VHF 5000 System

Workshop Manual

For a complete workshop manual for VHF 5000 System includes the following manuals:

B5006COM	Operation Manual SB5006 Service Tool
B5022GB0	Operation Manual RT5022 VHF / RT5020 VHF DSC Duplex

How to use this manual

This workshop manual covers the SAILOR VHF 5000 Series. The manual contains all necessary documentation to maintain, assemble and repair system components that are subject to be repaired according to the supported service concept. The manual also contains all reference documentation to install, configure and operate a full VHF 5000 Series system.

General

A VHF 5000 system is built around one of the following transceiver units:

- SAILOR RT5022 VHF DSC, Class A Simplex/Semi-duplex transceiver
- SAILOR RT5020 VHF DSC, Class A Duplex transceiver

The system is described in general terms. No detailed operations of the separate units. But the interconnections, medias/protocols, supplies, antennas, etc. are described.

Disclaimer:

Doc. No.: W5022GB Issue: B/1007

1007

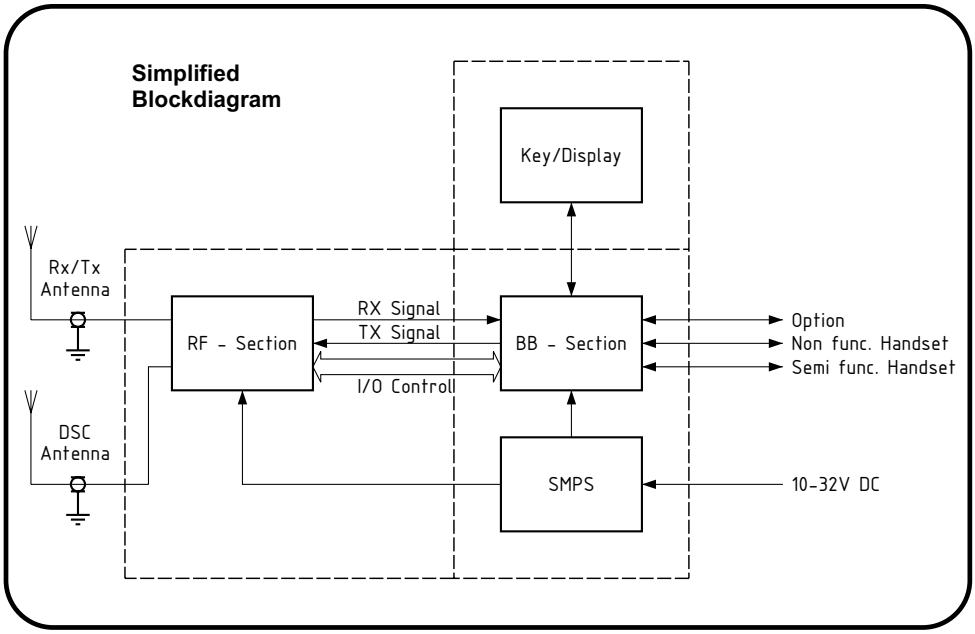
CONTENTS

1 Functional unit description

This chapter will – in general terms - describe each of the functional units in a VHF 5000 series system.

1.1 The RT5022/RT5020 VHF transceiver

Should include short description of the default handset used.



The VHF radio is a transceiver which means it consists of a transmitter and a receiver.

The radio has four main blocks

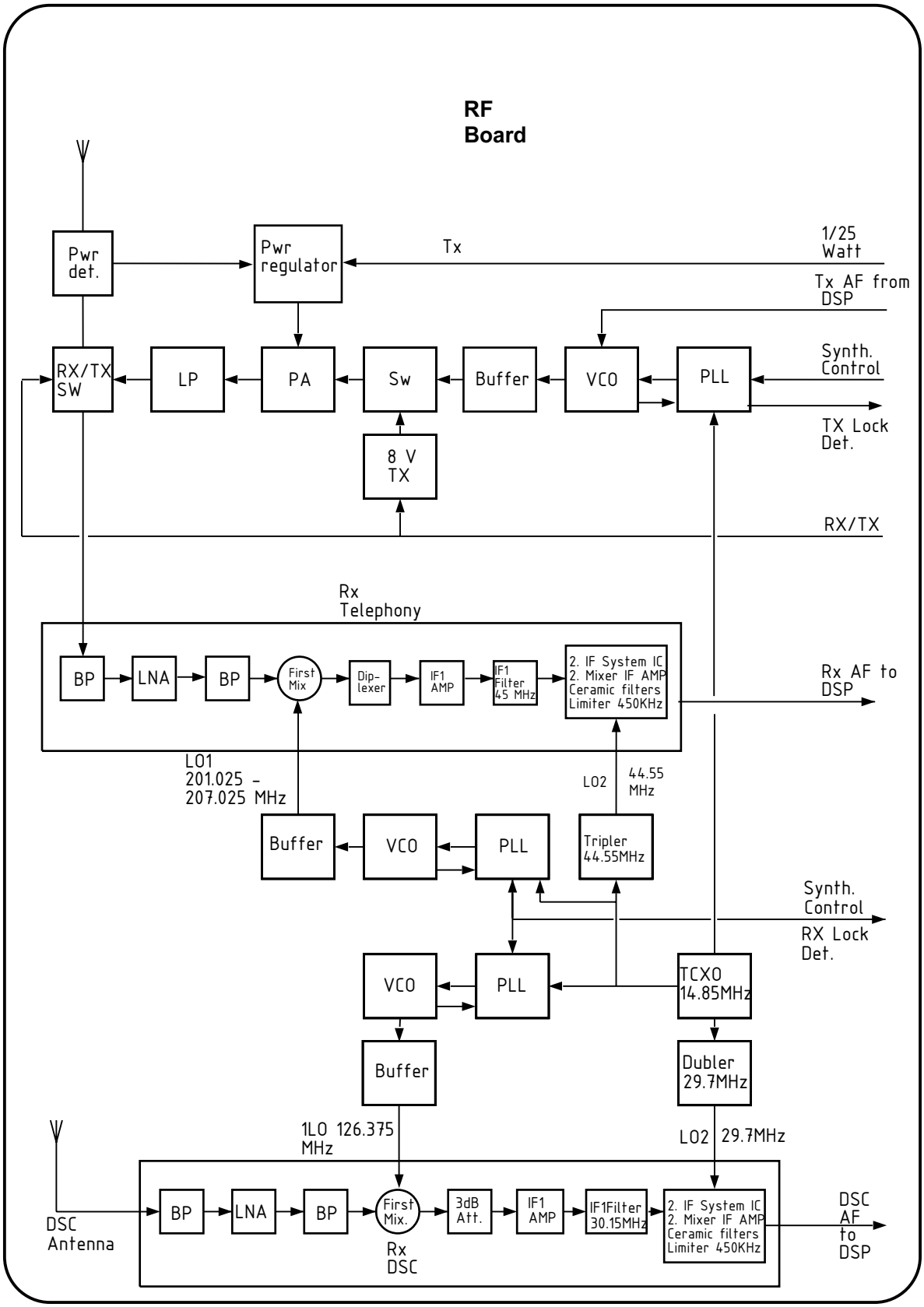
SMPS
Built-in Switch Mode Power Supply, which converts the input battery voltage to internal supplies for the radio. It also separates the battery potential from the radio.

MKD
Keyboard and Display unit. All controls and indicators are placed on this unit.

BB
The Base Band unit controls all the functions of the radio.

RF
This unit is the basic radio module with receivers for voice and DSC communication as well as a transmitter and synthesizers for channel settings.

1.1.1 RF Board



40342

The module is connected to two antennas. One for voice communications and one for DSC reception only.

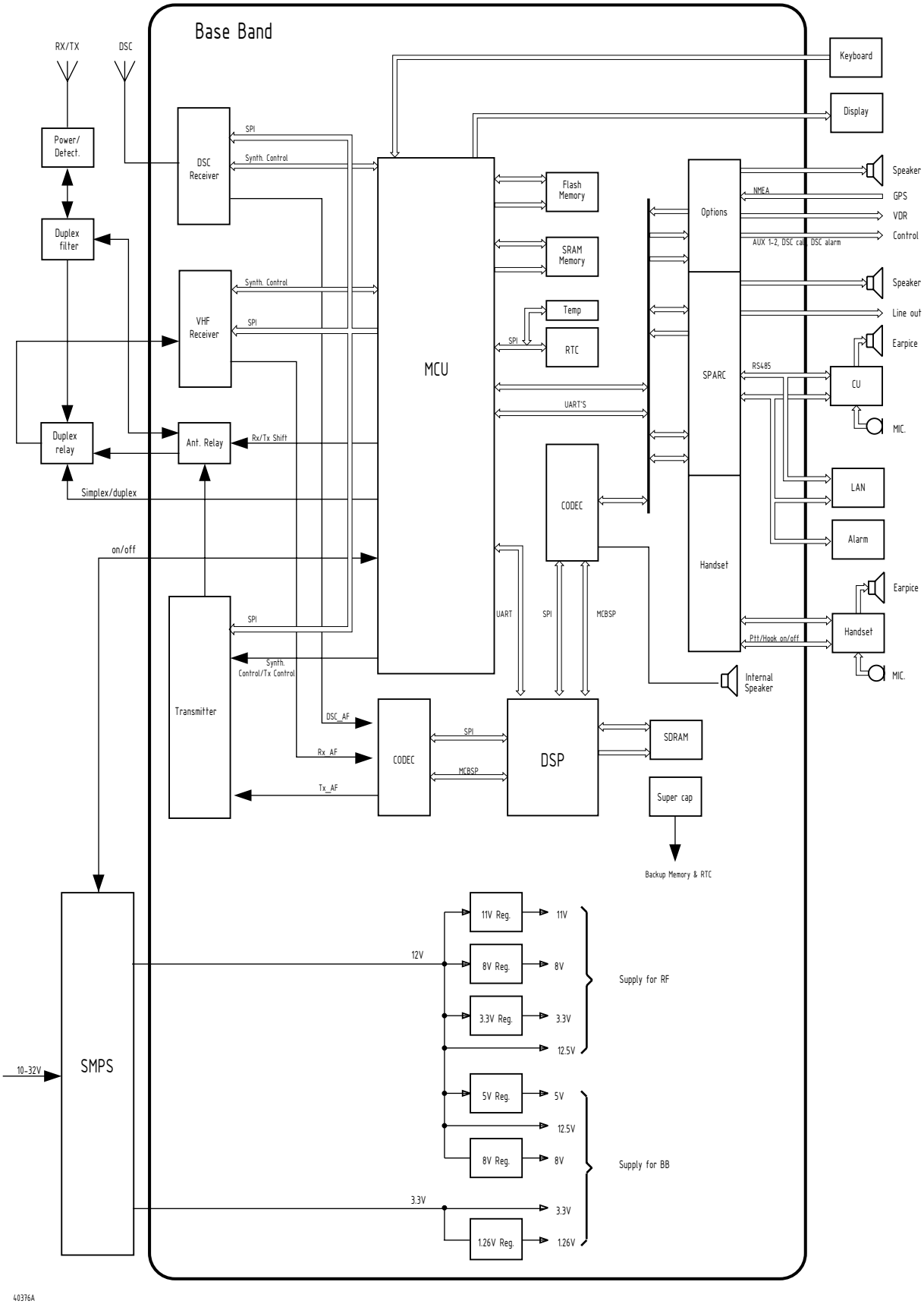
Transmitter
The AF signal from the base band module is led directly as modulation signal to the transmitter VCO. This signal is amplified in the power amplifier and led to the antenna through the RX/TX antenna shift relay.

Receivers
The DSC receiver is dedicated to listen to all communication on channel 70 independent of the main receiver. The main receiver is listening on the channel selected by the user.
Both receivers are designed in the same way as a super heterodyne. In front it has a sturdy 1st mixer ensuring good intermodulation and blocking immunity. The IF section is with no adjustable coils. In fact the receiver has no adjustment at all.
The 2nd mixer and 2nd IF section ensures good selectivity. The IF frequency of 450 kHz is filtered and demodulated to AF signal which is led to the Base Band for further handling.

Synthesizers
There are three synthesizer sections. One for each receiver and one for the transmitter.
The synthesizers are designed of the Phase Locked Loop principle and they are all locked to a temperature stabilized reference frequency of 14.85 MHz.

Duplex
In duplex version the receivers and the transmitter are working simultaneously. The main receiver and the transmitter frequency is separated by 4.6 MHz. Through a duplex relay the transmitter and the main receiver is connected to a duplex filter ensuring good duplex performance.
This module is adjusted in full at the factory and should not be adjusted again.

1.1.2 BB Main Block

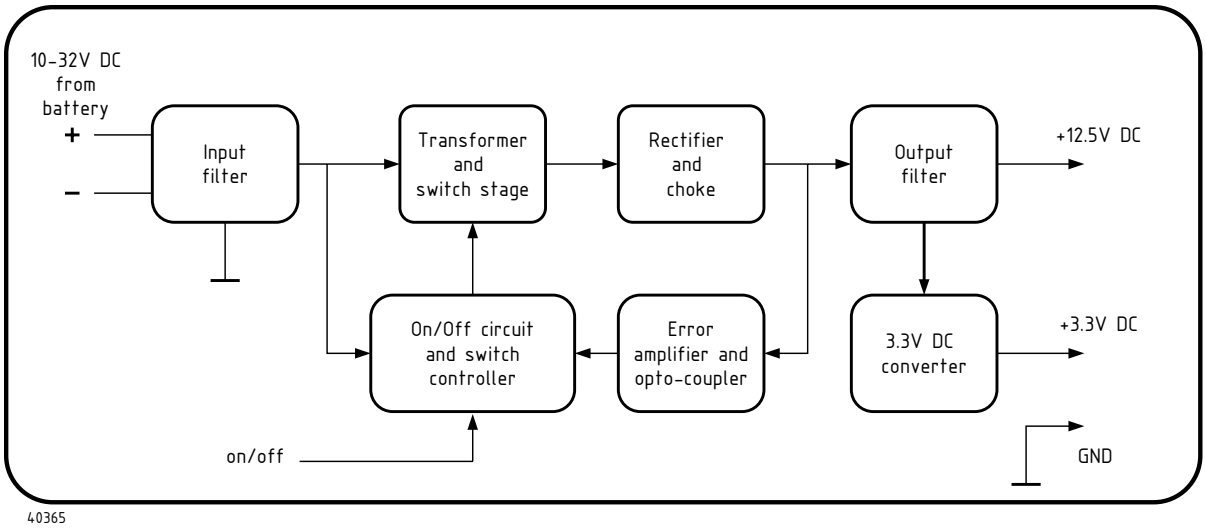


Baseband module

The baseband module is attached to all modules in the radio and is in control of these modules as well as peripheral interfaces. The baseband module has two main functionalities that are handled separately by a microprocessor and a digital signal processor.
The microprocessor controls the mode of the radio based on input from the user interface and incoming DSC messages. This includes display and keyboard control, configuration of the RF board for receiving and transmitting on a specified channel, and composition and decoding of DSC messages.
The digital signal processor performs all audio signal processing and audio switching on the received and transmitted signals. The FM demodulated signals from the main receiver and the watch receiver is fed into the DSP where the following functions are located: FSK demodulation, ATIS demodulation, squelch, replay buffering, de-scrambling, volume control, and general filtering. After processing of the RX signal the processed signal is routed to the 2-channel audio power amplifier and external connectors for handset and control units.
The digital signal processor is responsible for generating and handling the relevant modulation signal for the RF board. The modulations signal can consist of Voice, ATIS message, DSC message, or Scrambler data.
During voice transmission the DSP carries out compression, pre-filtering and optional scrambling of voice signals from the microphone. During transmission of DSC and ATIS messages the DSP carries out the FSK modulation. The modulation indexes related to the different modulation signals are adjusted internally in the DSP.

Front Control Unit
The MKD module is connected to the baseband board through 4 interfaces determined for sending keyboard data, receiving display data, controlling keyboard light, and connecting speaker. The baseband module solely carries out the control of these interfaces.

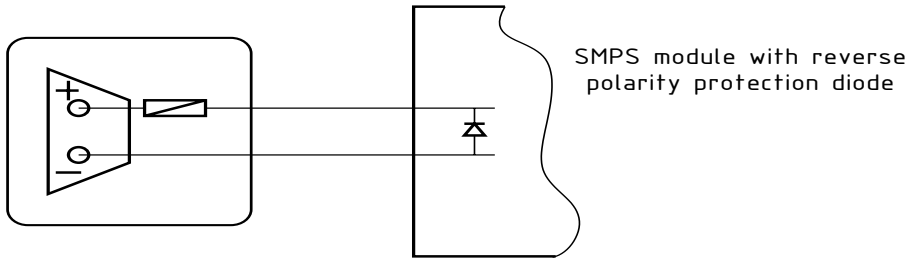
1.1.3 Switch mode power supply



The input power plug with filter and fuse is an integrated part of the power supply and must not be replaced by unauthorised parts. The fuse is accessible from the outside below the power input cable. The module is reverse polarity protected by a diode.

ON/OFF function
This power supply has a special function which means that if the battery connection to the radio accidentally is interrupted for a few minutes, the radio will switch on again by it self when power is back. However, this function is only valid if the radio has been switched on for a while and if the break is shorter than a few minutes.

Power converters
The main power converter is based on a push-pull principle and converts the battery voltage (10-32VDC) into 12.5VDC for the PA and internal supplies. A 3.3V DC converter works from the 12.5V to generate the 3.3V supply for the Base Band module.

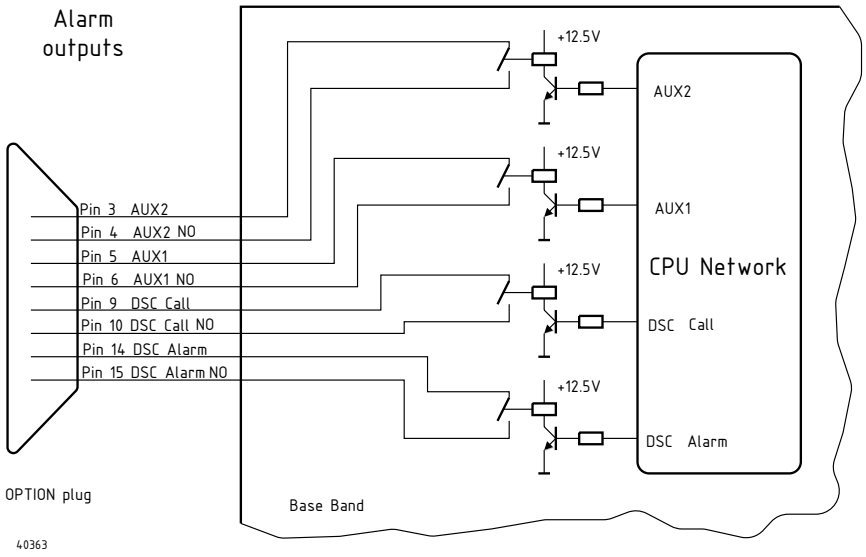


Input power plug with
fuse

40366

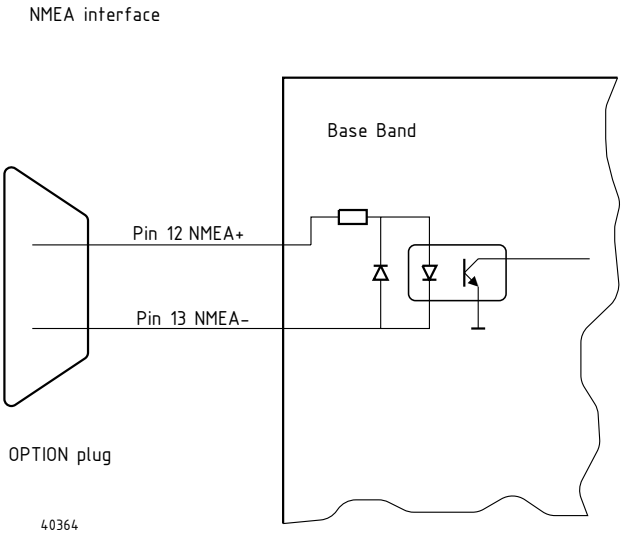
1.2 Interface descriptions

Relays in option connector



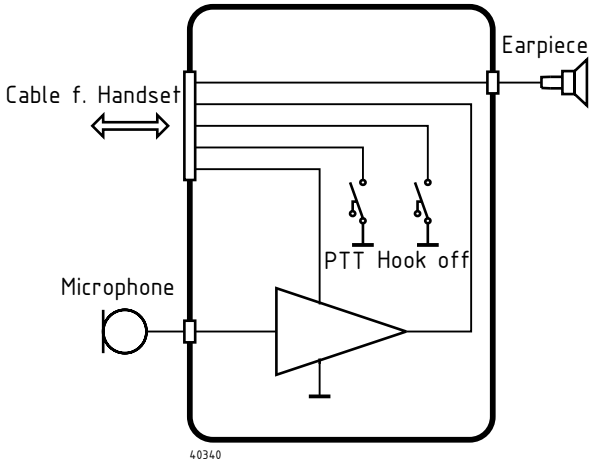
40363

GPS / NMEA input



40364

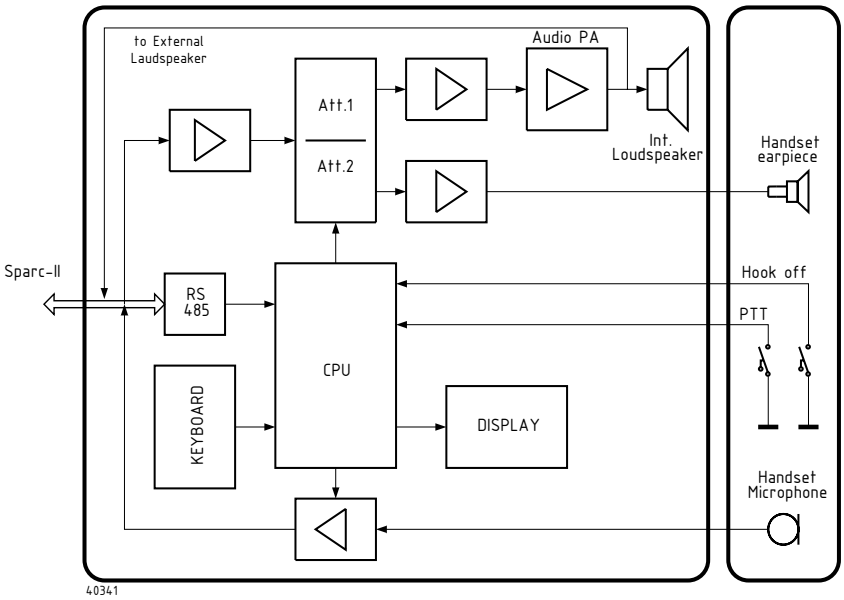
Handset Unit



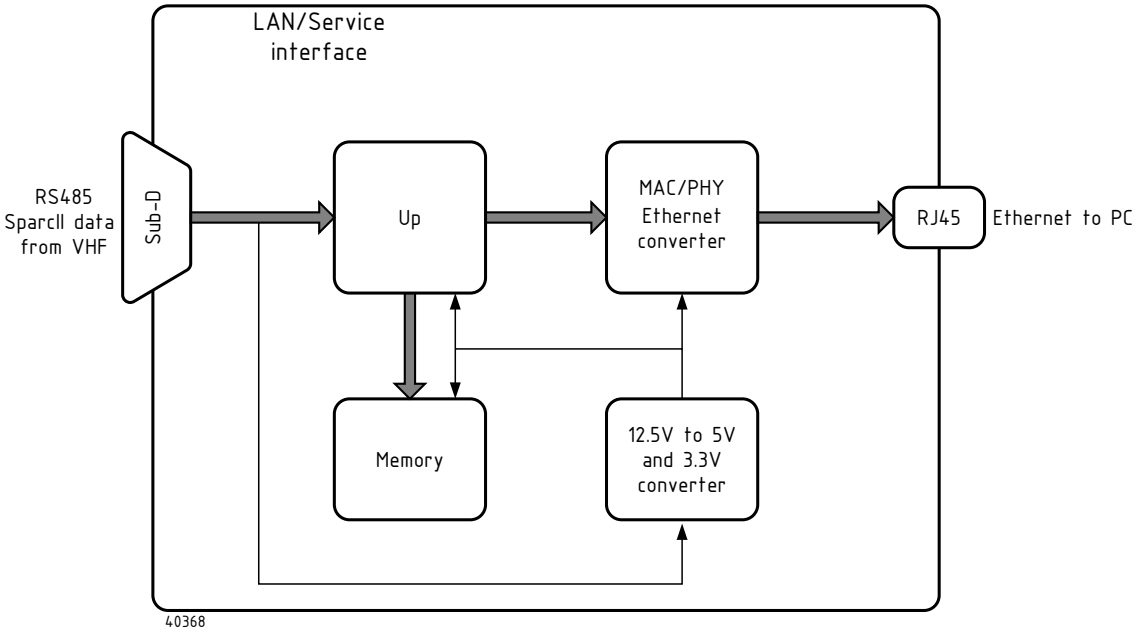
The default handset is of a non intelligent type consisting of an electret microphone and an earpiece and a PTT key. All built in a sturdy housing. In the housing is also placed a reed switch and together with a strong magnet in the cradle, it forms a hook-off function.
The handset used together with the remote control unit CU5000 is waterproof.

1.3 The CU5000 remote control unit

Should also include short description of the handset used.



1.4 The SB5006 service tool and the LB5007 LAN box



Principle of operation

LAN/Service box
The unit converts the data from the Sparcbus to Ethernet data.
The same unit is used for two applications. The LAN box is for fixed installation for connection to a printer and/ or a PC.
The service box is the same unit but only used by service personal for configuration and service purpose of the VHF.

2 Maintenance

If the VHF 5000 system has been installed properly the maintenance can, depending on the environments and working hours, be reduced to performance check at intervals, not exceeding 12 months.

2.1 Preventive maintenance

On a regular basis the following steps should be performed:

- Check the vessels power supply is within the specified limits
- Check conditions of the aireals
- Check the antenna installation, ground connection and cables in general
- Keep antenna feed-through insulators clean and dry
- Check the equipment mount is fixed and that cooling conditions are acceptable to the equipment.
- Perform a functional test of all active units in the system.
- Use the self test built into the radio for verification of optimal operator conditions
- Run the self test, build into the VHF.

Inspection of the antennas, cables, and plugs for mechanical defects, salt deposits, corrosion, shall be done at regular intervals not exceeding 12 months.

2.2 Software updates

A service message will be sent when new software files are available for download from the extranet.

The newest software file shall be downloaded on the service PC. We recommend the newest software available always be updated on equipment that runs an older software version. This will assure the maximum exploitation of the VHF 5000 equipment.

The distributed software will always be certified. Please check if a new version of the manual is also available with the software file.

The service update can be performed on board the vessel, using the SB5006 Service Tool, following the instructions in Appendix A.

2.3 Service tool update

A service message will be sent when new software files are available for download from the extranet.
The newest software file(s) shall be downloaded on the service PC. We recommend the newest software available always be updated on equipment that runs an older software version. This will assure the maximum exploitation of the SB5006 Service Tool.
Remember to check if a new version of the manual is also available with the software file.
Upload instructions are mentioned in "**SB5006 Service tool"**.
Latest version can be located at the extranet.

3 Functional unit workshop service

This chapter will explain in detail for each system component:

- The service concept
- How to replace parts that are covered by this service concept
- Verification of the unit that has been repaired

Repairs and components that are not covered by the service concept will not be supported or supplied by Thrane & Thrane.

3.1 Necessary test equipment

Function	Recommended type	Parameter
Multi meter	Fluke	R; >100K ohm
Oscilloscope	Textronics	400MHz
Power meter	Bird	50W
Frequency counter	Agilent	Solution 1Hz
Signal Generator	Agilent	150-170MHz
Dummy load ohm	Bird	50ohm 50W

Also recommended to use radio test set like CMT or Stabilock

3.2 Servicing the RT5022/RT5020 VHF transceiver

The VHF transceivers functionally exist in the following variants:

- RT5022 VHF DSC Simplex, semi-duplex
- RT5020 VHF DSC Duplex

Software updates and configuration tasks can always be performed on board using the SB5006 service tool.

Simple repairs, where the product is disassembled, and larger modules are exchanged, e.g. base unit or front unit, can also be performed on board, followed by a simple interface check performed from the transceiver user interface.
More detailed repairs inside the transceiver require the use of instruments to validate performance after repair. It is up to the service technician to decide whether the repair should be performed on board the ship or in the workshop.

3.2.1 Software

The software file always covers all functional transceiver models. The product difference is in the hardware, and which parts of the software that are enabled. The SB5006 is used to configure the software for the specific radio type.
We strongly recommend the products being updated with the newest software available. A few minutes should be spent to consider the following:

- All software parts are physically stored on the Base Band module.
- If the product is damaged in a way that no contact can be established to the Base Band module via the SB5006 service tool, all configuration data might be considered as lost for that radio.
- If it is possible to save configuration data before a possible Base Band module exchange, this should be done via the SB5006 service tool.

Updating the VHF transceiver to a new software version does not affect configuration data (contact list, private channels, etc.). Configuration data should always be compatible with new software releases.

Identifying Software failures

The following diagram indicates the checks that can be done to identify software or configuration problems.

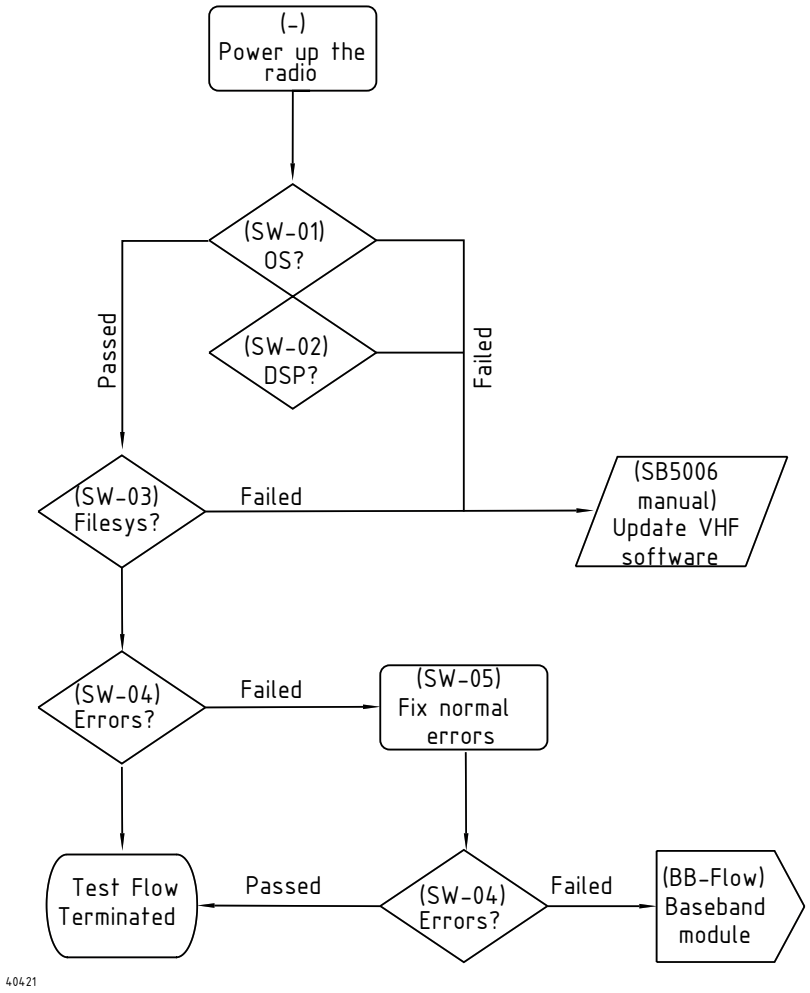


Fig. 1 (SW) – Software test flow diagram.

The most common operational faults are collected below:

Reference	Operation/Test	Test Criteria	Comments/instructions
SW-01	Check if the operating and application program is present.	**Fail:** ”- -” moving up and down on upper display. **Pass:** Otherwise	Radio in boot monitor. Application program not found. Please download new software image.
SW-02	Check if the DSP image is present.	**Fail:** ”- ” ” -” moving sidewards continuously. **Pass:** Otherwise	DSP software missing. Please download new software image.
SW-03	Check if file system is present in radio.	**Fail:** “Page not found” shown when running the service tool. **Pass:** Otherwise	Connect SB5006 service tool. • HTML file system missing in VHF radio. Please download new software • SB5006 configured wrong. Configure to auto-negotiate.
SW-04	Check if any errors are shown in display or service tool	**Fail:** Error messages after any start-up attempt. **Pass:** No error messages after start-up	If normal user errors like MMSI number or serial number settings have been set, only technical related errors
SW-05	Fix normal errors		Start-up errors like missing serial number or missing MMSI number should be fixed according to the description in manuals.

Tabel 1 (SW) - SW test operations.

3.2.2 Manuals

Only a single operations manual covers all VHF Series 5000 transceiver models. Software updates might add new features to the product, even if the upgrade is free of charge. In the service message sent out with new software releases, there might be a recommendation to also update the manuals on board the vessel.

3.2.3 Service tool

The SB5006 service tool is compatible with all models of the SAILOR VHF 5000 Series equipment. The tool is the single equipment needed for updating and configuration of the RT5022/RT5020 transceiver software.

3.2.4 Service concept – RT502x VHF DSC main unit

The service and repair concept of the RT502x VHF main unit may be divided into two situations, namely onboard repair and workshop repair. The two differs mainly in that specific workshop measurement devices for the verification of certain equipment performance parameters will not be available for onboard service - and to some extend the often limited time available onboard to perform the repair.

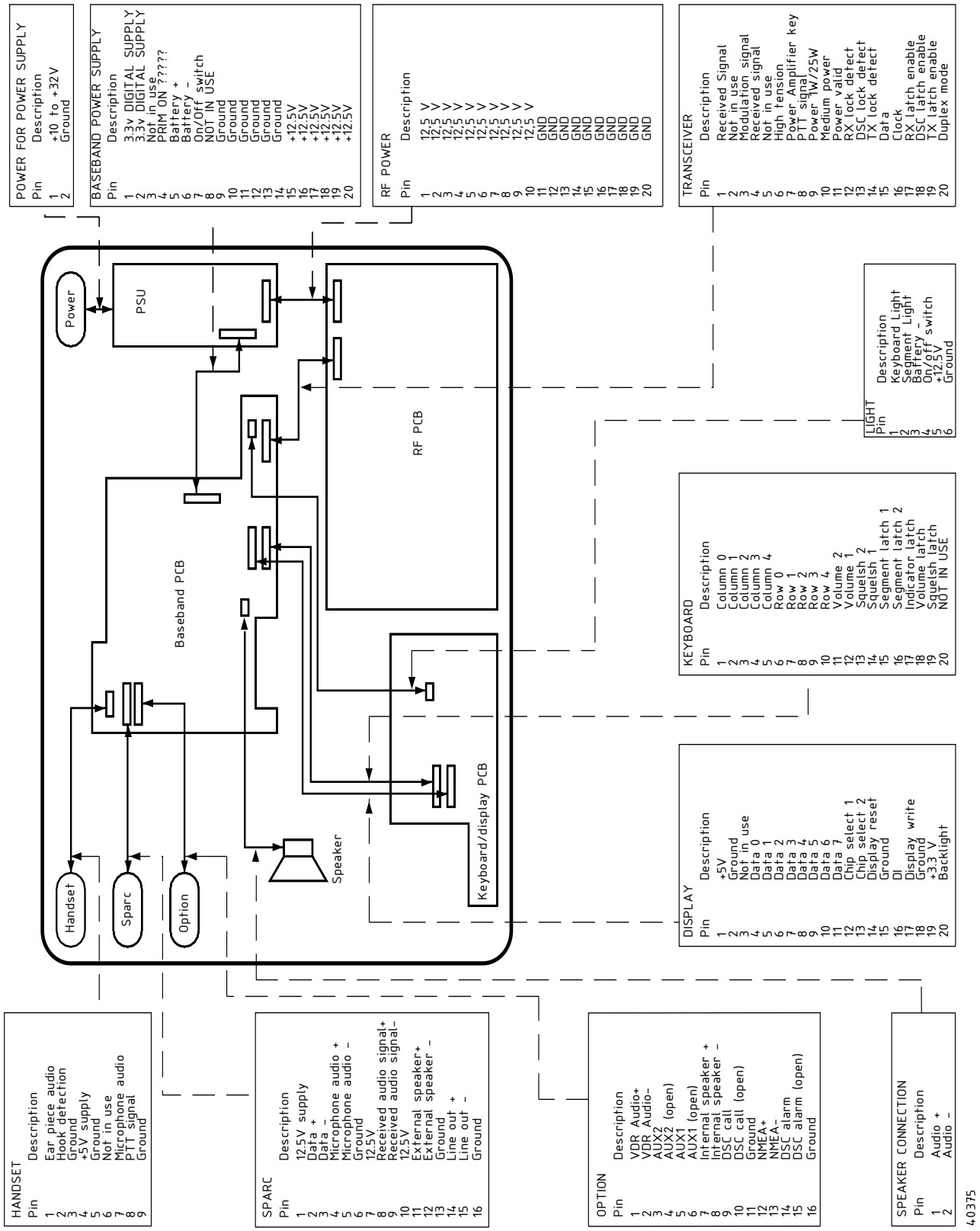
Onboard service & repair:
The onboard service & repair, besides the VHF equipment itself encompasses also the part of the ship's installation pertaining to the operation and performance of the VHF equipment, i.e. antenna installations, associated cabling, ships power supply, external power supply units etc. all of which must be in correct and proper condition to enable the proper function and performance of the VHF installation.
In terms of equipment repair this may be accomplished in different ways and levels, depending on the available time for the repair, available parts, technician's knowledge of the equipment etc. Fast and effective equipment repair will be accomplished through replacement of pre-tested base unit or front assy'. replacement.

Supported service repairs

This manual will be instructive to do the following repairs on the transceiver unit:

- Transceiver base unit (complete)
- Transceiver control unit (simplex complete)
- Transceiver control unit (duplex complete)
- Mounting plate
- Cover
- Base Band module
- RF module
- Power amplifier
- Switch mode power supply
- Duplex filter (including cables)

3.2.5 Electrical Interconnection diagram



3.2.6 Available spare parts

Check eShop at http://extranet.thrane.com

3.2.7 Removing/installing the Cover of RT5022/RT5020

Removal/Installing

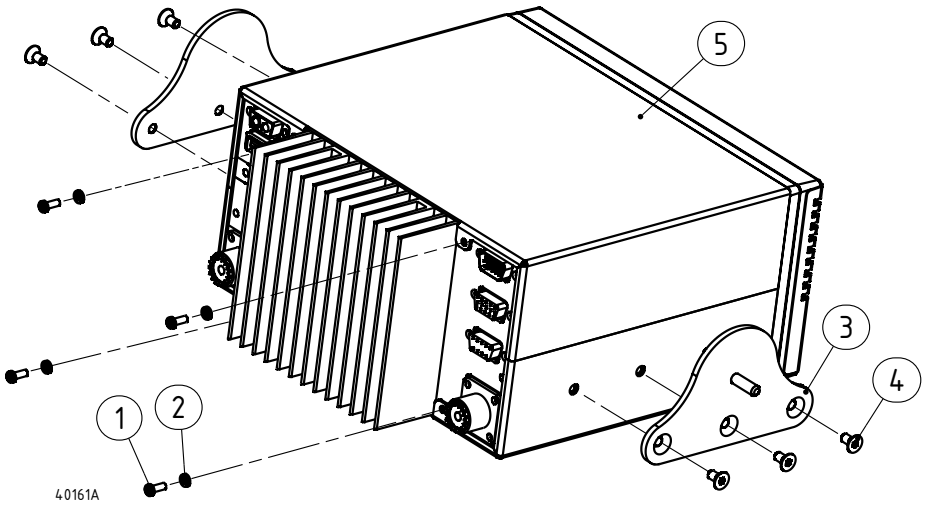
- If the radio has been installed using the Mounting Bracket, remove the two Mounting Plates (item 3) by removing the 6 x Screw M4x8 (item 4)

  Tools required: Torx screwdriver, size 15

- Remove the 4 x Screws M3x8 with Washers (items 1 and 2)

  Tools required: Torx screwdriver, size 10

- The cover (item 5) can now be removed by pulling it backwards from the Radio.



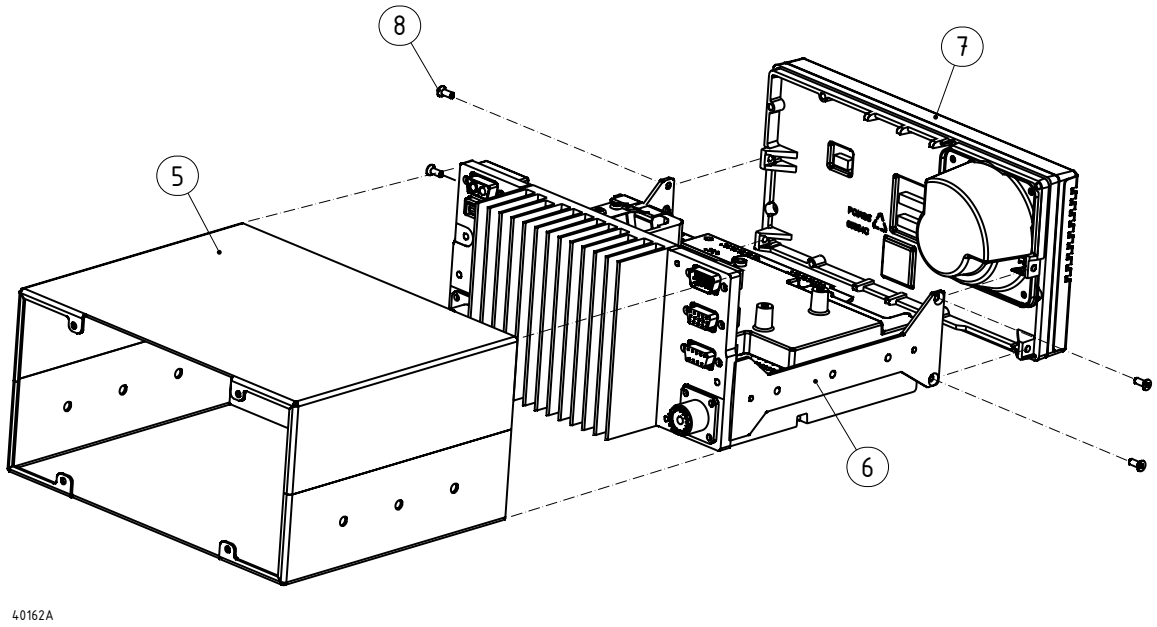
3.2.8 Removing/installing the Base Control Unit from Base Unit

Removal/Installing

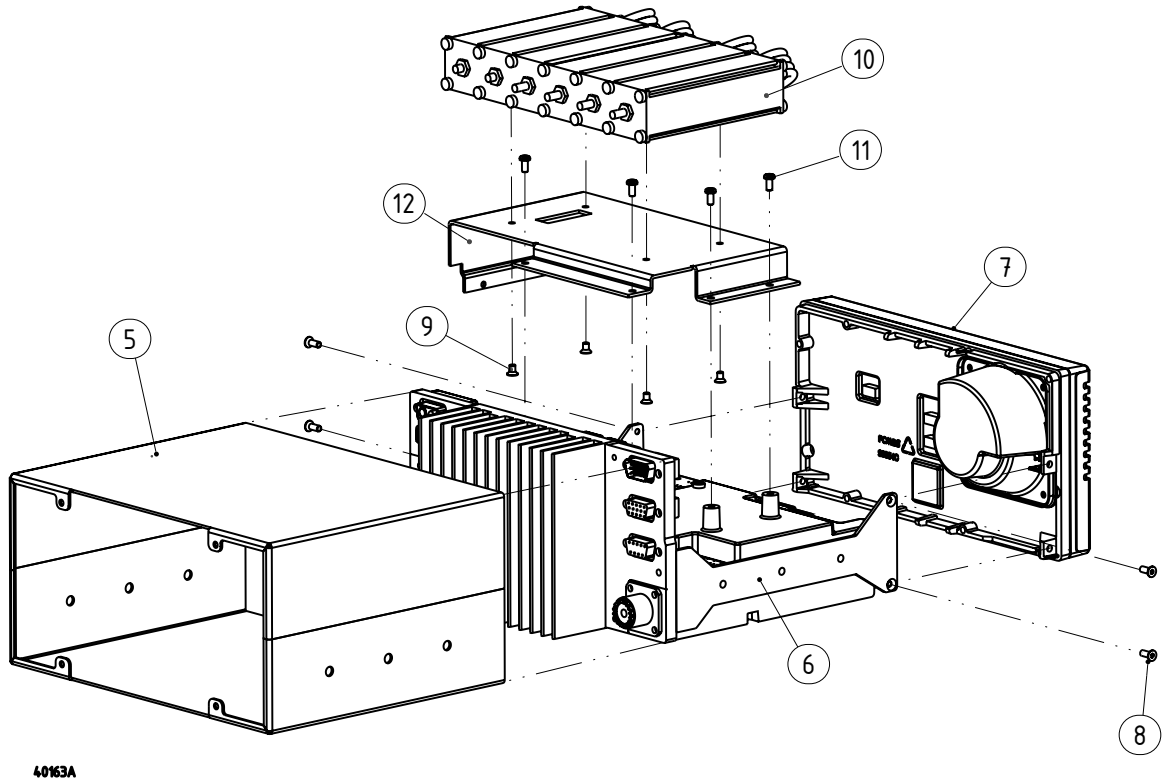
- Remove 4 x Screw M2.5x8 (item 8)

  Tools required: Torx screwdriver, size 8

- The base control unit (item 7) can now be disassembled from the base unit (item 6) by pulling forwards.
- Remove 3 x ribbon cable and loudspeaker cable between base control unit (item7) and base unit (item6)



40162A



40163A

3.2.9 Removing/installing the Duplex filter from the VHF transceiver unit

The Duplex filter should be firm fixed in all cable connections. There are no specific tests that identify failures in the duplex filter.

For the RT5020 – Duplex transceiver an over temperature detection is enabled. If the over temperature warning message displays on the RT5020, under conditions where the transceiver has not been overheated and has not been in a constant transmitting state for 1 hour, an error might be in the temperature sensing component. The temperature sensor is located on the Base Band module, which – in this case - should be replaced.

Use the following procedures & illustrations to remove/ install the Duplex Filter. The sequence of the procedures applicable to the removal and the installation respectively is consecutively numbered 1 through 3 and should be carried out in accordance with this.

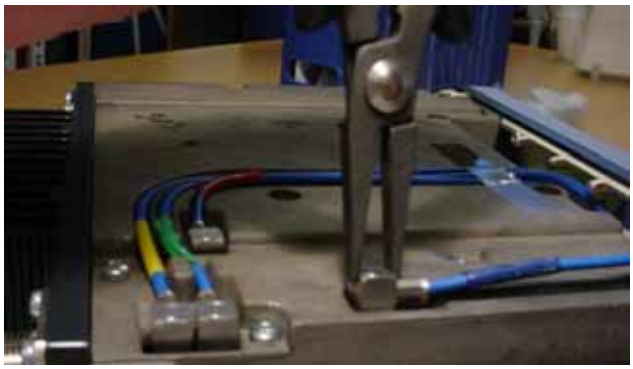


Fig. 1

Removal:

- Remove 4 x Cables on the bottom of the radio. (See Fig. 1)
  Tools required: Flat-nose pliers.
- Remove 4 x Screw M3x8.
  The duplex filter including bracket can now be removed from the radio.(See Fig. 3)
- Remove bracket from duplex filter by removing 4 x Screw M3x5. (See Fig. 4)

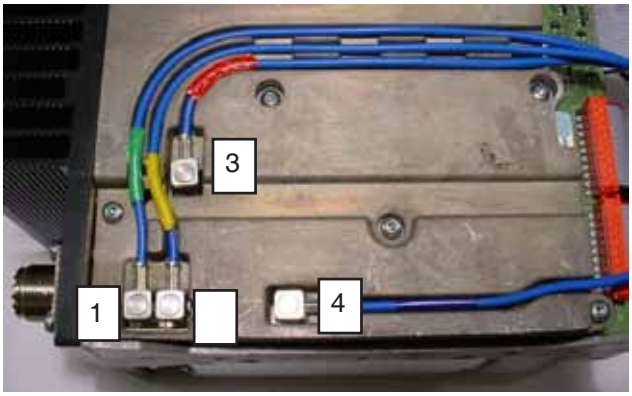


Fig. 2

Installing:

- Install the bracket onto the duplex filter using 4 x screw M3x5, applying a torque of max. 1Nm (See Fig. 4)
  Tools required: Torx screwdriver, size 10.
- Install bracket at the Base Band module shield using 4 x screws M3x8, applying a torque of max. 1Nm (See Fig 3).
  Tools required: Torx screwdriver, size 10.
- Mount Cables for Duplex filter as shown by numbers: (See Fig. 2)
  1. Green
  2. Yellow
  3. Red
  4. Blue
- Position the cables into the cable grooves at the RF module shield (See Fig. 1).

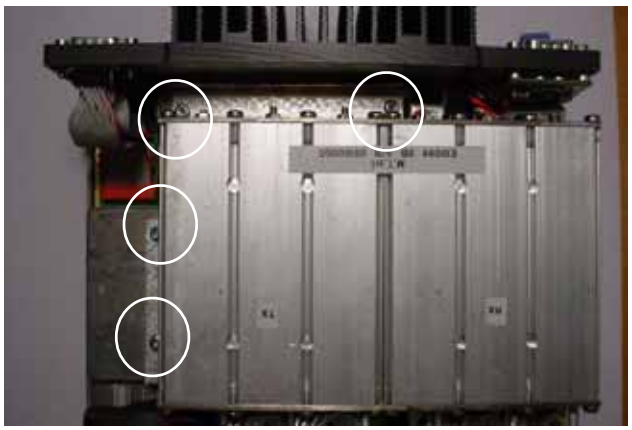


Fig. 3

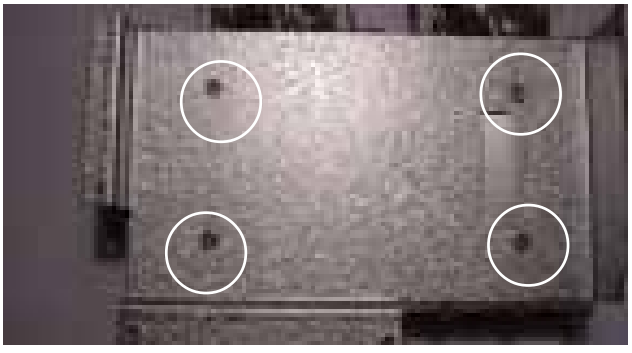


Fig. 4

3.2.10 Removing/installing the SMPS from the VHF transceiver unit.

The switch mode power supply module is a candidate for replacement identified from a number of flows:

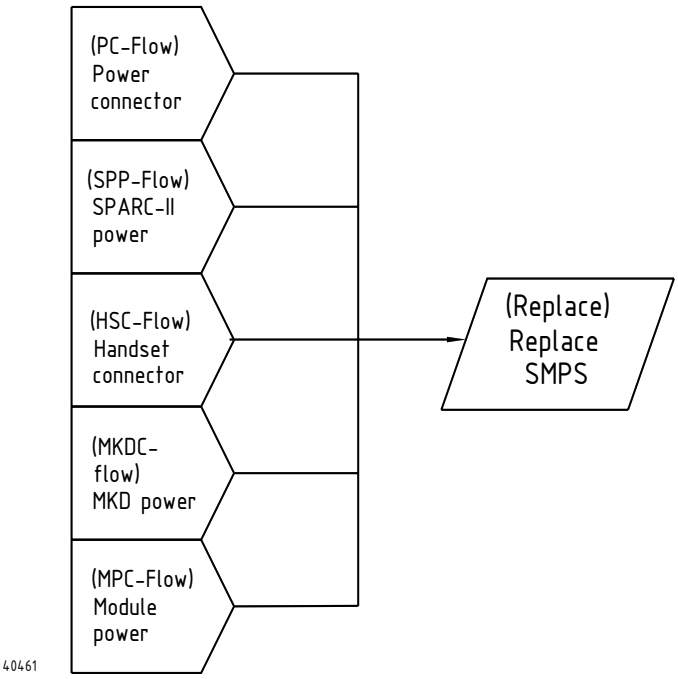


Fig. 2 SMPS module replacement. (See section 3.2.15 for details on fault identification)

No other fault identification tests are available before replacement of this module.

Use the following procedures & illustrations to remove/install the SMPS. The sequence of the procedures applicable to the removal and the installation respectively is consecutively numbered 1 through 5 and should be carried out in accordance with this.

Removal:

- Gain access to the build-in power supply module by removing the cover and the front part assy' (Control Unit) from the radio.

  The PSU is located in right hand side of the radio as viewed from front.

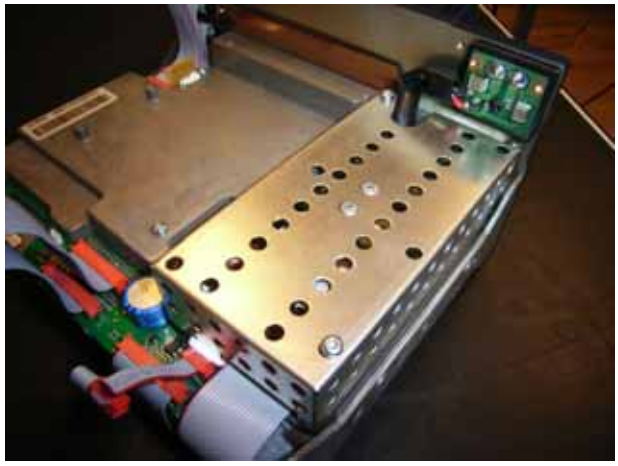


Fig. 1

- Locate the 8-pin connector in front of the PSU module.
  This connector is secured to shielding cover of the PSU module by means of a sealing compound.

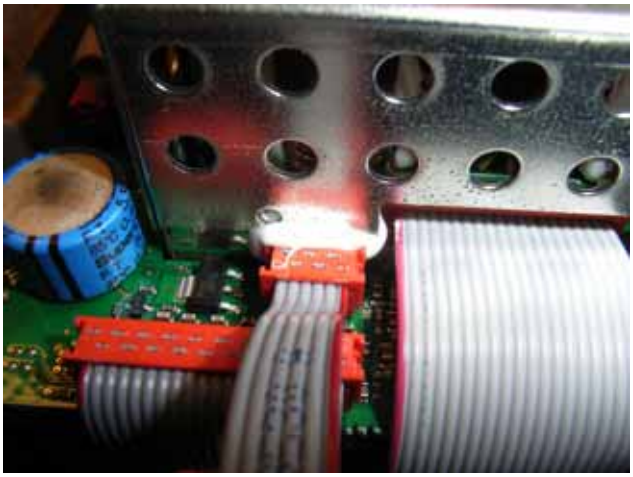


Fig. 2

- Release the sealing compound from the PSU shielding cover by cutting, using a sharp knife.
  Clean connector and PSU cover for any residual sealing compound.

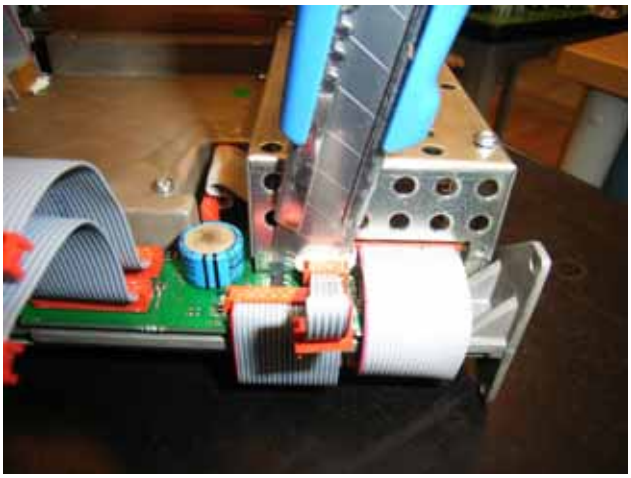


Fig. 3

- Remove the cover of the PSU by removing two (2) screws (Torx TX10) (see Fig. 4) securing the cover to the PSU chassis and carefully lift the cover from the PSU.
  Retain screw and cover for re-installation later.

  Remove the four (4) TORX TX10 screws located inside the PSU at the base, the two (2) stand offs and two (2) TORX TX10 screws located at the rear side of the radio securing the E-shaped cooling profile to the radio chassis.

  Remove the two (2) 20-pin ribbon cable connectors at the baseband PCB and RF PCB respectively. Do NOT remove connectors at PSU side since the ribbon cables will be included with the replacement PSU module.

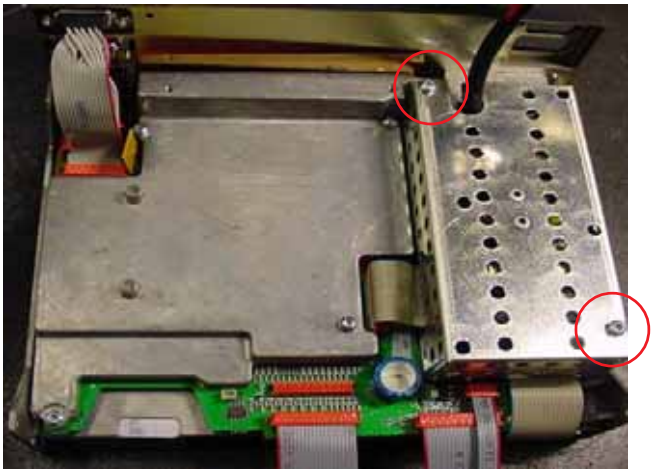


Fig. 4

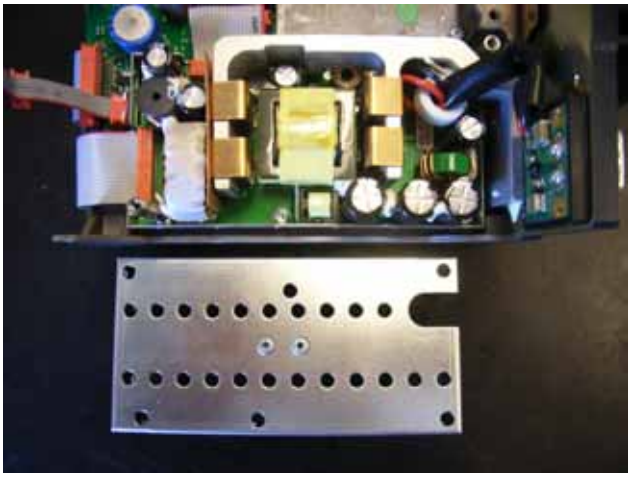


Fig. 5

Remove the two (2) socket screws securing the power plug to the radio chassis.

Fig. 6

- Remove the PSU module from the radio.

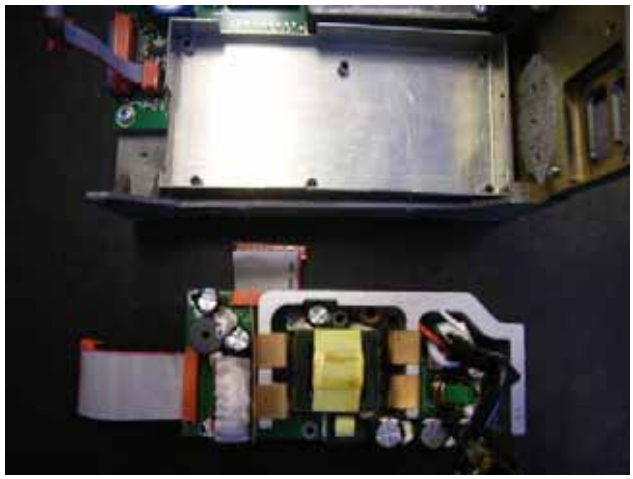


Fig. 7

- Remove the four (4) retainer clips holding the regulator transistors against the E-profile and remove the E-profile from the PSU module. Retain the E-profile for use with the replacement PSU module. Retainer clips may be discarded of as new clips are included with the replacement PSU module.

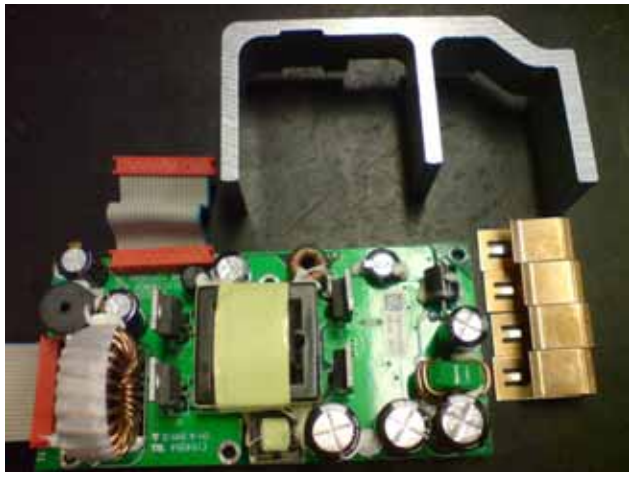


Fig. 8

- Prepare the new PSU module by soldering the DC power plug supplied with the replacement module to the PCU PC board. Refer to the removed PSU for correct wiring.

Fig. 9

Note: Cut the end stubs of the wires on the soldering side of the pcb to a length not exceeding 3mm.

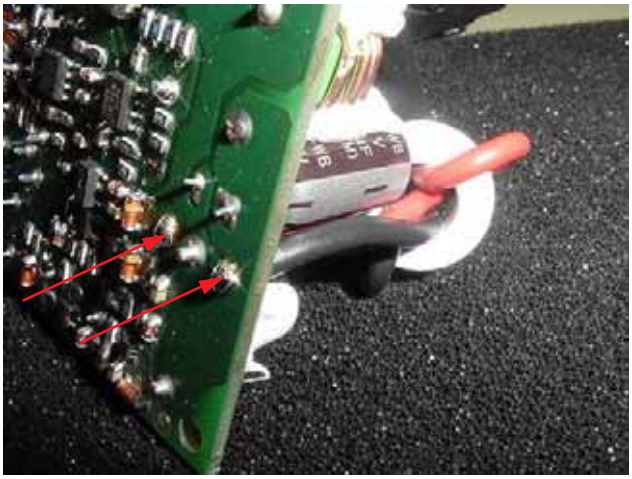


Fig. 10

Installing:

- Position the new PSU module in the chassis.

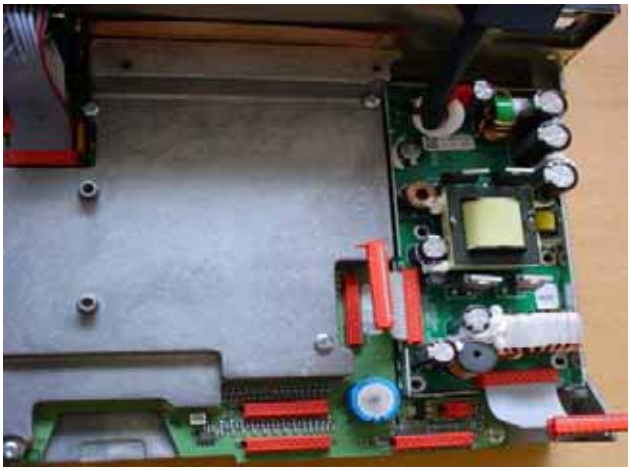


Fig. 11

- Install the screws and the two (2) stand offs which were removed in step 4.
  Note: When tightening up the screws and stand offs exercise care not to over tighten to avoid damaging the threads in the chassis.

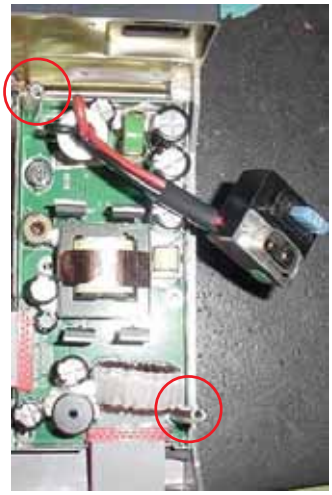


Fig. 12

- Verify that the two insulation sheets at the E-profile are in good condition. If damaged in any way they should be replaced.

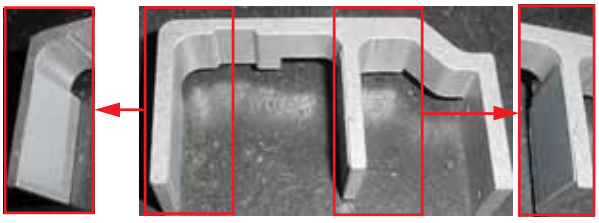


Fig. 13

- Fasten the E-profile to rear chassis by means of the two (2) screws installed from the back of the radio. Carefully observe that the E-profile does not rest on top of any components of the PSU module.

Fig. 14

- Install the Prespan carbon sheet between coil and the E-profile to ensure insulation of the coil from chassis.

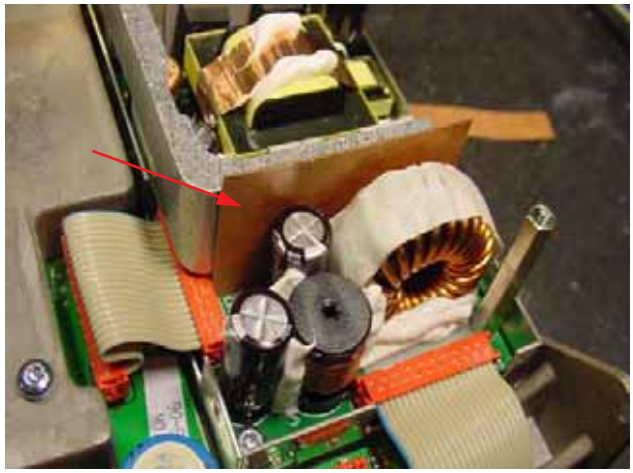


Fig. 15

- Carefully install a retainer clip over each of the regulator transistors to hold these tight against the E-profile to ensure proper cooling.

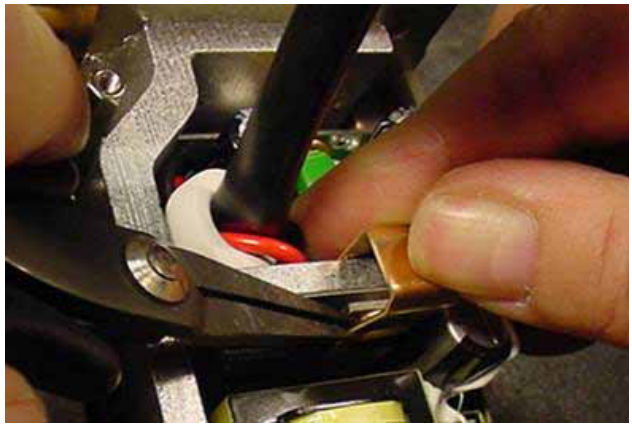


Fig. 16

- Using a piece of cardboard of approx. 1mm thickness, check and ensure sufficient spacing of clips to surrounding components to avoid clips shorting to such.

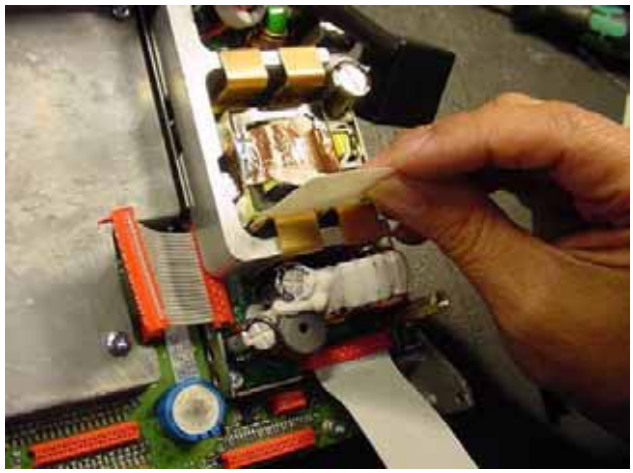


Fig. 17

- Use a small amount of sealing compound (must not contain acid) to provide support of the coil to the stand off.

Fig. 18

- Use a small amount of sealing compound (must not contain acid) to provide support of the ferrite coil and power plug wiring to the E-profile.

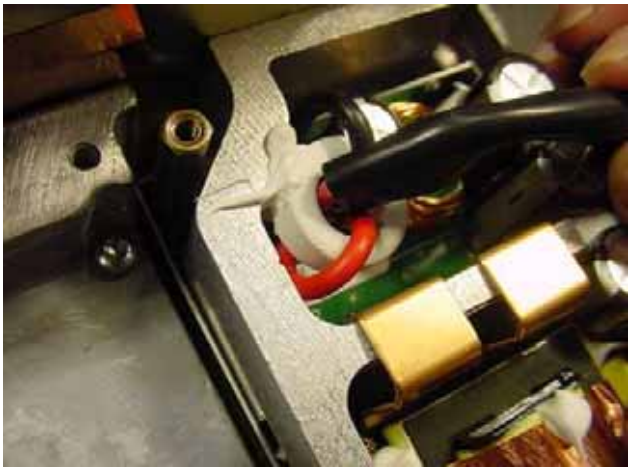


Fig. 19

- Reinstall the cover on top of the PSU module and secure it using the two (2) screws.

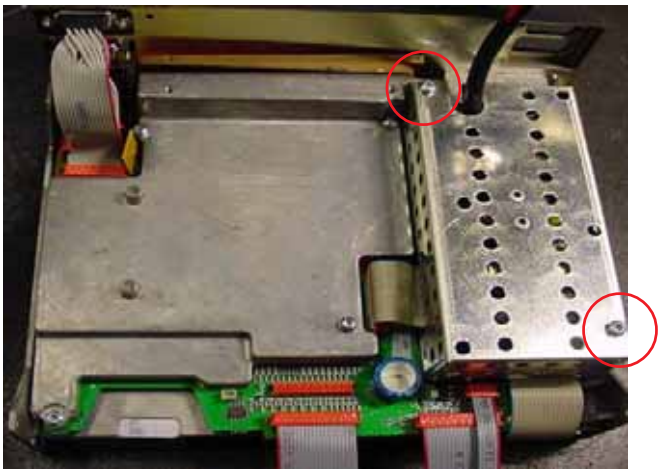


Fig. 20

- Position the DC power plug in the rear chassis of the radio and secure it using the two (2) socket screws.

Fig. 21

1007

Fig. 22

- Secure the 8-pin connector at front of the PSU to the PSU cover using a small amount of sealing compound (must not contain acid).

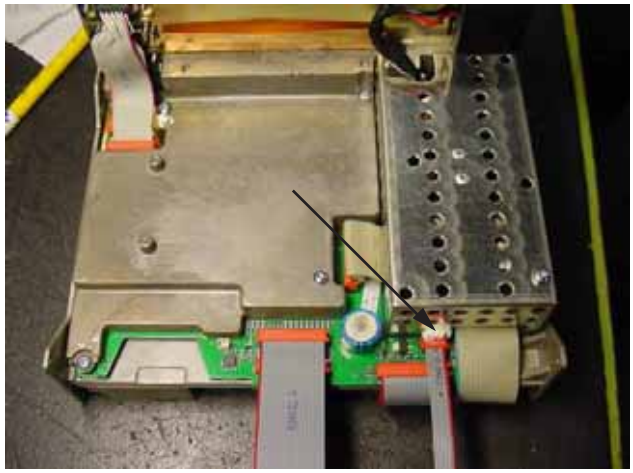


Fig. 23

- Connect the two (2) 20-pin ribbon cable connectors to the RF board and the Baseband board respectively.

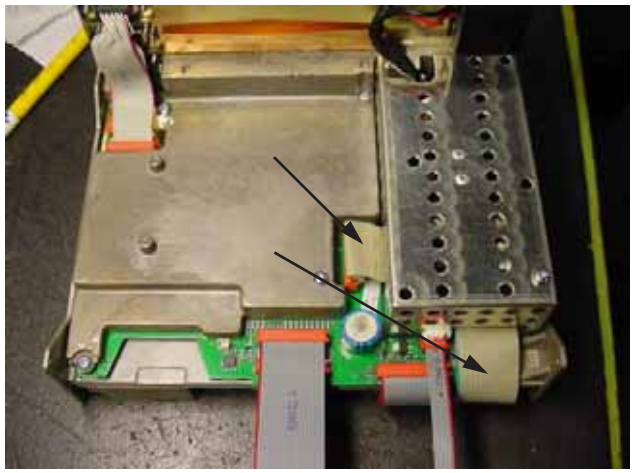


Fig. 24

- Connect the front part (Control Unit) to the radio. Assemble the cover of the radio and perform a final test of the complete radio.

3.2.11 Removing/installing the BB module from the VHF transceiver unit.

Use the following procedures & illustrations to remove/install the Base Band module. The sequence of the procedures applicable to the removal and the installation respectively is numbered 1 and 2 and should be carried out in this sequence.

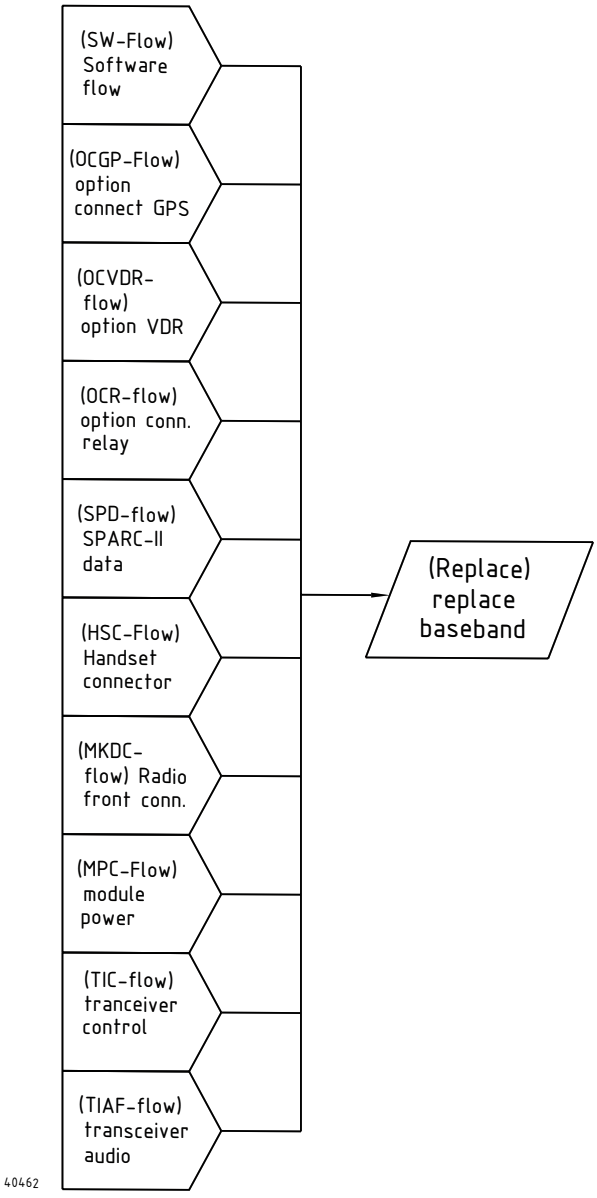


Fig. 3 Base Band module replacement. (See section 3.2.15 for details on fault identification)

The Base Band module is identified for replacements from several flows.

Removal:

- Remove 4 x screws securing the BB-shield to the chassis. (See Fig. 1)
  Carefully lift and remove shield from BB module.

- Disconnect all cables connected to the BB-module.
  Remove 2 x screws securing the audio power amplifier IC against the heatsink through the retaining plate.
  Remove two screws positioned in opposite corners of the BB module securing this to the chassis.
  Carefully lift out the BB module from the chassis.
  Tools required: Torx screwdriver, size 10

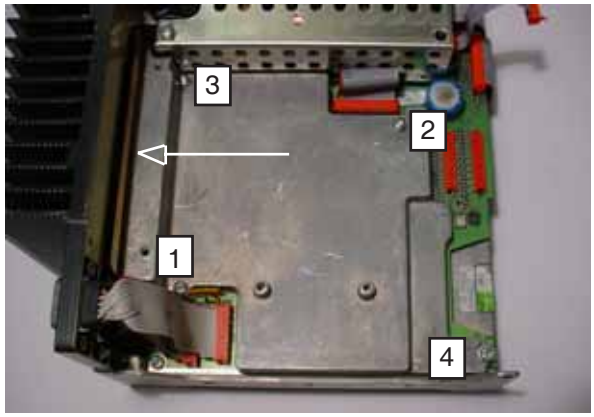


Fig. 1

Installing:

- Disconnect all cables connected to the BB-module.
  Remove 2 x screws securing the audio power amplifier IC against the heatsink through the retaining plate.
  Remove two screws positioned in opposite corners of the BB module securing this to the chassis.
  Carefully lift out the BB module from the chassis.position the BB module correctly in the transceiver chassis.
  Secure by installing two screws in opposite corners of the BB module, applying a torque of max. 0.7Nm.
  Install retaining plate on top of audio power amplifier IC and secure this against the heatsink by tightening 2 x screws, applying a torque of max. 1.0Nm.
  Connect cabling.


Fig. 2

- Position the BB-shield correctly over the BB module.
  Be careful in this process not to cause any damage to the copper grounding strip at tached to transceiver heatsink Install 4 x screws loosely.
  When ready to tighten screws gently press the BB-shield against the pc-board and against the grounding strip/heatsink.
  Tighten the 4 screws in the sequence indicated by the numbering (See Fig. 1), by applying a torque of max. 0.7Nm.
  Tools required: Torx screwdriver, size 10.


Fig. 3

Configuring the Radio after replacement of the Base Band module
As all radio configuration and identity data resides on the Base Band module, it is necessary to configure a few settings on the radio, after the base unit or the Base Band module has been replaced:

- **Serial number** must be set. The serial number of the radio is found on the identity tag on the rear bottom side of the cover. The serial number set in the radio, must match the serial number displayed on the tag. ***Important:*** You must program the serial number correct the first time. It can only be programmed once.
- **Radio Type**. The radio type must be set to either simplex or duplex according to the actual hardware. “Simplex” must be selected for an RT5022 Simplex type, and “Duplex” must be selected to configure the software to control a duplex radio.

The settings are entered using the SB5006 service tool. Please consult the SB5006 operations manual (e.g. Part 5 in this manual) on how to program “System Parameters”.
If the service interface is able to run with the RT50XX unit before repair, it will be possible to save the radios original user-specific settings (channel settings, contact list, etc.), before base unit/Base Band module is replaced.
After the repair has been done, any saved configuration parameters can be copied back to the radio.

NOTE: The System Parameters (e.g. serial number) are not part of the configuration parameters that can be automatically copied.

3.2.12 Removing/installing the RF module of the VHF transceiver unit.

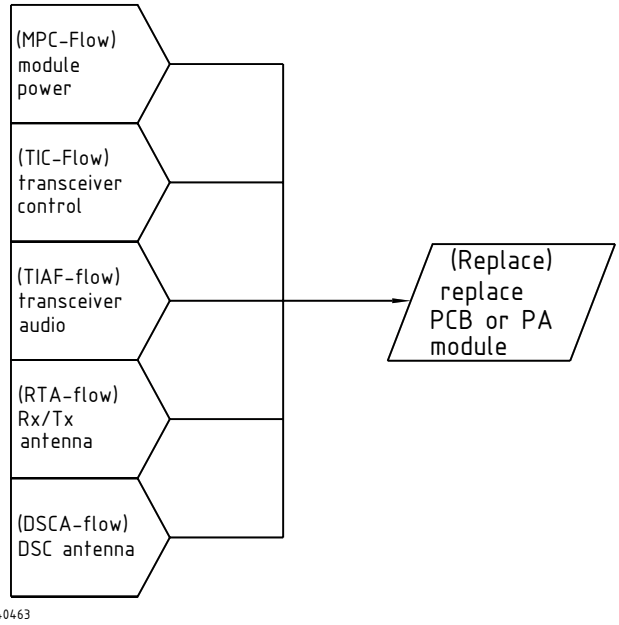


Fig. 4 RF or PA module replacement. (See section 3.2.15 for details on fault identification)

The antenna check flows (RTA and DSCA) might point on problems with the RF module. The connection between antennas and RF module are located under the Base Band module. Therefore the Base Band module must be removed before the antenna connection can be checked.
Use the following procedures & illustrations to remove/install the RF module. The sequence of the procedures applicable to the removal and the installation respectively is consecutively numbered 1 through 6 and should be carried out in accordance with this.

Note: In case of the RT5022 simplex/semi duplex VHF step 1) for “Removal” and step 6) for “Installing” in the following procedure, does not apply.

Tests that have lead to the replacement of either RF module or the Power amplifier module (PA) are listed in the following figure.

Removal:

- Disconnect 4 x cables connecting duplex filter to the RF module (See Fig. 1).
  Each cable is identified by a coloured sleeve as follows (See Fig. 2):
  1. Green
  2. Yellow
  3. Red
  4. Blue

  Tools required: Flat nose pliers

- Remove 10 x screws securing shielding cover of RF module and remove cover.

- unsolder the oins of the PA module and slightly lift these from the RF module.

- unsolder and remove the tinned copper wire connecting each antenna connector center pin to the RF module. Retain the tinned copper wires for subsequent installation of the RF-module

- remove antenna connectors by removing 4 x screws fastening each connector to chassis.

- remove 4 x screws securing RF module to chassis and carefully lift out the RF module while being careful not to bend pins of the PA-module in the process.

Installing:

- carefully position RF module in chassis while being observant not to damage or cause e x c e s s i v e bending of the pins of the PA-module Secure RF module to chassis by installing 4 x screws, applying a torque of max. 1.0Nm.
  Carefully solder pins of PA module to the RF-module.
  Tools required: Torx screwdriver, size 10 Soldering iron.

- Position antenna connectors in chassis while noting the correct position of the tapered opening for soldering and secure each by installing 4 x screws, applying a torque of max. 1.0Nm.
  Tools required: Torx screwdriver, size 10.

- Install and solder each tinned copper wire to the RF module making sure that the wire just passes through the module in order not to cause any short circuiting to chassis.
  Solder each copper wire to the respective antenna connector center pin.
  Tools required: Soldering iron, xx watts

- Solder each pin of the PA module to the RF-module.
  Tools required: Soldering iron.

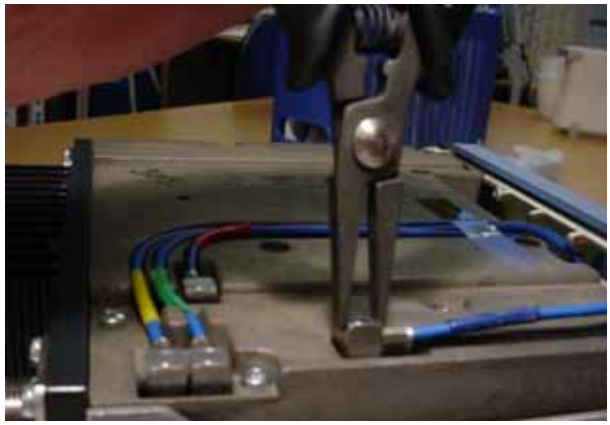


Fig. 1

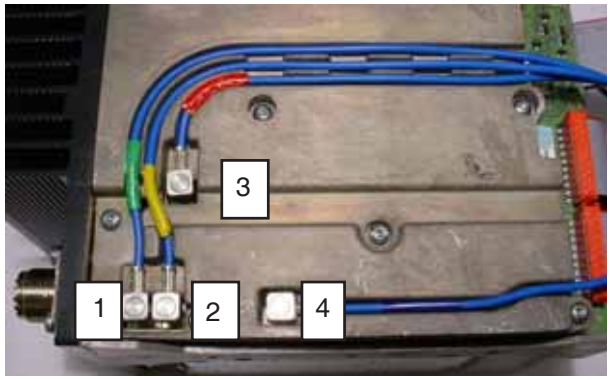


Fig. 2

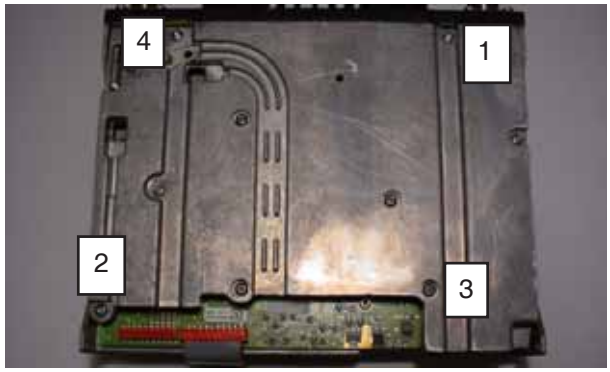


Fig. 3

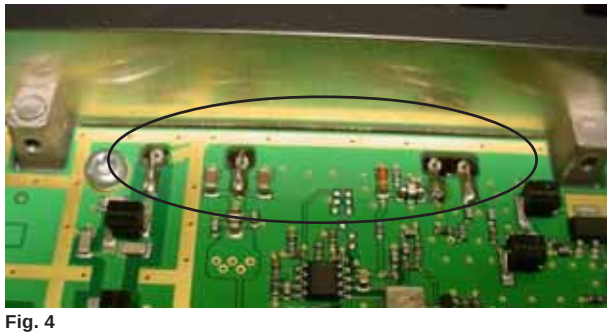


Fig. 4

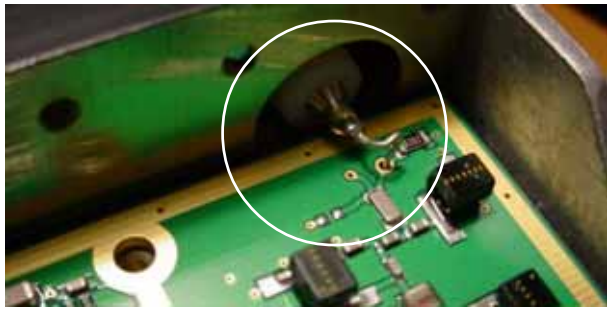


Fig. 5

- Position the shielding cover correctly over the RF module.
  Install all 10 x screws loosely followed by tightening the outermost 4 screws in the order indicated in the illustration, applying a torque of max. 0.7Nm.
  Tighten the remaining 6 x screws applying a torque of max. 0.7Nm.
  Using same sequence further tighten the 10 screws applying a torque of max. 1.0Nm.
  Tools required: Torx screwdriver, size 10.

- Connect duplex filter cabling according to their respective colour code – refer to Fig. 2
  - Ensure that each cable connector is seated properly in its respective mating connector of the RF module and position each cable in the appropriate cable groove of the RF module shielding cover.

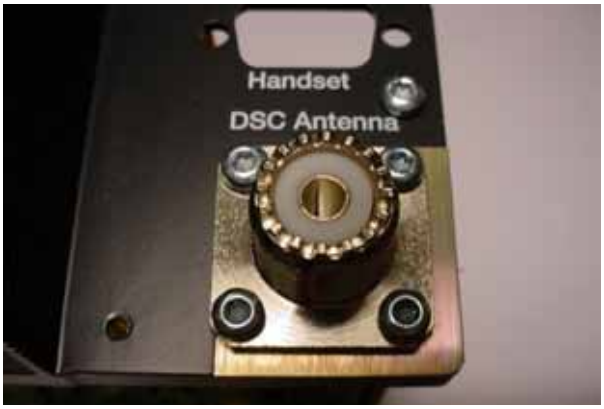


Fig. 6

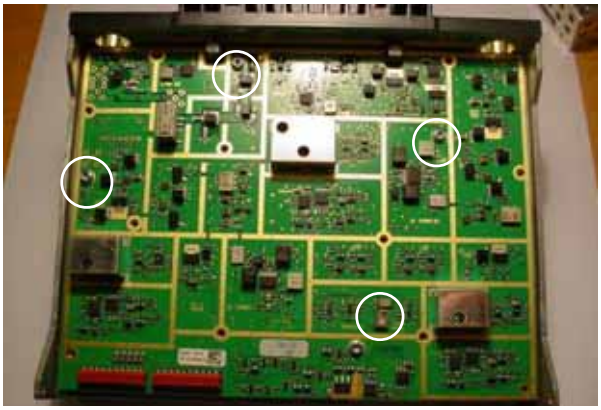


Fig. 7

3.2.13 Removing/installing the PA module of the VHF transceiver unit

Use the following procedures & illustrations to remove/install the PA module. The sequence of the procedures applicable to the removal and the installation respectively is consecutively numbered 1 through 5 and should be carried out in accordance with this.

Removal:

- Disconnect 4 x cables connecting duplex filter to the RF module (See Fig. 1).
  Each cable is identified by a coloured sleeve as follows (See Fig. 2):
  1. Green
  2. Yellow
  3. Red
  4. Blue

  Tools required: Flat nose pliers

- Remove 10 x screws securing shielding cover of RF-module and remove cover.

- Unsolder the pins of the PA module and lift these from the RF module Remove and retain the (glasflex) insolation from each PA module pin.

- Remove 4 x screws securing the BB-shielding cover to the chassis.
  Carefully lift and remove cover from BB module.

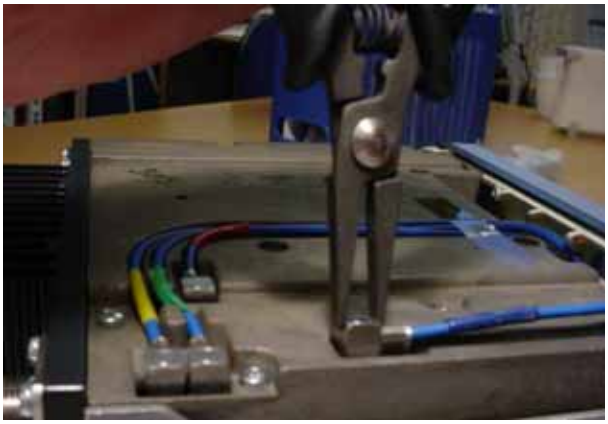


Fig. 1

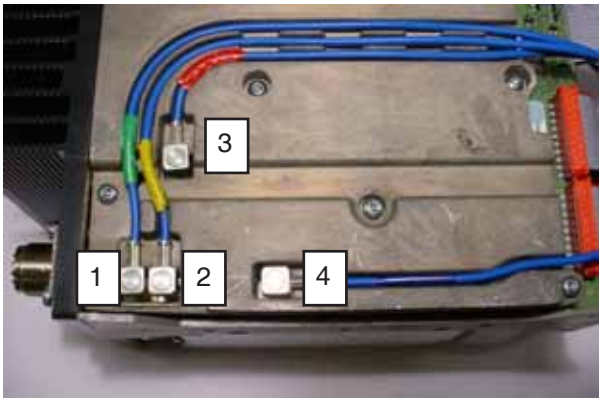


Fig. 2

- Remove 2 x screws securing the PA module to the chassis heatsink and gently lift out the PA module.

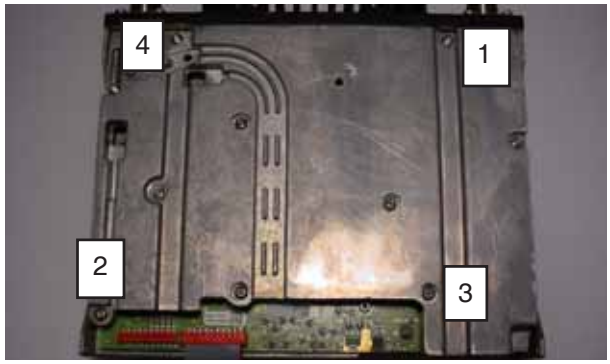


Fig. 3

Installing:

- Apply an adequate amount of heatsink compound to PA module base – (See Fig. 2).
  Place PA module in its correct position while being observant that the pins of the PA module pass freely through RF module cutouts.
  Install 2 x screws and fasten PA module securely to heatsink, applying a torque of max. 1.0Nm.
  Tools required: Torx screwdriver, size 10.

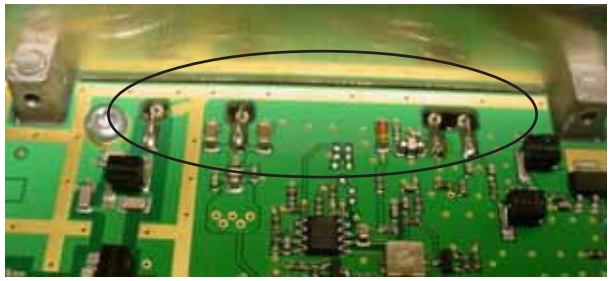


Fig. 4

- Position the BB-shield correctly over the BB module. Be careful in this process not to cause any damage to the copper grounding strip at - tached to transceiver heatsink.
  Install 4 x screws loosely.
  When ready to tighten screws gently press the BB-shield against the pc-board and against the grounding strip/heatsink.
  Tighten the 4 screws in the sequence indicated by the numbering, applying a torque of max. 0.7N.

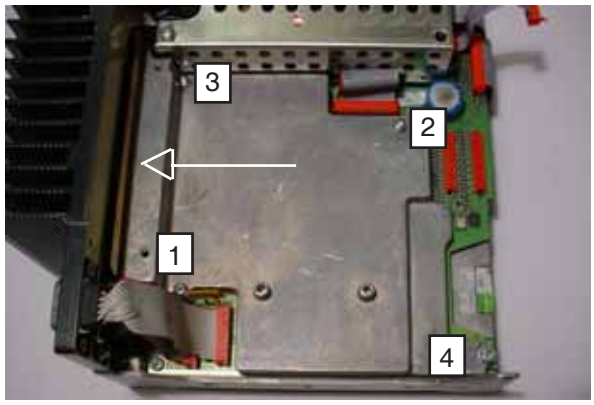


Fig. 5

- Insert (glasflex) insolation over each PA- module pin.
  Solder each pin to the RF module soldering pads.
  Tools required: Soldering iron.

Fig. 6

- Position the shielding cover correctly over the RF-module.
  Install all 10 x screws loosely followed by tight ening the outermost 4 screws in the order indicated in the illustration, applying a torque of max. 0.7Nm.
  Tighten the remaining 6 x screws applying a torque of max. 0.7Nm.
  Using same sequence further tighten the 10 screws applying a torque of max. 1.0Nm.

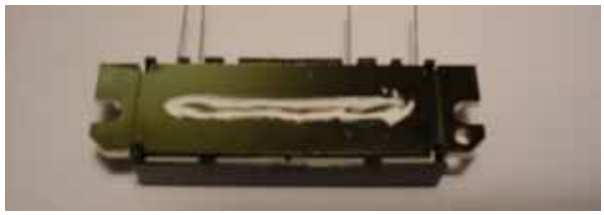


Fig. 7

- Connect duplex filter cabling according to their respective colour code – (See Fig. 2).
  - Ensure that each cable connector is seated properly in its respective mating connector of the RF module and position each cable in the appropriate cable groove of the RF module shielding cover.

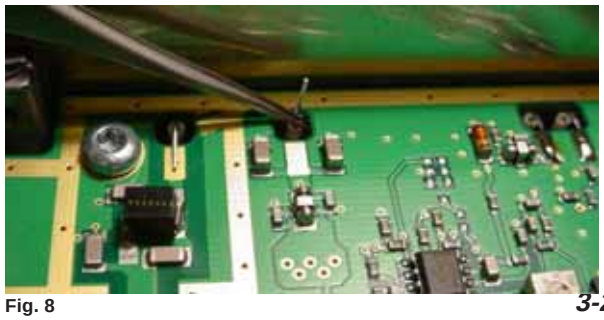


Fig. 8

3.2.14 Removing/installing the internal loudspeaker of the VHF

The transceiver front might need replacement (or perhaps only the speaker) if any of the flows indicate that replacement is needed.

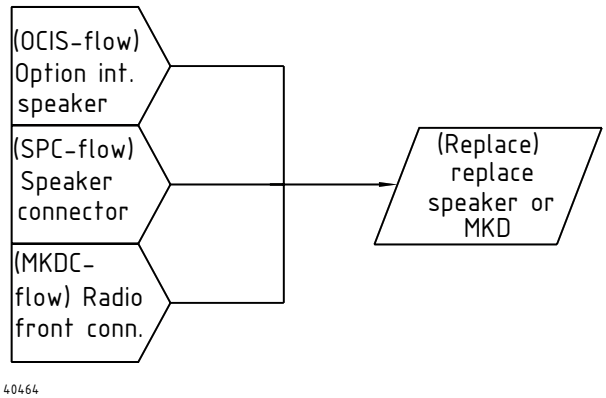


Fig. 5 MKD or internal speaker replacement. (See section 3.2.15 for details on fault identification)

No other tests have been created for further verification.

Use the following procedures & illustrations to remove/install the internal loudspeaker of the VHF5000.

Note: The Base Control Unit should be detached from the VHF Base Unit before proceeding (refer to para. 3.2.5.).

Removal:

- Remove 4 x screws securing the loudspeaker and loudspeaker housing to the Base Control Unit.
- Remove loudspeaker housing and lift out loudspeaker.

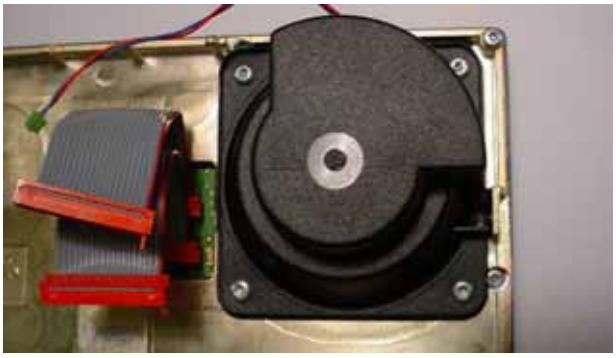


Fig. 1

Installing:

- Position loudspeaker and loudspeaker housing correctly in Base Control Unit with cable outlet at top.
- Install 4 x screws and tighten by applying a torque of max. 0.7Nm.
  Tools required: Torx screwdriver, size 10.

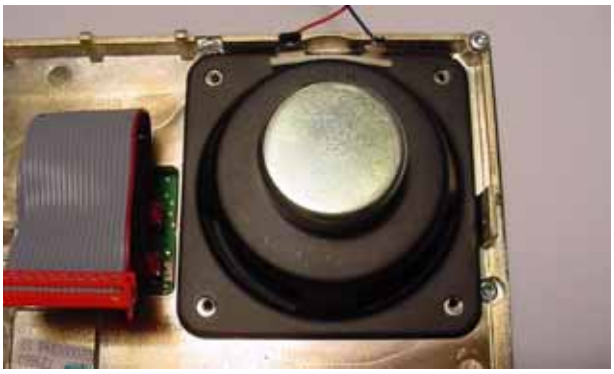


Fig. 2

3.2.15 Detailed fault finding

Identifying failures on the external connectors
This section will describe some possible scenarios to follow if the RT5022/RT5020 seems to be working poor or not at all together with attached external devices.

Before dismantling the transceiver unit, check always first the installation (with reference to the installation section in the manual). A full replacement of the RT5022 or RT5020 transceiver, to verify the installation, might save time before looking for errors inside the transceiver.

(PC) - Power connector
If you reach this section of the manual, it is because it has been impossible to power on the product. Installations and battery is already checked and found OK. The power connector is located on the rear side top right (see Section “Interface connections” in the installation section).

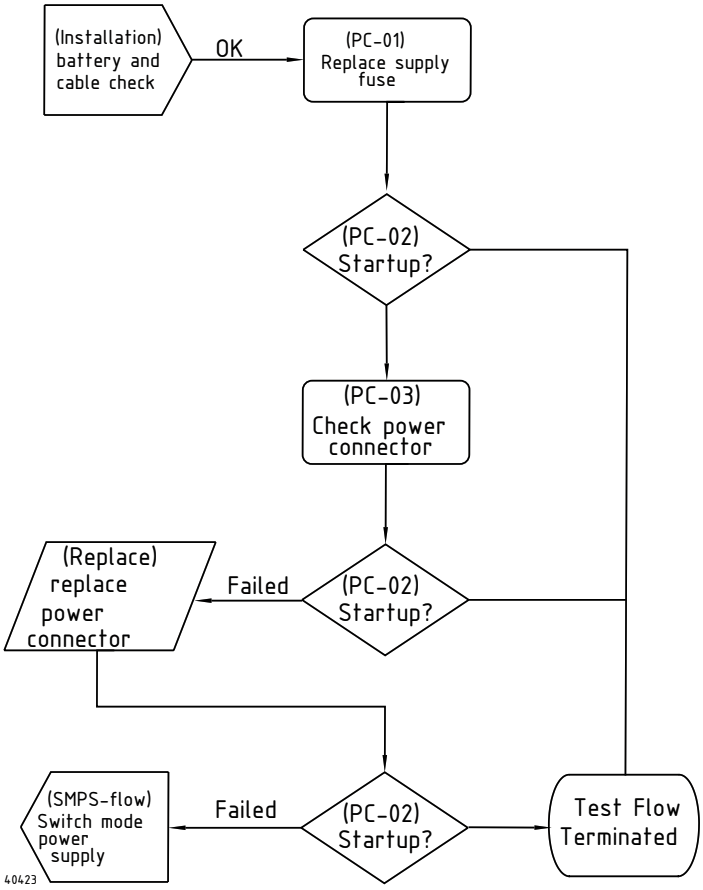


Fig. 6 (PC) - Power connector validation flow

Reference	Operation/Test	Test Criteria	Comments/instructions
PC-01	Replace main fuse in power line		On the back of the radio the main fuse is located. Check the fuse is fixed or replace the fuse with another one. See also installation section of the RT5022/RT5020
PC-02	Check start-up of product.	**Pass:** The radio can be powered, and it is possible – without warning messages to transmit with 25W output. **Fail:** Otherwise	Verification should be done with mounted antenna on the RX/Tx antenna output, or dummy load.
PC-03	Check power connector.		Check the sanity of the power connector. Pull out power cable and check for corrosion. If OK insert again and secure Power connector should be replaced if in bad condition.

Tabel 2 (PC) - Power connector test operations

(RTA) - Rx/Tx antenna connection

The Rx/Tx antenna connection is located on the rear right side of the VHF transceiver (see Section “Interface connections” in the installation section). If you reach this section of the manual, it is because there are identified problems with either the transmission of Voice/DSC or the reception of a voice signal. Antenna conditions and antenna installations have been checked OK as well.

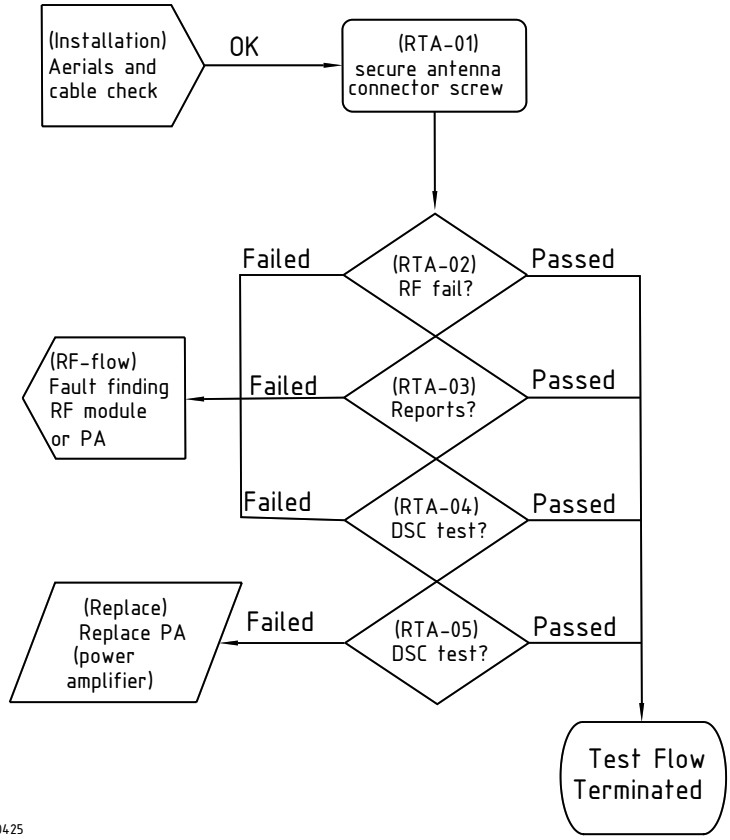


Fig. 7 (RTA) - Rx/Tx Antenna connection

Reference	Operation/Test	Test Criteria	Comments/instructions
RTA-01	Secure antenna connector		The antennas must be attached using original antenna connectors. The connector is buckled tight onto the antenna bush.
RTA-02	Check reports for severe RF module errors in transceiver display.	**Pass:** None of the listed messages **Fail:** Otherwise	During Rx/Tx shifts (PTT) no error messages with the category: “System malfunction” must be shown, e.g. Synthesizer lock errors.
RTA-03	Check reports for other errors in transceiver display.	**Pass:** No errors. Though high temperature protection messages are allowed. **Fail:** Otherwise.	Error messages should not show while the unit is used normally If an RT5020-duplex radio, power cycle product. Watch for the message (temp too high.....). In case this message appear, the product was overheated and automatically protected by degrading output power.
RTA-04	Make a DSC test	**Pass:** All DSC tests passed. **Fail:** External test fails, but internal test passes	External DSC test • Do a safety test call to an individual station or a GMDSS tester. Internal DSC test • From the transceiver front select the internal DSC test command from menu **5.5**.
RTA-05	Check output power	**Pass:** Output power higher than 25W **Fail:** See comments on the right	Measured with a power meter. In case the power is not what was expected and/or the message “Transmitter output power not valid” is shown in the display, but the product seems otherwise functional, proceed to PA replacement.

Tabel 3 (RTA) - Rx/Tx antenna connector tests

(DSCA) - DSC receiver antenna connection

The DSC antenna connection is located on the rear left side of the VHF transceiver (see Section “Interface connections” in the installation section). If you reach this section of the manual, it is because there are identified problems receiving DSC calls. Antenna conditions and antenna installations have been checked OK as well.

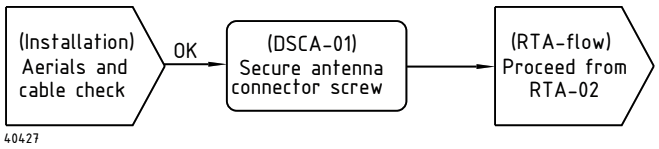


Fig. 8 (DSCA) - DSC antenna connection

Reference	Operation/Test	Test Criteria	Comments/instructions
DSCA-01	Secure antenna connector		The antennas must be attached using original antenna connectors. The connector is buckled tight onto the antenna bush.

Tabel 4 (DSCA) – DSC antenna connector tests.

(OCGP) – GPS/NMEA input

The option connector is the upper D-SUB 15 Male connector on the rear side (see Section “Interface connections” in the installation section). The GPS input is a differential input on pins 12 and 13.

This section is consulted after the installation and sanity check of the GPS device has been performed.

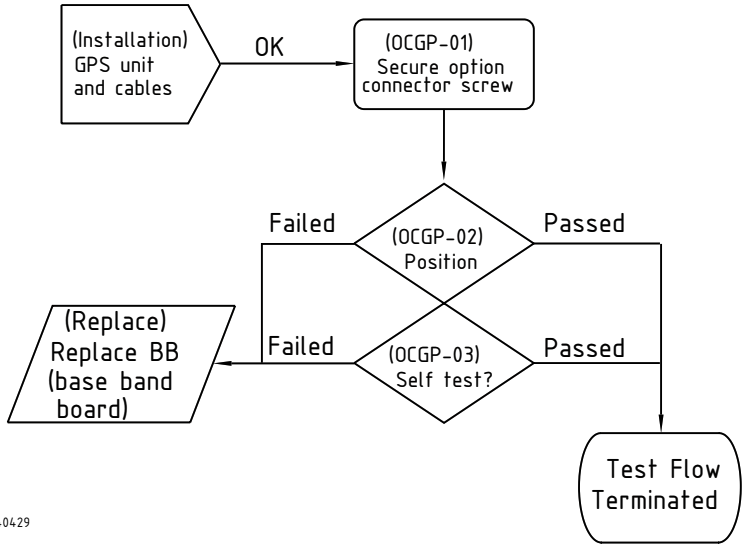


Fig. 9 (OCGP) - Option connector GPS tests

Reference	Operation/Test	Test Criteria	Comments/instructions
OCGP-01	Secure option connector		The 15-pole DSUB cable connector is fixed to the transceiver using the **NOTE:** *Refer to the installation section for connector pin ratings.*
OCGP-02	Verify position on Idle screen	**Pass:** The header line must **Fail:** Any other: (invalid) (manual) (GPS-OFF), shown when external GPS equipment is functioning, indicates the NMEA connection is defect.	
OCGP-03	Run GPS self test	**Pass:** The position is shown, and the header line must **Fail:** “Not connected” is shown in display.	The GPS test is executed by selecting “GPS” in the accessory menu **5.6.**

Tabel 5 (OCGP) - Option connector GPS tests

(OCVDR) – Option connector VDR interface

The option connector is the upper D-SUB 15 Male connector on the rear side (see Section “Interface connections” in the installation section). The VDR output is a differential output on pins 1 and 2

This section is consulted after the installation and sanity check of the VDR device has been performed.

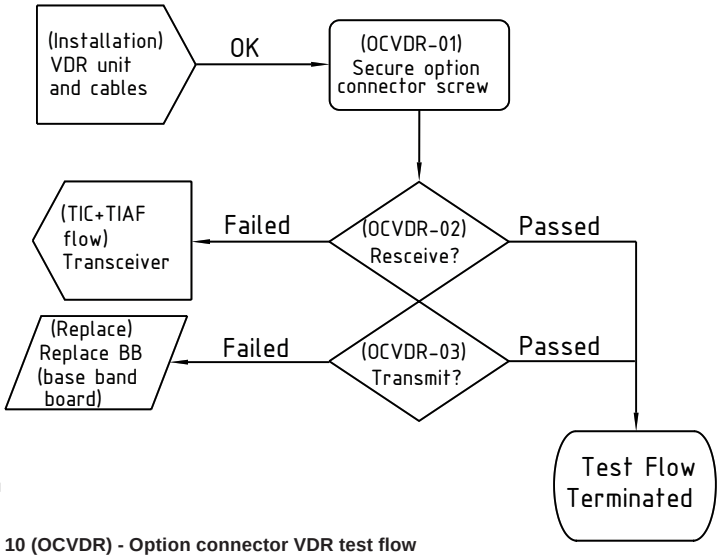


Fig. 10 (OCVDR) - Option connector VDR test flow

Reference	Operation/Test	Test Criteria	Comments/instructions
OCVDR-01	Secure option connector		The 15-pole DSUB cable connector is fixed **NOTE:** *Refer to the installation section for connector pin ratings.*
OCVDR-02	Verify received signal is passed to the VDR output	**Pass:** Voice signal received can be measured on pins 1 and 2. **Fail:** Signal is not measured OK.	The signal output on the VDR output is a 0dBm signal.
OCVDR-03	Verify transmitted signal is passed to the VDR output	**Pass:** Voice signal transmitted can be measured on pins 1 and 2. **Fail:** Signal is not measured OK.	The signal output on the VDR output is a 0dBm signal.

Tabel 6 (OCVDR) - Option connector VDR tests

(OCR) – Option connector external relay terminals

The option connector is the upper D-SUB 15 Male connector on the rear side (see Section “Interface connections” in the installation section). The Relay terminals are assigned as follows:

- AUX2 – pins 3 and 4
- AUX1 – pins 5 and 6
- DSC CALL – pins 9 and 10
- DSC ALARM – pins 14 and 15

This section is consulted after the installation and sanity check of the connected external devices and that the loading of the relays are within the specified values.

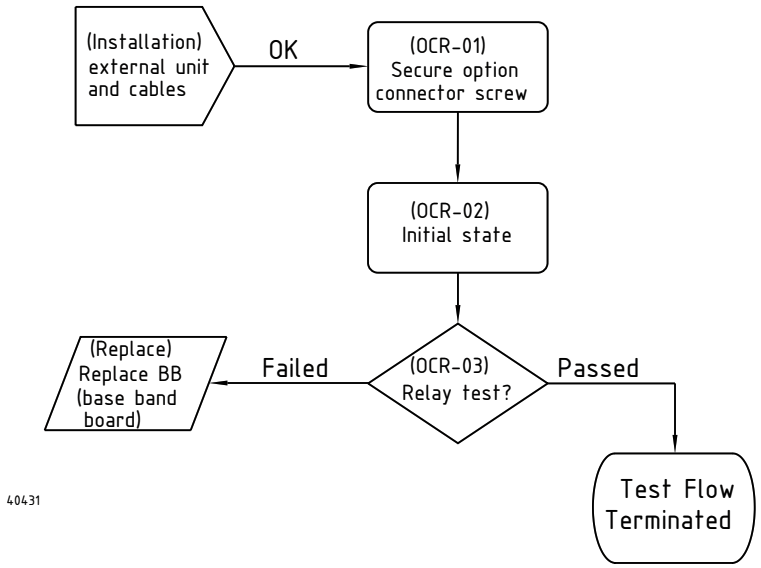


Fig. 11 (OCR) - Option connector relay test flow

Reference	Operation/Test	Test Criteria	Comments/instructions
OCR-01	Secure option connector		The 15-pole DSUB cable connector is fixed to the transceiver using the corresponding screws. ***NOTE:*** *Refer to the installation section for connector pin ratings.*
OCR-02	Initialize relay states to open state		The DSC CALL and DSC ALARM open relay state is achieved if no active DSC calls are active. The open state of the AUX1 and AUX2 relays is achieved by selection of a channel where the AUX relays has not been set as a channel property via the service tool.
OCVDR-03	Verify relay function	**Pass:** Closing state is recognized for all relays while alarm tone is heard. Open state is recognized when sound stops. **Fail:** Otherwise.	The relay test is executed via the menu **5.4**. The closing state will be activated in 3 seconds.

Tabel 7 (OCR) - Option connector relay test tasks

(OCIS) – Option connector internal speaker output

The option connector is the upper D-SUB 15 Male connector on the rear side (see Section “Interface connections” in the installation section). The internal speaker in the transceiver is connected to the pins 7 and 8 in this connector facilitated test purposes. If no audio is coming out of the built in speaker, while expected, the built in speaker might need replacement.

NOTE: During normal operation of the radio pins 7 and 8 in the option connector shall be left Not connected.

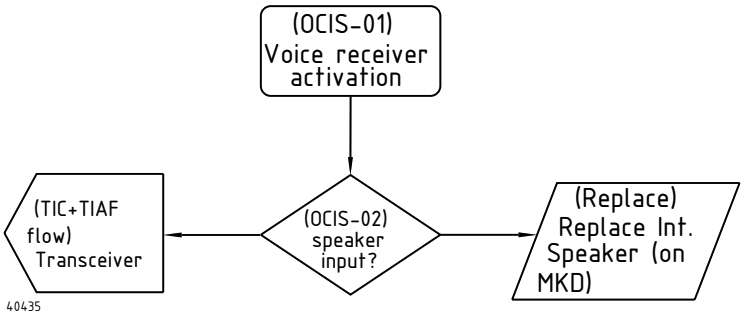


Fig. 12 (OCIS) - Option connector internal speaker amplifier verification

Reference	Operation/Test	Test Criteria	Comments/instructions
OCIS-01	Activate voice receiver		E.g. by turning down squelch button or run the alarm test from menu **5.4.**
OCIS-02	Verify voice data reception.	**Pass:** Voice signal is measured OK between pins 7 and 8. **Fail:** No signal measured on option pins 7 and 8.	Speaker input is OK but no sound is heard in the built in speaker. Quality could be checked by connecting a sound device between the two pins. **NOTE:** *Refer to the installation section for connector pin ratings*.

Tabel 8 (OCIS) - Internal speaker amplifier verification

(SPP) – SPARC-II connector Supply

The SPARC-II connector is the middle D-SUB 15 female connector on the left rear side (see Section “Interface connections” in the installation section). Accessories attached to the SPARC bus do need to be supplied from the connector.

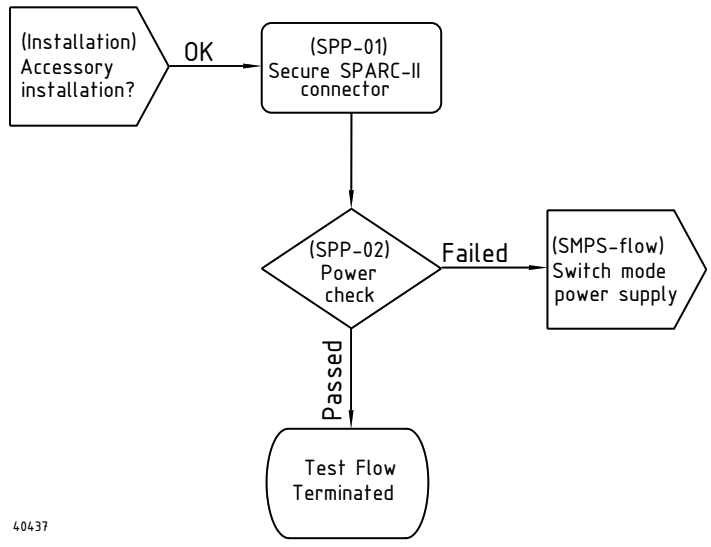


Fig. 13 (SPP) - SPARC-II bus power check

Reference	Operation/Test	Test Criteria	Comments/instructions
SPP-01	Secure SPARC-II connector		The 15-pole DSUB cable connector is fixed to the transceiver using the corresponding screws. **NOTE:** *Refer to the installation section for connector pin ratings.*
SPP-02	Check power supply in SPARC-II bus connector	**Pass:** All supplies are valid. **Fail:** Otherwise.	The following pins shall be measured to 12.5V: 1, 7 and 10. Ground for measurement should be pins 6 and/or 13.

Tabel 9 (SPP) – SPARC-II bus power check

(SPD) – SPARC-II connector data check

The SPARC-II connector is the middle D-SUB 15 female connector on the left rear side (see Section “Interface connections” in the installation section). All of the accessory units (CU5000 or AP4365) that can be connected to the SPARC-II port make use of the data signals in the line. If one unit is operational on the SPARC-II bus the transceiver connection is OK. The best verification unit is the SB5006 service tool.

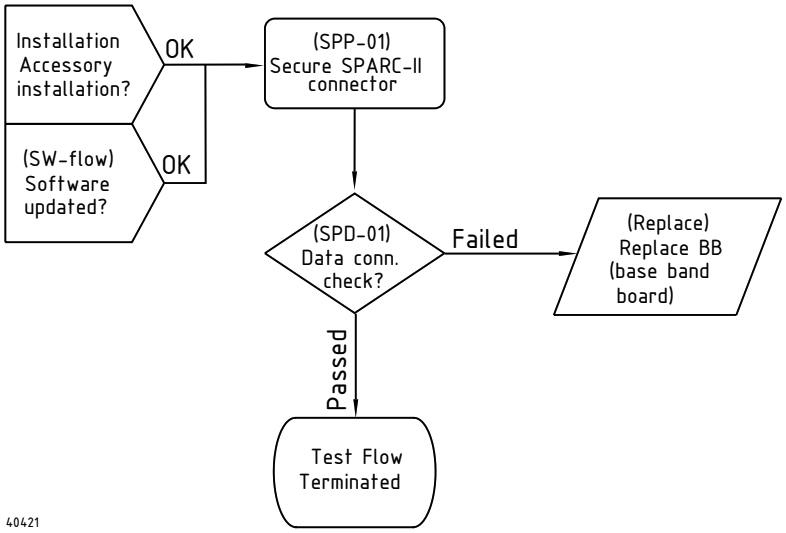


Fig. 14 (SPD) - SPARC-II Data connection test flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
SPD-01	Secure SPARC-II connector		The 15-pole DSUB cable connector is fixed to the transceiver using the corresponding screws. **NOTE:** *Refer to the installation section for connector pin ratings.*
SPD-01	Check data connection on the SPARC-II connector	**Pass:** Operational HTML pages. **Fail:** Missing data pages	The service tool is connected to the RT5022 SPARC-II connector. Power-on the RT5022. Verify the SB5006 service pages can be browsed without problems.

Tabel 10 (SPD) - SPARC-II Data connection verification.

(SPES) – SPARC-II external speaker test

The SPARC-II connector is the middle D-SUB 15 female connector on the left rear side (see Section “Interface connections” in the installation section). An external speaker can be connected to follow the Transceiver volume setting. The speaker output is located on pins 11 and 12.

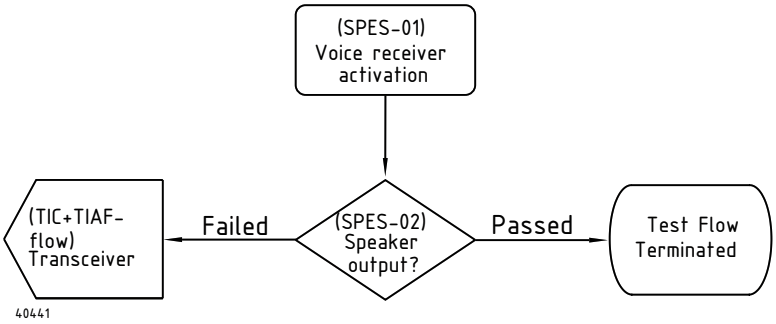


Fig. 15 (SPES) - SPARC-II connector external speaker test flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
SPES-01	Activate voice receiver		E.g. by turning down squelch button or run the alarm test from menu **5.4.**
SPES-02	Verify received voice signal	**Pass:** Voice signal is measured OK between pins 11 and 12. **Fail:** No signal measured on option pins 11 and 12.	Speaker output shall be controllable via the transceiver volume control. **NOTE:** *Refer to the installation section for connector pin ratings.*

Tabel 11 (SPES) - SPARC-II connector external speaker tests.

(SPMA) – SPARC-II microphone audio line input

The SPARC-II connector is the middle D-SUB 15 female connector on the left rear side (see Section “Interface connections” in the installation section). The microphone line input in the SPARC-II connector contains the microphone voice signal to transmit when operating the RT5022/RT5020 from a CU5000. The microphone input line connects to the transceiver on pins 4 and 5.

To continue this test flow, you must verify you can establish a data connection on the SPARC-II bus. A CU5000 is needed to route the microphone audio to the baseband board via the.

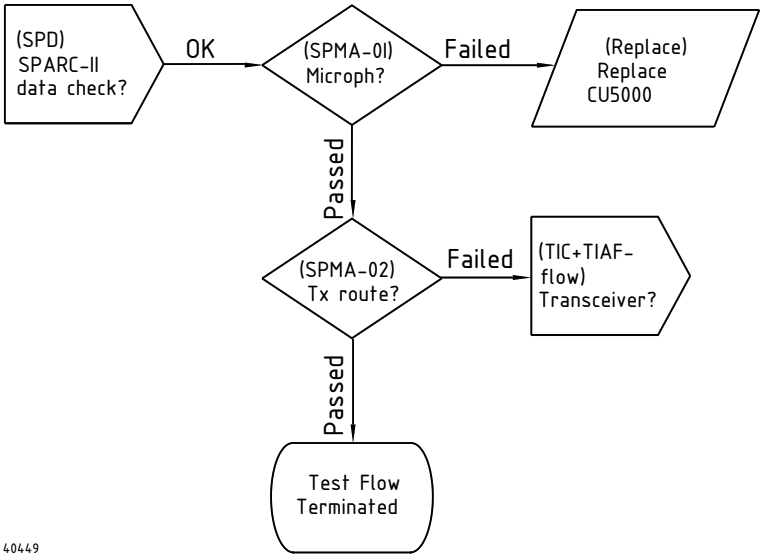


Fig. 16 (SPMA) - SPARC-II connector microphone audio input validation flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
SPMA-01	Verify microphone audio is routed out from the CU5000	**Pass:** Microphone audio signal is measured OK between pins 4 and 5. **Fail:** No signal measured on option pins 4 and 5.	Activate audio transmission by pushing PTT from an active CU5000. Measurement is done in parallel, f.ex. in the connection box. **NOTE:** *Refer to the installation section for connector pin ratings.*
SPMA-02	Verify audio routing is transmitted on radio	**Pass:** Measure transmitter output voice. **Fail:** No signal transmitted.	A VHF measure radio receiver can be used.

Tabel 12 (SPMA) - SPARC-II connector microphone audio input tests.

(SPRA) – SPARC-II Receive audio output

The SPARC-II connector is the middle D-SUB 15 female connector on the left rear side (see Section “Interface connections” in the installation section). The received audio output in the SPARC-II connector contains the received voice signal that is when operating the VHF from a CU5000. The receiver audio output is located on pins 8 and 9 in the connector.

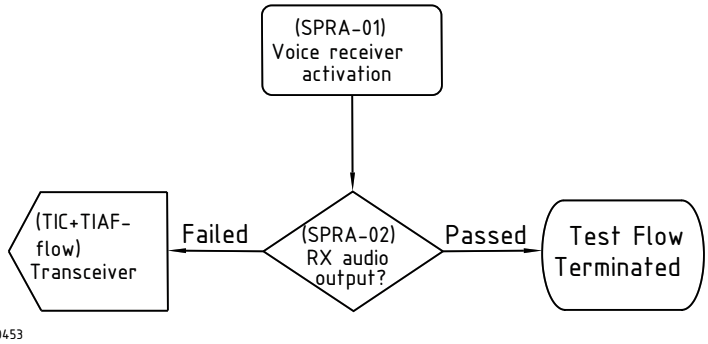


Fig. 17 (SPRA) - SPARC-II receive audio output verification flow

Reference	Operation/Test	Test Criteria	Comments/instructions
SPRA-01	Activate voice receiver		E.g. by turning down squelch button or run the alarm test from menu **5.4.**
SPRA-02	Verify received voice data	**Pass:** Voice signal is measured OK between pins 8 and 9. **Fail:** No signal measured on option pins 8 and 9.	The signal is a fixed normalized output. No volume control possible on this pin. **NOTE:** *Refer to the installation section for connector pin ratings.*

Tabel 13 (SPRA) - SPARC-II receive audio output verification tasks

(SPLO) – SPARC-II connector line output

The SPARC-II connector is the middle D-SUB 15 female connector on the left rear side (see Section “Interface connections” in the installation section). An auxiliary line output can be used to connect an external audio amplifier. Received voice is always routed to this output. The received audio line output in the SPARC-II connector contains any received voice signal. The receiver audio output is located on pins 14 and 15 in the connector.

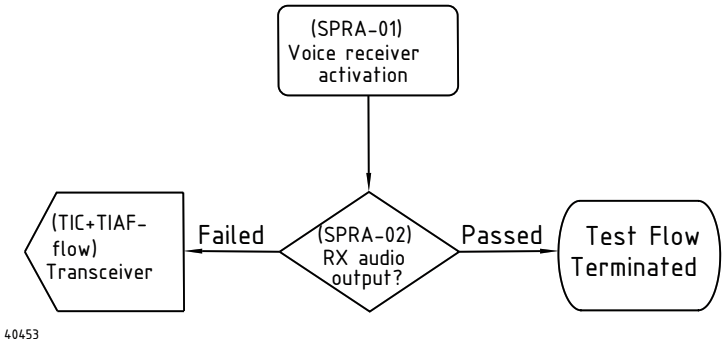


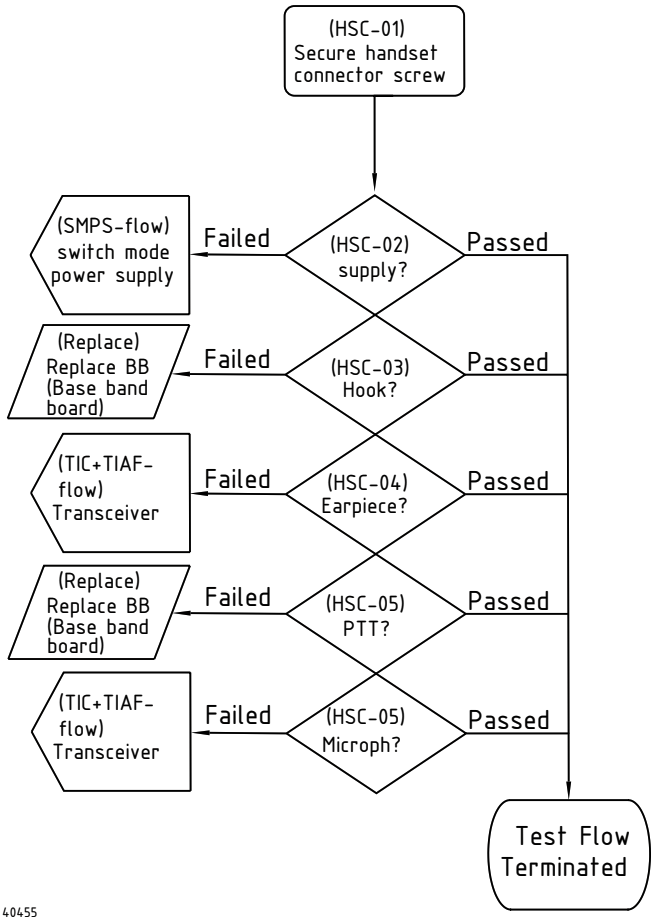
Fig. 18 (SPLO) – SPARC-II connector line output validation flow

Reference	Operation/Test	Test Criteria	Comments/instructions
SPLO-01	Activate voice receiver		E.g. by turning down squelch button or run the alarm test from
SPLO-02	Verify received voice data	**Pass:** Voice signal is measured OK between pins 14 and 15. Fail: No signal measured on option pins 14 and 15	The signal is a fixed normalized output. No volume control possible on this pin. **NOTE:** *Refer to the installation section for connector pin ratings.*

Tabel 14 (SPLO) – SPARC-II connector line output validation steps.

(HSC) – Handset connector flow

The handset connector is the lower D-SUB 9 connector on the rear left side of the transceiver (see Section “Interface connections” in the installation section). The handset connector validation – if problems with the handset are identified - is best done using a new handset or test equipment emulating a handset (see also section “Handset block” description).



40455

Fig. 19 (HSC) - Handset connector verification flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
HSC-01	Secure handset connector		The 9-pole DSUB cable connector is fixed to the transceiver using the corresponding screws. **NOTE:** *Refer to the installation section for connector pin ratings.*
HSC-02	Verify supply voltage	**Pass:** Measure 5V between pins 4 and (3,5,9). **Fail:** Otherwise.	
HSC-03	Hook on/off	**Pass:** Audio is routed to earpiece or PTT can control the Tx indicator on the transceiver – only if the handset is hooked-off. None **Fail:** Otherwise	Turn down squelch to receive voice.
HSC-04	Earpiece sound	**Pass:** Earpiece sound available using scenario in HSC-03. **Fail:** Otherwise	Assure earpiece level is set correct on the transceiver via menu **4.3.1.**
HSC-05	PTT function	**Pass:** Tx indicator on RT50XX is lit if PTT is **Fail:** Otherwise	Hook-off is required.
HSC-06	Handset microphone test	**Pass:** Tone is transmitted on VHF channel. **Fail:** Otherwise.	Apply a signal to the microphone input or use handset.

Tabel 15 (HSC) - Handset connector verification tasks.

Identifying module interconnect errors
As this section requires the opening of the transceiver unit (please refer to the assembly/disassembly sections). At this stage the following should already be checked:

- All installations have been verified to be sane and operational
- Accessory devices – if connected – have been validated.
- External connector validation flows have been followed.
- Self-test has been executed (menu **5**). The result of the self-test execution might be able to lead to some conclusions while searching for failures.

If one of the tests in this section fails, it would most likely involve the use of a cabling replacement kit. As a reference for locating the different connectors, please consult the electrical interconnection diagram. Pin number 1 is always identified by a red wire on the flat cables.

(SPC) – Internal speaker connection
The internal speaker is connected to the baseband PCB. The wires should be visually inspected for errors.

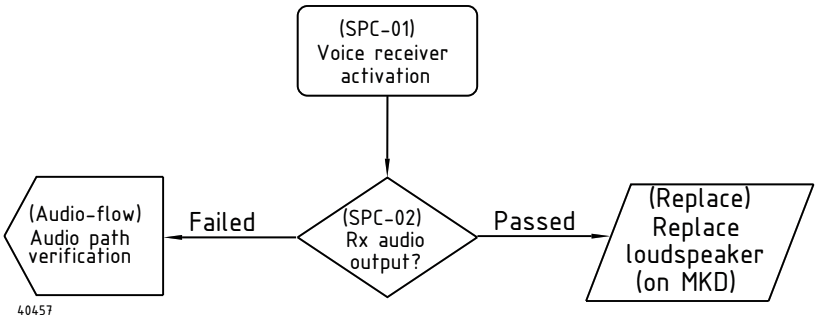


Fig. 20 (SPC) - Speaker connection check

Reference	Operation/Test	Test Criteria	Comments/instructions
SPC-01	Activate voice receiver		E.g. by turning down squelch button or run the alarm test from menu **5.4.**
SPC-02	Verify speaker signal	**Pass:** Speaker signal can be measured.	

Tabel 16 (SPC) - Internal speaker check.

(MKDC) – Connections to the radio front module
The radio control unit (front module) is connected using three flat cable connections:

- Display connector cable
- Keyboard connector cable
- Light connector cable

The check flow described in the following, is a guideline for identification of which module most likely is failing, and need to be replaced, after broken cables have been checked.

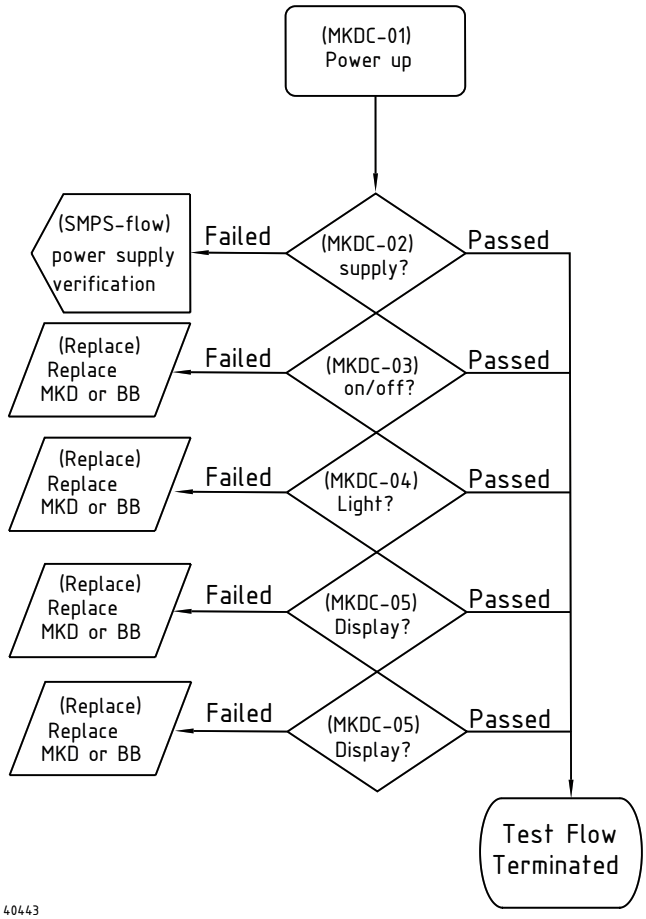


Fig. 21 (MKDC) - Radio front module connections.

Reference	Operation/Test	Test Criteria	Comments/instructions
MKDC-01	Power up radio		
MKDC-02	Power supply check	**Pass:** All power supplies are measured within **Fail:** Otherwise	See Figure (ref XX). Voltages are "LIGHT" connector: • Pin 5: +12.5V "DISPLAY" connector: • Pin 1: +5V • Pin 19: +3.3V
MKDC-03	Power on/off	**Pass:** Display switches to power off countdown when on/off is pushed. **Fail:** No reaction if on/off is pushed	
MKDC-04	Verify keyboard light and upper display segment light	**Pass1:** Keyboard light is activated all over the key pad. **Pass2:** All segments are activated. **Fail:** Otherwise.	**1)** Adjust the dimming level to maximum. If keyboard light is not activated at all the problem can also be in cable or baseband board. **2)** Run LED test from the self-test menu (5.3).
MKDC-05	Verify graphical display	**Pass1:** Display has adjustable backlight. **Pass2:** Pattern is perfectly recognized without any missing pixels or areas. **Fail:** Otherwise	**1)** Adjust the dimming level to maximum. If display back light is not activated at all, the problem can be in cable or baseband board. **2)** Run Display test from the self-test menu (5.2).
MKDC-06	Verify keypad and controls	**Pass1:** Volume and squelch knobs can control the volume and squelch indicator **Pass2:** Keypad test passed. **Fail:** Otherwise	**1)** Turn knobs left and right. **2)** Run Key test from the self-test menu **(5.1)**.

Tabel 17 (MKDC) - Radio front module checks

(MPC) – Module power connections

Three cables are connecting the main power supply:

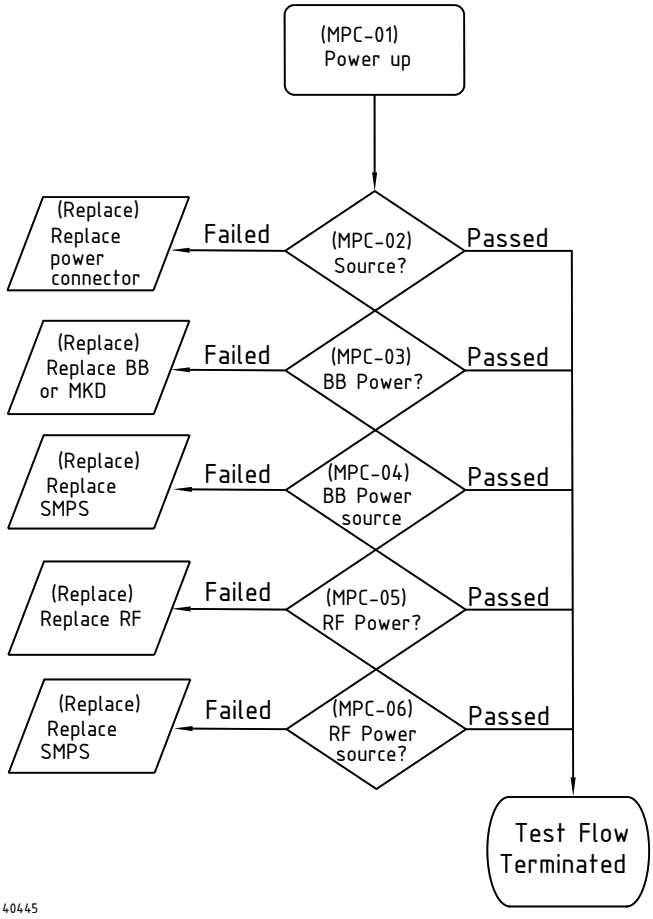


Fig. 23 (MPC) - Module Power supply check flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
MPC-01	Power up radio		
MPC-02	Power source check	**Pass:** Input power to the SMPS equals the voltage fed into the radio. **Fail:** Otherwise	See electrical interconnection diagram.
MPC-03	Baseband power	**Pass:** All voltages verified. **Fail:** Otherwise	Check voltages sourced into the baseband board are correct according to the prescribed voltages on the electrical interconnection diagram.
MPC-04	Baseband power source	**Pass:** All voltages verified. **Fail:** Otherwise	Repeat MPC-03 with “BASEBAND POWER SUPPLY” disconnected.
MPC-05	RF power	**Pass:** All voltages verified. **Fail:** Otherwise	Check voltages sourced into the RF board are correct according to the prescribed voltages on the electrical interconnection diagram.
MPC-06	RF power source	**Pass:** All voltages verified. **Fail:** Otherwise	Repeat MPC-05 with “RF POWER” disconnected.

Fig. 18 (MPC) - Module power supply checks.

(ECC) – Connector cables to external devices
Three cables are connecting external devices to the baseband module:

- SPARC connector
- Option connector
- Handset connector

If any external connector verification flow is failing, each of these three connector cables are examined for errors. If no errors are found on the cables, the baseband module PCB probably need to be replaced. If a power supply measure fails in any of the external connector checks, proceed to verification of the power supply module (SMPS).

(TIC) – Transceiver interconnection
The internal transceiver connection between the baseband board and the RF board contains:

- Radio control signals.
- Voice receiver/transmitter AF signals and the DSC receiver AF signal.

In the following it is possible to identify if there is a problem on either two boards connected with the cable.

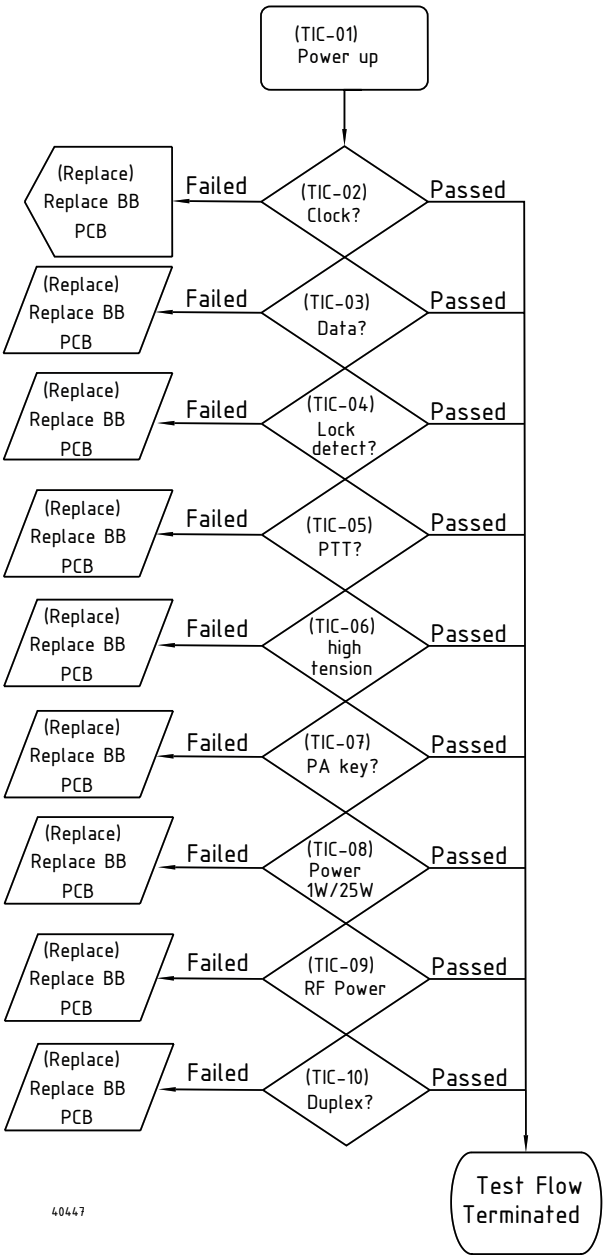


Fig. 24 (TIC) - Transceiver interconnection control signal flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
TIC-01	Power up radio		
TIC-02	SPI clock	**Pass:** Activity observed **Fail:** Otherwise	Digital output from baseband board (Pin 16) Check signal is toggling when activating/deactivating PTT.
TIC-03	SPI Data	**Pass:** Activity observed **Fail:** Otherwise	Digital output from baseband board (Pin 15) Check signal is toggling when activating/deactivating PTT.
TIC-04	Lock Detects	Pass: Signals high when required. Fail: Otherwise	Digital outputs from RF board. • Pin 12 – RX lock detect shall be high while receiving (measured 1 second after PTT is released). • Pin 14 – TX lock detect shall be high while receiving (measured 1 second after PTT is pressed). • Pin 13 – DSC lock detect shall always be high (measured 1 second after power- Any system failure reporting wrong frequencies in the display during normal operations, are related to these signals.
TIC-05	PTT	**Pass:** High on active PTT. **Fail:** Otherwise	Digital output from baseband board (Pin 8).
TIC-06	High Tension	**Pass:** High on active PTT. **Fail:** Otherwise	Digital output from baseband board Pin 6).
TIC-07	PA Key	**Pass:** High on active PTT. **Fail:** Otherwise	Digital output from baseband board Pin 7).
TIC-08	Power 1W/25W	**Pass:** Activation observed. **Fail:** Otherwise	Digital output from baseband board Pin 9). This signal is toggled by pushing the 1W button on the transceiver front.
TIC-09	Power Valid	**Pass:** High on active PTT. **Fail:** Otherwise	Digital output from RF board (pin 11). Shall be high during transmission (measured 1 second after PTT is activated).
TIC-10	Duplex (RT5020 duplex radio only)	**Pass:** Follow duplex channel selections (high on duplex channel). **Fail:** Otherwise	Digital output from baseband board. The duplex signal shall toggle if a channel shift from a duplex to a simplex channel is performed (or vice versa).

Tabel 19 (TIC) - Transceiver interconnection control signal verification tasks.

Control signals shall be verified before any AF signal path is checked (Transceiver interconnection control signal flow). If any of the control signals are failing it makes no sense to continue the following check flow (Transceiver interconnection AF flow).

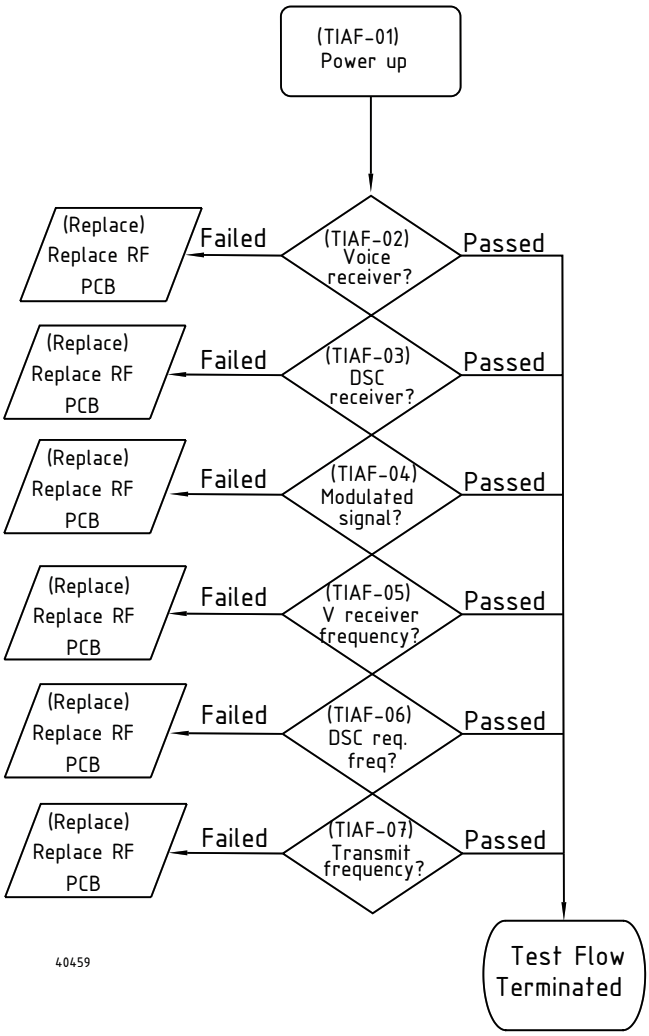


Fig. 25 (TIAF) - Transceiver interconnection audio frequency flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
TIAF-01	Power up radio		
TIAF-02	Voice receiver signal check	**Pass:** Activity AF signal present and – if equipment and skills are present - receiver **Fail:** Otherwise	Analog output (audio frequency) from RF board (pin 1). **1)** Bring radio in receiver mode generate signal on Rx/Tx antenna and check presence of the AF signal.
TIAF-03	DSC receiver signal check	**Pass:** Activity AF signal present and – if equipment and skills are present - receiver sensitivity measured OK. **Fail:** Otherwise	Analog output (audio frequency) from RF board (pin 4). **1)** Generate signal on DSC antenna and check presence of the AF signal. **2)** With use of suitable equipment, the DSC receiver sensitivity can also be verified.
TIAF-04	Voice modulation signal	**Pass:** Modulation signal is present. **Fail:** Otherwise	Analog output (audio frequency) from the baseband board (pin 3). **1)** Generate voice signal on any of the microphone inputs. Verify AF modulation signal. **2)** The modulation signal can also be generated with a DSC call transmission (e.g. via self test menu **5.5**).
TIAF-05	Voice receiver frequency	**Pass:** Test signal received OK on desired frequency. **Fail:** Otherwise	Generate a signal on the Rx/Tx antenna. Modulate the signal to a few test frequencies. Observe the clear voice data received with desired sensitivity.
TIAF-06	DSC receiver frequency	**Pass:** Test signal received OK on desired frequency (ch 70). **Fail:** Otherwise	Generate a DSC call sequence on the DSC antenna. Modulate the signal to channel 70. Observe the data is received with desired sensitivity.
TIAF-07	Voice transmitter frequency	**Pass:** Modulated test signal transmitted below frequency deviation. **Fail:** Otherwise	

Tabel 20 (TIAF) - Transceiver interconnection audio path flow.

3.3 Servicing the HS5001 transceiver handset

The HS5001 VHF transceiver handset comes in a single version. The handset used on the transceivers is identical for the RT5022 and RT5020.
NOTE: This handset is not the same as is used with the CU5000 remote control unit.

3.3.1 Manuals

There is no specific operations manual to the handset. Operation of the handset is described in the transceiver manual.

3.3.2 Service concept – HS5001 tranceiver handset

The passive handset HS5001 may be repaired onboard or in workshop in regards to replacement of the spiral cord only.

Supported service repairs
This manual will be instructive to do the following repairs on the transceiver unit:

- Cable

3.3.3 Mechanical assembly and disassembly

Removing/installing the spiral cable of the HS5001 Handset
Use the following procedures & illustrations to remove/install the spiral cable of the HS5001 handset. The sequence of the procedures applicable to the removal and the installation respectively is consecutively numbered 1 through 3 and should be carried out in accordance with this

Removal:

- Remove the 2 x screws as indicated in Fig. 1.
  Loosen (only) the screw at the cable end of the handset app. two turns – refer to Fig. 2.
  The upper handset part can now be separated from the bottom part – refer to Fig. 3.

- Remove the 4 x screws (crosshead) securing pcb tray to handset bottom part, refer to Fig. 4.
  Lift spiral cable bushing from its supporting bracket.

- Remove silicone packing from pc-board tray.

- Gently lift pc-board tray from handset bottom part just enough to turn over the tray to gain access to the pc-board.
  Disconnect spiral cable connector from pc-board (use a small flat head screwdriver to disengage connector from socket.
  Carefully guide connector out from tray through cutout, being careful not to damage the reed switch in the process, see Fig. 7.

Fig. 1


Fig. 2

Installing:

- Gently guide spiral cable connector through cutout in pc-board tray, being careful not to damage the reed switch in the process, see Fig. 7.
  Connect spiral cable connector to pc-board socket making sure connector is seated properly in socket.

- Install silicone packing over pc-board tray, making sure that packing groove is seated correctly all the way around.

- Position pc-board tray correctly in handset bottom part.
  Install 4 x screws securing tray and fasten by applying a torque of max. 0,3 Nm.
  Slide spiral cable bushing over its supporting bracket.
  Tools required:
  Torx screwdriver, size 8 or Crosshead screwdriver, size 2.5mm.


Fig. 3


Fig. 4

- Attach upper handset part to bottom part, engaging the taps at earpiece end first making sure that the two parts are seated correctly together – see Fig. 3 – and not having any cabling stuck between the two parts.
  Install 2 x screws and tighten by applying a torque of max. 0,4 Nm.
  Fasten the screw at the end of the handset by applying a torque of max. 0,4 Nm.
  Tools required:
  Torx screwdriver, size 10.

Fig. 5

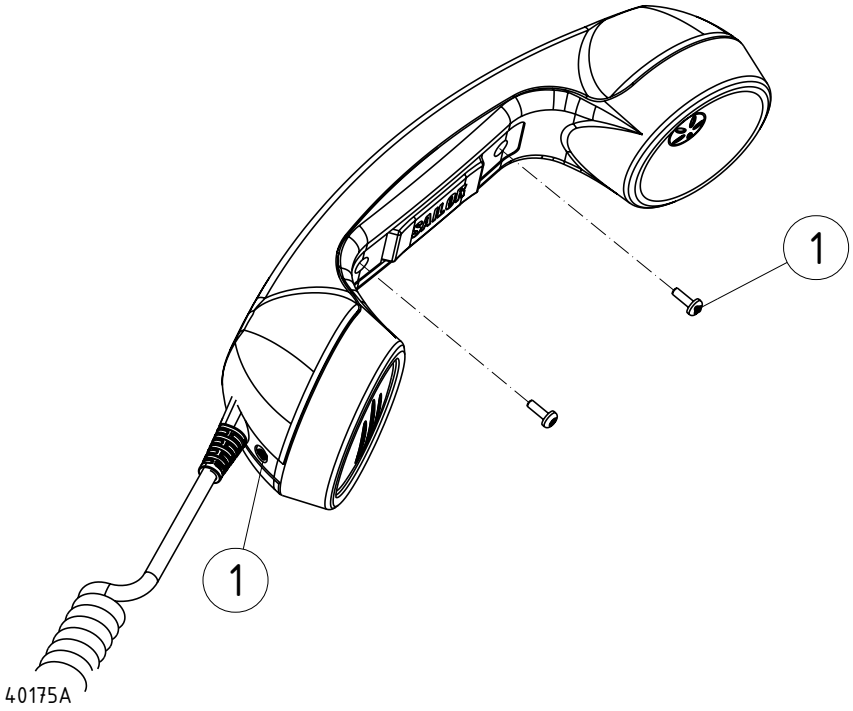
Fig. 6

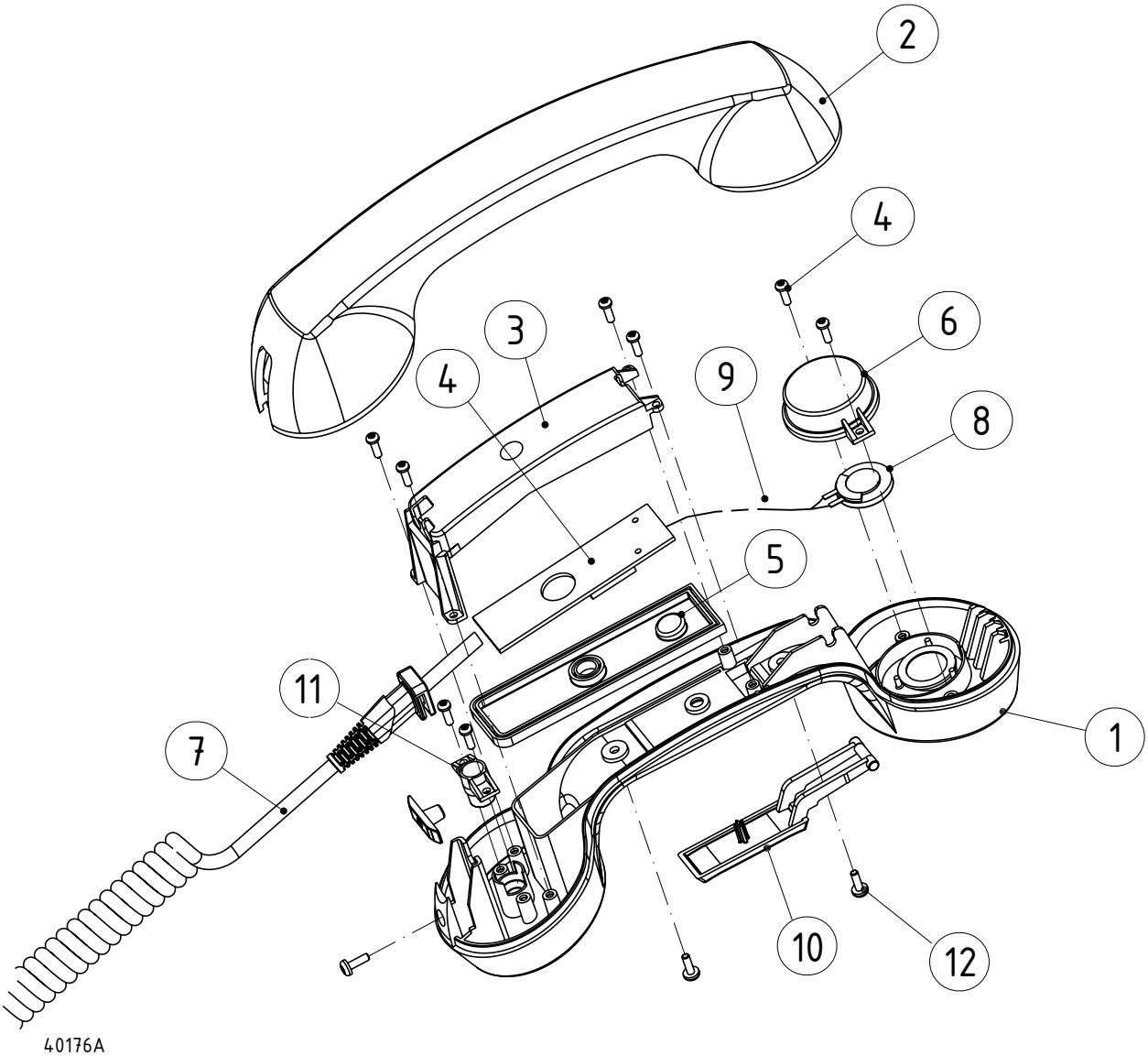
Fig. 7

Available spare parts

Check eShop at http://extranet.thrane.com

Drawings





3.3.4 Fault Finding (HS5001)

Fault finding on the HS5001 transceiver handset is done following exactly the same flow as for verifying the handset connector (HSC – Figure ??). Failing test should lead to errors in the handset functions tested, rather than following the suggested subsequent flows. Although any conclusion on handset errors should only be done if a new replacement handset works perfectly with the transceiver used for validation.

Common user faults

The most common operational faults are collected below:

Handset fixed upside down in cradle. The cradle contains a single magnet that matches the handset reed-switch. This means the hook-on state is only detected if the handset is hooked on to the cradle correct. The hook-on state can be checked the following way:

- Hook-on handset
- Press PTT while handset is hooked
- TX lamp on transceiver is not activated during PTT if the handset is hooked on.

3.4 Servicing the CU5000 remote control unit

Functionally there exists only a single version of the CU5000 remote control unit. The unit is operational with

3.4.1 Software

The CU5000 remote control unit contains software. Software update is possible in the units, but is not intended. Software update of the CU5000 is not intended performed on a regular basis, but is rather seen as a possibility to correct possible errors.

The CU5000 software is not contained in the transceiver software file, but will be distributed as a separate image.

The software update process is described in the SB5006 manual.

3.4.2 Manuals

There is no specific operations manual to the CU5000. Operation of the unit is fully described in the transceiver manual.

3.4.3 Service tool

The SB5006 service tool, that is used to update and configure the RT5022/RT5020 transceiver software, can also be used for updating the CU5000 software, if required.

3.4.4 Service concept – CU5000 Semi-functional Control Unit

The CU5000 Semi-functional Control Unit with integrated handset is not repairable. If taken apart in attempts to repair and subsequent re-assembling, the unit will not retain its waterproof integrity. Hence, if confirmed faulty the CU5000 Control Unit w/handset must be replaced in it’s entirety.

3.4.5 Fault Identifying tests (CU5000)

The CU5000 is water resistant, and shall never be disassembled for repair. The following flow describes a checklist to go through before determining the CU5000 should be replaced.

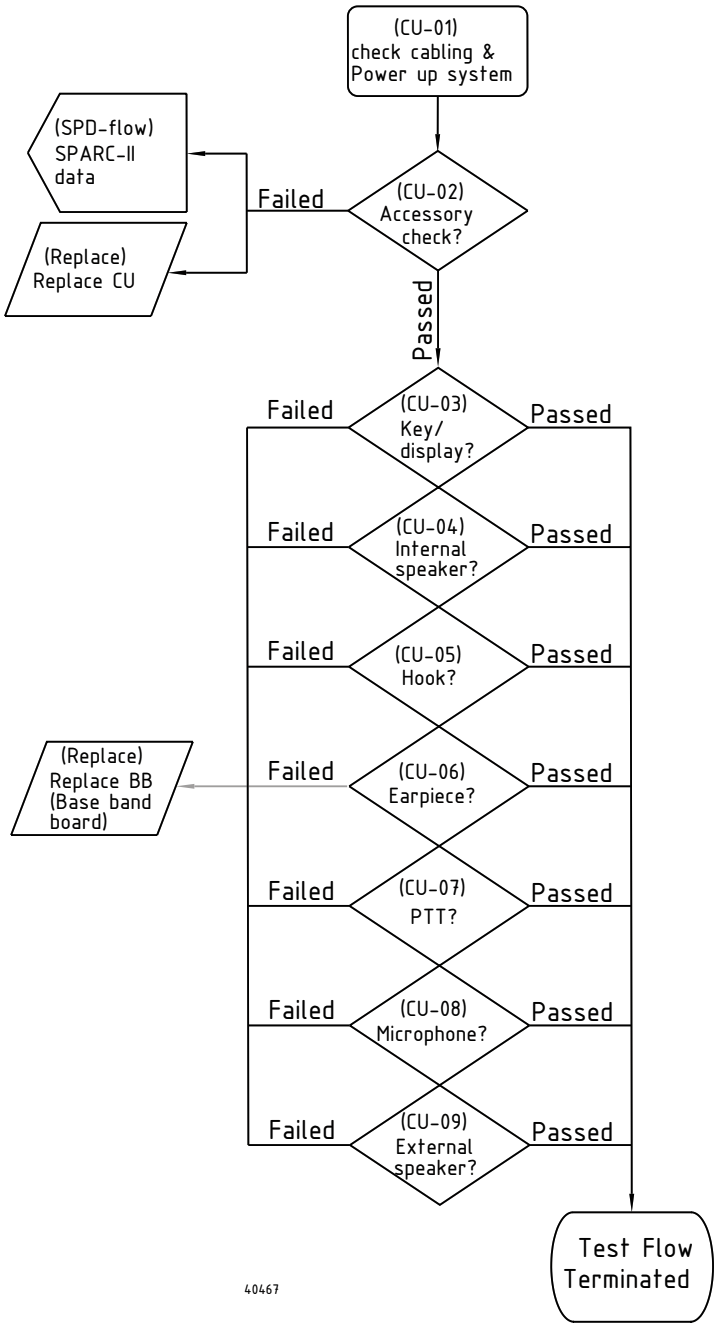


Fig. 26 (CU) - CU5000 verification flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
CU-01	Power up radio and CU5000		Power up the transceiver first. Then power up the CU5000.
CU-02	Verify connected CU	**Pass:** The CU5000 is lit. The number of powered CU's are reported in accessory self- **Fail:** Not connected or no light.	• If the CU5000 is not responding well press the "Dim" button. • Logic connection to VHF is verified under the self-test menu 5.6.5. • If the CU display contains "ES", connection to the VHF is failing.
CU-03	Key and display test	**Pass:** Functional test acting as expected. **Fail:** Otherwise	All keys are checked for functionality. Any of the key presses (except for mute) has a corresponding reaction in the display.
CU-04	Internal speaker	**Pass:** Internal speaker sound available. **Fail:** Otherwise	Turn down squelch to receive voice. Turn up volume on the CU5000.
CU-05	Hook on/off	**Pass:** Audio is routed to earpiece or PTT can control the Tx indicator on the CU5000 only if the handset is hooked-off. None of this is possible while hooked-on. **Fail:** Otherwise	Turn down squelch to receive voice.
CU-06	Earpiece sound	**Pass:** Earpiece sound available using scenario in CU-05. **Fail:** Otherwise	Assure earpiece level is set correct on the transceiver via menu **4.3.1.**
CU-07	PTT function	**Pass:** Tx indicator on CU5000 is lit if PTT is pushed. **Fail:** Otherwise	Hook-off is required.
CU-08	Handset microphone test	**Pass:** Tone is transmitted on VHF channel. **Fail:** Otherwise.	Activate microphone (PTT). Either observe signal on VHF channel or measure – if possible – the activation of the SPARC-II Microphone audio line.
CU-09	External speaker	**Pass:** External speaker sound available using scenario in CU-04. **Fail:** Otherwise	Pins 11 and 12 in the SPARC-II cable coming out of the CU5000 are optionally connected to external speakers. If this approach is used, the external speaker is controllable via the volume control of the CU5000.

Tabel 21 (CU) - CU5000 verification steps.

Common user faults

The most common operational faults are collected below:

Handset fixed upside down in cradle. The cradle contains a single magnet that matches the handset reed-switch. This means the hook-on state is only detected if the handset is hooked on to the cradle correct. The hook-on state can be checked the following way:

- Hook-on handset
- Press PTT while handset is hooked
- TX lamp on transceiver is not activated during PTT if the handset is hooked on.

3.5 Servicing the SB5006 service tool and LB5007 LAN box

The SB5006 service tool supports all VHF series 5000 products, that is either configurable (transceivers), or can be updated with new software (transceivers and remote control units).
To always assure the tool is optimal for servicing the SAILOR products it need to be upgraded to exploit service of the newest features available with the VHF series 5000 products.

The LB5007 shall only be installed if a printer is installed. The hardware and the software inside the LB5007 are identical to the SB5006 Service tool.

3.5.1 Software

The SB5006 hardware is released as two different platforms.

- Platform 1 is covered by software releases up to version **1.08**
- Platform 2 is covered by software releases from version **2.08** and up

NOTE: The LB5007 LAN box is built on platform 2 only.

To determine which version of the service tool is regarded, simply power it up and check the Service Tool frame on the front page. Below is shown the example for a platform 2.

LANBOX
169.254.86.86
Version 2.08
on Platform 2

The SB5006 software will be released on a regular basis on the extranet. We strongly recommend to upgrade for platform 2, as support for platform 1 solutions will not continue.

3.5.2 Manuals

SB5006 operation is covered in the SB5006 service tool operations manual. Please keep this updated along with your tool update.

3.5.3 Service concept

The service concept for the SB5006 unit is replacement only.

3.5.4 Fault identifying tests (LB5007/SB5006)

The LB5007 setup is described in the SB5006 manual. Basically the error scenarios that are seen on the SB5006 and LB5007 will be identical.

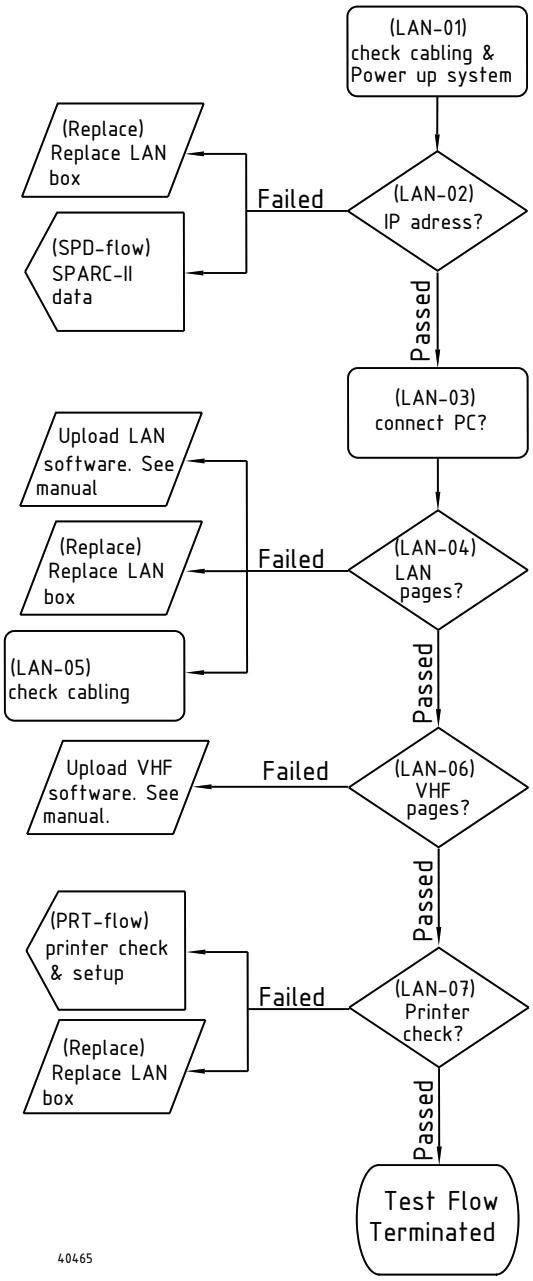


Fig. 27 (LAN) - LAN box verification flow.

Reference	Operation/Test	Test Criteria	Comments/instructions
LAN-01	Power up radio		Wait for approximately 20 seconds in an installation before any checks are performed.
LAN-02	Address of the LAN box	**Pass:** The IP address on the LAN box can be read out on the transceiver display. **Fail:** Not connected or IP address 0.0.0.0 is reported.	Verified under the self-test menu **5.6.3.**
LAN-03	Connect PC		Connect a service PC and browse for the IP address displayed in LAN-02.
LAN-04	Verify LAN HTML service pages	**Pass:** Index page is displayed correct. **Fail:** Otherwise	
LAN-05	Check cabling		Verify the correct cable is used to connect the service PC. • Crossed cable in connections without Ethernet switch • Otherwise a straight cable is used.
LAN-06	Verify VHF file system	**Pass:** VHF radio software versions are displayed on the main service page. **Fail:** Otherwise.	
LAN-07	Verify printer function	**Pass1:** The printer server is identified on the radio. **Pass2:** A test page can be printed.	**1)** The printer server is reported in the self-test accessory menu **(5.6.4)**. **2)** A test page is printed from the self-test menu **(5.7)**

Tabel 22 (LAN) - Lan box verification

3.5.5 Common user faults

Common problems using the SB5006/LB5007 units have been listed in the Trouble shooting section of the SB5006 manual (also Part 5 in this manual).

3.6 Servicing the AP4365/AP5065 Alarm Panel

For servicing the AP4365/AP5065 please refer to the AP4365/AP5065 manual.

3.7 Servicing the Matrix Printer

For servicing the OKI Microline matrix printer please refer to the H1252B printer manual.

3.7.1 Fault identifying tests (Printer)

The following checklist can be used to identify if the printer is somehow in disorder. As any printers in principle can be used with the RT5022/RT5020, the descriptions of only the OKI Microline (H1252B) will be specifically referenced.

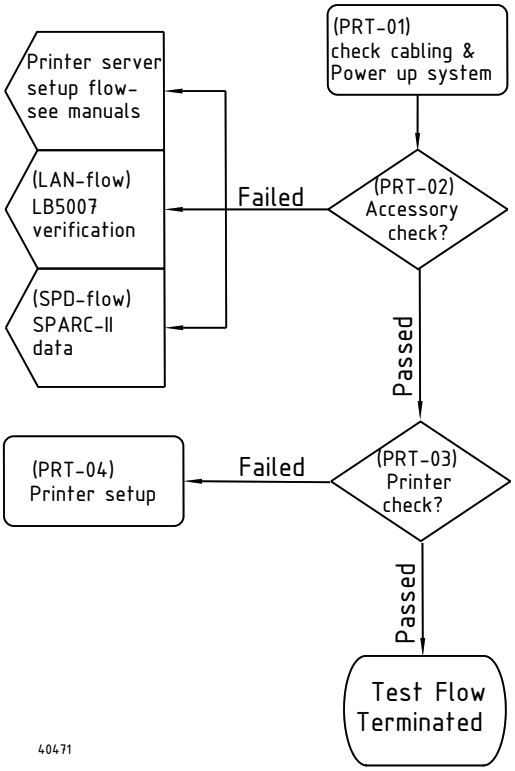


Fig. 29 (PRT) - Printer check flow

Reference	Operation/Test	Test Criteria	Comments/instructions
PRT-01	Power up radio		
PRT-02	Accessory check from VHF	**Pass:** The printer server is recognized in the VHF accessory check menu. **Fail:** Otherwise	Select the Printer server item in the accessory self test menu **(5.6.4)**. **NOTE:** *Two things are checked in this menu.* • *The presence of a LAN box (LB5007).* • *The presense of the printer server.*
PRT-03	Verify printer function	**Pass:** A test page can be printed. **Fail:** Otherwise.	A test page is printed from the self-test menu **(5.7)**.
PRT-04	Printer setup		Consult the printer manual for setting up the printer. For the OKI Microline the Latin 6 character set has been identified to be the best suitable for the current languages.

Tabel 24 (PRT) - Printer verification tasks.

4 Feature sales

For the VHF 5000 Series products it is possible to buy extra features. Once entered the matching license key in the product, the feature will be available to use.

The key is entered from the keypad on the transceiver. Once the key is entered the radio will have the application available forever.

4.1 How to get the license key

The feature enabling license key is acquired from the local sales office. When contacting the sales office for buying a key, the following information must be provided:

- The serial number of the product (can be read out via menu **4.6.1.2**)
- The feature to be enabled (see ordering information in Table 3-1)

4.2 Available features

In this section it is possible to examine the features that are available for the VHF 5000 Series products.

4.2.1 Scrambler

The scrambler option for VHF RT5022 makes it possible for the user to carry out private conversation on all simplex channels with another RT5022 capable of scrambling.

The scrambler option uses sophisticated technology to scramble the voice signal, which gives a high level of secrecy without compromising the speech quality.

The RT5022 scrambler option features an easy to use interface that only requires a minimum of interaction from the user to set up a scrambled call. The scrambled call is initiated using channel 70, which makes it possible to reach the call receiver at all instances.

During the initialisation of the scrambler a unique scrambling key is generated between the two parties, which ensures that only the intended listener is capable of decoding the message. To ensure the concealment of the conversation the replay functionality is disabled during the scrambled call.

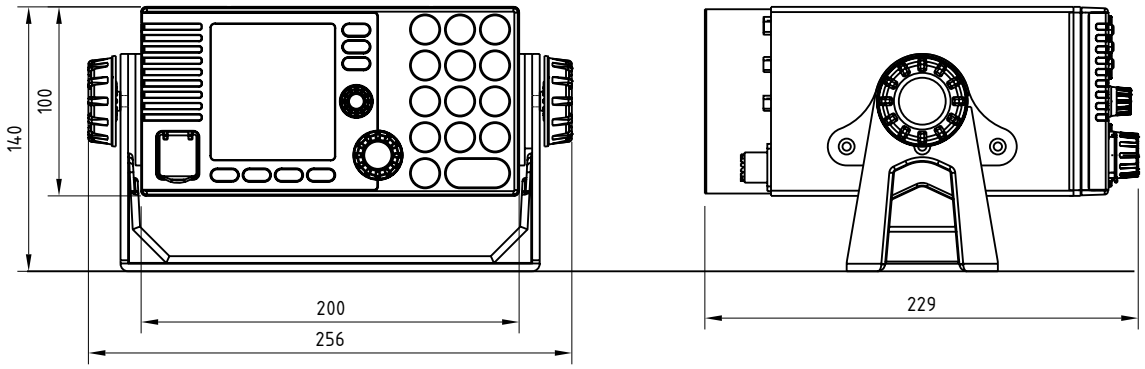
Enter the Scrambler licence key

The licence key for the Scrambler application is entered once for the product in menu **4.6.5**

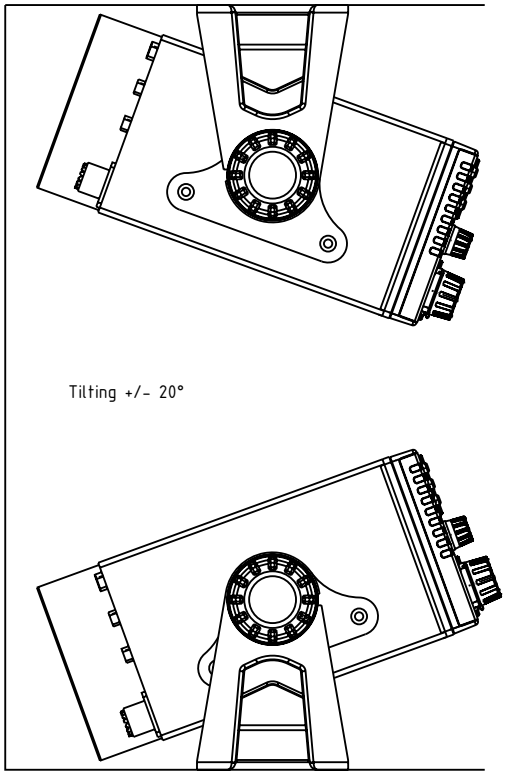
5 Installation

5.1 Mounting possibilities

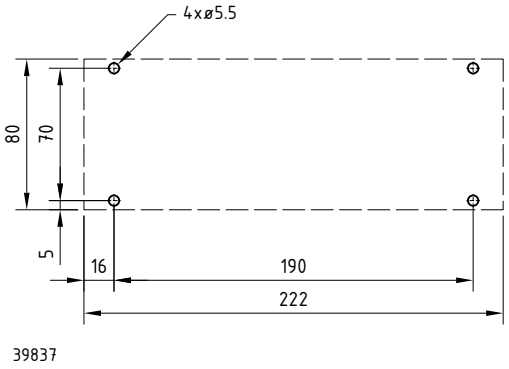
VHF with mounting bracket



Mounting option



Drilling plan



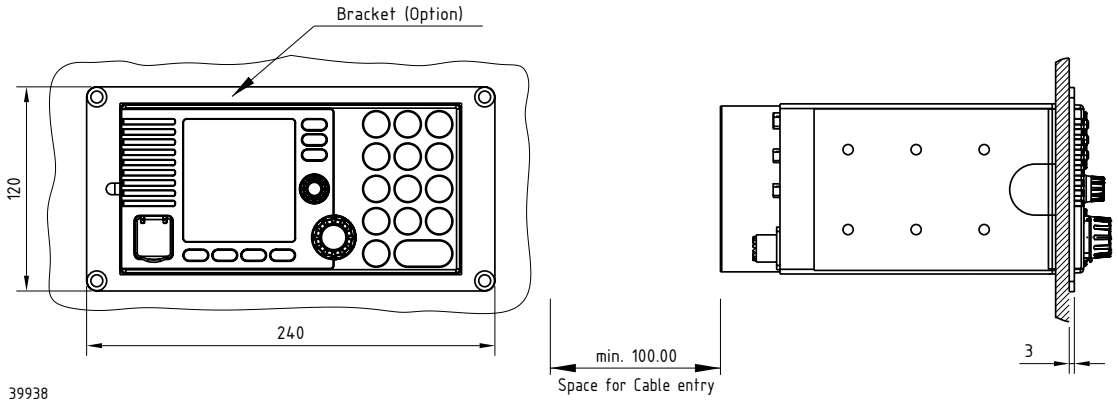
Weight (RT5022):

VHF	4.1 kg
Mounting bracket	1.0 kg

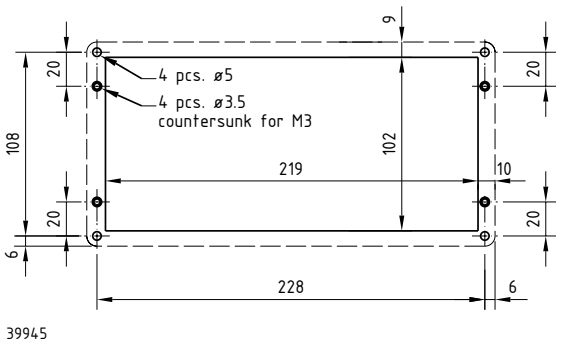
Weight (RT5020):

VHF	4.9 kg
Mounting bracket	1.0 kg

VHF with flush mounting bracket

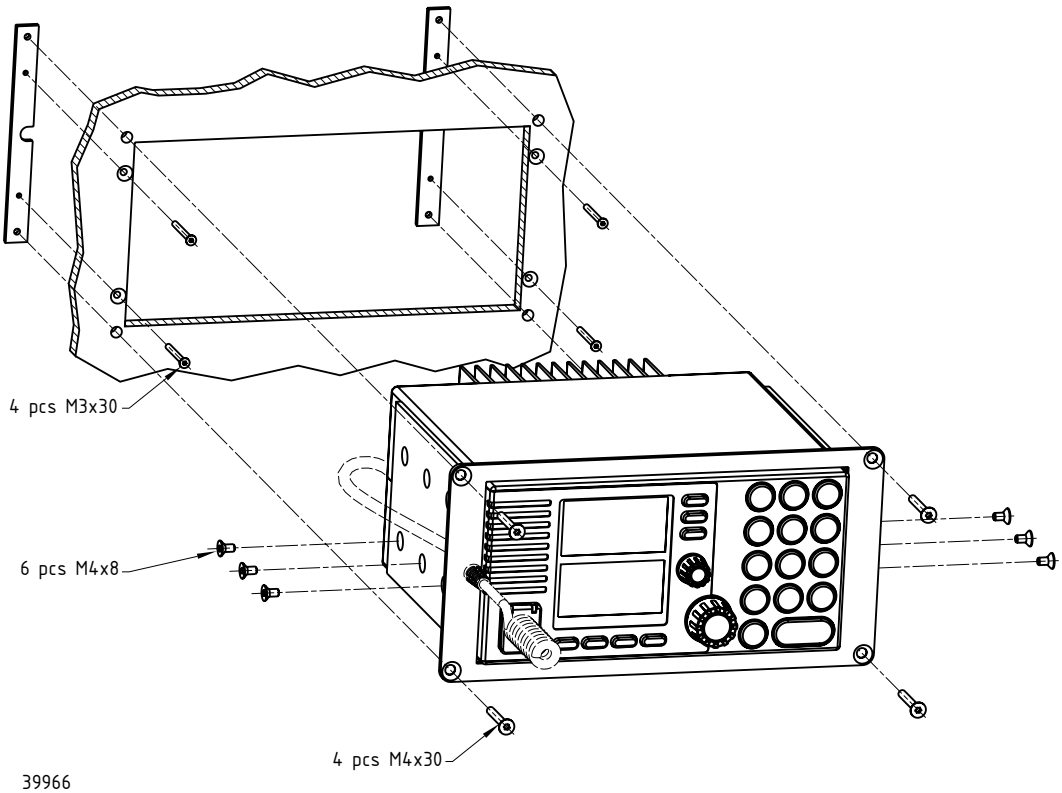


Drilling plan

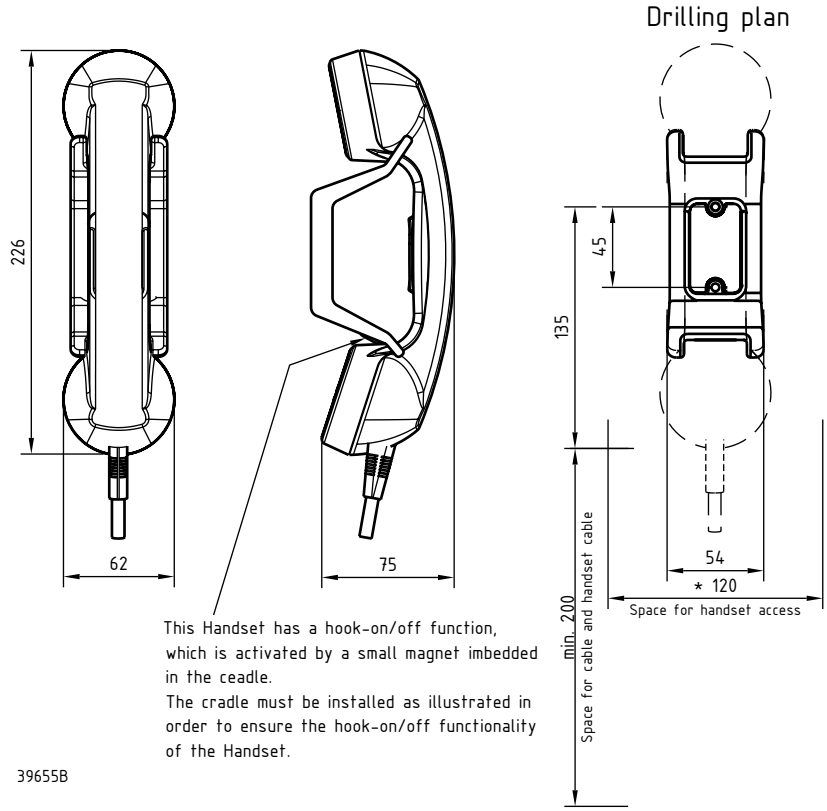


Weight:
Mounting kit
(Part no. 739814) 1 kg

WARNING:
Only use screws supplied with mounting kit for attaching flush mounting bracket to VHF radio.

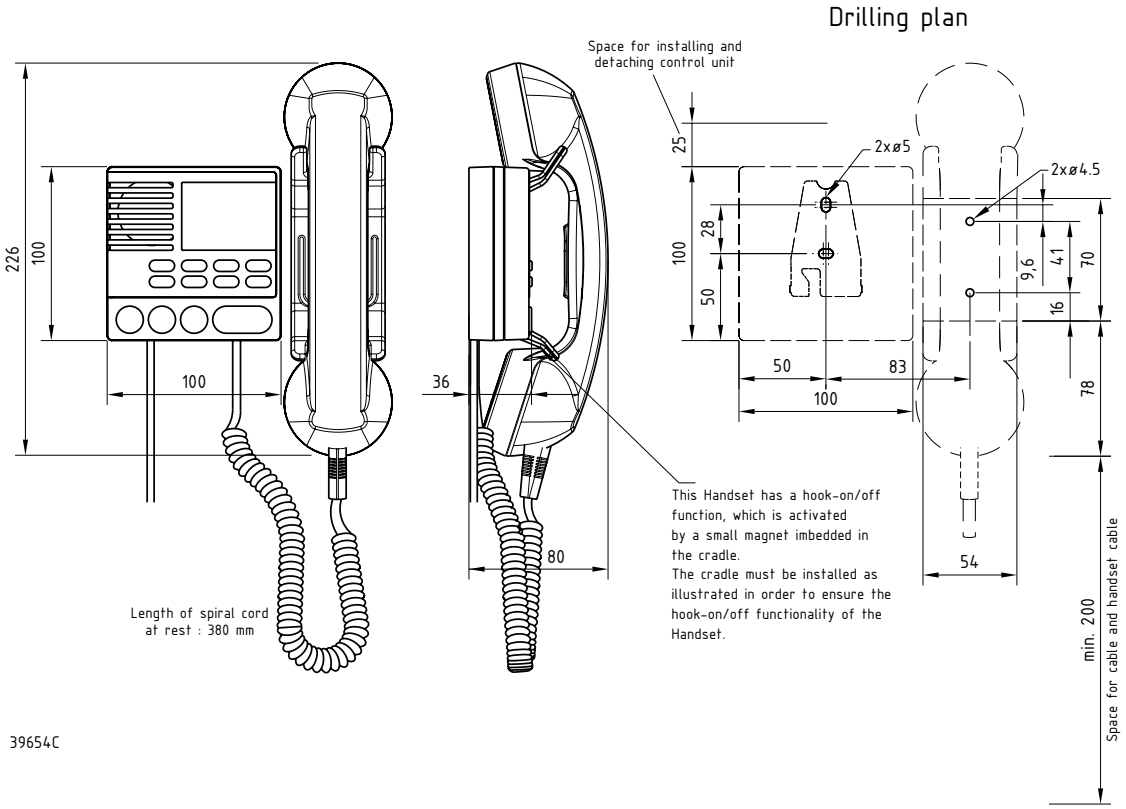


Handset for transceiver



Weight
Handset for transceiver 0.4 kg

Semi-functional control unit



Weight:
Semi-functional control unit 1.2 kg

Installing a single CU
After the CU is connected the unit can be operated straight away without any configuring.

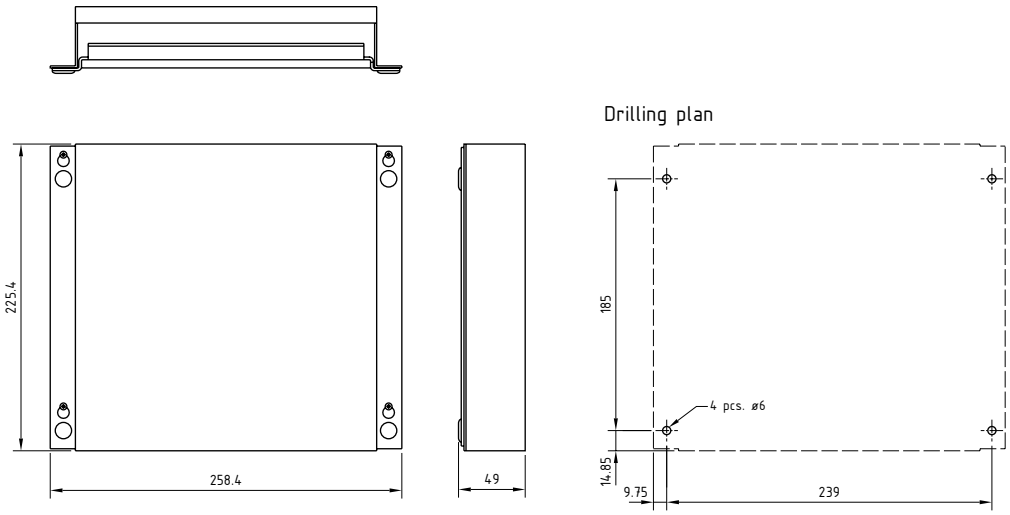
Installation with 2 CUs
If an installation is carried out providing 2 new CUs, it is important when powering these up for the first time, that this is done sequentially, to allow the CUs to acquire their individual identity on the SPARC II bus:

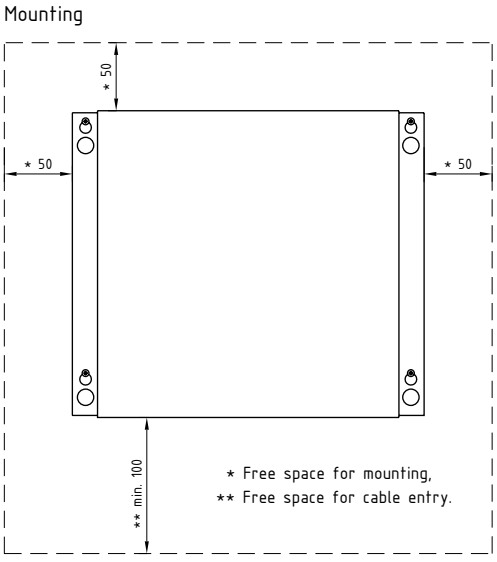
2 newly installed CUs:
- Power on VHF
- Power on first CU
- Power on second CU

If an additional CU is installed in a system already working with a single CU, the already existing CU must be switched on prior to the first power-on of the new CU.

Adding a CU in an installation already providing one CU:
- Power on VHF
- Power on the existing CU
- Power on the newly installed CU

This procedure is also followed if a CU is moved from another installation to this installation. Always turn on the existing CU before turning on the last acquired one - when powering for the first time after installation.
Connection box

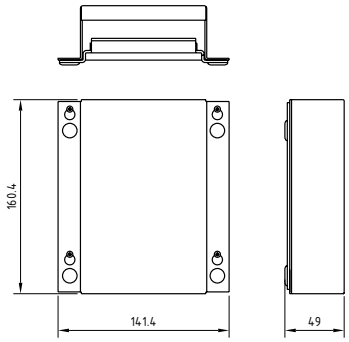


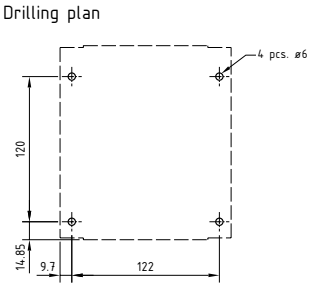


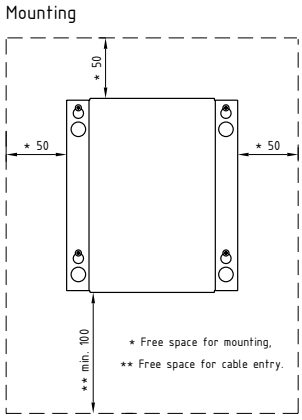
Weight
Connection box 1.7 kg

39656

Extension box

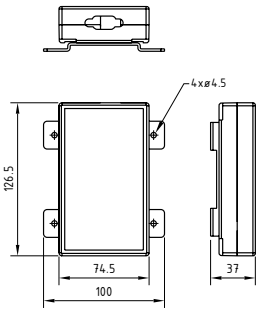


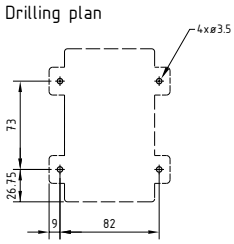


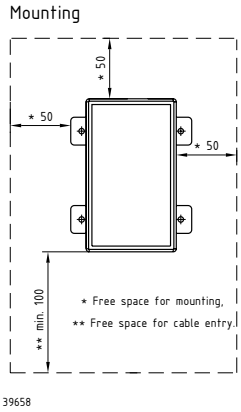


Weight
Extension box 0.7 kg

LAN box







Weight
LAN box 0.3 kg

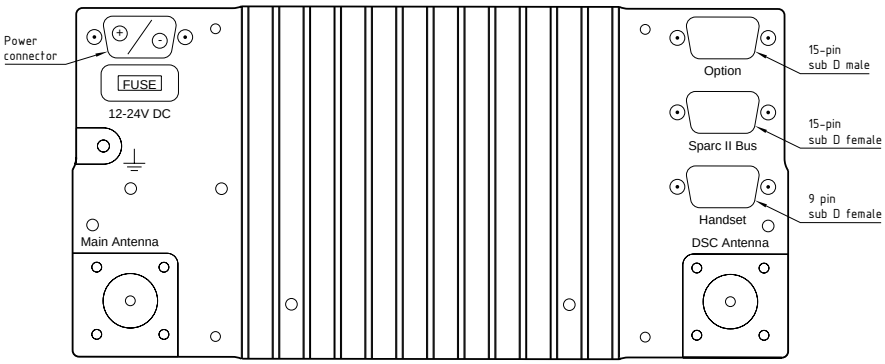
5.2 Compass safe distance

Safe distance in accordance with Annex A of ISO 694:2000.

Safe distance between the nearest point of the item and the centre of the compass at which it will produce a diviation of 0.3°	
Device	**After magnetization**
RT5022 Transceiver Unit	80 cm
C5001 Handset	85 cm
C5000 Semi-functional Control Unit	85 cm
CB5009 Connection Box	75 cm
EB Extension Box	55 cm
LB5007 LAN Box	30 cm
AP4365 Alarm Panel	50 cm

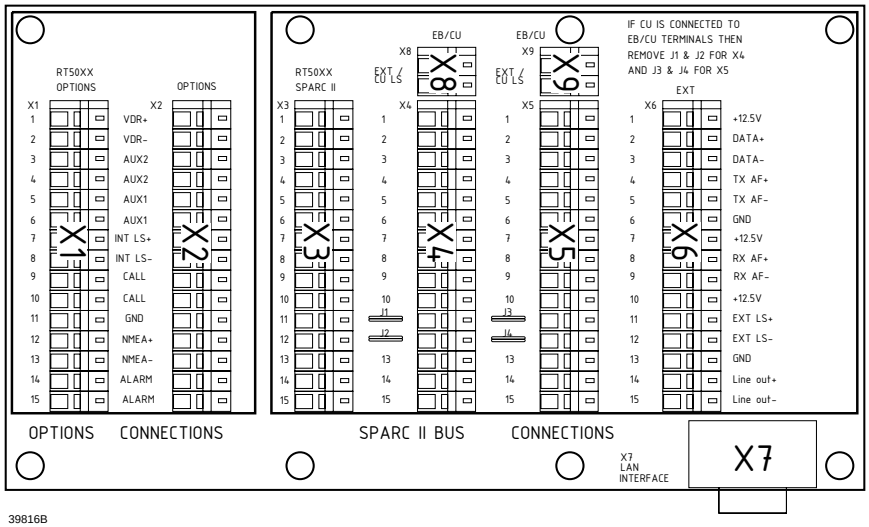
5.3 Interface connections

VHF (rear view)



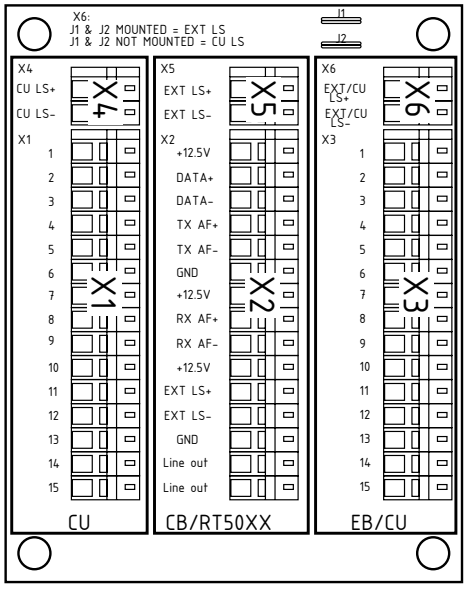
39815B

Connection box board 639121



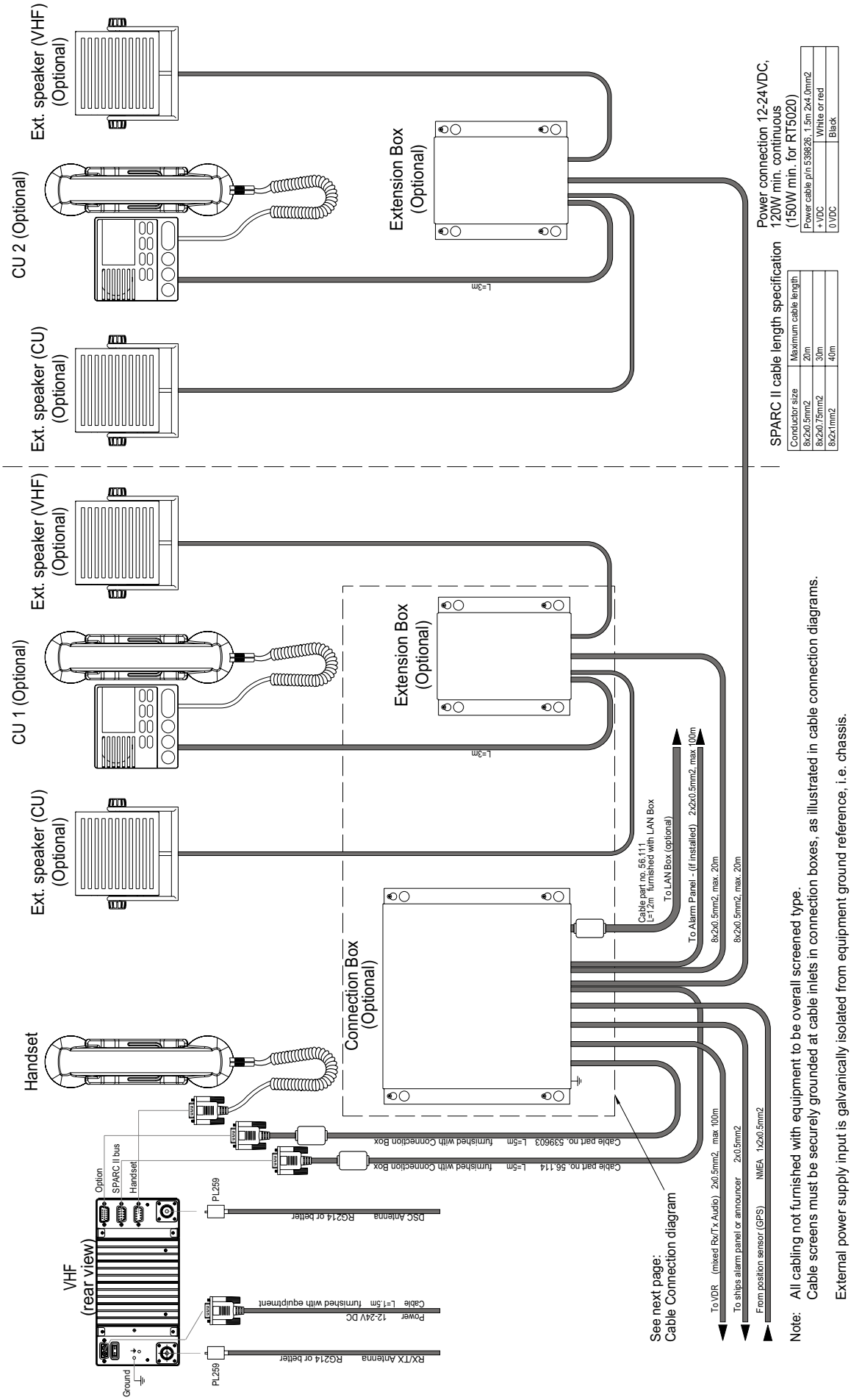
39816B

Extension board 639123



39817B

5.3.1 System block diagram with connection box and 2 x extension box



Note: All cabling not furnished with equipment to be overall screened type.
Cable screens must be securely grounded at cable inlets in connection boxes, as illustrated in cable connection diagrams.

External power supply input is galvanically isolated from equipment ground reference, i.e. chassis.
Equipment internal power supply reference (-) is at equipment ground reference, i.e. chassis.

5.2 Special installations

5.2.1 Flush mounting with Retrofit

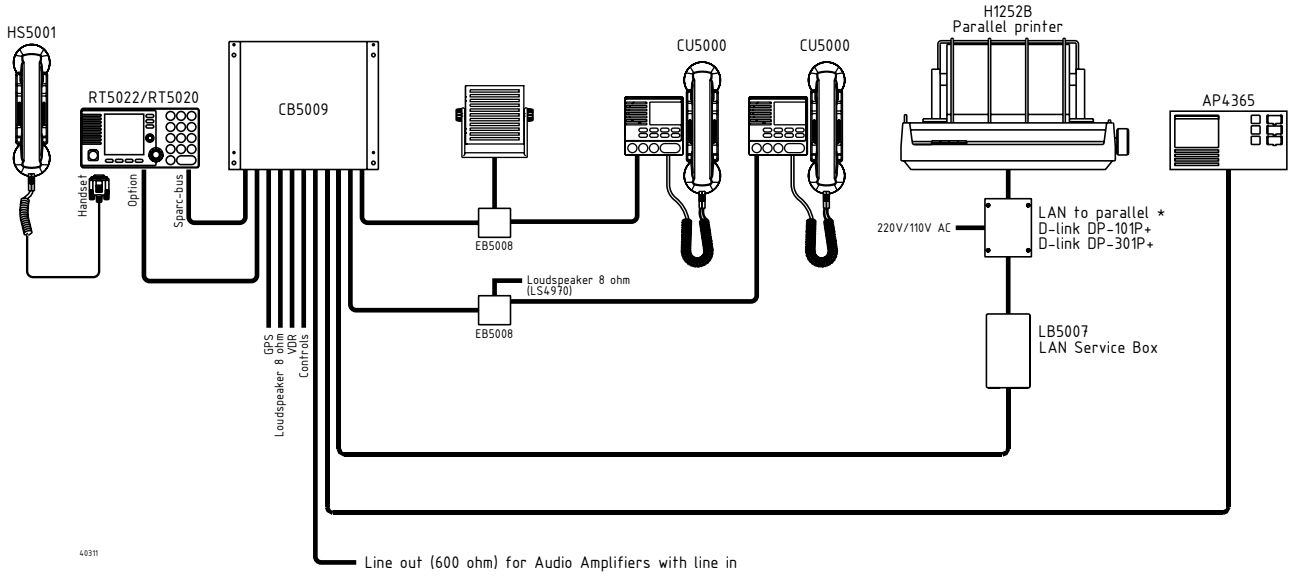
For replacing RT4822 in an existing installation following kits has been developed:

- P/N 739807 Flush Mounting kit RT5022 for replacement of RT4822

The consoles are being redesigned so that the RT5022 can be fitted into the consoles without ordering additional material.

5.2.2 Installing the Oki Microline Printer

Installation details regarding the H1252B are mentioned in the M1252GB manual.
See the RT5022/RT5020 operations manual for installation details.



Note: Printout is supported in the languages which can be set up for the RT5022/RT5020. The printers character set “Latin 6” has been identified to give the best support for all the implemented languages.

5.2.3 Installing other printers

Other printer types – including laser printers – might be used as well with the Sailor RT5000 Series equipment. For installation of other printers, refer to the printer manufacturers’ manual. Thrane & Thrane A/S cannot be held responsible for proper working of any type of printer.

5.2.4 Acquiring a printer server

This section serves as a short description of the compatible print servers for the RT5022/RT5020 radio connected with the LB5007 LAN box.
The following printer servers have been verified during development of the printing client on the LB5007:

D-Link DP 301P+ (Parallel)
Link to specifications of box:
ftp://ftp.dlink.co.uk/product_datasheets/dp-301p_plus+.pdf

TRENDnet TE100 P1P (Parallel)
Link to specifications of box:
http://www.trendnet.com/products/TE100-P1P.htm

TRENDnet TE100 P2U1P (Parallel & USB)
Link to specifications of box:
http://www.trendnet.com/products/TE100-P2U1P.htm

These print servers are verified. Though, most print servers that support the LPR printing protocols will be able to print using the RT5022/RT5020 with the LB5007.
The printer servers mentioned are delivered with a normal AC to DC power supply. If AC power is not readily available or reliable on board the vessel, it might be necessary to add a secure power supply from the ship DC power (e.g. 12V or 24V). Examples of power converters to use for the printer servers are:

- An inverter solution (e.g. 24VDC -> 230VAC) to supply the original server supply.
  Search for example under www.shipshop.dk
- A DC-DC converter (e.g. 24VDC -> 5VDC) that can be used instead of the original server supply.
  E.g. PMG/PCMG 15 - www.mtm-power.dk

Setting and configuration of the servers varies from manufacturer to manufacturer, though as a rule of thumb every print server that is configurable regarding IP-address, support LPR printing and is able to interface to the selected printer can be configured to print. Printing system configuration is to be done on the LB5007, where 3 parameters are to be given:

- IP-address / DHCP configuration of printer
- Name of printing que (is normally stated in the documentation for the specific printer under the LPR section)
- Type of printer & type of paper (Laser / matrix & single sheet / tractor feed paper)

These settings are configured and stored in the LB5007. See the SB5006 operations manual on how this is done.

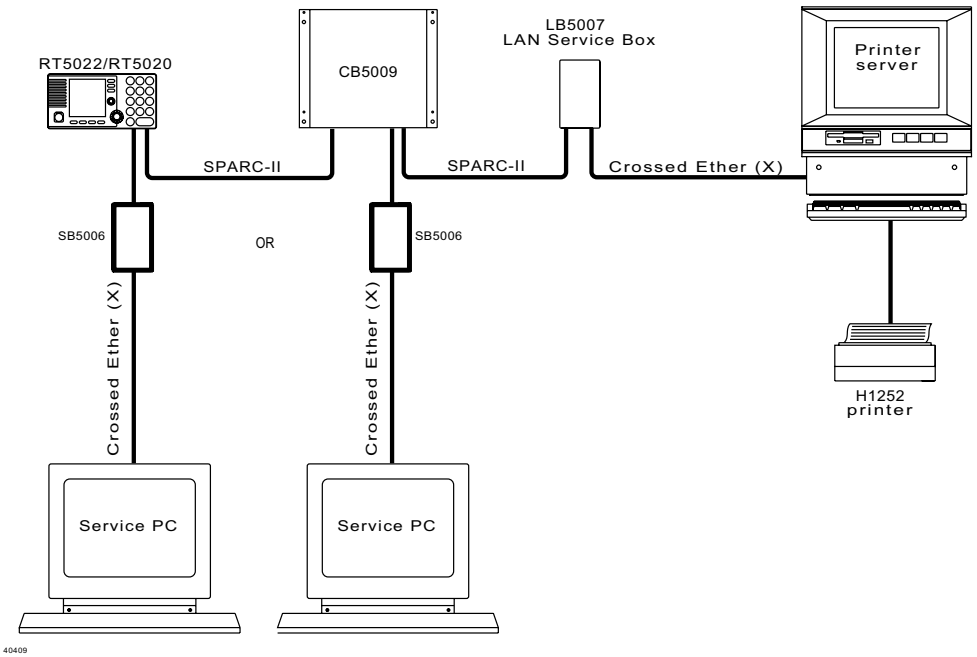


Fig. 1
Using the SB5006 service tool in installations with an LB5007. The LB5007 should be disconnected during service as shown.

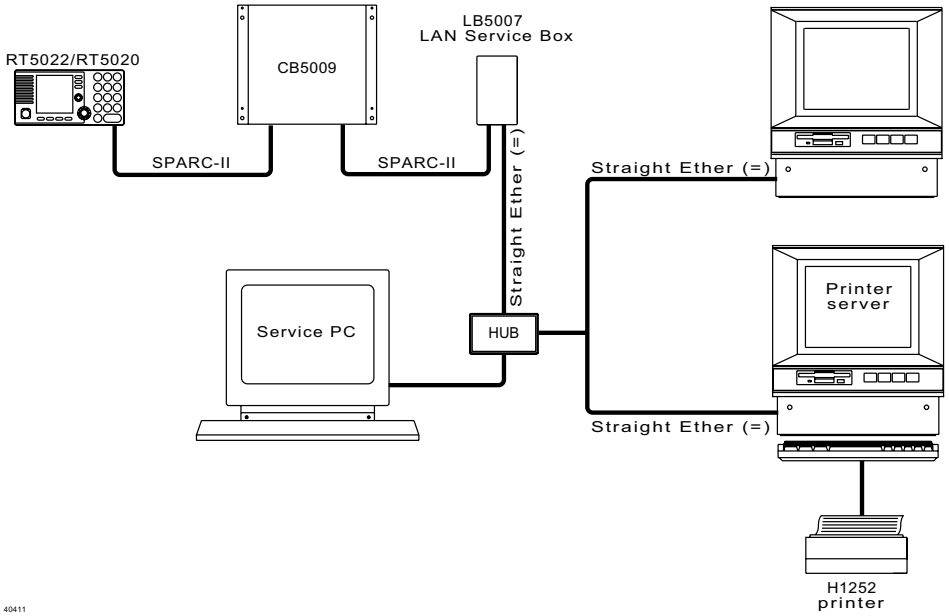


Fig. 2
Using the LB5007 as service tool in installations with an LB5007. The printer server should be disconnected during service as shown. LB5007 may be updated with the newest SB5006 software if required for service. The software image is identical for the two products.

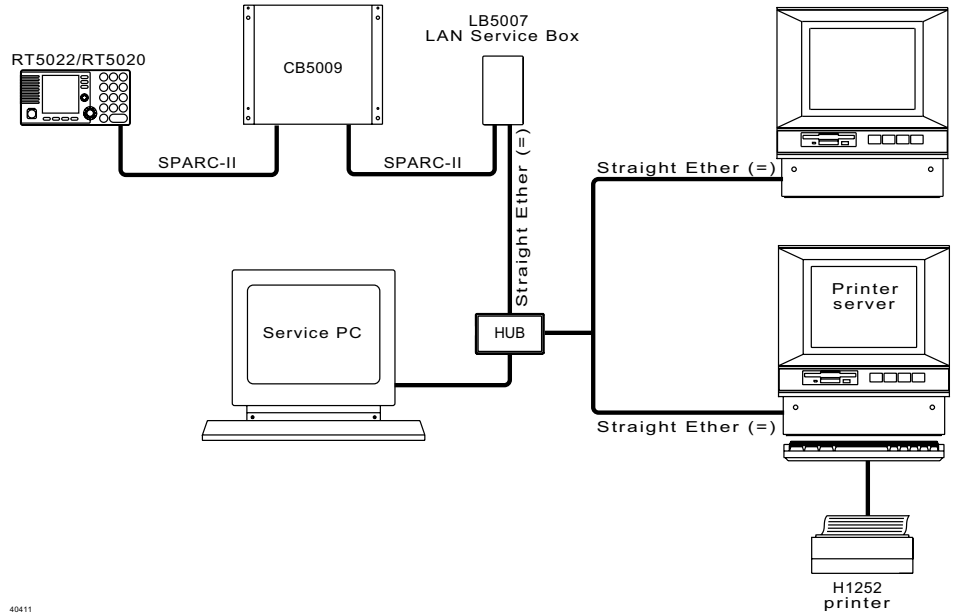


Fig. 3
Using the LB5007 as service tool in installations with a HUB. Straight Ethernet cables shall be used in this case. Before servicing the LB5007 IP address might be searched for in the RT5022/RT5020 Accessory menu (5.6.3), as it can be set up to a non-default value suiting the current installation.

5.2.5 Connecting the LB5007 LAN box

rect connection between the LB5007 and the printer server must be done using the crossed Ethernet cable. Alternatively, if operating in an office environment, an Ethernet HUB can be used, in which case the HUB does the terminal-terminal crossing inside.

Note: The LB5006 service tool is not qualified to operate directly on the internet, so do not plug it into an open internet connection. The router to the internet would probably not allow this anyway.

The LB5007 can also be used as service tool box. In installations with an LB5007 the service PC can be connected in place of the printer server during service. A selection of connection scenarios are outlined below:

5.2.6 Multiple unit equipment

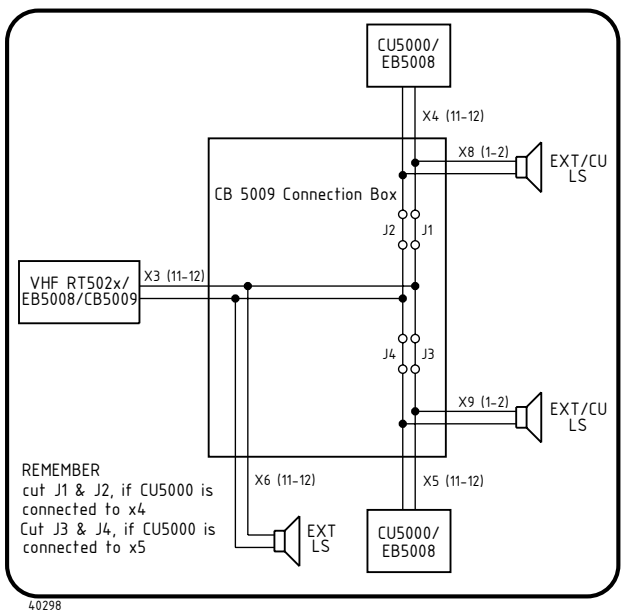
If a vessel is equipped with multiple VHF radios the MMSI numbers will be the same for all radios. The Sailor RT5000 series radios – in such a system - can be addressed individually by programming the 10th digit in the MMSI number different from 0. Thus giving the possibility to differentiate between (up to) 10 transceivers.

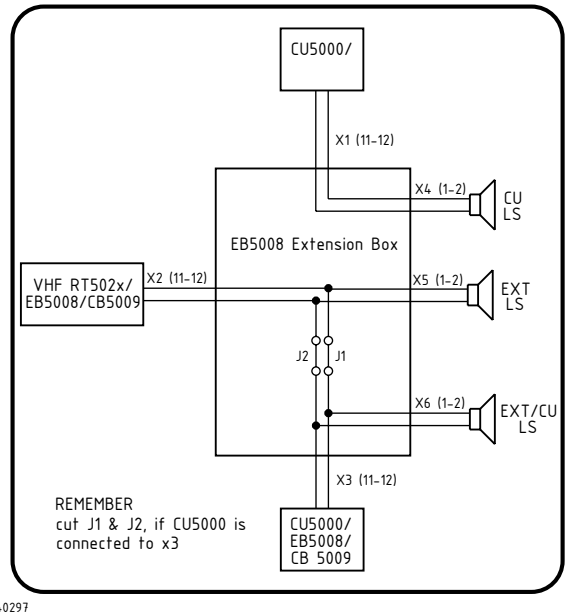
It is important for the installer to know the feature is only active for individual routine calls. All other calls types (especially Distress, urgency and safety calls) are not affected by this facility.

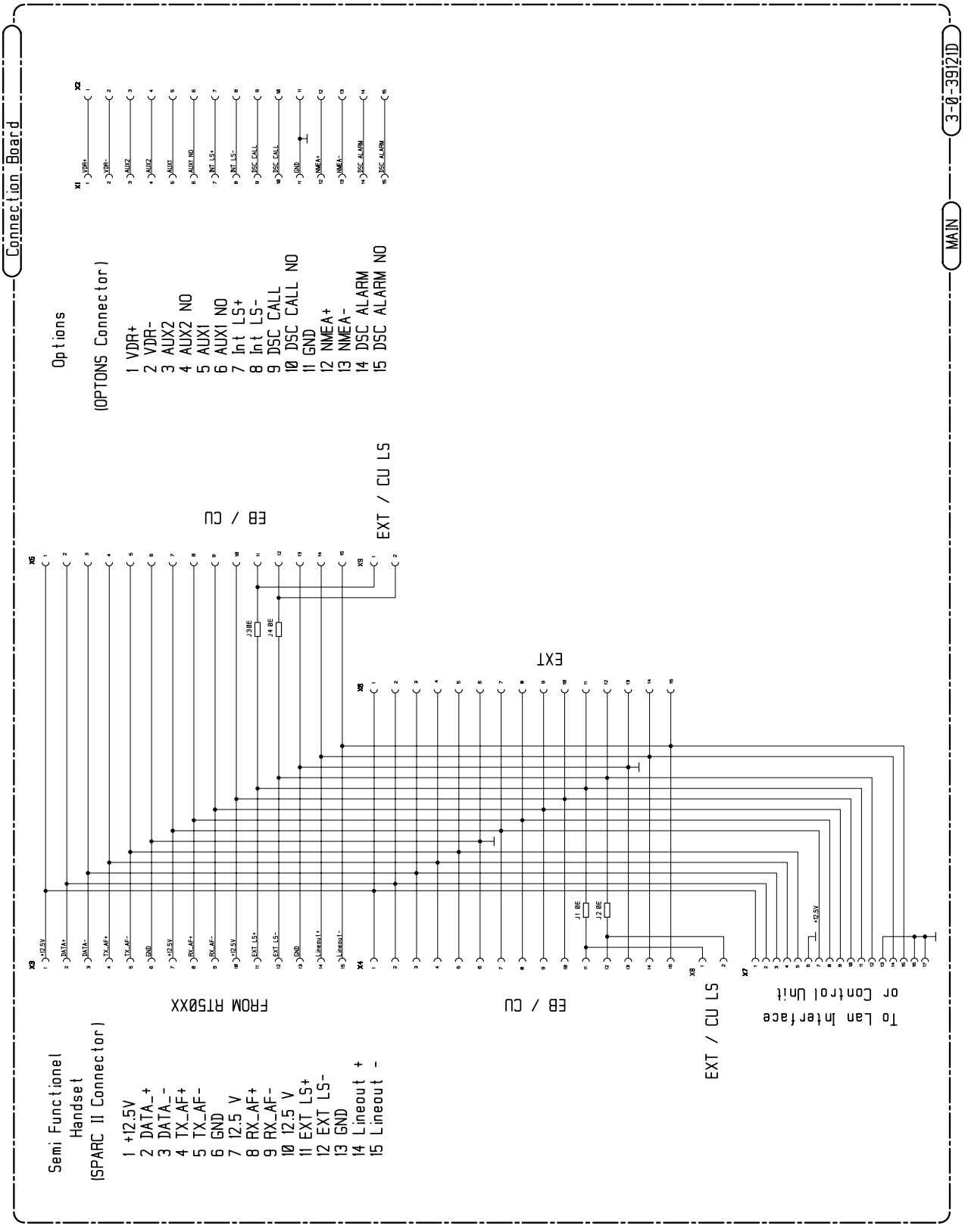
The installer must assure that the VHF unit placed on the main vessels steering position, has legally programmed the default MMSI number (with the 10th digit set to zero). The operator shall be advised not to change the configuration of the main communication unit, because this would violate regulations.

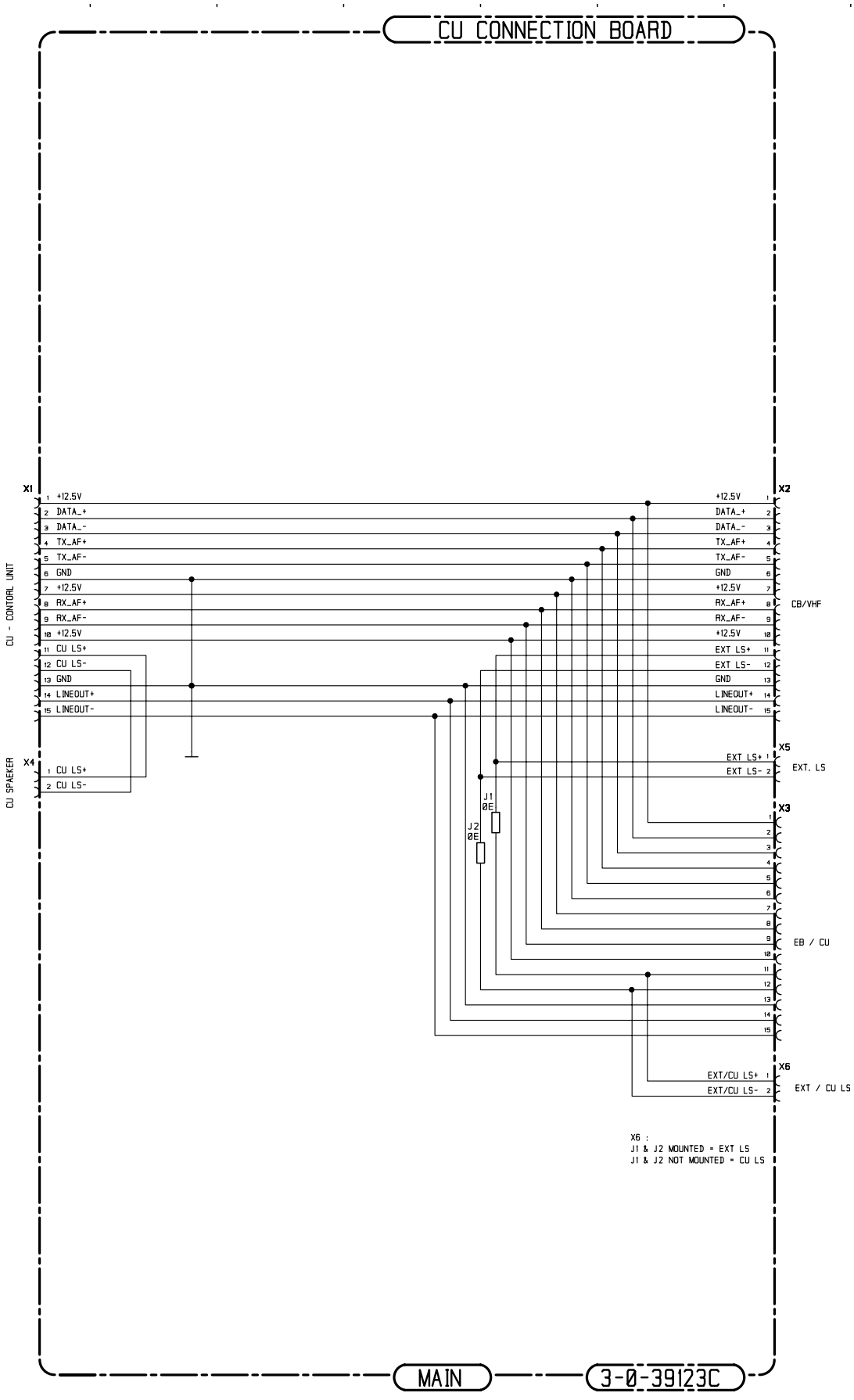
5.2.7 External speakers for the transceiver or remote CU positions

Opptional External speakers can be installed to follow volume control on either RT5022/RT5020, CU5000 or both.
Because each unit (transceiver and CU) is having a built in amplifier the following must be considered: If CU5000 are included in the installation must either the EB5008 or the CB5009 be modified via jumpers.






Connection Board
MAIN
3-0-39121D
Options
(OPTONS Connector)
1 VDR+
2 VDR-
3 AUX2
4 AUX2 NO
5 AUX1
6 AUX1 NO
7 Int LS+
8 Int LS-
9 DSC CALL
10 DSC CALL NO
11 GND
12 NMEA+
13 NMEA-
14 DSC ALARM
15 DSC ALARM NO
EXT / CU LS
EB / CU
EXT
Semi Functionel
Handset
(SPARC II Connector)
1 +12.5V
2 DATA_+
3 DATA_-
4 TX_AF+
5 TX_AF-
6 GND
7 12.5 V
8 RX_AF+
9 RX_AF-
10 12.5 V
11 EXT LS+
12 EXT LS-
13 GND
14 Lineout +
15 Lineout -
FROM RT50XX
EB / CU
EXT / CU LS
To Lan Interface
or Control Unit


CU CONNECTION BOARD
X1
1 +12.5V
2 DATA_+
3 DATA_-
4 TX_AF+
5 TX_AF-
6 GND
7 +12.5V
8 RX_AF+
9 RX_AF-
10 +12.5V
11 CU LS+
12 CU LS-
13 GND
14 LINEOUT+
15 LINEOUT-
CU - CONTORL UNIT
X4
1 CU LS+
2 CU LS-
CU SPAEKER
X2
+12.5V 1
DATA_+ 2
DATA_- 3
TX_AF+ 4
TX_AF- 5
GND 6
+12.5V 7
RX_AF+ 8
RX_AF- 9
+12.5V 10
EXT LS+ 11
EXT LS- 12
GND 13
LINEOUT+ 14
LINEOUT- 15
CB/VHF
X5
EXT LS+ 1
EXT LS- 2
EXT. LS
J1
0E
J2
0E
X3
1
2
3
4
5
6
7
8
9
EB / CU
10
11
12
13
14
15
X6
EXT/CU LS+ 1
EXT/CU LS- 2
EXT / CU LS
X6 :
J1 & J2 MOUNTED = EXT LS
J1 & J2 NOT MOUNTED = CU LS
MAIN
3-0-39123C