

# GARMIN<sup>®</sup>

## REACTOR™ 40 STEER-BY-WIRE

---

### Installation Instructions

#### Important Safety Information

##### WARNING

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

You are responsible for the safe and prudent operation of your vessel. The autopilot is a tool that enhances your capability to operate your boat. It does not relieve you of 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 autopilot on calm and hazard-free open water.

Use caution when operating the autopilot near hazards in the water, such as docks, pilings, and other boats.

##### CAUTION

When in use, beware of hot motor and solenoid components and the risk of entrapment from moving parts.

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

##### NOTICE

To avoid damage to your boat, the autopilot system should be installed by a qualified marine installer. Specific knowledge of hydraulic steering componentry and marine electrical systems is required for proper installation.

#### Registering Your Device

Help us better support you by completing our online registration today. Keep the original sales receipt, or a photocopy, in a safe place.

- 1 Go to [my.garmin.com/registration](http://my.garmin.com/registration).
- 2 Sign in to your Garmin<sup>®</sup> account.

#### Installation Preparation

The autopilot system consists of multiple components. You should familiarize yourself with all of the component mounting and connection considerations before beginning installation. You must know how the components operate together in order to correctly plan the installation on your boat.

You can consult the layout diagrams (*Power and Data Layout, page 2*) to help understand the mounting and connection considerations.

You should lay out all of the components on the boat as you plan the installation to make sure your cables will reach each component. If needed, extension cables (sold separately) for various components are available from your Garmin dealer or from [www.garmin.com](http://www.garmin.com).

You should record the serial number of each component for registration and warranty purposes.

#### Tools Needed

- Safety glasses
- Drill and drill bits
- 90 mm (3.5 in.) hole saw or a rotary cutting tool (for installing an optional helm control)
- 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)

**NOTE:** Mounting screws are provided for the main components of the autopilot system. If the provided screws are not appropriate for the mounting surface, you must provide the correct types of screws.

#### Mounting and Connection Considerations

The autopilot 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.

#### CCU Mounting and Connection Considerations

- The CCU is the primary sensor of the Reactor 40 Steer-by-Wire autopilot system. For best performance, observe these considerations when selecting a mounting location.
  - A handheld compass should be used to test for magnetic interference in the area where the CCU is to be mounted (*Testing a Location for Magnetic Interference, page 1*).
  - The CCU should be mounted on a rigid surface for best performance.
- Mounting screws are provided with the CCU. If you use mounting hardware other than the provided screws, the hardware must be quality stainless or brass material to avoid magnetic interference with the CCU.

Test any mounting hardware with a handheld compass to make sure no magnetic fields are present in the hardware.
- The CCU cable connects the CCU to the steering system and is 3 m (9 ft.) long.
  - If the CCU cannot be mounted within 3 m (9 ft.) of the steering system, extension cables are available from your local Garmin dealer or at [www.garmin.com](http://www.garmin.com).
  - This cable must not be cut.

#### Finding the Best Mounting Location

- 1 Create a list of all suitable mounting locations for the CCU. Suitable mounting locations should not be within 60 cm (2 ft.) of the following:
  - Iron
  - Magnets
  - High-current wires
  - Intermittently-running pumps, such as head pumps and live well pumps

A large magnet, such as a subwoofer-speaker magnet, should be no closer than 1.5 m (5 ft.) to any of the mounting locations.
- 2 Locate the center of rotation of the boat, and measure the distance between the center of rotation and each of the suitable mounting locations you listed in step 1.
- 3 Select the location closest to the center of rotation.

If more than one location is approximately the same distance from the center of rotation, you should select the location that best meets these considerations.

  - The best location is closest to the centerline of the boat.
  - The best location is lower in the boat.
  - The best location is slightly forward in the boat.

#### Testing a Location for Magnetic Interference

You can use a handheld compass to test a mounting location for magnetic interference.

- 1 Hold a handheld compass in the CCU mounting location.
- 2 Move the compass six inches to the left of the location, then six inches to the right, observe the needle, and select an action:
  - If the compass needle moves more than three degrees during this step, magnetic interference is present. Select a new mounting location and repeat the test.
  - If the compass needle does not move, or moves less than three degrees, proceed to the next step.
- 3 Repeat this process while moving the compass above and below the mounting location.
- 4 Repeat this process while moving the compass in front of and behind the mounting location.

#### Alarm Mounting and Connection Considerations

- The alarm should be mounted near the primary helm station.
- The alarm can be mounted under the dashboard.
- If needed, the alarm wires can be extended with 28 AWG (0.08 mm<sup>2</sup>) wire.

#### NMEA 2000® Connection Considerations

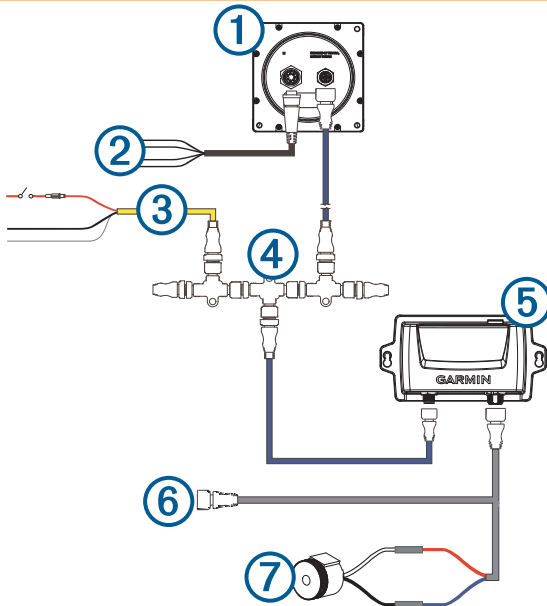
- The CCU and the helm control must connect to a NMEA 2000 network.
- If your boat does not already have a NMEA 2000 network, one can be built using the included NMEA 2000 cables and connectors (*Building a Basic NMEA 2000 Network for the Autopilot System*, page 3).
- To use the advanced features of the autopilot, optional NMEA 2000 devices, such as a wind sensor, a water-speed sensor, or a GPS device, can be connected to the NMEA 2000 network.

#### Power and Data Layout

##### ⚠ WARNING

When connecting the power cable, do not remove the in-line fuse holder. To prevent the possibility of injury or product damage caused by fire or overheating, the appropriate fuse must be in place as indicated in the product specifications. In addition, connecting the power cable without the appropriate fuse in place voids the product warranty.

Item	Description	Important Considerations
①	Helm control	A dedicated helm control is not included in all autopilot packages. If you install the autopilot without a dedicated helm control, the autopilot CCU must be connected to the same NMEA 2000 network as a compatible Garmin chartplotter to configure and control the autopilot system.
②	Helm control data cable	You should install this cable only if you are connecting the autopilot to optional NMEA® 0183 devices, such as a wind sensor, a water-speed sensor, or a GPS device ( <i>NMEA 0183 Connection Considerations</i> , page 4).
③	NMEA 2000 power cable	You should install this cable 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. You must connect the NMEA 2000 power cable to a 9 to 16 Vdc power source.
④	NMEA 2000 network	You must connect the helm control or compatible Garmin chartplotter and the CCU to a NMEA 2000 network using the included T-connectors ( <i>NMEA 2000® Connection Considerations</i> , page 2). If there is not an existing NMEA 2000 network on your boat, you can build one using the supplied cables and connectors ( <i>Building a Basic NMEA 2000 Network for the Autopilot System</i> , page 3).
⑤	CCU	You can mount the CCU in a non-submerged location near the center of the boat, in any orientation ( <i>CCU Mounting and Connection Considerations</i> , page 1). Mount the CCU away from sources of magnetic interference.
⑥	Engine connection	The CCU connects to the engine control either directly or through an adapter. Additional instructions are provided with the adapter, if applicable.
⑦	Alarm	The alarm provides audible alerts from the autopilot system, and you should install it near the primary helm station ( <i>Installing the Alarm</i> , page 3).



#### Installation Procedures

##### ⚠ CAUTION

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

##### NOTICE

When drilling or cutting, always check what is on the opposite side of the surface.

After you have planned the autopilot installation on your boat and satisfied all of the mounting and wiring considerations for your particular installation, you can begin mounting and connecting the components.

#### Helm Control Installation

A dedicated helm control is not included in all autopilot packages. If you install the autopilot without a dedicated helm control, the autopilot CCU must be connected to the same NMEA 2000 network as a compatible Garmin chartplotter to configure and control the autopilot system.

Detailed mounting instructions are included in the helm control box.

#### Mounting the CCU

- 1 Determine the mounting location.
- 2 Using the CCU as a template, mark the two pilot hole locations on the mounting surface.
- 3 Using a 3 mm (1/8 in.) bit, drill the pilot holes.

- Use the included screws to attach the CCU to the mounting surface.  
**NOTE:** If you use mounting hardware other than the provided screws, the hardware must be quality stainless or brass material to avoid magnetic interference with the CCU.  
Test any mounting hardware with a handheld compass to make sure no magnetic fields are present in the hardware.

### Connecting the CCU

- Route the connector end of the CCU cable to the steering system connection or CAN bus and make the connection.
- Route the orange and blue wires from the bare-wire portion of the CCU cable to the location where you plan to install the alarm (*Installing the Alarm, page 3*).  
If the cable is not long enough, extend the appropriate wires with 0.08 mm<sup>2</sup> (28 AWG) wire.

### Connecting to the Steering System of the Boat

#### NOTICE

Do not connect the steering controller cable to a NMEA 2000 network.

The autopilot requires a powered CAN bus to communicate with the steering controller. Ensure the steering controller CAN bus is properly powered and terminated. Consult the boat manufacturer if needed.

The steering controller cable allows the autopilot system to communicate with the steering system of the boat through a steering controller CAN bus. Additional instructions are supplied with the CAN bus.

If needed, consult the manufacturer of your boat for assistance locating the steering-system access.

- Locate the steering-system access for your boat.
- Connect the steering controller cable from the CCU to the steering system through the included steering controller CAN bus.  
**NOTE:** If necessary, the steering controller cable can be extended using a NMEA 2000 extension cable.

### Installing the Alarm

Before you can mount the alarm, you must select a mounting location (*Alarm Mounting and Connection Considerations, page 2*).

- Route the alarm cable to the bare-wire end of the CCU cable.  
If the cable is not long enough, extend the appropriate wires with 28 AWG (0.08 mm<sup>2</sup>) wire.
- Connect the cables, based on this table.

Alarm Wire Color	CCU Cable Wire Color
White (+)	Orange (+)
Black (-)	Blue (-)

- Solder and cover all bare-wire connections.
- Secure the alarm with cable ties or other mounting hardware (not included).

### NMEA 2000 and the Autopilot Components

A dedicated helm control is not included in all autopilot packages. If you install the autopilot without a dedicated helm control, the autopilot CCU must be connected to the same NMEA 2000 network as a compatible Garmin chartplotter to configure and control the autopilot system.

#### NOTICE

If you are connecting this device to an existing NMEA 2000 network, the NMEA 2000 network should already be connected to power. Do not connect the NMEA 2000 power cable to an existing NMEA 2000 network, because only one power source should be connected to a NMEA 2000 network.

If you are connecting this device to an existing NMEA 2000 network or engine network by another manufacturer, you should install a NMEA 2000 Power Isolator (010-11580-00) between the existing network and the Garmin devices.

You can connect the CCU and the optional helm control 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 autopilot package (*Building a Basic NMEA 2000 Network for the Autopilot System, page 3*).

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

If you are unfamiliar with NMEA 2000, you should read the “NMEA 2000 Network Fundamentals” chapter of the *Technical Reference for NMEA 2000 Products*. To download this document, select Manuals on the product page for your device at [www.garmin.com](http://www.garmin.com).

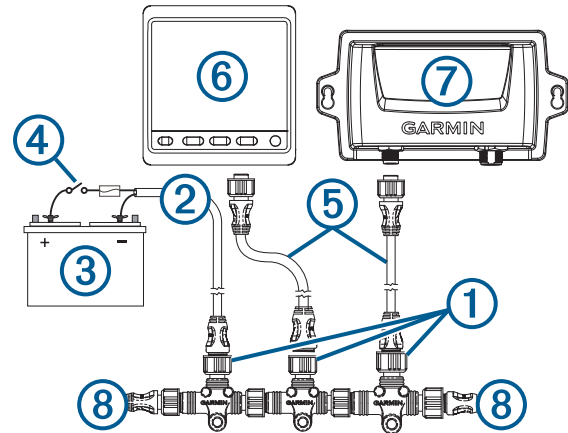
### Building a Basic NMEA 2000 Network for the Autopilot System

#### NOTICE

If you are installing a NMEA 2000 power cable, you must connect it to the boat ignition switch or through another in-line switch. NMEA 2000 devices will drain your battery if the NMEA 2000 power cable is connected to the battery directly.

A dedicated helm control is not included in all autopilot packages. If you install the autopilot without a dedicated helm control, the autopilot CCU must be connected to the same NMEA 2000 network as a compatible Garmin chartplotter to configure and control the autopilot system.

- Connect the three T-connectors ① together side-by-side.

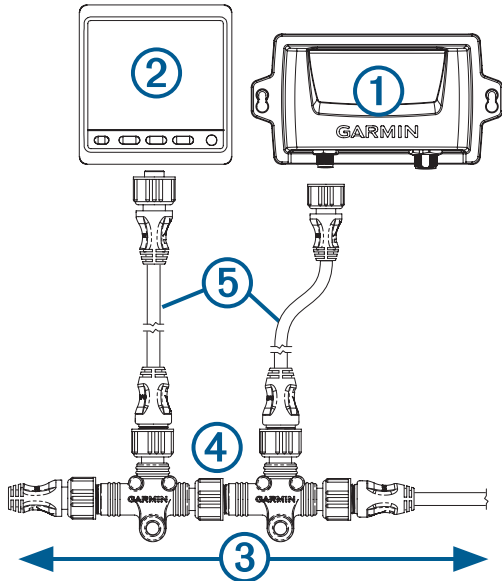


- Connect the included NMEA 2000 power cable ② to a 9 to 12 Vdc power source ③ through a switch ④.  
You should connect the power cable to the ignition switch of the boat if possible, or route it through an inline switch (not included).  
**NOTE:** The braided drain wire (bare) on the NMEA 2000 power cable must be connected to the same ground as the black wire on the NMEA 2000 power cable.
- 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 helm control (optional) or to a compatible Garmin chartplotter 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.

## Connecting the Autopilot Components to an Existing NMEA 2000 Network

A dedicated helm control is not included in all autopilot packages. If you install the autopilot without a dedicated helm control, the autopilot CCU must be connected to the same NMEA 2000 network as a compatible Garmin chartplotter to configure and control the autopilot system.

- 1 Determine where to connect the CCU ① and the helm control (optional) ② to your existing NMEA 2000 backbone ③.



- 2 In the location where you plan to connect the CCU, disconnect one side of a NMEA 2000 T-connector ④ from the network.
- 3 If necessary, connect a NMEA 2000 backbone extension cable (not included) to the side of the disconnected T-connector to extend the NMEA 2000 network backbone.
- 4 Add an included T-connector for the CCU 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 ⑤ to the CCU and to the bottom of the T-connector added in step 4.  
If the included drop cable is not long enough, you can use a drop cable up to 6 m (20 ft.) long (not included).
- 6 Connect the drop cable to the CCU and the T-connector.
- 7 If needed, repeat steps 2 through 6 for the helm control (optional) or a compatible Garmin chartplotter.

## Connecting Optional NMEA 2000 Devices to the Autopilot System

You can use advanced features of the autopilot system by connecting optional NMEA 2000 compatible devices, such as a GPS device, to the NMEA 2000 network.

**NOTE:** You can connect optional devices that are not NMEA 2000 compatible to the helm control through NMEA 0183 (*NMEA 0183 Connection Considerations*, page 4).

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

## Configuration

The autopilot must be configured and tuned to your boat dynamics. You can use the Dockside Wizard and the Sea Trial Wizard on the helm control or a compatible Garmin chartplotter to configure the autopilot.

See the included configuration guide for more information on configuring the autopilot.

## Appendix

### NMEA 0183 Connection Diagrams

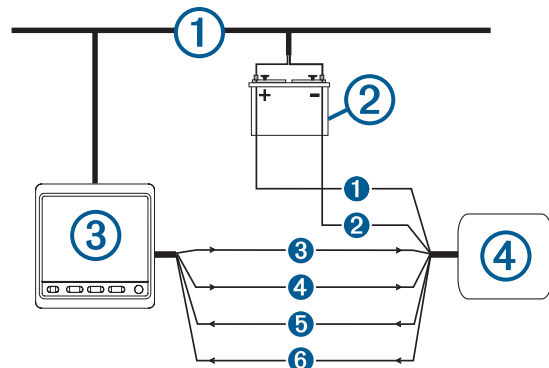
The helm control is not included in all autopilot packages. A helm control must be installed in your autopilot system to connect NMEA 0183 devices according to these diagrams. If you install the autopilot without a helm control, all NMEA 0183 devices you plan to use with the autopilot system must be connected to a compatible Garmin chartplotter on the same NMEA 2000 network as the CCU. See the installation instructions provided with your chartplotter for NMEA 0183 connection information.

These wiring diagrams are examples of different situations you may encounter when connecting your NMEA 0183 device to the helm control.

### NMEA 0183 Connection Considerations

- There is one internal NMEA 0183 input port (RX port) and one internal NMEA 0183 output port (TX port) on the included NMEA 0183 data cable. You can connect one NMEA 0183 device to the internal RX port to input data to this Garmin device, and you can connect up to three NMEA 0183 devices in parallel to the internal TX port to receive data output by this Garmin device.
- See the installation instructions for the NMEA 0183 device to identify the transmit (TX) and receive (RX) wires.
- The device provides one TX port and one RX port. Each internal port has 2 wires, labeled A and B according to the NMEA 0183 convention. The corresponding A and B wires of each internal port should be connected to the A (+) and B (-) wires of the NMEA 0183 device.
- You must use 28 AWG, shielded, twisted-pair wiring for extended runs of wire. Solder all connections and seal them with heat-shrink tubing.
- Do not connect the NMEA 0183 data wires from this device to power ground.
- The power cable from this device and the NMEA 0183 devices must be connected to a common power ground.
- For two-way communication with a NMEA 0183 device, the internal ports on the NMEA 0183 data cable are not linked. For example, if the input of the NMEA 0183 device is connected to TXA on the data cable, you can connect the output port of your NMEA 0183 device to the input port on the wiring harness.
- See *Specifications*, page 5 for a list of the approved NMEA 0183 sentences that are output by and input to this device.
- The internal NMEA 0183 ports and communication protocols are configured on the connected Garmin device. See the NMEA 0183 section of the chartplotter owner's manual for more information.

### Two-Way NMEA 0183 Communication



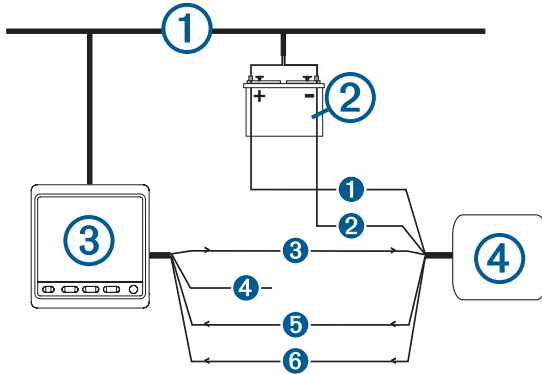
①	NMEA 2000 network (provides power to the helm control)
②	12 Vdc power source
③	Helm control
④	NMEA 0183 compatible device

Wire	Helm Control 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 a NMEA 0183 device with two transmitting and two receiving lines, you do not need to connect the NMEA 2000 bus and the NMEA 0183 device to a common ground.

**Only One Receiving Wire**

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



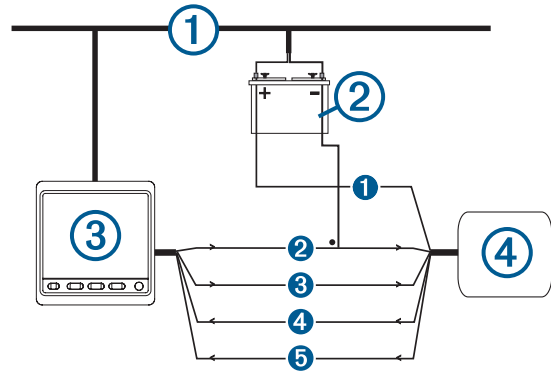
①	NMEA 2000 network (provides power to the helm control)
②	12 Vdc power source
③	Helm control
④	NMEA 0183 compatible device

Wire	Helm Control 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, you must connect the NMEA 2000 bus and the NMEA 0183 device to a common ground.

**Only One Transmitting Wire**

If your NMEA 0183 compatible device has only one transmitting wire (Tx), it must be connected to the brown wire (Rx/A) from the helm control, and the green wire (Rx/B) from the helm control must be connected to NMEA 0183 ground.



①	NMEA 2000 network (provides power to the helm control)
②	12 Vdc power source
③	Helm control
④	NMEA 0183-compatible device

Wire	Helm Control 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, you must connect the NMEA 2000 bus and the NMEA 0183 device to a common ground.

**Specifications**

**CCU**

Specification	Measurement
Dimensions (L × W × H)	170 × 90 × 50 mm (6.7 × 3.5 × 2 in.)
Weight	200 g (7 oz.)
Temperature range	From -15° to 70°C (from 5° to 158°F)
Material	Fully gasketed, high-impact plastic
Water resistance	IEC 60529 IPX7*
CCU cable length	3 m (9 ft.)
NMEA 2000 input voltage	From 9 to 16 Vdc
NMEA 2000 LEN	4 (200 mA)

\*The device withstands incidental exposure to water of up to 1 m for up to 30 min. For more information, go to [www.garmin.com/waterrating](http://www.garmin.com/waterrating).

**Alarm**

Specification	Measurement
Dimensions (L×diameter)	<sup>29</sup> / <sub>32</sub> × 1 in. (23 × 25 mm)
Weight	2.4 oz. (68 g)
Temperature range	From 5°F to 140°F (from -15°C to 60°C)
Cable length	10 ft. (3.0 m)

**NMEA 2000 PGN Information**

**CCU**

Type	PGN	Description
Transmit and receive	059392	ISO acknowledgment
	059904	ISO request
	060928	ISO address claim
	126208	NMEA: Command/Request/Acknowledge group function

Type	PGN	Description
	126464	Transmit/Receive PGN list group function
	126996	Product information
	127257	Transmit/Receive attitude data
	127251	Transmit/Receive rate of turn
Transmit only	127250	Vessel heading
Receive only	127258	Magnetic variation
	127488	Engine parameters: Rapid update
	128259	Water speed
	129025	Position: Rapid update
	129026	COG & SOG: Rapid update
	129283	Cross track error
	129284	Navigation data
	130306	Wind data

### Helm Control

Type	PGN	Description
Transmit and 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
Transmit only	128259	Water speed
	129025	Position: Rapid update
	129026	COG & SOG: Rapid update
	129283	Cross track error
	129284	Navigation data
	129540	GNSS satellites in view
	130306	Wind data
Receive only	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/Waypoint information
	130306	Wind data
	130576	Small craft status

### NMEA 0183 Information

When connected to optional NMEA 0183 compatible devices, the autopilot uses the following NMEA 0183 sentences.

Type	Sentence
Transmit	hdm
Receive	wpl
	gga
	grme
	gsa
	gsv
	rmc
	bod

Type	Sentence
	bwc
	dtm
	gll
	rmb
	vhw
	mwv
	xte

### Error and Warning Messages

Error Message	Cause	Autopilot Action
Autopilot is not receiving navigation data. Autopilot placed in Heading Hold.	The autopilot is no longer receiving valid navigation data while performing a Route To maneuver. This message also appears if navigation is stopped on a chartplotter before the autopilot is disengaged.	<ul style="list-style-type: none"> <li>Alarm sounds for 5 seconds</li> <li>Autopilot transitions to heading hold</li> </ul>
Connection with Autopilot Lost	The helm control has lost connection with the CCU.	N/A
Lost Wind Data (sailboat only)	The autopilot is no longer receiving valid wind data.	<ul style="list-style-type: none"> <li>Alarm sounds for 5 seconds</li> <li>Autopilot transitions to heading hold</li> </ul>

### Registering Your Device

Help us better support you by completing our online registration today. Keep the original sales receipt, or a photocopy, in a safe place.

- 1 Go to [my.garmin.com/registration](http://my.garmin.com/registration).
- 2 Sign in to your Garmin account.

### Contacting Garmin Support

- Go to [support.garmin.com](http://support.garmin.com) for help and information, such as product manuals, frequently asked questions, videos, and customer support.
- In the USA, call 913-397-8200 or 1-800-800-1020.
- In the UK, call 0808 238 0000.
- In Europe, call +44 (0) 870 850 1241.

© 2017 Garmin Ltd. or its subsidiaries  
 Garmin® and the Garmin logo are trademarks of Garmin Ltd. or its subsidiaries, registered in the USA and other countries. Reactor™ is a trademark of Garmin Ltd. or its subsidiaries. This trademark may not be used without the express permission of Garmin.  
 NMEA®, NMEA 2000®, and the NMEA 2000 logo are trademarks of the National Marine Electronics Association.

