SIMRAD

# Halo® Pulse Compression Radar

## Installation Manual

ENGLISH





simrad-yachting.com


PULSE COMPRESSION RADAR • PULSE COMPRESSION RADAR
HALO

# Preface

As Navico is continuously improving this product, we retain the right to make changes to the product at any time which may not be reflected in this version of the manual. Please contact your nearest distributor if you require any further assistance.

It is the owner's sole responsibility to install and use the instrument and transducers in a manner that will not cause accidents, personal injury or property damage. The user of this product is solely responsible for observing safe boating practices.

NAVICO HOLDING AS AND ITS SUBSIDIARIES, BRANCHES AND AFFILIATES DISCLAIM ALL LIABILITY FOR ANY USE OF THIS PRODUCT IN A WAY THAT MAY CAUSE ACCIDENTS, DAMAGE OR THAT MAY VIOLATE THE LAW.

Governing Language: This statement, any instruction manuals, user guides and other information relating to the product (Documentation) may be translated to, or has been translated from, another language (Translation). In the event of any conflict between any Translation of the Documentation, the English language version of the Documentation will be the official version of the Documentation.

This manual represents the product as at the time of printing. Navico Holding AS and its subsidiaries, branches and affiliates reserve the right to make changes to specifications without notice.

## Copyright



## Warranty

The warranty card is supplied as a separate document.

In case of any queries, refer to the brand web site of your display or system:

www.simrad-yachting.com

## Declarations and conformance

This equipment is intended for use in international waters as well as coastal sea areas administered by countries of the E.U. and E.E.A.

## Compliance Statements

The Simrad Halo® pulse compression radar,

* Comply with CE under R&TTE directive 1999/5/EC.
* The relevant Declaration of Conformity is available in the following website under model documentation section: www.simrad-yachting.com

## FCC Warning Statement

### FCC Part 15.19 Warning Statement

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

### FCC Part 15.21 Warning Statement

→ ***Note:*** NAVICO INC. IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

### FCC Part 15.105(b) Warning Statement

→ ***Note:*** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If

this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## INDUSTRY CANADA WARNING STATEMENTS:

**IC RSS-GEN, Sec 7.1.3 Warning Statement**

ENGLISH:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

FRENCH:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

**IC RSS-GEN, Sec 7.1.2 Warning Statement**

ENGLISH:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

FRENCH:

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée quivalente (p.i.r.e.) ne dépassepas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

**IC RSS-GEN, Sec 7.1.2 Warning Statement**

ENGLISH:

This radio transmitter – Halo™ Pulse Compression Radar – (4697A-HALO) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

FRENCH:

Le présent émetteur radio – Halo™ Pulse Compression Radar – (4697A-HALO) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

| Halo Antennas: | Description: | Max. permissible antenna gain (dBi): | Impedance: |
|---|---|---|---|
| 000-11464-001 | Antenna, 3ft, Halo | 26 | 50 Ohm (WR-90 Waveguide) |
| 000-11465-001 | Antenna, 4ft, Halo | 27.2 | 50 Ohm (WR-90 Waveguide) |
| 000-11466-001 | Antenna, 6ft, Halo | 29 | 50 Ohm (WR-90 Waveguide) |

## CE Compliance Statement

Countries of intended use in the EU:

| | |
|---|---|
| AT - Austria | LV - Latvia |
| BE - Belgium | LT - Lithuania |
| BG - Bulgaria | LU - Luxembourg |
| CY - Cyprus | MT - Malta |
| CZ - Czech Republic | NL - Netherlands |
| DK - Denmark | NO - Norway |
| EE - Estonia | PL - Poland |
| FI - Finland | PT - Portugal |
| FR - France | RO - Romania |
| DE - Germany | SK - Slovakia |
| GR - Greece | SI - Slovenia |
| HU - Hungary | ES - Spain |
| IS - Iceland | SE - Sweden |
| IE - Ireland | CH - Switzerland |
| IT - Italy | TR - Turkey |
| LI - Liechtenstein | UK - United Kingdom |

➔ ***Note:*** Most countries accept that RF power density levels below 100 W/m2 cause no significant RF hazard.

## Radio Frequency (RF) Exposure Information

Calculations for radar systems in table below show that the safe distance (for a rotating antenna) is within the antenna's turning circle. Irrespective, users should stay well outside the turning circle of the antenna to avoid injury through impact as it spins.

| System | 100 W /m2 Occupational safe distance | 10 W /m2 Public safe distance |
|---|---|---|
| All Halo™ Radars | 0 cm (0 ft) | 28 cm (0.92 ft) |

## Trademarks

- NMEA 2000 is a registered trademark of the National Marine Electronics Association
- Simrad is a trademark of Kongsberg Maritime AS Company registered in the US and other countries and is being used under license
- B&G, Lowrance, StructureScan, Navico, SonicHub, SimNet, Skimmer, InsightHD, Halo Pulse Compression Radar, Broadband Radar and Broadband Sonar are trademarks of Navico, registered in the US and other countries

## About this manual

This manual is a reference guide for installing the Simrad Halo pulse compression radar.

The manual does not cover basic background information about how equipment such as radars, echosounders and AIS work. Such information is available from our web site:

www.support.simrad-yachting.com

Important text that requires special attention from the reader is emphasized as follows:

➔ ***Note:*** Used to draw the reader's attention to a comment or some important information.

> ⚠ **Warning:** Used when it is necessary to warn personnel that they should proceed carefully to prevent risk of injury and/or damage to equipment/personnel.

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# 1 Introduction

This manual explains how to install the Halo® Pulse Compression Radar system. This manual should be used in conjunction with the installation manual provided with the display.

This manual is written for professional marine technicians, installation technicians, and service technicians. Dealers may use information contained in this document.

The Halo® Pulse Compression Radar combines the best characteristics of traditional pulse and FMCW broadband radar systems, our Halo™ Radar uses Pulse Compression technology to provide an unprecedented mix of long and short detection range, high target definition, and minimal clutter. Solid State technology means minimal warm-up time and maximum ocean-going reliability, while compliance with upcoming Low Emission standards makes Halo Radar safe to run in anchorages and marinas

The radar system consists of a pedestal, antenna, RI-12 radar interface and connection cables. An Ethernet network cable is used to connect the RI-12 radar interface module to the navigation Ethernet network and is intended for use in a marine environment.

➔ ***Notes:***

- Antennas are available in three sizes 3 ft, 4 ft and 6 ft to suit customer requirements.
- At the time of release the Halo radar will only work with Simrad NSSevo2 and NSOevo2 systems
- The radar should be installed by a qualified radar technician.

## Warnings

⚠ **Warning:** Use the radar at your own risk. Your radar is designed as a navigation aid. Always compare the navigation information received from your radar with data from other navigation aids and sources. When a conflict arises between the navigation data from your radar and data from other navigation aids, make sure you resolve the conflict before proceeding with navigation.

A CAREFUL NAVIGATOR NEVER RELIES ON ONLY ONE METHOD TO OBTAIN NAVIGATION INFORMATION.

International Regulations for Preventing Collisions at Sea mandate that when radar is on a vessel, the radar must be used at all times, regardless of weather conditions or visibility. Numerous court decisions have ruled that the radar must be used, and the radar operator must know all operational aspects of radar performance. Otherwise they will face a greater risk of liability if an accident occurs.

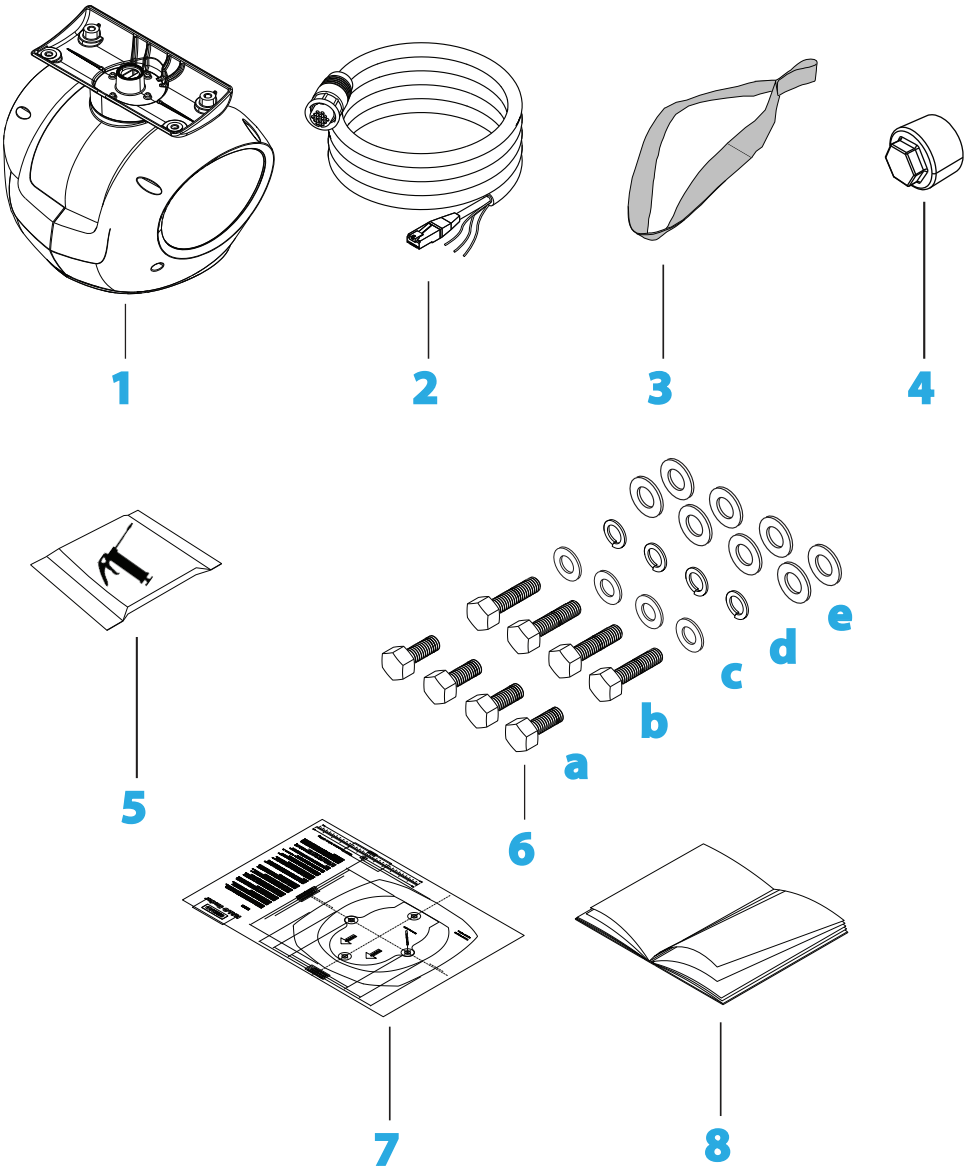
⚠ **Warning:** High Current, Stored and Microwave Energy Hazard. Technicians must exercise extreme care when working inside the unit. ALWAYS remove power before removing the cover. Some capacitors may take several minutes to discharge, even after switching off the radar. Before touching any high voltage components, ground them with a clip lead.

⚠ **Warning:** Halo™ Pulse Compression Radar's blue 4 level static accent pedestal lighting may not be approved for use in your boating location. Please check your local boating regulations before turning the blue accent lights ON.

⚠ **Warning:** The microwave energy radiated by a radar antenna is harmful to humans, especially to the eyes. NEVER look directly into an open waveguide or into the path of radiation from an enclosed antenna. Remove power or use the Safety switch on the rear of the Pedestal to turn off the radar whenever it is necessary to work on the antenna unit or other equipment in the beam of the radar.

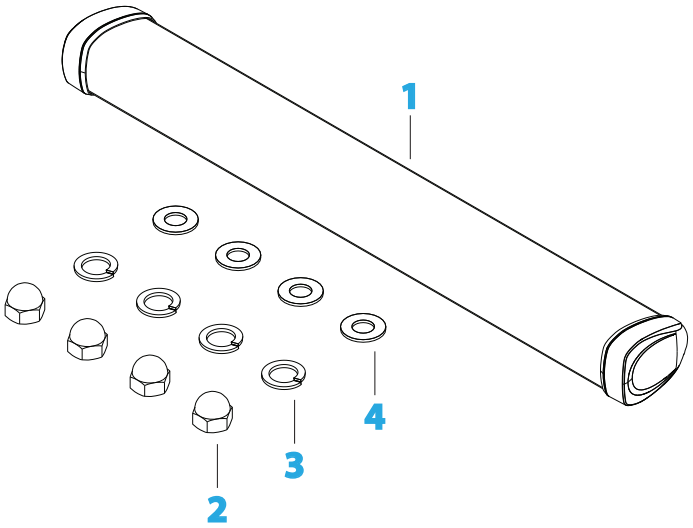
# 2 Check the parts

## Pedestal



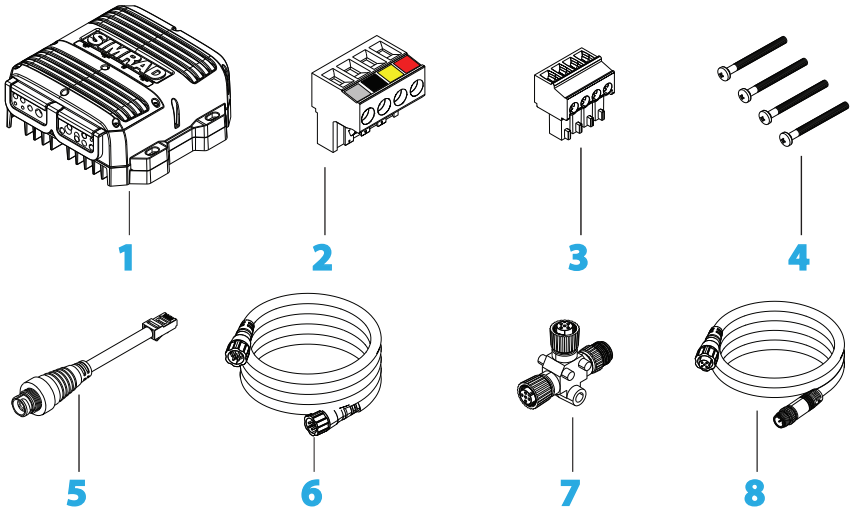

| | | |
|---|---|---|
| **1** | Radar pedestal | |
| **2** | Interconnection cable 20 m (65 ft) (other lengths available) | |
| **3** | Lifting strap | |
| **4** | Blanking plug (used when interconnection cable connected underneath the pedestal. Blanking plug is fitted underneath the pedestal when shipped) | |
| **5** | Anti-seize grease | |
| **6** | Mounting Bolts and washers | |
| | a) Bolts, hex head, M12 x 35 mm, 316 s/s | x 4 |
| | b) Bolts, hex head , M12 x 50 mm, 316 s/s | x4 |
| | c) Flat washer, M12 x 36 x 3, 316 s/s | x4 |
| | d) Spring washer, M12, 316 s/s | x4 |
| | e) Isolating washer, M12 x 38 | x8 |
| **7** | Drill template | |
| **8** | This manual | |

## Antenna




| No. | Description | |
|---|---|---|
| 1 | Radar antenna | 3 ft (3.70 ft Antenna 1127 mm (44.37″))<br>4 ft (4.70 ft Antenna 1431 mm (56.34″))<br>6 ft (6.69 ft Antenna 2038 mm (80.24″)) |
| 2 | Dome nuts, M8, 316 s/s | |
| 3 | Spring washer, M8, 316 s/s | |
| 4 | Flat washer, M8 x16x1.2, 316 s/s | |

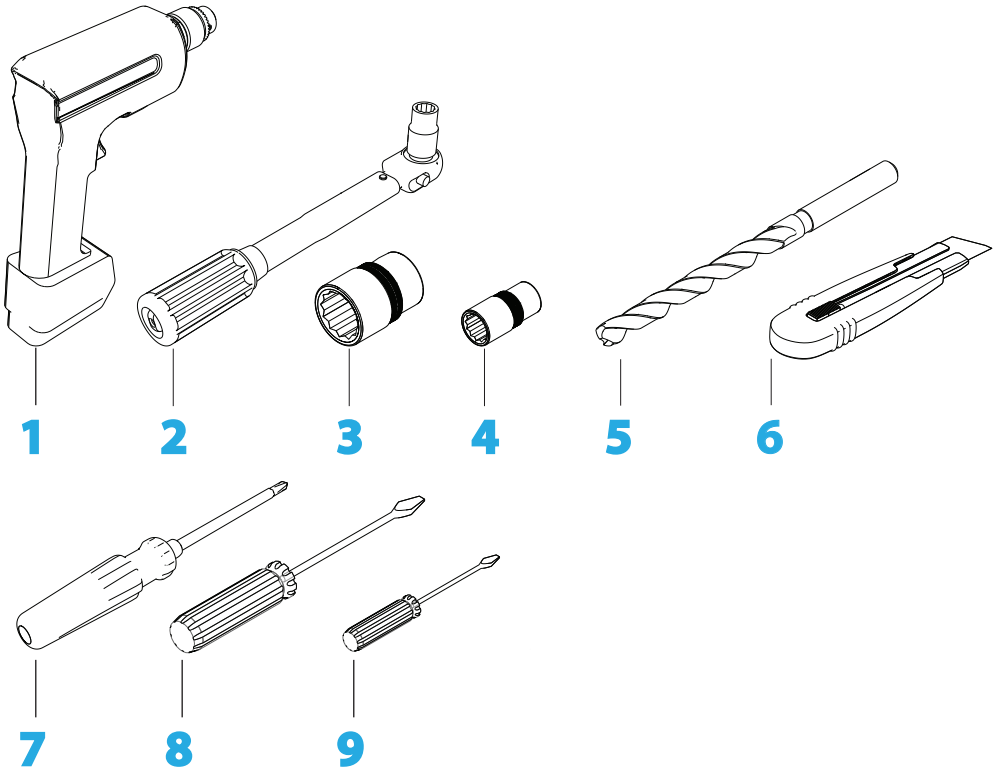
## RI-12 Radar interface module




| No. | Description |
|---|---|
| 1 | RI-12 Radar interface module |
| 2 | Connector for the pedestal interconnection cable |
| 3 | Connector for Aux In (NMEA 0183, remote power and park brake) |
| 4 | Mounting hard ware |
| 5 | Ethernet adapter. RJ45 male to 5 pin female 150 mm (5.9″) |
| 6 | Ethernet cable 1.8 m (6 ft) |
| 7 | Micro-C T Joiner |
| 8 | Micro-C drop cable 1.8 m (6 ft) |

# 2

## Tools required




| No. | Description |
|---|---|
| 1 | Drill |
| 2 | Torque wrench |
| 3 | 19 mm socket |
| 4 | 13 mm socket |
| 5 | Drill bit 12.5 mm (1/2") |
| 6 | Sharp Knife |
| 7 | Screw driver (pozidrive) |
| 8 | Screw driver (flat blade) |
| 9 | Screw driver (flat blade, small) |

# 3 Installation Guidelines

> ⚠ **Warning:** A radar unit should only be installed by a qualified marine technician, as improper installation poses risks to the installer, the public, and to the safety of the vessel.

> ⚠ **Warning:** Before commencing any installation or maintenance on the Halo radar make sure the safety switch on the rear of the pedestal is set to OFF

There is a transmit interlock that prevents radar transmissions if the scanner is not rotating. However, a high voltage remains for a period of time after the system is turned off. If you are not familiar with this type of electronics, consult with a trained service or installation technician before attempting to service any part of the equipment.

Installation includes:

- mechanical mounting
- electrical wiring
- configuring the display or network system to work with the radar
- adjusting the radar for proper performance

The radar's ability to detect targets depends greatly on the position of its scanner. The ideal location for the scanner is high above the vessel's keel line where there are no obstacles.

A higher installation position increases the radar ranging distance, but it also increases the minimum range around the vessel where targets cannot be detected and increases seaclutter pick up

When you're deciding on the location, please consider:

- The length of the 20 m (66 ft) interconnection cable supplied with the radar is usually sufficient. A longer 30 m (98 ft) cable is available. 30 m (98 ft) is the longest the cable that can be used.
- If the roof of the wheelhouse is the highest existing location, consider installing a radar mast or tower on which you can mount the radar. You may also need to construct a working platform for your own safety during installation and servicing work.
- If you locate the scanner on the mast, position it on the forward side so that there is a clear view to the front of the vessel.
- It is preferable to install the scanner parallel to the line of the keel.

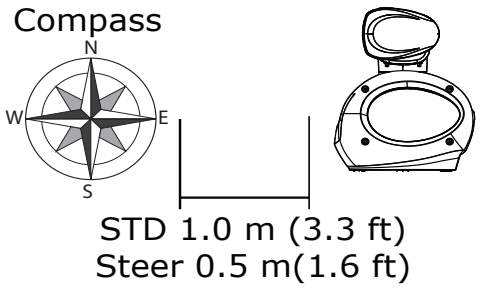
DO NOT DO THIS!

- DO NOT install the scanner too high up, where its weight will alter the stability of the vessel and cause degrade the radar picture over short ranges.
- DO NOT install the scanner close to lamps or exhaust outlets. The heat emissions may cause the equipment to break down. Soot and smoke will degrade the performance of the radar.
- DO NOT install the scanner close to the antennas of other equipment such as direction finders, VHF antennas, GPS equipment etc, as it may cause interference.
- DO NOT install the scanner where a large obstruction (such as an exhaust stack) is at the same level as the beam. The obstruction is likely to generate false echoes and/or shadow zones. If no other alternative location use the sector blanking feature in the radar software. (see "" on page 33)
- DO NOT install the scanner where it will be subjected to strong vibrations because the vibrations could degrade the performance of the radar.
- DO NOT install an open array close to halyards or flags because the wind could wrap these around the antenna and jam it.

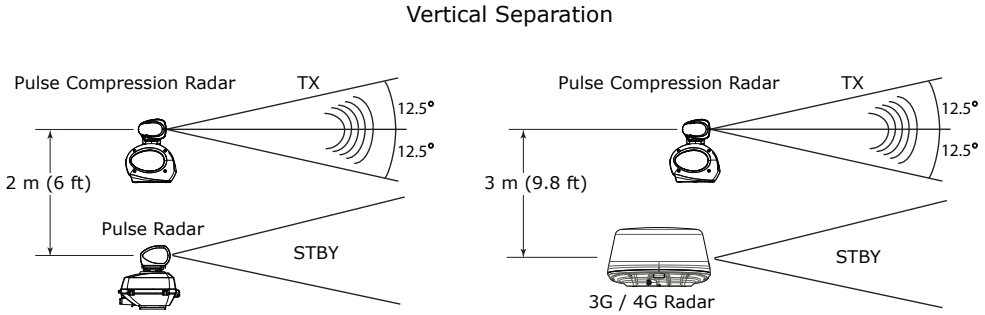
## Compass safe distance

> **Warning:** Do not install the radar inside of the recommended compass safe distances of any navigation instruments such as the magnetic compass and the chronometer. The compass safe distances are as follows:

Minimum distance to install near the ships compass is 1.0m (3.3 ft).



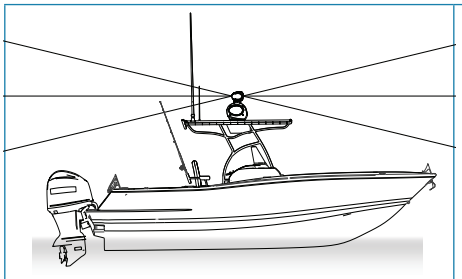

## Multi-radar installations



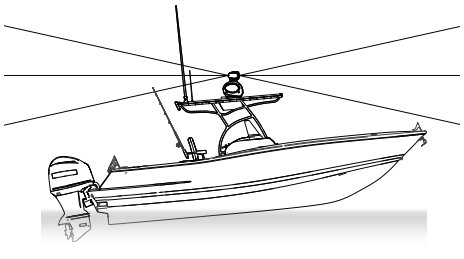

**Do not** install the Halo® pulse compression radar on the same beam plane as a conventional pulse radar. A pulse radar must be set to STBY or OFF any time the Halo® radar is being operated.

→ ***Note:*** Possible interference could be reduced by using the sector blanking feature (see "Sector blanking" on page 34)

## Power boat installations

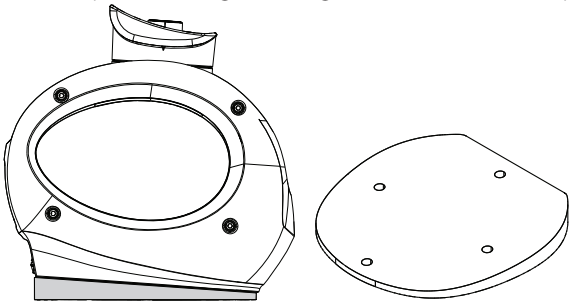


If possible ensure that the location site provides the scanner with a clear view all round the vessel.



Installations on power boats that have a steep planing angle, it is recommended to tilt the scanner angle down at the front. (Beam angle is 12.5° either side of center).

→ ***Note:*** Optional 4 degree wedge available from third party suppliers such as SeaView RW4-7

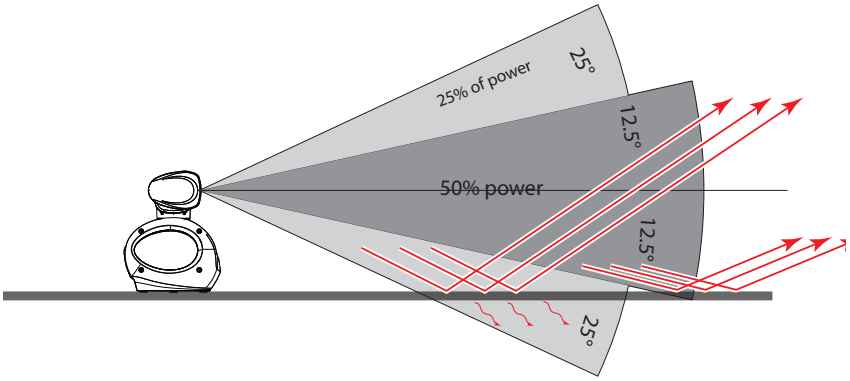


## Considerations for direct roof mounting

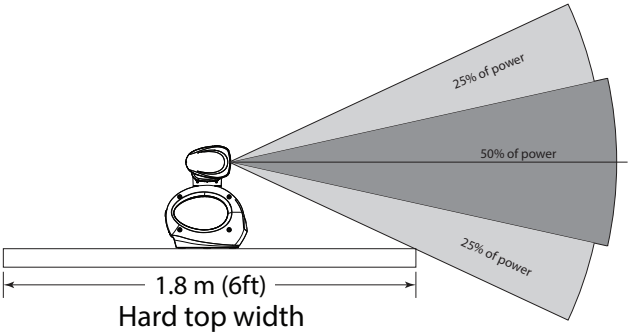
When deciding a suitable mounting location for the Halo® Pulse Compression Radar be aware that the vertical radar beam extends to 25° either side of horizontal. With 50% of the power projecting in a beam 12.5° off horizontal. If the radar beams cannot clear the roof line, this will decrease performance of the radar. Depending on the size of the hard top of the vessel, it is recommended to elevate the antenna to allow the radar beams to clear the roof line. Below are guide lines on heights above the hard top.

The below illustrates an installation with the Halo® Pulse Compression Radar mounted directly on to a large hard top. This installation could suffer decreased performance as the radar energy is either reflected or absorbed by the hard top.

➔ ***Note:*** Where the mounting surface is constructed of any form of metal you must elevate the dome so that the beam has complete clearance, else performance will be severely impaired.

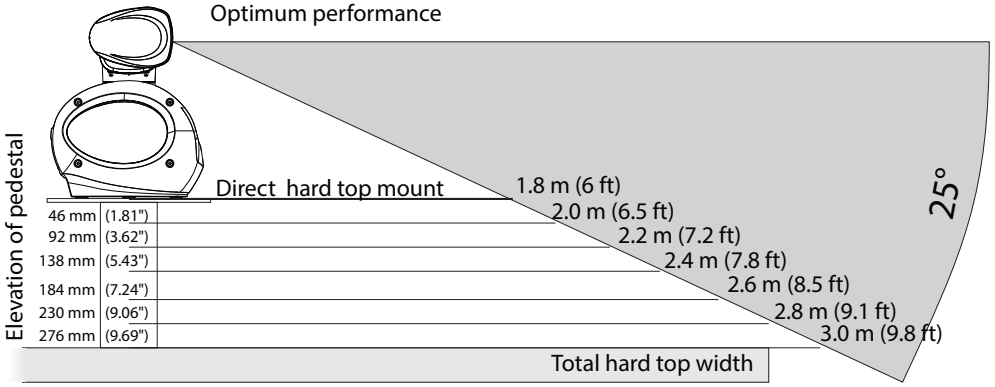



For best performance, the radar should be positioned to allow the beams to clear the superstructure of the boat.




Below is a guide to determine the antenna height in relation to a vessels hard top overall width.

Every Increase of 200 mm (7.9") of hard top total width over 1.8m wide: Increase the height of the antenna by 46 mm (1.8")




There are many radar mounting options available from third party vendors such as Seaview, Scanstrut and Edson. (see "Third party mounting options" on page 44)

# 4 Hardware mounting

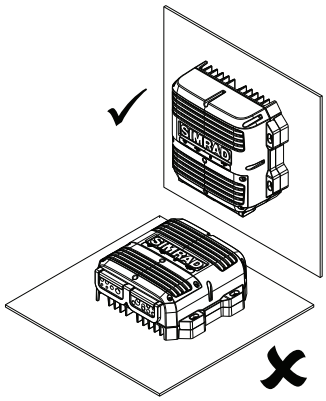
## Install the RI-12 radar Interface module

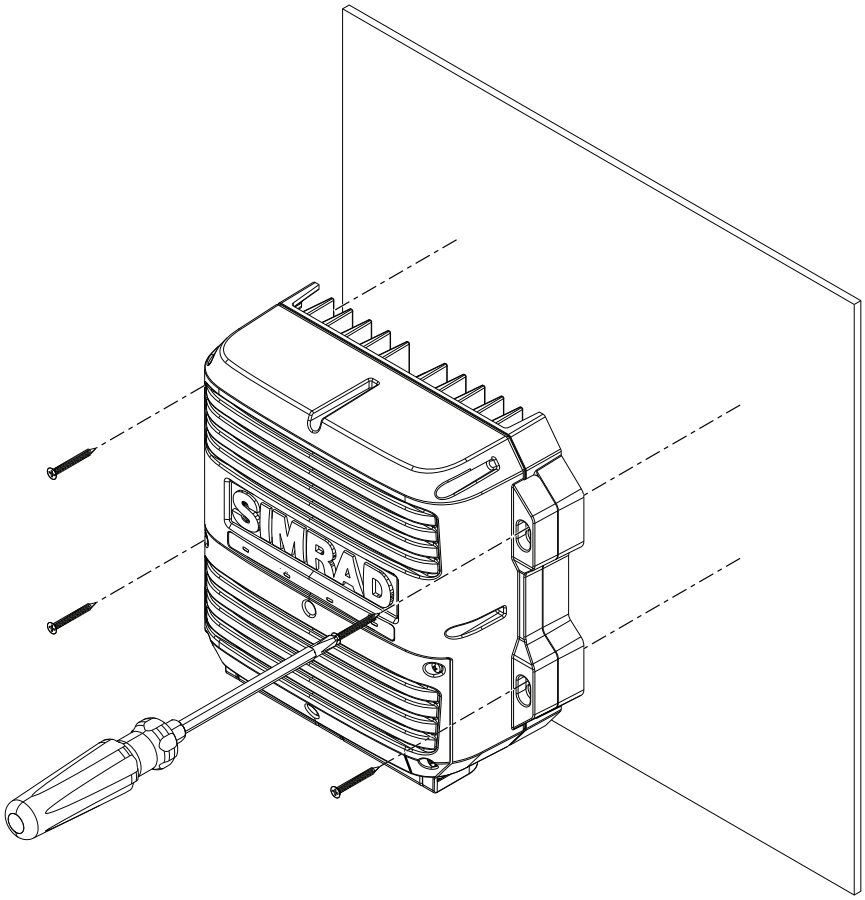
Install the RI-12 in a dry location away from spray, rain, drips and condensation or excessive heat. The mounting position should be easily accessible.

Always mount the RI-12 vertically, with the cable entry points facing downwards. This is to assist in cooling and to assist stopping any possible water ingress though the cable grommets.

The RI-12 must be located where it can be easily connected to the ship's ground, the pedestal interconnection cable, the power cable and the NMEA 2000 network. Check that these cables and the ship's ground can easily reach the radar processor BEFORE you drill.

Use fasteners suited to the mounting surface material. If the material is too thin for self tappers, reinforce it, or mount the RI-12 with machine screws nuts and washers. Use only 304 or 316 stainless steel fasteners. Mark the screw locations using RI-12 box as a template, and drill pilot holes.



## Install the pedestal

The eight hex head bolts supplied are suitable for surfaces up to 25 mm (1″) in thickness.

Use the 4 x M12 x 35 mm for a surface thickness from 5 mm (0.2″) up to 13 mm (1/2")

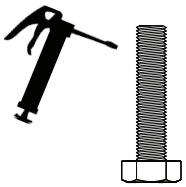
Use the 4 x M12 x 50 mm for surface thickness from 13 mm (1/2″) up to 25 mm (1″)

If using longer bolts make sure they are of marine grade stainless steel and allow for minimum of 12 mm (0.3″) and maximum of 20 mm (0.7″) of thread contact.

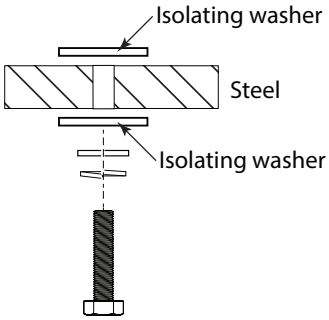
Use the supplied isolating washers where installed onto a steel surface.

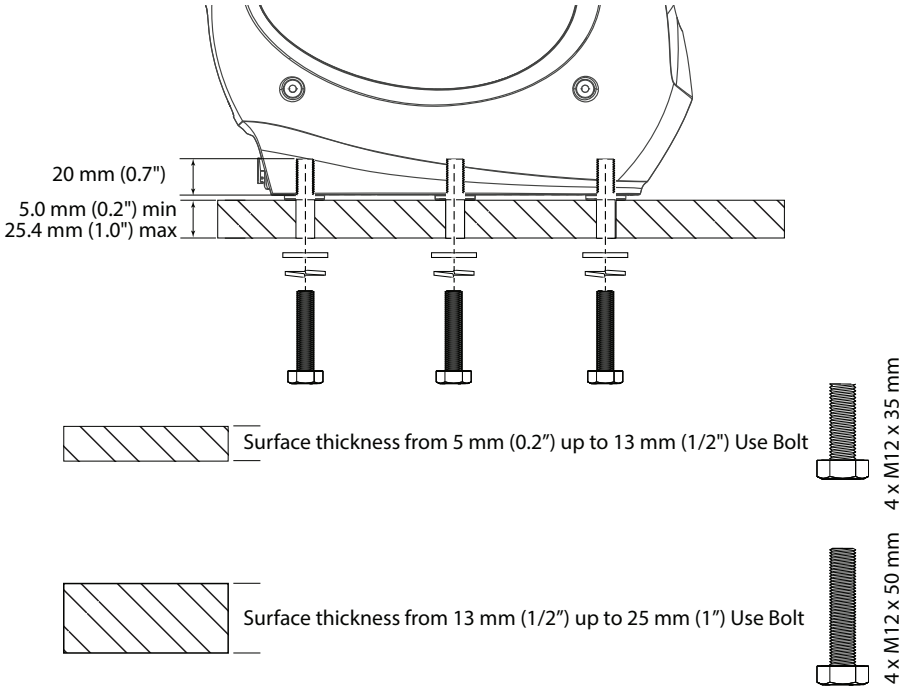
Apply a light coating of the supplied anti-seize paste to each bolt.

Apply a light coating of anti-seize paste to each bolt.



For steel boats use the supplied isolating washers.



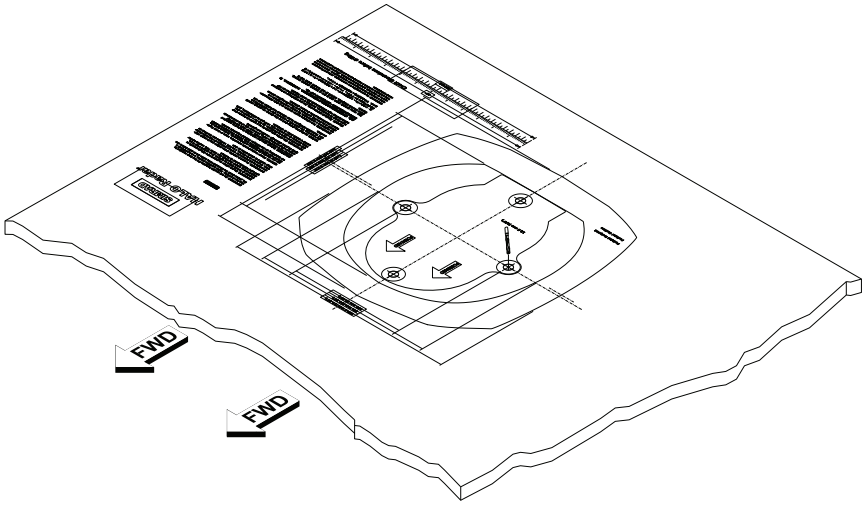




1. Run the interconnection cable between the pedestal and the location of the RI-12 Interface module. The 14 pin connector end of the interconnection cable connects to the pedestal.

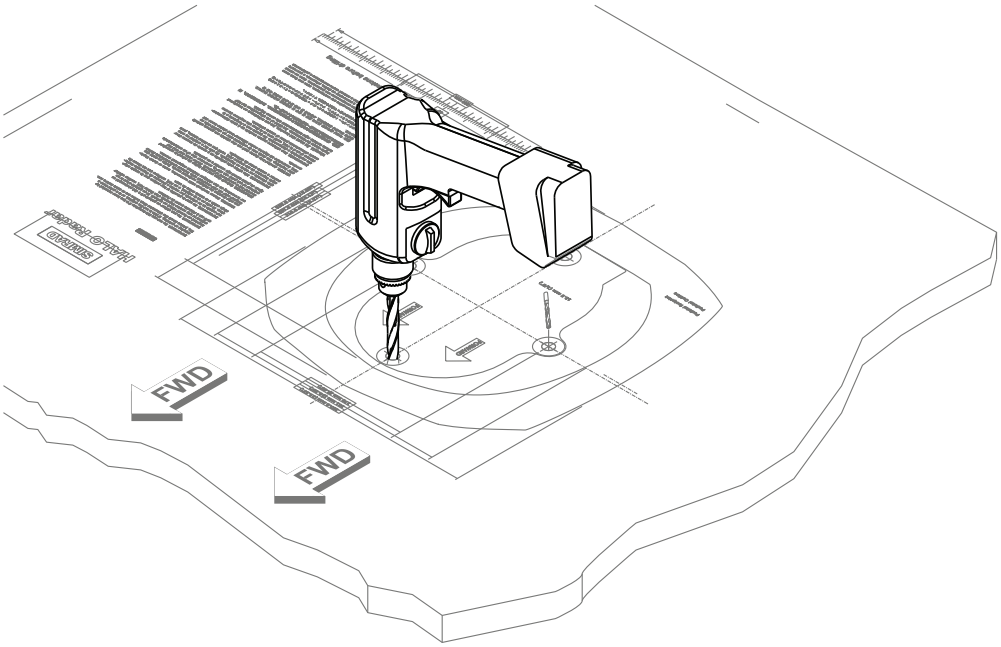
   → ***Note:*** Protect the connectors especially the RJ45 connector when pulling cable through the boat and avoid putting strain on to the connectors

   → ***Note:*** The interconnection cable is 9 mm in diameter. A 14 mm hole will be required in order for the RJ45 connector end to pass through to the RI-12 or 24 mm for the 14 pin connector to pass through to the pedestal..

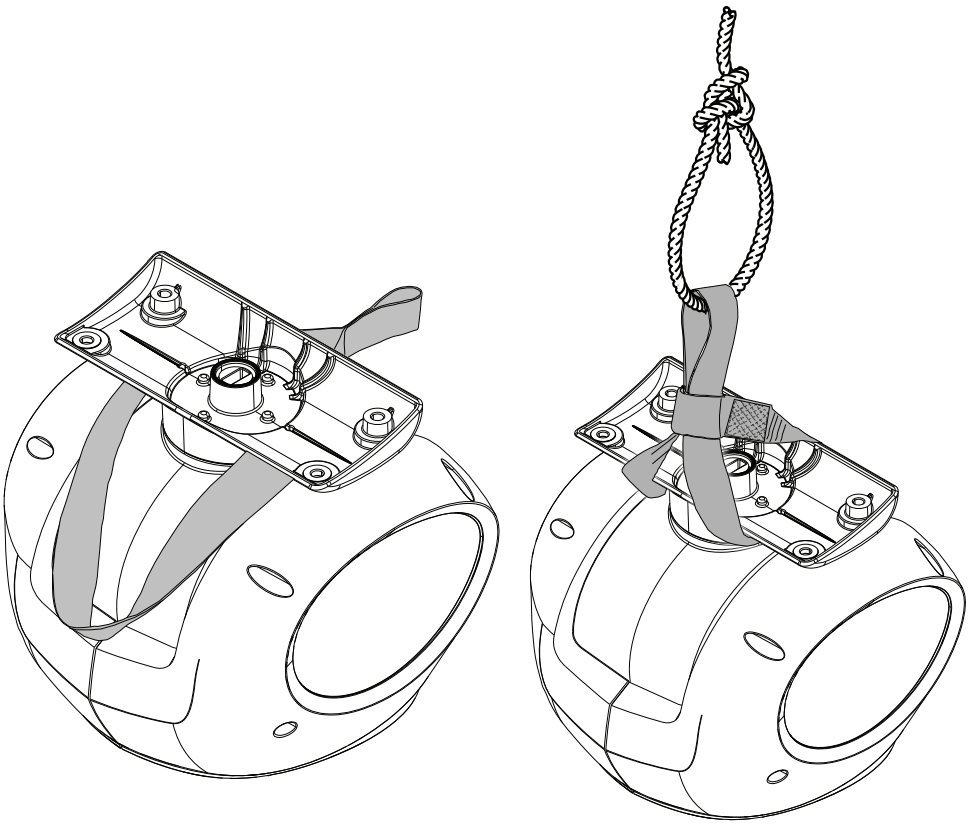
2. Stick down the mounting template in the desired installation location, observing correct orientation. (Minor deviation can be compensated for in the radar software).

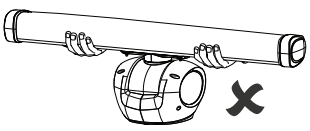


3. Drill pilot holes, Then use a 12.5 mm (1/2") drill bit to drill the four holes where shown on the mounting template.




4. Remove the mounting template .
5. Lift the pedestal into position using the supplied lifting strap.



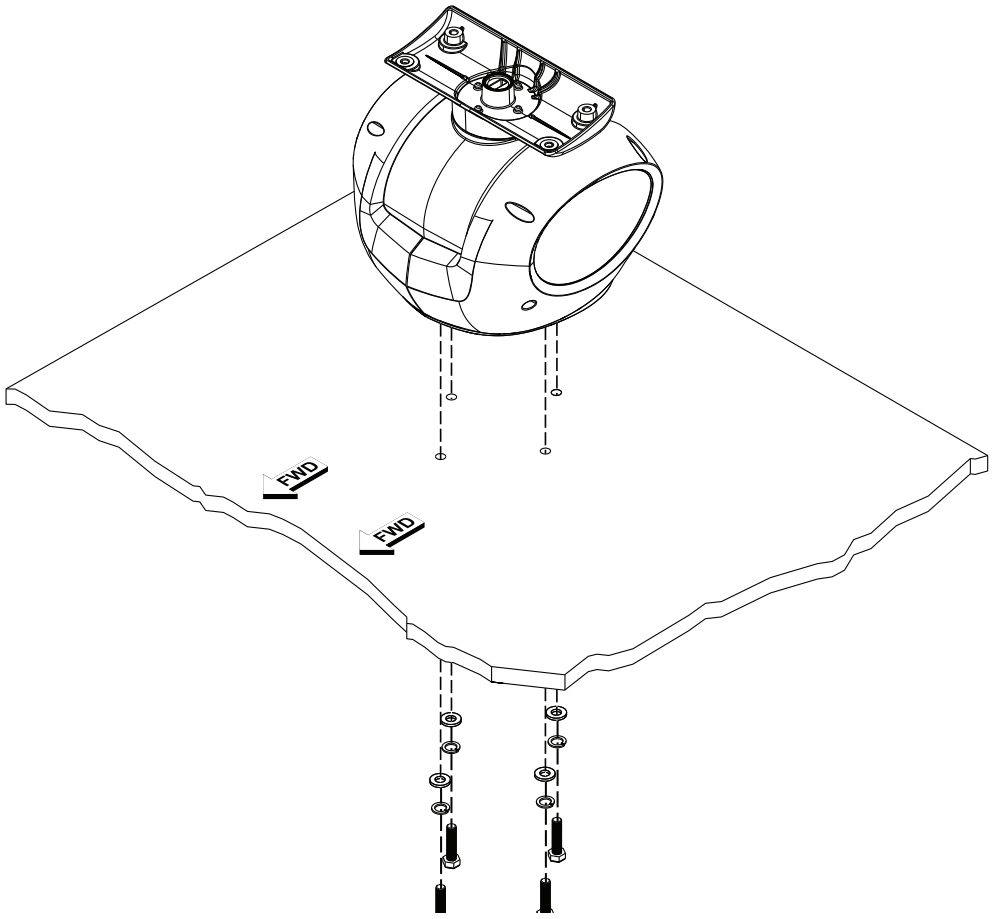


**Warning:** Do not lift the pedestal with the antenna attached

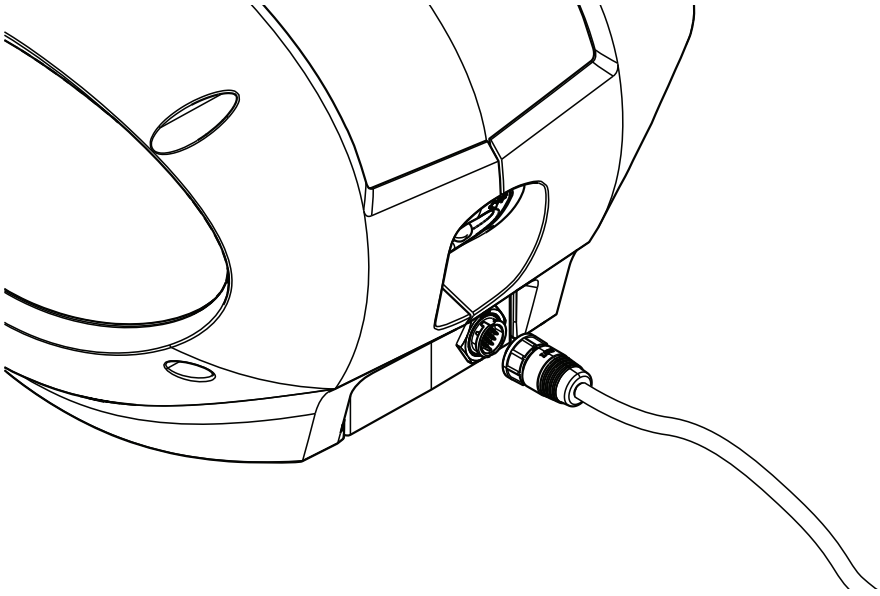
### Surface mount: Rear cable connection

1. Position the scanner carefully over the bolt holes so that they are aligned.
2. Place a flat washer and spring washer onto each bolt, as shown.
3. Add a light coating of anti-seize grease to the threads of each bolt
4. Insert bolts into the drilled holes and locate into the pedestals threaded mounting holes and tighten securely.

→ ***Note:*** The torque settings for the mounting bolts are 30 N.m – 40 N.m (22.1 ft·lbf – 39.5 ft·lbf).




5. Connect the 14 pin end of the interconnection cable. Take care to align the connector correctly to avoid bending the pins. Secure the locking collar by rotating clockwise until it clicks.

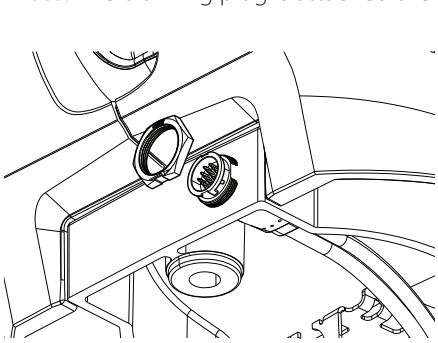


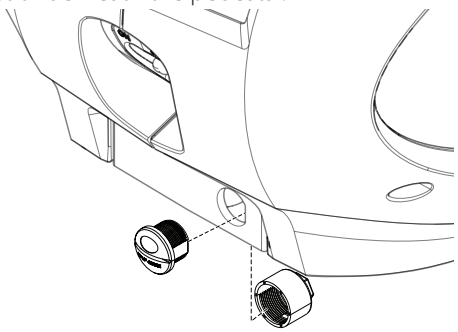
### Pole or tower mount: Discreet cable connection

The interconnection cable can be optionally connected discreetly underneath the pedestal by moving the 14 pin connector at the rear of the pedestal to a bracket underneath the pedestal.

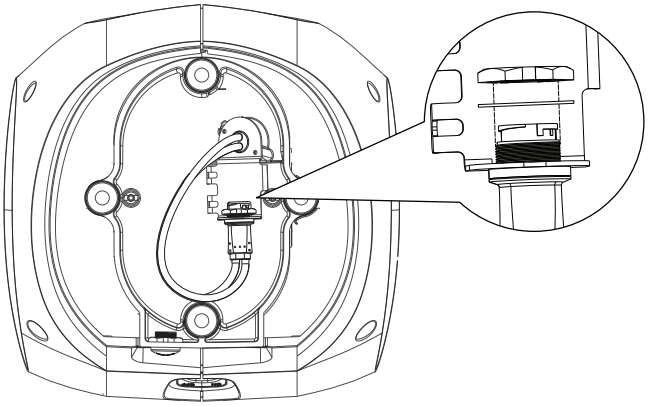
1. Remove the retaining nut and pull back the connector and fly lead.
2. Fit the supplied blanking plug where the connector used to be.

➔ ***Note:*** The blanking plug is attached the bracket underneath the pedestal.

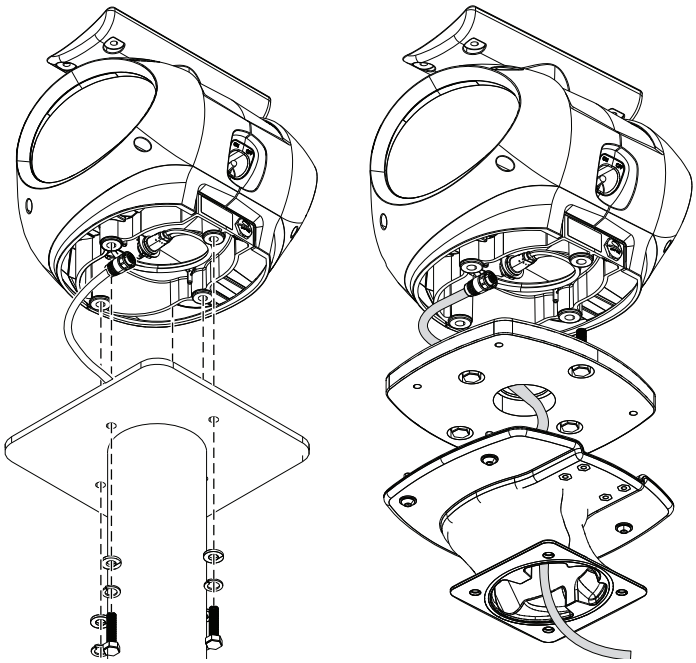




3. Re-route the internal fly lead to the bracket and secure with the nut.



4. Connect the interconnection cable. Take care to align the connector correctly to avoid bending the pins. Secure the locking collar by rotating clockwise until it clicks.
5. Lower the pedestal carefully over the bolt holes so that they are aligned.
6. Place a flat washer and spring washer onto each bolt, as shown.
7. Insert bolts into the drilled holes and locate into the pedestals threaded mounting holes and tighten securely.



## Fitting the antenna to the pedestal

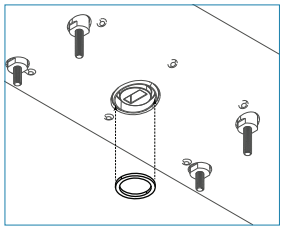
1. Remove the protective cap from the pedestal and the protective label on the antenna that protects the wave guide.

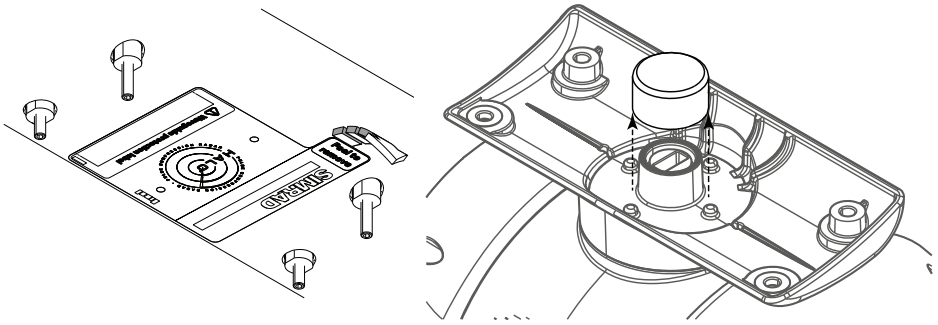
> ⚠ **Warning:** Do not operate the radar without the antenna connected.

➔ ***Note:*** The protection label and waveguide cover is in place to prevent contaminants from entering the waveguide. These covers MUST BE REMOVED IMMEDIATELY PRIOR TO INSTALLING THE ANTENNA TO THE PEDESTAL.

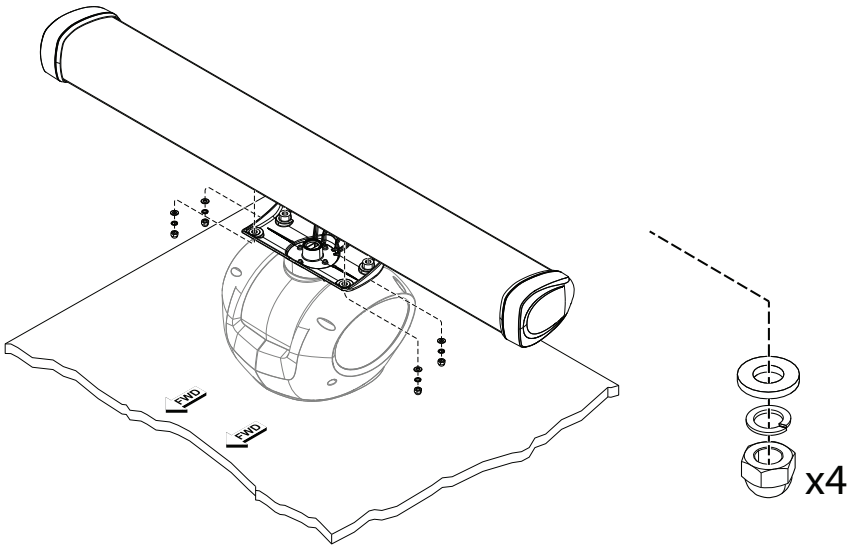
➔ ***Note:*** A antenna Sealing Ring is located under this label in the antenna waveguide chamber. Ensure the Sealing Ring remains in place prior to installing the antenna to the pedestal.

Ensure the Sealing Ring remains in place prior to installing the antenna to the pedestal.



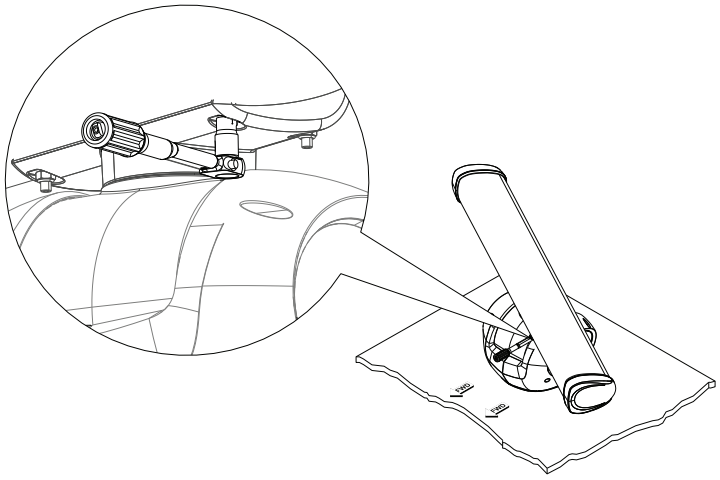


2. Carefully lower the antenna on to the pedestal. The antenna can only fit one way




3. Place a flat washer then a split washer followed by a dome nut on to each of the four antenna studs. Tighten the dome nuts using socket and torque wrench to 15 N.m (11 ft·lbf)

➔ ***Note:*** A socket wrench is recommended to minimise risk of chipping the powder coated surface of the pedestal

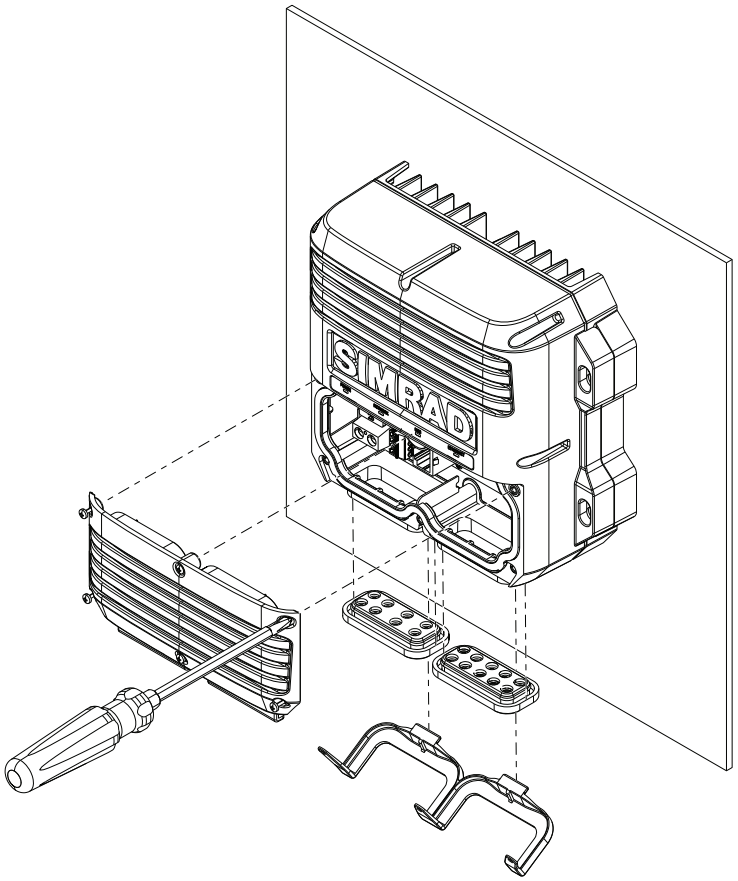


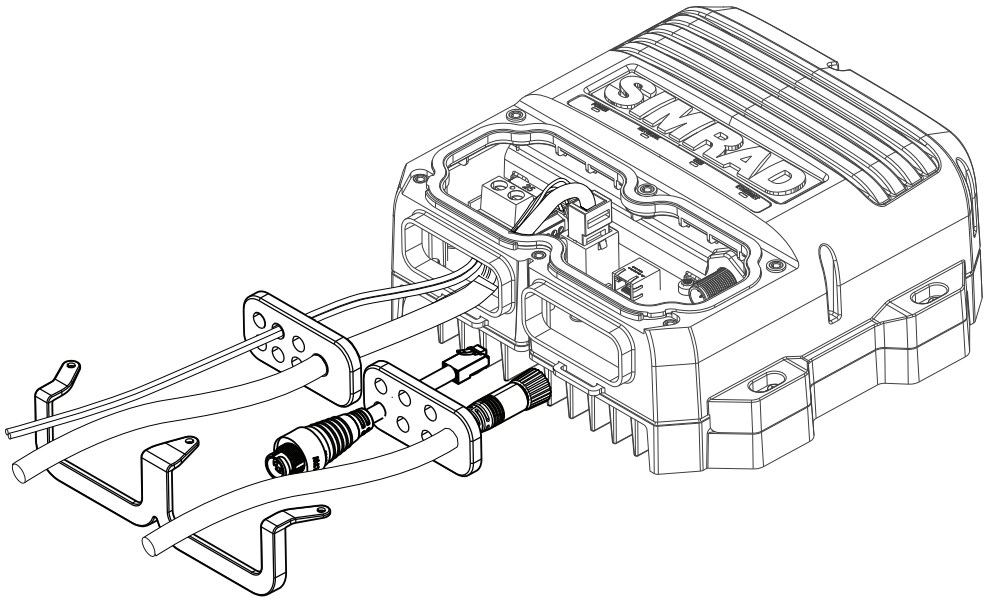
# 5 Wiring

> ⚠ **Warning:** SAFETY SWITCH. The pedestal unit has a safety switch, which removes power from the radar and disables the antenna rotating during maintenance and service. Make sure switch is set to off before commencing installation and back to ON after completion

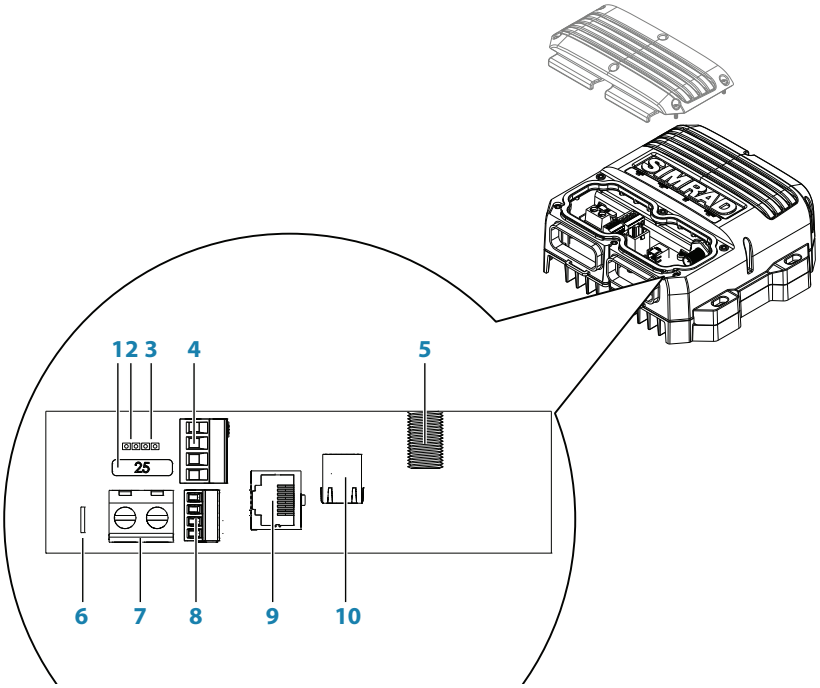
All wiring connections are made inside the RI-12 interface box. It is necessary to remove the lid to gain access to the connections

1. Remove the lid by unscrewing the six retaining screws
2. Remove the grommet retaining clip
3. Remove the rubber grommets
4. Pass the cables through the rubber grommets and into the RI-12. Use a sharp knife to cut a slit the grommet.



## RI-12 connections




| No. | Name | Description |
|---|---|---|
| 1 | FUSE | 25 Amp blade fuse |
| 2 | Power control: REMOTE | Remote power control activation jumper. Move to REMOTE position so radar power state is controlled by a multifunction display or switch (see "Remote power control" on page 27) |
| 3 | Power control: AUTO | Radar will turn on when power is applied to the main power connector. Remote power wire on AUX IN port is ignored |
| 4 | SCANNER POWER | Large green connector: Provides 36 V DC up to the pedestal and power for the park brake. Connect the four wires of the interconnection cable matching the color coded sticker on the connector |
| 5 | NMEA 2000 | Micro-C: NMEA 2000 network connection |
| 6 | SCREEN | Alternative chassis ground connection (see "Grounding requirements" on page 26) |
| 7 | - SUPPLY+ | 12 or 24 V DC input<br>12 volt system limits 10.8 V DC to 15.6 V DC<br>24 volt system limits 20 V DC to 31.2 V DC |
| 8 | AUX IN | Small connector: NMEA 0183 data input, remote power on and DC input for the antenna park brake |
| 9 | SCANNER | RJ45: Ethernet data from the pedestal. Connect the RJ45 connector of the interconnection cable |
| 10 | NETWORK/MFD | RJ45: Connects the radar to the navigation Ethernet network |

## LED Indicator lights

| LED | Color | Indication |
|---|---|---|
| Power | Green steady | Power is applied and the radar is turned on (by either remote power on or power control jumper set to Auto). |
| | Off | No supply voltage |
| Comms | Green fast flashing | NMEA 2000 traffic present |
| | Green slow flashing | RI-12 with pedestal communication active |
| | Off | No NMEA 2000 data and no communication with the pedestal |
| Status | Green steady | Radar is transmitting |
| | Orange | Radar is in standby |
| | Red | Low input voltage < 10 V DC (RI-12 has stopped sending power to the pedestal) |
| | Red flashing | Power supply fault |
| Ethernet | Green fast flashing | Successful communications with an MFD |
| | Green steady | Physical connection to an Ethernet device exists but there is no communication with any MFD |
| | Off | No connection to any other active Ethernet device |

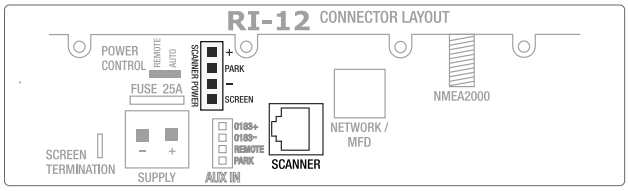
## Pedestal Interconnection cable

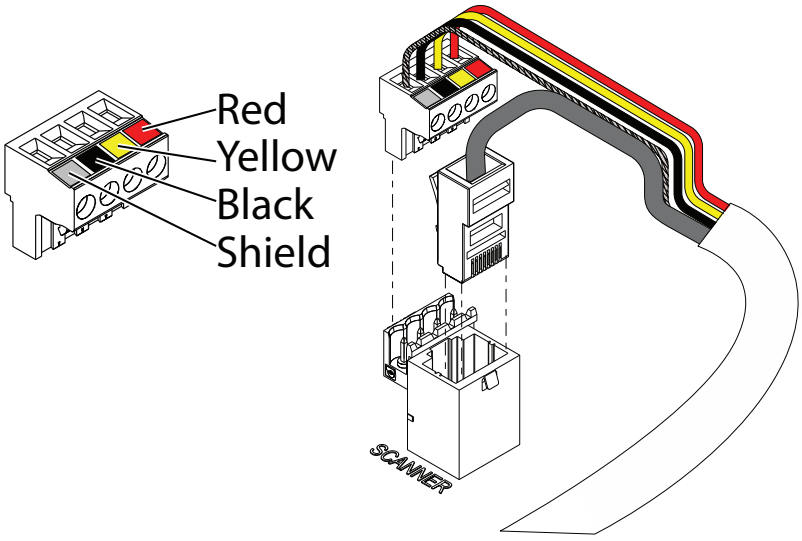
The interconnection cable connects the radar pedestal to the RI-12 Interface module. The cable connects to the pedestal using a 14 pin connector. The pedestal 14 pin connector can be set to either rear exit or discrete exit underneath the pedestal. (see "Pole or tower mount: Discreet cable connection" on page 19)

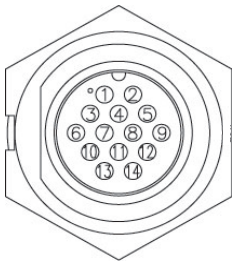
➔ ***Note:*** Protect the connectors especially the RJ45 connector when pulling cable through the boat and avoid putting strain on to the connectors.

The interconnection cable is 9 mm in diameter. A 14 mm hole will be required in order for the RJ45 (Interface module end) to pass through bulkheads or 24 mm hole for the 14 pin connector (pedestal end) to pass though.

Run the interconnection cable between the pedestal and the location of the RI-12 Interface module.



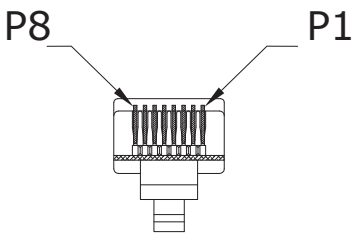


Scanner connector

Cable connector
Diameter = 23 mm

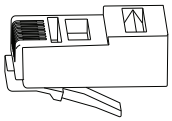
| Pin-out | Wire color | |
|---|---|---|
| 1 | Black | Pedestal power DC (-) |
| 2 | Red | Pedestal power DC (+) |
| 3 | Yellow | Park angle retention |
| 4 | Drain | Tinned wire |
| 5 | N/A | N/A |
| 6 | Blue | RJ45 Pin 4 |
| 7 | White / Blue | RJ45 Pin 5 |
| 8 | White / Brown | RJ45 Pin 7 |
| 9 | Brown | RJ45 Pin 8 |
| 10 | White / Green | RJ45 Pin 3 |
| 11 | N/A | N/A |
| 12 | White / Orange | RJ45 Pin 1 |
| 13 | Green | RJ45 Pin 6 |
| 14 | Orange | RJ45 Pin 2 |

**RJ45 Connector pinout**

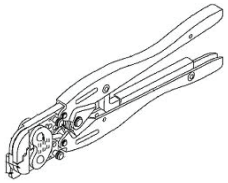



| Pin | Color |
|---|---|
| 1 | White/Orange |
| 2 | Orange |
| 3 | White/Green |
| 4 | Blue |
| 5 | White/Blue |
| 6 | Green |
| 7 | White/Brown |
| 8 | Brown |

**Required to complete**



RJ45 Connector



RJ45 Crimping tool

## Connect the power cable

Power for the radar is connected to the RI-12 Interface module. The radar requires either a **12 or 24 V DC** supply capable of delivering 20 A for 12 V system and 10 A for 24 V system.

The RI-12 is protected against reverse polarity, over and under voltage. The RI-12 must be connected to a dedicated fuse/circuit breaker. Use a 25 A for 12 V systems or 15 A for 24 V systems. The fuse/circuit breaker should be labeled accordingly.

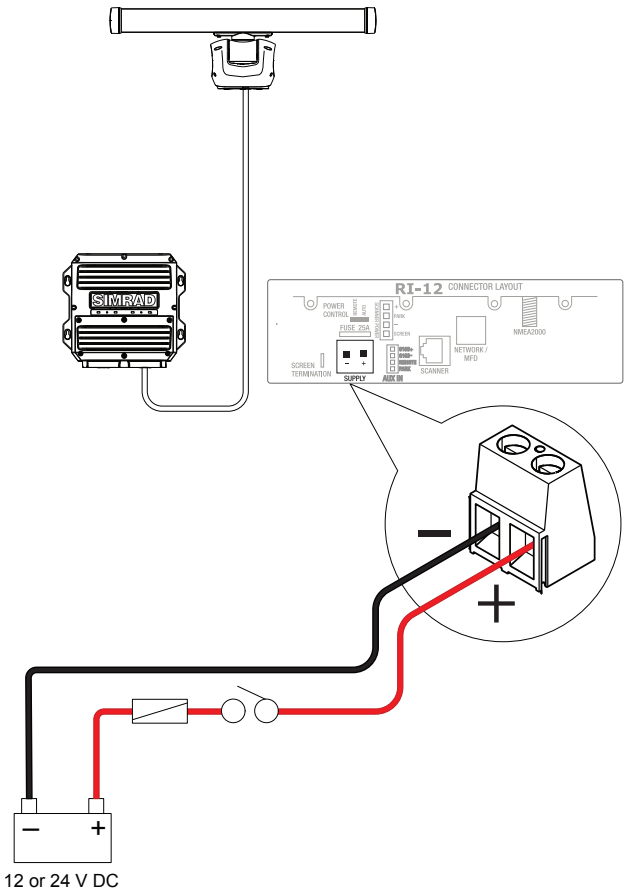
| Voltage | Cable length | | | |
|---|---|---|---|---|
| | 2 m (6.6 ft) | 5 m (16.4 ft) | 10 m (32 ft) | 20 m (66 ft) |
| 12 V DC | 2.1 mm (12-AWG) | 3.3 mm (8-AWG) | 4.1 mm (6-AWG) | N/A |
| 24 V DC | 1.3 mm (14-AWG) | 2.1 mm (12-AWG) | 3.3 mm (8-AWG) | 4.1 mm (6-AWG) |

➔ ***Notes:***

- Above values in mm=diameter of the cable conductor
- The RI-12 has an optional remote power control mode that can enable a compatible multifunction display or ignition switch to control the power state of the radar (see "Remote power control" on page 27)

### Connecting power

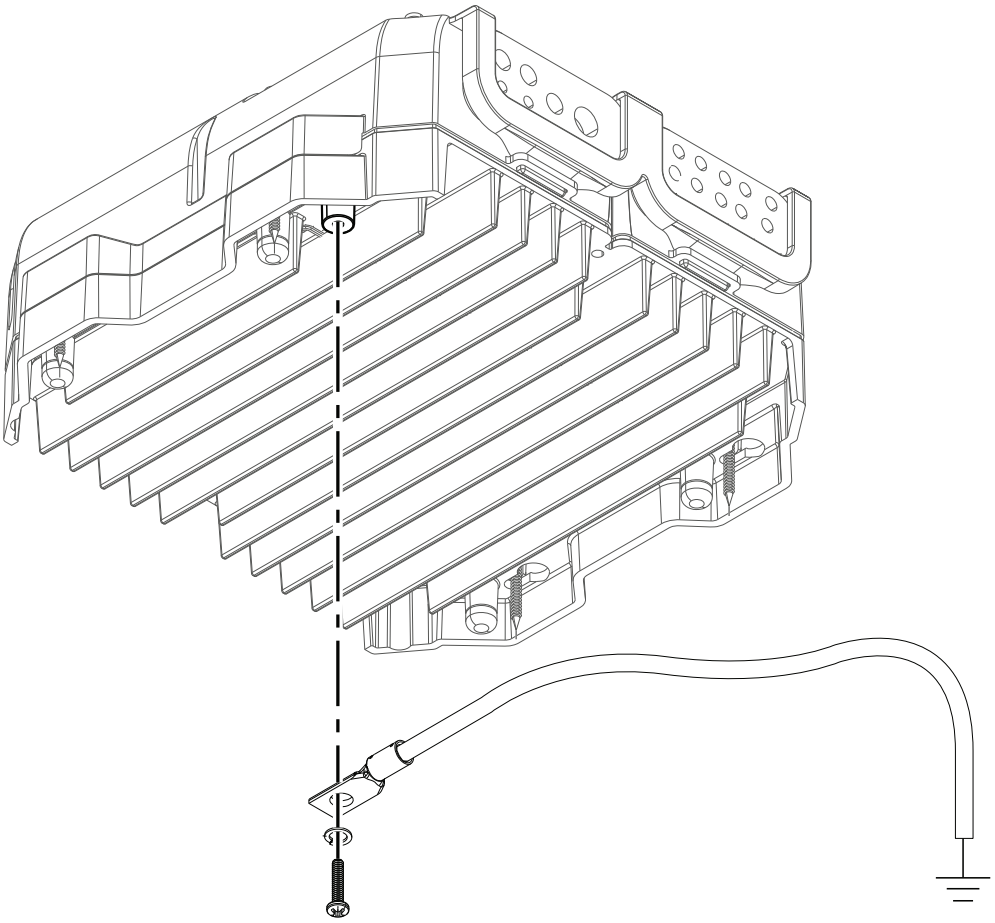
1. Strip away approximately 10 mm (0.4" ) of the insulation at the end of each core of the power cable
2. Unscrew the retention screw from the positive input connector (identified by the + sign) on the radar processor
3. Insert the bare end of the positive wire into the positive power cable input connector to make a connection
4. Tighten the holding screw to hold the positive wire in place. Gently pull on the positive wire to ensure that it is secured
5. Repeat this process to connect the negative wire to the negative power cable input connector (identified by the – sign)



## Grounding requirements

The RI-12 has a chassis ground terminal on the underside of the case. The chassis ground is DC isolated from power (–ve) to eliminate the risk of galvanic corrosion.

It is recommended that the RI-12 ground is connected to the vessels bonded ground or a non bonded RF ground at the closest possible location, using 12 AWG wire (or thicker):

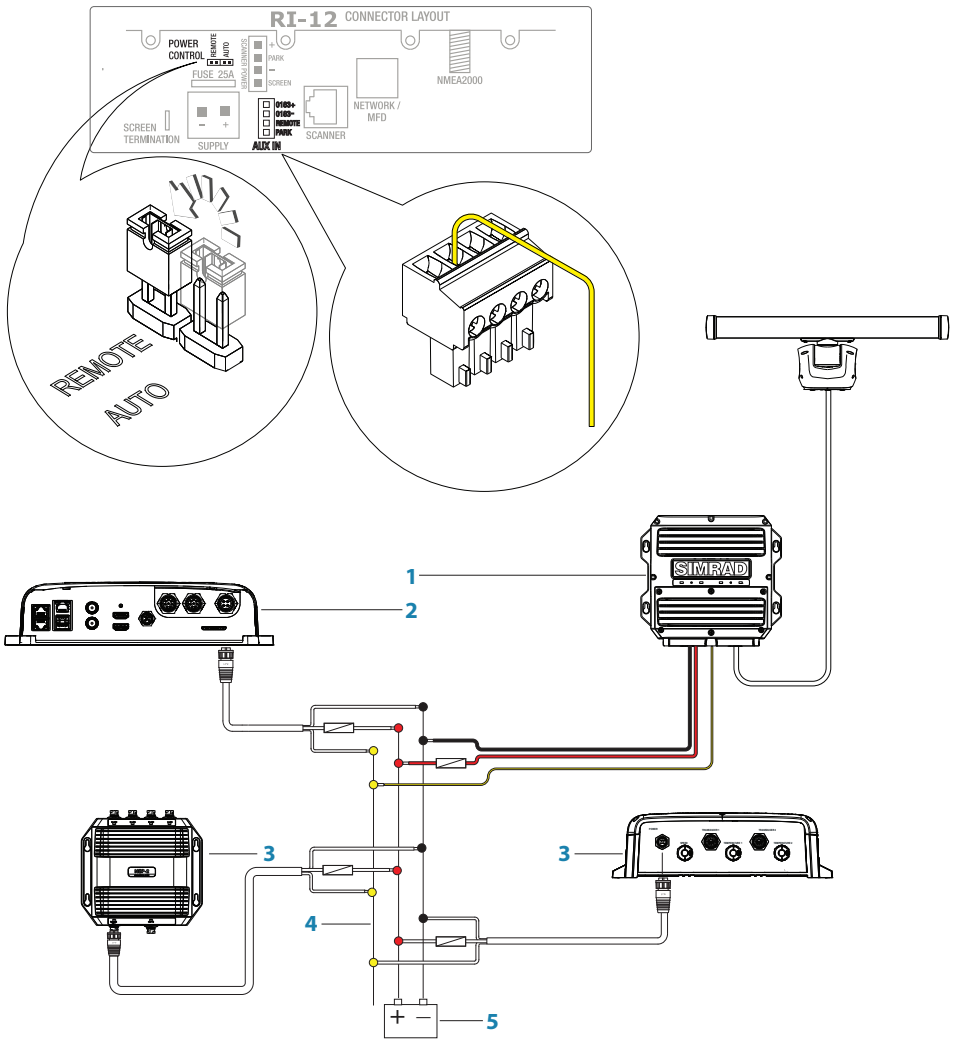


## Remote power control

Remote power control is a feature that allows the power state of the radar to be controlled either from a switch or when a compatible multifunction display is powered on or off.

➔ ***Notes:***

- The power control jumper must be moved from AUTO to REMOTE for the radar to use the remote power on function.
- +V DC (5 V DC - 32 V DC) from either a multifunction display set as power control master or a switch can be applied to the REMOTE port of the AUX IN connector for the remote power on to function.
- Connect the yellow wire to external wake up of a compatible multifunction display to the remote input. The radar will turn on when the display is turned on. The display must be set to 'Master' under Power Control. (Please refer to the displays user manual)
- If the radar is turned off via remote power control while transmitting, The radar will auto park the antenna before shutting down.
- There must be a common batt -ve for all devices on power control bus.

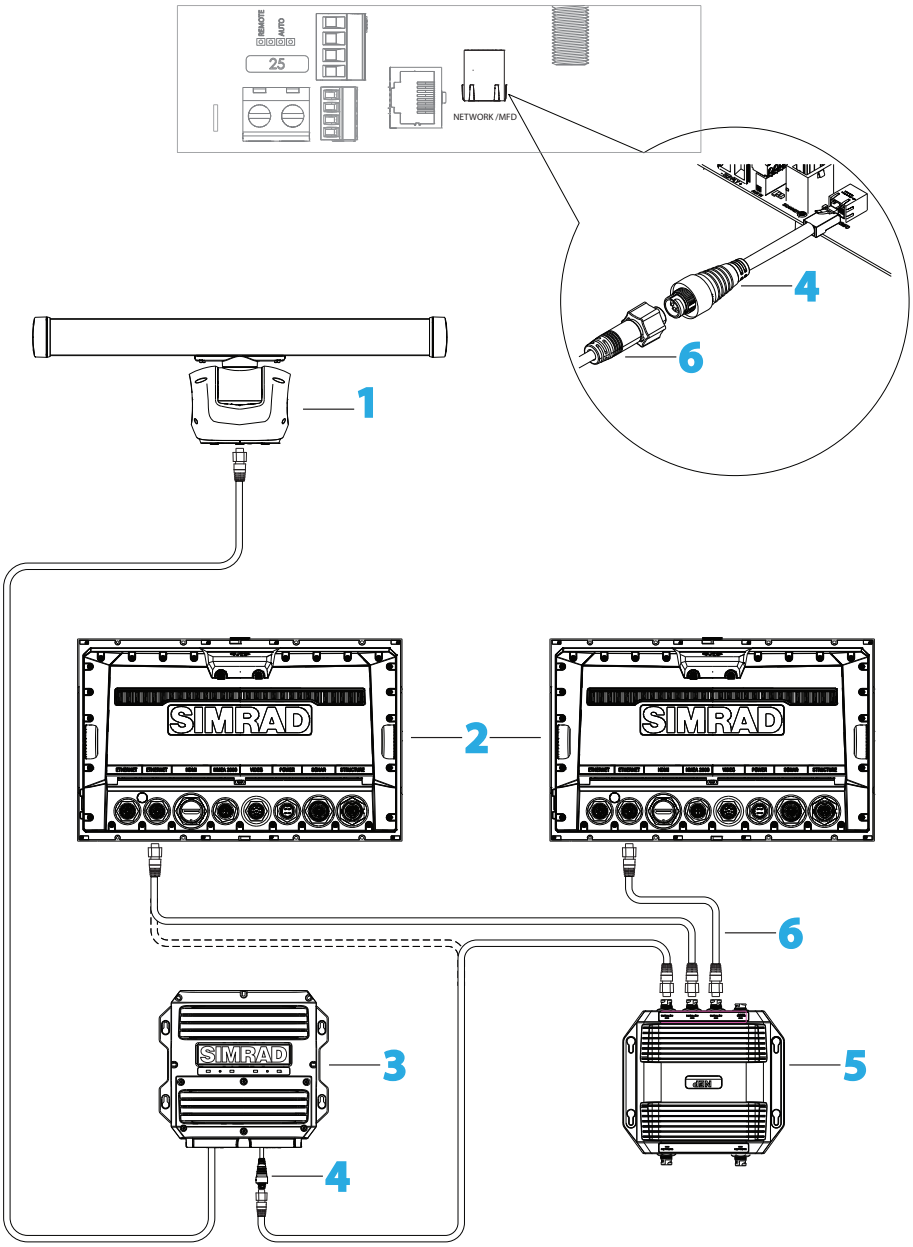



| No. | Description |
|---|---|
| **1** | Halo® RI-12 Interface module |
| **2** | NSO evo2 or other multifunction display (one or more multifunction display needs to be set to power control master) |
| **3** | Other Simrad device with remote power control |
| **4** | Power control bus |
| **5** | DC Power |

## Network

An Ethernet network is used to distribute the radar data to compatible multi-function displays.

The RI-12 is connected to the Ethernet network using a standard Simrad Ethernet cable and the supplied adapter cable. The RI-12 can be connected either directly to any Simrad compatible MFD or to a network switch such as an NEP-2 or SonarHub.




| No. | Description |
|---|---|
| 1 | Halo® pulse compression radar pedestal and antenna |
| 2 | Multi-function displays |
| 3 | RI-12 interface module |
| 4 | RJ45 to 5 pin yellow Ethernet adapter (p/n 000-11246-001) |
| 5 | NEP-2 or device with a built in Ethernet switch |
| 6 | Ethernet cables. Supplied with a 1.8 m (6 ft). The RI-12 can connect either directly to a multifunction display or to other an Ethernet switch such as NEP2 or SonarHub |

## NMEA 2000

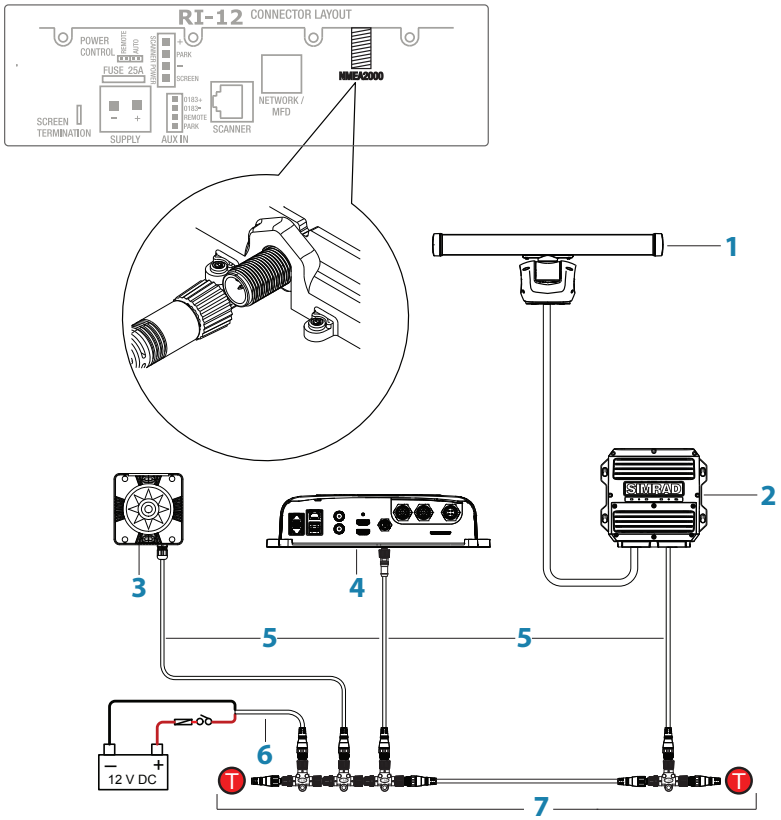
The RI-12 can be connected to a Micro-C NMEA 2000 network to receive heading and position information.

A heading sensor is required for the following functionality;

- MARPA : heading at 10 Hz or faster is required for the radar to calculate MARPA tracking. Heading must also be connected to the display.
- Radar Chart overlay and North-up: Heading is required by the multi-function display

For heading sensors that output NMEA 0183 (see "NMEA 0183" on page 30)

For magnetic heading sensors, heading calibration should be performed before using MARPA or Chart Overlay, and repeated annually, and after any major structural changes to the vessel.

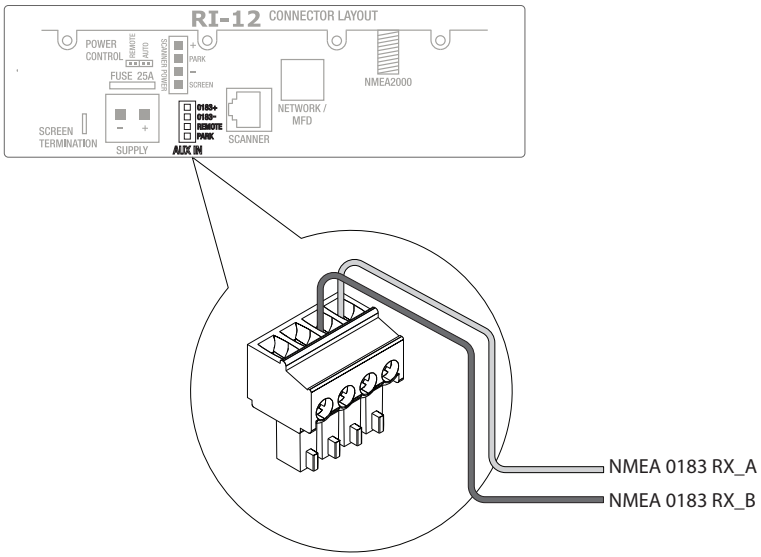



| No. | Description |
|---|---|
| 1 | Halo® radar pedestal and antenna |
| 2 | RI-12 interface modules |
| 3 | NMEA 2000 compliant heading sensor |
| 4 | Compatible multifunction display |
| 5 | Micro-C drop cables |
| 6 | Network power 12 V DC |
| 7 | Micro-C backbone (NMEA 2000) with terminators |

## NMEA 0183

The RI-12 has one NMEA 0183 (RS422) to accept heading and position information. The NMEA 0183 port is auto sensing and can accept 4800, 9600, 19200 or 38400 baud rates.

Sentences used HDG, HDT, HDM, GGA, GLL, RMC, VTG. Heading should be at a minium of 10 Hz update rate.




## RI-12 heading source selection:

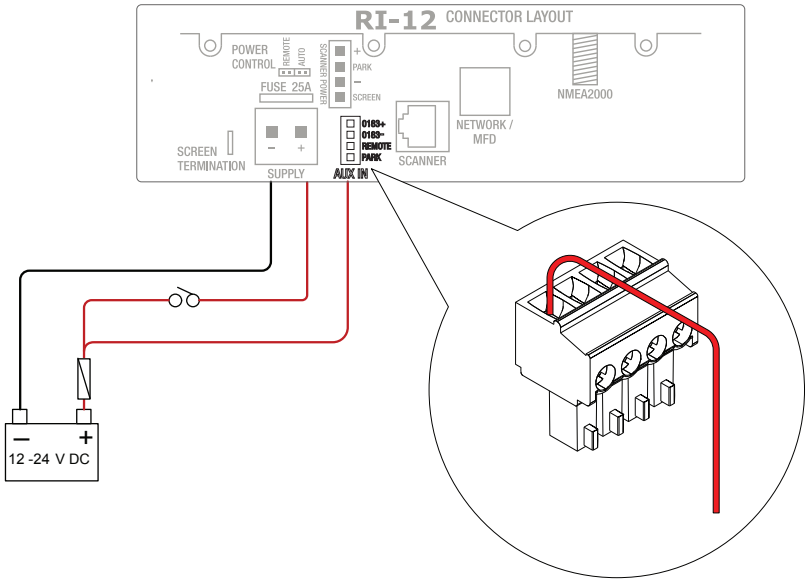
The RI-12 receives heading via the NMEA 2000 network and transmits this data to the radar, where MARPA processing is performed.

For Simrad installations with more than one heading source the RI-12 will use the Simrad group source. The source used by the Simrad group can be viewed or changed via the multifunction display in the Settings>Network>Sources… menu.

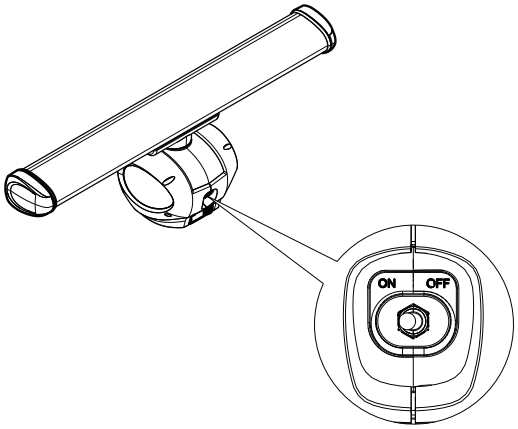
➔ ***Note:*** If an NMEA 0183 heading source is connected the RI-12 will use this. It will ignore a NMEA 2000 heading source.

## Antenna park

The Halo® Pulse Compression Radar has the ability to stop rotating the antenna and hold it at a predetermined angle in relation to the ships heading line. The park angle is set in the display (see "Adjust open array park angle" on page 34). In conjunction with this setting there is a park angle retention feature which is a very low current electromagnetic brake that will provide resistance for the antenna to maintain a parked angle against wind and movement. The park brake requires a continuous low current DC supply (10-32 V DC). This draws less than 100uA.



When all connections have been made and checked the safety switch on the rear of the pedestal can be set to the ON position



# 6 Setup and configuration

Setup and configuration of the Halo® radar has been simplified compared to traditional pulse radars. There is no zero range adjustment (time delay), no warm up time, and no burn in required.

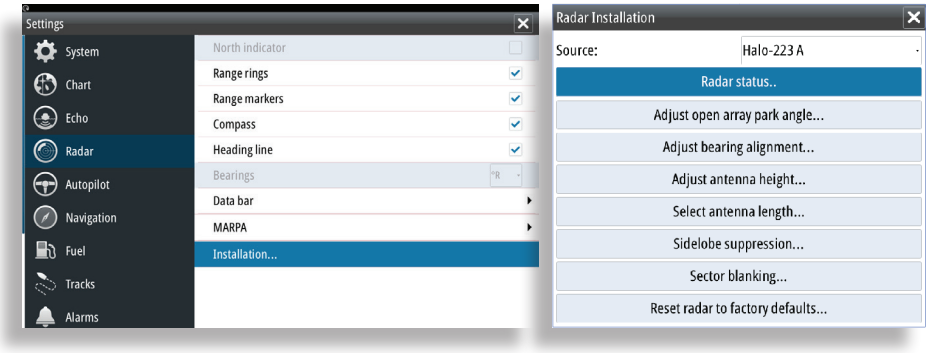
### Source

On the radar page, choose the radar to be setup using the source drop down. MENU>SOURCE
When setting up the Halo Pulse Compression radar choose either Halo-A or Halo-B

→ ***Note:*** Following settings require the radar to be in Transmit mode. MENU>TRANSMIT

## Entering radar setup on your display

Enter radar installation by pressing MENU > SETTINGS > RADAR > INSTALLATION.

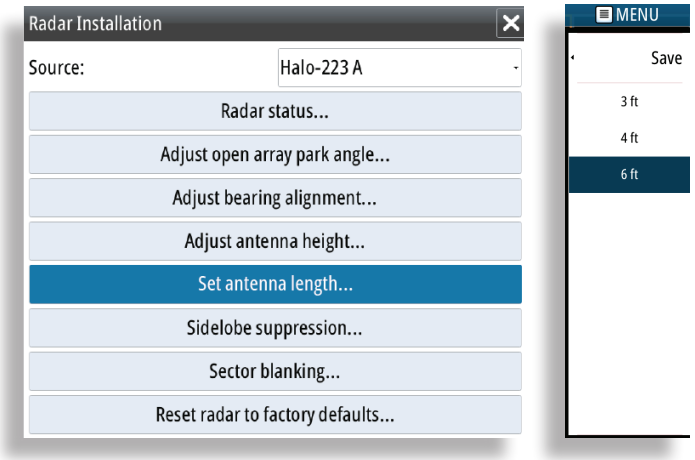



There are three essential steps to setup the Halo® radar:

- Set antenna length
- Set antenna height
- Set bearing alignment

## Select the antenna length

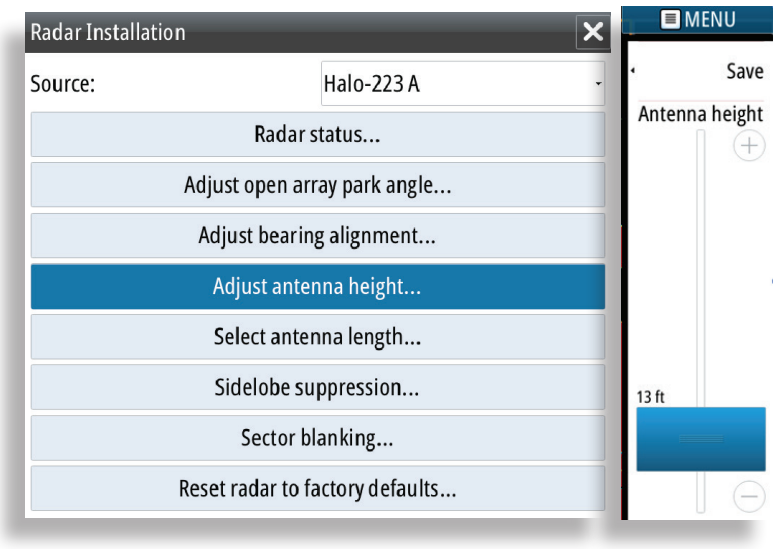
Select the correct length of antenna. Select Save to exit back to the radar installation page.




## Adjust antenna height...

Set the radar scanner height. Use the slider control or the "+" or "-" buttons to set the value then SAVE.

→ ***Note:*** The antenna height is the height of the antenna above the water line. It is very important to set the antenna height configured correctly as this will affect the sea clutter function. Do not set the height to 0.

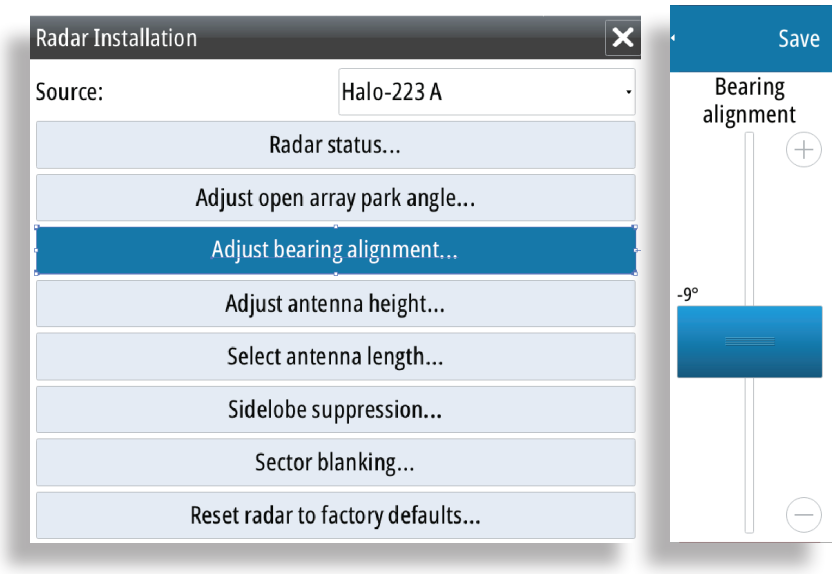



## Adjust bearing alignment...

Adjust the heading marker. This is to align with the heading marker on the screen with the center line of the vessel, this will compensate for any slight misalignment of the pedestal during installation. Any inaccuracy will be evident when using MARPA or chart overlay.

Point the boat towards a stationary isolated object. Adjust the bearing alignment so the heading line touches the end of the same object.

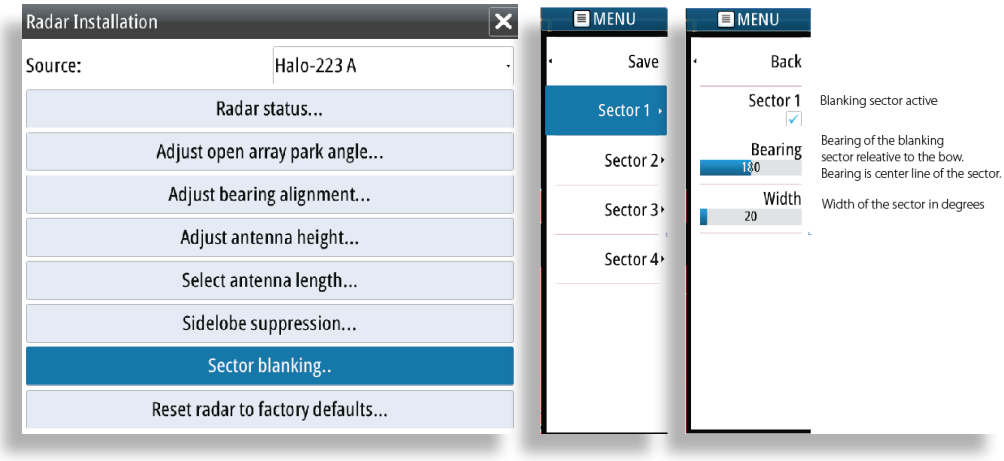
Use the slider control or the "+" or "-" buttons to set the value then SAVE



## Sector blanking

On vessels where the radar is installed in close proximity to a mast or structure that could cause unwanted reflections or interference to appear on the radar image. Use the sector blanking feature to stop the radar from transmitting in the direction up to four sectors.

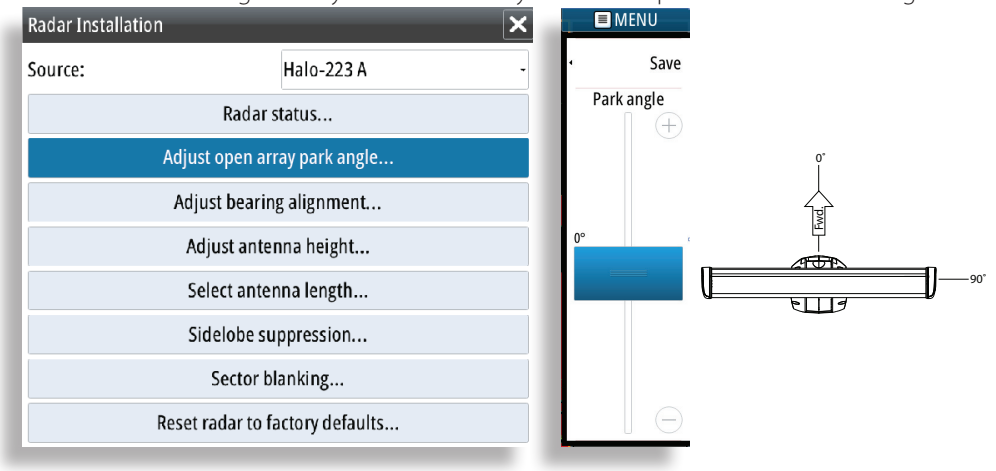
➔ ***Note:*** Sectors are setup relative to the heading line of the radar. The bearing of the sector is measured from the front of the vessel to the center line of the sector.




## Adjust open array park angle

The park angle is the final resting position of the antenna relative to the heading line of the radar when the radar is set to standby. The antenna will stop rotating at the desired offset. Optionally the antenna can be held in place against wind by connecting the antenna park wire (see "Antenna park" on page 30).

➔ ***Note:*** When entering standby the antenna may rotate multiple times before coming to rest




## Sidelobe suppression...

➔ ***Note:*** This control should only be adjusted by experienced radar users. Target loss in harbour environments may occur if this control is not adjusted correctly.

Occasionally false target returns can occur adjacent to strong target returns such as large ships or container ports.

This occurs because not all of the transmitted radar energy can be focused into a single beam by the radar antenna, a small amount energy is transmitted in other directions.

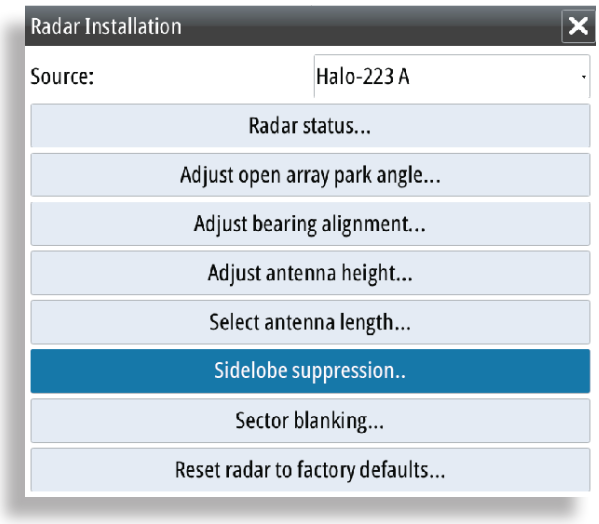
This energy is referred to as sidelobe energy and occurs in all radar systems.

The returns caused by sidelobes tend to appear as arcs:

When the radar is mounted where there are metallic objects near the radar, sidelobe energy increases because the beam focus is degraded. The increased sidelobe returns can be eliminated using the Sidelobe Suppression control in the Radar installation menu.

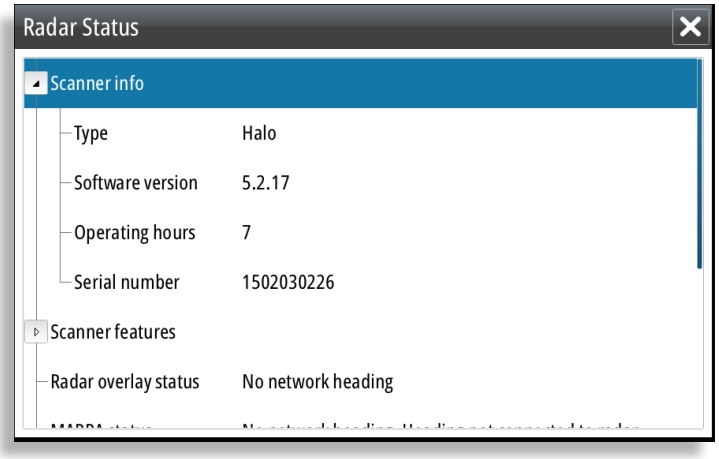
By default this control is set to Auto, and normally should not need to be adjusted. However if there is significant metallic clutter around the radar, sidelobe suppression may need to be increased. The control should be adjusted as follows:

1. Set radar range to between 1/2 nm to 1 nm and Sidelobe Suppression to Auto
2. Take the vessel to a location where sidelobe returns are likely to be seen. Typically this would be near a large ship, container port, or metal bridge
3. Traverse the area until the strongest sidelobe returns are seen
4. Change Auto sidelobe suppression to OFF then select and adjust the sidelobe suppression control until the sidelobe returns are just eliminated. You may need to monitor 5-10 radar sweeps to be sure they have been eliminated
5. Traverse the area again and readjust if sidelobes returns still occur
6. Exit the installation menu



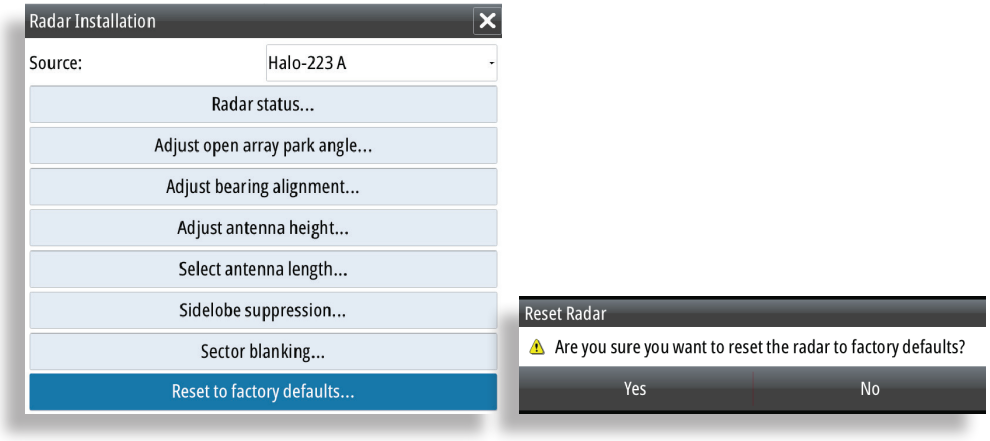

## Radar Status

Provides information on the radar such as Software version, Serial number, and operating hours




## Reset Radar to factory defaults

Reset to factory defaults function will only reset radar control settings, not installation settings.



## Control pedestal accent lighting

The Halo™ Pulse Compression Radar pedestal has a blue accent light. The LED accent light has four light levels controlled from the radar menu.

➔ ***Note:*** The accent light can only be adjusted when the radar is in standby

⚠ Halo™ Pulse Compression Radar's blue 4 level static accent pedestal lighting may not be approved for use in your boating location. Please check your local boating regulations before turning the blue accent lights ON.

## Error codes

If any of the error codes below are encountered, power cycle the radar. If the error code repeats, please refer to list below.

| Error code | Description | Reccomendation |
|---|---|---|
| 0x00000001 | Radar saved settings corrupted | Radar will revert to factory defaults. Re-enter your settings including installation settings. |
| 0x0001000C | Scanner not detected | 1. Check the pedestal interconnection cable connections<br>2. Power cycle the radar<br>3. Check input Voltage |
| 0x0001000D | Transmitter overheat (soft) | 1. Try changing to shorter ranges <6 NM<br>2. Switch to STBY, Allow unit cool |
| 0x0001000E | Transmitter overheat (hard) | Switch to STBY, Isolate power to the radar and contact service |
| 0x0001000F | Signal processing error | Unit should revert to STBY. Select trasnmit<br>If problem persists. power cycle the radar |
| 0x00010017 | Scanner failure | Contact service |
| **Power supply** | | |
| 0x00010010 | Power supply overheating | Switch to STBY, Allow unit cool then retry |
| 0x00010011 | Power supply voltage error | Check scanner cable for connections for corrosion or damage |
| 0x00010012 | Power supply overload | Contact service |
| 0x00010013 | Power supply hardware fault | Contact service |
| 0x00010014 | Power supply comms fault | Contact service |
| 0x00010019 | Low battery voltage (Supply voltage low) | 1. Recharge and check supply voltage<br>2. Restart the radar |
| 0x00010016 | LED Lighting fault | Turn accent lighting off then retry |
| 0x00010018 | Radar interface box fault | Check LED status light (see "LED Indicator lights" on page 23)<br>Check the pedestal interconnection cable for damage |
| **Mechanical** | | |
| 0x00010001 | Zero bearing sensor fault | Contact service |
| 0x00010002 | Bearing sensor fault | Contact service |
| 0x00010015 | Mechanical transmission fault | Contact service |
| 0x00010003 | Motor drive fault | Contact service |
| 0x0001001A | Motor or antenna has stalled | 1. Power down the radar.<br>2. Check and clear antenna obstructions such as ice |

# 7 Specifications

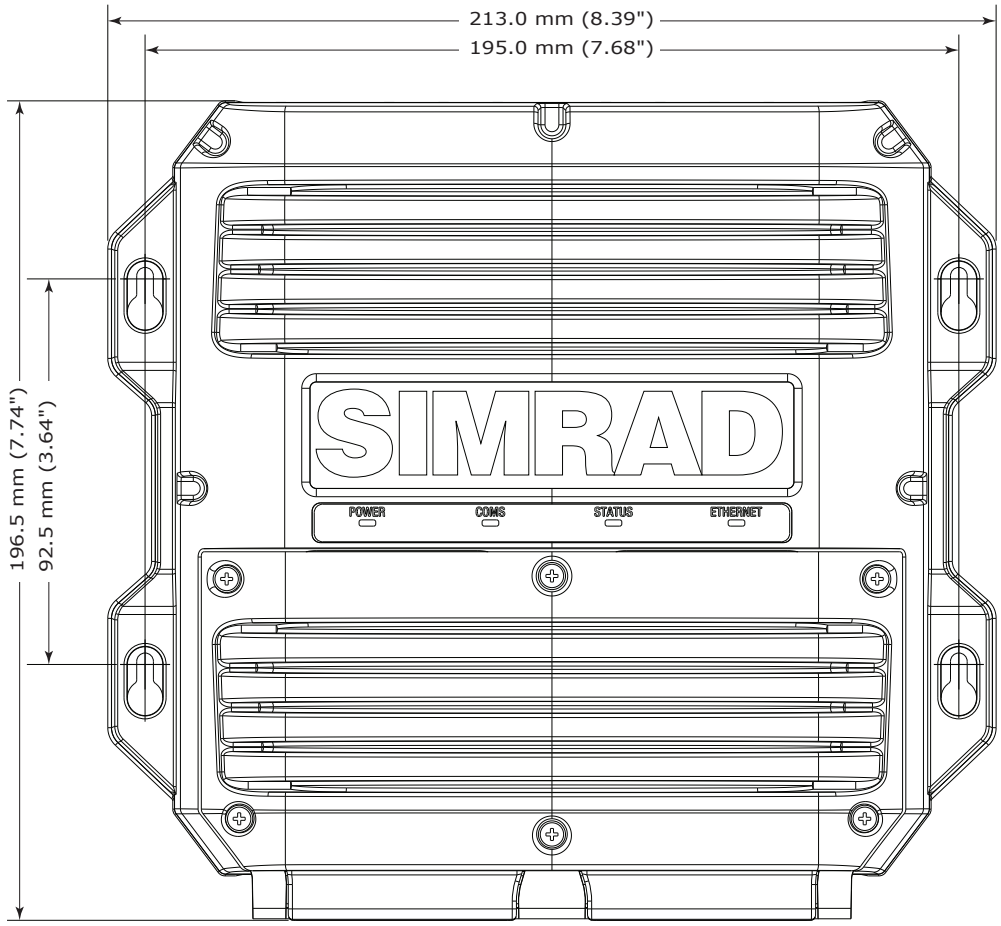
| | | |
|---|---|---|
| Description | 25 W Halo® Pulse Compression Radar System<br>System consists of radar pedestal, antenna, Interconnection cable and RI-12 Interface Module. | |
| Type of emission | FCC/IC/R&TTE Type Certification<br>FCC ID: RAYHALO<br>IC ID: 4697A-HALO<br>R&TTE: Emissions compliant to SM1541-4 (including -40 dB/dec future design objectives) | |
| **Environmental** | | |
| Operating Temperature | -25°C to +55°C (-13°F - 131°F) | |
| Relative humidity | IEC60945 Exposed product | |
| Shock and Vibration | IEC60945 Exposed product and 20G, 100,000 cycle | |
| UV | IEC60945 Exposed product | |
| Waterproofing | IPX6 | |
| Relative wind velocity | 70 knots for 3', 4', and 6' antenna at 48 rpm with RI-12 | |
| **Power** | | |
| Power consumption | 180 W (peak) at maximum wind velocity<br>40 W (average) at zero wind velocity<br>6.5 W (average) for Scanner + RI-12 in Standby mode | |
| DC input | Radar system input 12 OR 24 V DC in to the RI12<br>12 V Systems 10.8 - 15 V DC<br>24 V Systems 20 - 31.2 V DC<br>Pedestal voltage input is 36 V DC nominal generated by RI-12 | |
| Power up time | 16-25 seconds from POWER OFF to TRANSMIT | |
| **Physical** | | |
| Height<br>Antenna swing circle diameter | 427 mm (16.81") - with antenna mounted<br>3 ft model: 1141 mm (3.5 ft)<br>4 ft model: 1431 mm (4.5 ft)<br>6 ft model: 2045 mm (6.5 ft) | |
| Component weights | Pedestal<br>Antenna 3 ft<br>Antenna 4 ft<br>Antenna 6 ft<br>RI-12<br>10 m (33 ft) Cable<br>20 m (66 ft) Cable<br>30 m (100 ft) Cable | 18.75 Kg (41.3lb)<br>4.1 Kg (9.0 lb)<br>4.9 Kg (10.8 lb)<br>6.5 Kg (14.3 lb)<br>1.6 Kg ( 3.5 lb)<br>1.1 Kg (2.4 lb)<br>2.3 Kg (5.0 lb)<br>3.4 Kg (7.5 lb) |
| **Antenna** | | |
| Instrumented range | 3 ft model: 48 nm<br>4 ft model: 64 nm<br>6 ft model: 72 nm | |
| Transmitter | Solid state module with no long term transmitter power degradation | |
| Rotation | Approx. 24 to 48 rpm (Min 20 rpm at Max 70 kts).<br>Software controlled in modes | |

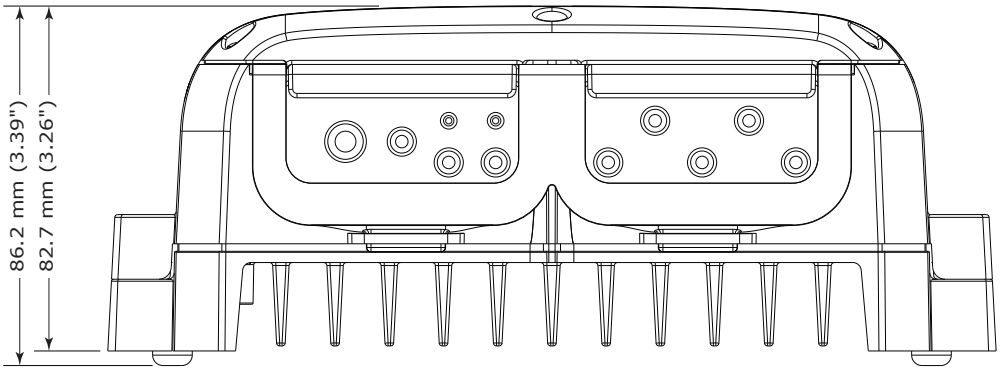
| | |
|---|---|
| Beam width | 3 ft: 2.4°+/-10% (-3 dB width) – 1.7 deg with Beam sharpening mode ON<br>4 ft: 1.8°+/-10% (-3 dB width) – 1.3 deg with Beam sharpening mode ON<br>6 ft 1.2°+/-10% (-3 dB width) - 0.8 deg with Beam sharpening mode ON |
| Beam width Vertical | 25° +/-20 % (-3 dB width) |
| Plane of polarization | Horizontal Polarization |
| Sidelobe level 3 ft | Below -23 dB max. (within ±10°)<br>Below –30 dB max. (outside ±10°) |
| Side lobe level 4 ft | Below -23 dB max. (within ±10°)<br>Below –30 dB max. (outside ±10°) |
| Side lobe level 6 ft | Below -23 dB max. (within ±10°)<br>Below –30 dB max. (outside ±10°) |
| Transmitter frequency | Synthesized - Upper half of X-Band 9.410 - 9.495 GHz |
| Peak power output | 25 W ± 10% under any transmit condition – up to 10% duty cycle max |
| Pulse length/PRF and Compression ratio | Pulse length: 0.04 usec<br>Chirp length:2-96 usec<br>Chirp Bandwidth: 2-32 MHz<br>Up to 1 pulse and 5 chirps in a burst with burst repetition rate of 500-2000. Range and mode dependent.<br>Effective Pulse Compression Ratio less than 150 in all modes. |
| SART/RACON Triggering | Yes – trigger distance: about 1nm max – weather, sea state, and SART position dependent |
| Duplexer | Circulator and isolator |
| Mixer | MIC front-end |
| IF section | Center frequency: 28.625 MHz<br>Bandwidth: 40 MHz max.* A/D; 16 bit 115 MSPS<br>*Narrower bandwidths defined by signal processing |
| Noise figure | 5 dB (Average) at front-end input. |
| Compass safe distance | STD. 1.0 m (3.3 ft) Steer 0.5 m 1.6 ft) |
| Other | |
| Communications Ports | Ethernet 10/100 Base-T for radar data and control<br>Micro-C male / NMEA2000 via RI-12<br>NMEA 2000 PGNS USED<br>127250 - Vessel Heading<br>127251 - Rate of Turn<br>129025 - Position, Rapid Update<br>129026 - COG & SOG, Rapid Update<br>129029 - GNSS Position Data<br>130818 - Proprietary<br>NMEA 0183 Input via RI-12 ..<br>Sentenses used by the radar application. HDG, HDT, HDM, GGA, GLL, RMC, VTG.<br>Baud rate: Auto sense 4800, 9600, 19200 or 38400<br>Antenna park<br>Remote power on |
| Motor | Brushless with solid state commutation with electromagnetic braking for parking. |

| | |
|---|---|
| Inter-connecting cable | Uses the same cable as the 3G/4G radars<br>Available in: 10 m (33 ft), 20 m (66 ft), 30 m (100 ft) lengths<br>Ships with (20 m (66 ft) Max length 30 m (100 ft)<br>Options for cable to exit from rear of pedestal or pole mount |

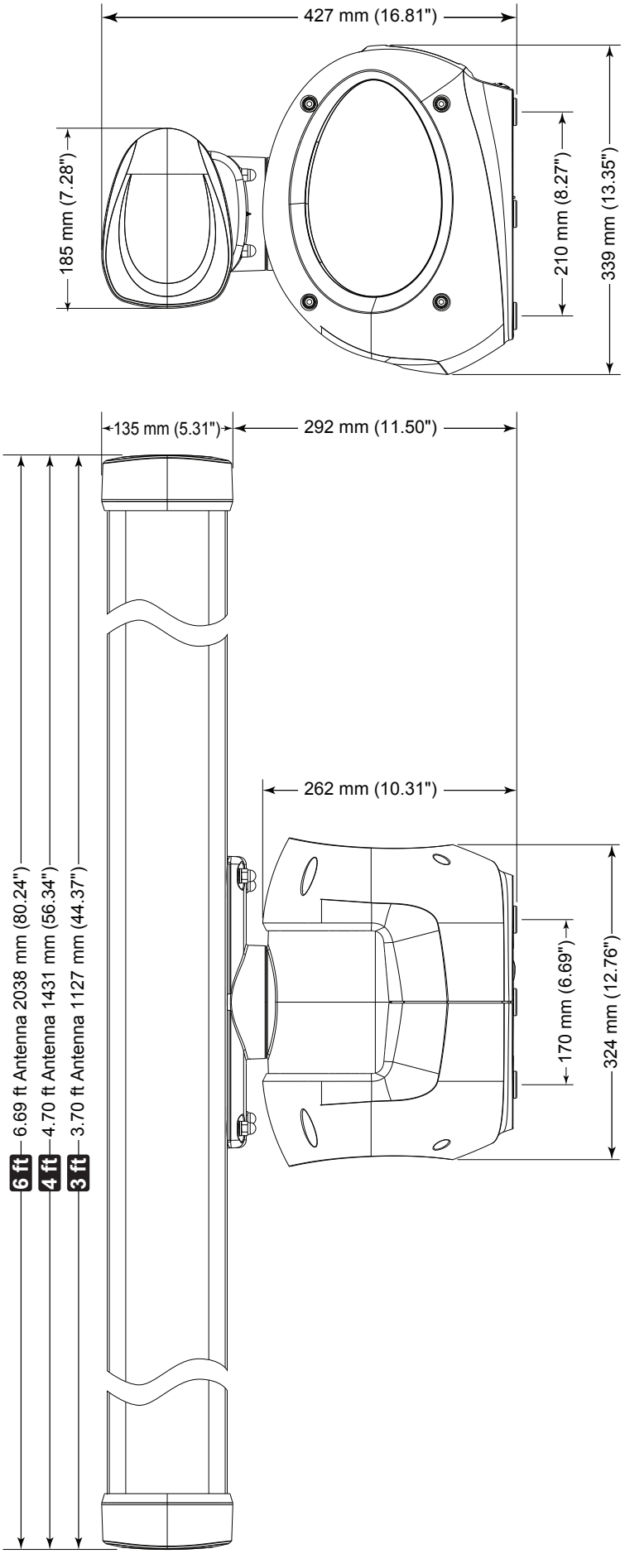
# 8 Drawings

## RI-12

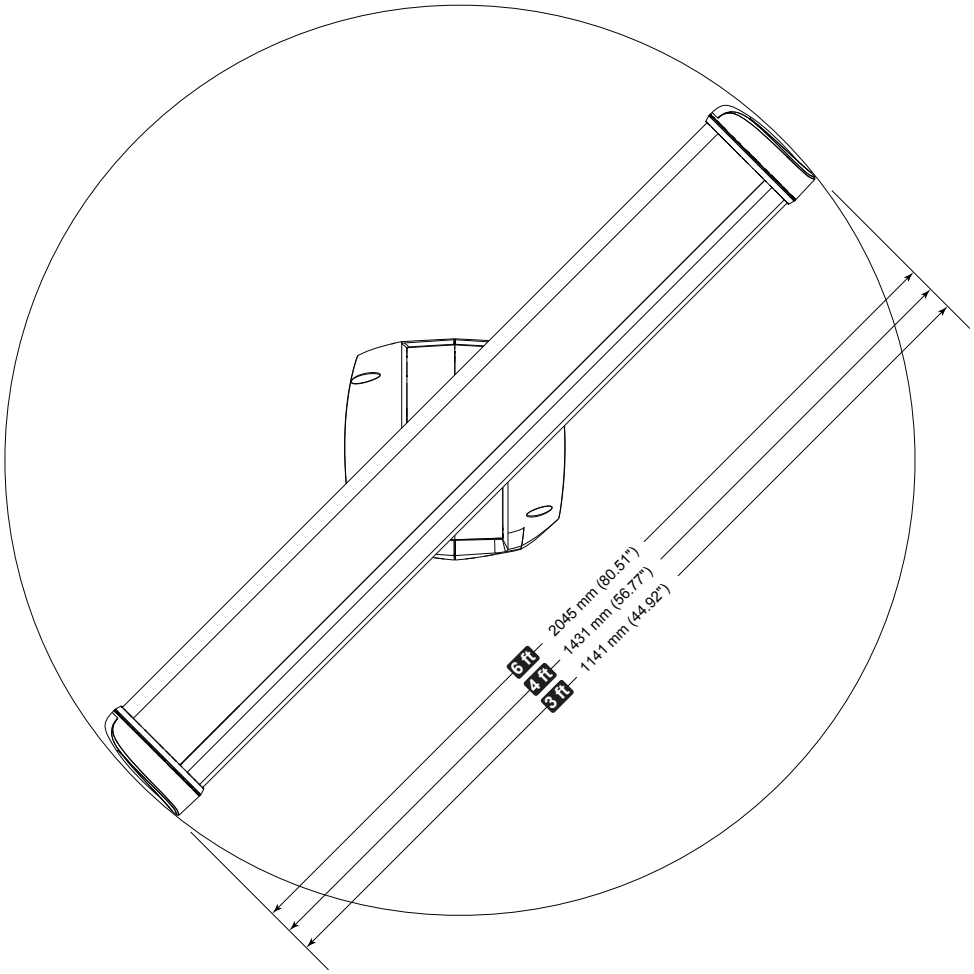


## Pedestal and antennas

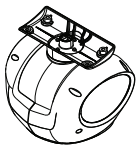
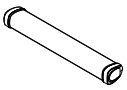
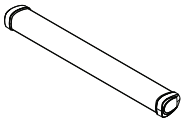
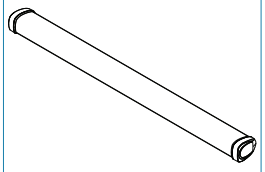
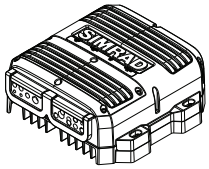
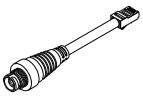


## Antenna maximum rotation



# 9

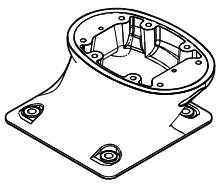
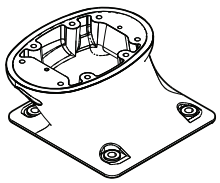
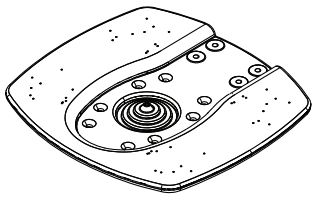
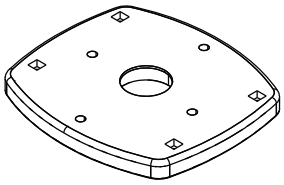
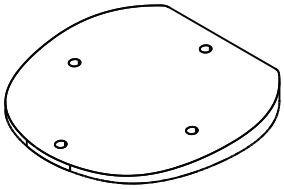
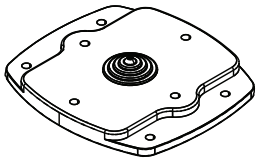
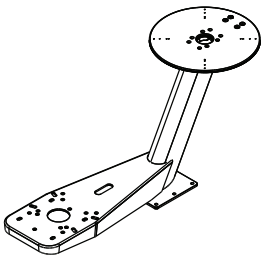
## Spare Parts

| | Part Number | Description |
|---|---|---|
|  | 000-11463-001 | Halo pedestal |
|  | 000-11464-001 | 3 ft (1127 mm) antenna |
|  | 000-11465-001 | 4 ft (1431 mm) antenna |
|  | 000-11466-001 | 6 ft (2038 mm) antenna |
|  | 000-11467-001 | RI-12 Radar interface module |
|  | AA010211 | Broadband scanner interconnection cable<br>10 m (33 ft) |
|  | AA010212 | Broadband scanner interconnection cable<br>20 m (65.6 ft) |
|  | AA010213 | Broadband scanner interconnection cable<br>30 m (98.5 ft) |
|  | 000-11246-001 | Adapter cable: yellow Ethernet female to RJ45 male. 150 mm (5.9") |

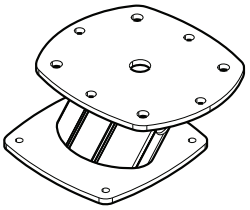
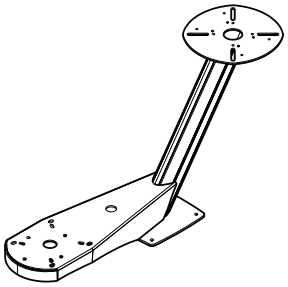
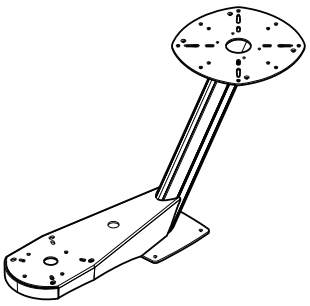
| | | |
|---|---|---|
| 000-00127-28 | Ethernet cable | 0.6 m (2 ft) |
| 000-0127-51 | Ethernet cable | 1.8 m (6 ft) |
| 000-0127-29 | Ethernet cable | 4.5 m (15 ft) |
| 000-0127-30 | Ethernet cable | 7.7 m (25 ft) |
| 000-0127-37 | Ethernet cable | 15.2 m (50 ft) |
| | | |
| 24005936 | AT10 NMEA0183 / NMEA 2000 converter (SimNet connector) | |
| 24006694 | AT10HD NMEA0183 heading to/ NMEA 2000 converter. (SimNet connector). | |

## Third party mounting options

**Seaview (www.seaviewglobal.com)**

| Image | Seaview part no. | Description |
|---|---|---|
|  | PMF-57-M1 | 127 mm (5.7") tall forward leaning mount |
|  | PMA-57-M1 | 127 mm (5.7") tall aft leaning mount |
|  | ADA-R1 | Top plate |
|  | ADA-HALO-3 | Adapter plate. Used in conjunction with ADA-R1 and a mounting tower |
|  | RW4-7 | 4° Angled wedge adapter |
|  | ADA-HALO-2 | Adapter for replacing 3G/4G, Raymarine and Garmin radars with Halo |
|  | PMA-DM2-M2 | Dual mount. (Not for 6 ft Halo) |

**Scanstrut (www.scanstrut.com)**

| Image | Scanstrut Part No. | Description |
|---|---|---|
|  | APT6003 | 150 mm (6") Aluminium PowerTower® for Halo (3 ft, 4 ft, 6ft) |
|  | DPT-40-SO3 | Dual PowerTower® for 40 cm satcom plus Halo 3 ft or 4 ft |
|  | DPT-60-SO3 | Dual PowerTower® for 60 cm satcom plus Halo 3 ft or 4 ft |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