STEERING SYSTEM

POWER STEERING
# Table of Contents

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6A-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque Specification</td>
<td>6A-1</td>
</tr>
<tr>
<td>Special Tools</td>
<td>6A-1</td>
</tr>
<tr>
<td>Lubricants/Sealers/Adhesives</td>
<td>6A-1</td>
</tr>
<tr>
<td>Description</td>
<td>6A-1</td>
</tr>
<tr>
<td>Power Steering System</td>
<td>6A-2</td>
</tr>
<tr>
<td>Power Steering System</td>
<td>6A-3</td>
</tr>
<tr>
<td>Power Steering System</td>
<td>6A-4</td>
</tr>
<tr>
<td>Steering Helm and Cable</td>
<td>6A-5</td>
</tr>
<tr>
<td>Power Steering Models</td>
<td>6A-5</td>
</tr>
<tr>
<td>Filling and Air Bleeding Power Steering System</td>
<td>6A-6</td>
</tr>
<tr>
<td>Balancing Power Steering Control Valve</td>
<td>6A-7</td>
</tr>
<tr>
<td>Power Steering Drive Belt Inspection</td>
<td>6A-9</td>
</tr>
<tr>
<td>Steering Cable Selection, Removal and Installation</td>
<td>6A-9</td>
</tr>
<tr>
<td>Selection</td>
<td>6A-9</td>
</tr>
<tr>
<td>Removal</td>
<td>6A-10</td>
</tr>
<tr>
<td>Installation</td>
<td>6A-10</td>
</tr>
<tr>
<td>Testing Power Steering System</td>
<td>6A-11</td>
</tr>
<tr>
<td>Test Gauge Assembly</td>
<td>6A-11</td>
</tr>
<tr>
<td>Power Steering Pump Lugging Test</td>
<td>6A-11</td>
</tr>
<tr>
<td>Power Steering System Pressure Test</td>
<td>6A-12</td>
</tr>
<tr>
<td>Pump Pressure Test</td>
<td>6A-14</td>
</tr>
<tr>
<td>Booster Cylinder Test</td>
<td>6A-15</td>
</tr>
<tr>
<td>Power Steering Component Repair</td>
<td>6A-16</td>
</tr>
<tr>
<td>Power Steering Unit</td>
<td>6A-16</td>
</tr>
<tr>
<td>Removal</td>
<td>6A-16</td>
</tr>
<tr>
<td>Installation</td>
<td>6A-16</td>
</tr>
<tr>
<td>Cable Guide Tube</td>
<td>6A-18</td>
</tr>
<tr>
<td>Removal</td>
<td>6A-18</td>
</tr>
<tr>
<td>Installation</td>
<td>6A-19</td>
</tr>
<tr>
<td>Control Valve</td>
<td>6A-20</td>
</tr>
<tr>
<td>Removal</td>
<td>6A-20</td>
</tr>
<tr>
<td>Disassembly</td>
<td>6A-20</td>
</tr>
<tr>
<td>Reassembly</td>
<td>6A-22</td>
</tr>
<tr>
<td>Installation</td>
<td>6A-25</td>
</tr>
<tr>
<td>Booster Cylinder</td>
<td>6A-26</td>
</tr>
<tr>
<td>Removal</td>
<td>6A-26</td>
</tr>
<tr>
<td>Installation</td>
<td>6A-27</td>
</tr>
<tr>
<td>Power Steering Pump</td>
<td>6A-29</td>
</tr>
<tr>
<td>Removal</td>
<td>6A-29</td>
</tr>
<tr>
<td>Flow Control Valve Servicing</td>
<td>6A-29</td>
</tr>
<tr>
<td>Pump Shaft Oil Seal Replacement</td>
<td>6A-29</td>
</tr>
<tr>
<td>Disassembly</td>
<td>6A-31</td>
</tr>
<tr>
<td>Cleaning And Inspection</td>
<td>6A-32</td>
</tr>
<tr>
<td>Reassembly</td>
<td>6A-32</td>
</tr>
<tr>
<td>Installation</td>
<td>6A-35</td>
</tr>
<tr>
<td>Determining Tie Bar Length</td>
<td>6A-36</td>
</tr>
<tr>
<td>Selection</td>
<td>6A-36</td>
</tr>
<tr>
<td>Installation</td>
<td>6A-37</td>
</tr>
<tr>
<td>Dual Installations With Steering Cable Attached To Starboard Power Package</td>
<td>6A-37</td>
</tr>
<tr>
<td>Dual Installations With Steering Cable Attached To Port Power Package</td>
<td>6A-38</td>
</tr>
</tbody>
</table>
Specifications

Torque Specification

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lb. in.</td>
</tr>
<tr>
<td>Coupler Nut</td>
<td>35</td>
</tr>
<tr>
<td>Pivot Bolts</td>
<td>25</td>
</tr>
<tr>
<td>Power Steering Hose (Large Fitting)</td>
<td>20-25</td>
</tr>
<tr>
<td>Power Steering Hose (Small Fitting)</td>
<td>96-108</td>
</tr>
<tr>
<td>Steering Tube Nut</td>
<td>15-20</td>
</tr>
<tr>
<td>Control Valve Screw</td>
<td>25-35</td>
</tr>
<tr>
<td>Power Steering Fitting Assembly</td>
<td>35</td>
</tr>
</tbody>
</table>

Special Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Steering Test Gauge</td>
<td>91-38053A3</td>
</tr>
<tr>
<td>Power Steering Pump Pulley Installer</td>
<td>91-93656A1</td>
</tr>
</tbody>
</table>

KENT-MOORE SPECIAL TOOLS

Can be ordered from:
Kent-Moore Tools, Inc.
29784 Little Mack
Roseville, MI 48066
Phone: 313-774-9500

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Steering Pump Pulley Remover</td>
<td>Kent-Moore Part No. J-25034-C</td>
</tr>
</tbody>
</table>

Lubricants/Sealers/Adhesives

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4-C Marine Lubricant</td>
<td>92-825407A2</td>
</tr>
<tr>
<td>Special Lubricant 101</td>
<td>92-13872A1</td>
</tr>
<tr>
<td>Locquic Primer T</td>
<td>92-59327-1</td>
</tr>
<tr>
<td>Loctite No. 35</td>
<td>92-59328-1</td>
</tr>
<tr>
<td>Loctite Type A</td>
<td>Obtain Locally</td>
</tr>
</tbody>
</table>

Description

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. Three 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 installa-tions are viewed from inside boat, looking at transom.
Power Steering System
(VIEWING FROM INSIDE OF BOAT LOOKING AT TRANSOM)

RIGHT TURN

PISTON

CONTROL VALVE

OIL COOLER

PUMP

RELIEF VALVE

PUMP HOUSING

HIGH PRESSURE
LOW PRESSURE
Power Steering System

(Viewing from Inside of Boat Looking at Transom)
Power Steering System
(VIEWING FROM INSIDE OF BOAT LOOKING AT TRANSOM)
Steering Helm and Cable

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.

All current production Quicksilver Ride Guide 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.)

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

Power Steering Models

POWER STEERING EQUIPPED UNITS ONLY-If cables with improper dimensions are installed, severe damage to transom assembly and/or steering system may result. DO NOT attempt to adjust cable guide tube on power steering unit, as guide tube and locknut have been torqued (with Loctite) at the factory, and an attempt to loosen nut or sleeve may result in damage to tube.

1. Steering cable must be the correct length, particularly when installed in larger boats.
2. Avoid sharp bends, kinks or loops in cable.
3. **Power Steering Models:** Fully extended steering cable end dimension must be correct.
Filling and Air Bleeding Power Steering System

IMPORTANT: Power Steering system MUST BE filled exactly as explained, following, to be sure 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. Position drive unit straight back. Remove fill cap from power steering pump and check fluid level with dipstick.
2. Add Quicksilver Power Trim and Steering Fluid or Dexron II, as required to bring fluid up to correct level.

3. (With engine not running), turn the steering wheel at a moderate rate, back-and-forth, to end of travel in each direction, pausing each time at end of travel for a few seconds to allow any air to bubble from pump reservoir. Do this a minimum of 5 complete cycles. Recheck fluid level and add if necessary.
4. Reinstall fill cap.

**CAUTION**
DO NOT operate engine without water being supplied to seawater pickup holes in gear housing. Overheating damage to engine may result.

5. Install flush test device and connect a hose between it and water tap.

6. Partially open water tap (approximately 1/2 max.) and allow water to enter cooling system. DO NOT use full water tap pressure.
7. Start engine and run at idle. During this time, turn steering wheel back-and-forth to end of travel in each direction several times.
8. Position drive unit so that it is straight back and then stop engine. Remove fill cap from pump. Allow any foam in pump reservoir to disperse, then check fluid level and add fluid, if needed. DO NOT OVERFILL. Reinstall fill cap and tighten securely.
9. If fluid was foamy in previous step, repeat steps 7 and 8 until fluid does not foam and level remains constant.

**Engine Warm from Operation**

a - Recommended Fluid Level

**Engine Cold**

a - Recommended Fluid Level

**NOTE:** If using a test tank or if boat is in the water, ensure sterndrive unit gear housing water intake holes are below water level.
Balancing Power Steering Control Valve

IMPORTANT: Control valve is balanced by the manufacturer and should not require further adjustment. However, if drive unit tends to creep in one direction or the other (with engine running, drive unit in neutral, and hands off the steering wheel), the control valve MUST BE balanced as explained following.

1. Ensure engine is off.
2. Disconnect steering cable from power steering control valve clevis.

3. Disconnect power steering control valve clevis from drive unit steering lever.

4. Remove dust cover.

DO NOT operate engine without water being supplied to seawater pickup holes in gear housing. Overheating damage to engine may result.

WARNING

Remain clear of power steering clevis when starting engine. If control valve is not balanced, unexpected movement of clevis could cause injury.

5. Connect a flush test device to drive unit. Partially open water tap (approximately 1/2 max.) and allow water to enter cooling system. DO NOT use full water tap pressure.
6. Start engine and adjust control valve by turning adjustment nut as follows:

- **Adjustment Nut**

  a. **If power steering piston rod end clevis moves toward right (starboard)**, turn nut clockwise until clevis just begins to move toward left (port), then turn nut counterclockwise until clevis just begins to move toward right (starboard). Turn nut clockwise to exactly 1/2 the rotation necessary to change direction of rod end clevis movement.

  b. **If power steering piston rod end clevis moves toward left (port)**, turn nut counterclockwise until clevis just begins to move toward right (starboard), then turn nut clockwise until clevis just begins to move toward left (port). Turn nut counterclockwise to exactly 1/2 the rotation necessary to change direction of rod end clevis movement.

7. Turn off engine.

8. Apply a liberal amount of Special Lubricant 101 to end of steering cable and install cable end in clevis. Secure with pin and cotter pin.

9. Torque coupler nut to 35 lb. ft. (48 N·m).

10. Install and tighten locking plate on coupler nut. Secure with self locking bolt and washer.
12. Place 2-4-C Marine Lubricant in adjustment nut cavity and reinstall dust cover.

13. Restart engine and observe drive unit. If drive unit still creeps in one direction or the other, an external tension may exist on steering cable. Ensure that nothing is attached to steering cable (pushing or pulling).

Power Steering Drive Belt Inspection

1. Inspect Power Steering pump drive belt on engine for excessive wear, cracks, fraying, and glazed surfaces. Check belt tension using either of the two methods following:

   a. Using a strand tension gauge, take gauge reading at mid-point of Power Steering pump drive belt. Reading should be 75-95 lbs. (334-423 N).

   b. Check belt tension by pushing down on upper strand of belt at mid-point of Power Steering pump drive belt. Belt should depress 1/2 in. (13 mm).

2. Adjust belt, if required.

Steering Cable Selection, Removal and Installation

Selection

Steering system has the steering cable guide tube set for cables with end dimensions which comply with the BIA Certification Handbook.

⚠️ CAUTION

If cables with improper dimensions are installed, severe damage to transom assembly and/or steering system may result.

⚠️ CAUTION

Steering cables MUST BE THE CORRECT LENGTH, particularly when installed in large boats. Sharp bends or too-short cables result in kinks; too-long cables require unnecessary bends and/or loops. Both place an extra stress on the cable. The proper cable is as short as possible, with the fewest bends and with radii as large as possible.
Removal
1. Remove steering cable.

Installation

![Diagram](image)

**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. Apply a liberal amount of Special Lubricant 101 to end of steering cable and install cable end in clevis. Secure with pin and cotter pin.
2. Torque coupler nut to 35 lb. ft. (48 N·m).
3. Install and tighten locking plate on coupler nut. Secure with self locking bolt and washer.
**Testing Power Steering System**

**Test Gauge Assembly**

1. Assemble gauge.
2. Install test gauge assembly between control valve and pump pressure hose. Tighten all fittings securely, but DO NOT OVERTIGHTEN.

---

**Power Steering Pump Lugging Test**

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO NOT operate engine without cooling water being supplied to water pickup holes in gear housing, or overheating damage to engine may result.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering cable outer casing MUST BE free to move back-and-forth for Power Steering to function properly. Make sure that no wires, cables, or other items are fastened to steering cable, as this may prevent it from moving.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>If Power Steering pump lugs when steering wheel is turned to end of travel in either direction (left or right), damage to steering system and/or sterndrive may result.</td>
</tr>
</tbody>
</table>

**IMPORTANT:** Make sure that Power Steering pump is filled to proper level before proceeding.

1. Completely open test gauge.
2. Start engine and run at idle speed.
3. Turn steering wheel to hard left and observe reading on gauge. If pressure reading is higher than 300 psi (2069 kPa), stop engine and check the following:
   a. Check for an obstruction between gimbal ring and gimbal housing and all moving steering system components.
   b. Check that steering lever is not contacting cut-out in transom. If contact is being made, modify cutout.
   c. Check steering cable guide tube dimensions and adjust as necessary.

---

**Diagram:**

- a - Pump Pressure Hose
- b - Gauge Fitting
- c - Gauge Valve Hose
- d - Control Valve

---

**Diagram:**

- a - Steering Cable Guide Tube
- b - 5/8-7/8 in. (16-22 mm) [Ideal 3/4 In. (19 mm)]
4. With engine running, turn steering wheel to **hard right** and observe reading on gauge. If reading is higher than 300 psi (2069 kPa), stop engine and check the following.

   a. Check for an obstruction between gimbal ring, and gimbal housing and all moving steering system components.

   b. Check that steering lever is not contacting cut-out in transom. If contact is being made, modify cutout.

   c. Check steering cable end dimensions with cable fully extended. If excessive, replace cable and/or steering head as required.

   d. Check steering cable guide tube dimension and adjust as necessary.

---

**Power Steering System Pressure Test**

**IMPORTANT INFORMATION**

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 steering cable from Power Steering unit and disconnect Power Steering unit from steering lever.

---

---

---
2. Assemble and install test gauge.
3. Open valve on gauge completely.

4. Connect a flush test device to drive unit. Partially open water tap (approximately 1/2 max.) 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.

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

   **If lower than 70 psi (483 kPa):** proceed to “Pump Pressure Test”, see “Index”.

   **If higher than 125 psi (862 kPa):** 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.

7. Push control valve adaptor block **momentarily** to the **left** and then to the **right**. Gauge reading should show an instant increase in pressure when block is pushed in both directions.

8. Push control valve adaptor block to the **right**, until booster cylinder piston rod is fully retracted. With piston rod in this position, **momentarily** push adaptor block to the **right** until maximum pressure reading is obtained.
If pressure is above 1000 psi (6897 kPa): system pressure is good.

If pressure is below 1000 psi (6897 kPa): conduct “Pump Pressure Test”, see “Index”.

---

**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.

2. Connect a flush test device to drive unit. Partially open water tap (approximately 1/2 max.) and allow water to enter cooling system. DO NOT use full water tap pressure.

3. Start engine and run 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 1150 and 1250 psi (7932-8621 kPa) and are within a range of 50 psi (345 kPa):** the pump is within specifications. If the pump tests OK, but system pressure was low (as tested under “Power Steering System Pressure Test”, see “Index”), proceed to “Booster Cylinder Test”, see “Index”.

   b. **If pressure readings are between 1150-1250 psi (7932-8621 kPa), but are not within a 50 psi (345 kPa) range:** the Power Steering pump flow control valve is sticking or pump hydraulic system is dirty.

   c. **If pressure readings are constant, but below 1000 psi (6897 kPa):** replace Power Steering pump.
Booster Cylinder Test

⚠️ CAUTION

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

1. Connect a flush test device to drive unit. Partially open water tap (approximately 1/2 max.) and allow water to enter cooling system. DO NOT use full water tap pressure.

2. Start engine.

3. Push control valve adaptor block to the right until booster cylinder rod is fully retracted.

4. Stop engine.

5. Remove top metal hydraulic line from control valve.

6. Plug port in control valve and cap end of metal line with cap and plug supplied in test gauge kit.

7. Start engine.

8. Push control valve adaptor block momentarily to the right and observe for conditions “a” or “b”, following:
   a. If piston rod extends, booster cylinder is leaking and must be replaced. After replacement, repeat “Power Steering System Pressure Test”. If pressure is still low, replace control valve.
   b. If piston rod does not extend, but pressure was low when performing “Power Steering System Pressure Test”, replace control valve.


10. Connect power steering piston rod clevis to drive unit steering lever. Secure with pin and cotter pin.

11. Apply a liberal amount of Special Lubricant 101 to end of steering cable and install cable end in clevis. Secure with pin and cotter pin.

12. Torque coupler nut to 35 lb. ft. (48 N·m).


Index

90-12934--2 1097
Power Steering Component Repair

Power Steering Unit

REMOVAL
1. Remove steering cable and Power Steering pump fluid hoses. Plug power steering pump hoses.

2. Remove Power Steering unit. Bend tab washer away from pivot bolt.

INSTALLATION
1. Lubricate power steering unit bushings with Special Lubricant 101.

2. Lubricate pivot bolts with Special Lubricant 101.

3. HAND THREAD pivot bolts all-the-way into inner transom plate and swivel ring. DO NOT use a wrench.

NOTE: Some earlier “R” models had a pin and cotter pin in place of pivot bolts.

4. Straddle tab washer tangs on inner transom plate ridge.

---

Index

6A-16 - STEERING SYSTEM
5. Torque pivot bolts to 25 lb. ft. (35 N·m). Bend washer tabs against corresponding flats on bolt tabs.

6. Move power steering unit back-and-forth to ensure that it pivots freely.

7. Connect power steering piston rod clevis to drive unit steering lever. Secure with pin and cotter pin.

8. Apply a liberal amount of Special Lubricant 101 to end of steering cable and install cable end in clevis. Secure with pin and cotter pin.

9. Torque coupler nut to 35 lb. ft. (48 N·m).

10. Install and tighten locking plate on coupler nut. Secure with self locking bolt and washer.

11. Connect power steering pump hoses to their respective fittings on control valve. Torque large fitting to 20-25 lb. ft. (27-34 N·m). Torque small fitting to 96-108 lb. in. (11-12 N·m).
Cable Guide Tube

REMOVAL

1. Remove power steering pump hoses from control valve. Cap hoses and plug holes in control valve.

2. Remove steering cable from power steering control valve.

3. Remove adaptor block as follows:
   a. Loosen adaptor block nut.
   b. Tap adaptor nut with hammer to loosen block.
   c. Remove nut; then remove block.

4. Heat area shown (to break down Loctite), and remove steering tube bushing, guide, and nut. Remove cable guide tube.
INSTALLATION

**WARNING**

Loctite MUST BE applied to cable guide tube threads to prevent tube from loosening during operation.

1. Clean guide tube threads with a wire brush to remove old Loctite. Spray threads with Locquic Primer "T". After primer has dried (approximately 10 minutes), apply a liberal amount of Loctite No. 35 to guide tube threads (in area where adaptor block and locknut will be installed).

2. Reinstall steering tube and related hardware and position so that threaded end of tube protrudes exactly 3/4 in. (19 mm) through adaptor block. Torque steering tube nut to 15-20 lb. ft. (20-27 N·m).

3. Apply a liberal amount of Special Lubricant 101 to end of steering cable and install cable end in clevis. Secure with pin and cotter pin.

4. Torque coupler nut to 35 lb. ft. (48 N·m).

5. Install and tighten locking plate on coupler nut. Secure with self locking bolt and washer.

6. Connect power steering pump hoses to their respective fittings on control valve. Torque large fitting to 20-25 lb. ft. (27-34 N·m). Torque small fitting to 96-108 lb. in. (11-12 N·m).
Control Valve

**NOTE:** If accessibility to control valve area is limited, remove Power Steering unit from transom assembly, to gain easier access to control valve.

**REMOVAL**


2. Remove tubes from control valve.

3. Heat area shown (to breakdown Loctite), and remove steering tube bushing, guide and nut.

4. Remove control valve from adaptor block assembly.

**DISASSEMBLY**

1. Remove adaptor block as follows:
   - Loosen adaptor block nut. Tap adaptor nut with hammer to loosen block. Remove nut, washer and adaptor block.

---

**Index**

6A-20 - STEERING SYSTEM
2. Remove dust cover and adjusting nut.

![Diagram of a steering system with labels for dust cover and adjusting nut]

- Dust Cover
- Adjusting Nut

3. Separate valve housing from adaptor.

![Diagram of a steering system with labels for valve housing and adaptor]

- Valve Housing
- Adaptor
- Screws (2)
- Lock Washers (2)

4. Remove components shown.

![Diagram of a steering system with labels for various components]

- Valve Spool
- Valve Adjustment Spring
- Reaction Spool
- Spring Thrust Washer
- Valve Spring
- Spring Retainer
- Annulus Seal
- Large ID Washer
- Reaction Spool O-ring
- Valve Spool "V" Block Seal
- Annulus Spacer
- Gasket
- Small Washer
- Plug Sleeve Key
- O-Ring
- Valve Housing

5. Carefully (so as not to nick the top surface) turn adjuster plug out of sleeve.

![Diagram of a steering system with labels for adjuster plug and turn direction]

- Adjuster Plug
- Turn Counterclockwise

6. Remove components shown.

![Diagram of a steering system with labels for valve shaft, ball seal spring, and upper ball seat]

- Valve Shaft
- Ball Seal Spring
- Upper Ball Seat

7. Remove sleeve bearing and lower ball seat.

![Diagram of a steering system with labels for ball stud, sleeve bearing, and lower ball seat]

- Ball Stud-Pull Up into Rubber Boot
- Sleeve Bearing
- Lower Ball Seat

8. Clean and inspect metal parts. If any metal part shows signs of wear, replace control valve assembly.
REASSEMBLY

1. Install lower ball seat into sleeve bearing.

2. Install sleeve bearing. Pull ball stud up into rubber boot.

3. Position ball stud in sleeve bearing.

4. Install upper ball seat.

5. Install ball seat spring.

6. Insert valve shaft into adjuster plug. Screw adjuster plug into sleeve until tight; then back-off plug until slot lines up with notches in sleeve.

7. Install key. Fit key tangs into notches in sleeve.
8. Install components shown.

- Valve Shaft Washer
- Gasket
- Annulus Spacer
- Large ID Washer

9. Install O-ring in control valve housing.

- O-ring
- Control Valve Housing

10. Install "V" block seal. Insert valve spool into adjusting nut end of control valve.

- "V" Block Seal-Lip Of Seal Facing Lands On Spool
- Spool
- Control Valve

11. Assemble reaction spool.

- Reaction Spool
- O-ring
- thrust Washer
- Valve Spring
- Spring Retainer
- Annulus Seal-Lip Facing O-ring End of Spool

12. Install valve adjustment spring.

- Valve Adjustment Spring
- Control Valve

13. Install reaction spool assembly into larger control valve cavity.

- Reaction Spool Assembly
- Control Valve-Large Cavity

15. Match annulus spacer to control valve housing. Secure adaptor housing to control valve housing. Torque screws to 20-30 lb. ft. (27-41 N·m).


17. Install dust cover.

18. Lubricate control valve with Quicksilver 2-4-C until lubricant appears around rubber boot.

19. Install adaptor block. Torque nut to 30-40 lb. ft. (41-54 N·m).
INSTALLATION


2. Install metal tubes onto control valve. Tighten securely but DO NOT overtighten.

3. Clean guide tube threads with a wire brush to remove old Loctite. Spray threads with Loctite Primer “T”. After primer has dried (approximately 10 minutes), apply a liberal amount of Loctite No. 35 to guide tube threads (in area where adaptor block and locknut will be installed).

4. Reinstall steering tube and related hardware and position so that threaded end of tube protrudes exactly 3/4 in. (19 mm) through adaptor block. Torque steering tube nut to 15-20 lb. ft. (20-27 N·m).

5. Apply a liberal amount of Special Lubricant 101 to end of steering cable and install cable end in clevis. Secure with pin and cotter pin.

6. Torque coupler nut to 35 lb. ft. (48 N·m).


**WARNING**

Loctite MUST BE applied to cable guide tube threads to prevent tube from loosening during operation.

---

**Index**

90-12934-2 1097
8. Connect power steering pump hoses to their respective fittings on control valve. Torque large fitting to 20-25 lb. ft. (27-34 N·m). Torque small fitting 96-108 lb. in. (11-12 N·m).

1. Remove steering cable and Power Steering pump fluid hoses. **Plug power steering pump hoses.**

---

**Booster Cylinder**

**REMOVAL**

*NOTE: If accessibility to booster cylinder area is limited, remove Power Steering unit from transom assembly to gain easier access to booster cylinder.*

2. Remove steering cable and Power Steering pump fluid hoses.

---

a - Cotter Pin (Hidden)
b - Clevis Pin
c - Power Steering Pump Fluid Hoses
d - Coupler Unit Lock
e - Cable Coupler Nut
f - Steering Cable
2. Remove metal lines from control valve.

3. Remove control valve from adaptor block assembly.

4. Remove clevis assembly.

5. Separate booster cylinder from adaptor block assembly. Thread a screw of appropriate length into retaining pins and remove.

6. Remove lines from booster cylinder.

7. Remove components shown.

INSTALLATION

1. Install components shown.

2. Install metal lines. Tighten securely, but DO NOT overtighten.
3. Install adaptor block assembly. Be sure to spread both ends of cotter pin.

4. Install clevis assembly. Tighten nut securely.


6. Install metal lines onto control valve. Tighten securely but DO NOT overtighten.

7. Apply a liberal amount of Special Lubricant 101 to end of steering cable and install cable end in clevis. Secure with pin and cotter pin.

8. Torque coupler nut to 35 lb. ft. (48 N·m).


10. Connect power steering pump hoses to their respective fittings on control valve. Torque large fitting to 20-25 lb. ft. (27-34 N·m). Torque small fitting to 96-108 lb. in. (11-12 N·m).
Power Steering Pump

REMOVAL
1. Disconnect hoses at pump. Cap hose and fittings.
2. Loosen pump bolts at engine to remove pump belt.
3. Remove bracket from pump.

FLOW CONTROL VALVE SERVICING
1. Drain fluid from pump.
2. Remove components shown.

3. Inspect control valve assembly and fitting assembly.
4. Install components shown. Torque fitting assembly to 35 lb. ft. (47 N·m).

PUMP SHAFT OIL SEAL REPLACEMENT
1. Remove pump pulley.
2. Push a .005 in. (0.13 mm) shim stock past oil seal until it bottoms in pump body. (Approximately 2-1/2 in. [64 mm] long)
3. Cut seal and tear metal body approximately 1 in. (25 mm).

---

Index
90-12934--2 1097

STEERING SYSTEM - 6A-29
4. Remove oil seal by forcing an awl between pump housing and seal. Remove shim stock.

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

6. Install pulley, as follows, using Pulley Pusher Assembly 91-93656A1, 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.
   e. Check pulley installation for correct alignment.
DISASSEMBLY

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

3. Remove fitting assembly, control valve assembly, flow control spring, o-ring and studs. Discard o-ring.
4. Remove reservoir by tapping from pump housing.
5. Remove remaining o-rings and discard.

6. Remove retaining ring and end plate. Insert awl into hole in housing to push ring from recess.

7. Remove pump components shown.

Index

90-12934--2 1097
8. Remove and discard O-rings from housing.

9. Remove retaining ring, rotor and thrust plate.

10. Remove magnet.

CLEANING AND INSPECTION
1. Clean and inspect all metal parts.

REASSEMBLY

NOTE: All references to Power Steering fluid refer to Quicksilver 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. Properly support pump reservoir so back does not distort.

2. Lubricate pressure plate O-ring with power steering fluid; place in third groove in housing. Install dowel pins.
3. Assemble pump shaft and rotor assembly.

- Pump Shaft
- Thrust Plate
- Rotor-Countersunk Side Toward Thrust Plate
- Retaining Ring

4. Install pump shaft and rotor assembly.

- Pump Shaft And Rotor Assembly
- Pump Housing

5. Install pump ring by placing two smaller holes over dowel pins.

- Pump Ring

6. Install vanes in rotor slots-Rounded edges toward pump ring. Vanes must slide freely.

- Vanes-Rounded Edges Toward Pump Ring

7. Install pressure plate.

- Pressure Plate
- Spring Groove-Facing Up
8. Lubricate end plate O-ring with power steering fluid and place in second groove in housing.

9. Install pressure plate spring, end plate and retaining ring.

10. Lubricate reservoir O-rings with power steering fluid and install in grooves in housing.

11. Place magnet on housing.
12. Secure reservoir to pump housing. Torque studs to 35 lb. ft. (47 N·m).

13. Install flow control spring, control valve assembly, o-rings and fitting assembly into reservoir. Torque fitting assembly to 35 lb. ft. (47 N·m).

14. Install pulley, as follows, using Pulley Pusher Assembly 91-93656A1, 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.
   e. Check pulley installation for correct alignment.

**INSTALLATION**

1. Install power steering pump on engine. (Refer to Appropriate Engine Service Manual)
Determining Tie Bar Length

**WARNING**

ON DUAL INSTALLATION USING STARBOARD TIE BAR KIT. The steering cable MUST have a minimum radius of 8 in. (203 mm) at the transom end. A radius less than 8 in. (203 mm) may kink the steering cable which, in turn, may affect steering operation. If the minimum 8 in. (203 mm) 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 drive units are to be “toed-in” or “toed-out”, measure from centerlines of steering levers (with drive 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 drive units positioned parallel.

1. Determine tie bar length.
   a. Measure centerline distance (a) from points (b) and (c). (Grease Fittings on Gimbal Housing)
   b. Apply measurement to appropriate chart to determine tie bar length.

### TIE BAR CHART
For Dual Installations with Steering Cable Attached to Starboard Power Package

<table>
<thead>
<tr>
<th>Tie Bar Required</th>
<th>Distance Between Engine Centerlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>92020A1</td>
<td>* 16” to 30”</td>
</tr>
<tr>
<td>92020A2</td>
<td>* 30” to 46”</td>
</tr>
<tr>
<td>92020A3</td>
<td>46” to 62”</td>
</tr>
</tbody>
</table>

*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

<table>
<thead>
<tr>
<th>Tie Bar Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>96708A4</td>
</tr>
<tr>
<td>96708A4</td>
</tr>
<tr>
<td>96708A6</td>
</tr>
</tbody>
</table>

*If centerline distance is the same as maximum figure, use next larger size tie-bar.
Installation

DUAL INSTALLATIONS WITH STEERING CABLE ATTACHED TO STARBOARD POWER PACKAGE

1. Install tie bar.
   a. Attach fixed bar end (a) to steering lever (b), using clevis pin (c) and cotter pin (d). Spread cotter pin ends.

b. Position drive units as desired and turn adjustable end (e) out (if necessary) to align hole in bar end with holes in steering lever and piston rod end clevis. Turn adjustable end (e) out 3 to 4 turns from this position. Apply Loctite Type “A”, or equivalent, to exposed tie bar threads; then turn tie bar back in (3 to 4 turns) to previously aligned position. Attach tie bar end using clevis pin (f), and cotter pin (g). Spread cotter pin ends. Apply Loctite Type “A”, or equivalent, to exposed tie bar threads, then, tighten locknut (h) (against tie bar) to 40-60 lb. ft. (54-81 N·m).
DUAL INSTALLATIONS WITH STEERING CABLE ATTACHED TO PORT POWER PACKAGE

1. Install tie bar.
   a. Attach fixed bar end (a) to steering lever (b), using clevis pin (c) and cotter pin (d). Spread cotter pin ends.

b. Position drive units as desired and turn adjustable end (e) out (if necessary) to align hole in bar end with holes in steering lever and piston rod end clevis. Turn adjustable end (e) out 3 to 4 turns from this position. Apply Loctite Type “A”, or equivalent, to exposed tie bar threads; then turn tie bar back in (3 to 4 turns) to previously aligned position. Attach tie bar end using clevis pin (f), and cotter pin (g). Spread cotter pin ends. Apply Loctite Type “A”, or equivalent, to exposed tie bar threads, then, tighten locknut (h) (against tie bar) to 40-60 lb. ft. (54-81 N·m).