

Description

This steering system consists of a mechanical cable from the helm to the drive, an engine mounted pump, and a power cylinder to move the tiller.

1 The hydraulic pump **A** is mounted on the front of the engine and is driven by a belt from a crankshaft pulley.

- The reservoir fill cap has a dipstick attached.
- The control valve and cylinder **B** is a single unit mounted to the transom bracket with two large anchor screws.
- The oil cooler **C** is a heat exchanger that uses engine cooling water to keep the hydraulic fluid cool.
- A high pressure hydraulic hose **D** carries fluid from the pump to the control valve, and low pressure hoses **E** and **F** carry the fluid from the valve to the oil cooler, and back to the reservoir.
- The steering cable casing **G** attaches to the valve.
- The cable ram passes thru the valve and attaches to the clevis **H**. The tiller arm **I** is also attached to the clevis.

System Operation

No Steering Input - Steering Wheel Not Turning

2 When there is no steering input from the helm the spring **S** in the control valve keeps the spool **V** centered. Fluid from the pump enters the control valve thru the pressure port **P**, flows past both cylinder ports **A** **B** with little restriction and thru both return ports **R** and back to the reservoir. There is a small equal force at both ends of the cylinder **C** **D** and the cylinder does not move.

With no steering input the outdrive is held in one position and the boat moves in a constant turn or in a straight line.

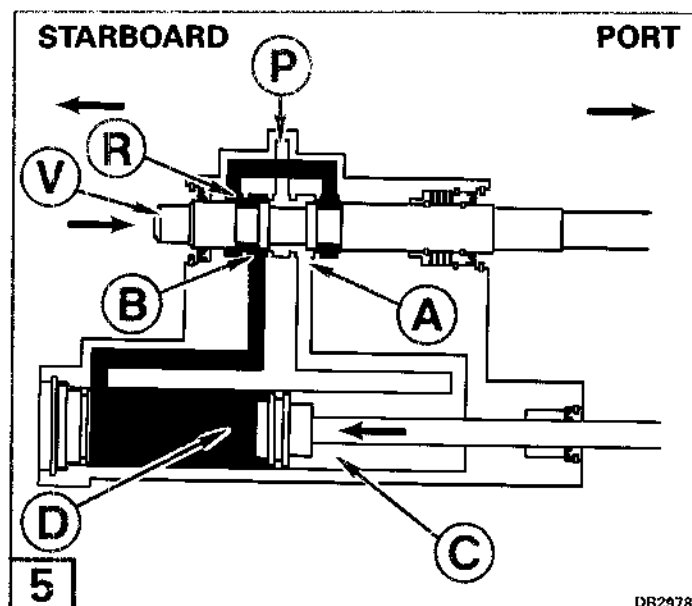
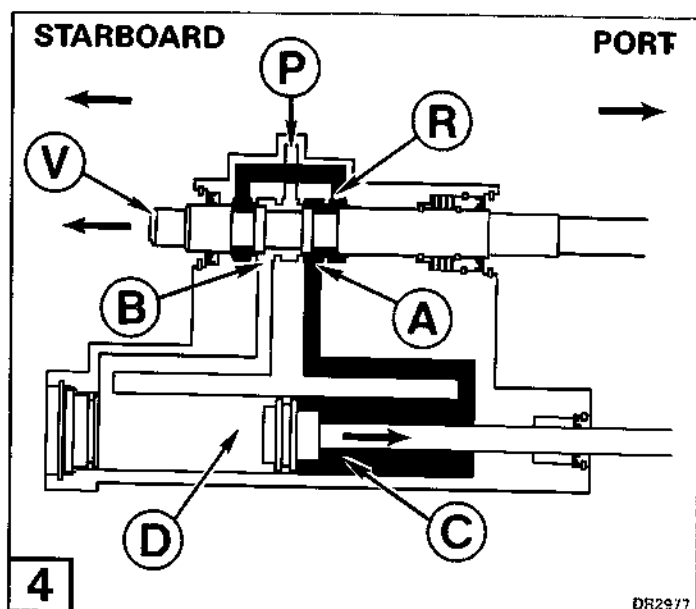
Steering To Port - Steering Wheel Turning To Left

3 When the helm is turned to port (either turning boat to left or straightening from a right turn) the steering arm is pulled to starboard. The steering cable casing pushes the valve spool **V** to port. Fluid from the pump enters the valve at **P** and is routed to the rod-end outlet **A** and to the rod end of the cylinder **C**. The pump pressure moves the piston and steering arm to starboard. Fluid at the base end of the cylinder **D** is forced out thru the valve from **B** to **R** and back to the reservoir.

As long as the helm is turning to port this motion continues, swinging the outdrive to port.

When the helm input stops (steering wheel not turning) the steering cable stops pulling the tiller arm to starboard, and the steering casing stops pushing the valve spool to port. When the cylinder moves the valve spool to a "centered" position hydraulic fluid is again routed past both cylinder outlets, and the steering cylinder has an equal force at both ends and stops moving.

The steering system is then back to the "no steering input" condition described above.



Steering To Starboard - Steering Wheel Turning To Right

4 When the helm is turned to starboard (either turning boat to right or straightening from a left turn), the steering arm is pushed to port. The steering cable casing pulls the valve spool (V) to starboard. Fluid from the pump enters the valve at (P) and is routed to the base-end outlet (B) and to the base-end of the cylinder (D). The pump pressure moves the piston and steering arm to port. Fluid at the rod-end of the cylinder (C) is forced out and thru the valve from (A) to (R) and back to the reservoir.

As long as the helm is turning to starboard this motion continues, swinging the outdrive to starboard.

When the helm input stops (steering wheel not turning), the steering cable stops pushing the tiller arm to port, and the steering casing stops pulling the valve spool to starboard. When the cylinder moves the valve spool to a "centered" position, hydraulic fluid is again routed past both cylinder outlets, and the steering cylinder has an equal force at both ends and stops moving.

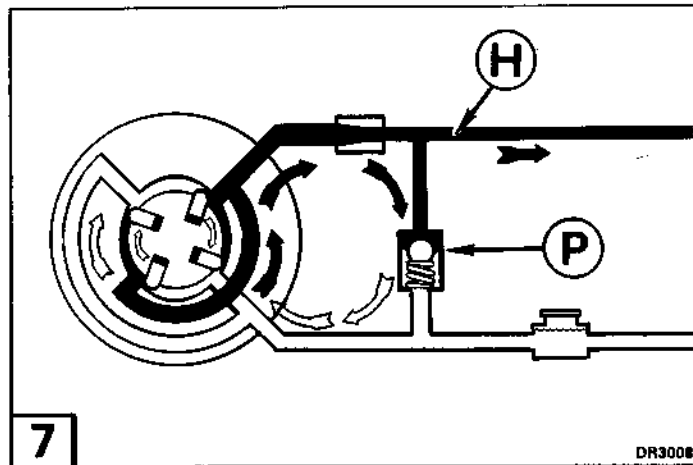
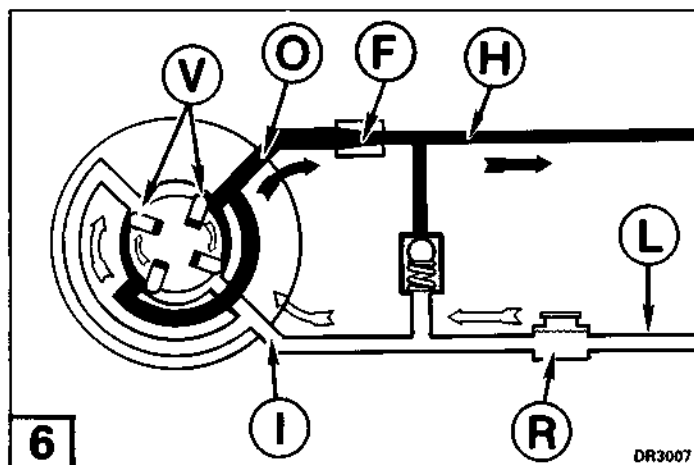
The steering system is then back at the "no steering input" condition described above.

Steering Without Power Assist

5 If the steering system is not providing power assist, the operator may still steer the boat. Turning the steering wheel to port causes the steering cable to pull the tiller arm to starboard, and causes the cable casing to push the valve spool (V) to port about 0.060 in. against the stop. The steering cable then transmits the full manual effort to pull the tiller arm.

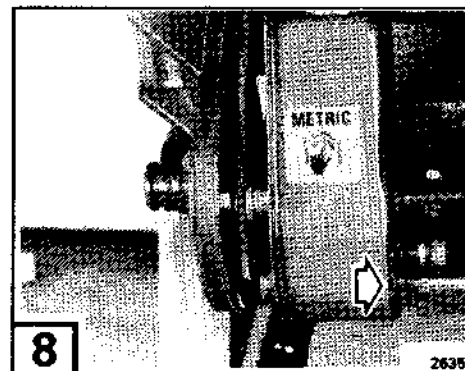
The fluid ahead of the piston (D) is forced out of the cylinder thru outlet (B) into the valve, and thru outlet (R) back to the reservoir. Additional fluid is drawn out of the reservoir thru the pressure inlet (P) and (A) to the opposite side of the piston (C).

More steering effort is required since all of the power required to steer the boat must be supplied by the operator, and additional force is required to move the fluid through the system when the pump is not operating.



6 7

- Ⓥ - Vanes
- Ⓢ - Input Passages
- Ⓞ - Output Passages
- ⓕ - Flow Restriction Orifice
- Ⓟ - Pressure Relief Valve
- Ⓡ - Reservoir
- ⓗ - High Pressure - Output
- Ⓛ - Low Pressure - Return



Pump Operation

6 During normal operation, fluid is drawn into dual pump intake ports **Ⓢ** from the reservoir **Ⓡ**. The pump output is thru ports **Ⓞ**. The vanes **Ⓥ** are held out against the pump bore by pressure behind the vanes. The pump has sufficient output **ⓗ** to allow quick boat maneuvers even at engine idle rpm. The pump output at high rpm is limited to about 2.3 gallons per minute by a flow restriction orifice **ⓕ**.

The pump output pressure is determined by the resistance to flow of the system. When no steering changes are being made, the pressure will be about 50-100 psi. When there is steering input, the pressure will be higher and will depend on the steering forces required due to the boat attitude, drive trim position, throttle position and quickness of the maneuver.

7 The pump is protected from very high pressures by a pressure relief valve **Ⓟ** that is located in the pump body. If the steering load becomes extremely high, the relief valve will open and limit the output pressure **ⓗ** to about 1,000-1,100 psi.

Note Internal damage to the pump will occur if the system is operated at relief valve pressure for more than a few seconds.

8 This pump has a metric output fitting. Use only a hose with a metric fitting.

Pump Removal

1. Place an oil drain pan under the pump.

9 2. Disconnect the high pressure hose (A) and return hose (B) at the pump. Do not lose o-ring from pressure hose fitting. Secure hose ends in a raised position to prevent fluid from draining from hoses. Cap or tape the ends of the hoses to keep out dirt. Drain pump completely before removing.

10 → 12 3. Loosen the pump bracket mounting screws and remove the drive belt.

4. Remove the mounting screws and pump from the engine.

13 5. Remove the pump pulley using OMC Pulley Remover P/N 982270, and remove the mounting bracket.

Pump Installation

14 1. Attach the mounting bracket to the pump. Attach the pulley using OMC Pulley Installer P/N 982271.

2. Attach the pump bracket loosely to the engine.

9 3. Connect the pressure hose fitting with the o-ring in place and in good condition. Tighten the fitting to a torque of 15-26 ft. lbs. (20-35 N-m).

9 4. Connect return hose to reservoir. Tighten hose clamp to a torque of 12-17 in. lbs. (1,4-2,0 N-m).

5. Fill the pump reservoir and bleed the pump, hoses, and valve by turning the pulley clockwise (as viewed from the pulley side of the pump) until air bubbles in the reservoir stop. Keep reservoir filled while purging air from the system.

6. Install the drive belt and adjust the belt tension as described under **Belt Adjustment** in this section. Do not pry on the pump reservoir.

7. Bleed the entire system as outlined under **Purging Air From Fluid After Servicing Pump**.

Hydraulic Fluid

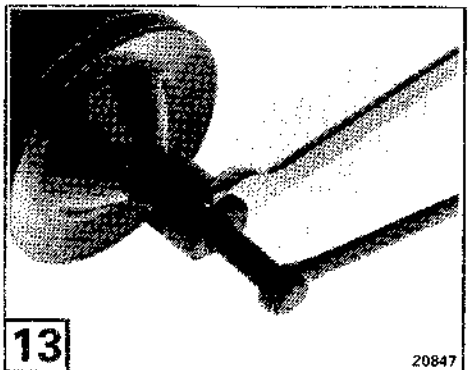
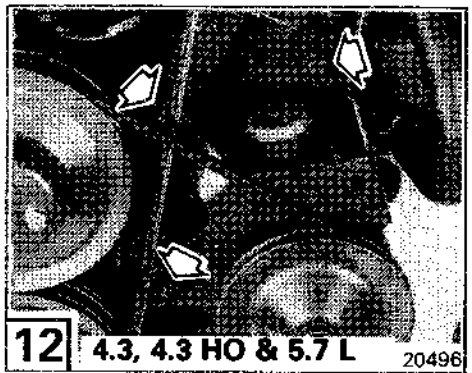
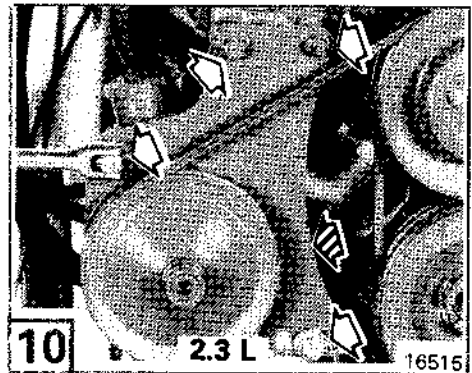
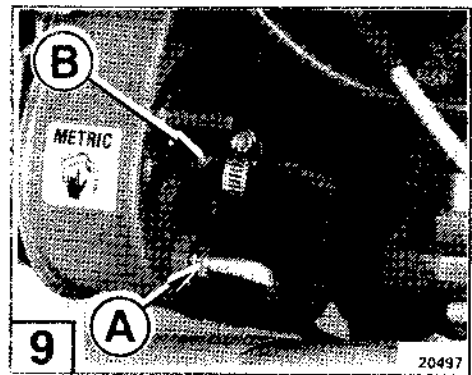
Use an approved power steering fluid such as *OMC Power Trim/Tilt and Power Steering Fluid* or *GM Power Steering Fluid*. If these fluids are not available, any automatic transmission fluid labeled *Dexron* or *Dexron II* may be used.

Checking Fluid Level

15 1. Warm up engine, then shut engine off. Remove reservoir filler cap and check if fluid level is at "HOT" mark on dipstick.

16 2. If fluid level is low, add recommended hydraulic fluid to bring fluid up to "HOT" mark on dipstick. Replace filler cap.

Note Do not over-fill a cold reservoir. Fluid could overflow when system reaches operating temperature.



Purging Air From Fluid After Servicing Pump

When system has been serviced, pump must be refilled with fluid before engine is started.

Note Do not run pump even momentarily without fluid. Pump will be ruined or severely damaged causing short life.

- With engine "OFF," turn helm all the way to port. Add power steering fluid to bring fluid level to "COLD" mark on dipstick.
- Start engine, run momentarily and shut off engine. Recheck fluid level and fill to "COLD" mark.
- Repeat step above as necessary.
- Complete the purging of air from system by starting engine and turning wheel from lock to lock slowly. Maintain fluid level above pump body in reservoir.
- Returning fluid with air in it will often be in the form of foam and will have a light tan or red appearance. Maintain fluid level high enough so foam is not drawn into pump inlet. All air must be eliminated from fluid before normal steering action can be obtained. If excessive foam accumulates in reservoir it must be removed, or let unit stand for an hour and repeat steps above.
- With engine "OFF" and at normal operating temperature, recheck to make sure fluid level is at "HOT" mark on dipstick.
- Return wheel to centered position, continue to run engine for several minutes, and then shut engine off.
- Water test the boat to make sure the steering functions normally and is free from noise.

Belt Adjustment

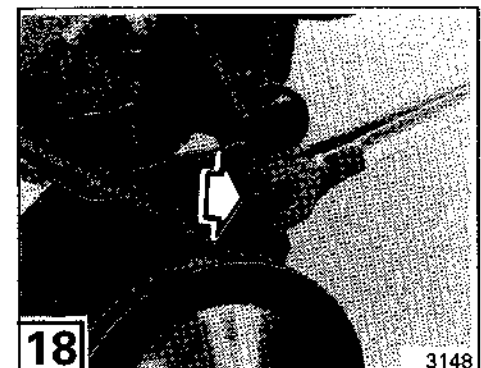
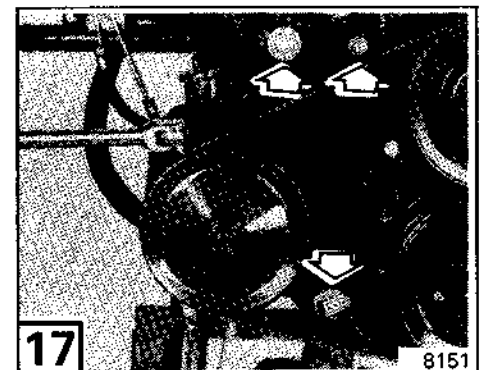
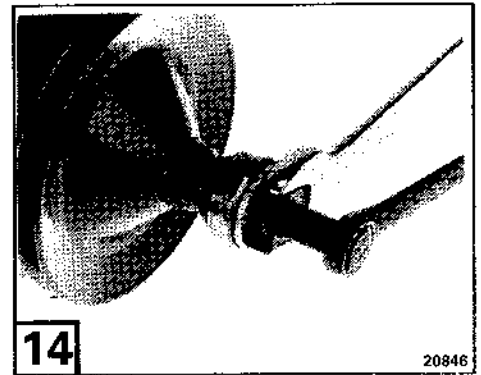
Note When adjusting a power steering pump belt, **never pry against the pump reservoir or pull against the filler neck.**

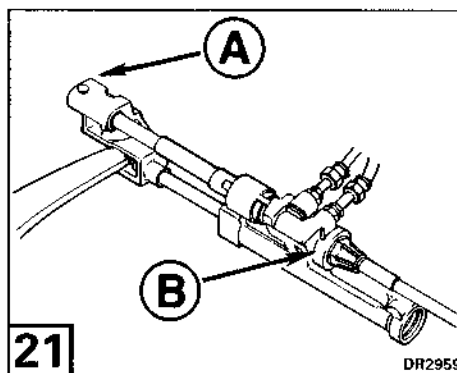
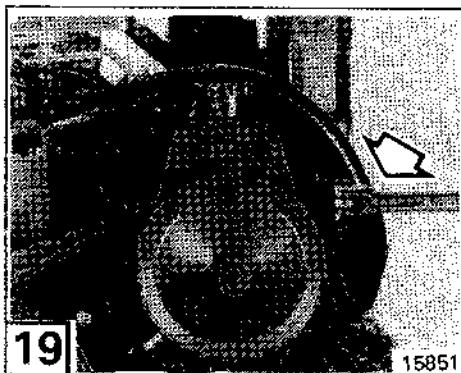
Model 2.3 L

17 To increase belt tension: - Loosen the three screws in front and one screw in the rear that secure the pump mounting bracket. Place a ½ in. breaker bar into the square hole in the pump mounting bracket, and pivot pump away from engine as shown. While maintaining pressure on pump, retighten all mounting screws. Recheck belt tension.

Models 3.0, 3.0 HO, 4.3, 4.3 HO & 5.7 L

18 To increase belt tension: - Loosen nut on lower pivot bolt, and loosen screw on brace behind pulley. Place a ½ in. breaker bar into the square hole in the pump mounting bracket, and pivot pump away from engine as shown. While maintaining pressure on pump, retighten all mounting screws. Recheck belt tension.





Models 5.0 L, 5.0 L HO & 5.8 L

- 19** To increase belt tension: - Loosen nut on lower pivot bolt, and loosen screw on brace behind pulley. Place a ½ in. breaker bar into the square hole in the pump mounting bracket, and pivot pump away from engine as shown. While maintaining pressure on pump, retighten all mounting screws. Recheck belt tension. Never pry against the pump reservoir or pull filler neck.

Note Do not pry against the timing chain cover. fluid leaks may result.

All Models:

- 20** 1. Tighten belt to 75 lbs. as measured with a belt tension gauge, or until finger pressure at the mid-point between pulleys produces a ¼-½ inch deflection.

2. Tighten pump bracket bolts to specified torque.

3. Retighten new belt after 10 hours service and every 50 hours thereafter.

Steering Cylinder

- 21** The steering cylinder assembly is a combination power cylinder and control valve. A piston rod clevis **A** provides the attachment to the steering arm and steering cable ram. The steering cable casing attaches to the threaded valve sleeve **B**.

Cylinder Removal

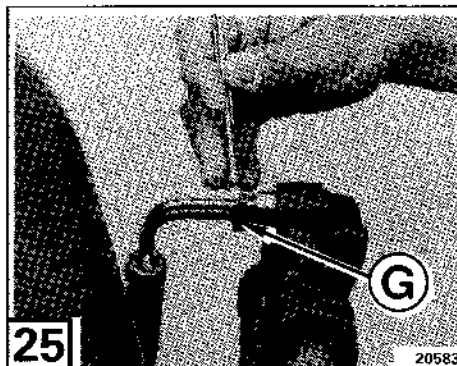
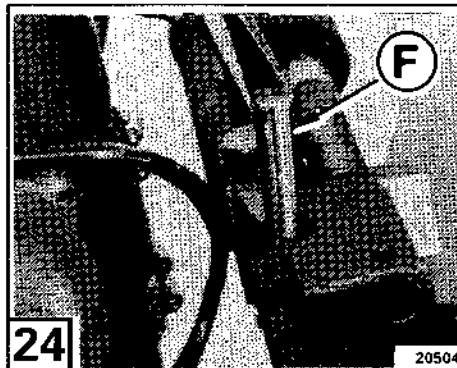
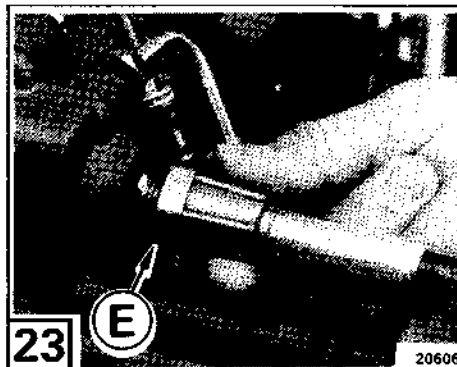
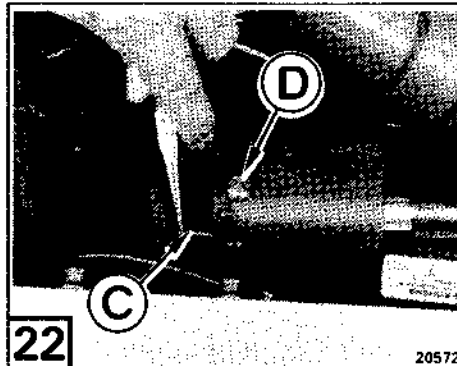
- 22** 1. Turn the helm full lock to port. Remove the cotter pin **C** and the steering cable pin **D**.

- 23** 2. Loosen steering cable anchor nut **E** and remove the steering cable from the valve.

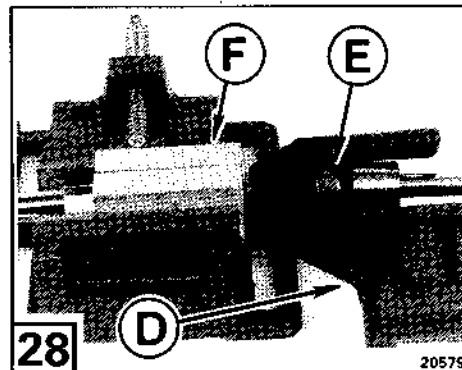
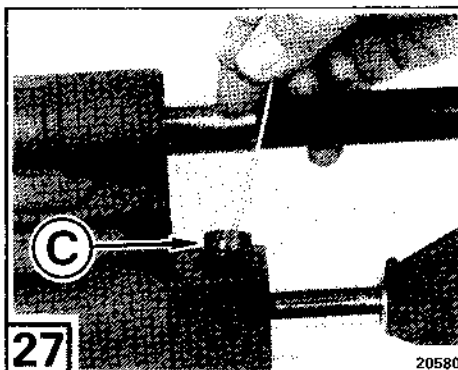
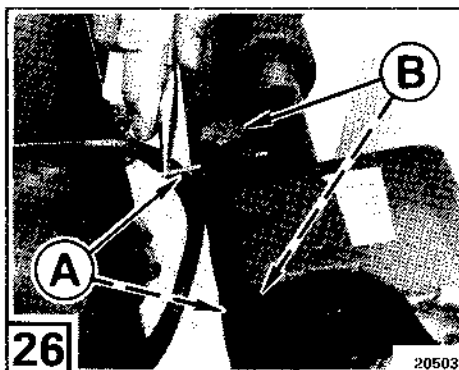
- 24** 3. Remove cotter pin and clevis to steering arm pin **F**.

- 25** 4. Remove the hose fittings **G** from the valve. Raise hoses and cover the ends to keep clean.

⚠ Do not move cylinder rod in or out until cylinder has been drained completely. A dangerous spray of fluid can discharge from the cylinder ports if the rod is moved in or out.



Safety Related



- 26** 5. Remove cotter pins **A** and loosen both anchor screws **B** until steering cylinder assembly can be removed.

Cylinder Servicing

- 27** 1. Pry out steering pivot bushings **C** if they are to be replaced. If necessary they may be carefully drilled in two places with a $\frac{1}{16}$ in. (1,5 mm) drill bit and then removed.

2. New bushings should be lubricated and pushed into place.

- 28** 3. The cylinder rod should be wrapped with heavy paper or pasteboard and held in clamping blocks **F** P/N 983213 in a vise. To remove the clevis **D**, unscrew the 19 mm locknut **E**.

- 28**  4. To reinstall clevis, **tighten piston rod to clevis locknut **E** to a torque of 23-28 ft. lbs. (31-38 N-m).**

Cylinder Installation

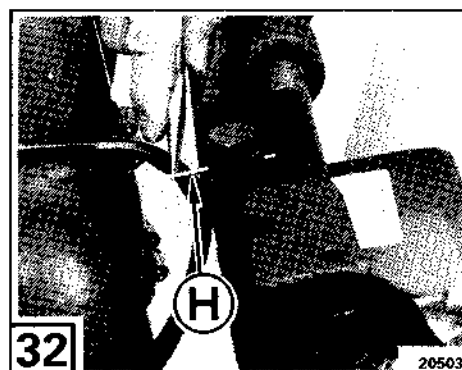
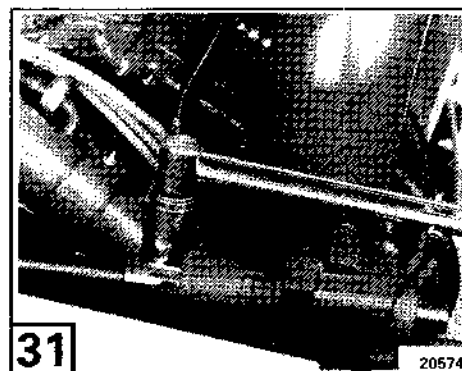
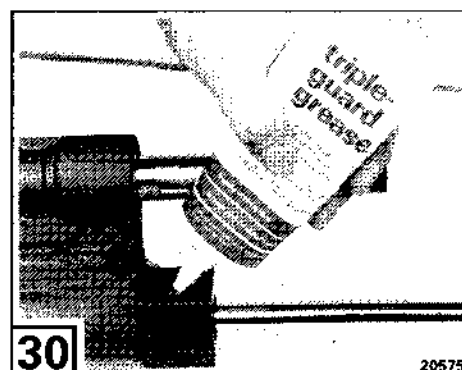
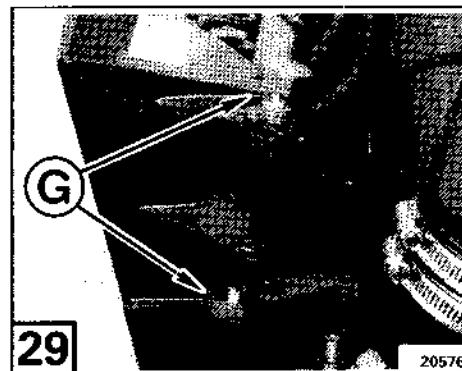
- 29** 1. Install anchor screws **G** flush with inside of inner transom bracket.

- 30** 2. Apply *OMC Triple-Guard* grease to both bushings.

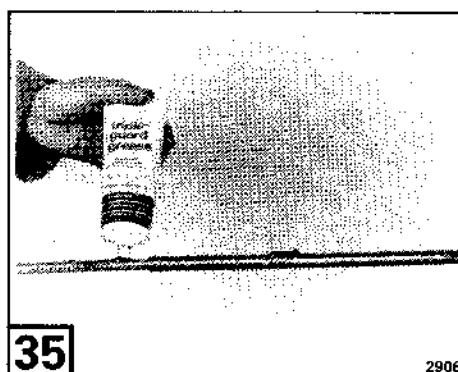
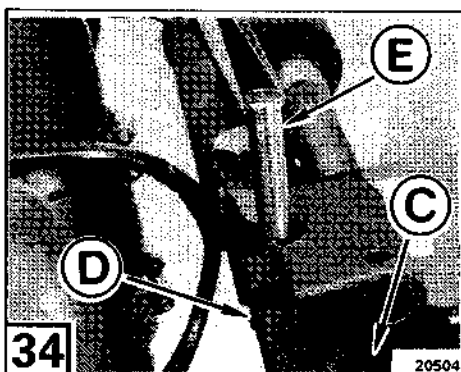
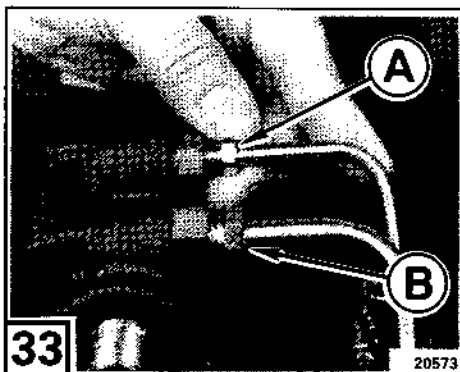
- 31**  3. Place steering cylinder assembly into position on the inner transom bracket. Align bushings of steering cylinder with screws. Hand start both anchor screws to ensure alignment and engagement into bushings. **Tighten anchor screws to a torque of 40-45 ft. lbs. (54-61 N-m).**

- 32**  4. Install cotter pins **H** through holes in transom bracket from transom side. **Spread ends of cotter pins to secure.**

-  **Do not move cylinder rod if cylinder contains any fluid. A dangerous spray of fluid may discharge from the ports.**



Safety Related



33 5. Connect hoses to cylinder. Start each fitting by hand. Tighten pressure fitting **A** to a torque of 103 in. lbs. (12 N·m). Tighten return fitting **B** to a torque of 25 ft. lbs. (34 N·m).

34  6. Pull steering arm **C** into hydraulic cylinder clevis **D**. Align holes and install large pin **E** from top of arm. **Secure large pin by installing and spreading ends of cotter pin.**

Cable Installation

35  1. Turn the steering wheel to fully extend the steering cable ram to its maximum extension. **Lubricate the full length of the steering cable ram with OMC Triple-Guard grease.**

36 2. Retract steering cable ram **F** and insert ram thru valve sleeve **G**.

37 3. Hold steering cable anchor nut back on cable casing to make certain the steering cable is completely seated in the end of valve sleeve.

38 4. While holding steering cable tight against valve sleeve, thread steering cable anchor nut **H** onto valve sleeve until snug.

36 **39**  5. Hold the other end of the valve sleeve with a 7/8 in. wrench on the flat **I**. Attach a crowfoot wrench at 90° to a torque wrench **J** and **tighten the steering cable anchor nut to a torque of 120 in. lbs. (14 N·m).**

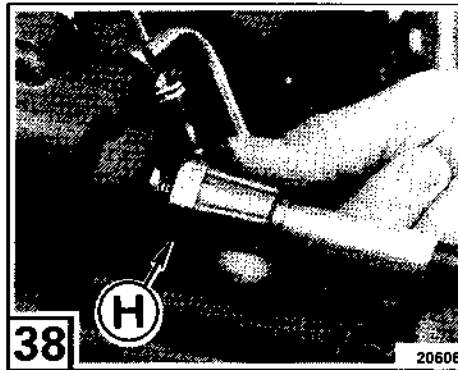
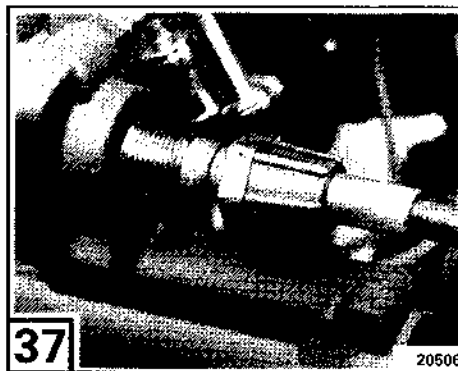
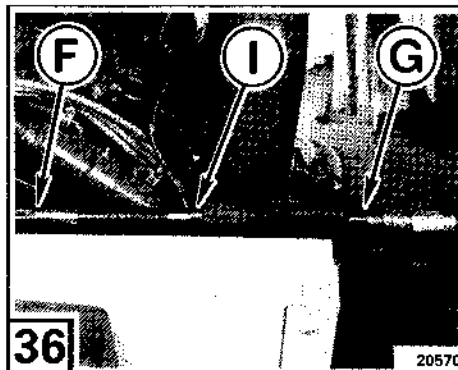
40  6. Align cable ram **K** with steering cylinder clevis **L** and install small pin from top of clevis. **Secure small pin by installing and spreading ends of cotter pin.**

7. Fill system with fluid and remove all air. See **Purging Air From Fluid After Servicing Pump.**

Lubrication

35  **Every 60 days, grease the steering ram with OMC Triple-Guard® grease.**

Note Due to local conditions, it may be necessary to lubricate your **OMC King Cobra®** at more frequent intervals.



Safety Related

Hoses

Note Do not start the engine with any power steering hose disconnected.

The pump output fitting has metric threads. Do not use a hose with SAE threads in the pump fitting.

After connecting the power steering hoses, make sure that there is ample clearance between the hoses and the drive belts and other components where a hose may rub during operation. Hoses installed out of position may be damaged during operation.

If either of the heat exchanger hoses or the pump return hose connection is removed, be sure to use "worm drive" clamps when reinstalling the hoses.

System Diagnosis

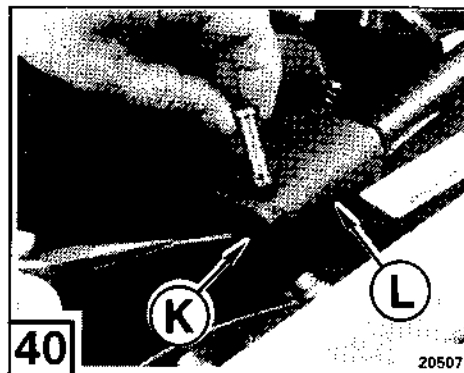
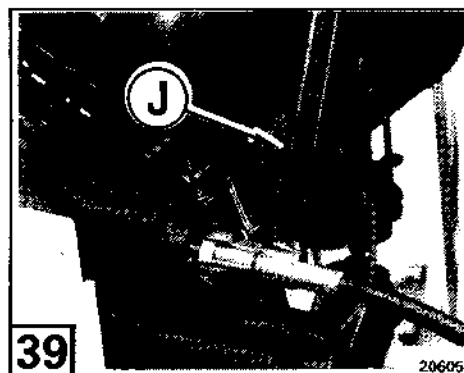
Complaints of faulty steering are frequently the result of problems other than the steering cylinder assembly or pump. Conditions such as hard or loose steering, or vibrations, are often related to such factors as the drive belt, pump and cylinder mounting, fluid level, or incorrect installation of the steering cable. These factors should be checked and corrected before disassembling or replacing parts of the steering system.

System Checks

Many factors affect power operation of the steering system. Some of the most common problem areas are:

1. Fluid level.
2. Loose or worn drive belt, or oily belt.
3. Steering cable jammed against something in boat at stern.
4. Steering cable too short or steering cable too long.
5. Loosely mounted components.
6. Loose pump pulley.

After the problem has been found, determine the cause. For example, if the fluid level in the reservoir is found to be low, refill and bleed the system and check the entire hydraulic system for leaks. Just refilling the reservoir will make the unit operate, but will not correct the condition that caused the problem.



Power Steering System Diagnosis Chart

Condition	Possible Cause	Correction
SYSTEM NOISE:		
Pump noise "chirp."	Loose belt.	Adjust belt tension to specification.
Belt squeal.	Loose belt.	Adjust belt tension to specification.
"Hissing" sound.	Some noise exists in all power steering systems. "Hiss" may be expected when turning the steering wheel, particularly at low speed.	None; a slight "hiss" is normal and in no way affects steering.
Rattle	Pressure hose touching other parts of powerhead.	Adjust hose position.
Rattle or chuckle.	Steering system looseness.	Check cable nut and cylinder pivot points for wear or looseness. Replace bushings if necessary.
Groan	Low fluid level. Air in fluid.	Find and repair leak. Fill reservoir and bleed system. Fill reservoir, find and repair leak. Check connections, bleed system.
Growl	Excessive back pressure caused by hose restriction.	Locate restriction and correct. Replace part if necessary.
Pump growl.	Incorrect steering cable adjustment. Cable to boat interference.	Adjust cable per procedure. Eliminate interference.
Whine in pump.	Pump shaft bearing scored.	Flush system, replace pump.
SYSTEM OPERATION:		
Excessive wheel kickback or loose steering (not boat wander).	Steering cable attachment loose.	Replace pin. Tighten steering cable anchor nut.
	Air in system.	Add fluid to pump reservoir and bleed system. Check all connections.
Steering wheel surges or jerks when turning with engine running, especially during slow speed operation.	Loose pump belt.	Adjust tension to specification.
	Air in fluid. Insufficient pump pressure.	Fill reservoir, find and repair leak. Bleed system. Replace pump if defective.
Momentary increase in effort when turning wheel fast to right or left.	Pump belt slipping.	Tighten or replace belt. If oily, fix leak.
	Low fluid level.	Fill reservoir and bleed system.
	High internal leakage.	Replace pump if defective.

Condition	Possible Cause	Correction
Hard steering or lack of assist.	High internal leakage. (Power cylinder or pump.)	Replace pump if defective. Replace cylinder if defective.
	Cable jacket movement restricted (bulkhead, fuel tank, jammed against inside of hull).	Do not clamp cable tight near output end. Eliminate interference.
	Loose pump belt.	Adjust belt tension to specification.
	Low fluid level in reservoir.	Fill to proper level. If excessively low, check all lines and joints for evidence of external leakage, torque to specs.
	Lack of lubricant in lube points.	Lubricate, relubricate at proper intervals.
	Excessive friction in steering linkage.	Find reason for excessive friction; relubricate or repair.
	Cable has too tight a radius at output end.	Eliminate small radius.
	Cable movement restricted by tie straps, anchors, attached wires, etc.	Remove all cable anchors, tie straps, etc. on cable between last bend and valve attachment point.
	Insufficient fluid pressure.	Replace pump if defective.
Hard steering to starboard.	Cable too long or movement restricted by bulkhead, etc.	Replace cable, or eliminate restriction.
Hard steering to port.	Cable too short or movement restricted by bulkhead, etc.	Replace cable, or eliminate restriction.
Low fluid pressure due to restriction in hoses.	Check for kinks in hoses.	Remove kink.
	Foreign object stuck in hose.	Remove restricting object or replace hose.
Low fluid pressure due to steering cylinder.	Pressure loss in cylinder due to worn piston ring or scored housing bore.	Replace cylinder assembly.
Low fluid pressure due to steering pump.	Loose belt.	Adjust tension to specification.
	Low fluid level.	Find and repair leak. Fill reservoir and bleed system.
	Air in fluid.	Fill reservoir, tighten fittings and hose clamps, Bleed system.
	Defective hoses.	Correct as necessary.
	Pump worn or damaged	Flush system, replace pump.
Foaming milky power steering fluid, low level and possible low pressure.	Air in fluid and loss of fluid due to internal pump leakage causing foaming and overflow.	Check for leak and correct. Bleed system. Keep fluid level up when very cold. If fluid level is correct and pump still foams, replace pump.

External Leakage

General Procedure

1. Wipe suspected area dry.
2. Check for over filled reservoir.
3. Check for fluid aeration and overflow.
4. Check hose connections - tighten if necessary.
5. Determine exact point of leakage.
6. When service is required, replace component.

Leakage Checks

Although some leaks are easily found, seepage type leaks may be difficult to pinpoint. Locate seepage leaks as follows:

1. With the engine off, wipe the complete power steering system dry (pump, hoses, and connections).
2. Check the fluid level in the pump reservoir and adjust as directed.
3. Start the engine and turn the steering wheel from stop to stop several times.
4. Find the exact area of leakage.

Easily Fixed Leaks

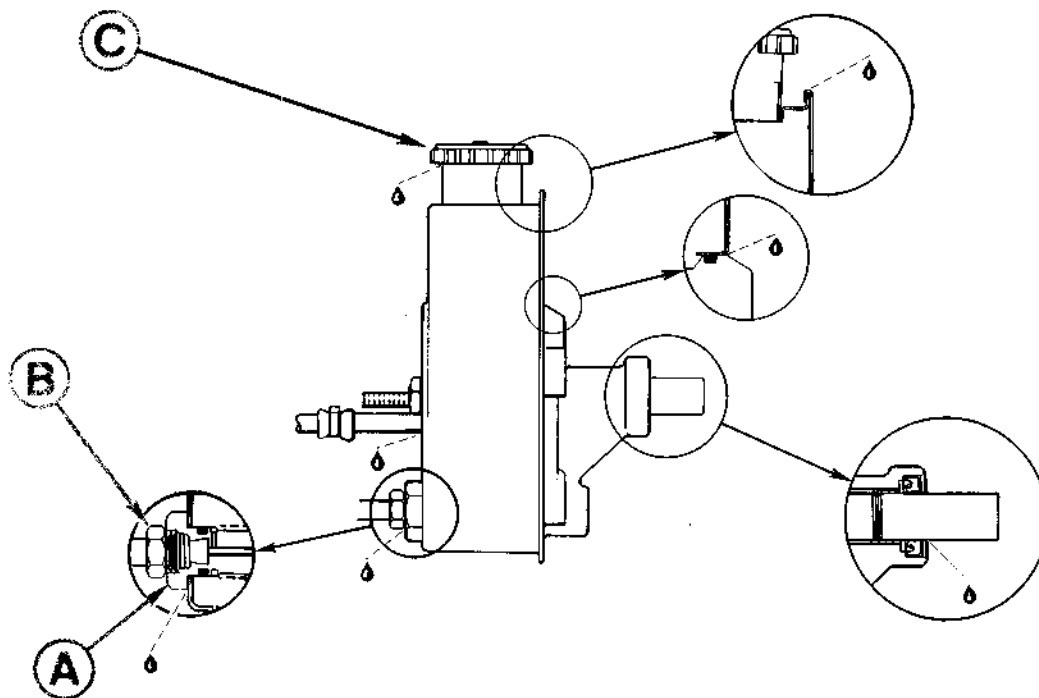
1. Loose clamp on pump return hose.
2. Loose pump or cylinder hose fitting. If fittings are not cross threaded, tighten to correct torque. See *Torque Specifications*.
3. Damaged o-ring on pump pressure fitting. Replace o-ring.
4. External leakage of power cylinder. Replace power cylinder.
5. Leakage of fluid in cooling water. Replace oil cooler.
6. Damage or cracked hose. Replace hose.

If the return hose is removed, the clamp must be replaced with a worm drive type clamp. Replace leaky hoses.

Pump Leakage

- 41** 1. An over filled pump reservoir can cause a leak. The fluid in the steering system expands as it heats up during normal usage and fluid level rises in reservoir. Excess fluid is forced through the breather cap hole where it may be sprayed over the engine by the drive belt.

41



DR3009

- 41 2. Check torque on fitting **A**. Tighten to a torque of 37-75 ft. lbs. (50-100 N·m). If fitting is not loose, replace pump.
- 41 3. Install new o-ring. Tighten the hose fitting **B** to 15-26 ft. lbs. (20-32 N·m). If leakage persists, replace the pump or hose as required.
- 41 4. Check the fluid level **C**. If leakage persists with the fluid at the correct level and the cap tight, replace the cap or pump.
- 41 5. Some non repairable pump leakage areas are marked with the oil-drop symbol. If leakage occurs in these areas replace the pump.

Bleeding Hydraulic System

1. With engine "OFF", turn helm all the way to port. Add power steering fluid to "COLD" mark on dipstick.
2. Start engine, run momentarily and shut off engine. Recheck fluid level. Add fluid to bring fluid up to "COLD" mark.
3. Repeat Step 2 as necessary.
4. Bleed air from system by starting engine and turning wheel slowly from lock to lock. Maintain fluid level just above pump body in reservoir.

Returning fluid with air in it will often be in the form of foam and will have a light tan or red appearance. Maintain fluid level high enough so foam is not drawn into pump inlet. All air must be eliminated from fluid before normal steering action can be obtained. If excessive foam accumulates in the reservoir it must be removed, or let unit stand for an hour and repeat steps above.

5. Return wheel to center position and continue to run engine for several minutes, then shut engine off.

6. With engine "OFF" and at normal operating temperature recheck to make sure fluid level is at "HOT" mark on dipstick. Water test boat to make sure steering functions normally and is free from noise.

Cable Installation Problems

The hydraulic valve reacts to steering cable casing movement. Total valve movement is about $\frac{1}{8}$ inch. This small motion is sufficient to operate the valve and direct hydraulic pressure to the appropriate side of the steering cylinder. Any restriction of movement of the steering cable casing at the stern of the boat will limit or restrict the movement of the valve and will result in hard steering in one or both directions.

When replacing the steering cable, the following points must be followed for proper power steering system operation:

42 1. Do not install a cable that is too short. Inadequate length will put tension on the cable casing, cause binding of the steering cable, restrict valve movement, and cause hard steering to port and a tendency to self steer to starboard.

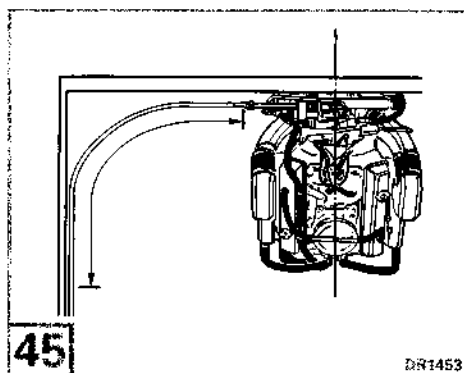
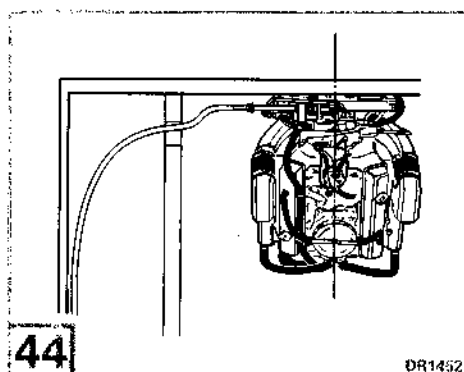
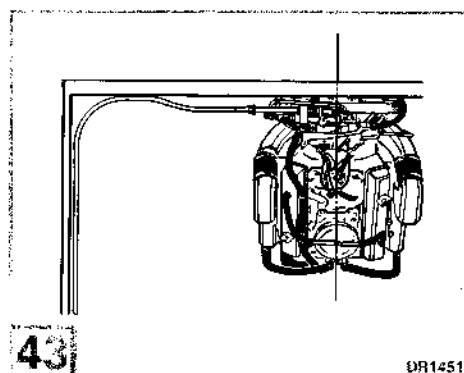
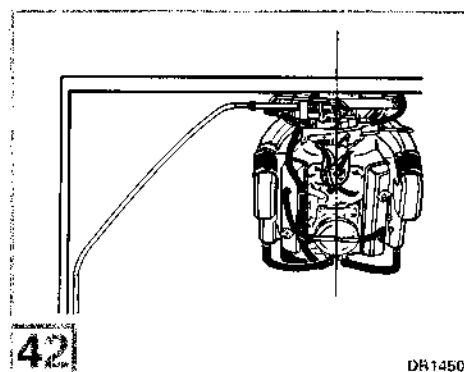
43 2. Do not install a cable that is too long. Excessive length will push on the cable casing, cause binding of the steering cable, restrict valve movement, and cause hard steering to starboard and a tendency to self steer to port.

3. Do not position steering cable in a sharp bend of less than 6 in. radius. Tight bends will cause binding and limit control valve movement. This will contribute to hard or uneven steering, or rough steering wheel movement.

44 4. Do not jam anything against cable at the engine end. Do not bind cable against inside of boat or against fuel tanks, battery boxes or flotation blocks. Jamming the steering cable will restrict steering cable movement and cause hard steering.

45 5. Do not interfere with or restrict steering cable movement through the last 90° of bend to the engine. Cable retainers, clips, clamps or tie straps should not be used in a manner that will restrict the cable movement near the engine. Do not attach wiring harness or control cables to this end of the steering cable.

! Do not restrict steering cable casing movement. Any restriction of the cable also restricts the valve movement. This will limit or stop hydraulic assist, or may hold the valve in one steering mode.



Feedback To The Helm

The steering system requires at least a little friction in the helm (and cable) to prevent hydrodynamic forces on the gearcase from feeding back and turning the steering wheel without the operator activating the power assist system. This may happen on single engine installations (or on twin engines having both drives rotating in the same direction).

Run the boat in a straight line in opposite directions at normal cruising speed with the drive trimmed in both a "bow up" position and in a "bow down" position. In each trim position, momentarily release the steering wheel to see if the wheel is turned by the gearcase, and in which direction.

If the steering wheel turns to both starboard and port, the helm friction must be increased slightly. This will allow the power steering system to hold the desired steering position.

If the helm always turns in one direction (when it turns), it may be caused by a steering cable that is too short, too long, or that is restricted from moving. See **Cable Installation Problems**. Twin engine problems may be corrected by having the drives rotate in opposite directions.

Specifications

Power Steering Pump Relief Valve Pressure

Relief valve pressure for the power steering pump is:
1000-1100 psi (6895-7584 kPa).

Torque Specifications

Component	Torque
Power Steering Pump Mounting Bracket Bolts	25 ft. lbs. (34 N·m)
Power Steering Pump Mounting Bolts	25 ft. lbs. (34 N·m)
Power Steering Pump Hose Fitting	15-26 ft. lbs. (20-35 N·m)
Inlet Control Valve Hose Fitting	103 in. lbs. (12 N·m)
Outlet Control Valve Hose Fitting	25 ft. lbs. (34 N·m)
Hose Clamps - Oil Cooler and Power Steering Pump	12-17 in. lbs. (1.4-2.0 N·m)
Nut - Steering Cable Anchor	120 in. lbs. (14 N·m)
Anchor Screw - Cylinder assy. to Transom Plate	40-45 ft. lbs. (54-61 N·m)
Locknut - Piston Rod To Clevis	23-28 ft.lbs. (31-38 N·m)

NOTES

Section 11

Throttle and Shift Control Systems

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Lubricants Required

OMC® Moly Lube
OMC Triple-Guard® Grease

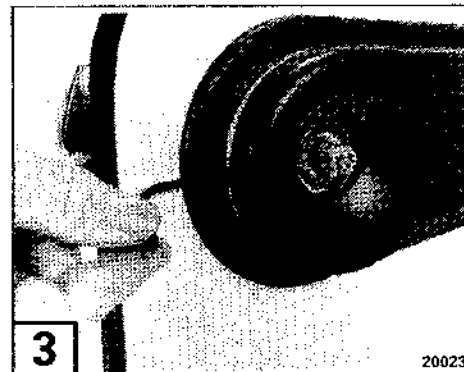
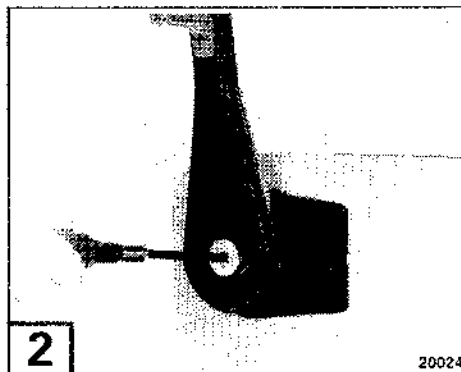
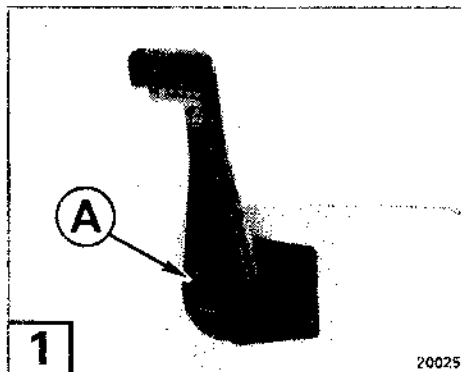


Safety Warning

- **Before working on any remote control system, read the section called *Safety* at the beginning of this manual.**
- **Replace any locking type fastener (example: locknut or patch screw) whose locking feature becomes weak. Definite resistance to tightening must be felt or locking fastener is not suitable for continued use. Replace only with authorized replacement part or equivalent.**

The following text will cover the replacement of parts, repair and testing of OMC remote controls used with *OMC Cobra®* stern drive applications.

No single test of the remote control after reassembly will, by itself, always ensure a properly functioning unit. To ensure correct assembly and operation you must follow all the assembly instructions in this section.



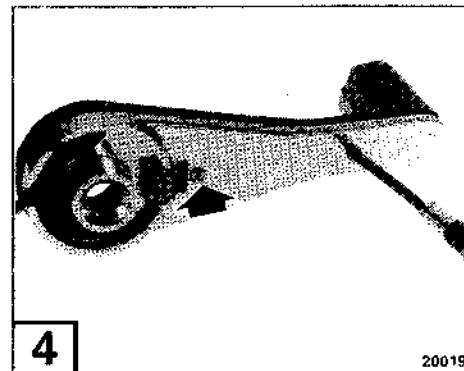
Trim Switch Replacement

Removal

⚠ 1. Disconnect battery cables at battery before servicing electrical systems. Failure to do so could result in injury from;

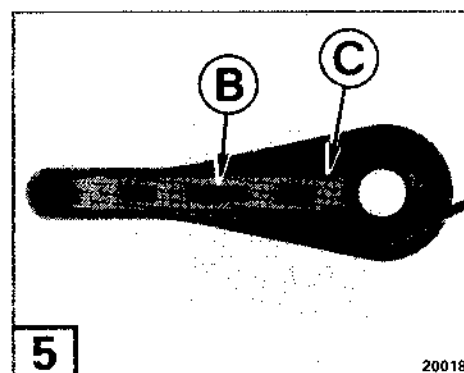
- ignition sources (sparks), causing possible fire and explosion from fumes in the engine compartment.
- contact with moving parts, if the engine is accidentally cranked or started.

2. Move control handle to the detent **Neutral** position. Disconnect the trim switch leads from the trim cable connector under the instrument panel.

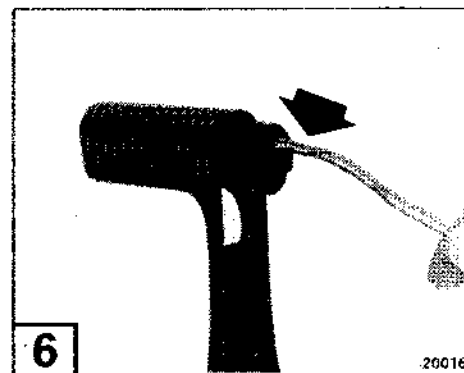


1 2 3. Remove the rubber boot **A** from the warm-up knob. Remove warm-up knob retaining screw and knob.

4. Disconnect the throttle cable at the carburetor. Move control handle to the full throttle **Reverse** position.



3 5. Insert an allen wrench into the opening on the bottom of the control handle. Loosen the allen screw retaining the handle onto the gear. Remove the control handle.



4 6. Remove the two handle retaining screws, and separate the cover from the handle.

5 **⚠** 7. Remove the neutral rod lockout spring **B** and the neutral rod lockout handle **C**. **Wear safety glasses and use caution when removing shift rod lockout handle and spring. The lockout spring is compressed and may fly out causing personal injury.**

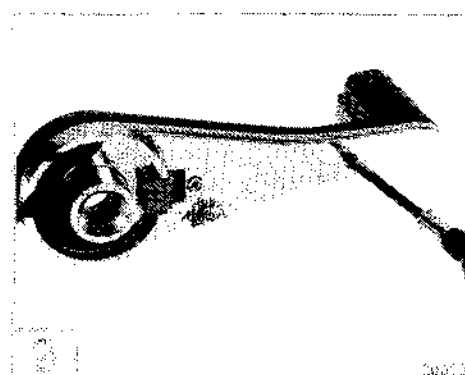
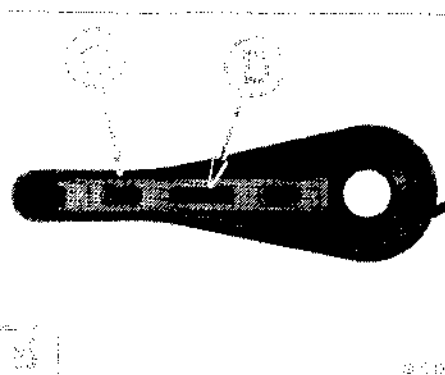
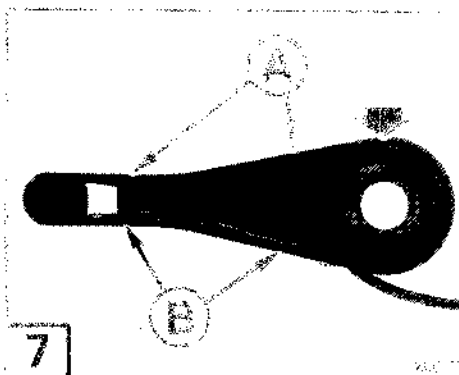
8. Pull switch and leads out through control handle, and discard trim switch.

Installation

6 1. The wires that are molded into the trim switch are off-center. Position the wires toward the top of the handle and install switch into the cover.



Safety Related



7 2. Insert the blue wire (A) into the slot in the cover at two places. Insert the red and green wire (B) into the slots on the opposite side, as shown.

7 3. Route the wire cable one complete loop around the hub inside the cover handle, as shown.

8 ⚠ 4. Reinstall the lockout lever (A) and lockout spring (B). Route trim switch lead through handle opening. **Wear safety glasses and use caution when installing shift rod lockout handle and spring. The lockout spring is compressed and may fly out causing personal injury.**

5. Route trim/tilt switch wires through opening in gunnel of boat.

9 6. Reinstall control handle and cover, and attach with two screws. Tighten screws securely.

10 7. Reinstall control handle assembly in original position, and tighten allen screw securely.

11 8. Reinstall warm-up knob and screw, and tighten screw securely.

12 9. Reinstall rubber boot over warm-up knob.

10. Loop trim wires loosely around control body, and secure loop to strain relief hole (next to neutral start switch) with a tie strap.

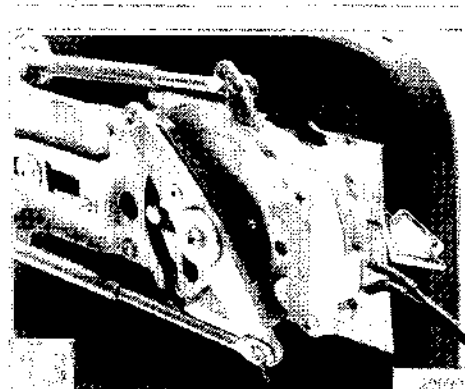
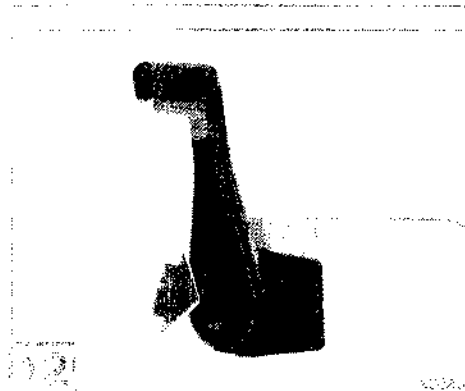
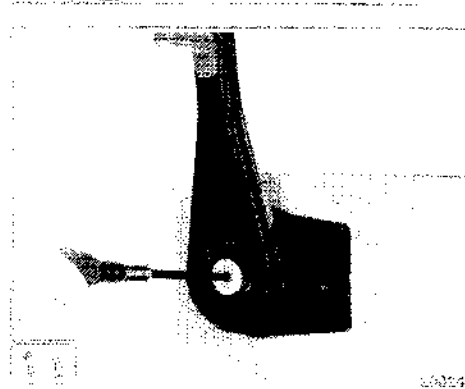
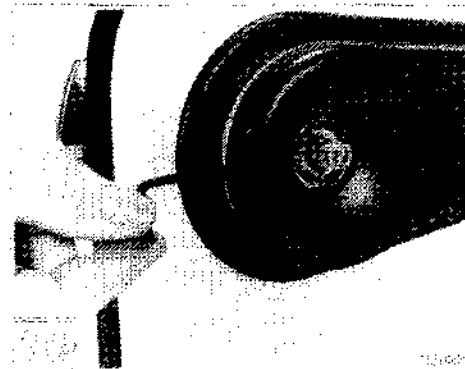
11. Reconnect battery cables. Check for proper trim function.

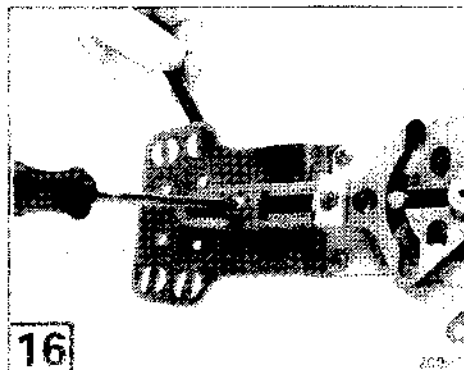
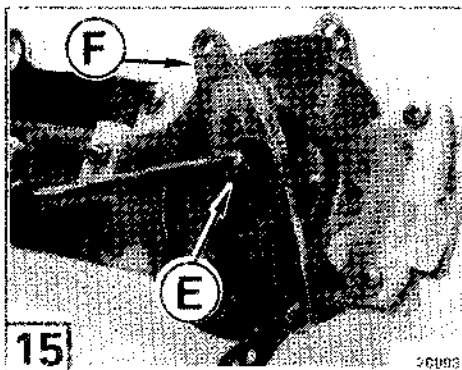
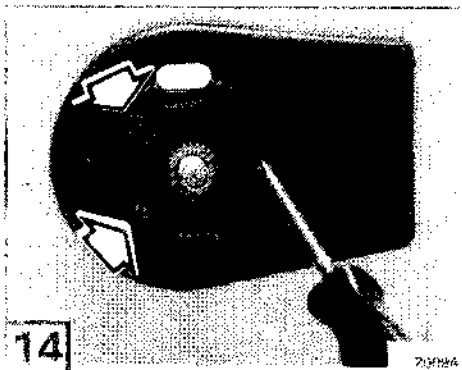
⚠ **Check that remote control handle operates freely, and that warm-up function works properly.**

Disassembly of Remote Control

⚠ 1. Disconnect battery cables at battery before servicing electrical systems. Failure to do so could result in injury from:

- ignition sources (sparks), causing possible fire and explosion from fumes in the engine compartment.
- contact with moving parts, if engine is accidentally cranked or started.





13. 2. Cut tie strap and disconnect neutral start switch and trim switch leads.

3. Remove control handle. Refer to section Trim Switch Replacement for removal of handle.

14. 4. Remove the three mounting screws attaching remote control to boat.

5. Remove remote control assembly and control cables from boat.

6. Disconnect throttle and shift cables from control.

15. 7. Remove throttle arm mounting screw, washer (F) and throttle arm (E).

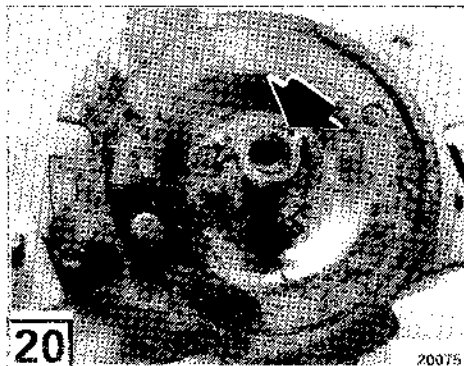
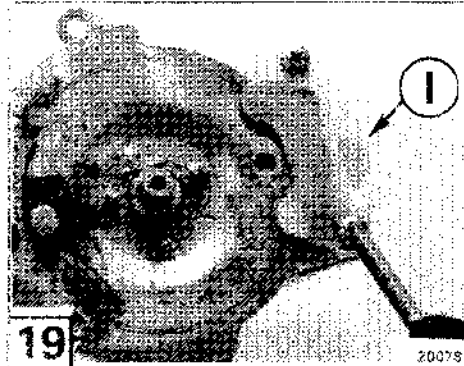
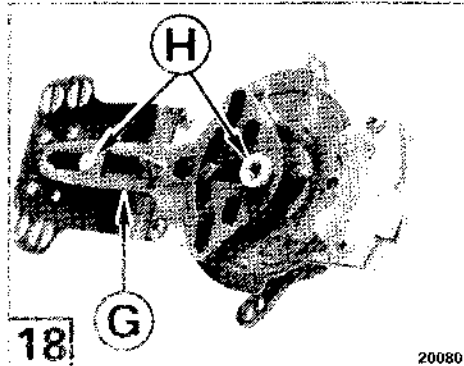
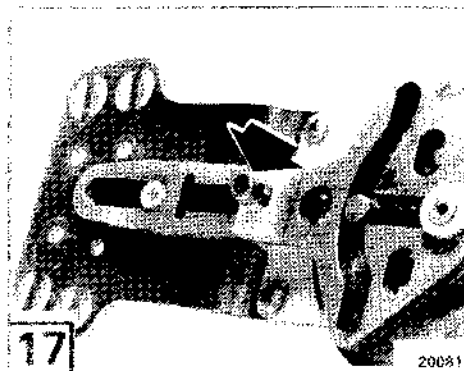
16. 8. Remove throttle cam mounting screw, washer and locknut.

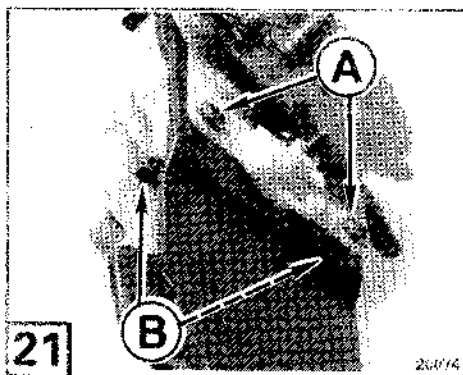
17. 9. Remove friction control cap locknut.

18. 10. Remove throttle cam (G) and two cam spacers (H).

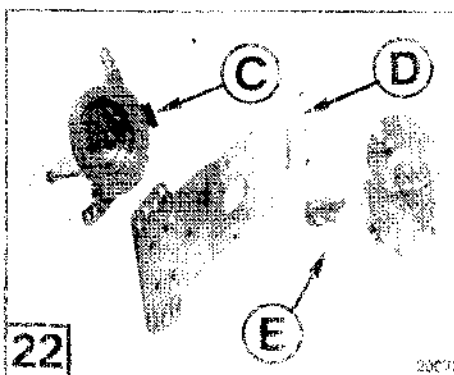
19. 11. Remove two driveshaft to plate mounting screws, locknuts and shoe (I).

20. 12. Remove throttle arm spacer.

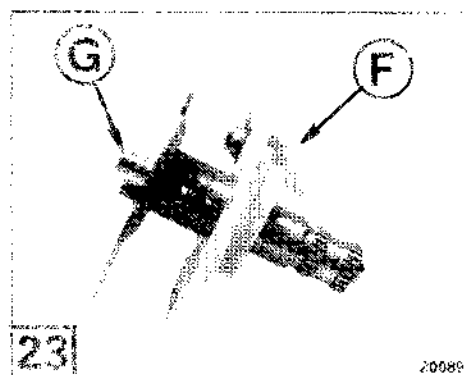




21 13. Remove driveshaft spacer mounting screws (A) and lock-nuts (B).

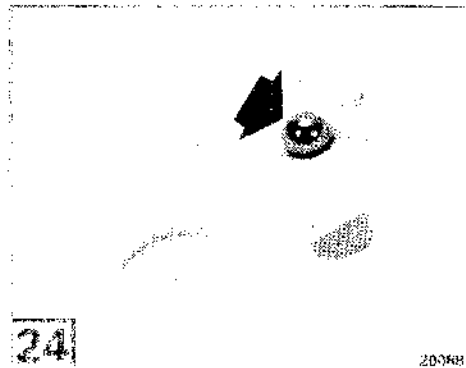


22 14. Separate spacer assembly (C), plate (D) and driveshaft assembly (E).

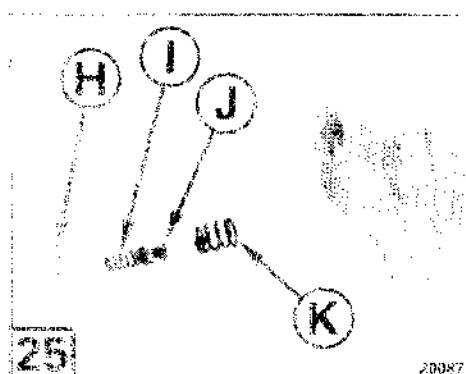


23 15. Remove driveshaft spacer (F) from driveshaft (G).

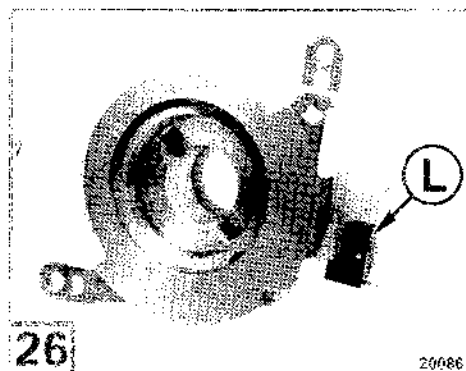
24 16. Remove neutral detent ball.



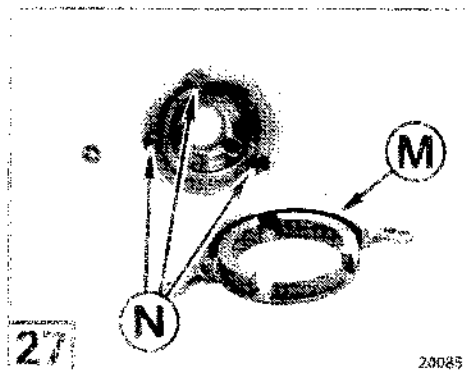
25 17. Remove neutral detent shoe (H), spring (I), screw, nut (J) and outer spring (K) from spacer.

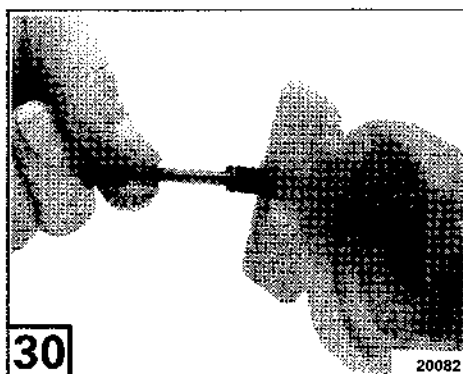
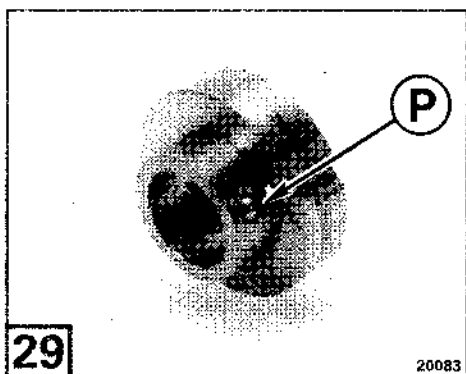
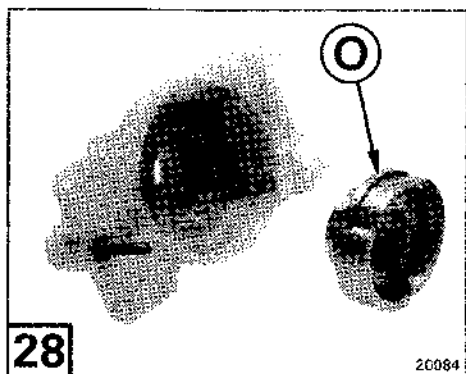


26 18. Remove neutral start switch (L).



27 19. Remove shift lever (M) and three shift cam rollers (N).





28 20. Remove shift lever cam (O).

29 21. Remove shift lever roller (P).

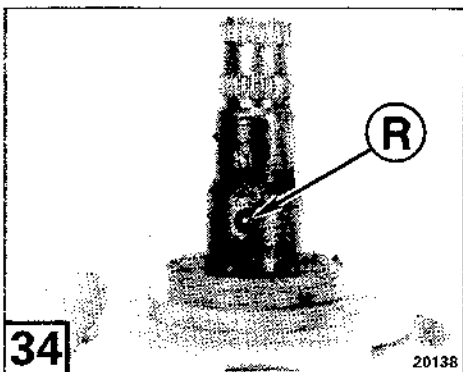
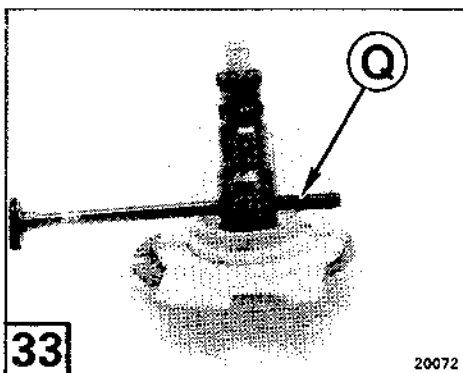
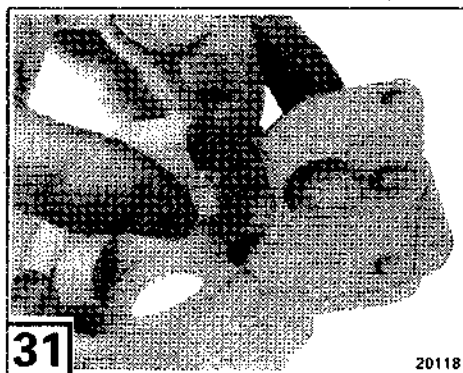
30 22. Remove throttle friction screw and spring.

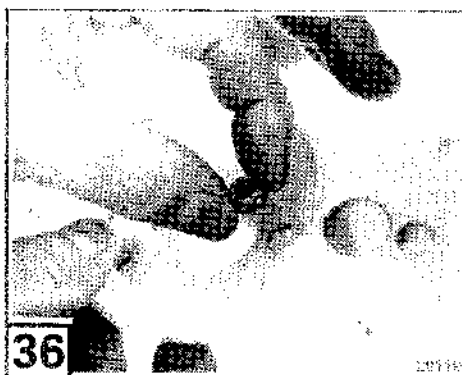
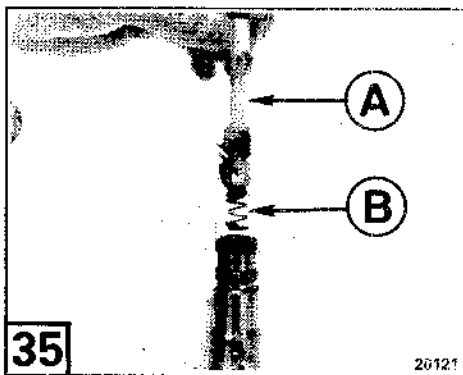
31 23. Remove spacer nut.

32 24. Remove mounting locknut.

33 25 Remove shift drive pin (Q).

34 26. Remove shift lever ball (R) from driveshaft.





- 35** 27. Remove the neutral warm-up rod (A) and spring (B) from driveshaft.

Cleaning, Inspection and Repair

Remove electrical components and disassemble mechanical parts. Clean mechanical parts in solvent but **DO NOT** immerse electrical components in solvent. Continuity of wiring and electrical components can be checked with a test light or ohmmeter. Replace any component that has failed.

Inspect mechanical parts for wear or cracks. Replace worn or broken parts.

Assembly of Remote Control

⚠ Failure to follow assembly instructions closely could result in operator losing control of engine speed or direction of propeller thrust.

Note Lubricate friction points on mechanical parts with *OMC Moly Lube*.

- 36** 1. Install locknut (flat side down) into driveshaft support mounting hole.

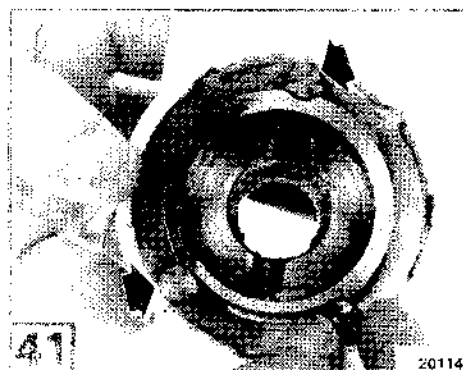
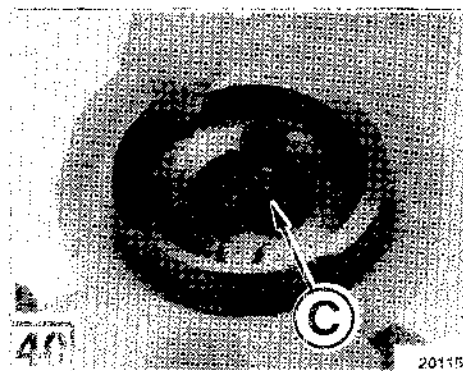
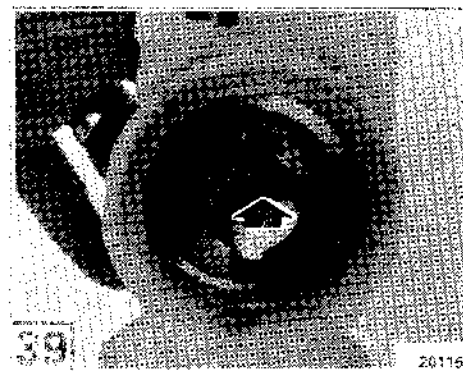
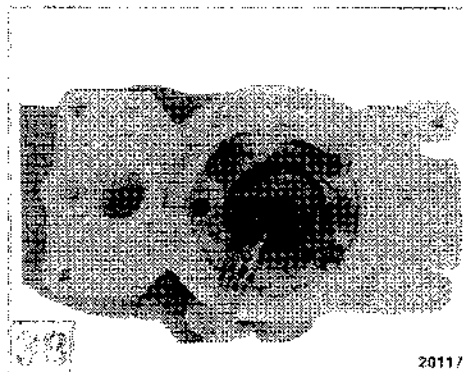
- 37** 2. Install control mounting screw spacer into support hole on top of the locknut.

- 38** 3. Grease the driveshaft slot and the shift lever cam surface.

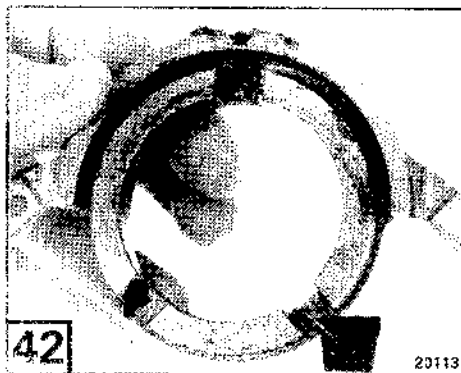
- 39** 4. Install the shift lever cam into the support. Rotate the cam so the cam roller hole is in line with the slot in the support.

- 40** 5. Install the cam roller (C) into the shift lever cam hole.

- 41** 6. Install three shift lever rollers, and position rollers as shown. Do not grease rollers.

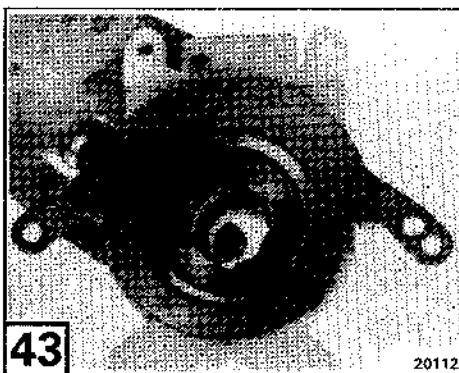


Safety Related



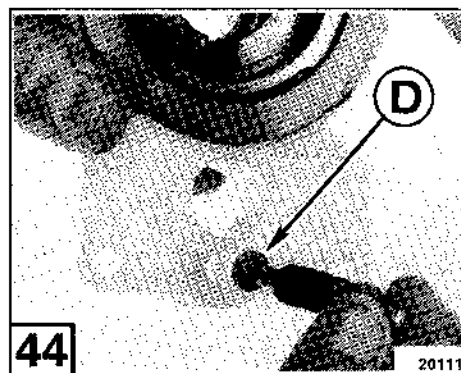
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42 7. Grease outside of shift lever, as shown.

43 8. Install shift lever onto support, and position lever as shown.

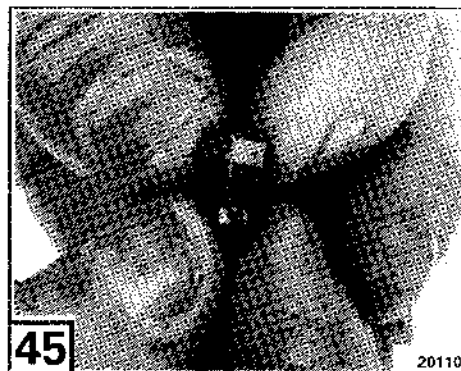
44 9. Install friction spring onto throttle friction control screw, then install screw with flat end of screw ④ into support as shown.

45 10. Install neutral detent nut onto neutral screw. **Screw has left-handed threads.**

46 11. Install screw and nut into driveshaft plate retaining hole. Install screw head into hole as shown. Make sure screw seats in hole.

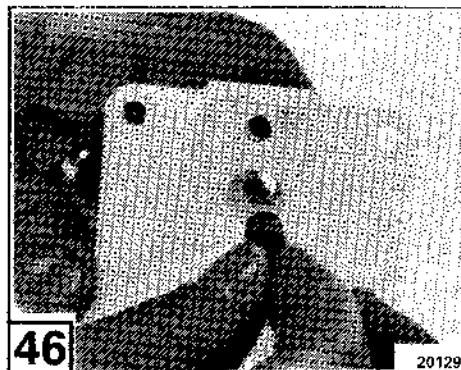
47 12. Grease neutral detent inner spring, then install spring into support hole, centering spring around screw.

48 13. Grease neutral detent outer spring, then install spring into support hole, centering spring around inner spring.



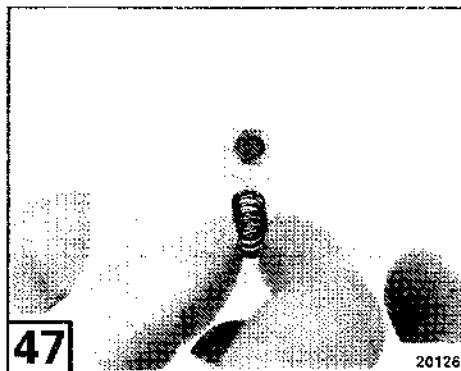
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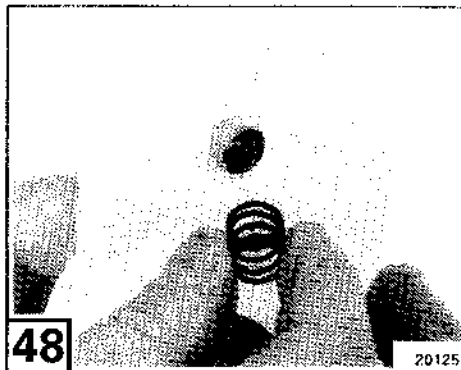
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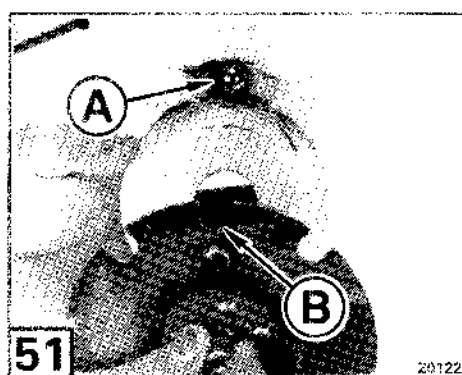
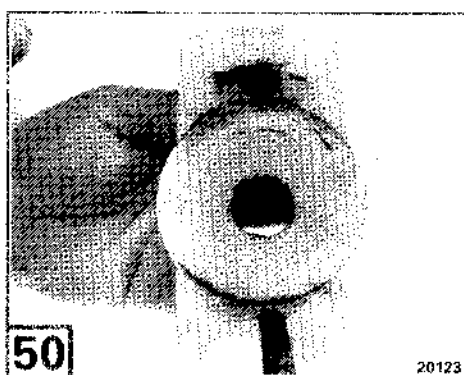
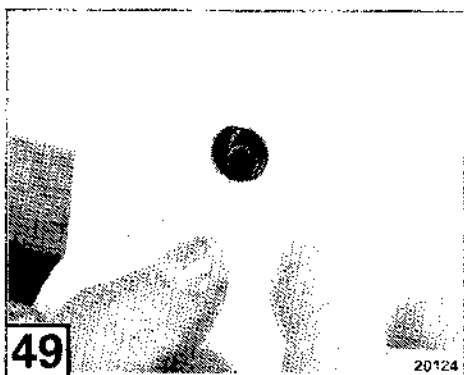
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49 14. Install neutral detent shoe on top of outer spring in support hole.

50 15. Grease neutral detent shoe and both sides of spacer surface, as shown.

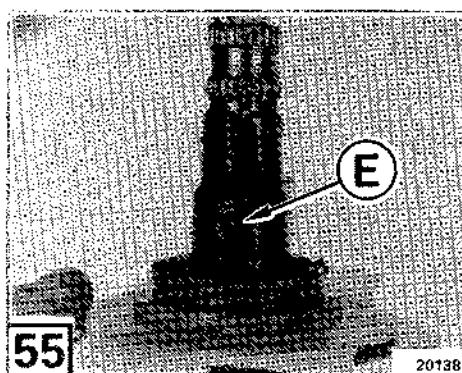
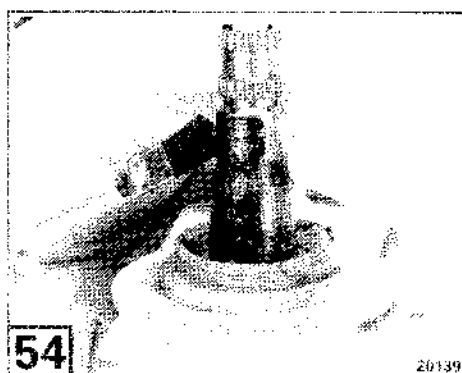
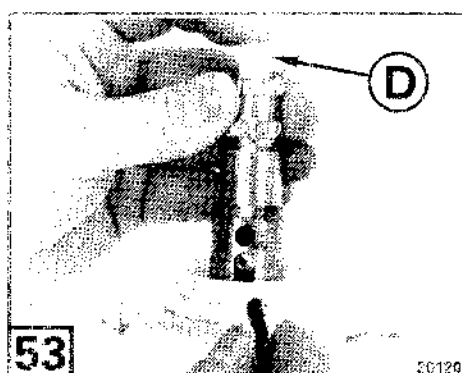
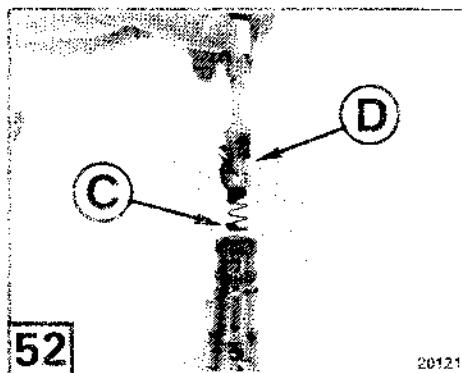
51 16. Install the neutral detent ball (A) onto the neutral detent shoe. Install the driveshaft into the driveshaft spacer aligning the neutral slot (B) with the neutral detent ball.

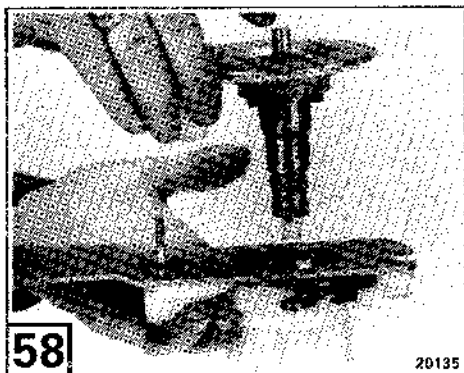
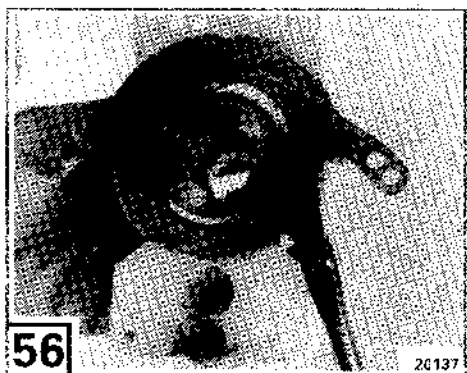
52 17. Grease the warm-up spring (C), and end of warm-up rod (D) and place spring on end of rod. Insert rod and spring into driveshaft hole.

53 18. Depress warm-up rod (D) then install pin into driveshaft hole, locking warm-up rod in place.

54 19. Grease spacer and driveshaft bearing surface, as shown.

55 20. Install shift lever ball into driveshaft hole (E).



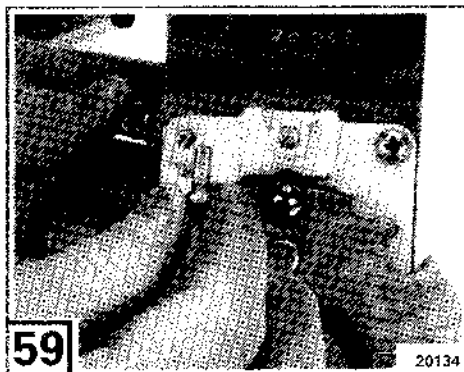


56 21. Grease the shift lever surface, as shown.

57 22. Install the cable mounting plate onto the shift lever, as shown.

58 23. Install the driveshaft assembly into the spacer and mounting plate assembly.

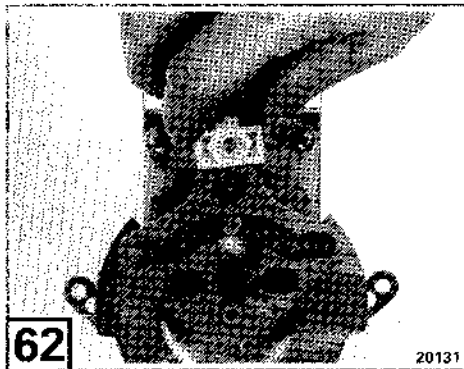
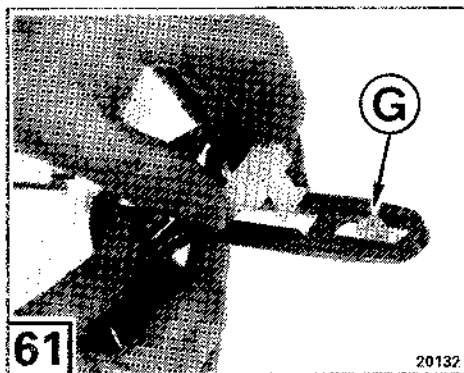
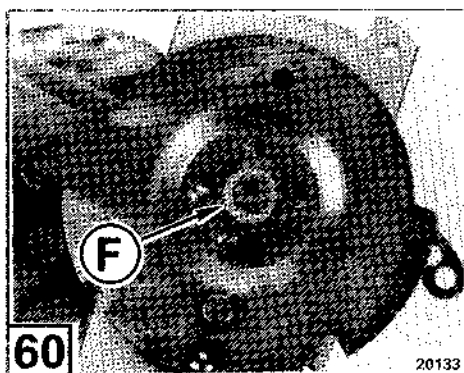
59 24. Install two spacer and plate mounting screws and lock-nuts. Tighten screws securely.

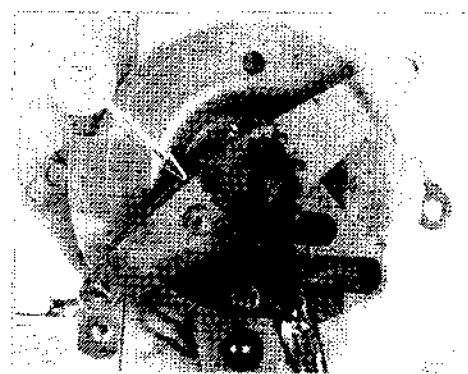
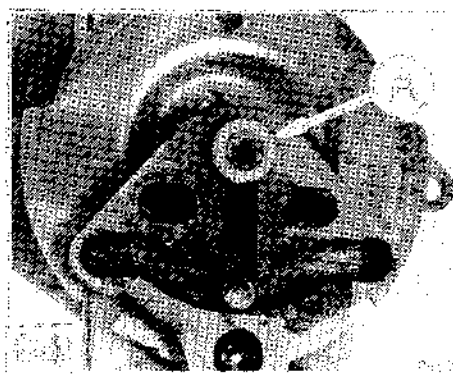
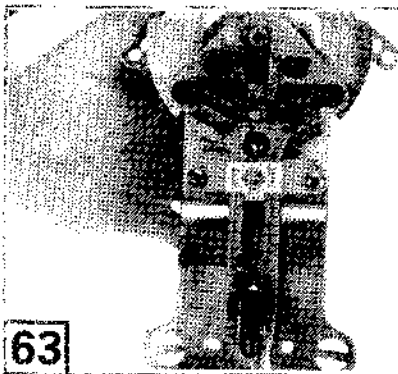


60 25. Install throttle arm spacer **F** onto driveshaft plate.

61 26. Install throttle cam bushing **G** into throttle cam slot. Turn cam over and install friction control cap into the slot in the throttle cam.

62 27. Install throttle cam assembly onto driveshaft plate, as shown.





63 28. Grease both ends of the throttle cam, as shown.

64 29. Install throttle arm spacer  onto driveshaft plate.

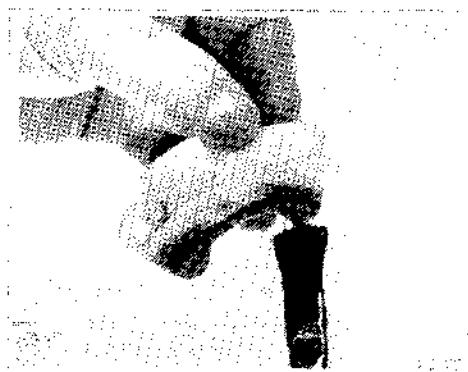
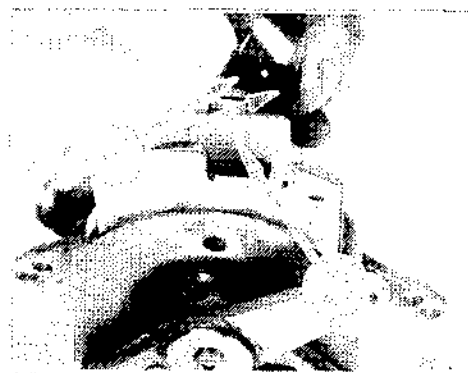
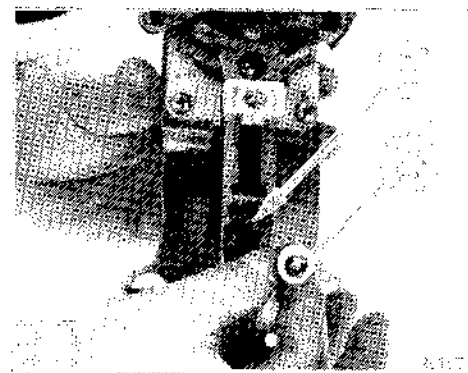
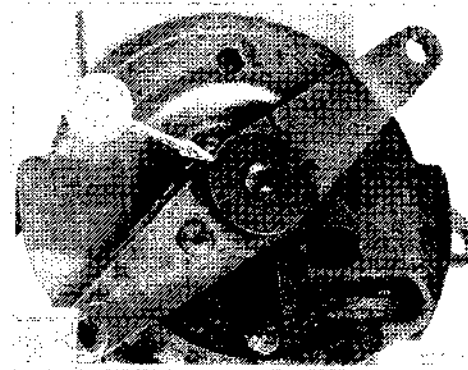
65 30. Install the throttle arm  onto the driveshaft bushing, then grease the center area of the throttle arm.

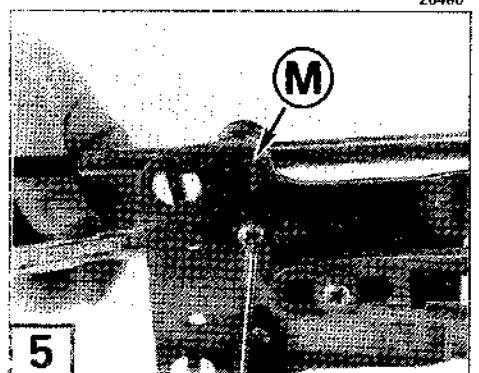
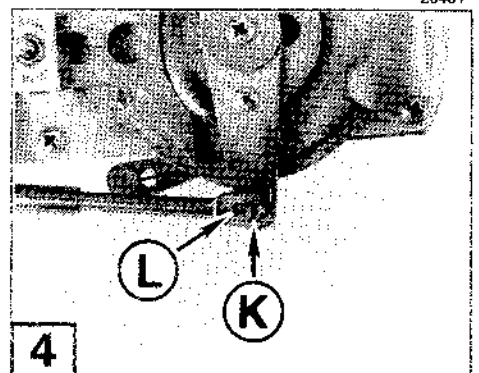
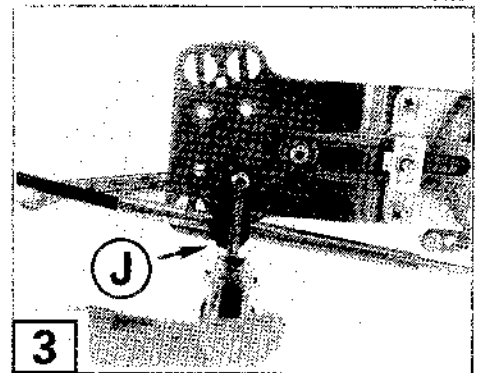
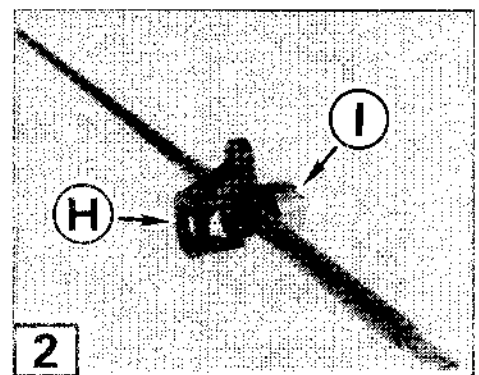
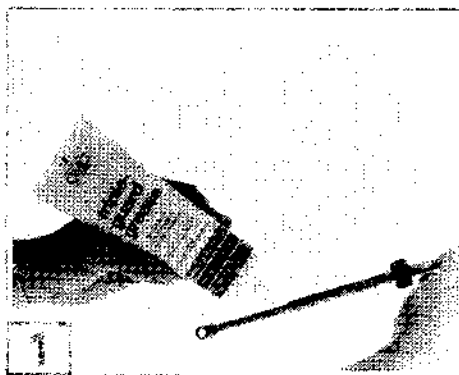
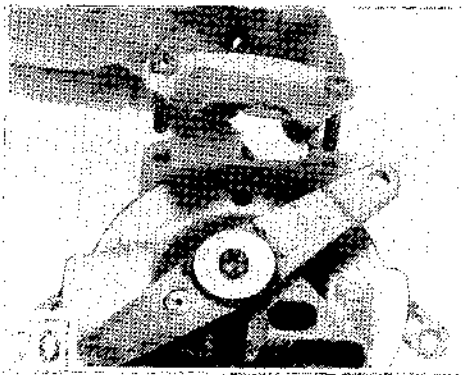
66 31. Install throttle arm screw and washer , then tighten screw securely.

67 32. Install throttle cam screw and washer  into throttle cam bushing , then tighten screw securely.

68 33. Install neutral start switch, aligning the two plastic pins  on the driveshaft spacer with the two holes  in the switch.

69 34. Grease the inside surface of the driveshaft shoe.





35. Install driveshaft shoe with two mounting screws and washers, tighten screws securely.

Installation of OMC Cables to Remote Control

Throttle Cable Installation

1. Lubricate shift and throttle cables ends with *OMC Triple-Guard®* grease.
2. Install throttle cable trunnion into anchor (H). Install anchor (I) on cable trunnion.
3. Insert anchor into forward spacer plate mounting hole (J). Install screw and locknut, and **tighten screw securely**.

Note When installing OMC remote control cables, attach trunnion only to the forward mounting hole (J). The rear mounting hole is used exclusively for SAE cables. If cable mounting positions are reversed, the cable will bind and prevent gear engagement.

4. Pull cable forward aligning cable end with the hole in the throttle arm. Install cable pin (K) and insert cotter pin (L). **Secure attachment by spreading ends of cotter pin.**

Shift Cable Installation

1. Install shift cable trunnion into anchor (M). Install anchor (I) on cable trunnion.
2. Insert anchor into spacer plate mounting hole (N). Install screw and locknut, then **tighten screw securely**.

Note When installing OMC remote control cables, attach trunnion only to the forward mounting hole (M). The rear mounting hole is used exclusively for SAE cables. If cable mounting positions are reversed, the cable will bind and prevent gear engagement.

- 6**  3. Pull cable end forward aligning cable end with the inner hole **A** in the shift arm. Install cable pin **B** and insert cotter pin **C**. **Secure attachment by spreading ends of cotter pin.**

⚠ 4. Check that remote control operates freely, warm-up function returns freely, and equal friction is felt in forward and reverse travel of control handle. Any binding could cause remote control to jam when cables are attached to boat and engine.

5. Attach the remote control to the boat and reconnect the neutral switch leads and trim leads.

6. Reconnect battery cables.

7. Check for proper trim friction.

Replacement of Remote Control Cables

Should it become necessary to remove or replace the remote control cables, the attachment at the engine is very important. Follow these steps for removal and installation of remote control cables.

Throttle Cable Removal From Remote Control

1. Shift remote control handle into **Neutral** detent position; propeller should rotate freely.

2. Follow Steps 1 thru 6 in the **Disassembly of Remote Control** section in this chapter.

3. Remove throttle cable from the remote control assembly.

Throttle Cable Removal From Engine

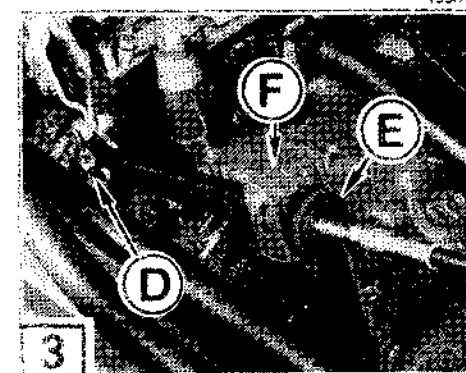
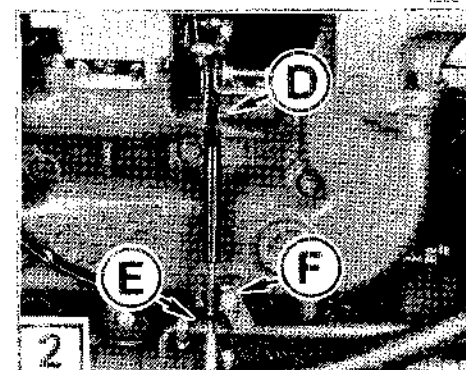
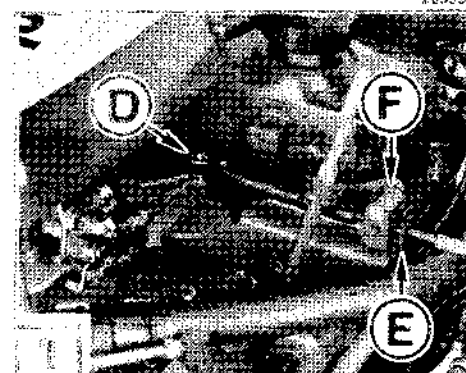
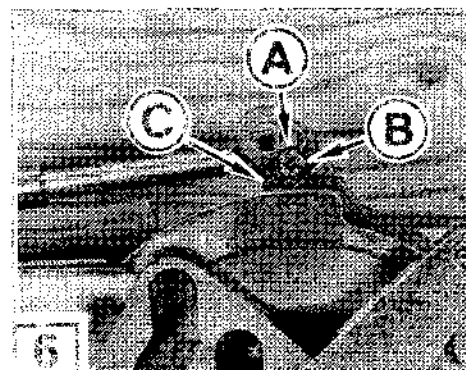
1 → **3** 1. Remove cotter pin and flat washer **D** from carburetor arm.

1 → **3** 2. Loosen anchor retainer screw and rotate retainer away from cable trunnion **E**. Remove throttle cable from carburetor and anchor bracket **F**.

Throttle Cable Installation and Adjustment

Install throttle cable into the remote control following **Installation Of OMC Control Cables** instructions in this section.

When using non-OMC remote controls: Follow the remote control manufacturer's installation instructions for attachment of the throttle cable.



Note Both the transom bracket and remote control shift cables must be installed and adjusted prior to throttle cable installation and adjustment. This will ensure proper throttle and shift system operation when using single lever controls.

When using OMC remote controls: Position remote control handle in neutral and rotate propeller to verify neutral position. Move control handle into forward detent (into forward gear), and then **HALFWAY BACK** to neutral. This positions control for proper throttle adjustment.

Note Failure to follow this positioning procedure for throttle adjustment, before attaching throttle cable at carburetor, can result in binding of the shift linkage in the remote control, and produce "hard shifting" when coming out of neutral detent.

1. Make sure carburetor throttle lever is against idle stop.

4  2. Apply *OMC Triple-Guard* grease to throttle lever pin. Connect casing guide to throttle arm with washer and cotter pin **G**. Flat side of casing guide must face away from carburetor throttle lever. **Spread ends of cotter pin for secure attachment.**

5 3. Grasp throttle cable trunnion nut **H** and pull firmly to remove backlash from cable and control. Unless backlash is removed before adjusting throttle cable, engine may not return to a consistent idle speed.

5  4. While holding throttle closed, turn trunnion nut until trunnion fits in anchor bracket **I**. **Turn anchor bracket retainer over trunnion and tighten nut.**

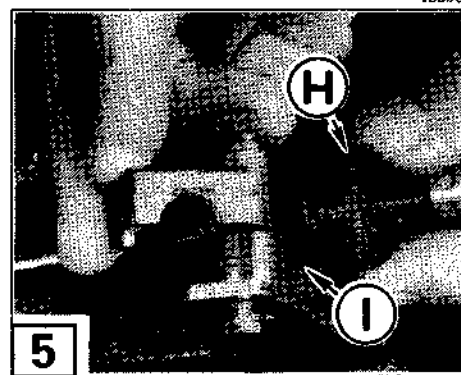
Note Under actual operating conditions, it may be necessary to adjust idle stop screw for proper idle speed, and readjust trunnion nut to get a consistent return to idle speed without excessive cable tension. Refer to appropriate service manual section for recommended idle speed.

Shift Cable Removal From Remote Control

1. Shift remote control handle into **NEUTRAL** detent position; propeller should rotate freely.

2. Follow Steps 1 thru 6 in the Disassembly of Remote Control section in this section.

3. Remove shift cable from the remote control assembly.



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Shift Cable Removal From Engine

- 6** 1. Remove cotter pin and washer **A** from the top pin of the shift lever.
- 6** 2. Loosen anchor block screw and retainer **B**. Remove shift cable.

Shift System Installation and Adjustment Procedure

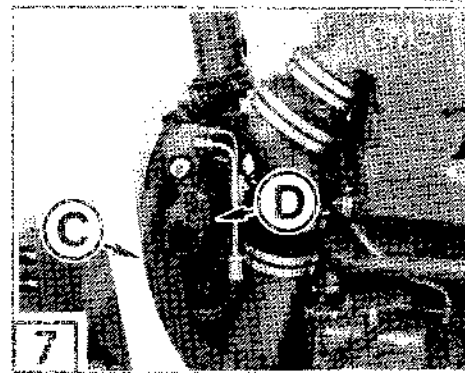
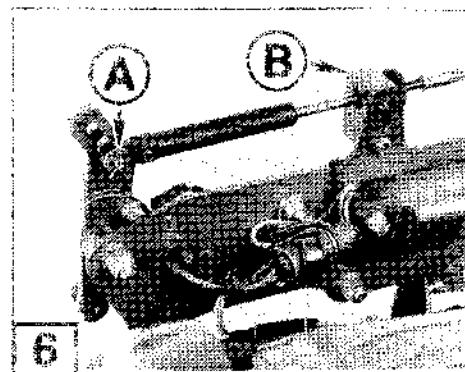
Note Prior to installing and adjusting shift system, the following conditions must be met:

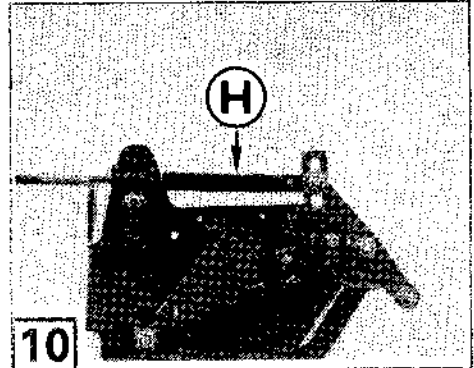
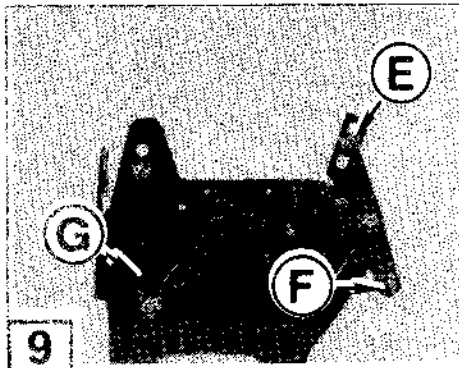
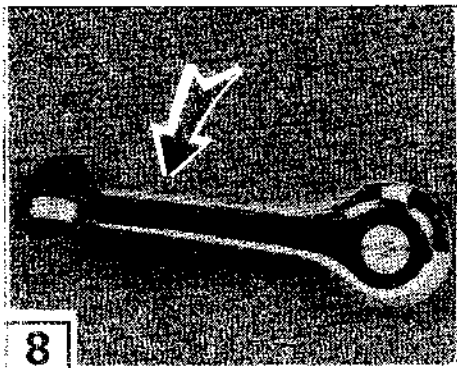
- Vertical drive must be installed.
- Throttle cable must be disconnected from carburetor.
- Transom bracket shift cable must be disconnected from engine shift bracket.
- Remote control shift cable must be disconnected from engine shift bracket.

This will ensure proper adjustment and operation of the shift system.

Note The shift cable must not be secured to the transom or routed in a manner which binds the cable and prevents the operation of the Electronic Shift Assist System.

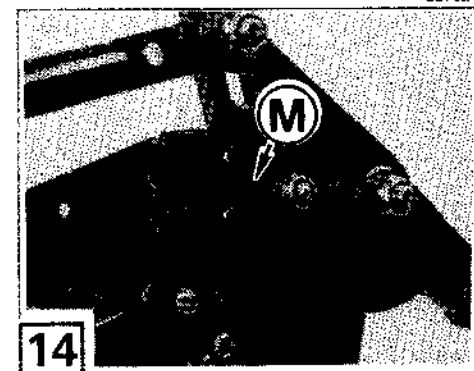
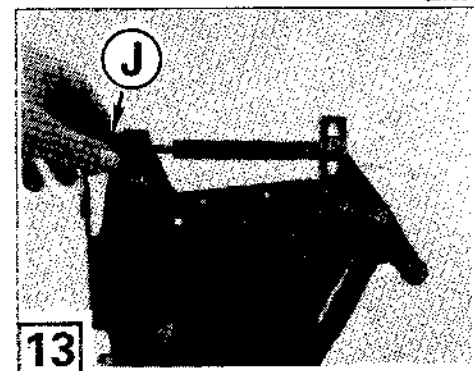
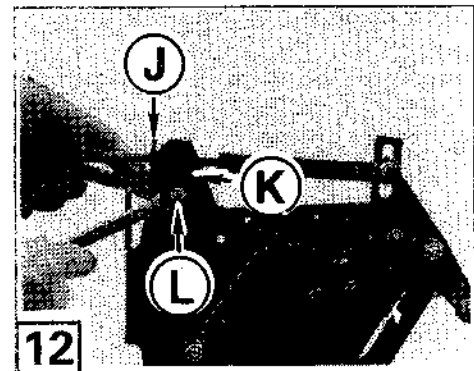
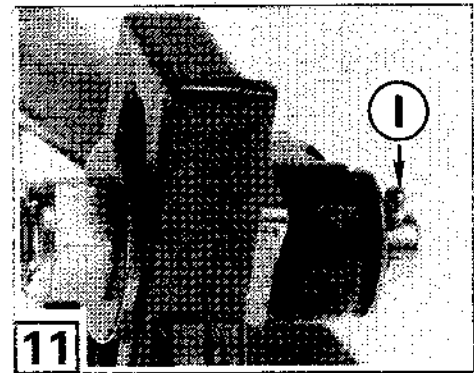
- 7** **All Except 2.3 L Models:** Route transom shift cable **C** behind either the power steering **D** or the mechanical steering assembly. If this should result in interference with the steering assembly, the shift cable may be routed in front of either steering assembly. **2.3 L Models:** route transom bracket shift cable only in front of steering assembly.

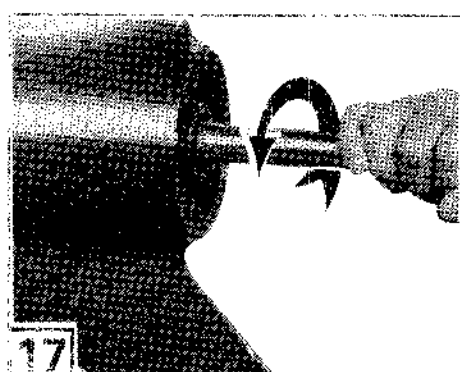
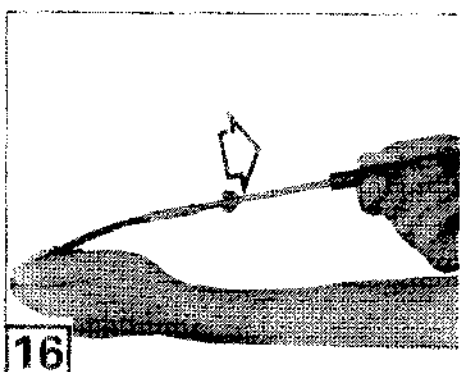
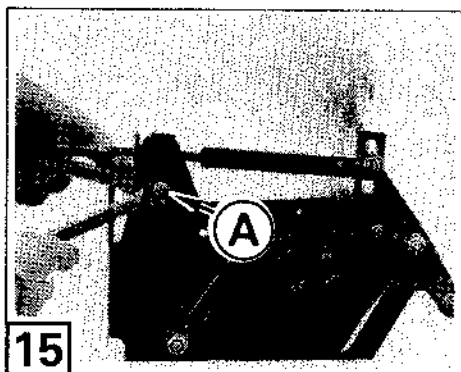




Remote Control Shift Cable Adjustment

1. Shift remote control into **FORWARD** and move remote control handle to full-throttle position.
2. Apply *OMC Triple-Guard®* grease to upper shift pin (E), lower shift pin (F), and actuator anchor (G).
3. Attach remote control shift cable (H) to upper pin of shift lever. Secure with flat washer and cotter pin (I). **Spread ends of cotter pin.**
4. Install remote control cable trunnion (J) into anchor block (K). After nut (L) has been tightened, loosen nut one-half turn for adjustment of trunnion.
5. Adjust remote control cable trunnion (J) to align center of fixed (upper) cam with switch button (M).





- 15** 6. Retighten anchor block nut **A** securely.

Transom Shift Cable adjustment

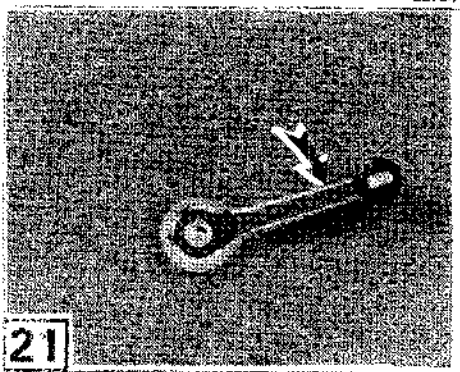
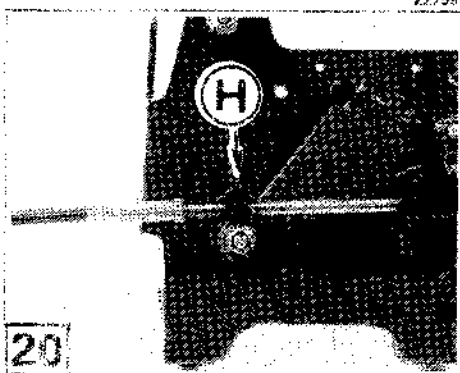
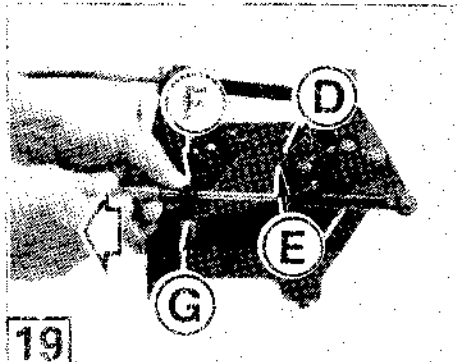
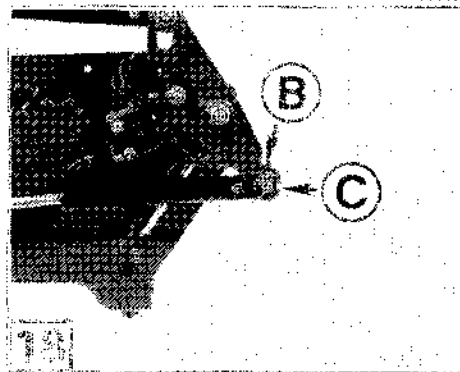
- 16** **17** 7. Pull transom shift cable to shift lower gearcase into **FORWARD** gear while rotating propeller shaft to fully engage clutch dog with forward gear. Propeller shaft will not rotate when in full engagement.

- 18**  8. Attach transom shift cable to lower shift lever pin **B** and secure with flat washer and cotter pin **C**. **Spread ends of cotter pin.**

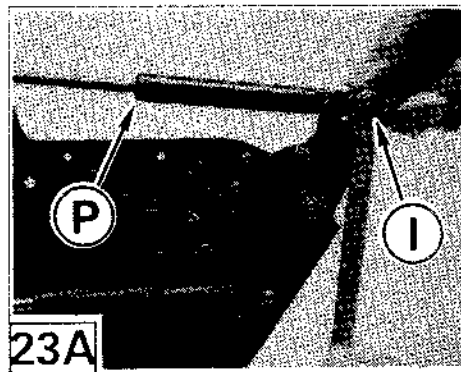
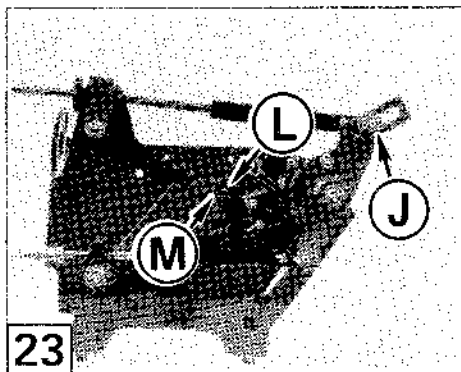
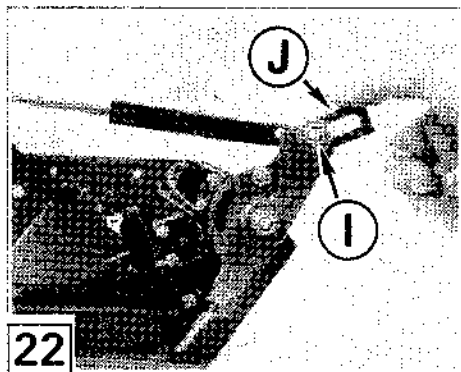
- 19** 9. Position switch roller **D** in center of V-notch **E**. While pulling transom shift cable back to remove end play from shift cables, adjust trunnion **F** to align with actuator anchor **G**.

- 20**  10. Install trunnion into actuator anchor and secure with cotter pin **H**. **Spread ends of cotter pin.**

- 21** **17** 11. Shift remote control into **REVERSE** while rotating propeller shaft. Move control handle to full-throttle position.



Safety Related



22 23 12. Loosen locknut (I). Push shift lever (J) down while rotating the propeller shaft to fully engage the clutch dog with reverse gear. Propeller shaft will not rotate when in full engagement. Release shift lever (J) to position switch roller (L) in center of V-notch (M).

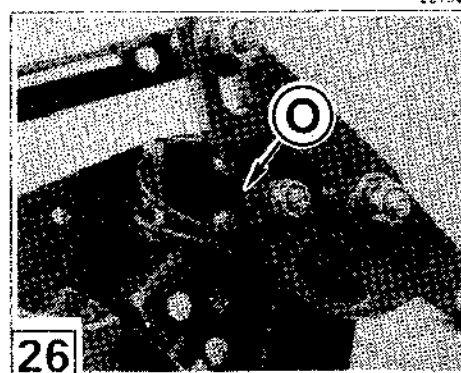
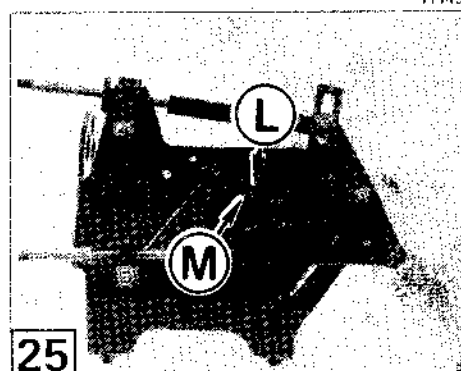
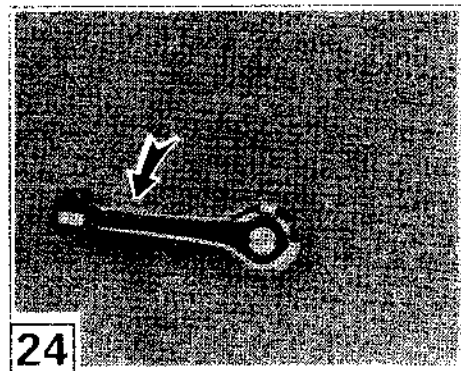
23A 13. Pull plastic cable guide (P) back and push down on shift lever to remove end play from cables. Retighten locknut (I) securely.

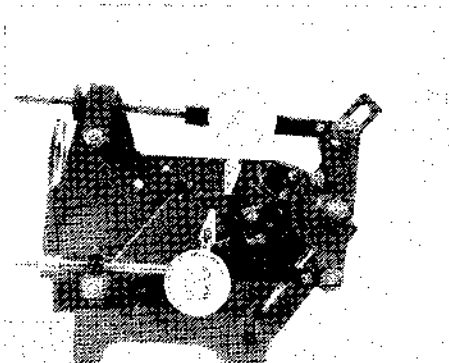
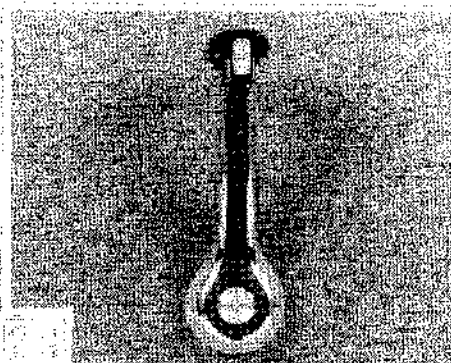
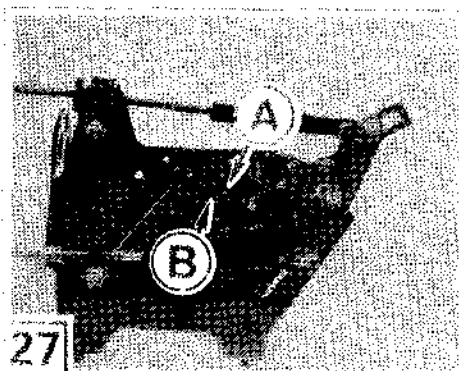
Adjustment Checks

24 17 14. **Check forward adjustment.** Shift remote control handle into **FORWARD** while rotating propeller shaft to fully engage clutch dog with forward gear. Move remote control handle to full-throttle position.

25 26 15. Switch roller (L) should be centered in V-notch (M) and center of fixed cam should depress switch button (O). If not, recheck Steps 4 thru 6, and Step 9.

21 17 16. **Check reverse adjustment.** Shift remote control handle into **REVERSE** while rotating propeller shaft to fully engage clutch dog and reverse gear. Move remote control handle to full-throttle position.





27 17. Switch roller **A** should be centered in V-notch **B**. If not, recheck Steps 11 thru 13.

28 29 18. Check neutral adjustment. Shift remote control handle into **NEUTRAL**. Switch roller **A** should be centered in V-notch **B** and propeller should rotate freely. If not, recheck entire adjustment procedure.

Electronic Shift Assist Switching Cable

Testing Interrupter Switch

Note Turn off ignition switch and disconnect battery while testing.

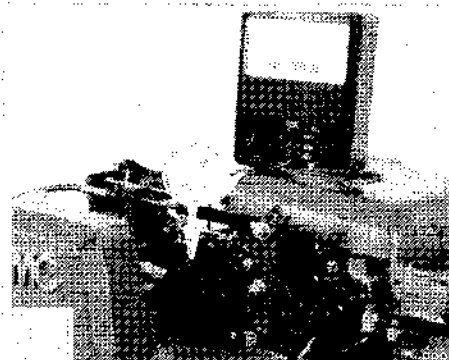
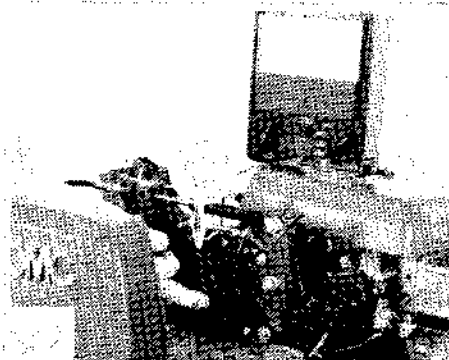
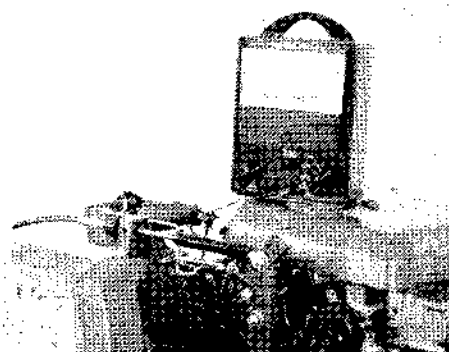
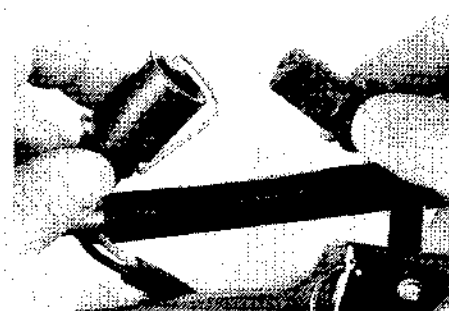
30 1. Remove the wire retainer and disconnect the plug from the receptacle located behind the shift cable bracket.

2. Insert test probes into the male connector plug cavities marked "C and "D" (blue leads), then attach probe leads to an ohmmeter.

31 3. To test the continuity, calibrate on ohmmeter on high ohms scale. With the control system in neutral, the ohmmeter must show an infinity (∞) reading.

32 33 4. Manually lower and raise the load lever **C**. The meter must show a ZERO (0) reading when the lever is held in each direction.

5. If the meter does not show ZERO, check the wire and probe connections at the rubber plug and test again. Replace the interrupter switch if the meter still fails to show ZERO.



Testing Overstroke Switch

1. Move the test probes to the cavities "A" and "B" (black leads) of the plug connector, then attach an ohmmeter. With the control system in **NEUTRAL**, the meter must show a **ZERO** reading.

- 34 2. Manually depress the overstroke switch stud . The meter must show infinity (∞).

If the meter does not show ∞ , check the wire and probe connections at the plug and test again. Replace the overstroke switch if the meter still fails to show ∞ .

Reconnect battery and test shift system in actual operation on water.

Transom Bracket Shift Cable

Removal at Engine Bracket

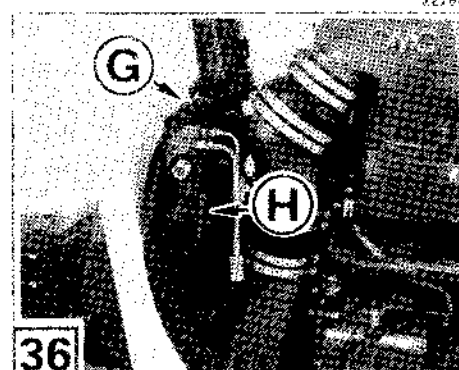
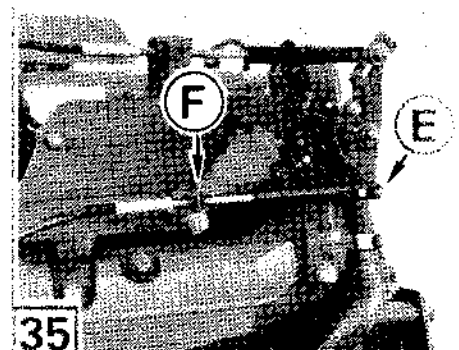
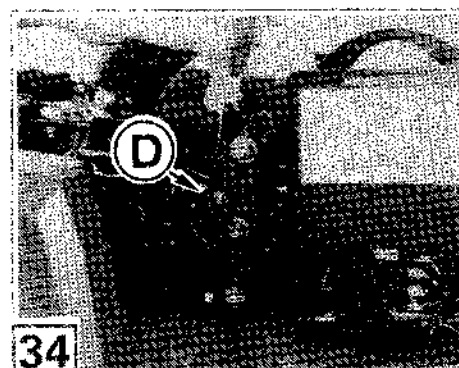
- 35 1. Remove cotter pin and washer  securing casing guide to shift lever pin.
- 35 2. Remove cotter pin  securing cable trunnion to load sensing lever. Pull cable off shift lever and bracket.

Installation at Engine Bracket

Note If cable was just disconnected and not replaced, follow steps 1 thru 4 below. If cable was replaced, go on to section titled *Transom Bracket Shift Cable Adjustment* in Section 6 - Transom Bracket.

- 36 1. **All Models Except 2.3 Litre:** Route shift cable  between exhaust pipe and flywheel housing, below starter, and behind either the power or mechanical steering assembly . If this should result in interference, the shift cable may be routed in front of either steering assembly as long as the operation of the electronic shift assist mechanism is not adversely affected. **2.3 Litre Models:** Route shift cable only in front of steering assembly.

Note Clean paint off inside of anchor pocket. Check cable trunnion for out-of-round condition. **Trunnion must be free to pivot in anchor pocket without restriction.**



Transom Bracket Shift Cable Adjustment

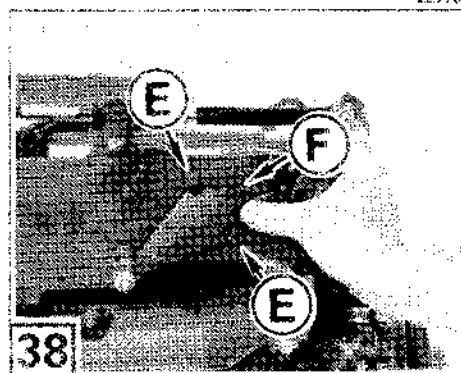
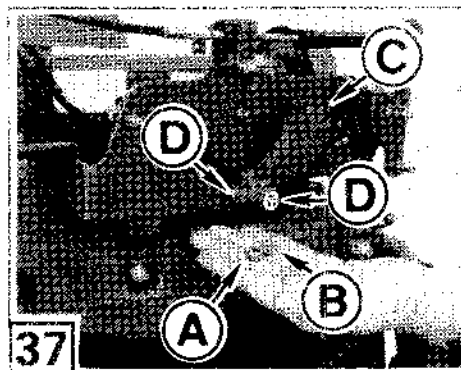
Note Whenever the shift cable is replaced, the cable must be adjusted prior to attachment at the engine shift bracket to ensure full range of travel and proper neutral position. Refer to the transom bracket shift cable adjustment procedures in Section 3 - Transom Bracket.

Install the shift cable to the engine shift bracket and adjust the shift system following the Shift System Installation and Adjustment Procedure in this section.

Load Sensing Lever Lubrication

Remove transom bracket cable from load sensing lever pocket. Manually push lever in both directions and release it. If lever does not immediately return to a NEUTRAL position, pivot shaft and bushings require lubrication.

- 37** 1. Remove and discard elastic locknut **A**. Slide flat washer **B**, lever **C** and two bushings **D** off pivot shaft.
2. Clean shaft and lubricate it with *OMC Triple-Guard* grease.
- 38** 3. Insert a nylon bushing in each side of lever. Slide onto shaft and position it between the two spring stops **E**. Lift up interrupter switch arm and push lever all the way onto shaft. Interrupter arm roller **F** must rest in notch of lever.



-  **4. Place flat washer on shaft and install new elastic locknut. Tighten nut to a torque of 6-8 ft. lbs. (8-11 N-m). Recheck lever movement before installing transom bracket shift cable.**

Troubleshooting the Shift System

To locate and solve shifting problems, isolate each of the following items to determine problem areas. Preferred testing is on the water under normal load conditions.

 **If a flushing adapter is used, a no load condition exists and clutch dog may not fully engage forward or reverse gear. When using a flushing adapter, shut off engine before shifting, then turn propeller shaft to ensure full gear engagement.**

Refer to the following pages for the procedures used to locate problems in these areas.

- A. Hard Shifting
- B. Ignition Interrupter Assembly
- C. Jumping Out of Gear



A. Hard Shifting

Hard shifting coming out of gear. Check "B"

Hard Shifting from Neutral Position

1. Disconnect throttle cable.
2. Run engine and shift remote controls.

YES

Hard Shifting

1. Disconnect remote control shift cable.
2. Run engine and manually shift. Shifting effort should not require more than 16 pounds @ 800 RPM. Use top pin of engine shift lever for test.

YES

Shifting Effort in Excess of 16 Pounds

Cause: shifting lever or vertical drive
Remove transom shift cable from shift lever only. Leave cable trunnion in load sensing lever. Run engine and manually shift. Shifting effort of cable should not require more than 14 pounds @ 800 RPM.

YES

Shifting Effort in Excess of 14 Pounds

Cause: vertical drive or cable
Loosen six outdrive retaining nuts one full turn. Manually shift unit while manually turning propeller shaft. Shifting effort should not exceed 14 pounds.

YES

Shifting Effort in Excess of 14 Pounds

Cause: transom shift cable or lower gearcase
Remove vertical drive. Check operation of transom shift cable. Cable should operate smoothly and freely.

YES

Cable Not Smooth and Free

Cause: cable guide transom bellcrank or transom shift cable

1. Loosen lock screw of cable guide and check for free operation of cable.
2. If not smooth, check for binding in transom bellcrank or transom shift cable.
3. If smooth and free, reinstall shift cable to lower shift lever pin and secure trunnion into lower anchor block. Readjust shift cable, being sure cable guide is pushed forward into pivot housing while tightening lock screw.
4. Pigtailling of transom cable.

No Hard Shifting

Cause: throttle cable

1. Throttle cable trunnion out of adjustment
2. Carburetor idle stop screw out of adjustment
3. Carburetor idle screws out of adjustment
4. Wrong throttle cable length
5. Throttle cable routing
6. Installation of throttle cable in remote control

Unit Shifts Within Required 16 Pound Range

Cause: remote control shift cable

1. Remote shift cable trunnion anchor out of adjustment
2. Incorrect remote shift cable length
3. Incorrect remote shift cable routing
4. Incorrect installation of remote shift cable into control box
5. Remote control binding

Unit Shifts Within required 14 Pound Range

Cause: shifting lever

Inspect shifting components - they must be secure, lubricated and have a smooth movement.

Unit Shifts Within Required 14 Pound Range

Cause: shift guide pin binding against shift rod in vertical drive

Remove vertical drive and position guide pin per specifications of service manual.

Cable Operation is Smooth and Free

Cause: lower gearcase

1. Check shift rod height per specifications in service bulletin No. 4022 or service manual.
2. If shift rod height is within specifications, position shift rod in neutral position. Manually turn propeller shaft and pull shift lever "up" into forward. Shifting will require between 14 to 17 pounds. Reposition shift rod in neutral position. Manually turn propeller shaft and push shift lever "down" into reverse. Shifting will require between 14 to 17 pounds. If either reading is over the required specification, the lower gearcase shifting is at fault.