

# STEERING SYSTEMS

## Section 6A - Power Steering

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## Parts List

Description	Qty.	Part Number
Power Steering Pump Seal Kit <sup>1</sup>	1	5688044

<sup>1</sup> Obtain from a local GM automotive dealer.

## Torque Specifications

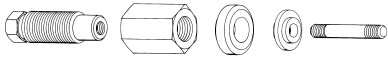
**NOTE:** Securely tighten all fasteners not listed below.

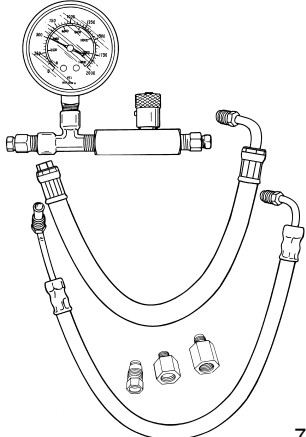
Description	Nm	lb-in.	lb-ft
Steering cable coupler nut	48		35
Steering system pivot bolts	34		25
Power steering hydraulic hose fittings	31		23
Power steering pump housing studs	47		35
Pump flow control valve fitting	47		35
Tie bar locknut	68		60
Fitting assembly	47		35
Power steering pump bolt and nut	41		30

## Lubricants / Sealants / Adhesives

Description	Where Used	Part Number
Special Lubricant 101	Clevis pins, steering cable end	92-802865A1
	Bushings	
Power Trim and Steering Fluid	O-ring	92-802880A1
	End plate O-ring	
	Reservoir O-rings	
Loctite 277	Tie bar threads	Obtain locally
Power Trim and Steering Fluid	Power Trim Pump	92-802880A1
Dexron III Automatic Transmission Fluid		Obtain locally

# Special Tools

Pulley Pusher Installer		
 <p style="text-align: right;">73670</p>	<p>Installs the pulley on the power steering pump.</p>	<p>91-93656A1</p>

Power Steering Test Gauge Kit		
 <p style="text-align: right;">74167</p>	<p>Tests the power steering system pressure.</p>	<p>91-38053A4</p>

## Kent-Moore Tools

<p><b>Kent-Moore Tools, Inc.</b>                  29784 Little Mack                  Roseville, MI 48066                  Phone: (313) 774-9500</p>	
Description	Part Number
Power Steering Pump Pulley Remover	J-25034

## Description

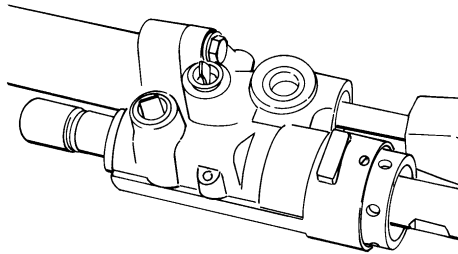
**NOTE:** The power steering pump and related components covered in this section do not pertain to Mercury MerCruiser 8.1 liter (496 cid) gasoline engine models or any Mercury MerCruiser or Cummins MerCruiser diesel engine models. For information on these models refer to the appropriate engine service manual.

The Power Steering system utilizes an engine-driven, vane-type hydraulic pump that supplies fluid flow and pressure by means of hoses to a control valve that, in turn, controls fluid flow and pressure to and from a booster cylinder. Modes make up the basic function of the Power Steering system: 1) neutral mode, 2) left turn mode, and 3) right turn mode. The control valve, which is activated by the steering cable, controls the steering system modes.

**NOTE:** The following Power Steering unit installations are viewed from inside boat, looking at transom.

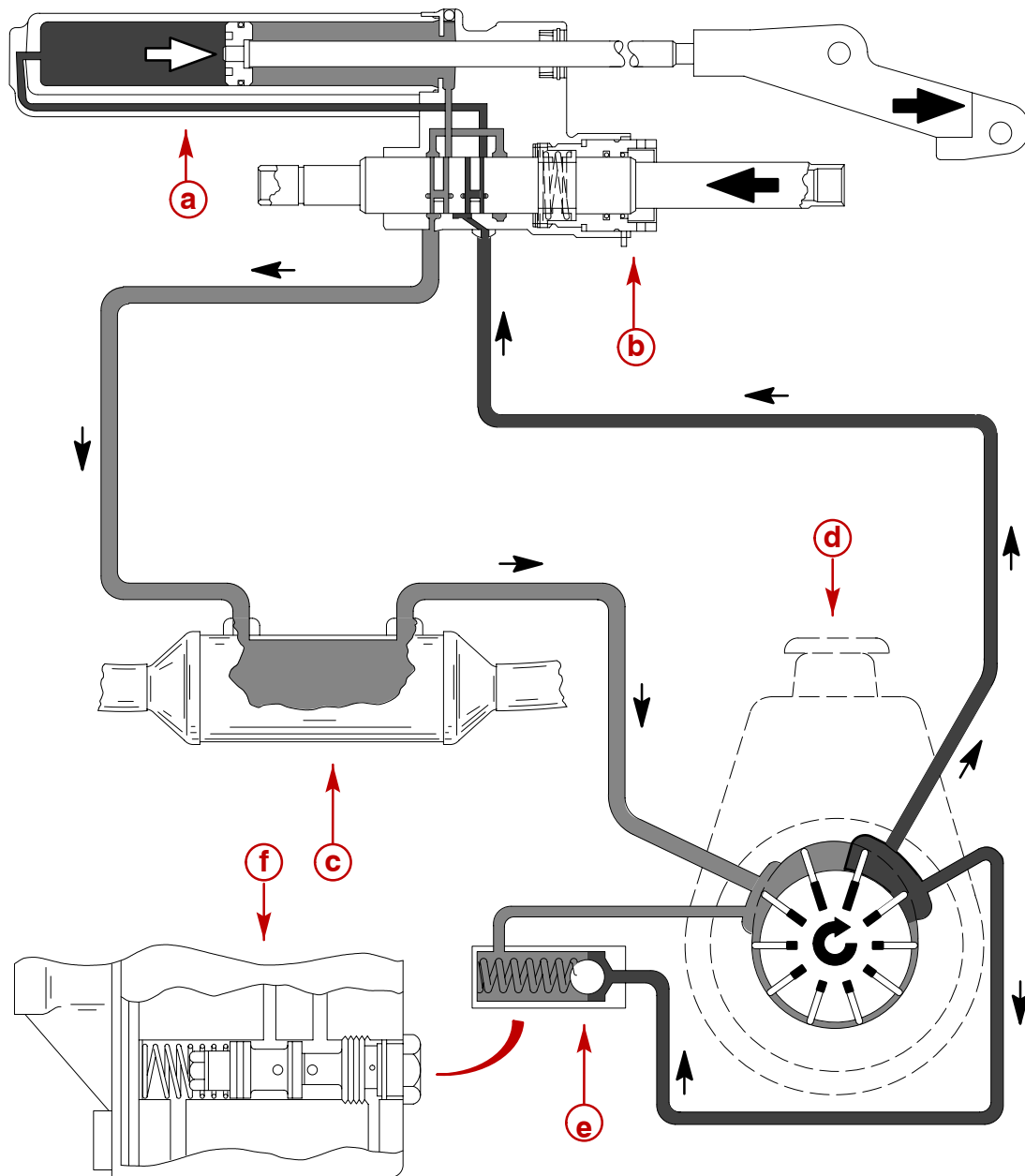
## Control Valve

The control valve is not serviceable and must be replaced as a complete assembly.



73898

# Power Steering System



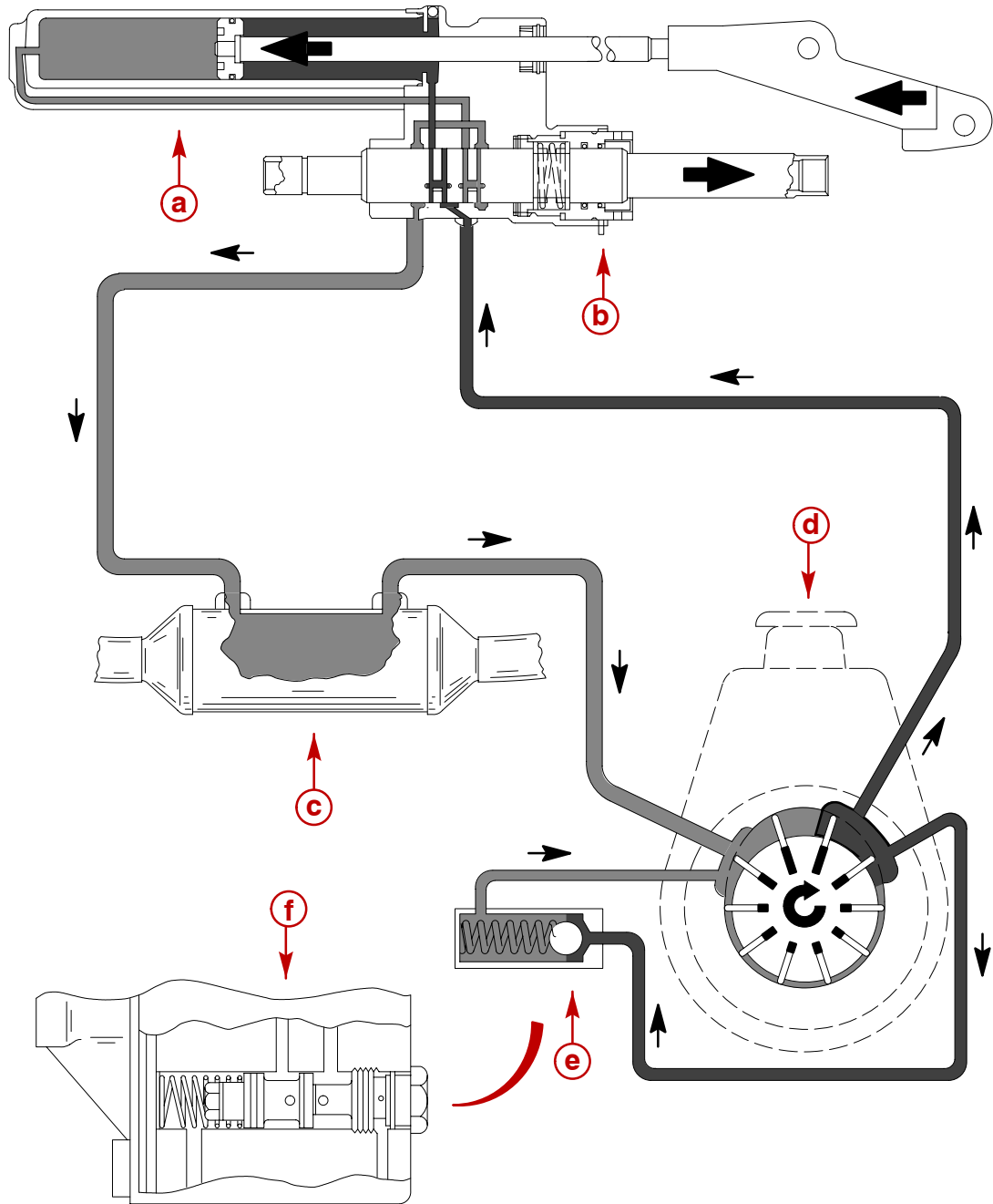
75238

### Right turn (Viewing from inside of boat looking at transom)

- a** - Piston
- b** - Control valve
- c** - Oil cooler
- d** - Pump
- e** - Relief valve
- f** - Pump housing

Description	High pressure	Low pressure
Internal System Pressure	7929-8618 kPa (1150-1250 psi)	483-862 kPa (70-125 psi)

# Power Steering System



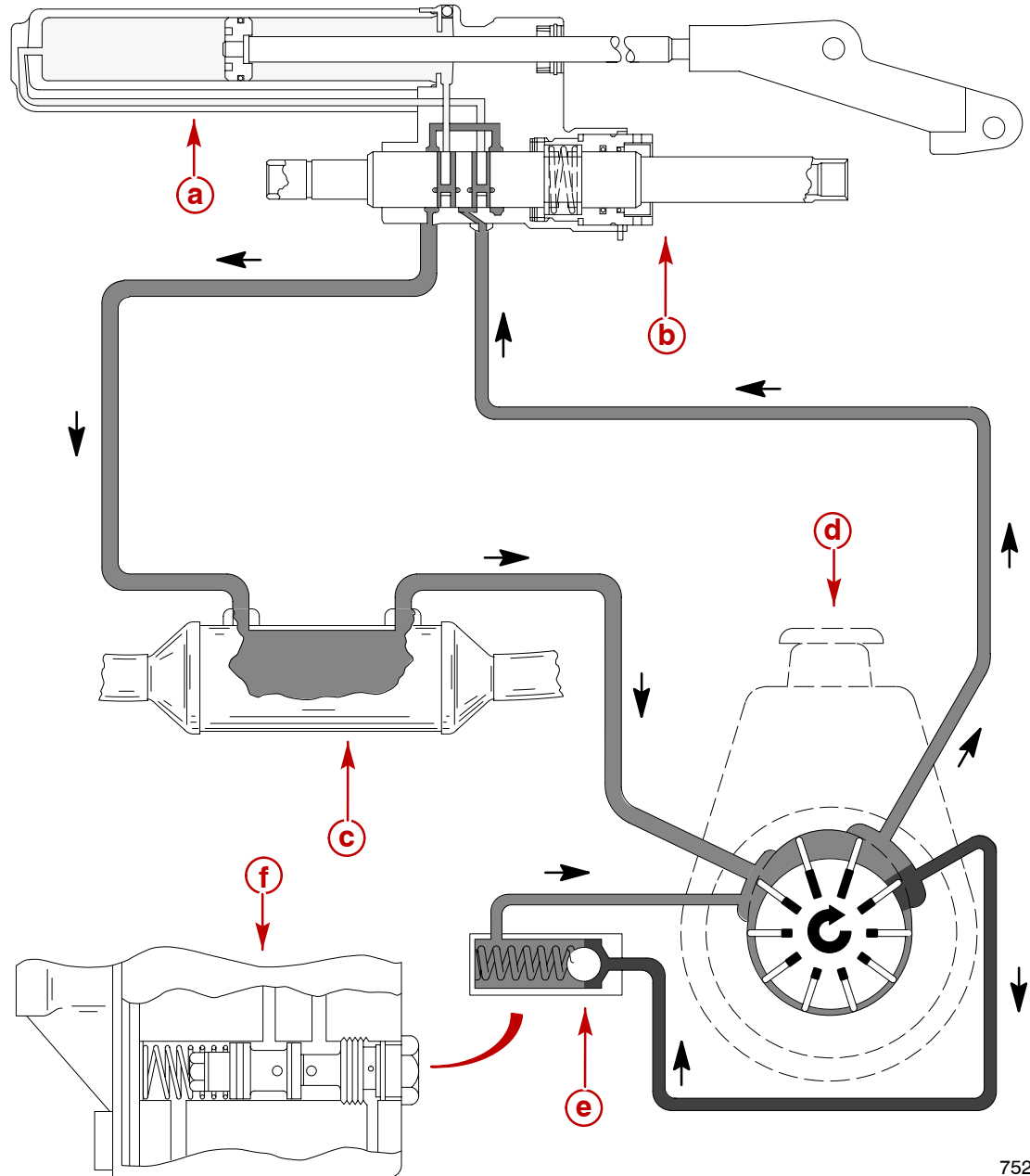
75239

**Left turn (Viewing from inside of boat looking at transom)**

- a** - Piston
- b** - Control valve
- c** - Oil cooler
- d** - Pump
- e** - Relief valve
- f** - Pump housing

Description	High pressure	Low pressure
Internal System Pressure	7929-8618 kPa (1150-1250 psi)	483-862 kPa (70-125 psi)

# Power Steering System



75237

**Neutral (Viewing from inside of boat looking at transom)**

- a** - Piston
- b** - Control valve
- c** - Oil cooler
- d** - Pump
- e** - Relief valve
- f** - Pump housing

Description	High pressure	Low pressure
Internal system pressure	7929-8618 kPa (1150-1250 psi)	483-862 kPa (70-125 psi)

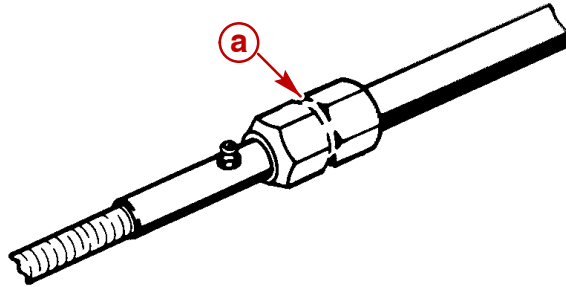
## Steering Helm and Cable

The transom assembly is shipped with the steering cable guide tube preset for cables with end dimensions that comply with ABYC standards as outlined in the NMMA certification handbook. The steering cable coupler nut must also have a means of locking it to the guide tube, as specified in ABYC requirements.

### WARNING

**Failure to use a steering cable locking device could cause loss of steering, which could cause damage to the boat and/or injury.**

**NOTE:** All current production Quicksilver RideGuide steering cables have a self-locking coupler nut and do not require an external locking device. (Other cable manufacturers also make cables with self-locking coupler nut.)



22060

**a** - Quicksilver RideGuide steering cable self-locking coupler nut (identified by groove)

**IMPORTANT:** If using a steering cable that does not have a self-locking coupler nut, an external locking device such as a locking sleeve must be used.

### CAUTION

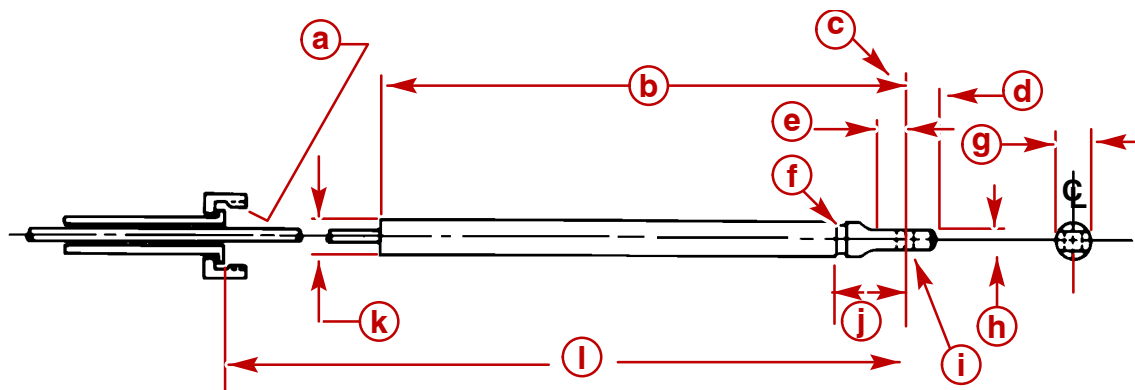
**If steering cable with improper dimensions is installed, severe damage to transom assembly and/or steering system may result.**

1. Steering cable must be the correct length, particularly when installed in larger boats.
2. Avoid sharp bends, kinks, or loops in cable.
3. Fully extended steering cable end dimension must be as shown.



## STEERING CABLE SPECIFICATIONS

**IMPORTANT: Power steering pump lugging (squealing) in a hard right turn (against lock) may mean a steering cable has been installed that does not have the correct dimensions.**



21435

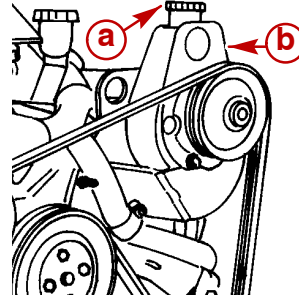
- a** - Coupler nut - 7/8 - 14 UNF - 2B thread
- b** - 298 mm (11-3/4 in.) minimum
- c** - Interface point
- d** - 12.7 mm (1/2 in.) maximum
- e** - 10.7 mm (27/64 in.) minimum flat
- f** - 3.1 mm (7/64 in.) minimum radius
- g** - 15.9 mm (5/8 in.) maximum diameter end fitting
- h** - 9.5 mm (3/8 in.)
- i** - 9.8 mm (3/8 in.) diameter through hole, chamfered each side
- j** - 34.9 mm (1-3/8 in.) maximum
- k** - 15.9 mm (5/8 in.) diameter tube
- l** - Cable travel:
  - Mid-travel position - 428.6 mm (16-7/8 in.)
  - Total travel to be 203.2 mm (8 in.) minimum, to 228.6 mm (9 in.) maximum
  - Travel each side of mid-travel position -101.6 mm (4 in.) minimum, 114.3 mm (4-1/2 in.) maximum

# Filling and Air Bleeding Power Steering System

## Checking Fluid Level

### ENGINE WARM

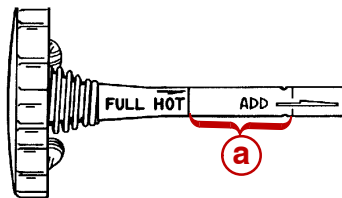
1. Stop engine. Position sterndrive unit so that it is straight back.
2. Remove fill cap / dipstick from power steering pump and note fluid level.



74908

- a** - Fill cap / dipstick
- b** - Power steering pump

3. Level should be between the FULL HOT mark and ADD mark on dipstick.



72518

- a** - Proper fluid level with engine warm

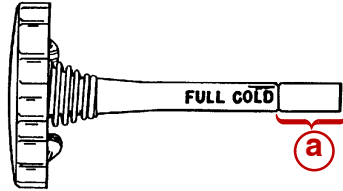
4. If level is below ADD mark, but fluid is still visible in pump reservoir, add required amount of fluid through fill cap opening, to bring level up to FULL HOT mark on dipstick. DO NOT OVERFILL.

Description	Where Used	Part Number
Power Trim and Steering Fluid	Power Trim Pump	92-802880A1
Dexron III Automatic Transmission Fluid		Obtain locally

5. If fluid is not visible in reservoir, a leak exists in the power steering system. Find cause and correct.

**ENGINE COLD**

1. With engine stopped, position sterndrive unit so that it is straight back.
2. Remove fill cap / dipstick from power steering pump and note fluid level.
3. Level should be between FULL COLD mark and bottom of dipstick.



72519

**a** - Proper fluid level with engine cold

4. If level is below bottom of dipstick, but fluid is still visible in pump reservoir, add required amount of fluid, through fill cap opening, to bring level up to FULL COLD mark on dipstick. DO NOT OVERFILL.

Description	Where Used	Part Number
Power Trim and Steering Fluid	Power Trim Pump	92-802880A1
Dexron III Automatic Transmission Fluid		Obtain locally

If fluid is not visible in reservoir, a leak exists in the power steering system. Find cause and correct.

## Filling and Bleeding

**IMPORTANT:** Power steering system must be filled exactly as explained in the following to ensure that all air is bled from the system. All air must be removed, or fluid in pump may foam during operation and be discharged from pump reservoir. Foamy fluid also may cause power steering system to become spongy, which may result in poor boat control.

1. With engine stopped, position sterndrive unit so that it is straight back.
2. Remove fill cap / dipstick from power steering pump.
3. Add approved fluid to bring level up to FULL COLD mark on dipstick.

**IMPORTANT:** Use only Power Trim and Steering Fluid or Dexron III automatic transmission fluid (ATF) in power steering system.

Description	Where Used	Part Number
Power Trim and Steering Fluid	Power Trim Pump	92-802880A1
Dexron III Automatic Transmission Fluid		Obtain locally

4. Turn steering wheel back and forth to end of travel in each direction several times.
5. Recheck fluid level and add fluid, if necessary.
6. Install vented fill cap. Tighten securely.

### CAUTION

**Do not operate engine without water being supplied to seawater pickup pump, or pump impeller may be damaged and subsequent overheating damage to engine may result.**

7. Start engine and operate at fast idle (1000-1500 rpm) until engine reaches normal operating temperature. During this time, turn steering wheel back and forth to end of travel in each direction several times.
8. Position sterndrive unit so that it is straight back and stop engine.
9. Remove fill cap from pump.
10. Allow any foam in pump reservoir to disperse.
11. Check fluid level and add fluid, as required, to bring level up to FULL HOT mark on dipstick. Do not over fill.
12. Reinstall fill cap. Tighten securely.

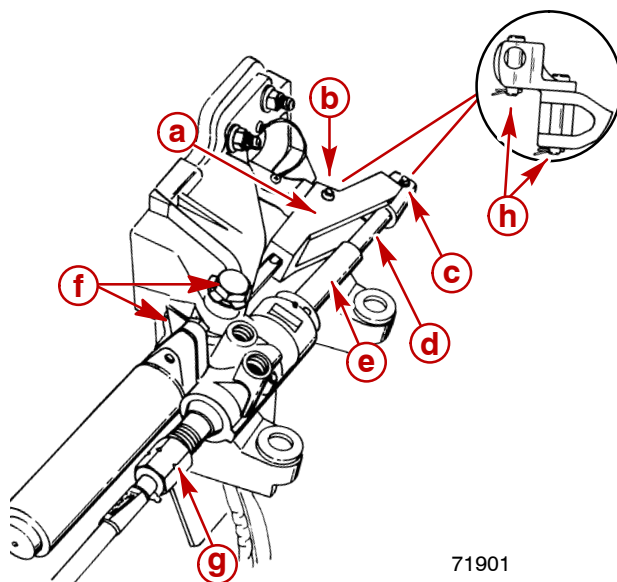
**IMPORTANT:** Sterndrive unit must be positioned straight back and power steering fluid must be hot to accurately check fluid level.

13. If fluid is still foamy (in Step 5.), repeat Steps 7. through 12. until fluid does not foam and level remains constant.

# Power Steering Assembly

## Removal

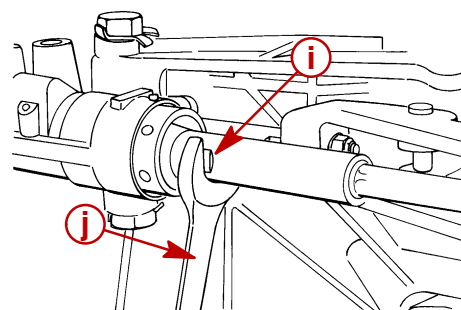
1. Remove rear clevis pin from steering lever.
2. Remove forward clevis pin from steering cable.
3. Using suitable wrenches, hold the flat surfaces on the cable guide tube in the vertical position then loosen the coupler nut and remove the steering cable.
4. Remove and plug the power steering hoses.
5. Straighten locking tabs on pivot bolt washers.
6. Remove the pivot bolts.
7. Remove the power steering unit from transom.



71901

### Control valve

- a** - Clevis
- b** - Rear clevis pin
- c** - Forward clevis pin
- d** - Steering cable end
- e** - Cable guide



73901

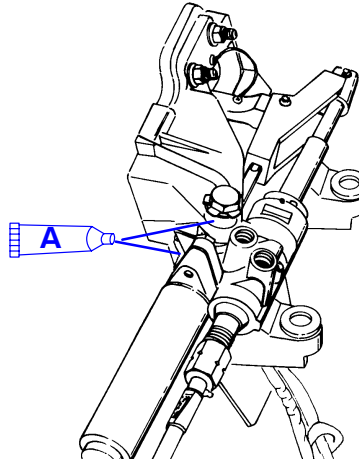
- f** - Pivot bolt
- g** - Coupler nut
- h** - Cotter pins
- i** - Flat surface on tube
- j** - Suitable wrench

# Installation

**⚠ WARNING**

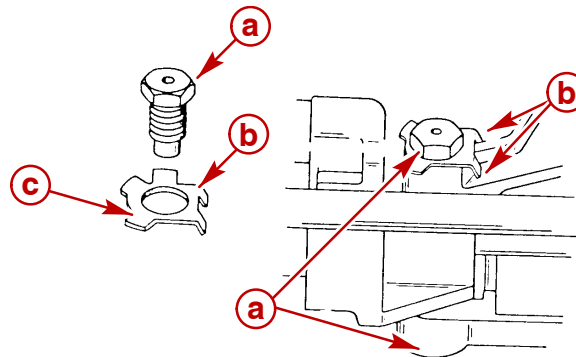
Steering cable outer casing must be free to move back-and-forth for steering to function properly. Do not fasten any wires, cables, or other items to steering cable, as this may prevent it from moving.

1. Lubricate bushings.



Description	Where Used	Part Number
<b>A</b> Special Lubricant 101	Bushings	92-802865A1

2. Slide the power steering cylinder bushings between the transom mounting brackets. Tighten the 2 pivot bolts by hand. Move the steering assembly slightly to ensure proper pin engagement into the pivot bushings.
3. Ensure that the washer tangs straddle the ridges on the inner transom plate.



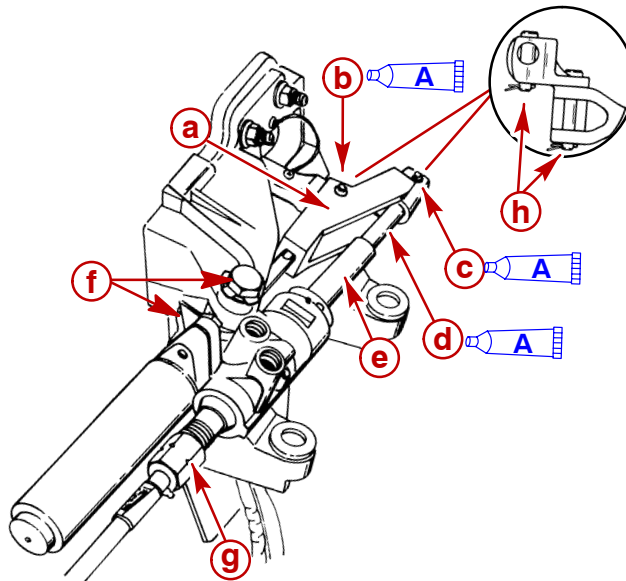
- a** - Pivot bolt
- b** - Washer tang
- c** - Washer tab

4. Torque the pivot bolts.

Description	Nm	lb-in.	lb-ft
Steering system pivot bolts	34		25

5. Bend the washer tabs against the corresponding flats on both pivot bolt heads.
6. Ensure the power steering control valve pivots freely.

7. Connect the power steering unit to the steering lever.
  - a. Lubricate the clevis pins.
  - b. Install the clevis pin in the clevis from the top.
  - c. Secure the pin in the clevis with a cotter pin. Spread the cotter pin ends.
8. Lubricate the steering cable end and install the cable through the guide.
9. Start the coupler nut on the cable guide tube. Do not tighten at this time.
10. Connect the cable end to the clevis with the forward clevis pin. Spread the cotter pin ends.



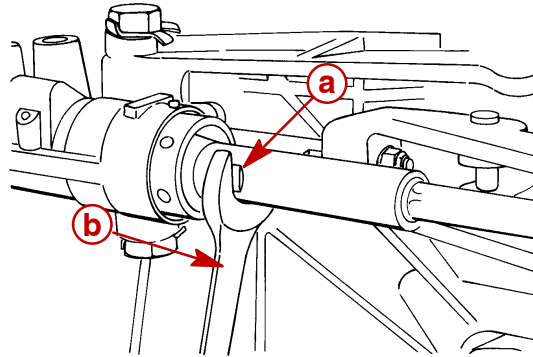
71901

**Control valve**

- |                               |                        |
|-------------------------------|------------------------|
| <b>a</b> - Clevis             | <b>e</b> - Cable guide |
| <b>b</b> - Rear clevis pin    | <b>f</b> - Pivot bolt  |
| <b>c</b> - Forward clevis pin | <b>g</b> - Coupler nut |
| <b>d</b> - Steering cable end | <b>h</b> - Cotter pins |

Description	Where Used	Part Number
<b>A</b> Special Lubricant 101	Clevis pins, steering cable end	92-802865A1

11. Using a suitable wrench, hold the flat surfaces on the cable guide tube in the vertical position. Torque the coupler nut. **Be certain the flat surfaces are still aligned vertically after torque is applied to coupler nut.**



73901

- a** - Flat surface  
**b** - Suitable wrench

Description	Nm	lb-in.	lb-ft
Steering cable coupler nut	47		35

12. Install power steering hoses to power steering assembly.
- a. Torque both fittings. Route hoses as described in **Section 2A** to avoid contact with the steering system components.

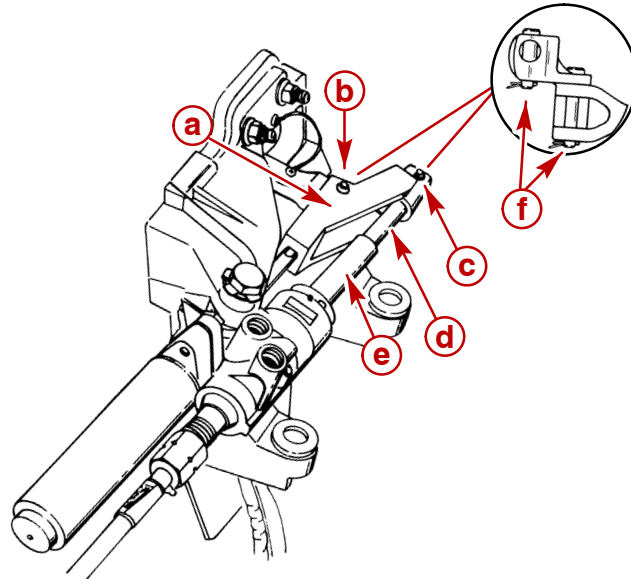
Description	Nm	lb-in.	lb-ft
Power steering hydraulic hose fittings	31		23



## Power Steering System Pressure

The following instructions are arranged so that a defective part can be detected by the process of elimination. It is suggested that the order of the instructions be followed so that the Power Steering System can be tested effectively.

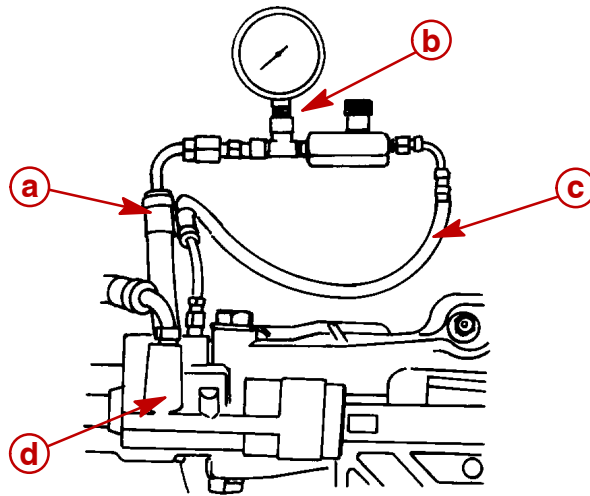
1. Remove front and rear clevis pins.
2. Retract cable into cable guide tube.



71901

- a** - Clevis
- b** - Rear clevis pin
- c** - Forward clevis pin
- d** - Steering cable end
- e** - Cable guide tube
- f** - Cotter pins

3. Assemble and install test gauge.



- a** - Pump pressure hose
- b** - Test gauge assembly
- c** - Gauge to control valve hose
- d** - Control valve

Power Steering Test Gauge Kit		
<p>74167</p>	<p>Tests the power steering system pressure.</p>	<p>91-38053A4</p>

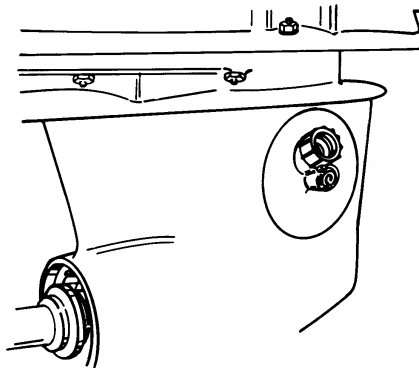
4. Open valve on gauge completely.

**⚠ CAUTION**

**Do not operate engine without cooling water being supplied to water pickup holes in gear housing, or overheating damage to engine may result.**

**NOTE:** For complete instructions for attaching a flush test device to the various water inlets refer to **Sterndrive Water Pickups in Section 1B.**

5. Connect a flush test device to sterndrive unit. Partially open water tap (approximately 1/2 maximum) and allow cooling system to fill completely. Cooling system is full when water is discharged through the propeller. Do not use full water tap pressure.



22029

**Standard Bravo shown**

6. Start engine and operate at 1000-1500 rpm until engine reaches normal operating temperature.
7. With engine at idle speed, test gauge reading should be between 483 and 862 kPa (70 and 125 psi). If not, proceed as follows:

**If lower than 483 kPa (70 psi), proceed to Pump Pressure Test.**

**If higher than 862 kPa (125 psi), check for hose restrictions in the system.**

**⚠ CAUTION**

**Do not lug pump at maximum pressure for more than 5 seconds in next step or damage to power steering pump may occur.**

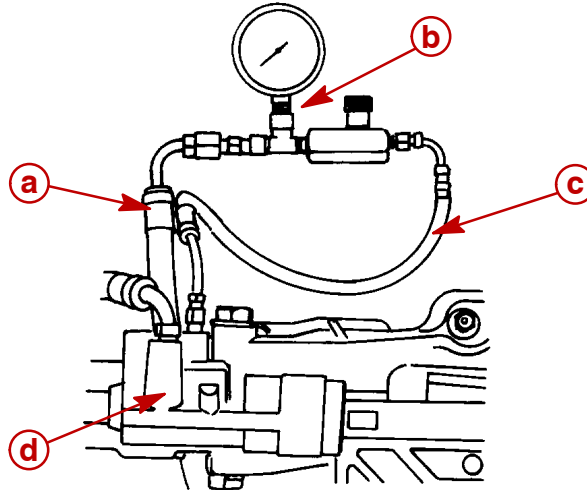
8. Push in then pull steering cable **momentarily**. Gauge reading should show an instant increase in pressure when block is pushed in both directions.
9. Push steering cable in until booster cylinder piston rod is fully retracted. With piston rod in this position, **momentarily** push steering cable in until maximum pressure reading is obtained.
  - **If pressure is above 6897 kPa (1000 psi), system pressure is good.**
  - **If pressure is below 6897 kPa (1000 psi), conduct Pump Pressure Test.**

# Pump Pressure Test

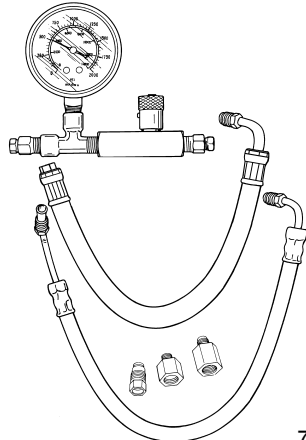
**⚠ CAUTION**

In performing the following test, do not lug pump at maximum pressure for more than 5 seconds or damage to power steering pump may occur.

1. Install test gauge.



- a** - Pump pressure hose
- b** - Test gauge assembly
- c** - Gauge to control valve hose
- d** - Control valve

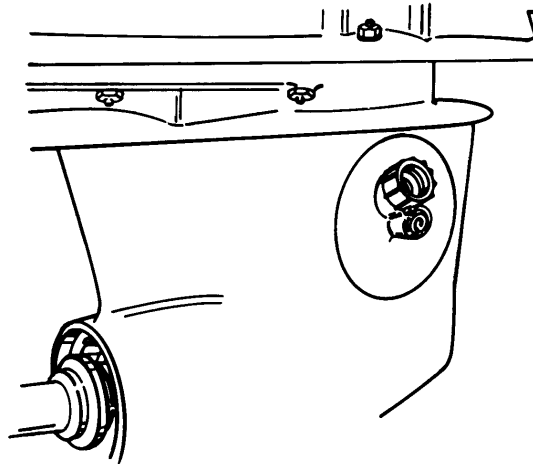
Power Steering Test Gauge Kit		
 <p>74167</p>	<p>Tests the power steering system pressure.</p>	<p>91-38053A4</p>

**⚠ CAUTION**

**Do not operate engine without cooling water being supplied to water pickup holes in gear housing, or overheating damage to engine may result.**

**NOTE:** For complete instructions for attaching a flush test device to the various water inlets refer to **Sterndrive Water Pickups in Section 1B.**

2. Connect a flush test device to sterndrive unit. Partially open water tap (approximately 1/2 maximum) and allow water to enter cooling system. Do not use full water tap pressure.



22029

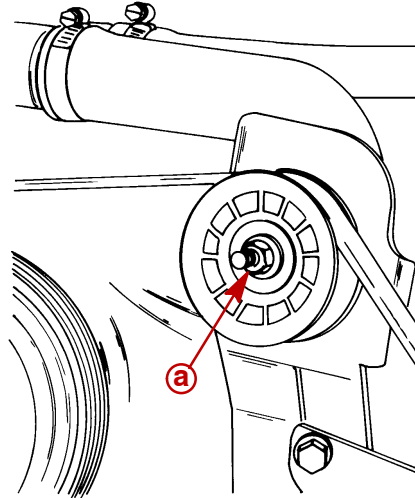
**Standard Bravo shown**

3. Start engine and operate at 1000-1500 rpm until engine reaches normal operating temperature.
4. Close test gauge valve just long enough to obtain maximum pressure reading.
5. Close and open valve 3 times. Record highest pressure reading attained each time.
  - a. **If pressure readings are between 7932-8621 kPa (1150 and 1250 psi) and are within a range of 345 kPa (50 psi),** the pump is within specifications. If the pump tests OK, but system pressure was low (as tested under **Power Steering System Pressure Test**), proceed to **Booster Cylinder Test**.
  - b. **If pressure readings are between 7932-8621 kPa (1150-1250 psi), but are not within a 345 kPa (50 psi) range,** the power steering pump flow control valve is sticking or pump hydraulic system is dirty.
  - c. **If pressure readings are constant, but below 6897 kPa (1000 psi ),** replace power steering pump.

# Power Steering Pump

## Removal

1. Loosen the adjusting stud and remove the serpentine belt from the power steering pulley.

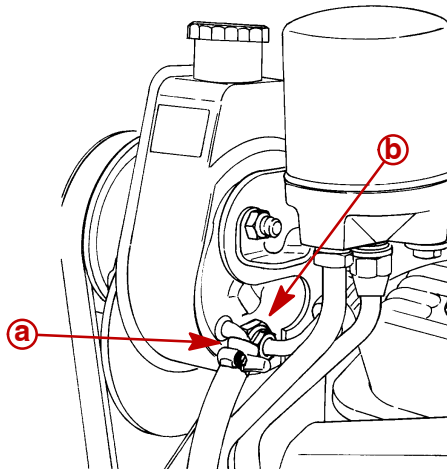


75483

**a** - Adjusting nut

**NOTE:** Use a suitable container to catch power steering fluid when removing the power steering hoses.

2. Remove the high pressure hose and return hose from the power steering pump.

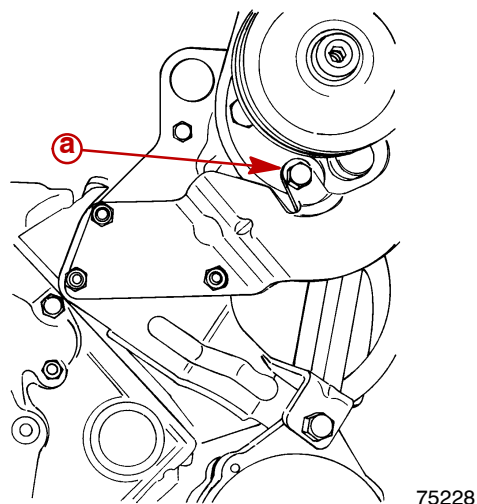
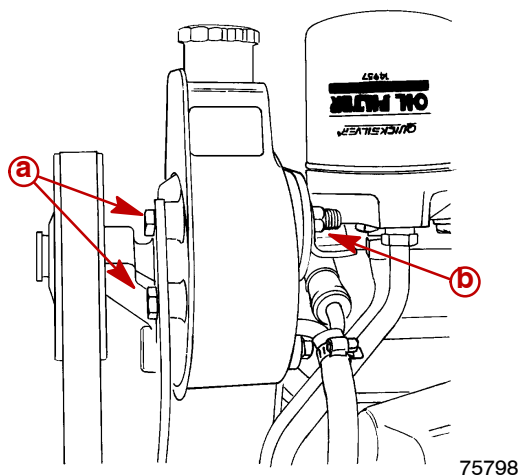


75228

### Power steering pump typical location

- a** - Return hose
- b** - High pressure hose

3. Remove mounting fasteners from pump.



**Power steering pump typical location**

- a - Nut
- b - Bolts

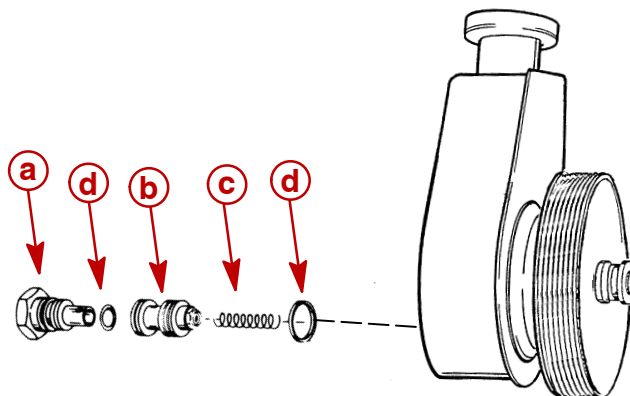
4. Remove the power steering pump from the bracket.

**Flow Control Valve Servicing**

**⚠ CAUTION**

**ENVIRONMENTAL HAZARD! Discharge of oil or oil waste into the environment is restricted by law. Do not spill oil or oil waste into the environment when using or servicing your boat. Contain and dispose of oil or oil waste as defined by local authorities.**

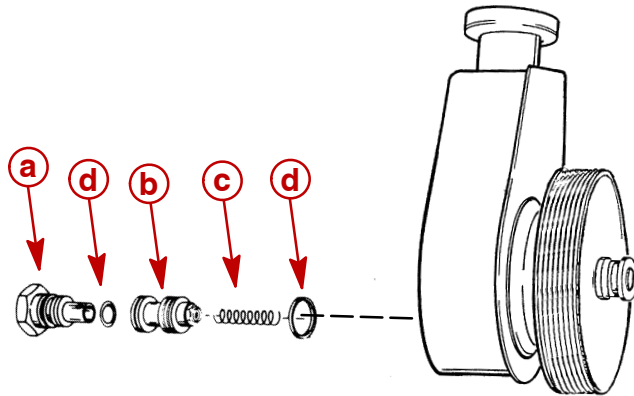
1. Drain fluid from pump.
2. Remove components shown.



- a - Fitting assembly
- b - Control valve assembly
- c - Flow control spring
- d - O-rings

76869

3. Inspect control valve assembly and fitting assembly for contamination and damage.
4. Install components shown and torque fitting.



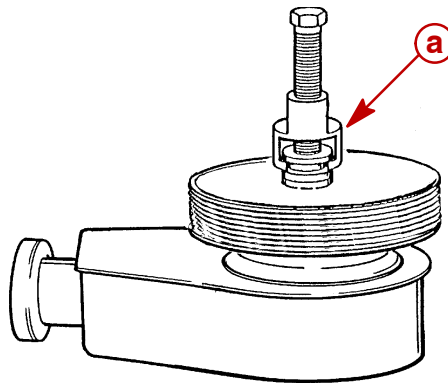
76869

- a** - Fitting assembly
- b** - Control valve assembly
- c** - Flow control spring
- d** - New O-rings

Description	Nm	lb-in.	lb-ft
Pump flow control valve fitting	47		35

### Pump Shaft Oil Seal Replacement

1. Remove pump pulley.



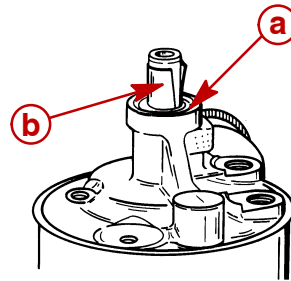
76895

- a** - Pulley removal tool

Description	Part Number
Pulley Removal Tool	J-25034



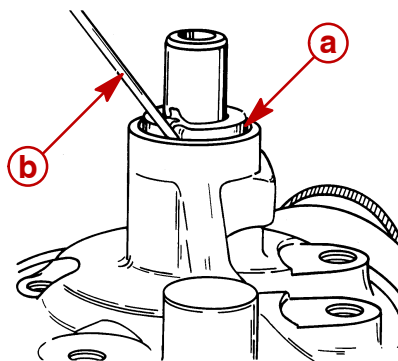
2. Push a 0.13 mm (0.005 in.) shim stock past the oil seal until it contacts the pump body (approximately 64 mm [2-1/2 in.] long).



76830

- a** - Oil seal
- b** - Shim stock

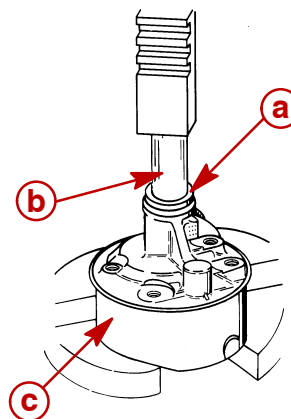
3. Remove oil seal.
4. Remove shim stock.



22152

- a** - Seal
- b** - Suitable tool

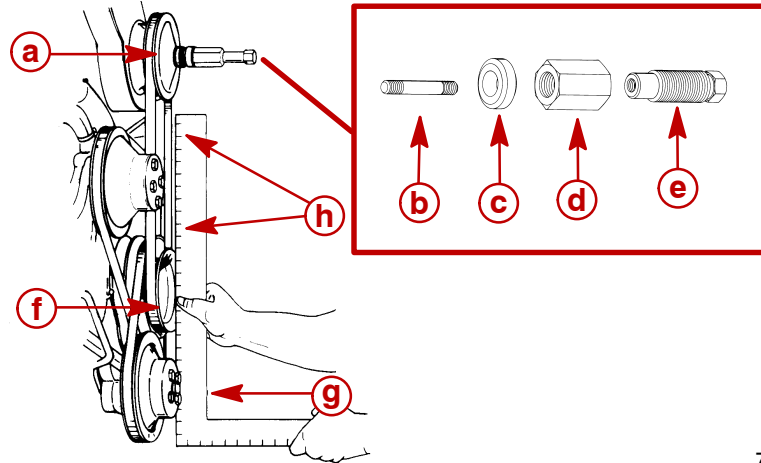
5. Install new oil seal. Properly support pump reservoir so that reservoir back does not distort.



22151

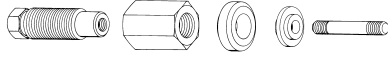
- a** - New oil seal - metal side up
- b** - Suitable mandrel
- c** - Pump reservoir

6. Install pulley using Pulley Pusher Installer and a long straight edge:
  - a. Place pulley on pump shaft.
  - b. Thread stud all the way into pump shaft.
  - c. Place bearing over stud.
  - d. Do not use spacer from kit.
  - e. Thread nut onto shaft. Thread shaft and nut all the way onto stud.
  - f. Using a long straight edge to check drive belt alignment, turn large pusher nut until drive belt is parallel to straight edge.
  - g. Check pulley installation for correct alignment.



76896

- a** - Power steering pump pulley
- b** - Stud
- c** - Bearing
- d** - Nut
- e** - Shaft
- f** - Crankshaft pulley (shown) or water circulating pump pulley
- g** - Long straight edge
- h** - Drive belt parallel

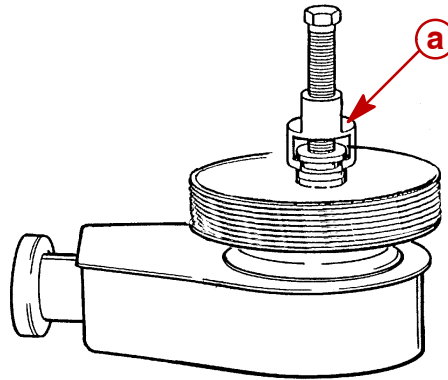
Pulley Pusher Installer		
 <p>73670</p>	<p>Installs the pulley on the power steering pump.</p>	<p>91-93656A1</p>

# Disassembly

**CAUTION**

**ENVIRONMENTAL HAZARD!** Discharge of oil or oil waste into the environment is restricted by law. Do not spill oil or oil waste into the environment when using or servicing your boat. Contain and dispose of oil or oil waste as defined by local authorities.

1. Drain fluid from pump.
2. Remove pump pulley.

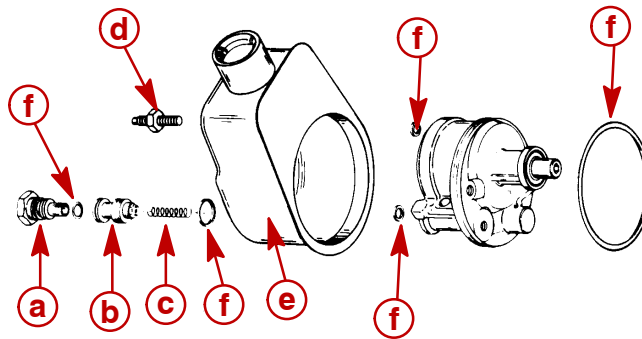


72821

**a** - Pulley Remover

Description	Part Number
Power Steering Pump Pulley Remover	J-25034

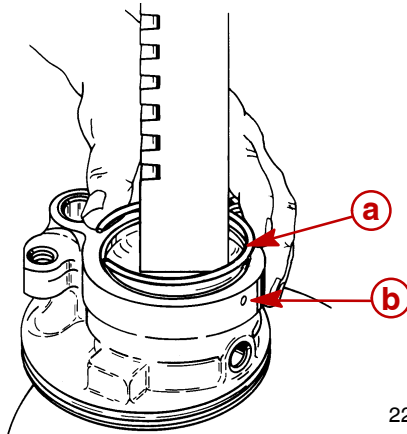
3. Remove reservoir, fitting assembly, control valve assembly, flow control spring, studs, and O-rings.
4. Discard O-rings and retain the other parts.



22155

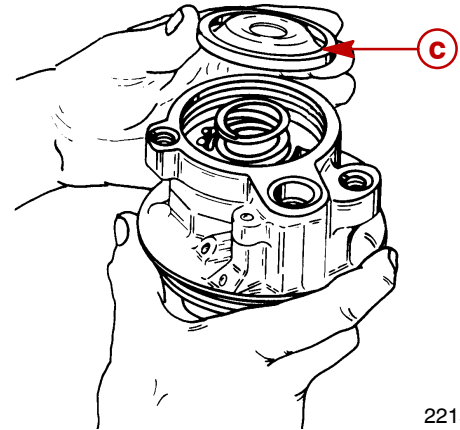
- a** - Fitting assembly
- b** - Control valve assembly
- c** - Flow control spring
- d** - Studs
- e** - Reservoir
- f** - O-rings

5. Position retaining ring so that ring end is 25 mm (1 in.) from end of hole in housing.
6. Support housing in press and push down on end plate to remove tension on retaining ring.
7. Insert awl into hole in housing to push ring from recess.
8. Use screwdriver to remove retaining ring and end plate.



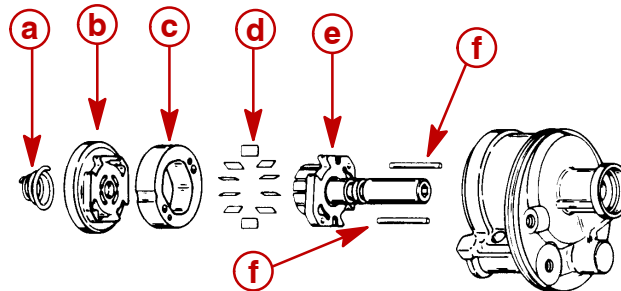
22151

- a** - Retaining ring
- b** - Hole
- c** - End plate



22152

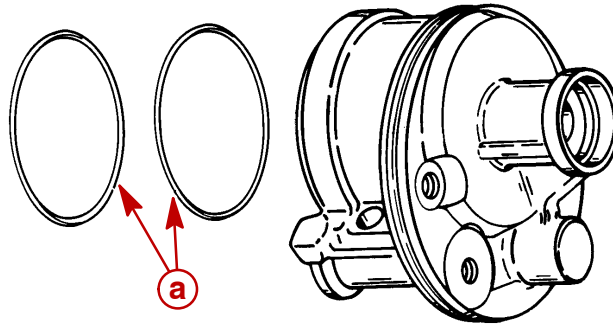
9. Remove pump components shown.



22155

- a** - Spring
- b** - Pressure plate
- c** - Pump ring
- d** - Pump vanes
- e** - Pump shaft and rotor assembly
- f** - Dowel pins

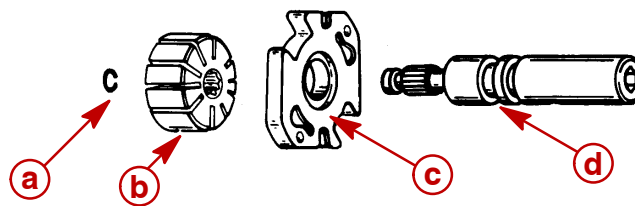
10. Remove and discard O-rings from housing.



**a** - O-rings

22155

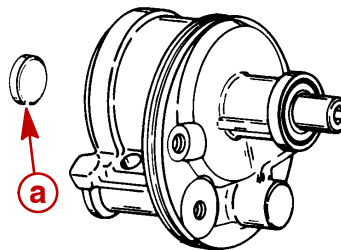
11. Remove retaining ring, rotor, and thrust plate.



**a** - Retaining ring  
**b** - Rotor  
**c** - Thrust plate  
**d** - Pump shaft

22155

12. Remove magnet.



**a** - Magnet

22154

## Cleaning And Inspection

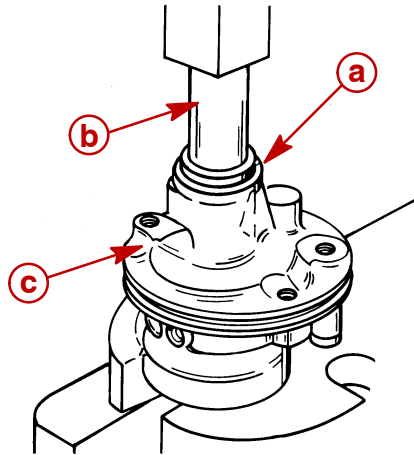
1. Clean and inspect all metal parts.

## Reassembly

**NOTE:** All references to Power Steering fluid refer to Power Trim and Steering Fluid or Dexron II if Quicksilver product is not available.

**NOTE:** Obtain and install a new seal kit 5688044 from a local GM automotive dealer when reassembling pump.

1. Install new pump shaft oil seal metal side up. Support the pump reservoir so that the back does not distort.



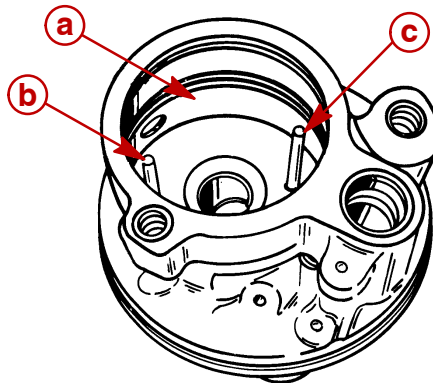
22151

- a** - New oil seal
- b** - 1 in. socket
- c** - Pump reservoir

2. Lubricate pressure plate O-ring and place in the third groove in the housing.

Description	Where Used	Part Number
Power Trim and Steering Fluid	O-ring	92-802880A1

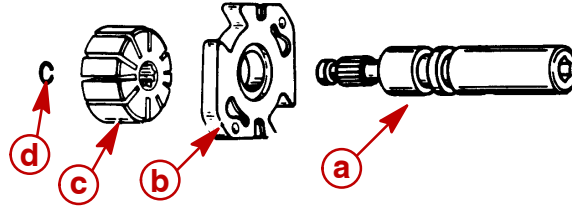
3. Install dowel pins.



22150

- a** - Pressure plate O-ring
- b** - Dowel pins

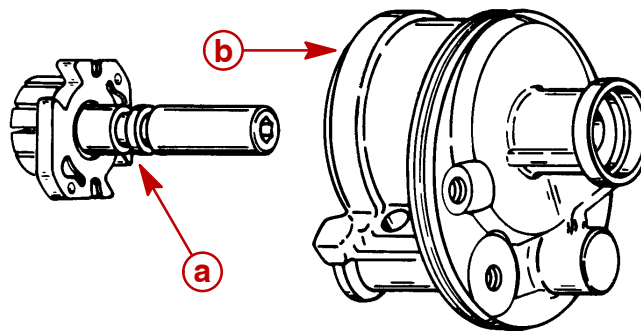
- Assemble pump shaft and rotor assembly. Rotor should be installed with the countersunk side toward the thrust plate.



22155

- a** - Pump shaft
- b** - Thrust plate
- c** - Rotor
- d** - Retaining ring

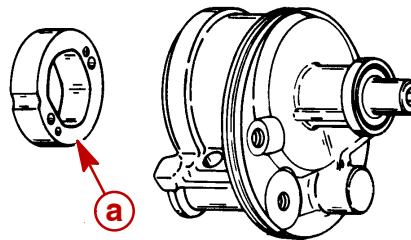
- Install pump shaft and rotor assembly.



22154

- a** - Pump shaft and rotor assembly
- b** - Pump housing

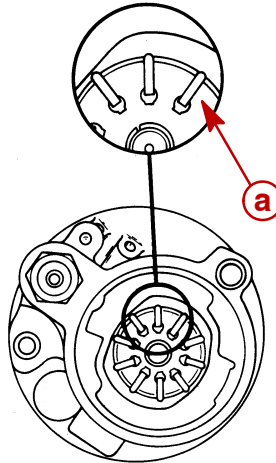
- Install pump ring by placing the 2 smaller holes over the dowel pins.



22154

- a** - Pump ring

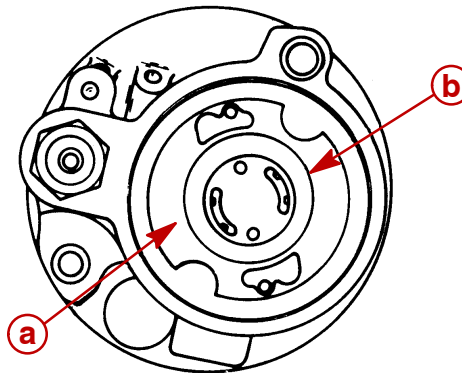
7. Install vanes in rotor slots with rounded edges toward pump ring. Vanes must slide freely.



22154

**a** - Vanes

8. Install pressure plate. Ensure spring groove faces up.

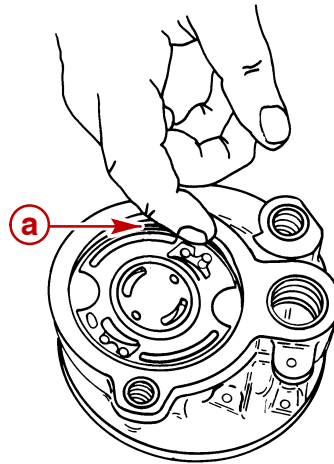


22154

**a** - Pressure plate  
**b** - Spring groove



9. Lubricate end plate O-ring and place in second groove in housing.

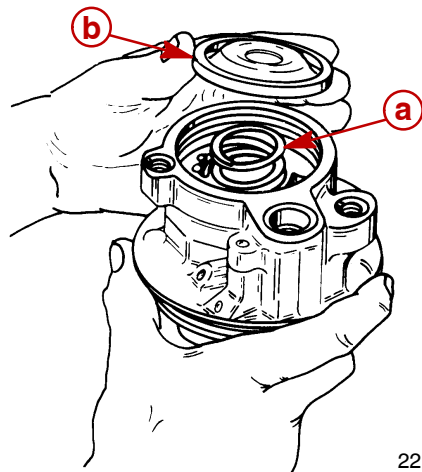


22150

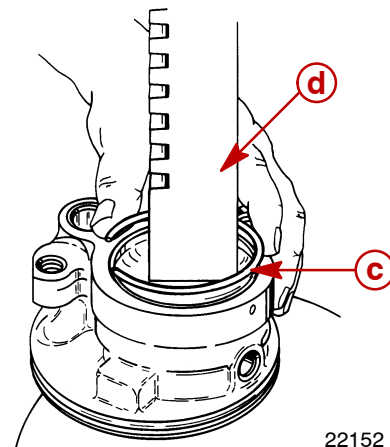
**a** - End plate O-ring

Description	Where Used	Part Number
Power Trim and Steering Fluid	End plate O-ring	92-802880A1

10. Install pressure plate spring, end plate, and retaining ring. Use care not to damage end plate and O-ring.



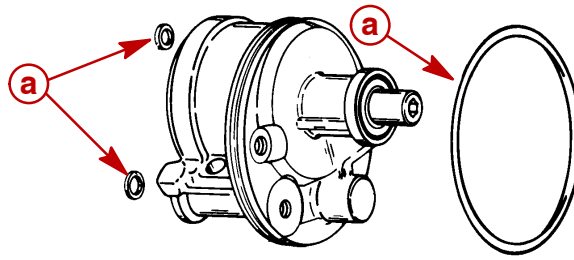
22151



22152

- a** - Pressure plate spring
- b** - End plate
- c** - Retaining ring
- d** - Arbor press

11. Lubricate reservoir O-rings and install in groove in pump housing.

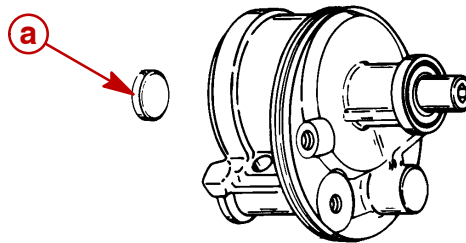


22153

**a** - Reservoir O-rings

Description	Where Used	Part Number
Power Trim and Steering Fluid	Reservoir O-rings	92-802880A1

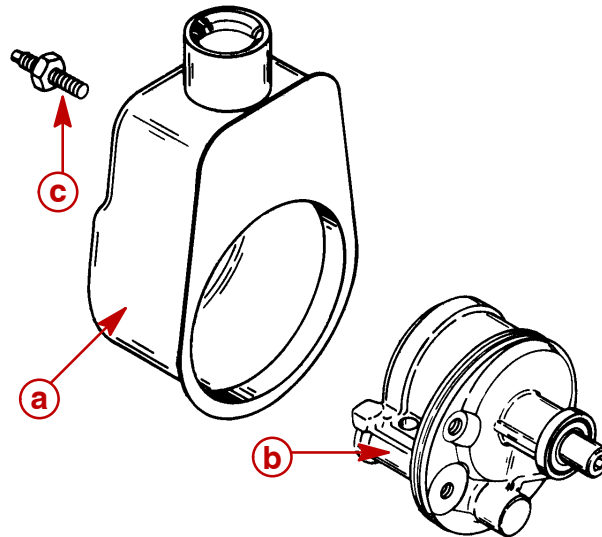
12. Place magnet on housing.



22153

**a** - Magnet

13. Secure reservoir to pump housing and torque studs.

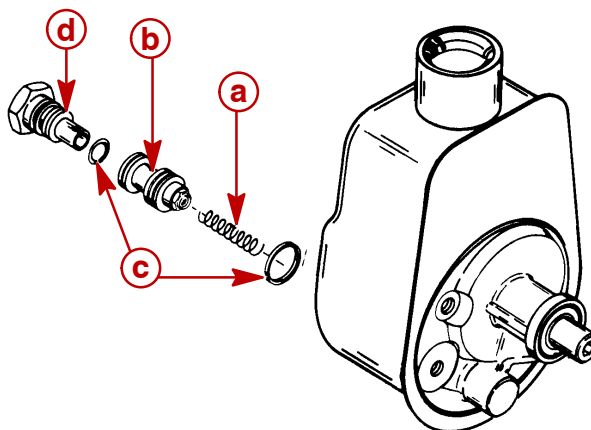


22153

**a** - Reservoir  
**b** - Pump housing  
**c** - Studs

Description	Nm	lb-in.	lb-ft
Power steering pump housing studs	47		35

14. Install components as shown. Torque fitting assembly.



22153

- a** - Flow control spring
- b** - Control valve assembly
- c** - O-ring for fitting assembly
- d** - Fitting assembly

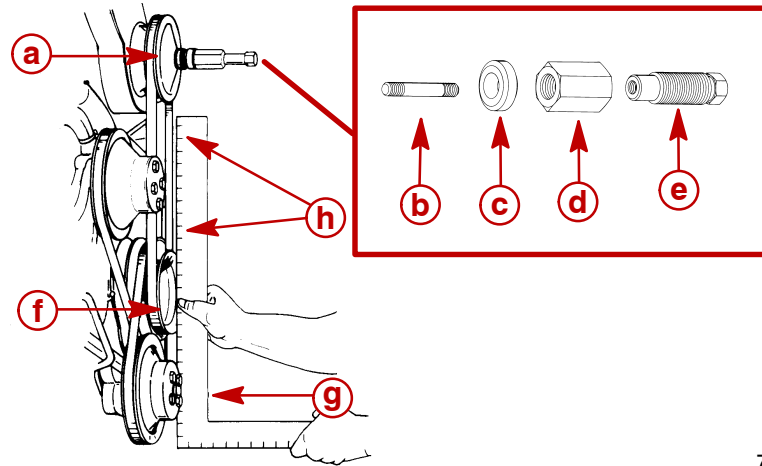
Description	Nm	lb-in.	lb-ft
Fitting assembly	47		35

15. Install pulley using Pulley Pusher Installer and a long straight edge:

- a. Place pulley on pump shaft.
- b. Thread stud all the way into pump shaft. Place bearing over stud. Do not use spacer from kit.
- c. Thread nut onto shaft. Thread shaft and nut all the way onto stud.
- d. Using a long straight edge to check drive belt alignment, turn large pusher nut until drive belt is parallel to straight edge.

Pulley Pusher Installer		
<p>73670</p>	Installs the pulley on the power steering pump.	91-93656A1

e. Check pulley installation for correct alignment. Do not use spacer.



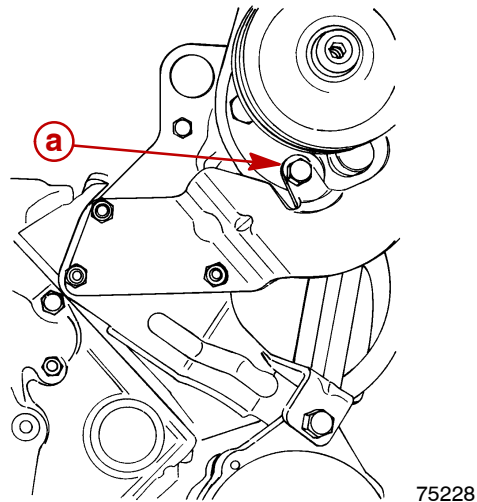
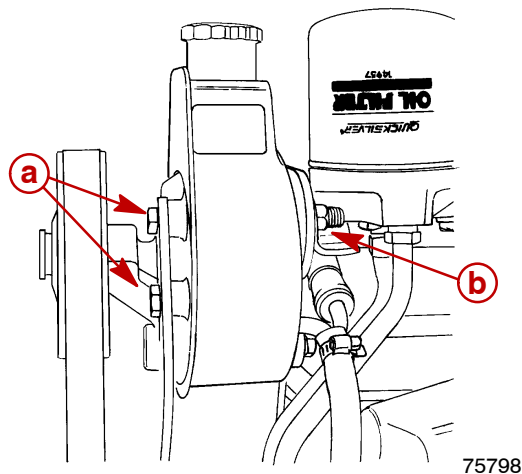
76896

- a** - Power steering pump pulley
- b** - Stud
- c** - Bearing
- d** - Nut
- e** - Shaft
- f** - Crankshaft pulley (shown) or water circulating pump pulley
- g** - Long straight edge
- h** - Drive belt parallel

# Installation

**IMPORTANT: Be careful to not cross-thread or overtighten hose fittings.**

1. Place the power steering pump on the bracket.
2. Install the bolt and nut and torque.



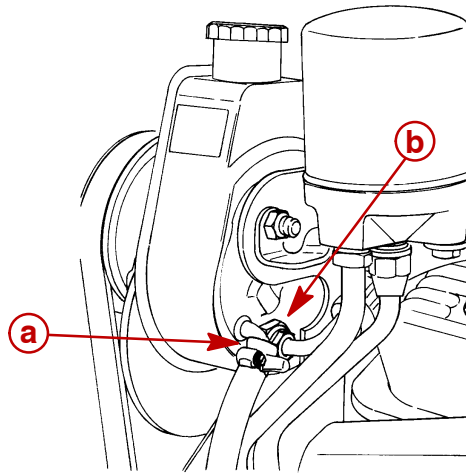
### Power steering pump typical location

- a** - Nut
- b** - Bolts

Description	Nm	lb-in.	lb-ft
Power steering pump bolt and nut	41		30

3. Ensure that a new high pressure hose O-ring is present.
4. Install threaded fitting in back of pump assembly. Tighten fitting securely.

5. Connect low pressure return hose on back of pump. Tighten hose clamp securely.



75228

### Power steering pump typical location

- a** - Return hose
- b** - High pressure hose

6. Install mounting hardware and fasteners to retain pump to bracket. (Refer to **Exploded View** for specific details on your engine.)
7. Install drive belt and adjust tension. Refer to **Pump Drive Belt Adjustment** as previously outlined.
8. Fill and air bleed system. Refer to **SECTION 1B - Maintenance**.

## Multiple Sterndrive Steering Tie Bar Arrangements

With multiple sterndrives you must select one of several possible steering systems.

### CAUTION

**Failure to observe the recommended Tie Bar Arrangements as presented in this section could result in serious damage to the steering and/or trim system components. This damage could adversely affect control of the boat.**

### INTERNAL POWER STEERING WITH INTERNAL TIE BAR ONLY

At the lower end of the performance spectrum, boats not capable of speeds in excess of 97 km/h. (60 mph), the basic internal tie bar is recommended. It connects the slave sterndrive to the sterndrive that is directly connected to the factory power steering output. This internal tie bar is available in a variety of lengths from the sterndrive manufacturer.

### INTERNAL POWER STEERING WITH INTERNAL AND EXTERNAL TIE BAR

As a boat moves into the moderate performance range of 97-113 km/h. (60-70 mph) or for a reduction in steering backlash, an external tie bar should be added. External tie bars are usually designed to attach at the aft power trim cylinder bosses. This location is an excellent choice because of its proximity to the propeller. HOWEVER, because of the potential overstress that can occur if one sterndrive is trimmed much differently than the other, a dual trim control kit (Part Number 90362A3) should be installed to limit this potential tilt differential to about 20°.

**IMPORTANT: Mercury Marine does not recommend the use of an external tie bar ONLY with no internal tie bar when using the internal power steering system. This can cause excessive loads on the steering components on the sterndrive connected to the internal power steering system. These increased loads can damage the steering components, resulting in increased play in the steering of the boat.**

### EXTERNAL POWER STEERING

When boat speeds move past 113 km/h (70 mph) or if additional steering backlash reduction is desired, external power steering is recommended. This normally will include an external tie bar mounted at the same general location as the power steering cylinders, which are generally attached at the top of the sterndrive's drive shaft housing. With this steering system, no internal tie bar should be used. These steering cylinders can be attached either inboard (between) or outboard of the sterndrives.

### EXTERNAL POWER STEERING WITH LOW EXTERNAL TIE BAR

For the fastest boats, over 129 km/h (80 mph), or for the ultimate in steering backlash reduction, use external power steering, BUT (where mechanically possible) with the external tie bar mounted at the trim cylinder boss location (as previously described in "Internal Power Steering with Internal and External Tie Bar" statements). Again, this system does not use an internal tie bar.

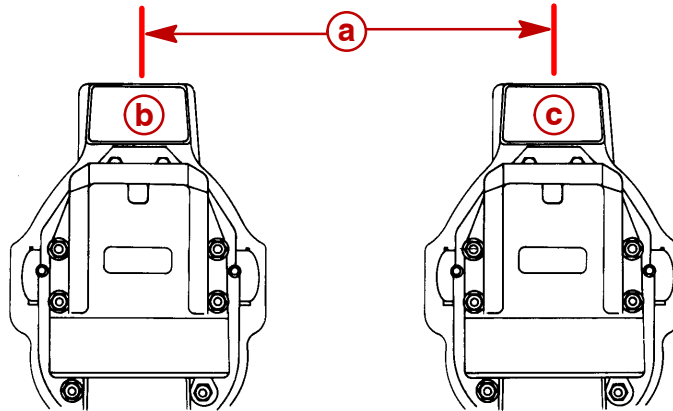
## Determining Tie Bar Length

### **⚠ WARNING**

**ON DUAL INSTALLATION USING STARBOARD TIE BAR KIT.** Bends or loops in the steering cable **MUST** have a minimum radius of 203 mm (8 in.) at the transom end. A radius less than 203 mm (8 in.) may kink the steering cable which, in turn, may affect steering operation. If the minimum 20.3 cm (8 in.) requirement cannot be met due to boat construction, etc., steering cable must then be routed to port transom and a port transom and a port tie bar kit 96708A4, A5, or A6 **MUST BE** used in place of the starboard tie bar kit.

**NOTE:** If sterndrive units are to be angled-in or angled-out, measure from centerlines of steering levers (with sterndrive units positioned as desired), instead of centerlines of power packages. In most cases, the best boat handling and performance characteristics will be obtained with the sterndrive units positioned parallel.

1. Determine tie bar length.
  - a. Measure centerline distance (dimple in gimbal housing is located beneath the decal in the top center).
  - b. Apply measurement to appropriate chart to determine tie bar length.



70133

- a** - Distance between centerlines
- b** - Port transom assembly centerline
- c** - Starboard transom assembly centerline



## Tie Bar Selection

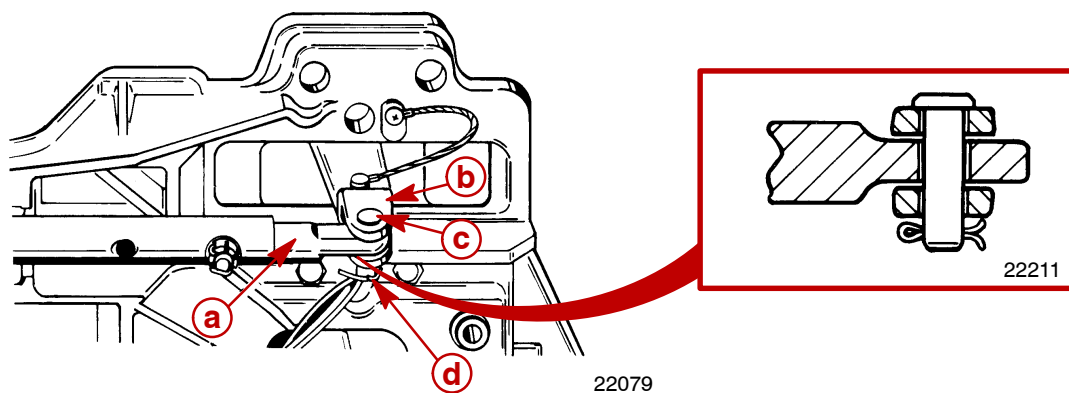
TIE BAR CHART For Dual Installations with Steering Cable Attached to Starboard Power Package	
*404.6-762 mm (16 to 30 in.)	92020A1
*762-1168.4 mm (30 to 46 in.)	92020A2
1168.4-1574.8 mm (46 to 62 in.)	92020A3
*If centerline distance is the same as maximum figure, use next larger size tie bar.	

TIE BAR CHART For Dual Installations with Steering Cable Attached to Port Power Package	
*711-952.5 mm (28 to 37-1/2 in.)	96708A4
*952.5-1397 mm (37-1/2 to 55 in.)	96708A5
1397-1828.8 mm (55 to 72 in.)	96708A6
*If centerline distance is the same as maximum figure, use next larger size tie bar.	

## Tie Bar Installation

### DUAL INSTALLATIONS WITH STEERING CABLE ATTACHED TO STARBOARD POWER PACKAGE

1. Attach fixed bar end to steering lever using clevis pin and cotter pin. Spread cotter pin ends.



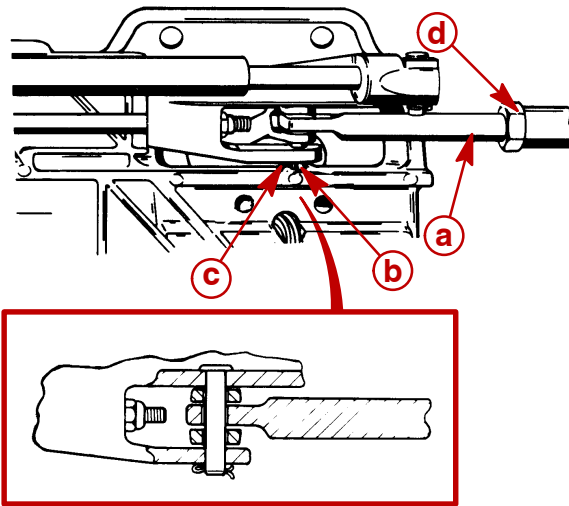
- a** - Fixed end
- b** - Steering lever
- c** - Clevis pin
- d** - Cotter pin

2. Position sterndrive units as desired and turn adjustable end out (if necessary) to align hole in bar end with holes in steering lever and piston rod end clevis.

3. Turn adjustable end out 3 to 4 turns from this position.
4. Apply sealant to exposed tie bar threads.

Description	Where Used	Part Number
Loctite 277	Tie bar threads	Obtain locally

5. Thread tie bar in 3 to 4 turns to previously aligned position.
6. Attach tie bar end using clevis pin and cotter pin.
7. Spread cotter pin ends.
8. Apply sealant to exposed tie bar threads.
9. Torque locknut against tie bar.



22079

22211

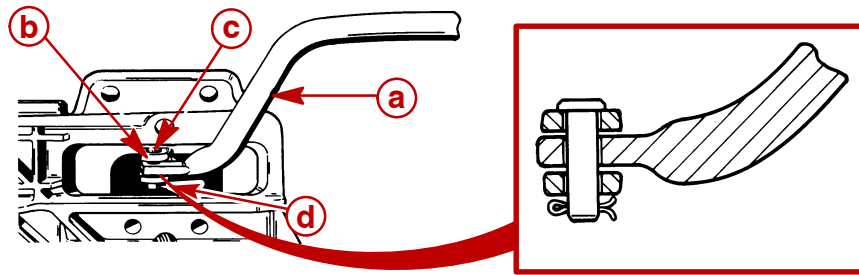
- a** - Adjustable end
- b** - Clevis pin
- c** - Cotter pin
- d** - Locknut

Description	Where Used	Part Number
Loctite 277	Tie bar threads	Obtain locally

Description	Nm	lb-in.	lb-ft
Tie bar locknut	68		50

**DUAL INSTALLATIONS WITH STEERING CABLE ATTACHED TO PORT POWER PACKAGE**

1. Attach fixed bar end to steering lever using clevis pin and cotter pin. Spread cotter pin ends.



22211

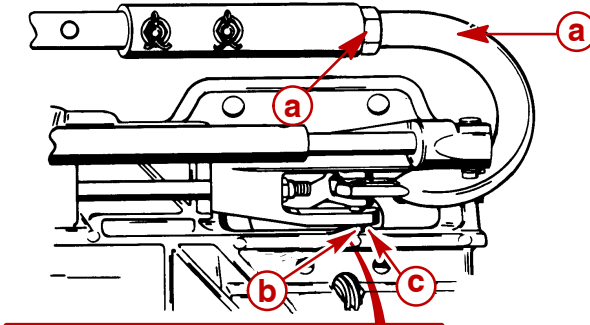
- a** - Fixed bar end
- b** - Steering lever
- c** - Clevis pin
- d** - Cotter pin

2. Position sterndrive units as desired and turn adjustable end out (if necessary) to align hole in bar end with holes in steering lever and piston rod end clevis.
3. Turn adjustable end out 3 to 4 turns from this position.
4. Apply sealant to exposed tie bar threads.

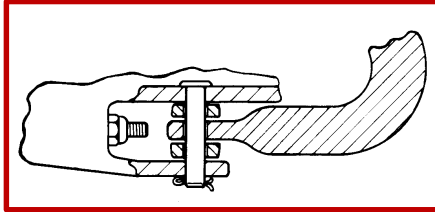
Description	Where Used	Part Number
Loctite 277	Tie bar threads	Obtain locally

5. Thread tie bar in 3 to 4 turns to previously aligned position.
6. Attach tie bar end using clevis pin and cotter pin.
7. Spread cotter pin ends.

8. Apply sealant to exposed tie bar threads.
9. Tighten and torque locknut against tie bar.



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22211

- a** - Adjustable end
- b** - Clevis pin
- c** - Cotter pin

Description	Where Used	Part Number
Loctite 277	Tie bar threads	Obtain locally

Description	Nm	lb-in.	lb-ft
Tie bar locknut	68		50