WIPAIRE, INC.

WIPLINE FLOATS • SKIS • MODIFICATIONS • AIRCRAFT SALES
AVIONICS • INTERIOR • MAINTENANCE • PAINT REFINISHING



# SERVICE MANUAL
# AND
# INSTRUCTIONS FOR
# CONTINUED AIRWORTHINESS
# FOR THE
# WIPLINE MODEL 6000 & 6100
# AMPHIBIOUS AND SEAPLANE FLOATS

**Revision P**

1700 Henry Ave – Fleming Field (KSGS), South St. Paul, MN 55075
Ph: 651.451.1205 Fax: 651.457.7858
www.wipaire.com

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## LOG OF REVISIONS

| Rev | Pages | Description | Date |
|---|---|---|---|
| A | All | Added an inspection time limit and tolerances for the Nose Block Track wear. | 4/18/2006 |
| B | 1-3, 5-6, 10, 25, 27, 39 | The cover page and footers were revised, additions to maintenance were made on 5, 6, 10. The T-seal upgrade is on page 25. More metal repairs included on 27. Added WT & Bal. Info. | 5/1/2008 |
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| N | 7 | Added note to introduction about parts manuals. | 7/11/2023 |
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# INTRODUCTION

This manual describes the general servicing and maintenance for the Model 6000/6100 float, including hull and landing gear. For services and repairs not covered by this manual contact Wipaire Customer Service.

When performing standard repairs for Wipline Aluminum Floats, please refer to the “Structural Repair Manual For Wipline Aluminum Floats” part number 1008274. It is available free of charge online at www.wipaire.com.

The service products referred to throughout this manual are described by their trade name and may be purchased from Wipaire Customer Service.

**Note:** For approved design data parts, reference 6000 & 6100 float parts manuals 1002177 for DeHavilland DHC-2 on bonded floats, 1005258 for Pilatus PC-6 on bonded floats, and 1009875 for both DeHavilland DHC-2 and Pilatus PC-6 on riveted floats with float serial numbers 61500 and later.

To contact Wipaire for technical support or parts sales, call, write or email:

Wipaire, Inc.
Customer Service
1700 Henry Avenue – Fleming Field
South St. Paul, MN 55075
Phone: (651) 306-0459
Fax: (651) 306-0666
Website: www.wipaire.com
Email: CustomerService@wipaire.com

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# CHAPTER 1 GENERAL INFORMATION

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# 1.1 GENERAL

The model 6000/6100 seaplane or amphibious float is an all aluminum constructed float with watertight compartments. The actual displacement in fresh water for each float is 5664 pounds buoyancy for the seaplane and 5518 pounds buoyancy for the amphibian. The amphibian float is geometrically the same as the seaplane except for the addition of landing gear and internal structure for the gear.

The water rudder system is cable operated with ball bearing pulleys. Water rudder cables tie into the existing aircraft rudder system.

The main landing gear has dual 600 x 6 6-ply tires and the nose landing gear has one 500 x 5 6-ply tire. The gear system is hydraulically actuated and driven by two hydraulic pumps. Brakes are hydraulic and have a caliper on each main wheel for a total of four brakes.

Steering on land is accomplished by differential braking. The nose wheels are full castering.

Access to the float interior is accomplished by removing covers on the top deck and six covers inside the wheel well. When necessary, water inside the float hulls may be removed through pump out cups located on the outboard edge of each float top skin.

# CHAPTER 2 FLOAT HULL MAINTENANCE

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## 2.1 GENERAL

The float structure is manufactured entirely of 6061-T6 corrosion resistant aluminum sheet and extrusions. Skins on the inside are primed with a 3M SCOTCHWELD primer after being cleaned and acid-etched. Exterior surfaces are cleaned and alodined. Surfaces are then primed with an epoxy-based primer and finished with enamel color paint.

**Hard Landing and Damage Investigation**

After a thorough cleaning of the suspected damaged area, all structural parts should be carefully examined to determine the extent of damage. Frequently the force causing the initial damage is transmitted from one member to the next causing strains and distortions. Abnormal stresses incurred by shock or impact forces on a rib, bulkhead, or similar structure may be transmitted to the extremity of the structural member, resulting in secondary damage, such as sheared or stretched rivets, elongated bolt holes, deformed skins or bulkheads. Points of attachment should be examined carefully for distortion and security of fasteners in the primary and secondary damaged areas as locations beyond the local damage. Inspect aircraft tubes in area of float fitting for signs of bending, cracked welds, or any other damage.

**Cleaning**

The outside of the float should be kept clean by washing with soap and water.

Special care should be taken to remove engine exhaust trails, waterline marks, and barnacle deposits. After saltwater operation, washing with fresh water should be done daily with special attention to hard-to-reach places such as: seams, wheel wells, etc.

Alternatively, water taxiing in FRESH WATER at step-speed can help to flush the entire system.

**OPERATORS IN SALTWATER ARE STRONGLY CAUTIONED – RINSING THE ENTIRE AIRCRAFT & FLOATS WITH FRESH WATER AT THE END OF EACH DAY OR PERIODICALLY IS CRITICAL. FAILING IN THIS CLEANING CAN SEVERLY SHORTEN THE LIFE OF THE FLOATS.**

The float interior should be flushed if salt water enters the compartments. If the floats are being stored inside, remove inspection covers so the interior will dry out.

**THE ABOVE CLEANING TECHNIQUES ARE VITAL FOR KEEPING CORROSION TO A MINIMUM. SALTWATER OPERATIONS AND ENVIRONMENT ARE STRONGLY LINKED TO CORROSION AND MUST BE ADDRESSED PROACTIVELY.**

**Corrosion**

Reference the Wipaire Structural Repair Manual (SRM) for allowable corrosion/material loss limits. Corrosion is a reaction that destroys metal by an electrochemical action that converts metal to oxide. Corrosion is accelerated when in contact with dissimilar metals such as aluminum and steel, or any material that absorbs moisture like wood, rubber, or dirt.



After removing the corroded area, restore area to original finish (prime and enamel). Boeshield T9, Corrosion X, or ACF-50 may also be applied to stop corrosion. Refer to manufacturer's instructions for
application instructions.

Maintaining the float inside and outside finishes by washing after saltwater operations will help protect the float from corrosion. Periodically all hardware should be covered with a waterproof grease or Par-al-ketone. Under saltwater conditions, bolts should be removed at least once a year and grease reapplied to the shafts, heads and nuts.

**THE ABOVE CLEANING TECHNIQUES ARE VITAL FOR KEEPING CORROSION TO A MINIMUM. SALTWATER OPERATIONS AND ENVIRONMENT ARE STRONGLY LINKED TO CORROSION AND MUST BE ADDRESSED PROACTIVELY.**

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# CHAPTER 3 FLOAT HANDLING, JACKING, AND AIRCRAFT TOWING

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## 3.1 TOWING

When towing the amphibian aircraft, 2 lugs are provided on the lower forward side of the nose spring.

On land, a rigid “V” frame can be fabricated to attach to these lugs for towing the aircraft with a tractor. Lake & Air Training and Pilot Shop has this tow bar available for purchase.



On water, a rope bridle arrangement can used to tow the aircraft from the lugs described above.

## 3.2 HOISTING

Hoisting the aircraft can be performed using a lifting rig that attaches to the aircraft with lifting rings that are installed at the wing attach points. If the lifting rings are not installed, reference applicable aircraft maintenance/service manual for additional hoisting specifications. Lake & Air Training and Pilot Shop has this hoisting rig available for purchase. Contact Wipaire Customer Service for additional guidance in removal or installation of floats.

**CAUTION!**

**Make sure nothing is under or above the airplane or floats when hoisting the aircraft**

1. Raise aircraft high enough to place float cradle under floats as shown in Figure 3-4.
2. Lower aircraft onto float cradle as shown in Figure 3-4.
3. Place fore and aft supports as shown in Figure 3-3 and Figure 3-4.

## 3.3 LEVELING

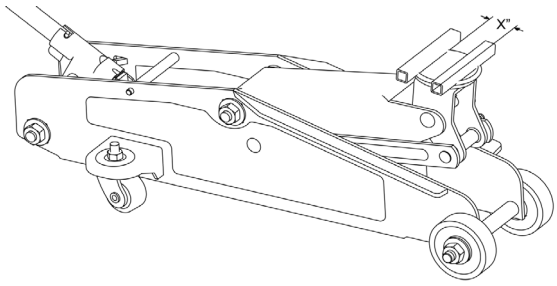
See applicable aircraft maintenance/service manual.

## 3.4 JACKING PROCEDURES

**CAUTION!**

**Make sure nothing is under or above the airplane or floats when jacking the aircraft.**

1. Turn off fuel.
2. Place weighted bags above the nose gear (approximately 100 lbs. on each float to start, more may be added as needed).
3. Position 1 person at each fore and aft of each float, and 3 people at the jacking location of one float.
4. Modify jack saddle of a 3 ton minimum jack by welding as shown in Figure 3-1.




(X = WIDTH OF CRADLE)

**FIGURE 3-1 JACK CRADLE RECOMMENDED MODIFICATION**

**NOTE:** This is not required and Wipaire does not have the parts for modification. It is recommended a similar modification be performed to the jack saddle to prevent the slippage of the cradle.

1. Center cradle on saddle and position so cradle is as far aft on the main keel as possible without interfering with main gear as it decompresses as shown in Figure 3-2.

**NOTE:** If desired to prevent possible cosmetic damage to float, use material to separate cradle and float.



**FIGURE 3-2 JACKING LOCATION**

1. Jack one side at a time, taking care to check the balance of the aircraft and adding more weight to the front if needed.
2. Two people, both outboard, lift the fore and aft cradle stands up to the cradle as a 3rd person release the pressure slowly, allowing the cradle and stands to gently contact the ground.
3. Repeat previous procedure to the other float.

**NOTE:** A smaller jack may be needed to slightly lift the float into a high enough position for the main jack.

4. Secure floats with fore and aft supports as shown in Figure 3-3 and Figure 3-4.

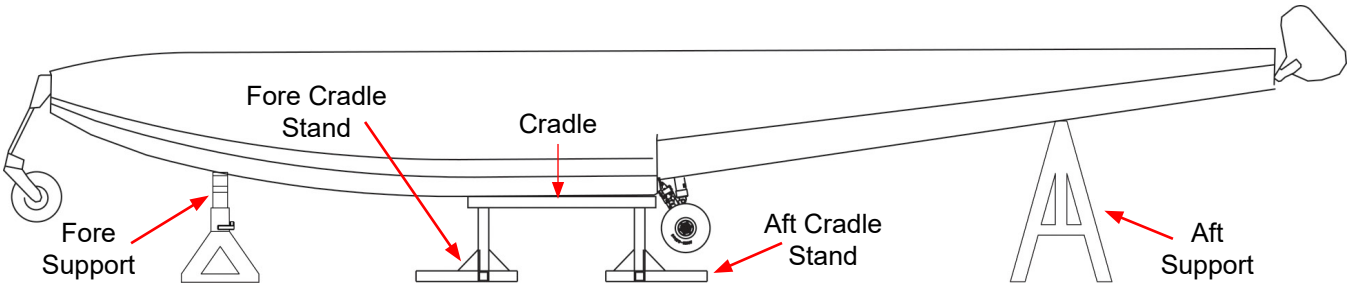




**FIGURE 3-3 FLOAT SECURING LOCATIONS**



***ALTERNATE JACKING METHOD IF WIPAIRE JACKING FIXTURE IS NOT AVAILABLE***
(8000A model shown for reference only)




(8000A MODEL SHOWN FOR REFERENCE ONLY)

**FIGURE 3-4 FLOAT SECURING LOCATIONS OVERVIEW**

## 3.5 JACK REMOVAL

**Make sure nothing is under or above the airplane or floats when removing the jacks from the aircraft**

1. Turn off fuel.
2. Verify landing gear is in the down and locked position.
3. Verify weighted bags are still located above the nose gear.
4. Position 1 person at each fore and aft of each float, and 1 person at the jacking location of one float.
5. Remove all fore and aft supports as shown in Figure 3-3 and Figure 3-4.
6. Using modified jack saddle as shown in Figure 3-1, center jack saddle in center of cradle on 1 of the floats,
7. Lift aircraft to clear fore and aft cradle stands and remove fore and aft cradle stands of lifted float.
8. Slowly lower float to the ground, remove jack from under float, and remove cradle from jack saddle.
9. Repeat previous procedure to the other float.
10. Remove weighted bags from floats.

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# CHAPTER 4 AMPHIBIAN LANDING GEAR SYSTEM OPERATION AND MAINTENANCE

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# 4.0 GENERAL

The landing gear incorporated within the amphibious floats on this airplane is retractable, quadricycle type with two swiveling nose (or bow) wheels and four (4) (two (2) sets of dual) main wheels. Air-oil shock struts on the two main landing gear assemblies provide shock absorption.

The main landing gear has dual 6:00 x 6 6-ply type III tires and the nose landing gear has one 5:00 x 5 6-ply tire. The gear system is hydraulically actuated and driven by two hydraulic pumps. Brakes are hydraulic and have a caliper on each main wheel.

Steering on land is accomplished by differential braking. The nose wheels are full castering.

Landing gear extension and retraction is accomplished by two (2) electrically-driven hydraulic pumps and four (4) hydraulic actuators (one (1) for each gear). The hydraulic pumps are located in fuselage aft of cockpit and the hydraulic actuators are located adjacent to each gear. Hydraulic system fluid level should be checked periodically by viewing the sight glass for fluid level in the upper one-third of the range. If fluid is low, fill with MIL-H-5606 or equivalent. Filters are installed on pickup tube inside of hydraulic reservoirs. Clean every 100 hours.

Landing gear operation is initiated by movement of the landing gear handle. When the handle is repositioned, hydraulic pressure in the system will drop and pressure switches will automatically turn on the hydraulic pump motors to maintain operating pressure in the system. When the gear cycle is completed, the pump will automatically shut off. If the pressure in the system drops to a preset value, the pressure switches turn the pump motors back on and build up the pressure to the limit again. Eight (8) position-indicator lights four (4) gear UP and four (4) gear DOWN are provided to show landing gear position. Two (2) additional indicator lights show when the landing gear pump motors are operating.

# 4.1 LANDING GEAR HANDLE

The landing gear handle controls a hydraulic selector valve within the selector head in the instrument panel and has two (2) positions (UP and DOWN LAND) which give a mechanical indication of the gear position selected. From either position, the handle must be pulled out to clear a detent before it can be repositioned.

# 4.2 INDICATOR LIGHTS

Ten (10) indicator lights are mounted on the landing gear control unit adjacent to the landing gear handle. Four (4) blue indicator lights, labeled NOSE and MAIN (left-hand lights for the left float and right-hand lights for the right float), show by their illumination that the landing gear is up and locked. The four (4) amber indicator lights, labeled NOSE and MAIN (left-hand lights for the let float and right-hand lights for the right float), are illuminated when the landing gear is down and locked. Neither set of lights is illuminated when the landing gear is in transit. Two (2) red indicator lights, labeled PUMP ON 1 and 2 illuminate when current is supplied to the landing gear motors. If the motors continue running during flight or on and off repeatedly, the motors should be shut off by pulling AMPHIBIAN PUMP 1 AND AMPHIBIAN PUMP 2 circuit breakers. Continual running of the motors can result in premature motor failure. Prior to landing, the circuit breakers should be pushed in to reactivate the circuits. Troubleshoot hydraulic problem per section 5.4.

# CHAPTER 5 MAIN AND NOSE GEAR OPERATION, REMOVAL AND SERVICE

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# 5.1 DESCRIPTION AND OPERATION

Retraction and extension of the main and nose landing gear is effected by a hydraulic actuation system shown schematically in figure 5.3.

The gear system is hydraulically actuated and driven by two hydraulic pumps located in the aft fuselage. A pressure of between 500 and 1000 psi is maintained in the supply line. When the pressure falls below 500 psi, the pressure switch activates the pump solenoid, providing power to the pump. When the pressure reaches 1000 psi, the pressure switch deactivates the solenoid and the pump motor stops. Figure 5.2 shows the electrical schematic of the system. A check valve on the output side of the pump retains pressure in the system while the pump is off. The pump has an internal relief valve, which directs oil back to the pump reservoir when the line pressure exceeds 1200 psi. The system also has an internal relief valve to protect against thermal expansion when line pressure exceeds 1900 psi.

A cockpit mounted control valve accomplishes the selection of gear up or gear down. Each float gear has individual indicator lights on the control valve allowing the pilot to confirm that each gear has fully retracted or extended.

An emergency hand pump is provided, in case of total electric pump failure, or loss of fluid. The reservoir has additional hydraulic fluid, available only to the hand pump.

The main gear is mechanically locked in both up and down positions. Locking and unlocking is effected utilizing a small amount of lost motion of the actuator rod. Retraction takes place when pressure is exerted on the actuator piston driving the collar along the slide tube. The lock is tripped when the follower slides up the contoured track in the actuator as shown in figure 5.3. A reverse process affects extension. Gear position light proximity switches are closed when the appropriate hook (containing the magnetic material) nests over the locking bar.

Shock absorption for the main landing gear is provided by a hydraulically dampened air spring. Figure 5.4 shows the main components. The oil and air share a common chamber. When the oleo is collapsed, the oil is forced through the main orifice, compressing the air in the upper cylinder. Extension reverses this process. The extended oleo is initially set at the factory to 140 psi no load. In-field adjustment of air pressure and oil volume is described in this section.

The nose gear has an over-center down lock. Retraction occurs when pressure is applied to the forward face of the actuator piston and the carriage is drawn along the tracks in the nose box as shown in figure 5.6. Gear position light proximity switches are closed when the piston containing the magnetic material has reached either end of its travel.

The nose gear consists of composite fiberglass beams that are attached at the bottom to castering blocks. Inside the block is a castering pin that is set into the machined fork assembly. The castering pin allows the nose wheel to pivot in a complete circle. The geometry is such that no shimmy dampers are necessary. A spring loaded cam rides in a groove machined in the castering pin. This groove as a flat surface on the back face with the result that the cam provides retention of the pin the block and self-centering of the wheel.

## 5.1.1 SERVICE – NOSE GEAR

The nose gear pivot assembly should be cleaned every 25 hours or more frequently whenever in water for extended period of time. Nose gear tracks after thorough cleaning can be left clean and dry or wiped with a silicone sprayed cloth on a stick or rod and run along tracks inside of the nose box, both sides.

**NOTE:** The nose pivot assembly and nose box tracks are exposed to the elements such as dirt and water. Careful and proactive care is required.

The nose wheels contain grease nipples for the wheel bearings. They should be greased every 25 hours.

Nose tires are standard 5:00 x 5, 6-ply, inflated to 40 +/- 5 psi.

## 5.1.2 NOSE BOX TRACK WEAR

Due the wear over time the roller/slide block places on the track as the gear are retracted, the block needs to be measured for the amount of wear. The tolerance for wear is .050 inches. If the wear is, or is less than the limit, it can still be used. If the wear in the track is greater than .050 inches, the block must be replaced. This check is to be done every 200 hours and is part of the maintenance checklist.

On the 6000 Series Floats Gear Track P/N 6A07337 (-001 LT -002 RT).

## 5.1.3 SERVICE – MAIN WHEELS AND BRAKES

Grease nipples are provided on all wheels and bearings and should be greased every 25 hours or after an extended period of time in the water. Water/heat resistant grease is recommended.

At brake installation, apply STA-Lube synthetic brake caliper grease or equivalent to brake caliper pins.

The dual piston brakes need no special care other than to maintain the brake disc free of rust, which causes premature brake lining wear. Bleeding is carried out in the usual manner from the bottom up.

Main wheel tires are standard 6:00 x 6, 6-ply type III aircraft tires, inflated to 40 +/- 5 psi. (Refer to figure 5-5).

## 5.1.4 SERVICE – MAIN GEAR OLEO

**OIL LEVEL -** The correct level is best set by draining and refilling with the correct quantity of fluid (950 ml). This should be done with the oleo removed from the float. **CAUTION:** Release air pressure and remove air valve before attempting to service oleo. After filling, refit valve and cap, then pressurize to 175 psi. (**Note:** Use only MIL-H-5606 hydraulic fluid.)

**AIR PRESSURE –** The correct air pressure is 175 psi (+/-10 psi) on a fully extended oleo (no load).

**SEALS –** Seals should be replaced whenever the oleo is disassembled or leaking.

**CAUTION: Release air pressure and remove air valve before attempting to service oleo.**

# 5.2 ADJUSTMENT / TEST

## 5.2.1 NOSE GEAR

Adjustment of actuator stroke is provided at the ends of the piston rods.

The length of the nose gear rod is adjusted such that the over-center knuckle (brass) rollers just bottom out on the down side and the piston just bottoms out on the mounting flange.

The up stops nests in the up-stop pin. See figure 5.6 for location and assembly.

Nose gear proximity switches are located on clips that are mounted on the outer cylinder body, one on each end. The most forward switch is for the gear down lights and most aft is for the gear up position lights. Set the proximity switch mounting clip along outer cylinder body to a position such that the light goes out when the over-center track is about ¼ inch from bottomed position while traveling in the up direction. Lights should come on about 1/8 inch from the bottomed position while traveling in the down direction.

The cylinder piston has a magnet that will activate the proximity switches.

## 5.2.2 MAIN GEAR

The main gear actuator cylinder is not adjustable. These are pre-set at the factory to ensure that the main gear is locked at the end of each stroke and that correct indication is given on the cockpit console. The up and down lock may be adjusted so the lock is fully engaged by adjusting the set screws shown in figure 5.3. Loosen the jamb nut adjust and tighten jamb nut.

The main gear proximity switches are located on each end of the gear stroke. The forward switch is located on the forward side of the gear tunnel. It is accessible through the top deck access cover. The aft proximity switch is located on the float bulkhead just aft of the wheel well, accessible though the float top deck cover.

The main gear proximity switches are adjusted loosening the mounting screws and positioning them as such that the light goes out when the lock hook is raised about 1/8 inch off its nested position and comes on again upon nesting.

## 5.2.3 BLEEDING HYDRAULIC SYSTEM AFTER SERVICE

The system automatically bleeds, provided sufficient oil is maintained in the reservoir. To check the fluid level, fill the reservoir with hydraulic oil and cycle the gear. The fluid level should be maintained in the upper one third (1/3) of the sight glass. If the reservoir empties (i.e. fluid disappears in sight glass) stop the cycle by pulling the circuit breaker on the control panel. Fill the reservoir again and complete the cycle. Continue this procedure until the fluid level in the reservoir stabilizes (it will vary in level between up and down positions). If the fluid level continues to decline during gear cycles, check for external leaks.

# 5.3 MAIN AND NOSE GEAR REMOVAL AND DISASSEMBLY

## 5.3.1 REMOVAL OF MAIN GEAR OLEO

Jack the aircraft by method described in section 3. With main wheels off the ground (both sides), run the gear up so that the main carriage is approximately 2 inches forward of down lock position. This must be accomplished to remove the top oleo bolt. In order to remove the lower bolt, it is necessary to remove the wheel on the head side of the bolt.

## 5.3.2 REMOVAL OF MAIN GEAR RETRACTION CYLINDER

Relieve pressure in system, place gear selector handle in neutral position (lever between up and down), and remove hydraulic lines. Remove end cap from end of cylinder. Drain fluid. Remove forward end of cylinder from bulkhead flange. Remove cylinder support ring from bulkhead.

**NOTE:** Piston to be in the up position for cylinder removal. Remove cylinder from piston and up through top float inspection cover. To remove piston, remove top inspection cover on top forward end of gear tunnel, accessible from top float inspection cover forward of step. Pull back piston to expose top of carriage in center of access cover. Remove .25 dia. retention bolt. Remove piston by pulling aft. See figure 5.3 for part breakdown.

## 5.3.3 REMOVAL OF MAIN GEAR DRAG LINK

Remove drag link from trunnions on step bulkhead. Axle is heat shrunk to drag link and is not removable.

## 5.3.4 REMOVAL OF NOSE GEAR FROM NOSE BOX

Gear must be in down position. Relieve pressure in system, place gear selector handle in neutral position (lever between up and down), and remove rear hydraulic line. Remove (4) bolts on forward end of cylinder. Drain fluid. Pull aft to expose internal piston rod. Loosen jamb nut on forward side of cylinder ram at rod end. Turn piston from aft side of nose box out of rod end. Lift up on gear assembly to unlock. Slide out of nose box.

**NOTE:** On installation adjust piston so it bottoms out on aft flange when nose gear is in locked position. Also note orientation of trolley blocks. The side with the most edge distance from hole is to go toward each other on inside of trolley. (See figure 5.6 for details).

## 5.3.5 REMOVAL OF NOSE GEAR BOX

Remove bolts securing forward box from nose bulkhead. Remove bolts securing aft box from bulkhead (2). Slide box out from front of float.

**NOTE:** Sealant will have to be cut for removal and replaced when installing.

## 5.3.6 REMOVAL OF LOWER NOSE GEAR FROM PIVOT BLOCK

With weight off of the nose wheel, remove 2 bolts on plate on aft side of pivot block. Remove spring and detent piston. Nose fork assembly will drop down from pivot block.

## 5.4 HYDRAULIC PUMP SYSTEM, DISASSEMBLY AND SERVICE

The hydraulic pump is factory preset to the following pressures:

- Pressures switch operates below 500 psi and shuts off at 1000 psi.
- The pump also has an internal relief valve that opens at 1200 psi and a thermal relief valve that opens at 1900 psi. These pressures are set with factory test equipment and are recommended to be sent back for overhaul or repair.

The unit may be disassembled for cleaning.

1. Relieve the pressure in the hydraulic system by placing the gear selector handle in the neutral position.
2. On the forward lower side of the reservoir, remove drain plug to drain most of the hydraulic fluid.
3. Remove the (4) screws on each tank (2) on upper side of the reservoir.
4. Dump out remaining oil, and clean reservoir.
5. Unscrew stand pipe with the filter attached.
6. Clean filter.
7. If filter is removed from stand pipe, a new filter should be used.
8. Reinstall tank and install seals to top of reservoir before installing on pump.
9. Install drain plug and fill with clean MIL-H-5606 hydraulic fluid through the breather pipe.
10. Fluid level should be in the upper 2/3 of the sight gauge.

**DESCRIPTION AND OPERATION**

**PROBLEM –** Powerpack does not run after gear selection.

**PROBABLE CAUSE**

- Circuit breaker has failed
- Pressure switch not pulling in at low cut in.
- Solenoid switch not pulling in.
- Faulty pump motor.
- Motor not properly grounded.

**VERIFICATION AND REMEDY**

- Reset circuit breaker.
- Short across pressure switch leads and see if motor runs. If motor operates, replace pressure switch.
- Short across solenoid pressure switch leads and see if motor runs. If motor operates, replace solenoid pressure switch.
- If above step does not produce results and it is verified that voltage was actually applied to motor, it can be assumed motor is bad or not properly grounded.
- Check motor ground.

**PROBLEM –** Power pack does not shut off after gear reaches position.

**PROBABLE CAUSE**

- Faulty pressure switch.
- Faulty or dirty pressure relief valve allowing insufficient pressure buildup.

**REMEDY**

- Replace pressure switch.
- Clean and check relief valve.

**PROBLEM –** Powerpack shuts off before gear reaches position.

**PROBABLE CAUSE**

- Binding or jammed gear retractor, which causes pressure to build up (and stay up), and pressure switch shuts off powerpack.
- Faulty or dirty pressure relief valve allowing insufficient pressure buildup.

**REMEDY**

- Repair retractor.

**PROBLEM –** Powerpack cycles on and off after gear is in position.

**PROBABLE CAUSE**

- Internal hydraulic leak.
- External hydraulic leak.

**REMEDY**

- Verify leak is not external by checking fluid level in reservoir and looking at couplings for oil leaks. If no external leaks are found, disconnect and cap off the hydraulic actuators one at a time and find the leaky one by process of elimination. If isolating entire system still indicates internal leak, powerpack check valve (located in pressure port of pump) is bad and needs replacement or reseating.
- Visually inspect lines, cylinders, and hoses and replace as necessary.

**PROBLEM –** Powerpack cycles on and off during gear cycle.

**PROBABLE CAUSE**

- Binding in retraction unit.
- Pressure switch cut off limit too low.

**REMEDY**

- Investigate for free operation. Check gear that retracts last.
- Replace pressure switch.

**PROBLEM –** Slow gear operation cycle (considerably longer than 30 seconds).

**PROBABLE CAUSE**

- Plugged oil screen.
- Poor electrical connection to motor.
- Poor motor.
- Worn pump gears.

**REMEDY**

- Clean intake screen located inside reservoir tank.
- Connect motor direct to 24 volt source and note its operation; if good, wire connection is bad; if operation poor, motor needs overhaul.
- See previous remedy.
- Replace pump.

**PROBLEM –** Circuit breaker pops during cycle.

**PROBABLE CAUSE**

- Wire connections bad or corroded.
- Bad motor brushes.
- Bad circuit breaker.

**REMEDY**

- Clean and protect terminal with grease.
- Overhaul motor.
- Replace circuit breaker.

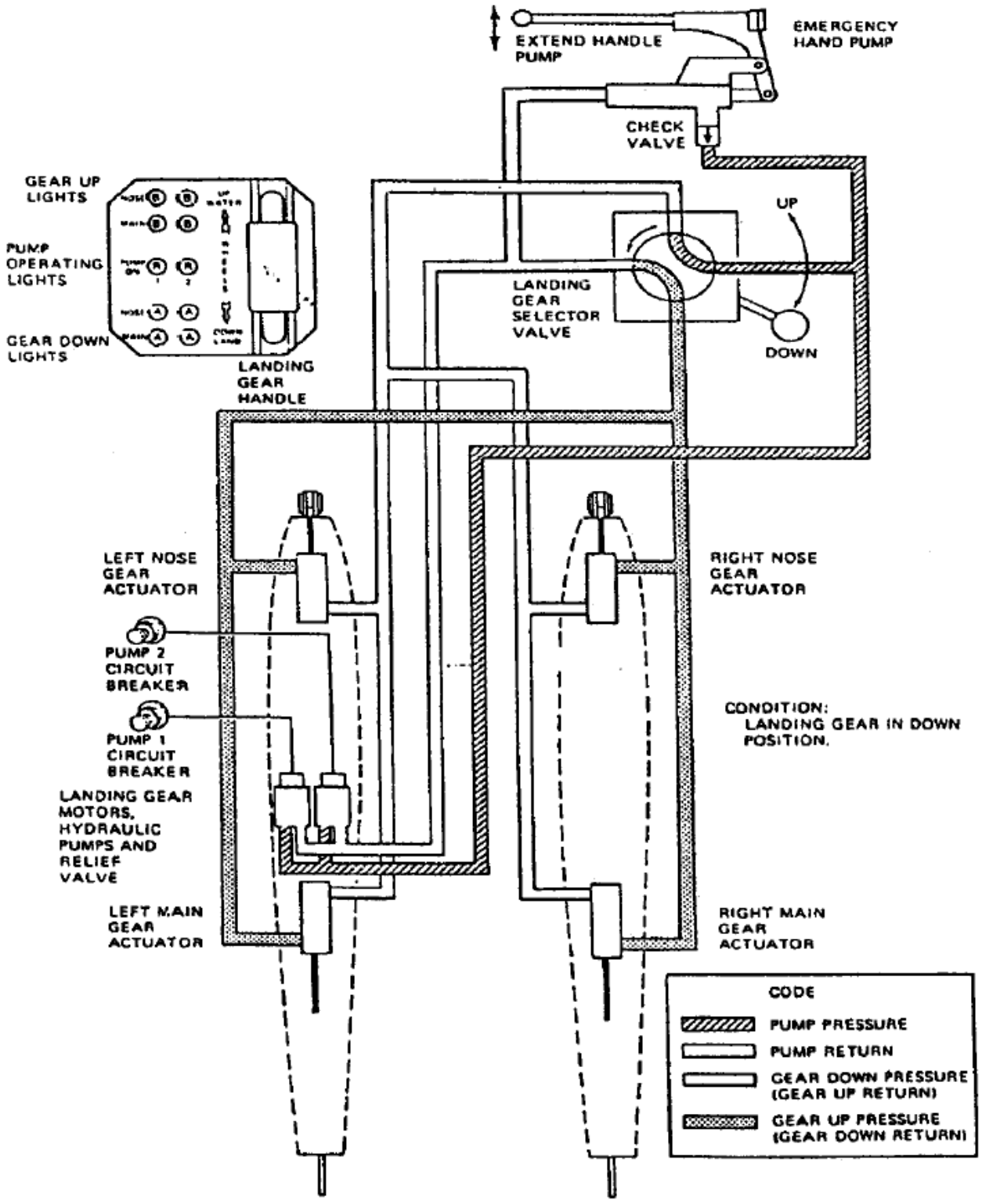



**FIGURE 5-1 SCHEMATIC, HYDRAULIC SYSTEM**

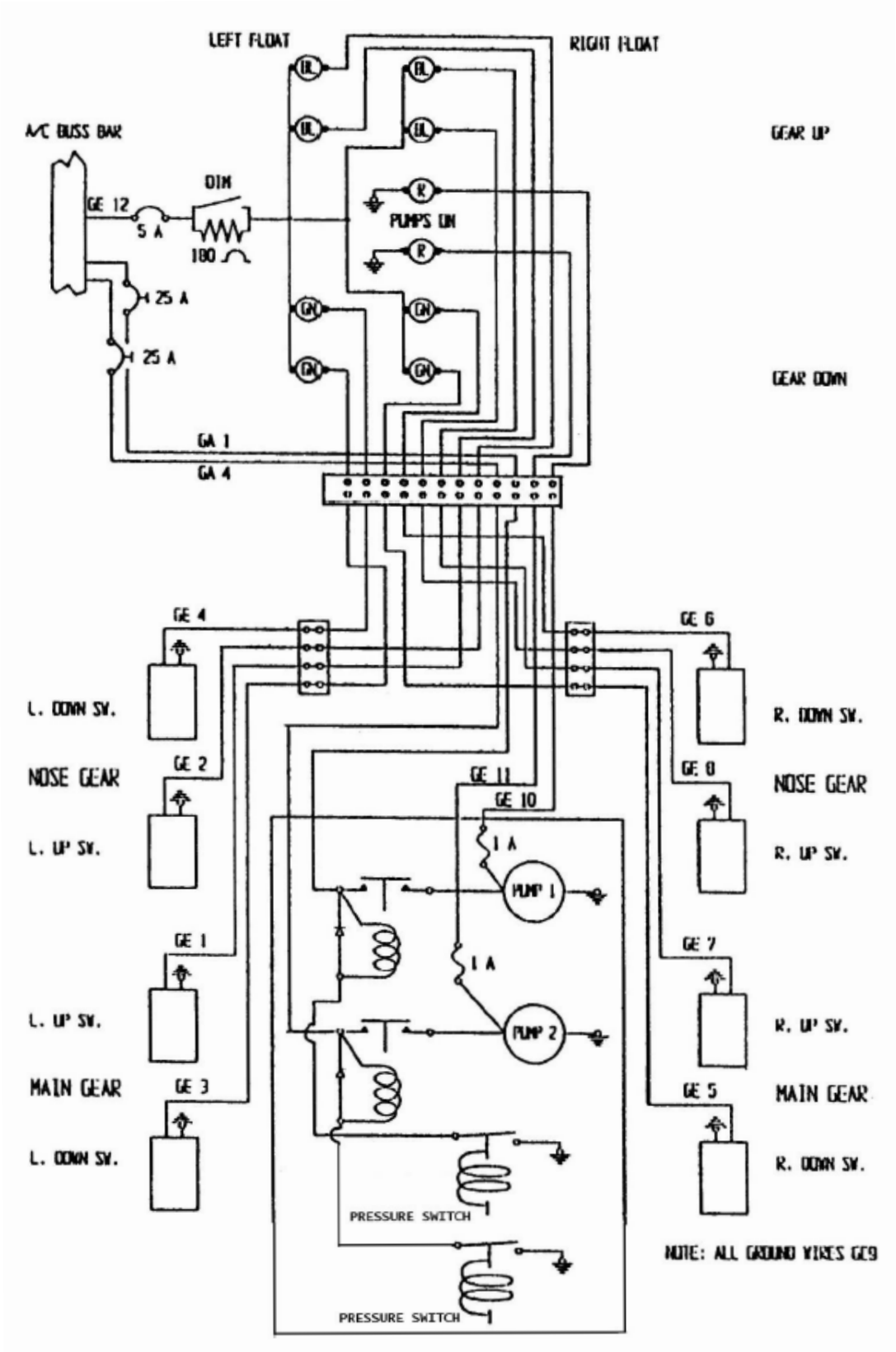



**FIGURE 5-2 SCHEMATIC, ELECTRICAL SYSTEM**

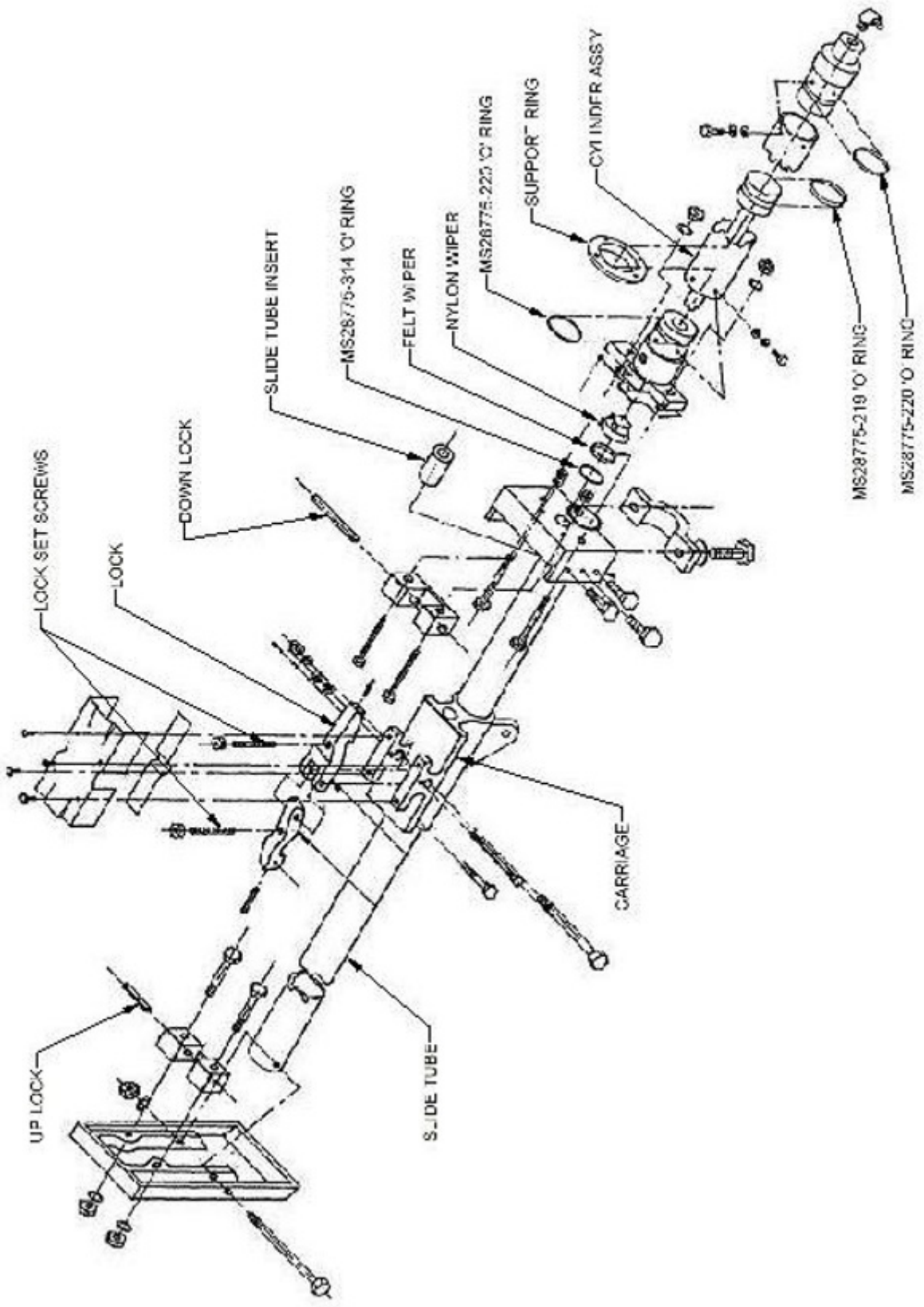



**FIGURE 5-3 ASSEMBLY MAIN GEAR RETRACTION SYSTEM**

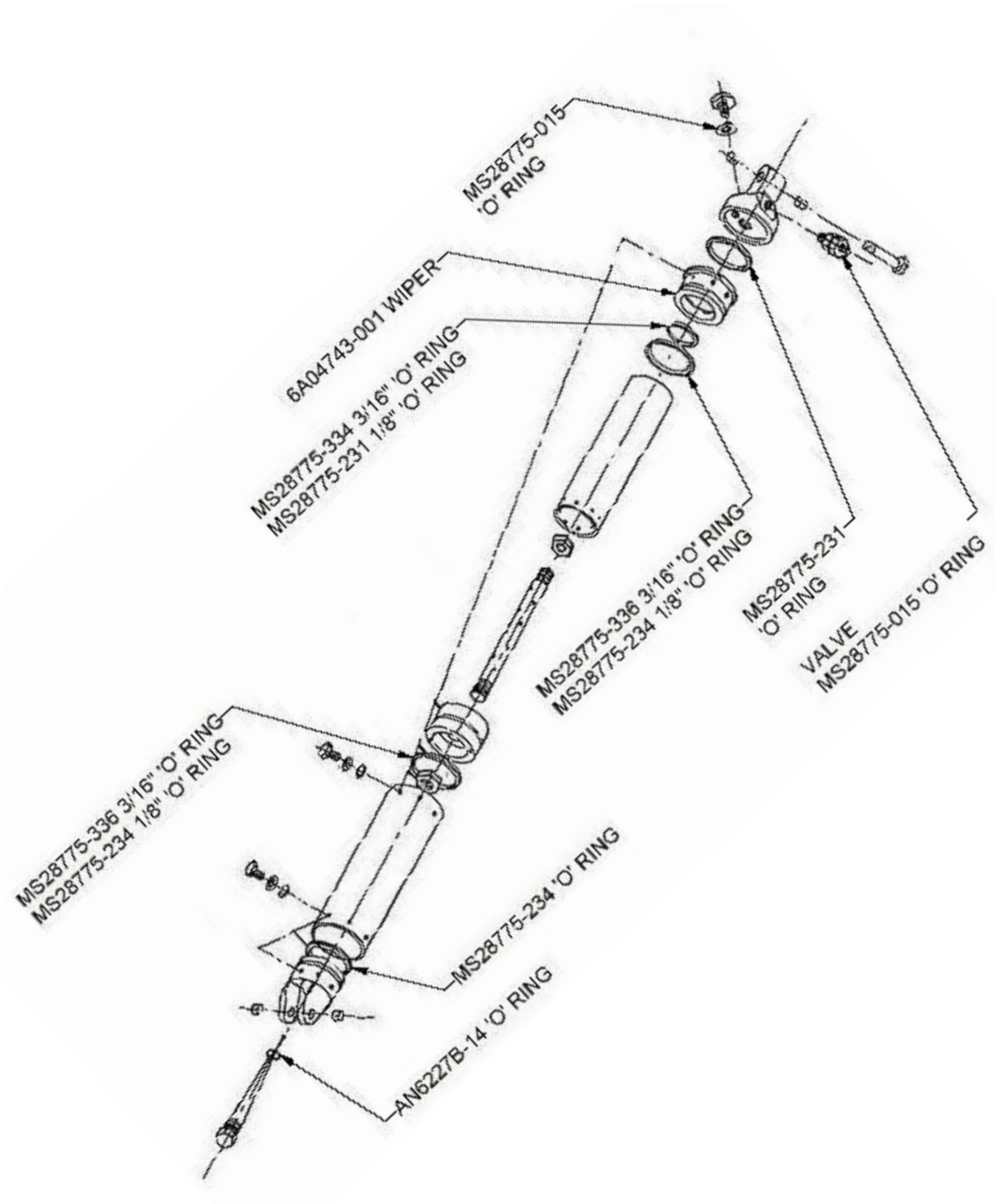



**FIGURE 5-4 SECTION MAIN GEAR OLEO (O-RINGS INSTALLED)**

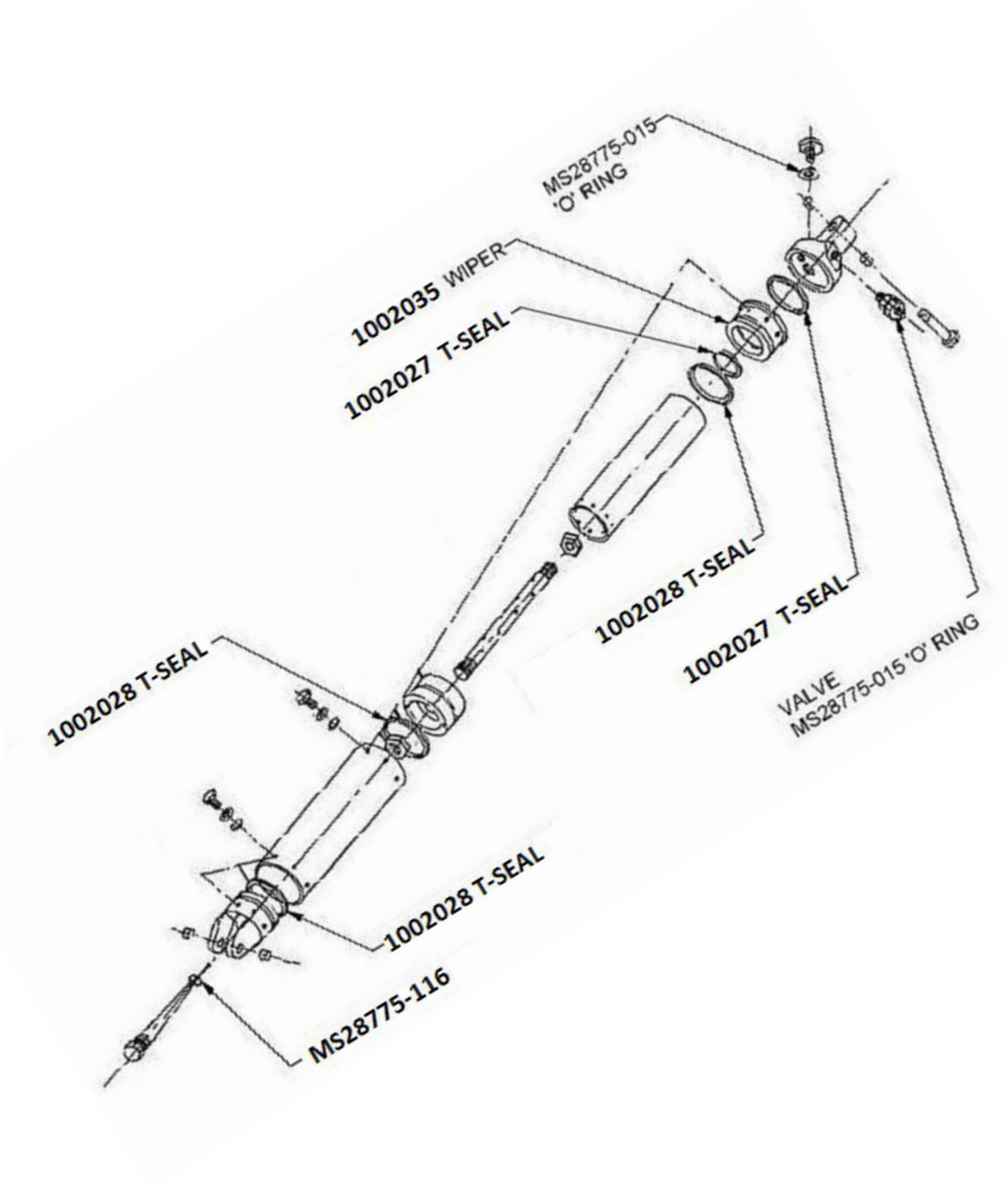



**FIGURE 5-4 SECTION MAIN GEAR OLEO (T-SEALS INSTALLED)**

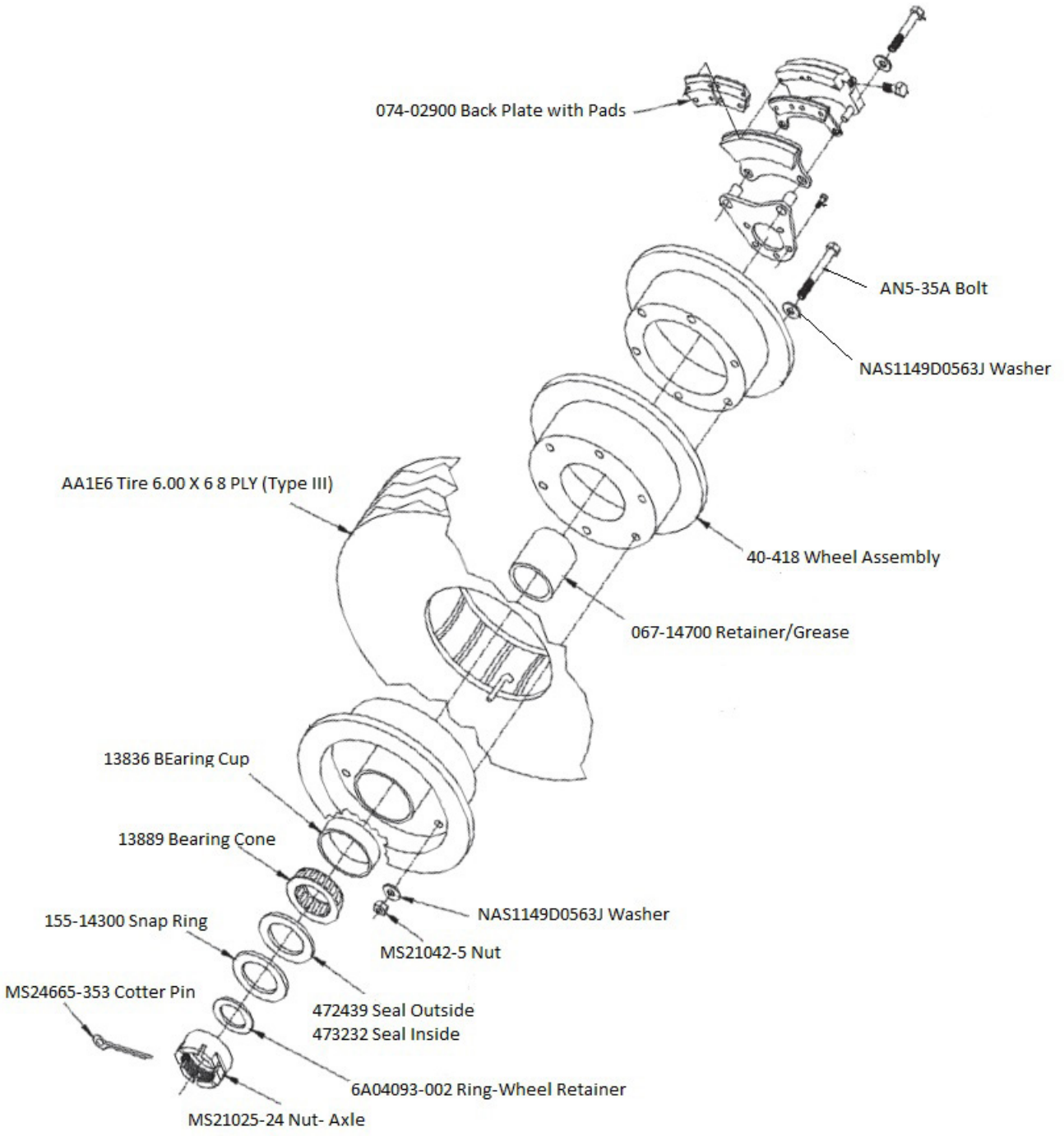



**FIGURE 5-5 ASSEMBLY MAIN GEAR AND BRAKE**

(Refer to Parts Manual for complete parts list)

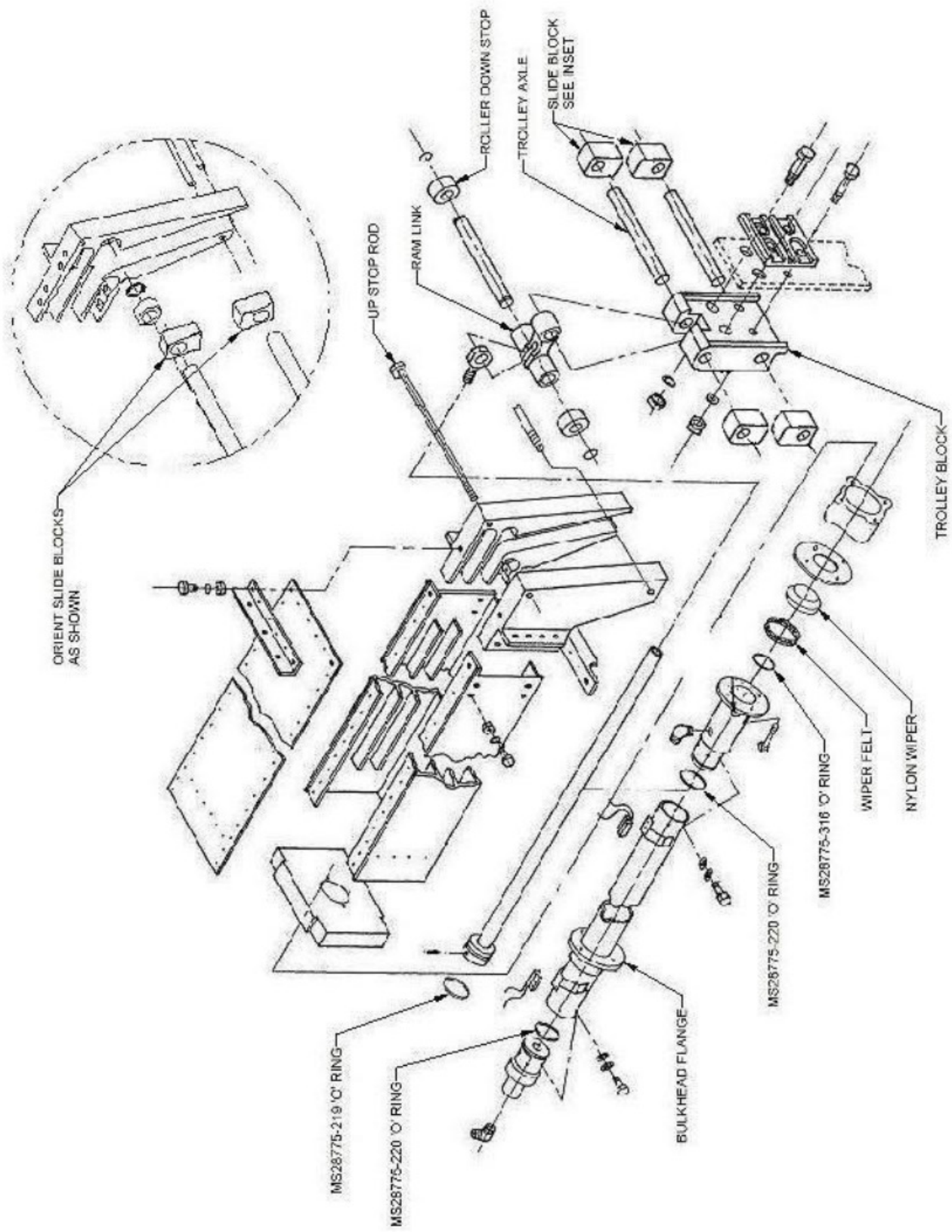



**FIGURE 5-6 ASSEMBLY NOSE GEAR SYSTEM**

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# CHAPTER 6 WATER RUDDER RETRACTION AND STEERING SYSTEM

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## 6.1 DESCRIPTION

The water rudder-retract system is manually operated by a lever through a system of cables and pulleys. Steering is directed from the aircraft rudder steering system.

## 6.2 ADJUSTMENT

Rigging of the water rudder steering cables is accomplished by centering the airplane rudder and adjusting the turnbuckles such that both rudders trail with the float center line. Cables should be tensioned to 40 pounds, +/- 5 psi.

Retraction cables should be rigged such that the top of the rudder blade is against the rudder stop on the rudder posts in the up position and that the cables are just slack in the down position.

**Service Schedule**

Cables - inspect for fraying annually.

Pulleys - inspect and lubricate annually.

# CHAPTER 7 SERVICE SCHEDULE & INSPECTION CHECKLIST

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# 7.0 SERVICE SCHEDULE

As coded in the Inspection Time Limits chart in this section, there are items to be checked each 25, 50, 100, and 200 hours. Also, there are notes on special items which may require servicing at more frequent intervals.

- When conducting an inspection at 25 hours, all items marked for 25 hours would be accomplished.
- When conducting an inspection at 50 hours, the 25 and 50-hour items would be accomplished.
- When conducting an inspection at 100 hours, the 25, 50, and 100-hour items would be accomplished.
- When conducting an inspection at 200 hours, the 25, 50, 100, and 200-hour items would be accomplished.
- A complete inspection (Annual Inspection) would include all 25, 50, 100, and 200-hour items.

When servicing float hull and amphibian components, below is list of recommended lubricants and “protection” products. This lists products used by Wipaire during assembly of the floats.

There may be equivalent products that are just as satisfactory for protection. It is recommended if trying different products, to inspect them frequently so as to determine their effectiveness.

**Protection of nuts, bolts, hydraulic lines or metal surfaces**
Zip D-5029NS Corrosion Inhibiting Compound
Zip Chemical Company

CRC – SP400 Soft Seal
CRC Industries

**General Lubricants**
LPS 1, LPS 2 and LPS 3
LPS Industries

**Wheel Bearings**
*HCF Grease, P/N 605
HCF Industries

*Aeroshell 22
Shell Global Solutions

*Green Grease, Multi-Purpose
Green Grease Inc.

*Aviation Grease SHC 100
ExxonMobil Aviation Lubricants

**Rust Protection**
Boeshield T9 Rut Protection
Boeing Company

Corrosion X
Corrosion Technologies Corp.

ACF-50 Rust Protection
Tef-Gel
Ultra Safety Systems, Inc.

**Float Sealant**
890 B2 or B4
Pro Seal Company

PR 1440 C
PPG Aerospace

1422 B2, B4 or B6
Pro Seal Company

RTV Silicones
General Electric

SIKAFLEX 201 or 252
Sika Manufacturing

**Electrical Insulating Compound**
Dow Corning 4 (DC4)
Dow Corning Corporation

**Brake Caliper Grease**
STA-Lube

* If existing grease cannot be identified you must lubri-flush all float grease fittings until visibly exhausting all old grease and new grease is coming out. Additionally, if you cannot determine existing grease in wheel bearings, completely clean and repack bearings with new grease.

**Hydraulic Fluid**
Mil-H-5606

As general inspection guidelines, each of the following areas should be inspected for their own unique attributes:

**Movable Parts**
For lubrication, servicing, security of attachment, binding, excessive wear, safe-tying, proper operation, proper adjustment, correct travel, cracked fittings, security of hinges, defective bearings, cleanliness, corrosion, deformation, sealing, and tension.

**Fluid Lines and Hoses**
For leaks, cracks, dents, kinks, chafing, security, corrosion, and deterioration.

**Metal Parts**
For security of attachment, cracks, metal distortion, broken welds, corrosion, condition of paint, and any other apparent damage.

**Wiring**
For security, chafing, burning, defective insulation, loose or broken terminals, corroded terminals.

**Bolts in Critical Area**
For corrosion, correct torque when installed, or when visual inspection indicates a need for a torque check.

Bolt and nut torque should be applied per the specified part installation drawing specifications. If no torque is specified, apply torque based on hardware application from tables below.

| **TENSION APPLICATION—FINE THREAD | | |
|---|---|---|
| NUT-BOLT SIZE | TORQUE LIMITS IN-LBS | |
| | MIN. | MAX. |
| 8-36 | 12 | 15 |
| 10-32 | 20 | 25 |
| 1/4-28 | 50 | 70 |
| 5/16-24 | 100 | 140 |
| 3/8-24 | 160 | 190 |
| 7/16-20 | 450 | 500 |
| 1/2-20 | 480 | 690 |
| 9/16-18 | 800 | 1000 |
| 5/8-18 | 1100 | 1300 |
| 3/4-16 | 2300 | 2500 |
| 7/8-14 | 2500 | 3000 |
| 1-14 | 3700 | 5500 |
| 1 1/8-12 | 5000 | 7000 |
| 1 1/4-12 | 9000 | 11000 |

| **SHEAR APPLICATION—FINE THREAD | | |
|---|---|---|
| NUT-BOLT SIZE | TORQUE LIMITS IN-LBS | |
| | MIN. | MAX. |
| 8-36 | 7 | 9 |
| 10-32 | 12 | 15 |
| 1/4-28 | 30 | 40 |
| 5/16-24 | 60 | 85 |
| 3/8-24 | 95 | 110 |
| 7/16-20 | 270 | 300 |
| 1/2-20 | 290 | 410 |
| 9/16-18 | 480 | 600 |
| 5/8-18 | 600 | 780 |
| 3/4-16 | 1300 | 1500 |
| 7/8-14 | 1500 | 1800 |
| 1-14 | 2200 | 3300 |
| 1 1/8-12 | 3000 | 4200 |
| 1 1/4-12 | 5400 | 6600 |

| **TENSION APPLICATION—COARSE THREAD | | |
|---|---|---|
| NUT-BOLT SIZE | TORQUE LIMITS IN-LBS | |
| | MIN. | MAX. |
| 8-36 | 12 | 15 |
| 10-32 | 20 | 25 |
| 1/4-28 | 40 | 50 |
| 5/16-24 | 80 | 90 |
| 3/8-24 | 160 | 185 |
| 7/16-20 | 235 | 255 |
| 1/2-20 | 400 | 480 |
| 9/16-18 | 500 | 700 |
| 5/8-18 | 700 | 900 |
| 3/4-16 | 1150 | 1600 |
| 7/8-14 | 2200 | 3000 |

| **SHEAR APPLICATION—COARSE THREAD | | |
|---|---|---|
| NUT-BOLT SIZE | TORQUE LIMITS IN-LBS | |
| | MIN. | MAX. |
| 8-32 | 7 | 9 |
| 10-24 | 12 | 15 |
| 1/4-20 | 25 | 30 |
| 5/16-18 | 48 | 55 |
| 3/8-16 | 95 | 100 |
| 7/16-14 | 140 | 155 |
| 1/2-13 | 2440 | 290 |
| 9/16-12 | 300 | 420 |
| 5/8-11 | 420 | 540 |
| 3/4-10 | 700 | 950 |
| 7/8-9 | 1300 | 1800 |

**A Torque of 80% should be used when Tef-Gel is applied to the bolt.

Some additional general maintenance areas are as follows:

**Nose and Main Gear Tracks**
Clean and lubricate with a dry teflon coating spray.

**Joints**
Spray all joints with light penetrating oil such as LPS 3 to ensure lubrication at all times.

**Electrical Connections**
Apply SP-400 SOFT SEAL or LPS 500 to all electrical connections to prevent corrosion.

**Hydraulic Fluid**
For use in all hydraulic systems, including brakes: MIL-H-5606.

# 7.1 INSPECTION TIME LIMITS AND CHECKLIST

| INSTRUCTIONS / PROCEDURES | | HOURLY LIMITS | | | | MECHANIC | |
|---|---|---|---|---|---|---|---|
| | | 25 | 50 | 100 | 200 | RT | LT |
| **General** | Wash aircraft and floats with fresh water and inspect surfaces and hardware for signs of corrosion, especially with salt water use. | X | | | | | |
| | Refer to Wipaire, Inc. Corrosion Prevention Program Manual for details. | | | | | | |
| | Check installed placards against the AFM or POH, and installation drawings. | | | X | | | |
| **Hulls & Struts** | Float Installation | | X | | | | |
| | Float exterior - inspect for damage, wrinkled metal, corrosion, paint loss, etc. | | | | | | |
| | Boarding steps: disassemble as needed and grease the step slide tubes. | | | X | | | |
| | Disassemble and grease the flying wire clevis bolts/pins. Check flying wire tension and alignment. | | | X | | | |
| | Spreader Bars: inspect for loose screws and cracks & seal between fairing and side skin. Insp. fairings for cracking and loose screws. | | | | | | |
| | Float covers: remove all covers and check for metal integrity and hardware security. | | | X | | | |
| | Also make sure seals are secure. Look for cracks under nut plates. | | | | | | |
| | Float interior: Inspect all bulkheads for wrinkled metal, cracked flanges and corrosion. | | | | X | | |
| | Pull up baggage floors and inspect bulkheads. | | | | | | |
| | Check nose box attach hardware and nose bumper. | | | X | | | |
| | Inspect hardware for corrosion and security. | | | | | | |
| | Pumper Tube Installation - inspect for condition, security, routing of hoses. | | | | X | | |
| **Water Rudder System** | Water rudder boots - inspect for cuts, tears, and condition | | | | | | |
| | | X | | | | | |

| | INSTRUCTIONS / PROCEDURES | HOURLY LIMITS | | | | MECHANIC | |
|---|---|---|---|---|---|---|---|
| | | 25 | 50 | 100 | 200 | RT | LT |
| | Water rudder steering and retract systems - inspect the following: cables for broken wire; fittings for cable slippage, cracks and distortion; cable pulleys for freedom of rotation and cable guard pins for presence; rigging & tension at 40 lbs +/- 5 lbs. | | | X | | | |
| | Check cable rollers for ease of rotation and lube with LPS 2.<br><br>Check water rudder steering cable attach bolt for wear and lube with grease. | | | | | | |
| | Water rudder blades and posts - inspect for damage, security of attachment, corrosion, paint, rigging. | | | X | | | |
| | Check post bolts and bushing wear. Lube with LPS 2. | | | | | | |
| **Electrical System** | Pump and indicator light wiring - inspect for chafing, broken or loose terminals and general condition. | | | X | | | |
| | Solenoids - inspect wiring, mounting and general condition. | | | X | | | |
| | Pressure Switches - inspect wiring, mounting and general condition. | | | X | | | |
| | Pump Motors - inspect wiring, mounting and general condition. | | | X | | | |
| **Landing Gear Systems** | Clean & Lubricate nose gear tracks | X | | | | | |
| | If the track is gold colored: grease for lubrication.<br>If the track is black: should be clean and dry or clean and wipe with spray silicone on a towel. | | | | | | |
| | Nose Gear Box/Block Tracks measured at slide route for wear, .050 inches or less wear tolerance. | | | | X | | |
| | Nose gear pivot blocks and forks - inspect for condition, lubrication, corrosion, paint. | X | | | | | |
| | Check side-play; 3/32 – 1/16 tolerance. | | | | | | |
| | Nose and main wheel bearing - grease Zerk fittings including main gear carriages. | X | | | | | |
| | Hydraulic fluid level: Mil-H-5606 | | X | | | | |

| INSTRUCTIONS / PROCEDURES | | HOURLY LIMITS | | | | MECHANIC | |
|---|---|---|---|---|---|---|---|
| | | 25 | 50 | 100 | 200 | RT | LT |
| | Wheels and tire - inspect for wear, pressure, condition | | | | | | |
| | | | X | | | | |
| | Nose inflate to 40 lbs +/- 5 lbs<br>Main inflate to 40 lbs +/- 5 lbs | | | | | | |
| | Brake assemblies - inspect for wear, corrosion, leakage | | X | | | | |
| | Hydraulic fluid screen - clean and inspect. **NOTE:** If floats sit for extended periods of time (I.e. If removed during winter months), screen should be cleaned before putting floats back into service. Hydraulic fluid in reservoir should be checked for moisture or other contaminates and changed if necessary. | | | X | | | |
| | Insp. FWD slide tube mounting bolt for corrosion and wear when the gear are out. Clean and lube the slide tube before returning. | | | | | | |
| | Main and Nose gear actuator, assemblies - inspect for condition, lubrication, leakage, corrosion, and cleanliness.<br>With gear out: Inspect FWD slide tube mounting bolt for corrosion and wear. Clean & grease FWD slide tube. | | | X | | | |
| | Nose gear springs - scotch ply springs, inspect for cracks, delaminating and paint. | | | X | | | |
| | Main gear drag link garlock bushings - inspect for condition, lubrication, and corrosion. | | | X | | | |
| | Clean the wheel wells to facilitate general condition inspection. | | | X | | | |

| INSTRUCTIONS / PROCEDURES | | HOURLY LIMITS | | | | MECHANIC | |
|---|---|---|---|---|---|---|---|
| | | 25 | 50 | 100 | 200 | RT | LT |
| | Main gear oleos - inspect for evidence of leakage, proper extension, check cylinder for corrosion, pitting, cleanliness and security | | | X | | | |
| | Hydraulic lines and fittings - inspect for leaks, condition and security. | | | | X | | |
| | Hydraulic Manifolds (if equipped) - inspect for condition, security, and leaks. | | | | X | | |
| | Brake system plumbing - inspect for leaks, condition and security. | | | | X | | |
| | Main gear oleos - service | | | | X | | |
| | Perform retraction test: | | | | X | | |
| | Inspect UP and DOWN switches & lights. | | | | X | | |
| | | | | | X | | |
| | | | | | X | | |
| | Nose and main wheel bearings - disassemble and inspect | | | | X | | |

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# CHAPTER 8 WEIGHT AND BALANCE

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# 8.0 WEIGHING PROCEDURES FOR THE BEAVER FLOATPLANE

**Viking Dehavilland published two methods for measuring the aircraft weight and balance. The first method uses a location on the wing 17.5" behind the wing leading edge, a 1/4 chord location datum. Items forward of this location have a (+) positive ARM and items aft of this location have a (-) negative ARM. The second method uses an imaginary datum forward of the aircraft so all items have a (+) positive ARM. Refer to the aircraft POH or POH supplement for proper W&B balance method used. Reference Viking Weight and Balance Manual PSM 1-2-8 for more information.

**Method 1 (Datum At Wing ¼ Chord)**

1. Level aircraft per manufacturer's instructions or use the cabin door lower sill.
2. Place scales under the right and left main and nose gears.
3. Place blocking under the right and left main gears to level aircraft.
4. Draw lines on the floor from the centerline main wheels and centerline nose wheel left to right.
5. At the wing root, measure 17.5 inches behind the main wing leading edge and hang a plumbob from this location and mark its location. Do this on both wings and draw a line in between both points. This line is 1/4 chord-station zero.
6. Draw another line between the nose wheel centers and a 4th line between the main wheel centers.

   • Measure the distance from 0.0 to the nose wheel line. This is X1 and X2.
   • Measure the distance from 0.0 to the main wheel line. This is Y1 and Y2.

7. Arm measurements forward of station zero are positive while measurements aft of the station 0 are negative.

**NOTE:** If the floats are seaplane floats, the scales go under the step point in the rear and a point towards the front of the float. These distances are measured and become the same X and Y as for the amphibian.

Use this table for the calculations:

| | WEIGHT X | ARM | = MOMENT |
|---|---|---|---|
| | Scale Reading | Distance from 0.0 | Weight X Arm |
| Left Front X1 | + | + | |
| Right Front X2 | + | + | |
| Left Rear Y1 | + | - | |
| Right Rear Y2 | + | - | |
| Totals | | | |

**Notes:**

1. Zero out or deduct tare weights at the Y arm.

**Method 2 (Datum At/Forward Of Spinner)**

1. Level aircraft per manufacturer's instructions or use the cabin door lower sill.
2. Place scales under the right and left main and nose gears.
3. Place blocking under the right and left main gears to level aircraft.
4. Draw lines on the floor from the centerline main wheels and centerline nose wheel left to right.
5. At the wing root, measure 17.5 inches behind the main wing leading edge and hang a plumbob from this location and mark its location. Do this on both wings and draw a line in between both points. This line is 1/4 chord.
6. Using a T-Level or carpenters square, mark a perpendicular line going forward of the 1/4 chord line. For DHC2-MKI aircraft, measure this line 100". For DHC2-MKIII aircraft, measure this line 200". For PC-6 measure 200". This is station 0.0.
7. Draw lines between the nose wheel centers and between the main wheel centers.

- Measure the distance from 0.0 to the nose wheel line. This is X1 and X2.
- Measure the distance from 0.0 to the main wheel line. This is Y1 and Y2.

**NOTE:** If the floats are seaplane floats, the scales go under the step point in the rear and a point towards the front of the float. These distances are measured and become the same X and Y as for the amphibian.

Use this table for the calculations:

| | WEIGHT X | ARM | = MOMENT |
|---|---|---|---|
| | Scale Reading | Distance from 0.0 | Weight X Arm |
| Left Front X1 | + | + | |
| Right Front X2 | + | + | |
| Left Rear Y1 | + | + | |
| Right Rear Y2 | + | + | |
| Totals | | | |

**Notes:**

1. Zero out or deduct tare weights at the Y arm.