



## GHP™ 10 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.

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

**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.

### Registering Your Device

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 3](#). The serial numbers are located on a sticker on each component.

### Contacting Garmin

Contact Garmin Product Support if you have any questions while using 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.

## Important Safety Information

### 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 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

Equipment to be connected to this product should have a fire enclosure or be provided with a fire enclosure.

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.

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# 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.

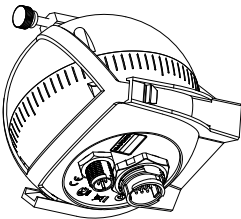
As you familiarize yourself with the GHP 10 components, confirm that your package includes the items listed below. All the components, except the hydraulic pump, are included in the GHP 10 core box. If any parts are missing, contact your Garmin dealer immediately.

Record the serial number of each component in the space provided.

## 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™ 20 user control interface.

### CCU

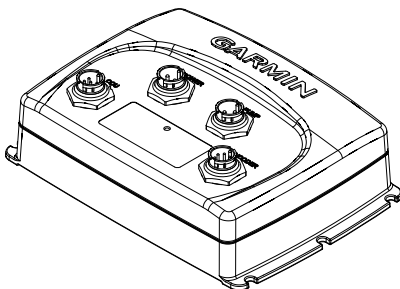


The CCU acts as the brain of the GHP 10. The CCU contains the sensory equipment used to determine heading. The CCU connects to the ECU and to the GHC 20 with a single cable. The CCU also connects to a NMEA 2000® network to communicate with the GHC 20, and to optional NMEA 2000-compatible GPS devices ([page 12](#)).

### Serial Number

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### ECU



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

### Serial Number

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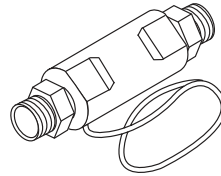
## Hydraulic Pump and Motor

The hydraulic pump (and motor) steers your boat by interacting with the hydraulic steering system, based on commands you enter using the GHC 20. 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. For information on installing the pump, see the installation instructions included in the pump box.

### Serial Number

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## Shadow Drive

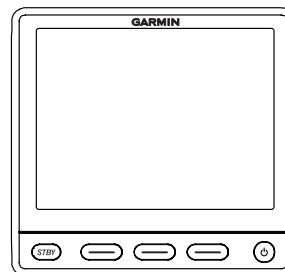


The Shadow Drive is a sensor you install in the hydraulic steering lines of your boat. While the GHP 10 is engaged, the Shadow Drive temporarily disengages the autopilot when you manually take control of the helm. When you establish a new straight line heading, the Shadow Drive automatically reengages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

### Serial Number

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## GHC 20



The GHC 20 is the primary interface used to operate the GHP 10 autopilot system. Using the GHC 20, you engage and steer the GHP 10. You also set up and customize the GHP 10 using the GHC 20.

The GHC 20 connects to a NMEA 2000 network to communicate with the CCU. The GHC 20 also connects with optional NMEA 2000-compatible devices such as a GPS device, to use advanced features of the GHP 10. If NMEA 2000-compatible devices are not available, you can connect the GHC 20 to optional NMEA 0183-compatible devices instead.

### Serial Number

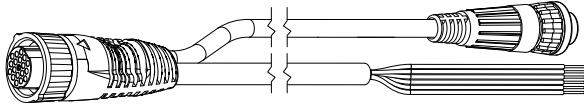
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## Cables and Connectors

The GHP 10 autopilot system includes multiple cables. These cables connect the components to power, to each other, to an alarm, and to optional devices.

### 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 alarm and to the yellow wire from the GHC 20.



### CCU/ECU Interconnect Extension Cables

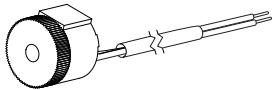
When installing the GHP 10 system, you may need to mount the CCU farther than 16 ft. (5 m) from the ECU. Garmin offers optional replacement or extension cables for purchase if this is necessary.

Type	Length
Replacement	32 ft. (10 m)
Replacement	66 ft. (20 m)
Extension	16 ft. (5 m)
Extension	50 ft. (15 m)
Extension	82 ft. (25 m)

Contact your local Garmin dealer or Garmin Product Support for ordering information.

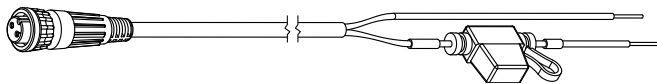
### Alarm

The alarm provides audible alerts from the GHP 10 (page 11).



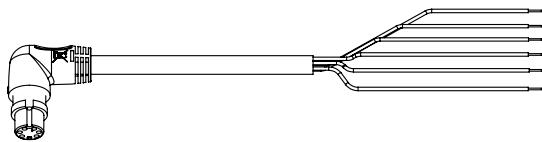
### ECU Power Cable

This cable powers the ECU (page 10).



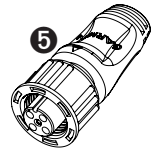
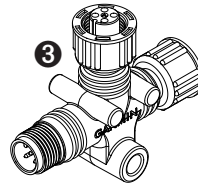
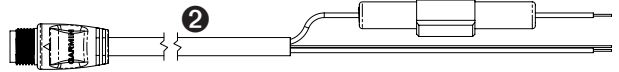
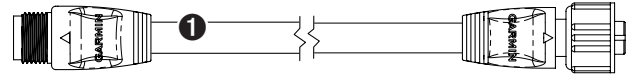
### GHC 20 NMEA 0183 Data Cable

This cable connects the GHC 20 to the yellow wire of the CCU, and to the same ground as the ECU (page 12). This cable can also be used to connect the GHC 20 to optional NMEA 0183-compatible devices (page 14).



## NMEA 2000 Cables and Connectors

The NMEA 2000 cables connect the CCU and the GHC 20 to the NMEA 2000 network. Either connect the CCU and the GHC 20 to an existing NMEA 2000 network using the included T-connectors and drop cables, or use all of the included NMEA 2000 cables and connectors to build a NMEA 2000 network on your boat if needed (page 12).



❶	NMEA 2000 drop cable, 6 ft. (2 m) (×2)
❷	NMEA 2000 power cable
❸	NMEA 2000 T-connector (×3)
❹	NMEA 2000 terminator, male
❺	NMEA 2000 terminator, female

### NMEA 2000 Extension Cables

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

### External Tachometer Filter

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), not included. 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
- Wire cutters/strippers
- Phillips and flat screwdrivers
- Cable ties
- Waterproof wire connectors (wire nuts) or heat-shrink tubing and a heat gun
- Marine sealant
- Portable or handheld compass (to test for magnetic interference when determining the best location to install the CCU)
- Anti-seize lubricant (optional)

**NOTE:** Mounting screws are provided for the GHC 20, for the CCU, for the ECU, and for the pump. If the provided screws are not appropriate for the mounting surface, you must provide the correct types of screws.

## Installation Preparation

Before installing the GHP 10 autopilot system, you must plan where all the components will be located on your boat. Temporarily place all the components where you intend to install them. Read these considerations and consult the diagrams on [pages 7–9](#) before you begin planning your installation.

**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.

### Mounting and Connection 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 connecting any components.

#### Shadow Drive Mounting Considerations

- Mount the Shadow Drive horizontally and as level as possible, using cable ties to firmly secure it in place.
- **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.
- Install the Shadow Drive lower than the helm, but higher than the pump.
- Avoid making loops in the hydraulic lines.
- 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.

#### ECU Mounting Considerations

- The ECU can be mounted on a flat surface facing any direction.
- 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.
- The ECU must be located within 19 in. (0.5 m) of the drive unit.
- The ECU must not be mounted in a location where it will be submerged or exposed to wash-down.

#### ECU Connection Considerations

- The ECU power cable connects to the boat battery, and it can be extended if needed ([page 10](#)).
- 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.
- **The cables connecting the pump to the ECU cannot be extended.**

#### Hydraulic Considerations for Avoiding ECU Drive Circuit Overload

- Ensure the appropriate pump has been correctly installed on your boat.

**NOTE:** If you have questions about the appropriate pump for your boat, contact your local Garmin dealer or Garmin Product Support for more information.

- If possible, use larger inside diameter hydraulic hoses on your steering system.
- Mount the pump closer to the cylinder to limit the length of the hose runs.
- Eliminate unneeded hydraulic fittings in the hydraulic fittings.

#### CCU Mounting Considerations

- **The CCU must be mounted in the forward half of the boat, no higher than 10 ft. (3 m) above the waterline.**
- The CCU must not be mounted in a location where it will be submerged or exposed to wash-down.
- **The CCU must not be mounted near magnetic material, magnets (speakers and electric motors), or high-current wires.**
- The CCU must be mounted at least 24 in. (0.6 m) away from movable or changing magnetic disturbances such as anchors, anchor chain, wiper motors, and tool boxes.
- A handheld compass should be used to test for magnetic interference in the area where the CCU is to be mounted.  
If the handheld compass does not point north when you hold it in the location where you intend to mount the CCU, there is magnetic interference. Choose another location, and test again.
- The CCU can be mounted below the waterline if it is not in a location where it will be submerged or exposed to wash-down.
- The CCU bracket must be mounted on a vertical surface or under a horizontal surface, so that the connected wires hang straight down.
- 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.

#### CCU Connection Considerations

- The CCU/ECU interconnect cable connects the CCU to the ECU and is 16 ft. (5 m) long.
  - If the CCU cannot be mounted within 16 ft. (5 m) of the ECU, replacement and extension cables are available ([page 4](#)).
  - **The CCU/ECU interconnect cable must not be cut.**
- The CCU/ECU interconnect cable connects the CCU to the GHC 20 with a single yellow signal wire ([page 11](#)). The autopilot system does not power on if this connection is not made.

#### Alarm Mounting Considerations

- The alarm should be mounted near the helm station.
- The alarm can be mounted under the dashboard.

#### Alarm Connection Considerations

- If needed, the alarm wires can be extended with 28 AWG (.08 mm<sup>2</sup>) wire.

### NMEA 2000 Connection Considerations

- The CCU and the GHC 20 connect to the NMEA 2000 network. If your boat does not have a NMEA 2000 network, one can be built using the included NMEA 2000 cables and connectors (page 13).
- To use advanced features of the GHP 10, optional NMEA 2000-compatible devices, such as a GPS device, can be connected to the NMEA 2000 network.

### GHC 20 Mounting Considerations

#### NOTICE

The mounting surface must be flat to avoid damaging the device when it is mounted.

- The mounting location should provide optimal viewing as you operate your vessel.
- The mounting location should allow easy access to the keys on the GHC 20.
- The mounting surface must be strong enough to support the weight of the GHC 20 and protect it from excessive vibration or shock.
- The area behind the surface must allow room for the routing and connection of the cables.  
There should be at least a 3-inch (8 cm) clearance behind the case of the GHC 20.
- The location must be at least 8 1/4 in. (209 mm) from a magnetic compass, to avoid interference.
- The location must be in an area that is not exposed to extreme temperature conditions (page 19).

### GHC 20 Connection Considerations

- You must connect the GHC 20 to the NMEA 2000 network.
- For the autopilot to function, you must correctly connect two wires from the GHC 20 data cable:
  - The yellow wire from the GHC 20 data cable must be connected to the yellow wire of the CCU/ECU interconnect cable.
  - The black wire from the GHC 20 data cable must be connected to the same ground as the ECU.
- Optional NMEA 0183-compatible devices, such as a GPS device, can be connected to the GHC 20 data cable (page 14).

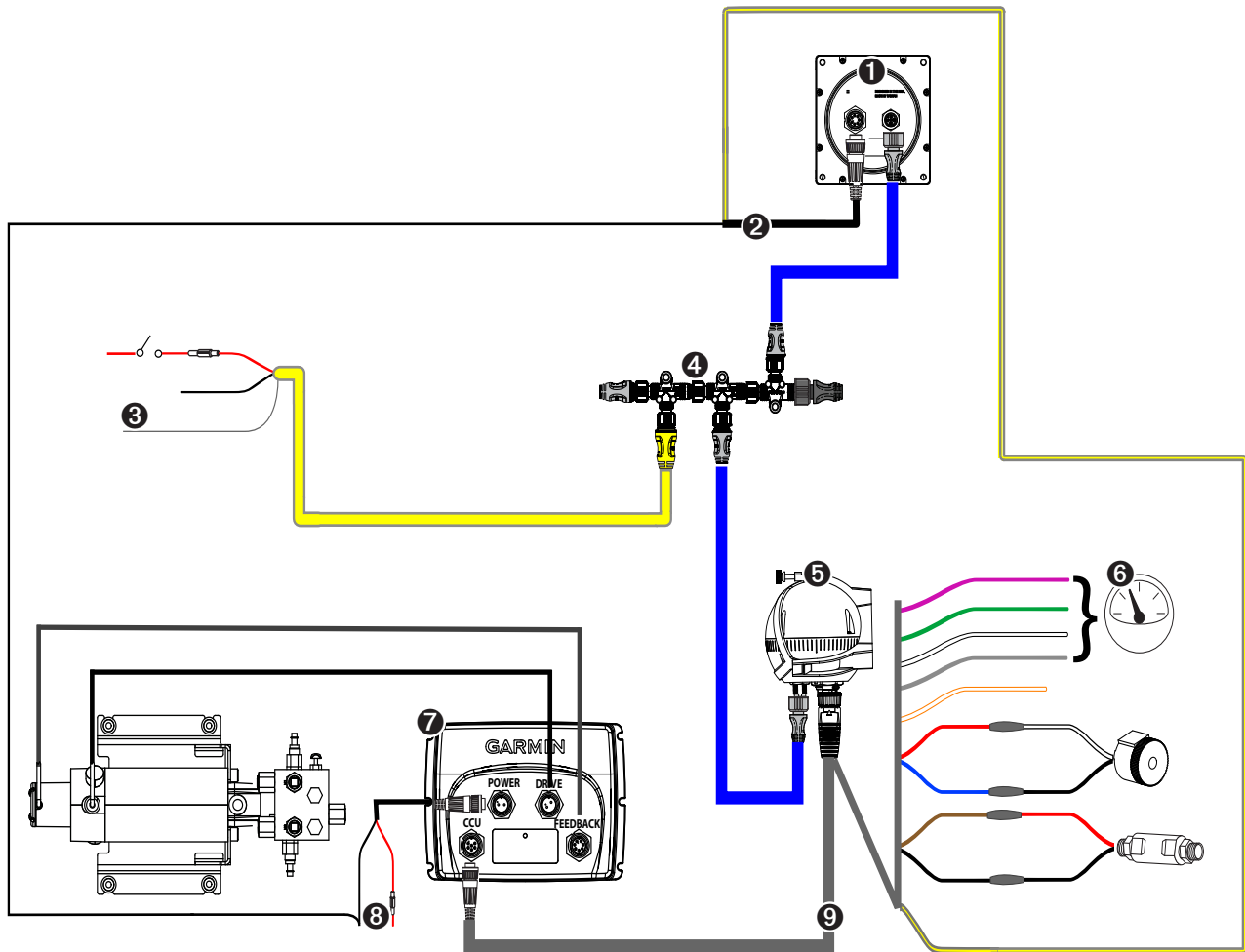
### Speed Source Connection Considerations

For optimal performance in all conditions, Garmin recommends connecting to a NMEA 2000 or analog tachometer speed source. Each speed source in the table is listed in order of best to least in terms of autopilot performance.

Speed Source	Appropriate Connection
NMEA 2000 Engine Data	<ul style="list-style-type: none"> <li>If your engine supports NMEA 2000 engine data, and is connected to the same NMEA 2000 network as the GHC 20 and the CCU, no other tachometry connection is necessary. For more information on the NMEA 2000 network, see page 12. <b>NOTE:</b> 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.</li> </ul>
Tachometer	<ul style="list-style-type: none"> <li>If your engine does not support NMEA 2000 engine data, you can connect 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.</li> <li><b>Refer to the owner's manual or shop manual for your engine to identify the color codes and location of the tachometer connections on your boat.</b></li> <li>For a list of common engine tachometry connections, visit <a href="http://www.garmin.com/ghp10/">www.garmin.com/ghp10/</a> and click the manuals quick link. <b>NOTE:</b> 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.</li> </ul>
GPS	<ul style="list-style-type: none"> <li>GPS data can be used when tachometer data is unavailable or unusable. <b>NOTE:</b> GPS speed source data is supported only with GHC 20 software version 3.00 or higher when used with GHP 10 software version 3.30 or higher.</li> <li>When connected to the GHC 20, GPS data can be sent to the GHP 10 by connecting the device to a NMEA 2000 or NMEA 0183 network.</li> </ul>
None	<ul style="list-style-type: none"> <li>Although it is not recommended; some boats, such as displacement hulls, can be configured to use no speed source.</li> <li>No connections are necessary when the selected speed source is 'None'.</li> </ul>

## General Connections Diagram

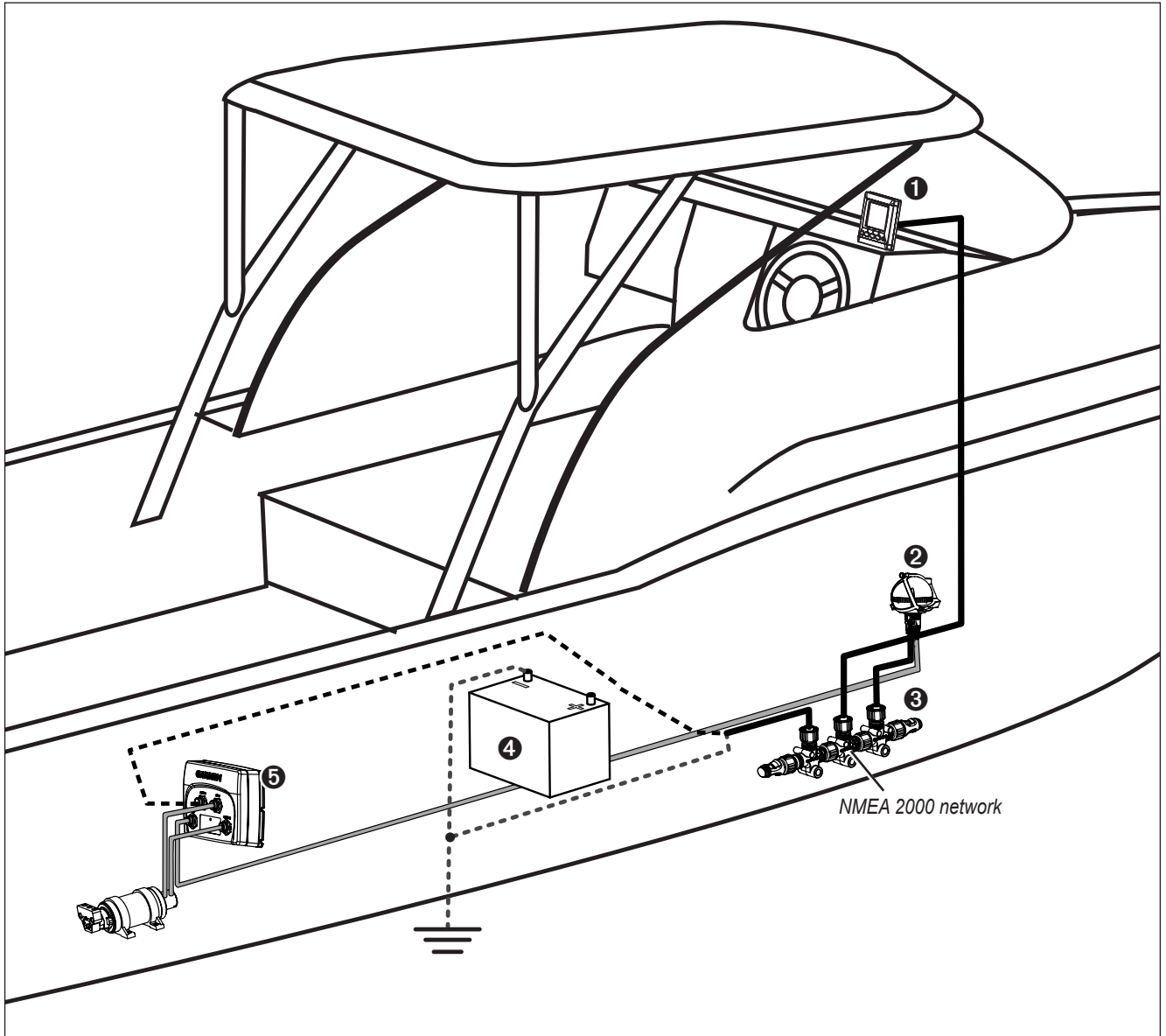
Refer to this diagram for component-interconnection reference only. Follow the detailed installation instructions for each component.



**GHP 10 General Connection Outline**

Item	Description	Important Considerations
❶	GHC 20	
❷	GHC 20 data cable	In order for the autopilot to turn on, the yellow wire from this cable must be connected to the yellow wire from the CCU/ECU interconnect cable, and the black wire from this cable must be connected to the same ground as the ECU (page 12).
❸	NMEA 2000 power cable	This cable should be installed only if you are building a NMEA 2000 network. Do not install this cable if there is an existing NMEA 2000 network on your boat (page 13). The NMEA 2000 power cable must be connected to a 9–16 Vdc power source.
❹	NMEA 2000 network	The GHC 20 and the CCU must be connected to the NMEA 2000 network using the included T-connectors (page 12). If there is not an existing NMEA 2000 network on your boat, you can build one using the supplied cables and connectors (page 13).
❺	CCU	Mount the CCU with the cables pointing straight down (page 10).
❻	Boat Tachometer	For tachometer connection, see page 11.
❼	ECU	The ECU can be mounted in any orientation.
❽	ECU power cable	The ECU can be connected to a 12–24 Vdc power source. To extend this cable, use the correct wire gauge (page 10). The black wire from the GHC 20 data cable must be connect to the same ground as this cable (page 12).
❾	CCU/ECU interconnect cable	In order for the autopilot to turn on, the yellow wire from this cable must be connected to the yellow wire from the GHC 20 data cable. To extend this cable to reach the ECU, purchase the necessary extensions (page 4). The red and blue wires from this cable must be connected to the alarm (page 11).

## Single-helm Layout Guidelines

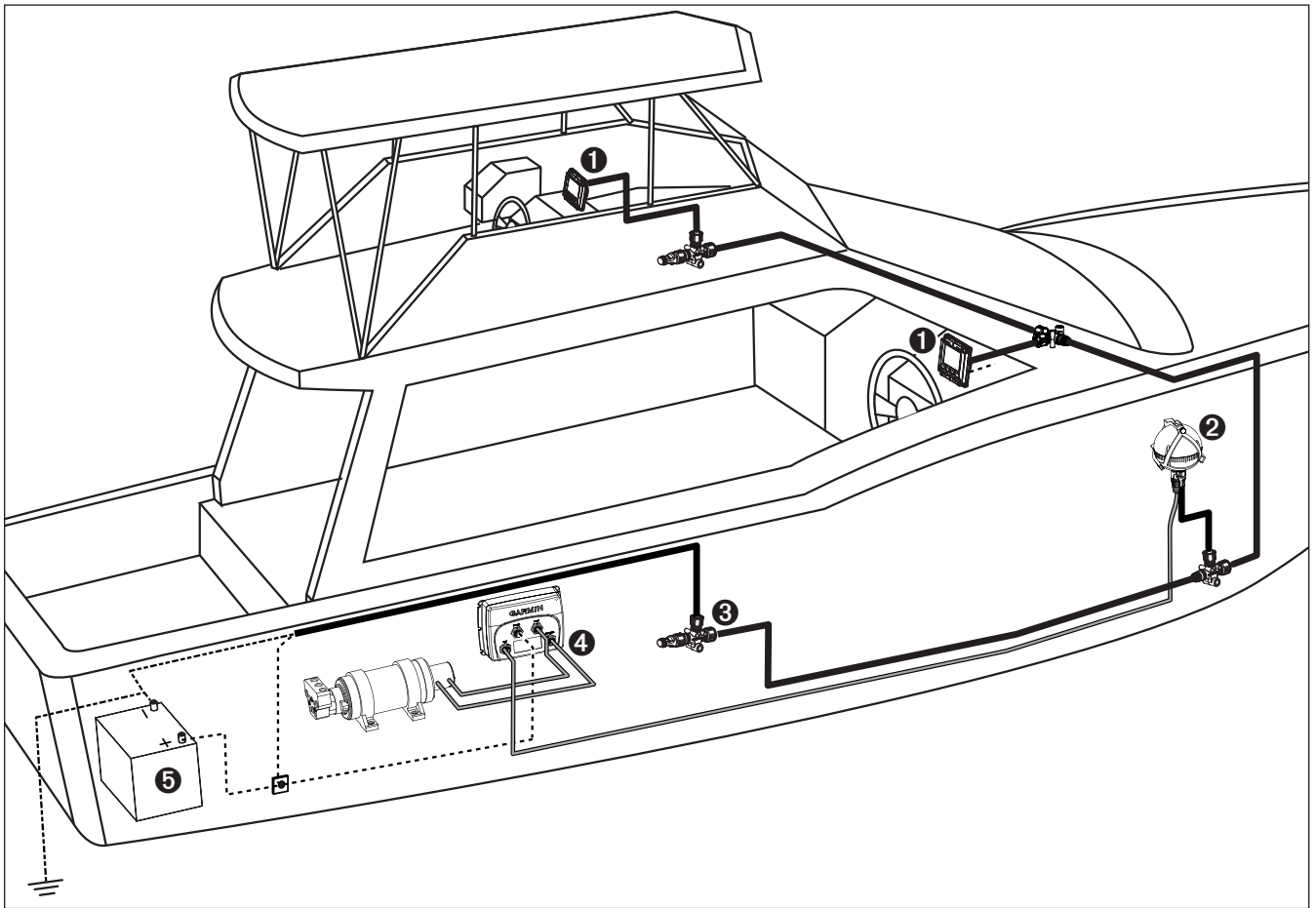


**NOTE:** This diagram is for planning purposes only. Specific connection diagrams are included in the detailed installation instructions for each component. Hydraulic connections are not shown in this diagram.

Item	Description	Important Considerations
❶	GHC 20	In order for the autopilot to turn on, the yellow wire from the GHC 20 data cable must be connected to the yellow wire from the CCU/ECU interconnect cable, and the black wire from the GHC 20 data cable must be connected to the same ground as the ECU (page 12).
❷	CCU	The CCU must be installed in the front half of the boat, no higher than 10 ft. (3 m) above the waterline.
❸	NMEA 2000 network	The GHC 20 and the CCU must be connected to the NMEA 2000 network using the included T-connectors (page 12). If there is not an existing NMEA 2000 network on your boat, you can build one using the supplied cables and connectors (page 13).
❹	12-24 Vdc battery	The ECU can be connected to a 12-24 Vdc power source. The NMEA 2000 power cable must be connected to a 9-16 Vdc power source.
❺	ECU	The ECU can be connected to either a 12 or a 24 Vdc battery.



## Dual-helm Layout Guidelines



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

Item	Description	Important Considerations
❶	GHC 20	In order for the autopilot to turn on, the yellow wire from the GHC 20 data cable must be connected to the yellow wire from the CCU/ECU interconnect cable, and the black wire from the GHC 20 data cable must be connected to the same ground as the ECU ( <a href="#">page 12</a> ).
❷	CCU	The CCU must be installed in the front half of the boat, no higher than 10 ft. (3 m) above the waterline.
❸	NMEA 2000 network	The GHC 20 and the CCU must be connected to the NMEA 2000 network using the included T-connectors ( <a href="#">page 12</a> ). If there is not an existing NMEA 2000 network on your boat, you can build one using the supplied cables and connectors ( <a href="#">page 13</a> ).
❹	ECU	The ECU can either be connected to a 12 or a 24 Vdc battery.
❺	12-24 Vdc battery	The ECU can be connected to a 12–24 Vdc power source. The NMEA 2000 power cable must be connected to a 9–16 Vdc power source.

## Installation Procedures

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

### Shadow Drive Installation

To install the Shadow Drive, connect it to the hydraulic steering line of your boat and connect it to the CCU/ECU interconnect cable.

#### Connecting the Shadow Drive to the Hydraulics

Before you can install the Shadow Drive, you must select a location at which to connect the Shadow Drive to the hydraulic steering of your boat, after you have read and followed the mounting and connection considerations (page 5). For more information, consult the hydraulic-layout diagrams found in the installation instructions included in the pump box.

Use the included connectors to install the Shadow Drive in the hydraulic line.

#### Connecting the Shadow Drive

When connecting the Shadow Drive to the hydraulic system, follow the important considerations (page 5).

To connect the Shadow Drive, connect it to the CCU/ECU interconnect cable.

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. Connect the cables, based on the table below.

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

3. Solder and cover all bare-wire connections.

### ECU Installation

To install the ECU, mount it to your boat (page 10), connect it to the pump and to the CCU (page 11), and connect it to the boat battery (page 10).

#### ECU on a 24 Vdc System

The ECU hardware has been updated to function with 24 Vdc electrical systems, though older ECU units run on only 12 Vdc electrical systems. To determine if your ECU is compatible with a 24 Vdc system, examine the serial number on the ECU (page 5).

**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

Before you can install the ECU, you must select a mounting location and determine the correct mounting hardware (page 5).

1. Cut out the mounting template provided on page 23.
2. Tape the template to the mounting location.
3. Drill pilot holes at the four mounting locations.
4. Use screws to mount the ECU.

### Connecting the ECU to Power

#### 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.

You should connect the ECU power cable directly to the boat battery if possible. Although it is not recommended, if you connect the power cable to a terminal block or other source, connect it through a 40 A fuse.

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 instead of extending the ECU power cable.

1. Route the connector-terminated end of the ECU power cable to the ECU, but do not connect it to the ECU.
2. Route the bare-wire end of the ECU power cable to the boat battery. If the wire is not long enough, it can be extended.
3. Determine the correct wire gauge for an extended run, based on the table below.

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

4. Connect the black wire (-) to the negative (-) terminal of the battery.
5. Connect the red wire (+) to the positive (+) terminal of the battery.
6. Do not connect the ECU power cable to the ECU.

**Connect the power cable to the ECU only after you install all of the other GHP 10 components.**

### CCU Installation

To install the CCU, you must mount it to your boat (page 10), connect it to the ECU (page 11), connect it to a NMEA 2000 network (page 12), and connect it to the alarm (page 11) and to the yellow CCU signal wire on the GHC 20 (page 11).

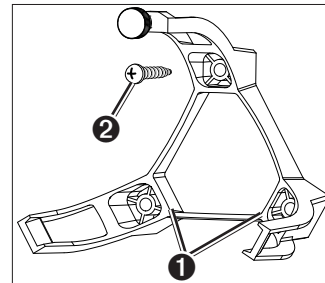
#### Installing the CCU Mounting Bracket

Before you can mount the CCU, you must select a location and determine the correct mounting hardware (page 5).

The CCU bracket has two portions, the mounting portion and the securing portion.

1. Cut out the mounting template provided on page 23.
2. Tape the template to the mounting location.

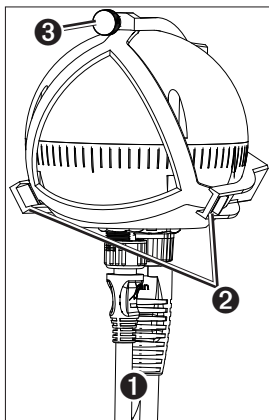
If you are installing the CCU on a vertical surface, install the mounting portion of the bracket with an opening ① at the bottom.



3. Drill pilot holes at the three mounting locations.
4. Use screws ② to secure the mounting portion of the CCU bracket.

## Securing 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 **1**.
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 **2** that do not have the thumbscrew **3**.
4. With the cables hanging straight down, 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.



## Connecting the CCU

1. Route the six-pin connector end of the CCU/ECU interconnect cable to the ECU and make the connection.
2. Route the wires from the bare-wire portion of the cable to the CCU/ECU interconnect cable.
  - Route the red and blue wires to the location where you plan to install the alarm (page 11).  
If the cable is not long enough, extend the appropriate wires with 28 AWG (.08 mm<sup>2</sup>) wire.
  - Route the yellow wire to the location where you plan to install the GHC 20 (page 11).  
If the cable is not long enough, extend the yellow wire with 22 AWG (.33 mm<sup>2</sup>) wire.
3. Cut and tape the remaining bare wires; they are not used.

## Connecting the GHP to the Tachometer

1. If you are connecting analog tachometry, identify the location and connection assignments for 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. Connect the cables, based on the table below.

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

4. 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.  
**NOTE:** For three or more outboard engines, connect to the outermost port and starboard engines, according to the table.
5. Solder and cover all bare-wire connections.

## Alarm Installation

The alarm audibly alerts you to important GHP 10 events.

To install the alarm, you must mount it to your boat (page 10), connect it to the CCU (page 10), and connect it to the yellow CCU signal wire on the GHC 20 (page 11).

### Mounting the Alarm

Before you can mount the alarm, you must select a mounting location (page 5).

Secure the alarm with cable ties or other appropriate mounting hardware (not included).

### Connecting the Alarm

1. Route the alarm-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 (.08 mm<sup>2</sup>) wire.
2. Connect the cables, based on the table below.
 

Alarm Wire Color	CCU/ECU Interconnect Cable Wire Color
White (+)	Red (+)
Black (-)	Blue (-)
3. Solder and cover all bare-wire connections.

## GHC 20 Installation

Install the GHC 20 by flush-mounting it in the dashboard near the helm, connecting it to the yellow wire from the CCU/ECU interconnect cable, and connecting it to a NMEA 2000 network.

To use advanced features of the GHP 10, optional NMEA 2000-compatible or NMEA 0183-compatible devices, such as a GPS device, can be connected to the NMEA 2000 network or connected to the GHC 20 through NMEA 0183.

### Mounting the GHC 20

#### NOTICE

The temperature range for the GHC 20 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.

If you are mounting the GHC 20 in fiberglass, when drilling the four pilot holes, 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.

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.

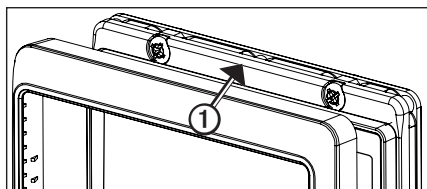
Before you can mount the GHC 20, you must select a mounting location (page 5).

1. Trim the flush-mount template and ensure it will fit in the location where you plan to mount the GHC 20.  
The flush-mount template is included in the product box, not in these instructions.  
The flush-mount template has adhesive on the back.
2. Remove the protective liner from the adhesive on the back of the template and apply it to the location where you plan to mount the GHC 20.

3. If you will be cutting the hole with a jigsaw instead of a 3<sup>17</sup>/<sub>32</sub> 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 3.5 in. (90 mm) hole saw, cut the mounting surface along the inside of the dashed line indicated on the flush-mount template.
5. If necessary, use a file and sandpaper to refine the size of the hole.
6. Place the GHC 20 into the cutout to confirm that the four mounting holes are correct.
7. Select an option:
  - If the mounting holes are correct, proceed to step 8.
  - If the mounting holes are not correct, mark the correct locations of the four mounting holes.
8. Remove the GHC 20 from the cutout.
9. Drill the four 7/64 in. (2.8 mm) pilot holes.
 

If you are mounting the GHC 20 in fiberglass, use a countersink bit as advised in the notice.
10. Remove the remainder of the template.
11. Place the included gasket on the back of the device and apply marine sealant around the gasket to prevent leakage behind the dashboard.
12. Place the GHC 20 into the cutout.
13. Securely fasten the GHC 20 to the mounting surface using the supplied screws.
 

If you are mounting the GHC 20 in fiberglass, use an anti-galling lubricant as advised in the notice.
14. Snap the decorative bezel ① into place.



### Connecting the GHC 20

For the autopilot system to function correctly, you must connect two wires from the GHC 20 data cable (yellow and black).

1. Connect the yellow wire from the GHC 20 data cable to the yellow wire from the CCU/ECU interconnect cable.
 

If the cable is not long enough, extend the yellow wire with 22 AWG (.33 mm<sup>2</sup>) wire.
2. Connect the black wire from the GHC 20 data cable to the same ground location as the ECU.
 

If the cable is not long enough, extend the black wire with 22 AWG (.33 mm<sup>2</sup>) wire.
3. Solder and cover all bare-wire connections.

### Multiple GHC 20 Considerations

You can install multiple GHC 20 devices (sold separately) to control the autopilot from different locations on the boat.

- All additional GHC 20 devices must be connected to the NMEA 2000 network (page 12).
- To use an additional GHC 20 to turn on the autopilot, connect the yellow and black wires from the additional GHC 20 to the same wires as the primary GHC 20.
  - If you connect additional GHC 20 devices to turn on the autopilot, you must turn them all off to turn off the autopilot.
  - If you do not connect an additional GHC 20 to turn on the

autopilot, then the additional GHC 20 enters standby mode when you turn it off, and the autopilot remains on until turned off by the primary GHC 20.

## Connecting the Devices to a NMEA 2000 Network

### 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.

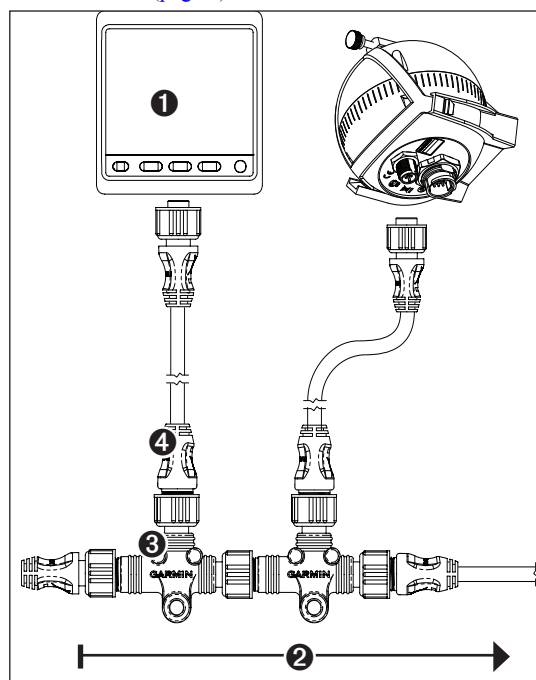
You can connect the GHC 20 to the CCU through an existing NMEA 2000 network. If you do not have an existing NMEA 2000 network on your boat, all the parts needed to build one are supplied in the GHP 10 package (page 13).

To use advanced features of the GHP 10, optional NMEA 2000-compatible devices, such as a GPS device, can be connected to the NMEA 2000 network.

For more information on NMEA 2000, go to [www.garmin.com](http://www.garmin.com).

### Connecting the GHC 20 to an Existing NMEA 2000 Network

1. Determine where to connect the GHC 20 ① to your existing NMEA 2000 backbone ② (page 5).



2. Disconnect one side of a NMEA 2000 T-connector from the network.
3. If necessary, to extend the NMEA 2000 network backbone, connect a NMEA 2000 backbone extension cable (not included) to the side of the disconnected T-connector.
4. Add the included T-connector ③ for the GHC 20 to the NMEA 2000 backbone by connecting it to the side of the disconnected T-connector or backbone extension cable.
5. Route the included drop cable ④ to the bottom of the T-connector added in step 4, and connect it to the T-connector.
 

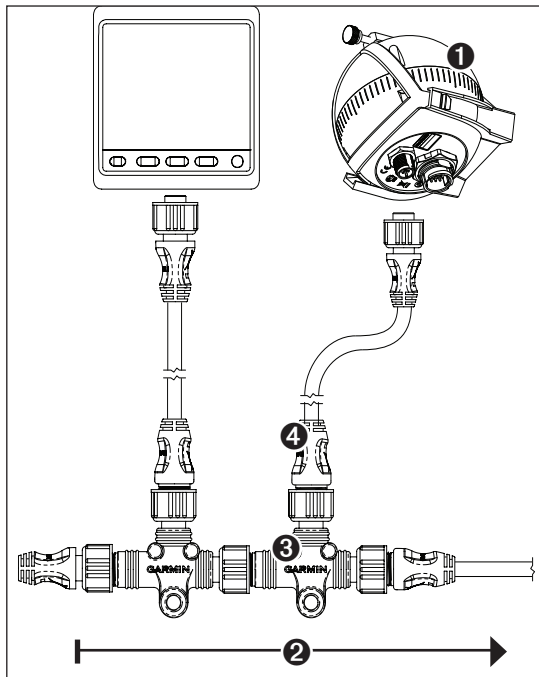
If the included drop cable is not long enough, you can use a drop cable up to 20 ft. (6 m) long (not included).
6. Connect the drop cable to the to the GHC 20.

- Connect the drop cable to the T-connector you added in step 3, and to the GHC 20.

**NOTE:** In order for the autopilot to turn on, the yellow wire from the GHC 20 data cable be connected to the yellow wire from the CCU/ECU interconnect cable, and the black wire from the GHC 20 data cable must be connected to the same ground as the ECU (page 12).

### Connecting the CCU to an Existing NMEA 2000 Network

- Determine where to connect the CCU ① to your existing NMEA 2000 backbone ② (page 5).



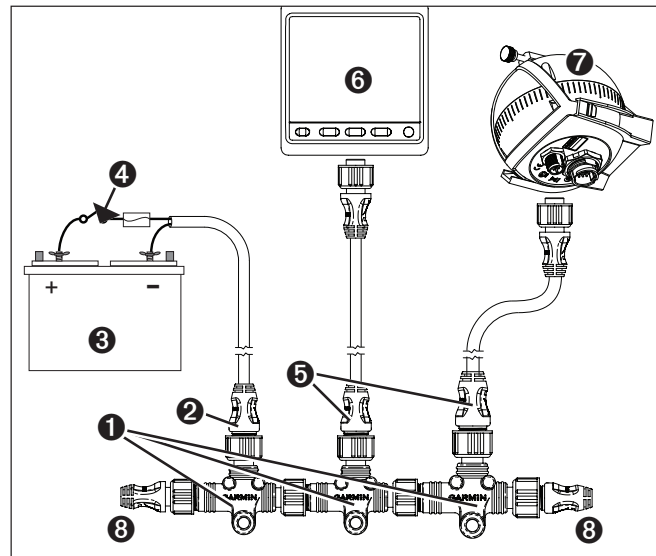
- Disconnect one side of a NMEA 2000 T-connector from the network.
- If necessary, to extend the NMEA 2000 network backbone, connect a NMEA 2000 backbone extension cable (not included) to the side of the disconnected T-connector.
- Add the included T-connector ③ for the CCU to the NMEA 2000 backbone by connecting it to the side of the disconnected T-connector or backbone extension cable.
- Route the included drop cable ④ to the bottom of the T-connector added in step 4, and connect it to the T-connector.  
If the included drop cable is not long enough, you can use a drop cable up to 20 ft. (6 m) long (not included).
- Connect the drop cable to the to the CCU.

### Building a Basic NMEA 2000 Network for the GHC 20 and the CCU

#### NOTICE

You must connect the included NMEA 2000 power cable to the boat ignition switch, or through another in-line switch. The GHC 20 will drain your battery if the NMEA 2000 power cable is connected to the battery directly.

- Connect the three T-connectors ① together by their sides.



- Connect included NMEA 2000 power cable ② to a 12 Vdc power source ③ through a switch.  
Connect to the ignition switch ④ of the boat if possible, or through an in-line switch (not included).
- Connect the NMEA 2000 power cable to one of the T-connectors.
- Connect one of the included NMEA 2000 drop cables ⑤ to one of the T-connectors and to the GHC 20 ⑥.
- Connect the other included NMEA 2000 drop cable to the other T-connector and to the CCU ⑦.
- Connect the male and female terminators ⑧ to each end of the combined T-connectors.

**NOTE:** The GHC 20 must connect to the CCU with the yellow CCU signal wire in the GHC 20 data cable. The black wire must connect to ECU ground (page 12).

## Connecting Optional Devices to the GHP 10 Autopilot System

To use advanced features of the GHP 10, optional NMEA 2000-compatible or NMEA 0183-compatible devices, such as a GPS device, can be connected to the NMEA 2000 network or to the GHC 20 through NMEA 0183.

### NMEA 0183 Connection Considerations

- To identify the Transfer (Tx) A(+) and B(-) wires for your NMEA 0183-compatible device, consult the installation instructions for your device.
- 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.
- 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.

### Connecting an Optional NMEA 0183-compatible Device to the GHC 20

1. Determine the NMEA 0183 connection assignments of your NMEA 0183-compatible device.
2. Connect your NMEA 0183-compatible device to the GHC 20, based on the table below.

GHC 20 Data Cable Wire Color	Function
Black	CCU signal ground
Yellow	CCU signal
Blue	Tx/A (+)
White	Tx/B (-)
Brown	Rx/A (+)
Green	Rx/B (-)

Three examples of various connection situations are provided in the appendix (page 18).

3. If necessary, use 22 AWG (.33 mm<sup>2</sup>) twisted-pair wire for extended runs of wire.
4. Solder and cover all bare-wire connections.

## 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 20 to configure the GHP 10. These wizards walk you through the necessary configuration steps.

### About the Dockside Wizard

#### NOTICE

If you perform the Dockside Wizard while your boat is out of the water, provide rudder-movement clearance to avoid damage to the rudder or other objects.

You can complete the Dockside Wizard while your boat is in or out of the water. If your boat in the water, it must be stationary while you complete the wizard.

### Starting the Dockside Wizard

1. Turn on the GHP 10.  
The first time you turn on the GHP 10, you are prompted to complete a short setup sequence on the GHC 20.
2. If necessary, complete the setup sequence.
3. After you complete the initial setup, select an option:
  - If the Dockside Wizard starts automatically, proceed to step 4.
  - If the Dockside Wizard does not start automatically, select **Menu > Setup > Dealer Autopilot Configuration > Wizards > Dockside Wizard**.
4. Select **Begin**.

### Performing the Dockside Wizard

1. Start the Dockside Wizard (page 14).
2. Select the vessel type.
3. Select the number turns it takes for your helm to go from lock to lock (page 14).
4. Select the helm displacement (page 14).
5. Test the steering direction (page 14).
6. Select the speed source (page 15).
7. If necessary, verify the tachometer (page 15).
8. Review the wizard results (page 15).

### Calibrating Lock-to-Lock Turns

1. Count the number of turns it takes your helm to go from lock to lock (fully turned port to fully turned starboard).
2. Use the arrows on the GHC 20 to enter the turns you counted (the default is 4.5).
3. Select **Done**.

### Calibrating 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.

1. Use the arrows on the GHC 20 to enter the helm displacement value (the default is 1.7 in<sup>3</sup>).
2. Select **Done**.

### Testing the Steering Direction

1. Use the arrows on the GHC 20 to test the steering direction.  
When you select the right arrow, the rudder should turn so that the boat would steer to the right, and when you select the left arrow, the rudder should turn so that the boat would steer to the left.

2. Select **Continue**.
3. Select an option:
  - If the steering test turns the boat in the correct direction, select **Yes**.
  - If the steering test turns the boat in the opposite direction, select **No**.
4. If you selected **No** in step 3, repeat steps 1–2.

**NOTE:** If it is incorrect, the steering direction can also be changed during the autotune procedure ([page 16](#)).

### Selecting the Speed Source

Select an option:

- If you connected a NMEA 2000-compatible engine (or engines) to the NMEA 2000 network, select **NMEA 2000**.
- If you did not connect a NMEA 2000-compatible engine (or engines), select the engine (or engines) to which you connected the tachometer sensor from the CCU.
  - For a single-engine boat, select **Port**.
- If tachometer data is unavailable or unusable, select GPS data as a speed source.
  - When GPS data is used as a speed source, the maximum speed for all vessel types must be configured.
- If you did not connect a speed source, select **None**.
  - If the autopilot does not perform well using None as the speed source, Garmin recommends connecting a tachometer or GPS as the speed source.

### Verifying the Tachometer

This procedure does not appear if GPS or None is selected as the speed source.

1. With the engine (or engines) running, compare the RPM readings on the GHC 20 with the tachometer (or tachometers) on the dashboard of your boat.
2. If the values do not match, use the arrows to adjust the **Pulses Per Rev** values.

**NOTE:** When you adjust the Pulses Per Rev with the arrows, there is a delay before the new RPM readings appear on the GHC 20. Ensure you wait until the GHC 20 adjusts to the new reading for each adjustment.

### Reviewing the Results of the Dockside Wizard

The GHC 20 displays the values you chose when you ran the Dockside Wizard.

1. Examine the results of the Dockside Wizard.
2. Select any incorrect value and select **Select**.
3. Correct the value.
4. Repeat steps 2 and 3 for all incorrect values.
5. When you are finished reviewing the values, select **Done**.

### About 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.

### Important Sea Trial Wizard Considerations

Complete the Sea Trial Wizard in calm water. The nature of calm water is relative to the size and shape of your boat.

- Ensure your boat does not rock while sitting still or moving very slowly.

- Ensure your boat is not significantly affected by the wind.
- **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.**

### Starting the Sea Trial Wizard

Before you start the Sea Trial Wizard, you must drive to an open area of calm water.

1. Turn on the GHP 10.
2. Select an option:
  - If the Sea Trial Wizard starts automatically, proceed to step 3.
  - If the Sea Trial Wizard does not start automatically, select **Menu > Setup > Dealer Autopilot Configuration > Wizards > Sea Trial Wizard**.
3. Select **Begin**.

### Performing the Sea Trial Wizard

1. Drive your boat to an open area of calm water.
2. Start the Sea Trial Wizard ([page 15](#)).
3. If necessary, configure the planing RPM ([page 15](#)).
4. If necessary, configure the planing speed ([page 15](#)).
5. If necessary, configure the high RPM limit ([page 15](#)).
6. If necessary, configure the maximum speed ([page 15](#)).
7. Calibrate the compass ([page 16](#)).
8. Perform the autotune procedure ([page 16](#)).
9. Set north ([page 16](#)).
10. If necessary, set the fine heading adjustment ([page 16](#)).

### Configuring the Planing RPM

**NOTE:** This procedure does not appear if you select displacement hull as your vessel type, or if you select None as the speed source.

1. Note the RPM reading from the tachometer on the dashboard of your boat at the point your boat transitions from displacement to planing speed.
2. If the tachometer value does not match the value on the GHC 20, use the arrows to adjust the value.
3. Select **Done**.

### Configuring the Planing Speed

**NOTE:** This procedure appears only when GPS is selected as the speed source and Planing Hull is selected as the vessel type.

1. Use the arrows on the GHC 20 to adjust the value.
2. Select **Done**.

### Configuring the High RPM Limit

**NOTE:** This procedure appears only when GPS is selected as the speed source.

1. Use the arrows on the GHC 20 to adjust the value.
2. Select **Done**.

### Configuring the Maximum Speed

**NOTE:** The procedure appears only when GPS is selected as the speed source.

1. Use the arrows on the GHC 20 to adjust the value.
2. Select **Done**.

## Calibrating the Compass

1. Drive your boat at cruising speed in a straight line.
2. Select **Begin**, and continue to drive in a straight line.
3. When instructed, turn the boat slowly clockwise, taking care to make the turn **as steady and flat** as possible.

**Turn slowly so that the boat DOES NOT list.**

After you successfully complete the calibration, the GHC 20 displays a completion message.

4. Select an option:
  - If the calibration completes successfully, select **Done**.
  - If the calibration fails, select **Retry** and repeat steps 1–3.

## Performing the Autotune Procedure

Before you can perform the autotune procedure, you must have a large stretch of open water available.

1. If you have a non-planing vessel, adjust the throttle so the boat travels at a typical cruising speed that provides responsive steering.

If you have a planing vessel, adjust the throttle so the boat travels below planing speed.

2. Select **Begin**.

The boat performs a number of zigzag motions while the Autotuning is in progress.

The GHC 20 displays a completion message.

3. Select an option:
  - If the autotune completed successfully, select **Done** and take manual control of the boat.
  - If the autotune failed, adjust the throttle and select **Retry Autotune**.
  - If the autotune failed, and the rudder went hard over or the boat went in a circle, select **Reverse Steering Dir. and Retry**.
  - If you receive an **Error: ECU Drive Circuit Overload**. See **manual for tips on reducing load** error message, see the tips on [page 17](#).
4. If autotune fails again, repeat steps 1–3 until the autotune completes successfully.
5. If the autotune procedure continues to fail after you reach maximum cruising speed, reduce your speed to the initial autotune speed and select **Alternate Autotune** to begin an alternate autotuning procedure.

## Setting North

Before you can set north, you must have at least 45 seconds of hazard-free, open water available.

This procedure appears if you connect an optional GPS device to the GHP 10 ([page 14](#)), and the device has acquired a GPS position. If you do not have a GPS device connected, you are prompted to set the fine heading adjustment ([page 16](#)).

1. Drive the boat in a straight line at cruising speed, and select **Begin**.  
The GHC 20 displays a completion message when the calibration is complete.
2. Select an option:
  - If the calibration completed successfully, select **Done**.
  - If the calibration failed, repeat steps 1–2.

## Setting the Fine Heading Adjustment

This procedure appears only if you do not have an optional GPS device connected to the GHP 10 ([page 14](#)). If you do have a GPS device installed on your boat that has acquired a GPS position, are prompted to set north instead ([page 16](#)).

1. Using a handheld compass, identify north.
2. Adjust the fine heading setting until it matches north on the magnetic compass.
3. Select **Done**.

## Evaluating the Results of the Autopilot Configuration

1. Test the autopilot at a slow speed.
2. If necessary, adjust the gain setting ([page 17](#)).
3. If you receive an **Error: ECU Drive Circuit Overload**. See **manual for tips on reducing load** error message, see the tips on [page 17](#).
4. Test the autopilot at a higher speed (normal operating conditions).
5. If necessary, adjust the gain and acceleration limiter settings.

## Testing and Adjusting 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 and observe the behavior.

The boat should turn smoothly, not too quickly or too slowly.

When you turn the boat using the autopilot, the boat should approach and settle on the desired heading with minimal overshoot and oscillation.

3. Select an option:
  - If the boat turns too quickly or too sluggishly, adjust the autopilot acceleration limiter ([page 16](#)).
  - If the heading hold oscillates significantly or the boat does not correct when turning, adjust the autopilot gain ([page 17](#)).
  - If you receive an **Error: ECU Drive Circuit Overload**. See **manual for tips on reducing load** error message, see the tips on [page 17](#).
  - If the boat turns smoothly, the heading hold oscillates only slightly or not at all, and the boat adjusts the heading correctly, proceed to step 5.
4. Repeat steps 2 and 3 until the boat turns smoothly the heading hold oscillates only slightly or not at all, and the boat adjusts the heading correctly.
5. For planing vessels, repeat steps 1–4 at faster speeds ([page 16](#)).

## Adjusting the Acceleration Limiter Settings

**NOTE:** When you manually adjust the acceleration limiter, make relatively small adjustments. Test the change before making additional adjustments.

1. Enable the advanced configuration procedure ([page 17](#)).
2. On the GHC 20, select **Menu > Setup > Dealer Autopilot Configuration > Autopilot Tuning > Acceleration Limiter**.
3. Select an option:
  - Increase the setting if the autopilot turns too quickly,
  - Decrease the setting if the autopilot turns too slowly.
4. Test the autopilot configuration.
5. Repeat steps 2 and 3 until the GHP 10 performance is satisfactory.



## Adjusting the Autopilot Gain Settings

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

1. Enable the advanced configuration procedure ([page 17](#)).
2. On the GHC 20, select **Menu > Setup > Dealer Autopilot Configuration > Autopilot Tuning > Rudder Gains**.
3. Select an option:
  - Select **Low Speed** or **High Speed** and use the arrows on the GHC 20 to adjust how tightly the rudder holds the heading and makes turns at low speed or high speed.  
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 drive unit, and drains the battery at a faster-than-normal rate.
  - Select **Low Speed Counter** or **High Speed Counter** to adjust 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.
4. Test the autopilot configuration.
5. Repeat steps 2 and 3 until the GHP 10 performance is satisfactory.

## Reducing the Risk of ECU Drive Circuit Overload

If you receive an **Error: ECU Drive Circuit Overload**. See **manual for tips on reducing load** error message, use these tips to help reduce the load:

- Ensure the appropriate pump has been correctly installed on your boat.
- If possible, use larger inside diameter hydraulic hoses on your steering system.
- Mount the pump closer to the cylinder to limit the length of the hose runs.
- Eliminate unneeded hydraulic fittings in the hydraulic fittings.
- If overloading occurs during the autotune procedure, skip the procedure and manually tune the autopilot.
- Increase the rudder rate limiter setting to slow the fluid rate.
- Reduce rudder gain to limit pump activity.

## Adjusting the Rudder Rate Limiter

If the **ECU Drive Circuit Overload**. See **manual for tips on reducing load** error message continues to appear, you may need to adjust the rudder rate limiter.

**NOTE:** Complete rudder rate adjustments only at the dock or while your boat is not moving.

**NOTE:** If you adjust the rudder rate limiter, you must perform the autotune procedure.


1. Enable the advanced configuration procedure ([page 17](#)).
2. On the GHC 20, select **Menu > Setup > Dealer Autopilot Configuration > Autopilot Tuning > Rudder Rate Limiter**.
3. Select **Continue**.  
Autopilot takes control of the rudder.
4. Use the arrows on the GHC 20 to adjust the speed of the limiter.
  - 0% is the default speed for the rudder rate limiter.
  - Lower rudder rate limiter numbers allow the rudder to move faster between the right rail and left rail.
  - Lower rudder rate limiter numbers increase the running current.
  - Higher rudder rate limiter numbers decrease the running current.

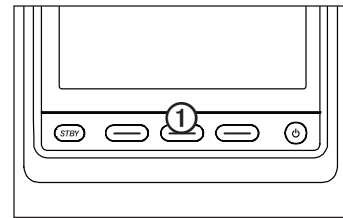
5. Select **Done**.
6. Test the rudder rate limiter settings.
7. Repeat steps 2–6 until rudder rate limiter performance is satisfactory.
8. Perform the autotune procedure.

## Advanced Configuration Procedure

Advanced configuration options are not available on the GHC 20 under normal conditions. To access the advanced configuration settings of the GHP 10, enable the advanced configuration procedure.

### Enabling the Advanced Configuration Procedure

1. From the heading screen, select **Menu > Setup > System > System Information**.
2. Press and hold the center soft key  for 5 seconds.  
Dealer Mode appears.



3. Press **Back > Back**.

If the option for Dealer Autopilot Configuration is available on the Setup screen, the advanced configuration procedure is enabled.

## Advanced Configuration Settings

You can run the Autotune automated configuration process, calibrate the compass, and define north on the GHP 10 through the GHC 20 without running the wizards. You can also define each setting individually, without running the configuration processes.

### Manually Running the Automated Configuration Procedures

1. Enable the advanced configuration procedure ([page 17](#)).
2. From the Heading screen, select **Menu > Setup > Dealer Autopilot Configuration > Automated Setup**.
3. Select **Autotune**, **Calibrate Compass**, or **Set North**.
4. Follow the on-screen instructions ([page 14](#)).

### 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. After running the wizards, if you do not feel the GHP 10 is working correctly, you can run the wizards again at any time. To access the wizards, enable the advanced configuration procedure ([page 17](#)).

### Manually Defining Individual Configuration Settings

1. Enable the advanced configuration procedure ([page 17](#)).
2. From the Heading screen, select **Menu > Setup > Dealer Autopilot Configuration**.
3. Select the setting category.
4. Select a setting to configure.  
Descriptions of each setting are available in the appendix ([page 20](#)).
5. Configure the value of the setting.

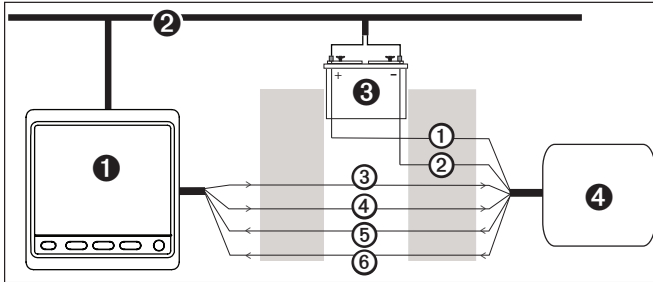
**NOTE:** Configuring certain settings in the advanced configuration procedure may require you to modify other settings. Review the GHP 10 Configurations Settings section ([page 20](#)) prior to modifying any settings.

# Appendix

## NMEA 0183 Connection Diagrams

The following three connection diagrams are examples of different situations you may encounter when connecting your NMEA 0183 device to the GHC 20.

### Example One of Three: Two-way NMEA 0183 Communication



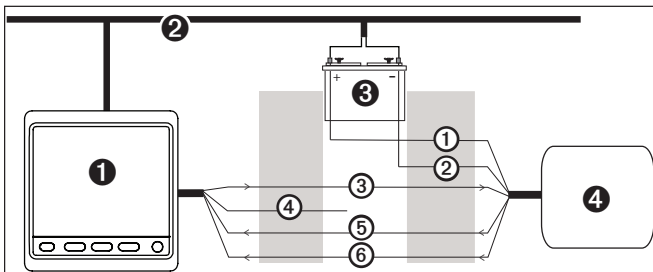
1	GHC 20
2	NMEA 2000 network (provides power to the GHC 20)
3	12 VDC power source
4	NMEA 0183-compatible device

Wire	GHC 20 Wire Color - Function	NMEA 0183-Compatible Device Wire Function
1	N/A	Power
2	N/A	NMEA 0183 ground
3	Blue - Tx/A (+)	Rx/A (+)
4	White - Tx/B (-)	Rx/B (-)
5	Brown - Rx/A (+)	Tx/A (+)
6	Green - Rx/B (-)	Tx/B (-)

**NOTE:** 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.

### Example Two of Three: Only One Receiving Wire

If your NMEA 0183-compatible device has only one receiving wire (Rx), connect it to the blue wire (Tx/A) from the GHC 20, and leave the white wire (Tx/B) from the GHC 20 unconnected.



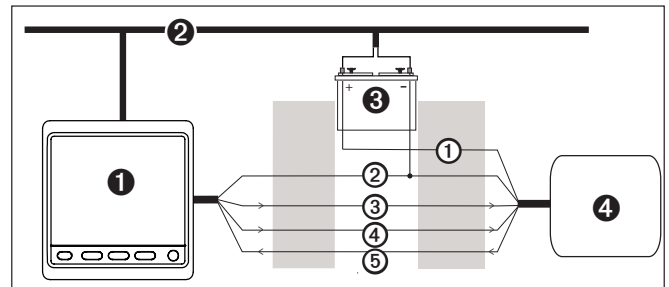
1	GHC 20
2	NMEA 2000 network (provides power to the GHC 20)
3	12 VDC power source
4	NMEA 0183-compatible device

Wire	GHC 20 Wire Color - Function	NMEA 0183-Compatible Device Wire Function
1	N/A	Power
2	N/A	NMEA 0183 ground
3	Blue - Tx/A (+)	Rx
4	White - unconnected	N/A
5	Brown - Rx/A (+)	Tx/A (+)
6	Green - Rx/B (-)	Tx/B (-)

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

### Example Three of Three: Only One Transmitting Wire

If your NMEA 0183-compatible device has only one transmitting wire (Tx), connect it to the brown wire (Rx/A) from the GHC 20, and connect the green wire (Rx/B) from the GHC 20 to NMEA ground.



1	GHC 20
2	NMEA 2000 network (provides power to the GHC 20)
3	12 VDC power source
4	NMEA 0183-compatible device

Wire	GHC 20 Wire Color - Function	NMEA 0183-Compatible Device Wire Function
1	N/A	Power
2	Green - Rx/B - connect to NMEA 0183 ground	NMEA 0183 ground
3	Blue - Tx/A (+)	Rx/A (+)
4	White - Tx/B (-)	Rx/B (-)
5	Brown - Rx/A (+)	Tx/A (+)

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

## Specifications

Device	Specification	Measurement
ECU	Dimensions	(W × H × D) 6 19/32 × 4 19/32 × 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)
	Input power	11.5–30 Vdc
	Fuse	40 A, blade-type
	Main power usage	1 A (not including the drive unit)

Device	Specification	Measurement
CCU	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 aluminum alloy, waterproof to IEC 529 IPX7 standards
	CCU/ECU interconnect cable length	16 ft. (5 m)
	NMEA 2000 LEN	2 (100 mA)
	Alarm	Dimensions
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 20	Dimensions	4 <sup>21</sup> / <sub>64</sub> × 4 <sup>17</sup> / <sub>32</sub> × 1 <sup>3</sup> / <sub>16</sub> in. (110 × 115 × 30 mm)
	Weight	8.71 oz. (247 g)
	Cables	NMEA 0183 data cable – 6 ft. (1.8 m) NMEA 2000 drop cable and power cable – 6 <sup>1</sup> / <sub>2</sub> ft. (2 m)
	Temperature range	From 5°F to 158°F (from -15°C to 70°C)
	Compass-safe distance	8 <sup>1</sup> / <sub>4</sub> in. (209 mm)
	Material	Case: fully-gasketed polycarbonate, waterproof to IEC 60529 IPX7 standards Lens: glass with an anti-glare treatment
	GHC 20 power usage	2.5 W max.
	NMEA 2000 input voltage	9–16 Vdc
	NMEA 2000 LEN	6 (300 mA)

## NMEA 2000 PGN Information

### CCU

Type	PGN	Description
Receive	059392	ISO Acknowledgment
	059904	ISO Request
	060928	ISO Address Claim
	126208	NMEA - Command/Request/Acknowledge Group Function
	126464	Transmit/Receive PGN List Group Function
	126996	Product Information
	127258	Magnetic Variation
	127488	Engine Parameters - Rapid Update
	129025	Position - Rapid Update
	129026	COG & SOG - Rapid Update
	129283	Cross Track Error
	129284	Navigation Data

Transmit	059392	ISO Acknowledgment
	059904	ISO Request
	060928	ISO Address Claim
	126208	NMEA - Command/Request/Acknowledge Group Function
	126464	Transmit/Receive PGN List Group Function
	126996	Product Information
	127250	Vessel Heading

### GHC 20

Type	PGN	Description
Receive	059392	ISO Acknowledgment
	059904	ISO Request
	060928	ISO Address Claim
	126208	NMEA - Command/Request/Acknowledge Group Function
	126464	Transmit/Receive PGN List Group Function
	126996	Product Information
	127245	Rudder Data
	127250	Vessel Heading
	127488	Engine Parameters - Rapid Update
	128259	Water Speed
	129025	Position - Rapid Update
	129029	GNSS Position Data
	129283	Cross-Track Error
	129284	Navigation Data
	129285	Navigation - Route/WP information
	130306	Wind Data
	130576	Small Craft Status
Transmit	059392	ISO Acknowledgment
	059904	ISO Request
	060928	ISO Address Claim
	126208	NMEA - Command/Request/Acknowledge Group Function
	126464	Transmit/Receive PGN List Group Function
	126996	Product Information
	128259	Water Speed
	129025	Position - Rapid Update
	129026	COG & SOG - Rapid Update
	129283	Cross Track Error
	129284	Navigation Data
	129540	GNSS Sats in View
	130306	Wind Data

The GHP 10 and the GHC 20 are NMEA 2000 certified.



## NMEA 0183 Information

When connected to optional NMEA 0183-compatible devices, the GHC 20 uses the following NMEA 0183 sentences.

Type	Sentence
Receive	wpl
	gga
	grme
	gsa
	gsv
	rmc
	bod
	bwc
	dtm
	gll
	rmb
	vhw
	mwv
	xte
Transmit	hdg

## GHP 10 Configuration Settings

Although all of the configuration is typically completed automatically through wizards, you can manually adjust any setting ([page 17](#)).

**NOTE:** Depending upon the configuration of the autopilot, certain settings may not appear.

**NOTE:** Each time you change to the Speed Source setting, you must review the Verify Tachometer, Low RPM Limit, High RPM Limit, Planing RPM, Planing Speed, or Max Speed settings, where applicable, prior to performing the autotune procedure ([page 16](#)).

Category	Setting	Description
Dealer Autopilot Configuration	Vessel Type	Allows you to select the type of vessel on which the autopilot is installed.
Speed Source Setup	Speed Source	Allows you to select NMEA 2000 tachometer, GPS speed, or the engine (or engines) to which you connected the tachometer sensor from the CCU.
Speed Source Setup	Verify Tachometer	Allows you to compare the RPM readings on the GHC 20 with the tachometers on the dashboard of your boat.
Speed Source Setup	Planing RPM	Allows you to adjust the RPM reading on the GHC 20 at the point your boat transitions from displacement to planing speed. If the value does not match the value on the GHC 20, use the arrows to adjust the value.
Speed Source Setup	Planing Speed	Allows you to adjust the planing speed of your boat. If the value does not match the value on the GHC 20, use the arrows to adjust the value.

Category	Setting	Description
Speed Source Setup	Low RPM Limit	Allows you to adjust lowest RPM point of your boat. If the value does not match the value on the GHC 20, use the arrows to adjust the value.
Speed Source Setup	High RPM Limit	Allows you to adjust the highest RPM point of your boat. If the value does not match the value on the GHC 20, use the arrows to adjust the value.
Speed Source Setup	Max Speed	Allows you to adjust the maximum speed of your boat. If the value does not match the value on the GHC 20, use the arrows to adjust the value.
Rudder Gains	Gain	Allows you to adjust how tightly the rudder holds a 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 drive unit ( <a href="#">page 17</a> ).
Rudder Gains	Counter Gain	Allows you to adjust how tightly the rudder corrects turn overshoot. If you set this value too high, the autopilot can overshoot the turn again when attempting to counter the original turn ( <a href="#">page 17</a> ).
Rudder Gains	Low Speed Gain	Allows you to set the rudder gain for low speeds. This setting applies to the vessel when operating below planing speed. 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 drive unit ( <a href="#">page 17</a> ).
Rudder Gains	Low Speed Counter	Allows you to set the rudder gain counter-correction for low speeds. This setting applies to the vessel when operating below planing speed. 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 drive unit ( <a href="#">page 17</a> ).

Category	Setting	Description
Rudder Gains	High Speed Gain	Allows you to set the rudder gain for high speeds. This setting applies to the vessel when operating above planing speed. 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 drive unit ( <a href="#">page 17</a> ).
Rudder Gains	High Speed Counter	Allows you to set the rudder gain counter-correction for high speeds. This setting applies to the vessel when operating above planing speed. 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 drive unit ( <a href="#">page 17</a> ).
NMEA Setup	NMEA Checksum	If the connected NMEA 0183 GPS unit incorrectly calculates checksums, you may still be able to use it if you turn this setting off. When set to off, data integrity is compromised.
NMEA Setup	Reversed XTE	If the connected NMEA 0183 GPS unit sends the incorrect steering direction with the cross track error signal. You can use this setting to correct the steering direction.
Navigation Setup	Navigation Gain	Allows you to adjust how aggressively the autopilot eliminates cross-track error while following a Route-To pattern. If this value is too high, the autopilot can oscillate back and forth across the course line over long distances. If this value is too low, the autopilot may respond slowly in eliminating cross-track error.
Navigation Setup	Navigation Trim Gain	Allows you to adjust the acceptable amount of long term cross-track error while following a Route-To pattern. Only adjust this setting after the navigation gain has been set. If this value is too high, the autopilot will overcompensate for cross-track error. If this value is too low, the autopilot will allow a large long term cross-track error.

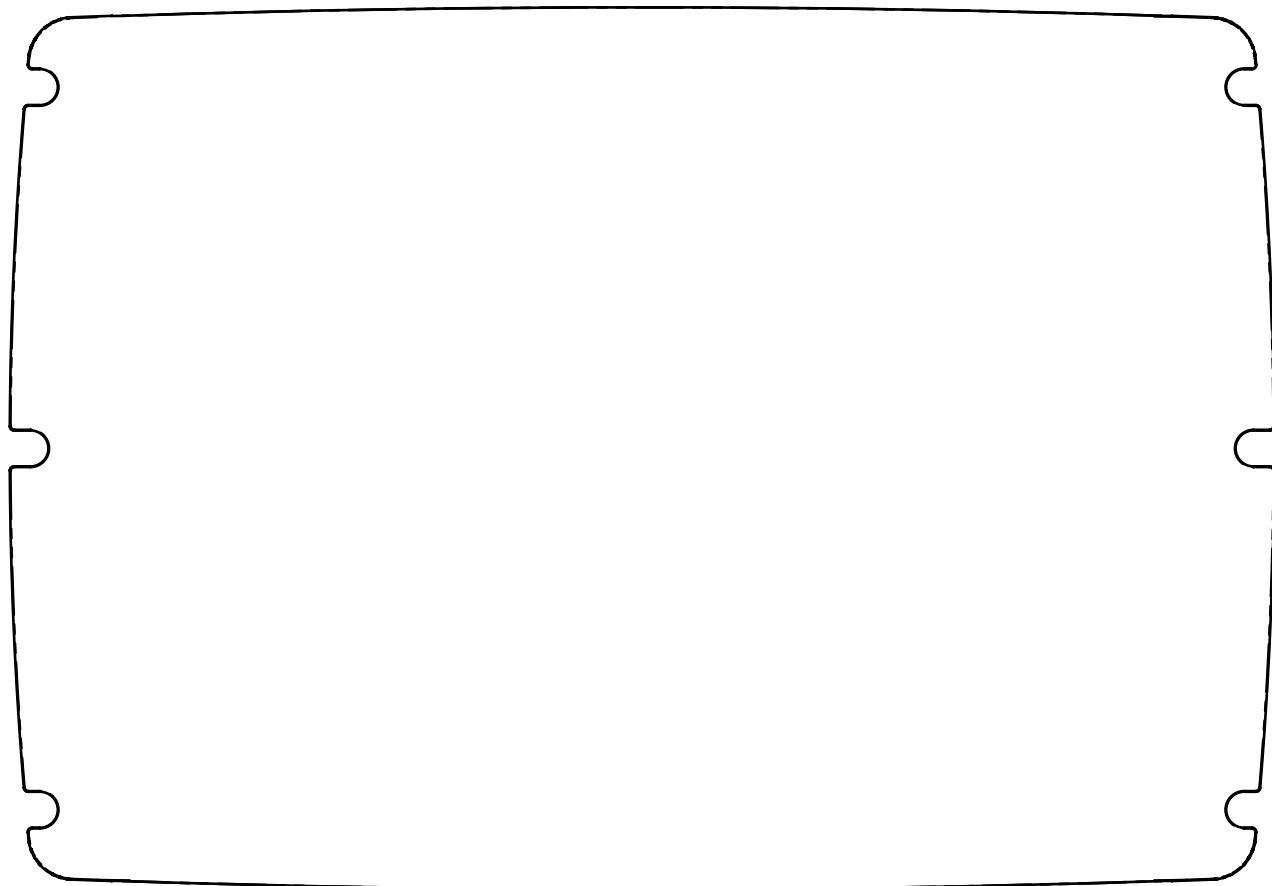
Category	Setting	Description
Steering System Setup	Verify Steering Direction	This setting tells the autopilot which direction the rudder must move to turn the vessel to port and to starboard. You can test and reverse the steering direction if necessary.
Steering System Setup	Lock-to-Lock Turns	Allows you to adjust the number of turns it takes your helm to go from lock to lock (fully turned port to fully turned starboard).
Steering System Setup	Helm Displacement	Allows you to calibrate helm displacement.
Steering System Setup	Linkage Compensation	Allows you to 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.

**NOTE:** Advanced configuration settings are available when using the advanced configuration procedure ([page 17](#)). Other settings are available during normal operation of the GHP 10. See the configuration section of the *GHC 20 Owner's Manual* for more information.

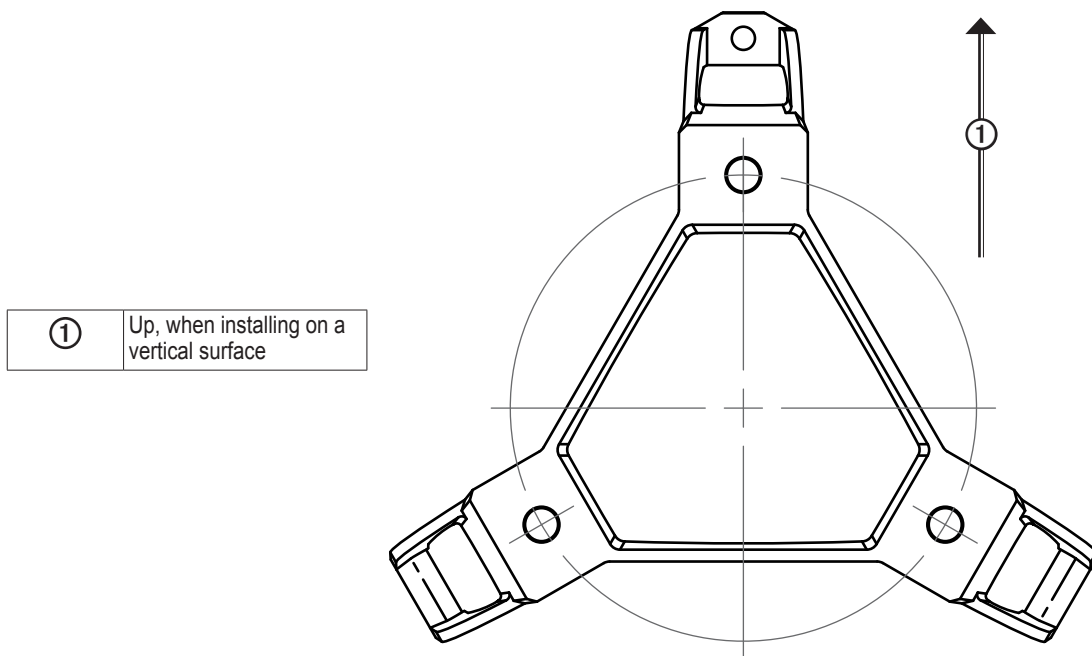
## Error and Warning Messages

Error Message	Cause	Autopilot Action
ECU voltage is low	The ECU supply voltage goes below 10 Vdc for longer than 6 seconds.	<ul style="list-style-type: none"> <li>Alarm sounds</li> <li>Continues in normal operation</li> </ul>
Autopilot is not receiving navigation data. Autopilot placed in heading hold.	The autopilot is no longer receiving valid navigation data. This message will also be shown if navigation is stopped on a chartplotter prior to disengaging the autopilot.	<ul style="list-style-type: none"> <li>Alarm sounds</li> <li>Autopilot transitions to heading hold</li> </ul>
Connection with autopilot lost	The GHC lost connection with CCU.	N/A
Low GHC supply voltage	The supply voltage level is below the value specified in the low voltage alarm menu.	N/A
Error: ECU high voltage	<p>The ECU supply voltage goes above a certain threshold:</p> <ul style="list-style-type: none"> <li>12v system: 20 volts</li> <li>24v system: 36 volts</li> </ul>	<ul style="list-style-type: none"> <li>Alarm sounds</li> <li>Drive unit is disabled</li> <li>GHC 20 begins a countdown timer that automatically powers off the autopilot after 60 seconds</li> </ul>
Error: ECU high temperature	The ECU temperature rises above 212°F (100°C).	<ul style="list-style-type: none"> <li>Alarm sounds</li> <li>Drive unit is disabled</li> <li>GHC 20 begins a countdown timer that automatically powers off the autopilot after 60 seconds</li> </ul>
Error: ECU Drive Circuit Overload. See manual for tips on reducing load.	The average ECU current value rises above 16 A.	<ul style="list-style-type: none"> <li>Alarm sounds</li> <li>Drive unit is disabled</li> <li>Autopilot switches to standby</li> </ul>
Error: Lost communication between ECU and CCU	Communication between the CCU and the ECU has timed out.	<ul style="list-style-type: none"> <li>Alarm sounds</li> <li>GHC 20 begins a countdown timer that automatically powers off the autopilot after 60 seconds</li> </ul>
Lost GPS as a speed source	<p>GPS signal is lost.</p> <ul style="list-style-type: none"> <li>Occurs when GPS is selected as the speed source.</li> </ul>	<ul style="list-style-type: none"> <li>Autopilot switches to heading hold.</li> </ul>

## ECU Mounting Template



## CCU Mounting Template







## GHP 10 Installation Checklist

Detach this checklist from the installation instructions and use it during the GHP 10 installation process.

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

	Refer to the diagram on <a href="#">page 7</a> and notes on <a href="#">page 5</a> to understand the necessary electrical and data connections.
	Lay out all of the components and check the cable lengths. Obtain extensions if necessary.
	Install the drive unit according to the instructions provided with the drive unit.
	Mount the ECU ( <a href="#">page 10</a> ). The ECU must be located within 19½ in. (0.5 m) of the drive unit.
	Connect the drive unit to the ECU.
	Mount the CCU ( <a href="#">page 10</a> ) in a location free of magnetic interference. Use a handheld compass to test for magnetic interference in the area. <b>Mount the CCU in the bracket so that the wires hang straight down.</b>
	Mount the GHC 20 ( <a href="#">page 11</a> ).
	Connect the yellow wire on the GHC 20 data cable to the yellow wire on the CCU/ECU interconnect cable, and connect the black wire on the GHC 20 data cable to ECU ground ( <a href="#">page 11</a> ).
	Connect the GHC 20 and the CCU to a NMEA 2000 network ( <a href="#">page 12</a> ).
	Connect any optional NMEA 2000-compatible devices to the NMEA 2000 network ( <a href="#">page 14</a> ), or connect any optional NMEA 0183-compatible devices to the GHC 20 if a NMEA 2000-compatible GPS device is not available ( <a href="#">page 14</a> ).
	Connect the ECU to the boat battery ( <a href="#">page 10</a> ).
	Configure the GHP 10 system by completing the Dockside Wizard and the Sea Trial Wizard ( <a href="#">page 14</a> ).
	Test and adjust the autopilot configuration.

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