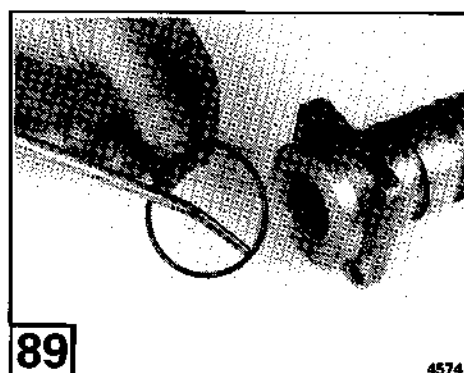
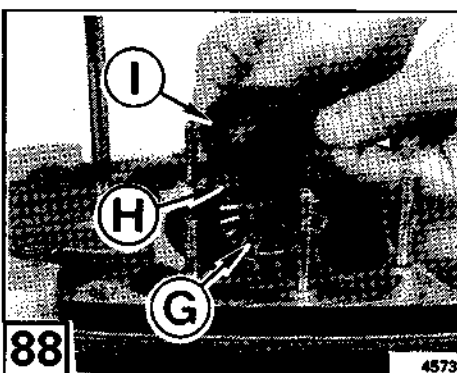
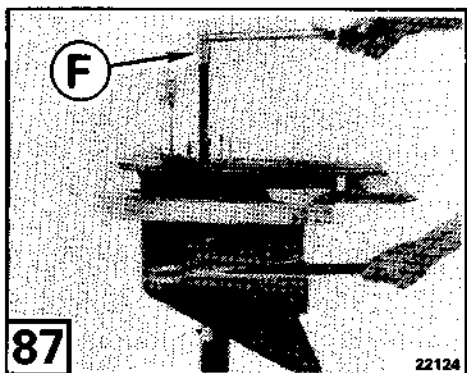




- 87** 3. Hold the nut with OMC Pinion Nut Holder P/N 334455. Place OMC Spline Socket P/N 311875 (F) on the driveshaft. Tighten the nut to a torque of 70-75 ft.lbs. (95-102 N-m). Take out the intermediate driveshaft.

Driveshaft Bearing Housing Installation

- 88** 1. In this order, set the thrust bearing (G), thrust washer (H), and shims (I) on the driveshaft.

- 89** 2. Apply gearcase oil to a new small O-ring and place it on the base of the driveshaft bearing housing.

- 90** 3. Lightly coat three new, thick O-rings (J) with *OMC Gasket Sealing Compound*. To ease installation, fit an O-ring into the upper groove first, then fill the remaining grooves consecutively down toward the flange.

- 90** 4. After installing the O-rings, lightly coat the entire housing surface (K) with *OMC Gasket Sealing Compound*. This will prevent corrosion buildup between the housing and the water passage cover.

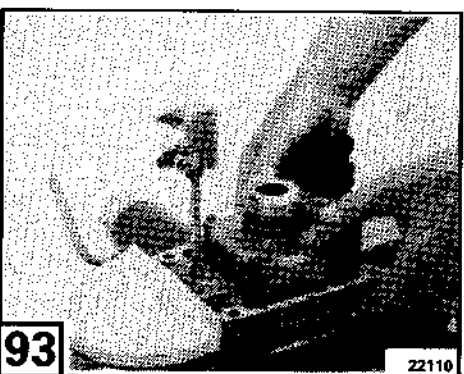
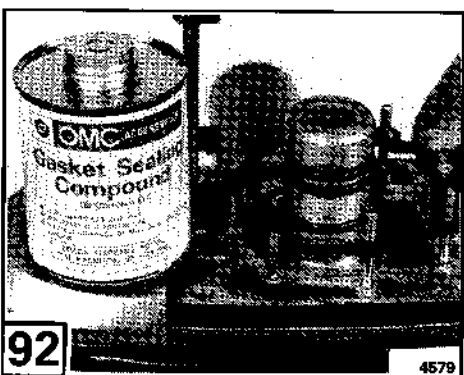
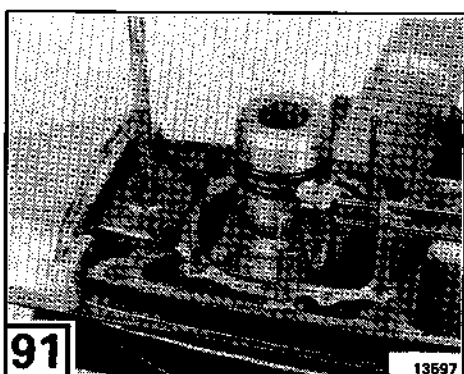
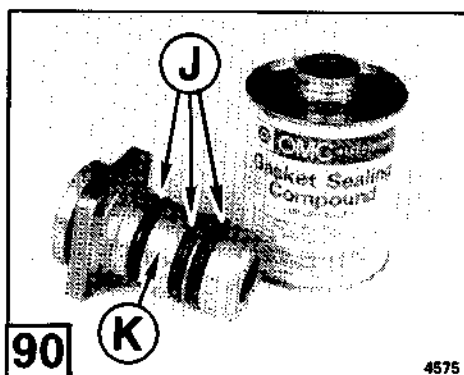
5. Install the driveshaft bearing housing and seat it with hand pressure.

- 91** 6. Make sure all old sealer has been cleaned from the four mounting bolts. Place the flat washers on the bolts, then lightly coat the threads with *OMC Gasket Sealing Compound*. Install the bolts and tighten them to a torque of 14-16 ft. lbs. (19-22 N-m).

Water Passage Cover Installation

- 92** 1. Coat both sides of a new water passage cover gasket with *OMC Gasket Sealing Compound* and place it on the gearcase. Also coat the length of all studs with *OMC Gasket Sealing Compound* to prevent corrosion.

- 93** 2. Install the water passage cover and seat it by hand. If it's difficult, tap it gently with a soft hammer.



- 94** 3. Place flat washers and new locknuts on the studs. Tighten the nuts to a torque of 9-11 ft. lbs. (12-15 N·m).

Forward Gear, Bearing Housing and Propeller Shaft Installation

- 95** 1. Lightly apply *OMC Triple-Guard* grease to a new O-ring **(A)** and install it on the bearing housing. Carefully apply *OMC Gasket Sealing Compound* to both housing flanges **(B)**.

2. Install the intermediate driveshaft, and shift the gearcase into reverse. Make sure there is complete clutch dog and gear engagement.

Note This will engage the clutch shaft and prevent it from "floating" when trying to install the forward gear and propeller shaft assembly.

- 96** 3. Vertically align the propeller shaft housing screw holes, and position the anode down. Insert the housing assembly until it seats. Hold the intermediate driveshaft, and rotate the propeller shaft to engage the internal splines of the two shafts. Push the housing in by hand until the retaining tab slots are flush with those in the gearcase housing.

- 97** 4. Install the two retaining tabs **(C)**. Torque the screws to 18-20 ft. lbs. (24-27 N·m).

Pressure and Vacuum Testing Lower Gearcase

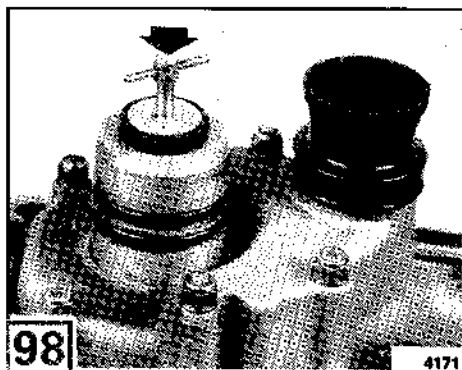
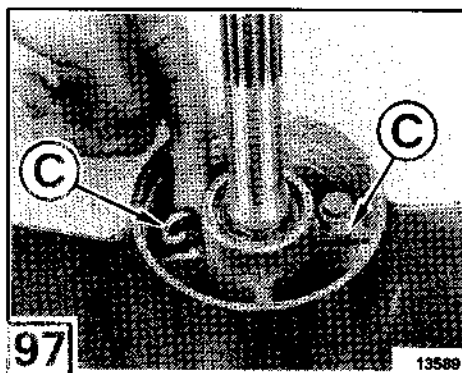
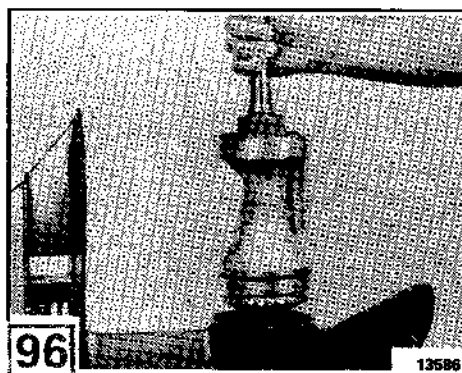
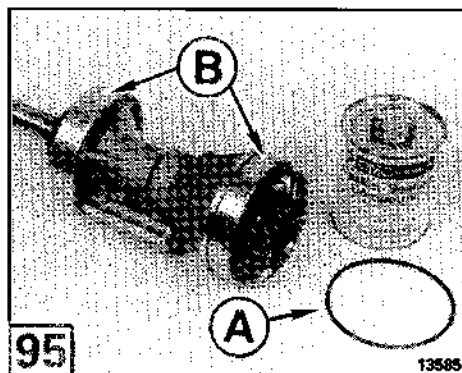
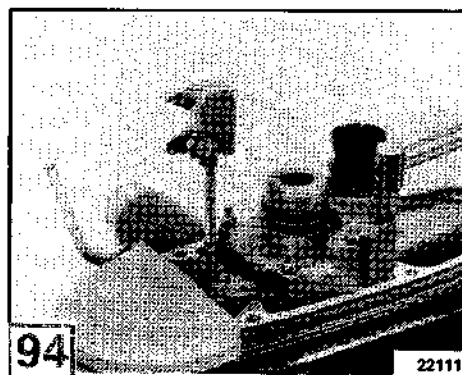
- 98** 1. Install and tighten a 1 in. expandable rubber plug inside the driveshaft bearing housing.

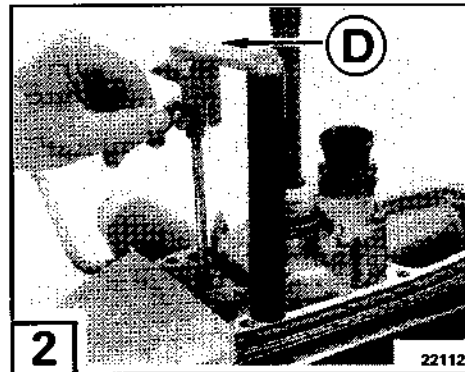
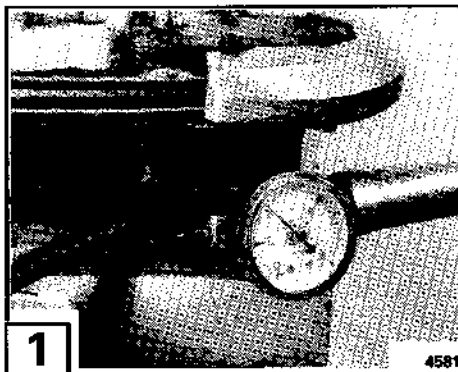
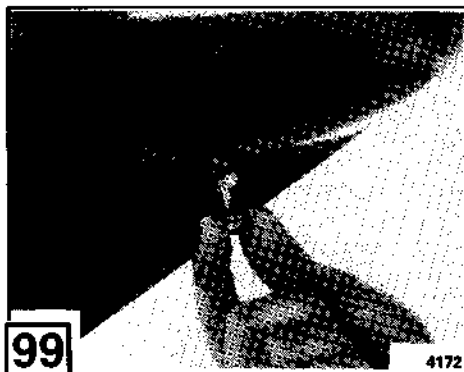
- 99** 2. Place a new washer on the magnetic drain plug, then install and tighten it to a torque of 60-84 in. lbs. (7-9 N·m).

3. Remove the oil level plug at the top of the gearcase.

1 **Pressure Test** - Attach a pressure tester (such as a *Stevens S-34*) and pressurize gearcase to 3-5 PSI (21-42 kPa). Rotate the propeller shaft to check sealing. If pressure loss is indicated, use a soapy water solution or submerge gearcase in water to find source of leak. Make necessary repairs, then repeat test. If pressure loss is not indicated, increase pressure to 16-18 PSI (110-124 kPa). If pressure loss is indicated, submerge to find source. Gearcase must hold pressure before making vacuum test, and must not lose more than 1 PSI in 3 minutes.

1 **Vacuum Test** - Attach a vacuum tester (such as a *Stevens V-34*) and pull vacuum in the gearcase in two steps. First, 3 to 5 inches of mercury, and then 15 inches of mercury. No loss of vacuum should occur on low test, and no more than 1 inch of mercury in 3 minutes on high test. If gearcase does not hold vacuum, put a heavy oil on seal and gasket surfaces to find source. Make necessary repairs and repeat test.





Shift Rod Height Adjustment

1. Move the shift rod to NEUTRAL position.

2. Rest OMC Shift Rod Height Gauge P/N 912277 on the housing surface, as shown. Screw the shift rod in or out until the upper arm of the gauge **D** just contacts the top of the shift rod head. (reference: 7 $\frac{13}{64}$ in. - 18,3 cm). An additional $\frac{1}{2}$ turn either way is acceptable, as long as the final setting has the notched side of the head facing forward.

Upper Gear Housing Installation

3. Be sure nylon plug is at base of splines inside lower driveshaft. Apply gearcase oil to the splines at both ends of the intermediate driveshaft, and insert it into the lower driveshaft. Rotate shift rod head **E** 90° to port to provide clearance when installing upper gear housing.

2. Install water tube in upper gearcase. See **Section 7** for text and photo.

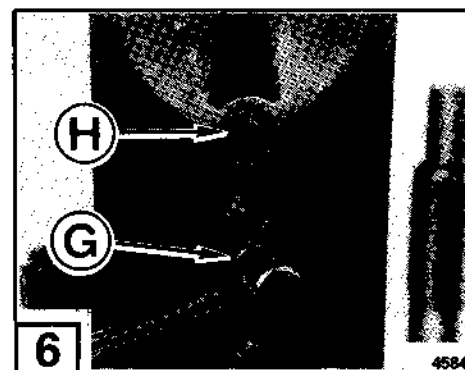
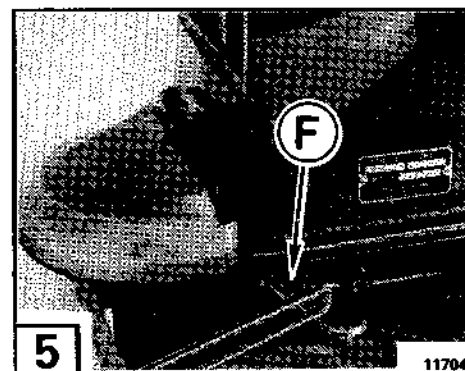
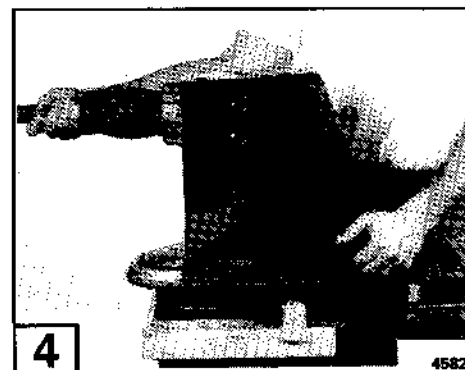
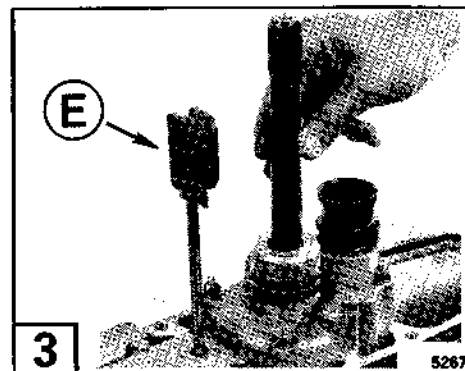
3. Align the upper gear housing fore and aft to make sure the driveshaft and water tube seat simultaneously, then set it onto the lower gearcase. As shift rod head appears inside exhaust opening, turn head forward to engage guide pin. You may have to rotate the U-joint shaft slightly to engage the driveshaft splines. Use hand pressure only to seat the housing.

4. Clean the six gear housing mounting bolts in solvent.

Note Do not wire brush the yellow-green material on the bolt threads. This is a locking device that prevents the bolts from loosening. If this material is removed, the bolts must be replaced.

5. Lightly apply *OMC Gasket Sealing Compound* to the four short bolts. Install and tighten them to a torque of 22-24 ft. lbs. (30-33 N-m). Use OMC Wrench P/N 912031 **F** for clearance.

6. Turn the gearcase over. Lightly apply *OMC Gasket Sealing Compound* to the threads of both bolts under ventilation plate. Place the $\frac{7}{16}$ in. flat washer on the largest bolt **G** and install it, then screw in the remaining bolt **H** under the trim tab. Tighten both to a torque of 22-24 ft. lbs. (30-33 N-m).



Pressure and Vacuum Testing Vertical Drive

Now that the vertical drive is assembled, repeat the pressure and vacuum tests made previously. Pressurize the drive to 3-5 PSI (21-42 kPa) and 16-18 PSI (110-124 kPa) and pull vacuum to 3-5 in. and 15 in. of mercury. These additional tests will check sealing of the driveshaft bearing housing O-ring and upper gear housing. Find pressure leaks by submerging drive or using a soapy water solution. Find vacuum leaks by applying a heavy oil to suspected areas. Make repairs if necessary and repeat these tests. Drive must not lose more than 1 unit of pressure/vacuum in 3 minutes.

Note Do not fill vertical drive with oil until it passes both pressure and vacuum tests. Drives that fail either test will allow water entry when in use and cause subsequent damage to internal parts.

Trim Tab Installation

1. Thoroughly clean all old sealer from the trim tab screw threads with a wire brush. Clean the housing hole with a thread tap.

7 2. Apply *OMC Gasket Sealing Compound* to the bolt threads. Position the trim tab on the housing and align the reference marks or the index rib with the original grid number setting. Tighten the screw to a torque of 28-32 ft. lbs. (38-42 N·m). If the original setting is not known, align the fib with grid number '3'.

Vertical Drive Filling, Gearcase Lubricant

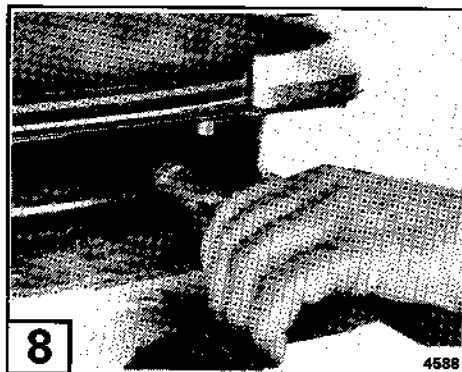
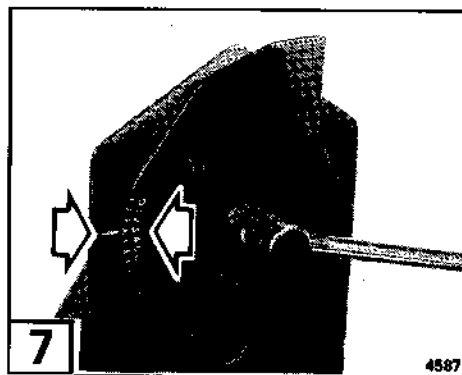
1. Place the drive in a vertical position. Remove the level indicator gauge and discard the seal. Install a new seal, then insert the gauge into the housing and let it rest on top of the threads.

Note Do not screw in the gauge. Gauge must rest on threads to ensure adding the proper amount of oil when making an initial fill. It will also allow the reservoir to vent while filling.

2. Remove the fill plug on the side of the lower gearcase above the anti-ventilation plate. Discard the nylon washer and replace it with a new one.

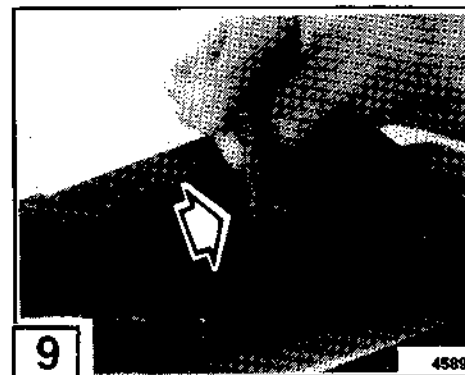
8 3. Fill the drive with *OMC Hi-Vis* gearcase lubricant. Fill slowly to allow air to purge.

Note Filling drive too quickly may form air pockets that will cause an inaccurate oil level reading. Running drive with improper oil level will result in immediate internal damage.



9 4. Frequently check gauge while filling. When oil reaches level line, stop filling and screw in gauge. This will create an air lock to prevent oil loss when the fill plug is installed. Tighten fill plug to a torque of 60-84 in. lbs. (7-9 N·m). Finish procedure by tightening level indicator to a torque of 10-20 ft. lbs. (14-16 N·m).

5. After drive has been run, recheck oil level. Fill drive through gauge opening to bring oil up to level line on gauge. Take this and subsequent level readings with gauge completely screwed in. **Checks made with gauge resting on threads are for initial fill only.**



Vertical Drive Installation

Remove vertical drive from the holding fixture and mount on boat. See **Section 17** for installation procedure.

Torque Specifications

Description	U.S.	Metric
*Forward gear assembly	100 ft. lbs.	136 N·m
Nut		
Driveshaft bearing housing	14-16 ft. lbs.	19-22 N·m
Pinion gear	100-110 ft. lbs.	136-149 N·m
Water passage cover	9-11 ft. lbs.	12-15 N·m
Screw		
Anode	60-84 in. lbs.	7-9 N·m
Fill and drain	60-84 in. lbs.	7-9 N·m
Lower to upper gearcase	22-24 ft. lbs.	30-33 N·m
Oil level indicator	10-12 ft. lbs.	14-16 N·m
Pinion bearing	48-84 in. lbs.	5-9 N·m
Propshaft bearing housing	10-12 ft. lbs.	14-16 N·m
Shift rod cover	60-84 in. lbs.	7-9 N·m
Trim tab	28-32 ft. lbs.	38-43 N·m

*Counter-rotation models only

Adhesives, Lubricants and Sealant Specifications

Adhesives

Screw, pinion bearing Stud, gearcase	<i>OMC Nut Lock</i> <i>OMC Ultra Lock</i>
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Lubricants

Between seal lips O-ring, propshaft bearing housing O-ring, shift rod Wiper, shift rod	<i>OMC Triple-Guard Grease</i>
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Sealants

Flange, propshaft bearing housing Gasket, shift rod cover Gasket, water passage cover O.D. all metal case seals O-ring, driveshaft bearing housing Screw, driveshaft bearing housing Screw, lower to upper gearcase Screw, trim tab Screw and O-ring, propshaft bearing housing Surface, driveshaft bearing housing	<i>OMC Gasket Sealing Compound</i>
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Section 9

Power Trim/Tilt

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OMC Special Tools Required

P/N 301857 OMC Retaining Ring Pliers No. 1
P/N 326005 OMC Seal Protector
P/N 326485 OMC End Cap Remover
P/N 326545 OMC Seal Installer
P/N 912084 OMC Spanner Wrench
P/N 914459 OMC Adapter, Pressure Tester
P/N 983213 OMC Rod Holder
P/N 983977 OMC Trim/Tilt In-Line Pressure Tester

Sealants and Lubricants Required

P/N 909570 *OMC Black Neoprene Dip*
P/N 384884 *OMC Locquic Primer*
OMC Triple-Guard Grease
OMC Needle Bearing Grease
P/N 172913 *OMC Power Trim/Tilt and Power Steering Fluid or*
Dexron II Automatic Transmission Fluid
P/N 384849 *OMC Nut Lock*

Miscellaneous

Stevens Gearcase Tester No. S-34 or Equivalent
Cleaning Solvent



Safety Warning

- Before working on any part of the trim/tilt system, read the section called Safety at the beginning of this manual.
- When replacement parts are required, use genuine OMC parts or parts with equivalent characteristics including type, strength and material. Failure to do so may result in product malfunction and possible injury to the operator and/or passengers.

System Description

The trim/tilt unit consists of a valve body, oil pump, and electric motor assembly connected to two hydraulic cylinders. A trim sending unit is mounted to the starboard side of the gimbal ring and connected to a dash mounted trim gauge.

To operate the trim/tilt, push the switch to the desired bow-up/bow-down position. Holding the switch in the desired position will activate the system until the switch is released. Holding the switch in the bow-up position, the electric motor drives the hydraulic oil pump forcing oil into the base of the hydraulic cylinders. The force developed by the cylinder moves the vertical drive through an unlimited trim range.

The dash mounted trim gauge indicates the bow position that is controlled by the trim angle of the vertical drive. Continued operation in the bow-up direction tilts the vertical drive to the full tilt-up position. (The trim gauge indicates full bow-up position when in the tilt range.) Holding the switch in the bow-down position, the vertical drive will move down through the tilt range into the trim range. If the trim switch is not released the vertical drive will move through the trim range to the full bow-down position.

Checking Reservoir Fluid Level

 **Do not attempt to check fluid level with drive in the down position. A hazardous high pressure oil spray will occur if fill plug is removed.**

1. Raise drive to the full tilt-up position.

 **2. Wear safety glasses.** Cover fill plug with a shop cloth, and slowly unscrew plug.

3. Fluid should be level with bottom of fill plug hole when trim system is properly filled. Use only *OMC Power Trim/Tilt and Power Steering Fluid*, or *Dexron II* automatic transmission fluid. Add as required.

4. Install fill plug and tighten securely. Cycle drive up and down three or four times. Return drive to the full tilt-up position and recheck fluid level. Repeat this procedure until no more fluid is required.



Valve Body Components Description

1 Manual release valve - This valve (A) allows manual lowering and raising of the vertical drive without electrical power. When this valve is turned counterclockwise, the vertical drive will lower by its own weight. The tilting motion may be stopped at any point by closing this valve. This valve must be fully open to raise the propulsion unit. This valve must be closed to maintain a tilt or trim position while static or running in forward gear.

1 Trim-in/tilt-down outlet - This valve body outlet (B) is connected by hydraulic lines to the rod end (low volume side) of the trim/tilt cylinders.

1 Trim-out/tilt-up outlet - This valve body outlet (C) (marked "UP") is connected by hydraulic lines to the high volume side of the hydraulic cylinders.

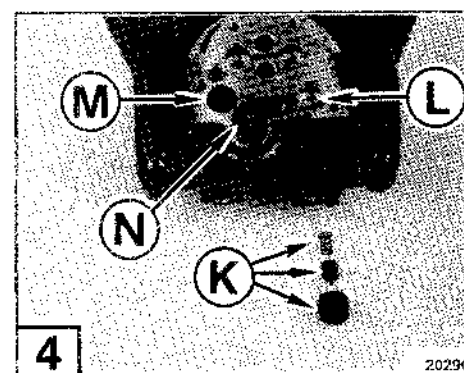
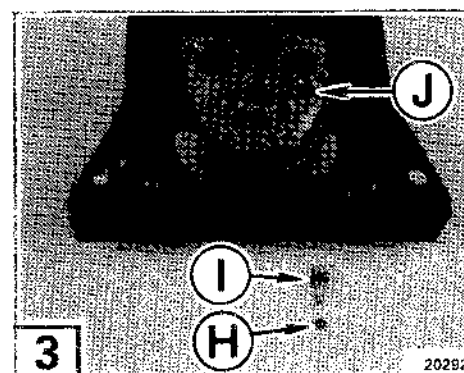
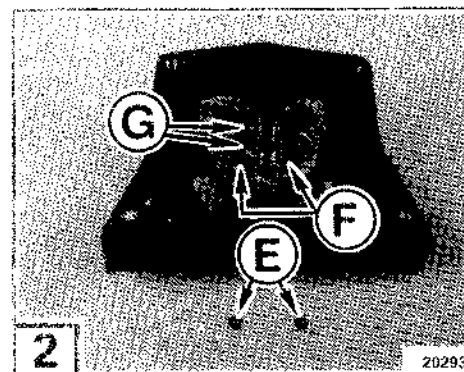
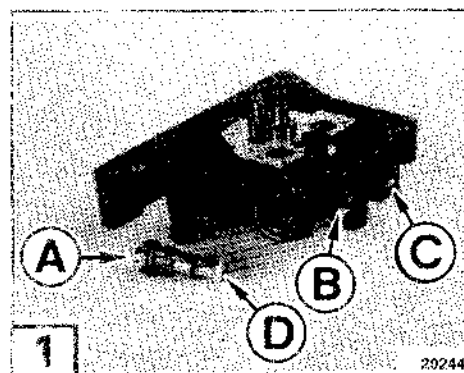
1 Thermal expansion relief valve - This valve (D) is located inside the manual release valve and prevents hydraulic lock-up in the full tilt-up position caused by thermal expansion of the hydraulic oil. It opens only under unusually high pressure conditions; 2500 ± 250 psi (17200 kPa).

2 Inlet check balls - The oil pump inlet check balls (E) rest in seats (F) on either side of the oil pump gears (G). The check balls allow oil from the reservoir to the pump when open. When closed, they prevent oil from the pump returning to the reservoir.

3 Manual release check ball and retainer - The manual release check ball (H) and retainer (I) are positioned in a seat (J) next to the trim-in/tilt-down check valve. The check ball allows fluid from the reservoir into the valve body, and the retainer limits its movement.

4 Trim-out/tilt-up check valve - This valve (K) opens under pressure to allow oil to flow to the high volume side of the cylinders during UP operation. It maintains oil in the high volume chamber of the cylinders to hold a tilt or trim position while running in forward gear. This valve also allows oil to return to the trim/tilt pump during DOWN operation after it has been opened by the pump control piston. It's positioned in a seat (L) connected to the "UP" port.

4 Trim-in/tilt-down check valve - This valve (M) opens under pressure to allow oil to flow from the pump to the low volume chamber of the cylinders during DOWN operation. It also allows oil from the low volume side of the cylinders to return to the pump during UP operation after it has been opened by the pump control piston. This valve prevents raising of the vertical drive during reverse gear operation (reverse lock). It also prevents oil flow from the cylinders during high-pressure impact conditions. It's components are identical to the trim-out/tilt-up check valve (K).



4 Filter screen - This is a serviceable part **(N)** held in place in the valve body by the gear housing. It filters oil returning to the reservoir from the manual release valve passage.

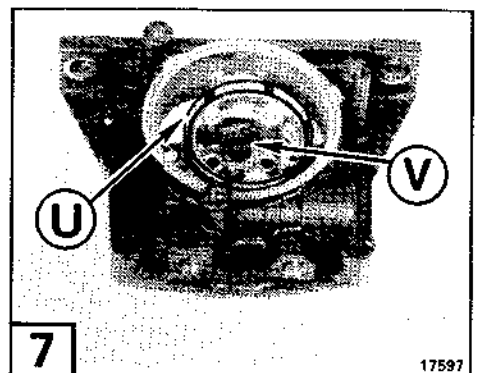
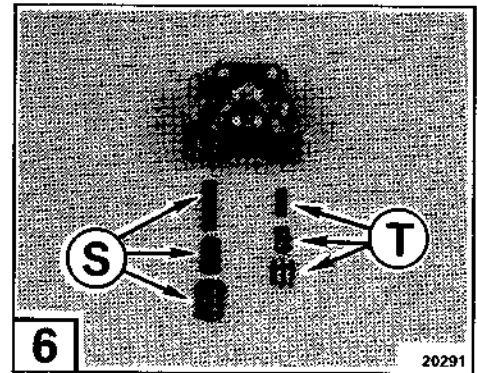
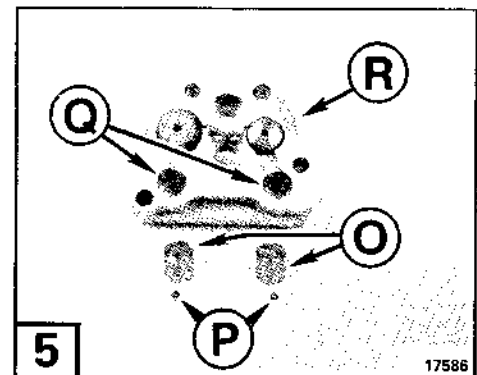
5 Pump control piston - The pump's oil pressure moves the control pistons **(Q)** to open the trim-in/tilt-down check valve when operating in the UP mode and open the trim-out/tilt-up check valve when operating in the DOWN mode.

The check balls **(P)** either allow or prevent fluid flow through the pistons, depending on direction of fluid flow. Both pistons free-float in chambers **(Q)** in the pump gear housing **(R)**, and the parts are identical.

6 Tilt-up relief valve - This valve **(S)** controls the maximum oil pressure in the system during UP operation. It also limits the pressure that can be developed at the full tilt-up stall position to a maximum of 1400 ± 200 psi (9567 kPa).

6 Trim-in relief valve - This valve **(T)** regulates oil pressure in the system during the DOWN operation. More oil returns from the high volume side of the trim/tilt cylinders than can go into the low volume side of the cylinders, due to the rod volume. The excess oil passes through the trim-in relief valve and maintains oil pressure on the DOWN side at 600 ± 200 psi (4100 kPa).

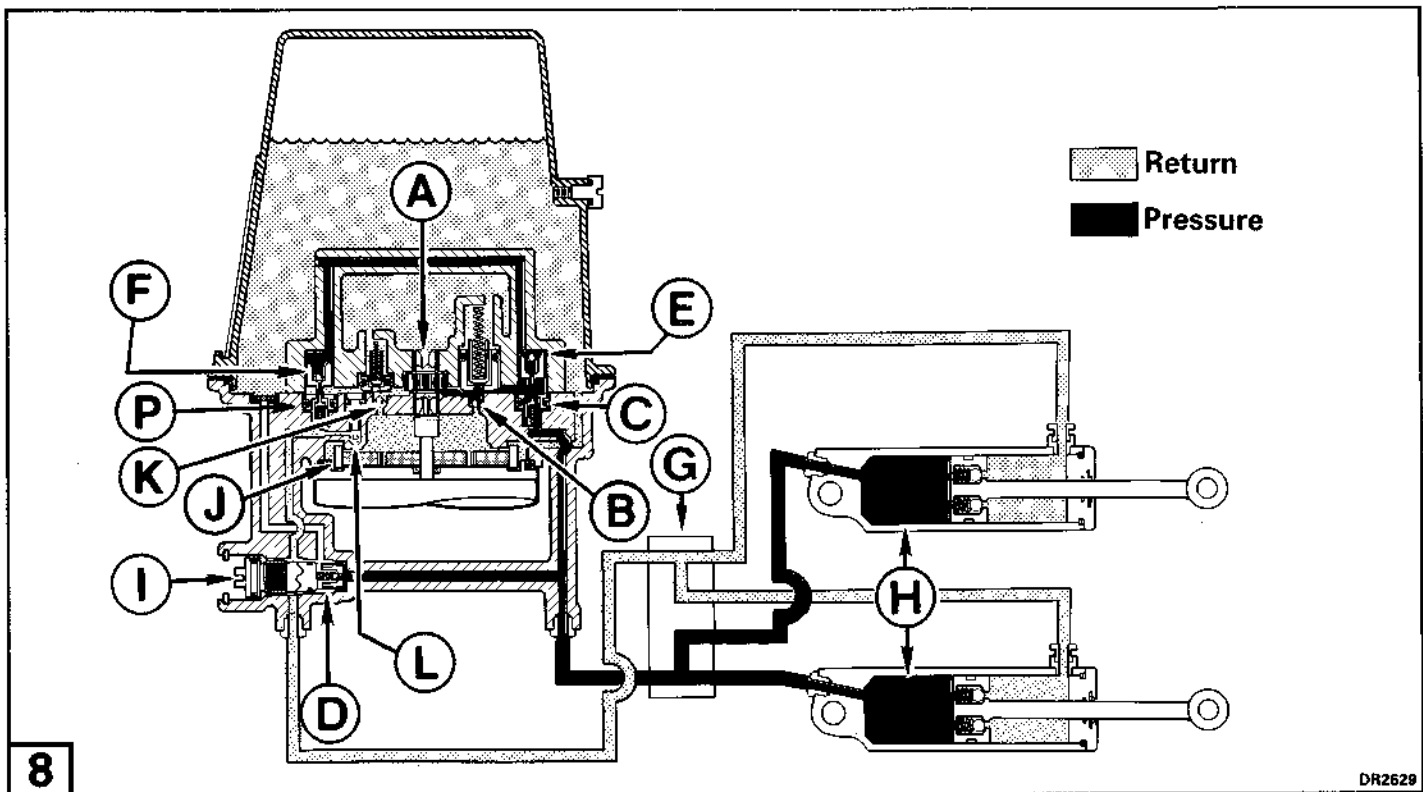
7 Filter and coupler - This serviceable filter **(U)** is located under the motor, and filters oil moving from the reservoir to the pump. The coupler **(V)** connects the motor armature to the pump drive gear.



Hydraulic Operation - Fluid Schematics

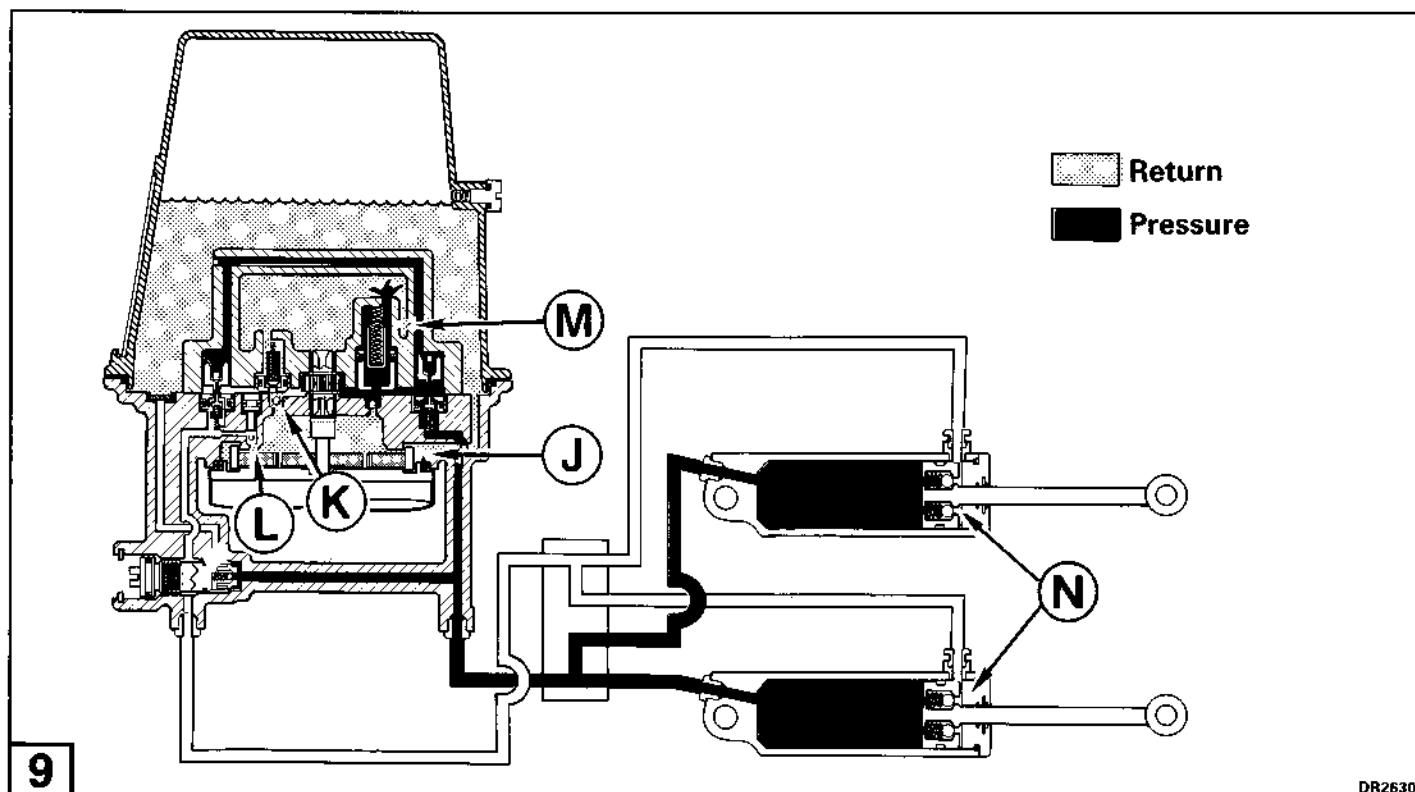
To understand the operation of the hydraulic unit, you must be familiar with the valve operation and oil flow in ten different operating modes which are:

- 8** Trim-Out/Tilt-Up (Bow Up)
- 9** Tilt-Up Relief Valve
- 10** Tilt-In/Tilt-Down (Bow Down)
- 11** Trim-In Relief Valve
- 12** Running in Forward Gear (and Shallow-Water Drive)
- 13** Running in Reverse Gear
- 14** Manual Release Valve (Lowering Drive Only)
- 15** Manual Release Valve (Raising or Lowering Drive)
- 16** Impact
- 17** Thermal Expansion Valve



Trim-Out/Tilt-Up (Bow Up)

1. The oil pump **A** pressurizes the passage leading to the high volume side of the trim cylinders. The reservoir check ball **B** seats to prevent fluid reentering the reservoir, and the trim-out/tilt-up check valve **C** opens under hydraulic pressure and allows fluid through. As oil exits the valve body, it fills the manual release passage. Fluid, however, is prevented from leaving this passage by the O-ring around the valve tip, and by the internal thermal expansion valve **D**.
2. The trim-in/tilt-down piston **E** is also in the pressurized passage. Oil pressure moves the piston away from the trim-out/tilt-up check valve and unseats the check ball inside the piston. Fluid passes through the piston and enters the passage leading to the trim-out/tilt-up piston **F**. Pressure seats the check ball inside this piston and prevents oil from passing through. The piston moves under pressure, contacts the trim-in/tilt-down check valve **P**, and opens it.
3. Hydraulic lines connect the valve body to the transom bracket manifold **G** which directs fluid to both trim cylinders. As the high volume trim chambers **H** fill, oil is pushed out of the low volume chambers. This low pressure oil returns to the valve body, and passes around the manual release valve **I**. Fluid passes through the held-open trim-in/tilt-down check valve and returns to the oil pump for recirculation back to the trim cylinders.
4. Since the amount of oil returning from the trim cylinders is insufficient to fill the high volume chambers, supplementary oil is drawn through the pump filter **J**. It enters past both the inlet check ball **K** and the manual release check ball **L**, and joins fluid returning to the pump.

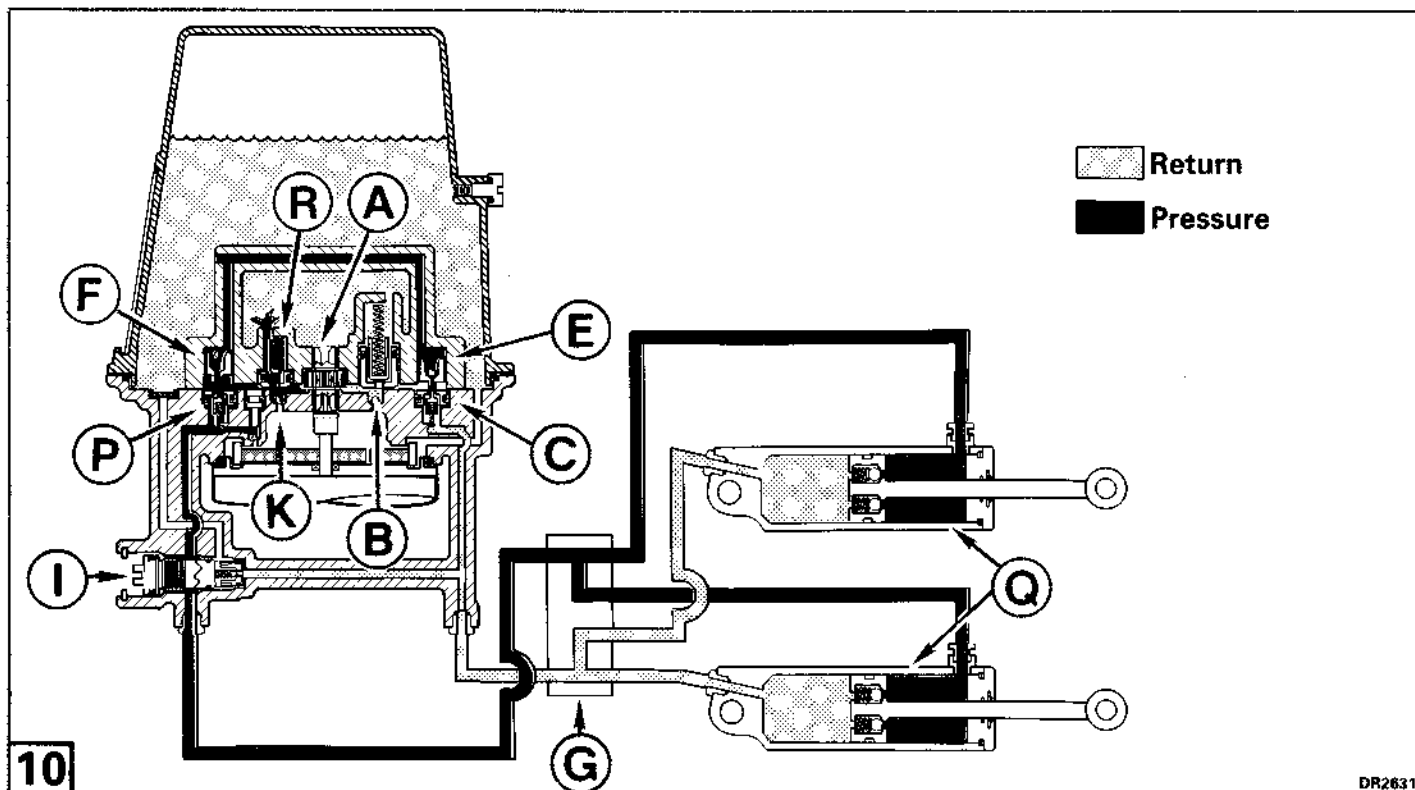


Tilt-Up Relief Valve

1. When the trim pump is operated in the bow-up direction, and the trim cylinders have reached their full tilt-up position, vertical drive movement ceases. The stoppage of drive movement causes fluid pressure to suddenly increase a significant amount. If the pump continues to operate in the bow-up direction, all pump valves will return to the position that allowed upward drive movement. Fluid pressure must now be relieved to prevent excessive current draw and motor stalling.

2. The tilt-up relief valve (M) contains a strong spring that holds the valve closed during normal operation. Under increased hydraulic pressure, the valve opens and permits discharge of total pump output back into the reservoir. Make-up oil is drawn through the pump filter (J) past the inlet check ball (K) and manual release check ball (L).

3. As long as the pump operates with the drive in the full tilt position, fluid will continue a circuitous flow from the pump, to the relief valve, to the reservoir, and back to the pump. There is no return flow from the trim cylinders since they're fully extended and the impact relief valves (N) are closed.



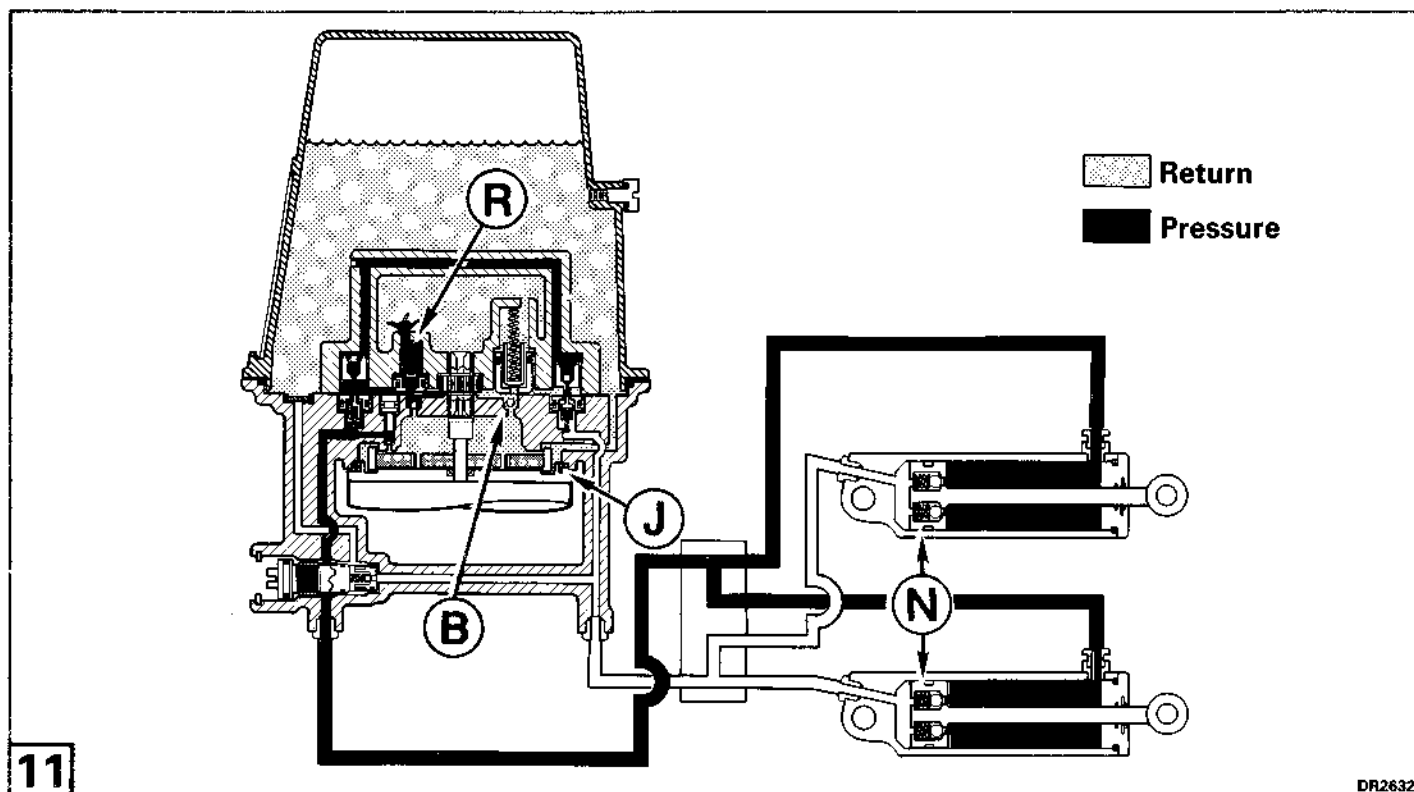
Trim-In/Tilt-Down (Bow Down)

1. The oil pump **A** pressurizes the passage leading to the low volume side of the trim cylinders. The reservoir check ball **K** seats to prevent fluid reentering the reservoir, and the trim-in/tilt-down check valve **P** opens under hydraulic pressure and allows fluid through. As oil exits the valve body, it passes around the manual release valve **I**.

2. The trim-out/tilt-up piston **F** is also in the pressurized passage. Oil pressure moves the piston away from the trim-in/tilt-down check valve and unseats the check ball inside the piston. Fluid passes through the piston and enters the passage leading to the trim-in/tilt-down piston **E**. Pressure seats the check ball inside this piston and prevents oil from passing through. The piston moves under pressure, contacts the trim-out/tilt-up check valve **C** and opens it.

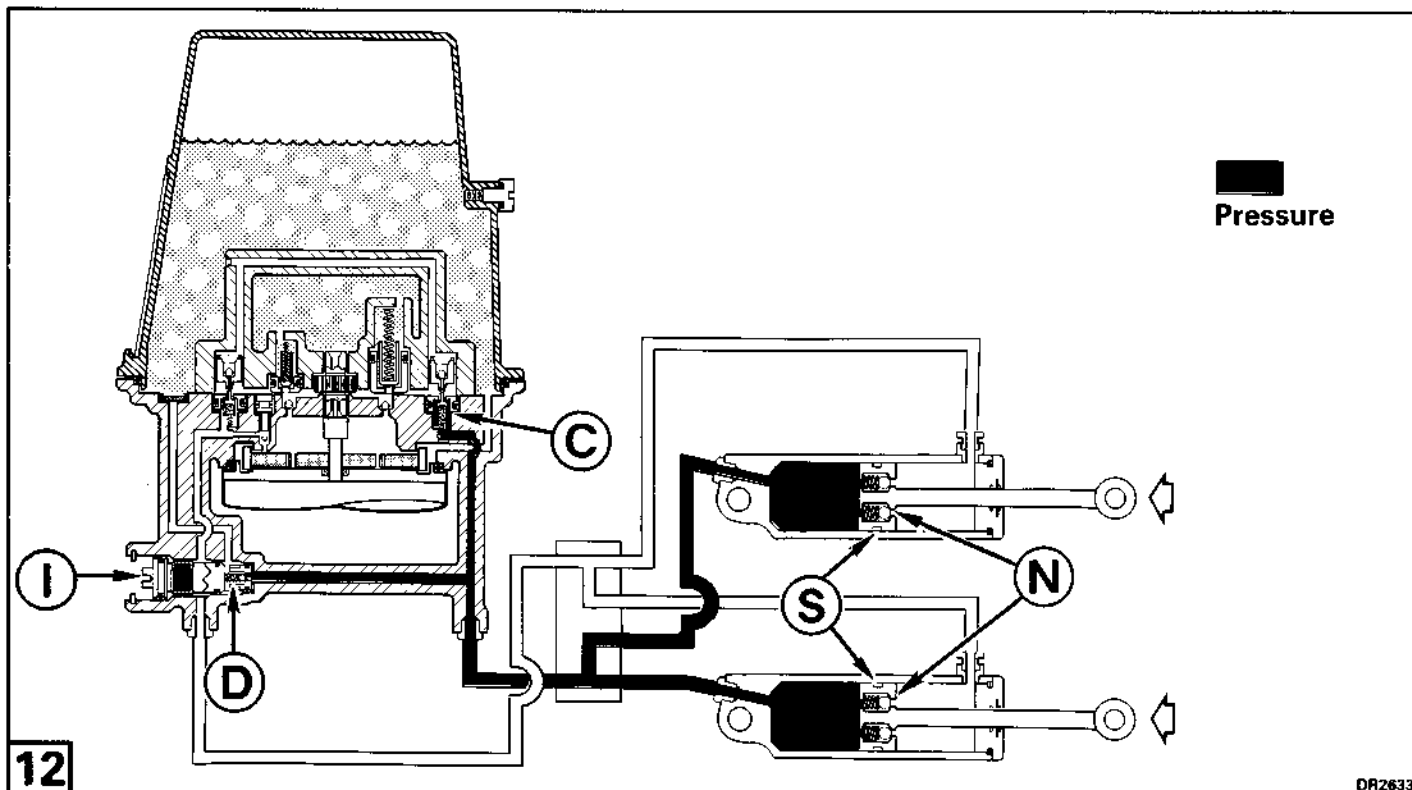
3. Hydraulic lines connect the valve body to the transom bracket manifold **G** which directs fluid to both trim cylinders. As the low volume trim chambers **Q** fill, oil is pushed out of the high volume chambers. This oil returns to the valve body, passes through the held-open trim-out/tilt-up check valve, and returns to the oil pump for recirculation back to the trim cylinders.

4. Since the amount of oil returning from the trim cylinders is greater than that needed to fill the low volume chambers, the returning oil is under some pressure and closes the inlet check ball **B**. All returning oil passes through the oil pump. Since the pump's output volume exceeds the cylinders requirements, the resulting oil pressure increase is great enough to open the trim-in relief valve **R**. Excess oil not required to fill the trim cylinders is returned to the reservoir.



Trim-In Relief Valve

1. When the pump is operated in the bow-down direction and the trim cylinders have reached their full tilt-down position, vertical drive movement ceases. The stoppage of drive movement causes fluid pressure to suddenly increase a significant amount. If the pump continues to operate in the bow-down direction, all pump valves will return to the position that allowed downward drive movement. Fluid pressure must now be relieved to prevent excessive current draw and motor stall.
2. When trimming in, excess fluid displaced by the retracting rods pressurizes the system and opens the relief valve **R**. When the piston bottoms, the valve remains open and permits discharge of total pump output back into the reservoir. Make-up oil is drawn through the pump filter **J** past the inlet check ball **B**.
3. As long as the pump operates with the drive in the full down position, fluid will continue a circuitous flow from the pump, to the relief valve, to the reservoir, and back to the pump. There is no return flow from the trim cylinders since they're fully retracted and pump hydraulic pressure is not sufficient to open the impact relief valves **N**.



DR2633

Running in Forward Gear (and Shallow-Water Drive)

1. Propeller thrust in forward gear causes the vertical drive to push against the trim/tilt cylinders, pressurizing the high volume side of the cylinders and the oil to the trim-out/tilt-up check valve ③, thermal expansion valve ④, and manual release valve ①.
2. All of these valves, plus the trim/tilt cylinder piston O-rings ⑤ and the impact relief valves ⑥, must hold pressure to maintain the vertical drive in a set trim position. There is no oil flow in the trim/tilt system while running in forward gear.

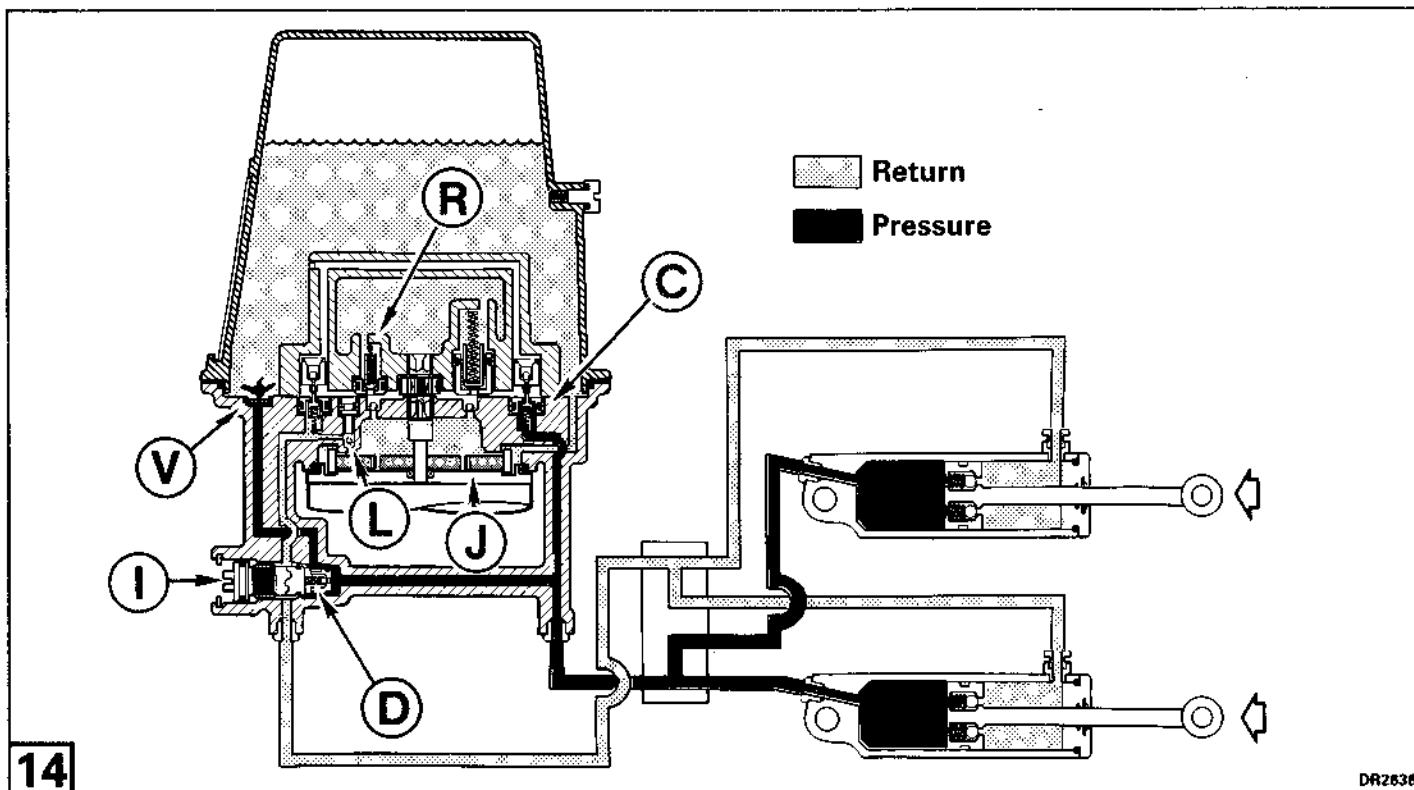
Pressure

13

DR2634

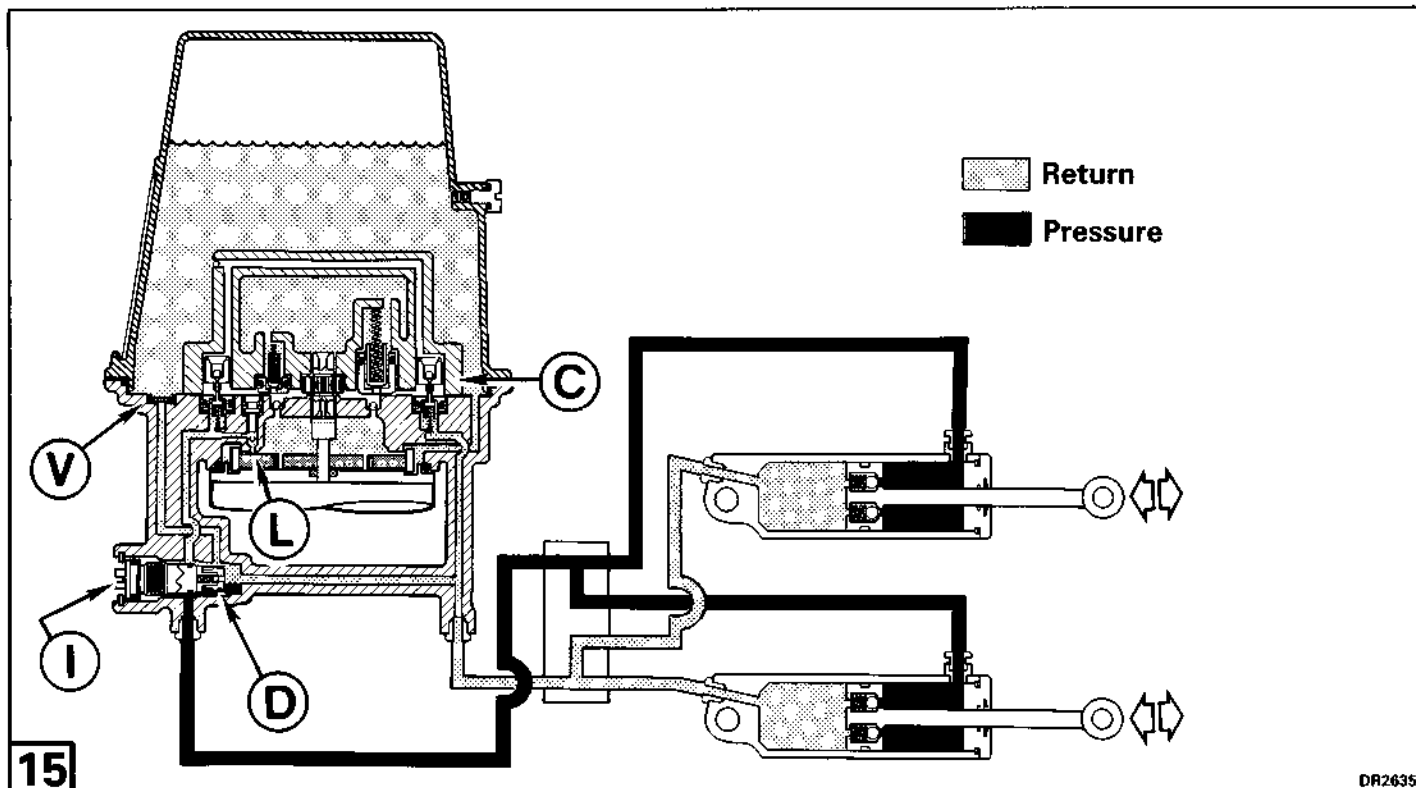
Running in Reverse Gear

1. Propeller thrust from operating in reverse gear creates a force that pulls on the trim/tilt cylinders, pressurizing the oil on the low volume side of the pistons and in the hydraulic lines to the manual release valve ①, trim-in/tilt-down check valve ② and manual release check ball ③.
2. For the vertical drive to maintain a fixed trim position, these valves plus the piston O-rings ④, impact relief valves ⑤, cylinder end cap O-ring ⑥ and piston rod O-ring ⑦ must hold pressure. No oil flow occurs in the trim/tilt system while operating in reverse gear.



Manual Release Valve (Lower Drive Only)

1. The weight of the vertical drive applies a force to the trim/tilt cylinders, and pressurizes the oil in the high volume side of the cylinders, the trim-out/tilt-up check valve (C), thermal expansion valve (D), and the manual release valve (I).
2. Opening the manual release valve one full turn lets oil flow past the valve tip, through the filter screen (V) to the oil reservoir, thus lowering the drive.
3. To fill the expanding low volume chambers of the trim/tilt cylinders, make-up oil is drawn through the filter (J) past the manual release valve check ball (L) to the low volume side of the cylinders.
4. The drive may be lowered completely or stopped at any position in the trim/tilt range by closing the manual release valve. With the valve open only one full turn, the drive may only be lowered, and it cannot be moved in the opposite direction (raised).
5. Should the trim pump be operated with the release valve one turn open, and the drive completely lowered, oil will be pumped back into the oil reservoir either through the trim-in relief valve (R) when trimming down, or past the open manual release valve and through the filter screen (V) when trimming up. No drive movement will occur.



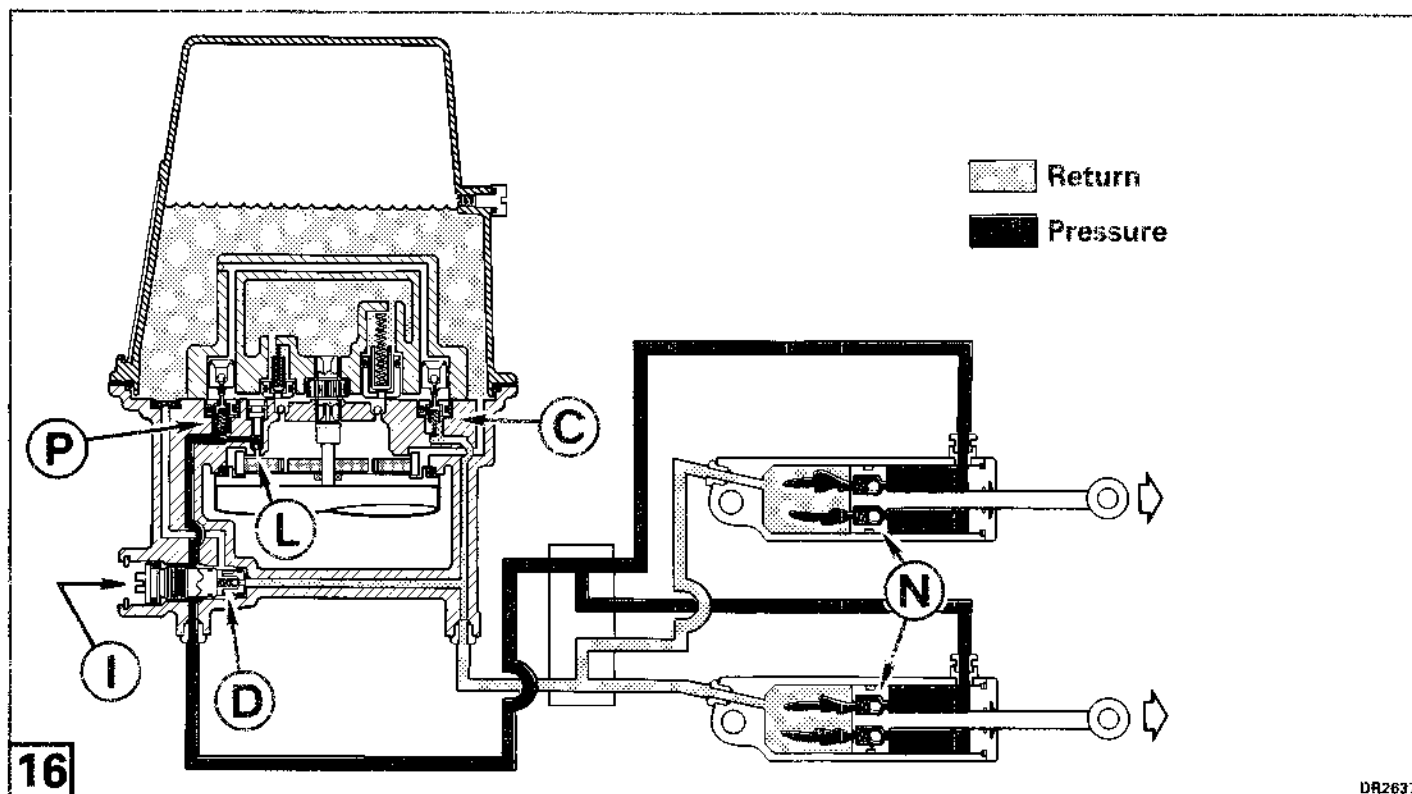
Manual Release Valve (Raising or Lowering Drive)

1. Fully opening the manual release valve until it contacts the retaining ring lets oil flow both to and from the oil reservoir and the trim/tilt cylinders.

2. Lowering Drive: The weight of the drive pressurizes the high volume cylinder chambers, the manual release valve ①, the thermal expansion valve ②, and the trim-out/tilt-up check valve ③. When the release valve is fully opened, oil flows out of the high volume chambers, through the lines and into the manual release valve cavity. Part of this fluid volume enters the line leading to the trim/tilt cylinders and provides fill oil to the expanding low volume chambers. Excess oil not required to fill the trim/tilt cylinders leaves the manual release valve cavity and returns to the reservoir through the filter screen ④. Spring pressure holds the trim-out/tilt-up check valve closed, and prevents oil from passing through it.

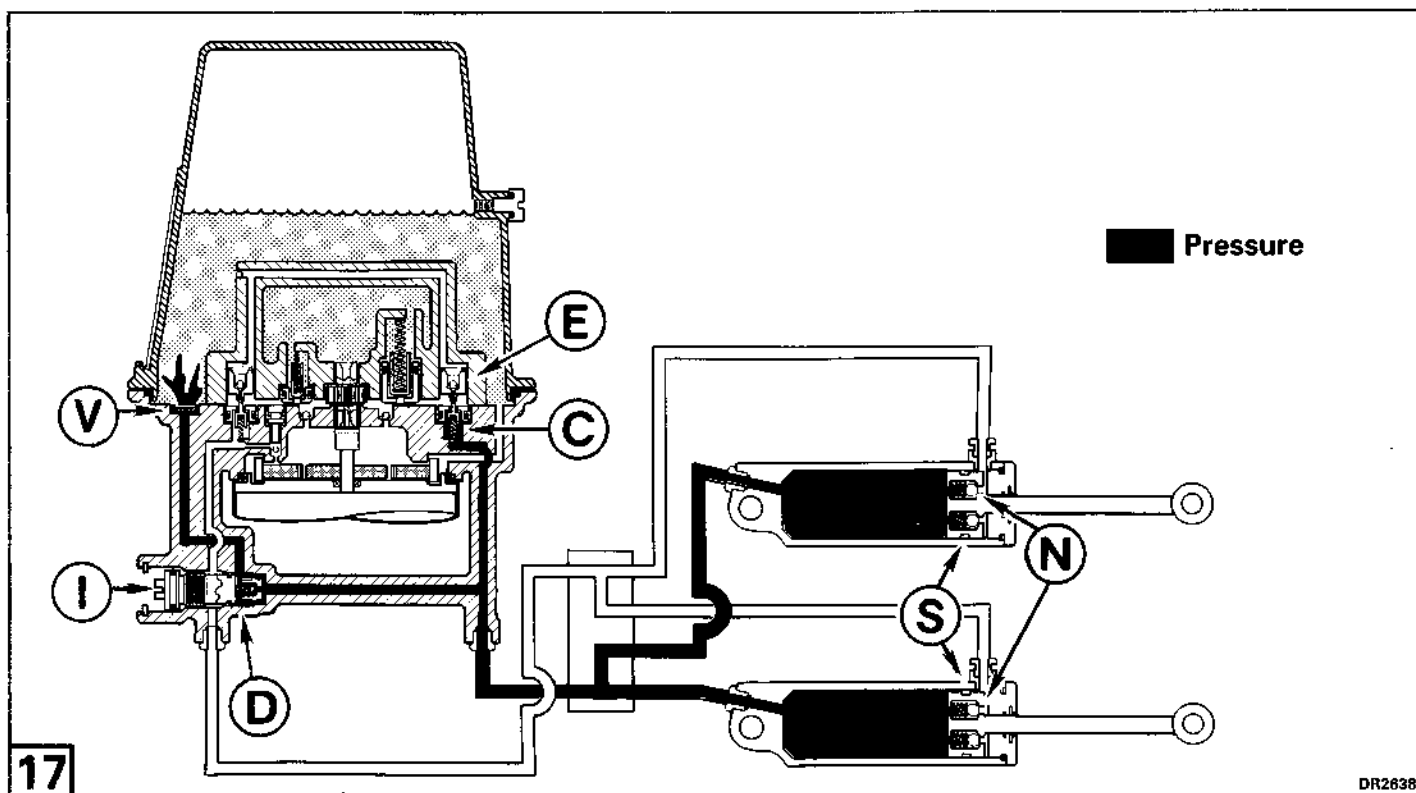
3. Raising Drive: When the manual release valve is fully opened and the drive is manually raised, the low volume cylinder chambers, trim lines and the manual release valve cavity are pressurized. Oil is forced out of the low volume chambers and into the manual release valve cavity where all returning oil enters the passage and line leading to the high volume trim/tilt chambers. Spring pressure holds the trim-out/tilt-up check valve ③ closed to prevent any fluid loss. Since oil volume from the low volume chambers is not sufficient to fill the expanding high volume chambers, make-up oil is drawn through the filter screen ④ and past the manual release check ball ①, and joins oil returning from the cylinders in the manual release valve cavity.

4. Should the trim pump be operated while the manual release valve is fully open, oil will be pumped to the manual release valve cavity where it will be returned to the reservoir through the filter screen ④. No drive movement will occur.



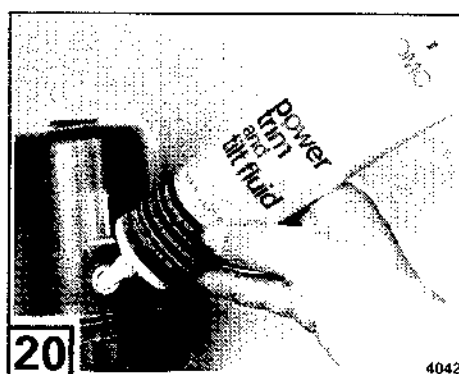
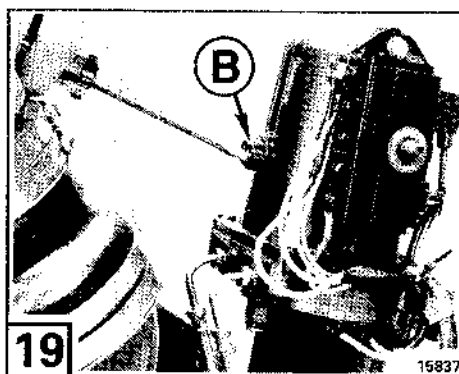
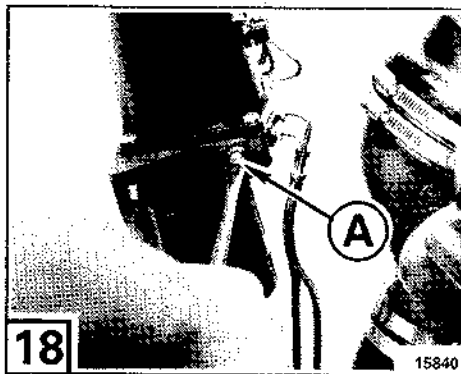
Impact

1. When the drive strikes an underwater object while moving forward, the movement of the vertical drive to the rear applies a substantially high force to the trim/tilt cylinders and quickly extends the rods.
2. The oil pressure in the high volume side of the trim/tilt cylinders and in the hydraulic lines to the manual release valve ①, thermal expansion valve ④, and trim-out/tilt-up check valve ③, suddenly drops.
3. The oil in the low volume side of the trim/tilt cylinders and in the connecting lines to the manual release valve ①, trim-in/tilt-down check valve ② and manual release check ball ⑤ is suddenly pressurized.
4. With the trim-in/tilt-down check valve and manual release check ball both closed allowing no oil flow, the high pressure oil must flow through the impact relief valves ⑥ to the high volume chamber, dissipating the energy of the impact.
5. Since the volume of the cylinder rod takes up some of the space at the top of the cylinder, less oil transfers from the low volume side of the cylinders than is required to fill the space in the high volume side of the cylinders, and some air is introduced to the high volume side after an impact.
6. To lower the vertical drive to the normal trim range, the trim/tilt unit must be operated in the bow-down direction.
7. Normally, one or two cycles of the trim/tilt unit through the full trim/tilt range will purge the accumulated air from the high volume side of the trim/tilt cylinder and connecting hydraulic lines.
8. The oil pressure at the low volume side of the trim/tilt cylinders will normally be about 1000 psi (7000 kPa) when the impact relief valves open.



Thermal Expansion Valve

1. When the vertical drive is in the full tilt-up position, that position is maintained by the piston O-rings ⑤, the impact relief valves ④, the trim-out/tilt-up check valve ③, the manual release valve ①, and the thermal expansion valve ②.
2. If the trim/tilt unit is exposed to a large increase in temperature, the oil pressure in this part of the system can increase substantially. The back side (or spring side) of the trim-out/tilt-up check valve is also exposed to this high pressure.
3. Under some conditions, the high pressure behind the trim-out/tilt-up check valve could prevent the trim-in/tilt-down piston ⑤ from opening the valve when attempting to tilt the propulsion unit down.
4. The thermal expansion valve, set at 2500 psi (17240 kPa), relieves this excess pressure and prevents lock-up in the full tilt-up position. The thermal expansion valve outflow is vented to the oil reservoir through filter ⑥.



Troubleshooting - General

In many cases an inspection or test of the "easy things" first will reveal the problem quickly and save valuable troubleshooting time.

1. **Visual inspection** - Look for indications of external oil leaks. Repair as necessary.

2. Check reservoir oil level.

Note Do not remove fill plug unless the vertical drive is in the full tilt-up position. Fill as required, see Reservoir - Filling and Bleeding.

18  3. Check manual release valve **A**. It must be closed and tightened to a torque of 45-55 in. lbs. (5-6 N-m).

Battery

The battery must be fully charged for some of the following tests. A fully charged battery will have a specific gravity of 1.260 to 1.280.

Reservoir - Filling and Bleeding

19  Do not remove fill plug **B** unless vertical drive is in the full tilt-up position. Raising the vertical drive reduces the pressure in the reservoir. Failure to raise vertical drive would cause a dangerous hydraulic fluid spray when the fill plug is removed.

1. If low, the reservoir should be filled to the level of the fill port with the drive unit in the full tilt-up position.

20 **Note** The only fluids approved for use in the trim/tilt reservoir are *OMC Power Trim/Tilt and Power Steering Fluid* or *Dexron II* automatic transmission fluid.

2. In the situation where air has entered the pump and the hydraulic lines because of low fluid level, or any part of the system has been disassembled, it will be necessary to bleed (purge) the air from the system. To remove air from the hydraulic system, cycle the trim/tilt system a minimum of five times, adding fluid as required. Total oil capacity with cylinders extended is 54 fl. oz. (1270 ml).



Safety Related

Trim/Tilt Diagnostic Chart

Some of the conditions and checkpoints have been listed to assist you in locating problems. Remember, some conditions result from more than one problem. Locate the condition in the column below and record the checkpoints. If the problem you are troubleshooting is described by only one of the conditions listed, the probable cause should be one of the numbers following the condition. If the problem you are troubleshooting is described by several of the conditions, all of the checkpoints listed after the conditions must be considered.

Trim/Tilt System Condition

Static leak-down and/or trim-in creep in forward gear:

3 5 4 6 17

Trim-out/tilt-up creep in reverse gear (no reverse lock):

8 9 6 17

Leaking, both up and down (trim-in/out creep):

7

Slow or no trim-out/tilt-up, motor runs:

1 3 4 5 6 7 8 11 12

No trim-out/tilt-up, motor does not run:

16 13 14 15

Slow or no trim-in/tilt-down, motor runs:

1 5 6 8 9 10 3 12

No trim-in/tilt-down, motor does not run:

16 13 14 15

No trim/tilt up or down, motor runs:

1 12 3

No trim/tilt up or down, motor runs fast:

12

No trim/tilt up or down, motor does not run:

13 14 15 16

No tilt-down from full tilt-up position; motor stalls:

4

Erratic operation, jumpy motion, pulsing/hissing fluid sound:

2

Continual use or loss of hydraulic fluid:

17

Checkpoints

- 1** Air or low/no oil in reservoir. Fill reservoir and cycle trim/tilt unit.
- 2** Air in hydraulic system. Cycle unit through entire range three to five times. Fill reservoir.
- 3**  Manual release valve loose or leaking. **Tighten to a torque of 45-55 in. lbs. (5-6 N·m).** Remove and check condition of plastic seal ring, O-rings, and seats. They cannot be worn or damaged and must be dirt-free.
- 4** Thermal expansion valve sticking, or spring damaged. Dirt under check ball.
- 5** Trim-out/tilt-up check valve sticking, damaged seal tip, dirt under seal, leaking O-ring, or damaged spring.
- 6** Pump control piston sticking or dirt under check balls or in small oil passages in control piston. Check piston condition, working surface in valve body, check ball seat and oil passage holes.
- 7** Trim/tilt cylinder internal leak - piston seal or impact relief valves damaged, dirt under relief valves.
- 8** Trim-in/tilt-down check valves sticking, damaged seal tip, dirt under seal, leaking O-ring, or damaged spring.
- 9** Manual release, check ball leaking. Check for damage to ball or seat, remove dirt.
- 10** Trim-in relief valve leaking. Check seal tip condition, seat condition, and spring. Check for evidence of sticking or presence of dirt. Seal tip can be serviced.
- 11** Tilt-up relief valve leaking. Check for valve sticking, damaged seal tip, dirt under seal, damaged spring, or valve body O-ring damage.
- 12** Pump coupling broken. See if pump turns freely. Check motor for bent shaft. Pump binding. Check for dirt, mechanical damage.
- 13** Blown 50 amp fuse or tripped circuit breaker. Replace fuse or reset circuit breaker.
- 14** Motor inoperative. See Test Procedure - Trim/Tilt Motor Bench Test, **Section 3.**
- 15** Relay control box malfunction.
- 16** Switch circuit malfunction. See Trim/Tilt Switch - Test Procedure, **Section 3.**
- 17** External oil leak. Check hydraulic lines and connections, cylinder rod and seal, valve body to motor O-ring, valve seals in valve body. See Disassembly of Valve Body.

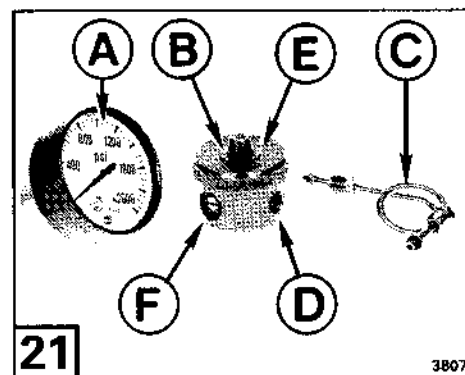


Troubleshooting With In-Line Pressure Tester

21 The OMC Trim/Tilt In-Line Pressure Tester P/N 983977 provides a method for checking the performance of the trim/tilt unit. The pressure tester can measure running pressure, stall pressure, and pressure leak-down. The tester can isolate the trim/tilt cylinders from the valve body to help locate a component causing leak-down.

21 The trim/tilt in-line pressure tester consists of a pressure gauge and adapter **A**, a tester body and shut-off valve assembly **B**, and a hydraulic line assembly **C**.

21 The tester body is designed so the hydraulic port stamped "A" **D** is always connected to the gauge, and the hydraulic port stamped "B" **E** opposite the valve can be shut off by closing the valve **F**. If you suspect that a valve or cylinder is leaking, the tester may be connected to the trim/tilt valve body four different ways to isolate and test components of the trim/tilt circuit.



How to Install Tester

⚠ Follow steps 1 through 5 below to prevent high pressure oil spray and excessive fluid loss when hydraulic fitting is loosened or removed. Spray could cause eye injury.

1. Raise the drive unit to its full tilt-up position.
2. Block the drive unit in full tilt-up position.
3. Fully open manual release valve for a few seconds to allow hydraulic pressure to equalize. Then fully close valve to minimize fluid loss when disconnecting lines.

⚠ 4. **Wear safety glasses.** Some residual pressure may be present in the trim/tilt system when the hydraulic line is loosened. **Always wrap a shop cloth around the hydraulic fitting before loosening.** This will trap any high-pressure oil as the fitting is loosened.

5. Catch any oil with a shop cloth and drip pan.



- 22**  Before disconnecting any hydraulic lines, label the port ("UP") line for identification. **Wear safety glasses when making all line disconnections.**

Trim/Tilt System Hydraulic Tests

Test No. 1 - Complete Circuit, Trim-out/Tilt-up

This test will provide running and stall PSI for the trim-out/tilt-up circuit.

- 22** 1. Disconnect port ("UP") hydraulic line from pump valve body.
- 23** 2. Connect tester hydraulic line **A** to "UP" outlet in pump valve body, and to outlet "A" on tester body.
- 23** 3. Connect port pump hydraulic line **B** to opening "B" in tester body.
-  4. Open tester shut-off valve one to two turns. **Do not open more than two turns; valve retaining ring may unseat and cause hydraulic fluid spray.**

5. Run drive through a complete trim-out/tilt-up cycle. Record running and stall PSI and compare to specifications.

Test Results: If trim fails to meet specifications, perform Test No. 2.

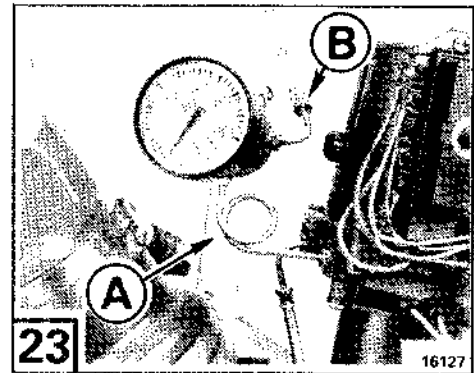
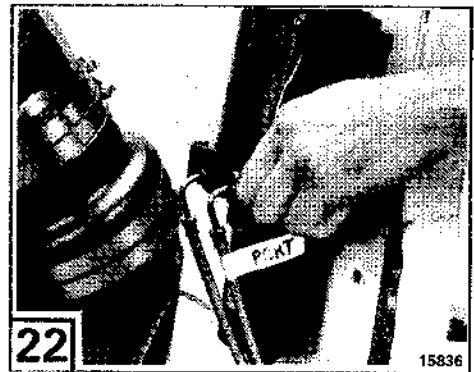
Test No. 2 - Pump Isolation, Trim-out/Tilt-up Circuit

This test will isolate the pump valve body trim-out/tilt-up components from the trim cylinders. It will help determine whether defective components are in the pump valve body, or in the trim/tilt cylinders.

1. Connect the tester as described in Test No. 1.
2. Run the drive to the full tilt position. Momentarily activate the trim switch in the DOWN direction to relieve pressure on gauge.
3. Completely close the tester shut-off valve.
4. Run pump in the trim-out/tilt-up direction and record the stall PSI. Release the trim switch and check the leakdown rate and final PSI. Compare the results to the specifications.

Test Results:

1. If the pressure gauge shows a stall PSI less than specifications, or a leakdown rate greater than specifications, the problem lies within the pump valve body.
2. If the stall PSI and leakdown figures are within specifications, the problem is with either or both trim/tilt cylinders.



⚠ Do not disconnect any lines if pressure still registers on gauge. This may cause a hazardous spray of high pressure hydraulic fluid. To relieve pressure, momentarily activate trim in opposite direction of last use. Watch gauge to make sure it registers zero before removing lines.

Test No. 3 - Complete Circuit, Trim-in/Tilt-down

This test will provide running and stall PSI for the trim-in/tilt-down circuit.

1. Disconnect starboard hydraulic line from pump valve body.

24 2. Connect tester hydraulic line © to starboard pump outlet, and to opening "A" on tester body.

24 3. Connect starboard pump hydraulic line ⑥ to opening "B" on tester.

⚠ 4. Open tester shut-off valve one to two turns. Do not open more than two turns; valve retaining ring may unseat and cause a hydraulic fluid spray.

5. Run drive through a complete trim-in/tilt-down cycle. Record running and stall PSI, and compare to specifications.

Test Results: If trim fails to meet specifications, perform Test No. 4.

Test No. 4 - Pump Isolation, Trim-in/Tilt-down Circuit

This test will isolate the pump valve body trim-in/tilt-down components from the trim cylinders. It will help determine whether defective components are in the pump valve body, or in the trim/tilt cylinders.

1. Attach the tester as described in Test No. 3.

2. Run drive to the full down position. Momentarily activate trim switch in the UP direction to relieve pressure on gauge.

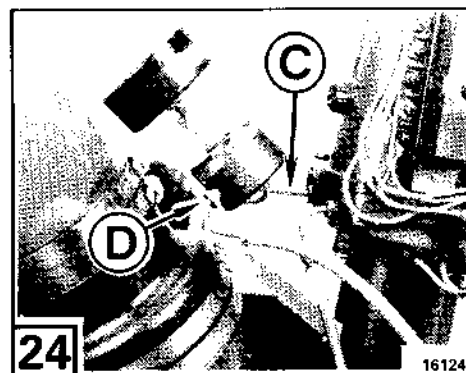
3. Completely close the tester shut-off valve.

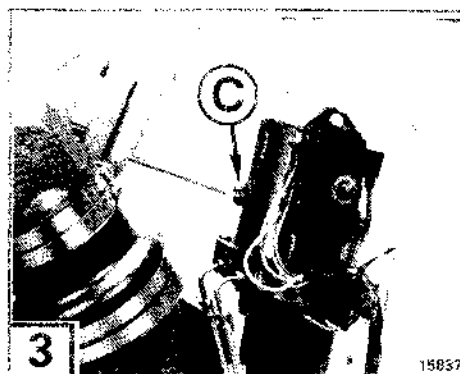
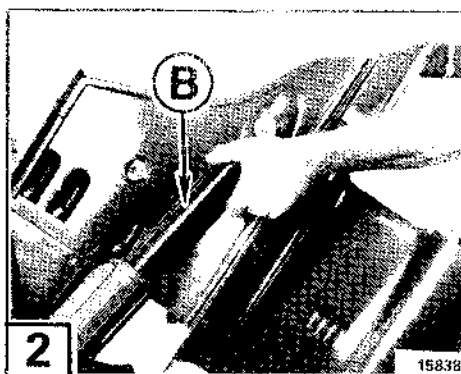
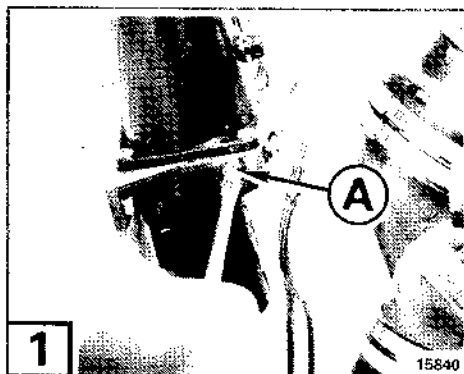
4. Run pump in the trim-in/tilt-down direction and record the stall PSI. Release the trim switch and check the leakdown rate and final PSI. Compare the results to specifications.

Test Results:

1. If the pressure gauge shows a stall PSI less than specifications, or a leakdown rate greater than specifications, the problem lies within the pump valve body.

2. If the stall PSI and leakdown figures are within specifications, the problem is with either or both trim/tilt cylinders.





Servicing of Trim/Tilt Unit

Draining Reservoir

1. Raise vertical drive to the full tilt-up position.

- If operative - use trim/tilt system.

2. If not operative - back out release valve **A** until it contacts snap ring, and slowly manually lift drive until cylinders are fully extended.

⚠ Raising the vertical drive reduces the pressure in the reservoir. Failure to raise the drive would cause a dangerous oil spray when the fill plug is removed.

2. Block vertical drive in the full tilt-up position. Trailing Lock Kit P/N 174448 **B** can be used.

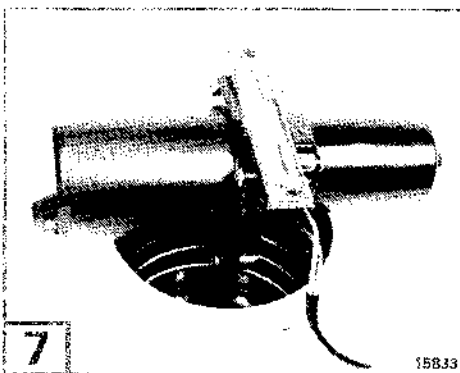
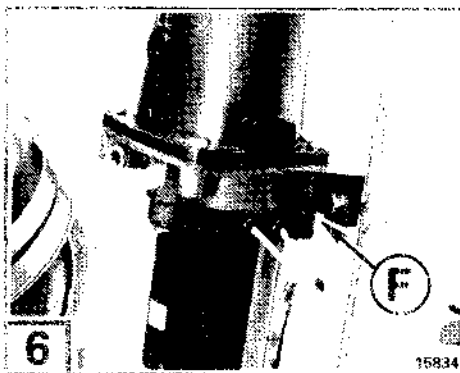
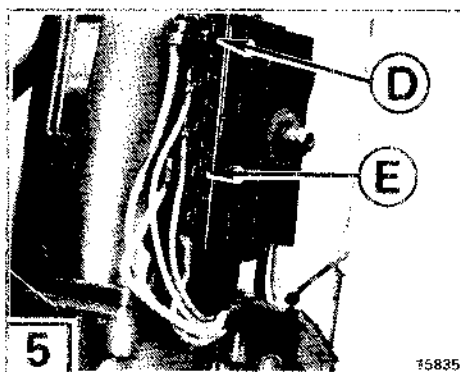
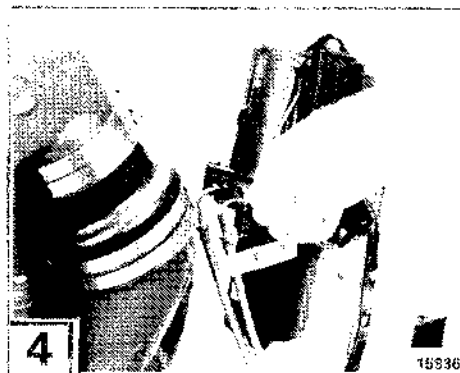
Note Failure to support the drive would allow its weight to pressurize the trim/tilt system and cause a hydraulic fluid spill. Place a container below the pump to catch any overflow oil after removing fill plug.

3. **⚠** 3. **Wear safety glasses.** Carefully remove fill plug **C**. There could be some residual pressure remaining in reservoir.

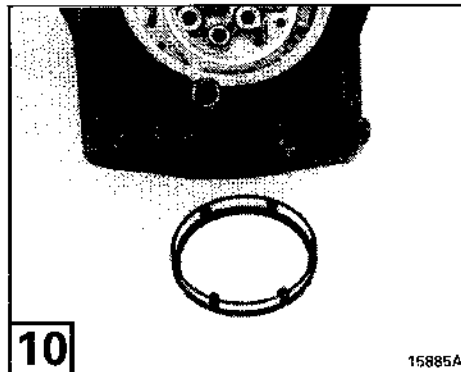
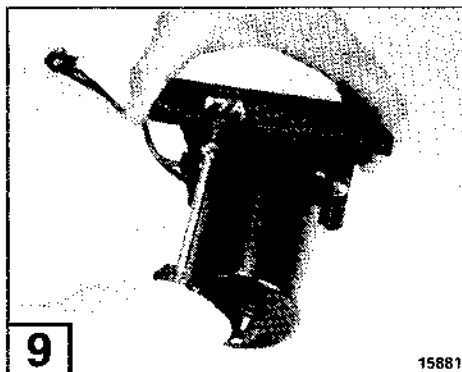
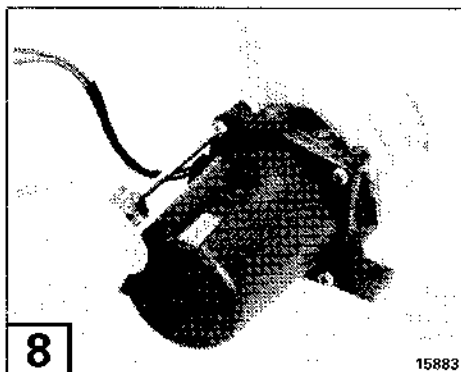
4. Identify port hydraulic line (marked "UP") and remove. Place line in container to catch fluid.

5. Remove starboard line and place in container to catch fluid. Place plugs in valve body to prevent dripping of residual fluid.

6. Remove blocking device and slowly lower vertical drive. This will force oil out of cylinders and lines.



Safety Related



Removal of Trim/Tilt Unit

5 **1. Disconnect cables at battery, or turn battery disconnect switch to "OFF."** Remove green **D** and blue **E** wires from terminal board. Remove tie strap and tape around wires. Take out screw at top of terminal board, and detach board from reservoir.

6 **2. Unscrew two lag screws **F** holding pump assembly to transom.**

7 **3. Drain any oil remaining in reservoir.**

4. Turn manual release valve in until seated.

Note It's necessary that the outside surface of the trim/tilt unit be completely free of dirt prior to disassembly. Wipe with a cleaner if necessary. Always use a lint-free cloth when handling trim/tilt components.

Removal of Reservoir and Motor

8 **1. Take out four screws securing reservoir to manifold. Discard O-ring in reservoir.**

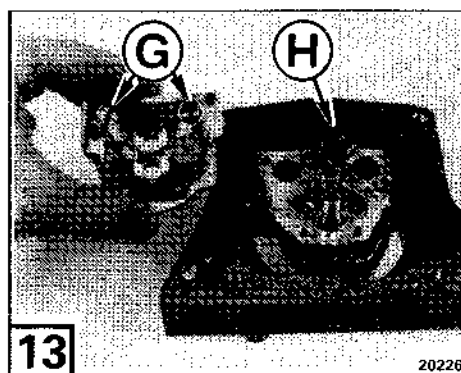
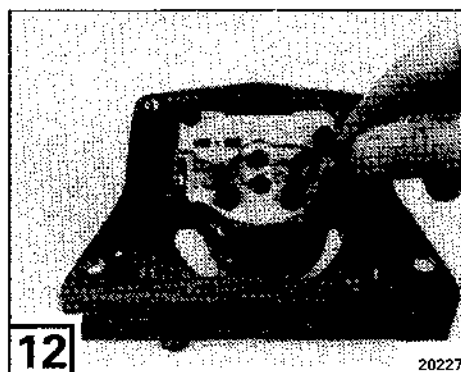
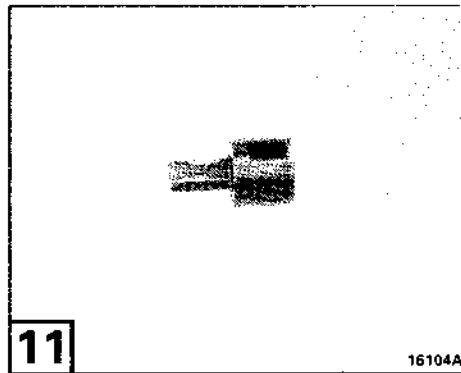
9 **2. Remove three screws securing motor to manifold. Discard O-ring on motor.**

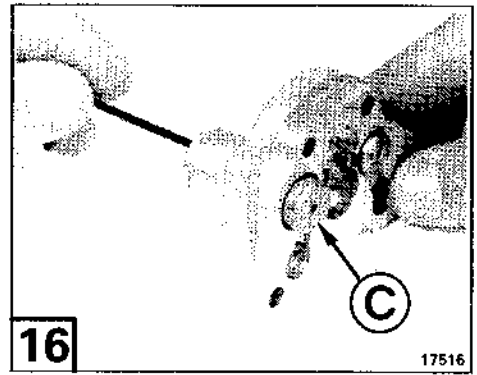
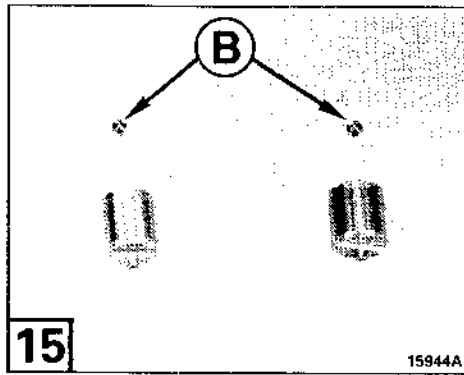
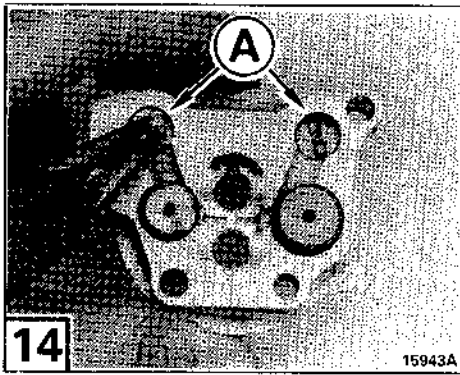
10 **11** **3. Remove and inspect filter. Clean or replace as necessary. Pull out motor drive coupling, and inspect for wear or damage.**

Separation of Gear Housing and Manifold

Note Mating surfaces between pump and manifold are critical for sealing, and cannot be scratched or gouged. Use extreme care during disassembly and reassembly procedures.

12 **13** **1. Remove four Allen screws mounting gear housing to manifold by turning each screw no more than one turn, then proceeding to another screw. Gear housing is under spring tension; back out screws equally and in small amounts. Lift gear housing off manifold. Be sure both pump control pistons **G** and check balls are retained in gear housing. Lift filter **H** out of manifold.**





Disassembly of Gear Housing

14 15 1. Remove both pump control pistons **A** with needle-nose pliers. Take out check ball **B** under each piston.

16 17 2. Remove the tilt-up relief valve **C** by inserting a suitable tool through the hole behind it and pushing it out. Remove and discard the valve O-ring **D**.

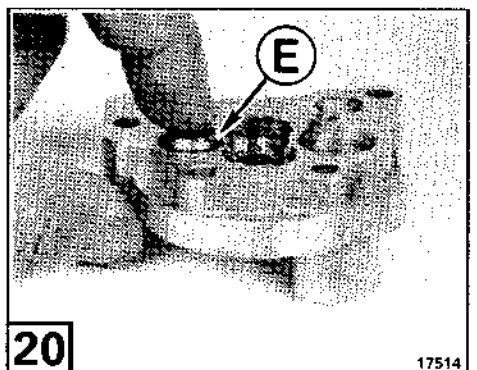
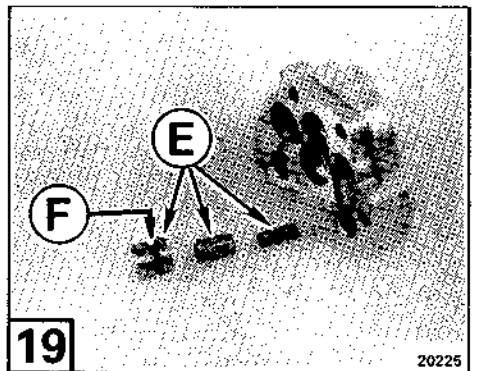
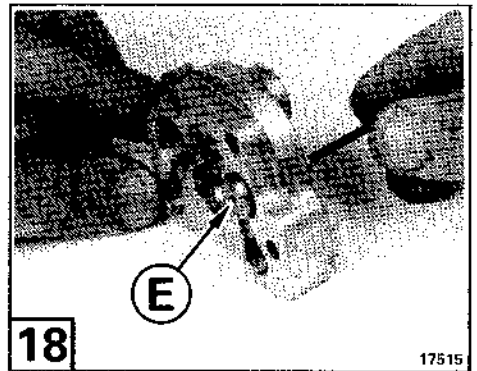
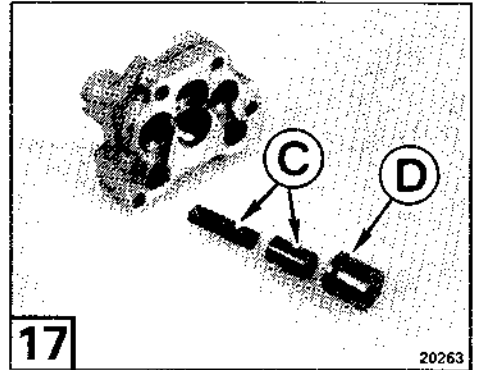
18 19 3. Remove trim-in relief valve (small diameter valve) **E** by inserting a suitable tool through the hole behind it and pushing it out. Discard the valve O-ring **F**.

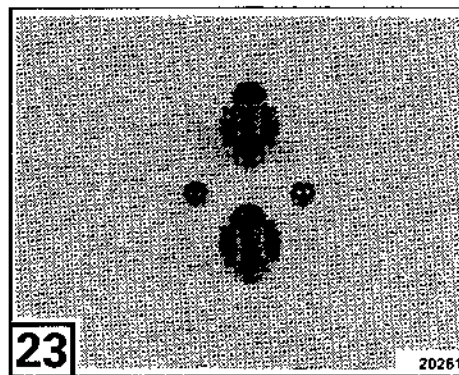
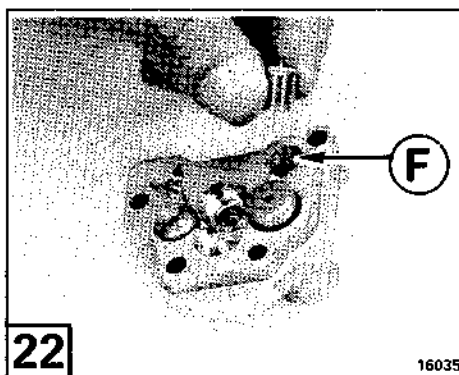
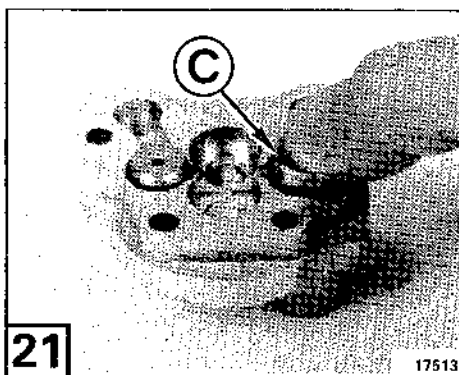
4. Inspect check balls, springs and valve components. Replace worn or damaged parts.

5. Thoroughly clean gear housing with solvent, then blow dry with compressed air. Keep all components clean and dust free. Dirt or lint can cause blocked passages, sticking valves, and prevent O-rings from sealing. Use only *OMC Power Trim/Tilt and Power Steering Fluid* to lubricate parts during reassembly.

Assembly of Gear Housing

20 1. Place a new O-ring on the trim-in relief valve piston **E** and apply *OMC Power Trim/Tilt and Power Steering Fluid* to both parts. Set the spring and seat in the gear housing, then push in the piston until it seats.





21 2. Place a new O-ring on the tilt-up relief valve piston © and apply *OMC Power Trim/Tilt and Power Steering Fluid* to both parts. Set the spring and seat in the gear housing, then push in the piston until it seats. Make sure piston does not cock in bore.

22 3. Set a check ball in each bore ⑥, then insert the pump control pistons.

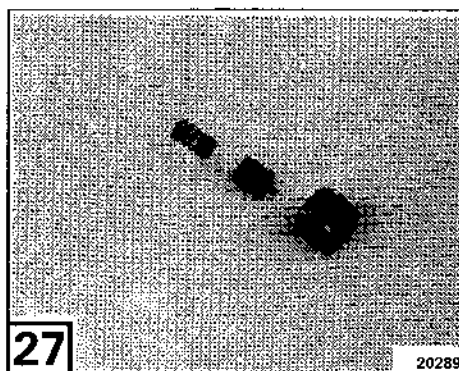
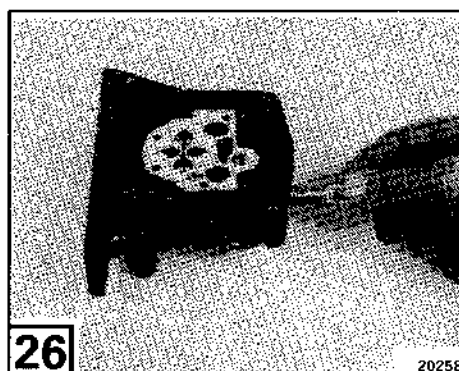
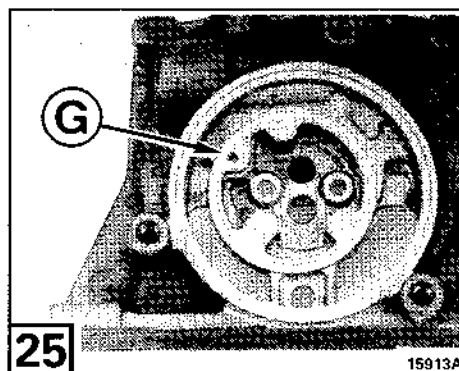
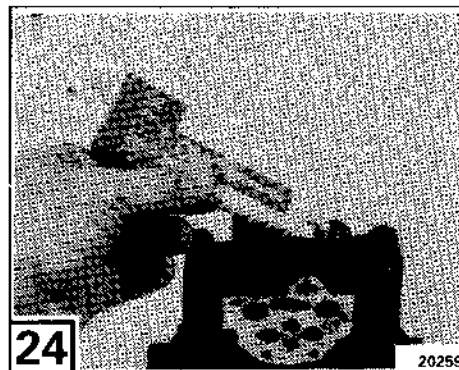
Disassembly of Manifold

23 1. Lift out the two pump drive gears and check for abnormal wear, chipped teeth, etc. Remove the two reservoir inlet check balls.

Note Hydraulic pressure is required to remove the two trim/tilt check valves. Any attempt to pry them out with a sharp object will damage the machined surface that seals the gear housing.

24 **25** **26** 2. Fill the unmarked hydraulic line port with *OMC Needle Bearing Grease*. Cover check ball hole ⑦ on underside of manifold, then screw a $\frac{7}{16}$ in. fine thread bolt into the unmarked port. If valve does not come completely free, add more grease and screw bolt in again.

27 3. Lift spring, valve and seat out of manifold. Discard valve O-ring.



4. Repeat the procedure in Step 2 to remove the remaining check valve. Insert grease and bolt into port marked "UP." There is no check ball hole to cover on underside of manifold.

28 **29** 5. Remove manual release check ball and retainer by pushing against check ball with a suitable tool **(A)** and forcing check ball **(B)** and retainer **(C)** out of manifold. Discard retainer O-ring.

30 **31** 6. Remove retaining ring from manual release valve opening, then unscrew release valve **(D)**. Discard all O-rings.

31 **Note** The thermal expansion valve **(E)** is located inside the tip of the manual release valve, and is not serviced separately. If either the manual release or thermal expansion valve do not function properly, they are replaced as an assembly.

7. Thoroughly clean the manifold with solvent making sure to remove all grease from the check valve passages. Blow out and dry with compressed air. Keep all components clean and dust free. Use only *OMC Power Trim/Tilt and Power Steering Fluid* to lubricate parts during reassembly.

Assembly of Manifold

1. Install new O-rings and plastic seal ring on the manual release valve. Lubricate valve and O-rings with *OMC Power Trim/Tilt and Power Steering Fluid*, then screw in valve until it seats.

Note Do not excessively tighten valve; tip can be damaged and valve will leak.

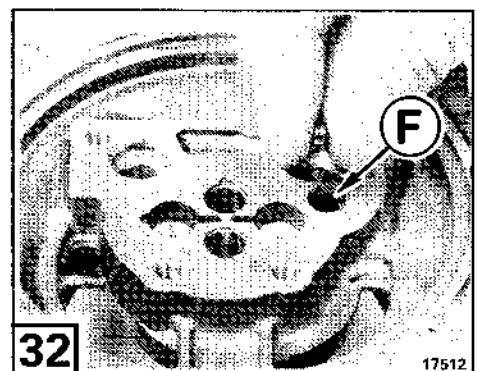
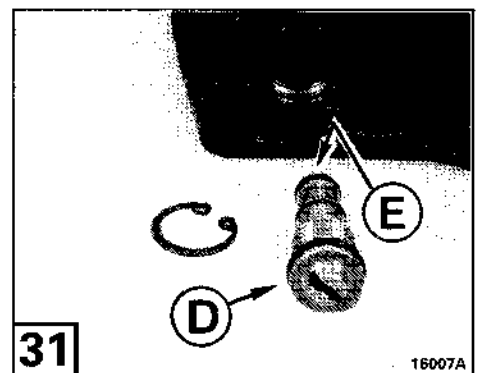
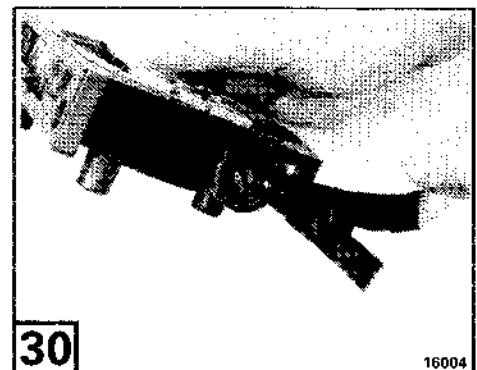
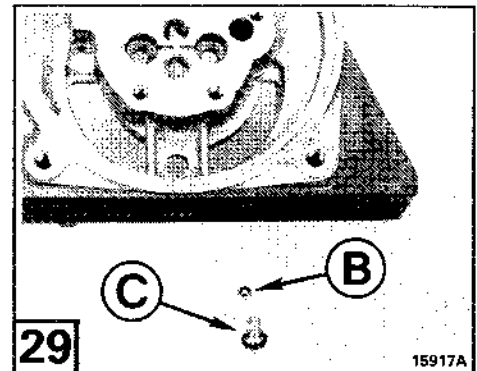
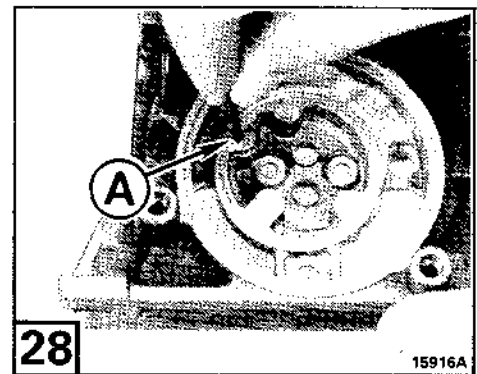
30 **!** 2. Install valve retaining ring. Make sure it seats completely in groove.

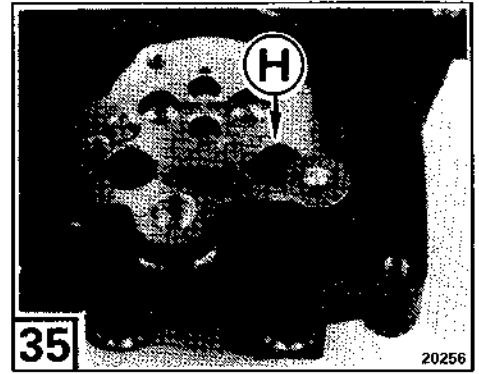
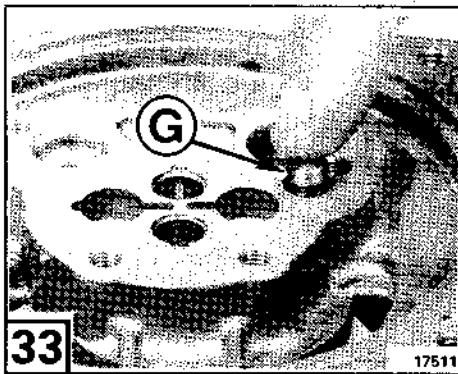
32 3. Place small check ball in manual release make-up oil passage **(F)**.

33 4. Install a new O-ring on the check ball retainer. Lubricate both parts with *OMC Power Trim/Tilt and Power Steering Fluid*. Press in retainer **(C)** until it's flush with the manifold surface.

Note Do not press retainer in below manifold surface. This would restrict or prevent check ball movement, and not allow the manual release circuit to function properly.

34 5. Place a spring in each check valve bore. Inspect both valve tips for damage, then set valves on top of springs. Place a new O-ring on each check valve seat, and apply *OMC Power Trim/Tilt and Power Steering Fluid* to both parts. Carefully center seat over valve tip, and press each seat in until it seats. If seat is difficult to install, place a proper diameter socket over seat, and gently tap it into place.





Pressure Testing Manifold

- 35** 1. Use a $1\frac{1}{32} \times \frac{1}{2}$ in. screw and a $\frac{5}{32}$ in. flat washer to retain the trim-out/tilt-up check valve (H). Place screw and washer in gear housing mounting hole nearest check valve. Make sure O.D. of washer does not cover hole in center of valve seat.

Note Hole must be uncovered so valve tip can project through and seat. Manifold will not pass pressure test if hole is covered.

- 36** 2. Attach OMC Adapter P/N 914459 to a *Stevens* Pressure Tester S-34. Make sure a lubricated hydraulic line O-ring (I) is on the adapter tip.

3. Screw pressure tester adapter into opening marked "UP." Pressurize manifold to 30 PSI, and check for leaks by using a soapy water solution or by submerging manifold in a container of *OMC Power Trim/Tilt and Power Steering Fluid*.

- 37** 4. Use a $1\frac{1}{32} \times \frac{1}{2}$ in. screw and $\frac{5}{32}$ in. flat washer to secure the trim-in/tilt-down check valve (J) and manual release check ball retainer (K). Place screw and washer in hole nearest check valve. Make sure O.D. of washer does not cover hole in center of valve seat (see Note in Step 1).

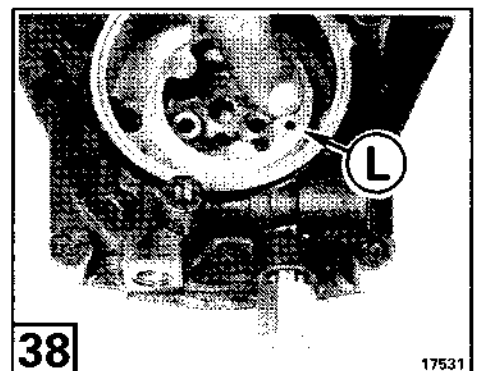
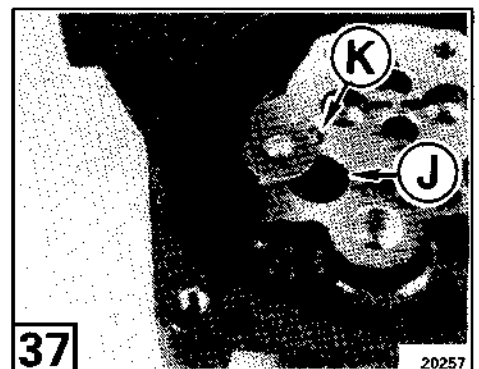
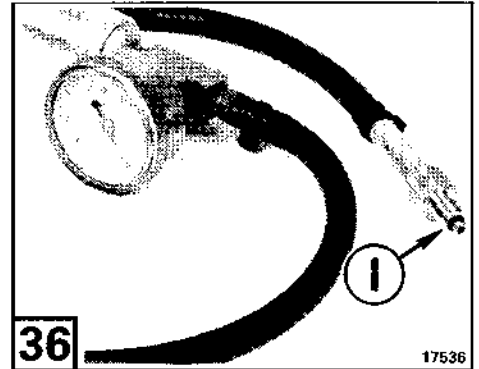
- 38** 5. Screw pressure tester adapter into unmarked port. Cover check ball hole (L) on underside of manifold with your finger or other suitable item, and pressurize manifold to 30 PSI. Check for leaks with soapy water or by submerging manifold in a container of *OMC Power Trim/Tilt and Power Steering Fluid*.

6. Before continuing the assembly, correct leaks by replacing suspect components.

Installation of Gear Housing

- 39** 1. Place the two check balls (A) in the reservoir inlet passages.

2. Determine the driving side of each pump gear. Do this by inserting pump coupler into both ends of each gear. One end (deepest recess) will allow coupler to sit flush on end of gear. Insert this end of each gear down into manifold.



Note If one or both gears are incorrectly installed, pump will bind or not allow motor to seat on manifold surface.

39 3. Lubricate both pump gears and insert them into the manifold. Place filter **Ⓐ** in manifold.

40 4. Rest gear housing on manifold. Install four Allen screws and lockwashers. Tighten screws one turn at a time in the sequence shown to be sure tilt-up relief valve seats properly. Tighten screws to 35 in. lbs. (3,9 N-m).

Installation of Motor and Reservoir

1. Insert motor drive coupling into pump gear. Rotate coupling by hand to check pump for binding.

Note If pump cannot be turned by hand, loosen gear housing mounting screws and check again. If pump now turns freely, cause of binding must be discovered and corrected before proceeding with assembly. Failure to correct binding will result in poor or no pump operation, and reduced operational life.

41 2. Install reservoir oil filter with foam gasket **Ⓒ** toward pump.

3. Place a new O-ring on the trim motor. Rotate motor body until screw holes align with holes in manifold (motor holes will align only one way). Turn coupler until its slot aligns with armature shaft blade, and install motor. Tighten screws to 35-52 in. lbs. (3,9-5,8 N-m).

4. Place a new O-ring on the reservoir. Align the screw holes and install the reservoir. Tighten the screws to 35-52 in. lbs. (3,9-5,8 N-m).

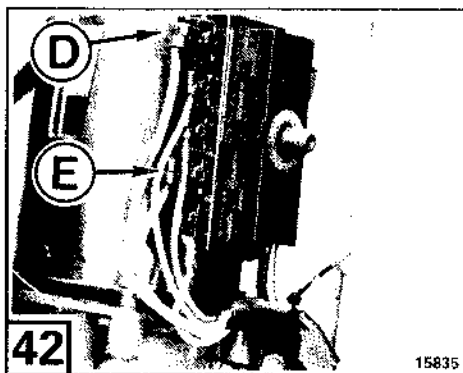
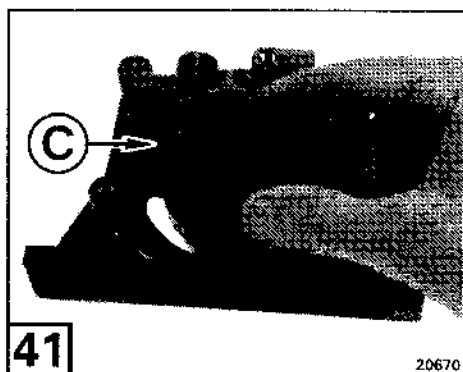
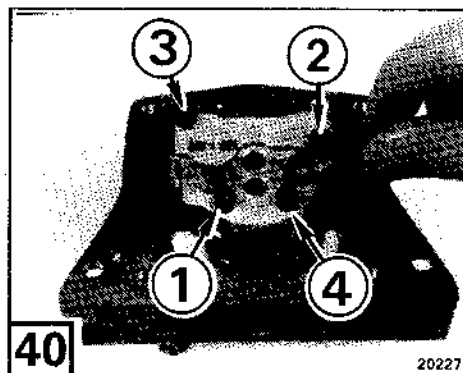
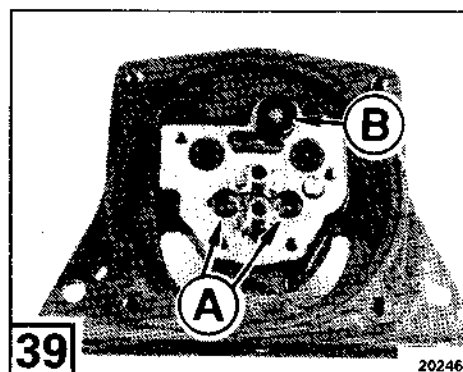
Installation of Trim/Tilt Unit

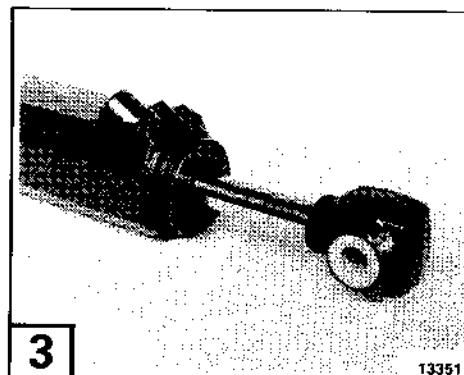
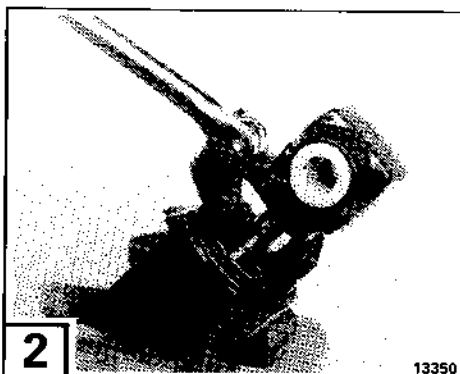
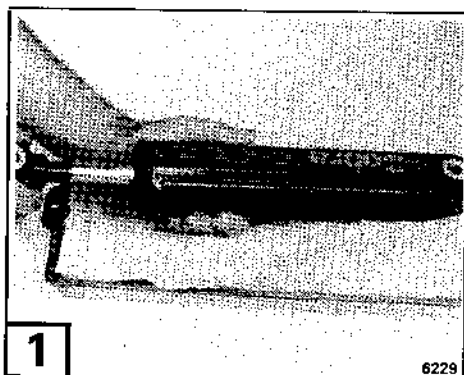
1. Attach trim/tilt unit to transom with two lag screws.

2. Connect hydraulic line tagged "port" to "UP" opening in trim/tilt unit. Connect remaining line to unmarked outlet. Tighten fittings securely.

42 3. Insert the terminal board into the retaining notch on the reservoir and tighten the mounting screw securely. Attach the green lead **Ⓓ** to the top screw of the terminal board, and connect the blue lead **Ⓔ** to the second screw from the bottom. Coat screws and terminals with *OMC Black Neoprene Dip* P/N 909570. Hold wires together with electrical tape and a tie strap.

4. Fill trim/tilt system with hydraulic fluid and purge air following the procedure in *Filling and Bleeding Dry System* on page 9-32.





Servicing Trim/Tilt Cylinders

Disassembly of Trim/Tilt Cylinder

1. Before disassembling trim/tilt cylinder, drain remaining fluid from it by extending and retracting rod.

⚠ Wear safety glasses. Turn cylinder ports down and place a container under both ports before piston is moved. Hydraulic fluid expelled from cylinder can result in injury to you and others nearby.

2. Remove cylinder pivot bushings if they are to be replaced. To remove cylinder end cap, clamp cylinder in a soft-jaw vise. Using OMC Spanner Wrench P/N 912084, unscrew cap. A light tap with a mallet is often more effective than force to remove an end cap that is stuck.

3. Unscrew end cap until held by one thread, then extend rod. Piston is more easily withdrawn if end cap is left threaded one turn in cylinder until rod is fully extended. Unscrew end cap and remove piston.

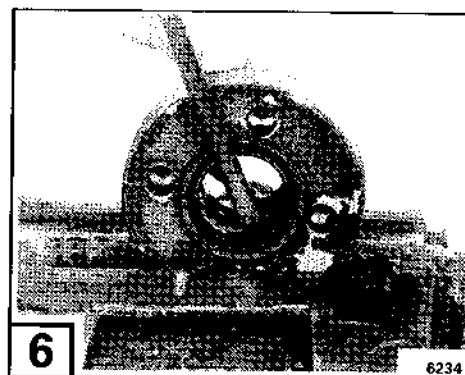
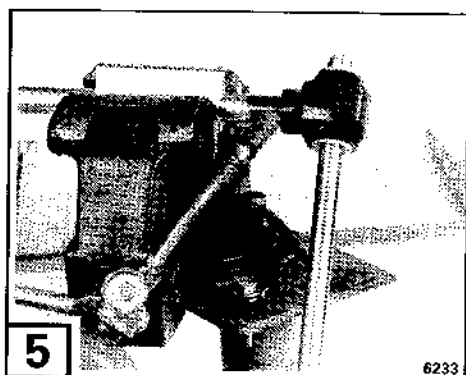
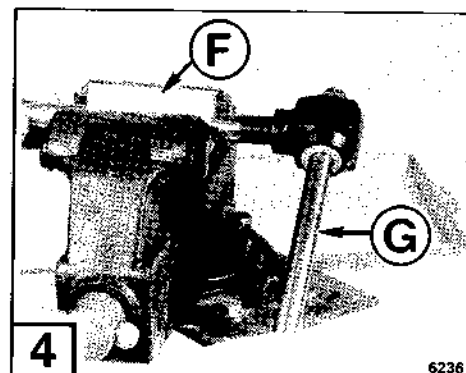
4. To replace internal O-ring and scraper in end cap, piston rod eyelet must be removed. Thoroughly degrease rod and holder. Clamp the piston rod assembly in a vise using OMC Rod Holder P/N 983213 (F).

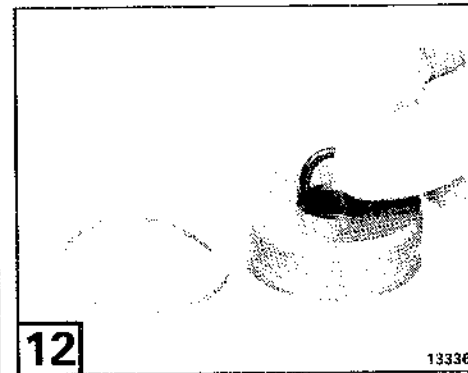
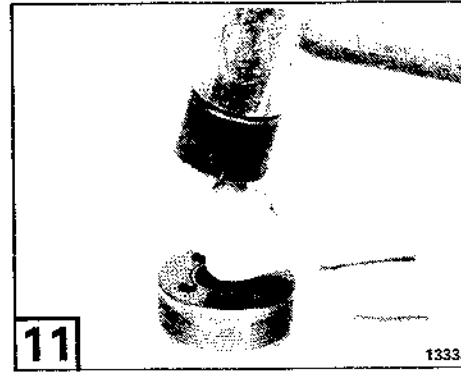
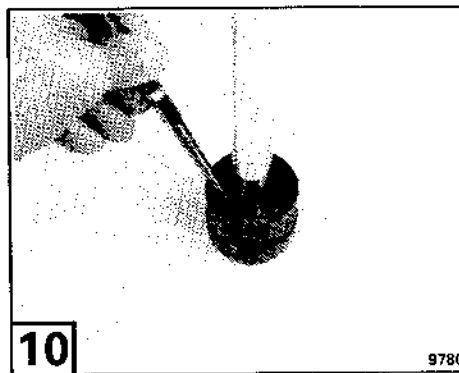
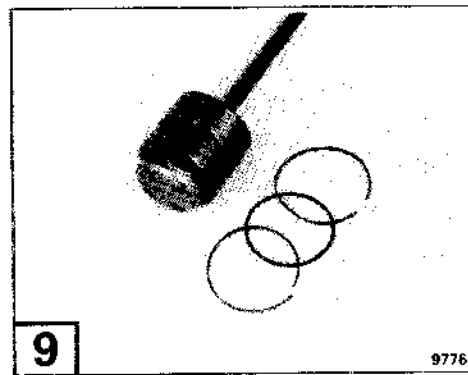
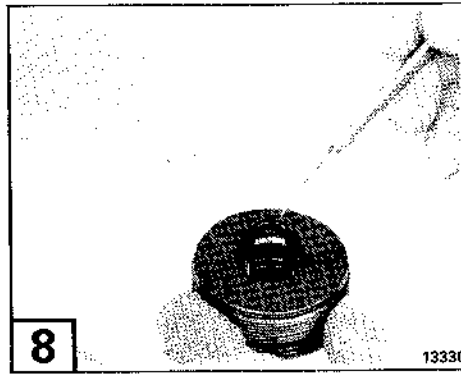
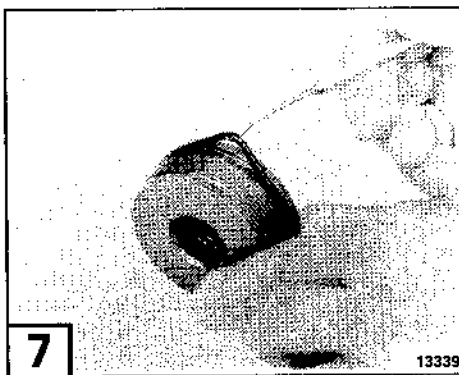
5. Remove eyelet by turning counterclockwise using the trim/tilt rod (G) that secures trim/tilt cylinders to gearcase. If rod slips in special tool, a piece of paper or thin card will increase grip on rod.

6. If eyelet cannot be removed as above, heat eyelet shank with torch or heat lamp until warm.

7. Pull end cap off rod, pry scraper out of end cap and discard.

8. Remove both external and internal O-rings from end cap and discard.





9 **10** 9. Carefully remove two split-ring retainers and O-ring from piston and discard. Do not remove or disassemble piston. If troubleshooting indicates impact valve leakage, unseat each ball with a drift, wash with solvent, and blow out with air.

Reassembly of Trim/Tilt Cylinder

1. Clean all hydraulic cylinder components in fresh solvent. Blow dry with compressed air. It is essential that all components are kept absolutely clean and dust free. Any dirt on internal components could cause scoring of the cylinder bore.

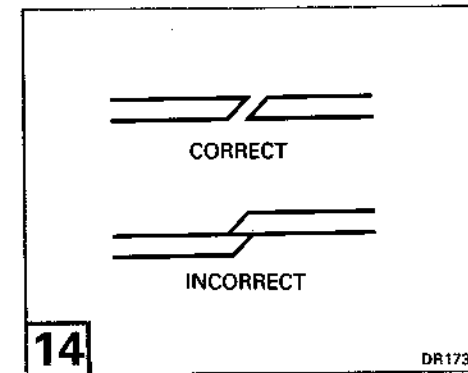
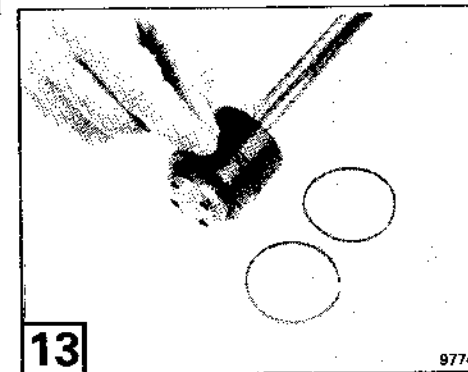
Note Lubricate all internal components with *OMC Power Trim/Tilt and Power Steering Fluid* or *Dexron II* automatic transmission fluid.

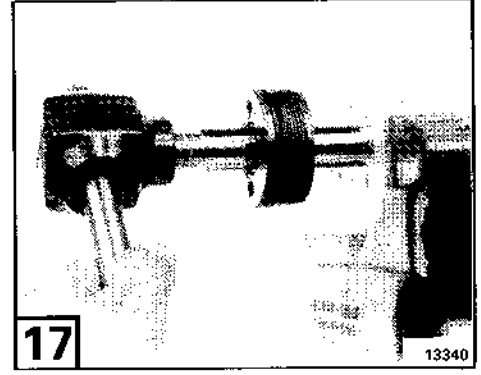
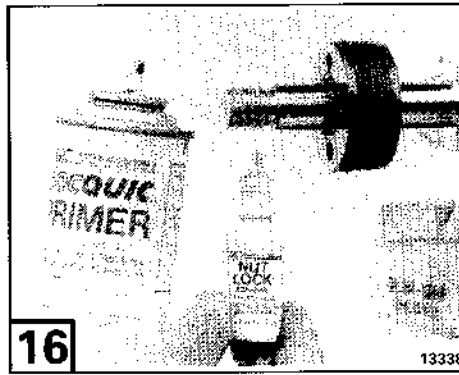
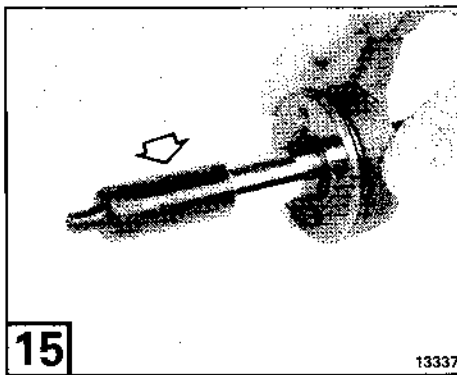
11 2. Use OMC Seal Installer P/N 326545, or socket to install new scraper in end cap with lip facing tool.

12 3. Install new inner O-ring in end cap and outer O-ring on end cap. Lubricate O-rings with trim fluid.

13 **14** 4. Place new O-ring on piston and lubricate with trim fluid. Position split-ring retainers on either side of O-ring making sure ends overlap as shown. The retainers are fragile and easily distorted or broken. Take care while installing them.

15 5. Lubricate internal O-ring, scraper, and piston rod. Place OMC Seal Protector P/N 326005 on end of rod, then slide end cap onto rod.





16 **17** 6. Thoroughly clean threads of piston rod and eyelet to remove old sealant. Use *Locquic Primer*, P/N 384884, on threads. Clamp rod in vise with rod holder special tool. Apply *OMC Nut Lock*, P/N 384849, to threads of rod and eyelet, and securely tighten eyelet on piston rod.

18 7. Clamp cylinder trunnion in soft-jaw vise. Lubricate cylinder bore, piston, and O-ring and place piston in end of cylinder. Construct a tubular piston ring guide from shim stock, or an aluminum beverage can, and insert it into the end of the cylinder. This will compress the piston rings as they enter the cylinder bore and prevent possible damage to them. Compress split-ring retainers with your fingers and push piston rod into cylinder bore.

19 8. Thread end cap into cylinder and tighten using OMC Spanner Wrench P/N 912084. Tighten end cap to a torque of 25-30 ft. lbs. (34-40 N·m).

20 9. Push piston rod all the way down into the cylinder to protect rod surface. Rotate eyelet hole until it's parallel to trim/tilt rod hole in base of cylinder.

Ground Clip Replacement

Removal

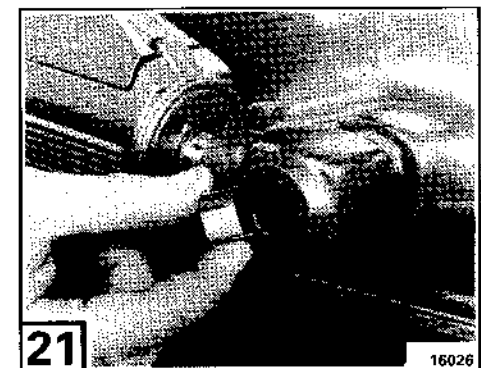
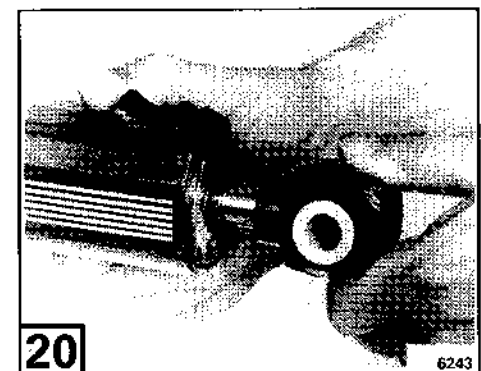
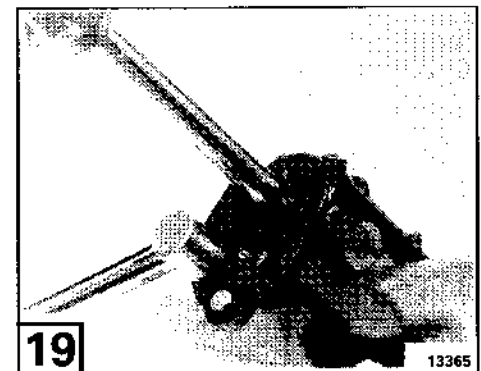
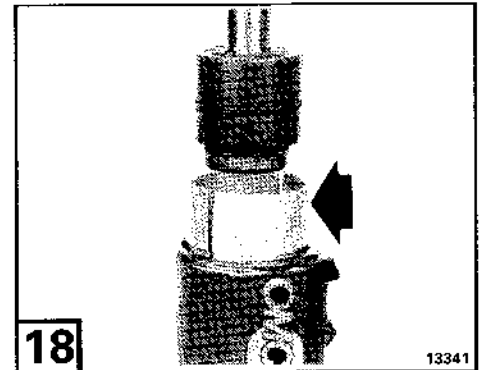
1. If trim cylinder is attached to drive unit, remove one nut and washer from rear shaft. Pull shaft out of cylinder rod eye.

21 2. Pull out bushing and grommet, then take out ground clip.

Installation

21 1. Insert ground clip into cylinder rod eye, then push in bushing and grommet.

2. To attach cylinder to drive unit, push trim/tilt shaft back through rod eye. Install flat washer and new elastic locknut. Screw on locknut until equal amounts of thread are exposed on both ends of the trim/tilt shaft, then tighten locknut to 10-12 ft. lbs. (1-1,4 N·m).



Filling and Bleeding Dry System

If trim components have been disassembled, or are known to be empty, follow this filling and bleeding procedure.

Trim Cylinders

1. Move trim rods to their fully retracted (down) position.
2. Unscrew cylinder end caps and fill the low-volume chambers with *OMC Power Trim/Tilt and Power Steering Fluid*. Install cylinder end caps and tighten to specifications.
3. Install trim cylinders and securely attach hydraulic lines.

Trim Motor and Reservoir

1. Mount motor and reservoir assembly on transom. Securely attach hydraulic trim lines.
2. Remove reservoir fill plug. Fill reservoir with *OMC Power Trim/Tilt and Power Steering Fluid* until level reaches bottom of fill hole.
3. While continuing to fill reservoir, activate trim in "UP" direction. Make several stops as drive raises to give fluid time to reach bottom of plug hole. Continue this fill-stop-fill sequence until trim rods are fully extended and drive is in full tilt position.
4. Add fluid until it's level with bottom of fill hole, then install and tighten plug.
5. Run drive through three or four up and down cycles to purge air. Stop drive at full tilt position to make a final check of fluid level. Top off reservoir as necessary.

Hydraulic Pressure Specifications

Mode	Normal Pressure	Notes
Trim-out/tilt-up running	225-275 psi (1550-1900 kPa)	48 amps maximum
Tilt-up stall	1200-1600 psi (8200-10,900 kPa)	92 amps maximum
Tilt-up stall/leak-down	200 psi (1380 kPa) maximum	5 minutes minimum
Trim-in/tilt-down running	400-800 psi (2700-5500 kPa)	60 amps maximum
Trim-in stall	400-800 psi (2700-5500 kPa)	66 amps maximum
Trim-in stall/leak-down	200 psi (1380 kPa) maximum	5 minutes minimum

Section 10

Steering System

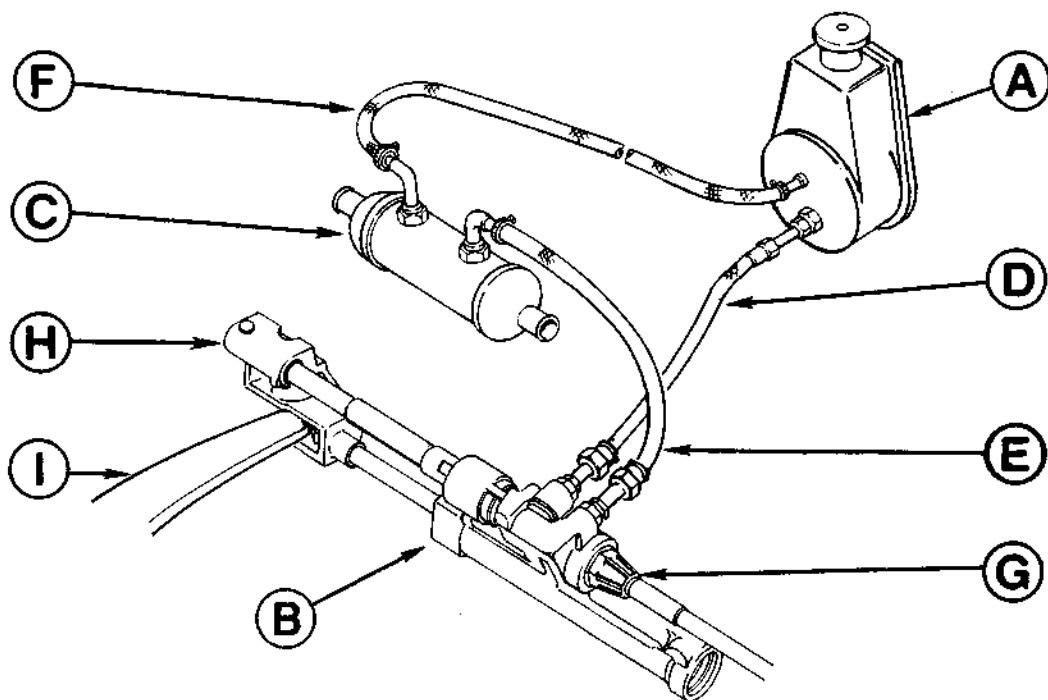
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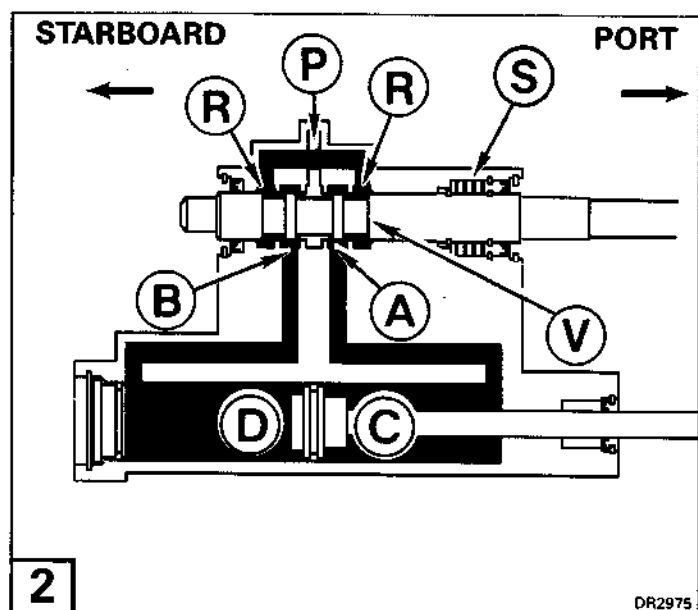
Safety Warning

- Before working on any part of the steering system, read the Safety section at the beginning of this manual.
- When replacement parts are required, use genuine OMC parts or parts with equivalent characteristics including type, strength and material. Failure to do so may result in product malfunction and possible injury to the operator and/or passengers.

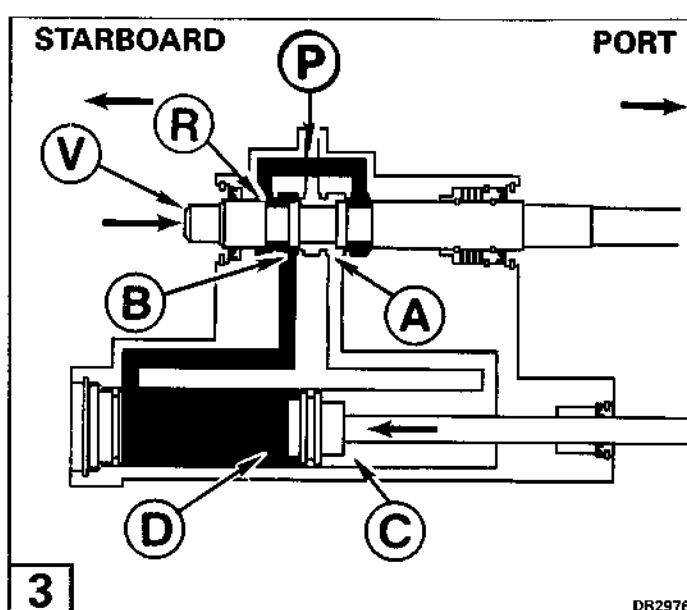


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Special Tools Required

Crowfoot Wrench (steering cable anchor nut)
 P/N 982270 OMC Power Steering Pump Pulley Remover
 P/N 982271 OMC Power Steering Pump Pulley Installer
 P/N 983213 OMC Rod Holder

Sealants, Lubricants and Adhesives

OMC Triple-Guard® Grease
 OMC Marine Wheel Bearing Grease
 OMC Pipe Sealant with Teflon
 OMC Power Trim and Tilt Fluid,
 GM Power Steering Fluid,
 Dexron, or Dexron II