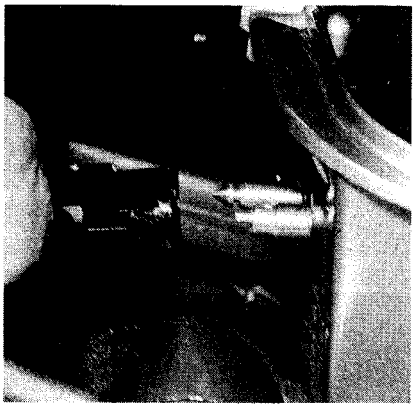


Fig. 27 Remove the fuel supply line fitting from the engine to check fuel flow (quick-connect shown)

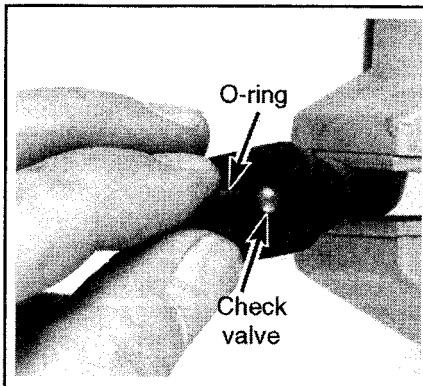


Fig. 28 Typical fuel quick-connector with O-ring and check valve visible

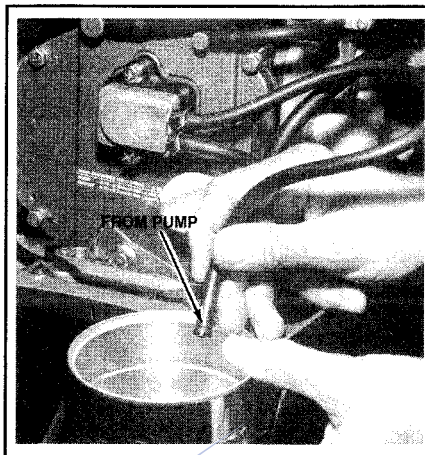


Fig. 29 Another method is to remove the fuel line at the fuel pump and check for flow

Fig. 30 Compressed air can be used to check for obstructions

3. Squeeze the primer bulb and observe if there is satisfactory fuel flow from the line. If there is no fuel discharged from the line, the check valve in the squeeze bulb may be defective, or there may be a break or obstruction in the fuel line.

4. If there is a good fuel flow, reconnect the tank-to-motor fuel supply line and disconnect the fuel line from the carburetor(s) or EFI vapor separator (basically the other end of the fuel pump output line), directing that line into a suitable container. Crank the powerhead. If the fuel pump is operating properly, a healthy stream of fuel should pulse out of the line. If sufficient fuel does not pulse from the line, compare flow at either side of the inline fuel filter (if equipped) or check the fuel pump.

5. Continue cranking the powerhead and catching the fuel for about 15 pulses to determine if the amount of fuel decreases with each pulse or maintains a constant amount. A decrease in the discharge indicates a restriction in the line. If the fuel line is plugged, the fuel stream may stop. If there is fuel in the fuel tank but no fuel flows out the fuel line while the powerhead is being cranked, the problem may be in one of several areas:

- Plugged fuel line from the fuel pump to the carburetor(s) or vapor separator tank (EFI).
- Defective O-ring in the fuel line connector into the fuel tank.
- Defective O-ring in the fuel line connector into the engine.
- Defective fuel pump.
- The line from the tank to the fuel pump may be plugged; the line may be leaking air; or the squeeze bulb may be defective.
- Defective fuel tank.

6. If the engine does not start even though there is adequate fuel flow from the fuel line, the fuel inlet needle valve and the seat may be gummed up, preventing adequate fuel flow into the float bowl or EFI vapor separator tank.

7. If a section of line is suspect as clogged, disconnect both ends and use compressed air to blow through the line checking for flow or obstructions. Though you may be able to clear some blockage using compressed air, it's usually a better idea to replace such a fuel hose.

Checking the Primer Bulb

◆ **See Figures 15, 17 and 31**

The way most outboards are rigged, fuel will evaporate from the system during periods of non-use (at least from the non high-pressure system on carburetor motors and that portion of the system on EFI motors). Also, anytime quick-connect fittings on portable tanks are removed, there is a chance that small amounts of fuel will escape and some air will make it into the fuel lines. For this reason, outboards are normally rigged with some method of priming the fuel system through a hand-operated pump (primer bulb).

When squeezed, the bulb forces fuel from inside the bulb, through the one-way check valve toward the motor filling the carburetor float bowl(s) or EFI vapor separator tank with the fuel necessary to start the motor. When the bulb is released, the one-way check valve on the opposite end (tank side of the bulb) opens under vacuum to draw fuel from the tank and refill the bulb.

When using the bulb, squeeze it gently as repetitive or forceful pumping may flood the carburetor(s) though we can't imagine it would do anything harmful with EFI motors, as the bulb would probably just get too hard to squeeze past a certain point). The bulb is operating normally if a few squeezes will cause it to become firm, meaning the float bowl/tank is full, and the float valve is closed. If the bulb collapses and does not regain its shape, the bulb must be replaced.

For the bulb to operate properly, both check valves must operate properly and the fuel lines from the check valves back to the tank or forward to the motor must be in good condition (properly sealed). To check the bulb and check valves use hand operated vacuum/pressure pump (available from most marine or automotive parts stores):

1. Remove the fuel hose from the tank and the motor, then remove the clamps for the fittings or quick-connect valves at the ends of the hose.

■ **Most fuel fittings and quick-connect valves are secured to the fuel supply hose using disposable plastic ties that must be cut and discarded for removal. If equipped, spring-type or threaded metal clamps may be reused, but be sure they are in good condition first. Do not over-tighten threaded clamps and crack the valve or cut the hose.**

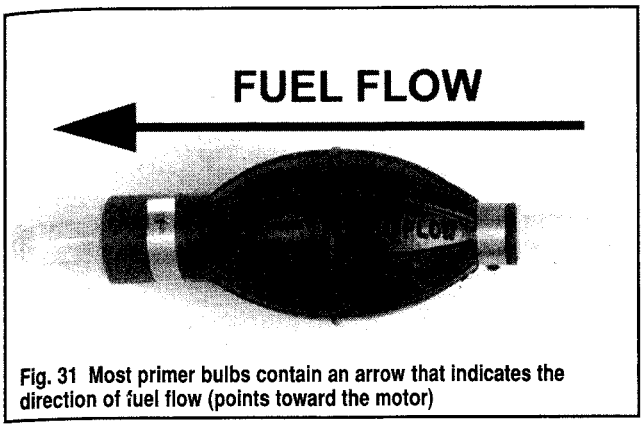


Fig. 31 Most primer bulbs contain an arrow that indicates the direction of fuel flow (points toward the motor)

2. Carefully remove the fitting or quick-connect valve from the motor side of the fuel line, then place the end of the line into the filler opening of the fuel tank. Gently pump the primer bulb to empty the hose into the fuel tank.

■ **Be careful when removing the fitting or quick-connect valve from the fuel line as fuel will likely still be present in the hose and will escape (drain or splash) if the valve is jerked from the line. Also, make sure the primer bulb is empty of fuel before proceeding.**

3. Next, remove the fitting or quick-connect valve from the tank side of the fuel line, draining any residual fuel into the tank.

■ **For proper orientation during testing or installation, the primer bulb is marked with an arrow that faces the engine side check valve.**

4. Securely connect the pressure pump to the hose on the tank side of the primer bulb. Using the pump, slowly apply pressure while listening for air escaping from the end of the hose that connects to the motor. If air escapes, both one-way check valves on the tank side and motor side of the prime bulb are opening.

5. If air escapes prior to the motor end of the hose, hold the bulb and check valve and hose connections under water (in a small bucket or tank). Apply additional air pressure using the pump and watch for escaping bubbles to determine what component or fitting is at fault. Repair the fitting or replace the defective hose/bulb component.

6. If no air escapes, attempt to draw a vacuum from the motor end of the primer bulb. The pump should draw and hold a vacuum, indicating that the tank side check valve is functioning and closed.

7. Securely connect the pressure pump to the motor side of the primer bulb. Using the pump, slowly apply pressure while listening for air escaping from the end of the hose that connects to the motor. This time, the check valve on the tank side of the primer bulb should remain closed, preventing air from escaping or pressurizing the bulb. If the bulb pressurizes, the motor side check valve is allowing pressure back into the bulb, but the tank side valve is not operating properly.

8. Replace the bulb and/or valves if they operate improperly.

SERVICE

EASY

◆ **See Figures 27, 31, 32 and 33**

Whenever work is performed on the fuel system, check all hoses for wear or damage. Replace hoses that are soft and spongy or ones that are hard and brittle. Fuel hoses should be smooth and free of surface cracks, and they should definitely not have split ends (there's a bad hair joke in there, but we won't sink that low). Do not cut the split ends of a hose and attempt to reuse it, whatever caused the split (most likely time and deterioration) will cause the new end to follow soon. Fuel hoses are safety items, don't scrimp on them, instead, replace them when necessary. If one hose is too old, check the rest, as they are likely also in need of replacement.

■ **When replacing fuel lines, make sure the inside diameter of the fuel hose and fitting is of sufficient size (generally 5/16 in./8mm or 3/8 in./9.5mm but use the original boat rigging as a starting point). Also, be certain to use only marine fuel line the meets or exceeds United States Coast Guard (USCG) A1 or B1 guidelines.**

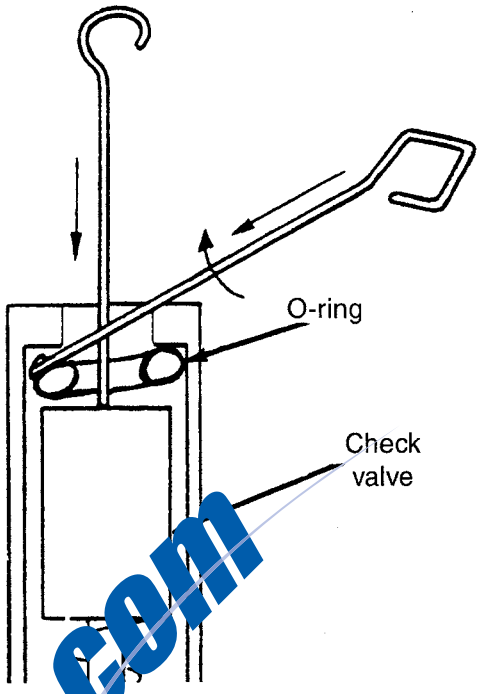


Fig. 32 Use two picks, punches or other small tool to replace quick connect O-rings. One to push the valve and the other work the O-ring free

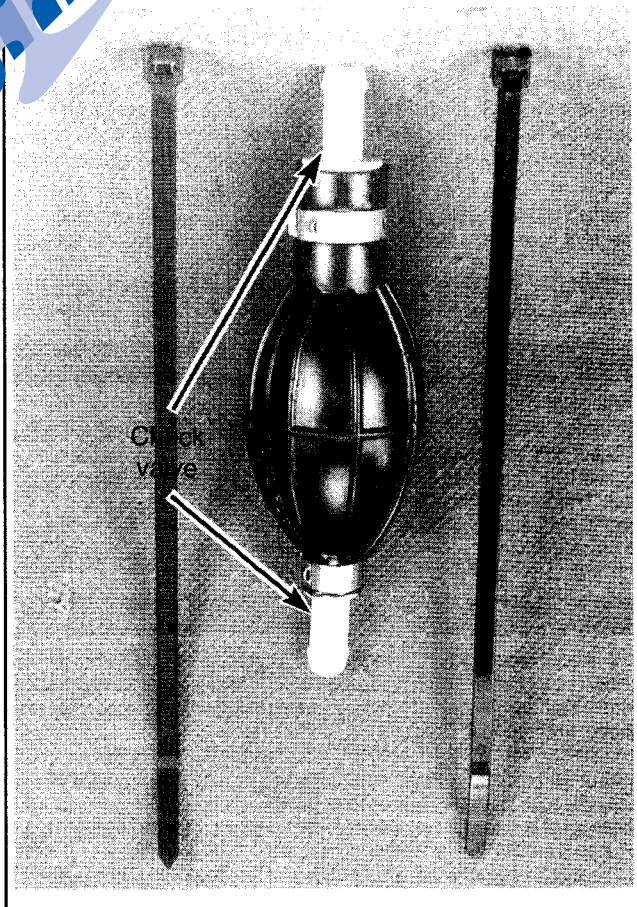


Fig. 33 A squeeze bulb kit usually includes the bulb, 2 check valves, and two tie straps

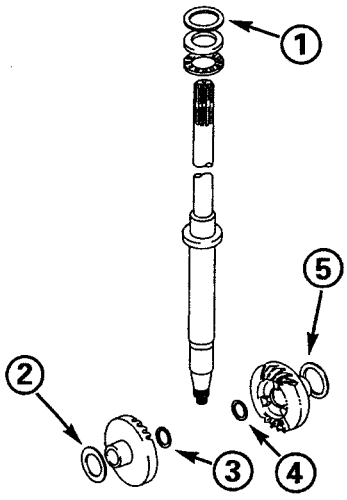
• CAREFULLY disassemble the gearcase again in order to remove the forward gear, taking great care not to turn the shaft again or to disturb the gear and markings in any way.

• Examine the gear to check gear tooth contact pattern.

8. Once disassembled, examine the marks on the convex (driven) side of the forward gear. Compare them to the accompanying illustrations to determine the next proper steps in shimming, as follows:

• The gear should show a contact pattern on the convex side of the tooth with the TOP of the pattern about 0.04 in. (1mm) below the top of the tooth. The length of the pattern should be about 1/3 of the tooth width. If the gears show a NORMAL contact pattern, proceed with the next step to check the reverse gear.

• If the contact pattern on the pinion shows a top side toe clearance, the pattern on the forward gear will appear on the outside edge of the tooth, but on the portion of the tooth toward the center of the hub. To correct this try changing the forward gear shim to the next **thinner** shim and/or the pinion shim to the next available **thicker** shim.



	Description	Thickness Available – mm	Thickness mm
1	Pinion Shim	0.50, 0.60, 0.70, 0.80, 0.90	
2	Forward Gear Shim	0.50, 0.60, 0.70, 0.8[illegible]	1
3	Forward Thrust Washer	2.0, 2.2	2.00
4	Reverse Thrust Washer	1.8, 1.9, 2.0, 2[illegible]	2.00
5	Reverse Gear Shim	0.50, 0.6[illegible]	1.00

Fig. 42 Shim and thru[illegible]

✳✳ WARNING

A top side toe clearance could result in a chipped forward gear tooth.

• If the contact pattern on your forward gear shows a bottom side toe clearance, the pattern will appear toward the base of the tooth (where the tooth itself meets the hub, but still at the center of the tooth length). To correct this, try changing the pinion gear shim to the next **thinner** shim and/or the forward gear shim to the next available **thicker** shim.

✳✳ WARNING

A bottom side toe clearance could result in a chipped pinion gear tooth.

9. Once you have a proper tooth contact pattern, check the driveshaft thrust play against the forward gear and note the measurement to be used in determining thrust play against the reverse gear. Position a dial-indicator to read vertical movement of the driveshaft (using a housing firmly clamped onto the shaft is the common m[illegible]). Zero the dial at one end of shaft play (we recommend pushing it fi[illegible]ward and then zeroing it), then pull the shaft to the other end of pla[illegible] observing the gauge. Record the total amount of movement.

10. Next install th[illegible] gear components and the bearing carrier. Once installed [illegible] sli[illegible]mmer to apply a couple of gentle outward taps on the shaft. Ke[illegible]OWARD pressure on the propeller shaft and check driveshaft thrust [illegible]gainst the reverse gear. Note the measurement. This second [illegible]urement should be equal to the forward gear measurement. HOWE[illegible] second measurement (against the reverse gear) is LESS th[illegible]uce the reverse gear shim to increase the measurement.

[illegible]Next, when you are happy with the gear positions, measure the [illegible]ft thrust play. Make sure all gear components, thrust washers [illegible] are installed and the propeller shaft bearing housing fasteners are [illegible] securely.

[illegible]. Position a dial-indicator to the end of the prop shaft in order to read propeller shaft endplay (thrust play, horizontal movement back and forth, into and out of the gearcase). Zero the dial at one end of shaft play (while either pulling outward or pushing inward on the shaft), then push or pull the shaft to the other end of play while observing the gauge. Record the total amount of movement, it must be 0.008-0.016 in. (0.2-0.4mm).

13. If propeller shaft endplay is outside the specified range, change the reverse gear thrust washer to a thickness that will put endplay inside the acceptable range. If there is TOO much play, use a thicker reverse gear thrust washer to reduce it. If there is TOO little play, use a thinner reverse gear thrust washer to increase it.

14. Once the proper shims/thrust washers are identified or verified, remove all temporary assemblies (disassemble the gearcase and remove the driveshaft) and lubricate the components for proper assembly.

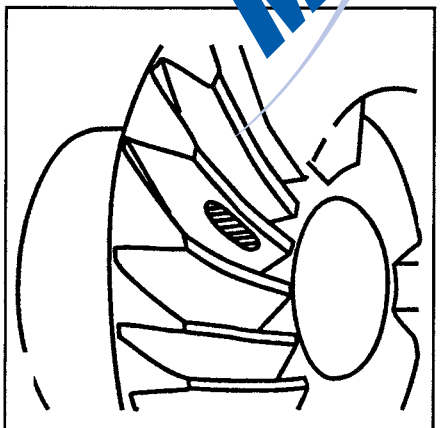


Fig. 43 Normal gear contact patterns, no shimming change is necessary

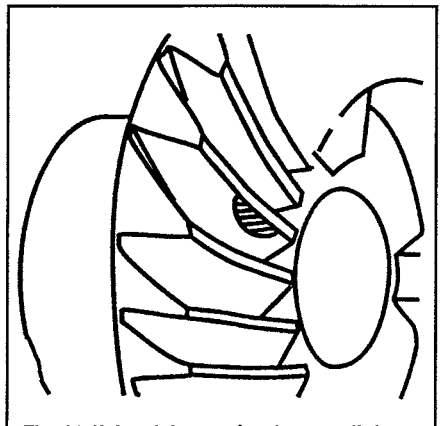


Fig. 44 If the pinion marks show too little clearance (top side toe contact) as illustrated, first try a thinner forward gear shim, then try a thicker pinion shim

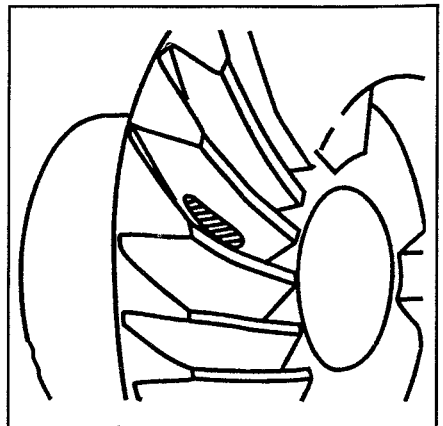


Fig. 45 If the forward gear marks show too much clearance (bottom side toe clearance) as illustrated, first try a thinner pinion gear shim, then try a thicker forward gear shim

ASSEMBLY

OEM ③ DIFFICULT

◆ **See Figures 33 thru 37**

Sometime during the 2005 model run a second style driveshaft assembly was first put into service on the 40/50 hp models that does not use a preload spring. It appears from the parts and service literature that both styles utilize the same driveshaft housing, including bearing and seals, but the later style also appears to have a bearing that is either pressed onto or simply positioned over the driveshaft (in the same position as the thrust bearing assembly on the earlier models). The literature does not specify, but it appears this bearing performs the same function as the thrust bearing assembly on the earlier models.

The lower unit should not be assembled in a dry condition. Coat all internal parts with Suzuki Outboard Motor gear lube oil as they are assembled. Unless otherwise noted, all seals should be coated with Water Resistant Grease.

1. On models with a removable front bearing race, if it was removed, apply a light coating of gear lube and install the forward bearing outer race using a suitable driver. The race must be properly seated before assembly (or shimming adjustments).

2. If the gearcase, a gear, bearing, shaft, thrust washer or shim was replaced, perform the Gearcase Shimming procedure as detailed in this section. Failure to properly shim the gearcase could cause significant damage to the internal components of the lower unit.

3. On 25/30 hp models, prepare to install the driveshaft, as follows:

a. Install the thrust washer and the preload spring on the driveshaft. Make sure the end of the spring fits into the notch on the thrust washer.

b. Place the tab lock washer and the other thrust washer in the preload spring collar. Make sure the tab of the lock washer fits into the slot at the pinion gear end of the collar.

c. Slide the preload spring collar onto the driveshaft.

d. Install the driveshaft through the driveshaft bearing housing. Push down firmly on the collar and secure it to the housing using the retaining rin

e. Install the pinion shim into the gearcase from above, then insert pinion gear into the case from below.

f. Install the forward gear bearing, shim and the gear into the case You'll have the tilt the gear slightly to get it by the pinion gear.

g. Apply a light coating of Suzuki Silicone Sealant to the surfaces of the gearcase and driveshaft bearing housing, driveshaft and housing assembly to the case. CAREFU assembly over the shift rod and slide it downward with with the pinion.

h. Install the 2 bolts that secure the drive housing to the gearcase.

4. On 40/50 hp models, prepare to install the driveshaft as follows:

a. Install the forward gear bearing, and thrust washer (you may wish to use a little needle bearing grease to hold the thrust washer in place or alternately, you can wait and install it on the propeller shaft later).

b. On models with a preload spring, install the driveshaft washers into the gearcase, first the one with the tang (positioned in the cavity facing forward) and then the washer without the tang.

c. Install the driveshaft collar (sleeve), aligning the collar tab with the opening in the gearcase housing.

d. Place the pinion gear into the gearcase.

e. For models with a preload spring, slide the spring onto the driveshaft and secure with the pin. Then install the thrust bearing, washer and pinion shim to the driveshaft.

f. For models without a preload spring, assemble the thrust bearing and pinion shim to the driveshaft.

g. Lower the driveshaft assembly down into the gearcase until the bottom extends through the center of the pinion.

h. If not done already, apply a light coating of Suzuki Water Resistant grease to the driveshaft oil seal.

i. Install the gearcase seal ring to the groove on the driveshaft bearing housing, then apply a light coating of Silicone Seal to the gearcase and driveshaft bearing housing mating surfaces.

■ **Make sure that detent ball, spring and plate assembly from earlier in the shift rod procedure is in the proper position in the gearcase at this time.**

j. Carefully slide the bearing housing and shift rod assembly into the gearcase. Make sure the stepped portion of the rod cam faces backward toward the propeller. In addition, make sure the other side of the rod cam, with the detent notch is positioned over the detent ball in the gearcase.

5. Apply a light coating of Thread Lock #1342 to the threads of the pinion nut. Make sure the pinion is fully installed on the driveshaft and thread the nut onto the bottom of the driveshaft.

6. Hold the pinion nut steady using a wrench (padding the side of the gearcase for protection), then use the Suzuki Driveshaft Holder or an adapter made from the splines of a discarded crankshaft and a torque wrench to tighten the nut to 13 ft. lbs. (18 Nm) on 25/30 hp motors, or to 36.2 ft. lbs. (50 Nm) on 40/50 hp motors.

7. If not done already, ready the propeller shaft and bearing housing for installation. Position the forward gear thrust washer (if its not on the gear already), the reverse gear thrust washer, the reverse gear and shim to the propeller shaft and into the bearing housing.

8. Apply a light coating of Suzuki Water Resistant, or equivalent marine grease to the NEW bearing carrier O-ring and to the clutch push rod in the end of the propeller shaft. Install the bearing carrier O-ring to the carrier groove, then wipe the carrier surface clean on either side of the groove.

9. Carefully install the propeller shaft and bearing carrier assembly to the gearcase. If necessary use a propeller shaft housing installer (like #09922-59410) to align and tap the housing into the gearcase. If the installer is not available you can gently tap into position using a soft-faced mallet, but in order to prevent damaging the carrier in the gearcase and damaging the case, shaft or bearings, be sure to gently tap around the entire perimeter of the carrier during installation. Also, make sure the retaining bolt ears remain aligned with the gearcase bolt holes.

10. Install the carrier retaining bolts and tighten to 71 inch lbs./5.8 ft. lbs. (8 Nm) on 30 hp motors or to 12.5 ft. lbs. (17 Nm) on 40/50 hp motors.

■ **We highly recommends rechecking the driveshaft and propeller shaft turning always after final installation to be assured the final assembly is within specification.**

11. Using a hand-held pressure pump, perform the Pressure Testing the Gearcase procedure in this section.

12. Install the Water Pump, as detailed in the Lubrication & Cooling section.

13. Properly refill the gearcase, as detailed in the Maintenance & Tune-Up section.

14. Install the gearcase assembly, as detailed in this section.

PRESSURE TESTING THE GEARCASE

OEM ② MODERATE

To uncover any possible problems with a newly rebuilt gearcase, or an overlooked problem on a gearcase that was not completely disassembled, use a hand-held pressure pump to check the gearcase for leaks before it is filled with fluid and returned to service.

■ **If the gearcase is not installed, temporarily secure the driveshaft housing using 2 bolts and nuts positioned diagonally through two of the gearcase mounting holes before proceeding with the leakage check.**

1. Remove the oil level plug from the top side of the gearcase.

2. Attach a hand pump with pressure gauge to the gearcase, then slowly rotate the driveshaft and propeller shaft clockwise for several turns.

3. Slowly apply 2.8-5.7 psi (20-40 kPa) of pressure to the assembly. Observe the gauge, the pressure gauge should indicate a steady reading. If gearcase shows no sign of leakage, slowly increase pressure to 14.2 psi (100 kPa), again watching for it to remain steady. If there are signs of pressure leaking at either plateau, submerge the gearcase in a tank of water and look for bubbles, then disassemble and rectify the leak. Recheck the gearcase after repairs are complete.

✳✳ CAUTION

DO NOT exceed a pressure of 15.6 psi (110 kPa) or the oil seals will likely be damaged.

4. Once repairs are made and verified, refill the gearcase with lubricant.

Power Trim/Tilt and Steering Fluid (or equivalent). Then, using a slotted-screwdriver, rotate the pump-to-motor coupler back and forth to bleed air from the pump. Continue to rotate it a few turns in each direction until bubbles stop coming out of the pump.

To install:

12. If not done already, lower the tilt rod to the full down position for clearance.
13. Apply a light coating of Suzuki Water Resistant grease, or equivalent marine grease to the lower and upper pins and the shaft bushings. Place the pins on a clean plastic bag until they are installed.
14. If removed, install the lower and upper tilt shaft bushings and position the lower tilt shaft into the assembly.
15. Position the PTT assembly between the stern brackets, then install and tighten the tilt tube nut to 31 ft. lbs. (43 Nm).

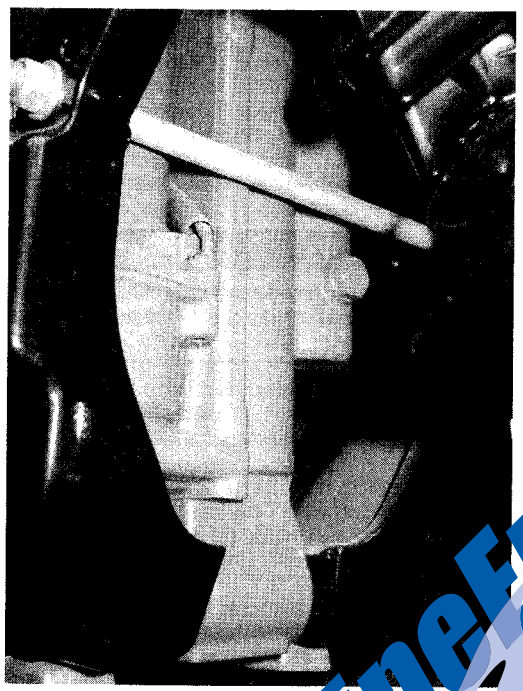


Fig. 28 Typical PTT unit used on 40/50 hp

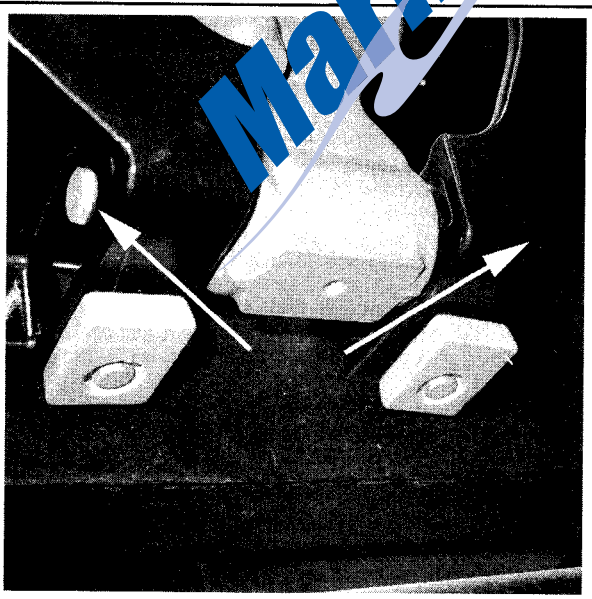


Fig. 29 The units are secured by 2 fasteners (nut and bolt or 2 bolts) at the bottom of the assembly

16. On early-models through 2000, slide the PTT cylinder lower shaft bolt through the clamp bracket and lower shaft, then secure using the nut.
17. On 2001 and later models, apply a light coating of Threadlock #1342 or equivalent threadlocking compound to the threads of the tilt cylinder shaft bolts, then install the bolts and tighten to 16.5 ft. lbs. (23 Nm).
18. Install and tighten the 2 transom bracket bolts.
19. Connect the negative battery cable and operate the PTT motor to fully extend the tilt cylinder rod, aligning it with the hole in the swivel bracket.
20. Install the upper tilt shaft and secure using the snapring. If the second snapring was removed, install it at this time also.
21. Route the PTT wiring through the lower engine cover and reconnect the PTT motor relay(s) as tagged or noted during removal.
22. Remove the hoist.
23. If not done already, check the fluid level and bleed the air from the system by cycling the PTT system fully down and up 4-5 times. Top off the fluid as necessary.

OVERHAUL

OEM 3 DIFFICULT

◆ **See Figures 26, 30, 31 a**

There are 2 different ... es typically used on these motors. Though they are both ... t ram units that mount in a similar fashion, the overhaul proc... ue to differences in construction of the actual hydraulic unit. T... arly- ...el unit should be found on outboards through the 2000 model ... late-model unit should be found on most or all 2001 and ...er uni...

Also ... at ...arting in the 2004 the hydraulic reservoir was changed in mat... ...m ...stic tank to a new aluminum bodied tank.

... ...n not clear from the exploded view, the motor on these PTT ... ...es ... mounted over the pump, next to the reservoir tank.

...ghly clean the external surfaces of all dirt and scale build-up before dis... ...bling. Clean the unit with a stiff bristle brush and plenty of soap and wa... ...o prevent any contamination of internal components.

Though access to the motor or other components is sometimes possible with the PTT assembly still on the outboard, it generally isn't worth the small amount of time saved.

1. Remove the PTT assembly from the outboard, clean it thoroughly. Dry the unit with low-pressure compressed air.
2. On early-models (through 2000) connect the PTT motor leads (Green and Blue) to a good 12-volt battery and operate the motor to fully extend the tilt rod.
3. Unscrew the reservoir cap and do your best to drain the PTT unit into a small suitable container.
4. Place the assembly on a workbench or carefully in a soft-jawed vise for access. You can mount the unit in a vise using the lower mounting eye but DO NOT over-tighten and damage the unit.
5. Remove the 4 screws that secure the PTT motor to the pump and reservoir, then carefully detach the motor from the pump and reservoir, noting the position of the drive joint and the brush holder-to-pump O-ring.

✳✳ CAUTION

DO NOT lay out PTT components on a rag as dirt or lint from the rag could be transferred to these components, potentially causing damage or operational problems after reassembly. We prefer to use a clean, degreased metal tray, like an old baking tray.

6. If necessary, disassemble the motor as follows:

a. Scribe a matchmark across the housing and holder to ensure installation with the proper alignment, then remove the 3 screws securing the housing and separate it from the brush holder and armature.

■ **You may need to use a soft-faced hammer to gently tap the motor housing from side-to-side in order to free it from the brush-holder. Once free, simply slide it straight up and off the holder.**

b. Slide the armature free of the brushes, noting the brush positioning.
c. Remove and discard the old housing-to-holder O-ring.
d. Clean and inspect the starter motor components as noted earlier under Troubleshooting.

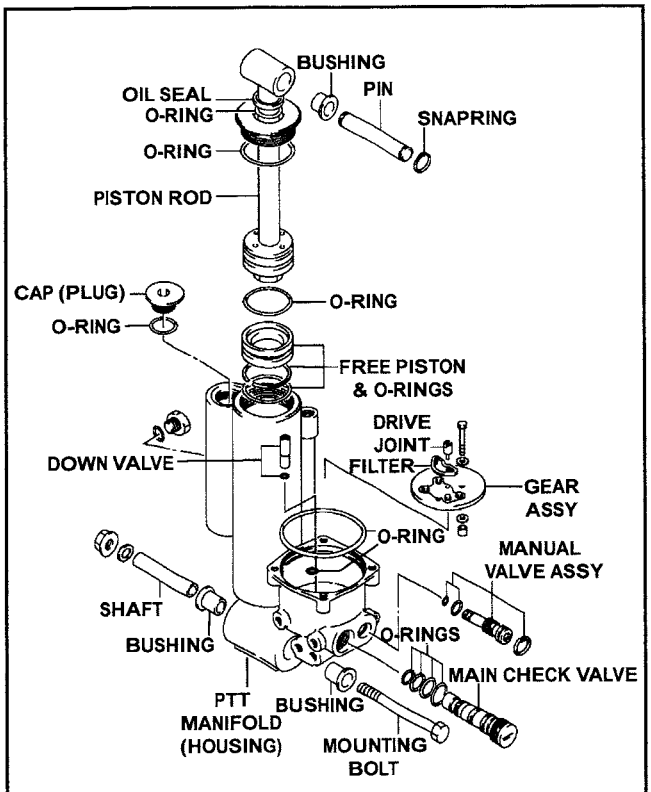
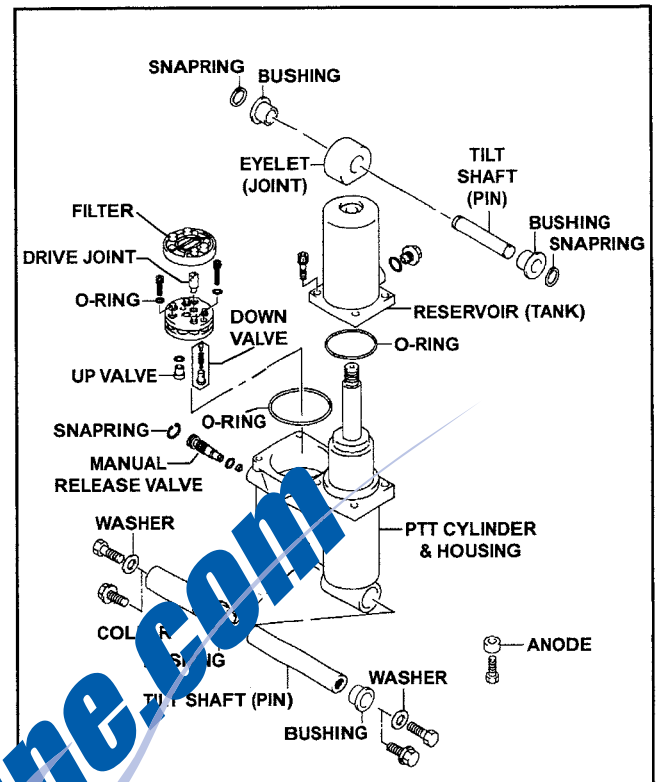


Fig. 30 Exploded view of the early-model PTT assembly - 40/50 hp motors through 2000



Exploded view of the late-model PTT assembly - 2001 and 40/50 hp motors

7. To remove the pump and valve components proceed as follows:

a. Remove the snapring, then carefully unthread the manual release valve, removing the seal washer as well.

b. On most early-models through about 2000, remove the main check valve and spool valve from the side of the PTT housing, then remove the manual release valve bore.

c. If not done already, remove the drive joint and tilt shaft from the top of the pump assembly.

d. Remove the bolts (usually 3) and the pump assembly from the PTT unit.

e. As applicable, from the pump assembly or PTT unit, remove the check valve, down-blow valve and the O-ring.

8. On most early-models through 2000, use a PTT Cylinder Cap Tool (#09944-08711, basically a large spanner) to loosen the cap from the PTT cylinder. Once loosened, remove the tilt rod/piston assembly from the cylinder body and the free piston from the body. If necessary, unscrew the piston retaining nut from the bottom of the tilt rod and remove the washer, carefully retain and account for the four shock valves, each composed of a spring, rod and ball. Remove the piston assembly and the PTT cylinder head by sliding them down and off the rod end.

9. On 2001 and later-models, using a long sturdy rod through the tilt cylinder upper eyelet and a suitable sized wrench underneath the rod, loosen and remove the tilt rod eyelet joint from the top of the rod. Then with the eyelet out of the way, remove the 4 bolts and remove the reservoir tank from the cylinder housing.

10. No further instructions are available from the manufacturer for pump assembly, O-ring or check valve overhaul but certain replacement components are available. If you should decide to disassemble the unit further, use great care to prevent damage to components until you know their availability. Also, take your time, noting positioning as you go. All internal O-rings should be replaced anytime they are disturbed.

To Assemble:

11. On most early-models through about 2000, if removed, install the valves and/or tilt rod assembly as follows:

a. Oil and install the spool valve and main check valve to the bores in the side of the PTT unit. Tighten the main check valve plug to 14.5 ft. lbs. (20 Nm).

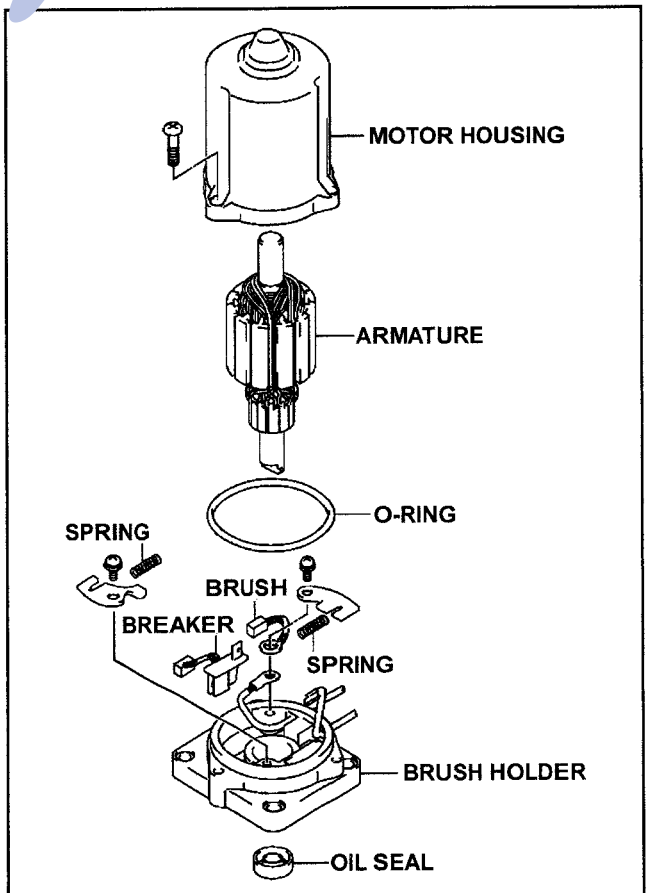


Fig. 32 Exploded view of the PTT motor