OPERATOR AND INSTALLATION MANUAL

TR-7750C
TA-7650C
RA-7203C

VHF Maritime Communication Radios

JOTRON

www.jotron.com

Approvals
The equipment is designed to meet the essential requirements of European Directives 1999/5/EC, 89/336EEC as amended by Directive 93/68/EEC and 72/23/EEC

Standards
The following standards are applied:

EMC:	EN301843-1 and EN301843-2
	FCC part 80
Health and Safety:	EN60950
Radio specifications:	EN301929-1 and EN301929-2

For an updated list of approvals and statements of conformity, these are available on:

www.jotron.com

List of abbreviations and definitions

BITE
Built In Test Equipment

bps
Bits Per Second.

DSP
Digital Signal Processor

ETSI
European Telecommunication Standardisation Institute

ICAO
International Civil Aviation Organization

IEC
International Electro-technical Commission.

LAN
Local Area Network

PA
Power Amplifier

PSU
Power Supply Unit. Separate unit to power the equipment.

PTT
Push To Talk

RF
Radio Frequency

S/N
SIGNAL- TO-NOISE RATIO

SNMP
Simple Network Management Protocol, a network protocol used to control the radio equipment. This equipment is defined as an AGENT in a SNMP system.

VSWR
Voltage Standing Wave Ratio

Amendment Record

NO	INIT	DATE	CHAPTERS	VERSION	REASONFOR CHANGE
1	ES	13.08.08	All	84748_O	New product
2	OH	11.11.08	3.2.5, 3.2.6, 3.2.7, 3.4.4, 3.4.5, 3.4.6	B	Information regarding Frequency stability, Hardware Key and protection of I/O lines added.
3	ES	29.06.09	3-5	C	Information regarding type of LAN cable
4	OH	10.11.09	3.4.5, 1.1	D	Pin 8 Aux 2 is N/C, Output power configuration range in radio model table.
5	BA	05.04.13	3.2.7, 3.2.8, 3.4.6, 4.6.1	E	Fixed RS485 polarity error.
6	BR	28.04.14	4.4	**F**	FCC and IC approval
7	BA	04.06.14	Page vi	G	Added warning statement, modification warning statement and digital device statement.
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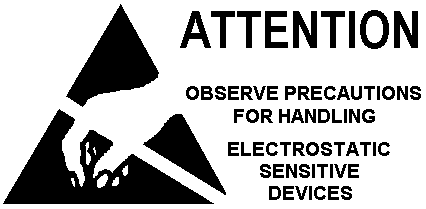
SAFETY INSTRUCTIONS



CAUTION!
This equipment contains CMOS integrated circuits. Observe handling precautions to avoid static discharges which may damage these devices.

WARNING!
Some RF semiconductor devices used in this equipment may contain Beryllium Oxide. If inhaled, dust from this oxide can be toxic. No danger will arise from normal handling but no attempt should be made to tamper with these devices. On no account must these transistors be destroyed or discarded with industrial or domestic waste, but should be returned to the manufacturers for subsequent disposal.

WARNING STATEMENT

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

MODIFICATION WARNING STATEMENT

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

DIGITAL DEVICE STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

--Reorient or relocate the receiving antenna.

--Increase the separation between the equipment and transceiver.

--Connect the equipment into an outlet on a circuit different from that to which the transceiver is connected.

--Consult the dealer or an experienced radio/TV technician for help.

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1 Introduction

1.1 Models covered by this manual

The following models / variants are covered by this operator's manual

Model	P/N	Contain units	Output	Frequency range	Modes
TR-7750C, Transceiver	X-84610	RA-7203C, TA-7650C, PSU-7002	10 - 50 Watts	156-162 MHz	FM, (G3E)
TA-7650C, Transmitter	X-84555	TA-7650C, PSU-7002	10 - 50 Watts	156-162 MHz	FM, (G3E)
RA-7203C, Receiver	X-84550	RA-7203C	N/A	156-162 MHz	FM, (G3E)

Table 1.1-1, Radio models

Throughout this manual the term transmitter unit, TX, TA-7650C refers to the transmitter unit. The term transceiver, TR, TR-7750C refers to any variant of the transceiver unless specifically noted in the text and the term receiver, RX and RA-7203C is used for the receiver unit.

1.2 Layout of the transceiver

The receiver unit, RA-7203C operates as an independent receiver. The transmitter unit TA-7650C operates as an independent transmitter, but requires the power supply unit, PSU-7002 for operation on AC power. The receiver and transmitter units may be placed in entirely different locations or together when configured as a transceiver.

Figure 1.1, Complete Transceiver, RA-7203C, TA-7650C and PSU-7002

1.3 Applications

The transmitter TA-7650C and the receiver RA-7203C can be used either as a standalone transmitter / receiver for maritime voice or data communication, or combined as a transceiver.
The transmitter / receiver can be operated in the following modes:

- Locally as an analogue FM transceiver, with microphone and headphone connected to the front panel connector,
- Connected to a VCS (Voice Control System) using 600-ohm analogue lines for audio, together with keying in form of in-band tones, external voltages or phantom keying.
- In addition the transmitter/receiver has a large range of options for remote control using Ethernet, serial lines or front panel controls.

2 Technical SPECIFICATIONS

2.1 General specification, Transceiver Units, TR-7750C

Standards	EN 301489-x ,Health and Safety: EN 60950,Radio specifications:EN301929-1 and EN301929-2,FCC part80		
Environmental, all units			
Temperature range	-20°C to +55°C (operating) -40°C to +70°C (storage)		
Humidity	90% @+40°C (non condensing)		
Shock	Transport: IEC-721-3-2, Class 2M3		
Vibration	Transport: IEC-68-2-32, Class 2M3. IEC-68-2-6		
EMC	EN 301 489 – part 22, FCC, IC		
General, all units	FM 25 kHz	FM 12.5 kHz	DSC
Frequency range	156-162 MHz , All channels, simplex and duplex within the maritime VHF band is available.		
Frequency stability	+/- 1.0 ppm		
RF Modes	G3E	G3E	G2B
Keying time	< 1.0ms	< 1.0ms	< 1.0ms
Bit rate			2.4 kbit/s
Frequency response	300-3400 Hz	350-2500 Hz	
Data ports	RS232, RS485, 100BaseT		
Protocols	Simple Network Management Protocol (SNMP v.2), RS232, RS485; See Protocol description		
BITE monitoring	VSWR, Voltages, Currents, Levels, Lock detect,		
	Temperature, Output power, Reflected power, a.o.		
Supply voltage, AC	115/230VAC +15/-10% / 50-60Hz		
Supply voltage, DC	21.6 - 31.2VDC negative ground		
MTBF	>10 years / unit		
MTTR	<30 minutes at lowest replaceable unit		

2.2 Transmitter Units, TA-7650C

Transmitter unit	FM 25 kHz	FM 12.5 kHz	DSC
Output power	10-50W		
Adjacent channel power	>80dBc	>70dBc	>80dBc
Modulation level	up to ± 5kHz deviation		
Distortion	< 3%		
Line input	600Ω, -36 - +7dBm		
Intermodulation protection	*>40 dB when interfering signal is decoupled with at least 30 dB*		
Tx timeout	10s to 5 min in 10s steps		
Inband keying	Configurable tones: 150 – 3400Hz		
VSWR	1 : Infinity		
Duty cycle	100% continuous operation @ambient below 40°C		
Power consumption	<280VA		
Dimension Transmitter nit	142mm(28TE)(W) * 230mm(D) * 128mm (H), Weight 3.0 kg		

2.3 Receiver Unit, RA-7203C

Receiver unit	FM 25 kHz	FM 12.5 kHz	DSC
Sensitivity, FM@1µV/30% pd	10dB SINAD (CCITT)		
Adjacent channel rejection	>80dB	>80dB	>70dB
Intermodulation (3 signal)	>80 dBc		
IF bandwidth	+/- 11kHz	+/- 3.5 kHz	+/- 11 kHz
Image and IF frequency	>110 dB		
Squelch operation	Adjustable -107dBm, 30dB		
	S/N + carrier override		
	Activation time <20ms		
	Hysteresis <3dB		
Audio AGC	30% - 90%, <1dB variation		
Signal / Noise	>45dB on any output @100µV, 30%		
AGC range	-107dBm to +5dBm		
Inband squelch signal	User configurable tones: 150 - 3400 Hz		
Line output	600Ω, -36 - +7dBm @90% modulation		
Harmonic distortion	<5% @90% AM (line output)		
Cross modulation	>85dB @ 100 kHz frequency offset		
Blocking	>100dB @1MHz offset,>110 dB out of band signals		
Dynamic range	>110dB		
Spurious response rejection	>90dB		
Weight	1.7 kg		
Dimension Receiver unit	71mm (14TE)(W) * 230mm(D) * 128mm (H)		

2.4 Power Supply Unit, PSU-7002

Power supply unit	
Supply voltage, AC	115/230VAC +15/-10% / 50-60Hz
Output voltage	+28 VDC regulated
DC throughput	When AC not present
Max load	10A average, 18A peak (300W)
Dimension PSU unit	71mm (14TE)(W) * 303mm(D) * 128mm (H)
Weight	1.3Kg

3 Functional description

3.1 Front Panel Controls, Transmitter unit

Figure 3.1-1, Front view, transmitter unit, TA-7650C/25C/10C

3.1.1 Display

The display shows the most important operational parameters; Channel, frequency and modulation. In addition, the display will show several menus, submenus and operational parameters when entering into the menu using Navigation button A.

3.1.2 Scroll/Select switch and Navigation buttons A, B and C

The navigation buttons, A, B and C, together with the Scroll/Select switch are used to navigate through the menus.

The Scroll/Select switch has three actions: It can be turned clockwise, anti-clockwise, or momentarily pressed.

In general the use of the navigation buttons are:

A or Scroll/Select right: Increase a value (up)
B or Scroll/Select left: Decrease a value (down)
C or Scroll/Select press: Confirm or Enter.

The user interface will indicate which navigation button to use.

3.1.3 PTT button

This button is used to immediately key the transmitter for test/measurement purposes, connected together with the PTT line available on the microphone connector.

3.1.4 ON/OFF button

Press and hold button (for app. 2s) to switch unit ON or OFF.

3.1.5 LED Indicators

LOW (yellow): The transmitter transmits in low power, either caused by an internal failure (SWR, Temperature, or low input voltage) or set by the user. The low power level is adjustable.

AL (red): Indicates that an alarm is present in the transmitter unit. Details of the alarm will be shown on the display.

REM (green): This LED has multiple functions. The REMOTE indicator will be lit with a constant green colour when the transmitter is "ready" for remote operation. Ready means that the keying options has been set to include keying from an external source, and that the voice input has been set to an external source (600 ohm line input).
In addition the REMOTE indicator will flash yellow each time the unit is communicating on either of the remote interfaces (RS232, RS485, Ethernet).

STBY (yellow): The transmitter is kept in standby, either by user input, an external signal to the remote interface or because an alarm condition has been detected, and the transmitter is set up as a MAIN transmitter. In standby the transmitter will not be able to send, even if a valid key signal is input to the unit.

OUT (yellow): Indicate that the transmitter is keyed and power is being generated. The LED is activated based on RF detected on the output of the power amplifier, thus the LED gives an indication that power is generated.

SWR (red): Indicate that the SWR on the antenna is above the threshold value (app. 3:1). The transmitter will reduce the output power to the predefined low power level in order to protect the output stage.

3.1.6 Mic/Headset connector

Mic/Headset connector		
Name	PIN	Purpose
Mic input	1	Dynamic. Sensitivity 2.5mV nominal.
Mic GND	2	Reference input for mic signal
Headset	3	Headset output, contains sidetone and/or received audio when used with a receiver (RA7203)
RS232	4	RS232 TX
RS232	5	RS232 RX
PTT	6	PTT input. Connect to GND (p.8) to key
+12VDC	7	+12 VDC to mic. Amplifier (10mA)
GND	8	Common ground

Table 3.1-1, Mic/Headset connector, transmitter, pin out

The Mic/Headset connector is used for multiple purposes:

- Microphone/Headset connector:
  Connect the microphone to the Mic input/Mic GND, the +12VDC can be used to power the microphone or a microphone amplifier. The +12VDC is current limited at 100mA.
  The Headset output (referenced to GND) contains the local sidetone generated from the demodulated signal on the output of the transmitter when the transmitter is keyed, or the

received audio if the transmitter is connected to a receiver using the T/R bus available on the rear panels (for details see chapter 3.2.4)

- RS232 serial line
  The RS232 serial line that can be used to control radio parameters from an external unit, or to upload new firmware into the radio unit for future functionality. Details regarding firmware upgrade is described in the maintenance and repair manual.

- Hardware key to change access level:
  In order to change the access level (see chapter 5.5.3 for details) a hardware key must be inserted into the microphone/headset connector before entering in to the menu system. The hardware key consists of a RJ45 connector where pin no. 4 and 5 (RS232 RX and TX) is connected together.

3.2 Transmitter, rear connections

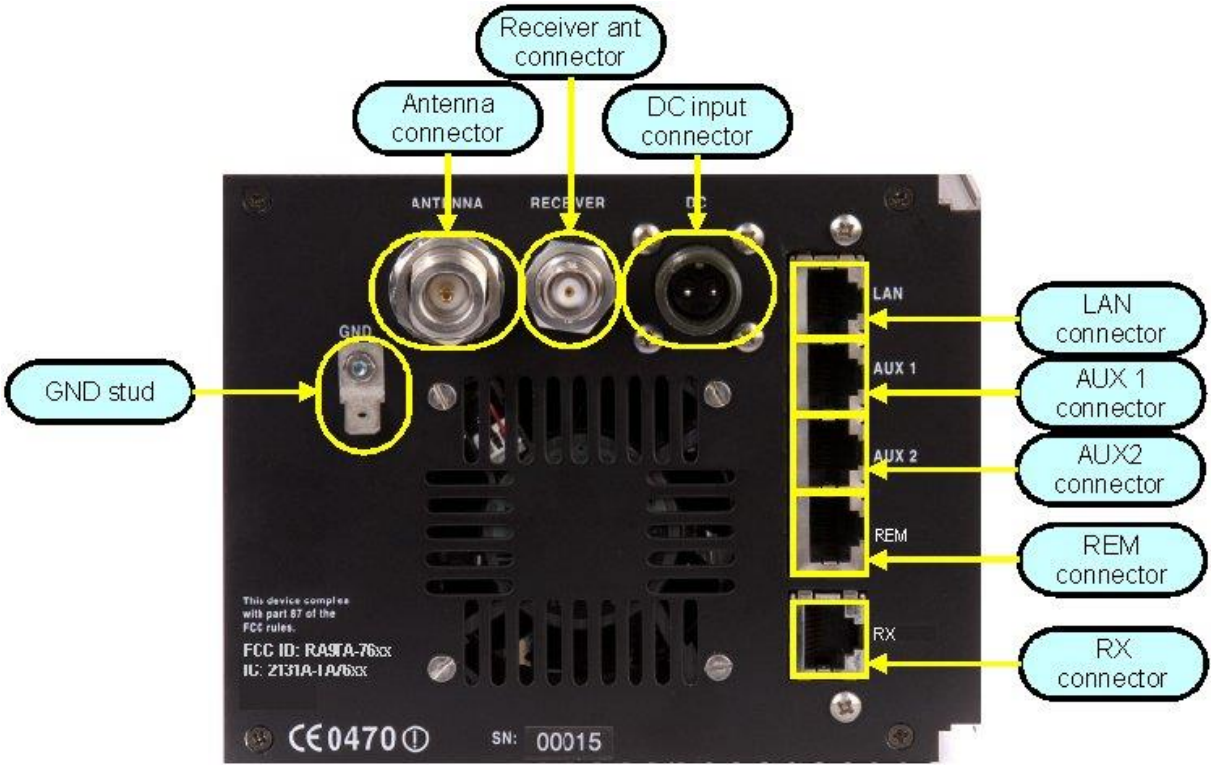


Figure 3.2-1, Rear view, transmitter unit, TA-7650C/25C/10C.

3.2.1 Antenna connector (50 ohm N)

Interface to the antenna cable for the transmitter or the transceiver when used together with a receiver unit

3.2.2 Receiver ant. Connector (50 ohm BNC)

BNC-Type antenna output – 50 ohm. This connecor is connected to the antenna relay internally in the transmitter unit and can be connected directly to the antenna input of a mating receiver unit (RA7203).

3.2.3 DC input connector (Amphenol MS 3106A 10SL4S)(Jotron P/N: 96715)

Figure 3.2-2, Transmitter DC input connector, rear view

Connector for DC supply (21.6 - 31.2 VDC).
Connected to the mating power supply, PSU-7002, or to an external DC supply.
A is the positive (+) connection and B is the negative (-) connection points.

3.2.4 LAN connector (RJ45)

This connector contains the Ethernet bus and is normally connected to a nearby switch/hub or directly to a computer, using a screened twisted pair Ethernet cable.

LAN interface connector		
Name	PIN	Purpose
LAN_TXP	1	Tx data
LAN_TXN	2	Tx data
LAN_RXP	3	Rx data
LAN_D3P	4	Optional
LAN_D3N	5	Optional
LAN_RXN	6	Rx data
LAN_D4P	7	Optional
LAN_D4N	8	Optional

Table 3.2-1, LAN interface connector, pin out

3.2.5 AUX1 CONNECTOR (RJ45)

This connector is normally connected to equipment used for remote control / remote supervision of the transmitter.

AUX1 connector, transmitterAUX		
Name	PIN	Purpose
ALARM_P	1	Alarm out-relay (NO)
ALARM_N	2	Alarm out-relay (NO)
Select_in_P	3	Select in, optocoupler input
RS232_S	4	RS232 Transmit data
RS232_R	5	RS232 Receive data
Select_in_N	6	Select in, optocoupler input
+12V	7	+12VDC output to external equipment (max 300mA)
GND	8	Common ground

Table 3.2-2, AUX1 connector, transmitter, pin out

3.2.6 AUX2 connector (RJ45)

This connector is normally connected to equipment used for remote control / remote supervision of the transmitter.

AUX2 connector, transmitter		
Name	PIN	Purpose
KEY_OUT_P	1	Closed=Transmitting, optocoupler output
KEY_OUT_N	2	Closed=Transmitting, optocoupler output
MONITOR_P	3	Monitor output to tape recorder
TXLOW_P	4	Applying a voltage > 5VDC between pin 4 and 5 forces the transmitter into low power
TXLOW_N	5	Applying a voltage > 5VDC between pin 4 and 5 forces the transmitter into low power
MONITOR_N	6	Monitor output to tape recorder
TXKEY_P	7	Applying a voltage > 5VDC between pin 7 and 8 will key the transmitter
TXKEY_N	8	Applying a voltage > 5VDC between pin 7 and 8 will key the transmitter

Table 3.2-3, AUX2 connector, transmitter, pin out

3.2.7 REM connector (RJ45)

This connector is normally connected to equipment used for remote control / remote supervision of the transmitter. It contains the most basic interfaces used for remote control, and will in many cases be the only connector used.

Note that this connector will also have the most basic functionality for remote controlling the receiver when the Rx connector is connected to the REM connector on a receiver. In this case the line, and squelch out signals from the receiver are reflected also on the REM connector.

REM connector, transmitter – Remote control of transceiver		
Name	PIN	Purpose
RS485+	1	RS485 (+)
RS485-	2	RS485(-)
LINE_P	3	Diff. line input/output to TA/RA, 600 ohm
TX_KEY_G	4	Grounding this pin will key transmitter
RX_BUSY_OUT	5	RX Busy indicator output (squelch indicator)
LINE_N	6	Diff. line input/output to TA/RA, 600 ohm
ALARM	7	Low=Alarm (TA or TA/RA)
GND	8	Common ground

Table 3.2-4, REM connector, transmitter, pin out

3.2.8 Rx connector (RJ45)

This connector is normally connected to the REM connector on a mating receiver when used in a transceiver configuration.
It gives functionality to a transceiver such as: Common 2 wire line interface, received audio in transmitter local headset, transceiver alarm, TX/RX busy signalling when used as a VDL modem.

Rx connector, transmitter. Interface to RX (transceiver config)		
Name	PIN	Purpose
RS485+	1	RS485 (+)
RS485-	2	RS485(-)
LINE_P	3	Diff. line input from Receiver unit, 600 ohm
TX_BUSY	4	TX Busy indicator output (Mute output)
RX_BUSY	5	RX Busy optocoupler-input (Repeater key input)
LINE_N	6	Diff. line input from Receiver unit, 600 ohm
INT_ALARM	7	Low=Alarm (Note: I/O – low input will also be recognized as an alarm (EXT))
GND	8	Common ground

Table 3.2-5, Rx connector, transmitter, pin out

3.3 Front Panel Controls, Receiver unit

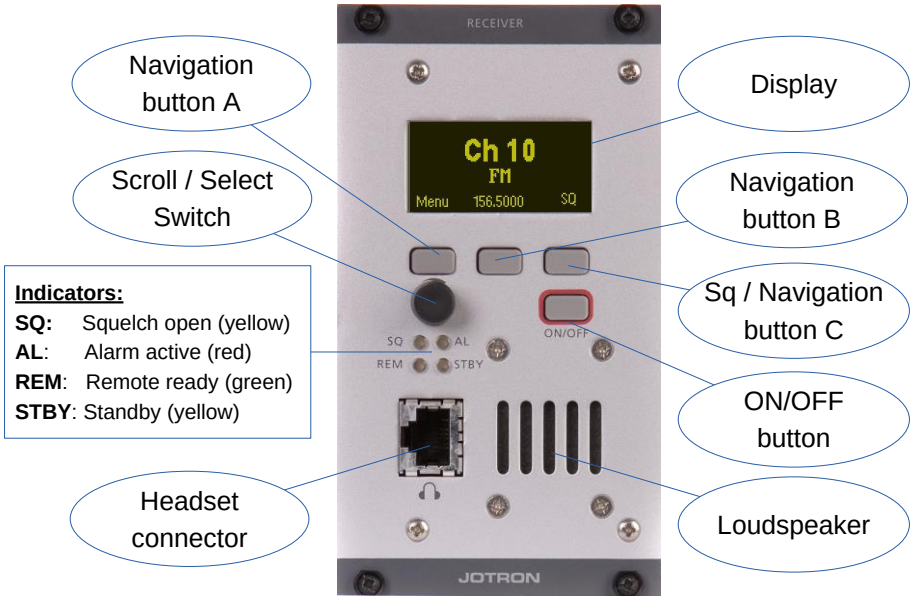


Figure 3.3-1, Front view, receiver unit, RA-7203C

3.3.1 Display

The display shows the most important operational parameters; Channel, frequency and modulation. In addition, the display will show several menus, submenus and operational parameters when entering into the menu using Navigation button A.

3.3.2 Scroll/Select switch and Navigation buttons A, B and C

The navigation buttons, A, B and C, together with the Scroll/Select switch are used to navigate through the menus.
The Scroll/Select switch has three actions: It can be turned clockwise, anti-clockwise, or momentarily pressed in.
In general the use of the navigation buttons are:

A or Scroll/Select right: Increase a value (up)
B or Scroll/Select left: Decrease a value (down)
C or Scroll/Select press: Confirm or Enter.

The user interface will indicate which navigation button to use.
Navigation button C is dedicated to squelch ON/OFF button in the default view.

3.3.3 ON/OFF button

To switch the unit ON or OFF: Press and hold button for approx 2s

3.3.4 LED Indicators

SQ (yellow): The receiver squelch is open (receiving audio) when lit.

AL (red): Indicates that an alarm is present in the receiver unit. Details of the alarm will be shown on the display.

REM (green): This LED has multiple functions. The REMOTE indicator will be lit with a constant green colour when the receiver is "ready" for remote operation. Ready means that the audio is output to an external source (600 ohm line input).
In addition the REMOTE indicator will flash yellow each time the unit is communicating on either of the remote interfaces (RS232, RS485, Ethernet).

STBY (yellow): The receiver is kept in standby, either by user input, an external signal to the remote interface or because an alarm condition has been detected, and the receiver is set up as a MAIN receiver. In standby the receiver will not output any audio on any audio interface.

3.3.5 Headset connector

Mic/Headset connector		
Name	PIN	Purpose
N/C	1	No connection
N/C	2	No connection
Headset	3	Headset output contains received audio.
RS232	4	RS232 TX
RS232	5	RS232 RX
N/C	6	No connection
+12VDC	7	+12 VDC to external amplifier (10mA)
GND	8	Common ground

Table 3.3-1, Headset connector, receiver, pin out

The Headset connector is used for multiple purposes:

- Headset connector:
  The Headset output (referenced to GND) contains the received audio.

- RS232 serial line
  The RS232serial line that can be used to control radio parameters from an external unit, or to upload new firmware into the radio unit for future functionality. Details regarding firmware upgrade is described in the maintenance and repair manual.

- Hardware key to change access level:
  In order to change the access level (see chapter 5.5.3 for details) a hardware key must be inserted into the microphone/headset connector before entering in to the menu system. The hardware key consists of a RJ45 connector where pin no. 4 and 5 (RS232 RX and TX) is connected together.

3.4 Receiver, rear connections

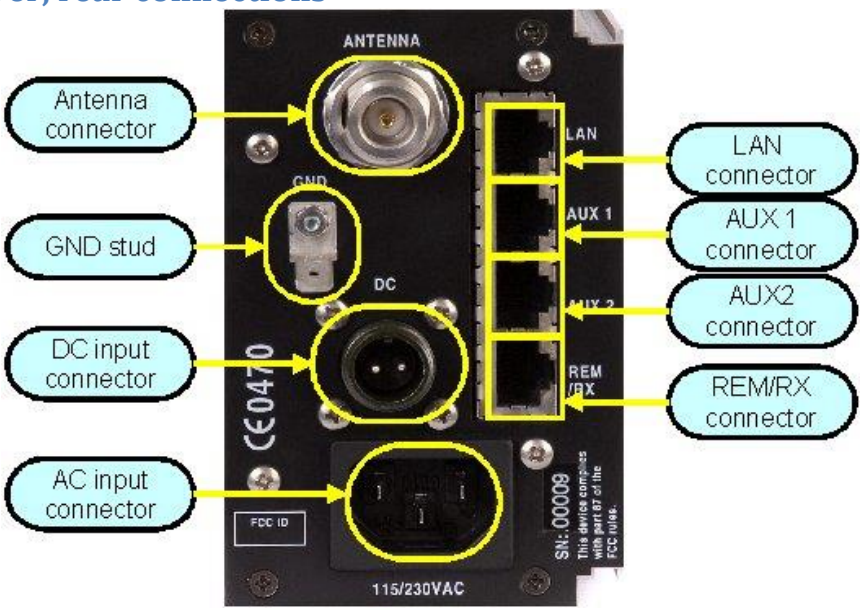


Figure 3.4-1, Rear view, receiver unit, RA-7203C.

3.4.1 Antenna connector (50 ohm N)

Connect directly to a receiver antenna, or to the receiver antenna connector (BNC) on the transmitter unit.

3.4.2 DC input connector (Amphenol MS 3106A 10SL4S)(Jotron P/N: 96715)

Figure 3.4-2, Receiver DC input connector, rear view

Connector for DC supply (21.6 - 31.2 VDC).
Connect to an optional external DC supply to operate the unit on DC or as a backup supply if the main AC fails.
A is the positive (+) connection and B is connected to ground or chassis (-).

3.4.3 LAN connector (RJ45)

This connector contains the Ethernet bus and is normally connected to a nearby switch/hub. It can also be connected directly to a computer, using a twisted pair Ethernet cable.

LAN interface connector		
Name	PIN	Purpose
LAN_TXP	1	Tx data
LAN_TXN	2	Tx data
LAN_RXP	3	Rx data
LAN_D3P	4	Optional
LAN_D3N	5	Optional
LAN_RXN	6	Rx data
LAN_D4P	7	Optional
LAN_D4N	8	Optional

Table 3.4-1, LAN interface connector, pin out

3.4.4 AUX1 CONNECTOR (RJ45)

This connector is normally connected to equipment used for remote control / remote supervision of the receiver.

AUX1 connector, receiver unit		
Name	PIN	Purpose
ALARM_P	1	Alarm out-relay (NO)
ALARM_N	2	Alarm out-relay (NO)
Select_in_P	3	Select in, optocoupler input
RS232_S	4	RS232 Transmit data
RS232_R	5	RS232 Receive data
Select_in_N	6	Select in, optocoupler input
+12V	7	+12VDC output to external equipment (max 100mA)
GND	8	Common ground

Table 3.4-2, AUX1 connector, receiver, pin out

3.4.5 AUX2 connector (RJ45)

This connector is normally connected to equipment used for remote control / remote supervision of the transmitter.

AUX2 connector, receiver unit		
Name	PIN	Purpose
Squelch_out_P	1	Closed=Receiving (Sq open), optocoupler output
Squelch_out_N	2	Closed=Receiving (Sq open), optocoupler output
AGC_HILO_P	3	Hi/Lo output depending on signal strength, optocoupler output
N/C	4	
N/C	5	
AGC_HILO_N	6	Hi/Lo output depending on signal strength
AGC_OUT	7	AGC analogue voltage output, depending on signal strength. Referred to GND
N/C	8	

Table 3.4-3, AUX2 connector, receiver, pin out

3.4.6 REM connector (RJ45)

This connector is normally connected to a mating transmitter unit (RX connector) when used in a transceiver configuration, or to other equipment used for remote control of the receiver.
When connected to a transmitter, the connector gives “transceiver” functionality to the transmitter and contains necessary signals for audio and control. The TX_BUSY and RX_BUSY signals are also used in data modes to signal that the transmitter or receiver is busy transferring data.

Interface to Remote equipment or a transmitter unit		
Name	PIN	Purpose
RS485+	1	RS485 (+)
RS485-	2	RS485(-)
LINE_P	3	Line output from Receiver unit, 600 ohm
TX_BUSY	4	TX Busy indicator input (Mute input)
RX_BUSY	5	RX Busy output
LINE_N	6	Line output from Receiver unit, 600 ohm
INT_ALARM	7	Low=Alarm (Note: I/O – low input will also be recognized as an alarm (EXT))
GND	8	Common ground

Table 3.4-4, REM connector, receiver, pin out

3.5 PSU-7002, Power Supply Unit, frontview

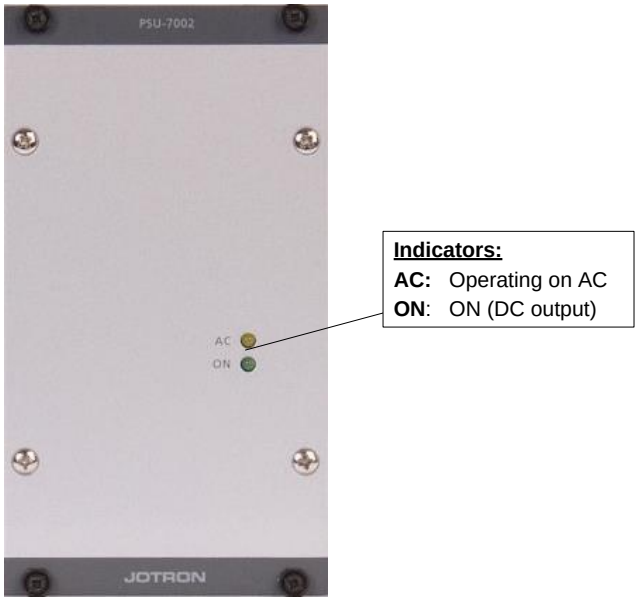


Figure 3.5-1, PSU-7002, front view

3.5.1 LED Indicators

AC (yellow): Indicates that AC is present, and that the unit currently is operating on the main AC power supply.

ON (green): Indicates that the PSU is ON and delivers DC on its output.
The DC is either derived from the main AC input (shown by the AC indicator), or from the backup DC input (AC indicator dark).

3.6 Power Supply Unit rear connectors.

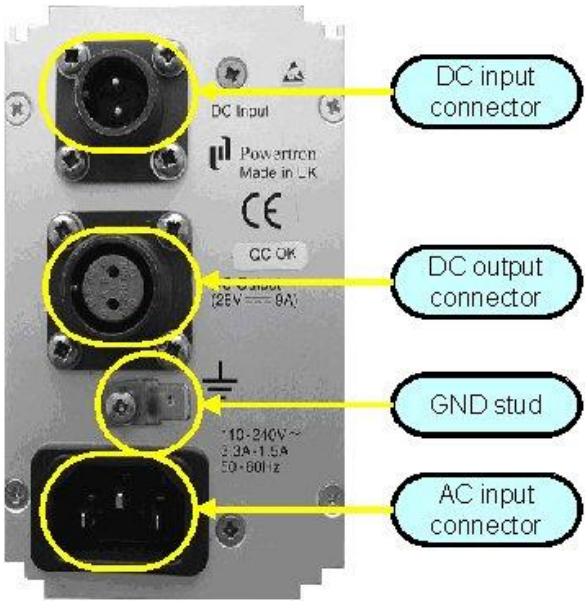


Figure 3.6-1, Power supply unit - rear view

3.6.1 DC input connector (Amphenol MS 3106A 10SL4S)(Jotron P/N: 96715)

The DC input is connected to the DC backup supply (if available).
Input range is 21.6 - 31.2 VDC and current consumption is max 9A average when the transmitter operates with full power output (50W).
A is the positive (+) connection and B is connected to ground (-).

Figure 3.6-2, DC input connector, PSU

3.6.2 DC Output Connector(Amphenol MS 3106A 12S3P)(Jotron P/N: 93697)

The DC output connector is connected to the transmitter unit and contains the +28V DC supply for the transmitter. The DC is generated from the main AC input or the DC backup input.

Figure 3.6-3, DC output, PSU

A is the positive connector pin (+) and B is connected to ground (-).

3.6.3 AC Input connector

Input for external AC.
AC is input between A and C, B is chassis ground.
The voltage range is from 85 to 250 VAC

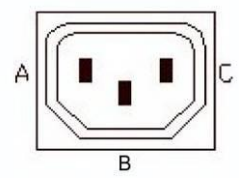


Figure 3.6-4, AC input connector, PSU

4 Installation

4.1 Introduction.

The procedures for installing the radio units / transceiver are described in table 4.1 below.
It is recommended that these procedures are completed in the order shown.

Procedure		Reference
1	Initial inspection	4.2
2	Install equipment into 19" sub racks (equipment cabinet)	4.3
3	Connect chassis stud to system earth or cabinet	Figure 3.2-1 (TX) Figure 3.4-1 (RX) Figure 3.6-1 (PSU)
4	Connect remote connectors as required	4.6
5	Connect antenna connectors	4.4
6	Connect DC supply (if required)	4.5
7	Connect AC supply (if required	4.5

Table 4.1-1, Installation procedures

4.2 Initial inspection

Items included for a TA-7650C transmitter		P/N
1	Radio unit TA-7650C[1]	84555
2	Power supply unit PSU-7002	82417
3	Interconnecting cord between TA and PSU	81725
4	CD with Operators guide	84417
5	DC connector	96715
6	AC power cord	92375

Items included for a RA-7203C receiver		P/N
1	Radio unit RA-7203C	84550
2	CD with Operators guide	*84417*
3	DC connector	96715
4	AC power cord	92375

On receipt of the radio units, remove all transit packaging and check that there is no damage to the equipment. If damage is evident, contact Jotron immediately and retain the original transit packaging.

[1]Variants may include:
- Reduced maximum power level <50 W
- PM modulation
- Frequency range 156 – 162MHz
- Inband ptt signalling (option: 84358)
- Inband squelch signalling (option: 84358)

4.3 Installation into equipment cabinet

The units may be installed into a standard 19" subrack with a height of 3U.
The total subrack is divided into 84 TE units. The transmitter occupies 28 TE, the PSU occupies 14TE and the receiver unit occupies 14TE.
For a transceiver this leaves a free space of 28TE available for other equipment.
Figure 4.3-1 shows some examples for installation into 19" subrack. From top to bottom the figure shows: 6 receivers in one subrack, 2 transmitters with PSU in one subrack and 3 transmitters without PSU (operated on DC) in one subrack.

Figure 4.3-1, Examples of various configurations

4.4 Antenna connectors

The antenna should be of good quality with regards to gain and VSWR to obtain maximum performance. Recommended antennas can be Procom CXL-2-1LW/H (0dBd), Procom CXL-2-3C/M (3dBd) or similar. Make sure that the VSWR on the antenna is low, and that the cable from the transmitter to the antenna is of good quality to avoid mismatch and unnecessary losses. The antenna used with this radio should be installed at least 260cm away from any area where people are likely to be.
A cable loss of 1 dB is the same as reducing the power output of a 50W transmitter to less than 40W. Similarly, a cable loss of 2 dB is the same as reducing the output power to less than 32W.

In areas were thunderstorms and lightning is a problem, surge arrestors should be mounted between the antenna connector and the antenna cable. The arrestors should be of good quality and be capable of handling the output power of the transmitter.

The antenna output of the transmitter is an N-type antenna connector on the back of the transmitter. The second connector (BNC-type) is the output of the antenna switch and can be used to connect the input of a receiver.

4.5 AC and DC connectors

Refer to section 3.4.2, 3.6.1 and 3.6.3 for voltages and connectors.

4.6 Remote signals

Several remote signals are available on the rear interfaces of the radio units.
These signals can be grouped into: Audio signals, Key signals, Data interface signals and other signals. Note, for all interface signals, RJ45 connectors are used. As far as practically possible, the pairs used on a standard ethernet connection are used when a signal is input/output as a pair to the radio (e.g. audio lines). For interconnections between the transmitter and receiver, and for interconnection to a

distribution panel with RJ45 connectors, standard Cat5E, ethernet cable should be used. This is a good quality, screened cable, with 1 to 1 connections between the two connectors.
Below is an overview of the signals available and their primary use. Refer to chapter 3.2 and 0 for and overview of the different connectors.

4.6.1 REM connector (receiver) and RX connector (transmitter)

CABLE		TX - REM/RX	RX - REM	PIN NAME	DESCRIPTION
		Pin no	Pin no		
RJ45 - Cat 5E, FTP	4 pairs	1	1	RS485+	RS485 - serial communication
		2	2	RS485-	RS485 - serial communication
		3	3	LINE_P	RX Audio 600ohm balanced
		4	4	TX BUSY	TTL L=transmitting (RX pullup)
		5	5	RX BUSY	TTL L=receiving (TX pullup)
		6	6	LINE_N	RX Audio 600ohm balanced
		7	7	ALARM	Alarm (TTL) I/O TRX alarm
		8	8	GND	Ground

Table 4.6-1, Transceiver, transmitter – receiver interconnections

The RX connector on the transmitter unit has a special function, and is normally used only in a "transceiver" configuration.
When connecting the signals on the transmitter RX connector with the signals on the receivers REM connector, the following functionality is added to the transmitter and receiver:

- **The receiver audio line (p.3 and p.6) is input to the transmitter.**
  This enables the possibility to monitor the audio from the receiver from the transmitter headphone connector, allowing only one plug to be used for a combined headset/microphone.
  In addition, it enables the possibility to use a 2 wire interface to the transmitters audio input line for the combined transmitter and receiver audio.
  Finally, it enables the functionality to monitor both the transmitted audio and the received audio on the monitor output (TA-AUX2) line on the transmitter.

- **A RX Busy signal (p.5) is input to the transmitter from the receiver.**
  This signal signals the transmitter that the RX is busy. This is used in VDL operation.

- **A TX Busy signal (p.4) is output from the transmitter to the receiver.**
  This signal signals the receiver that the TX is busy (transmitting). This is used in VDL operation, and to mute the receiver while transmitting (see table below).

- **A receiver alarm in/out is connected to the transmitter alarm in/out.**
  This enables the functionality that the complete transceiver (both receiver and transmitter unit) will enter into alarm state if one of the units fails. This is useful if the complete transceiver should be switched to a backup transceiver.

- **The RS485 serial lines from both units are connected in parallel.**
  This is useful to have only one connection point for the RS485 on the transceiver for remote control.

Menu path: Interface config ►	Parameter	Range	Default	Details
RS485 (TX and RX)	**Bitrate**	1200 – 115200	1200	Set the bit rate to use on the RS485 port
RS485 (TX and RX)	**Address**	1 – 255	1	Set the address to use on the RS485. In a remote system using the RS485 communication port, all units that are interconnected need to have a unique address in order to avoid collisions and misinterpretation of data.
RS485 (TX and RX)	**Protocol**	Legacy | standard	Legacy	The protocols are described in the data manual. **Legacy** uses a protocol where the 9. bit is used for address recognition, this is the protocol used on the previous radio models (TA7450, RA7202) and is compatible with the RACS II PC software and the RCU remote control unit. **Standard** is an eight bit protocol that uses the multidrop capability of the RS485 bus. For more information on protocols, refer to the SW manual.
Menu path: RX config ►	**Parameter**	**Range**	**Default**	**Details**
Audio (RX)	**Mute on transmit**	False | True	True	Set this to true if the receiver should be muted while transmitting. Requires that the Tx busy signal on the transmitters RX connector is routed to the TX busy input on the receiver REM connector. (p.4)

Table 4.6-2, Settings associated with the transmitter - receiver interconnection

4.6.2 Audio in/out and Line loop keying

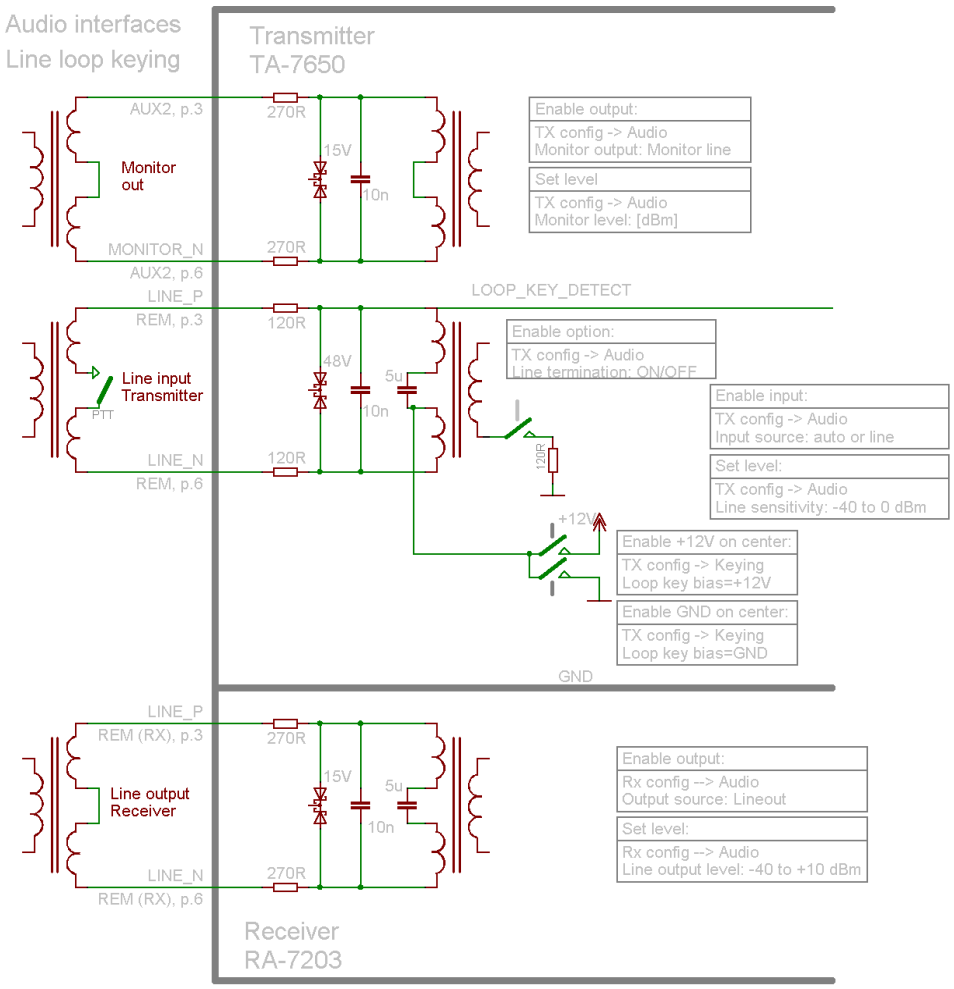


Figure 4.6-1, Audio interfaces on the transmitter and receiver units

With reference to

Figure 4.6-1, the following audio remote signals are available on the rear connectors:

- **Monitor out:** Monitor signal, usually connected to a recording unit.

Menu path: TX config ►	Parameter	Range	Default	Details
Audio (TX)	**Monitor output**	Headset | Monitor output	Monitor output	Set where the monitor output signal and the received audio (if a receiver is connected) is routed. Can be set to the headset connector, the 600 ohm monitor line output or both. The monitor signal is the demodulated signal detected on the output of the transmitter.
Audio (TX)	**Monitor level**	-80 – 10 dB	-50 dB	Set the relative output level of the monitor signal. 10dB = max output, -80dB=minimum

Table 4.6-3, Settings associated with MONITOR OUTPUT (TA – AUX1)

- **Line input, transmitter:** This is the transmitter audio line input. This signal is usually connected to a VCS system or a remote control that uses a 600 ohm line interface.

Menu path: TX config ►	Parameter	Range	Default	Details
Audio (TX)	**Input source**	Auto | Line | Mic | modgen | VoIP	Auto	The input source determines where the audio is applied to the transmitter. ▪ **Auto**: Uses line input for when a key signal is detected on one of the remote connectors and mic input if the key signal is detected on the front panel connector. ▪ **Line**: Uses the 600 ohm line interface as the audio source ▪ **Mic**: Uses the microphone input as the audio source ▪ **Modgen**: Uses the internal modgen as audio input source – se also Modgen frequency ▪ **VoIP**: Uses the IP interface as the audio source (availability depends on radio specifications).
Audio (TX)	**Line sensitivity**	-40 – 0 dBm 1 dB steps	-17 dBm	Set the sensitivity of the 600 ohm line input. This setting determines where the VOGAD (automatic gain control) start to operate. Thus if it is set to -17 dBm, levels above -17 dBm will be modulated with 85% (default setting). For levels below -17 dBm the modulation will decrease linearly.
Audio (TX)	**Line termination**	OFF | 600 ohm	600 ohm	Set the termination of the input line to either **OFF** or **600 ohm**. Normally this is set to 600 ohm, but can be set to **OFF** on one of the radios, if two transmitters are connected in parallel. This is to maintain the 600 ohm impedance on the lines.
Audio (TX)	**Line mute level**	OFF or -40 to -10dBm 1 dB steps	OFF	Below this level, the line input will be muted. Used where noisy lines are connected to the transmitter to avoid unnecessary noise on the produced RF signal during periods of silence (Automatic transmissions; VOLMET, ATIS)
Keying (TX)	**Source**	Mic, line, txkey, txgnd, inband	Mic, txkey	Determines what signal that will be used as the source for keying the transmitter. Any combinations can be set ▪ **Mic:** Local PTT input from a microphone, where the PTT is connected to pin 4 and 8(gnd) on the Mic/headset connector. ▪ **Line:** Keying from a phantom signal on the line input. Pin 3 and 6 on the Rem/TR connector. ▪ **Txkey:** The transmitter is keyed by an external voltage on the TXKEY_P and TXKEY_N input pins. Signals located on Pin 7 and 8 on the | connector. ▪ **Txgnd:** The transmitter is keyed by a signal on the TXKEY_G input pin Signals are located on Pin 4 and 8 (gnd) on the REM/TR connector. ▪ **Inband:** The transmitter is keyed using an inband tone (see also inband frequency and inband sensitivity)

Menu path: TX config ►	Parameter	Range	Default	Details
Keying (TX)	**Loop key bias**	+12V, Gnd, floating	Floating	Connects the center pin of the line input transformer to: ▪ **Floating:** The center pin is not connected. If loop keying is used, an external voltage must be applied to pin 3 (REM connector) in order to key the transmitter ▪ **Gnd:** The center pin is grounded. If loop keying is used, an external voltage must be applied to pin 3 (REM connector) in order to key the transmitter. ▪ **+12V:** A 12V DC is supplied on pin 3(REM/TR connector). The transmitter can be keyed with a relay (or equivalent) that create a DC path on the line input pin, pin 3 and 6 (REM/TR connector).

Table 4.6-4, Settings associated with LINE_INPUT (TX-REM)

- **Line output, receiver:** This is the receiver audio line output. This signal is usually connected to the VCS system or a remote control that uses a 600 ohm line interface.

Menu path: RX config ►	Parameter	Range	Default	Details
Audio (RX)	**Output source**	Speaker | Headphone | Lineout | VoIP	Speaker, Headphone, Lineout	The output source determines where the received audio is output. ▪ **Line**: Output audio on the 600 ohm line interface ▪ **Speaker:** Output audio on the integrated speaker. ▪ **Headphone:** Output audio to a headphone connected to the front panel connector. ▪ **VoIP**: Output audio on the IP interface (availability depends on radio specifications).
Audio (RX)	**Line output level**	-40 to +10 dBm 1 dB steps	-10 dBm	Set the maximum output level on the 600 ohm line output.

Table 4.6-5, Settings associated with LINE_OUTPUT (RX-REM)

4.6.3 Other key signals

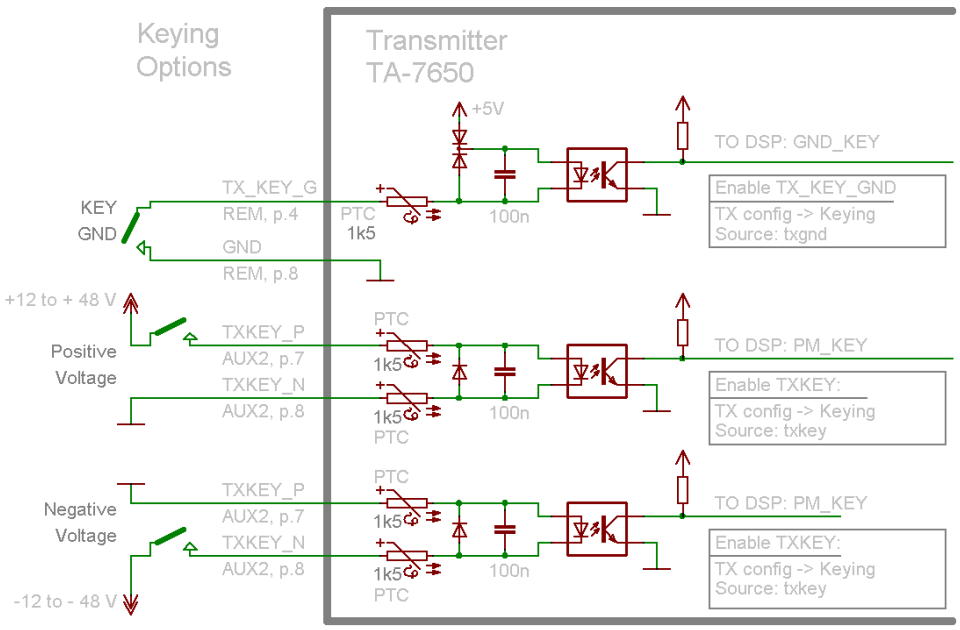


Figure 4.6-2, Key signals on the transmitter unit

In addition to the line loop keying, it is possible to key the transmitter, using several other hardware and software options.

- **TX_KEY_G**
  This is a signal available on the transmitter REM connector, pin 4. This signal, if connected to GND will key the transmitter.

- **TXKEY_P, TXKEY_N**
  This is a differential signal, available on the transmitter AUX2 connector, pin 7 and 8. This signal will key the transmitter if a voltage between 12 and 48 V is fed between them. Note also that this is a differential signal, not connected to any ground potential inside the transmitter, therefore the signal can be configured for both positive and negative voltage keying (see figure).

Menu path: TX config ►	Parameter	Range	Default	Details
Keying (TX)	**Source**	Mic, line, txkey, txgnd, inband	Mic, txkey	Determines what signal that will be used as the source for keying the transmitter. Any combinations can be set ▪ **Mic:** Local PTT input from a microphone, where the PTT is connected to pin 4 and 8(gnd) on the Mic/headset connector. ▪ **Line:** Keying from a phantom signal on the line input. Pin 3 and 6 on the Rem/TR connector. ▪ **Txkey:** The transmitter is keyed by an external voltage on the TXKEY_P and TXKEY_N input pins. Signals located on Pin 7 and 8 on the | connector. ▪ **Txgnd:** The transmitter is keyed by a signal on the TX_KEY_G input pin Signals are located on Pin 4 and 8 (gnd) on the REM/TR connector. ▪ **Inband:** The transmitter is keyed using an inband tone (see also inband frequency and inband sensitivity)

Table 4.6-6, Key Source settings

4.6.4 Squelch and AGC signals, receiver unit

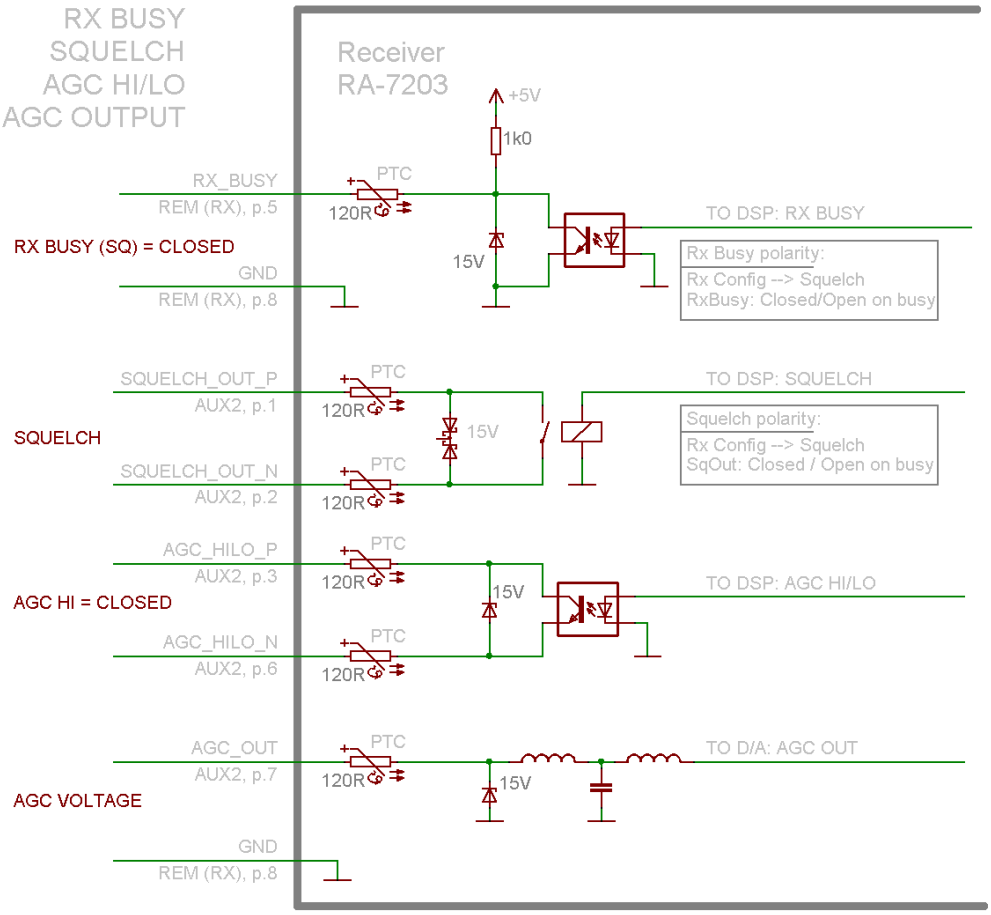


Figure 4.6-3, Squelch and AGC signals receiver unit

- **RX_BUSY (REM, p.5)**
  Squelch output signal that is referenced to GND.
  This signal can be used to detect that the receiver is busy on a connected transmitter unit, on a remote control or an other unit that can use this signal.
  The signal polarity can be configured.

- **SQUELCH (AUX2, p.1 and p.2)**
  This signal indicates that the squelch is activated / closed.
  The polarity can be configured. The output is a solid state relay, rated for maximum 100V / 100mA.

- **AGC_HILO_P, AGC_HILO_N (AUX2, p.3 and p.6)**
  This signal indicates that a signal above approximately +40 dBuV is received.
  This can be used to detect if the signal comes from a collocated transmitter operating on the same frequency or a transmission from an aircraft.
- **AGC VOLTAGE (AUX2, p.7)**
  This is an analogue output 0-5V. The output voltage is 0V for an input of xxx uV and increases linearly with the input signal up to xxx uV where the voltage reach +5V.

Menu path: RX config ►	Parameter	Range	Default	Details
Squelch	**SqOut output**	Closed | Open | Closed on busy| Open on busy	Closed on busy	Set the behavior of the SqOut output (AUX2, pin 1 and pin 2).
Squelch	**RxBusy output**	Closed | Open | Closed on busy| Open on busy	Closed on busy	Set the behavior of the RxBusy output (REM, pin 5).

Table 4.6-7, Squelch output configuration

4.6.5 Alarm and Select signals transmitter and receiver

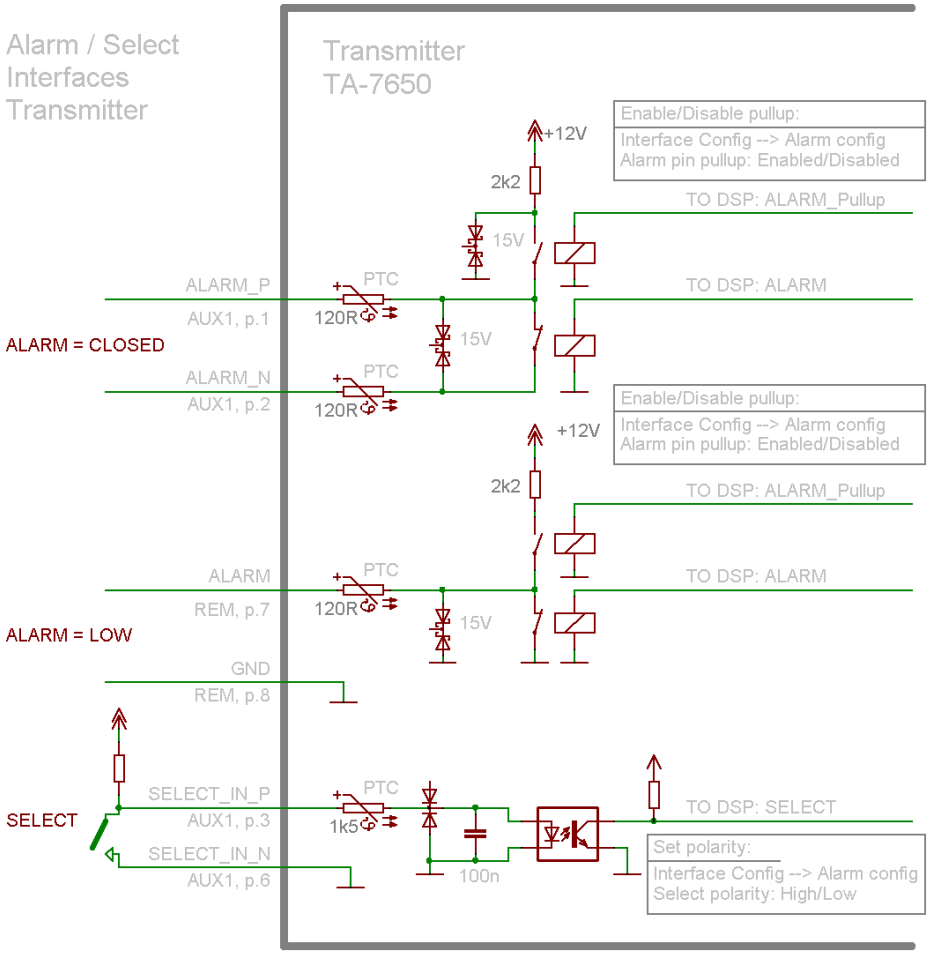


Figure 4.6-4, Alarm and select signals, transmitter

The alarm signals are outputs used to signal that the radio units has detected an alarm internally. The Select signal is used to select or deselect (inhibit) a particular unit. By deselecting a unit, the unit will enter into standby and can not be used for radio communication. However, all other functionality of the radio units is operational when the radio is in the standby state.
The pinout and signals are equal on the transmitter and the receiver unit, except the ALARM (REM, p.7) pin. This pin has a fixed +5V pull-up on the receiver, while the pull-up is configurable on the transmitter.

- **ALARM_P, ALARM_N (AUX1, pin 1 and 2)**
  This is a differential signal, used to signal the alarm state. The radio can be set up with an internal pull-up to +12V if desired.

- **ALARM (REM, pin 7)**
  Same as the signal above, but this signal is referenced to GND.

- **SELECT (AUX1, pin 3 and 6)**
  This input is connected to an optocoupler. The SELECT requires an external voltage to operate.
  One way to use the SELECT signal is in conjunction with the ALARM output signal from another radio unit. If the ALARM signal (ALARM_P and ALARM_N) on a primary (main) radio is connected to the SELECT_P and SELECT_N on a secondary (backup) radio, then automatic switchover from the main to the standby radio is performed when the main radio detects an alarm. In this mode, a pull-up is required on the ALARM output from the primary radio.

Menu path: Interface config ►	Parameter	Range	Default	Details
Alarm config (TX and RX)	**Alarm pin pull-up**	Disabled | Enabled	Enabled	The ALARM_OUT_P and ALARM_OUT_N output pins on AUX1 is used to signal that the radio has an alarm. This parameter applies a pull up voltage to ALARM_OUT_P when there are no alarms present. When an alarm is detected the relay contact close.
Alarm config (TX and RX)	**Select polarity**	High | Low	Low	The SELECT_IN_P and SELECT_IN_N input pins on AUX1 can be used to select / deselect (Standby) the radio with an external signal (e.g. alarm from a main radio). This setting determines if the radio should be operational on a low select input signal or a high select input signal.

Table 4.6-8, Alarm and Select settings, transmitter and receiver

4.6.6 Miscellaneous signals, transmitter

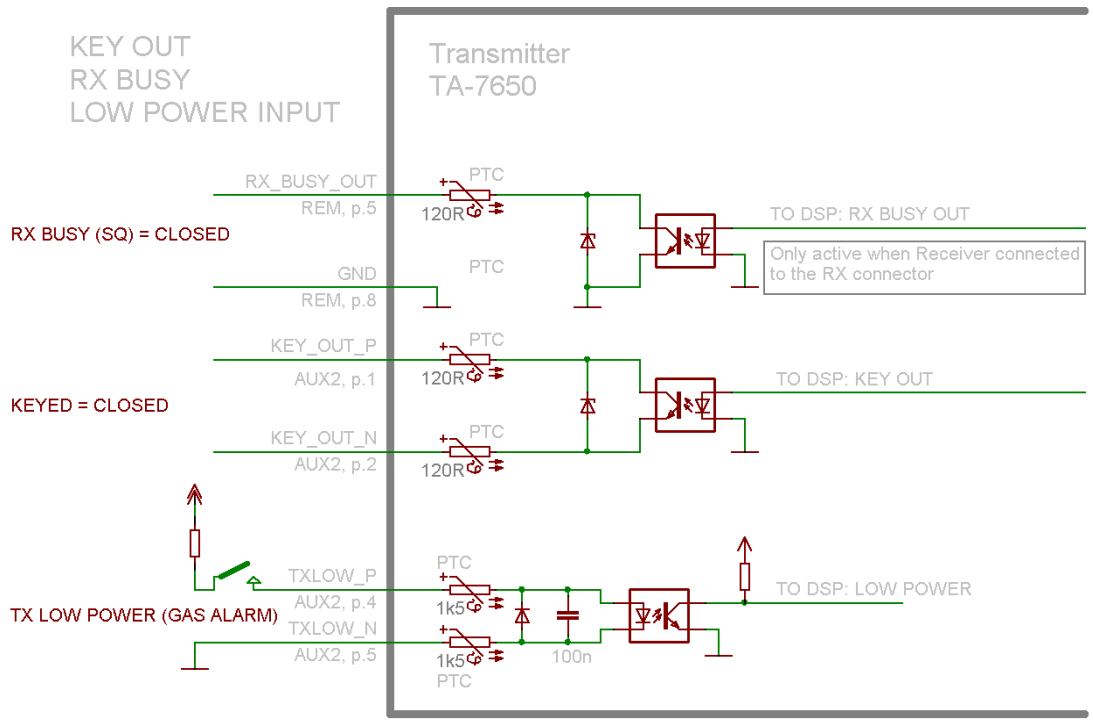


Figure 4.6-5, Misc signals, transmitter

- **RX BUSY (SQ) (REM, pin 5)**
  This signal is only available when a receiver is connected with a 8 pin bus between the transmitter RX and the receiver REM connector.
  The signal is the same as the RX BUSY from the receiver, settings are done on the receiver unit.

- **KEY_OUT_P, KEY_OUT_N (AUX2, pin 1 and 2)**
  This output can be used for external equipment that needs a key signal from the transmitter. The key signal is available immediately after a key input is received on any of the key inputs. Normally RF is produced only a few ms (<10ms) after a key signal is applied to the transmitter.
  If the KEY_OUT is used for external equipment that used relays for switching the RF, it is necessary to delay the RF output, this can be done with a software setting, see below.

- **TXLOW_P, TXLOW_N (AUX2, pin 4 and 5)**
  This input is used to immediately switch the transmitter into low power. The input requires an external pull-up to work. The low power level can be adjusted with a software setting.

Menu path: Radio control ►	Parameter	Range	Default	Details

Menu path: Radio control ►	Parameter	Range	Default	Details
Low power level (TX)		30 – 41 dBm 1 dB steps	41 dBm	Set the low power level of the transmitter in 1 dB steps. The low power level is the output power of the transmitter when the transmitter is set to low power, either by a command or by an external input signal. 30 dBm corresponds to 1W output, 41 dBm is 12W ouput.

Menu path: TX config ►	Parameter	Range	Default	Details
Keying (TX)	**RF delay**	0 – 200 ms	0 (OFF)	This setting is useful when the transmitter is used together with external equipment such as T/R relays, power amplifier or other equipment that includes RF switchover relays. Since the RF switching in the transmitter is done electronically, the RF is produced in less than 10ms after the PTT signal is detected. It could be harmful for the external relays if the RF is applied to them before switchover has occurred. In order to delay the RF carrier this parameter should be used under such circumstances. A reasonable setting should be in the order of 40-50 ms.

Table 4.6-9, Misc. settings, transmitter.

4.7 Applications

4.7.1 Transceiver, local configuration

In a transceiver setup for local configuration, the mic and headset signals are interfaced to the microphone/headset connector on the transmitter. The headphone signal can also be derived from the headset connector on the transmitter.

Connection for local operation is shown in Figure 4.7-1 and tab.

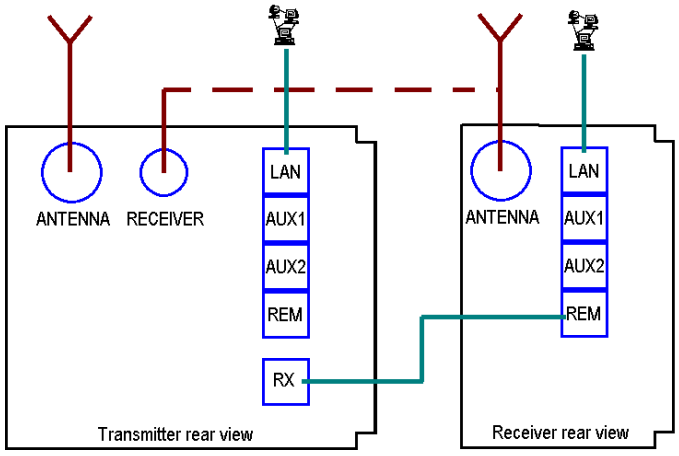


Figure 4.7-1, Transceiver, Local configuration, interfacing

Step	Description	Reference
1	Connect an 8 wire Cat5e cable between TA-RX connector and RA-REM connector.	**4.6.1 - Pin description**
2	Set the **Mute on transmit** to enabled (receiver)	**5.9.2 - RX config group**
3	Set **Audio output source** to **Lineout** (receiver)	**5.9.2 - RX config group**
4	Set **Audio input source** to **mic** (transmitter)	**5.5.2 – TX config group**
5	Set **Monitor output** to headset (transmitter)	**5.5.2 – TX config group**
6	Set **Keying source** to include **mic** (transmitter)	**5.5.2 – TX config group**
7	Connect a coax cable (RG58 or better) between the TA – Receiver antenna connector (BNC) and the antenna input on the receiver. Alternatively, use separate antennas for the TA and RA.	**3.2.2 and 3.4.1**
	Other useful signals in Local configuration:	
AUX1	Alarm out, Select in, RS232, +12V	**3.2.5 (transmitter AUX1) and 3.4.4 (receiver AUX1)**
TA-AUX2	Key out relay, Monitor output, TX_LOW (Gas alarm) input, TXKEY	**3.2.6 (transmitter AUX2)**
RA-AUX2	Squelch out relay, AGC HILO output, AGC voltage output	**3.4.6 (receiver AUX2)**
TA – REM	RS485, Line input, Key, Squelch, Alarm	**3.2.7 (transmitter REM)**

Table 4.7-1, Transceiver, Local configuration

4.7.2 Transceiver, remote configuration

In a transceiver setup for remote configuration, the audio is fed into the transmitter and the received audio is output from the receiver on the 600 ohm lines.
The line can either be a 2 wire (2W) audio line connected to the transmitter only, or a 4 wire (4W) interface connected to the transmitter and the receiver units.

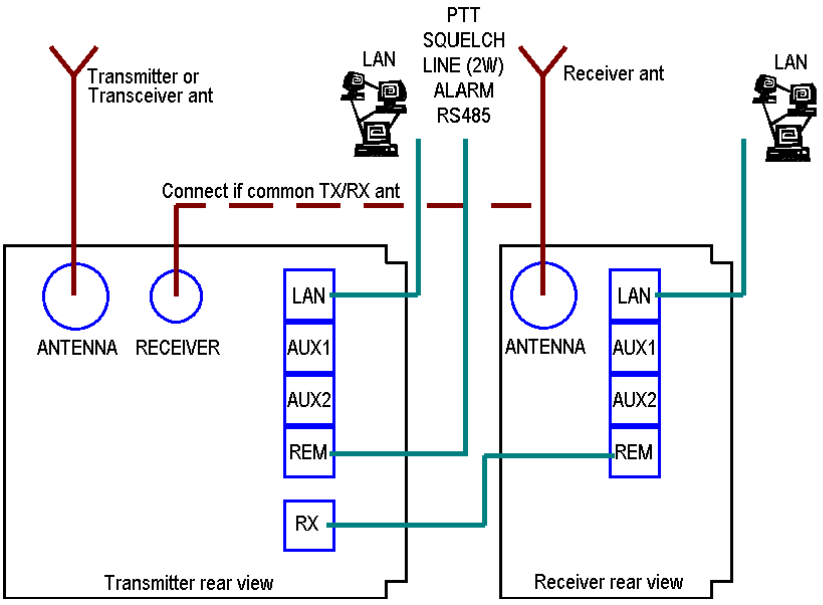


Figure 4.7-2, Transceiver, Remote configuration with 2 wire audio interface

Step	Description	Reference
1	Connect an 8 wire Cat5e cable between TA-RX connector and RA-REM connector.	**4.6.1 - Pin description**
2	Set **Mute on transmit** to enabled (receiver) – if desired	**5.9.2 - RX config group**
3	Set **Audio output source** to **Lineout** (receiver)	**5.9.2 - RX config group**
4	Set **Audio input source** to **line** (transmitter)	**5.5.2 – TX config group**
5	Set **Keying source** to include **txkeygnd**	**5.5.2 – TX config group**
6	Connect a coax cable (RG58 or better) between the TA – Receiver antenna connector (BNC) and the antenna input on the receiver. Alternatively, use separate antennas for the TA and RA.	**3.2.2 and 3.4.1**
	Other useful signals in Remote configuration:	
AUX1	Alarm out, Select in, RS232, +12V	**3.2.5 (transmitter AUX1) and 3.4.4 (receiver AUX1)**
TA-AUX2	Key out relay, Monitor output, TX_LOW (Gas alarm) input, TXKEY	**3.2.6 (transmitter AUX2)**
RA-AUX2	Squelch out relay, AGC HILO output, AGC voltage output	**3.4.6 (receiver AUX2)**
TA – REM	RS485, Line input, Key, Squelch, Alarm	**3.2.7 (transmitter REM)**

Table 4.7-2, Transceiver, Remote (2W) interface

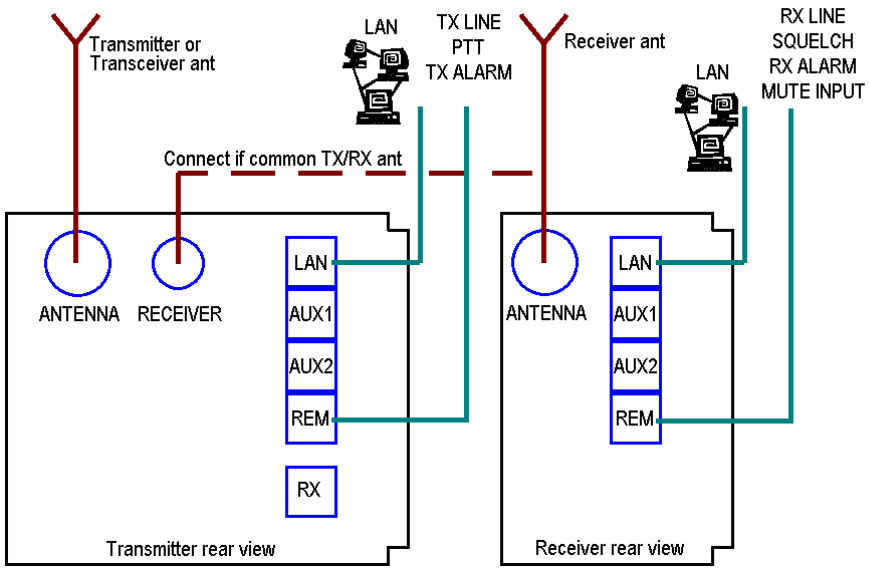


Figure 4.7-3, Transceiver, Remote configuration with 4 wire audio interface

Step	Description	Reference
1	For audio line interfaces refer to the reference	**4.6.2 – Audio interface**
3	Set **Audio output source** to **Lineout** (receiver)	**5.9.2 - RX config group**
4	Set **Audio input source** to **line** (transmitter)	**5.5.2 – TX config group**
5	Set **Keying source** to include **txkeygnd** (or other signal if desired)	**5.5.2 – TX config group**
6	Connect a coax cable (RG58 or better) between the TA – Receiver antenna connector (BNC) and the antenna input on the receiver. Alternatively, use separate antennas for the TA and RA.	**3.2.2 and 3.4.1**

Step	Description	Reference
	Other useful signals in Remote configuration:	
AUX1	Alarm out, Select in, RS232, +12V	**3.2.5 (transmitter AUX1) and 3.4.4 (receiver AUX1)**
TA-AUX2	Key out relay, Monitor output, TX_LOW (Gas alarm) input, TXKEY	**3.2.6 (transmitter AUX2)**
RA-AUX2	Squelch out relay, AGC HILO output, AGC voltage output	**3.4.6 (receiver AUX2)**
TA – REM	RS485, Line input, Key, Squelch, Alarm	**3.2.7 (transmitter REM)**

Table 4.7-3, Transceiver, Remote (4W) interface

4.7.3 Transmitter, main / backup configuration

By connecting the alarm output from one (main) transmitter to the select input on a backup unit, it is possible to perform automatic switching between them. In this way, if a main transmitter detects an internal failure, it can be set up to enter into standby mode and stop transmissions. The alarm signal will also signal to a backup unit to take over the transmit function.

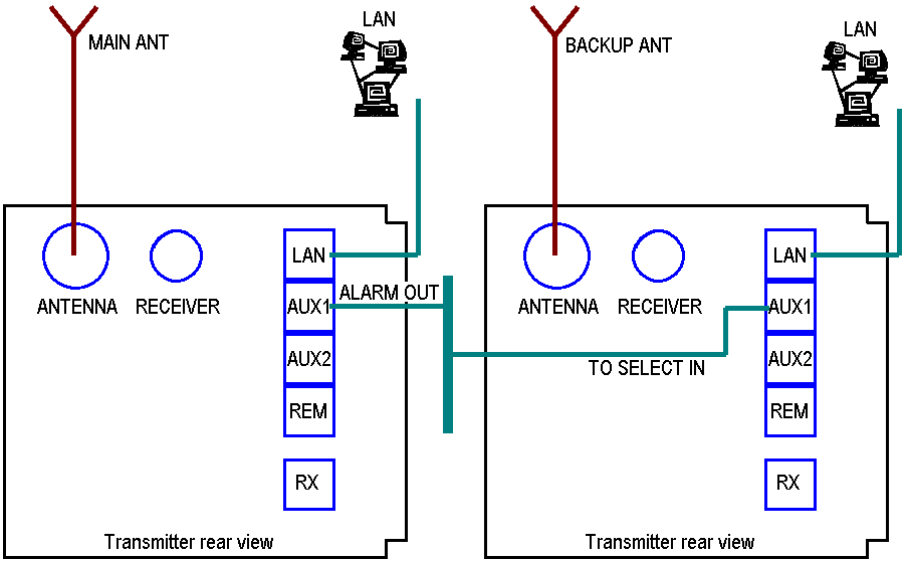


Figure 4.7-4, Main / Backup transmitter

Step	Description	Reference
1	Connect the alarm_out signal (p.1,2) from AUX1 on the main transmitter to the select_in signal (p.3.6) on AUX1 on the standby transmitter. The connection can be done via a distribution panel or by making a special with RJ45 connectors in each end. The cables used should be of the same quality as a CAT5E network cable and the screen should be connected in the plugs.	**3.2.5 – AUX1 connector**
2	Set **Alarm config, Alarm pin pullup** to **Enabled** (default)	**5.5.3 – Interface config group**
3	Set **Alarm config, Select polarity** to **Low** (default)	**5.5.3 – Interface config group**
4	Set the main transmitter **Operation mode** to **Main**	**5.5.1 – Radio control group**
5	Set the backup transmitter **Operation mode** to **Norm** (default)	**5.5.1 – Radio control group**
6	Connect separate antennas to the two transmitters. Alternatively use an external antenna change over unit (ACU) in order to switch the antenna between the main and standby transmitters. The antenna change over unit can be controlled by the alarm signal on the main unit	

Table 4.7-4, Main/backup configuration, transmitters

4.7.4 Receiver, main / backup configuration

By connecting the alarm output from one (main) receiver to the select input on a backup unit, it is possible to perform automatic switching between them. In this way, if a main transmitter detects an internal failure, it can be set up to enter into standby mode and stop reception of signals. The alarm signal will also signal to a backup unit to take over the receive function.

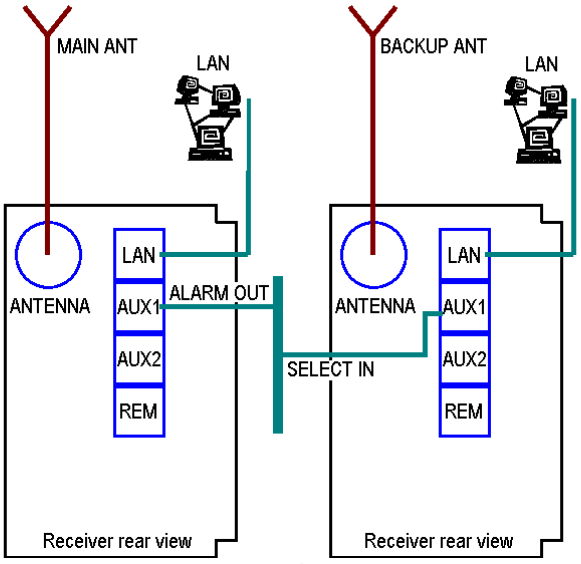


Figure 4.7-5, Main / Backup receiver

Step	Description	Reference
1	Connect the alarm_out signal (p.1,2) from AUX1 on the main receiver to the select_in signal (p.3.6) on AUX1 on the standby receiver. The connection can be done via a distribution panel or by making a special with RJ45 connectors in each end. The cables used should be of the same quality as a CAT5E network cable and the screen should be connected in the plugs.	**3.4.4 – AUX1 connector**
2	Set **Alarm config, Alarm pin pullup** to **Enabled** (default)	**5.8.3 – Interface config group**
3	Set **Alarm config, Select polarity** to **Low** (default)	**5.8.3 – Interface config group**
4	Set the main receiver **Operation mode** to **Main**	**5.8.1 – Radio control group**
5	Set the backup receiver **Operation mode** to **Norm** (default)	**5.8.1 – Radio control group**
6	Connect separate antennas to the two receivers. Alternatively use an external antenna change over unit (ACU) in order to switch the antenna between the main and backup receivers. The antenna change over unit can be controlled by the alarm signal on the main unit. The antenna connection can also be done via a pair of main/backup transmitters.	

Table 4.7-5, Main/backup configuration, receivers

5 Operating Instructions

5.1 Introduction

To set up the transmitter and receiver units, several parameters can be selected from the front panel. This section details how this is done and the range of all parameters.
Since the radio units contains no manual tuning points or switches, all parameters can in principal be set from the front panel, however except in some rare occasions, most parameters should be left at their default (factory preset) values.
There are 4 user levels that can be selected to limit the user access to certain parameters. The user levels can be set on one of the data interface ports. There is also a way to override the user levels, described in the technical manual.
These user levels are:

- **Restricted** Limits front panel operation to selecting preset channels and adjusting audio output levels and display appearance. Use this level when the radio units are used from a remote position or in cases where the user should be restricted to use preset channels only (1 – 100).
- **Operation** Same as restricted, but in addition the local user has full access to changing and storing frequencies, and to change the squelch level.
- **Technician** This level gives the local user access to the most used installation specific parameters (line levels, output power, etc.) and should be used when installing or maintaining the radio units.
- **SysOp** This level gives unlimited access to all parameters within the radio units and should be used with care.

In the following section, these symbols and abbreviations are used to explain navigation in menus / setting of values:

- Scroll/Select switch = SW
- Navigation button A (left button) = A
- Navigation button B (middle button) = B
- Navigation button C (right button) = C
- Clockwise = **CW**
- Counter Clockwise = **CCW**

5.2 User menu – transmitter (Restricted access level)

Main display window in restricted mode.

Display	Description
	When the transmitter is switched on, it will show the channel, the frequency and the operation mode (FM).
	Press SW to navigate to the channel recall screen. Select any channel (up to 100) that is previously stored in the radio by rotating SW. Recall selected channel with C If no channel is stored, the display will show: CH: No channels
	Press SW to navigate to the audio output level screen. This setting adjusts the audio level output at the front panel microphone/headset connector. Rotate SW **CW** or **CCW** to adjust the headset level.
	Press SW to navigate to the display intensity adjust screen. This setting adjusts the intensity of the display and LED indicators. Rotate SW CW or CCW to adjust the intensity.
	Press SW to return to the default screen
	Pressing A from the main display will bring up the menu options available for the current user level.
	Menus for user level: Restricted For details regarding submenus, refer to chapter 5.4.

Table 5.2-1, User menu selections transmitter - restriced access level

5.3 User menu – transmitter (Default access level)

Main display window for user levels: Operator, Technician and SysOp.

Display	Description
	When the transmitter is switched on, it will show the channel, the frequency,and the operation mode (FM).
	Press SW to navigate to the channel recall screen. Select any channel (up to 100) that is previously stored in the radio by rotating SW. Recall selected channel with C If no channel is stored, the display will show: CH: No channels
	Press SW to navigate to the audio output level screen. This setting adjusts the audio level output at the front panel microphone/headset connector. Rotate SW **CW** or **CCW** to adjust the headset level.
	Press SW to navigate to the channel select screen. Select channel number by rotating SW CW or CCW. Confirm new channel with SW or C.
	Confirm with SW or C. If the channel is already programmed, the channel may be cleared using B
	Press SW to navigate to the display intensity adjust screen. This setting adjusts the intensity of the display and LED indicators. Rotate SW CW or CCW to adjust the intensity.
	Press SW to return to the default screen
	Pressing A from the main display will bring up the menu options available for the current user level.
	Menus for user level: Operator For details regarding submenus, refer to chapter 5.4.
	Menus for user level: Technician For details regarding submenus, refer to chapter 5.4.
	Menus for user level: SysOp For details regarding submenus, refer to chapter 5.4.

Table 5.3-1, User menu selections transmitter- Operator, Technician and SysOp access levels

5.4 Setting, information and configuration menus – transmitter

Under the menu selection from the user menu, various submenu groups are available depending on the user level.
The submenus and details for them are shown in the tables below.

Submenu	Access level	Description
Radio control ▶	SysOp, Technician	Access to operation mode, low power level, climax offset parameters, modulation and standby settings.
TX config ▶	SysOp	Access to configuration parameters for modulation, audio settings, key (PTT) settings and internal calibration settings.
Interface config ▶	SysOp	Access to configuration parameters for the ethernet interface, RS232 port, RS485 port, various pin settings on the hardware interface (remote connectors) and the user access level.
Bite system ▶	SysOp, Technician	Displays information about active alarms and gives the user access to internal measurements.
System info ▶	All	Displays information about the firmware and hardware release, system up-time and radio identification

Table 5.4-1, Submenus available on the transmitter

5.4.1 Radio control group

SysOp and Technician access levels. Refer to section 5.5.1 for details.

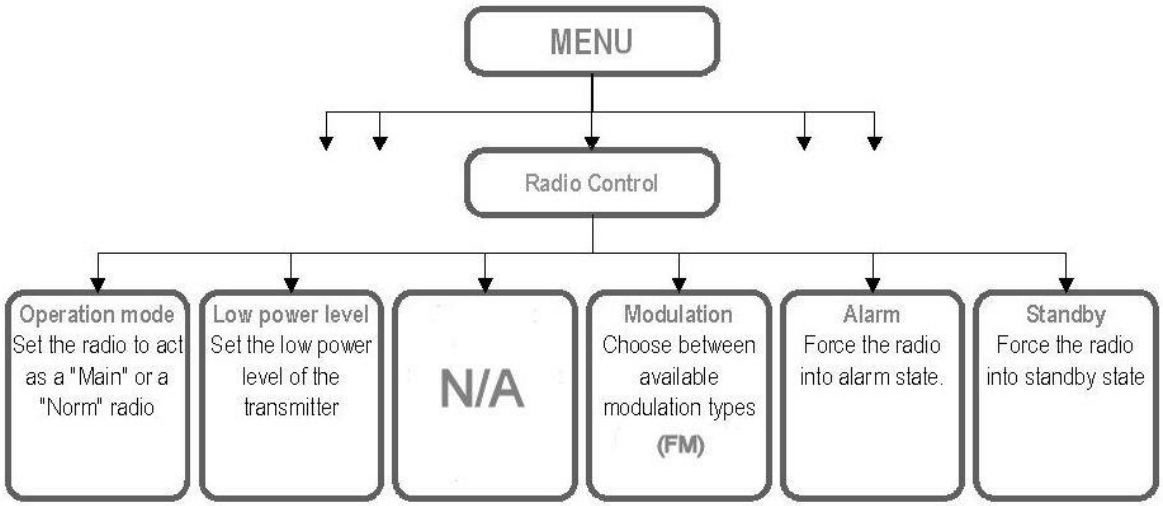


Figure 5.4-1, Radio control group, transmitter

5.4.2 TX config group

SysOp access level. Refer to section 5.5.2 for details.

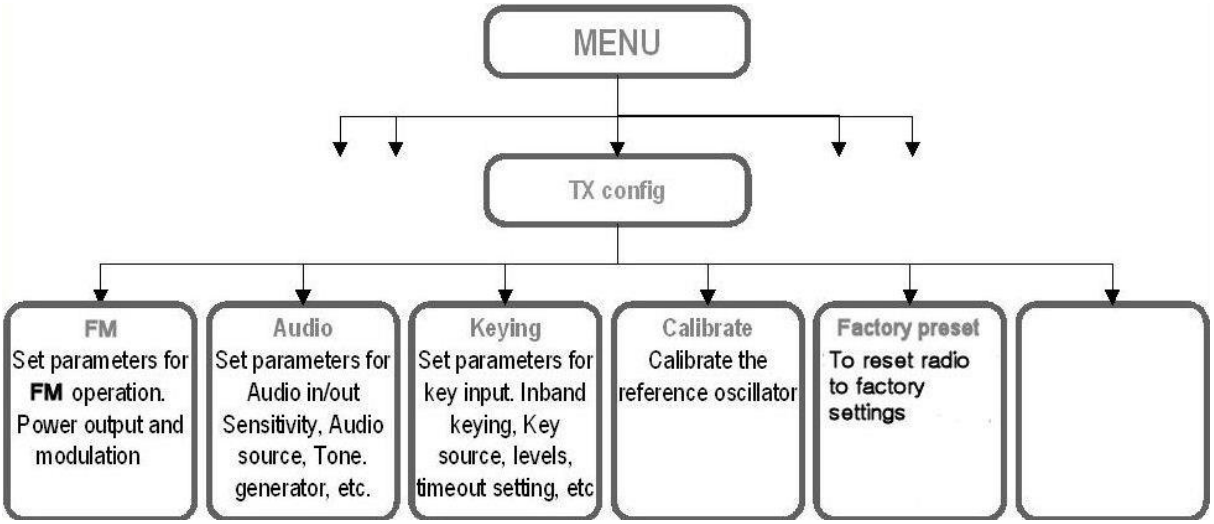


Figure 5.4-2, TX config group, transmitter

5.4.3 Interface config group

SysOp access level. Refer to section 5.5.3 for details.

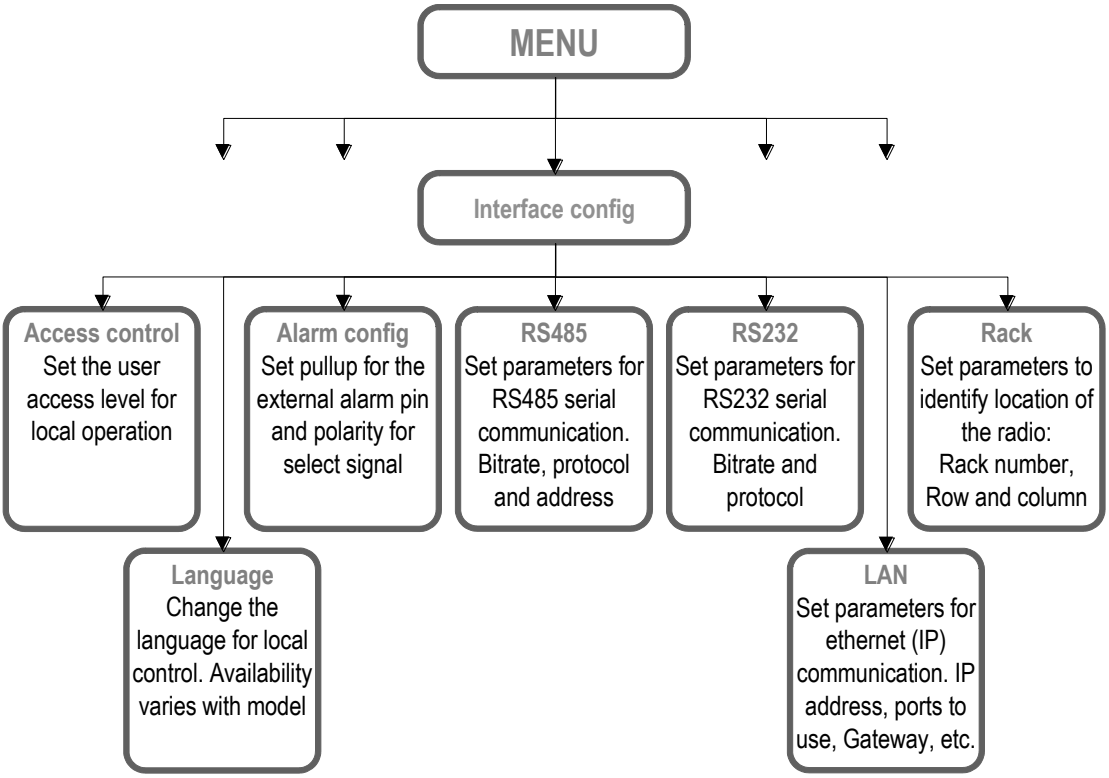


Figure 5.4-3, Interface config group, transmitter

5.4.4 Bite system group

SysOp and Technician access levels. Refer to section 5.5.4 for details.

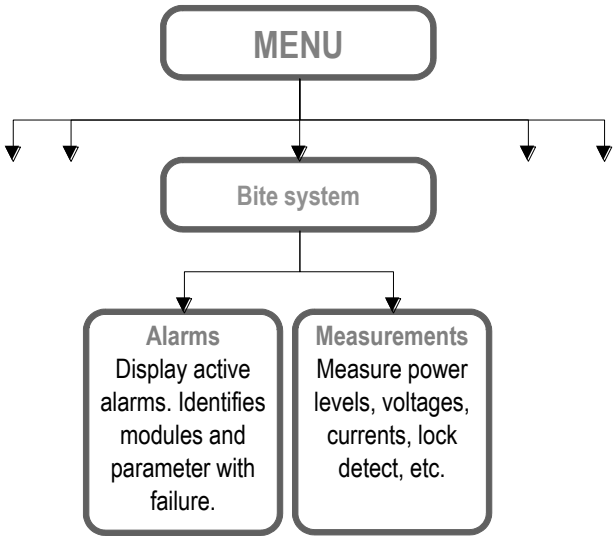


Figure 5.4-4, Bite system group, transmitter

5.4.5 System info group

All access levels.

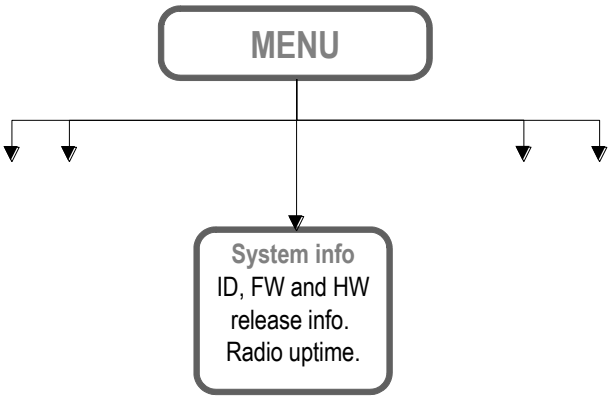


Figure 5.4-5, System info group, transmitter

5.5 Parameter details – transmitter

5.5.1 Radio control group

Menu path: Radio control ►	Parameter	Range	Default	Details
	Operation mode	Main | Norm	Norm	A **main** radio will enter into standby if an alarm is detected by the internal BITE system. A **norm** radio will continue operation (if possible) even if a failure is detected. In a main / standby configuration, the main radio is set to **Main** and the standby radio is set to **Norm**. In this way the control can automatically be transferred to the standby radio by using the available alarm output and select input on the radios.
	Low power level	30 – 41 dBm 1 dB steps	41 dBm	Set the low power level of the transmitter in 1 dB steps. The low power level is the output power of the transmitter when the transmitter is set to low power, either by a command or by an external input signal. 30 dBm corresponds to 1W output, 41 dBm is 12W ouput.
	Modulation	FM	FM	Select the modulation type / waveform to use. Availability depends on radio specifications.
	Alarm	On | Off	Off	This setting force the radio into alarm state (forced alarm) if set to **On**. Used for simulations, or to force a radio to signal an alarm in order to select a backup (standby) radio.
	Standby	On | Off	Off	This setting force the radio into standby state (forced standby) if set to **On**. Used to manually set a radio to standby.

Table 5.5-1, Radio control group, transmitter

5.5.2 TX config group

Menu path: TX config ►	Parameter	Range	Default	Details
FM	**Output power**	30 – 47 dBm 1 dB steps	47 dBm	Set the output power for FM operation. Max. level depends on radio model and is: ▪ 47 dBm for TA7650C
FM	**Modulation**	Up to ±5kHz deviation	±5kHz	Set the deviation for FM operation.

Menu path: TX config ►	Parameter	Range	Default	Details
Audio	**Input source**	Auto | Line | Mic | modgen | VoIP	Auto	The input source determines where the audio is applied to the transmitter. ▪ **Auto**: Uses line input for when a key signal is detected on one of the remote connectors and mic input if the key signal is detected on the front panel connector. ▪ **Line**: Uses the 600 ohm line interface as the audio source ▪ **Mic**: Uses the microphone input as the audio source ▪ **Modgen**: Uses the internal modgen as audio input source – se also Modgen frequency ▪ **VoIP**: Uses the IP interface as the audio source (availability depends on radio specifications).
Audio	**Mic sensitivity**	-40 – 0 dBm 1 dB steps	-25 dBm	Set the gain (sensitivity) for the microphone connected to the front panel connector. Use this setting to increase or decrease the gain if needed. Setting depends on microphone used.
Audio	**Line sensitivity**	-40 – 0 dBm 1 dB steps	-17 dBm	Set the sensitivity of the 600 ohm line input. This setting determines where the VOGAD (automatic gain control) start to operate. Thus if it is set to -17 dBm, levels above -17 dBm will be modulated with 85% (default setting). For levels below -17 dBm the modulation will decrease linearly.
Audio	**Line termination**	OFF | 600 ohm	600 ohm	Set the termination of the input line to either **OFF** or **600 ohm**. Normally this is set to 600 ohm, but can be set to **OFF** on one of the radios, if two transmitters are connected in parallel. This is to maintain the 600 ohm impedance on the lines.
Audio	**Line mute level**	OFF or -40 to -10dBm 1 dB steps	OFF	Below this level, the line input will be muted. Used where noisy lines are connected to the transmitter to avoid unnecessary noise on the produced RF signal during periods of silence (Automatic transmissions; VOLMET, ATIS)
Audio	**Monitor output**	Headset | Monitor output	Monitor output	Set where the monitor output signal and the received audio (if a receiver is connected) is routed. Can be set to the headset connector, the 600 ohm monitor line output or both. The monitor signal is the demodulated signal detected on the output of the transmitter.
Audio	**Monitor level**	-80 – 10 dBm	-50 dBm	Set the relative output level of the monitor signal.
Audio	**VOGAD**	Off, x-fast, fast, norm, slow, x-slow	Norm	Set the attack and decrease time of the automatic gain control (VOGAD). ▪ Off is used only for maintenance purposes.
Audio	**Modgen frequency**	100 – 5000 Hz 1 Hz steps	1003 Hz	Set the frequency of the internal modulation generator. Used in conjunction with the Audio input source
Audio	**Line=>Head gain**	-10 to +20 dB	0 dB	Defines the scaling factor of the Rx Audio on the headset output when the transmitter is connected to a receiver. The level is a relative value -10 to +20 dB

Menu path: TX config ►	Parameter	Range	Default	Details
Keying	**Source**	Mic, line, txkey, txgnd, inband	Mic, txkey	Determines what signal that will be used as the source for keying the transmitter. Any combinations can be set ▪ **Mic:** Local PTT input from a microphone, where the PTT is connected to pin 4 and 8(gnd) on the Mic/headset connector. ▪ **Line: Keying** from a phantom signal on the line input. Pin 3 and 6 on the REM connector. ▪ **Txkey:** The transmitter is keyed by an external voltage on the TXKEY_P and TXKEY_N input pins. Signals located on Pin 7 and 8 on the | connector. ▪ **Txgnd:** The transmitter is keyed by a signal on the TXKEY_G input pin Signals are located on Pin 4 and 8 (gnd) on the REM connector. ▪ **Inband:** The transmitter is keyed using an inband tone (see also inband frequency and inband sensitivity)
Keying	**Inband frequency**	100 – 5000 Hz 1 Hz steps	5000	Set the frequency to be used for the inband tone that will be used to key the transmitter. By selected the tone frequency to use, the transmitter will automatically calculate the notch filter to use an insert this into the audio path. Applicable to the line interface input only.
Keying	**Inband trig level**	-40 to -10 dBm	-30	The level of the tone used to key the transmitter on the 600ohm input line. The value is given in dBm (absolute level related to 600 ohm). Values above the limit will key the transmitter. See also Keying source and Inband frequency.
Keying	**TX Timeout**	OFF | 15-300 s 1s steps	OFF	Set the timeout for the key signal. If the PTT is pressed longer than this timeout, the transmitter will automatically stop transmitting. The transmitter will automatically reset the timer when the key signal is released.
Keying	**RF delay**	0 – 200 ms	0 (OFF)	This setting is useful when the transmitter is used together with external equipment such as T/R relays, power amplifier or other equipment that includes RF switchover relays. Since the RF switching in the transmitter is done electronically, the RF is produced in less than 10ms after the PTT signal is detected. It could be harmful for the external relays if the RF is applied to them before switchover has occurred. In order to delay the RF carrier this parameter should be used under such circumstances. A reasonable setting should be in the order of 40-50 ms.

Menu path: TX config ►	Parameter	Range	Default	Details
Keying	**Loop key bias**	Ground, +12V, Floating	Floating	Connects the centre pin of the line input transformer to: ▪ **Floating:** The centre pin is not connected. If loop keying is used, an external voltage must be applied to pin 3 (REM connector) in order to key the transmitter ▪ **Ground:** The centre pin is grounded. If loop keying is used, an external voltage must be applied to pin 3 (REM connector) in order to key the transmitter. ▪ **+12V:** A 12V DC is supplied on pin 3(REM connector). The transmitter can be keyed with a relay (or equivalent) that create a DC path on the line input pin, pin 3 and 6 (REM connector).
Calibrate	**Ref oscillator**	-127 – +128	0	This setting is used to fine adjust (calibrate) the reference oscillator of the transmitter. The full range is approximately 10 ppm. This setting should be used with care, and only when a calibrated frequency measuring instrument is connected to the transmitter.

Table 5.5-2, TX config group, transmitter

5.5.3 Interface config group

Menu path: Interface config ►	Parameter	Range	Default	Details
	Access control	SysOp, Technician, Operator, Restricted	SysOp	Set the user access level for local control. This setting limits the availability of some menus, depending on the access level. In order to set the access level from the user interface, a special hardware key must be inserted into the microphone/headset connector. Details of the key is available in chapter **Error! Reference source not ound.**
	Set language	Depending on model	English	Set the language to use on the user interface. Availability of different languages depends on specifications when ordering the transmitter.
Alarm config	**Alarm pin pull-up**	Disabled | Enabled	Enabled	The ALARM_OUT_P and ALARM_OUT_N output pins on AUX1 is used to signal that the radio has an alarm. This parameter applies a pull-up voltage to ALARM_OUT_P when there are no alarms present. When an alarm is detected the relay contact close.
Alarm config	**Select polarity**	High to select| Low to select	Low to select	The SELECT_IN_P and SELECT_IN_N input pins on AUX1 can be used to select / deselect (Standby) the radio with an external signal (e.g. alarm from a main radio). This setting determines if the radio should be operational on a low select input signal or a high select input signal.
RS485	**Bitrate**	1200 – 115200	1200	Set the bit rate to use on the RS485 port

Menu path: Interface config ►	Parameter	Range	Default	Details
RS485	**Address**	1 – 255	1	Set the address to use on the RS485. In a remote system using the RS485 communication port, all units that are interconnected need to have a unique address in order to avoid collisions and misinterpretation of data.
RS485	**Protocol**	Legacy | standard	Legacy	The protocols are described in the data manual. **Legacy** uses a protocol where the 9. bit is used for address recognition, this is the protocol used on the previous radio models (TA7450, RA7202) and is compatible with the RACS II PC software and the RCU remote control unit. **Standard** is an eight bit protocol that uses the multidrop capability of the RS485 bus. For more information on protocols, refer to the SW manual.
RS232	**Bitrate**	1200 – 115200	115200	Set the bit rate to use on the RS232 interface ports
LAN	**Address**	4 octets IP address	192.168.2.1	IP interface address for the unit. Must be unique on the network it connects to.
LAN	**Netmask**	4 octets IP netmask	255.255.0.0	The netmask used on the IP interface. Should correspond to the local network that the radio is connected to.
LAN	**Default gateway**	4 octets IP address	0.0.0.0	If set different from the default, the radio unit will send IP traffic to the default gateway if the address is unreachable on the local network
LAN	**SNMP port**	1 – 65535	161	The input port used for SNMP commands The default port is the global port for SNMP commands
LAN	**SNMP trap IP**	4 octets IP address	0.0.0.0	The IP address where SNMP traps are sent. The address can be in the form of a unicast, multicast or broadcast address.
LAN	**SNMP trap port**	1 – 65535	162	The output port where SNMP traps are sent. The default value is the global port for SNMP traps
LAN	**SNMP trap int**	0 – 60	5	The interval on which an “alive” trap (operstate) are sent to the host, if the TrapIP and TrapPort are set. The value is given in seconds. 0=OFF
RACK	**Number**	0 – 100	0	Used to identify the location of the radio from a remote application. Defines the rack where the radio is located.
RACK	**Row**	0 – 20	0	Used to identify the location of the radio from a remote application. Defines the row number in the rack. The row number is counted from the top to the bottom of the rack.
RACK	**Column**	0 – 6	0	Used to identify the location of the radio from a remote application. Defines the column in the rack. The column number is counted from the left in steps of one receiver width or 14TE. There are 84 TE in a 19” rack. I.e. in a 19” frame width 6 receivers, the receivers will have the column set to 1,2,3,4,5 or 6. In a 19” frame width 3 transmitters, the transmitters will have the column set to 1,3 or 5.

Table 5.5-3, Interface config group, transmitter

5.5.4 Bite system group

Menu path: Interface config ►	Parameter	Range	Default	Details
TX alarm	**Depends on the alarm status of the radio unit**			This option displays all active alarms in the unit. See section 6.1 for more info.
Measurements	**Forward**	30 – 47 dBm		Displays the forward power in dBm detected at the output of the transmitter
Measurements	**Reflected**	0 – Forward power		Displays the reflected power in dBm detected on the output of the transmitter
Measurements	**VSWR**	1 : ∞		Displays the calculated VSWR from the forward and reflected measurements
Measurements	**Modulation**	Up to ± 5kHz		Displays the measured modulation level on the output of the transmitter [kHz]
Measurements	**Current**	Max 10 A when keyed		Displays the total current consumption (28V) of the transmitter [A]
Measurements	**PA Temp**	Max 85°C		Displays the temperature measured on the PA module in the transmitter [°C]
Measurements	**LO level**	Min. 0 dBm		Displays the level measured at the output of the local oscillator in dBm
Measurements	**Line level**	Input line level		Displays the input line level in dBm
Measurements	**28 Volt**	20.0 – 29.0 V		Displays the regulated 28V supply from the power regulator board. The 28V is used on the PA board.
Measurements	**12 Volt**	11.0 – 12.8 V		Displays the regulated 12V supply from the power regulator board The 12V is used on the main board
Measurements	**6 Volt**	5.0 – 7.0 V		Displays the regulated 6V on the modulator board
Measurements	**5 Volt**	4.5 – 5.5 V		Displays the regulated 5V supply from the power regulator board. The 5V is used on several modules
Measurements	**-5 Volt**	-6.2 - -4.0 V		Displays the regulated -5V supply from the power regulator board. The -5V is used on the main board.
Measurements	**3.3 Volt**	2.9 – 3.6 V		Displays the regulated 3.3V supply from the power regulator board. The 3.3V is used on several modules

Table 5.5-4, Bite system group, transmitter

5.6 User menu – receiver (Restricted access level)

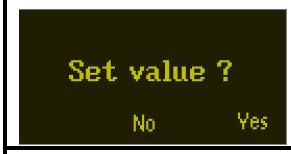
Main display window in restricted mode.

Display	Description
	When the receiver is switched on, it will show the channel, the frequency and the operation mode (FM).
	When the DSC dedicated receiver is switched on, it will show the DSC channel, the DSC frequency and the operation mode (DSC).
	Press SW to navigate to the channel recall screen. Select any channel (up to 100) that is previously stored in the radio by rotating SW. Recall selected channel with C If no channel is stored, the display will show: CH: No channels
	Press SW to navigate to the loudspeaker audio output screen. This setting adjusts the audio level output in the integrated loudspeaker. Rotate SW CW or CCW to adjust the audio level.
	Press SW to navigate to the headset audio output screen. This setting adjusts the audio level output in the integrated loudspeaker. Rotate SW CW or CCW to adjust the audio level.
	Press SW to navigate to the display intensity adjust screen. This setting adjusts the intensity of the display and LED indicators. Rotate SW **CW** or **CCW** to adjust the intensity.
	Press SW to return to the default screen
	Pressing SW from the main display will bring up the menu options that are available for the current user level. Press C to disable / active the squelch.
	Menus for user level: Restricted For details regarding submenus, refer to chapter 5.4.

Table 5.6-1, User menu selections receiver - restriced access level

5.7 User menu – receiver (Default access level)

Main display window for user levels: Operator, Technician and SysOp.

Display	Description
	When the receiver is switched on, it will show the channel, the frequency and the operation mode (FM).
	When the DRC dedicated receiver is switched on, it will show the DSC channel, the DSC frequency and the operation mode (DRC).
	Press SW to navigate to the channel recall screen. Select any channel (up to 100) that is previously stored in the radio by rotating SW. Recall selected channel with C If no channel is stored, the display will show: CH: No channels
	Press SW to navigate to the loudspeaker audio output screen. This setting adjusts the audio level output in the integrated loudspeaker. Rotate SW CW or CCW to adjust the audio level.
	Press SW to navigate to the headset audio output screen. This setting adjusts the audio level output in the integrated loudspeaker. Rotate SW CW or CCW to adjust the audio level.
	Press SW to navigate to the channel select screen. Select channel number by rotating SW CW or CCW. Confirm new frequency with SW or C .
	Confirm with SW or C. If the channel is already programmed, the channel may be cleared using B
	Press SW to navigate to the display intensity adjust screen. This setting adjusts the intensity of the display and LED indicators. Rotate SW CW or CCW to adjust the intensity.
	Press SW to return to the default screen
	Pressing A from the main display will bring up the menu options available for the current user level. Press C to disable / activate the squelch.
	Menus for user level: Operator For details regarding submenus, refer to chapter 5.4.

	Menus for user level: Technician For details regarding submenus, refer to chapter 5.4.
	Menus for user level: SysOp For details regarding submenus, refer to chapter 5.4.

Table 5.7-1, User menu selections receiver - Operator, Technician and SysOp access levels

5.8 Setting, information and configuration menus – receiver

Under the menu selection from the user menu, various submenu groups are available depending on the user level.
The submenus and details for them are shown in the tables below.

Submenu	Access level	Description
Radio control ▶	SysOp, Technician	Access to operation mode, low power level, climax offset parameters, modulation and standby settings.
RX config ▶	SysOp	Access to configuration parameters for modulation, audio settings, Squelch settings and internal calibration settings.
Interface config ▶	SysOp	Access to configuration parameters for the ethernet interface, RS232 port, RS485 port, various pin settings on the hardware interface (remote connectors) and the user access level.
Bite system ▶	SysOp, Technician	Displays information about active alarms and gives the user access to internal measurements.
System info ▶	All	Displays information about the firmware and hardware release, system up-time and radio identification

Table 5.8-1, Submenus available on the receiver

5.8.1 Radio control group

SysOp and Technician access levels. Refer to section 5.9.1 for details.

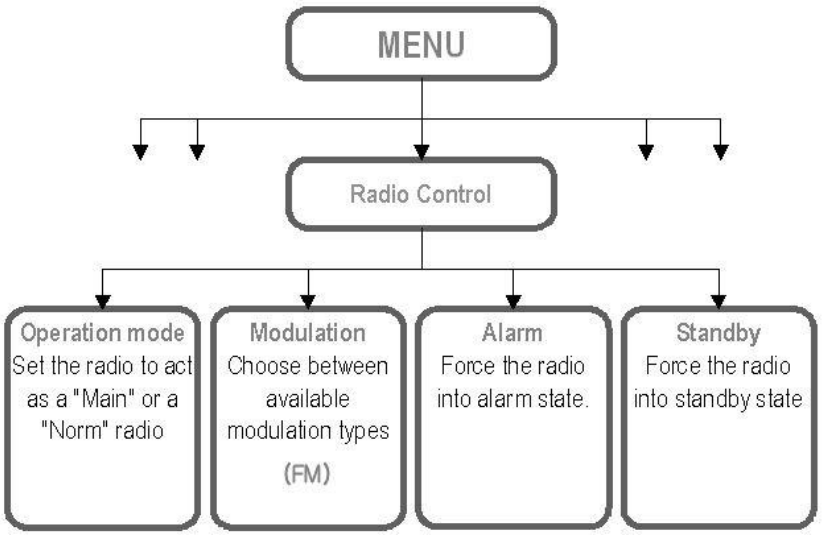


Figure 5.8-1, Radio control group, receiver

5.8.2 RX config group

SysOp access level. Refer to section 5.9.2 for details.

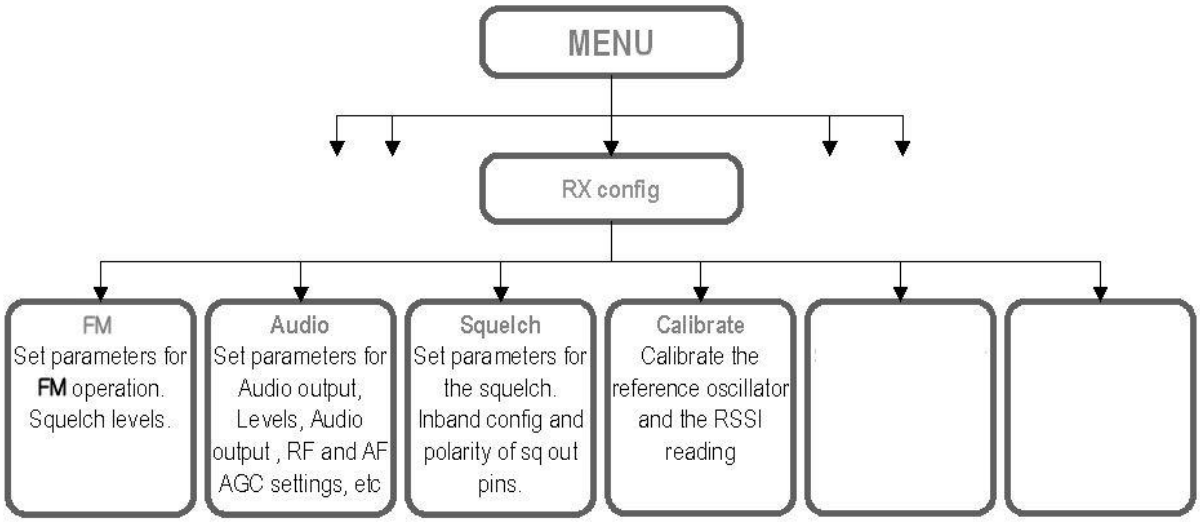


Figure 5.8-2, RX config group, receiver

5.8.3 Interface config group

SysOp access level. Refer to section 5.9.3 for details.

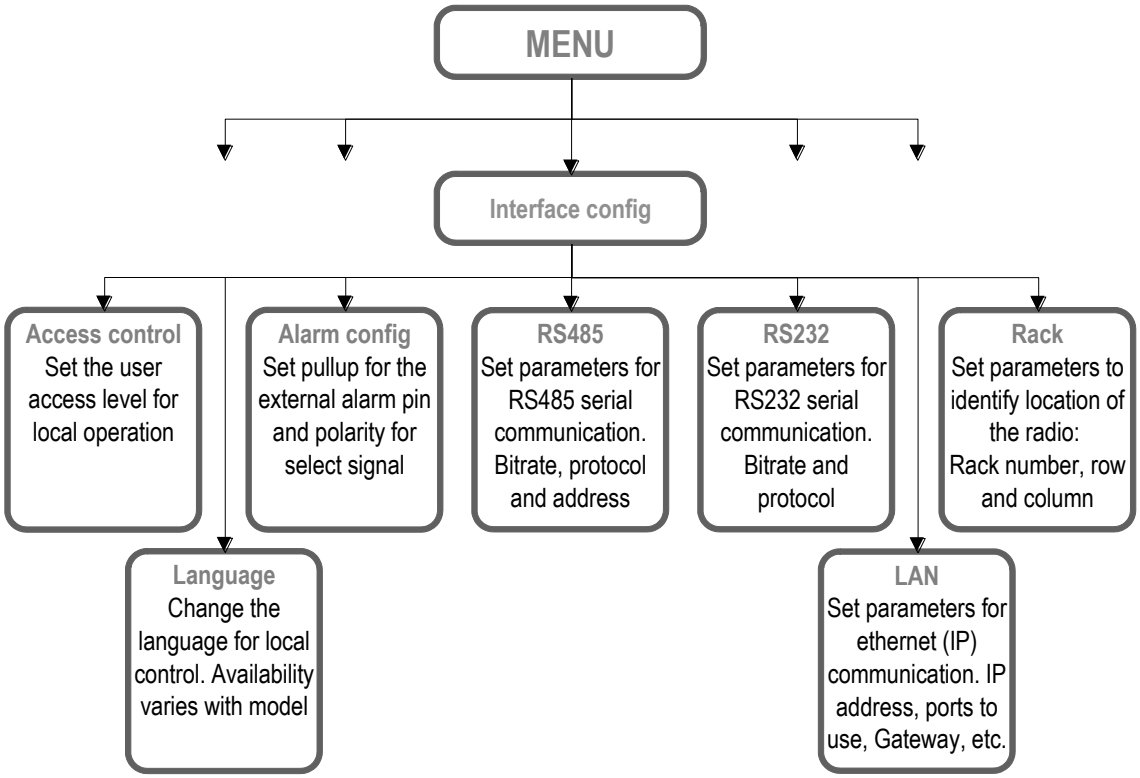


Figure 5.8-3, Interface config group, receiver

5.8.4 Bite system group

SysOp and Technician access levels. Refer to section 5.9.4 for details.

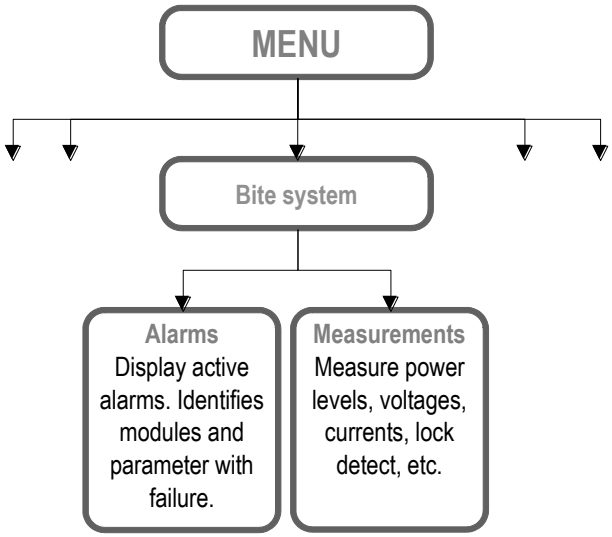


Figure 5.8-4, Bite system group, receiver

5.8.5 System info group

Available for all access levels

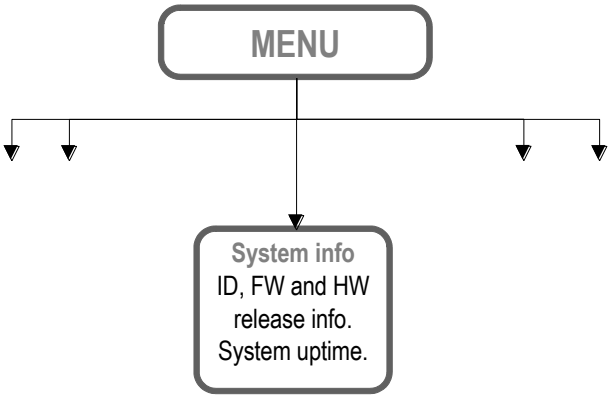


Figure 5.8-5, System info group, receiver

5.9 Parameter details – receiver

5.9.1 Radio control group

Menu path: Radio control ►	Parameter	Range	Default	Details
	Squelch level	-10 dBuV to +30 dBuV	0 dBuV	Squelch level This squelch level is the level for the digital noise compensated squelch.
	Operation mode	Main | Norm	Norm	A **main** radio will enter into standby if an alarm is detected by the internal BITE system. A **norm** radio will continue operation (if possible) even if a failure is detected. In a main / standby configuration, the main radio is set to **Main** and the standby radio is set to **Norm**. In this way the control can automatically be transferred to the standby radio by using the available alarm output and select input on the radios.
	Modulation	FM	FM	Select the modulation type / waveform to use. Availability depends on radio specifications.
	Alarm	On | Off	Off	This setting force the radio into alarm state (forced alarm) if set to **On**. Used for simulations, or to force a radio to signal an alarm in order to select a backup (standby) radio.
	Standby	On | Off	Off	This setting force the radio into standby state (forced standby) if set to **On**. Used to manually set a radio to standby.

Table 5.9-1, Radio control group, receiver

5.9.2 RX config group

Menu path: RX config ►	Parameter	Range	Default	Details
Audio	**Output source**	Speaker | Headphone | Lineout | VoIP	Speaker, Headphone, Lineout	The output source determines where the received audio is output. ▪ **Line**: Output audio on the 600 ohm line interface ▪ **Speaker:** Output audio on the integrated speaker. ▪ **Headphone:** Output audio to a headphone connected to the front panel connector. ▪ **VoIP**: Output audio on the IP interface (availability depends on radio specifications).
Audio	**Line output level**	-40 – +10 dBm 1 dB steps	-10 dBm	The max. output level on the 600 ohm line output.
Audio	**RF AGC**	Off, x-fast, fast, norm, slow, x-slow	Norm	Set the attack and release times for the RF AGC ▪ Off is used only for maintenance purposes.
Audio	**AF AGC**	On | Off	Off	Set the automatic AF gain control on or off. Setting AF AGC on will lead to constant audio output when received signals have varying modulation levels
Audio	**Mute on transmit**	On | Off	On	Set this to On if the receiver should be muted while transmitting. Requires that the Tx busy signal on the RX connector on the transmitter is routed to the TX busy input on the receiver REM connector.
Squelch	**Override level**	-10 dBuV to +30 dBuV	20 dBuV	The override level where the analogue squelch will open even if it is a “noisy” signal. This squelch level overrides the noise compensated squelch. Setting this level to a lower level than the “SQ level” will disable the noise compensated squelch completely.
Squelch	**Inband config**	Off, open, closed, both	Off	Defines the behavior of the inband squelch signal. ▪ **Off**: No inband tone is generated ▪ **Open:** An inband tone is generated when the squelch is open (receiving) ▪ **Closed:** An inband tone is generated when the squelch is closed (muted) ▪ **Both:** Different tones are generated depending on the status of the squelch.
Squelch	**Inband freq open**	100 – 5000 Hz 1 Hz steps	5000	Set the frequency to be used for the inband tone that will be used to signal that the squelch is open. Requires that **open** is included in the Inband config setting. The receiver will automatically notch the received signal and insert a tone at the given frequency. Applicable to the line interface output only.
Squelch	**Inband freq closed**	100 – 5000 Hz 1 Hz steps	5000	Set the frequency to be used for the inband tone that will be used to signal that the squelch is closed. Requires that closed is included in the Inband config setting. The receiver will automatically insert a tone at the given frequency. Applicable to the line interface output only.

Menu path: RX config ►	Parameter	Range	Default	Details
Squelch	**Inband level**	-30 to -10	-24	The level of the inband tone relative to the setting in the line level output level in dB, Applicable to the line interface output only.
Squelch	**SqOut output**			Set the behavior of the SqOut output (AUX2, p.1 and p.2).
Squelch	**RxBusy output**	Closed | Open | Closed on busy| Open on busy	Closed on busy	Set the behavior of the RxBusy output (REM, p.5).
Calibrate	**Ref oscillator**	-127 – +128	0	This setting is used to fine adjust (calibrate) the reference oscillator of the receiver. The full range is approximately 10 ppm. This setting should be used with care, and only when a calibrated frequency measuring instrument is used to measure the frequency of the receiver. The exact frequency of the receiver can be determined either by connecting a spectrum analyzer to the antenna connector of the receiver and measure the leakage of the LO output (45 MHz above the operating frequency) – or by using a radio test set to measure the bandwidth of the receiver and adjust until centre is on the operating frequency.
Calibrate	**RSSI reading**	-10 to +10 dB	0 dB	In order to measure the RSSI level exactly, there is a provision to calibrate the reading. Normally the reading is within +/-2 dB without calibration, but it can be useful if to signals are being compared.
Factory preset		0, 1	0	Writing a "**1**" to this parameter will reset the receiver and restore the settings that where set before shipping from the factory. Use with care – all settings that has been changed will be reset!

Table 5.9-2, RX config group, receiver

5.9.3 Interface config group

Menu path: Interface config ►	Parameter	Range	Default	Details
	Access control	SysOp, Technician, Operator, Restricted	SysOp	Set the user access level for local control. This setting limits the availability of some menus, depending on the access level. In order to set the access level from the user interface, a special hardware key must be inserted into the microphone/headset connector. Details of the key is available in chapter **Error! Reference source not ound.**.
	Set language	Depending on model	English	Set the language to use on the user interface. Availability of different languages depends on specifications when ordering the receiver.
Alarm config	**Alarm pin pullup**	Disabled | Enabled	Enabled	The ALARM_OUT_P and ALARM_OUT_N output pins on AUX1 is used to signal that the radio has an alarm. This parameter applies a pullup voltage to ALARM_OUT_P when there are no alarms present. When an alarm is detected the relay contact close.

Menu path: Interface config ►	Parameter	Range	Default	Details
Alarm config	**Select polarity**	High to select| Low to select	Low	The SELECT_IN_P and SELECT_IN_N input pins on AUX1 can be used to select / deselect (Standby) the radio with an external signal (e.g. alarm from a main radio). This setting determines if the radio should be operational on a low select input signal or a high select input signal.
RS485	**Bitrate**	1200 – 115200	1200	Set the bit rate to use on the RS485 port
RS485	**Address**	1 – 255	1	Set the address to use on the RS485. In a remote system using the RS485 communication port, all units that are interconnected need to have a unique address in order to avoid collisions and misinterpretation of data.
RS485	**Protocol**	Legacy | standard	Legacy	The protocols are described in the data manual. **Legacy** uses a protocol where the 9. bit is used for address recognition, this is the protocol used on the previous radio models (TA7450, RA7202) and is compatible with the RACS II PC software and the RCU remote control unit. **Standard** is an eight bit protocol that uses the multidrop capability of the RS485 bus. For more information on protocols, refer to the SW manual.
RS232	**Bitrate**	1200 – 115200	115200	Set the bit rate to use on the RS232 interface ports
LAN	**Address**	4 octets IP address	192.168.2.1	IP interface address for the unit. Must be unique on the network it connects to.
LAN	**Netmask**	4 octets IP netmask	255.255.0.0	The netmask used on the IP interface. Should correspond to the local network that the radio is connected to.
LAN	**Default gateway**	4 octets IP address	0.0.0.0	If set different from the default, the radio unit will send IP traffic to the default gateway if the address is unreachable on the local network
LAN	**SNMP port**	1 – 65535	161	The input port used for SNMP commands The default port is the global port for SNMP commands
LAN	**SNMP trap IP**	4 octets IP address	0.0.0.0	The IP address where SNMP traps are sent. The address can be in the form of a unicast, multicast or broadcast address.
LAN	**SNMP trap port**	1 – 65535	162	The output port where SNMP traps are sent. The default value is the global port for SNMP traps
LAN	**SNMP trap interval**	0 – 60	5	The interval on which an “alive” trap (operstate) are sent to the host, if the TrapIP and TrapPort are set. The value is given in seconds. 0=OFF
LAN	**VDL output IP**	4 octets IP address	0.0.0.0	The IP address that VDL packets received will be sent to. Must be set in order to detect VDLpackets.
LAN	**VDL output port**	1 – 65535	3006	The output port used for VDL traffic if the VDL input source is set to IP
Rack	**Number**	0 – 100	0	Used to identify the location of the radio from a remote application. Defines the rack where the radio is located.
Rack	**Row**	0 – 20	0	Used to identify the location of the radio from a remote application. Defines the row number in the rack. The row number is counted from the top to the bottom of the rack.

Menu path: Interface config ►	Parameter	Range	Default	Details
Rack	**Column**	0 – 6	0	Used to identify the location of the radio from a remote application. Defines the column in the rack. The column number is counted from the left in steps of one receiver width or 14TE. There are 84 TE in a 19" rack. I.e. in a 19" frame width 6 receivers, the receivers will have the column set to 1,2,3,4,5 or 6. In a 19" frame width 3 transmitters, the transmitters will have the column set to 1,3 or 5.

Table 5.9-3, Interface config group, receiver

5.9.4 Bite system group

Menu path: Interface config ►	Parameter	Range	Default	Details
RX alarm	**Depends on the alarm status of the radio unit**			This menu item displays all active alarms in the unit. See Receiver error conditions for more information
Measurements	**RSSI**	-10 - +110 dBuV		Displays the received signal level (RSSI) in dbuV
Measurements	**Line level**	-40 - +10 dBm		Displays the level measured on the output of the 600 ohm line interface
Measurements	**AGC volt**	0 – 5 V		Displays the internal AGC voltage
Measurements	**Codec/Eth LD**	Lock / Unlock		Displays the status of the VCO used for the Codec and Ethernet chips.
Measurements	**Temperature**	Max 85°C		Displays the internal temperature measured on the main board [°C]
Measurements	**DC current**	0.1 – 0.3 A		Displays the total current consumption [28V] of the receiver [A]
Measurements	**IF current**	20 – 60 mA		Displays the current consumption in the IF (Intermediate Frequency) circuit [mA]
Measurements	**LNA current**	20 – 60 mA		Displays the current consumption in the LNA (Low noise amplifier) [mA]
Measurements	**LO level**	Min. 15 dBm		Displays the level measured at the output of the local oscillator in dBm
Measurements	**LO lock**	Lock / Unlock		Displays the status of the local oscillator in the receiver.
Measurements	**12 Volt**	11.0 – 12.8V		Displays the regulated 12V supply from the power supply board The 12V is used on the main board
Measurements	**6 Volt**	5.0 – 7.0V		Displays the regulated 6V on the demodulator board
Measurements	**5 Volt**	4.5 – 5.5V		Displays the regulated 5V supply from the power supply board. The 5V is used on several modules
Measurements	**3.3 Volt**	2.9 – 3.6V		Displays the regulated 3.3V supply from the power supply board. The 3.3V is used on several modules
Measurements	**AC**	Present/Not		Present / Not present. Signals that AC is present or not present at the input of the unit.
Measurements	**VDL2-CO**	0 – 100 %		Displays the channel occupancy (CO) when in VDL 2 mode. The value is calculated every second, or by the interval set in VDL2-CO Trap interval.

Table 5.9-4, Bite system group, receiver

6 ERROR CONDITIONS AND CORRECTIVE ACTIONS

When the internal BITE (Built In Test Equipment) in the transmitter or the receiver units detects a failure, the alarm indicator on the front panel of the unit will be lit. In addition the radio unit will signal with an automatically generated SNMP trap message on the ethernet interface.
Details about the fault that caused the alarm are accessible for user access levels: SysOp and Technician.
The error messages are available in two levels, first the module that has the failure will be identified, next the user has the option to view in details what particular message that caused the alarm condition.

In the following (LRU) refers to the Lowest Replaceable Unit – and is normally the first line maintenance where the complete unit is replaced. (LRM) refers to the Lowest Replaceable Module and is the module within the unit that can be replaced. The LRM level normally requires a well equipped workshop with appropriate tools for testing and calibration.

6.1 Transmitter error conditions

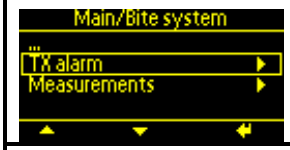
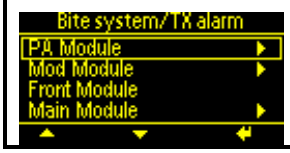
Display	Description
	Press A from the main display to bring up the available menus.
	Use SW to navigate to the Bite system menu and select by pressing SW
	Select TX alarm
	The displays shows module(s) where the BITE system has detected failures. To view more details about the failure, select module.

Table 6.1-1, Alarm indication, transmitter navigation

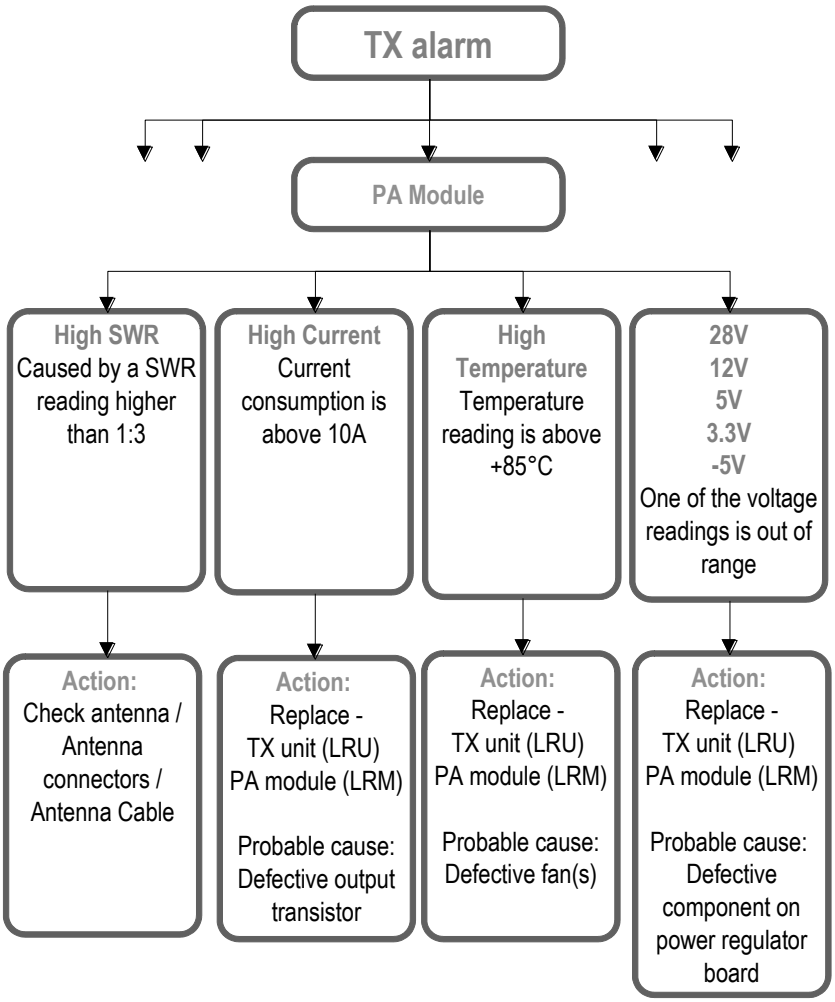


Figure 6.1-1, Transmitter PA module, errors and corrective actions

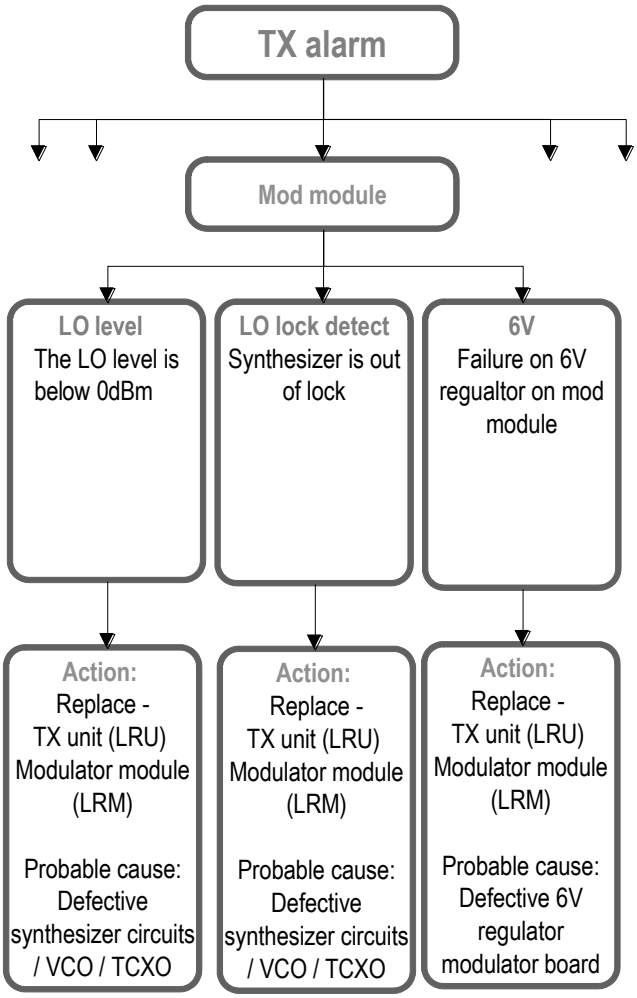


Figure 6.1-2, Transmitter Modulator module, errors and corrective actions

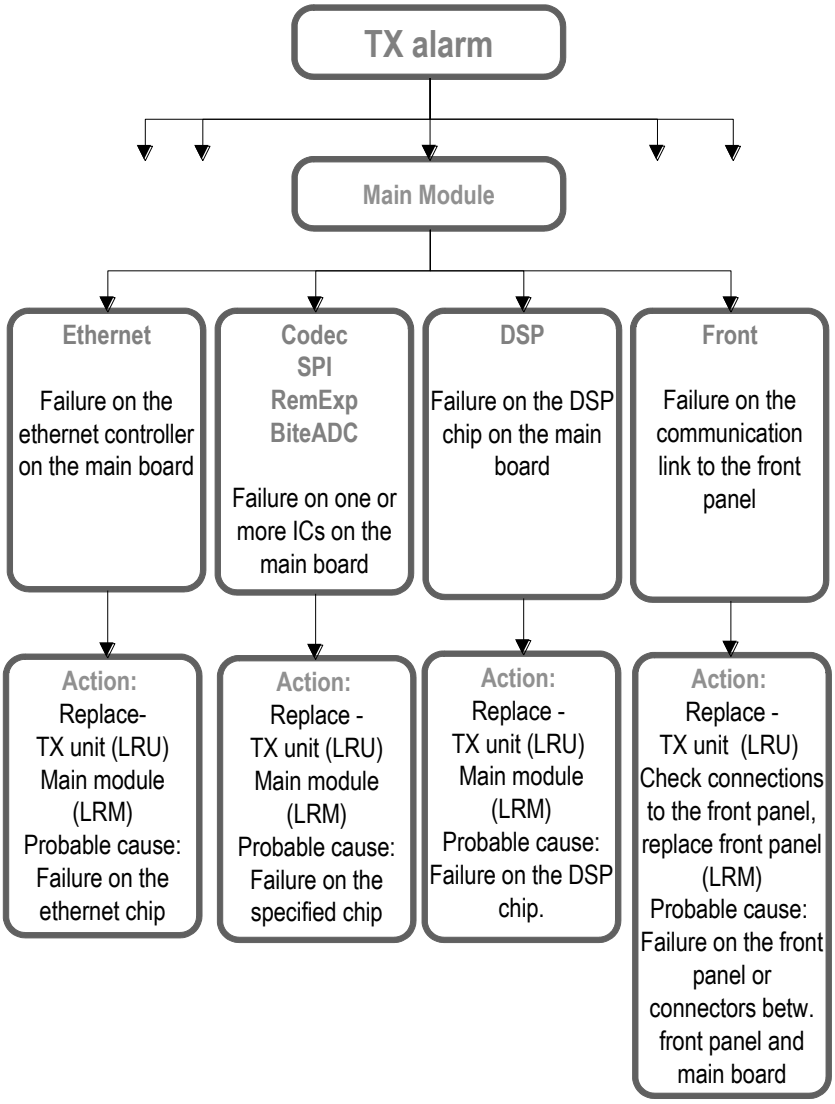


Figure 6.1-3, Transmitter Main module, errors and corrective actions

6.2 Receiver error conditions

Display	Description
	Press A from the main display to bring up the available menus.
	Use SW to navigate to the Bite system menu and select by pressing SW
	Select Alarms and press SW
	The displays shows module(s) where the BITE system has detected failures. To view more details about the failure, select module.

Table 6.2-1, Alarm indication, receiver navigation

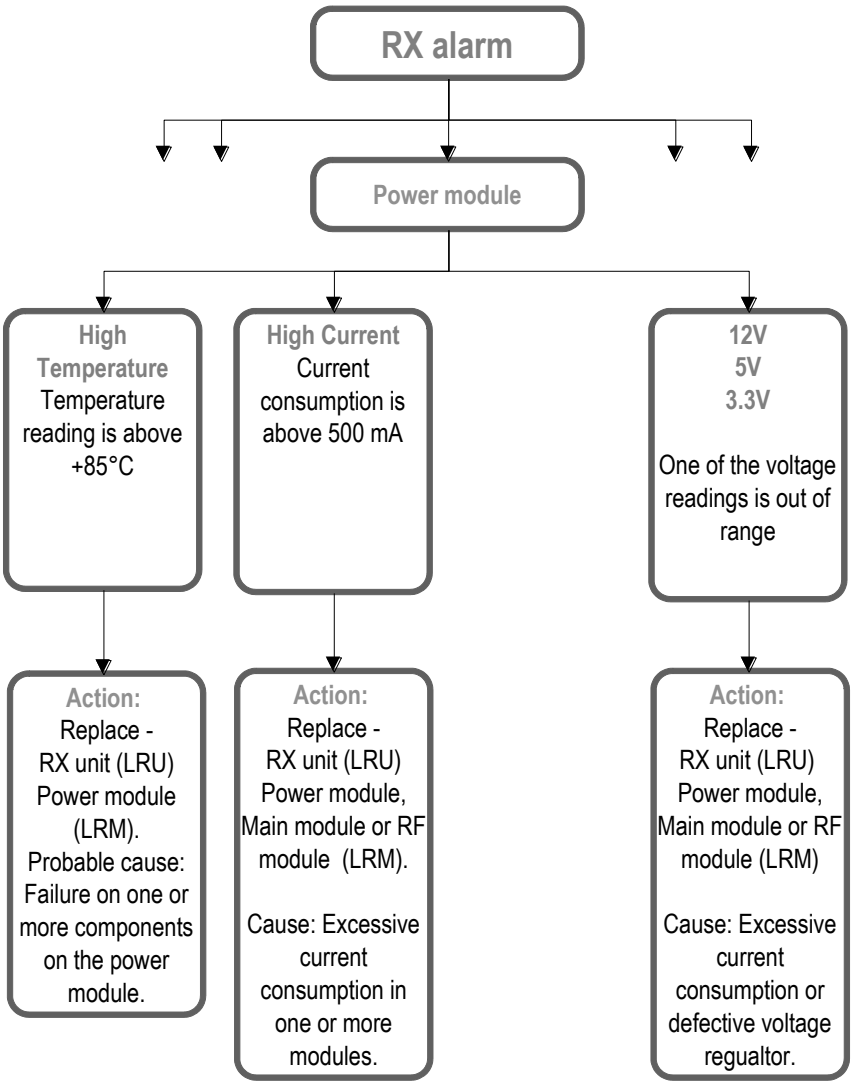


Figure 6.2-1, Receiver Power module, errors and corrective actions

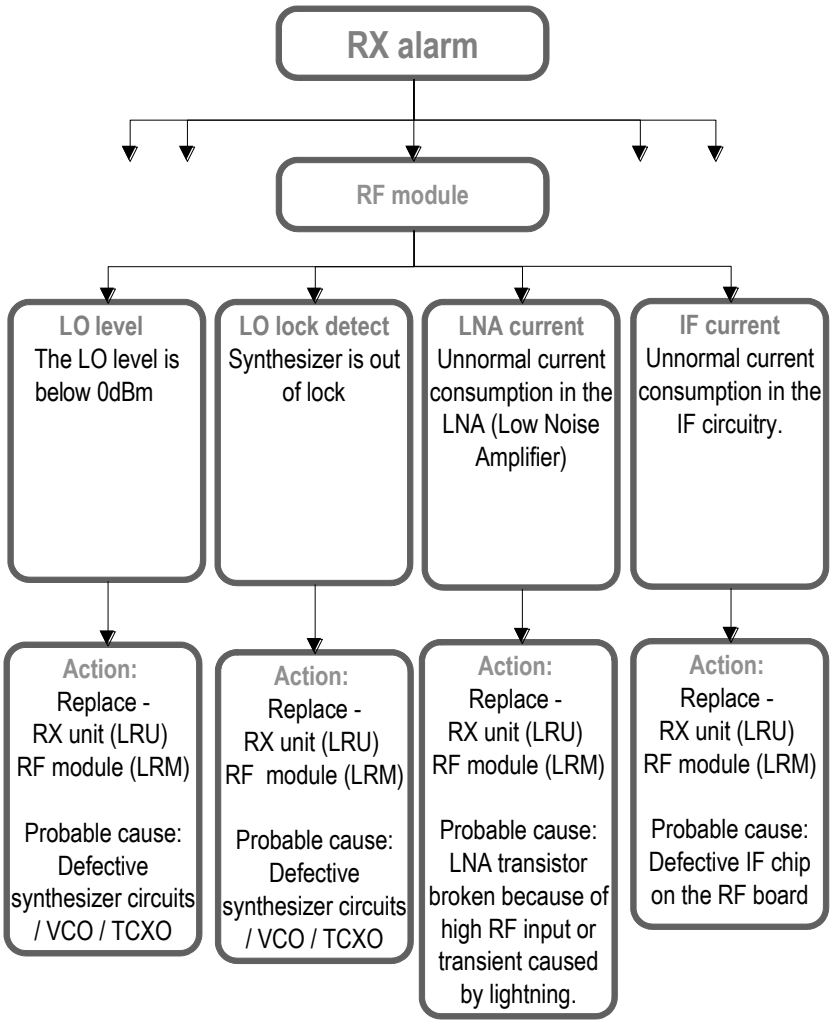


Figure 6.2-2, Receiver RF module, errors and corrective actions

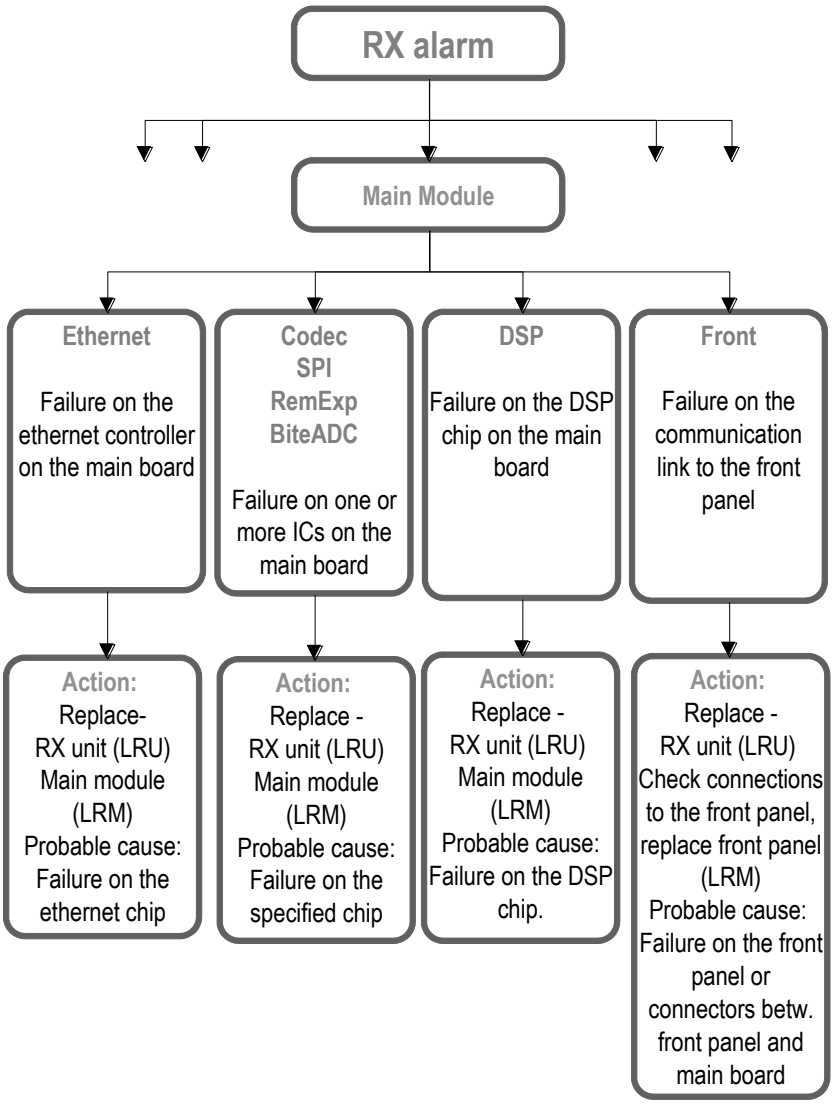


Figure 6.2-3, Receiver Main module, errors and corrective actions

7 LIST OF TABLES AND FIGURES

Appendix A. LIST OF MARITIME CHANNELS AND FREQUENCIES

Channel Designators	BASE RX MHz	BASE TX MHz
0	156.000	156.000
60	156.025	160.625
1	156.050	160.650
61	156.075	160.675
2	156.100	160.700
62	156.125	160.725
3	156.150	160.750
63	156.175	160.775
4	156.200	160.800
64	156.225	160.825
5	156.250	160.850
65	156.275	160.875
6	156.300	156.300
66	156.325	160.925
7	156.350	160.950
67	156.375	156.375
8	156.400	156.400
68	156.425	156.425
9	156.450	156.450
69	156.475	156.475
10	156.500	156.500
DSC 70	156.525	156.525
11	156.550	156.550
71	156.575	156.575
12	156.600	156.600
72	156.625	156.625
13	156.650	156.650
73	156.675	156.675
14	156.700	156.700

Channel Designators	BASE RX MHz	BASE TX MHz
74	156.725	156.725
15	156.750	156.750
75	-	156.775
16	156.800	156.800
76	-	156.825
17	156.850	156.850
77	156.875	156.875
18	156.900	161.500
78	156.925	161.525
19	156.950	161.550
79	156.975	161.575
20	157.000	161.600
80	157.025	161.625
21	157.050	161.650
81	157.075	161.675
22	157.100	161.700
82	157.125	161.725
23	157.150	161.750
83	157.175	161.775
24	157.200	161.800
84	157.225	161.825
25	157.250	161.850
85	157.275	161.875
26	157.300	161.900
86	157.325	161.925
27	157.350	161.950
87	157.375	157.375
28	157.400	162.000
88	157.425	157.425

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