

Genesis Elite Series TRANSMITTER

Operator's Manual

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Genesis Elite Series TRANSMITTERS

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2. SAFETY OPERATIONS
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6. : CIRCUIT DIAGRAMS

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FOREWORD (how to consult the manual)

1. MANUAL ORGANIZATION

The manual is composed of the following sections:

- section 1 "Operator's Manual" including general information, installation guide, operating instructions, maintenance;
- section 2 "Technical Manual" dealing with units and sub-units which make up the equipment;

2. CIRCUIT DIAGRAMS (HOW TO CONSULT THEM)

2.1 Acronyms

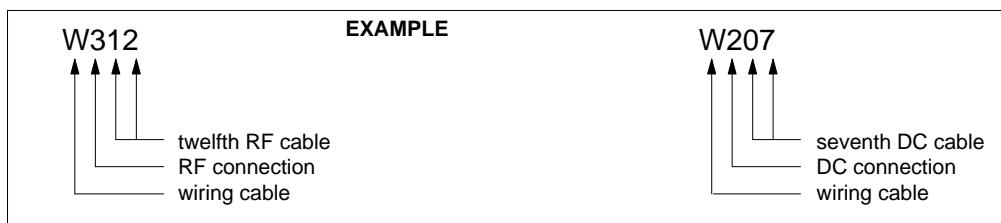
CIRCUIT DIAGRAMS ARE IDENTIFIED BY ACRONYMS AFTER THE DRAWING NUMBER (I.E.: 6320636082**IC**). A LIST OF THE ACRONYMS USED IS GIVEN HERE BELOW:

acronym	explanation
IC	wiring diagram
ED	circuit diagram
CL	component layout
ML	Mechanical layout

2.2 Classification of wiring cables

Wiring cables (unipolar, multipolar, flat cables) are identified by an alphanumeric code on circuit diagrams; this code is composed of 4 digits as follows:

- 1st digit is 'W' (for wiring)
- 2nd digit identifies the type of wiring (e.g.: ac connections, dc connections, RF connections etc.) as follows:
 - 1 ... for **AC** connections;
 - 2 ... for **DC** connections;
 - 3 ... for **RF** connections;
 - 4 ... for **LF** connections;
 - 5 ... for logic signals, alarms connections.
- 3rd and 4th digits indicate the progressive numbering for each type of wiring.



2.3 Connection of wiring cables

The wiring cables between two connectors, are always intended pin-to-pin unless otherwise specified. In the event the wiring is not pin-to-pin, it is shown on the drawing.

2.4 Symbols and identifications of connectors/terminal blocks

Connectors and terminal boards arranged inside an equipment, a unit or a board, are identified on the associated circuit diagram, by symbols as follows:

symbol	objetc
	male connector identified by "Jx"
	female connector identified by "Jx"
	terminal block identified by "Kx"
	coaxial cable identified by "Wx"

Both for connectors and terminal blocks, the numbering is progressive within each equipment, unit, or board; that is on a general wiring diagram two or more "J6" (or "K3") may exist because they are arranged inside different equipment, unit or board.

Male and female connectors are identified respectively by "J" and "P" in some circuit diagrams before the year 2000.

However a connector (or terminal block) will always have the same identification number both on the general wiring diagram of the unit and on the general wiring diagram of the equipment where the unit is arranged.

FOREWORD (how to consult the manual)

3. SAFETY INFORMATION

2.5 Introduction

The equipment fully complies with the requirements for the safety of personnel as specified in IEC 215 rules. The equipment, if operated per specification, is designed and manufactured to protect the operator from high voltage, heat, radiation and other dangers.

Warning labels are attached to enclosures and/or various assemblies to identify potentially dangerous conditions to the operator. These Warning labels must be adhered to.

2.6 Warning, Cautions and Notes

Throughout the manual *Warning* and *Cautions* notices are used to identify procedures, conditions and materials that could be potentially cause death, injury or damage to equipment.

WARNING!

Used to indicate a potential hazard that requires correct procedures or practises in order to prevent personal injury or damage to equipment.

CAUTION!

Used to indicate correct operation or maintenance in order to prevent damage to, or destruction of equipment or other property.

NOTE!

Used to highlight important information or procedures.

TIP

Tips on how alert the operator faster or easier to complete a task



Read the relevant Technical Manual

2.7 Hazard symbols

Throughout the manual *hazard symbols* are used to alert the operator of a potential hazard related to the operation to be carried out.



Warning



Shock hazard



Danger of getting crushed when working with loads.



Danger of falling off ladders while working



Danger when lifting heavy loads.



Danger of getting hands crushed when working.



Danger of burns on contact with hot surfaces.

2.8 Beryllia devices

Some units or parts of the equipment may contain beryllia devices. Normally these components can be handled without risk, but there is a toxic hazard if beryllia dust from a damaged component is inhaled or implanted in the skin.

Units or parts containing beryllia oxide are identified by the label shown on the left.

For handling and disposal of beryllia devices, refer to "Safety Precautions" section, para 3. – "SPECIFICATION ON HANDLING AND DISPOSAL OF BERYLLIA DEVICES".



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1.: GENERAL INFORMATION

1.1 INTRODUCTION

1.1.1 Manual Applicability

This Operator's Manual provides system-oriented information, procedures and data for operation and installation of the following:

- **Genesis Elite Series** VHF/UHF Transmitters arranged in 24HU–19" steel rack–frames.

From here on for the sake of simplicity, throughout this manual **Genesis Elite Series** VHF/UHF Trans-mitters, will be referred to as Genesis TX and *the pictures shown in this manual concern UHF transmitter.*

The contents of the present manual are arranged in sections according to the following:

- 1.: General Information
- 2.: Installation
- 3.: Operating Instructions
- 4.: Maintenance

1.1.2 Physical description

Genesis TxS (arranged in 24HU–19" steel rack–frames) encompass equipments operating in VHF (band III)/UHF (band IV/V) and delivering output VHF power up to 1.4kW for *DVB–T/H*,

DVB–T2 and *ISDB–T/Tb*, up to 1.6kW for *ATSC* and up to 3.5kW for *analog TV*; considering the UHF band they deliver respectively (referring to the previous classification) following maximum powers: 1.2 kW, 1.5 kW and 3.2 kW.

The equipments fully comply with the requirements for the safety of personnel as specified in IEC 215 rules. Each unit is designed in order to be easily removed and individually checked.

The amplifier modules are hot–pluggable thanks to the use of isolated combiners, allowing safe removal and insertion without interrupting transmitter operation.

Genesis TX arranged in 24HU–19" steel rack–frames are able to house 1 or 2 HPA.

The configuration and typical views of the equipments are shown in Fig. 1.1.

Genesis TX transmitter is made up by the following units available to the operator on transmit-ter front panel:

- RF Monitor panel
- Central Control Unit
- Exciter (*qty 2, for dual drive version*)
- RF Power Amplifier module (*qty 1 or 2*)
- Mains Distribution Unit

The following units are arranged within the cabinet and they are available to the operator from the rear side of the cabinet by opening the rear door:

- Splitter/Combiner system (*only 2 HPA version*)
- BB/RF Interface (*only for dual drive version*)
- Output Directional Coupler

An external band pass filter is available *on request*.

Genesis TXs are forced air cooled: each unit is endowed with its own fans and an extractor blower (arranged on top panel of the cabinet) exhausts the hot air outside.



NOTE!

From now on, throughout the manual, the description and the associated pictures, will be referred to a Genesis TX with 2 HPAs and dual drive option.

It is understood that the same consideration are still valid for the other configuration. Any difference will be dealt explicitly.

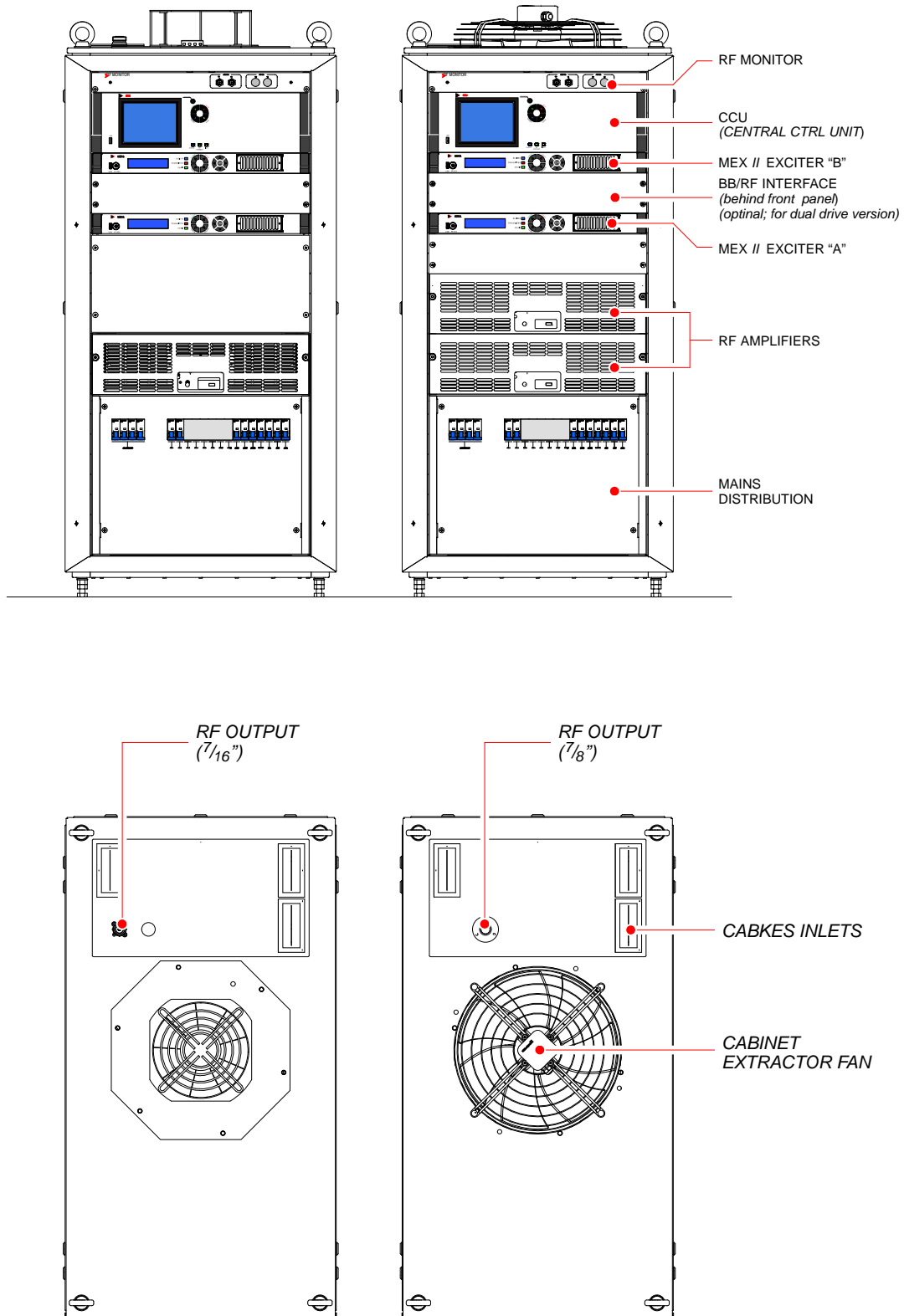
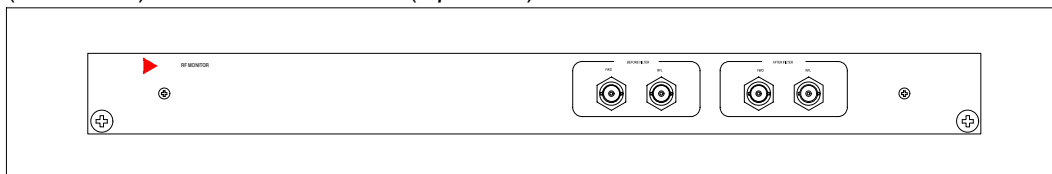


Fig. 1.1 – Transmitter general views

1.1.3 TX Cabinet Units Description

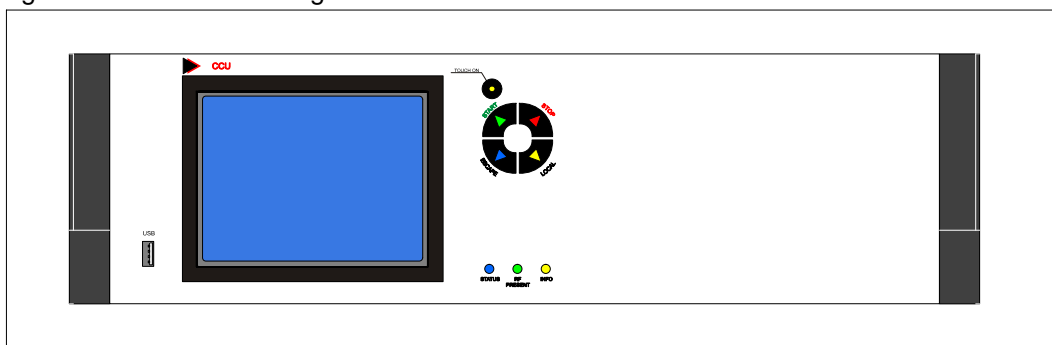
RF MONITOR PANEL

The panel supports the connectors (BNC female) for monitoring transmitter RF output power (*fwd* and *rfi*) before and after filter (*if present*).



CENTRAL CONTROL UNIT

Central Control Unit (CCU) guarantees the complete and easy management of the entire equipment. The unit monitors in real time each module contained in the equipment. The **CONTROL LOGIC** unit carries out the interface between the transmitter and the operator or the software supervisory system, if it is required. All the information about the functioning state of the the amplifier modules, the cooling system and the general status of the transmitter are available on the Control Logic front panel display. Control Logic unit is also able to manage the dual-exciter configuration.



EXCITER

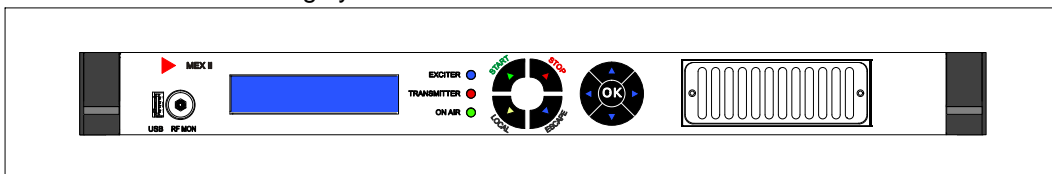
The unit uses OFDM (**O**rtogonal **F**requency **D**ivision **M**ultiplex) modulation, with a large number of sub-carriers delivering a robust signal. LDPC (**L**ow **D**ensity **P**arity **C**heck) coding combined with BCH (**B**ose-**C**haudhuri-**H**ocquengham) coding offers excellent performance in the presence of high noise levels and interference, resulting in a very robust signal.

Several options are available in areas such as the number of carriers, guard interval sizes and pilot signals, so that the overheads can be minimised for any target transmission channel. The Rotated Constellations technique, provides significant additional robustness in difficult channels. Also, a mechanism is provided to separately adjust the robustness of each delivered service within a channel to meet the required reception conditions (e.g. in-door antenna/roof-top antenna). This same mechanism allows transmissions to be tailored such that a receiver can save power by decoding only a single programme rather than a whole multiplex of programmes.

DVB-T2 also specifies a transmitter diversity method, known as MISO (**M**ultiple **I**nput – **M**ultiple **O**utput), which improves coverage in smallscale single-frequency networks. Finally, DVB-T2 has defined a way that the standard can be compatibly enhanced in the future through the use of Future Extension Frames.

The modulator is able to modulate either an MPEG2 or T2-MI Transport Stream into a DVB-T2 fully compliant RF signal.

With its integrated RF up-converter option, the modulator outputs an RF signal that can be directly exploited for live broadcasting or testing purposes. It generates the exact signal needed for any DVB-T2 deployment, validation campaign, debug test, integration constraints simulation with a broadcast quality signal that is required by operators, and matches with terrestrial transmitting systems.



F AMPLIFIER (qty 2 max)

The High Power Amplifier used is the W3-215A (for VHF) or the W6-218A (for UHF). They are full LDMOS wideband amplifiers delivering a nominal output power as follows:

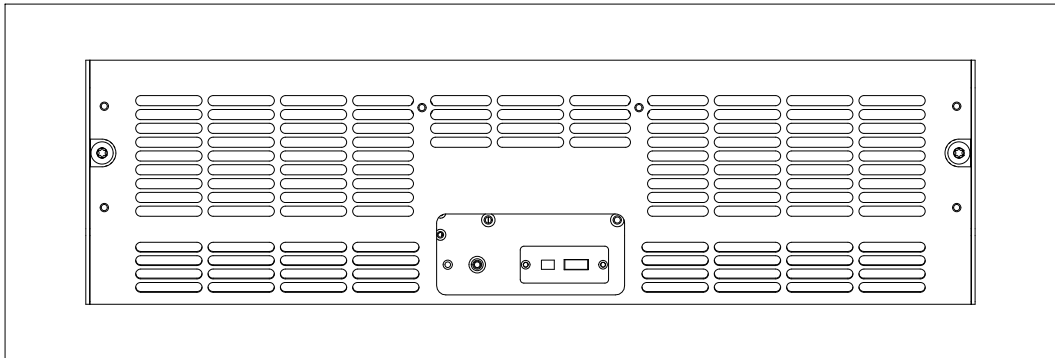
– VHF:

- $700W_{rms}$ for DVB-T/H, DVB-T2 and ISDB-T/T_b signal;
- $1000W_{rms}$ for DAB signal;
- $850W_{rms}$ for ATSC signal;
- 1800W p.s. (ATV)

– UHF:

- $600W_{rms}$ for DVB-T/H, DVB-T2 and ISDB-T/T_b signal;
- $800W_{rms}$ for ATSC signal;
- 1600W p.s. (ATV)

The cooling system is built-in air forced, performed by four DC fans: three for RF stages cooling and the fourth for the cooling of the power supply section. The unit is arranged in a 19"-3HE mechanical frame. The amplifier final stages work using *Doherty* technology. The module is self-protected from overdrive of the RF input power, from incidental reflected power, from overvoltage of the amplifier power supply voltages and from driver and final stage abnormal absorption. The protections are performed through the module control section, which consists of a *CMI Board (Control Module Interface)* and a *Module Status Interface* boards.

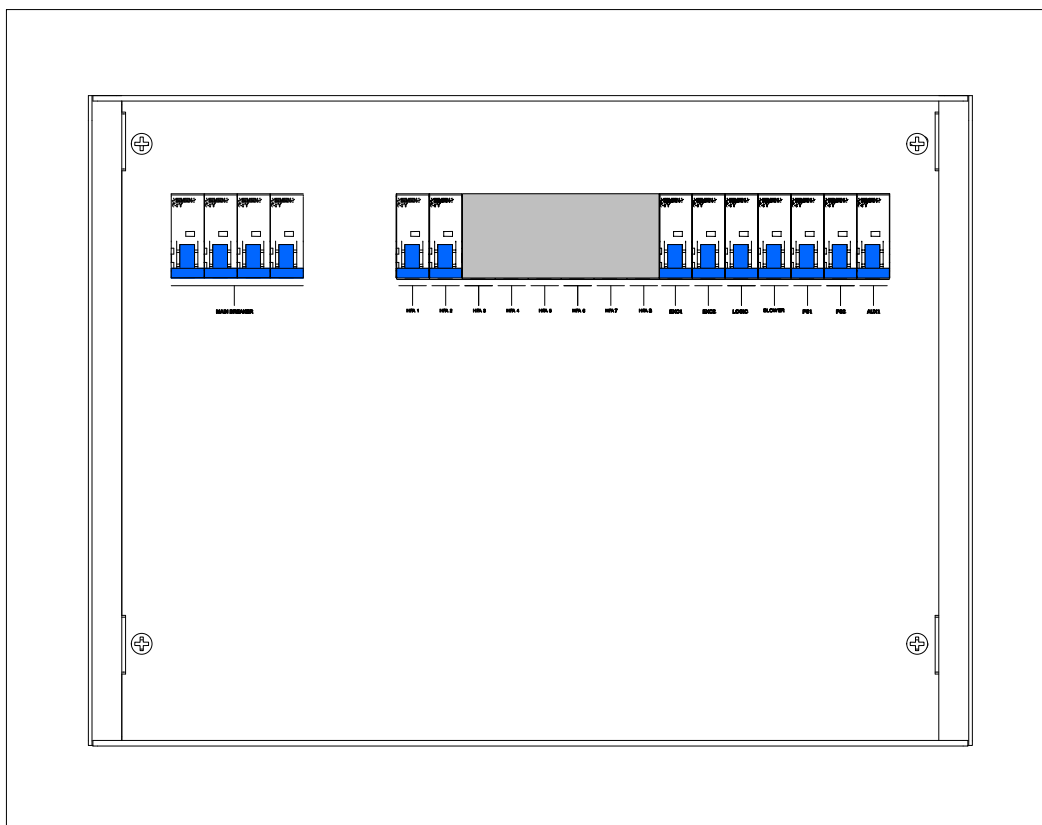


MAINS DISTRIBUTION UNIT

Mains Distribution unit acts as a distributor of power supply voltages for the units contained in the Transmitter cabinet and for air cooling systems. It delivers the power supply voltages to the exciter, to the control unit and to amplifiers modules. In regard to the cooling section, it delivers the power supply voltages to the extractor blower of the rack.

A *Phase Control* relay checks the mains voltage supply is within the correct range or any wrong connections of the phases or a phase lack.

Four *AC/DC Converters* (parallel connected two by two) are also included within Mains Distribution in order to deliver $+24V_{DC}$ and $+12V_{DC}$ supply to *Master HPA Board*.



SPLITTER/COMBINER SYSTEM is made up by a *Splitter* which splits the RF signal outgoing from exciter and sends the output signals to the amplifier section. The assembly is hybrid type carried out on PCB and is arranged in a metal box which also includes the unbalance load. *Combiner* sums up the RF output signals of the amplifier section. The assembly is made up by a hybrid coupler carried out with air suspended lines. The *unbalance load* of the output combiner is air cooled and a thermal switch enables the fan ($t \geq 60\text{ }^{\circ}\text{C}$), another one stops the transmitter ($t \geq 90\text{ }^{\circ}\text{C}$). The resistor is endowed with a directional coupler and an RF detector which allow the measurement of the power dissipated.

BB/RF INTERFACE splits the input signals and routes them to both exciters; it also performs the change-over of the RF output signal of the operative exciter towards the amplifier section. The board is able to manage both analog and digital signals.

OUTPUT DIRECTIONAL coupler (*optional*) at *band pass filter* output, picks-up the voltages proportional to forward (2 samples) and reflected power (2 samples) for monitoring purposes. The power samples are routed to Control Logic unit in order to be processed for the relevant measurement.

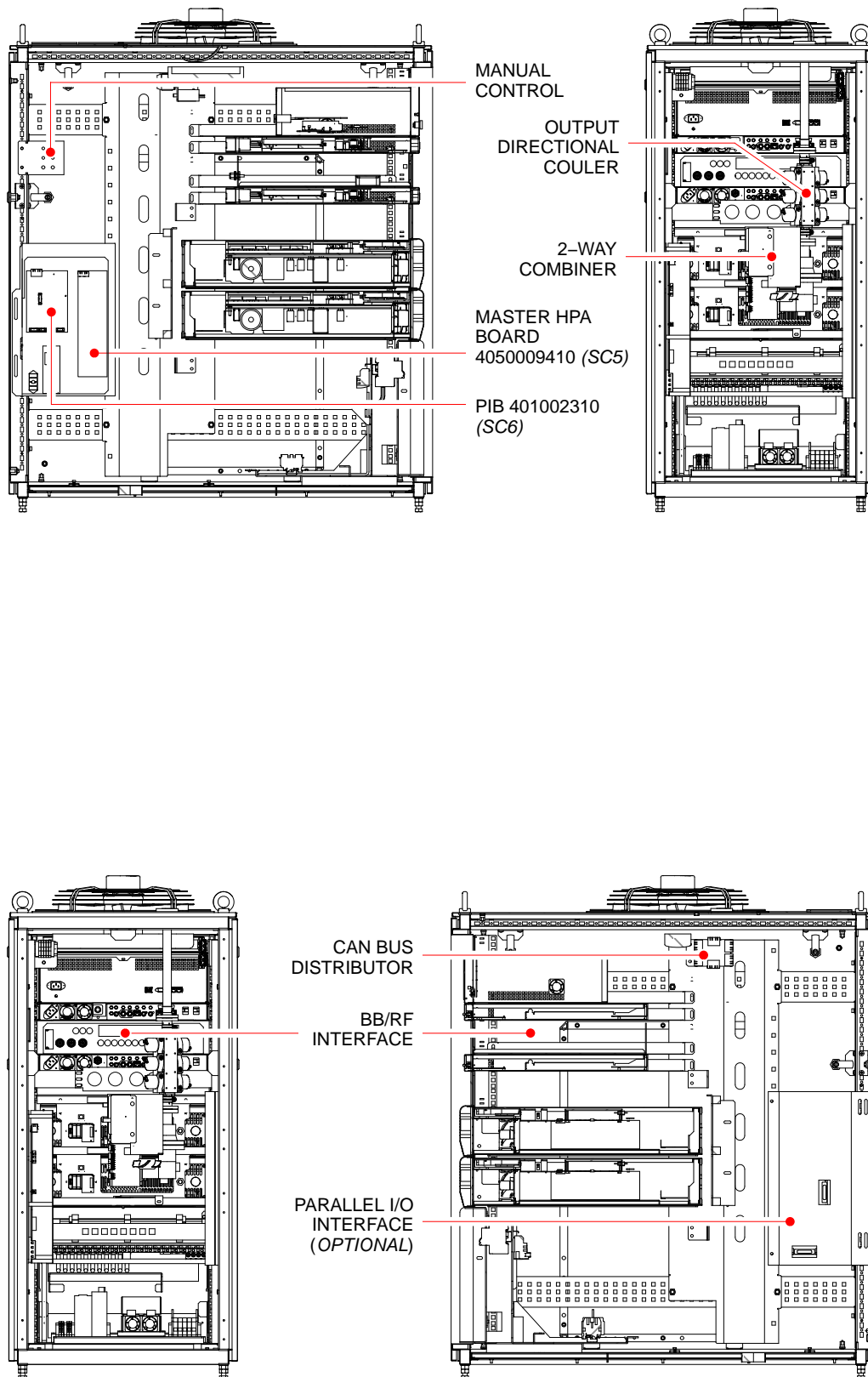


Fig. 1.2 – Transmitter rack internal views

1.2 FUNCTIONAL DESCRIPTION OF THE EQUIPMENT

This paragraph provides a functional description of the transmitter; the description below, refers to the following figures:

- Fig. 1.3 block diagram of transmitter RF section;
- Fig. 1.4 block diagram of transmitter Control section;
- Fig. 1.5 block diagram of transmitter Power supply section;
- Fig. 1.6 transmitter air cooling system.

1.2.1 RF section

The input signals enter *BB/RF Interface* board which routes them to the exciter set as operative (*master*). The RF output of this exciter enters *RF Switch* board which outputs it to the amplification chain.

The amplification chain is made up by an attenuator, a 2-way splitter, two amplifier modules and a 2-way combiner. The RF output signal from the combiner passes through a directional couplers and is made available to the antenna. An external band-pass filter with a directional coupler at its output, is available as option. In this way the RF output power can be monitored before and after the filter.

The forward (*fwd*) and reflected (*refl*) power samples, picked up from output directional coupler are routed, via the boards of logic section, to *Central Control Unit* unit in order to be processed for displaying the relevant measurement.

Two other samples of *fwd* output power from the directional coupler, enter exciters and are processed for the precorrection operations.

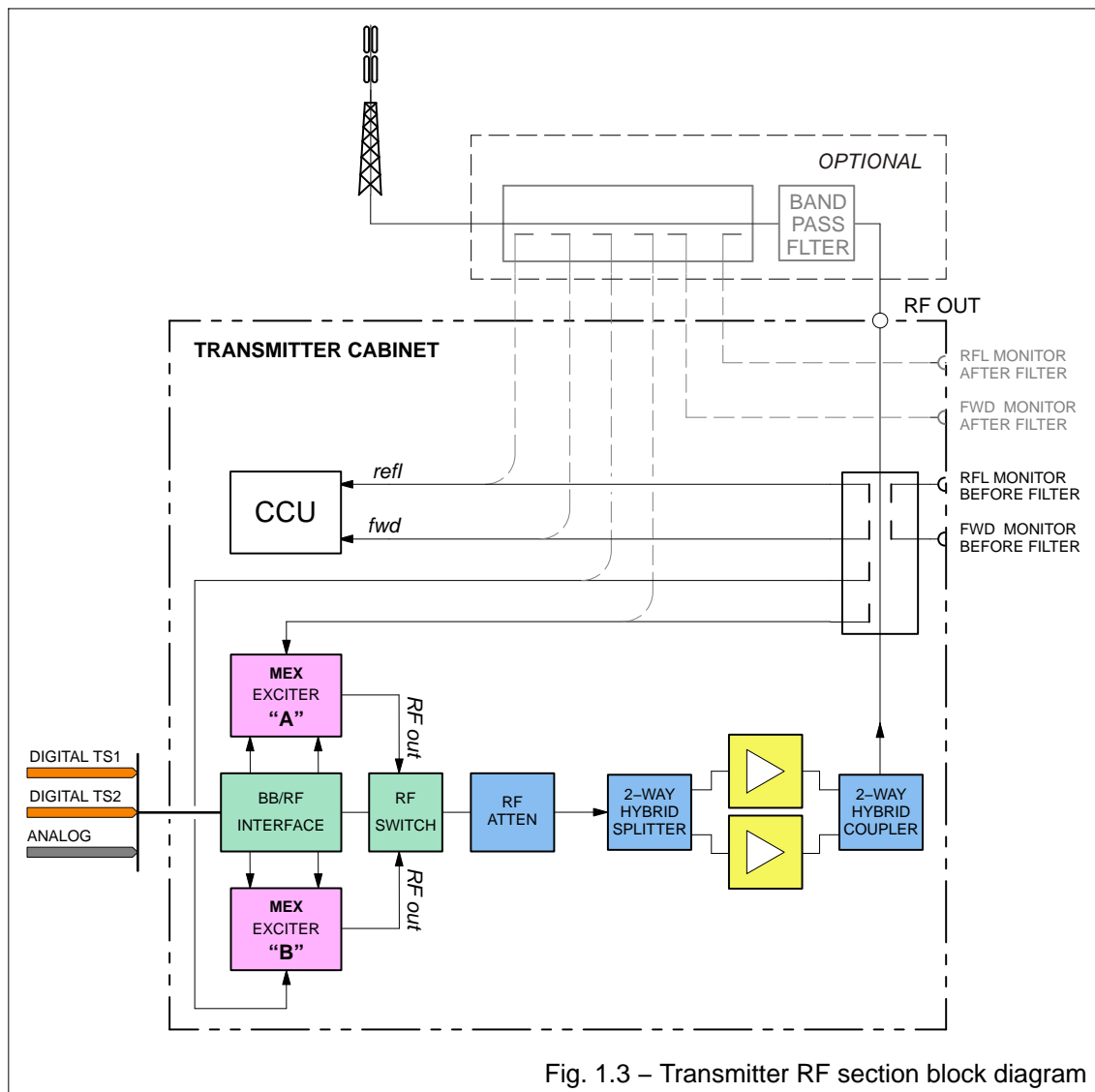


Fig. 1.3 – Transmitter RF section block diagram

1.2.2 Control section

Control section consists of a **Central Control Unit (CCU)**, a **CAN Bus Distributor**, a **Master HPA Board**, an **Unbalance Load PIB Interface**, a **PIB Core Parallel Interface**, and a **PIB board**.

CENTRAL CONTROL UNIT allows transmitter management and collects information on general functioning of the transmitter, on general status of its cooling system and on amplifier modules status. The information is displayed on the liquid crystal display.

CAN BUS DISTRIBUTOR allows interfacing CCU with the other units and detectors. It is a concentrator and distributor of information from transmitter units.

MASTER HPA BOARD interfaces the amplifiers modules and the parts of the transmitter involved with them (temperature of unbalance loads heatsink) with CCU. The interfacing is via CAN BUS DISTRIBUTOR. The board also allows manual control of the transmitter if CCU is under failure conditions or removed for servicing: through *Manual Control* assembly it is possible starting/stopping transmitter and setting "exciter A" or "exciter B" on air. *Manual Control* assembly is disabled under normal operating condition (CCU operating).

UNBALANCE LOAD PIB INTERFACE interfaces the cooling air temperature detector of the unbalance load of the output combiner to CAN BUS DISTRIBUTOR.

PIB CORE PARALLEL INTERFACE (*optional*) allows the interfacing outwards through parallel port.

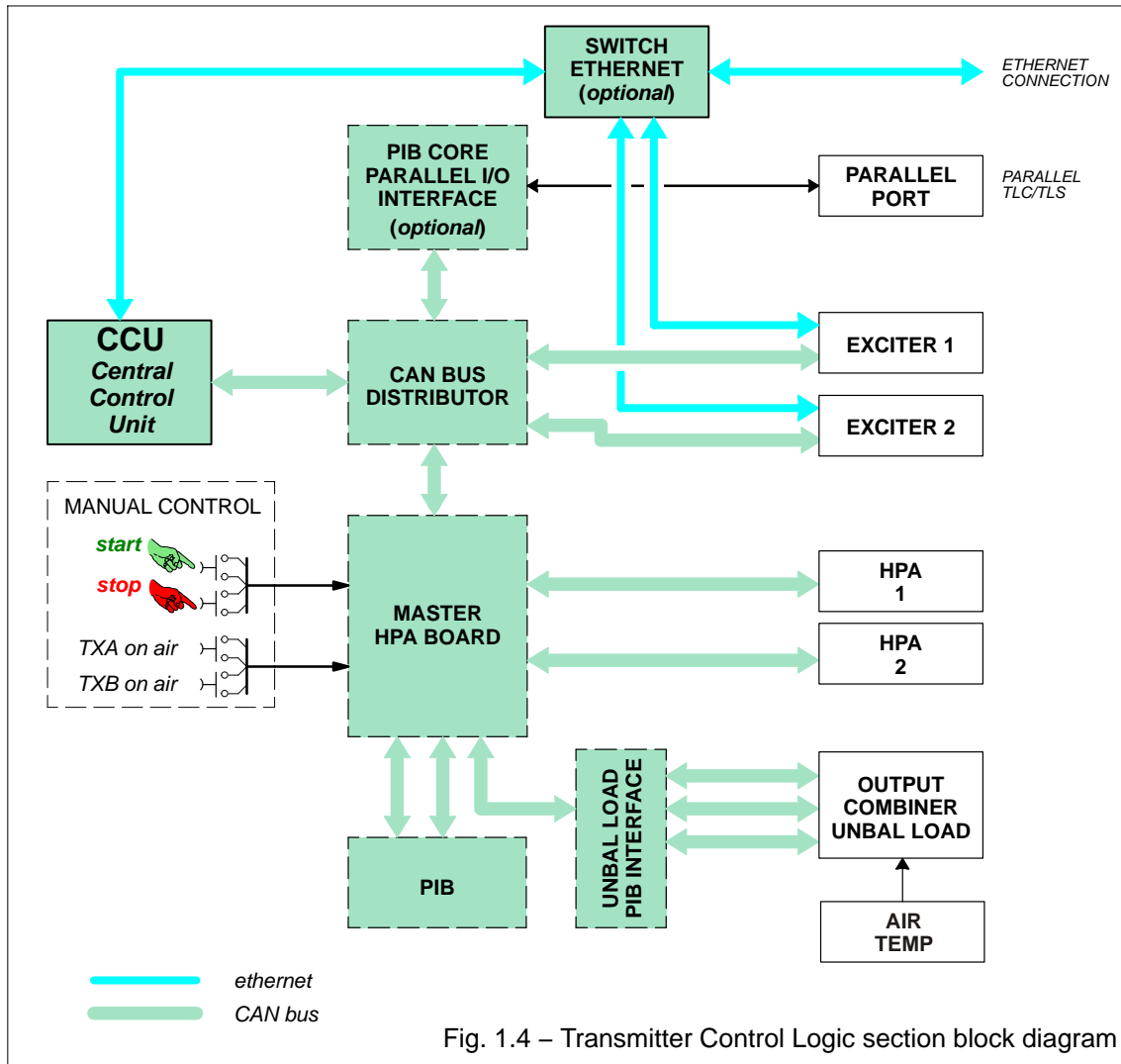
PIB board interfaces *Unbalance Load PIB Interface* to *Master HPA Board*.

A fault of a PIB board is displayed by CCU with the number associated to this PIB: the following Tab. 1.1 lists the number of PIB boards (column 1), its arrangement within the transmitter cabinet (column 2), the reference on the associated circuit diagram (column 3) and the board part number (column 4).

ETHERNET SWITCH (*optional*) allows the remote control of the transmitter via *web server*.

Tab. 1.1 – PIBs arrangement within TX cabinet

PIB	arrangement	REFERENCE ON TX WIRING DIAGRAM	p/n.
1	left side wall of the cabinet (from the rear)	PIB SC6	4010002313
2		MEX II Multimode Exciter unit A	4050010610
3		MEX II Multimode Exciter unit B	4050010610
4	TX Water Cooling unit	NOT USED for air cooled TXs	
5	right side wall of the cabinet (from the rear)	PIB CORE PARALLEL I/O INTERFACE	4010000510
6	TX cabinet	only TX with HPA ≥ 6 SC14	4010002310



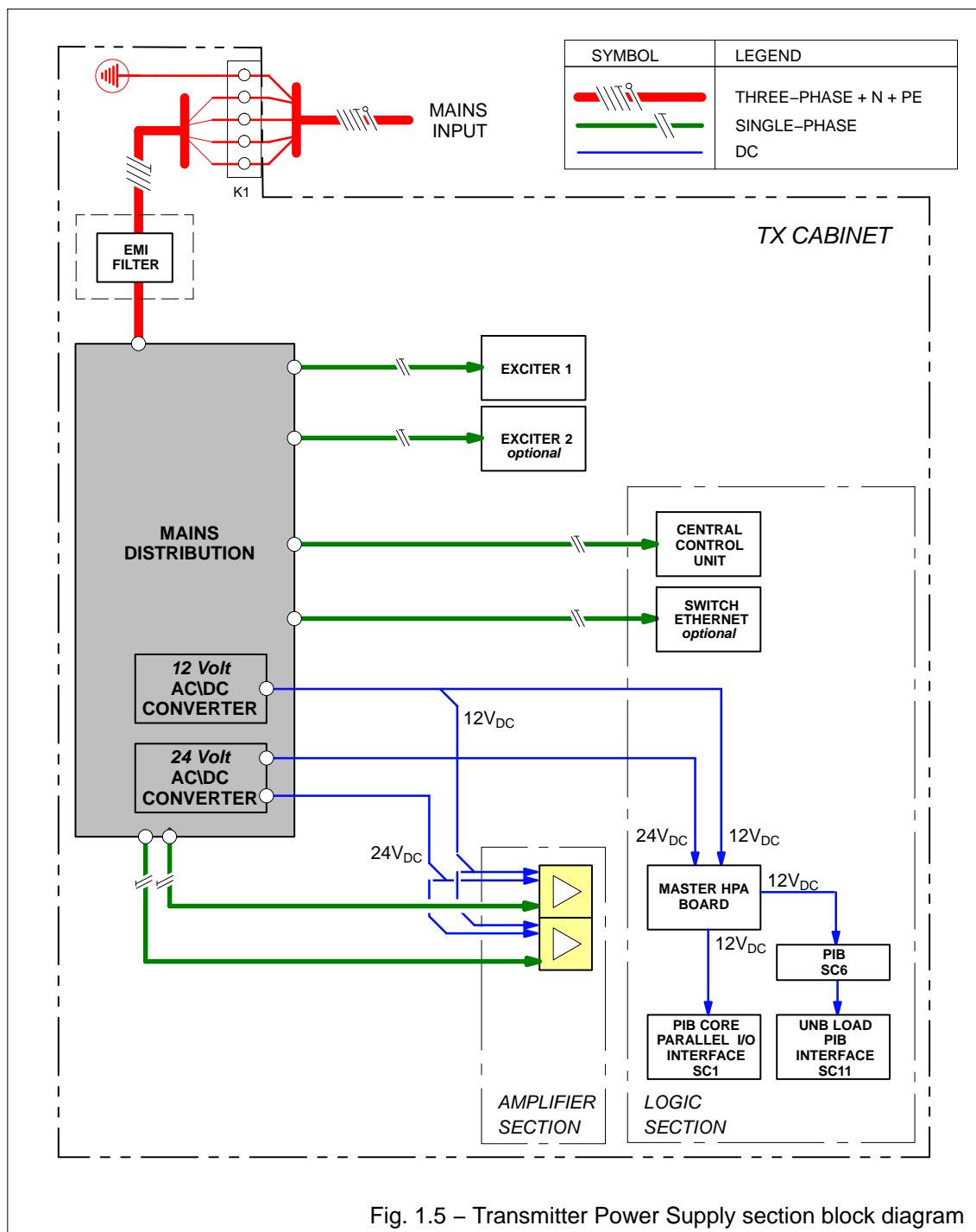
1.2.3 Power supply section

Power supply section includes the devices which distribute the power supply voltage to the different units which make up the transmitter. The power supply section consists mainly of *Mains Distribution* unit and two *AC/DC Converters*.

Mains Distribution unit includes a set of mains breakers routing the mains voltages to the units.

Two *AC/DC Converters* deliver, $+24V_{DC}$ and $+12V_{DC}$ supply to the boards of the *logic section* (*Master HPA Board, PIBs*) and to amplifier modules of *amplifier section*.

The power supply may be 208/240 V_{AC} 3-phase or 360/415 V_{AC} 3-phase; on request an *EMI Filter* is available.

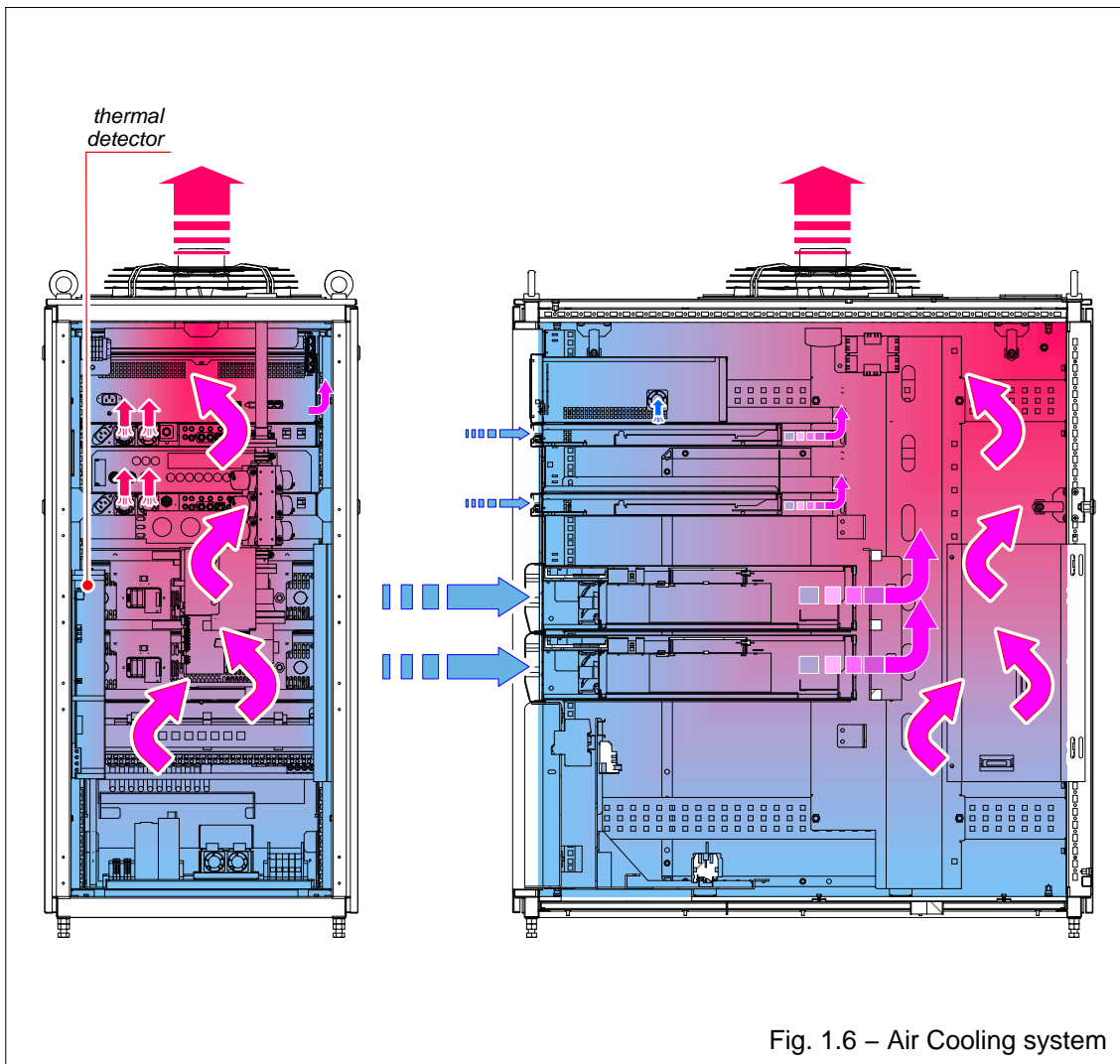


1.2.4 Air Cooling system

An air forced system is used to cool the transmitter cabinet. This kind of cooling allows compact size and is also recommended for simplicity and efficiency whenever moderate quantities of heat have to be dissipated in low and medium power transmitters. The use of low velocity blowers, that means low noise, guarantees easy operation and maintenance to the operator.

From a structural point of view the air cooling system consists of an extractor blower for the cabinet and of a fan for each unit: the air is exhausted from the top of the cabinet by the blower and dispersed to the ambient or ducted outside the building.

Air temperature of the cabinet is monitored by a thermal detector arranged inside the cabinet on the side wall.



1.3 TECHNICAL SPECIFICATIONS

1.3.1 General Data

ENVIRONMENTAL	
Ambient temperature range	0 °C to +55 °C
Storage temperature range	–30 °C to +70 °C
Relative humidity (@ 40 °C)	95% without condensation
Max. Operating altitude (asl)	Up to 3000 meters
Safety rules	EN 60215 / EN 60950
EMC	EN 301489
MAINS SUPPLY VOLTAGE	
Genesis 1HPA	single phase 208V _{ac} – 230V _{ac}
Genesis 2HPA	three phase + N + PE 3 x 208V _{ac} 3 x 230V _{ac} 3 x 400V _{ac}
Frequency	50/60 Hz ± 4%
Power factor	> 0.95
Efficiency (COFDM)	VHF: up to 30% class AB 38% Doherty (up to 41% DAB, Doherty) UHF: up to 22% class AB / 37% Doherty
THD	< 6%
Safety	EN 60215/EN 60950
EMC	EN 301489
Power consumption	see Test Report
Mechanical noise level	< 55dBA
Air conditioning requirement	no requirement
COOLING SYSTEM	
Transmitter cabinet	forced air
METERING	
■ Digital TV	
	– forward output power – reflected power
■ Analog TV	
	– vision carrier output power – sound carrier output power – forward output power – reflected power
PROTECTION CIRCUITS	
Output power:	– excessive reflected pwr
Temperature:	– excessive air cooling temperature
MECHANICAL	
RACK	19" – 24 HU/ steel
DIMENSIONS (W x H x D, in mm)	
24 HU	600 x 1215+98 x 1100
WEIGHTS (kg)	
24 HU	80
COLOUR	
Cabinets	black
Units	light grey

1.3.2 Broadcasting features

RF DATA		
Frequency range		
■ VHF band III	174 to 254 MHz	
■ UHF band IV–V	470 to 860 (870) Mhz 470 to 690	class AB Doherty mode
RF Output power	refer to Tab. 1.2	
RF Output connector	refer to Tab. 1.2	
Shoulder	> 38 dB	
MER	> 35 dB (DAB > 30 dB)	
Crest factor	8.5 to 9.5 dB	
Spurious Emissions	<–60 dBc (< –70 dBc with filter)	
Harmonic Emissions	<–60 dBc (< –70 dBc with filter)	
In band Spurious Emissions	<–70 dBc	
STANDARDS		
■ Digital TV		
Standards	DVB–T (fully compliant with EN 300 744, TS 101 191) DVB–T2 (EN 302 755, TS 102 773; TR101 290; TS 102 2831) ISDB–T/T _b (ARIB STB–B31, TR–B14) ATSC, ATSC Mobile DTV, ATSC 3.0 DTMB	
Channel Bnadwidth	• DVB–T 5/6/7/8 MHz • DVB–T2 1.7/5/6/7/8 MHz • ISDB–T/T _b 6/8 MHz • ATSC 3.0 6 MHz, 7 MHz, 8 MHz • DTMB 8 MHz	
Inputs	• DVB–T/T2, ISDB–T/T _b , DTMB 2 BNC 75 Ω, DVB ASI, TS 188/204 packets, continuous and burst mode, 2 RJ45 GbE • ATSC, ATSC 3.0 2 SMPTE310M or 2 ASI, 75 Ω BNC, 2 RJ45	
■ Digital Radio/Mobil tv in VHF band		
Standards	DAB, DAB+, T–DMB	
Channel Bnadwidth	1.536 MHz	
Inputs	• ETI 2 BNC 75 Ω, (NI, G703), (NA, G7049 5376, (NA,G704) 5592 and jitter tolerance according to G.823 • EDI 2 RJ45, IP, RTP, UDP, IGMP (v2 & v3)	
■ Analog TV		
Standards (compliance to CCIR report 642–2 volume XI part I, ETS 300 384)	B/G/D/K/K1/M/N//I1/L	
Color transmission	PAL, NTSC, SECAM	
Sound transmission	IRT dual–sound config, FM single sound and NICAM728 (–13 dB/–20 dB) optional, FM single sound (–10 dB)	
Inputs	• Video 2 BNC 75 Ω, 1 V _{pp} ± 6 dB. Manual Gain or AGC on ITS line, DC Restore, White Limiter (85–95%), Sync Restore (20–30%) • Audio 2 XLR 600 Ω/5 kΩ balan/unbal, 0 dBm –3 dB +19 dB. In wideband mode input 2 works up to 120kHz (MPX) • Additional Audio 1 BNC 50 Ω/5 kΩ for MPX (up to 120 kHz) and 1 BNC 50 Ω for auxiliary services for standard M • NICAM audio 2 XLR 600 Ω/5 kΩ balan/unbal, 0 dBm ± 10 dB • NICAM data input 1 BNC TTL 728 Kbit/s ext. data, 1 BNC TTL 728 kHz ext. clock	

REMOTE INTERFACES	
Local control	Display(s), Keyboard(s), and USB ports
Remote control	Ethernet for HTTP (Web Server)/SNMP/NTP/SSL, RS232, Parallel
Test points	RF out monitor, RF amp output, RF exciter output
SYNCHRONIZATION	
Reference frequency	Internal (OCXO or integrated GPS)/Internal locked to the External (BNC 50 Ω , 10 MHz)
Reference pulse	1pps Internal (integrated GPS)/External (BNC 50 Ω , TTL)
Internal reference Accuracy	$\pm 1 \cdot 10^{-8}$ (0 to 70 °C) $\pm 5 \cdot 10^{-10}$ per day (after 30 day) $\pm 1 \cdot 10^{-7}$ per year

Tab. 1.2 – Genesis Elite Series configuration data			
HPAs number		PWR (KW) TYPICAL	RF OUT CONNECTOR (EIA flanged)
VHF			
1 HPA	DIGITAL TV standards	0.7 <small>(MER 35dB)</small>	7/16" (not flanged)
	ATSC 1.0	0.85	
	DAB	1	
	ANALOG	1.8	
2 HPA	DIGITAL TV standards	1.4 <small>(MER 35dB)</small>	7/8"
	ATSC 1.0	1.6	
	DAB	2	
	ANALOG	3.5	
UHF			
1 HPA	DIGITAL TV standards	0.6 <small>(MER 35dB)</small>	7/16"
	ATSC 1.0	0.8	
	ANALOG	1.6	
2 HPA	DIGITAL TV standards	1.2 <small>(MER 35dB)</small>	7/8"
	ATSC 1.0	1.5	
	ANALOG	3.2	

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2.: INSTALLATION

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INFORMATION FOR THE OPERATOR

Throughout the manual *Warning* and *Caution* notices are used along with *hazard symbols*.

Warning and *Caution* notices identify procedures, conditions and materials that could be potentially cause death, injury or damage to equipment.

Hazard symbols are used to alert the operator of a potential hazard related to the operation to be carried out.

Here below *Warning*, *Caution* notices and *hazard symbols* used, are shown.

WARNING!

Used to indicate a potential hazard that requires correct procedures or practises in order to prevent personal injury or damage to equipment.

CAUTION!

Used to indicate correct operation or maintenance in order to prevent damage to, or destruction of equipment or other property.



NOTE!

Used to highlight important information or procedures.



TIP

Tips on how alert the operator faster or easier to complete a task



All electrical installation and connections are to be carried out only by qualified personnel.

In setting up racks observe the relevant regulations for the prevention of accidents.

These regulations especially refer to the following:



Shock hazard



Danger of getting crushed when working with loads.



Danger of falling off ladders while working



Danger when lifting heavy loads.



Danger of getting hands crushed when working.

2.: INSTALLATION

2.1 INTRODUCTION

This chapter provides drawings and information concerning installation of Genesis Elite Series transmitters. This paragraph deals with the actions normally performed when the equipment has to be moved. More in detail *paragraph 2.2* gives information and installation drawings, to mount and interconnect the equipment.

2.1.1 Requirements for Installation

The definition of the site where the equipment has to be installed is determined by the careful analysis of its standard dimensions (see Fig. 2.1). There are no specific constraints in the installation of the equipment, however the site must be defined in order to satisfy the following requirements and ensure the best utilization of the equipment:

- Each unit must be installed in such a way to provide optimum performance as long as it is possible.
- The room in which the equipment is housed must to be provided with controls of the environmental conditions.
- The ambient temperature must be kept in a range from 0°C to +45°C. Outside this temperature range, regular functioning of the equipment is not guaranteed.
- The relative humidity can reach 90% maximum, without condensation. Higher humidity encourages corrosion and deterioration of the equipment structures and in a short time could damage the insulation among the electrical parts which are subject to high voltage.
- It also encourages *CONDENSATION* on the internal and external surfaces causing therefore severe damage especially to the electrical parts of the equipment subject to high voltage.
- In the room where the equipment is housed, filters must be present at all air inlets and louvres at all air outlets. No sources of dust, even potential, ought to be present; in fact the dust may cause the clogging of the cooling system.
- The space around the unit must be sufficient to permit installation and maintenance. The amount of clearance from walls or other equipments must include the space necessary to open the doors.
- Sufficient space for cable connectors must also be available. In light of the above, any solution which limits the accessibility must be considered unacceptable.

2.1.2 Transport

The cabinet and the equipment units have been carefully packed for transport; the equipment cabinet may travel both in vertical and in horizontal position. Four eye-bolts placed on the upper part of the cabinet are used to lift it.

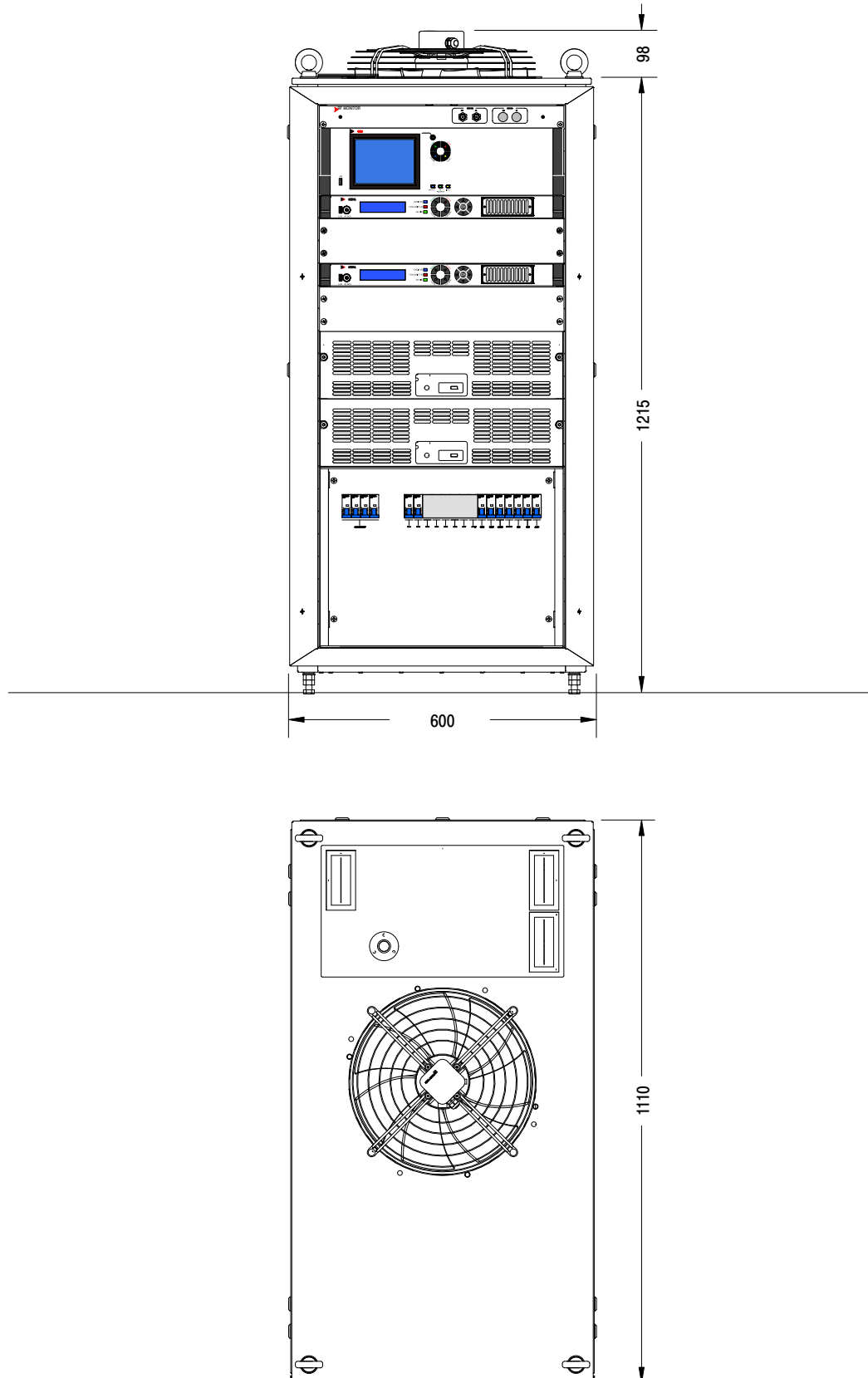


NOTE!

INSPECTION FOR DAMAGE DURING TRANSPORT

When the equipment arrives at destination, it should be inspected immediately for possible damage incurred during transport.

If any damage is found, both the insurance company and the shipping agent must be informed immediately. If the name of the insurance company is unknown, a Lloyd's inspector should be called in.



dimensions in mm

Fig. 2.1 – Transmitter overall dimensions

2.1.3 Unpacking

No particular procedures are necessary to unpack the crate. However, it is suggested to carry out this operation as close as possible to the final installation site.

Avoid damage to the crate and to the packing material inside them, so they can be re-utilized in case the equipment should be moved to another installation site.

2.1.4 Storage

After the material contained in the crate has been inspected and it has been verified for damages, the unit shall be stored in its original packing until the time of installation. The storage deposit must be well protected and free from humidity.

Avoid keeping the units in storage for a long time, scheduling the delivery date precisely. Long time storage may cause frequency failures during the initial period of utilization.

If the equipment should be kept in storage for a long time, it is advisable to insert hygroscopic substances (such as silicon gel salts) in the crates.

2.1.5 Repacking

The packing methods may be different according to: the transportation means, the environment, the expected period of inactivity and the storage.

The following suggestions are referred to a typical package able to withstand by land, by sea or by air transportation.

The cabinet must be inserted in a proper wooden box lined internally with polystyrene foam tailored to the cabinet dimensions. When the cabinet has been introduced, a packet of dehydrant must be added and the box must be closed with a polystyrene foam cover first and then with a wooden cover provided with hinges on one side and locking devices on the other side.

Finally the box must be properly wrapped with iron or plastic straps which can withstand very hard handling causing the box to be opened.

Each unit must be packed, wrapped with barrier paper and sealed with adhesive tape. The unit packaged must be introduced in a box internally lined with gummed horse hair.

The boxes must be closed with adhesive tape, wrapped with iron or plastic straps and then the identification tags must be applied.

2.2 PHYSICAL INSTALLATION

The installation procedure consists of the steps described in the following paragraphs:

2.2.1 Racks set up (refer to Fig. 2.2)

- *Positioning and lining up rack*

Transmitter rack must be fitted, fixed in place and lined up (in horizontal) after it has been placed in the desired position. Four bolts on the bottom of the rack are used for this purpose. These bolts must be unscrewed until they touch the floor. In this way they block and allow lining up the rack.

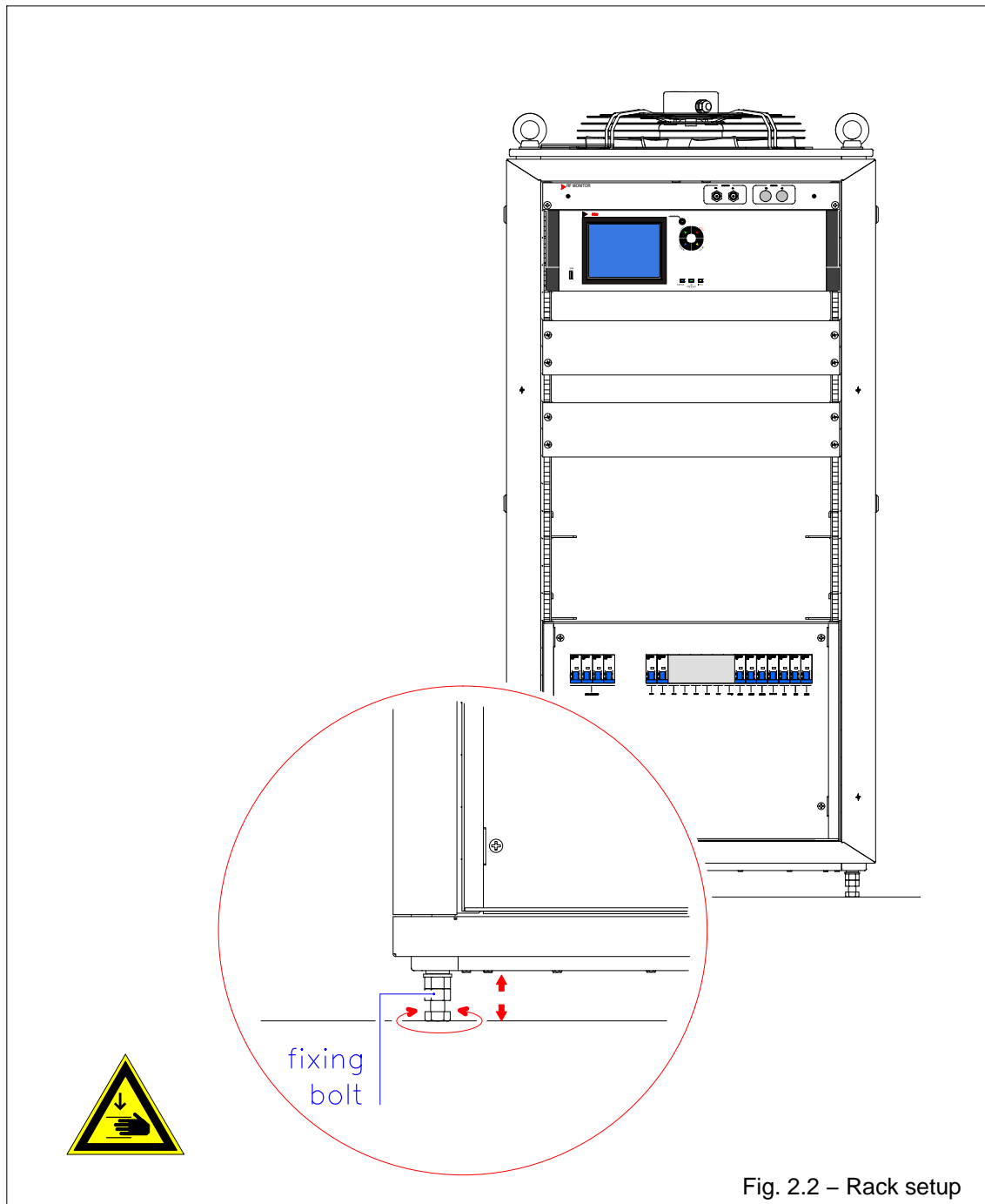



Fig. 2.2 – Rack setup

2.2.2 Ground connections (refer to Fig. 2.3)

- Grounding is made using the special termination found within the cabinet and pointed out by the label . It should be kept in mind that good ground contact is not always achieved merely by locking through bolts. Defective grounding not only may represent a danger to personnel, but can also increase possibilities of interferences or abnormal functioning. To prevent or reduce interference between the transmitter and other telecommunication equipments all external shields must be connected to the ground terminal board. This connection also serves to prevent formation of static loads on the unit.

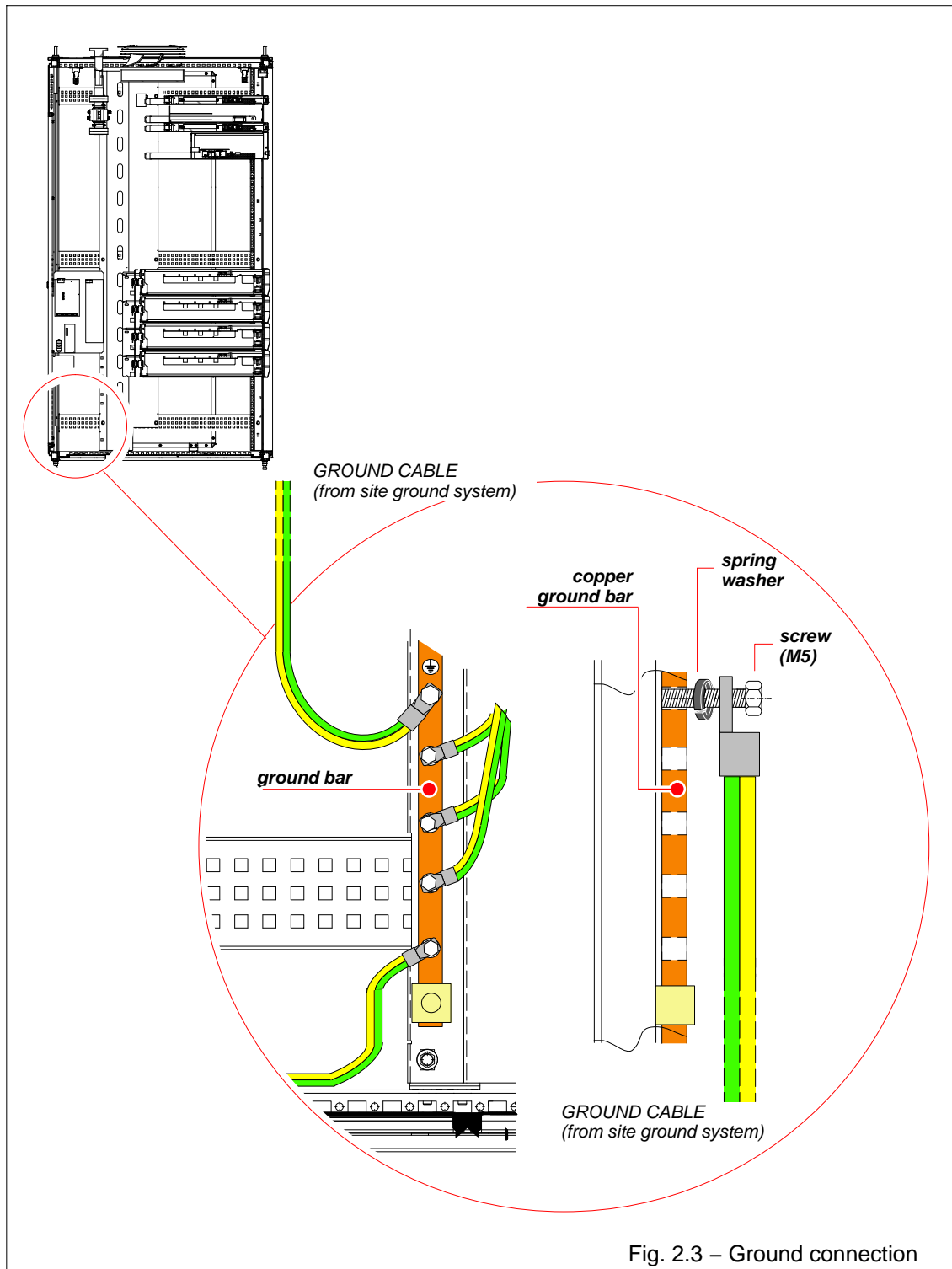


Fig. 2.3 – Ground connection

2.2.3 Fitting units to transmitter cabinet (refer to Fig. 2.4)

Due to their weight for safety reasons, some units of the transmitter are packed separately, so it is necessary to fit them to transmitter cabinet. The units that have to be fitted are:

- **EXCITER**
- **AMPLIFIERS MODULES**
- **FITTING EXCITER UNIT**
Exciter units must be inserted into transmitter cabinet, in their suitable housing taking care to fit exciter "A" in the lower position.
- **FITTING AMPLIFIERS MODULES**
Amplifiers modules must be inserted into transmitter cabinet, in their suitable housing according to the indications labelled on the rack.
- **CONNECTION OF THE UNITS**
Connection of the units has to be carried out according to the wiring diagram included on divider no. 6 "Wiring diagrams".

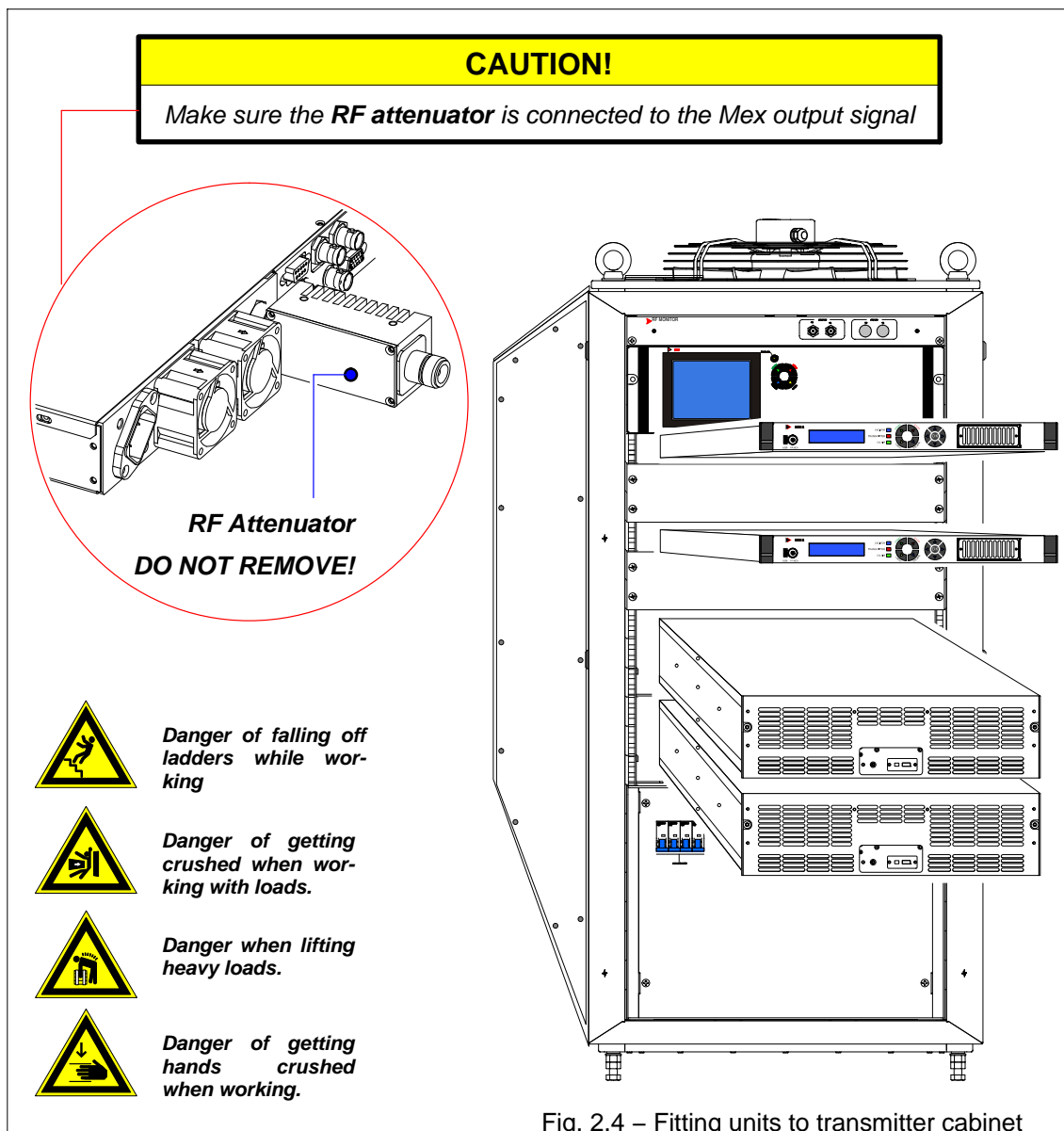


Fig. 2.4 – Fitting units to transmitter cabinet

2.2.4 Connection of the Filter assembly (optional) (refer to Fig. 2.5)

Filters assembly is connected to TX cabinet with the suitable rigid line (W340) delivered. According to the transmitter output power the rigid line can be 1-5/8" or 3-1/8".

Connect also the cables outgoing from TX cabinet, to the probes of the output directional couplers following the directions of the labels attached on it; refer also to wiring diagram included on divider no. 6 "Wiring diagrams".

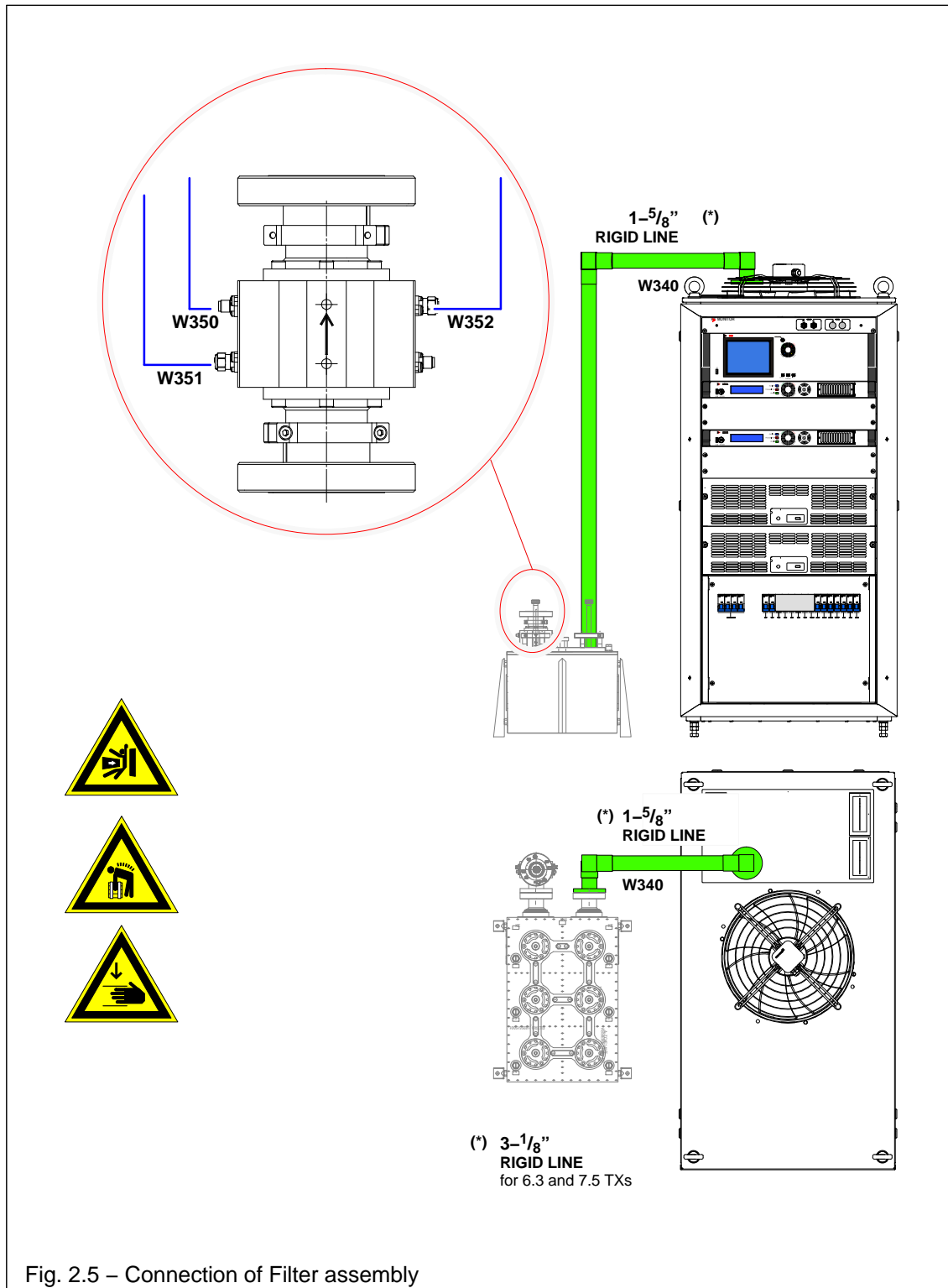


Fig. 2.5 – Connection of Filter assembly

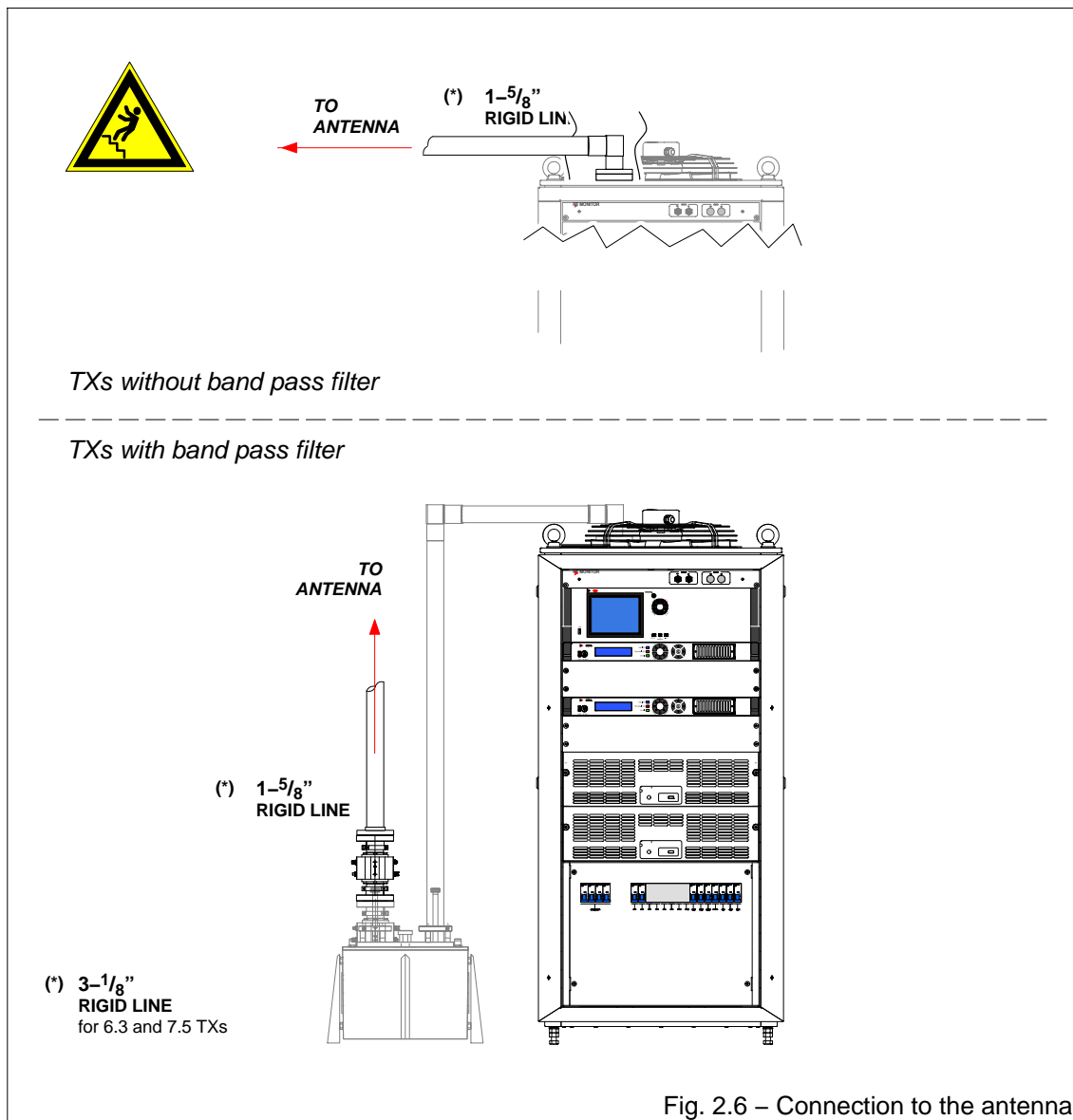
2.2.5 Connection to the antenna (refer to Fig. 2.6)

• TRANSMITTERS WITHOUT BAND PASS FILTER

The RF output of the transmitter is $1\frac{5}{8}$ " or $3\frac{1}{8}$ " EIA flanged according to the output power. It is available on top panel of the cabinet. The connection to the antenna must be carried out via rigid line or coaxial cable of the suitable dimension.

• TRANSMITTERS WITH BAND PASS FILTER

The RF output of the transmitter is available on the output directional coupler at band pass filter output. According to the output power, it is $1\frac{5}{8}$ " or $3\frac{1}{8}$ ". EIA flanged
The connection to the antenna must be carried out via rigid line or coaxial cable of the suitable dimension.

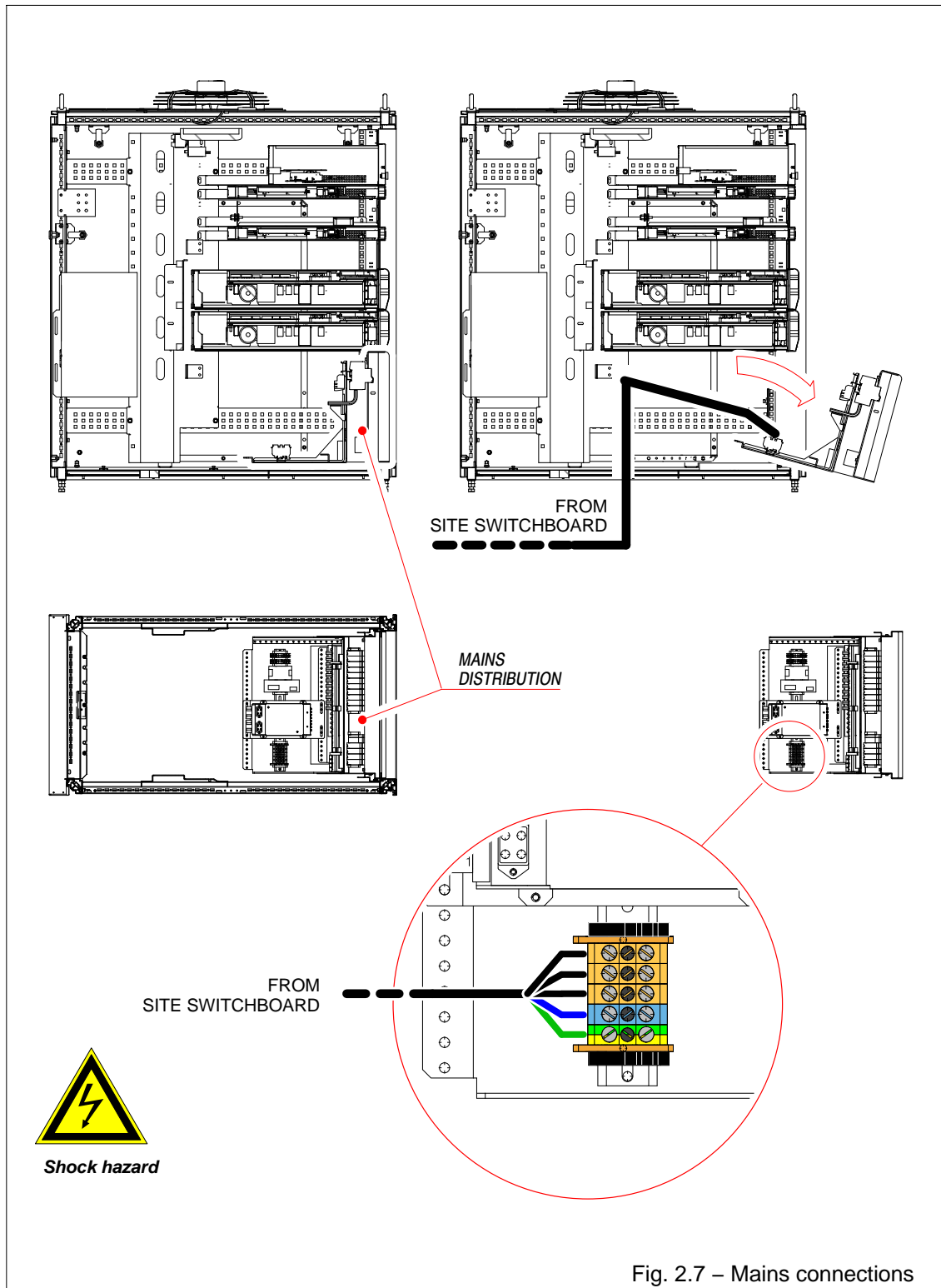


2.2.6 Mains connections (refer to Fig. 2.7 and wiring diagram of the transmitter)

Mains supply must be connected to K1 terminal blocks of *Mains Distribution* unit. Refer to Fig. 2.7 and to TX wiring diagram for carrying out the mains connections. Following the indications drawn on each terminal block, connect the cables (L1, L2, L3, N) of the three-phase mains and ground cable (PE) to the terminal block inside *Mains Distribution* unit.

The mains supply cables can be connected to *Mains Distribution Unit* also from the rear side of the cabinet removing the back panel.

Suitable through holes available on top panels of the cabinets allow the input/output of mains cables.



2.2.7 Program signals connection

TX SINGLE DRIVE (refer to Fig. 2.8; Fig. 2.9)

The connectors for the program signals are available on the rear panel of the exciter unit. It is accessed from the rear side of the cabinet removing the back panel.

10MHz and 1PPS signals must be also connected to the exciter, the connectors are available on rear panel.

Suitable through- holes on top panel of the cabinet allows the entry of the program signals cables; refer to wiring diagram included on divider no. 6 “Wiring diagrams”.

■ *Analog/dualcast version*

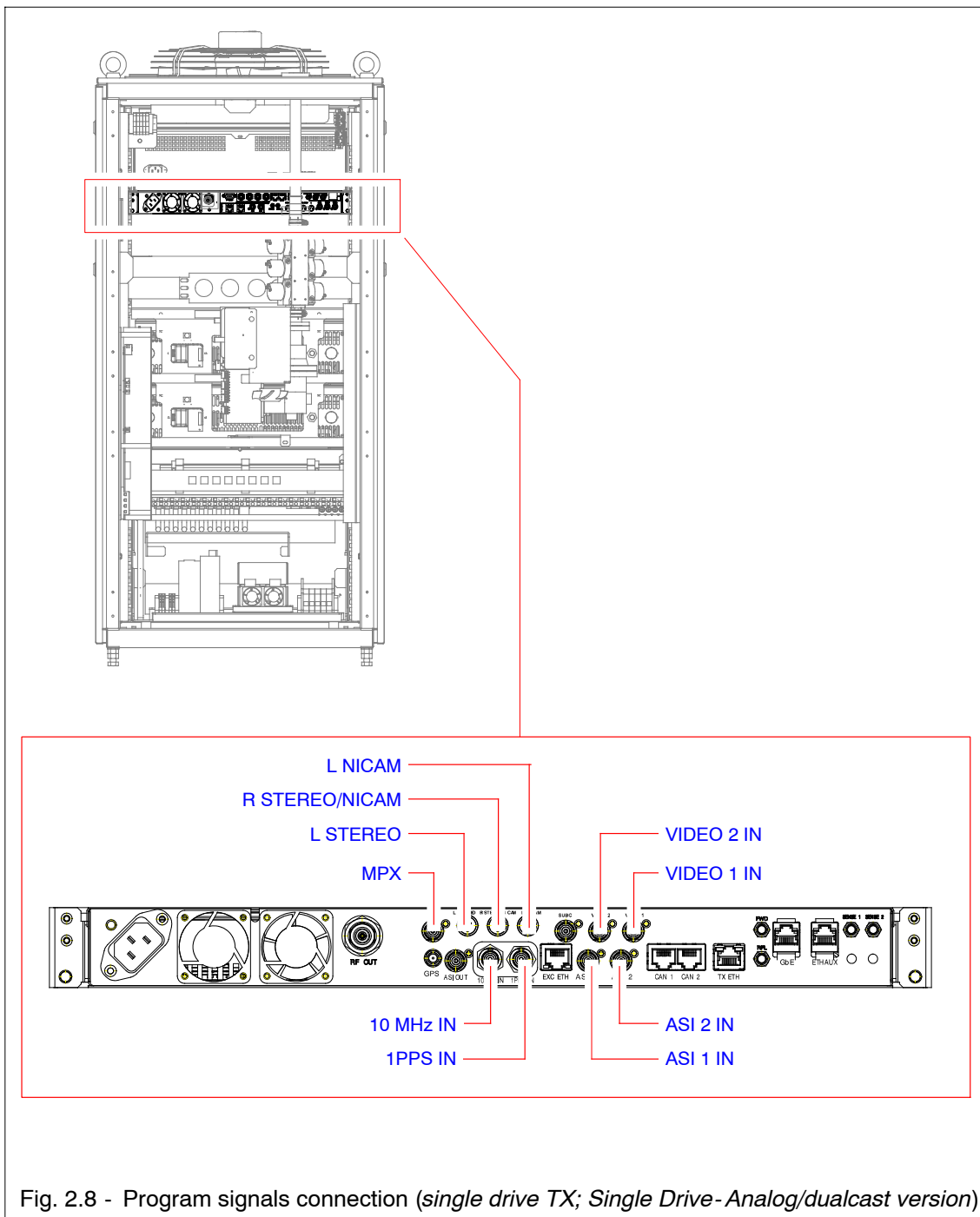


Fig. 2.8 - Program signals connection (*single drive TX; Single Drive- Analog/dualcast version*)

■ *Digital version*

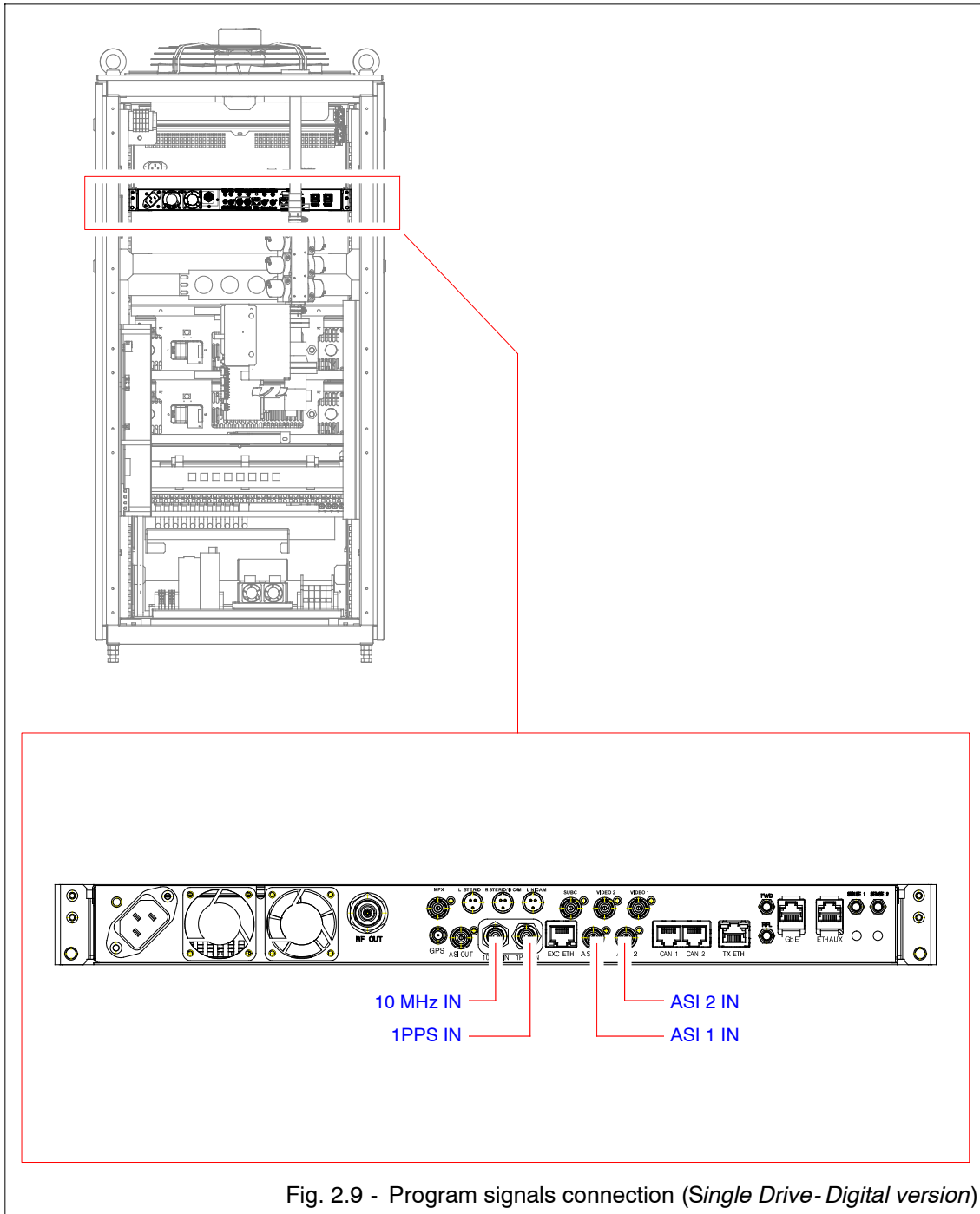


Fig. 2.9 - Program signals connection (*Single Drive-Digital version*)

TX DUAL DRIVE (refer to Fig. 2.10; Fig. 2.11)

The connectors for the program signals are available on the panel of “BB/RF Interface” unit. It is accessed from the rear side of the cabinet removing the back panel.

10MHz and 1PPS signals must be connected to both exciters “1” and “2”, the connectors are available on rear panels of the relevant units.

Suitable through- holes on top panel of the cabinet allows the entry of the program signals cables; refer to wiring diagram included on divider no. 6 “Wiring diagrams”.

■ *Analog/dualcast version*

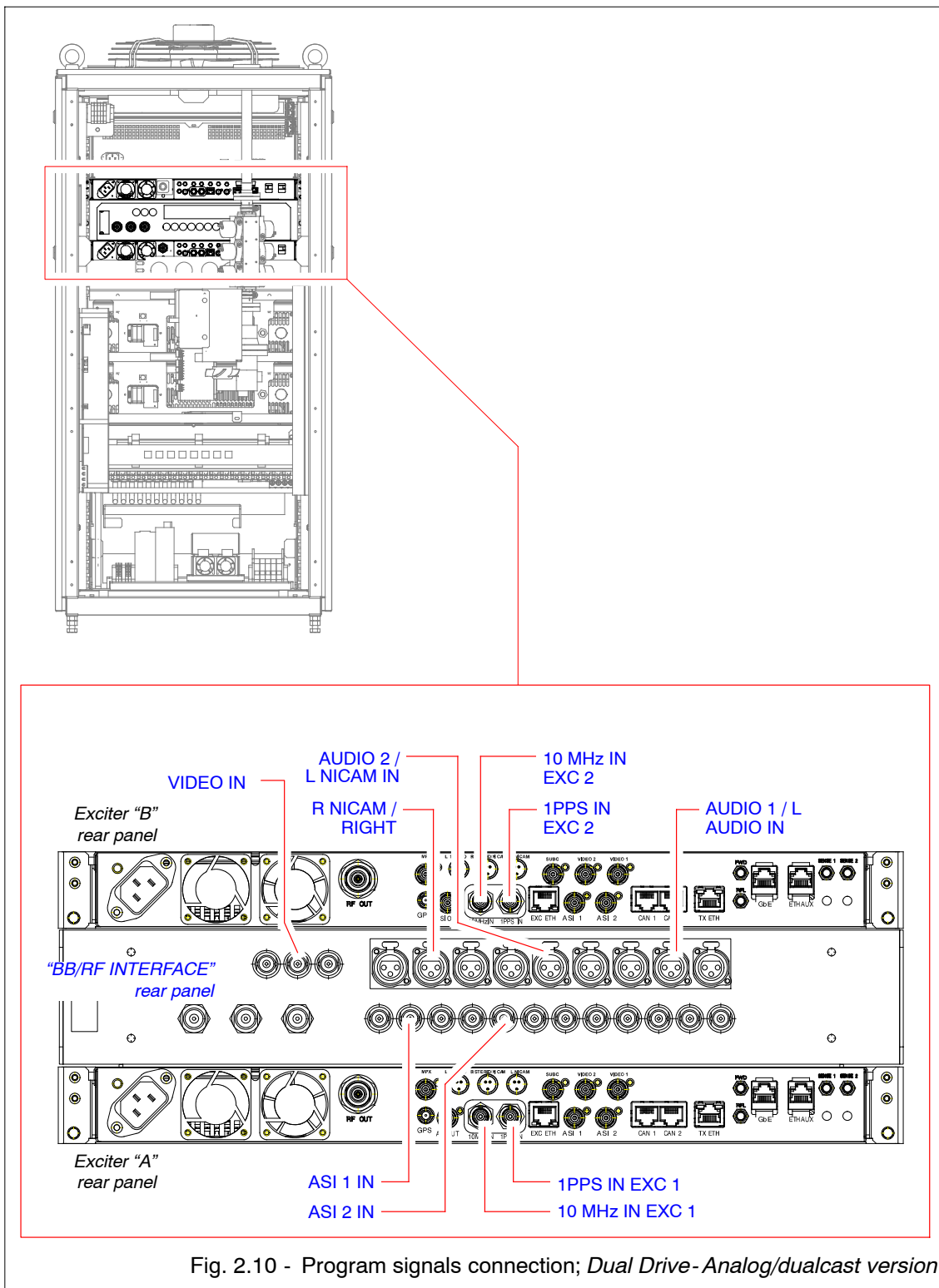


Fig. 2.10 - Program signals connection; *Dual Drive - Analog/dualcast version*

■ Digital version

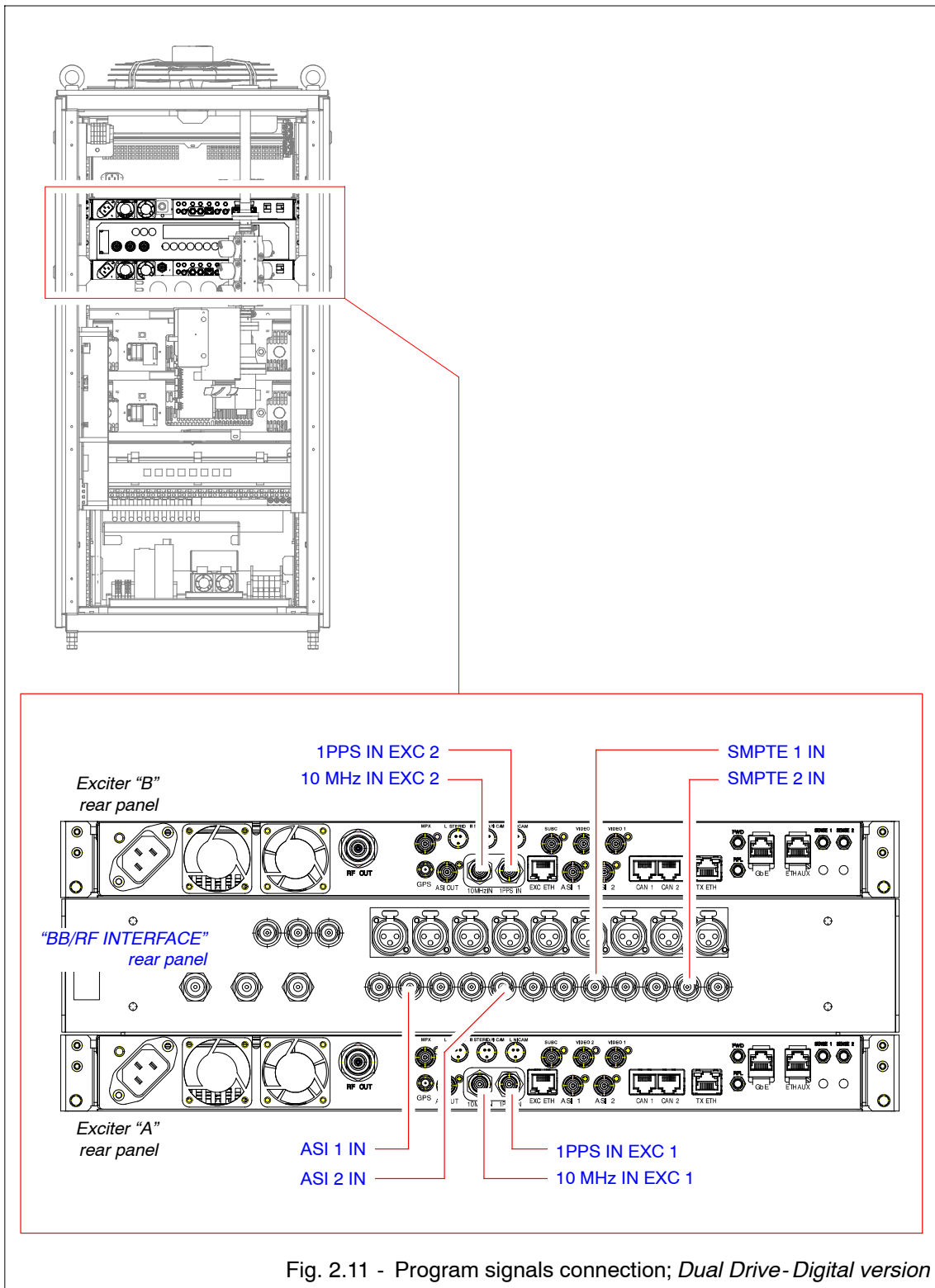


Fig. 2.11 - Program signals connection; *Dual Drive-Digital version*

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3.: OPERATIONS

3.1 INTRODUCTION

The present chapter contains the operations, the information and procedures necessary to enable the operating personnel to efficiently and effectively use the equipment.

3.2 CALL OUT OF CONTROLS AND INDICATORS ON TRANSMITTER FRONT PANEL

The following tables refers to the figures showing the call out of the front panel of the units included in the equipment, which have controls and connectors available to the operator.

Each number of the tables marks and indicator, connector, test point etc. located on the panels. A simple description of the function carried out is given for each number.

The content is subdivided as follows:

- Tab. 3.1 refers to Fig. 3.1 which is the call out of “RF Monitor” front panel
- Tab. 3.2 refers to Fig. 3.2 which is the call out of “Central Control Unit” front panel
- Tab. 3.3 refers to Fig. 3.3 which is the call out of “MEX Exciter” front panel
- Tab. 3.4 refers to Fig. 3.4 which is the call out of “HPA” front panel

3.2.1 Call out of the units on transmitter cabinet

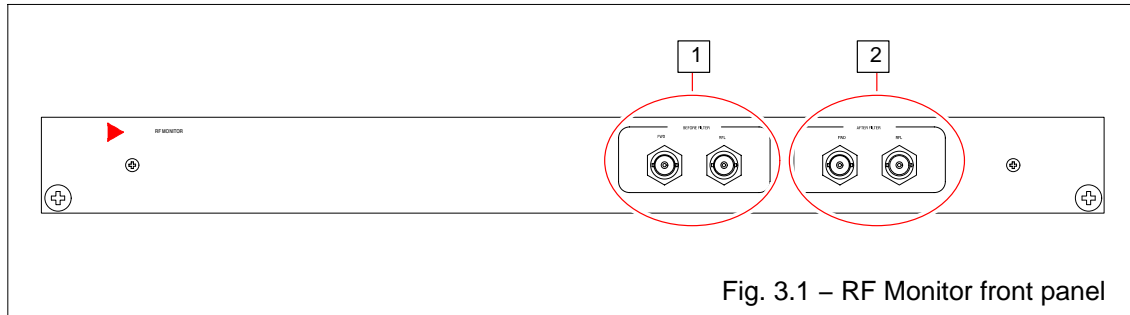


Fig. 3.1 – RF Monitor front panel

Tab. 3.1 – RF Monitor front panel legend (ref. Fig. 3.1)		
No.	LABEL	FUNCTION
1	BEFORE FILTER	Monitor connector (BNC female); allows monitoring the RF output power (<i>FWD</i> and <i>RFL</i>) of the transmitter before the filter (signal level labelled beneath connector).
2	AFTER FILTER	Monitor connector (BNC female); allows monitoring the RF output power (<i>FWD</i> and <i>RFL</i>) of the transmitter after the filter (signal level labelled beneath connector). <i>MOUNTED ONLY IF THE BAND PASS FILTER IS PRESENT.</i>

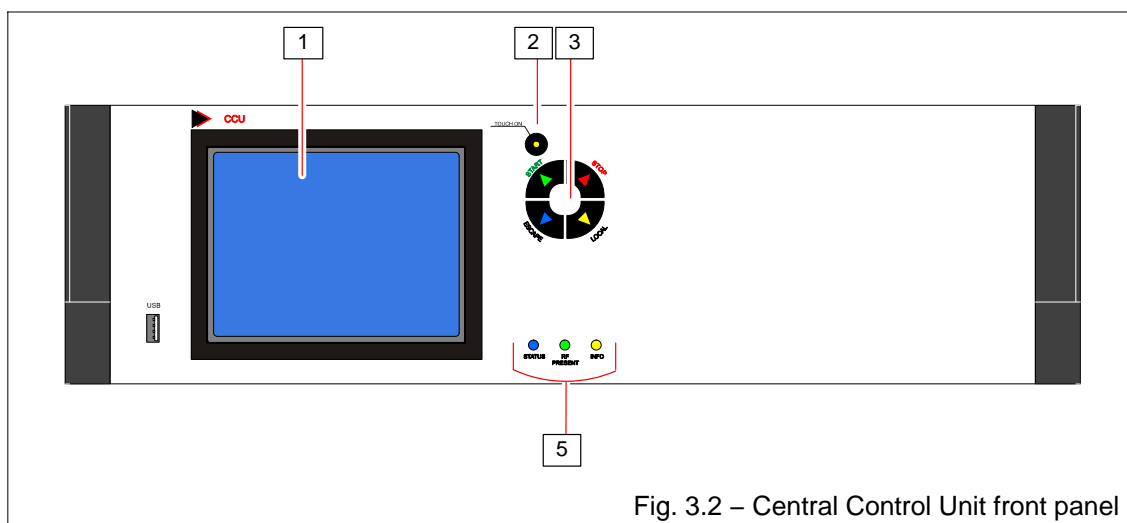



Fig. 3.2 – Central Control Unit front panel

Tab. 3.2 – Central Control Unit front panel legend (ref. Fig. 3.2)

NO.	LABEL	FUNCTION
1		Liquid Crystal <i>touch-screen</i> Display. It displays the information on the functioning state of the equipment.
2	TOUCH – SCREEN	Push-button; it enables (the associated yellow led is lit) or disables the transmitter control via <i>touch-screen</i> . Disabling <i>touch-screen</i> control enables the keyboard (#4).
3		Control buttons: START allows starting the equipment functioning when the <i>Central Control Unit</i> is set in local mode. The associated <i>green</i> led is lit. STOP allows stopping the equipment functioning when the <i>Central Control Unit</i> is set in local mode. The associated <i>red</i> led is lit. LOCAL toggle button; sets <i>local/remote</i> control of the equipment. When <i>local</i> mode is selected, “START” and “STOP” buttons and navigation keyboard are enabled and the associated <i>yellow</i> led (arrow), lights up. ESCAPE allows to quit from current menu.
4	STATUS	Indicator led (<i>multicolor</i>); According to the colour, it shows TX status, as follows: <i>SOLID BLUE</i> TX is delivering its nominal RF output power; <i>BLINKING BLUE/RED</i> when an alarm with <i>Warning level</i> has occurred (transmitter goes on). <i>SOLID RED</i> when an alarm with <i>Critical level</i> has occurred (transmitter stops).
	RF PRESENT	Indicator led (<i>solid green</i>); it indicates TX operates properly (RF output power at the rated value).
	INFO	Indicator led (<i>solid yellow</i>); it indicates that an alarm condition occurred since alarm history has been displayed for the last time

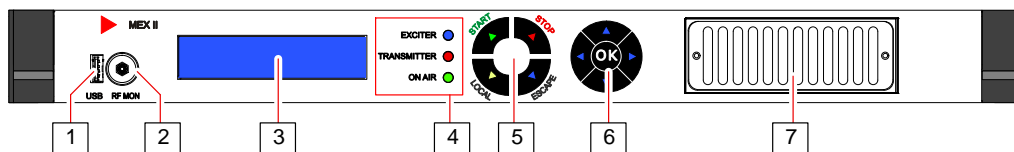




Fig. 3.3 – MEX Exciter front panel

Tab. 3.3 – MEX // Exciter front panel legend (ref. Fig. 3.3)

No.	LABEL	FUNCTION
1		USB connection used only by <i>Itelco</i> for maintenance purposes. <i>Do not use for communication with DVB-T2 modulator.</i>
2	RF MONITOR	Monitor connector (SMB female); it allows monitoring the RF output signal of the unit.
3		LCD display of the unit; displays information and data relevant to the functioning of MEX // (4 lines x 30characters).
4	EXCITER	Led indicator (green/red); indicates MEX status according to the colours, as follows: <i>BLUE</i> MEX is delivering its nominal RF output power; <i>BLUE (blinking)</i> warm up at the switching-on (approx. 30sec); within this time interval all alarms are inhibited; <i>BLUE/RED (blinking)</i> warning condition of MEX (MEX is still working); <i>RED</i> failure condition of MEX (no RF output power); <i>OFF</i> MEX is in <i>STOP</i> condition (<i>EXCITER RF OFF</i>).
	TRANSMITTER	Led indicator (green/red); it is active only when MEX operates also as control logic of the transmitter where it is housed. According to the colour, it shows the transmitter status, as follows: <i>BLUE</i> the transmitter is delivering its nominal RF output power; <i>BLUE/RED (blinking)</i> warning condition of the transmitter (transmitter is still working); <i>RED</i> failure condition of the transmitter (no RF output power); <i>OFF</i> when the transmitter is in <i>STOP</i> condition.
	ON AIR	Led indicator (green); <i>NOT USED</i> .

Tab. 3.3 – MEX // Exciter front panel legend (ref. Fig. 3.3)

No.	LABEL	FUNCTION
5		<p>Push-buttons; allow setting the operating conditions of the unit:</p> <p>START Push-button; it is active only if <i>local</i> functioning mode has been set. Under this condition, it operates as follows:</p> <ul style="list-style-type: none"> • if MEX operates only as exciter starts the unit; • if MEX operates as TX CTRL LOGIC starts TX. <p>When pushed, the associated green led, lights up.</p> <p>STOP Push-button; it is active only if <i>local</i> functioning mode has been set. Under this condition, it operates as follows:</p> <ul style="list-style-type: none"> • if MEX operates only as exciter switches-off the unit; • if MEX operates as TX CTRL LOGIC switches-off TX. <p>When pushed, the associated red led, lights up.</p> <p>ESCAPE Push-button; it allows to quit from current menu.</p> <p>LOCAL/REMOTE Push-button which allows <i>local/remote</i> control of the equipment. When <i>local</i> mode is selected, "START" and "STOP" push-buttons and the keyboard are enabled. When <i>remote</i> mode is selected, "START" and "STOP" push-buttons and the keyboard are disabled.</p>
6		<p>Controller keyboard. It allows accessing the menu (listed on right-hand side of the display) and setting the functioning parameters of MEX.</p> <p>Accessing the menu and setting of the parameter is as follows:</p> <ul style="list-style-type: none"> – "▲" and "▼" arrows select the menu; once accessed the menu, select the parameter to be changed; change the values of the parameters inside a menu. – "◀" and "▶" arrows allow scrolling the pages of each menu. – "OK" key is used to enter the selected menu and to confirm the setting carried out.
7		Grid for the inlet of the cooling air of the unit.

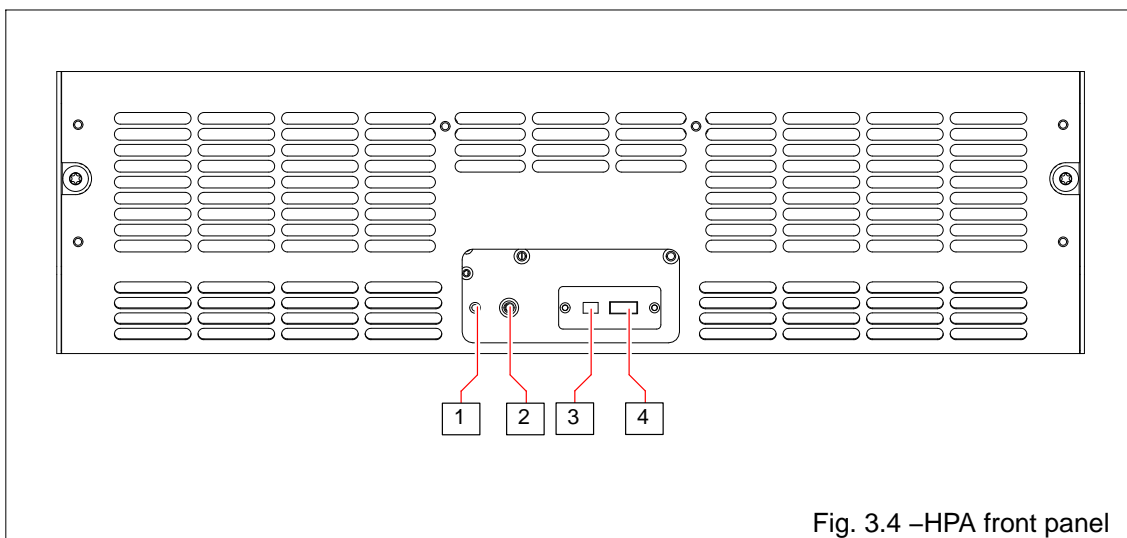


Fig. 3.4 –HPA front panel

Tab. 3.4 – HPA front panel (ref. Fig. 3.4)		
No.	LABEL	FUNCTION
1		Push-button; it allows resetting logic section of the unit.
2		Connector (SMB, female); it allows monitoring RF output of the amplifier module.
3		Indicator led (multicolor); depending on the unit status it is lit: <i>SOLID GREEN</i> when the unit is AC supplied, but it does not deliver RF output power; <i>SOLID BLUE</i> when the unit is AC supplied and it delivers RF output power (normal operating conditions). <i>BLINKING BLUE/RED</i> when an alarm with <i>Warning level</i> has occurred (transmitter goes on). <i>SOLID RED</i> when an alarm with <i>Critical level</i> has occurred (transmitter stops).
4		USB connector; PC connection for monitoring the amplifier status. A dedicated software is needed.

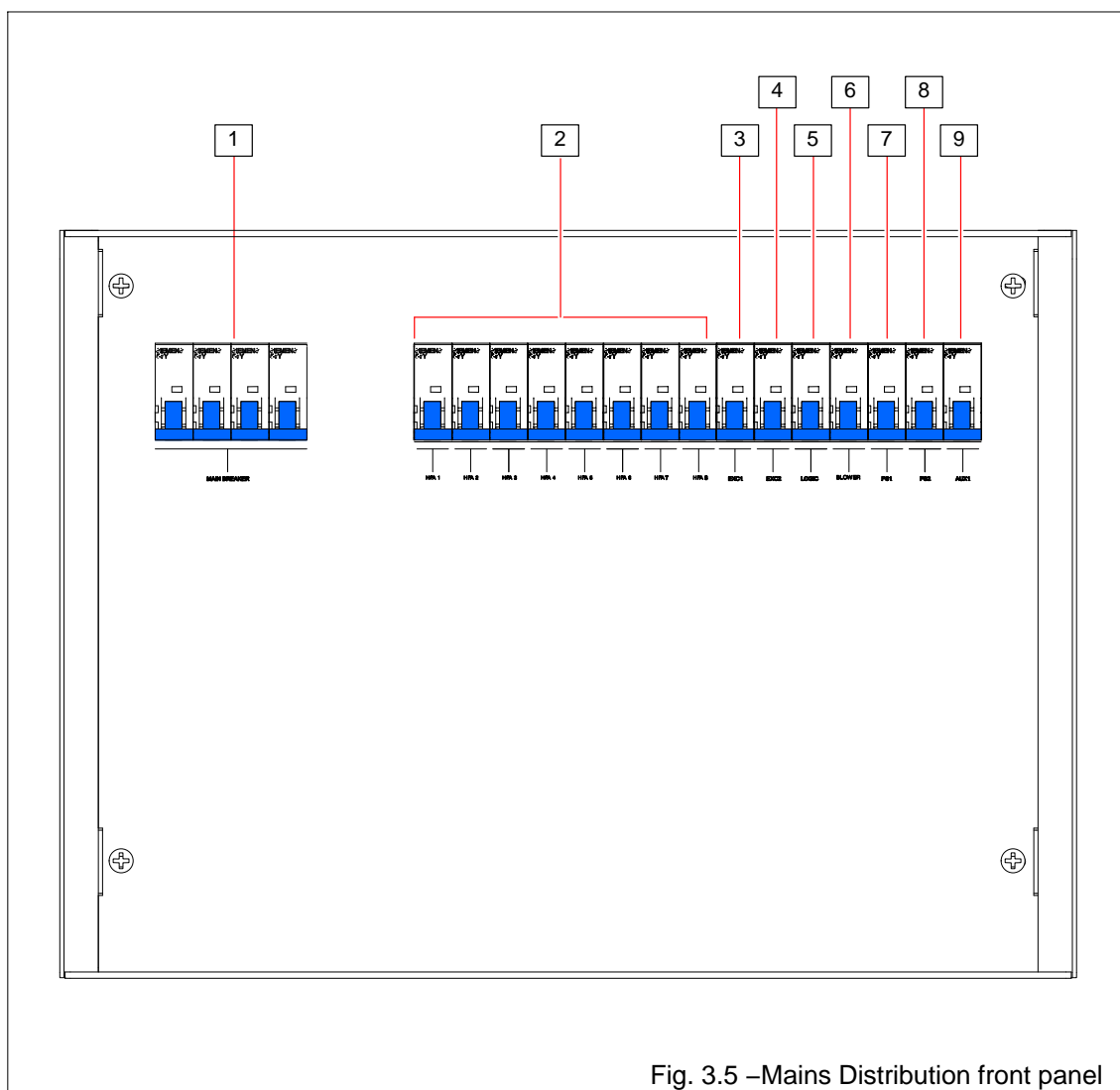


Fig. 3.5 –Mains Distribution front panel

Tab. 3.5 – Mains Distribution front panel (ref. Fig. 3.5)

No.	LABEL	FUNCTION
1	MAIN BREAKER	It is the general breaker of the transmitter.
2	PA1 to PA 8	Set of breakers. They connect the AC power supply to the relevant amplifier module. <i>They are present in a number equal to the amplifiers modules.</i>
3	EXC. 1	Breaker. It connects the AC power supply to exciter 1.
4	EXC. 2	Breaker. It connects the AC power supply to exciter 2.
5	LOGIC	Breaker. It connects the AC power supply to CCU unit.
6	BLOWER	Breaker. It connects the AC power supply to the extractor blower of the cabinet.
7	PS1	Breaker. It connects the AC power supply to the internal AC/DC power supplies (+24V _{DC} /GR1 and +12V _{DC} /GR2).
8	PS2	Breaker. It connects the AC power supply to the internal AC/DC power supplies (+24V _{DC} /GR3 and +12V _{DC} /GR4).
9	AUX 1	NOT USED

3.3 SUMMARY TABLE OF INDICATOR LEDS ON TX FRONT PANEL

The following table refers to Fig. 3.6 which point out all the indicator LEDs available to the operator, on the front panels of the transmitter's units. A simple description of the function carried out is given for each number.

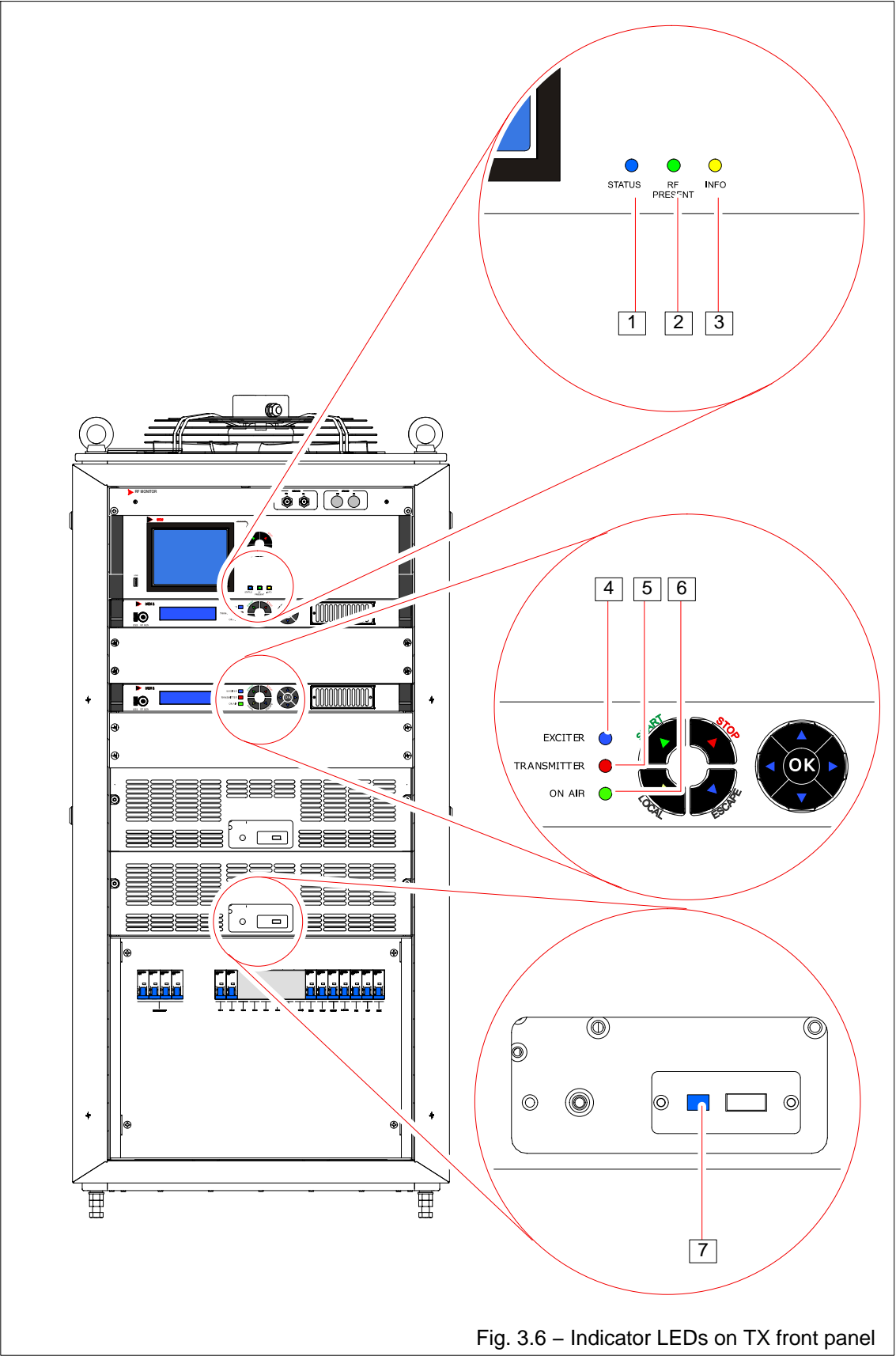


Fig. 3.6 – Indicator LEDs on TX front panel

Tab. 3.6 – Indicator LEDs on TX front panel (ref. Fig. 3.6)

No.	LED	COLOR	INDICATION
“CCU” Central Control Unit			
1	STATUS	MULTICOLOR	<p><i>SOLID BLUE</i> TX delivering its nominal RF output power</p> <p><i>BLINKING BLUE/RED</i> . . alarm with <i>Warning level</i> occurred (TX goes on)</p> <p><i>SOLID RED</i> alarm with <i>Critical level</i> occurred (TX stops)</p>
2	RF PRESENT	GREEN	TX operating (RF output power at the rated value)
3	INFO	YELLOW	alarm condition occurred since alarm history has been displayed for the last time
“MEX” exciter			
4	EXCITER	MULTICOLOR	<p>Led indicator (green/red); indicates MEX status according to the colours, as follows:</p> <p><i>BLUE</i> MEX is delivering its nominal RF output power;</p> <p><i>BLUE (blinking)</i> warm up at the switching-on (approx. 30sec); within this time interval all alarms are inhibited;</p> <p><i>BLUE/RED (blinking)</i> warning condition of MEX (MEX is still working);</p> <p><i>RED</i> failure condition of MEX (no RF output power);</p> <p><i>OFF</i> MEX is in <i>STOP</i> condition (<i>EXCITER RF OFF</i>).</p>
5	TRANSMITTER	MULTICOLOR	<p>Led indicator (green/red); it is active only when MEX operates also as control logic of the transmitter where it is housed. According to the colour, it shows the transmitter status, as follows:</p> <p><i>BLUE</i> the transmitter is delivering its nominal RF output power;</p> <p><i>BLUE/RED (blinking)</i> warning condition of the transmitter (transmitter is still working);</p> <p><i>RED</i> failure condition of the transmitter (no RF output power);</p> <p><i>OFF</i> when the transmitter is in <i>STOP</i> condition.</p>
6	ON AIR	GREEN	Led indicator (green); <i>NOT USED</i> .
“Genesis” High Power Amplifier			
7		MULTICOLOR	<p>Indicator led (multicolor); depending on the unit status it is lit:</p> <p><i>SOLID GREEN</i> when the unit is AC supplied, but it does not deliver RF output power;</p> <p><i>SOLID BLUE</i> when the unit is AC supplied and it delivers RF output power (normal operating conditions).</p> <p><i>BLINKING BLUE</i> warm up at the switching-on (approx. 12 sec); within this time interval all alarms are inhibited;</p> <p><i>BLINKING BLUE/RED</i> when an alarm with <i>Warning level</i> has occurred (transmitter goes on).</p> <p><i>SOLID RED</i> when an alarm with <i>Critical level</i> has occurred (transmitter stops).</p>

3.4 INSTALLATION CHECKS

After each unit has been installed, as described in the previous chapter, a series of checks must be performed to verify that:

- neither equipment nor cables have been damaged during installation;
- the equipment operates regularly and is fully able to carry out the functions for which has been installed.

The check procedure consists of two steps:

- Cold checks;
- Hot checks.

3.4.1 Cold checks

Check that each unit has been installed in accordance with the instructions given in the previous chapter. Particularly verify that:

- ▶ the place of installation complies with the stated requirements;
- ▶ sufficient space is available around the unit for maintenance requirements;
- ▶ the unit is easily accessible to the operator;
- ▶ the unit is grounded;
- ▶ connectors and cables attached to the unit are well tightened
- ▶ RF output of the transmitter is connected to antenna or to a suitable dummy load

Then check that the unit has been connected in accordance with the indications given in the interconnection diagrams, and check the ohmic continuity of all conductors.

3.4.2 Hot checks

Upon completion of "cold" checks with the equipment switched off, switch it on (carry out steps 1 and 2 of Tab. 3.7) and verify that functioning is regular. It is advisable to check:

- ▶ all power supply voltages to the various units;
- ▶ regular functioning of equipment, on *CCU* display; regular functioning of the equipment may be also checked referring to Tab. 3.6 which lists the indicator LEDs on equipment front panels and their associated status (*alarm* or *regular*);
- ▶ air cooling system is efficient, making sure that the air can be felt from all nozzles.

3.5 SWITCHING-ON

The switching on procedure for the equipment is given on Tab. 3.7.

Tab. 3.7 – Switching on the equipment (local control procedure)		
Step	DESCRIPTION	EXPECTED RESULT
1	– Close the breakers on front panel of Mains Distribution unit (see para 3.2, Fig. 3.3).	<p>These LEDs light up on front panels of the following units:</p> <p><u>Exciter “1” (on-air):</u></p> <ul style="list-style-type: none"> ● <i>EXCITER (blue)</i> blinks for about 30 s then goes off; <p><u>Exciter “2”:</u></p> <ul style="list-style-type: none"> ● <i>EXCITER (blue)</i> blinks for about 30 s then goes off; <p><i>Displays on Exciters light-up and the exciters start the software loading ('loading...' operation).</i></p> <p><u>CCU (Central Control Unit)</u></p> <ul style="list-style-type: none"> ● <i>STATUS (blue)</i> blinks for about 30 s then remains lit; ● <i>LOCAL (yellow)</i> on relevant push button ● <i>STOP (red)</i> on relevant push button <p><i>See note (1).</i></p> <p><u>RF Amp. modules</u></p> <ul style="list-style-type: none"> ● <i>(LED blinking green) modules supplied</i>
2	– Press “ START ” button on front panel of CCU .	<p>These LEDs light up on front panels of the following units:</p> <p><u>Exciter “1” (on-air):</u></p> <ul style="list-style-type: none"> ● <i>EXCITER (blue);</i> <p><u>RF Amp. modules</u></p> <ul style="list-style-type: none"> ● <i>(LED blue) modules deliver RF Pwr</i> <p>TRANSMITTER DELIVERS RF POWER</p>

NOTE

(1) The units at the switching-on, are under the operative conditions they had before the switching-off. In this table it is stated that:

- CCU was in local functioning and in stop condition (no RF power delivered).
- Exciters were in remote functioning and in stop condition (no RF power delivered by Exciter on-air).

3.6 SWITCHING-OFF

The equipment can be switched off locally only if it is working under this condition; if it is working in remote control, the switching-off must be carried out sending the relevant command from the remote control unit.

The switching off in 'local' functioning is achieved carrying out the following operations:

- ▶ push 'STOP' on CCU;
- ▶ open the mains breakers on *Mains Distribution* front panel.

3.7 MANUAL CONTROL UNDER EMERGENCY CONDITIONS

Under emergency conditions (i.e.: failure of *CCU* or maintenance operations) the manual control of the transmitter (TX on/off; dual-exciter configuration switch-over) is allowed through a set of push-buttons, arranged inside Tx cabinet. These group is accessed from the rear panel of the cabinet and is arranged on the left side wall.



NOTE!

Under normal operating conditions "Manual Control" groups are disabled.

3.7.1 TX on/off and manual control of dual-exciter configuration

"Manual control" group allows *starting/stopping* the transmitter ("START" and "STOP" push-buttons) and also setting the exciter on air ("TXA ON AIR" and "TXB ON AIR" push-buttons).

Two indicator LEDs (green) show the operative conditions of the transmitter:

- "INTERLOCK PRESENT" . . indicates the *interlock chain* is closed;
- "LOGIC PRESENT" indicates *CCU* is operating normally (under failure conditions of *CCU* the LED is off).

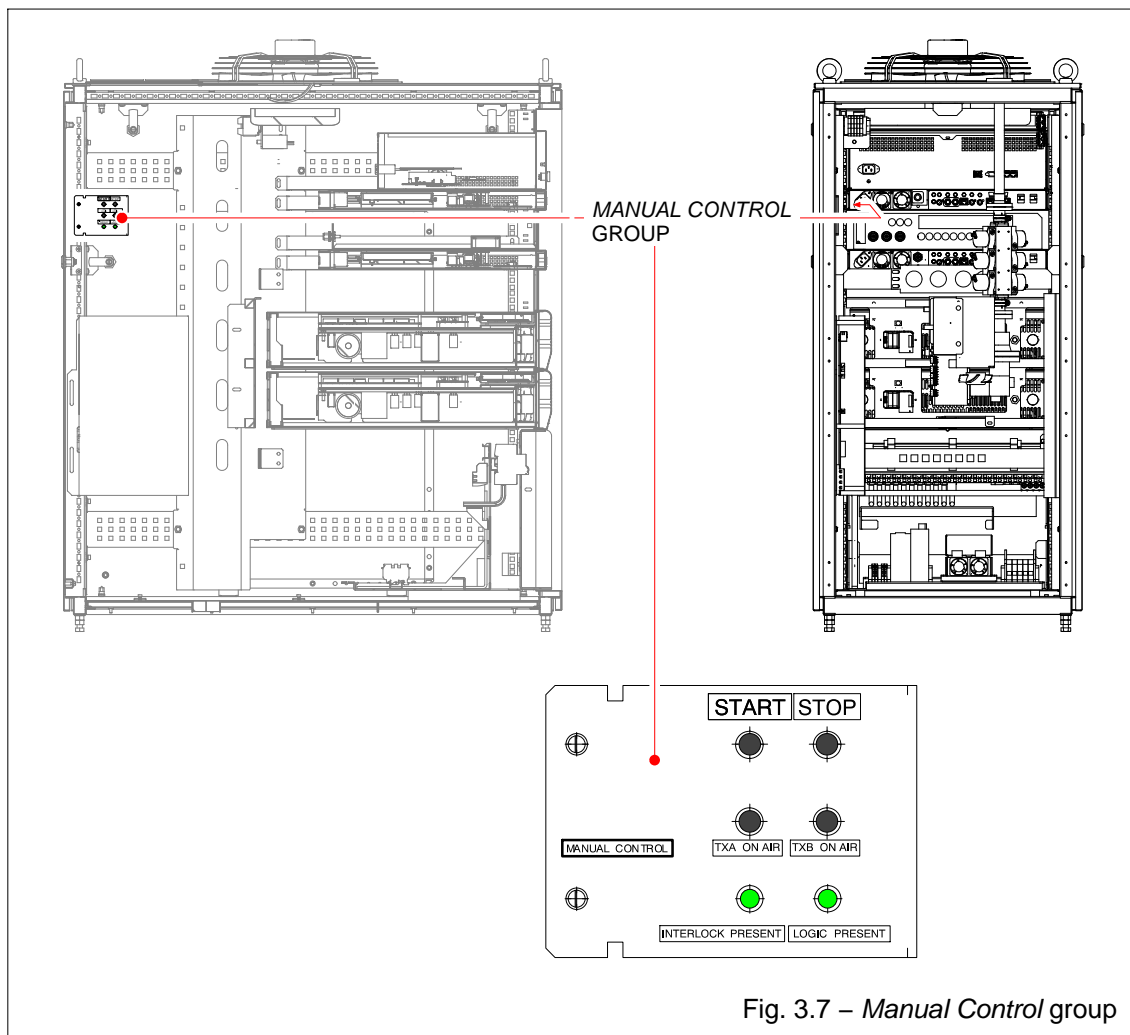


Fig. 3.7 – Manual Control group

3.8 REMOTE CONTROL

The remote control of the transmitter is allowed via *ethernet* and via *parallel interface (only on request)*.

3.8.1 Remote control via *ethernet*

A special connector is available on rear panel of *CCU* and *MEX* units. The remote control is achieved via *web server*, typing the address (i.e.: 192.4.0.186) associated to each unit, you have access to the remote control of the units.

An “*ETHERNET SWITCH*” unit is available *on request*.

Further details about *ETHERNET* interfaces and connection protocols, are given in Appendix “B”: *Ethernet Interface Installation Guide*.

3.8.2 Remote control via *parallel interface*

The parallel interface (delivered as *option*) is arranged in the rear part of the cabinet on the right side wall. Tab. 3.8 lists the pin-out assignment of the PARALLEL I/O port.

Tab. 3.8 – Pin-out assignment of PARALLEL I/O connector					
PIN		FUNCTION	PIN		FUNCTION
1		TX START (TLC)	18		EXT. INTERLOCK (TLC)
2		TX STOP (TLC)	19		EXC "B" ON AIR (TLC)
3		RESET (TLC)	20		EXC "A" ON AIR (TLC)
4		SPARE (TLC)	21		RF PRESENT (TLS)
5		TX WARNING (TLS)	22		EXC. RES. EXCHANGE (TLS)
6		TX OFF (TLS)	23		RF ABSENT (TLS)
7		TX LOCAL (TLS)	24		SPARE (TLS)
8		NOT CONNECTED	25		COMMON EXT. INTERLOCK TLC
9		TX REMOTE (TLS)			
10		TX NORMAL (TLS)			
11		TX IN DVB MODE (TLS)			
12		TX FAULT (TLS)			
13		TX POWERED (TLS)			
14		GND (COMM. TLC)			
15		+12 V EXTERNAL			
16–17		COMMON (TLS)			

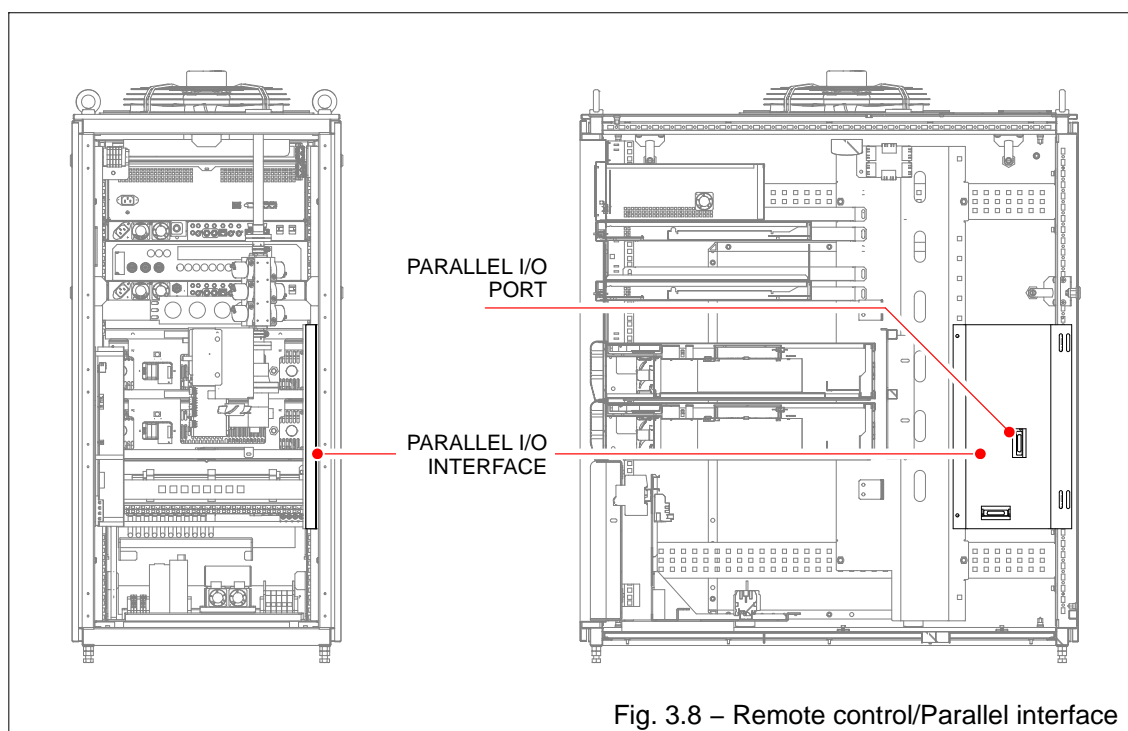


Fig. 3.8 – Remote control/Parallel interface

3.9 REGULATION AND SETTINGS

3.9.1 Measurement and Regulation of the transmitter Output Power

A transmitter unit replacement could change the transmitter output power, that is factory set. So it could be necessary to check the RF output power and eventually adjust it again. The procedure must be performed on Exciter.

Refer to *MEX II* Technical Manual for information on how to perform the RF output power adjustment.

The test-bench set-up is shown in Fig. 3.9.

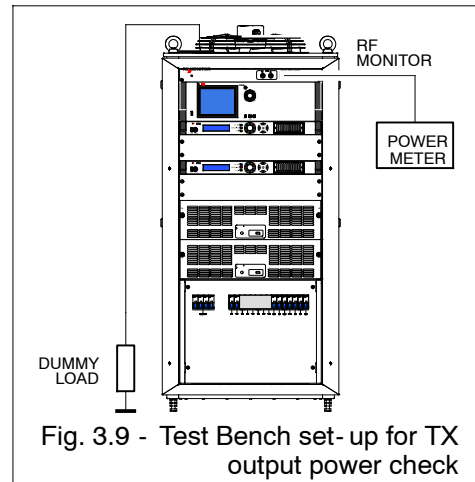


Fig. 3.9 - Test Bench set-up for TX output power check

3.9.2 Changing the transmission channel

The steps to be carried out to tune the transmitter to the transmission channel concern the units listed here below; for each of them is also given (*between parentheses*) the reference to the technical manual where the topic has dealt with.

3.9.2.1 TX equipped with CCU

☐ CCU



(section 2, Tech Manual; Cahp. 2 - paragraph 2.4.4 "Description of Menu"; Fig. 2.16 'Options/Configuration' menu)

☐ MEX II EXCITER



(section 2, Tech Manual; see the relevant description)



NOTE!

Keep in mind that the set-up relevant the two types of modulators (DVB-T and TV) are completely independent.

So changing the transmission channel on a modulator type, the other ones keeps its pre-existing set-up.

☐ BAND PASS FILTER (if present)

- Tuning the filter cavities (refer to test report which comes with the equipment)

3.9.2.2 TX without CCU

☐ MEX // EXCITER



(section 2, Tech Manual; see the relevant description)



NOTE!

Keep in mind that the set-up relevant the two types of modulators (DVB- T and TV) are completely independent.

So changing the transmission channel on a modulator type, the other ones keeps its pre-existing set-up.

CAUTION!

After setting the new frequency, execute the following procedure:

- access the < Settings > menu,
- select the "HPA Alignment",
- push "OK" of the keyboard on MEX front panel (the arrows on both sides of the "HPA Alignment" blink,
- push "OK" of the keyboard once again to confirm the setting (if you do not confirm the operation, it will have no effect).

```

< SETTINGS > FWD :  -- dBm
▶ * HPA Alignment
EXT INTERLOCK      ENABLED
TRIP CHANGEOVER    ON
  
```

☐ BAND PASS FILTER (if present)

- Tuning the filter cavities (refer to test report which comes with the equipment)

3.9.3 Changing the *dual-cast* modulator

The steps to be carried out to change the modulator operation from *analog* to *digital* and vice versa, concern the units listed here below; for each of them is also given (*between parentheses*) the reference to the technical manual where the topic has dealt with.

3.9.3.1 TX equipped with CCU

- ☐ CCU



(section 2, Tech Manual; Chap. 2 - paragraph 2.4.4 "Description of Menu"; Fig. 2.16 'Options/Configuration' menu)

- ☐ MEX // EXCITER



(section 2, Tech Manual; see the relevant description)



NOTE!

Keep in mind that the set-up relevant the two types of modulators (DVB- T and TV) are completely independent.

So changing the transmission channel on a modulator type, the other ones keeps its pre-existing set-up.

3.9.3.2 TX without CCU

- ☐ MEX // EXCITER



(section 2, Tech Manual; see the relevant description)



NOTE!

Keep in mind that the set-up relevant the two types of modulators (DVB- T and TV) are completely independent.

So changing the transmission channel on a modulator type, the other ones keeps its pre-existing set-up.

CAUTION!

After changing the modulation standard, execute the following procedure:

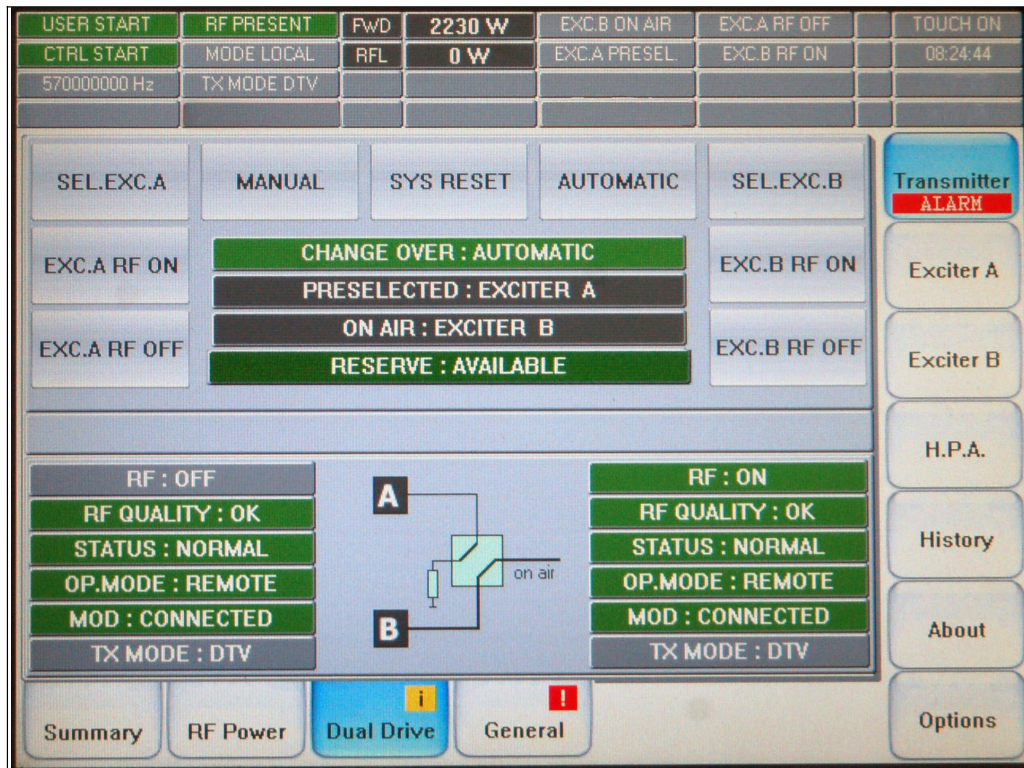
- access the < Settings > menu,
- select the "HPA Alignment",
- push "OK" of the keyboard on MEX front panel (the arrows on both sides of the "HPA Alignment" blink,
- push "OK" of the keyboard once again to confirm the setting (if you do not confirm the operation, it will have no effect).

```

< SETTINGS > FWD :   -- dBm
▶* HPA Alignment
EXT INTERLOCK        ENABLED
TRIP CHANGEOVER      ON
  
```

3.10 DUAL EXCITER CONFIGURATION SET UP

The set-up of the Dual Exciter configuration (i.e. choice of operative exciter, switching on/switching off the exciter) is achieved via *Central Control Unit*. The managing is allowed in "Transmitter" menu, "Dual Drive" tab:



The following set-up are available:

- **FUNCTIONING MODE**

AUTOMATIC automatic changeover of faulty exciter with the standby one is enabled: *CCU* performs the changeover without any intervention of the operator.

MANUAL any type of automatic changeover is inhibited and therefore all the unit functions (changeover of the faulty exciter with the standby one, switching on of standby exciter) must be carried out by the operator.

- **SETUP OF ON AIR EXCITER**

Setup of the operative exciter is allowed pushing "SEL. EXC.A" or "SEL. EXC.B" button.

- **SWITCHING- ON/OFF EXCITERS**

Switching- on/off exciters is allowed pushing "EXC A RF ON" or "EXC A RF OFF" button.

- **SYSTEM RESET**

Pushing "SYS RESET" button resets the system configuration. In this way ExcA is preselected again as preferential. If there are still the alarm conditions which caused the exciter's changeover, setting ExcB as preferential, then a changeover will occur again, putting ExcB as the preselected.

3.10.1 Presetting Dual exciter configuration under emergency conditions

Under emergency conditions (i.e.: failure of *CCU* or servicing) "Manual control" assembly available inside the transmitter cabinet (Fig. 3.7) allows setting the exciter on air ("TXA ON AIR" and "TXB ON AIR" push- buttons).

3.11 EXTRACTION OF THE MODULE FROM THE CABINET (only for TX with 2 HPA)

The module is hot-pluggable thanks to the use of an isolated combiner, allowing safe removal and insertion without interrupting transmitter operation. The extraction is obtained with a release device operating from the amplifier front panel, operating only from the front of the transmitter. The following Fig. 3.10 shows the location of the release device.



NOTE!

Before extracting the amplifier module open the associated main breaker on Mains Distribution front panel.

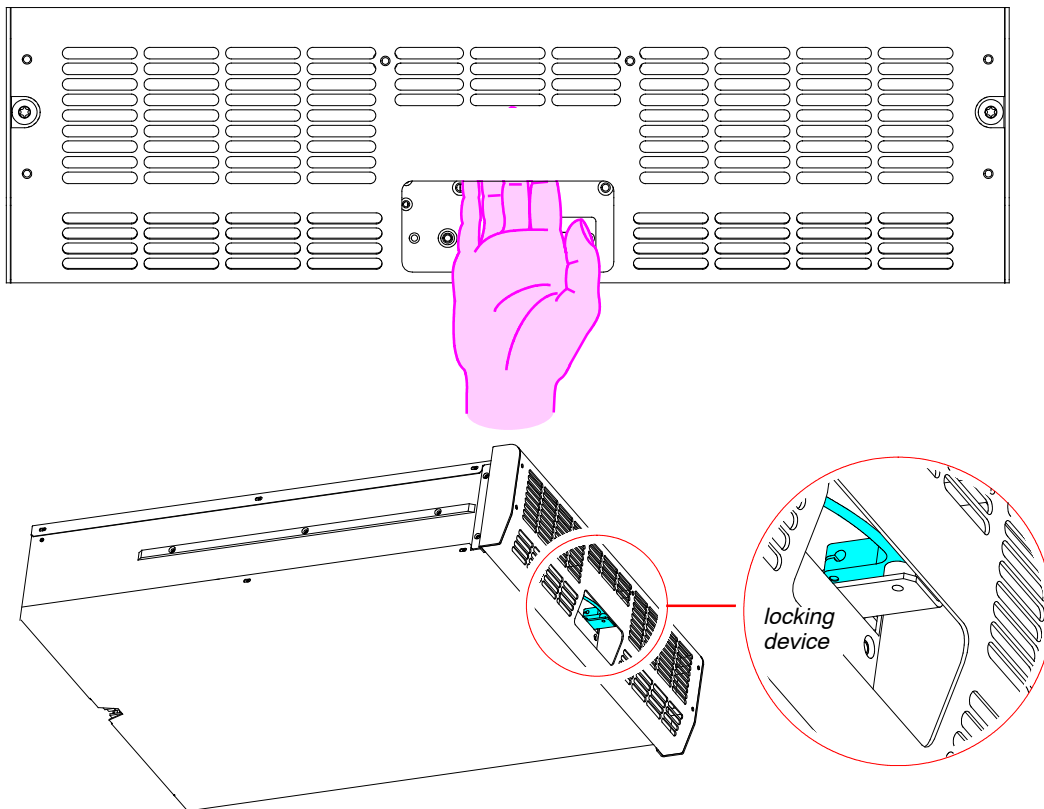
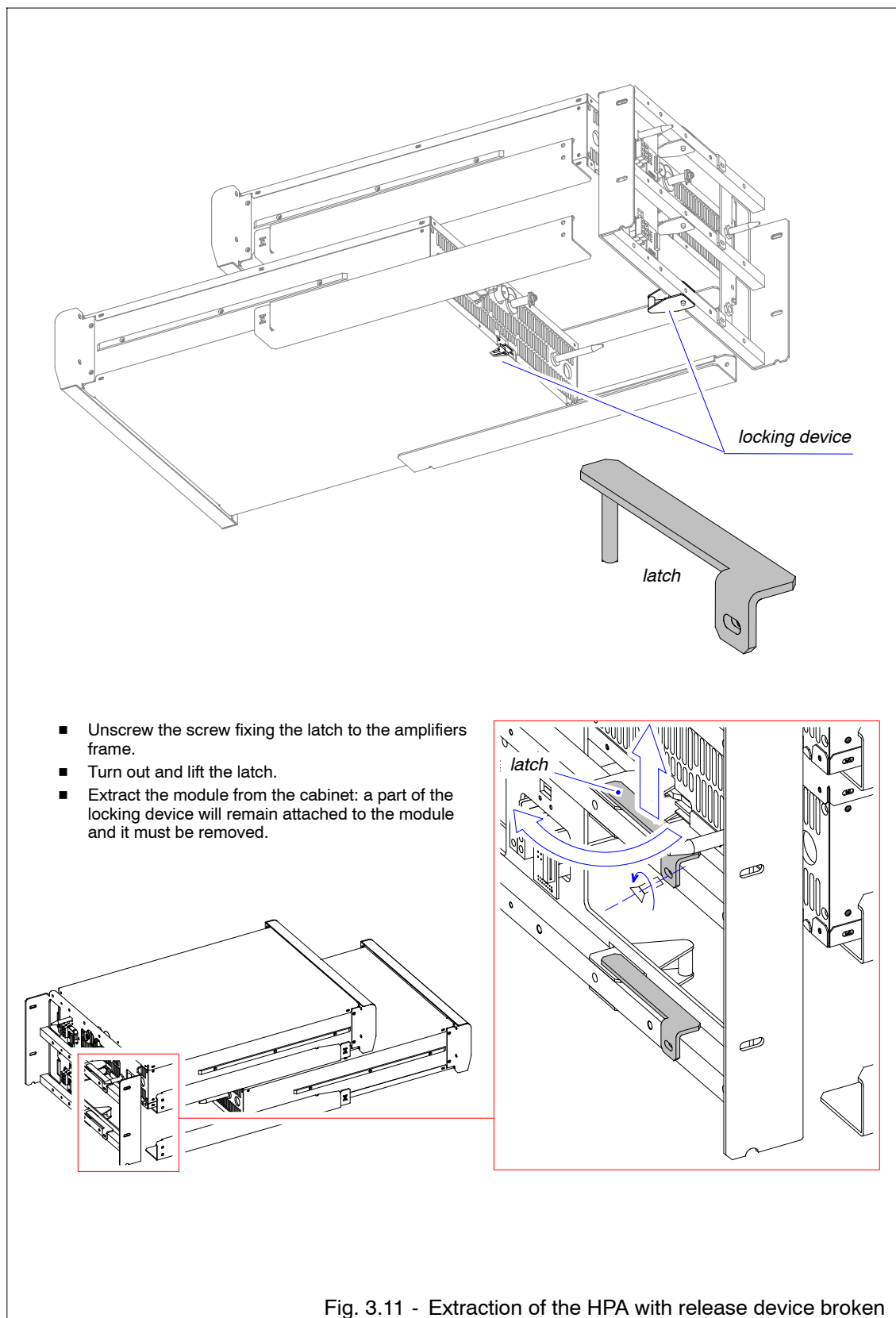


Fig. 3.10 - Extraction of the HPA

3.11.1 Extraction of the module with the release device (steel wire) broken

In case of breakage of the release device of the module (steel wire), this last may be extracted from the rack, removing the latch mounted on the rear of the frame of the modules. To do this remove the rear panel of the cabinet and operate as shown in Fig. 3.11.



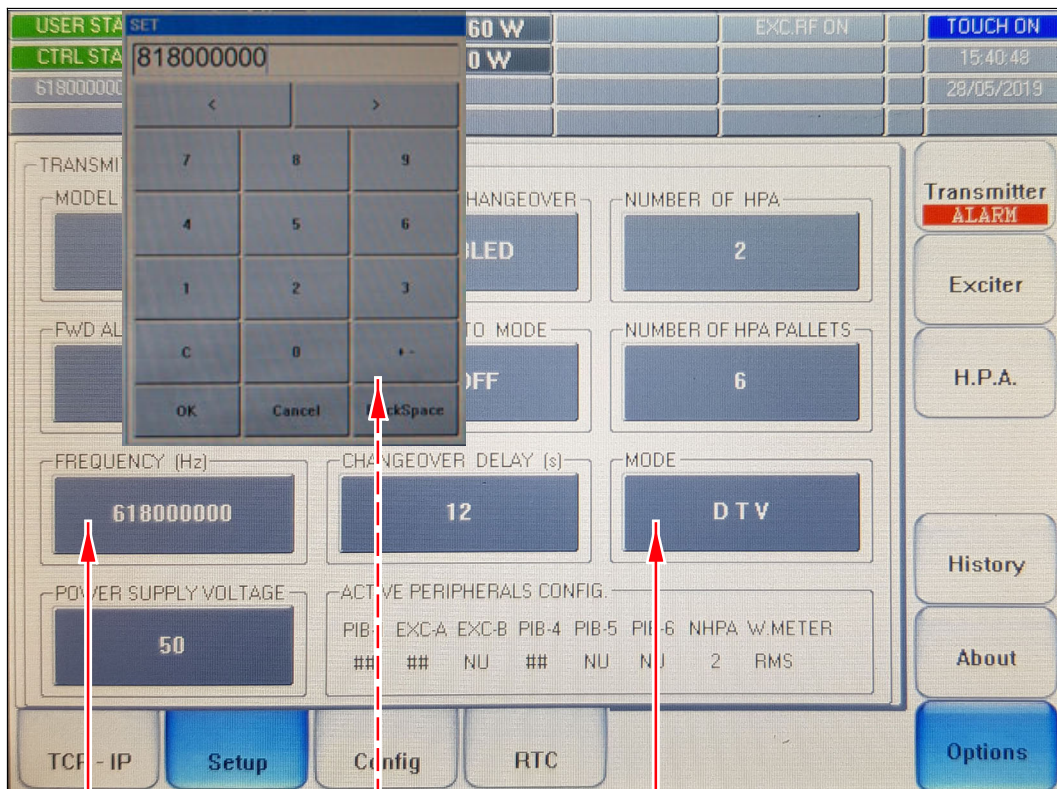
3.12 REPLACEMENT OF A FAULTY AMPLIFIER MODULE

3.12.1 Extraction of the amplifier module from the cabinet

The extraction of the faulty module from the cabinet must be carried out according to the indications of the previous paragraph 3.11.

3.12.2 Fitting the spare amplifier module to the cabinet

1. Before fitting the spare module to the cabinet pull the handle of the locking device (refer to Fig. 3.10): this operation is necessary because in the event that the locking device is closed, the module cannot be inserted into its slot. If the locking device is closed, by pulling the handle you must hear the click of the device.
2. Insert the amplifier module into the slot and be sure it is locked in place.
3. Close the associated main breaker.
4. Now it is necessary to send to the spare module just inserted:
 - a. the transmission frequency.
 - b. the operating mode of the modulator (*analog or digital*; only for dualcast transmitters)
 This is achieved on CCU unit accessing the “Option/Setup” menu in “FREQUENCY (Hz)” field and “MODE” field. Operate as follows:



- a1. touch on “FREQUENCY (Hz)” field to set or to change the frequency
- a2. a pop-up keyboard is displayed. Enter the frequency to be set (in Hz) then push “OK”.

- b. set ATV or DTV depending on the modulation standard in use

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4.: MAINTENANCE

4.1 INTRODUCTION

4.1.1 Introduction to Maintenance

The purpose of this section is to assist the maintenance personnel in keeping the equipment at best operational status. Maintenance can be subdivided into the following actions:

- PREVENTIVE MAINTENANCE
- CORRECTIVE MAINTENANCE

Preventive maintenance refers to maintenance procedures which have to be carried out periodically so as to prevent malfunctions. Corrective maintenance includes a series of tables representing a troubleshooting guide used to locate the most likely area where a malfunction has occurred or reference to the equipment manuals.

4.1.2 Maintenance tools

Maintenance tools include *Commercial*, *Standard* and *Special Tools* used for the 1st and 2nd levels of Maintenance. *Commercial Tools* include the tools normally used for the maintenance activities (screwdrivers, pliers, soldering irons, etc.) and are normally available on the local market. *Standards Tools* include those materials considered as standard for maintenance activities (coax cables of standard length, coax adapters, etc.) and are available on the local market and/or from the manufacturer of the Equipment. *Special Tools* include tools prepared by the manufacturer for maintenance requirements and are available only from the manufacturer of the Equipment for which they are designed.

4.1.3 Test Instruments

The Test Instruments required on-site in order to carry out the maintenance activities are listed in the technical manual pertinent to each unit. Please note that all the listed Test Instruments are of commercial type and may be substituted by equivalents available on the local market.

4.2 PREVENTIVE MAINTENANCE

This chapter deals with the suggested preventive maintenance operations to guarantee continued performance of the equipment. The preventive maintenance operations are grouped in a table according to their periodicity. The following paragraphs describe those operations which cannot be considered procedures but which have to be carried out for the correct operation of the Equipment. These operations are also listed in the preventive maintenance table.

4.2.1 General Instruction

All Equipment parts shall be examined to check for dust or dirt, overheating, loose screws and foreign bodies. Dust, for example, may cause current discharges or leakages.

1 Cabinets

Cabinets, through which the ventilation air flows, need to be internally cleaned from dust. Cleaning can be carried out using a vacuum cleaner for the accessible parts or a clean, dry cloth or bristle brush.

2 Air Filters

Cabinet air filters shall be disassembled and cleaned to eliminate the dust accumulated during Equipment operation. The cleaning intervals depend on the number of Equipment operational hours and on the amount of dust present in the room where the Equipment operates. However, generally filters should be cleaned on monthly basis. If the dust layer is thin, it can be removed using a pressurized water spray; then dried by means of compressed air. If the dust layer is hard, dip the filter in hot water for approximately 20 minutes. Then clean the filter by means of a pressurized water spray, dry using compressed air; when perfectly dry, reassemble inside the cabinet.

3 *Connections Cables*

Connection cables shall be periodically examined to ensure that breaks in the external insulating coating are not present to cause possible short-circuits. Cover the parts showing deterioration of the insulating coating. Coaxial cables shall be carefully examined since they can be easily damaged by crushing or sharp bends. Connectors shall be checked to ascertain that corrosion is not present on their metallic contacts. Cables showing damages must be protected and eventually replaced.

4 *Terminal Blocks*

Terminal blocks shall be examined to ascertain that there are no traces of dirt, loose wires or excess solder on the terminals, which could cause undue contacts with the adjacent terminals. Fixing screws or mounting brackets shall be tightened. Terminal boards shall be cleaned using a dry cloth or bristle brush.

5 *Mechanical Inspection*

According to the environmental conditions, periodically check and lubricate the following mechanical parts:

- hinges of front doors;
- hinges of rear doors.

4.2.2 Preventive maintenance Table

The preventive maintenance actions have been grouped according to periodicity; Tab. 4.1 gives the summary of periodical checks. The table is divided into four columns. The first column indicates the periodicity of the preventive maintenance. The second describes the function to be checked or the operation to be carried out. The third column contains applicable notes and/or references. The fourth column shows the time needed to carry out the maintenance procedure to allow planning of preventive maintenance for the whole Equipment.

Tab. 4.1 – Summary of periodic checks				
REF.	PERIODICITY	TYPE OF SERVICING	REFERENCE FOR THE EXECUTION	ESTIMATED EXECUTION TIME
2	Monthly	Cleaning of the air filters	Chapt. 4; para. 4.2.1 step 2, of this OPERATOR'S MANUAL	20 min.
3	Monthly	Checking of the voltage power supply of amplifier modules.	On CCU display (<i>HPA/Summary menu</i>). See relevant TECH. MAN.	1 min.
4	Monthly	Checking of the current absorption of amplifier modules.	On CCU display (<i>HPA/Summary menu</i>). See relevant TECH. MAN.	1 min.
5	Six-Monthly	Checking of the mains terminal blocks tightening	Chapt. 2; para.2.2.6 (Fig. 2.7), of this OPERATOR'S MANUAL	5 min.

4.3 CORRECTIVE MAINTENANCE

Causes which give rise to a corrective maintenance action can derive from:

- Out of tolerance conditions of standard levels, waveforms and timings, detected during preventive maintenance;
- Failure conditions shown either by displays and/or LEDs.
- Failure conditions detected by operative personnel.

Restoring the unit to operation in a short time also depends on the availability of spare parts and components.

4.3.1 Identification and replacement of “P.I.B.s” boards

When a P.I.B. is faulty *CCU* displays the number associated to this P.I.B.: the following Tab. 4.2 lists the number of P.I.B. boards (column 1), its arrangement within the transmitter cabinet (column 2), the reference on the associated circuit diagram (column 3) and the board part number (column 4).

Tab. 4.2 – P.I.B.s arrangement within TX cabinet			
PIB	arrangement	REFERENCE ON TX WIRING DIAGRAM	p/n.
1	left side wall of the cabinet (from the rear)	PIB SC6	4010002313
2		MEX II Multimode Exciter unit A	4050010610
3		MEX II Multimode Exciter unit B	4050010610
4	TX Water Cooling unit	NOT USED for air cooled TXs	
5	right side wall of the cabinet (from the rear)	PIB CORE PARALLEL I/O INTERFACE	4010000510
6	TX cabinet	only TX with HPA ≥ 6 SC14	4010002310

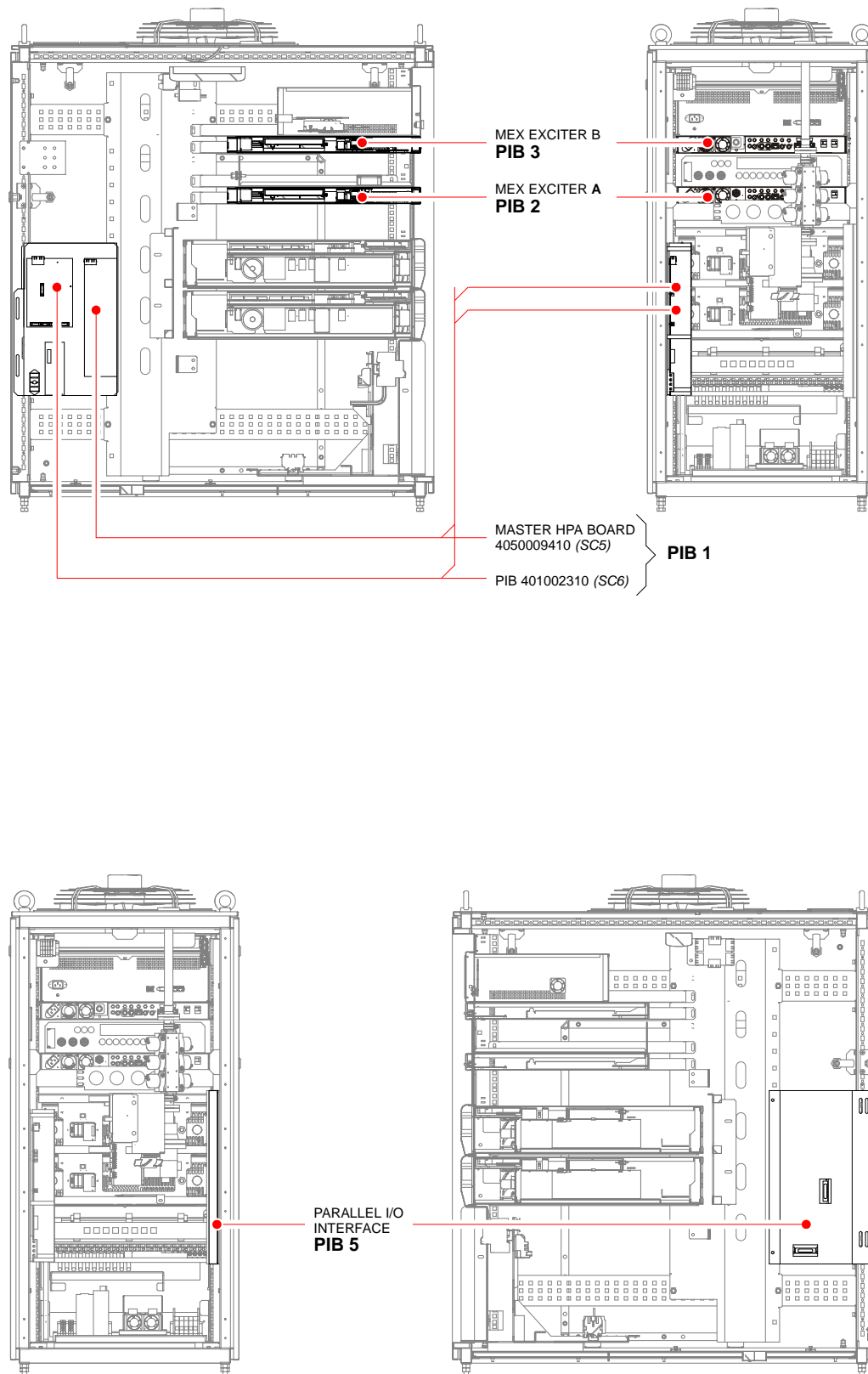


Fig. 4.1 – PIB boards arrangement

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APPENDICES

A ... SAFETY PRECAUTION

B ... "*ETHERNET INTERFACE*" INSTALLATION GUIDE

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SAFETY PRECAUTIONS

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 - 3.1 Handling
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- 4. ABSTRACT OF APPENDIX “E” OF CEI EN 60215 SAFETY RULES**
Guide to safety precautions which must be observed by the personnel operating with radio-transmitters

1 INTRODUCTION

1.1 Application notes

The following rules apply to radio-transmitters, included every auxiliary equipment requested for their functioning, working under the responsibility of trained personnel. Antennas system and their supplying lines are excluded.

1.2 Purpose

The content of this section provides information concerning safety precautions which must be observed by the operating personnel. Para. 4 provides in addition, an abstract of the “Appendix E of CEI EN 60215 Safety Rules”.

The information given throughout this section concerns the safety operations (protection against electric shock, burns, dangerous radiations, sundry risks) and the specifications on handling and disposal of beryllia devices.

These directions do not ensure necessarily the safety of not-trained personnel operating with the equipment when it is not working in normal conditions.

1.3 General

Itelco® equipments have been designed and manufactured taking into due consideration:

- personnel safety requirements as specified by IEC 215 Standard;
- Council recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300GHz) [1999/519/EC].

Depending upon the material to be highlighted, the following attention headings are used in the technical content.

WARNING!

An operating or maintenance procedure, practice, condition and statement which, if not strictly observed, could result in injury to or death personnel.

CAUTION!

An operating or maintenance procedure, practice, condition and statement which, if not strictly observed, could result in damage to or destruction of equipment or loss of mission effectiveness.

NOTE!

An essential operating or maintenance procedure, condition and statement which must be highlighted.

When a precaution is required which relates specifically to a part of the technical content, the information is given in the relevant part of the manual. WARNING and CAUTIONS precede applicable text.

2 SAFETY OPERATIONS

2.1 Introduction

The following are general safety precautions that are not related to any specific procedure and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUIT

Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustment, inside the equipment with the high voltage supply turned on.

Under certain conditions, dangerous potentials may exist when the power breaker is in the OFF position, also due to charges retained by capacitors. To avoid casualties, always remove power and discharge and ground a circuit before touching it.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person initiate servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

2.2 Electric shock

Factors affecting electric shock consequence are:

- amount of current flown thru human body;
- current path thru human body;
- contact duration.

The following table gives probable effects of electric shock described by MIL-STD-454C specification.

CURRENT (mA)		EFFECT ON HUMAN BODY
A.C. 50/60 HZ	D.C.	
0 to 1	0 to 4	SENSATION
1 to 4	4 to 15	SURPRISE
4 to 21	15 to 80	REFLECTED ACTION
21 to 40	80 to 160	MUSCLES INHIBITION
40 to 100	160 to 300	CHOCKING
> 100	> 300	FATAL

2.3 Rescue

In case of electric shock, shut off the high voltage at once and ground circuits. If the high voltage cannot be turned off without delay, free the victim from the contact with the live conductor as promptly as possible.

Avoid direct contact with either the live conductor or the victim's body. An axe with a dry wooden handle may be used to cut the high voltage wire. Use extreme caution to avoid the resulting electric flash.

2.4 Resuscitation

Personnel working with or near high voltage should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

2.5 Emergency First Aid instructions

WARNING!

VOLTAGES THAT ARE DANGEROUS TO LIFE ARE INVOLVED
IN THE OPERATION OF THIS ELECTRONIC EQUIPMENT.

OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE
ALL SAFETY REGULATION.

DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE
THE EQUIPMENT WITH THE VOLTAGES APPLIED.

DANGEROUS CONDITIONS MAY EXIST IN CIRCUITS WITH
POWER CONTROLS IN THE "OFF" POSITION DUE TO
CHARGES RETAINED BY CAPACITORS, ETC.

ALWAYS DISCHARGE AND GROUND CIRCUITS PRIOR TO
TOUCHING THEM TO AVOID PERSONAL INJURY OR LOSS
OF LIFE.

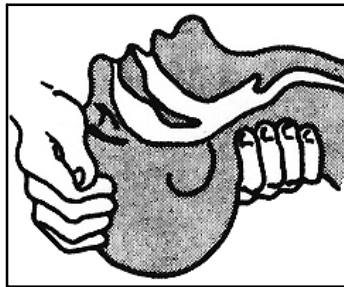
Personnel engaged in the installation, operation, or maintenance of this equipment or similar equipment are urged to become familiar with the following rules both in theory and practice. It is the duty of all operating personnel to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

2.5.1 Rescue breathing



1. Find out if the person is breathing.

You must find out if the person has stopped breathing. If you think he is not breathing, place him flat on his back. Put your ear close to his mouth and look at his chest. If he is breathing, you can see his chest move up and down. If you do not feel the air or see the chest move, he is not breathing.



2. If he is not, open the airway by tilting his head backward.

Lift up up his neck with one hand and push down on his forehead with the other. This opens the airway. Sometimes doing this will let the person breathe again by himself. If it does not, begin rescue breathing.



3. If he is still not breathing begin rescue breathing:

Keep his head tilted backward.
Pinch his nose shut.
Put your mouth tightly over his mouth.
Blow into his mouth once every five seconds.
Do Not Stop Rescue Breathing Until Help Comes.

LOOSEN CLOTHING KEEP WARM

Do this when the victim is breathing by himself or help is available. Keep him quiet as possible and from becoming chilled. Otherwise, treat him for shock.

2.5.2 Burns

SKIN REDDENED:

Apply ice cold water to burned area to prevent burn from going deeper into skin tissue.
Cover area with clean sheet or cloth to keep away air.
Consult a physician.

SKIN BLISTERED OR FLESH CHARRED:

Apply ice cold water to burned area to prevent burn from going deeper into skin tissue.
Cover area with clean sheet or cloth to keep away air. treat the victim for shock and take to hospital.

EXTENSIVE BURN-SKIN BROKEN:

Cover area with clean sheet or cloth to keep away air. Treat the victim for shock and take to hospital.

3 SPECIFICATION ON HANDLING AND DISPOSAL OF BERYLLIA DEVICES

3.1 Handling

Normally the components can be handled without risk, but there is a toxic hazard if beryllia dust from a damaged component is inhaled or implanted in the skin. It is therefore necessary to follow the indications described below:

- cover cuts and abrasions with dressing;
- wear disposable gloves;
- do not eat, drink, smoke, make up;
- wash hands and face after the contact with these damaged components;
- if beryllia penetrates under the skins through cuts or abrasions, the wound has to be cleaned and treated by a qualified medical personnel.

3.2 Disposal

The disposal procedure is normally laid down by Operating Authority and must be strictly adhered to. However, in the absence of such instructions the following points will be of assistance.

The disposal procedure is divided into two categories:

- Electrically faulty, but not mechanically damaged.

The faulty component should be placed in a polythene bag which is to be sealed and placed in a Beryllia scrapbox ⁽¹⁾.

- Mechanically damaged components.

Using disposable gloves and tweezers, all visible parts are to be placed in a polythene bag which is to be sealed and placed in a Beryllia scrapbox ⁽¹⁾.

Still wearing gloves, clean the area with a damp cloth then place the cloth and gloves into a polythene bag, seal the bag and place it in a Beryllia scrapbox.

The hands must be thoroughly washed after handling damaged components.

(1) Ideally the Beryllia scrapbox is a sealed metal container clearly marked with a warning.

4 ABSTRACT OF APPENDIX “E” OF CEI EN 60215 SAFETY RULES

E **Guide to safety precautions which must be observed by the personnel operating with radio-transmitters**

E.1 **INTRODUCTION**

For the safety of the staff working on radio-transmitters and associated equipment, a full evaluation of the several dangers which may occur is necessary.

The considered factors are:

- *the special precautions which have to be taken in presence of voltages over 1000V of peak;*
- *the special precautions which have to be taken when high radiofrequency voltages, often higher than the previous ones, are being used;*
- *the effects of electromagnetic fields, present by the antennas and their conductors, which may present dangers of fire for the surroundings, of electric shock and of burns for the staff;*
- *dangers of explosion in presence of inflammable gas;*
- *dangers of falls of the staff working on structures or buildings, which can get worse because of shakes caused by the accidental contact with conductors under voltage.*

E.4 **A RADIO-TRANSMITTER’S FUNCTIONING**

E.4.1 *The equipment has to be kept in such a way as to fulfil the safety rules.*

E.4.2 *A person, competent and certified by the responsible units, has to make sure, at regular intervals, of the good functioning of the equipment and of the protection and safety devices.*

Functioning tests have to be carried out on door block devices, on mechanical blocks, on line- and earth breakers, on parallel resistors, and on protection devices against overvoltages and overcurrents.

The above said tests have to be carried out as well when a protection or safety device works after a failure has occurred.

The safety devices have not either to be altered or disconnected, except for the substitution, nor to be modified without approval, in any case, of the responsible units.

E.4.3 *All the covers assuring protection against accidental contacts with parts under dangerous voltage must be kept in their position during the ordinary service. They can be taken off, for maintenance or repair operations, only under the responsibility of the charged staff.*

E.4.4 *All the covers and metal casings of the electric and electronic equipment have to be grounded with effective methods, and particular attention must be paid to the maintenance of these connections to the protection ground.*

E.4.5 *The rooms occupied by parts of equipment having open structure are considered as fences.*

E.4.6 *If a radio transmitter is put under voltage, the trained person in charge of it has to personally verify that: no other person is working on the transmitter or on the associated antenna; that each work carried out is sufficiently completed in order to allow the transmission; that no tool, test equipment or portable lamp remains inside or on the transmitter; and that all test or auxiliary equipment used for the tests has been disconnected.*

E.6 PROCEDURE TO VERIFY ABSENCE OF VOLTAGE

After the equipment has been sectioned, the absence of voltage has to be verified on the work place. This can be carried out by using voltage indicators, measuring instruments, neon lamps indicating radiofrequency voltages or any other convenient means.

E.7 WORK ON CIRCUITS UNDER VOLTAGE

Work on circuits under voltage with peak voltages over 72V, or in proximity of such circuits, has to be reduced to the lowest. Such a work can be performed only if the following conditions are fulfilled.

- *The work has to be carried out by an authorized person, qualified in electrical engineering, supervised at least by another person who has been trained and who can immediately interrupt the voltage, and furthermore who has been trained to administer first aid through artificial respiration and heart massage.*
- *No risk of ionizing or non-ionizing radiation has to exist.*
- *The work has to be carried out in such a way as not to run the risk of formation of arcs or currents through the body.*
- *For the safe execution of the work, adequate equipment, devices and test tools have to be employed.*
- *Adequate safety measures for the indication of the dangerous areas have to be taken.*
- *The work has to be carried out only for urgent reasons, e.g. if it is not possible to carry out the work or locate a failure in absence of voltage.*

NOTE In some Countries stricter rules and/or regulations may be applied.

E.8 OTHER DANGERS

E.8.1 DANGERS OF RADIOFREQUENCY RADIATIONS

- a) *The utmost power levels in the field of microwaves and/or lower radio frequencies electric or magnetic field, which the staff can be exposed to, have not to exceed the limits foreseen by the laws of the considered Country. For those Countries where a national law for the levels of non-ionizing radiation does not still exist, directions from the IEC 657 and World Health Organization Publication can be obtained: "Hygienic rules of the surrounding environment 16" (1981).*

NOTE Limits given are applied to the radio transmitter, except for its antenna, in a frequency range from 30 MHz to 30 GHz. Under 30 MHz, higher limits can be appropriate.

- b) *During the transmission period the staff has never to look directly at a radiator, spot-light, waveguide or any other irradiating element which concentrates energy in a narrow, intense beam.*



“ETHERNET INTERFACE” **USER’S GUIDE**

ETHERNET INTERFACE USER'S GUIDE

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ETHERNET INTERFACE USER'S GUIDE

1.1 INTRODUCTION

The Itelco Ethernet Interface has inside three Internet Protocol Suite protocols:

- HTTP
- Telnet
- SNMP

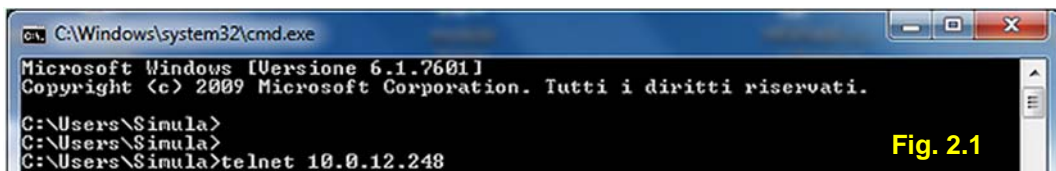
1.2 TELNET PROTOCOL

The manufacturer has developed Telnet server as a tools for changing basic parameters remotely. For connection to Telnet server a Telnet client is needed.

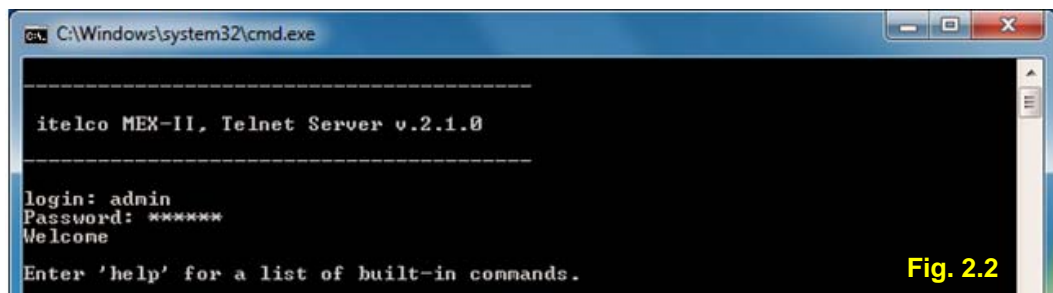
1.3 OPENING A TELNET SESSION

If you are connecting for the first time, these are the steps to follow:

1. Open the command prompt window, type "telnet <IP>" (in Fig. 2.1, the IP address is 10.0.12.248) and then push 'enter'. If the server does not answer, you have to wait a few seconds and try again. The hardware that handles the Ethernet protocol needs a while to initialize itself. If after some attempts the connection is impossible, you can reset the system.

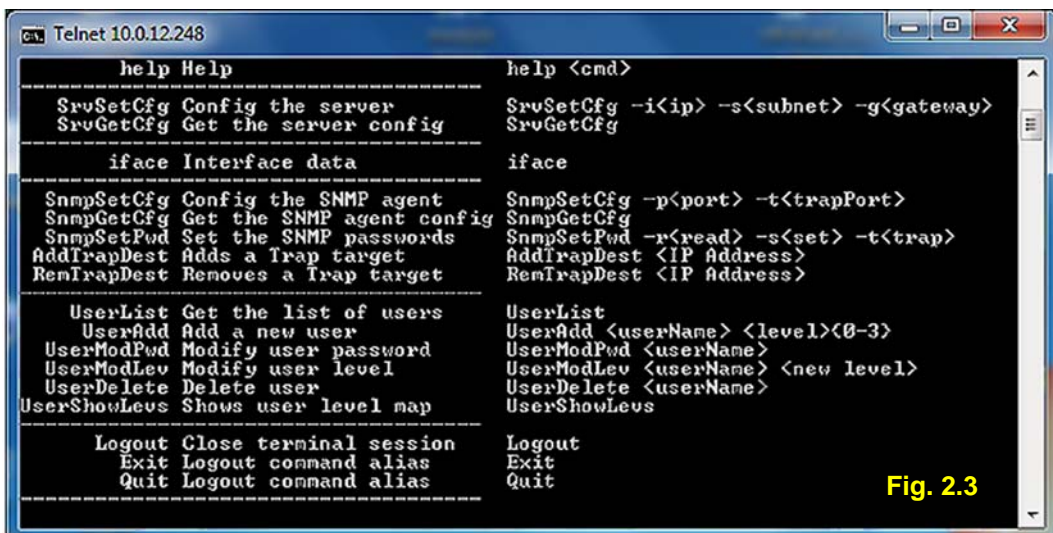


2. For logging in, type "admin" and "system" as password. Now you are logged in (Fig. 2.2).



1.4 HELP

Typing "help", the server will give a view of all command, of the syntax and a brief description of each command (Fig. 2.3):



1.5 COMMANDS

The server parameters and privilege tables are stored in a no-volatile memory. The commands make it possible to set the basic server parameters. These are:

- IP address
- Subnet
- Gateway

1.5.1 Changing the server IP address, Subnet and Gateway

When the connection is established, using the default parameters you can change the server ip address, subnet and gateway, with the following commands:

- "SrvSetCfg -i<new IP>"
↑ *type the new address here*
- "SrvSetCfg -s<new subnet>"
↑ *type the new subnet here*
- "SrvSetCfg -g<new gateway>"
↑ *type the new gateway here*

You can change several parameters simultaneously typing the relevant commands, i.e:

- "SrvSetCfg -i<new IP>" -s<new subnet>"

Take note the new server IP address, because this will be the new IP address that you will have to use for server connections.

Example: (Fig. 2.4) We want change the server ip address. The new ip address that we want set is 10.0.12.249.



NOTE!

Once the IP address, subnet and gateway have been changed, the telnet session is terminated and you have to open a new one with the new IP address.

1.5.2 Getting the server configuration

Typing "SrvGetCfg", you get information on server configuration (Fig. 2.5).

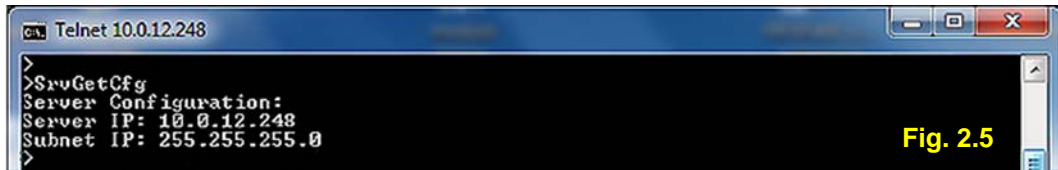


Fig. 2.5

1.5.3 About server parameters commands

The privilege management is completely achieved for all protocols (HTTP, SNMP, Telnet) through two tables.

The first one contains all users and the relevant passwords of the system.

Each user has only one level (from 0 to 3) showing the privilege of the user in the system management.

"**Level 3**" user (*System Administrator*) can access any possible operation on the equipment, that is:

- *Telnet* session for changing or updating the transmitter parameters and the users parameters.
- *FTP* for firmware upgrading.
- *HTTP* page (R/W) for reading information and sending commands to the equipment (supervisory system).
- *SNMP*. The SNMP access is managed with the community table. Then this table will have a description.

"**Level 2**" user (*Supervisor R/W*) can access:

- *FTP* for firmware upgrading.
- *HTTP* page (R/W) for reading information and sending commands to the equipment (supervisory system).
- *SNMP*. The SNMP access is managed with the community table. Then this table will have a description.

"**Level 1**" user (*Device Administrator*) can access:

- *HTTP* page (R/W) for reading information and sending commands to the equipment (supervisory system).
- *SNMP*. The SNMP access is managed with the community table. Then this table will have a description.

"**Level 0**" user (*Read Only*) can access:

- *HTTP* page (R) for reading information about the equipment (supervisory system).
- *SNMP*. The SNMP access is managed with the community table. Then this table will have a description.

1.5.4 Getting the interface data

Typing "iface", you get information on interface data (Fig. 2.6).

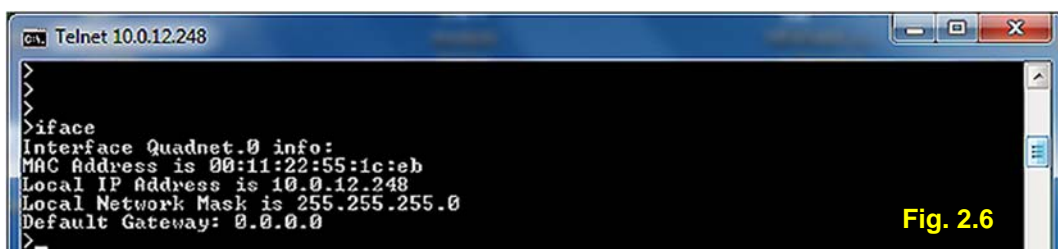
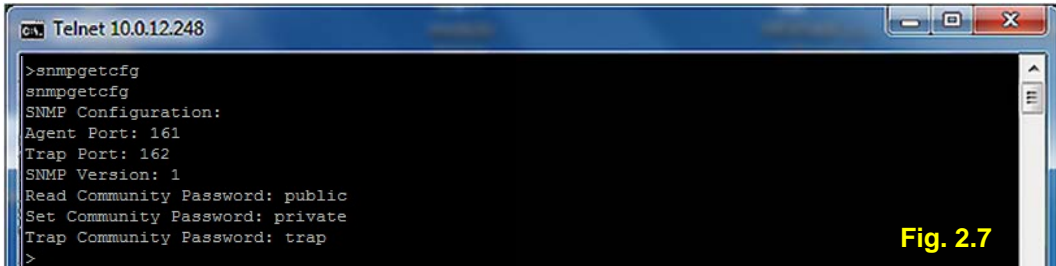


Fig. 2.6

1.5.5 Snmp agent

Typing "SnmpGetCfg", you get information on snmp agent configuration (Fig. 2.7).



```

>snmpgetcfg
snmpgetcfg
SNMP Configuration:
Agent Port: 161
Trap Port: 162
SNMP Version: 1
Read Community Password: public
Set Community Password: private
Trap Community Password: trap
>
  
```

Fig. 2.7

1.5.6 The SNMP community management

The SNMP protocol has a privilege management that we can consider disconnected to the management for HTTP and Telnet. In particular the management is made through the community table. There are 3 community and the related passwords that to default are:

Community	Password	Related level	Description
Read only	public	0	Read Only
Read/Write	private	1	Read and Write commands
Trap Receiver	trap	2	Receive Alarms

Changing the password requires to be a user of level 3 and to have the possibility to access to Telnet and to use the command:

- "SnmpSetPwd -r<read> -s<set> -t<trap>"

↑

*type the new pwd of read
only community here*

↑

*type the new pwd of read/write
community here*

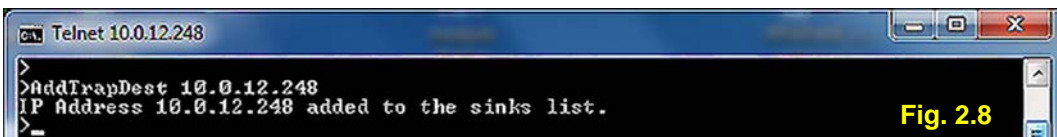
↑

*type the new pwd of trap recei-
ver community here*

1.5.7 Adding/Removing a trap destination

A *trap destination* is an IP address (max 5) to which the system sends notifications of events occurred.

Typing "AddTrapDest", allows you adding a trap destination (Fig. 2.8).

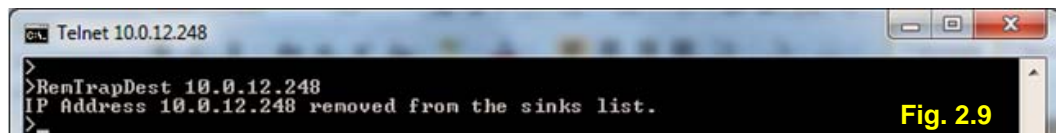


```

>AddTrapDest 10.0.12.248
IP Address 10.0.12.248 added to the sinks list.
>
  
```

Fig. 2.8

Typing "RemTrapDest", allows you removing a trap destination (Fig. 2.9).



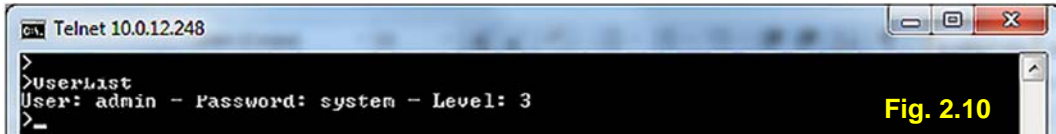
```

>RemTrapDest 10.0.12.248
IP Address 10.0.12.248 removed from the sinks list.
>
  
```

Fig. 2.9

1.5.8 User List

Typing "UserList", you have the list of the users (Fig. 2.10).



```

C:\> Telnet 10.0.12.248
>
>UserList
User: admin - Password: system - Level: 3
>

```

Fig. 2.10

1.5.9 Adding/Deleting a User

In order to insert a new user type the command "UserAdd" (Fig. 2.11).

The user name or the password is a word up to 10 characters and not shorter of 4, consisting of numbers or letters. The level is a number in the range (0 – 3).

"UserAdd <userName> <level><0-3>"

↑ type new user here
↑ type the level here

If the user name you want insert already exists, the server will send you an error message.

In the example of Fig. 2.11, the new user added is "operator" with level "3".



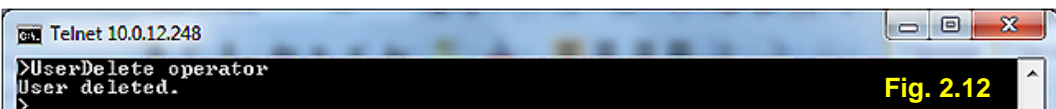
```

C:\> Telnet 10.0.12.249
>
>useradd operator level3
Insert password:
*****
User added.
>

```

Fig. 2.11

In order to delete a user type the command "UserDelete" (Fig. 2.12). In the example here below the user "operator" has been deleted.



```

C:\> Telnet 10.0.12.248
>
>UserDelete operator
User deleted.
>

```

Fig. 2.12

Note that a user of level 3 can erase or update any user.

Default user of the unit is a level 3 user with user name "admin" and password "system". Adding a new user of level 3, overwrites the "admin" user.



NOTE!

Take note of the password of user "admin".

Erasing the last user of level 3, restores "admin" user with its pwd:

- "system" if it has not been changed;
- last pwd set if "system" has been changed.

WARNING!

The passwords cannot be recovered! If the only administrator user forgets its password, it is no more possible to open a telnet session.

1.5.10 Modifying the User Password and/or level

In order to modify the user, type the command (Fig. 2.13):

"UserModPwd <userName>"
↑ type the user name you want to modify the pwd

You have to type the old password and then the new one.

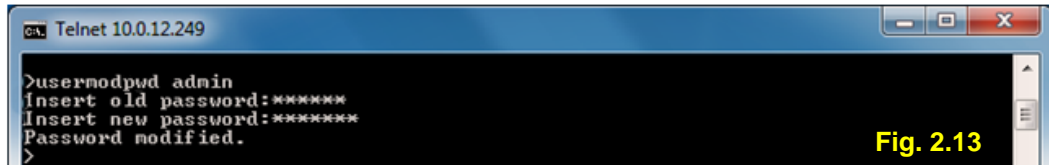


Fig. 2.13

The same operation leads to the modification of the user level (Fig. 2.14). Now the command is:

"UserModLev <userName> <new level>"
↑ ↑
type user name here type the new level here



Fig. 2.14

1.5.11 User Level Map (Level of security offered to protect against unauthorised control access to remote transmitter when connected over the corporate LAN/WAN system)

Typing "UsersShowLevs", you get a map of the users with the associated levels (Fig. 2.15). For further details refer to para. 1.5.3 "About server parameters commands".



Fig. 2.15

The application related to the Ethernet Interface of the Tx and N+1 Changeover CCU, the Exciters and the IEC devices implements control over IP.

No encryption is provided (no SSL ecc.).

The application uses a 4 level privileges defined by a user-id and a password :

"Level 3" user (System Administrator) can access any possible operation on the equipment, that is:

- _ Telnet session for changing or updating the transmitter parameters and the users privileges parameters.
- _ FTP for firmware upgrading.
- _ HTTP page (R/W) for reading information and sending commands to the equipment (supervisory system).
- _ SNMP. The SNMP access is managed with the community table.

"Level 2" user (Supervisor) R/W can access:

- _ FTP for firmware upgrading.
- _ HTTP page (R/W) for reading information and sending commands to the equipment (supervisory system).
- _ SNMP. The SNMP access is managed with the community table.

“**Level 1**” user (Device Administrator) can access:

- _ HTTP page (R/W) for reading information and sending commands to the equipment (supervisory system).
- _ SNMP. The SNMP access is managed with the community table.

“**Level 0**” user (Read Only) can access:

- _ HTTP page (R) for reading information about the equipment (supervisory system).
- _ SNMP. The SNMP access is managed with the community table.

The SNMP Agent offers protection by the use of one community for Read–Only GET queries and one community for the Read–Write SET commands.

Only the System Administrator can set and change the community table.

1.5.12 Closing terminal session

Typing “Logout”, the connection is closed. The system will be reset and will be ready (after few seconds) to accept a new connection.



NOTE!

If you do not press any key for 120 seconds, the session is terminated due to timeout.

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WIRING DIAGRAMS

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