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GMR Fantom™ Open Array Series Field Service Manual

⚠ WARNING

The GMR Fantom Open Array series radar generates and transmits non-ionizing radiation. The radar must be turned off before approaching the scanner for service. Avoid looking directly at the scanner while it is transmitting, as the eyes are the most sensitive part of the body to electromagnetic radiation. **Before performing any bench test procedure, remove the antenna and install the antenna terminator provided in the Garmin Radar Service Kit (T10-00114-00).** Failure to install the antenna terminator will expose the service technician to harmful electromagnetic radiation that can result in personal injury or death.

The GMR Fantom Open Array series radar contains high voltages. The scanner must be turned off before the covers are removed. While servicing the unit, be aware high voltages are present and take the necessary precautions. The high voltages in the scanner can take some time to decay. Failure to adhere to this warning can result in personal injury or death.

DO NOT place the GMR Fantom Open Array series radar into a test mode for display purposes. When the antenna is attached, there is a danger of non-ionizing radiation. The test modes should only be used for troubleshooting purposes with the antenna removed and the antenna terminator in place.

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

NOTICE

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

Important Information Regarding Field Service of the GMR Fantom Open Array Series Radar

*   Before performing any service to the radar, ensure that the system software is up to date. If it is not, go to www.garmin.com to download the latest software version and update the radar (page 2). Proceed with the service only if the software update does not resolve the issue.

*   Record the serial number of your radar. You will need the serial number when you order replacement parts.

Contacting Garmin Product Support

Replacement parts are available only through Garmin Product Support.

*   For dealer specific support, call 1-866-418-9438
*   Go to support.garmin.com.
*   In the USA, call 913-397-8200 or 1-800-800-1020.
*   In the UK, call 0808 2380000.
*   In Europe, call +44 (0) 870.8501241.

Table of Contents

Getting Started

Radar Software Update

Before using this manual to troubleshoot a problem, ensure all Garmin devices on the boat, including the chartplotter and the GMR Fantom Open Array series radar, are operating on the latest-released software version. Software updates may resolve the problem.

If your chartplotter has a memory card reader, or there is a memory card reader accessory on the Garmin Marine Network, you can update the software using a memory card up to 32 GB, formatted to FAT32.

If your chartplotter has Wi-Fi® technology, you can use the ActiveCaptain™ app to update the device software.

Checking the Radar Software Version on a Compatible Chartplotter

1 Turn on the chartplotter.
2 Select **Settings** > **Communications** > **Marine Network**, and note the software version listed for the radar.
3 Go to www.garmin.com/support/software/marine.html.
4 Click on **See All Devices in this Bundle** under **GPSMAP Series with SD Card** to see if your software is up to date.

Updating the Software Using the ActiveCaptain App

NOTICE
Software updates may require the app to download large files. Regular data limits or charges from your Internet service provider apply. Contact your Internet service provider for more information about data limits or charges.

The installation process can take several minutes.

If your chartplotter has Wi-Fi technology, you can use the ActiveCaptain app to download and install the latest software updates for your devices.

1 Connect the mobile device to the compatible chartplotter.
2 When a software update is available and you have internet access on your mobile device, select **Software Updates** > **Download**.

The ActiveCaptain app downloads the update to the mobile device. When you reconnect the app to the chartplotter, the update is transferred to the device. After the transfer is complete, you are prompted to install the update.

3 When you are prompted by the chartplotter, select an option to install the update.
   • To update the software immediately, select **OK**.
   • To delay the update, select **Cancel**. When you are ready to install the update, select **ActiveCaptain** > **Software Updates** > **Install Now**.

Loading the New Software on a Memory Card Using the Garmin Express™ App

You can copy the software update to a memory card using a computer with the Garmin Express app.

Use of an 8 GB or higher memory card formatted to FAT32 with speed class 10 is recommended.

Downloading the software update may take from a few minutes up to a few hours.

You should use a blank memory card for software updates. The update process erases the content on the card and reformats the card.

1 Insert a memory card into the card slot on the computer.
2 Install the Garmin Express app.
3 Select your vessel.
4 Select **Software Updates** > **Continue**.
5 Read and agree to the terms.
6 Select the drive for the memory card.
7 Review the reformat warning, and select **Continue**.

8 Wait while the software update is copied to the memory card.
9 Close the Garmin Express app.
10 Eject the memory card from the computer.

After loading the update onto the memory card, install the software on the chartplotter.

Updating the Software Using a Memory Card

To update the software using a memory card, you must obtain a software-update memory card or load the latest software onto a memory card using the Garmin Express app (page 2).

1 Turn on the chartplotter.
2 After the home screen appears, insert the memory card into the card slot.

   NOTE: In order for the software update instructions to appear, the device must be fully booted before the card is inserted.

3 Select **Update Software** > **Yes**.
4 Wait several minutes while the software update process completes.
5 When prompted, leave the memory card in place and restart the chartplotter.
6 Remove the memory card.

   NOTE: If the memory card is removed before the device restarts fully, the software update is not complete.

Radar Diagnostics Page

Opening the Radar Diagnostics Page on a Compatible Chartplotter

1 From the Home screen, select **Settings** > **System** > **System Information**.
2 Hold the upper left corner of the system information box (where it shows the software version) for about three seconds.

   The **Field Diagnostics** menu appears in the list on the right.

3 Select **Field Diagnostics** > **Radar**.

Viewing a Detailed Error Log on a Compatible Chartplotter

The radar keeps a log of reported errors, and this log can be opened using a compatible chartplotter. The error log contains the last 20 errors reported by the radar. If possible, it is recommended to view the error log while the radar is installed on the boat where the problem is encountered.

1 On a compatible chartplotter, open the radar diagnostics page.
2 Select **Radar** > **Error Log**.

Tools Needed

- Screwdrivers
  - Number 1 Phillips
  - Number 2 Phillips
  - 6 mm hex
  - 3 mm hex
- Sockets
  - 16 mm ($5/8$ in.) (to remove the internal network connector)
  - 20.5 mm ($13/16$ in.) (to remove the internal power or grounding connector)
- External retaining ring pliers (to remove the antenna rotator or drive gear)
- Multimeter
- Compatible Garmin chartplotter
- 12 Vdc power supply
- Radar service kit (T10-00114-00)
- Cable tie

Troubleshooting

Errors on the radar are reported on the chartplotter as an error message. When the radar reports an error, it may stop, go into standby mode, or continue operating, depending on the severity of the error. When an error is encountered, note the error message and perform the universal troubleshooting steps before proceeding with error-specific troubleshooting.

Universal Troubleshooting Steps

You must perform these troubleshooting steps prior to performing error-specific troubleshooting. You should perform these steps in order, and check to see if the error remains after performing each step. If the error remains after completing all of these steps, you should see the topic that corresponds to the error message you received.

1 Update the radar and chartplotter software (page 2).
2 Examine the radar power cable and connections on the radar and on the battery or fuse block.
   • If the cable is damaged or a connection is corroded, replace the cable or clean the connection.
   • If the cable is good, and the connections are clean, test the radar with a known good power cable.
3 Examine the Garmin Marine Network cable and connections on the radar and the chartplotter or GMS™ 10 network port extender.
   • If the cable is damaged, or a connection is corroded, replace the cable or clean the connection.
   • If the cable is good, and the connections are clean, test the radar with a known good Garmin Marine Network cable.

Radar Status LED

A status LED is located on the product label, and it can help you troubleshoot installation issues.

Status LED color and activity	Radar Status
Solid red	The radar is getting ready for use. The LED is solid red briefly and changes to flashing green.
Flashing green	The radar is operating properly.
Flashing orange	The radar software is being updated.
Flashing red	The radar has encountered an error.

Testing the Voltage Converter

GMR Fantom 120/250 series radars require an external voltage converter to provide the proper voltage for operation. The radar service kit contains a test wiring harness you can use to test the voltage converter for correct operation.

NOTE: The voltage converter does not provide accurate voltage readings on the output pins unless you connect the test wiring harness.

1 Disconnect the voltage converter from the radar.
2 Connect the test wiring harness to the voltage converter using the connector on the end of the harness ①.
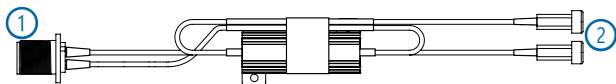
3 If necessary, switch on the power feed to the voltage converter.
4 Using a multimeter, test the DC voltage at the terminals on the test wiring harness ②.
   If the measurement reads a steady 36 Vdc, then the voltage converter is working properly.

Error Codes and Messages

Major warning and severe error codes for the radar appear on the chartplotter screen. These codes and messages can be helpful when troubleshooting the radar. In addition to the major warning and severe error codes, all error and diagnostic codes are also stored in an error log. You can view the log on the chartplotter (page 2).

1004 - Input Voltage Low
1005 - Input Voltage High

1 Perform the universal troubleshooting steps (page 3).
2 Complete an action:
   • On a GMR Fantom 50 series, using a multimeter, check for 10 to 24 Vdc on the power cable that connects to the radar.
   • On a GMR Fantom 120/250 series, test the voltage converter
3 If a correction is made to the input voltage and the problem persists, perform the universal troubleshooting steps (page 3) again.
4 Check the internal power cable (page 8).
5 If the problem persists, replace the electronics box (page 7).
6 If the problem persists, replace the motor control PCB (page 7).

1013 - System Temperature High
1015 - Modulator Temperature High

1 Perform the universal troubleshooting steps (page 3).
2 Check the temperature in the installed location, and make sure it meets the specification for the radar.
   NOTE: The temperature specification for the GMR Fantom 50/120/250 series radar is from -15 to 55°C (from 5 to 131°F).
3 If a correction is made to the temperature in the installed location and the problem persists, perform the universal troubleshooting steps (page 3) again.
4 Replace the fan on the electronics box (page 7).
5 If the problem persists, replace the electronics box (page 7).

1019 - Rotation Speed Failed During Spin Up
1025 - Rotation Speed Could Not be Maintained

1 Perform the universal troubleshooting steps (page 3).
2 If the problem persists, with the radar still installed on the boat, turn on the radar, and begin transmitting.
3 Observe the antenna.
4 Complete an action:
   • If the antenna rotates and you receive this error, go to the "The antenna does rotate" topic for further troubleshooting.
   • If the antenna does not rotate and you receive this error, go to the "The antenna does not rotate" topic for further troubleshooting.

The antenna does rotate

1. Turn off the radar, remove the antenna, and install the antenna terminator (page 6).
2. Open the pedestal housing (page 6).
3. Disconnect the power cable from the motor to the motor controller PCB.
4. Disconnect the ribbon cable from the electronics box to the motor controller PCB and the antenna position sensor PCB.
5. Examine the cables, connectors, and ports for damage, and complete an action:
   • If a cable, connector, or port is damaged, replace the damaged cable or component.
   • If the cables, connectors, and ports are all undamaged, go to the next step.
6. Reconnect all cables securely, and test to see if the error is resolved.
7. If the error persists, replace the antenna position sensor PCB (page 7).
8. If the error persists, replace the motor controller PCB (page 7).
9. If the error persists, replace the electronics box (page 7).

The antenna does not rotate

1. Turn off the radar, remove the antenna, and install the antenna terminator (page 6).
2. Open the pedestal housing (page 6).

4. Disconnect the ribbon cable from the electronics box to the motor controller PCB and the antenna position sensor PCB.

5. Examine the cable, connectors, and ports for damage, and complete an action:
   - If a cable, connector, or port is damaged, replace the damaged cable or component.
   - If the cables, connectors, and ports are all undamaged, proceed to the next step.

6. Reconnect all cables securely and test to see if the error is resolved.

3. Remove the motor assembly (page 6).

4. Inspect the motor drive gear and the antenna drive gear for damage, and complete an action:
   - If the motor drive gear is damaged, replace the motor assembly (page 6).
   - If the antenna drive gear is damaged, replace the antenna drive gear (page 8).
   - If the gears are undamaged, proceed to the next step.

5. Rotate the motor drive gear by hand, and observe how it rotates:
   - If the motor drive gear is hard to turn, or does not turn smoothly and easily, replace the motor assembly.
   - If the motor drive gear turns smoothly and easily, proceed to the next step.

6. Replace the motor controller PCB (page 7).

7. If the error is unresolved, replace the electronics box (page 7).

Failure With No Error Code

The radar does not appear on the network-device list, and no error message is shown

1. Check the network cable:
   1.1 Inspect the radar network cable for damage on the cable or connectors.
   1.2 If possible, check the radar network cable for continuity.
   1.3 Repair or replace the cable if needed.

2. If a GMS 10 marine network switch is installed, check the LEDs on the GMS 10 for activity:
   2.1 If there is no activity, check the GMS 10 power cable for damage on the cable or connectors.
   2.2 If there is no activity, check the network cable from the chartplotter to the GMS 10 for damage on the cable or connectors.
   2.3 If possible, check the network cable for continuity.
   2.4 Repair or replace the GMS 10 or cables if needed.

3. Inspect the internal network harness (page 8), and replace the harness if needed.

4. Check the external power connection:
   4.1 With the radar off, check the fuse in the power cable, and replace it with a 15 A slow-blow blade-type fuse if necessary.
   4.2 Inspect the power cable for damage on the cable or connectors, and repair, replace, or tighten the cable if needed.

5. If the radar uses an external voltage converter, test the converter (page 3), and replace it if necessary.

6. Inspect the internal power harness (page 8), and replace the harness if needed.

7. Using a multimeter, check the voltage on the power cable from the motor controller PCB to the electronics box.
   If you do not read 12 Vdc, replace the cable from the motor controller PCB to the electronics box.

8. Connect the radar to a known good chartplotter.

9. If the radar does not appear on the network list for a known working chartplotter, replace the electronics box (page 7).

10. If the error is unresolved, replace the motor controller PCB (page 7).

### There is no radar picture or a very weak radar picture, and no error message is shown

1. Using the radar diagnostics page on the chartplotter (page 2), return the radar to factory default settings.

2. If the error is unresolved, replace the electronics box (page 7).

3. If the error is unresolved, replace the rotary joint (page 7).

4. If the error is unresolved, install a new antenna.

"Radar Service Lost" is shown on the chartplotter

1. Examine all power and network connections on the radar, the chartplotter, the battery, and a GMS 10 network port expander if applicable.

2. Tighten or repair any loose, disconnected, or damaged cables.

3. If the power wires are extended, make sure the wire gauge is correct for the extended distance, according to the *GMR Fantom Open Array Series Installation Instructions*.
   If the wire gauge is too small, it may result in a large voltage drop and cause this error.

4. Inspect the internal power harness (page 8), and replace the harness if needed.

5. Replace the electronics box (page 7).

Major Component Locations
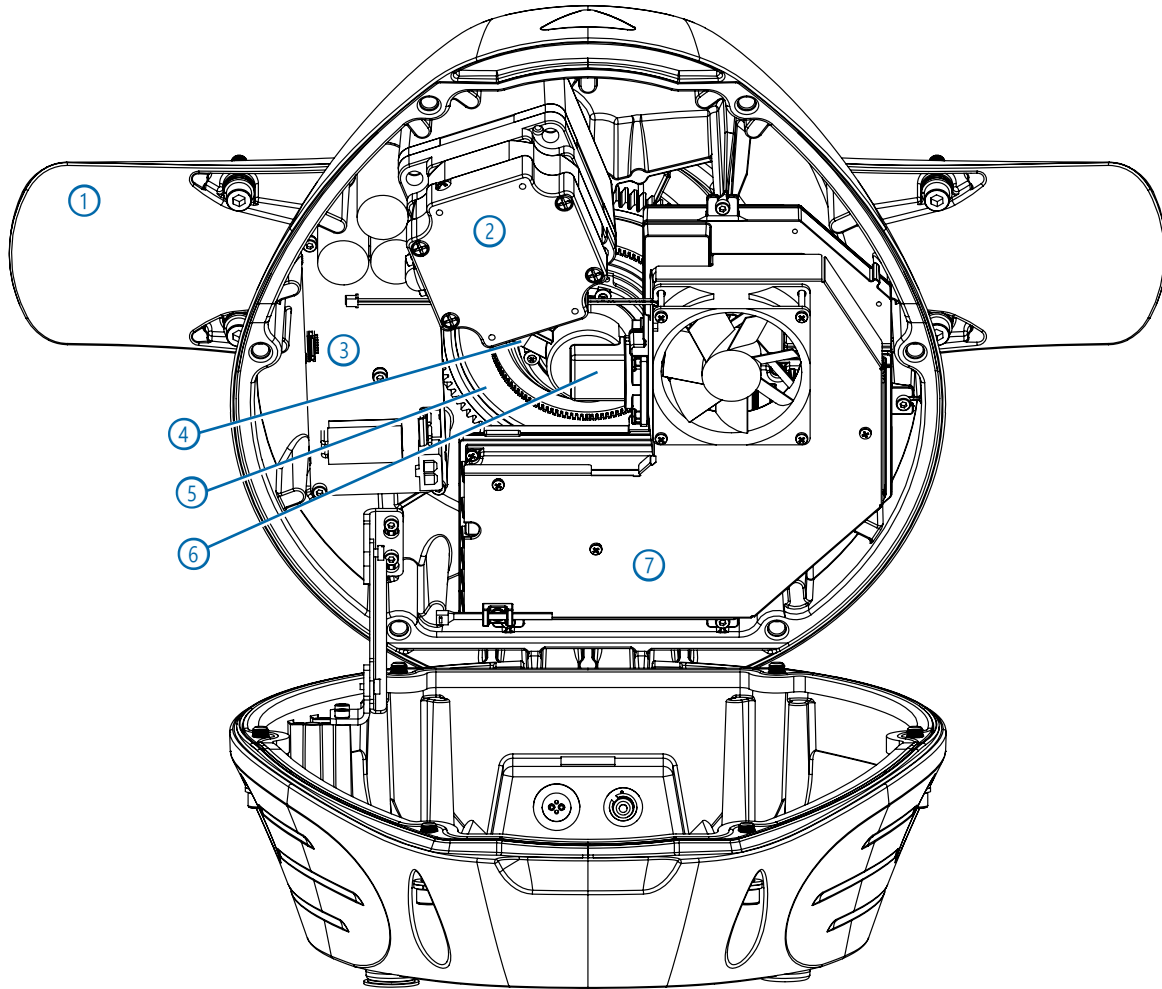
Item	Description	Note
1	Antenna rotator	To remove the antenna rotator, you must remove the electronics box, rotary joint, and antenna drive gear
2	Motor/gearbox assembly	
3	Motor controller PCB	
4	Antenna position sensor PCB	To remove the antenna position sensor PCB, you must remove the rotary joint
5	Antenna drive gear	
6	Rotary joint	To remove the rotary joint, you must remove the electronics box
7	Electronics box	

Radar Disassembly

Removing the Antenna

> **⚠ WARNING**
>
> Before you perform any service on the radar, you must remove the antenna to avoid potentially dangerous radiation.

1 Disconnect the power from the radar.
2 Using a 6 mm hex bit, remove the four screws and four split washers from under the antenna arm.
3 Lift up by applying pressure evenly on both sides of the antenna.
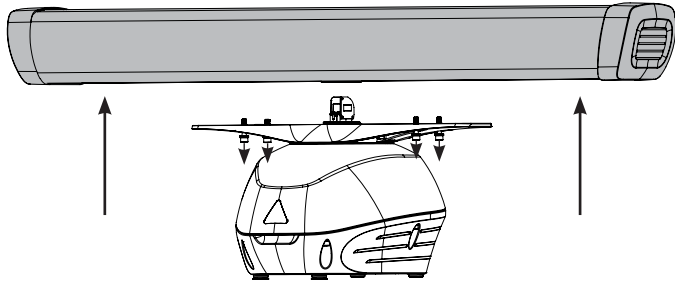
It should pull free easily.

Installing the Antenna Terminator

After removing the antenna, you must install the antenna terminator.

The Garmin Radar Service Kit (T10-00114-00) contains the antenna terminator and three screws to hold it in place.

1 Hold the antenna terminator ① against the flat portion of the rotary joint ②.
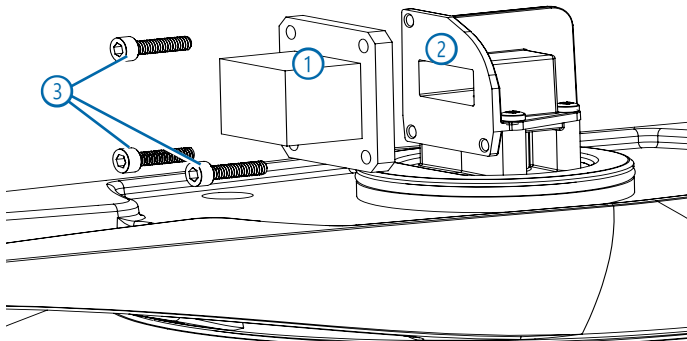
2 Use the three screws ③ to fasten the antenna terminator to the rotary joint.

Opening the Pedestal Housing

> **⚠ CAUTION**
>
> The radar components mounted to the top of the pedestal housing make the housing top-heavy. To avoid a potential crushing hazard and possible personal injury, use caution when opening the pedestal housing.

1 Disconnect the power from the radar.
2 Remove the antenna ().
3 Using a 6 mm hex bit, loosen the six captive bolts ① on the pedestal housing.
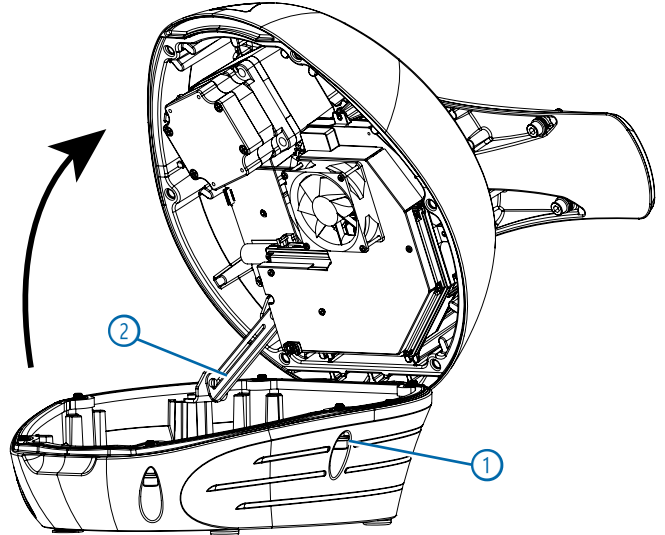
4 Lift up on the top of the pedestal housing until it stops and the hinge locks ②.

The hinge on the pedestal housing holds it in the open position.

Removing the Motor Assembly

1 Disconnect the power from the radar.
2 Remove the antenna ().
3 Open the pedestal housing ().
4 Disconnect motor cable from the motor control PCB.
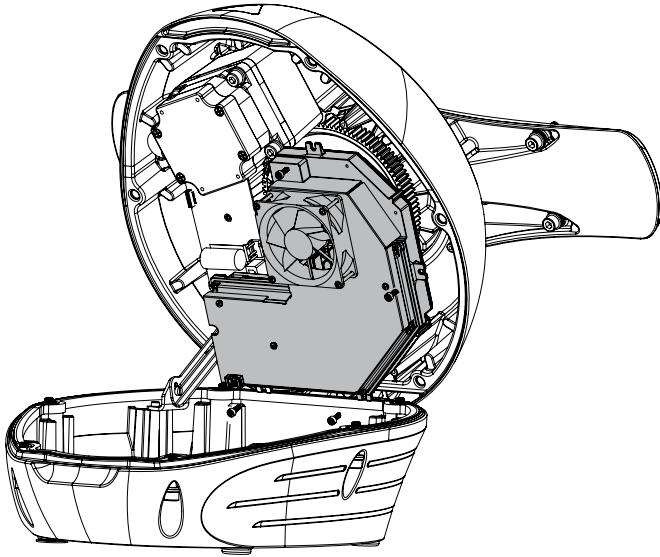5 Using a 6 mm hex bit, remove the four bolts securing the motor assembly to the pedestal housing.
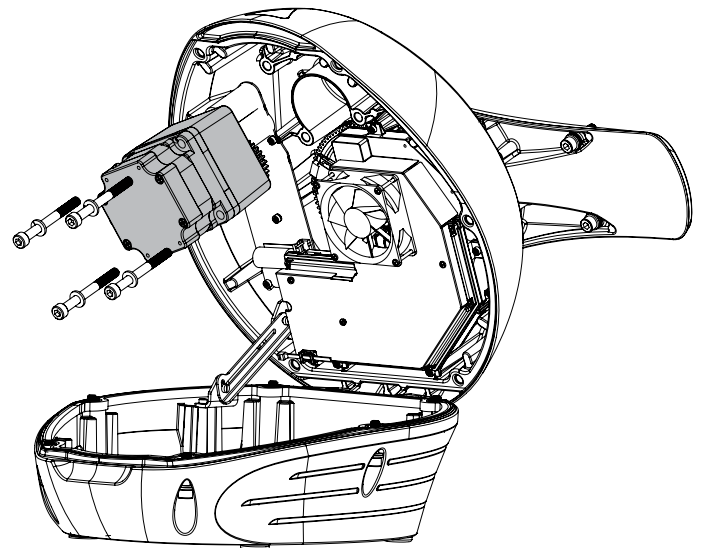
6 Remove the motor assembly.

Removing the Fan on the Electronics Box

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 Open the pedestal housing (page 6).
4 Disconnect the fan cable from the electronics box.
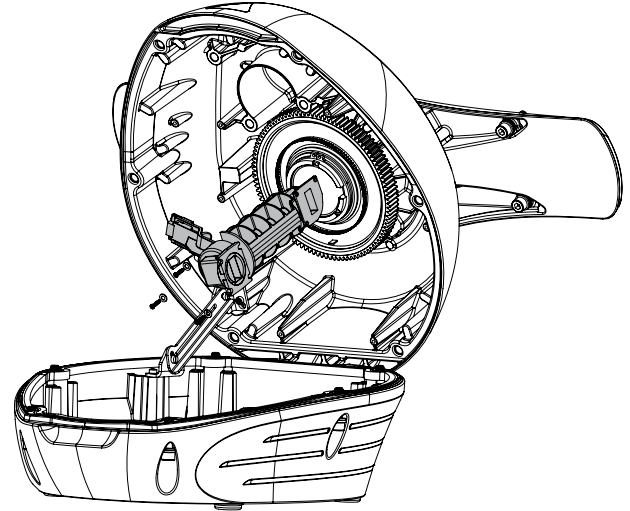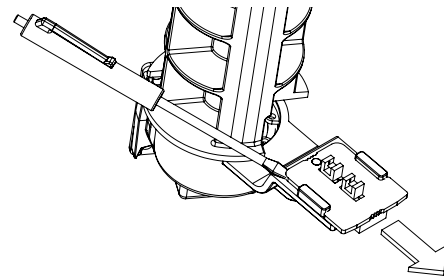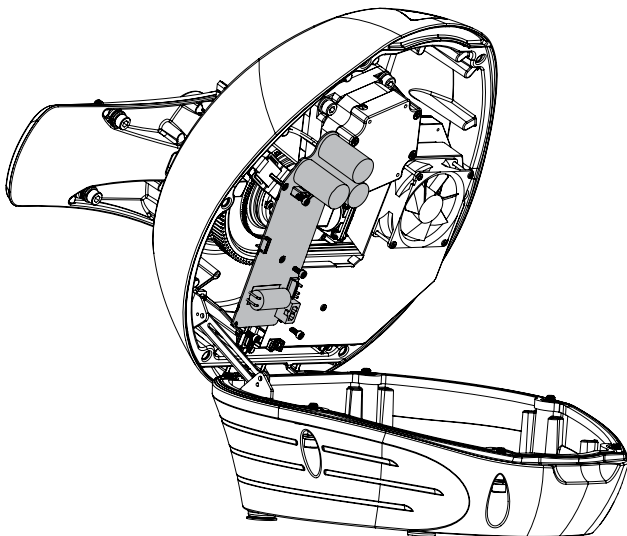5 Remove the 4 screws that secure the fan to the electronics box.
6 Remove the fan.

Removing the Electronics Box

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 Open the pedestal housing (page 6).
4 Disconnect all of the connectors from the ports on the electronics box.
5 Using a 3 mm hex bit, remove the four screws holding the electronics box to the pedestal housing.
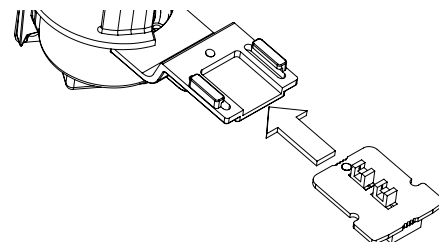6 Remove the electronics box from the pedestal housing.

Removing the Motor Controller PCB

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 Open the pedestal housing (page 6).
4 Disconnect the power cable from the Motor Controller PCB.
5 Using a 3 mm hex bit, remove the five screws securing the motor controller PCB to the pedestal housing.

Removing the Rotary Joint

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 Open the pedestal housing (page 6).
4 Remove the electronics box (page 7).
5 Using a #2 Phillips screwdriver, remove the three screws connecting the rotary joint to the pedestal housing.
6 Pull out the rotary joint.

Removing the Antenna Position Sensor PCB

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 Open the pedestal housing (page 6).
4 Remove the electronics box (page 7).
5 Remove the rotary joint (page 7).
6 Using a flat screwdriver, lift up the end of the antenna position sensor PCB and slide it out of the waveguide.

The antenna position sensor PCB fits securely in place on the rotary joint, so it may take some force to pry it off, and the PCB may break.

### Installing a New Antenna Position Sensor PCB

1 Remove the old antenna position sensor PCB.
2 Slide the new antenna position sensor PCB into the slots on the waveguide.

The raised spot on the waveguide snaps into the hole on the antenna position sensor PCB to hold it in place.

Removing the Antenna Drive Gear

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 Open the pedestal housing (page 6).
4 Remove the electronics box (page 7).
5 Remove the rotary joint (page 7).
6 Using external retaining ring pliers, remove the retaining ring that holds the antenna drive gear onto the antenna rotator.
7 Remove antenna drive gear from the antenna rotator
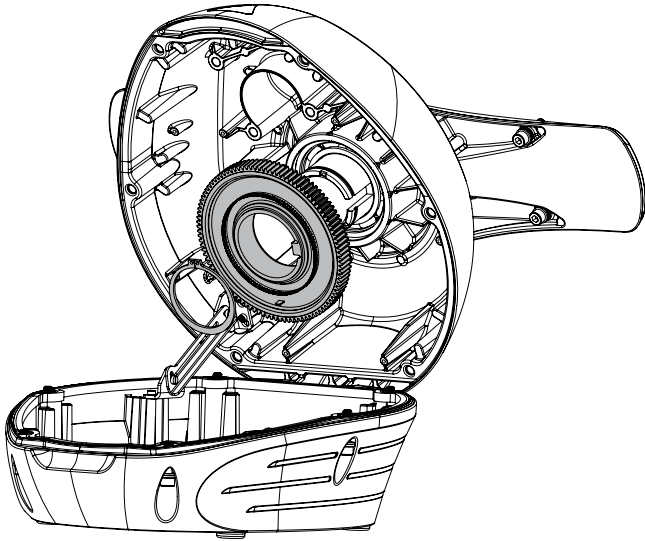
Removing the Antenna Rotator

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 Open the pedestal housing (page 6).
4 Remove the electronics box (page 7).
5 Remove the rotary joint (page 7).
6 Remove the antenna drive gear (page 8).
7 Using external retaining ring pliers, remove the retaining ring that holds the antenna rotator onto the pedestal housing.
8 Remove the antenna rotator from the pedestal housing.
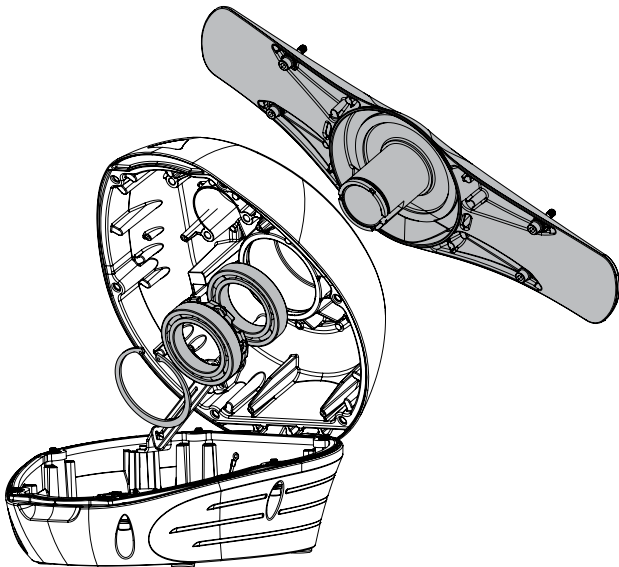
Removing the Internal Power, Network, and Grounding Harnesses

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 Open the pedestal housing (page 6).
4 Cut the cable tie from the power/network cable harnesses to gain access (be sure to add a new cable tie at reassembly).
5 Complete an action:
   • Disconnect the power harness.
   • Disconnect the network harness.
   • Using a #2 Phillips screwdriver, unscrew the grounding harness from the base of the pedestal housing.
6 Complete an action.
   • To disconnect the power or grounding harness, use a 20.5 mm ($^{13}/_{16}$ in.) socket.
   • To disconnect the network harness, use a 16 mm ($^{5}/_{8}$ in.) socket.
7 Use the appropriate socket to loosen the connector on the outside of the pedestal housing.
8 Remove the plastic nut from the connector on outside of the pedestal housing.
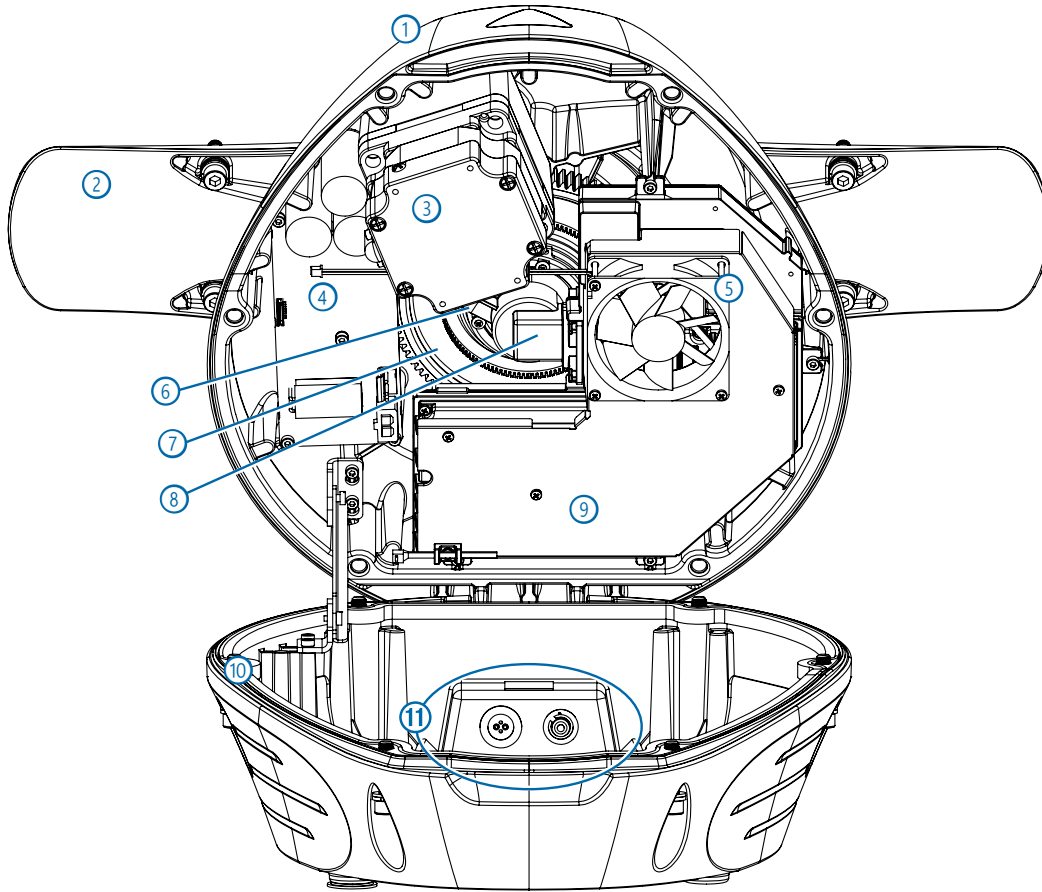
   The cable pulls free on the inside of the housing.

Removing a Mounting Socket

1 Disconnect the power from the radar.
2 Remove the antenna (page 6).
3 If necessary, remove nuts, washers, and the threaded rod from the damaged mounting socket.
3 Open the pedestal housing (page 6).
4 Using a 3 mm hex bit, remove the damaged mounting socket.
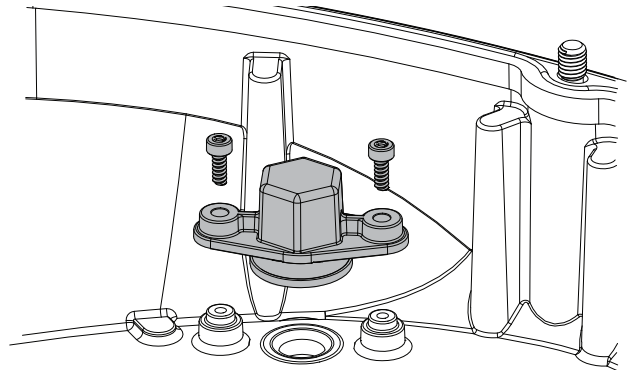
Service Parts

Number	Description	Kit Number
①	Pedestal housing	Fantom 50 series: S00-00900-01 Fantom 120 series: S00-00900-03 Fantom 250 series: S11-03836-73
②	Antenna rotator	S00-00900-07
③	Motor assembly	S00-00900-05
④	Motor controller PCB	S12-02859-00
⑤	Electronics box fan	Fantom 50/120 series: S00-00900-12 Fantom 250 series: S00-00700-03 (included shroud and inlet guard are not needed for Fantom 250 series)
⑥	Antenna position sensor PCB	S00-00900-09
⑦	Antenna rotary gear	S00-00900-13
⑧	Rotary joint	S11-03836-60
⑨	Electronics box	Fantom 50 series: S00-00900-02 Fantom 120 series: S00-00900-04 Fantom 250 series: S11-03836-47
⑩	Housing gasket	S00-00900-06
⑪	Internal wire harnesses	Power cable: S00-00600-10 Network cable: S00-00900-11 Grounding cable: S00-00900-10 LED cable: S00-00485-00
Not shown	Mounting socket	S11-03836-A0
	Outer cable cover door	S00-00900-08
	Voltage converter	Fantom 50/120 series: S11-01315-30 Fantom 250 series: S11-01315-50