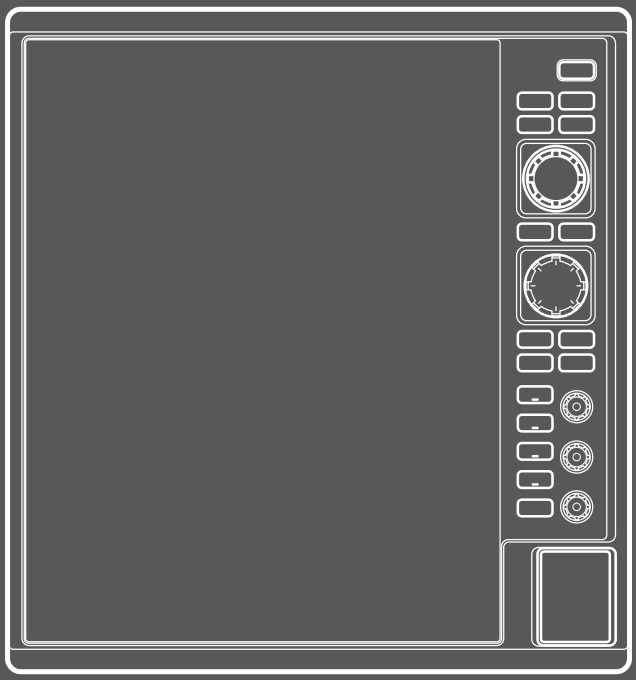
GARMIN



CR 1522

Marine Chart Radar

Owner's Manual

GARMIN

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CHAPTER 1 INTRODUCTION

⚠ WARNING

See the Important Safety and Product Information in the Installation Instructions for product warnings and other important information.

All route and navigation lines displayed on the device are intended to provide general guidance to identify proper channels, and are not intended to be strictly followed. Always refer to the navaids and conditions on the water when navigating to avoid groundings or hazards that could result in vessel damage, personal injury, or death.

Do not rely solely on the Simplified Target Tracking (TT) feature for collision avoidance. Always pay attention to your surroundings, including other vessels, obstacles, water and weather conditions. Never leave the helm unattended. You are responsible for the safe operation of your boat.

1.1 A Brief History of Marine Radars

1.1.1 Basic Principles of Radars

Radar, originally an acronym for Radio Detection and Ranging, is a detection system that determines the position and velocity of objects by transmitting radio waves outward and processing the radio waves reflected off the objects.

1.1.2 Development of Marine Radars

Marine radars were developed during the period of the Second World War. Before its development, seafarers had to rely on sound waves generated by a whistle, a gunshot, or a bell sound to determine the direction and distance of obstacles when visibility is low.

Since its invention, marine radars are used to detect other vessels or land obstacles and assist in navigation and collision avoidance at sea. A rotating antenna sweeps the surface of water around the ship toward the horizon with a narrow beam of microwave signals. The antenna then listens for bouncebacks of the signal to determine the bearing, distance, and motion of detected targets based on the variations in the reflected signals. The radar uses these information to map out the ship's surroundings on the radar display in a bird's eye view.

1.1.3 Determining the Bearing

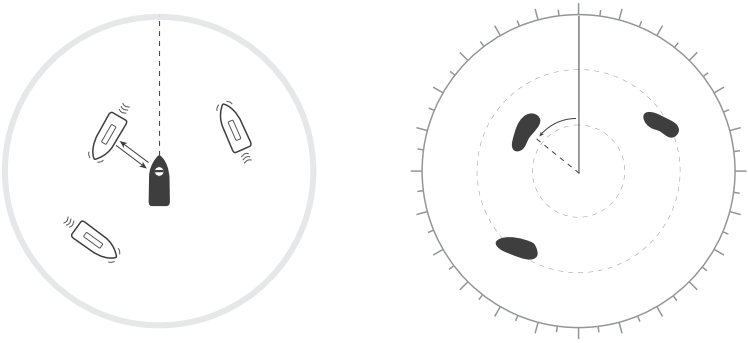
As the antenna rotates in the 360° circle, electronic pulses are sent out at slightly different bearings. The signals, and their reflected echoes, travel at the speed of light (roughly 161,785 nautical miles per second), and echoes are received almost instantaneously when they reflect off objects. The bearing of a target is therefore the angle of the antenna at which the echoes are received.

1.1.4 Determining the Range

The range, or the distance to a target, is calculated by multiplying half the speed of light by the time difference between the transmission and reception of a signal. The speed is halved because the signal traveled the distance twice (to and from the target).

1.1.5 Displaying Relative Positions

The calculated relative positions of detected targets are plotted on the radar display with the own ship position usually at the center. The plot is refreshed as the antenna rotates, and the relative motions and speeds of targets can also be displayed.



Aerial View Radar Display

1.2 Specifications

Display Specification	Measurement
Dimensions (W x H x D)	355 x 376.7 x 82.7 mm
Weight	3.7 kg (5.7 kg with bail mount)
Display size (W x H)	15" (228.1 x 304.1 mm)
Display type	XGA
Display resolution	1024 x 768 pixels
PPI effective diameter	213.8 mm
Orientation	North up, course up, head up
Display range (nm)*	0.125, 0.25, 0.5, 0.75, 1, 1.5, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 64, 72, 96
Range ring interval (nm)	0.0625, 0.125, 0.25, 0.5, 0.75, 1, 1.5, 2, 3, 4, 6, 8, 12, 16, 18, 24
Range accuracy	1% of the maximum range in use
Range resolution	GMR Fantom: 10 m GMR xHD2: 16 m
EBL	2 (EBL 1 / EBL 2)
VRM	2 (VRM 1 / VRM 2)
PIP (Picture-in-Picture)	2x
Power supply	10 to 36 VDC
Fuse	8 A, 125 V fast-acting
Max. power consumption at 12 VDC	27 W
Typical current draw at 12 VDC	2.71 A
Max. current draw at 12 VDC	3 A
Temperature range	-15° to 50°C (5° to 122°F)
Material	Polycarbonate plastic and die-cast aluminum
Waterproof rating**	IPX6/IPX7 (IEC 60529)
Memory card	2 SD™ card slots; 32 GB max. storage

Display Specification	Measurement
Max. TT targets	50 (automatic or manual acquisition)
Max. AIS targets	300
Max. waypoints	5,000
Max. routes	100
Max. saved tracks	50
Chart format	Garmin BlueChart
Interface	2 NMEA 0183, 1 NMEA 2000
Compass-safe distance	65 cm (25.5 in)
NMEA 2000 LEN	2
NMEA 2000 draw	75 mA max.
SW version (as of Dec 2019)	2.0

* Depending on radar scanner model.

** The device is protected against powerful jets of water, and withstands incidental exposure to water of up to 1 m for up to 30 minutes. For more information on water rating, go to *Garmin.com/waterrating*.

1.2.1 NMEA 2000 PGN Information

Type	PGN	Description
Transmit and receive	059392	ISO acknowledgment
	059904	ISO request
	060928	ISO address claim
	126208	NMEA: Command, request, and acknowledge group function
	126464	Transmit and receive PGN list group function
	126996	Product information
	127250	Vessel heading
	128259	Speed: Water referenced
	128267	Water depth
	129025	Position: Rapid update
	129026	COG and SOG: Rapid update
	129029	GNSS position data
	129540	GNSS satellites in view
	130306	Wind data
	130312	Temperature
Transmit	127258	Magnetic variance
	129283	Cross track error
	129284	Navigation data
	129285	Navigation route and waypoint info
Receive	065030	Generator average basic AC quantities (GAAC)
	126992	System time
	127488	Engine parameters: Rapid update
	127489	Engine parameters: Dynamic
	127493	Transmission parameters: Dynamic
	127504	AC output status

Type	PGN	Description
Receive	127505	Fluid level
	127508	Battery status
	129038	AIS class A position report
	129039	AIS class B position report
	129040	AIS class B extended position report
	129539	GNSS DOPs
	129794	AIS class A static and voyage related data
	129809	AIS class B “CS” static data report, part A
	129810	AIS class B “CS” static data report, part B
	130310	Environmental parameters
	130311	Environmental parameters (obsolete)
	130313	Humidity
	130314	Actual pressure

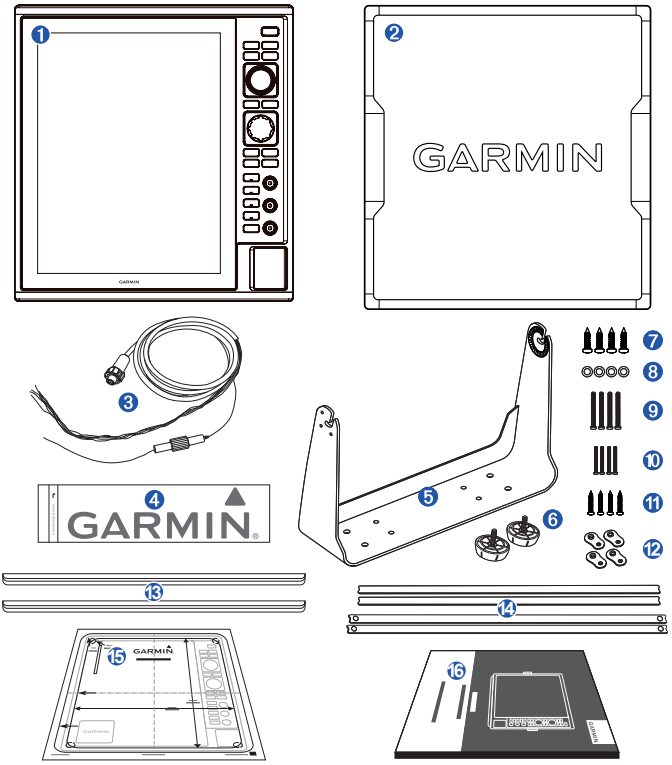
1.2.2 NMEA 0183 Information

Type	Sentence	Description
Transmit	GPAPB	APB: Heading or track controller (autopilot) sentence “B”
	GPBOD	BOD: Bearing (origin to destination)
	GPBWC	BWC: Bearing and distance to waypoint
	GPGGA	GGA: Global positioning system fix data
	GPGLL	GLL: Geographic position (latitude and longitude)
	GPGSA	GSA: GNSS DOP and active satellites
	GPGSV	GSV: GNSS satellites in view
	GPRMB	RMB: Recommended minimum navigation information
	GPRMC	RMC: Recommended minimum specific GNSS data
	GPRTE	RTE: Routes
	GPVTG	VTG: Course over ground and ground speed
	GPWPL	WPL: Waypoint location
	GPXTE	XTE: Cross track error
	PGRME	E: Estimated error
	PGRMM	M: Map datum
	PGRMZ	Z: Altitude
	SDDBT	DBT: Depth below transducer
	SDDPT	DPT: Depth
	SDMTW	MTW: Water temperature
	SDVHW	VHW: Water speed and heading
	TLL	Target latitude and longitude
	TTM	Tracked target message
	TLB	Target label
	ZDA	Date and time
	XDR	Transducer values

Type	Sentence	Description
Receive	DPT	Depth
	DBT	Depth below transducer
	MTW	Water temperature
	VHW	Water speed and heading
	WPL	Waypoint location
	DSC	Digital selective calling information
	DSE	Expanded digital selective calling
	HDG	Heading, deviation, and variation
	HDM	Heading, magnetic
	MWD	Wind direction and speed
	MDA	Meteorological composite
	MWV	Wind speed and angle
	VDM	AIS VHF data-link message
You can purchase complete information about National Marine Electronics Association (NMEA) format and sentences from: NMEA, Seven Riggs Avenue, Severna Park, MD 21146 USA (*www.nmea.org*).		

1.3 Inside the Box

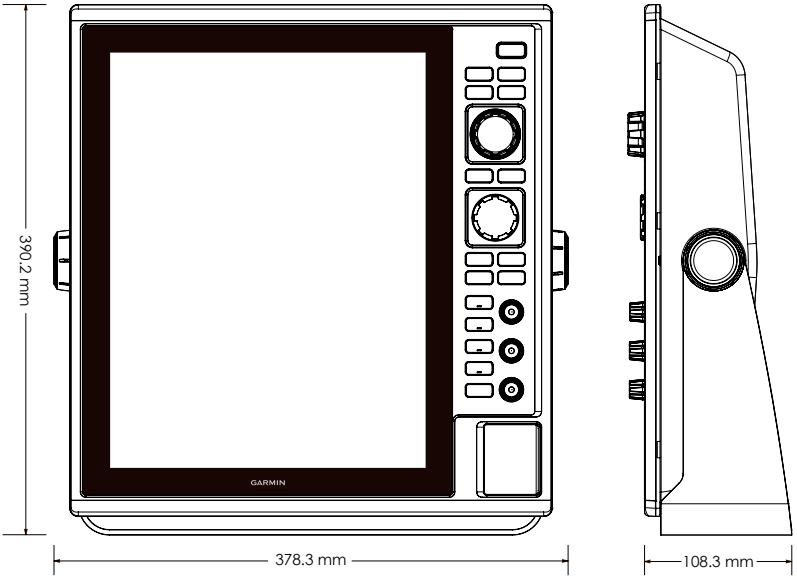
Check that these items are included in the box.



Item	Description	Part Number
❶	CR 1522 Display Unit	011-04973-00
❷	Protective cover	145-03158-60
❸	Power cable (2 m)	320-00458-70
❹	Garmin sticker	161-04518-01
❺	Bail mount bracket	011-04973-90
❻	Bail mount knob x 2	145-02020-01
❼	Bail mount screw x 4, M6.3 x 1.8 x 25	211-00171-04
❽	Bail mount washer x 4	212-20084-00
❾	Flush mount screw x 4, M4 x 0.7 x 40	211-00210-04
❿	Flush mount screw x 4, M3 x 0.5 x 30	211-52207-55
⓫	Flush mount screw x 4, M4.2 x 1.4 x 25	211-00171-00
⓬	Nut plate x 4	115-01407-50
⓭	Trim piece snap cover x 2	145-03158-50
⓮	Flush mount foam gasket x 4	253-01299-00
⓯	Flush mount template	190-02655-03
⓰	Documentation	K00-01227-00

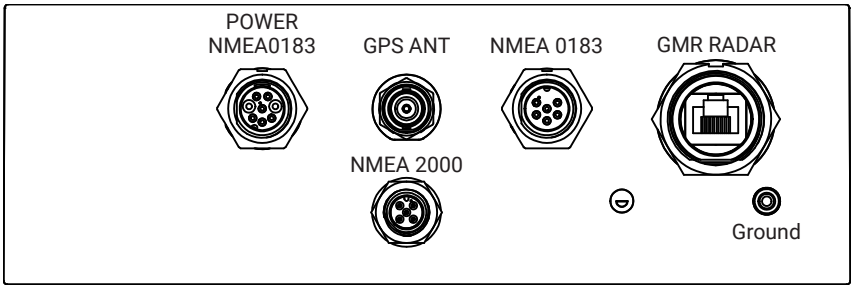
1.3.1 Device Overview

The Garmin CR 1522 features a 15-inch XGA display, with a control panel, and 2 SD card slots on the side. The CR 1522 can be bail mounted or flush mounted to your boat. Connection to a marine radar such as GMR Fantom 6 or GMR 24 xHD, is required.



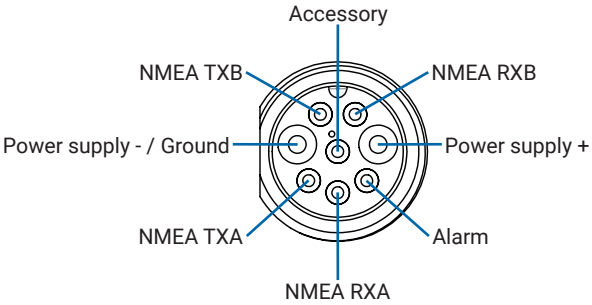
1.3.2 Ports

The ports are located at the back of the device.

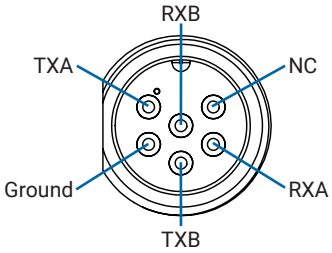


1.3.3 Port Pin Definition

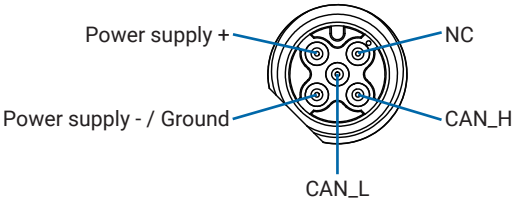
Power Port



NMEA 0183 Port



NMEA 2000 Port



1.4 Installation

⚠ WARNING

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

⚠ CAUTION

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

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

NOTICE

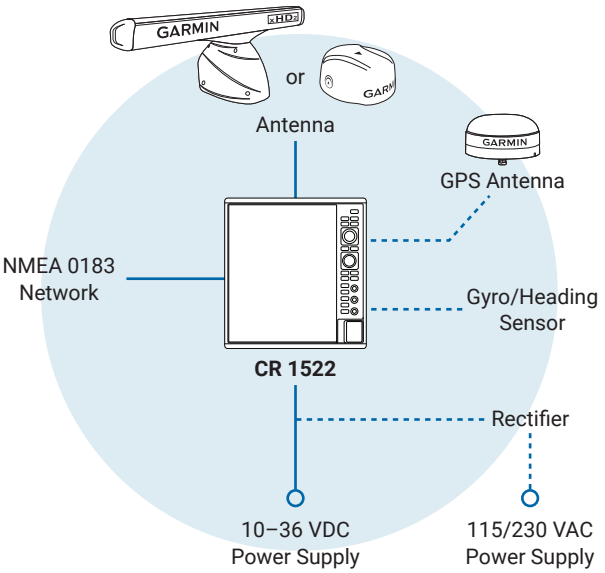
When drilling or cutting, always check what is on the opposite side of the surface.

The device should be installed by a qualified marine installer.

Read all installation instructions before proceeding with the installation. If you experience difficulty during the installation, contact Garmin support.

1.4.1 Typical Configuration

The diagram shows a typical configuration of the device.



1.4.2 Tools Needed

- Bail mount: drill and drill bits appropriate for the surface and hardware
- Flush mount: drill and 14 mm (9/16 in), 6 mm (1/4 in) and 3.6 mm (9/64 in) drill bits with nut plates, or 3.2 mm (1/8 in) drill bit without nut plates

- #2 Phillips screwdriver
- Jigsaw or rotary tool
- File and sandpaper
- Marine sealant (recommended)

1.4.3 Mounting Considerations

NOTICE

This device should be mounted in a location that is not exposed to extreme temperatures or conditions. The temperature range for this device is listed in the product specifications. Extended exposure to temperatures exceeding the specified temperature range, in storage or operating conditions, may cause device failure. Extreme-temperature-induced damage and related consequences are not covered by the warranty.

When selecting a mounting location, you should observe these considerations:

- The location should be directly in front or slightly to your left as you operate your boat, to provide optimal viewing and allow easy access to all device interfaces, such as the control panel and the SD card slots.
- The location must be strong enough to support the weight of the device and protect it from excessive vibration or shock.
- To avoid interference with a magnetic compass, the device should not be installed closer to a compass than the compass-safe distance value listed in the product specifications.
- The location must allow room for the routing and connection of all cables.

1.4.4 Bail Mounting the Device

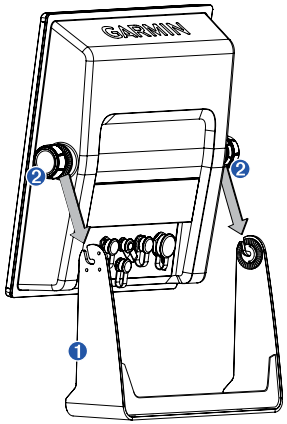
NOTICE

If you are mounting the bracket on fiberglass with screws, it is recommended to use a countersink bit to drill a clearance counterbore through only the top gel-coat layer. This will help to avoid cracking in the gel-coat layer when the screws are tightened.

Stainless-steel screws may bind when screwed into fiberglass and overtightened. It is recommended to apply an anti-seize lubricant on the screws before installing them.

You can use the bail mount bracket to bail mount the device on a flat surface.

1 Using the bail mount bracket ❶ as a template, mark the pilot holes.



2 Using a 3 mm (1/8 in) drill bit, drill the pilot holes.
3 Secure the bail mount bracket to the mounting surface using the bail mount screws and washers.
4 Install the bail mount knobs ❷ on the sides of the device.
5 Place the device in the bail mount bracket, and tighten the bail mount knobs.

1.4.5 Flush Mounting the Device

NOTICE

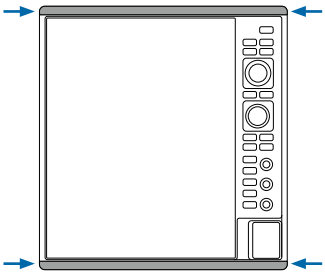
Use the included template and hardware to flush mount the device in your dashboard.

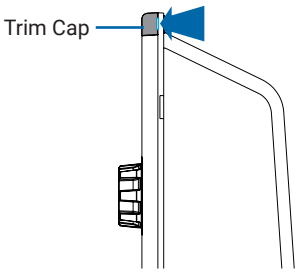
Be careful when cutting the hole to flush mount the device. There is only a small amount of clearance between the case and the mounting holes, and cutting the hole too large could compromise the stability of the device after it is mounted.

1 Trim the template, and make sure it fits in the location you want to mount the device.
2 Secure the template to the mounting location.
3 Using a 14 mm (9/16 in) drill bit, drill one or more of the holes inside the corners of the solid line on the template to prepare the mounting surface for cutting.
4 Using a jigsaw or a rotary tool, cut the mounting surface along the inside line on the template.
5 Place the device in the cutout to test the fit.
6 If necessary, use a file and sandpaper to refine the size of the cutout.
7 Use a pry tool, such as a flat piece of plastic or a screwdriver, to carefully pry up the trim caps from the sides, slide the pry tool to the center, and remove the trim caps.

NOTICE

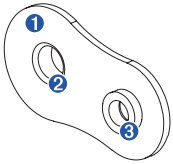
Use a plastic pry tool when possible. Using a metal pry tool such as a screwdriver can damage the trim caps and the device.





8 After the device fits correctly in the cutout, ensure the mounting holes on the device line up with the larger 6 mm (1/4 in) holes on the template.
9 If the mounting holes on the device do not line up, mark the new hole locations.
10 Select an option:
- If you are using a nut plate, drill a 6 mm (1/4 in) hole in the hole locations.
- If you are not using a nut plate, drill 3.2 mm (1/8 in) holes in the hole locations.

11 Starting in one corner of the template, place a nut plate ❶ over the larger hole ❷ drilled in the previous step.



If you are using a nut plate, the smaller hole ❸ on the nut plate should line up with the smaller hole on the template.

12 If the smaller hole on the nut plate does not line up with the smaller hole on the template, mark the new hole location.

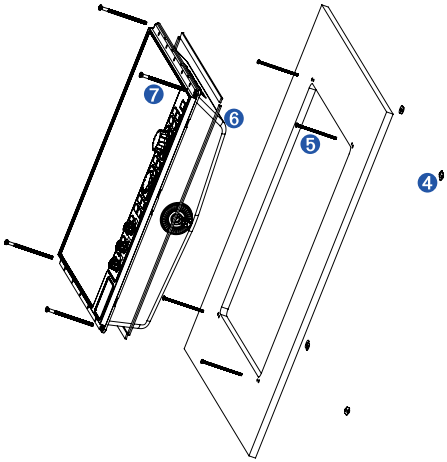
13 If you are using a nut plate, drill a 3.6 mm (9/64 in) hole in the smaller hole location.

14 Repeat to verify placement of the remaining nut plates and holes on the template.

15 Remove the template from the mounting surface.

16 Starting in one corner of the mounting location, place a nut plate ❹ on the back of the mounting surface, lining up the large and small holes.

The raised portion of the nut plate should fit into the larger hole.



17 Secure the nut plates to the mounting surface by fastening the included M3 screws ❺ through the smaller 3.6 mm (9/64 in) holes.

18 Install the foam gasket ❻ on the back of the device.

The pieces of the foam gasket have adhesive on the back. Make sure you remove the protective liner before installing them on the device.

19 If you will not have access to the back of the device after you mount it, connect all necessary cables to the device before placing it into the cutout.

NOTICE

To prevent corrosion of the metal contacts, cover unused connectors with the attached weather caps.

20 Apply marine sealant between the mounting surface and the device to properly seal and prevent leakage behind the dashboard.

21 If you have access to the back of the device, apply marine sealant around the cutout.
22 Place the device into the cutout.
23 Secure the device to the mounting surface using the included M4 screws ❼.
24 Wipe away all excess marine sealant.
25 Install the trim caps by snapping them in place around the edges of the device.

1.5 Radar Unit Installation

⚠ CAUTION

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

NOTICE

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

1.5.1 Tools Needed

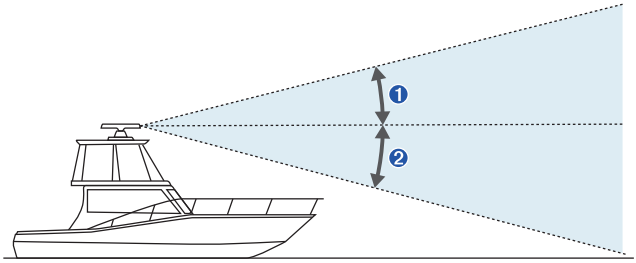
- Drill and drill bits
- #2 Phillips screwdriver
- 5 mm Allen wrench
- Wrench and socket set

1.5.2 Mounting Considerations

To complete the installation, you need the appropriate fasteners, tools, and mounts. These items are available at most marine dealers.

When selecting a mounting location, observe these considerations:

- It is highly recommended that the device is mounted out of range of personnel, with the beam width above head height. To avoid exposure to harmful radio frequency (RF) levels, the device should not be mounted closer to people than the maximum safe distance value listed in the product specifications.
- The device should be mounted high above the ship's keel line with minimal blockage of the radar beam. Obstructions may cause blind and shadow sectors, or generate false echoes. The higher the installation position, the farther the detection range.
- The device should be mounted on a flat surface or a platform that is parallel to the vessel's water line and is sturdy enough to support the device's weight. The weight for each model is listed in the product specifications.
- Most radar beam spreads vertically 12° above ❶ and 12° below ❷ the radar's radiating element. On vessels with higher bow angles at cruise speed, the installation angle can be lowered to point the beam slightly downward to the waterline while at rest. Shims can be used if necessary.



- The device should be mounted away from heat sources, such as smoke stacks and lights.
- The device should be mounted at a different level than horizontal spreaders and mast crosstrees.
- To avoid interference with a magnetic compass, the device should not be mounted closer to a compass than the compass-safe distance value listed in the product specifications.
- Other electronics and cables should be mounted more than 2 m (6.5 ft) from the radar beam path.
- GPS antennas should be either above or below the radar beam path.
- The device should be mounted at least 1 m (40 in) from any transmitting equipment.
- The device should be mounted at least 1 m (40 in) from cables carrying radio signals such as VHF radios, cables, and antennas.
- The device should be mounted at least 2 m (6.5 ft) from Single Side Band (SSB) radios.

1.5.3 Cable Considerations

It may be necessary to drill 32 mm (1¼ in) holes for routing the power or network cables.

- When routing multiple cables through the same hole, you must route the network cable before the power and ground cables because of the size of the network connector.
- You must apply marine sealant to the hole after the cables are in place to ensure a waterproof seal.

If the routing hole must be made in a visible location, decorative cable grommets can be purchased from Garmin or a Garmin dealer (optional).

- If needed, you can trim the grommet to enable you to route multiple cables through the same hole.
- The optional grommet does NOT provide a waterproof seal. You must apply marine sealant to the grommet after the cables are in place to ensure a waterproof seal.

When installing the cables, you should observe these considerations:

- Cutting the Garmin Marine Network cable is not recommended, but a field install kit can be purchased from Garmin or a Garmin dealer if cutting the network cable is necessary.
- To ensure safety, appropriate tie-wraps, fasteners, and sealant should be used to secure the cable along the route and through any bulkheads or the deck.
- You should not run cables near moving objects and high-heat sources, or through doorways and bilges.
- To avoid interference with other equipment, you should not run network and power cables next to or parallel to other cables, such as radio antenna lines or power cables. If this is not possible, the cables should be shielded with metal conduit or a form of EMI shielding.
- You should install the power cable as close to the battery source as possible.
  - If it is necessary to extend the cable, you must use the appropriate wire gauge.
  - Incorrectly extended runs of cable may cause the radar to malfunction due to insufficient power transmission.

1.5.4 Performance Monitor Notices

The performance monitor should be installed at around 10 cm from the radar.

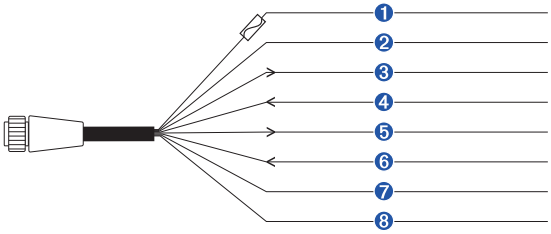
- For open-array type radars, the performance monitor should be installed at the same height as the antenna.
- For dome type radars, the performance monitor should be installed at the same height as the radar.

1.6 Cable and Connection Considerations

- The cables may have been packaged without the locking rings installed. If so, you should route the cables before you install the locking rings.
- After connecting a locking ring to a cable, make sure the ring is securely connected and the O-ring is in place so the connection remains secure.

1.6.1 Power/NMEA 0183 Cable

- The wiring harness connects the device to power, NMEA 0183 devices, and a lamp or a horn for visible or audible alerts.
- If it is necessary to extend the NMEA 0183 or alarm wires, you must use 22 AWG (.33 mm^2) wire.



Item	Wire Color	Wire Function
1	Red	Power supply +
2	Black	Power supply - / Ground (power supply and NMEA 0183)
3	Blue	NMEA 0183 TXA
4	Brown	NMEA 0183 RXA
5	Gray	NMEA 0183 TXB
6	Violet	NMEA 0183 RXB
7	Orange	Accessory on
8	Yellow	Alarm low

1.6.2 Connecting the Wiring Harness to Power

⚠ WARNING

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

1. Route the wiring harness to the power source and to the device.
2. Connect the red wire to the positive (+) battery terminal, and connect the black wire to the negative (-) battery terminal.

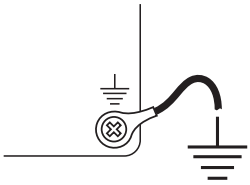
3 If necessary, install the locking ring and O-ring on the end of the wiring harness.
4 Insert the cable into the POWER connector on the back of the device, pushing firmly.
5 Turn the locking ring clockwise to attach the cable to the device.

Additional Grounding Consideration

This consideration is applicable only to devices that have a grounding screw.

Not all models have a grounding screw.

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



1.6.3 GPS Antenna Considerations

Before you can receive GPS information, you must install a compatible external GPS antenna and connect it to the device. When connecting the GPS antenna, you should observe these considerations.

- For a list of compatible antenna, visit *support.garmin.com*.
- Follow the instructions provided with the GPS antenna to install it on your boat.
- Connect the antenna to the GPS ANT port.

1.6.4 GMR Radar Considerations

NOTICE

The GMR Radar port can connect to a radar module. Connecting other devices to the port will cause abnormal behavior and the device to turn off.

When connecting a GMR radar module to this device, observe these considerations.

- A Garmin Marine Network cable must be used.
  - Third-party CAT5 cable and RJ45 connectors must not be used.
  - Additional Garmin Marine Network cables and connectors are available from your Garmin dealer.

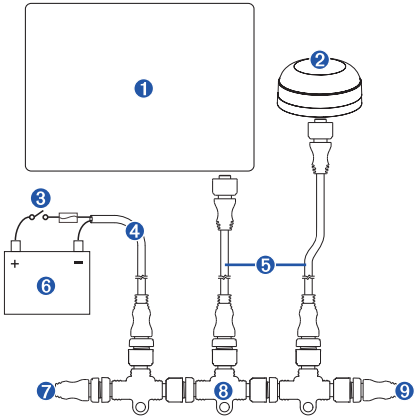
1.6.5 NMEA 2000 Considerations

NOTICE

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

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

- The port labeled NMEA 2000 is used to connect the device to an NMEA 2000 network.
- If you are installing a NMEA 2000 power cable, you must connect it to the boat ignition switch or through another in-line switch. NMEA 2000 devices will drain your battery if the NMEA 2000 power cable is connected to the battery directly.
- This device can connect to a NMEA 2000 network on your boat to share data from NMEA 2000 compatible devices such as a GPS antenna or a VHF radio. The included NMEA 2000 cables and connectors allow you to connect the device to your existing NMEA 2000 network. If you do not have an existing NMEA 2000 network you can create a basic one using cables from Garmin.
- If you are unfamiliar with NMEA 2000, you should read the "NMEA 2000 Network Fundamentals" chapter of the Technical Reference for NMEA 2000 Products.



Item	Description
1	NMEA 2000 compatible Garmin device
2	GPS antenna
3	Ignition or in-line switch
4	NMEA 2000 power cable
5	NMEA 2000 drop cable
6	12 VDC power source
7	NMEA 2000 terminator or backbone cable
8	NMEA 2000 T-connector
9	NMEA 2000 terminator or backbone cable

1.6.6 NMEA 0183 Connection Considerations

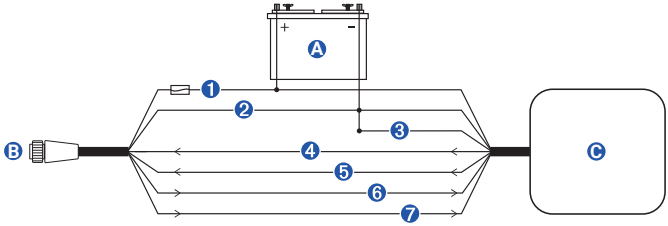
- There is one internal NMEA 0183 input port (RX port) and one internal NMEA 0183 output port (TX port) on the included NMEA 0183 data cable. You can connect one NMEA 0183 device to the internal RX port to input data to this Garmin device, and you can connect up to three NMEA 0183 devices in parallel to the internal TX port to receive data output by this Garmin device.
- See the installation instructions for the NMEA 0183 device to identify the transmit (TX) and receive (RX) wires.
- The device provides one TX port and one RX port. Each internal port has 2 wires, labeled A and B according to the NMEA 0183 convention. The corresponding A and B wires of each internal port should be connected to the A (+) and B (-) wires of the

NMEA 0183 device.

- You must use 28 AWG, shielded, twisted-pair wiring for extended runs of wire. Solder all connections and seal them with heat-shrink tubing.
- Do not connect the NMEA 0183 data wires from this device to power ground.
- The power cable from this device and the NMEA 0183 devices must be connected to a common power ground.
- For two-way communication with a NMEA 0183 device, the internal ports on the NMEA 0183 data cable are not linked. For example, if the input of the NMEA 0183 device is connected to TXA on the data cable, you can connect the output port of your NMEA 0183 device to the input port on the wiring harness.
- See NMEA 0183 Information, page 6 for a list of the approved NMEA 0183 sentences that are output by and input to this device.
- The internal NMEA 0183 ports and communication protocols are configured on the connected Garmin device. See the NMEA 0183 section of the chartplotter owner's manual for more information.

NMEA 0183 Device Connections

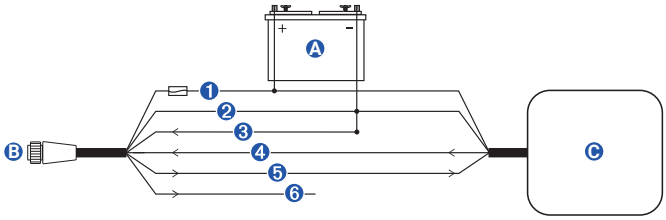
This diagram illustrates two-way connections for both sending and receiving data. You can also use this diagram for one-way communication. To receive information from a NMEA 0183 device, refer to items ❶, ❷, ❸, ❹, and ❺ when connecting the Garmin device. To transmit information to a NMEA 0183 device, refer to items ❶, ❷, ❸, ❻, and ❼ when connecting the Garmin device.



Item	Description
Ⓐ	DC Power supply / battery
Ⓑ	Power / NMEA 0183 cable
Ⓒ	NMEA 0183 device

Item	Garmin Wire Color	Garmin Wire Function	NMEA 0183 Device Wire Function
❶	Red	Power supply +	Power supply +
❷	Black	Power supply - / ground	Power supply - / ground
❸	Black	Data ground	Data ground
❹	Brown	RXA (+)	TXA (+)
❺	Violet	RXB (-)	TXB (-)
❻	Blue	TXA (+)	RXA (+)
❼	Gray	TXB (-)	RXB (-)

Single-Ended NMEA 0183 Device Connections



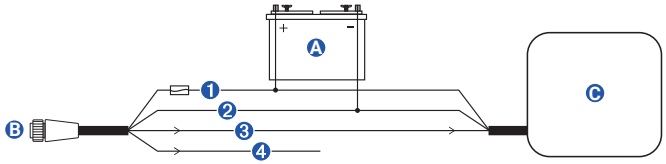
Item	Description
A	Power source
B	Power / NMEA 0183 cable
C	NMEA 0183 device

Item	Garmin Wire Color	Garmin Wire Function	NMEA 0183 Device Wire Function
1	Red	Power	Power
2	Black	Power ground	Power ground
3	Violet	RXB	N/A
4	Brown	RXA	TX
5	Blue	TXA	RX
6	Gray	TXB	N/A

- If the NMEA 0183 device has only one input (receive, RX) wire (no A, B, +, or -), you must leave the TXB wire unconnected.
- If the NMEA 0183 device has only one output (transmit, TX) wire (no A, B, +, or -), you must connect the RXB wire to ground.

NMEA 0183 Device Connected with a Single Receive Wire

In this example, the NMEA 0183 device is receiving data from the chartplotter.

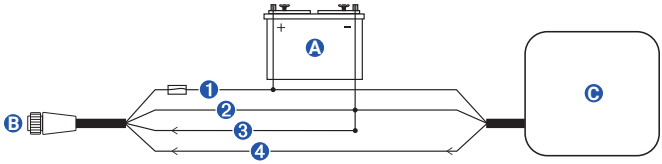


Item	Description
A	DC Power supply / battery
B	Power / NMEA 0183 cable
C	NMEA 0183 device

Item	Garmin Wire Color	Garmin Wire Function	NMEA 0183 Device Wire Function
1	Red	Power supply +	Power supply +
2	Black	Power supply - / ground	Power supply - / ground
3	Blue	TXA	RXA
4	Gray	TXB	N/A

NMEA 0183 Device Connected with a Single Transmit Wire

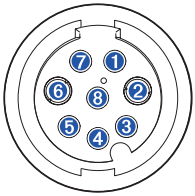
In this example, the NMEA 0183 device is sending data to the chartplotter.



Item	Description
A	DC Power supply / battery
B	Power / NMEA 0183 cable
C	NMEA 0183 device

Item	Garmin Wire Color	Garmin Wire Function	NMEA 0183 Device Wire Function
1	Red	Power	Power
2	Black	Power ground	Power ground
3	Violet	RXB	N/A
4	Brown	RXA	TXA

NMEA 0183 and Power Cable Pinout

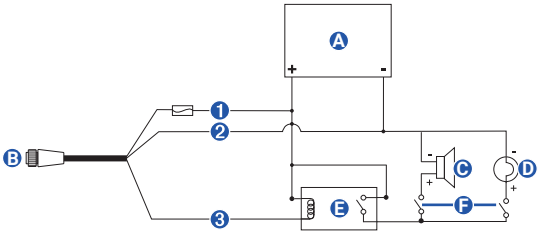


Pin	Wire Color	Wire Function
1	Gray	NMEA TXB
2	Black	Ground / Power supply -
3	Blue	NMEA TXA
4	Brown	NMEA RXA
5	Yellow	Alarm
6	Red	Power supply +
7	Violet	NMEA RXB
8	Orange	Accessory on

1.6.7 Lamp and Horn Connections

The device can be used with a lamp, a horn, or both, to sound or flash an alert when the chartplotter displays a message. This is optional, and the alarm wire is not necessary for the device to function normally. When connecting the device to a lamp or horn, observe these considerations.

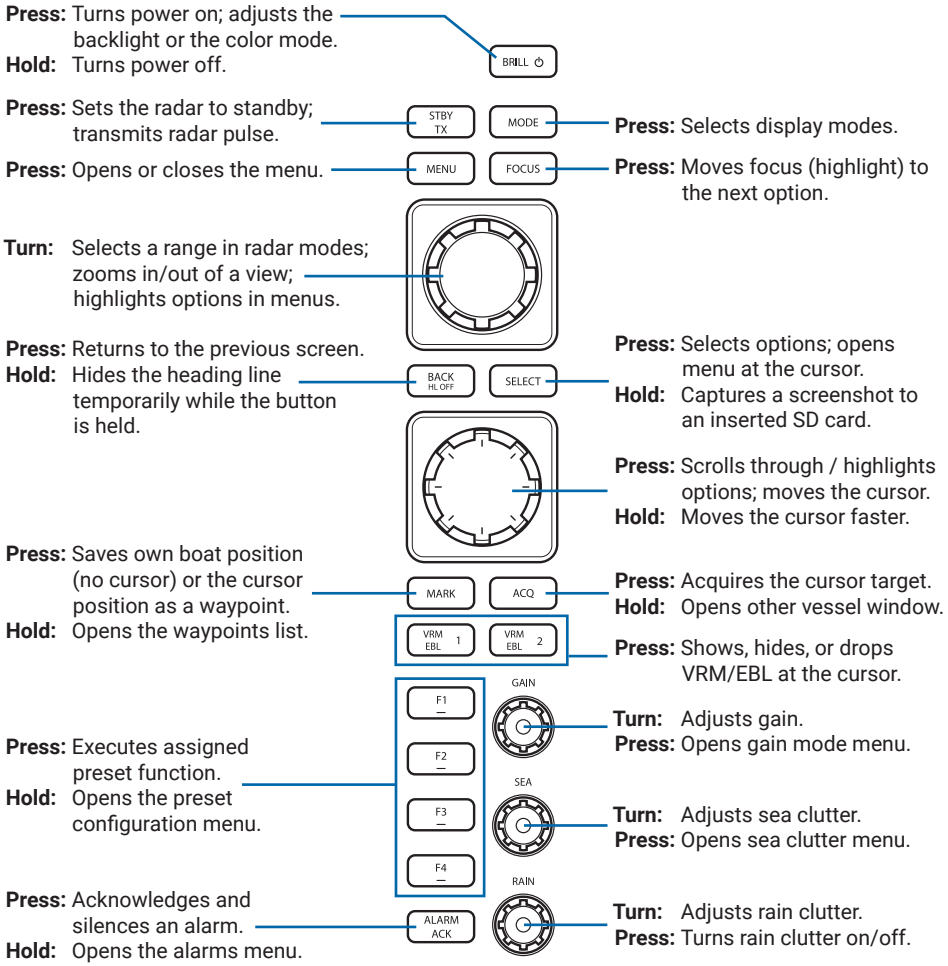
- The alarm circuit switches to a low-voltage state when the alarm sounds.
- The maximum current is 1 A, and a relay is needed to limit the current from the chartplotter to 1 A.
- To manually toggle visual and audible alerts, you can install single-pole, single-throw switches.



Item	Description
A	DC Power supply / battery
B	Power cable
C	Horn
D	Lamp
E	Relay (1 A coil current)
F	Toggle switches to enable and disable lamp or horn alerts

Item	Wire Color	Wire Function
1	Red	Power supply +
2	Black	Power supply - / Ground
3	Yellow	Alarm

1.7 Control Panel



1.8 SD Card

NOTICE

To prevent corrosion and damage to the device, do not open the access flap when there are risks of water ingress.

You can use optional SD cards with the device for screen capturing, image viewing, and software installation. Map cards allow you to view high-resolution satellite imagery and aerial reference photos of ports, harbors, marinas, and other points of interest.

NOTE: This device supports memory cards with a storage of up to 32 GB, in FAT32 format.

1. Open the access flap below the control panel.
2. Insert an SD card to one of the two slots.

3 Press the card in until it clicks.
4 Close the flap.

1.8.1 Capturing a Screenshot

1 Insert an SD card.

SELECT

2 Hold **[SELECT]** until a confirmation message appears. The captured screenshot is saved to the inserted SD card.

1.8.2 Updating the Software

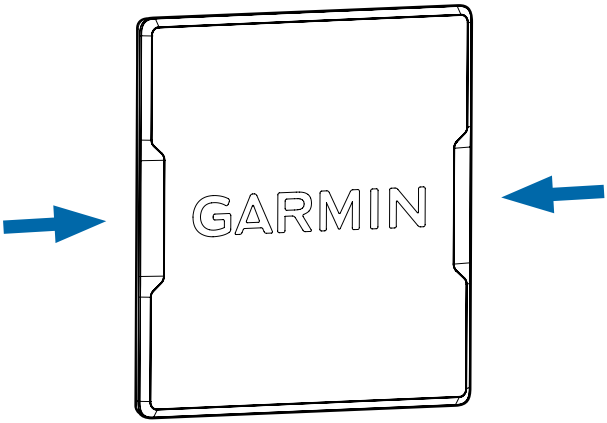
You can either purchase a preloaded software SD card or download the software update to your own SD card.

NOTE: You must copy the software update to an SD card using a computer that is running Windows® software.

1 Go to the product page and download the software update.
2 Open the downloaded file, and follow the on-screen instructions to copy the software update to an SD card.
A Garmin folder containing the software update is created on the SD card.
3 Power on the device, and insert the SD card into one of the card slots.
NOTE: In order for the software update instructions to appear, the device must be fully booted before the card is inserted.
4 Follow the on-screen instructions.
5 Wait several minutes while the software update process completes.
6 When prompted, leave the SD card in place and restart the device manually.
7 Remove the SD card.
NOTE: If the memory card is removed before the device restarts fully, the software update is not complete.

1.9 Protective Cover

The protective cover protects the screen when the device is not in use. To remove the cover, hold the cover at the tab, and pull forward.



1.10 Garmin Support Center

Go to *support.garmin.com* for help and information, such as product manuals, frequently asked questions, videos, software updates, and customer support.

1.10.1 Registering Your Device

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

1. Insert an SD card into the card slot on the device.
2. Wait a few moments.
   The device creates a file named GarminDevice.xml in the Garmin folder on the SD card.
3. Remove the SD card.
4. Insert the SD card into your computer.
5. On your computer, go to *my.garmin.com*.
6. Follow the on-screen instructions to download, install, and open the Garmin Express application.
7. Select **Add a Device**.
8. While the application searches, select **Sign In** next to Have marine charts or devices? near the bottom of the screen.
9. Create or sign in to your Garmin account.
10. Follow the on-screen instructions to set up your vessel.
11. Select **Add**.
    The Garmin Express application searches the memory card for the device information.
12. Select **Add Device** to register the device.
    When registration is complete, the Garmin Express application searches for additional charts and chart updates for your device.

When you add devices to the chartplotter network, repeat these steps to register the new devices.

CHAPTER 2 GETTING STARTED

2.1 Basic Operations

2.1.1 Powering On/Off

BRILL

Press **[⏻]** to turn on the device. The GARMIN logo appears, and the control panel lights up. A countdown timer will appear if the magnetron is warming up, after which a **Ready to Transmit** message will appear.

BRILL

To turn the power off, hold **[⏻]** until the GARMIN logo appears.

2.1.2 Transmitting

⚠ CAUTION

The marine radar antenna transmits microwave energy that has the potential to be harmful to humans and animals. Before beginning radar transmission, verify that the area around the antenna is clear. The antenna transmits a beam approximately 12° above and below a line extending horizontally from the center of the antenna.

When the radar is transmitting, do not look directly at the antenna at close range; eyes are the most sensitive part of the body to electromagnetic energy.

STBY TX

When the **Ready to Transmit** message appears, press **[TX]** to start transmitting radar pulses.

The radar transmits a narrow beam of microwave energy as it rotates to a 360° pattern. Some of the energy would be reflected back to the radar when they come in contact with objects on or above the surface of water, forming a picture of your surroundings.

2.1.3 Putting the Radar on Standby

You can put the radar on standby if you are not going to use the radar for an extended period of time. While on standby, the radar is ready for use but transmission is paused.

STBY TX

- While transmitting, press **[STBY]** to put the radar on standby. Press **[TX]** to resume transmission.

MENU

- You can also put the radar on standby by pressing **[MENU]** > **Radar Setup** > **Radar To Standby**.

2.1.4 Switching Display Modes

The device features five display modes for different purposes.

MODE
SELECT

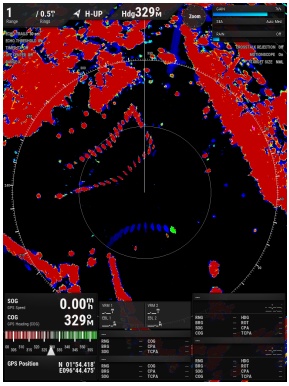
Press **[MODE]** to open the **Display Mode** menu, use the main knob or the control pad to highlight a display mode, and press **[SELECT]** to switch to the highlighted mode.

Mode	Description
Professional	Radar view with maximum amount of information onscreen.
Basic	Radar view with less information and a larger radar display.
Dual Range	Radar view displaying two split screens with customizable ranges.
Radar Overlay	Professional mode overlaid on the Navigation Chart.
Navigation Chart	Chart view with information for navigation.

2.2 Display Modes

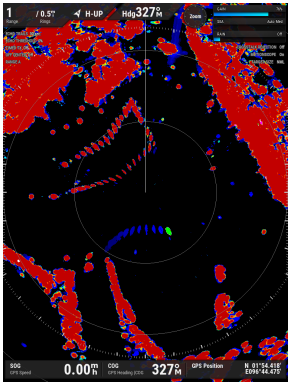
2.2.1 Typical Views

The following views are typical examples of how each display mode looks like.



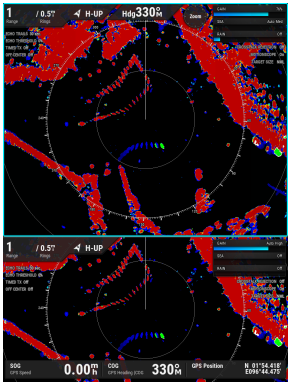
Professional

Professional mode shows the full set of data on the screen, and shows two TT target data and two AIS targets on screen.



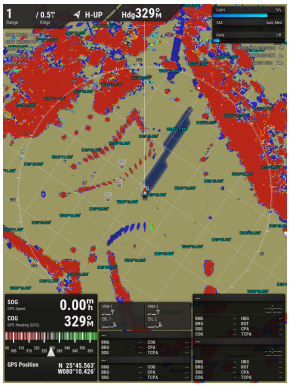
Basic

Basic mode shows less data on the screen with a larger radar display.



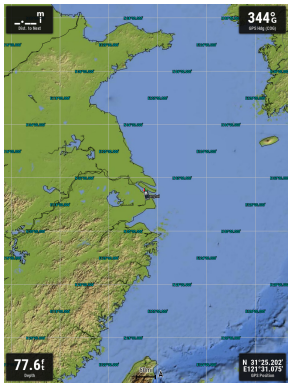
Dual

Dual Range mode splits Basic mode to two separate radar displays each with its own range, zoom, display settings, and offset.



Overlay

Radar Overlay mode shows the Professional mode overlaid on a navigation chart.

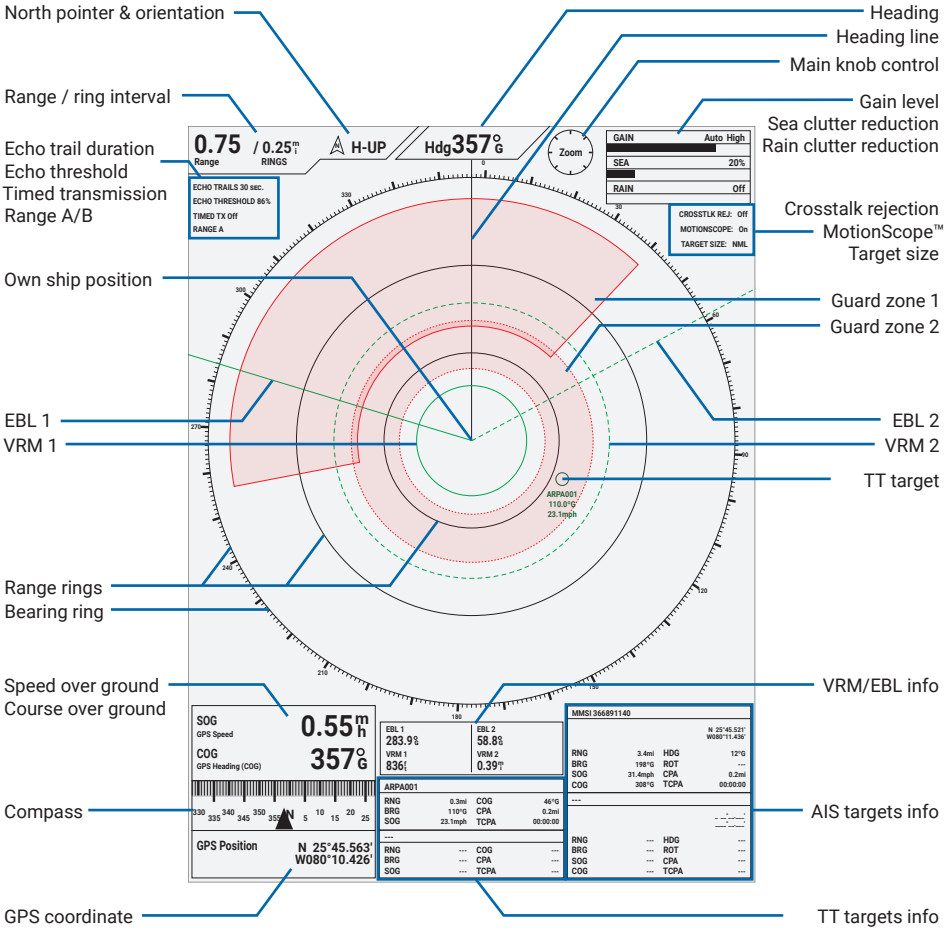


Navigation Chart

Navigation Chart mode shows your vessel and navigation data on the map. The data includes tides & currents, service points, navaids, grids, restricted areas, waypoints, boundaries, tracks, routes, and more.

2.2.2 Radar Interface Overview

The following is an overview of the radar interface, using the Professional mode as an example.



2.3 Adjusting the Appearance of the Radar Display

2.3.1 Adjusting the Backlight and Color Mode

BRILL

1 Press **[BRILL]** to bring up the display settings menu, with **Backlight** highlighted.

BRILL

2 Continue pressing **[BRILL]** to switch the backlight between 100%, 50%, and 0%, or rotate the main knob to adjust the backlight manually.

3 Press up/down on the control pad to highlight **Color Mode**, and rotate the main knob or press left/right on the control pad to switch between **Standard** and **Green** color modes.

2.3.2 Adjusting the Range and Zoom

The range of the radar signal indicates the length of the pulsed signal transmitted and received by the radar. As the range increases, the radar transmits longer pulses in order to reach distant targets. Closer targets, especially rain and waves, also reflect the longer pulses, which can add noise to the radar screen. You can also zoom in and out to adjust the visible range on the radar screen.

SELECT

1 Before pressing any other buttons, press **[SELECT]** to switch the main knob control between **Range** and **Zoom**.

BACK HL OFF

TIP: Press **[BACK]** to cancel a selection.

2 Rotate the main knob to adjust the range or the zoom. The range determines the intervals between the range rings, which are concentric circles on the radar display. The range and the range ring interval are shown at the top-left corner of the radar display. The range is marked by the bearing ring (the range ring with markings).

TIP: Adjust to a shorter range to navigate through crowded water, and increase the range when you move out to open water to prevent possible collisions.

2.3.3 Hiding the Heading Line

The heading line may obscure a target ahead of your boat. To temporarily hide the

BACK HL OFF

heading line, press and hold **[HL OFF]**.

The heading line and optionally the range rings and target symbols will be hidden while

MENU

the button is held. Press **[MENU]** > **Preferences** > **HL Off Mode** to change this.

2.4 Optimizing the Radar Display

2.4.1 Adjusting Gain

Gain controls the level of detail and noise shown on the radar display. A higher gain amplifies the signals received and reveals smaller targets but increases noise and clutter shown on the radar display. A gain too low will miss smaller targets while a gain too high will obscure even larger targets.

- Rotate the **[GAIN]** knob to adjust the gain and reduce background noise on the screen.
- Press the **[GAIN]** knob to open the **Gain** menu. Rotate and press the knob to make a selection.

MENU

- You can also adjust gain by pressing **[MENU]** > **Echo Tuning** > **Gain**.

TIP: From a high level of gain, gradually reduce gain until the noises are barely showing on the radar display.

2.4.2 Adjusting Sea Clutter Reduction

Sea Clutter are echoes reflected off sea waves, shown on the central area of the radar screen with random echo signals. The sea clutter reduction setting affects the appearance of nearby signals more than it affects distant echoes. A higher sea clutter reduction setting reduces the appearance of clutter caused by nearby waves, but it can also reduce or eliminate the appearance of nearby targets.

- Rotate the **[SEA]** knob to adjust the sea clutter reduction and reduce echoes caused by choppy sea conditions.
- Press the **[SEA]** knob to open the **Sea Clutter** menu. Rotate and press the knob to make a selection.

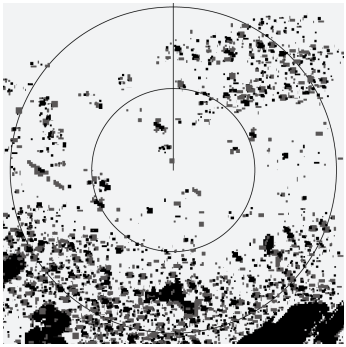
MENU

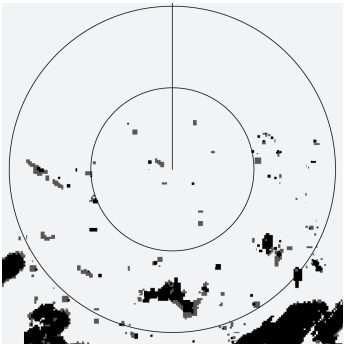
- You can also adjust sea clutter by pressing **[MENU]** > **Echo Tuning** > **Sea Clutter**.

TIP: Adjust the sea clutter reduction to a level such that some clutter remains visible on the radar display. If all clutter is removed, smaller targets may be missed and become a threat to your boat.

2.4.3 Adjusting Rain Clutter Reduction

Rain Clutter are echoes reflected off rain, snow, and hail in the same manner as normal targets. The rain clutter setting reduces the appearance of clutter caused by nearby rain, but it can also reduce or eliminate the appearance of nearby targets. Reducing the radar range can also minimize rain clutter.





- Rotate the **[RAIN]** knob to adjust the rain clutter reduction and reduce echoes caused by rain.

MENU

- You can also adjust rain clutter by pressing **[MENU]** > **Echo Tuning** > **Rain Clutter**.

TIP: Adjust the rain clutter reduction to a level such that other targets are clearly visible on the radar display. Some clutter caused by rain may still be visible.

2.4.4 Reducing Crosstalk Clutter

Interference caused by nearby radar sources in the same frequency band as your radar, and may appear as clutter on the radar display. Turn on crosstalk rejection to reduce cross talk clutter.

MENU

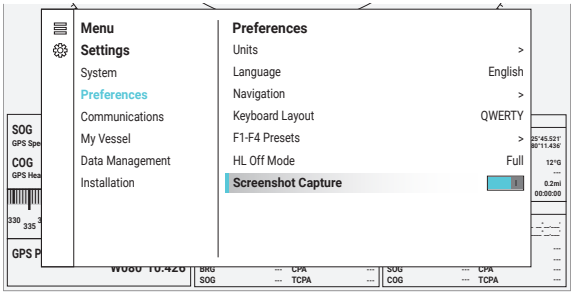
- Press **[MENU]** > **Echo Tuning** > **Crosstalk Rejection** to toggle crosstalk rejection on/off.

2.5 Interfacing with the Radar Display

2.5.1 Accessing the Menu

MENU

Press **[MENU]** to open/close the menu window for mode-specific menu and system settings (see *Chapter 3*).

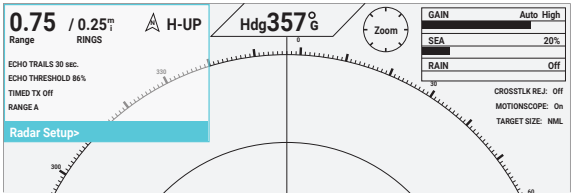


2.5.2 Selecting Data Panels

Data panels around the radar display can be selected for additional settings.

FOCUS
SELECT

- Press **[FOCUS]** to sequentially highlight data panels, and press **[SELECT]** to jump to settings related to the data panel.

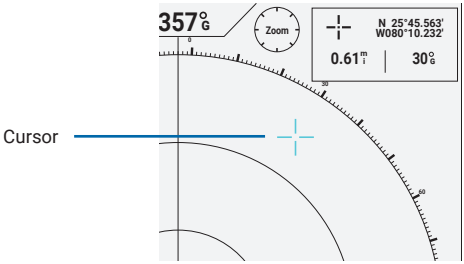


BACK
HL OFF

- Press **[BACK]** to cancel the highlight.

2.5.3 Invoking the Cursor

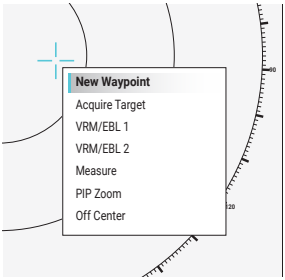
Press a direction on the control pad to bring up the cursor. The range, bearing, and coordinates corresponding to the position of the cursor are shown at the top-right corner of the radar display.



With the cursor showing:

MARK
ACQ
SELECT

- Press **[MARK]** to mark a waypoint.
- Press **[ACQ]** to acquire a target.
- Press **[SELECT]** for more options.



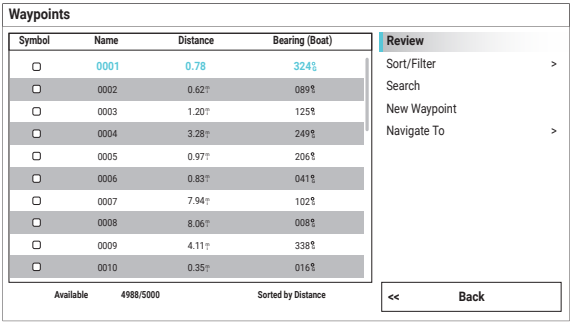
2.5.4 Marking a Waypoint

MARK
MARK
SELECT

- To mark your boat position as a waypoint, press **[MARK]** without invoking the cursor.
- To mark other positions, move the cursor to the position, and either press **[MARK]** or press **[SELECT]** > **New Waypoint**.

MARK

- Hold **[MARK]** to open the **Waypoints** list:

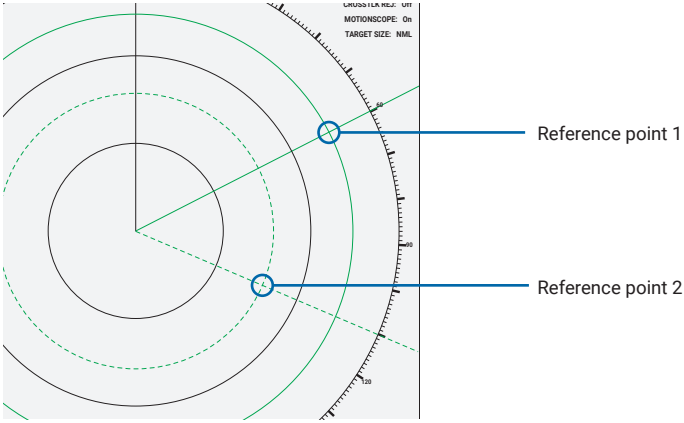


SELECT

- Use the control pad to highlight a waypoint, and press **[SELECT]** or select **Review** to: move, navigate to, edit, change the symbol of, delete, or send an SOS distress call at the waypoint.
- Select **Sort/Filter** to sort the list by name, symbol, distance, or filter the list by symbol.
- Select **Search** to search for a waypoint by name.
- Select **New Waypoint** to add a new waypoint by entering the coordinates, selecting on the chart, using the current position, or entering the range and bearing.
- Select **Navigate To** to navigate to the highlighted waypoint either in a straight line or by marking a route on the chart.

2.5.5 Dropping Reference Points

The radar can measure the bearing and range to two reference points, each marked by a variable range marker (VRM)—a circle centered on the own ship position, and an electronic bearing line (EBL)—a straight line extending from the own ship position to and beyond the reference point, crossing the VRM at the reference point. The first point is marked with solid lines, and the second with dashed lines.



VRM EBL 1
SELECT

To drop a reference point, use the control pad to move the cursor to the desired position, and either press **[VRM EBL 1]** / **[VRM EBL 2]** or press **[SELECT]** > **Drop VRM/EBL 1** / **Drop VRM/EBL 2**. The bearings and ranges will be displayed in the VRM/EBL data panel.

Hiding/Editing the VRM/EBL

To hide or adjust the reference points and the respective lines:

VRM EBL 1

1 Press **[VRM EBL 1]** / **[VRM EBL 2]** to hide the respective lines.

VRM EBL 1

2 Press **[VRM EBL 1]** / **[VRM EBL 2]** again and use the control pad to adjust the position of the reference point.

SELECT

3 Press **[SELECT]** or **[VRM EBL 1]** / **[VRM EBL 2]** again to confirm the new position.

2.5.6 Measuring Range and Bearing Between Two Points

To measure the relative range and bearing between two points:

SELECT

1 Press the control pad to invoke the cursor, and press **[SELECT]** > **Measure**.

SELECT

2 Use the control pad to move the cursor to the first point and press **[SELECT]** > **Set Reference**, a pin is placed at the first point.

3 Use the control pad to move the cursor to the second point. The range and bearing relative to the first point, as well as the coordinates are shown on the top-right corner of the radar display.

2.5.7 Off Centering the Radar Display

The own ship position on the radar display can be shifted away from the center of the radar display to view the situation further away from your vessel.

1 Use the control pad to move the cursor to where you wish to shift the own ship position to on the radar display.

SELECT

2 Press **[SELECT]** > **Off Center** to shift the own boat position to the selected position.

To shift the own ship position back to the center, press the control pad to invoke the

SELECT

cursor, and press **[SELECT]** > **Cancel Off Center**.

2.5.8 Viewing a Zoomed In Region of the Radar Display

You can magnify a region around the cursor for a clearer view without adjusting the zoom.

1 Use the control pad to move the cursor to where you wish to magnify.

SELECT

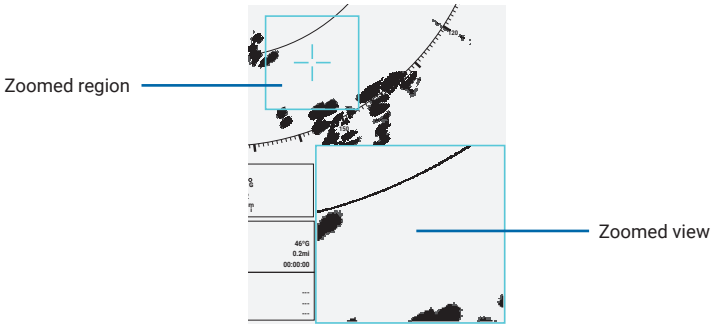
2 Press **[SELECT]** > **PIP Zoom**.

3 A picture-in-picture view of the selected region appear at the bottom-right corner.

4 Use the control pad to shift the cursor, the magnified view will follow the cursor.

BACK HL OFF

5 Press **[BACK]** to close the inset window.



2.5.9 Capturing a Screenshot

SELECT

From any screen, hold **[SELECT]** for 3 seconds, a screenshot (in PNG format) will be saved to your inserted SD card (see *1.8*).

2.5.10 Acknowledging and Silencing an Alarm

ALARM ACK

ALARM ACK

- When an alarm sounds, you can acknowledge and silence the alarm by pressing **[ALARM ACK]**.
- You can hold **[ALARM ACK]** to open the **Alarms** menu (see *3.5*).

2.6 Simplified Target Tracking (TT)

⚠ WARNING

Do not rely solely on the Simplified Target Tracking (TT) feature for collision avoidance. Always pay attention to your surroundings, including other vessels, obstacles, water and weather conditions. Never leave the helm unattended. You are responsible for the safe operation of your boat.

⚠ CAUTION

The tracking information, including the course and speed of acquired targets, depends on the radar and the tracked targets. The radar must be tuned and functioning normally to ensure the targets can be correctly identified and tracked.

Sea and weather conditions can affect target acquisition and target tracking. Adjust gain and clutter reduction settings correctly to properly keep track of TT targets (see *2.4*).

Tracking accuracy can be affected by echo intensity, pulse width, bearing error, and course change. The accuracy will decrease when either your boat or the target changes course, and the restoration of the accuracy may take between 10 and 60 seconds, depending on the relative speed between your boat and the target.

Simplified Target Tracking (TT) enables you to manually or automatically acquire and track targets and is primarily used for collision avoidance. To use TT, you assign a TT tag to a target. The radar then automatically tracks the tagged target and provides you with tracking information about the target.

2.6.1 TT Features

- Targets in all ranges can be selected as TT targets.
- Up to 50 targets can be acquired and plotted with adjustable vector time (**Projected Heading**) on the screen (see *3.4.3*).
- Targets can be acquired automatically by using **Boundaries**, **MotionScope™**, or **Guard Zones** (see *2.6.3*).
- Collision alarm can be turned on for TT targets, with adjustable CPA limits (**Range**) and TCPA limits (**Time To**) (see *3.5.1*).
- Tracked targets can be canceled individually or altogether (see *3.4.1*).

2.6.2 Acquiring Targets Manually

ACQ
SELECT

To acquire a TT target manually, use the control pad to move the cursor to a target, and either press **[ACQ]** or press **[SELECT]** > **Acquire Target** to acquire the cursor-located echo as a TT target.

2.6.3 Acquiring Targets Automatically

MENU

To automatically acquire TT targets, press **[MENU]** > **Other Vessels** > **TT** > **Auto Acquire**.

With **Auto Acquire** toggled on:

- Select **All** to automatically acquire all targets within range.
- Select **Boundaries** to automatically acquire targets within the set boundary.
- Select **MotionScope™** to automatically acquire all/approaching targets detected by MotionScope. This requires **MotionScope™** in **Echo Tuning** to be turned on.
- Select **Guard Zone** to automatically acquire targets inside the guard zone, which can be enabled in the **Alarms** menu.

2.6.4 Removing Targets Automatically

MENU

To automatically remove lost TT targets, press **[MENU]** > **Other Vessels** > **TT** > **Auto Remove** and choose one of the settings:

- Select **Off** to never remove TT targets automatically.
- Select **5 sec** to remove lost TT targets 5 seconds after the target is lost.
- Select **30 sec** to remove lost TT targets 30 seconds after the target is lost.
- Select **1 min** to remove lost TT targets 1 minute after the target is lost.
- Select **When Full** to remove the oldest lost TT target when the upper limit has been reached and a new target is acquired.

2.6.5 TT Symbols

TT symbols on the radar display indicate the status of each tagged target, and the device can sound a collision alarm if the object is on a collision course or enters your guard zone.

Symbol	Description
	Acquiring a target. Concentric, dashed green rings radiate from the target while the radar is locking onto it.
	Target has been acquired. A solid green ring indicates the location of a target that the radar has locked onto. A dashed green line attached to the circle indicates the projected course over ground or the GPS heading of the target.
	Dangerous target is in range. A red ring flashes from the target while an alarm sounds and a message banner appears. After the alarm has been acknowledged, a solid red dot with a dashed red line attached to it indicates the location and the projected course over ground or the GPS heading of the target. If the safe- zone collision alarm has been set to Off, the target flashes, but the audible alarm does not sound and the alarm banner does not appear.
	Target has been lost. A solid green ring with an X through it indicates that the radar could not lock onto the target.
	Closest point of approach and time to closest point of approach to a dangerous target.

SELECT

To select a TT target, move the cursor near the TT symbol, and press **[SELECT]**. Select **Review Target** from the pop-up menu to view its information or remove the target.

Information, including the range (RNG), bearing (BRG), GPS speed (SOG), GPS heading (COG), closest point of approach (CPA), and time to closest point of approach (TCPA), of the two most recently selected TT targets are displayed at the bottom of the screen.

FOCUS
SELECT

Press **[FOCUS]** to highlight the data panel and press **[SELECT]** to review or remove the target.

2.7 Navigation Chart

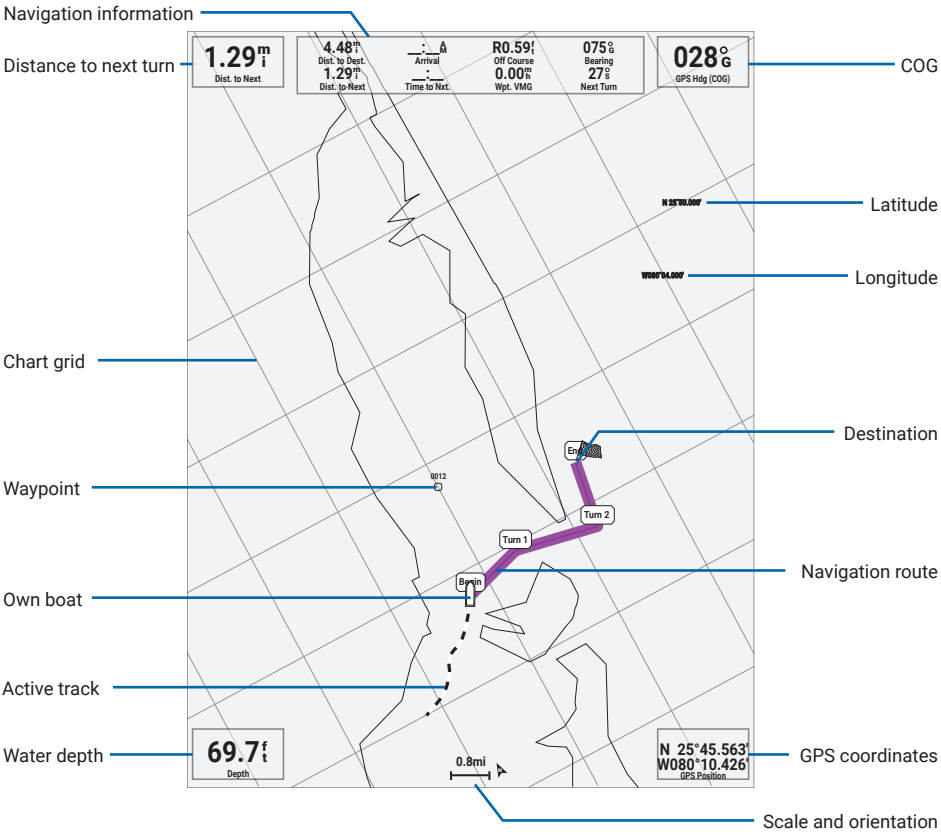
⚠ CAUTION

The navigation feature does not ensure obstacle and bottom clearance. Carefully compare the course to all visual sightings, and avoid any land, shallow water, or other obstacles that may be in your path.

The Navigation Chart mode allows you to view your vessel on preloaded or purchased charts and navigate to your destination.

2.7.1 Navigation Chart Interface

The following is an overview of the Navigation Chart interface. Rotate the main knob to zoom in and out.



2.7.2 Navigating to a Point

You can select a point on the chart and set a course to the destination.

Navigating Directly to a Destination

1 Use the control pad to move the cursor to a point you would like to navigate to.

SELECT 2 Press **[SELECT]** > **Go To** to set a straight-line course to the destination.

Creating a Route to a Destination

1 Use the control pad to move the cursor to a point you would like to navigate to.

SELECT 2 Press **[SELECT]** > **Route To**. to create a route with turns to the destination.

SELECT 3 Use the control pad to move the cursor to the final turn, and press **[SELECT]** > **Add Turn**.

4 Working backward, continue adding turns until you've added the first turn.

SELECT 5 Press **[SELECT]** > **Done** to set the course.

A magenta line appears. In the center of the magenta line is a thinner purple line that represents the corrected course from your current location to the destination. The corrected course is dynamic, and it moves with your boat when you are off course.

Follow the magenta line, steering to avoid land, shallow water, and other obstacles.

If you are off course, follow the purple line (corrected course) to go to your destination, or steer back to the magenta line (direct course).

Stopping Navigation

MENU To cancel a route or stop navigation, press **[MENU]** > **Stop Navigation**.

2.7.3 Viewing Information

Tides

You can view information about a tide station for a specific date and time, including the tide height, and when the next high and low tides will occur. By default, the device shows tide information for the most recently viewed tide station, present date, and past hour.

1 Use the control pad to invoke the cursor.

SELECT 2 Press **[SELECT]** > **Information** > **Tides**.

Currents

You can view information about a current station for a specific date and time, including the current speed and level of the current. By default, the device shows current information for the most recently viewed current station and for the present date and time.

1 Use the control pad to invoke the cursor.

SELECT 2 Press **[SELECT]** > **Information** > **Currents**.

Celestial

You can view information about sunrise, sunset, moonrise, moonset, moon phase, and the approximate sky view location of the sun and moon. The center of the view represents the sky overhead, and the outermost rings represent the horizon. By default, the device shows celestial information for the present date and time.

1 Use the control pad to invoke the cursor.

SELECT 2 Press **[SELECT]** > **Information** > **Celestial**.

Local Services

You can view local services information.

1 Use the control pad to invoke the cursor.

SELECT 2 Press **[SELECT]** > **Information** > **Local Services**.

2.8 F1-F4 Shortcuts

The F1 to F4 shortcut buttons are assigned to various functions for quick accesses.

Mode	F1	F2	F3	F4
Professional	Echo Trails	Off Center	Crosstalk	Pulse Expansion
Basic				
Dual Range				
Radar Overlay				
Navigation Chart	Go To	Route To	Active Track	AIS

2.8.1 Using a Shortcut Function

F1 1 Press a shortcut button to bring up the shortcut menu.

F1 2 Press the shortcut button you wish to use.

NOTE: Some shortcut functions require the cursor on the screen.

2.8.2 Swapping an Assigned Function

F1 1 Hold a shortcut button to bring up the **F1-F4 Presets** menu.

2 Use the main knob or the control pad to highlight the function you wish to swap out.

SELECT 3 Press **[SELECT]**.

4 Use the main knob or the control pad to highlight the function you wish to swap in.

SELECT 5 Press **[SELECT]**.

Available Functions for Radar Display Modes

- Echo Trails
- Off Center
- Crosstalk Rejection
- Pulse Expansion
- MotionScope
- PI Lines
- Guard Zone 1
- Guard Zone 2
- PIP Zoom
- Timed Transmit
- Nav Lines

Available Functions for Navigation Chart Display Mode

- Go To
- Route To
- Auto Guidance
- Active Track
- Saved Tracks
- Orientation
- Detail
- Chart Size
- World Map
- Inset Map
- Depth Shading
- Shallow Shading
- Spot Depths
- AIS

CHAPTER 3 MENU AND SETTINGS

3.1 Accessing the Menu

The menu contains more advanced or less frequently used features and settings.

MENU

- From any screen, press **[MENU]** to open the menu.
- Use the main knob and the control pad to scroll through the menu.

SELECT

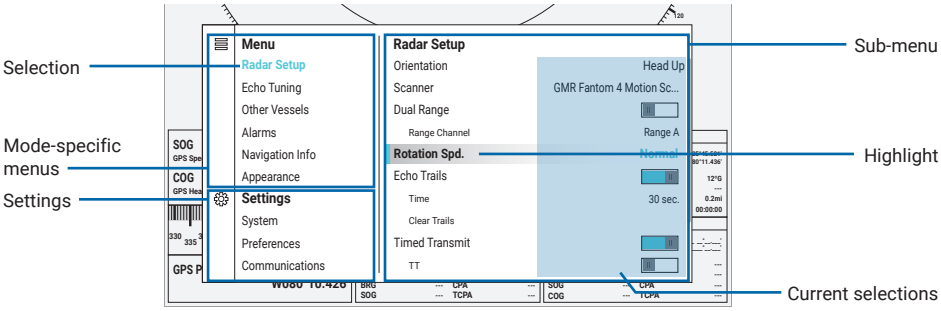
- Press **[SELECT]** to make a selection.

BACK HL OFF

- Press **[BACK]** to go back up a level.

MENU

- Press **[MENU]** again to close the menu.

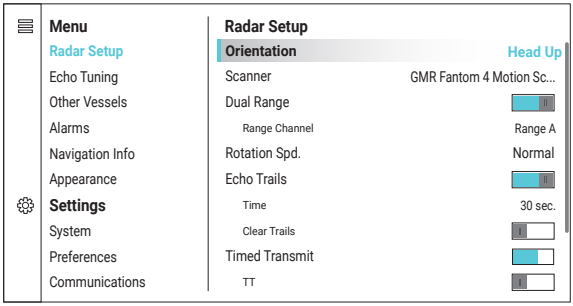


3.2 Radar Setup

MENU

Press **[MENU]** > **Radar Setup** in radar modes to customize the settings of your radar display.

NOTE: The menu is specific to **Professional**, **Basic**, **Dual Range**, and **Radar Overlay** modes.



3.2.1 Selecting the Radar Orientation

The radar display can be oriented in three different ways.

Select **Orientation** and select an orientation:

- Select **Head Up** to orient the radar display so the heading always points straight up. This is particularly suitable for navigating in congested waters.
- Select **North Up** to orient the radar display so north always points straight up. This will reduce echoes caused by the yaw of your vessel.

- Select **Course Up** to orient the radar display so the course (the direction your vessel is moving) always points straight up.

3.2.2 Selecting Two Ranges

The radar can transmit two pulses set to different ranges.

Select **Dual Range** to toggle the second range channel on/off.

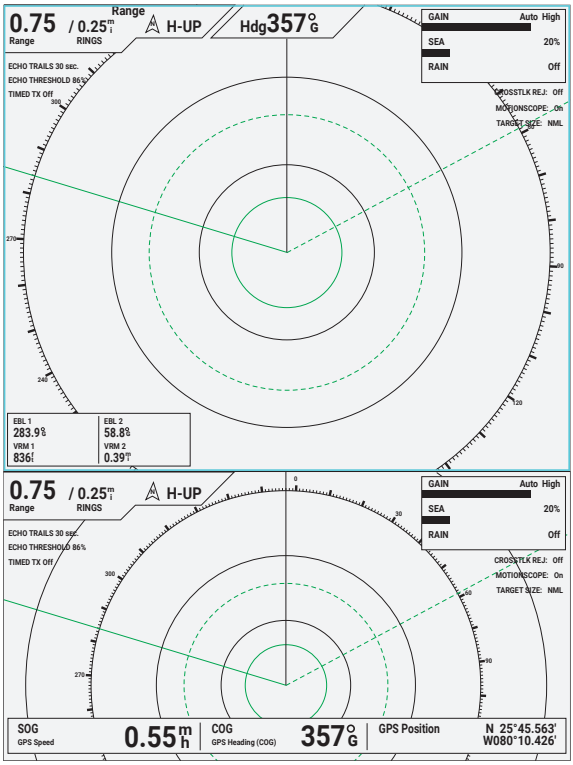
With **Dual Range** toggled on, select **Range Channel** to select a range channel to display (**Range A** or **Range B**).

Viewing Two Ranges Simultaneously

The two range channels can be displayed simultaneously in **Dual Range** mode.

MODE

- Press **[MODE]** and select **Dual Range** to display two split screens, each with its own range, zoom, offset, and display settings.



FOCUS

- Press **[FOCUS]** to highlight the next split screen.

3.2.3 Changing the Rotation Speed of the Antenna

You can change the rotation speed of the antenna, and thus how fast the radar display is refreshed.

Select **Rotation Speed** to select the rotation speed (**High Speed** or **Normal Speed**).

NOTE: When **Dual Range** is toggled on, the rotation speed is fixed to **High Speed**.

3.2.4 Echo Trails

The radar shows movements of targets on the radar display by keeping previous instances of the echoes on the display in a different color (deep blue versus red by default) for a set amount of time, forming a trail behind moving targets.

Select **Echo Trail** to toggle echo trails on/off.

With **Echo Trail** toggled on:

- Select **Time** to set the time echoes are kept on the display, ranging from 10 seconds to 10 minutes.
- Select **Clear Trails** to refresh the screen clearing all trails on the screen.

3.2.5 Timed Transmit

To conserve power, you can set the radar to transmit and go to standby at set intervals.

Select **Timed Transmit** to toggle timed transmit on/off.

With **Timed Transmit** toggled on:

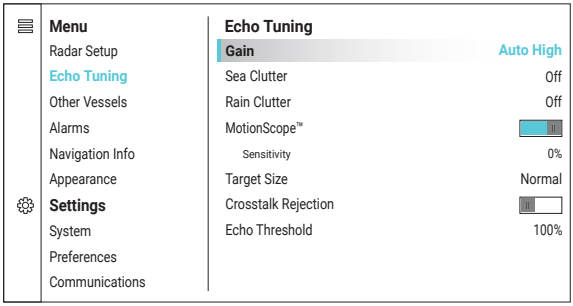
- Select **TT** to toggle TT targets on/off (Using TT during timed transmission is not recommended).
- Select **Stdby Time** to set the time interval between transmissions (in minutes).
- Select **Transmit Time** to set the duration of each transmission (in minutes).

3.3 Echo Tuning

MENU

Press **[MENU]** > **Echo Tuning** in sonar modes to fine-tune the echoes to reduce clutter and increase visibility (see *2.4* for more information).

NOTE: The menu is specific to **Professional**, **Basic**, **Dual Range**, and **Radar Overlay** modes.



3.3.1 Adjusting Gain

You can control the level of detail and noise of the echoes shown on the radar display by adjusting gain (see *2.4.1* for more information).

Select **Gain** and make a selection:

- **Manual** allows you to adjust gain manually using the main knob or the control pad.
- **Auto Bird** adjusts gain automatically to show birds over the surface of water.
- **Auto High** adjusts gain automatically giving more details.
- **Auto Low** adjusts gain automatically with less noise.

3.3.2 Reducing Sea Clutter

You can reduce echoes reflected off sea waves cluttering nearby signals by adjusting sea clutter (see *2.4.2* for more information).

Select **Sea Clutter** and make a selection:

- **Manual** allows you to adjust the level of sea clutter reduction using the main knob or the control pad.
- **Auto High** reduces sea clutter automatically at a high level.
- **Auto Med** reduces sea clutter automatically at a medium level.
- **Auto Low** reduces sea clutter automatically at a low level.
- **Off** turns off sea clutter reduction.

NOTE: The selections vary depending on the connected radar.

3.3.3 Reducing Rain Clutter

You can reduce echoes reflected off rain, snow, and hail by adjusting rain clutter (see *2.4.3* for more information).

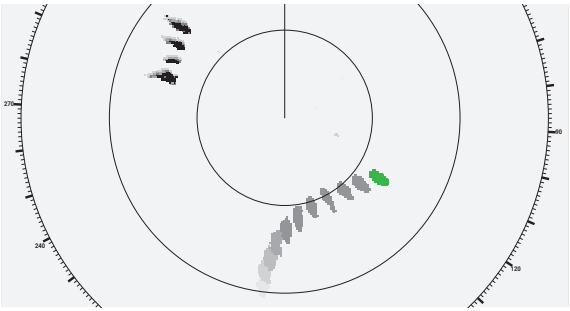
Select **Rain Clutter** and make a selection:

- **Manual** allows you to adjust the level of rain clutter reduction using the main knob or the control pad.
- **Off** turns off rain clutter reduction.

3.3.4 MotionScope™ Doppler Radar Technology

The MotionScope feature uses the Doppler effect to detect and highlight moving targets to help you navigate around other boats or severe weather, or toward fishing spots where birds are feeding at the surface. The moving targets are color-coded so you can tell at a glance which targets are heading your way and which are heading away from you. On most color schemes, green indicates targets moving away from you and red indicates targets moving toward you.

Select **MotionScope™** to toggle MotionScope on/off.



With **MotionScope™** toggled on, select **Sensitivity** and use the main knob to change the speed threshold for target highlighting. A higher setting highlights slower targets, and a lower setting highlights only faster targets.

NOTE: Only available on Fantom models.

3.3.5 Selecting Target Size

You can adjust how the resolution of the radar image by selecting the size of targets.

Select **Target Size** and make a selection:

- **Larger** displays larger echoes for point targets, like boats and buoys.
- **Normal** displays normal sized targets.
- **Smaller** displays a sharp, high resolution radar image.

NOTE: Only available on Fantom models.

3.3.6 Extending Radar Pulses

You can increases the duration of the transmit pulse to maximize the energy directed toward targets. This helps to enhance the detection and identification of targets.

Select **Pulse Expansion** to toggle pulse expansion on/off.

NOTE: This option is only available on xHD radome and xHD2 open array models.

3.3.7 Echo Threshold

You can adjust the threshold level for the returned echo. Signals below the threshold are not shown on the radar display.

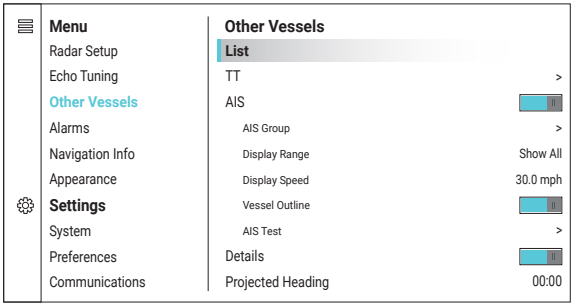
Select **Echo Threshold** and use the main knob to adjust the threshold level.

NOTE: Echo Trail must be disabled (see *3.2.4*).

3.4 Other Vessels

MENU

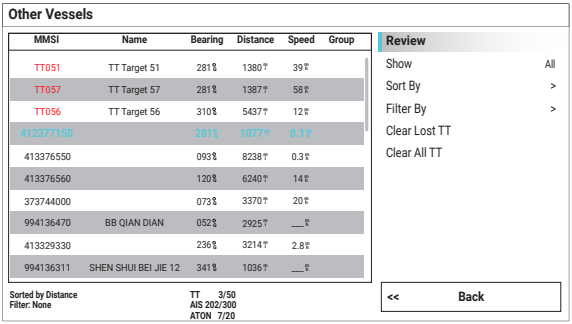
Press **[MENU]** > **Other Vessels** to manage other vessels, including TT, AIS, and ATON targets, and change how they appear with these settings.



3.4.1 Managing Other Vessels

You can view/sort/filter a list of vessels, review individual vessels, or clear TT targets.

Select **List** to open the list of other vessels.



3.4.2 AIS

With the Automatic Identification System (AIS), the device identifies and tracks other vessels, and alerts you to area traffic. The device shows AIS information about vessels within range equipped with a transponder, and are actively transmitting AIS information.

Targets are indicated on the radar display with targeting symbols.

Symbol	Description
	AIS vessel. The vessel is reporting AIS information. The direction of the triangle indicates the direction the AIS vessel is moving.
	Selected target.
	Activated target. The target appears larger on the chart. A green line attached to the triangle indicates the heading of the target. The MMSI, speed, and direction of the vessel appear beneath the target if **Details** is turned on. If the AIS transmission from the vessel is lost, a message banner appears.
	Lost target. A green X indicates that the AIS transmission from the vessel is lost, and the device displays a message asking whether the vessel should continue to be tracked. If you discontinue vessel tracking, the lost target symbol disappears from the chart.
	Dangerous target in range. The target flashes while an alarm sounds and a message appears. A red line attached to the triangle indicates the heading of the target. If **Collision Alarm** is off, the target flashes, but the audible alarm does not sound and the alarm message does not appear. If the AIS transmission from the vessel is lost, a message appears.
	Lost dangerous target. A red X indicates that the AIS transmission from the vessel is lost, and the device displays a message asking whether the vessel should continue to be tracked. If you discontinue vessel tracking, the lost dangerous target symbol disappears from the chart.
	The location of this symbol indicates the closest point of approach to a dangerous target, and the numbers near the symbol indicate the time to the closest point of approach to that target.

Select **AIS** to toggle AIS tracking on/off.

⚠ CAUTION

If turned off, all AIS functionality, including AIS vessel targeting, tracking, collision alarms from AIS vessels, and the display of information about AIS vessels, will be disabled.

With **AIS** toggled on:

- Select **AIS Group** to view and manage targets by 3 AIS groups.
- Select **Display Range** to select a range within which targets are displayed.
- Select **Display Speed** to set a speed above which targets are displayed.
- Select **Vessel Outline** to toggle vessel outlines on/off.
- Select **AIS Test** to select whether to receive or ignore Emergency Position Indicating Radio Beacon (EPIRB), Man Overboard (MOB), and Search and Rescue Transponder (SART) test alerts.

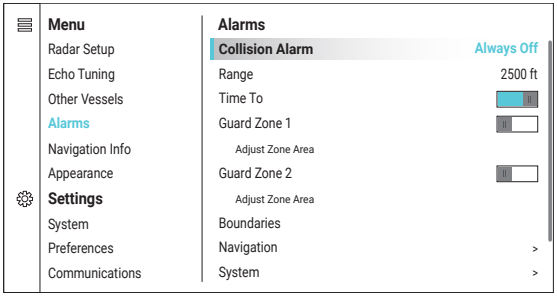
3.4.3 Adjusting Vector Times

Select **Projected Heading** to adjust the vector time (length of the line attached to the triangle).

3.5 Alarms

MENU

Press **[MENU]** > **Alarms** to set up multiple alarms that will sound when the set conditions are met.



3.5.1 Setting Collision Alarms

⚠ CAUTION

The collision alarm may not be able to detect all targets. Do not rely solely on the collision alarm. You are responsible for the safe and prudent operation of your vessel.

The collision alarm will sound if an object or vessel is on a collision course with your boat.

Turning Collision Alarms On/Off

Select **Collision Alarm** and choose one of the settings:

- Select **On** to turn the alarm on.
- Select **Off** to turn the alarm off until you restart the radar.
- Select **Always Off** to keep the alarm turned off until manually turned back on.

Including/Excluding TT Targets

With **Collision Alarm** turned **On**, select **TT Alarm** and make a selection:

- Select **Off** to exclude TT targets.
- Select **On** to include TT targets.
- Select **Dangerous Only** to sound the alarm only for dangerous targets.

Adjusting Alarm Sensitivity

- Select **Range** to select a collision alarm range (from 500 feet to 10 miles). The collision alarm will sound when the target on a collision course comes within the selected range.
- Select **Time To** to select a collision alarm time (from 15 seconds to 24 minutes). The collision alarm will sound when the target on a collision course is expected to collide with your boat within the selected time.

3.5.2 Setting Up Guard Zones

You can set up 2 guard zones around your vessel to alert you when objects enters the guard zones. The guard zones are fan-shaped or ring-shaped areas overlaid on the radar display. Guard zone 1 has a solid outline, Guard zone 2 has a dashed outline.

Select **Guard Zone 1** / **Guard Zone 2** to toggle the guard zone on/off.

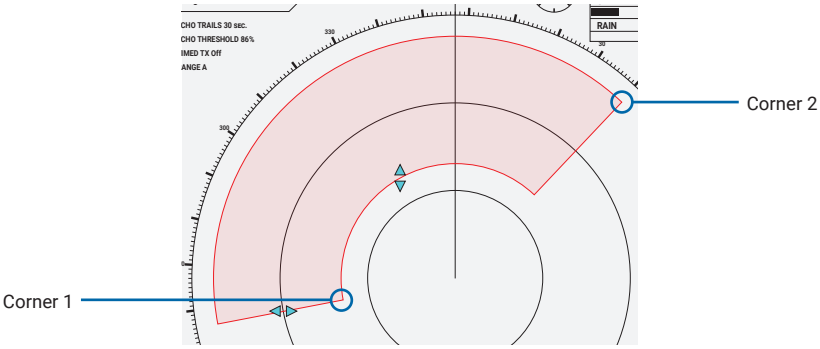
NOTE: Not available in **Navigation Chart** mode.

Adjusting Guard Zones

To adjust the guard zone, with **Guard Zone 1** / **Guard Zone 2** toggled on:

1 Select **Adjust Zone Area**.

2 Use the control pad to adjust the position of one of the two corners.



SELECT **3** Press **[SELECT]** > **Corner 1** / **Corner 2** to switch corners.

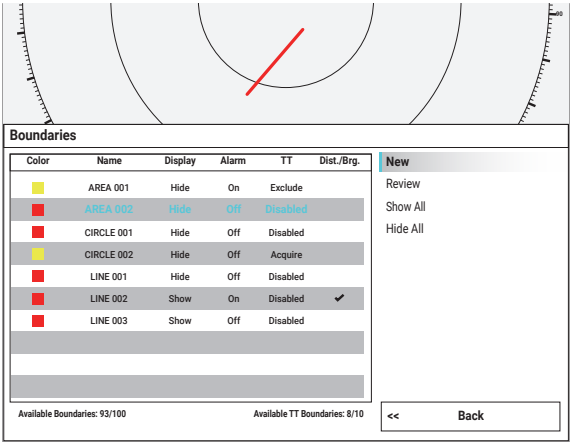
SELECT **4** Press **[SELECT]** > **Circle** to expand the guard zone to a ring-shaped zone that completely surrounds your boat.

SELECT **5** Press **[SELECT]** > **Done** to confirm your adjustment.

3.5.3 Setting Up Boundaries

You can set up custom boundaries that alert you if your boat or other vessels enter or exit a boundary.

Select **Boundaries** to open a list of boundaries.



Adding a Boundary

1 Select **New** to add a new boundary.
   - Select **Line** to draw a linear boundary.
   - Select **Area** to draw a polygonal boundary area.
   - Select **Circle** to draw a circular boundary area.

2 Use the control pad to move the cursor to the first point, or the center of the circle.

SELECT 3 Press **[SELECT]** > **Add Point** / **Set Center** to confirm the position.

4 Use the control pad to move the cursor to the next point, or the rim of the circle.

SELECT 5 Press **[SELECT]** > **Add Point** / **Set Radius** to confirm the position.

6 For **Line** or **Area**, continue to add points until the boundary is complete.

7 Using the main knob, select **Done** to create the boundary.

Reviewing a Boundary

Use the control pad to highlight a boundary on the left, and select **Review**:

- Select **Display Options** to change how the boundary is displayed.
- Select **Edit Boundary** to edit or delete the boundary.

SELECT
- Select **Alarm** and press **[SELECT]** to toggle the boundary alarm on/off.
- Select **TT** to disable, acquire, or exclude TT targets for the boundary.

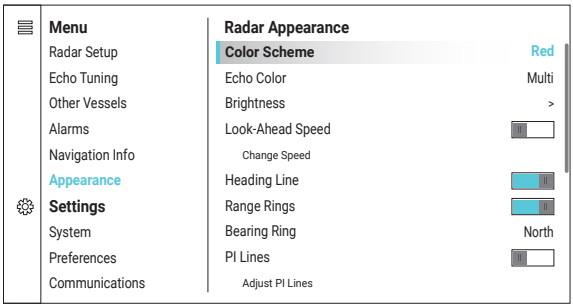
Showing/Hiding Boundaries

- Select **Show All** to display all boundaries on the radar display.
- Select **Hide All** to hide all boundaries from the radar display.

3.6 Radar Appearance

MENU Press **[MENU]** > **Appearance** in radar modes to customize the appearance of your radar display.

NOTE: The menu is specific to **Professional**, **Basic**, **Dual Range**, and **Radar Overlay** modes.



3.6.1 Changing the Colors

You can change how echoes are displayed on the radar screen.

- Select **Color Scheme** and select one of the color schemes.
- Select **Echo Color** to switch between **Multi** and **Mono** color mode. In **Mono** color mode, the echoes and echo trails will all be in one single color.

3.6.2 Adjusting the Brightness of the Bearing and Range Lines

You can change how visible the bearing or range lines appear on the radar display.

1 Select **Brightness** and select **Heading Line**, **Range Rings**, or **VRM/EBL**.

2 Use the main knob to increase/decrease the visibility of the selected lines.

SELECT 3 Press **[SELECT]** to confirm the brightness setting.

3.6.3 Looking Further Ahead

You can set the whole radar display to automatically shift toward the bottom of the screen as you accelerate, increasing your awareness to the situations ahead of your boat.

Select **Look-Ahead Speed** to toggle the setting on/off.

With **Look-Ahead Speed** toggled on, select **Change Speed** and enter your top speed.

3.6.4 Selecting On-Screen Data

You can show or hide individual elements on the screen.

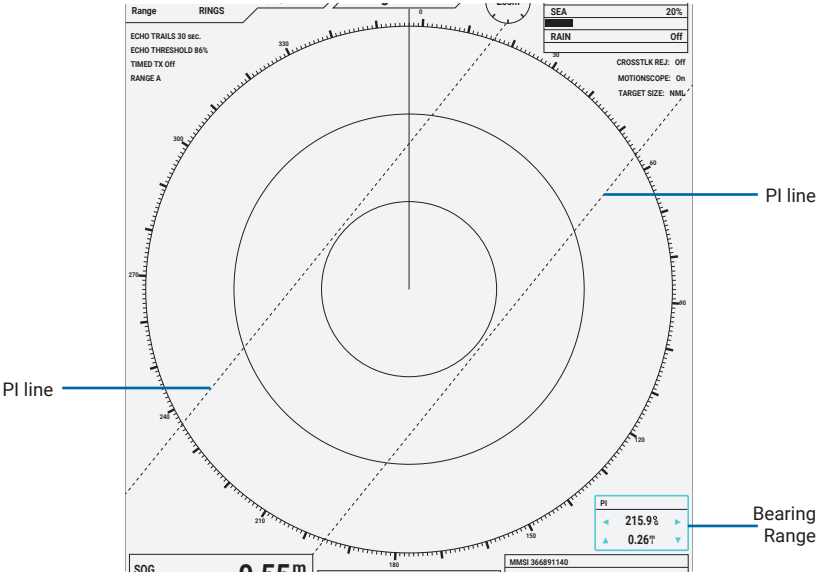
- Select **Heading Line** to show/hide the heading line.
- Select **Range Rings** to show/hide the range rings.
- Select **Bearing Ring** to show/hide the bearing ring.
- Select **PI Lines** to show/hide the PI lines.
- Select **VRM/EBL 1** / **VRM/EBL 2** to show/hide the VRM/EBL.
- Select **Boundaries** to show/hide the boundaries (see *3.5.3*).

3.6.5 Using PI Lines

Parallel Indexing (PI) Lines can help you navigate through congested water or narrow canals, keeping your vessel on track, at a fixed distance from shorelines or edges of a traffic lane.

With **PI Lines** toggled on:

- Select **Display Side** > **One** to set up a PI line on the starboard side of your vessel, or **Both** to set up PI lines on both sides of your vessel.
- Select **Adjust PI Lines** and use the control pad to adjust the distance and bearing of the PI lines.



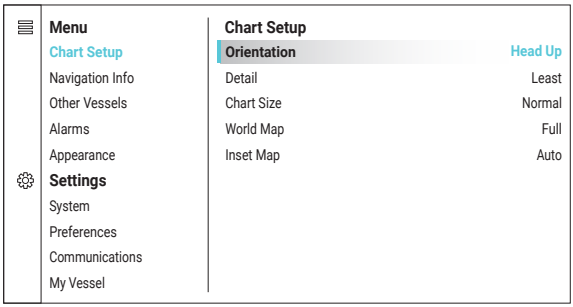
- Select **Reset PI Lines** to reset the bearing of the PI lines to align with your heading.

3.7 Chart Setup

MENU

Press **[MENU]** > **Chart Setup** in Navigation Chart mode to customize the settings of your navigation chart.

NOTE: The menu is specific to **Navigation Chart** mode.



3.7.1 Selecting the Chart Orientation

The chart can be oriented in three different ways.

Select **Orientation** and select an orientation:

- Select **Head Up** to orient the chart so the heading always points straight up.
- Select **North Up** to orient the chart so north always points straight up.
- Select **Course Up** to orient the chart so the course (the direction your vessel is moving) always points straight up.

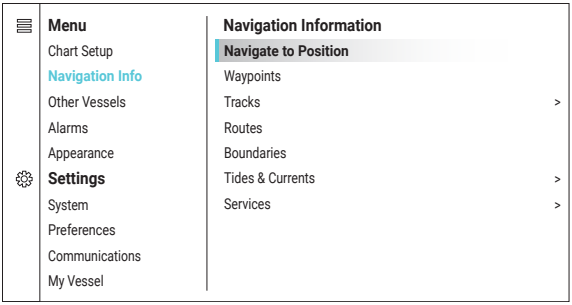
3.7.2 Personalizing the Chart

You can customize the chart based on your preference.

- Select **Detail** to adjust the level of detail of the chart (from **Least** to **Most**).
- Select **Chart Size** to adjust the size of the chart (from **Smallest** to **Largest**).
- Select **World Map** to switch between **Basic** view and **Full** view.
- Select **Inset Map** to show/hide an inset map.

3.8 Navigation Info

MENU Press **[MENU]** > **Navigation Info** to access navigation settings.



3.8.1 Navigating to Coordinates

You can navigate to a known position by entering its coordinates (in DDM format).

NOTE: Only available in **Navigation Chart** mode.

1 Select **Navigate To Position** and enter the coordinates.

2 Select **Done** or to begin navigating.

MENU 3 Press **[MENU]** > **Navigation Options** > **Stop Navigation** to stop navigating.

3.8.2 Managing Navigational Data

You can manage recorded waypoints, tracks, and routes. These can be stored in an inserted SD card.

- Select **Waypoints** to open the waypoints list (see *2.5.4*).
- Select **Tracks** to view and edit track options (see *3.8.3*).
- Select **Routes** to view and manage routes (see *2.7.2*).
- Select **Boundaries** to view and manage boundaries (see *3.5.3*).

3.8.3 Managing Tracks

A track is a recording of the path of your boat. The track being recorded is the active track.

Select **Tracks** and choose one of the settings:

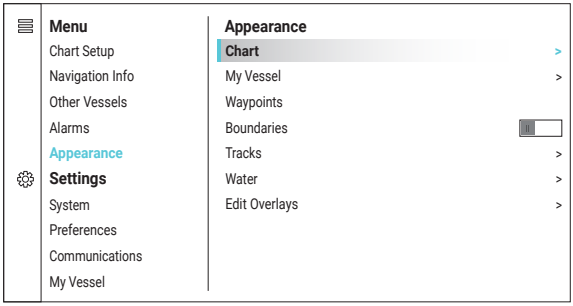
- Select **Active Track Options** to toggle on active tracking.
  With the option toggled on:
  - Select **Record Mode** and select **Fill** to record until the memory is full, or **Wrap** to continuously record a track that replaces the oldest data, or **Off** to stop recording.
  - Select **Interval** > **Interval** and select **Distance** to record the track based on a distance interval, select **Time** to record the track based on a time interval, or select **Resolution** to record the track based on a variance from your course.
  - Select **Interval** > **Change** to enter a value.
  - Select **Track Color** to change the color of the track on the chart.
- Select **Save Active Track** to save the active track.
- Select **Clear Active Track** to clear the active track.
- Select **Follow Active Track** to retrace the active track.
- Select **Saved Tracks** to view, edit, follow, or delete saved tracks.

3.9 Navigation Chart Appearance

MENU

Press **[MENU]** > **Appearance** in **Navigation Chart** mode to customize the appearance of your navigational chart.

NOTE: The menu is specific to **Navigation Chart** mode.



3.9.1 Customizing Chart Layers

- Select **Chart** to toggle chart layers on/off. Layers include **Tides & Currents**, **Land POIs**, **Service Points**, **Navaid**, **Grids**, and more.
- Select **My Vessel** to add/remove visual aids around your vessel. Visual aids include **Heading Line**, **Angle Markers**, **Compass Rose**, and more.
- Select **Waypoints** to manage waypoints.
- Select **Boundaries** to show/hide the boundaries (see *3.5.3*).
- Select **Tracks** to show/hide saved tracks (see *3.8.3*).
- Select **Water** to adjust how water depths are displayed on the chart.
- Select **Edit Overlays** > **Compass Tape** to show/hide the compass tape at the top or bottom of the screen.

3.9.2 Editing Data Panels

You can change the layout of the overlaying data panels.

Select **Edit Overlays** > **Data** and make a selection:

- **Top Bar** displays 6 data on the top of the screen.
- **Double Top Bar** displays 8 data in 2 rows on the top of the screen.
- **Corners** displays 4 data at the corners of the screen.
- **Double Corners** displays 8 data at the corners of the screen.
- **None** hides all data panels from the screen.

Replacing Data

To display a different data:

FOCUS
1 Press **[FOCUS]** and highlight the data box you wish to replace.

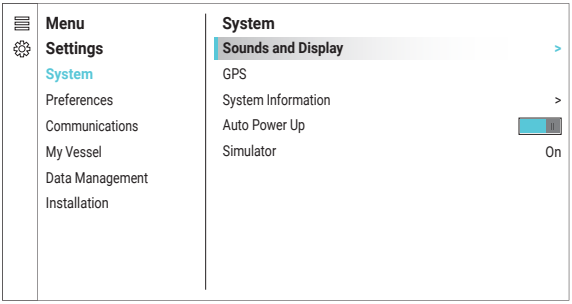
SELECT
2 Press **[SELECT]** and select the data you wish to display.

3.10 Settings

Settings below are for system-wide settings, device and software information, user preferences, and vessel information.

3.10.1 System Settings

MENU
Press **[MENU]** > **System** to adjust system-wide settings.



- Select **Sounds and Display** to adjust **Beeper**, **Backlight**, and **Color Mode**.
- Select **GPS** to view satellite information and adjust satellite settings.
- Select **System Information** to view device and software information.
- Toggle **Auto Power Up** to set the device to power on automatically or not when your vessel powers on.

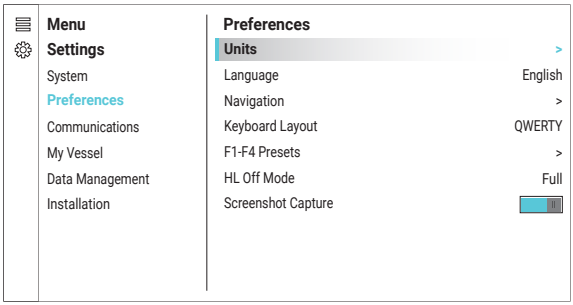
Resetting to Default Settings

Select **System Information** > **Reset** > **Reset Default Settings** to restore the device to factory default settings.

3.10.2 Preferences

MENU

Press **[MENU]** > **Preferences** to adjust user preferences.



- Select **Units** to adjust the **System Units**, **North Reference**, **Variance**, **Position Format** **Map Datum**, **Time Format**, and **Time Zone**.
- Select **Language** to change the system language.
- Select **Navigation** to adjust navigation settings.
- Select **Keyboard Layout** to choose between **ABCDE** and **QWERTY** keyboards.
- Select **F1-F4 Presets** to customize the shortcut buttons (see *2.8*).
- Select **HL Off Mode** to select whether to hide only the heading line or the range rings and target symbols as well when holding **[HL OFF]** (see *2.3.3*).

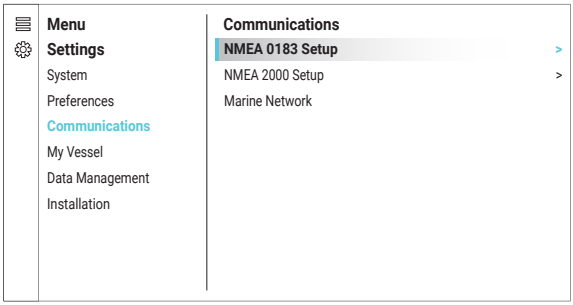
BACK HL OFF

- Toggle **Screenshot Capture** to enable or disable the feature (see *2.5.9*).

3.10.3 Communications Settings

MENU

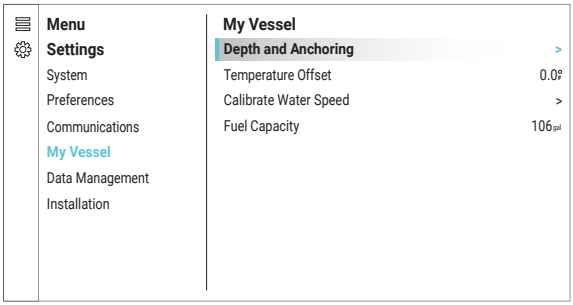
Press **[MENU]** > **Communications** to adjust marine network settings.



- Select **NMEA 0183 Setup** to change NMEA 0183 port and device settings.
- Select **NMEA 2000 Setup** to change NMEA 2000 device settings.
- Select **Marine Network** to rename devices connected to the network.

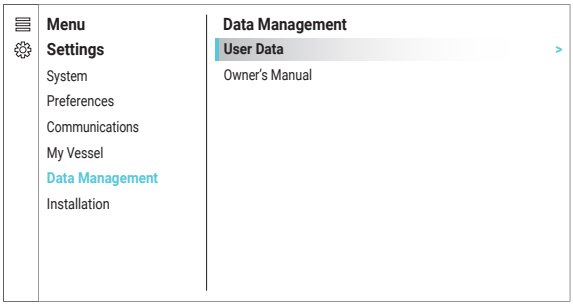
3.10.4 My Vessel Settings

MENU Press **[MENU]** > **My Vessel** to adjust your vessel's settings, such as anchor height and fuel capacity.



3.10.5 Data Management

MENU Press **[MENU]** > **Data Management** to edit and retrieve stored data.



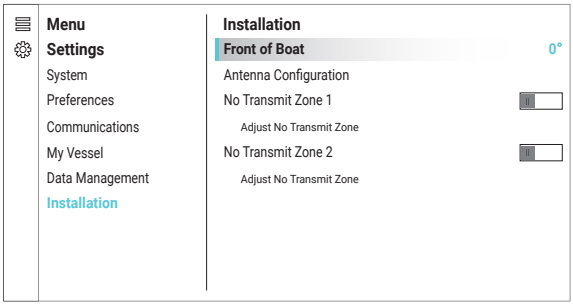
- Select **User Data** to transfer or delete user data, such as waypoints, routes, and tracks.
- Select **Owner's Manual** > **Open** to read the manual on the device.

3.10.6 Installation Settings

⚠ CAUTION

These function is restricted to authorized engineers.

MENU Press **[MENU]** > **Installation** to configure antenna settings.

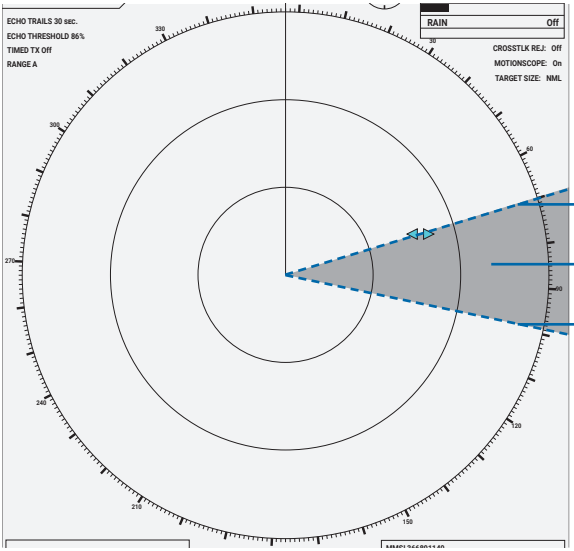


- Select **Front of Boat** to set the orientation corresponding to the front of your vessel.
- Select **No Transmit Zone 1** / **No Transmit Zone 2** to toggle the no transmit zone on/off. A no transmit zone is a sector between two bearings.

  With a no transmit zone toggled on:

  1 Select **Adjust No Transmit Zone**.

  2 Use the control pad to adjust the angle of one side of the sector.



SELECT

SELECT

3 Press **[SELECT]** > **Angle 1** / **Angle 2** to switch the side to adjust.

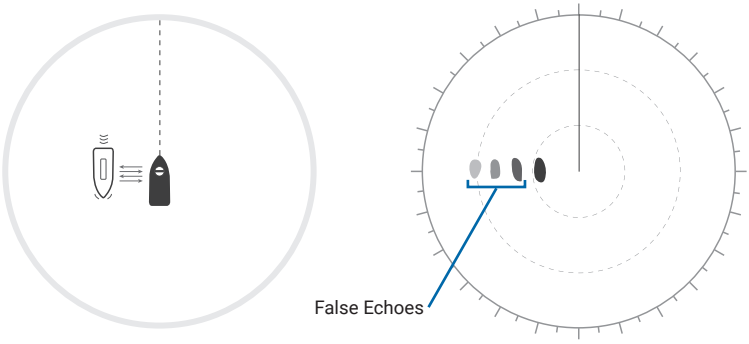
4 Press **[SELECT]** > **Done** to confirm your adjustment.

CHAPTER 4 FALSE ECHOES

False echoes are echoes appearing at positions where there is no target. False echoes occur occasionally as a result of the antenna receiving signals reflected off secondary objects. The phenomenon can be reduced but it takes some experience to recognize the distinct patterns of these echoes. There are several types of false echoes, you should familiarize yourself with the appearances of each type of false echoes, and the situations in which each type of false echoes tends to occur.

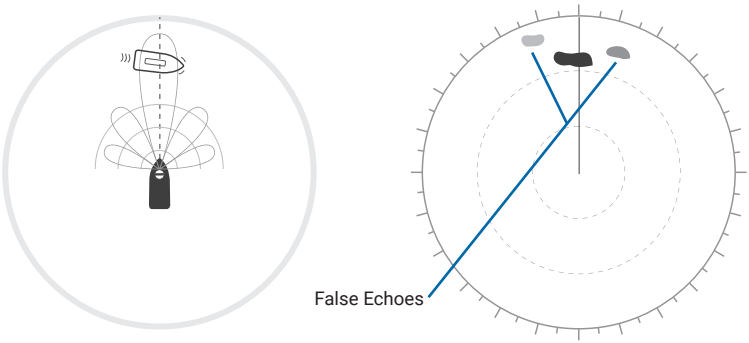
4.1 Multiple Echoes

When echoes are reflected from a nearby object, some of the reflected echoes may bounce back and forth between the own ship and the nearby object, forming multiple targets on the radar display at multiple ranges of the actual object. This effect can be reduced by decreasing Gain or adjusting the Sea clutter reduction (see *2.4*).



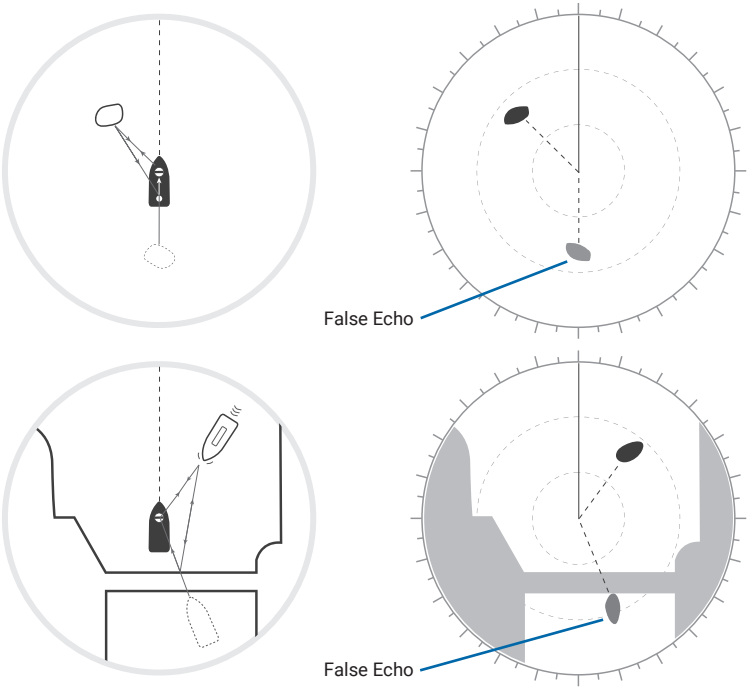
4.2 Side-Lobe Echoes

The radio waves emitted in the desired direction is the main lobe, while unwanted radiation on each side of the main lobe are called side lobes. Larger objects near the own ship may be detected by both the main lobe and the side lobes, showing duplicates at the same range. This effect can be reduced by decreasing Gain or adjusting the Sea clutter reduction (see *2.4*).



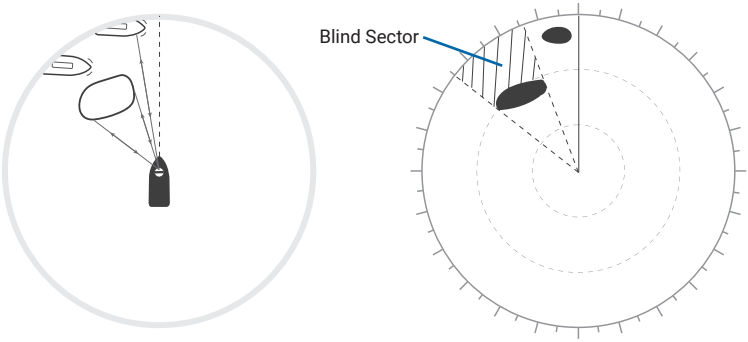
4.3 Indirect Echoes

Echoes may return indirectly through multiple reflections off surrounding objects. Indirect echoes would appear as a target at the same range as the direct echo but at the bearing from which the indirect echo was received. Indirect echoes usually have abnormal shapes and movements.



4.4 Blind and Shadow Sectors

Large or tall objects may block the path of radar beams and form a blind or shadow sector. Within a blind or shadow sector, small targets behind the blocking object may be hidden from view.



CHAPTER 5 APPENDICES

5.1 Error Message and Troubleshooting

If you encounter an error, refer to the table below for possible solutions.

Error Message	Solution
Software Update Required	Update the software.
Unit Voltage Alarm	The suggested input voltage is 10–36 VDC. Make sure there is no significant voltage drop along the power cable when the unit is in operation.
Lost Remote GPS Connection	Check the connections and the cables connecting external GPS antenna.
Satellite reception was lost.	Make sure the GPS antenna, whether internal or external, has a clear view of the sky.
Memory card is write protected.	Make sure the Lock switch is slid up to the unlock position.
Database Error	The device is unable to access the internal memory. Please contact Garmin Support.
Radar Error Code: (error code)	Please refer to the field service manual.
Radar Service Lost	Check the power and network connections on the radar and the radar display.
Radar Service Incompatible. Software Update Required.	Update the software.
Radar Service Interrupted	Check the power and network connections on the radar and the radar display.
Only one legacy radar can be connected at a time.	Make sure there are no other redundant or legacy radars connected to the network.

5.2 Hazardous Substance Table

产品中有害物质的名称及含量

部件名称	有害物质					
	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚
印刷电路板组件	×	○	○	○	○	○
金属零件	×	○	○	○	○	○
电缆 电缆组件 连接器	×	○	○	○	○	○

本表格依据 SJ/T11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

5.3 Declaration of Conformity

Issued: 28/10/2019
Revised:

DECLARATION of CONFORMITY

Application of Council Directive: 2011/65/EU 2014/30/EU

Standard to which conformity is declared:

EN 301 489-1 v2.2.0 2017-03 - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
EN 301 489-19 v2.1.1 2019-04 - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations
EN 303 413 v1.1.1 (2017-06) Satellite Earth Stations and Systems (SES); Global Navigation Satellite System (GNSS) receivers; Radio equipment operating in the 1 164 MHz to 1 300 MHz and 1 559 MHz to 1 610 MHz frequency bands
IEC 60945:2002-08 - Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results
EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013 / IEC60950-1:2005 (2nd Ed) Am 1:2009 Am 2:2013 Information technology equipment – Safety – Part 1: General requirements
EN 62368-1:2014 - Audio, video, Information & Communication. Technology Equipment - Safety requirement

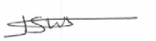
Manufactured by: Manufacturer's Address:	GARMIN International 1200 E. 151st Street Olathe, Kansas 66062 U.S.A.	&	GARMIN Corporation No.68 Zhangshu 2nd Rd., Xizhi Dist., New Taipei City 221, TAIWAN, R.O.C

Authorised Representative: GARMIN Würzburg GmbH
Beethovenstraße 1 a+b
97080 Würzburg, Germany

Type of Equipment: Portrait Radar/Sonar Display

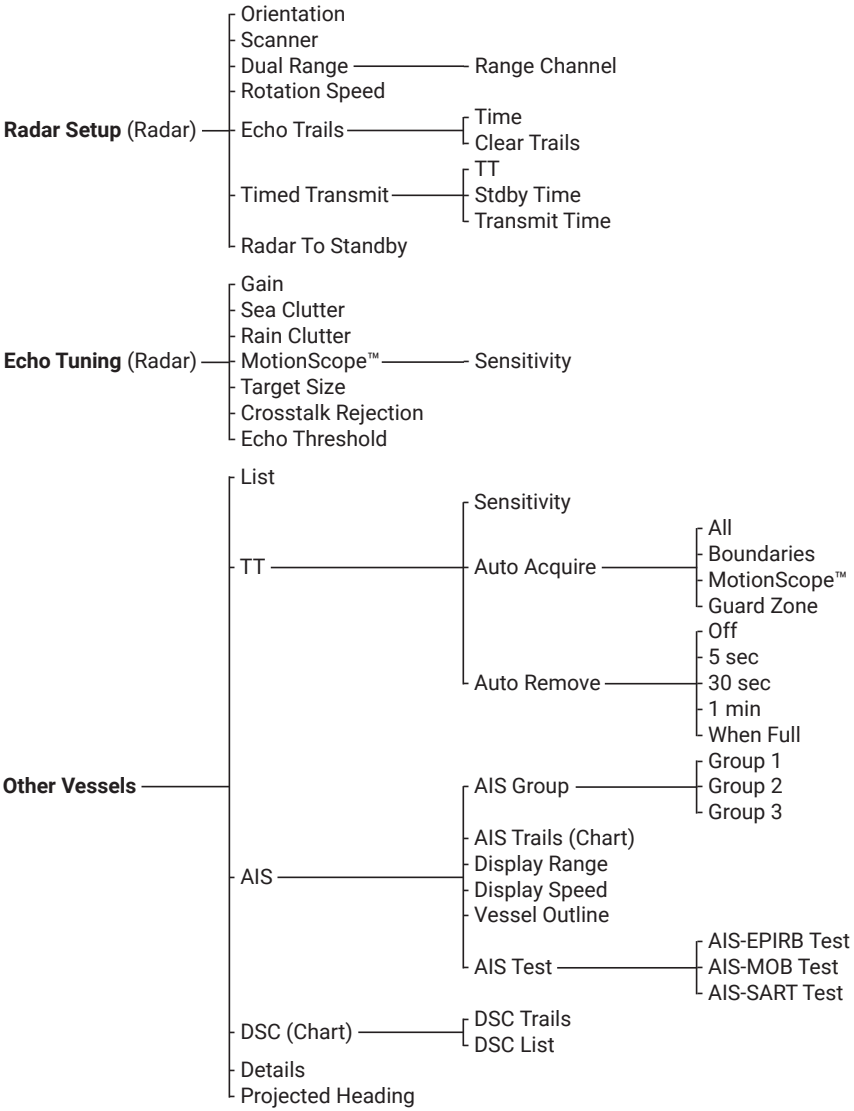
Model Number(s): A03785 (CR 1522, CR 1523, CS 1522, CS 1523)

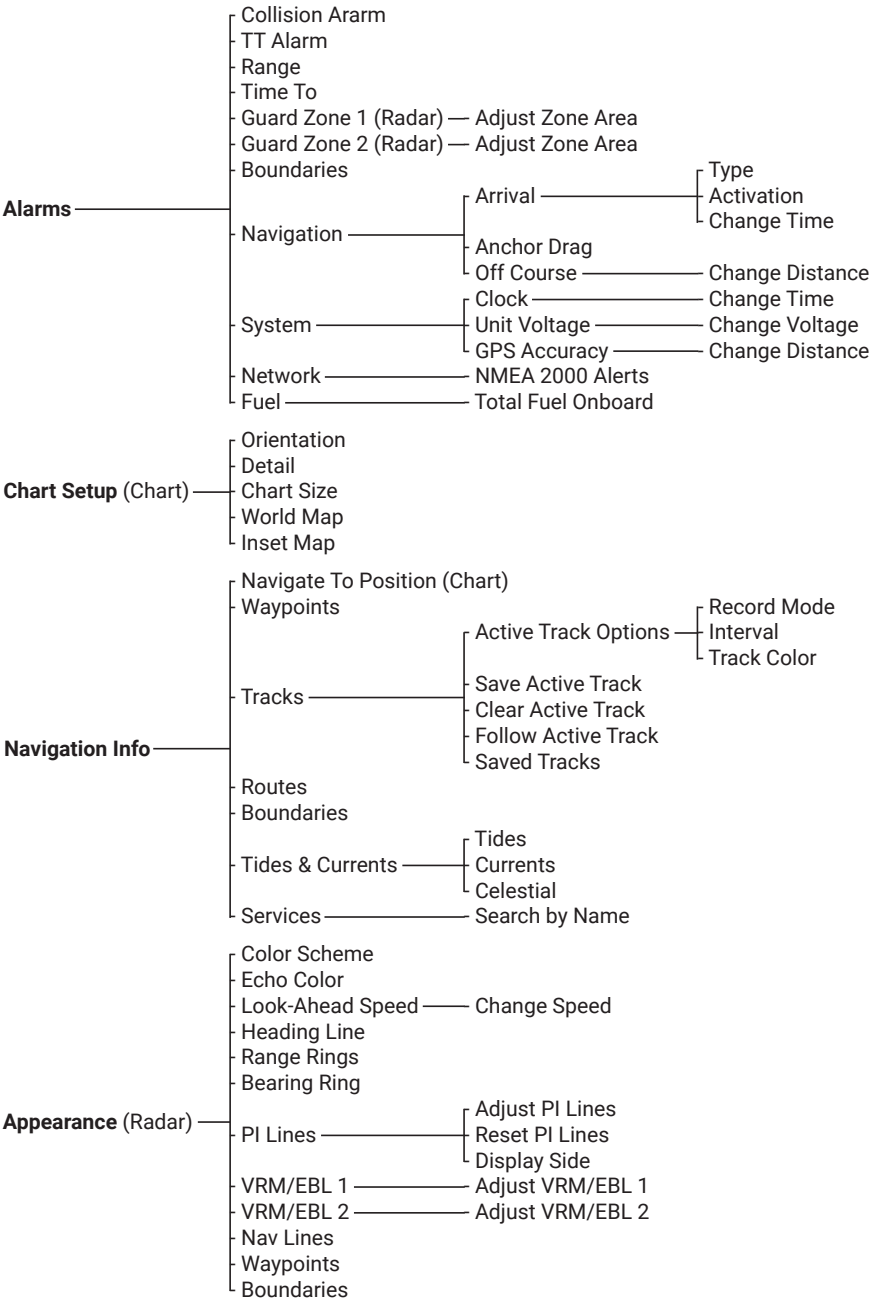
The undersigned does hereby declare that the equipment complies with the above Directives

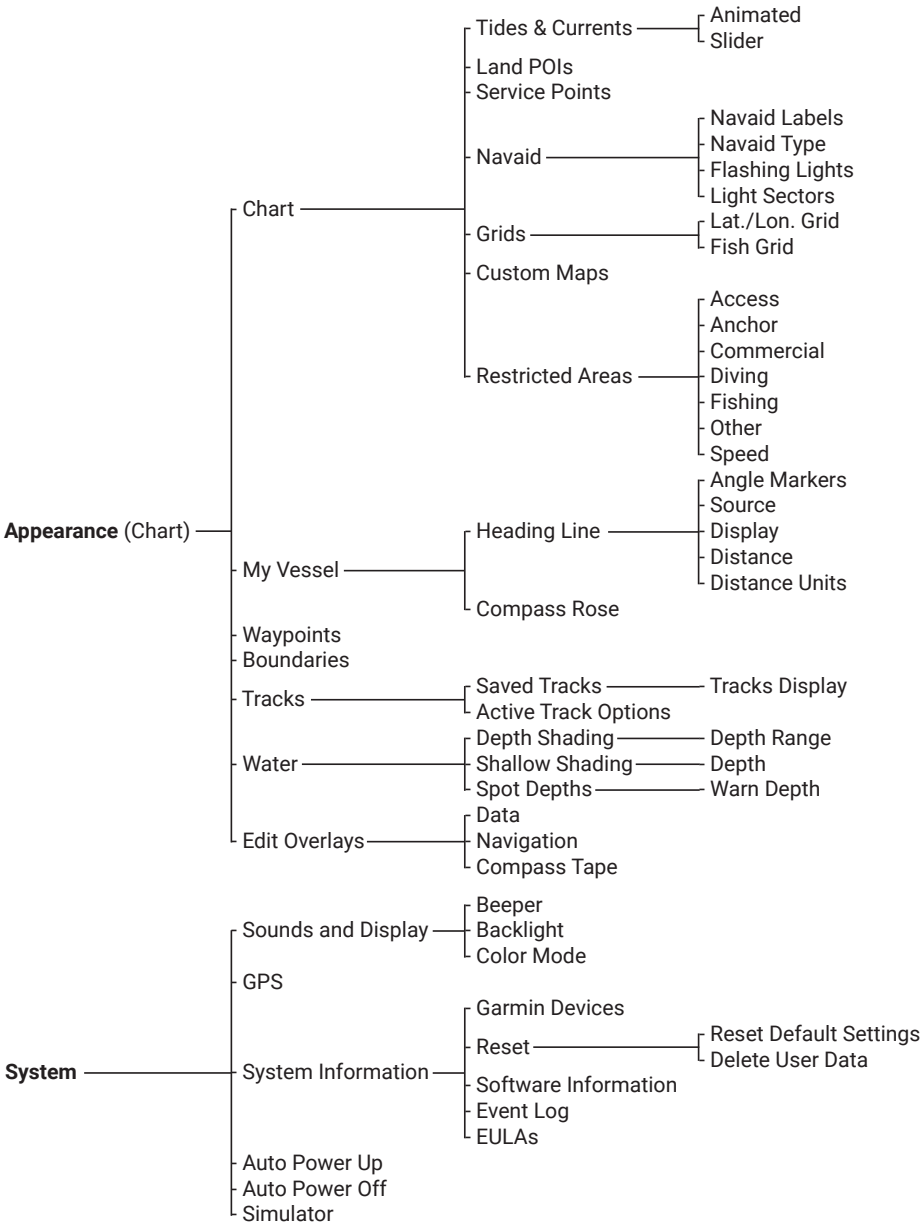


Jamie Wiltshire
Quality Supervisor
Garmin (Europe) Ltd. 28/10/2019

5.4 Menu Tree


Radar Setup (Radar)
Orientation
Scanner
Dual Range
Range Channel
Rotation Speed
Echo Trails
Time
Clear Trails
Timed Transmit
TT
Stdby Time
Transmit Time
Radar To Standby
Echo Tuning (Radar)
Gain
Sea Clutter
Rain Clutter
MotionScope™
Sensitivity
Target Size
Crosstalk Rejection
Echo Threshold
Other Vessels
List
TT
Sensitivity
Auto Acquire
All
Boundaries
MotionScope™
Guard Zone
Auto Remove
Off
5 sec
30 sec
1 min
When Full
AIS
AIS Group
Group 1
Group 2
Group 3
AIS Trails (Chart)
Display Range
Display Speed
Vessel Outline
AIS Test
AIS-EPIRB Test
AIS-MOB Test
AIS-SART Test
DSC (Chart)
DSC Trails
DSC List
Details
Projected Heading


Alarms
Collision Ararm
TT Alarm
Range
Time To
Guard Zone 1 (Radar)
Adjust Zone Area
Guard Zone 2 (Radar)
Adjust Zone Area
Boundaries
Navigation
Arrival
Type
Activation
Change Time
Anchor Drag
Off Course
Change Distance
System
Clock
Change Time
Unit Voltage
Change Voltage
GPS Accuracy
Change Distance
Network
NMEA 2000 Alerts
Fuel
Total Fuel Onboard
Chart Setup (Chart)
Orientation
Detail
Chart Size
World Map
Inset Map
Navigation Info
Navigate To Position (Chart)
Waypoints
Tracks
Active Track Options
Record Mode
Interval
Track Color
Save Active Track
Clear Active Track
Follow Active Track
Saved Tracks
Routes
Boundaries
Tides & Currents
Tides
Currents
Celestial
Services
Search by Name
Appearance (Radar)
Color Scheme
Echo Color
Look-Ahead Speed
Change Speed
Heading Line
Range Rings
Bearing Ring
PI Lines
Adjust PI Lines
Reset PI Lines
Display Side
VRM/EBL 1
Adjust VRM/EBL 1
VRM/EBL 2
Adjust VRM/EBL 2
Nav Lines
Waypoints
Boundaries


Appearance (Chart)
Chart
Tides & Currents
Animated
Slider
Land POIs
Service Points
Navaid
Navaid Labels
Navaid Type
Flashing Lights
Light Sectors
Grids
Lat./Lon. Grid
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Restricted Areas
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Other
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Tracks Display
Active Track Options
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Depth Shading
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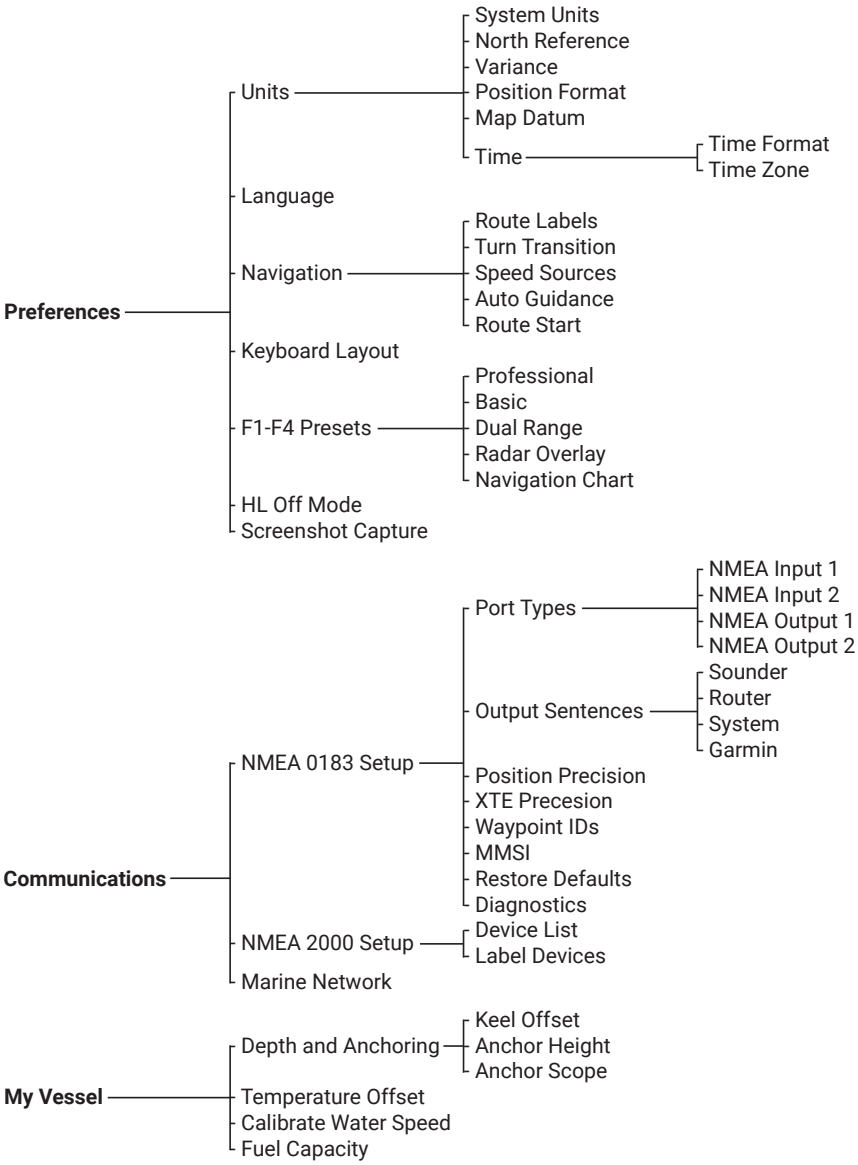
GPS
System Information
Garmin Devices
Reset
Reset Default Settings
Delete User Data
Software Information
Event Log
EULAs
Auto Power Up
Auto Power Off
Simulator


Preferences
Units
System Units
North Reference
Variance
Position Format
Map Datum
Time
Time Format
Time Zone
Language
Navigation
Route Labels
Turn Transition
Speed Sources
Auto Guidance
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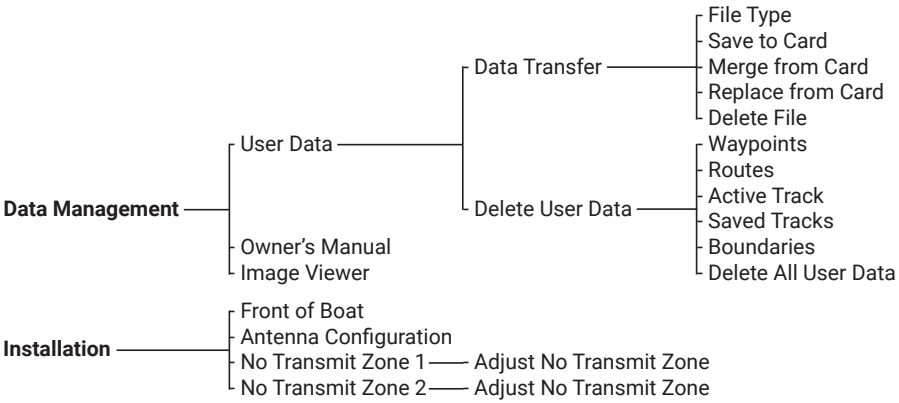
Device List
Label Devices
Marine Network
My Vessel
Depth and Anchoring
Keel Offset
Anchor Height
Anchor Scope
Temperature Offset
Calibrate Water Speed
Fuel Capacity


Data Management
User Data
Data Transfer
File Type
Save to Card
Merge from Card
Replace from Card
Delete File
Delete User Data
Waypoints
Routes
Active Track
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Boundaries
Delete All User Data
Owner's Manual
Image Viewer
Installation
Front of Boat
Antenna Configuration
No Transmit Zone 1
Adjust No Transmit Zone
No Transmit Zone 2
Adjust No Transmit Zone

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