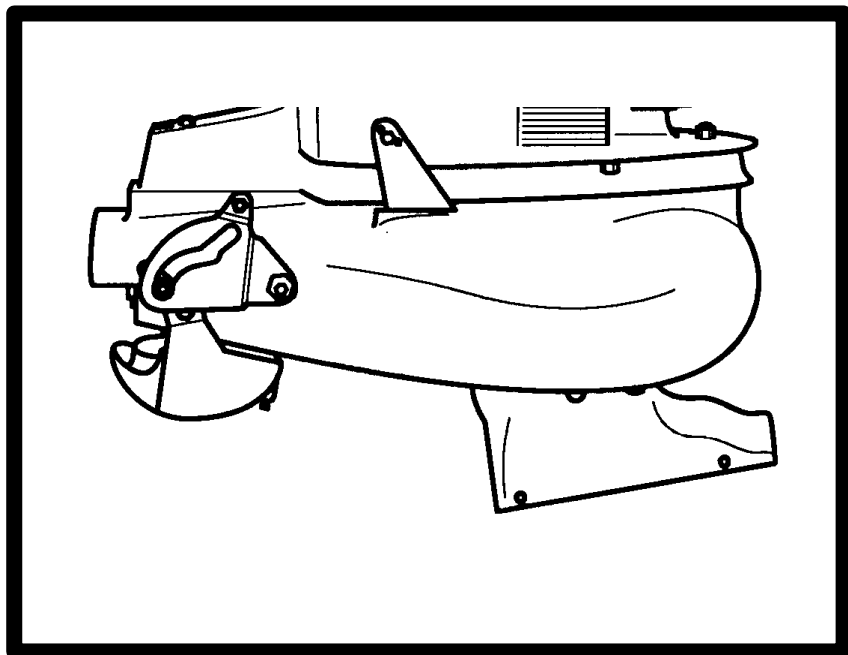




LOWER UNIT



JET DRIVE

6

B



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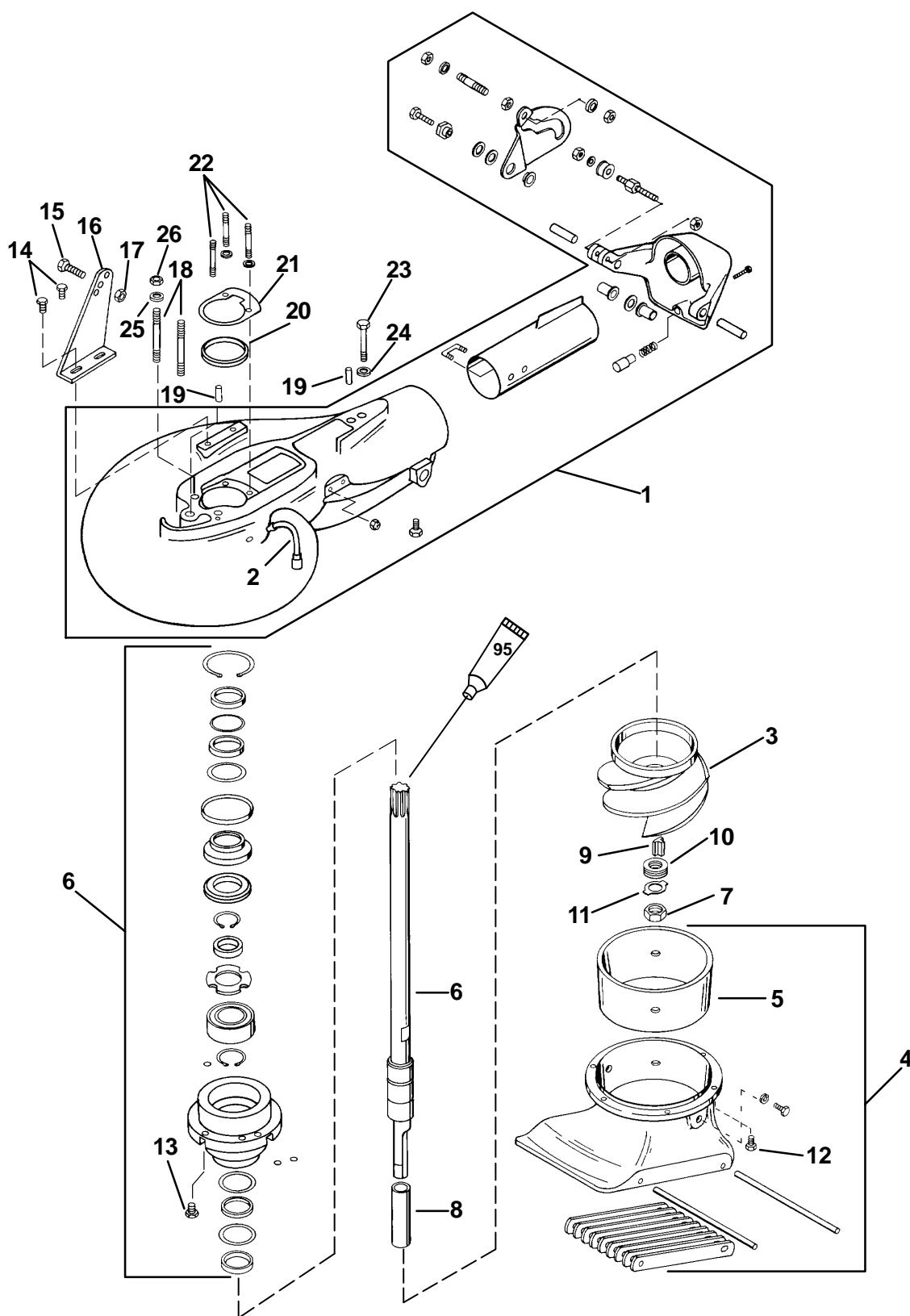


Notes:





Jet Pump Assembly



 2-4-C With Teflon (92-825407A12)



Jet Pump Assembly

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	HOUSING–pump			
2	1	HOSE–lube			
3	1	IMPELLER			
4	1	HOUSING–intake			
5	1	LINER			
6	1	SHAFT–drive			
7	1	NUT			
8	1	SLEEVE–shaft			
9	1	KEY			
10	8	SHIM			
11	1	TAB WASHER			
12	6	SCREW (1/4-20 x .75)	96	8	10.8
13	4	SCREW (1/4-20 x .875)	70		7.9
14	2	SCREW (1/4-20 x .625)	70		7.9
15	1	SCREW (.312-18 x 1.25)			
16	1	BRACKET			
17	1	NUT	160	13.3	18.1
18	2	STUD			
19	2	PIN–dowel			
20	1	RING SUPPORT–water pump			
21	1	GASKET–water pump base			
22	3	STUD (1/4 x 2-5/8")			
23	1	SCREW (3/8-16 x 3")		22.5	30.5
24	1	WASHER			
25	2	WASHER			
26	2	NUT		60	81.3



Selecting A Boat That Is Best Suited For Jet Power

To obtain the best performance from the jet drive, the boat should have the following features:

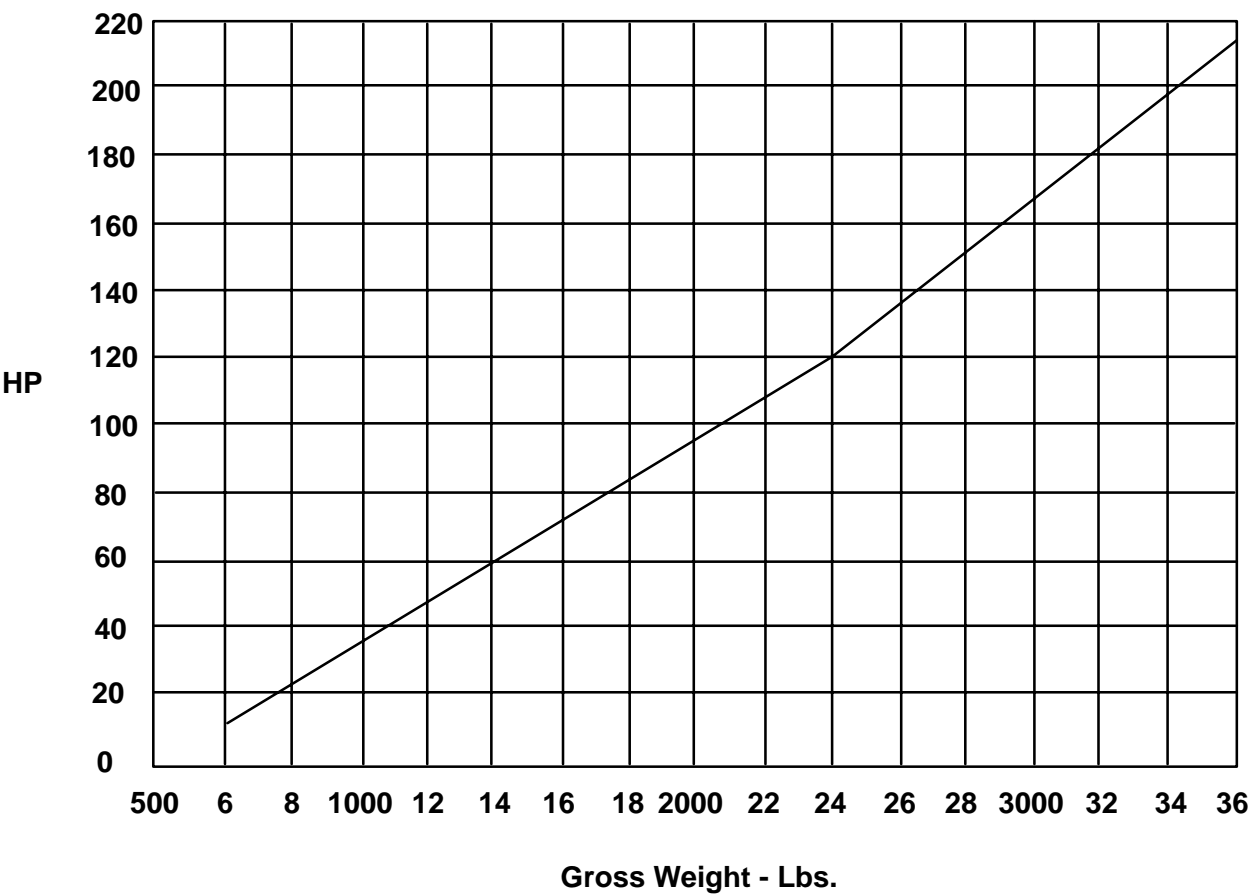
- 1. The boat should be as light as possible.
- 2. The boat should have hull and transom that is designed for use with a jet drive.
- 3. The boat should be at least 13 feet in length.

Engine Horsepower Selection

A boat operating at slow speed requires considerably more depth than one which is planing on the surface of the water. It is important therefore to use sufficient horsepower and not to overload your boat beyond its ability to plane. See the following table.

Engine Horsepower Selection

The following table is based on experience obtained with sled-type boats using outboard jets. The gross weights shown includes the outboard, boat, people, and all the gear carried. For a given horsepower loading beyond these weights will give less than good performance.





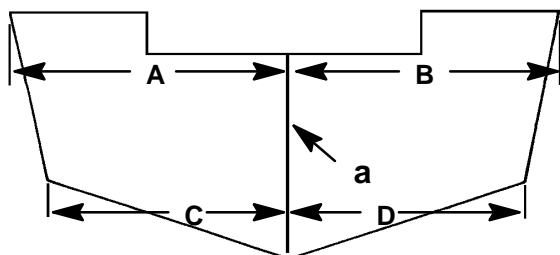
Transom Height of the Boat

Outboards with jet drives will be mounted approximately 7 inches higher on the transom than propeller driven outboards. This requires outboards that have a 15 in. shaft length to be installed on boats having a 22 in. transom height and outboards that have a 20 in. shaft length to be installed on boats having a 27 in. transom height.

If the boat transom is of insufficient height, and the outboard cannot be installed to the recommended height, contact the boat manufacturer for recommended procedure to build up the boat transom.

Locate Centerline Of The Outboard

Locate (and mark with pencil) the vertical centerline of boat transom.



a - Centerline of Transom

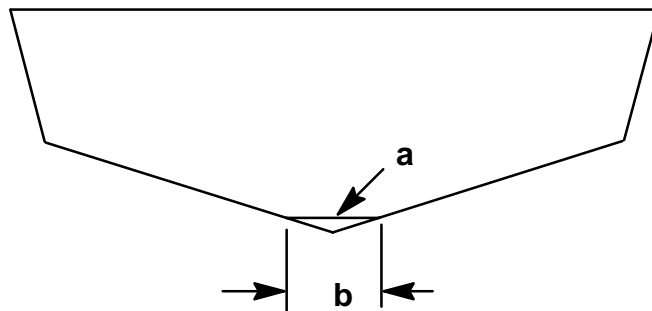
Outboard Mounting Height

The initial outboard mounting height setting will work good for most applications, however, because of different boat/hulls designs, the setting should be re-checked by test-running the boat. Refer to Water Testing.

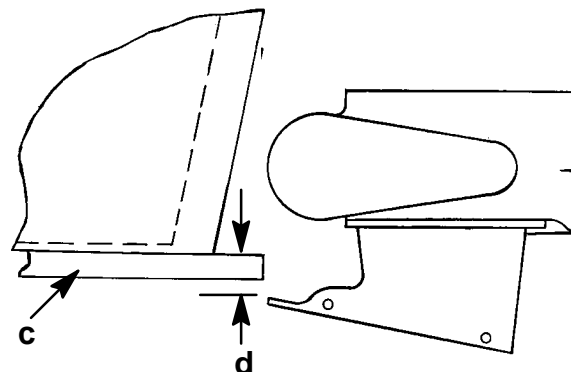
- Installing the outboard too high on the transom will allow the water intake to suck in air and cause cavitation. (Cavitation will cause the engine to over-speed in spurts and reduce thrust). This condition should be avoided by proper height setting.
- Installing the outboard too low on the transom will allow excessive drag.

SETTING OUTBOARD MOUNTING HEIGHT ON BOATS WITH "V" BOTTOM HULLS

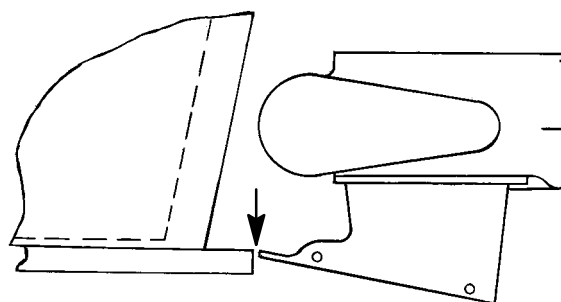
1. Measure the width of the leading edge on the water intake housing. Make a horizontal line (a) on the transom up from the "V" bottom the same length as the width of the water intake housing (b).



2. Place (center) the outboard on the boat transom so that the transom brackets are resting on top of the transom. Temporarily fasten the outboard to the transom using two C-clamps.
3. Position the outboard in a vertical position.
4. Line up a straight edge (c) along the bottom of the boat with the horizontal line made in Step 1 and measure the distance between the horizontal line and top front edge of the water intake housing (d).



5. Raise The outboard up on the transom the distance measured in Step 4. Use a straight edge and recheck the mounting height. The top edge of the water intake housing should be lined up with the horizontal line made in Step 1.

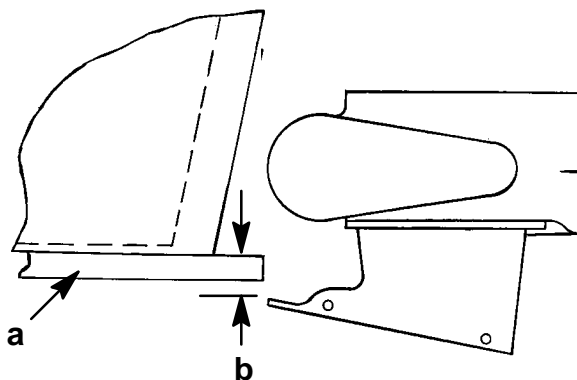


6. Fasten outboard to the transom at this height.



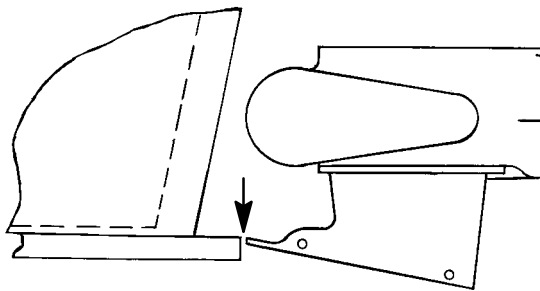
SETTING OUTBOARD MOUNTING HEIGHT ON BOATS WITH FLAT BOTTOM HULLS

1. Place (center) the outboard on the boat transom so that the transom brackets are resting on top of the transom. Temporarily fasten the outboard to the transom using two C-clamps.
2. Position the outboard in a vertical position.
3. Place a straight edge along the bottom of the boat as shown and measure the distance between the bottom of the boat and top front edge of the water intake housing.



- a - Straight Edge
b - Top Edge of Water Intake Housing

4. Raise the outboard up on the transom the distance measured in Step 3. Use a straight edge and recheck the mounting height. The top edge of the water intake housing should be in line with the bottom of the boat as shown.



5. Fasten outboard to the transom at this height.

Water testing

Checking for Cavitation

Making the initial outboard height setting should be close to the optimum setting for the outboard. However because of the hull design of some boats, obstructions or imperfections in the hull ahead of the water intake may require this setting to change in order to prevent cavitation at running speeds.

When operating the boat, the outboard drive shaft should be vertical when planing or tilted toward the boat in order to provide a scooping angle on the water intake. Tilting the outboard out beyond a vertical position reduces the scoop angle and can cause impeller slippage and cavitation. If the angle of the boat transom does not allow the drive shaft to be positioned vertically, a Wedge kit should be installed behind the transom brackets to increase the tilt-in angle.

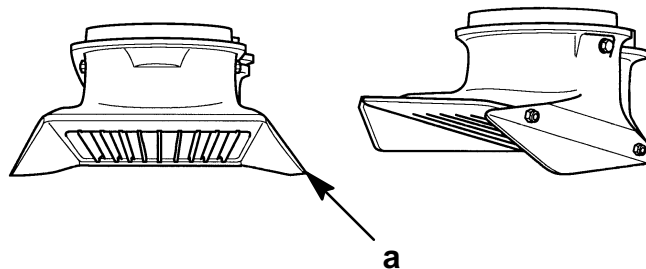
NOTE: *Slight cavitation in sharp turns and rough water is acceptable but excessive cavitation is harmful to the outboard and should be avoided.*

Test run the boat. If cavitation occurs (air enters the pump causing loss of thrust, engine over-speeds erratically), the first thing to try is lowering the outboard height 1/4 in. This can be accomplished by elongating the drilled mounting holes in the boat transom by 1/4 in.

If cavitation still exists after lowering the outboard 1/4 in., it maybe helpful to seek advice from the boat manufacturer.

A number of other options are available to further reduce cavitation.

1. Water intake fin kit – Available from the Specialty Mfg. Co. for jet models 30 thru 140. The purpose of these fins is to ram more water into the intake and shield the forward sides of the intake from the entrance of air. This kit will help reduce cavitation when running with the wind in a chop.



- a - Intake Fin Kit

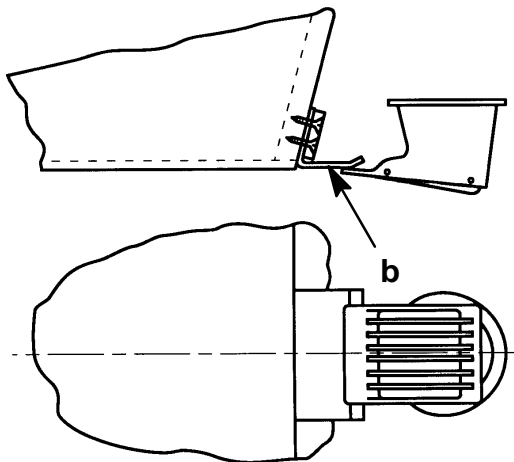
Water Intake Fin Kit Part No.1186 for jet models 45 thru 140 and Part No. 1185 for jet model 30 is available from:
Specialty Mfg. Co.
2035 Edison Ave.
San Leandro, CA 94577



Water testing

Checking for Cavitation (Continued)

2. Rough Water Plate – Using this type of plate may be helpful in reducing cavitation when running in windy rough water conditions where air is sucked-in the water intake when jumping waves. Install a 1/32 in. metal plate that extends from the hull bottom to the top of the water intake housing. This plate tends to reduce air intake as well as reduce spray.



b - Rough Water Plate

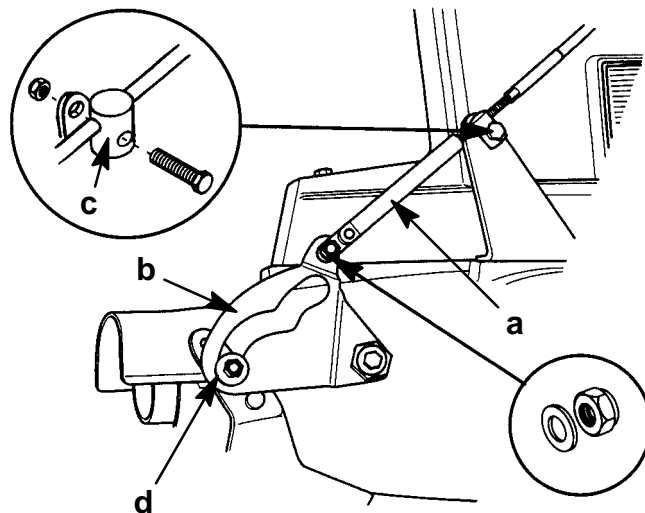
Shift Cable Installation

⚠ WARNING

The shift cable must be adjusted to lock the reverse gate against unexpected engagement (caused by water pressure hitting the gate) while operating the boat in forward. Activation of the reverse gate will cause sudden unexpected stopping of the boat. Sudden stopping may cause occupants to be thrown within the boat or even out of the boat. This action may result in serious injury or death.

1. Attach shift cable to the shift cam with flat washer and locknut as shown. Tighten locknut against the flat washer, then back-off the locknut 1/4 turn.
2. Place remote control handle into full forward position.
3. Adjust the brass barrel on the shift cable so that roller is at the full end of travel (bottom) in the shift cam when the remote control is in full forward.

4. Attach the brass barrel to the bracket with bolt and locknut. Tighten the bolt until it seats against the barrel, then back-off the bolt 1/4 turn. Hold bolt from turning, and tighten locknut on bolt. The barrel must be free to pivot.



a - Shift Cable
b - Shift Cam
c - Barrel
d - Roller

5. Recheck the shift cable adjustment in forward shift position. The correct shift adjustment will position the cam far enough on the roller in order to lock the the reverse gate into forward position. You should not be able to forcibly push up the reverse gate toward neutral. Pull on the reverse gate by hand to verify this.

IMPORTANT: The forward locking of the reverse gate must be met. If not, readjust the shift cable.

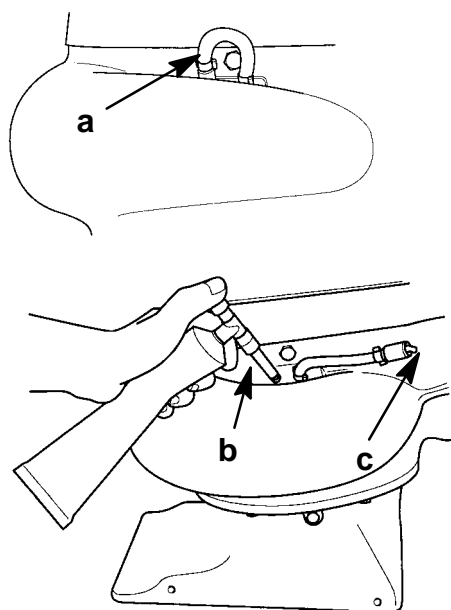


Lubricating The Drive Shaft Bearing

Recommended Lubrication - Use Quicksilver 2-4-C w/Teflon, or Lubriplate 630-AA Grease.

IMPORTANT: It is important that you do not use a general-all-purpose grease for this bearing. The lubricant we recommend is a water resistant grease of the proper consistency for this application. If you use a substitute grease, be sure that it is water resistant and of the same consistency.

Frequency of lubrication - We recommend lubricating the drive shaft bearing after each day's use and after every 10 hours of operation. After every 30 hours of operation, pump in extra grease to purge out any moisture.



- a - Vent Hose
- b - Grease Gun
- c - Grease Exiting Vent Hose

Lubricating Procedure - Pull vent hose off the grease fitting. Pump in grease through the grease fitting (using the grease gun provided) until excess grease starts to exit the vent hose.

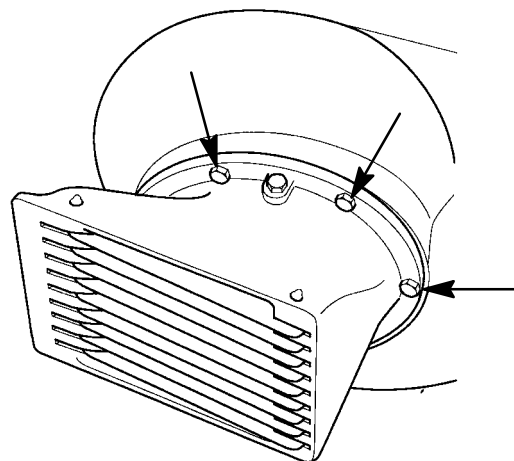
Reconnect the vent hose onto the grease fitting after greasing.

After 30 hours of operation, pump in extra grease to purge out any moisture. Visually inspecting the purged grease at this time will give you an indication of conditions inside the bearing housing. A gradual increase in moisture content indicates seal wear. If the grease begins to turn dark or dirty gray, the drive shaft bearing and seals should be inspected and replaced if necessary. Some discoloration of the grease is normal during the break-in period on a new set of seals.

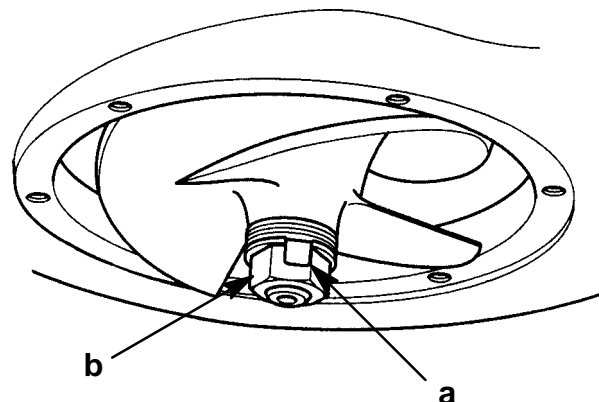
Impeller Removal and Installation

REMOVAL

1. Shift outboard to NEUTRAL (N) position.
2. Remove spark plug leads to prevent engine from starting.
3. Remove the water intake housing that is fastened with six screws.



4. Straighten the bent tabs on the impeller nut retainer and remove the impeller nut.
5. Pull impeller straight off the shaft. If the impeller is tight, use a hammer and block of wood to rotate the impeller (clockwise) on the shaft until the keyway is directly above the flat on the shaft. This will free the jammed key and allow removal.

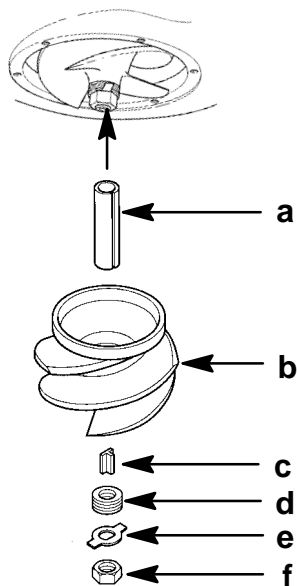


- a - Tab
- b - Nut



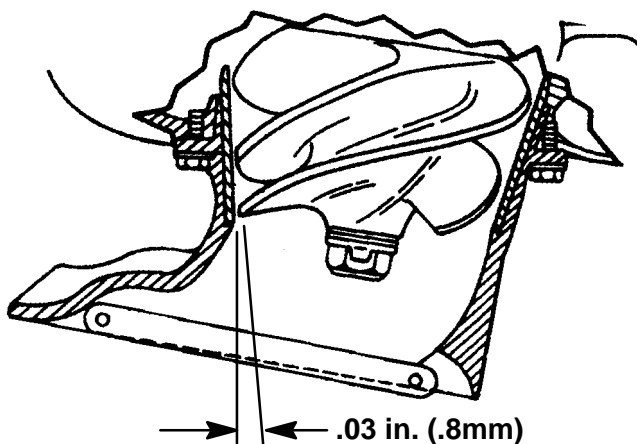
INSTALLATION

1. Grease the drive shaft, shear key, and impeller bore. Place the plastic sleeve inside the impeller and install impeller, shear key, shims nut retainer, and impeller nut. Turn the nut tight on the shaft to remove any play between the impeller and shaft. If the tabs on the retainer do not line up with the flats on the nut, remove the nut and turn the retainer over and re-tighten the nut.

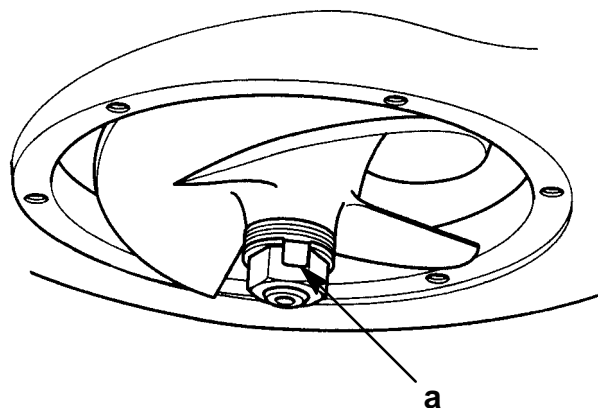


- a - Plastic Sleeve
- b - Impeller
- c - Shear Key
- d - Shims
- e - Nut Retainer
- f - Impeller Nut

2. Temporarily reinstall the water intake housing in order to check for impeller clearance. The clearance between the impeller and liner should be 0.030 in. (0.8 mm). Shim washers can be transferred to either side of the impeller to raise or lower the impeller to the correct clearance setting. The water intake housing can be shifted sideways a small amount in order to center the liner.

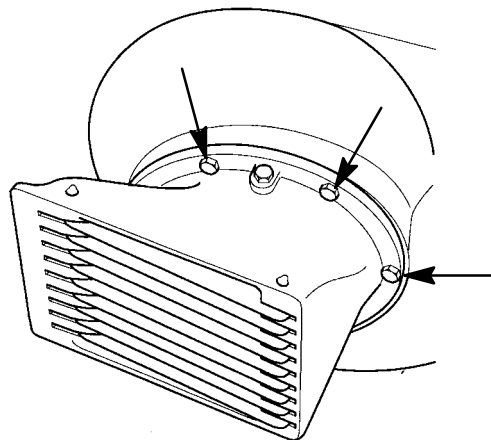


3. After setting the impeller height, tighten the impeller nut snug with a wrench. Secure impeller nut by bending tabs against the flats on the impeller nut.



a - Tabs

4. Reinstall the water intake housing with six bolts. Check clearance around the impeller to make sure the water intake housing is centered and not rubbing against the liner. Torque mounting bolts to 96 lb. in. (10.8 N·m).

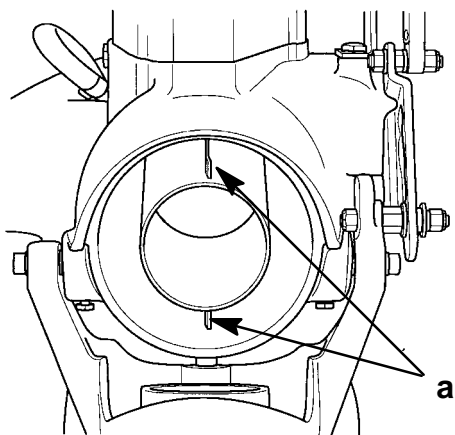


NOTE: If the outboard is used in salt water, apply Quicksilver Anti-Corrosion Grease around the entire mounting flange on the water intake housing and also to the threads on the six mounting bolts.



Steering Pull Adjustment

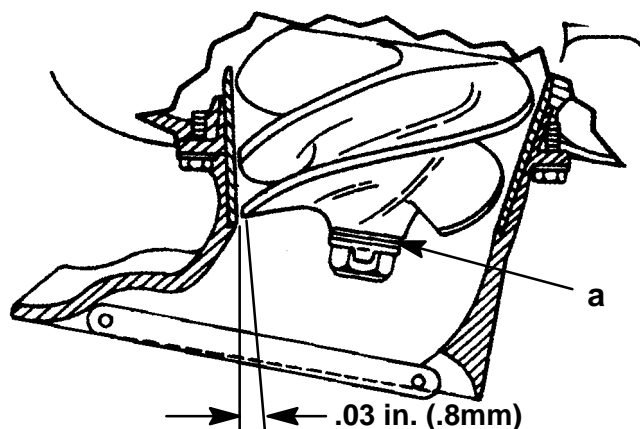
The steering on some boats will have the tendency to pull towards starboard. This pulling condition can be corrected by using a pliers and bending the ends of the exhaust fins $\frac{1}{16}$ in. (1.5mm) toward the starboard side of the outboard.



a - Exhaust Fins

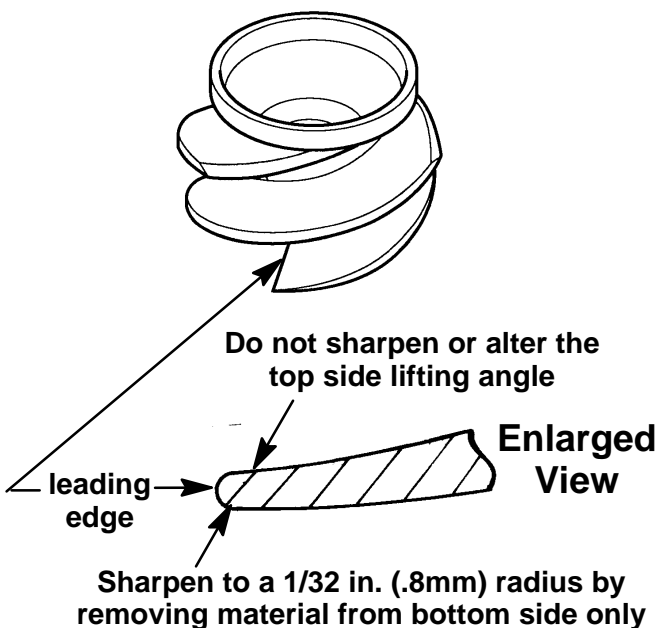
Impeller Clearance Adjustment

1. The impeller should be adjusted so there is approximately 0.03 in. (0.8mm) clearance between the impeller edge and liner. Operating the jet drive in waters that contain sand and gravel can cause wear to the impeller blades, and the clearance will start to exceed 0.03 in. (0.8mm). As the blades wear, shims located in the stack outside of the impeller can be transferred behind the impeller. This will move the impeller further down into the tapered liner to reduce the clearance.
2. Check the impeller clearance by sliding a feeler gauge through the intake grate and measure the clearance between the impeller edge and liner. If adjustment is required, refer to Impeller Removal and Installation.



a - Shims

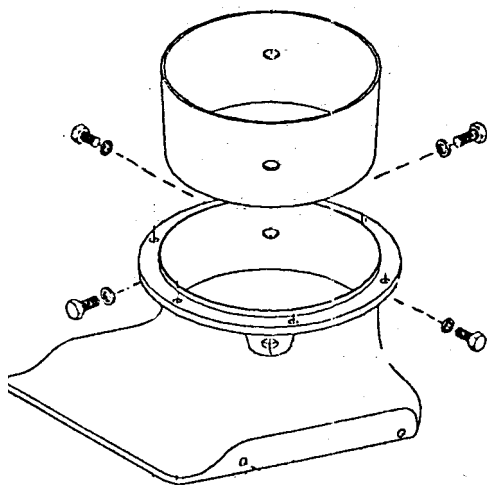
Worn (Dull) Impeller



The intake of gravel through the pump can round off and wear the leading edges on the impeller. Some conditions you may experience from a worn impeller are: (1) a noticeable performance loss, especially on acceleration, (2) difficulty getting the boat on plane, or (3) an increase in engine RPM at wide open throttle. Check the impeller blades occasionally for damage. Use a flat file to resharpen the leading edges as shown.



Liner Replacement



1. Mark the liner mounting bolts for reassembly into the same holes. Remove the bolts.
2. Remove the liner. If the liner is tight, tap on the inner edge of the liner with a long drift punch through the intake grate.

NOTE: Apply grease to the liner mounting bolt threads before assembly.

3. Position the liner into the water intake housing. Line up one of the liner bolts and lightly thread it in. It may be necessary to tap or press the liner into the water intake housing to locate the liner for installation of the remaining bolts. Torque bolts to 100 lbs. in. (11.2 N·m).
4. Grind off the ends of any bolts that may extend beyond the inner liner surface.

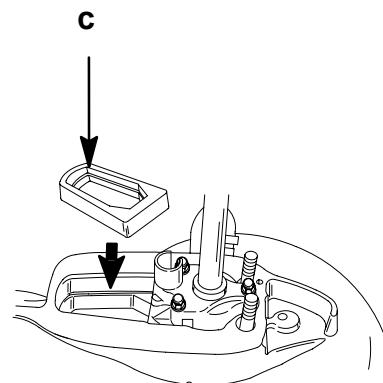
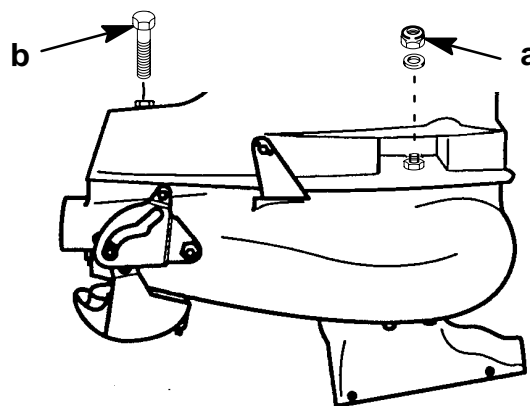
Jet Drive Removal and Installation

REMOVAL

1. Remove 2 locknuts and bolt securing jet drive to drive shaft housing and remove jet drive.

INSTALLATION

1. Install the exhaust tube seal into the jet drive.
2. Install jet drive with bolt and locknuts as shown.



- a - Locknut and Washer (2) - Torque to 60 lb. ft. (81.4 N·m)
b - Bolt - Apply Loctite to Threads and Torque to 22.5 lb. ft. (30.5 N·m)
c - Seal - Exhaust Seal



Water Pump Removal and Installation

REMOVAL

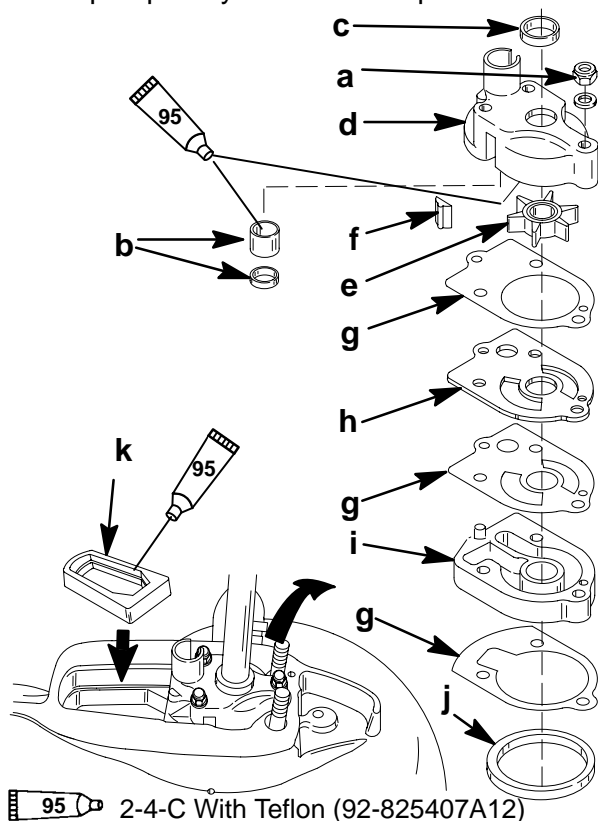
1. Remove water pump assembly as shown.

INSTALLATION

IMPORTANT: If impeller being installed has been previously used and vanes have taken a "set," **DO NOT** install the impeller with the vanes reversed from their previous "set" as vane breakage will occur shortly after unit is returned to service.

NOTE: Apply a light coat of 2-4-C w/Teflon to inside of pump body to ease installation of body over impeller.

1. Seat the metal ring into the counter bore below the water pump.
2. Reassemble water pump assembly as shown. Rotate drive shaft **CLOCKWISE** while pressing water pump body down over impeller.



95 2-4-C With Teflon (92-825407A12)

- a - Locknut and Flat Washer (3), Torque to 30 lb. in. (3.4N·m)
- b - Water Tube Seal and Washer
- c - Rubber Ring
- d - Water Pump Body Assembly
- e - Impeller
- f - Key
- g - Gasket
- h - Plate
- i - Base
- j - Metal Ring
- k - Seal - Exhaust Tube (Place into Jet Drive Housing)

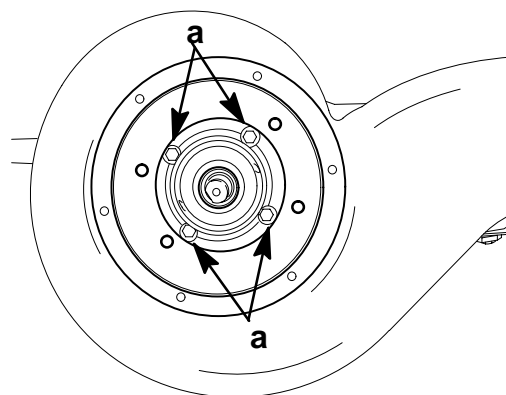
Bearing Carrier Removal and Installation

REMOVAL

1. Remove water assembly.
2. Remove 4 bolts securing bearing carrier to jet drive, and remove bearing carrier.

INSTALLATION

1. Reinstall bearing carrier as shown.

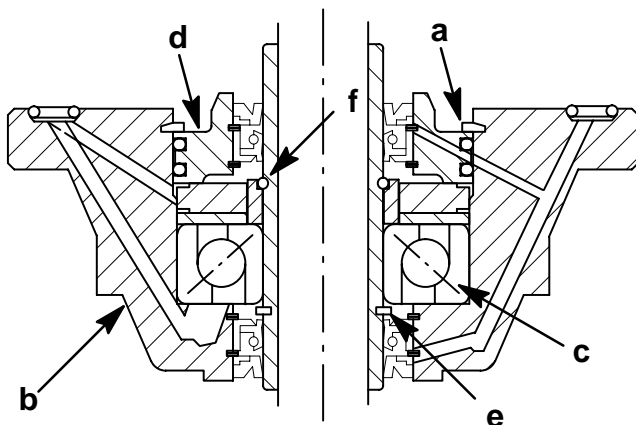


- a - Bolts (4) Apply Loctite 271 to Threads, Torque to 70 lb. in. (7.9 N·m)



Bearing Carrier Disassembly

1. Remove the large beveled snap ring from the bearing carrier.
2. Heat the bearing carrier with a torch only until you can barely touch it.
3. Hold the drive shaft vertical and bump the impeller end of the drive shaft against a wooden block causing the bearing carrier to slide down off the bearing.
4. Remove snap ring, press the ball bearing off the drive shaft. Leave the bearing thrust ring (located in the drive shaft groove) unless damaged.
5. Remove the seals and spiral retaining rings from the bearing carrier and the upper seal housing.
6. Clean all parts thoroughly and remove any burrs.



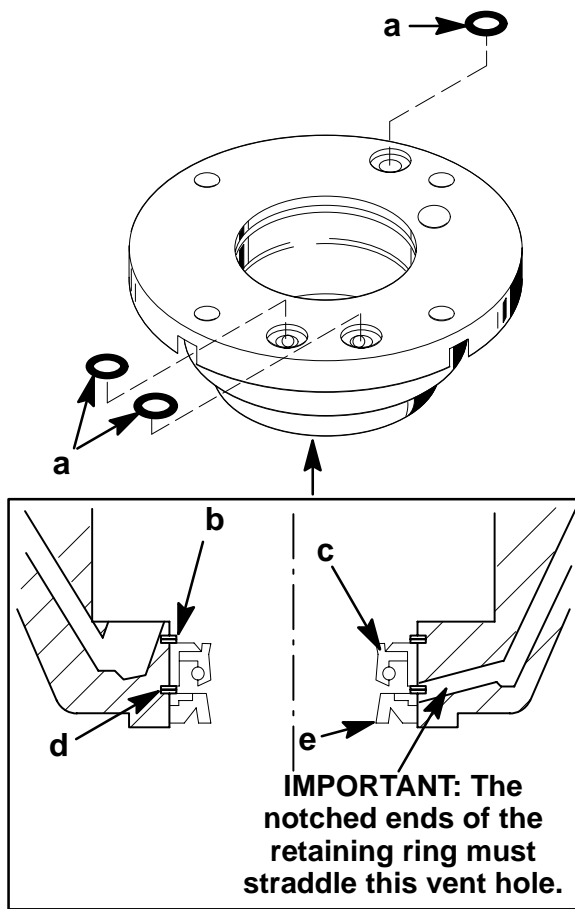
- a - Snap Ring
- b - Bearing Carrier
- c - Ball Bearing
- d - Upper Seal Housing
- e - Snap Ring
- f - Thrust Ring

Bearing Carrier Reassembly

Installing Lower Seals

Install seals into bearing carrier as follows:

1. Install O-ring seals into the top seats of the three passage holes.
2. Install spiral retaining ring into the inner ring groove.
3. Spread a film of grease around the inside bore of the seal surface before pressing in the seals.
4. Press in the garter spring seal against the inner retaining ring as shown. Fill the garter spring cavity in the seal with grease.
5. Install spiral retaining ring into the outer ring groove. Align the notched ends of the retaining ring to straddle the small vent hole drilled in the ring groove.
6. Press in the outer seal against the retaining ring as shown.
7. Grease all the seal lips.

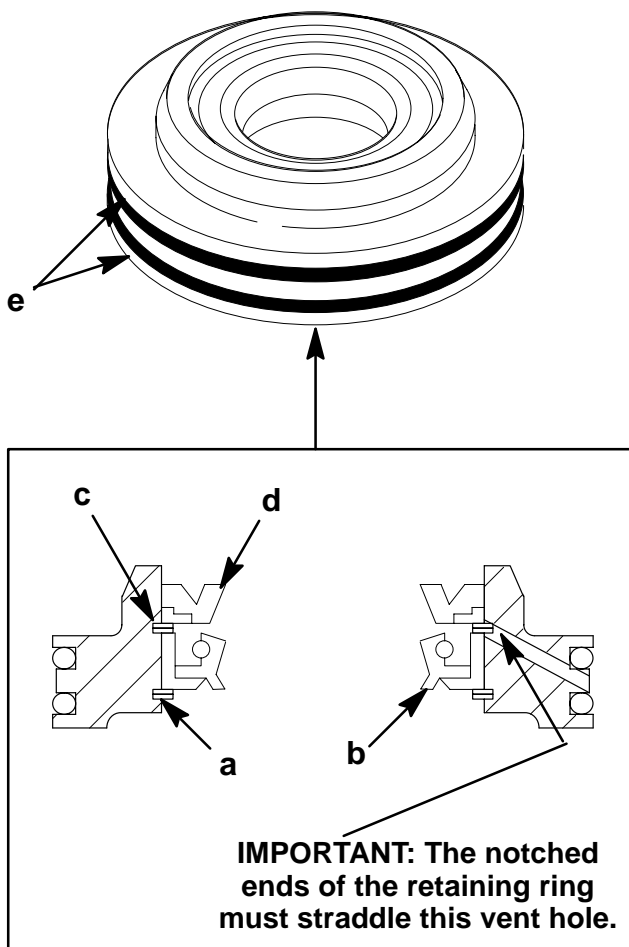


- a - O-rings
- b - Retaining Ring
- c - Spring Seal
- d - Retaining Ring
- e - Outer Seal



Installing Upper Seals

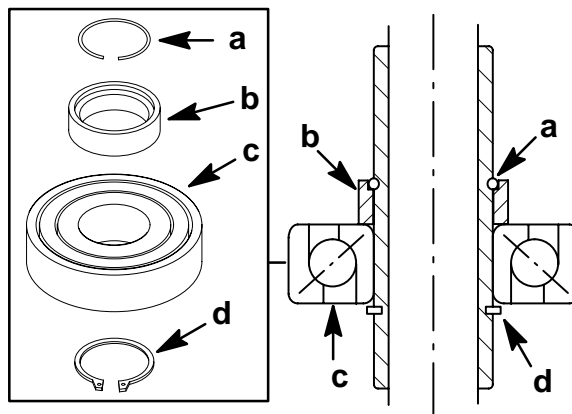
1. Install spiral retaining ring into the inner ring groove of the upper seal housing.
2. Spread a film of grease around the inside bore of the seal surface before pressing in the seals.
3. Press in the garter spring seal against the inner retaining ring. Fill the garter spring cavity in the seal with grease.
4. Install spiral retaining ring into the outer ring groove. Align the notched ends of the retaining ring to straddle the small vent hole drilled in the ring groove.
5. Press in the outer seal against the retaining ring.
6. Grease all the seal lips.
7. Grease the two O-ring seals and install them into the outer ring grooves.



- a - Retaining Ring
- b - Spring Seal
- c - Retaining Ring
- d - Outer Seal
- e - O-rings

Installing Drive Shaft Ball Bearing

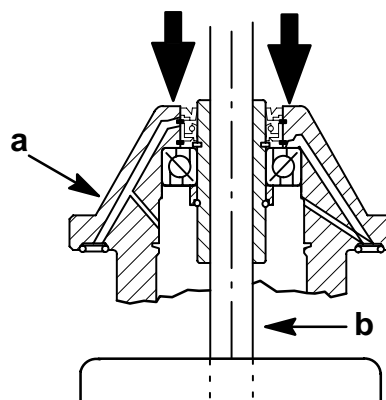
1. If removed, install the bearing thrust ring into the groove on the drive shaft.
2. Install collar onto the drive shaft. Press the new ball bearing onto the drive shaft, **pressing against the inner race only**. Press collar over the thrust ring, locking it in its groove. Install snap ring into drive shaft groove below the bearing.



Installing Drive Shaft

1. Lubricate the seals and inside bore of the bearing carrier.
2. Place the drive shaft ("b" impeller end facing up) into a vise.
3. Heat the bearing carrier until it feels warm to the touch.
4. Place the bearing carrier onto the drive shaft. Square up the inner bore with the ball bearing and push the bearing carrier down until it bottoms out against the bearing. It may be necessary to lightly tap bearing carrier onto the bearing using a rubber hammer.

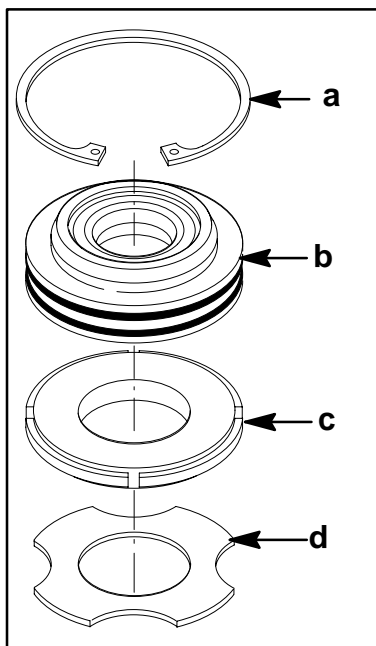
NOTE: Only a light pressing force is needed to press on the bearing carrier. It may be necessary to lightly tap the bearing carrier onto the bearing using a rubber hammer.



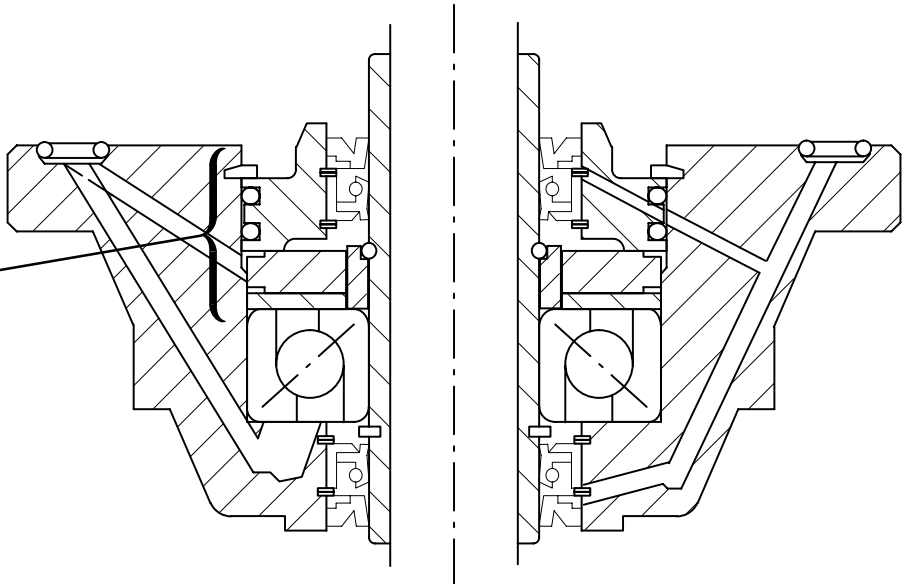
- a - Bearing Carrier
- b - Drive Shaft



5. Grease the upper seals and inside bore of the bearing carrier to ease entry of the seal housing.
6. Install the thrust washer against the ball bearing.
7. Install spacer, and the upper seal housing being careful not to damage the O-ring seals as they pass the snap ring groove. Only finger pressure should be necessary to push in the housing.
8. Install the beveled snap ring, beveled side facing up into the ring groove. Make sure the snap ring is fully seated into groove.



- a - Snap Ring
b - Upper Seal Housing
c - Spacer
d - Thrust Washer





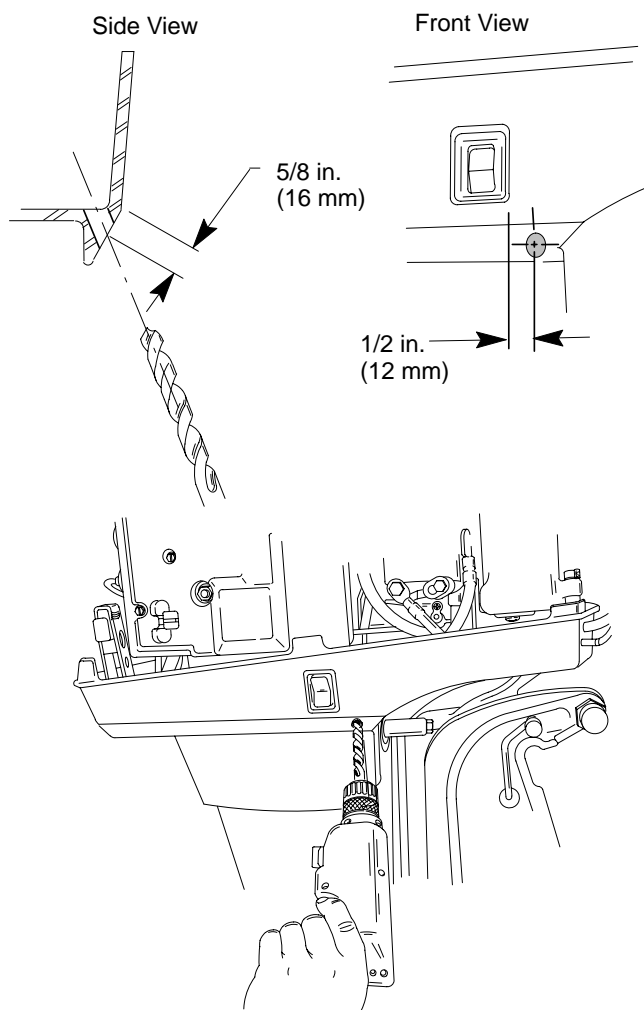
Jet Drive Tiller Handle Adaptor Kit

Installation Instructions

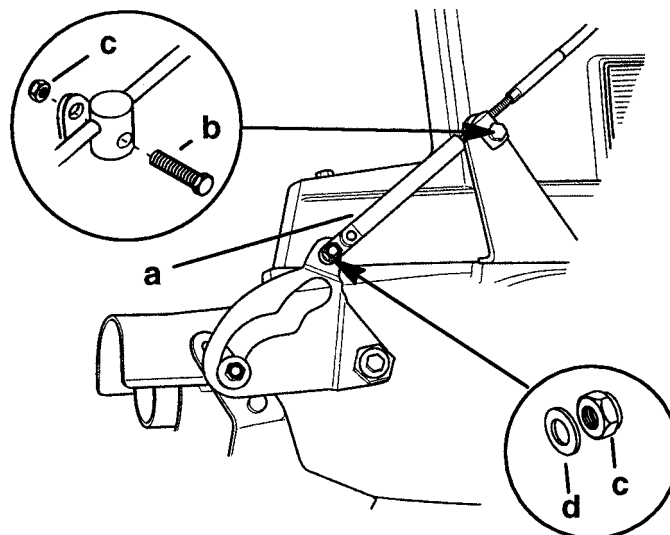
NOTE: This kit must be used in conjunction with the recommended Quicksilver tiller handle kit.

Install tiller handle kit (except shift cable connection and adjustment) using instructions provided with kit.

1. Drill hole in bottom cowl for cable routing as follows:
 - a. Locate the centerlines for the hole following the dimensions given in the illustration below. Use a center punch to mark center of hole.
 - b. Drill a 1/4 in. pilot hole and then a 9/16 in. hole angling up into the bottom cowl.

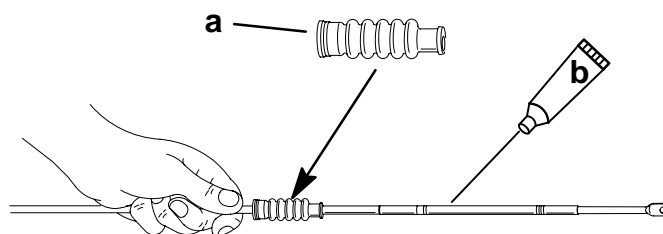


2. Install the shift cable to the jet drive. Use the existing mounting hardware supplied with the out-board. Adjust shift cable after kit is installed.



- a - Shift Cable
- b - Bolt
- c - Locknut
- d - Flat Washer

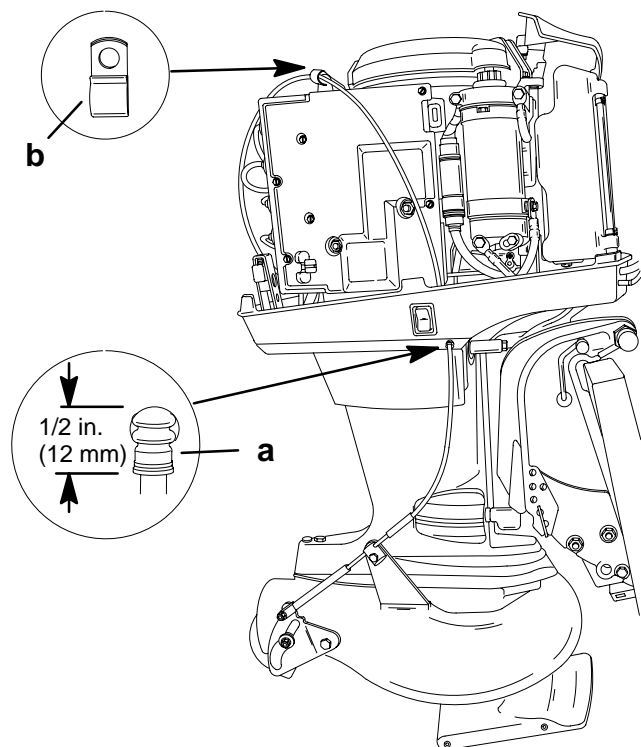
3. Lubricate the shift cable. Slide the cable boot onto the cable.



- a - Cable Boot
- b - Lubricant

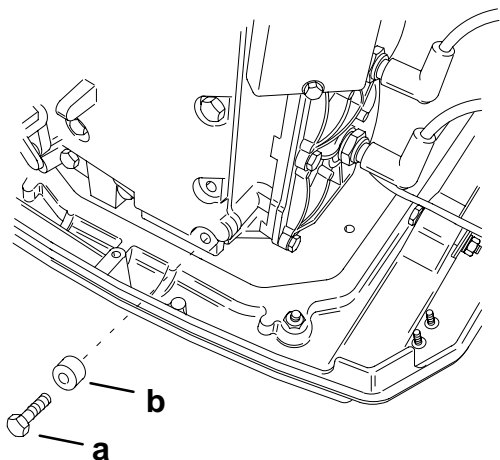


4. Slide the shift cable through the drilled hole.
5. Position the cable boot 1/2 in. (12 mm) out of the drilled hole.
6. Fasten shift cable to the engine with J-clip.



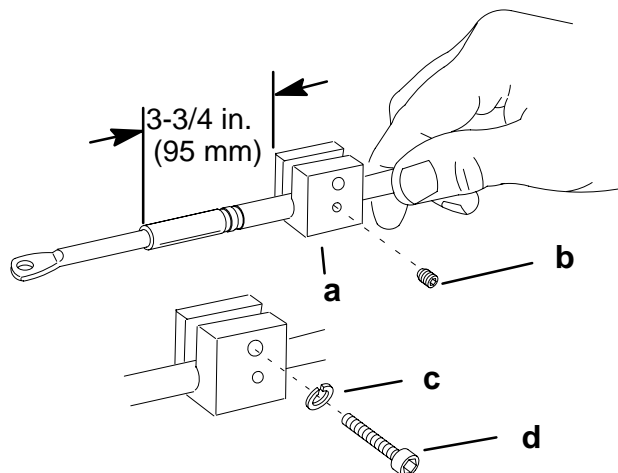
a - Position Cable Boot 1/2 in. (12 mm) Out of Drilled Hole
b - J-Clip

7. Install bolt and 21/32 in. long spacer into bottom hole on the exhaust cover. Do not tighten bolt at this time.



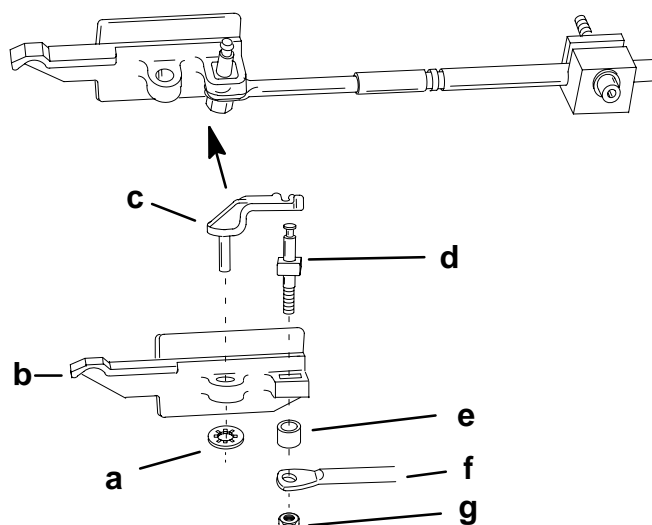
a - Bolt - 1-3/4 in. Long - Do Not Tighten At This Time
b - Spacer - 21/32 in. Long

8. Rotate the shift cable retainer so that the set screw is facing out and the slot is facing up.
9. Slide shift cable into retainer until brass tube extends out 3-3/4 in. (95 mm). Secure the retainer at this position by tightening the set screw until its snug, then add an additional 1/8 turn.
10. Install the Allen head screw and tighten securely.



a - Shift Cable Retainer
b - Set Screw
c - Lock Washer
d - Allen Head Screw - Tighten Securely

11. Install the shift slider onto the end of the shift cable. Tighten locknut, then back-off 1/4 turn.
12. Fasten the rod end retainer with retaining ring.

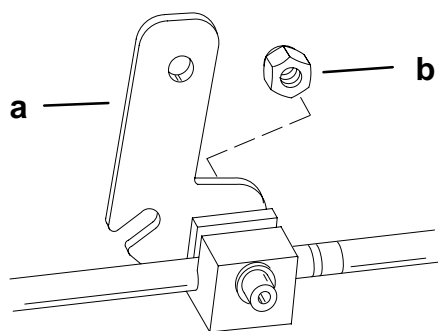


a - Retaining Ring
b - Shift Slider
c - Rod End Retainer
d - Stud
e - Bushing
f - Shift Cable
g - Locknut - Tighten, Then Back-Off The Locknut 1/4 Turn



13. Fasten the anchor plate to the shift cable retainer.

IMPORTANT: Do not over-tighten. Shift cable retainer must be free to pivot.

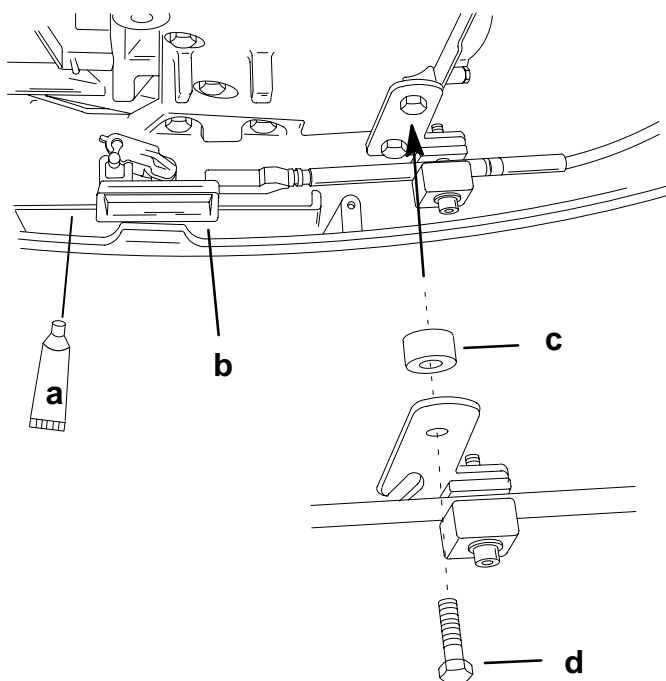


a - Anchor Plate

b - Locknut - Tighten, Then Back-Off The Locknut 1/4 Turn

14. Lubricate the shift slider rail in the bottom cowl with Quicksilver 2-4-C Multipurpose Lubricant with Teflon.

15. Place the shift slider on the rail and fasten the anchor plate to the engine. Torque bolts to 200 lb. in. (22.6 N-m).



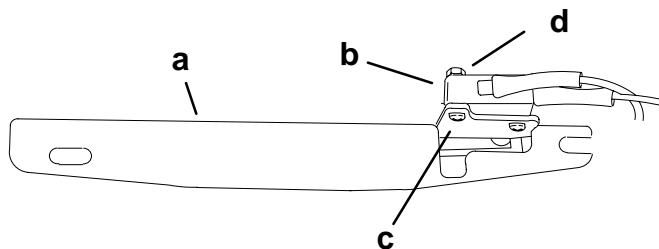
a - Lubricate Shift Slider Rail With Quicksilver 2-4-C Multipurpose Lubricant with Teflon

b - Shift Slider

c - Spacer - 23/32 in. Long

d - Bolt - 1-3/4 in. Long

16. Refer to the parts provided with your tiller handle kit and install the neutral start switch to the retainer. Do not tighten screws at this time.



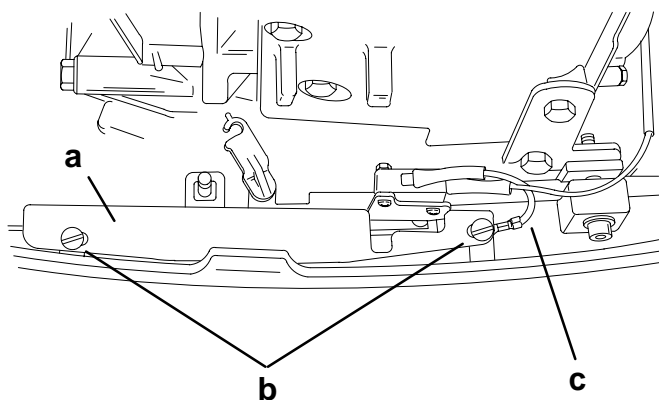
a - Retainer

b - Neutral Start Switch

c - Screw (2) - Do Not Tighten At This Time

d - Locknut (2)

17. Install retainer with two screws.



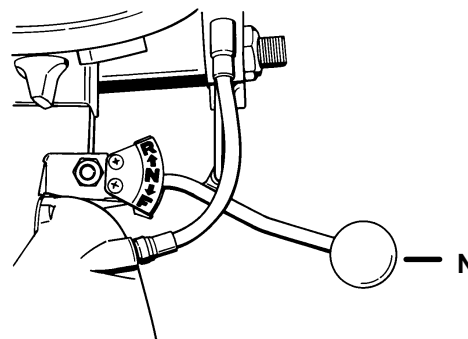
a - Retainer

b - Screw (2) - Provided With This Kit

c - Connect Ground Wire (From Neutral Start Switch) With Screw

18. Adjust the neutral start switch as follows:

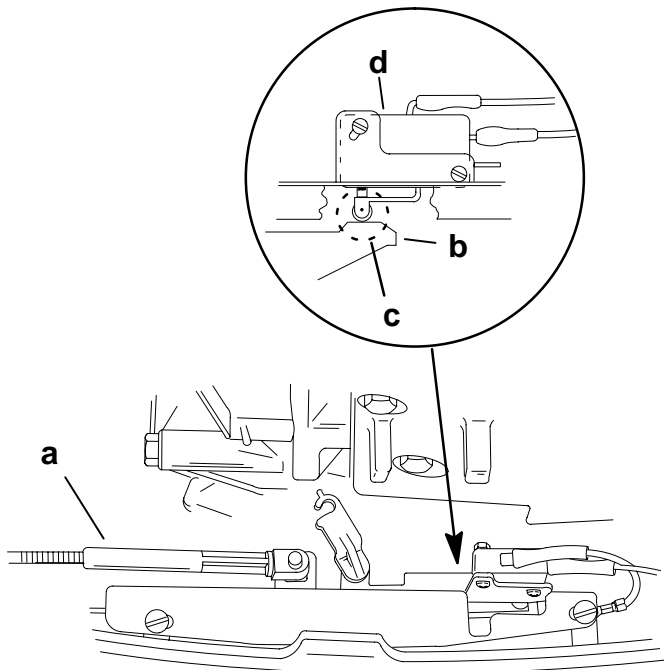
a. Place the outboard shift lever into neutral position.



b. With the shift lever in neutral, adjust the shift rod so that the flat lobe on the shift slider is centered with the roller on the neutral start switch.

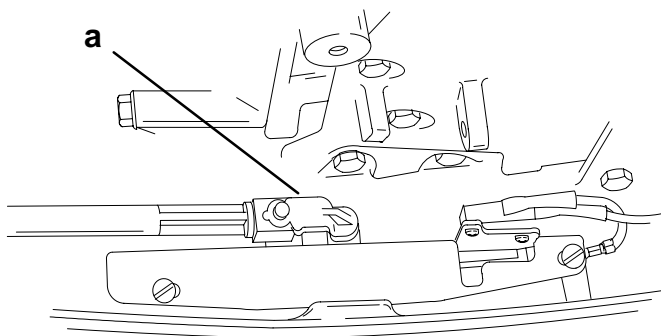


- c. Loosen the upper mounting screw for the neutral start switch. Rotate the neutral start switch up, then lower the switch until the roller activates the switch (clicks). Fasten switch at this position.



- a - Shift Rod
b - Shift Slider
c - Center Flat Lobe with Roller
d - Neutral Start Switch

19. Secure shift rod with rod end retainer.



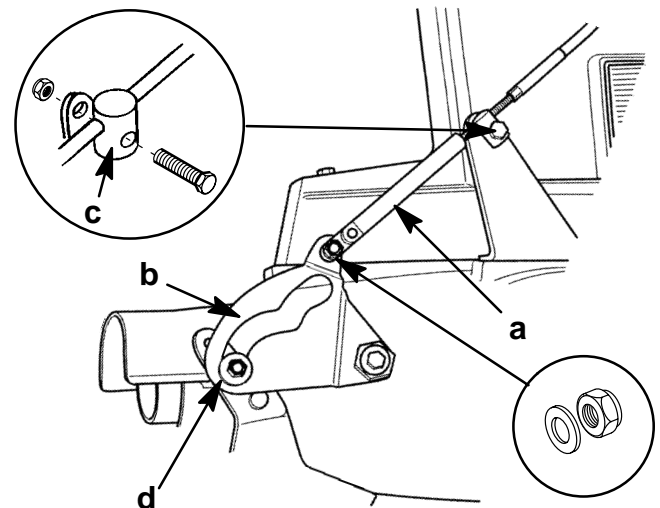
- a - Rod End Retainer

Shift Cable Adjustment

⚠ WARNING

The shift cable must be adjusted to lock the reverse gate against unexpected engagement (caused by water pressure hitting the gate) while operating the boat in forward. Activation of the reverse gate will cause sudden unexpected stopping of the boat. Sudden stopping may cause occupants to be thrown within the boat or even out of the boat. This action may result in serious injury or death.

1. Place shift lever into full forward position.
2. Adjust the brass barrel on the shift cable so that roller is at the full end of travel (bottom) in the shift cam when the shift lever is in forward.
3. Attach the brass barrel to the bracket with bolt and locknut. Tighten the bolt until it seats against the barrel, then back-off the bolt 1/4 turn. Hold bolt from turning, and tighten locknut on bolt. The barrel must be free to pivot.



- a - Shift Cable
b - Shift Cam
c - Barrel
d - Roller

4. Recheck the shift cable adjustment in forward shift position. The correct shift adjustment will position the cam far enough on the roller in order to lock the the reverse gate into forward position. You should not be able to forcibly push up the reverse gate toward neutral. Pull on the reverse gate by hand to verify this.

IMPORTANT: The forward locking of the reverse gate must be met. If not, readjust the shift cable.