SIMRAD

R3016 12U/6X

Configuration and Maintenance Manual

ENGLISH

www.navico.com/commercial

Preface

Disclaimer

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 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.

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.

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.

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.

Copyright

Warranty

The warranty card is supplied as a separate document.

In case of any queries, refer to the brand website of your display or system: www.navico.com/commercial.

Regulatory statements

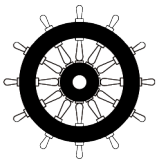
This equipment is intended for use in international waters as well as coastal sea areas administrated by member states pursuant to international conventions.

The R3016 12U/6X Radar system complies with:

- the Navigation requirements of Marine equipment directive (MED) 96/98/EC, and the last modification by directive 2015/559/EU, Annex A.1. item 4.36, Radar equipment for CAT 3 vessels.

The relevant Declaration of Conformity is available on the product's section on the following website: www.navico.com/commercial.

Wheelmark



The Marine Equipment Directive 96/98/EC (MED) applies to all ships for which safety certificates are issued by - or on behalf of - member states pursuant to international conventions. This applies to all new ships, to existing ships not previously carrying such equipment, and to ships having their equipment replaced. This means that all system components covered by annex A1 must be type-approved accordingly and must carry the Wheelmark, which is a symbol of conformity with the Marine Equipment Directive.

Navico has no responsibility for incorrect installation or use of the equipment. It is essential for the person in charge of the installation to be familiar with the relevant requirements as well as with the contents of the manuals, which covers correct installation and use.

About this manual

This manual is a reference guide for commissioning the Maggie radar system. The manual is written for the professional radar and marine electronics technicians, and assumes some prior knowledge and skills relevant to the type of work to be carried out.

The latest available manual version can be downloaded from the website: www.navico.com/commercial.

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.

Hazard distances are given in the following table:

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 ft. antenna	-	0.05	0.9

The system is however designed to always disable the microwave radiation when the antenna is not rotating.

X-Ray radiation

This radar system does not generate X-ray radiation.

Trademarks

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NMEA® and NMEA 2000® are registered trademarks of the National Marine Electronics Association.

SD™ and microSD™ are trademarks or registered trademarks of SD-3C, LLC in the United States, other countries or both.

Contents

1 Introduction

R3016 12U/6X Radar system

The R3016 12U/6X Radar system is a type approved radar system conforming to the International Maritime Organization (IMO) requirements for vessels that are subject to SOLAS regulations.

The system consists of:

- R3016 Control unit
- 12kW up-mast transceiver with 6ft. antenna
- R3000 Power supply unit

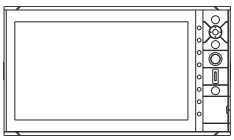
The radar assists in safe navigation and in avoiding collision by providing an indication, in relation to own ship, of the position of other surface craft, obstructions and hazards, navigation objects and shorelines. For this purpose, the radar provides the integration and display of radar video, target tracking information, positional data derived from own ship's position and geo-referenced data.

To be able to provide consistent data, the R3016 12U/6X Radar system is designed to be integrated using serial interfaces with other electronic equipment normally present in a vessel bridge:

- Gyro-compass or transmitting heading device (HDG)
- Speed and Distance Measuring Equipment (SDME)
- Electronic Position Fixing System (EPFS)
- Automatic Identification System (AIS)
- Bridge Alert Management system (BAM)

The R3016 12U/6X Radar system is a Category 3 type approved system, approved only in the configuration specified in the certificate. The type approval certificates are available at the product web site: www.navico.com/commercial.

System components



The R3016 Control unit

The R3016 Control unit includes 3 main components: a processor, a monitor and a keypad.

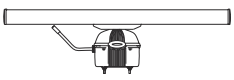
The processor is made of a dual core CPU that integrates information coming from the transceiver and the external sensors.

The monitor is a non-touch monitor type approved for Category 3 Radar use.

The keypad is the main control device for the system. The system cursor is controlled by the directional pad, while several options are provided to activate radar functionalities and navigate menus during operation.

The R3016 Control unit is fitted with an SD card reader used for updating the software and for transferring data from the system.

The control unit is directly linked with the transceiver using a dedicated signal cable (15, 30 or 65 m length).



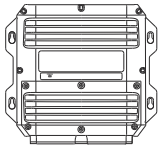
The up-mast radar sensor

The up-mast radar sensor comprises two main parts: a 6 foot antenna and a 12 kW transceiver.

The antenna is a 6 foot X-band antenna, fixed to the transceiver unit with 4 bolts.

The transceiver is the system radio transmitter and receiver, measuring the radar echo received from the pulse transmission. The transceiver includes a processing unit that eliminates unwanted echoes or noise, and transfers digitized video data to the control unit.

On the back of the unit there is a safety switch and 3 connectors: Signal connector, Main power connector, and a connector for the optional Heater kit.



The R3000 Power supply unit

System nominal input is 24 VDC. The power supply unit converts the available 24 VDC power source up to the transceiver's operating voltage. The transceiver input voltage is higher to minimize the effect of voltage drop due to cable length.

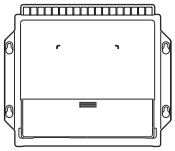
Output power cables are available in 15, 30 and 65 m lengths.

The Heater kit

The optional Heater kit is used when installing the heater in the transceiver. The heater warms up the radar transceiver to ensure safe start-up and operation. The main components of the Heater kit are:

- the R3000 Power supply unit - provides the additional output required to drive heater element
- the Heater upgrade kit - all the parts that are to be included in the transceiver unit
- the cable - connects the R3000 Power supply unit to the transceiver heater power connector

Power cables for connection between R3000 Power supply unit and Heater kit are available in 15, 30 and 65 m lengths.



SI80 Signal Interface unit

The optional SI80 Signal Interface unit is used to provide an additional IEC 61162-2 port. Connection to the R3016 Control unit is made via NMEA 2000. The SI80 provides power and termination for the backbone.

R3016 12U/6X manuals

The following documentation is delivered with the R3016 12U/6X Radar system:

R3016 12U/6X Operator manual (988-10911-00n)
User descriptions of the radar and of the features included in the system.

Intended audience: System operator.

R2009/R3016 Quick Guide (988-10951-00n)
Graphical document describing the keys and the main functions.

Intended audience: System operator.

R3016 12U/6X Installation and System wiring manual (988-10912-00n)
Mechanical installation and wiring, technical specifications and mechanical drawings for all system components.

Intended audience: Shipyard installation personnel.

R3016 12U/6X Configuration and maintenance manual (988-10913-00n)
System setup/configuration, commissioning, trouble shooting, maintenance procedures, replacement procedures for replaceable parts and spare parts listing.

Intended audience: Installation and service engineers.

R3016 Control unit Mounting template (988-10917-00n)
1:1 cut-out template with dimensions.

→ ***Note:*** The last digit in the part numbers is the document's revision code. The latest version of all documents can be downloaded from the product website on www.navico.com/commercial.

2

User interface

Main panel

The main panel is divided into predefined areas as shown in the figure below.

1 **Plan Position Indicator (PPI)**
Radar video area where all tracking and navigation options are performed.

2 **Own ship information**
Stabilization mode indicator, picture freeze indicator and gauges showing primary and secondary sensors.

3 **Target panel**
Detailed information about selected targets and AIS targets.

4 **Softkey bar**
Reference for softkey functions.

5 **Target indicators**
Overview of target indicator settings.

6 **Markers**
Details for active VRM and EBL markers.

7 **Cursor information**
Range and bearing from the vessel to the cursor position. Also including position information if a position source is available.

8 **Alerts panel**
List of all active alerts.

9 **Signal indicators**
Gauges for signal processing and indicators for radar functions.

10 **System information**
Range, mode and pulse details.

3

Software setup

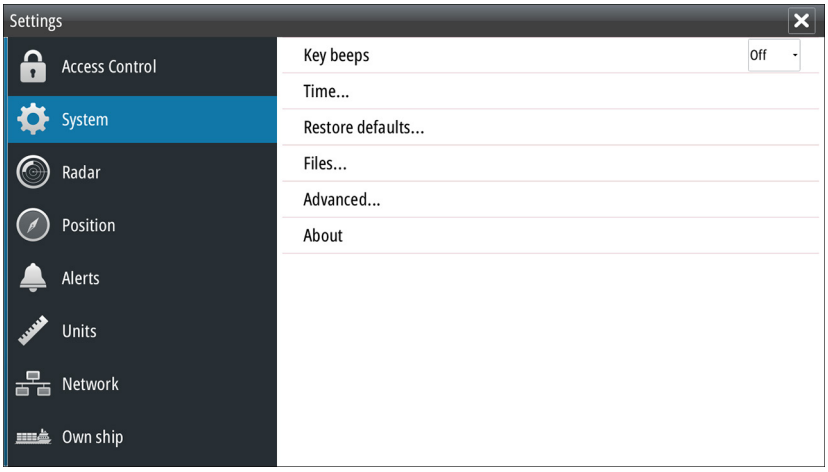
Commissioning

Prior to use, the R3016 12U/6X Radar system requires a number of settings be configured in order for the system to perform as expected.

Access to the required menus for commissioning can be found in the **Settings** dialog.

Open the **Settings** dialog from the main **Menu**.

The Settings dialog consists of numerous parameters that will seldom require adjustment beyond initial setup. All settings are stored in non-volatile memory. Most are intended to be configured by the technician commissioning the system, by the operator at first use, or by a technician after servicing or replacement of system parts.



Overview

The following areas must all be addressed during commissioning, and should be stepped through one at a time, referring to the detailed sections for further information:

1 Access control

2 Setting up external sensors (Network dialog)

3 Radar settings (Installation dialog)

- Radar source
- Radar status
- Antenna setup
- Adjust range offset
- Adjust bearing alignment
- Tune
- Sector Blanking
- Auto coarse tune Adjustment
- Performance monitor adjustment

4 Own ship - vessel properties

- Reset Magnetron Timers
- Reset radar to factory defaults

Access control

To start the commissioning process, open the Access control dialog and select **Enter password**.

QWERTY is the service password.

When you are logged in:

- **Service mode** should show a tick next to it.
- All previously greyed-out menu items are now accessible.
- **Service mode** does not time out.
- The unit will go back to **Operator mode** if the user exits from the Settings dialog, or if the user manually unticks **Service mode**.

Setting up external sensors

Access the **Network** dialog to setup sensors.

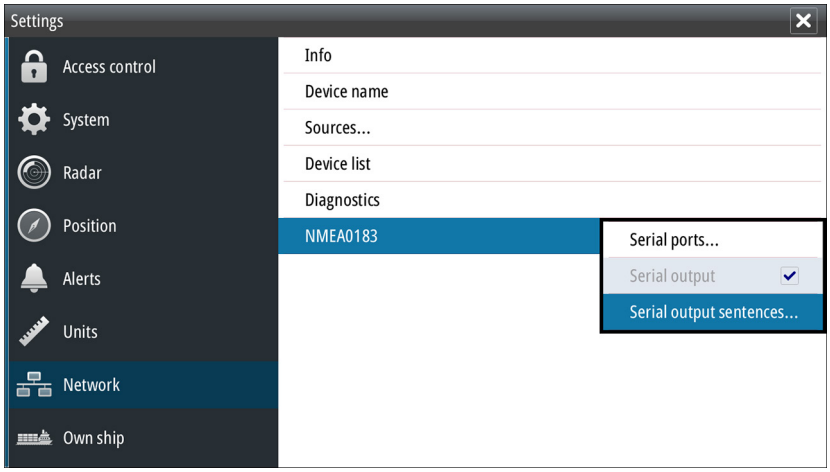
The sensors interface to the display via the NMEA 0183 ports, either directly to the display, or via an optional SI80 interface. The baud rate for all ports must be set to suit the connected sensor.

Sensors connected to the control unit NMEA 0183 ports

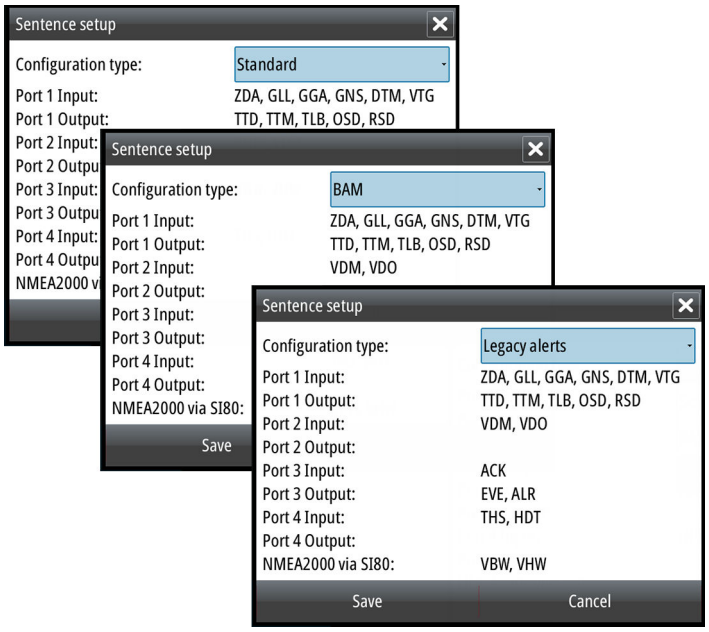
Access the **NMEA 0183** dialog, and select appropriate NMEA 0183 baud rate settings for the connected sensors for AIS, SDME, THD, EPFS, and BAM, etc. in the **Serial ports** dialog.

Serial output sentences

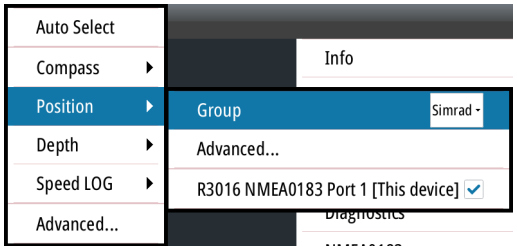
There are three possible configurations that define what sentences are transmitted and received by each port. Select **Serial output sentences**.



Then in the **Sentence setup** dialog select a Configuration type. The ports support the indicated data. Selected Configuration type must match the physical connection of sensors.



Then access the **Sources** dialog and assign the data sources.



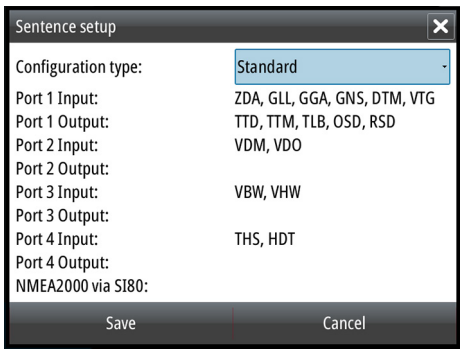
For **BAM** configuration:

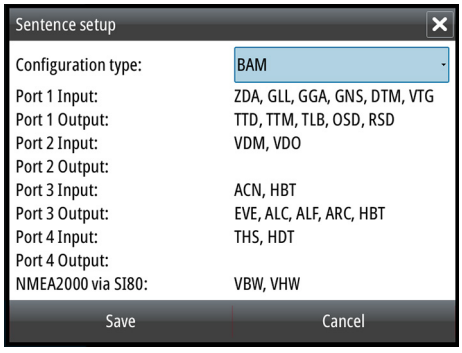
- EPFS is selected under the **Position** option. Select **R3016 NMEA 0 183 Port 1 [This device]**
- GYRO is selected under the **Compass** option. Select **R0316 NMEA 0183 Port 4 [This device]**

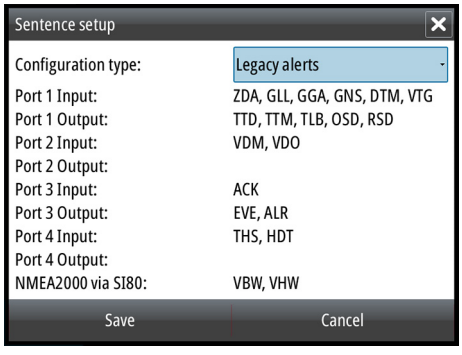
For **Standard** and **Legacy** configurations:

- EPFS is selected under the **Position** option. Select **R3016 NMEA 0 183 Port 1 [This device]**
- SDME is selected under the **Boat** speed option. Select **R3016 NMEA 0183 Port 4 [This device]**
- GYRO is selected under the **Compass** option. Select **R0316 NMEA 0183 Port 4 [This device]**

➔ ***Note:*** AIS and BAM inputs do not require any configuration.

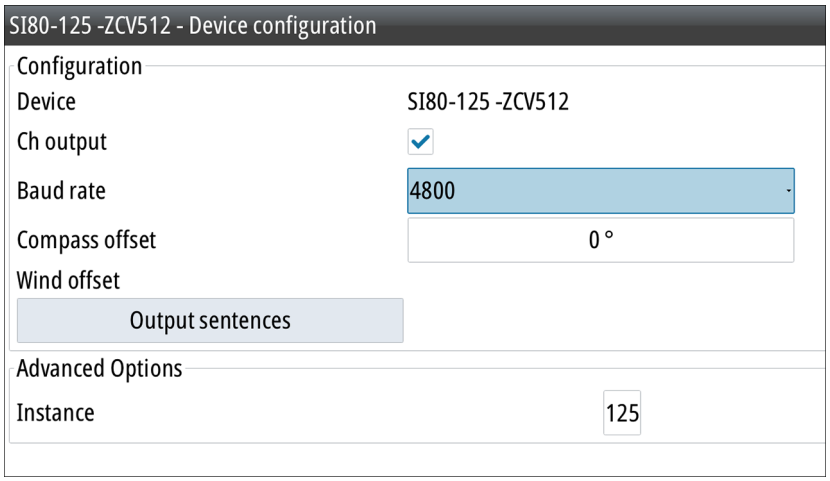






Sensor connected to the SI80

Access the **Device list**, select the device listed as **SI80 - x** (where **x** equals the physical port sensor is connected to), then select the **Configure** option. The SDME is connected to the SI80.



Select appropriate NMEA 0183 settings for the connected sensors:

- Baud rate: set the baud rate to suit the connected sensor.

Then access the Sources dialog and select the NMEA 2000 device which will supply the required data. In this case the port on the SI80.

→ ***Note:*** The SI80's port can be assigned a more meaningful name when viewing the Device Information page for the port. It is recommended that the default port name be appended with a description of sensor type, for example, SI80-3 SDME.

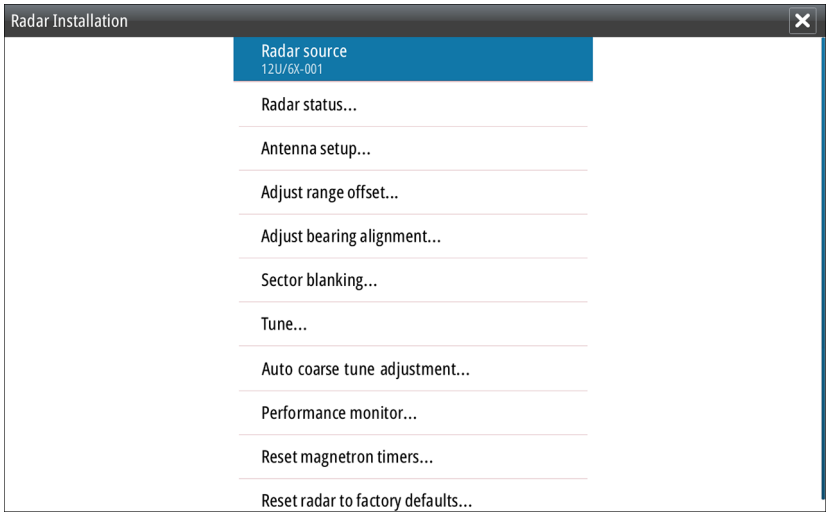
→ ***Note:*** See the *"Supported IEC 61162 messages"* on page 49 for supported sentences.

Radar settings

Radar installation

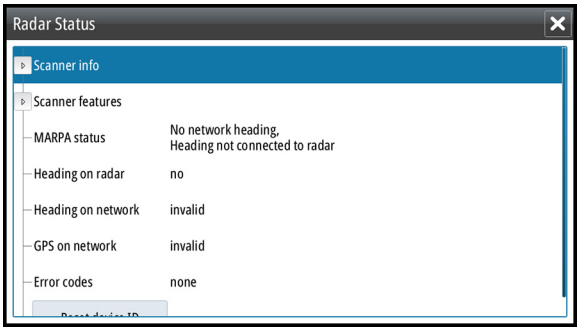
The radar system requires scanner specific adjustments to be made in order to adjust for a number of variables found in different installations.

Access the **Radar** menu, and choose **Installation,** then configure the settings under the following headings.



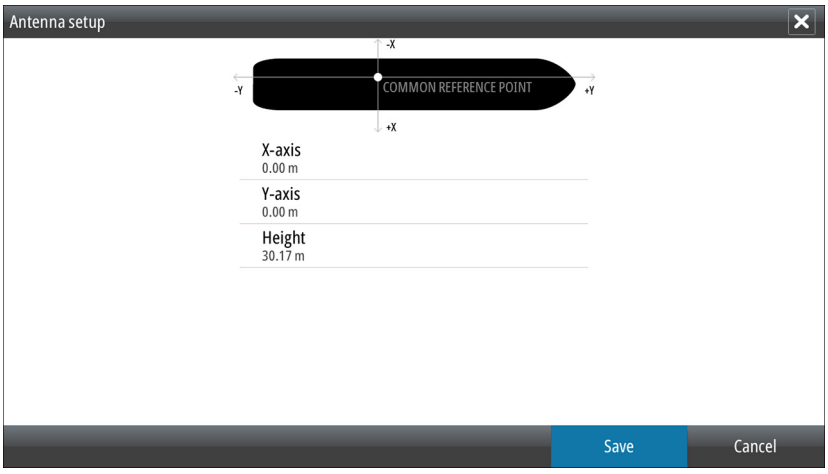
Radar status

Primarily for information and to assist with fault finding.



Antenna setup

This function is used for setting position and height of radar transceiver on the vessel.

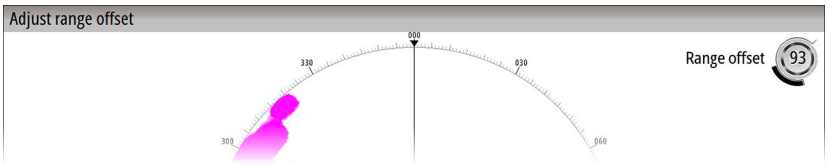


The approximate position of the transceiver on the vessel must be set in order to correctly position the vessel outline when viewing close range settings.

The antenna height is the height of the antenna above the water line, when vessel is carrying a typical load. It is very important to set the antenna height correctly as this will affect the sea clutter function. Do not set the height to 0.

Adjust range offset

The radar sweep should commence at your vessel (a radar range of zero). You may need to adjust the radar range offset to achieve this. If this is set incorrectly, a large dark circle in the center of the sweep might occur. You might notice straight objects such as straight sea walls or piers having curves or an indentation. Objects close to your vessel may appear "pulled in" or "pushed out".

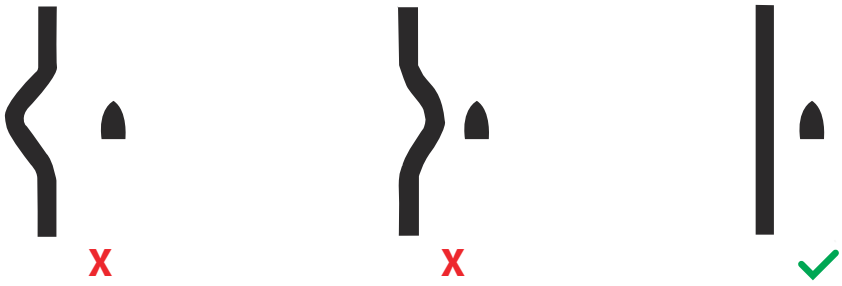


Adjust the range offset as below when the vessel is about 45 to 90 m (50 to 100 yards) from a straight-walled jetty or similar feature that produces a straight line echo on the display.

- Point the boat towards the jetty
- Adjust the gain setting until a reasonably good image of the jetty echo is displayed

With the Range offset dialog open:

- Turn the rotary knob to adjust the range offset to make the jetty echo appear as a straight line on the display
- Press the **ENT** key to save the settings

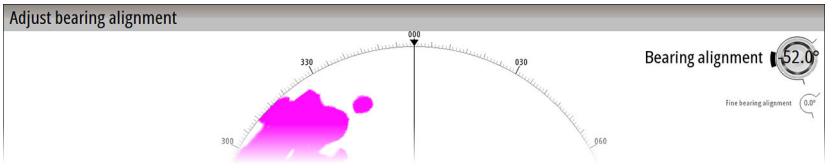


Adjust bearing alignment

This is to align the heading marker on the screen with the center line of the vessel. This setting compensates for any slight misalignment of the up-mast transceiver during installation. Misalignment that is not corrected for will compromise target tracking and can result in dangerous misinterpretation of potential navigation hazards.

Point the vessel towards a stationary isolated object. Then with the Bearing alignment dialog open:

- Press the rotary knob to switch focus between coarse and fine bearing alignment
- Turn the rotary knob to adjust the bearing alignment so that the heading line touches the end of the selected stationary object
- Press the **ENT** key to save the settings and close the Bearing alignment dialog



Sector blanking

To assure passenger safety from radiation and if 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 a defined direction, over a variable sector size. Up to four sectors can be set up.

➔ ***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.

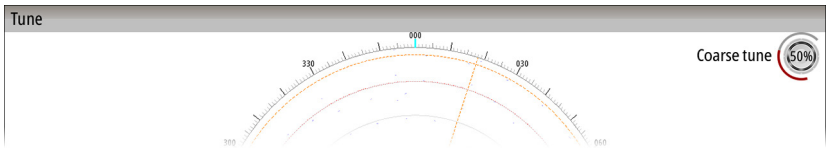
Tune

The Tune option is used to do initial manual tuning of the radar system and to adjust the radar when a new magnetron has been fitted.

Set the range scale at 24 NM, the tuning control in manual and centered at 50.

With the Tune dialog open:

- Turn the rotary knob to adjust the coarse tune value until the best reflection is obtained
- Press the **ENT** key to save the settings and close the Tune dialog

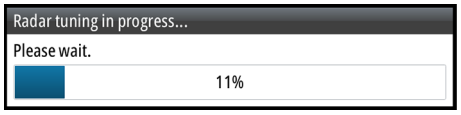


Auto coarse tune adjustment

The Auto coarse tune adjustment is used to do initial automatic tuning of the radar system and to adjust the radar when a new magnetron has been fitted.

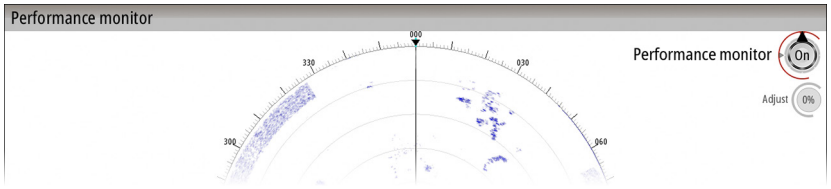
Set the range scale at 24 NM, the tuning control in manual and centered at 50.

When the the Auto coarse tune adjustment is selected, a progress bar indicates status. The coarse value is stored automatically when the tuning is completed.



Performance monitor

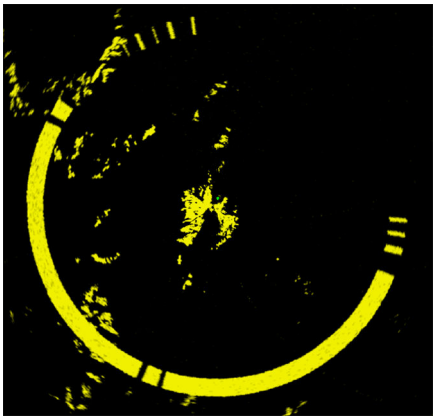
The performance monitor is used to check the output performance of the transceiver. It is very important that it is initially adjusted at time of installation, and when the magnetron is replaced, when power output is still optimal.



➔ ***Note:*** Before entering the performance monitor setup dialog, set to system to 24 NM range scale.

With the Performance monitor dialog open:

1. Press the rotary knob to switch focus between the on/off icon the adjustment icon
2. Turn the rotary knob to adjust the value of the active icon
3. Activate the Adjust icon and adjust the value until the opening with of the displayed noise ring is around 60° to 100° width



4. Press the **ENT** key to save the settings and close the Performance monitor dialog

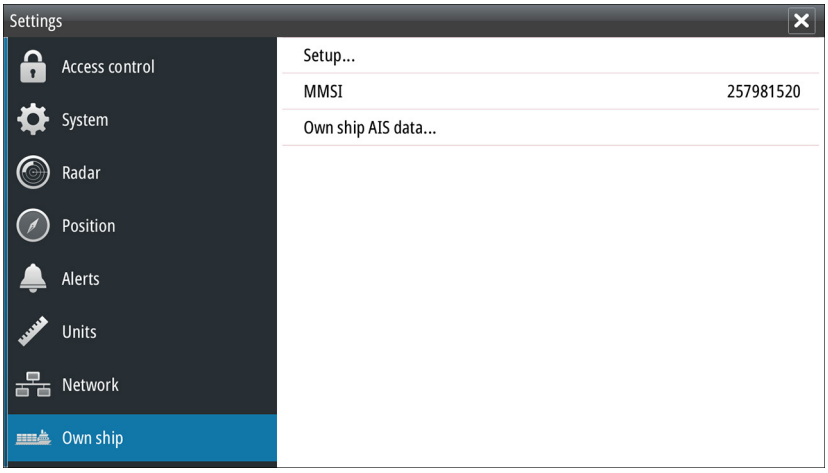
Reset magnetron timers

Refer to *"Magnetron timer reset"* on page 31.

Reset radar to factory defaults

Clears all user and installer settings applied to radar, and restores ex-factory settings. Use with caution, taking note of current settings first, especially those set by the operator if radar has already been in active service.

Own ship



MMSI

Set the vessel's own MMSI number. This prevents the vessel being identified as an AIS target on own display.

General settings of the system

This menu contains miscellaneous settings and functions that are required during commissioning.

Key beeps

You can set one of three loudness levels of beeping for beeps (quiet, normal, loud) or turn beeps off.

Time

Set local time and formats of time and date.

Restore defaults

Clears all user adjustments to the radar, but maintains settings applied by the installer.

Files

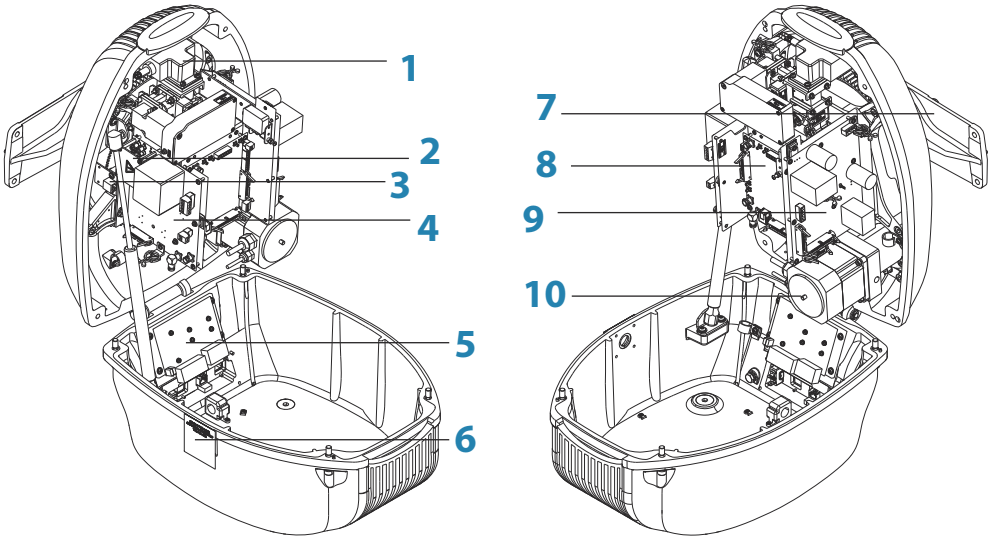
This menu is used to browse the contents of an inserted SD card, primarily for the purpose of installing updates to the system software, and to allow the saving of system configuration back-ups.

Perform a backup once all other commissioning steps have been completed.

4

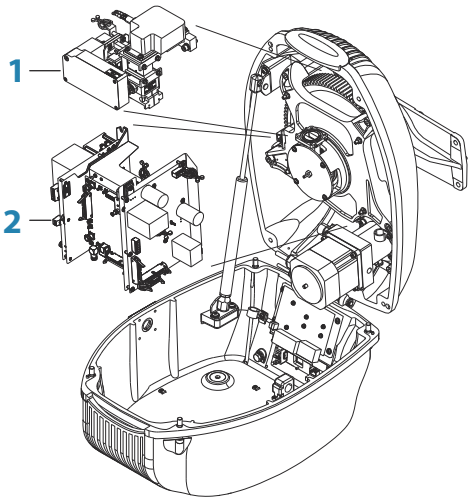
Functional description

The drawing below represents the general view of the main components that are described in detail in other sections of this manual. This drawing serves as a reference for the location of these parts.



1	Magnetron
2	Magnetron HT connection
3	Bearing reader board
4	MOS PCB
5	Brushless motor controller PCB
6	Performance monitor connection point
7	Antenna platform
8	Control PCB
9	Power PCB
10	Motor & gearbox assembly

→ ***Note:*** The mini power supply system and SRT LAN PCBs are not shown here, as they are concealed within the electronics assembly.



1	RF head
2	Electronics assembly

5 Servicing

Software updates

Software update to the radar console

1. Download the update file from www.navico.com/commercial
2. Copy to SD card, and insert in to the card reader slot on unit
3. Turn on or restart unit
4. Update will be applied automatically, do not interrupt installation

Software update to the radar transceiver

1. Download the update file from www.navico.com/commercial
2. Copy to SD card, and insert in to the card reader slot on unit
3. Access **Files** dialog from the **System** menu, and locate the file on the memory card
4. Select the file, and select **Upgrade** from the dialog that appears
5. Do not interrupt the installation process

Back up the system

It is essential to backup the user and installer settings before any service or repair work. The back up file is used for restoring the settings in case they are accidently deleted or hardware storing the settings is replaced.

To create a backup file:

1. Access the **Files** dialog
2. Insert an SD card in to the card reader.
3. Select **System settings**, and then select the destination folder on the SD card (memory card). The settings will be saved. See *"Back up parameters"* on page 53 for example of the settings list.

Tools required

Type	Size
Torx driver	T10x100 T20x100
Flat screw driver	0.5x3.75 0.4x2.5x75 0.8x5x125
Phillips screwdriver	PH2
Ball-end hex driver	4x100 5x100
Socket driver	5.5 mm 8 mm
Wrenches (spanners) open ended	19 mm 13 mm 8 mm 1/4 inch
Hex key (allen key)	6 mm 1.5 mm [RF head removal grub screws]
Cable ties Multimeter	TY100-18 Fluke or equivalent

6 Diagnostics and troubleshooting

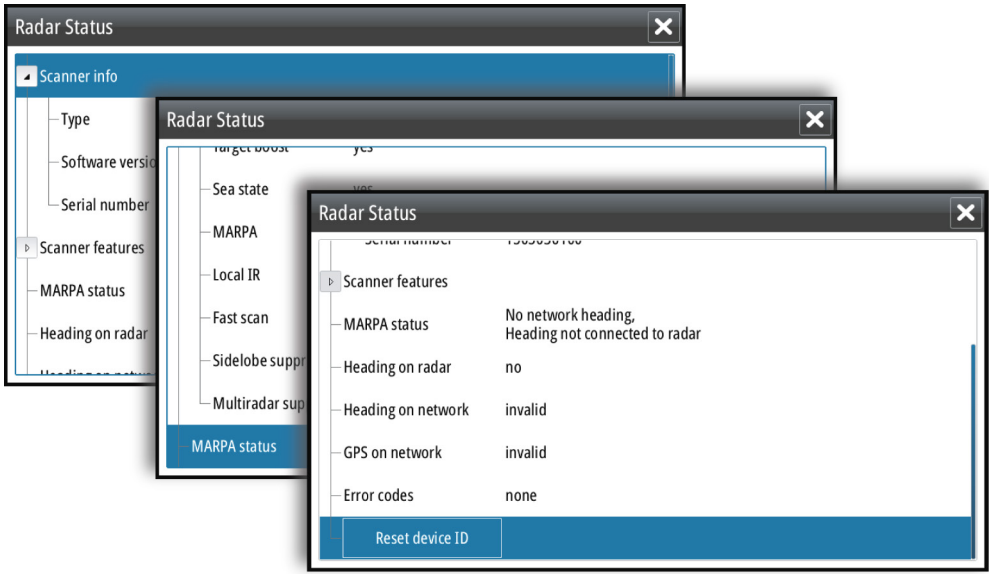
The chapter contains information about diagnostics of the R3016 12U/6X Radar system and procedures for a fault localization in case some problem occurs. The troubleshooting procedures are represented as table. When a faulty component is identified, refer to *"Fault repair"* on page 32 for replacement instructions.

> ⚠ Warning: Only suitably trained technical personnel should attempt service or repair work on this radar system. This product works with voltage levels and radiation that could cause injury or death.

Radar status menu

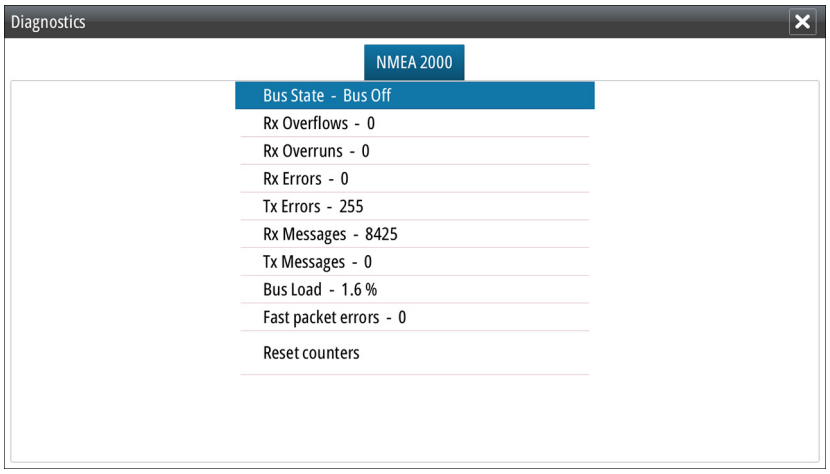
The radar status menu provides information about the version of software, as well as availability of features and data sources at the radar up-mast transceiver.

Available features depend on scanner or relate to the availability of required data (i.e. Target Tracking will show **No**, if heading data is missing).



NMEA 2000 network diagnostics dialog

The NMEA 2000 diagnostics dialog provides information for identifying an issue with the network.



Item	Values	Description
Bus state	Bus On/Bus Off	The status does not indicate connection to any data source. If the status is 'Bus Off', but power is present along with an increasing error count, check the termination and cable topology.
Rx Overflows	0, 1, 2, ...	The CAN driver got too many messages for its buffer and the application cannot read them.
Rx Overruns	0, 1, 2, ...	The CAN hardware got too many messages for its buffer and the CAN driver cannot read them.
Rx Errors	0, 1, 2, ...	This is not cumulative count. The number increases with error, and decreases when messages are recieved successfully. The normal state is 0. Values around 96 upwards indicate a heavily error prone network. The device responsible for causing the errors should eventually drop off the bus automatically if this number does not decrease.
Tx Errors	0, 1, 2, ...	This is not cumulative count. The number increases with error, and decreases when messages are recieved successfully. The normal state is 0. Values around 96 upwards indicate a heavily error prone network. The device responsible for causing the errors should eventually drop off the bus automatically if this number does not decrease. Bus State changes to Bus Off.
Rx messages	0, 1, 2, ...	Total number of recieved messages.
Tx messages	0, 1, 2, ...	Total number of transmitted messages.
Bus load	0%..100%	Bus load. High bus load indicates system is nearly at capacity. A network bridge may be used to increase bus size.
Fast packet errors	0, 1, 2, ...	This is a cumulative counter that counts missed frames, frames out of sequence, etc. NMEA 2000 PGNs are made of up to 32 frames. The entire message will be discarded when a frame is missed.

→ ***Note:*** The above information may not always indicate an issue that can be simply resolved with minor adjustment to network topology or connected devices and their activity on the network. However Rx and Tx errors are most likely indicating issues with the physical network, which may be resolved by correcting termination, reducing backbone or drop lengths, or reducing the number of network nodes (devices).

Diagnostic LEDs on power supply unit

The two LEDs on the front cover of the R3000 power supply unit provide basic diagnostic information on the wiring and presence of a suitable power source.

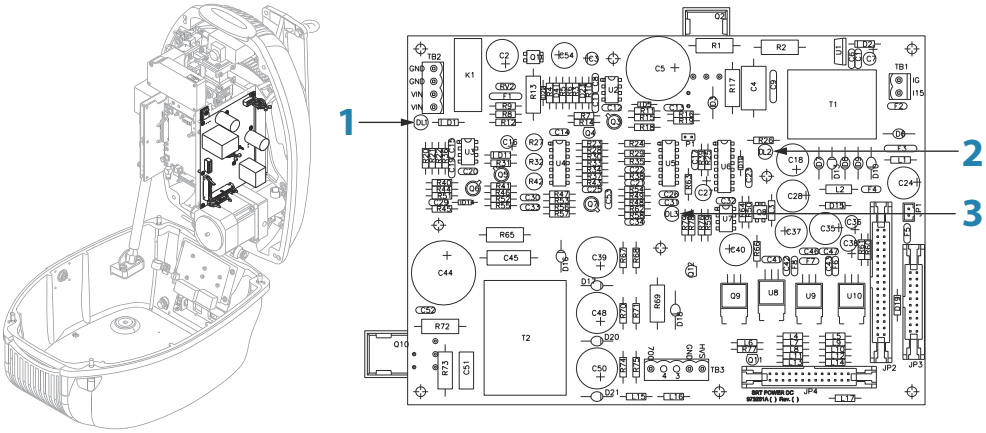
LED name	Color	Pattern	Meaning
Status	Green	On constant	Output voltage (50 V DC) is available to the transceiver

LED name	Color	Pattern	Meaning
Power	Green	On constant	Input supply is good, voltage is within acceptable range
	OFF	N/A	No supply, or protection fuse is blown
	Red	On constant	• R3000 switch set to OFF • Output overload • Input voltage too high (>36 V DC) • Input voltage too low (<17 V DC) • Output voltage too high (>60V) • Temperature too high (>125° C)
	Red	Blinking	Output overload

→ ***Note:*** The power supply unit has an initialization sequence when starting up, and will momentarily illuminate the red LED, this is normal behavior.

Diagnostic LEDs inside transceiver

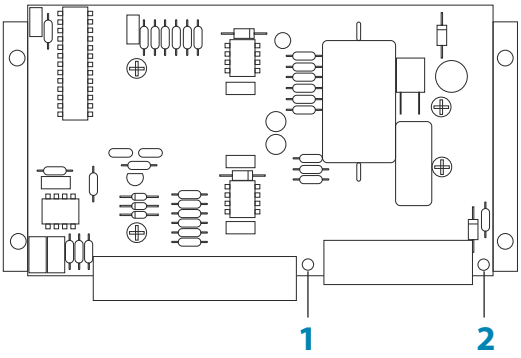
The three LEDs on the SRT power board provide diagnostic information on the correct functioning of the power supply board, whose task is to convert incoming 50 V DC to 24 V DC and 5 V DC used inside the transceiver.



Key	PCB label	LED color	ON indication
1	DL1	Green	+24 V DC OK
2	DL2	Green	+5 V DC OK
3	DL3	Red	High voltage OK (700 V DC for modulator)

Diagnostic LEDs on the brushless motor controller

The two LEDs on the brushless motor controller provide diagnostic information on the correction functioning of the power supply board. The board converts incoming 50 V DC to 24 V and 5 V DC used inside the transceiver. The motor controller is found in the lower half of the transceiver housing, directly above the cable entry point.



Key	PCB label	LED color	Indication
1	DL2	Red	LED ON = motor in OFF or controller in protection LED OFF = motor in rotation
2	DL1	Green	LED ON = +50 V DC OK

Main possible failures

The main possible failures of the system are listed below. The numbers listed should be cross references with the table that follows, in order to help for a diagnosis of the issue.

- XCVR does not turn on: 1, 2, 3, 4
- Transmitter can not be controlled: 4
- Antenna data cannot be controlled: 4, 8, 9
- Transmitter performance is low: 5, 10
- Sector blanking is not working: 8, 9
- Antenna does not rotate: 4, 6, 11, 12
- There is no current to magnetron: 5, 7, 13
- Transmitter does not generate RF: 6, 7, 13
- Antenna rotates, but rotation speed cannot be controlled: 14

Key	Potential cause	Check	Remedy
1	Power supply is missing or polarity is inverted	Check DL1 LED status and measure voltage on TB2 of PCB SRT power	Connect the 24VDC voltage to the transmitter properly
2	Power ON signal is missing	Close P1 link on PCB SRT power and make sure the LED DL2 lights on properly	Replace SRT control board
3	Voltage supply is too low	Check DL1 LED status and measure voltage on TB2 of SRT power board	Connect the 24VDC voltage to the transmitter properly
4	Ethernet cable is interrupted	Check electrical continuity and insolation from GND	Replace SRT LAN board or Mini PSU
5	Magnetron exhausted	Check magnetron transmission hours and current. Check on console	Replace magnetron
6	The safety switch is open	Check switch position and continuity	Close the safety switch or replace it
7	High voltage generator is damaged	Disconnect 700V cable from TB3 of SRT power board, disconnect motor cables, turn S1 of the SRT control board on position 3 and make sure DL3 is off	Replace SRT power board

Key	Potential cause	Check	Remedy
8	Cable between Bearing Reader and SRT Control boards is interrupted	Check electrical continuity of the cables	Replace the cable
9	Circuits are damaged	Check input and output azimuth signals on SRT control board	Replace the damaged board
10	High voltage is too low	Check magnetron current and 700 V DC voltage value	Adjust high voltage values on SRT power board
11	Motor power supply is missing	Check if 24VDC voltage value on brushless motor controller ends is low or missing	Connect the 24VDC voltage to the controller properly
12	Motor power supply is missing	Check brushless if motor controller enable signals are missing	If missing: replace SRT control board If present: replace the brushless motor controller
13	Modulator is damaged	Disconnect 700V cable from TB3 of SRT power board, disconnect motor cables, turn S1 of the SRT control board on position 3 and make sure DL3 is off	Replace SRT MOS board
14	Brushless motor controller is not enabled properly	Check brushless motor controller signals	Replace SRT control board

7

Preventative maintenance

Follow the procedures that are described in this chapter to ensure the radar system operates at its optimum.

The maintenance procedures are described below. Each description lists the operations which must be performed, their interval, the materials, and the time required for each task.

> ⚠ Warning: High voltage is present inside the unit. Do not open the cabinet cover before the main radar breaker has been turned to off position. All work performed on the transceiver must be recorded in the unit log book.

> ⚠ Warning: Before starting any maintenance or repair work, it is mandatory that, for the safety of personnel, all high-voltage capacitors be short-circuited by means of an insulated screwdriver or other suitable tool. Switch off the power supply before connecting instrumentation used for performing measurements inside the unit.

External inspection of the 12U/6X X-BAND unit

The operation is performed twice a year.

Tools required:

- 6 mm hex key
- waterproof general purpose grease,
- paint (if required)

Time required: 15 minutes.

> ⚠ Warning: On the electric switchboard, switch OFF the radar main breaker and place a card reading WORK IN PROGRESS - DO NOT SWITCH ON.

Steps to follow

1. Turn off the R3000 Power supply unit via the safety switch inside.
2. Place a placard at the radar controls stating unit is being serviced.
3. Check that no parts of the plastic covering the up-mast transceiver have been painted.
4. Check the casing preservation state.
5. Unscrew and grease the 4 fastening screws of the cover to avoid corrosion and facilitate future inspections.
6. If paint has been scratched off ant any point
   - Degrease the part to be painted
   - Scuff lightly with emery paper
   - Dust off with a dry brush
   - Apply an rust resistance paint system suited to harsh environments. Refer to paint supplier instructions for application details.
7. On the electric switchboard, switch ON the radar main breaker and remove the card reading WORK IN PROGRESS - DO NOT SWITCH ON.

Internal inspection of the 12U/6X X-BAND unit

The operation is performed twice a year.

Tools required:

- 6 mm hex key
- waterproof general purpose grease
- paint (if required) set of screwdrivers (define)
- contact cleaner
- soft brush
- emery paper

- soft cloth

Time required: 15 minutes.

> ⚠ Warning: On the electric switchboard, switch OFF the radar main breaker and place a card reading WORK IN PROGRESS - DO NOT SWITCH ON.

Steps to follow

Preliminary operations

1. Position the antenna so it is facing to the bow of the vessel.
2. Unscrew and remove the four cover screws, using the 6 mm hex key.
3. Open the cover fully.

Internal multi-pin connectors and cables inspection

1. Check for any signs of water ingress.
2. Check the condition of all connector contacts (pins and plugs).
3. Clean any corroded contacts with contact cleaner or emery paper if required.
4. Repair or replace any defective part.

Mechanical Checks

1. Check the gear integrity.
2. Add a thin coating of grease if the main gear shows lack of lubrication.
3. Check that there are no loose screws inside the housing.
4. Replace or tighten firmly as necessary.

General cleaning

Internal cleaning is necessary only when a visible buildup of dirt is present. Use IPA alcohol if dirt will not be moved by a dry cloth alone. Compressed air or a small soft brush may also be used to remove dust.

1. Dry any damp surfaces by using a soft cloth.
2. Remove dust, ash, and grease from the external surfaces of the cabinet. Use a soft brush and alcohol.
3. Clean the exterior of the housing in a similar manner. Degreaser may be used to remove stubborn residue.

Final steps

1. Close the radar housing, paying attention to any stray cables that may get pinched in the opening.
2. Grease the fastening screws to prevent corrosion and ease future removal.
3. Secure the cover in place.
4. On the electric switchboard, switch ON the radar main breaker and remove the card reading WORK IN PROGRESS - DO NOT SWITCH ON.

Magnetron replacement of the 12U/6X X-BAND unit

The operation is performed as required or by 8000 hours.

Tools required:

- screwdriver set
- hex socket set
- hex-key set
- hex T-handle wrench set
- silicone grease (compound 340)

Time required: 30 minutes.

> ⚠ Warning: On the electric switchboard, switch OFF the radar main breaker and place a card reading WORK IN PROGRESS - DO NOT SWITCH ON.

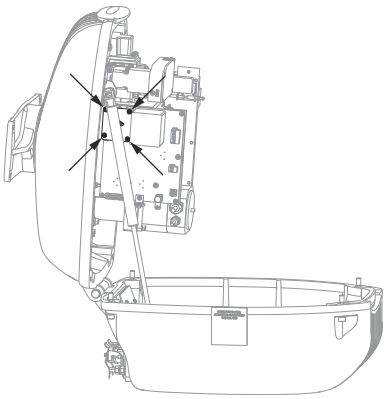
Steps to follow

Preparation

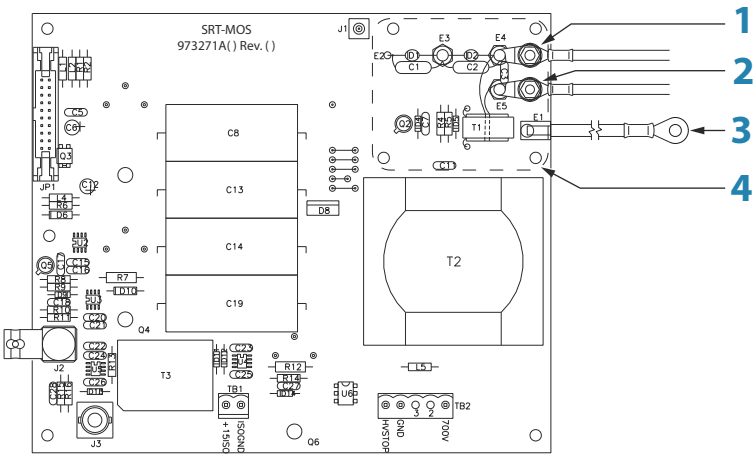
1. Position the antenna so it is facing to the bow of the vessel.
2. Unscrew and remove the four cover screws, using the 6 mm hex key.
3. Open the cover fully.

Removal

1. Unscrew the 4x10 mm torx screws securing the protective transparent cover (indicated below) over the magnetron high voltage connections.

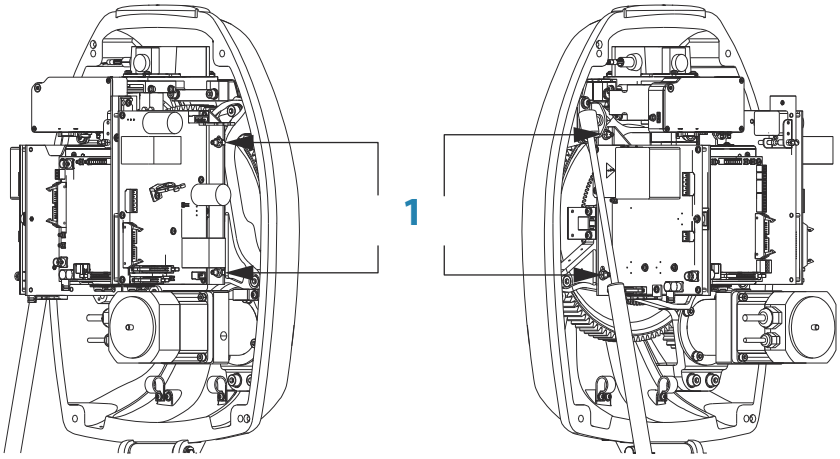


2. Remove the hex nuts on the terminal posts marked K and FIL, using a 5.5 mm socket driver.
3. Remove the magnetron wires from the terminals, taking note of their position.

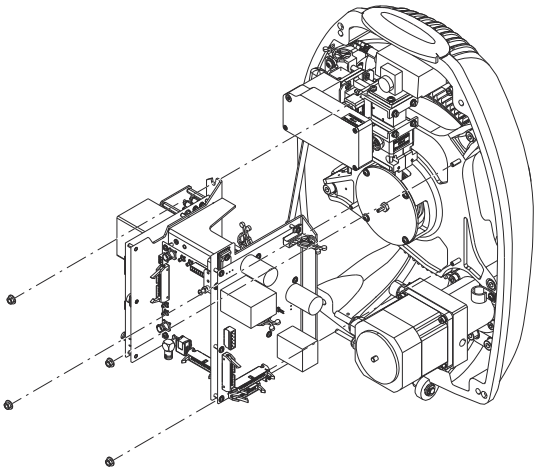


- **1** - K terminal
- **2** - FIL terminal
- **3** - ground wire
- **4** - transparent cover

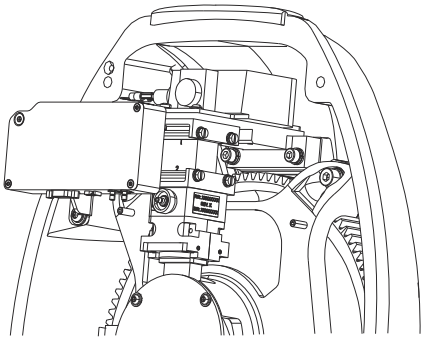
4. Unplug cabling connectors that connect to other components not mounted to the electronics assembly.
5. Ensure cables are extracted from any cable clips mounted to the electronics assembly using the *"List of connectors"* on page 44
6. Unscrew the four hex nuts fixing the electronics assembly to the housing using a 8 mm wrench. (**1** - electronics rack chassis fasteners)



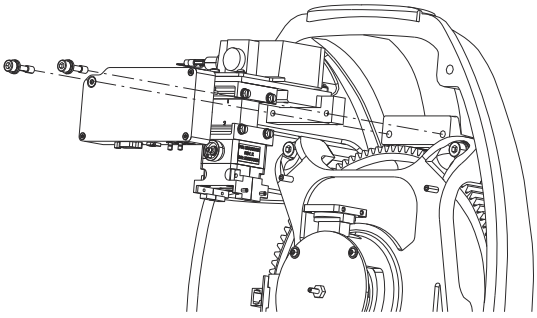
7. Slowly extract the electronics assembly from the housing, looking for any cables still joining the assembly to the case, or remaining components.



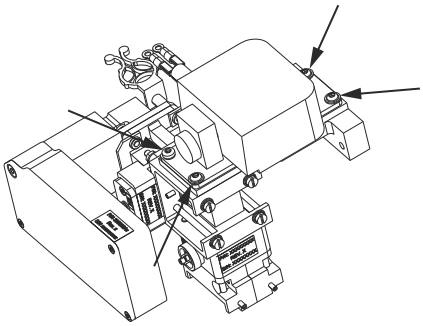
8. Using the 1.5 mm hex key with ends ball, loosen off the four small grub screws on the sides of the wave-guide (coupling the RF head to the rotary joint).



9. Holding the RF head with one hand, use a ball-end hex key to loosen and remove the two 5 mm hex cap screws securing the RF head to the case.
10. Extract the RF head from the cover.



11. Remove the 4x torx 10 mm screws fixing the magnetron to the rest of the RF head.



Installation

1. Before fitting the new magnetron to the RF head, spread a layer of silicone grease on the contact surface to improve the magnetron's heat dissipation.
2. In order to install the new magnetron, perform the removal steps in reverse order, leaving the transceiver housing open at this stage.

Final operation

Close the equipment cover by following the reverse procedure to opening.

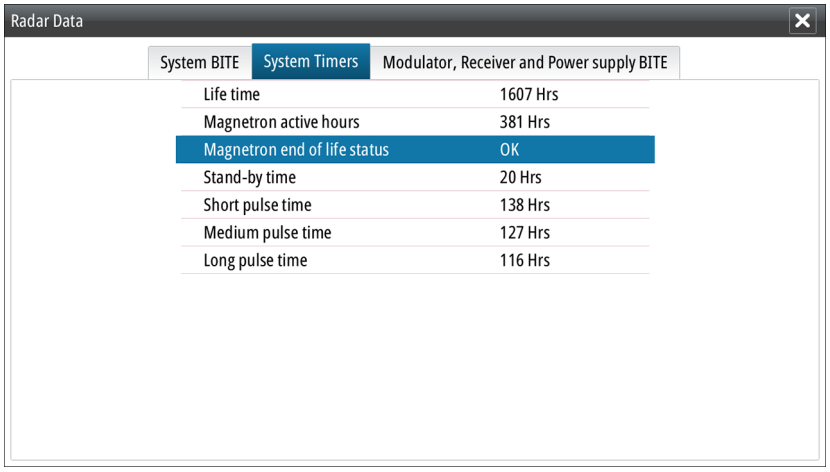
Magnetron timer reset

The timers count the number of hours the magnetron has been transmitting, the pulse length, and the pulse repetition frequency (PRF).

When the magnetron is replaced with a new item the timers of the transceiver must be reset.

Using the R3016 Control unit, access the **Installation** dialog, and select the option **Magnetron timers reset**.

The R3016 system gives a warning when the magnetron is close to the end of its expected lifetime. From within the **Radar data** dialog, it is possible to view the hours and the magnetron end of life status (which reports OK or FAIL).



8 Fault repair

This section provides a detailed description of the steps to be taken in order to replace a damaged component on or within the R3016 12U/6X transceiver unit. The R3016 Control unit and R3000 Power supply unit not field serviceable items, and should be returned to a Navico distribution center for any repair work required.

The following topics are covered:

Ensure the following service tools are available:

- 7 mm, 8 mm, 13 mm combination wrenches
- T10, T20 torx wrenches
- 5 mm, 8 mm, 13 mm socket wrenches
- 1.5 mm, 5 mm, 6 mm hex wrenches (allen keys), with ball end
- 5 mm, 8 mm, 13 mm T-Handle wrenches with swiveling hexagonal socket
- 0.5x3 mm, 0.8x4 mm flat screwdriver
- PH1, PH2 Philips screwdriver
- Small diagonal cutters
- Silicone grease, compound 340

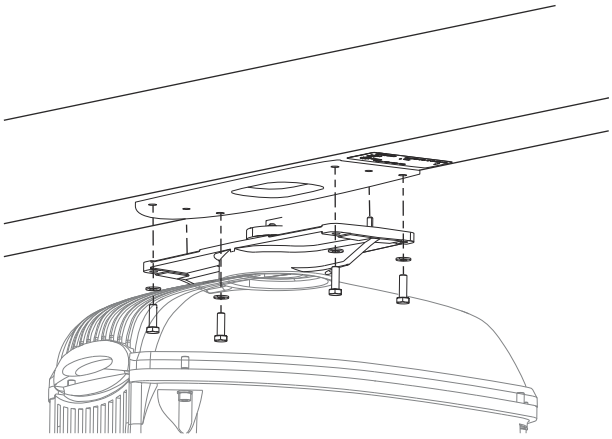
→ ***Note:*** Any maintenance operation must only be carried out after the equipment has been switched off. Before commencing with repair work, ensure the spare part is available, and its condition has been verified as good.

⚠ Warning: The replacement operations must be carried out exclusively by skilled personnel with appropriate equipment training.

Antenna replacement

Removal

1. On the electric switch board, set the radar main breaker to OFF and hang up a card reading WORK IN PROGRESS - DO NOT SWITCH ON.
2. Using the 13 mm open wrench, loosen and remove the bolts securing the antenna to the platform on top of the up-mast transceiver.
3. Lift the antenna off the up-mast transceiver, taking care not to knock the waveguide protruding from the up-mast transceiver.



Installation

1. Check the integrity of the new antenna.
2. In order to install the antenna, perform the removal operations in reverse order, ensuring the alignment pins on the antenna support engage with the holes in the antenna.

Opening and closing of the transceiver cover

Opening

1. On the electric switch board, set the radar main breaker to OFF and hang up a card reading WORK IN PROGRESS - DO NOT SWITCH ON.
2. Rotate the antenna by hand, as needed, so it is positioned facing to the bow of the vessel.
3. Unscrew and remove the four cover screws, using the 6 mm hex key.
4. Open the cover fully.

The cover should be held open by the gas strut.

Closing

1. Check the integrity of the cover seal, and replace it if it shows any signs of damage or deformation.
2. Close the radar housing, paying attention to any stray cables that may get pinched in the opening.
3. Grease the fastening screws to prevent corrosion and ease future removal.
4. Secure the cover in place.
5. On the electric switchboard, set to ON the power breaker relevant to the unit and remove the warning card.

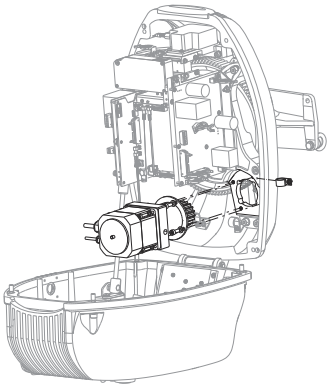
Replacement of the motor or gearbox assembly

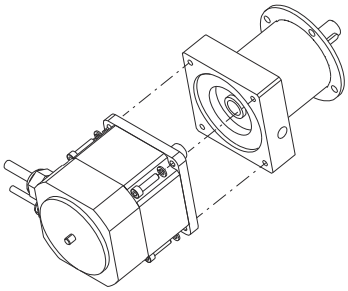
Removal

1. On the electric switch board, set the radar main breaker to OFF and hang up a card reading WORK IN PROGRESS - DO NOT SWITCH ON.
2. Rotate the antenna by hand, as needed, so it is positioned facing to the bow of the vessel.
3. Unscrew and remove the four cover screws, using the 6 mm hex key.
4. Open the cover fully. The cover should be held open by the gas strut.
5. Using a small flat terminal screwdriver, remove wires connected to the motor at the Brushless motor controller end.
6. From CN1 remove:
   - Brown (terminal 1)
   - Orange (terminal 2)
   - Yellow (terminal 3)
   - Red (terminal 4, two wires)
   - Black (terminal 5 & 7, two wires)
7. From CN2 remove:
   - Red (terminal 1)

- White (terminal 2)
- Black (terminal 3)

8. Unclip the cable loom from the saddle clips mounted on top and bottom halves of housing.
9. Cut any cable ties preventing unbundling of cable loom.
10. Pull cables attached to motor out of loom and protective sheath
11. Using a small flat terminal screwdriver, remove wires connected to terminals 1 and 3 on TB3 of the SRT controller board (these are common with Red and Black on CN1).
12. Ensure all wires coming out of the two cables on side of motor are now free from cable loom and connection to other components.
13. Using a 5 mm ball head hex key, undo the four hex cap screws securing the gearbox and motor to the upper half of the housing.
14. Remove assembly from housing. Using a 4 mm hex key, undo the four hex cap screws that join the gearbox and motor together.





15. Substitute faulty item with replacements part.

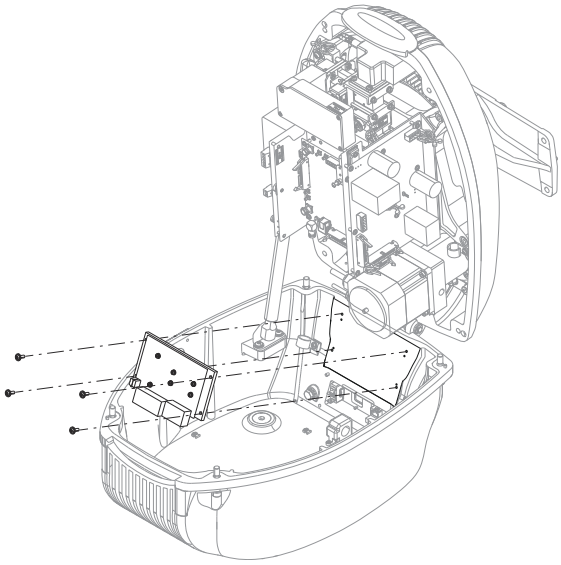
Installation

In order to install the motor unit with the gearbox, perform the removal operations in reverse order.

Replacement of the brushless motor controller

Removal

1. On the electric switch board, set the radar main breaker to OFF and hang up a card reading WORK IN PROGRESS - DO NOT SWITCH ON.
2. Rotate the antenna by hand, as needed, so it is positioned facing to the bow of the vessel. Unscrew and remove the four cover screws, using the 6 mm hex key.
3. Open the cover fully.
4. The cover should be held open by the gas strut.
5. Disconnect the Brushless motor controller, by unplugging the green connectors CN1, and CN2.
6. Using a T20 torx driver, unscrew the 4 screws fixing the backing plate including Brushless motor controller to the lower housing
7. Remove PCB from housing.



Installation

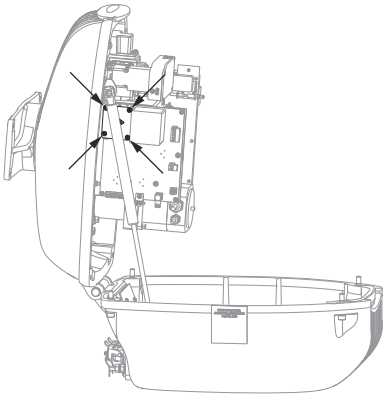
1. In order to install the Brushless motor controller, perform the removal operations in reverse order.
2. Check the integrity of the cover seal, and replace it if it shows any signs of damage or deformation.
3. Close the radar housing, paying attention to any stray cables that may get pinched in the opening.
4. Grease the fastening screws to prevent corrosion and ease future removal.
5. Secure the cover in place.
6. On the electric switchboard, set to ON the power breaker relevant to the unit and remove the warning card.

Electronics assembly replacement

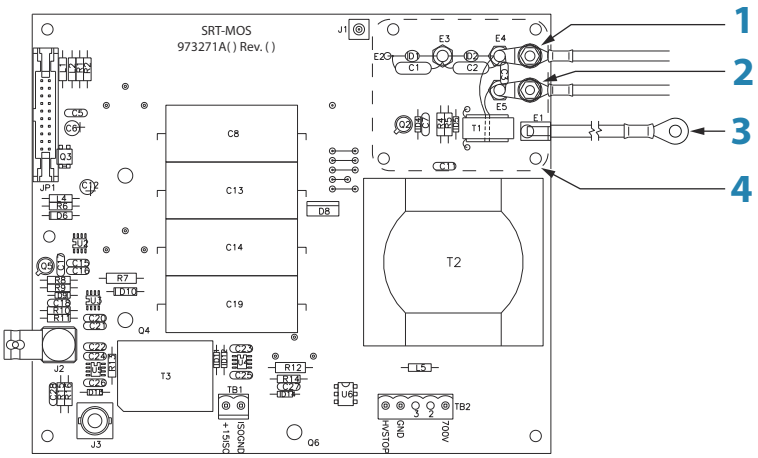
Removal

Position the antenna so it is facing to the bow of the vessel.

1. Unscrew and remove the four cover screws, using the 6 mm hex key.
2. Open the cover fully.
3. Unscrew the 4 xT10 torx screws securing the protective cover (indicated below) over the magnetron connections.

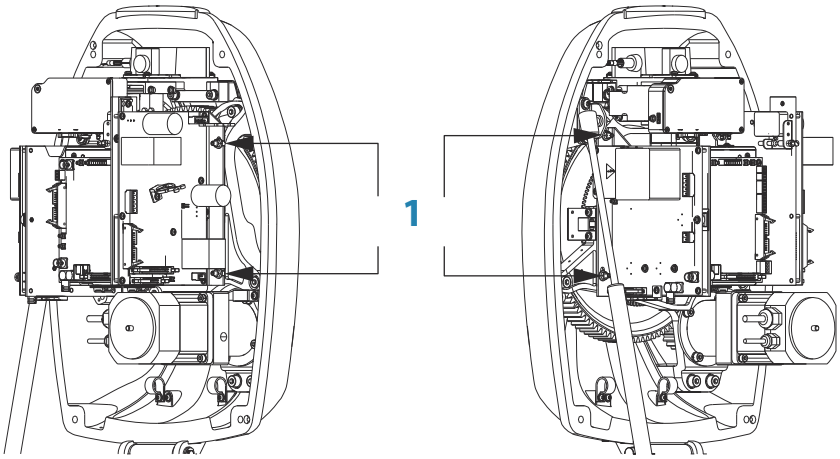


4. Remove the hex nuts on the terminal posts marked K and FIL, using a 5.5 mm socket driver.
5. Remove the Magnetron wires from the terminals, taking note of their position.

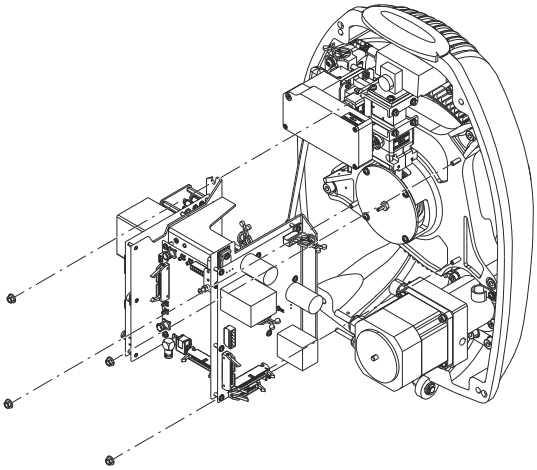


- **1** - K terminal
- **2** - FIL terminal
- **3** - ground wire
- **4** - transparent cover

6. Disconnect the yellow-green earth cable that is connected next to the terminal posts – do this by removing the torx screw holding down the ring terminal to the magnetron base.
7. Unplug the electronics assembly cabling connectors, taking note of their position. Refer to *"List of connectors"* on page 44.
8. Using a 8 mm wrench unscrew the four hex nuts fixing the Electronics assembly to the housing.(**1** - Electronics rack chassis fasteners)



9. Extract the Electronics assembly from the housing. Pay close attention to the cables and the waveguide joint.



Installation

1. If installing a new electronics assembly, remove the EEPROM U30 from the SRT control board of the old electronics assembly and replace it in the SRT control board of the new one.
2. If this operation is skipped, then the unit must be set up manually from blank to recover values and settings stored in the old board EEPROM.
3. In order to install the electronics assembly, perform the Removal steps in reverse order.

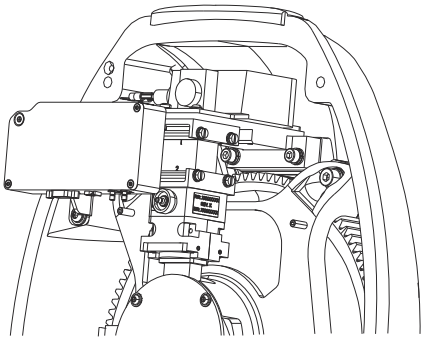
Replacement of the magnetron

Refer to *"Magnetron replacement of the 12U/6X X-BAND unit"* on page 28.

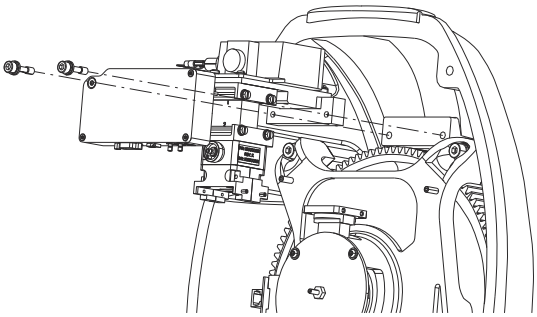
RF head replacement

Removal

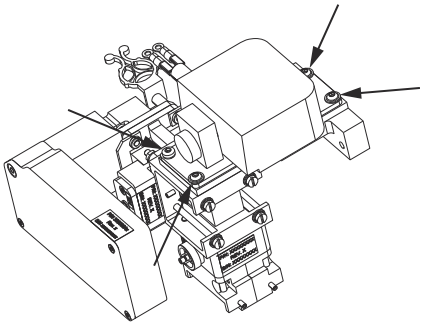
1. Using the 1.5 mm hex key with ends ball, loosen off the four small grub screws on the sides of the wave-guide (coupling the RF head to the rotary joint).



2. Holding the RF head with one hand, use a ball-end hex key to loosen and remove the two 5 mm hex cap screws securing the RF head to the case.
3. Extract the RF head from the cover.



4. Remove the 4x torx T20 screws fixing the magnetron to the rest of the RF head.



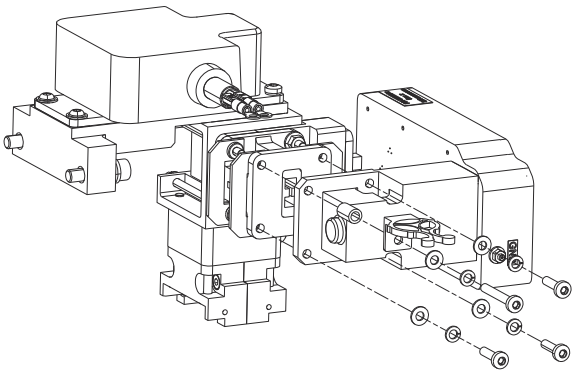
Installation

1. Before fitting the new magnetron to the RF head, spread a layer of silicone grease on the contact surface to improve the magnetrons heat dissipation.
2. In order to install the new magnetron, perform the removal steps in reverse order, leaving the transceiver housing open.

Replacement of the RF amplifier

Removal

1. Follow all steps in the Removal of the *"Electronics assembly removal"* on page 35.
2. Follow all steps in the *"Removal of the RF head "* on page 37.
3. Holding the RF amplifier, remove the 4 T20 torx screws. The RF amplifier will detach from the Limiter.



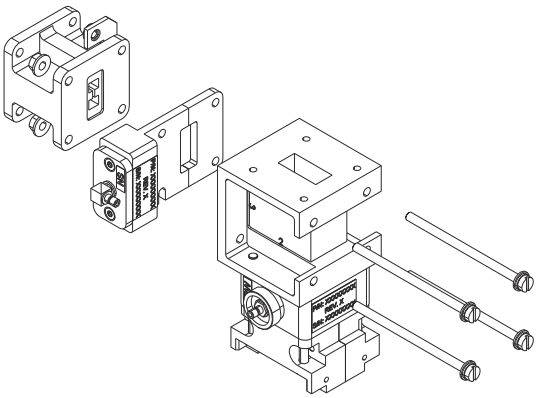
Installation

1. In order to install the RF amplifier, perform the removal operations in reverse order, leaving the housing open at this stage.
2. Follow steps described in *"Calibration"* on page 0 .

Replacement of limiter and noise diode

Removal

1. Perform the removal steps of *"Replacement of the RF amplifier"* on page 38.
2. Using a 0.8x4 mm flat head screw driver and a 7 mm hex wrench, remove the four machine screws, washers, and hex nuts that attach the limiter and noise diode to the side of the circulator.



Installation

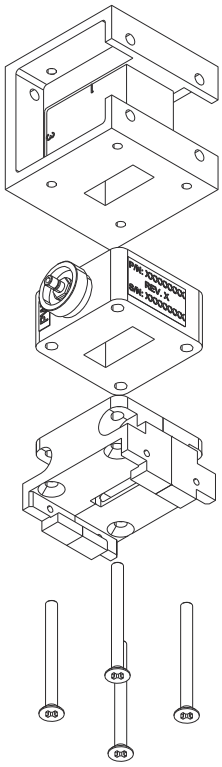
In order to install the limiter and noise diode, perform the removal operations in reverse order.

Replacement of circulator or monitor diode

Removal

1. Follow the removal steps of *"Replacement of limiter and noise diode"* on page 38.
2. Holding the circulator, remove the 4x PH2 screws.

Circulator and monitor diode will separate from the adaptor.



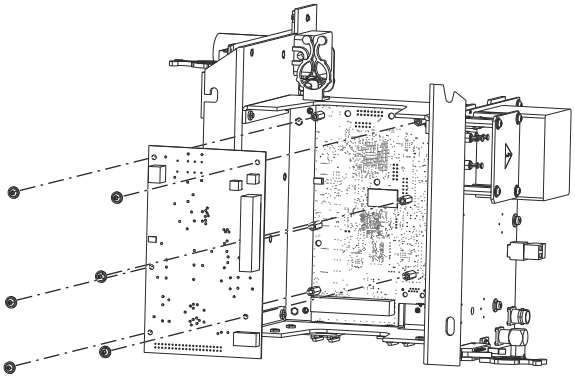
Installation

In order to install the circulator and monitor diode, perform the removal operations in reverse order.

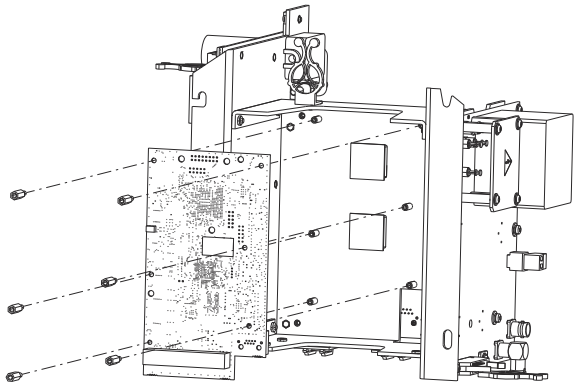
Replacement of the SRT LAN and Mini PSU PCBs

Removal

1. Follow the removal steps of *"Removal of the electronics assembly"* on page 35.
2. Turn the electronic assembly around so it is viewed from the mounting feed end.
3. Disconnect all cables plugged in to the PCB's connectors.
4. Remove the 6 torx screws using a TX driver, and extract the Mini PSU PCB.



5. Remove the 6 hexagonal spacers using a 5 mm hex driver, and extract the SRT LAN PCB.



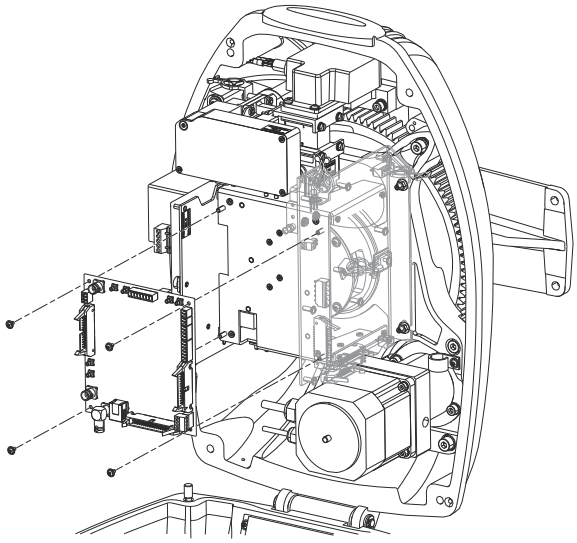
Installation

In order to install the SRT LAN PCB and Mini PSU PCB, perform the removal operations in reverse order.

Replacement of the SRT control PCB

Removal

1. Disconnect all cables plugged in to the PCB's connectors, and release any cables held in place by cable clips attached to the PCB.
2. Remove the 4 torx screws using a TX driver, and extract PCB.



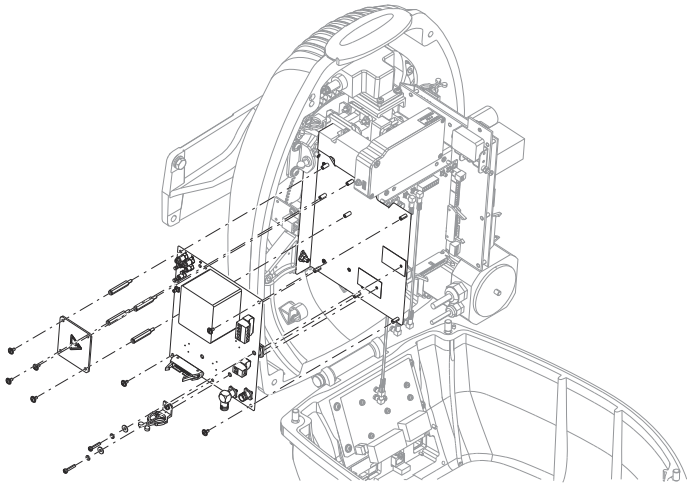
Installation

1. Replace EEPROM U30 on the new SRT control board with the one from the old board. Failing to do so will mean the replacement must be configured, as all settings will be lost.
2. In order to install the SRT control PCB, perform the removal operations in reverse order.

Replacement of the SRT MOS PCB

Removal

1. Disconnect all cables plugged in to the PCB's connectors, and release any cables held in place by cable clips attached to the PCB.
2. Remove the 7 torx screws using a TX driver, and extract PCB.



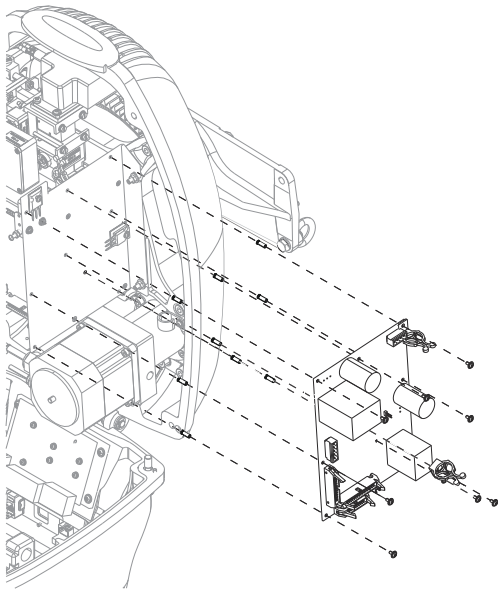
Installation

In order to install the SRT MOS PCB, perform the removal operations in reverse order.

Replacement of the SRT power PCB

Removal

1. Disconnect all cables plugged in to the PCB's connectors, and release any cables held in place by cable clips attached to the PCB.
2. Remove the 11 torx screws using a TX driver, and extract PCB.



Installation

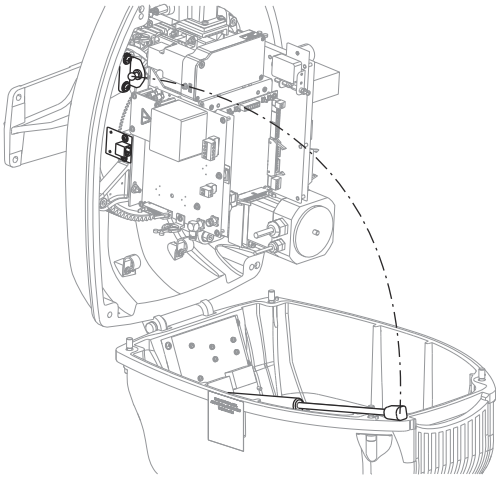
In order to install the SRT power PCB, perform the removal operations in reverse order.

Replacement of the bearing reader board

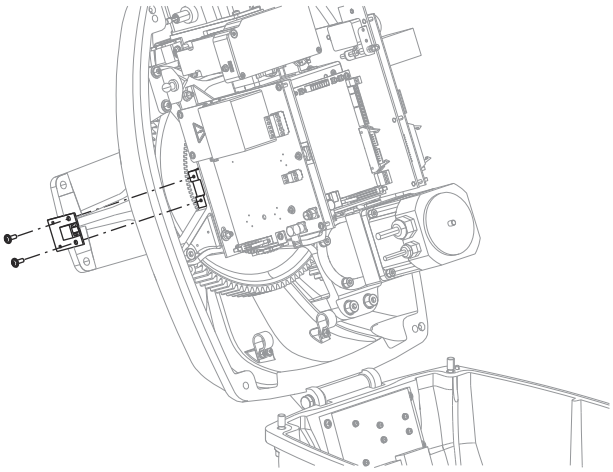
Removal

1. The gas strut may be disconnected at one end if required for improved access to the Bbearing reader board. Hold the upper housing firmly with one hand, then using a small flat screwdriver, undo the metal clip securing the gas strut's upper ball joint, and pull the strut outwards to disengage. The housing may be hinged backward slowly till the hinge reaches its limit. The top housing should be secured so it cannot accidentally close.

➔ ***Note:*** The top housing is very heavy and if unsecured and accidentally allowed to close, it could cause serious injuries.



2. Unplug the bearing reader board cable from the RJ45 socket.
3. Remove the 2 torx screws using a TX driver and extract the bearing reader board from the housing.



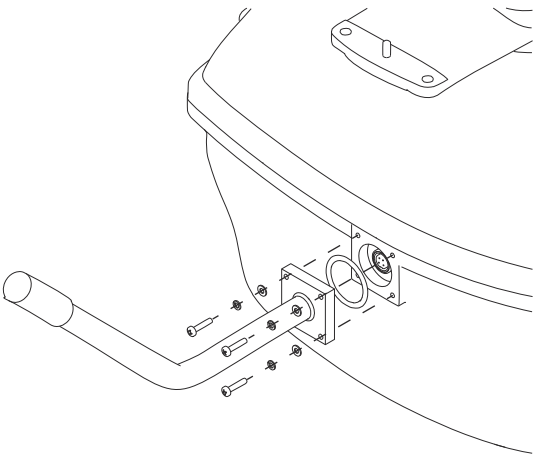
Installation

In order to install the Bearing reader board, perform the removal operations in reverse order.

Replacement of the performance monitor

Removal

Remove the 4 torx T20 screws.



Installation

Installation is the reverse of removal. Ensure the o-ring gasket is correctly seated before screwing the arm in place.

9 List of connectors

The table below contains descriptions of connectors for different boards. These boards and connectors are included into a fault repair and maintenance processes.

Board	Connector	Purpose
SRT control	J14	Video In
	J11	Tune In
	TB3	RF controls
	J5	Noise source
	J1	Noise detect
	TB1	Interlock
	TB5	Performance monitor
	TB6	OPT. motor controller/heater voltage
	TB2	Motor controls
	J12	Antenna data sensor
	TB8	Safety switch
SRT power	TB2	Main Power input
SRT MOS	A – K – Fil	Magnetron terminals
	Ground cable	To disconnect magnetron side
CPU LAN	RJ45 LAN	LAN connection to control unit

10 Technical specifications

For updated technical specifications, compliance and certifications, refer to the product website.

General	
Description	12 kW X-band pulse radar IMO class 3 with 6 ft end-fed slotted waveguide antenna
Standards	• IMO-Resolution A.278 (VIII), A.694 (17), A. 823 (19), MSC 191 (79), MSC 192 (79) • EN 62388 Ed.2.0, 2014 • EN 62288 Ed.2.0, 2014 • EN 60945 Ed.4.0, 2002 incl. Corr.1, 2008 • EN 61162-1 Ed.4.0, 2010 • EN 61162-2 Ed.1.0, 1999
Type approval	Maritime Equipment Directive 96/98/EC, 4.36 Radar Equipment CAT 3

Environmental	
Temperature	
Operating temperature, protected unit	-15°C to 55°C (According to IEC 60945 ed.4.0)
Operating temperature, exposed unit	-25°C to 55°C (According to IEC 60945 ed. 4.0)
Operating temperature, exposed unit (heater kit fitted)	-40°C to 55°C according to RMRS rules (2-020101-040-E Vol 2 - Environmental Test of Equipment)
Storage temperature, exposed unit	-25°C to 70°C (According to IEC 60945 ed. 4.0)
Storage temperature, exposed unit (heater kit fitted)	-60°C to 70°C according to RMRS rules (2-020101-040-E Vol 2 - Environmental Test of Equipment)
Damp heat	+40°C, 93 % relative humidity 1 cycle (According to IEC 60945 eg. 4.0)
Vibration	According to IEC60945 ed. 4.0
Shock	According to RMRS rules (2-020101-040-E Vol 2 - Environmental Test of Equipment)
IP class	
R3016 Control unit	IP66
Scanner	IP66
Power supply units	IP65
Relative wind velocity	100 knots wind tunnel test at 20 RPM (According to IEC 62388)

Power	
Transceiver up-mast unit	
Supply voltage (V DC)	50
Average power (W)	250. (Additional 300W if heater kit is included)
R3016 Control unit	
Supply voltage (V DC)	24

Power	
Average power (W)	20
R3000 Power supply unit	
Supply voltage (V DC)	24
Max power (W)	300 330 when used for Heater kit
Fuse Rating (A)	30
Heater kit	
Warm-up time from cold start-up at -40 °C (heater kit fitted)	3 hours
Fuse rating (for heater loom in transceiver) (A)	10

Physical	
Dimensions	Refer to Dimensional drawings
Antenna swing circle diameter (cm)	183 cm (6 feet)
Weight	
Pedestal + Antenna (Kg)	40 (35 kg transceiver + 5 kg antenna)
R3016 Control unit (Kg)	4
Power Supply Unit (Kg)	1
Heater loom & connector	Trivial

Performance	
RPM	20 or 36 (selectable)
Nominal peak power (KW)	12
Operating frequency (MHz)	9410
Pulse length (ns)	
Short pulse	75
Medium pulse	300
Long pulse	825
PRF (Hz)	
Short pulse	3000
Medium pulse	1500
Long pulse	750
Modulator	MOSFET Solid State
IF amplifier	Logarithmic
IF dynamic (dB)	95
IF center frequency (MHz)	60
IF bandwidth (MHz)	
Short pulse	24
Medium pulse	4.8
Long pulse	1.8
Horizontal Beam width (deg.)	1.35
Vertical Beam width (deg.)	22
VSWR	< 1.20

Performance	
Overall noise figure (nominal dB)	< 5
MDS on long pulse (dBm)	-105

Display features	
Presentation mode	Day or Night
Typical viewing distance (m)	0.75
Resolution (pixels)	1366x768
Aspect ratio	16:9
PPI Diameter (mm)	>180
Short range	
Available scales (NM)	1/8, 1/4, 1/2, 3/4, 1.5 and 3
Range video resolution (m)	11.25
Azimuth on-screen resolution (Deg)	0.1
Medium range	
Available scales (NM)	6 and 12
Range video resolution (m)	45
Azimuth on-screen resolution (Deg)	0.1
Long range	
Available scales (NM)	24, 36, 48, 64, 72
Range video resolution (m)	125
Azimuth on-screen resolution (Deg)	0.1
Relative Motion (RM)	Head Up, Course Up and North Up
True Motion (TM)	Course Up and North Up
Off-centering	Up to 75% of range scale in use
Cursor	Polar and Geographical coordinates, continuously displayed when cursor is activated

I/O interface	
Data inputs	
Serials	2 x IEC 61162-1 2 x IEC 61162-2 1 x IEC 61162-1 using SI80 (optional)
Radar Video Input	1 x Ethernet 100Mbs
Data outputs	
Serials	2 x IEC 61162-1
Alarm output	1 x Isolated pair normally closed radar failure contact
Micro-C connector	SI80 connection for IEC 61162-1 expansion (to be used with Speed Log sensor, when BAM is present)
VDR	HDMI output, same resolution as radar display

Target tracking	
Acquisition	Manual, up to 20 targets

Target tracking	
Tracking	Automatic, up to 20 targets

AIS	
Presentation	Totally 120 target capacity, of which a maximum of 20 can be activated. AIS overflow mechanism of priority
Safe checking	120 targets in total

Mapping	
Map drawing	Operator compiled maps Up to 32 maps, each may contain up to 120 segments and 32 symbols Selectable colors and line styles
Map stabilization	Relative Geographic
Map storage	By name Built-In non-volatile memory used SD Card transfer available
Map adjustments	Translation and rotation allowed
Parallel Index	Four independent parallel index lines
Data readout	Own ship data Target tracking data AIS target data

Compass safe distance		
	Safe distance to the standard magnetic compass	**Safe distance to the steering magnetic compass**
R3016 Control unit	0.65 m	0.43 m
12 kW X-Band SRT transceiver	1.43 m	0.87 m
R3000 Power supply unit	0.3 m	0.24 m

11 Supported IEC 61162 messages

Sentence	Description	Standard	BAM	Legacy alert
ZDA	Time and date	Port 1 IN	Port 1 IN	Port 1 IN
GLL	Geographic position-latitude and longitude	Port 1 IN	Port 1 IN	Port 1 IN
GGA	Global positioning system (GPS) fix data	Port 1 IN	Port 1 IN	Port 1 IN
GNS	GNNS fix data	Port 1 IN	Port 1 IN	Port 1 IN
DTM	Datum reference	Port 1 IN	Port 1 IN	Port 1 IN
VTG	Course over ground and ground speed	Port 1 IN	Port 1 IN	Port 1 IN
VDM	AIS VHF data-link message	Port 2 IN	Port 2 IN	Port 2 IN
VDO	AIS VHF data-link own vessel report	Port 2 IN	Port 2 IN	Port 2 IN
ACN	Alert command		Port 3 IN	
HBT	Heartbeat supervision sentence		Port 3 IN Port 3 OUT	
THS	True heading and status	Port 4 IN	Port 4 IN	Port 4 IN
HDT	Heading true	Port 4 IN	Port 4 IN	Port 4 IN
TTD	Tracked target data	Port 1 OUT	Port 1 OUT	Port 1 OUT
TTM	Tracked target message	Port 1 OUT	Port 1 OUT	Port 1 OUT
TLB	Target label	Port 1 OUT	Port 1 OUT	Port 1 OUT
OSD	Own ship data	Port 1 OUT	Port 1 OUT	Port 1 OUT
RSD	Radar system data	Port 1 OUT	Port 1 OUT	Port 1 OUT
EVE	General event message		Port 3 OUT	
ALC	Cyclic alert list		Port 3 OUT	
ALF	Alert sentence		Port 3 OUT	
ARC	Alert command refused		Port 3 OUT	
ACK	Acknowledge alarm			Port 3 IN
ALR	Set alarm state			Port 3 OUT
VBW	Dual ground/ water speed	Port 3IN	SI80	SI80
VHW	Water speed and heating	Port 3 IN	SI80	SI80

12 Spare parts

For updated technical specifications, compliance, and certifications refer to the product website.

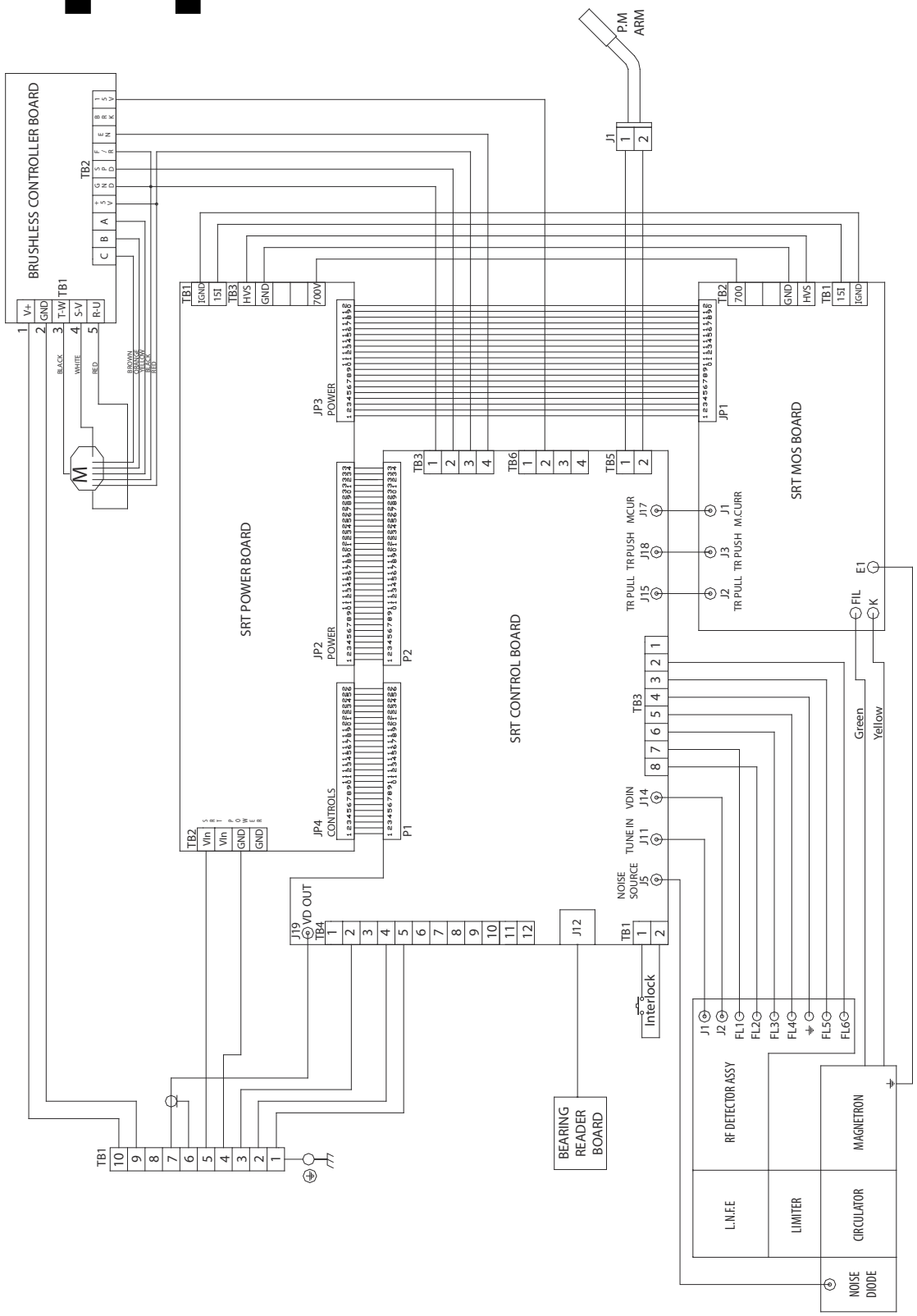
Part number	Description	Note
000-10668-001	Performance monitor (PM) arm	
000-13252-001	SRT LAN electronic assembly	
000-10675-001	RF detector assembly with LNFE	
000-10680-001	Noise diode	
000-10683-001	Motor	
000-10682-001	SRT gear reducer	
SP-305274A1-001	Performance monitor diode	
000-10678-001	Duplexer circulator	
000-10679-001	Limiter	
000-10684-001	Brushless controller assembly	
000-10681-001	Bearing reader PCB	
000-10671-001	SRT power PCB	
000-10672-001	SRT MOS PCB	
000-10674-001	SRT control PCB	
000-13253-001	Magnetron	
000-12393-001	Serial cable high speed NMEA 0183 8 way (2 m)	Serial cable
000-12399-001	Front case service pack R3016	Bonded touch screen replacement
000-12401-001	Keypad reader kit R3016	Keypad PCB and buttons replacement
000-12408-001	SD door kit R3016	Card reader door and gasket replacement
000-12410-001	Dash mounting kit R3016	
000-12412-001	Bracket mounting pack R3016	
000-12414-001	Suncover R3016	
000-12520-001	Bezel assembly edge R3016	

13 Accessories

Part number	Description	Note
000-12387-001	Power cable (15 m)	For transceiver or heater use
000-12388-001	Power cable (30 m)	For transceiver or heater use
000-12389-001	Power cable (65 m)	For transceiver or heater use
000-12390-001	Ethernet cable (15 m)	For transceiver or heater use
000-12391-001	Ethernet cable (30 m)	For transceiver or heater use
000-12392-001	Ethernet cable (65 m)	For transceiver or heater use
000-12427-001	HDMI DVI cable (1.5 m)	
000-10425-001	SI80 SIMRAD signal interface	
000-0127-52	TR-120-KIT	NMEA 2000 terminator kit
000-0119-88	Micro-C cable (0.6 m)	NMEA 2000 cable
000-0127-53	Micro-C cable (1.8 m)	NMEA 2000 cable
000-12386-001	Heater upgrade kit for SRT LAN	Requires separate power cable

14 System diagrams

Transceiver internal interconnection diagram



15 Back up parameters

The following parameters and settings are backed up:

- Alarm and key beeps settings
- Screen and keypad backlight settings
- NMEA 0183 settings
- Radar offset settings
- Time settings
- Date format
- Position
- Target tracking history data
- NMEA 2000 settings
- Radar presentation settings
- Parallel index line settings
- General presentation settings
- Serial port settings
- Units
- AIS settings
- EBL and VRM settings
- Trails settings
- Vector settings
- Range for each VRM

16 System installation checklist

Section 1: Physical installation details

→ ***Note:*** This section to be completed in full at time of hardware and cabling installation.

→ ***Note:*** Ensure this document stays with the equipment and is available for commissioning of system.

Vessel name:
Vessel MMSI:
Vessel displacement:

Vessel dimensions (overall)

Height		meters
Draft		meters
Load		meters
Beam		meters

Shipyard contact details

Address	
Phone	
Email	

Hardware serial numbers

Control unit	
Transceiver	
Antenna	
R3000 power supply unit	
Heater kit power supply unit (where used)	
SI80 (where used)	

Cable lengths used (fixed length cables)

Ethernet: Transceiver - Control unit	m
Radar power: Transceiver - R3000 power supply unit	m
Heater power: Transceiver - R3000 power supply unit (where fitted)	m

Alarm output connection to BAM	YES	☐	NO	☐
VDR output connection	YES	☐	NO	☐

Serial port connections	Make/Model of connected sensor
Port 1 Listener	
Port 2 Listener	
Port 1 Talker	
Port 3 Listener	
Port 4 Listener	
Port 3 Talker	

Serial port connections	Make/Model of connected sensor
SI80 Listener (if connected)	

Section 2: System Commissioning (Control unit settings)

→ ***Note:*** This section to be completed in full at time of System commissioning.

→ ***Note:*** Ensure this document stays with the equipment and is available for future servicing.

Serial port baud rate

Port 1 Listener	baud
Port 2 Listener	baud
Port 1 Talker	baud
Port 3 Listener	baud
Port 4 Listener	baud
Port 1 Talker	baud
SI80 Listener (if connected)	baud

Radar antenna settings

Position (relative to CCRP - refer to Section 1)	X:	Y:
Height		m
Bearing alignment		degrees
Range offset		m
Sector blanking	# of sector configured:	
Tuning - completed		☐
Performance monitor - completed		☐

Own ship settings

MMSI number entry - completed		☐		
CCRP *	Distance to Stern	m	Distance to Bow	m
	Distance to Port	m	Distance to Stbd	m
GPS Position **	X:		Y:	

* common reference point - refer to Section 1

** relative to CCRP - refer to Section 1

Backup

Create backup file at completion of commissioning - completed ☐

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