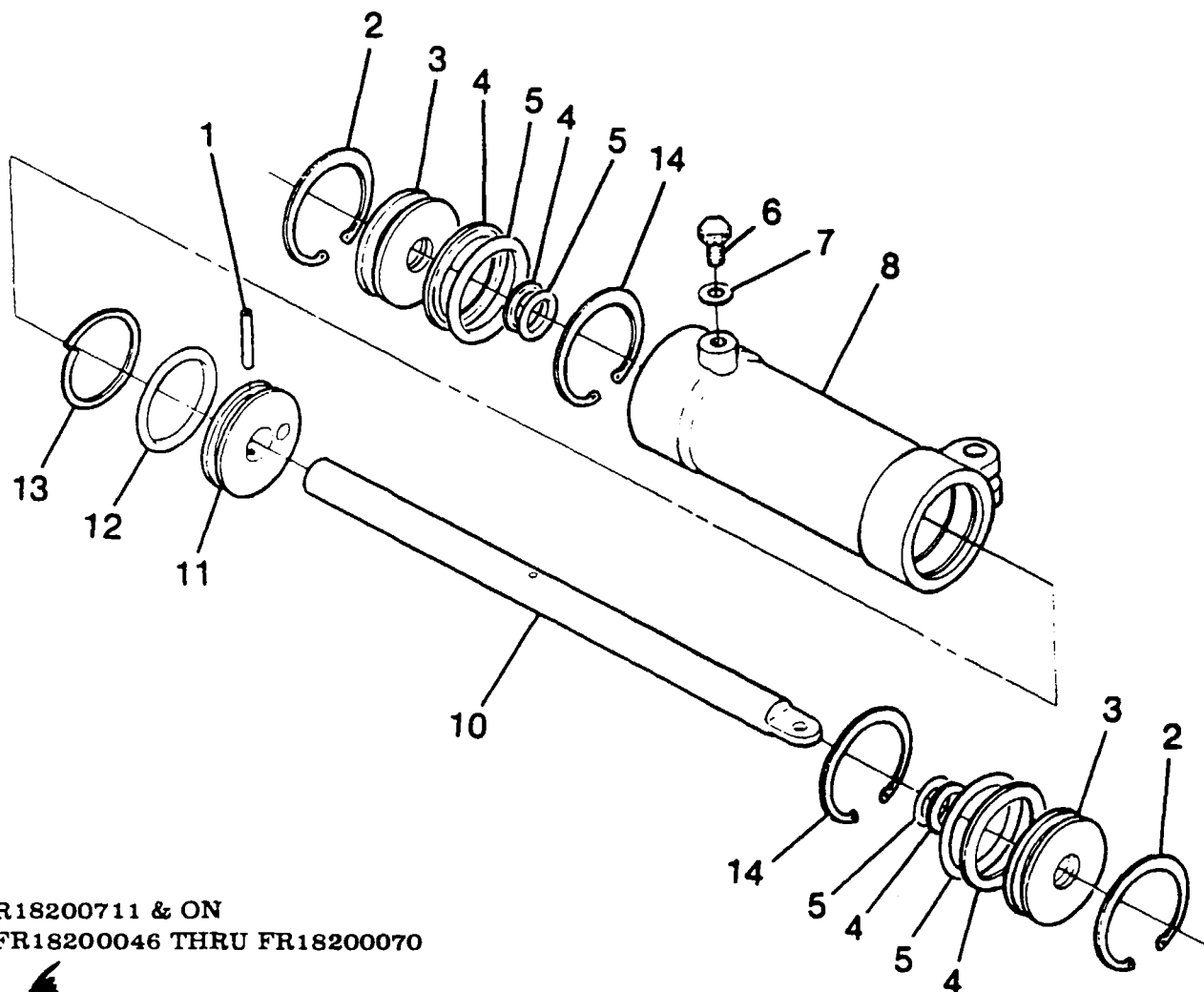


R18200001 THRU R18200710
FR18200001 THRU R18200045

1. Lock Ring
2. Bearing Head
3. Packing
4. Packing
5. Rod
6. Piston
7. Roll Pin
8. Packing
9. Back-up Ring
10. Packing
11. Plug
12. Body

Figure 5-16. Shimmy Damper (Sheet 1 of 2)

MODEL R182 AND TR182 SERVICE MANUAL



R18200711 & ON
FR18200046 THRU FR18200070

1. Roll Pin
2. Outer Retainer
3. Bearing Head
4. Back-Up Ring
5. Packing
6. Filler Plug
7. Stat-O-Seal
8. Barrel
9. Bushing
10. Piston Rod
11. Piston
12. O-Ring
13. Retainer
14. Inner Retainer

Figure 5-16. Shimmy Damper (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

- 5-99. **DISASSEMBLY.** (See figure 5-16, sheet 1.)
- Remove lock rings (1).
 - Remove bearing heads (2).
 - Remove packings (3) from bearing heads (2).
 - Remove rod (5).
 - Remove packing (8), and back-up ring (9) from piston (6). (Do not remove piston (6) from rod (5) unless new part is needed.)
 - Remove plug (11) and packing (10).
- 5-99A. **DISASSEMBLY.** (See figure 5-6, sheet 2.)
- Remove outer retainers (2) from each end of barrel (8) and remove bearing heads (3). Discard packings (5) and back-up rings (4) from bearing heads.
 - Remove inner retainers (14) from barrel (8).
 - Withdraw piston rod (10) from barrel (8) and discard O-ring (12). Piston (11) need not be removed from piston rod (10) unless replacement is required.
 - Remove plug (6) and stat-o-seal (7).
- 5-100. **INSPECTION AND REPAIR.** (See figure 5-16.)
- Thoroughly clean all parts in solvent and inspect carefully.
 - Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification PC-458), providing their removal does not affect the operation of the unit.
 - Replace all worn or defective parts.
- 5-101. **REASSEMBLY.** (See figure 5-16.)

NOTE

Install all new O-rings, packings, and back-up rings, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7 before assembly.

- Reassemble using reverse procedure of directions outlined in paragraph 5-99 or 5-99A.
- 5-102. **TORQUE LINKS.** Torque links are illustrated in figure 5-15. Removal and installation procedures for torque links are discussed in paragraphs 5-105 and 5-106 along with removal and installation of the nose gear squat switch. Lubricator fittings and bushings should not be removed except for replacement of parts. Excessively worn parts should be replaced with new parts.
- 5-103. **SQUAT SWITCH.** (See figure 5-14.)
- 5-104. **DESCRIPTION.** The squat (or safety) switch interrupts the landing gear circuit, preventing landing gear retraction while the aircraft is resting on the ground also, while airborne the switch prevents the nose gear from retracting into the well, except when the nose wheel is in alignment. The squat switch is installed through a hole in the upper torque link, and is threaded into a centering block, attached to the forward side of the torque link. A portion of the squat switch plunger protrudes from the aft side of the centering block $.080 \pm .005$ -inch. The threaded portion of the switch is sealed in the threads of the centering block with Grade B Loctite Sealant.

MODEL R182 AND TR182 SERVICE MANUAL

5-105. REMOVAL. (See figures 5-14 and 5-15.)

- a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
- b. Mark positions of sta-straps along routing of wires from squat switch at upper torque link to splices. Mark wires to facilitate correct installation of replacement leads; cut sta-straps.
- c. Disconnect or cut wires at splices and remove wires from routing down to squat switch at upper torque link.
- d. Deflate shock strut completely.
- e. Disconnect upper torque link from lower torque link, noting positions of washers and spacers.
- f. Disconnect upper torque link from upper strut lugs; remove upper torque link.
- g. Remove (2) screws attaching centering block to torque link.
- h. Retain any shims removed from between centering blocks and torque link for replacement.
- i. Break loose sealant in threads and remove squat switch from centering block.
- j. Remove all sealant from threads in centering block.

5-106. INSTALLATION. (See figures 5-14 and 5-15.)

- a. Install two leads from replacement squat switch through hole in centering block.
- b. Apply Loctite Grade B, or equivalent sealant, to threads in centering block.

NOTE

Cure time of Grade B sealant is 2 to 6 hours (unprimed) or 5 to 20 minutes (primed). Excessive sealant may be wiped off with a rag moistened with trichlorethylene.

- c. Screw replacement squat switch into centering block, ensuring that leads remain untwisted.
- d. Adjust squat switch by screwing or unscrewing into centering block to allow switch plunger to protrude $.080 \pm .005$ -inch, as shown in view B-B, figure 5-14.
- e. After sealant has cured (refer to note following step "b"), attach centering block to upper torque link with (2) screws, and insert leads and squat switch through hole in torque link.
- f. Attach torque link to upper strut lugs, installing washers and spacers in positions from which they were removed.
- g. Attach upper torque link to lower torque link.

NOTE

Tighten bolt snug, then tighten one more castellation and install cotter pin.

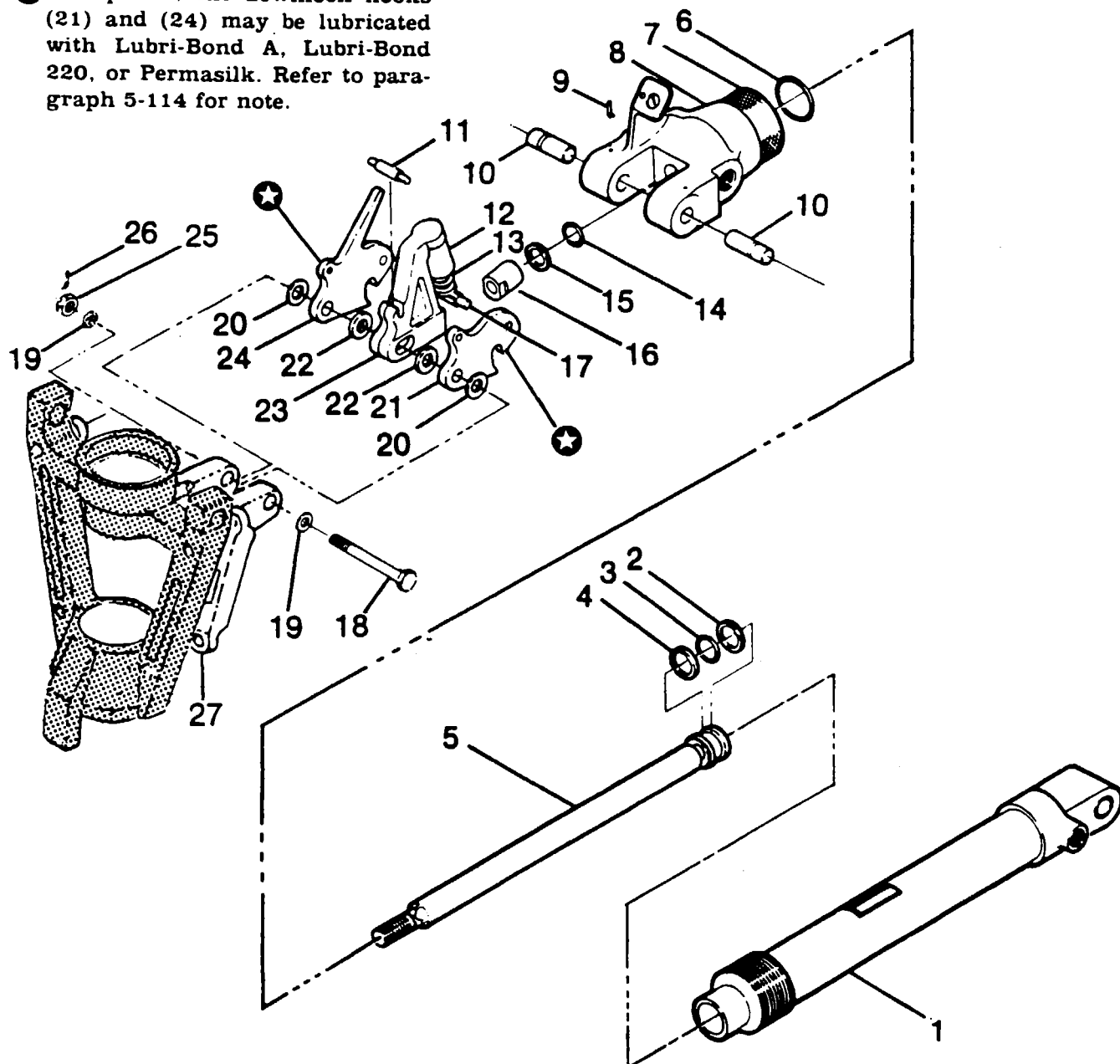
- h. With strut fully extended, check amount of extension. Add or delete shims (28) (figure 5-15), as necessary until strut extends 5.00 in. as shown in view A-A, figure 5-14.
- i. Inflate shock strut as outlined in Section 2.
- j. Route squat switch leads to match routing of removed wires.
- k. Install sta-straps in locations marked during removal.
- l. Splice squat switch leads, or connect at quick-disconnects to existing wires which were tagged during removal of old leads.

MODEL R182 AND TR182 SERVICE MANUAL

- 5-107. NOSE GEAR DOWNLOCK MECHANISM. (See figure 5-17.)
- 5-108. DESCRIPTION. The downlock mechanism consists of downlock hooks (21) and (24) on either side of the rod end (23). The downlock hooks are spring-loaded in the locked position. As the gear moves to the full-down position, the downlock hooks engage lock pins (10) on the bearing end (8), preventing retraction of the gear. As the gear-up cycle begins, the slotted hole in the actuator rod end (23) allows the rod end to move forward slightly, pushing against the cross bar (11) connecting the downlock hooks (21) and (24), causing the hooks to rotate up from the lock pins (10). As the rod end (23) continues to move forward, the free travel afforded by the slotted hole is taken up, and retraction of the gear begins.
- 5-109. REMOVAL, INSTALLATION AND RIGGING.
- See figure 5-17 and paragraph 5-112, which outlines procedures for removing the nose gear actuator. Components of the downlock mechanism will be freed as the actuator is removed.
 - Refer to paragraph for rigging instructions.
- 5-110. NOSE GEAR ACTUATOR. (See figure 5-17.)
- 5-111. DESCRIPTION. The nose gear actuator extends and retracts the nose gear and serves as a rigid drag strut in the gear-down position.
- 5-112. REMOVAL.
- Jack aircraft or weight down tail to raise nose wheel off the ground as outlined in Section 2 of this manual.
 - Tag for identification and disconnect electrical wires at the gear-down switch, located at the forward end of the actuator.
 - Disconnect hydraulic hoses from actuator. Cap or plug hose and fitting openings to prevent entry of foreign material.
 - Disconnect actuator from actuator attach fitting (7, figure 5-15) by removing cotter pin, castellated nut, washers and bolt.
 - Retain components of downlock mechanism which will be freed by removing bolt.
 - Disconnect actuator from airframe by removing cotter pin, castellated nut, washers and bolt from aft mounting bracket.
- 5-113. DISASSEMBLY. (See figure 5-17.)
- Loosen lock nut at end of piston rod and remove rod end assembly as a unit; remove lock nut from piston rod.
 - Remove safety wire from knurled nut, and loosen knurled nut.
 - Remove bearing end from cylinder, and remove nut from cylinder.
 - Pull piston from cylinder.
 - Remove packings and back-up rings from bearing end and piston.
 - Disassemble hook assembly.
- 5-114. INSPECTION AND REPAIR.
- Inspect all threaded surfaces for cleanliness and for cracks or excessive wear.
 - Inspect downlock hook spring for evidence of breaks and distortion. Free length of spring must be 2.406 ± 0.080 -inches, and compressed to 2.00-inches under 19.80 ± 2.0 pound load.

MODEL R182 AND TR182 SERVICE MANUAL

★ If required, the downlock hooks (21) and (24) may be lubricated with Lubri-Bond A, Lubri-Bond 220, or Permasilk. Refer to paragraph 5-114 for note.



- | | | |
|-----------------|------------------|-----------------------------|
| 1. Body | 10. Lock Pin | 19. Washer |
| 2. Back-up Ring | 11. Cross Bar | 20. Washer |
| 3. Packing | 12. Shield | 21. Downlock Hook |
| 4. Back-up Ring | 13. Spring | 22. Washer |
| 5. Piston/Rod | 14. Packing | 23. Red End |
| 6. Packing | 15. Back-up Ring | 24. Downlock Hook |
| 7. Knurled Nut | 16. Nut | 25. Nut |
| 8. Bearing End | 17. Spring Guide | 26. Cotter Pin |
| 9. Pin | 18. Bolt | 27. Actuator Attach Fitting |

Figure 5-17. Nose Gear Actuator/Downlock Assembly

MODEL R182 AND TR182 SERVICE MANUAL

- c. Inspect hooks, spring guide, bearing end, piston, cylinder and bushing for cracks, chips, scratches, scoring, wear or surface irregularities which may affect their function or the overall function of the nose gear actuator.
- d. Repair of most parts of the actuator assembly is impractical. Replace defective parts with serviceable parts.
- e. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification PC-458), providing their removal does not affect operation of the unit.

NOTE

The downlock hooks may be field lubricated with Lubri-Bond A, Lubri-Bond 220, or Permasilk. These products may be secured from the following companies.

Lubri-Bond A, and Lubri-Bond 220:

Electro-Film Inc.
7116 Laurel Canyon Blvd.
Hollywood, CA. 91605

Permasilk:

Everlube Corp. P.O. Box 2200
Hi-Way 52 N.W.
West Lafayette, IND. 47906

After application of either lubricant, allow parts to air dry for six hours, or dry for one hour at 120°F.

5-115. ASSEMBLY. (See figure 5-17.)

NOTE

When reassembling actuator, install new packings lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7.

MODEL R182 AND TR182 SERVICE MANUAL

- a. Install packing (6) in bearing end (8).
- b. Install packing (3), and back-up rings (2) and (4) on piston/rod (5).
- c. Insert piston/rod (5) rod into body (1). Do not damage back-up rings and packing when inserting piston rod.
- d. With knurled nut (7) on body (1), install bearing end (8) on body (1). Use care to avoid damage to packing and back-up rings when installing bearing end on body (1).

NOTE

Centerlines of lock pins (10) and bushing hole in body (1) must be parallel within 0.005-inch with actuator assembled to a length of 13.58" + 0.03-inches, measured from centerline of pins to centerline of bushing in cylinder at cylinder anchor end.

- e. Tighten and safety wire knurled nut (7).
- f. Install nut (16) on end of piston/rod (5).
- g. Assemble and install hook assembly on actuator attach fitting (27).

5-116. INSTALLATION.

NOTE

Before installing nose gear actuator, check condition of fit and attaching bolts and bushings. Replace any defective parts. Fill actuator with hydraulic fluid.

- a. Attach aft end of actuator to fuselage structure with bolt, washer and nut. Safety nut with cotter pin.
- b. Assemble and attach nose gear downlock mechanism to actuator attach fitting as shown in figure 5-17.
- c. Connect hydraulic lines to actuator and connect electrical leads to gear-down switch.
- d. See "Nose Gear Rigging" paragraph for adjustment and checking of downlock.

5-117. NOSE GEAR DOORS. (Thru R18201798.) (See figure 5-18.)

MODEL R182 AND TR182 SERVICE MANUAL

- 5-118. **DESCRIPTION.** The nose gear door system consists of a left and right hand door, interconnected by a crossover actuator assembly. As the gear is retracted, the forward side of the nose gear fork boss contacts the actuator crossover, causing the doors to close. Overcentering springs, attached to the actuator, serve to hold the doors in the full-open or closed position.
- 5-119. **REMOVAL AND INSTALLATION.** (Thru R18201798.) (See to figure 5-18.)
- Remove hinge bolts and related nuts washers and bushings (6).
 - Disconnect adjusting rod (9) from center hinge and remove door.
 - Disconnect springs (7) and remove actuator pivot bolts and related nuts, washers and bushings (5); remove actuator.
 - Reverse procedure to install doors.
- 5-120. **NOSE GEAR DOORS.** (Beginning with R18201799.) (See figure 5-19.)
- 5-121. **DESCRIPTION.** The nose gear door system is comprised of a left and right-hand door, interconnected by a crossover actuator assembly. As the gear is retracted, the forward side of the nose gear fork boss contacts the actuator crossover, causing the doors to close. Overcentering springs, attached to the actuator crossover, serve to hold the doors in the full open or closed position.
- 5-122. **REMOVAL.** (Beginning with R18201799.) (See figure 5-19.)
- Remove hinge bolts and related nuts, washers (8), (9) and bushings (10).
 - Disconnect adjusting rod assemblies (11) from center hinges and remove doors.
 - Disconnect springs (7), and remove actuator pivot bolts and related nuts, washers and bushings (6).
- 5-123. **INSTALLATION.** (Beginning with R18201799.) (See figure 5-19.) Reverse procedures outlined in paragraph 5-122 to install doors.

NOTE

Thru serial R18201899, check clearance between nose gear doors and lower cowl skin to be $.10 \pm .06/00$ inch. Safety wire rod assemblies to fair nose gear doors in closed position. Adjust stop bolts (14) on brackets (13) to contact bushings (5) when nose gear doors are in full open position.

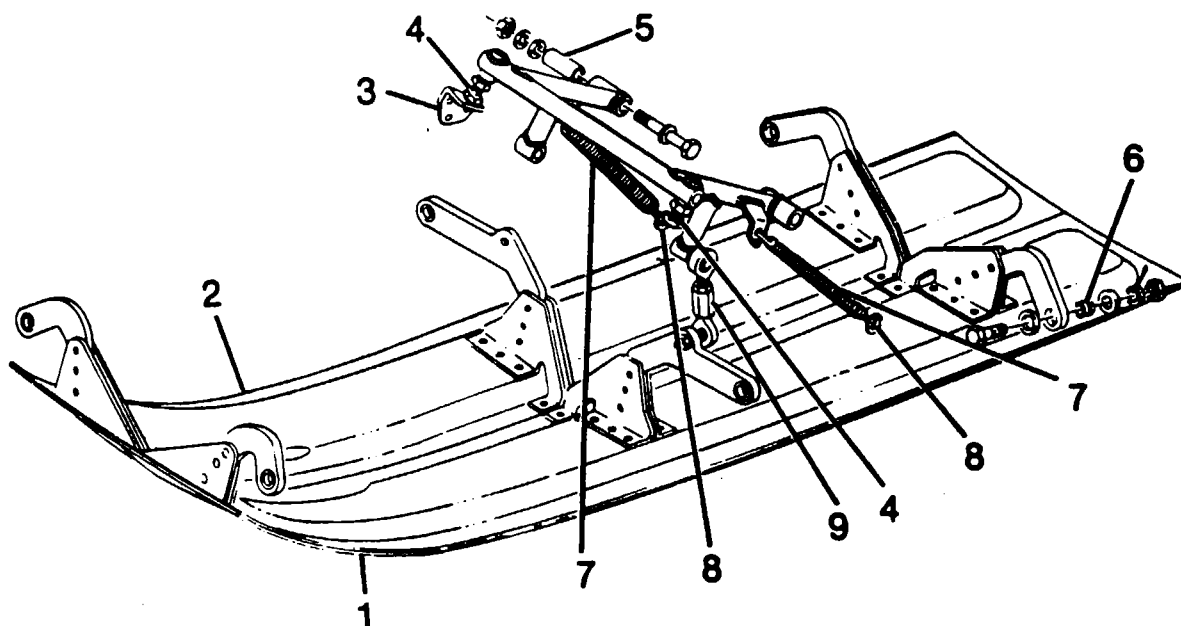
- 5-124. **DELETED.**

MODEL R182 AND TR182 SERVICE MANUAL

- 5-125. NOSE WHEEL STEERING SYSTEM. (See figure 5-19.)
- 5-125. DESCRIPTION. The nose wheel steering system links the rudder pedals to the nose wheel fork, affording steering control through use of the rudder pedals. Kinematics of the system automatically straighten the nose wheel as the landing gear is retracted. During retraction the centering block on the upper torque link aligns and locks the nose wheel in the neutral position. Continued free movement of the rudder pedals is assured by the steering bungee. (See figure 5-14.)
- 5-126. STEERING BUNGEE ASSEMBLY. (See figure 5-19.)
- 5-127. DESCRIPTION. The steering bungee assembly is spring-loaded, and should not be disassembled internally. The steering bungee is connected to the steering bellcrank on the nose gear strut by a bearing end assembly, and to the rudder bar assembly by a rod assembly thru R18201798. Beginning with R18201799, the steering bungee assembly is connected to the steering bellcrank on the nose gear strut by a bearing end assembly, and to the rudder bar assembly by a barrel nut and two snap rings.
- 5-128. REMOVAL. (Thru R18201798.) (See figure 5-19.)
- Disconnect bearing end assembly from steering bellcrank (8) on nose gear strut.
 - Disconnect rod end assembly from rudder bar assembly (2).
 - Remove sprocket (4) from chain assembly (3); remove steering bungee assembly (5).
- 5-129. INSTALLATION. (Thru R18201798.) (See figure 5-19.)
- Install chain assembly (3) on sprocket (4).
 - Connect rod end assembly to rudder bar assembly (2).
 - Connect bearing end assembly to steering bellcrank (8) on nose gear strut.
- 5-130. REMOVAL. (Beginning with R18201799.) (See figure 5-19.)
- Disconnect bearing end assembly from steering bellcrank (8) on nose gear strut.
 - Remove pin (14) and flex shaft (11) from shaft of steering bungee assembly (5).
 - Remove snap rings (13) and barrel nut (12) securing steering bungee (5) to ears of rudder bar assembly (2).
 - Disconnect bearing end assembly from steering bungee assembly (5).

MODEL R182 AND TR182 SERVICE MANUAL

THRU R18201798

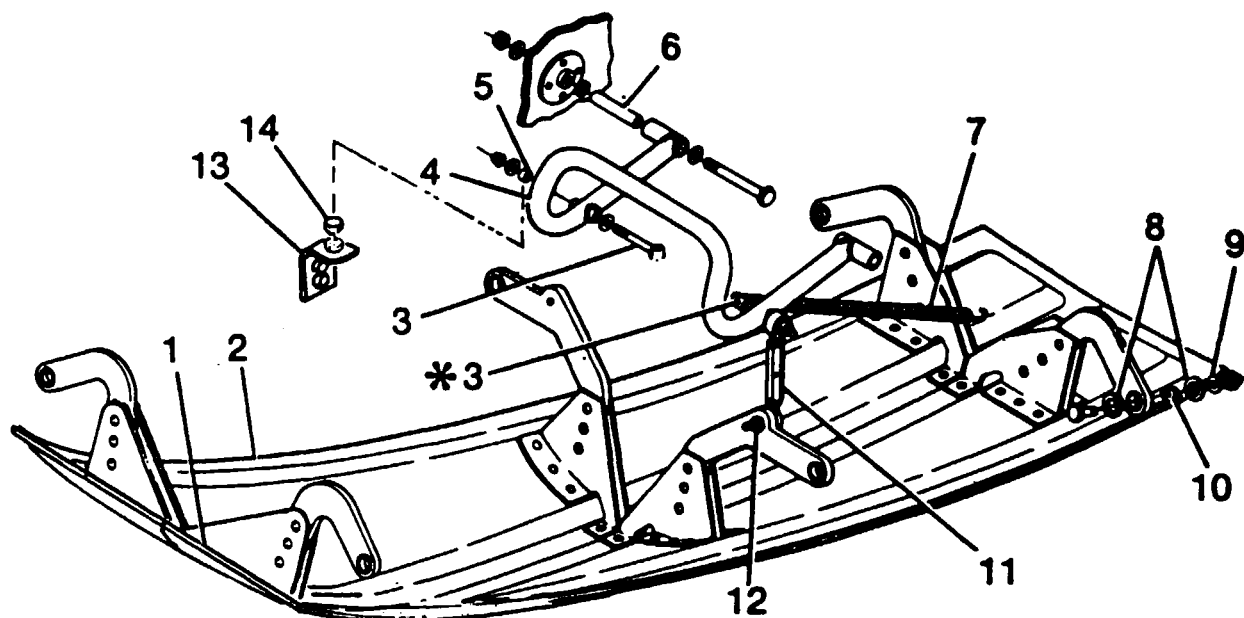


1. Left-Hand Door Assembly
2. Right-Hand Door Assembly
3. Bracket
4. Stop Bolt and Jam Nut Adjustment
5. Bushing (2)
6. Bushing (6)
7. Spring
8. Washer
9. Adjusting Rod

Figure 5-18. Nose Gear Doors (Sheet 1 of 2.)

MODEL R182 AND TR182 SERVICE MANUAL

BEGINNING WITH R18201799



1. Left-Hand Door Assembly
2. Right-Hand Door Assembly
3. Bolt
4. Actuator Assembly
5. Bushing
6. Bushing
7. Spring
8. AN 960-616L Washer
9. AN 960-10L Washer
10. Bushing
11. Rod Assembly
12. Nut
13. Bracket
14. Stop Bolt and Adjusting Nut

* Bolt is replaced with an eyebolt beginning with R18201949

Figure 5-18. Nose Gear Doors (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

- 5-131. **INSTALLATION.** Beginning with R18201799.) (See figure 5-19).
- Install steering bungee (5) such that shaft is positioned between ears of rudder bar assembly (2).
 - Install barrel nut (12) and two snap rings (13).
 - Connect bearing end assembly to steering bellcrank (8) on nose gear strut.
 - Install flex shaft (11) over shaft of steering bungee assembly (5); install pin (14).
- 5-132. **REMOVAL AND INSTALLATION OF NOSE WHEEL STEERING SYSTEM COMPONENTS.** (See figure 5-19.) Use the figure as a guide in determining system component relationship and for removal and installation of system components.
- 5-133. **RIGGING NOSE WHEEL STEERING SYSTEM.** Since the nose wheel steering system is connected with the rudder control system, adjustment to one system would directly affect the other. Refer to Section 10 of this manual for rigging procedures for the rudder system and the nose wheel steering system.
- 5-134. **NOSE WHEEL AND TIRE ASSEMBLY.**
- 5-135. **DESCRIPTION.** The aircraft may be equipped with either Cleveland or McCauley wheel assemblies. Separate disassembly, inspection and re-assembly instructions are provided for each type. Basic difference of the two types are shown in figure 5-20.

CAUTION

Use of recapped tires or new tires not listed on the aircraft equipment list are not recommended due to possible interference between the tire and structure when landing gear is in the retracted position.

MODEL R182 AND TR182 SERVICE MANUAL

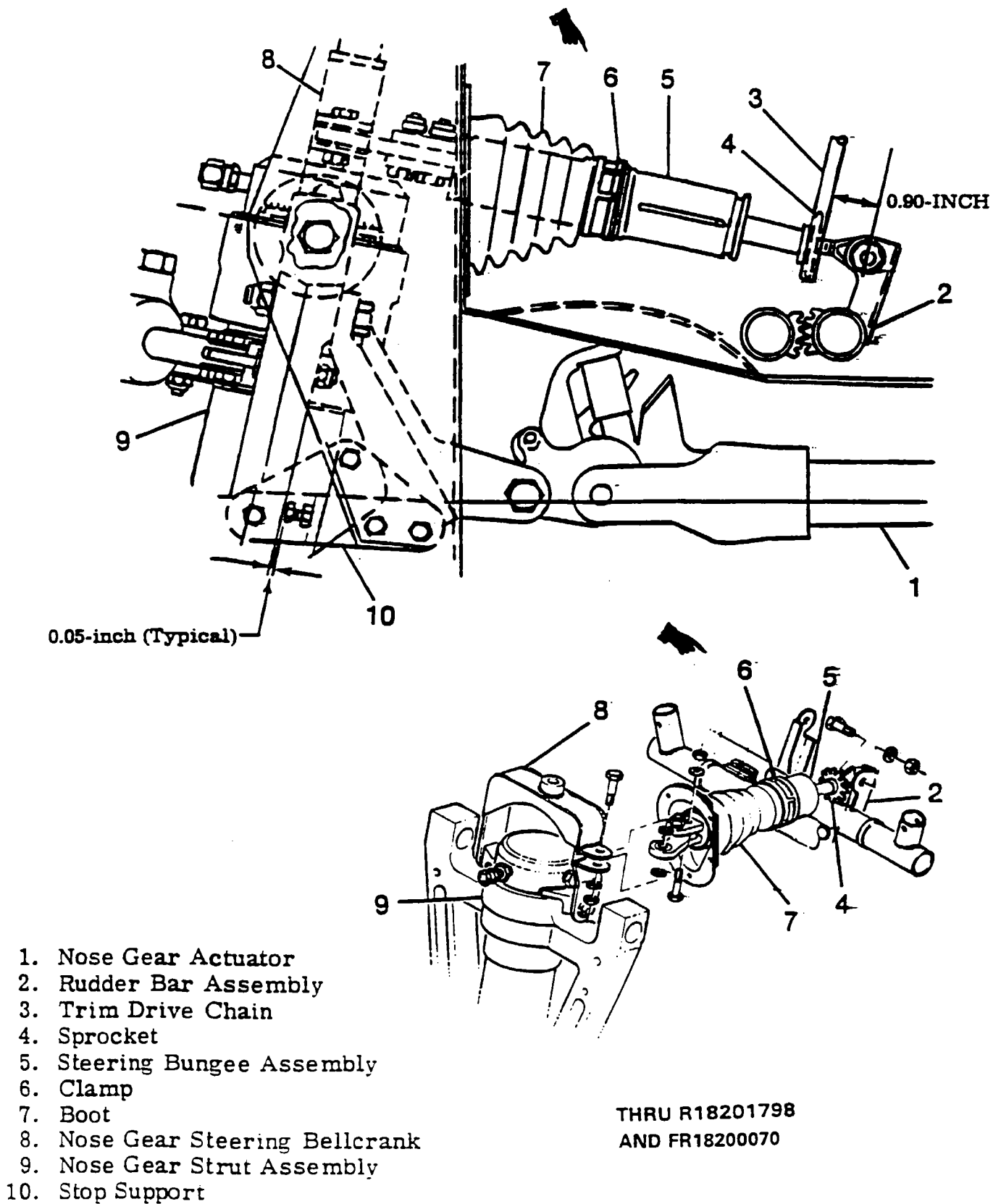
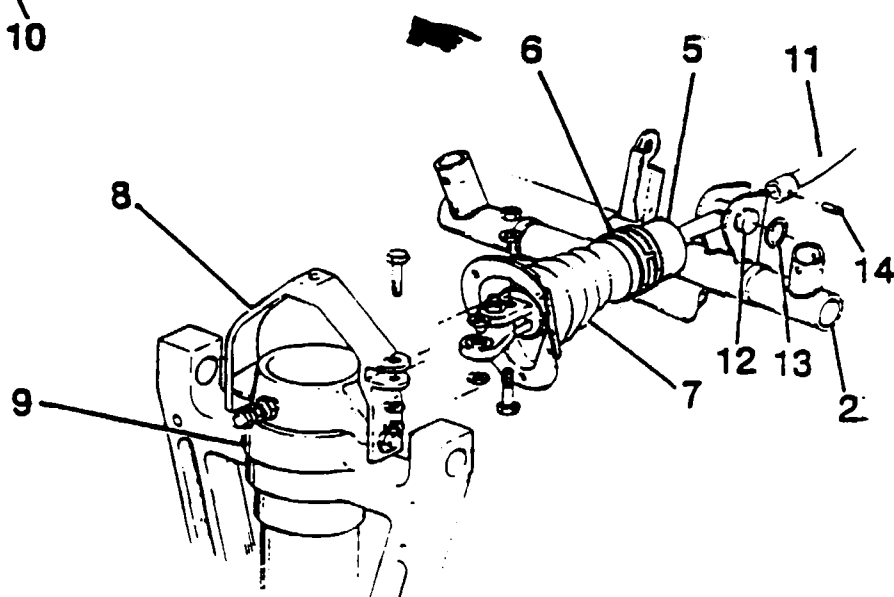
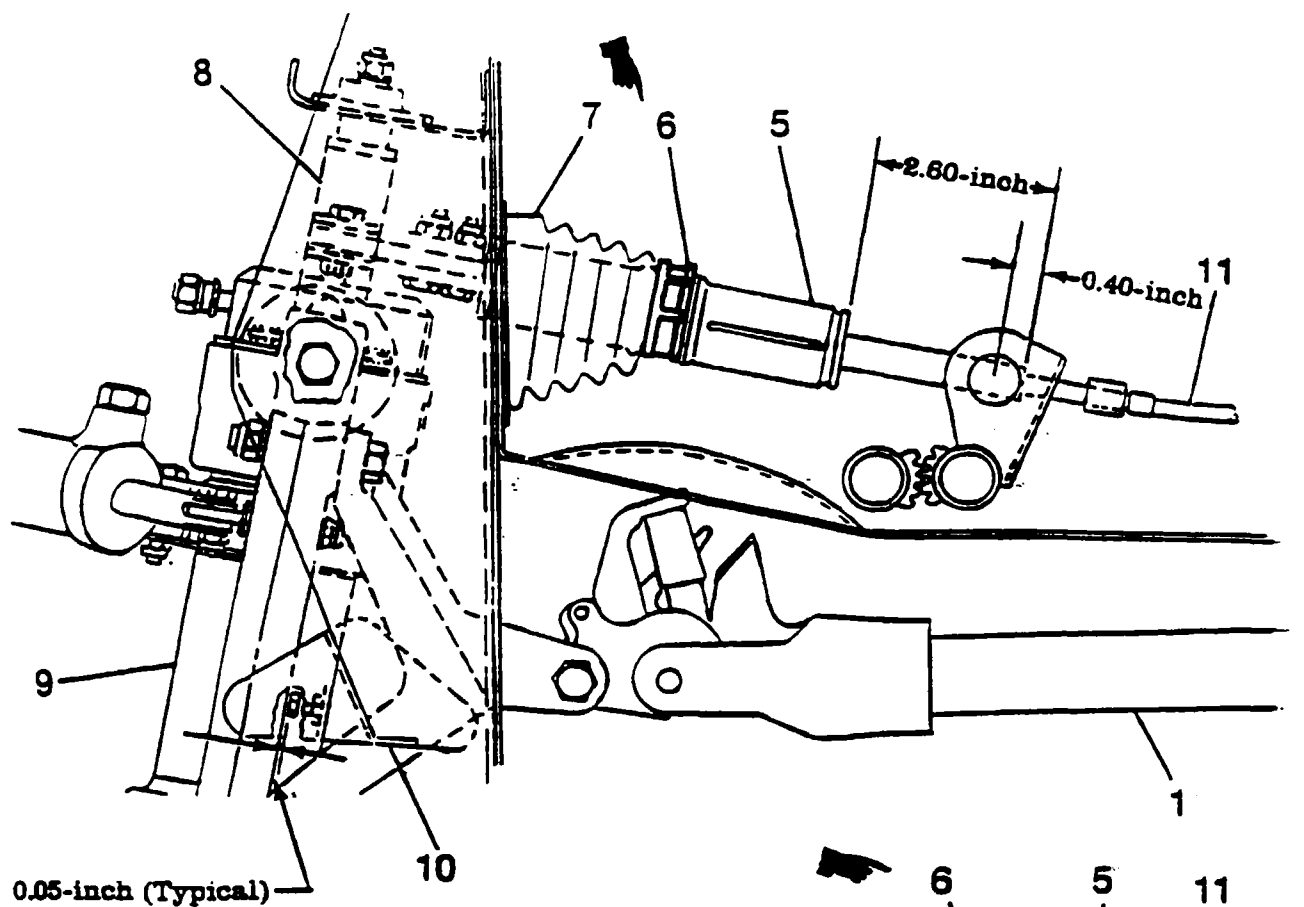


Figure 5-19. Nose Gear Steering (Sheet 1 of 2)

MODEL R182 AND TR182 SERVICE MANUAL



1. Nose Gear Actuator
2. Rudder Bar
5. Steering Bungee
6. Clamp
7. Boot
8. Nose Gear Steering Bellcrank
9. Trunnion
10. Stop Support
11. Flex Shaft
12. Barrel Nut
13. Snap Ring
14. Pin

BEGINNING WITH R18201799

Figure 5-19. Nose Gear Steering (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

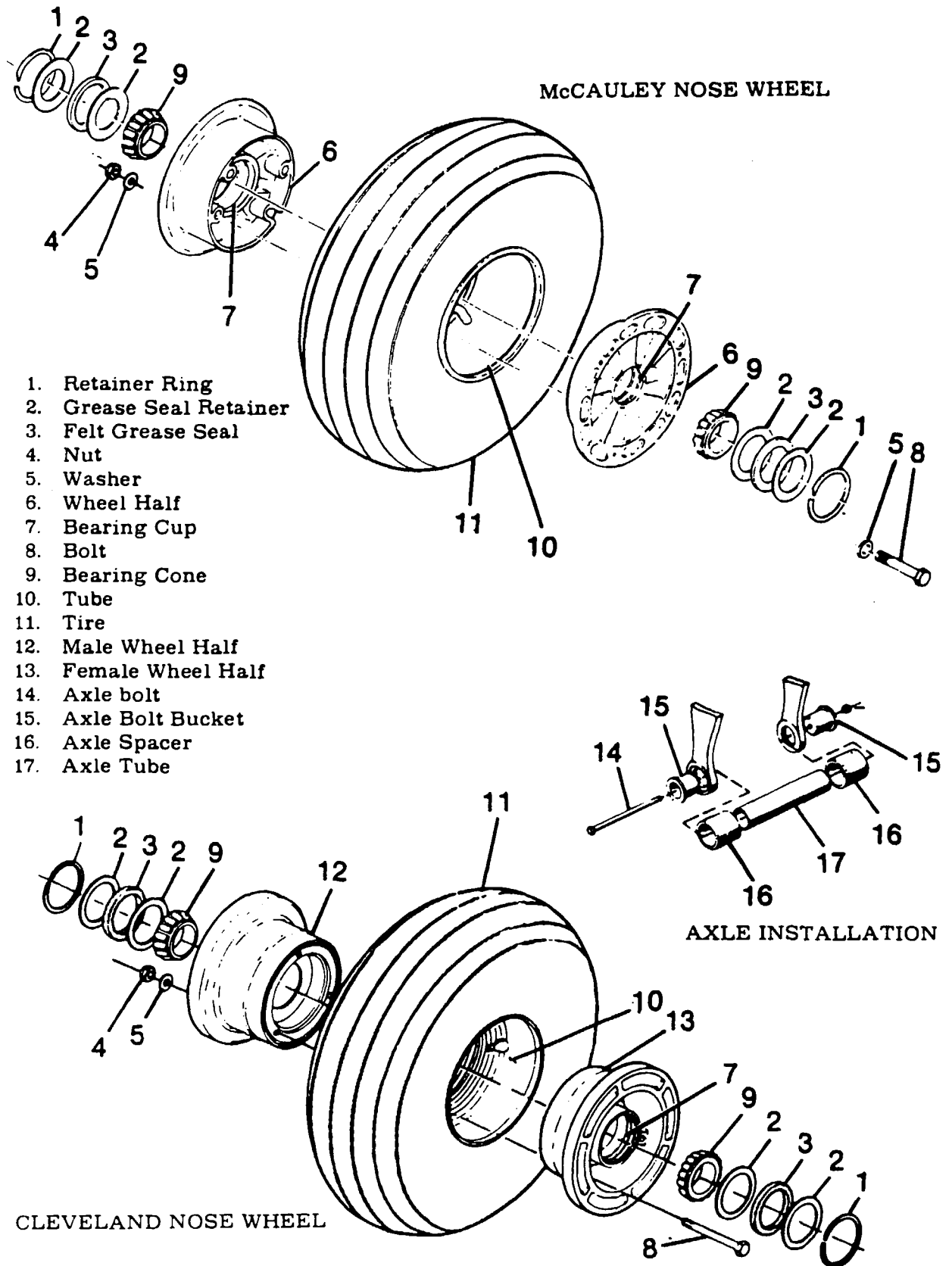


Figure 5-20. Nose Gear Wheel and Tire Assembly

MODEL R182 AND TR182 SERVICE MANUAL

5-136. REMOVAL AND INSTALLATION.

- a. Weight or tie-down tail of aircraft to raise the nose wheel off the floor.
- b. Remove nose wheel axle bolt.
- c. Use a rod or long punch inserted through one axle bolt ferrule to tap the opposite ferrule out of the fork. Remove both ferrules and pull the nose wheel from the fork.
- d. Remove spacers and axle tube from the nose wheel.
- e. Reverse the preceding steps to install the nose wheel. Tighten axle bolt until a slight bearing drag is obvious when the wheel is turned. Back the nut off to the nearest castellation and install cotter pin.

5-137. DISASSEMBLY OF CLEVELAND NOSE WHEEL AND TIRE ASSEMBLY. (See figure 5-20.)

- a. Remove hub cap, completely deflate tire and break tire beads loose from wheel rims.

WARNING

Injury can result from attempting to separate wheel halves with the tire inflated. Avoid damaging wheel flanges when breaking tire beads loose. Do not use impact wrenches on thru-bolts or nuts.

- b. Remove thru-bolts and separate wheel halves.
- c. Remove tire and tube from wheel halves.
- d. Remove bearing retaining rings, grease seals, and bearing cones.

NOTE

The bearing cups are a press fit in the wheel halves and should not be removed unless installation of new cups is necessary. To remove, heat wheel half in boiling water for 15 minutes. Using an arbor press if available, press out the bearing cup and press in the new one while the wheel is still hot.

5-138. INSPECTION AND REPAIR OF CLEVELAND WHEEL AND TIRE ASSEMBLY.

- a. Clean all metal parts and the grease seal felts in cleaning solvent and dry thoroughly.
- b. Inspect wheel halves for cracks. Cracked wheel halves must be rejected and new parts installed. Sand out nicks, gouges, and corroded areas. When the protective coating has been removed, the area should be cleaned thoroughly, primed with zinc chromate and painted with aluminum lacquer.
- c. Bearing cups and cones must be inspected carefully for damage and discoloration. After cleaning, repack cones with clean aircraft wheel bearing grease before installation in the wheel half.

5-139. REASSEMBLY OF CLEVELAND NOSE WHEEL AND TIRE ASSEMBLY. (See figure 5-20.)

- a. Insert tube in tire, aligning index marks on tire and tube.
- b. Place tire and tube on wheel half and position valve stem through hole in wheel half.
- c. Insert thru-bolts, position other wheel half, and secure with washers and nuts. Take care and avoid pinching tube between wheel halves. Torque thru-bolts evenly to 140-150 lb in.

CAUTION

Uneven or improper torque on thru-bolt nuts may cause bolt failure with resultant wheel failure.

MODEL R182 AND TR182 SERVICE MANUAL

- d. Clean and repack bearing cones with clean aircraft wheel bearing grease.
- e. Assemble bearing cones, seals, and retainers into wheel halves.
- f. Inflate tire to seat tire beads, then adjust to correct pressure.
- g. Install hub caps and install wheel in accordance with paragraph 5-125.

5-140. DISASSEMBLY OF McCAULEY NOSE WHEEL AND TIRE ASSEMBLY.

NOTE

Serious damage can result from attempting to separate wheel halves with tire and tube inflated.

- a. Completely deflate tire and tube and break loose tire beads. Extreme care must be exercised to prevent tire tool damage when removing tire from wheel halves.
- b. Remove nuts and washers.
- c. Remove thru-bolts and washers.
- d. Separate and remove wheel halves from tire and tube.
- e. Remove retaining ring, grease seal retainer felt grease seal, grease retainer and bearing cone from each wheel half.

NOTE

Bearing cups (races) are a press fit in the wheel halves and should not be removed unless a new part is to be installed. To remove bearing cups, heat wheel half in boiling water for 30 minutes or in an oven not to exceed 121°C (250°F). Using an arbor press, if available, press out bearing cup and press in new bearing cup while wheel half is still hot.

5-141. INSPECTION AND REPAIR OF McCAULEY NOSE WHEEL AND TIRE ASSEMBLY.

- a. Clean all metal parts and felt grease seals in Stoddard solvent, or equivalent, and dry thoroughly.

NOTE

A soft bristle brush may be used to remove hardened grease, dust or dirt.

- b. Inspect wheel halves for cracks or damage.
- c. Inspect bearing cones, cups, retaining rings and seals for wear or damage.
- d. Inspect thru-bolts and nuts for cracks in threads or cracks in radius under bolt head.
- e. Replace cracked or damaged wheel halves.
- f. Replace damaged retaining rings and seals.
- g. Replace any worn or cracked thru-bolts or nuts.
- h. Replace any worn or damaged bearing cups or cones.
- i. Remove any corrosion or small nicks.
- j. Repair reworked areas of wheel by cleaning thoroughly, then applying one coat of clear lacquer.
- k. Pack bearings with grease specified in Section 2 of this manual.

MODEL R182 AND TR182 SERVICE MANUAL

5-142. REASSEMBLY OF McCAULEY NOSE WHEEL AND TIRE ASSEMBLY.

- a. Assemble bearing cone, grease seal retainer, felt grease seal, grease seal retainer and retaining rings into both wheel halves.
- b. Insert tube in tire, aligning index marks on tire and tube.
- c. Place wheel half into tire and tube (side opposite valve stem), aligning base of valve stem in valve slot. With washer under head of thru-bolt, insert bolt through wheel half.
- d. Place wheel half into other side of tire and tube, aligning valve stem in valve slot.
- e. Install washers and nuts on thru-bolts and pre-torque to 10-50 lb. in.

CAUTION

Uneven or improper torque of the nuts can cause failure of the bolts with resultant wheel failure.

- f. Prior to torquing nuts, inflate tube with approximately 10-15 psi air pressure to seat tire.

CAUTION

Do not use impact wrenches on thru-bolts or nuts.

- g. Dry torque all nuts evenly to a torque value of 140-150 lb. in.
- h. Inflate tire to correct pressure specified in Section 1 of this manual.

5-143. WHEEL BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, installing a new tire probably will correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The light-weight point of the tire is marked with a red dot on the tire sidewall and the heavy-weight point of the tube is marked with a contrasting color line usually near the valve stem. When installing a new tire, place these marks adjacent to each other. If a wheel becomes unbalanced during service, it may be statically rebalanced. Wheel balancing equipment is available from the Cessna Supply Division.

5-144. NOSE GEAR RIGGING. (Thru R18201798.) (See figure 5-21.)

- a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
- b. Place gear position selector handle in "down" position, turn master switch on and allow system to pressurized. Turn master switch off and pull gear pump circuit breaker.
- c. See figure 5-14, view A-A, for correct amount of strut extension. Add or delete shims between centering block and upper torque link as required until specified extension is obtained with strut fully extended.

MODEL R182 AND TR182 SERVICE MANUAL

WARNING

Completely deflate nose gear strut before disconnecting torque links.

- d. Check that downlock hooks (19) fully engage lock pins (18) as shown and that gear down switch (23) is properly positioned. If hooks (19) fail to engage pins (18), place gear position selector handle in a neutral position and pull the gear forward by hand until nut (25) is accessible. Loosen nut and, using wrench on flats of piston, screw piston (26) several turns into rod end (22); tighten nut (25). Place gear position selector handle in "down" position, turn master switch on and allow gear to extend to the down and locked position. Recheck downlock hook (19) and gear down switch (23) positions; adjust as necessary.
- e. Disconnect adjusting rods (14) from gear doors and secure doors in full open position with tape.
- f. Turn master switch on and place landing gear position selector handle in "up" position and allow gear to rotate until downlocks disengage. Place gear position selector handle in a neutral position.
- g. Adjust stop bolts (3) on door actuator assembly (4) to provide simultaneous contact with brackets (16) on each side with minimum stop bolt extension. Start with stop bolts turned all the way in. Linkage must be overcenter when doors are fully open.
- h. Install hooks of springs (13) on door actuator assembly (4) with hooks turned inward. Washers (12) are installed on wheel well side.
- i. Turn master switch on and place gear position selector handle in the up position. Allow gear to rotate to full up position, then turn master switch off.
- j. Centerline of axle (1) should be aligned with top edge of gear well (± 0.10 -inch). Adjust upstop bumper (6) as necessary to position axle correctly.
- k. Check that switch (7) is closed and plunger has small amount of free travel remaining. (Plunger should not be bottomed out.)
- l. Close gear doors, one at a time, and attach adjusting rods (14). Adjust length of rod (14) until door fairs with cowling. Remove rods (14) from doors and secure doors in full open position with tape.
- m. Turn master switch on, engage gear pump circuit breaker and run gear down to midway position; turn master switch off, pull gear pump circuit breaker and place gear position selector handle in a neutral position.
- n. Attach adjusting rods (14) to doors and swing gear by hand to ensure that doors clear strut and tire by 0.25-inch minimum clearance.
- o. Turn master switch on, engage gear pump circuit breaker and run gear to full up position and check that doors fair. Thru R18201899 trim outboard edges of door assemblies on 45° angle (inside corner), if necessary, to clear cowl skins with 0.10 + .06, -.00-inch in closed position. Make final adjustments to adjusting rod assemblies.
- p. Run gear to full down position. Adjust stop bolts (3) on stop supports (27) to obtain 0.050-inch clearance between stop bolt head and nose gear trunnion.
- q. Turn master switch off and remove aircraft from jacks.

CAUTION

Be sure that stop bolts on stop supports are adjusted

MODEL R182 AND TR182 SERVICE MANUAL

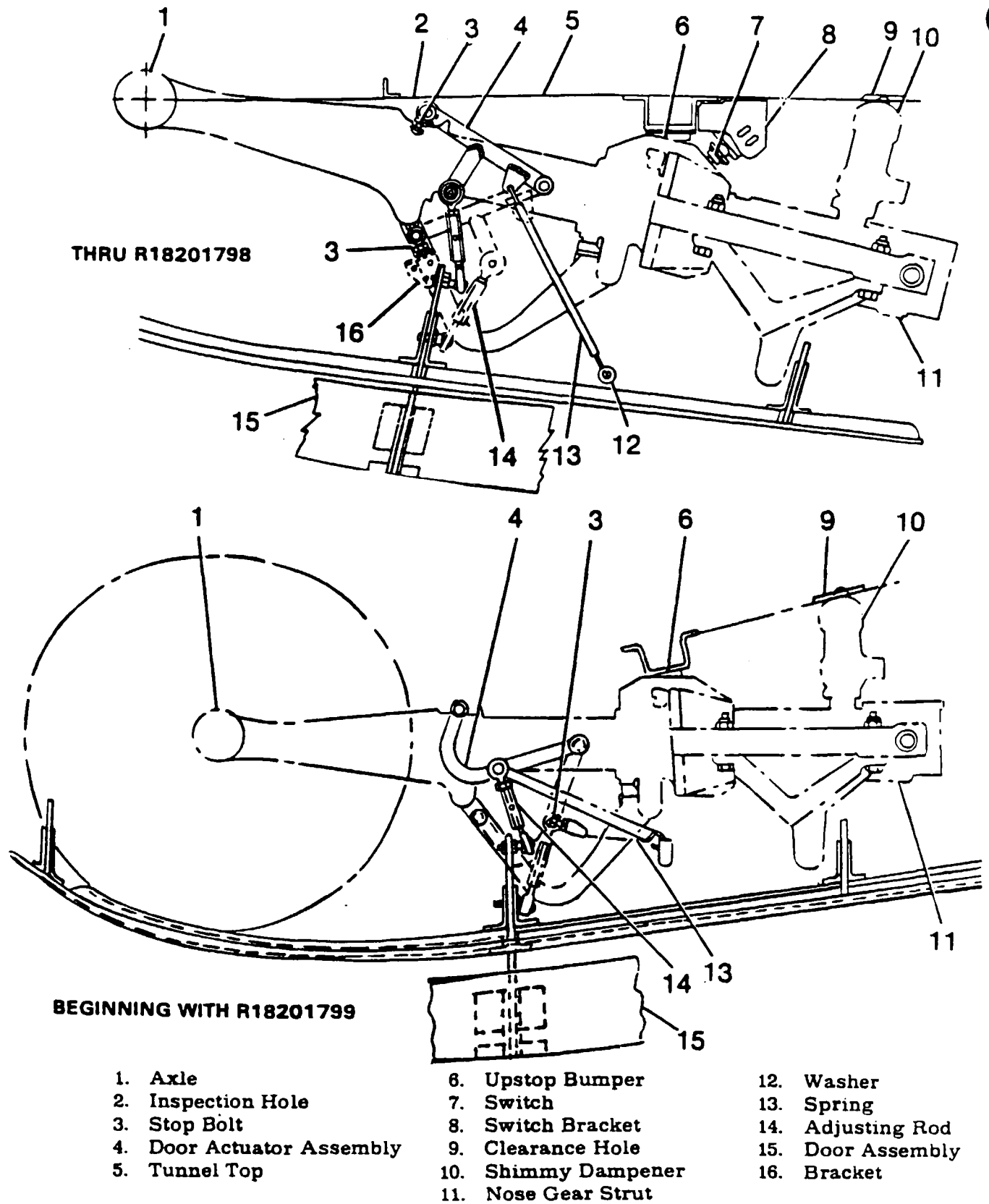


Figure 5-21. Nose Gear Rigging (Sheet 1 of 3)

MODEL R182 AND TR182 SERVICE MANUAL

LOOKING UP AND AFT
INTO NOSE WHEEL WELL

- 6. Upstop Bumper
- 7. Switch
- 8. Switch Bracket
- 17. Actuator
- 18. Lock Pin
- 19. Downlock Hook
- 20. Trunnion
- 21. Cross Bar
- 22. Rod End
- 23. Gear Down Switch

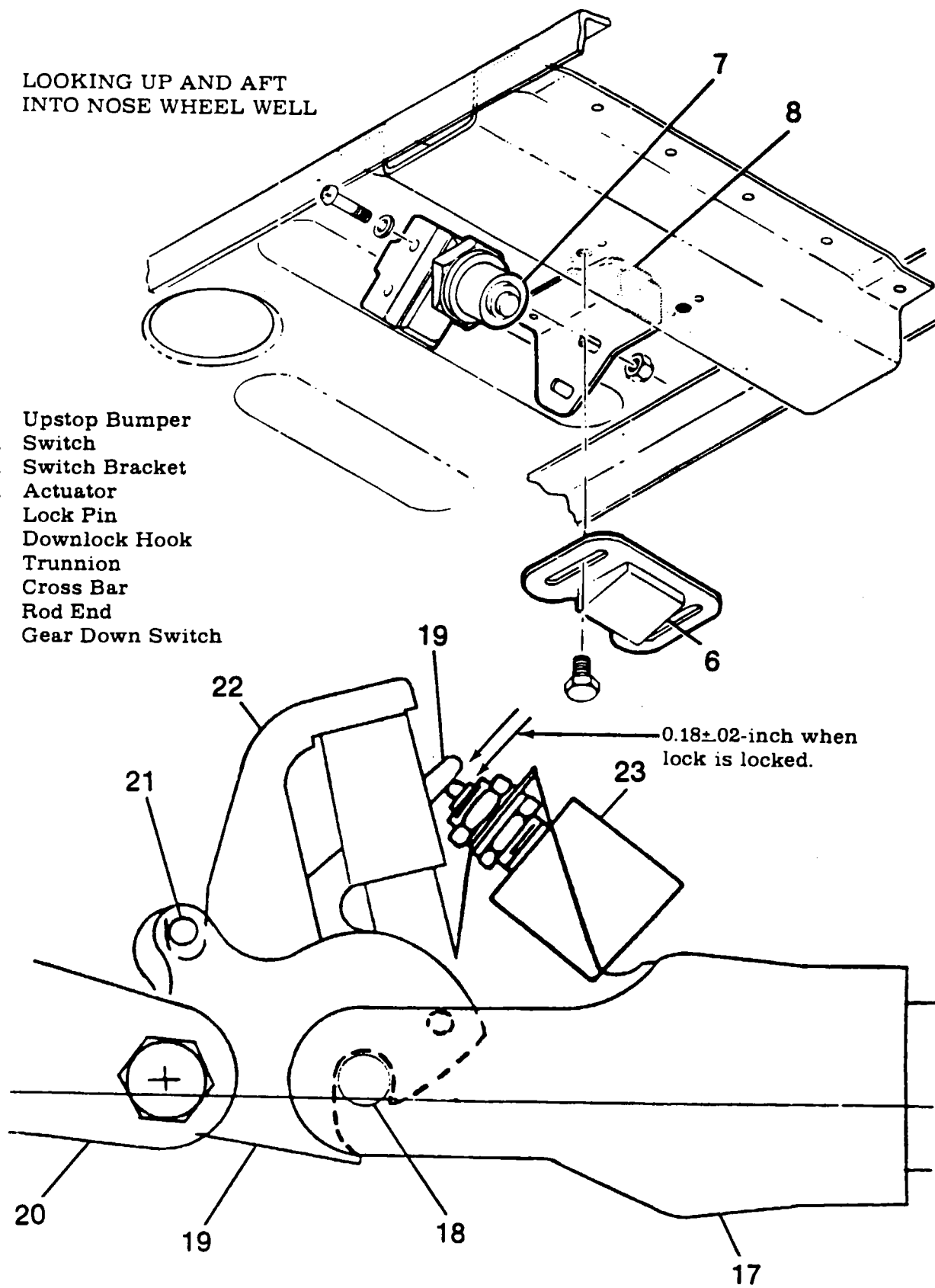
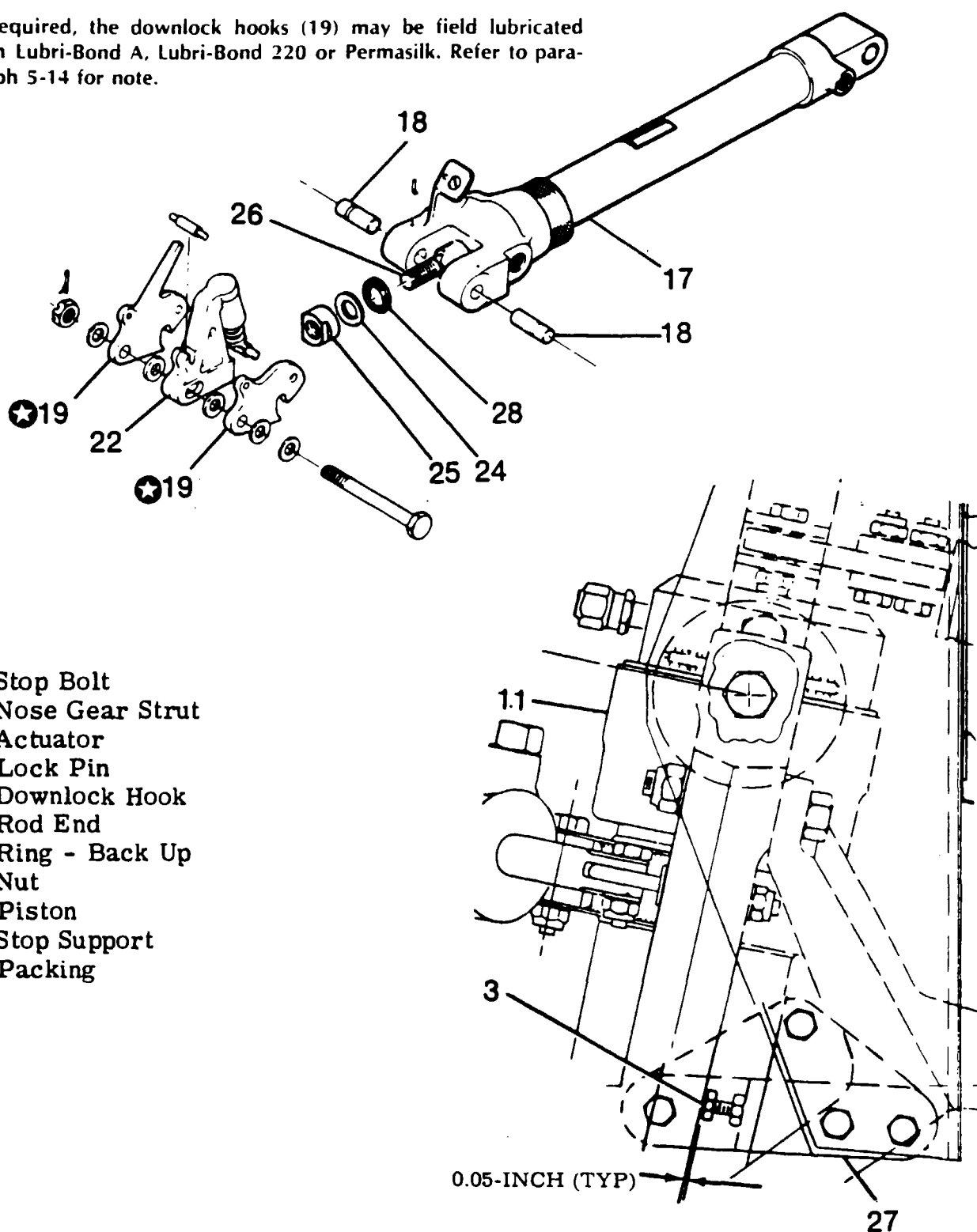


Figure 5-21. Nose Gear Rigging (Sheet 2 of 3)

MODEL R182 AND TR182 SERVICE MANUAL

★ If required, the downlock hooks (19) may be field lubricated with Lubri-Bond A, Lubri-Bond 220 or Permasilk. Refer to paragraph 5-14 for note.



- 3. Stop Bolt
- 11. Nose Gear Strut
- 17. Actuator
- 18. Lock Pin
- 19. Downlock Hook
- 22. Rod End
- 24. Ring - Back Up
- 25. Nut
- 26. Piston
- 27. Stop Support
- 28. Packing

Figure 5-21. Nose Gear Rigging (Sheet 3 of 3)

MODEL R182 AND TR182 SERVICE MANUAL

correctly. If stop bolts are not properly adjusted, nose gear will not extend fully and lock.

- 5-145. NOSE GEAR RIGGING. (Beginning with R18201799.) (See figure 5-21.)
- Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
 - Place gear selector handle in "down" position, turn master switch on, and allow system to pressurize. Turn master switch off and pull gear pump circuit breaker.
 - See figure 5-14, view A-A, for correct amount of strut extension.

WARNING

Completely deflate nose gear strut before disconnecting torque links.

- Check that downlock hooks (19) fully engage lock pins (18) as shown and that gear down switch (23) is properly positioned. If hooks (19) fail to engage pins (18), place gear position selector handle in a neutral position and pull the gear forward by hand until nut (25) is accessible. Loosen nut and, using wrench on flats of piston, screw piston (26) several turns into rod end (22); tighten nut (25). Place gear position selector handle in "down" position, turn master switch on and allow gear to extend to the down and locked position. Recheck downlock hook (19) and gear down switch (23) positions; adjust as necessary.
 - Disconnect adjusting rods (11) from gear doors, and secure doors in full open position with tape.
 - Turn master switch "on" and place landing gear selector handle in "up" position.
 - Close gear doors, one at a time, and attach adjusting rods (11). Adjust length of rods until doors fair with cowling. Remove rods from doors, and secure doors in full open position with tape.
 - Run gear down to midway position. Turn master switch off.
 - Attach adjusting rods (14) to doors and swing gear by hand to ensure that doors clear any part of the nose gear assembly by a minimum of 0.25-inch clearance. Check clearance between nose gear door and lower cowl skin to be .10 + .06, -.00 inch.
 - Run gear to full "up" position and check that doors fair. If necessary, make final adjustments to adjusting rods (14). Tighten nuts on rods. Safety wire rod assemblies. Check that gear up indicator actuates and up light illuminates.
 - Run gear to full "down" position and turn master switch "off". Adjust stop bolts (3) to provide simultaneous contact with door actuator (4) on each side with minimum stop bolt extension. Start with stop bolts turned all the way in. Linkage must be overcenter when doors are fully open.
 - Cycle gear several times, using ship's power pack, and at least twice, using the system's emergency hand pump. A 28-volt DC, 60-amp electrical power supply may be used.
 - Run gear to full "down" position and remove aircraft from jacks.
- 5-146. BRAKE SYSTEM. (See figure 5-24.)
- 5-147. DESCRIPTION. The hydraulic brake system is comprised of two master cylinders, located immediately forward of the rudder pedals, brake lines connecting each master cylinder to its wheel brake cylinder, and the single-disc, floating cylinder-type brake assembly, located at each main landing gear wheel.

MODEL R182 AND TR182 SERVICE MANUAL

5-148. TROUBLE SHOOTING - BRAKE SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
DRAGGING BRAKES.	Brake pedal binding.	Lubricate pivot points; replace or repair defective parts.
	Weak or broken piston return spring in master cylinder.	Repair or replace master cylinder.
	Parking brake control improperly adjusted.	Adjust properly.
	Insufficient clearance between lock-O-seal and piston in master cylinder.	Adjust clearance per paragraph 5-142.
	Restriction in hydraulic lines or in passage in master cylinder compensating sleeve.	Remove restrictions; flush brake system with hydraulic fluid. Repair or replace master cylinder.
	Warped or badly scored brake disc.	Replace disc and linings.
BRAKES FAIL TO OPERATE.	Damage or accumulated dirt restricting free movement of wheel brakes.	Clean and repair or replace brake parts.
	Fluid low in master cylinder or wheel cylinder.	Fill system and bleed brake parts.
	Faulty O-rings in master cylinder or wheel cylinder.	Replace O-rings.
	Faulty lock-O-seal in master cylinder.	Replace lock-O-seal.
	Excessive clearance between lock-O-seal and piston.	Adjust clearance per paragraph 5-143.
	Internal damage to hose and O-rings due to use of wrong type of hydraulic fluid.	Replace damaged parts. Flush system with denatured alcohol. Fill and bleed brake system.
	Pressure leak in system.	Tighten connection; repair or replace faulty parts.
	Brake linings worn out.	Replace linings.
	Oil or grease on brake linings or new linings just installed.	Clean linings with carbon tetrachloride.

MODEL R182 AND TR182 SERVICE MANUAL

- 5-149. BRAKE MASTER CYLINDER. (See figure 5-22.)
- 5-150. DESCRIPTION. The brake master cylinders, located immediately forward of the pilot's rudder pedals, are actuated by applying pressure at the top of the rudder pedals. A small reservoir is incorporated into each master cylinder for the fluid supply. When dual brakes are installed, mechanical linkage permits the copilot pedals to operate the master cylinders.
- 5-151. REMOVAL.
- Remove bleeder screw at wheel brake assembly and drain hydraulic fluid from brake cylinders.
 - Remove front seats and rudder bar shield for access to brake master cylinders.
 - Disconnect parking brake linkage and disconnect brake-master cylinders from rudder pedals.
 - Disconnect hydraulic hose from brake master cylinders and remove cylinders.
- 5-152. DISASSEMBLY. (Thru 1978 Models.) (See figure 5-22, Sheet 1 of 2.)
- Unscrew clevis (1) and jamb nut (2).
 - Remove screw (18).
 - Remove filler plug (17) and setscrew (5).
 - Unscrew cover (4) and remove up over piston rod (3).
 - Remove piston rod (3) and compensating sleeve (16).
 - Slide sleeve (16) up over rod (3).
 - Unscrew nut (12) from threads of piston rod (3).
 - Remove piston spring (13) and O-ring (9) from piston (14).
 - Remove Lock-O-Seal (15).
- 5-153. INSPECTION AND REPAIR. (Thru 1978 Models.) (See figure 5-122, Sheet 2 of 2.) Repair is limited to installation of new parts, cleaning and adjusting. (Refer to assembly paragraph for adjustment.) Use clean hydraulic fluid (MIL-H-5606) as a lubricant during reassembly of the cylinders. Inspect Lock-O-Seal (Parker Seal Co. (P/N 800-001-6) and replace if damaged. Replace all O-rings. Filler plug must be vented so pressure cannot build up in the reservoir during brake operation. Remove plug and drill 1/16-inch hole, 30° from vertical, if plug is not vented.
- 5-154. REASSEMBLY. (Thru 1978 Models.) (See figure 5-22, Sheet 1 of 2.)
- Install Lock-O-Seal (15) at bottom of piston rod (3).
 - Install O-ring (9) in groove in piston (14); insert piston spring (13) into piston, and slide assembly up on bottom threaded portion of piston rod (3).
 - Run nut (12) up threads to spring (13). Tighten nut enough to obtain 0.040 ± 0.005 -inch clearance between top of piston and bottom of Lock-O-Seal, as shown in the figure.
 - Install piston return spring (11) into cylinder (10) portion of body (7).
 - Install piston rod (3) through spring (11).
 - Slide compensating sleeve (16) over rod (3).
 - Install cover (4) and screw (18).
 - Install jam nut (2) and clevis (1).
 - Install filler plug (17), making sure vent hole is open.
 - Install setscrew (5).

MODEL R182 AND TR182 SERVICE MANUAL

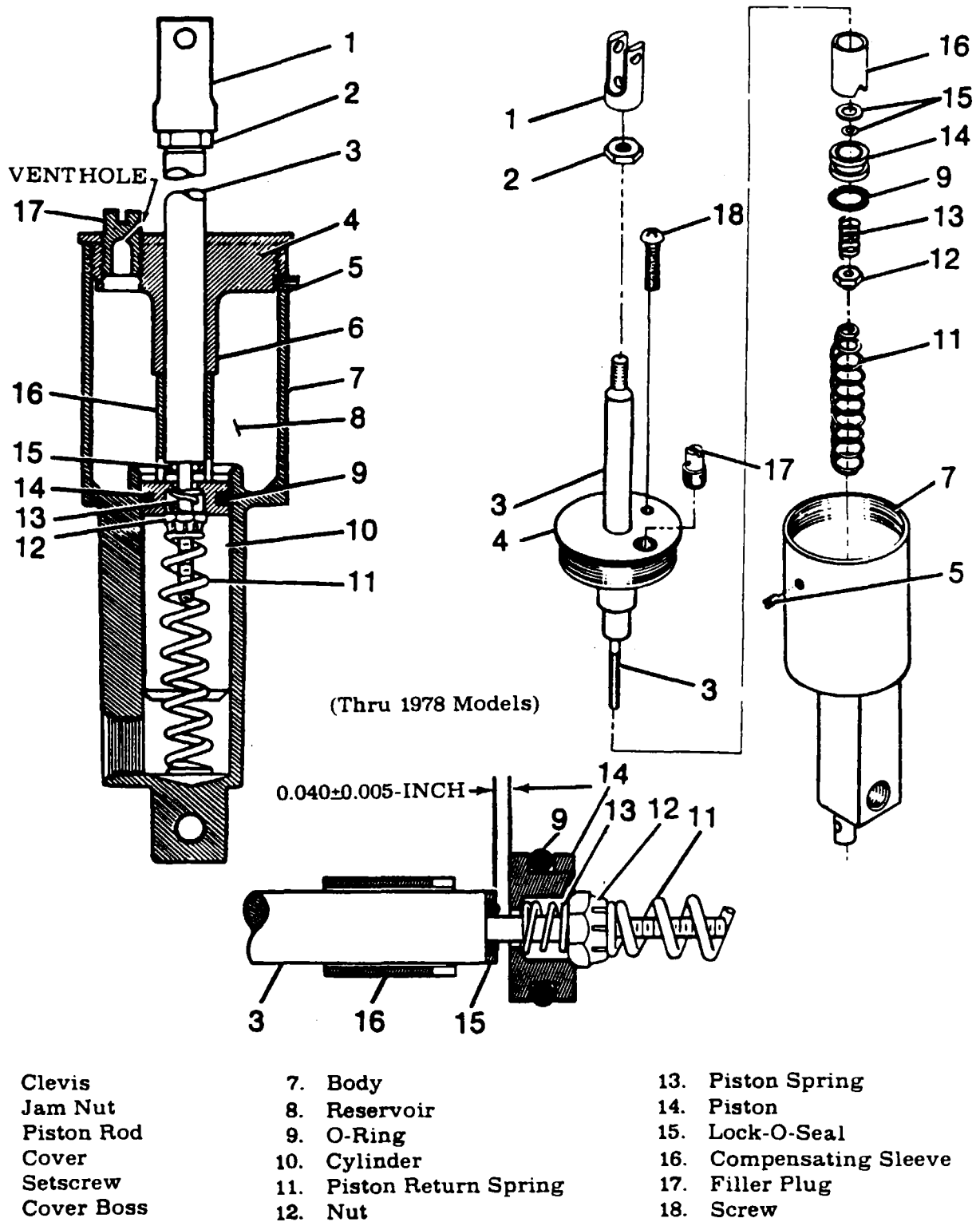


Figure 5-22. Brake Master Cylinder (Sheet 1 of 2)

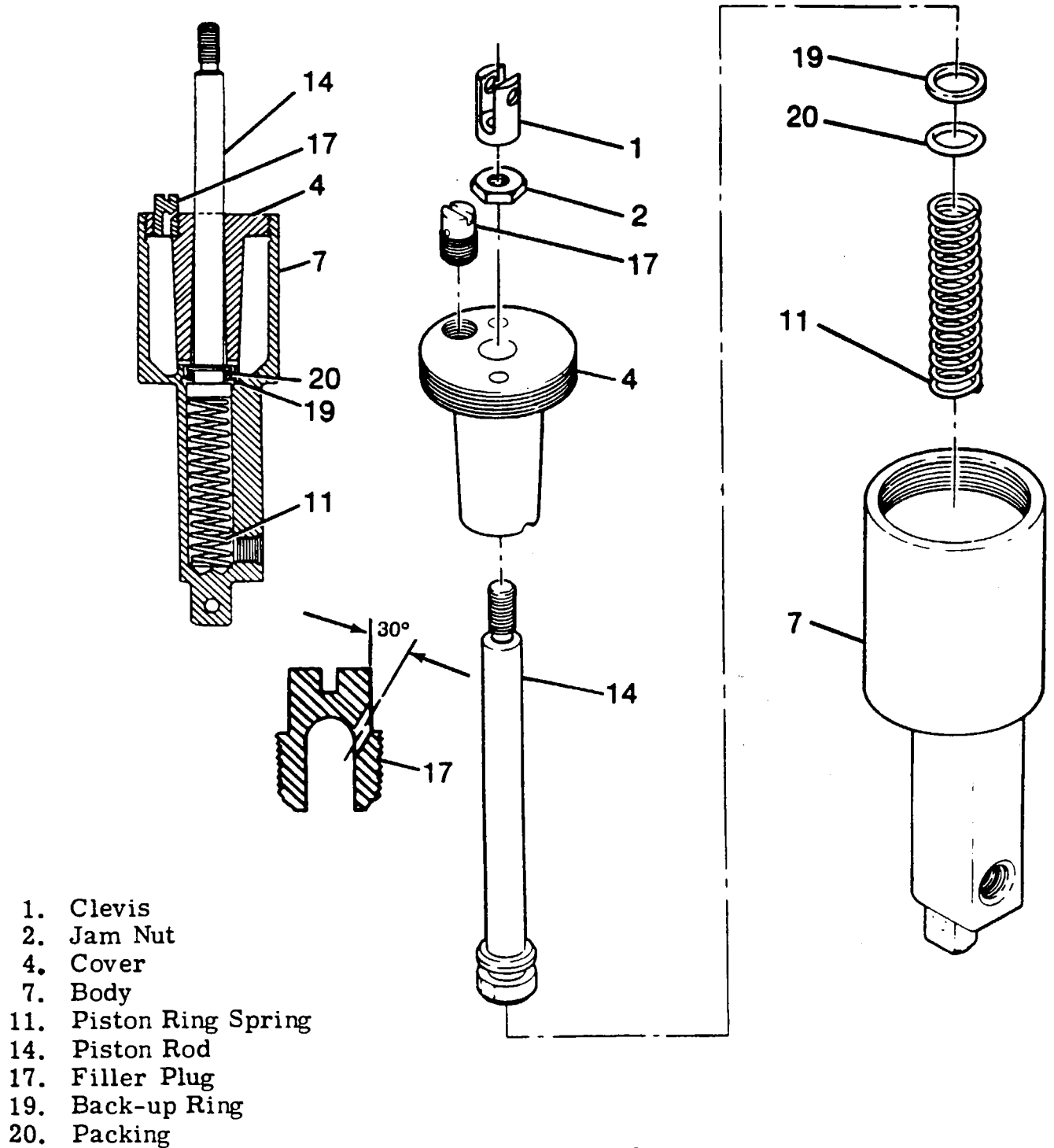


Figure 5-22. Brake Master cylinder (Sheet 2 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

- 5-155. **DISASSEMBLY.** (Beginning with 1979 Models.) (See figure 5-22, sheet 2.)
- a. Unscrew clevis (1) and jam nut (2).
 - b. Remove filler plug (17).

NOTE

A special tool, brake master cylinder wrench No. 34-101 is available from the Cessna Supply Division to accomplish the following step.

- c. Unscrew cover (4) and remove up over piston (14).
 - d. Remove piston (14) and spring (11).
 - e. Remove packing (20) and back-up ring (19) from piston (14).
- 5-156. **INSPECTION AND REPAIR.** (Beginning with 1979 Models.) (See figure 5-22, Sheet 2 of 2.) Repair is limited to installation of new parts and cleaning. Use clean hydraulic fluid (MIL-H-5606) as a lubricant during reassembly of the cylinder. Replace packing and back-up ring. Filler plug (17) must be vented so pressure cannot build up during brake operation. Remove plug and drill 1/16-inch hole 30° from vertical, if plug is not vented. Refer to view A-A for location of hole.
- 5-157. **REASSEMBLY.** (Beginning with 1979 Models.) (See figure 5-22, Sheet 2 of 2.)
- a. Instal spring (11) into cylinder body (7).
 - b. Install back-up ring (19) and packing (20) in groove of piston (14).
 - c. Install piston (14) in cylinder body (7).
 - d. Install cover (4) over piston (14) and screw cover into cylinder body (7).
 - e. Install nut (2) and clevis (1).
 - f. Install filler plug (17), making sure vent hole is open.
- 5-158. **INSTALLATION.**
- a. connect hydraulic hoses to brake master cylinders and install cylinders.
 - b. Connect brake master cylinders to rudder pedals and connect parking brake linkage.
 - c. Install rudder bar shield and install front seats.
 - d. Install bleeder screw at wheel brake assembly and fill and bleed brake system in accordance with applicable paragraph in this section.
- 5-159. **HYDRAULIC BRAKE LINES.**
- 5-160. **DESCRIPTION.** The brake lines are of rigid tubing, except for flexible hose used at the brake master cylinders. A separate line is used to connect each brake master cylinder to its corresponding wheel brake cylinder.
- 5-161. **WHEEL BRAKE ASSEMBLIES.** (See figure 5-10.)
- 5-162. **DESCRIPTION.** The wheel brake assemblies employ a floating brake assembly and a disc which is attached to the main wheel.
- 5-163. **REMOVAL.** (See figure 5-8.) Disconnect and drain brake line and remove brake back plate. The brake disc is removed after the wheel is removed and disassembled. To remove torque plate, remove wheels and axles.
- 5-164. **DISASSEMBLY.** See figure 5-10 for a breakdown of wheel brake parts. This figure may be used as a guide for disassembling the wheel brakes.

MODEL R182 AND TR182 SERVICE MANUAL

5-165. INSPECTION AND REPAIR.

- a. Clean all parts except brake linings and packings in dry cleaning solvent and dry thoroughly.
- b. Install all new packings. If packing reuse is necessary, wipe with a clean cloth saturated in hydraulic fluid and inspect for damage.

NOTE

Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in the hydraulic brake system.

- c. Check brake lining for deterioration and wear.
- d. Inspect brake cylinder bore for scoring. A scored cylinder will leak or cause rapid packing wear. Install a new brake cylinder if the bore is scored.
- e. If the anchor bolts on the brake assembly are nicked or gouged, they should be sanded smooth to prevent binding with the pressure plate or torque plate. When new anchor bolts are to be installed, press out old bolts and install new bolts with a soft mallet.
- f. Inspect wheel brake disc for a minimum thickness of .33 inch. If brake disc is below minimum thickness, install a new disc.

5-166. REASSEMBLY. (See figure 5-8.)

NOTE

Assemble parts, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7.

- a. See figure 5-8 as a guide while reassembling wheel brakes.

5-167. INSTALLATION.

- a. Place brake assembly in position with pressure plate in place.

NOTE

If torque plate was removed, install as the axle is installed, or install on axle. If the brake disc was removed, install as wheel is assembled.

CAUTION

Correct clocking of the brake line elbow on the wheel brake cylinder is very important in order to avoid interference with aircraft structure during retraction of the gear.

- 5-168. CHECKING BRAKE LINING WEAR. New brake lining should be installed when the existing lining has worn to a thickness of 3/32-inch. A 3/32-inch thick strip of material held adjacent to each lining can be used to determine amount of wear. The shank end of a drill bit of the correct size can also be used to determine wear of brake linings.

MODEL R182 & TR182 SERIES SERVICE MANUAL

5-169. BRAKE INSTALLATION. (Refer to figure 5-10.)

- a. Remove bolts securing back plate and remove back plate.
- b. Pull brake cylinder out of torque plate and slide pressure plate off anchor bolts.
- c. Place back plate on a table with lining side down flat. Center a 9/64-inch (or slightly smaller) punch in the rolled rivet and hit the punch sharply with a hammer. Punch out all rivets securing the linings to the back plate and the pressure plate in the same manner.

NOTE

A rivet setting kit, Part No. 199-00100, is available from the Cessna Parts Distribution (CPD 2). This kit consists of an anvil and punch.

- d. Clamp the flat side of the anvil in a vise.
- e. Align new lining on back plate and place brake rivet in hole with rivet head in the lining. Place the head against the anvil.
- f. Center rivet setting punch on lips of rivet. While holding back plate down firmly against lining, hit punch with hammer to set rivet. Repeat blows on punch until lining is firmly against back plate.
- g. Realign the lining on the back plate and install and set rivets in the remaining holes.
- h. Install a new lining on pressure plate in the same manner.
- i. Position pressure plate on anchor bolts and place cylinder in position so that anchor bolts slide into the torque plate.
- j. Install back plate with bolts and washers, torque bolts to 110-120 in.-lbs.

5-170. BRAKE SYSTEM BLEEDING.

NOTE

Bleeding with a clean hydraulic pressure source connected to the wheel cylinder bleeder is recommended.

- a. Remove brake master cylinder filler plug and screw flexible hose with appropriate fitting into the filler hole at the top of the brake master cylinder.
- b. Immerse opposite end of flexible hose into a container with enough hydraulic fluid to cover end of the hose.
- c. Connect a clean hydraulic pressure source, such as a hydraulic hand pump or Hydro-Fill unit to the bleeder valve in the wheel cylinder.
- d. As fluid is pumped into the system, observe the immersed end of the hose at the master brake cylinder for evidence of air bubbles being forced from the brake system. When bubbling has ceased, remove bleeder source from wheel cylinder and tighten the bleeder valve.

5-171. BRAKE LINING BURN-IN.

5-172. DESCRIPTION. The brake pads are equipped with either a non-asbestos organic lining or an iron based metallic lining. These materials must be properly conditioned (glazed) in order to provide maximum performance and service life. This is accomplished by a brake burn-in.

- a. Non-asbestos organic lining.
 1. Taxi airplane for 1500 feet with engine at 1700 RPM applying brake pedal force as needed to develop a 5 to 9 knots taxi speed.
 2. Allow brakes to cool for 10 to 15 minutes.

MODEL R182 & TR182 SERIES SERVICE MANUAL

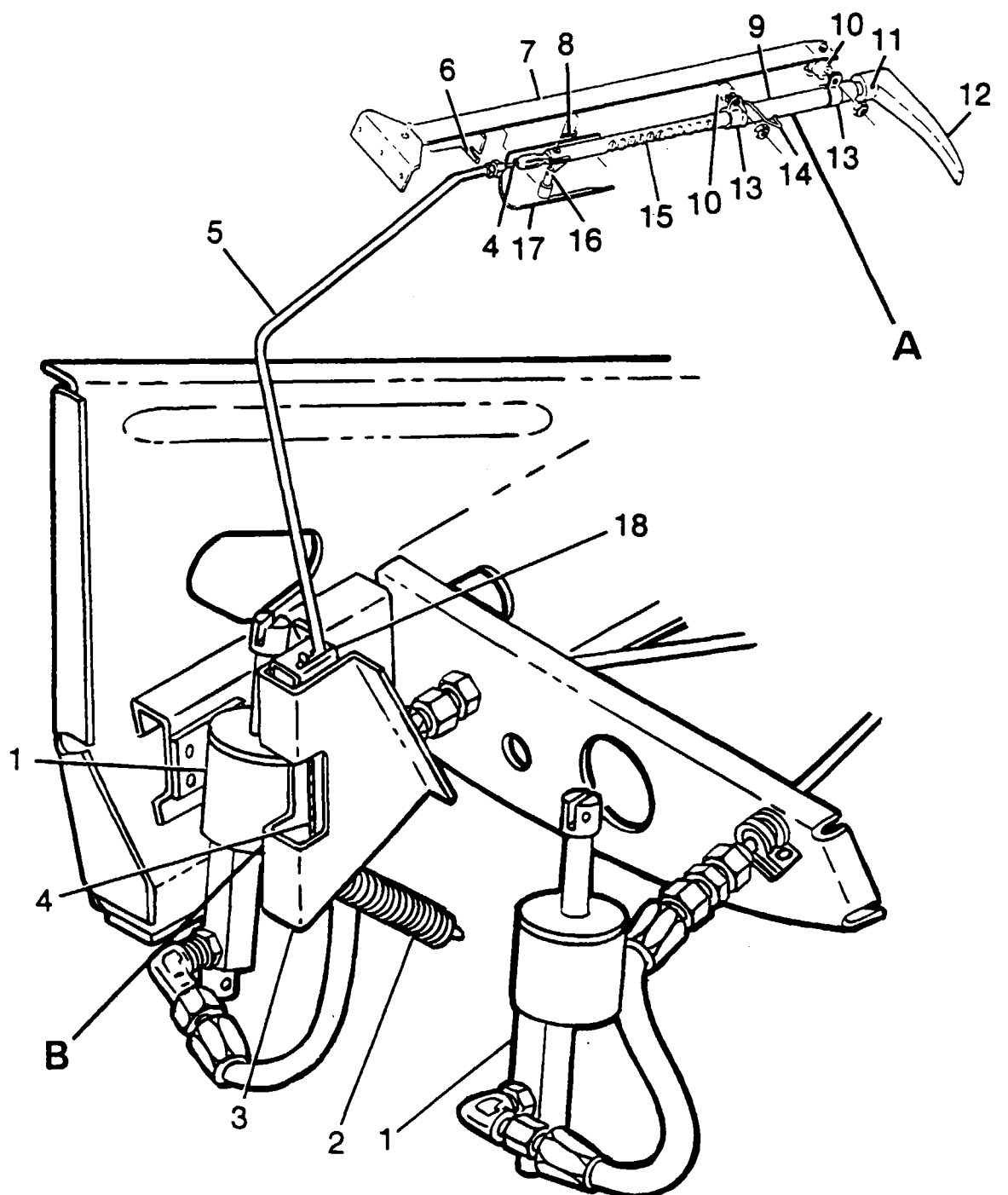
3. Apply brakes and check to see if a high throttle static run up may be held with normal pedal force. If so, burn-in is complete.
 4. If static run up cannot be held, repeat steps 1. thru 3. as needed to successfully hold.
- b. Iron based metallic lining.
1. Perform two consecutive full stop braking applications from 30 to 35 knots. Do not allow the brake discs to cool substantially between stops.
 2. Apply brakes and check to see if a high throttle static run up may be held with normal pedal force. If so, burn-in is complete.
 3. If static run up cannot be held, repeat step 1. as needed to successfully hold.

NOTE

Light brake usage can cause the glaze to wear off, resulting in reduced brake performance. In such cases, the lining may be conditioned again following the instructions set forth in this burn-in procedure.

- 5-173. **PARKING BRAKE SYSTEM.** (Refer to figure 5-23.)
- 5-174. **DESCRIPTION.** The parking brake system consists of a handle and ratchet mechanism, connected by a cable to linkage at the brake master cylinders. Pulling out on the handle depresses both brake master cylinder piston rods and the handle ratchet locks the handle in this position until the handle is turned and released.
- 5-175. **REMOVAL AND INSTALLATION.** Refer to figure 5-23 for relative location of system components. The illustration may be used as a guide during removal and installation of components.
- 5-176. **INSPECTION AND REPAIR OF SYSTEM COMPONENTS.** Inspect lines for leaks, cracks, dents, chafing, improper radius, security, corrosion, deterioration, obstructions and foreign matter. Check brake master cylinders and repair as outlined in applicable paragraph in this Section. Check parking brake handle and ratchet for proper operation and release. Replace worn or damaged parts.

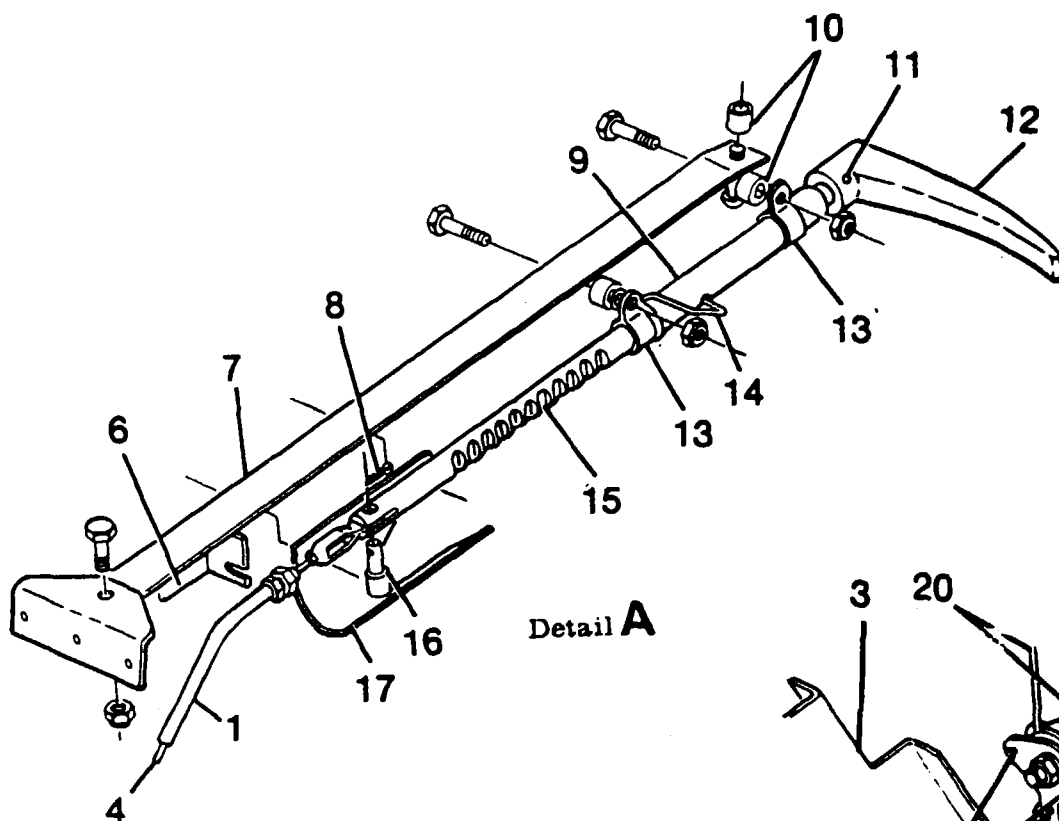
MODEL R182 AND TR182 SERVICE MANUAL



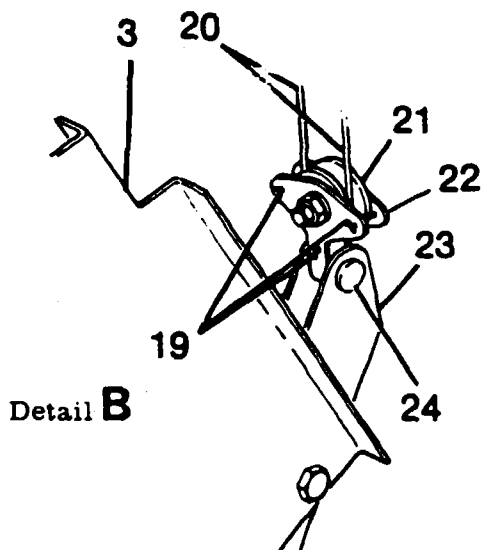
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|--------------------|---------------------|----------------------|
| 1. Master Cylinder | 7. Angle | 13. Clamp |
| 2. Spring | 8. Cotter Pin | 14. Catch |
| 3. Bracket | 9. Housing Assembly | 15. Handle Assembly |
| 4. Cable Assembly | 10. Spacer | 16. Positioning Pin |
| 5. Tube | 11. Pin | 17. Positioning Rack |
| 6. Angle | 12. Handle | 18. Support |

Figure 5-23. Parking Brake System (Sheet 1 of 2)

MODEL R182 AND TR182 SERVICE MANUAL



Detail A



Detail B

1. Tube
3. Bracket
4. Cable Assembly
6. Angle
7. Angle
8. Cotter Pin
9. Housing Assembly
10. Spacer
11. Pin
12. Handle
13. Clamp
14. Catch
15. Handle Assembly
16. Positioning Pin
17. Positioning Rack
19. Cotter Pin
20. Cable Assembly
21. Pulley
22. Bracket Assembly
23. Bellcrank
24. Pin

MODEL R182 AND TR182 SERVICE MANUAL

1. RH Master Cylinder
2. Hose
3. LH Master Cylinder
4. RH Brake Line
5. LH Brake Line
6. Clamp

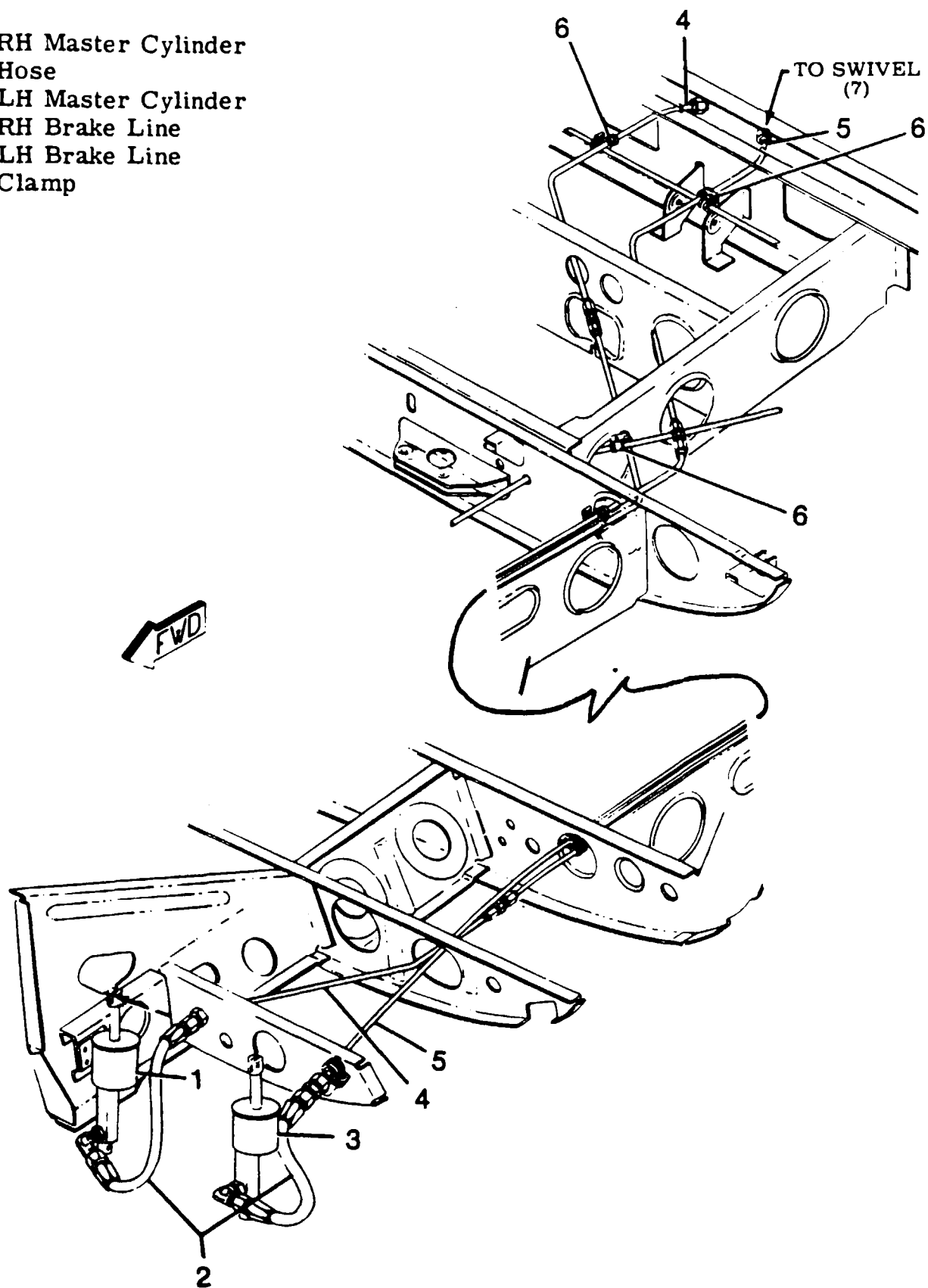


Figure 5-24. Brake System (Sheet 1 of 2)

MODEL R182 AND TR182 SERVICE MANUAL

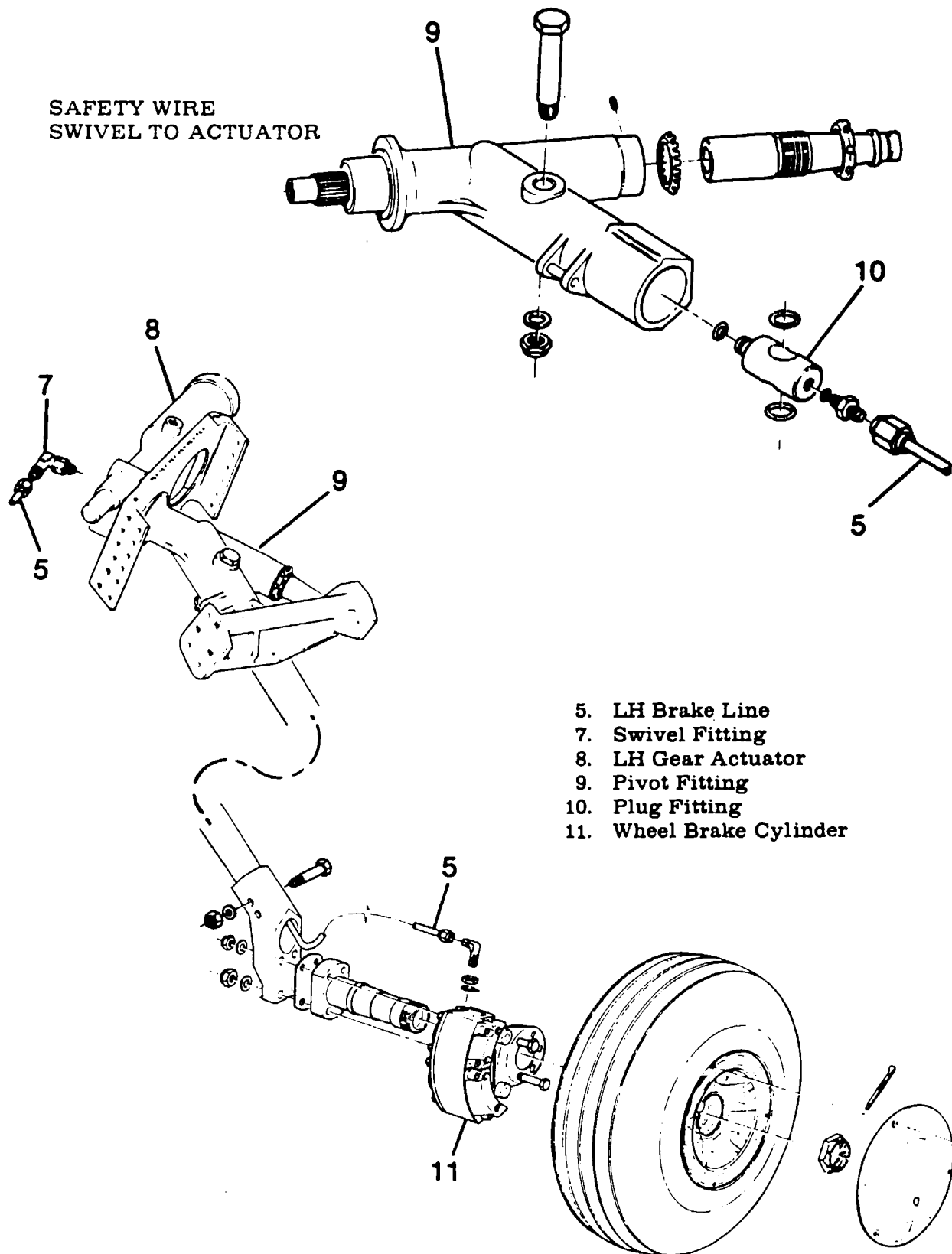


Figure 5-24. Brake System (Sheet 2 of 2)