



Cte broadcast



TX 1000/SR PLUS 1 KW FM TRANSMITTER

Model	Option		
	stereo	remote controll	head family
TX 1000/SR PLUS	yes	yes	yes
TX 1000/S PLUS	yes	no	no
TX 1000/MR PLUS	no	yes	no
TX 1000/M PLUS	no	no	no

SERVICE AND OPERATION MANUAL

TX 1000 PLUS is the generic name used in this handbook for identify all the variant of the TX 1000/SR PLUS.

Issued: September 2003 -Version 1.3

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CODE 60...

TX 1000 PLUS 1000 W FM EXCITER

SERVICE AND OPERATION MANUAL

1 GENERAL INFORMATION

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1.1 SAFETY SUGGESTIONS

Regardless of how well electrical equipment is designed, personnel can be exposed to **dangerous electrical shock** when protective covers are removed for maintenance or other activities. Therefore, it is incumbent on the user to see that all safety regulations are consistently observed and that each individual assigned to the equipment has a clear understanding of the first aid related to electrical shocks. (see next pages)

In addition these safety practices must be followed:

- Do not attempt to adjust unprotected circuit controls or to dress leads with power on.
- Always avoid placing parts of the body in series between ground and circuit points.
- To avoid burns, do not touch heavily loaded or overheated components without precautions.
- Remember that some semiconductor cases and solid-state circuits carry high voltages.
- Do not assume that all danger of electrical shock is removed when the power is off. Charged capacitors can retain dangerous voltages for a long time after power is turned off. These capacitors should be discharged through a suitable resistor before any circuit points are touched.
- Don't take chances. Be fully trained. CTE International equipment should be operated and maintained by fully qualified personnel.
- Do not service alone and do not perform internal adjustments of this unit unless another person capable of rendering first aid and resuscitation is present.
- Some components used in the construction of this equipment contain Beryllium Oxide (BeO). This substance is harmless as it is, but becomes highly dangerous if it is ground to powder. Special procedures of disposal must be observed in case of failure of these devices.

NOTE: This section is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this electronic equipment or others. CTE International shall not be responsible for injury or damage resulted from improper procedures or from using it by improperly trained or inexperienced personnel.

1.2 GENERAL SAFETY RECOMMENDATIONS

When connecting the equipment to the power , please follow these important recommendations:

- This product is intended to operate from a power source that will not apply more than 10% of the voltage specified on the rear panel between the supply conductors or between either supply conductor and ground. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.
- This equipment is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired socket before connecting to the product input or output terminals.
- Upon loss of the protective-ground connection, all accessible conductive parts (including parts that may appear to be insulating) can render an electric shock.
- To avoid fire hazard, use only the fuse of correct type, voltage rating, and current rating. Refer fuse replacement to qualified service personnel.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

1.3 GOOD PRACTICES

In maintaining the equipment covered in this manual, please keep in mind the following, standard good practices:

- When connecting any instrument (wattmeter, spectrum analyzer, etc.) to a high frequency output, use the appropriate attenuator or dummy load to protect the final amplifiers and the instrument input.
- When inserting or removing printed circuit boards (PCBs), cable connectors, or fuses, always turn off power to the affected portion of the equipment. After power is removed, allow sufficient time for the power supplies to bleed down before reinserting PCBs.
- When troubleshooting, remember that FETS and other metal-oxide semiconductor (MOS) devices may appear defective because of leakage between traces or component leads on the printed circuit board. Clean the printed circuit board and recheck the MOS device before assuming it is defective.
- When replacing MOS devices, follow standard practices to avoid damage caused by static charges and soldering.
- When removing components from PCBs (particularly ICs), use care to avoid damaging PCB traces.

1.4 FIRST AID IN CASE OF ELECTRICAL SHOCK

If someone seems unable to free himself while receiving an electric shock, **turn power off** before rendering aid. A muscular spasm or unconsciousness can make a victim unable to free himself from the electrical power.

**DO NOT TOUCH VICTIM OR HIS CLOTHING BEFORE
POWER IS DISCONNECTED OR YOU CAN ALSO
BECOME A SHOCK VICTIM**

If power cannot be turned off immediately, **very carefully** loop a length of dry non-conducting material (such as a rope, insulating material, or clothing) around the victim and pull him free of the power. Carefully avoid touching him or his clothing until free of power.

1.4.1 EMERGENCY RESUSCITATION TECHNIQUE



Step 1

Check the victim for unresponsiveness. If there is no response, **immediately call for medical assistance**, and then return to the person.



Step 2

Position the person flat on their back. Kneel by their side and place one hand on the forehead and the other under the chin. Tilt the head back and lift the chin until teeth almost touch. Look and listen for breathing.



Step 3

If not breathing normally, pinch the nose and cover the mouth with yours. Give two full breaths. The person's chest will rise if you are giving enough air.

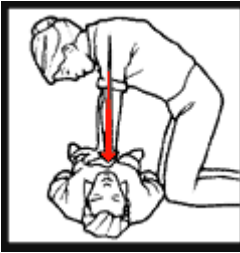


Step 4

Put the fingertips of your hand on the Adam's apple, slide them into the groove next to the windpipe. Feel for a pulse. If you can not feel a pulse or are unsure, move on to the next step.

**Step 5**

Position your hands in the center of the chest between the nipples. Place one hand on top of the other.

**Step 6**

Push down firmly two inches. Push on chest 15 times.

CONTINUE WITH TWO BREATHS AND 15 PUMPS UNTIL HELP ARRIVES.

1.4.2 TREATMENT FOR BURNS

- Continue treat victim for electrical shock.
- Check for points of entry and exit of current.
- Cover burned surface with a clean dressing.
- Remove all clothing from the injured area, but cut around any clothing that adheres to the skin and leave it in place. Keep the patient covered, except the injured part, since there is a tendency to chill.
- Splint all fractures. (Violent muscle contractions caused by the electricity may result in fractures.)
- Never permit burned surfaces to be in contact with each other, such as: areas between the fingers or toes, the ears and the side of the head, the undersurface of the arm and the chest wall, the folds of the groin, and similar places..
- Transport to a medical facility

1.5 WARNING INSTRUCTION

1.5.1 INTRODUCTION

The transmitter or the equipment that this manual is referred to is developed, produced and tested following the relevant safety standards EN 602125. The following safety instruction advice the operator about the dangerous operation concerning the equipment. The user must be read the safety instruction contained in the manual and they must follow them. As mentioned on the safety rules qualified technical staff only can operate this equipment. CTE declines any responsibility for damages caused by an improper use or improper setting up performed by inexperienced staff, not qualified or operating with instruments or tools not in compliance with safety set of rules.

The staff in charge, besides being technically qualified, must be trained in first aid in case of emergency or accident (reanimation, heart massage, mouth to mouth respiration, etc.).

Before going on with the operations to be performed, it is necessary to know the position of the general electric switch and the one of the extinguishers, which have to be used very quickly if necessary.

1.5.2 CHECKING OF SAFETY CONDITIONS

The following connection and verify must be observed to guarantee the safety for the personnel.

- Correct connection with the antenna cable
- Correct connection with a mains line cable
- Correct connection with a ground cable (EARTH CONNECTION)
- Verify that the ambient where the equipments is installed is in compliance with the specification declared by the manufacturer : altitude, humidity, temperature.
-

1.5.3 AC/DC LINE WARNING


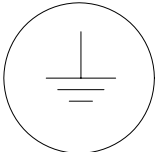

This equipment is working with dangerous high voltage and current. Any voltage present inside this equipment can be potentially dangerous for personnel. The technical staff designed for the service and repair operation must be qualified and they must take the appropriate safety measures stated on safety rules.

1.5.4 SERVICE and OPERATIONAL WARNING

The technical staff in charge of the service operations inside the equipment with any cover removed must check that the mains line is disconnected. After the service operation is completed the cover must be correctly mounted before the connection with the mains line. The high voltage is present on the mains stage of the equipments also when the mains switch is in OFF positions and the mains line cable is connected. If it is really necessary and after authorization of CTE very qualified technical staff only can work with on live parts. In this special case special safety precautions must be taken. CTE declines any responsibility if any safety rule is not respected. The replacement of the accessible fuse must be made with the transmitters turned off and using a fuse with the identical characteristics only as specified by the manufacturer.

1.5.5 WARNING SYMBOLS

The following symbols are used on this equipment to advise the user about the most important dangerous parts.

	DANGER SHOCK HAZARD	
	PE TERMINAL	
	<p>WARNING ! TOXIC HAZARD THESE DEVICES CONTAIN BERYLLIUM OXIDE OBSERVE SAFETY INSTRUCTIONS !</p>	<p>Certain devices (for example the RF final circuits MOSFETS) contain Beryllium Oxide BeO; these components must not be broken, crashed or heated. This oxide passes through the common systems of filtering, including the respiratory apparatus. The prolonged inhalation at high degrees causes poisoning with respiratory apparatus paralysis, until death.</p>

TX 1000 PLUS 1000 W FM EXCITER

SERVICE AND OPERATION MANUAL

2 FEATURES & OPERATIONS

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2.1 INTRODUCTION

TX 1000 PLUS is a modern FM broadcasting transmitter which produces an output radio signal with high characteristics of quality.

The TX 1000 PLUS is complete FM Transmitter developed connect the FM Mono, MPX, Stereo Exciter TX 25 PLUS with the VL 1000 PLUS in the same mechanical.

All printed circuits are to surface mounting technology component assembling. The transmitter, of simple and rugged construction, is able to satisfy the requests of all those end-users looking for top-quality equipment at reasonable prices.

2.2 PURPOSE

This manual contains information and reference documentation on installation, operation and maintenance of the TX 1000 PLUS transmitter.

- Weighs only 42 Kg, for easy moving and maintenance.
- Better operation temperature of the equipment, thanks to the air filter placed on the front panel and to the optional air convey to be placed in the rear part of unit.
- Impressive number of utilities, controls and data, with local or remote record facility.
- High quality/price ratio.

2.3 TECHNICAL SPECIFICATIONS

2.3.1 ENVIRONMENTAL

Operating frequency range	FM: 87,5 to 107,95 MHz (10 Khz steps)
Cooling	2 blower 12 V 12x12 cm Forced air cooling
Operating temperature	From -5°C to +45 °C
Storage temperature	From -10°C to +60 °C
Guaranteed Performance Temperature	From 0°C to +45°C
Maximum relative humidity	90%, non condensing
Main supply	230 Volt \pm 15% Single Phase 50 – 60 Hz
Dimensions (max.)	(5 Unit) 220 (H) x 448 (W) x 600 (D) mm
Weight	42 kg.
Max Operating Altitude	2000 mt. a.s.l.

2.3.2 MONO OPERATION

Audio Response	\pm 0,1 dB (From 40 Hz to 15 kHz)
THD 40 Hz to 15 kHz	< 0,1%
19 KHz Suppression	> 46 dB

2.3.3 STEREO PARAMETERS

Audio Filter Attenuation	> 50 dB @ 19 kHz
Crosstalk Attenuation	> 45 dB (From 40 Hz to 15 kHz)
Spurious Product	> 55 dB (> 53 KHz Attenuations)
38 KHz Suppression	> 50 dB
THD on Encoded Channels	< 0,1 % (From 40 Hz to 15 kHz)
Audio Response	\pm 0,2 (From 40Hz to 15 kHz)
Sub Carrier Generation	Internal Crystal
Pilot Frequency	19KHz \pm 1Hz

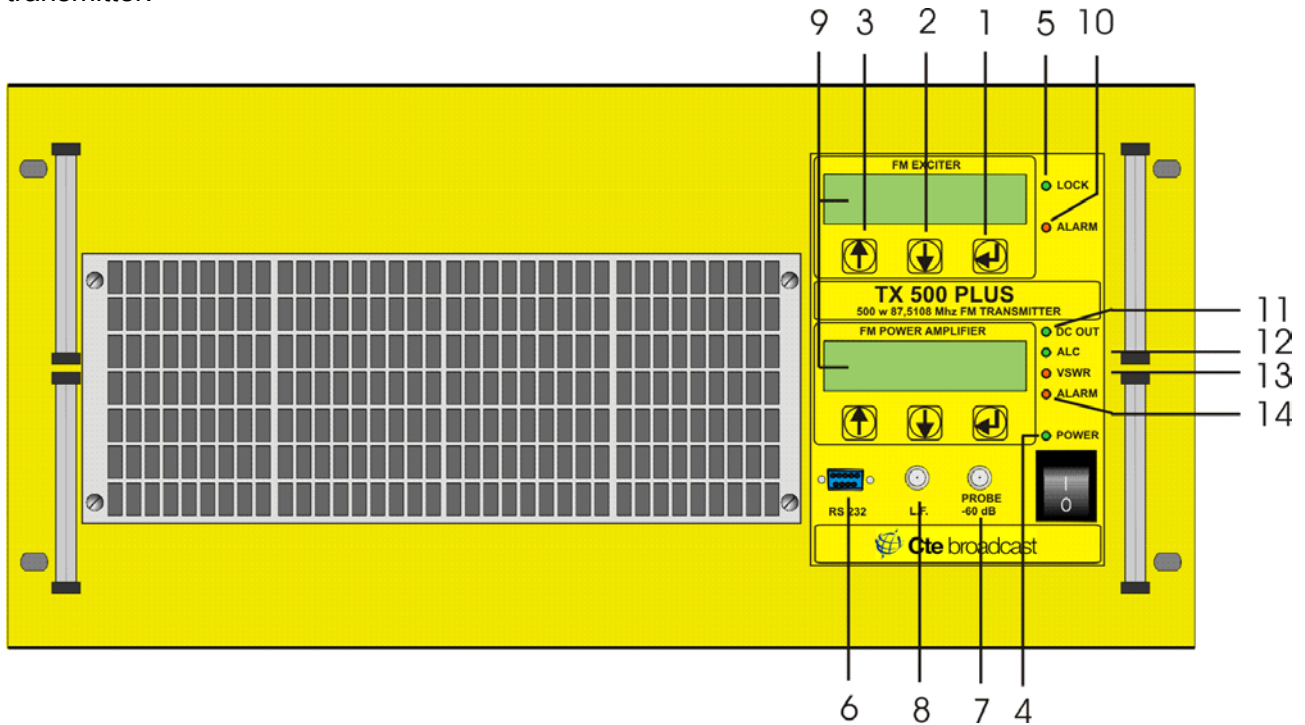
2.3.4 RF CHARACTERISTIC

RF Power Output	1000 W
RF Output Impedance	50ohm, Unbalanced
VSWR	less than1,5:1
RF Output connector	7/16 Female
Frequency Control	Synthesiser/ Micro
Off Lock Attenuation	> 60dBc
Type of Modulation	F3E/F8E Direct FM / Carrier Frequency
Frequency Deviation	± 75 KHz=100%
Stability of Frequency Deviation	$\pm 2,5\%$ over 6 months
Variation of Sensitivity for 75KHz Deviation	$\pm 3\%$ (From 87,5 to 107,95 MHz)
Reference	TCXO 12,8 MHz
Variation of Centre Frequency	± 300 Hz/ 3months
RF Harmonics	< -75dBc
RF Spurious	<-90 dBc
Pre-Emphasis	Flat / 50 / 75uS
AM noise	> 65 dB weighted. Ref to 100% AM
Power Meter accuracy	5%

2.4 LOCATION MAIN PARTS AND CONNECTORS

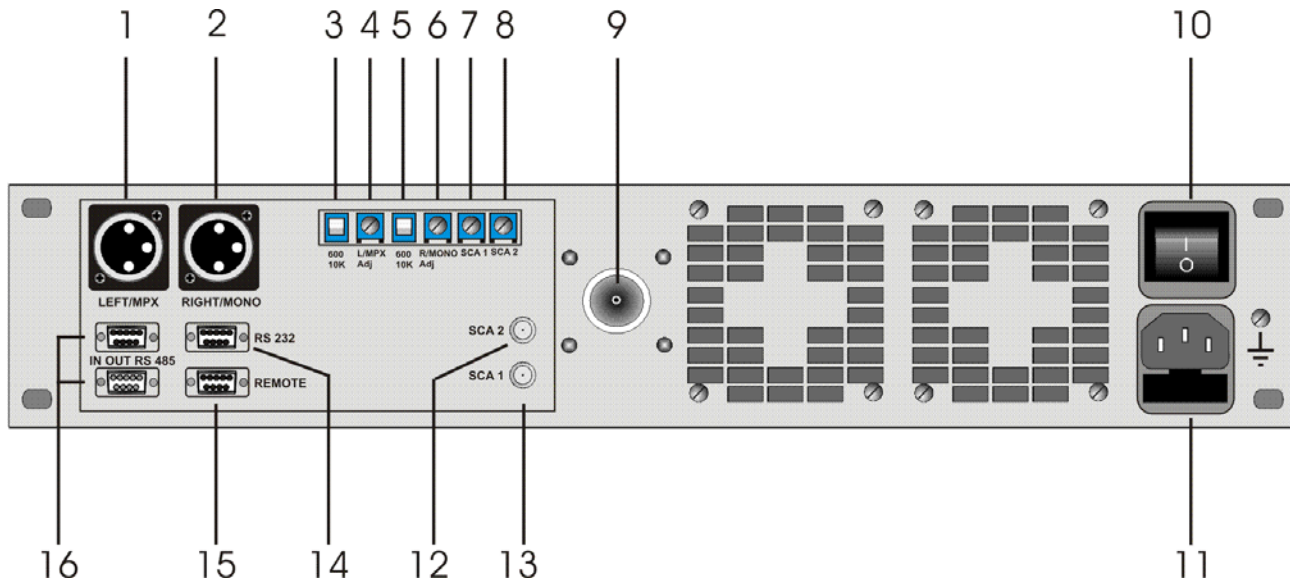
2.4.1 FRONT VIEW

Please make reference to the following pictures in order to locate the main parts of the FM transmitter.



Number	Description
1	SWITCH ENTER (for the drive and for the amplifier)
2	SWITCH DOWN (for the drive and for the amplifier)
3	SWITCH UP (for the drive and for the amplifier)
4	LED MAINS POWER indicates that the AC mains power is available
5	LED PLL LOCKED
6	RS232 PC CONNECTION The RS232-type connector is an auxiliary RS232 front connection.
7	RF FREQUENCY MONITOR The connector marked with R.F. Probe is a – 40dB output coming from the RF filter unit suitable for linear RF measurements in the 87,5 to 107.95 MHz frequency range.
8	BASE BAND FREQUENCY MONITOR L.F. Probe
9	LCD DISPLAY Control panel – It is composed by an alpha LCD display. The LCD display normally shows the amplifier's status and another parameter (e.g. power, time, date etc.). The combination between the keypad and the LCD makes easy to provide settings, check measurements etc.
10	LED ALARM Indicates that an alarm has been occurred on the TX 25 PLUS
11	DCOUT shows the availability of the power supply output voltage
12	ALC when glowing, shows that the ALC (Automatic Level Control) is engaged, so the output RF power can be kept constant
13	VSWR glows when the VSWR is excessive
14	LED ALARM Indicates that an alarm has been occurred on the VL 1000 PLUS
	REMOTE REMOVABLE AIR FILTER
	AC Mains power switch. Allows to switch on/off the whole Transmitter

2.4.2 REAR VIEW EXCITER


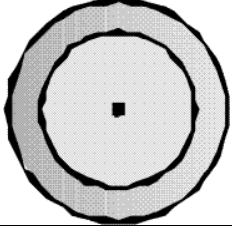
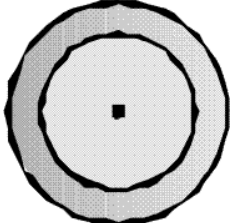


Number	Description
1	LEFT & MPX INPUT Left- MPX external input.
2	RIGHT & MONO INPUT Right-Mono external input.
3	Left-MPX input impedance switch 600 ohm –10Kohm .
4	Right-Mono input impedance switch 600 ohm –10Kohm.
5	Left- MPX level adjustment.
6	Right-Mono level adjustment.
7	RDS AND SCA INPUT SCA1 sub-carrier input level adjustment.
8	RDS AND SCA INPUT SCA2 sub-carrier input level adjustment.
9	RF OUTPUT RF output connector (N-female).
10	MAINS SWITCH AC Mains power switch. Allows the whole amplifier to be switched of or off.
11	INPUT MAINS PLUS FUSE AC power input plug IEC type 90-265V/50-60Hz.
12	SCA2 input sub-carrier.
13	SCA1 input sub-carrier
14	RS 232 VL1000PLUS CONNECTION RS232 DB9 female(only GSM).
15	Remote control DB9 Female.
16	RS 485 INPUT OUTPUT RS 486 In/Out DB9 Male Female

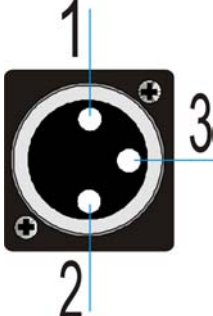



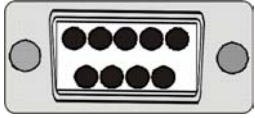
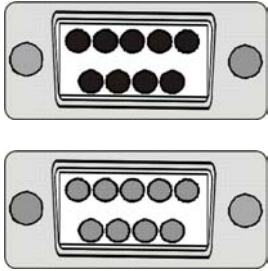
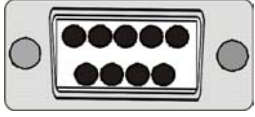
2.4.3 DESCRIPTION OF CONNECTOR AND SETTING

A total of 11 connectors are available in the FM transmitter. Three of them are located in the front panel and the other 8 are located in the rear panel.

2.4.3.1 Front panel connections

PICTURE	ITEM	DESCRIPTION
	RS 232	The RS232 -type connector (6) is an auxiliary RS232.
	L.F.	The connector marked with L.F. (8) is a low frequency output coming from L.F. AGC output.
	PROBE – 60 dB	The connector marked with RF probe (7) is a –40 dB output coming from the RF Filter Unit suitable for linear RF measurements in the 87,5 to 107.95 MHz frequency range.

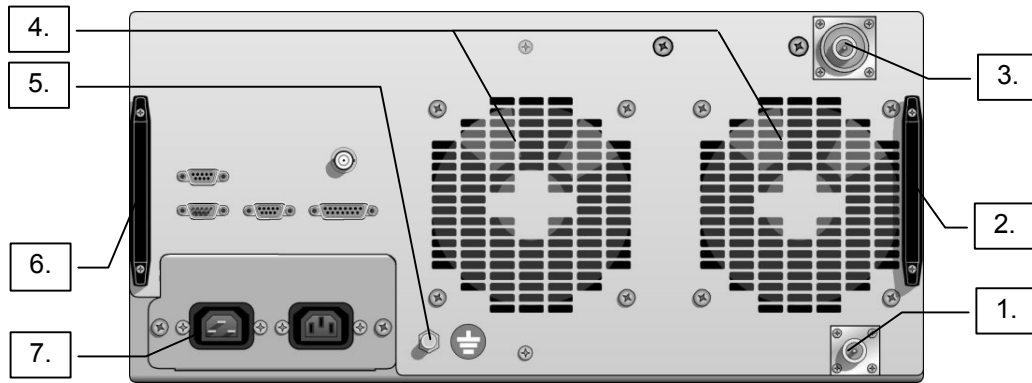
2.4.3.2 Rear panel connections

PICTURE	ITEM	DESCRIPTION
	LEFT-MPX RIGHT-MONO	Pin 1 connected to Gnd , Pin 2 connected to +input , Pin 3 connected to -input . Input balanced pins 3-2 . Input unbalanced pins 3/1-2 to Gnd.
	SWITCH IMPEDANCE AUDIO 1 AUDIO2	The two switch indicated on the picture allow the setting of the input low frequency impedance . Switch ON =600 ohm Switch Off = 10Kohm
	LEFT-MPX Adjustment RIGHT-MONO Adjustment	The two trimmer indicated on the picture allow the setting level of the input low frequency sensitivity. They are working only if the function "-6/+12dBm" is selected.
	SCA 1, SCA 2 Adjustment	By means the above trimmer is possible to set the two sub carrier from 10% up to 90% of the nominal value
	REMOTE	The above connector allows the connection with a GSM module for SMS sending and remote control features.
	RS 485 IN OUT	The twin (male and female) RS485-type connectors are designed for the eventual parallel connection of more amplifiers.
	RS 232	The 9 pin DB9-type connector is designed for several remote controls and service.

2.4.3.3 Wiring connections of the DB9-type connector:

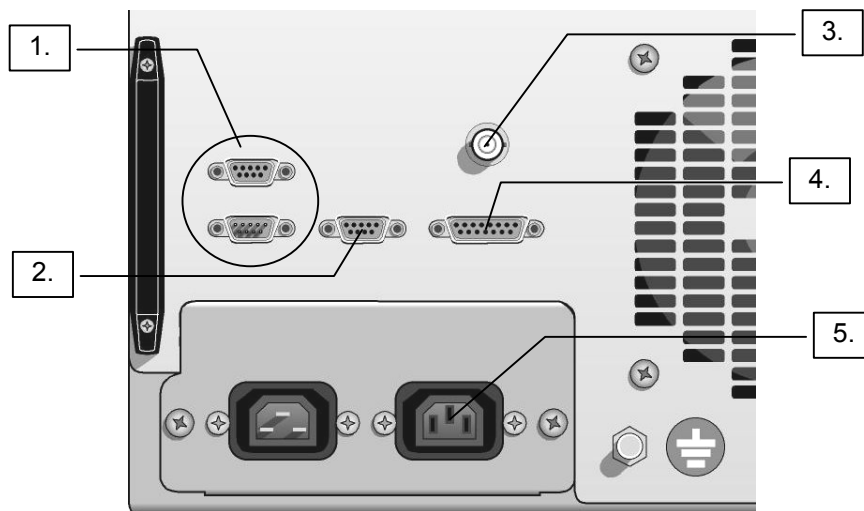
PIN	DESCRIPTION
1	STAND-BY signal (the contact is NO in normal operation, connected to GND in STAND-BY alarm).
2	Signal which is proportional to the square root of the ref. power (+4V = 5W).
3	NO alarm contact.
4	STAND-BY command line (activated by short circuiting this line with GND)
5	Common alarm contact.
6	GND
7	Signal which is proportional to the square root of the direct power (+8V = 25W).
8	NC alarm contact (the contact is NO in normal operation).
9	+15Volts (Output).

2.4.4 REAR VIEW AMPLIFIER



Number	Description
1	RF input connector connect to this input the output of the exciter (as per the following directions)
2	Right rear handle use it in combination to the left handle to move the amplifier (it also fixes the rear panel)
3	RF output connector connect this output to the antenna (as per the following directions)
4	Fans they provide the air flow necessary to the RF amplifier cooling
5	Ground terminal general ground terminal
6	Left rear handle use it in combination to the left handle to move the amplifier (it also fixes the rear panel)
7	AC power input plug connect the AC mains supply voltage as per the following directions

2.4.4.1 Rear panel



Additional connectors (rear)

Number	Description
1	The twin (male and female) RS485-type connectors is designed for the eventual parallel connection of more amplifiers
2	The RS232-type connector is designed for the connection to the exciter (if the exciter supports such this connection).
3	The BNC connector is for the carrier enable
4	The 15 pin DB15-type connector is designed for several remote controls and services as described in paragraph 2.4.4.2
5	AUX is a general purpose auxiliary switched AC output (2A max)

2.4.4.2 Wiring connections of the DB15-type connector:

PIN	DESCRIPTION
1	GND
2	Signal which is proportional to the power supply module output voltage (1V = 10V)
3	Signal which is proportional to the square root of the direct power (5V = 1000W)
4	For factory use only
5	GND
6	STAND-BY command line (activated by short circuiting this line with GND)
7	Reserved
8	RESET command line (activated by short circuiting this line with GND)
9	Signal which is proportional to the power supply module output current (1V = 10A)
10	Signal which is proportional to the square root of the reflected power (4V = 50W)
11	For factory use only
12	STAND-BY signal (the contact is NC in normal operation, connected to GND in STAND-BY alarm)
13	NO alarm contact (the contact is NC in normal operation, connected to PIN 15 in ALARM mode)
14	NC alarm contact (the contact is NO in normal operation)
15	Common alarm contact (see 13 and 14)

2.5 BLOCK DIAGRAM

**INSERIRE PDF IN
FORMATO A3
FILE**

**TX 1000 PLUS Schema Blocchi
Details 1**

2.6 OPERATIONS






2.6.1 PUTTING IN OPERATION

2.6.1.1 Unpacking






After unpacking the Fm transmitter and choosing a suitable place to put it, check that all the necessary parts are available to continue:

1. Spare fuses.
2. AC power plug (inside its package).
3. Documentation

2.6.1.2 Connections

1. AC power plug (inside its package). Make sure that the AC power switch I O  is in O (Off) position.
2. Connect all the earth wires coming from the other devices fitted in the rack to the earth terminal  provided in the rear of the equipment and marked with the appropriate symbol.
3. Connect the AC power cable to the AC power plug following the instructions printed on its package, taking particular care with the earth connection
4. Ensure that the AC mains supply voltage is either 230V_{CA} (±15%) or 110V_{ca} (±15%) and insert the AC power input plug in the AC connector  located in the rear of the FM transmitter.
5. Ensure that the antenna or amplifier is suitable for the FM broadcasting frequency range (from 87.5 to 108 MHz) and connect it to the N-type RF output connector  available in the rear of the transmitter.
6. Switch the exciter on and adjust it to the minimum output power
7. Connect the exciter's RF output to the N-type RF input connector  located in the rear panel.
8. Now the equipment is ready to work at the minimum configuration.

2.6.2 SWITCHING THE SYSTEM ON

1. AC power plug (inside its package). Make sure that the AC power switch I O  is in O (Off) position.
2. Switch the FM transmitter on by pressing the AC Power switch I O  in I position
3. Set the frequency and wait the PLL LED switching ON .
4. Set the required output power
5. Carefully and slowly raise the exciter's output power and stop at the point in which the **ALC** LED  will steadily glow.
6. Now the system is operating. If all is properly working, the following LEDs should glow: **DC OUT**  (meaning that the power supply voltage is available) and **POWER**  (AC mains power is available).
7. Now the system is operating. If all is properly working, the following leds should glow: **LED PLL** (meaning that the PLL is locked) and **POWER** (AC mains power is available).
8. Moreover the upper line of the LCD display should show the output power and the lower should visualize "Normal" (normal working condition). The LCD Display should stay back lighted for 30 minutes after the last button pressed.
9. Check the forward and reflected RF power .

2.6.3 CARES AND MAINTENANCE

As many other electronic equipment, this transmitter need some care which is mandatory to guarantee years of perfect operation. On the other side, if maintenance operation is not regularly carried out, faults can occur, particularly in harsh environments.

Air cooling fans must be regularly inspected and replaced every 10,000 hours. Vent air filter must be regularly replaced or cleaned according to the environment conditions.

TX 1000 PLUS 1000 W FM TRANSMITTER

OPERATION MANUAL

3 CIRCUIT AND SOFTWARE DESCRIPTION

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3.1 TX 25 PLUS FM EXCITER

3.1.1 GENERAL BLOCK DIAGRAM TX 25 PLUS

The TX 25 Plus is composed of seven basic blocks:

- Input L.F. (S3132),
- Controller (S3135),
- Stereo Coder (3133),
- Synthesis (S3134),
- Power 25W (S3131), and
- Power Supply (S3130).

The input is able to manage three different types of signals, which are:

- a) External L.F. stereophonic signal
- b) Mono signal from the right
- c) Mono signal from the left

These can all be balanced or unbalanced with an impedance of 600 ohm or 10Kohm. On these signals it is possible to set a value of 50us or 75us.

The output board has two SCA inputs with a 10K impedance. The L.F. signals pass through a 15Khz low pass filter which limits the modulation frequency band. This is to avoid, in case of stereophonic transmission, interference with the sub-carrier of the Multiplexer signal.

The left and right signals are combined in the stereo coder block. A composed signal is obtained at the output of the summing amplifier which enters into AGC and limits its width. Furthermore a clipper limits any modulation peaks that may occur. The AGC and Clipper may both be excluded by the S6 and S1. The signal therefore enters the synthesis block.

The composed signal directly modulates the VCO. The reference is obtained by a Tcxo at 12,8 Mhz and a micro-controller sets the frequency on the PLL. The Synthesis block has an RF output signal of approximately +10 dBm. The power amplifier is wide band and able to give a variable output power from 0.5 to 1000W, which is controlled by a RF AGC. The directional coupler has a directivity of approximately 28dB and has a - 40dB probe RF.

The power supply switching is managed by a network with fly-back configuration. The input tension may vary from 90 and 265 Volts, and may have a frequency of 50/60 Hz. There are four output tensions. All the data is visualized on the LCD panel on the front panel, while the commands are set by using the three buttons.

The transmitter interfaces with a Pc, modem, GSM module and other systems which use the same communication protocol through two RS232 ports and one RS485 port. See block diagram.

3.1.2 VCO SYNTHESIS TX 25 PLUS (S3134)

The synthesis circuit is located on the control board and is connected by EC3 EC4 connectors, which allow it to be easily replaced. The operating frequency is from 87.5 to 107.95 MHz. The oscillator, which is the main part, is composed by Q3 (BFR93A).

D2, D3, D8, D9, D10, D11 and the coils L6, L7 form the tanks and bring about the modulation of the oscillator. The transistor Q4 (BC847B) is a capacity multiplier which reduces the flickers-noise which reaches the power supply.

The U5 IC (Max 2471) un-couples the oscillator from the next stages and gives two outputs. The first pilots the transistor Q6 (BFR106) which gives a power of approximately +10dBm. The second is for the input of the internal prescaler to U4 (LMX2306). This circuit has integrated all the synthesis functions and is programmed by a microprocessor U23 (M30620FCAFP) located on the controller board.

The frequency reference is produced by U3, which is a TCXO with 12,8 Mhz output. The error amplifier is composed by a pair of operational U1a-U1b (TL072). The circuit composed by the U2 (LM358) IC that gives the micro a low signal and then the PLL is correctly connected. All the circuit has been adequately screened to avoid emissions of illegitimate frequencies.

3.1.3 POWER AMPLIFIER TX 25 PLUS (S3131)

The power amplifier is assembled to a radiator and to avoid illegitimate signals it is screened by using a hood. The interface with the controller board is made by means of two connectors, EC2-EC4. The Q1 (BLF245) transistor has direct power supply of +28V from the switching power supply (EC5 connector).

The driver, power circuit, low pass filter and directional coupler are all on the same PC Board. To avoid calibration during the quality control the coils in all of these circuits have been replaced with micro strips. The driver is composed by the Q2 (BLT50) transistor, with a micro which controls the tension of the power supply and an AGC.

The RV2 trimmer regulates the VCE of the equipment with approximately +6.5V. With only +10 dBm on the EC1 (SMB) connector the transistor gives an output of approximately 0,5Watts to the Q1 (BLF245) transistor, which then gives a output power of 25 Watts on all band.

The RV1 trimmer regulates the drain current when the equipment approximately at 200 mA. The low pass filter is elliptic type with minimum inductor shapes Cauer-Chebyshev. A directional coupler is placed on the output of the filter, which gives the tension to measure the direct and reflex power.

On the same line a signal for an "RF Probe" is taken at - 40dB equalized in band (EC2). The U1a and U1d amplify the output DC signal from the D3, C31, D4 , C26 rectifiers.

3.1.4 POWER SUPPLY TX 25 PLUS (S3130)

The Power Supply is composed by four principal stages:

3.1.4.1 Front panel connections Main Filter

The on board main filter has the purpose of limiting the emission created by the switching Power Supply and rejected to the main cable and it protects the equipment from over voltages and noise coming from the main line.

3.1.4.2 Starting Point Limitation Circuit

A starting point limitation circuit limits the spike current when the equipment is switched on. At the beginning of this stage there is the general protection fuse , which protects all the power supply board. The NTC resistor which limits the initial current is RK1.

3.1.4.3 Power Supply Stage

The Power supply stage is a switching type Fly-back conversion mains direct and converts the rectified main to the 28.5V output. The switching frequency is 70KHz.

The power stage is obtained by the MOSFET Q2, the transformer T1, diode D4 as well as capacitors C7, C6 along with a linear post-regulation circuit formed by Q1, C8, C9, DZ5 and the associated components. The regulation IC is UC3844 (U5). The transformer T1 offers a galvanic insulation between the generated power and auxiliary voltages and the source (the output coming from the bridge).

The stage is intrinsically protected against overloads and short circuits and provides a variety of signals to the General Control board, e.g. the output current (obtained by the shunt R6), the output voltage (obtained by the output). The output voltage 100 Hz ripple is less than 20 mV_{PP} at full load in order to minimize the residual AM modulation.

The total efficiency conversion stages is 0.75.

3.1.4.4 Auxiliary Voltage Supply

The transformer T1 supply also the three- auxiliary output voltage + 15, -15 and +5, additional +24 for the fan dedicated. The +15 and -15 and +5 voltages are necessary to feed all the chip of the equipment and the additional +24 is dedicated for the fan. The circuit is protected against of an over charge, short-circuit of the output voltages.

3.1.5 INPUT LF TX 25 PLUS (S3132)

The L.F. circuit is designed to manage different types of input signals. It interfaces with the controller through the EC5 connector. This circuit has a Right/Mono and Left/MPX inputs on two 3-pole female cannon connectors and two SCA inputs with BNC connectors.

The Right/Mono and Left/MPX signals are filtered through the RF noise filters and pass in U1a and U3a. The R26 and R31 trimmers regulate the gain of the signal with excursion which goes from -6 to +12dBm. The input impedance can be selected on 600 ohm or on 10Kohm by regulating the S1 and S2 switches.

The option setting menu enables the setting of the input attenuator with fixed value at 0 to +6 and variable value -6/+12. In fact, the U2-U4 IC are digital switches. The U1b and U3b (LM833) buffers send the signal to the controller.

The R10 and R12 trimmers regulate the gain of the SCA input signals and the U5a and U5b (LM833) buffers send the signal to the controller. In this circuit are also located the RS232 (EC3) connector and two male-female connectors for the RS485 (EC1-EC2).

The remote connector (EC4) of the transmitter enables the use of analogue signals to read several parameters and logic signals to give alarm and stand-by signals.

3.1.6 CODER STEREO TX 25 PLUS (S3133)

The stereo coder is located on the controller board and is connected to it by using EC1 and EC2 connectors.

The frequency reference is obtained through a 4867 KHz quartz. The U14 IC works as a buffer for the U5a. The power supply of the circuit gives a dual tension of ± 8 Volts which comes from the controller board.

The Left and Right signals are amplified by U10a and U10b and integrated resistant circuit. The U8 IC (4051b), which is piloted by a U5 (4520), composes the multiplexer signal. The 100 KHz low pass filter is composed by the operational U4 and U3. At 19Khz the signal is obtained from the integrated resistant circuit on the U7 (4051), which is also piloted by the U5. The signal is filtered by the U1 and U20b. At 19 KHz the R37 trimmer regulates the signal percentage.

The U20a IC is a summing amplifier which mixes the Multiplexer signal, the 19 KHz signal and a percentage of the right and left signals that are regulated by the R50 and R49 trimmers.

A composed signal with width almost equal to 8,8 Vpp is obtained as output from the U3a. As output from the U3a a phase compensation at frequencies from 10 KHz to 15 KHz is obtained, while the R36 trimmer regulates the phase at 19 KHz and at 38 KHz.

3.1.7 CONTROLLER CIRCUIT TX 25 PLUS (S3135)

Besides having its own functions the controller also as a connection controller for the various external functions. The U23 (3062) IC microprocessor is the master of the board.

The flash memory makes it possible to load the new versions of the software on board by using the EC7 connector and the circuit supplies upon client request. The U25 IC manages the clock/date function, and on the EC12 connector the clock signal is available together with the tension of the back-up battery.

In case of blackout the U29 IC (St93C86) saves on the memory all the set data External communication with the GSM and the RS232 occurs with the aid of the U20 (DS14C232) IC and U9 (DS14C232) IC, while the IC U24 (DS75176) serves the RS485. The IC pair U28 (LM336) and U34b allows the interface between the temperature sensor located on the power amplifier and input of the microprocessor.

The reading temperature figure on the display is regulated through the trimmer RV6. The integrated circuit U26a and U26b (LM358) supply the DC voltage (regulated by the trimmer RV4 and RV5) for the visualization of the voltage and current value of the power amplifier stage. The transistors Q1, Q3, Q7, Q9, Q10, Q15 are the logical translator from +5V to $\pm 8V$ for the several functions (preemphasis, L.F.L. Mono/Stereo). The integrated U2 and U8 are the voltage stabilizer of the $\pm 8V$ tension of feeding of coder the stereo.

The relative DC voltage of the forward power and the reflected power, coming from the directional coupler (connector EC10) are opportunely amplified from U21a-b and regulated through trimmer RV3 and RV2 before entering in microprocessor. On the EC10 are also captures the DC signal for the AGC controlling of the direct and reflected power.

The output of the U21c and U21d are summed by the double diode D5 to obtain a DC voltage to drive the base of the power transistor Q12 (TIP31c). This voltage is variable from +4.5V to 13,5V and allow a power regulation from 0,5W to 25W. The input signal Right/Mono and Left/MPX coming from the EC2 connector and if the transmitter is configured in STEREO mode these audio signal are connected directly to the pre-emphasis filters U3 (4051) - U400a(TI072) e U12(4051) – U13(TL072). Subsequently the audio signal is connected to the 15KHz filter. The filtered signal will be available on the EC4b connector (coder stereo). The Multiplexed signal will be available on the EC4a.

If the transmitter is in MONO operation the microprocessor will commutate the output of the IC U11 (4051) e U5(4051) to connect the Mono signal to the IC U10b (TL072). This component is an IC summing amplifier that provides to mix all the signal included the SCA. The two trimmers RV10 (mono) and RV13(MPX) reduce the difference level between the two channels up 0,1 dB max. The output of the U10b is connected to the input of U32 (4051) e U33(4051) that drive from the U35 provide to reduce the level of the low frequency signal in case of over modulation only.

This integrated circuit is programmed through the S4 connector. The jumper S6 put ON or OFF the limiter function. On the output of the U31 is placed the clipper U14b that cuts the signal when the over modulation reach ± 110 Khz. The clipper circuit can be excluded buy the S1 jumper. The final result audio signal is connected to synthesizer circuit through the EC1a connector. The level of the modulation is regulated by RV7. The double half wave rectifier composed by U22-U18-U30 eU16 gives the

microprocessor the DC voltage level to visualise the modulation value on the display. The level is regulated by the trimmer RV11.

The three relay RL1-RL2- RL3 provides the contacts for the alarm and stand-by remote(see dedicated description). The connector EC9 allows the interface by the micro with the front panel keyboard and display.

3.1.8 START UP CONDITION TX 25 PLUS

At the start up the name, the version and the serial number of the equipment appears on the LCD display. Simultaneously all the leds will be tested.



At the end of the start up, the **Main Menu** will be visualized. It is composed by two lines:

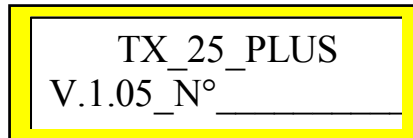
- **The upper line** shows the default measurement **Fwd. Pow.** which is the RF Output power and is followed by its value. This measurement can be changed by the menu according to your need.
- **The second line** is the status of the equipment (**Normal** if all is going well).

3.1.9 MENU DESCRIPTION TX 25 PLUS

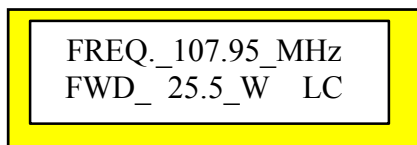
By entering the menu, it is possible to change the default measurement displayed in the upper line of the LCD and to access to a range of visualizations (e.g. the event log) and settings (half output power, switching between front and rear RS232 connectors etc.)

3.1.10 FUNCTIONING OF THE DISPLAY TX 25 PLUS

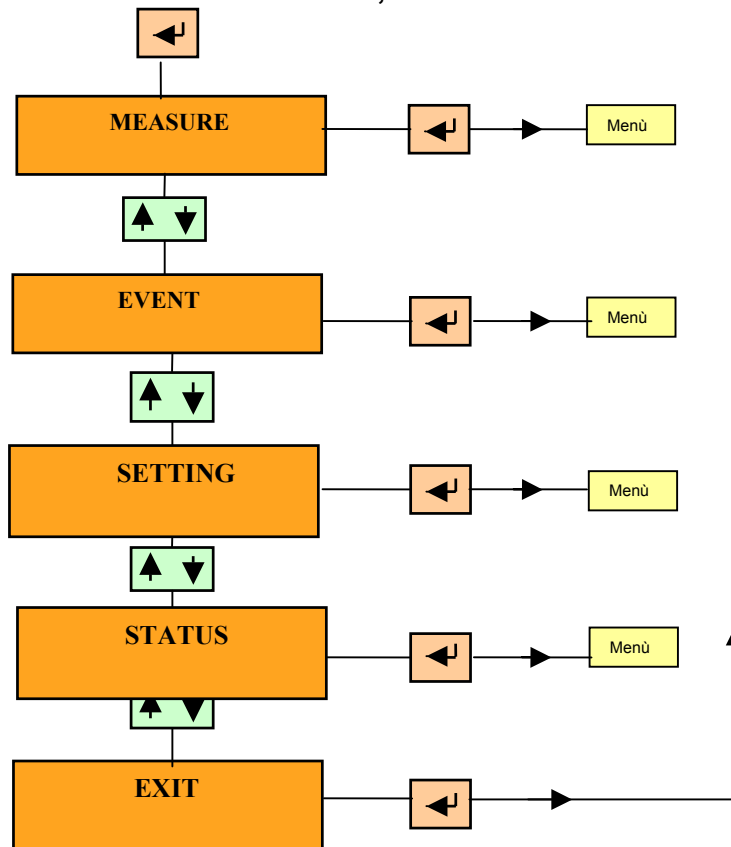
When the equipment is 'On' the display will show the TX model name, the software version and the serial number. Simultaneously the front panel leds are tested. This entire operation lasts approximately 5 seconds.



The frequency and power will then appear on the display. Each time any of the 3 buttons on the front panel are touched the display will remain lit for 30 seconds.



The enter button gives access to the main menu, which is divided into 5 headings:



To exit this menu you must move to the EXIT option and press 'ENTER'. You will otherwise pass on to the sub-menu.

3.1.11 DETAILS OF EACH MENU TX 25 PLUS

MEASURE

This menu reads all the measures of the equipment, which are displayed in groups of two at a time. By pressing the buttons 'UP' or 'DOWN' you pass on to the two previous or following measurements. By using the 'ENTER' button from any sub-menu you return to the Measure menu. The specific readings are:

1) Modulation measure:

□□□□□□□□□□
Mod. 000 KHz

The first line shows a measuring bar (VU- Meter type), whose value increases and decreases according to the variation made on the L.F. input signal
The second line shows the modulation value in digits, and it also varies with the L.F. signal.

2) Direct power and reflex power.

Fwd Pow. 00.0 W Ref.
Pow. 0.0 W

In this case the forward power and reflected power of the equipment are displayed.

3) Voltage and current of the power module.

PA Voltage 00.0 V
PA Current 0.0 A

In this case the figures will vary according to the input voltage.
This measure gives a voltage reading within the range +1.1V to +33.5, and from 0.1A to 3A for the current.

4) Frequency and temperature reading.

Freq 000.000 MHz
Temperature ±00°C

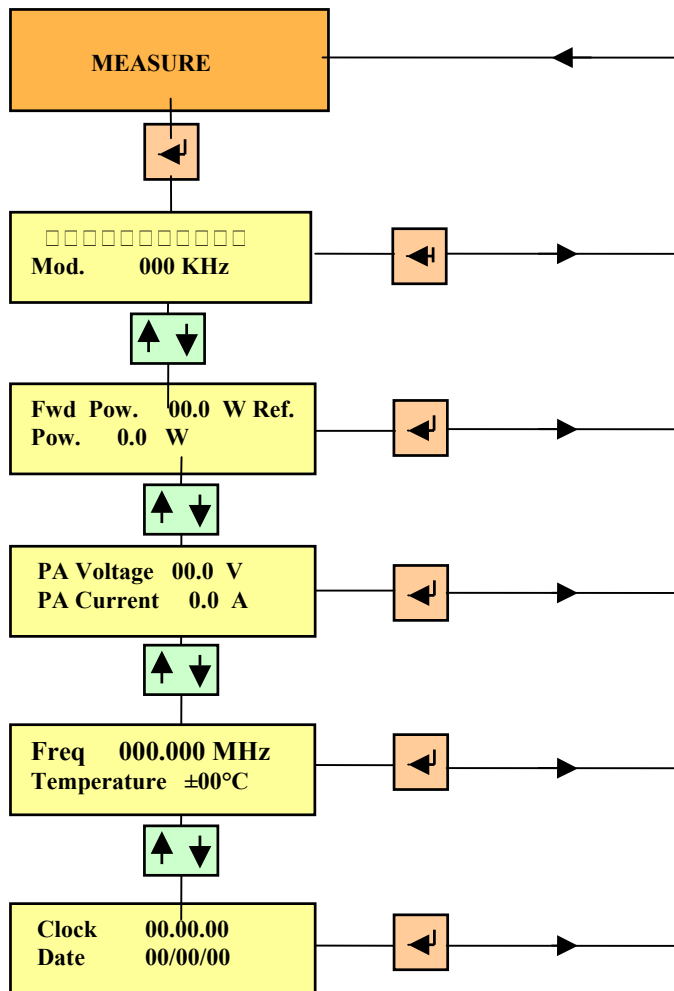
The frequency reading shows the setting of the programmed PLL – through the use of the 'Up', 'Down' and 'Enter' buttons in the **SETTING** section.
The temperature is displayed in the range from **-20°C** to **99°C**.

5) Reading of the clock and date.

Clock 00.00.00
Date 00/00/00

This sub-menu displays the current time and date.

Graphic summary of the **MEASURE** menu:



3.1.12 MENU EVENT LOG TX 25 PLUS

EVENT LOG

This menu allows you to visualize all the operations undertaken by the equipment in chronological order. Once the number of operations reaches 99 the memory of the operations cancels the first operation in chronological order. For each operation the equipment will display the type of operation on the upper line and the date and time on the lower line. Each time the equipment returns to the normal function this event is also recorded as Normal with date and time.

To move within this sub-menu you must use the **Up** and **Down** buttons, while if you press **ENTER** from any position you will return to the **EVENT LOG** menu.

The menu is composed by the following :

1) Excessive V.S.W.R.

Exc. V.S.W.R. n° 00
00:00 00/00/00

This signal will be memorized when the maximum power will exceed the 5W set limit.

2) Power On.

Power On n° 00
00:00 00/00/00

Indicates that the equipment is switched on.

3) Over Heat.

Over Heat n° 00
00:00 00/00/00

This is the maximum temperature display signal, which corresponds to **68°C**.

4) Stand-by Al. (alarm).

Stand-by Al. n° 00
00:00 00/00/00

This signal is memorized each time one of the alarm protection sections intervenes and the equipment is automatically set on Stand-by.

5) P.S . Overload.

P.S. Overload	n°00
00:00	00/00/00

This signal refers to the maximum PA Current (3 Amperes).

6) V.aux failure.

V.Aux faliure	n° 00
00:00	00/00/00

Indicates that one of the two auxiliary power supplies is absent.

7) Stand-by Re.

Stand-by Re.	n° 00
00:00	00/00/00

This signal appears each time the equipment is put on remote Stand-by through the RS232 or through the Remote connector.

8) PLL Unlocked.

PLL Unlocked.	n° 00
00:00	00/00/00

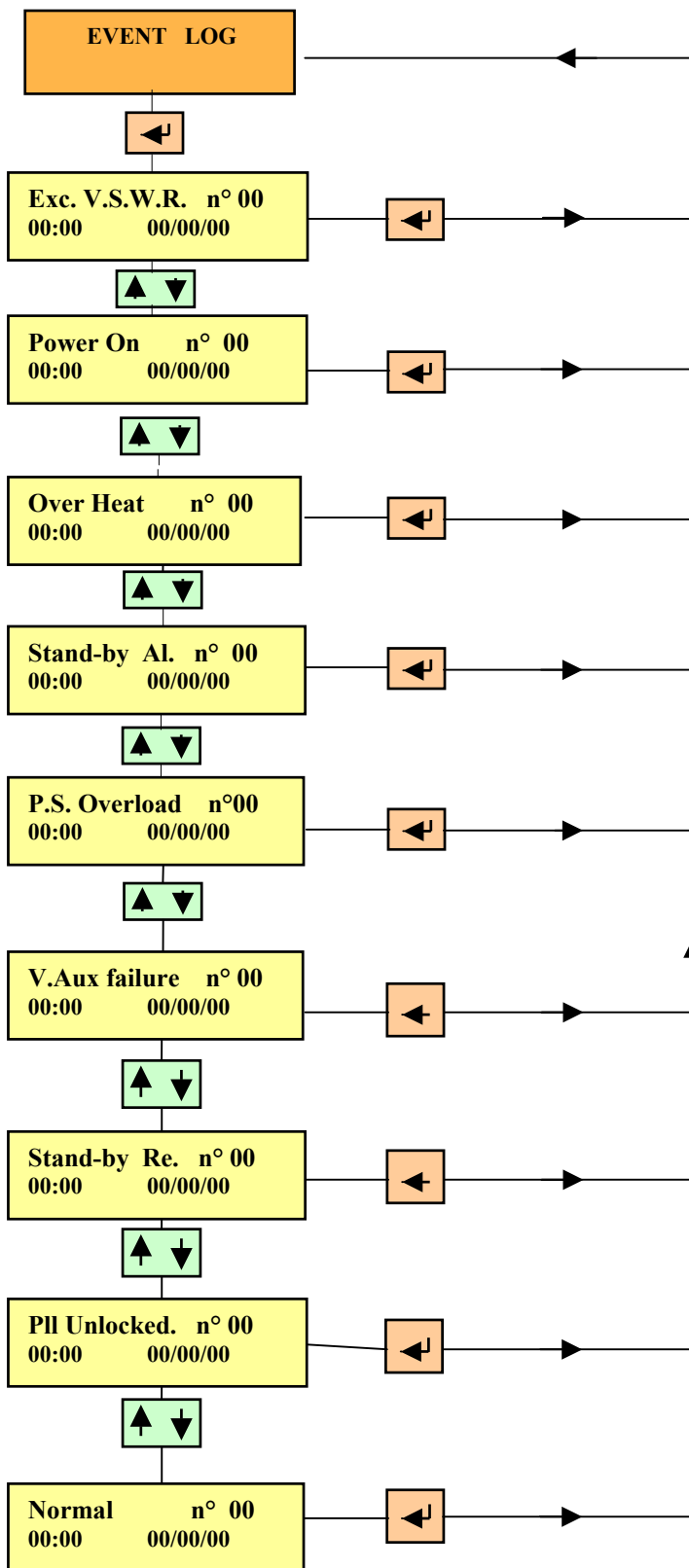
This event is memorized when the PLL is Unlocked.

9) Normal.

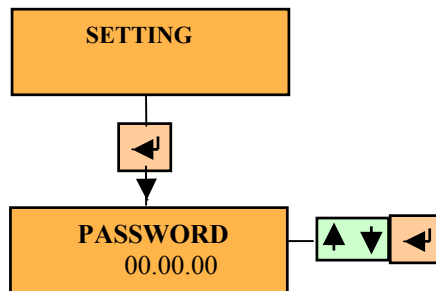
Normal	n° 00
00:00	00/00/00

This last event is displayed each time the equipment returns to its normal functioning.

Summary of the **EVENT LOG** menu.



3.1.13 MENU SETTING TX 25 PLUS

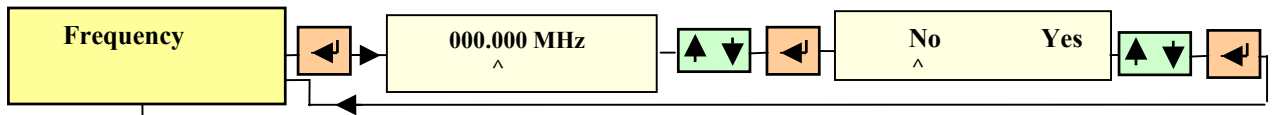


The SETTING menu is used to set all the data for the functioning of the equipment. You must digit a password to access this menu. To move inside the main menu you simply press the **Up** and **Down** buttons, while to set data you must use the **ENTER** button which brings you to the sub-menu.

To exit the SETTING menu you must go to the 13th option (Exit) and press the ENTER button.

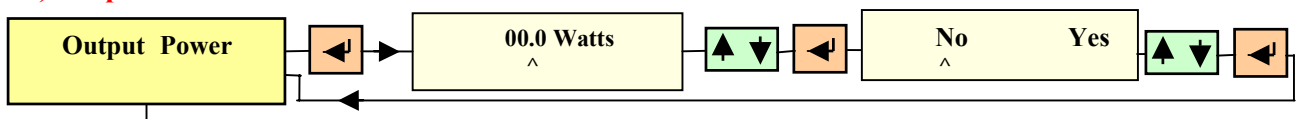
There are 12 sets of parameters that can be set.

1) Frequency .



By pressing the ENTER button the cursor will place itself on the first MHz digit. To write the number you must use the **Up** or **Down** buttons to increase or decrease the number required (form 0 to 9). By pressing on **ENTER** button you will save the data and pass on to the next digit. Follow the same procedure for each next digit. By pressing on **ENTER** button on the last digit you will access to the sub menu that allowed to set the frequency. After the required selection press enter to go back to the frequency menu. This procedure is the same for all the successive menus. It is not possible to set a frequency below **87.50 MHz** and above **107.950 MHz**. When the ENTER button is pressed on the last digit the power goes to 0 and then returns to its nominal value after 3-4 seconds.

2) Output Power.

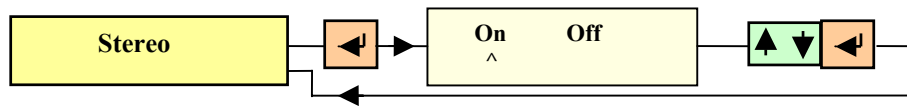


Instructions to set the output power:

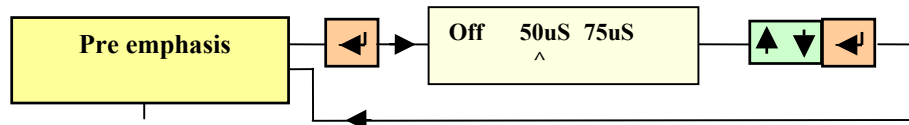
Press Enter to pass on to the output power menu.

Vary the power by using the **'Up'** and **'Down'** buttons

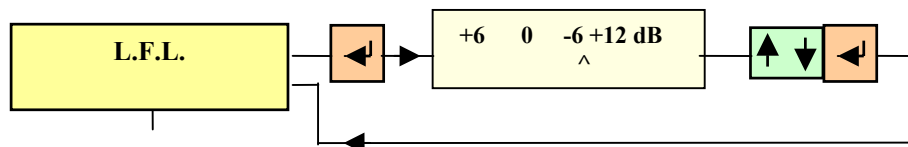
By pressing **ENTER** on the last digit you will access to the sub menu that allows the power to be set. After the required selection press enter to go back to the power menu.

3) Stereo.

This option allows to set the equipment in the 'Stereo' mode. By entering the sub-menu you can select **On** or **Off**. This is done by using the **Up** and **Down** buttons and confirming by pressing **ENTER** – which will also make you return to the menu. The 'Stereo' option can only be selected once the stereo coder is inserted in the connector.

4) Pre emphasis.

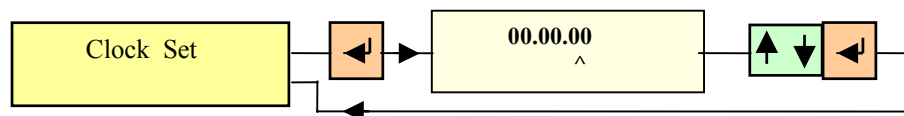
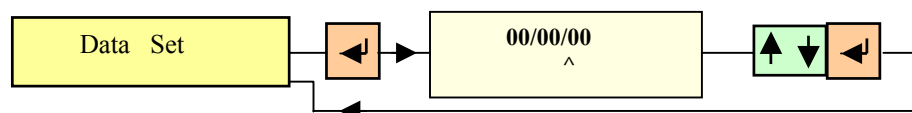
The procedure to enter, select and set this data from the sub-menu is the same as in point Nr.3.

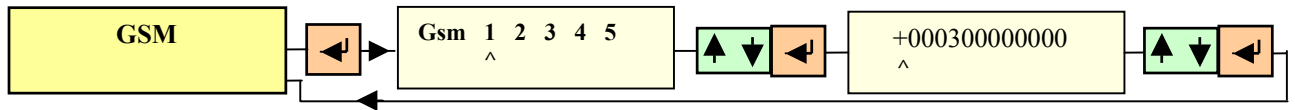
5) L.F.L.

The **Low Frequency Level** menu allows the setting of the input regulator. The procedure is the same as in the previous point.

6) Clock Set.

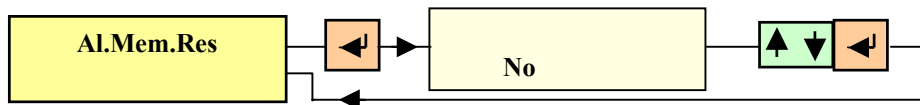
The time and date are set by simply using the **Up** and **Down** buttons when the cursor is positioned on the character. Then press **ENTER** to pass on to the next character.

**7) Data Set.**

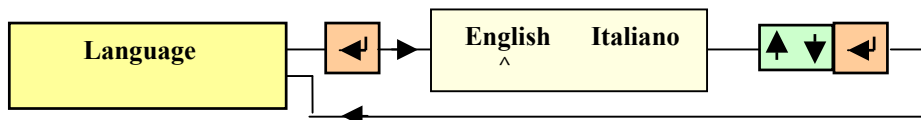
8) GSM

This sub-menu allows the programming of 5 GSM telephone numbers to send the following SMS message to:

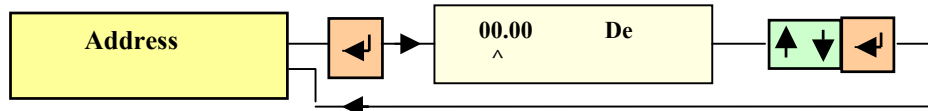
"General Alarm" , Model and Serial Number of the equipment.

9) Al. Mem . Reset.

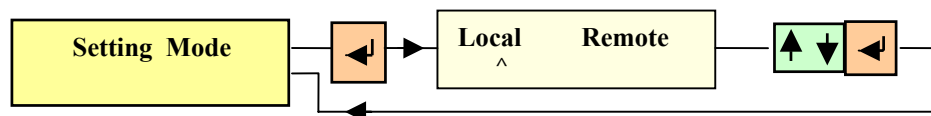
A complete reset of all alarm is possible by selecting this option.

10) Language.

By using this option you can select the language required on the display.

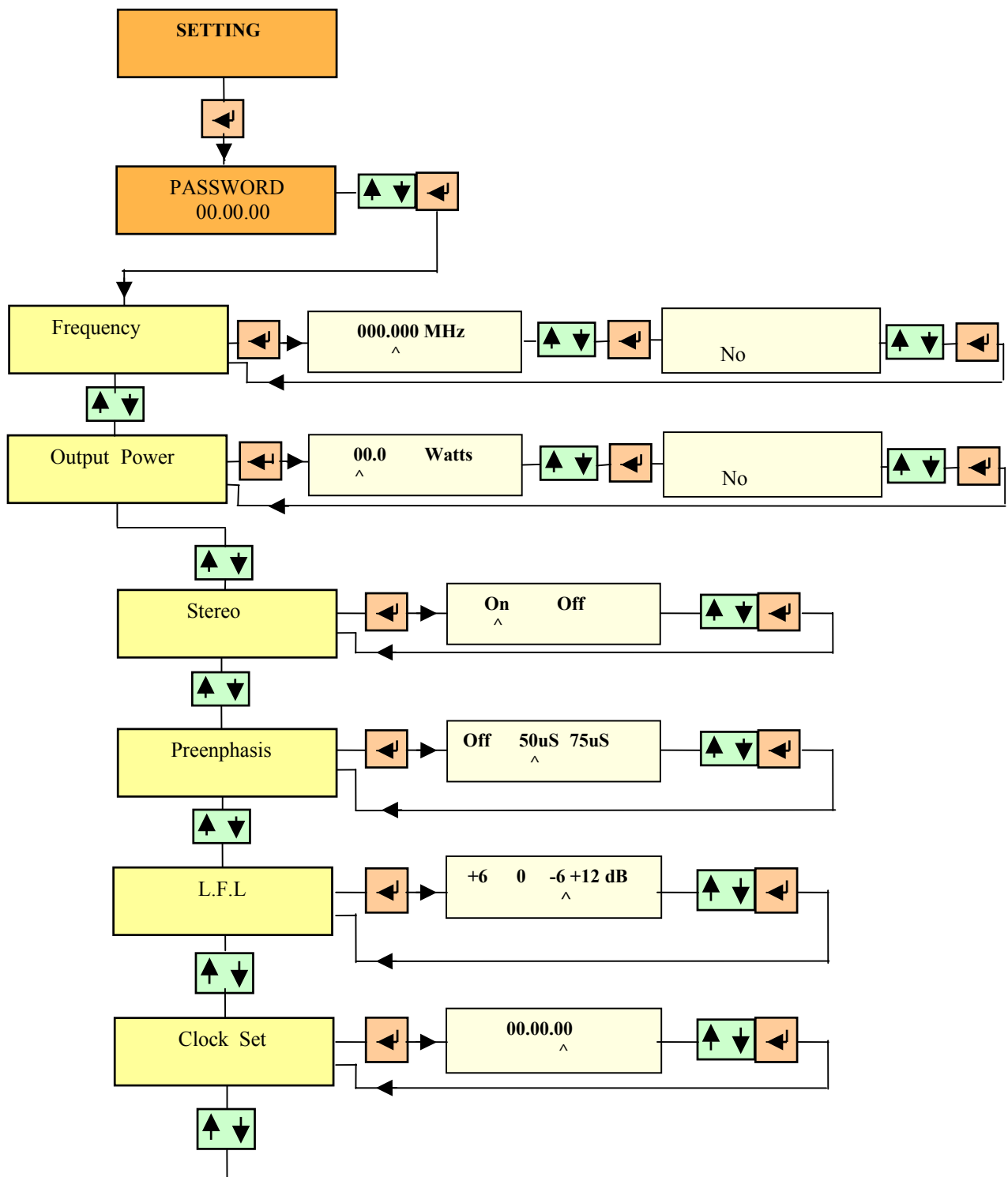
11) Address.

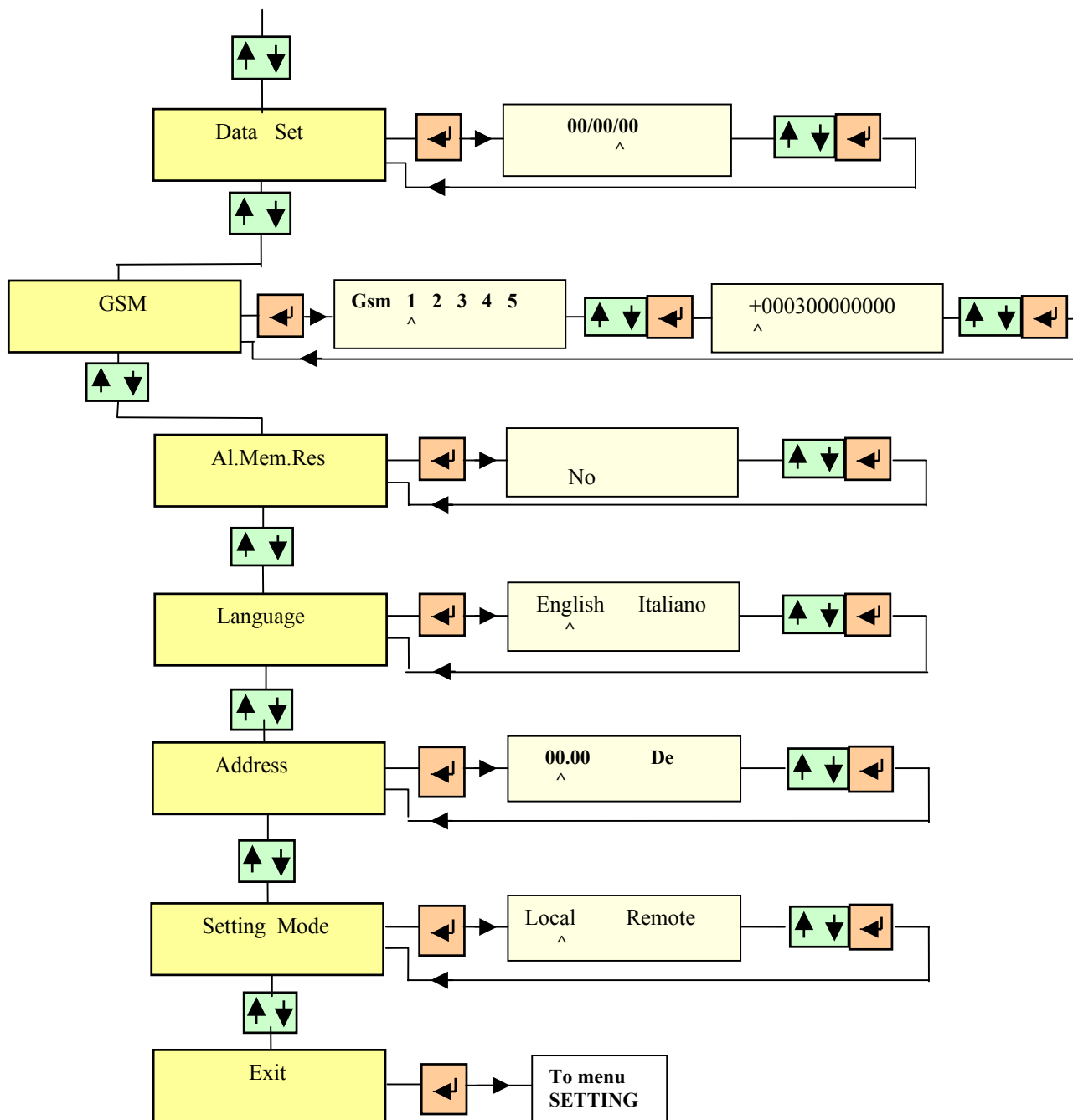
Allows the setting of the address information of the **RS485** port.

12) Setting Mode.

With this menu you can select the possibility to set data locally or via Remote. In case they are set via Remote the buttons on the front panel must be blocked. When the equipment is controlled via Remote (from the computer to the base) the first option possible is the "Setting" mode. Therefore if the TX is locally monitored it can be modified via the remote and the settings can be changed.

Summary of the **SETTING** menu.





3.1.14 MENU STATUS TX 25 PLUS

STATUS

With this menu you can monitor some readings of the equipment. This menu and the way to shift from the sub-menu to the main menu works in a similar way as the Measure menu . You can visualize the following:

1) Mono or Stereo

Mono / Stereo

Indication on whether the equipment is set to operate in Mono or Stereo. Clearly only one of the two options must be visualized.

2) Pre emphasis 50usec –75usec-Off

Pre emphasis
50/75/Off

Indication on the 'Setting' of the pre-emphasis: 50usec,75usec or Off. Clearly, also in this case only one option must be visualized.

3) L.F.L. +6 / 0 / -6 : +12dB

L.F.L .
+6 / 0 / -6 : +12dB

Low Frequency level , is the input sensitivity setting and indicates the input attenuator condition.

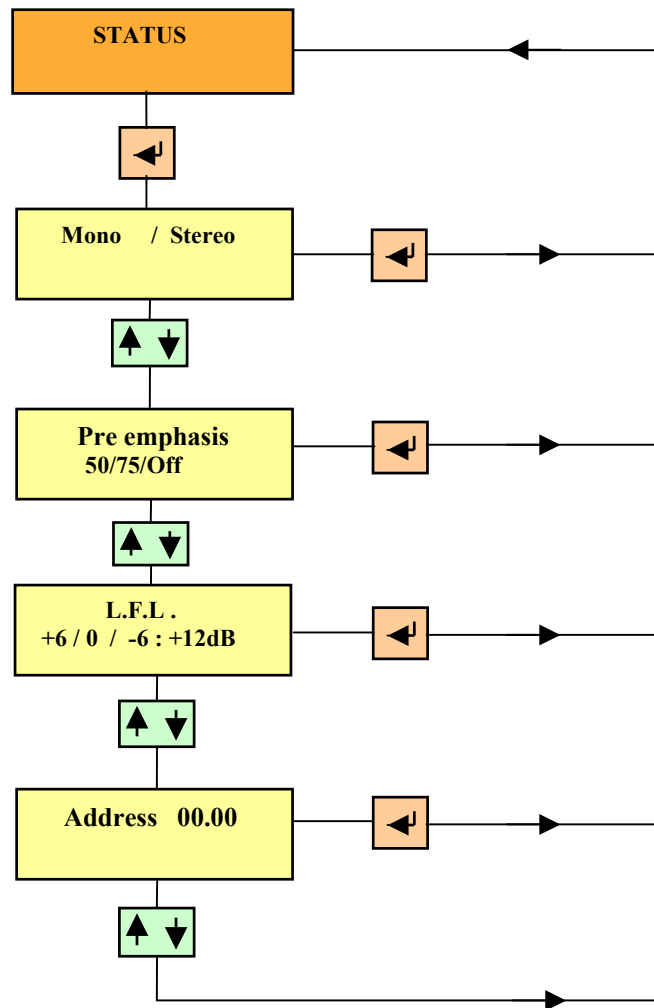
Only one value can be shown.

4) Address.

Address 00.00

Shows the address of the RS485.

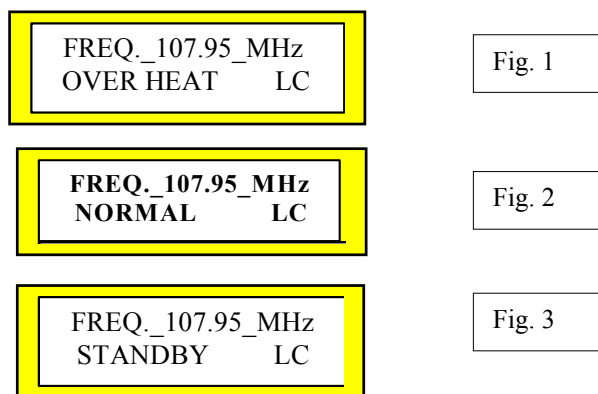
Summary of the **STATUS** menu.



3.1.15 ALARM SECTION TX 25 PLUS

Throughout all alarm cases of anomalous functioning of the equipment the second line of the display which should read FWD 00.0 W will be replaced (fig.1). In case it returns to function normally the display will read Normal (fig.2) which indicates that protection has occurred.

Each intervention must be registered in the Event Log menu. The equipment can be put on stand-by and reset an infinite number of times, and the display must indicate Stand-by instead of Normal.



The alarm conditions are the following:

- 1) **V.Aux faliure.**
When one of the two auxiliary voltages $\pm 15V$ is absent.
- 2) **P.S.Overload.**
When the prime current passes the pre-set value (**3 Amperes**).
- 3) **EXC V.S.W.R.**
When the output reflex power exceeds the pre-set value of **5W**.
- 4) **Over Heat**
When the temperature passes the pre-set value of **68°C**.

3.2 VL 1000 PLUS POWER AMPLIFIER

3.2.1 GENERAL BLOCK DIAGRAM VL 1000 PLUS

The VL 1000 Plus is composed of seven basic blocks:

- Input Power Splitter (S3109B)
- RF Amplifier module (S3110A01)
- Output Power Combiner (S3111B)
- RF Low pass Filter (S3119A)
- RF Control Circuit (K3123A01)
- Power Supply (K3113C01)
- Main AC supply filter (S3114D)
- General Control (S3115D01)
- Connection rear panel - LCD Display unit (S3120B)
- Keyboard (Keyboards_ED)

3.2.2 INPUT POWER SPLITTER VL 1000 (S3109B)

The input power from the exciter is applied to a 2 WAYS splitter 3 Db 90°; the signals on the outputs are out of phase by 90°.

The resistive termination resistor R1 absorb the unbalanced power when one of the BLF278 stages fail.

3.2.3 RF AMPLIFIER MODULE VL 1000 PLUS (S3110A01)

The amplifier circuit is composed two identical base modules. The input matching of the active device BLF278 composed of two FET is done by means of the transformation ratio 4:1 of transformer T1, by the capacitor C1, C2 and by the inductor L1.

The resistors R1, R2, R3 and R4 connected between the four gates of BL278 serve to increase the margin of stability of the amplifier and at the same time to get a SWR that is acceptable over the whole operating frequency band.

The two FET composing the BLF278 operate in push pull mode.

The line connected between the two drains serves to compensate for the capacitate component of the output impedance. The ensuing impedance is raised by the transformation ratio 1:4 of the transformer T2, and so taken to the value of 50Ω by the adapter circuit composed of C7, L2 and L3.

The parallel resonating circuit composed of C6 and L2 is calculated so as to lower the value of the 2nd harmonic component generated by the amplifier.

The gates of the two FET are connected, by means R8, R41 and L6, to a polarization circuit(BIAS=2,3v). The direct voltage on the gates regulated by means the trimmer RV1.

The NTC physically located on the case of the active device serves to compensate the variation of the polarization on the basis of the operating temperature. Through point 9 connected to the control circuit is possible, by means of an appropriate negative voltage, to zero the level of output power in the event of operating trouble detected by the RF Control Circuit itself

The toroid ferrite cores the output transformer is wound on may be damaged by strong magnetic fields created by current.

This situation may arise in the event of a FET failure.

3.2.4 OUTPUT POWER COMBINER VL 1000 PLUS (S3110A01)

The power coming from the two BL278 stages are sent to the input of one 3dB couplers .

In output line is placed a directional coupler that detects the reflected power. The resistive termination R3 absorb all unbalanced power. At the ends of the termination there is a unbalanced detector. Both signal are connected the control circuit.

3.2.5 RF LOW PASS FILTER VL 1000 PLUS (S3119A)

The output signal coming from the power amplifier module is connected to the input of a low pass filter.

This filter is a constant coupling type and it is composed by two π network section including two second harmonic traps.

The filter's capacitors consist in microstrips printed on a Teflon substrate. The inductances are made in silver-laminated copper wire wound in air.

The directional coupler is obtained with microstrips technology; it offers two voltages depending by the forward and reflected power. In this module is placed a probe RF -60db connected by a coaxial cable to the front panel.

3.2.6 RF CONTROL CIRCUIT VL 1000 PLUS (K3123A01)

The protection function of the four BLF278 stages is obtained by the Control Circuit.

The amplifier is protected of the excessive SWR, excessive unbalanced powers and overheating. The signal WR coming from the "reflected power detector" of the RF module, it's amplified by U2A and will reach the comparator U2D.

If the reflected power will excess the pre-set value, set by the resistive trimmer RV1, the comparator U2D its output representing an excessive reflected power level.

The signal of unbalanced UMB2 previously processed, is offered to the diode D12 to the input of buffer U2B.

The output of U1B is connected to the comparator U2C which output represents excessive internal unbalanced power error. The intervention protection level of UMB2 can be adjusting with the resistive trimmers RV3.

When the temperature level of the heatsink reaches the intervention level (80°C), the temperature chip sensor at the center of the same heatsink transmits a signal to the microprocessor that switch of the Amplifier.

The constant current generator formed by transistor Q3 and surrounding, components, is feeding the diodes D4 and DZ1 and between their terminals always offers a voltage of 10V.

This is the polarization and the control voltage of the basic module.

The previous described are lead through D7 coming into the basis of the Darlington pair Q1 and Q2, in case of intervention, can regulate the control voltage to a level of about -12V which totally cutoff the output power of the module. If the control voltage (-15V auxiliary supply) fail the general control by means the microprocessor switch off the amplifier.

POWER SUPPLY VL 1000 PLUS (K3113C01)

The Power Supply is composed by four principal stages:

3.2.6.1 Front panel connections Main Filter

It consists in a board which is separate from the Power Supply and located in the internal side of the rear panel, The main filter has the purpose to limit the emission created by the switching Power Supply and rejected to the main cable and it protects the equipment from overvoltages and noise coming from the main line.

3.2.6.2 Starting Point Limitation Circuit

A starting point limitation circuit provide to limit the spike current when the equipment is switched on. At the beginning of this stage there is the general protection fuse F1, which protects all the power supply board. The resistor which limits the initial current is R103, this resistor is further short circuited by the relay RL1 for the normal operation; the short circuit becomes operating in less than 1 second (the time necessary to charge the capacitors); this time is defined by an RC circuit.

3.2.6.3 Power Supply Stage

The Power supply stage is a switching type double conversion mains direct. The first stage conversion is AC/DC, it transform the 230V alternate signal into a 400V direct signal. The switching frequency is 40KHz. The circuit which provides the first conversion regulates the power coefficient of the 230V main line current absorption, the power coefficient at full charge isn't less than 99%. The power factor control (PFC) is obtained by the dedicated IC UC3854 (U5) and related circuitry: P1 e P2, the IGBT transistor Q4, the inductor L1, diodes from D1 to D4 and capacitors from C8 to C11. This configuration offers a very effective protection against input overvoltages which are absorbed by the inductor L1 as well as the capacitors from C8 to C11, additionally increasing the reliability of the mains direct switching regulator.

The second conversion stage has a DC/DC half-bridge structure, it transforms the direct voltage from 400V to 48V insulated from the mains line. The switching frequency is 40KHz. The Power Supply is protected of an over charge, short-circuit of the output voltage and by means the General Control it is protected of the overheating.

The IC which provides the regulation of the half bridge stage is U4 SG3525. The half bridge is obtained by means of the IGBT transistors Q1 and Q7, by the capacitors C1 and C12, as well as the transformer T3 which offers galvanic insulation from the mains supply. The rectifying diodes are D9, D10, D17 and D22. The first filter cell is made by the inductors L4 and L7 as well as the capacitors C15 and C17, while the second filter cell is obtained with L5 and C19.

The second DC/DC conversion stage is intrinsically protected against overloads and short circuits and provides a variety of signals to the General Control board, e.g. the output current (obtained by the shunts from SH1 to SH4), the output voltage (obtained by the output), a signal which is proportional to the operating temperature (IC LM335 RK1 which is fixed to one heatsink nearby the diode D38). The second DC/DC conversion stage also receives the ALC feedback signal coming from the control board by means of L9 and R57 to the IC U2 changing the power supply voltage in order to keep constant the RF output power.

In case of overheating, the board acts on the opto-insulator U6 with a ST-BY hi level signal which locks the two stages U5 e U4 (SG3525) and highlights unwanted events. Therefore, any signal which is not referred to the ground or the accidental removal of the EC2 connector forces the power supply in stand-by mode.

The output voltage 100 Hz ripple is less than 20 mVPP at full load in order to minimize the residual AM modulation.

The total efficiency of the two conversion stages is 0.88.

3.2.6.4 Auxiliary Voltage Supply

A voltage supply main direct with three-output voltage + 15 and -15, additional +15 for the fans composes this circuit. The +15 and -15 voltages are necessary to feed all the chip of the equipment and the additional +15 is dedicated for the fans. On the output of the fans supply are placed two fuse to save the fans against short circuit. The circuit is protected of an over charge, short-circuit of the output voltage.

At the beginning of this stage the fuse F4 protects the whole auxiliary stage. The stage is obtained by a flyback-type stage made by the MosFET Q11, the transformer T4, diodes D16 and D18 as well as capacitors C78, C96 and C79. The regulation IC is UC3844 (U7). The transformer T4 offers a galvanic insulation between the generated auxiliary voltages and the source (the output coming from the bridge).

3.2.7 GENERAL CONTROL VL 1000 PLUS (S3115D01)

The General Control Board is obtained with a microprocessor PIC17C756A with following characteristics:

- Clock 16MHz
- 12 input A/D 10bit
- 2 Universal asynchronous receiver transmit
- The microprocessor is connected at the memory EEPROM 93C86 that has an 1K word capacity, at the data/time chip, at an interface for two COM port RS232 and an interface for one COM port RS485

The microprocessor control all the protection of the power amplifier:

- Excessive SWR
- Power Supply Overheating
- Power Amplifier Overheating
- Supply Auxiliary Voltage-15V Failure
- Unbalanced Power

Moreover it manage the navigation on the display of the functions:

- Measure
- Display Failures
- Language
- Reset Mode
- Warning Temperature
- Power Output -3 dB
- Failure Counter
- Time and Data Set
-

3.2.7.1 Excessive SWR Protection

The amplifier has two protections by the SWR. The first detector is located in the power amplifier module and the second is located in the Low Pass Filter. The first protection has an intervention time more quickly than the second.

In case of not correct antenna's impedance the General Control gives a signal at the power supply, it reduce the output voltage and so the RF output power will be reduced to have the maximum level of the SWR 1.8.

If there is a momentary spike of the reflected wave ratio (SWR) the detector on the power amplifier module gives a signal at the control circuit (located in same module) and it reduce the voltage of the BLF278's gate.

3.2.7.2 Power Supply and Power Amplifier Overheating

When the heatsink temperature of the power amplifier module and power supply module reaches about 80°C, the general Control switches the Power Supply off. In this case the equipment is in Stand by mode. During this process the fans will work, when the temperature will reach less than 70°C (approx.) the general control restores the normal Power Supply operation.

3.2.7.3 Supply Auxiliary Voltage -15V Failure

This supply voltage is important to control the voltage on the BLF278's gate. If it shall be broken The equipment will go in stand-by.

3.2.7.4 Measure

The measurement available via the menu (see 3.2.8.4)are forward a direct power, voltage and current of the Power Amplifier, temperature regarding heatsink power supply and power amplifier; date and time.

3.2.7.5 Display Failures

The failures display indicates the alarm type that the equipment has (SWR, etc).

3.2.7.6 Warning Temperature

If this option is ON, when the heatsink temperature of the power amplifier module and power supply module reaches about 70°C (near to the level of overheating alarm) the General Control adjusts the equipment in order to output the half of the rated full power only (-3 dB/250W).

3.2.7.7 Function -3dB

This function allows to set the equipment's output power at -3 dB (the half of the rated full power).

3.2.8 MENU COMMANDS

3.2.8.1 Start Up Condition

At the start up the name, the version and the serial number of the equipment appear on the LCD display. Simultaneously all the LEDs will be tested.





At the end of the start up, the **Main Menu** will be visualized. It is composed by two lines:








- **The upper line** shows the default measurement **Dir . Pow .** Which is the RF Output Power and is followed by its value. This measurement can be changed by the menu according to your need.
- **The second line** is the status of the equipment (**Normal** if all is going well).
-

3.2.8.2 Menu Description

By entering the menu, it's possible to change the default measurement displayed in the upper line of the LCD and to access to a range of visualizations (e.g. the event log) and settings (half output power, switching between front and rear RS232 connectors etc.)

3.2.8.3 Navigation commands

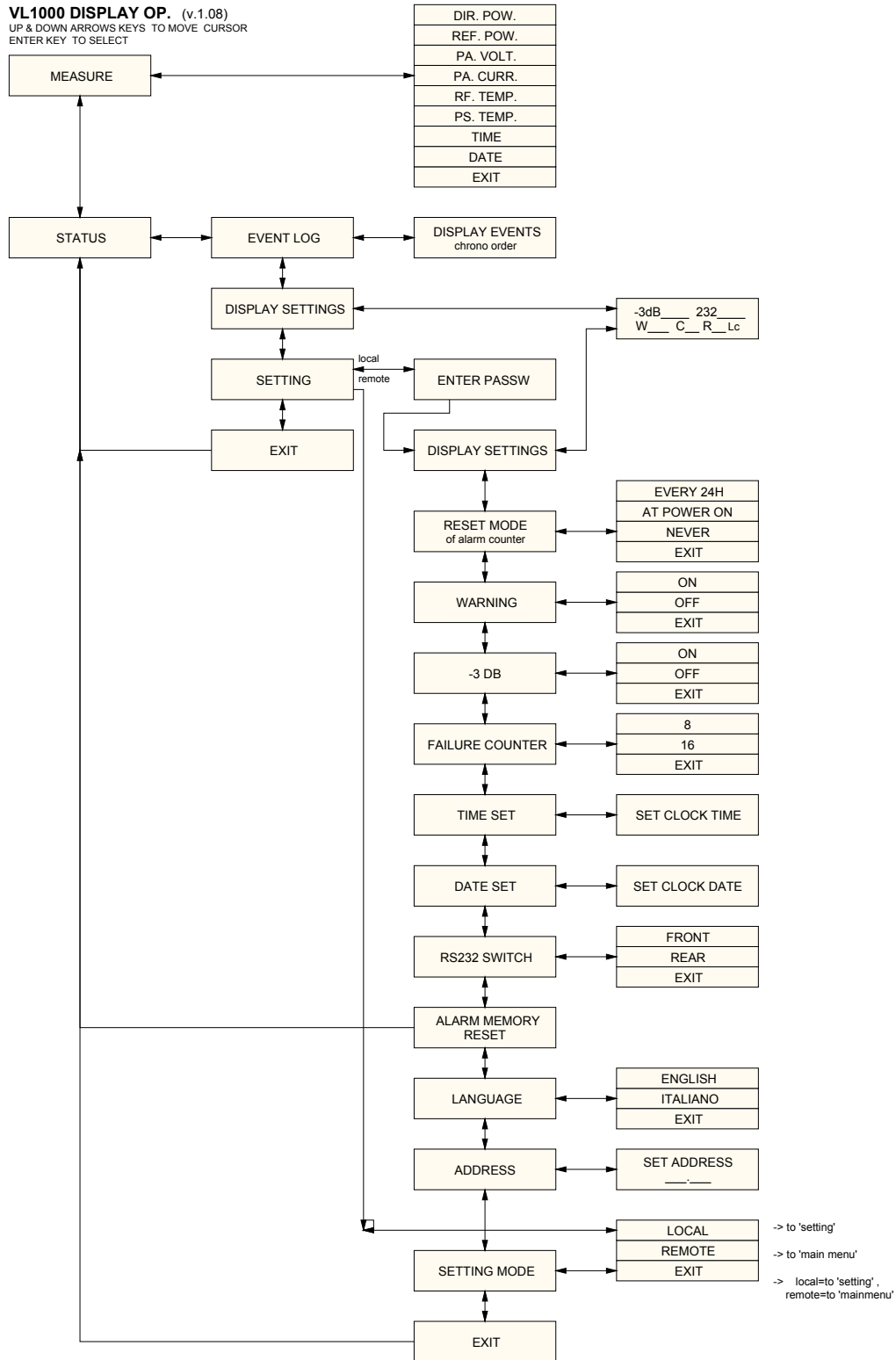
- At the right of the LCD display there is an asterisk * which indicates the selected menu item.
- The two keys  and  allow, respectively, to scroll the menu up and down in order to select the various menu items.

 *Note: the menu scroll function is not cyclic. Therefore after selecting the last menu item it's necessary to press the  key in order to scroll the items back.*
- To access a menu item in order to change/set it, move the position of the asterisk * on that item by pressing the  and  keys and then press the  key.
- By pressing **at the same time** the two keys  and , the Main Menu is recalled and the selected menu item won't be changed.

3.2.8.4 Flow chart






The flow chart of the menu is organized as follows.

MENU FLOW CHART






3.2.8.5 Upper line Menu (parameter selection)

As over stated, the upper line normally shows the RF Output Power. To show another parameter:






- 1 Make sure that the asterisk * is on the upper line (or move it with the  and  keys)
- 2 Press the  key in order to access the parameter list.
- 3 With the  and  keys, scroll the available parameters as per the following table:

Parameter	Description
Dir. Pow.	RF output power (in W)
Ref. Pow.	Reflected power (in W)
PA.Volt.	RF power amplifier supply voltage (in V)
PA.Curr.	RF power amplifier drained current (in A)
RF.Temp	RF power amplifier temperature (in °C)
PS.Temp	Power Supply temperature (in °C)
Time	Current time (hours, minutes and seconds)
Date	Current date (in MM/DD/YY format)
Exit	It's obviously not a parameter, but a command to exit the menu without changing the current parameter.


- 4 Press the  and  keys in order to move the asterisk * to the line which shows the new parameter to be selected (or to **Exit** in case you want to keep the current parameter).
- 5 Press the  key in order to select the new needed measurement (or escape the list in case you selected **Exit**)

3.2.8.6 Lower line Menu (seeing event log and settings)

As over stated, the lower line shows the amplifier status and can't be changed, however this selects a Menu which allows to read the **Event log** as well as to read/change some settings. To access to this menu:

- 1 Make sure that the asterisk * is on the **lower** line (or move it with the  and  keys)
- 2 Press the  key to access the menu.
- 3 With the  and  keys, you can select three submenus:





Submenu	Description
Event Log	Allows to see the event log
Display	Allow to see in one screen shot all the settings described at 3.2.8.6.2
Setting	Allow to change each of the various available settings (access protected by a 3igits password)
Local/Remote	Setting of the operational mode
Exit	It's obviously not a submenu, but a command to come back to the main menu.

- 4 Press the  key in order to select the new needed submenu (or escape the submenus in case you selected **Exit**)



3.2.8.6.1 “Event Log” submenu

- 1 After entering in this submenu you will see the last event as per the following example

	Display	Description
First line	Normal 67	Event name followed by its order number
Second line	12:56 09/06/00	Time and date in which the event happened

- 2 The  and  keys you can scroll the various events. The  key moves to the lower order numbers, while the  key moves to the higher ones. The following list states the various events you could see and their description

Event	Description
Normal	Normal working condition
Vaux Fail	Auxiliary supply voltage failure
PA Overheat	RF power amplifier temperature was too high
PA Unbalance	The four stages of the RF power amplifier were unbalanced
PS Overheat	Power supply temperature was too high
PS Overload	The current required to the power supply was too high
Exc. SWR	Reflected power (SWR) was too high
Power-On	Start up condition
Stand-By Al	Automatic stand-by caused by an alarm
Stand-By Rem	Manual stand-by was performed
-3dB Warning ON	The amplifier automatically reduced its RF output power down to the half (-3dB) because the temperature was too high
-3dB Cmd ON	-3dB manual command was enabled
-3dB Off	-3dB manual command was disabled

- 3 You can see up to 99 events which are stored in FIFO (First in First Out) and divided into two 50-events blocks. As soon as the event 100 happens, the older 50-event bloc is automatically canceled in order to make room for other future 49 events.
- 4 The  key pressed from any event allows to escape the event list and come back to the Event Log screen shot. If there aren't stored events (or the reset has just been performed), the  key has no effect.

3.2.8.6.2 “Display” submenu

The submenu Display allows to see in one screen shot all the settings which will be described in the next paragraph. After entering in this submenu you will simply see them in short format as per the following example:

Display	
First line	-3dB Off 232Rear
Second line	Warn On C 8 R24

This is a brief description of the related meanings:

- The caption **-3dB Off** means that the amplifier is working at the full rated power (1KW).
- **232Rear** means that the rear RS232 connector is enabled (the front connector is therefore disabled)
- **Warn On** means that in case of RF power unit overheating the power will be automatically reduced to the half (250W)
- The caption **C 8** inside the machine there is a counter which counts the eventual failures (e.g. overheating, excessive SWR etc.). After 8 failures the amplifier will be switched in stand-by mode
- **R24** means that the counting of the failure counter is reset each 24 hours






The detailed description of all these setting is stated in the next paragraph, in which is explained how to change such these settings and other ones.









3.2.8.6.3 “Setting” submenu

The submenu Setting allows to change each of the various available settings. Part of them can be seen in one screen shot as described in the previous paragraph. This submenu is protected by a 3-digits password which is stated in the red **Code Card** label attached to the amplifier. The password can be uninhabited by an internal jumper (plased on the general control board).

- 1 After entering in this submenu you will be prompted to enter the password

Display	
First line	Password:
Second line	00 . 00 . 00

- 2 The cursor will be already positioned on the 1st digit and set to 1. By means of the  and  keys you can increase or decrease that figure
- 3 Press the  key to enter the 1st digit
- 4 Repeat steps b) and c) for the other two digits of the password
- 5 If the password will be correct, the display screenshot will be recalled, however, by repeatedly pressing the  and  keys, the settings will be available as well according to the following table:

Setting	Description	Available settings/Notes
Display	Same submenu explained in the dedicated paragraph	A quick visualization of the settings which is automatically recalled after a setting has been changed
Reset Mode	Defines if the failure counter should be regularly reset and the reset time.	R24 - every 24hours Ron - At Power on Rne - never Exit - exit without affecting the preset value
Warning	If this warning feature is set to on, the amplifier automatically reduces its power down to 1000W (-3dB) in case of overheating (10 °C below the critical temperature)	Warn on - warning feature is on Warn off - warning feature is off Exit - exit without affecting the preset value
-3dB	Manual reduction of the RF output power to the half (-3dB)	-3dB on - half power (500W) -3dB off - full power (1000W) Exit - exit without affecting the preset value
Failure Counter	Defines the number of faults which the failure counter must count before switching the amplifier into stand-by condition	C_8 - stand-by after 8 faults C_16 - stand-by after 16 faults Exit - exit without affecting the preset value
Time Set	Allows to set the internal clock	Use the  and  keys to increase/decrease each figure and press the  key to enter. In the minutes/time setting, figures can be increased/decreased at 10 digits steps by keeping either the  and  keys held pressed
Date Set	Allows to set the internal calendar (in MM/DD/YY format)	Use the  and  keys to increase/decrease each figure and press the  key to enter.
RS232 Switch	Switches the RS232 connection between the rear and the front connector	232Rear - rear RS232 connector 232Front - front RS232 connector Exit - exit without affecting the preset value
AI.Mem Reset	Manual reset of the event log and failure counter. It also escape the Setting menu leading back to the Main menu	
Language	Selects the needed language for the LCD messages among the available languages	English is the default. The number of the available languages depend on the version
Address	Allows to set up the address of the RS485 connector	Leads to Set Address screen shot
Exit	Escapes the setting menu and restore the Main menu	

3.2.9 SERVICE

3.2.9.1 General information and warnings

CAUTION: Only qualified and authorized engineers are allowed to perform the following service operations

CAUTION: The amplifier may only be removed from the rack (rackmount) or opened and module disassembled and assembled while no voltage has been applied. Before performing any operation be sure that the AC plug is disconnected, the power switch is in OFF position and wait few minutes in order to allow the internal capacitor to discharge

CAUTION: After any disassembling/removing/replacing operation, is meant that to restore the original conditions the described operations must be carried out in the opposite order unless otherwise specified

CAUTION: The normal operation of the amplifier can restored only if all the parts are assembled and connected

3.2.9.2 Adjustments

This a description related of each adjustment trimmer available in the amplifier ordered per unit

3.2.9.2.1 PCB S3110A .02 RF Power Amplifier Unit

Adjustment	Test point/function	Value
RV3	adjusts the gate voltage of Q3	2.3V
RV4	adjusts the gate voltage of Q4	2.3V
RV3	adjusts the gate voltage of Q3	2.3V
RV4	adjusts the gate voltage of Q4	2.3V

Adjustments of PCB S3110A.02 RF Power Amplifier Unit

3.2.9.2.2 PCB K3123A02 RF module control

Adjustment	Test point/function	Value
RV1	adjusts the protection against excessive SWR	200W
RV2	adjusts the unbalance protection of the power FETs BLF278 Q1-Q2	400W
RV3	adjusts the unbalance protection of the power FETs BLF278 Q3-Q4	400W
RV4	adjusts the unbalance protection of the power FETs BLF278 Q1-Q4	200W
RV5	adjusts the measurement of temperature "RF TEMP" read on the LCD display	

Adjustments of PCB K3123A02 RF module control

3.2.9.2.3 PCB S3115D02– General controller

Adjustment	Test point/function	Value
RV1	RV1 adjusts the measurement of voltage PA.Volt. read on the LCD display (see 3.2.8.4)	
RV2	adjusts the total protection against excessive SWR	100W
RV3	adjusts the measurement against excessive current PA.Curr. read on the LCD display (see 3.2.8.4)	
RV4	adjusts the measurement of reflected RF power Ref. Pow. read on the LCD display (see 3.2.8.4)	
RV5	adjusts the RF output power in ALC condition	1000W
RV6	adjusts the measurement of direct RF power Dir. Pow. read on the LCD display (see 3.2.8.4)	
RV7	adjusts the -3dB output power	500W

Adjustments of PCB S3115D02 – General controller

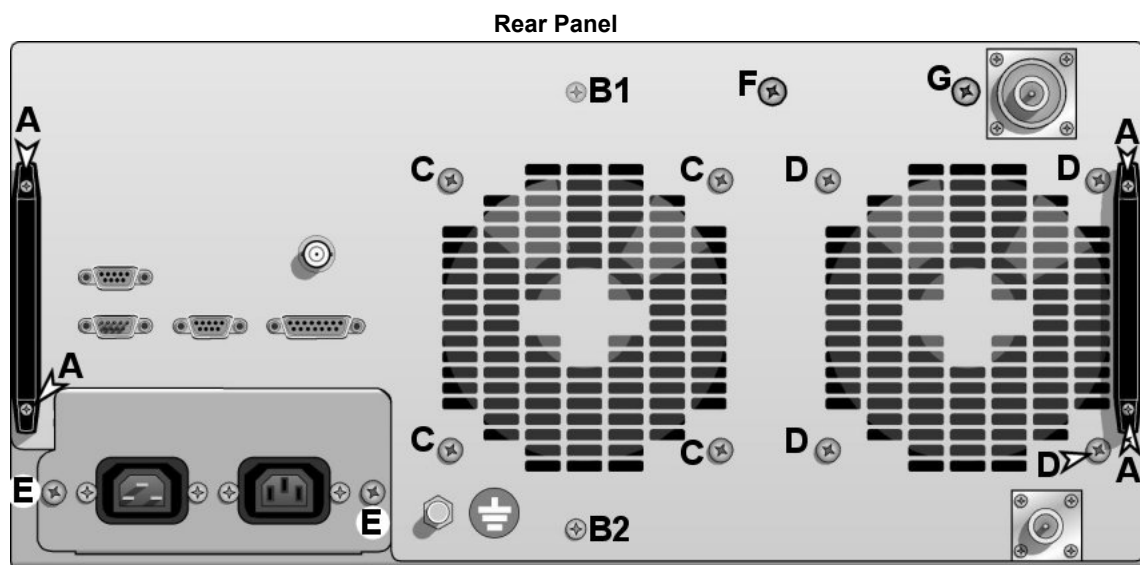
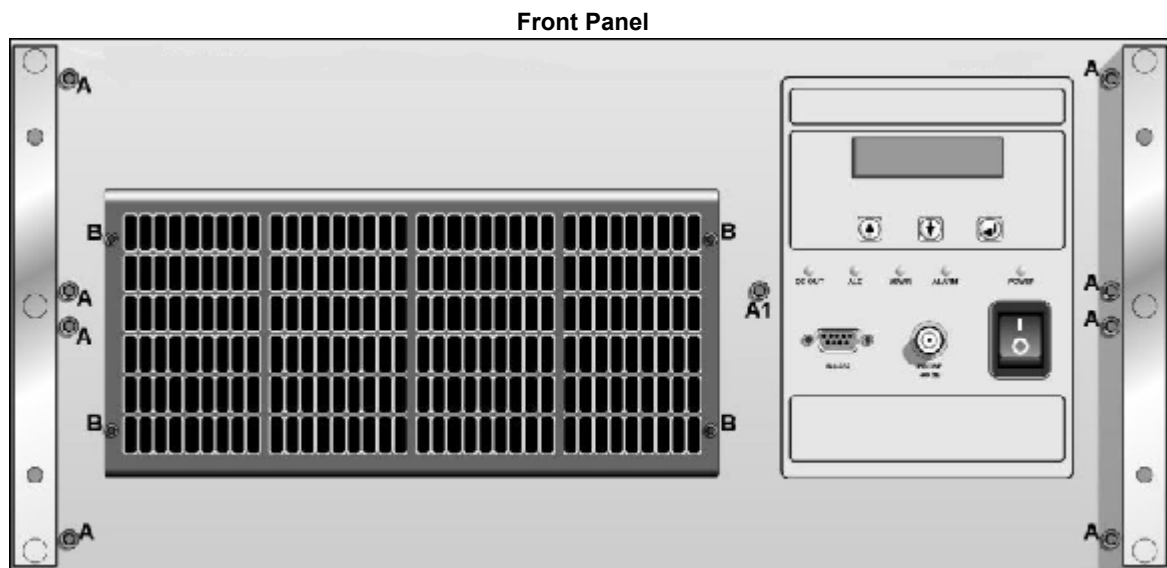
3.2.9.2.4 PCB K3113C.01 - Power Supply Unit

Adjustment	Test point/function	Value
RV1	adjusts the power supply voltage	48V
RV2	adjusts the maximum current for the protection	50A @ 48V
RV3	adjusts the protection against over load	40A @ 48V
RV4	adjusts the temperature measurement PS.Temp. read on the LCD display (see 3.2.8.4)	

Adjustments of PCB K3113C.01 - Power Supply Unit

3.3 OPENING THE TRANSMITTER

Make reference to the following pictures:



- 1 Removing the top cover - Unscrew the nine screws which fix the top cover in place
- 2 Removing the bottom cover - Unscrew the ten screws which fix the bottom cover in place
- 3 Dismounting fans
 - Use an allen key to remove the four exagonal screws which hold the handles (2 screws each handle, marked **A**) to the rear panel.
 - Use an allen key to remove the hexagonal securing screws (marked **B1** and **B2**) placed over and below the left fan (marked on the rear external panel with a circle): the rear external panel will be free to be tilted.
 - Remove fan cables from the Power Supply board.
 - Remove the rear panel together with the two fans
 - Unscrew the four cross-head screws which lock the fan(s) on the panel (marked **C** and/or **D**)
 - Replace the fan(s) and the related vent filter(s) as described in the manual

CAUTION 1

At step 2. the rear external panel can just be tilted, not removed. Take care about all the internal wires.

CAUTION 2

The missing regular filter replacement or cleaning will activate the thermal protection.

4 Dismounting vent filter(s)

- Use an allen key to remove the four exagonal screws which hold the vent grid located on the front panel (marked with **B**)
- Replace the filter or clean it by means of a air compressor.

5 Replacing mains AC fuses

- Remove the two cross-head screws marked with **E** which hold the AC Mains Filter Unit to the rear panel (don't remove the four screws which hold the two AC connectors to the filter)
- Slightly extract the AC Main Filter Unit from the rear panel (it's not necessary to remove it) in order to access the two fuses
- Replace the fuse F1 (mains AC power) and/or the fuse F2 (auxiliary 2A switched output) according to their condition.

6 Removing the AC Mains Filter Unit

- Remove the two cross-head screws marked with **E** which hold the AC Mains Filter Unit to the rear panel (don't remove the four screws which hold the two AC connectors to the filter)
- Carefully extract the AC Main Filter Unit from the rear panel in order to access the two connectors
- Carefully unplug the two connectors
- Remove the AC Mains Filter Unit

7 Removing the Controller Unit

- Remove the top cover as over stated
- Locate the Controller Unit and carefully unplug all its connectors
- Unscrew the four screws which seats the PCB to the chassis
- Remove the Controller Unit board

8 Dismounting the front LCD Display Unit

- Remove the top cover as over stated
- Carefully unplug the two flat cables
- Unscrew the two exagonal nuts which hold the two LCD display PCBs to the panel
- Remove the two PCBs together

9 Dismounting the AC Mains Power Switch

- Remove the top cover as over stated
- Take down note the connection of the four colored wires (brown, blue + 2 gray wires) and unplug their Faston-type connectors from the switch
- Press the two tabs inward which fix the switch to the front panel and keep them pressed
- Press the switch toward the front panel and remove it

CAUTION 3

When restoring/replacing the new switch take care to observe the wiring connections as noted at step 2.

10 Removing the RF Board Unit

- Remove the top and the bottom covers as over stated
- Before going on, please remove the cover of the RF Board Unit (accessible from the top) by unscrewing all its screws (this operation is mandatory, otherwise the RF Unit can't be extracted).
- Remove the nine screws near the front handles marked with **A**
- Remove the screw located in the center of the front panel between the vent grid and the control panel (marked with **A1**): the front panel will be free
- Remove the front panel: only the main chassis with Display Unit and Keyboard will be left in the front of the VHF amplifier
- Remove the internal N-type male connector from the female-to-female pass-through transition fixed on the rear panel which makes the RF IN connector.
- Remove the side power supply connector (the one with four red wires), the side flat cable coming from the Control Unit as well as the 4 wires connector coming from the RF Filter Unit.
- Unscrew the six exagonal side screws which hold the RF Unit in place. Please note that the central inner screw fixes the power supply voltage negative wire.
- Loose the only the upper screw located on the rear panel marked with **B1** (it's not necessary to loose the lower screw marked with **B2**).
- Loose the two big pass-through screws located on the rear panel (marked **F** and **G**). Just loose them (not remove), otherwise the RF filter can fall down.
- Unscrew the N-type connector between the RF Unit and the RF Filter Unit
- Carefully extract the RF Unit toward the front taking care not to damage the RF input cable.

CAUTION 4

To restore the RF Board Unit in place, strictly follow the dedicated paragraph. Do not carry on the over stated steps in the opposite order

11 Removing the RF Filter Unit

- Perform the over stated steps to remove the RF Board Unit, apart the last step.
- Slightly extract the RF unit toward the front just for 10 centimeters approx. in order to access the RF filter unit
- Completely remove the hexagonal screw **B1** and two big pass-through screws **F** and **G** described at steps 9. and 10. in the previous paragraph
- Remove the RF angle connector which feeds the -60dB measure signal from the RF filter unit to the front panel
- Remove the RF Filter Unit
- To open the RF Filter Unit, simply unscrew the twelve screws which fix its cover

Should you just need to perform a control of the RF Filter board, you can just unscrew the screws stated at step 6. without removing the filter

12 Restoring the RF Board Unit

- Insert the RF Board unit in the slot of the front panel and locate it at the middle position (approx.)
- Track the RF input cable inside in a path between the two fans and carefully move it to the left toward the female-to-female N-type pass-through transition fixed on the rear panel to which it should be connected
- Carefully slide the module toward the RF Filter Unit and slightly start to screw its N connector just to "hook" it on the RF Filter's one
- Push the RF Board Unit completely onto the RF Filter Unit
- Screw completely the three screws which fix the filter to the rear panel and check that the RF Filter is perfectly and steadily fixed
- Screw perfectly the N connector in order to ensure the perfect RF connection between RF Board Unit and the RF Filter
- Screw the six side hexagonal screws described at step 8. of 0 ensuring that the central inner screw perfectly fixes the power supply voltage negative wire
- Perform in reverse order the steps from 2. to 7. described in 0

13 Removing the Power Supply board

- Remove the bottom cover as over stated
- Unplug the connectors which connects the two fans, the negative and positive power supply voltage, the Control Unit (flat cable) and the AC mains supply (six connectors in total)
- Unscrew the nine screws which seat the Power Supply board in the VHF amplifier
- Replacing the Lexan Keypad/LED Unit
- Unscrew the eight screws near the front handles
- Unscrew the screw located in the center of the front panel between the air vent and the control panel
- Remove the front panel (only the main chassis with display and control panel will be left in the front of the VHF amplifier)
- Unplug the flat connector which connects the Lexan Keypad/LED Unit with the LCD Display Unit
- Remove the AC Mains Power Switch as described in □
- Remove the BNC connector from the front panel (it feeds the -60dB measure signal from the RF filter unit to the front panel)
- Remove the female-to-female pass-through BNC transition from the front panel by unscrewing the related nut
- Carefully remove the Lexan Keypad/LED Unit (it is jammed onto the front panel by means of its adhesive tape)
- Perfectly clean the surface where the old Lexan Keypad/LED Unit was jammed in order to ensure a perfect adherence of the new one
- Peel off the protection film from the new Lexan Keypad/LED Unit
- Stick the new Lexan Keypad/LED Unit onto the front panel making reference on the three holes for the BCN transition, the RS232 connector as well as the AC Mains Power Switch

3.4 RESTRICTIONS FOR FM BROADCASTING TX 1000 PLUS

ENGLISH

COUNTRY	FM Broadcasting introduced	Deviations from ERC Decisions and other comments
AUSTRIA	Yes	Individual licence is required
BELGIUM	Yes	Individual licence is required
DENMARK	Yes	Individual licence is required
FINLAND	Yes	Individual licence is required
FRANCE	Yes	Individual licence is required
GERMANY	Yes	Individual licence is required
GREECE	Yes	Individual licence is required
IRELAND	Yes	Individual licence is required
ITALY	Yes	Individual licence is required
LUXEMBOURG	Yes	Individual licence is required
NETHERLANDS	Yes	Individual licence is required
NORWAY	Yes	Individual licence is required
PORTUGAL	Yes	Individual licence is required
SPAIN	Yes	Individual licence is required
SWEDEN	Yes	Individual licence is required
SWITZERLAND	Yes	Individual licence is required
UNITED KINGDOM	Yes	Individual licence is required

ITALIAN

STATO	Introduzione FM Broadcasting	Restrizioni all'uso
AUSTRIA	Si	Richiesta la licenza individuale
BELGIO	Si	Richiesta la licenza individuale
DANIMARCA	Si	Richiesta la licenza individuale
FINLANDIA	Si	Richiesta la licenza individuale
FRANCIA	Si	Richiesta la licenza individuale
GERMANIA	Si	Richiesta la licenza individuale
GRECIA	Si	Richiesta la licenza individuale
IRLANDA	Si	Richiesta la licenza individuale
ITALIA	Si	Richiesta la licenza individuale
LUSSEMBURGO	Si	Richiesta la licenza individuale
NORVEGIA	Si	Richiesta la licenza individuale
OLANDA	Si	Richiesta la licenza individuale
PORTOGALLO	Si	Richiesta la licenza individuale
REGNO UNITO	Si	Richiesta la licenza individuale
SPAGNA	Si	Richiesta la licenza individuale
SVEZIA	Si	Richiesta la licenza individuale
SVIZZERA	Si	Richiesta la licenza individuale

FRANCE

PAYS	FM Broadcasting présentè	Correction de la directive ERC et autre commentaires
ALLEMAGNE	Oui	Licence individuelle demandée
ANGLETERRE	Oui	Licence individuelle demandée
AUTRICHE	Oui	Licence individuelle demandée
BELGIQUE	Oui	Licence individuelle demandée
DANEMARK	Oui	Licence individuelle demandée
ESPAGNE	Oui	Licence individuelle demandée
FINLANDE	Oui	Licence individuelle demandée
FRANCE	Oui	Licence individuelle demandée
GRECE	Oui	Licence individuelle demandée
IRLANDE	Oui	Licence individuelle demandée
ITALIE	Oui	Licence individuelle demandée
LUXEMBOURG	Oui	Licence individuelle demandée
NORVEGE	Oui	Licence individuelle demandée
PAY-BAS	Oui	Licence individuelle demandée
PORTUGAL	Oui	Licence individuelle demandée
SUEDE	Oui	Licence individuelle demandée
SUISSE	Oui	Licence individuelle demandée

ESPANIOL

PAIS	FM Broadcasting introducida	Restricciones al uso y otros comentarios
ALEMANIA	Si	Requiere licencia individual
AUSTRIA	Si	Requiere licencia individual
BÉLGICA	Si	Requiere licencia individual
DINAMARCA	Si	Requiere licencia individual
ESPAÑA	Si	Requiere licencia individual
FINLANDIA	Si	Requiere licencia individual
FRANCIA	Si	Requiere licencia individual
GRAN BRETAÑA	Si	Requiere licencia individual
GRECIA	Si	Requiere licencia individual
HOLANDA	Si	Requiere licencia individual
IRLANDA	Si	Requiere licencia individual
ITALIA	Si	Requiere licencia individual
LUXEMBURGO	Si	Requiere licencia individual
NORUEGA	Si	Requiere licencia individual
PORTUGAL	Si	Requiere licencia individual
SUECIA	Si	Requiere licencia individual
SUIZA	Si	Requiere licencia individual

GERMAN

LAND	FM Broadcasting eingeführt	Abweichungen von ERC Vorschriften und Kommentare
BELGIEN	Ja	Individuelle Lizenz erforderlich
DÄNEMARK	Ja	Individuelle Lizenz erforderlich
DEUTSCHLAND	Ja	Individuelle Lizenz erforderlich
FINNLAND	Ja	Individuelle Lizenz erforderlich
FRANKREICH	Ja	Individuelle Lizenz erforderlich
GRIECHENLAND	Ja	Individuelle Lizenz erforderlich
GROBBRITANNIEN	Ja	Individuelle Lizenz erforderlich
IRLAND	Ja	Individuelle Lizenz erforderlich
ITALIEN	Ja	Individuelle Lizenz erforderlich
LUXEMBURG	Ja	Individuelle Lizenz erforderlich
NIEDERLANDE	Ja	Individuelle Lizenz erforderlich
NORWEGEN	Ja	Individuelle Lizenz erforderlich
ÖSTERREICH	Ja	Individuelle Lizenz erforderlich
PORTUGAL	Ja	Individuelle Lizenz erforderlich
SPANIEN	Ja	Individuelle Lizenz erforderlich
SCHWEDEN	Ja	Individuelle Lizenz erforderlich
SCHWEIZ	Ja	Individuelle Lizenz erforderlich

LATIN AMERICANO

PAÍS	FM Broadcasting introduzido	Desvios estabelecidos pelo ERC e outras notas
ALEMANHA	Sim	Exigida licença individual
AUSTRIA	Sim	Exigida licença individual
BÉLGICA	Sim	Exigida licença individual
DINAMARCA	Sim	Exigida licença individual
ESPAÑA	Sim	Exigida licença individual
FINLÂNDIA	Sim	Exigida licença individual
FRANÇA	Sim	Exigida licença individual
GRÉCIA	Sim	Exigida licença individual
HOLANDA	Sim	Exigida licença individual
IRLANDA	Sim	Exigida licença individual
ITALIA	Sim	Exigida licença individual
LUXEMBURGO	Sim	Exigida licença individual
NORUEGA	Sim	Exigida licença individual
PORTUGAL	Sim	Exigida licença individual
REINO UNIDO	Sim	Exigida licença individual
SUÉCIA	Sim	Exigida licença individual
SUÍÇA	Sim	Exigida licença individual