



## GHP™ 10 Marine Autopilot System Installation Instructions

To obtain the best possible performance and to avoid damage to your boat, install the Garmin® GHP 10 marine autopilot system according to the following instructions. Professional installation of the autopilot system is highly recommended. Specific training in hydraulic pipe-fitting and in marine electrical connections is required to properly install the autopilot system.

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

**NOTE:** If your boat uses a Mercury® Verado® engine, you must also purchase a Mercury Verado Adapter Kit (Garmin part number 010-11202-00). Contact your local Garmin dealer or Garmin Product Support for ordering information.

### Product Registration

Help us better support you by completing our online registration today. Go to <http://my.garmin.com>. Keep the original sales receipt, or a photocopy, in a safe place.

For future reference, write the serial number assigned to each component of your GHP 10 system in the spaces provided on [page 2](#). The serial numbers are located on a sticker on each component.

### Contact Garmin

Contact Garmin Product Support if you have any questions while installing your GHP 10. 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) 800.1020.

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 information, or contact Garmin (Europe) Ltd. by phone at +44 (0) 870.8501241.

#### WARNINGS

**You are responsible for the safe and prudent operation of your vessel.** The GHP 10 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.

Always be prepared to promptly regain manual control of your boat.

Learn to operate the GHP 10 on calm and hazard-free open water.

Use caution when operating the GHP 10 at high speeds near hazards in the water, such as docks, pilings, and other boats.

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

#### CAUTION

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

#### NOTICE

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

# GHP 10 Package Contents and Tools Needed

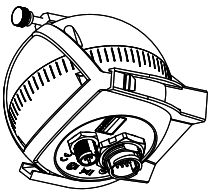
The GHP 10 autopilot system consists of multiple components. Familiarize yourself with all of the components before beginning installation. You must know how the components operate together in order to correctly plan the installation on your boat.

As you familiarize yourself with the GHP 10 components, confirm that your package includes the following items. All the components, except the hydraulic pump, are included in the GHP 10 core box. The pump is packaged separately. If any parts are missing, contact your Garmin dealer immediately.

## The Main Components

The GHP 10 autopilot system consists of five main components: the Electronic Control Unit (ECU), the Course Computer Unit (CCU), a hydraulic pump, the Shadow Drive™, and the GHC™ 10 user control interface.

### The Course Computer Unit (CCU)

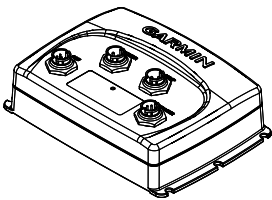


The CCU acts as the “brain” of the GHP 10. The CCU contains the sensory equipment used to determine heading and engine speed. The CCU connects to the Electronic Control Unit (ECU), to the GHC 10, and to the tachometer of your boat with a single cable. The CCU also connects to a NMEA 2000® network to communicate with the GHC 10, and to an optional NMEA 2000-compatible GPS device. See [page 32](#).

Garmin part number: 010-11353-00

Serial number \_\_\_\_\_

### The Electronic Control Unit (ECU)

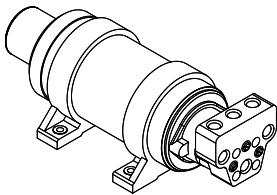


The ECU connects to the CCU and to the pump. The ECU controls the pump based on information from the CCU. The ECU powers both the CCU and the pump.

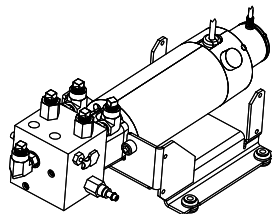
Garmin part number: 010-11053-00

Serial number \_\_\_\_\_

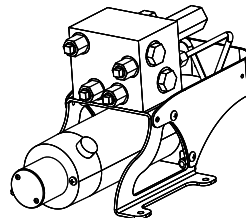
### The Hydraulic Pump (and motor)



**1.2 L/2.0 L Pump**



**Compact 2.1 L Pump**



**Legacy 2.1 L Pump**

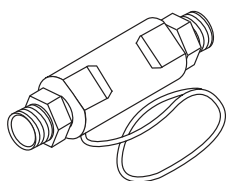
The hydraulic pump (and motor) steers your boat by interacting with the hydraulic steering system, based on commands you enter using the GHC 10. The pump is not included in the GHP 10 core package box because the type of pump you use with your GHP 10 is determined by the size and type of steering system on your boat. The pump is in a separate box.

- The 1.2 L/2.0 L pump is designed for use on a balanced-cylinder steering system, but can be adapted for use with an unbalanced-cylinder steering system.
- The compact 2.1 L pump can be adapted for use on either a balanced-cylinder or an unbalanced-cylinder steering system.
- The legacy 2.1 L pump can only be used on a balanced-cylinder steering system.
- See [page 19](#) for more information on using compatible pumps with unbalanced-cylinder steering systems.

Garmin part numbers: 010-11097-00 (2.0 L pump), 010-11098-00 (1.2 L pump), 010-11099-10 (compact 2.1 L Pump), and 010-11099-00 (legacy 2.1 L pump - discontinued)

Pump model and serial number \_\_\_\_\_

## The Shadow Drive

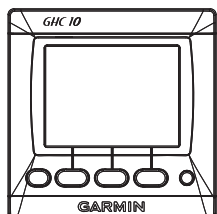


The Shadow Drive is a sensor you install in the hydraulic steering lines of your boat. While the GHP 10 is engaged, the Shadow Drive temporarily disengages the autopilot when you manually take control of the helm. When you establish a new straight line heading, the Shadow Drive automatically reengages the autopilot.

Garmin part number: 010-11054-00

**Serial number** \_\_\_\_\_

## The GHC 10



Use the GHC 10 to operate the GHP 10 autopilot system. Using the GHC 10, you engage and steer the GHP 10. You also set up and customize the GHP 10 using the GHC 10. The GHC 10 connects to a NMEA 2000 network to communicate with the CCU and with an optional NMEA 2000-compatible GPS device (to use waypoint and route information). If a NMEA 2000-compatible GPS device is not available, you can wire the GHC 10 to an optional NMEA 0183-compatible GPS device instead.

Garmin part number: 010-00688-00

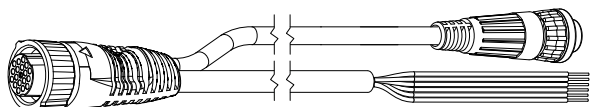
**Serial number** \_\_\_\_\_

## Cables and Connectors

The GHP 10 autopilot system contains multiple cables. These cables connect the components to power, to each other, to an alarm, and to optional devices such as a NMEA 0183-compatible GPS device.

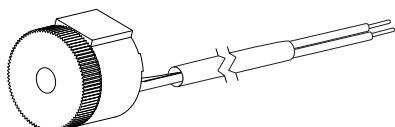
### CCU/ECU Interconnect Cable

This cable connects the CCU to the ECU. A portion of this cable contains color-coded wires with bare ends. These wires connect the CCU to the tachometer of your boat, to the Shadow Drive, and to the alarm. (Garmin part number: 010-11055-00)



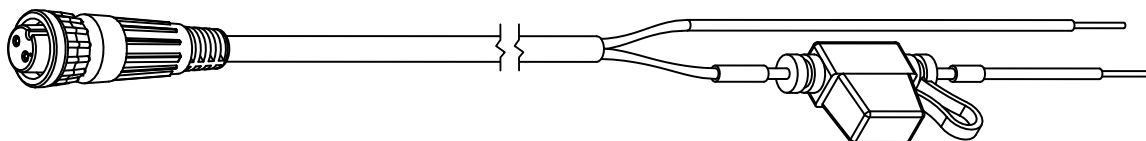
### The Alarm

The alarm is wired to the CCU and provides audible alerts from the GHP 10. See [page 27](#). (Garmin part number: 010-11056-00)



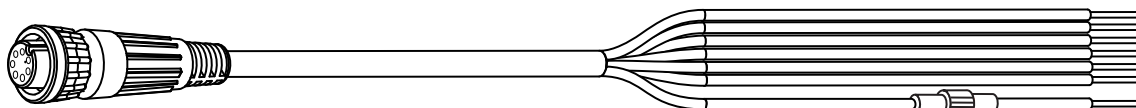
### ECU Power Cable

This cable powers the ECU. Wire this to the battery of your boat as one of the last connections made in the GHP 10 installation. See [page 33](#). (Garmin part number: 010-11057-00)



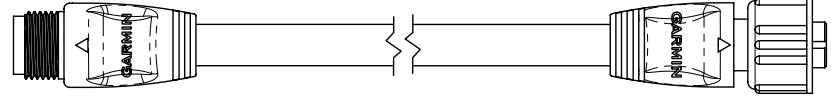
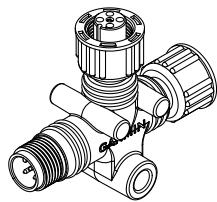
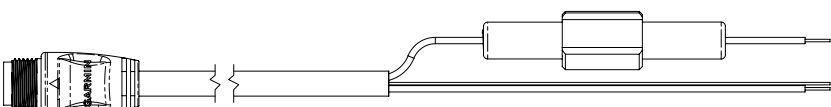
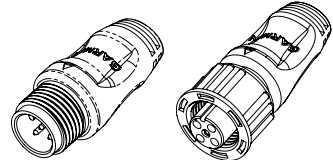
### GHC 10 NMEA 0183 Data Cable

This cable is included in the GHC 10 box. This cable is used to connect to an optional NMEA 0183-compatible GPS device and to the Accessory Turn On of the GHP 10. See [page 29](#). (Garmin part number: 320-00023-07)



## NMEA 2000 Cables and Connectors

The NMEA 2000 cables connect the CCU and the GHC 10 to the NMEA 2000 network. Use the NMEA 2000 power cable and two terminators to create a NMEA 2000 network on your boat if one does not exist. For more information on NMEA 2000, see [page 30](#).

	
<p>NMEA 2000 drop cable, 6 ft. (2 m) (×2), Garmin part number: 320-00387-00</p>	<p>NMEA 2000 T-connector (×3), Garmin part number: 330-00563-00</p>
	
<p>NMEA 2000 power cable, Garmin part number: 320-00389-00 (×1)</p>	<p>NMEA 2000 terminators, male Garmin part number: 330-00564-00 (×1); female Garmin part number: 330-00565-00 (×1)</p>

NMEA 2000 extension cables are available if needed. Contact your local Garmin dealer or Garmin Product Support for ordering information.

### CCU/ECU Interconnect Extension Cables (Not Included)

When installing the GHP 10 system, you may need to mount the CCU farther than 16 ft. (5 m) from the ECU. Garmin offers optional replacement or extension cables for purchase if this is necessary. Contact your local Garmin dealer or Garmin Product Support for ordering information.

Type	Length	Garmin Part Number
Replacement	32 ft. (10 m)	010-11055-01
Replacement	66 ft. (20 m)	010-11055-02
Extension	16 ft. (5 m)	010-11156-00
Extension	50 ft. (15 m)	010-11156-01
Extension	82 ft. (25 m)	010-11156-02

### CCU/ECU Interconnect Extension Cables

### External Tachometer Filter (Not Included)

If your tachometer source is a direct alternator connection or other signal larger than 12 Vdc, or if you sporadically receive tachometer errors, install an external tachometer filter (Garmin part number: 010-11399-00). Contact your local Garmin dealer or Garmin product support for ordering information.

### Tools Needed

- Safety glasses
- Drill and drill bits
- 3 1/2 in. (90 mm) hole saw
- Wrenches
- Wire cutters/strippers
- Phillips and flat screwdrivers
- Cable ties
- Waterproof wire connectors (wire nuts) or heat-shrink tubing and a heat gun.
- Marine sealant
- Compass (to test for magnetic interference when determining the best location to install the CCU)
- Anti-seize lubricant (optional)
- Hydraulic supplies (Shipyard Supply)
  - Additional hydraulic hose with machine-crimped or field-replaceable fittings that have a minimum rating of 1,000 lbf/in<sup>2</sup>
  - Additional hydraulic fluid
  - Rags
  - Thread sealant (Loctite® Pro Lock Tight® multipurpose anaerobic gel, part number 51604 or equivalent)
  - Helm/hydraulic bleeding equipment

**NOTE:** Mounting screws are provided for the GHC 10, for the CCU, for the ECU, and for the pump. If the provided screws are not appropriate for the mounting surface, you will need to provide the correct types of screws.

# Installation Preparation

Before installing the GHP 10 autopilot system, it is important for you to completely understand where all the components will be located on your boat. Temporarily place all the components where you plan to install them. Ensure that all cables and hydraulic hoses can reach the necessary components before mounting any components.

**NOTE:** There is an installation checklist on the last page of these instructions. Remove the last page and refer to the checklist as you proceed through the GHP 10 installation.

## Electrical/Data Connection and Mounting Considerations

The GHP 10 components connect to each other and to power using the included cables. Ensure that the correct cables reach each component and that each component is in an acceptable location before mounting or wiring any components. Read the following considerations and consult the diagrams on [pages 6–8](#) before you begin installation.

### The Pump and the ECU

- **The cables from the pump to the ECU cannot be extended.**
- The pump must be located within 19 in. (0.5 m) of the ECU, and mounted horizontally if possible. If you cannot mount the pump horizontally, do not mount the pump vertically with the pump head (connectors) down.
- The ECU power cable connects to the boat battery.

### The CCU and the ECU

- **Mount the CCU in the forward half of the boat, no higher than 10 ft. (3.05 m) above the waterline.**
- Do not mount the CCU or the ECU in a location where they will be submerged or exposed to wash-down.
- **Do not mount the CCU near magnetic material, magnets (speakers and electric motors), or high-current wires.** Mount the CCU at least 24 in. (0.6 m) away from movable or changing magnetic disturbances such as anchors, anchor chain, wiper motors, tool boxes, and the autopilot pump. Use a handheld compass to test for magnetic interference in the area.
- You can mount the CCU below the waterline, if it is not in a location where it will be submerged or exposed to wash-down.
- Mount the CCU bracket on a vertical surface or under a horizontal surface, so that the connected wires hang straight down.
- The CCU/ECU interconnect cable connects the CCU to the ECU, and is 16 ft. (5 m) long. If you cannot mount the CCU within 16 ft. (5 m) of the ECU, replacement and extension cables are available. (See [page 4](#)).
- The CCU/ECU interconnect cable connects the CCU to the Shadow Drive, the alarm buzzer, the tachometer of the boat, and the yellow CCU signal wire of the GHC 10 using wires with bare ends. See [page 26](#) for wiring instructions and diagrams.
- If your boat uses an electrical system that provides more than 12 Vdc, or if you sporadically receive tachometer errors, install an external tachometer filter (010-11399-00). Contact your local Garmin dealer or Garmin product support for more information.

### The CCU and the GHC 10

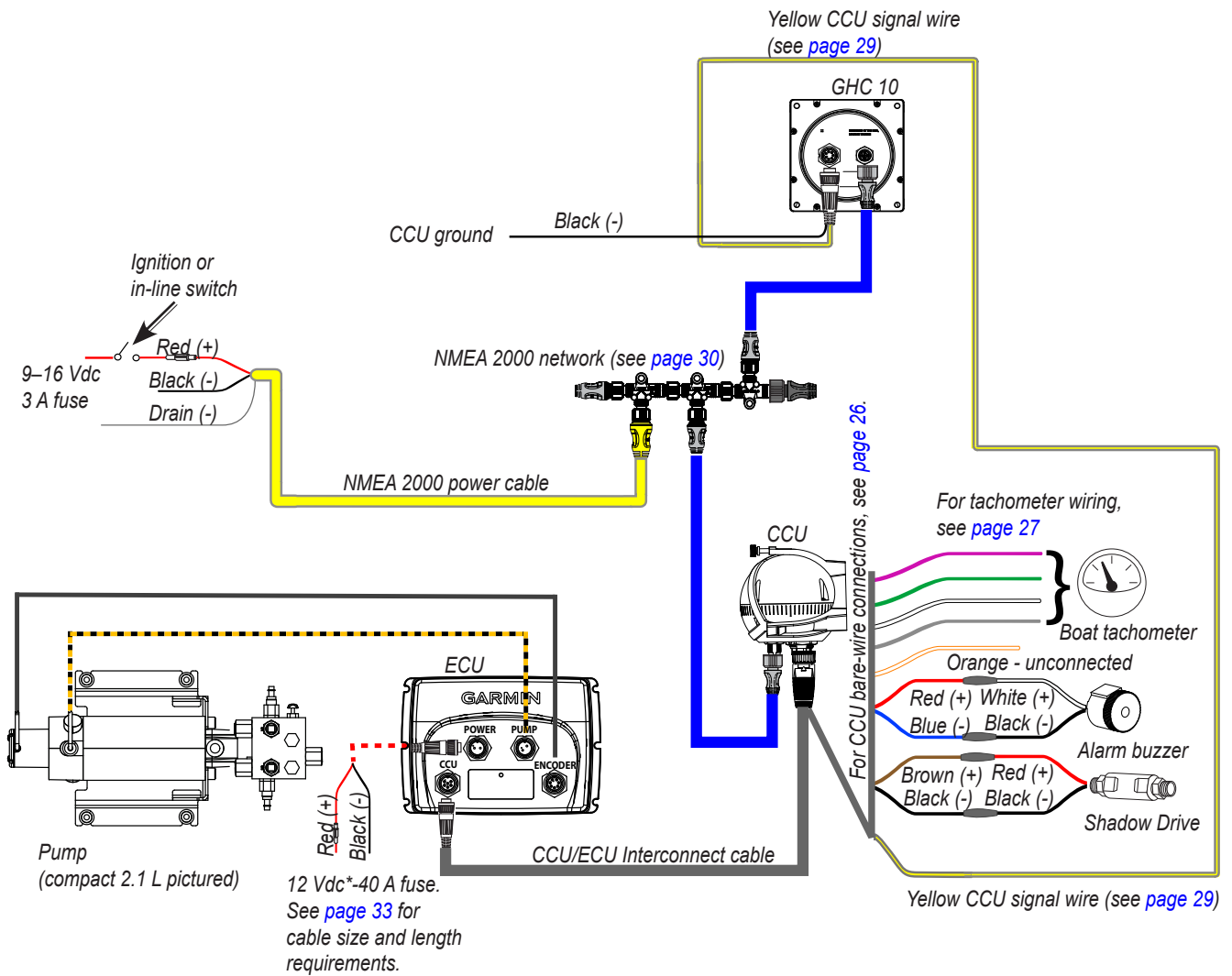
- The CCU and the GHC 10 connect to a NMEA 2000 network. If you do not have a NMEA 2000 network on your boat, the equipment necessary to build one is provided. For instructions on setting up the NMEA 2000 network, see [page 30](#).
- You can connect an optional NMEA 2000-compatible GPS device to the NMEA 2000 network to use waypoint and route data with the GHP 10.

### The GHC 10

- Connect the GHC 10 to a NMEA 2000 network.
- Connect the yellow CCU signal wire from the GHC 10 data cable to the yellow CCU signal wire of the CCU/ECU interconnect cable. Connect the black wire to CCU ground.
- If you do not have an optional NMEA 2000-compatible GPS device, you can wire an optional NMEA 0183-compatible GPS device to the data cable of the GHC 10 instead (see [page 32](#)).

### The Shadow Drive

- **Mount the Shadow Drive horizontally, as level as possible.**
- **Mount the Shadow Drive at least 12 in. (0.3 m) away from magnetic material such as speakers and electric motors, including the autopilot pump.**
- Install the Shadow Drive closer to the helm than to the pump.



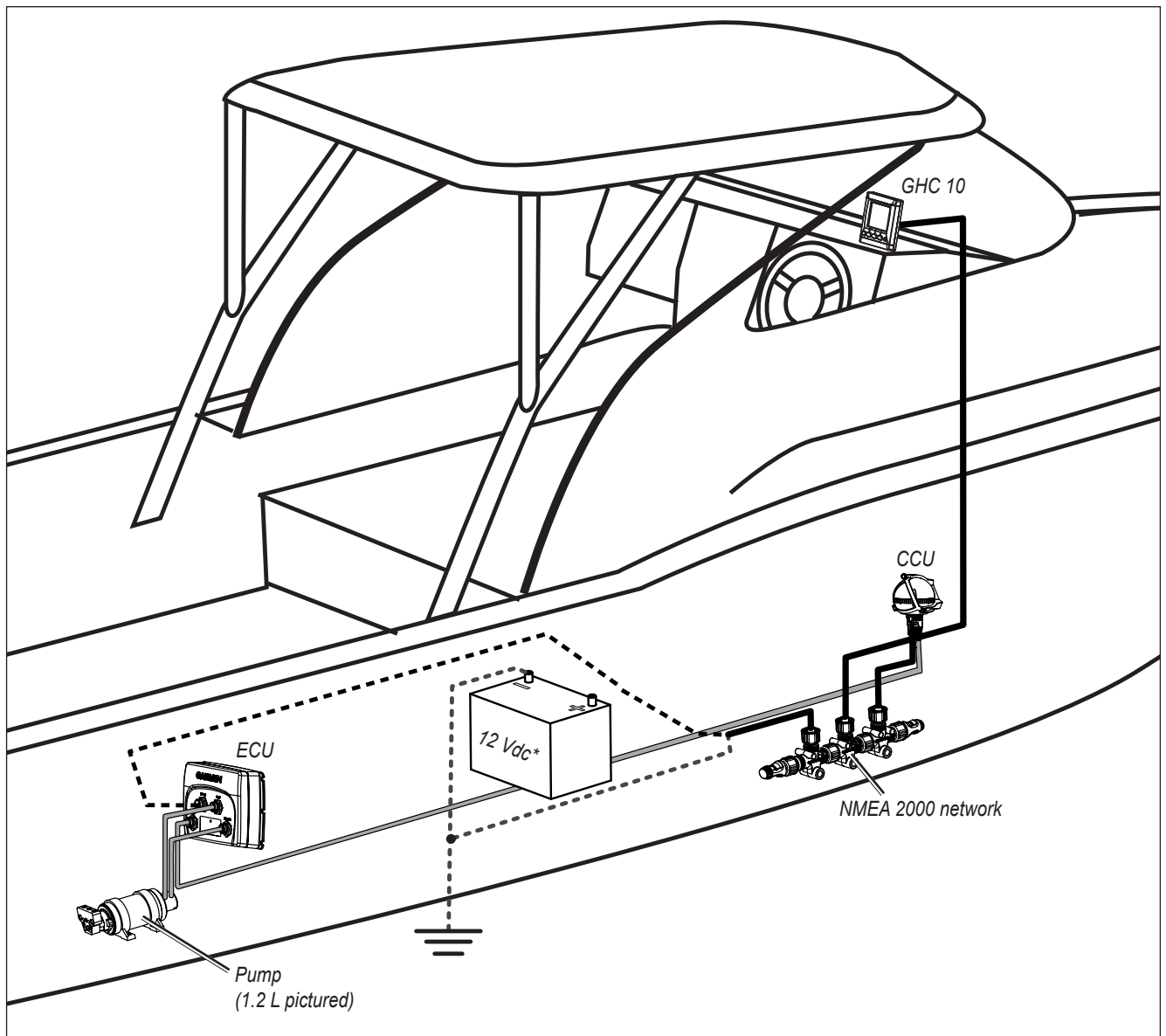
### GHP 10 General Wiring Outline

#### Notes:

- This diagram is for planning purposes only. Specific wiring diagrams are included in the detailed installation instructions for each component. Hydraulic connections are not shown in this diagram.
- If your boat uses an electrical system that provides more than 12 Vdc, or if you sporadically receive tachometer errors, install an external tachometer filter (010-11399-00). Contact your local Garmin dealer or Garmin product support for more information.
- Connect an optional NMEA 0183-compatible GPS device to the data cable on the GHC 10. See [page 32](#) for more information.
- Connect an optional NMEA 2000-compatible GPS device to the NMEA 2000 network. See [page 32](#) for more information.

\* Newer ECU units are compatible with 24 Vdc systems. See [page 25](#) for more information.

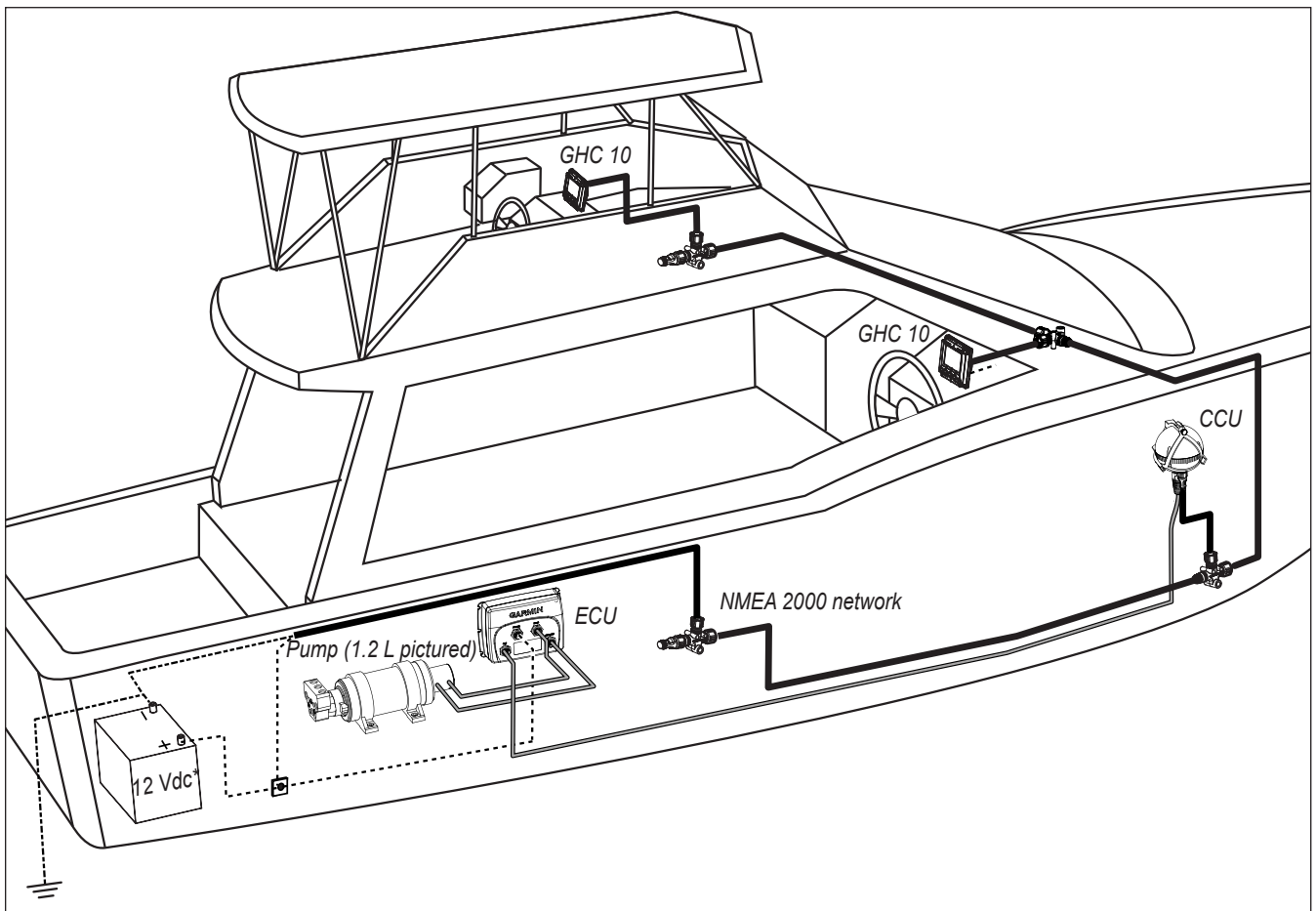
## Single-helm Layout Guidelines



**NOTE:** This diagram is for planning purposes only. Specific wiring diagrams are included in the detailed installation instructions for each component. Hydraulic connections are not shown in this diagram.

\* Newer ECU units are compatible with 24 Vdc systems. See [page 25](#) for more information.

## Dual-helm Layout Guidelines



**NOTE:** This diagram is for planning purposes only. Specific wiring diagrams are included in the detailed installation instructions for each component. Hydraulic connections are not shown in this diagram.

\* Newer ECU units are compatible with 24 Vdc systems. See [page 25](#) for more information.



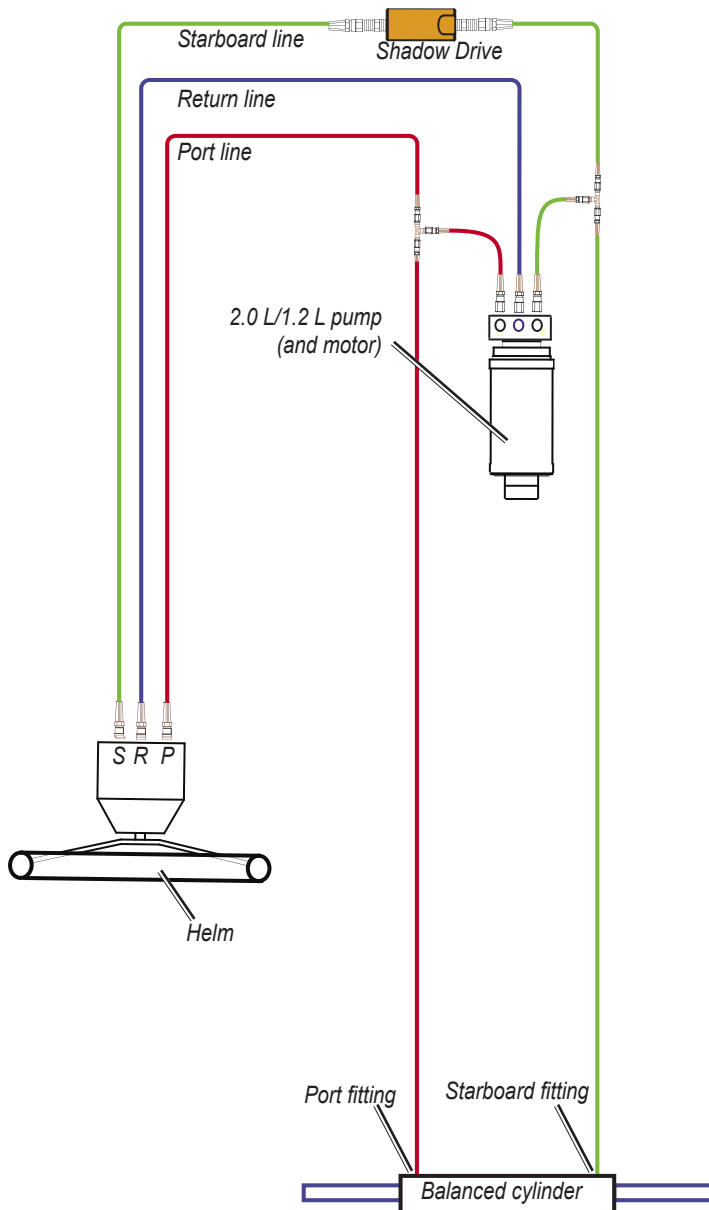
## Hydraulic Considerations – 2.0 L and 1.2 L Pumps

Different boats have different hydraulic considerations you must examine before mounting the pump or disconnecting any hoses. Before starting the hydraulic installation, verify the type of hydraulic steering in your boat, and where to install the appropriate type of pump.

### NOTICE

If the hydraulic steering of your boat does not match the hydraulic layouts in this manual, contact Garmin Product Support.

## 2.0 L or 1.2 L Pump Hydraulic Layout on Single-Helm Boats (without Power Assist)



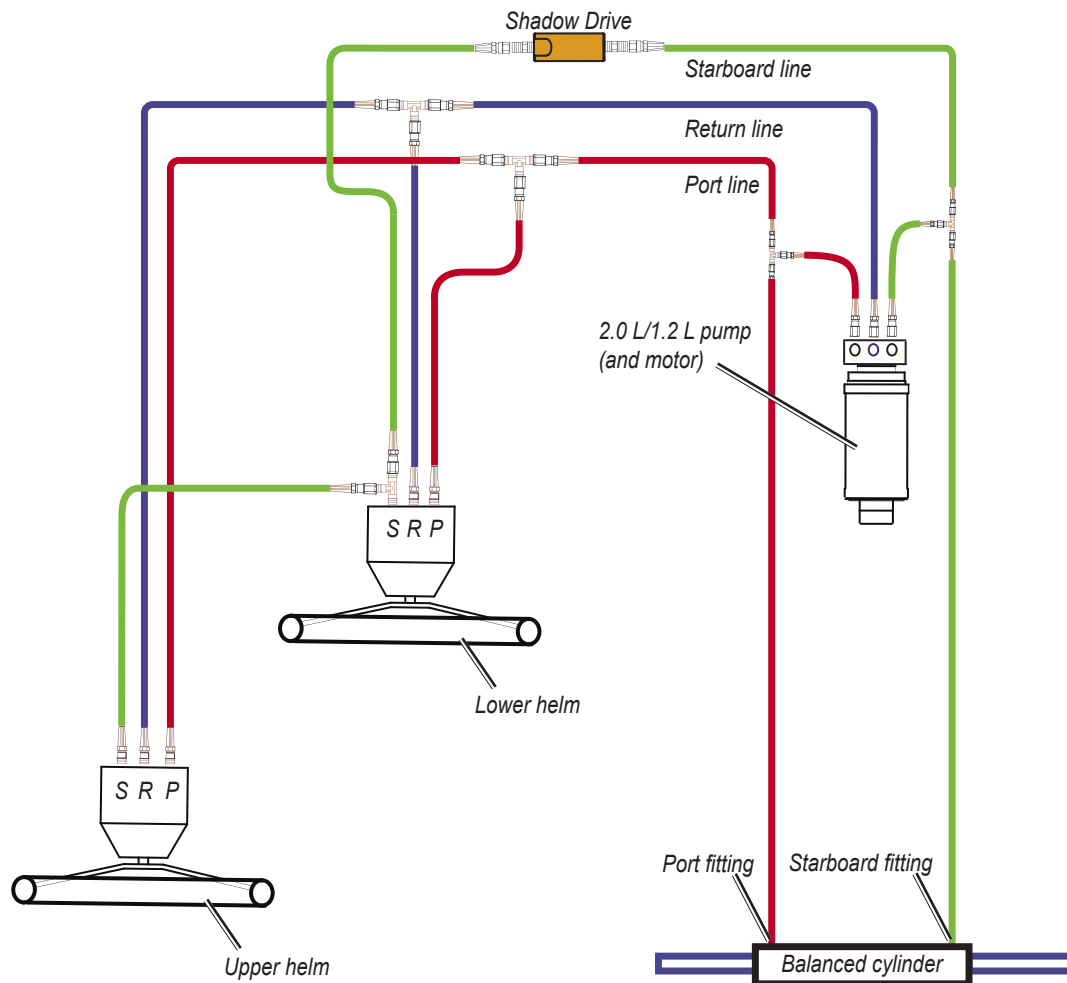
### Notes:

- 2.0 L/1.2 L pump (and motor):
  - An unbalanced cylinder requires an unbalanced valve on the pump ([page 21](#))
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic steering line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - **Do not install the Shadow Drive directly to the helm.**
  - Install the Shadow Drive between the pump and the helm.
  - **Do not install the Shadow Drive between the pump and the cylinder.**

### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See [page 34](#).

## 2.0 L or 1.2 L Pump Hydraulic Layout on Dual-Helm Boats



### Notes:

- 2.0 L/1.2 L pump (and motor):
  - An unbalanced cylinder requires an unbalanced valve on the pump ([page 21](#)).
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic steering line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - Install the Shadow Drive between the pump and both helms.
  - **Do not install the Shadow Drive directly to the helm.**
  - **Do not install the Shadow Drive between the pump and the cylinder.**
  - **Do not install the Shadow Drive between the two helms.**

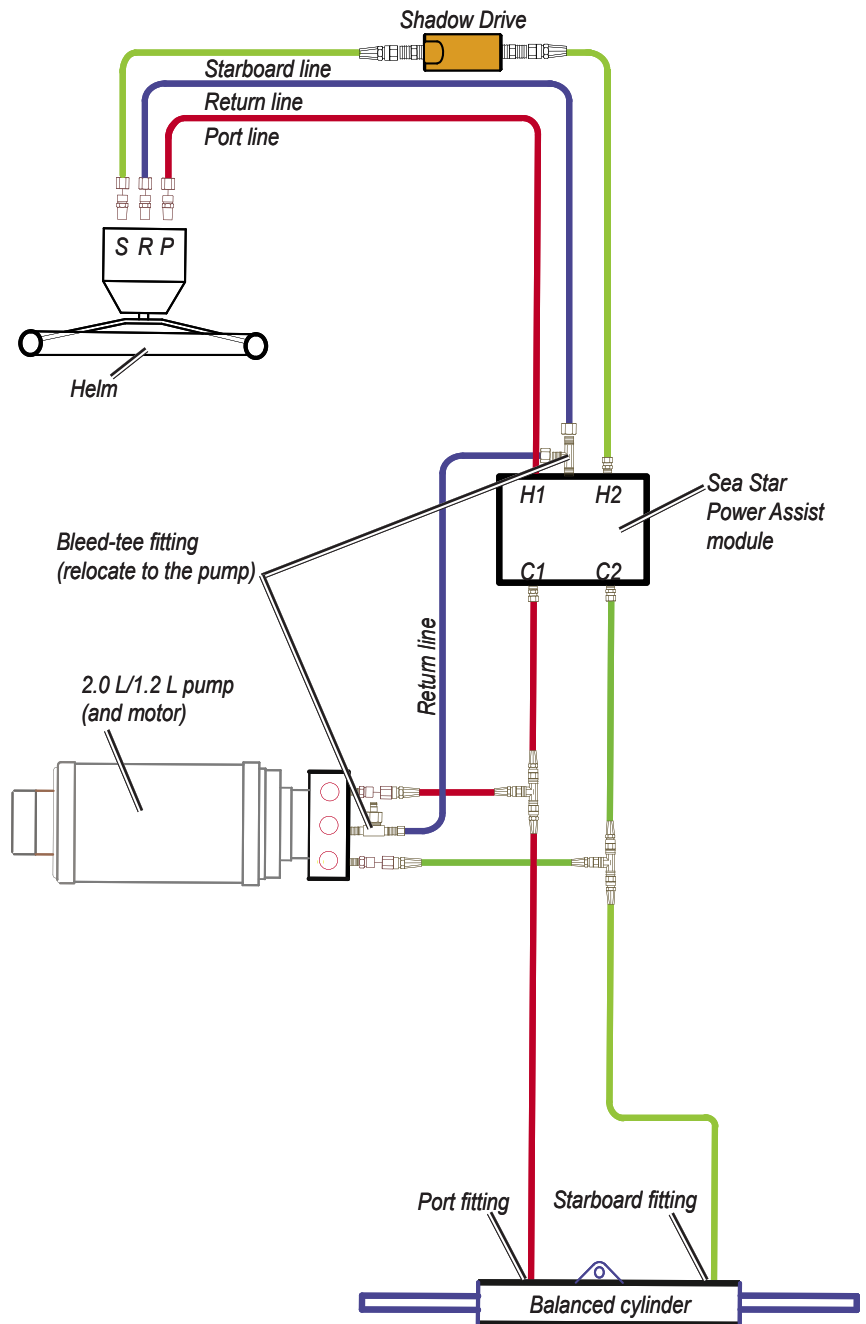
### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See [page 34](#).

## 2.0 L or 1.2 L Pump Hydraulic Layout on SeaStar Power Assist-Enabled Boats

### Notes:

- Power Assist module:
  - It may be necessary to remove the Power Assist module to gain access to the fittings, the hoses, and the bleed-tee fitting.
  - Remove the bleed-tee fitting from the Power Assist module and relocate it to the return port on the pump.
- 2.0 L/1.2 L pump (and motor):
  - Install the pump to the steering lines between the cylinder and the Power Assist module.
  - **Do not install the pump to the steering lines between the helm and the Power Assist module.**
  - An unbalanced cylinder requires an unbalanced valve on the pump (See [page 21](#))
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic steering line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - **Do not install the Shadow Drive directly to the helm.**
  - Install the Shadow Drive between the helm and the Power Assist module.
  - **Do not install the Shadow Drive between the Power Assist module and the pump.**
  - **Do not install the Shadow Drive between the Power Assist module and the cylinder.**



### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See [page 34](#).

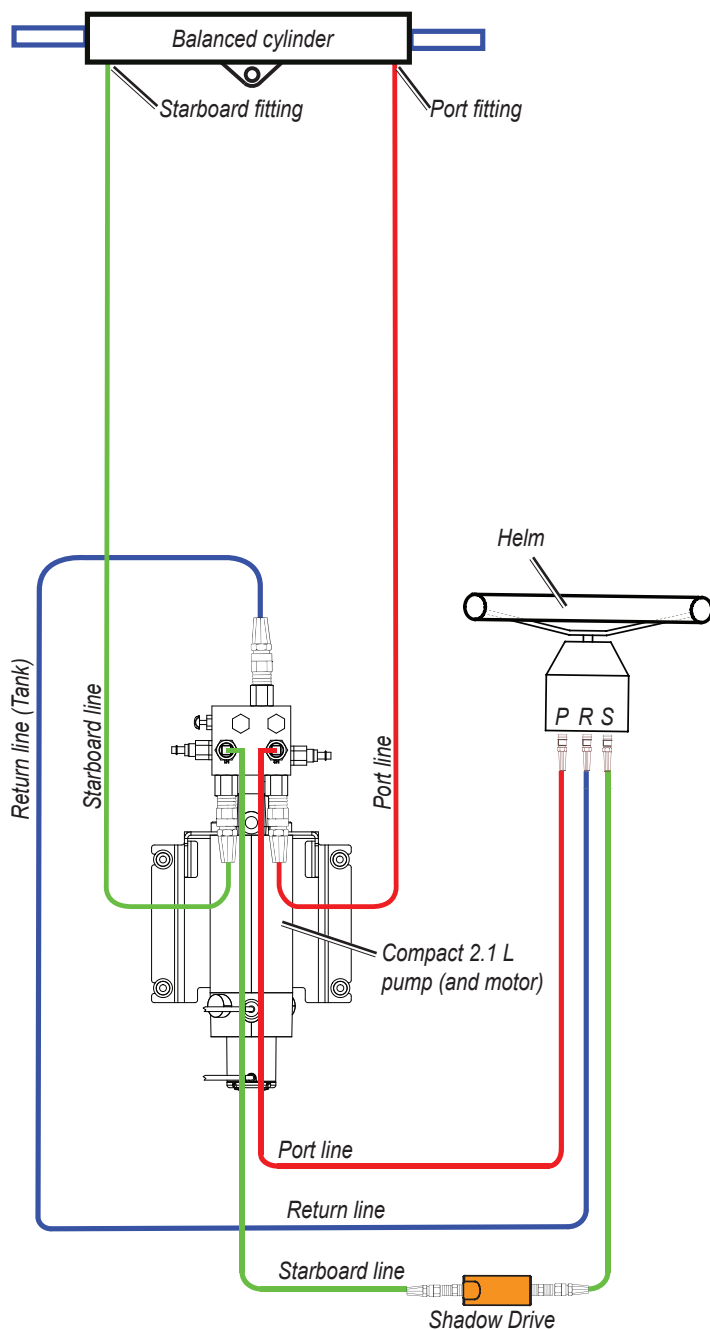
## Hydraulic Considerations - Compact 2.1 L Pump

Different boats have different hydraulic considerations you must examine before mounting the pump or disconnecting any hoses. Before starting the hydraulic installation, verify the type of hydraulic steering in your boat, and where to install the appropriate type of pump.

### NOTICE

If the hydraulic steering of your boat does not match the hydraulic layouts in this manual, contact Garmin Product Support.

## Compact 2.1 L Pump Hydraulic Layout on Single-Helm Boats



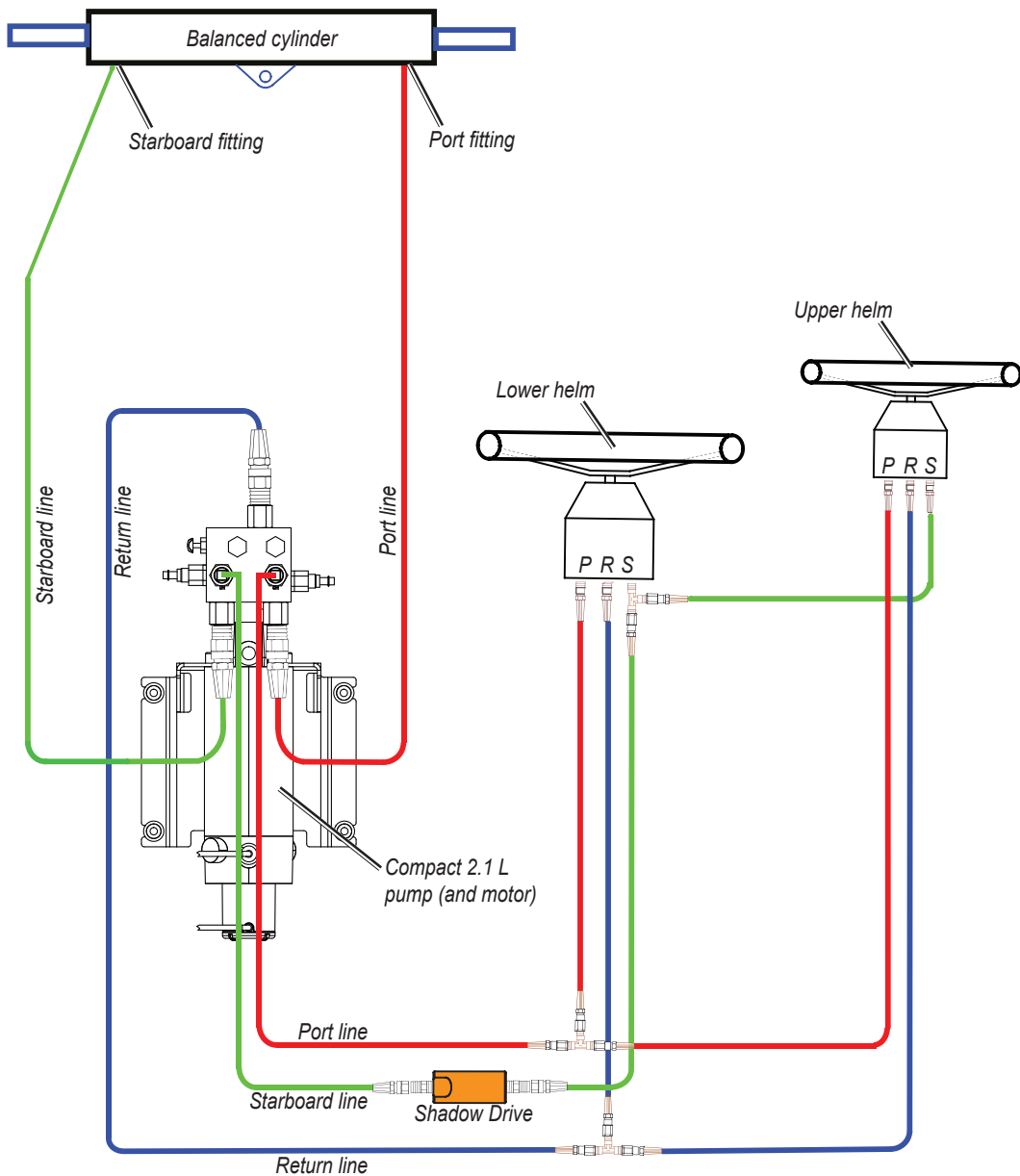
### Notes:

- Compact 2.1 L pump (and motor):
  - To use the compact 2.1 L pump on a system with an unbalanced cylinder, follow the procedures on page 24.
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - Do not install the Shadow Drive directly to the helm.
  - Install the Shadow Drive between the pump and the helm.
  - Do not install the Shadow Drive between the pump and the cylinder.

### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See page 34.

## Compact 2.1 L Pump Hydraulic Layout on Dual-Helm Boats



### Notes:

- Compact 2.1 L pump (and motor):
  - **To use the compact 2.1 L pump on a system with an unbalanced cylinder, follow the procedures on [page 24](#).**
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - Install the Shadow Drive between the pump and the helm.
  - **Do not install the Shadow Drive directly to the helm.**
  - **Do not install the Shadow Drive between the pump and the cylinder.**

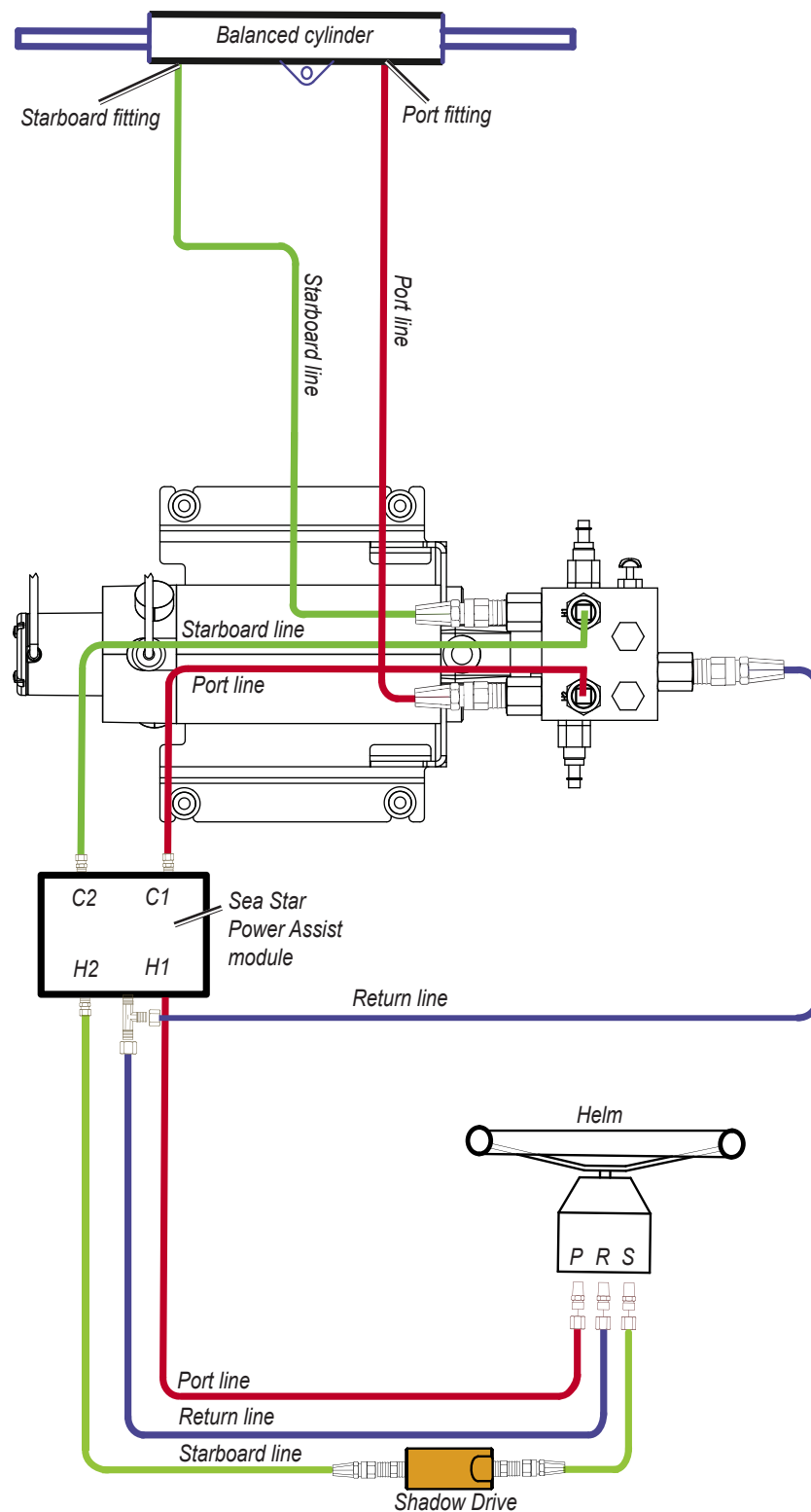
### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See [page 34](#).

## Compact 2.1 L Pump Hydraulic Layout on SeaStar Power Assist-Enabled Boats

### Notes:

- Power Assist module:
  - It may be necessary to remove the Power Assist module to gain access to the fittings, the hoses, and the bleed-tee fitting
  - You may need to add a tee fitting in the return line at the Power Assist module to connect the pump.
- Compact 2.1 L pump (and motor):
  - Install the pump to the steering lines between the cylinder and the Power Assist module.
  - **Do not install the pump to the steering lines between the helm and the Power Assist module.**
  - **To use the compact 2.1 L pump on a system with an unbalanced cylinder, follow the procedures on [page 24](#).**
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic steering line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - Install the Shadow Drive between the helm and the Power Assist module.
  - **Do not install the Shadow Drive directly to the helm.**
  - **Do not install the Shadow Drive between the Power Assist module and the pump.**
  - **Do not install the Shadow Drive between the Power Assist module and the cylinder.**



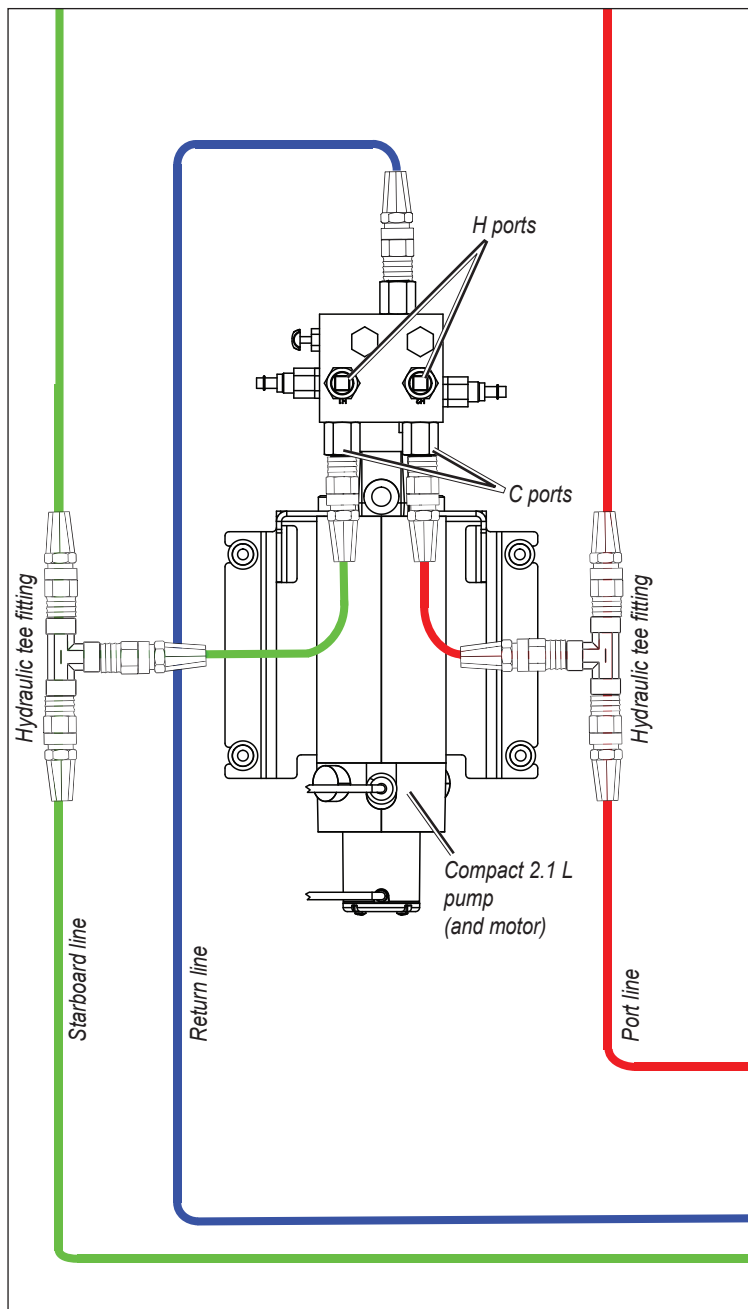
### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See [page 34](#).

## Alternative Compact 2.1 L Pump Hydraulic Configurations

Depending on the hydraulic layout of your boat, alternative hydraulic installations using the compact 2.1L pump are possible:

- The C1 and H1 ports are directly connected to each other internally, and the C2 port is directly connected to H2. Because these ports are connected internally, you can leave the plugs in the C ports and use tee fittings to connect both the helm and cylinder hoses to the H ports. Though you should use all four ports for an ideal installation, this type of installation will steer the boat correctly.
- If you plan to use this alternative compact 2.1L pump installation on a larger boat with long spans of hydraulic hose, the fitting size you choose is important. The fittings on the C ports are SAE #6, while the fittings on the H ports are SAE #4. Therefore, for alternative installations on larger boats, it is best to move the plugs from the C ports to the H ports and use tee fittings to connect both the helm and cylinder hoses to the larger C ports as illustrated below.



**Alternative Hydraulic Installation Using the C (SAE #6) Ports**

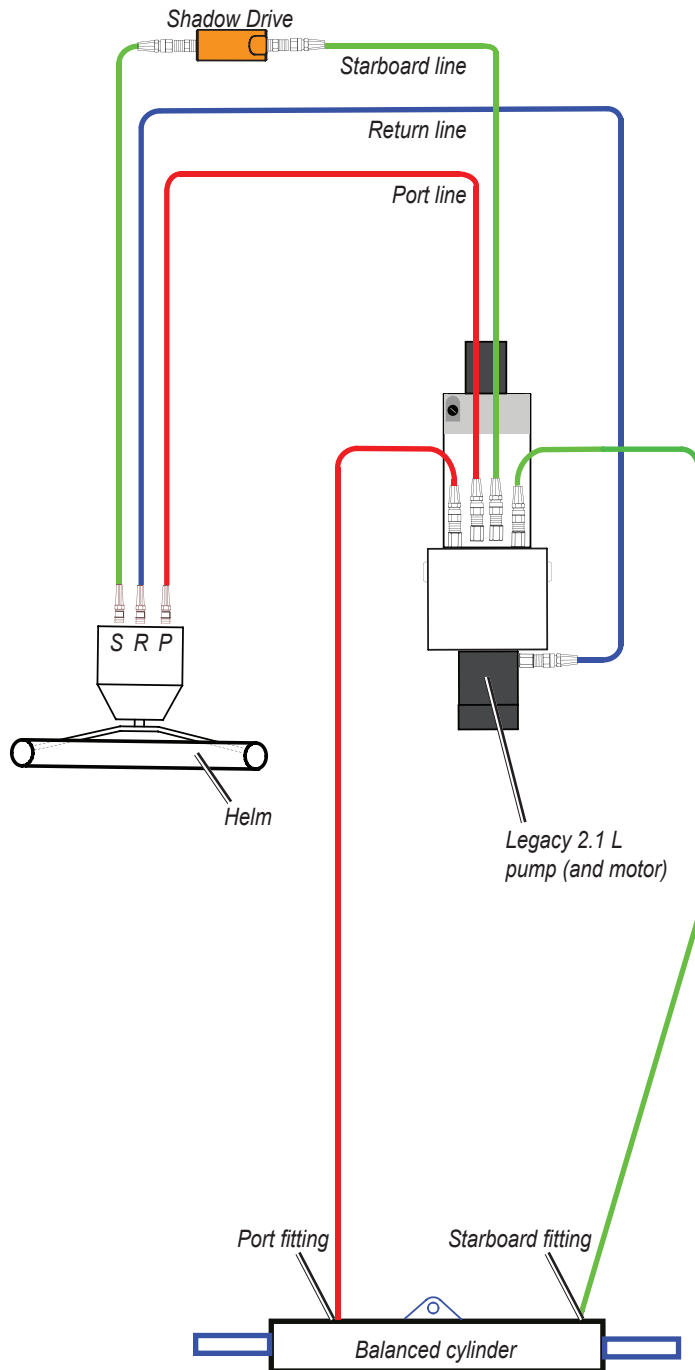
## Hydraulic Considerations – Legacy 2.1 L Pump

Different boats have different hydraulic considerations you must examine before mounting the pump or disconnecting any hoses. Before starting the hydraulic installation, verify the type of hydraulic steering in your boat, and where to install the appropriate type of pump.

### NOTICE

If the hydraulic steering of your boat does not match the hydraulic layouts in this manual, contact Garmin Product Support.

## Legacy 2.1 L Pump Hydraulic Layout on Single-Helm Boats



### Notes:

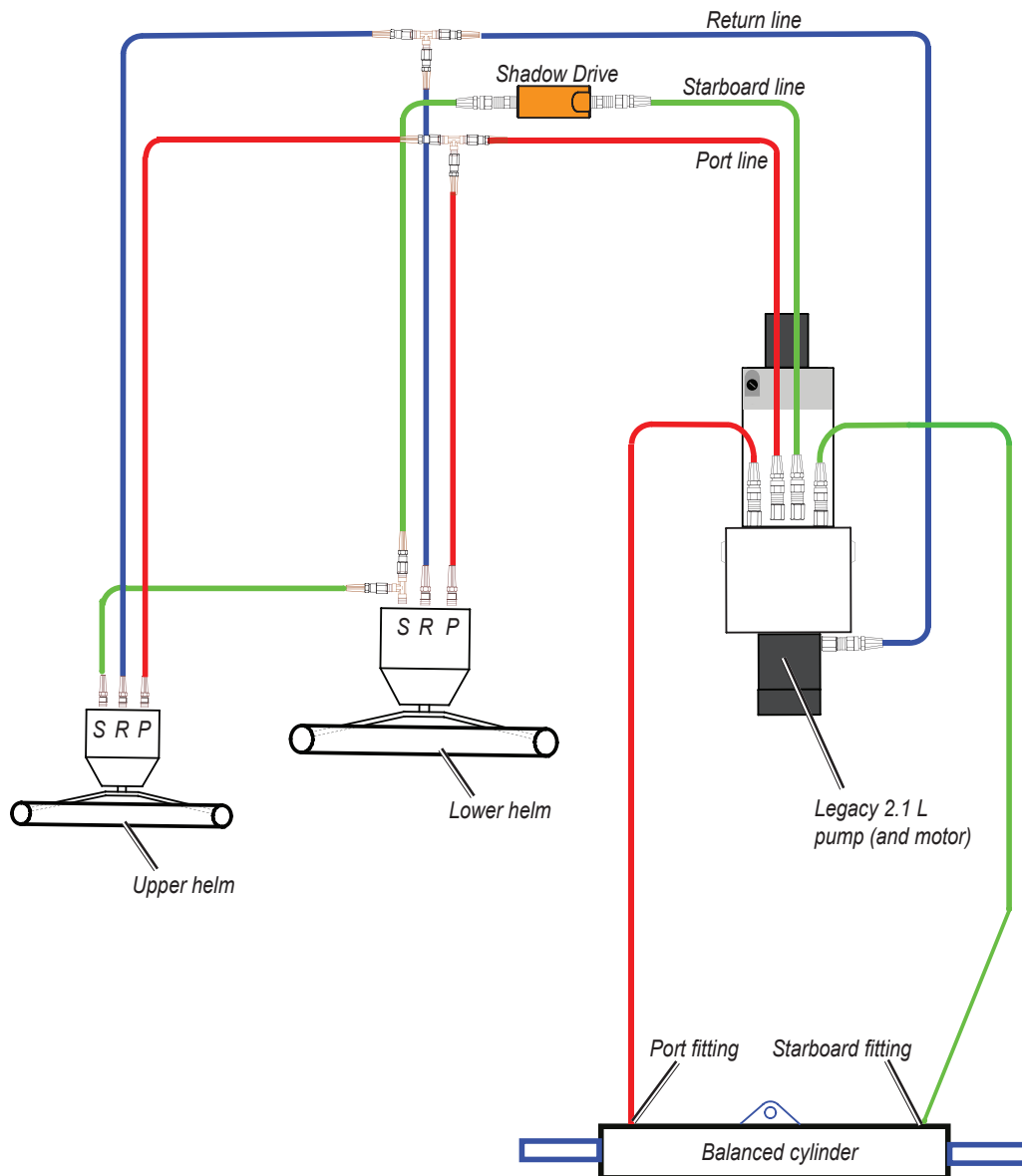
- Legacy 2.1 L pump (and motor):
  - **Do not use the legacy 2.1 L pump on a system with an unbalanced cylinder.**
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - Install the Shadow Drive between the pump and the helm.
  - **Do not install the Shadow Drive directly to the helm.**
  - **Do not install the Shadow Drive between the pump and the cylinder.**

### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See [page 34](#).



## Legacy 2.1 L Pump Hydraulic Layout on Dual-Helm Boats



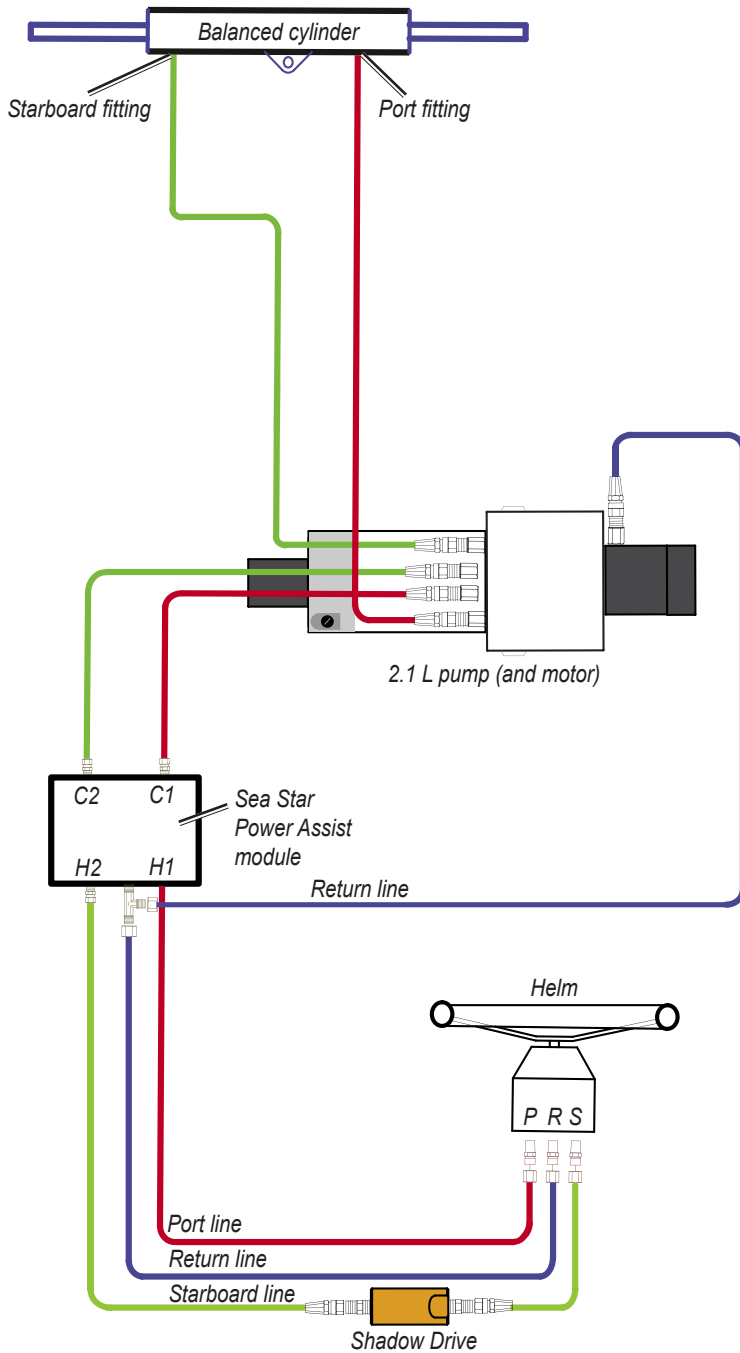
### Notes:

- Legacy 2.1 L pump (and motor):
  - **Do not use the legacy 2.1 L pump on a system with an unbalanced cylinder.**
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - Install the Shadow Drive between the pump and the helm.
  - **Do not install the Shadow Drive directly to the helm.**
  - **Do not install the Shadow Drive between the pump and the cylinder.**

### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See [page 34](#).

## SeaStar Power Assist-Enabled Boats



### Notes:

- Power Assist module:
  - It may be necessary to remove the Power Assist module to gain access to the fittings, the hoses, and the bleed-tee fitting.
  - You may need to add a tee fitting in the return line at the Power Assist module to connect the pump.
- Legacy 2.1 L pump (and motor):
  - Install the pump to the steering lines between the cylinder and the Power Assist module.
  - **Do not install the pump to the steering lines between the helm and the Power Assist module.**
  - **Do not use the 2.1 L pump on a system with an unbalanced cylinder.**
  - Mount the pump horizontally if possible. Do not mount the pump vertically with the pump end (hydraulic connections) down.
- Shadow Drive:
  - Mount the Shadow Drive horizontally and as level as possible.
  - Install the Shadow Drive in either the port or the starboard hydraulic steering line.
  - Always install a length of hose between the helm and the Shadow Drive.
  - Install the Shadow Drive between the helm and the Power Assist module.
  - **Do not install the Shadow Drive directly to the helm.**
  - **Do not install the Shadow Drive between the Power Assist module and the pump.**
  - **Do not install the Shadow Drive between the Power Assist module and the cylinder.**

### NOTICE

Do not turn the system on until you bleed all the air from the helm, the Shadow Drive, the pump, and all the hydraulic lines. See [page 34](#).

# Installation Procedures

After you have completely planned the GHP 10 installation on your boat, and have satisfied all the hydraulic, mounting, and wiring considerations for your particular installation, you can begin mounting and connecting the components.

## Installing the Pump (and Motor)

Install the pump by mounting it on your boat, connecting it to the hydraulic steering lines of your boat, and connecting it to the ECU.

### Installing the Pump on an Unbalanced Cylinder Steering System

If your boat uses an unbalanced-cylinder steering system, consider the following before proceeding with the pump installation:

- If you have a 2.0 L or a 1.2 L pump and an unbalanced-cylinder steering system, then you must install the unbalanced kit (Garmin part number 010-11201-00) on the pump. Follow the directions on [page 21](#) to install an unbalanced kit for use with an unbalanced-cylinder steering system.
- If you have a compact 2.1 L pump, then you must configure it for use with an unbalanced-cylinder steering system. Follow the directions on [page 24](#) to configure the pump for use with an unbalanced-cylinder steering system.
- Do not use a legacy 2.1 L pump with an unbalanced-cylinder steering system.

### Mounting the Pump

When choosing a location to mount the pump, consider the following:

- Mount the pump within 19 in. (.5 m) of the ECU.
- Mount the pump horizontally on a solid surface.
  - Mounting the pump horizontally on the floor is preferable, but you can also mount the pump horizontally on a wall.
  - If horizontal mounting is not possible, do not install the pump vertically with the pump head (containing the hose fittings) down.
- Mount the pump in a location to which you can extend the hydraulic steering lines of the boat.

#### To mount the pump:

1. Determine the best location for the pump on your boat, satisfying the hydraulic and wiring considerations.
2. Determine the correct type of screws for the mounting surface. Mounting screws are included with the pump, but you may need to provide different screws if the supplied screws are not suitable for the mounting surface.
3. Use the correct mounting template for your pump. The templates are provided on [pages 45–46](#). Tape the template to the mounting location and use a center punch and hammer to mark the pilot-hole locations.
4. Drill pilot holes at the four mounting locations.
5. Use screws to mount the pump.

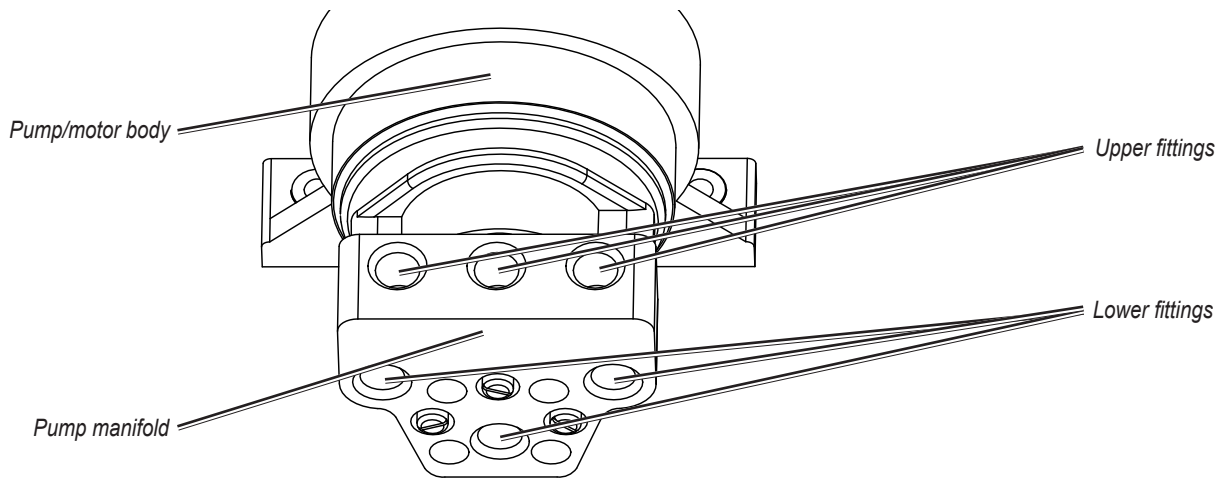
**NOTE:** To reduce noise while the autopilot is running, install a vibration-isolation mounting pad between the pump and the mounting surface.

6. Apply a spray-on corrosion blocker to the pump after it is mounted and all hydraulic and electrical connections are made.

### Connecting the 2.0 L or the 1.2 L Pump to the Hydraulic Lines

Before disconnecting any hydraulic lines on your boat, consult the manufacturer of your boat or steering system. You must know how to properly prepare the hoses for removal, and you must know how to properly bleed the hydraulic system of air when you complete the connections. **When adding hydraulic hose to the steering system, only use hose with machine-crimped or field-replaceable fittings that have a minimum rating of 1,000 lbf/in<sup>2</sup>.**

The 2.0 L and the 1.2 L pump manifolds have two sets of hose-connector fittings, both upper and lower, to allow for different hose configurations. You can use the upper fittings, the lower fittings, or a combination of the two. **Do not use Teflon tape on any hydraulic fitting.** Use an appropriate thread sealant such as Loctite Pro Lock Tight multipurpose anaerobic gel, part number 51604, or equivalent, on all pipe threads in the hydraulic system.



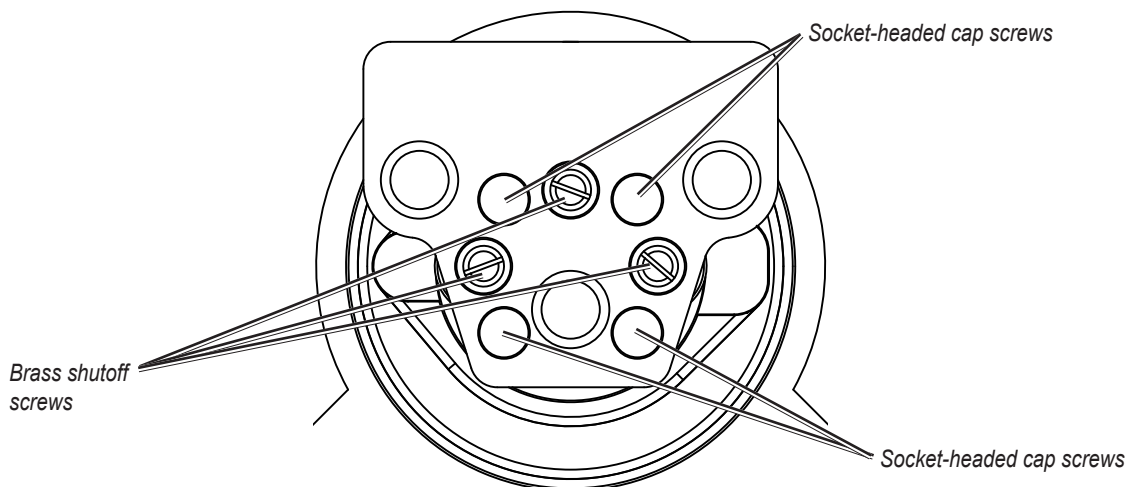
### To connect the pump to the hydraulic lines:

1. Consult the hydraulic layout diagrams starting on [page 9](#) to find the correct place to connect the pump to your hydraulic system.
2. Prepare to disconnect the hydraulic lines in your boat as specified by the manufacturer of your boat or steering system.
3. Disconnect the hydraulic lines from the steering system where appropriate.
4. Add additional hose where necessary, and add the included t-connectors in the hydraulic lines.
5. Add hydraulic hose from the t-connectors to the pump, using the included fittings to attach the hose to the pump.
6. Add hydraulic hose from the return connector at the back of the helm to the pump, using the included fittings.
7. Connect the hoses to the upper fittings, the lower fittings, or a combination of both fittings on the pump. Do not connect more than three hoses to the pump (port, starboard, and return).
8. Insert, tighten, and seal the included plugs in the three unused pump fittings.
9. You will eventually need to bleed the hydraulic system, but not until the Shadow Drive is installed. See [page 34](#) for more information.

**NOTE:** The pump may vibrate the hydraulic lines and cause noise when the autopilot is running. To eliminate the noise, tie the hydraulic lines to a solid surface.

### Operating the Shutoff Valve

The 2.0 L and the 1.2 L pumps feature a shutoff valve for troubleshooting and repairing the system. To engage the shutoff valve and isolate the pump from the hydraulic system, fully tighten the three brass screws near the lower hydraulic connectors. To disengage the shutoff valve, loosen the three brass screws until they stop.



### NOTICE

Do not force the three brass screws past the stopping point when disengaging the shutoff valve. Forcing the screws past the stopping point may permanently damage the manifold.

When the shutoff valve is engaged, the boat will steer normally, and the pump will not 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.

**To remove the pump from the shutoff-valve manifold:**

1. Tighten the three brass screws near the lower hydraulic connectors.
2. Remove the four socket-head cap screws that connect the manifold to the pump.
3. When the manifold is no longer connected to the pump, the pump can be disconnected from the ECU and removed from its mounting location. The hydraulic steering system will operate normally.

**To reconnect the pump to the shutoff-valve manifold:**

1. Remount the pump and reconnect the pump to the ECU.
2. Connect the manifold to the pump using the four socket-head cap screws.
3. Loosen the three brass screws near the lower hydraulic connectors until they stop. Do not loosen the screws past the stopping point.

**Connecting the Pump to the ECU**

Do not connect the pump to the ECU until you have mounted the ECU to the boat following the procedures on [page 25](#).

**Installing an Unbalanced Kit on a 1.2 L or 2.0 L Pump**

If your boat has an unbalanced cylinder steering system, then you need to install the optional unbalanced kit (Garmin part number 010-11201-00).

**To install the unbalanced kit:**

1. Loosen and remove the four screws that hold the manifold to the pump body. 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. There are six O-rings: three on the pump body, and three on the unbalanced valve.
4. Use the four longer screws included 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) of torque.

**Adjusting and Calibrating the Unbalanced Valve**

The brass screws on the sides of the unbalanced valve adjust the valve. Compare the amount of screw protruding beyond the valve body on both sides of the valve. Both screws should protrude the same distance. To recalibrate the screws, fully tighten both of them until they stop. Be sure they protrude the same distance after they stop. If not, loosen the shorter screw until they protrude the same distance. Unscrew each screw by two and one-half turns. The valve is ready for use.

**NOTICE**

Do not unscrew the brass screws more than the specified amount. Do not operate the system with the brass screws fully tightened.

## Connecting the Legacy 2.1 L Pump to the Hydraulic Lines

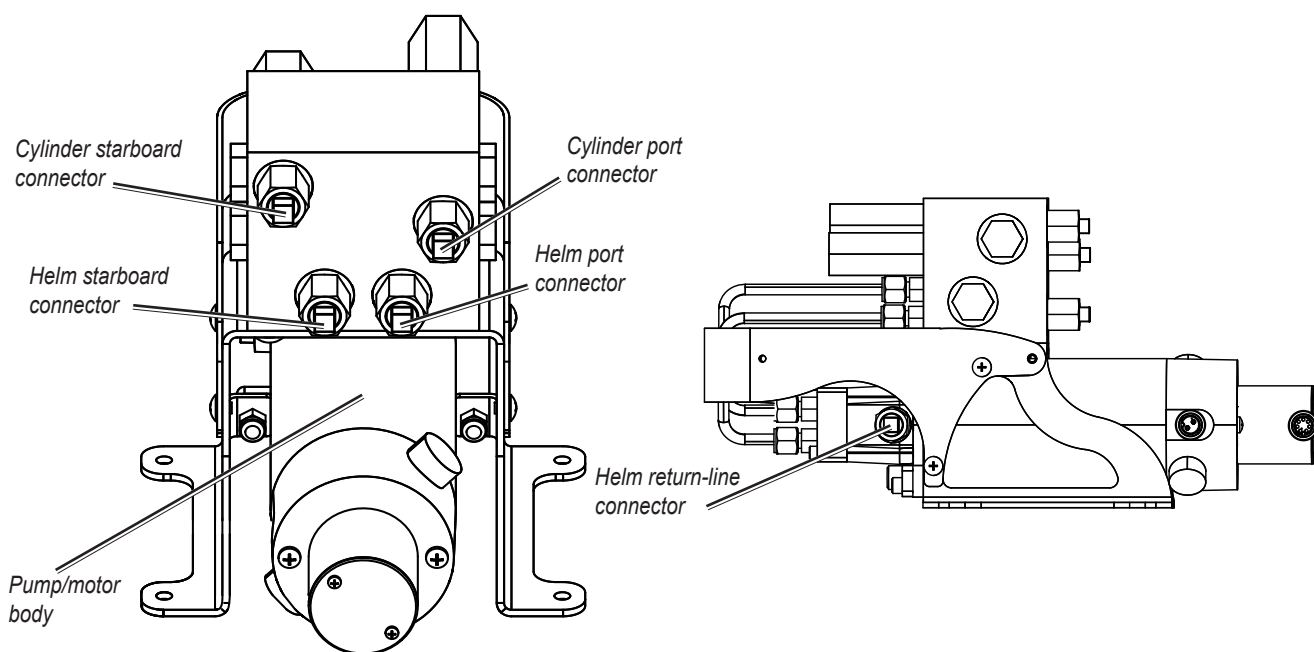
The legacy 2.1 L pump must be isolated from the electrical ground of the boat. Use insulating washers under the pump if it is installed on an electrically-grounded (metal) surface. Install the washers between the pump bracket and the grounded surface

**Before disconnecting any hydraulic lines on your boat, consult the manufacturer of your boat or steering system.** You must know how to properly prepare the hoses for removal, and you must know how to properly bleed the hydraulic system of air when you complete the connections.

### NOTICE

When adding hydraulic hose to the steering system, only use hose with machine-crimped or field-replaceable fittings that have a minimum pressure rating of 1,000 lbf/in<sup>2</sup>.

Install the legacy 2.1 L pump in-line with the hydraulic steering lines of the boat. The 2.1 L pump does not branch off of the hydraulic steering lines like the 2.0 L or the 1.2 L pumps. The 2.1 L pump manifold has five hose-connector fittings, three to the helm (port, starboard, and return), and two to the cylinder (port and starboard). **Do not use Teflon tape on any hydraulic fitting.** Use an appropriate thread sealant such as Loctite Pro Lock Tight multipurpose anaerobic gel, part number 51604, or equivalent, on all pipe threads in the hydraulic system.



### To connect the pump to the hydraulic lines:

1. Consult the hydraulic layout diagrams starting on [page 16](#) to determine the correct place to connect the pump to your hydraulic system.
2. Prepare to disconnect the hydraulic lines in your boat as specified by the manufacturer of your boat or steering system.
3. Disconnect the hydraulic lines from the steering system where appropriate.
4. Remove the plugs from the five connectors on the pump.
5. Add hydraulic hose as necessary, and route the hose to the pump.
6. Use the included fittings to attach the hoses to the pump. Use the above diagram to identify the connectors on the pump.
7. Add hydraulic hose from the return connector at the back of the helm to the pump.
8. Connect the hose to the helm and to the return-line connector on the pump using the included fittings.
9. You will eventually need to bleed the hydraulic system, but not until the Shadow Drive is installed. See [page 34](#) for more information.

**NOTE:** The pump may vibrate the hydraulic lines and cause noise when the autopilot is running. To eliminate the noise, tie the hydraulic lines to a solid surface.

## Connecting the Pump to the ECU

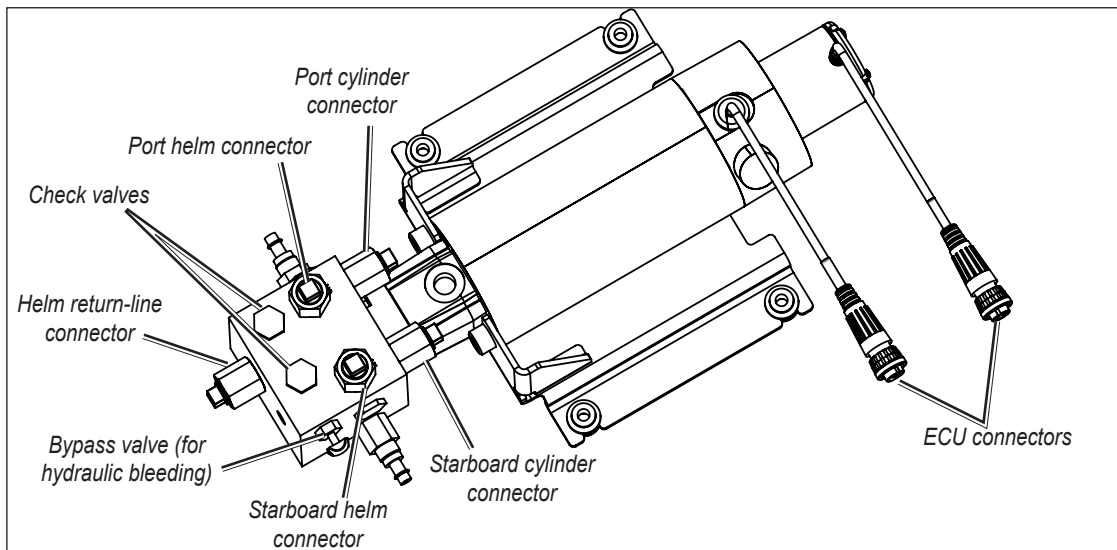
Do not connect the pump to the ECU until you have mounted the ECU to the boat following the procedures on [page 25](#).

## Connecting the Compact 2.1 L Pump to the Hydraulic Lines

Before disconnecting any hydraulic lines on your boat, consult the manufacturer of your boat or steering system. You must know how to properly prepare the hoses for removal, and you must know how to properly bleed the hydraulic system of air when you complete the connections.

### NOTICE

When adding hydraulic hose to the steering system, only use hose with machine-crimped or field-replaceable fittings that have a minimum pressure rating of 1,000 lbf/in<sup>2</sup>.



**Compact 2.1 L Pump Connectors and Valves**

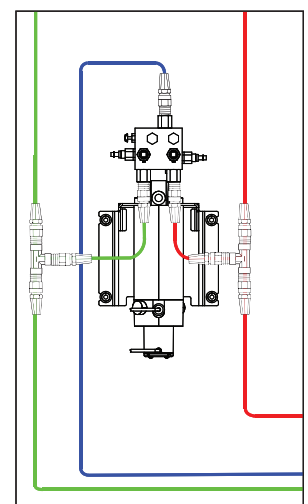
Install the compact 2.1 L pump in-line with the hydraulic steering lines of the boat. The compact 2.1 L pump manifold has five hose-connector fittings, three to the helm (port, starboard, and return), and two to the cylinder (port and starboard). **Do not use Teflon tape on any hydraulic fitting.** Use an appropriate thread sealant such as Loctite Pro Lock Tight multipurpose anaerobic gel, part number 51604, or equivalent, on all pipe threads in the hydraulic system.

Use the built-in bypass valve on the pump manifold when bleeding the hydraulic lines. See [page 34](#) for more information.

**NOTE:** To avoid possible autopilot performance degradation, ensure that the built-in bypass valve on the pump manifold is fully closed during normal operation..

### To connect the pump to the hydraulic lines:

1. Consult the hydraulic layout diagram below to determine the correct place to connect the pump to your hydraulic system.
2. Depending on the hydraulic layout of your boat, alternative hydraulic installations using the compact 2.1L pump are possible:
  - The C1 and H1 ports are directly connected to each other internally, and the C2 port is directly connected to H2. Because of this, instead of connecting the cylinder-bound hose to the C port and the helm-bound hose to the H port, you can leave the plugs in the C ports and use tee fittings to connect both the helm and cylinder hoses to the H ports. Though you should use all four ports for an ideal installation, this type of installation will steer the boat correctly.
  - If you plan to use this alternative compact 2.1L pump installation on a larger boat with long spans of hydraulic hose, the fitting size you choose is important. The fittings on the C ports are SAE #6, while the fittings on the H ports are SAE #4. Therefore, for alternative installations on larger boats, it is best to move the plugs from the C ports to the H ports and use tee fittings to connect both the helm and cylinder hoses to the larger C ports.
3. Prepare to disconnect the hydraulic lines in your boat as specified by the manufacturer of your boat or steering system.



**Alternative Hydraulic Installation Using the C (SAE #6) Ports**

4. Disconnect the hydraulic lines from the steering system where appropriate.
5. Use the diagram above to identify the connectors on the pump.
6. Remove the plugs from the five connections on the pump labeled C1, C2, H1, H2, and Tank.
7. Route hydraulic hose from the helm to the pump, and from the cylinder to the pump. Be sure to route three hoses to the helm, one for port, one for starboard, and one for the return line. Add hose if needed.
8. Use the correct connectors to connect the hoses to the pump.
  - The C1 and C2 ports on the pump are SAE #6 straight-thread O-ring ports, and the H1, H2, and Tank ports are SAE #4 straight-thread O-ring ports. Do not attempt to thread male pipe-thread fittings into these ports.
  - The pre-installed fittings adapt from straight-thread O-ring port to female pipe-thread. If needed, male pipe thread to male straight thread fittings are also included with the pump. Use the included fittings only if they are applicable to your hydraulic fitting configuration.
  - In alternative installations (see [page 23](#)) where the helm and cylinder hoses tee together externally and connect to the H ports, the C ports will remain plugged. If port size is a concern, the plugs can be moved to the H ports and helm and cylinder hoses can tee into the C ports, as the C ports use the larger SAE #6 fitting.
9. Connect the hoses to the helm and to cylinder.
10. You must bleed the hydraulic system, but wait until after you install the Shadow Drive. See [page 34](#) for more information on bleeding the hydraulic system.

**NOTE:** The pump may vibrate the hydraulic lines and cause noise when the autopilot is running. To eliminate the noise, secure the hydraulic lines to a solid surface.

### Connecting the Pump to the ECU

Do not connect the pump to the ECU until you have mounted the ECU to the boat following the procedures on [page 25](#).

### Configuring the Compact 2.1 L Pump for an Unbalanced-Cylinder Steering Configuration

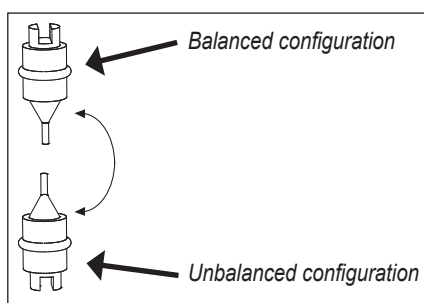
The compact 2.1 L pump is factory-configured for use with a balanced-cylinder steering configuration. If necessary, it can be configured to work with an unbalanced-cylinder steering configuration. If you are unsure of the cylinder steering configuration of your boat, consult the boat manufacturer.

**NOTE:** The following steps are necessary only if your boat has an unbalanced-cylinder steering configuration. Be sure to follow these steps before bleeding the hydraulic system. If you remove the check valves after bleeding the hydraulic system, you will need to bleed it again.

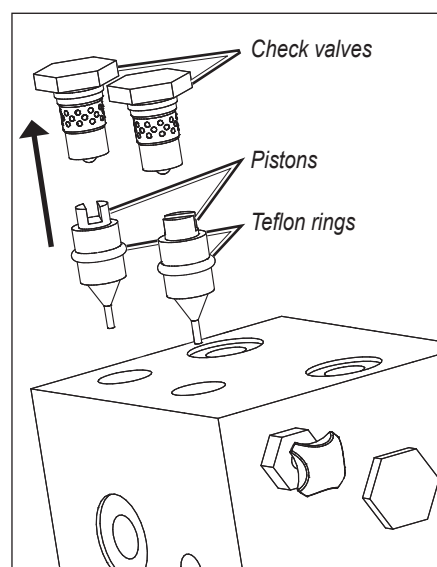
#### NOTICE

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

1. Remove the check valves from the pump manifold.
2. Pull the pistons out of the pump manifold. Take note of the piston orientation as you remove them; you will need to reverse them as part of these procedures.
3. Remove the Teflon rings.
4. Reverse the direction of the Pistons and reinsert them in the pump manifold.
5. Reinstall the check valves on the pump manifold.



**Reversing the Pump Pistons for an Unbalanced-cylinder Configuration**



**Removing the Check Valves and Pistons (Pistons Shown in a Balanced Configuration)**



## Installing the Electronic Control Unit (ECU)

To install the ECU, mount it to your boat, connect it to the pump and to the CCU, and wire it to the boat battery.

### Installing the ECU on a 24 Vdc System

The ECU hardware has been updated to function with 24 Vdc electrical systems, though older ECU units will only run on 12 Vdc electrical systems. To determine if your ECU is compatible with a 24 Vdc system, examine the serial number on the ECU.

- ECU units with a serial number prior to 19E002748 are only compatible with 12 Vdc systems.
- ECU units with a serial number of 19E002748 or later are compatible with both 12 Vdc and 24 Vdc systems.

**NOTE:** The GHP 10 system software (CCU software) must be version 2.70 or newer in order to support 24 Vdc installations.

### Mounting the ECU

Mount the ECU on a preferably flat surface within 19 in. (.5 m) of the pump. **The cables from the pump cannot be extended.** Mount the ECU in a location where you can run a power wire to the boat battery, but do not connect it to the battery at this time. The power wire can be extended, if necessary. Use the table on [page 33](#) to determine the correct type of wire for extending the battery cable.

#### To mount the ECU:

1. Determine the best location for the ECU on your boat, satisfying the wiring considerations.
2. Determine the correct type of screws for the mounting surface. Mounting screws are included with the ECU, but you may need to provide different screws if the supplied screws are not suitable for the mounting surface.
3. Use the mounting template provided on [page 43](#). Tape the template to the mounting location and use a center punch and hammer to mark the pilot-hole locations.
4. Drill pilot holes at the four mounting locations.
5. Use screws to mount the ECU.

### Wiring the ECU

Connect the two wires from the pump to the connectors marked PUMP and ENCODER on the ECU. The connectors are keyed to the appropriate fittings on the wires. **Do not connect the ECU to power until all the connections of the entire GHP 10 system have been completed** ([page 33](#)). Wait to connect the CCU/ECU interconnect cable until you have mounted the CCU by following the procedures in the next section.

## Installing the Course Computer Unit (CCU)

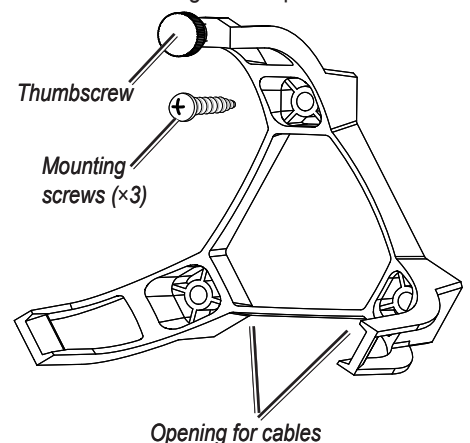
Install the CCU by mounting it to your boat, connecting it to the ECU and to a NMEA 2000 network, and wiring it to the Shadow Drive, to the tachometer of your boat, to the alarm buzzer, and to the yellow CCU signal wire on the GHC 10.

### Mounting the CCU

Mount the CCU on the boat by using the included bracket. The CCU bracket has two portions, the mounting portion and the securing portion. Install the mounting portion on the mounting surface, and secure the CCU in the bracket with the securing portion.

#### When mounting the CCU:

- **Mount the CCU in the forward half of the boat, no higher than 10 ft. (3.05 m) above the waterline.**
- You can mount the CCU below the waterline, as long as it is not in a location where it will be submerged or exposed to wash-down.
- Mount the CCU bracket on a vertical surface or under a horizontal surface, so that the connected wires hang straight down.
- **Do not mount the CCU near magnetic material, magnets (speakers and electric motors), or high-current wires.**
- Mount the CCU at least 24 in. (0.6 m) away from movable or changing magnetic disturbances such as anchors, anchor chain, wiper motors, tool boxes, and the autopilot pump.
- Use a handheld compass to verify the absence of magnetic interference. If the handheld compass does not point north when you hold it in the location you want to mount the CCU, then there is magnetic interference. Choose another location and test again.



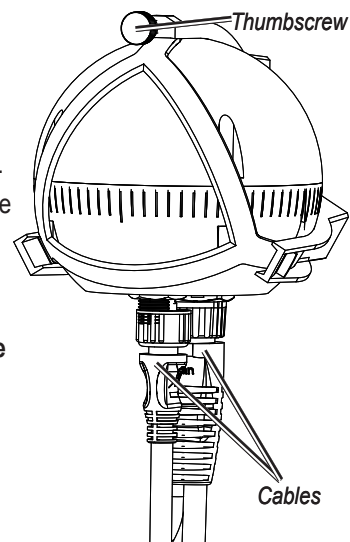
- If possible, mount the CCU within 16 ft. (5 m) of the ECU. If you cannot mount the CCU within 16 ft. (5 m) of the ECU, extension and replacement cables are available (see [page 4](#)).

#### To mount the CCU bracket:

1. Determine the best location for the CCU on your boat. Use a handheld compass to ensure that the location is free of magnetic interference.
2. Determine the correct type of screws for the mounting surface. Mounting screws are included with the CCU, but you may need to provide different screws if the supplied screws are not suitable for the mounting surface.
3. Use the mounting template provided on [page 43](#). Be sure to install the mounting portion of the bracket with an opening at the bottom. Tape the template to the mounting location.
4. Drill pilot holes at the three mounting locations.
5. Use screws to secure the mounting portion of the CCU bracket.

#### To secure the CCU in the CCU bracket:

1. Connect the CCU/ECU interconnect cable and the NMEA 2000 drop cable to the CCU.
2. Place the CCU in the mounting portion of the CCU bracket with the wires hanging straight down.
3. Place the securing portion of the bracket over the ball and snap it into the mounting portion of the bracket, starting with the two arms that do not have the thumbscrew.
4. Ensure that the cables hang straight down, and connect the arm with the thumbscrew. **The cables must hang straight down for the CCU to accurately read your heading.**
5. Hand-tighten the thumbscrew until the CCU is held firmly in the bracket. **Do not overtighten the thumbscrew.**



#### Wiring the CCU

Route the connector-terminated end of the CCU/ECU interconnect cable to the ECU and make the connection. Do not connect the bare-wire portion of the cable CCU/ECU interconnect cable at this time. Before you connect the bare-wire portion, install the Shadow Drive and the alarm buzzer ([page 27](#)), and mount the GHC 10 ([page 28](#)).

#### Installing the Shadow Drive

Install the Shadow Drive by connecting it to the hydraulic steering line of your boat and wiring it to the CCU/ECU interconnect cable.

#### Connecting the Shadow Drive to the Hydraulics

Choose a location at which to connect the Shadow Drive to the hydraulic steering of your boat by consulting the hydraulic-layout diagrams starting on [page 9](#). Use the included connectors to install the Shadow Drive in the hydraulic line.

#### When connecting the Shadow Drive to the hydraulic system:

- Install the Shadow Drive lower than the helm, but higher than the pump. Mount the Shadow Drive horizontally and as level as possible, using cable ties to firmly secure it in place.
- Avoid making loops in the hydraulic lines. Install the Shadow Drive closer to the helm than to the pump.
- **Do not mount the Shadow Drive within 12 in. (0.3 m) of any magnetic interference such as speakers and electric motors.**
- Do not install the Shadow Drive directly to the fittings at the back of the helm. Install a length of hose between the fitting at the helm and the Shadow Drive.
- Do not install the Shadow Drive directly to a hydraulic T-connector in the hydraulic line. Install a length of hose between a T-connector and the Shadow Drive.
- **In a single-helm installation, do not install a T-connector between the helm and the Shadow Drive.**
- **In a dual-helm installation, install the Shadow Drive between the pump and the lower helm, closer to the helm than to the pump.**
- Install the Shadow Drive in either the starboard steering line or the port steering line. **Do not install the Shadow Drive in the return line.**
- Do not use Teflon tape on any hydraulic fitting. Use an appropriate thread sealant such as Loctite Pro Lock Tight multipurpose anaerobic gel, part number 51604, or equivalent, on all pipe threads in the hydraulic system.

## Wiring the Shadow Drive

Wire the Shadow Drive to the CCU/ECU interconnect cable.

### To wire the Shadow Drive:

1. Route the bare-wire end of the CCU/ECU interconnect cable to the Shadow Drive. If the cable is not long enough, extend the appropriate wires with 28 AWG wire.
2. Use the Shadow Drive Wiring Table to make the appropriate connections.

Shadow Drive Wire Color	CCU/ECU Interconnect Cable Wire Color
Red (+)	Brown (+)
Black (-)	Black (-)

**Shadow Drive Wiring Table**

3. Solder and cover all bare-wire connections.

## Wiring the GHP 10 to the Tachometer

The tachometer connection is an important part of the GHP 10 system, and **must be wired correctly for the autopilot to function**.

If your engine supports NMEA 2000 engine data, and is connected to the same NMEA 2000 network as the GHC 10 and the CCU, then no other tachometry wiring is necessary. For more information on the NMEA 2000 network, see [page 30](#).

**NOTE:** Mercury and Volvo offer add-on NMEA 2000 gateways to share Mercury and Volvo engine information over the NMEA 2000 network. If you have a Mercury or Volvo engine, these adapters provide the easiest installation and the most reliable engine data transfer. See your marine dealer for more details.

If your engine does not support NMEA 2000 engine data, then wire the GHP 10 autopilot system to the tachometer of your boat using the bare-wire portion of the CCU/ECU interconnect cable. In most cases, this connection can be made behind the dashboard at the tachometer display. **Refer to the owner's manual or shop manual for your engine to identify the color codes and location of the tachometer wiring on your boat.** For a list of common engine tachometry wiring, visit [www.garmin.com/ghp10/](http://www.garmin.com/ghp10/) and click on the manuals link.

**NOTE:** If your boat uses an electrical system that provides more than 12 Vdc, or if you sporadically receive tachometer errors, install an external tachometer filter (010-11399-00). Contact your local Garmin dealer or Garmin product support for more information.

### To wire the GHP 10 to the tachometer of your boat:

1. Identify the location and wire assignments of the tachometer (or tachometers) on your boat.
2. Route the bare-wire end of the CCU/ECU interconnect cable to the tachometer (or tachometers). If the cable is not long enough, extend the wires with twisted pair, 22 AWG wire.
3. Use the Tachometer Wiring Table to determine the appropriate wires on the CCU/ECU interconnect cable. Connect the tachometer wire or wires from the CCU/ECU interconnect cable to the tachometer sensor wire or wires from the engine (or engines). Connect the ground wires to a clean ground.

Engine Configuration	Tachometer	Ground
Single engine	Green and violet (twist together)	White and grey (twist together)
Dual engines	Port engine = violet	Port engine = grey
	Starboard engine = green	Starboard engine = white

**Tachometer Wiring Table**

**NOTE:** For three or more outboard engines, connect to the outermost port and starboard engines, according to the table.

4. Solder and cover all bare-wire connections.

## Installing the Alarm Buzzer

The alarm buzzer audibly alerts you to important GHP 10 events. It must be installed near the helm station.

### Mounting the Alarm Buzzer

Mount the alarm buzzer near the helm station. You can mount the alarm buzzer under the dashboard if you prefer. Secure the alarm buzzer with cable ties or other appropriate mounting hardware (not included).

## Wiring the Alarm Buzzer

Wire the alarm buzzer to the CCU/ECU interconnect cable.

### To wire the alarm buzzer:

1. Route the alarm-buzzer cable to the bare-wire end of the CCU/ECU interconnect cable. If the cable is not long enough, extend the appropriate wires with 28 AWG wire.
2. Use the Alarm Buzzer Wiring Table to make the appropriate connections.

Alarm Buzzer Wire Color	CCU/ECU Interconnect Cable Wire Color
White (+)	Red (+)
Black (-)	Blue (-)

**Alarm Buzzer Wiring Table**

3. Solder and cover all bare-wire connections.

## Installing the GHC 10

Install the GHC 10 by flush-mounting it in the dashboard near the helm, connecting it to the yellow CCU signal wire from the CCU/ECU interconnect cable, and connecting it to a NMEA 2000 network. Optionally, you can connect the GHC 10 to a NMEA 2000 or NMEA 0183-compatible GPS device to use waypoint and route data.

## Mounting the GHC 10

Flush mount the GHC 10 in the dashboard near the helm.

### When you select an installation location for the GHC 10, choose a location with the following characteristics:

- Provides optimal viewing as you operate your vessel.
- Allows easy access to the keypad on the GHC 10.
- Is strong enough to support the weight of the GHC 10 and protect it from excessive vibration or shock.
- Allows room for the routing and connection of the cables. There should be at least a 3-inch (8 cm) clearance behind the case.
- Is at least 9 1/2 in. (0.24 m) from a magnetic compass, to avoid interference.
- Is in an area that is not exposed to extreme temperature conditions.

### NOTICE

The temperature range for the GHC 10 is from 5°F to 158°F (from -15°C to 70°C). Extended exposure to temperatures outside of this range (in storage or operating conditions) may cause failure of the LCD screen or other components. This type of failure and related consequences are not covered by the manufacturer's limited warranty.

### To flush mount the GHC 10:

1. The flush-mount template is included in the product box. Trim the template and ensure it will fit in the location at which you want to flush mount the GHC 10.
2. The flush-mount template has adhesive on the back. Remove the protective liner and apply the template to the location where you want to flush mount the GHC 10.
3. If you will be cutting the hole with a jigsaw, and not a 3 17/32 in. (90 mm) hole saw, use a 3/8 in. (10 mm) drill bit to drill a pilot hole as indicated on the template to begin cutting the mounting surface.
4. Using the jigsaw or the 3 17/32 in. (90 mm) hole saw, cut the mounting surface along the inside of the dashed line indicated on the flush-mount template. Use a file and sandpaper to refine the size of the hole.
5. Place the GHC 10 into the cutout to confirm that the four mounting holes are correct after refining the hole. If not, mark the correct locations of the four mounting holes. Remove the GHC 10 from the cutout.
6. Using the center punch, indent the center of each of the four pilot-hole locations.



7. Drill the four 1/8 in. (3.2 mm) pilot holes.

#### NOTICE

If you are mounting the GHC 10 in fiberglass, it is recommended to use a countersink bit to drill a clearance counterbore through only the top gel-coat layer. This will help to avoid any cracking in the gel-coat layer when the screws are tightened.

8. Remove the remainder of the template.
9. Place the GHC 10 into the cutout.
10. Securely tighten the four mounting screws through the GHC 10 into the drilled mounting holes.

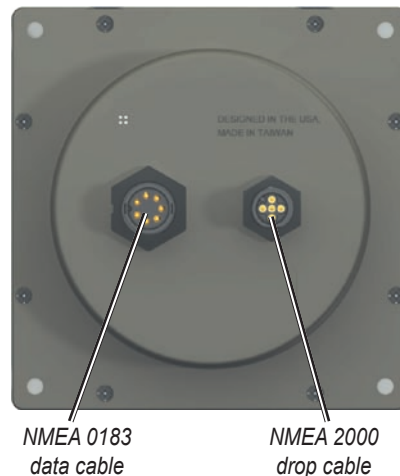
#### NOTICE

Stainless-steel screws may bind when screwed into fiberglass and overtightened. Garmin recommends applying an anti-galling, stainless anti-seize lubricant to the screws before installing them.

11. Snap the mounting covers into place to install them.

### Wiring the GHC 10 to the CCU/ECU Interconnect Cable

Connect the GHC 10 data cable to the yellow CCU signal wire on the CCU/ECU interconnect cable and connect the black wire on the GHC 10 data cable to CCU ground. Optionally, you can wire the GHC 10 data cable to a NMEA 0183-compatible GPS device to use waypoint and route information with the GHP 10, although a NMEA 2000 GPS device is preferred.



#### To connect the yellow CCU signal wire from the GHC 10 data cable to the CCU/ECU interconnect cable:

1. Route the GHC 10 data cable to the bare end of the color-coded wires from the CCU/ECU interconnect cable. If the cable is not long enough, extend the yellow CCU signal wire with 22 AWG wire.
2. Connect the yellow CCU signal wire from the GHC 10 data cable to the yellow wire on the CCU/ECU interconnect cable.  
If you install multiple GHC 10 units and want to turn the GHP 10 autopilot system on with any of the installed GHC 10 units, connect all of the yellow CCU signal wires from the GHC 10 units to the yellow wire on the CCU/ECU interconnect cable.  
Connect the black wire on the GHC 10 data cable to CCU ground.
3. Solder and cover all bare-wire connections.

**NOTE:** The yellow CCU signal wire and the black ground wire must be connected from the GHC 10 data cable to the CCU/ECU interconnect cable, or the GHP 10 autopilot system will not power on with the GHC 10.

## Connecting the GHC 10 to a NMEA 2000 Network

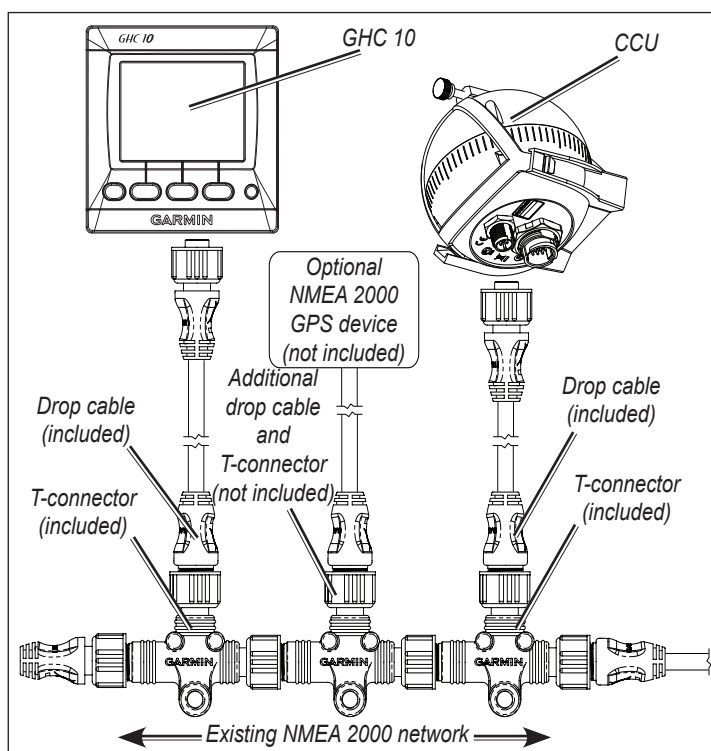
Connect the GHC 10 to the CCU through your existing NMEA 2000 network. If you do not have an existing NMEA 2000 network on your boat, all the parts needed to build one are supplied in the GHP 10 package. Optionally, you can connect a NMEA 2000-compatible GPS device to your NMEA 2000 network to use waypoint and route information with the GHP 10. For more information on NMEA 2000, visit [www.garmin.com](http://www.garmin.com).

### To connect the GHC 10 to your existing NMEA 2000 network:

1. Determine where to connect the GHC 10 to your existing NMEA 2000 backbone.
2. Disconnect one side of a NMEA 2000 T-connector from the network at an appropriate location.  
If you need to extend the NMEA 2000 network backbone, connect an appropriate NMEA 2000 backbone extension cable (not included) to the side of the T-connector you disconnected.
3. Add the included T-connector for the GHC 10 to the NMEA 2000 backbone by connecting it to the side of the disconnected T-connector.
4. Route the included drop cable to the bottom of the T-connector you added to your NMEA 2000 network.  
If the included drop cable is not long enough, you can use a drop cable up to 20 ft. (6 m) long (not included).
5. Connect the drop cable to the T-connector you added in step 3, and to the GHC 10.
6. **Do not power the NMEA 2000 network on until all of the GHP 10 components are installed correctly.** (See [page 33.](#))

### NOTICE

If you have an existing NMEA 2000 network on your boat, it should already be connected to power. Do not connect the included NMEA 2000 power cable to an existing NMEA 2000 network, because only one power source should be connected to a NMEA 2000 network.



Connecting the GHC 10 (and CCU) to an Existing NMEA 2000 Network

### To connect the CCU to your existing NMEA 2000 network:

1. Determine where to connect the CCU to your existing NMEA 2000 backbone.
2. Disconnect one side of a NMEA 2000 T-connector from the network at an appropriate location.  
If you need to extend the NMEA 2000 network backbone, connect an appropriate NMEA 2000 backbone extension cable (not included) to the side of the T-connector you disconnected.
3. Add the included T-connector for the CCU to the NMEA 2000 backbone by connecting it to the side of the disconnected T-connector.

4. Route the included drop cable to the bottom of the T-connector you added to your NMEA 2000 network.  
If the included drop cable is not long enough, you can use a drop cable up to 20 ft. (6 m) long (not included).
5. Connect the drop cable to the T-connector you added in step 3, and to the CCU.
6. **Do not power the NMEA 2000 network on until all of the GHP 10 components are installed correctly.** (See [page 33.](#))

### NOTICE

If you have an existing NMEA 2000 network on your boat, it should already be connected to power. Do not connect the included NMEA 2000 power cable to an existing NMEA 2000 network, because only one power source should be connected to a NMEA 2000 network.

#### Notes:

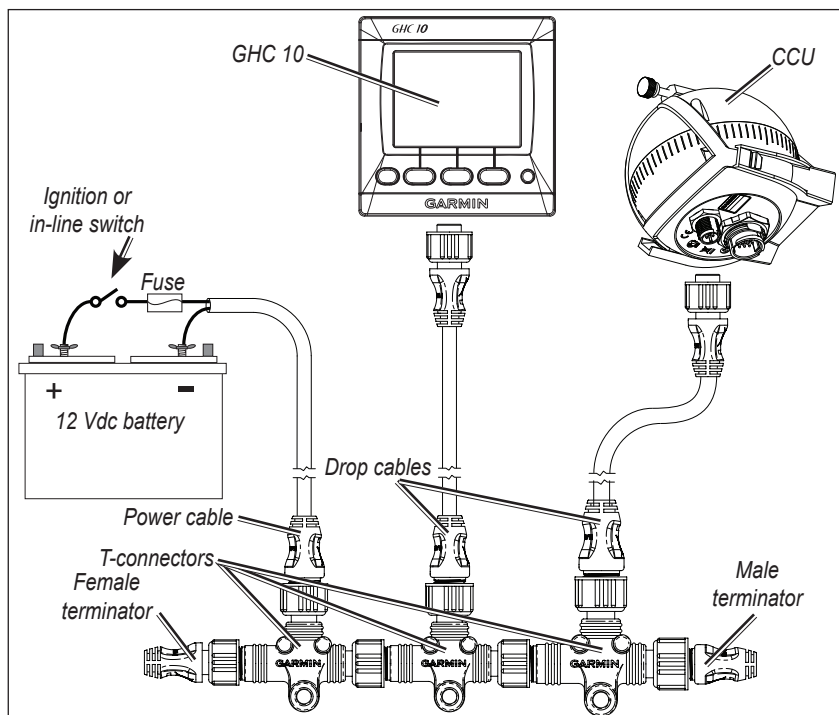
- The GHC 10 is powered by the NMEA 2000 network.
- The GHC 10 must also connect to the CCU with the yellow CCU signal wire in the GHC 10 data cable and the black ground wire must be connected to CCU ground.
- To add additional sensors to your NMEA 2000 network, follow the instructions included with the sensor.

#### To create a basic NMEA 2000 Network for the GHC 10 and the CCU:

1. Connect the three T-connectors together by their sides.
2. The included NMEA 2000 power cable must be connected to a 12 Vdc power source through a switch. Connect to the ignition switch of the boat if possible, or through an appropriate additional switch (not included).
3. Connect the NMEA 2000 power cable to one of the T-connectors.
4. Connect one of the included NMEA 2000 drop cables to one of the T-connectors and to the GHC 10.
5. Connect the other included NMEA 2000 drop cable to the remaining T-connector and to the CCU.
6. Connect the appropriate terminators to each end of the combined T-connectors.
7. **Do not power the NMEA 2000 network on until all of the GHP 10 components are installed correctly.** (See [page 33.](#))

### NOTICE

You must connect the included NMEA 2000 power cable to the boat ignition switch, or through another in-line switch. The GHC 10 will drain your battery if it is connected directly.



**Creating a Basic NMEA 2000 Network for the GHC 10 and the CCU**

**Notes:**

- To add additional sensors to your NMEA 2000 network, follow the instructions included with the sensor.
- The GHC 10 must connect to the CCU with the yellow CCU signal wire in the GHC 10 data cable. The black wire must connect to CCU ground.

**Connecting an Optional GPS Device to the GHP 10 Autopilot System**

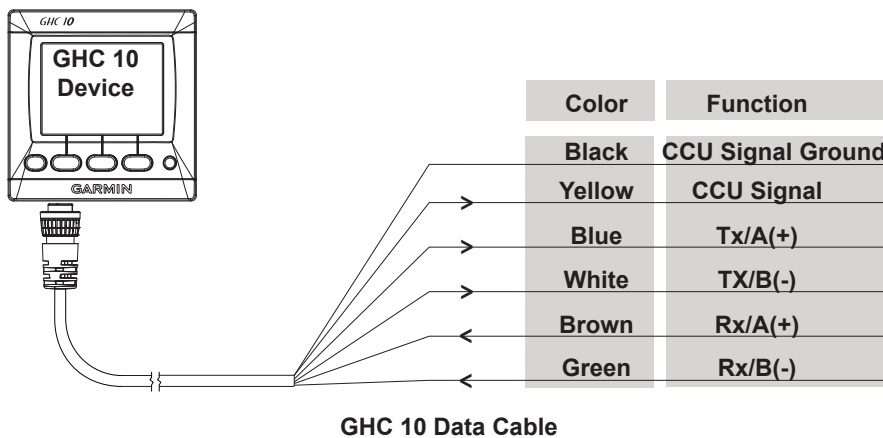
Connect an optional GPS device to the NMEA 2000 network to use waypoint and route information with the GHP 10. Alternatively, you can connect a NMEA 0183-compatible GPS device to the GHC 10 to use waypoint and route information with the GHP 10.

**To connect an optional NMEA 2000-compatible GPS device to your GHP 10:**

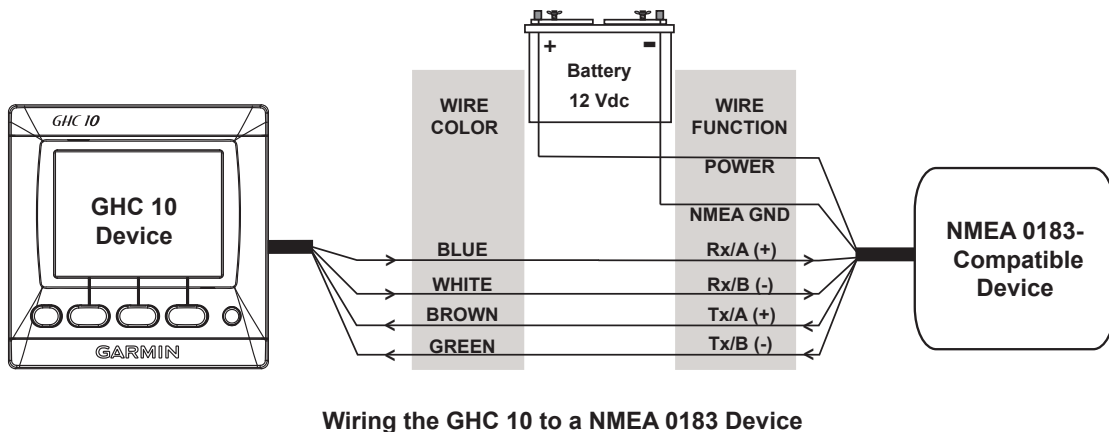
1. Add an additional T-connector (not included) for the optional GPS device you want to add to the NMEA 2000 network.
2. Connect the GPS device to the T-connector by following the instructions provided with the GPS device.

**To connect an optional NMEA 0183-compatible GPS device to your GHP 10:**

1. Determine the NMEA 0183 wiring assignments of your NMEA 0183-compatible GPS device.
2. Use the GHC 10 data cable wiring diagrams to correctly wire your NMEA 0183-compatible GPS device.
3. Use 22 AWG twisted-pair wire for extended runs of wire.
4. Solder and cover all bare-wire connections.



**Example:**

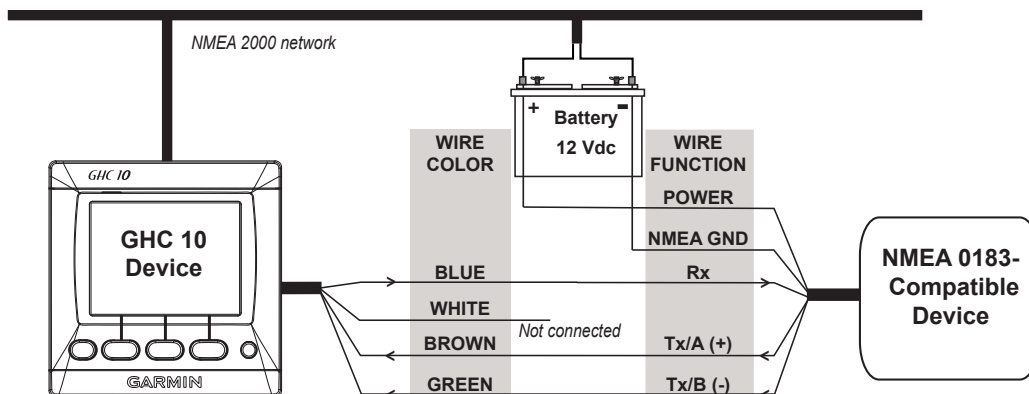


**Notes:**

- Consult the installation instructions for your NMEA 0183-compatible device to identify the Transfer (Tx) A(+) and B(-) wires.
- When connecting NMEA 0183 devices with two transmitting and two receiving lines, it is not necessary for the NMEA 2000 bus and the NMEA 0183 device to connect to a common ground.
- **The GHC 10 yellow (CCU signal) wire must be wired to the yellow wire of the CCU/ECU interconnect cable (page 6).**
- **The black (ground) wire of the GHC 10 must be wired to CCU ground (page 6).**

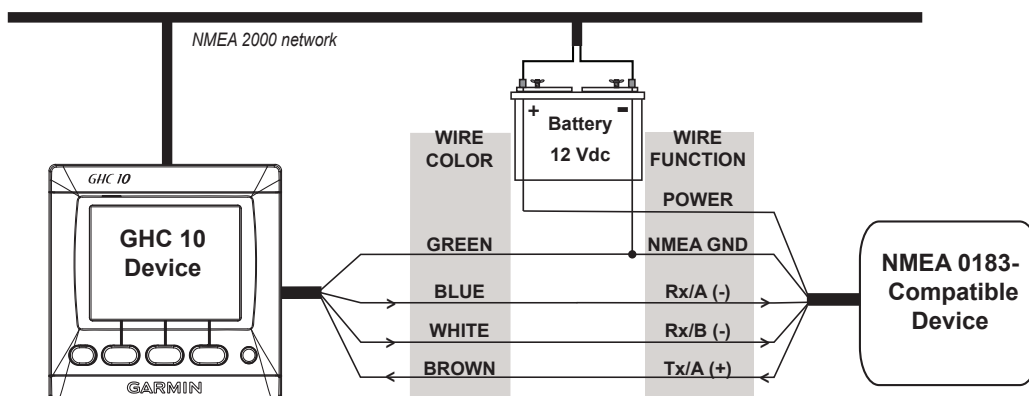


If your NMEA 0183-compatible device has only one receiving wire (Rx), connect it to the blue wire (Tx/A) from the GHC 10, and leave the white wire (Tx/B) from the GHC 10 unconnected.



**Wiring the GHC 10 to a NMEA 0183 Device with One Receiving Wire**

If your NMEA 0183-compatible device has only one transmitting wire (Tx), connect it to the brown wire (Rx/A) from the GHC 10, and connect the green wire (Rx/B) from the GHC 10 to NMEA ground.



**Wiring the GHC 10 to a NMEA 0183 Device with One Transmitting Wire**

**NOTE:** When connecting a NMEA 0183 device with only one transmitting (Tx) line or with only one receiving (Rx) line, the NMEA 2000 bus and the NMEA 0183 device must be connected to a common ground.

## Making the Final Power Connections

After all the components are mounted, connected to the hydraulics of your boat, and wired correctly, connect the ECU to the boat battery. Use the checklist provided in the back of this manual to ensure that the preceding installation procedures are complete. Connect the ECU power cable directly to the boat battery if possible. Though it is not recommended, if you connect the power cable to a terminal block or other source, connect it through a 40 A supply.

If you plan to route the ECU through a breaker or a switch near the helm, consider using an appropriately sized relay and control wire rather than extending the ECU power cable.

### NOTICE

Do not remove the in-line fuse holder from the battery cable when connecting to the battery. If you remove the in-line fuse holder, you will void the GHP 10 warranty and possibly damage the GHP 10 autopilot system.

#### To connect the ECU to the battery:

1. Route the connector-terminated end of the ECU power cable to the ECU, and route the bare-wire end of the ECU power cable to the boat battery. If the wire is not long enough, use the Wire Gauge Table to determine the correct wire gauge for an extended run.

Extended Length	10 ft. (3 m)	15 ft. (4.5 m)	20 ft. (6 m)	25 ft. (7.5 m)
Recommended Wire Gauge	12 AWG (3.31 mm <sup>2</sup> )	10 AWG (5.26 mm <sup>2</sup> )	10 AWG (5.26 mm <sup>2</sup> )	8 AWG (8.36 mm <sup>2</sup> )

**Wire Gauge Table**

2. Connect the black wire (-) to the negative (-) side of the battery first.
3. Connect the red wire (+) to the positive (+) side of the battery next.
4. Connect the ECU power cable to the ECU last.

To connect the data cable to the GHC 10, align the notches on the cable plug and on the back of the GHC 10. Insert the cable into the connector, and turn the locking ring clockwise until it stops.

**NOTE:** After the ECU and the GHC 10 are connected to power, the GHP 10 autopilot system and the NMEA 2000 network can be powered on.

## Bleeding the Hydraulic Steering System

Air must be purged completely from all the hydraulic lines, the helms, the cylinders, the pump, and the Shadow Drive for the system to function. If the hydraulic system is not bled, then the GHP 10 autopilot system will not work correctly. **Follow the instructions provided by the manufacturer of your steering system to properly bleed the hydraulic system on your boat.** Treat the pump as the lowest helm when bleeding the system.

### Notes:

- Disable the Shadow Drive from the GHC 10 to make the bleeding process easier. On the GHC 10, select **Menu > Setup > Autopilot Configuration > Hydraulic Setup > Shadow Drive Enable**. Change the **Shadow Drive Enable** setting to **Disable**.
- **Remember to enable the Shadow Drive after the bleeding process is complete.**
- To completely bleed the hydraulic system, it may be necessary to drive the autopilot pump in both directions to remove any air trapped within the pump. You can do this during the Verify Steering Direction portion of the Dockside Wizard (see [page 35](#)). Drive the rudder to each stop in each direction, and then perform any additional bleeding that may be necessary.

### NOTICE



Check for leaks at every hydraulic fitting, both after the bleeding process is complete and after the sea trial is complete.

## Bleeding the Hydraulic System Through the Compact 2.1 L Pump

The compact 2.1 L pump has a bypass valve to aid in the hydraulic-system bleeding process. In addition to the general instructions in the following section, follow the standard bleeding recommendations provided by the manufacturer of your helm.

**NOTE:** Neither the 1.2/2.0 L pump nor the legacy 2.1 L pump has this bypass valve. These steps only apply to the compact 2.1 L pump.

### General hydraulic bleeding procedures:

1. Ensure the helm reservoir is full of hydraulic fluid. Add fluid if necessary.
2. Manually steer the helm to both cylinder stops.
3. Manually steer the helm fully to port to the stop.
4. Open a bypass valve at the cylinder ports.
5. Turn the helm slowly to port for 3 minutes.
6. Close the cylinder bypass valve.
7. Check the helm reservoir level, and add fluid if necessary. Continue to perform steps 2 through 7 until the helm reservoir level remains full.
8. Open the bypass valve on the manifold of the compact 2.1 L pump.
9. Push and hold the  soft key on the GHC 10 for 10 seconds, and watch for steering movement. If there is no movement, push the  soft key.
10. Continue to hold the soft key that produces steering movement and steer fully to the stop.
11. Steer the helm to both cylinder stops using the GHC 10.
12. Close the bypass valve on the manifold of the compact 2.1 L pump.

### NOTICE

Ensure that the built-in bypass valve on the pump manifold is fully closed during normal operation to avoid possible autopilot performance degradation.

13. Check the helm reservoir level, and add fluid if necessary. Perform steps 2 through 7 until the helm reservoir level remains full.

# Configuring the GHP 10

The GHP 10 must be configured and tuned to your boat dynamics and motor configuration. Use the Dockside Wizard and the Sea Trial Wizard on the GHC 10 to configure the GHP 10. These wizards will walk you through the necessary configuration steps.

## The Dockside Wizard

The Dockside Wizard can be performed at the dock, before heading for open water. The first time you power the GHP 10 on, you are prompted to complete a short setup sequence on the GHC 10. Use the soft keys to select the language, the units of measure, the heading type, and the auto power-on setting if necessary. When you complete the initial setup, you are ready to start the Dockside Wizard.

### To complete the Dockside Wizard configuration:

1. After completing the initial setup, if the Dockside Wizard does not start automatically, from the Heading screen, select **Menu > Setup > Dealer Autopilot Configuration > Wizards > Dockside Wizard**. The Dockside Wizard welcome screen appears on the GHC 10. Select **Begin** to start the wizard.
2. **Lock to Lock:** Count the number of turns it takes your helm to go from lock to lock (fully turned port to fully turned starboard). Use the arrows on the GHC 10 to enter the turns you counted (the default is 4.5) and select **Done**.
3. **Helm Displacement:** The helm displacement is usually written on the body of the helm pump. If you are unsure, consult the manufacturer of your boat for the helm displacement value. Use the arrows on the GHC 10 to enter the helm displacement value (the default is 1.7 in<sup>3</sup>) and select **Done**.
4. **Steering Direction:** Use the arrows on the GHC 10 to test the steering direction. When you push the right arrow, the motor should turn the boat to the right, and when you push the left arrow, the motor should turn the boat to the left. Select **Menu**. If the steering test turns the boat in the correct direction, select **Finished**. If the steering test turns the boat in the opposite direction, select **Switch Directions**.
5. **RPM Source:** Select the engine (or engines) to which you wired the tachometer sensor from the CCU. If you connected a NMEA 2000-compatible engine (or engines) to the NMEA 2000 network, select **NMEA 2000**. For a single-engine boat, select port.
6. **Verify Tachometer:** With the engine (or engines) running, compare the RPM readings on the GHC 10 with the tachometer (or tachometers) on the dashboard of your boat. Adjust the **Pulses Per Rev** with the arrows if the values do not match, and then select **Done**. When you adjust the **Pulses Per Rev** with the arrows, there is a delay before the new RPM readings appear on the GHC 10. For each adjustment, be sure to wait until the GHC 10 adjusts to the new reading.
7. **Dockside Wizard Review:** The GHC 10 displays the values you chose when you ran the Dockside Wizard. If any of the values are incorrect, use the arrow to select the value and select **Select** to re-enter the value. When you are finished reviewing the values, select **Done**.

## The Sea Trial Wizard

The Sea Trial Wizard configures the fundamental sensors on the autopilot, and it is extremely important to complete the wizard in conditions appropriate for your boat. In general, it is highly recommended to complete the Sea Trial Wizard in calm water with little or no wind. Because the nature of calm water is relative to the size and shape of your boat, be sure you choose a location where:

- Your boat does not rock while sitting still or moving very slowly.
- Your boat is not significantly affected by the wind.

While completing the Sea Trial Wizard in calm water, it is important to observe the following:

- **Keep the weight on your boat balanced. DO NOT move around on the boat while completing any of the steps in the Sea Trial Wizard.**
- Be sure that the engines are trimmed down, and that the trim tabs are up.

## Completing the Sea Trial Wizard:

Drive to calm, open water and, if the Sea Trial Wizard does not start automatically, select **Menu > Setup > Dealer Autopilot Configuration > Wizards > Sea Trial Wizard**. The Sea Trial Wizard welcome screen appears on the GHC 10. Select **Begin** to start the wizard.

### Configuring the planing RPM:

1. Follow the directions on the GHC 10.
2. Note the RPM reading from the tachometer on the dashboard of your boat at the point your boat transitions from displacement to planing speed.
3. If the tachometer value does not match the value on the GHC 10, use the arrows to adjust the value.
4. When you are finished, select **Done**.

**NOTE:** If you have a displacement-hull boat, there will not be a transition point for you to set. Instead, adjust the Planing RPM to the highest possible value (6,000 RPM).

### Calibrating the compass:

1. Before you begin the compass calibration procedure, drive your boat in a slow, straight line and wait for the wake generated by the planing RPM configuration procedure to pass.
2. Select **Begin**.
3. When instructed, turn the boat slowly clockwise, taking care to make **as steady and flat** a turn as possible. **Turn slowly so that the boat DOES NOT list.**

**NOTE:** If you have a dual-engine boat, slowly run the port engine forward and the starboard engine in reverse to pivot on a stationary position.

4. After you successfully complete the calibration, and the GHC 10 displays a completion message, select **Done**. If the calibration fails, select **Retry** to begin the process again.

### Performing the Autotune procedure:

1. Before you begin the Autotune procedure, adjust the throttle so that the boat travels at a constant RPM below planing speed, with enough speed to maintain responsive steering.
2. Select **Begin** when you are ready.
3. The boat will perform a number of zigzag motions while the Autotuning is in progress.
4. When the GHC 10 displays a completion message, select **Done**. **Be sure to take manual control of the boat when Autotuning is complete.**

### If the Autotuning fails:

- Increase the throttle approximately 200 RPM and select **Retry** to begin the process again.
- If it fails again, continue retrying the process adding increments of 200 RPM.
- If you reach planing speed through adding increments of 200 RPM and the autotune procedure continues to fail, reduce speed below planing speed and select **Alternate Autotune** to begin an alternate autotuning procedure.

### NOTICE

The Alternate Autotune is only applicable to a small number of boats, and should be the last attempt at autotuning. Do not perform the Alternate Autotune until you are sure the standard autotune procedure will not work on your boat.

**NOTE:** If the autotune procedure continually fails, it is possible that air is present in the hydraulic system. It is also possible that a leak or other problem exists in the hydraulic system on your boat. If you cannot complete the autotune procedure or the Alternate Autotune, check the hydraulic system for leaks or other problems, and bleed it completely if necessary.

### Setting North:

1. To complete this step, you must have a large stretch of open water available. Be sure to have at least 45 seconds of hazard-free, open water available while at planing speed.
2. Drive the boat in a straight line, at planing speed, and select **Begin** when you are ready.
3. When the GHC 10 displays a completion message, select **Done**. If the calibration fails, select **Retry** to begin the process again.

## Evaluating the Results of the Autopilot Configuration

When the Dockside and Sea Trial Wizards are complete, test the autopilot to be sure it is configured correctly. Test the autopilot first at slow speeds (below planing), and then test the autopilot at planing speeds.

### To test the autopilot configuration:

1. Drive the boat in one direction with the autopilot engaged (heading hold). The boat should not oscillate significantly; however, a small amount of oscillation is normal.
2. Turn the boat in one direction using the autopilot.
  - Does the boat turn too aggressively or too sluggishly?
  - When you release the turn button, the boat should overshoot the turn and quickly correct the heading to the point at which you released the button. You will notice that the faster you are going, the greater the boat will overshoot the turn.
3. If the autopilot is configured properly at slow speeds, repeat these tests at planing speed.

## Adjusting the Autopilot Configuration

If you feel that the heading hold oscillates significantly or that the autopilot does not quickly correct the heading when turning, make slight adjustments to the autopilot gain.

If you feel that the autopilot turns too aggressively or too sluggishly, make slight adjustments to the acceleration limiter.

### To adjust the autopilot Gain settings:

**NOTE:** When you manually adjust the rudder gain (or counter gain), make small adjustments, and adjust only one value at a time. Test the change before entering any further adjustments.

1. Power the GHP 10 on using the advanced configuration power-on procedure on [page 38](#).
2. On the GHC 10, select **Menu > Setup > Dealer Autopilot Configuration > Turn Fine Tuning Setup > Rudder Gains** to access the rudder gain adjustments. There are two types of gain settings at both low and high speeds:
  - **Rudder Gain**—Adjusts how tightly the rudder holds the heading and makes turns. If you set this value too high, the autopilot may be overactive, attempting to constantly adjust the heading at the slightest deviation. An overactive autopilot can cause excess wear and tear on the autopilot pump.
  - **Counter Gain**—Adjusts how tightly the rudder corrects the turn overshoot. If you set this value too high, the autopilot can overshoot the turn again when attempting to counter the original turn.
3. Adjust the setting that you want to change, and test the adjustment. Repeat steps 2 and 3 until the GHP 10 performance is satisfactory.

### To adjust the acceleration limiter settings:

**NOTE:** When you manually adjust the acceleration limiter, make small adjustments. Test the change before entering any further adjustments.

1. Power on the GHP 10 using the advanced configuration power-on procedure on [page 38](#).
2. On the GHC 10, select **Menu > Setup > Dealer Autopilot Configuration > Turn Fine Tuning Setup > Acceleration Limiter** to access the acceleration limiter adjustments.
3. Adjust the setting and test the adjustment. Repeat steps 2 and 3 until the GHP 10 performance is satisfactory.

## Advanced Configuration Power-on Procedure

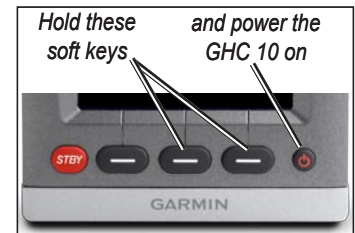
Advanced configuration options are not available on the GHC 10 under normal conditions. To access the advanced configuration settings of the GHP 10, use the advanced configuration power-on procedure.

### To access the wizards and advanced configuration options:

1. With the power off, press both the center and the right soft keys on the GHC 10.
2. While pressing the center and the right soft keys, power the GHC 10 on.
3. Press all 3 buttons until the heading screen appears. Release the buttons.

### To make sure the wizards and advanced configuration options are available:

1. From the heading screen, select **Menu > Setup**.
2. If the option for **Dealer Autopilot Configuration** is available, you correctly performed the advanced configuration power-on procedure.



**Advanced Configuration Power-on Procedure**

## Manually Running the Dockside and Sea Trial Wizards

The Dockside Wizard and the Sea Trial Wizard allow you to quickly define all of the important configuration settings on the GHP 10. If, after running the wizards, you do not feel as though the GHP 10 is working correctly, you can run the wizards again at any time. To access the wizards, power the GHC 10 on using the advanced configuration power-on procedure.

### To manually run the Dockside Wizard:

1. From the Heading screen, select **Menu > Setup > Dealer Autopilot Configuration > Wizards > Dockside Wizard**.
2. Perform the steps as prompted. For more information, see [page 35](#).

### To manually run the Sea Trial Wizard:

1. From the Heading screen, select **Menu > Setup > Dealer Autopilot Configuration > Wizards > Sea Trial Wizard**.
2. Perform the steps as prompted. For more information, see [page 35](#).

## Changing Advanced Configuration Settings

You can run the Autotune automated configuration process, calibrate the compass, and define north on the GHP 10 through the GHC 10 without running the wizards. Additionally, without running the wizards, you can individually define each configuration setting. To access the automated configuration settings and the advanced configuration settings, power the GHC 10 on using the advanced configuration power-on procedure

### To manually run the automated configuration settings:

1. From the Heading screen, select **Menu > Setup > Dealer Autopilot Configuration > Automated Setup**.
2. Select **Autotune**, **Calibrate Compass**, or **Set North**.
3. Perform the steps as prompted. For more information on each automated configuration setting, see [page 35](#).

### To manually define individual configuration settings:

1. From the Heading screen, select **Menu > Setup > Dealer Autopilot Configuration**.
2. Select the appropriate category of setting you want to configure.
3. Select the setting you want to configure. Refer to the description of each setting on [page 39](#).

Category	Setting	Description
Tachometer Setup	Verify Tachometer	With the engine (or engines) running, compare the RPM readings on the GHC 10 with the tachometer on the dashboard of your boat. Adjust the <b>Pulses Per Rev</b> with the arrows if the values do not match, and then select <b>Done</b> . When you adjust the <b>Pulses Per Rev</b> with the arrows, there is a delay before the new RPM readings appear on the GHC 10. For each adjustment, be sure to wait until the GHC 10 adjusts to the new reading.
Tachometer Setup	RPM Source	Select the engine (or engines) to which you wired the tachometer sensor from the CCU. If you connected a NMEA 2000-compatible engine to the NMEA 2000 network, select <b>NMEA 2000</b> . For a single-engine boat, select port.
Tachometer Setup	Planing RPM	Take note of the RPM reading from the tachometer on the dashboard of your boat at the point your boat transitions from displacement to planing speed. If the value does not match the value on the GHC 10, use the arrows to adjust the value.
Tachometer Setup	Low RPM Limit	Take note of the RPM reading from the tachometer on the dashboard of your boat at the lowest RPM point. If the value does not match the value on the GHC 10, use the arrows to adjust the value.
Tachometer Setup	High RPM Limit	Take note of the RPM reading from the tachometer on the dashboard of your boat at the highest RPM point. If the value does not match the value on the GHC 10, use the arrows to adjust the value.
Hydraulic Setup	Helm Displacement	The helm displacement is usually written on the body of the helm pump. If you are unsure, consult the manufacturer of your boat for the helm displacement value. Use the arrows on the GHC 10 to enter the helm displacement value.
Hydraulic Setup	Lock to Lock Turns	Count the number of turns it takes your helm to go from lock to lock (fully turned port to fully turned starboard). Use the arrows on the GHC 10 to enter the value you counted.
Hydraulic Setup	Verify Steering Direction	Use the arrows on the GHC 10 to test the steering direction. When you push the right arrow, the motor should turn the boat to the right, and vice versa. Determine if the engines are steering in the correct direction and press <b>Continue</b> . Use the GHC 10 to answer the questions.
Hydraulic Setup	Linkage Compensation	Adjust the linkage compensation if the steering is loose or sloppy. The higher you set this value, the more the autopilot compensates for loose or sloppy steering. Use this setting with caution.
Turn Fine Tuning Setup > Rudder Gains	Low Speed	Set the rudder gain for low speeds.
Turn Fine Tuning Setup > Rudder Gains	Low Speed Counter	Set the rudder gain counter-correction for low speeds.
Turn Fine Tuning Setup > Rudder Gains	High Speed	Set the rudder gain for high speeds.
Turn Fine Tuning Setup > Rudder Gains	High Speed Counter	Set the rudder gain counter-correction for high speeds.
Turn Fine Tuning Setup	Acceleration Limiter	Limit the aggressiveness of autopilot-controlled turns. Increase the percentage to limit the turn rate, and decrease the percentage to allow higher turn rates.
Navigation Setup	Fine Heading Adjustment	Increase or decrease to fine-tune the autopilot heading.
Navigation Setup > NMEA Setup	NMEA Checksum	If the connected GPS unit incorrectly calculates checksums, you may still be able to use it if you turn this setting off. When off, data integrity is compromised.
Navigation Setup > NMEA Setup	Reversed XTE	If the connected GPS unit sends the incorrect steering direction with the cross track error signal, use this setting to correct the steering direction.
Navigation Setup	Navigation Gain	Because the cross track error data transmitted by a NMEA 0183 GPS device is only accurate within .01 mile (60 ft.), the gain may need adjustment. Increase this setting until the boat oscillates back and forth near the course line, then lower it a few levels.
Navigation Setup	Navigation Trim Gain	After adjusting the Navigation gain, increase this setting until you can see the standoff from the course line decreasing over time.

**NOTE:** Certain configuration settings are available when using the GHC 10 normally, such as enabling and disabling the Shadow Drive, adjusting the sensitivity of the Shadow Drive, and adjusting the Sea State Filtering setting. See the configuration section of the GHP 10/GHC 10 Quick Start Manual for more information.

# Appendix

## Specifications

### ECU

#### Physical

**Dimensions (W×H×D):** 6 <sup>19</sup>/<sub>32</sub> × 4 <sup>19</sup>/<sub>32</sub> × 2 in. (167.6 × 116.8 × 50.8 mm)

**Weight:** 1.5 lb. (0.68 kg)

**Temperature Range:** from 5°F to 131°F (from -15°C to 55°C)

**Case Material:** Fully gasketed, high-impact aluminum alloy, waterproof to IEC 529 IPX7 standards

**Power Cable Length:** 9 ft. (2.7 m)

#### Power

**Input Power:** 11.5–14 Vdc prior to serial number 19E002748  
11.5–28 Vdc after serial number 19E002748 (only with CCU software version 2.70 or later)

**Fuse:** 40 A

**Main Power Usage:** 1 A (not including the pump)

### CCU

#### Physical

**Dimensions:** 3 <sup>19</sup>/<sub>32</sub> in. diameter (91.4 mm)

**Weight:** 5.6 oz. (159 g)

**Temperature Range:** from 5°F to 131°F (from -15°C to 55°C)

**Case Material:** Fully gasketed, high-impact plastic alloy, waterproof to IEC 529 IPX7 standards

**CCU/ECU Interconnect Cable Length:** 16 ft. (5 m)

#### Power

**NMEA 2000 Power Input:** 9–16 Vdc

**NMEA 2000 LEN:** 2 (100 mA)

### 1.2L/2.0L Pump

#### Physical

**Dimensions (W×H×D):** 11 × 4 <sup>11</sup>/<sub>16</sub> × 3 <sup>11</sup>/<sub>16</sub> in. (279.4 × 119.4 × 94 mm)

**Weight:** 8.05 lb. (3.65 kg)

**Temperature Range:** From 5°F to 131°F (from -15°C to 55°C)

**Cable Length:** 19 in. (0.5 m)

#### Power

**Main Power Usage:** Varies based on hydraulic loading

### Compact 2.1L Pump

#### Physical

**Dimensions (W×H×D):** 16 <sup>1</sup>/<sub>2</sub> × 6 × 7 <sup>1</sup>/<sub>2</sub> in. (420 × 150 × 190 mm)

**Weight:** 17.6 lb. (8 kg)

**Temperature Range:** From 5°F to 131°F (from -15°C to 55°C)

**Cable Length:** 19 in. (0.5 m)

#### Power

**Main Power Usage:** Varies based on hydraulic loading



## Legacy 2.1L Pump

### Physical

**Dimensions (W×H×D):** 15 × 7 1/2 × 7 3/16 in. (381 × 190.5 × 182.9 mm)

**Weight:** 17.6 lb. (8 kg)

**Temperature Range:** From 5°F to 131°F (from -15°C to 55°C)

**Cable Length:** 19 in. (0.5 m)

### Power

**Main Power Usage:** Varies based on hydraulic loading

## Shadow Drive

**Dimensions (L × Diameter):** 2 19/32 × 1 5/16 in. (66 × 33 mm)

**Weight:** 1 lb. (0.45 kg)

**Temperature Range:** From 5°F to 131°F (from -15°C to 55°C)

**Cable Length:** 9 ft. (2.7 m)

## Alarm Buzzer

**Dimensions (L × Diameter):** 29/32 × 1 in. (23 × 25 mm)

**Weight:** 2.4 oz. (68 g)

**Temperature Range:** From 5°F to 131°F (from -15°C to 55°C)

**Cable Length:** 10 ft. (3.0 m)

## GHC 10

### Physical

**Dimensions (W×H×D):** 4 5/16 × 4 3/8 × 1 29/32 in. (109 × 111 × 48 mm)

**Weight:** 9.6 oz. (272 g)

**Cables:** NMEA 0183 data cable – 6 ft. (1.8 m); NMEA 2000 drop cable and power cable – 6 1/2 ft. (2 m)

**Temp range:** From 5°F to 158°F (from -15°C to 70°C)

**Compass Safe Distance:** 9 1/2 in. (241 mm)

**Case Material:** Fully gasketed, high-impact plastic alloy, waterproof to IEC 529 IPX7 standards

### Power

**GHC 10 power usage:** 2.5 W max

**NMEA 2000 Power Input:** 9–16 Vdc


**NMEA 2000 LEN:** 6 (250 mA)

## NMEA 2000 PGN Information

### GHC 10

Receive		Transmit	
059392	ISO Acknowledgment	059392	ISO Acknowledgment
059904	ISO Request	059904	ISO Request
060928	ISO Address Claim	060928	ISO Address Claim
126208	NMEA - Command/Request/Acknowledge Group Function	126208	NMEA - Command/Request/Acknowledge Group Function
126464	Transmit/Receive PGN List Group Function	126464	Transmit/Receive PGN List Group Function
126996	Product Information	126996	Product Information
127250	Vessel Heading	129025	Position - Rapid Update
127488	Engine Parameters - Rapid Update	129026	COG & SOG - Rapid Update
129025	Position - Rapid Update	129029	GNSS Position Data
129029	GNSS Position Data	129283	Cross Track Error
129284	Navigation Data	129284	Navigation Data
129285	Navigation - Route/WP information	129285	Navigation - Route/WP information
		129540	GNSS Sats in View

### CCU

Receive		Transmit	
059392	ISO Acknowledgment	059392	ISO Acknowledgment
059904	ISO Request	059904	ISO Request
060928	ISO Address Claim	060928	ISO Address Claim
126208	NMEA - Command/Request/Acknowledge Group Function	126208	NMEA - Command/Request/Acknowledge Group Function
126464	Transmit/Receive PGN List Group Function	126464	Transmit/Receive PGN List Group Function
126996	Product Information	126996	Product Information
127258	Magnetic Variation	127250	Vessel Heading
127488	Engine Parameters - Rapid Update	The GHP 10 and the GHC 10 are NMEA 2000 certified.	
129025	Position - Rapid Update		
129026	COG & SOG - Rapid Update		
129283	Cross Track Error		
129284	Navigation Data		

## NMEA 0183 Information

The GHC 10, when connected to an optional NMEA 0183-compatible GPS device, uses the following NMEA 0183 sentences:

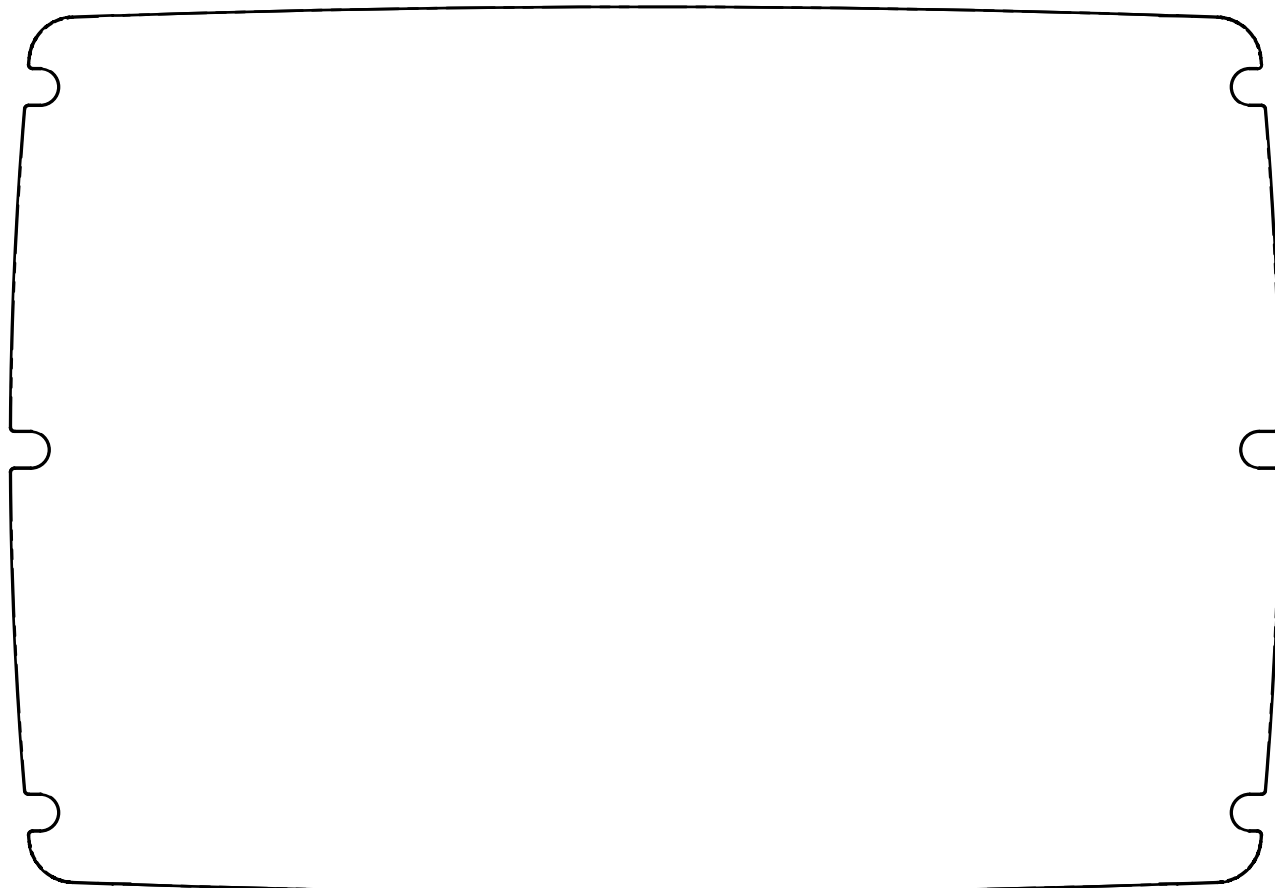
**Receive**—wpl, gga, grme, gsa, gsv, rmc, bod, bwc, dtm, gll, rmb, and xte.

**Transmit**—hdg.

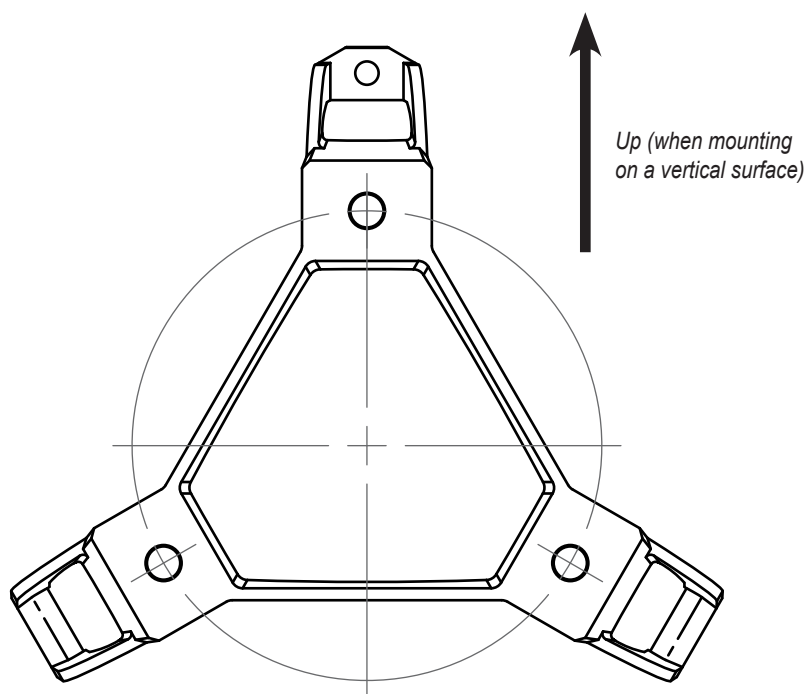
## Mounting Templates

Use the following mounting templates to assist with the mounting process.

### ECU Mounting Template

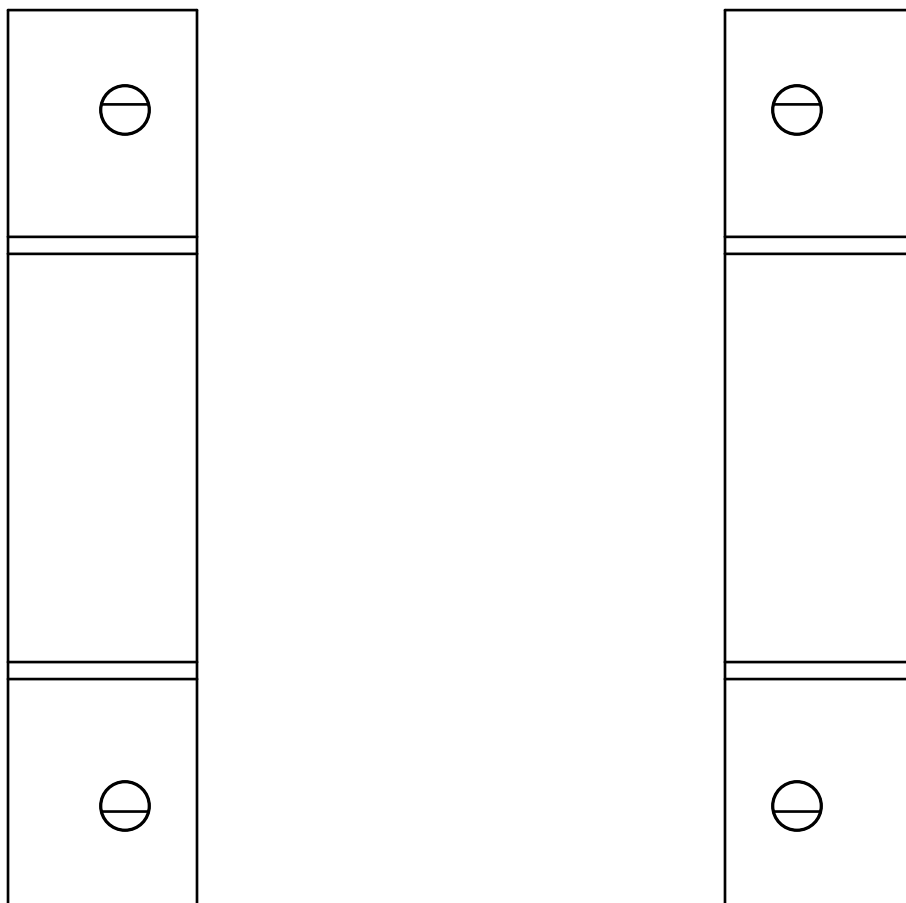


### CCU Mounting Template



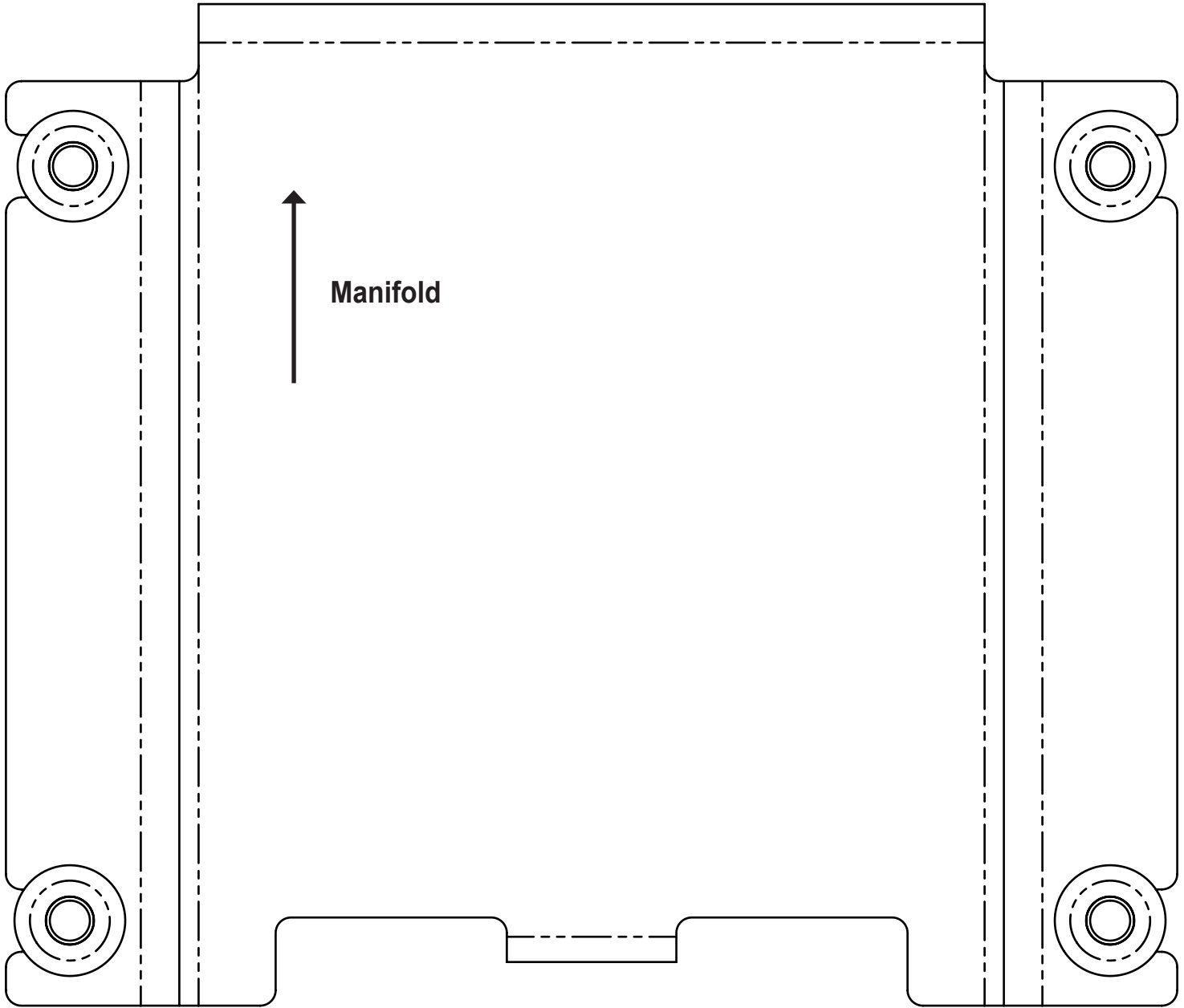


## 1.2 L/2.0 L Pump Mounting Template



## Compact 2.1 L Pump Mounting Template

**NOTE:** This template should also be used with the legacy 2.1 L pump.



## GHP 10 Installation Checklist

Detach this checklist from the installation instructions and use it to assist with the GHC 10 installation process.

Read all installation instructions before installing the GHC 10. Contact Garmin Product Support if you have any questions during the installation process.

1. Refer to the charts on [pages 9–18](#) for the proper locations of the pump, the Shadow Drive, and other hydraulic requirements. Verify that the hydraulic steering layout of the boat supports the GHP 10 autopilot system.
2. Refer to the diagram and notes on [page 5](#) to understand the necessary electrical and data connections.
3. Lay out all of the components, and check the cable lengths. Obtain extensions if necessary.
4. Mount the pump by following the directions starting on [page 19](#). The pump must be located within 19½ in. (0.5 m) of the ECU.
5. Install the pump in the hydraulic steering system by following the directions starting on [page 19](#). **Do not bleed the hydraulic steering system at this time (wait until step 14).**
6. Mount the ECU by following the directions starting on [page 25](#). The pump must be located within 19½ in. (0.5 m) of the ECU. Connect the pump to the ECU.
7. Mount the CCU by following the directions starting on [page 25](#). Mount the CCU in a location free of magnetic interference. Use a handheld compass to test for magnetic interference in the area. **Mount the CCU in the bracket so that the wires hang straight down.**
8. Install the Shadow Drive by following the directions starting on [page 26](#). **Do not bleed the hydraulic steering system at this time (wait until step 14).**
9. Wire the CCU to the tachometer of the boat by following the directions starting on [page 27](#).
10. Mount the GHC 10 by following the directions starting on [page 28](#).
11. Connect the GHC 10 and the CCU to a NMEA 2000 network. Connect an optional NMEA 2000-compatible GPS device to the NMEA 2000 network ([page 30](#)).
12. Wire the yellow wire on the GHC 10 data cable to the yellow CCU signal wire on the CCU/ECU interconnect cable and the black wire on the GHC 10 data cable to CCU ground. Wire an optional NMEA 0183-compatible GPS device to the GHC 10 if a NMEA 2000-compatible GPS device is not available ([page 29](#)).
13. Complete the final battery connections by following the directions on [page 33](#).
14. Bleed the hydraulic steering system. Consult the manufacturer of your steering system for bleeding instructions. **Thoroughly check for leaks in the hydraulic steering system ([page 34](#)).**
15. Apply a corrosion blocker to all of the installed components except the GHC 10. (Bo-Shield or Corrosion X, for example)
16. Configure the GHP 10 system by completing the Dockside Wizard and the Sea Trial Wizard ([page 35](#)).
17. Re-examine the hydraulic steering system for leaks and for proper hydraulic fluid levels.

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