

GARMIN®

REACTOR™ 40 KICKER

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.

To avoid possible personal injury and 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.

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.

If your motor features a kill switch, you should know how to operate it in case of an emergency. If your motor does not feature a kill switch, you should install one before installing the autopilot system.

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

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

When in use, beware of hot surfaces on the heat-sink, motor, and solenoid components to avoid possible personal injury.

When in use, beware the risk of entrapment or pinching from moving parts to avoid possible personal injury.

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 garmin.com.

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



Tools and Supplies Needed

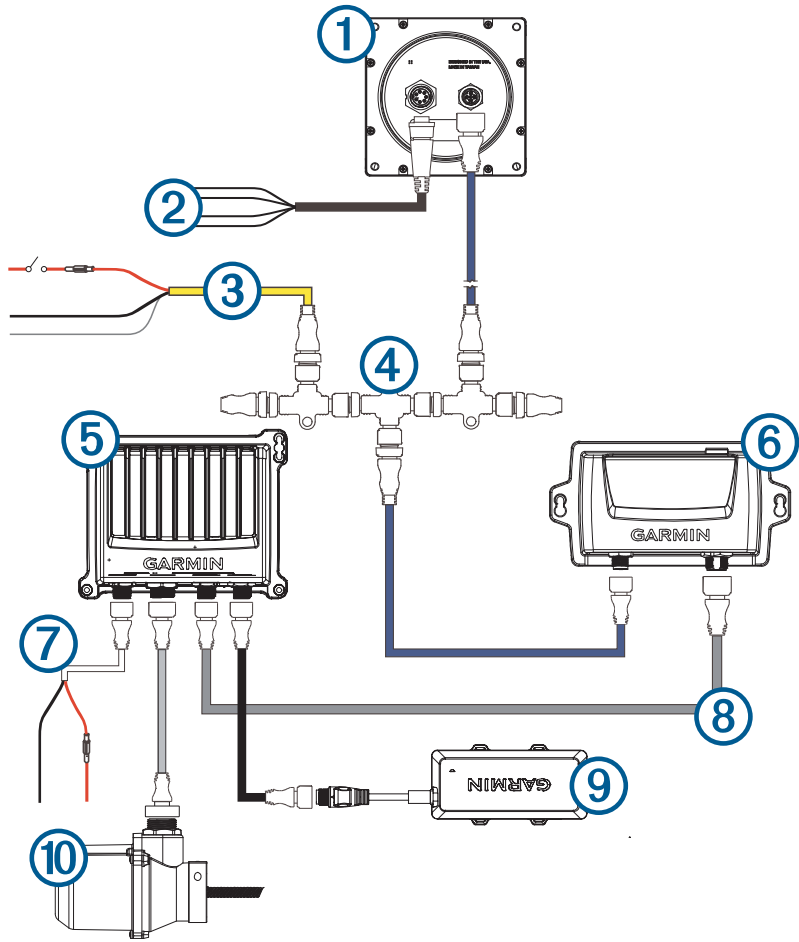
- Safety glasses
- Drill and drill bits
- Wrenches
- Jigsaw or a rotary cutting tool (for installing an optional helm control)
- Wire cutters/strippers
- Phillips and flat screwdrivers
- Cable ties
- Solder and water-tight heat shrink tubing or water-tight, heat-shrink, butt-splice connectors
- Dielectric grease
- Marine sealant
- Portable or handheld compass (to test for magnetic interference)
- White lithium grease
- Stainless steel tilt tube (required if the vessel does not have a stainless steel tilt tube installed)
- Thin cloth or small sponge (for cleaning the inside of the tilt tube)

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 20</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 6</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 17</i>).
⑤	ECU	
⑥	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, page 5</i>). 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 (<i>Power Cable Extensions, page 8</i>).
⑧	CCU cable	To extend this cable to reach the ECU, you may need to use cable extensions (sold separately) (<i>CCU Mounting and Connection Considerations, page 5</i>).
⑨	Throttle actuator	The throttle actuator controls the speed of the motor. The throttle actuator power cable cannot be cut or extended. This diagram shows only the electrical connection to the throttle actuator. Detailed installation instructions are included with the throttle actuator.
⑩	Steering actuator	The steering actuator steers the motor. The steering actuator power cable cannot be cut or extended.

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 Kicker 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 5](#)).
 - 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 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 pumpsA 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 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 8](#)).

Steering Actuator Installation and Connection Considerations

NOTICE

You must install the steering actuator in a tilt tube made of stainless steel. Installing the steering actuator in a tilt tube made of a material other than stainless steel will cause rust to develop inside of the tilt tube, and eventually the steering actuator will seize. Mechanical damage to the steering actuator caused by attempting to free a seized push rod is not covered by the product warranty.

- The steering actuator mounts in the tilt tube of your motor and uses a steering arm and linkage system to steer.
- You can install the steering actuator from either side of the tilt tube.
- You must install the steering actuator before permanently mounting the ECU.
- You cannot extend the cable that connects the steering actuator to the ECU.
- Popular motor manufacturers such as Honda® and Yamaha® commonly use tilt tubes made of steel that is not stainless. You must replace the original tilt tube with a stainless steel tilt tube before installing the steering actuator.
- Even when installing the steering actuator in a stainless steel tilt tube, if you use your boat in saltwater, you should perform the routine maintenance at least twice per year ([Steering Actuator Routine Maintenance and Storage Information, page 19](#)).

Throttle Actuator Mounting and Connection Considerations

- The throttle actuator mounts inside the motor housing and connects to the throttle to control the speed.
- You should follow the instructions provided with the throttle actuator for assembly and mounting details.
- You must install the throttle actuator before permanently mounting the ECU.
- You cannot extend the cable that connects the throttle actuator to the ECU.

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 17](#)).
- 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

To avoid possible personal injury, 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 to avoid damaging the vessel.

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 6](#)).

- 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.

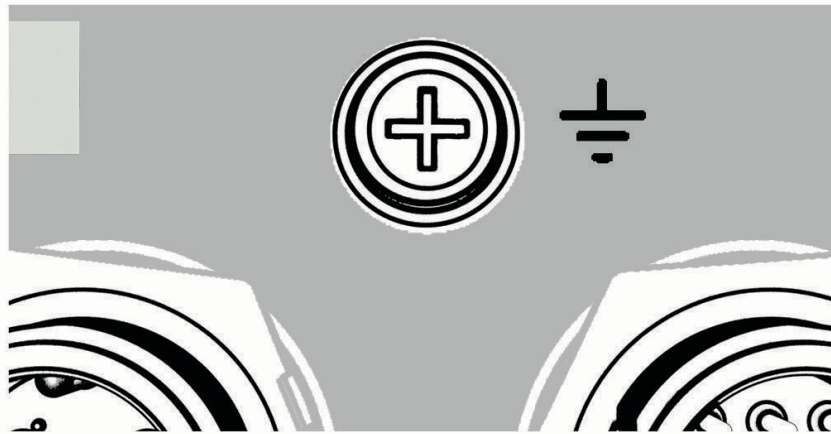
- 1 Route the connector-terminated end of the ECU power cable to the ECU, but do not connect it to the ECU.
- 2 Route the bare-wire end of the ECU power cable to the boat battery.
If the wire is not long enough, it can be extended ([Power Cable Extensions, page 8](#)).
- 3 Connect the black wire (-) 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.

NOTICE

You should apply dielectric grease to the pin holes on the cable connector to prevent corrosion, especially if you are using the autopilot system in saltwater.

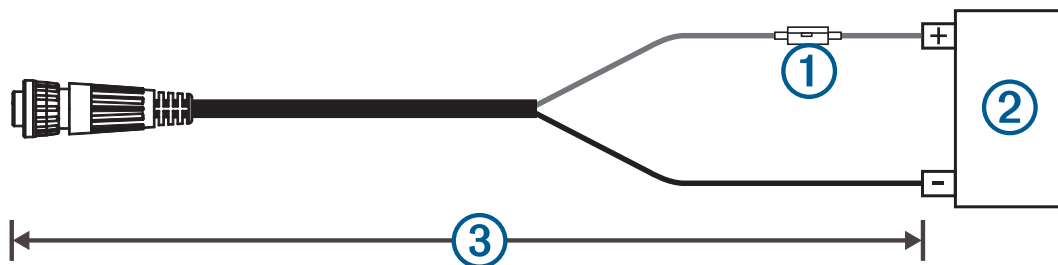
Additional Grounding Consideration

This device should not need additional chassis grounding in most installation situations. If you experience interference, you can use the grounding screw on the housing to connect the device to the water ground of the boat to help avoid the interference.

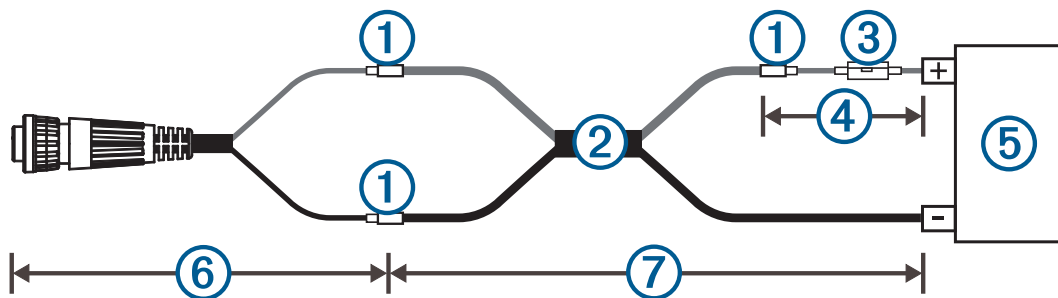


Power Cable Extensions

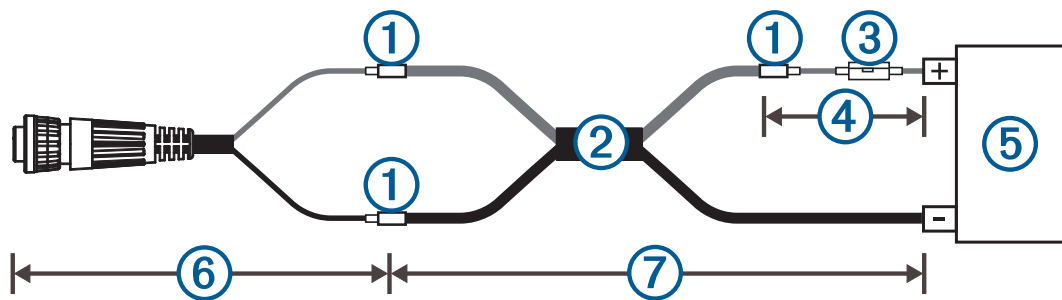
If necessary, you can extend the power cable using the appropriate wire gauge for the length of the extension.



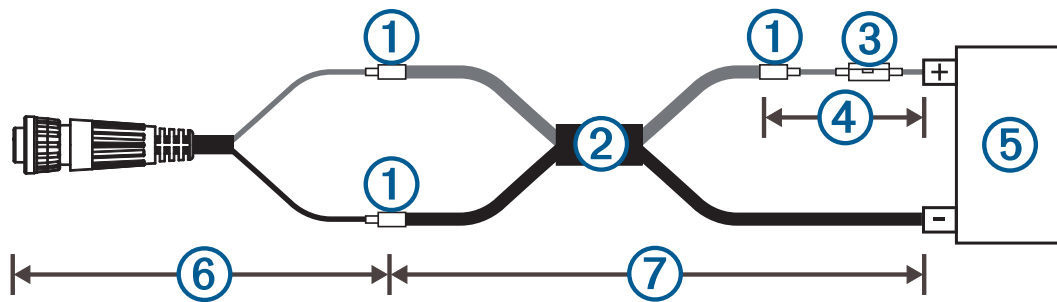
Item	Description
①	Fuse
②	Battery
③	9 ft. (2.7 m) no extension



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 the Steering Actuator

- 1 If necessary, remove the tiller lock on the motor ([Removing the Tiller Lock on the Motor, page 10](#)).
- 2 Prepare the tilt tube on the motor ([Preparing the Tilt Tube, page 11](#)).
- 3 Install the steering actuator in the tilt tube ([Installing the Steering Actuator in the Tilt Tube, page 12](#)).
- 4 Install the bracket on the motor and connect it to the steering actuator ([Installing the Kicker Motor Bracket and Steering Linkage, page 13](#)).

Removing the Tiller Lock on the Motor

Some motors have a tiller lock that allows you to lock the motor in a specified angle. These locking mechanisms are unnecessary when using this autopilot system, and may interfere with the installation or performance of the system. If your motor has a tiller lock, you should remove it before installing the steering actuator.

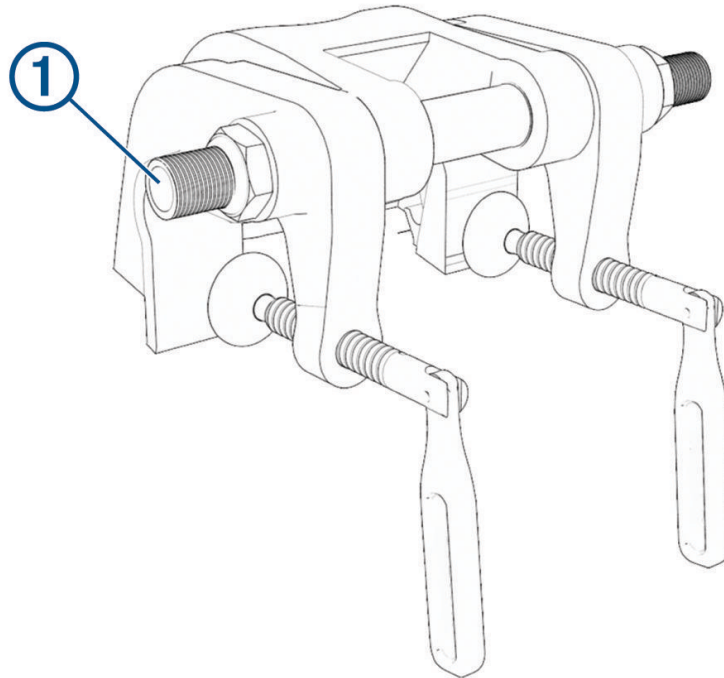
- 1 Determine if your motor has a tiller lock.
- 2 If necessary, see your motor manual or contact the manufacturer for instructions on removing the tiller lock.

Preparing the Tilt Tube

NOTICE

You must install the steering actuator in a tilt tube made of stainless steel. Installing the steering actuator in a tilt tube made of material other than stainless steel will cause rust to develop inside of the tilt tube, and eventually the steering actuator will seize. Mechanical damage to the steering actuator caused by attempting to free a seized push rod is not covered by the product warranty.

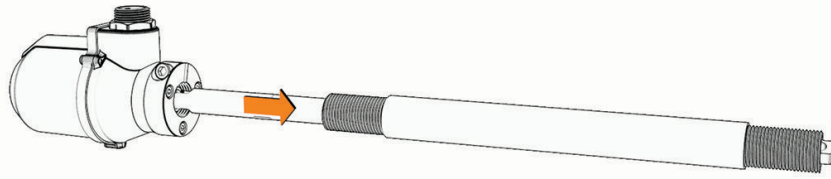
- 1 Locate the tilt tube ① on your motor mount.



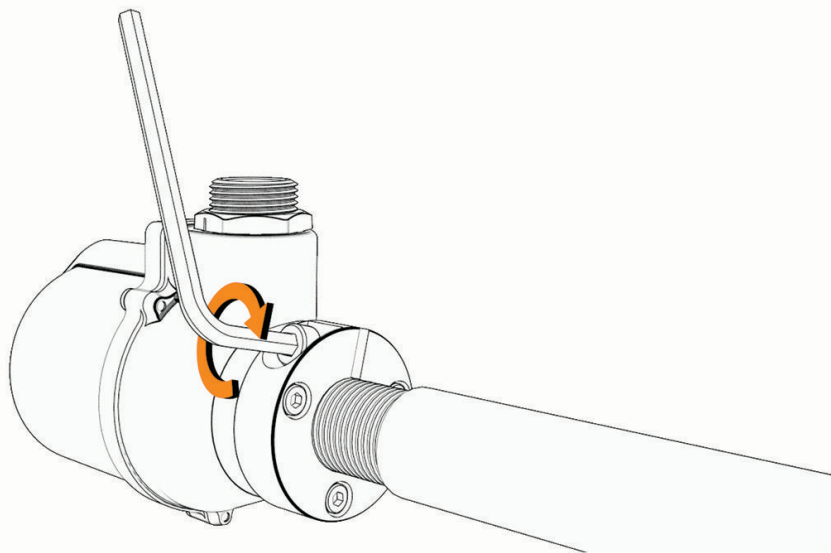
- 2 If the tilt tube is not made of stainless steel, which is common with Honda and Yamaha motors, remove the original tilt tube and install the stainless steel tilt tube.
NOTE: Some kits contain a stainless steel tilt tube, or you can purchase a stainless steel tilt tube from your local marine dealer or from garmin.com.
- 3 If necessary, remove the caps on both ends of the tilt tube.
- 4 Using a long object such as a screwdriver, push a cloth or small sponge through the inside of the tilt tube to clean out loose rust or debris.

Installing the Steering Actuator in the Tilt Tube

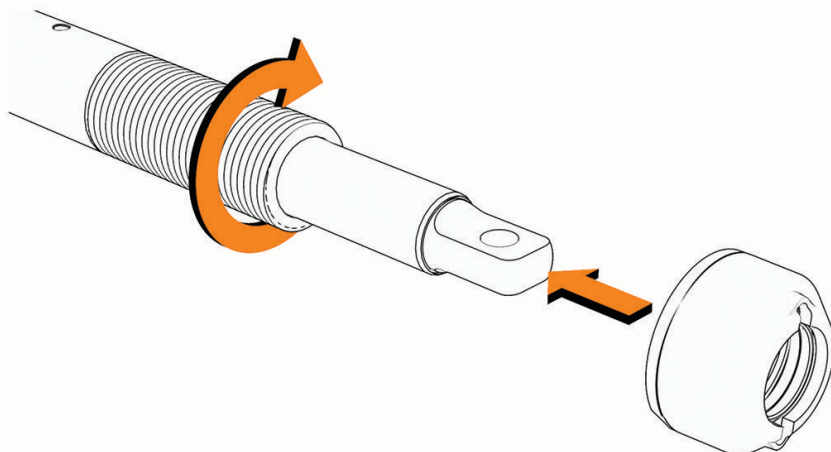
- 1 Apply white lithium grease to the push rod on the steering actuator.
- 2 Starting from either side, feed the steering actuator into the tilt tube.



- 3 Screw the steering actuator onto the end of the tilt tube.
- 4 Rotate the steering actuator until the connector is facing the best direction for your installation.
- 5 Using the included 5 mm hex wrench, tighten the screw to prevent the steering actuator from rotating on the tilt tube.



- 6 Slide the seal onto the other end of the steering actuator, and rotate it clockwise to attach it to the tilt tube.



Installing the Kicker Motor Bracket and Steering Linkage

After you have installed the steering actuator in the tilt tube, you must install one of the provided motor brackets on the Kicker motor tiller arm and connect it to the steering actuator using the a linkage arm.

- 1 Review the table to determine which type of bracket your motor requires.

Motor Brand or Type	Motor Bracket Needed
Honda	Right angle
Mercury®	Right angle
Yamaha	Flat

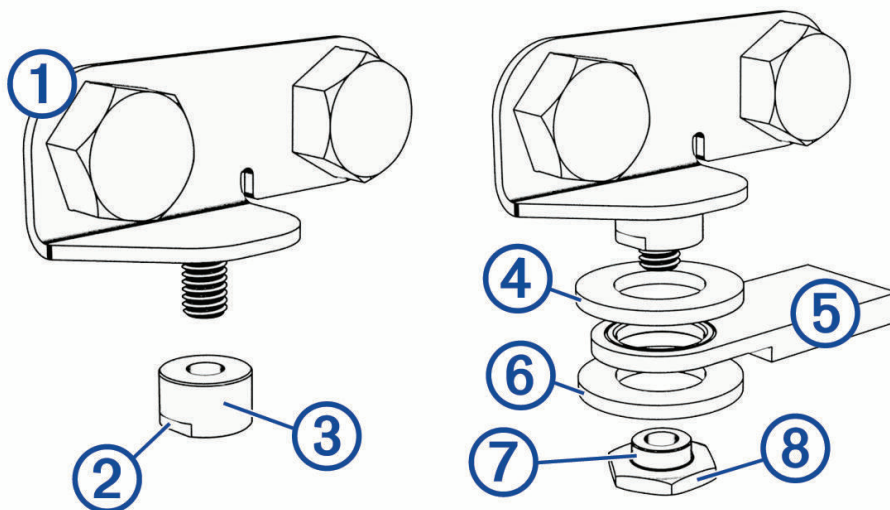
- 2 Select an action:
 - If your installation requires a right-angle bracket, follow the instructions for assembling and installing the right-angle bracket and linkage arm (*Installing the Right-Angle Bracket and Linkage Arm, page 13*).
 - If your installation requires a flat bracket, follow the instructions for assembling and installing the flat bracket and linkage arm (*Installing the Flat Bracket and Linkage Arm, page 14*).
- 3 Connect the linkage rod to the steering actuator (*Connecting the Linkage Arm to the Steering Actuator, page 15*).

Installing the Right-Angle Bracket and Linkage Arm

Because Kicker motors create excessive vibration under use, you must apply a humidity-cured ethyl-based thread-locking compound, such as LOCTITE® 435 to the threads on the motor bracket, the bushing, and the nut in this assembly. You must follow the directions on the product and allow for proper curing time before assembling and installing the bracket.

You should use the right-angle bracket when installing the steering actuator on motors with bolts on the tiller arm of the kicker motor, such as Honda or Mercury motors.

- 1 Locate the bolts on the tiller arm of the kicker motor that align with the holes on the bracket.
- 2 Remove and retain the bolts.
- 3 Using the existing bolts ①, secure the bracket to the tiller arm.



NOTE: If there is adequate clearance for you to tighten the bolts after the linkage is assembled, you may find it easier to secure the bracket to the kicker motor tiller arm after you have assembled the linkage on the bracket.

On some Mercury motors, removing the bolts allows the tiller arm to separate from the motor. You should place the bracket between the tiller arm and the motor when securing it with the bolts.

- 4 With the wrench flats ② on the bushing pointing away from the bracket, screw the bushing ③ onto the threaded rod on the bracket.

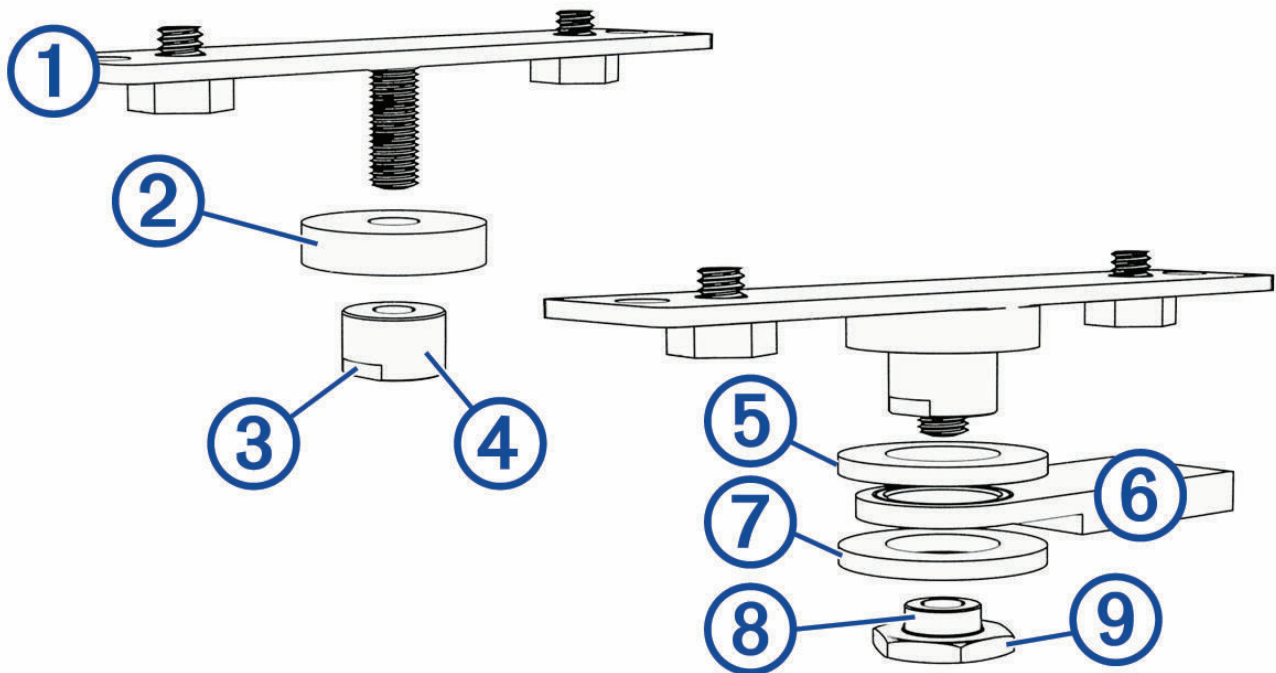
- 5 Using an 11 mm ($7/16$ in.) wrench, tighten the bushing onto the bracket.
- 6 Place a nylon washer ④ over the bushing on the bracket.
- 7 With the notched end of the linkage arm facing away from the bracket, place the linkage arm ⑤ over the bushing on the bracket.
- 8 Place the other nylon washer ⑥ over the bushing on the bracket.
- 9 With the narrow end of the nut ⑦ facing towards the bracket, screw the nut ⑧ onto the end of the threaded rod.
- 10 Using a 15 mm ($19/32$ in.) wrench, tighten the nut to secure the linkage arm to the bracket.

Installing the Flat Bracket and Linkage Arm

Because Kicker motors create excessive vibration under use, you must apply a humidity-cured ethyl-based thread-locking compound, such as LOCTITE 435 to the threads on the motor bracket, the bushing, and the nut in this assembly. You must follow the directions on the product and allow for proper curing time before assembling and installing the bracket.

You should use the flat bracket when installing the steering actuator on kicker motors with bolts or mounting holes on the underside of the tiller arm, such as Yamaha motors.

- 1 Locate the mounting holes or bolts on the underside of the tiller arm on the kicker motor that align with the holes on the bracket.
- 2 Complete an action:
 - If your motor has bolts in the holes, remove and retain the bolts.
 - If your motor does not have bolts in the holes, purchase the appropriate bolts for the holes.
- 3 Using the existing bolts or purchased bolts, secure the bracket ① to the underside of the tiller arm.



NOTE: If there is adequate clearance beneath the motor for you to tighten the bolts after the linkage is assembled, you may find it easier to secure the bracket to the kicker motor tiller arm after you have assembled the linkage.

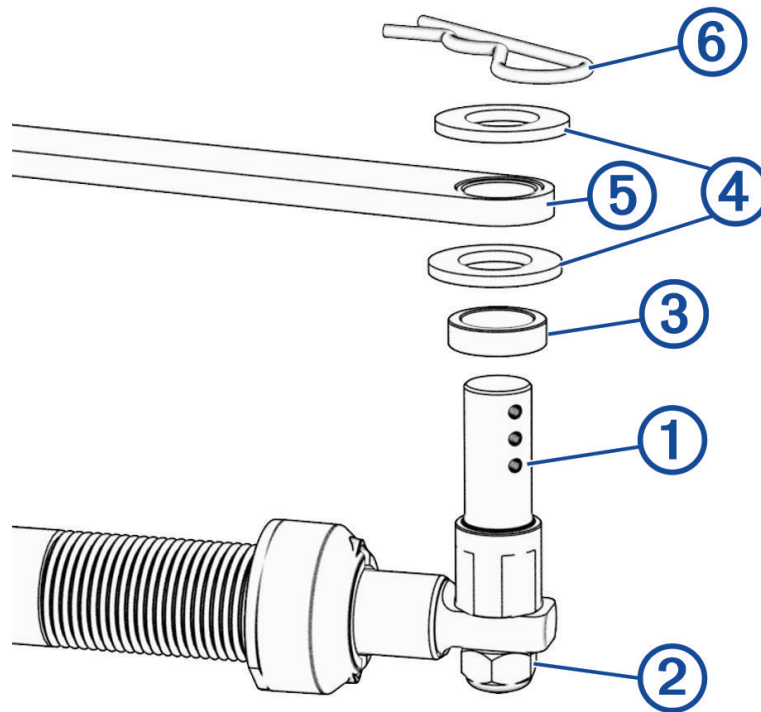
- 4 Place the black nylon washer ② over the threaded rod on the bracket.
- 5 With the wrench flats ③ on the bushing ④ pointing away from the bracket, screw the bushing onto the threaded rod on the bracket.
- 6 Using an 11 mm ($7/16$ in.) wrench, tighten the bushing onto the bracket.
- 7 Place a nylon washer ⑤ over the bushing on the bracket.

- 8 With the notched end of the linkage arm facing away from the bracket, place the linkage arm ⑥ over the bushing on the bracket.
- 9 Place the other nylon washer ⑦ over the bushing on the bracket.
- 10 With the narrow end of the nut ⑧ facing towards the bracket, screw the nut ⑨ onto the end of the threaded rod.
- 11 Using a 15 mm (¹⁹/₃₂ in.) wrench, tighten the nut to secure the linkage arm to the bracket.

Connecting the Linkage Arm to the Steering Actuator

After you connect the linkage arm to your kicker motor tiller arm using the appropriate bracket, you must connect it to the steering actuator.

- 1 Screw the linkage pin ① into the end of the steering actuator rod, and secure it with the lock nut ②.



- 2 Referring to the diagram, install the spacer ③, washers ④, and linkage arm ⑤ onto the linkage pin.
NOTE: You can install an additional black spacer (included) on the linkage pin if needed to help level the linkage arm.
- 3 Push the R-pin ⑥ through the hole on the linkage pin to secure the linkage arm.

Installing the Throttle Actuator

Follow the throttle actuator installation instructions provided with your autopilot system to mount the actuator and connect it to the motor throttle.

Connecting the CCU

Route the connector end of the CCU cable to the ECU and make the connection.

NOTICE

You should apply dielectric grease to the pin holes on the cable connector to prevent corrosion, especially if you are using the autopilot system in saltwater.

Connecting the Drive Actuator and Throttle Actuator

You should install the drive actuator and throttle actuator on the motor before connecting them to the ECU.

- 1 Route the drive actuator cable to the drive actuator and to the ECU, and make sure there is enough slack in the cable to allow for the motor to turn fully port and starboard.

This cable cannot be extended, so if it is not long enough, you must relocate the ECU, extending the ECU power cable if necessary (*Power Cable Extensions, page 8*).

- 2 Connect the drive actuator cable to the drive actuator and to the ECU.

NOTICE

You should apply dielectric grease to the pin holes on the cable connector to prevent corrosion, especially if you are using the autopilot system in saltwater.

- 3 Route the throttle actuator cable from inside the motor housing to the ECU, and make sure there is enough slack in the cable to allow for the motor to turn fully port and starboard.
- 4 Connect the throttle actuator cable to the ECU.

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 17*).

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 *Technical Reference for NMEA 2000 Products* at garmin.com/manuals/nmea_2000.

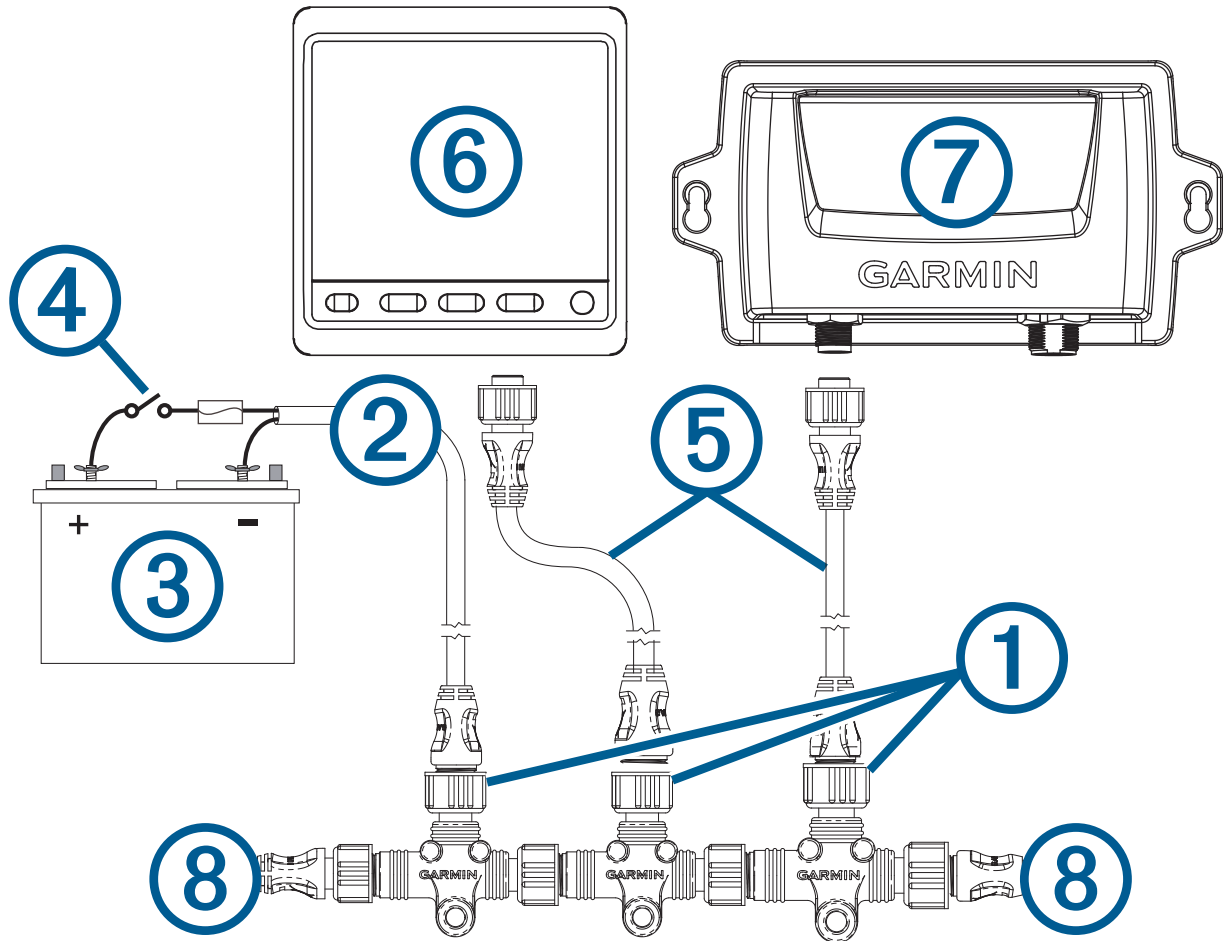
Building a Basic NMEA 2000 Network for the Autopilot System

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.

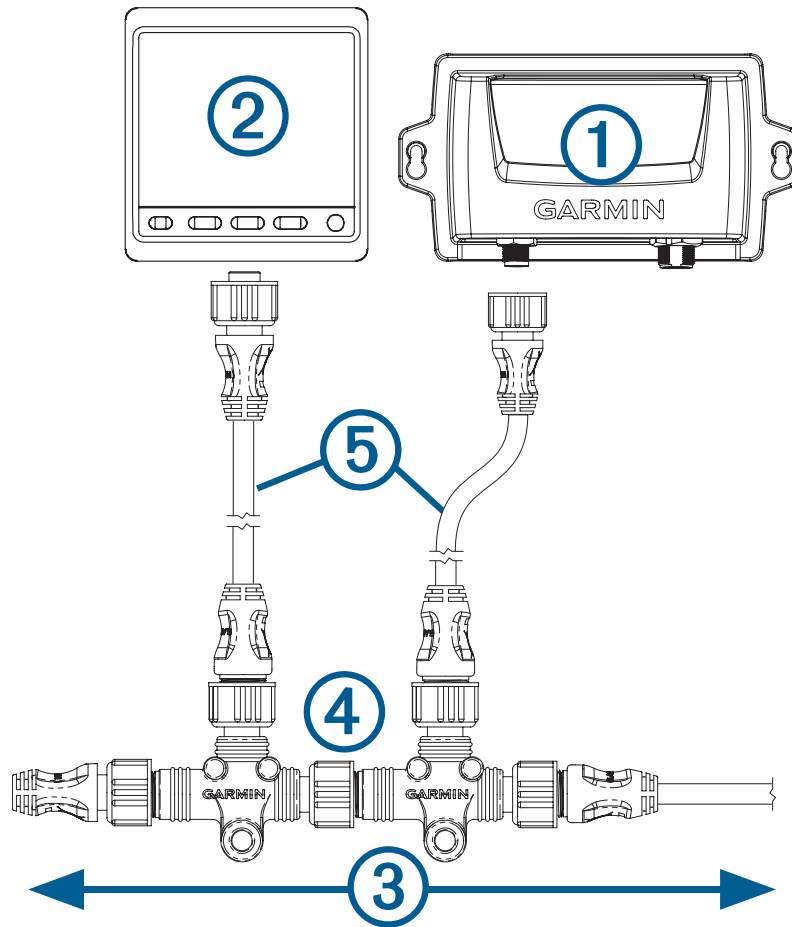
Connecting the Autopilot Components to an Existing NMEA 2000 Network

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.

NOTICE

You should apply dielectric grease to the pin holes on the cable connectors to prevent corrosion, especially if you are using the autopilot system in saltwater.

- 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

NOTE: You can connect optional devices that are not NMEA 2000 compatible to the helm control through NMEA 0183 (*NMEA 0183 Connection Considerations, page 20*).

- 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

Steering Actuator Routine Maintenance and Storage Information

To keep the autopilot functioning properly, you must perform routine maintenance to the steering actuator throughout the boating season, and you must take precautions when storing the boat for the off-season.

NOTICE

You must use white lithium grease when lubricating the steering actuator in the tilt tube. Any other type of grease may harden and cause the actuator to seize.

- Once or more per season (depending on use), you should remove the steering actuator from the tilt tube and complete these actions:
 - Clean the push rod on the steering actuator to remove all grease and rust.
 - Clean the inside of the tilt tube to remove all grease and rust.
 - Clean the cable connectors, and re-apply dielectric grease to remove and prevent corrosion.

NOTICE

After cleaning the steering actuator and tilt tube, you must apply white lithium grease to the push rod on the steering actuator before re-installing it in the tilt tube. White lithium grease helps prevent corrosion, and is required to keep the autopilot functioning properly.

- When you store the boat for the off-season, you should complete these actions:
 - Turn the motor fully to one side so the push rod on the steering actuator is fully extended out of the tilt tube.
 - Clean the extended push rod, and cover it with white lithium grease.

Freeing a Seized Steering Actuator

NOTICE

If the steering actuator becomes stuck inside the tilt tube, you must not attempt to force the steering actuator with the outboard tiller or with a hammer. Forcing the steering actuator with the tiller or with a hammer may damage the motor, the push rod, or the tilt tube.

- 1 Remove the linkage pin from the end of the push rod on the steering actuator.
- 2 Place a screwdriver or other suitable rod through the hole at the end of the steering actuator.
- 3 Carefully rotate the push rod using the screwdriver until it loosens and is no longer stuck in the tilt tube.
- 4 Remove the steering actuator from the tilt tube.
- 5 Using solvent and a wire bore brush, clean the inside of the tilt tube.
- 6 Using solvent and a rag, clean the push rod on the steering actuator.
- 7 Apply white lithium grease to the push rod, and re-install the steering actuator.

Replacement Parts

Replacement parts are available for this autopilot system. Contact your Garmin dealer or go to garmin.com for more information.

Appendix

NMEA 0183 Connection Diagrams

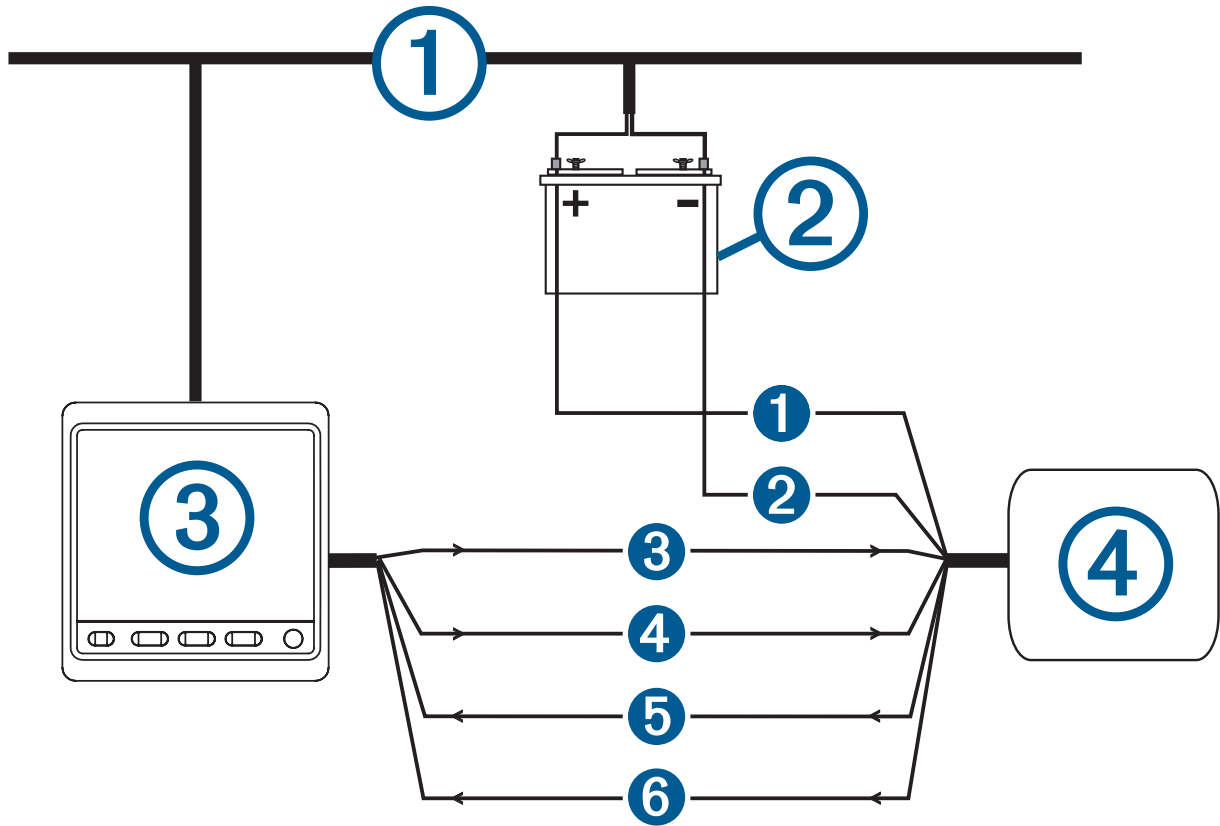
The helm control is not included in all autopilot packages. A helm control must be installed in your autopilot system to connect NMEA 0183 devices according to these diagrams. If you install the autopilot without a helm control, all NMEA devices you plan to use with the autopilot system must be connected 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



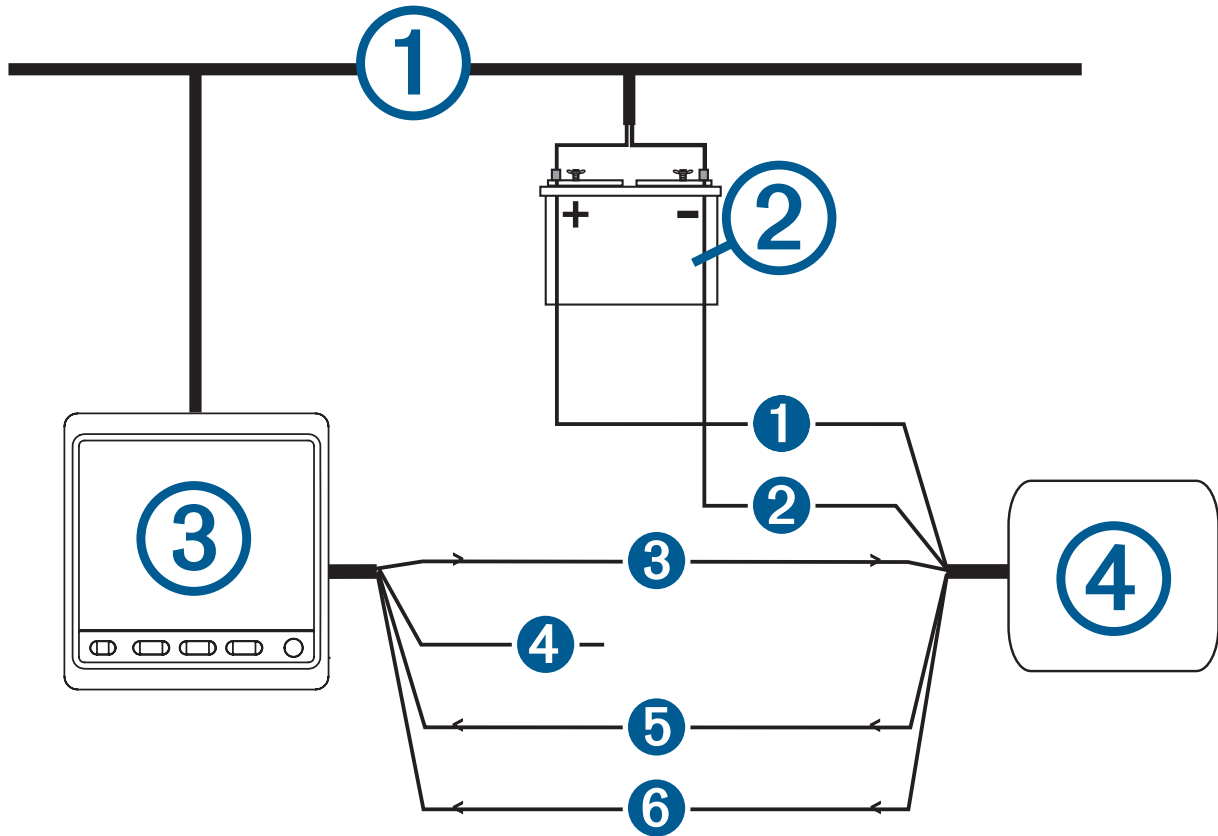
①	NMEA 2000 network (provides power to the helm control)
②	12 Vdc power source
③	Helm control
④	NMEA 0183 compatible device

Wire	Helm Control Wire Color – 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.



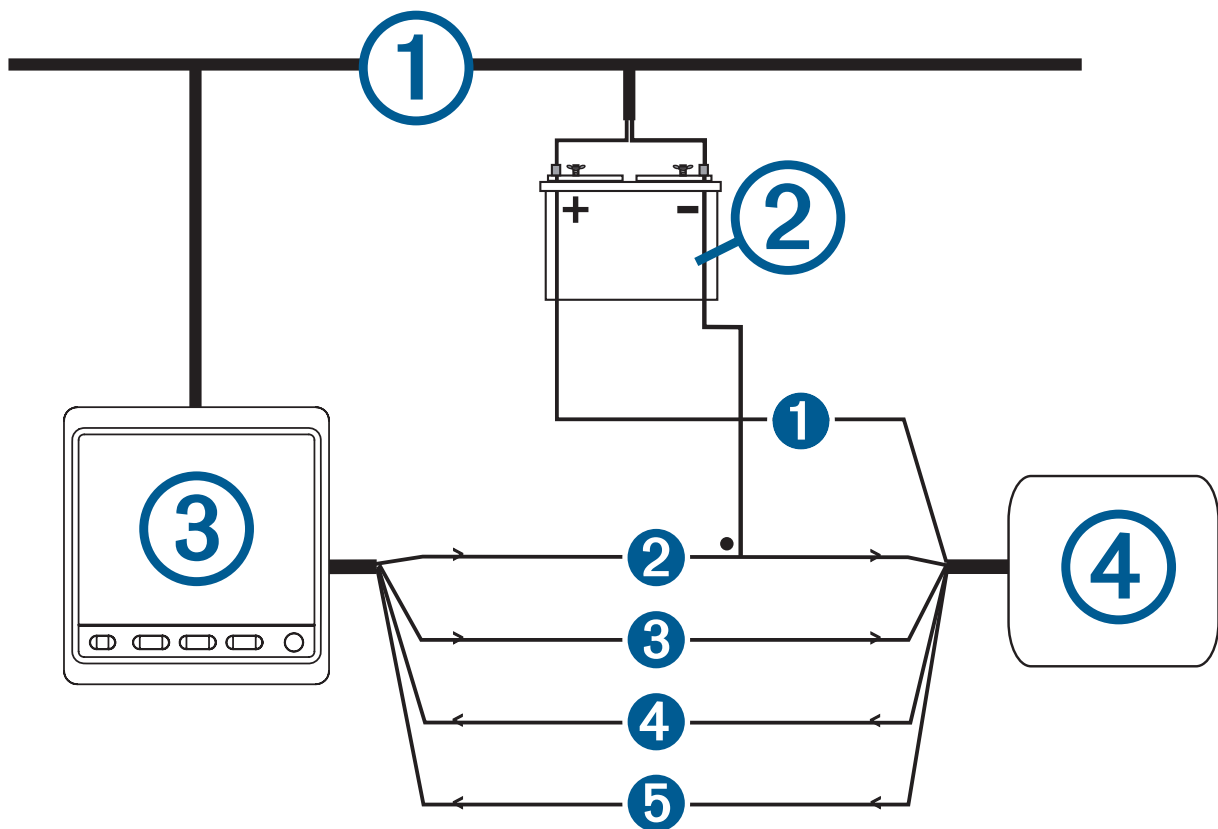
①	NMEA 2000 network (provides power to the helm control)
②	12 Vdc power source
③	Helm control
④	NMEA 0183 compatible device

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

Steering Actuator

Dimensions (L × W × H)	415 × 90 × 63 mm (16.3 × 3.5 × 2.5 in.)
Weight	1 kg (2.16 lb.)
Temperature range	From -15° to 70°C (from 5° to 158°F)
Material	Steel and plastic
Water rating	IEC 60529 IPX7*
ECU cable length	3 m (9 ft.)
Input voltage (from the ECU)	From 11.5 to 30 Vdc


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.

CCU

Dimensions (L × W × H)	170 × 90 × 50 mm (6.7 × 3.5 × 2 in.)
Weight	575 g (20 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)	175 × 142 × 64.5 mm (6.9 × 5.6 × 2.5 in.)
Weight	680 g (24 oz.)
Temperature range	From -15° to 60°C (from 5° to 140°F)
Material	Plastic housing with aluminum heat sink
Water rating	IEC 60529 IPX7 ¹
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 actuator)

¹ 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.

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	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
	bwc
	dtm
	gll
	rmb
	vhw
	mwv
	xte

Error and Warning Messages

Error Message	Cause	Autopilot Action
ECU Voltage is Low	The steering actuator supply voltage has fallen below 10 Vdc for longer than 6 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.	Autopilot transitions to heading hold
Connection with Autopilot Lost	The helm control has lost connection with the CCU.	N/A
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 steering actuator supply voltage has risen above 33.5 Vdc	The ECU shuts down
Error: ECU Voltage has Dropped Rapidly	The ECU voltage has dropped quickly below 7.0 Vdc.	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).	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.

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.

© 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™ is a trademark of Garmin Ltd. or its subsidiaries. This trademark may not be used without the express permission of Garmin.

Honda® is a registered trademark of Honda Motor Co., Ltd. and its subsidiaries and affiliates. LOCTITE® is a trademark of Henkel Corporation in the U.S. and elsewhere. Mercury® is a trademark of Brunswick Corporation. NMEA®, NMEA 2000®, and the NMEA 2000 logo are trademarks of the National Marine Electronics Association. Yamaha® is a trademark of the Yamaha Motor Corporation.

