



2.1 L Hydraulic Pump Installation Instructions

To obtain the best performance and to avoid damage to your boat, install the Garmin® 2.1 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

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- 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, 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 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 2.1 L Hydraulic Pump

The 2.1 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

- 2.1 L pump kit (part number 010-11099-10)
- Hydraulic hose with machine-cripmpted or field-replaceable fittings that have a minimum rating of 1000 lbf/in².
- Inline hydraulic shut-off valves
- 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
- Wire cutter/strippers
- Screwdrivers: Phillips and flat-head
- 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 5–7](#) for connection and dimension considerations.
2. Choose a location to install the pump, considering the following 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 pump 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.
 - The pump has five hydraulic-connector fittings, enabling an alternate installation method. Refer to [page 4](#) to view an illustration of the fitting layout and [page 8](#) to view an illustration of the alternate installation method.

Mounting the Pump

Before you mount the pump, if your boat has an unbalanced cylinder steering system, you must re-configure the pump to work properly with the unbalanced cylinder ([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-crimped or field-replacable fittings that have a minimum rating of 1000 lbf/in².

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, refer to 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 5](#))
- Dual helm without power assist ([page 6](#))
- Single helm with power assist ([page 7](#))
- Five-connector install method ([page 8](#))

The diagrams on [pages 5–7](#) show the recommended pump installation method, with t-connectors in the hydraulic steering lines of the boat, using only three fittings on the manifold. However, it is possible to install the pump using the five-connector method shown on [page 8](#).

Single Helm without Power Assist

1. Disconnect the necessary lines from the hydraulic system.
2. Add a t-connector to the starboard and port lines of the system.
3. Add hydraulic hose to the unused fitting on each t-connector, sufficient to connect the t-connector to the pump fittings.
4. Connect the starboard line t-connector to the H1 or H2 pump fitting.
5. Connect the port line t-connector to the H pump fitting that you did not use in step 4.
6. Install the Shadow Drive to the port or starboard hydraulic 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 Tank fitting of the pump.
8. Install a shut-off valve ([page 2](#)) on each hydraulic line that connects directly to the pump (optional).
9. Insert, tighten, and seal the included plugs in the unused pump fittings.

Dual Helm without Power Assist

1. Disconnect the necessary lines from the hydraulic system.
2. Add a t-connector to the starboard and port lines of the system between the helm t-connector and the steering cylinder.
3. Add hydraulic hose to the unused fitting on each t-connector, sufficient to connect the t-connector to the pump fittings.
4. Connect the starboard line t-connector to the H1 or H2 pump fitting.
5. Connect the port line t-connector to the H pump fitting that you did not use in step 4.
6. Install the Shadow Drive to the port or starboard hydraulic 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 Tank fitting of the pump.
8. Install a shut-off valve ([page 2](#)) on each hydraulic line that connects directly to the pump (optional).
9. Insert, tighten, and seal the included plugs in the unused pump fittings.

Single Helm with Power Assist

1. Disconnect the necessary lines from the hydraulic system.
2. Add a t-connector to the starboard and port lines of the system between the power assist module and the steering cylinder.
3. Add hydraulic hose to the unused fitting on each t-connector, sufficient to connect the t-connector to the pump fittings.
4. Connect the starboard line t-connector to the H1 or H2 pump fitting.
5. Connect the port line t-connector to the H pump fitting that you did not use in step 4.
6. Install the Shadow Drive to the port or starboard hydraulic line between the helm and the t-connector.
See the installation instructions provided with your Garmin autopilot for Shadow Drive installation instructions.
7. Add a t-connector to the return line between the power assist module and the helm.
8. Connect the return line from the helm to the Tank fitting of the pump.
9. Install a shut-off valve ([page 2](#)) on each hydraulic line that connects directly to the pump (optional).
10. Insert, tighten, and seal the included plugs in the unused pump fittings.

Shut-Off Valve

Garmin recommends the installation of shut-off valves on each line connected to the pump. The shut-off valves allow you to easily disconnect and remove the pump from the hydraulic system without affecting helm steering. Refer to the diagrams on [pages 5–7](#) to view ideal shut-off valve placement.

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 appropriate 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. The pump has a bypass valve to allow air to be bled from the system.

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 fitting.
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.
9. Open the bypass valve on the pump manifold.
10. Turn on the autopilot system and disable the Shadow Drive.
11. Hold  on the GHC 10 for 10 seconds and watch for steering movement.
12. Select an option:
 - If there is steering movement, proceed to step 13.
 - If there is no movement, hold  until steering movement occurs.
13. Hold the soft key that produces steering movement and steer fully to the stop.
14. Steer the helm to the opposite stop using the GHC 10.
15. Close the bypass valve on the pump manifold.
16. When hydraulic bleeding is complete, re-enable the Shadow Drive.

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 Cylinder Configuration

If the boat has an unbalanced cylinder steering system, you must configure the pump to work properly with the steering system.

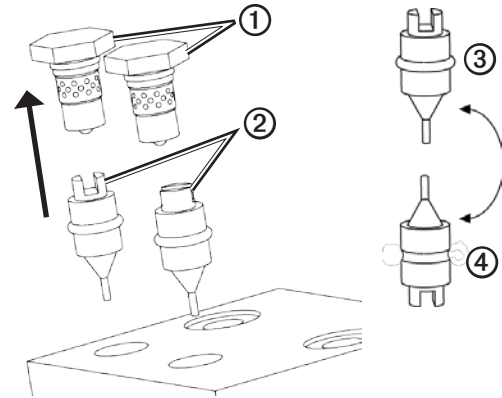
Configuring the Pump for an Unbalanced Cylinder

NOTICE

Keep all parts clean and free of dust and debris while configuring the pump for an unbalanced-cylinder steering system.

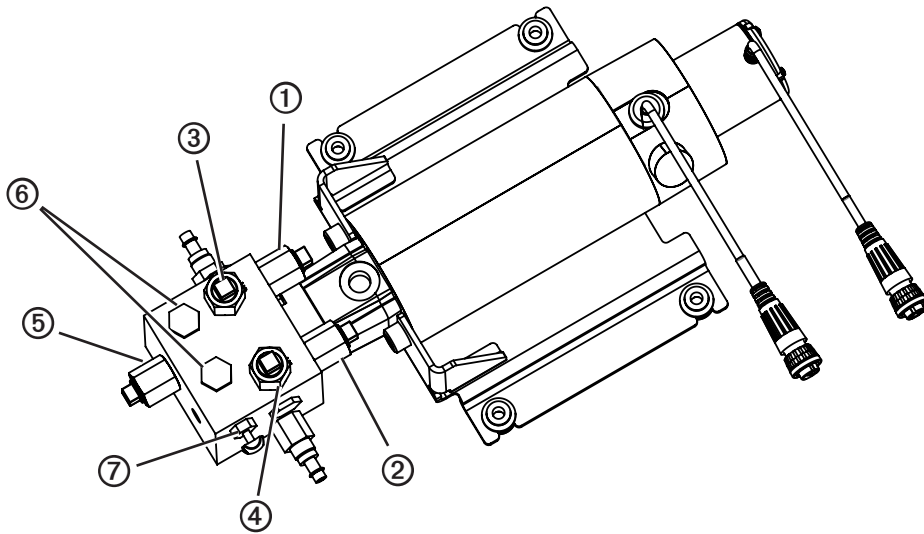
If you remove the check valves after bleeding the hydraulic system, you must bleed it again.

1. Remove the check valves ① from the pump manifold.
2. Pull the pistons ② out of the pump manifold.
The pump is configured from the factory with the pistons in the balanced configuration ③.
3. Re-insert the pistons into the pump manifold in the unbalanced configuration ④.
4. Insert and tighten the check valves into the pump manifold.



Pump Valves and Fittings

The 2.1 L pump can be connected to the hydraulic system using one of two methods. The five-connector method ([page 8](#)) uses the C1 ① and C2 ② fittings to connect the pump to the cylinder and the H1 ③ and H2 ④ fittings to connect the pump to the helm. The three-connector method ([pages 5-7](#)) uses only the H1 and H2 fittings, with a t-connector splitting the connection between the helm and cylinder. The return line fitting ⑤ is used in both cases to connect to only the helm. The check valves ⑥ do not need to be reconfigured if the boat is equipped with a balanced cylinder. If the boat is equipped with an unbalanced cylinder, the check valves must be reconfigured ([page 3](#)). The bypass valve ⑦ is only opened for hydraulic bleeding, and must be fully tightened during normal operation.



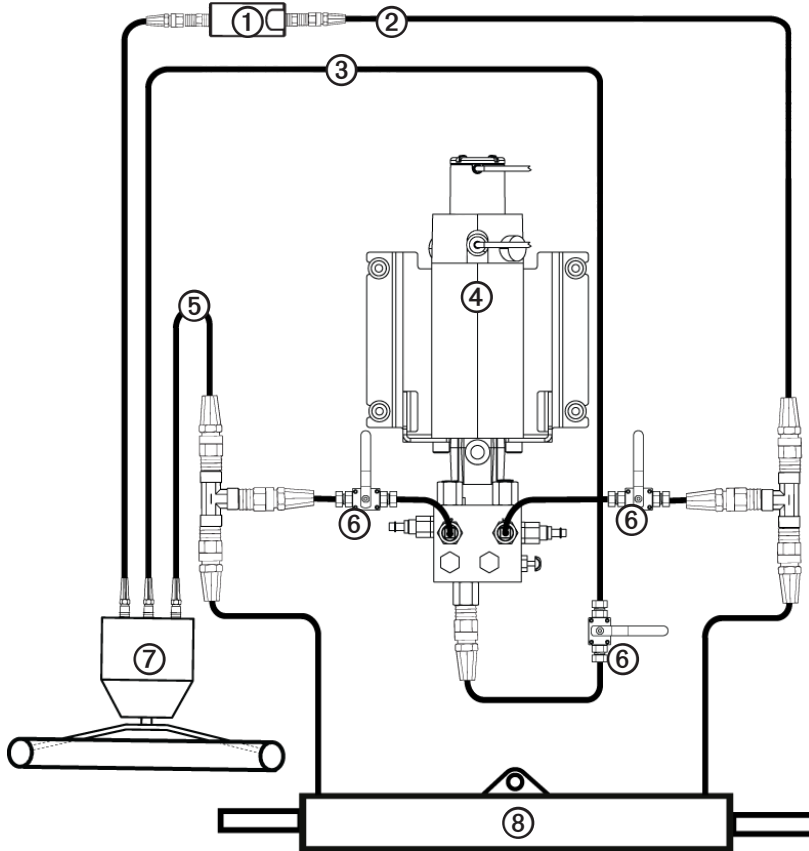
Hydraulic Layouts

NOTICE

If the steering system in your 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

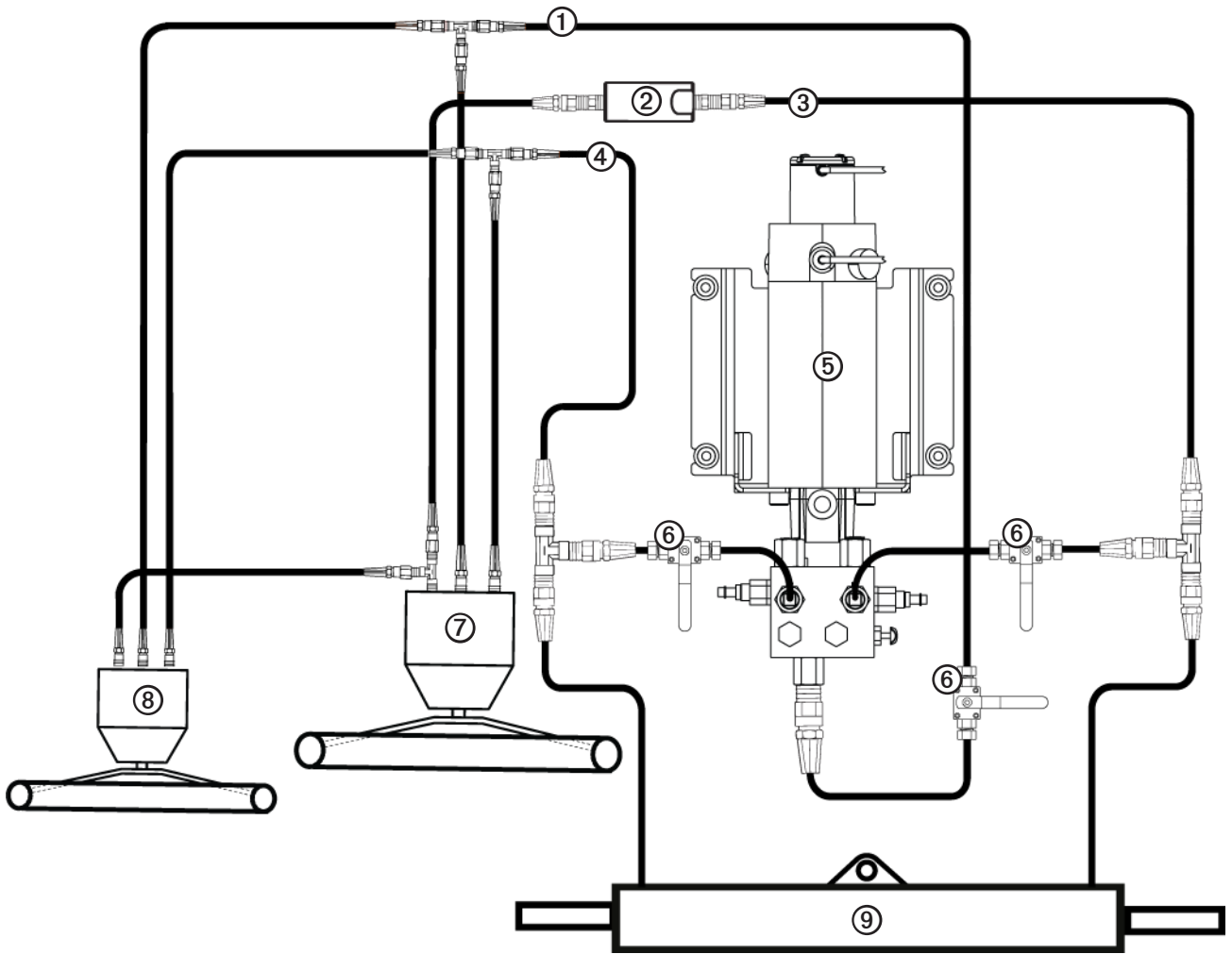


①	Shadow Drive
②	Port line
③	Return line
④	Pump
⑤	Starboard line
⑥	Shut-off valves
⑦	Helm
⑧	Steering cylinder

Installation Considerations

- The pump must be reconfigured if the boat is equipped with an unbalanced steering cylinder ([page 3](#)).
- The pump should be mounted the pump horizontally if possible.
- If the pump must be mounted vertically, mount it with the hydraulic connections facing upward.
- Garmin recommends using the t-connector method to connect the hydraulic lines to the pump. See the diagram [page 8](#) to view the alternate connection method.
- To allow for easy pump disabling and removal, Garmin recommends installing shut-off valves in the hydraulic lines between the pump manifold and t-connectors.

Dual Helm without Power Assist Layout

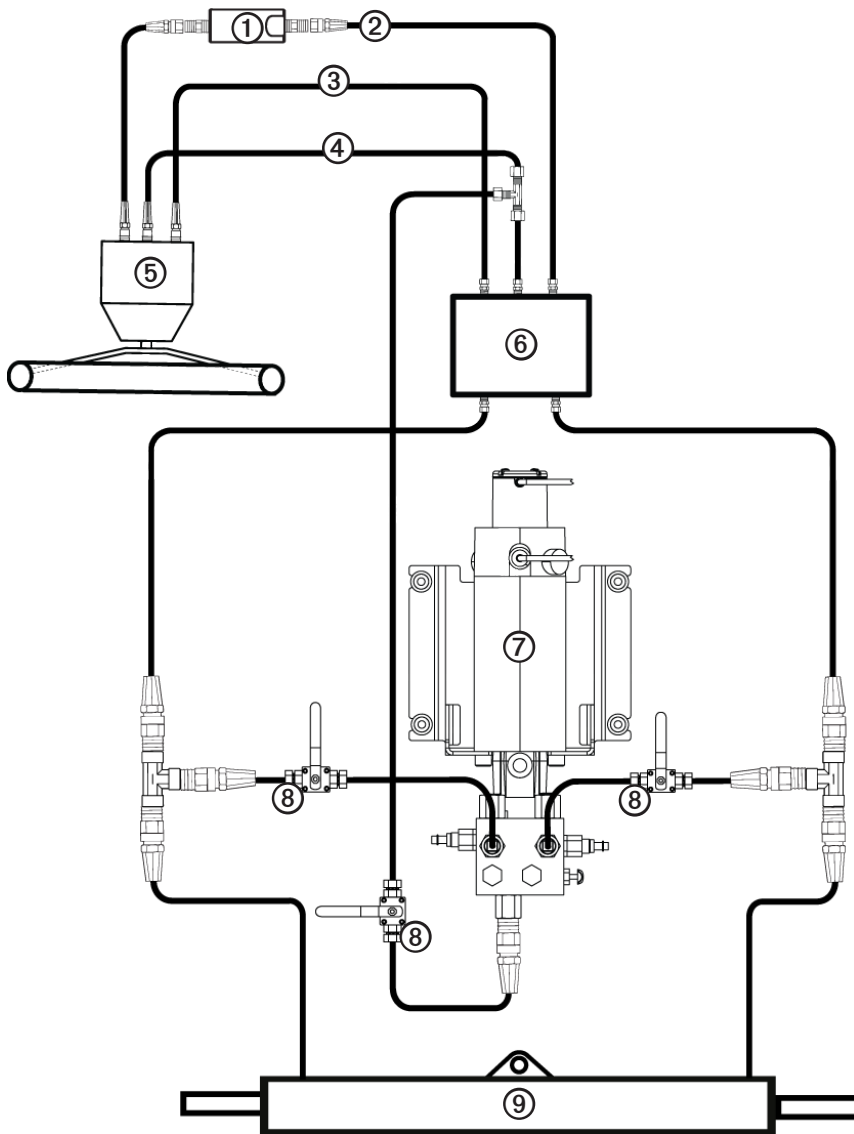


①	Return line
②	Shadow Drive
③	Port line
④	Starboard line
⑤	Pump
⑥	Shut-off valves
⑦	Lower helm
⑧	Upper helm
⑨	Steering cylinder

Installation Considerations

- The pump must be reconfigured if the boat is equipped with an unbalanced steering cylinder ([page 3](#)).
- The pump should be mounted the pump horizontally if possible.
- If the pump must be mounted vertically, mount it with the hydraulic connections facing upward.
- Garmin recommends using the t-connector method to connect the hydraulic lines to the pump. See the diagram [page 8](#) to view the alternate connection method.
- To allow for easy pump disabling and removal, Garmin recommends installing shut-off valves in the hydraulic lines between the pump manifold and t-connectors.

Single Helm with Power Assist Layout



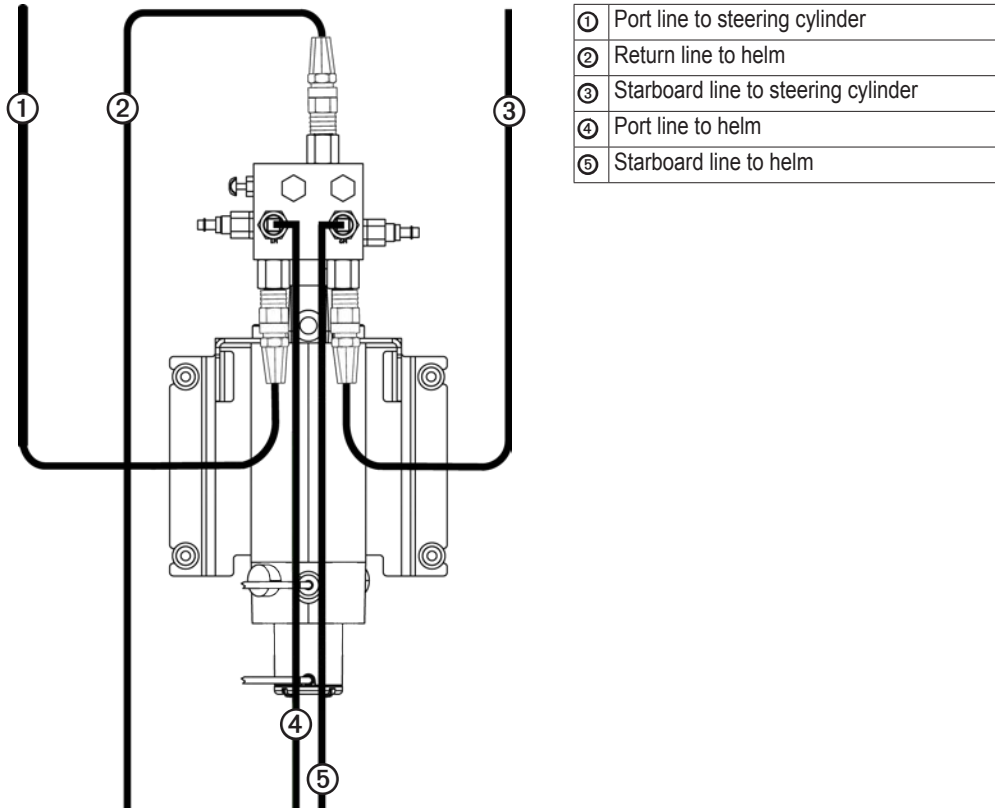
①	Shadow Drive
②	Port line
③	Starboard line
④	Return line
⑤	Helm
⑥	Power assist module
⑦	Pump
⑧	Shut-off valves
⑨	Steering cylinder

Installation Considerations

- The pump must be reconfigured if the boat is equipped with an unbalanced steering cylinder ([page 3](#)).
- The pump should be mounted the pump horizontally if possible.
- If the pump must be mounted vertically, mount it with the hydraulic connections facing upward.
- 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.
- Garmin recommends using the t-connector method to connect the hydraulic lines to the pump. See the diagram [page 8](#) to view the alternate connection method.
- To allow for easy pump disabling and removal, Garmin recommends installing shut-off valves in the hydraulic lines between the pump manifold and t-connectors.

Five-Connector Install Method

The diagrams on pages 5–7 show the recommended pump installation method, with t-connectors in the hydraulic steering lines of the boat, using only three fittings on the manifold. However, it is possible to install the pump using the five-connector method, as shown in this illustration.



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