



# 1.2 and 2.0 L Hydraulic Pump Installation Instructions

To obtain the best performance and to avoid damage to your boat, install the Garmin® 1.2/2.0 L hydraulic pump according to the following instructions. These instructions are a supplement to the installation instructions provided with your Garmin autopilot.

Professional installation of the pump is highly recommended, because specific knowledge of hydraulic steering componentry is required to properly install the pump.

**Read all installation instructions before proceeding with the installation.** If you experience difficulty during the installation, contact Garmin Product Support.

## Registering Your Product

Help us better support you by completing your online registration today.

- Go to <http://my.garmin.com>.
- Keep the original sales receipt, or a photocopy, in a safe place.

## Contacting Garmin Product Support

Contact Garmin Product Support if you have any questions about this product.

- In the USA, go to [www.garmin.com/support](http://www.garmin.com/support), or contact Garmin USA by phone at (913) 397.8200 or (800) 800.1200.
- In the UK, contact Garmin (Europe) Ltd. by phone at 0808 2380000.
- In Europe, go to [www.garmin.com/support](http://www.garmin.com/support) and click Contact Support for in-country support.

## Important Safety Information

### WARNING

**Your are responsible for the safe and prudent operation of your vessel.** The autopilot is a tool that will enhance your capability to operate your boat. It does not relieve you from the responsibility of safely operating your boat. Avoid navigational hazards and never leave the helm unattended.

See the *Important Safety and Product Information* guide in the autopilot product box for product warnings and other important information.

### CAUTION

Failure to install and maintain this equipment in accordance with these instructions could result in damage or injury.

Always wear safety goggles, ear protection, and a dust mask when drilling, cutting, or sanding.

### NOTICE

This equipment should be installed by a qualified marine installer.

This equipment is only for use with Garmin autopilots.

When drilling or cutting, always check the opposite side of the surface. Be aware of fuel tanks, electrical cables, and hydraulic hoses.

## About the 1.2/2.0 L Hydraulic Pump

The 1.2/2.0 L hydraulic pump steers your boat by interacting with the hydraulic steering system, based on commands you enter using the autopilot display unit. The pump is not included in the autopilot core package box because the type of pump you use with your autopilot is determined by the size and type of steering system on your boat.

## Hardware Needed

- 1.2/2.0 L pump kit (part number 010-11098-00)
- Unbalanced kit (if installing in a boat with an unbalanced steering cylinder, part number 010-11201-00)
- Hydraulic hose with machine-crimpted or field-replaceable fittings that have a minimum rating of 1000 lbf/in<sup>2</sup>.
- Hydraulic fluid
- Thread sealant
- Hydraulic bleeding equipment
- Mounting screws: mounting screws are provided in the pump kit, but if the provided screws are not appropriate for the mounting surface, you must provide the correct types of screws.

## Tools Needed

- Safety glasses
- Drill and drill bits
- Wrenches
- Torque wrench (if installing unbalanced kit)
- Wire cutter/strippers
- Screwdrivers: Phillips and flat
- Cable ties
- Marine sealant
- Marine corrosion inhibitor spray

## Pump Installation

Because every boat is different, care must be taken when planning the pump installation.

1. Choose a mounting location ([page 1](#)).
2. Mount the pump ([page 2](#)).
3. Connect the pump to the hydraulic lines ([page 2](#)).
4. Connect the pump to the autopilot ECU ([page 2](#)).

## Choosing a Mounting Location

1. Consult the diagrams on [pages 4–6](#) for connection and dimension considerations.
2. Choose a location to install the pump, considering these guidelines:
  - The pump must be located within 19 in. (0.5 m) of the ECU.
  - The cables that connect the pump to the ECU cannot be extended.
  - The pump should be mounted horizontally, if possible.
  - If the pump cannot be mounted horizontally, it must be mounted vertically with the pump head connectors facing up.
  - The pump must be mounted in a location to which you can extend the hydraulic steering lines of the boat.

## Mounting the Pump

Before you mount the pump, if your boat has an unbalanced cylinder steering system, you must install the optional unbalanced valve kit (page 3).

1. After you select a mounting location, determine the mounting hardware needed for the surface.  
Mounting hardware is included with the pump, but it may not be suitable for the mounting surface.
2. If necessary, purchase the mounting hardware.
3. Hold the pump in the intended mounting location and mark the locations of the mounting holes on the mounting surface, using the pump as a template.
4. Using a drill bit appropriate for the mounting surface and selected mounting hardware, drill the four holes through the mounting surface.
5. Secure the pump to the mounting surface using the selected mounting hardware.

## Connecting the Pump to Hydraulic Lines

### NOTICE

Do not attempt to use the autopilot to steer the boat until you bleed all air from each part of the hydraulic system (page 3).

When adding hydraulic line to the system, use only hose with machine-cripped or field-replacable fittings that have a minimum rating of 1000 lbf/in<sup>2</sup>.

Do not use plumber's tape on any hydraulic fitting. Use an appropriate thread sealant rated for marine use on all pipe threads in the hydraulic system.

Before you connect the pump to the hydraulic lines, consult one of these diagrams to find the correct place to add the pump and fittings to the hydraulic system.

- Single helm without power assist (page 4)
- Dual helm without power assist (page 5)
- Single helm with power assist (page 6)

The pump has two sets of hose-connector fittings to allow for different hose configurations. You can use either set of fittings or a combination of the two. Where necessary, add hydraulic hose.

### Single Helm without Power Assist

1. Disconnect the necessary lines from the hydraulic system.
2. Add the t-connector to the starboard line.
3. Connect the starboard line t-connector to the starboard fitting of the pump.
4. Add the t-connector to the port line.
5. Connect the port line t-connector to the port fitting of the pump.
6. Install the Shadow Drive to the port or starboard line between the helm and the t-connector.  
See the installation instructions provided with your Garmin autopilot for Shadow Drive installation instructions.
7. Connect the return line from the helm to the return fitting of the pump.
8. Insert, tighten, and seal the plugs in the unused pump fittings.

### Dual Helm without Power Assist

1. Disconnect the necessary lines from the hydraulic system.
2. Add the t-connector to the starboard line between the helm t-connector and the steering cylinder.
3. Connect the starboard line t-connector to the starboard fitting of the pump.
4. Add the t-connector to the port line between the helm t-connector and the steering cylinder.
5. Connect the port line t-connector to the port fitting of the pump.
6. Install the Shadow Drive to the port or starboard line between the helm t-connector and the pump t-connector.  
See the installation instructions provided with your Garmin autopilot for Shadow Drive installation instructions.
7. Connect the return line from the helm t-connector to the return fitting of the pump.
8. Insert, tighten, and seal the plugs in the unused pump fittings.

### Single Helm with Power Assist

1. Disconnect the necessary lines from the hydraulic system.
2. Add the t-connector to the starboard line between the power assist module and the steering cylinder.
3. Connect the starboard line t-connector to the starboard fitting of the pump.
4. Add the t-connector to the port line between the power assist module and the steering cylinder.
5. Connect the port line t-connector to the port fitting of the pump.
6. Install the Shadow Drive to the port or starboard line between the helm and the power assist module.  
See the installation instructions provided with your Garmin autopilot for Shadow Drive installation instructions.
7. Remove the bleed-tee fitting from the return line of the power assist module.
8. Install the bleed-tee fitting on the return fitting of the pump.
9. Add the t-connector to the return line between the power assist module and the helm.
10. Connect the return line t-connector to the return fitting of the pump.
11. Insert, tighten, and seal the plugs in the unused pump fittings.

### Connecting the Pump to the ECU

Before you connect the pump to the ECU, you must mount the pump (page 2) and ECU.

See the installation instructions provided with your Garmin autopilot for ECU installation instructions.

Connect the two cables from the pump to the ports on ECU marked DRIVE and FEEDBACK.

The ports are keyed to the fittings on the cables.

## Hydraulic Fluid Bleeding

### NOTICE

The following is a general procedure for bleeding a hydraulic steering system. Refer to the instructions provided by the manufacturer of the steering system for more-specific information about bleeding the system.

Before you bleed the hydraulic system, ensure that all hose connections are complete and fully tightened.

### Hydraulic Bleeding

1. Complete an action:
  - If the helm reservoir contains insufficient fluid, fill it with the appropriate amount of hydraulic fluid.
  - If the helm reservoir contains excess fluid, remove the excess to avoid fluid overflow during the bleeding process.
2. Manually steer the helm to both cylinder stops.
3. Manually steer the helm fully to port.
4. Open a bypass valve at the cylinder port.
5. Turn the helm slowly to port for three minutes.
6. Close the cylinder bypass valve.
7. Add fluid to the helm reservoir if necessary.
8. Repeat steps 2 through 7 until the helm reservoir remains full.

## Corrosion Blocker

### NOTICE

To ensure long life of all parts, apply corrosion blocker to the pump at least twice yearly.

After the pump installation is complete and all hydraulic connections and electrical connections are made, apply a marine-rated corrosion blocker to the pump.

## Unbalanced Valve Kit

If your boat has an unbalanced cylinder steering system, you must install the optional unbalanced valve kit.

### Installing the Unbalanced Valve Kit

1. Remove the four screws that hold the manifold to the pump body and remove the manifold from the pump body.
2. Replace the o-rings on the pump body with the o-rings supplied in the unbalanced kit.
3. Place the unbalanced valve between the pump body and the manifold, with the o-rings on the unbalanced valve facing the manifold.
4. Use the longer screws supplied in the unbalanced kit to connect the manifold and unbalanced valve to the pump body. Use thread-locking compound, and tighten the screws to 35 lbf-in. (3.95 N-m).

### Calibrating the Unbalanced Valve

### NOTICE

Do not unscrew the brass screws more than the specified amount.

Do not operate the system with the brass screws fully tightened.

Before you calibrate the unbalanced valve, you must install the unbalanced valve and connect the hydraulic lines. The brass calibration screws on the sides of the unbalanced valve adjust the valve.

1. Tighten both calibration screws until they stop.
2. Measure the distance by which each screw protrudes.

3. If the screws do not protrude the same distance, loosen the shorter screw until they protrude the same distance.
4. Unscrew each screw by two and one-half turns.

## Engaging and Disengaging the Shutoff Valve

### NOTICE

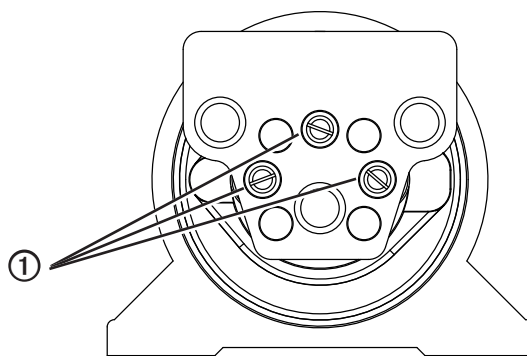
When disengaging the shutoff valve, do not force the three brass screws past the stopping point. Forcing the screws past the stopping point may permanently damage the manifold.

The 1.2/2.0 L pump features a shutoff valve that isolates the pump from the hydraulic system for troubleshooting and repairing the system.

When the shutoff valve is engaged, the boat steers normally, and the autopilot cannot control the steering system. When the shutoff valve is engaged, you can remove the pump from the system for repair without disconnecting any hydraulic lines.

Complete an action:

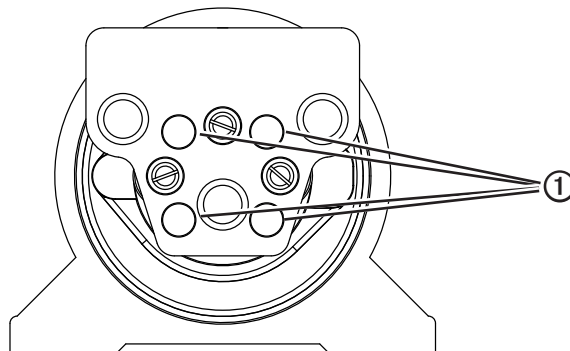
- To engage the shutoff valve, fully tighten the three screws ①.
- To disengage the shutoff valve, fully loosen the three screws.



### Removing the Pump

Before you remove the pump from the hydraulic system, you must engage the shutoff valve (page 3).

1. Remove the four socket-head cap screws ① that connect the manifold to the pump.



2. Disconnect the pump from the ECU.
3. Remove the pump from its mounting location.

### Reconnecting the Pump

1. Mount the pump in its original location.
2. Connect the pump to the ECU.
3. Connect the manifold to the pump using the four socket-head cap screws.
4. Disengage the shutoff valve (page 3).

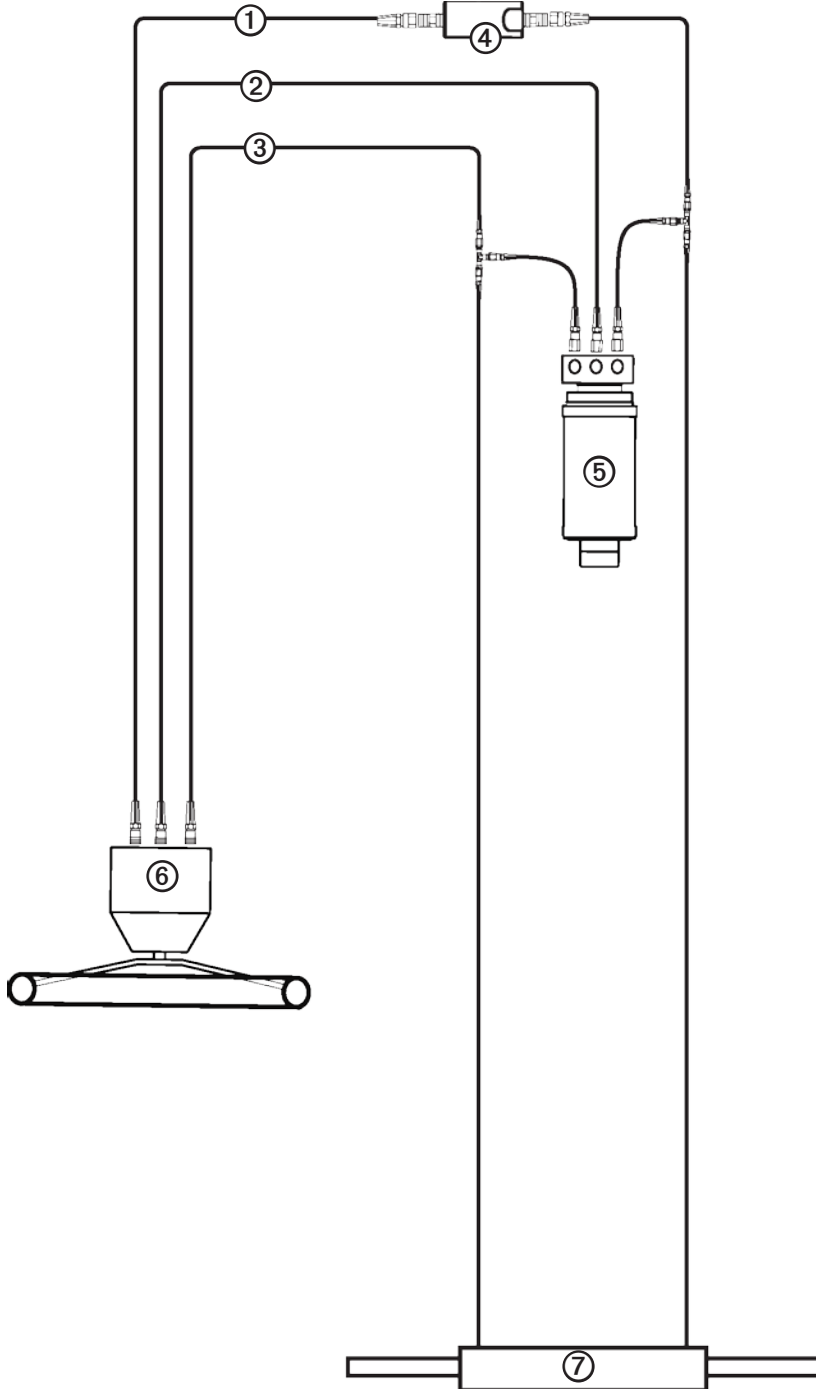
## Hydraulic Layouts

### NOTICE

If the steering system in the boat does not match any of the hydraulic layouts in this manual and you are unsure how to install the pump, contact Garmin Product Support.

Before you start the pump installation, identify the type of hydraulic steering system in your boat. Each boat is different, and you must consider certain aspects of the existing hydraulic layout before deciding where to mount the pump.

### Single-Helm without Power Assist Layout

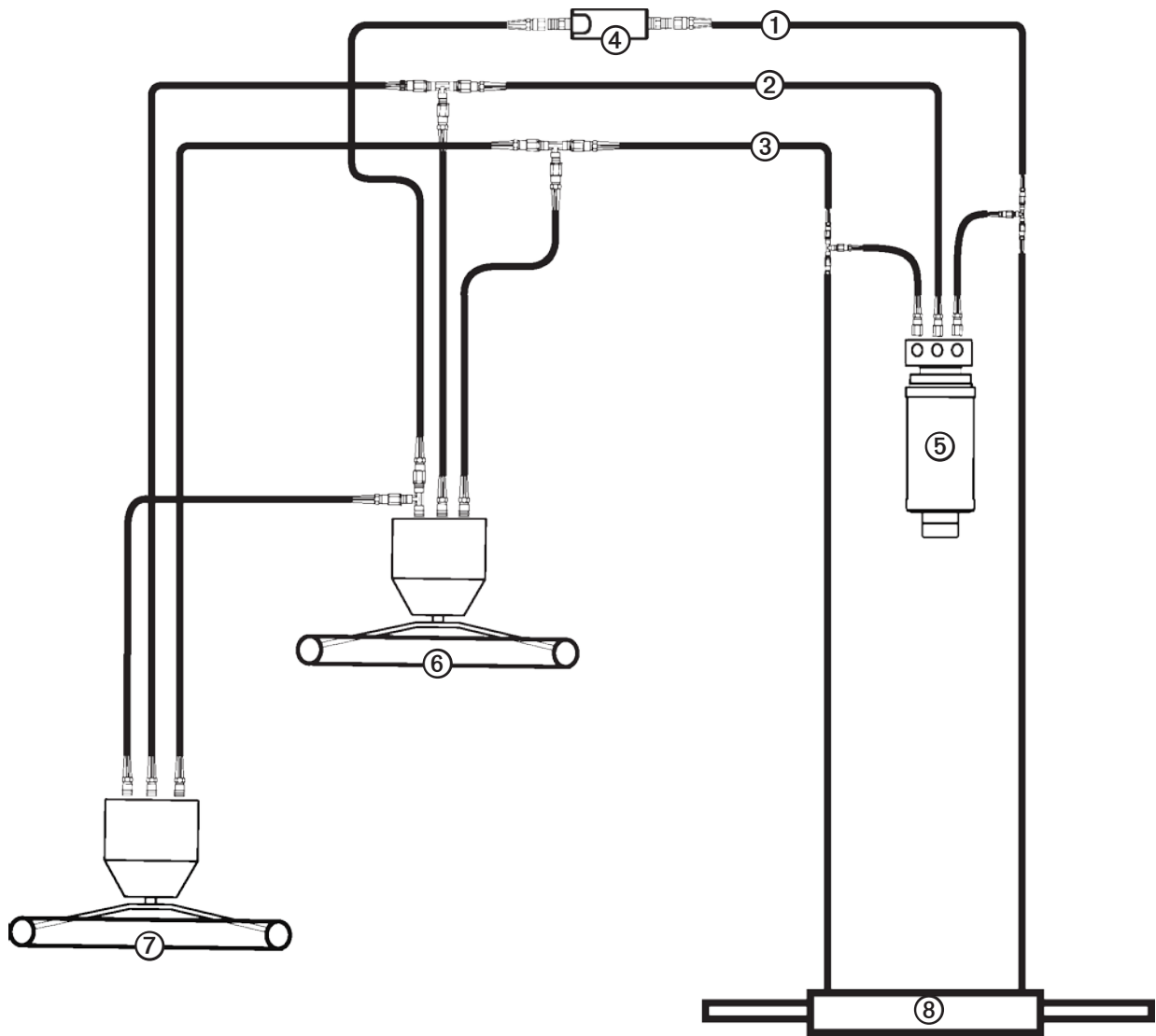


①	Starboard line
②	Return line
③	Port line
④	Shadow Drive
⑤	Pump
⑥	Helm
⑦	Steering cylinder

### Installation Considerations

- An unbalanced cylinder requires an unbalanced valve on the pump.
- The pump must be located within 19 in. (0.5 m) of the ECU.
- The cables that connect the pump to the ECU cannot be extended.
- The pump should be mounted horizontally, if possible.
- If the pump cannot be mounted pump horizontally, it must be mounted vertically with the pump head connectors facing up.
- The pump must be in a location to which you can extend the hydraulic steering lines of the boat.

## Dual Helm without Power Assist Layout

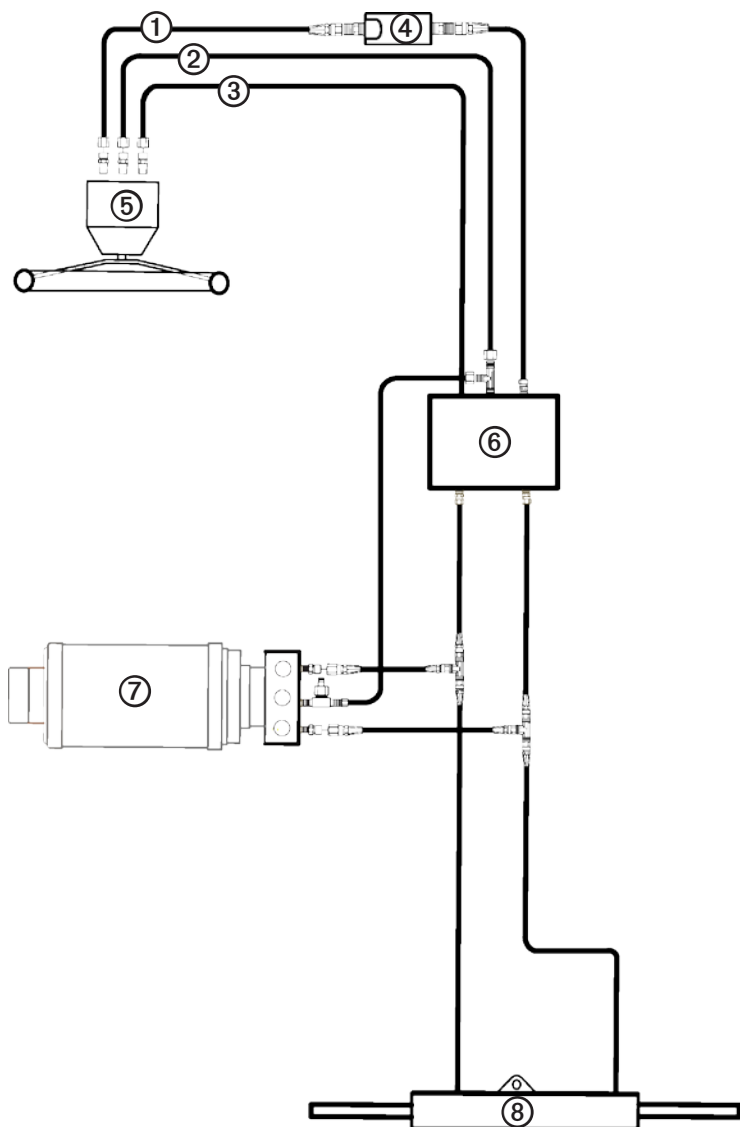


①	Starboard line
②	Return line
③	Port line
④	Shadow Drive
⑤	Pump
⑥	Lower helm
⑦	Upper helm
⑧	Steering cylinder

### Installation Considerations

- An unbalanced cylinder requires an unbalanced valve on the pump.
- The pump must be located within 19 in. (0.5 m) of the ECU.
- The cables that connect the pump to the ECU cannot be extended.
- The pump should be mounted horizontally, if possible.
- If the pump cannot be mounted pump horizontally, it must be mounted vertically with the pump head connectors facing up.
- The pump must be in a location to which you can extend the hydraulic steering lines of the boat.

## Single Helm with Power Assist Layout



①	Starboard line
②	Return line
③	Port line
④	Shadow Drive
⑤	Helm
⑥	Power assist module
⑦	Pump
⑧	Steering cylinder

### Installation Considerations

- An unbalanced cylinder requires an unbalanced valve on the pump.
- The pump must be located within 19 in. (0.5 m) of the ECU.
- The cables that connect the pump to the ECU cannot be extended.
- The pump should be mounted horizontally, if possible.
- If the pump cannot be mounted horizontally, it must be mounted vertically with the pump head connectors facing up.
- The pump must be in a location to which you can extend the hydraulic steering lines of the boat.
- Removal of the power assist module may be necessary to gain access to the fittings, hoses, and bleed-tee fitting.
- The pump must be installed between the cylinder and the power assist module.

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