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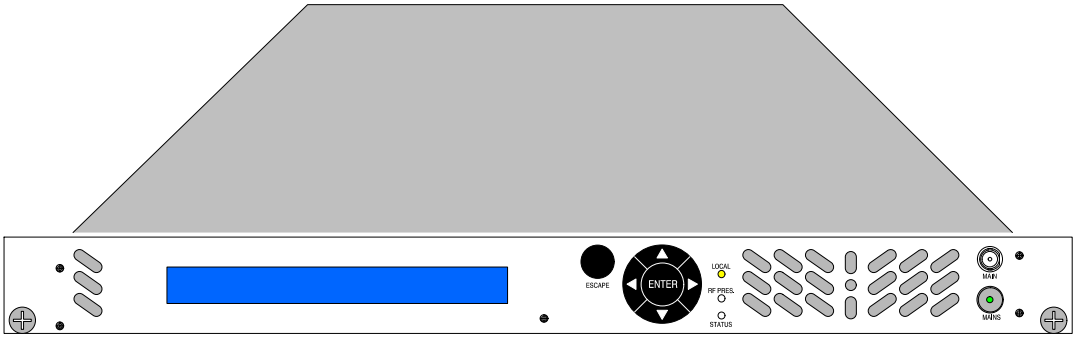

FEX2S25-A FM MODULATOR 25W

Technical Manual

Rev.	Date	Code	Title	Page
A F	21/04/2010 27/05/2013	5450202501	FEX 2S25-A *FM Modulator*	1 | 50

CE

Restrictions:

The use of this equipment is only under authority licence.

Note for countries submitted to 1999/05/EC directive:

This equipment can be operated in the following countries:

AT	DE	MT	GB
BE	GR	NL	IS
CY	HU	PL	LI
CZ	IE	PT	NO
DK	IT	SK	CH
EE	LV	SI	BG
FI	LT	ES	RO
FR	LU	SE	TR

As option the equipment may be provided with telemetering connectors for PTSN, ADSL, or GSM networks

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“ETHERNET INTERFACE” INSTALLATION GUIDE

5. CIRCUIT DIAGRAMS

FOREWORD (how to consult the manual)

1 MANUAL ORGANIZATION

The manual is composed of the following sections:

- section 1 "*Operator's Manual*" . . including general information, installation guide, operating instructions, maintenance and circuit diagrams (wiring diagram of the equipment, other circuit diagrams associated to units, sub-units or boards without "*Technical Manual*");
- section 2 "*Technical Manual*" . . . dealing with units and sub-units which make up the equipment along with the associated circuit diagrams.

2 PARTS LIST

The parts list of equipment, units, sub-units is delivered as an Excel file (Microsoft Excel 97 & 5.0/95). The search of a specific part of the equipment is achieved using "*Automatic filter*" from "*Data*" menu. The parts list is composed by 6 columns as follows:

- the 1st column "LEV" (level) is the level of the part within the equipment;
- the 2nd column "PROG" (progressive) is the progressive number of each part (keep in mind that two or more identical parts are identified by the same progressive number);
- the 3rd column "PARENT" is the code of the part at the upper level;
- the 4th column "COMPONENT" is the code of the part;
- the 5th column "DESCRIPTION" is the description of the part;
- the 6th column "REF" (reference) is the reference note of the part with which it is referred to on the circuit diagram of column 3 "PARENT".

An "ABBRV_PL" file, lists the abbreviations used in "DESCRIPTION" column of the parts list file. For opening "ABBRV_PL" file:

1. close "*homepage.pdf*" file which automatically starts upon CD manual insertion in the PC driver;
2. click on "My Computer" icon to access its contents;
3 .click on "Compact Disc (D:)" icon to access it;
4 .the window opened shows files and folders included on CD: open "ABBRV_PL" file to access it.

3 CIRCUIT DIAGRAMS (*how to consult them*)

3.1 Acronyms

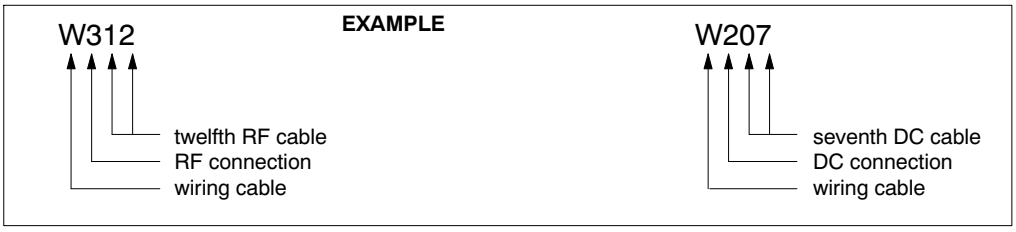
Circuit diagrams are identified by acronyms after the drawing number (i.e.: 6300621005**ID**). A list of the acronyms used is given here below:

acronym	***explanation***	***acronym***	***explanation***
SI	general wiring diagram *(for 9 digits codes)*	ST	component layout *(for 9 digits codes)*
ID	general wiring diagram *(for 10 digits codes)*	CL	component layout *(for 10 digits codes)*
SE	circuit diagram *(for 9 digits codes)*	SD	general wiring diagram for interlock chain
ED	circuit diagram *(for 10 digits codes)*		

3.2 Classification of wiring cables

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

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



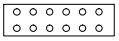
FOREWORD (how to consult the manual)

3.3 Connection of wiring cables

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

3.4 Symbols and identifications of connectors/terminal blocks

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

symbol	*objetc*
	male connector identified by “Jx”
	female connector identified by “Jx”
	terminal block identified by “Kx”
	coaxial cable identified by “Wx”

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

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

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

4 SAFETY INFORMATION

4.1. Introduction

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

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

4.2. Warning, Cautions and Notes

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

WARNING!

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

CAUTION!

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

NOTE!

Used to highlight important information or procedures.

TIP

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

FOREWORD (how to consult the manual)

4.3. Hazard symbols

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

Warning

Shock hazard

Danger of getting crushed when working with loads.

Danger of falling off ladders while working

Danger when lifting heavy loads.

Danger of getting hands crushed when working.

Danger of burns on contact with hot surfaces.

4.4. Beryllia devices

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

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

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

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1. *GENERAL INFORMATION*

LIST OF ILLUSTRATIONS

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1. GENERAL INFORMATION

1.1 INTRODUCTION

1.1.1 Manual Applicability

This manual provides system-oriented information, procedures and data for operation and installation of the following units:

- FEX 2S25-A *FM Modulator 25W* . . . . . p/n. 5450202501

From here on for the sake of simplicity, throughout this manual FEX 2S25-A *FM Exciter 25W* will be referred to as FEX.

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

- Chapter 1 : General Information

- Chapter 2 : Operating Instructions

1.1.2 General information

FEX is the State-of-The-Art FM Exciter capable of modulation by means of fully digital signal processing. A wise use of the latest technologies and innovative and downsizing design of the cards, in particular the innovative single chip MODULATOR, have enabled us to reduce significantly the overall dimensions of the exciter. The integration of the digital and RF stages in a single rack simplifies and improves the equipment.

Using FEX is very simple: a keyboard and an LCD display, available to the operator on unit front panel, allow easy operation, settings and monitoring. Moreover FEX may be remotely controlled by using web browser, ESS or SNMP.

With reference to Fig. 1.1 and Fig. 1.2, FEX may be divided into the following functional area:

- *digital modulator* . . . . . including the digital modulator circuitry (on a single assembly) which is able to perform the modulation compliant with the transmission standard. It also includes an analog band pass filter which filters the spurious signals generated by DAC.
  The digital modulator board also includes the *control section* (not represented on Fig. 1.1) which allows commands, configuration setting and paramenters monitoring of the unit.
- *RF section* . . . . . including the RF amplifiers stages and an *FM Filter*. The RF stages are able to deliver up to 25W.
- *pwr supp. section* . . . . including two *AC/DC Converters* and a *Power Distribution* board- which supply all the circuits and assemblies of the unit.
- *remote interface* . . . . . is a board allowing the remote control of the unit via parallel interface. The remote control is allowed by means of *on/off* levels, managed by relay line.

  The unit may be also remote controlled via *web server* over HTTP, TFTP, SNMP, Telnet protocols.

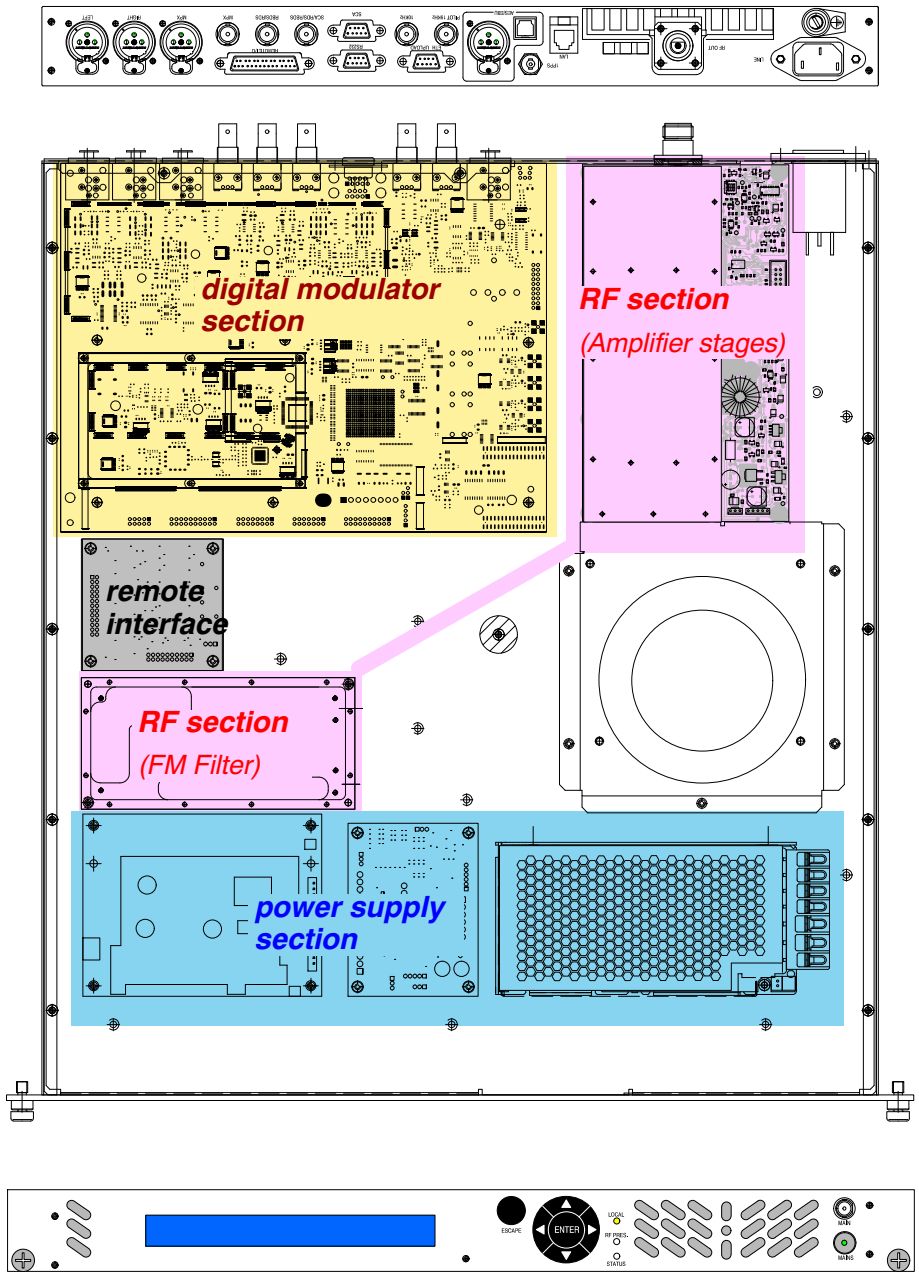

Fig. 1.1 - *FEX* functional areas

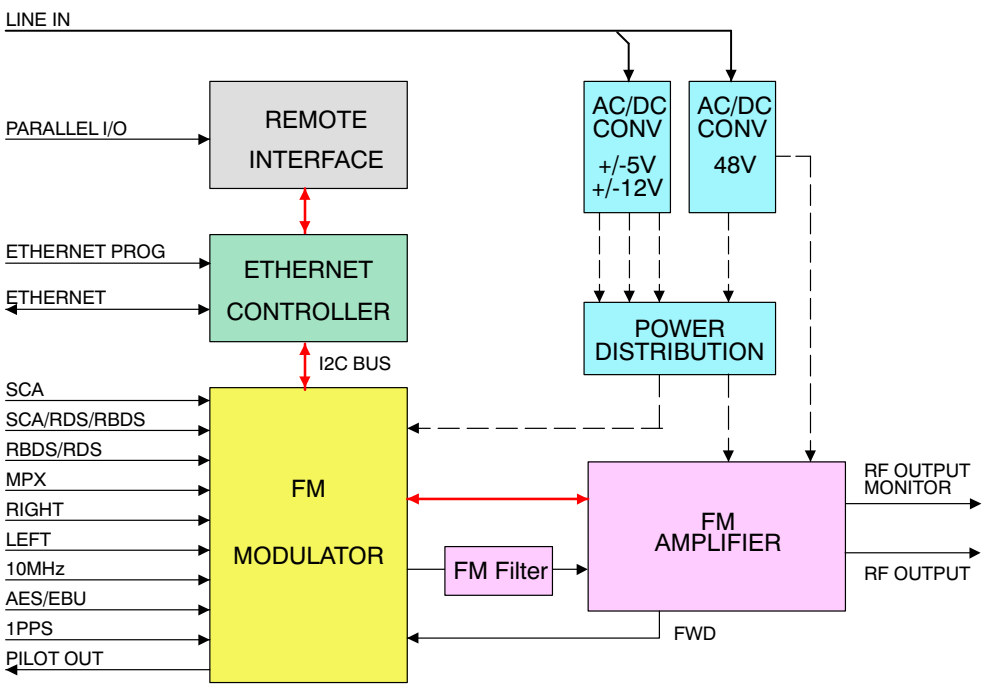

Fig. 1.2 - *FEX* general bklock diagram

1.2 FUNCTIONAL DESCRIPTION

1.2.1 Digital Modulator section

The modulator is able to handle *analog* and *digital* inputs as follows:

- right and left analog inputs;
- wide band analog input (MPX);
- AES/EBU data digital input (electrical and optical);
- input for SCA 1 signal (internally generated);
- input for SCA 2 signal (internally generated);
- input for RBDS/RDS signal (externally generated);
- wide band input for SCA/RBDS/RDS signal (externally generated).

The digital modulator performs the stereo encoding starting from the analog signals on *right* and *left* input connectors or, as alternative, starting from AES/EBU digital input.
The board performs the digital modulation and encoding with a FPGA BGA including the local control system carried out through a processor. A single *clock* is used; all operations of FPGA are carried out in a synchronous way with the *clock signal.* When different *clock* signals are required inside FPGA, they are generated by DCM internal to FPGA itself.
The modulator is endowed with a 10MHz TCXO (***T****hermally* ***C****ontrolled (****X****)Crystal* ***O****scillator*) delivering the frequency reference for *clock* signals.
The local control system manages all functions of the modulator and, in addition, store any alarm condition which may occur. The functioning parameter will be set by the operator via keybord and display (on exciter front panel) of the *controller* which, in turn, sends them through I^2C bus, to local control system.
Any alarm condition is detected by the local control system and sent to *controller* to be dispalyed; the system is able to get alarm events of any duration.
it is possible to choose a *main* and a *secondary* input. If the *main* input is lost the exciter switch on the *secondary* input after an adjustable *change-over delay*. When the *main* input return, the modulator switches again to the *main* input after an adjustable *restore delay*, only if the "INPUT AUTO RESTORE" function is enabled (see *Chap. 2 - para. 2.7 "Menu and Contents"*).

ADC CONVERTERS
Five ***A****naolog to* ***D****igital* ***C****onverters* are present:

- 24 bit audio converter for left and right channel (sampling frequency 48kHz);
- 16 bit MPX converter (sampling frequency greater than 200kHz);
- 24 bit SCA converter (sampling frequency 48kHz);
- 16 bit RBDS/RDS converter (sampling frequency greater than 200kHz);
- 16 bit SCA/RBDS/RDS converter (sampling frequency greater than 200kHz).

The input signal is oversampled in order to avoid anti-aliasing phenomena.

LOW PASS FILTERS
The filters are present at the inputs available before ADC devices in order to avoid *anti-alis - ing* phenomena; their cut-off frequency is set according to the sampling frequency of the converters.

GAIN
They adjust the amplitude of the audio input signals so to have the right level requested for the correct functioning of the modulator.

PRE-EMPHASIS
A numerical filtering is carried out which performs the *pre-emphasis* according to a table stored on FPGA.

SOFT/HARD LIMITER
It carries out a limitation on the frequency deviation and may be *hard* type (clean clipping of the signal) or *soft* type (gain decreasing of the inputs causing the problem before an over--modulation occurs).

STEREO ENCODER
Starting from *right* (R) and *left* (L) input audio signals, it generates:

- a *sum signal* or *auxiliary stereophonic signal* M = (L+R)/2; this signal is used by monophonic receivers;
- a *difference signal* or *monophonic signal* S = (L-R)/2; this signal, used along with M signal, allows the stereophonic receivers to rebuilt L and R signals.

FM MODULATOR

FM Modulator uses the obtained signal in base band for modulating the carrier of RF channel chosen. The carrier frequency is digitally generated by a 32 bits programmable NCO. The carrier frequency is set by the operator via keybord and display (on exciter front panel) of the *controller*.

BAND PASS FILTER

It filters the spurious signals generated by DAC. The filter is able to self-tune on the channel frequency.

VCA

Voltage Controlled Amplifier amplifies the signal outgoing from DAC with a variable gain according to the wanted RF output power. The gain may be both manually and automatically controlled: with automatic gain control (AGC) the RF output power is kept at a constant value.

POWER METER

It measures the Rf output power of the exciter in order to carry out the AGC function.

SOFT PROCESSOR

It carries out the local control of the system and communicates with exciter *controller* via I^2C bus.

CONTROL SECTION

FEX exciter allows commands, configuration and parameters monitoring. An ESS (***E****lectrosys* ***S****upervisory* ***S****ystem*) software allows the remote control and monitoring of the exciter by means of a proprietary Electrosys protocol or HTTP (Web Server) and SNMP protocols. Moreover the ESS supports also TFTP and Telnet protocols for services operations, including the remote firmware upgrade of all the exciter digital parts. in this way any adjustment, due to standard specification changes or specific customer requirements, can be accomplished without replacing any part, from a remote position.

The complete control of the exciter is achieved with a keyboard and a frontal display.

1.2.2 RF Section

The power amplifier generates up to 25W appropriate for subsequent high power RF amplification. It is made up by a *pre-driver* stage, a *driver* stage and a *final* stage.

An attenuator stage is present on RF input before the amplifiers stages: *pre-driver* , *driver* and *fianal*. Both *pre-driver* stage and *driver* stage, are amde to work in class “A” with a gain of 12dB; *final* stage works in class “B” with a gain of 20dB.

A low-pass filter (LC type with a 110MHz cut-off frequency) is present at *final* stage output. The dierctional coupler picks-up, through a detector circuit, two samples of voltage which are proportional to the forward and reflected output power: the forward power sample is used for monitor and AGC purposes while the reflecetd power sample is routed to a *control circuitry* which performs the control of the amplifier functioning.

The *control circuitry* gets also the information about temperature and current absorption of *fianl* stage, in case of dangerous conditions it switches the RF input on a dummy load (5Ω/25W).

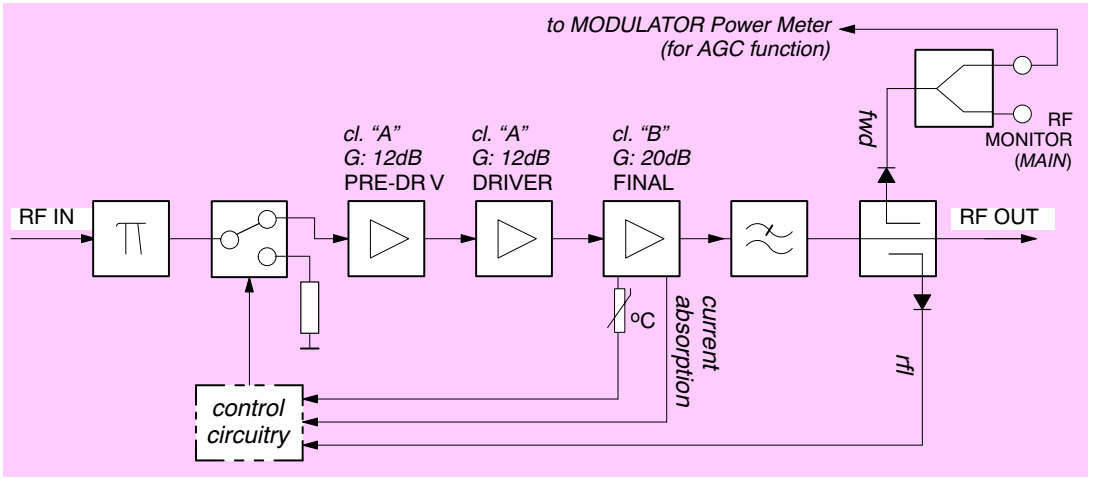

Fig. 1.3 - *RF section* Block diagram

1.2.3 Power Supply Section

The power supply section is made up by two AC/DC converters supplying all the circuits and assemblies of FEX unit. One AC/DC converter is used to supply the final RF stages with a $+48V_{DC}$ voltage; the other AC/DC converter delivers $\pm 5V_{DC}$ and $\pm 12V_{DC}$ used to supply the other circuits of FEX.

1.3 TECHNICAL CHARACTERISTICS

1.3.1 General data

ENVIRNOMENTAL CONDITIONS	
Operation temperature range	0°C to +45°C
Storage temperature range	-40 °C to +70°C
Relative humidity	5% to 90%
Altitude a.s.l.	up to 3000 m
Ambient air pressure:	65kPa to 105kPa
Cooling system:	forced air
AC REQUIREMENTS	
AC supply	90 to 264V 90 to 253V *for EC countries*
Frequency	50/60Hz
Power factor	0.9 min.
Power consumption	220VA
MECHANICAL	
Frame:	standard 19” - 1HE
Dimensions (wxhxd) (mm):	483x44.5x505
Weight (kg):	15

1.3.2 Remote interfaces

REMOTE INTERFACES	
RS-232	for proprietary control protocol
Parallel	for simple controls and commands
Ethernet	for HTTP, TFTP,SNMP and Telnet protocols

1.3.3 Outputs

PILOT 19KHz	
Connector	BNC, female
Impedance	50Ω, unbalanced
Level	$1V_{PP}$ sine wave
RF OUT	
Connector	, female
Input impedance	50Ω, unbalanced
Level	25W
RF MONITOR	
Connector	BNC, female
Input impedance	50Ω, unbalanced
Level	10dBm at nominal power

1.3.4 Inputs

LEFT and RIGHT	
Connector	XLR, female
Input impedance	600Ω/10kΩ, balanced and unbalanced
Input level	10dBm/600Ω nominal for 100% deviation@400Hz Range: -3dBm to +18dBm (0.1dB step)
Amplitude response	pre-emphasis curve ±0.1dB, 20Hz - 15kHz
Intermodulation distorsions	≤0.01%
AES/EBU	
Connector	XLR, female
Input impedance	110Ω, balanced
Input level	0dBFS nominal for 100% deviation@400Hz Range: 0dBm to -25dBFS (0.1dB step)
Sample rate	up to 96kHz, 16-24 bits
Intermodulation distorsions	≤0.01%
MPX	
Connector	XLR, female balanced BNC, female unbalanced
Input impedance	balanced impedance 50Ω/10kΩ unbalanced impedance 600Ω/10kΩ
Input level	6dBm/600Ω ± 10dB nominal for 100% modulation (0.5dB step) 10dBm/50Ω ± 10dB nominal for 100% modution (0.5dB step)
Amplitude response	±0.1dB, 40Hz - 100kHz
Intermodulation distorsions	≤0.01%
SCA 1 & SCA 2 (*for internal modulation)*	
Connector	D female, 9 pin
Input impedance	600Ω/10k balanced
Input level	10dBm/600Ω nominal for 10% deviation Range: 0dBm to +12dBm (0.1dB step)
Amplitude response	±0.1dB, 20Hz - 7.5kHz
RBDS/RDS (*for internal operatuion)*	
Connector	BNC female
Input impedance	50Ω unbalanced
Input level	10dBm = 2dB -10dB nominal for 10% deviation (0.1dB step)
Amplitude response	±0.1dB, 53kHz - 100kHz
SCA/RBDS/RDS (*for external SCA/RBDS/RDS generator)*	
Connector	BNC female
Input impedance	50Ω unbalanced
Input level	$3.5V_{pp}$ nominal for 10% deviation Range: $1V_{pp}$ to $4V_{pp}$ (10dBm/50Ω +2dB -10dB; 0.5dB step)
Amplitude response	±0.1dB, 53kHz - 100kHz
10MHz EXTERNAL REFERENCE INPUT	
Connector	BNC female
Input impedance	50Ω unbalanced
Input level	-10dBm to +10dBm
1PPS	
Connector	BNC female
Input impedance	50Ω unbalanced
Input level	TTL

1.3.5 FM Modulator

MODULATOR CHARACTERISTICS	
Frequency range	87.5 to 108MHz (1Hz step)
Carrier frequency accuracy	±1ppm
Modulation capability	±100kHz
Asyncronous AM SNR	≥80dB below equivalent 100% modulation @ 400Hz and 75 μs deemphasis
Syncronous AM SNR	≥60dB below equivalent 100% modulation @ 400Hz and 75 μs deemphasis
Spurious and harmonics	≥90dBc
Pre-emphasis	50 μs (±0.1dB), *for CCIR* 75 μs, *for FCC*
MPX input FM SNR	90dB below equivalent 100% modulation @ 400Hz and 75 μs deemphasis, 22Hz to 22kHz bandwidth unweighted
MPX FM THD + noise	≤0.01% @ 400Hz, 75 μs deemphasis, 22Hz to 53kHz
FM stereo SNR	≥80dB below equivalent 100% modulation @ 400Hz and 75 μs deemphasis, 22Hz to 22kHz bandwidth unweighted
FM stereo THD + noise	≤0.01%, 30Hz to 15kHz
FM mono SNR	≥90dB below equivalent 100% modulation @ 400Hz and 75 μs deemphasis, 22Hz to 22kHz bandwidth unweighted
FM mono THD + noise	≤0.01% @ 400Hz, 75 μs deemphasis
L&R stereo separation	≥60dB, 20Hz to 15kHz
L&R linear cross-talk	90dB below 100% modulation, 20Hz to 15kHz
AES/EBU stereo separation	≥70dB, 20Hz to 15kHz
MPX Stereo Separation	≥60dB, 40Hz to 15kHz with MPX stereo separation better than 60dB
38/57/67/92 kHz suppression	80dB, below 100% modulation
SCA 1/2 SNR	≥55dB
SCA 1/2 THD + noise	≤0.1%, 20Hz to 7.5kHz

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2. *OPERATING INSTRUCTIONS*

LIST OF TABLES

LIST OF ILLUSTRATIONS

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2. OPERATING INSTRUCTIONS

2.1 INTRODUCTION

This chapter describes the operative functions, controls and correct ways in which to use FEX. The contents of the present chapter are arranged in paragraphs according to the following:

- 2.2: Legend
- 22.3: Mains connection
- 22.4: Switching on/off
- 22.5: Parallel I/O connector pin-out assignment
- 22.6: Using the controller
- 22.7: Menu and contents
- 22.8: Changing the transmission frequency
- 22.9: regulation of rf output power
- 22.10: Calibrations and settings

2.2 LEGEND

The front panel of FEX is shown in Fig. 2.1; Tab. 2.1 refers to this figure, each number of the table marks an indicator, a fuse or a connector located on the front panels of the unit.

Fig. 2.2 shows the rear panel of FEX; Tab. 2.2 refers to this figure, each number of the table marks an indicator, a fuse or a connector located on the rear panels of the unit.

From now on, every reference to indicators, fuses or connectors is carried out by indicating (between parentheses) the corresponding identification number with which is marked on Fig. 2.1 and Fig. 2.2. A simple description of the function carried out is given for each number.

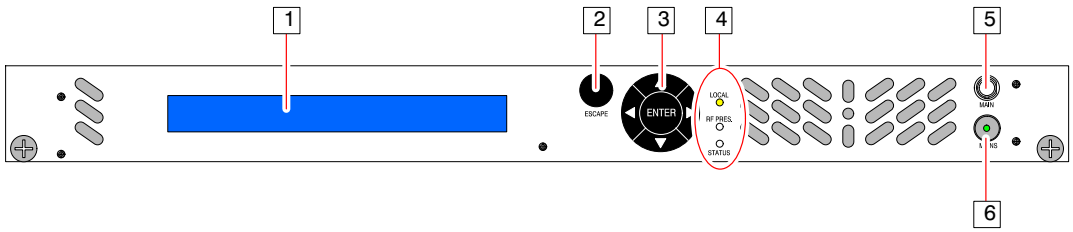


Fig. 2.1 - FEX 2S25-A FM Exciter front panel

Tab. 2.1 - FEX 2S25-A FM Exciter front panel legend (ref. Fig. 2.1)

No.	LABEL	FUNCTION
1		LCD display of the unit (40 characters, 2 lines); displays information and data relevant to the functioning of FEX.
2	ESCAPE	Push-button; it allows to quit from the current menu.
3		Controller keyboard. It allows accessing the menu (listed on right--hand side of the display) and setting the functioning parameters of FEX. Accessing the menu and setting of the parameter is as follows: - "◀" and "▶" arrows select the menus (shown between < and > symbols); once accessed the menu, they select the digit to be changed. - "▲" and "▼" arrows allow scrolling the parameters of each menu. - "*ENTER*" key is used to set the selected parameter and to enter the setting carried out. A confirmation is requested at the end of the operation, pushing "▲" arrow.
4	LOCAL RF PRES. STATUS	Led indicator (yellow); indicates FEX is operating under *local* control Led indicator (green/red); indicates FEX status according to the colours, as follows: *GREEN* indicates FEX is delivering its nominal RF output power; *RED* when FEX is in *STOP* condition (*EXCITER RF=OFF*); under this condition *STATUS* led is *off*. Led indicator (green/red/yellow); indicates FEX status according to the colours, as follows: *GREEN* indicates FEX is delivering its nominal RF output power; *RED* indicates a failure condition of FEX (no RF ouput power); *YELLOW* indicates a *warning* condition of FEX (FEX is still working); *OFF* when FEX is in *STOP* condition (*EXCITER RF=OFF*).
5	MAIN	Monitor connector (BNC female); it allows monitoring the RF output signal of the unit.
6	MAINS	Push-button; it is the power switch of the unit. The associated green led is lit when the unit is switched-on.

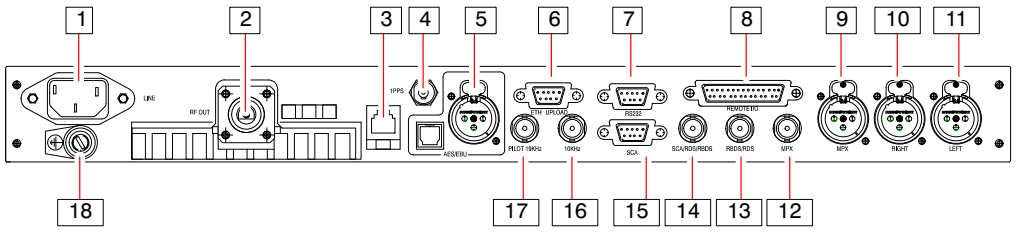


Fig. 2.2 - FEX 2S25-A FM Exciter rear panel

Tab. 2.2 - FEX 2S25-A FM Exciter rear panel legend (ref. Fig. 2.2)

No.	LABEL	FUNCTION
1	LINE	Line socket.
2	RF OUT	Connector (N female); RF signal output of FEX.
3	LAN	Connector (RJ45); it allows *ethernet* control and monitoring over HTTP (*web server*), TFTP, SNMP, Telnet protocols
4	1PPS	Connector (BNC female); it is the input for 1PPS signal.
5	AES/EBU	Set of 2 input connectors for AES/EBU digital signal. A “XLR” and a “TOSLINK” connectors are available: the second one allows the connection via optical fiber.
6	ETH-UPLOAD	Connector (9 pin/D male); it allows the *firmware* upgrade of the Web Server and the SNMP manager using an RS232 serial line.
7	RS232	Connector (9 pin/D male); it allows the connection via an RS232 serial line by external RS232 *master* applications.
8	REMOTE I/O	Connector (25 pin female); it is the parallel interface connector outwards.
9	MPX	Connector (XLR female); it is the analog input for an MPX signal.
10	RIGHT	Connector (XLR female);it is the input of *right* channel, for a stereo signal.
11	LEFT	Connector (XLR female);it is the input of *left* channel, for a stereo signal.
12	MPX	Connector (BNC female); it is the analog input for an MPX signal.
13	RBDS/RDS	Connector (BNC female); it is the analog input for: - an RBDS signal. - an RDS signal;
14	SCA/RBDS/RDS	Connector (BNC female); it is the analog input for: - an SCA subcarrier; - an RDS signal; - an RBDS signal
15	SCA	Connector (9 pin/D female); it is the analog input for SCA subcarrier.
16	10MHz	Connector (BNC female); input of 10MHz external reference frequency.
17	PILOT 19KHz OUTPUT	Connector (BNC female); output of 19KHz pilot tone for synchronizing an external stereo coder.
18		Grounding screw of unit frame.

2.3 MAINS CONNECTION

The unit is connected to the mains by means of line socket ([1] on Fig. 2.2) located on rear panel. The mains must have the following characteristics:

▶ 230 Vac ± 10 %, 50/60 Hz.

A suitable external protection must be used with a maximum current of 6A.

2.4 SWITCHING ON/OFF

The unit is switched on by pressing the power switch ([6] on Fig. 2.1) located on the front panel; the associated green led lights up.

2.5 REMOTE CONTROL

Transmitter remote control is allowed via *web server* and via *parallel interface*.

REMOTE CONTROL VIA WEB SERVER

Transmitter remote control is allowed through an *"Ethernet"* connector available on rear panel of the unit ([3] on Fig. 2.2). For accessing *web* type the address (i.e.: 192.4.0.186) associated to the unit.

Further details about *ETHERNET* interfaces and connection protocols, are given in Appendix: *Ethernet Iterface Installation Guide.*

REMOTE CONTROL VIA PARALLEL INTERFACE

All the main functions of the unit can be remote controlled via "REMOTE I/O" connector arranged on unit rear panel ([8] on Fig. 2.2). The remote control can be performed by means of free contacts (*open/closed*), managed by relay line. The pin-out assignment is listed in the following Tab. 2.3 (*see also J4 connector on "Remote I/O Interface" dwg. no. 4050006010ED*).

Tab. 2.3 - Pin-out assignment of the PARALLEL I/O connector

PIN	FUNCTION		NOTE	PIN	FUNCTION		NOTE
1	COMMON TLS			14	RF OFF	(TLC)	*3*
2	+24V REM		*1*	15	PROG1	(TLS)	*2*
3	RF OFF	(TLS)	*2*	16	RESET	(TLC)	*3*
4	RF ON	(TLS)	*2*	17	EXT. INTERLOCK	(TLC)	*3-4*
5	+24V EXT		*1*	18	RF ON	(TLC)	*3*
6	SQUELCH ABSENT	(TLS)	*2*	19	PROG2	(TLS)	*2*
7	SQUELCH PRESENT	(TLS)	*2*	20	PROG3	(TLS)	*2*
8	FAULT	(TLS)	*2*	21	REMOTE	(TLS)	*2*
9	RF PRESENT	(TLS)	*2*	22	LOCAL	(TLS)	*2*
10	PROG4	(TLS)	*2*	23	POWERED	(TLS)	*2*
11	PROG5	(TLS)	*2*	24	NOT POWERED	(TLS)	*2*
12	*NOT USED*			25	NORMAL	(TLS)	*2*
13	COMMON TLS						

NOTES

(1) "Remote I/O" port needs an external +24V_{DC} on pin 5, for normal opertaing conditions. As alternative pin 5 must be linked to pin 2 delivering an internal +24V_{DC} voltage.
(2) TLS need an external pull-up with a voltage level set by the operator.
(3) TLC must be pulses (500ms minimum duration) to ground.
(4) This pin must be connected to ground otherwise the exciter does not deliver RF power. If a ground connection is not available, access < EXCITER RF OUT > *menu and execute:*
`[▼] INTERLOCK > [ENTER] > [◀ or ▶] CLOSE [ENTER] > [▲]`
☞ *If pin 4 is connected to ground,* `INTERLOCK` *may set* `CLOSE` *or* `OPEN`.

2.6 USING THE CONTROLLER

The controller allows monitoring and/or setting the functioning parameters of the unit. For the purpose several menus are available to the operator who accesses them by the keyboard on unit front panel ([3] on Fig. 2.1). The controller can be used either locally (by means of the relevant keyboard,[3] on Fig. 2.1) or remotely by a supervisory software.

2.6.1 Keyboard functions

Accessing the menu and setting of the parameter is as follows:

- "◀" and "▶" arrows select the menus (shown between < and > symbols); once accessed the menu, they select the digit to be changed.
- "▲" and "▼" arrows allow scrolling the parameters of each menu.
- *"ENTER"* key is used to enter the selected parameter (*pointers will blink*). A confirmation of the setting carried out, is required.
  If no setting is performed within about 10 sec, the controller exits from the editing mode.
- "*ESCAPE*" push-button allows to quit from the current menu.

KEEP IN MIND THAT:

if the parameter to be set is numerical, the digit to be changed must be selected by means of "◀" and "▶" arrows of the keyboard ; the current digit is underscored; "▲" arrow increases the value, "▼" arrow decreases the value. Confirm the setting pressing "ENTER".
The controller will display: ARE YOU SURE?
Press "▲" arrow (YES) for confirmation or "▼" arrow (NO) in order to cancel the setting.
For non-numerical parameters (or better for the ones which have a limited number of options, also numerical) "▲" and "▼" arrows change directly to next option.
During the set-up, 10 seconds are available for next setting. If no key is pressed within about 10 sec, the settings will be cancelled.
At the end of the set-up, 10 seconds are available for the confirmation, otherwise the settings will be cancelled.

2.6.2 General information on data displaying

At the switching-on FEX displays "FM Exciter loading...." after a while and then data relevant to RF ouput power and transmission frequency along with the current menu. The menu displayed at the switching-on, is always < EXCITER RF OUT >.

In order to access a menu it is necessary to quit from the current one: to quit from an accessed menu press "ESCAPE" key (this causes going back to the first parameter of the current menu). Now "◀" and "▶" arrows of the keyboard allow accessing the other menu.

The following Fig. 2.3 shows a typical data displaying along with and explanation of symbol and items.

Tab. 2.4 lists indications and symbols displayed, and also gives a short explanation for each of them.

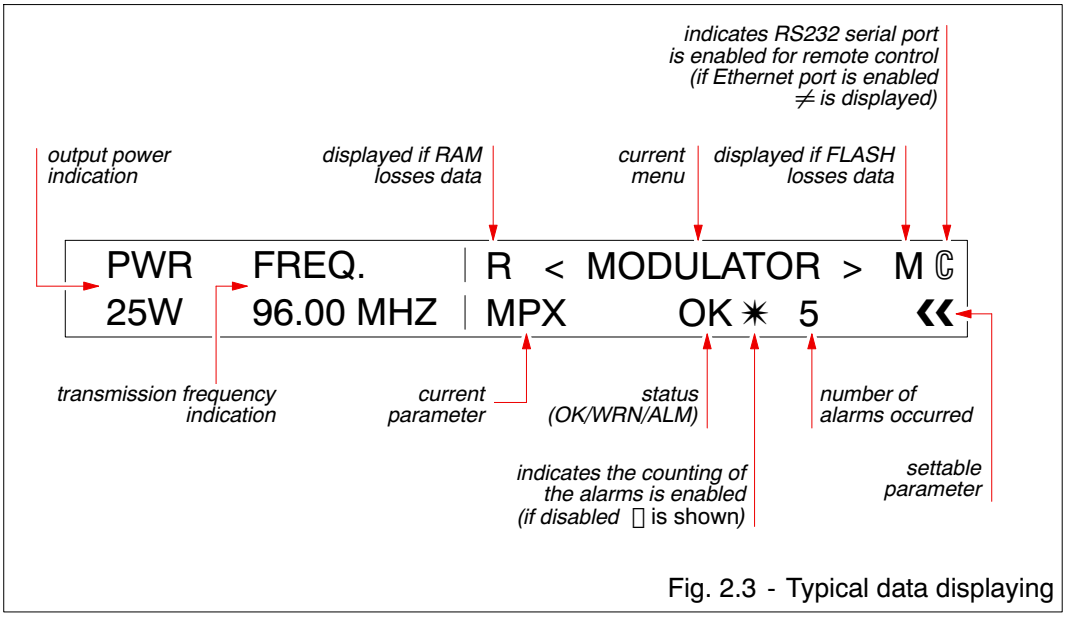
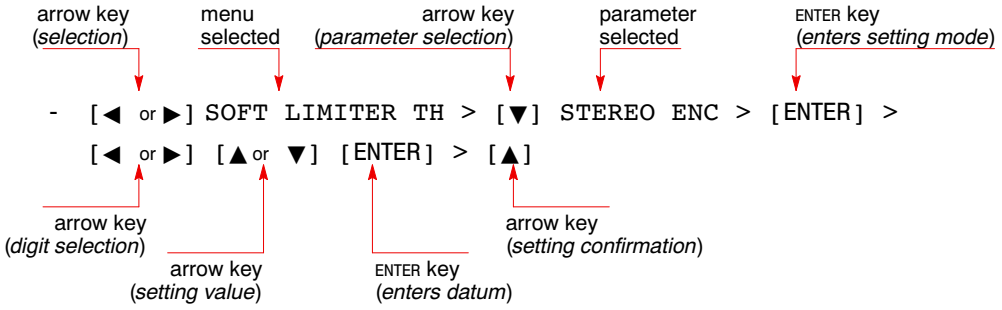


Fig. 2.3 - Typical data displaying

Tab. 2.4 - List of indications and symbols used on screen-shots	
symbol	**meaning**
< >	Indicate a menu including submenus
«	On right-hand side of a parameter, indicates it is *settable*
←	On right-hand side of a parameter, indicates it is a *read-only* one.
✶	On right-hand side of a parameter, indicates that the counting of the relevant alarm has been enabled.
▯	On right-hand side of a parameter, indicates that the counting of the relevant alarm has been disabled.
R	On left-hand side of a < MENU > indicates a parameters loss of the RAM
M	On right-hand side of a < MENU > indictaes a parameters loss of the FLASH
ℂ	On right-hand side of a < MENU > indicates RS232 seral port (on unit rear panel) is enabled
≠	On right-hand side of a < MENU > indicates Ethernet port (on unit rear panel) is enabled

2.6.3 Typographical Convections

Form now on, throughout this manual the commands that you have to execute will be shown in `Courier` type, the keys are referred [between parentheses]: when you are instructed to execute a setting, the sequence of the steps is illustrated by " > " as follows:



2.6.4 Enabling/disabling and resetting the alarms storage

Functioning parameters of FEX may generate *alarms* (ALM) or *warning* (WRN) conditions. An *alarm* condition stops the exciter and causes “RF PRES” and “FAULT” leds lights-up (red) while a *warning* condition causes only “FAULT” led lights-up (yellow) and FEX goes on delivering RF power.

Alarms and *warning* events are stored on < HISTORY > menu only if the relevant *alarm/warning* is enabled (“ ✳ ” symbol displayed), under this condition the related counter will be increased when that alarm/warning will occur.

- **Enabling *alarms/warning* events**
  1. Select the menu of parameter involved, with “◀” or “▶” key.
  2. Select parameter, with ”▲” or ”▼” keys.
  3. Press “ENTER” key and select ”EN” with ”▲” or ”▼” key.
  4. Press “ENTER” key again and “ ✳ ” symbol is displayed to indicate the *alarm/warning* enabling.
- **Disabling *alarms/warning* events**
  1. Select the menu of parameter involved, with “◀” or “▶” key.
  2. Select parameter, with ”▲” or ”▼” keys.
  3. Press “ENTER” key and select ”DS” with ”▲” or ”▼” key.
  4. Press “ENTER” key again and “ ” symbol is displayed to indicate the *alarm/warning* disabling. Under this condition the status is “OK”.
- **Resetting *alarms/warning* counter**
  1. Select the menu of parameter involved, with “◀” or “▶” key.
  2. Select parameter, with ”▲” or ”▼” keys.
  3. Press “ENTER” key and select ”RS” with ”▲” or ”▼” key.
  4. Press “ENTER” key again and “0” is displayed to indicate the *alarm/warning* resetting.

2.7 MENU AND CONTENTS

< EXCITER RF OUT >		
EXCITER RF	«	enables (ON) disables (OFF) the RF output
POWER SET	«	sets RF output power of the exciter from -7dB through 0.9dB in respect to the nominal output power (25W).
INTERLOCK	«	displays status of *interlock* chain (“CLOSE” or “OPEN” flag). It is also possible to enable/disable the *alarm* condition relevant to *interlock* chain. The number on right-hand side, indicates how many times the *alarm* condition has occurred.
AGC	«	enables (ON) disables (OFF) AGC (***A**utomatic **G**ain **C**ontrol*) function.
MAN. GAIN	«	sets *gain* value (0/1023). If AGC = OFF fixes the RF output power; if AGC = ON fix the upper threshold for RF output power.
FILT. GAIN	«	sets output *filter gain* value (0/1023).
NOTE		*Enabled only when “Full Scale” of FACTORY menu has been set at 1 or 2KW.*
< EXCITER STATUS >		
POWER OUT	←	displays current value of RF output power (Watt) of the unit
INPUT	←	displays input status: - *NORMAL* - *LOW* - *OVERDRIVE* - *ABSENT*
MODULATOR	←	displays modulator status: - *NORMAL* - *FAULT* - *WARNING*
OPERAT. MODE	«	sets the operating mode of FEX (LOCAL/REMOTE). The new setting must be confirmed. - *LOCAL* :set-up of exciter parameters is allowed only locally, but via *web server* it is possible displaying parameters set-up, alarms and history. - *REMOTE*: set-up of exciter parameters is allowed only remotely. Anyhow for “FACTORY” menu is requested the password.
1PPS XXX REF. XXX	←	displays status of the external reference (PRST/ABST).
Exciter Elapsed Time:		
HOURS	←	displays working hours of the unit
Exc. settings backup:	←	
✳ Save Settings	«	allows saving the current settings of the parameters (i.e.: when you want change some of them for testing FEX and then you want to restore the previous settings). The new setting must be confirmed.
✳ Restore Settings	«	restores the last settings saved with “✳ Save Settings”.
RTC Settings:		***R**eal **T**ime **C**lock*
SECOND	«	sets the value of the field “second”
MINUTE	«	sets the value of the field “minute”
HOUR	«	sets the value of the field “hour”
DAY	«	sets the value of the field “day”
MONTH	«	sets the value of the field “month”
YEAR	«	sets the value of the field “year”
WARMUP TIMER	«	sets time interval within which alarm conditions are ignored (range 5 to 50sec., pre-set at 20 sec.)

< INPUT >		
IN USE	←	displays the *input* type: - *MAIN* - *SECONDARY*
MAIN INPUT	«	sets the *mian input* type: - *ANALOG*: analog left and right inputs - *AES EBU*: digital AES/EBU left and right inputs - *MPX*: analog IMPX input
SEC. INPUT	«	sets the *secondary* backup input type: - *ANALOG*: analog left and right inputs - *AES EBU*: digital AES/EBU left and right inputs - *MPX*: analog IMPX input - *NOTHING*: no secondary input selected. If *SEC INPUT = NOTHING*, the modulator must use only the main input.
INPUT SEL.	«	sets the operative input: - *MAIN* - *SEC.* If SEL MODE = MANUAL it sets the operative input (MAIN/-SEC). If SEL MODE = AUTO it sets the highest priority input (MAIN/SEC) and the modulator uses this input (if present) according to the following table: **INPUT SEL** / **MAIN** / **SEC** / **INPUT IN USE** MAIN / ABST / ABST / MAIN MAIN / ABST / PRST / SEC MAIN / PRST / ABST / MAIN MAIN / PRST / PRST / MAIN SEC / ABST / ABST / SEC SEC / ABST / PRST / SEC SEC / PRST / ABST / MAIN SEC / PRST / PRST / SEC If *SEC INPUT = NOTHING*, the modulator must use always *main* input.
SEL. MODE	«	sets the selection mode (MANUAL/AUTO) of the inputs. - *MANUAL*: the modulator uses *main* or *secondary* input according to “INPUT SEL” setting. For example if INPUT SEL = SEC the modulator uses the secondary input. - *AUTO*: the modulator uses *main* or *secondary* input according to the following table: **INPUT SEL** / **MAIN** / **SEC** / **INPUT IN USE** MAIN / ABST / ABST / MAIN MAIN / ABST / PRST / SEC MAIN / PRST / ABST / MAIN MAIN / PRST / PRST / MAIN SEC / ABST / ABST / SEC SEC / ABST / PRST / SEC SEC / PRST / ABST / MAIN SEC / PRST / PRST / SEC If INPUT SEL is lost, the modulator switches to the other input, if present, after an adjustable delay (*CH. OVER DELAY*). If INPUT SEL returns, the modulator switches back to this input, after an adjustable delay (*RESTORE DELAY*) only if the “IN. AUTO STORE” function is enabled. If SEC INPUT = NOTHING the modulator uses the *main* input.
CH.OVER DELAY	«	sets change-over time delay from 0 to 255 sec.. *See SEL. MODE description for further details.*
RESTORE DELAY	«	sets *restore delay time* from 0 to 255 sec. *See SEL. MODE description for further details.*

IN.AUTOSTORE	«	enables (ON) disables (OFF) the INPUT AUTO RESTORE function.
AES/EBU IN USE	←	displays the input connector in use: - *OPT* - *XLR*
AES/EBU SEL.	«	If *AES/EBU MODE = MANUAL*, it sets the operative digital input (XLR, TOSLIINK). If *AES/EBU MODE = AUTO*, it sets the highest priority digital input (XLR, TOSLIINK) and the modulator uses this input (if present) according to the following table:

SEL AES/EBU USE	XLR	TOSLINK	DIGITAL INPUT IN USE
XLR	ABST	ABST	XLR
XLR	ABST	PRST	TOSLINK
XLR	PRST	ABST	XLR
XLR	PRST	PRST	XLR
TOSLINK	ABST	ABST	TOSLINK
TOSLINK	ABST	PRST	TOSLINK
TOSLINK	PRST	ABST	XLR
TOSLINK	PRST	PRST	TOSLINK

AES/EBU MODE	«	sets the selection mode (MANUAL/AUTO) of the digital inputs. - *MANUAL*: the modulator uses *XLR* or *TOSLINK* input according to "AES/EBU SEL" setting. For example if AES/EBU = XLR the modulator uses always XLR input. - *AUTO*: the modulator uses *XLR* or *TOSLINK* input according to the following table:

INPUT SEL	MAIN	SEC	INPUT IN USE
MAIN	ABST	ABST	MAIN
MAIN	ABST	PRST	SEC
MAIN	PRST	ABST	MAIN
MAIN	PRST	PRST	MAIN
SEC	ABST	ABST	SEC
SEC	ABST	PRST	SEC
SEC	PRST	ABST	MAIN
SEC	PRST	PRST	SEC

SCA	«	sets the *SCA* input type: - *OFF*: no SCA signal - *EXTERNAL*: SCA from external source (SCA/RBDS/-RDS BNC connectors) - *INTERNAL 1*: analog audio input for internal generation of 67kHz SCA - *INTERNAL 2*: analog audio input for SCA internal generation of 92kHz SCA - *INTERNAL 1+2* both 67kHz and 92kHz SCA internal generation.
RDS/RBDS	«	sets the *RBDS RDS* input type: - *OFF*: no RBDS/RDS - *EXTERNAL*: RBDS/RDS from external source (RBDS/-RDS BNC connectors) - *INTERNAL*: *NOT AVAILABLE*

< ATTENUATION >		
LEFT	«	sets input level attenuation of *left* signal (-15.0dB/+10.0dB).
RIGHT	«	sets input level attenuation of *right* signal (-15.0dB/+10.0dB).
MPX	«	sets input level attenuation of *MPX* signal (-10.0dB/+10.0dB; 0.5dB steps). ☞ *Digits are not underscored*
SCA 1	«	sets input level attenuation of *SCA 1 (67kHz)* signal (-10.0dB/+1.9dB).
SCA 2	«	sets input level attenuation of *SCA 2 (92kHz)* signal (-10dB/+1.9dB).
RDS/RBDS	«	sets input level attenuation of *RDS/RBDS* signal (-10.0dB/+10.0dB; 0.5dB steps). ☞ *Digits are not underscored*
SCA/RDS/RBDS	«	sets input level attenuation of *SCA/RDS/RBDS* signal (-10.0dB/+1.9dB).
AES/EBU	«	sets the input level gain of *AES/EBU* signal (-25dB/0dB).
< DEVIATION >		
AUDIO 1	←	displays frequency deviation (in kHz) of the relevant input
AUDIO 2	←	displays frequency deviation (in kHz) of the relevant input
MPX	←	displays frequency deviation (in kHz) of the relevant input
SCA 1	←	displays frequency deviation (in kHz) of the relevant input
SCA 2	←	displays frequency deviation (in kHz) of the relevant input
RDS/RBDS	←	displays frequency deviation (in kHz) of the relevant input
SCA/RDS/RBDS	←	displays frequency deviation (in kHz) of the relevant input
ST.COD.PILOT	←	displays frequency deviation (in kHz) of the relevant input
COMPOSITE	←	displays frequency deviation (in kHz) of the relevant input
< INPUT PRESENCE >		
ANALOG	«	enables/disables the *alarm* condition relevant to the absence of ANALOG input. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
MPX	«	enables/disables the *alarm* condition relevant to the absence of MPX input. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
AES/EBU XLR	«	enables/disables the *alarm* condition relevant to the absence of AES EBU input on XLR connector. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
AES/EBU OPT	«	enables/disables the *alarm* condition relevant to the absence of AES EBU input on TOSLINK connector. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*

RDS/RBDS	«	enables/disables the *alarm* condition relevant to the absence of RDS RBDS input. The input status is also displayed with an “OK” or “WRN” flag. The number on right--hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
SCA/RDS/RBDS	«	enables/disables the *alarm* condition relevant to the absence of SCA RDS RBDS input. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
PILOT LEVEL	«	enables/disables the *alarm* condition relevant to the level of *19KHz Pilot* tone of the internal stereo encoder. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
COMP.H.LIM.	«	enables/disables the *alarm* condition relevant to the level of the *hard limiter*. The status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
< SOFT LIMITER TH >		
NOTE		*“Soft Limiter” acts only if the deviation of the relevant input overcomes the preset threshold (OVERDRIVE ALARM). The intervention is not instantaneous and the delay time of the intervention is adjustable.*
STEREO ENC	«	sets threshold value (50 to 200kHz) of the alarm for freq. deviation overdrive of the *stereo encoder*. “*Soft limiter*” does not affect the pilot tone but only *left* and *right* audio signals.
MPX	«	sets threshold value (50 to 200kHz) of the alarm for freq. deviation overdrive of *MPX* signal. “*Soft limiter*” does not affect the pilot tone but only *left* and *right* audio signals.
DELAY TIME	«	sets the *delay time* (HIGH/LOW/MEDIUM) of *soft limiter* intervention as follows: - *HIGH* 1 sec. approx (advised); - *MEDIUM* 0.4 sec.; - *LOW* 0.2 sec.
< HARD LIMITER TH >		
HARD LIM.	«	sets the threshold value (range 50 to 200kHz) of the alarm for freq. deviation overdrive of the inputs. The intervention of this circuit is faster than the “*soft limiter*” circuit.
SCA 1	«	sets the threshold value (range 6 to 12kHz) of the alarm for freq. deviation overdrive of *SCA 1* signal.
SCA 2	«	sets the threshold value (range 6 to 12kHz) of the alarm for freq. deviation overdrive of *SCA 2* signal.
< PREEMPHASIS >		
ANALOG	«	disables (OFF) *preemphasis* filter or sets the *preemphasis* value of the filter (50μs/75μs) on analog input.
SCA 1	«	disables (OFF) *preemphasis* filter or sets the *preemphasis* value of the filter (50μs/75μs) on SCA 1 input.
SCA 2	«	disables (OFF) *preemphasis* filter or sets the *preemphasis* value of the filter (50μs/75μs) on SCA 2 input.

< IMPEDANCE >		
ANALOG	«	sets the impedance of the relevant input: - *HIGH* - *600 OHM*
MPX	«	sets the impedance of the relevant input: - *UNBAL. 50 OHM* - *UNBAL. HIGH* - *BALAN. 600 OHM* - *BALAN. HIGH*
SCA	«	sets the impedance of the relevant input: - *HIGH* - *600 OHM*
< OVERDRIVE >		
AUDIO 1	«	enables/disables the *alarm* condition relevant to an *overdrive* of AUDIO 1 input. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
AUDIO 2	«	enables/disables the *alarm* condition relevant to an *overdrive* of AUDIO 2 input. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
SCA 1	«	enables/disables the *alarm* condition relevant to an *overdrive* of SCA 1 input. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
SCA 2	«	enables/disables the *alarm* condition relevant to an *overdrive* of SCA 2 input. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
MPX	«	enables/disables the *alarm* condition relevant to an *overdrive* of MPX input. The input status is also displayed with an “OK” or “WRN” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
< MODULATOR >		
ENCODER	«	sets the *encoder* type: - *RIGHT MONO*: the modulator uses only the *right* audio input without stereo encoding; - *LEFT MONO*: the modulator uses only the *left* audio input without stereo encoding; - *L+R MONO*: the modulator uses the sum of *left* and *right* audio inputs without stereo encoding; - *STEREO*: the modulator performs the stereo encoding using *left* and *right* analog inputs.
FREQ.:	«	sets the operative frequency (frequency range from 87500000Hz to 108000000MHz).

< MODULATOR ALARM >		
DAC	«	enables/disables the *alarm* condition relevant to DAC. The status is also displayed with an “OK” or “ALM” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. This check is performed only at the power up (*FAULT* status). *Further details for enabling/disabling alarms on para. 2.6.4.*
PLL 115MHz	«	enables/disables the *alarm* condition relevant to PLL 115MHz circuit. The status is also displayed with an “OK” or “ALM” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
VCXO	«	enables/disables the *alarm* condition relevant to VCXO (unlocked). The status is also displayed with an “OK” or “ALM” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
VCO	«	enables/disables the *alarm* condition relevant to VCO (unlocked). The status is also displayed with an “OK” or “ALM” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
DCM	«	enables/disables the *alarm* condition relevant to DCM (unlocked). The status is also displayed with an “OK” or “ALM” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
TEMPERATURE	←	displays the temperature of the modulator board
< REFERENCE >		
REFERENCE	«	set the type of the frequency reference: - *INTERNAL* . . . . set the internal reference of the unit. 10MHz internal reference is adjusted by INT. REF. TUNE menu (see the relevant item). - *EXTERNAL* . . . . set an external reference. 10MHz internal reference is locked to the external one, only if this last is present, otherwise the exciter works with the internal reference.
INT.REF.TUNE	«	allows adjusting 10MHz internal reference.
1PPS	«	enables/disables the locking of the unit to 1PPS signal from GPS if properly connected. Under this conditions *Time Offset* and *Phase Offset* parameters are enabled.
T. DELAY	«	sets the delay time of the FM signal.
PHASE OFFSET	«	sets the phase displacement of 19KHz pilot tone.
10MHz EXT	«	displays the status of *10MHz Ext Reference* (“LOCK” or “UNLCK” flag). It is also possible to enable/disable the *alarm* condition relevant to *10MHz Ext Reference*. The number on right-hand side, indicates how many times the *alarm* condition has occurred. This check is performed only at the power up (*FAULT* status). *Further details for enabling/disabling alarms on para. 2.6.4.*
NOTE		*Enabled only if REFERENCE=EXTERNAL and 1PPS=LOCK*
1PPS	«	displays the status of *1PPS.* It is also possible to enable/-disable the *alarm* condition relevant to *1PPS*. The status is also displayed with a “LOCK” or “UNLCK” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. This check is performed only at the power up (*FAULT* status). *Further details for enabling/disabling alarms on para. 2.6.4.*
NOTE		*Enabled only if REFERENCE=EXTERNAL and 1PPS=LOCK*

< EXC RF OUT Alarm >		
POWER OUT	«	enables/disables the *alarm* condition relevant to RF output power, if this one is under the preset threshold (see TH menu). The output status is also displayed with an “OK” or “ALM” flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
EXC RF OUT TH	«	sets alarm threshold (dB) for RF output power from -10dB through -1dB in respect to the nominal output power (25W).
REFLECTED	←	displays value (W) of the reflected power
REFLEC TH	«	sets alarm threshold of the reflected power (-13 to -7dB).
48V OVERCUR	«	enables/disables the *alarm* condition relevant to an excessive current absorption of $48V_{DC}$ power supply of the RF stages. The power supply status is also displayed with an “OK” or “ALM” (on reverse field) flag. The number on right--hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
TEMP. HPA	←	displays heatsink temperature of the RF stages.
TEMP. HPA TH	«	sets alarm threshold (60 to 100ºC) of the temperature of RF stages heatsink.
TEMP. HPA	«	enables/disables the *alarm* condition relevant to an excessive temperarure of RF stages heatsink. The heatsink status is also displayed with an “OK” or “ALM” (on reverse field) flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
PALLET 1 HPA	←	displays measurement of the current absorption of pallet 1.
PALLET 2 HPA	←	displays measurement of the current absorption of pallet 2 (*only for 2KW units*).
PALLET 1	«	enables/disables the *alarm* condition relevant to pallet 1. The pallet status is also displayed with an “OK” or “ALM” (on reverse field) flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
PALLET 2	«	enables/disables the *alarm* condition relevant to pallet 2. The pallet status is also displayed with an “OK” or “ALM” (on reverse field) flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred (*only for 2KW units*). *Further details for enabling/disabling alarms on para. 2.6.4.*
REFLECTED	«	enables/disables the *alarm* condition relevant to an excessive reflected power at the RF output. The output status is also displayed with an “OK” or “ALM” (on reverse field) flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.*
P DERATING	«	enables/disables the associated *alarm* condition. The output status is also displayed with an “OK” or “ALM” (on reverse field) flag. The number on right-hand side, indicates how many times the *alarm* condition has occurred. *Further details for enabling/disabling alarms on para. 2.6.4.* With this alarm enabled, if the relected out pwr threshold is reached, the unit carry out the following operations: - cuts off RF output power - try restarting - rises up out pwr until the reflected pwr reaches again the preset trheshold and goes on delivering this out pwr. Under these conditions *power derating* alarm shows “ALM”

< DETAILS >		
Modulator hw v.	🡐	displays *hardware* version of the modulator
Mod. FPGA fw v.	🡐	displays *software* version of the modulator FPGA
Mod. MICRO fw v.	🡐	displays *software* version of the modulator MICRO
IP: __.__.__.__	🡐	displays IP address
NM: __.__.__.__	🡐	dispalys NM (***N**et **M**ask*) address
New value 1 [ ]	🡐🡒	sets a new value for address of IP and NM
New value 2 [ ]	🡐🡒	sets a new value for address of IP and NM
New value 3 [ ]	🡐🡒	sets a new value for address of IP and NM
New value 4 [ ]	🡐🡒	sets a new value for address of IP and NM
✶ Set New IP Address	🡐🡒	sends the new value set to IP
✶ Set New Netmask	🡐🡒	sends the new value set to NM
< FACTORY >		
STATUS		
PASSWORD	🡐🡒	allows accessing the editing mode of *FACTORY* menu.
✶ LOGOUT	🡐🡒	allows logging out from *FACTORY* menu.
FWD CALIBR.		
RFL CALIB.		
RFLECTED		
MIN POWER SET		
REMOTE CONTROL		
PROG. ETH		
AM AM CALIBR.		
FREQ.:		
MPX L+R AMP CAL.		
MPX PILOT CAL.		
MPX L-R PHASE CAL.		
ST. PILOT PH ADJ		
ST.PILOT LEV.		
ST.AM PHASE		
ST.MONO AMPL.ADJ		
CLOCK TYPE		
SIN AMPL.		
COS AMPL.		
DELAY ENABLE		
INVERT		
DELAY VALUE		
IDAC GAIN		
FILTER ADJ		
FULL SCALE		

RESERVED

☞ *These parameters are under password and may be modified only after logging in.*

< N+1 MODE >		
N+1 MODE	«	allows the following settings: - addressing a transmitter in a N+1 system (transmitters are referred to as *PARENT 1* to *PARENT 5* and *RESERVE*); - setting (*RES. PROG 1* to *5*) the functioning parameters (*MAIN INPUT, POWER SET, FREQ., ENCOD*) for the *RESERVE* transmitter. *For further details see para. 2.10.1*
TX PROGRAM		
FREQ.	«	sets transmission frequency of the addressed transmitter (87 500 000 to 108 000 000Hz)
POWER SET	«	sets RF output power of the addressed transmitter
MPX	«	sets the input level attenuation of MPX signal (range -10.0dB/+10.0dB; 0.5dB steps). ☞ *Digits are not underscored*
MAIN INPUT	«	sets the input type of the addressed transmitter: - *ANALOG* - *AES EBU* - *MPX*
ENCOD.	«	sets TX encoder type of the addressed transmitter: - *RIGHT MONO* - *LEFT MONO* - *L+R MONO* - *STEREO*
< HISTORY >		
View History Log		displays the number of alarms occurred (NONE, 1, 2, 3....). *See details on paragraph 2.6.4.*
Reset History Log		resets all stored alarms

Tab. 2.5 - Alarms list of *History Log*			
code	LABEL	*TYPE*	DESCRIPTION
D01	EXC. SWITCH ON	*ALARM*	Alarm displayed only on “HISTORY” menu; it indicates the time of the switching-on
D02	RESET HISTORY	*ALARM*	Alarm displayed only on “HISTORY” menu; it indicates the time of the reset
D03	INTERLOCK OPEN	*ALARM*	It indicates the *interlock chain* is open
D04	IN. ANALOG ABST	*WARNING*	Absence of analog input
D05	IN MPX ABST	*WARNING*	Absence of MPX input
D06	AES EBU XLR ABSENT	*WARNING*	Absence of AES EBU inputs on XLR connector
D07	AES EBU OPT ABSENT	*WARNING*	Absence of AES EBU inputs on TOSLINK connector
D08	RDS RBDS ABST	*WARNING*	Absence of RDS RBDS inputs
D09	NO SCA RDS BDS	*WARNING*	Absence of SCA RDS RBDS inputs
D10	LOW PIL LEVEL	*WARNING*	Low level of pilot tone
D11	COMP .H LIM. WRN	*WARNING*	Low level of the *hard limiter*.
D12	AUDIO 1 OVRDRV	*WARNING*	Overdrive of AUDIO 1 input
D13	AUDIO 2 OVRDRV	*WARNING*	Overdrive of AUDIO 2 input
D14	SCA 1 OVRDRV	*WARNING*	Overdrive of SCA 1 input
D15	SCA 2 OVRDRV	*WARNING*	Overdrive of SCA 2 input
D16	MPX OVRDRV	*WARNING*	Overdrive of MPX input
D17	MOD. DAC ALM	*ALARM*	Digital Modulator
D18	MOD. PLL115 ALM	*ALARM*	Unlocking of the 115MHz clock signal
D19	MOD. VCXO ALM	*ALARM*	Digital modulator fault
D20	MOD. VCO ALM	*ALARM*	Digital modulator fault
D21	MOD. DCM ALM	*ALARM*	Digital modulator fault
D22	EXT. REF. UNLOCK	*ALARM*	Unlocking of the external reference
D23	LOW POWER OUT	*ALARM*	Low level of RF output power
D24	48V OVERCURR.	*ALARM*	Excessive current absorption
D25	AMP. TEMP. HIGH	*ALARM*	High temperature of the amplifier stages
D26	HIGH REFLECTED	*ALARM*	High reflected power at output
D27	1PPS UNLOCK	*ALARM*	Unlocking of the relevant signal
D28	POWER DERATING	*ALARM*	
D29	CURRENT PALLET 1	*ALARM*	Excessive current absorption of pallet 1

2.8 CHANGING THE TRANSMISSION FREQUENCY

Changing the transmission frequency is allowed by "MODULATOR" menu. Execute:

1. [▲▼] MODULATOR > [▼] FREQ. > [ENTER]
   (a blinking cursor will be displayed under a digit of POWER SET *value)*
2. Shift the cursor under the digit to be changed, using "◀" or "▶" arrow.
3. Increase ("▲" arrow) or decrease ("▼" arrow) the digit to the wanted value. Carry out the operation on each digit to be changed.
4. Press "ENTER" key. Confirm the setting by pressing the "▲" arrow (YES). If "▼" arrow is pressed (NO) the setting is not carried out. If no key is pressed within about 10 sec., no operation will be carried out.

2.9 REGULATION OF RF OUTPUT POWER

The RF output power of the unit may be set by "EXC. RF OUT" menu. The regulation range is from -7 to +0.9dB in respect to the nominal output power (25W). Starting from main menu execute:

1. [▲▼] EXC. RF OUT > [▼] > POWER SET > [ENTER]
   (a blinking cursor will be displayed under a digit of POWER SET *value)*
2. Shift the cursor under the digit to be changed, using "◀" or "▶" arrow.
3. Increase ("▲" arrow) or decrease ("▼" arrow) the digit to the wanted value. Carry out the operation on each digit to be changed.
4. Press "ENTER" key. Confirm the setting by pressing the "▲" arrow (YES). If "▼" arrow is pressed (NO) the setting is not carried out. If no key is pressed within about 10 sec., no operation will be carried out.

2.10 CALIBRATIONS and SETTINGS

This paragraph gives information concerning the calibrations that have to be performed on FEX, after a replacement of an assembly or board inside FEX itself, or in the transmitter where FEX is arranged.

The calibrations are allowed by "FACTORY" menu, which require a password for the acces: *please contact our After SalesDepartment for details.*

2.10.1 Settings for N+1 system

FEX is able to operate in a N+1 (N ≤ 5) system. For the purpose it is necessary to address each FEX as TX1, TX2....., TXN, TXR (on FEX display TX1, TX2....., TXN, TXR are referred to as PARENT 1, PARENT 2.....,PARENT N, RESERVE).

It is also necessary to set on the RESERVE FEX, all the functioning parameter (*MAIN INPUT, POWER SET, FREQ., ENCOD*) of each exciter

1. Access "N+1 MODE" menu.
2. Set N+1 MODE = RES. PROG 1
3. Set *MAIN INPUT, POWER SET, FREQ., ENCOD* as the ones of FEX PARENT 1.
4. Carry out steps 2 and 3 for each FEX of the system (N+1 MODE = RES. PROG 2, and so on up to N+1 MODE = RES. PROG N).
5. Now set N+1 MODE = RESERVE
6. Confirm the settings and quit (ESCAPE)

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3. *MAINTENANCE*

LIST OF TABLES

LIST OF ILLUSTRATIONS

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3. MAINTENANCE

3.1 INTRODUCTION

3.1.1 Introduction to Maintenance

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

- PREVENTIVE MAINTENANCE,
- CORRECTIVE MAINTENANCE.

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

3.1.2 Types and Levels of Maintenance

The type and level of maintenance to be carried out on unit depends on the adopted maintenance policy, and depends entirely on the operational requirements and level of experience of the maintenance personnel. In general, there are three maintenance levels that can be carried out:

1st Level (*On site*), including the following tasks:

- switch-on and switch-off procedures, also for emergency situations;
- activation and/or deactivation of operative and semi- operative functions, which can be performed on the relative control panel;
- replacement of fuses and monitor lamps located both on panels and switches;
- preventive maintenance on both mechanical and electrical/electronic parts. The maintenance tools and instruments will be simple to use (e.g. spanners, screwdrivers, multimeters etc.);
- corrective maintenance which includes the replacement of units or sub-assemblies. These do not require complicated procedures or adjustments and are coherent with the capabilities of the maintenance personnel.

2nd Level (*On Site*), including the following tasks:

- all first level maintenance tasks**;**
- all corrective maintenance operations which require the use of instruments which are not part of the equipment (e.g. oscilloscope, counters, function generators, ect.);
- all on-site alignments from a single module up to the whole system;
- troubleshooting procedures;
- corrective maintenance which includes the replacement of faulty modules;
- corrective maintenance of mechanical parts;
- setting of semi-operative variables (setting-up optimization) depending on the operational environment and requirements;
- evaluation of the performance of the Equipment and of the System.

3rd Level (*Laboratory*)

This is the highest maintenance level that can be performed and includes procedures which allow the personnel to isolate and replace faulty components. This level also includes adjustment procedures for the repaired modules, as well as the calibration of the instruments used by the maintenance personnel on site.
The way this maintenance is carried out depends on the available technical resources and logistic infrastructure. The technical personnel working at this level should have specific knowledge of the laboratory instruments and tools, and should be skilled in carrying out repairs to a high quality standard.

3.1.3 Maintenance Tools

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

3.1.4 Test Instruments

The Test Instruments required on-site in order to carry out the maintenance activities are listed in paragraph 3.4 ”Maintenance Procedures”. Please note that all the listed Test Instruments are of commercial type and may be substituted by equivalents available on the local market.

3.2 PREVENTIVE MAINTENANCE

This paragraph deals with the suggested preventive maintenance operations to guarantee continued performance of the RF Amplifier Unit.

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

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

2) *Printed Circuit Boards (PCB)*
PCBs shall not be removed unless dust is noted on their surface. In this case, the PCBs shall be removed one at a time. Use only moderately compressed air or a soft bristle brush to remove the dust. Clean the lance contacts of the connectors on the PCB using a bristle brush soaked in pure alcohol.

3) *Power Supply Modules and Converters*
Removal of the dust accumulated on the housing and components is normally sufficient to clean power supply modules. To clean the PCBs extract them from the Module, then carefully clean the connector pins using a bristle brush soaked in pure alcohol.

4) *Indicator Lamps*
Lamps must be well inserted in their socket. Remove any trace of corrosion, oxidation or dirt by the use of a cloth soaked in carbon tetrachloride.

5) *Fuses*
Fuse tips are subject to oxidation and must be periodically removed from their holders to check for any presence of oxidation. The oxidation or dust increases the resistance of the electrical circuit. Fuse tips shall be cleaned using a cloth soaked in carbon tetrachloride.

TIP

FUSES SHALL BE REMOVED ONE AT A TIME IN ORDER TO AVOID INSERTING THEM INTO A WRONG HOLDER.

THE VALUE PRINTED ON THE FUSES SHALL CORRESPOND TO THAT PRINTED ON THEIR OWN HOLDERS.

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

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

8) *Resistors*
Resistors shall be checked for evidence of cracks, discoloration or ”cooking”. Discoloration indicates that the resistor is subject to overload which could be caused by an incorrect operation of the circuit. Examine resistor leads for dust, dirt or loose connections.

9) *Transformers and Coils*
Examine transformers and coil leads for any trace of dust, dirt or humidity. Check that they are secured in their seats; tighten fixing screws and mounting brackets. Housings, terminals and insulators supporting transformers and coils should be free from foreign objects. Use a dry cloth or, if necessary, moisten the cloth with a suitable solvent. Should the wiring be corroded, tag each wire, disconnect and clean the contact surface using emery paper with a fine grain and then clean the surfaces using a clean cloth. Reconnect the wires.

10) *Potentiometers and Variable Resistors*
Potentiometers and variable resistors, with the exception of those with special features and mounting, shall be examined to ascertain that there is not mechanical backlash. If necessary, disassemble the knob mounted on the axis and tighten the locking screw. The knob must be reassembled in its original position. The housing, if any, must be cleaned from dust by using a bristle brush or compressed air. Ascertain that there are no traces of overheating which indicates an irregular operation of the circuit on which the potentiometer or the variable resistor is inserted. Look for the cause of overheating and eliminate it as soon as possible.

3.3 CORRECTIVE MAINTENANCE

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

- Out of tolerance conditions of standard levels, waveforms and timings, detected during preventive maintenance;
- Failure conditions shown either by indicator lamps, displays, LEDs located on PCB (if any), TTY diagnostic print outs.
- Failure conditions detected by operative personnel.

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

3.3.1 Corrective Maintenance Concepts

1) The corrective maintenance involves the location and isolation of the failure at site level. One or more failed replaceable parts may correspond to each failed function. These parts are classified as follows:
   - repairable PCB's and assemblies;
   - single components not included in the above repairable items.
2) Once the failed part has been isolated, it shall be replaced with a serviceable one from the available spare parts. The replaceable parts of the "single components" type (i.e. fans, pushbuttons, transformers, relays, etc.) once replaced shall be discarded. The repairable items shall be sent to the third maintenance level (laboratory) where they shall be repaired by using Test Stations, repair procedures and personnel suitable for this Level of maintenance. In the same area, calibration and repair of the instruments and tools, both for site and laboratory maintenance will be accomplished.

3.4 MAINTENANCE PROCEDURES

The maintenance procedures can be utilized for periodic performances checks or after a substitution of failed component or board.

Remove the top cover of the unit in order to access the *FINAL* stage; location of the pallet is shown on Fig. 3.1. Remove the electric shield to access the components.

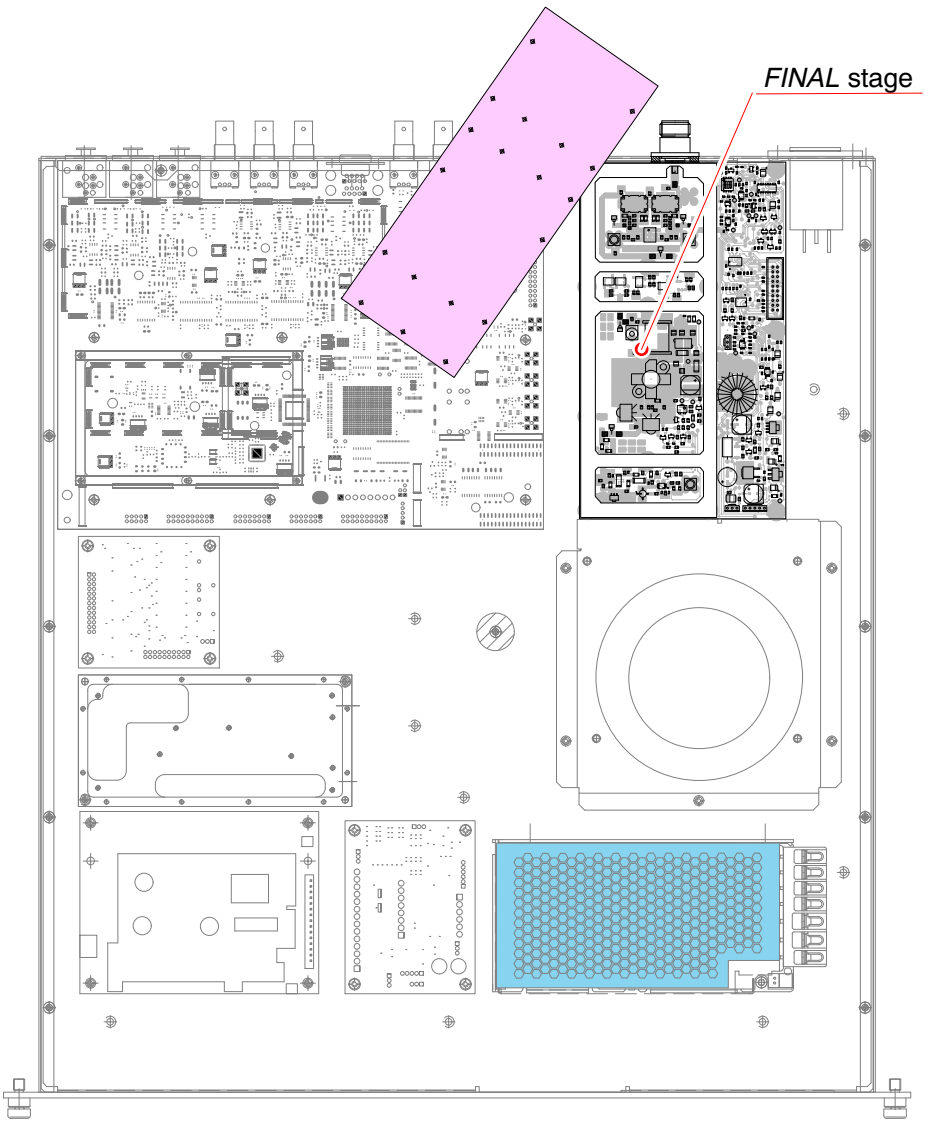

Fig. 3.1 - *FEX* final stages arrangement (bottom view)

3.4.1 Necessary test equipment and preliminary operations

A digital multimeter (e.g.:*"Fluke" model 87*) is required the functional check of the unit. The following procedure must be performed without RF output power. To do this execute:

- [◀ or ▶] EXCITER RF OUT > [ENTER] > EXCITER RF > [ENTER] > [▲or ▼] > OFF >[ENTER]

3.4.2 Functional checks on *FINAL* stage

(*FM Amplifier p/n. 4040028010*)

Remove the top cover of the unit in order to access the *FINAL* stages; pallet arrangement inside the unit is shown in Fig. 3.1. Remove the electric shield to access the components. The functional checks on the pallet can be carried out by following the indication given in Tab. 3.1.

Tab. 3.1 - Functional checks on *FINAL* stage

checking	measure point / component	measurements	regulation
T12 biasing (quiescent curr.)	R120	5mV	rotate R8 completely anti-clockwise; adjust R8 (clck-wise) in order to read on digital voltmeter **5mV** corre-sponding to *50mV*)

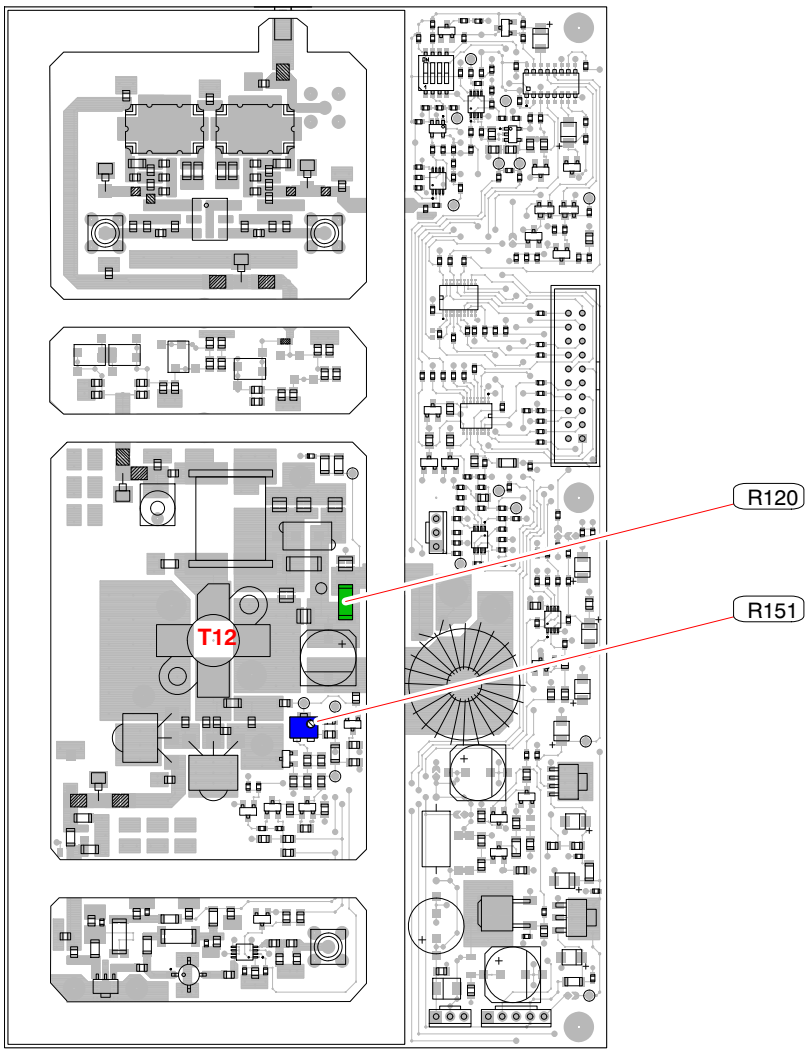

Fig. 3.2 - FINAL stage (FM Amplifier p/n. 4040028010) layout

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SAFETY PRECAUTIONS

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Application notes

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

1.2 Purpose

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

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

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

1.3 General

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

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

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

WARNING!

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

CAUTION!

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

NOTE!

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

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

2 SAFETY OPERATIONS

2.1 Introduction

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

KEEP AWAY FROM LIVE CIRCUIT

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

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

DO NOT SERVICE OR ADJUST ALONE

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

2.2 Electric shock

Factors affecting electric shock consequence are:
- amount of current flown thru human body;
- current path thru human body;
- contact duration.

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

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

2.3 Rescue

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

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

2.4 Resuscitation

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

2.5 Emergency First Aid instructions

WARNING!

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

OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY REGULATION.

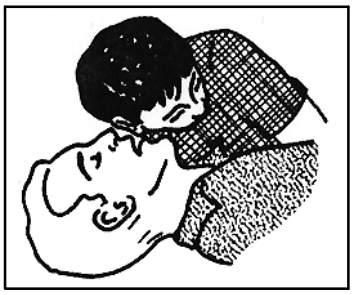
DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE THE EQUIPMENT WITH THE VOLTAGES APPLIED.

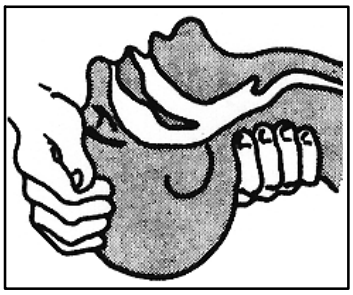
DANGEROUS CONDITIONS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE ”OFF” POSITION DUE TO CHARGES RETAINED BY CAPACITORS, ETC.

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

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

2.5.1 Rescue breathing





1. Find out if the person is breathing.

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

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

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

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

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

LOOSEN CLOTHING
KEEP WARM

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

2.5.2 Burns

SKIN REDDENED:

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

SKIN BLISTERED OR FLESH CHARRED:

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

EXTENSIVE BURN-SKIN BROKEN:

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

3 SPECIFICATION ON HANDLING AND DISPOSAL OF BERYLLIA DEVICES

3.1 Handling

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

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

3.2 Disposal

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

- Electrically faulty, but not mechanically damaged.

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

- Mechanically damaged components.

Using disposable gloves and tweezers, all visible parts are to be placed in a polythene bag which is to be sealed and placed in a Beryllia scrapbox (1).
Still wearing gloves, clean the area with a damp cloth then place the cloth and gloves into a polythene bag, seal the bag and place it in a Beryllia scrapbox.
The hands must be thoroughly washed after handling damaged components.

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

4 ABSTRACT OF APPENDIX "E" OF CEI EN 60215 SAFETY RULES

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

E.1 INTRODUCTION

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

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

E.4 A RADIO-TRANSMITTER'S FUNCTIONING

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

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

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

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

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

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

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

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

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

E.6 PROCEDURE TO VERIFY ABSENCE OF VOLTAGE

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

E.7 WORK ON CIRCUITS UNDER VOLTAGE

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

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

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

E.8 OTHER DANGERS

E.8.1 DANGERS OF RADIOFREQUENCY RADIATIONS

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

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

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

4. *APPENDIX*

ETHERNET INTERFACE INSTALLATION GUIDE

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Ethernet Interface

V.1.1

Installation Guide

Contents

Introduction

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

HTTP
SNMP
Telnet

Telnet Protocol

The manufacturer has developed Telnet server as a tools for changing basic parameters remotely. For connection to Telnet server a Telnet client is needed (Each Windows version has a Telnet client), taking care to enable the **local echo**. (For Windows XP this parameter is already set when the connection is established).

1.1.1 How setup the connection for the first time

If you are connecting for the first time, these are the steps to follow:
Open a Dos shell (Figure 1)

Figure 1

Type telnet 192.4.0.29 (Figure 2). The default server Ip address is set (all default parameters are

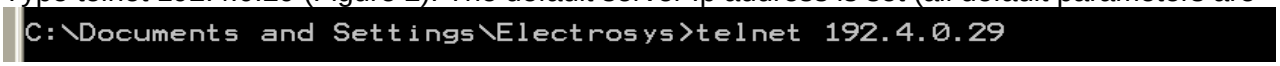


Figure 2

written in Appendix A. If the server does not answer, you have to wait a few seconds and try again. The hardware that handles the Ethernet protocol needs a while to initialize itself. If after some attempts the connection is impossible, you can reset the system.
When the connection is established the following view will appear. (Figure 3)

Figure 3

Types **admin** (this is the default user id)
Types **system** (this is the default password)
If the two last operations have correctly executed, the commands prompt > will appear. (Figure 4)

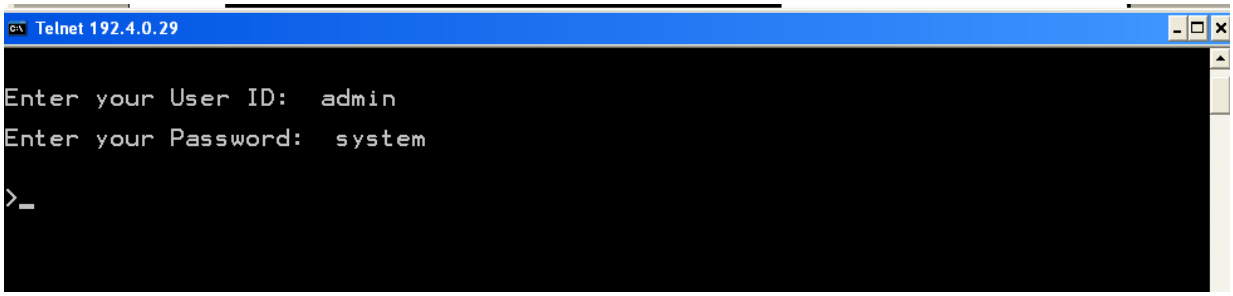


Figure 4

Now you can insert the available commands. The description and syntax is available by inserting help.

1.1.2 Available commands

The server parameters and privilege tables are stored in the flash memory and RAM.
In normal conditions, the server at the boot, loads the information about the parameters server and table from the flash memory. After 3 failures of this operation the server sends a warning message and works with the data stored in the Ram. In this case if transmitter was off, the Ram has a casual data and then, the server will restore the default parameters (see Appendix A).
Each time you will change a system parameter the server asks you a confirmation and asks you to reset the system.
When you type the characters you have to pay attention to insert the visible characters otherwise the server sends you a command error even if it will seem not to be right. In fact there are some characters that result invisible but they are buffered from the server leading to an erroneous command interpretation.

1.1.2.1 About server parameters commands

The commands that will be described, make it possible to set the basic server parameters. These are:
Ip address
Netmask
Gateway
SNMP Managers Ip address

1.1.2.1.1 Changing the server Ip address

After you have established the connection for the first time using the default parameters you can change the server ip address with the command:

Changeip new_ip_address

Note. You have to note the new server ip address because this will be the new ip address that you will have to use for server connections.

Example: (Figure5)
We want change the server ip address. The new ip address that we want set is 192.4.0.28

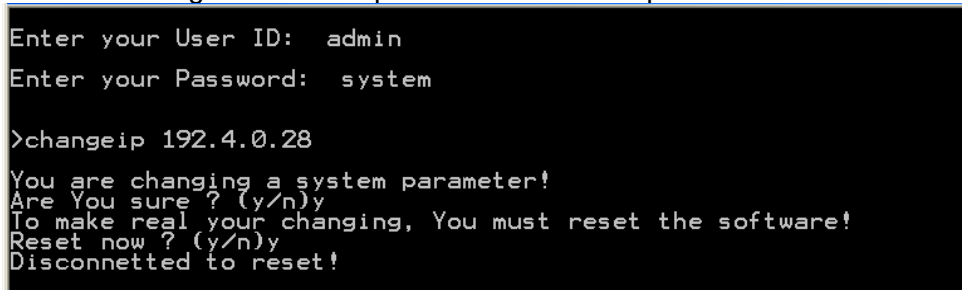


Figure 5

1.1.2.1.2 Changing the server Netmask

In order to change the server Netmask, the operations are the same to the operations followed for the previous command.
In this case the command is:

Changenm new_netmask

1.1.2.1.3 Changing the server gateway

In order to change the server Gateway, the command is:

Changegw new_gateway

Example:(Figure6)
We want change the server gateway. The new gateway that we want set is *6.6.6.6*

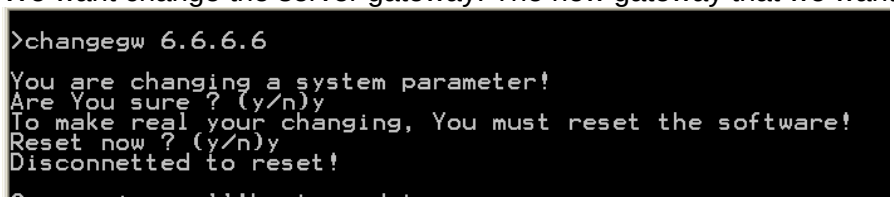


Figure 6

1.1.2.1.4 Changing the trap destinations

In order to change the SNMP Managers Ip address or the address where the traps has to be sent it is necessary to use the command:

Setmanageripx new_ip_address

The settable trap destinations are five.
The ‘x’ command parameter will be a number in the range (1 – 5).
If you want to set the first Manager: x=1 ecc.
In the case that all trap destinations are set to default value (0.0.0.0), the server will send a warning message to indicate this particular state.

Example:(Figure7)
We want change the SNMP Manager 1 Ip address. The new ip address that we want to set is 5.5.5.5

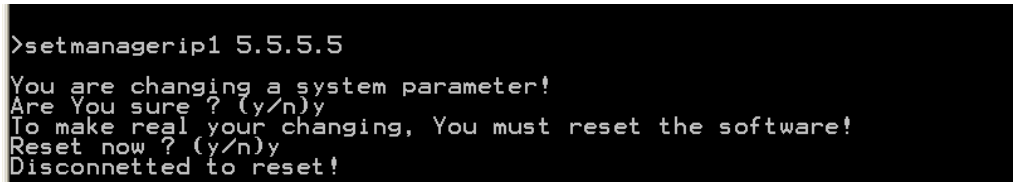


Figure 7

1.1.2.1.5 Restoring The SNMP Manager Ip address to the default address

In order to restore the ip address of one of five SNMP Manager to the default address two ways are allowed:
with the previous command ‘setmanageripx’
with the command delmanageripx
In this case the ‘x’ parameter as in the previous command indicates the SNMP Manager whose address will be the default ip address 0.0.0.0.
Also for this command in case that it is called on the last SNMP Manager not equal from the default ip address, the server will send a warning message and ask you a confirmation before to continue.

1.1.2.1.6 Server parameters view

To have a total server parameters view you can use the command:

Showparam

You will see this view .
Example: (Figure8)

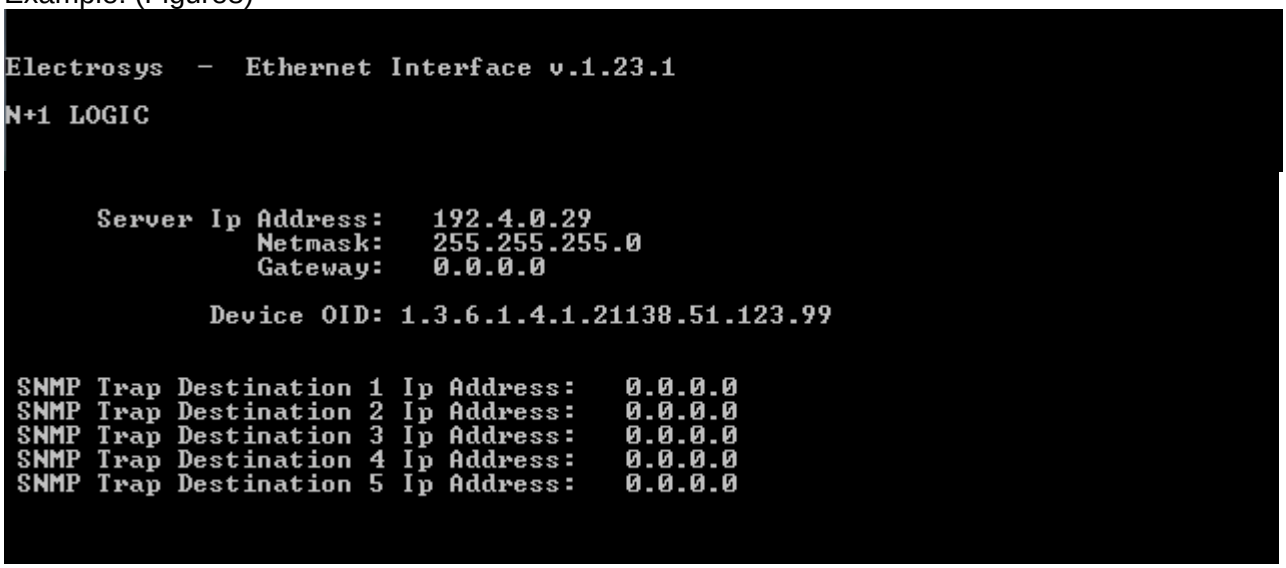


Figure 8

1.1.2.2 About privilege management commands

The privilege management is completely done for all protocols (HTTP, SNMP, Telnet) trough two tables.
The first one contains all users and the relevant passwords of the system.
Each user has only one level (0 – 2) that indicates the privilege of the user in the system management.
A 2 level user (System Administrator) can access any possible operation on the transmitter:
He can enter in the Telnet session and change or update the transmitter parameters and the users parameters but for the users of level 2 (the other administrators).
He can access to the dynamic Html page and send the commands to the transmitter.
He can access to SNMP. The SNMP access is managed with the community table. Then this table will have a description.
A 1 level user (Device Administrator):
He can’t access to Telnet but he can access to the Html page; he can send commands to the transmitter and can access to SNMP session if he knows one of the community passwords (See the management of the community in SNMP).
A 0 level user (Read Only):

He can’t access to Telnet, but can access to the Html page only for reading and can access to SNMP only if he knows a community password.

1.1.2.2.1 Management of user table

We are already said that only the users of level 2 can access to Telnet and to modify the user table.
Default table has only one user ID and one password of level 2. These parameters are used to login Telnet in the first time.

1.1.2.2.1.1 Inserting a new user in the table

In order to insert a new user it needs use the command:

Insertuser userid password level

The user ID or the password is a word up to 10 characters and not shorter of 4, made up of numbers or letters.
The level is a number in the range (0 – 2).
If the user ID of the user that you want insert is already present in the table, the server will send you an error message.
Also if the table is full the server will send you an error message (The max number of user in the table is 16), otherwise will store the new user in the first free position of the table.
In example (Figure9) we want insert the new user with user ID: asdf, password: qwer and level:2.

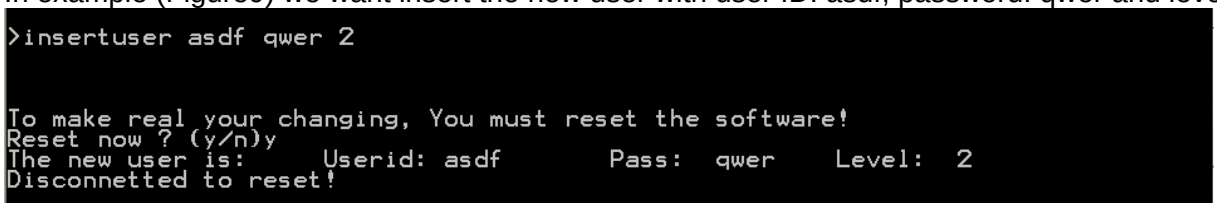


Figure 9

1.1.2.2.1.2 Erasing an user

In order to erase a user from the table it is necessary to use the command:

Eraseuser userid

Note that the user of level 2 can erase or update only users of level smaller of its or itself.
If the user attempts to erase itself when he is the last user of level 2 in the table, the server will send a warning message.

1.1.2.2.1.3 Updating user id, password or level

A user of level 2 has also the possibility to update the data of a user of level 1 or 0 or the data of itself.
In order to update the user it is necessary the command:

Updateuser userid new_user_id

The parameter ‘userid’ indicates the user ID of user of which you want update the userid parameter. The parameter ‘new_user_id’ is the new user ID that you want give to the user.
In order to update the password, the command is:

Updatepass userid new_password

Also in this case the ‘userid’ indicates the user that you want update and ‘new_password’ the new password you want give to the user.
The same operation lead to the updating of user level.
In this case the command is:

Updatelevel userid new_level

Where the ‘userid’ indicates the table record to be changed and ‘new_level’ the new parameter.
In example (Figure10) we want update the user ‘asdf’ with the new user ID ‘cvbn’.

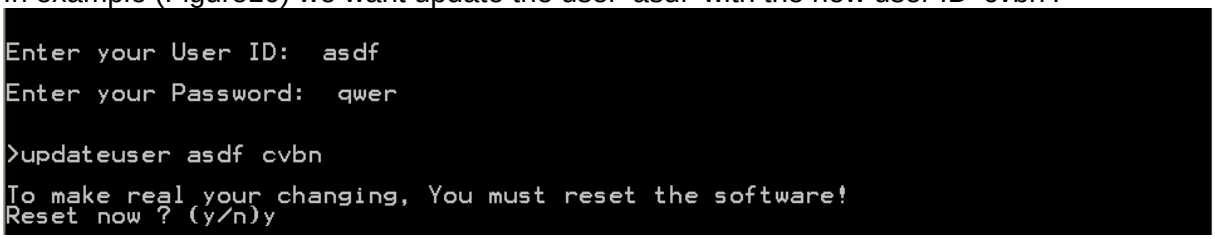


Figure 10

1.1.2.2.2 The SNMP community management

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

Community	Related level	Description
Public	0	Read Only
Private	1	Read and Write commands
Trap	2	Read and Write and Receive Alarms

To change the password it needs to be a user of level 2 and to have the possibility to access to Telnet and to use the command:

Setcommunityx new_password

Where ‘x’, in the range (0 – 2) indicates the level of the related community to update and ‘new_password’ the new password for that community.
To summarize, the users that can access to SNMP must know a password related to a community or to be a System Administrator that is to be users of level 2 (the users of level 2 have access to all passwords trough the command ‘showpriv’. We will talk after of this command.

1.1.2.2.3 Disabling the privilege system

A user of level 2 has also the possibility to disable all the privilege trough the command:

Setflagpriv

This command send an information to the user about the state of the flag that disables or enables the privileges and changes the state of the flag.
Example:
When the flag is in the state ‘DISABLE’, all the tables of the privileges are ignored.
In this case each user can access to all the possibilities available in the Http and Snmp server.
The community password are reset to the default passwords.
Only the Telnet session keeps protected. Only the users of level 2 can access to the Telnet server.

1.1.2.2.4 View of the privilege tables

As in the case of the transmitter parameters also for the privilege tables can be created a view, trough the command:

Showpriv

The command creates a view of users table, of state of flag that disable/enable the privileges and of the community table.
This is the view:(Figure 11)

Figure 11

The password of the user of level 2 will result crypted.

1.1.2.3 Miscellaneous command

These are commands that not form part of the previous categories.

1.1.2.3.1 Logout

The logout command stops the Telnet session without closing the server connection.
This command will result useful to the user that are working with the Telnet server and that want to stop the session being sure that nobody (who does not have the password of level 2) can enter in the Telnet session.

Example:(Figure12)
If I type ‘logout’ after the prompt ‘>’ this is the result:

Figure 12
The connection is not closed but it is temporarily on stand-by.

1.1.2.3.2 Resetsys

The command Resetsys simply resets the system.
The syntax is:

Resetsys

1.1.2.3.3 Exit/quit command

Typing

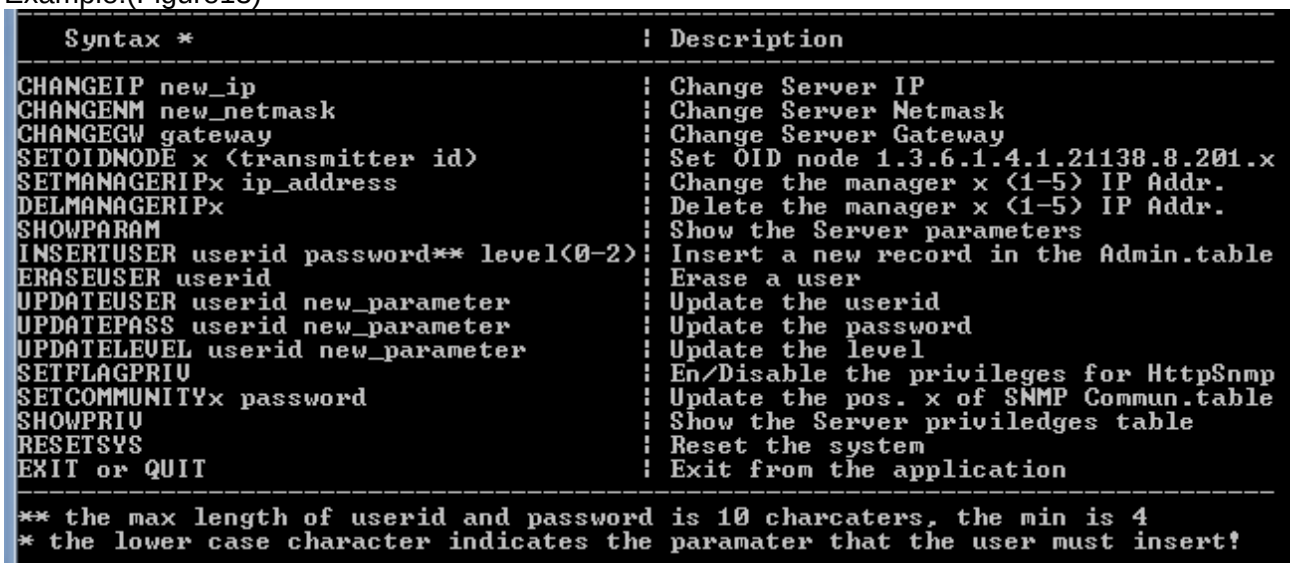
Exit or quit

The connection is closed.
The system will be reset and will be ready (after few seconds) to accept a new connection.

1.1.2.3.4 Help

Typing

Help
The server will give a view of all command, of the syntax and a brief description of each command.
Example:(Figure13)



Syntax *	Description
CHANGEIP new_ip	Change Server IP
CHANGENM new_netmask	Change Server Netmask
CHANGEGW gateway	Change Server Gateway
SETOIDNODE x (transmitter id)	Set OID node 1.3.6.1.4.1.21138.8.201.x
SETMANAGERIPx ip_address	Change the manager x (1-5) IP Addr.
DELMANAGERIPx	Delete the manager x (1-5) IP Addr.
SHOWPARAM	Show the Server parameters
INSERTUSER userid password** level(0-2)	Insert a new record in the Admin.table
ERASEUSER userid	Erase a user
UPDATEUSER userid new_parameter	Update the userid
UPDATEPASS userid new_parameter	Update the password
UPDATELEVEL userid new_parameter	Update the level
SETFLAGPRIV	En/Disable the privileges for HttpSnmp
SETCOMMUNITYx password	Update the pos. x of SNMP Commun.table
SHOWPRIV	Show the Server priviledges table
RESETSYS	Reset the system
EXIT or QUIT	Exit from the application

Figure 13

Appendix A

Power-up Diagnostics

During normal operation , the boot process requires approximately 10 seconds, when the unit is running you have:

-)Green leds D4 +5Volt and D5 +3,3Volt light on to indicate the voltage present.
-)Green led named LNK (on Rabbit module) light on to indicate an Ethernet connection is made.
-)Yellow led named ACT (on Rabbit module) light flashes to indicate the transfer data.
-)Green led LD4 blinks every 500 msec.
-)Green leds LD7 and LD8 light flashes to indicate the serial link.
-)Green leds LD5 and LD6 default light on.

Appendix B

Dip switch settings(SW7)

Bit 1 = ON Downloading Ethernet SW	OFF = Normal Operation
Bit2 = ON Format Flash (Only Factoring Setup)	OFF = Normal Operation
Bit3 = ON Recall Factoring Settings	OFF= Normal Operation
Bit4 = ON Reset Ram BackUp	OFF=Normal Operation

Appendix C

The default parameters
Server parameters:

Server Ip Address: 192.4.0.29
Netmask: 255.255.255.0
Gateway: 0.0.0.0
SNMP Manager 1 Ip Address: 0.0.0.0
SNMP Manager 2 Ip Address: 0.0.0.0
SNMP Manager 3 Ip Address: 0.0.0.0
SNMP Manager 4 Ip Address: 0.0.0.0
SNMP Manager 5 Ip Address: 0.0.0.0
User Table:
The default table has only one user with userid: admin password: system level: 2

Community table:

public
private
trap

Appendix D

In case of bad flash (read,write) of Server Ip Address or Netmask, the system will enter in a fault state in which the Ip address or Netmask will not be initialized. In this case it is necessary to switch the dip3 (SW7)=ON to restore the factory settings.

4. *CIRCUIT DIAGRAMS*

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