



OPERATION MANUAL

DIGITAL TRANSCEIVERS

VHF TRX9000-2G / UHF TRX9010-2G

V/UHF TRX9020-2G



Reliability
Innovation
High-quality

LIST OF MODIFICATIONS

N°	CORRECTED PAGE(S)	REVISION DATE	VISA
V1.00	Creation	2018/10/05	JPD
V1.01	Releases after DD & XS reading	2019/03/07	JPD
V1.02	HMI modifications on Main/Standby mode management, Test CW, Test Tone, Test RX and Test VDL2. Adding § 4.9 Commissioning in Main/Standby configuration	2019/03/13	JPD
V1.03	Releases after R&D reading	2019/04/02	JPD
V1.04	Modification of conformities	2019/04/12	JPD
V1.05	§ 1.6 Updating the reference directives	2019/05/16	JPD
V1.06	§ 2.3.1.2.1 Modifying Output AF min level, from -11 to -30dBm § 5.3.1.3.1 Modifying flowchart p.3 § 5.3.1.3.7.2.1 Adding arrows and Rf output parameter § 5.3.1.3.7.4.1, § 5.3.1.3.7.4.2.1, § 5.3.1.3.7.4.2.2 Modifying list of PCBs and modules in the CBIT and IBIT controls § 5.3.1.3.7.4.3 and associated sub-§ Replacing MODE2 by VDL2	2019/07/15	JPD
V1.07	§ 1.1.3.1 Suppressing Death icon, adding first aid (V2) § 1.1.3.3 Adding Manutention (V2) § 5.3.1.3.1 Reference version released from V1.06 to V1.09 § 2.3.1.2.1, § 2.3.1.2.2, § 2.3.1.3.1 and § 5.3.1.3.6.2 Value extension of the PTT TO upto 600s § 5.3.1.3.7 Adding MAINT* screen § 5.3.1.3.7.4.1 Adding CBIT NOK § 5.3.1.3.7.4.2.1 and § 5.3.1.3.7.4.2.2 Adding IBIT NOK	2019/11/22	JPD
V1.08	§ 5.3.1.3.7.2.2 Modifying Serial links activity screen § 5.3.1.3.6.4.1 Adding confirmation of IP address modification screen	2020/01/13 2020/02/19	JPD
V1.09	§ 4.1.2.2 Modifying the circuit breaker reference § 5.5 Becomes the Maintenance paragraph § 7.2 Adding mechanical slide 45000126	2020/03/12 2020/05/18	JPD

N°	CORRECTED PAGE(S)	REVISION DATE	VISA
V1.10	<p>§ 1.1.2.1 Adding multisources icon</p> <p>§ 1.1.3.1 Adding Paragraph Accessibility</p> <p>§ 2.3.1.1 Adding consumption for TRX9020-2G</p> <p>§ 2.3.1.2.1 Adding RED directive</p> <p>§ 2.3.1.2.2 Modifying Power in G3E (33 to 47 dBm instead of 39 to 49)</p> <p>Adding § 3.1.3 TRX9020-2G Rear panel description</p> <p>§ 3.2.2.1 Adding multisources icon</p> <p>§ 3.2.2.2 becomes : TRX9020-2G Mains Power supply connector description. Adding multisources icon.</p> <p>§ 3.2.2.3 Adding multisources icon</p> <p>§ 3.2.2.4 becomes : TRX9020-2G Battery Power supply connector description. Adding multisources icon.</p> <p>Adding § 3.2.2.10 TRX9020-2G.J12 connector description</p> <p>§ 3.2.2.15 Adding indication for PWR17 max current: 0,5A</p> <p>§ 3.2.3 Replacing interface 60-12 by 61-2 (2 fuses)</p> <p>§ 5.5.2.1.2 Adding multisources icon.</p> <p>Adding § 5.5.3.2 Procedure for fuses replacement</p> <p>Adding § 5.5.3.3 Procedure for circuit-breakers retriggering</p>	<p>2020/07/27</p> <p>2020/10/22</p>	JPD
V1.11	<p>§ 2.3.1.1 Adding Headset and loudspeaker characteristics</p> <p>§ 5.3.1.3.7.1 Modification page 4 table of measurements : Adding 50V values for TRX9020-2G</p>	2021/01/12	JPD
V1.12	<p>§ 3.1.2 et § 3.1.3 Modifying TRX9000-2G/TRX9010-2G rear views adding the internal Cavity connectors</p> <p>§ 3.1.4 Adding the internal Cavity connectors on the TRX9020-2G rear view</p> <p>§ 3.2.2.18 Becomes Internal cavity J40 and J41 connectors</p> <p>Creating § 3.2.2.19 for the Ground connector</p> <p>§ 4.5.1 to 4.5.4, § 4.9.1 to 4.9.4 Modifying the rear views with the internal cavity outputs</p> <p>§ 4.13.1 to 4.13.3 Adding internal cavity</p> <p>§ 4.13.4 Adding R2 procedure for the TRX9020-2G</p>	2021/02/09	JPD
	Creating § 5.3.1.3.6.4.1.3 Link aggregation on ETH2 (V2.05)	2021/02/18	JPD
	§ 3.2.2.15, § 3.2.2.17, § 4.6, § 5.3.1.3.4.1.1, § 5.3.1.3.7.1 Modifying Output AF level, from -30 to +10dBm, Modifying Input AF level, from -30 to 0dBm	2021/03/22	JPD
	<p>Version 2.12 :</p> <p>§ 5.3.1.3.6.4.1.3 Link aggregation on ETH2 becomes § 5.3.1.3.6.4.1.4</p> <p>§ 5.3.1.3.6.4.1.3 becomes Link aggregation on ETH1</p>	2021/03/24	JPD
V1.13	<p>§ 2.3.1.1 Adding Main/Standby and links aggregation functions</p> <p>§ 6.1.3 Modifying DC Power supply module reference for TRX9020C-2G</p>	2021/05/06	JPD
V1.14	<p>Corrections after JMB reading :</p> <p>§ 3.1.2 & 3.1.4 : 120V_{AC} becomes 110V_{AC}</p> <p>§ 3.1.4 & 3.1.5 : 40A/48V_{DC} becomes 40A/65V_{DC}</p>	2021/05/31	JPD
V2.00	<p>Chapter 4 : Adding RJ45 crossed cable reference CY96425</p> <p>Chapter 6 : Adding CTTQ versions</p>	2021/06/24	JPD

DIGITAL TRANSCEIVERS**VHF TRX9000-2G / UHF TRX9010-2G / V/UHF TRX9020-2G**

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N°	CORRECTED PAGE(S)	REVISION DATE	VISA
V2.01	§ 2.2.2.x : Modifying the name of Tx/Rx relay, becoming T/R_V/U § 2.2.2.3 : Adding CTTQ reference PCB § 2.2.3.x : Adding CTTQ reference PCB § 2.3.1.1 : Adding NOTE 1 about TRX9020-2G consumption § 4.14 : Adding SCAN function § 5.3.1.3.6 Adding Modes & Frequencies Menu with Scan Operation § 6.1.x : Adding CTTQ reference PCB	2021/09/09	JPD
V2.02	§ 4.10.4 Adding SIP CHECKSTATUS § 4.10.5 Adding RTP SKEW Updating ICD MAINT, JBUS and SNMP references § 2.2.2.1, 2.2.2.2, 6.1.1 and 6.1.2 Adding motorized cavity kit options	2021/10/12 2021/12/22 2022/01/10	JPD
V2.03	§ 3.2.2.4 Modifying pin A1 SCAN function no more as an option but permanent § 2.3.1.2.1 and § 5.3.1.3.5.1 Adding +12,5kHz channel spacing in VHF (V2.60) Updating through Cloud version	2022/02/14 2022/02/24 2022/03/25	JPD
V2.04	§ 2.2.2.1, 2.2.2.2, 6.1.1 and 6.1.2 Adding CTTQ15136B reference § 2.2.2.3 and 6.1.3 Adding CTTQ15137B reference § 5.3.1.3.2 Suppressing line Modul Depth in FM in TX menu (V4.30) § 5.3.1.3.5.4 Creating CS sub-menu (V4.30) § 5.3.1.3.7.1 Suppressing line Mod in FM in MEAS sub-menu p.1/4 (V4.30)	2022/05/11	JPD
V3.00	ProCSS3 / HTML5 publishing	2022/07/19	JPD
V3.01	§ 2.3.1.1 Updating consumptions § 4.1.2.2 Updating circuit-breakers references	2022/09/30	JPD
V3.02	Adding Extended FM option	2022/10/03	JPD

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CHAPTER I

INTRODUCTION

1.1 SAFETY RULES

The TELERAD radio devices are compliant with the current EC standards. To maintain this level of safety, the user must comply with the safety guidelines described in this manual before switching on the equipment for the first time. If these rules are not followed or the equipment is used for a purpose for which it is not designed (incorrect use), TELERAD cannot be held responsible for risks related to equipment damage or physical injury.

1.1.1 INFORMATION REGARDING SAFETY

The equipment is designed to operate entirely safely when it is installed and used in compliance with the instructions for use and the general safety rules.

Scrupulously respecting the information contained in this section and the specific instructions supplied with the equipment enables you to protect yourself from the risks, and create a safe working environment.


1.1.1.1 INSTALLATION REQUIREMENTS

The equipment operates in a safe manner when it is used according to the fixed electrical magnitudes, and in compliance with its instructions for use.

1.1.1.2 VENTILATION

The equipment's radiators, ports and openings are intended for cooling and ventilation, and must never be blocked or covered. They ensure reliable operation of the product and protect it against excessive temperatures.

1.1.1.3 PROTECTION THROUGH EARTHING

The terminal on the rear of the device, identified with the symbol  is the main protective earth terminal. The minimum cross-section of the wire used must be 2.5 mm².

This connection must be made before any other connection, and must be disconnected last. It is also recommended to check the earth continuity regularly.

When the equipment has a Mains power input, it is fitted with a three-pin plug with an earth. Earthing is a safety element. Do not nullify the protection by connecting the plug to a socket that does not have an earth connection.

1.1.2 SYMBOLS USED

The following list gives the symbols used in this manual and the equipment, along with their explanation. They are divided into two groups:

- Safety symbols,
- Functional symbols.

1.1.2.1 SAFETY SYMBOLS



Indicates a **CAUTION** message. Carefully read the corresponding paragraph of the instructions first. Present also eventually on the equipment to indicate a danger.



Indicates presence of dangerous voltages.



Indicates a risk of high temperature of certain elements. The operator must expect the cooling of this element before starting maintenance operations.



Indicates the risk of physical injury during equipment handling due to its heavy weight.



Indicates a risk of fire to the equipment.



Indicates risk of damage to equipment by electrostatic discharge (ESD).



CAUTION : Indicates a **RISK OF ELECTRIC CHOCK**. All the power supply sources must be disconnected before any equipment manipulation.

1.1.2.2 FUNCTIONAL SYMBOLS



This symbol indicates an earthed connection.



Indicates that the equipment must be supplied with alternating current (AC) at the indicated terminal.



Indicates that the equipment must be supplied with direct current (DC) at the indicated terminal.



Indicates that the equipment power supply is ON.



Indicates that the equipment power supply is OFF.


1.1.3 SAFETY INSTRUCTIONS

The following general safety precautions must be respected during the equipment use, maintenance and repair phases. Failure to respect these precautions or any other warning present in the instructions constitutes a violation of the safety standards applied to the design, manufacture and use of the equipment.

TELERAD may not be held responsible for the user's failure to respect these instructions.

1.1.3.1 ELECTRICAL RISKS

EARTH CONNECTION

This equipment may have significant earth leakage current. To reduce the risk of electrical shock, the equipment chassis must be connected to earth, by a low impedance cord, with a minimal cross-section of 2,5mm² using the appropriate terminal marked .

In particular, when the equipment is installed in a rack, check that its earth terminal is indeed connected to the rack chassis, which shall itself be connected to earth. This terminal must be connected first and disconnected last, and must be connected to a conductor with a cross-section suited to the default current.

ACCESSIBILITY

The socket for the AC or DC plugs used to supply the radio equipment power supply sources must be easily accessed.

POWER SUPPLY CORD SELECTION

Select a power supply cord that offers all safety guarantees according to the legislation in force in the country in which the equipment is used, and which is suited to the equipment in terms of current.

POWER SUPPLY VOLTAGES

Before powering on the device, check that the mains and/or battery power supply voltages correspond to those values recommended by TELERAD.

If batteries are used, they must not be exposed to extreme temperatures. Do not short-circuit the batteries. Respect their technical characteristics and their expiry date. Comply with the environmental standards in force during recycling.

PROTECTIONS AGAINST LIQUIDS

In order to avoid any risk of short-circuit, fire or any other internal damage, do not spill any liquids inside the device, and protect it from rain and from contact with liquids of any kind.

PROTECTION AGAINST METAL OBJECTS

Do not insert any metal conductors into the equipment.

PROTECTION AGAINST RF RADIATIONS

In order to avoid any risk of burns by RF radiation or by the presence of high RF voltage when the device is transmitting, do not unplug the antenna cable and do not touch the Antenna output connector when the device is transmitting.

The antenna cable must be connected or disconnected with the equipment powered off.

PROTECTION OF MAINTENANCE STAFF

Unless otherwise specified by TELERAD, the equipment must be powered off before any operations, with the power cord(s) disconnected.

In event of the equipment falling or sustaining damage, of unusual smells, smoke or overheating, immediately switch off the equipment and unplug the power cord(s).

PROTECTION AGAINST ELECTROSTATIC DISCHARGE (ESD)



To avoid the risk of damage linked to electrostatic discharges, it is strongly recommended to avoid any physical contact with the connector pins.

ELECTRIC SHOCK : FIRST AID

The rules for first aid concern all staff: whether they are installing, operating or maintaining this hardware. Everyone must be ready to give first aid to avoid any loss of human life.

Generally, an electric shock does not kill instantly; the victim may be saved, even if they are not breathing. You must always remain calm.



CAUTION : *In case of injury (from an electric origin or not), enforce the victims first aid prescriptions established by the employer – in accordance with its general obligation about health and safety – item L. 4121-1 of the Labour code for France.*

1.1.3.2 RISKS RELATED TO THE WORK ENVIRONMENT

AMBIENT TEMPERATURE

Do not install the equipment near a heat source.

Do not leave the equipment in direct sunlight.

IRRITATIONS / ALLERGIES

In case of irritation or allergy resulting from the use of the equipment, immediately consult a doctor.

PROTECTION AGAINST ELECTROMAGNETIC RADIATIONS

Some equipment may increase electromagnetic radiation when being used. It is recommended that pregnant women and people with pacemakers keep away from these high-risk zones.

CONDENSATION

When there is heavy condensation resulting from the equipment being moved (*e.g. from a hot to a cold area*), do not use the equipment until it is fully dry.

EQUIPMENT MAINTENANCE

Do not use the equipment in a dusty place, as dust particles can hinder its normal functioning.

Disconnect the equipment before cleaning. Do not use liquid or aerosol cleaners. Use a damp cleaning cloth.

TEMPERATURE

The radiator of the equipment RF power amplifier module may reach high temperatures under certain transmission conditions. To avoid any risks of burns, do not touch the RF power amplifier module when the equipment is transmitting and at least for 10 minutes after it switches to standby mode.

1.1.3.3 RISKS RELATED TO TRANSPORTATION

MANUTENTION

Certain equipment designed by TELERAD may be very heavy. In this case do not transport the equipment without using appropriate lifting devices.



Manutention



CAUTION : For equipment transportation, enforce the prevention and safety measures and wear adapted personal protective equipment (PPE) related to instructions established by the employer – in accordance with its general obligation about health and safety – item L. 4121-34 of the Labour code for France.



For information on the equipment's weight, see paragraph « [Mechanical characteristics](#) » on page 22*.

PACKAGING

The equipment is delivered in a protective packaging. Keep this packaging for reuse when sending the equipment back to TELERAD.

1.2 TRANSPORT AND STORAGE

1.2.1 PACKAGING

This operation consists in protecting the previously-packed hardware and components from shocks that occur during handling, and from various damaging external factors during storage.

1.2.1.1 HARDWARE AND MECHANICAL ELEMENTS

Each element must have a rigid box (polystyrene, wood or cardboard) suited to the transport and storage conditions.

The item shall be fixed in place with soft material that cushions against shocks, or properly fixed inside the box.

1.2.1.2 DESICCATION

Condensation of humidity, in a closed container, is essentially caused by the outside temperature dropping, resulting in lowering of the pressure of the internal atmosphere, encouraging the penetration of damp air.

The relative humidity of the internal atmosphere of packaging must be lower than 30%. All packaging must therefore contain a quantity of desiccant related to the climatic conditions encountered.

1.2.1.3 MARKING

All packaging must at least have identification marking specifying its content, (description, reference, quantity) independent of any other regulatory markings.

1.2.2 TRANSPORTATION

All TELERAD products are supplied in specific protective packaging, and must be transported without this being modified in any manner whatsoever.

In the event of loss, damage or breakage of the equipment during transport, please inform the transport company or shipping agent by a written report.

1.2.3 STORAGE

Store equipment in a cool (preferably below 30°C) and ventilated place, away from humidity, heat sources, naked flames, food products or drinks. Keep equipment in its original packaging until used, and do not pile up equipment haphazardly.

1.3 CONFORMITY

The VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers are compliant with the directives currently in force relating to EMC, low voltage, radio communication, and worker safety aspects :

- **EMC Directive 2014/30/UE** of the European Parliament and of the Council of 26 february 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.
- **BT Directive 2014/35/UE** of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.
- **RED Directive 2014/53/EU** of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive R&TTE 1999/5/EC.
- **Directive 2009/104/EC** of the European Parliament and of the Council of 16 September 2009 concerning the minimum safety and health requirements for the use of work equipment by workers at work (*second individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC*).

1.4 WARRANTY

TELERAD shall not be held liable for any damage resulting from the modification of the as-delivered configuration. This shall include damages resulting from an accident, incorrect use, deliberate damages or damages due to the environment.

Lastly, the environment for the use of TELERAD products must be compliant with the climatic specifications described in this manual.

1.5 COPYRIGHT

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REMARK : *The information contained in this document is deemed to be reliable. However, TELERAD shall reserve the right to modify this information at any time without prior notice.*

1.6 REFERENCE DOCUMENTS

- | | | |
|-----|--|---|
| [1] | ICDGB 40600040 9000-2G Series
MAINTENANCE | Interface Control Document relating to the local operation and configuration link from the rear panel TELNET interface. |
| [2] | ICDGB 40600039 9000-2G Series SNMP | Interface Control Document relating to the SNMP protocol supervision link. |
| [3] | ICDGB 40600038 9000-2G Series JBUS | Interface Control Document relating to the JBUS protocol supervision link. |
| [4] | KITGB 40700003 9000-2G Series | Procedure for software release through a Web Server HTML page. |

CHAPTER II

PRESENTATION

2.1 GENERALITIES

The VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers have been developed to fulfil voice and data transmission or reception telecommunication requirements, for different users:

- The Civil aviation telecommunications in the 118-144MHz VHF frequency range,
- The Civil maritime telecommunications in the 156-163MHz VHF frequency range,
- The Air Force telecommunications in the 225-400MHz UHF frequency range or in the 118-144MHz and 225-400MHz V/UHF frequency range.

An « Extended FM » option is also available for the TRX9020-2G, such a way to operate in F3E / G3E:

- In the VHF range: Between 136 and 174MHz,
- In the UHF range: Between 225 and 400MHz.

Designed for ground communication stations, they are a multi-mode and multi-frequency unit suited to various configurations.

2.2 DEVICES OVERVIEW

2.2.1 HARDWARE PRESENTATION

The multi-mode VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers are multi-module systems designed to be installed in a standard 19" rack, taking up a height of 3U.

They have all an identical structure, made up of a mechanical chassis to which the following modules and PCBs are fixed:

- **The power supply module**, located on the right side of the device. It is made up of a Mains and Battery monitoring and switching PCB (*in all versions*), and an AC/DC converter providing internal voltage from the Mains (*in TRX9000A, TRX9010A-2G and TRX9020A-2G versions only*). It is connected on one hand to the control PCB by a ribbon cable as well as a 3-wires cable for the internal voltages, and on the other hand to the VHF (*TRX9000-2G*), UHF (*TRX9010-2G*) or V/UHF (*TRX9020-2G*) amplifier module by a power cord.
- **The Control PCB**, located at the bottom of the device. It represents the node interconnecting the other elements of the transceiver: VHF, UHF or V/UHF Amplifier module according to the version, Frequency Synthesis module(s) (*1 or 2 depending on the requirements*), Power supply module, Reception module and Front panel. It embeds a new technology replacing the classical DSP component to process the TxAF signals on one hand and to communicate with the Reception module relatively to the demodulated signals on the other hand.

- **The Microprocessor module** representing the management center of the system, fitted as a daughter board of the Control PCB. It is connected to the control PCB by two SEAM/SEAF type high density connectors and manages all serial links (*internal and external Ethernet links, JBUS or Maintenance serial links, SPI type internal synchronous links with the HMI or the Frequency synthesizers*).
- **The Synthesizer module(s)**, supplying the carrier, each connected with the control PCB through a ribbon cable. Presence of 2 synthesizer modules is required when the radio device is used in a Marine mode with full-duplex channels, having possibly different frequencies in transmission and in reception.
- **The Amplifier module, VHF** for the TRX9000-2G, **UHF** for the TRX9010-2G, **V/UHF** for the TRX9020-2G, which constitutes the left side of the equipment. It is also linked to the control PCB by two ribbon cables of different size depending on the Amplifier version, but also to the power supply module by a power cord.
- **The front-end Receiver module, VHF** for the TRX9000-2G, **UHF** for the TRX9010-2G, **V/UHF** for the TRX9020-2G, located nearby the Control PCB. It manages the Reception part of the transceiver by demodulating the RF signal received on the antenna input and by processing the AF signal through also a new technology of component. It is also linked to the control PCB by a ribbon cable.
- **The front panel management PCB**, which groups together the local commands and light indicators. It is also linked to the control PCB, by another ribbon cable.
- **The Display screen PCB** that manages the Front panel Screen/Keyboard. This PCB is connected directly to the front panel management PCB.

A removable cover protects these sub-assemblies from the environment.

Functionally, each transceiver ensures:

- Modulation/Demodulation of audio voice received or transmitted to the controller through a VCS, or of data received or transmitted to the upper layer of a communication system.
- Management of the various Human-Machine Interfaces (HMI) allowing configuration, operation, local and remote testing and monitoring.
- Self-monitoring.

2.2.2 SOFTWARE PRESENTATION

The software embedded in the multi-mode VHF TRX9000-2G, UHF TRX9010-2G or V/UHF TRX9020-2G transceiver is designed around a real-time multi-process kernel used by the microcontroller of the Microprocessor module. After reading the configuration parameters, the microcontroller downloads the appropriate softwares, depending on the current operating mode, in the programmable components.

It is structured into a set of applications, which the aforementioned kernel manages and shares the resources required for them to execute correctly.

So, applications managed by the microcontroller are:

- Management of synchronous, asynchronous and Ethernet serial links for communication with internal and external control components of the transceiver,
- Control and monitoring of the transceiver,
- Management of the transceiver's HMI.

AF signal processing tasks (*modulation, demodulation, filtering, compression, tests, input and output AF line levels, codecs management, etc...*) are now located on special components specifically dedicated for those functions.

2.2.3 DIFFERENT VERSIONS

There are three versions of equipment:

- **Version TRX9000-2G** (TLD P/N: 82300080): Multi-modes and Multi-frequency VHF transceiver,
- **Version TRX9010-2G** (TLD P/N: 82300081): Multi-modes and Multi-frequency UHF transceiver,
- **Version TRX9020-2G** (TLD P/N: 82300082): Multi-modes and Multi-frequency V/UHF transceiver.

2.2.4 OPTIONS

Three sets of options are defined here below:

- Options of the TRX9000-2G,
- Options of the TRX9010-2G,
- Options of the TRX9020-2G.

In the following paragraphs, « **X** » referred options are not mandatory options. They do not exclude themselves i.e. several « **X** » options can be selected at same time. All the other options (« **A** », « **B** », « **C** », etc...) are mandatory options, meaning that selecting one excludes all the other ones.

2.2.4.1 OPTIONS OF THE TRX9000-2G

Five options are available for the VHF transceiver:

- **Option A: TRX9000A-2G** (TLD P/N: 84500217): VHF transceiver with Mains and Battery inputs,
- **Option B: TRX9000C-2G** (TLD P/N: 84500218): VHF transceiver with Battery input only,
- **Option X: RECX_TRX_N/S** (TLD P/N: 84500234): Coaxial relay for Main / Standby mode,
- **Option X: RECXTRX_T/R_V/U** (TLD P/N: 84500235): Coaxial relay for Tx / Rx or VHF / UHF antenna,
- **Option X: TRX9000-2G CAVITY** (TLD P/N: 84500252): VHF internal motorized cavity kit for TRX9000-2G.

2.2.4.2 OPTIONS OF THE TRX9010-2G

Five options are also available for the UHF transceiver:

- **Option A: TRX9010A-2G** (TLD P/N: 84500219): UHF transceiver with Mains and Battery inputs,
- **Option B: TRX9010C-2G** (TLD P/N: 84500220): UHF transceiver with Battery input only,
- **Option X: RECX_TRX_N/S** (TLD P/N: 84500234): Coaxial relay for Main / Standby mode,
- **Option X: RECXTRX_T/R_V/U** (TLD P/N: 84500235): Coaxial relay for Tx / Rx or VHF / UHF antenna,
- **Option X: TRX9010-2G CAVITY** (TLD P/N: 84500253): UHF internal motorized cavity kit for TRX9010-2G.

2.2.4.3 OPTIONS OF THE TRX9020-2G

Six options are available for the V/UHF transceiver:

- **Option A: TRX9020A-2G** (TLD P/N: 84500250): V/UHF transceiver with Mains and Battery inputs (CTTQ PCB version),
- **Option C: TRX9020C-2G** (TLD P/N: 84500251): V/UHF transceiver with Battery input only (CTTQ PCB version),
- **Option D: TRX9020A-2G** (TLD P/N: 84500229): V/UHF transceiver with Mains and Battery inputs (CTNU PCB version),
- **Option E: TRX9020C-2G** (TLD P/N: 84500230): V/UHF transceiver with Battery input only (CTNU PCB version),
- **Option X: RECX_TRX_N/S** (TLD P/N: 84500234): Coaxial relay for Main / Standby mode,
- **Option X: RECXTRX_T/R_VIU** (TLD P/N: 84500235): Coaxial relay for Tx / Rx or VHF / UHF antenna,
- **Option X: EXTENDED FM** (TLD P/N: 84500256): Extended frequency ranges in F3E / G3E modes.

2.2.5 SUB-ASSEMBLIES

2.2.5.1 SUB-ASSEMBLIES OF THE TRX9000-2G

The VHF transceiver is made of seven specific modules located in a mechanical chassis:

- **Power supply module:**
 - ▶ **ALIN26300** (TLD P/N: 52000695): AC/DC module supplying the internal +24V_{DC}, from Mains or Battery inputs, with Mains/Battery switching management (*A option*),
 - ▶ **ALDC26302** (TLD P/N: 52000697): DC/DC module supplying the internal +24V_{DC} from Battery input (*B option*).
- **VHF Amplifier module:**
 - ▶ **AMPV26260** (TLD P/N: 52000634): VHF Power Amplifier module of the modulated carrier
- **VHF Reception module:**
 - ▶ **RHUM22018** (TLD P/N: 52000690): VHF Heterodyne receiver module.
- **AF and Digital Control PCB:**
 - ▶ **CTNU15139C** (TLD P/N: 51001351): Digital and AF control PCB (*up to 09/2021*),
 - ▶ **CTTQ15136A** (TLD P/N: 51001363): Digital and AF control PCB (*from 09/2021 to 05/2022*),
 - ▶ **CTTQ15136B** (TLD P/N: 51001370): Digital and AF control PCB (*from 05/2022*).
- **Programmed μ P/DSP module:**
 - ▶ **MIPR11020** (TLD P/N: 53500030): Programmed Micro-Processor module (*up to 09/2021*),
 - ▶ **MIPR11023** (TLD P/N: 53500033): Programmed Micro-Processor module (*from 09/2021*).
- **VHF Synthesizer module(s):**
 - ▶ **SVHF25077** (TLD P/N: 52000620): VHF Synthesizer(s) module(s) (*1 or 2*).
- **Front panel:**
 - ▶ **PAVT45038** (TLD P/N: 50001559): Equipped Front Panel.
- **Mechanical chassis:**
 - ▶ **CHTR41177** (TLD P/N: 50001560): Mechanical chassis for TRX9000-2G.

2.2.5.2 SUB-ASSEMBLIES OF THE TRX9010-2G

The UHF transceiver is also made of seven specific modules located in a mechanical chassis:

- **Power supply module:**
 - ▶ **ALIN26301** (TLD P/N: 52000696): AC/DC module supplying the internal +28V_{DC}, from Mains or Battery inputs, with Mains/Battery switching management (*A option*),

- ▶ **ALDC26302** (TLD P/N: 52000697): DC/DC module supplying the internal +28V_{DC} from Battery input(*B option*).
- **UHF Amplifier module:**
 - ▶ **AMPV26246** (TLD P/N: 52000597): UHF Power Amplifier module of the modulated carrier.
- **UHF Reception module:**
 - ▶ **RHUM22019** (TLD P/N: 52000691): UHF Heterodyne receiver module.
- **AF and Digital Control PCB:**
 - ▶ **CTNU15139C** (TLD P/N: 51001351): Digital and AF control PCB (*up to 09/2021*),
 - ▶ **CTTQ15136A** (TLD P/N: 51001363): Digital and AF control PCB (*from 09/2021 to 05/2022*),
 - ▶ **CTTQ15136B** (TLD P/N: 51001370): Digital and AF control PCB (*from 05/2022*).
- **Programmed μ P/DSP module:**
 - ▶ **MIPR11020** (TLD P/N: 53500030): Programmed Micro-Processor module (*up to 09/2021*),
 - ▶ **MIPR11023** (TLD P/N: 53500033): Programmed Micro-Processor module (*from 09/2021*).
- **UHF Synthesizer module:**
 - ▶ **SUHF25078** (TLD P/N: 52000621): UHF Synthesizer module.
- **Front panel:**
 - ▶ **PAVT45038** (TLD P/N: 50001559): Equipped Front Panel.
- **Mechanical chassis:**
 - ▶ **CHTR41177** (TLD P/N: 50001560): Mechanical chassis for TRX9010-2G.

2.2.5.3 SUB-ASSEMBLIES OF THE TRX9020-2G

The V/UHF transceiver is also made of seven specific modules located in a mechanical chassis:

- **Power supply module:**
 - ▶ **ALIN26303** (TLD P/N: 52000698): AC/DC module supplying the internal +50V_{DC}, from Mains or Battery inputs, with Mains/Battery switching management (*A option*),
 - ▶ **ALDC26297** (TLD P/N: 52000693): DC/DC module supplying the internal +50V_{DC} from Battery input(*B option*).
- **V/UHF Amplifier module:**
 - ▶ **AMPL26279** (TLD P/N: 52000655): V/UHF Power Amplifier module (*up to 01/2021*),
 - ▶ **AMPL26319** (TLD P/N: 52000720): V/UHF Power Amplifier module (*from 01/2021*).
- **V/UHF Reception module:**
 - ▶ **RHUM12186** (TLD P/N: 52001319): V/UHF Heterodyne receiver module.
- **AF and Digital Control PCB:**
 - ▶ **CTNU15140C** (TLD P/N: 51001352): Digital and AF control PCB (*up to 09/2021*),
 - ▶ **CTTQ15137A** (TLD P/N: 51001364): Digital and AF control PCB (*from 09/2021 to 05/2022*),
 - ▶ **CTTQ15137B** (TLD P/N: 51001371): Digital and AF control PCB (*from 05/2022*).
- **Programmed μ P/DSP module:**
 - ▶ **MIPR11020** (TLD P/N: 53500030): Programmed Micro-Processor module (*up to 09/2021*),
 - ▶ **MIPR11023** (TLD P/N: 53500033): Programmed Micro-Processor module (*from 09/2021*).
- **V/UHF Synthesizer module:**
 - ▶ **SYVU25101** (TLD P/N: 52000710): V/UHF Synthesizer module.
- **Front panel:**
 - ▶ **PAVT45038** (TLD P/N: 50001559): Equipped Front Panel.
- **Mechanical chassis:**
 - ▶ **CHTR41178** (TLD P/N: 50001589): Mechanical chassis for TRX9020-2G.

2.2.6 SPECIFIC ELEMENTS

Each radio device is customized by specific elements:

- **ELSP TRX9000A-2G** (TLD P/N: 58001268): Specific elements for the TRX9000A-2G,
- **ELSP TRX9000C-2G** (TLD P/N: 58001269): Specific elements for the TRX9000C-2G,
- **ELSP TRX9010A-2G** (TLD P/N: 58001270): Specific elements for the TRX9010A-2G,
- **ELSP TRX9010C-2G** (TLD P/N: 58001271): Specific elements for the TRX9010C-2G,
- **ELSP TRX9020A-2G** (TLD P/N: 58001283): Specific elements for the TRX9020A-2G,
- **ELSP TRX9020C-2G** (TLD P/N: 58001282): Specific elements for the TRX9020C-2G.

2.3 EQUIPMENT CHARACTERISTICS

2.3.1 ELECTRICAL CHARACTERISTICS

2.3.1.1 GENERAL CHARACTERISTICS



REMARK: The **CEI62368-1** standard relative to the Safety requirements for communication Technology equipments defines an **Assigned voltage** corresponding to the voltage value specified by the manufacturer for a device. It defines also tolerances on this assigned voltage which are:

- $\pm 10\%$ for the AC source,
- $+20\%/-15\%$ for the DC source.

About this last one, and in accordance with the classical range of operation of the Telerad equipments, between $+21V_{DC}$ and $+31V_{DC}$, the assigned voltage has been specified to $+25V_{DC}$.

However, Telerad supplies also a **Recommended voltage**, corresponding to the typical power supply voltage of the DC source.

Characteristics	Value
Operational modes	<ul style="list-style-type: none"> ■ Basic: A3E ■ Optional: F3E / G3E / ACARS / VDL2
Power supply	<ul style="list-style-type: none"> ■ AC Input (<i>version A only</i>): <ul style="list-style-type: none"> ▶ Assigned voltage: $110-240V_{AC}$, tolerance $\pm 10\%$ ▶ Assigned frequency: 50 - 60Hz, tolerance $\pm 10\%$ ■ DC Input (<i>versions A and C</i>): <ul style="list-style-type: none"> ▶ For the TRX9000-2G: <ul style="list-style-type: none"> • Assigned voltage: $+25 V_{DC}$, • Recommended voltage: $+24 V_{DC}$, • Operational range: $+21$ to $+31 V_{DC}$. ▶ For the TRX9010-2G or the TRX9020-2G: <ul style="list-style-type: none"> • Assigned voltage: $+25 V_{DC}$, • Recommended voltage: $+28 V_{DC}$, • Operational range: $+21$ to $+31 V_{DC}$.

<i>Characteristics</i>	<i>Value</i>
Consumption in transmission	<i>(50W AM-modulated @ 85% carrier, typical values).</i>
	<ul style="list-style-type: none"> ■ <u>For the TRX9000-2G:</u> <ul style="list-style-type: none"> ▶ +24V_{DC} Battery input: 13.3A ▶ 115V_{AC} Mains input: 3.6A ▶ 230V_{AC} Mains input: 1.8A ■ <u>For the TRX9010-2G:</u> <ul style="list-style-type: none"> ▶ +28V_{DC} Battery input: 14.5A ▶ 115V_{AC} Mains input: 4.2A ▶ 230V_{AC} Mains input: 2.1A ■ <u>For the TRX9020-2G:</u> <ul style="list-style-type: none"> ▶ +28V_{DC} Battery input: 12.9A ▶ 110V_{AC} Mains input: 3.6A ▶ 230V_{AC} Mains input: 1.8A
	<i>(for more information, see NOTE 1)</i>
Consumption in reception.....	<i>(Typical values).</i>
	<ul style="list-style-type: none"> ■ <u>For the TRX9000-2G and TRX9010-2G:</u> <ul style="list-style-type: none"> ▶ +24V_{DC} / +28 V_{DC} Battery input: 1.35A ▶ 115V_{AC} Mains input: 480mA ▶ 230V_{AC} Mains input: 440mA ■ <u>For the TRX9020-2G:</u> <ul style="list-style-type: none"> ▶ +28V_{DC} Battery input: 1.95A ▶ 110V_{AC} Mains input: 550mA ▶ 230V_{AC} Mains input: 630mA
Antenna SWR.....	Operation at rated power up to an SWR of 2
Power reduction in transmission.....	<ul style="list-style-type: none"> ■ <u>For the TRX9000-2G and TRX9010-2G:</u> Gradual power reduction: <ul style="list-style-type: none"> ▶ For an SWR > 2, ▶ For a power supply module or RF amplifier module temperature > 70°C, ▶ For a power supply voltage < 23.8V_{DC} ■ <u>For the TRX9020-2G:</u> Gradual power reduction: <ul style="list-style-type: none"> ▶ For an SWR > 2, ▶ For an RF amplifier module temperature: <ul style="list-style-type: none"> • 0,1 dB/°C between 77 and 92°C • 1 dB/°C between 92 and 100°C • Transmission Inhibition above 100°C ▶ No power reduction vs the power supply voltage for the TRX9020-2G: <ul style="list-style-type: none"> • Nominal output power available as soon as +21V_{DC}.
Max RF input level on the reception antenna.....	+30 dBm
Headset output.....	<ul style="list-style-type: none"> ■ Output Impedance : 600Ω ■ Output level : Adjustable from -30 to +10dBm

<i>Characteristics</i>	<i>Value</i>
Headset output (cont.)	<ul style="list-style-type: none"> ■ Nominal output level: <ul style="list-style-type: none"> ▶ <u>In reception</u>: -8dBm ▶ <u>In transmission</u>: Rx level - Anti-Larsen (3dB by default factory-adjusted) ■ Isolated output level: < -50dBm
Loudspeaker output	<ul style="list-style-type: none"> ■ Output Impedance: 8Ω ■ Output level: Adjustable from 0 to 500mW ■ Nominal output level: <ul style="list-style-type: none"> ▶ <u>In reception</u>: 100mW ▶ <u>In transmission</u>: Rx level - Anti-Larsen (3dB by default factory-adjusted) ■ Isolated output level: < -50dBm ■ Output disconnected as soon as a headset is connected
Local maintenance	<ul style="list-style-type: none"> ■ Two possible means of access: <ul style="list-style-type: none"> ▶ Maintenance connector through USB type B port (COM port). Telerad reserved for network debugging. ▶ Front panel Screen / Keyboard (HMI interface), accessing the following commands. ■ 2 built-in Tests with report display on the local screen: <ul style="list-style-type: none"> ▶ Continuous (CBIT) ▶ Initiated (IBIT) ■ TCXO adjustment available from the HMI. ■ Programming of the operating parameters: <ul style="list-style-type: none"> ▶ Mode, Operational frequency, Offset frequency, Output power, Input AF line sensitivity, Output AF line level, Squelches, Squelches thresholds ■ Programming of the configuration parameters: <ul style="list-style-type: none"> ▶ Hard/Soft ON/OFF control, PTT safety, Brightness, IP parameters, Audio compressor in reception ■ Measurement display: <ul style="list-style-type: none"> ▶ Forward and reflected RF output power, SWR, Modulation ratio, Field level, SNR, Input and Output AFs power, Temperature of the VHF or UHF amplifier module, the Power supply module, the RF front-end module and the Control PCB, Power supply voltages
Remote maintenance	By Ethernet connection, using TELNET protocol. Allows to access two sets of commands (<i>Guest and Admin</i>).
Remote Monitoring	<ul style="list-style-type: none"> ■ By Ethernet connection, using SNMP protocol ■ Via RS485 serial link, using JBUS protocol
Software releases	Through HTML page
Safety	Redundancy functions included: <ul style="list-style-type: none"> ■ In Analog mode: Main/Standby function with integrated M/S relay, ■ In VoIP mode: Links aggregation function on ETH1 and ETH2 Ethernet ports.



NOTE 1: The TRX9020-2G transceiver consumption can vary vs the typical values, depending on the power supply conditions, the frequency range and the SWR. For a 50W 85% modulated carrier, values are:

- +21V_{DC} Battery input: 16.1A in VHF, 14.6A in UHF, 19.1A in VHF SWR = 2:1,
- +25V_{DC} Battery input: 13.4A in VHF, 12.2A in UHF,
- +31V_{DC} Battery input: 10.8A in VHF, 9.8A in UHF,
- 110V_{AC} Mains input: 3.6A in VHF, 2.9A in UHF,
- 230V_{AC} Mains input: 1.8A in VHF, 1.5A in UHF.

2.3.1.2 TRX9000-2G SPECIFICATIONS

2.3.1.2.1 SPECIFICATIONS IN A3E



NOTA : Although the transceiver **complies with the EN300676 standard** that defines an ATC frequency range between **118 and 137MHz**, it operates over an extended band comprised between **118 and 144MHz**. Consequently, the operator will have to take **all necessary precautions** when using the equipment outside the range defined by the standard.



REMARK : The available mode in the 137-144MHz extended range is the **A3E mode**, and qualification of the equipment in this band is based on measures of performances defined in the EN300676. So, measures for qualification and production are realized **over all the 118-144MHz frequency range**, according to the procedures defined in the EN300676.

Characteristics	Value
Mode.....	A3E
Frequency range.....	<ul style="list-style-type: none"> ■ Standard: 118-144MHz ■ Optional: Extended to 112-156MHz
Frequency stability.....	< ±0,3ppm (from -20°C to +55°C)
Channel spacing.....	25kHz, 12.5kHz and 8.33kHz

CHARACTERISTICS IN TRANSMISSION

Output power.....	Programmable from 33 to 47dBm/50Ω, by 0.5dB steps
Adjacent Channel Power (ACP).....	(for an AF signal @ 1kHz) <ul style="list-style-type: none"> ■ 25kHz and 12.5kHz channels: ≤ -70dBc ■ 8.33kHz channels: ≤ -60dBc
Cyclic ratio.....	<ul style="list-style-type: none"> ■ 100% between -20°C and +40°C in normal power supply conditions ■ 20% in extreme temperature conditions (Tx/Rx Cycle: 1mn/ 5mn)
Modulation ratio.....	≥ 85%
Harmonic distortion.....	≤ 3% (m = 85%)
Input AF level.....	<ul style="list-style-type: none"> ■ Adjustable from -30dBm to 0dBm, in 3dB steps ■ Maximum admissible level: +10dBm / 600Ω

Characteristics	Value
Compressor variation.....	< 0.5dB for 30dB variation in the AF input level, at the compressor's threshold
AF bandwidth.....	(0dB reference @ 1kHz) <ul style="list-style-type: none"> ■ 25kHz and 12.5kHz channels: Attenuation < 3dB between 300 and 3400Hz, > 40dB at 5kHz ■ 8.33kHz channels: Attenuation < 3dB between 300 and 2500Hz, > 40dB at 3,2kHz
Operation with Offset frequency.....	(Compliant with ICAO annex 10) <ul style="list-style-type: none"> ■ 25kHz channels: Possible operation up to 5 carriers, spaced by ±2.5kHz, ±4kHz, ±5kHz, ±7.3kHz, ±7.5kHz and ±8kHz ■ 12.5kHz channels: No Offset frequency. ■ 8.33kHz channels: 2 carriers only, spaced by ±2.5kHz
Spectral purity.....	<ul style="list-style-type: none"> ■ Harmonic lines: < -43dBm ■ Non-harmonic lines: < -54dBm
Wide band noise.....	< -150dBc/Hz (at 1% of the carrier frequency)
Standby-to-Transmission switching time.....	< 50ms
PTT safety.....	Programmable from 0 (disabled) to 600s, by 5s step
CHARACTERISTICS IN RECEPTION	
Sensitivity.....	≤ -105dBm (1.2μV/50Ω, typical: -107dBm (1μV/50Ω))
Overall bandwidth at -6dB.....	<ul style="list-style-type: none"> ■ 25kHz and 12.5kHz channels: ≥ ±11kHz ■ 8.33kHz channels: ≥ ±2.8kHz
Adjacent channel rejection.....	<ul style="list-style-type: none"> ■ 25kHz channels: ≥ 70dB ■ 12.5kHz channels: ≥ 70dB (in the 2nd adjacent channel, as no specific filter at 12.5kHz) ■ 8.33kHz channels: ≥ 60dB
Rejection of interfering signals.....	≥ 70dB
3d-order intermodulation.....	≥ 80dB (12dB SINAD, scramblers at 100kHz & 200kHz)
Crossmodulation rejection.....	≥ 85dB
Image frequency rejection.....	≥ 80dB
Dynamics.....	≤ 3dB (for 100dB variation on the RF)
Desensitization.....	≥ 100dB
Spurious emitted by conduction.....	< -57dBm
AF noise.....	> 50dB (Carrier at -13dBm, 90% modulated by a 1kHz AF signal)
AF AGC.....	< 1,5dB
Harmonic distortion.....	≤ 5% (Carrier 90% modulated by a 1kHz AF signal)
AF bandwidth.....	<ul style="list-style-type: none"> ■ 25kHz and 12.5kHz channels: Attenuation < 3dB between 300 and 3400Hz

Characteristics	Value
AF bandwidth (cont.).....	■ 8,33kHz channels: Attenuation < 3dB between 300 and 2500Hz
Output AF level.....	Adjustable from -30dBm to +10dBm by 0.5dB steps
Squelch attenuation.....	≥ 60dB
Types of squelch.....	Two types of squelch: <ul style="list-style-type: none"> ■ RF level: Two RF squelches: <ul style="list-style-type: none"> ▶ RF1: from -120dBm to -60dBm by 0,5dB step ▶ RF2: from -120dBm to 0dBm by 0,5dB step ■ SNR: from 6 to 20dB by 1dB step

2.3.1.2.2 SPECIFICATIONS IN G3E

Measurement conditions as per EN 301 929-1 V1.2.1 ETSI standard.



CAUTION: This standard, relative to the Maritime Mobile Services, refers two types of modulations: **G3E** modulation for analog audio, **G2B** modulation for the Digital Selecting Call operation. The current transceivers are compliant only with the « Analog audio » part and do not manage the DSC signal.



NOTA: Do not take the following electrical characteristics into account if the G3E option has not been installed in the TRX9000-2G transceiver.

Characteristics	Value
Mode.....	G3E in Simplex or Duplex mode
Frequency ranges.....	Standard: 156-163MHz
Frequency stability.....	< ±0,3ppm (from -20°C to +55°C)
Channel spacing.....	25kHz, 12,5kHz

CHARACTERISTICS IN TRANSMISSION

Output power.....	Programmable from 33dBm to 47dBm/50Ω, by 0.5dB steps
Cyclic ratio.....	■ 100% between -20°C and +40°C in normal power supply conditions ■ 20% in extreme temperature conditions (Tx/Rx Cycle : 1mn/5mn)
Frequency excursion.....	±5,6kHz à 3400Hz
Pre-emphasis.....	+6dB CW from 300 to 3400Hz
Harmonic distortion.....	< 10% ($\Delta F = 5,6kHz$)
Input AF level.....	Adjustable from -30dBm to 0dBm, in 3dB steps Maximum admissible level: +10dBm / 600Ω
Compressor variation.....	< 0.5dB for 30dB variation in the AF input level, at the compressor's threshold
AF bandwidth.....	(0dB reference at 1kHz) Attenuation < 3dB between 300 and 3400Hz, > 40dB at 5kHz

Characteristics	Value
PTT safety.....	Programmable from 0 (disabled) to 600s, by 5s step
CHARACTERISTICS IN RECEPTION	
Sensitivity.....	$\leq -107\text{dBm}$ ($1\mu\text{V} / 50\text{W}$) (excursion $\pm 2,4\text{kHz}$, SNR = 10dB, CCITT weighting)
Frequency excursion.....	$\pm 5,6\text{kHz}$ à 3400Hz
De-emphasis.....	-6dB/octave
Overall bandwidth at -6dB.....	$\geq \pm 11\text{kHz}$
Dynamics.....	$\geq 94\text{dB}$
Adjacent channel rejection.....	$\geq 55\text{dB}$
Co-channel rejection.....	$\geq -8\text{dB}$
Rejection of interfering signals.....	$\geq 70\text{dB}$
Image frequency rejection.....	$\geq 75\text{dB}$
3d-order intermodulation.....	$\geq 70\text{dB}$
Desensitization.....	$\geq 84\text{dB}$
Spurious emitted by conduction.....	<ul style="list-style-type: none"> ■ From 9kHz to 1GHz: $\leq -57\text{dBm}$ ■ From 1GHz to 4GHz: $\leq -47\text{dBm}$
AF bandwidth at -3dB.....	> 300-3600 Hz
Types of squelch.....	Two types of squelch: <ul style="list-style-type: none"> ■ RF level: from -120dBm to -60dBm by 0,5dB step ■ SNR: from 6 to 20dB by 1dB step

2.3.1.3 TRX9010-2G SPECIFICATIONS

2.3.1.3.1 SPECIFICATIONS IN A3E

Measurement conditions as per EN 302 617-1 V1.1.1 ETSI standards for the 25kHz channels.

Characteristics	Value
Mode.....	A3E
Frequency ranges.....	Standard: 225-400MHz
Frequency stability.....	$< \pm 0,3\text{ppm}$ (from -20°C to $+55^{\circ}\text{C}$)
Channel spacing.....	25kHz, 12.5kHz and 8.33kHz

CHARACTERISTICS IN TRANSMISSION

Output power.....	Programmable from 37 to 47dBm/50Ω, by 0.5dB steps
Cyclic ratio.....	<ul style="list-style-type: none"> ■ 100% between -20°C and $+40^{\circ}\text{C}$ in normal power supply conditions. ■ 20% in extreme temperature conditions (<i>Tx/Rx Cycle : 1mn/ 5mn</i>).

<i>Characteristics</i>	<i>Value</i>
Modulation ratio	≥ 85%
Harmonic distortion	≤ 3% (<i>m = 85%</i>)
Input AF level	<ul style="list-style-type: none"> ■ Adjustable from -30dBm to 0dBm, in 3dB steps ■ Maximum admissible level: +10dBm / 600Ω
Compressor variation	< 0.5dB for 30dB variation in the AF input level, at the compressor's threshold
AF bandwidth	<i>(0dB reference @ 1kHz)</i> <ul style="list-style-type: none"> ■ <u>25kHz and 12.5kHz channels</u>: Attenuation < 3dB between 300 and 3400Hz, > 40dB at 5kHz ■ <u>8.33kHz channels</u>: Attenuation < 3dB between 300 and 2500Hz, > 40dB at 3,2kHz
Operation with Offset frequency	<i>(Compliant with ICAO annex 10)</i> <ul style="list-style-type: none"> ■ <u>25kHz channels</u>: Possible operation up to 4 carriers, spaced by ±2.5kHz, ±5kHz, ±7.3kHz and ±7.5kHz ■ <u>12.5 and 8.33kHz channels</u>: No Offset.
Adjacent Channel Power (ACP)	<ul style="list-style-type: none"> ■ <u>25kHz & 12.5kHz channels</u>: ≤ -60dBc ■ <u>8.33kHz channels</u>: ≤ -50dBc
Spectral purity	< -33dBm (<i>Harmonic and non-harmonic lines</i>)
Wide band noise	< -150dBc/Hz (<i>at 1% of the carrier frequency</i>)
PTT safety	Programmable from 0 (<i>disabled</i>) to 600s, by 5s step
CHARACTERISTICS IN RECEPTION	
Sensitivity	≤ -105dBm (<i>1.2μV / 50Ω</i>)
Overall bandwidth at -6dB	<ul style="list-style-type: none"> ■ <u>25kHz and 12.5kHz channels</u>: ≥ ±11kHz ■ <u>8,33kHz channels</u>: ≥ ±2.8kHz
Adjacent channel rejection	<ul style="list-style-type: none"> ■ <u>25kHz channels</u>: ≥ 60dB ■ <u>12.5kHz channels</u>: ≥ 60dB (<i>in the 2nd adjacent channel, as no specific filter at 12.5kHz</i>) ■ <u>8.33kHz channels</u>: ≥ 50dB
Rejection of interfering signals	≥ 70dB
3d-order intermodulation	≥ 80dB (<i>12dB SINAD, scramblers at 100kHz & 200kHz</i>)
Crossmodulation rejection	≥ 80dB
Image frequency rejection	≥ 75dB
Dynamics	≤ 3dB (<i>for 100dB variation on the RF</i>)
Desensitization	≥ 95dB
Spurious emitted by conduction	< -57dBm
AF noise	> 50dB (<i>Carrier at -13dBm, 90% modulated by a 1kHz AF signal</i>)
AF AGC	< 1,5dB

Characteristics	Value
Harmonic distortion.....	≤ 5% (Carrier 90% modulated by a 1kHz AF signal)
AF bandwidth at -3dB.....	<ul style="list-style-type: none"> ■ 25kHz and 12.5kHz channels: ≥ 300-3400Hz ■ 8.33kHz channels: ≥ 300-2500Hz
Output AF level.....	Adjustable from -30dBm to +10dBm by 0.5dB steps
Squelch attenuation.....	≥ 60dB
Types of squelch.....	Two types of squelch: <ul style="list-style-type: none"> ■ RF level: Two RF squelches: <ul style="list-style-type: none"> ▶ RF1: from -120dBm to -60dBm by 0,5dB step ▶ RF2: from -120dBm to 0dBm by 0,5dB step ■ SNR: from 6 to 20dB by 1dB step

2.3.1.4 TRX9020-2G SPECIFICATIONS

Measurement conditions as per EN 300 676-1 V1.5.1 ETSI standard for the VHF part, and EN 302 617-1 V1.1.1 ETSI standards for the 25kHz channels for the UHF part.

The TRX9020-2G specifications are the same as the TRX9000-2G ones for the VHF range and the TRX9010-2G ones for the UHF range.

So in the standard version, the G3E FM mode is available only VHF in the 156 - 163MHz range.

An « **Extended FM** » option (TLD P/N: 84500256) allowing the TRX9020-2G to operate in both F3E et G3E FM modes, and in extended frequency ranges is also available. Characteristics for this option are:

Characteristics	Value
Mode.....	F3E, G3E
Frequency ranges.....	<ul style="list-style-type: none"> ■ VHF range: Between 136 and 174MHz, ■ UHF range: Between 225 and 400MHz.
Frequency stability.....	< ±0,3 ppm (from -20°C to +55°C)
Channel spacing.....	25kHz, 12.5kHz
Puissance de sortie.....	Programmable de 37 à 47dBm/50Ω, par pas de 0,5dB

2.3.2 MECHANICAL CHARACTERISTICS



For the mechanical dimensions of the TRX9000-2G or TRX9010-2G : see plate **45000117**.
For the mechanical dimensions of the TRX9020-2G : see plate **45000126**.

■ **Dimensions:**

- ▶ TRX9000-2G and TRX9010-2G: H x L x P = 132.5mm (3U) x 483mm (19") x 534mm (handles included).
- ▶ TRX9020-2G: H x L x P = 132.5mm (3U) x 483mm (19") x 594mm (handles included).

■ **Weight:**

- ▶ TRX9000-2G and TRX9010-2G: ≈ 12 kg
- ▶ TRX9020-2G: ≈ 14,5 kg



WARNING: Since the equipment weights approximately 14.5 kg, it is advisable to handle with care to avoid any injury to the back or any other body part.

2.3.3 ENVIRONMENT AND CLIMATIC CHARACTERISTICS

- **Temperature of operation:** between -20°C and $+55^{\circ}\text{C}$
- **Relative humidity:** 95% @ 40°C (without condensation)
- **Temperature of stocking:** from -40°C to $+80^{\circ}\text{C}$

CHAPTER III

PRESENTATION OF THE UNIT

3.1 GENERAL DESCRIPTION

3.1.1 PRESENTATION OF THE FRONT PANEL

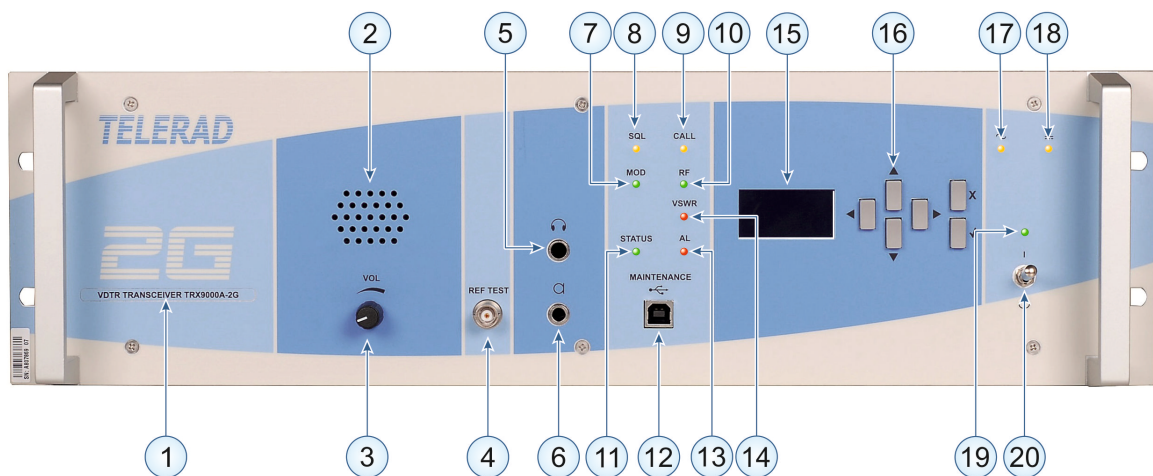

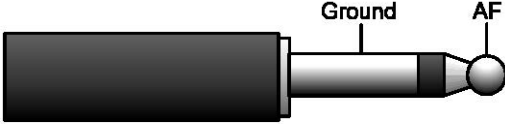

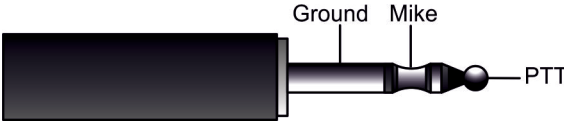






Figure 1 : Front panel of the TRX90x0-2G transceivers

N°	Element of the front panel	Description
①	Identifier label	Label allowing to identify the equipment. There are 6 different labels :
		■ VHF transceiver with AC and DC inputs,
		■ VHF transceiver with DC input only,
		■ UHF transceiver with AC and DC inputs,
		■ UHF transceiver with DC input only,
		■ V/UHF transceiver with AC and DC inputs,
		■ V/UHF transceiver with DC input only,
②	Loudspeaker Output	Allows the received AF listening (<i>configurable through the IHM or the commands Terminal</i>)
③	VOLUME adjustment	Potentiometer allowing to adjust the listening level for the audio signal sent to the Loudspeaker or the Headphone output.

N°	Element of the front panel	Description
④	TEST BNC connector	Test output of the Synthesizer module. Provides a sample of the Local Oscillator in reception or the carrier in transmission. By connecting an external frequency meter, it is possible to measure frequency and accuracy. (Output level : $-7dBm \pm 3dB/50\Omega$)
⑤	HEADPHONE Jack connector 	Jack connector for headphone plug type ELNO JK34 (TLD P/N: 150 00163), PL55-300 (TLD P/N: 150 00146) or RR60900 (TOTEM), 6.35 mm diameter . Allows the demodulated AF signal to be locally listened (configurable through the IHM or the commands Terminal). Headset impedance : 600Ω .
		
⑥	MICROPHONE Jack Connector 	Jack connector for microphone plug type ELNO JK33 (TLD P/N: 150 00164, PL 68-301 plug (TLD P/N: 150 00145), 5.25 mm diameter . Allows the transceiver to be used from the front panel, but only in A3E, F3E and G3E analog modes. Three kinds of microphones can be used: <ul style="list-style-type: none"> ■ Dynamic microphone low level, ■ Static microphone high level, carbon compatible, ■ Electret microphone supplied low level. Selection made through a software command.
		
⑦	MODULATION PRESENCE (MOD) light indicator	Indicates that the transceiver detects a modulated Carrier on its Antenna output. The detection condition depends on the Operating mode: <ul style="list-style-type: none"> ■ A3E mode : Modulation > 70% of the configured ratio. ■ Other modes : Always off.
⑧	SQUELCH (SQL) indicator light	Indicates the Squelch status : <ul style="list-style-type: none"> ■ ON : The squelch is active, ■ OFF : The squelch is inhibited.
⑨	CALL (CALL) indicator light	Lit as soon as an RF signal with an SNR above the programmed value, or with a level above the Squelch threshold, is received on the transceiver's Antenna input.
⑩	CARRIER PRESENCE (RF) light indicator	Indicates that the transceiver detects a Carrier on its Antenna output (Detection level: $P_n - 3dB$ during operation, $P_n - 2dB$ during testing).
⑪	STATUS (STATUS) light indicator	Indicates the status of the transceiver. It is on as soon as the transceiver is ready to transmit. The conditions for the indicator light to turn off are: <ul style="list-style-type: none"> ■ « ON/OFF » Command set to « OFF », ■ « Hardware » transmission inhibition, including the conditions :

N°	Element of the front panel	Description
11	 STATUS (STATUS) light indicator (cont.)	<ul style="list-style-type: none"> ▶ Inhibition by the Power supply Module (Power supply level below a low voltage threshold), ▶ Inhibition by the external Inhibition Command (present on the Operating connector). ■ « Software » transmission inhibition, including the conditions : <ul style="list-style-type: none"> ▶ µP Alarm on Reset or Watchdog triggering, ▶ Low or High voltage detection (« see figure »p. 28)*, ▶ Inhibition by the Synthesizer module (PLL unlocking or weak RF Master Oscillator level), ▶ High temperature (of the VHF or UHF or V/UHF Amplifier module or the Power supply module). ■ Change of operational frequency, ■ Learning procedure not realized.
12	 MAINTENANCE USB connector	4-pins USB type-B female connector for connection to a PC emulating a terminal.
13	 ALARM (AL) light indicator	<p>This light indicator indicates an operating fault in the transceiver. It is on in one of the following conditions:</p> <ul style="list-style-type: none"> ■ « Hardware » transmission inhibition, including the conditions : <ul style="list-style-type: none"> ▶ Inhibition by the Power supply Module (Power supply level below a low voltage threshold), ■ « Software » transmission inhibition, including the conditions : <ul style="list-style-type: none"> ▶ µP Alarm on Reset or Watchdog triggering (equipment restart) ▶ Alarm on internal resources, ▶ Low or High voltage detection (« see figure »p. 28)*, ▶ Inhibition by the Synthesizer Module (PLL unlocking or weak RF Master Oscillator level), ▶ High temperature (of the VHF or UHF or V/UHF Amplifier module or the Power supply module). ▶ Fault due to an external cavity. ■ Loss of forward transmitted power without VSWR detection (< -2dB of Pn during testing, < -3dB of Pn during operation), ■ Loss of modulation (< 75% during testing, < 30% during operation), ■ Operation on infinite VSWR, ■ Default detected by the Built-In test.
14	 SWR (VSWR) presence light indicator	Indicates the instantaneous detection by the transceiver in transmission of an SWR level ≥ 2 .
15	IHM Display screen	<p>Displaying element of the local HMI that allows:</p> <ul style="list-style-type: none"> ■ The transceiver's setting parameters to be viewed, ■ Displaying measurements

N°	Element of the front panel	Description
16	Keyboard	Data entering element of the local HMI that allows: <ul style="list-style-type: none"> ■ The transceiver's configuration parameters to be programmed, ■ Selecting the available functions, ■ Launching the Built-In test.
17	 MAINS light indicator	Indicates the Mains power supply source is connected to the transceiver.
18	 BATTERY light indicator	Indicates the Battery power supply source is connected to the transceiver.
19	 +V= light indicator	Indicates that the transceiver is powered on (+V _{DC} present on the PCBs and modules).
20	 ON / OFF Switch	Locking switch allowing the transceiver to be powered on or off.

3.1.1.1 MANAGEMENT OF THE « ALARM » LED VS THE POWER SUPPLY VOLTAGE

The transceiver can go on transmission only if the power supply voltage is between two values, a minimum and a maximum. The following flowchart displays how the alarm led is managed depending on the supply voltage changes, as well as the going-on-transmission enabling or disabling:

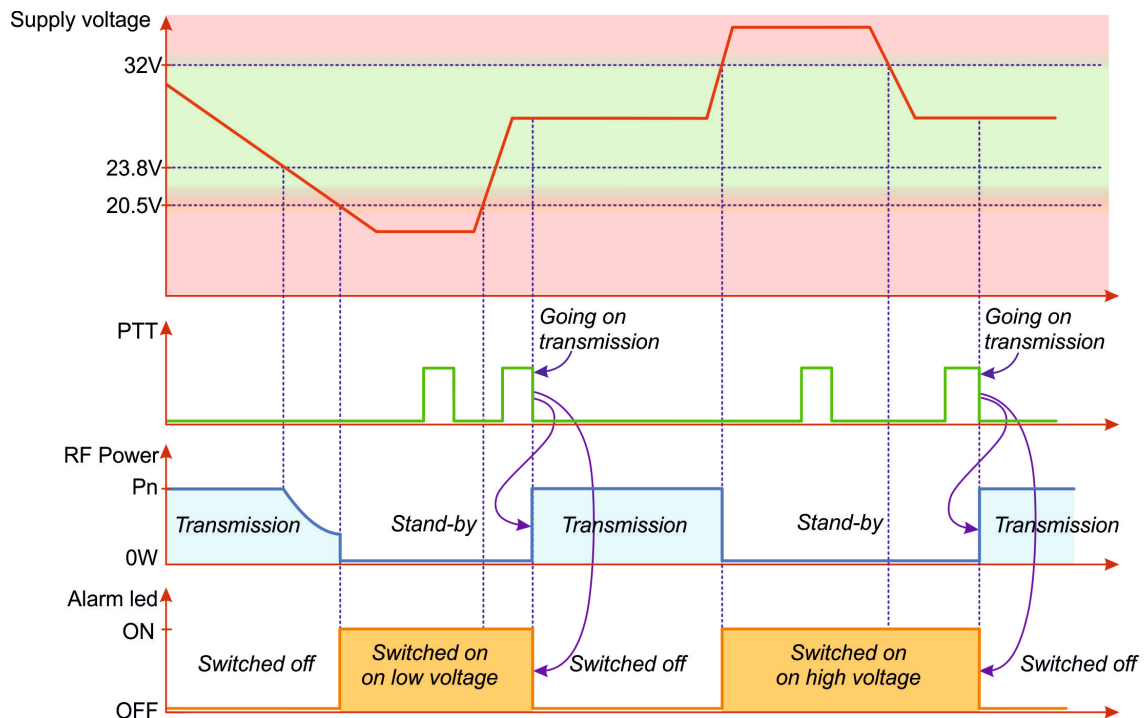


Figure 2 : Management of the Alarm light indicator

3.1.2 PRESENTATION OF THE TRX9000/9010A-2G REAR PANEL

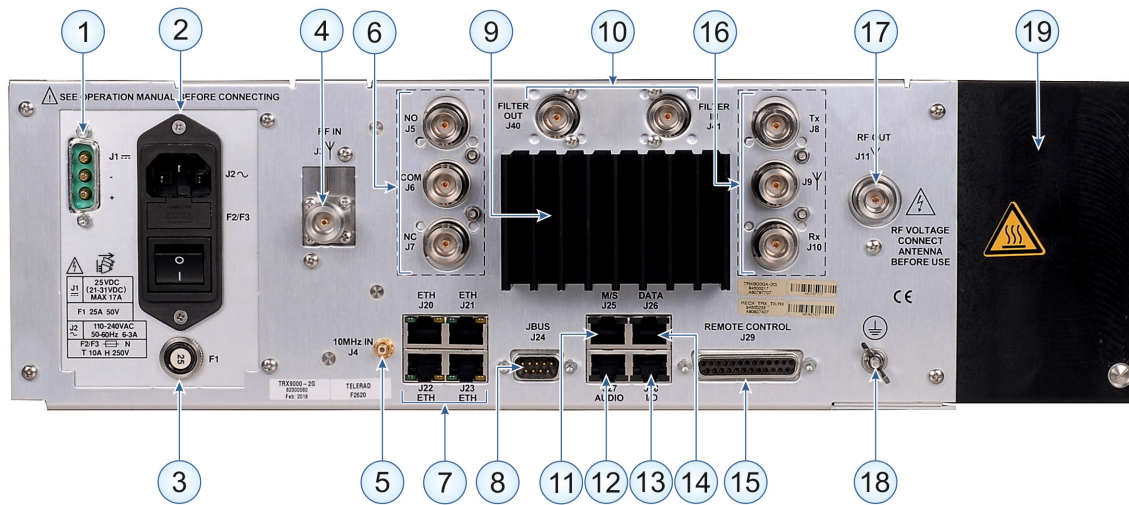







Figure 3 : Rear panel of the TRX9000A-2G and TRX9010A-2G transceivers

N°	Element of the rear panel	Description
①	J1 Connector : BATTERY power supply input 	+V _{DC} battery input connector, present on all radio devices versions. Receives the +V _{DC} power supply from a battery or external power station, required for the transceiver to operate. In the event of failure of the Mains input, the transceiver automatically switches over to this input.
②	J2 Connector : MAINS power supply input 	110V _{AC} /240V _{AC} mains power supply input, only present on the A versions of the transceivers. It includes : <ul style="list-style-type: none"> ■ A CEI950 Phase/Neutral/Earth 3-pin plug, ■ A mains EMC filter, ■ An ON  / OFF  switch, ■ Two 10A/250V slow-blow fuses, on phase and neutral, (Reference 0215010.MXP 5x20mm 10A).
③	F1 Circuit-breaker: Battery input protection	Battery input 25A/50V _{DC} thermal protective circuit-breaker, connected to the « + battery » terminal (Reference W58-XC4C12A-25)
④	J3 RF IN connector: Reception Antenna input	N female connector allowing connection of the transceiver to a reception antenna.
⑤	J4 Connector: 10MHz INPUT	SMA type connector that receives an external 10MHz reference signal, which can be used by the SVHF25077 or SUHF25078 Synthesizer modules to generate the RF Master Oscillator.
⑥	J5 NO, J6 COM, J7 NC connectors: Main/Standby coaxial relay	N female connectors allowing connection of two transceivers to a single Transmission / Reception Main / Standby antenna: <ul style="list-style-type: none"> ■ Main transceiver's Antenna relay output J9 externally connected to J7 (Normal Close),

N°	Element of the rear panel	Description
⑥	J5 NO, J6 COM, J7 NC connectors: Main/Standby coaxial relay (Cont.)	<ul style="list-style-type: none"> ■ Standby transceiver's Antenna relay output J9 externally connected to J5 (Normal Open), ■ Transmission / Reception Main / Standby antenna connected to J6 (COMmon). <p>Power supply and Command signal of the relay are supplied by the transceiver it is installed into.</p>
⑦	J20 to J23 : equipped with 2 indicator lights,  Link and  Data for ETHERNET 1 to 4 serial links	<p>1 Gbits/s 8-contacts female RJ45 connectors representing the Ethernet interfaces with a data network. They are used within the context of voice over IP transfer using the VoIP protocol, or monitoring data transfer using SNMP protocol.</p> <p>They are used also with a TELNET protocol to access the commands pages of a terminal and HTTP to access the Web pages. The associated indicator lights view activity on each port.</p>
⑧	J24 Connector: JBUS link	9-contact female SUBD connector allowing the transceiver to be connected as a Slave to an RCMS using the JBUS protocol.
⑨	Radiator	Cooling radiator.
⑩	J40 and J41 connectors : Internal tunable motorized cavity filter	Female N connectors allowing to connect a motorized cavity filter to a Tx or Tx/Rx antenna according to the antenna coaxial relay presence (<i>see below</i>). The Tx Antenna output J11 or the Antenna coaxial relay ANT. output J9 is connected to J41 , and the filter output J40 is connected to the antenna. The control of the motorized cavity filter is made by an internal link.
⑪	J25 M/S Main/Standby connector	8-contacts female RJ45 connector for connection between two transceivers operating in a Main/Standby mode via an Ethernet cross-cable.
⑫	J27 AUDIO connector	8-contacts female RJ45 connector for a simplified connection of the transceiver to an analog remote VCS (<i>Transmitted and received AF, Call and PTT</i>)
⑬	J28 I/O Input/Output connector	8-contacts female RJ45 connector for supplying commands and information.
⑭	J26 DATA connector	<p>8-contacts female RJ45 connector representing the data transfer interface with the upper layers of a communication system :</p> <ul style="list-style-type: none"> ■ Used in the data modes (ACARS, VDL2) to exchange transmitted and received data with the application level. ■ Used in the A3E mode to communicate with an external motorized cavity. <p>The electrical interface is RS485 type.</p>
⑮	J29 REMOTE CONTROL connector:	25-contact female SUB-D connector supplying as input, all the remote operating commands for the transceiver, and, as output, all the information required to control the operation of the transceiver.

N°	Element of the rear panel	Description
16	J8 Tx, J9 ANT., J10 Rx connectors: Antenna coaxial relay for Transmission / Reception configuration	N female connectors allowing connection of a transceiver to a Transmission/Reception antenna. The transmitter part antenna output is connected to J8 , the receiver part antenna input to J10 , and the transmission / reception antenna to J9 . The power supply and the command signal of the relay (<i>deduced from the PTT command</i>) are supplied by the transceiver.
17	J11 RF OUT Transmission antenna:	N female connector allowing connection of the transceiver to a transmission antenna (See REMARK 1).
18	Protective earth terminal 	4mm diameter wing screw, allowing protective earthing of the equipment chassis. The minimum cross-section of the wire used must be 2.5mm². This connection must be made before any other connection, and must be disconnected last. It is also recommended to check the earth continuity regularly.
19	Radiator	Radiator associated with the VHF, UHF or V/UHF Amplifier module, allowing it to be cooled by natural ventilation (see REMARK 2).



REMARK 1 : Always connect the antenna connector to the transmission antenna before the equipment is used : Presence of RF voltages that can cause serious burns.



REMARK 2 : The radiator may be hot and cause burns.

3.1.3 PRESENTATION OF THE TRX9000/9010C-2G REAR PANEL

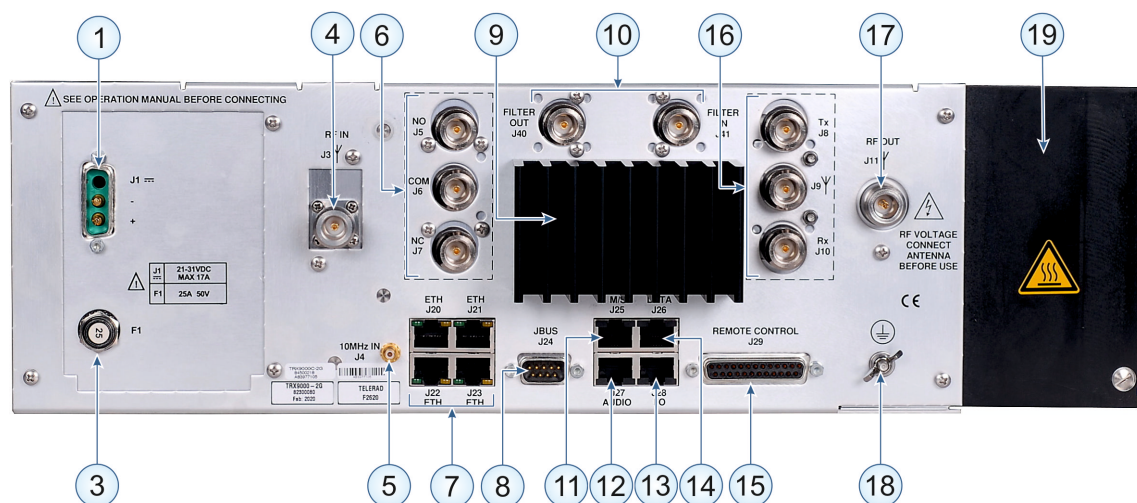



Figure 4 : Rear panel of the TRX9000C-2G and TRX9010C-2G transceivers

N°	Element of the rear panel	Description
①	J1 Connector : BATTERY power supply input 	+V _{DC} battery input connector, present on all radio devices versions. Receives the +V _{DC} power supply from a battery or external power station, required for the transceiver to operate.
②	/	Not used
③	F1 Circuit-breaker: Battery input protection	Battery input 25A/50V _{DC} thermal protective circuit-breaker, connected to the « + battery » terminal (<i>Reference W58-XC4C12A-25</i>)
④ to ⑱	/	See previous paragraph.

3.1.4 PRESENTATION OF THE REAR PANEL OF THE TRX9020-2G

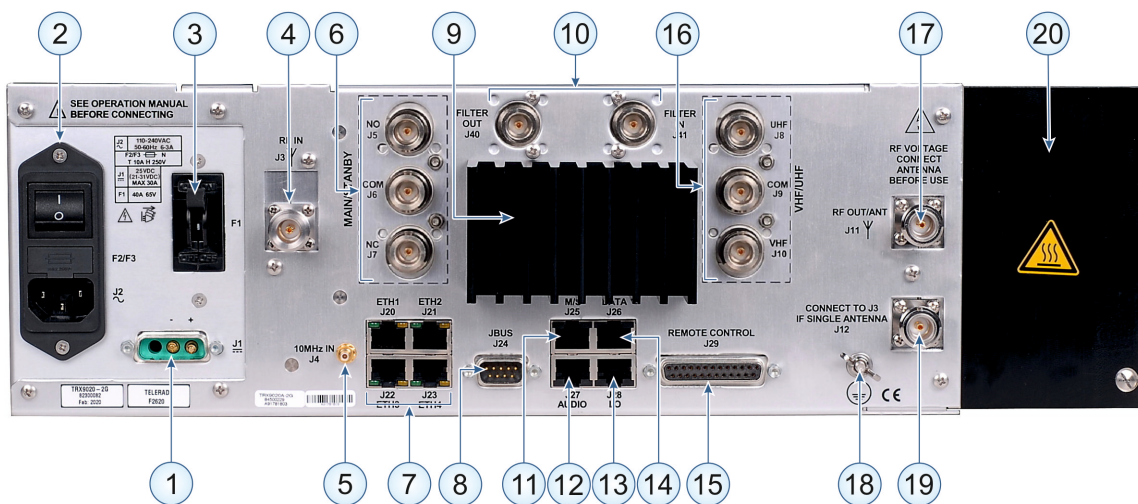









Figure 5 : Rear panel of the TRX9020A-2G transceiver

N°	Element of the rear panel	Description
①	J1 Connector : BATTERY power supply input 	+V _{DC} battery input connector, present on all radio devices versions. Receives the +V _{DC} power supply from a battery or external power station, required for the transceiver to operate. In the event of failure of the Mains input, the transceiver automatically switches over to this input.
②	J2 Connector : MAINS power supply input 	110V _{AC} /240V _{AC} mains power supply input, only present on the A versions of the transceivers. It includes : <ul style="list-style-type: none"> ■ A CEI950 Phase/Neutral/Earth 3-pin plug, ■ A mains EMC filter, ■ An ON  / OFF  switch, ■ Two 10A/250V slow-blow fuses, on phase and neutral, (<i>Reference 0215010.MXP 5x20mm 10A</i>).

N°	Element of the rear panel	Description
③	F1 Circuit-breaker : Battery input protection	Battery input 40A/65V _{DC} thermal protective circuit-breaker, connected to the « + battery » terminal (Reference W91-X152-40)
④	J3 RF IN connector: Reception Antenna input	N female connector allowing connection of the transceiver to a reception antenna. In the case of a VHF/UHF Transmission/Reception one antenna configuration , this input must be connected to J12 output connector (see item ⑱).
⑤	J4 Connector: 10MHz INPUT	SMA type connector that receives an external 10MHz reference signal, which can be used by the SVHF25077 or SUHF25078 Synthesizer modules to generate the RF Master Oscillator.
⑥	J5 NO, J6 COM, J7 NC connectors: Main/Standby coaxial relay	N female connectors allowing connection of two transceivers to a single Transmission / Reception Main / Standby antenna: <ul style="list-style-type: none"> ■ Main transceiver's Antenna relay output J9 externally connected to J7 (Normal Close), ■ Standby transceiver's Antenna relay output J9 externally connected to J5 (Normal Open), ■ Transmission / Reception Main / Standby antenna connected to J6 (COMmon). Power supply and Command signal of the relay are supplied by the transceiver it is installed into.
⑦	J20 to J23 : equipped with 2 indicator lights,  Link and  Data for ETHERNET 1 to 4 serial links	1 Gbits/s 8-contacts female RJ45 connectors representing the Ethernet interfaces with a data network. They are used within the context of voice over IP transfer using the VoIP protocol, or monitoring data transfer using SNMP protocol. They are used also with a TELNET protocol to access the commands pages of a terminal and HTTP to access the Web pages. The associated indicator lights view activity on each port.
⑧	J24 Connector: JBUS link	9-contact female SUBD connector allowing the transceiver to be connected as a Slave to an RCMS using the JBUS protocol.
⑨	Radiator	Cooling radiator.
⑩	J40 and J41 connectors : Internal tunable motorized cavity filter	Female N connectors allowing to connect a motorized cavity filter to a Tx or Tx/Rx antenna according to the J3/J12 cable presence. The Antenna output J11 is connected to the filter input J41 , and the filter output J40 is connected to the antenna. The control of the motorized cavity filter is made by an internal link.
⑪	J25 M/S Main/Standby connector	8-contacts female RJ45 connector for connection between two transceivers operating in a Main/Standby mode via an Ethernet cross-cable.
⑫	J27 AUDIO connector	8-contacts female RJ45 connector for a simplified connection of the transceiver to an analog remote VCS (Transmitted and received AF, Call and PTT)

N°	Element of the rear panel	Description
13	J28 I/O Input/Output connector	8-contacts female RJ45 connector for supplying commands and information.
14	J26 DATA connector	8-contacts female RJ45 connector representing the data transfer interface with the upper layers of a communication system : <ul style="list-style-type: none"> ■ Used in the data modes (ACARS, VDL2) to exchange transmitted and received data with the application level. ■ Used in the A3E mode to communicate with an external motorized cavity. The electrical interface is RS485 type.
15	J29 REMOTE CONTROL connector:	25-contact female SUB-D connector supplying as input, all the remote operating commands for the transceiver, and, as output, all the information required to control the operation of the transceiver.
16	J8 Tx, J9 ANT., J10 Rx connectors: Antenna coaxial relay for Transmission / Reception configuration	N female connectors allowing connection of a transceiver to a Transmission/Reception antenna. The transmitter part antenna output is connected to J8 , the receiver part antenna input to J10 , and the transmission / reception antenna to J9 . The power supply and the command signal of the relay (<i>deduced from the PTT command</i>) are supplied by the transceiver.
17	J11 RF OUT Transmission antenna:	N female connector allowing connection of the transceiver to a transmission antenna (2 antennas configuration) or a VHF/UHF Transmission/Reception wideband antenna (1 antenna configuration) (See REMARK 1).
18	Protective earth terminal 	4mm diameter wing screw, allowing protective earthing of the equipment chassis. The minimum cross-section of the wire used must be 2.5mm ² . This connection must be made before any other connection, and must be disconnected last. It is also recommended to check the earth continuity regularly.
19	J12 connector : Reception Antenna output (to J3)	Used only in a 1 antenna configuration , Female N connector allowing to connect the RF Reception output of the antenna coaxial relay integrated in the Amplifier module of the Transceiver to the RF Reception of the Receiver module of the Transceiver.
20	Radiator	Radiator associated with the VHF, UHF or V/UHF Amplifier module, allowing it to be cooled by natural ventilation (see REMARK 2).



REMARK 1 : Always connect the antenna connector to the transmission antenna before the equipment is used : Presence of RF voltages that can cause serious burns.



REMARK 2 : The radiator may be hot and cause burns.

3.1.5 PRESENTATION OF THE TRX9020C-2G REAR PANEL

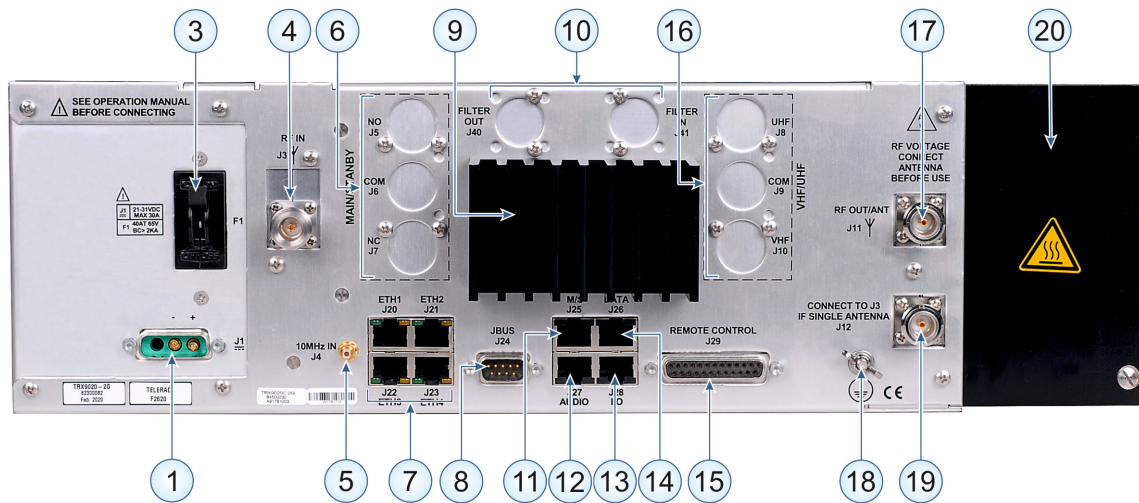



Figure 6 : Rear panel of the TRX9020C-2G transceiver

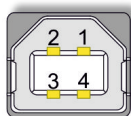
N°	Element of the rear panel	Description
①	J1 Connector : BATTERY power supply input 	+V _{DC} battery input connector, present on all radio devices versions. Receives the +V _{DC} power supply from a battery or external power station, required for the transceiver to operate.
②	/	Not used
③	F1 Circuit-breaker: Battery input protection	Battery input 40A/65V _{DC} thermal protective circuit-breaker, connected to the « + battery » terminal (<i>Reference W91-X152-40</i>).
④ to ⑳	/	See previous paragraph.

3.2 DESCRIPTION OF CONNECTORS

3.2.1 FRONT PANEL CONNECTORS

Only one connector is present on the front panel of the equipment.

3.2.1.1 MAINTENANCE CONNECTOR



4 contact USB Type-B female connector..... UPMB5-05M..... TLD P/N (134 00100)
4 contact USB Type-B male mobile plug..... Trade Standard..... /

Transmission characteristics : **USB 2.0 full-speed.**

The table here below displays the list of signals available on this connector:

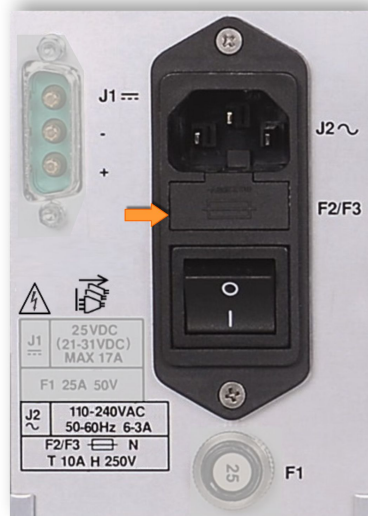
PIN	I/O	SIGNAL ID	CHARACTERISTICS	INT. NB.
1	I	VBUS	External +5V input	60-11
2	I/O	USB-DM	Data transmission/reception USB-. Complemented I/O.	41-8
3	I/O	USB-DP	Data transmission/reception USB+. Direct I/O.	41-8
4	/	GND	Electrical ground	/
/	/	SHIELD	Shielding. Connected to ground.	/
/	/	SHIELD	Shielding. Connected to ground.	/

Table 1 : B type USB MAINTENANCE connector pinout

3.2.2 REAR PANEL CONNECTORS

The following paragraphs describe connectors present on the rear panel of the equipment.

3.2.2.1 J2 MAINS POWER SUPPLY CONNECTOR FOR TRX9000-2G/TRX9010-2G



REMARK: This connector is only present on the TRX9000A-2G, TRX9010A-2G and TRX9020A-2G versions of the digital transceivers.

220V AC with switch and 2 fuse-holders
plug..... FN 282-10/06..... TLD P/N (37000442)
Mobile plug: Moulded CEE Mains cord
(Length 1.8m, fitted with IEC female angled
connector)..... AC-C13 EU CUI..... TLD P/N (275 00011)


PIN	I/O	SIGNAL	SIGNAL ID	CHARACTERISTICS	INT. NB.
1	E	Neutral	N	Corresponds to the mains feedback circuit	60-15
2	E	Earth		Earths the connected device	60-15
3	E	Phase	L	Corresponds to the mains phase providing alternative current	60-15

Table 2 : J1 MAINS connector pinout

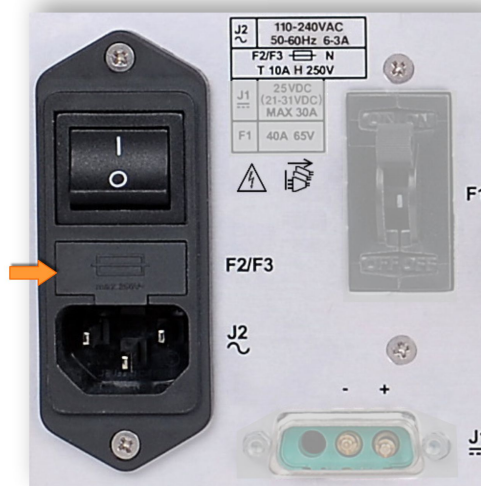


CAUTION: The « Phase » and « Neutral » inputs are protected by 10A/250V slow-blow fuses, TLD P/N: 0215010.MXP 5x20mm 10AT (Telrad P/N : 210 00159).



CAUTION RISK OF ELECTRIC CHOCK: Disconnect all power supply sources of the equipment before any manipulation of it.

3.2.2.2 J2 MAINS POWER SUPPLY CONNECTOR FOR TRX9020-2G



REMARK: This connector is only present on the TRX9000A-2G, TRX9010A-2G and TRX9020A-2G versions of the digital transceivers.


220V AC with switch and 2 fuse-holders

plug..... FN 282-10/06..... TLD P/N (37000442)

Mobile plug: Moulded CEE Mains cord

(Length 1.8m, fitted with IEC female angled

connector)..... AC-C13 EU CUI..... TLD P/N (275 00011)

PIN	I/O	SIGNAL	SIGNAL ID	CHARACTERISTICS	INT. NB.
1	E	Neutral	N	Corresponds to the mains feedback circuit	60-15
2	E	Earth		Earths the connected device	60-15

PIN	I/O	SIGNAL	SIGNAL ID	CHARACTERISTICS	INT. NB.
3	E	Phase	L	Corresponds to the mains phase providing alternative current	60-15

Table 3 : J1 MAINS connector pinout

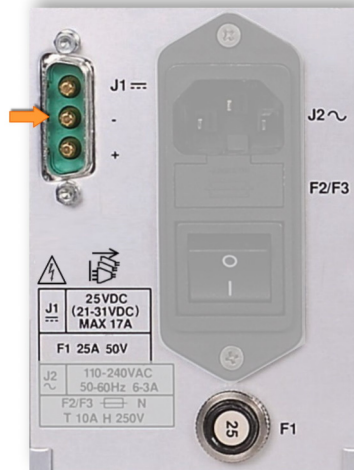


CAUTION: The « Phase » and « Neutral » inputs are protected by 10A/250V slow-blow fuses, TLD P/N: 0215010.MXP 5x20mm 10AT (Telerad P/N : 210 00159).



CAUTION RISK OF ELECTRIC CHOCK: Disconnect all power supply sources of the equipment before any manipulation of it.

3.2.2.3 J1 DC POWER SUPPLY CONNECTOR FOR TRX9000-2G/TRX9010-2G



- 3-contact male SUB-D15 connector part FM3W3P-2125 TLD P/N (150 01535)
- 3-contact female SUB-D15 mobile plug part. FM3W3S-K121 TLD P/N (150 01034)
- 40A Power pins 172704-0156 FCT TLD P/N (150 00833)
- Plastic protective cover FKC2GE TLD P/N (150 01283)

PIN	I/O	SIGNAL	SIGNAL ID	CHARACTERISTICS	INT. NB.
A1	E	+V =	+V _{DC}	+24V _{DC} (VHF equipment) or +28V _{DC} (UHF equipment) input, current protected by 25A thermal circuit breaker and voltage protected by Tranzorb SM6T33A.	60-14
A2	E	Electrical ground	GND	Input – of the power supply linked to the electrical ground of the equipment.	60-14
A3	/	/	/	Not used	60-14

Table 4 : DC Power supply connector pinout

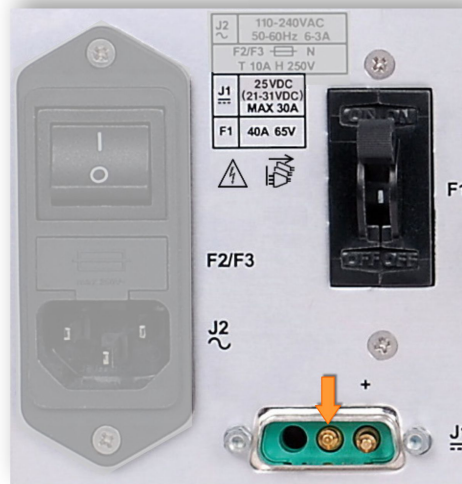


CAUTION: For TRX9000-2G and TRX9010-2G (A and C versions), the « +V= » +V_{DC} input is protected by a **thermal circuit-breaker 25A/50V (F1 reference on the rear panel)**, reference W58-XC4C12A-25 (TLD P/N: 180 00353).



CAUTION RISK OF ELECTRIC CHOCK: Disconnect all power supply sources of the equipment before any manipulation of it.

3.2.2.4 J1 DC POWER SUPPLY CONNECTOR FOR TRX9020-2G



- 3-contact male SUB-D15 connector part..... FM3W3P-2125..... Telerad P/N (150 01535)
- 3-contact female SUB-D15 mobile plug part. FM3W3S-K121..... Telerad P/N (150 01034)
- 40A Power pins..... 172704-0156 FCT..... Telerad P/N (150 00833)
- Plastic protective cover..... FKC2GE..... Telerad P/N (150 01283)

PIN	I/O	SIGNAL	SIGNAL ID	CHARACTERISTICS	INT. NB.
A1	E	+V =	+V _{DC}	+28V _{DC} input, current protected by 40A thermal circuit breaker and voltage protected by Tranzorb SM6T33A.	60-14
A2	E	Electrical ground	GND	Input – of the power supply linked to the electrical ground of the equipment.	60-14
A3	/	/	/	Not used	60-14

Table 5 : DC Power supply connector pinout



CAUTION: For TRX9020-2G (A and C versions), the « +V= » +V_{DC} input is protected by a **thermal circuit-breaker 40A/65V (F1 reference on the rear panel)**, reference W91-X152-40 (TLD P/N: 180 00357).



CAUTION RISK OF ELECTRIC CHOCK: Disconnect all power supply sources of the equipment before any manipulation of it.

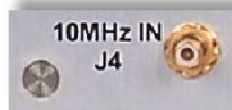
3.2.2.5 J3 RF IN RECEPTION ANTENNA CONNECTOR



N-Female coaxial connector.....	R161 410000W.....	TLD P/N (160 00118)
N-Male coaxial mobile plug.....	UG1185A/U.....	TLD P/N (160 00047)

Allows the transceiver to be connected to a reception antenna through a suitable 50Ω coaxial cable.

3.2.2.6 J4 10MHZ INPUT CONNECTOR



Male straight contact SMB connector.....	R114305.....	TLD P/N (160 00073)
Female straight contact SMB mobile plug.....	11-SMB-50-2-11.....	TLD P/N (160 00357)

Used to connect an external 10 MHz reference.

Level: **0 dBm ± 8 dB.**

3.2.2.7 J5, J6 AND J7 MAIN/STANDBY RELAY CONNECTORS



N female Coaxial connectors.....	R161 252.....	TLD P/N (160 00133)
N male Coaxial mobile plugs.....	UG1185A/U.....	TLD P/N (160 00047)

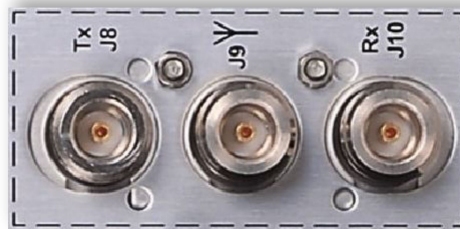


NOTE: When present, this relay is available as an **Option X: Main / Standby Coaxial Relay**. Telerad reference: RECX_TRX_N/S, TLD P/N: 84500234.

3 N-connectors Electromechanical relay:

- **J5 connector: NO** (Normal Open) position : Position not internally connected to connector **J6** when the relay is in standby state,
- **J6 connector: COM** (Common) position : Middle point of the relay, internally connected to connector **J7** when the relay is in standby state,
- **J7 connector: NC** (Normal Close) position : Position internally connected to connector **J6** when the relay is in standby state.

3.2.2.8 J8, J9 AND J10 COAXIAL RELAY CONNECTORS



N female Coaxial connectors.....	R161 252.....	TLD P/N (160 00133)
N male Coaxial mobile plugs.....	UG1185A/U.....	TLD P/N (160 00047)

3 N-connectors Electromechanical relay:

- **J8 connector: Tx** position : Position not internally connected to connector **J9** when the relay is in standby state. Can be externally connected, through a coaxial cable, to the RF OUT Transmission antenna connector of the transceiver.
- **J9 connector: ANT.** position : Middle point of the relay, internally connected to connector **J10** when the relay is in standby state. Connected either to a Tx/Rx antenna, or to the M/S relay when this relay is present.
- **J10 connector: Rx** position : Position internally connected to connector **J9** when the relay is in standby state. Can be externally connected, through a coaxial cable, to the RF IN Reception antenna connector of the transceiver.



NOTE: When present, this relay is available as an **Option X: Antenna Coaxial Relay**: RECX_TRX_TX/RX, TLD P/N: 84500235.

3.2.2.9 J11 RF OUT TRANSMISSION ANTENNA CONNECTOR



N-Female coaxial connector.....	R161 252.....	TLD P/N (160 00133)
N-Male coaxial mobile plug.....	UG1185A/U.....	TLD P/N (160 00047)

Allows the transceiver to be connected to a transmission antenna through a suitable 50Ω coaxial cable.



DANGER: Presence of hazardous RF voltages. Do not touch this connector during the transmission phases.



CAUTION: Presence of hazardous RF voltages associated with burn risks need the antenna cable to be connected before any use of the device.

3.2.2.10 J12 RF ANTENNA CONNECTOR



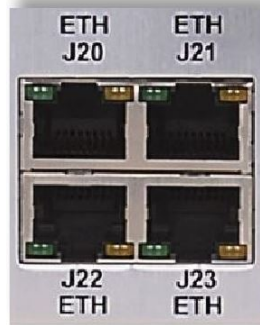
N-Female coaxial connector.....	R161 252.....	TLD P/N (160 00133)
N-Male coaxial mobile plug.....	UG1185A/U.....	TLD P/N (160 00047)

In the context of a **two Tx/Rx VHF and UHF separated antennas configuration**, allows to connect the Rx output of the Transmission/Reception coaxial relay designed in the V/UHF Amplifier module AMPL26279 of the transceiver to the Antenna input of its Reception module. It requires to use an external coaxial cable between both connectors **J3** and **J12**.



CAUTION : If the transceiver is used in this configuration, connect the antenna cable before any use of the device.

3.2.2.11 J20 TO J23 ETHERNET CONNECTORS



2 x 2 RJ45 female connectors..... RJSAE-5384-04..... TLD P/N (160 01532)

Ethernet link connector **with green** and **yellow** light indicators, for data transfer under a VoIP and/or SNMP protocol :

- The **green** light indicator displays **the link status** as well as **the communication rate**:
 - ▶ **Off**: No link,
 - ▶ **1 flashing**: rate at 10 Mbits/s,
 - ▶ **2 flashing**: rate at 100 Mbits/s,
 - ▶ **3 flashing**: rate at 1 Gbits/s.

- The **yellow** light indicator displays **the link activity**:
 - ▶ **Off**: No activity
 - ▶ **On**: Data Transmission/Reception

In the table here below : $i \in [1, 4]$:

PIN	I/O	SIGNAL	CHARACTERISTICS	INT. NB.
1	I/O	ETHi_MX2P	Full duplex Ethernet link n°2. Not inverted input.	41-3
2	I/O	ETHi_MX2N	Full duplex Ethernet link n°2. Inverted input.	41-3
3	I/O	ETHi_MX3P	Full duplex Ethernet link n°3. Not inverted input.	41-3
4	I/O	ETHi_MX1P	Full duplex Ethernet link n°1. Not inverted input.	41-3
5	I/O	ETHi_MX1N	Full duplex Ethernet link n°1. Inverted input.	41-3
6	I/O	ETHi_MX3N	Full duplex Ethernet link n°3 Inverted input.	41-3
7	I/O	ETHi_MX4P	Full duplex Ethernet link n°4. Not inverted input.	41-3
8	I/O	ETHi_MX4N	Full duplex Ethernet link n°4. Inverted input.	41-3
/	/	SHIELD	Shielding pin. Connected to ground.	/

Table 6 : ETHi ETHERNET connectors pinout

3.2.2.12 J24 JBUS CONNECTOR

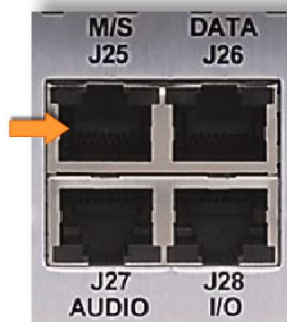


SUB-D 9-pins male connector..... DEM09P500M..... TLD P/N (150 01134)
 SUB-D 9-pins female mobile plug..... DEP09S..... TLD P/N (150 00025)
 Protective cover..... FMH1..... TLD P/N (150 01120)

PIN	I/O	SIGNAL	SIGNAL ID	CHARACTERISTICS	INT. NB.
1-2	/	Not used	/	/	/
3	I	Ground	GND	General ground for the equipment	/
4	O	Serial link TxD A n°2	AA1	JBUS link: Data Transmission +. RS485 not inverted output. Logical level: 0/+3.3V.	40-8
5	O	Serial link TxD B n°2	AA2	JBUS link: Data Transmission -. RS485 inverted output. Logical level: 0/+3.3V.	40-8
6-7	/	Not used	/	/	/
8	I	Serial link RxD A n°2	AB1	JBUS link: Data Reception +. RS485 not inverted input. Logical level: 0/+3.3V.	41-4
9	I	Serial link RxD B n°2	AB2	JBUS link: Data Reception -. RS485 inverted input. Logical level: 0/+3.3V.	41-4

Table 7 : Slave JBUS connector pinout

3.2.2.13 J25 MAIN/STANDBY M/S CONNECTOR



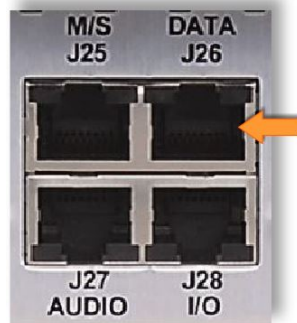
RJ45 Female connector 1 of 4 RJSAE-5380-04..... TLD P/N (160 01530)

Main/Standby connector **without green** and **yellow** indicator lights:

N°	I/O	SIGNAL	CHARACTERISTICS	N° INT.
1	O	TRxA_FCT	Equipment « A » Proper operation information. Open drain output, saturated to ground for « OK ».	2-9
2	/	GND	Electrical ground	/
3	I	TRxB_FCT	Equipment « B » Proper operation information. Standard input to ground for « OK ».	11-9
4	O	AUX1_OUT	Logical output n°1	2-3
5	O	AUX2_OUT	Logical output n°2	2-3
6	/	GND	Electrical ground	/
7	I	AUX1_IN	Logical input n°1	11-9
8	I	AUX2_IN	Logical input n°2	11-9
/	/	SHIELD	Shielding pin. Connected to ground.	/

Table 8 : M/S connector pinout

3.2.2.14 J26 DATA CONNECTOR



RJ45 Female connector 2 of 4 RJSAE-5380-04..... TLD P/N (160 01530)

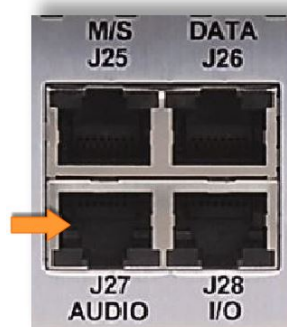
Data link connector **without green** and **yellow** indicator lights :

PIN	I/O	SIGNAL ID	CHARACTERISTICS	INT. NB.
1	I	M2	DATA (ACARS or VDL2) or EXTERNAL CAVITY (A3E, F3E or G3E) link : Data Reception -. RS485 inverted input.	41-4
2	E	M1	DATA (ACARS or VDL2) or EXTERNAL CAVITY (A3E, F3E or G3E) link : Data Reception +. RS485 not inverted input.	41-4
3	/	GND	General ground	/
4	O	L1	DATA (ACARS or VDL2) or EXTERNAL CAVITY (A3E, F3E or G3E) link : Data Transmission+. RS485 not inverted output.	40-8
5	O	L2	DATA (ACARS or VDL2) or EXTERNAL CAVITY (A3E, F3E or G3E) link : Data Transmission -. RS485 inverted output.	40-8
6	/	GND	General ground	/

PIN	I/O	SIGNAL ID	CHARACTERISTICS	INT. NB.
7	I	1PPS_A	1 Pulse Per Second synchronization signal. RS485 not inverted input.	41-4
8	I	1PPS_B	1 Pulse Per Second synchronization signal. RS485 inverted input.	41-4
/	/	SHIELD	Shielding pin. Connected to ground.	/

Table 9 : DATA connector pinout

3.2.2.15 J27 AUDIO CONNECTOR



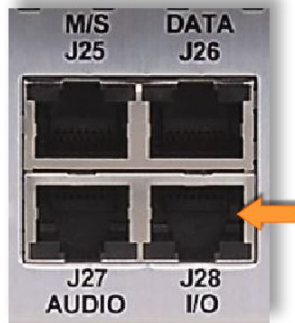
RJ45 Female connector 3 of 4 RJSAE-5380-04 TLD P/N (160 01530)

AF link connector **without green** and **yellow** indicator lights :

N°	I/O	SIGNAL	CHARACTERISTICS	N° INT.
1	O	CW1	AF+ Reception output on a 600Ω balanced transformer. Level: between -30 and +10 dBm/600Ω	20-5
2	O	CW2	AF- Reception output on a 600Ω balanced transformer. Level : idem pin 1.	20-5
3	I	ALT_DIST	Remote PTT control from the VCS. Contact to ground for « Transmission ».	11-4
4	O	APPEL_A	Call information. Side A of a Call dry contact. Connected to pin 5 when « Call present ».	10-3
5	O	APPEL_B	Call information. Side B of a Call dry contact. Connected to pin 4 when « Call present ».	10-3
6	/	GND	Electrical ground	/
7	I	DN	AF+ Transmission input on an 600Ω balanced transformer. Level: between -30 and 0 dBm/600Ω.	21-3
8	I	DO	AF- Transmission input on an 600Ω balanced transformer. Level: idem pin 7.	21-3
/	/	SHIELD	Shielding pin. Connected to ground.	/

Table 10 : AUDIO connector pinout

3.2.2.16 J28 INPUT/OUTPUT I/O CONNECTOR



RJ45 Female connector 4 of 4 RJSAE-5380-04..... TLD P/N (160 01530)

Inputs/Outputs link connector **without green** and **yellow** indicator lights:

N°	I/O	SIGNAL	CHARACTERISTICS	N° INT.
1	O	PWR17	+24V _{DC} (21 - 31V _{DC}) Power supply output protected by a 1,5A retriggerable fuse and a 33V Tranzorb. Maximum output current : 0,5A.	61-2
2	O	CDE_RELAIS3	PTT feedback information. Indicates the standby / transmission state of the equipment. Controls the Tx/Rx coaxial relay when it is present. Power open drain output, saturated to ground for « Transmission ».	5-3
3	I	GND	Electrical ground	/
4	O	CDE_REXT	External Main/Standby coaxial relay control. Allows to control an external relay when the equipment is used as a Standby one. Power open drain output, saturated to ground for « Active command ».	5-3
5	I	CDE_MTRX2	Remote ON / OFF control. Connected to ground for « ON ».	11-9
6	/	/	Not used	/
7	O	TRXA_FCT	« A » equipment Proper operation information. Open drain output, saturated to ground for « OK ».	2-3
8	O	CDE_VENT3	External fan control. Allows to enable an external fan circuitry. Power open drain output, saturated to ground for « Fan control active ».	5-4
/	/	SHIELD	Shielding pin. Connected to ground.	/

Table 11 : I/O connector pinout

3.2.2.17 J29 REMOTE CONTROL CONNECTOR



25-pins female SUB-D connector..... DBP-25S-500..... TLD P/N (150 00229)
 25-pins male SUB-D mobile plug..... DBP-25P..... TLD P/N (150 00149)
 Protective cover..... 8630-3639A..... TLD P/N (150 00153)

N°	I/O	SIGNAL	CHARACTERISTICS	N° INT.
1	O	CW1	AF+ Reception output on a 600Ω balanced transformer. Level: between -30 and +10 dBm/600Ω	20-5
2	O	S_CODEC	CODEC Interface output. Analog voltage managed by the CODEC (provision).	51-9
3	O	CW2	AF- Reception output on a 600Ω balanced transformer. Level : idem pin 1.	20-5
4	O	APPEL_A	Call information. Side A of a Call dry contact. Connected to pin 16 when « Call present ».	10-3
5	I	ALT_DIST	Remote PTT control from the VCS. Contact to ground for « Transmission ».	11-4
6	O	PP_HF	Carrier presence on the Antenna output information. Detection threshold: Pn – 3dB. Open drain output, saturated to ground for « Carrier present ».	2-3
7	I	DN	AF+ Transmission input on an 600Ω balanced transformer. Level: between -30 and 0 dBm/600Ω.	21-3
8	O	TRxA_ALARM	TRxA Transceiver Alarm information. Open drain output, saturated to ground for « Alarm ».	2-9
9	I	DO	AF- Transmission input on an 600Ω balanced transformer. Level: idem pin 7.	21-3
10	O	DM	Recorder output. 600Ω AF unbalanced output. Level: 0dBm @ 80% of modulation in transmission and 30% of modulation in reception.	50-4
11	O	INF_INH_EM	Transmission Inhibition information. Open collector output saturated to ground for « Tx Inhibition ».	2-9
12	/	GND	Electrical ground	/
13	I	CDE_MTR2	Transceiver ON/OFF control. Connected to ground for « ON ».	11-9
14	I	CDE_SIL2	Remote Squelch control. Contact to ground for « Squelch active ».	11-9
15	/	GND	Electrical ground	/

N°	I/O	SIGNAL	CHARACTERISTICS	N° INT.
16	O	APPEL_B	Call information. Side B of a Call dry contact. Connected to pin 4 when « Call present ».	10-3
17	O	CU1	Field voltage. Analog voltage proportional to the level of the field received on the Reception antenna input. Level : between 0 and 14V for a field between -120 and +10dBm. Reference points : 2V for -107dBm (1µV), 6V for -73dBm (50µV)	51-9
18	O	TRxA_FCT	Transceiver A Proper operation information. Open drain output, saturated to ground for « OK ».	2-3
19	/	/	Not used	/
20	O	INF_MTR	Transceiver ON/OFF information. Status of the Hard or Soft ON/OFF control. Open drain output, saturated to ground for « ON ».	2-3
21	I	INH_EXPL	Transmission Inhibition control. Sets the transceiver in standby for all modes. Connected to ground for « Inhibition ».	11-9
22	O	CDE_VENT2	External fan control. Allows to enable an external fan circuitry. Powered open drain output, saturated to ground for « Fan control active ».	5-4
23	O	ROS_MEM2	Memorized SWR information. Indicates an SWR ≥ 2 on the Transmission antenna output. Connected to ground for « SWR presence ».	2-3
24	O	CDE_RELAIS2	PTT feedback information and Relay control. Indicates the standby / transmission state of the transceiver. Controls the Tx/Rx coaxial relay when it is present. Powered open drain output, saturated to ground for « Transmission ».	5-3
25	O	PWR17	+24V _{DC} (21 - 31V _{DC}) Power supply output protected by a 1,5A retriggerable fuse and a 33V Tranzorb. Maximum output current : 0,5A.	60-12

Table 12 : Remote Control connector pinout

3.2.2.18 J40 AND J41 INPUT / OUTPUT INTERNAL CAVITY FILTER CONNECTORS



N-Female coaxial connector..... R161 252..... TLD P/N (160 00133)
N-Male coaxial mobile plug..... UG1185A/U..... TLD P/N (160 00047)

Two N-connectors Internal Cavity filter:


- **J40** connector: **FILTER OUT** output: Position connected to the antenna,
- **J41** connector: **FILTER IN** input:

- ▶ **For the TRX9000-2G or TRX9010-2G:** Position connected either to the ANT. output **J9** of the antenna coaxial relay (*cavity used in I/O*), or the RF OUT output **J11** of the transceiver (*cavity used in output only*),
- ▶ **For the TRX9020-2G:** Position connected to the RF OUT ANT. output **J11** of the transceiver. For a transmission/reception operation, connectors **J3** and **J12** must be linked.

3.2.2.19 GROUNDING TERMINAL

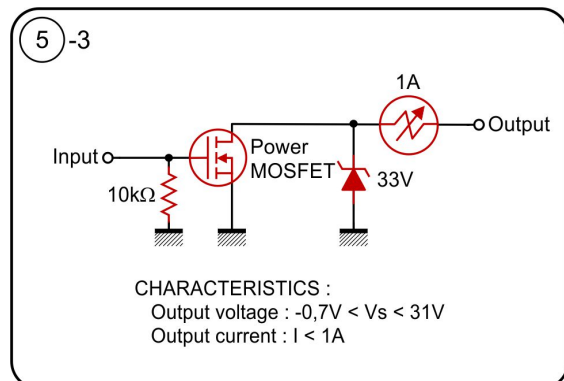
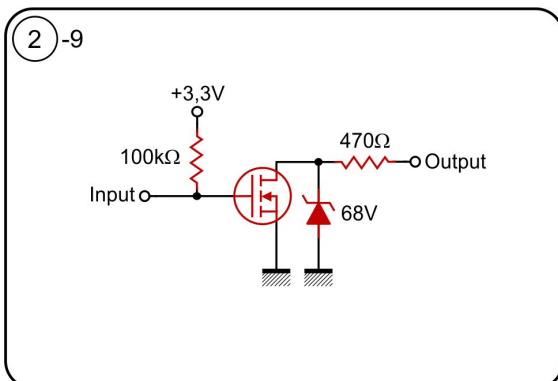
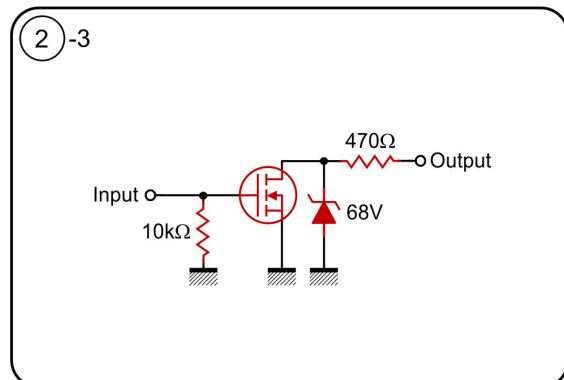
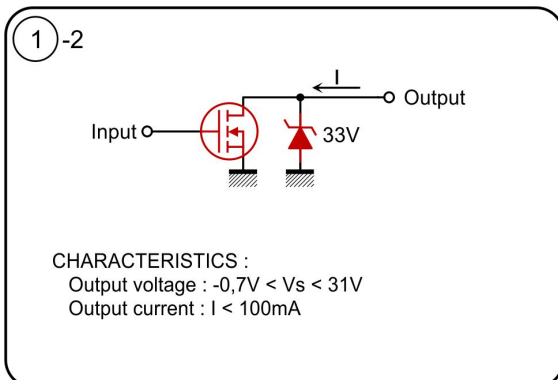


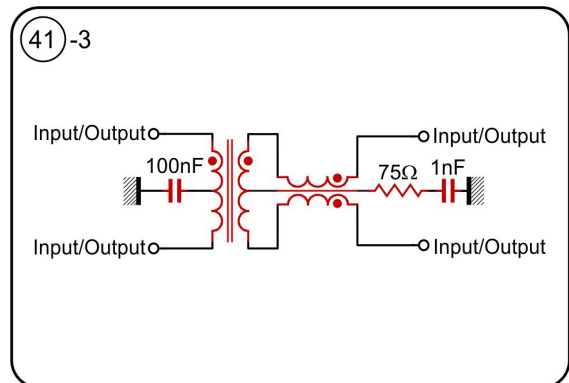
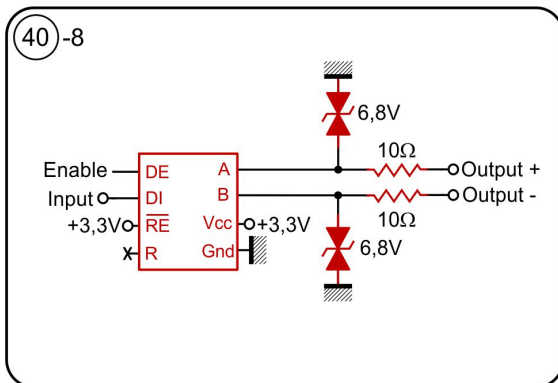
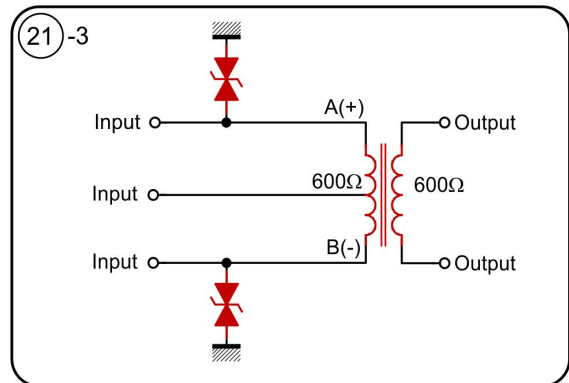
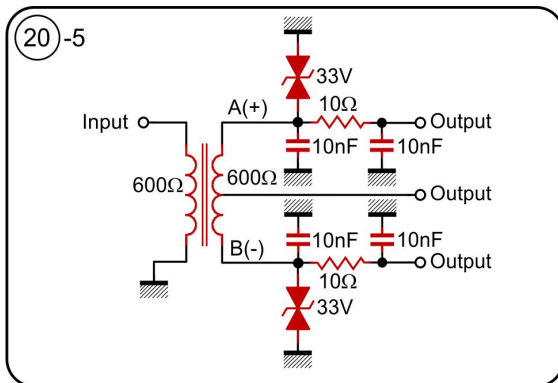
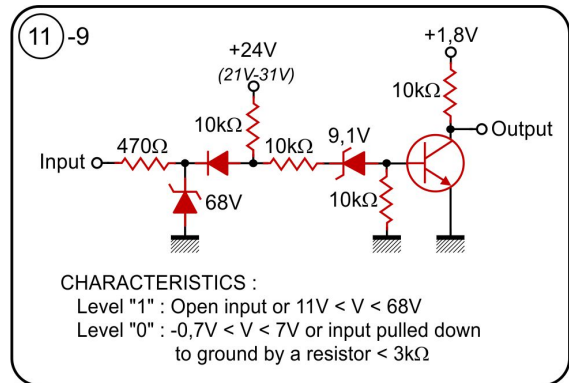
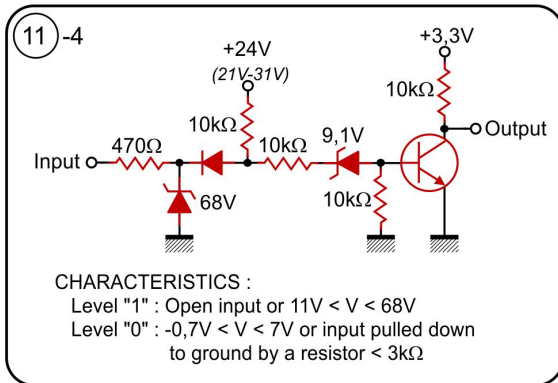
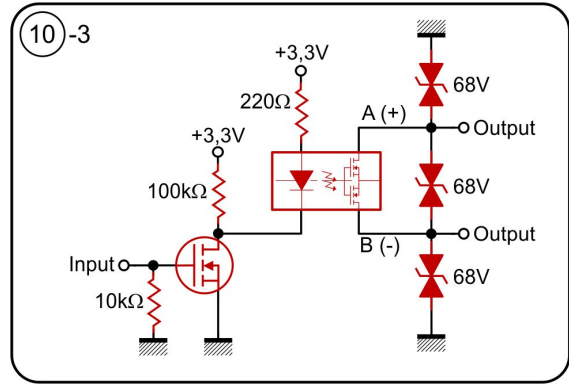
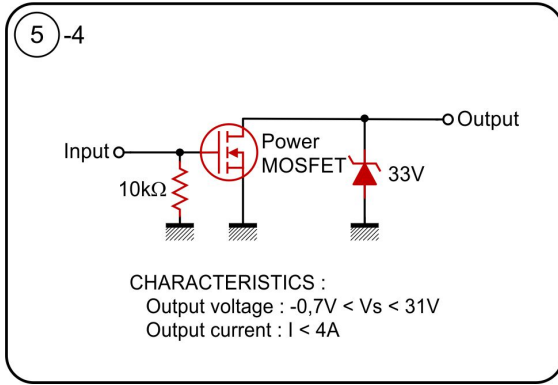
4mm diameter screw with butterfly nut for grounding by attachment to fork.

The terminal on the rear of the device, identified with the symbol  is the main protective earth terminal. The minimum cross-section of the wire used must be 2.5 mm².

This connection must be made before any other connection, and must be disconnected last. It is also recommended to check the earth continuity regularly.

3.2.3 ELECTRICAL INTERFACES USED





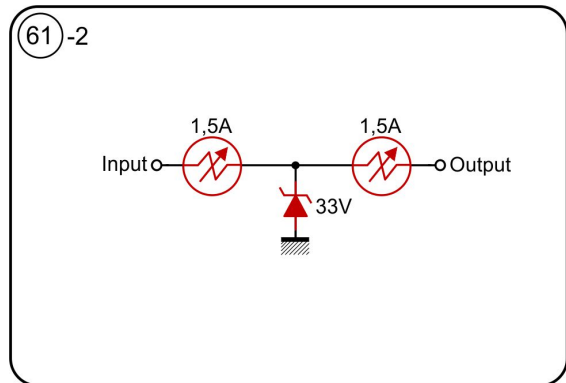
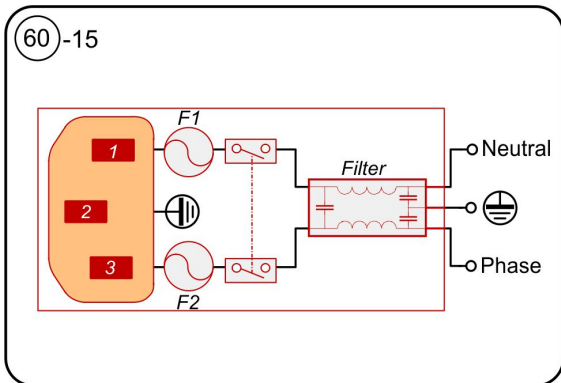
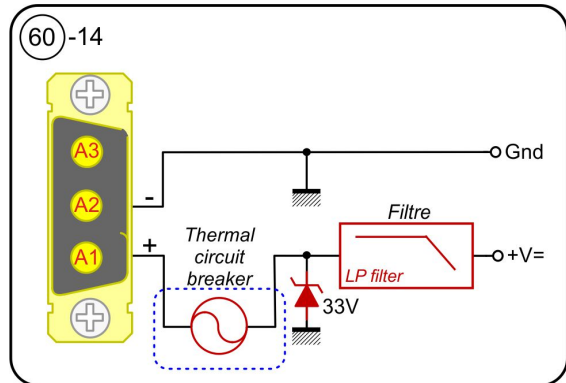
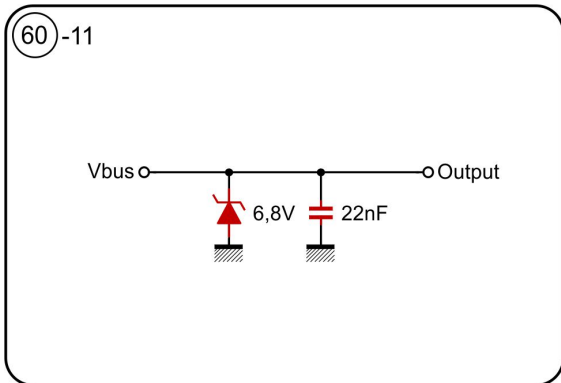
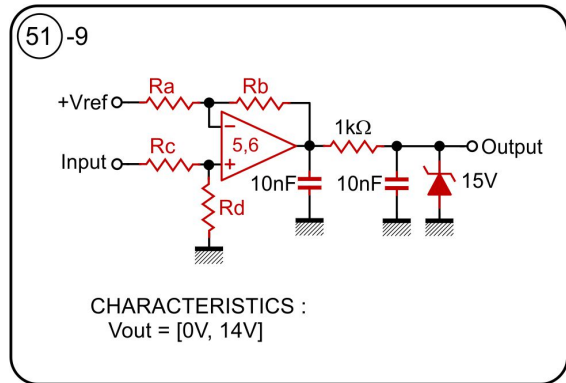
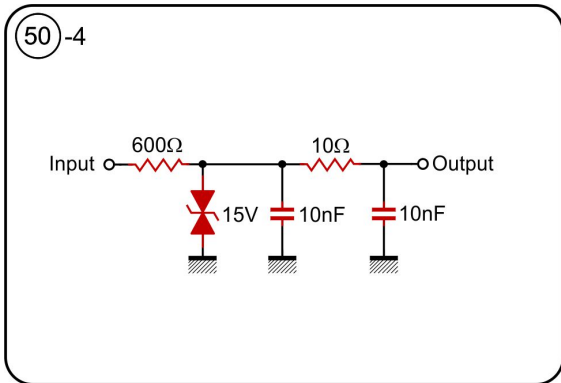
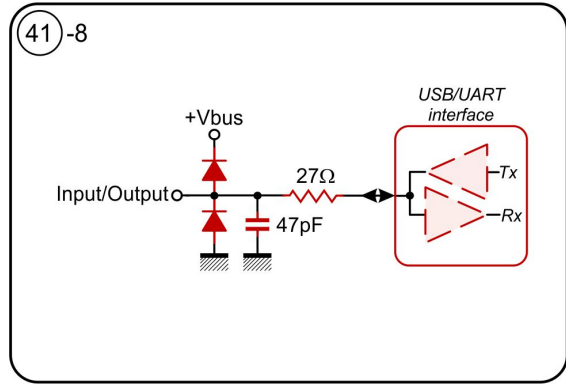
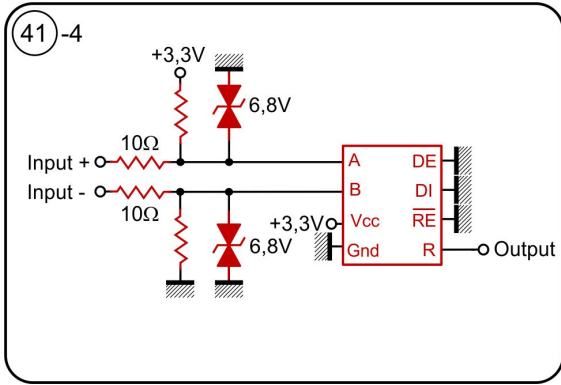


Table 13 : List of electrical interfaces

CHAPTER IV

INSTALLATION – CONFIGURATION – COMMISSIONING

4.1 INSTALLATION

The paragraphs here below indicate the operations to do to correctly install the VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers.

4.1.1 UNPACKING

The equipment is delivered in a packaging intended to protect it from chocks that occur during handling, and from various damaging external factors during storage.

It is installed in a rigid box (wood and cardboard) suited to these transport and storage conditions, and is fixed in place with soft material that cushions against shocks, or properly fixed inside the box.

Keep the packaging to reuse when sending the equipment back to TELERAD.


When unpacking, avoid touching the pins of the connectors on the front or rear of the equipment, particularly if not wearing an antistatic bracelet on one wrist, connected to an earth socket using the bracelet cord.

4.1.2 ELECTRICAL PROTECTION OF THE EQUIPMENT

Two main types of protections must be checked :

- Protections through earthing,
- Protections by circuit breakers.

4.1.2.1 PROTECTION THROUGH EARTHING

The terminal on the rear of the device, identified with the symbol  is the main protective earth terminal. The minimum cross-section of the wire used must be 2.5 mm².

This connection must be made before any other connection, and must be disconnected last. It is also recommended to check the earth continuity regularly.

When the equipment has a Mains power input, it is fitted with a three-pin plug with an earth. Earthing is a safety element. Do not nullify the protection by connecting the plug to a socket that does not have an earth connection.

4.1.2.2 PROTECTION THROUGH CIRCUIT-BREAKERS

In order to comply with the electrical safety rules, the power supply inputs of the VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers must be mandatory

protected by external circuit-breakers. The following table indicates the recommended range and type of circuit breaker:

- For the TRX9000-2G :

TYPE	NAME	P/N	RANGE	PROTECTION
Circuit breaker	R9PFC610	18000366	1 contact + Neutral 10A _{AC} / 230V _{AC} C curve	230V _{AC} mains input
Circuit breaker	5SY6120-7	18000356	1 contact 20A _{DC} / 72V _{DC} C curve	+V _{DC} battery input

Table 14 : Protection by circuit breakers

- For the TRX9010-2G :

TYPE	NAME	P/N	RANGE	PROTECTION
Circuit breaker	R9PFC610	18000366	1 contact + Neutral 10A _{AC} / 230V _{AC} C curve	230V _{AC} mains input
Circuit breaker	5SY6120-7	18000356	1 contact 20A _{DC} / 72V _{DC} C curve	+V _{DC} battery input

Table 15 : Protection by circuit breakers

- For the TRX9020-2G :

TYPE	NAME	P/N	RANGE	PROTECTION
Circuit breaker	R9PFC610	18000366	1 contact + Neutral 10A _{AC} / 230V _{AC} C curve	230V _{AC} mains input
Circuit breaker	5SY6130-7	18000369	1 contact 30A _{DC} / 72V _{DC} C curve	+V _{DC} battery input

Table 16 : Protection by circuit breakers

4.1.3 CONFIGURATION

There is a default factory hardware configuration for the equipment.

After installing the equipment in its location and turning it on, it is then possible to configure the transceiver using software. Software configuration of the transceiver applies to two categories of parameters:

- **System parameters**, corresponding to the general functions of the transceiver: IP, DATA, and JBUS links, Hardware/Software « ON/OFF » command priority, PTT safety, Audio compressor in reception, Authorization of listening the AF outputs.
- **Operating parameters**, fixing the equipment operating conditions: Mode, Frequency, Frequency offset, Output power, Modulation ratio, AF input and output line sensitivity, Squelches thresholds, CSMA parameters (*in VDL2 mode*).

The VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers can be configured using software, in four different ways:

- Through the **Telnet port**,



For more details about commands, refer to document [1] **ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.

- Through the **SNMP port**,



For more details about the MIB, refer to document [2] **ICDGB 9000-2G Series TRX90x0-2G SNMP**, TELERAD P/N 40600039: Interface Control Document relating to the SNMP protocol supervision link.

- Through the **JBUS port**,



For more details about the JBUS tables, refer to document [3] **ICDGB 9000-2G series TRX90x0-2G JBUS**, TELERAD P/N 40600038: Interface commands document relating to the JBUS protocol supervision link.

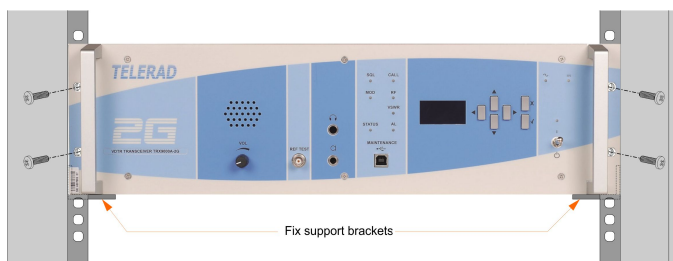
- Through the **local front panel HMI** interface,



For more details, see paragraph « [Local operation through the front panel Screen/Keyboard interface](#) » on page 104*.

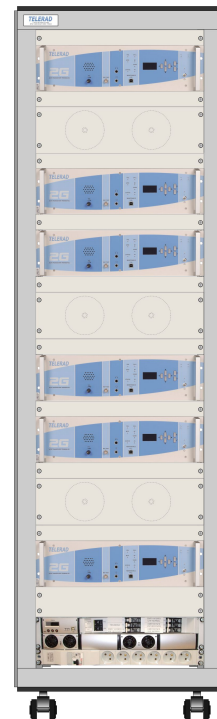
4.1.4 MECHANICAL INSTALLATION

The TRX9000-2G, TRX9010-2G and TRX9020-2G transceivers are generally installed in a 19" rack, on two fixed support brackets. Four screws allow the front panel of the transceiver to be fixed to the frame of the rack.



For frequencies used with a **cyclic ratio below or equals to 20%**, several transceivers can be installed in the rack the one below each other, without increasing drastically the temperature, and so reducing their output power.

For **superior cyclic ratios**, it is recommended to let a 1U space between each transceiver to allow a free air-cooling around the radiators. Figure opposite displays a possible architecture based on six frequencies with cavities in a 42U cabinet:



When the equipment is used outside a cabinet, it must be located on a flat, stable, resistant and vibration-free surface, at least 10cm or so from the wall or any other device, such a way to allow free circulation of air, with or without a ventilation system.

The equipment must be installed by qualified staff.

4.2 DESCRIPTION AND CONFIGURATION OF JUMPERS AND SWITCHES

The equipment configuration is entirely software made. There is **no jumper nor switch present** on the PCBs and modules constituting the transceiver, except the CTNU/CTTQ PCB that includes a 4-contacts switch **S1** as well as a pushbutton **S2** used in relation with a specific component of the PCB, both of them being TELERAD reserved.

4.3 USE OF THE COAXIAL RELAYS

4.3.1 GENERALITIES

The TRX9000-2G, TRX9010-2G and TRX9020-2G transceivers have two locations on their rear panel dedicated to coaxial relays installation :

- A first Antenna coaxial relay allowing to use :
 - ▶ For the TRX9000-2G and TRX9010-2G : A **Transmission/Reception antenna**,
 - ▶ For the TRX9020-2G : Two **separated VHF and UHF** antennas, as the Transmission/Reception relay has been directly **designed inside the AMPL26279 Amplifier module**.
- A second M/S coaxial relay to manage a **Main/Standby configuration**.

Control and power supply of those coaxial relays are realized by the transceiver itself, through two BERG connectors **J53** (Tx/Rx) and **J54** (M/S) located on the CTNU/CTTQ PCB, and whose pinout is as following :

N°	I/O	SIGNAL	SIGNAL ID	CHARACTERISTICS	N° INT.
1	S	Logical ground	GND	General ground of the equipment	
2	/	Identifier	/	/	/
3	S	Coaxial relay power supply	+V=	+V _{DC} power supply of the coaxial relay coil.	
4	S	On J53 : PTT feedback control	/	Control of the 1st Transmission / Reception or VHF/UHF coaxial relay. It corresponds to the « PTT feedback » signal, such as « 0 » = Transmission.	1-2
		On J54 : Main/Standby control	/	Control of the 2d Main / Standby coaxial relay. It corresponds to the « M/S control » signal, such as « 0 » = Standby.	1-2
5	E	Logical ground	GND	General ground of the equipment	/
6	/	/	/	Not used	/

Table 17 : Coaxial relays connectors pinout



The electrical interface 1-2 is shown in the electrical interfaces (See Paragraph « **Electrical interfaces used** » on page 50)*. About the Mounting/Demounting procedure of the coaxial relays, see the paragraph here below.



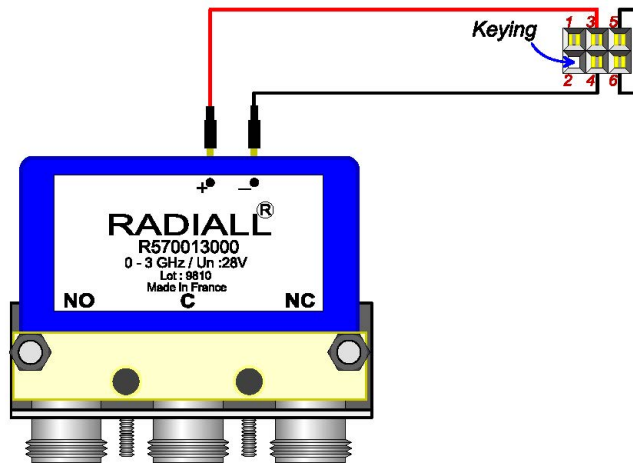
REMARK:

- The **Main/Standby relay** is available as an **X option** under the Telerad reference : **RECX_TRX_N/S**, TLD P/N: 84500234. It si associate with a specific RJ45 cross-cable reference **CY96425**, TLD P/N: 28002306.

- The **Transmission/Reception antenna relay** is also available as an **X option** under the Telerad reference : **RECXTRX_T/R_V/U**, TLD P/N: 84500235.

4.3.2 DISASSEMBLY / REASSEMBLY OPERATIONS

The Antenna or Main/Standby coaxial electromechanical relays recommended by TELERAD to be installed in the slots designed for that are as following :



4.3.2.1 LIST OF REQUIRED TOOLS

- A 5mm-diameter Phillips screwdriver.
- A 5.5mm-diameter elbow tubular wrench.

4.3.2.2 PROTECTIVE PLATE DISASSEMBLY PROCEDURE

The different steps for disassembling the protective plate are :

1. Gently disconnect the various connectors from the rear panel of the transceiver.
2. If the equipment is installed in a rack, remove it and place it on a clean flat surface.
3. Using the Phillips screwdriver, remove the top cover (16 screws).
4. Using the Phillips screwdriver and the 5.5mm elbow tubular wrench, unscrew the 4 CM 3x8 screws attaching the blocking kit (Telerad P/N: 55000293).
5. Remove the blocking plate, being careful to recover the 4 W3 grower washers.

4.3.2.3 COAXIAL RELAYS ASSEMBLY PROCEDURE

The Antenna or Main/Standby Coaxial relays assembly procedure is as following :

1. Offer up the two fastening lugs of the electromechanical relay support bracket into the holes provided for this purpose on the rear panel of the transceiver.
2. Place 1 W3 Grower washer then 1 HU3 nut on each of the 2 lugs.
3. Using a 5.5mm elbow tubular wrench, tighten the 2 nuts to hold the relay in place. Place the relay's power supply and command connector on the **J53** connector of the CTNU/CTTQ PCB for the antenna relay or on the **J54** connector of the same PCB (identified by a yellow line) for the M/S relay, taking the keying into account for each one (J53-2 or J54-2 pins).
4. Reassemble the transceiver top cover (16 screws).

5. About the antenna relay, install the CX99348 coaxial cord (*Telerad P/N: 28001229*) between the **J8** connector marked TX, corresponding to the **NO** side of the relay, and the **J11** antenna connector.
6. To take into account the presence of the antenna relay, connect a terminal on one of the ETH connectors on the rear side of the transceiver, enter the **Login admin <pwd>** control (*Administrator login, default value for <pwd> = ADMIN*), then the **RELAY ON** one (*indicates the presence of the electromechanical relay*).

4.3.2.4 COAXIAL RELAYS DISASSEMBLY PROCEDURE

The coaxial relays disassembly procedure is as following :

1. Gently disconnect the various connectors from the rear panel of the transceiver.
2. If the equipment is installed in a rack, remove it from the rack, and place it on a clean flat surface.
3. Using the Phillips screwdriver, remove the top cover (*16 screws*).
4. Using a 5 mm elbow tubular wrench, undo the 2 nuts attaching the Antenna relay.
5. Remove the relay.
6. Put the blocking plate in place.
7. Using the Phillips screwdriver and the 5.5mm elbow tubular wrench, tighten the 4 CM 3x8 screws attaching the blocking kit (*Telerad P/N: 55000293*), checking that the 4 W3 grower washers are present under the screw heads before tightening.
8. Reconnect the antenna cable directly to the transceiver **J11** antenna connector.
9. If required, do again the previous steps 4 to 7 for disassembling the M/S relay.

4.4 MINIMUM CONNECTION FOR COMMISSIONING

In the event of simplified use of the transceiver, it is possible to connect just a part of the signals present on all the rear panel connectors.

- **For the TRX9000-2G and the TRX9010-2G**, this minimum connection is as follows:
 - ▶ Connect the earth using the wing screw,
 - ▶ Connect the battery power supply to **J1** and/or the mains power supply to **J2** (*depending on the version*).
 - ▶ Connect a transmission antenna or a suitable 50Ω power load to the **J11** connector,
 - ▶ Connect a reception antenna to the **J3** connector.

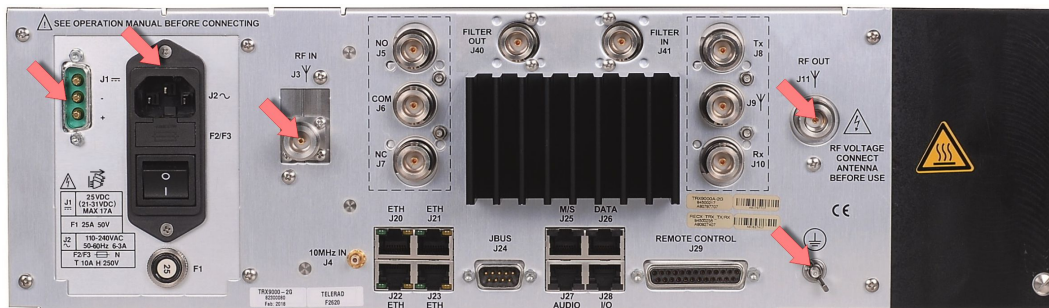


Figure 7 : Minimum connection

- **For the TRX9020-2G**, two possibilities are available for the minimum connection:
 - ▶ **In a two separated Transmission and Reception antennas configuration:**
 - Connect the earth using the wing screw,

- Connect the battery power supply to **J1** and/or the mains power supply to **J2** (depending on the version).
- Connect a transmission antenna or a suitable 50Ω power load to the **J11** connector,
- Connect a reception antenna to the **J3** connector.

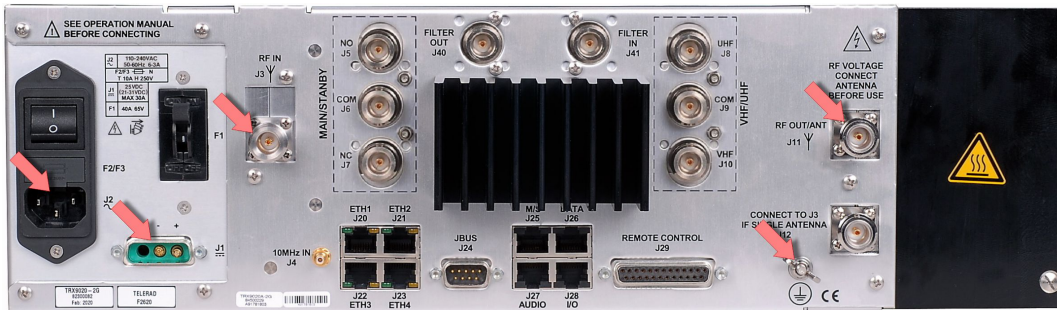


Figure 8 : Minimum connection for TRX9020-2G in a 2 antennas configuration

► **In a one Transmission/Reception antenna configuration:**

- Connect the earth using the wing screw,
- Connect the battery power supply to **J1** and/or the mains power supply to **J2** (depending on the version).
- Connect a transmission antenna or a suitable 50Ω power load to the **J11** connector,
- Using an external coaxial cable, connect the Reception antenna input **J3** connector to the Reception output of the Transmission/Reception integrated relay **J12** connector.

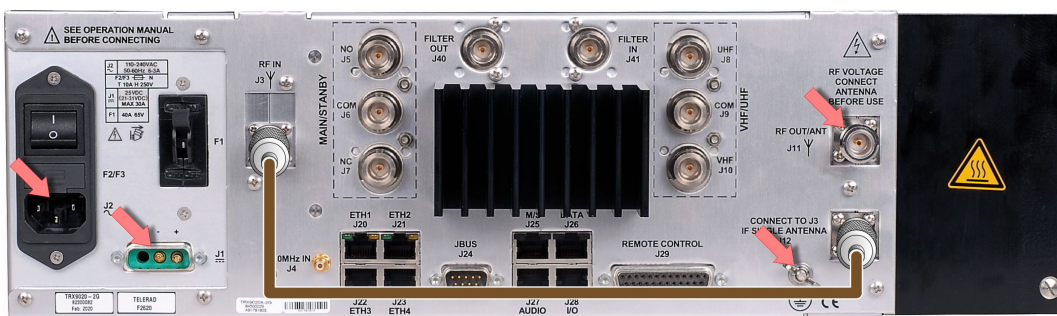


Figure 9 : Minimum connection for TRX9020-2G in a 1 antenna configuration

■ **In analog mode**, connect the remote operating unit either to the J27 connector (See Paragraph « **J27 AUDIO connector** » on page 46)*, or to the J29 connector (See Paragraph « **J29 Remote Control connector** » on page 48)*:

► **Minimum wiring on these connectors:**

- Reception AF on 2 wires (contacts **J27-1** and **J27-2** or **J29-1** and **J29-3**),
- Modulation AF on 2 wires (contacts **J27-7** and **J27-8** or **J29-7** and **J29-9**),
- Remote PTT command (contact **J27-3** or **J29-5**),
- Call information (contacts **J27-4** and **J27-5** or **J29-4** and **J29-16**),
- Electrical ground (contact **J27-6** or **J29-15**).

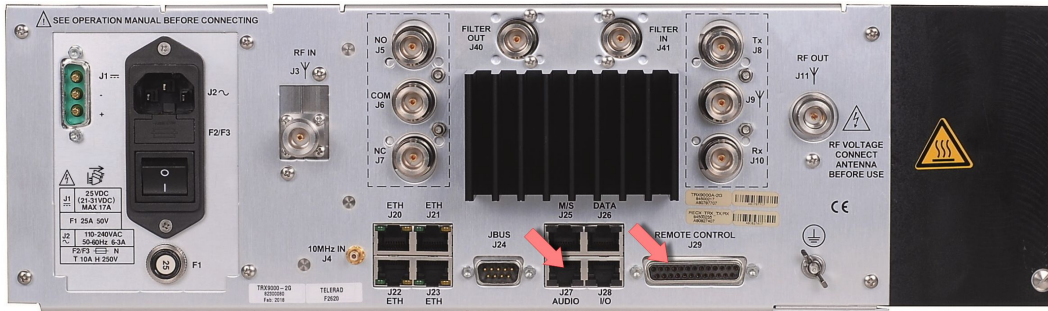


Figure 10 : Connection of the TRX9000-2G or the TRX9010-2G in Analog mode

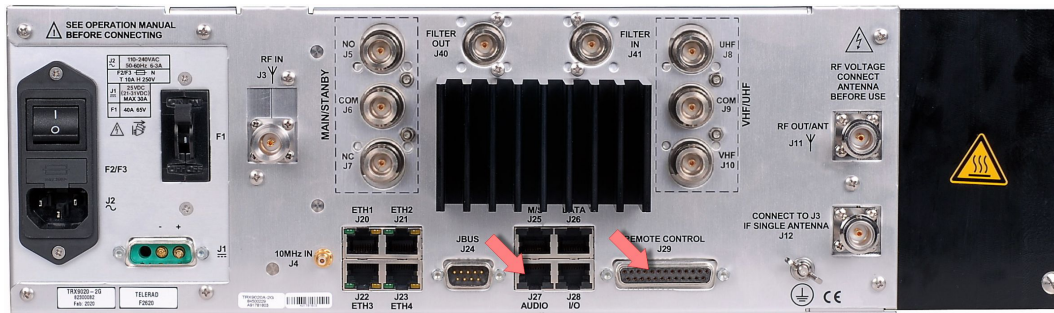


Figure 11 : Connection of the TRX9020-2G in Analog mode

- In VoIP mode, connect network to the ETH1 Ethernet connector J20 (See Paragraph « J20 to J23 ETHERNET connectors » on page 43)*.

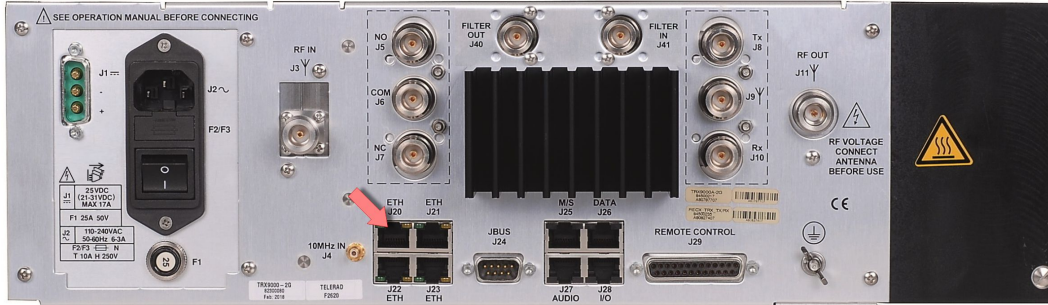


Figure 12 : Connection of the TRX9000-2G or the TRX9010-2G in VoIP mode

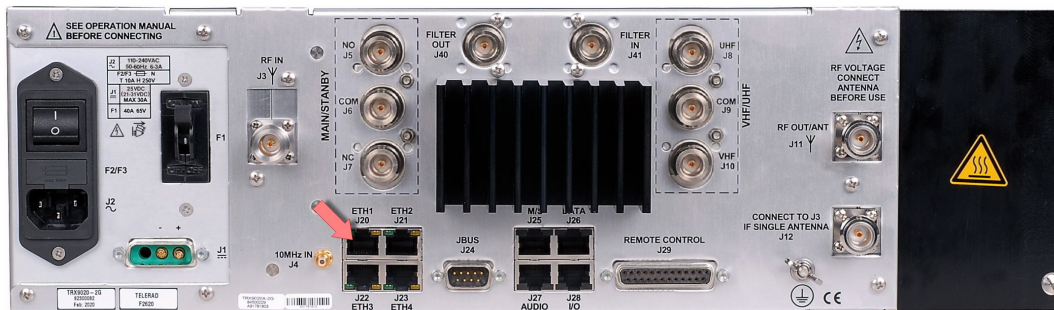


Figure 13 : Connection of the TRX9020-2G in VoIP mode

- In digital mode (Data), connect the operating unit to the J26 connector (See Paragraph « J26 DATA connector » on page 45)*.

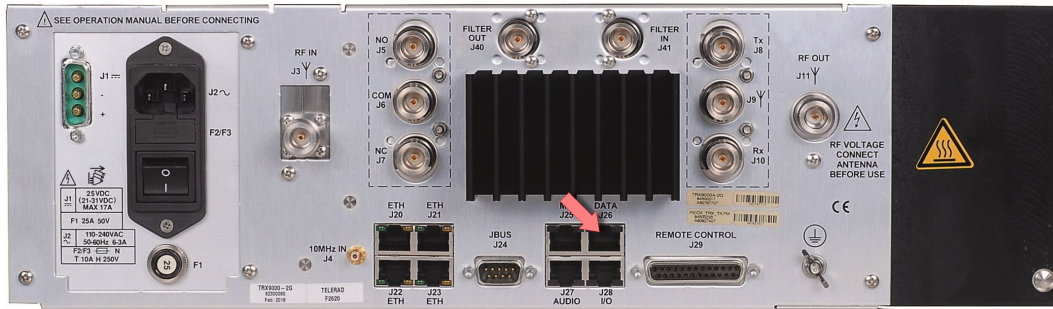


Figure 14 : Connection of the TRX9000-2G or the TRX9010-2G in Data mode

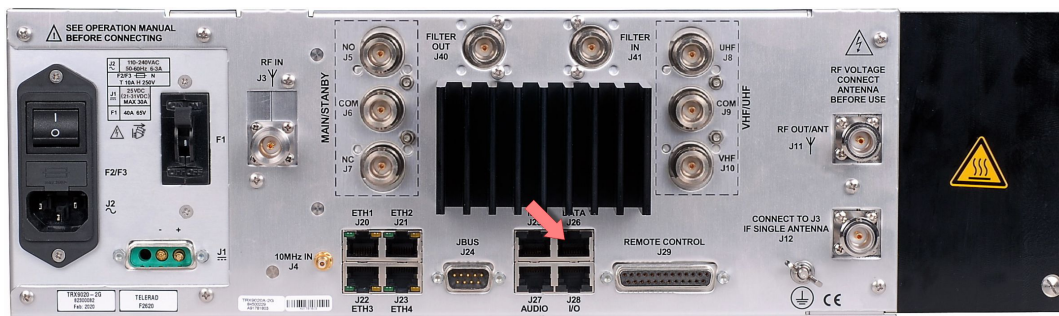


Figure 15 : Connection of the TRX9020-2G in Data mode

4.5 SYSTEM ARCHITECTURES

The VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers can be used with different aerial configurations:

- One antenna settings:
 - ▶ « One Transmission/Reception antenna » configuration of a **standalone transceiver**,
 - ▶ « One Transmission/Reception antenna » configuration of **two transceivers in Main/Standby** (associated with an internal or external M/S coaxial relay),
- Two antennas settings:
 - ▶ « Two separated Transmission and Reception antennas » configuration of a **standalone transceiver**,
 - ▶ « Two separated VHF and UHF Transmission/Reception antennas » of a **standalone TRX9020-2G**,
 - ▶ « Two Transmission/Reception antennas » configuration of **two transceivers in Main/Standby**,
- Three antennas settings:
 - ▶ « Three antennas configuration : 2 separated VHF and UHF in Transmission + 1 V/UHF in Reception » of a **standalone TRX9020-2G**,
- Four antennas settings:
 - ▶ « Four Transmission and Reception antennas » configuration of **two transceivers in Main/Standby**.



REMARK 1: All those configurations can be upgraded with an external fans control, if required.



REMARK 2: One antenna configurations can also be upgraded with a motorised internal or external cavity control (See Paragraph « [Command of a cavity filter](#) » on page 86)* when a cavity is installed between the equipment and the common antenna.

4.5.1 ONE ANTENNA CONFIGURATIONS

4.5.1.1 STANDALONE EQUIPMENT

- **TRX9000-2G or TRX9010-2G transceiver:** Equipped with a Tx/Rx antenna coaxial relay:

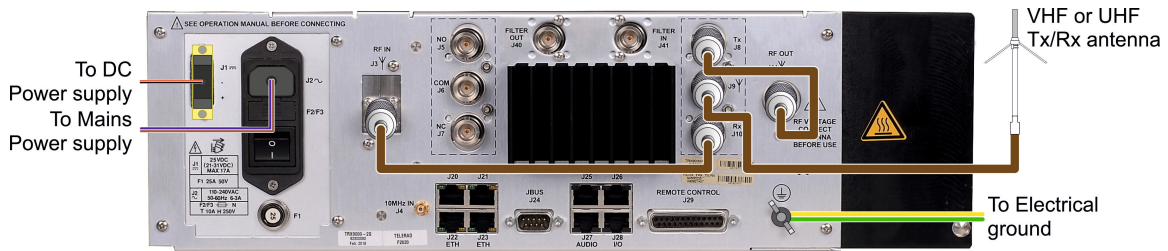


Figure 16 : One Tx/Rx VHF or UHF antenna architecture

- **TRX9020-2G transceiver:** The Tx/Rx antenna coaxial relay is integrated inside the AMPL26279 Amplifier module:

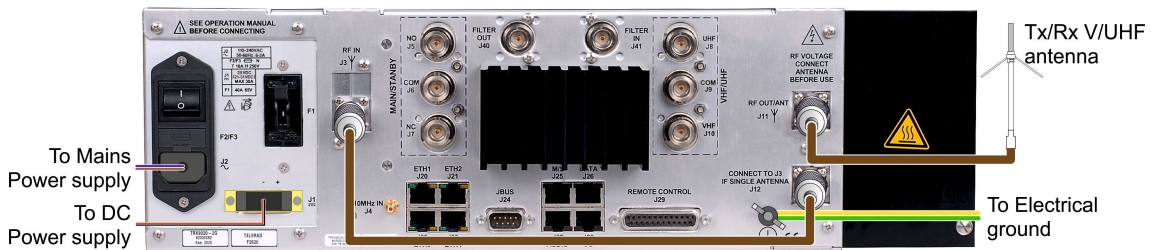


Figure 17 : One Tx/Rx V/UHF antenna architecture

4.5.1.2 STANDALONE EQUIPMENT WITH CAVITY

- **TRX9000-2G or TRX9010-2G transceiver with an external cavity filter:** Equipped with a Tx/Rx coaxial relay, and managing an external motorised cavity.



Figure 18 : One VHF or UHF antenna architecture with control of an external cavity

Whatever be the transceiver, VHF or UHF, the **J26** « DATA » connector must be connected to the cavity using a **standard RJ45 straight cable**.

- **TRX9000-2G or TRX9010-2G transceiver with an internal cavity filter:** Equipped with a Tx/Rx coaxial relay. The motorized cavity is internally managed.

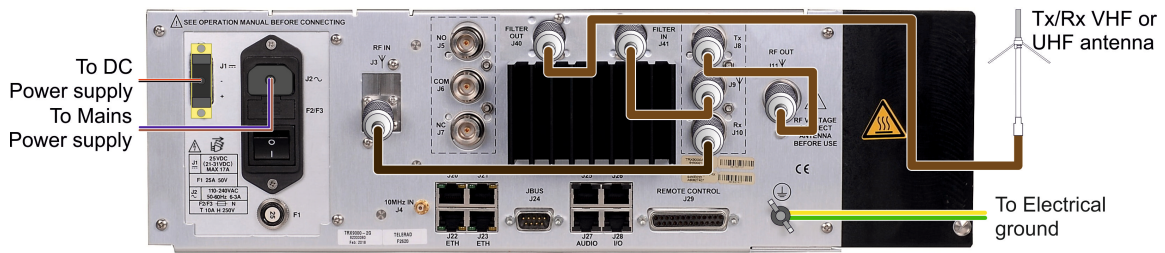


Figure 19 : One VHF or UHF antenna architecture with control of an internal cavity

- **TRX9020-2G transceiver with an internal cavity filter:** The transceiver manages directly the internal motorised cavity.

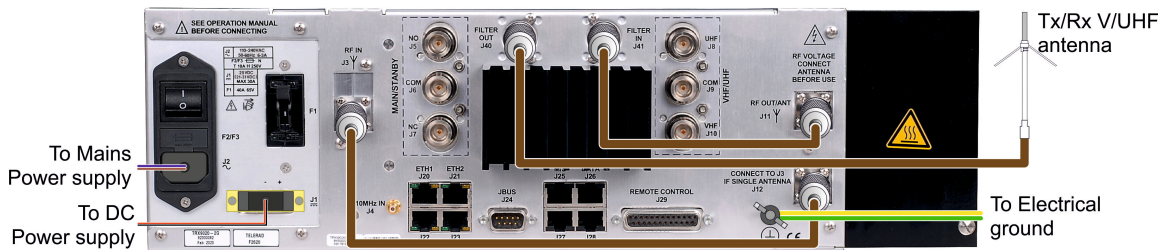


Figure 20 : One V/UHF antenna architecture with control of an internal cavity

4.5.1.3 TWO EQUIPMENTS IN M/S WITH AN INTERNAL M/S RELAY

- **TRX9000-2G or TRX9010-2G transceivers:** Two transceivers equipped each one with a Tx/Rx coaxial relay and an internal Main/Standby relay.

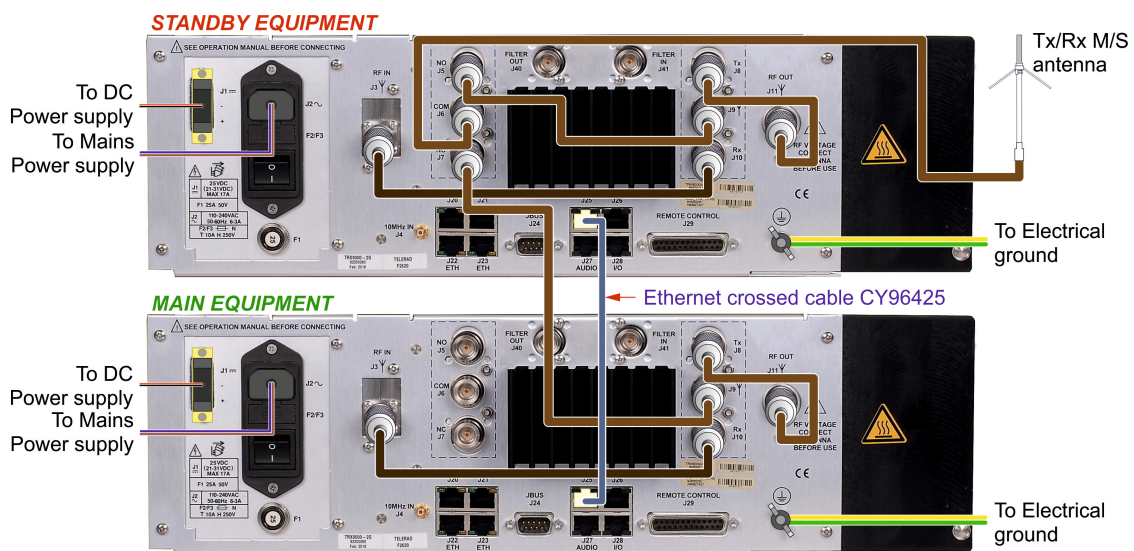


Figure 21 : One VHF or UHF antenna architecture using an internal M/S relay

The **J25** « M/S » connectors of both transceivers must be connected together using an **RJ45** crossed cable.

REMARK: In this configuration, only the Main/Standby relay of the Standby equipment is used.

- **TRX9020-2G transceivers:** Two transceivers equipped each one with an internal Main/Standby relay.

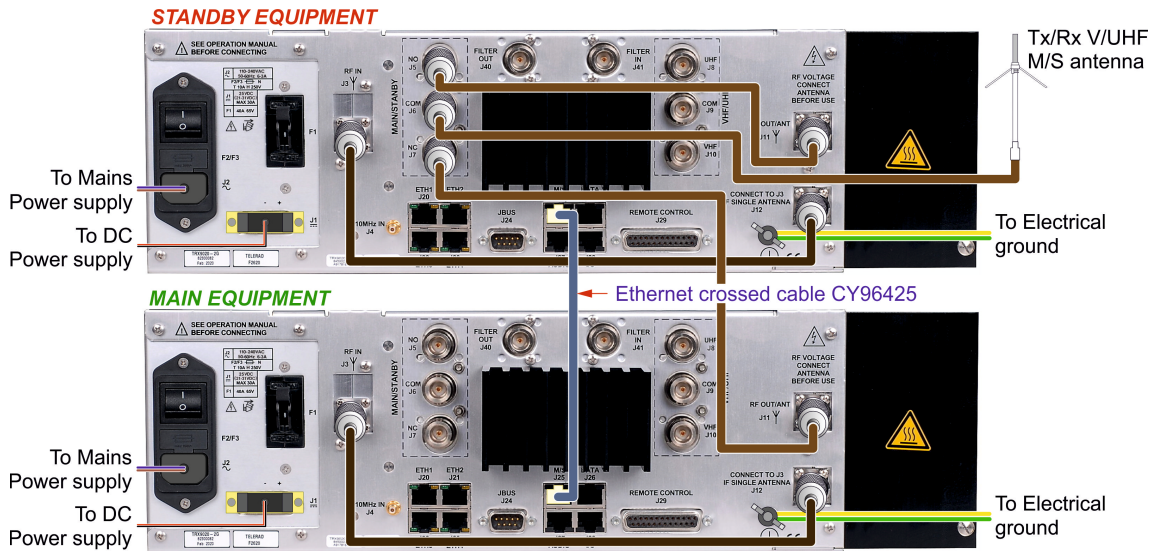


Figure 22 : One V/UHF antenna architecture using an internal M/S relay

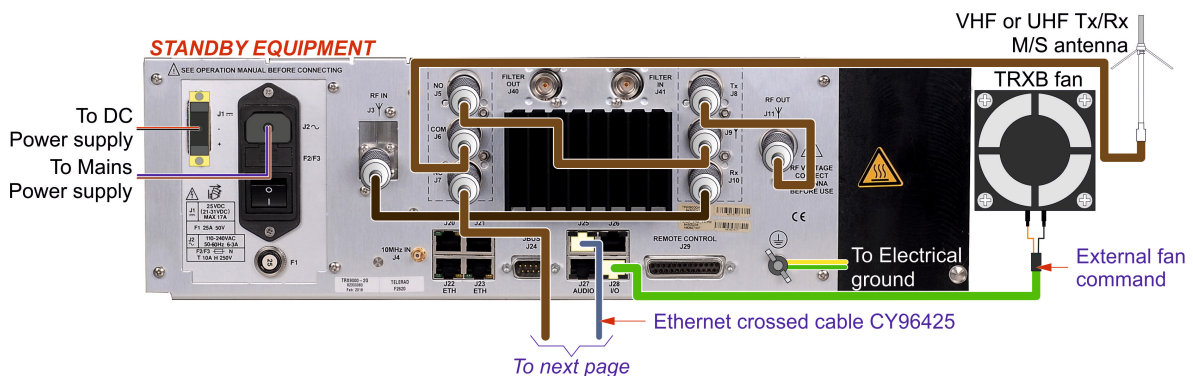
Like for the TRX9000-2G or TRX9010-2G, the **J25** « M/S » connectors of each transceiver must be connected together using an **RJ45 cross-cable**.

REMARK: As for the TRX9000-2G and TRX9010-2G, only the Main/Standby relay of the Standby equipment is used.

4.5.1.4 TWO EQUIPMENTS IN M/S WITH AN INTERNAL M/S RELAY AND AN EXTERNAL FAN

- **TRX9000-2G or TRX9010-2G transceivers:** Two devices equipped each one with a Tx/Rx coaxial relay, an internal Main/Standby relay and an external fan.

Realize first the connections described in the previous case, then add the **J28** « I/O » connectors of the Main and Standby transceivers. They connect the fans power supply.



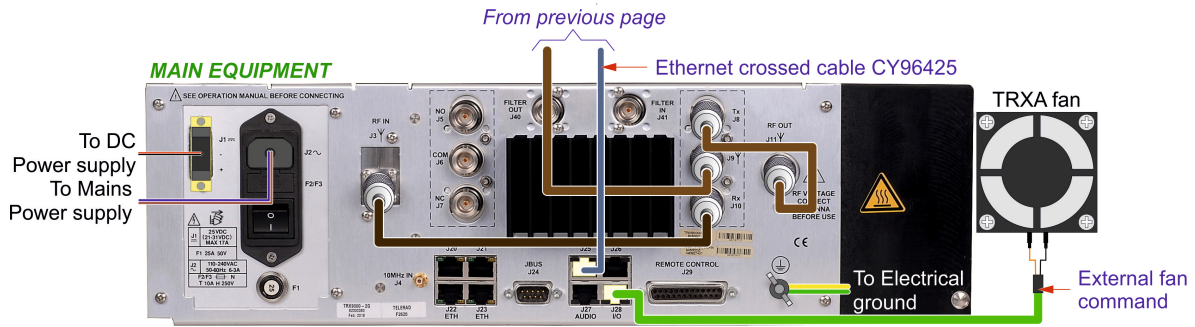


Figure 23 : One antenna architecture using internal M/S relay and external fans

- **TRX9020-2G transceivers:** The mounting is the same as the previous case (3d case), and the fan control is the same as for the TRX9000-2G or TRX9010-2G here above (connector **J28**).

4.5.1.5 TWO EQUIPMENTS IN M/S WITH AN EXTERNAL M/S RELAY

- **TRX9000-2G or TRX9010-2G transceivers:** Two devices equipped each one with a Tx/Rx coaxial relay.
 - ▶ Both transceivers share a same external Main/Standby relay,
 - ▶ The **J25** « M/S » connectors of each transceiver must be connected together using an **RJ45 cross-cable**,
 - ▶ The **J28** « I/O » connector of the Standby transceiver must be connected to the external relay. It supplies the power supply and the command of the relay.

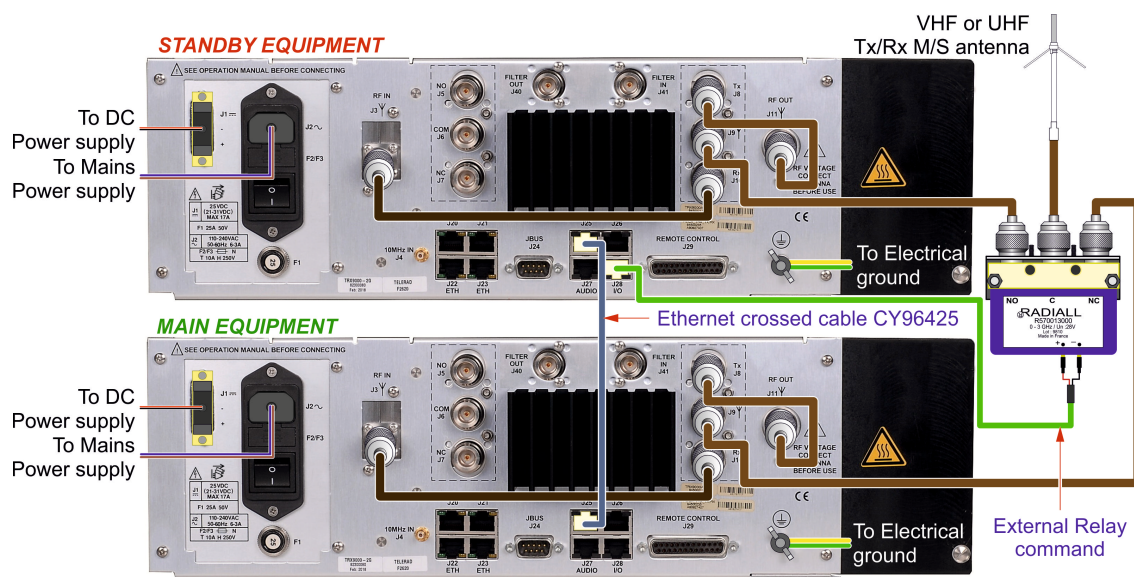


Figure 24 : One VHF or UHF antenna architecture using an external M/S relay

- **TRX9020-2G transceivers:** Two devices sharing a same external Main/Standby relay.
 - ▶ The **J25** « M/S » connectors of each transceiver must be connected together using an **RJ45 cross-cable**,
 - ▶ The **J28** « I/O » connector of the Standby transceiver must be connected to the external relay. It supplies the power supply and the command of the relay.

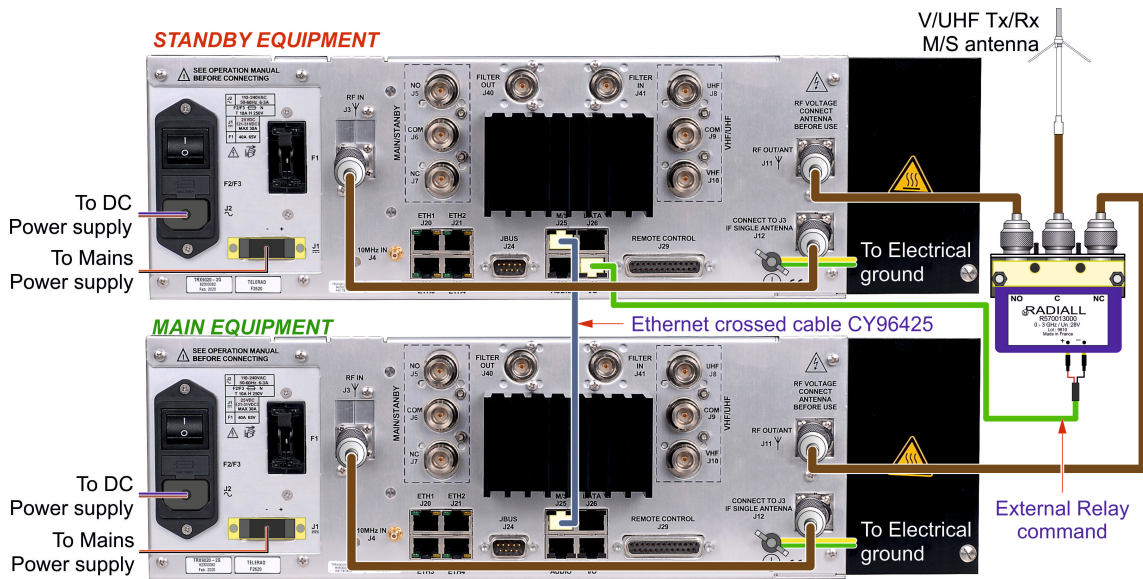


Figure 25 : One V/UHF antenna architecture using an external M/S relay

4.5.1.6 TWO EQUIPMENTS IN M/S WITH EXTERNAL M/S RELAY AND FAN

- **TRX9000-2G or TRX9020-2G transceivers:** Two devices sharing a same external Main/Standby relay, and equipped each one with:
 - ▶ A Tx/Rx coaxial relay,
 - ▶ An external fan.

Do first connections described in the previous case, then connect the **J28** « I/O » connector of the Standby transceiver on one hand to the external relay (power supply and command of the relay) and on the other hand to the fans power supply.

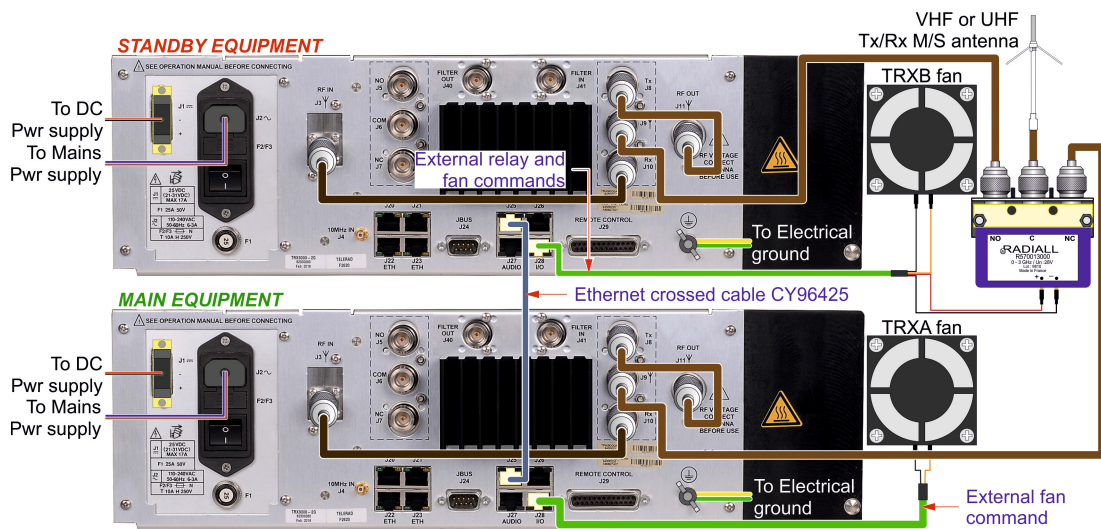


Figure 26 : One antenna architecture using external M/S relay and fans

- **Transceivers TRX9020-2G:** the mounting is the same as the previous case (5th case), and the fan control is the same as for the TRX9000-2G or TRX9010-2G here above (connector **J28**).

4.5.2 TWO ANTENNAS CONFIGURATIONS

4.5.2.1 STANDALONE EQUIPMENT

- **TRX9000-2G or TRX9010-2G transceiver:** Equipped with two separated VHF or UHF antennas : one for Transmission and one for Reception :

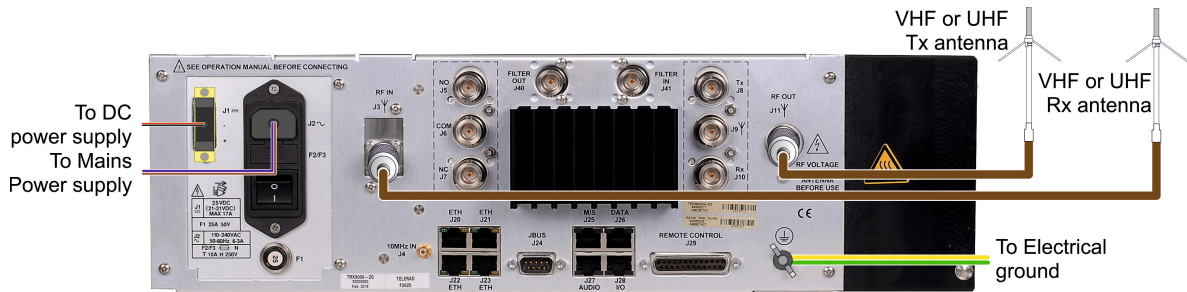


Figure 27 : Two separated VHF or UHF Tx and Rx antennas architecture

- **TRX9020-2G transceiver:** Two V/UHF wideband separated antennas: one for Transmission and one for Reception.



Figure 28 : Two separated V/UHF Tx and Rx antennas architecture

4.5.2.2 STANDALONE EQUIPMENT WITH A VHF/UHF RELAY

- **Available only for the TRX9020-2G transceiver:** Equipped with a VHF/UHF coaxial relay associated with two Transmission/Reception separated antennas : one for the VHF range and the other one for the UHF range :



Figure 29 : Two separated VHF and UHF Tx/Rx antennas architecture

4.5.2.3 TWO EQUIPMENTS IN M/S

- **TRX9000-2G or TRX9010-2G transceivers:** Two devices equipped each one with a Tx/Rx coaxial relay.

The **J25** « M/S » connectors of each transceiver must be connected together using an **RJ45 cross-cable**.

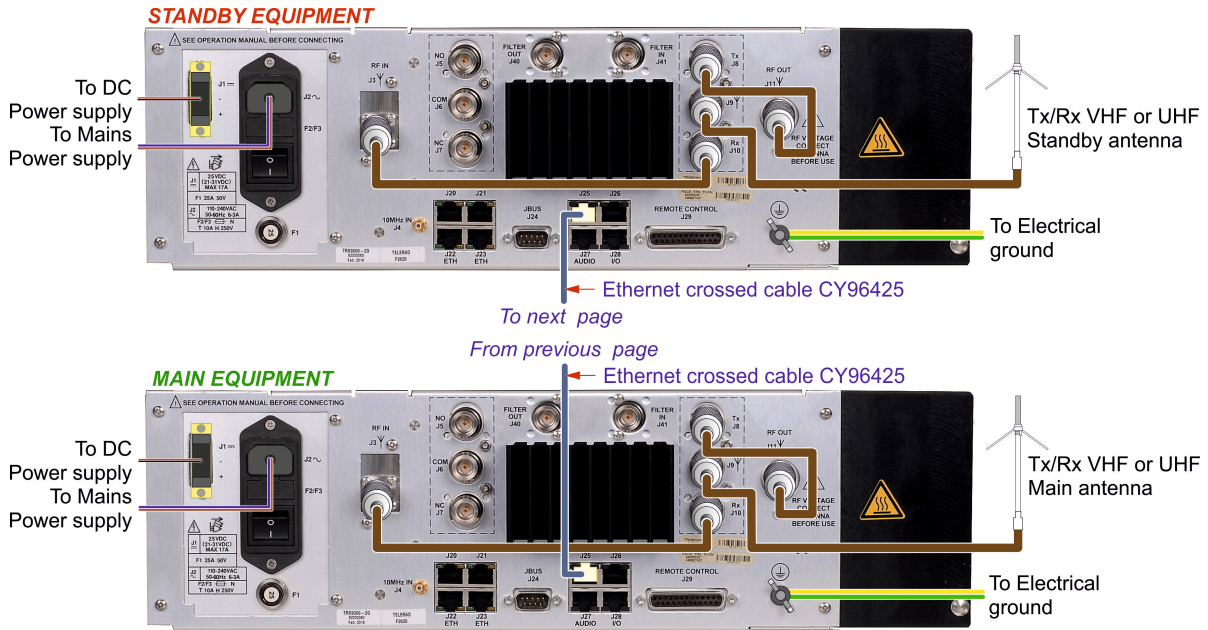


Figure 30 : Two VHF or UHF antennas architecture in a M/S configuration

- **TRX9020-2G transceivers:** Two devices equipped each one with a V/UHF Wideband Tx/Rx antenna.

The **J25** « M/S » connectors of each transceiver must be connected together using an **RJ45 cross-cable**.

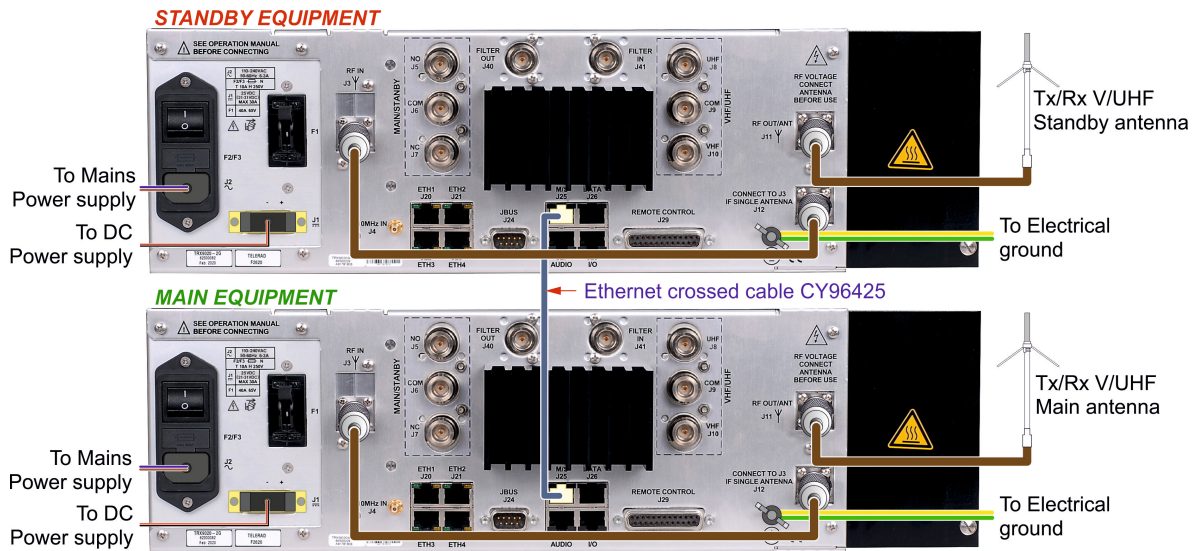


Figure 31 : Two V/UHF antennas architecture in a M/S configuration

4.5.3 THREE ANTENNAS CONFIGURATIONS



CAUTION : This configuration is **available only for the TRX9020-2G transceiver.**

Standalone configuration with VHF/UHF coaxial relay in Transmission and wideband antenna in reception:

- About the Transmission part: The transceiver is equipped with a VHF/UHF coaxial relay associated with two separated Transmission antennas, one for the VHF range and the other one for the UHF range,
- About the Reception part: It is connected to a standalone V/UHF Wideband antenna.

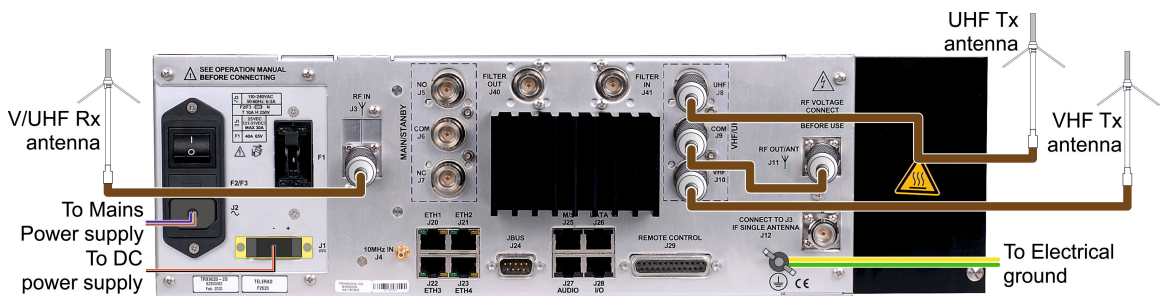


Figure 32 : Three VHF and UHF Tx and V/UHF Rx antennas architecture

4.5.4 FOUR ANTENNA CONFIGURATION

This configuration is available only in a Main/Standby architecture. For any transceiver, two devices connected each one to two separated Transmission and Reception antennas:

- VHF for the TRX9000-2G,
- UHF for the TX9010-2G,
- V/UHF for the TRX9020-2G.

The **J25** « M/S » connectors of both transceivers must be connected together using a **RJ45 crossed cable**.

- **TRX9000-2G or TRX9010-2G transceivers:**

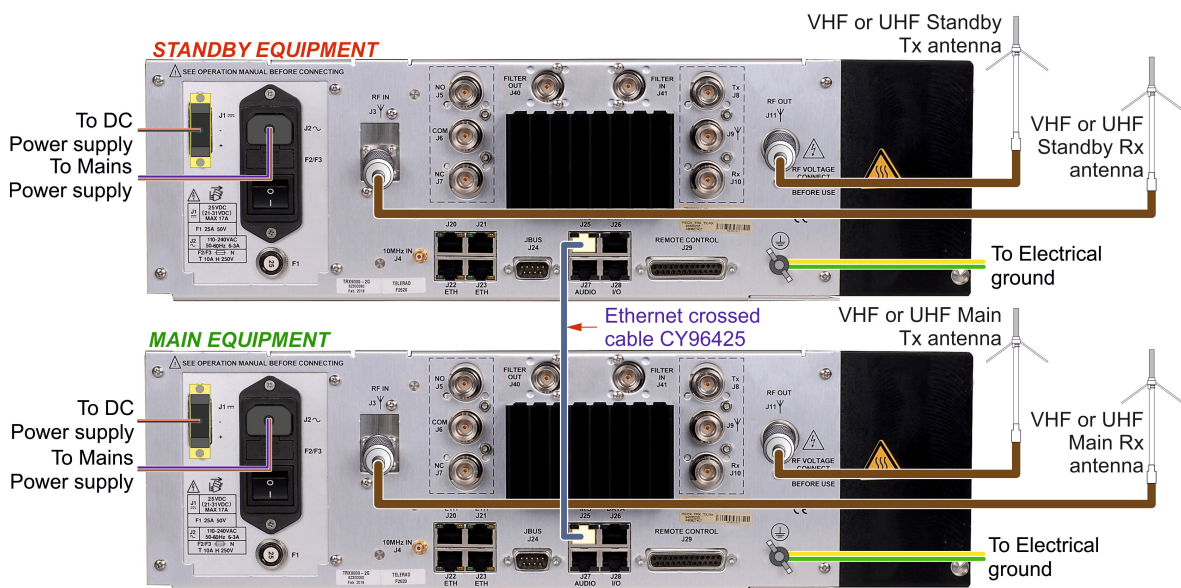


Figure 33 : Four antennas architecture

■ TRX9020-2G transceivers:

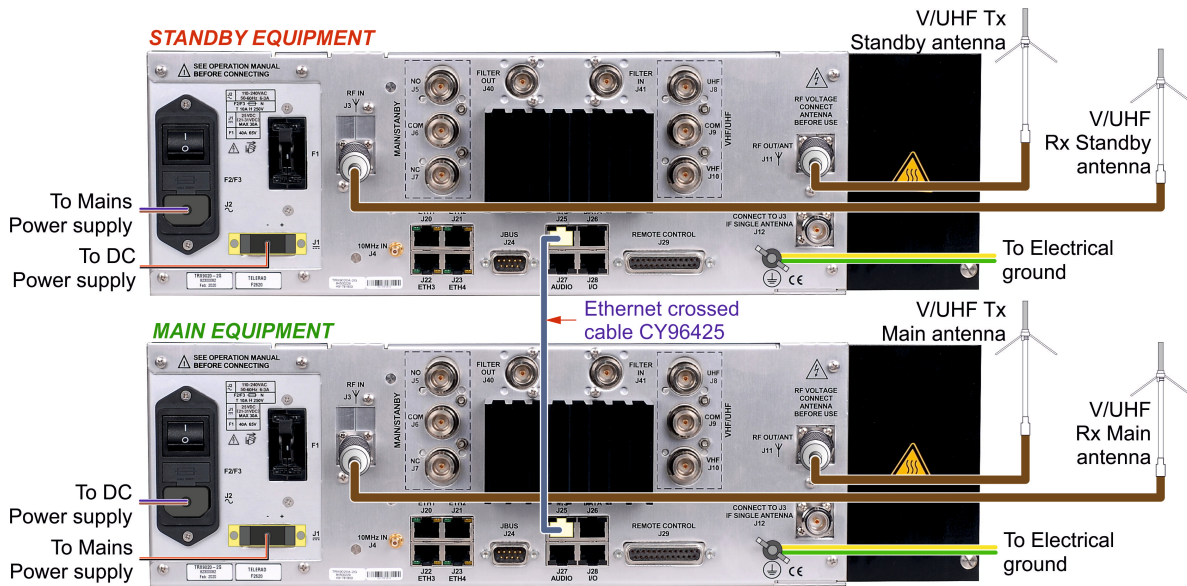




Figure 34 : Four antennas architecture

4.6 BASIC COMMISSIONING

For the TRX9000-2G, TRX9010-2G ou TRX9020-2G transceivers, once the rear panel connections are made, check that the yellow « Mains Presence » and/or « Battery Presence » indicator lights are on (the Mains ON/OFF switch of the rear J2 connector is supposed to be in the « ON » position ).

Then place the Front panel ON/OFF switch in the « ON » position . The transceiver then performs the following steps:

1. Test of all the front panel indicator lights, which stay lit for approximately 10s.
 - ▶ « Mains Presence » (○ ⇒ ●), « Battery Presence » (○ ⇒ ●),
 - ▶ « +V_{DC} Presence » (○ ⇒ ●),
 - ▶ « Status » (○ ⇒ ●), « RF Info » (○ ⇒ ●) and « MOD Info » (○ ⇒ ●),
 - ▶ « Squelch » (○ ⇒ ●) and « Call » (○ ⇒ ●),
 - ▶ « Alarm » (○ ⇒ ●) and « SWR » (○ ⇒ ●),
 - ▶ The display screen stays black.
2. At the same time, the embedded real-time multitasking application is launched.
3. Then the initiated built-in test is launched, with internal analysis of the results.
4. At the end of the initialization phase, the indicator lights except the Power supply ones (« +V_{DC} Presence », « Mains Presence » and/or « Battery Presence ») go out and the default operating menu is displayed on the screen. If any default has been detected, the « Alarm » indicator light is switched on again (○ ⇒ ●).

The transceiver can now be accessed by the user.

Perhaps the **remote ON/OFF command** present on the « REMOTE CONTROL » connector is not connected (command at « OFF » state). In this case, the STATUS indicator light is off (○ ⇒ ○).

Set the **remote ON/OFF command** to « **ON** », either by hardware (*pin J29-13 to ground*), or by software (See Paragraph « **SETUP / ON/OFF** » sub-menu » on page 130)*, and check the the STATUS indicator light switches on (○⇒●).

Then enter the operating configuration in the transceiver:

- Using the local screen/keyboard:
 - ▶ **Output power:** Adjustment in dBm, by step of 0,5dB, depending on the frequency range and the mode:
 - In VHF: Between **33** and **47dBm/50Ω** (2 to 50W) in A3E, Between **39** and **49dBm/50Ω** (8 to 80W) in G3E,
 - In UHF: Between **37** and **47dBm/50Ω** (5 to 50W) in A3E.
 - ▶ **Minimum RF1 level detection:** Between **-120dBm** and **-60dBm** by step of 0.5dB, for a relative adjustment between **-60** and **+60**. Default value: 0, corresponding to -90dBm,
 - ▶ **Minimum RF2 level detection:** Between **-120dBm** and **0dBm** by step of 0.5dB, for a relative adjustment between **-60** and **+180**.
 - ▶ **Squelch Threshold SNR:** Between **6** and **20dB** by step of 1dB, directly expressed in dB. Default value : 12dB,
 - ▶ **Input AF line level sensitivity:** From **-30** to **0dBm**, by step of 3dB. Output on 600Ω balanced transformer, in Analog mode only. Default value : -12dBm,
 - ▶ **Output AF line level sensitivity:** From **-30** to **+10dBm** by step of 0.5dB. Output on 600Ω balanced transformer, in Analog mode only. Default value : 0dBm,
 - ▶ **Mode:** According to ICAO standards:
 - For the TRX9000-2G: **A3E, G3E, F3E, ACARS** and **VDL2**,
 - For the TRX9010-2G: **A3E, G3E** and **F3E**,
 - For the TRX9020-2G: **Idem** TRX9000-2G in VHF and TRX9010-2G in UHF.
 - ▶ **Frequency:** According to ICAO standards:
 - For the TRX9000-2G: Between **118.000** and **144.000 MHz**,
 - For the TRX9010-2G: Between **225.000** and **400.000 MHz**.
 - For the TRX9020-2G: **Idem** TRX9000-2G in VHF and TRX9010-2G in UHF.
 - ▶ « **ON/OFF** » controls priority: **HARD** or **SOFT**. Selects the priority between the hardware control (*pin n°13 of connector J29*) and the software control. If the control is hardware, pin 13 must be **connected to ground** for « ON/OFF control to ON »,
 - ▶ **Status of the software « ON/OFF » control:** **ON** or **OFF**. Selects the status of the software control. In the control is software, the value must be ON for « ON/OFF control to ON »,
 - ▶ **IP parameters (Ethernet):** IP address and subnet mask. According to the user.



For operation by the HMI, see paragraph « **Local operation through the front panel Screen/Keyboard interface** » on page 104*.

- Or using the TELNET Terminal link:
 - ▶ **Output power:** **POWER [xx.x]**, by step of 0,5dB:
 - In VHF, A3E: xx.x ∈ [33.0, 47.0dBm],
 - In VHF, G3E: xx.x ∈ [39.0, 49.0dBm],
 - In UHF, A3E: xx.x ∈ [37.0, 47.0dBm],
 - ▶ **RF1 detection level:** **SQ RF ON**, then **SQ RF 0** for an adjustment to -90dBm,
 - ▶ **RF2 detection level:** **SQ RF OFF**,
 - ▶ **SNR detection level:** **SQ SNR ON**, then **SQ SNR 12** for an adjustment to 12dB,
 - ▶ **Input AF line sensitivity:** **LINE -12**. Sensitivity adjusted to -12dBm.

- ▶ **Output AF line sensitivity: LINE 0.** Sensitivity adjusted to 0dBm.
- ▶ **Mode of modulation: A3E,**
- ▶ **Frequency: FREQ [xxx.xxx]**
 - For the TRX9000-2G: xxx.xxx ∈ [118.000, 144.000MHz],
 - For the TRX9010-2G: xxx.xxx ∈ [225.000, 400.000MHz],
 - For the TRX9020-2G: xxx.xxx ∈ [118.000, 144.000MHz] and [225.000, 400.000MHz].
- ▶ **« ON/OFF » control priority: RADIO PRIO HARD or RADIO PRIO SOFT,**
- ▶ **Software « ON/OFF » control status: RADIO ON,**
- ▶ **IP parameters (Ethernet) : ETH1 IP [xxx.xxx.xxx.xxx], ETH1 MASK [xxx.xxx.xxx.xxx] and ETH GATEWAY [xxx.xxx.xxx.xxx], xxx.xxx.xxx.xxx at IPv4 format.**



For more details about commands, refer to document [1] **ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.

4.7 PRELIMINARY ADJUSTMENTS

There is a preliminary adjustment to be made before putting the transceiver into operation: checking the accuracy of the local oscillator. This adjustment is made through software, using the front panel HMI interface (See Paragraph « *« MAINT / TCXO » sub-menu »* on page 145)*.

4.8 EQUIPMENT COMMISSIONING IN ANALOG CONFIGURATION

Commissioning a transceiver in Analog configuration is basically required in a Standalone configuration : a transceiver managing an operational frequency connected to an analog remote VCS. It follows three steps:

- **Connection to the VCS** (See Paragraph « *MINIMUM CONNECTION FOR COMMISSIONING »* on page 58)*,



REMARK : Make sure that the ON/OFF control of the transceiver allows to take into account the remote PTT ans Call coming from or going to the remote control (STATUS indicator light switched on in green on the front panel):

- If **the control is hardware**, then pin J29-13 must be connected to ground for « ON/OFF command to ON », and the HARD control must be prior (by the HMI, see paragraph « *« SETUP / ON/OFF » sub-menu »* on page 130*, or **RADIO PRIO HARD** control on the command terminal).
- If **the control is software**, the SOFT control must be prior and at ON (by the HMI, see paragraph « *« SETUP / ON/OFF » sub-menu »* on page 130*, or **RADIO PRIO SOFT** then **RADIO ON** controls on the command terminal).

- **Configuration of the operating mode.** Two possibilities:
 - ▶ If there is no SIP session established with the transceiver, the analogue source is automatically selected (*Transmission AF, Reception AF, PTT and Call on J27 and/or J29 connectors*).
 - ▶ When one or more SIP sessions are established, **the analogue source stays available**. So an analogue PTT will be taken into account when no more "Voip" PTT is active.

About the other operating parameters, see paragraph « *Basic commissioning* » on page 70*.

- Commissioning.

4.9 EQUIPMENT COMMISSIONING IN MAIN/STANDBY CONFIGURATION

Operating in Analog configuration is also possible using two transceivers in a Main/Standby configuration. This architecture represents an equipments redundancy such a way to improve the level of safety for operating a given operational frequency. It requires to follows four steps:

- Interconnection of the transceivers,
- Connection to the Remote VCS,
- Configuration of the operating mode,
- Commissioning.

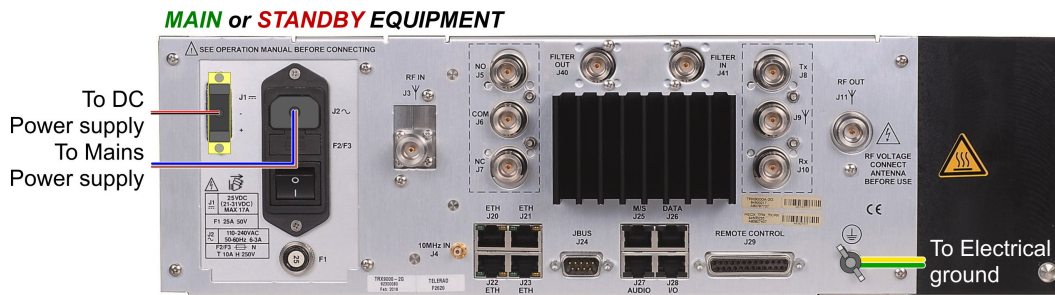
4.9.1 TRANSCEIVERS INTERCONNECTION

The transceivers interconnection is made of 4 sub-steps:

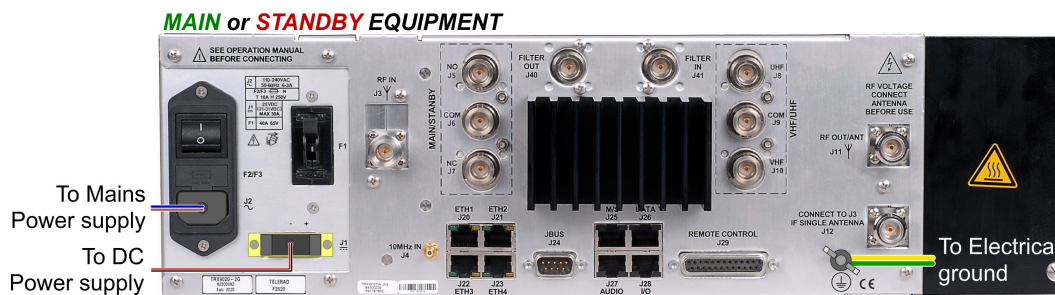
- Power supply,
- Connection to the Tx/Rx relay,
- Connection to the Main/Standby relay,
- Connection of the Ethernet crossed cable.

4.9.1.1 STEP 1 : TRANSCEIVERS POWER SUPPLY

- TRX9000-2G or TRX9010-2G transceivers:



- ▶ TRX9020-2G transceiver:



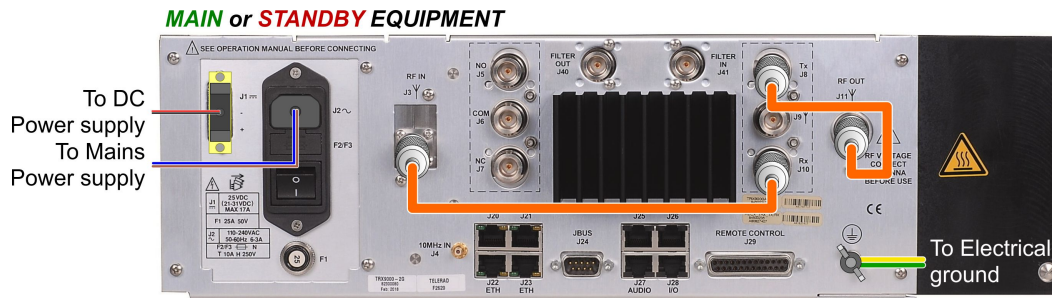
Depending on the kind of the transceivers, the power supply part connection corresponds to :

- ▶ Connection to the AC source (*A versions of the transceivers*),
- ▶ Connection to the DC source (*A and C versions of the transceivers*).

The ground connection is generally realized by connecting the ground wires of both transceivers to an Earth bar located inside the cabinet in which the equipments are installed.

4.9.1.2 STEP 2 : CONNECTION TO THE TX/RX RELAY

■ TRX9000-2G or TRX9010-2G transceivers:

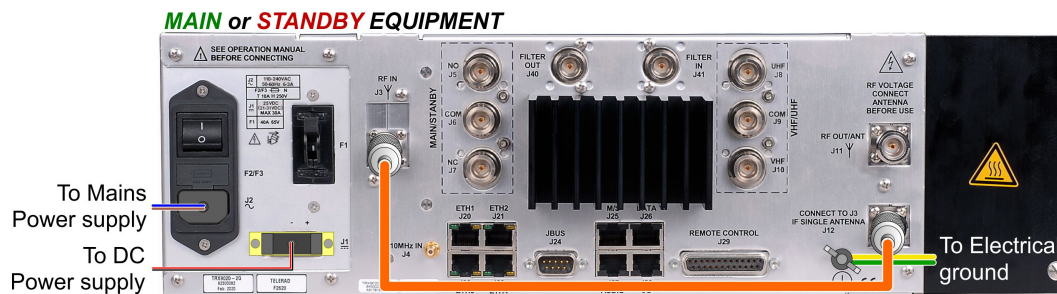


The Tx/Rx relay is optional and has a meaning only when a Transmission/Reception antenna is used.

On each transceiver, the Tx/Rx relay connection corresponds to:

- Connection of the Transmission Antenna output **J11** to connector **J8** of the relay (*Tx*),
- Connection of the Reception Antenna input **J3** to connector **J10** of the relay (*Rx*).

■ TRX9020-2G transceivers:



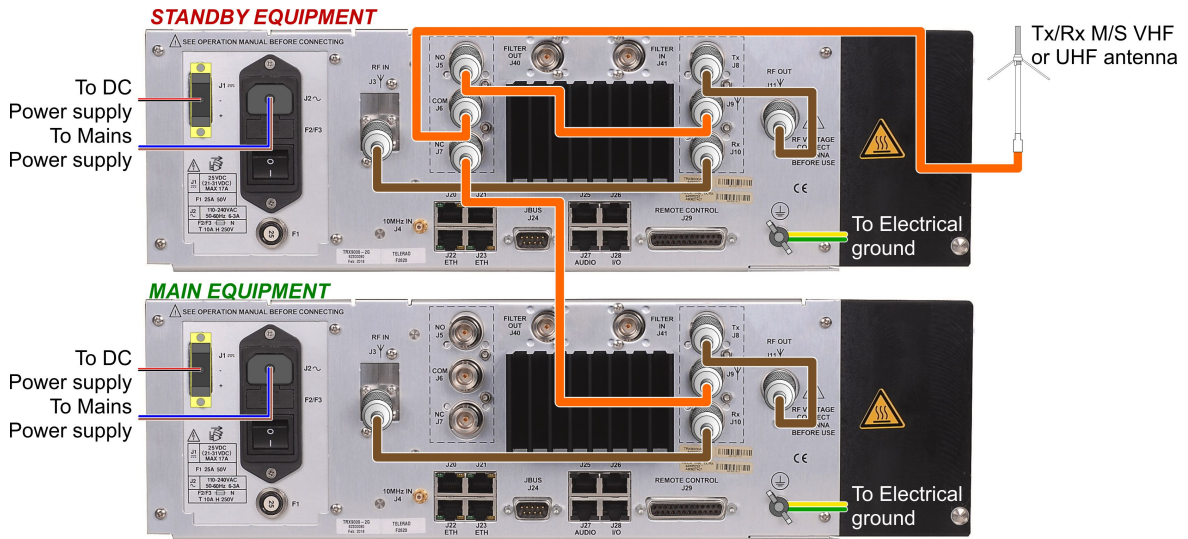
The Tx/Rx relay has been designed inside the AMPL26179 Amplifier module.

Supposing the use of a standalone Transmission/Reception antenna on each transceiver, the internal Tx/Rx relay requires only one connection:

- ▶ Connection of the Reception Antenna output **J12** to the Reception Antenna input connector **J3** of the transceiver.

4.9.1.3 STEP 3 : CONNECTION OF THE MAIN/STANDBY RELAY

■ TRX9000-2G or TRX9010-2G transceivers:

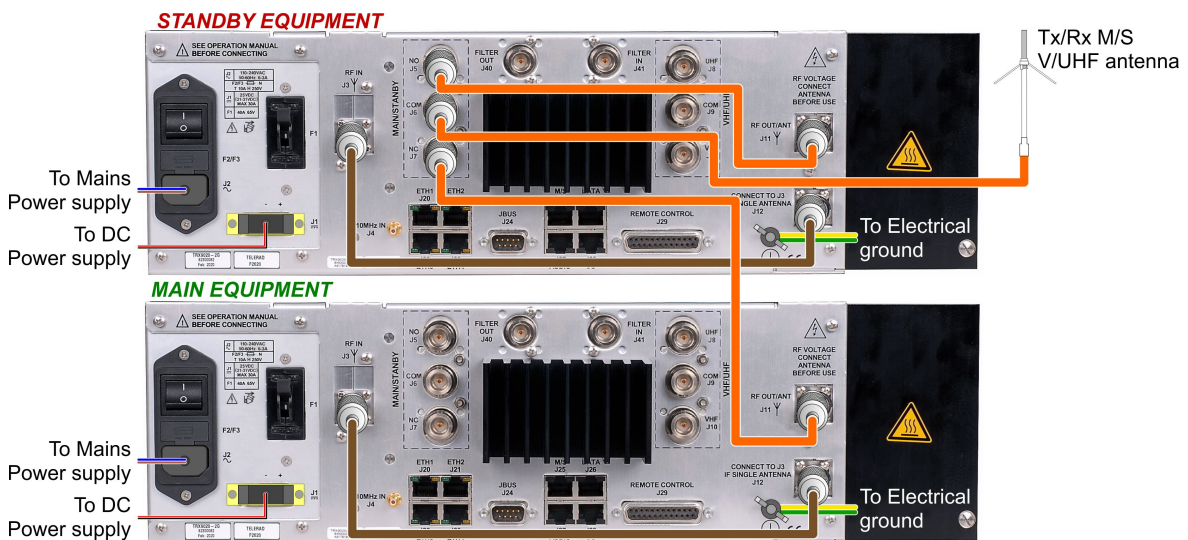


The Main/Standby relay used in this architecture must be **the one of the Standby transceiver**.

On each **TRX9000-2G or TRX9010-2G transceiver**, links done during this step are:

- ▶ Connection of the Tx/Rx relay Antenna output **J9** of the « Main » transceiver on connector **J7** of the M/S relay (**NC**),
- ▶ Connection of the Tx/Rx relay Antenna output **J9** of the « Standby » transceiver on connector **J5** of the M/S relay (**NO**),
- ▶ Connection of the M/S relay Antenna output (**COM**) **J6** to a Transmission / Reception Main / Standby VHF or UHF antenna.

■ TRX9020-2G transceivers:



For the **TRX9020-2G transceivers**, links done during this step are:

- ▶ Connection of the Antenna output **J11** of the « Main » transceiver on connector **J7** of the M/S relay (**NC**),

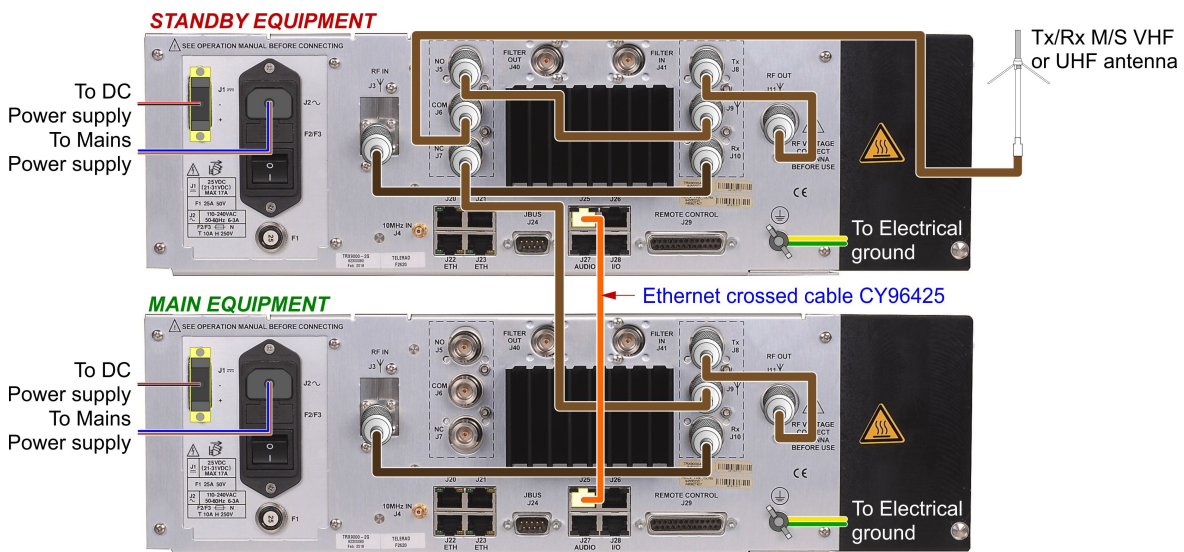
- ▶ Connection of the Antenna output **J11** of the « Standby » transceiver on connector **J5** of the M/S relay (NO),
- ▶ Connection of the M/S relay Antenna output (COM) **J6** to a Wideband Transmission / Reception Main / Standby V/UHF antenna.



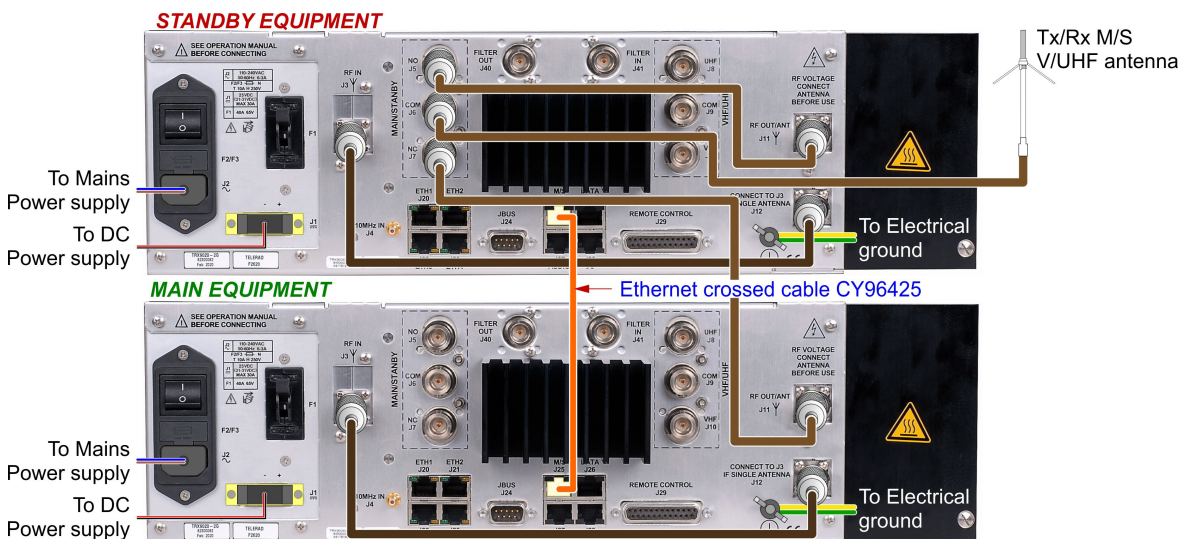
CAUTION : As the M/S relay to be used is obligatory the one of the Standby transceiver, **the architecture is not symmetrical.** This means that one equipment is clearly identified as the Main Transceiver and the second as the Standby Transceiver. So a « 1 + 1 » type switching, in which each equipment becomes the Standby of the other one, is not possible in this case.

4.9.1.4 STEP 4 : CONNECTION OF THE ETHERNET CROSSED CABLE

■ TRX9000-2G or TRX9010-2G transceivers:



■ TRX9020-2G transceivers:



With this last wiring step of the Main/Standby architecture, both transceivers will be able to exchange information involved in the switching management by using an **Ethernet crossed cable CY96425** (TELERAD P/N : 28002306) linking the two M/S **J25** connectors of the transceivers.

Through this cable the « Standby » transceiver reads and monitors the « **Proper Operation** » information of the « Main » transceiver:

- ▶ In Normal operation (no default on the « Main » transceiver), the « Standby » transceiver controls the M/S relay such a way the Antenna output **J6** (COM) is linked to output **J7** (NC). So the antenna is **connected to the Main transceiver**.
- ▶ When a default has been detected on the « Normal » transceiver, the « Standby » transceiver controls the switching of the M/S relay such a way the Antenna output **J6** (COM) is now linked to output **J5** (NO). In this case the antenna is **connected to the Standby transceiver**.

4.9.2 CONNECTION TO THE REMOTE VCS

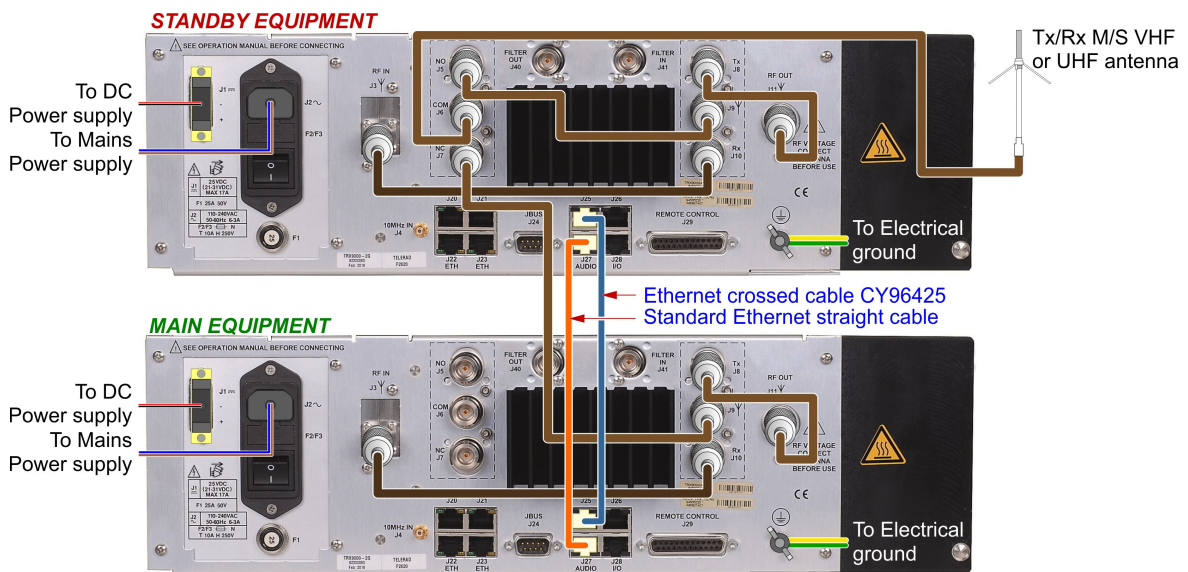
Connection to the Remote control of the transceivers follows two additional steps:

- Connection of the Ethernet straight cable,
- Connexion to the Remote Operation.

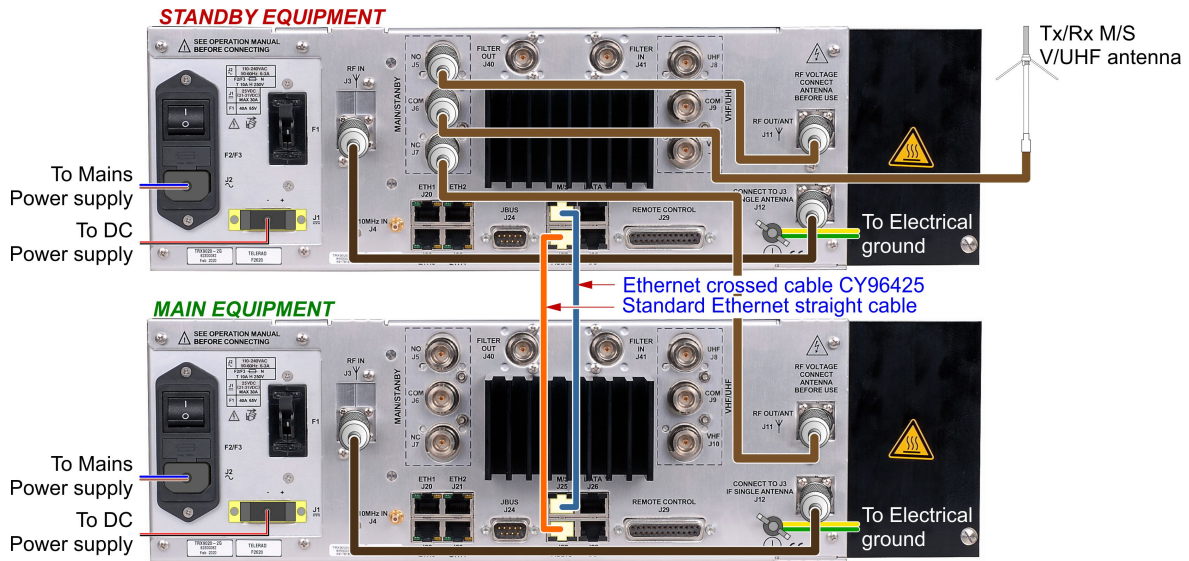
4.9.2.1 STEP 5 : CONNECTION OF THE ETHERNET STRAIGHT CABLE

On one hand the « M/S » connectors **J25** of each transceiver are linked together using an **RJ45 crossed cable**. On the other hand, the Analog remote control of this set of equipments requires also to link together the « AUDIO » connectors **J27** of each transceiver using a **standard RJ45 straight cable**, such a way the signals exchanged with the remote VCS are splitted on both transceivers. This connector **J27** contains all the signals required for operation (See Paragraph « **J27 AUDIO connector** » on page 46)*.

- TRX9000-2G or TRX9010-2G transceivers:



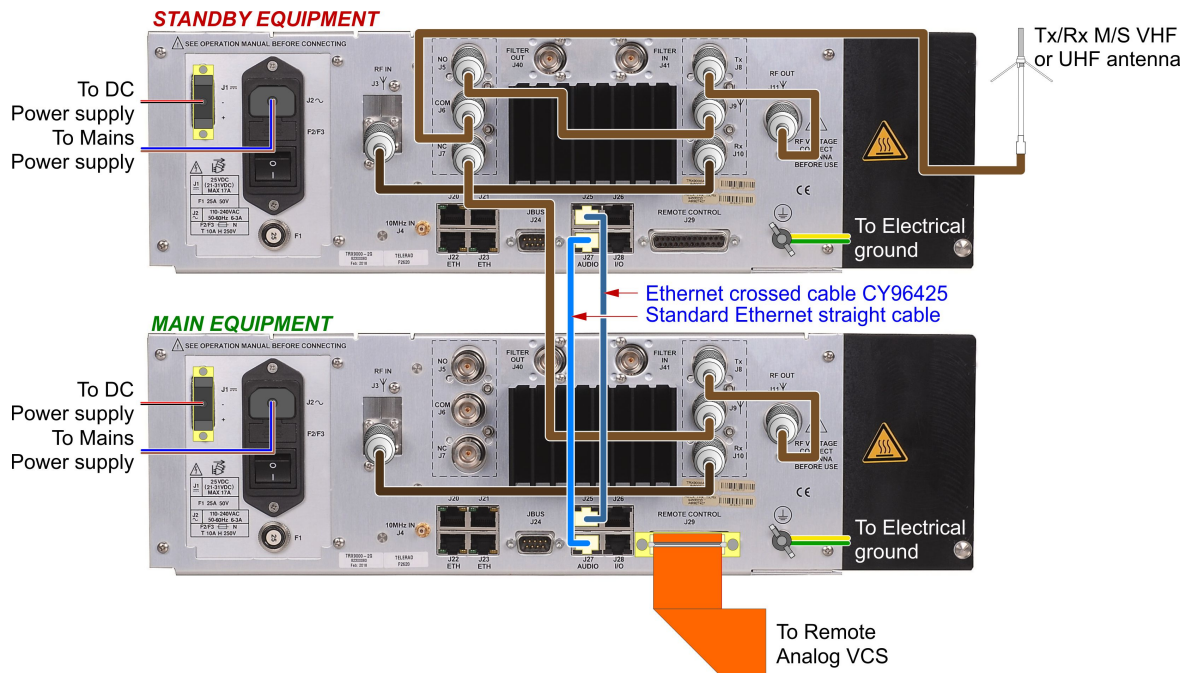
■ TRX9020-2G transceivers:



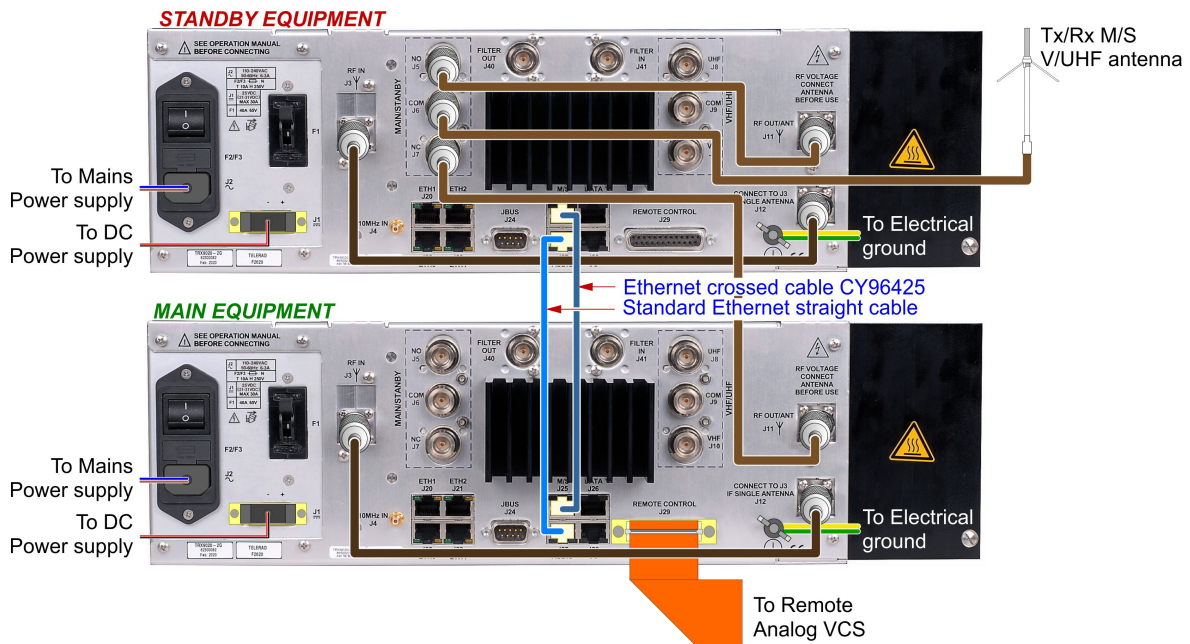
4.9.2.2 STEP 6 : CONNECTION TO THE REMOTE VCS

The connection with the remote VCS is realized through the « REMOTE CONTROL » connector **J29** of the « Main » equipment (see the figure above), but can be realized too through the « REMOTE CONTROL » connector **J29** of the « Standby » equipment. In all cases, **only one connection** must be done with the remote VCS.

■ TRX9000-2G or TRX9010-2G transceivers:



■ TRX9020-2G transceivers:



In this context, as the operation in Main / Standby mode is mainly used in analog, two possibilities of operation are available:

- ▶ If there is no SIP session established with the transceivers, the analogue source is automatically selected (*Transmission AF, Reception AF, PTT and Call on J29 connector sent to the second transceiver through the J27 connectors*),
- ▶ When one or more SIP sessions are established, **the analog source stays available**. So an analog PTT will be taken into account when no more « Voip » PTT is active.

4.9.3 CONFIGURATION OF THE OPERATING MODE

The configuration of the Operating mode requires one additional step.

4.9.3.1 STEP 7 : CONFIGURATION OF THE OPERATING MODE

Once the transceivers interconnection allowing a correct operation in a Main / Standby operation has been done through the six previous steps, they must be now software configured:

- ▶ Configure the redundancy on each transceiver through their respective « SETUP/ON/OFF » menu (See Paragraph « *SETUP / ON/OFF* » sub-menu » on page 130)*:
 - On the « Main » equipment: Configure the « Redun. » field to « ON » and the « Act » field to « MAIN »,
 - On the « Standby » equipment: Configure the « Redun. » field to « ON » and the « Act » field to « STANDBY ».
- ▶ The other operating parameters programming (*Modulation, Frequency, Offset, etc...*) is done during the commissioning (See Paragraph « *Basic commissioning* » on page 70)*. Both transceivers must be configured with exactly the same operating parameters, such a way the switching from one equipment to the other one remains transparent for the user.

4.9.4 COMMISSIONING

The commissioning requires an eighth and last step.

4.9.4.1 STEP 8 : COMMISSIONING

Now the transceivers are ready to be used in a Main / Standby configuration.

Information used to manage the switching is the « TRxA_FCT » information available on pin **J25-1**. It is connected to the « TRxB_FCT » information of the other transceiver, available on pin **J25-3** through the Ethernet cross-cable. They are referred to ground, available on pin **J25-2**, and are « 0 » for « Proper Operation ».

This information is exchanged through the Ethernet crossed cable (see step 4). The principle of operation is as follows:

- ▶ The transceiver **selected by default** is always the « Main »,
- ▶ In case of failure of the « Main » equipment (« TRxA_FCT » information ≠ « 0 »), the « Standby » transceiver detects the status change (« TRxB_FCT » information ≠ « 0 »), and commands automatically the **M/S relay switching** at the output of its own Tx / Rx relay,
- ▶ When the « Main » equipment returns operational (« TRxA_FCT » information = « 0 »), the « Standby » transceiver also detects the status change (« TRxB_FCT » information = « 0 »), and commands again the M/S relay switching now at the output of the « Main » equipment Tx / Rx relay,
- ▶ If the « Standby » equipment is in failure, the command of the M/S relay stays on the (NC) position and so allows the « Main » equipment to be connected to the antenna,
- ▶ The equipment selected by the M/S relay is displayed through the state of the « Status » indicator lights of both transceivers :
 - « **Status** » indicator light **ON** (●): the corresponding equipment is selected,
 - « **Status** » indicator light **OFF** (○): the corresponding equipment is not selected.
- ▶ The operating data (AFTx, AFRx, PTT and Call) are supplied by the remote VCS to the « Main » equipment through connector **J29** (see step 6), and then sent to the « Standby » equipment through **J27** (see step 5). Those data will be processed by the selected equipment.

In redundant mode, the ON/OFF controls of both transceivers are replaced by a Redundancy control linked to the « TRxA_FCT » information status. For each transceiver, the status of this command is displayed in the HMI (See Paragraph « **MAINT / STATUS / RADIO** » sub-menu » on page 143)*.

Supposing that the « Normal » transceiver has been selected:

- ▶ The « Redundant Control Status » field on the « Main » transceiver HMI is at **ON** (Status light indicator lit) and the one of the « Standby » transceiver at **OFF** (Status light indicator off).
- ▶ If the transceiver fails, automatically the « Redundant Control Status » field on the « Main » transceiver HMI goes to **OFF** (Status light indicator switches off) and the one of the « Standby » transceiver goes to **ON** (Status light indicator switches on). The « Standby » transceiver is selected.
- ▶ If the redundancy function has not enabled (See Paragraph « **SETUP / ON/OFF** » sub-menu » on page 130)*, the « Redundant Control Status » field on the HMI of both transceivers goes to ---.

4.10 EQUIPMENT COMMISSIONING IN VOIP CONFIGURATION

The commissioning of the equipment in VoIP configuration needs to follow the next steps:

- Connection to network,
- Configuration of the network parameters,
- Configuration of the operating mode,
- Configuration of the SIP parameters,
- Configuration of the RTP parameters,
- Normal users names listing,
- Emergency users names listing,
- Commissioning.

4.10.1 CONNECTION TO THE NETWORK

Operation of the transceiver in Voice over IP requires to connect it to an Ethernet network through a hub or a switch, using the **ETH1** connector located on the rear panel (*ETH2 to ETH4 not available in VoIP*).

Then the equipment must be configured such a way it can operate in VoIP mode. On a general way, all the VoIP parameters can be configured by using a command terminal connected to one of the four « ETHERNET » connectors on the rear panel, through a TELNET protocol.

In this case, the user must be first logged as Administrator by entering the control: **Login admin** <pwd> (<pwd> default value = admin).

However, some parameters can be also configured by using the local HMI : this is the case for the Ethernet addresses and their associated subnet masks, as well as the default gateway address.

4.10.2 CONFIGURATION OF THE NETWORK PARAMETERS

Using the local HMI or the terminal, enter the IP network parameters of the transceiver:

- Using the HMI, select the « **SETUP/IP/ETH1** » menu.
- Using the terminal, enter the following controls:
 1. **ETH1 IP** control to define the IP address of the transceiver:
 - ▶ **Ex : ETH1 IP 172.16.10.1**
 2. **ETH1 MASK** control to define the subnet mask of the transceiver:
 - ▶ **Ex : ETH1 MASK 255.255.0.0**
- Using the HMI, select the « **SETUP/IP/GATE** » menu.
- Using the terminal, enter the **ETH GATEWAY** control to define the IP address of the default gateway of the transceiver:
 - ▶ **Ex : ETH GATEWAY 172.16.10.254**



CAUTION: The IP address of the ETH1 to ETH4 interfaces must obligatory indicate **different sub-networks**. If not, it will be impossible to exchange data with the radio.

Otherwise, the 192.160.100.XXX IP addresses (Subnet mask 255.255.255.000) are forbidden because reserved for an internal use.

4.10.3 CONFIGURATION OF THE OPERATING MODE

The operating mode in Voice over IP is automatically established when at least one SIP session has been opened with the transceiver.

4.10.4 CONFIGURATION OF THE SIP PARAMETERS

As the transceivers are compliant with the ED137/1 standard, establishing a communication link between the VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers and a user (*for example a VCS*) through an Ethernet network is done by generating a **SIP protocol** (*Session Initiation Protocol*) between both devices.

This protocol is used only for establishing a network connection between the VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers and the user, and this connection is done only when initiated by the user, never by the transceiver.

So the **SIP** protocol parameters must be defined during the communication setting. A difference with the previous parameters is that these ones are available only by using the command terminal:

1. Define the name of the equipment such as a SIP user:
 - ▶ **SIP USERNAME <Equipment name>**
2. Define the SIP communication port on the equipment side:
 - ▶ **SIP PORT <port>**
3. Define the number of VCS authorized to be connected with the equipment:
 - ▶ **SIP NBCON <value>** (*the transceivers define up to 32 possibles connections*)

Those parameters allow to establish a **SIP** connection, whose the **SIP URI** (Uniform Resource Identifier) is of type :

sip:<Equipment name>@<IP address of the equipment>:Port

Other attributes associated with the SIP session can be entered. So we find :

- Checking the name of the VCS that request a session : **SIP CHECKVCS <ON/OFF>**,
- Checking the Maintenance status of the equipment : **SIP CHECKMAINT <ON/OFF>**,
- Enabling/Disabling the « Linked Sessions » function : **SIP LS <ON/OFF>**,
- Checking the « STATUS » light indicator of the equipment : **SIP CHECKSTATUS <ON/OFF>**.

4.10.5 CONFIGURATION OF THE RTP PARAMETERS

Once the SIP session has been established in transmission and in reception, transferring data frames containing on one hand the digitalized transmitted audio and the PTT command and on the other hand the digitalized received audio and the Call information on the network is done using a second real time protocol : the **RTP protocol** (*Real time Transport Protocol*).

So parameters used by the **RTP** protocol must be defined. They are available only using the command terminal :

1. Define the VoIP packets transmission port on the transceiver side :
 - ▶ **RTP PORT <port>**
2. Define the authorized beating when receiving the VoIP packets :
 - ▶ **RTP JITTER <value>**, expressed in ms, representing the authorized jitter between two consecutive packets received on the transceiver part,
3. Define the VoIP packet size for the packets generated by the transceiver :

- ▶ **RTP PSIZE <value>**, expressed in 10, 20 or 30ms, corresponding to the voice packets containing 80, 160 or 240 bytes.

Other attributes associated with the RTP session can be entered. So we find :

- Adding several sources of PTT (several users are authorized to share a frequency and speak simultaneously) : **RTP PTTSUM <ON/OFF>**,
- Adding several AF signals when operating in Re-transmission-Coupling mode : **RTP CPLSUM <ON/OFF>**,
- The clock skew management between source and recipient : **RTP SKEW <ON/OFF>**.

4.10.6 LIST OF NAMES OF NORMAL USERS

So the SIP protocol allows establishing a communication between the VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers and a user. In fact it is possible to define a list of several users able to use the « transceiver » resource, accessible through the network. These users are generally VCS used for Air Traffic management, and are divided into two categories: *the Normal users and the High priority users*.

This paragraph defines a users name list, up to 50 user names, corresponding to the **VCS having a Normal priority**, that can communicate with the VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers, through Adding and Removing controls.

To add or remove a Normal VCS (*Voice Communication System*), enter the following controls:

- VCS control for adding a Normal user:
 - ▶ **VCS NORMAL ADD <VCS name>**
- VCS control for removing a Normal user:
 - ▶ **VCS NORMAL REM <VCS name>**
- VCS control for suppressing all the Normal users:
 - ▶ **VCS NORMAL REM**

4.10.7 LIST OF NAMES OF HIGH PRIORITY USERS

This paragraph defines a users name list, up to 50 user names, corresponding to the **VCS having a High priority**, that can communicate with the VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers, through Adding and Removing controls:

- VCS control for adding a Normal user:
 - ▶ **VCS EMERGENCY ADD <VCS name>**
- VCS control for suppressing a Normal user:
 - ▶ **VCS EMERGENCY REM <VCS name>**
- VCS control for removing all the Normal users:
 - ▶ **VCS EMERGENCY REM**

4.10.8 COMMISSIONING

After the transceiver has been configured to operate in VoIP mode through the previous steps, it allows :

- On one hand the *reception of VoIP type frames containing the digitalized voice and PTT*, that it translates to an **analog signal for audio** and a **logical signal for PTT**,
- On the other hand the *transmission of VoIP type frames containing the digitalized received voice and CALL information*, from **an analog signal for audio** and **a logical signal for CALL**.

To do that, it uses a specific *Digital-to-Analog decoder*, previously configured by using the **CODEC** control of the terminal:

- **CODEC** G711 A law control for Europe : **CODEC PCMA ON**
- **CODEC** G711 μ law control for United States : **CODEC PCMU ON**

4.11 EQUIPMENT COMMISSIONING IN SNMP CONFIGURATION

4.11.1 PRESENTATION

The VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers include 4 Ethernet links. These ports allow to connect them to a IP network. So it is possible to remotely control and remotely monitor the equipment through an SNMP protocol.

There are no priority between the different sources of control (Terminal, JBUS 1, SNMP), so the last command correctly received will be executed, whatever its origin.

4.11.2 SNMP PROTOCOL

The units are compliant with the 3 versions of SNMP Protocol (*v1, v2c and v3*).

The MIB used by the SNMP agent on the TRX9000-2G, TRX9010-2G or TRX9020-2G transceivers is made of several MIB such a way to comply with the requirements of the ED137/5C standard from the RCMS point of view. The specific MIB of the transceivers is available in the following file :

TELERAD-TRX90X02G-MIB.TXT For series 9000-2G transceivers

The MIB OID for the TRX9000-2G, TRX9010-2G or TRX9020-2G transceivers is : **1.3.6.1.4.1.30397.8**. It can also be expressed by the following denomination : **ISO.ORG.DOD.INTERNET.PRIVATE.ENTREPRISES.TELERAD.TRX90X02G**

An Eurocontrol MIB, whose OID is : **1.3.6.1.4.1.2363.6.2.**, such as defined in the ED-137 standard, volume 5C Supervision, is also available in the radio devices, and can also be expressed by the following denomination: **ISO.ORG.DOD.INTERNET.PRIVATE.ENTREPRISES.EUROCONTROL.ATCCOMMUNICATION.ATCGRS**

It is defined in the standard as « the basic set of VoIP monitoring and control messages between VCS and GRS », and uses the « Trap » notion that allows the radio equipment to initiate an information transmission to the VCS. This MIB is available in the following files:

EUROCAE-COMMON-MIB.MIB MIB EUROCONTROL ED137/C Entry point
ATC-GRS-MIB.MIB MIB EUROCONTROL ED137/C

From this entry point, three groups of OIDs are available :

- The « Events » OIDs : **1.3.6.1.4.1.2363.6.2.0.**, or : **ISO.ORG.DOD.INTERNET.PRIVATE.ENTREPRISES.EUROCONTROL.ATCCOMMUNICATION.ATCGRS.ATCRADIOEVENTS**
- The « Objects » OIDs : **1.3.6.1.4.1.2363.6.2.1.**, or : **ISO.ORG.DOD.INTERNET.PRIVATE.ENTREPRISES.EUROCONTROL.ATCCOMMUNICATION.ATCGRS.ATCRADIOOBJECTS**
- The « Conformance » OIDs : **1.3.6.1.4.1.2363.6.2.2.**, or :

At last, a System MIB, defined as well in the ED-137 standard volume 5C Supervision, is also available in the radio devices, whose OID is: **1.3.6.1.2.1.1.**, and can be expressed by the following denomination: **ISO.ORG.DOD.INTERNET.MANAGEMENT.MIB-2.SYSTEM**

4.11.3 PARAMETERS TO BE MONITORED AND CONTROLLED

The parameters to monitor and control are supplied in the equipment MIB (See Paragraph « [Remote commands through SNMP link](#) » on page 103)*.

4.11.4 EQUIPMENT CONFIGURATION

The following parameters have to be configured, before the units are used:

- **The Network parameters:** IP Address, Subnet mask,
- **The SNMP parameters:** SNMP Port, SNMP protocol version to be used, communities (v1 and v2c), levels of protection, users and their password (v3). Values associated to the parameters are the default ones:
 - ▶ SNMP Port: 161
 - ▶ SNMP protocol version: the 3 available versions
 - ▶ Read community (v1/v2c): public
 - ▶ Write community (v1/v2c): private
 - ▶ Security level (v3): Authentication
 - ▶ Authentication Protocol (v3): MD5
 - ▶ Encryption protocol (v3): DES
 - ▶ Read user (v3): user1
 - ▶ Read password (v3): notpassword
 - ▶ Write user (v3): user2
 - ▶ Write password (v3): notpassword
 - ▶ SNMP engine ID (v3): <string of characters from 5 to 32 bytes>
 - ▶ Notification port (v3): 162
 - ▶ Notification recipient (v3): /
 - ▶ Contact (system): telerad@telerad.fr
 - ▶ Location (system): TELERAD 64600 ANGLET – FRANCE
 - ▶ Name (system): TRX90x0-2G
 - ▶ « Heart Beat » activity: OFF
 - ▶ « Heart Beat » interval: 1

These parameters can be configured by a command terminal connected to one of the ETHERNET connectors located on the rear panel of the equipment.



REMARKS ABOUT SNMPv3:

1 - The SNMP agent embedded in the equipment uses an authentication mechanism :

- ▶ Either the **MD5 algorithm**: Cryptographic hash function that produces a 128-bits hash value,
- ▶ Or the **SHA algorithm**: Cryptographic hash function designed by NSA stronger than MD5.

It uses also a encryption mechanism :

- ▶ Either the **DES algorithm**: Symmetrical cyphering algorithm using 56-bits keys,
- ▶ Or the **AES algorithm**: Symmetrical cyphering algorithm, approved by NSA and stronger than DES (128-bits key).

2 - The SNMP engine ID is a unique identifier for every « SNMP machine » embedded in the device, and is made of the following:

- ▶ The very first bit is always 1 (SNMPv3),
- ▶ The first 4 bytes define the number of the private company delivered by IANA,
- ▶ The fifth byte specifies the format of the following bytes. For instance, value 4 means that they correspond to a text string whose maximum value is 27 bytes,
- ▶ The following bytes depend on the company.

3 - Notifications are sent, through the specified port, to a list of recipients whose addresses are also specified. By default, this list is empty and the port is 162.

4 - At last, « Contact », « Location » and « Name » are OIDs defined in the System MIB, that correspond to System information.



For more details about the MIB, refer to document [2] **ICDGB 9000-2G Series TRX90x0-2G SNMP**, TELERAD P/N 40600039: Interface Control Document relating to the SNMP protocol supervision link.

4.12 PROCEDURE FOR SOFTWARE UPLOAD

The VHF TRX9000-2G, UHF TRX9010-2G and V/UHF TRX9020-2G transceivers have a « Web server » function inside, that allows to access an HTML page for software updating.



Fore more details about the procedure, refer to document [4] **KITGB Series 9000-2G**, TELERAD P/N 40700003: Procedure for software release through a Web Server HTML page.

4.13 COMMAND OF A CAVITY FILTER

4.13.1 PRESENTATION

A VHF TRX9000-2G or UHF TRX9010-2G transceiver equipped with an internal antenna coaxial relay that allows to connect a single Transmission/Reception antenna, is able to control a tunable motorized cavity, that can be either external or internal:

- **If the cavity filter is external**: It can be located between the ANT. output **J9** of the relay and the antenna. It is managed in this case by the transceiver itself, through an RS485 serial link under a JBUS protocol.

The serial link used is the one present on the DATA connector **J26**, normally used in the ACARS or VDL2 digital modes for receiving data to be transmitted.

In the A3E, F3E and G3E modes, this serial link is dedicated to the command of a cavity, in which the transmitter is JBUS Master and the cavity the JBUS Slave.

- **If the cavity filter is internal**: The TRX9000-2G or TRX9010-2G transceiver embeds in this case an internal cavity, directly installed inside its mechanical chassis. It requires only to connect the **J9** ANT. output of the relay to the **J41** FILTER IN connector, and the **J40** FILTER OUT to the

antenna. The cavity tuning is done by the transceiver through an internal connector **J50** of the CTNU/CTTQ PCB, including a serial link interface, under a JBUS protocol.

The TRX9020-2G is also for its own able to control an internal cavity, directly installed inside its mechanical chassis. It requires only to connect the **J11** RF OUT/ANT output to the **J41** FILTER IN connector, and the **J40** FILTER OUT to the antenna. For its part, the **J3** RF IN antenna input must be connected to the **J12** CONNECT TO J3 SINGLE ANTENNA connector through an external coaxial cable. Then the tuning is done by the TRX9020-2G through an internal connector **J50** of the CTNU/CTTQ PCB, including a serial link interface, under a JBUS protocol.

Once the cavity has been declared present to the transceiver, **any frequency change done by the transceiver**, whatever the source of modification, **involves an automatic tuning of the cavity on the new frequency**, without any intervention by the user. During this tuning phase, **the transceiver is automatically inhibited** (*Transmission Inhibition command « active »*).

At last, the cavity status as well as the serial link one are displayed in the integrated IBIT and CBIT tests.



For programming the « CAVITY » command or using the « IBIT » or « CBIT » tests, refer to document **[1] ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the RS232 front panel interface.

In case of communication failure or cavity default, the « Alarm » led on the transceiver front panel switches on (○ ⇒ ●). The default will be acknowledged only by generating a « OFF / ON » front edge on the « OFF / ON » control.

4.13.2 TECHNICAL CHARACTERISTICS FOR THE TRX9000-2G AND THE TRX9010-2G

- JBUS characteristics:
 - ▶ Start bit : **1**,
 - ▶ Data bits : **8**,
 - ▶ Parity : **No**,
 - ▶ Stop bit : **1**,
 - ▶ Rate : **19200 bauds**,
 - ▶ Slave address : **1**,
 - ▶ Number of « idle » characters : **3**.
- Pinout of the radio equipment RJ45 8 pins « DATA » connector **J26 for the external cavity filter**:
 - ▶ Pin 4: TxD+ : Not inverted Data transmission,
 - ▶ Pin 5: TxD- : Inverted Data transmission,
 - ▶ Pin 2: RxD+ : Not inverted Data reception,
 - ▶ Pin 1: RxD- : Inverted Data reception,
 - ▶ Pins 3 and 6: GND : Electrical ground
- Pinout of the CTNU/CTTQ PCB Internal ATI 10 pins Male connector **J50 for the internal cavity filter**:
 - ▶ Pins 1, 2, 5 and 6: GND : Electrical ground,

- ▶ Pins 3 and 4: PWR18 : DC power supply $+V_1$ =
 - ▶ Pin 7: CAVITY_TxD : Data transmission to the cavity,
 - ▶ Pins 8 and 10: / : Keying pins,
 - ▶ Pin 9: CAVITY_RxD : Data reception from the cavity.
- Pinout on the cavity **for the External Cavity**: Directly depends on the type of cavity used (*MT or TELSA references*). Here below, an example of connection on the RJ45 connector of a TELSA cavity:
- ▶ Pin 1: Tx Data (-) : Inverted Data transmission
 - ▶ Pin 2: Tx Data (+) : Not inverted Data transmission
 - ▶ Pin 3: GND : Electrical ground
 - ▶ Pin 4: Rx Data (+) : Not inverted Data reception
 - ▶ Pin 5: Rx Data (-) : Inverted Data reception
 - ▶ Pin 6: GND : Electrical ground
 - ▶ Pins 7 and 8 : Not connected
- Pinout on the cavity **for the Internal Cavity**: TELERAD reserved. The connexion is done using a specific cable between the CTNU/CTTQ **J50** connector and this one.



NOTE: For a proper operation of the serial link, a standard **ETHERNET straight cable** can be used.

- Power supply:
- ▶ **For the External Cavity**: Depending on the type of cavity, it is generally supplied either from mains, or from a $+24V_{DC}$ DC source, or both of them.
 - ▶ **For the Internal Cavity**: The power supply is obtained from the internal connector **J50** of the CTNU/CTTQ PCBs (*pins 3 and 4*).
- Data exchange:
- ▶ The data exchange is done through JBUS Read only or Read/Write tables. An identification JBUS table allows identifying the structure of the JBUS tables used.
 - ▶ Information available in the **Read-only table** is:
 - The cavity tuning frequency,
 - The cavity Alarm information,
 - The cavity status (Tuning / Ready),
 - The tuned frequency (OK / NOK),
 - The channel spacing and the frequency offset (eventually),
 - The minimum frequency tunable by the cavity,
 - The maximum frequency tunable by the cavity.
 - ▶ Information available in the **Read/Write table** is:
 - The frequency to be tuned,
 - The cavity locking (« Parking » position),
 - The tuning launching,
 - The channel spacing and the frequency offset (eventually) to be programmed.

4.13.3 ADJUSTMENT PROCEDURE USING A TRX9000-2G OR A TRX9010-2G

MAINTENANCE SHEET: R1

EQUIPMENT: TRX9000-2G VHF, TRX9010-2G UHF and TRX9020-2G V/UHF DIGITAL TRANSCEIVER

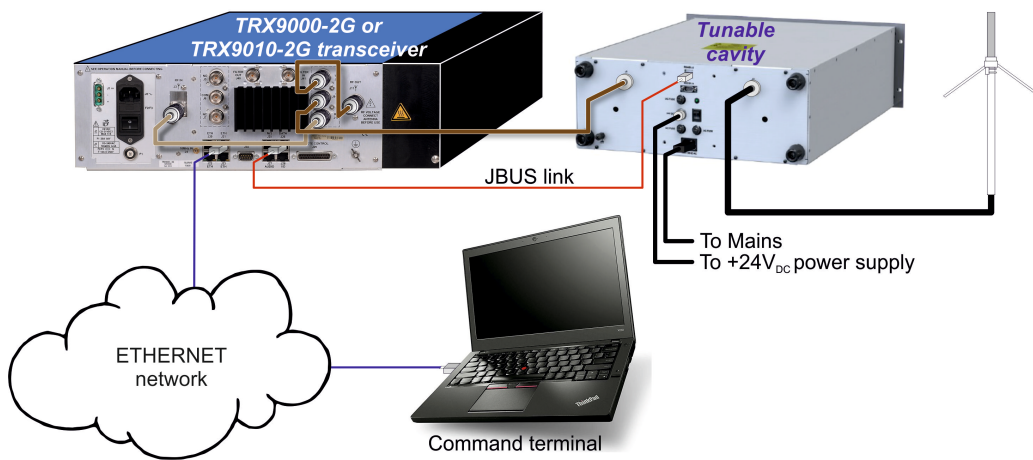
SCOPE: Tuning a cavity.

INVOLVED STAFF: 2^d and 3^d degree

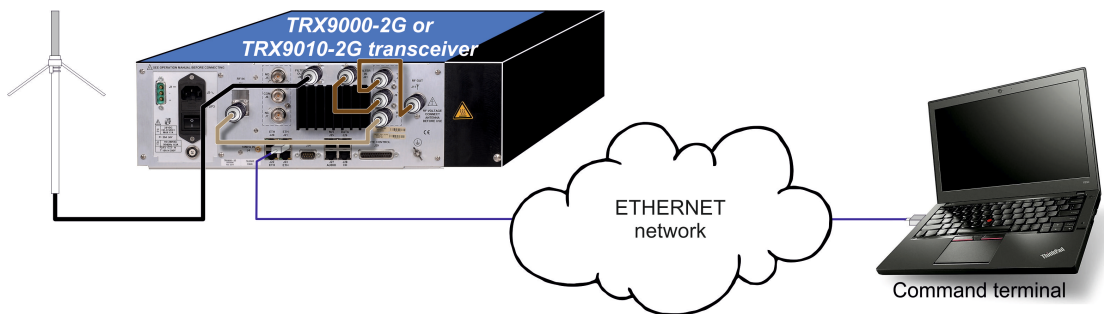
PRELIMINARY CONDITIONS:

- A PC in terminal emulation is supposed connected on one of the 4 « ETHERNET » connectors located on the rear panel of the transceiver.
- Transceiver and cavity are supposed power supplied.

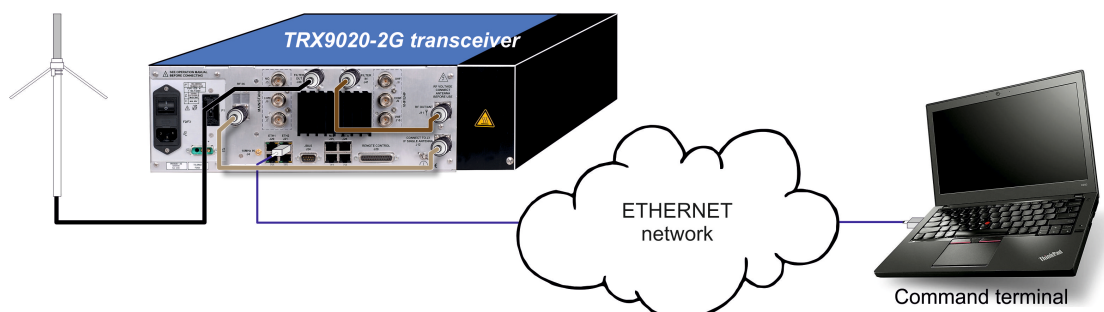
INSTALLATION DIAGRAM WITH AN EXTERNAL CAVITY:



INSTALLATION DIAGRAM WITH AN INTERNAL CAVITY (TRX9000/9010-2G):



INSTALLATION DIAGRAM WITH AN INTERNAL CAVITY (TRX9020-2G):



ADJUSTMENT PROCEDURE:

- Using the terminal, enter the « CAVITY? » command and check the cavity status:
TRX90002G> cavity?
ACTIVITY : **OFF**
STATUS : OK
STATE : READY
COMMUNICATION : OK
ADDRESS : 1
BAUD RATE : 19200
IDLE NB : 3

- Using the terminal, enter the « CAVITY ACTIVITY » command then check again the cavity status using the « CAVITY? » command:
TRX90002G> cavity activity on
OK

TRX90002G> cavity?
ACTIVITY : **ON**
STATUS : OK
STATE : READY
COMMUNICATION : OK
ADDRESS : 1
BAUD RATE : 19200
IDLE NB : 3

- Using the terminal, program the frequency to be tuned. Verify that cavity motor starts.

- Enter again the « CAVITY? » command and check the cavity is now in tuning phase:
TRX90002G> cavity?
ACTIVITY : ON
STATUS : OK
STATE : **TUNING**
COMMUNICATION : OK
ADDRESS : 1
BAUD RATE : 19200
IDLE NB : 3

- Using the terminal, enter the « RSTAT? » command, then check the transceiver is inhibited during the tuning phase:
TRX90002G> rstat?
EQUIPMENT STATUS : **NOK**
CBIT STATUS : OK
IBIT STATUS : OK
INHIBITION : **YES**
CAVITY : OK
PTT STATUS : OFF
EXTERNAL FAN : OFF

POWER-UP NUMBER : 37
IN SERVICE TIME : 150H

- Wait for the end of the cavity tuning, then using the terminal, enter the « CAVITY? » then « RSTAT? » commands, and check that cavity and transceiver are ready again to operate:

TRX90002G> cavity?

ACTIVITY : ON
STATUS : OK
STATE : READY
COMMUNICATION : OK
ADDRESS : 1
BAUD RATE : 19200
IDLE NB : 3

TRX90002G> rstat?

EQUIPMENT STATUS : **OK**
CBIT STATUS : OK
IBIT STATUS : OK
INHIBITION : **NO**
CAVITY : OK
PTT STATUS : OFF
EXTERNAL FAN : OFF
POWER-UP NUMBER : 37
IN SERVICE TIME : 150H

- **In case of linking failure** between the transceiver and the cavity, the « CAVITY? » command allows displaying the problem:

TRX90002G> cavity?

ACTIVITY : ON
STATUS : OK
STATE : READY
COMMUNICATION : **NOK**
ADDRESS : 1
BAUD RATE : 19200
IDLE NB : 3

- On a same way, the « CBIT? » command displays a default with the cavity:

TRX90002G> cbit?

CBIT STATUS : **NOK**
CBIT MIDS : OK
CBIT CTRL : OK
CBIT AMP : OK
CBIT SY : OK
CBIT REAL : OK
CBIT ALIM : OK
CBIT ROS : OK
CBIT CAVITY : **NOK**

- After fixing the cause of Alarm, the Alarm information update is made either on a change of state of the « **ON/OFF** » command, or with the **PTT control** (*going on transmission*).

4.14 « SCAN » FUNCTION

4.14.1 PRESENTATION

From software version **V2.30**, the series 9000-2G transceivers include a « SCAN » function that allows to periodically scan several channels in traffic or in listening, previously selected in a polling list.

Channels can operate either in the VHF range or in the UHF one, and use A3E or F3E modulation .

Commissioning the « SCAN » function requires two dedicated controls « SCAN » and « SEARCH », as well as the « LOG? » control to display historical.



For more details about SCAN, SEARCH and LOG? commands, refer to document **[1] ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.

4.14.2 AVAILABLE FUNCTIONS

Managing channels involved in the periodical polling assumes the following functions have been downloaded in the devices:

- Possibility to program channels to be supervised,
- Possibility to declare a channel as **Priority n°1**, **Priority n°2** or **Favorite**,
- Availability of different types of polling :
 - ▶ Polling the **programmed channels**,
 - ▶ Polling the **favourite channels**,
 - ▶ Polling the **priority channels**,
 - ▶ Possibility to **mix priority channels with both other types**,
 - ▶ Polling the **priority channel n°1** and **current operating channel** (*Dual monitoring*),
 - ▶ Polling the **priority channel n°1**, **priority channel n°2** and **current operating channel** (*Triple monitoring*).
- Possibility to save up to **128** favourite channels,
- Signalling of the polling conditions,
- Possibility to enable/disable transmission in the scanned channels, signalling the disabling,
- Possibility to filter permanent calls, removing the concerned channel from the list of scanned channels,
- Squelches management:
 - ▶ **During polling**: RF1 squelch enabled by default (*RF2 squelch disabled*), and possibility to associate the SNR squelch.
 - ▶ **When the polling is disabled**: Squelches return to their initial value.
- Historical of the **128** last calls with timestamp and possibility to clear it,
- Log file generation to follow any event linked to the scanning (*calls, configuration changes, etc...*).

4.14.3 MODES OF TRANSMISSION

Three modes of transmission are available:

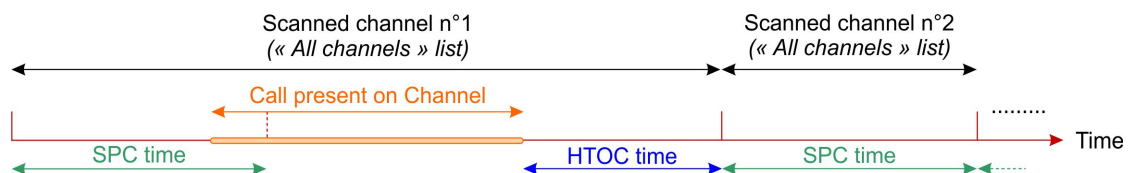
- The **Enabled transmission** (*TX ENABLED*): The user can transmit only on the channel receiving a call during the polling,
- The **Disabled transmission** (*TX DISABLED*): The user cannot transmit even if a call has been detected during the polling,
- The **transmission on Operating channel** (*TX OPER*): The user can transmit only on the Operating channel, even if a call has been received on the channel currently scanned.

4.14.4 ASSOCIATED TIMES

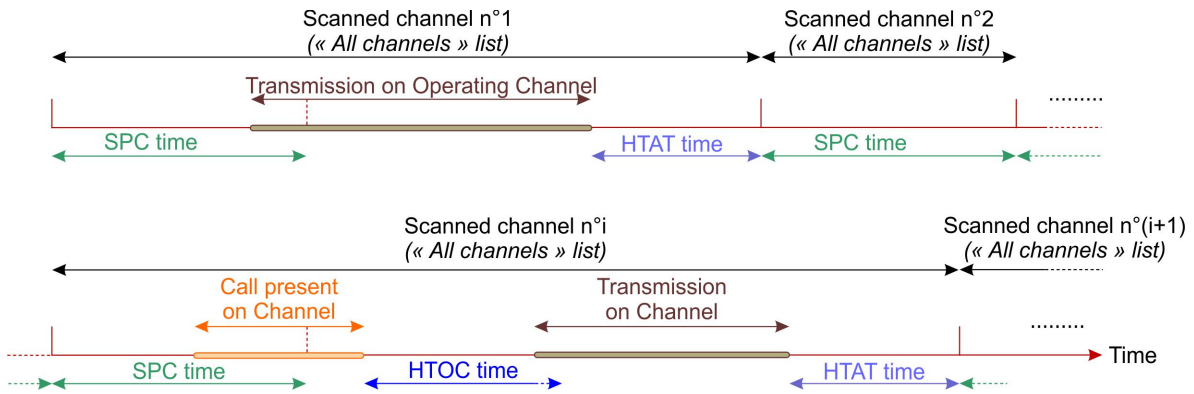
Several timing parameters related to channels scanning must be configured:

- **SPOC: Scanning period of the Operating Channel:** Call search time on the main Operating channel.
SPOC \in [300, 5000], expressed in milliseconds, by step of 100ms. Its default value is **500ms**.
- **SPPC: Scanning period of the Priority Channels:** Call search time on priority channels.
SPPC \in [300, 5000], expressed in milliseconds, by step of 100ms. Its default value is also **500ms**.
- **SPC: Scanning period of Channels:** Call search time on not-priority and not-operating channels.
SPC \in [300, 5000], expressed in milliseconds, by step of 100ms. Its default value is also **500ms**.
- **HTOC: Hold Time On Call:** Hold time following a call end, before resuming the scanning.
HTOC \in [0, 60], expressed in seconds, by step of 1s. Its default value is **5s**.
- **HTAT: Hold Time After Transmission:** Hold time following a transmission end, before resuming the scanning,
HTAT \in [0, 60], expressed in seconds, by step of 1s. Its default value is also **5s**.

The timing diagram here-below shows a HTOC time once a call is detected on the scanned channel before the SPC polling time is out:



On a same way, the timing diagram here-below shows HTAT and HTOC times once a transmission has been realized either on the current Operating channel or on the scanned channel before the SPC polling time is out, following or not a call reception:



So, transmission on a channel will be possible if the following conditions have been matched:

- ▶ Call present on the channel or HTOC not totally elapsed,
- ▶ Transmission authorized in Channel scanning mode and transmission on channel enabled.

4.14.5 CHANNELS TYPE AND ACCESS TYPE

As specified in the Available functions paragraph, channels involved in the scan can be of different types:

- **Without:** This kind of channel is scanned when the radio device is configured in the « All channels » or « Priority and All channels » polling modes. All preset channels must pertain this category by default.
- **Priority channel n°1:** This kind of channel is scanned when the radio device is configured in the « All channels », « Priority channels », « Priority and Favourite channels », « Priority and All channels », « Dual monitoring » and « Triple monitoring » polling modes.
Example: The VHF Guard frequency 121.500MHz or channel 16 in Marine mode is this type of channel.
- **Priority channel n°2:** This kind of channel is scanned when the radio device is configured in the « All channels », « Priority channels », « Priority and Favourite channels », « Priority and All channels » and « Triple monitoring » polling modes.
Example: The UHF Guard frequency 243MHz or channel 9 in Marine mode is this type of channel.
- **Favourite channel:** This kind of channel is scanned when the radio device is configured in the « All channels », « Favourite channels », « Priority and Favourite channels » and « Priority and All channels » polling modes.

On a same way, channels can be configured according to several access types:

- **Authorized access:** The channel can be operated by the radio device, and all information related to the channel is displayed,
- **Protected access:** The channel can be operated by the radio device, but frequency and modulation are no more displayed,
- **Inhibited access:** The channel cannot be operated by the radio device.

4.14.6 POLLING CYCLES

Paragraphs here-below show the different polling cycles depending on the channel type included in the scanned channels list.

4.14.6.1 POLLING ALL CHANNELS

All channels present in the All-Channels list are scanned in the ascending order then, after scanning the last channel in the list, the cycle restarts to the first one:

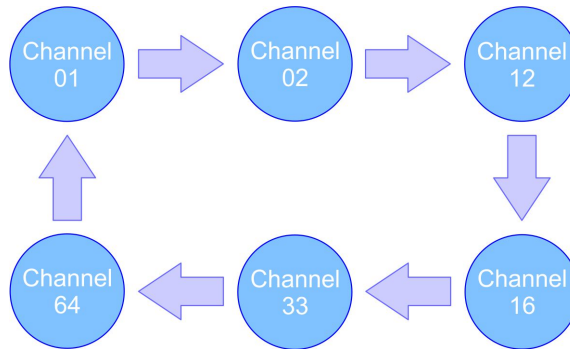


Figure 35 : All channels scanning

The polling timing diagram is as following:



4.14.6.2 POLLING FAVOURITE CHANNELS

All channels memorized in the Favourite-channels list are scanned in the ascending order then, after scanning the last channel in the list, the cycle restarts to the first one:

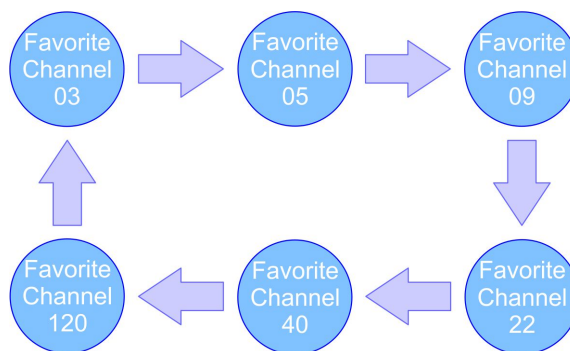
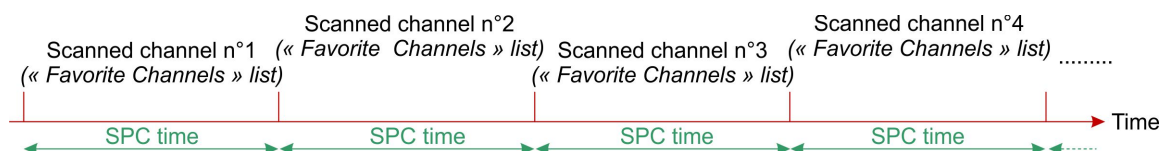


Figure 36 : Favorite channels scanning

The polling timing diagram is as following:



4.14.6.3 POLLING PRIORITY CHANNELS

Both priority channels selected in the Priority-Channels list are scanned in the 1 ⇒ 2 order then the cycle restarts on the first one:

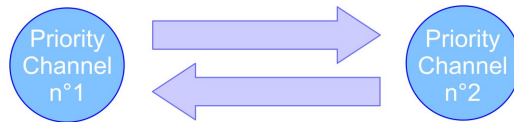
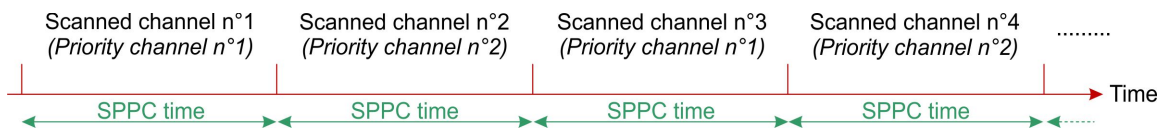


Figure 37 : Priority channels scanning

The polling timing diagram is as following:



4.14.6.4 POLLING PRIORITY AND FAVOURITE CHANNELS

Both priority channels selected in the Priority-Channels list as well as all channels memorized in the Favourite-Channels list are scanned in the Priority channel n°1 ⇒ Priority channel n°2 ⇒ Favourite channel n°1, then Priority channel n°1 ⇒ Priority channel n°2 ⇒ Favourite channel n°2, etc... order. After scanning the last channel in the Favourite-list, the cycle restarts to the Priority channel n°1:

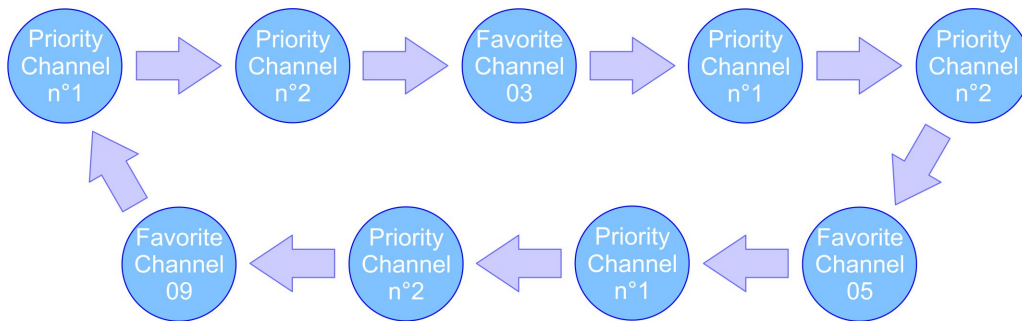


Figure 38 : Priority and favorite channels scanning

The polling timing diagram is as following:



4.14.6.5 POLLING PRIORITY AND ALL CHANNELS

Both priority channels selected in the Priority-Channels list as well as all channels memorized in the All-Channels list are scanned in the Priority channel n°1 ⇒ Priority channel n°2 ⇒ Channel n°1, then Priority channel n°1 ⇒ Priority channel n°2 ⇒ Channel n°2, etc... order. After scanning the last channel in the All-list, the cycle restarts to the Priority channel n°1:

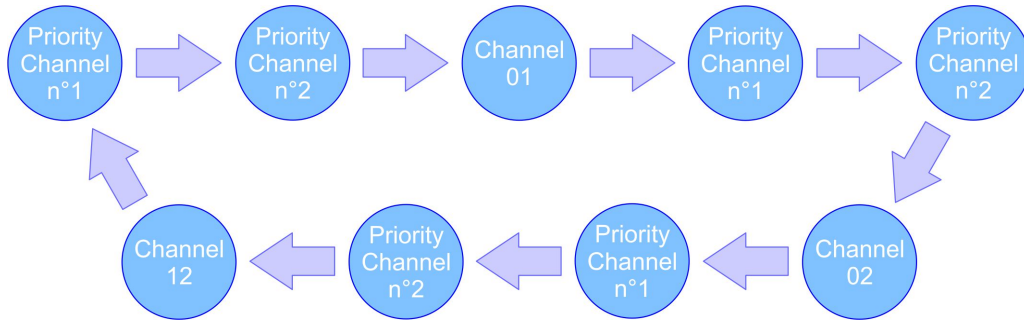


Figure 39 : Priority and all channels scanning

The polling timing diagram is as following:



4.14.6.6 POLLING IN DUAL MONITORING

Priority channel n°1 selected in the Priority-Channels list then current Operating channel are scanned in the Priority channel n°1 ⇒ Operating channel order then the cycle restarts on Priority channel n°1:

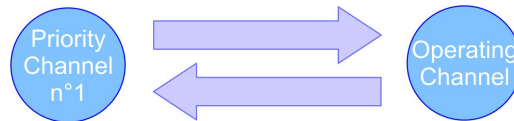


Figure 40 : Dual monitoring scanning

The polling timing diagram is as following:



4.14.6.7 POLLING IN TRIPLE MONITORING

Both priority channels selected in the Priority-Channels list as well as the current Operating channel are scanned in the Priority channel n°1 ⇒ Priority channel n°2 ⇒ Operating channel order. Then the cycle restarts to the Priority channel n°1:

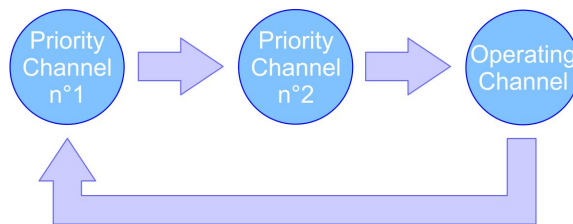
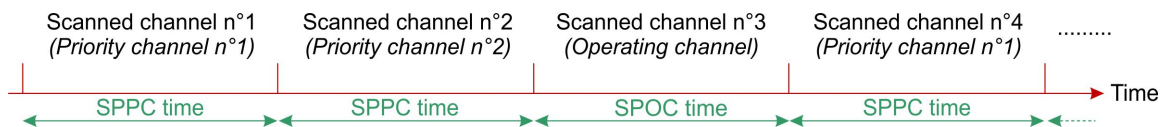


Figure 41 : Triple monitoring scanning

The polling timing diagram is as following:



4.14.7 POLLING TYPES

Three types of polling are available:

- The **Continuous polling** (*CONTINUOUS*): It scans **indefinitely** the polling loop defined by the user,
- The **Standalone polling** (*ONCE*): It scans **only once** the polling loop defined by the user,
- The **First polling** (*FIRST*): It scans the polling loop defined by the user up to **detect a Call**. Once detected, the channel receiving the Call becomes the Operating channel and the polling stops.

4.14.8 ADDITIONAL FUNCTIONS FOR POLLING

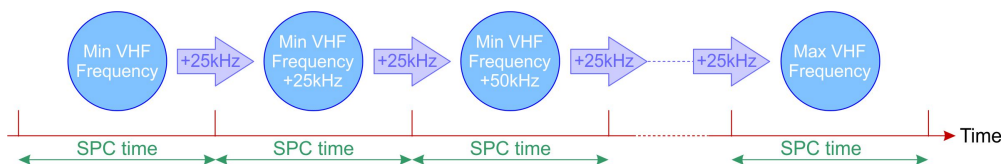
Several functions added to the scanning allow a more precise use of the « SCAN » function. So are available:

- **Possibility to pass over a channel receiving a Call:** The user can pass over the channel currently receiving a call to resume the polling of others channels in the polling loop,
- **Pause / Polling resume:** The user can also temporarily stop the polling loop, then resume it when he wants at the point where it stopped,
- **Possibility to suppress a channel currently receiving a Call:** The user can temporarily suppress a channel receiving a Call from the polling loop up this loop stops. Following the stop, the suppressed channel is automatically replaced in the polling list.

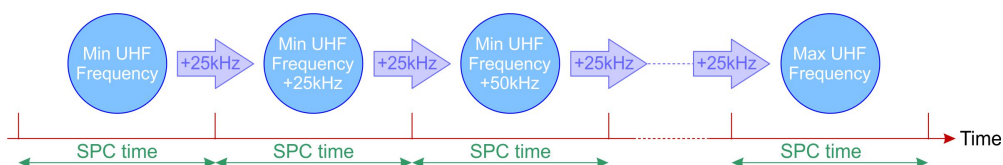
4.14.9 POLLING FREQUENCY RANGES

When a frequency polling is enabled, the radio device scans the user-defined frequency range by step of 25kHz, with an also user-defined time interval, using the « SPC » parameter:

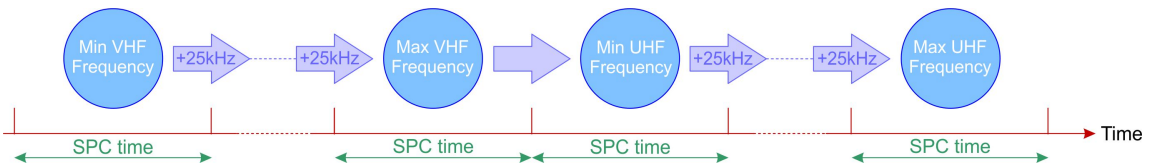
- **VHF scanning:** The VHF range is scanned as indicated here-below:



- **UHF scanning:** The UHF range is scanned as indicated here-below:



- **V/UHF scanning:** The VHF and UHF ranges are scanned as indicated here-below:



4.14.10 PENDING FUNCTIONS

The future evolution of the « SCAN » function plans to include the following functionalities:

- Management of Duplex channels (*Different transmission and reception frequencies, possibility to swap transmission and reception frequencies*),
- Management of channels number over 4 digits (*Marine channels*),
- Management of labels associated to channels over 12 characters,
- Management of transmission output power in channels (*Marine channels*),
- Polling of VHF or UHF sub-ranges,
- Evolution of the Calls historical by displaying the Field voltage of each Call.

CHAPTER V

OPERATION - MAINTENANCE

5.1 PRESENTATION

This chapter provides:

- On one hand, the information required for programming and operating the radio equipment:
 - ▶ **Either locally:**
 - Via the front panel **screen/keyboard**,
 - Via a **command Terminal** directly connected to one of the 4 « ETHERNET » connectors to the rear panel, under a TELNET protocol.



REMARK: The « MAINTENANCE » Slave USB connector located on the front panel is exclusively Telerad reserved.

- ▶ **Or remotely:**
 - Via the same **command Terminal** under the TELNET protocol, connected now to a Network switch,
 - Via the **JBUS link**,
 - Via the **SNMP link**.
- On the other hand, the information related to the equipment Maintenance:
 - ▶ From **Default locations** via the front panel **screen/keyboard**,
 - ▶ From **Maintenance actions:**
 - Either **preventive**, such as adjustment or cleaning actions,
 - Or **corrective**, by replacing the defective element.

5.2 COMMANDS AVAILABLE FOR OPERATION

Commands available on the equipment have several origins:

- Commands through the HMI,
- Commands through the Command terminal,
- Commands through the JBUS link,
- Commands through the SNMP link.

5.2.1 LOCAL COMMANDS THROUGH THE SCREEN/KEYBOARD INTERFACE

The HMI structure is as following:

Main menu: Change Control to Local ?

POWER: Adjustment of the Output power and the compressed Modulation ratio of the carrier

SQL: Choice of Squelches

SQL RF: Squelch management on carrier level criterion and Threshold adjustment

SQL SNR: Squelch management on S/N ratio criterion and Threshold adjustment

Operator: Selection of the logical operator applied on the squelches

2d threshold Management: Management of the second RF threshold

AUDIO: Adjustment of the Audio signals and the Listening feedback

ANALOG: Input and Output line level adjustment

AF & RF Outputs: Selection of the support used for the AF listening feedback, with possibility to activate a Radio Silence mode

MODE / FREQ / OFFS: Selection of the Operating parameters

MANUAL: Selection of the modulation mode, the operational frequency and the offset frequency

PRESET: Operating channels programming

Select: Selection of an operating pre-programmed channel

Create/Modify: Creation / modification of a pre-programmed channel

Clear: Clearing a pre-programmed channel or all channels

SCAN: Scanning Preset channels

SETUP: Transceiver configuration

ON/OFF: Selection of the On/Off Command or the Redundancy mode

PTT: Selection of the PTT time-out

Display: Selection of display parameters

IP: IP parameters

ETH1: Ethernet channel no. 1 parameters (Address and Mask)

ETH2: Ethernet channel no. 2 parameters (Address and Mask)

ETH3: Ethernet channel no. 3 parameters (Address and Mask)

ETH4: Ethernet channel no. 4 parameters (Address and Mask)

GATE: Default gateway parameters (Address)

COMP: Activation/Deactivation of the reception audio compressor

Remote ctl: Activation of remote control of the equipment

MAINT: Radio equipment maintenance

Measures: Radio measurements

Test: Radio testing

CBIT: Radio continuous test (CBIT)

IBIT: Radio initiated test (IBIT) and viewing report

TESTS: Continuous tests

CW: Test in Transmission with a non-modulated carrier

TONE: Test in Transmission with a modulated carrier (AF signal 1kHz)

RX: Test in reception (RF and AF)

MODE2: Test in Transmission with a modulated carrier (binary frame). Available only if the operating mode is « VDL2 »

TCXO: Adjustment of frequency Master Oscillator(s)

About : Information about the model, serial no. and software version



For more information, see *paragraph* « [Local operation through the front panel Screen/Keyboard interface](#) » on page 104*.

5.2.2 COMMANDS WITH THE TERMINAL

The command terminal can be used locally as well as remotely via one of the « ETHERNET » ports located on the rear side of the transceiver, under a TELNET protocol.

The connection supplies **two sets of commands** allowing to configure the different parameters of the equipment:

- A first set of commands at the « **GUEST** » level, available without login. The commands available at this level correspond to the ones available on the HMI interface,
- A second set of commands at the « **ADMINISTRATOR** » level, available with login.



For more details about commands, refer to document **[1] ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.

5.2.3 REMOTE COMMANDS THROUGH THE JBUS LINK

Two types of tables are available through JBUS:

- The Read/Write table,
- The Read only table.



For more details about the JBUS tables, refer to document **[3] ICDGB 9000-2G series TRX90x0-2G JBUS**, TELERAD P/N 40600038: Interface commands document relating to the JBUS protocol supervision link.

5.2.4 REMOTE COMMANDS THROUGH SNMP LINK

The transceiver MIB is made of 3 separated MIBS : The Telerad MIB, the Eurocae MIB and the System MIB.



For more details about the MIB, refer to document **[2] ICDGB 9000-2G Series TRX90x0-2G SNMP**, TELERAD P/N 40600039: Interface Control Document relating to the SNMP protocol supervision link.

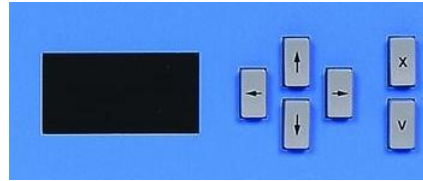
5.3 LOCAL OPERATION OF EQUIPMENT

Two types of local operation are available:

- Through the HMI,
- Through the Command terminal interface.

5.3.1 LOCAL OPERATION THROUGH THE FRONT PANEL SCREEN/KEYBOARD INTERFACE

The Screen/Keyboard interface of the front panel has been designed as shown here after :

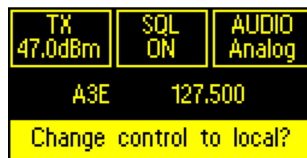


5.3.1.1 SCREEN OPERATING

The screen of the radio equipment is a 128x64 pixel OLED screen, 20x40mm in size, for which each pixel can be accessed and lit independently. It allows the user to:

- Configure and monitor the equipment locally,
- View the mode and the various operating parameters.

By default, the equipment is systematically placed under remote control, through a JBUS or SNMP link. Pressing any key on the keyboard allows part of the operating screen to be displayed, and gives the option to take back local control of the equipment:



By pushing the Valid key of the keyboard, the screen displays the following message: « **ANY PARAMETER MODIFICATION WILL DISCONNECT VOIP SESSIONS** », followed by a confirmation request for a local control.

This means also that **any read-only action in local mode of parameters or measurements will not involve any disconnection.**

The corresponding screen is:



By pressing the validation key on the keyboard, the equipment changes to local mode, and the screen displays the complete operating menu:



After 5 minutes of inactivity, a standby message is displayed randomly on the screen, and control of the equipment automatically changes back to remote:



The operating screen is divided into functional zones, which are accessed using the keys on the keyboard.

All zones of the welcome screen can be activated, the ones outlined with a rectangle as well as the center one.

Example of a zone that can be activated:



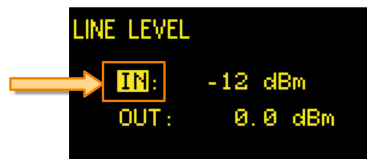
When it is activated, the zone is displayed in reverse video. It will then be possible to access sub-menus and parameters or to modify a value if necessary.

Example of activated zones:

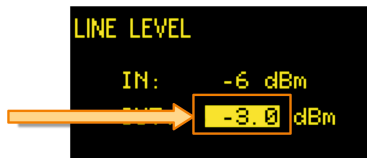
1 – Sub-menu:



2 - Parameter:

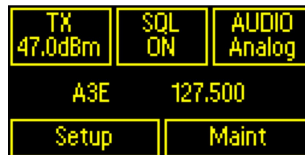


3 – Parameter value:

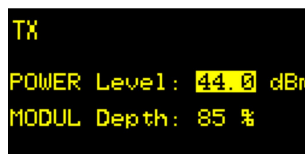


There are various types of screens :

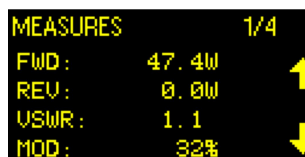
Screen with zones that can be activated: (Example: Main menu)



Parameter value entry screen: (Example: Output power)








Information display screens: (Example: Measurements)



5.3.1.2 KEYBOARD OPERATING

The front panel keyboard is made up of 6 pushbuttons:

- Four moving buttons , ,  and .

- ▶ The  button allows:


- Either to move in the main menu or the submenus, from active zone to active zone towards the top of the screen, by scrolling up (*moves from the first line to the last line*),
- Or to move upside in the configuration screens, from « parameter » filed to « parameter » field, scrolling them up too,
- Or to decrease the information pages in the display screens, always scrolling them up,
- Or at last to increase the « value » field of a parameter, up to its maximum value.

- ▶ The  button allows:


- Either to move in the main menu or the submenus, from active zone to active zone towards the bottom of the screen, by scrolling down (*moves from the last line to the first line*),
- Or to move downside in the configuration screens, from « parameter » filed to « parameter » field, scrolling them down too,
- Or to increase the information pages in the display screens, always scrolling them down,
- Or at last to decrease the « value » field of a parameter, up to its minimum value.


- ▶ The  button allows:

- Either to move from active zone to active zone towards the right then towards the bottom of the main menu or the submenus, wrapping around (*moves from the last zone in the bottom right to the first zone in the top left*),
- Or to select the « value » field of a parameter in the configuration screens,
- Or at last to select a particular digit to the right of a « value » field in the configuration screens.

- ▶ The  button allows:

- Either to move from active zone to active zone towards the left then towards the top of the screen, wrapping around (*moves from the first zone in the top left to the last zone in the bottom right*),
- Or to come back on a « parameter » field from a « value » field in the configuration screens,
- Or at last to select a particular digit to the left of a « value » field in the configuration screens.

- ▶ A  validation button: It allows:
- Either select a zone that can be activated,
 - Or to validate a change of value of a particular parameter.

- ▶ Lastly, the  escape button: It allows to cancel:
- Either the selection of a zone that can be activated,
 - Or the modification of a parameter value.

In all cases, pressing this button takes back either to the main operating screen, or to the previous menu in the tree structure.

5.3.1.3 COMMANDS DESCRIPTION

5.3.1.3.1 MAIN MENU

When the TRX9000-2G or TRX9010-2G transceiver is powered on, it first launches its startup sequence for a few seconds, then displays the main operating screen on the front panel display. This menu indicates the current operating parameters.

Having selected local control of the equipment, from this main screen and using the keys on the local keyboard, it will then be possible to select a zone and to modify the value.

The accessible zones are the following :

POWER zone: Allows you to access the output power selection and the compressed modulation ratio menu.

TX 47.0dBm	SQL ON	AUDIO Analog
A3E		127.500
Setup	Maint	

SQL zone: Displays the programmed value of the squelch threshold selected according to the carrier level and/or SNR criteria, and gives access to the menu to activate and modify these values, as well as the associated parameters.

TX 44.0dBm	SQL ON	AUDIO Analog
A3E		127.500
Setup	Maint	

AUDIO zone: Displays the type of AF transmitted and received by the transceiver. In Analog mode, allows to configure the input and output AF levels.

TX 47.0dBm	SQL ON	AUDIO Analog
A3E		127.500
Setup	Maint	

- MODE / FREQ zone:** Allows to access :
- Either to the Mode, Frequency and Offset frequency programming menu, according to the ICAO recommendations relatively to the 8.33kHz, 12.5kHz or 25kHz channels,
 - Or to the Preset channels programming menu.

TX 47.0dBm	SQL ON	AUDIO Analog
A3E		127.500
Setup	Maint	

Setup zone: Gives access to different transceiver configuration menus.

TX 47.0dBm	SQL ON	AUDIO Analog
A3E		127.500
Setup	Maint	

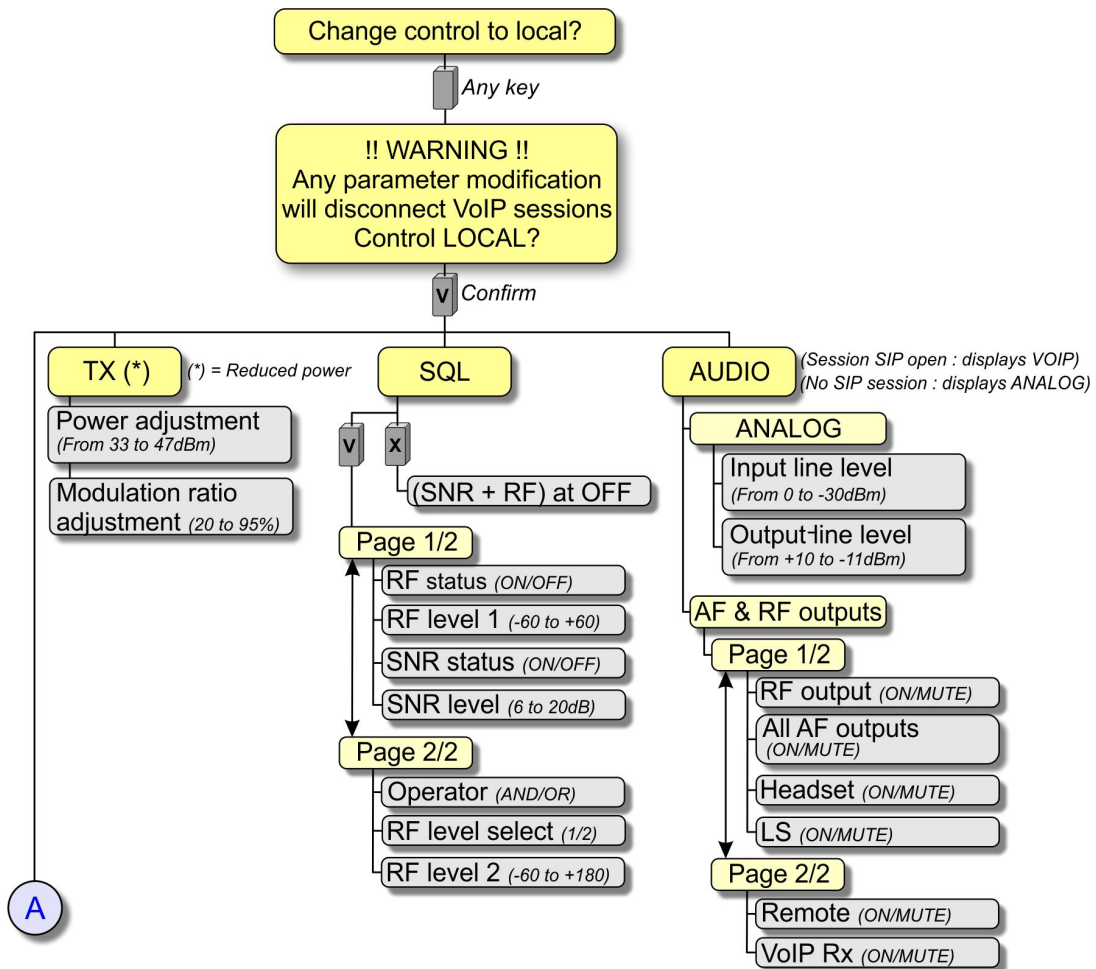
Maint zone: Gives access to different transceiver test and maintenance menus, including the measurements screen.

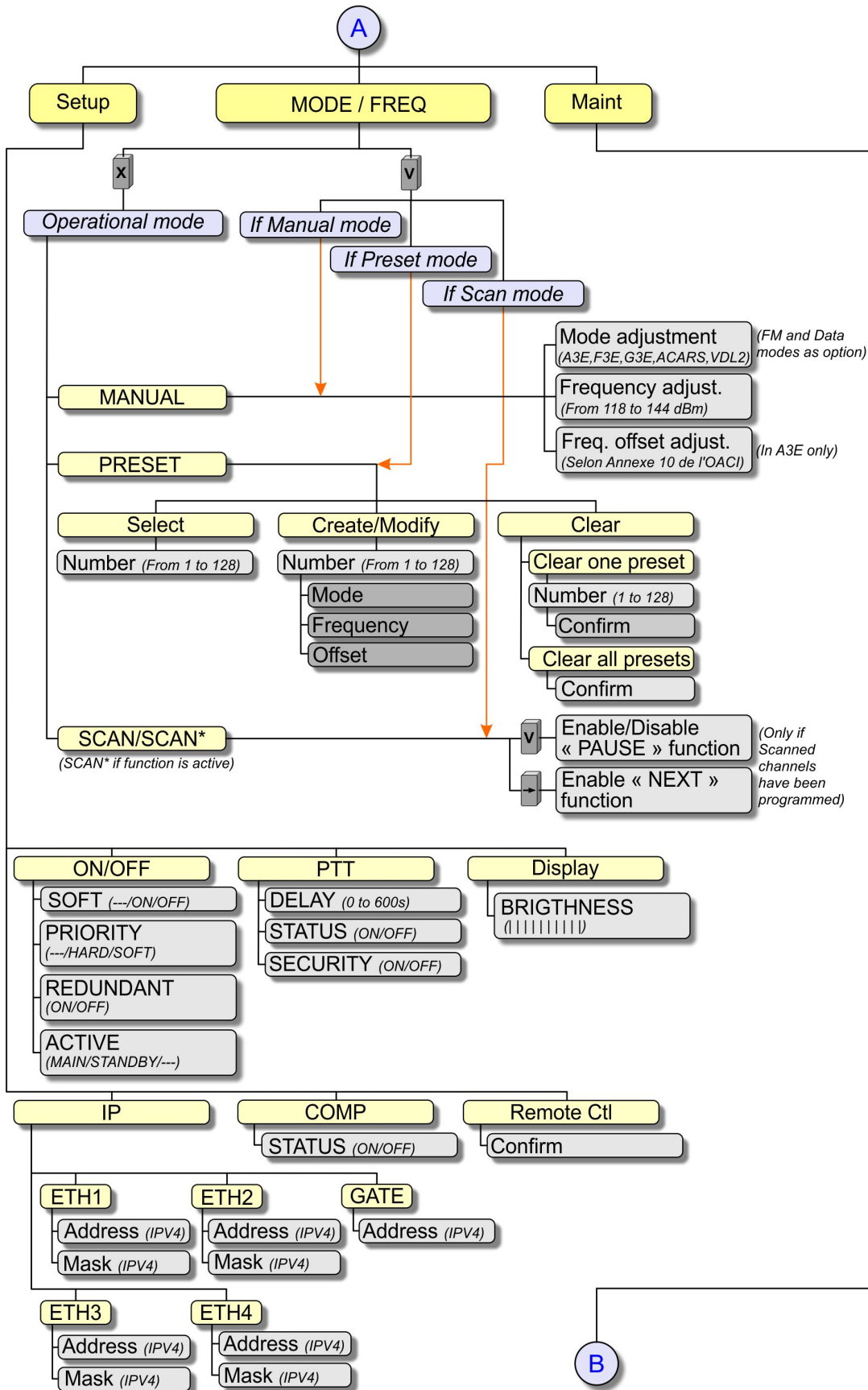
TX 47.0dBm	SQL ON	AUDIO Analog
A3E		127.500
Setup		Maint



CAUTION: The HMI organization and operation such as described in the following flowcharts and paragraphs correspond to **version V1.09** of the software embedded in the transceivers.

The menu navigation flowchart is as follows:





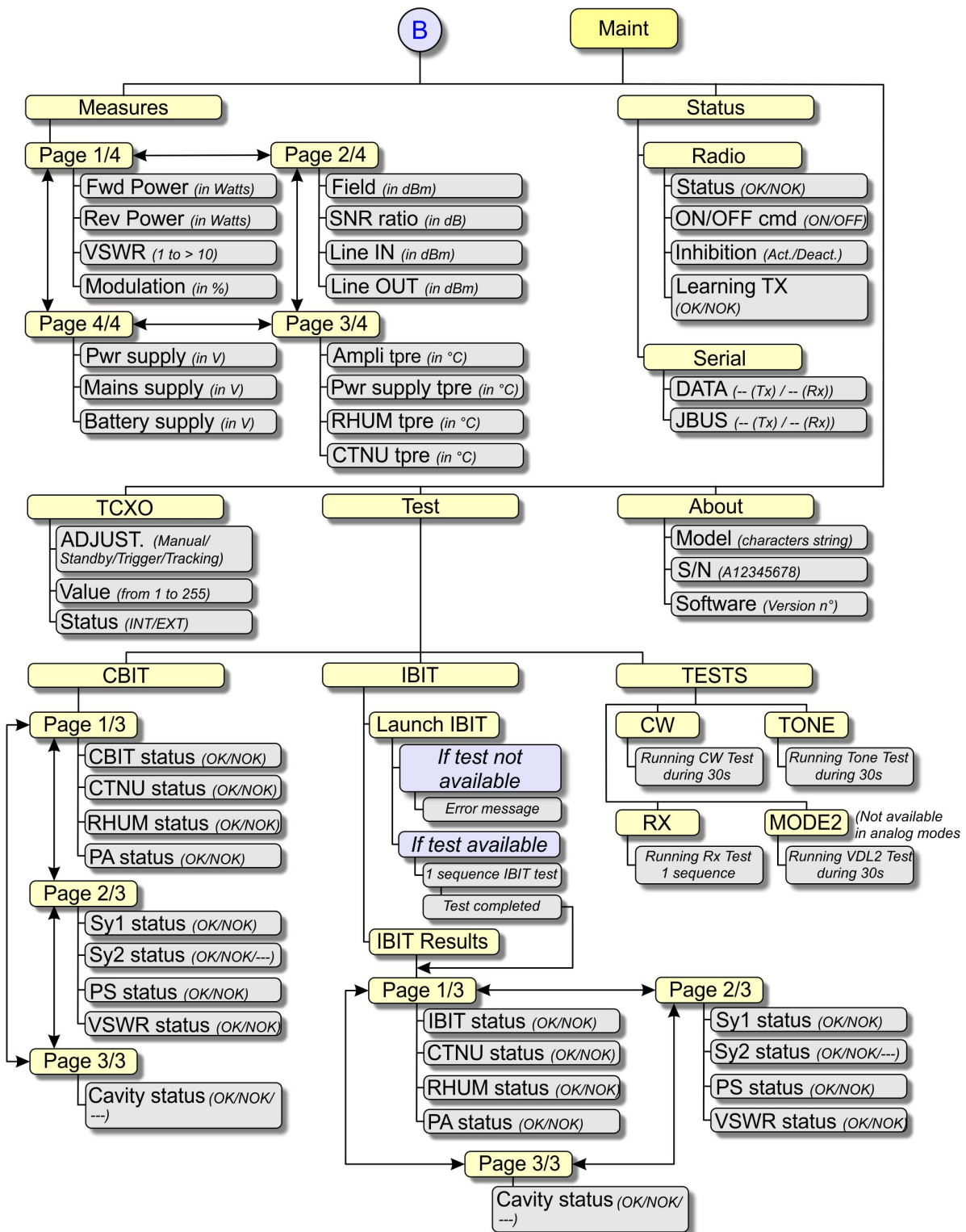


Figure 42 : IHM flowchart of the transceiver

5.3.1.3.2 « TX » MENU

Purpose: This menu allows you to access the parameters to adjust the output power and the modulation ratio of the transmission part of the transceiver.

Values: One or two parameters are available in this menu, according to the modulation mode:

■ **In A3E mode:** Two parameters are available:

- ▶ Parameter **POWER Level:** It adjusts the power of the carrier transmitted by the transceiver. It is expressed in dBm and depends on the VHF, UHF or V/UHF frequency range:
 - In **VHF:** The power can be set between **33** and **47dBm** (2 to 50W), by step of 0,5dB,
 - In **UHF** or in **V/UHF:** The power can be set between **37** and **47dBm** (5 to 50W), by step of 0,5dB.

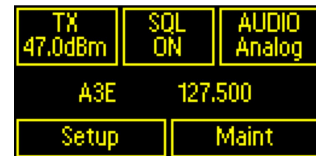
- ▶ Parameter **MODUL Depth:** It corresponds to the level adjustment, at the audio compressor output, of the AF signal to be transmitted, that can be expressed by a maximum modulation ratio of the transmitted carrier:
 - Possible values: From **20 to 95%** in A3E modulation, by step of 1%.

In ACARS, VDL2, F3E or G3E modes: The **POWER Level** parameter only is available. Effectively:

- ▶ In the Data modes, the modulation ratio is directly managed by the equipment itself,
- ▶ In the FM modes, the carrier is frequency-modulated (*so modulation ratio = 0%*).

Procedure: The procedure to access the « TX » menu is as follows:

The main operating screen supplies the basic values to operate with the transceiver : Power, Squelches status, AF type, mode and frequency:




In this screen, any power reduction (*temperature, power supply voltage, etc...*) is visualized displaying an asterisk (*) in the « TX » zone:

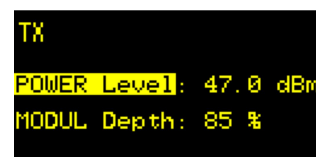


Using the arrow keys of the keyboard, select the **TX** zone, such a way it displays in reverse video:

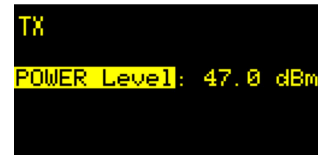


Press the  key to enter the « TX » menu:

- If the **modulation mode is A3E**, the following screen is displayed in which the « POWER LEVEL » field is automatically selected:

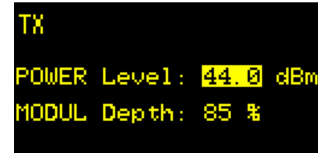


- If the **modulation mode is ACARS, VDL2, F3E or G3E**, the following screen is displayed in which the « POWER LEVEL » field is also automatically selected:

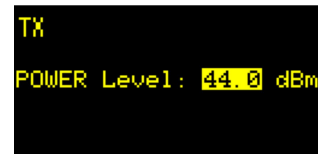


Select the « value » field of the « POWER LEVEL » line and adjust the reduction level:

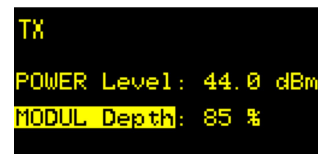
- If the **modulation mode is A3E**:



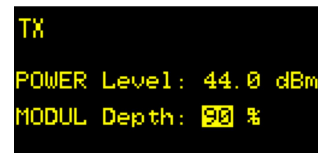
- Or if the **modulation mode is ACARS, VDL2, F3E or G3E**:




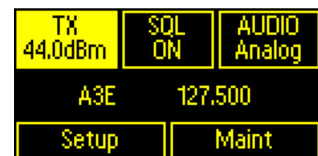
Then for the A3E modulation mode only, select the « MODUL DEPTH » field:



Select the « value » field of the « MODUL DEPTH » line and adjust the compressed modulation ratio:



Press the  key to return to the main menu. The modified power is displayed under the « TX » field.



5.3.1.3.3 « SQL » MENU

Purpose: Transceivers are equipped with 3 squelches:

- **Two RF squelches**, operating on the carrier level detection criteria. So the squelch RF 1 can be selected as the « normal » triggering threshold, and the squelch RF 2 as a « stormy » threshold, when atmospheric conditions generate high levels of noise.
- **One SNR squelch**, operating on the quality of the received AF criteria, by calculating its SNR.

So this menu allows to access on one hand the squelches parameters, selected on the RF level or SNR criteria, and on the other hand to configure the logic operator applied on these squelches, then the RF squelch among both of them, and at last the second RF threshold level.

Values: Seven parameters are defined to set the squelches and are presented on 2 pages:

■ Page 1:

- ▶ Parameter **RF status**: Displays the selected RF Squelch status:
 - Value **ON**: The RF Squelch is enabled,
 - Value **OFF**: The RF Squelch is disabled.
- ▶ Parameter **RF level 1**: Allows to adjust the RF Squelch n°1 Threshold:
 - Value: From **-60 to +60**, i.e. 120 positions for a threshold adjustment between -120dBm and -60dBm (*position 0 ≈ -90dBm*).

- ▶ Parameter **SNR status**: Displays the SNR Squelch status:
 - Value **ON**: The SNR squelch is enabled,
 - Value **OFF**: The SNR squelch is disabled.

- ▶ Parameter **SNR level**: Allows to adjust the SNR Squelch Threshold:
 - Value: From **6 to 20dB**, indicating an SNR value, by step of 1dB.

■ **Page 2:**

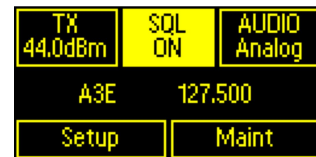
- ▶ Parameter **OPERATOR**: Selects the logic operator applied to the squelches when the two types of squelches (*RF and SNR*) are enabled:
 - Value **OR**: The selected logic operator is an « OR »,
 - Value **AND**: The selected logic operator is an « AND ».


- ▶ Parameter **RF lvl Sel**: Indicates the RF squelch selected:
 - Value **1**: The selected RF Squelch is squelch n°1,
 - Value **2**: The selected RF Squelch is squelch n°2.

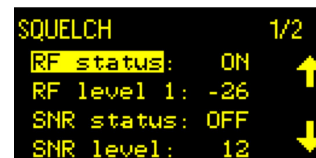
- ▶ Parameter **RF level 2**: Allows to adjust the RF Squelch n°2 Threshold:
 - Value: From **-60 to +180**, i.e. 240 positions for a threshold adjustment between -120dBm and 0dBm (0 ⇒ -90dBm).

Procedure: The procedure to access the « SQL » menu is as follows:

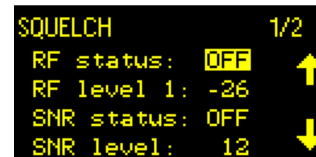
Using the arrow keys of the keyboard, select the **SQL** zone such a way it is displayed in reverse video:



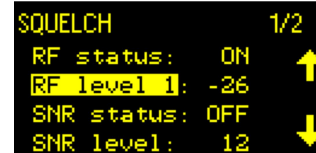
Press the  key to enter the « SQUELCH » menu (*page 1/2*). The « RF status » field is automatically selected:



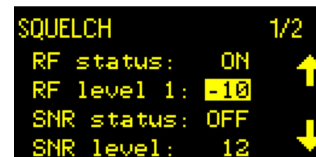
Select the « value » field of the « RF status » line and adjust the value (*ON or OFF*):



Select the « RF level 1 » field:



Select the « value » field of the « RF level 1 » line and adjust the value between -60 and +60 (*example : value -10 = -95dBm = 4µV/50Ω*):



Select the « SNR status » field:

```
SQUELCH 1/2
RF status: ON
RF level 1: -10
SNR status: OFF
SNR level: 12
```

Select the « value » field of the « SNR status » line and adjust the value (ON or OFF):

```
SQUELCH 1/2
RF status: ON
RF level 1: -10
SNR status: ON
SNR level: 12
```

Select the « SNR level » field:

```
SQUELCH 1/2
RF status: ON
RF level 1: -10
SNR status: OFF
SNR level: 12
```

Select the « value » field of the « SNR level » line and adjust the value between 6 and 20 (example : value 10 = 10dB):

```
SQUELCH 1/2
RF status: ON
RF level 1: -10
SNR status: OFF
SNR level: 10
```

Select the following page (page 2/2). The « OPERATOR » field is automatically selected:

```
SQUELCH 2/2
OPERATOR: OR
RF lvl sel: 1
RF level 2: -26
```

Select the « value » field of the « OPERATOR » line and adjust the value (AND or OR) :

```
SQUELCH 2/2
OPERATOR: AND
RF lvl sel: 1
RF level 2: -26
```

Select the « RF level sel » field :

```
SQUELCH 2/2
OPERATOR: AND
RF lvl sel: 1
RF level 2: -26
```

Select the « value » field of the « RF level sel » line and adjust the value (1 or 2):

```
SQUELCH 2/2
OPERATOR: OR
RF lvl sel: 2
RF level 2: -26
```


Select the « RF level 2 » field:

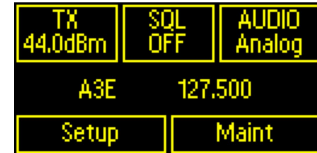
```
SQUELCH 2/2
OPERATOR: OR
RF lvl sel: 2
RF level 2: -26
```

Select the « value » field of the « RF level 2 » line and adjust the value between -60 and +180 (example : value 40 = -70dBm = 71µV/50Ω):

```
SQUELCH 2/2
OPERATOR: OR
RF lvl sel: 2
RF level 2: 40
```



Press the  key to validate the modifications relating to squelch, and return to the main operating screen. The modified status of the squelches is displayed under the « SQL » field.



5.3.1.3.4 « AUDIO » MENU

Purpose: This menu allows:

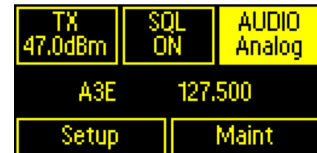
- To *select the level of the input and output analog AF signals* of the transceiver,
- To *enable the « Radio Silence » function*, or select the *AF output(s) used for audio listening*.


Value: The values of the sub-menu associated with the « AUDIO » menu are:

- **ANALOG** sub-menu: Enters the menu for programming the input and output AF levels of the transceiver,
- **AF & RF Outputs** sub-menu: Enables or disables the « Radio Silence » function and selects the output(s) for the audio listening (*Headset, Loudspeaker, line, VoIP, all*).

Procedure: The procedure to access the « AUDIO » menu is as follows:

Using the arrow keys of the keyboard, select the **AUDIO** zone, such a way it displays in reverse video:



Press the  key to enter the « AUDIO » menu. The **ANALOG** zone is automatically selected:



When one SIP sessions or more have been opened with the transceiver, it **switches automatically in VoIP mode**. However, **the analog interfaces** (AFin, AFout, PTT and Call) **remain always available**. In this case, the main operating screen displays « Voip » instead of « Analog » in the « AUDIO » zone, and *the « ANALOG » and « AF & RF Outputs » sub-menus of the « AUDIO » main menu remain available*:



5.3.1.3.4.1 « AUDIO / ANALOG » SUB-MENU

Purpose: This menu allows the input and output analog AF levels to be programmed.

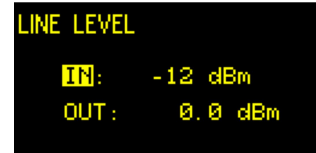
Value: The values of these parameters associated with the input and output analog AF levels:

- Parameter **LINE LEVEL IN**: Input AF line level:
 - ▶ Value: From **0** to **-30dBm**, by step of 3dB.
- Parameter **LINE LEVEL OUT**: Output AF line level:
 - ▶ Value: From **+10** to **-30dBm**, by step of 0,5dB.

Procedure: The procedure to access the « LINE LEVEL » sub-menu is as follows:



Press the **V** key to enter the « LINE LEVEL » page of the « AUDIO/ANALOG » sub-menu. The « IN » field is automatically selected:



Select the « value » field of the « IN » line and adjust the value between 0 and -30dBm, by step of 3dB:



Select the « OUT » field:



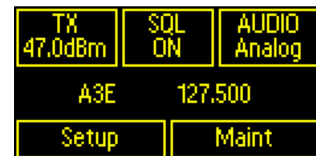
Select the « value » field of the « OUT » line and adjust the value between +10 et -30dBm, by step of 0.5dB:



Press the **V** key to validate the new values, and return to the « AUDIO » menu:



Push the **X** key to return to the main menu. The type of audio (*Analog or Voip*) is displayed under the « AUDIO » field:



5.3.1.3.4.2 « AUDIO / AF & RF OUTPUTS » SUB-MENU

Purpose: This menu allows the « Radio Mute » function and the AF listening output(s) to be selected.

Value: The values of the parameters associated with the AF listening are:

- Parameter **RF OUTPUT:** « Radio Mute » function, it sets the status of the equipment RF output:
 - ▶ Value **ON:** The RF output (*Transmission Antenna output*) is enabled,
 - ▶ Value **MUTE:** The RF output is disabled ⇒ So the « Radio Mute » function is active.

- Parameter **ALL AF OUTP:** It allows to enable or disable all the listening AF outputs of the equipment (*Headset, Loudspeaker, Line AF, VoIP AF*):
 - ▶ Value **ON:** All the listening AF outputs are enabled,
 - ▶ Value **MUTE:** All the listening AF outputs are disabled ⇒ No AF is supplied by the Transceiver,
 - ▶ Value **---**: The status of one AF output at least is different from the other ones ⇒ The listening AF outputs cannot be controlled at same time through this parameter.


- Parameter **HEADSET:** It allows to enable or disable the Headset output of the equipment only:

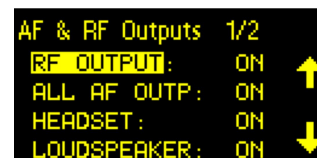
- ▶ Value **ON**: The Headset output is enabled ⇒ The received AF is heard on the Headset output,
 - ▶ Value **MUTE**: The Headset output is disabled ⇒ No AF is sent to the Headset.
- Parameter **LOUDSPEAKER**: It allows to enable or disable the Loudspeaker output of the equipment only:
 - ▶ Value **ON**: The Loudspeaker output is enabled ⇒ The received AF is heard on the Loudspeaker output,
 - ▶ Value **MUTE**: The Loudspeaker output is disabled ⇒ No AF is sent to the Loudspeaker.
- Parameter **REMOTE**: It allows to enable or disable the Analog AF line output of the equipment only:
 - ▶ Value **ON**: The Analog AF line output is enabled ⇒ The received AF is sent to a remote VCS,
 - ▶ Value **MUTE**: The Analog AF line output is disabled ⇒ The received AF is not sent to a remote VCS.
- Parameter **VOIP RX**: It allows to enable or disable the Digital AF line output of the equipment only:
 - ▶ Value **ON**: The VoIP AF line output is enabled ⇒ The received AF is sent through RTP packets to a remote Digital VCS,
 - ▶ Value **MUTE**: The VoIP AF line output is disabled ⇒ The RTP packets constituting the digitalized received AF is not sent to a remote Digital VCS.

Procedure: The procedure to access the « AUDIO/AF & RF Outputs » sub-menu is as follows:

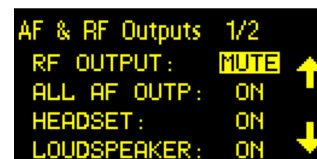
Using the arrow keys of the keyboard, select the **RF & AF Outputs** zone, such a way it displays in reverse video:



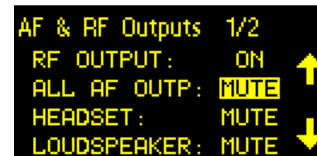
Press the  key to enter the « RF & AF Outputs » sub-menu. The « RF OUTPUT » field is automatically selected:



Select the « value » field of the « RF OUTPUT » line and adjust the value ON or MUTE. When the MUTE value has been selected, the transceiver is in the « **Radio Silence** » mode.

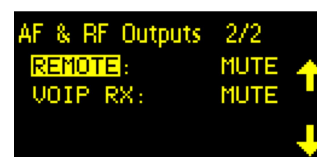


Select the « ALL AF OUTPUT » field then the corresponding « value » field, and adjust the value ON or MUTE. All the other « value » fields on both pages **automatically switch to the selected value** (ex : « ALL AF OUTP » = MUTE). Page 1/2:

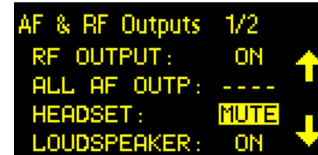


And page 2/2:

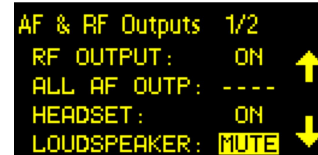
Next, if one AF field at least is different from the others, the « value » field of the « ALL AF OUTP » line **will display dashed lines**.



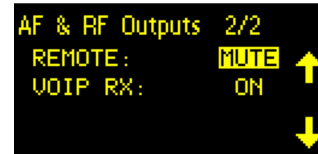
Select the « HEADSET » field then the corresponding « value » field, and adjust the value ON or MUTE. In the example, « HEADSET » = MUTE and the other value fields = ON, so the « value » field of the « ALL AF OUTP » line **displays dashed lines**:



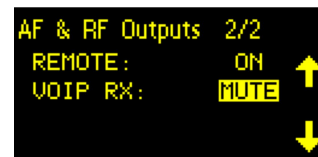
Select the « LOUDSPEAKER » field then the corresponding « value » field, and adjust the value ON or MUTE. In the example, « LOUDSPEAKER » = MUTE and the other value fields = ON, so the « value » field of the « ALL AF OUTP » line **displays dashed lines**:





Select the « REMOTE » field in page 2/2 then the corresponding « value » field, and adjust the value ON or MUTE:




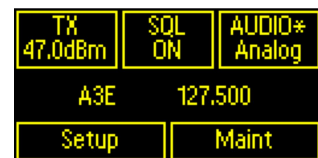
Select the « VOIP RX » field in page 2/2 then the corresponding « value » field, and adjust the value ON or MUTE:



Press the  or  keys to return to the « AUDIO » menu:



Press the  key to return to the main operating screen. If the RF output or any AF output has been muted, an asterisk is displayed at the right side of the « AUDIO » field:



5.3.1.3.5 « MODE & FREQUENCY » MENU

Purpose: The transceiver can then operate on three operating modes:

- **Operation in Manual mode:** In this case, The « MODE & FREQUENCY » zone allows to set the main operating parameters : Mode, Frequency and Offset frequency. A « MANUAL » sub-menu has been created for that.

When the transceiver is operating in Manual mode, this zone displays *the operational mode, frequency* and eventually *offset frequency*.

- **Operation in Preset mode:** In this case, The « MODE & FREQUENCY » zone allows to set up to 128 preset channels with for each the following main operating parameters : Mode, Frequency and Offset frequency. A « PRESET » sub-menu has been created for that, that allows to create, modify, delete or select a preset channel number. Then those channels can be selected to set the current operating parameters of the equipment.

When the transceiver is operating in Preset mode, this zone displays the message: « *PRESET <channel number>* ».

- **Operation in Scan mode:** In this case, the « MODE & FREQUENCY AREA » allows to manage the scanning mode of a predefined list of channels.

When the transceiver is operating in Scan mode, this area displays the message « *SCAN : <channel n° currently scanned>* ».

Whatever be the selected operating mode, it is also possible to enable or disable a **12.5kHz channel spacing**.

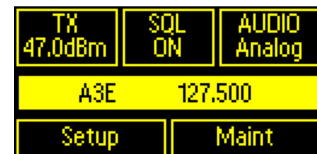
Value: The sub-menus associated with the « MODE & FREQUENCY » menu are:

- Sub-menu **MANUAL**: Accesses the manual parameters for operation,
- Sub-menu **PRESET**: Accesses the sub-menu to Create/Modify/Select the preset channels.
- Sub-menu **CS**: (*Channel Spacing*) Enables or disables an operation in 12.5kHz channels,
- Sub-menu **SCAN**: Accesses the parameters related to the preset channels scanning management.

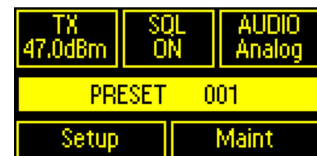
Procedure: The procedure to access the « OPERATION MODE » sub-menu of the « MODE & FREQUENCY » menu is as follows:

Using the arrow keys of the keyboard, select the **MODE & FREQUENCY** zone, such a way it displays in reverse video:

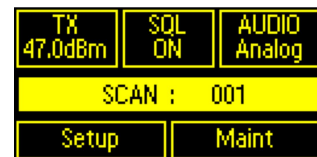
- Either in Manual mode:






- Or in Preset mode:

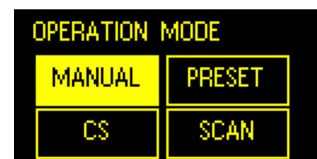



- Or in Scan mode:



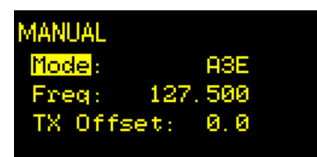
From the previous screens, pressing the  or  keys involves a different behaviour of the HMI:

- Pressing the  key allows to access the « OPERATION MODE » menu:



- Press the  key will depend on the current mode:

- ▶ When the current mode is the **Manual mode**, pressing this key allows to directly access the « MANUAL » sub-menu of the « OPERATION MODE » menu:



- ▶ When the current mode is the **Preset mode**, pressing this key allows to directly access the « PRESET » sub-menu of the « OPERATION MODE » menu:



- ▶ When the current mode is the **Scan mode**, and **preset channels have been programmed**, pressing this key allows to directly access the « SCAN » sub-menu of the « OPERATION MODE » menu:



5.3.1.3.5.1 « MANUAL » SUB-MENU

Purpose: The « MANUAL » sub-menu allows to set the Mode, Frequency and Offset frequency parameters of the transceiver, used for operation.

Value: The parameters associated with the « MANUAL » sub-menu menu are:

- Parameter **Mode**: Selects the modulation mode of the carrier. Possible values are:
 - ▶ Value **A3E**: Selects the Amplitude modulation (*AM*) of the carrier,
 - ▶ Value **F3E**: Selects the Frequency modulation (*FM*) of the carrier,
 - ▶ Value **G3E**: Selects the Emphasized Frequency modulation (*FM*) of the carrier,
 - ▶ Value **ACARS**: Selects the AM-MSK modulation of the carrier,
 - ▶ Value **VDL2**: Selects the D8PSK modulation of the carrier.



CAUTION: All modulation mode except A3E are optional on the device.

- Parameter **Frequency**: Selects the Operational Frequency:

- ▶ In VHF: Between **118** and **144 MHz**,
- ▶ In UHF: Between **225** and **400 MHz**.

It must comply the ICAO, Annex 10 requirements, about the frequency encoding vs the channel spacing and the modulation mode:

- ▶ **A3E modulation**: The channel spacing can be either 8.33kHz, 12.5kHz or 25kHz,
- ▶ **All other modulations** (*G3E, F3E, ACARS, VDL2*): The channel spacing is 25kHz.

VHF and UHF frequencies encoding in 25kHz, 12.5kHz and 8.33kHz channel spacing: The table below describes the possible encoded frequency values for the 1st one hundred kHz of the VHF or UHF range and the true values that correspond:

▶ **25kHz channel spacing:**

- Encoded: **118.000** or **225.000** ⇒ True: 118.000000MHz or 225.000000MHz,
- Encoded: **118.025** or **225.025** ⇒ True: 118.025000MHz or 225.025000MHz,
- Encoded: **118.050** or **225.050** ⇒ True: 118.050000MHz or 225.050000MHz,
- Encoded: **118.075** or **225.075** ⇒ True: 118.075000MHz or 225.075000MHz.

▶ **12.5kHz channel spacing:**

- Encoded: **118.000** or **225.000** ⇒ True: 118.000000MHz or 225.000000MHz,
- Encoded: **118.012** or **225.012** ⇒ True: 118.012500MHz or 225.012500MHz,
- Encoded: **118.025** or **225.025** ⇒ True: 118.025000MHz or 225.025000MHz,

- Encoded: **118.037** or **225.037** ⇨ True: 118.037500MHz or 225.037500MHz,
- Encoded: **118.050** or **225.050** ⇨ True: 118.050000MHz or 225.050000MHz,
- Encoded: **118.062** or **225.062** ⇨ True: 118.062500MHz or 225.062500MHz,
- Encoded: **118.075** or **225.075** ⇨ True: 118.075000MHz or 225.075000MHz,
- Encoded: **118.087** or **225.087** ⇨ True: 118.087500MHz or 225.087500MHz.

▶ **8.33kHz channel spacing:**

- Encoded: **118,005** or **225.005** ⇨ True: 118.000000MHz or 225.000000MHz,
- Encoded: **118.010** or **225.010** ⇨ True: 118.008333MHz or 225.008333MHz,
- Encoded: **118.015** or **225.015** ⇨ True: 118.016666MHz or 225.016666MHz,
- Encoded: **118.030** or **225.030** ⇨ True: 118.025000MHz or 225.025000MHz,
- Encoded: **118.035** or **225.035** ⇨ True: 118.033333MHz or 225.033333MHz,
- Encoded: **118.040** or **225.040** ⇨ True: 118.041666MHz or 225.041666MHz,
- Encoded: **118.055** or **225.055** ⇨ True: 118.050000MHz or 225.050000MHz,
- Encoded: **118.060** or **225.060** ⇨ True: 118.058333MHz or 225.058333MHz,
- Encoded: **118.065** or **225.065** ⇨ True: 118.066666MHz or 225.066666MHz,
- Encoded: **118.080** or **225.080** ⇨ True: 118.075000MHz or 225.075000MHz,
- Encoded: **118.085** or **225.085** ⇨ True: 118.083333MHz or 225.083333MHz,
- Encoded: **118.090** or **225.090** ⇨ True: 118.091666MHz or 225.091666MHz.

- Parameter **Climax**: Selects the Frequency Offset encoding. The list here-below gives the Frequency Offset values according to the Frequency range, the Channel spacing and the Number of carriers:

▶ **VHF or UHF Range:**

- 25kHz channel spacing with 2 carriers: The offset is: **±5kHz**,
- 25kHz channel spacing with 3 carriers: The offset is: **0kHz** and **±7,3kHz**,
- 25kHz channel spacing with 4 carriers: The offset is: **±2,5kHz** and **±7,5kHz**.
- 12.5kHz channel spacing: No Offset frequency mode.


▶ **VHF Range:**

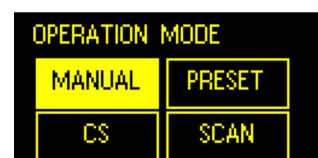
- 25kHz channel spacing with 5 carriers: The offset is: **0kHz**, **±4kHz** and **±8kHz**,
- 8.33kHz channel spacing with 2 carriers: The offset is: **±2,5kHz**.

▶ **UHF Range:**


- 8.33kHz channel spacing: No Offset frequency mode.

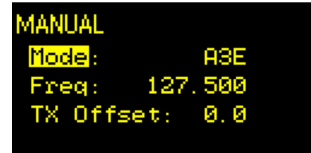
Procedure: The procedure to access the « MANUAL » sub-menu is as follows:

As specified before, pressing the  key allows to access the « OPERATION MODE » menu in which the **MANUAL** zone of the menu is automatically selected:





Press the  key to enter the « MANUAL » sub-menu. The « Mode » field of the sub-menu is automatically selected.

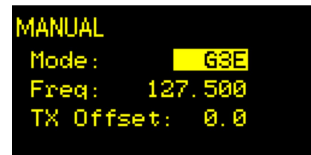


REMARK: Remember that *if the transceiver is already in Manual mode*, pressing the

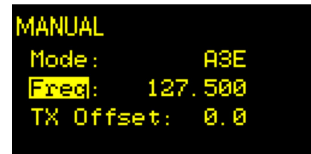


key allows to access the same sub-menu directly from the « MODE & FREQUENCY » zone, without going through the « OPERATION MODE » sub-menu.

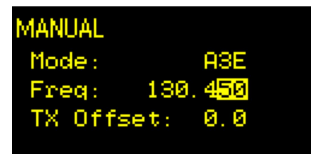
Select the « value » field of the « Mode » line and select one of the possible values: A3E, F3E(*), G3E(*), ACARS(*) and VDL2(*):
(*): Optional.



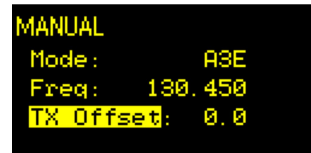
Select the « Freq » field:



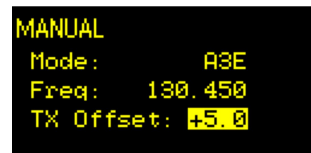
Select the « value » field of the « Freq » line and select the value between 118 and 144 MHz and/or between 225 and 400MHz according to the selected transceiver:




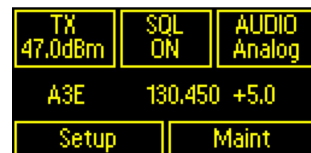
Select the « TX Offset » field:



Select the « value » field of the « TX Offset » line and select one of the possible values:



Press the  key to validate the new values, and return to the main operating screen. The new mode, frequency and Offset values are displayed in the « MODE & FREQUENCY » zone:



If the ACARS or MODE2 modes have been selected, the main operating screen displays the « SQL » and « AUDIO » zones crossed out (*example in VDL2 mode*). Note also that the frequency offset has been suppressed (*value 0Hz*):




5.3.1.3.5.2 « PRESET » MODE SUB-MENU

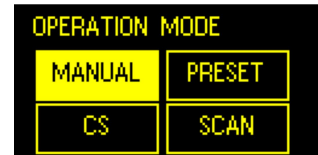
Purpose: The « PRESET » menu allows you to create/modify/clear/select a preset channel. These channels can then be used to establish the operating parameters of the equipment.

Value: The parameters associated with this menu are:

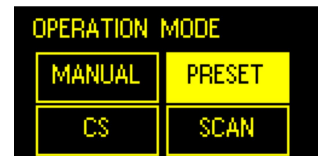
- Sub-menu **SELECT**: Selects a preset channel from among 128,
- Sub-menu **CREATE/MODIFY**: Creates or modifies a preset channel from among 128,
- Sub-menu **CLEAR**: Removes the specified preset channel or all channels.


Procedure: The procedure to access the « PRESET » menu is as follows:

As specified before, pressing the  key allows to access the « OPERATION MODE » menu in which the **MANUAL** zone of the menu is automatically selected:




Select the **PRESET** zone such a way it displays in reverse video:



Press the  key to enter the « PRESET » sub-menu in which the **Select** zone of the menu is automatically selected.



REMARK: Remember that *if the transceiver is already in the Preset mode, pressing*

the  key allows to access the same sub-menu directly from the « MODE & FREQUENCY » zone, without going through the « OPERATION MODE » sub-menu.


5.3.1.3.5.2.1 « PRESET / SELECT » SUB-MENU

Purpose: This sub-menu allows a preset channel number to be selected, in order to fix the operating parameters of the equipment.

Value: The value of the parameter associated with this sub-menu is:

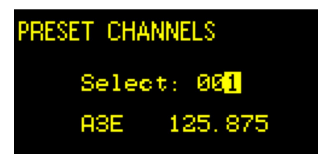
- Parameter **SELECT**: Channel number between **001 and 128**.

Procedure: The procedure to access the « Select » sub-menu is as follows:

Press the  key to enter the « Select » menu. If no channel has been preset, the screen displays the following message:



Otherwise, select a channel number in the list of created channels:

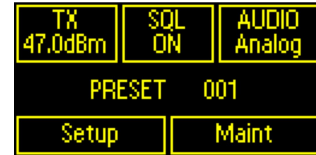




Press the key to validate the input. A confirmation screen displays the following message:



Press the key to confirm the input. The main menu is displayed again with the selected channel number:



5.3.1.3.5.2.2 « PRESET / CREATE / MODIFY » SUB-MENU

Purpose: This sub-menu allows:

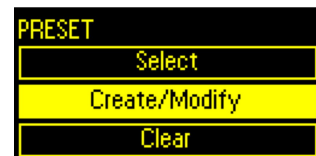
- A preset channel to be created, by fixing the associated parameters,
- An existing channel to be modified, by changing the value of one or more of its parameters.

Value: The parameters associated with a preset channel are:

- Parameter **MODE**: **A3E, F3E, G3E, ACARS** and **VDL2**.
- Parameter **FREQUENCY**:
 - ▶ In VHF: Between **118 and 144 MHz**,
 - ▶ In UHF: Between **225 and 400 MHz**.
- Parameter **CLIMAX**:
 - ▶ In VHF:
 - For 25kHz channels: **0, ±2.5, ±4, ±5, ±7.3, ±7.5, ±8 kHz** (from 2 to 5 carriers),
 - For 8,33kHz channels: **0, ±2.5 kHz** (2 carriers only).
 - ▶ In UHF:
 - For 25kHz channels: **0, ±2.5, ±5, ±7.3, ±7.5 kHz** (from 2 to 4 carriers).

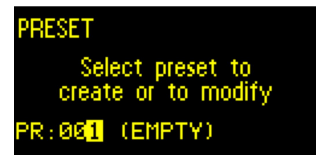
Procedure: The procedure to access the « Create/Modify » sub-menu is as follows:

Select the « Create/Modify » sub-menu of the « Preset » menu:

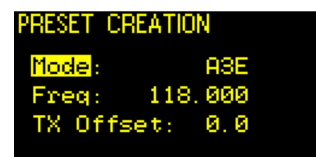


Press the key to enter the « Create/Modify » sub-menu.

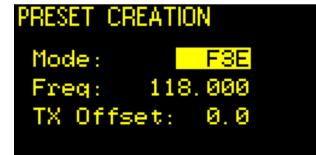
- **If this is a creation**, the screen displays:



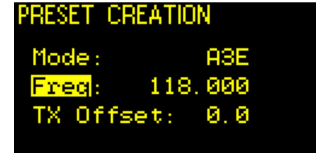
Press the key to enter the parameter entry menu:



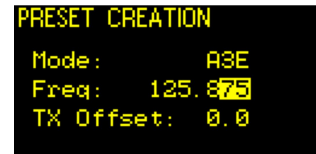
Select the « value » field of the « Mode » line and adjust the value (A3E, F3E, G3E, ACARS and VDL2):



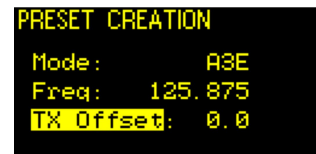
Select the « Freq » field:



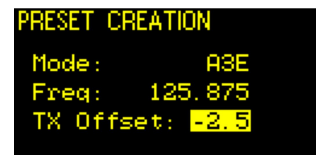
Select the « value » field of the « Freq » line and configure the value between 118 and 144 MHz and/or between 225 and 400 MHz according to the type of the transceiver:




Select the « TX Offset » field:




Select the « value » field of the « TX Offset » line and adjust the value among the possible values:



Press the  key to validate the parameter input. A confirmation screen appears:



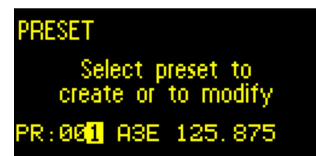
Press the  key to confirm. The « PRESET » sub-menu is displayed on the screen again:



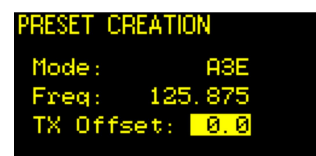
- **If this is a modification**, and if the modified channel is the current operating channel, the screen displays:



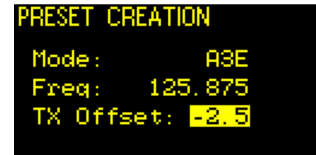
Else, the screen displays:




Select a channel number, then validate. The screen displays the parameters of the selected channel:




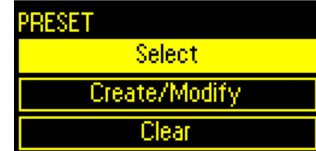
Modify the value of the Mode, Frequency or Frequency offset parameters:



Press the  key to validate the input. A confirmation screen displays the following message:



Press the  key to confirm. The « PRESET » sub-menu is displayed on the screen:



5.3.1.3.5.2.3 « PRESET / CLEAR » SUB-MENU

Purpose: This sub-menu allows:

- A preset channel to be cleared by specifying its number,
- All preset channels to be cleared.


Value: The sub-menus associated with the « CLEAR » menu are:

- Sub-menu **CLEAR ONE PRESET:** Deletes the channel whose number has been specified,
- Sub-menu **CLEAR ALL PRESETS:** Deletes all the channels.

Procedure: The procedure to access the « CLEAR PRESETS » sub-menu is as follows:

Select the « Clear » sub-menu of the « Preset » menu:




Press the  key to enter the « CLEAR PRESETS » sub-menu. The screen displays:



■ Clearing one channel:



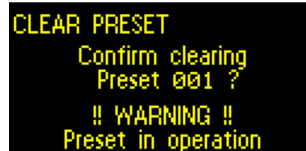
Press the  key to enter the « Clear one preset » sub-menu. If no channel has been created before, the following message is displayed:



Else, the screen displays:




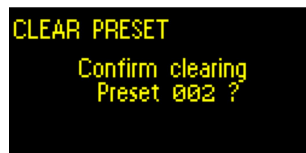
Select the number of the channel to be cleared. If the selected channel is currently selected for operation, the following message is displayed:
In case the action is confirmed, the channel is cleared and the equipment returns in « MANUAL » mode.




Else, select the number of the channel to be cleared. The only numbers proposed by the equipment are the existing channels:



Press the  key to validate the input. A confirmation screen appears:




Press the  key to confirm. The « PRESET » sub-menu is displayed on the screen again:



■ **Clearing all channels:**

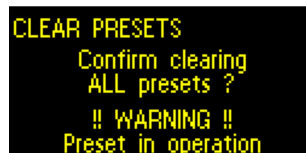
Select the « Clear all Presets » sub-menu. The screen displays:



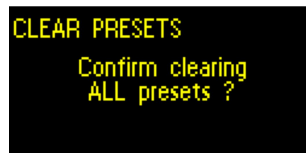
Press the  key to enter the « Clear all presets » sub-menu. If no channel has been created before, the following message is displayed:




Else, a confirmation screen displays. If one channel is currently in operation, the following message displays:



Else, the following screen displays:



Press the  key to confirm. The « PRESET » sub-menu is displayed on the screen again:




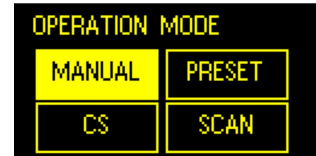
5.3.1.3.5.3 « SCAN » SUB-MENU



Purpose: The « SCAN » sub-menu allows to scan preset channels previously defined in a scan list.

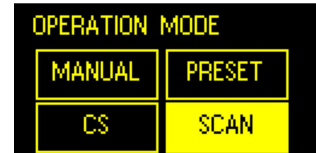
Value: There is no parameters associated with the « SCAN » menu. However, it is mandatory to previously program preset channels such a way to allow their scanning. If not, an error message will be displayed on the HMI.


Procedure: The procedure to access the « SCAN » sub-menu is as following:

As it has been specified previously, pressing the  key allows to access the « OPERATION MODE » menu in which the **MANUAL** area is automatically selected:

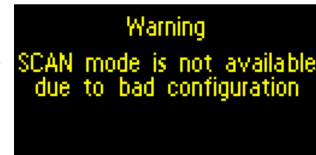


Using the  or  keys, select the **SCAN** area such a way it displays in reverse video:

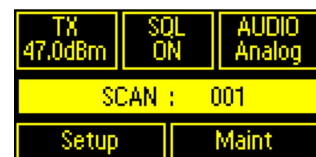



Press the  key to enter the « SCAN » mode. If it is not operational, an error message is displayed on screen:

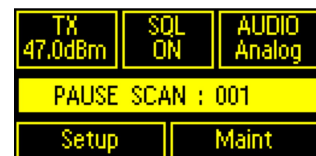
- On transceiver **configuration error** (*Current VoIP session, Current Call, Current Transmission, « ON/OFF » control at « OFF »*)
- On **programming error of channels to be scanned** (*no channel programmed*)
- On **compatibility error with the scanning mode**




If there is no error, the following screen is displayed:

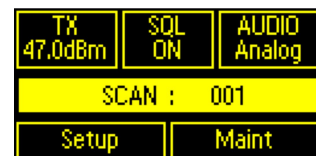


The scanning operation can be stopped at any time by pressing the  key (**Enabling the « PAUSE » function**). In this case, a pause message is displayed on screen:



On a same way, the scanning operation can be resumed at any time.

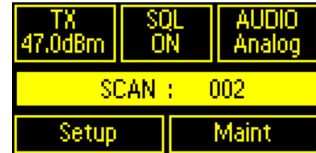
To do that, press the  key (**Disabling the « PAUSE » function**).



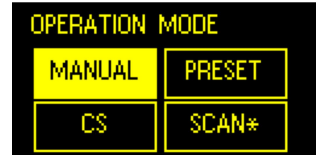
If the current scanned channel is receiving a call, it is possible to skip it



by pressing the key (« **NEXT** » function). In this case, the scanning restarts on the following channel in the list:



To return the « OPERATION MODE » menu, press the key. To indicate the « SCAN » function is active, an asterisc is added in the « SCAN » area:



5.3.1.3.5.4 « CS » SUB-MENU

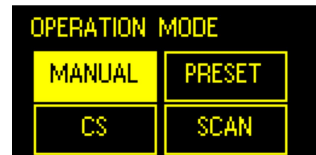
Purpose: The « CS » (Channel Spacing) sub-menu enables or disables a 12.5kHz channel spacing.

Value: The parameter associated with the « CS » menu is:

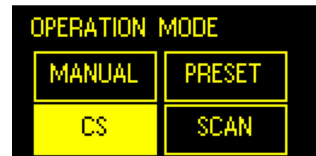
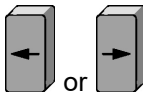
- Parameter **FREQ 12.5:** It can have values **ON** or **OFF** to enable or disables the 12.5kHz channel spacing.

Procedure: The procedure to access the « CS » sub-menu is as following:

As it has been specified previously, pressing the key allows to access the « OPERATION MODE » menu in which the **MANUAL** area is automatically selected:



Using the or keys, select the **CS** area such a way it displays in reverse video:



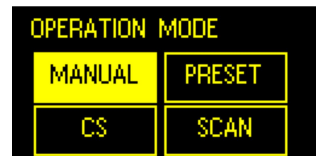
Press the key to enter the « CS » sub-menu. The « FREQ 12.5 » field is automatically selected:



Select the « value » field of the « FREQ 12.5 » line and adjust the value:



Press the key to return to the « OPERATION MODE » menu:



5.3.1.3.6 « SETUP » MENU

Purpose: This menu allows configuration of the transceiver parameters not directly linked to the main operating menu. The base « SETUP » menu is itself broken down into several sub-menus, each dedicated to a particular set of parameters.


Value: The values of the sub-menus associated with the « SETUP » menu are:

- **ON/OFF** sub-menu: Allows the « On/Off » or « Redundancy » Commands parameters to be accessed,
- **PTT** sub-menu: Allows the « PTT safety » parameters to be accessed,
- **DISPLAY** sub-menu: Allows the screen « Brightness » adjustment to be accessed,
- **IP** sub-menu: Allows the « IP access configuration » parameters to be accessed,
- **COMP** sub-menu: Allows the « Audio Compressor » parameter to be accessed,
- **REMOTE CTL** sub-menu: Allows the « Equipment remote control » parameter to be accessed.

Procedure: The procedure to access the « SETUP » menu is as follows:

Select the **Setup** zone such a way it displays in reverse video:



Press the  key to enter the « SETUP » menu. The **ON/OFF** zone is automatically selected:



5.3.1.3.6.1 « SETUP / ON/OFF » SUB-MENU

Purpose: This sub-menu enables or disables the software « ON/OFF » command, fixes the priority between the software command and the hardware command, specifies a « Main/Standby » operating mode, and the « Main » or « Standby » state of the equipment.

Value: The parameters associated with the « ON/OFF » menu are:

- Parameter **SOFT**: Status of the software command :
 - ▶ Value **---**: If the Main/Standby mode is activated,
 - ▶ Value **ON**: Allows the software « ON/OFF command » to be enabled,
 - ▶ Value **OFF**: Allows the software « ON/OFF command » to be disabled.
- Parameter **PRIO**: Command priority:
 - ▶ Value **---**: If the Main/Standby mode is activated,
 - ▶ Value **SOFT**: Allows priority to be given to the software « ON/OFF command »,
 - ▶ Value **HARD**: Allows priority to be given to the hardware « ON/OFF command ».
- Parameter **REDUN.**: Main/Standby operation:
 - ▶ Value **ON**: Allows the Main/Standby mode to be activated,
 - ▶ Value **OFF**: Allows the Main/Standby mode to be deactivated.
- Parameter **ACT**: Equipment function in a « Main/Standby » context:
 - ▶ Value **MAIN**: When the Main/Standby mode is activated, the equipment has a Main function,
 - ▶ Value **STANDBY**: When the Main/Standby mode is activated, the equipment has a Standby function,
 - ▶ Value **---**: If the Main/Standby mode is deactivated.



REMARK 1:


- The transceiver **hardware or software « ON/OFF » controls** are used:
 - ▶ **At the transmission side:** To take into account or not a remote AF signal and a PTT source coming from a VCS. However, the local PTT sources being always active, when this control is « OFF », it allows local check of the transceiver, in case of an on-site maintenance, with the guarantee that no remote PTT will act during this phase,
 - ▶ **At the reception side:** To supply a Call and an AF signals to the VCS. When this control is « OFF », it allows to isolate the reception part of the transceiver from the VCS.
- Remember that **the hardware « ON/OFF Command »** is available on pin **J29-13** of the operating connector.
- Whatever be its origin, software or hardware, **the « ON/OFF » control status** has a direct effect on the « Status » light indicator of the transceiver's front panel. Supposing that the others sources acting on this light indicator are inactive:
 - ▶ **« ON/OFF » control at « OFF »:** « Status » light indicator switched off,
 - ▶ **« ON/OFF » control at « ON »:** « Status » light indicator lit.



REMARK 2: **Operating in « Main/Standby » mode** requires a specific cable (See Paragraph « [Equipment commissioning in Main/Standby configuration](#) » on page 73)* between both redundant transceivers.

Procedure: The procedure to access the « ON/OFF » menu is as follows:



Press the  key to enter the « ON/OFF COMMAND » sub-menu. The « Soft » field is automatically selected:

```
ON/OFF COMMAND
Soft:      ON
Prio:      HARD
Redun. :   OFF
Act:       ---
```

Select the « value » field of the « Soft » line and configure the state of the software « ON/OFF command » (*ON or OFF*):

```
ON/OFF COMMAND
Soft:      OFF
Prio:      HARD
Redun. :   OFF
Act:       ---
```

Select the « Prio » field:

```
ON/OFF COMMAND
Soft:      OFF
Prio:      HARD
Redun. :   OFF
Act:       ---
```

Select the « value » field of the « Prio » and configure the value (*HARD or SOFT*).

```
ON/OFF COMMAND
Soft:      OFF
Prio:      SOFT
Redun. :   OFF
Act:       ---
```

Select the « Redun. » field. If the corresponding value is « OFF », then the following field « Act » is irrelevant (*dashed line*).

```
ON/OFF COMMAND
Soft:      OFF
Prio:      SOFT
Redun. :   OFF
Act:       ---
```

Select the « value » field of the « Redun. » line and configure the value (ON or OFF). If the corresponding value is « ON », then:

- The « Soft » and « Prio » fields become irrelevant (*dashed lines*),
- The following « Act » field becomes relevant.

```
ON/OFF COMMAND
Soft:      ---
Prio:      ---
Redun. :   ON
Act:       MAIN
```


In this case, select the « Act » field:

```
ON/OFF COMMAND
Soft:      ---
Prio:      ---
Redun. :   ON
Act:       MAIN
```

Select the « value » field of the « Act » line and configure the value (MAIN or STANDBY):

```
ON/OFF COMMAND
Soft:      ---
Prio:      ---
Redun. :   ON
Act:       STANDBY
```



Push the  key to validate the modification and to return to the « SETUP » menu.

```
SETUP
ON/OFF  PTT  Display
IP  COMP  Remote Ctl
```

5.3.1.3.6.2 « SETUP / PTT » SUB-MENU

Purpose: The purpose of this sub-menu is to fix the maximum duration of the PTT command before activation of protection.


Value: The parameter associated with the « PTT » menu is:

- Parameter **Timeout** : Configures the PTT safety activation delay :
 - ▶ Value **0 (off)**: No delay (*No security enabled*),
 - ▶ Value **5** to **300** seconds (*up to version V1.11*), by step of 5s,
 - ▶ Value **5** to **600** seconds (*from version V1.11*), by step of 5s.
- Parameter **Status**: Read only parameter, it displays the PTT status:
 - ▶ Value **ON**: The transmitter is transmitting,
 - ▶ Value **OFF**: The transmitter is in standby.
- Parameter **Security**: Read only parameter, it displays the PTT Safety:
 - ▶ Value **ON**: The PTT Safety is active,
 - ▶ Value **OFF**: The PTT Safety is inactive.

Procedure: The procedure to access the « PTT » menu is as follows:

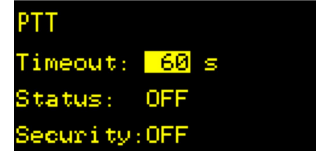
Using the arrow keys of the keyboard, select the **PTT** zone of the « SETUP » menu, such a way it displays in reverse video:


```
SETUP
ON/OFF  PTT  Display
IP  COMP  Remote Ctl
```

Press the  key to enter the « PTT » menu:



The « value » field of the « Timeout » line being automatically selected, modify the delay value:



Press the  key to return to the « SETUP » menu.



5.3.1.3.6.3 « SETUP / DISPLAY » SUB-MENU

Purpose: The purpose of this sub-menu is to adjust the display screen brightness.


Value: The parameter associated with the « DISPLAY » menu are:

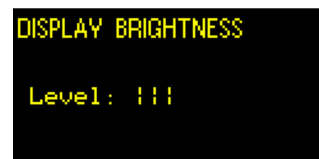
- Parameter **Brightness:** Allows the display screen brightness to be adjusted by a bar graph, whose length is proportional to the luminosity:
 - ▶ **Short:** low brightness,
 - ▶ **Long:** high brightness.



Procedure: The procedure to access the « DISPLAY » menu is as follows:

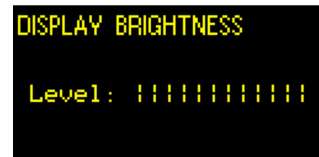
Using the arrow keys of the keyboard, select the **Display** zone of the « SETUP » menu, such a way it displays in reverse video:




Press the  key to enter the « DISPLAY BRIGHTNESS » sub-menu.



Press the  or  keys on the keyboard to adjust the brightness:



Press the  key to return to the « SETUP » menu.



5.3.1.3.6.4 « SETUP / IP » SUB-MENU

Purpose: The purpose of this sub-menu is to configure the IP parameters, used for the Ethernet links ETH1 to ETH4 (connectors **J20** to **J23**).


Value: The sub-menus associated with the « IP » menu are:

- Sub-menu **ETH1**: Configuration of the Ethernet link n°1 parameters (**J20**),
- Sub-menu **ETH2**: Configuration of the Ethernet link n°2 parameters (**J21**),
- Sub-menu **ETH3**: Configuration of the Ethernet link n°3 parameters (**J22**),
- Sub-menu **ETH4**: Configuration of the Ethernet link n°4 parameters (**J23**),
- Sub-menu **GATE**: Configuration of the Default gateway IP address.

Procedure: The procedure to access the « IP » sub-menu is as follows:

Using the arrow keys of the keyboard, select the **IP** zone of the « SETUP » menu, such a way it displays in reverse video:



Press the  key to enter the « IP CONFIGURATION » sub-menu. The **ETH1** zone is automatically selected:



5.3.1.3.6.4.1 « SETUP / IP / ETHi » SUB-MENUS

Purpose: Four of the five zones of the « IP CONFIGURATION » sub-menu allows the IP parameters configuration of the Ethernet link ETH_i, $i \in [1, 4]$, that represent the 4 Ethernet links no. 1 to no. 4 available on the transceiver.

Value: The parameters associated with the « ETH_i » menu are:


- Parameter **IP**: Sets the IP address according to the IPv4 format: **xxx.xxx.xxx.xxx**, where each xxx field can go from 000 to 255,
- Parameter **Mask**: Sets the subnet mask according to the IPv4 format: **xxx.xxx.xxx.xxx**, where each xxx field can go from 000 to 255.

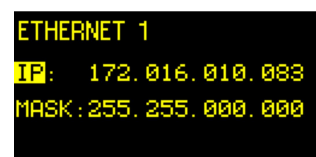


CAUTION: The IP address of ETH1 to ETH4 interfaces must obligatory **indicate a different sub-network**. If not, it will be impossible to exchange data with the radio. Otherwise, the 192.160.100.XXX IP addresses (Subnet mask 255.255.255.000) are forbidden because reserved for an internal use.

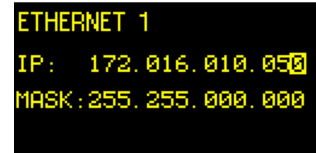
5.3.1.3.6.4.1.1 MODIFICATION OF THE IP ADDRESS

Procedure: The procedure to access the « ETH_i » menus to modify the address is as follows:

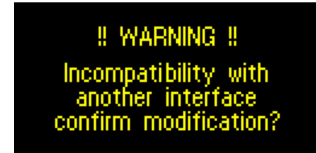
Press the  key to enter the « ETH1 » sub-menu of the « IP CONFIGURATION » sub-menu. The « IP » field is automatically selected:




Modify if required the IP address of the ETH1 link:



If the new IP address of the ETH1 interface conflicts with the IP address of another ETH2, 3 or 4 interface (*same sub-network*), then a « WARNING » message displays:




■ **To confirm the modification:** Press the  key. Data is memorized **but is not used dynamically**. The following message displays:




To take the new IP address of the Ethernet no. 1 link into account, a **reset of the device is required**. The following message displays to specify this requirement:



Restart the equipment or, if any other IP parameter requires a modification, press the  key to return to the « IP CONFIGURATION » sub-menu.



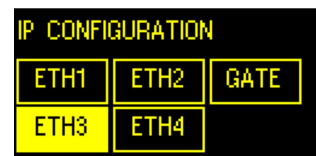
■ **To cancel the modification:** Press the  key. The modification is not confirmed and the screen display returns to the « IP CONFIGURATION » sub-menu.



Using the arrow keys of the keyboard, select the **ETH2** to **ETH4** zones of the « IP CONFIGURATION » sub-menu, such a way they display in reverse video, then redo the previous steps for each link.
For ETH2:




Then for ETH3:



Then at last for ETH4:




Push the  key to return the « SETUP » menu:





5.3.1.3.6.4.1.2 MODIFICATION OF THE SUBNET MASK

Procedure: The procedure to access the « ETHi » menu to modify the mask is as follows:

Press the  key to enter the « ETH1 » sub-menu of the « IP CONFIGURATION » sub-menu. The « IP » field is automatically selected:


```
ETHERNET 1
IP: 172.016.010.083
MASK:255.255.000.000
```

Using the  or  keys, select the « MASK » field:

```
ETHERNET 1
IP: 172.016.010.050
MASK:255.255.000.000
```

Modify if required the Subnet mask of the ETH1 link:


```
ETHERNET 1
IP: 172.016.010.050
MASK:255.255.255.000
```

Press the  key to confirm. Data are memorized **but are not used dynamically**. The following message displays:

```
Reconfiguring
Ethernet...
```

To take this new sub-network mask of the Ethernet no. 1 link into account, **a reset of the device is required**. The following message displays to specify this requirement:

```
!! WARNING !!
Please restart the
radio for using new
Ethernet configuration
```

Restart the equipment or, if any other IP parameter requires a modification, press the  key to return to the « IP CONFIGURATION » sub-menu.

```
IP CONFIGURATION
ETH1 ETH2 GATE
ETH3 ETH4
```

Using the arrow keys of the keyboard, select the **ETH2** to **ETH4** zones of the « IP CONFIGURATION » sub-menu, such a way they display in reverse video, then redo the previous steps for each link.

```
IP CONFIGURATION
ETH1 ETH2 GATE
ETH3 ETH4
```

For ETH2:

```
IP CONFIGURATION
ETH1 ETH2 GATE
ETH3 ETH4
```

Then for ETH3:

```
IP CONFIGURATION
ETH1 ETH2 GATE
ETH3 ETH4
```

Then at last for ETH4:



Push the key to return the « SETUP » menu:



5.3.1.3.6.4.2 LINK AGGREGATION ON ETH1

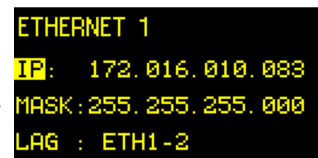
Purpose: An link aggregation can be established between ports ETH1 and ETH2, meaning an IP and MAC address redundancy. This link redundancy is made by the **ETH control** of the Maintenance interface. This paragraph supplies information relatively to port ETH1.

Procedure: The procedure for displaying the « ETH1 » port status is as follows:

Using the arrow keys of the keyboard, select the **ETH1** zone of the « IP CONFIGURATION » sub-menu, such a way it displays in reverse video:



Press the key to enter the « ETH1 » sub-menu of the « IP CONFIGURATION » sub-menu. **When the aggregation link is enabled**, the « **LAG : ETH1-2** » message (*) is displayed on 3° line of port ETH1:



(*) LAG: Link Agreggation Group



Push the key to return the « IP CONFIGURATION » menu:



About the « ETH » command programming, refer to document [1] **ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.

5.3.1.3.6.4.3 LINK AGGREGATION ON ETH2

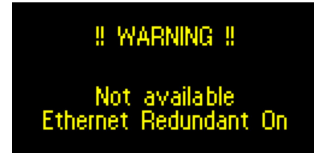
Purpose: Always in the frame of link aggregation between ports ETH1 and ETH2, this paragraph supplies information relatively to port ETH2. Remind that the link redundancy is made by the **ETH control** of the Maintenance interface.


Procedure: The procedure for displaying the « ETH2 » port status is as follows:

Using the arrow keys of the keyboard, select the **ETH2** zone of the « IP CONFIGURATION » sub-menu, such a way it displays in reverse video:



If the aggregation link is enabled, the following message is displayed on port ETH2:



Push the  key to return the « IP CONFIGURATION » menu:



About the « ETH » command programming, refer to document [1] **ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.

5.3.1.3.6.4.4 « SETUP / IP / GATE » SUB-MENU

Purpose: The next zone of the « IP CONFIGURATION » sub-menu allows configuration of the parameters for the default gateway. For this gateway, the IP parameters are limited to its IP address configuration.

Value: The parameters associated with the « GATE » menu are:

- ▶ Parameter **IP**: Sets the gateway address according to the IPv4 format: **xxx.xxx.xxx.xxx**, where each xxx field can go from 000 to 255.




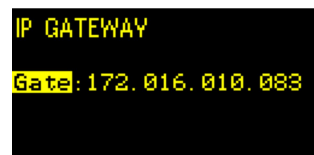
CAUTION: The IP address of the GATE gateway must obligatory **pertain to one of the previous sub-network**. If not, it will be impossible to access the gateway with the radio.

Procedure: The procedure to access the « GATE » menu is as follows:

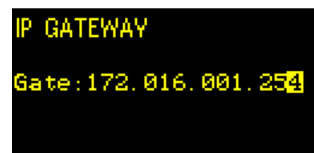
Using the arrow keys of the keyboard, select the **GATE** zone of the « IP CONFIGURATION » sub-menu, such a way they display in reverse video:




Press the  key to enter the « IP GATEWAY » sub-menu of the « IP CONFIGURATION » sub-menu. The « Gate » field is automatically selected:



Select the « value » field of the « Gate » and change if required the IP address of the default gateway:




Press the  key to confirm. Data are memorized **but are not used dynamically**. The following message displays:




To take the new value of the default gateway into account, **a reset of the device is required**. The following message displays to specify this requirement:



Press the  key to return to the « IP CONFIGURATION » sub-menu:



Push the  key to return the « SETUP » menu:



5.3.1.3.6.5 « SETUP / COMP » SUB-MENU

Purpose: The purpose of this menu is to activate or deactivate the audio compressor of the reception part of the transceivers.


Value: The parameter associated with the « COMP » menu is:

- Parameter **Status** : Configures the Audio compressor status :
 - ▶ Value **ON**: The audio compressor of the Reception part is enabled,
 - ▶ Value **OFF**: The audio compressor of the Reception part is disabled.

Procedure: The procedure to access the « COMP » menu is as follows:

Using the arrow keys of the keyboard, select the **COMP** zone of the « SETUP » menu, such a way they display in reverse video:




Press the  key to enter the « COMPRESSOR » sub-menu of the « SETUP » menu. The « value » field of the « Rx Status » line is automatically selected:



Modify if required the compressor status (*ON or OFF*):



Press the  key to return to the « SETUP » menu.



5.3.1.3.6.6 « SETUP / REMOTE CTL » SUB-MENU


Purpose: The purpose of this sub-menu is to place the radio equipment under remote control again, i.e. under the control of a Remote Monitoring System. When the equipment is under local control, note that it automatically changes back to remote controlled mode after **5 minutes of inactivity** on the local keyboard.

Value: No parameter.


Procedure: The procedure to access the « Remote ctl » sub-menu is as follows:

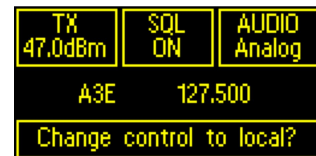
Using the arrow keys of the keyboard, select the **Remote Ctl** zone of the « SETUP » menu, such a way they display in reverse video:



Press the  key to enter the « CONTROL » sub-menu. A confirmation screen displays:



Press the  key to return to the Operating menu. Now this one displays the message : « Change control to local ? »:



5.3.1.3.7 « MAINT » MENU

Purpose: This menu allows:

- Equipment maintenance help screens to be provided in the form of measurement screens,
- Radio status as well as DATA and JBUS serial links activity to be displayed,
- Different types of test to be managed: continuous, initiated or specific,
- The accuracy of the frequency master oscillator to be adjusted,
- Information relating to the equipment to be obtained: model, serial number, onboard software version.

Value: The values of the sub-menus associated with the « MAINT » menu are:

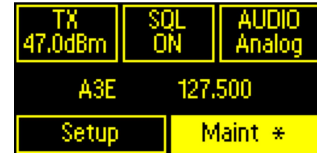
- Sub-menu **MEASURES**: Allows the measurement screens to be accessed,
- Sub-menu **STATUS**: Allows the radio and the serial links status to be displayed,
- Sub-menu **TEST**: Allows the test reports to be accessed,
- Sub-menu **TCXO**: Allows the frequency Master oscillator to be adjusted,
- Sub-menu **ABOUT**: Allows the general information to be accessed.

Procedure: The procedure to access the « MAINT » menu is as follows:

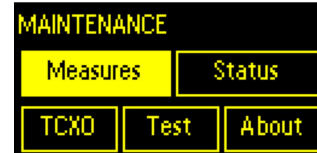
Select the **Maint** zone such a way it displays in reverse video:



If the CBIT or IBIT test report in the **Test** sub-menu of the **Maint** menu is **NOK** or **DEGRADED**, then an asterisk (*) is added in the Maint zone:



Press the **V** key to enter the « MAINTENANCE » menu. The **Measures** zone is automatically selected:



5.3.1.3.7.1 « MAINT / MEASURES » SUB-MENU

Purpose: This menu allows the measurement screens to be accessed.

Value: The transceiver parameters displayed in the « MEASURES » menu are:

■ Page 1: Output power:

- ▶ Parameter Direct power FWD: 2 to 50W (33 to 47dBm) in VHF, 10 to 50W (40 to 47dBm) in UHF,
- ▶ Parameter Reflected power REV: 0 to 10W ($-\infty$ to 40dBm),
- ▶ Parameter Stationary wave ratio VSWR: 1 to $+\infty$,
- ▶ Parameter Modulation depth MOD: 0 to 100% (in A3E, ACARS and VDL2 mode only).

■ Page 2: Reception measurements and Line levels:

- ▶ Received Electromagnetic Field level FIELD: -120 à +30dBm,
- ▶ CW SNR: 0 to 40dB,
- ▶ Output AF line level LINE OUT: -30 à +10dBm,
- ▶ Input AF line level LINE IN: -30 à 0dBm.

■ Page 3: Temperatures:

- ▶ Amplifier Module PA temperature: -30 to +90°C,
- ▶ Power Supply Module PS Temperature: -30 to +90°C,
- ▶ RHUM Module temperature: -30 to +90°C,
- ▶ CTNU/CTTQ PCB temperature: -30 to +90°C.

■ Page 4: Power supply: (For the TRX9000-2G and TRX9010-2G)

- ▶ +V_{DC} power supply +V=: 20,5V(*) to 31V,
- ▶ +V= (AC/DC) power supply from the Mains source: 20,5V(*) to 31V,
- ▶ +V= (DC) power supply from the Battery source: 20,5V(*) to 31V.


■ Page 4: Power supply : (For the TRX9020-2G)

- ▶ +V_{DC} power supply +V=: 49V to 51V,
- ▶ +V= (AC/DC) power supply from the Mains source : ≈ 51V,
- ▶ +V= (DC) power supply from the Battery source : 20,5V(*) to 31V.

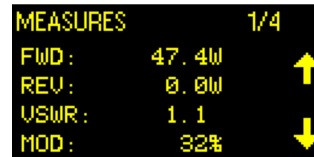
(*): The display screen stays on up to 18.5V, although the transceiver has been inhibited as soon as the power supply falls below 20.5V.

Procedure: The procedure to access the « MEASURES » menu is as follows:

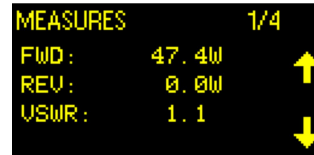



Press the  key on the keyboard, to display page 1/4 of the « MEASURES » sub-menu:

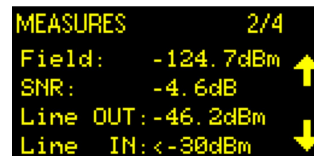
- In A3E, ACARS or VDL2 mode:




- Or in F3E or G3E modes:

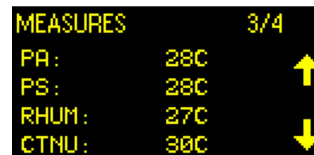


Press the  key to display page 2/4 of the « MEASURES » sub-menu:

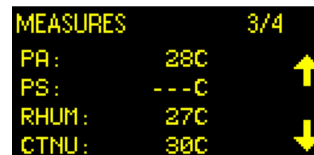



Press the  key to display page 3/4 of the « MEASURES » sub-menu:

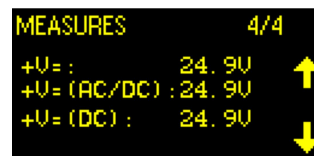
- If the transceiver has been configured **with a Mains input**, the screen displays the following information:



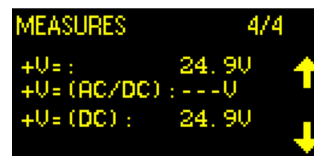
- If the transceiver has been configured **without a Mains input**, the screen suppresses the AC/DC converter temperature information (PS line in dashed lines):




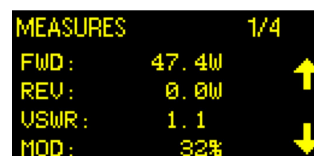
Press the  key to display page 4/4 of the « MEASURES » sub-menu.




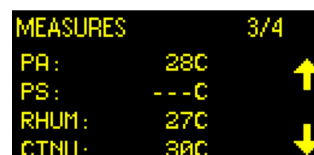
Like for the previous page, if the transceiver has been configured **without a Mains input**, the screen suppresses the AC/DC converter voltage information (+V= (AC/DC) line in dashed lines):



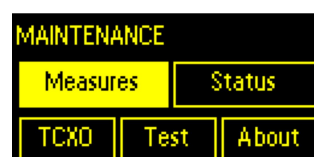
Press the  key on the keyboard, to display again page 1/4 of the « MEASURES » sub-menu:



Pages can be also scrolled up by using the  key (passage from page 4/4 to 3/4, then 2/4, etc...):



Push the  key to return the « MAINTENANCE » menu.



5.3.1.3.7.2 « MAINT / STATUS » SUB-MENU

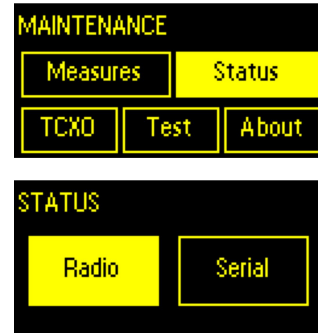
Purpose: This sub-menu allows the equipment status as well as the DATA and JBUS serial links activity to be displayed.


Value: The parameters associated with the « STATUS » sub-menu are:

- Sub-menu **RADIO**: Allows the equipment status to be displayed,
- Sub-menu **SERIAL**: Allows the serial links activity to be displayed.

Procedure: The procedure for accessing the « STATUS » sub-menu is as follows:

Using the arrow keys of the keyboard, select the **Status** zone of the « MAINTENANCE » menu, such a way it displays in reverse video:



Press the  key to enter the « STATUS » sub-menu. The **Radio** zone is automatically selected:

5.3.1.3.7.2.1 « MAINT / STATUS / RADIO » SUB-MENU

Purpose: This sub-menu allows equipment information to be displayed, such as general status, « ON/OFF » or « Inhibition » commands status, checking the presence of learning and the status of the Main/Standby function.

Value: The parameters of the transceiver associated with the « RADIO » sub-menu are displayed on 2 pages:

■ **Page 1/2 : 4 parameters:**

- ▶ Parameter **Status**: General Status of the equipment:
 - **OK**: The equipment is operational,
 - **NOK**: The equipment is not operational.
- ▶ Parameter **On/Off Cmd**: « ON/OFF » control status:
 - **ON**: The « ON/OFF » control is at « ON »,
 - **OFF**: The « ON/OFF » control is at « OFF ».
- ▶ Parameter **Inhibition**: « Transmission Inhibition » control status:
 - **Act.:** The « Inhibition » control is active, so the transmitter is inhibited,
 - **Deact.:** The « Inhibition » control is inactive.
- ▶ Parameter **LearningTx**: Internal learnings status:
 - **OK**: The Internal learnings have been realized correctly,
 - **NOK**: The Internal learnings have a problem.

■ **Page 2/2: 2 parameters:**


- ▶ Parameter **Rf output**: Status of the RF output (*as well as the STATUS led*):

- **ON:** The RF output is operational,
- **OFF:** The RF output is inhibited (*Radio mute, default, etc...*).



► Parameter **M/S control:** « Main/Standby » control status:

- **ON:** The « Main/Standby » control is active,
- **OFF:** The « Main/Standby » control is inactive.


Procedure: The procedure for accessing the « RADIO » sub-menu is as follows:

Press the  key to enter the « RADIO STATUS » sub-menu of the « RADIO » sub-menu:

```
RADIO STATUS 1/2
Status:      OK
On/Off Cmd: OFF
Inhibition:  Deact.
LearningTx:  OK
```

Press the  or  keys to display page 2/2 of the « RADIO STATUS » sub-menu:

```
RADIO STATUS 2/2
Rf output:  ON
M/S ctrl:   ---
```

Push the  key to return the « STATUS » menu.

```
STATUS
Radio      Serial
```

5.3.1.3.7.2.2 « MAINT / STATUS / SERIAL » SUB-MENU

Purpose: This sub-menu allows the DATA and JBUS serial links activity in transmission and in reception to be displayed.


Value: The parameters associated with the « SERIAL » sub-menu are:

- Parameter **DATA:** Displays the status of the DATA link:
 - **NOT AVAILABLE:** The DATA serial link is not used,
 - *******:** Displays the Tx / Rx activity of the DATA link.
- Parameter **JBUS:** Displays the status of the JBUS link:
 - **NOT AVAILABLE:** The JBUS serial link is not used,
 - *******:** Displays the Tx / Rx activity of the JBUS link.

Procedure: The procedure for accessing the « SERIAL » sub-menu is as follows:

Using the arrow keys of the keyboard, select the **Serial** zone of the « STATUS » menu, such a way it displays in reverse video:

```
STATUS
Radio      Serial
```


Press the  key to enter the « SERIAL LINK » sub-menu:

- If the serial links are not used, the screen displays:


```
SERIAL LINK
DATA
Not Available
JBUS
Not Available
```

- If the serial links are used, the indication of activity is displayed by rotating lines (✱✱✱✱):



Push the  key to return the « STATUS » menu:



Push the  key again to return the « MAINTENANCE » menu:





5.3.1.3.7.3 « MAINT / TCXO » SUB-MENU

Purpose: This sub-menu allows the accuracy of the frequency Master oscillator generating the carrier for the transmission part of a transceiver or the Local oscillator for its reception part to be adjusted.

Value: The parameters associated with the « TCXO » sub-menu of the « MAINTENANCE » menu are:

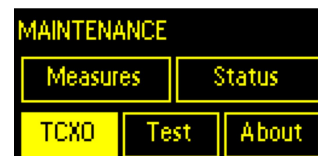
- Parameter **SETUP**: Indicates the type of adjustment for the Master Oscillator: **Manual**, **Standby**, **Trigger** or **Tracking**,
- Parameter **VALUE**: Master Oscillator adjustment value between **001** and **255**,
- Parameter **STATUS**: Indicates the source of the 10MHz reference **internal** or **external**.


 **REMARK 1:** The two first parameters are Read/Write available, when the third one is Read only available.

 **REMARK 2:** The electronic potentiometer (EEPOT) used for this adjustment is made up of 255 steps, and allows **compensation of ±15ppm**, i.e. a resolution of about 0.12ppm per step (between 14 and 19Hz in VHF, and between 27 and 48Hz in UHF).

Procedure: The procedure for accessing the « TCXO » sub-menu is as follows:

Using the arrow keys of the keyboard, select the **TCXO** zone of the « MAINTENANCE » menu, such a way it displays in reverse video:



Press the  key to enter the « TCXO ADJUST » sub-menu. The screen that will display after depends on an external 10MHz signal presence or not as specified in the following paragraphs.

5.3.1.3.7.3.1 « MAINT / TCXO / SETUP MANUAL » SUB-MENU

Purpose: This sub-menu allows a manual adjustment of the TCXO through the « Value » field. This « Setup » mode is not available if an external 10MHz reference is present inside the equipment.

Value: The adjustment values are:

- Values between **001** and **127** decrease frequency,
- Values between **127** and **255** increase frequency.

Procedure: The manual adjustment procedure of the TCXO's EEPROM is as follows:

Using the arrow keys of the keyboard, select the « Value » field of the « TCXO ADJUST » sub-menu, such a way it displays in reverse video:

```
TCXO ADJUST
Setup:  Manual
Value:  127
Status:  INT
```




REMARK: The « Status » field displays « INT » to specify an internal adjustment of the TCXO.

Select the 1st and/or the 2d and/or the 3d digit of the « value » field of the « Value » line then configure the adjustment value. Each modification is immediately transmitted.

```
TCXO ADJUST
Setup:  Manual
Value:  130
Status:  INT
```



Push the  key again to return the « MAINTENANCE » menu.

```
MAINTENANCE
Measures  Status
TCXO      Test   About
```

5.3.1.3.7.3.2 « MAINT / TCXO / SETUP STANDBY » SUB-MENU

Purpose: This sub-menu specifies that the TCXO is automatically slaved on an accurate external 10MHz signal.

Value: No parameter.

Procedure: The automatic adjustment procedure of the TCXO's EEPROM is as follows:


Switching in the « Standby » mode is automatic, at the moment the equipment detects an external 10MHz reference presence, and impossible if this reference is absent.

```
TCXO ADJUST
Setup:  Standby
Value:  127
Status:  EXT
```



REMARK: The « Status » field displays « EXT » to specify an external adjustment of the TCXO.



Push the  key again to return the « MAINTENANCE » menu.



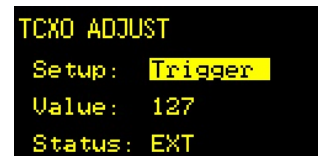
5.3.1.3.7.3.3 « MAINT / TCXO / SETUP TRIGGER » SUB-MENU

Purpose: This sub-menu indicates that, though the TCXO is automatically slaved on an accurate external 10MHz signal, the internal adjustment TCXO's EEPOT is **automatically adjusted once** to take into account the possible drift of the 10MHz internal reference quartz crystal, and so giving an immediate proper operation of the equipment, when the external 10MHz signal disappears, and the equipment returns to its internal reference. Once the adjustment has been done, the « Setup » field returns automatically in « Standby » mode.

Value: No parameters.


Procedure: The TCXO's EEPOT adjustment procedure in the « Trigger » mode is as follows:

Select the « Setup » field and display « Trigger ».




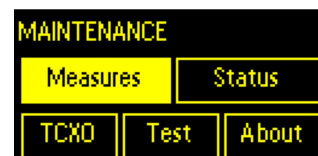
REMARK: The « Status » field always displays « EXT » to specify an external adjustment of the TCXO.



Press the  key to launch the adjustment. After a few seconds, this adjustment can involve a change of the EEPOT value and the setup returns in « Standby » mode.



Push the  key again to return the « MAINTENANCE » menu.



5.3.1.3.7.3.4 « MAINT / TCXO / SETUP TRACKING » SUB-MENU

Purpose: This sub-menu indicates that, though the TCXO is automatically slaved on an accurate external 10MHz signal, the internal adjustment TCXO's EEPOT is automatically adjusted **periodically** to take into account the possible drift of the 10MHz internal reference quartz crystal. Once the adjustment has been done, the « Setup » field remains in « Tracking » mode. The adjustment period is programmed every **24hours** and cannot be modified.

Value: No parameters.

Procedure: The TCXO's EEPOT adjustment procedure in the « Tracking » mode is as follows:

Select the « Setup » field and display « Tracking ».



REMARK: The « Status » field always displays « EXT » to specify an external adjustment of the TCXO.



Press the **V** key to launch the adjustment. After a few seconds, this adjustment can involve a change of the EEPOT value but the setup remains in « Tracking » mode. The next adjustment will be done automatically in 24 hours.



Push the **X** key again to return the « MAINTENANCE » menu.



5.3.1.3.7.4 « MAINT / TEST » SUB-MENU

Purpose: This sub-menu allows three types of tests built into the equipment to be accessed:

- A CBIT test (*Continuous Build-In Test*),
- An IBIT test (*Initiated Build-In Test*),
- Continuous tests in transmission and in reception.

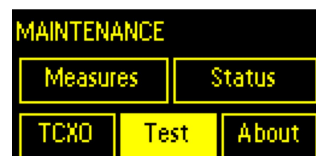
About the two first types of tests, it allows also the associated test reports to be viewed.

Value: The parameters associated with the « TEST » sub-menu of the « MAINT » menu are:

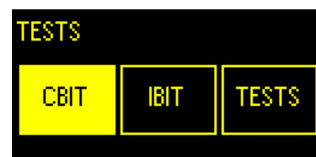
- **CBIT** (*Continuous Built-In Test*) sub-menu: Permanent testing of some resources of the equipment,
- **IBIT** (*Initiated Built-In Test*) sub-menu: Test triggered by the user on request,
- **TESTS** sub-menu: Test triggered in transmission and in reception.

Procedure: The procedure for accessing the « TEST » sub-menu is as follows:

Using the arrow keys of the keyboard, select the **Test** zone of the « MAINTENANCE » menu, such a way it displays in reverse video:



Press the **V** key to enter the « TESTS » sub-menu. The **CBIT** zone is automatically selected:



5.3.1.3.7.5 « MAINT / TEST / CBIT » SUB-MENU

Purpose: This sub-menu allows the result of the transceiver's continuous test to be displayed. These test reports include the presence or not of an external motorized cavity.

Value: The transceiver parameters displayed in the « CBIT » sub-menu are:

■ **Page 1: General Status, CTNU/CTTQ and Synthesizer(s) status**

- ▶ General status of the equipment: **OK, NOK** or **DEGRADED**,
- ▶ CTNU/CTTQ PCB status: **OK, NOK** or **DEGRADED**,
- ▶ First Synthesizer module status SY1: **OK, NOK** or **DEGRADED**,
- ▶ Second Synthesizer module status SY2: **OK, NOK, DEGRADED** or **---** (Absent).


■ **Page 2: RHUM PCB, Power supply and Amplifier modules, SWR**

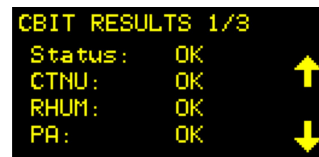
- ▶ RHUM PCB status: **OK** or **NOK**,
- ▶ Power supply module status PS: **OK, NOK** or **DEGRADED**,
- ▶ Amplifier module status PA: **OK, NOK** or **DEGRADED**,
- ▶ Antenna SWR status VSWR: **OK, NOK** or **DEGRADED**.


■ **Page 3: Cavity**

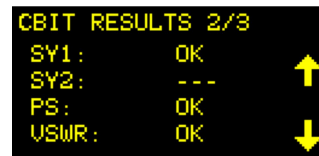
- ▶ Communication status with an external cavity: **OK, NOK** or **---** (Absent).

Procedure: The procedure to display the continuous test is as follows:

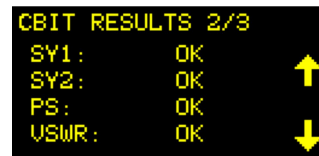
Press the  key on the keyboard, to display page 1/3 of the « CBIT RESULTS » sub-menu.




Press the  key on the keyboard, to display page 2/3 of the « CBIT RESULTS » sub-menu:

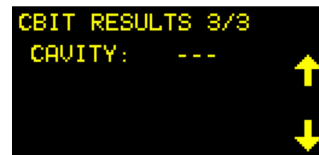


■ If the transceiver is configured with only one Synthesizer module, the following screen is displayed:

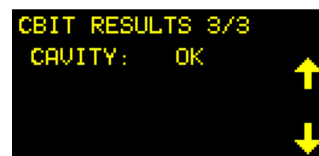


■ If the second Synthesizer module is present, then the screen displays:

Press the  key on the keyboard, to display page 3/3 of the « CBIT RESULTS » sub-menu.




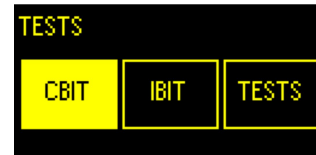
■ If the transceiver is not configured with an external motorized cavity, the screen displays :



■ If the transceiver is configured with an external motorized cavity, the screen displays :



Push the  key again to return the « TESTS » menu.



If the test report is **NOK** or **DEGRADED**, then an asterisk (*) is added in the Maint zone of the Main menu :



5.3.1.3.7.6 « MAINT / TEST / IBIT » SUB-MENU

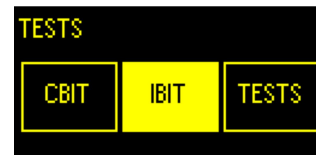
Purpose: This sub-menu allows the equipment's initiated test to be accessed.

Value: The parameters associated with the « IBIT » sub-menu of the « TEST » menu are:

- Sub-menu **LAUNCH IBIT**: Launching the initiated test,
- Sub-menu **IBIT RESULTS**: Display of the results of the initiated test.

Procedure: The procedure to launch the initiated test is as follows:

Using the arrow keys of the keyboard, select the **IBIT** zone of the « TESTS » menu, such a way it displays in reverse video:



Press the  key to enter the « IBIT » sub-menu. The **Launch IBIT** zone is automatically selected:




5.3.1.3.7.6.1 « MAINT / TEST / IBIT / LAUNCH IBIT » SUB-MENU

Purpose: This sub-menu allows the transceiver's initiated test to be launched.

Value: No parameters.

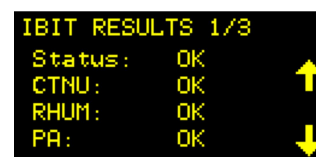
Procedure: The procedure to launch the initiated test is as follows:



Press the  key on the keyboard, to launch the « IBIT » triggered test.



At the end of the test, page 1/3 of the « IBIT RESULTS » sub-menu is automatically displayed.



If the CBIT or IBIT test report in the **Test** sub-menu of the **Maint** menu is **NOK** or **DEGRADED**, then an asterisk (*) is added in the Maint zone (See Paragraph « *MAINT* » menu » on page 140)*:

```
IBIT RESULTS 1/3
Status:   NOK      ↑
CTNU:    OK       ↓
RHUM:    NOK
PA:      OK
```



Press the key on the keyboard, to display page 2/3 of the « IBIT RESULTS » sub-menu:

- If the transceiver is configured with only one Synthesizer module, the following screen is displayed:

```
IBIT RESULTS 2/3
SY1:     OK      ↑
SY2:     ---     ↓
PS:      OK
VSWR:    OK
```

- If the second Synthesizer module is present, then the screen displays:

```
IBIT RESULTS 2/3
SY1:     OK      ↑
SY2:     OK      ↓
PS:      OK
VSWR:    OK
```



Press the key on the keyboard, to display page 3/3 of the « IBIT RESULTS » sub-menu.

- If the transceiver is not configured with an external motorized cavity, the screen displays:

```
IBIT RESULTS 3/3
CAVITY:   ---     ↑
                                     ↓
```

- If the transceiver is configured with an external motorized cavity, the screen displays:

```
IBIT RESULTS 3/3
CAVITY:   OK      ↑
                                     ↓
```

5.3.1.3.7.6.2 « MAINT / TEST / IBIT / IBIT RESULTS » SUB-MENU

Purpose: This sub-menu allows the result of the transceiver's initiated test to be displayed. These test reports include the presence or not of an external motorized cavity.


Value : The transceiver parameters displayed in the « IBIT RESULTS » sub-menu are:

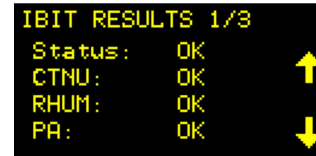
- **Page 1: General Status, CTNU/CTTQ and Synthesizer(s) status**
 - ▶ General status of the equipment: **OK**, **NOK** or **DEGRADED**,
 - ▶ CTNU/CTTQ PCB status: **OK**, **NOK** or **DEGRADED**,
 - ▶ First Synthesizer module status SY1: **OK**, **NOK** or **DEGRADED**,
 - ▶ Second Synthesizer module status SY2: **OK**, **NOK**, **DEGRADED** or **---** (*Absent*).
- **Page 2: RHUM PCB, Power supply and Amplifier modules, SWR**
 - ▶ RHUM PCB status: **OK** or **NOK**,
 - ▶ Power supply module status PS: **OK**, **NOK** or **DEGRADED**,
 - ▶ Amplifier module status PA: **OK**, **NOK** or **DEGRADED**,
 - ▶ Antenna SWR status VSWR: **OK**, **NOK** or **DEGRADED**.
- **Page 3: Cavity**
 - ▶ Communication status with an external cavity: **OK**, **NOK** or **---** (*Absent*).

Procedure: The procedure to display the results of the initiated test is as follows:

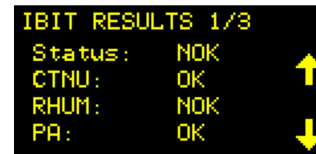
Using the arrow keys of the keyboard, select the **IBIT Results** zone of the « IBIT » menu, such a way it displays in reverse video:




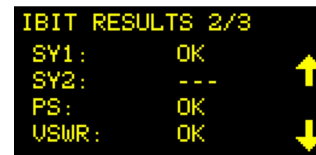
Press the  key to display page 1/3 of the « IBIT RESULTS » sub-menu is automatically displayed.



If the CBIT or IBIT test report in the **Test** sub-menu of the **Maint** menu is **NOK** or **DEGRADED**, then an asterisk (*) is added in the Maint zone (See Paragraph « « MAINT » menu » on page 140)*:

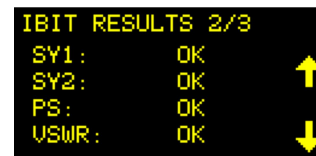



Press the  key on the keyboard, to display page 2/3 of the « IBIT RESULTS » sub-menu:



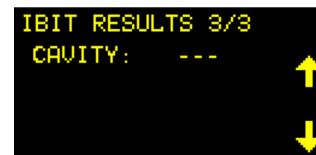
- If the transceiver is configured with only one Synthesizer module, the following screen is displayed:

- If the second Synthesizer module is present, then the screen displays:

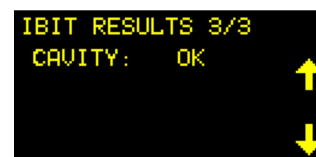


Press the  key on the keyboard, to display page 3/3 of the « IBIT RESULTS » sub-menu.

- If the transceiver is not configured with an external motorized cavity, the screen displays:



- If the transceiver is configured with an external motorized cavity, the screen displays:



5.3.1.3.7.7 « MAINT / TEST / TESTS » SUB-MENU

Purpose: This sub-menu allows the equipment's particular test to be accessed.

Value: The parameters associated with the « TESTS » sub-menu of the « TEST » menu are:

Parameter **CW**: Launches a CW test during 30s,

Parameter **TONE**: Launches a CW test modulated by a 1kHz AF Tone during 30s,

Parameter **RX**: Launches a test of the equipment's Reception part,

Parameter **MODE2**: Launches a CW test modulated by a binary frame during 30s.

Procedure: The procedure to launch the particular tests is as follows:

Using the arrow keys of the keyboard, select the **TESTS** zone of the « TESTS » menu, such a way it displays in reverse video:



Press the **V** key to enter the « TESTS » sub-menu. The **CW** zone is automatically selected.

- If the equipment is not currently operating in a VDL2 mode, the screen displays information indicating that tests in this mode are not available:



- Else the screen displays:



5.3.1.3.7.7.1 « MAINT / TEST / TESTS / CW » SUB-MENU

Purpose: This sub-menu allows the transceiver's CW test to be launched.

Value: No parameters.

Procedure: The procedure to launch the CW test is as follows:



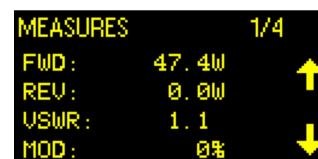
Press the **V** key on the keyboard, to launch the « CW » test. The test runs and the following screen is displayed during all the test duration:



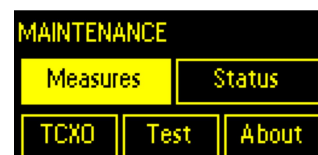
Pressing the **V** key at any moment stops the « CW » test:



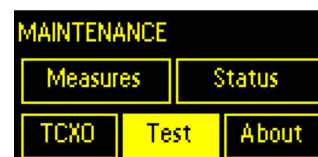
Pressing the **X** key during the test involves page 1/4 of the « MEASURES » screen to be displayed:



Pressing the **↑** or **↓** keys scroll up or down the measures pages.



Pressing the **X** key return to the « MAINTENANCE » menu:




Select again the **TEST** zone of the « MAINTENANCE » menu:

Select again the « TESTS » field of the « TEST » menu:



If the time used to display the measures pages is lower than the « CW » test duration, then the test is always running:



To stop the « CW » test, either press the  key, or wait for the timeout (about 30s). At the end of the test, the screen displays the « TESTS » sub-menu:



5.3.1.3.7.2 « MAINT / TEST / TESTS / TONE » SUB-MENU


Purpose: This sub-menu allows the transceiver's Tone test to be launched. The modulation is internally generated and corresponds to a 1kHz Sine wave signal modulating @ 85% the carrier.

Value: No parameters.


Procedure: The procedure to launch the TONE test is as follows:

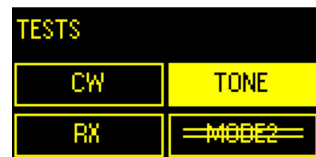
Using the arrow keys of the keyboard, select the **TONE** zone of the « TESTS » menu, such a way it displays in reverse video:




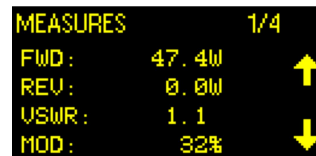
Press the  key on the keyboard, to launch the « TONE » test. The test runs and the following screen is displayed during all the test duration:



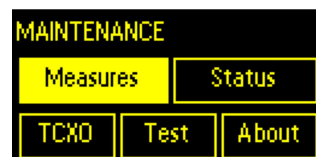
Pressing the  key at any moment stops the « TONE » test:




Pressing the  key during the test involves page 1/4 of the « MEASURES » screen to be displayed:



Pressing the  or  keys scroll up or down the measures pages.

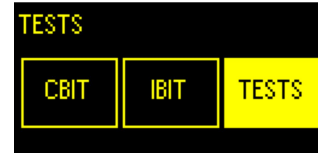


Pressing the  key return to the « MAINTENANCE » menu:

Select again the **TEST** zone of the « MAINTENANCE » menu:



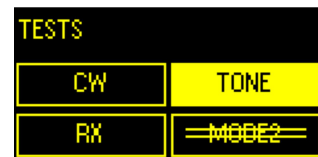
Select again the « TESTS » field of the « TEST » menu:



If the time used to display the measures pages is lower than the « TONE » test duration, then the test is always running:



To stop the « TONE » test, either press the **V** key, or wait for the timeout (*about 30s*). At the end of the test, the screen displays the « TESTS » sub-menu:



5.3.1.3.7.3 « MAINT / TEST / TESTS / RX » SUB-MENU

Purpose: This sub-menu allows the transceiver’s Rx test to be launched. This test checks the two resources constituting the Reception part of the transceiver :

- The RF part of the reception module (RHUM PCB) via the use of a Zener diode,
- The AF part supplied by the transceiver (CTNU/CTTQ PCB) via the generation of an internal 1 kHz AF signal.

Value: No parameters.

Procedure: The procedure to launch the Rx test is as follows:

Using the arrow keys of the keyboard, select the **RX** zone of the « TESTS » menu, such a way it displays in reverse video:




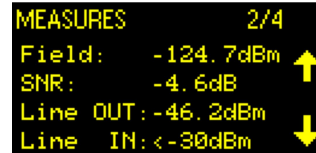
Press the **V** key on the keyboard, to launch the « RX » test. The test runs and the following screen is displayed during all the test duration:




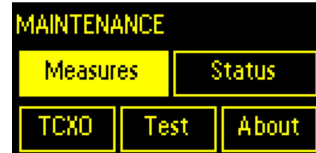
Pressing the **V** key does not stop the « RX » test. It realizes systematically a complete cycle:




Pressing the  key during the test involves page 2/4 of the « MEASURES » screen to be displayed:



Pressing the  or  keys scroll up or down the measures pages.



Pressing the  key return to the « MAINTENANCE » menu:



Select again the **TEST** zone of the « MAINTENANCE » menu:



Select again the « TESTS » field of the « TEST » menu:



As the cycle of the « RX » test is short (around 5s), it will be probably finished when returning to the « TESTS » screen:



To leave the « RX » test, wait for the end of cycle. At the end of the test, the screen displays the « TESTS » sub-menu:

5.3.1.3.7.4 « MAINT / TEST / TESTS / VDL2 » SUB-MENU

Purpose: This sub-menu allows the transceiver's VDL2 test to be launched. This test is available only if the equipment is currently operated in this mode. Modulation is internally constituted by a random binary frame from which the transceiver generates a D8PSK modulation of the carrier.

Value: No parameters.

Procedure: The procedure to launch the TONE test is as follows:

Check first that the equipment is configured in VDL2 mode:



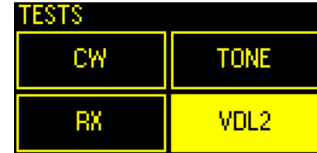
Then using the arrow keys of the keyboard, select the **MODE2** zone of the « TESTS » menu, such a way it displays in reverse video:



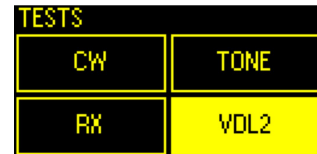
If the equipment is operating in any other mode than VDL2, the screen of the « TESTS » sub-menu is as follows, showing that the access to the **MODE2** zone is impossible:



Press the **V** key on the keyboard, to launch the « MODE2 » Data test. The test runs and the following screen is displayed during all the test duration:



At the end of the test, the screen displays the « TESTS » sub-menu:



5.3.1.3.7.8 « MAINT / ABOUT » SUB-MENU

Purpose: This sub-menu allows information relating to the transceiver to be viewed, such as the model, serial number or the embedded software version. This information is **read-only**, and therefore cannot be modified.

Value: The parameters associated with the « About » sub-menu of the « MAINTENANCE » menu are:

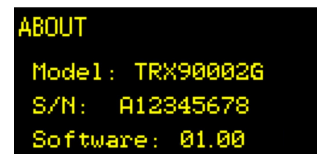
- Parameter **Model:** Describes the **type of equipment**,
- Parameter **S/N:** Highest level of the equipment **serial number** (800 or 803 families),
- Parameter **Software:** Supplies the embedded **software version**.

Procedure: The procedure for accessing the « About » sub-menu is as follows:

Using the arrow keys of the keyboard, select the **About** zone of the « MAINTENANCE » menu, such a way it displays in reverse video:



Press the **V** key to enter the « ABOUT » sub-menu. the page displays the value of the three parameters : Model, Serial Number and Software version:



Press the **X** key to return to the « MAINTENANCE » menu.



5.3.2 LOCAL OPERATION THROUGH THE MAINTENANCE INTERFACE

The transceiver Maintenance interface is not specifically a local connection as it is the Ethernet interface under a TELNET protocol. So the connection can be realized:

- Either locally, directly connecting a PC in terminal emulation on one of the 4 Ethernet ports of the transceiver,

- Or remotely connecting now the PC via a switch.



For more details, see paragraph « [Remote operation through ETHERNET link](#) » on page 158*.



For more details about commands, refer to document [1] **ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.

5.3.3 REMOTE OPERATION OF EQUIPMENT

5.3.3.1 REMOTE OPERATION THROUGH ETHERNET LINK

The rear panel ETHERNET interfaces (See Paragraph « [J20 to J23 ETHERNET connectors](#) » on page 43)* allow to connect a PC in terminal emulation, through which two sets of commands are available via a TELNET protocol, mainly dedicated to the transceiver configuration, but also to its maintenance (via the test commands *CBIT*, *IBIT*, *Tx* or *Rx*, and the associated test reports).



For more details about commands, refer to document [1] **ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.

5.3.3.2 REMOTE OPERATION THROUGH THE JBUS LINK

The JBUS interface allow the transceiver to be supervised from a remote Master Supervisor, through a RS485 type electrical interface. The transceiver is fitted with two JBUS interfaces:

- JBUS n°1, available on « SUPERVISION » J24 connector (See Paragraph « [J24 JBUS connector](#) » on page 44)*,
- JBUS n°2, available on « DATA » J26 connector (See Paragraph « [J26 DATA connector](#) » on page 45)*, when the transceiver is not operating in a Data transmission (ACARS or VDL2) and uses an external motorized cavity.



For more details about the JBUS tables, refer to document [3] **ICDGB 9000-2G series TRX90x0-2G JBUS**, TELERAD P/N 40600038: Interface commands document relating to the JBUS protocol supervision link.

5.3.3.3 REMOTE OPERATION THROUGH SNMP LINK

The SNMP interface allows the equipment to be supervised from a RCMS located on the same network, through an Ethernet type electrical interface.



For more details about the MIB, refer to document [2] **ICDGB 9000-2G Series TRX90x0-2G SNMP**, TELERAD P/N 40600039: Interface Control Document relating to the SNMP protocol supervision link.

5.4 MAINTENANCE CONCEPT

5.4.1 REMINDER OF SAFETY RULES

Maintenance operations may result in handling the equipment, opening it, as well as replacing or checking certain modules or PCBs.



Before any handling, carefully read the paragraph about the Safety rules (See Paragraph « **SAFETY RULES** » on page 1)* of this manual.

5.4.2 PREVENTIVE MAINTENANCE

Preventive maintenance consists in performing a series of periodical checks and operations that aim at keeping the equipment operating smoothly.

About the transceiver, **two preventive maintenance operations** are suggested, with a **recommended period of one year** for each of them.

They consist in:

- On one hand, the **periodic cleaning of the equipment**,
- On the other hand, the **checking and adjustment of the TCXO accuracy**.

5.4.2.1 MAINTENANCE AND CLEANING OPERATIONS

5.4.2.1.1 LIST OF REQUIRED TOOLS

- Dry cloth.
- Cleaning brush.
- Computer equipment cleaner.

5.4.2.1.2 CLEANING PROCEDURE



CAUTION RISK OF ELECTRIC CHOCK: *Disconnect all power supply sources of the equipment before any manipulation of it.*

SAFETY INSTRUCTIONS:

Power off the equipment.

The person handling the equipment must be equipped with a ground bracelet.

PROCEDURE OF EXECUTION:

1. Gently disconnect the various connectors from the rear panel of the transceiver.
2. If the equipment is installed in a rack, remove it from the rack, and place it on a clean flat surface.
3. Using a dry cloth, remove all traces of dust on the top cover (*and possibly the bottom cover*), as well as on the front and rear panels.
4. Using a brush, clean the contacts of the various front and rear panel connectors.
5. If necessary, replace the equipment in the rack, then connect all the connectors.

5.4.2.2 ADJUSTMENT OPERATIONS

5.4.2.2.1 LIST OF REQUIRED TOOLS

- A +24V_{DC} / 30A (for TRX9000C-2G version), +28V_{DC} / 30A (for TRX9010C-2G or TRX9020C-2G versions) laboratory power supply.
- A Frequency meter.
- A 50Ω load.

5.4.2.2.2 PROCEDURE OF ADJUSTMENT

PRELIMINARY CONDITIONS:

The transceiver must be powered on, and not connected to an external 10MHz reference.

PROCEDURE OF EXECUTION:

1. Connect a Frequency meter to the « REF TEST » BNC output on the front panel of the transceiver.
2. Using the HMI, put the transceiver in transmission (See Chapter « « MAINT / TEST / TESTS / CW » sub-menu » on page 153)*.
3. If the accuracy is worse than 0.3ppm (0.3 part per million = $3 \cdot 10^{-7}$), then using the HMI, select the frequency adjustment menu (See Paragraph « « MAINT / TCXO » sub-menu » on page 145)*.

5.4.3 CORRECTIVE MAINTENANCE

Corrective maintenance involves the transceiver to be replaced in operational mode after a fault has been detected.



CAUTION: Due to the high complexity of the modules constituting the transceiver, all PCBs or modules Disassembly/Reassembly operations inside the equipment is **strictly forbidden**. Those operations must be realized only by qualified TELERAD staff.

However some help-to-diagnostic tools are present in the transceiver, available either through the local HMI, or through the Maintenance Terminal, or through again the JBUS or SNMP interfaces, and allow to check the status of each PCB or module constituting the transceiver.

5.4.3.1 FAULT LOCALIZATION

Faults may be detected in a number of ways:

- Equipment operation is impossible,
- Front panel alarm indicator light lit,
- IBIT and CBIT built-in tests in failure,
- Detection of fault by RCMS.

Locally, the fault can be quickly located using the test menu available on the front panel Human-Machine Interface (See Paragraph « « MAINT / TEST / CBIT » sub-menu » on page 149)*.

The report analysis specifies the faulty PCB(s) or module(s):

- The first page gives the status of the following PCBs and modules:
 - ▶ The global transmission/reception function: **OK**, **NOK** or **DEGRADED** (in case of one module at least in degraded mode).

- ▶ The CTNU/CTTQ Control PCB: **OK**, **NOK** or **DEGRADED**,
 - ▶ The first synthesizer module SVHF25077, SUHF25078 or SYVU25076: **OK**, **NOK** or **DEGRADED** (for adjustment values < 40 or > 216),
 - ▶ When present, the second synthesizer module SVHF25077, SUHF25078 or SYVU25076: **OK**, **NOK** or **DEGRADED** (same reasons).
- The second page gives the status of the following PCBs and modules:
 - ▶ The RHUM22018, RHUM22019 or RHUM12186 reception PCB: **OK** or **NOK**,
 - ▶ The PS (Power Supply) module ALIN26300, ALIN26301, ALIN26303,ALDC26302 or ALDC26297: **OK**, **NOK** or **DEGRADED** (in case of power reduction due to the power supply temperature or low voltage),
 - ▶ The PA (Power Amplifier) module AMPV26260, AMPU26246 or AMPL26279: **OK**, **NOK** or **DEGRADED** (in case of power reduction due to the SWR presence, the amplifier temperature, the power supply temperature, the power supply voltage or a failure of the amplifier).
 - ▶ The SWR presence: **OK**, **NOK** (∞ SWR) or **DEGRADED** (SWR > 2).
 - At last, the third page gives the status of communication with an external motorized cavity:
 - ▶ The link with the cavity: **OK**, **NOK** or **---** (cavity absent).



For more details about commands, refer to document [1] **ICDGB 9000-2G Series TRX90x0-2G MAINTENANCE** Telerad P/N 40600040: Interface Control Document relating to the local operation and configuration link from the Ethernet TELNET rear panel interface.



For more details about the MIB, refer to document [2] **ICDGB 9000-2G Series TRX90x0-2G SNMP**, TELERAD P/N 40600039: Interface Control Document relating to the SNMP protocol supervision link.



For more details about the JBUS tables, refer to document [3] **ICDGB 9000-2G series TRX90x0-2G JBUS**, TELERAD P/N 40600038: Interface commands document relating to the JBUS protocol supervision link.

Finally, the only Maintenance operation available for the user is the **protective fuses replacement**.

5.4.3.2 TYPE OF PROTECTIVE FUSES



Protective fuses present on the power supply inputs.



DOUBLE POLE / FUSE ON NEUTRAL.

If this symbol is present on the rear of the device, then there is also a fuse on Neutral. Risk of electric shock.



For the fuses reference, see paragraph « [Protection through circuit-breakers](#) » on page 53*.

5.4.3.3 PROCEDURE FOR REPLACING THE MAINS FUSES



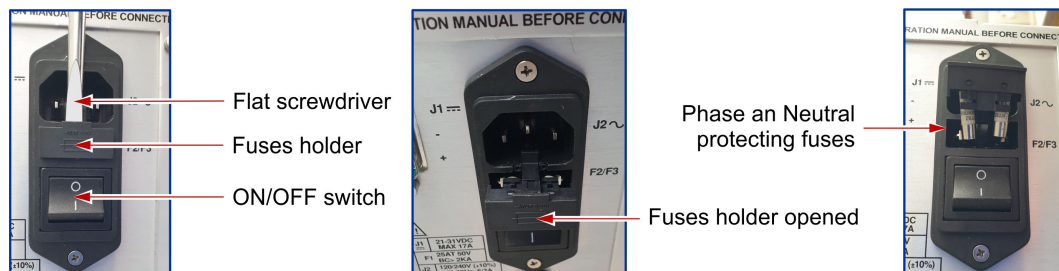
CAUTION RISK OF ELECTRIC CHOCK: Disconnect all power supply sources of the equipment before any manipulation of it.

■ **PRELIMINARY CONDITIONS:**

The transceiver must be powered off.

■ **PROCEDURE OF EXECUTION:**

1. Gently disconnect the various connectors from the rear panel of the transceiver.
2. If the equipment is installed in a rack, remove it from the rack, and place it on a clean flat surface.
3. Using a flat screwdriver, lever the Mains connector up to open the holder containing the Mains input protecting fuses.
4. Pull the fuses holder maximum on the rear then open it up (*on the Mains cord plug side*).
5. Extract the fuses then replace them by two identical fuses.
6. Close the fuses holder, replace the transceiver in the rack if necessary, then gently reconnect the various connectors on the rear panel of the transceiver.



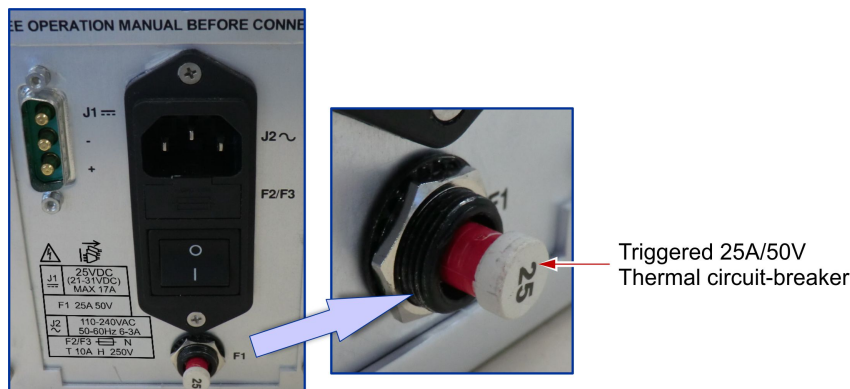
CAUTION: The « Phase » and « Neutral » inputs are protected by 10A/250V slow-blow fuses, reference 0215010.MXP 5x20mm 10AT (Telerad P/N : 210 00159).

5.4.3.4 PROCEDURE FOR RETRIGGERING THE THERMAL CIRCUIT-BREAKER

■ **PRELIMINARY CONDITIONS:**

The transceiver is supposed operating on its DC power supply source.
The thermal circuit-breaker has been triggered.

■ **EXECUTION PROCEDURE FOR THE TRX9000-2G AND TRX9010-2G:**



1. The figure here above displays the position of the thermal circuit-breaker once the protection has been triggered.
2. Push on the thermal circuit-breaker to put it back in service.
3. Using the « RF + MOD » front panel test pushbutton of the equipment, put it in transmission then check that the thermal circuit-breaker does not trigger again.

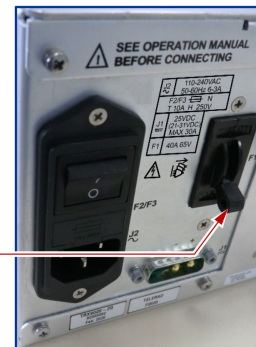


CAUTION: For TRX9000-2G and TRX9010-2G (A and C versions), the « +V= » +V_{DC} input is protected by a **thermal circuit-breaker 25A/50V (F1 reference on the rear panel)**, reference W58-XC4C12A-25 (TLD P/N: 180 00353).

■ EXECUTION PROCEDURE FOR THE TRX9020-2G:



Thermal Circuit-breaker
at « ON » position



Thermal Circuit-breaker
at « OFF » position

1. The figure here above displays the position of the thermal circuit-breaker once the protection has been triggered.
2. Rearm the thermal circuit-breaket by replacing the switch on its up position.
3. Using the equipment front panel HMI, select the MAINT/TEST/TESTS/CW sub-menu et launch the test to put it in transmission.
4. Check that the thermal circuit-breaker does not switch off again.



CAUTION: For TRX9020-2G (A and C versions), the « +V= » +V_{DC} input is protected by a **thermal circuit-breaker 40A/65V (F1 reference on the rear panel)**, reference W91-X152-40 (TLD P/N: 180 00357).

CHAPTER VI

PART LIST

6.1 LEVEL ONE PART LIST

6.1.1 TRX9000-2G VHF TRANSCEIVER

VHF DIGITAL TRANSCEIVER	TRX9000-2G	(82300080)
■ MECHANICAL CHASSIS	CTHR41177	(50001560)
■ CONTROL PCB (<i>up to 09/2021</i>)	CTNU15139C	(51001351)
■ CONTROL PCB (<i>from 09/2021 up to 05/2022</i>)	CTNU15136A	(51001363)
■ CONTROL PCB (<i>from 05/2022</i>)	CTNU15136B	(51001370)
■ VHF SYNTHESIZER MODULE	SVHF25077	(52000620)
■ VHF AMPLIFIER MODULE	AMPV26260	(52000634)
■ VHF RECEPTION MODULE	RHUM22018	(52000690)
■ MICROCONTROLLER PCB (<i>up to 09/2021</i>)	MIPR11020	(53500030)
■ MICROCONTROLLER PCB (<i>from 09/2021</i>)	MIPR11023	(53500033)
■ COAXIAL RELAY OUTPUTS BLOCKING PLATE KIT	KIT BOUCHAGE RELAIS	(55000293)
■ OPTION A: VHF + AC/DC VERSION	TRX9000A-2G	(84500217)
■ OPTION B: VHF + DC VERSION	TRX9000C-2G	(84500218)
■ OPTION X: MAIN/STANDBY COAXIAL RELAY	RECX_TRX_N/S	(84500234)
■ OPTION X: Tx/Rx OR VHF/UHF ANTENNA COAXIAL RELAY	RECX_TRX_TX/RX	(84500235)
■ OPTION X: VHF MOTORIZED CAVITY KIT	CAVITE TRX9000-2G	(84500252)
■ OPTION X: SET OF MOBILES PLUGS	JFM TRX90X0-2G	(57001166)
DIGITAL TRANSCEIVER MAINS AND BATTERY INPUTS	TRX9000A-2G	(84500217)
■ FRONT PANEL PCB	PAVT45038	(50001559)
■ POWER SUPPLY MODULE	ALIN26300	(52000695)
■ SPECIFIC ELEMENTS	ELSP TRX9000A-2G	(58001268)
DIGITAL TRANSCEIVER BATTERY INPUT ONLY	TRX9000C-2G	(84500218)
■ FRONT PANEL PCB	PAVT45038	(50001559)
■ POWER SUPPLY MODULE	ALDC26302	(52000697)
■ SPECIFIC ELEMENTS	ELSP TRX9000C-2G	(58001269)

6.1.2 TRX9010-2G UHF TRANSCEIVER

UHF DIGITAL TRANSCEIVER	TRX9010-2G	(82300081)
■ MECHANICAL CHASSIS	CTHR41177	(50001560)
■ CONTROL PCB (up to 09/2021)	CTNU15139C	(51001351)
■ CONTROL PCB (from 09/2021 up to 05/2022)	CTNU15136A	(51001363)
■ CONTROL PCB (from 05/2022)	CTNU15136B	(51001370)
■ UHF AMPLIFIER MODULE	AMPU26246	(52000597)
■ UHF SYNTHESIZER MODULE	SUHF25078	(52000621)
■ UHF RECEPTION MODULE	RHUM22019	(52000691)
■ MICROCONTROLLER PCB (up to 09/2021)	MIPR11020	(53500030)
■ MICROCONTROLLER PCB (from 09/2021)	MIPR11023	(53500033)
■ COAXIAL RELAY OUTPUTS BLOCKING PLATE KIT	KIT BOUCHAGE RELAIS	(55000293)
■ OPTION A: UHF + AC/DC VERSION	TRX9010A-2G	(84500219)
■ OPTION B: UHF + DC VERSION	TRX9010C-2G	(84500220)
■ OPTION X: MAIN/STANDBY COAXIAL RELAY	RECX_TRX_N/S	(84500234)
■ OPTION X: Tx/Rx OR VHF/UHF ANTENNA COAXIAL RELAY	RECXTRX_T/R_V/U	(84500235)
■ OPTION X: UHF MOTORIZED CAVITY KIT	CAVITE TRX9010-2G	(84500253)
■ OPTION X: SET OF MOBILES PLUGS	JFM TRX90X0-2G	(57001166)
DIGITAL TRANSCEIVER MAINS AND BATTERY INPUTS	TRX9010A-2G	(84500219)
■ FRONT PANEL PCB	PAVT45038	(50001559)
■ POWER SUPPLY MODULE	ALIN26301	(52000696)
■ SPECIFIC ELEMENTS	ELSP TRX9010A-2G	(58001270)
DIGITAL TRANSCEIVER BATTERY INPUT ONLY	TRX9010C-2G	(84500220)
■ FRONT PANEL PCB	PAVT45038	(50001559)
■ POWER SUPPLY MODULE	ALDC26302	(52000697)
■ SPECIFIC ELEMENTS	ELSP TRX9010C-2G	(58001271)

6.1.3 TRX9020-2G V/UHF TRANSCEIVER

V/UHF DIGITAL TRANSCEIVER	TRX9020-2G	(82300082)
■ MECHANICAL CHASSIS	CTHR41178	(50001589)
■ V/UHF RECEPTION MODULE	RHUM12186	(51001319)
■ V/UHF SYNTHESIZER MODULE	SYVU25101	(52000710)
■ V/UHF AMPLIFIER MODULE	AMPL26319	(52000720)
■ COAXIAL RELAY OUTPUTS BLOCKING PLATE KIT	KIT BOUCHAGE RELAIS	(55000293)
■ OPTION A : V/UHF + AC/DC VERSION (CTTQ)	TRX9020A-2G	(84500250)

■ OPTION C : V/UHF + DC VERSION (CTTQ)	TRX9020C-2G	(84500251)
■ OPTION D : V/UHF + AC/DC VERSION (CTNU)	TRX9020A-2G	(84500229)
■ OPTION E : V/UHF + DC VERSION (CTNU)	TRX9020C-2G	(84500230)
■ OPTION X : MAIN/STANDBY COAXIAL RELAY	RECX_TRX_N/S	(84500234)
■ OPTION X : Tx/Rx OR VHF/UHF ANTENNA COAXIAL RELAY	RECXTRX_T/R_V/U	(84500235)
■ OPTION X : SET OF MOBILES PLUGS	JFM TRX90X0-2G	(57001166)
DIGITAL TRANSCEIVER MAINS AND BATTERY INPUTS (CTNU VERSION)	TRX9020A-2G	(84500229)
■ FRONT PANEL PCB	PAVT45038	(50001559)
■ CONTROL PCB	CTNU15140C	(51001352)
■ POWER SUPPLY MODULE	ALIN26303	(52000698)
■ MICROCONTROLLER PCB	MIPR11020	(53500030)
■ SPECIFIC ELEMENTS	ELSP TRX9020A-2G	(58001283)
DIGITAL TRANSCEIVER BATTERY INPUT ONLY (CTNU VERSION)	TRX9020C-2G	(84500230)
■ FRONT PANEL PCB	PAVT45038	(50001559)
■ CONTROL PCB	CTNU15140C	(51001352)
■ +24V/+50V DC/DC POWER SUPPLY MODULE	ALDC26311	(52000712)
■ MICROCONTROLLER PCB	MIPR11020	(53500030)
■ SPECIFIC ELEMENTS	ELSP TRX9020C-2G	(58001282)
DIGITAL TRANSCEIVER MAINS AND BATTERY INPUTS (CTTQ VERSION)	TRX9020A-2G	(84500250)
■ CONTROL PCB (<i>from 09/2021 to 05/2022</i>)	CTTQ15137A	(51001364)
■ CONTROL PCB (<i>from 05/2022</i>)	CTTQ15137B	(51001371)
■ FRONT PANEL PCB	PAVT45038	(50001559)
■ MICROCONTROLLER PCB	MIPR11023	(53500033)
■ POWER SUPPLY MODULE	ALIN26303	(52000698)
■ SPECIFIC ELEMENTS	ELSP TRX9020A-2G	(58001283)
DIGITAL TRANSCEIVER BATTERY INPUT ONLY (CTTQ VERSION)	TRX9020C-2G	(84500251)
■ CONTROL PCB (<i>from 09/2021 up to 05/2022</i>)	CTNU15137A	(51001364)
■ CONTROL PCB (<i>from 05/2022</i>)	CTNU15137B	(51001371)
■ FRONT PANEL PCB	PAVT45038	(50001559)
■ MICROCONTROLLER PCB	MIPR11023	(53500033)
■ +24V/+50V DC/DC POWER SUPPLY MODULE	ALDC26311	(52000712)
■ SPECIFIC ELEMENTS	ELSP TRX9020C-2G	(58001282)

CHAPTER VII

DIAGRAMS

7.1 LIST OF PHOTOS

TELERAD CODE	NAME	ASSEMBLY OR SUB-ASSEMBLY
44001117	$\frac{3}{4}$ view of the TRX9000-2G VHF and TRX9010-2G UHF transceivers	TRX9000-2G TRX9010-2G
44001118	Front and Rear views of the TRX9000-2G VHF and TRX9010-2G UHF transceivers	TRX9000-2G TRX9010-2G
44001256	$\frac{3}{4}$ view of the TRX9020-2G V/UHF transceiver	TRX9020-2G
44001257	Front and Rear views of TRX9020-2G V/UHF transceiver	TRX9020-2G

7.2 LIST OF MECHANICAL SLIDES

TELERAD CODE	NAME	ASSEMBLY OR SUB-ASSEMBLY
45000117	Mechanical dimensions / weight 1/1	TRX9000A-2G TRX9010A-2G
45000126	Mechanical dimensions / weight 1/1	TRX9020A-2G

LIST OF ABBREVIATIONS

Acronym	Description
AC	Alternative current
ACARS	Aircraft Communication Addressing and Reporting System
AES	Advanced Encryption Standard
AF	Audio Frequency
AGC	Automatic Gain Control
AM	Amplitude Modulation
AM-MSK	Amplitude Modulation-Minimum Shift Keying
BNC	Bayonet Nut Connector
CBIT	Continuous Build-In Test
CODEC	COder - DECoder
CSMA	Carrier Sense Multiple Access
D8PSK	Differential 8-Phase Shift Keying
dB	Decibel
dBm	Decibel referred to a power of 1mW
DC	Direct current
DES	Data Encryption Standard
DHCP	Dynamic Host Configuration Protocol
DSCP	Differentiated Services Code Point
EC	European Conformity
EEPOT	Electrically Erasable POTentiometer
EMC	Electro Magnetic Compatibility
ESD	Electro-Static Discharge
ETSI	European Telecommunication Standard Institute
FM	Frequency Modulation
GRS	Ground Radio Station
HDLC	High Data Link Communication
HMI	Human Machine Interface
IANA	Internet Assigned Numbers Authority
IBIT	Initiated Build-In Test
ICAO	International Civil Aviation Organization

Acronym	Description
ICD	Interface Control Document
IP	Internet Protocol
LO	Local Oscillator
MAC	Media Access Control
MD5	Message Direct 5
OLED	Organic Light-Emitting Diode
PC	Personal Computer
PLL	Phase Locked Loop
ppm	Part Per Million
R&TTE	Radio and Telecommunications Terminal Equipment (Directive)
RF	Radio Frequency
RTP	Real-time Transport Protocol
RxD	Received Data
SHA	Secure Hash Algorithm
SIP	Session Initiation Protocol
SNMP	Simple Network Management Protocol
SNR	Signal/Noise Ratio
SNTP	Simple Network Time Protocol
SQL	Squelch
SWR	Stationary Wave Ratio
TLD	Telerad
TxD	Transmitted Data
UART	Universal Asynchronous Receiver Transmitter
UHF	Ultra High Frequency
USB	Universal Serial Bus
VCS	Voice Communication Switching System
VDL	VHF Data Link
VHF	Very High Frequency
VoIP	Voice over Internet Protocol



TELERAD

Aeronautical and Maritime Radiocommunication Systems



2, Avenue de la Butte aux Cailles
BP 302 – 64603 ANGLET Cedex – France
SIRET : 341 143 915 00013 – APE : 2651 A
Tel.: +33 (0)5 59 58 55 00 – Fax: +33 (0)5 59 58 55 01
Email: courrier@telerad.fr



www.telerad.fr

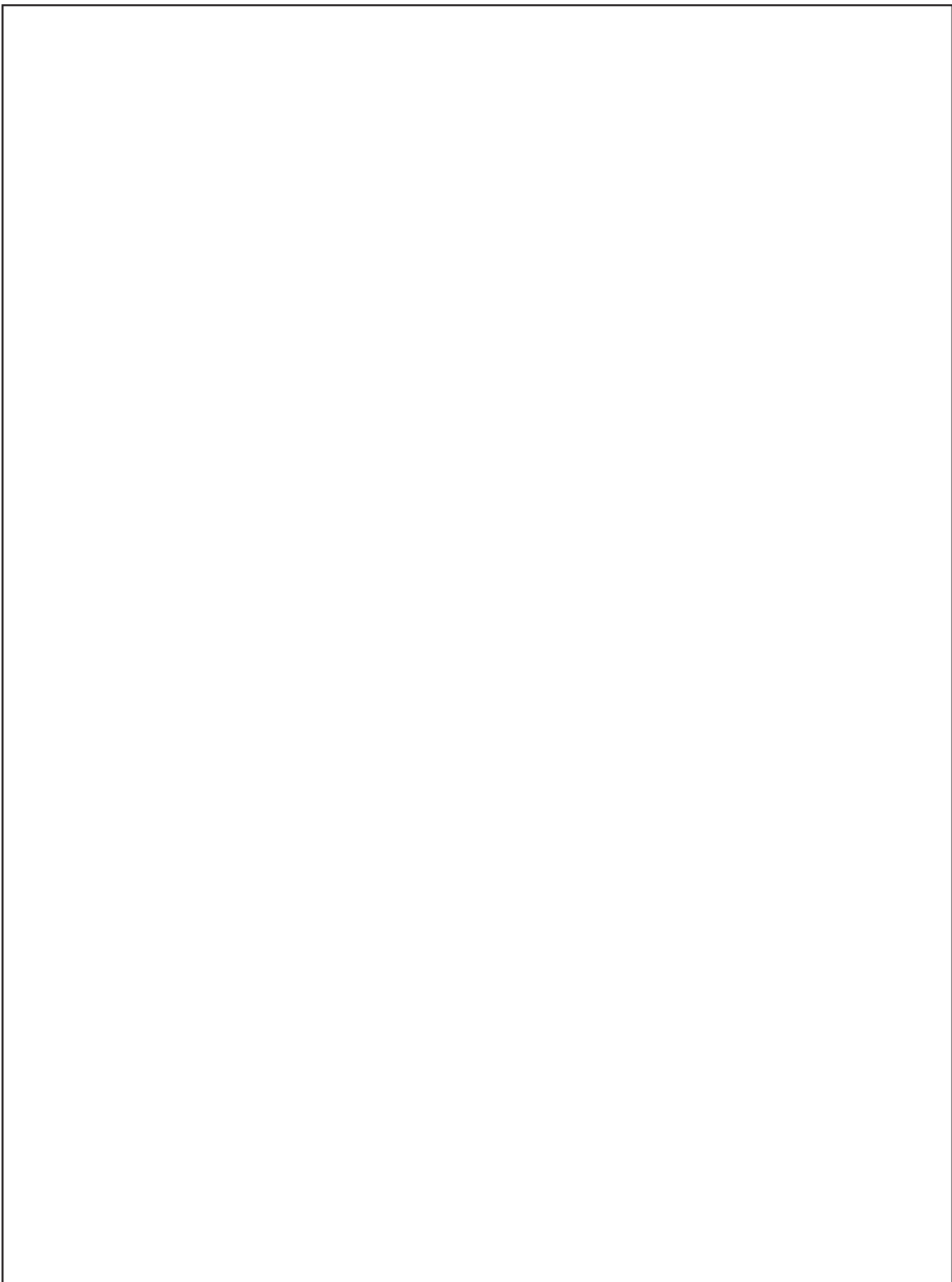




**AC/DC VHF TRANSCEIVER
Overall view**

44001117

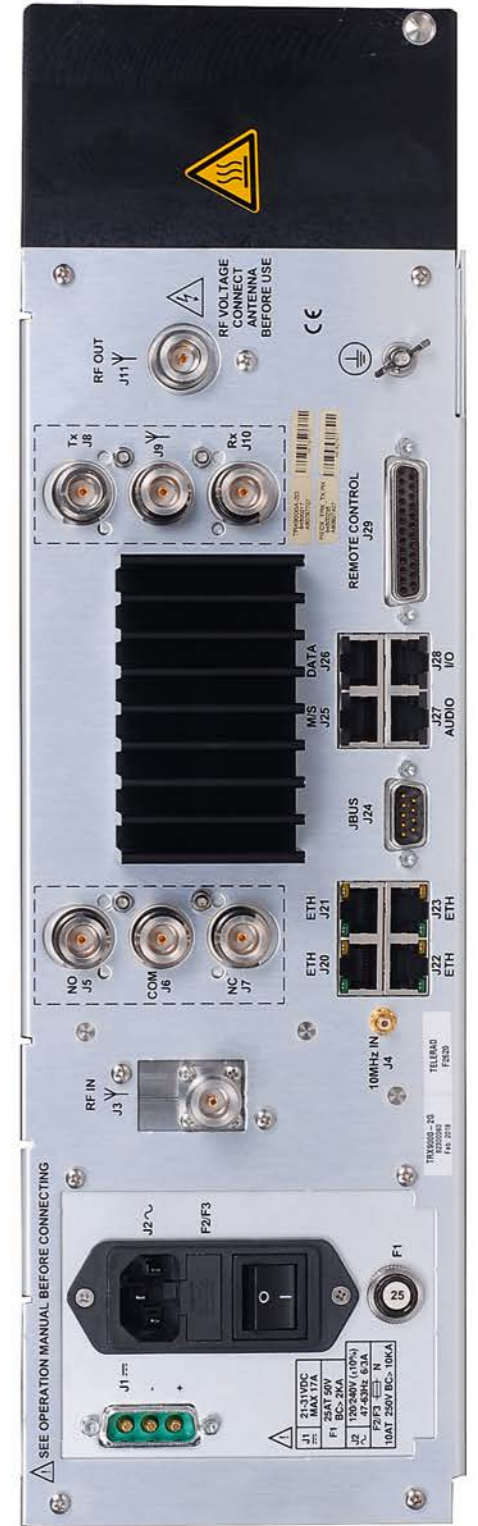
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		TRX9000A-2G	84500217	



Front view



Rear view



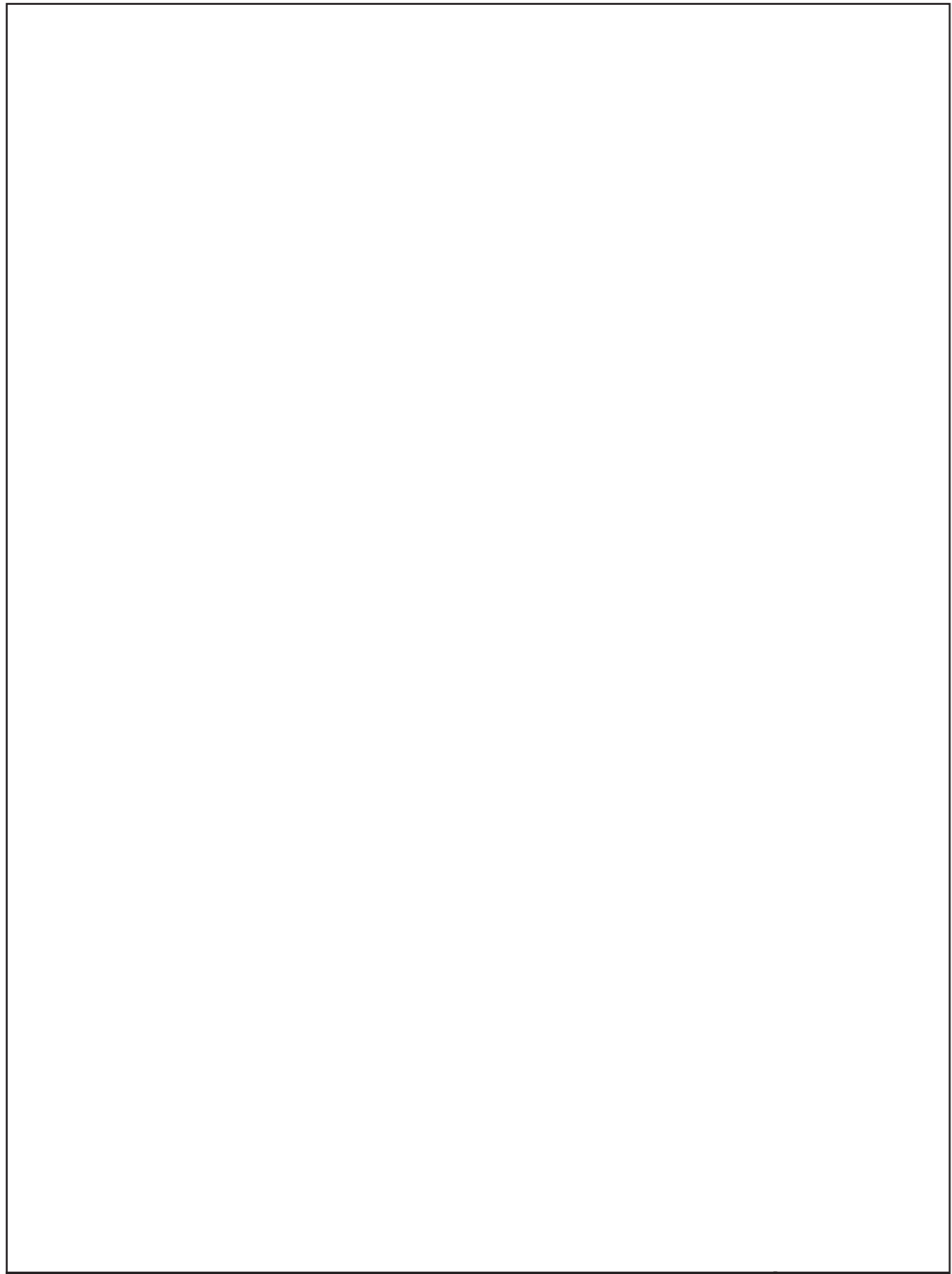
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		Index rev. : V1.00 Date rev. : 24/01/19 Page : 1/1	
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**V-UHF TRANSCEIVER
Overall view**

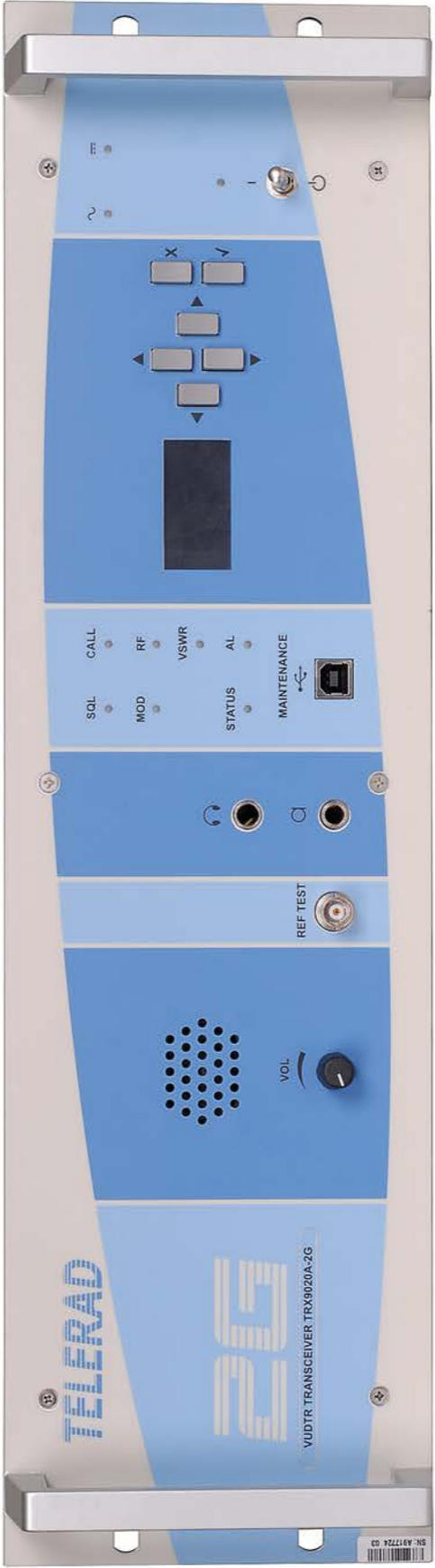
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V-UHF TRANSCEIVER Front and rear views			44001257
Subset reference:	Subset code:	Set reference:	Set code:
		TRX9020A-2G	84500229
			Index rev. : V1.01 Date rev. : 27/07/20 Page : 1/1
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Front view

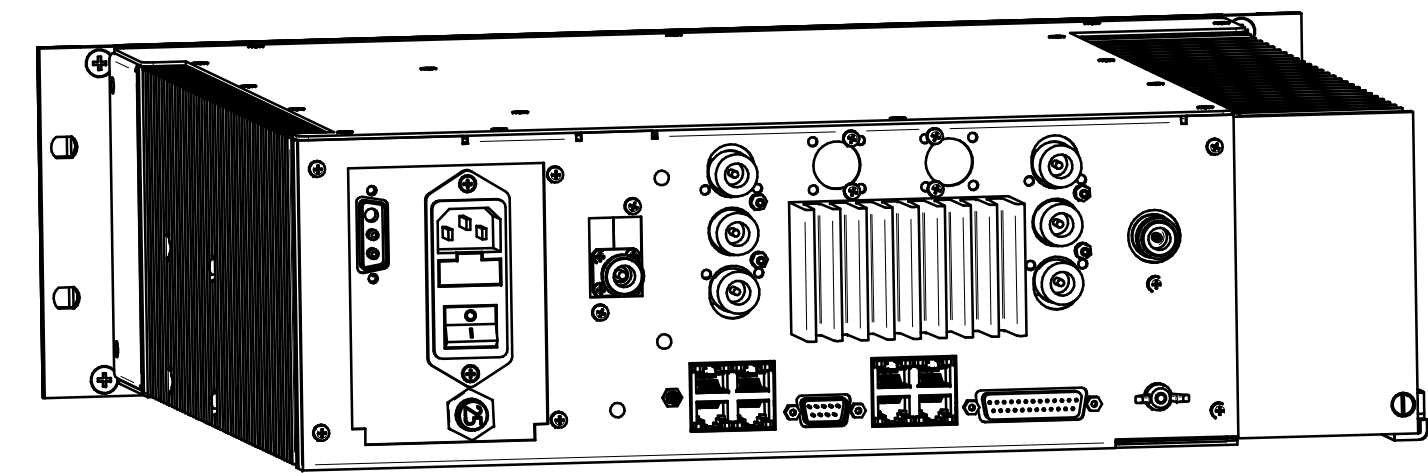
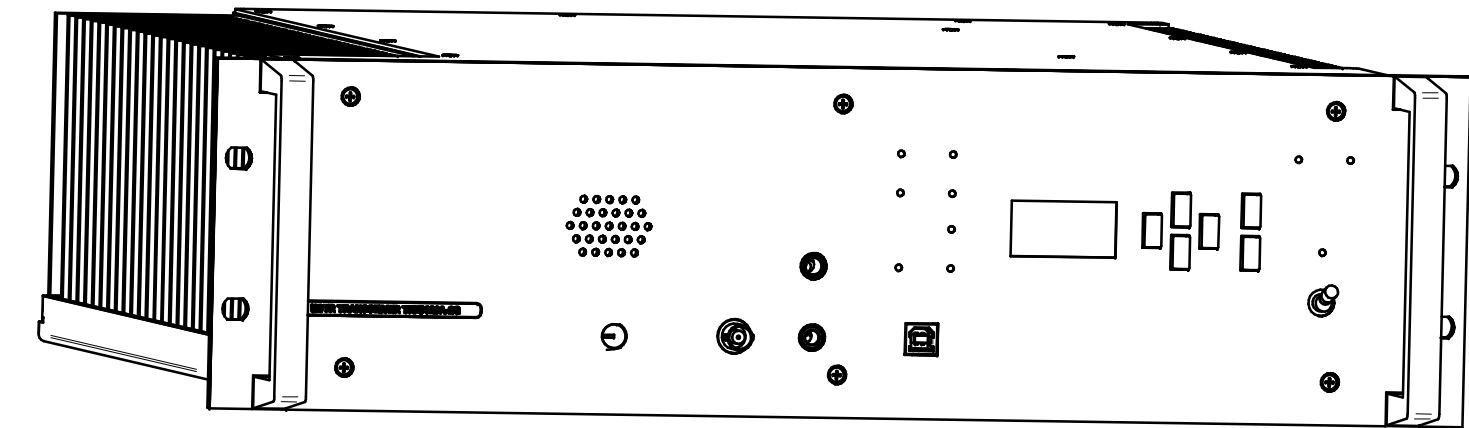
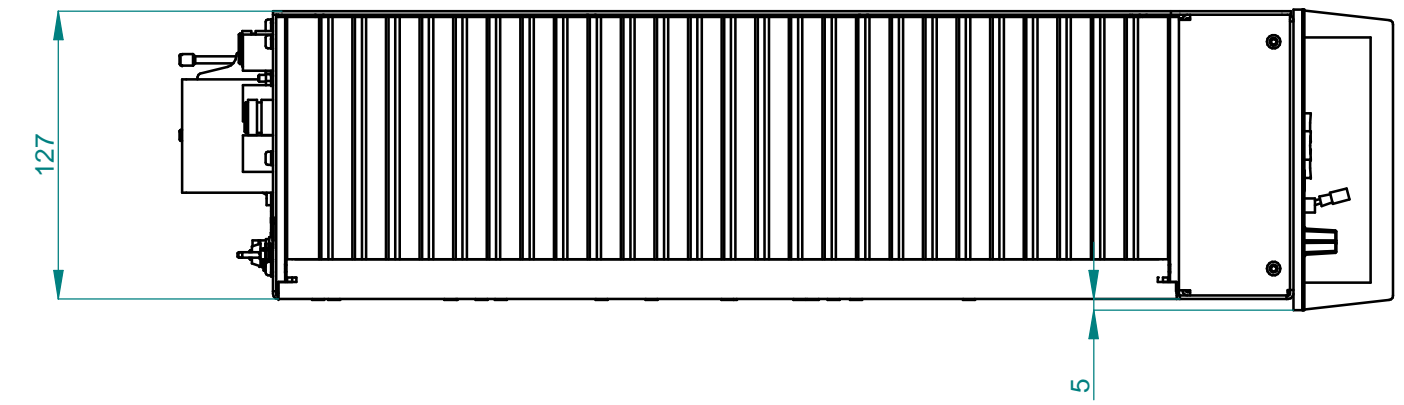
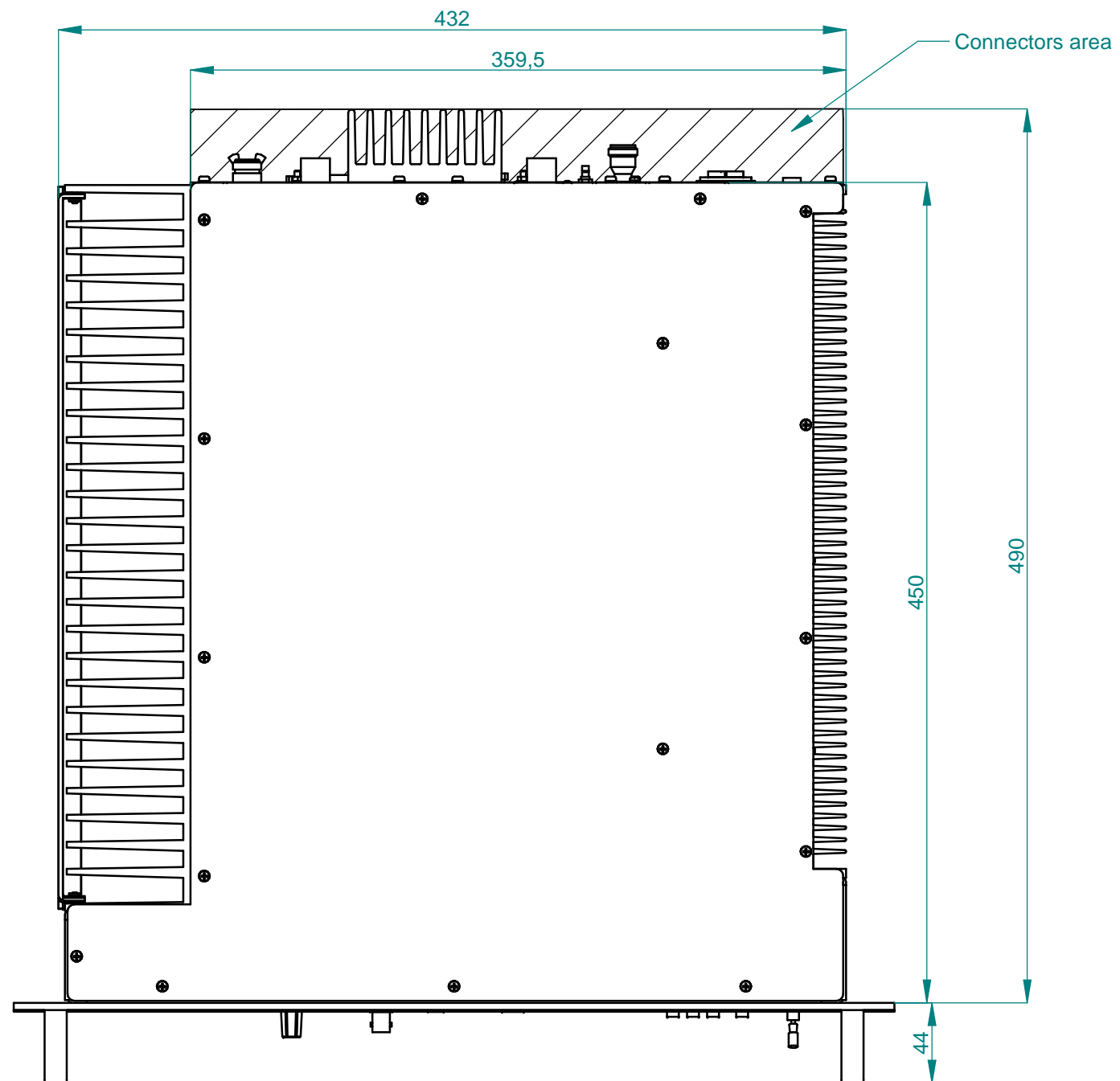
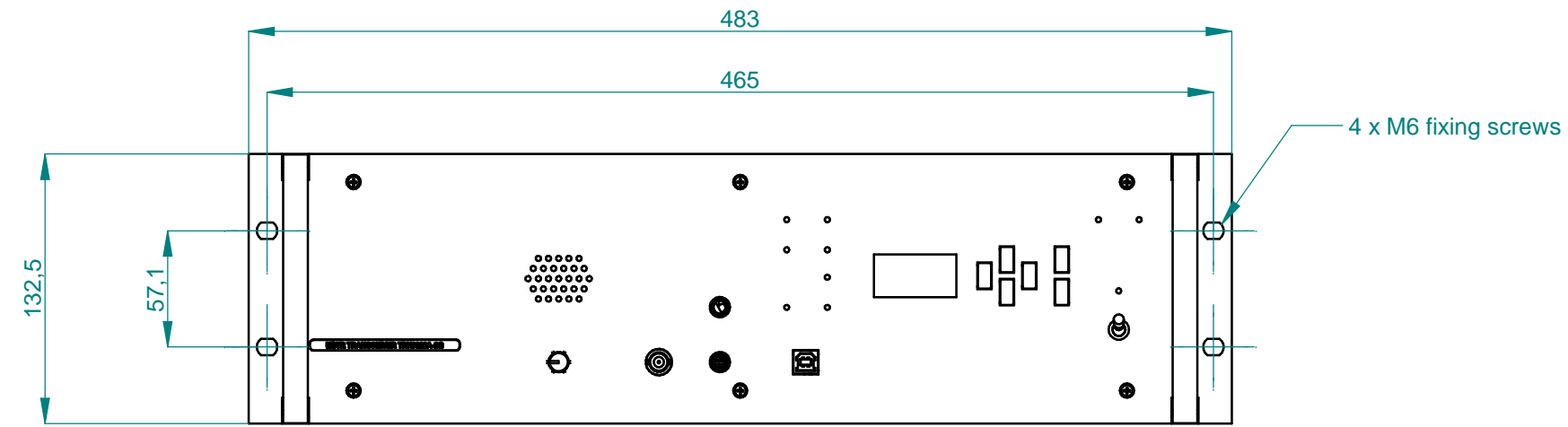
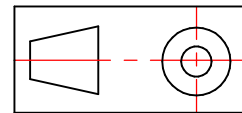


Rear view



VHF TRX9000-2G AND UHF TRX9010-2G TRANSCEIVERS WITH AC/DC OPTION				45000117
				Indice rév. : V1.01 Date rév. : 19/05/2020
Mechanical dimensions/weight (1/1)				
Subset reference :	Subset code :	Set reference :	Set code :	Page :
		TRX9000A-2G TRX9010A-2G	84500217 84500219	1/1
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- Sides : mm
- Weight : 12.5Kg



**V/UHF TRX9020-2G TRANCEIVER
WITH AC/DC OPTION
Mechanicals dimensions/weight (1/1)**

45000126

Indice rév. : V1.00
Date rév. : 19/05/2020

Subset reference :	Subset code :	Set reference :	Set code :	Page :
		TRX9020A-2G	84500229	1/1

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 Adresse email : courrier@telerad.fr TEL: +33 5 59 58 55 00
 FAX: +33 5 59 58 55 01

- Sides : mm
- Weight : 14Kg

