5 Radar Service Tool

The radar system is managed through the Radar Service Tool (RST) running on a laptop or on a PC connected to the radar LAN.

The Radar Service Tool provides the user with a consistent look and feel across the various features implemented. It supports different perspectives, where each perspective corresponds to a particular arrangement and subset of Radar Service Tool windows (views). The user may define, store and recall individual perspectives. The user may also use the Log Viewer function in the RST to monitor performance of the transceiver(s) and to identify errors or warnings detected by the system.For a detailed description of the Radar Service Tool functions, see document “SCANTER Radar Service Tool - Operator’s Manual”. Doc number: 357641-HO.

5.1 RST features

5.1.1 Authentication

The available access administration is:

- Access to the computer is protected by a normal Windows login.

5.1.2 Access levels

To operate or to change parameters in the radar it is necessary to connect to the radar using one of the three access levels available:

- Operational access level.
- Service access level.
- Debug access level.

Operational access level allows the user to change the most commonly used parameters and to operate the radar.

The service access level allows to change all parameters, while the debug access level is intended for technicians having intensive and detailed knowledge about the radar system.

5.1.3 User documentation

The Radar Service Tool will display set-up and maintain information in form of documents stored in the transceiver.

5.1.4 Parameters and BITE access

The Radar Service Tool provides status on radar functions and performance as well as detailed status on all modules in the system. All BITE information available about the modules are shown together with any status or error message issued by the module.

Access to all necessary parameters is available through the RST.

5.1.5 Situation display

The situation display presents live video, A-Scope, EBL, VRM, continuous zoom, histograms, primary-, secondary- and AIS tracks, plots, maps, etc.

These operator tools are available to allow the user to perform more detailed analysis of the system performance. Display of track data is possible by mouse click on the individual target, in combination with a pop-up menu (right mouse click).

The situation display is one of four default perspectives, all described in details in the following pages.

5.2 RST screen layout

The Radar Service Tool screen layout is shown in Fig. 5.1 (p. 90) with definitions of the different operation areas.

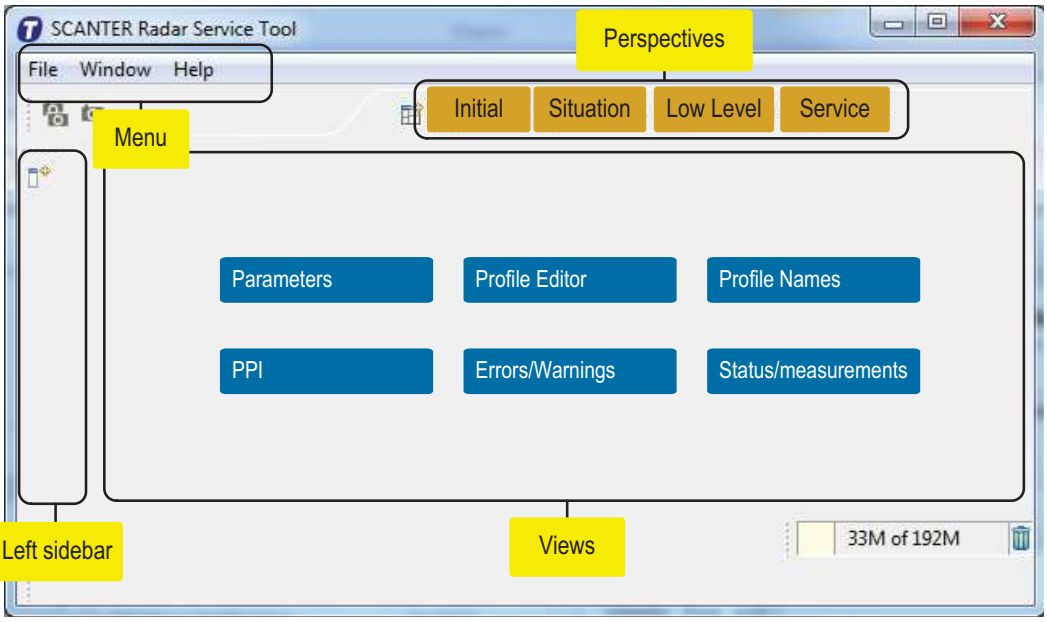


Fig. 5.1 RST - Screen layout

In the “Views” area of the screen, it is possible to open interactive views for display and handling of graphical information, e.g. radar video, measurement tools, radar control, parameters, BITE information, etc.

Presentation of these views can be selected and deselected individually. A certain number of views, freely selected by the operator, can be combined into a personal “perspective”, which can be stored in the “Perspectives” area. By default, there are four perspectives:

- Initial
- Situation

- Low Level
- Service

The “Initial” perspective is used to set-up a connection to the transceiver and to backup/restore transceiver configuration data.

The “Situation” perspective contains PPI view, zoom, measurements tools, video setup and high level radar control.

The “Low Level” perspective can be used by technicians to change parameters and to edit profiles, etc.

The “Service” perspective can be used to back up or restore transceiver data, upgrade transceiver software and to have access to documents stored in the transceiver.

The Radar Service Tool menu bar consists of “File”, “Window” and “Help”.

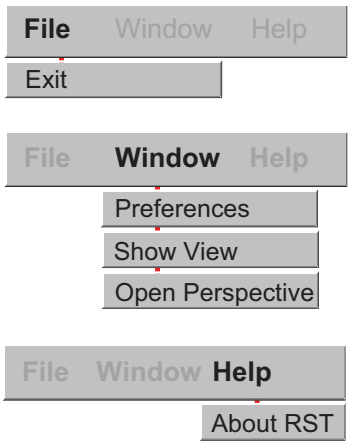


Fig. 5.2 Radar Service Tool - menus and submenus

The ”File” menu is used to exit the RST, while the “Help” menu displays the RST software version.

In the “Window” menu, the submenu “Preferences” is used to set default colors, units, snapshots storage directory, radar video setting such as decay, sweep, trails history, video gain, etc.

“Show View” and “Open Perspective” are used to activate a view or a perspective.

The left side bar, shown in Fig. 5.1 (p. 90), is used to open fast views. A fast view remains on the monitor as long as it is in focus. It will disappear from the monitor if the operator clicks any place outside the fast view.

5.2.1 RST keyboard and mouse actions

5.2.2 General

General	
Maximize/Restore view	Double left click on view tab
Move view to another docking	Left drag view tab

5.2.3 Adjust text size

Adjust text size	
Parameters view	Ctrl - scroll wheel
Profile Editor view	
Profile Names view	
Errors/Warnings view	
Status/Measurements view	

5.2.4 Situation perspective control

PPI view	
Re-center	Ctrl - right click
Zoom	Scroll wheel
Zoom in	Ctrl - right drag - up - right
Zoom out	Ctrl - right drag - down - left
Reset zoom and re-center to own unit position	Ctrl - right drag - up - left

Zoom view	
Define visible area in PPI view	Right drag

A-Scope view	
Zoom	Scroll wheel
Pan/Adjust VRM circle	Left drag

VRM-Scope view	
Zoom	Scroll wheel
Pan/Adjust EBL angle	Left drag

A-Scope and VRM (Tools view)	
Define EBL angle/VRM circle	Left drag
Freeze EBL/VRM	
Hide EBL/VRM	

Area Masking view	
Press buttons “Delete Mask” or “Create Mask” to start creating a polygon	
Add polygon vertices	Left click
Finish creating polygon	Right click
Delete last vertex while creating a polygon	Ctrl - left click
Abort current polygon creation	Esc

5.2.5 RST menu navigation and search

Use the four buttons at the top to the right of the view to collapse the navigation tree (All parameters) or to expand the tree. See Fig. 5.3 (p. 93). The view can be minimized into a sidebar or maximized.

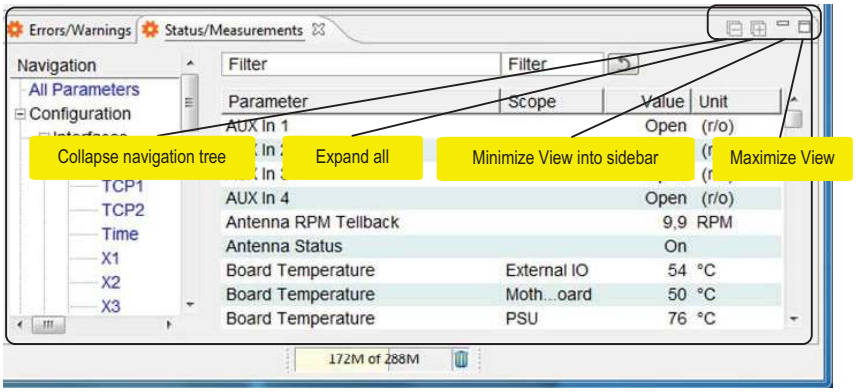


Fig. 5.3 View - control buttons

To search for a parameter, enter the parameter name in the “Parameter filter” or in the “Scope filter” field. See Fig. 5.4 (p. 94). The shown search is sector 11. To change a parameter value, simply click and enter the new value in the relevant field. The “All parameters” in the navigation tree must be selected to enable the search in the entire navigation tree.

In case a parameter cannot be found, pay attention to the log-on access level.

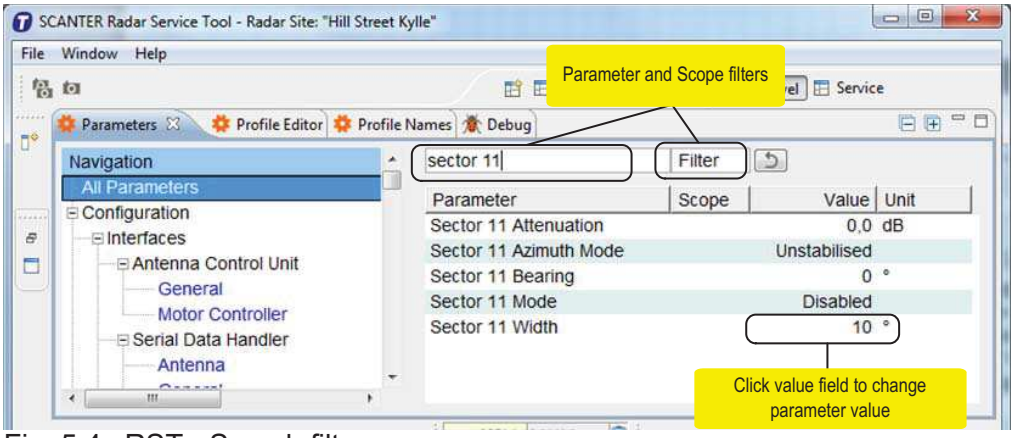


Fig. 5.4 RST - Search filters

5.3 Preferences

In the Preferences menu it is possible individually to change color and fonts. The user can select what unit format to use, specify general settings of the RST, the PPI (radar video, background, trails etc). The following sections describe the usage of the RST Preferences.

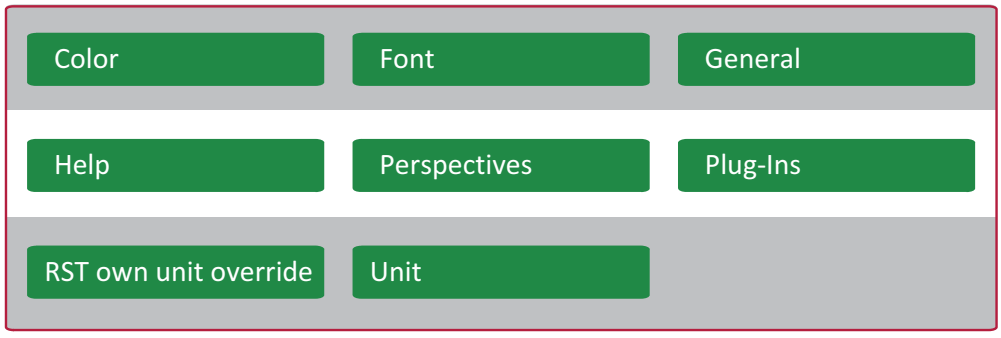


Fig. 5.5 RST - Preferences

5.4 Perspectives

When launching the RST program for the first time, there are four default perspectives, each of these containing a certain number of views. The presentation of these views can be selected and deselected individually.

The “Initial” perspective is used when a connection to the transceiver and its services is established. See Fig. 5.6 (p. 94).

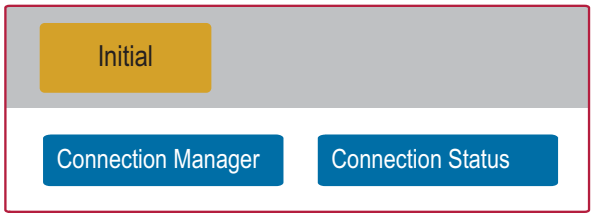


Fig. 5.6 “Initial” perspective - default

The “Low Level” perspective provides parameter and profile views for configuring profile content and editing profile names. Errors/Warnings and Status/Measurements views to monitor the health of the radar system. See Fig. 5.7 (p. 95).

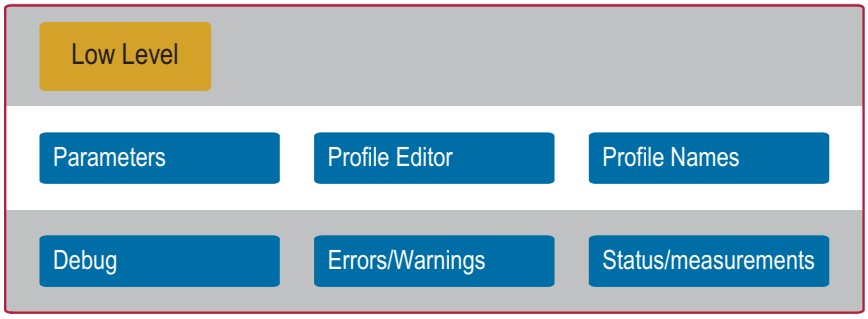


Fig. 5.7 “Low Level” perspective - default

The “Situation” perspective can be used by the operator to start the radar and transmission, to select profile and monitor the radar video. Measurement tools are included in this perspective. See Fig. 5.8 (p. 95).

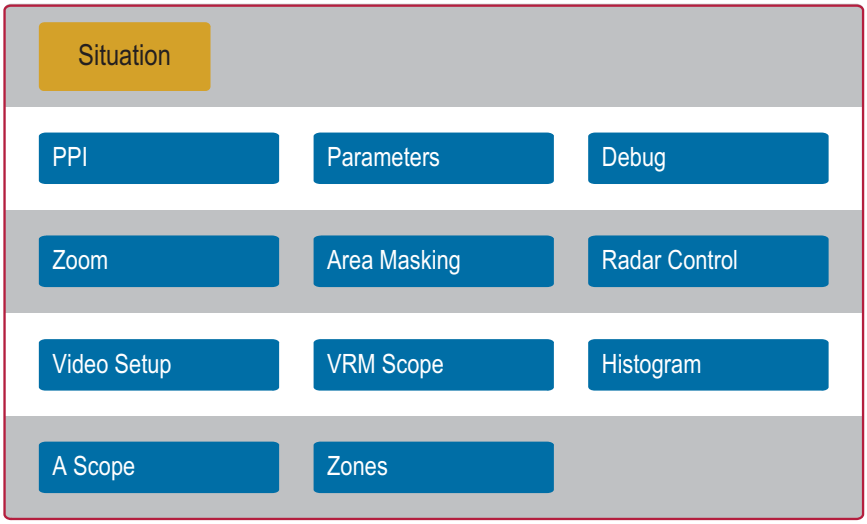


Fig. 5.8 “Situation” perspective - default

The “Service” perspective can be used for transceiver backup/restore and software update. Further, it provides access to the documents/user guides stored in the transceiver. See Fig. 5.9 (p. 95).

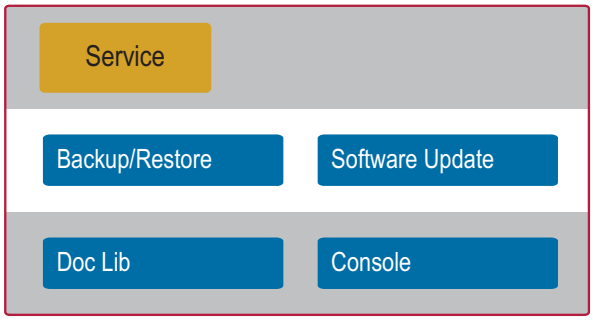


Fig. 5.9 “Service” perspective - default

Any default perspective, can be customized by adding or removing views freely selected by the user.

Alternatively, new personal perspectives can be created, which can be stored in the perspectives area.

Views are placed inside the “Views” area, or “minimized” and placed in the sidebar areas (right and left side) of the RST window.

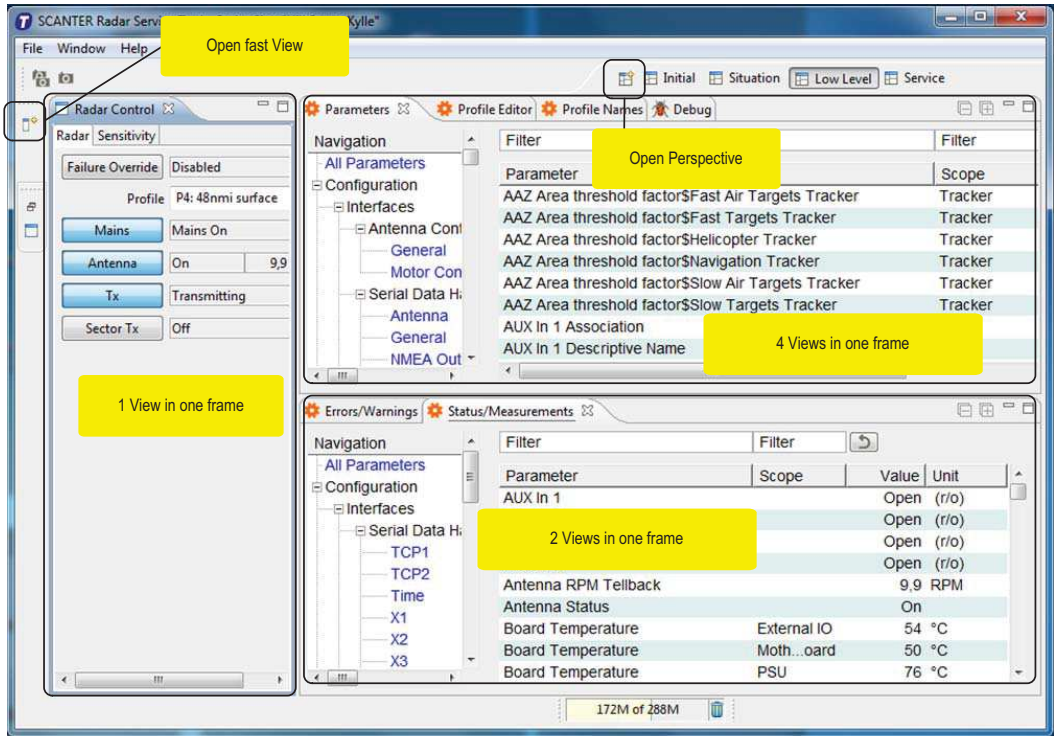


Fig. 5.10 RST - Views

A view can be placed in its own frame, or several views can be placed in the same frame/window. See Fig. 5.10 (p. 96).

To move a view within the view area, select the view tab with the left mouse button while holding down the button. Move the view to another location or inside a frame already containing one or more views.

5.5 Radar Control

The "Radar Control" view is used for switching on and off the system, switch on/off the antenna motor, the transmitter, and sector transmission.

To change transceiver configuration, the "Profile" drop-down menu, see Fig. 5.12 (p. 98), gives the possibility to select one of sixteen predefined profiles.

"Mains" gives the possibility to switch the system on and off. The read-only box to the right provides information about the system status.

With "Antenna" it is possible to switch on and off the antenna motor - to the right is shown the actual antenna rotation speed in RPM.

With "Tx" it is possible to switch on and off the transmitter and to the right is shown the status of the transmitter (warming up, stand by etc.).

"Sector Tx" switches on and off the sector transmission and will affect all sectors enabled.

To adjust attenuation and gain for surface video, use the Radar Control view - Sensitivity. Manual adjustment of STC and Gain are not supported for the SCANTER 5102/5202.

Manual adjustment of tracker sensitivity for surface and air channels or select auto for auto adjustments.

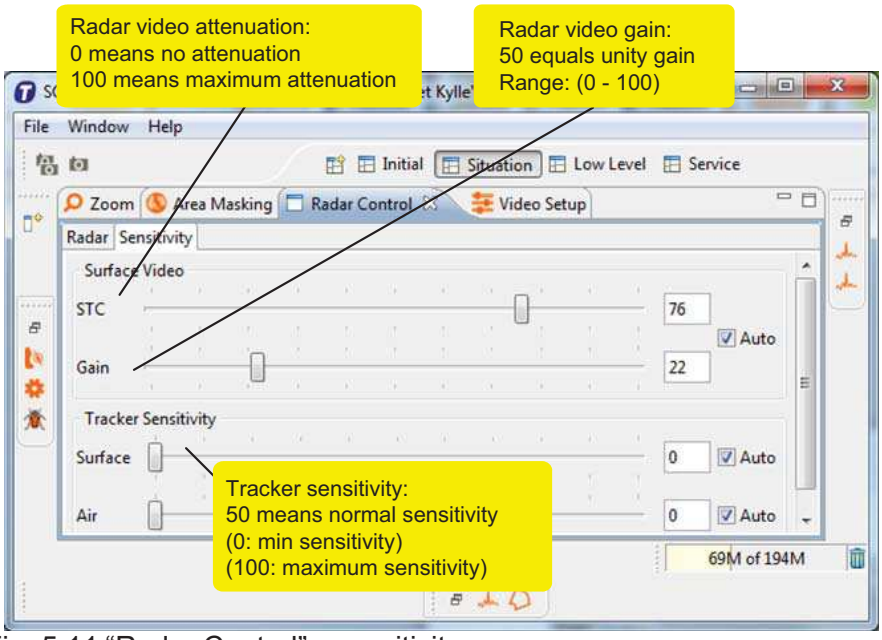
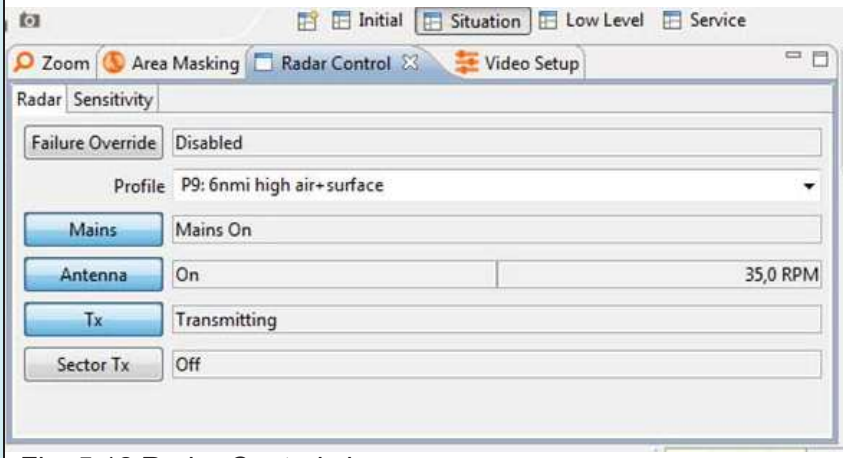


Fig. 5.11 “Radar Control” - sensitivity

5.5.1 Start transceiver

1	Turn on power to the transceiver using the power switch on the Power Supply Unit

2	Switch “Mains” on by means of the RST-”Radar Control” view, select “antenna”, “Tx” and an appropriate profile. See Fig. 5.12 (p. 98)  Fig. 5.12 Radar Control view Enable sector transmission if created and needed.

5.5.2 Stop transceiver

1	Switch off “Tx”, “Antenna” and “Mains”
2	Turn off power to the transceiver using the power switch on the Power Supply Unit.

5.5.3 Create Sectors

In the “Parameters” view - Sectors, it is possible to set up sixteen independent sectors, selected as transmission sectors, prohibit sectors or reduced power transmitting sectors. All available as stabilized or not stabilized sectors.

A stabilized sector is always kept relative to north. Unstabilized sectors will follow the moving platform when it is turning, i.e. they are not kept relative to north.

When setting up a sector it is necessary to know or to calculate the bearing of the sector, i.e. the middle. In the same way it is necessary to know or to calculate the width (extent) of the sector (in degrees). See Fig. 5.13 (p. 99).

A prohibited sector is a non-transmission sector.

By selecting reduced power sector, it is possible to transmit with reduced power. Power attenuation is selectable in the interval 0..15.5 dB.

Note! Prohibited sectors have priority over transmission sectors, which should be considered when all types of sectors are mixed on a moving platform.

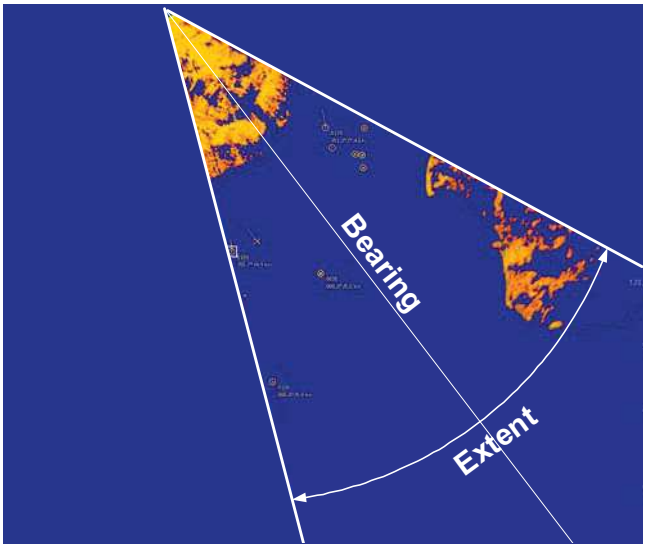


Fig. 5.13 Sector Bearing and Width

Sector bearing:	0..359 degrees
Sector width:	10..350 degrees
Sector mode:	Disabled, prohibited, reduced power sector, transmitting sector
Azimuth mode	Stabilized or unstabilized
Sector attenuation	0..15.5 dB

5.5.4 Backup/Restore

The backup and restore functions in the RST provide backup and restore facilities for the SCANTER 5102/5202 radar system.

The transceiver contains the application SW, factory default data, transceiver configuration data and site default data. Furthermore, some space is allocated for log files (i.e. performance and measurement data) and temporary files. See Fig. 5.14 (p. 100).

The data set currently being used by the transceiver is stored in the “transceiver configuration” memory area.

The “Site Default” data area is used to store a copy of the “transceiver configuration”. It is recommended to copy the “transceiver configuration” to the “Site Default” area after Setting-To-Work (STW) and later on after major changes of the settings.

Furthermore, it is also recommended to back up the “transceiver configuration” on the Radar Service Tool. When activating the backup from the RST, the FTP server will create and store a temporary backup file which is then transmitted to the RST.

The “Temporary files” directory has a limited size, hence it is possible to delete some of these files by means of the RST.

The “Factory Default” data area contains basic settings for the transceiver, created and used at transceiver production. These data are not intended to be used on site.

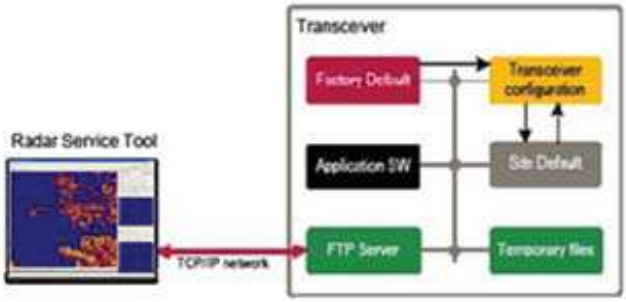


Fig. 5.14 Transceiver - SW and configuration data

5.5.4.1 Create/Restore backup of configuration data

To create a backup of the “transceiver configuration”, use the RST “Backup/ Restore” view. See Fig. 5.15 (p. 101).

The RST saves the backup file in a subdirectory under:

C:\RST-357641-NF-2B\357641-NF-XX\Backup

For each zipped backup file, the date is used as the file name (i.e. BackupDate.tar). The backup file contains all parameters for the transceiver and the radar system (i.e. including ACU parameters etc), logs, area masking and maps.

The restore function copies the transceiver backup file from the RST to the “transceiver configuration” area. The transceiver will restart to activate and use the restored backup file. An option of the restore function is to restore transceiver independent parameters only. This function is useful when having several sites, where the transceiver configuration is identical.

“Delete Temp” removes temporary files stored in the transceiver (FTP Server).

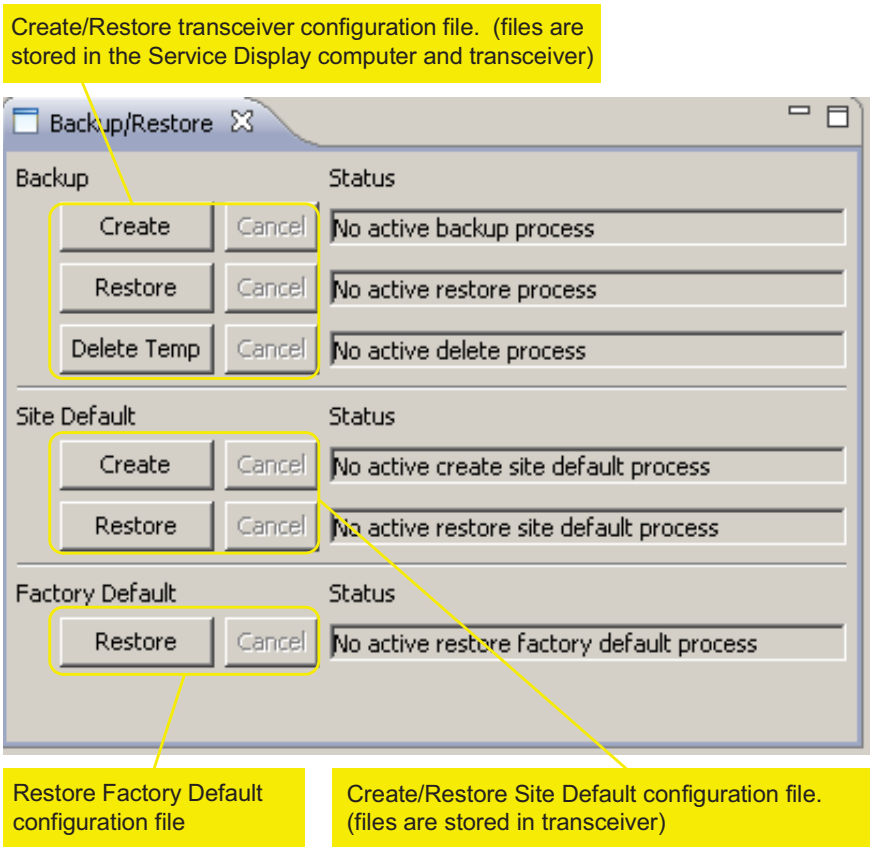


Fig. 5.15 Menu: Window / Show View / Backup/Restore

The “Site Default” create option copies the” transceiver configuration” to the “Site Default” area. Restore copies the “Site Default” to the “transceiver configuration” area. The transceiver will restart to activate and use the new data.

The “Factory Default” data contains basic parameter values for the transceiver. These are created at transceiver production and should not be used after the radar has been set up.

Warning!

Restoring the “Factory Default” data will delete the “transceiver configuration” area. The transceiver is then out of service, unless there has been created a backup on the RST that can be restored.

5.6 RST installation

5.6.1 System requirements

The system requirements for the computer running the RST are found in document: “357641-HI SCANTER Radar Service Tool”.

5.6.2 Installing the Radar Service Tool

Extract the zip file from the CD (357641-NF) to the computer. In the directory, "357641-NF-B\rst", the rst.exe file is located.

The Radar Service Tool may now be started by double-clicking the "rst.exe" file. The user may create a shortcut to this file and place it on the desktop.

6 Safety loops / Enabling ACU

The SCANTER 5102/5202 system has built-in safety precautions to prevent the antenna from rotating and the transceiver from transmitting when personnel need to work close to the antenna. This loop is interrupted by a Man Aloft switch, which is activated when the work on the antenna starts; it isolates power from the turning unit and prohibits transmission as long as the switch is activated.

In order to protect the immediate surroundings from extended exposure to electromagnetic radiation, the safety system will prevent transmitting whenever the antenna is not rotating. This is achieved by not powering up the SSPA unless antenna encoder signals are indicating that the antenna is rotating.

Inside SCANTER antenna turning units the motor is protected by means of a bimetallic switch integrated in the motor for efficient shut down if the motor is overheated. The bimetallic switch opens at 150 ºC, shutting down the turning unit and transmission. At 120 ºC, a warning is reported by the BITE system.

Furthermore, an ACU fault will also stop antenna rotation and transmission.

6.1 Single System

6.1.1 Safety loop

For human safety, a hard-wired safety current loop prevents antenna rotation and RF transmission, if the safety loop is broken or opened. A number of serial connected switches comprise the entire safety loop.

Further, the antenna drive motor is equipped with temperature sensors, which initially give a warning when the temperature is excessive and eventually switch off both transmission and motor.

The transmission can be controlled externally via the available external hardware EMCON/Tx Inhibit logical interface, which will instantaneously force the transmitter to react accordingly.

Transceiver transmission can be started by issuing a “transmit start” command, either by clicking the Tx button in the Radar Service Tool program or by activating transmission from another client program. The radar will remember the transmission status when power is switched off, so the system will always return to the same transmission status it had previously. Transmission will only start if all of the below prerequisites are fulfilled:

	Antenna rotation (RPM) is greater than 0.
	ACU status is normal.
	Motor protection and Man Aloft Switch are not activated.

The antenna start and transmit permissions are controlled by the transceiver.

Fig. 6.1 (p. 104) shows the safety loop of a single system. The safety loop is supplied with +24 VDC; the Man Aloft switch(es) and motor protection are supplied

from the transceiver and the “ACU Fault” is supplied from the motor controller (through the ACU mains switch).

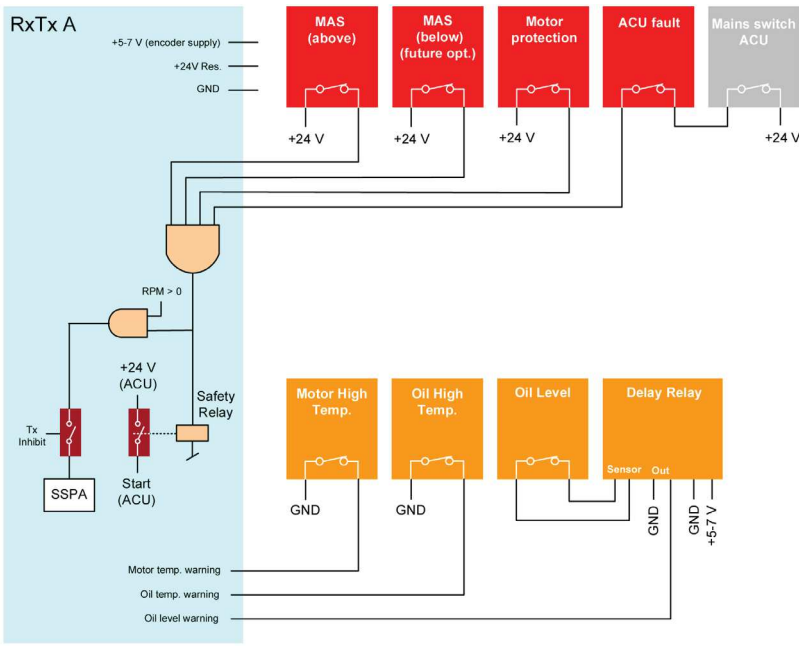


Fig. 6.1 Safety Loop and warnings, single system

The four inputs from the loop (Man Aloft Switch (above), Man Aloft Switch (below), motor protection, and ACU Fault) are AND’ed together. Provided that they all are true (i.e.no errors), the output of the AND-function is true as well and with that the safety relay is energized.

When +24 V is applied to “Start” on the ACU, the start function is enabled and with that it is possible to start the antenna rotation with a command via the serial communication.

To activate transmission from the SSPA the 4 above mentioned inputs are AND’ed with the signal “RPM > 0” which ensures that transmission is only possible when the antenna rotates.When the SSPA is enabled with antenna rotation and no errors in the safety loop, the transmission can be controlled externally using the “Tx Inhibit/EMCOM” function.

6.1.2 Warnings from antenna system

Fig. 6.1 (p. 104) also shows input signals from the antenna unit which give a warning without any impact on the safety loop. The signals are as follows:

	Motor High Temperature - motor temperature has reached 120 degrees Celsius.
	Oil High Temperature (if available).
	Oil Level (optional) - a delay is introduced to this signal to avoid short-termed variations on the oil level.

6.1.3 Enabling ACU

The safety relay, together with the “Radar Mains ON” relay, ensures that the start function of the antenna is enabled in all possible situations. The wiring is shown in Fig. 6.2 (p. 105) where the red wires show how the start input of the motor controller is supplied with +24 VDC. In a single system, two of the terminals are connected as shown close to the start input.

The relays are shown in the position where mains is on and the safety loop is not interrupted. Whenever the safety loop is interrupted by a failure or activation of the man aloft switch, the contacts of K1 change position and thereby remove the +24 VDC to the start input of the motor controller. The same happens when the mains switch turns off the transceiver and the contacts of K2 change position.

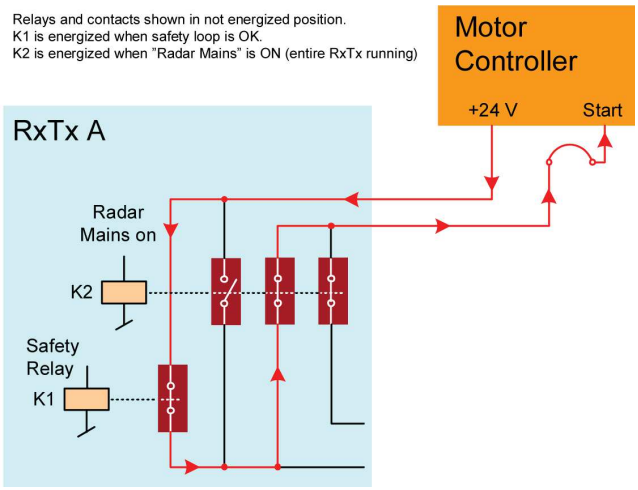


Fig. 6.2 Start enabled - single system

6.2 Redundant system

6.2.1 Safety loop

Fig. 6.3 (p. 106) shows the safety loop of a redundant system consisting of a transceiver A (RxTx A) and a transceiver B (RxTx B). The four inputs from the loop (Man Aloft Switch (above), Man Aloft Switch (below), motor protection, and ACU Fault are AND’ed together in both transceivers, i.e. the two transceivers are holding same circuits for the safety loop. Provided that they all are true (i.e.no errors), the output of the AND-function is true as well and thereby the safety relay is energized.

When +24 V is applied to “Start” on the ACU, the start function is enabled and with that it is possible to start the antenna rotation with a command via the serial communication.

To activate transmission from the SSPA, the 4 above-mentioned inputs are AND’ed with the signal “RPM > 0” which ensures that transmission is only possible when the antenna rotates. When the SSPA is enabled with antenna rotation and no errors in the safety loop, the transmission can be controlled externally with the “Tx Inhibit/ EMCOM” function.

6.2.2 Warnings from antenna system

Fig. 6.3 (p. 106) also shows input signals from the antenna unit which give a warning without any impact on the safety loop - these are

- Motor High Temperature - motor temperature has reached 120 degr.
- Oil High Temperature (if available)
- Oil Level (optional) - a delay is introduced to this signal to avoid short-termed variations on the oil level.

All signals are applied in both transceiver A and transceiver B.

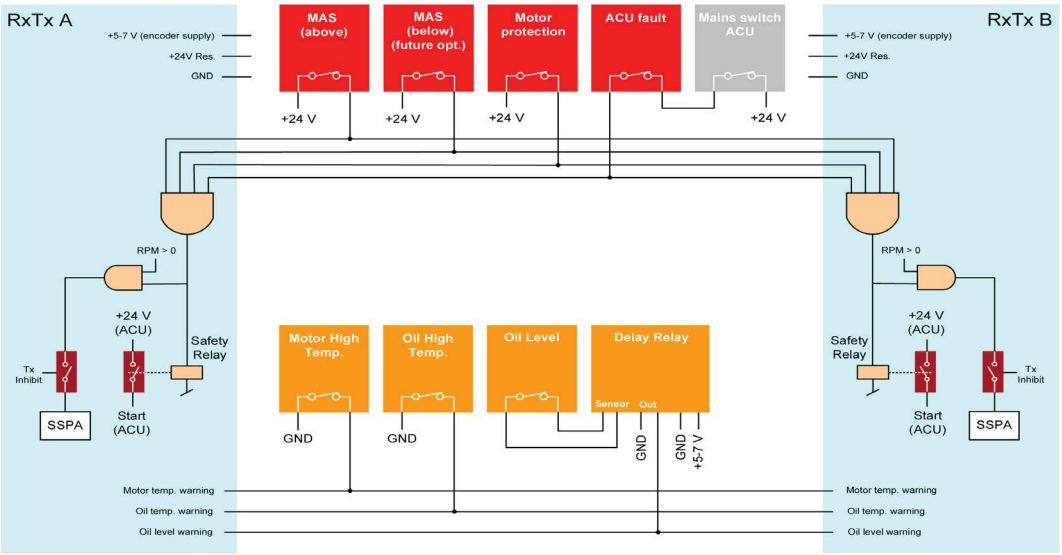


Fig. 6.3 Safety Loop, redundant system

6.2.3 Enabling ACU

The safety relay together with the “Radar Mains ON” relay ensures that the start function of the antenna is enabled in all possible situations, i.e. also when one of the transceivers is switched off. The interconnections between the two transceivers are shown in Fig. 6.4 (p. 107) and therefore enabling the motor controller start depends on two safety relays and two mains switches, one set of functions in each transceiver.

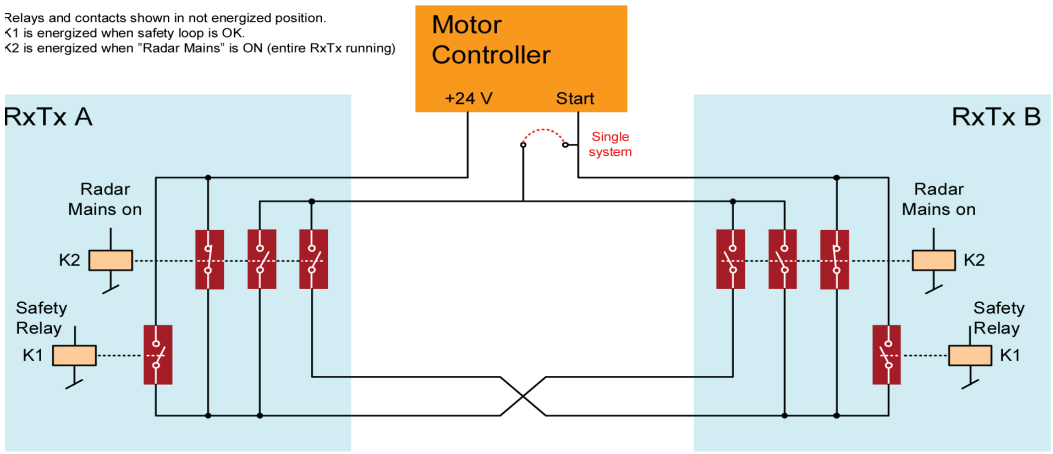


Fig. 6.4 Interconnections - redundant system

6.2.3.1 RxTx A on / RxTx B off

Fig. 6.5 (p. 108) shows the situation where transceiver A (RxTx A) is on and transceiver B (RxTx B) is off.

The red wires show how the start input of the motor controller is applied +24 VDC.

The relays in RxTx A are shown in the position where mains is on and safety loop not interrupted and in RxTx B both relays are de-energized. The +24 VDC is applied the start input of the motor controller through the contacts of the energized relays in RxTx A and thereafter, through the contacts of the de-energized relays in RxTx B.

Whenever the safety loop is interrupted by a failure or activation of the man aloft switch, the contacts of K1 in RxTx A change position and with that remove the +24 VDC to the start input of the motor controller. The same happens when the mains switch of RxTx A is turning off the transceiver and the contacts of K2 change position.

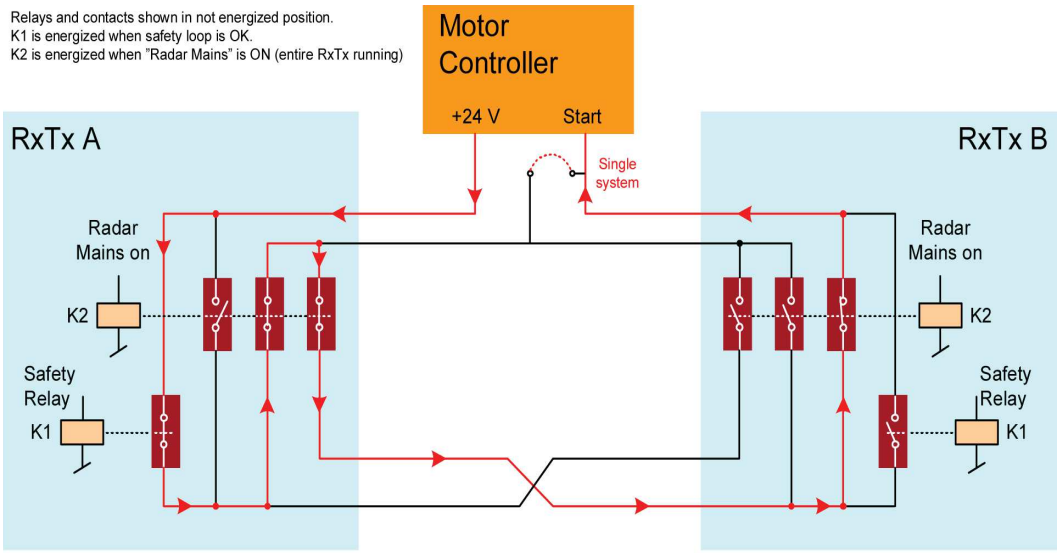


Fig. 6.5 Start enabled - RxTx A on, RxTx B off

6.2.3.2 RxTx A off / RxTx B on

Fig. 6.6 (p. 108) shows the situation where transceiver A (RxTx A) is off and transceiver B (RxTx B) is on.

The red wires show how the start input of the motor controller is applied +24 VDC.

The relays in RxTx B are shown in the position where mains is on and the safety loop is not interrupted and in RxTx A both relays are de-energized. The +24 VDC is applied the start input of the motor controller through the contacts of the energized relays in RxTx B and thereafter, through the contacts of the de-energized relays in RxTx A.

Whenever the safety loop is interrupted by a failure or activation of the man aloft switch, the contacts of K1 in RxTx B change position and with that remove the +24 VDC to the start input of the motor controller. The same happens when the mains switch of RxTx B is turning off the transceiver and the contacts of K2 change position.

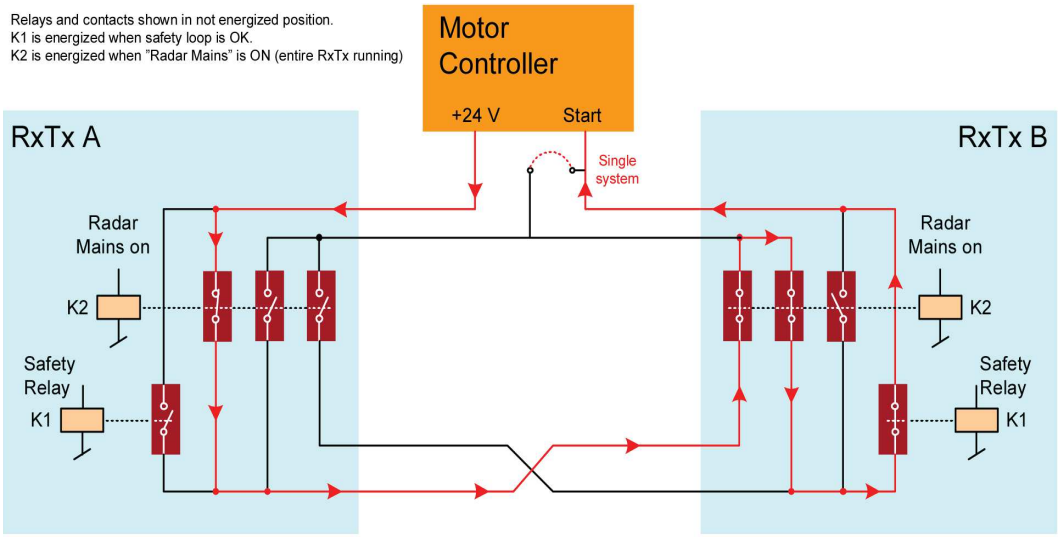


Fig. 6.6 Start enabled - RxTx A off, RxTx B on

6.2.3.3 RxTx on / RxTx on

Fig. 6.7 (p. 109) shows the situation where both transceiver A (RxTx A) and transceiver B (RxTx B) are on.

The red wires show how the start input of the motor controller is applied +24 VDC.

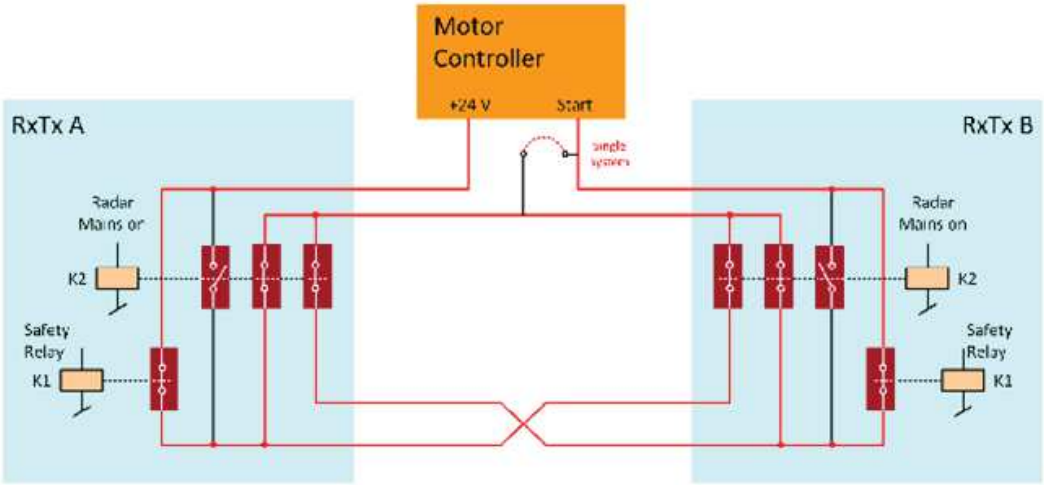


Fig. 6.7 Start enabled - RxTx A on, RxTx B on

7 Maintenance

7.1 Preventive maintenance

7.1.1 General preventive maintenance

Keep equipment dry and free from dirt.

Keep connection points for lightning protection free from paint/corrosion. Keep them well greased (Poly Buly Copysil, grade 492).

Keep protective ground wires in good condition, and check the connection if any of them has been removed.

Clean all surfaces with a soft cloth. Remove dirt using small amounts of water with a mild soap. Do never use trichlorethylene or alcoholic agents.

7.1.2 Scheduled preventive maintenance

		6 months	12 months	7 years	8 years
Entire installation	Perform visual inspection of the entire installation - repair observed damages	X			
ACU	Clean/replace air filter	X			
Waveguide	Check for leakage, deformations, corrosion etc. including grounding points		X		
	Check dehydrator/dessicator (pressure, hour counter or change in color)	X			
Transceiver	Clean/replace air filters	X			
	Replace Blower Assy				X
	Replace battery on PC Controller Board			X	

The above intervals assume that the equipment is mounted in rough conditions. On the basis of experience, the intervals may be extended on individual sites if conditions are mild. In dust filled environments, air filters may require more frequent cleaning/replacement.

7.2 Consumables, spare parts and tools

7.2.1 Consumables

Consumables	Part number
Air filter, transceiver	524884-001
Air filter, ACU	262394-001
Static dehydrator	249703-001
Cable strap, Ø44 x 4 mm, black	201197-010
Cable strap, Ø20 x 2.5, natural	201197-049
Consumables, SCANTER 5/6k (on-site kit containing:) Filter Element (air filter, 524884-001) Fuse, 15A, Fast, Cartridge (307609-018) Fuse, Time-lag, 6.3X32mm 6.3A (610376-019)	696294-001

7.2.2 Spare Parts

Module	Part number
Waveguide Assembly	386240-00x
SSPA, Long Range	386250-002
RxTx	386232-00x
RxTx Controller	386222-00x
Crate Assy incl. Motherboard	386265-00x
PC Controller Board	386285-00x
Battery, lithium, for PC Controller Board	519886-001
Common Platform 4 (CP4) Board	386260-00x
External I/O Board	386270-00x
Power Supply Unit	386290-00x
Blower Assy	386298-00x
Blower Assy, CP4	386268-00x
Waveguide, SSPA	524894-00x
Interconnection PCB	386275-00x
Fuse, mains, 15 A, Fast, Cartridge	307609-018
Fuse, mains, 6.3 x 32 Slow, 16 A	610376-019
Antenna Control Unit (ACU)	659000-00x

7.2.3 Tools

Tools	Part number
Standard tools	N. A.
Terma Tool Kit	696293-001
Vacuum cleaner	N. A.
Brush	N. A.

7.2.3.1 Standard Tools

A collection of standard tools which are expected to be in a technician's tool box such as screwdrivers (for Philips, Pozi drive, and slotted screws), side cutters, spanners, Allen keys, tweezers, etc.

7.2.3.2 Terma Tool Kit

The Terma Tool Kit includes tools necessary to perform maintenance on the SCANTER 5102/5202.

Below a description of the tools and where they are used.

Fig. 7.1 Terma Tool Kit

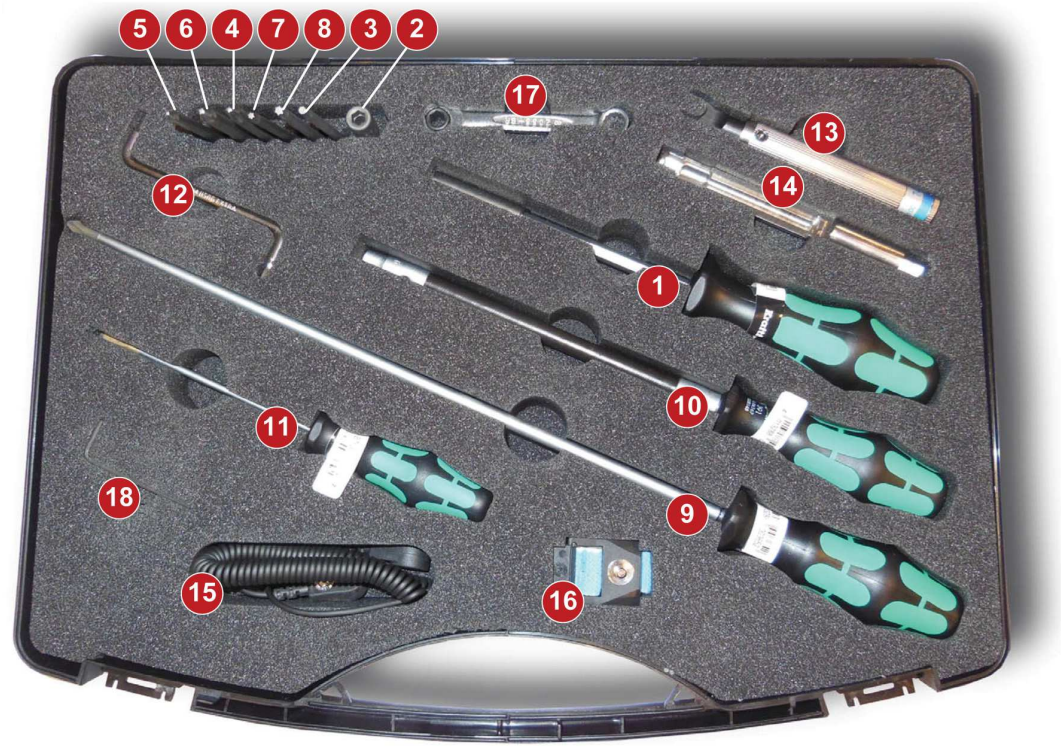


Fig. 7.2 Contents, Terma Tool Kit

		Use:
1	Bit screwdriver	Handle for bits
2	Bit, socket SW 5.5	Interconnection PCB
3	Bit, Allen, 3 mm x 89	Cable support (Frame Assy)
4	Bit, PH2 x 89	Filter, CP4, PC Board
5	Bit, PZ1 x 89	Cover plate
6	Bit, PZ2 x 89	Blower
7	Bit, Torx T10 x 89	Interconnection PCB
8	Bit, Torx T20 x 89	External I/O, Frame Assy
9	Screwdriver PH2 x 300	PSU, RxTx, RxTx Control
10	Screwdriver, flexible, 6 mm	WG Assy SSPA
11	Screwdriver, 3.5 mm x 100	D-Sub Connectors
12	Screwdriver, angled	D-Sub Connectors
13	Torque wrench, 1 Nm	SMA Connectors
14	Extender for torque wrench	SMA Connectors
15	ESD Cable	ESD protection
16	ESD Bracelet	ESD protection
17	Ratchet for bits	Blower (crate) if present
18	Allen key, 2 mm	Blower

7.2.4 Cable Marking

In general, when a module is removed from the transceiver it is always a good idea to note the positions where the cables are connected - specially if there is no marking on the cables.

All cables within the transceiver are marked. This means that it should be possible to find the position for each connector.

The way of marking the cables in the transceiver is shown below.

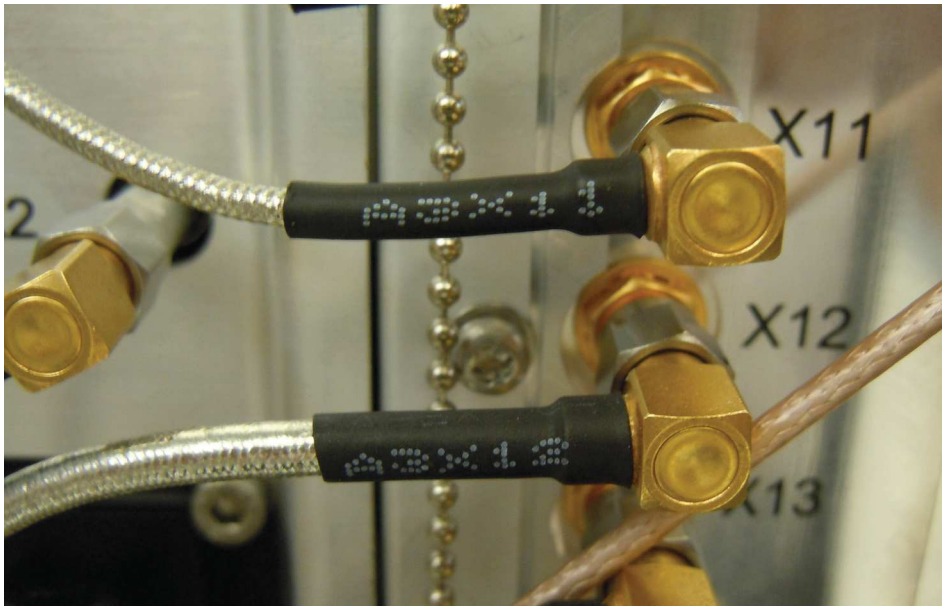


Fig. 7.3 Marking SMA (A3X11 and A3X12)

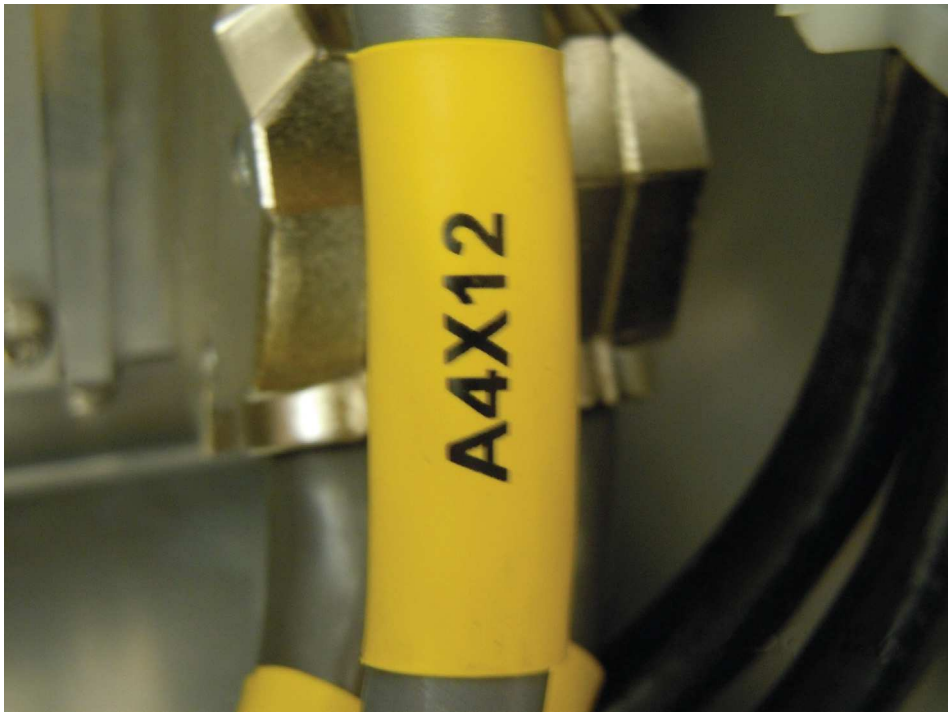


Fig. 7.4 Marking, other cables

The marking shows the module number, in this case A3 for the SMA connectors and A4 for the cable below. The following X-number tells to which connector the cable shall be connected (X11 and X12 in first picture and X12 in the second picture.

Information as shown below about the module numbers is located on the inside of the front door.

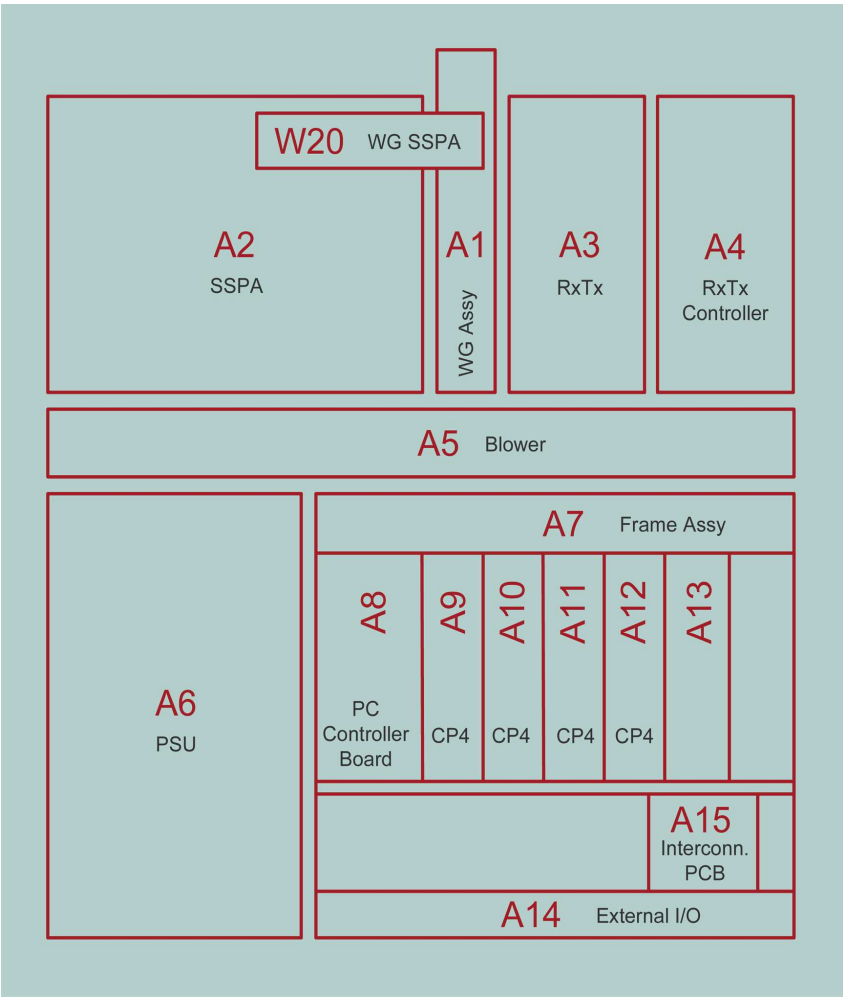


Fig. 7.5 Module numbers

7.3 Maintenance tasks

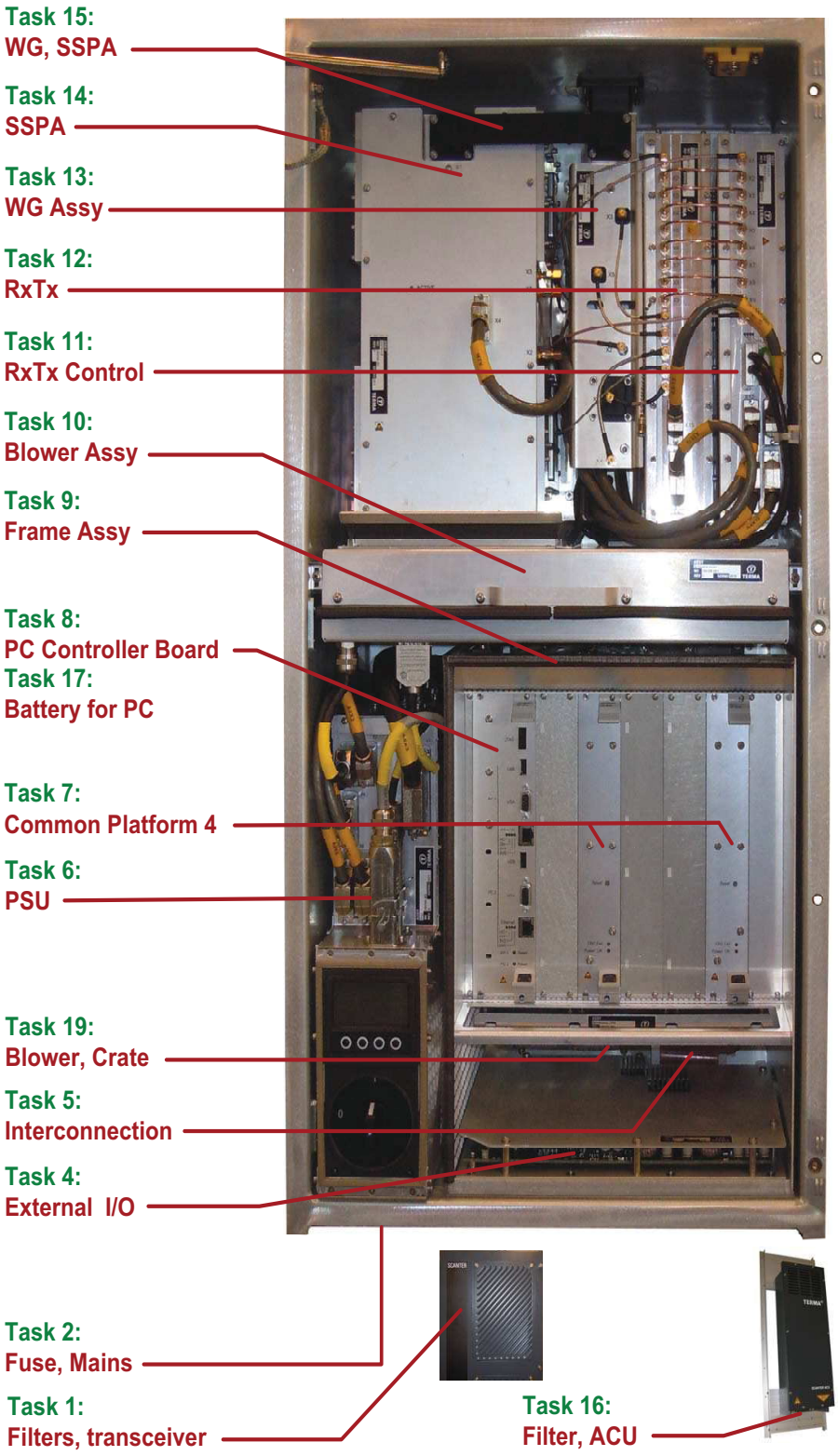


Fig. 7.6 Task overview, Preventive and corrective maintenance

7.3.1 Task 1: Replace Filters, Transceiver

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Screwdriver PH1 (tools 1/4 or 9) Vacuum cleaner / Brush
Spare parts / consumables:	2 pcs. Terma no. 524884-001 (Filter)

This task can be performed without shutting down the transceiver as all the work is done from outside.

The task is the same for both filters (air inlet and air outlet) - therefore only one of the filters are shown below.

1 Using tools 1/4 or tool 9 and/or fingers, unscrew the two screws holding the filter cover - see location of the screws on Fig. 7.7 (p. 118).

2 Remove the cover.

3 The filter appears as shown in Fig. 7.8 (p. 118). Check if it is clean. If positive remount the cover and check the other filter.

4 If the filter is dusty, use a vacuum cleaner to remove the dust. Use the vacuum cleaner on the filter from the same side as the dust entered the filter.

5 Check for dust behind the filter (Fig. 7.9 (p. 118). If any, clean with the vacuum cleaner and a brush.

6 Mount the cover.

Fig. 7.7 Filter cover

Fig. 7.8 Filter

Fig. 7.9 Behind filter

7.3.2 Task 2: Replace Fuse, Mains

Refer to Fig. 7.6 (p. 117)

Tool requirements:	None
Spare parts / consumables:	Terma no. 307609-018 (Fuse 15 A, Fast, Cartridge) / Terma no. 610376-019 (Fuse 16 A, Slow, 6.3 x 32 mm)

1. Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”
2. Turn off power to the transceiver using the power switch on the Power Supply Unit.
3. Turn the cap of the fuse holder counterclockwise and take out the fuse. See location of the fuse holder in Fig. 7.10 (p. 119).
4. Replace the blown fuse in the fuse holder with a new.
5. Insert fuse in the fuse holder, press the cap against the fuse holder and turn clockwise until it is tightened.
6. Turn on power to the transceiver using the power switch on the Power Supply Unit.
7. Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

Fig. 7.10 Fuse, Mains

7.3.3 Task 4: Replace External I/O (A14)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	ESD protection (tools 15/16) Torx screwdriver T10 and T20 (tools 1/7 and 1/8) Socket wrench (tools 1/2)
Spare parts / consumables:	Terma no. 386270-00x (External I/O, A14)

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Remove all cables and connections from the External I/O at the bottom of the cabinet.

Mark all connector positions to ensure that they are correctly connected after replacement.

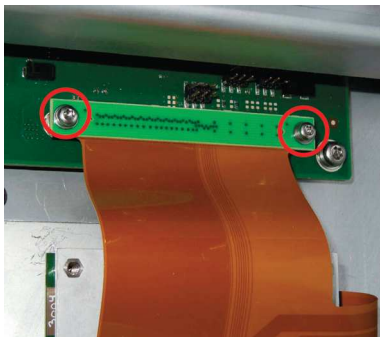


Fig. 7.11 Connector

4 Remove the two screws holding the connector for the interconnection PCB to the motherboard - use Torx T10 (tools 1/7). Shown in Fig. 7.11 (p. 120).

Pull out the connector.

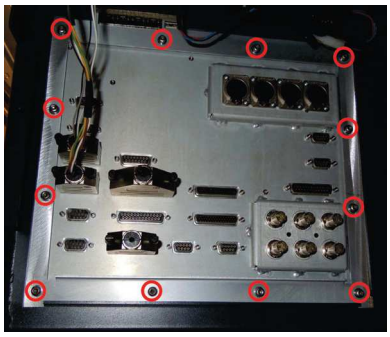


Fig. 7.12 12 screws

5 From the bottom of the cabinet, remove 12 Torx T20 screws holding the External I/O board (tools 1/8). The position of the screws is shown in Fig. 7.12 (p. 120).

6 Lift the board, take it out and take it to an ESD-approved workstation.

7 Remove two screws and two nuts holding the connector and the support angle, respectively. See Fig. 7.13 (p. 120) - red circles indicate two screws on connector (tools 1/7), yellow circles indicate the two nuts holding the support angle (tools 1/2).

Move the interconnection PCB to the new External I/O and fasten the angle and the connector (tools 1/7 and 1/2).

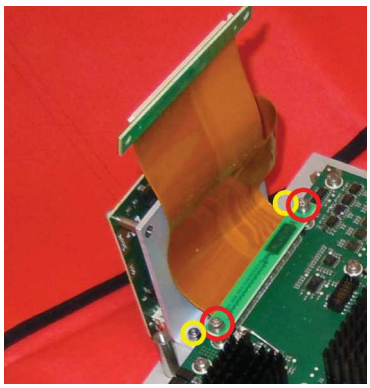


Fig. 7.13 Removal of PCB

8 Put the old External I/O in an antistatic bag.

9 Place the new External I/O board with the existing interconnection PCB and mount/tighten 12 screws at the bottom (tools 1/8).

10 Mount the connector of the interconnection PCB connector on the motherboard and fasten it with 2 Torx T10 screws (tools 1/7).

11 Re-establish all connections to the bottom of the External I/O board.

12 Turn on power to the transceiver using the power switch on the Power Supply Unit.

13 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

7.3.4 Task 5: Replace Interconnection PCB (A15)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	ESD protection (tools 15/16) Torx screwdriver T10 and T20 (tools 1/7 and 1/8) Socket wrench (tools 1/2)
Spare parts / consumables:	Terma no. 386275-00x (Interconnection PCB, A15)

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Remove all cables and connections from the External I/O at the bottom of the cabinet.
Mark all connector positions to ensure that they are correctly connected after replacement.

4 Remove the two screws holding the connector for the interconnection PCB to the motherboard - use Torx T10 (tools 1/7). Shown in Fig. 7.14 (p. 122).
Pull out the connector.

5 From the bottom of the cabinet, remove 12 Torx T20 screws holding the External I/O board (tools 1/8). The position of the screws is shown in Fig. 7.15 (p. 122).

6 Lift the board, take it out and take it to an ESD-approved workstation.

7 Remove two screws and two nuts holding the connector and the support angle, respectively. See Fig. 7.16 (p. 122) - red circles indicate two screws on connector (tools 1/7), yellow circles indicate the two nuts holding the support angle (tools 1/2).

Mount the new interconnection PCB on the External I/O and fasten the angle and the connector (tools 1/7 and 1/2).

8 Put the old module in an antistatic bag.

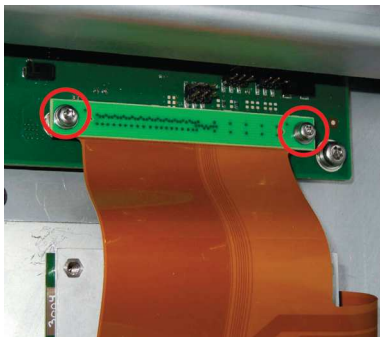


Fig. 7.14 Connector

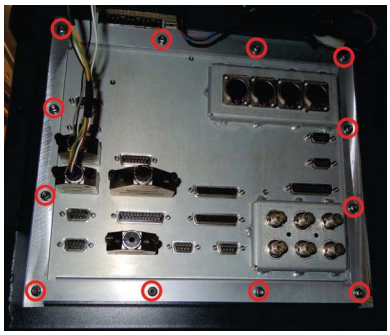


Fig. 7.15 12 screws

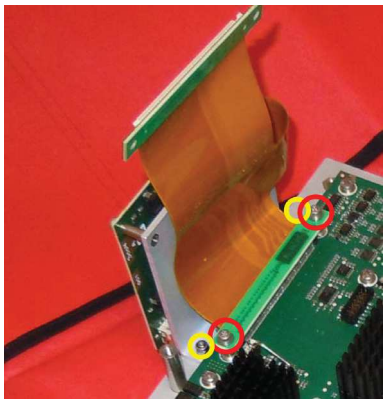


Fig. 7.16 Removal of PCB

9 Place the External I/O board with the new interconnection PCB and mount/tighten 12 screws at the bottom (tools 1/8).

10 Mount the connector of the interconnection PCB connector on the motherboard and fasten it with 2 Torx T10 screws (tools 1/7).

11 Re-establish all connections to the bottom of the External I/O board.

12 Turn on power to the transceiver using the power switch on the Power Supply Unit.

13 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

7.3.5 Task 6: Replace PSU (A6)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Screwdriver PH1 x 300 (tool 9) Screwdriver 3.5 x 100 (tool 11)
Spare parts / consumables:	Terma no. 386290-00x (Power Supply Unit, A6)

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Remove all connections from the power supply unit (tool 11) - those indicated in Fig. 7.17 (p. 124) and the connector (if optional heater is present there might be two connectors) at the bottom as well. Check marking on cables.

Fig. 7.17 Connectors

4 Using tool 9, remove the screw fixing the PSU at the bottom (front). Indicated with a red arrow in Fig. 7.18 (p. 124).

5 Using tool 9, unscrew four captive screws - two are placed at the top of the unit, two are placed at the bottom with access through two holes at the bottom of the front plate. See Fig. 7.18 (p. 124).

6 Remove the Power Supply Unit - lift it before pulling out as the connectors and fuse holders should be free of the cut-out in the cabinet.

7 Place the new PSU.

8 Fasten all five screws.

9 Mount all connectors removed earlier.

10 Turn on power to the transceiver using the power switch on the Power Supply Unit.

11 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

Fig. 7.18 Screws

7.3.6 Task 7: Replace Common Platform 4 (A9-A12)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	ESD protection (tools 15/16) Screwdriver PH1 (tools 1/4 or 9)
Spare parts / consumables:	Terma no. 386260-00x (Common Platform 4, A9-A13)

1 Using the Radar Service Tool, create a transceiver backup file. Use the Backup/Restore view.

Stop antenna rotation (if active) and switch “Mains Off”.

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Using tools 1/4 or tool 9, loosen the screws in the upper and lower handle, marked with 1 in Fig. 7.19 (p. 125) - these two screws are fixing the module to the frame.

Release the two handles (upper handle and lower handle) by pushing the black button into the handle - marked as “2” in Fig. 7.19 (p. 125). While doing this simultaneously on the two handles, move the upper handle upwards and the lower handle downwards (“3”). This will pull the module out of the connector.

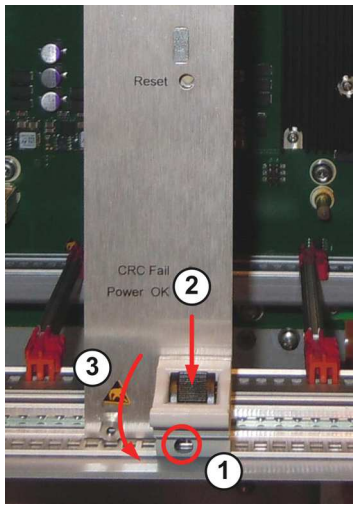


Fig. 7.19 Handle

Now the module can be removed.

4 Place the Common Platform 4 board in an antistatic bag.

5 Mount the new module in the slot - be sure to hit the upper and lower guide for proper mounting.

6 Keep the handles in the unlocked position until these reach the crate - press the two handles towards each other to move the module fully into the crate (until the connection is made on the motherboard).

7 Tighten the two screws fixing the module to the frame using tool 1/4 or tool 9.

8 Turn on power to the transceiver using the power switch on the Power Supply Unit.

The transceiver starts and automatically detects that the module needs SW. Uploading of SW to the module starts automatically and lasts several minutes. The upload of the module SW is completed when the transceiver front panel turns green.

To check the SW status of the module, open a browser window and enter the transceiver address followed by port number 8081:

http://__.__.__.__:8081/

The firmware status is found in “Operation/BITE/Status/FPGA Firmware Status” and the status is expected to show “OK”

If the firmware status of the module is not “OK”, then execute a manual module update (flash):

Open ”debug” view using RST and choose the ”Force Platform Flash Update” menu.

Select “Update to Production Firmware” and click “OK”

Flashing of the system starts. When completed a message appears in the same window. The transceiver restarts.

Check the SW status of the module in “Operation/BITE/Status/FPGA Firmware Status”.

9 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

7.3.7 Task 8: Replace PC Controller Board (A8)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	ESD protection (tools 15/16) Screwdriver PH1 (tools 1/4 or 9)
Spare parts / consumables:	Terma no. 386285-00x (PC Controller Board, A8)

1 Using the Radar Service Tool, create a transceiver backup file. Use the Backup/Restore view.

Stop antenna rotation (if active) and switch “Mains Off”.

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Using tools 1/4 or tool 9. loosen the screws in the upper and lower handle, marked with 1 in Fig. 7.20 (p. 127) - these two screws are fixing the module to the frame.

Release the two handles (upper handle and lower handle) by pushing the black button into the handle - marked as “2” in Fig. 7.20 (p. 127). While doing this simultaneously on the two handles, move the upper handle upwards and the lower handle downwards (“3”). This will pull the module out of the connector.

Now the module can be removed.

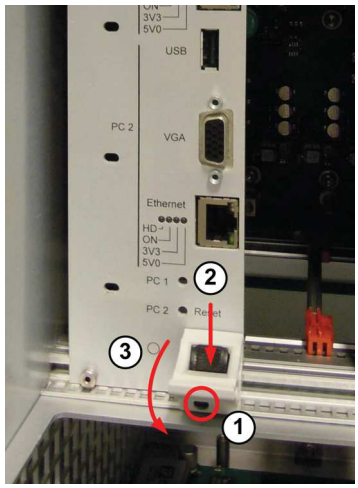


Fig. 7.20 Handle

4 Place the PC Controller Board in an antistatic bag.

5 Mount the new module in the slot - be sure to hit the upper and lower guide for proper mounting.

6 Keep the handles in the unlocked position until they reach the crate - press the two handles towards each other to move the module fully into the crate (until the connection is made on the motherboard).

7 Tighten the two screws fixing the module to the frame using tools 1/4 or tool 9.

8 Turn on power to the transceiver using the power switch on the Power Supply Unit. Wait for the booting of the PC to end.

9 Using the default IP address for the transceiver (this is determined by the controller board), switch “Mains On” by means of the Radar Service Tool.

10 Using Radar Service Tool, restore back-up. Settings and IP addresses are now changed to usual values.

11 If needed, select antenna rotation, Tx and profile etc.

7.3.8 Task 9: Replace Frame Assy (A7)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Torx T10 and T20 screwdriver (tools 1/8 and 1/7) Screwdriver PZ2 (tools 1/6) Screwdriver PZ2 (tools 1/5) Screwdriver PH1 (tools 1/4 or tool 9) Screwdriver Allen 3 mm (tools 1/3) Screwdriver, angled (tool 12) Screwdriver, 3.5 x 100 mm (tool 11)
Spare parts / consumables:	Terma no. 386265-00x (Frame Assy, A7)

The Frame Assy is carrying Motherboard, External I/O, Interconnection PCB and three cables connecting to the PSU. The motherboard is part of the Frame Assy while the External I/O and the Interconnection PCB are both separate LRU's. Therefore, the External I/O, the Interconnection PCB (mounted on the External I/O) and the three cables have to be dismounted from the Frame Assy.

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch "Mains Off"

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Remove the External I/O according to the description in Task 4 but let the Interconnection PCB remain on the External I/O as both have to be mounted in the new Frame Assy.

4 Remove the Blower Assy according to the description in Task 10.

5 Remove PC Controller Board and Common Platform Boards as necessary to get access to the screws behind these modules according to respective tasks, 8 and 7. Antistatic bags !!

6 Using screwdriver (tools 1/5), loosen 10 captive screws/washers fixing the Frame Assy to the back plate.
The location of these is shown with red circles in Fig. 7.21 (p. 129). The two upper screws (dotted red circles) are accessible above the Frame Assy (marked with red circles in Fig. 7.22 (p. 130)).

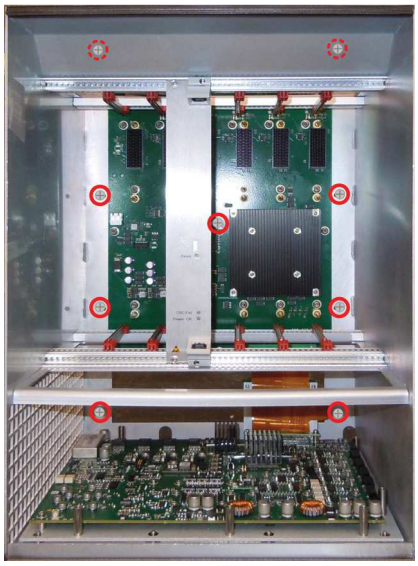


Fig. 7.21 Screws

7 Unplug X2, X3 and X4 on the PSU. These three cables are connecting to the Frame Assy. If the screws are tightened too hard, use tool 11.

8 Using Allen 3 mm screwdriver (tools 1/3), remove 5 screws and washers holding two cable supports - shown with yellow circles in Fig. 7.22 (p. 130). Remove the two cable supports.

The Frame Assy can now be moved a little outwards (only kept in place now by two cables).

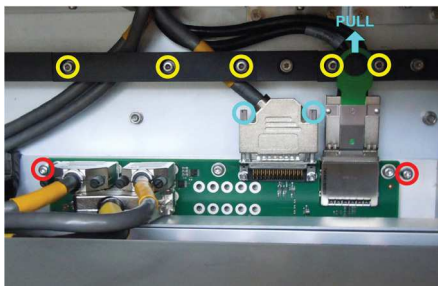


Fig. 7.22 Support and cables

9 Referring to Fig. 7.22 (p. 130), pull the green ring upwards on the rightmost connector to release it from the Motherboard (light blue arrow).

On the leftmost connector loosen the two screws (shown with light blue circles) to release it from the Motherboard. If too tight to loosen them with the fingers, use the angled screwdriver (tool 12).

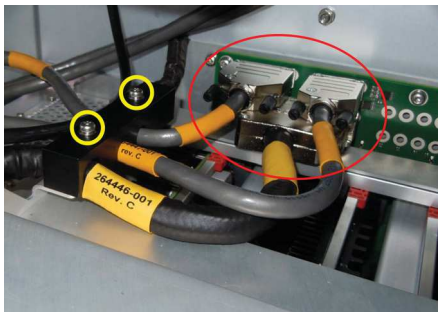


Fig. 7.23 Support, connectors

10 Take out the Frame Assy. Remove the cable support using Torx T20 screwdriver (tools 1/8) to remove two screws as indicated with yellow circles in Fig. 7.23 (p. 130). Disconnect the three connectors within the red ellipse in Fig. 7.23 (p. 130) and remove the three cables.

Re-establish the cable support without cables going through it.

11 Connect the three cables on the new Frame Assy and fix them with the cable support (Fig. 7.23 (p. 130)). Place the new Frame Assy in RxTx.

12 Mount the connectors removed in step 9 and mount the cable supports removed in step 8 (Fig. 7.22 (p. 130)).

13 Connect X2, X3 and X4 on the PSU.

14 Fix the Frame Assy with the ten screws (step 6).

15 Replace the PC Controller Board and the CP4 Boards.

16 Mount the Blower Assy and connect to PSU.

17 Mount the External I/O and Interconnection PCB and re-establish all connections at the bottom of the cabinet.

18 Turn on power to the transceiver using the power switch on the Power Supply Unit.

19 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

7.3.9 Task 10: Replace Blower Assy (A5)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Screwdriver, PH1 (tools 1/4 or 9) Screwdriver, 3.5 x 100 (tool 11) Allen Key, 2 mm (tool 18)
Spare parts / consumables:	Terma no. 386298-00x (Blower Assy, A5)

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 On the power supply unit, remove the connection to the blower assy - the location of the connector is shown in Fig. 7.24 (p. 131). Use tool 11 if the screw is tightened too hard.

4 On left and right side of the Blower Assy, two pointed screws are fastening the Blower Assy in place. See Fig. 7.25 (p. 131).

Remove the two screws using tool 18 out the Blower Assy together with its cable.

5 Slide in the new unit - a horizontal slot in left and right side will guide the assy. Make sure that the cable follows the unit in.

6 Secure its position by mounting angles and screws in each side.

7 Mount the connector on the power supply unit.

8 Turn on power to the transceiver using the power switch on the Power Supply Unit.

9 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

Fig. 7.24 Connector

Fig. 7.25 Screws

7.3.10 Task 11: Replace RxTx Control (A4)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	ESD protection (tools 15/16) Moment spanner, 1 Nm (tool 13) Extension, moment spanner (tool 14) Screwdriver PH1 x 300 (tool 9) Screwdriver 3.5 x 100 (tool 11)
Spare parts / consumables:	Terma no. 386222-00x (RxTx Control, A4)

1 Using the Radar Service Tool, create a transceiver backup file. Use the Backup/Restore view.

Stop antenna rotation (if active) and switch “Mains Off”.

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 On RxTx Control, loosen all SMA connectors (X1 - X10) using tools 13/14, four D-Sub connectors (X12, X13, X14, X15) using tool 11 and one PCIe connector (X11) as indicated on the RxTx Control module with red circles and ellipses - see Fig. 7.26 (p. 132).

The PCIe connector is unplugged by pulling outwards in the green plastic ring on the side of the connector.

Avoid bending the semi-rigid cables!!

4 On the RxTx to the left of the RxTx Control, loosen SMA connectors X2 - X9 to remove or turn the semi-rigid cables so the RxTx Control can be pulled out without any obstructions - use tools 13/14. Indicated with yellow circles in Fig. 7.26 (p. 132).

5 Loosen the 4 captive screws holding the RxTx Control to the back of the cabinet (tool 9). 2 screws are located at the top and 2 screws are located at the bottom as indicated in Fig. 7.27 (p. 133).

6 Take out the RxTx Control module and put it in an antistatic bag.

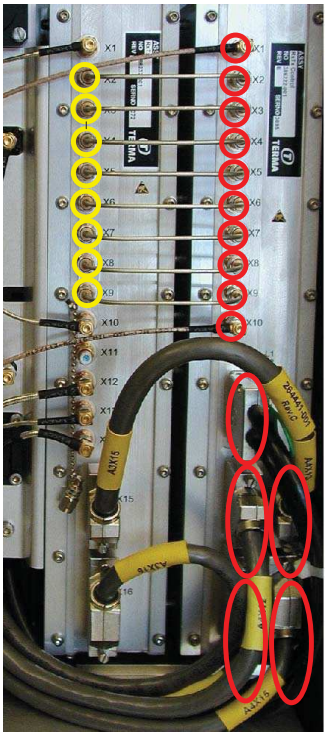


Fig. 7.26 Connectors

7 Mount the new RxTx Control module and fasten it with the 4 captive screws loosened in step 5 using tool 9.

8 Mount and tighten all SMA connectors (X1 - X10) using tools 13/14.
Mount four D-Sub connectors (X12, X13, X14, X15) using tool 11 and mount one PCIe connector (X11) by simply pushing it into the connector.

9 On the RxTx, tighten SMA connectors X2 - X9 using tools 13/14.

10 Turn on power to the transceiver using the power switch on the Power Supply Unit.

The transceiver starts and automatically detects that the module needs SW. Uploading of SW to the module starts automatically and lasts several minutes. The upload of the module SW is completed when the transceiver front panel turns green.

To check the SW status of the module, open a browser window and enter the transceiver address followed by port number 8081:

http://__.__.__.__:8081/

The firmware status is found in “Operation/ BITE/Status/FPGA Firmware Status” and the status is expected to show “OK”

If the firmware status of the module is not “OK”, then execute a manual module update (flash):

Open ”debug” view using RST and choose the ”Force Platform Flash Update” menu.

Select “Update to Production Firmware” and click “OK”

Flashing of the system starts. When completed, a message appears in the same window. The transceiver restarts.

Check the SW status of the module in “Operation/BITE/Status/FPGA Firmware Status”.

11 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

12 Make a PSAT calibration of the SSPA. (For details on the procedure, see 8.6 (p. 149).

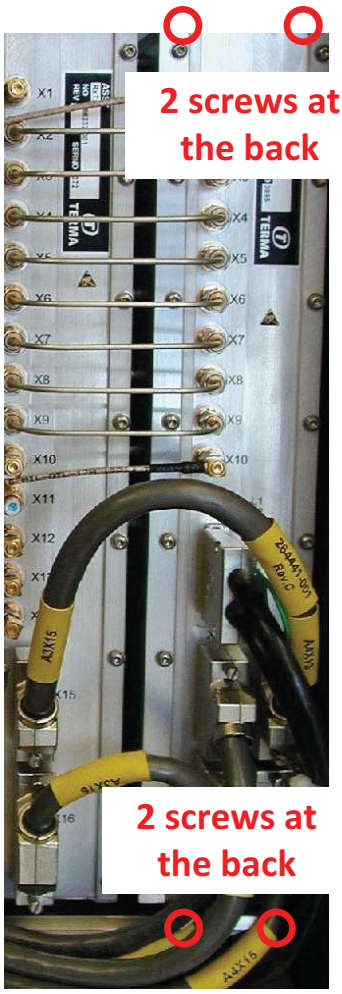


Fig. 7.27 Screws

7.3.11 Task 12: Replace RxTx (A3)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	ESD protection (tools 15/16) Moment spanner, 1 Nm (tool 13) Extension, moment spanner (tool 14) Screwdriver PH1 x 300 (tool 9) Screwdriver 3.5 x 100 (tool 11)
Spare parts / consumables:	Terma no. 386232-00x (RxTx, A3)

1 Using the Radar Service Tool, create a transceiver backup file. Use the Backup/Restore view.

Stop antenna rotation (if active) and switch “Mains Off”.

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Loosen X6 on the Waveguide Assy and X14 on RxTx using tools 13/14 and remove the small cable.
Mount the termination on X14 (this is attached the RxTx with a chain).

To avoid damage of the RxTx, it is important to mount the termination, as the X14 input has a very high impedance. See Fig. 7.29 (p. 134).

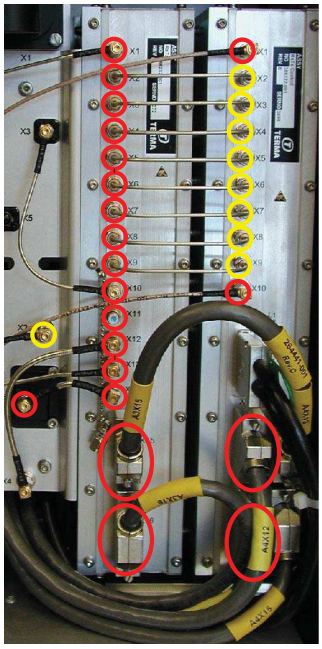


Fig. 7.28 Connectors

4 On RxTx, loosen all SMA connectors (X1 - X14) using tools 13/14 and two D-Sub connectors (X15 - X16) using tool 11 as indicated on the RxTx module with red circles and ellipses - see Fig. 7.28 (p. 134).

Avoid bending the semi-rigid cables!!

5 On the RxTx Controller, loosen and remove SMA connectors X1 and X10 and D-Sub connectors X12 and X14 as these might obstruct free passage for the RxTx when pulled out.

Fig. 7.29 Termination

6 On the RxTx Controller, loosen SMA connectors X2 - X9 to remove or turn the semi-rigid cables allowing the RxTx to be pulled out (yellow circles in Fig. 7.28 (p. 134)).

7 On the Waveguide Assy, loosen X2 (only loosen slightly), so the cable can be turned away from RxTx.

8 Loosen the 4 captive screws holding the RxTx to the back of the cabinet.

2 screws at the top and 2 screws at the bottom as indicated in Fig. 7.30 (p. 135). Use tool 9.

9 Take out the RxTx module.

10 Mount the new RxTx module and fasten it with the 4 captive screws loosened in step 8 - use tool 9.

11 On the RxTx Controller, mount and tighten SMA connectors X1, X10 and D-Sub connectors X12 and X14. Use tools 13/14 and tool 11, respectively.

12 On the Waveguide Assy, tighten X2 using tools 13/14.

13 Dismount the termination from X14 on the RxTx module and mount the small cable from Waveguide Assy X6 to RxTx X14. Use tools 13/14 to tighten.

14 On RxTx, mount and tighten all remaining SMA connectors (X1 - X13) and two D-Sub connectors (X15 - X16).

Use tools 13/14 and 11, respectively.

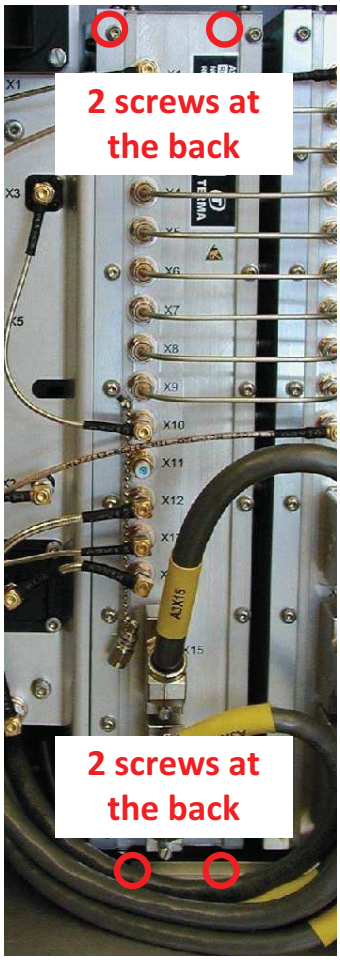


Fig. 7.30 Screws

15 On the RxTx Controller, tighten SMA connectors X2 - X9 using tool 13/14.

16 Make a PSAT calibration of the SSPA. (For details on the procedure, see 8.6 (p. 149).

16 Turn on power to the transceiver using the power switch on the Power Supply Unit.

The transceiver starts and automatically detects that the module needs SW. Uploading of SW to the module starts automatically and lasts several minutes. The upload of the module SW is completed when the transceiver front panel turns green.

To check the SW status of the module, open a browser window and enter the transceiver address followed by port number 8081:

http://__.__.__.__:8081/

The firmware status is found in “Operation/BITE/Status/FPGA Firmware Status” and the status is expected to show “OK”

If the firmware status of the module is not “OK”, then execute a manual module update (flash):

Open ”debug” view using RST and choose the ”Force Platform Flash Update” menu.

Select “Update to Production Firmware” and click “OK”

Flashing of the system starts. When completed, a message appears in the same window. The transceiver restarts.

Check the SW status of the module in “Operation/BITE/Status/FPGA Firmware Status”.

17 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

7.3.12 Task 13: Replace Waveguide Assy (A1)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Screwdriver, PH1 (tool 9) Screwdriver PZ2 (tools 1/6) Moment spanner, 1 Nm (tool 13) Extension, moment spanner (tool 14) Flexible screwdriver, 6 mm (tool 10)
Spare parts / consumables:	Terma no. 386240-00x (Waveguide Assy, A1) 1 pc. Cable strap, Terma no. 201197-010

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Remove Waveguide SSPA according to Task 15. Use tool 10.

It might not be necessary to remove more units, but to have more space, the Blower Assy and the SSPA can be removed. In this case, execute step 4 and 5 or continue with step 6.

(4) Remove Blower Assy according to Task 10.

(5) Remove SSPA according to Task 14.

6 Using tool 13/14, loosen and remove all SMA connectors from the waveguide assy (X3, X5, X2, X6 and X4) together with X14 on RxTx (and remove the small cable).
All these connections to be removed are shown with red circles on Fig. 7.31 (p. 137).

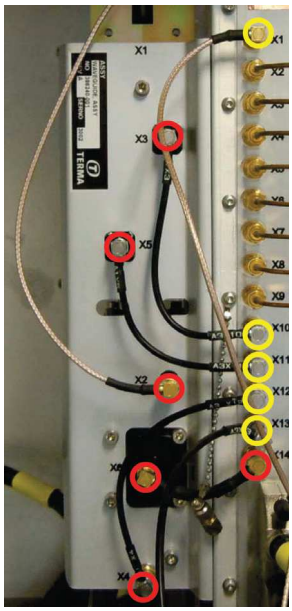


Fig. 7.31 Connectors

7 Mount the termination on X14 on RxTx. The termination is attached to RxTx with a chain. See Fig. 7.32 (p. 137).

8 Loosen SMA connectors on RxTx marked with a yellow circle (X1, X10, X11, X12, and X13) - see Fig. 7.31 (p. 137) and turn the cables upwards or downwards so the waveguide assy has free passage when it is taken out. For doing this, the connectors should be loosened just a little bit. Use tools 13/14.

Fig. 7.32 Termination

9 In the cable tray at the bottom of the Waveguide Assy, cut the cable strap holding the cables to the assy. See Fig. 7.33 (p. 138).

10 Remove the waveguide connector coming from the installation to get acces to the top flange of the Waveguide Assy. Using tools 1/6, loosen and remove the four screws holding the top flange. See Fig. 7.34 (p. 138).

11 Loosen the four screws fixing the Waveguide Assy to the back - see Fig. 7.35 (p. 138). The two lower screws are accessible through the cable tray at the bottom - the two upper screws are accessible through the two slots on the front plate indicated in Fig. 7.36 (p. 138). All four screws are captive. Use tool 9.

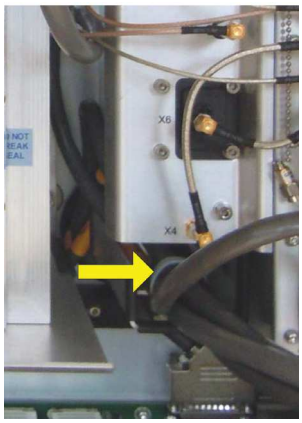


Fig. 7.33 Cable strap

12 Pull old unit downwards and out and place the new - ensure that the top flange is guided properly through the circular cut-out in the top of the cabinet.

13 Mount and tighten the four screws holding the top flange to the cabinet (tools 1/6) and mount the waveguide connector. Check that the O-ring is placed correctly.

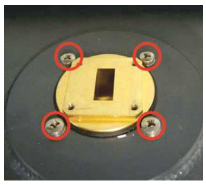


Fig. 7.34 Top flange

14 Tighten the four screws holding the unit to the back (tool 9).

15 Mount a new cable strap to fix the cables to the cable tray at the bottom of the assy.

16 Mount and tighten the connectors X3, X5, X2 and X4 (tools 13/14).
Remove the termination on RxTx X14 and mount the small cable between X6 (Waveguide Assy) and X14 (RxTx) and tighten (tools 13/14).
Tighten connectors X1, X10, X11, X12 and X13 on the RxTx (tools 13/14).

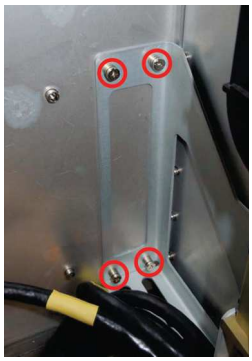


Fig. 7.35 4 screws

17 Mount SSPA and Blower Assy according to Task 14 and 10, respectively, if these have been removed

18 Mount Waveguide SSPA according to Task 15.

19 Turn on power on the mains switch on the PSU.

20 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

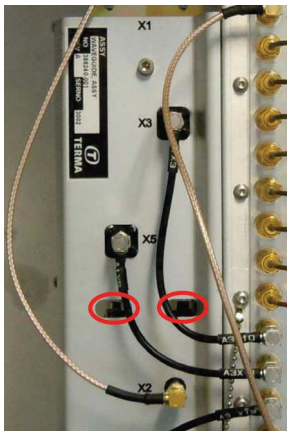


Fig. 7.36 Two slots

7.3.13 Task 14: Replace SSPA (A2)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Screwdriver, PH2 (tool 9) Moment spanner, 1 Nm (tool 13) Screwdriver, 3.5 x 100 (tool 11)
Spare parts / consumables:	Terma no. 386250-002 (SSPA, Long Range, A2)

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Remove Waveguide SSPA according to Task 15.

4 Remove Blower Assy according to Task 10.

5 Unscrew and unplug D-Sub connector X4 using tool 11.
Unscrew and unplug the three SMA connectors X2, X3 and X5 using tool 13.
See Fig. 7.37 (p. 139).

X2 connects to RxTx, X1
X3 connects to RxTx, X13
X5 connects to RxTx Control, X10

Fig. 7.37 Connectors

6 On the PSU, unplug the Harting connector supplying the SSPA. See Fig. 7.38 (p. 139).

7 The SSPA module is fixed to the cabinet with eight screws, four to the left and four to the right. The left side screws of the SSPA is shown in Fig. 7.39 (p. 140) and the right side is equal to the left side - the screws in red circles must be loosened totally while the screw in yellow circle should be left untouched.

Using tool 9, loosen the screws according to the above mentioned and let the SSPA hang in the “yellow” screws.

Lift the SSPA module and take it out.

Fig. 7.38 SSPA supply

8 Mount the new unit - fasten it to the back with all eight screws.

9 Mount the Harting connector in the PSU.

10 Mount the D-Sub connector (X4) and three SMA connectors (X2, X3 and X5).

11 Mount the Blower Assy according to Task 10.

12 Mount the Waveguide SSPA according to Task 15.

13 Turn on power on the mains switch on the PSU.

14 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

15 Make a PSAT calibration of the SSPA. (For details on the procedure, see 8.6 (p. 149).

Fig. 7.39 6 screws

7.3.14 Task 15: Replace Waveguide, SSPA

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Flexible screwdriver, 6 mm (tool 10)
Spare parts / consumables:	Terma no. 524894-001 (Waveguide, SSPA)

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Remove eight screws holding the waveguide assembly and remove it. Use tool 10.
See Fig. 7.40 (p. 141)

4 Mount the new waveguide assembly, mount and tighten the eight screws using tool 10.

5 Turn on power to the transceiver using the power switch on the Power Supply Unit.

6 Switch “Mains On” by means of the Radar Service Tool (if needed, select antenna rotation, Tx and profile).

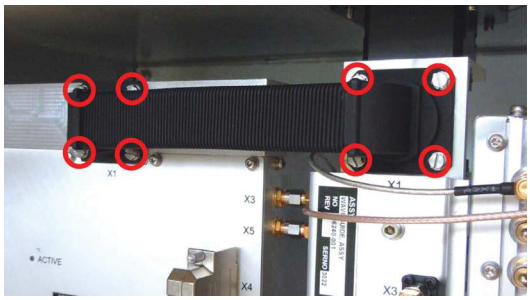


Fig. 7.40 WG SSPA, screws

7.3.15 Task 16: Replace Filter, ACU

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Screwdriver PH1 (tool 9) Vacuum cleaner Brush
Spare parts / consumables:	1 pc. Terma no. 262394-001 (Filter)

This task can be performed without shutting down the ACU, as all the work is done from outside.

1 Use a screwdriver (tool 9) and/or fingers to unscrew the four screws holding the filter cover - see location of the screws on Fig. 7.41 (p. 142).

2 Remove the cover.

3 The filter appears. Check if it is clean. If positive remount the cover.

4 If the filter is dusty, use a vacuum cleaner to remove the dust. Use the vacuum cleaner on the filter on the same side as the dust came in.

If necessary, replace the filter.

5 Check for dust behind the filter. If any, clean with the vacuum cleaner and a brush.

6 Mount the cover.

Fig. 7.41 4 screws

7.3.16 Task 17: Replace Battery, PC Controller Board (A8)

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	ESD protection (tools 15/16) Screwdriver PH1 (tool 9)
Spare parts / consumables:	Terma no. 519886-001 (battery, lithium) Terma no. 201197-049 (cable strap, Ø20 x 2.5)

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Take out the PC Controller Board according to Task no. 8 and place it on an ESD-approved workstation.

4 Locate the green, cylindrical battery fastened to the PCB with a cable strap.
See Fig. 7.43 (p. 143).

5 Cut the strap fixing the battery to the PCB, disconnect the red/black wire from the connector and remove the battery.

6 Place the new battery in same position as the old battery and fix it with a cable strap - cut the strap where necessary.

Fig. 7.42 PC Board

7 Connect the red/black wire to the connector.

8 Mount the PC Controller Board in the crate according to Task 8.

9 Turn on power to the transceiver using the power switch on the Power Supply Unit.

10 Switch “Mains On” by means of the Radar Service Tool.

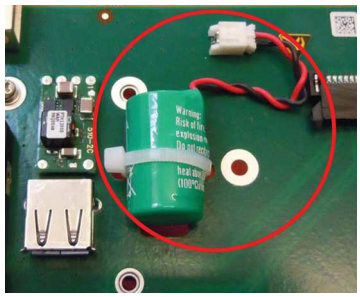


Fig. 7.43 Battery

11 Set up date and time in the operational system.

12 If needed, select antenna rotation, Tx and profile.

7.3.17 Task 19: Replace Blower, CP4

Refer to Fig. 7.2 (p. 114) and Fig. 7.6 (p. 117)

Tool requirements:	Ratchet and bit Torx T10 (tools 17/7)
Spare parts / consumables:	Terma no. 386268-00x (Blower Assy, CP4)

1 Using the Radar Service Tool, stop antenna rotation (if active) and switch “Mains Off”

2 Turn off power to the transceiver using the power switch on the Power Supply Unit.

3 Disconnect the connection to the blower assy. The connector is to the left of the blower assy. See Fig. 7.44 (p. 144)

4 Using tool 17, rachet and tool 7, Torx T10, remove the four screws holding the blower assy (the four screws which are holding the assy to four spacers). See the location of the four screws on Fig. 7.45 (p. 144).

5 Mount the new Blower Assy with the four screws.

6 Re-establish the connection to the blower.

7 Turn on power to the transceiver using the power switch on the Power Supply Unit.

8 Switch “Mains On” by means of the Radar Service Tool.

9 If needed, select antenna rotation, Tx and profile.

Fig. 7.44 Connector

Fig. 7.45 Screws, 4 pcs.

8 Transceiver setup and adjustments

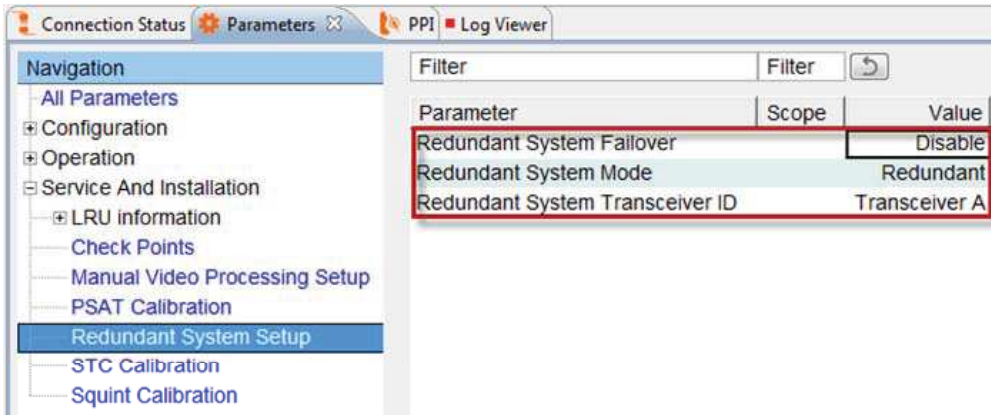
8.1 Setting up transceiver redundancy (redundant systems only)

If the transceiver is part of a redundant system setup, observe the following points:

- A direct network connection should be established between network interface X14 on the two transceivers.
- The configuration parameter “Redundant System Mode” must be set to "Redundant".

Menu: Window / Show View / Parameters

Navigation window: Service And Installation / Redundant System Setup



1	On transceiver A, set "Redundant System Mode" to "Redundant".
2	Set "Redundant System Failover" to "Disable". This will be enabled later during the procedure.
3	Set "Redundant System Transceiver ID" to "Transceiver A".
4	On transceiver B, set “Redundant System Mode" to "Redundant".
5	Set "Redundant System Failover" to "Disable". This will be enabled later during the procedure.
6	Set "Redundant System Transceiver ID" to "Transceiver B".

To enable automatic failover, the following conditions must be fulfilled:

- No critical errors must be present in **EITHER** transceiver.
- Mains must be set to “On” in **BOTH** transceivers.
- “Redundant System Failover” must be set to “Enable” in **BOTH** transceivers.

When failover has been successfully enabled, “Redundant System Status" (in the Status and Measurement view) changes to "Operational" and "Redundant System Failover Disabled Warning" is no longer reported.

8.2 How to activate a transceiver (redundant systems only)

Menu: Window / Show View / Parameters

Navigation window: Service And Installation / Redundant System Setup

1	To make a transceiver active, use the RST controlling the transceiver in question.
2	In the “Redundant System Failover” parameter, select “Force”.

8.3 Transceiver redundancy test (redundant systems only)

1	Make sure that the direct network LAN connection between the transceivers is established and that the ACU is connected to both transceivers.
2	Check that "Redundant System Mode" is set to "Redundant" on both transceivers.
3	With mains on, set "Redundant System Failover" on both transceivers to "Enable".
4	With transceiver A as active, start the antenna and transmission.
5	Inspect that radar video is present on transceiver A.
6	From transceiver A check that the RPM value can be changed and inspect correct antenna tell-back value. Set RPM value to normal operation again.
7	Force a critical BITE error on transceiver A by setting "Forward Power Offset" to -100 W, thus forcing a "Forward Power Too Low" BITE error on transceiver A.

When the BITE error appears, verify that:

8	“Redundant System Role" of the two transceivers now has interchanged.
9	The waveguide switch has changed position to transceiver B.
	Transceiver B is transmitting and distributing video.
10	"Redundant System Status" is "Degraded" in transceiver A.
11	"Redundant System Failover" in both transceivers is "Disabled"

12	From transceiver B, stop antenna and transmission.
13	Repeat the above procedure for transceiver B.

8.4 Antenna correction and range adjustment

1	In the “Video Setup” view, set the RST measurement units to correspond to the available target data.
2	Set the “Antenna Correction” parameter to zero. (Configuration/Interfaces/Antenna)
3	Set “Range Adjust” parameter to zero. (Configuration/Interfaces/Antenna)
4	Locate a uniform, non-moving, small and stable target at a long range with a known range/bearing or GPS. Use the EBL/VRM tool to show the target on the VRM scope and measure the exact bearing. See Fig. 8.1 (p. 147) GPS positions can be converted to range and bearing from e.g. http://www.gpsvisualizer.com/calculators
5	Calculate and set the “Antenna Correction” parameter (bearing correction). Antenna correction = 360° – Measured bearing + Actual bearing
6	Watch the PPI and inspect correct bearing to target, fine adjust if required.
7	Measure the exact distance to the target. Calculate and set the “Range Adjust” parameter. Range adjust = Antenna range – Actual range
8	Watch the PPI and inspect correct range to target, fine adjust as required.

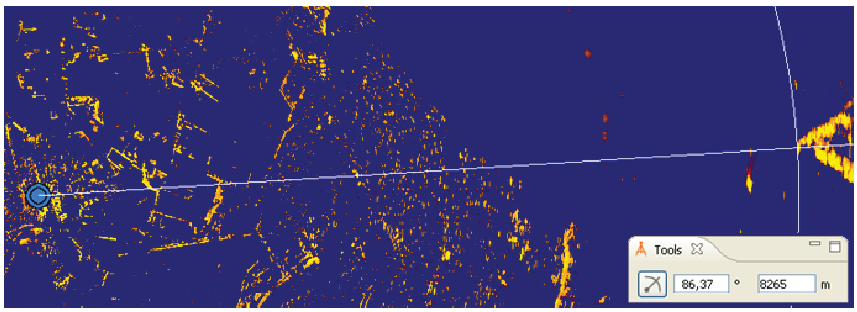


Fig. 8.1 Range and antenna correction

8.5 Antenna squint calibration

1	In the “Parameters” view, set the parameter “Burst TMFD Sequence Length” to 6. (Configuration/RxTx/Timing Calculation/Input)
2	Set the “Squint Calibration” parameter to “On”. (Service and Installation/Squint Calibration)
3	Set the ”Frequency Selection” parameter to “f0” (The first of 6 frequencies). (Service and Installation/Squint Calibration)
4	Locate a uniform, non-moving, small and stable target at a long range and use the EBL/VRM tool to show the target on the “VRM-scope” view. Zoom the scope in to cover 3-4 deg. in azimuth.
5	Place the EBL exactly on the centre of the target and then press the “Hold” icon (H) to be found inside the view, topmost right corner.
6	Set the “Squint Calibration Options” parameter to “Store data set”. (Service and Installation/Squint Calibration)
7	Set the ”Frequency Selection” parameter to the next frequency (f1 - f5). (Service and Installation/Squint Calibration)
8	Adjust the “Antenna Correction” parameter until the target max. amplitude is directly on the previously max. amplitude from step 5. Higher correction value moves target to the right in the EBL scope. See Fig. 8.2 (p. 149). (Configuration/Interfaces/Antenna/)
9	Set the “Squint Calibration Options” parameter to “Store data set”. (Service and Installation/Squint Calibration)
10	Repeat from step 7 until data sets from all 6 frequencies (f0 – f5) have been stored.
11	Set “Squint Calibration Options” parameter to “Calculate Coefficients” (if available). (Service and Installation/Squint Calibration)
12	Set “Squint Calibration” to “Off”. (Service and Installation/Squint Calibration)
13	Watch the PPI and inspect all frequencies correctly aligned.
14	Reset the “Burst TMFD Sequence Length” to previous value (default 4).

15	For redundant systems: Copy squint calibration from transceiver A to B: On transceiver B, set “Squint Calibration” to “On” Insert the “Antenna Correction Data Sets” from transceiver A
16	Set “Squint Calibration” to “Off”.

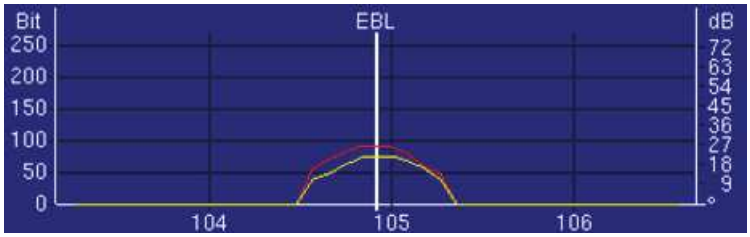


Fig. 8.2 Aligned antenna correction seen in the EBL scope of the first and second frequency, during squint calibration

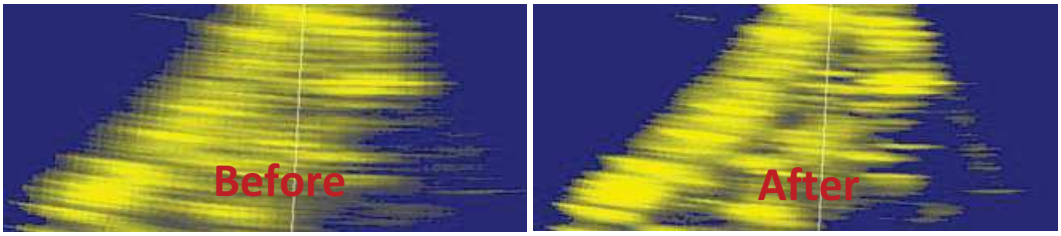


Fig. 8.3 Example of two frequencies before and after squint calibration

8.6 PSAT calibration

This procedure assumes that all profiles use the same frequency bands. If this is not the case, then each profile should be PSAT calibrated separately.

1	In the “Low Level” perspective, open the “Profile Editor” view. Find the “Carrier frequency scale factors” parameters and make sure that none of the scale factors are checked as “profiled”. (Configuration/RxTx/Chirp Generation)
2	In the “Profile Editor” view, find the “PSAT Calibration Status” parameter. Make sure it is not checked as “Profiled” (Service And Installation/PSAT Calibration)
3	In the “Parameter” view, check if the value of the “PSAT Calibration Status” parameter. If the value is “Not Calibrated”, then change the “PSAT Calibration” parameter from “off” to “on”. The calibration process will take a few minutes. The “PSAT Calibration Status” will then show the value “Calibrated”.

9 BITE errors and warnings

The following lists BITE errors and warnings that may be detected in the system. Please note that the list is not exhaustive. For a complete list of errors and warnings, please refer to doc. 386303-DI “SCANTER 5000 Series Transceiver Control Protocol Data Definition - Service Access Mode”.

Name	Min	Max	Severity	Description
ACU Fault			Redundant System Critical Error	Indicates that the safety loop has been opened by the ACU. Antenna rotation and transmission will cease.
Antenna Rotation Tellback Error			Redundant System Critical Error	Indicates that no antenna rotation tellback is received although the antenna is expected to be rotating
BITE Measurement Log Disk Limit Reached			Error	Indicates that the amount of disk space allocated to the BITE Measurement Log has been used up
BITE Status Log Disk Limit Reached			Error	Indicates that the amount of disk space allocated to the BITE Status Log has been used up
BITE Warning and Error Log Disk Limit Reached			Error	Indicates that the amount of disk space allocated to the BITE Warning and Error Log has been used up
Blanking Map Status			Error	Indicates that the blanking map is missing
Board Temperature Error#External IO	85.0	500.0	Fatal Error	Indicates that the board surface temperature is outside the recommended temperature range and that Mains has been turned off to prevent component damage
Board Temperature Error#Motherboard	85.0	500.0	Fatal Error	Indicates that the board surface temperature is outside the recommended temperature range and that Mains has been turned off to prevent component damage
Board Temperature Error#PSU	85.0	500.0	Fatal Error	Indicates that the board surface temperature is outside the recommended temperature range and that Mains has been turned off to prevent component damage
Board Temperature Error#RxTx	85.0	500.0	Fatal Error	Indicates that the board surface temperature is outside the recommended temperature range and that Mains has been turned off to prevent component damage
Board Temperature Error#RxTx Ctrl	85.0	500.0	Fatal Error	Indicates that the board surface temperature is outside the recommended temperature range and that Mains has been turned off to prevent component damage
Board Temperature Error#SSPA Ctrl	85.0	500.0	Fatal Error	
Board Temperature Error#SSPA PA1	85.0	500.0	Fatal Error	
Board Temperature Error#SSPA PA2	85.0	500.0	Fatal Error	
Board Temperature Error#SSPA PA3	85.0	500.0	Fatal Error	
Board Temperature Error#SSPA PA4	85.0	500.0	Fatal Error	

Name	Min	Max	Severity	Description
Board Temperature Error#SSPA PSU	85.0	500.0	Fatal Error	Indicates that the board surface temperature is outside the recommended temperature range and that Mains has been turned off to prevent component damage
Board Temperature Warning#External IO	75.0	85.0	Warning	Indicates that the board surface temperature is outside the recommended temperature range
Board Temperature Warning#Motherboard	75.0	85.0	Warning	Indicates that the board surface temperature is outside the recommended temperature range
Board Temperature Warning#PSU	75.0	85.0	Warning	Indicates that the board surface temperature is outside the recommended temperature range
Board Temperature Warning#RxTx	75.0	85.0	Warning	Indicates that the board surface temperature is outside the recommended temperature range
Board Temperature Warning#RxTx Ctrl	75.0	85.0	Warning	Indicates that the board surface temperature is outside the recommended temperature range
Board Temperature Warning#SSPA Ctrl	75.0	85.0	Warning	
Board Temperature Warning#SSPA PA1	75.0	85.0	Warning	
Board Temperature Warning#SSPA PA2	75.0	85.0	Warning	
Board Temperature Warning#SSPA PA3	75.0	85.0	Warning	
Board Temperature Warning#SSPA PA4	75.0	85.0	Warning	
Board Temperature Warning#SSPA PSU	75.0	85.0	Warning	Indicates that the board surface temperature is outside the recommended temperature range
Chirp Reference Level Low Error#f0 #f0 – f7			Error	Indicates that the power of the transmitted signal as seen by the receiver is lower than expected for frequency 0.
Communication Error#Board Temperature Sensor#External IO			Error	Indicates that a communication error occurred and that no valid reading could be obtained from the board surface temperature sensor
Communication Error#Board Temperature Sensor#Motherboard			Error	Indicates that a communication error occurred and that no valid reading could be obtained from the board surface temperature sensor
Communication Error#Board Temperature Sensor#PSU			Error	Indicates that a communication error occurred and that no valid reading could be obtained from the board surface temperature sensor
Communication Error#Board Temperature Sensor#RxTx			Error	Indicates that a communication error occurred and that no valid reading could be obtained from the board surface

Name	Min	Max	Severity	Description
				temperature sensor
Communication Error#Board Temperature Sensor#RxTx Ctrl			Error	Indicates that a communication error occurred and that no valid reading could be obtained from the board surface temperature sensor
Communication Error#Board Temperature Sensor#SSPA PSU			Error	Indicates that a communication error occurred and that no valid reading could be obtained from the board surface temperature sensor
Communication Error#External IO			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#External IO#DPM			Error	Indicates that a error occurred while communicating with the specified POL
Communication Error#Motherboard#DPM			Error	Indicates that a error occurred while communicating with the specified POL
Communication Error#Motor Controller	0	0	Error	Indicates that an error occurred on the serial link (communication port or TCP/IP connection) to the Motor Controller
Communication Error#RxTx Ctrl			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 3#FPGA 1			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 3#FPGA 2			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 3#FPGA 3			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 3#FPGA 4			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 6#FPGA 1			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 6#FPGA 2			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 6#FPGA 3			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 6#FPGA 4			Error	Indicates that an error occurred while trying to communicate with the FPGA specified
Communication Error#Slot 5#VCC1V0 2			Error	
Communication Error#Slot 5#VCC1V8 1			Error	

Name	Min	Max	Severity	Description
Communication Error#Slot 5#VCC1V8 2			Error	
Communication Error#Slot 6#VCC1V0 1			Error	
Communication Voltage Setup Error#PSU I2C 1			Error	Indicates that a communication error occurred while trying to setup the 1st voltage measurement circuit of the PSU
Communication Voltage Setup Error#PSU I2C 2			Error	Indicates that a communication error occurred while trying to setup the 2nd voltage measurement circuit of the PSU
Communication Voltage Setup Error#SSPA I2C			Error	
Control Link Down#CFAR Control#Air#MTI#Area			Critical Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#CFAR Control#Air#NR#Area			Critical Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#CFAR Control#Surface#Area			Critical Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#ClutterMap#Surface			Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#CoreTracker			Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#Display			Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#ET2			Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#MainsOn			Critical Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#NTPWatch#ET2			Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#NTPWatch#VDT			Error	Indicates that the communication between the main software node and the software node specified is not established

Name	Min	Max	Severity	Description
Control Link Down#Observations			Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#SCD Control#Air			Critical Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#SCD Control#Surface			Critical Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#SDH			Critical Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#TrackPublisher			Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#Transceiver Monitor			Critical Error	Indicates that the communication between the main software node and the software node specified is not established
Control Link Down#VDT			Error	Indicates that the communication between the main software node and the software node specified is not established
CP4 Board Not Present Error#Slot 2			Critical Error	Indicates that a required CP4 Board is not present
CP4 Board Not Present Error#Slot 3			Critical Error	Indicates that a required CP4 Board is not present
CP4 Board Not Present Error#Slot 4			Critical Error	Indicates that a required CP4 Board is not present
CP4 Board Not Present Error#Slot 5			Critical Error	Indicates that a required CP4 Board is not present
CP4 Board Not Present Error#Slot 6			Critical Error	Indicates that a required CP4 Board is not present
Custom antenna pattern Error			Error	
Dehydrator Error			Error	
DPE Not Ready#Air			Warning	Indicates that the Doppler Phase Estimator processing module has not yet been completely configured by the application software
Duty Cycle Error			Error	Indicates that the duty cycle requested through the Duty Cycle parameter could not be obtained
Dynamic Map Status			Error	Indicates that the dynamic bitmaps are missing

Name	Min	Max	Severity	Description
Dynamic Measured STC file Error			Error	
Dynamic STC dB to DAC file Error			Error	
EEPROM VCO Multiplier Configuration Missing	0	0	Error	Indicates that the VCO multiplier configuration is not stored in the LRU EEPROM of the RxTx LRU. A 2x multiplier configuration is assumed, which will lead to garbled radar video if used with a 4x multiplier unit. The correct setting is available from the operation sheet of the RxTx LRU and may be programmed in the LRU EEPROM from the debug www page
EMCON Active	0	0	Warning	Indicates that the EMCON signal in connector X16 has been activated by an external system
Encoder Power Supply Voltage Level Error	0	0	Error	Indicates that the encoder power supply voltage level requested could not be set
Failure Override Enabled Warning			Warning	
Fan A Speed Error#Fan Controller	0	500	Error	Indicates that the transceiver fan speed tellback is outside the expected range
Fan A Speed Warning#Fan Controller	500	1000	Warning	Indicates that the transceiver fan speed tellback is outside the expected range
Fan Differential Pressure Error#Fan Controller	535.0	822.7	Error	Indicates that the latest valid reading of the transceiver fan differential pressure sensor is outside the allowed range
Fan Differential Pressure Warning#Fan Controller	490.0	535.0	Warning	Indicates that the latest valid reading of the transceiver fan differential pressure sensor is outside the recommended range
FFT Bandwidth Exceeded Error			Error	Indicates that the configured timing scenario exceeds the signal processing capabilities of the transceiver and that delays have been introduced to compensate for this (resulting in a lower duty cycle and PRF than could otherwise be expected)
Firmware Initialization Error			Redundant System Critical Error	Set when the application was unable to establish access to a firmware board.
Firmware Module Not Present Error			Redundant System Critical Error	Set when the application was unable to establish access to a firmware module.
Forward Power Calibration Table Invalid Error#RxTx Ctrl			Error	Indicates an error occurred while reading RxTx Controller calibration data from the PC hard disk
Forward Power Calibration Table Invalid Error#SSPA			Error	Indicates an error occurred while reading SSPA calibration data from the PC hard disk

Name	Min	Max	Severity	Description
Forward Power Calibration Table Used Not Verified Warning#RxTx Ctrl			Warning	Indicates a testing RxTx Controller table is used
Forward Power Calibration Table Used Not Verified Warning#SSPA			Warning	Indicates a testing SSPA calibration table is used
Forward Power Low			Warning	Indicates when currently transmitted power is lower than warning level but higher than specified Forward Power Threshold parameter
Forward Power Too Low			Redundant System Critical Error	Indicates when currently transmitted power is lower than specified Forward Power Threshold parameter
FPGA Firmware Mismatch Error			Error	Indicates that the version of the firmware loaded into one or more of the transceiver FPGAs does not match the version expected by the transceiver application software
FPGA Temperature Error#External IO	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#RxTx Ctrl	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 2#FPGA 1	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 2#FPGA 2	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 2#FPGA 3	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 2#FPGA 4	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 3#FPGA 1	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 3#FPGA 2	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 3#FPGA 3	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage

Name	Min	Max	Severity	Description
FPGA Temperature Error#Slot 3#FPGA 4	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 4#FPGA 1	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 4#FPGA 2	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 4#FPGA 3	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 4#FPGA 4	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 5#FPGA 1	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 5#FPGA 2	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 5#FPGA 3	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 5#FPGA 4	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 6#FPGA 1	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 6#FPGA 2	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 6#FPGA 3	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Error#Slot 6#FPGA 4	90.0	500.0	Fatal Error	Indicates that the FPGA core temperature is outside the allowed range and that Mains has been turned off to prevent component damage
FPGA Temperature Warning#External IO	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warn-	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the

Name	Min	Max	Severity	Description
ing#RxTx Ctrl				recommended range
FPGA Temperature Warning#Slot 2#FPGA 1	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 2#FPGA 2	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 2#FPGA 3	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 2#FPGA 4	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 3#FPGA 1	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 3#FPGA 2	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 3#FPGA 3	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 3#FPGA 4	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 4#FPGA 1	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 4#FPGA 2	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 4#FPGA 3	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 4#FPGA 4	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 5#FPGA 1	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 5#FPGA 2	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 5#FPGA 3	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 5#FPGA 4	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 6#FPGA 1	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 6#FPGA 2	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range

Name	Min	Max	Severity	Description
FPGA Temperature Warning#Slot 6#FPGA 3	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
FPGA Temperature Warning#Slot 6#FPGA 4	85.0	90.0	Warning	Indicates that the FPGA core temperature is outside the recommended range
Gearbox Oil Level Low Warning	0	0	Warning	Indicates that the oil level in the antenna gear box is below the recommended level
Gearbox Temperature Warning	0	0	Warning	Indicates that the temperature inside the antenna gear box is higher than recommended
Local Temperature Error#Fan Controller	85	127	Fatal Error	Indicates that the temperature measured by the internal temperature sensor of the Fan Controller is outside the recommended temperature range and that Mains has been turned off to prevent component damage
Local Temperature Warning#Fan Controller	75	85	Warning	Indicates that the temperature measured by the internal temperature sensor of the Fan Controller is outside the recommended temperature range
Long Chirp Length Truncated Warning			Warning	Indicates that the long chirp length resulting from the configured timing scenario exceeds the maximum chirp length allowed (160us) and that the long chirp length therefore has been truncated to 160us
Low Disk Space Error			Error	
Low Disk Space Warning			Warning	
LRU calibration data error#RxTx			Error	Indicates that an error occurred while accessing the LRU calibration data of the specified LRU
LRU calibration data error#SSPA			Error	Indicates that an error occurred while accessing the LRU calibration data of the specified LRU
LRU calibration data writing file error#RxTx			Error	Indicates that an error occurred while writing the LRU calibration data of the specified LRU to the Housekeeping PC harddisk
LRU calibration data writing file error#SSPA			Error	Indicates that an error occurred while writing the LRU calibration data of the specified LRU to the Housekeeping PC harddisk
LRU checksum error#Application			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#CP4 Slot 2			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#CP4 Slot 3			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less

Name	Min	Max	Severity	Description
LRU checksum error#CP4 Slot 4			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#CP4 Slot 5			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#CP4 Slot 6			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#External IO			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#Fan			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum er-ror#Motherboard			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#PSU			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#RxTx			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#RxTx Controller			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum error#SSPA			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum er-ror#Transceiver			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU checksum er-ror#Waveguide			Error	Indicates that the checksum of the LRU information for the specified LRU is not valid. An attempt is made to parse the LRU information and make it available none the less
LRU information er-ror#Application			Error	
LRU information reading file error#Application			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#CP4 Slot 2			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk

Name	Min	Max	Severity	Description
LRU information reading file error#CP4 Slot 3			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#CP4 Slot 4			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#CP4 Slot 5			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#CP4 Slot 6			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#External IO			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#Fan			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#Motherboard			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#PSU			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#RxTx			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#RxTx Controller			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#SSPA			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#Transceiver			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU information reading file error#Waveguide			Error	Indicates that an error occurred reading LRU information from a file on the Housekeeping PC harddisk
LRU reading eeprom error#Application			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#CP4 Slot 2			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#CP4 Slot 3			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#CP4 Slot 4			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#CP4 Slot 5			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#CP4			Error	Indicates that an error occurred reading LRU information

Name	Min	Max	Severity	Description
Slot 6				from the LRU EEPROM
LRU reading eeprom error#External IO			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#Fan			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#Motherboard			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#PSU			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#RxTx			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#RxTx Controller			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#SSPA			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#Transceiver			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
LRU reading eeprom error#Waveguide			Error	Indicates that an error occurred reading LRU information from the LRU EEPROM
Man Aloft Switch Open			Redundant System Critical Error	Indicates that the safety loop is open because the Man Aloft switch has been activated. Antenna rotation and transmission will cease.
Map GPS Status			Error	Indicates that the GPS position is missing
Mapped Frequency Too High Error			Error	Indicates a 'RX to TX Frequency #f' mapping parameter is higher than 9.5GHz
Mapped Frequency Too Low Error			Error	Indicates a 'RX to TX Frequency #f' mapping parameter is lower than 9GHz
Maximum Track Latency Exceeded			Warning	The maximum processing latency for track generation through the tracker has been exceeded.
Missing ACP#EXTIO			Error	
Missing ACP#RXTX			Error	
Missing ARP#EXTIO			Error	
Missing ARP#RXTX			Error	
Motor Protection Open			Redundant System Critical Error	Indicates that the safety loop has been opened to prevent antenna motor damage. Antenna rotation and transmission will cease.

Name	Min	Max	Severity	Description
Motor Temperature Warning	0	0	Warning	Indicates that the temperature in the antenna motor is higher than recommended
Network Video Replication Warning#Air			Warning	Indicates that antenna rotation speed is too high compared to the requested timing scenario, resulting in more than 10% of all sweeps being replicated to avoid gaps in the video. This in turns reduces the actual azimuth resolution of the transceiver.
Network Video Replication Warning#Surface			Warning	Indicates that antenna rotation speed is too high compared to the requested timing scenario, resulting in more than 10% of all sweeps being replicated to avoid gaps in the video. This in turns reduces the actual azimuth resolution of the transceiver.
No Connection To NTP Daemon			Error	>Unable to establish connection to the local NTP daemon
No Connection To NTP Daemon#ET2			Error	>Unable to establish connection to the local NTP daemon
No Connection To NTP Daemon#VDT			Error	>Unable to establish connection to the local NTP daemon
No valid GPS data			Error	No valid GPS data
No valid GYRO data			Error	No valid GPS data
No valid LOG data			Error	No valid GPS data
Noise Figure Calibration Table Invalid Error#RxTx			Error	Indicates an error occurred while reading RxTx calibration data from the PC hard disk
Noise Figure Calibration Table Invalid Error#RxTx Ctrl			Error	Indicates an error occurred while reading RxTxCtrl calibration data from the PC hard disk
Noise Figure Calibration Table Used Not Verified Warning#RxTx			Warning	Indicates a testing RxTx calibration table is used
Noise Figure Calibration Table Used Not Verified Warning#RxTx Ctrl			Warning	Indicates a testing RxTxCtrl calibration table is used
Noise Figure High Error			Redundant System Critical Error	Indicates when noise figure is higher than specified Noise Figure Error Threshold parameter
Noise Figure High Warning			Warning	Indicates when noise figure is higher than specified Noise Figure Warning Threshold parameter
Observations Input Link			Error	Could not connect to data input source.
Observations Performance Decreased			Error	Input plot older than latest output plot

Name	Min	Max	Severity	Description
Over Voltage Error#PSU Mains	264.0	1000.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU N7V5 1	-7.1	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU N7V5 2	-7.1	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU N7V5 I	-7.1	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU P7V5 1	7.9	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU P7V5 2	7.9	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU P7V5 I	7.9	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU SSPA AC	264.0	1000.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU 13V5	14.2	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU 24V0	25.2	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU 12V0 1	12.6	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU 12V0 2	12.6	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU 13V5 I	14.2	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#PSU 12V0 VP	12.6	100.00	Error	Indicates that the supply voltage measurement is above the expected range
Over Voltage Error#SSPA Analog 5V0	5.5	100.0	Fatal Error	
Over Voltage Error#SSPA Digital 5V0	5.5	100.0	Fatal Error	
Over Voltage Error#SSPA PSU N8V5	-8.1	100.0	Fatal Error	
Over Voltage Error#SSPA PSU P8V2	8.6	100.0	Fatal Error	
Over Voltage Error#SSPA PSU	6.3	100.0	Fatal Error	

Name	Min	Max	Severity	Description
P6V0				
Over Voltage Error#SSPA PSU VCC3V3	3.5	100.0	Fatal Error	
Over Voltage Error#SSPA PSU VCC5V0	5.3	100.0	Fatal Error	
Over Voltage Error#SSPA 3V3	3.8	500.0	Fatal Error	
Parameter Change Log Disk Limit Reached			Error	Indicates that the amount of disk space allocated to the Parameter Change Log has been used up
Phase Shifter Calibration Table Invalid Error#SSPA			Error	
Phase Shifter Calibration Table Used Not Verified Warning#SSPA			Warning	
PlotServer Overload#Surface			Error	The number of received plots from HDL PEX is to big.
Profile Unsaved Warning			Warning	Indicates that changes were made to current profile that are not yet saved
PSAT Calibration Running Warning			Warning	Indicates that a PSAT calibrating session is ongoing and that optimal transceiver performance cannot be expected
PSAT Not Calibrated Warning			Warning	Indicates that a PSAT calibration has not been completed with the current frequency planning configuration
PSU I2C Communication Error			Error	
Redundant System Configuration Error			Error	Indicates that a problem with the redundant system configuration, e.g. the network configuration or transceiver IDs, has been detected
Redundant System Degraded Warning			Warning	Indicates that the redundant system is currently not capable of handling another critical error
Redundant System Failover Disabled Warning			Warning	Indicates that automatic failover is currently not enabled for the redundant system
Redundant System Heartbeat Communication Error			Error	Indicates that no heart beat messages has been received from the other transceiver for at least 1 sec.
Reverse Power Calibration Table Invalid Error#RxTx			Error	Indicates an error occurred while reading RxTx calibration data from the PC hard disk
Reverse Power Calibration Table Invalid Error#RxTx Ctrl			Error	Indicates an error occurred while reading RxTx Controller calibration data from the PC hard disk
Reverse Power Calibration Table Used Not Verified Warning#RxTx			Warning	Indicates a testing RxTx calibration table is used

Name	Min	Max	Severity	Description
Reverse Power Calibration Table Used Not Verified Warn-ing#RxTx Ctrl			Warning	Indicates a testing RxTx Controller table is used
Reverse Power Too High			Critical Error	Indicates when reflected power measured is lower than specified Forward Power Threshold parameter
Squint Angles Not Calibrated Warning			Warning	Indicates that the a squint calibration procedure has not been carried out
SSPA Range Property Unknown Error			Error	
Static STC dB to DAC file Error			Error	
Static STC Long Chirp file Error			Error	
Static STC Short Chirp file Error			Error	
STC Calibration in progress			Warning	
STC Curve Error			Error	
Synthetic Encoder Data Enabled Warning			Warning	Indicates that synthetic encoder data generation is active (i.e. the Synthetic Encoder Data parameter has been set to 'Enable')
Time Not Synchronized			Warning	Time has not (yet) been synchronized with the time server
Time Not Synchronized#ET2			Warning	Time has not (yet) been synchronized with the time server
Time Not Synchronized#VDT			Warning	Time has not (yet) been synchronized with the time server
Track Drop Threshold Auto Overload Error	0.0	100	Error	The track generation overload.
Track Drop Threshold Auto Overload Warning	-10.0	0	Warning	The tracker is approaching track generation overload.
Track Overflow$Fast Air Tar-gets Tracker#Tracker			Error	
Track Overflow$Fast Targets Tracker#Tracker			Error	
Track Overflow$Helicopter Tracker#Tracker			Error	
Track Overflow$Navigation Tracker#Tracker			Error	
Track Overflow$Slow Air Tar-gets Tracker#Tracker			Error	

Name	Min	Max	Severity	Description
Track Overflow$Slow Targets Tracker#Tracker			Error	
Track Publisher Input Link			Error	Could not connect to data input source.
Transceiver Configuration Restore Error			Error	Indicates that a restore operation has failed
TX Inhibit Active	0	0	Warning	Indicates that the TX Inhibit signal in connector X15 has been activated by an external system
Unexpected LOG data			Error	No valid GPS data
Video Out$Fast Air Targets Tracker#Tracker			Error	
Video Out$Fast Targets Tracker#Tracker			Error	
Video Out$Helicopter Tracker#Tracker			Error	
Video Out$Navigation Tracker#Tracker			Error	
Video Out$Slow Air Targets Tracker#Tracker			Error	
Video Out$Slow Targets Tracker#Tracker			Error	
Video Server Link Error#Air	0	1	Error	
Video Server Link Error#Surface	0	1	Error	
Waveguide Not Available Error			Critical Error	Indicates that the waveguide switch tellback reports that a waveguide switch is connected and in the position where this transceiver does not have access to the waveguide, even though the Redundant System Mode parameter is set to Single
Waveguide Switch 2 error			Error	Indicates that waveguide switch is out of sync
Waveguide Switch Tellback Error			Error	Indicates that the waveguide switch tellback was unexpected, i.e. the tellback was invalid or the waveguide switch position did not match the requested position
Waveguide Switch Tellback Error			Error	Indicates that the waveguide switch tellback was unexpected, i.e. the tellback was invalid or the waveguide switch position did not match the requested position

10 List of installation documents

This chapter includes a reference list for documents needed for installation of and communication with the transceiver.

Doc. number	Contents
386305-ZD	Installation drawing, transceiver
337318-EB	Block schematics and interconnections
650000-ZD	Installation cabling (wire list)
659000-ZD	SCANTER ACU Dimensions
659000-EC	SCANTER ACU Schematic
386300-DI	Interface specification
502074-DI	Interface control document
264122-DI	Transceiver Control Interface
705502-ZD	Redundant 5000 Series
705502-PD	Redundant 5000 Series

11 Technical terms and definitions

Accuracy	The difference between the average of repeated measurements of the same quantity under identical conditions and the known "true" value i.e. the difference between the average of the measurements of the range to a fixed reference target and the range value calculated from the geographical coordinates of the reference target and radar sensor.
Antenna	The upper rotating part of the antenna system. The antenna is radiating the RF power and receiving the echoes from the targets. Depending on the antenna type the radiating component can be a slotted waveguide or a horn with belonging reflector.
Antenna Polarization	Antenna polarization is determined by the direction of the electrical field. It can either be horizontal, vertical or circular.
Antenna System	System consisting of antenna, motor and gear for antenna rotation and, if present, stabilized platform (motors and gears to compensate for roll and pitch on a ship).
AToN	Aids to Navigation. Buoys and other relatively fixed point targets used for navigational purposes are designated by the name Aids to Navigation with abbreviation AToN. A defined AToN consists of an absolute position and a radius around this position. A tracked AToN is a track which has been associated to an AToN because the track position is within the defined radius of the defined AToN position.
Azimuth	The angle between a horizontal reference direction (north or heading) and the horizontal projection of the direction of interest, measured clockwise.
Blind speed	Blind speed is one limitation occurring in pulse MTI radars. The blind speed occurs in pulse radar because the Doppler frequency is measured by discrete samples at the pulse repetition frequency. Blind speeds occur if the moving target Doppler frequency happens to be equal to the PRF or a multiple thereof. Increasing the wavelength or the PRF, results in a higher first blind speed value. Blindspeed occurrence is due to the use of delay-line cancellers. Can be avoided by using stagger.

Circular Polarization	Circular polarization is a combination of a horizontal and a vertical wave (that is horizontal is shifted 90 degrees) with same magnitude. Circular polarization can be right or left rotated. Circular polarization is an advantage when suppression of rain echoes is a consideration.
Coherent MTI	In coherent MTI radar, the phase information of the transmitted signal is preserved as a reference signal. The reference signal is needed to detect the Doppler frequency shift.
Diplexer	A 3-port device with 1 input and 2 outputs, or 2 inputs and 1 output, all ports with waveguide flanges. The diplexer includes two band pass filters enabling the diplexer to split a two-frequency input signal into two separate signals. The diplexer is often used in Frequency Diversity systems.
Doppler Effect	In radar technology the Doppler Effect is used for speed measurement and Moving Target Indication (MTI). The Doppler Effect is the apparent change in frequency or pitch when a moving target is hit by a radar beam. When a target is approaching the radar, the target is "compressing" the beam in front of it resulting in a higher frequency in the echo.
Double Cancellation	A circuit consisting of two cascaded Single Delay Line Cancellers. The frequency response of the Double cancellation circuit improves the filters ability to eliminate DC components of fixed targets and clutter.
Encoder	Unit which provides information about the azimuth i.e. the direction in which the antenna is pointing. For each rotation the encoder sends a number of azimuth count pulses (ACP's), typically 8192 pulses and one azimuth reference pulse (ARP). The encoder is included in a encoder assembly which normally holds one or two encoders.
Extractor	The extractor analyses the incoming video for plot creating plots. Furthermore, it calculates plot properties such as area, intensity, centre of gravity etc.
Frequency Diversity	Frequency Diversity (FD) is a sequential transmission on two different frequencies which after processing increases the signal quality by an increase of the signal-to-noise ratio. The target is hit twice and behaves differently depending upon the frequency of the electromagnetic wave hitting it. Furthermore, if slotted waveguide antennas are used, an additional advantage is achieved, namely the time diversity.

Lack	Lack is a number counting unsuccessful consecutive updates of a track.
Log Compression	In this process, the signal is converted from a 26 bit floating point signal into an 8-bit logarithmic signal.
Mixer	A function of the mixer is to convert frequencies, either up or down. The ideal mixer performs the mathematical multiplication of two input signals. It creates signal components positioned at frequencies equal to the sum and difference of the input signals. For ideal performance, the mixing device must be perfectly linear and there must be no leakage of the input signals to the output port. Typically, either the sum, or the difference frequency is removed with a filter. The term Double Balanced Mixer is used to imply neither of the input terms will appear at the mixer output. In practice, suppression of these input components is never perfect. Odd harmonics of the carrier frequency are present but can be easily filtered out. In a Single Balanced Mixer, both even and odd harmonics are present at the output.
MTI Radar	Moving Target Indicator radar utilizes the Doppler frequency shift as a means for discriminating moving and fixed targets. Usually, it operates with ambiguous Doppler measurement, so-called blind speeds, but with unambiguous range measurements.
Noise Figure	Noise Figure is defined as the signal-to-noise ratio at the input divided by the signal-to-noise ratio at the output. Noise Figure is expressed in dB.
Own Unit	A moveable platform, normally a ship, which is carrying the radar sensor and the VDT.
Parameter	A parameter is a quantity which influences the radar video, the subsequent signal processing, the plot extraction, or the target tracking. Examples are: transmitted power, video sampling rate, video threshold for plot selection, and expected maximum speed of target.
Plot	A radar plot is a group of connected radar cells in which the measured video signal exceeds a defined threshold value and/or fulfils some other discrimination criterion.
Precision	The standard deviation of repeated measurements of the same quantity under identical conditions i.e. the standard deviation of the measurements of the range to a fixed reference target.

Profile	A profile is a set of common operational parameters for the transceiver and the VDT. Profiles are identified by a name. When a specific Profile i.e. Profile Name is chosen by the operator all transceiver and VDT parameters are set according to the profile content.
Pulse Compression	For a simple rectangular pulse, the pulse duration is equal to the reciprocal value of its bandwidth. Improving the radar sensitivity by increasing pulse duration and thereby the transmitted power, will have a negative impact on the range resolution. Pulse compression, also known as pulse coding, is a signal processing technique designed to maximise the sensitivity and resolution of a radar system. By manipulating the amplitude and phase of a pulse, it is possible to increase the pulse bandwidth, while keeping the pulse duration unchanged, or vice versa. By doing so, the increased average transmitted power improves sensitivity while having a high range resolution. The effectiveness of a particular pulse code is often judged by its time-bandwidth product. The time-bandwidth product for a simple rectangular pulse is equal to one. A compressed pulse might have a time-bandwidth product of ten. This means that each compressed radar pulse contains ten times the energy of the simple un-coded pulse of the same resolution. Equivalently, range resolution is ten times finer than an un-coded pulse of the same duration.
Radar Cell	The disc around the radar out to the maximum range is covered by a polar grid. In the present VDT the polar grid consists of 4096 equal azimuth sectors. Each azimuth sector is divided into 4096 range cells of equal range depth. A specific range cell in a specific azimuth sector is called a radar cell.
Radar Cross Section	The Radar Cross Section (abbreviated RCS) is the size and ability of a target to reflect RF energy - this is summarized in a single term, which has the dimension [m^2]. The size of the RCS depends on frequency, antenna polarisation and a lot of characteristics of the target, ex. physical dimensions, aspect angle, coating and material, surface. The RCS can be quite difficult to estimate and is normally determined by measurements and in certain extend experience.

Radial Speed	The true velocity of an airplane is composed of three vectors. The vector, which points directly towards the radar or away from the radar, represents the radial speed of the airplane. Assuming, an airplane is flying around the radar in a circle path, the radial speed will be permanently zero. The produced Doppler frequency is zero and the airplane is not detected.
Resolution	The minimum distance in range or angle between two equally strong radar targets (same radar cross section) which allow the echoes from these targets to be perceived as separate echoes.
Scan	The collection of consecutive sweeps covering one full rotation.
SSI Filter	An SSI filter performs a sweep-to-sweep integration, where a pre-selected number of consecutive sweeps are averaged. Only the amplitude is taken into consideration. The sweeps will contain a number of targets which have the same position from sweep to sweep. The sweeps will also contain noise which is sporadic and the noise spikes will have random positions in the sweep. By making an average of a number of sweeps, the targets will add up and the noise spikes will not (due to the randomized positions).
Stabilized platform	A stabilized platform is (or can be) used on ships. The antenna is mounted on the stabilized platform which, within a certain range, secures that the antenna always is kept in horizontal position, independent of the ships movements (roll and pitch).
Staggered PRF	Staggered PRF is mainly used to cope with multiple-time-around echoes. In fact, targets at ranges greater than maximum range appear as echoes of the following pulses at shorter range. It is possible to remove this range ambiguity by changing the PRI during time-on-target. With different PRIs, the target will appear at different ranges. Using a proper logic, it is possible to identify the echo as a second-time-around one, and assign to it the proper range.
Sweep	The radar return of one transmitted pulse as a function of range.
Track	The track of a target is a table holding position, speed, course, etc. versus time.

Tracking	Tracking is the process of associating a time series of plots with the physical movement of one physical object (the target) and to derive speed, course etc from this time series.
Track update	A track is updated when a plot from the most recent scan is associated to a tentative or a confirmed track.
Trail	Historic radar echoes, usually presented in a color different from the actual radar echoes and fading away within a user defined time interval.
Waveguide	Hollow metal conductor within which RF energy can be efficiently transmitted.

12 Abbreviations and acronyms

Term	Definition
1D	One-dimensional
2D	Two-dimensional
AAZ	Automatic Acquisition Zone
ACP	Azimuth Count Pulse
ACU	Antenna Control Unit
AIS	Automatic Identification System
AQAP	Allied Quality Assurance Publications
ARP	Azimuth Reference Pulse
ASC	Adaptive Sensitivity Control
ASCII	American Standard Code for Information Interchange
AToN	Aids To Navigation
BITE	Built-In Test Equipment
CFAR	Constant False Alarm Rate
CFR	Code of Federal Regulations
CMS	Combat Management System
CNR	Cahier des charges sur les normes radioéléctriques
CNR-Gen	Exigences générales relatives à la conformité des appareils de radiocommunication
COG	Course Over Ground
CP	Circularly Polarized
CP4	Common Platform Board 4
CRP	Chirp Repetition Frequency
CS	Coastal Surveillance
CSA	Canadian Standards Association
EIA	Electronics Industries Alliance
EMC	ElectroMagnetic Compatibility
EMCON	EMission CONtrol
ESD	ElectroStatic Discharge
FCC	Federal Communications Commission

Term	Definition
FD	Frequency Diversity
FPGA	Field Programmable Gate Array
HAZCHEM	Hazardous Chemicals
HP	Horizontally Polarized
I/O	Input/Output
IALA	International Association of Lighthouse Authorities
ICNIRP	International Commission on Non-ionizing Radiation Protection
IEC	International Electrotechnical Commission
IF	Intermediate Frequency
IP	International Protection / Internet Protocol
ISDE	Innovation, Sciences et Développement économique Canada
ISED	Innovation, Science and Economic Development Canada
ISO	International Standardization Organization
ITU	International Telecommunication Union
Kn	Knots
LAN	Local Area Network
LRU	Line Replaceable Unit
LVDS	Low Voltage Differential Signalling
MDR	Minimum Detectable Range
MDS	Minimum Detectable Signal
MMIC	Monolithic Microwave Integrated Circuit
MTI	Moving Target Indicator
NMEA	National Marine Electronics Association
nmi	Nautical Mile
NTIA	National Telecommunications and Information Administration
NTZ	Non-Tracking Zone
NAAZ	Non-Automatic Acquisition Zone
PA	Power Amplifier
PC	Personal Computer
PRF	Pulse Repetition Frequency

Term	Definition
PSLR	Peak Sidelobe Level Ratio
R&TTE	Radio & Telecommunications Terminal Equipment Directive
RCS	Radar Cross Section
RF	Radio Frequency
RH	Relative Humidity
RIV	Radar Image Viewer
RoHS	Restriction of Hazardous Substances
RPM	Rotations per minute
RS	Recommended Standard
RSS	Radio Standards Specification
RSS-Gen	General Requirements for Compliance of Radio Apparatus
Rx	Receive / Receiver
RxTx	Transceiver
SCD	Sea Clutter Discriminator
SFP	Small Form-factor Pluggable
SNR	Signal-to-Noise Ratio
SNTP	Simple Network Time Protocol
SOG	Speed Over Ground
SSPA	Solid State Power Amplifier
STC	Sensitivity Time Control
STW	Speed Through Water / Setting-To-Work
TCP/IP	Transmission Control Protocol / Internet Protocol
TIA	Telecommunications Industry Association
TMS	Terma Management System
Tx	Transmit / Transmitter
UDP/IP	User Datagram Protocol / Internet Protocol
UL	Underwriters Laboratories
USB	Universal Serial Bus
UV	Ultra Violet
VAC	Voltage Alternating Current
VDC	Voltage Direct Current

Term	Definition
VDT	Video Distribution and Tracking
VMZ	Video Mask Zone
VTS	Vessel Traffic Services
VSWR	Voltage Standing Wave Ratio
WAN	Wide Area Network

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