

GARMIN[®]

REACTOR™ 40 MECHANICAL

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 surfaces on the heat-sink, motor, and solenoid components.

When in use, beware the risk of entrapment or pinching 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 marine steering and electrical systems is required for proper installation.

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 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.

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

Tools and Supplies 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

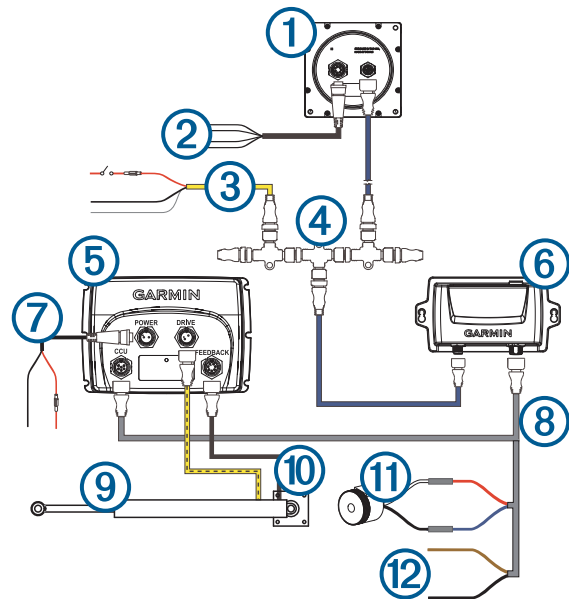
- Waterproof wire connectors (wire nuts) or heat-shrink tubing and a heat gun
- Marine sealant
- Portable or handheld compass (to test for magnetic interference)

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.

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.

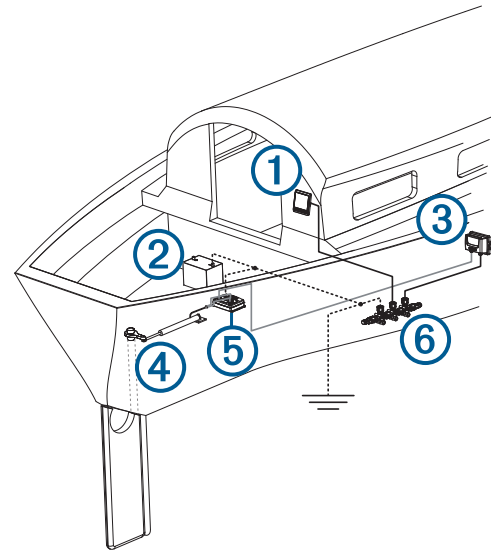


Item	Description	Important Considerations
①	Helm control	A dedicated helm control is not included in all autopilot packages. If you install the autopilot without a dedicated helm control, the autopilot CCU must be connected to the same NMEA 2000® network as a compatible Garmin chartplotter to configure 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, page 8</i>).
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, page 4</i>). 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, page 7</i>).

Item	Description	Important Considerations
⑤	ECU	
⑥	CCU	You can mount the CCU in a non-submerged location near the center of the boat, in any orientation (CCU Mounting and Connection Considerations, page 3). Mount the CCU away from sources of magnetic interference.
⑦	ECU power cable	You must connect the ECU to a 12 to 24 Vdc power source. To extend this cable, use the correct wire gauge (Power Cable Extensions, page 4).
⑧	CCU cable	To extend this cable to reach the ECU, you may need to use cable extensions (sold separately) (CCU Mounting and Connection Considerations, page 3). You must connect this cable to the alarm and the Shadow Drive™ sensor. NOTE: The Shadow Drive sensor is optional and sold separately
⑨	Drive unit	This diagram shows only the electrical connections for the drive unit (sold separately). Detailed installation instructions are included with the drive unit. If you purchased a drive unit from Garmin, it includes the necessary power and feedback cables.
⑩	Drive unit power and feedback cables	The drive unit power cable cannot be cut or extended. If you are using the autopilot with a drive unit not sold by Garmin, you must use a drive unit power cable (sold separately) (Connecting to an Existing Drive Unit, page 5). If you are using the autopilot with a solenoid drive unit, you must use a solenoid power cable (sold separately) (Connecting to a Solenoid Drive Unit, page 5). If you are using the autopilot with a drive unit not sold by Garmin or a solenoid drive unit, you must install a Garmin rudder feedback sensor (recommended) or connect to an existing rudder feedback sensor using a rudder feedback cable (sold separately) (Drive Unit Installation, page 5).
⑪	Alarm	The alarm provides audible alerts from the autopilot system, and you should install it near the primary helm station (Installing the Alarm, page 6).
⑫	Shadow Drive sensor connection (optional)	The Shadow Drive sensor is an optional accessory that can be used only on a boat with a hydraulic steering system (Installing the Shadow Drive Sensor, page 6).

Component Layout

Single-Helm Layout



NOTE: This diagram is for planning purposes only. If needed, specific connection diagrams are included in the detailed installation instructions for each component.

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	12 to 24 Vdc battery	You must connect the ECU to a 12 to 24 Vdc power source. To extend this cable, use the correct wire gauge (Power Cable Extensions, page 4). You must connect the NMEA 2000 power cable to a 9 to 16 Vdc power source.
③	CCU	You can mount the CCU in a non-submerged location near the center of the boat, in any orientation (CCU Mounting and Connection Considerations, page 3). Mount the CCU away from sources of magnetic interference.
④	Drive unit	The drive unit power cable cannot be cut or extended. If you are using the autopilot with a drive unit not sold by Garmin, you must use a drive unit power cable (sold separately) (Connecting to an Existing Drive Unit, page 5). If you are using the autopilot with a solenoid drive unit, you must use a solenoid power cable (sold separately) (Connecting to a Solenoid Drive Unit, page 5).
⑤	ECU	
⑥	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 (NMEA 2000 Connection Considerations, page 4). If there is not an existing NMEA 2000 network on your boat, you can build one using the supplied cables and connectors (Building a Basic NMEA 2000 Network for the Autopilot System, page 7).

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 Mechanical 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 3](#)).
 - 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 ECU and is 5 m (16 ft.) long.
 - If the CCU cannot be mounted within 5 m (16 ft.) of the ECU, extension cables are available from your local Garmin dealer or at 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.

ECU Mounting and Connection 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 mounted within 0.5 m (19 in.) of the drive unit.
 - The cables connecting the ECU to the drive unit cannot be extended.
- The ECU must be mounted in a location where it will not be submerged or exposed to wash down.
- The ECU power cable connects to the boat battery, and it can be extended if needed ([Power Cable Extensions, page 4](#)).

Drive Unit Mounting and Wiring Considerations

- If a compatible drive unit is not already installed on your boat, the drive unit is sold separately, and must be installed by an experienced professional in order to correctly steer your boat.
- The drive unit must be installed before the ECU is permanently mounted.
- The cables connected to the drive unit cannot be extended.
- If you are connecting to an existing drive unit (not sold by Garmin), a drive unit power cable (sold separately) must be used to adapt your drive unit for use with the autopilot system ([Connecting to an Existing Drive Unit, page 5](#)).
 - The drive unit power cable cannot be extended.
- If you are connecting to a solenoid drive unit, a solenoid power cable (sold separately) must be used to adapt your solenoid drive unit for use with the autopilot system ([Connecting to a Solenoid Drive Unit, page 5](#)).
 - The solenoid power cable cannot be extended.
- If you are connecting to a drive unit not sold by Garmin, you must also install a rudder feedback sensor, such as the Garmin GRF™ 10, or connect to an existing rudder-feedback sensor using a rudder feedback cable (sold separately).

NOTE: The Reactor 40 Mechanical autopilot is compatible with a typical three-terminal, potentiometer-type rudder feedback sensor only. The system does not work with a frequency-based rudder feedback sensor.

Shadow Drive Sensor Mounting Considerations

NOTE: The Shadow Drive sensor is a device you install in the hydraulic steering lines of your boat. It detects when you manually take control of the helm and suspends autopilot control of the boat. It is an optional accessory that can be used only on a boat with a hydraulic steering system.

- The Shadow Drive sensor must be mounted horizontally and as level as possible, with cable ties firmly securing it in place.
- The Shadow Drive sensor must be mounted at least 305 mm (12 in.) away from magnetic materials or devices, such as speakers or electric motors.
- The Shadow Drive sensor should be mounted closer to the helm than to the pump.
- The Shadow Drive sensor should be mounted lower than the lowest helm, but higher than the pump.
- The Shadow Drive sensor must not be connected directly to the fitting at the back of the helm. There must be a length of hose between the fitting at the helm and the Shadow Drive sensor.
- The Shadow Drive sensor must not be connected directly to a hydraulic T-connector in the hydraulic line. There must be a length of hose between a T-connector and the Shadow Drive sensor.

- In a single-helm installation, there must not be a T-connector between the helm and the Shadow Drive sensor.
- In a dual-helm installation, the Shadow Drive sensor should be installed between the pump and the hydraulic T-connector that leads to the upper and lower helm, closer to the T-connector than to the pump.
- The Shadow Drive sensor must be installed in either the starboard steering line or the port steering line.
The Shadow Drive sensor must not be installed in either the return line or the high-pressure line, if applicable.

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 mm²) 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 7*).
- 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.

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.
- 4 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.

ECU Installation

Mounting the ECU

Before you can mount the ECU, you must select a location and determine the correct mounting hardware (*ECU Mounting and Connection Considerations, page 3*).

- 1 Hold the ECU in the intended mounting location and mark the locations of the mounting holes on the mounting surface, using the ECU as a template.
- 2 Using a drill bit appropriate for the mounting surface and selected mounting hardware, drill the four holes through the mounting surface.
- 3 Secure the ECU to the mounting surface using the selected mounting hardware.

Connecting the ECU to Power

⚠ 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.

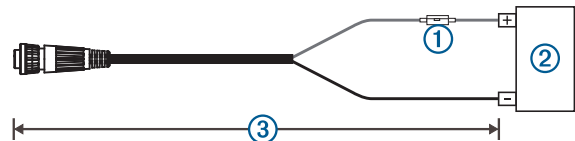
You should connect the ECU power cable directly to the boat battery, if possible. Although it is not recommended, if you connect the power cable to a terminal block or other source, you must connect it through a 40 A fuse.

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

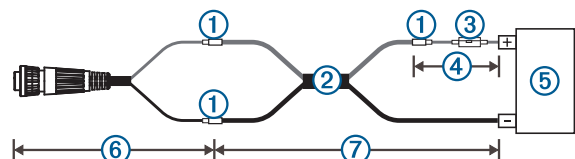
- 1 Route the connector-terminated end of the ECU power cable to the ECU, but do not connect it to the ECU.
- 2 Route the bare-wire end of the ECU power cable to the boat battery.
If the wire is not long enough, it can be extended (*Power Cable Extensions, page 4*).
- 3 Connect the black wire (-) to the negative (-) terminal of the battery, and connect the red wire (+) to the positive (+) terminal of the battery.
- 4 After you install all of the other autopilot components, connect the power cable to the ECU.

Power Cable Extensions

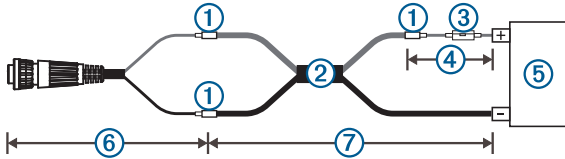
If necessary, you can extend the power cable using the appropriate wire gauge for the length of the extension.



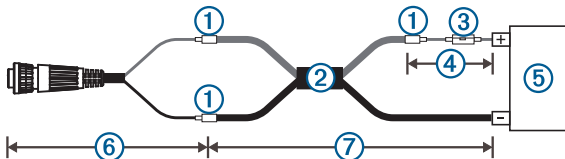
Item	Description
①	Fuse
②	Battery
③	9 ft. (2.7 m) no extension



Item	Description
①	Splice
②	10 AWG (5.26 mm ²) extension wire
③	Fuse
④	8 in. (20.3 cm)
⑤	Battery
⑥	8 in. (20.3 cm)
⑦	Up to 15 ft. (4.6 m)



Item	Description
①	Splice
②	8 AWG (8.36 mm ²) extension wire
③	Fuse
④	8 in. (20.3 cm)
⑤	Battery
⑥	8 in. (20.3 cm)
⑦	Up to 23 ft. (7 m)



Item	Description
①	Splice
②	6 AWG (13.29 mm ²) extension wire
③	Fuse
④	8 in. (20.3 cm)
⑤	Battery
⑥	8 in. (20.3 cm)
⑦	Up to 36 ft. (11 m)

Installing a Garmin Rudder Feedback Sensor

If you installed a drive unit provided by Garmin, rudder feedback data is provided by the drive unit, and a separate rudder feedback sensor is not required. If you are connecting the autopilot to a drive unit not sold by Garmin, you must also install a rudder feedback sensor, such as the GRF 10 (sold separately).

Follow the installation instructions provided with your GRF rudder feedback sensor to connect it to your rudder control and autopilot system.

Drive Unit Installation

The drive unit (sold separately) must be connected to your rudder control so the Reactor 40 Mechanical autopilot can steer your boat. When you purchase a drive unit sold by Garmin, it will include the correct cables, connectors, and instructions.

If a drive unit is installed on your boat already, you can use a drive unit power cable (sold separately) to adapt your drive unit for use with the autopilot system.

If you connect the autopilot system to a drive unit not sold by Garmin, you must also provide rudder-feedback information by installing and connecting a Garmin rudder-feedback sensor (recommended) or by connecting to an existing rudder-feedback sensor on your boat using a rudder feedback cable (sold separately).

Installing a Garmin Drive Unit

Follow the installation instructions provided with your Garmin drive unit to mount it and connect it to your rudder control and autopilot system.

Connecting to an Existing Drive Unit

You must install a drive unit power cable to use a drive unit not sold by Garmin with the Reactor 40 Mechanical autopilot. This cable is sold separately.

These instructions do not apply to a solenoid-type drive unit ([Connecting to a Solenoid Drive Unit, page 5](#)).

- 1 If necessary, use the installation instructions provided with the drive unit to install it on your boat.
 - 2 If your drive unit has cables connected, disconnect the cables.
 - 3 Consult the documentation provided by the manufacturer of your drive unit to identify the connections on your drive unit.
 - 4 Connect the drive unit power cable (not included) to your drive unit, based on the wire colors and functions in the table.
- The drive unit power cable cannot be extended.

Wire Color	Function
Red	Drive unit positive (+)
Black	Drive unit negative (-)
Blue	Clutch power (cut and tape this wire if your drive unit has no clutch)
White	Clutch ground (cut and tape this wire if your drive unit has no clutch)

- 5 Connect the drive unit power cable to the ECU.

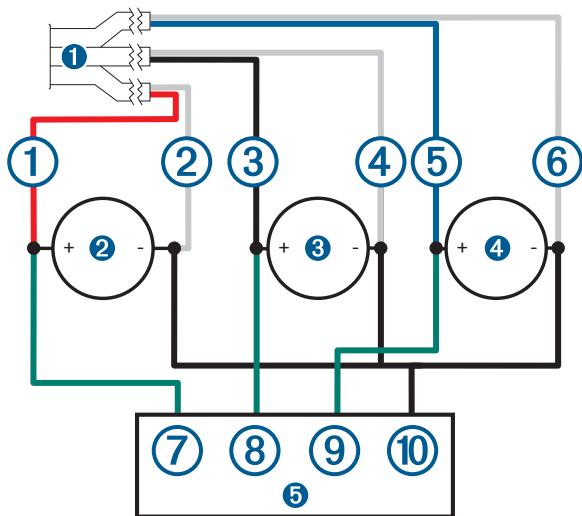
Connecting to a Solenoid Drive Unit

You must install the solenoid power cable to use a solenoid drive unit with the Reactor 40 Mechanical autopilot system. This cable is sold separately.

These instructions apply only to solenoid-type drive units.

- 1 If necessary, use the installation instructions provided with the solenoid drive unit to install it on your boat.
- 2 If your solenoid drive unit has cables connected, disconnect the cables.
- 3 Consult the documentation provided by the manufacturer of your solenoid drive unit to identify the connections on your drive unit.
- 4 Connect the solenoid power cable (not included) to your solenoid drive unit, based on the diagram and tables.

The solenoid power cable is 0.8 m (2.6 ft.) long, and cannot be extended.



Item	Description	Notes
1	Solenoid power cable	Sold separately.
2	Starboard solenoid	
3	Port solenoid	
4	Bypass solenoid	May not be present in all systems.
5	Auxiliary steering system	May not be present in all systems.

Wire	Color	Description
1	Red	Connect to starboard solenoid positive (+).
2	White/red	Connect to starboard common (-).
3	Black	Connect to port solenoid positive (+).
4	White/black	Connect to port common (-).
5	Blue	Connect to bypass solenoid positive (+). Cut and tape this wire if no bypass solenoid is present.
6	White/blue	Connect to bypass solenoid common (-). Cut and tape this wire if no bypass solenoid is present.
7	N/A	Auxiliary steering starboard positive (+) (if present).
8	N/A	Auxiliary steering port positive (+) (if present).
9	N/A	Auxiliary steering bypass positive (+) (if present).
10	N/A	Auxiliary steering common (-) (if present).

5 Connect the solenoid power cable to the ECU.

Installing a Garmin Rudder Feedback Sensor

If you installed a drive unit provided by Garmin, rudder feedback data is provided by the drive unit, and a separate rudder feedback sensor is not required. If you are connecting the autopilot to a drive unit not sold by Garmin, you must also install a rudder feedback sensor, such as the GRF 10 (sold separately).

Follow the installation instructions provided with your GRF rudder feedback sensor to connect it to your rudder control and autopilot system.

Connecting to an Existing Rudder Feedback Sensor

If you connected the autopilot to a drive unit not sold by Garmin, and you plan to connect to a rudder feedback sensor not sold by Garmin, you must use a rudder feedback cable to connect your sensor to the Reactor 40 Mechanical autopilot. This cable is sold separately.

NOTE: The Reactor 40 Mechanical autopilot is compatible with a typical three-terminal, potentiometer-type rudder feedback

sensor only. The system does not work with a frequency-based rudder feedback sensor.

- 1 If necessary, use the installation instructions provided with the rudder feedback sensor to install it on your boat.
- 2 If your rudder feedback sensor has cables connected, disconnect the cables.
- 3 Consult the documentation provided by the manufacturer of your rudder feedback sensor to identify the connections on your rudder feedback sensor.
- 4 Connect the rudder feedback cable (not included) to your drive unit, based on the wire colors and functions in the table. If necessary, the cable can be extended using 22 AWG (0.33 mm²) wire.

Wire Color	Function
Red	Rudder feedback positive (+)
Black	Rudder feedback negative (-)
Yellow	Rudder feedback wiper

- 5 Connect the rudder feedback cable to the ECU.

Connecting the CCU

- 1 Route the connector end of the CCU cable to the ECU and make the connection.
- 2 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 6*).

If the cable is not long enough, extend the appropriate wires with 0.08 mm² (28 AWG) wire.

- 3 Route the brown and black wires from the bare-wire portion of the CCU cable to the location where you plan to install the Shadow Drive sensor (*Installing the Shadow Drive Sensor, page 6*) (optional).

If the cable is not long enough, extend the appropriate wires with 0.08 mm² (28 AWG) wire.

If you do not plan to install the Shadow Drive sensor, cut and tape the brown and black wires.

Installing the Shadow Drive Sensor

NOTE: The Shadow Drive sensor is an optional accessory that can be used only on a boat with a hydraulic steering system.

Connecting the Shadow Drive Sensor to the Hydraulic System

Before you can install the Shadow Drive sensor, you must select a location at which to connect the Shadow Drive sensor to the hydraulic steering of your boat (*Shadow Drive Sensor Mounting Considerations, page 3*).

Use hydraulic connectors (not included) to install the Shadow Drive sensor in the appropriate hydraulic line.

Connecting the Shadow Drive Sensor to the CCU

- 1 Route the bare-wire end of the CCU cable to the Shadow Drive sensor.

If the cable is not long enough, extend the appropriate wires using 28 AWG (0.08 mm²) wire.

- 2 Connect the cables, based on this table.

Shadow Drive Sensor Wire Color	CCU Cable Wire Color
Red (+)	Brown (+)
Black (-)	Black (-)

- 3 Solder and cover all bare-wire connections.

Installing the Alarm

Before you can mount the alarm, you must select a mounting location (*Alarm Mounting and Connection Considerations, page 4*).

- 1 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 mm²) wire.

2 Connect the cables, based on this table.

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

3 Solder and cover all bare-wire connections.

4 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 to an **existing** NMEA 2000 network, identify the NMEA 2000 power cable. Only one NMEA 2000 power cable is required for the NMEA 2000 network to operate properly.

A NMEA 2000 Power Isolator (010-11580-00) should be used in installations where the existing NMEA 2000 network manufacturer is unknown.

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 7).

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.

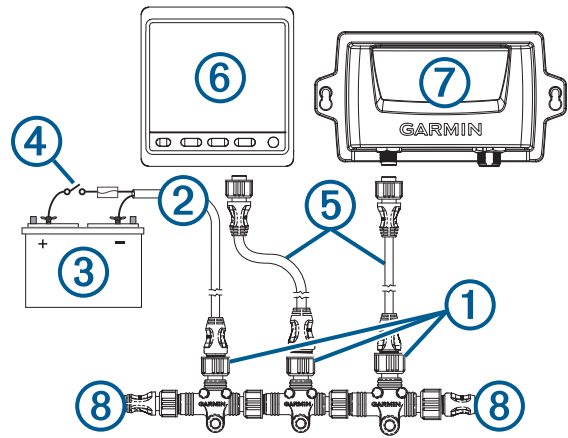
Building a Basic NMEA 2000 Network for the Autopilot System

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.

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



2 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.

3 Connect the NMEA 2000 power cable to one of the T-connectors.

4 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.

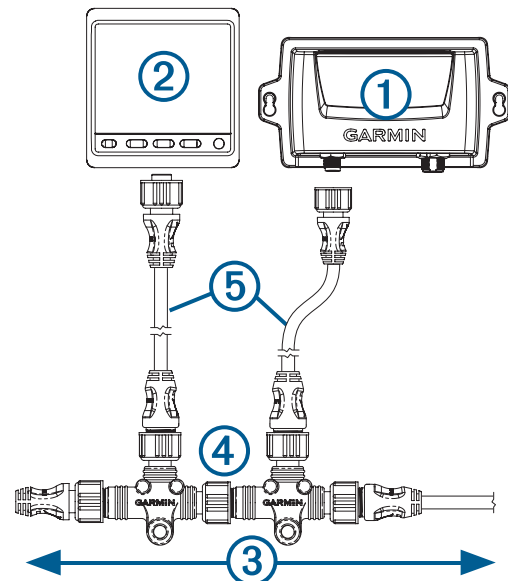
5 Connect the other included NMEA 2000 drop cable to the other T-connector and to the CCU ⑦.

6 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 wind sensor or 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 8*).

- 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.

Maintenance

Corrosion Blocker

NOTICE

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

A marine-rated corrosion blocker should be applied to the drive unit after all connections are made.

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 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.

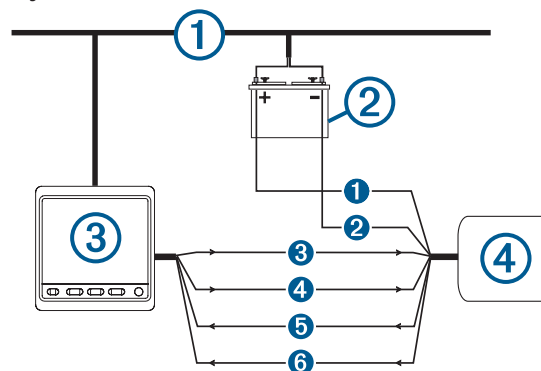
NMEA 0183 Connection Considerations

- The chartplotter provides one Tx (transmit) port and one Rx (receive) port.
- Each 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 can connect one NMEA 0183 device to the Rx port to input data to this chartplotter, and you can connect up to three NMEA 0183 devices in parallel to the Tx port to receive data output by this chartplotter.
- See the NMEA 0183 device installation instructions to identify the transmit (Tx) and receive (Rx) wires.
- 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 the chartplotter and the NMEA 0183 devices must be connected to a common power ground.
- The internal NMEA 0183 ports and communication protocols are configured on the chartplotter. See the NMEA 0183 section of the chartplotter owner's manual for more information.
- See the chartplotter owner's manual for a list of the approved NMEA 0183 sentences that the chartplotter supports.

Two-Way NMEA 0183 Communication



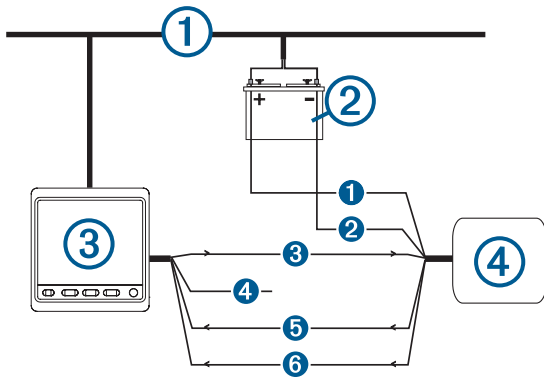
①	NMEA 2000 network (provides power to the helm control)
②	12 Vdc power source
③	Helm control
④	NMEA 0183 compatible device

Wire	Helm Control Wire Color —	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.



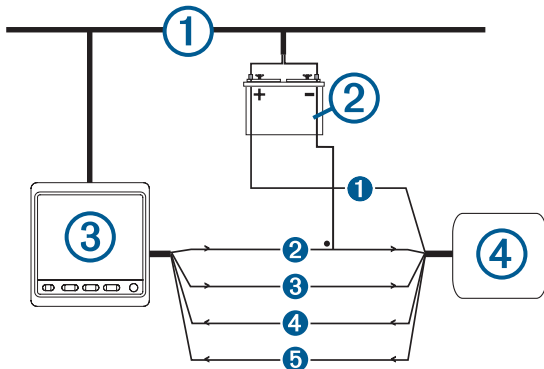
①	NMEA 2000 network (provides power to the helm control)
②	12 Vdc power source
③	Helm control
④	NMEA 0183 compatible device

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 (+)

Wire	Helm Control Wire Color — Function	NMEA 0183 Compatible Device Wire Function
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

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 rating	IEC 60529 IPX7*
CCU cable length	5 m (16 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.

ECU

Dimensions (W × H × D)	168 × 117 × 51 mm (6.6 × 4.6 × 2 in.)
Weight	680 g (24 oz.)
Temperature range	From -15° to 60°C (from 5° to 140°F)
Material	Fully gasketed, high-impact aluminum alloy
Water resistance	IEC 60529 IPX7*
Power cable length	2.7 m (9 ft.)
Input voltage	From 11.5 to 30 Vdc
Fuse	40 A, blade-type
Main power usage	1 A (not including the drive unit)

*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.

Alarm

Specification	Measurement
Dimensions (L×diameter)	²⁹ / ₃₂ × 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
	126464	Transmit/Receive PGN list group function
	126996	Product information
	127257	Transmit/Receive attitude data
	127251	Transmit/Receive rate of turn
Transmit only	127245	Rudder data
Transmit only	127250	Vessel heading

Type	PGN	Description
Receive only	127245	Rudder data
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
	bwc
	dtm
	gll
	rmb
	vhw
	mwv
	xte

Error and Warning Messages

Error Message	Cause	Autopilot Action
ECU Voltage is Low	The drive unit supply voltage has fallen below 10 Vdc for longer than 6 seconds.	Alarm sounds for 5 seconds Continues in normal operation
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.	Alarm sounds for 5 seconds Autopilot transitions to heading hold
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.	Alarm sounds for 5 seconds Autopilot transitions to heading hold
Low GHC™ Supply Voltage	The supply voltage level has fallen below the value specified in the low voltage alarm menu.	N/A
Error: ECU High Voltage	The drive unit supply voltage has risen above 33.5 Vdc.	Alarm sounds for 5 seconds The ECU shuts down
Error: ECU Voltage has Dropped Rapidly	The ECU voltage has dropped quickly below 7.0 Vdc.	Alarm sounds for 5 seconds The error is cleared when the ECU voltage rises above 7.3 Vdc.
Error: ECU High Temperature	The ECU temperature has risen above 100°C (212°F).	Alarm sounds for 5 seconds The ECU shuts down
Error: Lost Communication Between ECU and CCU (when the autopilot is engaged)	Communication between the CCU and the ECU has timed out.	The helm control or chartplotter beeps, and the autopilot transitions to standby.

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.
- 2 Sign in to your Garmin account.

Contacting Garmin Support

- Go to 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.

© 2017–2019 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™ and Shadow Drive™ are trademarks of Garmin Ltd. or its subsidiaries. These trademarks 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.

