

GARMIN®

FORCE® TROLLING MOTOR

FIELD SERVICE MANUAL

Tools, Supplies, and Equipment Needed

WARNING

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

Failure to follow these warnings, cautions, and notices could result in personal injury, damage to the vessel or device, or poor product performance.

You must perform the services and repairs described in this document according to the instructions provided. Failure to do so could result in damage to the trolling motor or its components or could result in serious personal injury.

Repairing and performing maintenance on Garmin® electronics is complex work that can result in serious personal injury or product damage if not done correctly.

Always disconnect the motor from the battery before handling or working with the propeller, propeller drive motor, electrical connections, or electronics enclosures to avoid serious injury or property damage.

CAUTION

When stowing or deploying the motor, be aware of the risk of entrapment or pinching from moving parts, which can result in injury.

When stowing or deploying the motor, be aware of slick surfaces around the motor. Slipping when stowing or deploying the motor may result in injury.

NOTICE

Garmin is not responsible for, and does not warrant, the work that you or a non-authorized repair provider perform on your product.

The tools, supplies, and equipment needed to service and repair the trolling motor depend on the service or repair needed. Not all of the items listed are applicable for every procedure.

Tools, Supplies, and Equipment Needed for Maintenance

When performing routine maintenance, you must have the following tools and supplies.

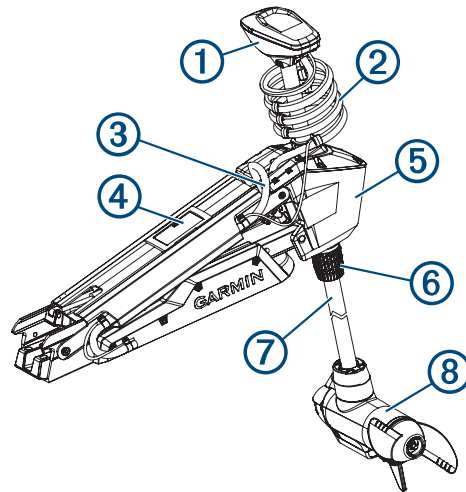
- #2 Phillips screwdriver
- 4 mm and 3 mm hex bits or wrenches
- 10 and 15 mm sockets
- $\frac{9}{16}$ in. socket
 - For removing the propeller
 - A 15 mm socket is acceptable, if necessary
- Replacement anodes (010-12832-35)
- Wire brush
- Silicone lubricating grease
- Non-stick, dry-film lubricant (such as DuPont™ Dry Film Lubricant with Teflon®)
- Dielectric grease
- Isopropyl alcohol (for cleaning areas before applying touch-up paint)
- Liquid polyurethane paint (for touching up nicks and scratches)

Tools, Supplies, and Equipment Needed for Repair

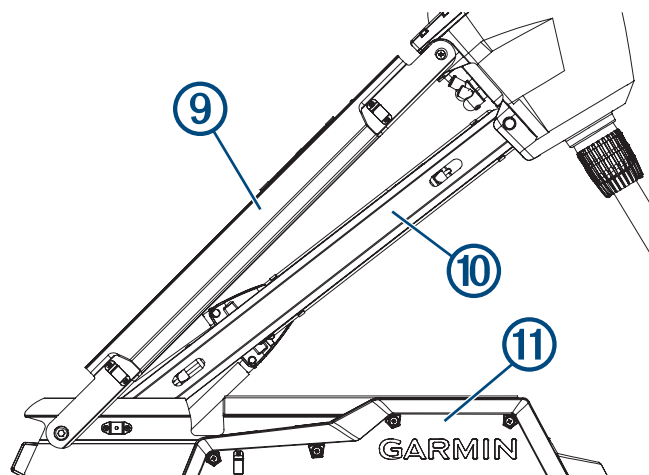
When performing repair or replacement procedures, you must have the following tools and supplies.

- Suitable workbench or table
 - Must be at least 8 ft. long for working on the 50 in. models
 - Must be at least 10 ft. long for working on the 57 in. models
- #1 Phillips screwdriver
- #2 Phillips screwdriver
- 3 mm and 4 mm and 8 mm hex bits or wrenches
- 10 and 15 mm socket
- 29 mm socket or wrench (for replacing the PCB)
- $\frac{9}{16}$ in. socket
 - For removing the propeller
 - A 15 mm socket is acceptable, if necessary
- 36 mm or adjustable wrench (for replacing the coil cable)
- Torque wrench
 - With 4 mm, 6 mm, and 8 mm hex bits
 - Capable of measuring torque from 5 kgf-cm (4.3 lbf-in) to 55 N-m (40.5 lbf-in.)
- Silicone lubricating grease (for replacing the latching mechanism or steering servo components)
- Needle-nose pliers
- Dielectric grease (for replacing the power cable or coil cable)
- Shaft and motor hardware service kit
 - S00-01000-35
 - For replacing the shaft or propeller drive motor
- Metal parts accessory kit
 - S00-01000-20
 - Contains all of the metal parts, such as brackets and screws, that may be needed when performing repairs
- Plastic parts accessory kit
 - S00-01000-46
 - Contains all of the plastic parts, such as washers and bushings, that may be needed when performing repairs

Overview and Part Locations



Item	Description
①	Shaft cap
②	Coil cable (and transducer cable)
③	Power cable (and transducer cable)
④	Display panel
⑤	Steering servo housing
⑥	Depth-adjustment collar
⑦	Shaft
⑧	Drive motor and propeller



Item	Description
⑨	Upper link of the mount
⑩	Lower link of the mount
⑪	Mount base

Maintenance Needs and Schedule

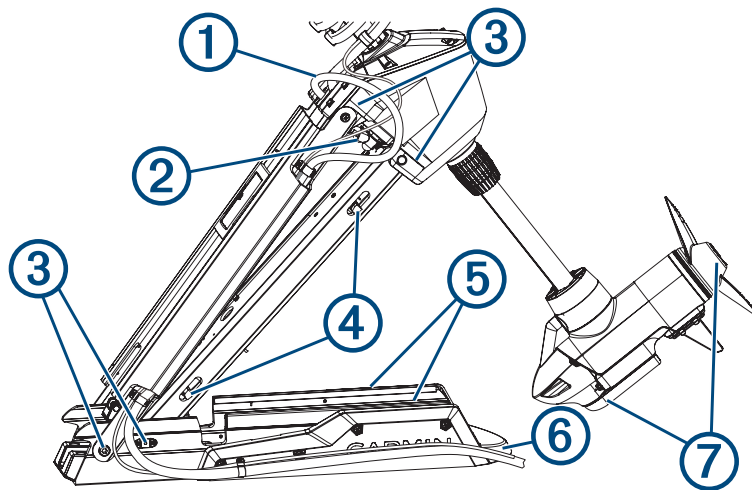
⚠ CAUTION

Use extreme care when following the procedures in this section. Some maintenance tasks require you to move the motor from the stowed to the deployed position multiple times, which presents a potential for hands or fingers to be crushed by the weight of the motor.

NOTICE

After using the motor in salt water or brackish water, you must rinse off the entire motor with fresh water, and apply a water-based silicone spray using a soft cloth. You should avoid spraying jets of water at the cap on the top of the shaft when rinsing the motor.

To maintain your warranty, you must perform a series of routine maintenance tasks as you prepare your motor for the season. If you use or transport the motor in dry, dusty environments (traveling on gravel roads, for example) you should perform these tasks more often during the season.



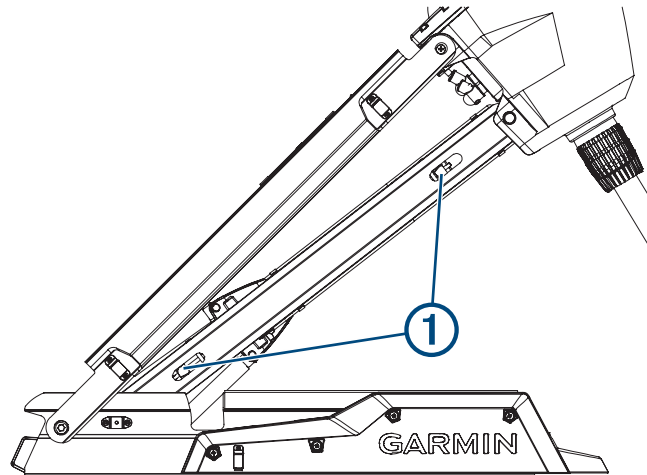
- Examine the power cable for wear, and patch, repair, or replace as necessary ①.
- Check and clean the power terminals and tighten the nuts, if necessary ② (*Checking and Cleaning the Power Terminals, page 9*).
- Lubricate the hinges and bushings ③ (*Lubricating the Hinges and Bushings, page 7*).
- Clean and lubricate the stow and deploy latch mechanism ④ (*Cleaning and Lubricating the Locking Mechanism, page 5*).
- Check the mount rails, and replace them if necessary ⑤ (*Checking and Replacing the Mount Rails, page 10*).
- Check the mount bumper, and replace it if necessary ⑥ (*Checking and Replacing the Mount Bumper, page 11*).
- Clean or replace the anodes in the propeller drive motor ⑦ (*Servicing the Anodes, page 8*).

Cleaning and Lubricating the Locking Mechanism

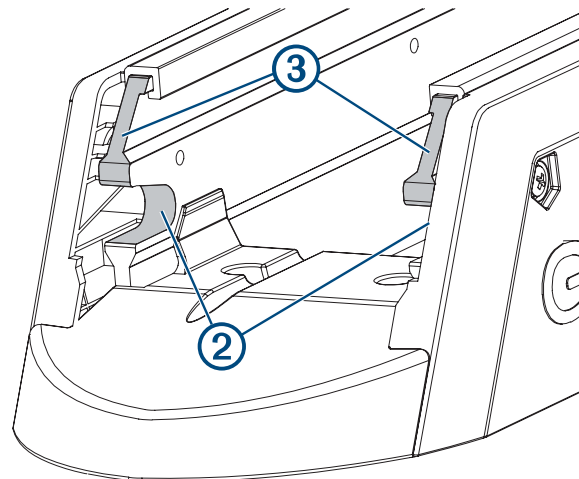
⚠ CAUTION

This procedure is best performed with the motor halfway between the stowed and deployed positions. When in this position, the motor is not secured, so you should support the motor and use extreme caution to avoid pinching or crushing hands or fingers.

- 1 Place the motor between the stowed and deployed positions so the base is oriented vertically and you can access both locking mechanisms ①.

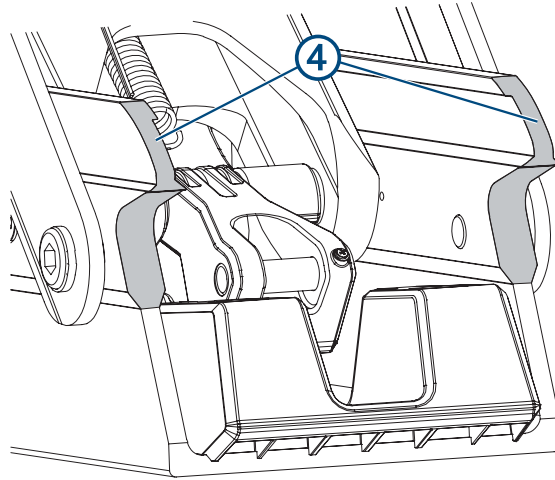


- 2 Support the weight of the motor so it cannot fall and crush your hands or fingers.
- 3 Clean any debris, dirt, and build up from all of the locking mechanism channels.
- 4 Apply a silicone lubricating grease to the locking mechanisms and the channels.
- 5 Pull and release the pull cable a number of times to move the mechanisms in the channels and distribute the grease.
- 6 If necessary, apply additional grease and repeat the previous step.
- 7 Clean any debris, dirt, and build up from the latch receivers ② on the front of the mount base.



- 8 Apply a silicone lubricating grease to the upper surface ③ of the latch receivers on the front of the mount base, so the locking mechanisms slide smoothly into the receivers.

- 9 Repeat the previous two steps for the latch receivers on the back of the mount base ④.

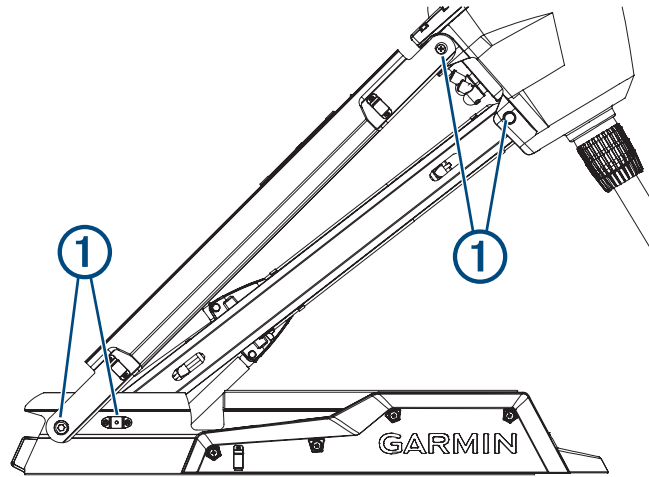


- 10 Return the motor to the stowed or deployed position.

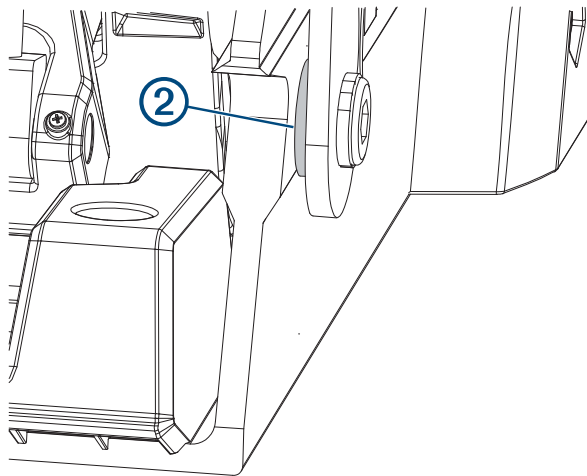
Lubricating the Hinges and Bushings

There are a number of hinges and bushings that allow the motor to transition smoothly from the stowed to deployed position and back again. You should lubricate these areas as needed.

- 1 Locate the four primary hinge points ①.



- 2 Apply a non-stick, dry-film lubricant to each hinge point, in the space between the moving parts ②, and allow it to dry according to the instructions provided with the product.

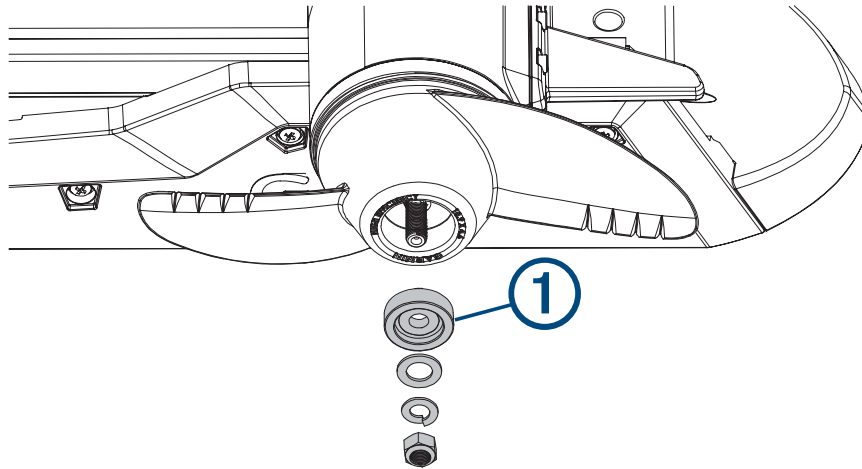


- 3 Move the motor from the stowed to the deployed position and back a number of times to distribute the lubricant.
- 4 If necessary, apply additional lubricant and repeat the previous step.

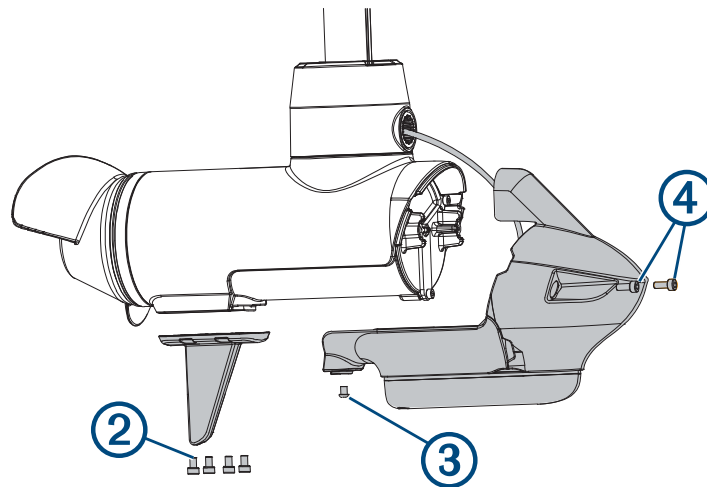
Servicing the Anodes

The anodes protect the motor components from corrosion, and each season they must be examined and cleaned or replaced if necessary.

- 1 Using a $\frac{9}{16}$ in (15 mm) socket, loosen the nut on the end of the propeller.
- 2 Remove the nut, lock washer, flat washer, and anode ①.

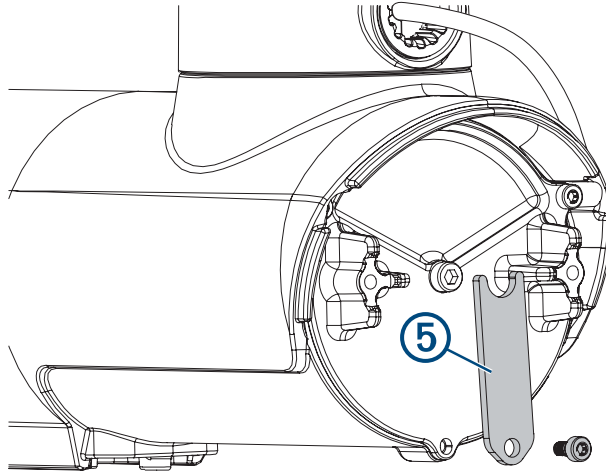


- 3 Examine the anode, and complete an action:
 - If the anode is more than half of the original size, clean the anode using a wire brush or sandpaper.
 - If the anode is less than half of the original size, discard the anode and purchase a replacement.
- 4 Place the cleaned or new anode on the propeller shaft, and secure the propeller with the lock washer, flat washer, and nut.
- 5 Using a $\frac{9}{16}$ in (15 mm) socket, tighten the nut to 8.13 N-m (6 lbf-ft).
- 6 Using a 4 mm hex bit or wrench, remove the skeg ② from the bottom of the motor.



- 7 Using a 3 mm hex bit or wrench, remove the screw ③ that secures the transducer and nose cone to the bottom of the motor.
- 8 Using a 4 mm hex bit or wrench, remove the screws ④ to disconnect the nose cone from the front of the motor.

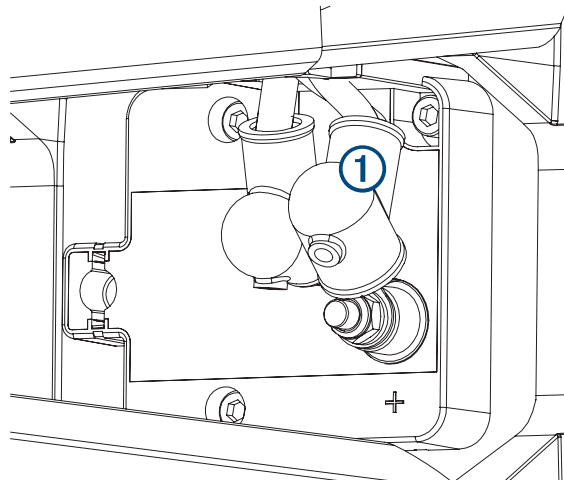
- 9 Using a 3 mm hex bit or wrench, remove the screw and anode ⑤ on the front of the motor.



- 10 Examine the anode, and complete an action:
- If the anode is more than half of the original size, clean the anode using a wire brush or sandpaper.
 - If the anode is less than half of the original size, discard the anode and purchase a replacement.
- 11 Place the cleaned or new anode on the screw and secure it to the motor.
- 12 Secure the nose cone to the front of the motor.
- 13 Install the screw that secures the transducer and nose cone to the bottom of the motor.
- 14 Install the skag on the bottom of the motor.

Checking and Cleaning the Power Terminals

- 1 With the motor in the deployed position, pull the rubber shields away from the positive and negative power terminals ①.

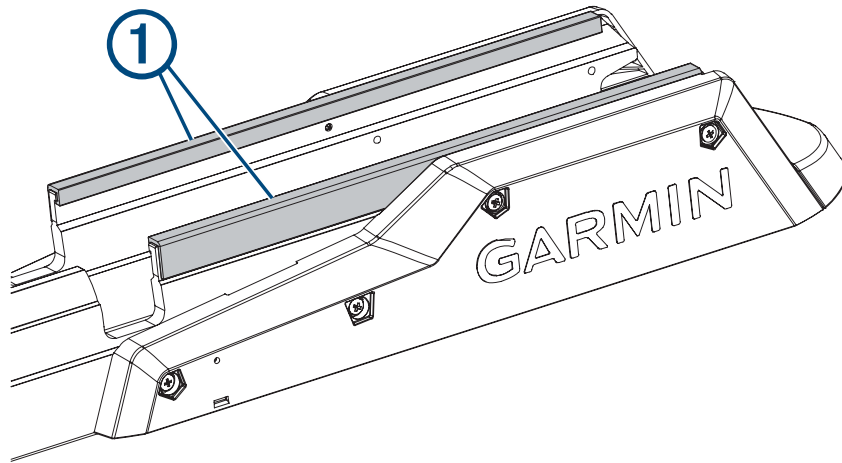


- 2 If necessary, clean any corrosion from the terminals using a wire brush.
- NOTE:** In cases of heavy corrosion, you may need to remove the power cables for an effective cleaning ([Removing the Power Cable from the Steering Servo Housing, page 59](#)).
- 3 Cover the connections with dielectric grease.
- 4 Securely place the rubber shields back over the power terminals.

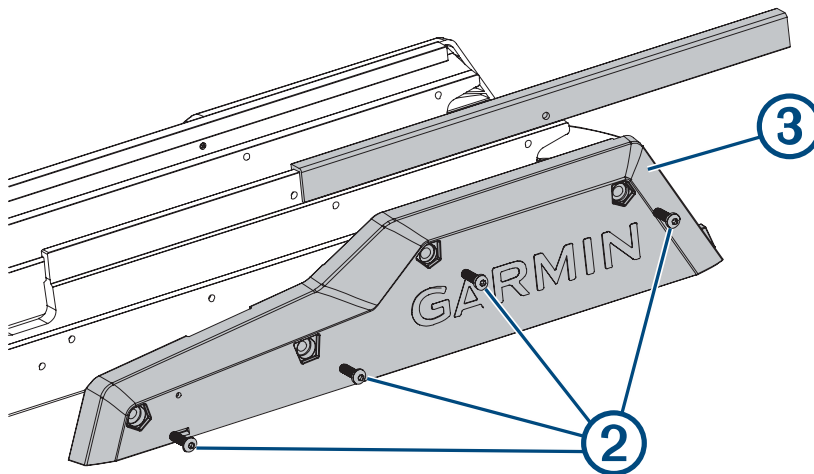
Checking and Replacing the Mount Rails

The rails protect the propeller drive motor and the mount from impact when stowing the motor, and may become worn over time. If the rails are damaged or worn and the mount base is visible through them, you must replace them.

- 1 With the motor in the stowed position, examine the rails ① for wear and damage.



- 2 Select an action:
 - If the rails are in good condition, and you cannot see the metal mount base through any worn areas, no further action is needed.
 - If the rails are damaged or if you can see the metal mount base through worn areas in the rails, proceed to the next step to replace them.
- 3 Using a 4 mm hex bit or wrench, remove the screws ② that secure the shrouds ③ to the mount base.

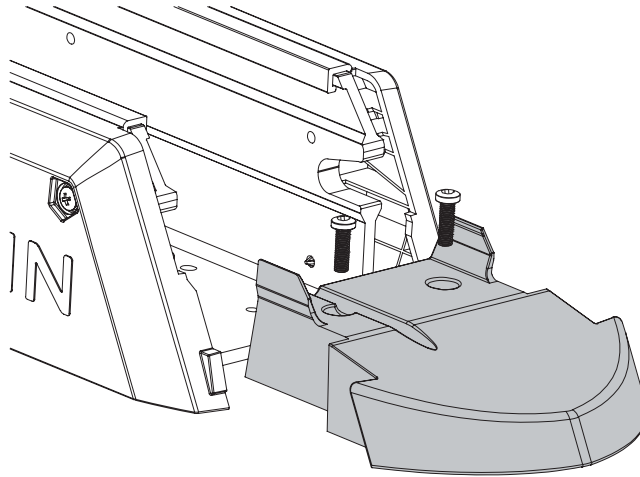


- 4 Slide the damaged rails off of the mount base.
- 5 Slide the replacement rails onto the mount base.
- 6 Secure the shrouds to the mount base using the screws you removed previously.

Checking and Replacing the Mount Bumper

The mount bumper is the part of the mount base that overhangs the bow of the boat.

- 1 Place the motor between the stowed and deployed positions, and check the mount bumper for damage.
- 2 Select an action:
 - If the mount bumper is undamaged, no further action is needed.
 - If the mount bumper is damaged, proceed to the next step to replace it.
- 3 Using a 4 mm hex bit or wrench, remove the two screws that secure the mount bumper to the mount base.

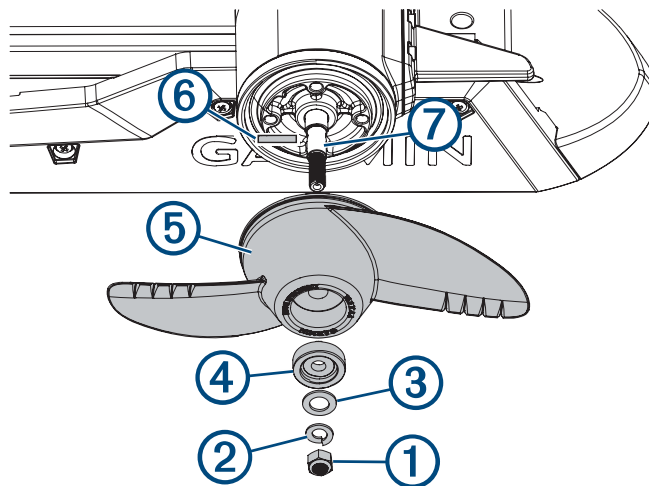


- 4 Install a replacement mount bumper, and secure it to the mount base using the screws provided with the replacement part.

Replacing the Propeller

If the propeller is damaged, you must replace it.

- 1 Using a 15 mm socket, remove the nut ① that secures the propeller.



- 2 Remove the lock washer ②, flat washer ③, anode ④, and damaged propeller ⑤.
- 3 Service the anode, if necessary ([Servicing the Anodes, page 8](#)).
- 4 If necessary, install the pin ⑥ in the propeller motor shaft ⑦.
- 5 Install a replacement propeller.
- 6 Place the anode, flat washer, lock washer, and nut onto the end of the motor shaft.
- 7 Using a $\frac{9}{16}$ in (15 mm) socket, tighten the nut to 8.13 N-m (6 lbf-ft) to secure the propeller.

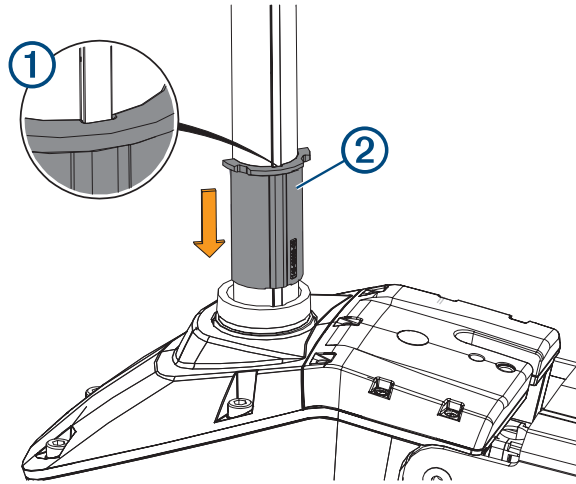
Fixing Paint Scratches

Over time, parts of the motor may become scratched or dinged. You can use paint to touch up these areas for cosmetic purposes.

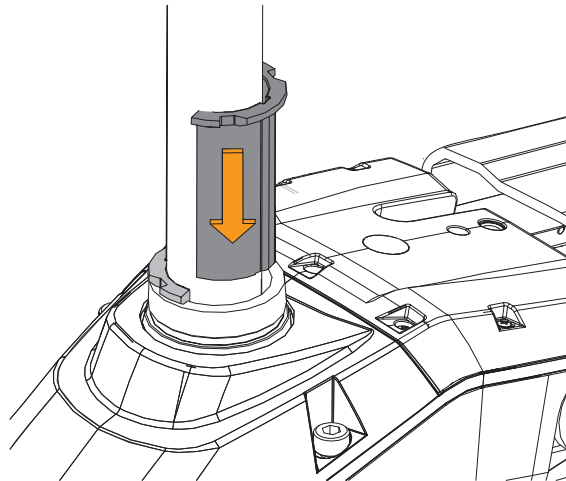
- 1 Using isopropyl alcohol, thoroughly clean the areas where the paint has been scratched or damaged.
- 2 Apply liquid polyurethane touch-up paint to the scratched or damaged areas.
- 3 Follow the instructions on the paint, and allow for proper drying before using the motor.

Installing the Depth Limiter

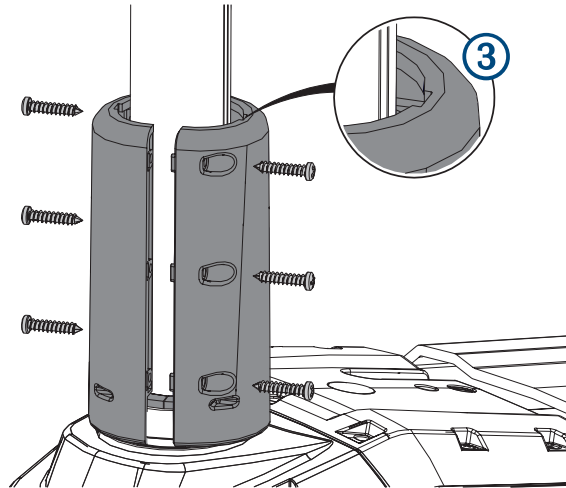
- 1 Place the bushing with the inner notch **①** over the keyed side of the shaft **②** and slide it down until it stops.



- 2 Place the smooth bushing over the other side of the shaft and slide it down until it stops.



- 3 Place both halves of the depth limiter over the shaft and the top of the steering servo housing ③.



- 4 Using a #2 Phillips screwdriver, install the six 3 mm pan head screws to secure both halves of depth limiter together.

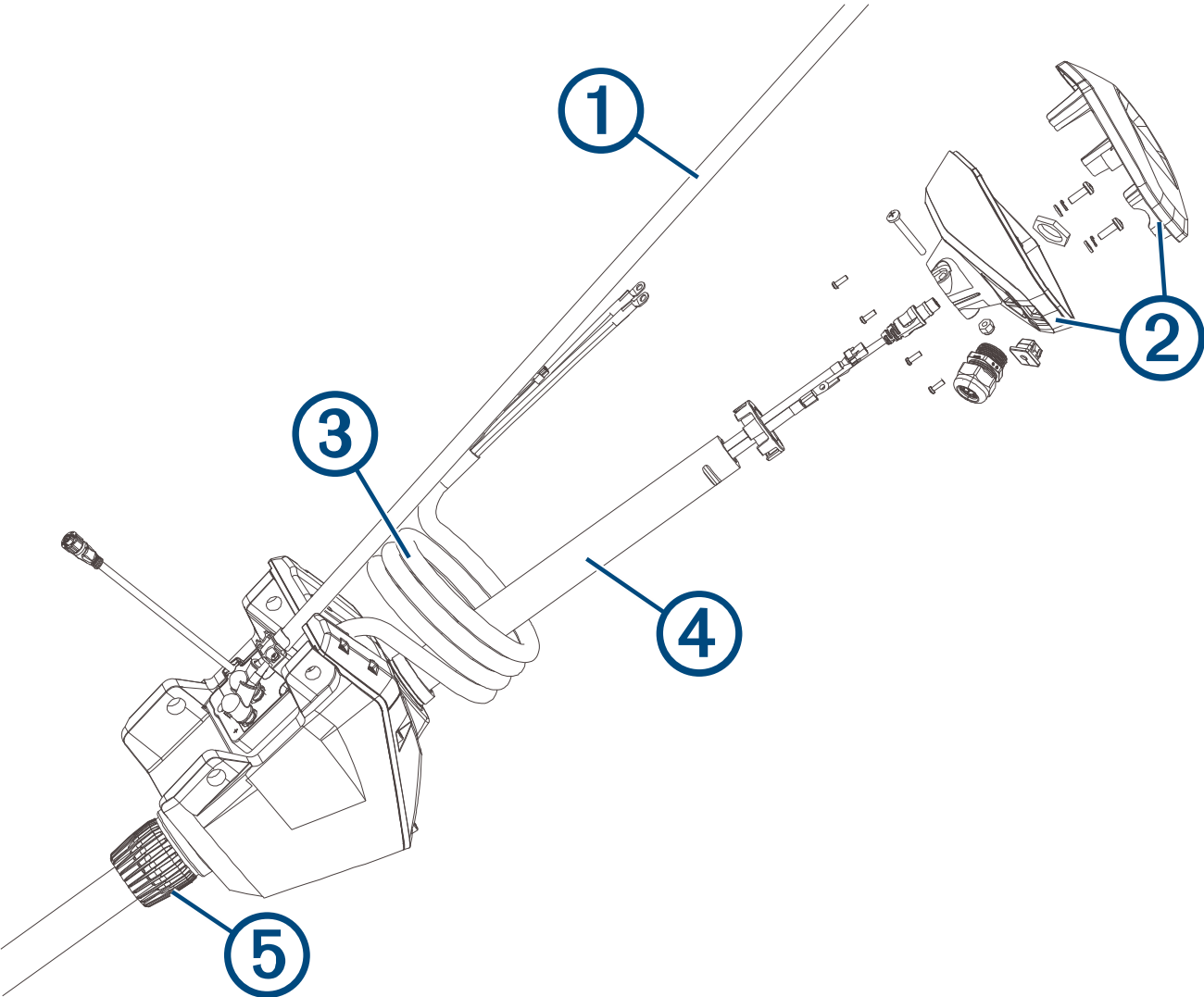
If the depth limiter is installed properly, you cannot slide it up the shaft.

Service Parts

You can use these diagrams to identify and order service parts. You can follow the links where provided for detailed disassembly and replacement procedures.

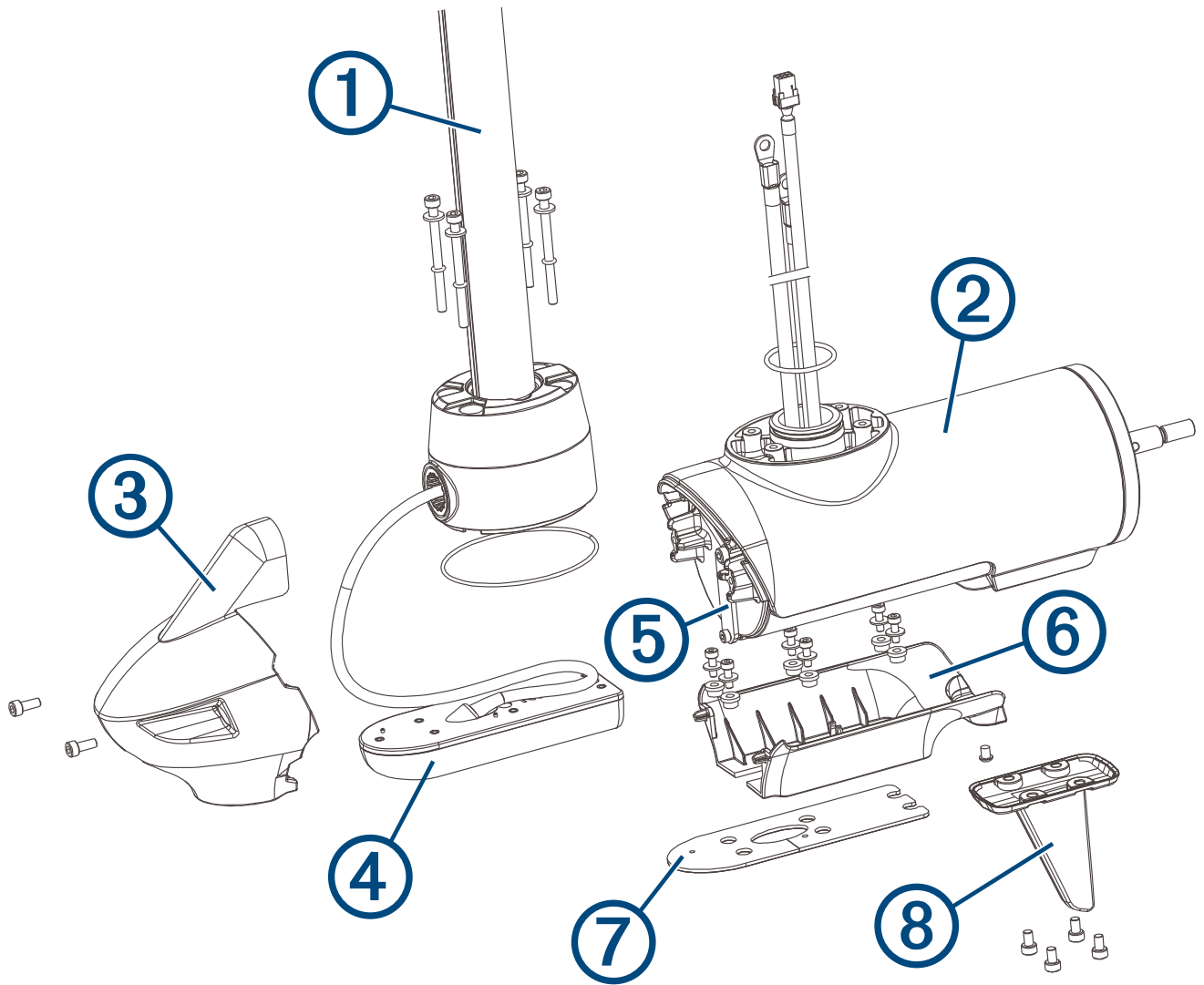
To order the service parts listed in this manual, contact Garmin at 1-800-800-1420 or send an email to dealer.tech@garmin.com to place an order.

Shaft and Cable Parts



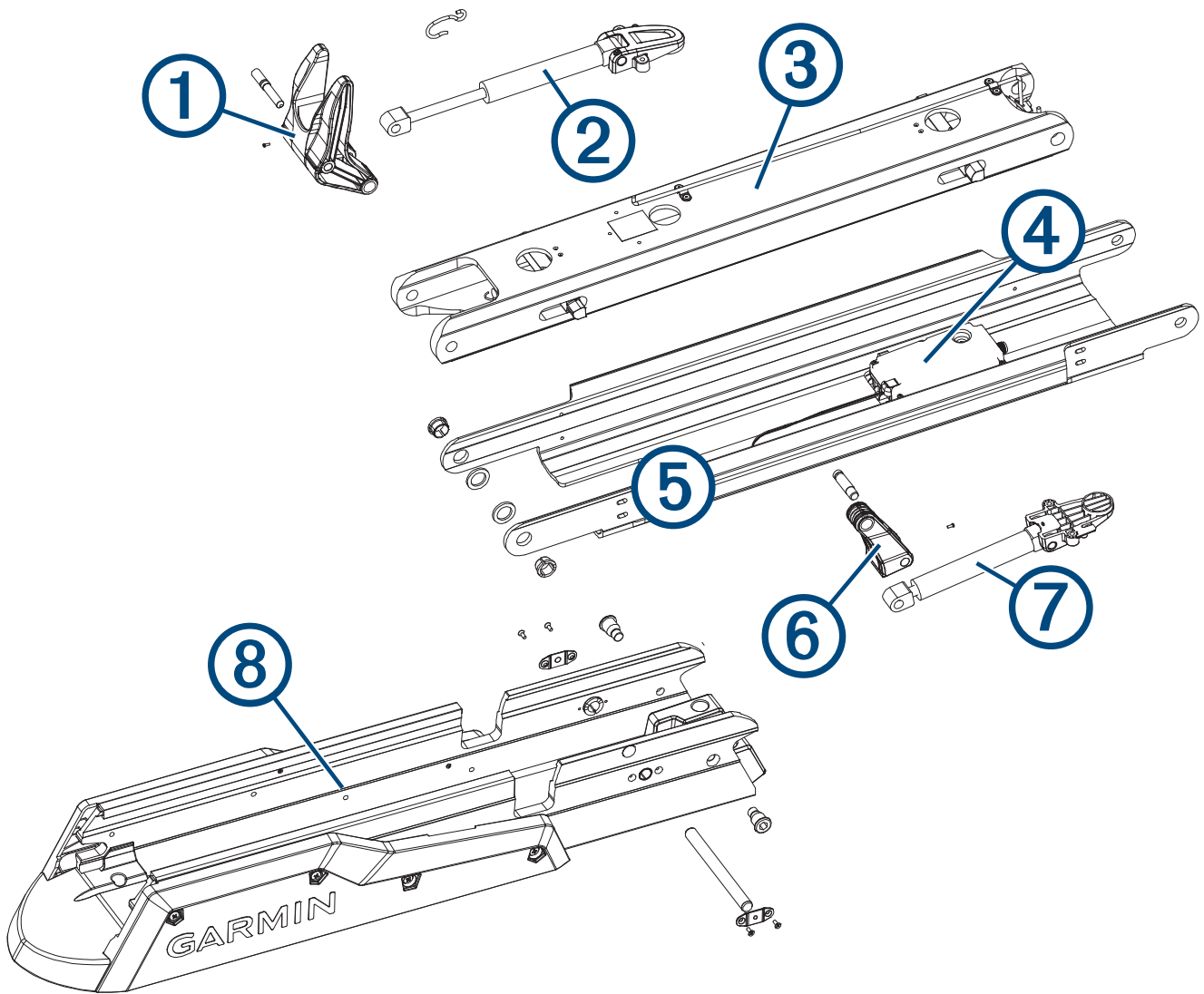
Item	Description	Service Part Number	Details
①	Power cable	S00-01000-22	<i>Removing the Power Cable from the Steering Servo Housing, page 59</i>
②	Shaft cap	S00-01000-12	The service kit contains the internal hardware, cable grip, and grommet. <i>Removing the Shaft Cap, page 31</i>
③	Coil cable	S00-01000-48	<i>Removing the Coil Cable from the Steering Servo Housing, page 61</i>
④	Shaft	50 in. model: S00-01000-02 57 in. model: S00-01000-07	<i>Removing the Propeller Drive Motor and Nose Cone from the Shaft, page 33</i>
⑤	Depth adjustment collar	S00-01000-41	<i>Removing the Depth-Adjustment Collar, page 32</i>
Not shown	Pull cable and handle	010-12832-30	<i>Installing a New Pull Cable, page 24</i>
Not shown	60 A circuit breaker accessory	010-12832-40	Instructions are provided with the circuit breaker.
Not shown	Power cable plug accessory	010-12832-41	Instructions are provided with the power cable plug.
Not shown	Power cable receptacle accessory	010-12832-42	Instructions are provided with the power cable socket.
Not shown	Foot pedal power cable replacement	010-12832-10	Installation instructions are provided with your foot pedal.

Propeller Drive Motor Parts



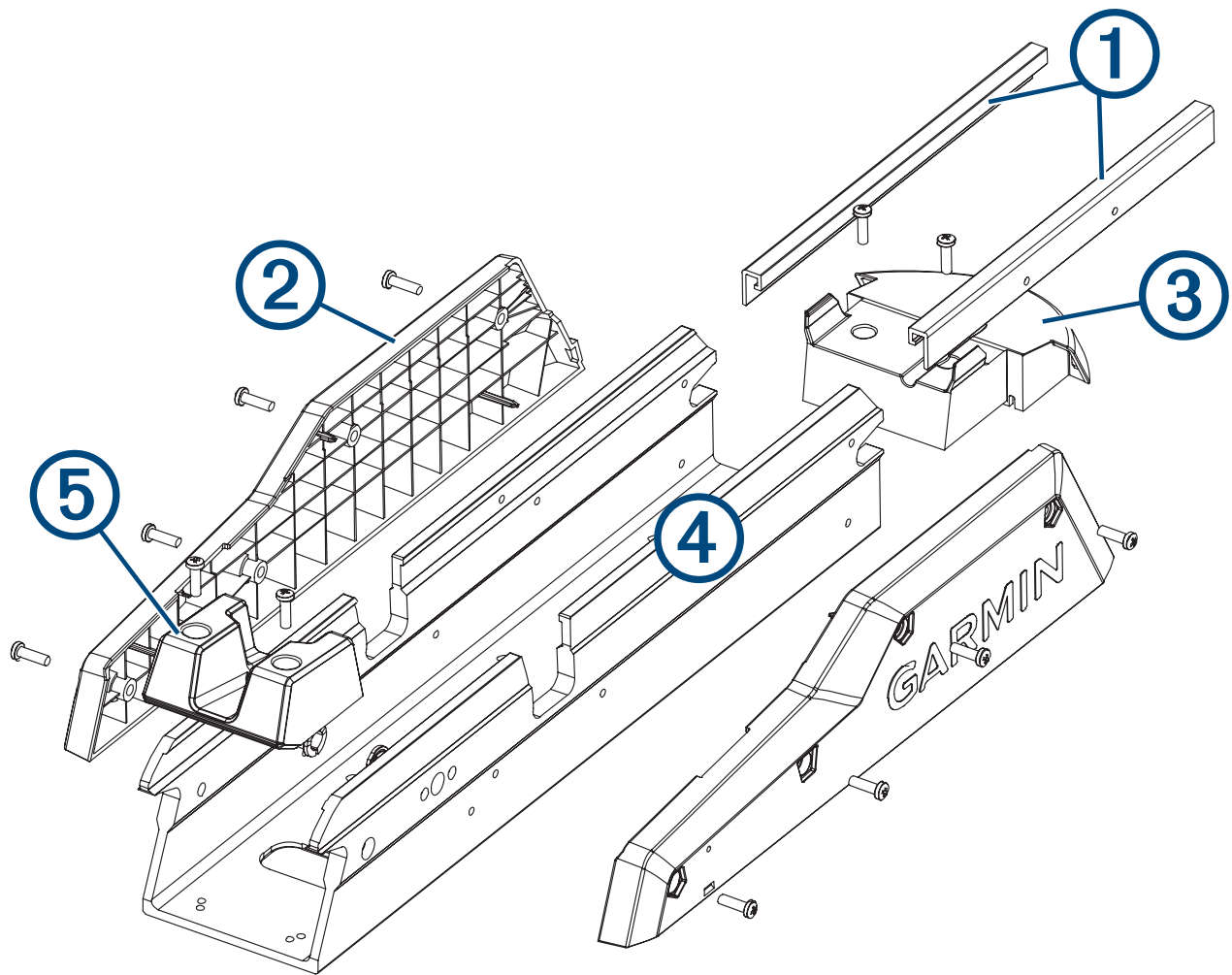
Item	Description	Service Part Number	Details
①	Shaft	50 in. model: S00-01000-02 57 in. model: S00-01000-07	Removing the Propeller Drive Motor and Nose Cone from the Shaft, page 33
②	Propeller drive motor	50 in. model: S00-01000-01 57 in. model: S00-01000-06	Removing the Propeller Drive Motor, page 34
③	Nose cone	Transducer: 010-12832-20 No transducer: 010-12832-22	One of two parts included with a replacement nose cone. (Replacing the Nose Cone, page 36)
④	Transducer	Contact Garmin support for replacement transducer options. Transducer replacement kit: 010-12832-25	The replacement transducer and transducer replacement kit are sold separately. Detailed replacement instructions (190-02521-94) are included with the transducer replacement kit.
⑤	Motor anode	010-12832-35	The anode kit contains the motor anode and the propeller anode (not shown). Servicing the Anodes, page 8
⑥	Lower nose cone	Transducer: 010-12832-20 No transducer: 010-12832-22	One of two parts included with a replacement nose cone. (Replacing the Nose Cone, page 36)
⑦	Transducer pad	010-12832-25	Included in the transducer replacement kit.
⑧	Skeg	010-12832-18	Removing the Skeg and Nose Cone, page 33
Not shown	Propeller	Power propeller: 010-12832-00 Weedless propeller: 010-12832-01	Replacing the Propeller, page 11

Mount Parts



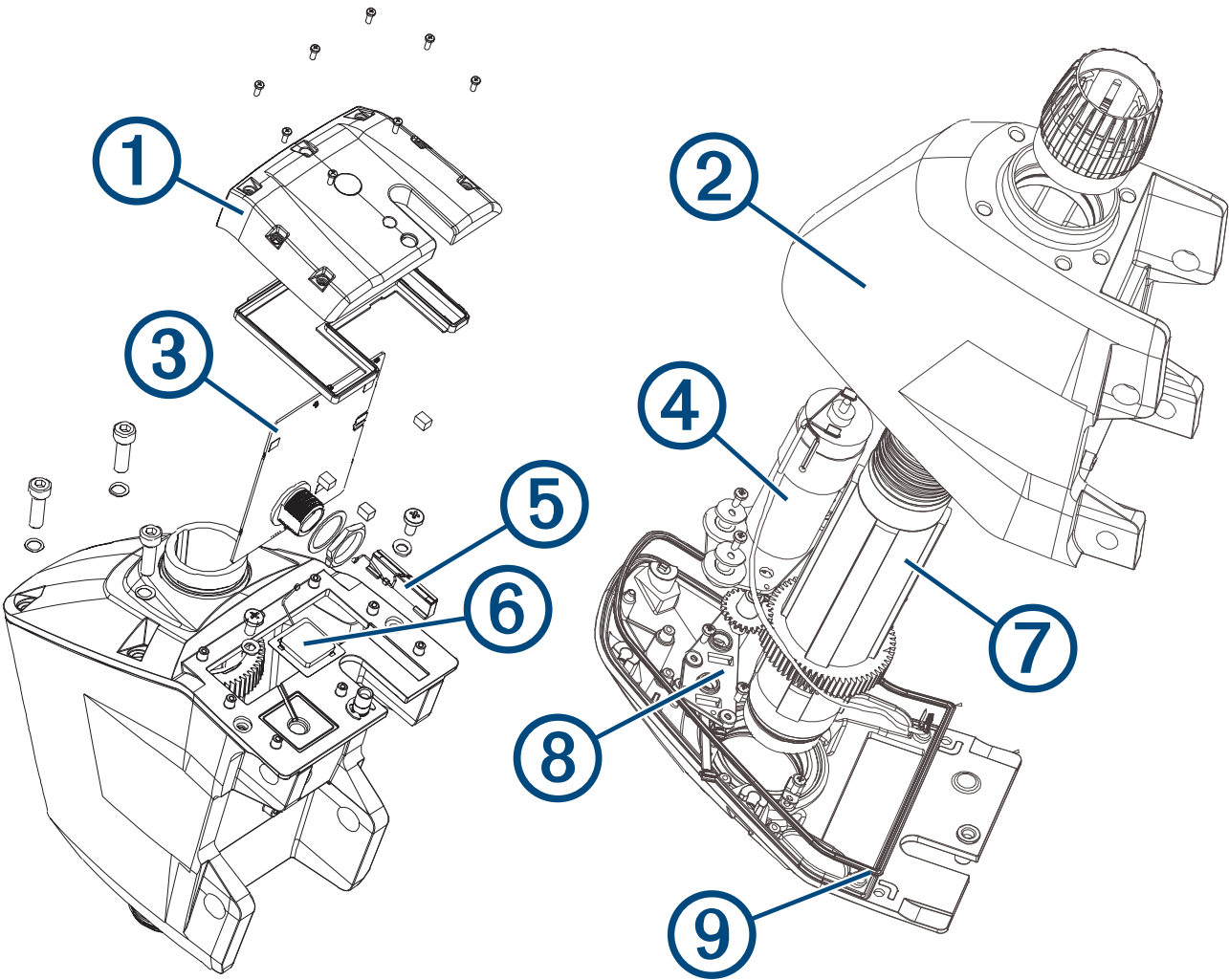
Item	Description	Service Part Number	Details
①	Lower gas spring arm and shaft stabilizer	S00-01000-18	<i>Disconnecting the Lower Gas Spring, page 47</i>
②	Lower gas spring (deploy)	S00-01000-37	<i>Disconnecting the Lower Gas Spring, page 47</i>
③	Mount lower link	Lower link and latching components assembled, 50 in. model: S00-01000-04 Latching components only, 50 in. model: S00-01000-45 Lower link and latching components assembled, 57 in. model: S00-01000-09 Latching components only, 57 in. model: S00-01000-11	<i>Removing the Lower Link from the Mount Base, page 65</i>
④	Display panel (Ebox)	S00-01000-39	<i>(Replacing the Display Panel, page 63)</i>
⑤	Mount upper link	50 in. model: S00-01000-03 57 in. model: S00-01000-08	<i>Removing the Upper Link from the Mount Base, page 64</i>
⑥	Upper gas spring arm	S00-01000-17	<i>Disconnecting the Upper Gas Spring, page 51</i>
⑦	Upper gas spring (stow)	50 in. model: S00-01000-38 57 in. model: S00-01000-40	<i>Disconnecting the Upper Gas Spring, page 51</i>
⑧	Mount base	See <i>Mount Base Parts, page 20</i> for mount base service part numbers.	<i>Mount Base Parts, page 20</i>

Mount Base Parts



Item	Description	Service Part Number	Details
①	Mount base rails	50 in. model: S00-01000-33 57 in. model: S00-01000-34	Replacing the Mount Rails, page 69
②	Mount base shrouds	S00-01000-14	Replacing the Mount Shrouds, page 69
③	Motor bumper	S00-01000-19	Replacing the Mount Bumper, page 70
④	Mount base	50 in. model: S00-01000-05 57 in. model: S00-01000-10	This replacement part includes the base and all of the plastic parts, including the shrouds, rails, stow support, and motor bumper, fully assembled. Replacing the Mount Base, page 68
⑤	Mount base stow support	S00-01000-47	Replacing the Stow Support, page 70

Steering and Electronics Parts



Item	Description	Service Part Number	Details
①	Electronics cover and seal	S00-01000-52	<i>Removing the Electronics Cover, page 71</i>
②	Lower steering servo housing	S00-01000-16	<i>Opening the Steering Servo Housing, page 76</i>
③	Control PCB	S12-03433-00	<i>Replacing the PCB, page 74</i>
④	Motor and gear assembly	S00-01000-50	<i>Removing the Steering Servo Motor, page 77</i>
⑤	Antenna module	S00-01000-42	<i>Replacing the Antenna Module, page 72</i>
⑥	GPS module	S00-01000-43	<i>Replacing the GPS Antenna, page 73</i>
⑦	Shaft carrier	S00-01000-49	<i>Removing the Shaft Carrier and Gears, page 81</i>
⑧	Steering position sensor bracket	S00-01000-51	<i>(Replacing the Steering Position Sensor, page 82)</i>
⑨	Upper steering servo housing and seal	S00-01000-15	<i>Opening the Steering Servo Housing, page 76</i>

Service Procedures

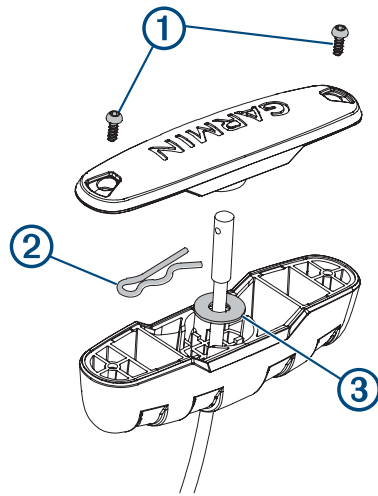
Replacing the Pull Cable

You can replace the pull cable without disassembling the motor.

- 1 If necessary, remove the handle from the pull cable (*Removing the Pull Cable Handle, page 23*).
- 2 Remove the pull cable from the mount (*Removing the Pull Cable, page 23*).
- 3 Install the new pull cable on the mount (*Installing a New Pull Cable, page 24*).
- 4 Install the handle on the new pull cable (*Installing the Handle on the Pull Cable, page 25*).

Removing the Pull Cable Handle

- 1 Using a #1 Phillips screwdriver, remove the two screws ① that secure top of the handle.



- 2 Push the pull cable up from the bottom of the handle, and remove the R-pin ②.
- 3 Pull the cable through the washer ③ and the bottom of the handle.

Removing the Pull Cable

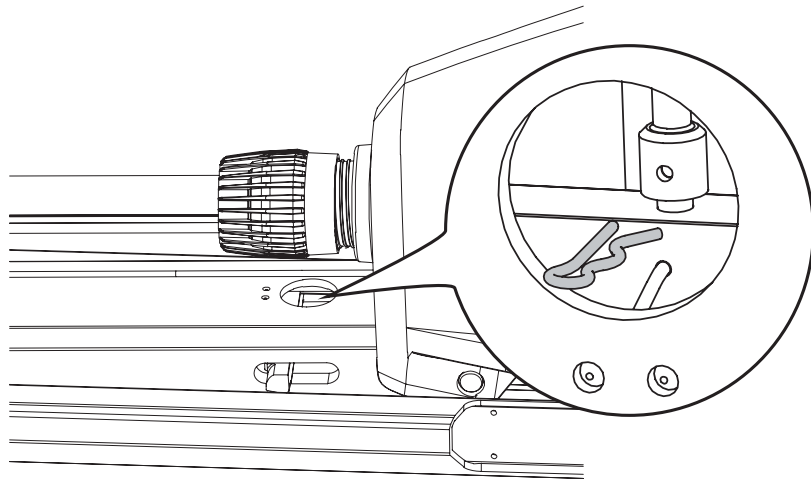
Before you can remove the pull cable, you must remove the pull cable handle ([Removing the Pull Cable Handle, page 23](#)).

- 1 Transition the motor to the stowed position.

⚠ CAUTION

You should leave the motor in the stowed position until you have connected the new pull cable. If the mount is not securely locked in the deployed position, it may shift and crush your hands or fingers.

- 2 Locate the access hole on the underside of the mount base.
- 3 Using needle-nose pliers, remove the R-pin that secures the pull cable to the locking mechanism.



- 4 Remove the pull cable from the mount base, and pull it through the steering servo housing.

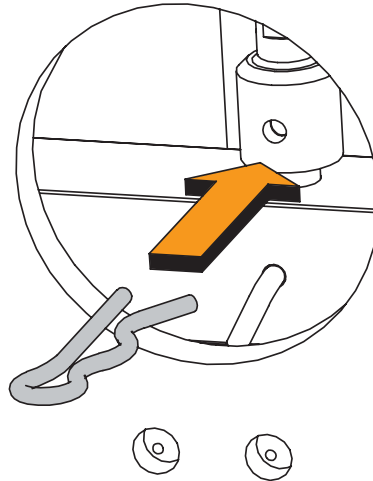
Installing a New Pull Cable

Before you can install a new pull cable, you must remove the existing pull cable ([Removing the Pull Cable](#), page 23).

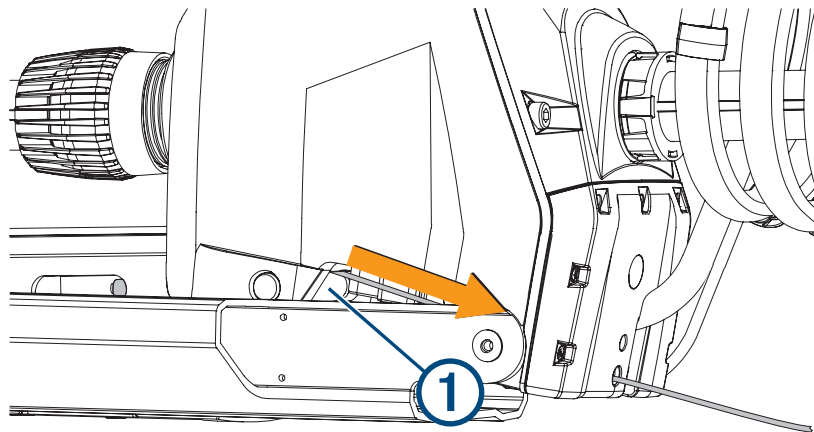
⚠ CAUTION

After you have removed the existing pull cable, should leave the motor in the stowed position until you have connected the new pull cable. If the mount is not securely locked in the deployed position, it may shift and crush your hands or fingers.

- 1 Feed the end of the new pull cable into the mount base, and place it over the stud on the locking mechanism.
- 2 Using needle-nose pliers, push the R-pin through the hole on the end of the pull cable to secure it to the locking mechanism.

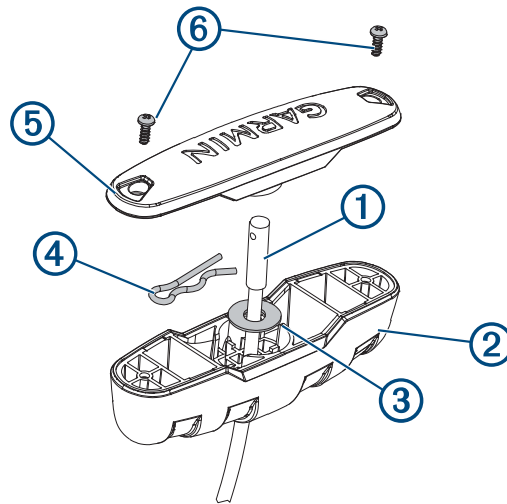


- 3 Feed the other end of the pull cable through the steering servo housing, routing the cable between the upper link of the mount and the pivot pin.



Installing the Handle on the Pull Cable

- 1 Insert the pull cable ① through the bottom half of the handle ②.

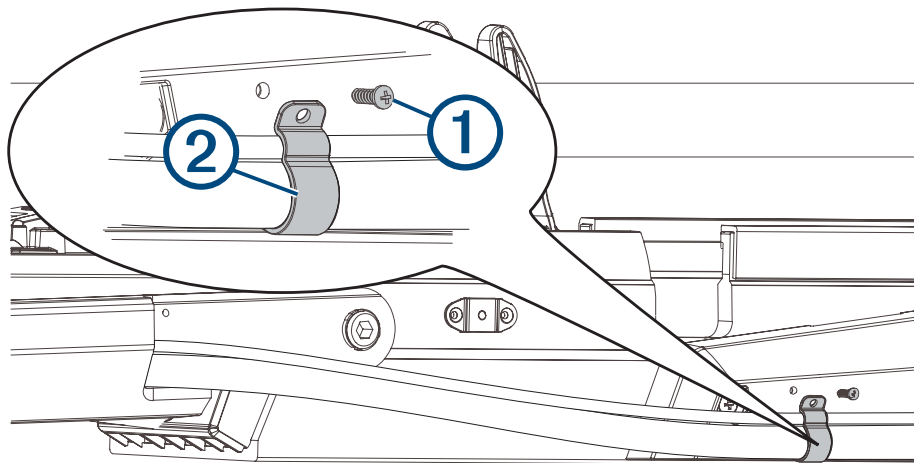


- 2 Insert the pull cable through the washer ③.
 - 3 Push the R-pin ④ through the hole on the end of the pull cable.
 - 4 Pull the cable down so that the washer and R-pin rest in the bottom half of the handle.
- NOTE:** The R-pin fits in the bottom half of the handle one way only.
- 5 Using a #1 Phillips screwdriver, secure the top of the handle ⑤ to the bottom using the screws ⑥.

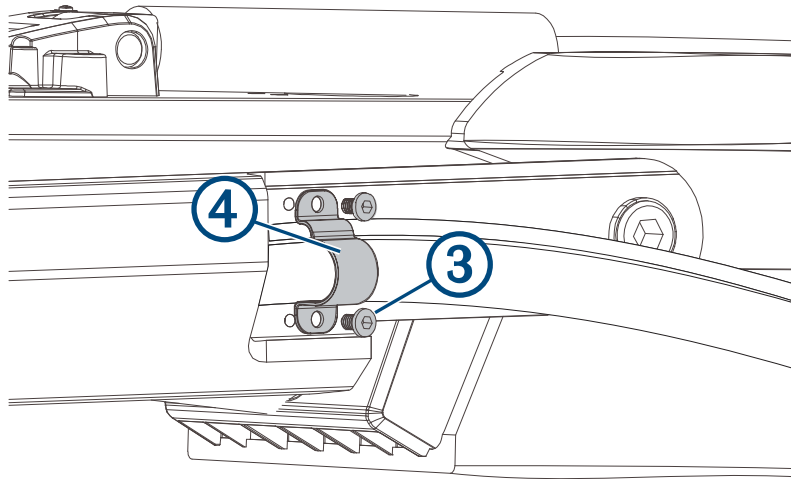
Removing the Power and Transducer Cables From the Mount

You should remove the power and transducer cables from the mount if you are replacing a damaged cable, transducer, shaft, or propeller drive motor.

- 1 Disconnect the motor from the power source.
- 2 With the motor in the stowed position, using a #1 Phillips screwdriver, remove the single screw ① that secures the upper tab of the bracket ② to the mount base, and remove the bracket.



- 3 Using a 3 mm hex bit or wrench, remove the four screws ③ that secure the two brackets ④ to the mount on both sides of the cable channel.



- 4 Pull the power cable out of the channel along the side of the mount.
- 5 Pull the transducer cable out of the channel along the side of the mount.

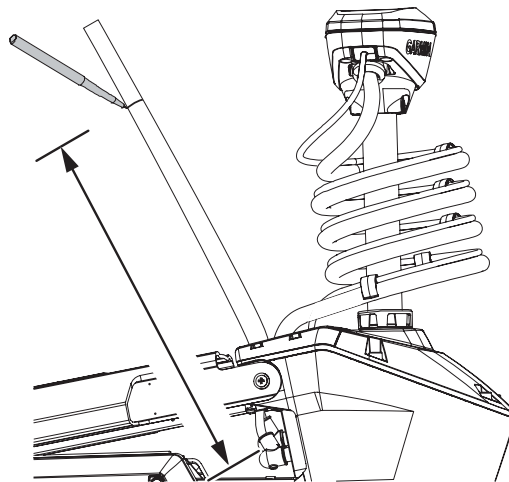
Routing the Power and Transducer Cables Through the Mount

After you have installed a replacement power cable, transducer, shaft, or propeller drive motor, you should route the power and transducer cables through the mount.

NOTICE

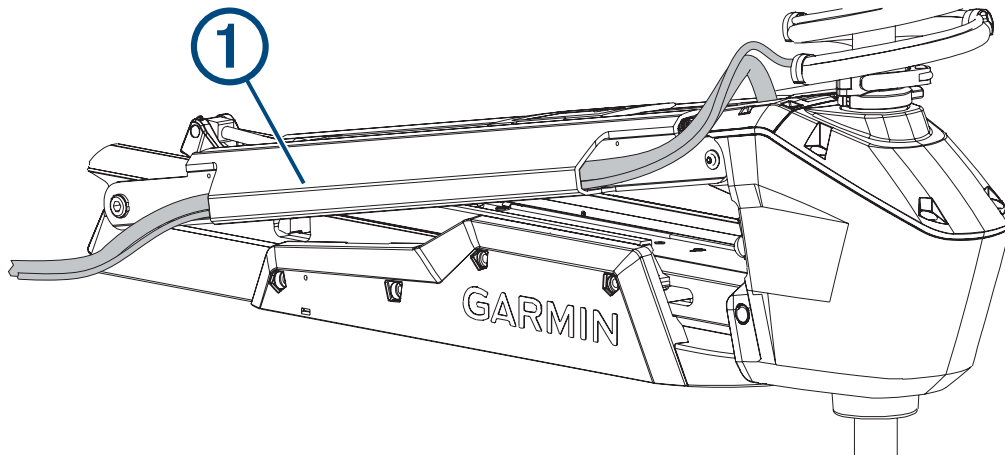
To avoid damaging the power and transducer cables when deploying and stowing the trolling motor and to avoid interference with the GPS and heading sensors in the motor, you must route the cables through the right (starboard) side of the mount and secure them using the included hardware. You must not route the power cable through the left (port) side of the mount, and it is not possible to install the included brackets on the left (port) side. The left (port) side is reserved for additional accessories or transducer cables that you may install in the future.

- 1 Measure approximately 40 cm (16 in.) on the power cable from where it connects to the steering servo housing, and look for the mark on the cable applied at the factory.



- 2 If you do not see a mark on the cable, or if the mark is not approximately 40 cm (16 in.) from the connection, make a mark with a marker or tape.

- 3 With the motor in the deployed position, route the transducer cable through the channel along the right (starboard) side of the mount ①.



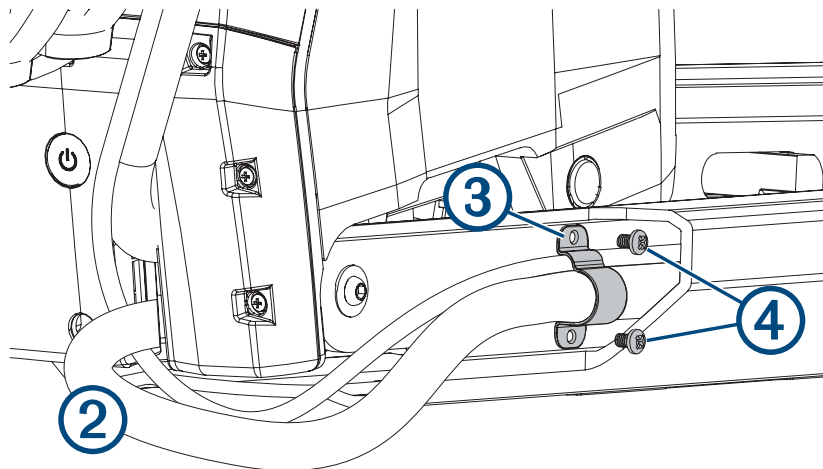
TIP: To determine the right (starboard) side of the mount, stand in a location where you can read the information on the display panel.

- 4 Route the power cable through the channel above the transducer cable.
- 5 Using the pull cable, carefully lift the motor from the deployed position to the stowed position.

NOTICE

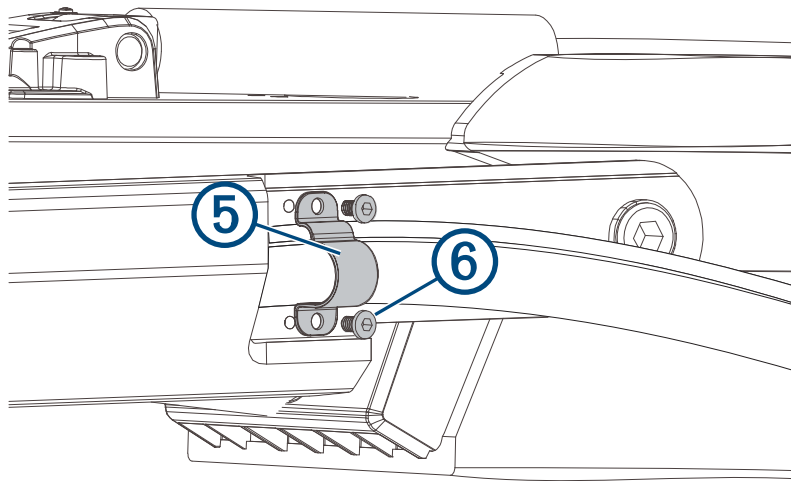
You must secure the cables to the mount with the motor in the stowed position. If you complete this procedure with the motor in the deployed position, the cables are not at their fully extended length, and the added stress may damage the cables during use.

- 6 Leaving a rounded bend in the cables ②, hold them against the side of the mount where they enter the channel.

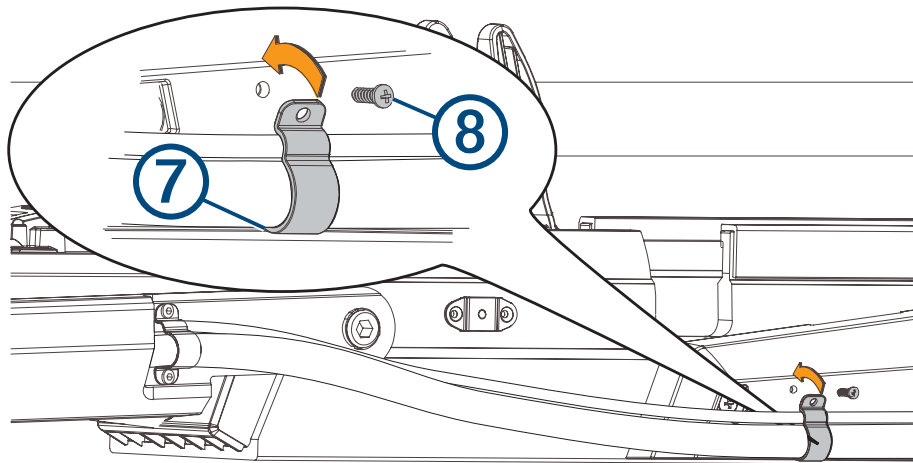


- 7 At the marked location on the power cable, place one of the brackets that has two screw holes ③ over the cables and against the mount, aligning the holes on the bracket with the holes on the mount.
- 8 Using a 3 mm hex bit or wrench, secure the bracket to the mount using two screws ④.
- 9 Hold the cables against the bottom of the mount where they exit the channel.

- 10 Place the other bracket that has two screw holes ⑤ over the cables and against the mount, aligning the holes on the bracket with the holes on the mount.



- 11 Using a 3 mm hex bit or wrench, secure the bracket to the mount using two screws ⑥.
- 12 Hold the cables against the plastic portion of the mount base, close to the boat deck.
- 13 Insert the lower tab on the remaining bracket into a slot below the cables ⑦, and rotate the bracket toward the mount base to hold the cables.



- 14 Using a #1 Phillips screwdriver, secure the upper tab of the bracket to the mount base using a single screw ⑧.

Removing the Shaft and Propeller Drive Motor from the Steering System

Before you can remove the shaft and propeller drive motor, you must remove the transducer cable from the mount, if applicable ([Removing the Power and Transducer Cables From the Mount, page 25](#)).

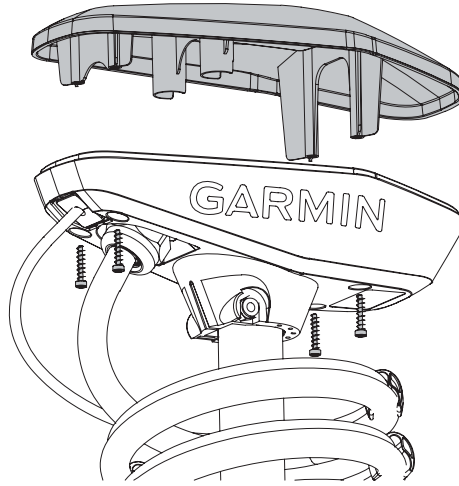
- 1 Disconnect the motor from the power source.
- 2 Open the shaft cap ([Opening the Shaft Cap, page 29](#)).
- 3 Disconnect the cables in the shaft cap ([Disconnecting the Cables in the Shaft Cap, page 29](#)).
- 4 Remove the transducer cable from the shaft cap ([Removing the Transducer Cable from the Shaft Cap, page 30](#)).
- 5 Remove the shaft cap ([Removing the Shaft Cap, page 31](#)).
- 6 Remove the shaft from the steering system ([Removing the Shaft from the Steering Servo, page 32](#)).

Opening the Shaft Cap

NOTICE

Before you open the shaft cap, you must disconnect the motor from the power source.

- 1 Using a #2 Phillips screwdriver, remove the four screws that secure the lid of the shaft cap.



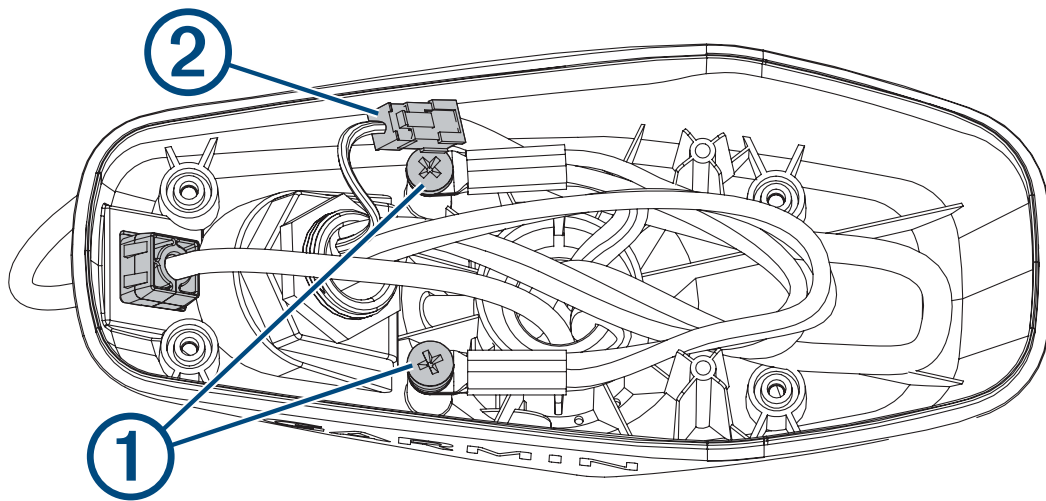
You should place these screws in a safe place, because you must use them to close the shaft cap.

- 2 Lift up to remove the lid of the shaft cap.

Disconnecting the Cables in the Shaft Cap

Before you can disconnect the cables in the shaft cap, you must open the shaft cap ([Opening the Shaft Cap](#), page 29).

- 1 Using a #3 Phillips screwdriver, remove the two screws ① that secure the power cables in the shaft cap.



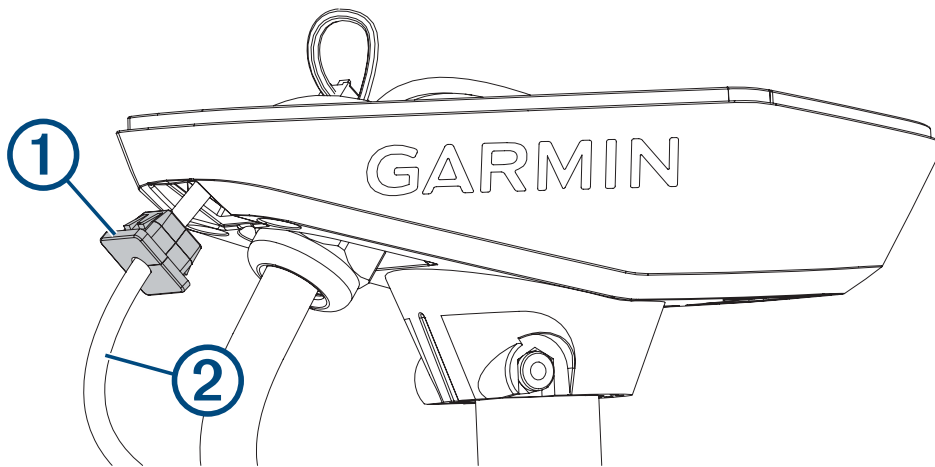
You should keep these screws in a safe place, because you must use them when reconnecting the cables.

- 2 Release the latch ② and pull the connectors apart to disconnect the data cable.

Removing the Transducer Cable from the Shaft Cap

Before you can remove the transducer cable from the shaft cap, you must open the shaft cap ([Opening the Shaft Cap, page 29](#)).

- 1 Disconnect the transducer cable from the chartplotter.
- 2 Remove the power and transducer cables from the mount ([Removing the Power and Transducer Cables From the Mount, page 25](#)).
- 3 Remove the plastic cable clamps that secure the transducer cable to the coiled power cable.
You should keep these cable clamps in a safe place, because you must reinstall later.
- 4 Straighten the transducer cable so you can easily pull it through the shaft cap.
- 5 Push from the inside out to remove the square grommet ① that holds the transducer cable ② in the shaft cap.

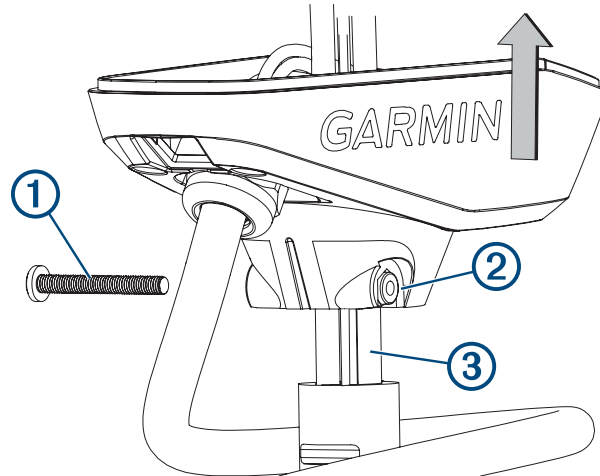


- 6 Remove the grommet from the transducer cable.
The grommet is split on one side to make it easy to remove from the cable.
You should keep the grommet in a safe place, because you must reinstall it later.
- 7 Feed the transducer cable through the shaft cap from the outside in until it is no longer routed through the square hole.

Removing the Shaft Cap

Before you can remove the shaft cap, you must remove the transducer cable from the shaft cap ([Removing the Transducer Cable from the Shaft Cap, page 30](#)) and disconnect the cables in the shaft cap ([Disconnecting the Cables in the Shaft Cap, page 29](#)).

- 1 Count and write down the number of coils in the coil cable that wraps around the shaft.
When re-assembling the shaft and shaft cap, it is beneficial to use the same number of coils around the shaft.
- 2 Using a 4 mm hex bit or wrench, remove the $\frac{1}{4}$ -20 bolt ① and nut ② that secure the shaft cap to the shaft.



You should keep this bolt and nut in a safe place, because you must use them when reinstalling the shaft cap.

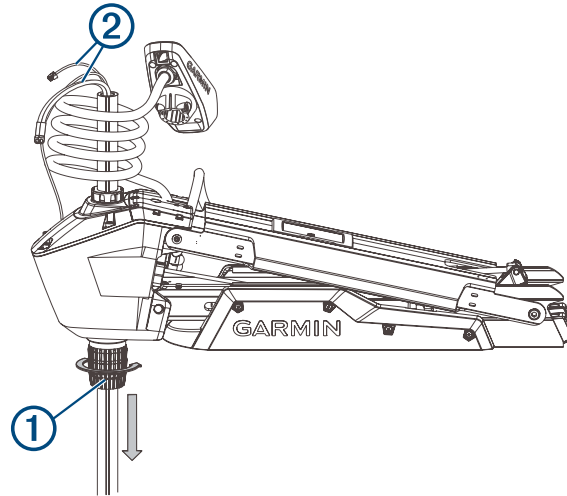
- 3 Lift up on the shaft cap to disconnect it from the shaft.
- 4 Pull the cables ③ from the shaft completely through the shaft cap, taking care to avoid damaging the data cable connector when you pull it through.

Removing the Shaft from the Steering Servo

Before you can remove the shaft from the steering servo, you must remove the shaft cap ([Removing the Shaft from the Steering Servo, page 32](#)).

This procedure is best performed with two people.

- 1 Loosen the depth adjustment collar on the base of the steering servo ①.



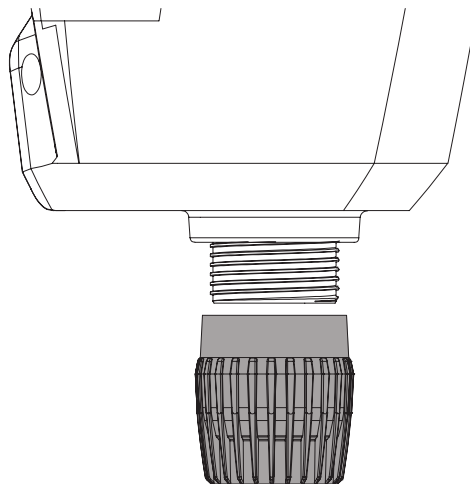
- 2 Slide the shaft down and out of the steering servo, taking care not to damage the skeg and transducer or snag the cables or connectors ② as you pull it through.

TIP: Depending on the height of your trailer, you may find it easier to remove the shaft if you transition the mount halfway between the deployed and stowed positions.

Removing the Depth-Adjustment Collar

Before you can remove the depth-adjustment collar, you must remove the shaft from the steering servo ([Removing the Shaft from the Steering Servo, page 32](#)).

Turn the depth-adjustment collar counter-clockwise to remove it from the steering servo.



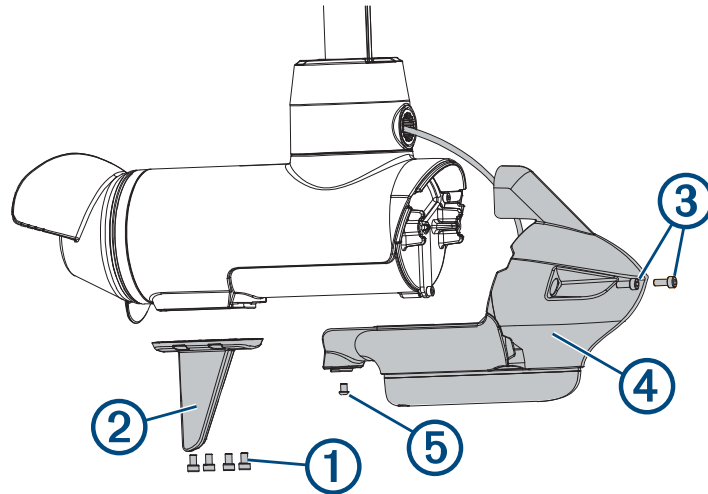
Removing the Propeller Drive Motor and Nose Cone from the Shaft

Before you can remove the propeller drive motor and transducer from the shaft, you must remove the shaft from the steering servo ([Removing the Shaft and Propeller Drive Motor from the Steering System](#), page 28).

- 1 Remove the skeg and nose cone from the propeller drive motor ([Removing the Skeg and Nose Cone](#), page 33).
- 2 Remove the propeller drive motor from the shaft ([Removing the Propeller Drive Motor](#), page 34).
- 3 Remove the nose cone and transducer from the shaft ([Removing the Nose Cone and Transducer](#), page 35).

Removing the Skeg and Nose Cone

- 1 Using a 4 mm hex bit or wrench, remove the four screws ① that secure the skeg ② to the propeller drive motor.



- 2 Remove the skeg.
- 3 Using a 4 mm hex bit or wrench, remove the two screws ③ that secure the front of the nose cone ④ to the propeller drive motor.
- 4 Using a 3 mm hex bit or wrench, remove the single screw ⑤ that secures the bottom of the nose cone to the propeller drive motor.

You should keep all of these screws and parts in a safe place, because you must reinstall them when reassembling the skeg and nose cone.

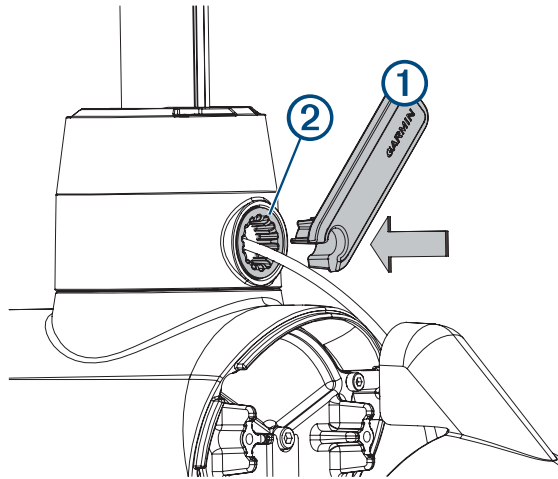
Removing the Propeller Drive Motor

Before you can remove the propeller drive motor, you must remove the shaft from the steering servo ([Removing the Shaft from the Steering Servo](#), page 32).

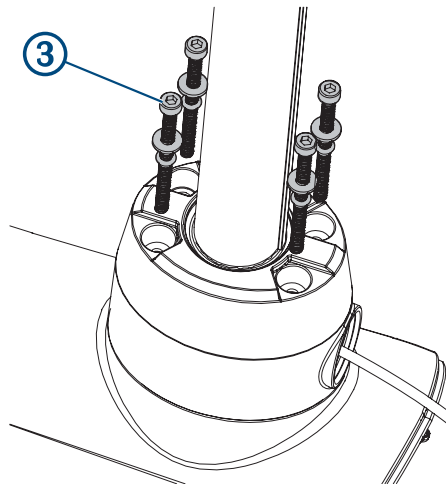
NOTE: When removing the propeller drive motor, using a ball-head hex bit or wrench is highly recommended because of the angle needed to reach the head of the screws.

- 1 Using the tool ① included in the shaft and motor hardware service kit, remove the recessed nut ② that secures the transducer cable to the shaft.

NOTE: It is necessary to remove the recessed nut only if you are replacing the shaft or the transducer. This nut can remain in place if you are replacing the propeller drive motor.

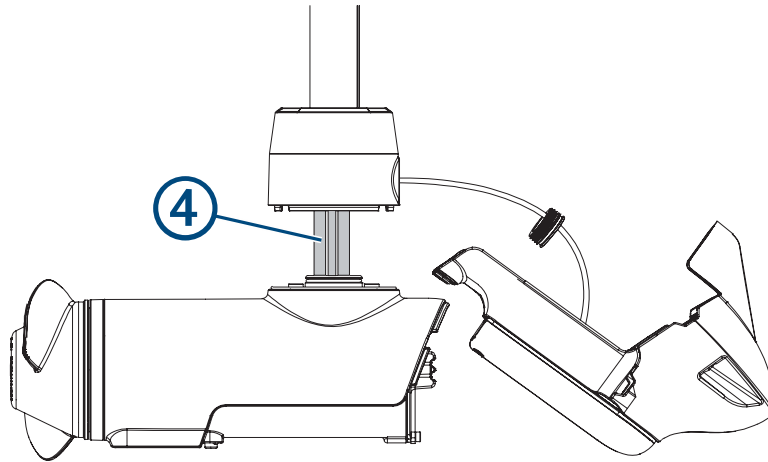


- 2 Using a ball-head 4 mm hex bit or wrench, remove the four screws ③ that secure the shaft base to the propeller drive motor.



When replacing the transducer, you should dispose of these four screws. New screws, washers, and O-rings are provided in the shaft and motor hardware service kit.

- 3 Straighten the cables at the top of the shaft, and slowly pull the propeller drive motor away from the shaft base until you can see the power and data cables ④ connected to the propeller drive motor.



- 4 Holding the cables only, slowly pull them through the shaft, taking care that the ring terminals and data cable connector do not get caught on the top of the shaft.

NOTICE

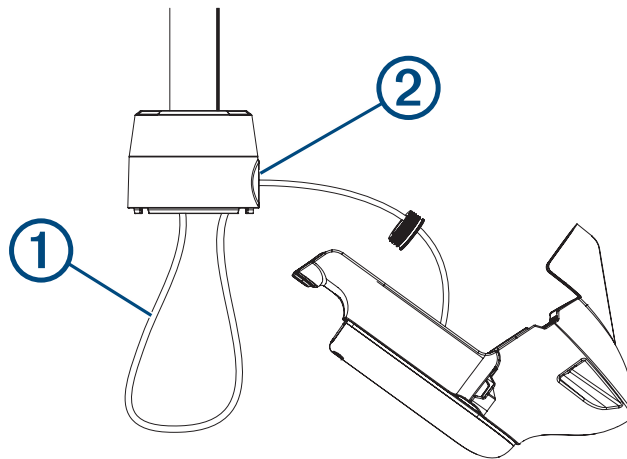
When removing the propeller drive motor from the shaft, you must pull the cables themselves, and not the motor. Pulling on the propeller drive motor may damage the cable connections inside the motor.

The power and data cables should pull through the shaft, but the transducer cable should mostly stay in place.

Removing the Nose Cone and Transducer

Before you can remove the nose cone and transducer, you must remove the propeller drive motor ([Removing the Propeller Drive Motor, page 34](#)).

- 1 Carefully pull the transducer cable ① straight down through the bottom of the shaft until it is completely removed from the shaft.

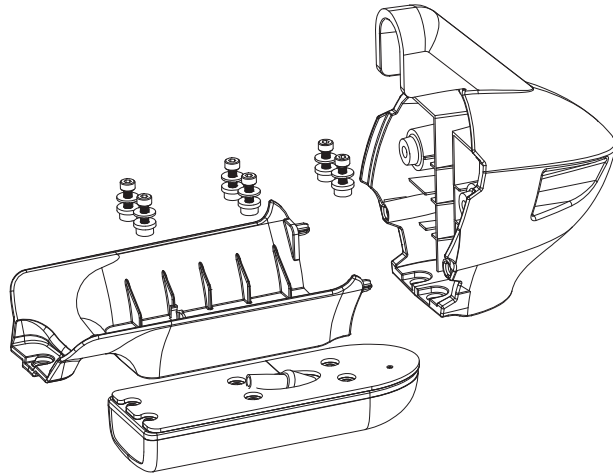


- 2 After you pull the transducer cable out of the shaft, pull it through the hole in the front of the shaft base ②, along with the rubber cable gland and the recessed nut.
- 3 Dispose of the cable gland and recessed nut.
The shaft and motor hardware service kit contains a new cable gland and recessed nut.

Disassembling the Nose Cone

Before you can disassemble the nose cone, you must remove the skeg and nose cone from the propeller drive motor ([Removing the Skeg and Nose Cone, page 33](#)).

- 1 Using a 3 mm hex bit or wrench, remove the six screws that secure the transducer to the nose cone.



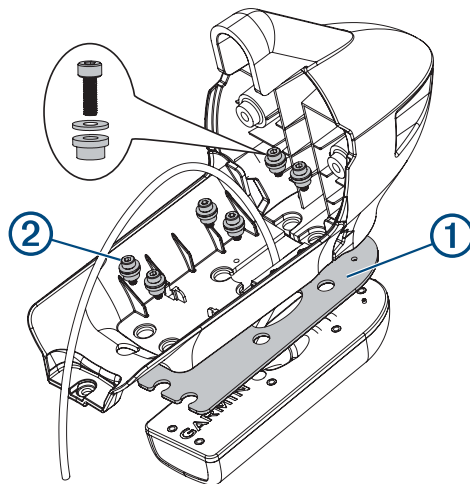
- 2 Remove the transducer and transducer pad from the nose cone.

If you are not replacing the transducer, you should keep the transducer pad and six screws so you can secure the transducer to the replacement nose cone.

Replacing the Nose Cone

Before you can replace the nose cone, you must disassemble the nose cone ([Disassembling the Nose Cone, page 36](#)).

- 1 Place the transducer pad ① on the transducer.



- 2 Using a 3 mm hex bit or wrench, secure the transducer to the nose cone using the six screws and bushings ②.
- 3 Install the nose cone and skeg on the shaft ([Installing the Nose Cone and Skeg, page 42](#)).

Installing the Propeller Drive Motor in the Shaft

You must perform these actions to reassemble the propeller drive motor in the shaft.

NOTICE

The screws, replacement seals, and grease packet are included in the motor hardware service kit (S00-01000-35). You should use the new parts from the kit instead of reusing the screws and seals you removed with the propeller drive motor.

- 1 Install the nose cone and transducer in the shaft (*Installing the Nose Cone and Transducer in the Shaft*, page 38).
- 2 Install the propeller drive motor on the shaft (*Installing the Propeller Drive Motor*, page 39).
- 3 Install the nose cone and skeg on the propeller drive motor (*Installing the Nose Cone and Skeg*, page 42).

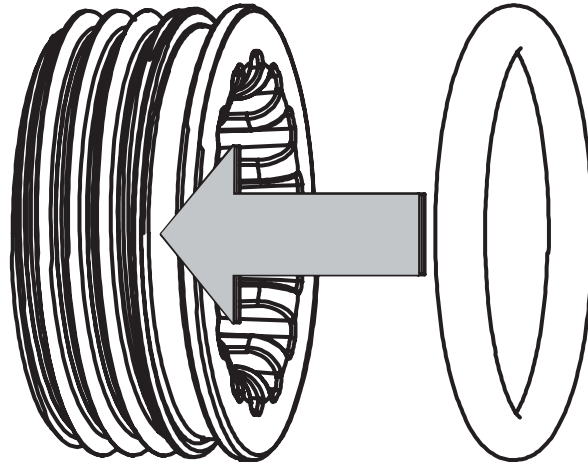
Installing the Nose Cone and Transducer in the Shaft

NOTICE

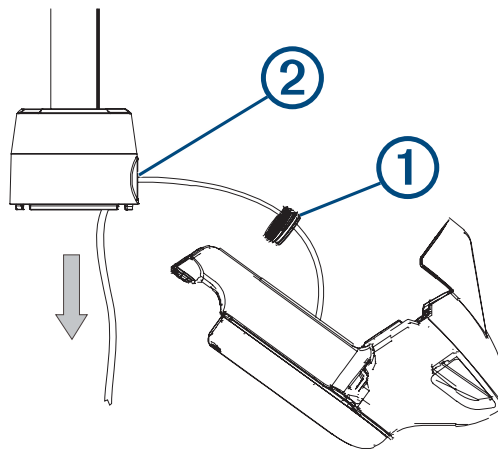
The shaft and motor hardware service kit contains new seals. You should use the new parts from the kit instead of reusing the seals you removed with the nose cone and transducer.

NOTE: If you are performing this procedure because you are removing the transducer completely, you should complete only the first step.

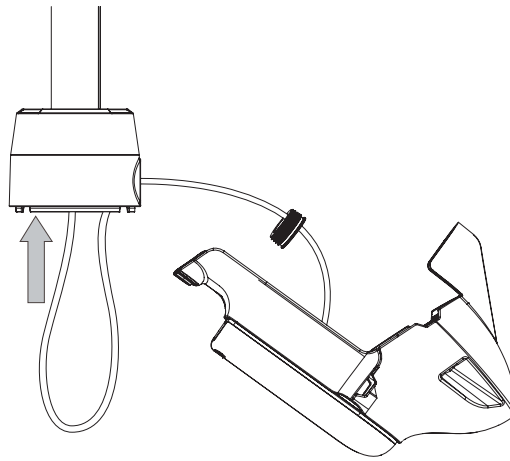
- 1 Place the 25 mm (1 in.) O-ring on the recessed nut from the shaft and motor hardware service kit.



- 2 With the O-ring facing the transducer, feed the replacement transducer cable through the recessed nut ① and the hole ② in the front of the shaft base, but do not feed it up through the shaft.



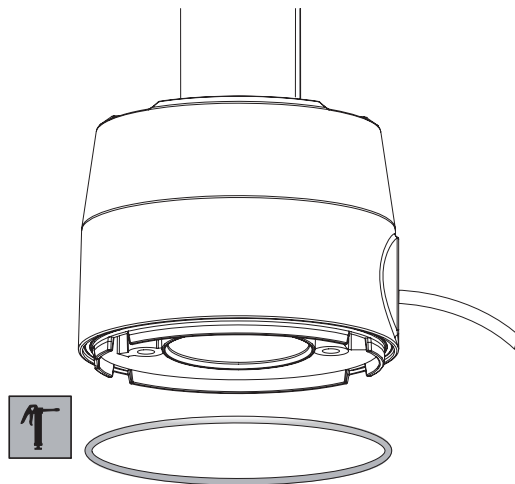
- 3 After you have fed all but approximately 60 cm (2 ft.) of the transducer cable through the hole in the shaft base, feed the transducer cable up through the shaft.



Installing the Propeller Drive Motor

Before you can install the propeller drive motor in the shaft, you must route the transducer cable through the shaft (if applicable) ([Installing the Nose Cone and Transducer in the Shaft](#), page 38).

- 1 Remove the large 78 mm (3 in.) O-ring on the shaft base, and discard it.



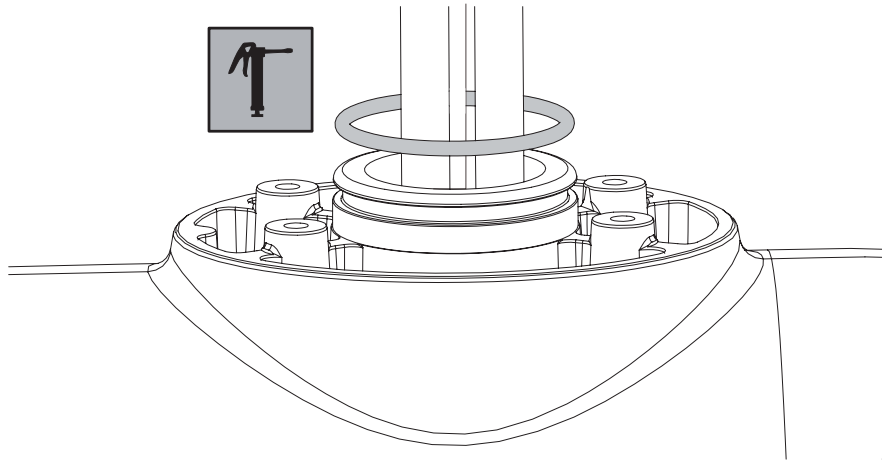
- 2 Using the packet included in the shaft and motor hardware service kit, apply grease to the new 78 mm (3 in.) O-ring in the shaft and motor hardware service kit.
- 3 Place the new 78 mm (3 in.) O-ring in the groove on the shaft base.
- 4 Using canned compressed air or an air compressor, blow out any dirt or debris in the four threaded holes on the top of the propeller drive motor.
- 5 Apply a medium-strength thread-locking compound such as LOCTITE® 243™ to the threads in the four threaded holes on the top of the propeller drive motor.

NOTICE

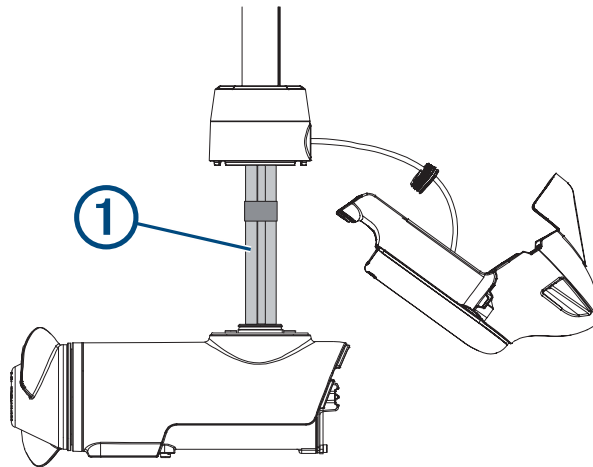
Thread-locking compound is required in these holes to maintain a tight connection between the shaft base and the propeller drive motor.

- 6 Remove the 36 mm (1⁷/₁₆ in.) O-ring from the top of the propeller drive motor, and discard it.
- 7 Thread the cables from the propeller drive motor through the new 36 mm (1⁷/₁₆ in.) O-ring in the shaft and motor hardware service kit.

- 8 Using the packet included in the shaft and motor hardware service kit, apply grease to the new 36 mm (1⁷/₁₆ in.) O-ring.



- 9 Place the new 36 mm (1⁷/₁₆ in.) O-ring in the groove on the top of the propeller drive motor.
- 10 If the power and data cables from the propeller drive motor are not already aligned and bundled, straighten, align, and bundle them with tape.
If the power and data cables are not straight and aligned, they may not feed through the shaft smoothly.
- 11 Feed the power and data cables ① from the propeller drive motor up through the shaft until they emerge from the top.

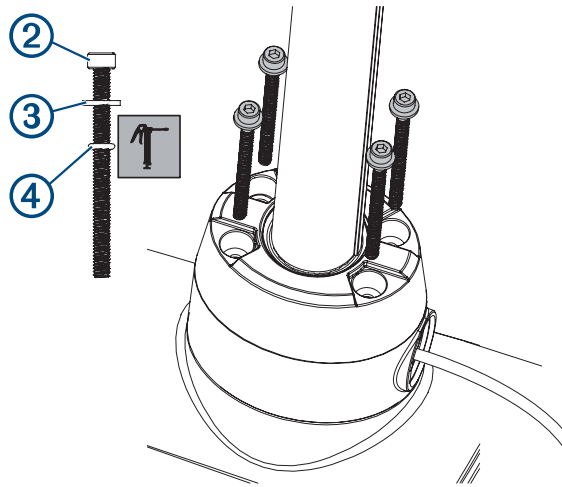


- 12 Gently pull the ends of the power and data cables as you feed them the rest of the way through the shaft.

NOTICE

When feeding the cables, you must pull on the cable and not on the cable connectors. The data cable connector is fragile and may break if you pull on the connector.

- 13 Prepare the four bolts ② in the shaft and motor hardware service kit by placing a washer ③ and a 4.75 mm ($\frac{3}{16}$ in.) O-ring ④ on each one.



- 14 Using the grease packet included in the shaft and motor hardware service kit, apply grease to the 4.75 mm ($\frac{3}{16}$ in.) O-ring on each bolt.
Avoid getting grease on the bolt threads.
- NOTE:** If you did not previously apply thread-locking compound in the four mounting holes for these bolts, you must apply it before installing these bolts.
- 15 Using a ball-head 4 mm hex bit or wrench, thread all four of the prepared bolts approximately halfway to make sure that the shaft base and the propeller drive motor are properly aligned.
- 16 With the shaft base and the propeller drive motor properly aligned, lightly tighten all four bolts by hand.
- 17 Using a torque wrench, tighten all four bolts to 4 N-m (35 lbf-in).

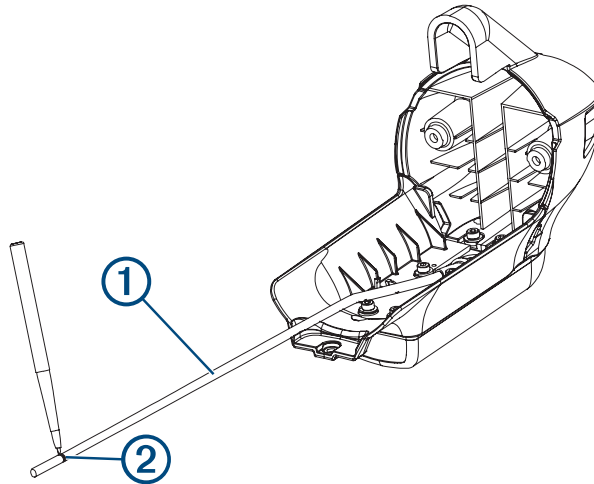
Installing the Nose Cone and Skeg

Before you can install the nose cone and skeg, you must install the propeller drive motor on the shaft base (*Installing the Propeller Drive Motor*, page 39).

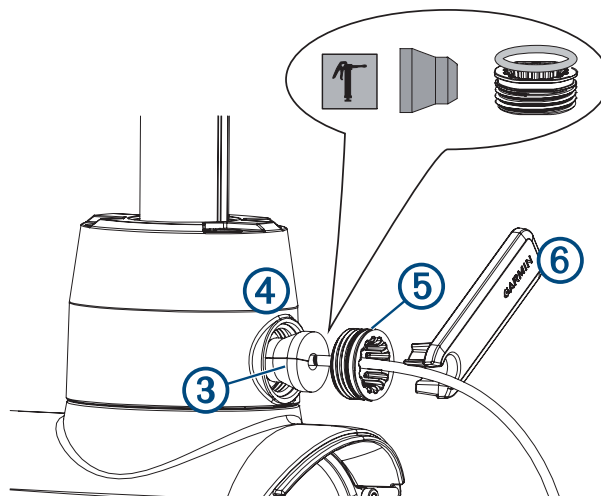
- 1 From the shaft and motor hardware service kit, select the cable gland that fits your transducer cable:
 - For a 4-pin transducer, select the cable gland with the smaller hole.
 - For an 8- or 12-pin transducer, select the cable gland with the larger hole.

NOTE: A cable gland without a hole is provided if you are not installing a transducer or not routing the transducer cable through the shaft.

- 2 Pull the transducer cable ① straight, and measure a 38 cm (15 in.) from the where the cable enters the transducer.



- 3 Using a permanent marker, mark the measured location on the cable ②.
- 4 Using the packet included in the shaft and motor hardware service kit, apply grease completely to all surfaces of the cable gland you selected to fit your transducer cable.
- 5 Place the cable gland ③ at the marked location on the transducer cable.

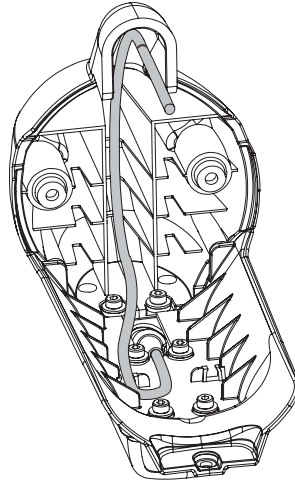


- 6 While keeping the cable gland aligned with the mark on the transducer cable, gently pull the excess cable through the top of the shaft until the cable gland fits into the hole on the shaft base ④.
- 7 Using the packet included in the shaft and motor hardware service kit, apply grease to the 25 mm (1 in.) O-ring on the recessed nut ⑤ on the transducer cable.
- 8 Place the recessed nut into the hole on the shaft base, and tighten it using the included tool ⑥.

9 Tighten the recessed nut until it stops, then loosen it $\frac{1}{14}$ of a turn.

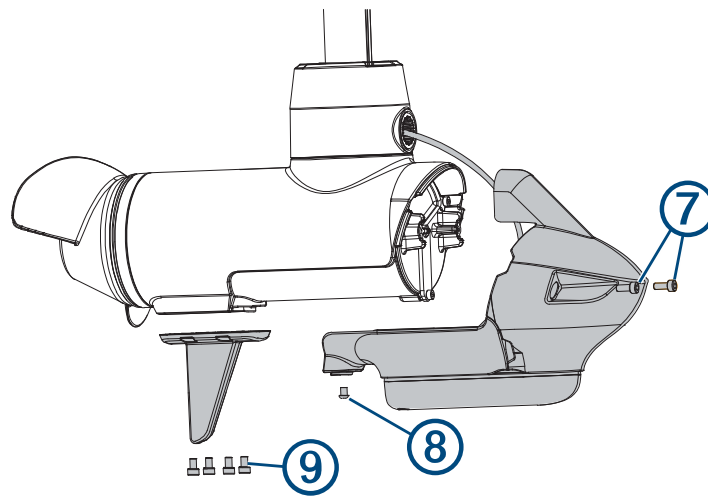
NOTE: For reference, the notches inside the recessed nut are centered $\frac{1}{14}$ of a turn apart.

10 Route the transducer cable through the nose cone so it will fit correctly onto the propeller drive motor.



11 Place the nose cone onto the propeller drive motor.

12 Using a 4 mm hex bit or wrench, secure the front of the nose cone to the propeller drive motor using the existing two screws ⑦.



13 Using a 3 mm hex bit or wrench, secure the bottom of the nose cone to the propeller drive motor using the existing screw ⑧.

14 Using a 4 mm hex bit or wrench, secure the skeg to the bottom of the propeller drive motor using the existing four screws ⑨.

Installing the Drive Motor and Shaft

You should perform these actions to reassemble the motor after replacing the shaft, transducer, propeller drive motor, or servicing the steering servo.

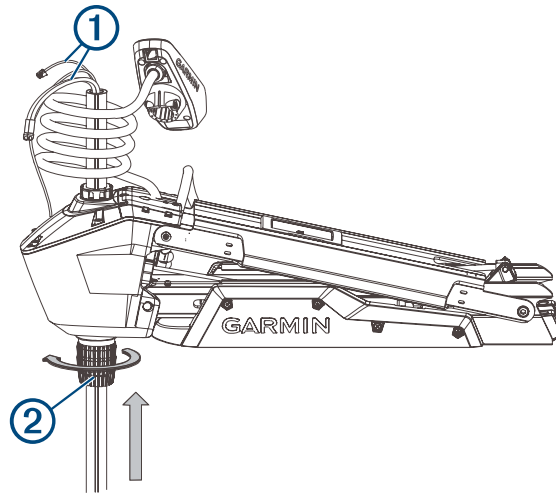
- 1 Install the shaft in the steering servo housing (*Installing the Shaft in the Steering Servo Housing, page 44*).
- 2 Install the shaft cap on the shaft (*Installing the Shaft Cap, page 45*).
- 3 Install the transducer cable in the shaft cap (*Installing the Transducer Cable in the Shaft Cap, page 45*).
- 4 Connect the cables in the shaft cap (*Connecting the Cables in the Shaft Cap, page 46*).
- 5 Close the shaft cap (*Closing the Shaft Cap, page 47*).
- 6 Route the power and transducer cables through the mount (*Routing the Power and Transducer Cables Through the Mount, page 26*).
- 7 Connect the motor to the power source.

Installing the Shaft in the Steering Servo Housing

If you removed the depth-adjustment collar (*Removing the Depth-Adjustment Collar, page 32*), you must reinstall it before you install the shaft in the steering servo housing.

This procedure is best performed with two people.

- 1
- 2 Feed the cables ① up through the steering servo housing.



TIP: Depending on the height of your trailer or workbench, you may want to move the motor mount up about halfway to make it easier to install the shaft.

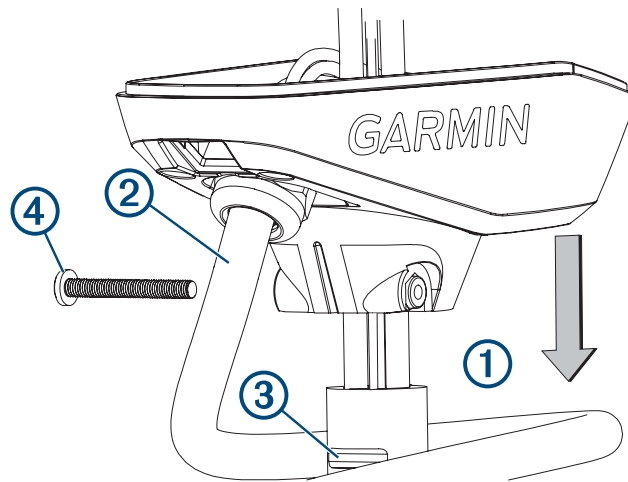
- 3 Insert the shaft into the bottom of the steering servo housing, and push it up through the top.

NOTE: The shaft is keyed to fit in the steering servo housing one way only.

- 4 Tighten the depth adjustment collar on the base of the steering servo housing ②.

Installing the Shaft Cap

- 1 Pull the cables ① from the shaft completely through the shaft cap.

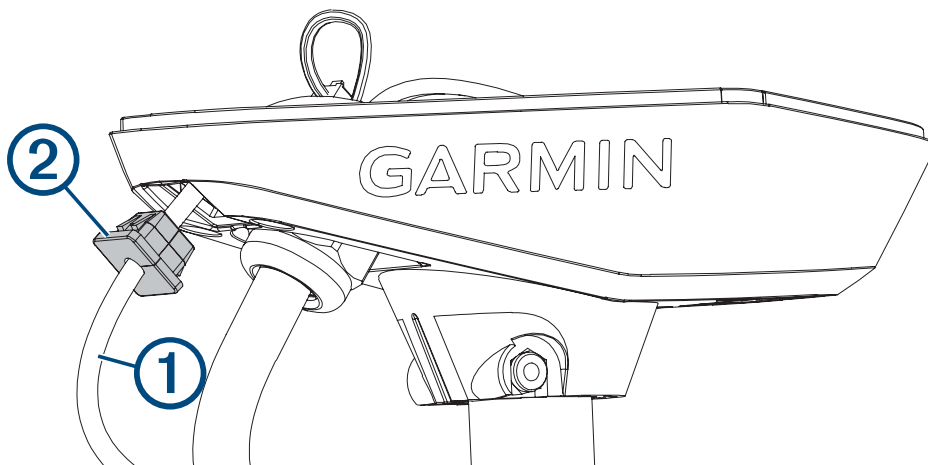


- 2 Using the coil count you recorded when you removed the shaft cap, wrap the coil cable around the shaft the appropriate number of times.
- 3 Place the shaft cap on the shaft, aligning the coil cable extending from the shaft cap ② with the groove on the shaft ③.
- 4 Using a 4 mm hex bit or wrench, install the $\frac{1}{4}$ -20 bolt ④ and nut to secure the shaft cap to the shaft.

Installing the Transducer Cable in the Shaft Cap

Before you can install the transducer cable in the shaft cap, you must install the shaft cap ([Installing the Shaft Cap, page 45](#)).

- 1 Feed the transducer cable ① completely through the square hole in the shaft cap.



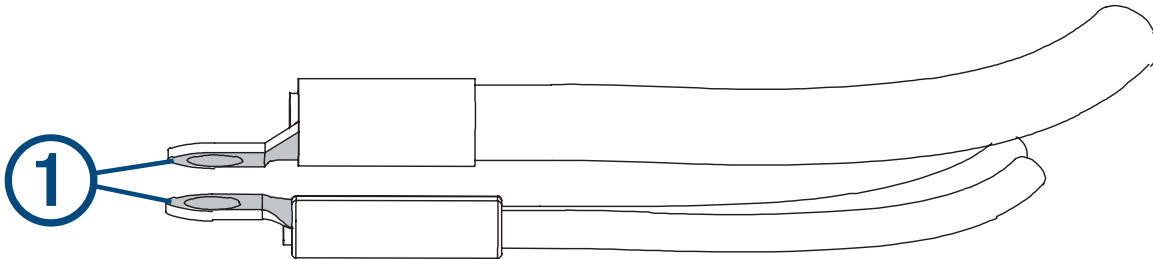
- 2 Install the grommet ② on the transducer cable.
The grommet is split on one side to make it easy to install on the cable.
- 3 Push from the outside to secure the square grommet in the shaft cap.
- 4 Route the transducer cable alongside the coil cable, using the cable clamps to hold the cables together.
- 5 Route the transducer cable through the mount base alongside the coil cable, using the cable clamps to secure the cables to the base.
- 6 Route the transducer cable to the chartplotter, and connect it.

Connecting the Cables in the Shaft Cap

Before you can connect the cables in the shaft cap, you must install the shaft cap ([Installing the Shaft Cap, page 45](#)).

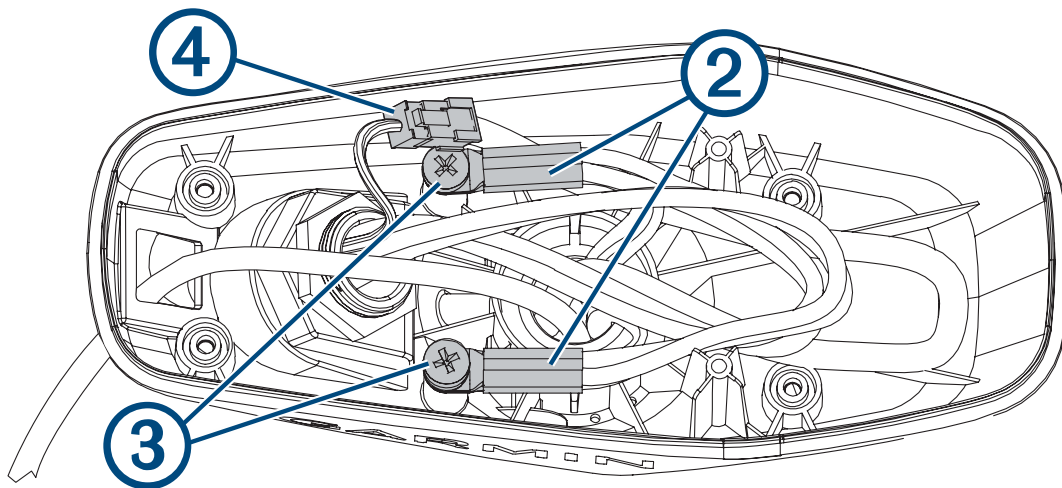
- 1 Align the rings on the ends of the cables according to color.

You must stack the red cables together and stack the black cables together, aligning the flat sides of the connectors ① on the cables.



NOTE: If the cables are stacked incorrectly, you cannot close the shaft cap cover.

- 2 Place the stacked cables ② over the stand outs in the shaft cap.

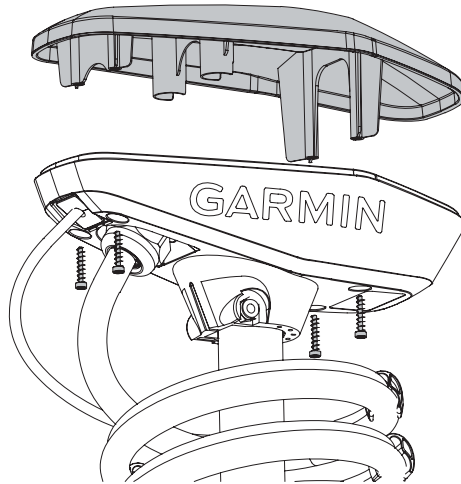


- 3 Using a #3 Phillips screwdriver, install the two screws and lock washers ③ to secure the power cables onto the stand outs in the shaft cap.
- 4 Align both sections of the data cable connector ④, and push together to connect them.

Closing the Shaft Cap

Before you can close the shaft cap, you must connect the cables inside the shaft cap ([Connecting the Cables in the Shaft Cap, page 46](#)).

- 1 Place the lid on the shaft cap.
- 2 Using a #2 Phillips screwdriver, install the four screws to secure the lid of the shaft cap.



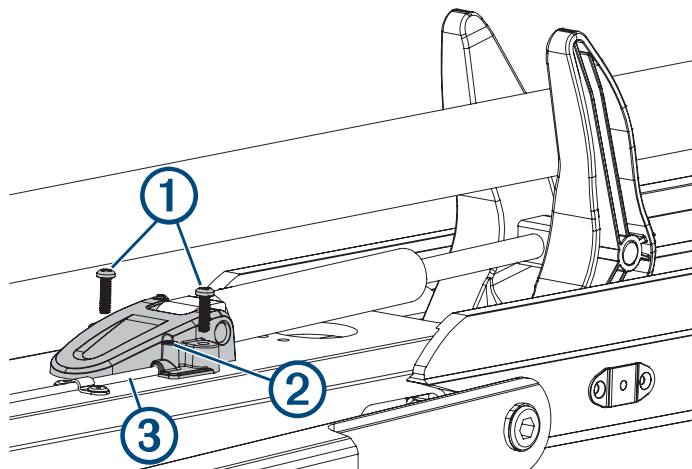
Removing the Steering Servo from the Mount

Before you can remove the steering servo from the mount, you must remove the power and transducer cables from the mount ([Removing the Power and Transducer Cables From the Mount, page 25](#)).

- 1 Disconnect the lower gas spring ([Disconnecting the Lower Gas Spring, page 47](#)).
- 2 Disconnect the upper link of the mount ([Disconnecting the Upper Link of the Mount, page 49](#)).
- 3 Disconnect the upper gas spring ([Disconnecting the Upper Gas Spring, page 51](#)).
- 4 Disconnect the lower link of the mount ([Disconnecting the Lower Link of the Mount from the Steering Servo, page 52](#)).

Disconnecting the Lower Gas Spring

- 1 Place the trolling motor in the stowed position.
- 2 Using a #2 Phillips screwdriver, remove the screws ① that secure the lower gas spring clevis ② to the lower link of the mount.

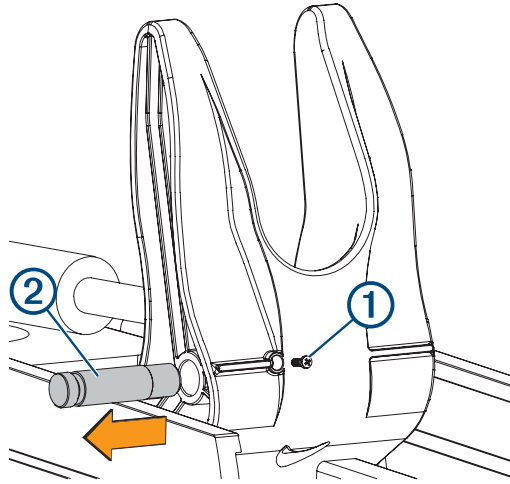


- 3 Lift the lower gas spring clevis off of the safety rod ③.

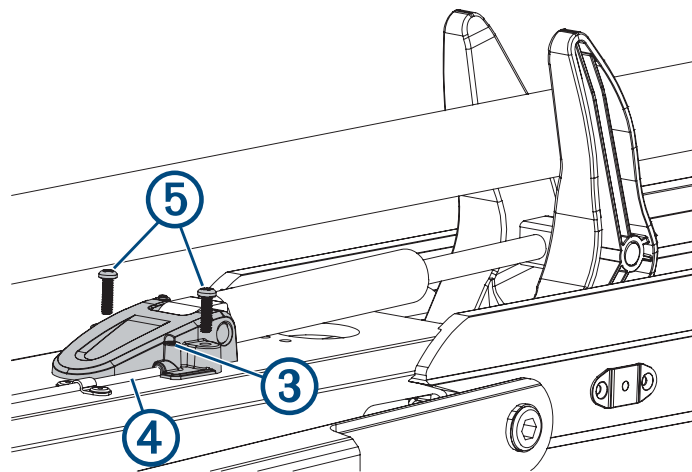
Replacing the Lower Gas Spring

Before you can replace the lower gas spring, you must disconnect it from the mount (*Disconnecting the Lower Gas Spring, page 47*).

- 1 Using a #0 Phillips screwdriver, remove the set screw ① that secures the gas spring pin ② to the shaft stabilizer on the mount.



- 2 Slide out the gas spring pin and lift up on the gas spring to remove it.
- 3 Place the end of the replacement gas spring into the shaft stabilizer on the mount.
- 4 Slide the gas spring pin into the shaft stabilizer, through the end of the gas spring, until it is flush with the edge of the shaft stabilizer.
- 5 Install the set screw in the shaft stabilizer to secure the gas spring pin.
- 6 Place the lower gas spring clevis ③ on the lower link of the mount, fitting it over the safety rod ④.

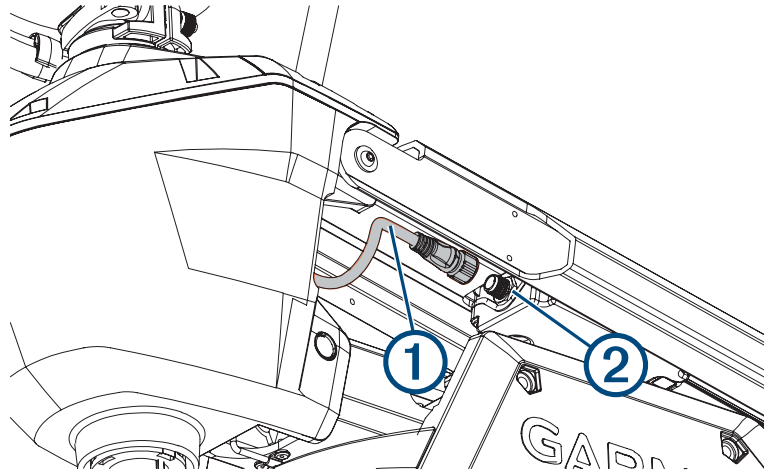


- 7 Using a #2 Phillips screwdriver, install the screws ⑤ that secure the lower gas spring clevis to the lower link of the mount.

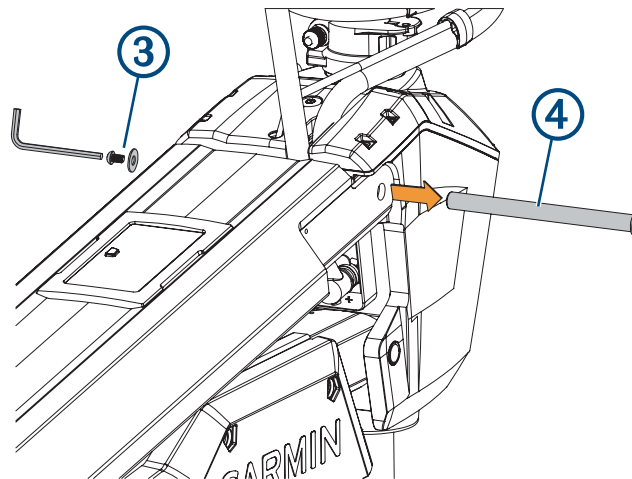
Disconnecting the Upper Link of the Mount

Before you can disconnect the upper link of the mount, you must remove the power and transducer cables from the mount ([Removing the Power and Transducer Cables From the Mount, page 25](#)).

- 1 With the motor in the deployed position, disconnect the cable ① from the display panel on the upper link of the mount ②.



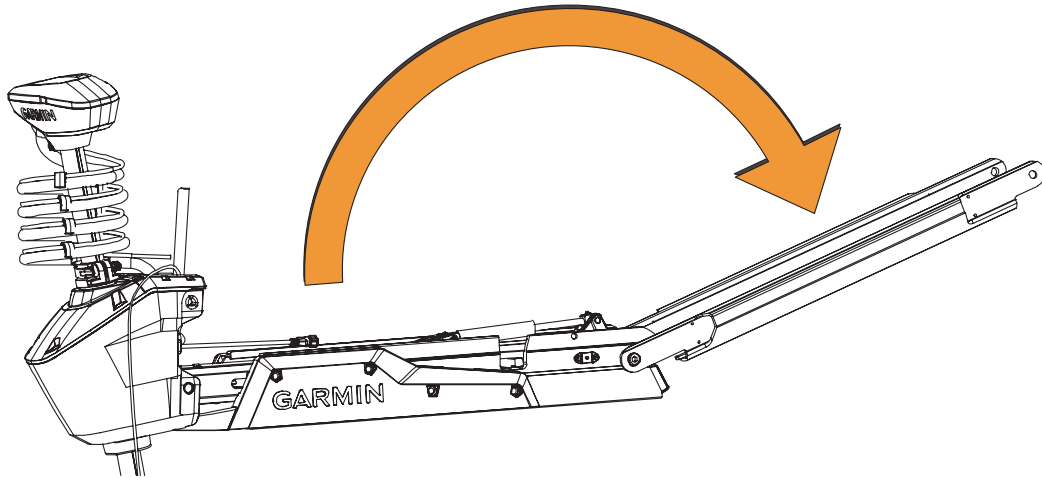
- 2 Using a 4 mm hex bit or wrench, remove a screw and washer ③ from one side of the upper pin ④ on the steering servo housing.



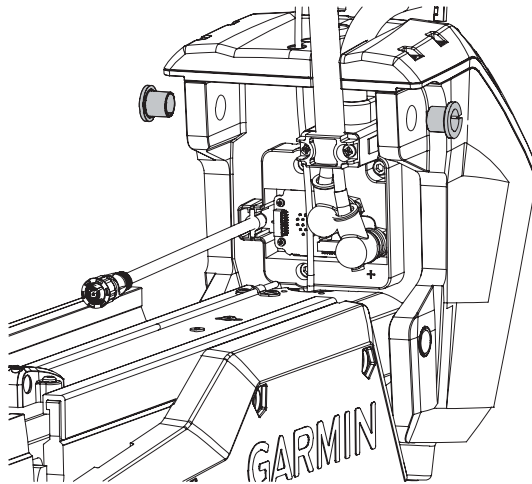
TIP: It is helpful to use another 4 mm hex wrench to hold one end of the upper pin stationary while you remove one screw.

- 3 Remove the upper pin from the steering servo housing.

- 4 Pivot the upper link away from the steering servo housing.



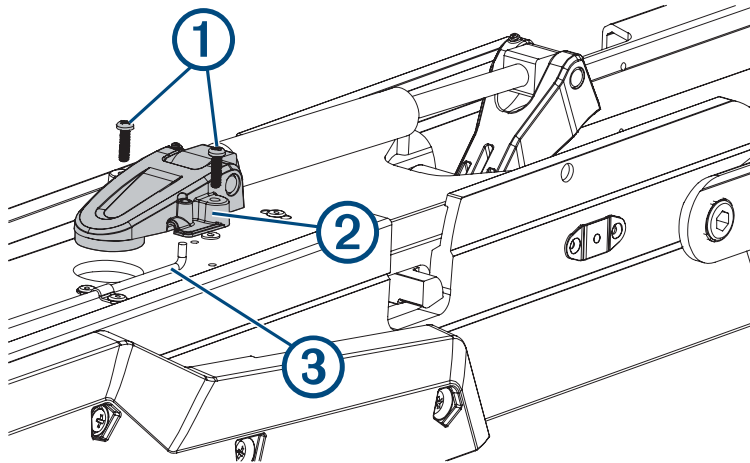
- 5 Remove the bushings from the upper holes in the steering servo housing.



Disconnecting the Upper Gas Spring

Before you can disconnect the upper gas spring, you must disconnect the upper link of the mount ([Disconnecting the Upper Link of the Mount, page 49](#)) and disconnect the lower gas spring ([Disconnecting the Lower Gas Spring, page 47](#)).

- 1 Using a #2 Phillips screwdriver, remove the two screws ① that secure the lower gas spring clevis ② to the lower link of the mount.

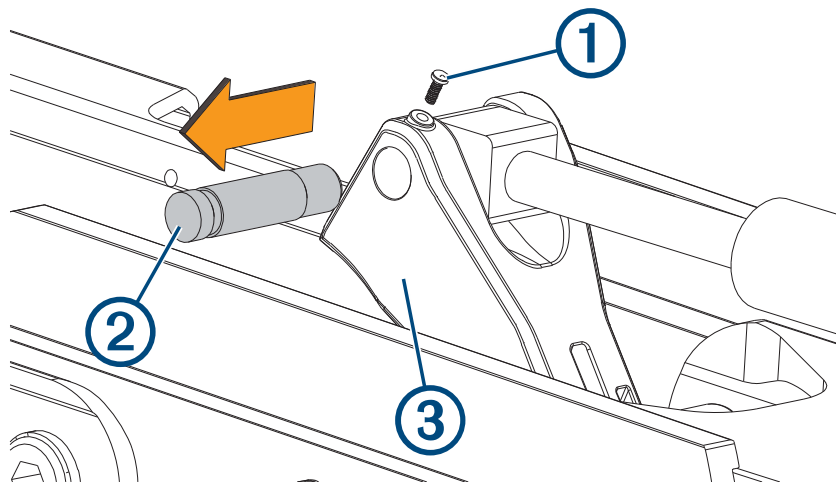


- 2 Lift the upper gas spring clevis off of the safety rod ③.

Replacing the Upper Gas Spring

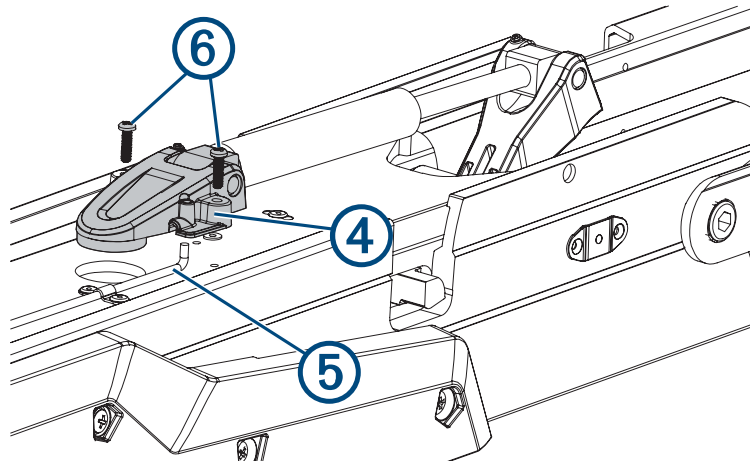
Before you can replace the upper gas spring, you must disconnect it from the mount ([Disconnecting the Upper Gas Spring, page 51](#)).

- 1 Using a #0 Phillips screwdriver, remove the set screw ① that secures the gas spring pin ② to the upper gas spring arm ③.



- 2 Slide out the gas spring pin and lift up on the gas spring to remove it.
- 3 Place the end of the replacement gas spring into the upper gas spring arm.
- 4 Slide the gas spring pin into the upper gas spring arm, through the end of the gas spring, until it is flush with the edge of the upper gas spring arm.
- 5 Install the set screw in the upper gas spring arm to secure the gas spring pin.

- 6 Place the upper gas spring clevis **④** on the lower link of the mount, fitting it over the safety rod **⑤**.



- 7 Using a #2 Phillips screwdriver, install the two screws **⑥** that secure the lower gas spring clevis to the lower link of the mount.

Disconnecting the Lower Link of the Mount from the Steering Servo

Before you can disconnect the lower link of the mount from the steering servo, you must disconnect the lower gas spring ([Disconnecting the Lower Gas Spring, page 47](#)) and you must disconnect the upper gas spring ([Disconnecting the Upper Gas Spring, page 51](#)).

⚠ CAUTION

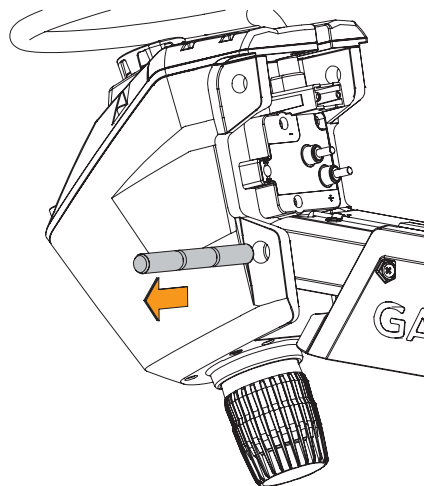
The lower pin is the final piece connecting the steering servo to the mount. When you remove the pin, the steering servo, and the drive motor and shaft, if they are still installed, may fall causing injury or damage. Use caution to support the weight of the steering servo before you remove the pin.

NOTE: This procedure is best performed with two people.

- 1 Slide the safety rods away from the steering servo to release the lower pivot pin.

NOTE: The two safety rods don't need to move very far to release the lower pivot pin. If either gas spring is still connected to the lower link, however, the safety rods lock the lower pivot pin in place, and it cannot be removed.

- 2 While supporting the weight of the steering servo, push the lower pin out from one side, and pull to remove it completely.



The steering servo is no longer connected to the mount.

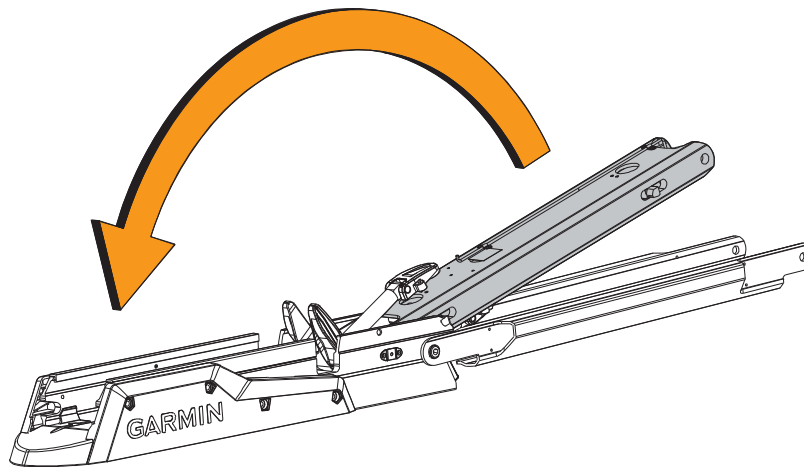
Connecting the Steering Servo to the Mount

If you removed the steering servo from the mount for service, you can follow these procedures to reconnect it.

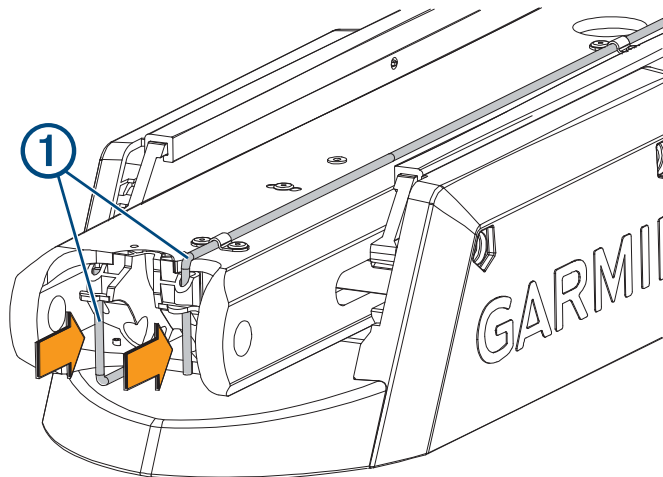
- 1 Connect the steering servo to the lower link of the mount ([Installing the Steering Servo on the Lower Link of the Mount, page 53](#)).
- 2 Secure the upper gas spring ([Securing the Upper Gas Spring, page 55](#)).
- 3 Connect the upper link of the mount to the steering servo ([Connecting the Upper Link of the Mount to the Steering Servo Housing, page 56](#)).
- 4 Connect the motor to the display panel ([Connecting the Motor to the Display Panel, page 58](#)).
- 5 Secure the lower gas spring ([Securing the Lower Gas Spring, page 58](#)).
- 6 Route the power and transducer cables through the mount ([Routing the Power and Transducer Cables Through the Mount, page 26](#)).

Installing the Steering Servo on the Lower Link of the Mount

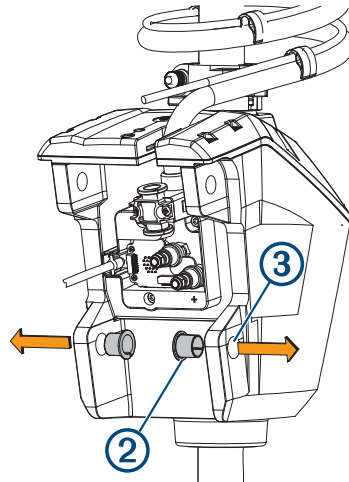
- 1 Pivot the lower link of the mount forward until it locks into the base.



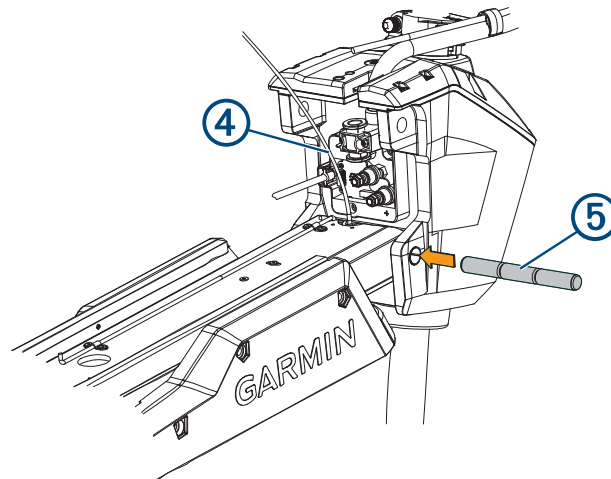
- 2 Push the two safety rods ① into the lower link as far as possible.



- 3 From the inside out, insert the bushings ② into the lower holes ③ on the steering servo housing.



- 4 Holding the pull cable ④ up, place the steering servo housing onto the lower link of the mount, aligning the lower holes on the housing with the holes on the link.

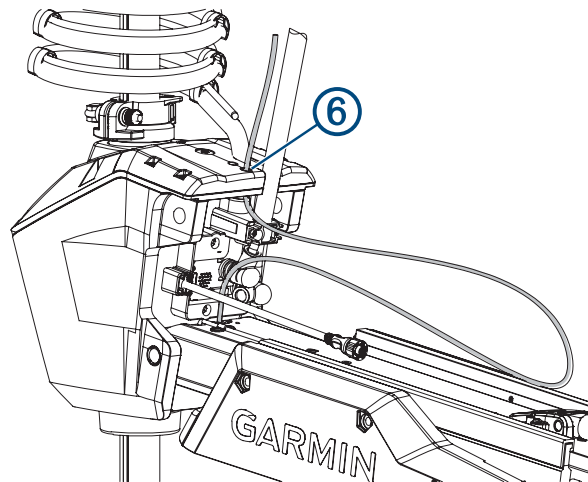


- 5 While lifting up on the steering servo housing, push the pivot pin ⑤ through the housing and the link to hold it in place.

NOTICE

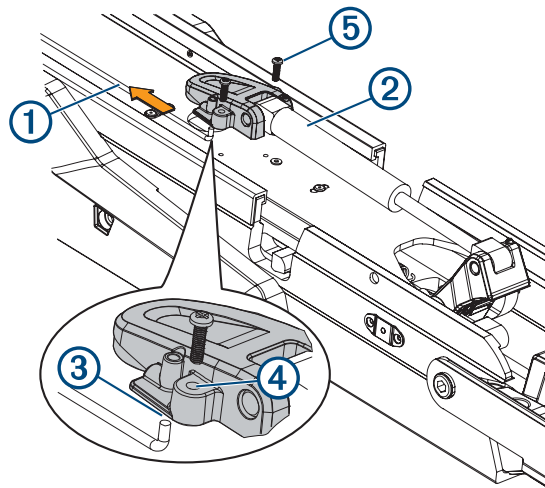
Do not hit the pin with a hammer or other object. Do not drill or modify the holes. Although it is a snug fit, the pin slides in completely when pushed by hand. Damage caused by hammering the pin or modifying the holes is not covered under warranty.

- 6 Route the pull cable upward through the top of the steering servo housing ⑥.



Securing the Upper Gas Spring

- 1 Push the safety rod ① toward the steering servo housing as far as possible to lock the lower pivot pin in place.



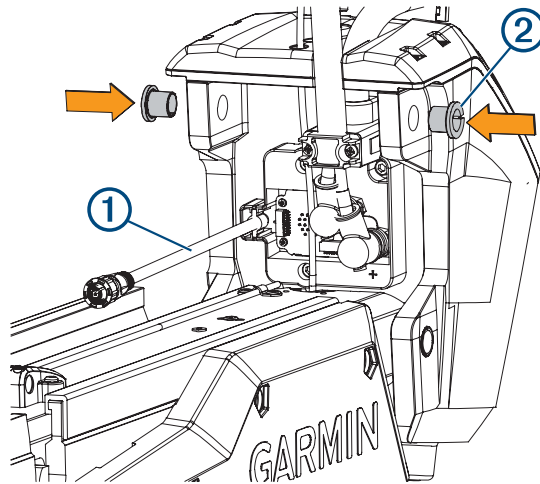
- 2 If necessary, pivot the upper gas spring ② toward the lower link of the mount so the base of the gas spring aligns with the safety rod and mounting holes.

NOTE: If you must rotate the gas spring so the base aligns with the mount, rotate the spring in a clockwise direction only. Rotating the gas spring in a counter-clockwise direction may loosen the fittings.

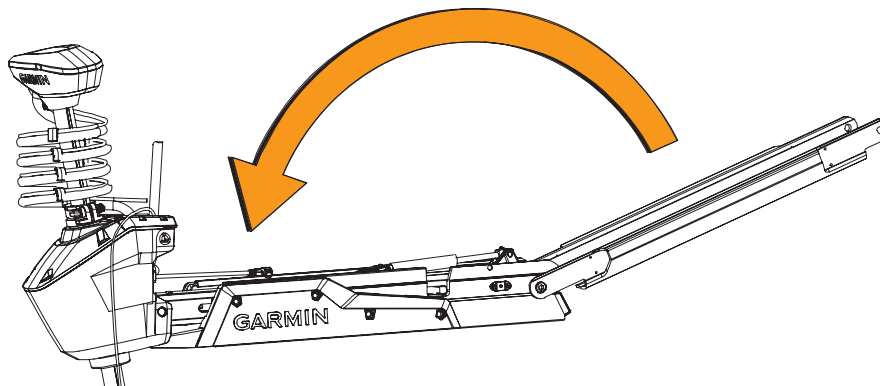
- 3 Align the single hole on the base of the gas spring ③ with the safety rod, and press down. The screw holes on the base ④ should align with the holes on the bottom of the mount.
- 4 Using a #2 Phillips screwdriver, secure the base of the gas spring to the lower link of the mount using the included screws ⑤.

Connecting the Upper Link of the Mount to the Steering Servo Housing

- 1 Make sure that the data cable ① is accessible, and not trapped by any part of the mount.
- 2 From the outside in, insert the bushings ② in the upper holes on the steering servo housing.

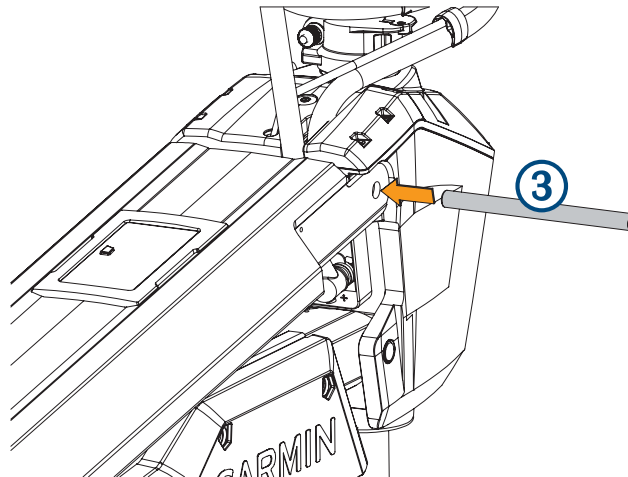


- 3 Pivot the upper link of the mount forward.

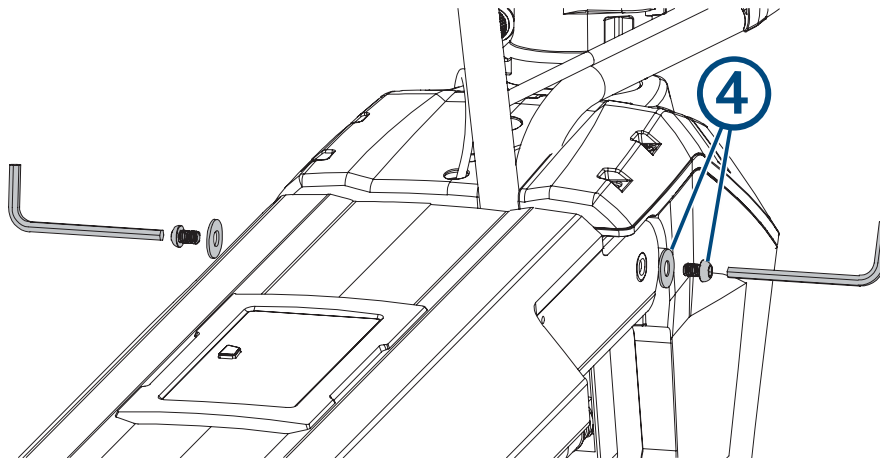


- 4 Tip the top of the steering servo housing inward so the holes on the upper link and the housing align.

- 5 Push the pin ③ through the holes on the upper link of the mount and the steering servo housing.



- 6 Using a 4 mm hex bit or hex wrench, secure the pin using the screws and washers ④ on both sides.



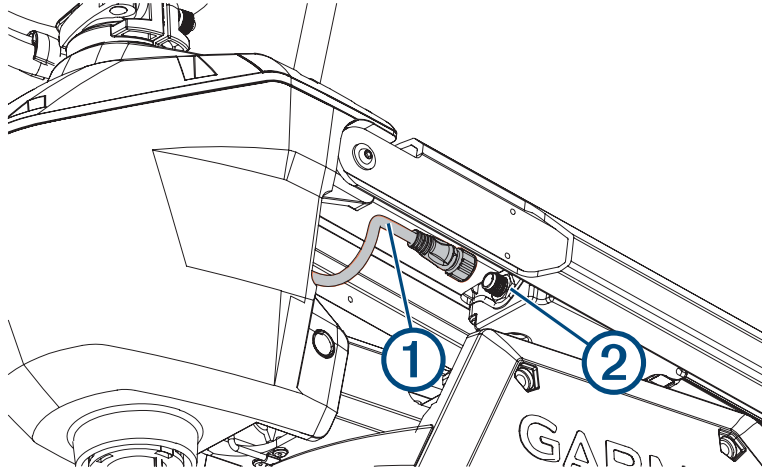
NOTE: To properly secure the pin, you should use two hex bits or wrenches so the pin does not rotate as you tighten the screws.

Connecting the Motor to the Display Panel

NOTICE

You must connect the cable from the steering servo to the display panel before proceeding further with assembly. If you do not make this connection now, the unsecured cable may damage the display panel when moving the mount.

- 1 Route the cable ① from the steering servo housing to the display panel ② on the upper link of the mount.

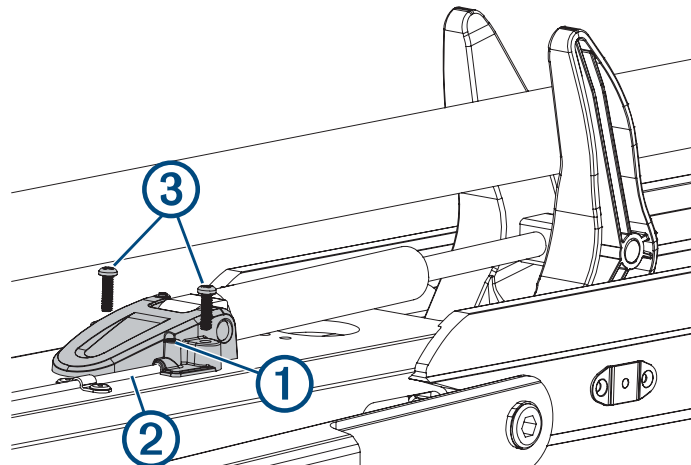


- 2 Push the connector onto the port on the display panel, and rotate the locking ring clockwise to secure it.

NOTE: The connector is keyed to fit into the port one way only, and will fit easily when aligned correctly. Do not force the connector into the port.

Securing the Lower Gas Spring

- 1 If necessary, transition the trolling motor from the deployed to the stowed position.
If the gas spring is positioned on the other side of the mount after you stowed the motor, you may need to lift up the mount and flip over the gas spring so you can secure it to the mount.
- 2 Align the hole on the base of the lower gas spring ① with the safety rod ②, and press down.



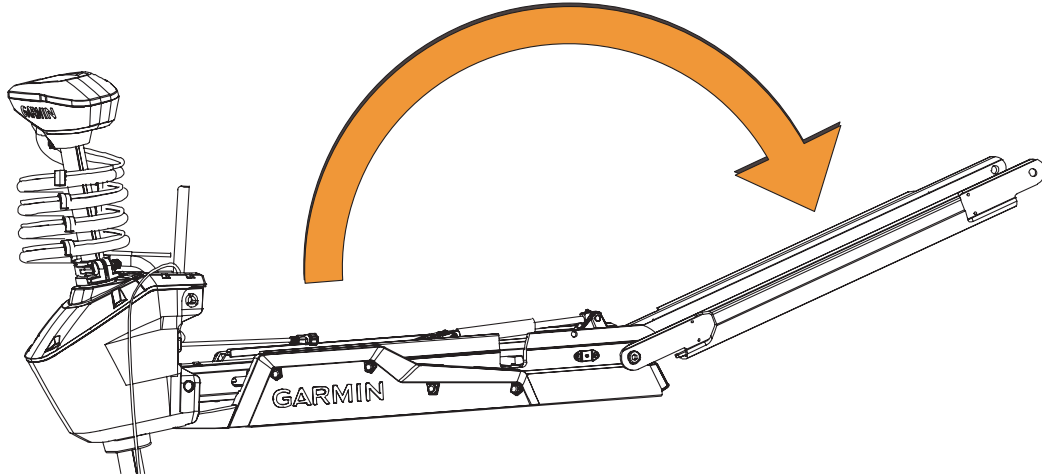
NOTE: If you must rotate the gas spring so the base aligns with the mount, rotate the spring in a clockwise direction only. Rotating the gas spring in a counter-clockwise direction may loosen the fittings.

- 3 Using a #2 Phillips screwdriver, secure the base of the lower gas spring to the mount using the screws you removed when disconnecting the gas spring ③.

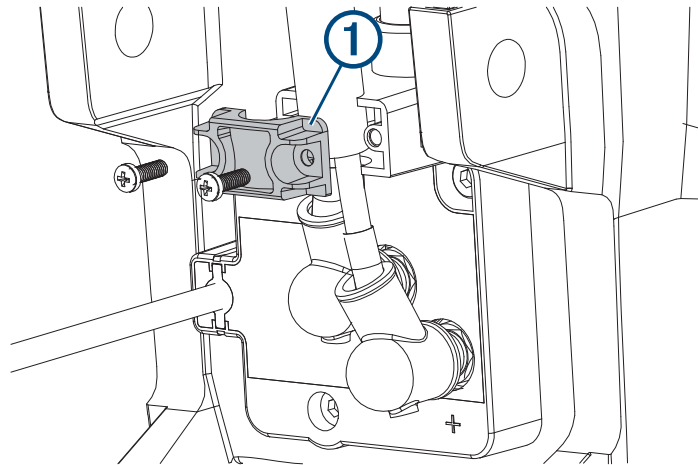
Removing the Power Cable from the Steering Servo Housing

Before you can remove the power cable from the steering servo housing, you must remove the power and transducer cables from the mount ([Removing the Power and Transducer Cables From the Mount, page 25](#)).

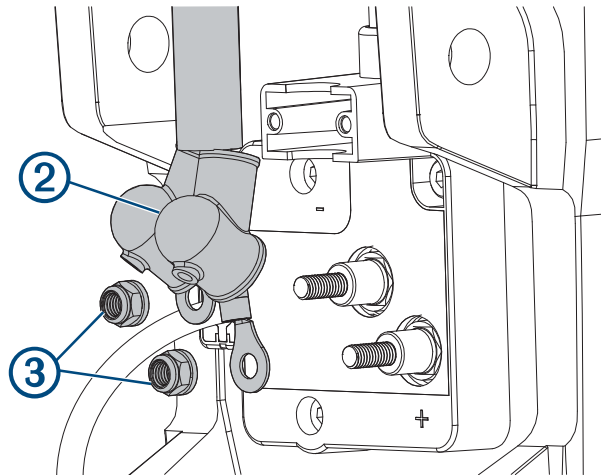
- 1 Disconnect the upper link of the mount from the steering servo housing ([Disconnecting the Upper Link of the Mount, page 49](#)).
- 2 Pivot the upper link away from the steering servo housing.



- 3 Using a #2 Phillips screwdriver, remove the bracket ① that secures the power cable to the steering servo housing.



- 4 Pull the rubber shields ② away from the power cable connectors.



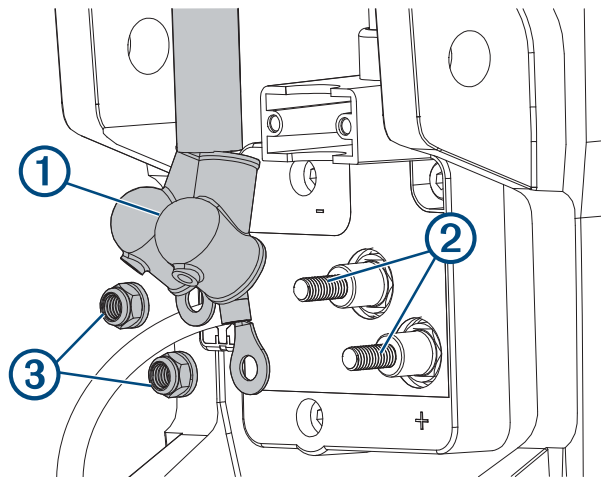
- 5 Using a 10 mm socket, remove the nuts ③ that secure the power cable connectors.

- 6 Remove the power cable from the steering servo housing.

Reconnecting the Power Cable

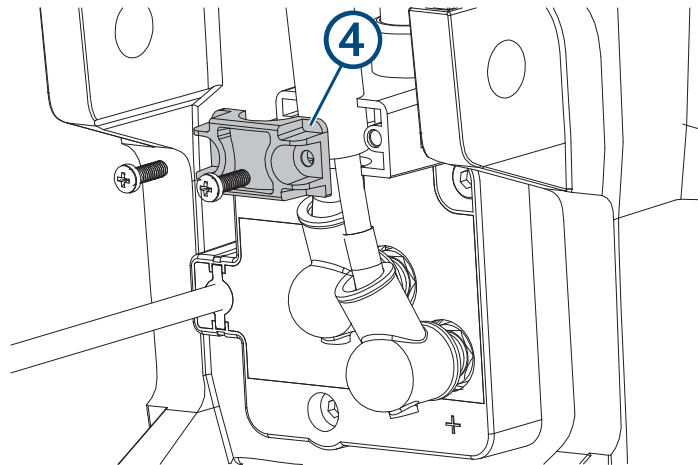
If you are replacing the power cable, you must first remove the existing power cable from the steering servo housing [Removing the Power Cable from the Steering Servo Housing, page 59](#).

- 1 Pull the rubber shields ① away from the power cable connectors.



- 2 Apply dielectric grease to the power cable connectors ② and bolts ③ on the steering servo housing.
- 3 Place the power cable connectors over the bolts on the steering servo housing, with the red cable on the positive (+) terminal, and the black cable on the negative (-) terminal.
- 4 Using a 10 mm socket, install the nuts ③ that secure the power cable connectors.
- 5 Tighten the nuts to 30 kgf-cm (26 lbf-in).
- 6 Pull the rubber shields down to cover the power cable connectors.

- 7 Using a #2 Phillips screwdriver, install the bracket ④ that secures the power cable to the steering servo housing.

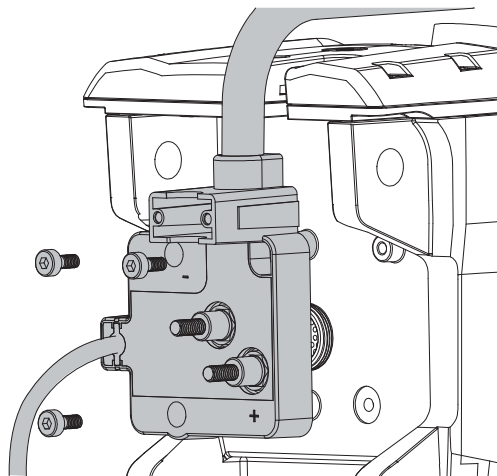


- 8 Tighten the screws to 5 kgf-cm (4.3 lbf-in).
9 Reconnect the upper link to the steering servo housing ([Reconnecting the Upper Link to the Mount Base, page 65](#)).

Removing the Coil Cable from the Steering Servo Housing

Before you can remove the coil cable, you must disconnect the power cable from the steering servo housing ([Removing the Power Cable from the Steering Servo Housing, page 59](#)).

- 1 Using a 4 mm hex bit or screwdriver, remove the three screws that secure the coil cable block to the steering servo housing.



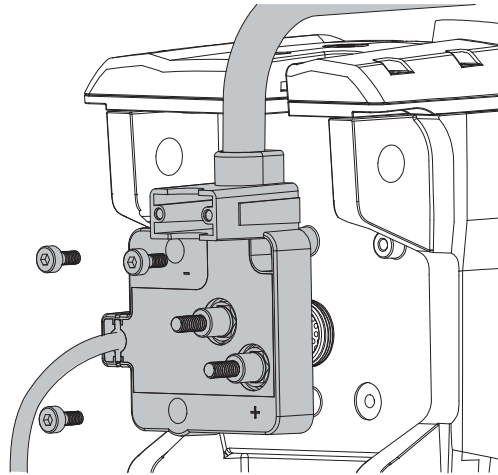
- 2 Pull the coil cable block away from the steering servo housing to remove it.

⚠ CAUTION

The coil cable block connects to the PCB in the steering servo housing. When removing the block take care to avoid damaging the connector on the PCB.

Reconnecting the Coil Cable

- 1 If you are replacing the coil cable, remove the coil cable from the shaft cap ([Removing the Coil Cable from the Shaft Cap, page 62](#)).
- 2 If necessary, install the replacement coil cable in the shaft cap ([Installing the Coil Cable in the Shaft Cap, page 63](#)).
- 3 Place the coil cable block over the connector on the steering servo housing, and push it into place, taking care to avoid damaging the connector.

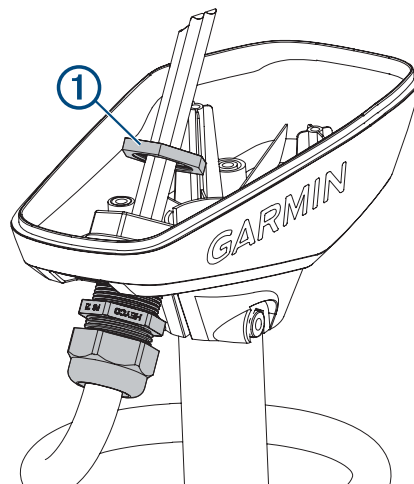


- 4 Using a 4 mm hex bit or screwdriver, insert and tighten the three screws to secure the coil cable block to the steering servo housing.
- 5 tighten the three screws to 20 kgf-cm (17.4 lbf-in)
- 6 Reconnect the power cable ([Reconnecting the Power Cable, page 60](#)).

Removing the Coil Cable from the Shaft Cap

Before you can remove the coil cable from the shaft cap, you must disconnect the cables in the shaft cap ([Disconnecting the Cables in the Shaft Cap, page 29](#)).

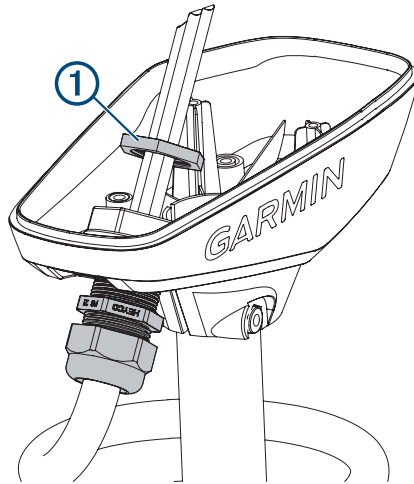
- 1 Using a 36 mm or adjustable wrench, remove the plastic nut ① on the coil-cable connector inside the shaft cap.



- 2 Pull the coil cable out of the shaft cap to remove it.

Installing the Coil Cable in the Shaft Cap

- 1 Feed the cables from the existing or replacement coil cable into the hole on the shaft cap.
- 2 Using the existing plastic nut ① or the nut provided with the replacement coil cable, secure the coil-cable connector to the shaft cap.

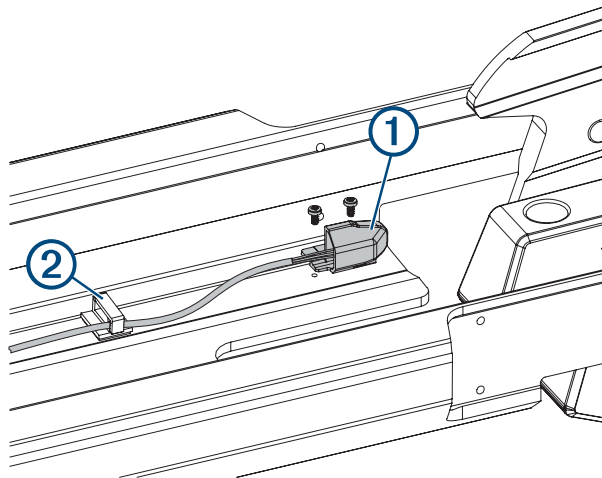


- 3 Using a 36 mm or adjustable wrench, tighten the plastic nut on the coil-cable connector inside the shaft cap

Replacing the Display Panel

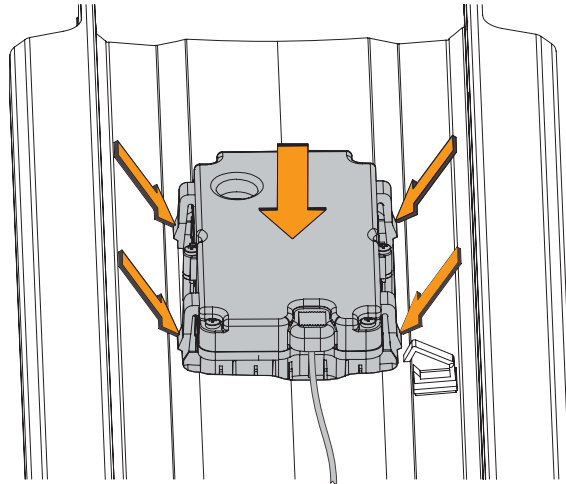
Before you can remove the display panel from the upper link of the mount, you must disconnect the upper link of the mount from the steering servo housing ([Disconnecting the Upper Link of the Mount, page 49](#)).

- 1 Using a #0 Phillips screwdriver, remove the position sensor ① from the upper link of the mount.



- 2 Open the cable clips ② to remove the position-sensor cable.

- 3 Pinch the tabs on the side of the display panel, and push it out of the upper link from the back.



- 4 Feed the cable from the replacement display panel through the upper link, taking care to feed the cable completely through the upper link.

NOTICE

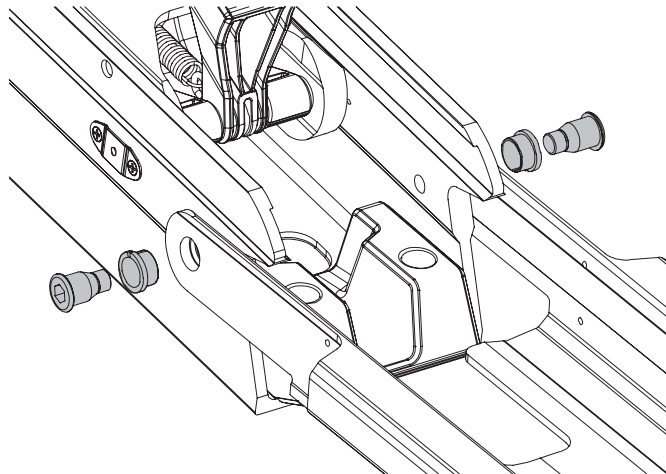
Use caution when installing the replacement display panel, because the cable may become pinched between the display panel and the upper link. This damages the cable and causes unwanted behavior when stowing the motor.

- 5 Secure the replacement display panel by placing it in the upper link and pushing until it snaps into place.
- 6 Using a #0 Phillips screwdriver, secure the position sensor to the mount.
- 7 Route the position sensor cable through the cable clips and snap them closed to secure the cable.

Removing the Upper Link from the Mount Base

Before you can remove the upper link from the mount base, you must disconnect the upper link from the steering servo housing ([Disconnecting the Upper Link of the Mount, page 49](#)).

- 1 Using an 8 mm hex bit or wrench, loosen the two bolts that secure the upper link to the mount base.

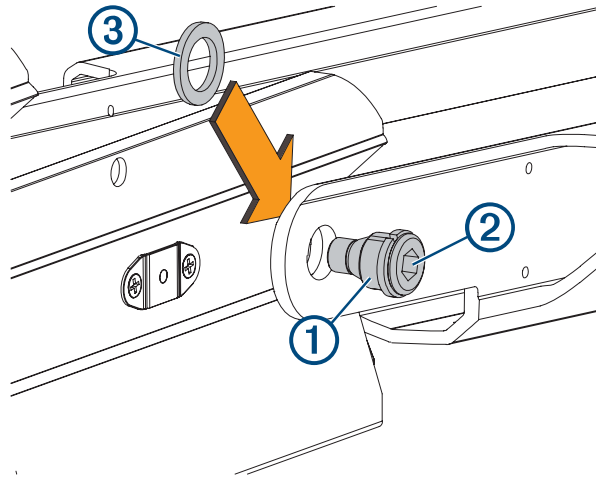


TIP: The bolts that secure the upper link to the mount base are fastened very securely at the factory. You may need to use a ratchet to hold the 8 mm hex bit to provide the leverage needed to loosen these bolts.

- 2 Remove the bolts, bushings, and washers from both sides of the upper link.

Reconnecting the Upper Link to the Mount Base

- 1 Place the plastic bushings ① over the bolts ② you removed with the original upper link, or over the two bolts supplied with the replacement upper link.

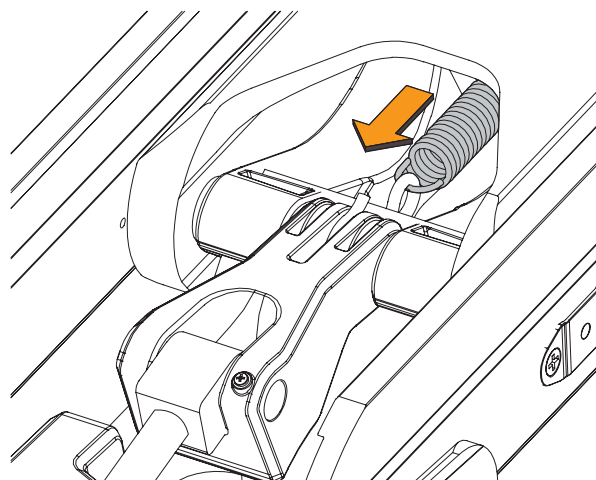


- 2 Place a plastic washer ③ that you removed with the original upper link or a washer supplied with the replacement upper link between the upper link and the mount base.
NOTE: Replacement plastic washers may have adhesive on one side. If your washers have adhesive, you can stick them to the mount base to make installing the bolts easier.
- 3 Push one of the bolts with a plastic bushing through the upper link and washer, and using an 8 mm hex bit or wrench, screw it into the mount base.
- 4 Repeat the previous step on the other side of the mount.
- 5 Tighten the bolts to 55 Nm (40.5 lbf-ft.).

Removing the Lower Link from the Mount Base

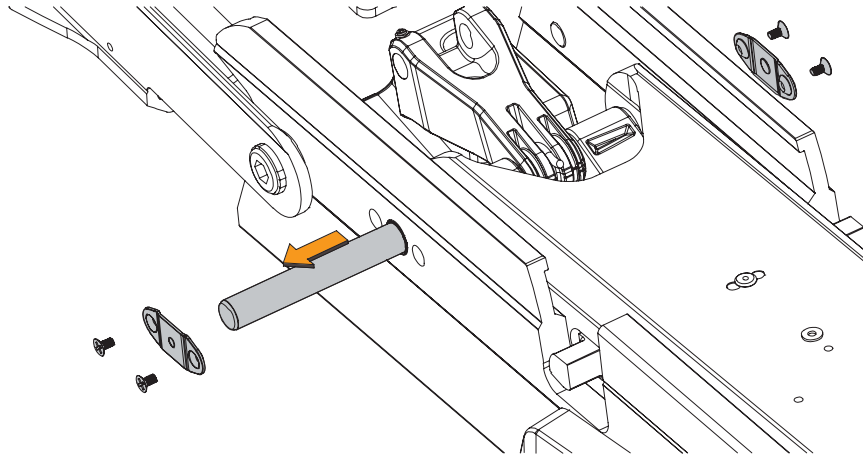
Before you can remove the lower link from the mount base, you must remove the steering servo from the mount ([Removing the Steering Servo from the Mount, page 47](#)).

- 1 Rotate the lower link up so you can access the latching mechanism spring.



- 2 Using needle-nose pliers, disconnect the spring from the hook on the base of the gas spring.

- 3 Using a #2 Phillips screwdriver, remove the pin covers from the sides of the mount base.

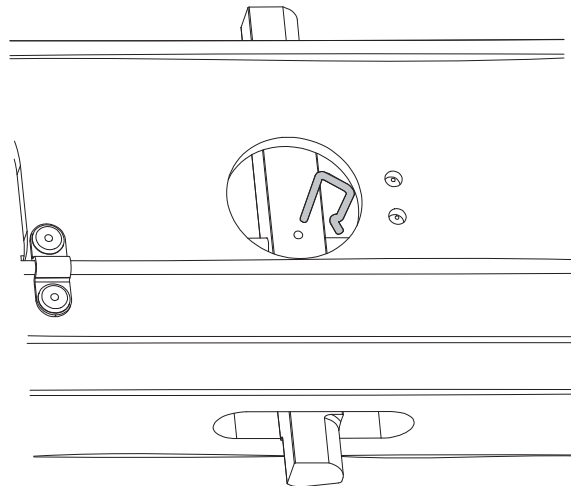


- 4 Push the pin out from one side and pull to remove it from the mount base.
5 Lift up to remove the lower link from the mount base.

Replacing the Locking Mechanism in the Lower Link

Before you can replace the locking mechanism in the lower link, you must remove the lower link from the mount base ([Removing the Lower Link from the Mount Base, page 65](#)).

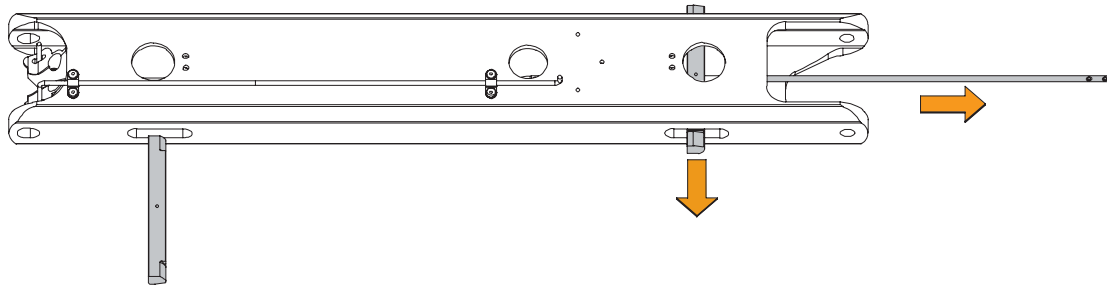
- 1 If it is still connected, remove the pull cable from the latching mechanism ([Removing the Pull Cable, page 23](#)).
2 Using a pair of needle-nose pliers, remove the pins that secure the latch bars to the central rod.



⚠ CAUTION

Take note of the orientation of the latch pins prior to removing them. Installing the latch pins incorrectly may cause damage.

- 3 Slide the central rod out of either end of the lower link.



- 4 Slide the two latch bars out of the lower link.

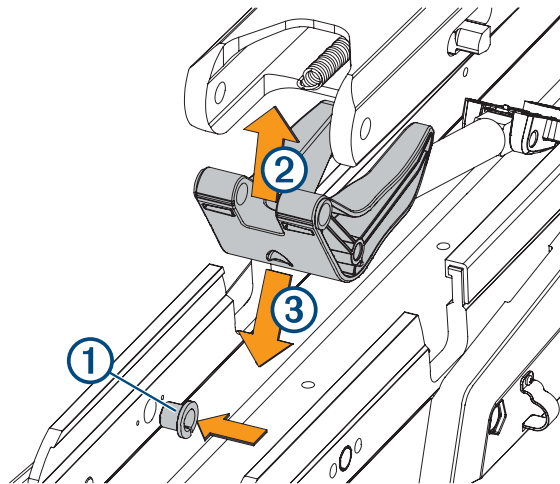
⚠ CAUTION

Take note of the orientation of the latch bars prior to removing them. Installing the latch bars incorrectly may cause damage.

- 5 Apply a silicon-based lubricating grease to the replacement latch bars.
- 6 Insert the replacement latch bars into the lower link, with the rounded ends of the latch bars facing the hinge end of the lower link.
- 7 Insert the replacement rod into either end of the lower link, feeding it through the holes in the two latch bars.
- 8 Reinstall the pins to secure the latch bars to the central rod.

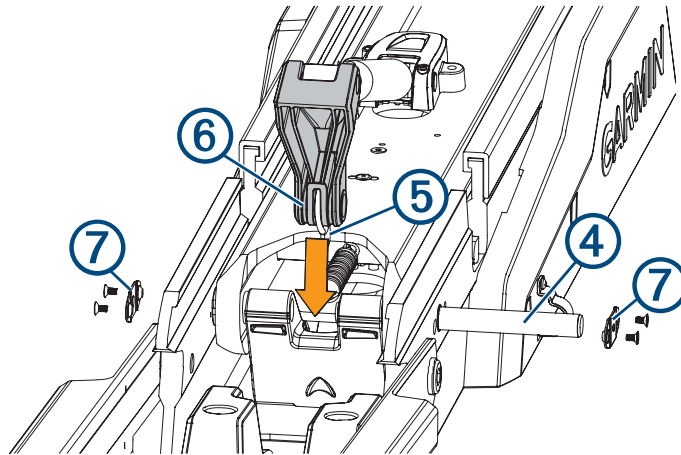
Reconnecting the Lower Link to the Mount Base

- 1 If necessary, install the bushings ① in the mount base from the inside.

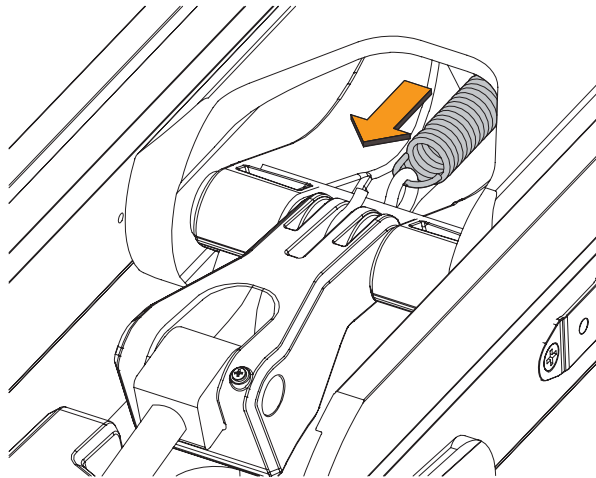


- 2 Insert the lower gas spring assembly into the lower link ②, with the shaft stabilizer pointing toward the front of the lower link.
- 3 Insert the combined lower link and lower gas spring into the mount base ③.

- 4 Push the pin ④ into the mount base, feeding it through one side of the lower link and shaft stabilizer.



- 5 Holding the spring hook ⑤ towards the lower link, place the upper gas spring arm ⑥ into the shaft stabilizer, and push the pin the rest of the way through all of the parts, until it is flush with the sides of the mount base.
- 6 Using a #2 Phillips screwdriver, install the pin covers ⑦ on the sides of the mount base.
- 7 Rotate the lower link up so you can access the latching mechanism.
- 8 Using needle-nose pliers, connect the spring from the latching mechanism to the hook on the base of the gas spring.



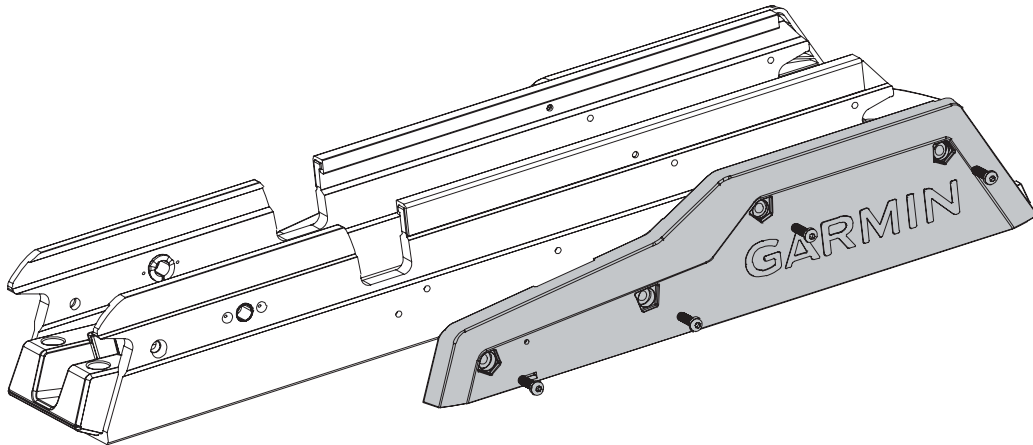
- 9 Install the steering servo on the mount ([Connecting the Steering Servo to the Mount, page 53](#)).

Replacing the Mount Base

- 1 Remove the steering servo from the mount ([Removing the Steering Servo from the Mount, page 47](#)).
- 2 Remove the upper link from the mount base ([Removing the Upper Link from the Mount Base, page 64](#)).
- 3 Remove the lower link from the mount base ([Removing the Lower Link from the Mount Base, page 65](#)).
- 4 Uninstall the fasteners that secure the mount base to the boat.
- 5 Secure the replacement mount base to the deck of the boat, replacing the existing mounting hardware if necessary.
- 6 Install the lower link on the mount base ([Reconnecting the Lower Link to the Mount Base, page 67](#)).
- 7 Install the upper link on the mount base ([Reconnecting the Upper Link to the Mount Base, page 65](#)).
- 8 Install the steering servo on the mount ([Connecting the Steering Servo to the Mount, page 53](#)).

Replacing the Mount Shrouds

- 1 Using a 4 mm hex bit or wrench, remove the screws that secure the mount shrouds to the mount base.

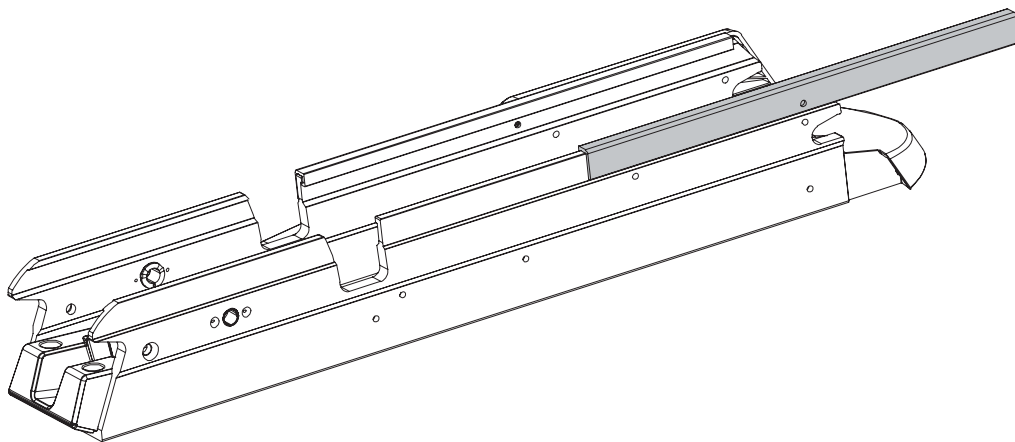


- 2 Secure the replacement shrouds to the mount base using the screws provided with the replacement shrouds.

Replacing the Mount Rails

Before you can replace the mount rails, you must remove the shrouds from the mount base ([Replacing the Mount Shrouds, page 69](#)).

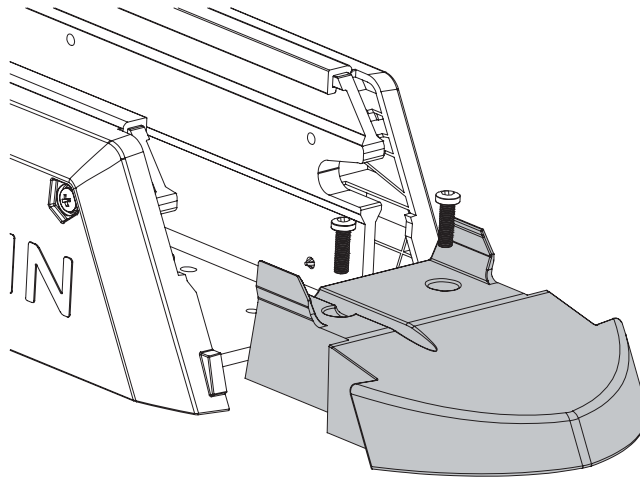
- 1 Slide the two mount rails off of the mount base.



- 2 Slide the replacement rails onto the mount base.
- 3 Reinstall the shrouds.

Replacing the Mount Bumper

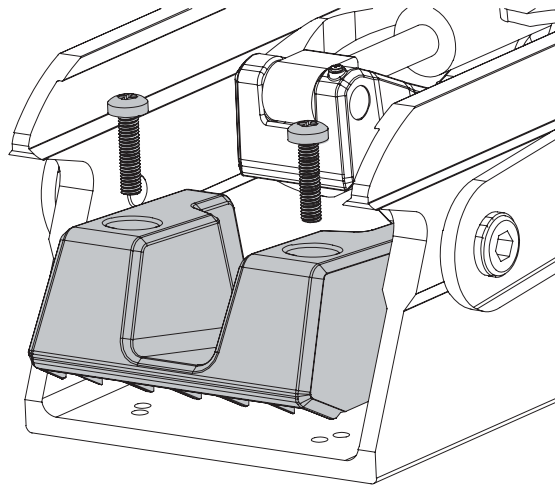
- 1 Using a 4 mm hex bit or wrench, remove the two screws that secure the mount bumper to the mount base.



- 2 Install the replacement mount bumper, and secure it to the mount base using the screws provided with the replacement part.

Replacing the Stow Support

- 1 Using a 4 mm hex bit or wrench, remove the screws securing the stow support to the mount base.

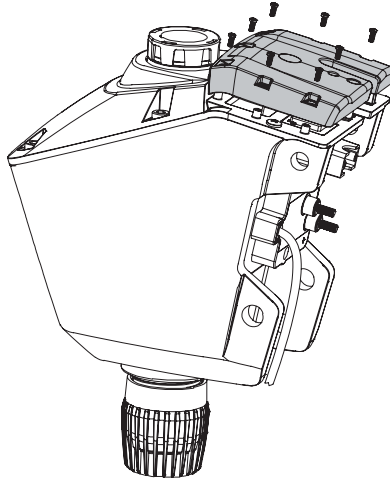


- 2 Install the replacement stow support using the screws provided with the replacement part.

Removing the Electronics Cover

If you are planning to remove the PCB for service, before you remove the electronics cover, you must remove the steering servo from the mount ([Removing the Steering Servo from the Mount, page 47](#)) and remove the shaft from the steering servo ([Removing the Shaft from the Steering Servo, page 32](#)).

- 1 Using a #1 Philips screwdriver, remove the eight screws that secure the electronics cover to the steering servo housing.



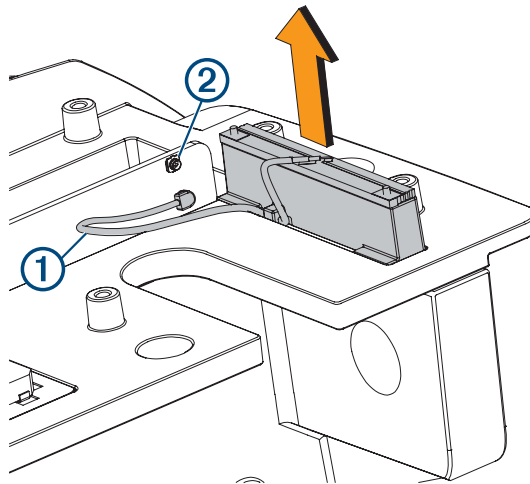
NOTE: The screws are not secured to the electronics cover. Take care when removing the cover because the screws are loose and may fall out.

- 2 Lift the cover up and away from the steering servo housing.

Replacing the Antenna Module

Before you can replace the antenna module, you must remove the electronics cover.

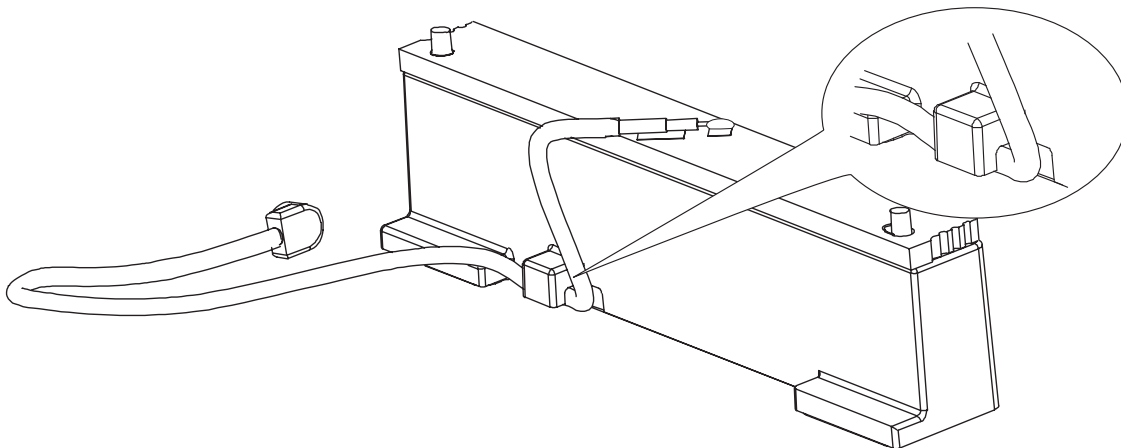
- 1 Disconnect the coax cable ① on the antenna module from the connector ② on the PCB.



NOTICE

The coax cable and connector are very fragile. Use extreme care when removing and reconnecting this cable to the PCB.

- 2 Pull the antenna module off of the steering servo housing.
The module is secured with double-sided tape.
- 3 Remove the green tape that holds the coax cable to the antenna module.
This tape is required during reassembly.
- 4 Clean the surface with isopropyl alcohol and allow it to dry.
- 5 Remove the liner from the double-sided tape on the bottom of the replacement antenna module.
- 6 Route the coax cable under the small clip on the bottom of the antenna module and secure it to the steering servo housing.



- 7 Connect the coax cable on the antenna module to the PCB.
- 8 Use the tape you removed from the original antenna module to hold the coax cable to the replacement module.
- 9 Reinstall the electronics cover ([Reinstalling the Electronics Cover, page 75](#)).

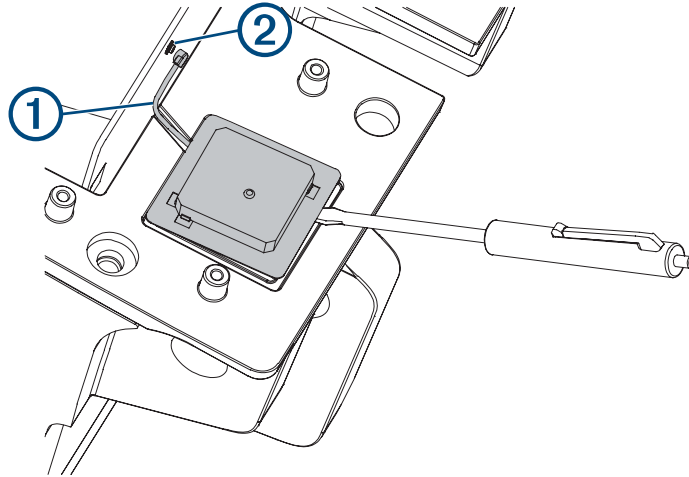
Replacing the GPS Antenna

Before you can replace the GPS antenna, you must remove the electronics cover ([Removing the Electronics Cover, page 71](#)).

NOTICE

Removing the GPS antenna damages the antenna, and it can no longer be used. Remove the antenna only if you have tested it with a working antenna first.

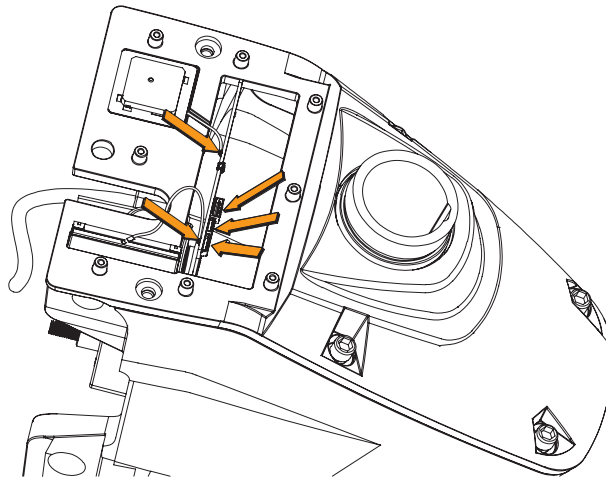
- 1 Disconnect the coax cable ① on the GPS antenna from the connector ② on the PCB.



- 2 Using a flat screwdriver, pry up on the GPS antenna to remove it from the steering servo housing.
- 3 Discard the GPS antenna, because it cannot be used after removing it from the housing.
- 4 Clean the surface with rubbing alcohol, and allow it to dry.
- 5 Remove the liner from the double-sided tape on the bottom of the replacement GPS antenna, and secure it to the housing.
- 6 Route the coax cable along the channel in the housing, and connect it to the PCB.

Replacing the PCB

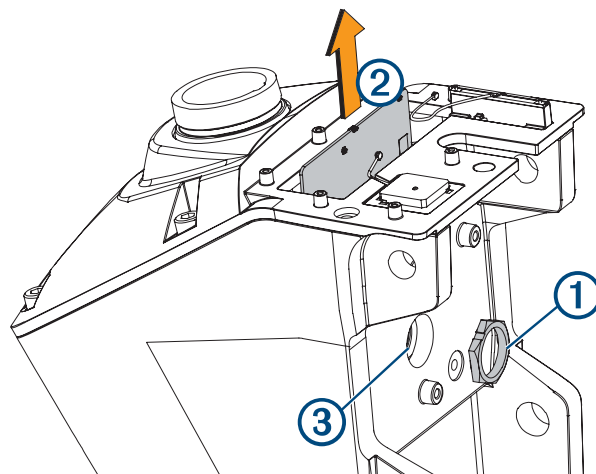
- 1 Remove the coil cable from the steering servo housing (*Removing the Coil Cable from the Steering Servo Housing, page 61*).
- 2 Open the electronics cover (*Removing the Electronics Cover, page 71*).
- 3 Carefully remove the green tape covering the connectors.
This tape is required during reassembly.
- 4 Disconnect the three wiring harnesses and two coax cables from the PCB.



NOTICE

The cables and connectors are very fragile. Use extreme care when disconnecting and reconnecting these cables to the PCB.

- 5 Using a 29 mm wrench or socket, remove the nut on the electronics connector ①.

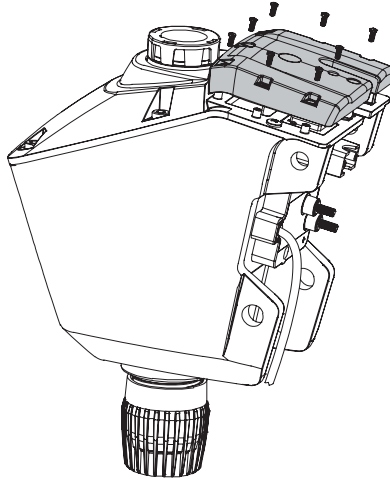


- 6 Remove the PCB by lifting it up and out of the steering servo housing ②.
- 7 Check the replacement PCB to make sure a gasket is installed on the circular connector that feeds through the steering servo housing.
If a gasket is not present, you should install the gasket from the original PCB on the connector of the replacement PCB.
- 8 Place the replacement PCB into the steering servo housing, feeding the electronics connector through the hole ③.
- 9 Secure the replacement PCB to the steering servo housing using the nut you removed in the previous step.

- 10 Reconnect the three wiring harnesses and the two coax cables to the PCB.
- 11 Place the tape you removed from the original PCB over the connectors on the replacement PCB.
- 12 Reinstall the electronics cover ([Reinstalling the Electronics Cover, page 75](#)).

Reinstalling the Electronics Cover

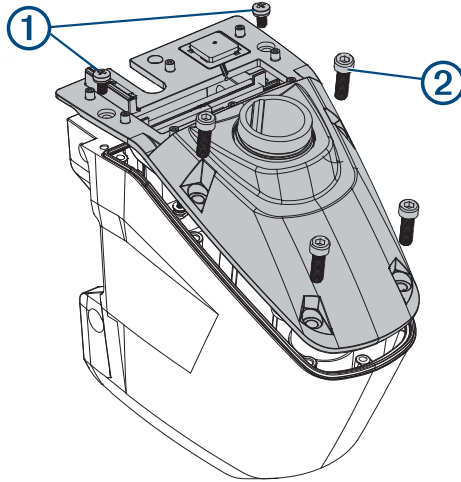
- 1 If necessary, replace the rubber seal on the bottom of the electronics cover.
- 2 Place the electronics cover on the steering servo housing.



- 3 Using a #1 Phillips screwdriver, secure the electronics cover to the steering servo housing using the eight screws you removed with the cover.
- 4 Tighten the screws to 7 kgf-cm (6.1 lbf-in).

Opening the Steering Servo Housing

- 1 Remove the shaft from the steering servo (*Removing the Shaft from the Steering Servo*, page 32).
- 2 Remove the steering servo from the mount (*Removing the Steering Servo from the Mount*, page 47).
- 3 Remove the depth-adjustment collar (*Removing the Depth-Adjustment Collar*, page 32).
- 4 Remove the electronics cover (*Removing the Electronics Cover*, page 71).
- 5 Remove the PCB (*Replacing the PCB*, page 74).
- 6 Using a #3 Phillips screwdriver, remove the two screws ① and washers on the top of the steering servo housing.



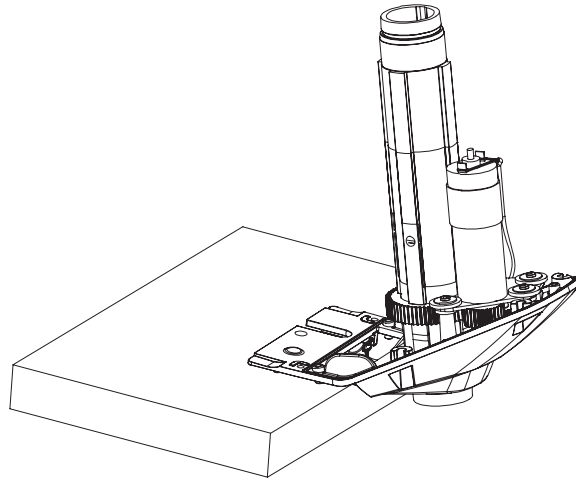
These two screws and washers are hidden by the electronics cover when fully assembled.

- 7 Using a 6 mm hex bit or wrench, remove the four hex bolts ② and nylon washers on the top of the steering servo housing.
- 8 Turn over the steering servo housing.
- 9 Lift up carefully and evenly on the base of the steering servo housing to separate the two parts.

Removing the Steering Servo Motor

Before you can remove the steering servo motor, you must open the steering servo housing ([Opening the Steering Servo Housing, page 76](#)).

- 1 Support the top of the steering servo housing on the edge of a bench or a table and not on the top of the shaft carrier when removing the steering servo motor.

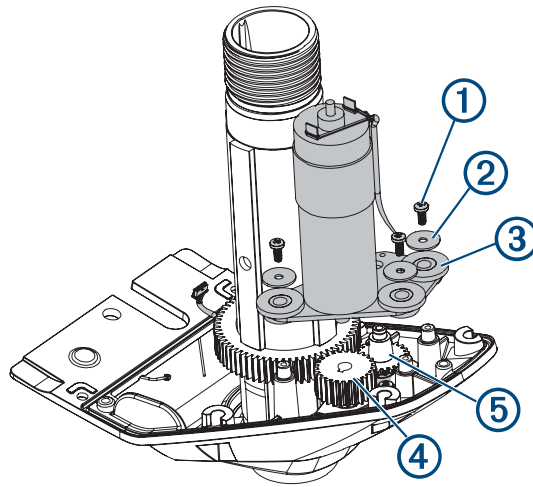


NOTICE

Do not clamp the top of the housing to the bench or table to support it. Clamping the housing may damage the coating or bend the housing.

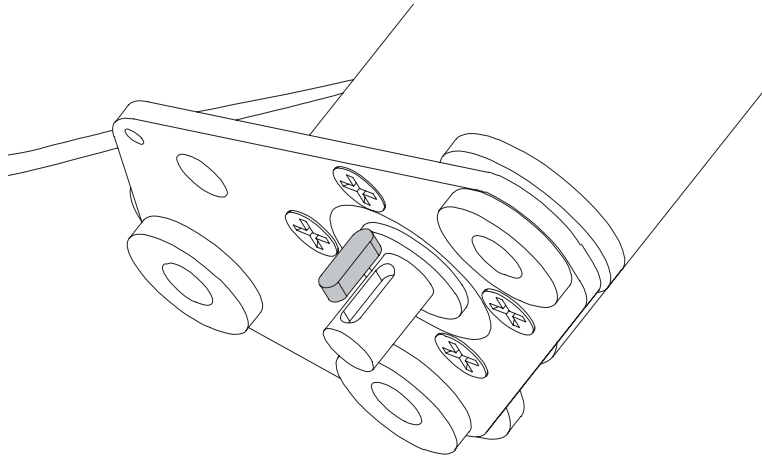
- 2 Using a #2 Phillips screwdriver, remove the clip that secures the motor cable to the housing.

- 3 Using a #2 Phillips screwdriver, remove the three screws ①, metal washers ②, and rubber washers ③ that secure the steering servo motor to the housing.



NOTICE

The key is not fixed to the shaft of the steering servo motor, and may fall out when you remove the motor from the metal drive gear. Take care to save this key.



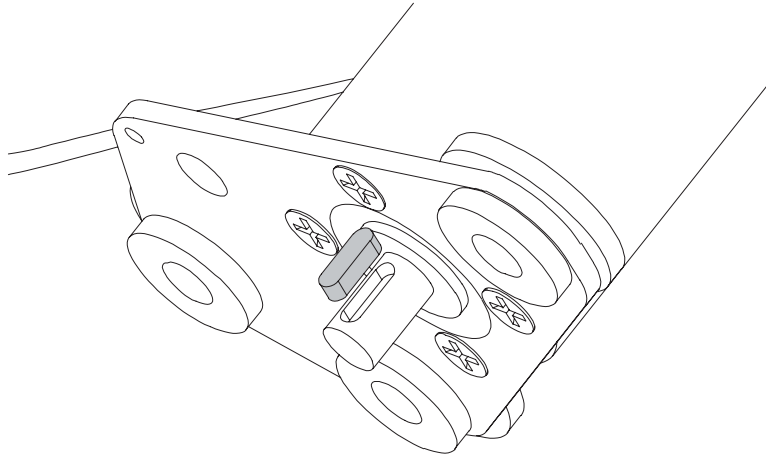
- 4 Lift up on the steering servo motor to remove it from the housing.
The metal drive gear ④ and the plastic position sensor gear ⑤ should remain in the housing after you remove the motor, because they are not secured to the motor shaft.

NOTE: Because of the lubricating grease, the metal drive gear may pull out of the housing when you remove the motor. If it does remain connected to the motor, you can pull the drive gear off of the motor shaft.

Reinstalling the Steering Servo Motor

Before you can reinstall or replace the steering servo motor, you must reinstall the shaft carrier and gears ([Reinstalling the Shaft Carrier and Gears, page 81](#)).

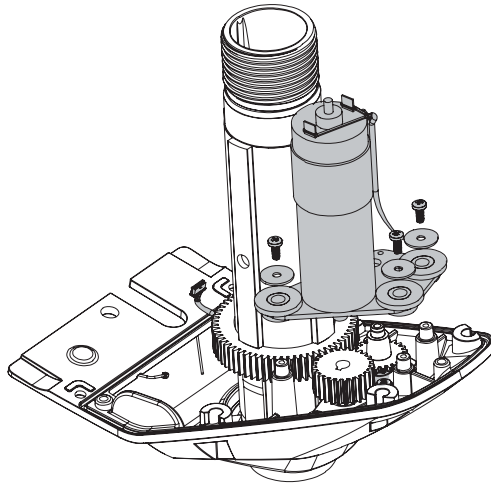
- 1 If necessary, place the key into the shaft on the steering servo motor.



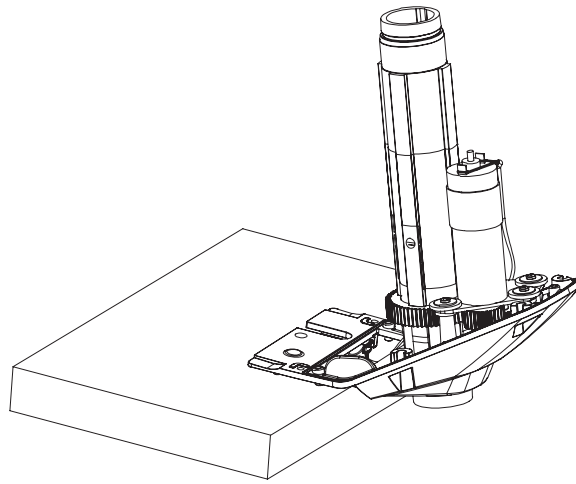
- 2 Place the metal drive gear onto the shaft of the existing or replacement steering servo motor, fitting the key on the shaft into the gear.

It is easier to place the gear on the motor shaft before placing it into the housing.

- 3 Place the existing or replacement steering servo motor into the top of the steering servo housing, fitting the metal gear onto the position sensor bracket.



NOTE: You should support the top of the steering system housing on the edge of a bench or table and not on the top of the shaft carrier when reinstalling or replacing the steering servo motor



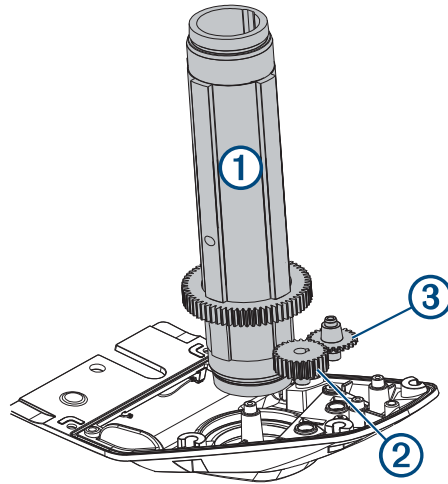
- 4 Secure the existing or replacement steering servo motor to the top of the steering servo housing using the three original screws, metal, and rubber washers or the new hardware provided with the replacement motor.
- 5 Tighten the three screws to 10 kgf-cm (8.7 lbf-in).
- 6 Using a #2 Phillips screwdriver, install the existing or replacement clip that secures the motor cable to the housing.
- 7 Close the steering system housing ([Closing the Steering Servo Housing, page 82](#)).

Removing the Shaft Carrier and Gears

Before you can remove the shaft carrier and gears, you must remove the steering servo motor ([Removing the Steering Servo Motor, page 77](#)).

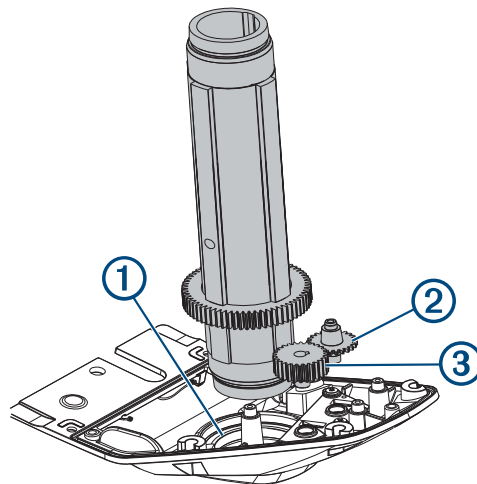
Complete an action:

- To remove the shaft carrier ①, lift straight up on the shaft carrier using even pressure.
- To remove the drive gear ②, lift up on the drive gear.
- To remove the position sensor gear ③, lift up on the position sensor gear.



Reinstalling the Shaft Carrier and Gears

- 1 Apply a light layer of silicone grease to the black rubber seal ① around the shaft-carrier opening in the steering servo housing.
- 2 Place the shaft carrier into the upper steering servo housing.
- 3 Place the plastic gear ② into the hole on the steering position sensor bracket near the edge of the steering servo housing.

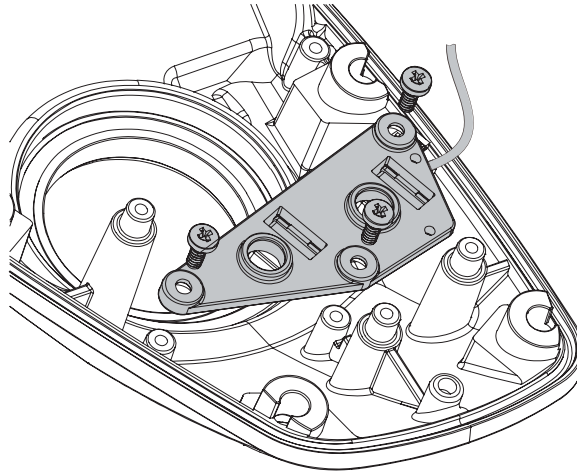


- 4 Generously apply silicone grease to the gear on the shaft carrier.
- 5 Apply silicone grease to metal drive gear ③, but do not place it into the steering position sensor bracket. It is easier to first install the metal drive gear on the steering servo motor when reinstalling the motor.
- 6 Reinstall the steering servo motor ([Reinstalling the Steering Servo Motor, page 79](#))

Replacing the Steering Position Sensor

Before you can replace the steering position sensor, you must remove the shaft carrier and gears ([Removing the Shaft Carrier and Gears, page 81](#)).

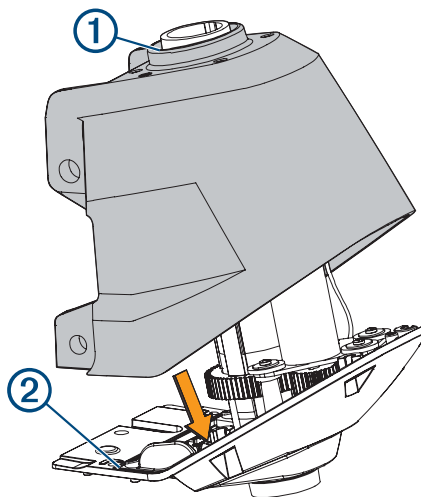
- 1 Using a #2 Phillips screwdriver, remove the three screws and the steering position sensor from the steering servo housing.



- 2 Install the replacement steering position sensor using the screws provided with the replacement part.
- 3 Tighten the screws to 10 kgf-cm (8.7 lbf-in)
- 4 Reinstall the shaft carrier and gears ([Reinstalling the Shaft Carrier and Gears, page 81](#)).

Closing the Steering Servo Housing

- 1 Apply a light layer of silicone grease to the black rubber seal ① around the shaft-carrier opening in the steering servo housing.



- 2 Set the top of the steering servo housing on a table or workbench with the shaft carrier and servo motor pointing up.
- 3 Make sure the gasket ② is installed in the groove around the perimeter of the upper steering servo housing.
- 4 Place the bottom of the steering servo housing over the shaft carrier, and lower it onto the top of the steering servo housing.

NOTE: You may need to start by connecting the back parts of the housing first, and rotate the front of the housing into place.

- 5 Keeping the steering servo housing upside down, install one or two of the screws to hold the parts together.

6 Turn the steering servo housing over, and install the rest of the screws.

7 Tighten all of the screws to 50 kgf-cm (43.4 lbf-in).

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