SIMRAD®

SRT LAN X-Band Up-Mast

Installation manual

English



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Preface

Disclaimer

⚠ Warning: Refer to important safety information in the product documentation and review all warnings, limitations, and disclaimers before using this product.

This product is not a substitute for proper training and prudent seamanship. It is the owner's sole responsibility to install and use the equipment in a manner that will not cause accidents, personal injury or property damage. The user of this product is solely responsible for observing maritime safety practices.

Navigational features that appear in this document are not a substitute for proper training and prudent seamanship. They do not replace a human navigator and SHOULD NOT be relied on as a sole or primary source of navigation. It is the operator's sole responsibility to use more than one navigational methods to ensure the route suggested by the system is safe.

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Governing language

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The warranty card is supplied as a separate document. In case of any queries, refer to the brand website of your unit or system:

www.navico-commercial.com

Compliance statement

Navico declare under our sole responsibility that the product conforms with the requirements of:

- European Council Directive 2014/90/EU on Marine Equipment modified by Commission Implementing Regulation (EU) 2023/1667 (8 August 2023) - Wheelmark

The relevant declaration of conformity is available in the product's section at the following website:

- www.navico-commercial.com

About this manual

Intended audience

This manual is written for system installers.

This manual is written for professional installation and service engineers.

The manual assumes that the reader has basic knowledge about this type of equipment with regards to:

- installation work to be carried out
- nautical terminology and practices

Important text conventions

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.

Change log

Part no	Date and description
988-12291-001	2018-sept-28
	First version.
988-12291-002	2018-oct-31
	Updates to Technical specifications.
988-12291-003	2021-July-25
	Compliance updates.
988-12291-004	2023-Sept-25
	Update cover, compliance, and copyright.
988-12291-005	2023-December-15
	Updates to comply with IEC62288 Ed.3.

Safety precautions

Safety precautions described in this section are applicable to the radar system. They are general safety precautions that are not related to any specific procedure, and they might therefore not appear elsewhere in this manual. They are recommended precautions that personnel must understand and apply during operation and maintenance of the system.

You are obliged to read these operating instructions prior to operation, and to adhere to the operating instructions in order to prevent possible danger. Prevention of danger includes that operator personnel are trained and authorized for safe operation of the equipment. We assume no liability for damage due to improper operation which could have been prevented.

The system must only be operated by persons who have passed the relevant mandatory training on the respective systems and applications. Only reading these operating instructions cannot replace such training. Persons authorized to operate, maintain and troubleshoot the system are instructed and trained by Simrad. Persons operating or servicing this radar system must be familiar with the general safety regulations and specific safety systems, and they must have passed all required training. They must have read the relevant operating instructions and manuals before starting to work.

Have these operating instructions always at hand on all relevant locations, and ensure that copies are available to all operators. Operating personnel must at all times follow all safety regulations.

During normal operation, the unit can be quickly disconnected from the main power line by turning OFF the relevant circuit breaker located on the electric switchboard.

Do not replace components or make adjustments inside the unit when the voltage supply is turned ON. Always remove power and discharge to ground a circuit before touching it. Under no circumstances should any person initiate servicing or repairing the unit except in the presence of a qualified person.

Ensure unobstructed access to all operator panels, controls, and relevant switchgear cabinets in order to enable instant response to alarms.

Whenever it is necessary to disconnect the waveguide from a radar transmitter for maintenance purpose, the transmitter output should be terminated with a matched load. If this is not possible, care should be taken. Do not stand in front of an open-ended waveguide from which power is being radiated.

➔ ***Note:*** Main power is always present on the terminal board unless the main break from the power distribution panel of the vessel is turned off.

⚠ Warning: Never look down a waveguide from which power is being radiated!

Warnings

High voltage

Radar equipment includes high voltage that can cause injury or loss of life. Danger exists only when the units are opened, exposing internal circuits, as when servicing the equipment.

This radar has been carefully designed to protect personnel from possible injury from high voltages. Although every effort has been made to eliminate danger to personnel, no responsibility is accepted for any injury or loss of life suffered in connection with this equipment.

Radio frequency radiation

Harmful effects (particularly to the eyes) may be caused by exposure of any part of the human body to high power radio frequency radiation.

However, the system is designed to always disable the microwave radiation when the antenna is not rotating.

Hazard distances

Configuration	Distance 100 W/m^2 point (m)	Distance 50 W/m^2 point (m)	Distance 10 W/m^2 point (m)
12 KW Transceiver 6' X-band Antenna	-	0.15	0.6
12 KW Transceiver 9' X-band Antenna	-	-	0.5
12 KW Transceiver 12' X-band Antenna	-	-	0.35
25 KW Transceiver 6' X-band Antenna	0.1	0.2	1.3
25 KW Transceiver 9' X-band Antenna	-	0.1	1.0
25 KW Transceiver 12' X-band Antenna	-	0.05	0.9

X-Ray radiation

This radar system does not generate X-ray radiation.

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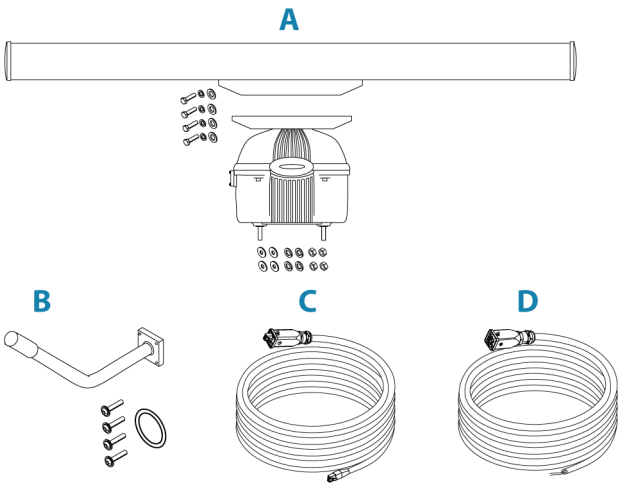
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1 Parts included

R5000 X-band up-mast SRT LAN radar sensor



A Radar antenna (6 feet, 9 feet or 12 feet) and SRT LAN up-mast transceiver

B Radar performance monitor arm kit

C Ethernet cable

D Power cable

2 Installation

Installation guidelines

The information provided by radar is of vital importance to skippers and the safe navigation of ships. Special care should be taken to ensure correct installation of the radar, in order to ensure the performance of the radar system is not compromised.

Interference, either by reflecting structures or other RF transmitters, may significantly impair radar performance by creating blind sectors, clutter on the radar display or generation of false targets.

The antenna should be mounted clear of any structure that may cause signal reflections and resultant blind sectors. Large flat metallic structures perpendicular to the radar generally cause the worst reflections, and should be avoided.

All hardware should be mounted with appropriate gauge and number of fasteners, and structure radar is mounted to should be determined to be fit for purpose, capable of supporting the radar in any weather or sea state.

Service platform

Safe service access should be provided using service platforms where necessary, having a minimum size of 1 m^2 at a suitable height and with a safety rail of suitable height.

The design of the mounting platform for the up-mast transceiver should take into account the vibration requirements defined by IEC 60945.

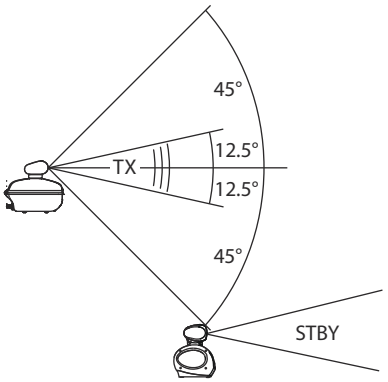
The platform that is being mounted to should be level when vessel is loaded and underway at typical cruise speed.

→ ***Note:*** When working at height, ensure appropriate safety harness and lanyard is used.

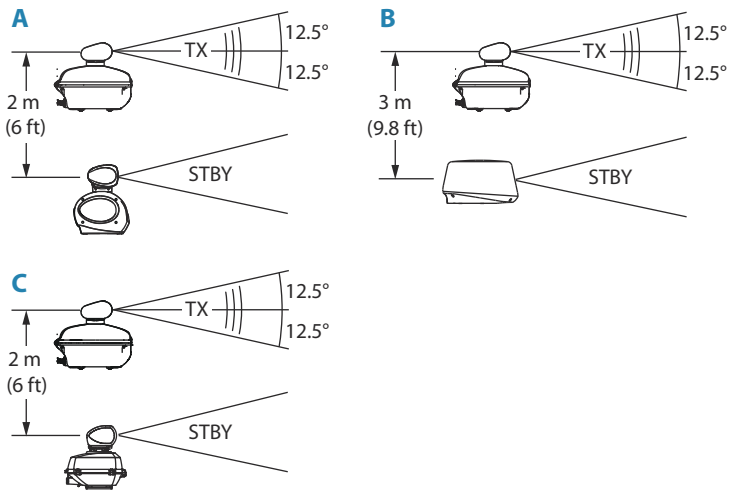
Interference

Other radars

Do not install the radar transceiver on the same beam plane as other radars, provide at least 45 degrees vertical separation. Use sector blanking as required to eliminate interference from same frequency radar on vessel.



The following illustrations shows suggested minimum vertical separation for different radar combinations, where radars are installed one above the other:



A Pulse radar and pulse compression radar

B Pulse radar and broadband radar

C Two pulse radars

Other RF sources

The radar antenna should be installed at a safe distance from interfering high-power energy sources and other transmitting and receiving radio antennas.

Sensitive equipment

Some electronics such as GPS and electronic heading sensors may be particularly sensitive to radar emissions. Follow the manufacturers guide on suitable separation distances. Avoid having such equipment directly in the beam of the radar.

Obstructions and blind sectors

Railings

The underside of the radar antenna should be a minimum of 50 cm above any safety rail.

Swing diameter

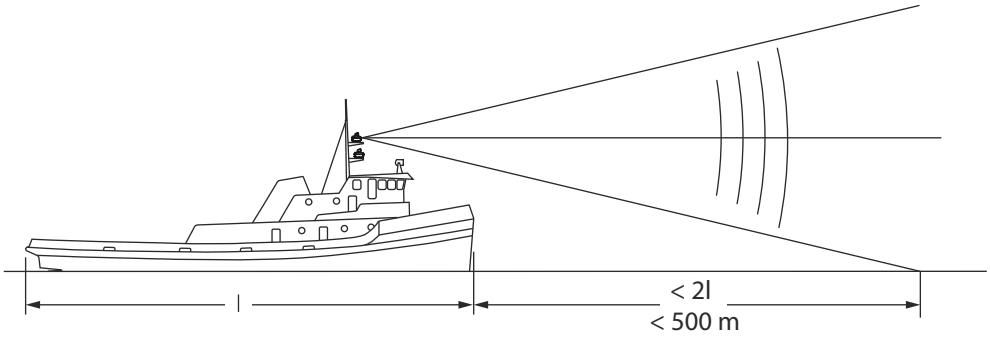
Ensure all obstructions are clear of the rotation of the antenna. To avoid the antenna coming in contact with other installed objects while it is rotating, ensure that there is at least 200 mm between the swing circle (turning radius) and the other installed objects.

Blind sectors

It should be kept to a minimum, and not occur in an area of the horizon from right ahead to 22.5° abaft the beam to either side. Any two blind sectors separated by 3° or less should be treated as one combined blind sector. Individual blind sectors of more than 5°, or a total of blind sectors of more than 20°, should not occur in the remaining area abaft the aforementioned area. For radar installations with two radar systems, where possible, the antennas should be placed in such a way as to minimize the blind sectors.

Distance to water surface

For all radar systems and where practical, a line of sight from the radar antenna to the bow of the ship should hit the surface of the sea at no more than 500 m or twice the ship length, depending which value is smaller. This goes for all load and trim conditions.



Radar antenna height implications

Antenna elevation table

The antenna elevation from the water surface determines the distance the radar beam travels before hitting the water surface.

Height (m)	1	2	3	4	5
Distance (m)	4.7	9.4	14.1	18.8	23.5

Height (m)	7.5	10	15	20	25
Distance (m)	35.3	47.0	70.6	94.1	117.6

Height (m)	30	40	50		
Distance (m)	141.1	188.2	235.2		

Elevation impact

The radar antenna should be installed in an elevated position to permit maximum target visibility, but not higher than necessary as sea clutter increases and short range performance is compromised with increased installation height. On smaller vessels excessive height may also have a negative impact on vessel stability.

Mounting

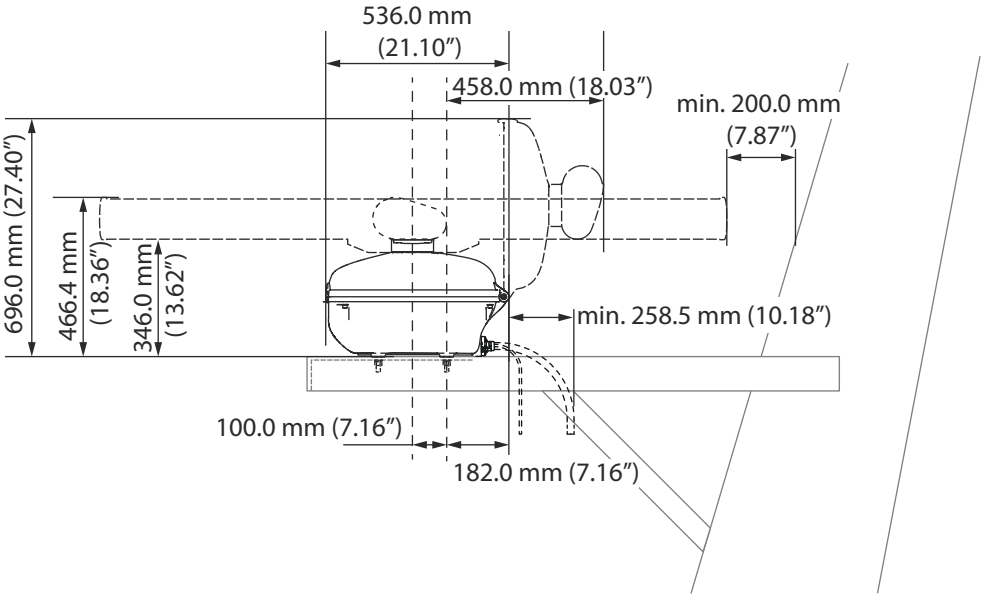
Mounting guidelines

- Choose a location that will not expose the unit to conditions that exceed the specifications, refer to the technical specification in the *"Technical specifications"* on page 19
- The mounting surface needs to be structurally strong, with as little vibration as possible
- Ensure that any holes cut are in a safe position and will not weaken the boat's structure
- Before cutting a hole in a panel, make sure that there are no hidden electrical wires or other parts behind the panel
- Check that it is possible to route cables to the intended mounting location. Leave sufficient clearance to connect all relevant cables
- Make drip and service loops for cables

⚠ Warning: Inadequate ventilation and subsequent overheating of the unit may cause unreliable operation and reduced service life. Exposing the unit to conditions that exceed the specifications could invalidate your warranty, refer to the technical specification in the *"Technical specifications"* on page 19.

SRT LAN up-mast transceiver

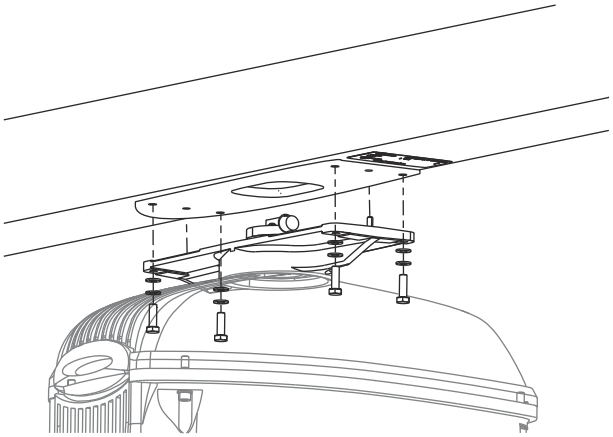
Ensure that there is adequate space for the SRT LAN up-mast transceiver housing and antenna. Securely mount the SRT LAN up-mast transceiver prior to fitting the antenna. For dimensional drawings, refer to *"Dimensional drawings"* on page 22.



➔ ***Note:*** A length of at least 0.5x the diameter of the screw should be visible when the SRT LAN up-mast transceiver is properly secured. Use a good quality isolating or anti-seize compound on the thread, to prevent electrolysis.

Radar antenna

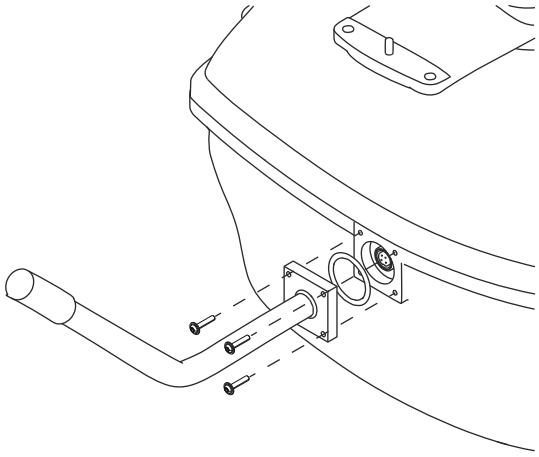
Remove the 2 lifting eye bolts from the SRT LAN transceiver. Mount the antenna over its support and make sure that the waveguide connection on the SRT LAN transceiver is aligned with the connection in the antenna. Tighten the 4 screws holding the antenna. Tighten the screws to a torque of 22 Nm.



➔ ***Note:*** The waveguide protection cover on the SRT LAN transceiver must not be removed until immediately prior to antenna fitment.

Radar performance monitor arm

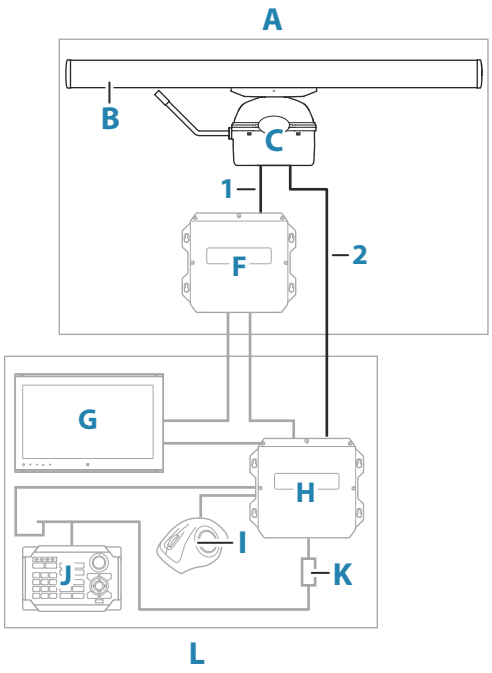
Attach the performance monitor arm to the SRT LAN transceiver housing. The arm should be oriented to point upwards. Ensure the gasket ring is fitted between the housing and the base of the arm.



All electrical connections are made when the performance monitor arm is attached to the pedestal. It is not necessary to complete any further connections inside SRT LAN transceiver enclosure.

3 Wiring

System example

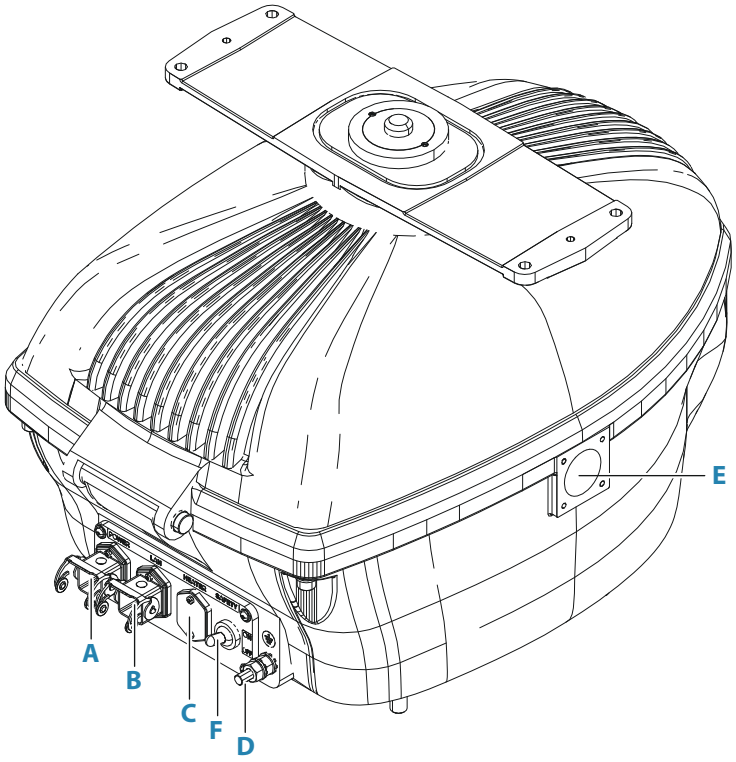


A	SRT LAN radar sensor
B	Antenna
C	SRT LAN up-mast transceiver
F	R5000 power supply unit
G	M5000 monitor
H	R5000 radar processor
I	O5000 trackball
J	O2000 controller
K	O2000 power supply unit
L	R5000 control station
1	Power cable
2	LAN cable

General wiring guidelines

- Check all ground connections. During the hardware installation they must be completed before power and communication cabling
- Create drips loops where cable connects to product, to prevent water collecting on device connectors
- All cables should be routed as directly as possible, consistent with consideration for other equipment, in order to reduce electromagnetic interference effects and voltage drop
- Cables should not be installed close to high-power or high frequency conducting cables, such as radar or radio-transmitter lines or large DC motor cables
- Where cables intersect, try to stay at right angles (90°) to minimize inductance of noise
- Only use suitable waterproof connectors when joining cables
- If a cable being pulled through a concealed area requires excessive force to finish pulling through the remaining cable, consider rerouting cable via an alternative route – otherwise cable conductors may get broken, the cable sheath & insulation may be damaged, or the same damage may be done to adjacent cables, which may cause a fire

SRT LAN up-mast transceiver overview



A Power connector
B LAN connector
C Heater connector location (shown with a protective cover attached)
D Grounding terminal
E Radar performance monitor arm flange
F Safety switch

Grounding the SRT LAN transceiver

Connect a tinned copper cable (>25 mm2) between the ground terminal on the SRT LAN transceiver and the ship´s structure. Cable should be kept to minimum necessary length. Ensure it is fastened using a suitable stainless bolt and lock nut or spring washer. Self-tapping screws should not be used. Good electrical connection is essential, ensure paint or other isolating coatings on surface are properly removed around area of bolt and ring terminal contact. After fitting, apply a suitable anti-corrosive coating to the assembly.

→ ***Note:*** Radar mast should be a good conductor (i.e. metal), and be bonded to rest of ships ground. If not, earth cable should be run to nearest grounded structure.

→ ***Note:*** Earth strap is ideally braided tinned copper, but tinned power cable is also suitable.

Ethernet cable

For Ethernet wiring details, refer to the System Installation Manual.

Power cable

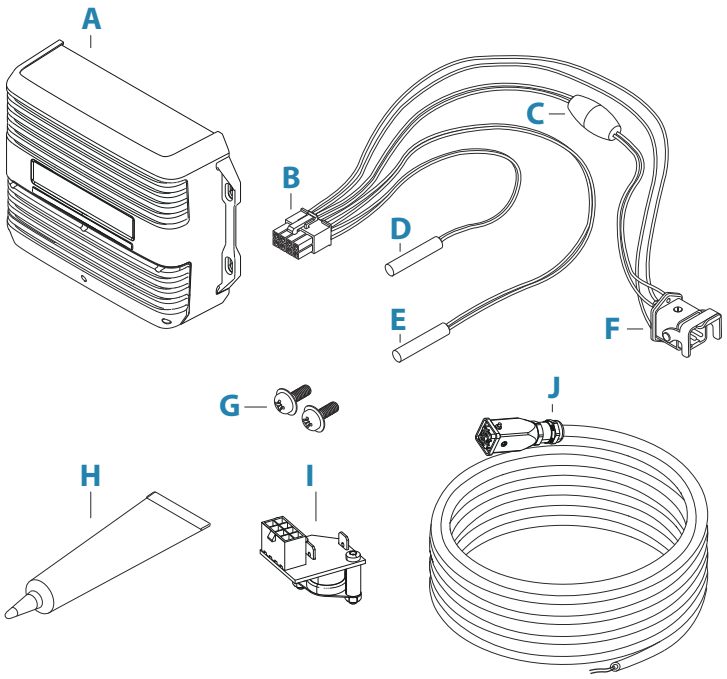
For power wiring details, refer to the System Installation Manual.

4 Heater kit (optional)

The heater kit

The optional heater kit is used to ensure safe start-up and operation in harsh conditions. For details, refer to *"Technical specifications"* on page 19.

Parts included

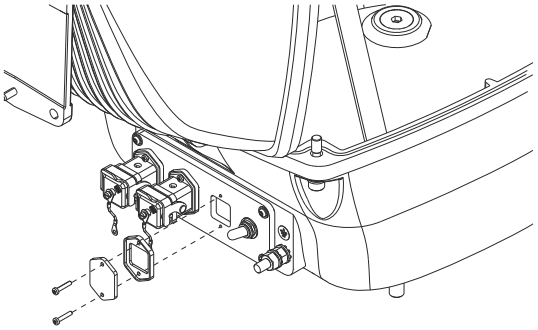


- **A** R5000 power supply unit
- **B** Connector (8-pin female) for temperature sensor and controller PCB
- **C** In-line fuse holder (10 A SB fuse)
- **D** Lower heater element
- **E** Upper heater element
- **F** External waterproof socket
- **G** Screws, M4
- **H** Thermal conductive compound
- **I** Temperature sensor and controller PCB, including 2x M3 screws for mounting
- **J** Power cable

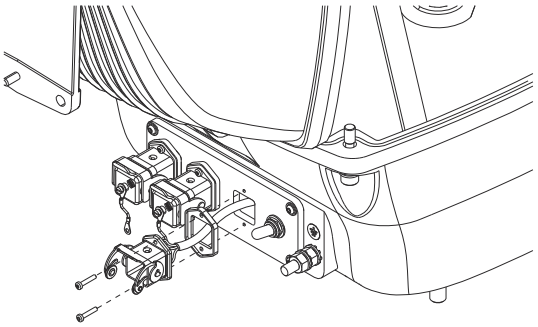
Installing the heater kit

1. Ensure that the radar system is shut down, and a warning sign has been placed at the radar control station. Make sure that the safety switch located on the SRT LAN transceiver is switched OFF.

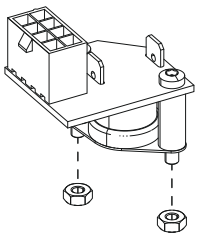
2 Remove the blanking plate and gasket from the heater connection at the SRT LAN transceiver.



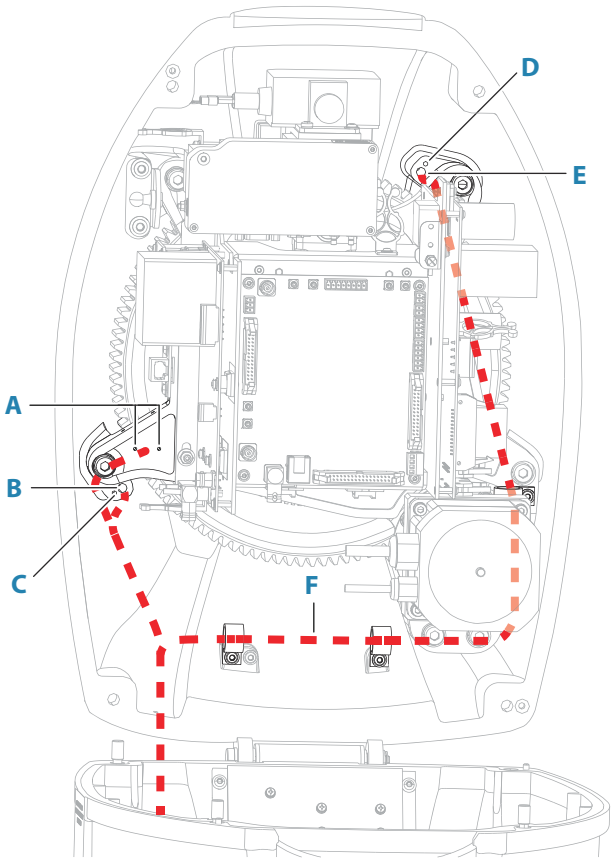
3 Pass the heater elements, 8-pin connector, and fuse holder through the hole, from outside to the inside. Mount the external connector to the SRT LAN transceiver using the removed screws.



4 Inside the SRT LAN transceiver identify the temperature sensor and controller PCB, and the heater elements mounting locations by referring to the following diagram. Route the heater kit cables along the dotted lines shown in the image. Ensure no part of the cable has enough slack to risk coming in to contact with moving parts like the main gear wheel.
Remove the two nuts from the temperature sensor and controller PCB.



Secure the temperature sensor and controller PCB with the supplied M3 screws, and attach the 8-pin female connector.
Apply a layer of thermal conductive compound to the surface of the heater elements. Insert the heater elements into the mounting holes and secure them in place using the M4 screws.



A Temperature sensor and controller PCB screw holes
B Lower heater element mounting hole
C Lower heater element retaining screw hole
D Upper heater element retaining screw hole
E Upper heater element mounting hole
F Cable route

5 Connect and route the external power cable to the R5000 power supply unit

R5000 power supply unit mounting and wiring

The heater kit operates at 52 V DC and should be connected to the 52 V DC output. Refer to the power supply unit documentation for mounting and wiring details.

5 Technical specifications

SRT LAN Radar sensor X-band up-mast

General	
Antenna type	End-fed-slotted waveguide
Type approval	Radar Equipment CAT 1 (H), CAT 2 (H) and CAT 3
Environmental	
Temperature	
Operating temperature	-25°C to 55°C (According to IEC 60945 ed. 4.0)
Operating temperature with heater kit installed	-40°C to 55°C according to RMRS rules (2-020101-040-E Vol 2 - Environmental Test of Equipment)
Storage temperature	-25°C to 70°C (According to IEC 60945 ed. 4.0)
Storage temperature with heater kit installed	-60°C to 70°C according to RMRS rules (2-020101-040-E Vol 2 - Environmental Test of Equipment)
Vibration	According to IEC60945 ed. 4.0
Shock	According to RMRS rules (2-020101-040-E Vol 2 - Environmental Test of Equipment)
Product category	Exposed
IP class	IPX6
Relative wind velocity	100 knots wind tunnel test (According to IEC 62388)
Compass safe distance	
Safe distance to the standard magnetic compass	1.43 m (4.69 ft) 12 kW transceiver 1.35 m (4.43 ft) 25 kW transceiver
Safe distance to the steering magnetic compass	0.87 m (2.86 ft) 12 kW transceiver 0.85 m (2.79 ft) 25 kW transceiver
Physical	
Dimensions	Refer to dimensional drawings
Weight	
6 ft antenna	5 kg (11.0 lbs.)
9 ft antenna	10 kg (22.1 lbs.)
12 ft antenna	15 kg (33.1 lbs.)
SRT LAN up-mast transceiver	36 kg (79.4 lbs.)
Performance	
RPM	
6 ft. antenna	20 or 40 RPM (selectable)
9 ft. antenna	20 or 40 RPM (selectable)
12 ft antenna	20 RPM
Nominal peak power	12 kW or 25 kW depending on transceiver
Operating frequency	9410 ± 30 MHz
Pulse length	
Short pulse	70 ns
Medium pulse	250 ns
Long pulse	800 ns

PRF	
Short pulse	3000 Hz
Medium pulse	1500 Hz
Long pulse	750 Hz
Modulator	MOSFET Solid State
IF amplifier	Logarithmic
IF dynamic	95 dB
IF center frequency	60 MHz
IF bandwidth	
Short pulse	20 MHz
Medium pulse	4.8 MHz
Long pulse	1.5 MHz
Horizontal beam width	
6 ft. antenna	1.35 degrees
9 ft. antenna	0.9 degrees
12 ft. antenna	0.7 degrees
Vertical beam width	22 degrees
Antenna gain	
6 ft. antenna	29 dB
9 ft. antenna	31 dB
12 ft. antenna	32.5 dB
Antenna polarization	Horizontal
VSWR	< 1.20
Overall noise figure	< 5 nominal dB
MDS on long pulse	-105 dBm

6 Accessories

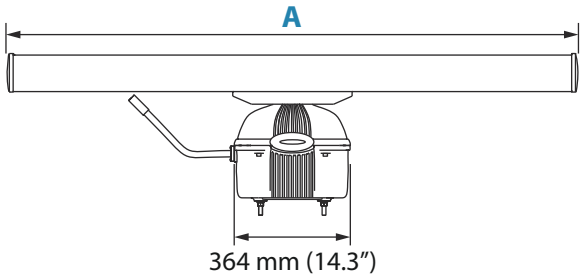
The most up-to-date accessories list is available at:

- www.navico-commercial.com

7 Dimensional drawings

SRT LAN Radar sensor X-band up-mast

Front:



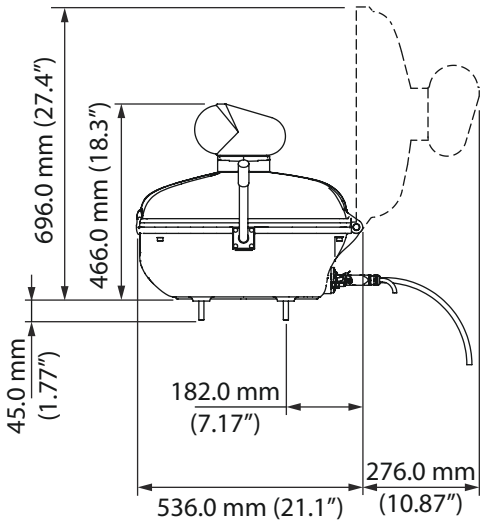
The antenna length (**A**) is model dependent:

6 feet antenna: 1810 mm (71.26")

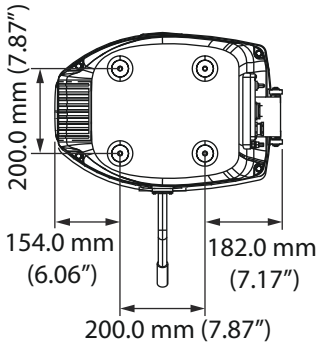
9 feet antenna: 2660 mm (104.72")

12 feet antenna: 3628 mm (142.83")

Side:



Bottom:



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