

FOREWORD

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## MEX // Multimode UHF Exciter

### *Technical Manual*

	Rev.	Date	Code	itle	Page	
	A	29/03/2016	5450500107	MEX // MULTIMODE UHF EXCITER	1	104
	P	18/11/2019				

Document History		
Rev.	Date	Details
A	29/03/2016	First release of the document
B	05/05/2016	Updating para 2.4.4 – Menu (menu “Settings”)
C	16/05/2016	Updating Tab. 2.1 (item# 4; Led On Air)
D	13/07/2016	Updating para 1.3 – Tech Specs (ISDB-T/T <sub>b</sub> & ATSC added)
E	12/06/2017	Updating para 2.6 – Changing the transmission channel (NOTE! Added)
F	29/11/2017	Added the following paragraphs: <ul style="list-style-type: none"> <li>■ para. 2.5.1.1.7 – The System menu</li> <li>■ para. 2.5.1.1.8 – Alarms system</li> <li>■ para. 2.5.1.1.9 – Events and Alarms</li> </ul>
G	24/01/2018	Minor corrections and clarifications added on Chap. 1. <ul style="list-style-type: none"> <li>■ Updating para. 1.3 (GPS tech. specs.)</li> <li>■ Updating Fig. 2.2 and Tab 2.2.</li> <li>■ Added para. 2.6 (precorrection procedure)</li> </ul>
H	14/02/2018	Minor corrections. Deletion of para. b.4 on page 42/78
I	07/03/2018	Updating: <ul style="list-style-type: none"> <li>■ para. 1.1.2</li> <li>■ para. 1.3</li> </ul>
J	14/03/2018	Updating: <ul style="list-style-type: none"> <li>■ para. 2.9 (added para 2.9.2)</li> </ul>
K	09/05/2018	Added the following paragraphs: <ul style="list-style-type: none"> <li>■ para. 2.5.4 – Description of the main functional block</li> </ul>
L	01/06/2018	Updating the following paragraphs: <ul style="list-style-type: none"> <li>■ para. 3.1 – Introduction</li> <li>■ para. 3.2 – Preventive Maintenance</li> <li>■ para. 3.4 – Maintenance Procedures</li> </ul>
M	17/10/2018	Removed para. 2.5.5 – Transmitter Webservice interface Added paragraph 3.2.1 (Tab. Summary of periodic checks)
N	26/07/2019	Updating: <ul style="list-style-type: none"> <li>■ change of Fig. 2.2</li> <li>■ change of Tab. 2.2</li> </ul>
O	01/08/2019	Updating: <ul style="list-style-type: none"> <li>■ change of para. 1.3</li> </ul>
P	18/11/2019	Added: <ul style="list-style-type: none"> <li>■ para. 2.5.4.6</li> <li>■ para. 2.9 “Switching-on/off the unit Remote operation”</li> <li>■ para. 2.12 “Changing the Modulator Standard”</li> </ul> Updating para. 2.8 “Regulation of RF Output power”
Q	07/01/2022	Clarified Sense 1 and Sense 2 connection diagrams (fig 2.2) General spelling and grammar cleanup

# MEX // MULTIMODE UHF EXCITER

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## 4. APPENDIX

### A Q “ETHERNET INTERFACE” USER’S GUIDE

### B Q SAFETY PRECAUTION

1. INTRODUCTION
2. SAFETY OPERATIONS
3. SPECIFICATION ON HANDLING AND DISPOSAL OF BERYLLIA DEVICES
4. ABSTRACT OF APPENDIX “E” OF CEI EN 60215 SAFETY RULES

## 5. WIRING DIAGRAMS

■

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## FOREWORD (how to consult the manual)

### 1 MANUAL ORGANIZATION

The manual of a generic equipment, which can be housed in a 12, 24 or 42-unit rack, consists of two sections as follows:

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

### 2 CIRCUIT DIAGRAMS (HOW TO CONSULT THEM)

#### 2.1 Acronyms

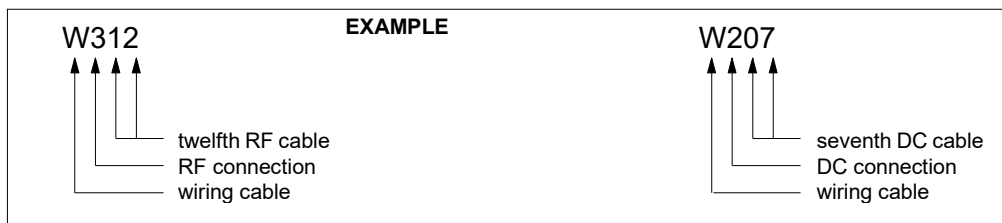
CIRCUIT DIAGRAMS ARE IDENTIFIED BY ACRONYMS AFTER THE DRAWING NUMBER (I.E.: 6320636082IC). A LIST OF THE ACRONYMS USED IS GIVEN HERE BELOW:

<b>acronym</b>	<b>explanation</b>
IC	wiring diagram
ED	circuit diagram
CL	component layout
ML	Mechanical layout

#### 2.2 Classification of wiring cables

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

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



#### 2.3 Connection of wiring cables

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

#### 2.4 Symbols and identifications of connectors/terminal blocks

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

<b>symbol</b>	<b>objetc</b>
	male connector identified by "Jx"
	female connector identified by "Jx"
	terminal block identified by "Kx"
	coaxial cable identified by "Wx"

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

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

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

## FOREWORD (how to consult the manual)

### 3 SAFETY INFORMATION

#### 3.1 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.

#### 3.2 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*



*Read the relevant Technical Manual*

#### 3.3 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**



**Danger of getting crushed when working with loads.**



**Danger when lifting heavy loads.**



**Danger of burns on contact with hot surfaces.**



**Shock hazard**



**Danger of falling off ladders while working**



**Danger of getting hands crushed when working.**

#### 3.4 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

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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### 3.4.1 **GENERAL INFORMATION**

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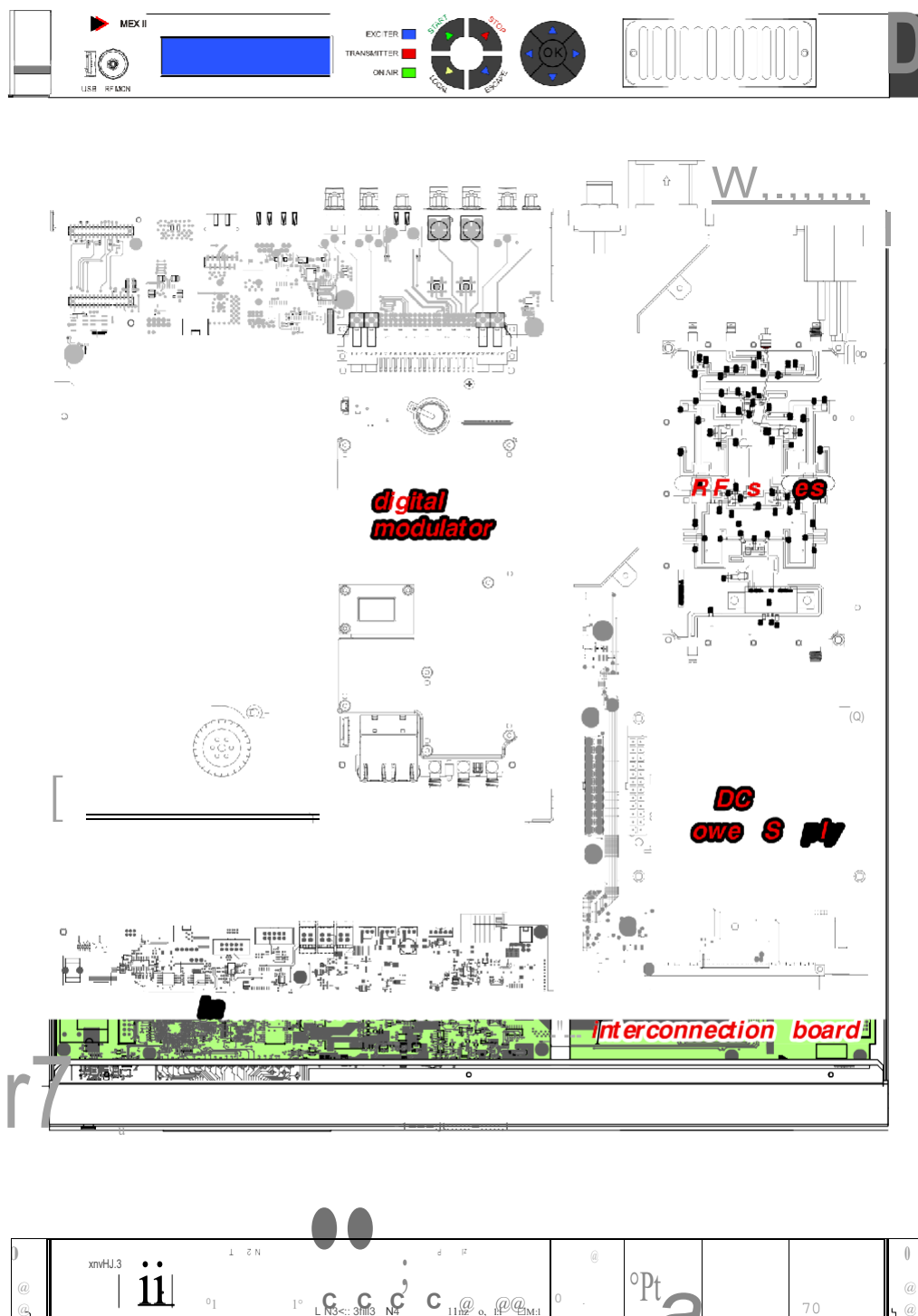


Fig. 1.1 – MEX // front/rear and top views



# 1: GENERAL INFORMATION

## 1.1 INTRODUCTION

### 1.1.1 Manual Applicability

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

- MEX // MULTIMODE UHF EXCITER.....p/n. 5450500107.

From here on for the sake of simplicity, throughout this manual MEX // MULTIMODE UHF EXCITER unit will be referred to as MEX //.

The contents of the present manual are arranged as follows:

- 1. General Information
- 2. Operations
- 3. Maintenance

### 1.1.2 General information

MEX-II (Fig. 1.1) is an exciter unit for *digital* broadcasting (**Digital TV**) operating in UHF (BIV-V) frequency range. MEX-II is able to deliver nominal output power of  $1W_{avg}$  (without pre-correction)/ $10W_{avg}$  (with pre-correction).

The equipment, fully complying with the requirements for the safety of personnel as specified in IEC 215 rules, is arranged in a single 1HE-19" standard frame, which guarantees an optimum mechanical rigidity.

All operations necessary for the generation of a high quality RF signal, in accordance with all digital television standards (DTV) DVB-T/H, ATSC, ATSC 3.0, DVB-T2, ISDB-Tb, are completely performed by a Real Time Digital Signal Processing using a FPGA.

DVB-T2 is a digital terrestrial transmission system developed by the DVB Project. It is the most advanced such system in the world and introduces the latest modulation and coding techniques to enable highly efficient use of valuable terrestrial spectrum for the delivery of audio, video and data services to fixed, portable and mobile devices.

As with its predecessor, DVB-T2 uses OFDM (orthogonal frequency division multiplex) modulation, with a large number of sub-carriers delivering a robust signal. Also in common with DVB-T, the new specification offers a range of different modes making it a very flexible standard. In the realm of error correction, DVB-T2 uses the same coding that was selected for DVB-S2. LDPC (Low Density Parity Check) coding combined with BCH (Bose-Chaudhuri-Hocquengham) coding offers excellent performance in the presence of high noise levels and interference, resulting in a very robust signal.

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

DVB-T2 also specifies a transmitter diversity method, known as MISO (Multiple Input – Multiple Output), which improves coverage in small scale single-frequency networks. Finally, DVB-T2 has defined a way that the standard can be compatibly enhanced in the future through the use of Future Extension Frames.

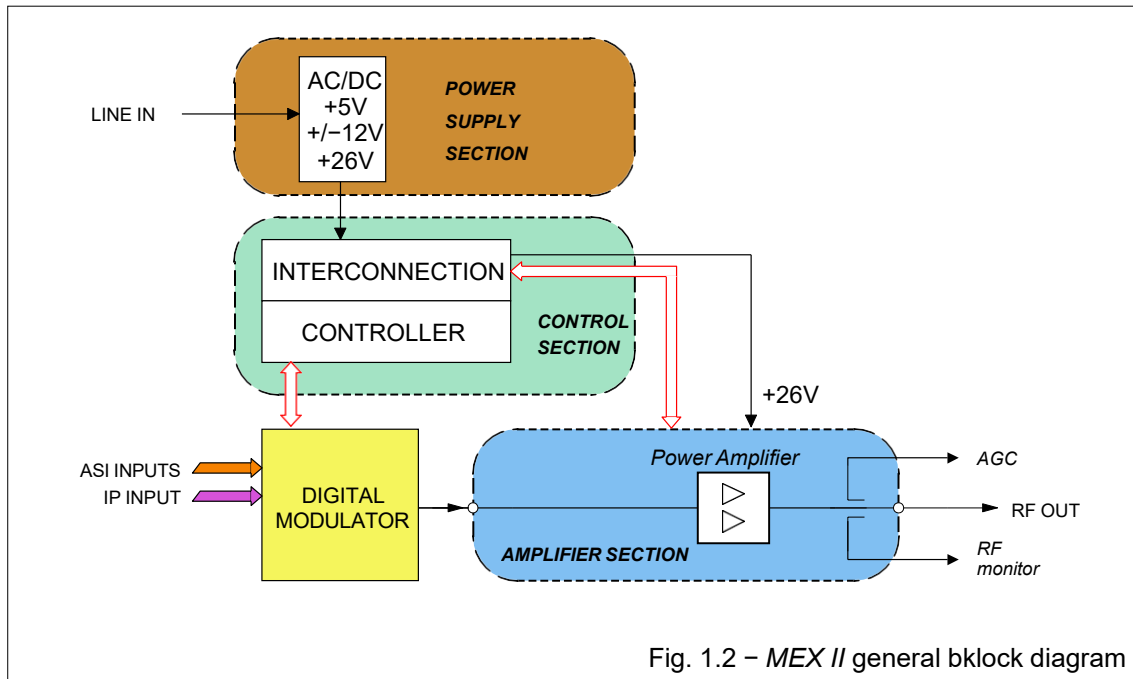
The modulator is capable to perform both linear and non-linear adaptive precorrection. It can operate in different modes (SINGLE, CONTINUOUS, RUN TO TARGET, AUTO RUN, MONITORING) by monitoring MER, shoulder, PAPR for *non-linear precorrection* and amplitude signal, group delay peak to peak, for *linear precorrection*.

## 1.2 FUNCTIONAL DESCRIPTION

With reference to Fig. 1.2, MEX-II may be divided into the following functional area:

- *modulator section*
- *amplifier section*
- *power supply section*

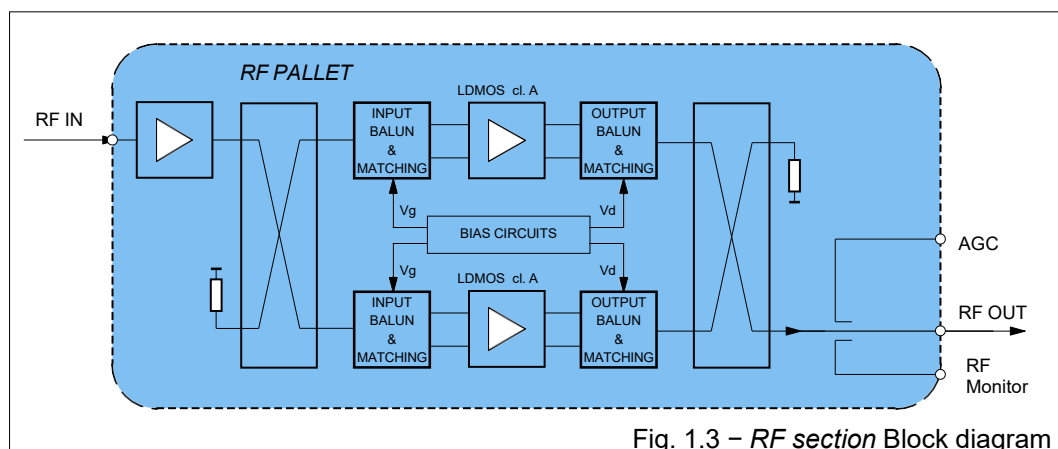
Cooling system is forced air, performed by two extractor fans arranged on rear panel of the unit.



### 1.2.1 Amplifier section

It is made up by a single pallet with a hybrid amplifier module and two MOSFET devices which are made to work in class "A". The gain is  $32 \text{ dB} \pm 0.5 \text{ dB}$  and the pallet is able to deliver  $1W_{rms}$ . The power supply voltage is  $26V_{DC}$ .

The directional coupler picks-up samples proportional to forward and reflected output power: the forward power sample is used for monitor and AGC purposes while the reflected power sample is routed to a *control circuitry* which performs the control of the amplifier functioning.



### 1.3 TECHNICAL SPECIFICATIONS

GENERAL/ENVIRONMENTAL CONDITIONS	
Operation temperature range	0°C to +55°C
Storage temperature range	-55°C to +70°C
Relative humidity	0% to 95% (non condensing) at 45C
Altitude a.s.l.	up to 3000 m
Ambient air pressure:	65kPa to 105kPa
Safety	EN 60215 / EN 60950
EMC	EN 301489
AC REQUIREMENTS	
AC supply (Feller connector)	90 to 264V– 90 to 253V <i>for EC countries</i>
Frequency	50/60Hz
Power factor	> 0.95
MECHANICAL	
Frame:	standard 19" – 1HE
Overall Dimensions (wxhxd) (mm):	483x43.5x565
Weight (kg):	6
DISPLAYED STATUS	
	Listed in "Exciter Status" menu
PROTECTION CIRCUITS	
	Software based
RF	
Frequency range	470 to 862MHz (UHF/BIV-V)
Frequency step	1 Hz
RF Output	
Connector	N female
Impedance	50Q
Return Loss	> 16 dB
Spectrum polarity	selectable inverted/non-inverted
Nominal output power	
<i>DTV (without precorrection)</i>	1W <sub>avg</sub>
<i>DTV (with precorrection)</i>	10W <sub>avg</sub> (MER > 35dB)
Adjustable to nominal level	-7 to +1 dB
Stability at nominal level	± 0.25 dB
PAPR reduction	L1-ACE/P2-TR with T2 version 1.2.1 and 1.3.1 (HW and Fw prepared for L1-ACE only, L1-ACE and TR only, L1-ACE ACE and TR)
Spurious Emissions	< -60 dBc (< -70 dBc with filter)
Harmonic Emissions	< -60 dBc (< -70 dBc with filter)
Amplitude flatness	< ± 0.25dB
10MHz Reference Input	
Connector	BNC female
Impedance	50Q
Return Loss	> 20 dB
Output	1V ± 0.2 Vpp
Rise time	3 – 10 ns
Internal Reference Accuracy	±1 · 10 <sup>-8</sup> (0 to 70°C) ±5 · 10 <sup>-10</sup> per day (after 30 day) ±1 · 10 <sup>-7</sup> per year
ASI INPUTS	
Connectors	2; BNC female/75 Q, DVB ASI, TS 188/204 packets, continuous and burst mode
Input packet framing	188
Maximum input bit rate	50 Mbps

IP INPUTS	
Data Interface	10/100/1000bT
Protocols	UDP/RTP, SMPTE 2022, IGMP v2/v3
Connectors	2; RJ45
REMOTE INTERFACES	
Ethernet protocol	HTTP, NTP, SNMP, SSL
CAN Bus	for transmitter control system
GPS CHARACTERISTICS	
Connector	SMA
Frequency	1.575 Ghz (GPS) 1.602–1.603 Ghz (GLONASS)
Antenna Gain Range	0 – +32 dB
Antenna	passive or active ( <i>not included</i> )
Antenna DC supply	OFF , 3V <sub>dc</sub> or 5 V <sub>dc</sub> ( $\pm 0.5V$ ) selectable
Antenna DC current	50 mA max
Reference Accuracy	$\pm 1 \cdot 10^{-12}$
DIGITAL GENERAL DATA	
Shoulder	> 38 dB
MER	> 35 dB (DAB > 30 dB)
Carrier Suppression	> 30dB (typical > 35 dB)
Amplitude imbalance	< 0.1%
Quadrature error	< 0.1°
Quadrature error per carrier	–
Modulator processing delay	up to 250 ms depending on the operating mode
Crest factor	from 8.5 to 9 dB
DVB-T/H CHARACTERISTICS	
Input Bit Rate	according to ETS 30 744 in SFN Bit rate adaptation and PCR restamping in MFN
Standard	Fully compliant with EN 300 744, TS 101 191
IFFT	2K, 4K, 8K
Code rate	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32
Interleaver	Native, in-depth
Constellation	QPSK, 16QAM, 64QAM
Hierarchical (alpha)	1, 2, 4
Network operation	MFN, SFN
Bandwidth	5, 6, 7, 8 MHz
DVB-T2 CHARACTERISTICS	
Inputs	2 BNC 75 $\Omega$ , DVB ASI, TS/T2–MI, 188/204 packets, continuous and burst mode, 2 RJ45 GbE
PLP Mode	A/B
T2 profile	Main and Lite, FEF support
PLP ISSY	ON/OFF
Standard	EN 302 755, TS 102 773; TR101 290, TS 102 831
Channel Bandwidth	1.7/5/6/7/8 MHz
PLP Management	1/8
PLP Constellation	QPSK, 16QAM, 64QAM, 256QAM
L1 Post Constellation	BPSK, QPSK, 16QAM, 64QAM
Constellation Rotation	Normal, Rotate
Guard Interval	1/128, 1/32, 1/16, 19/256, 1/8, 19/128, 1/4
FFT mode	1k, 2k, 4k, 8k, 16k, 32k (normal and extended)
Code rate	1/2, 3/5, 2/3, 3/4, 4/5, 5/6
FEC	Short (16k), Normal (64k)
Pilot pattern	from PP1 to PP8r
Network type	MFN and SFN (relative timestamp), MISO/SISO

**ISDB-T/Tb CHARACTERISTICS**

Guard Interval	1/32, 1/16, 1/8, 1/4
Modes	QPSK, 16QAM, 64QAM
ISDB-T TRX modes	Mode 1, Mode 2, Mode 3
Time Interleaving	supported
Frequency Interleaving	Intersegment/intrasegment
Selectable inner code rates	1/2, 2/3, 3/4, 5/6, 7/8
Hierarchical transmission	up to 3 levels
Network models	MFN, SFN
Test Modes	Single Carrier, PRBS
Input Data Format	3 ASI, 1 GbE

**ATSC CHARACTERISTICS**

Input mode	ASI or SMPTE-310, selectable
Standard supported	A/153 (ATSC MH) – A/110:B and A/110:2011 (ATSC SFN)

**ATSC 3.0 CHARACTERISTICS**

Input mode	Ethernet RJ45 (IP Gigabit)
System bandwidth	6 MHz, 7 MHz, 8 MHz
Multiple PLP	64 PLP
PLP modulation	QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM
PLP LDPC code rate	2/15, 3/15, 4/15, 5/15, 6/15, 7/15, 8/15, 9/15, 10/15, 11/15, 12/15, 13/15,
FFT Size	8K, 16K, 32K
Guard intervals (samples)	192, 384, 512, 768, 1024, 1536, 2048, 2432, 3072, 3648, 4096, 4864
Pilot pattern	SP3_2, SP3_4, SP4_4, SP6_2, SP6_4, SP8_2, SP8_4, SP12_2, SP12_4, SP16_2, SP16_4, SP24_2, SP24_4, SP32_2, SP32_4
Signalling FEC Type	Modes 1 to 7 for L-Basic and L1-Detail
Network modes	MFN & SFN

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## 2: OPERATIONS

### 2.1 INTRODUCTION

The present chapter describes all the control and indicators available to the operating personnel and the correct ways in which to use MEX // unit.

### 2.2 CONTROLS AND INDICATORS

The following Tab. 2.1 refers to Fig. 2.1 in which the front panel of MEX // unit is shown.

Fig. 2.2 shows the rear panel of MEX //, Tab. 2.2 refers to this figure.

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

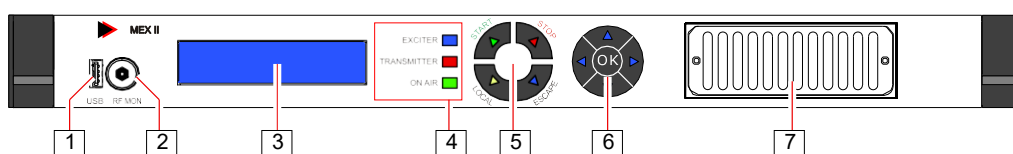




Fig. 2.1 – MEX // front panel

Tab. 2.1 – MEX // front panel legend (ref. Fig. 2.1)

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

Tab. 2.1 – MEX // front panel legend (ref. Fig. 2.1)

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

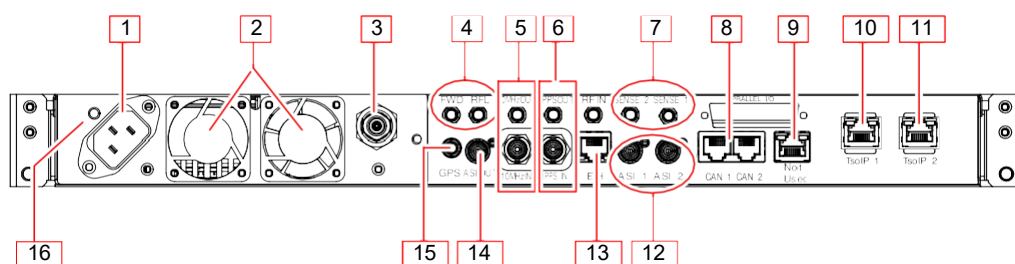


Fig. 2.2 – MEX II rear panel

Tab. 2.2 – MEX II rear panel legend (ref. Fig. 2.2)

No.	LABEL	FUNCTION
1		Line socket.
2		Extractor fans of the exhaust air.
3		Connector (N female); RF signal output of MEX II.
4	FWD  RFL	Connector (SMA female; 50Q/0dBm; +3/-7dBm); input connector of the forward power signal outgoing from an external directional coupler ( <i>before filter</i> ; for relevant measurement displayed on the front panel display).  Connector (SMA female; 50Q/0dBm; +3/-7dBm); input connector of the reflected power signal outgoing from an external directional coupler (for relevant measurement displayed on the front panel display)
5	10MHz OUT 10MHz IN	Connectors (SMA female); output of 10MHz reference signal. Connector (BNC female); input of 10MHz reference signal.
6	1PPS OUT 1PPS IN	Connectors (SMA female); output of 1PPS reference signal. Connector (BNC female); input of 1PPS reference signal.
7	SENSE 1/SENSE 2	S1= Pre-filter non-linear correction. S2= Post-filter linear correction
8	CAN1/CAN2	Connectors (RJ-45); allow the connection to a <b>Controller Area Network</b> serial bus.
9	Not Used	Connector (RJ-45); <b>NOT USED</b>
10	TSolP 1	Connector (RJ-45); TSolP 1 input. It also can be used ( <i>if configured</i> ) for <i>ethernet</i> control and monitoring of the unit over TCP/IP.
11	TSolP 2	Connector (RJ-45); TSolP 2 input. It also can be used ( <i>if configured</i> ) for <i>ethernet</i> control and monitoring of the unit over TCP/IP.
12	ASI1/2	Connectors (BNC female); DVB serial type MPEG2 Transport Stream inputs.
13	ETH	Connector (RJ-45); it allows <i>ethernet</i> control and monitoring over TCP/IP of the <i>modulator</i> .
14	ASI OUT	<b>NOT USED</b>
15	GPS	Connectors (SMA female);input of the signal from GPS.
16		Grounding screw of the frame.

### 2.3 MAINS CONNECTION

---

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

- 80 to 220 Vac, 50/60 Hz.

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

## 2.4 NAVIGATION

The controller keyboard allows monitoring and/or setting the functioning parameters of MEX //. Several menus are available to the operator who can access them by the keyboard ([6] on Fig. 2.1) on unit front panel.

### 2.4.1 Keyboard functions

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

- "←" and "→" arrows select the menu; once accessed the menu, move the cursor under digits of a parameter to be changed (with "j" and "k" arrows);
- "j" and "k" arrows allow scrolling items of each menu.  
In the editing mode (set-up of a parameter, after "OK" is entered) allow setting the digit to be changed.
- "OK" is used to access the selected item. In the editing mode (set-up of a parameter) enter the datum.  
*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 or from the editing of a parameter.

#### KEEP IN MIND THAT:



for numerical parameter to be set, "j" arrow increases the value, "k" arrow decreases the value.

For non-numerical parameters (the ones with a limited number of options, also numerical) "j" and "k" arrows change directly to next option.

*If no key is pressed within about 10 sec, the settings will be cancelled.*

*At the end of the settings these ones must be saved, otherwise after a switching-off of the unit, the settings will be lost.*

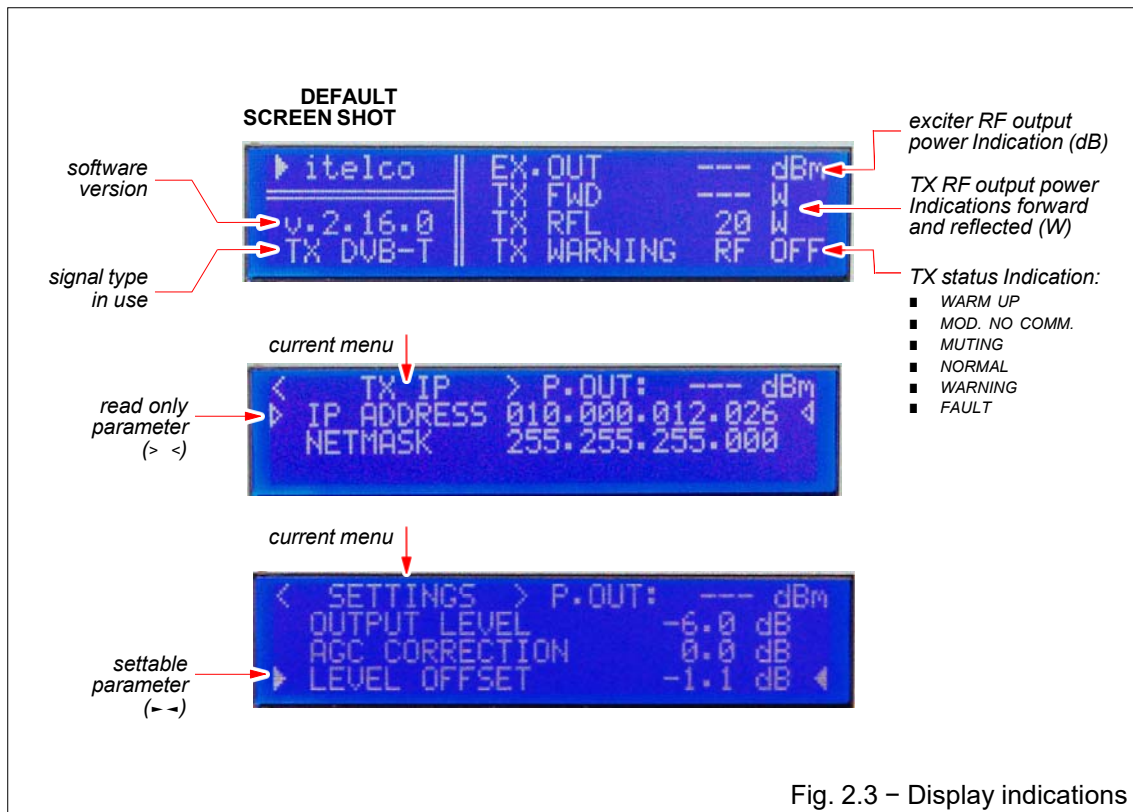
### 2.4.2 Indications and symbols used on screen-shots

Here below a list of the indications and symbols used on the screen-shots of the menu, is given along with a short explanation.

Tab. 2.3 – List of indications and symbols used on screen-shots	
symbol	meaning
> <	Located inside the page of an accessed menu, indicate the parameter selected: – > < indicates a <i>non-editable</i> parameter (only reading) <i>N.B. a parameter may be editable under certain conditions and non-editable under other conditions.</i>
▶ ◀	Located inside the page of an accessed menu, indicate the parameter selected: – ▶ ◀ indicates an <i>editable</i> parameter <i>N.B. a parameter may be editable under certain conditions and non-editable under other conditions.</i>
◆	Indicates parameters to be saved on the <i>flash memory</i> .

### 2.4.3 General information on data displaying

At the switching-on and after a while, the unit shows the default menu shown on Fig. 2.3.



## 2.4.4 Menus

This paragraph gives information on controller menus and submenus, available to the operator on unit display. A family tree of the menus available to the operator is shown in Fig. 2.4.

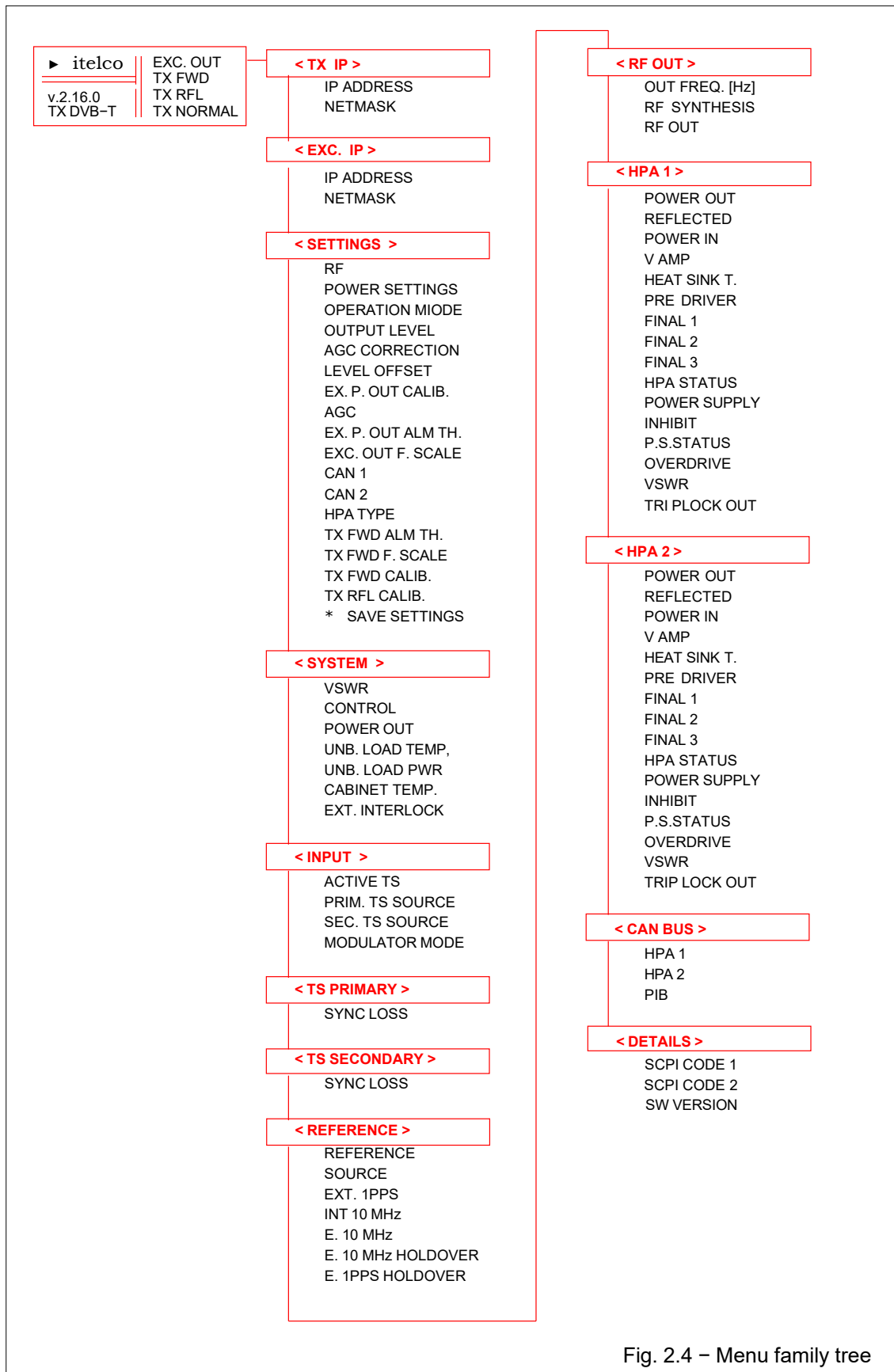


Fig. 2.4 – Menu family tree

**< TX IP >**

- > IP ADDRESS shows TX *IP address* (i.e.: 010.000.011.150)
- > NETMASK shows TX *netmask* (i.e.: 255.255.000.000)

**< EXC IP >**

- > IP ADDRESS displays *IP address* of the unit
- > NETMASK displays *netmask* of the unit

**< SETTINGS>**

- RF enables (ON) disables (OFF) the RF output power
- POWER SETTING sets the level (as percentage of nominal power) of the unit output power
- OPERATION MODE sets the operation mode of the unit (LOCAL, REMOTE). The new setting must be confirmed.
  - LOCAL : set-up of unit parameters is allowed only locally, but through *web service* it is possible displaying parameters set-up, alarms and event log.
  - REMOTE: set-up of unit parameters is allowed only remotely.
- > OUTPUT LEVEL shows the RF output level (dB) of the unit
- > AGC CORRECTION shows the current value (dB) of the correction operated by AGC circuit.
- LEVEL OFFSET set the the offset value (dB) of the output level.  
*A new setting of this parameter must saved to "flash memory" ("\* SAVE SETTINGS" command) otherwise at the unit switching off, the setting is lost.*
- EX. P.OUT CALIB. sets the measurement calibration of the unit *output* power.  
*A new setting of this parameter must saved to "flash memory" ("\* SAVE SETTINGS" command) otherwise at the unit switching off, the setting is lost.*
- AGC enables (ON) disables (OFF) the AGC function.  
*A new setting of this parameter must saved to "flash memory" ("\* SAVE SETTINGS" command) otherwise at the unit switching off, the setting is lost.*
- EX.P.OUT ALM TH. sets the alarm threshold (dB) of the *unit* RF output power from -10dB through 0.0dB in respect to the nominal output power.  
*A new setting of this parameter must saved to "flash memory" ("\* SAVE SETTINGS" command) otherwise at the unit switching off, the setting is lost.*
- EXC.OUT F. SCALE sets the full scale indication of the *unit* output power.  
*A new setting of this parameter must saved to "flash memory" ("\* SAVE SETTINGS" command) otherwise at the unit switching off, the setting is lost.*
- CAN1 setting reserved when MEX-II operates as *logic unit* of equipment. Settings allowed:
  - NOT USED (MEX-II not operating as logic unit of equipment);
  - MASTER [TX+1HPA] (MEX-II operating as logic unit of equipment with 1HPA);
  - MASTER [TX+2HPA] (MEX-II operating as logic unit of equipment with 2HPA);
  - TX WMETER NO CAN (MEX-II not managing peripherals, but enabling the internal wattmeter for FWD and RFL power measurements);



> USER	shows the command sent by the user (START/STOP).
> CONTROL	shows the current command active (START/STOP). Under normal operating conditions the indications of “USER” and “CONTROL” are the same, but if an anomalous condition occurs the <i>user</i> can send the “START” command, but the <i>control</i> shows “STOP” indicating that an anomaly occurred.
> POWER OUT	shows the status (NORMAL, FAULT) of TX RF output.
> UNB.LOAD TEMP.	shows the status (NORMAL, FAULT) of the heat sink of the unbalance load of the output combiner of the equipment where the unit is housed.
> UNB.LOAD PWR	shows the power (W) dissipated on the unbalance load of the output combiner of the equipment where the unit is housed.
> CABINET TEMP.	shows the temperature (°C) inside the cabinet.
> EXT. INTERLOCK	shows the status of transmitter <i>interlock chain</i> (OPEN, CLOSED)

> ACTIVE TS	shows current <i>transport stream</i> (ASI IN 1/ASI IN 2)
> PRIM. TS SOURCE	shows current <i>primary transport stream</i> (ASI IN 1/ASI IN 2)
> SEC. TS SOURCE	shows current <i>secondary transport stream</i> (ASI IN 1/ASI IN 2)
> MODULATOR MODE	shows current modulator active (DVB-T/DVB-T2)

**< TS PRIMARY/SECONDARY >**

- > SYNC LOSS shows the status (OK, ALARM) of the relevant parameter

**< REFERENCE >**

- > REFERENCE SOURCE shows the type of frequency reference set (auto/INTERNAL, EXTERNAL)
- > EXT 1PPS shows the status of *1PPS* (OK, ALARM)
- > INT 10 MHz shows the status of *10 MHz internal frequency reference* (OK, ALARM).
- > EXT 10 MHz shows the status of *10 MHz external frequency reference* (OK, ALARM).
- > E.10 MHz HOLDOVER shows the status (OK, ALARM) of the relevant parameter
- > E.1PPS HOLDOVER shows the status (OK, ALARM) of the relevant parameter

**< RF OUT >**

- > OUT FREQ. [Hz] shows the output frequency value (Hz) of the unit
- > RF SYNTHESIS shows the status of *synthesizer* (OK, ALARM)
- > RF OUT shows the status of RF output (OK, ALARM) of the unit

**< HPA 1/2>**

- > POWER OUT shows the value (W) of HPA1/2 output power
- > REFLECTED shows the value (W) of reflected output power of HPA1/2
- > POWER IN shows the value (mW) of HPA1/2 input power
- > V AMP shows the value (V) of the voltage power supply of HPA1/2 final stages
- > HEAT SINK T. shows the temperature value (°C) of the amplifier stage heat sink
- > PRE DRIVER shows current absorption of the *pre-driver* (mA)
- > DRIVER shows current absorption of the *driver* (mA)
- > FINAL 1/2/3 shows current absorption of the *final 1/2/3* (mA)
- > HPA STATUS shows the status of the amplifier module (OK, FAULT)
- > POWER SUPPLY shows the value (V) of the service voltage power supply of HPA1/2
- > INHIBIT shows presence/absence (PRESENT, ABSENT) of the *inhibit* condition (RF signal processing interrupted)
- > P.S. STATUS shows the status of the amplifier module power supply (OK, FAULT)
- > OVERDRIVE shows an *overdrive* condition of the amplifier module
- > VSWR shows the presence of *reflected power* at the RF output of the amplifier module (OK, FAULT).
- > TRIP LOCK OUT shows the block condition of the amplifier module due to a *trip lock out* alarm

**< CAN BUS >**

- > H.P.A. 1 shows the status of connection with H.P.A. 1. (CONNECTED, NO COMM)
- > H.P.A. 2 shows the status of connection with H.P.A. 2. (CONNECTED, NO COMM)
- > P.I.B. shows the status of connection with P.I.B. board (CONNECTED, NO COMM)

**< DETAILS>**

- > SCPI Code 1 *FOR INTERNAL USE*
- > SCPI code 2 *FOR INTERNAL USE*
- > SW Version shows the current software version of the unit (*MEX-II v2.16*)

## 2.5 REMOTE CONTROL (Webservice operation)

MEX II is fully controllable over Ethernet by means of the Webservice function (Web browser control). A suitable “Ethernet” connector is available on unit rear panel ([“ETH” – 12] on Fig. 2.2) for the connection to a PC.

MEX II also allows to remote control the transmitter where it is housed with Webservice function. A suitable “Ethernet” connector is available on unit rear panel (“TX ETH” – [10] on Fig. 2.2) for the connection to a PC.

### 2.5.1 MEX II Webservice main page

Connection to the Webservice function is established simply by entering in the Web browsers address field the IP address of MEX II unit. The IP address is read on “EXC. IP” menu. As soon as the connection has been opened the primary control and status page will appear. The page is divided into an upper section and a lower section.

The upper section provides a graphic representation of the block schematic of the device. The block schematic provides general status information about the device and serves as navigation tool for accessing specific status and configuration menus.

The lower section provides space for simultaneous display of three control and status panels for specific functional areas of the unit. The control panels are easily adapted to the current activity by dragging-and-dropping the required functional block from the upper section of the screen to the lower section of the screen (see paragraph 2.5.2 for details).

The elements of the block schematic are highlighted by different colors depending on their state, as follows:

- **red** color if an *alarm* condition occurs;
- **green** color for *normal* operating conditions;
- **gray** color for functional blocks that are *not used* in the current configuration.



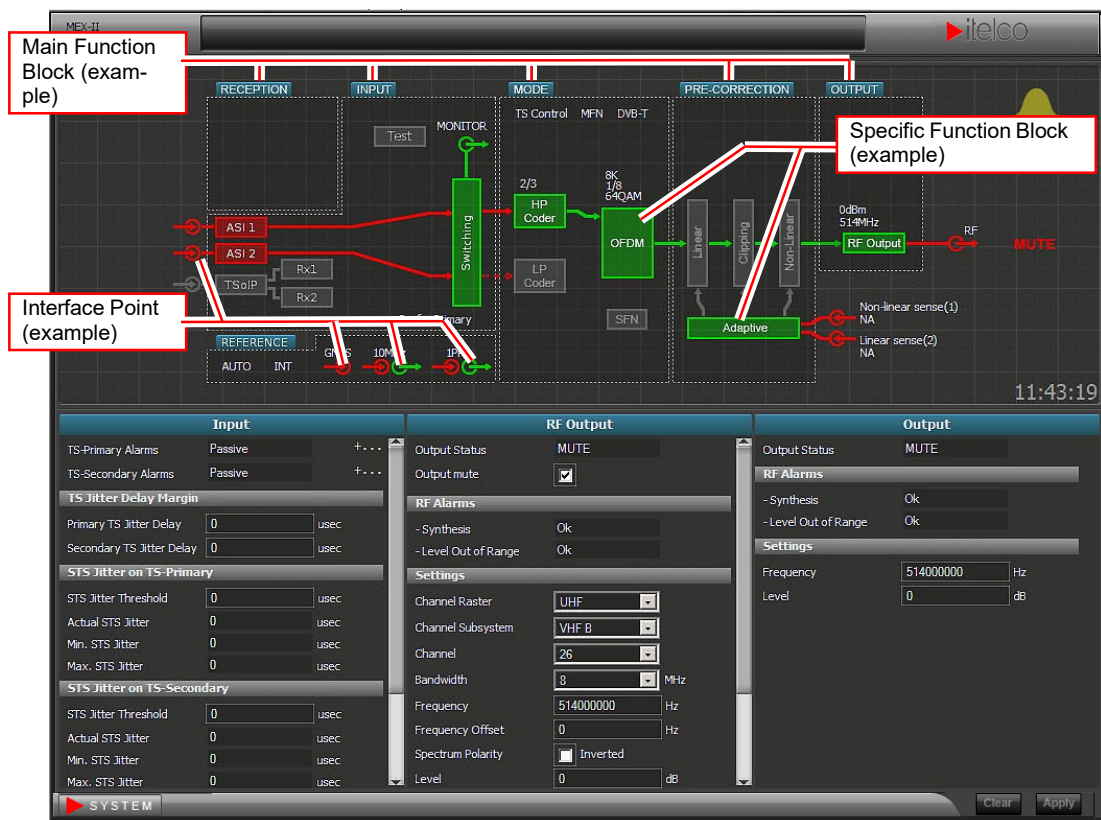
## 2.5.2 Webservice – Operation principle

### 2.5.2.1 Control panel configuration

The control panel (lower section of the screen) is easily adapted to the current activity by dragging-and-dropping the required functional block from the upper section of the screen to the lower section of the screen. Control panels for three functional blocks can be open simultaneously in the lower section.

The 'Functional Blocks' in the upper section of the screen can be subdivided into three types:

- **Main function block:** a main function block holds the top level control and status parameters for a specific function. These blocks are identified by the blue label 'attached' above the block (white text on blue background). In the below example screen print main functional blocks exist for the sub-functions Input, RF output and Output.
- **Specific function block:** a specific function block holds control and status functions for a specific function within a 'Main functional block'. In the below example screen print it can for example be noted that the Input main block contains specific functional blocks for the ASI Inputs and the Switching functions. Likewise, it can be seen that the Output block contains specific functional blocks for RF Output and Precorrection functions.
- **Interface points:** The various interface points in and out of the unit presented in the upper section of the block are themselves mini functional blocks and similar to the main and specific functional blocks these points can be dragged-and-dropped to the lower section of the screen whenever it is desired to check or set parameters related to the specific point. In the below screen print it can for example be noted that individual connection points exist for 10MHz (out) and 1PPS (out).

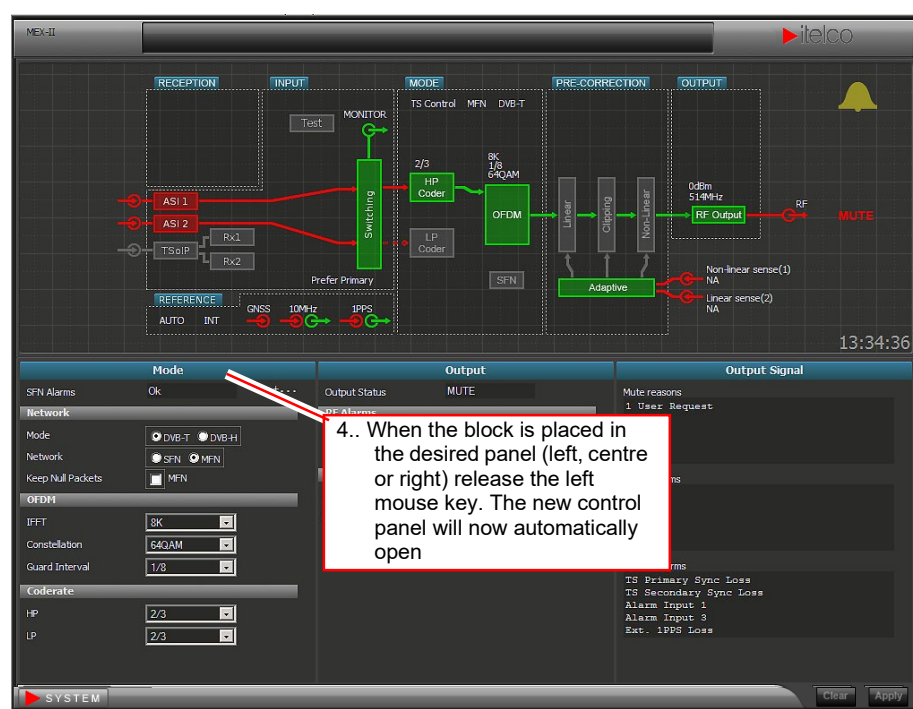
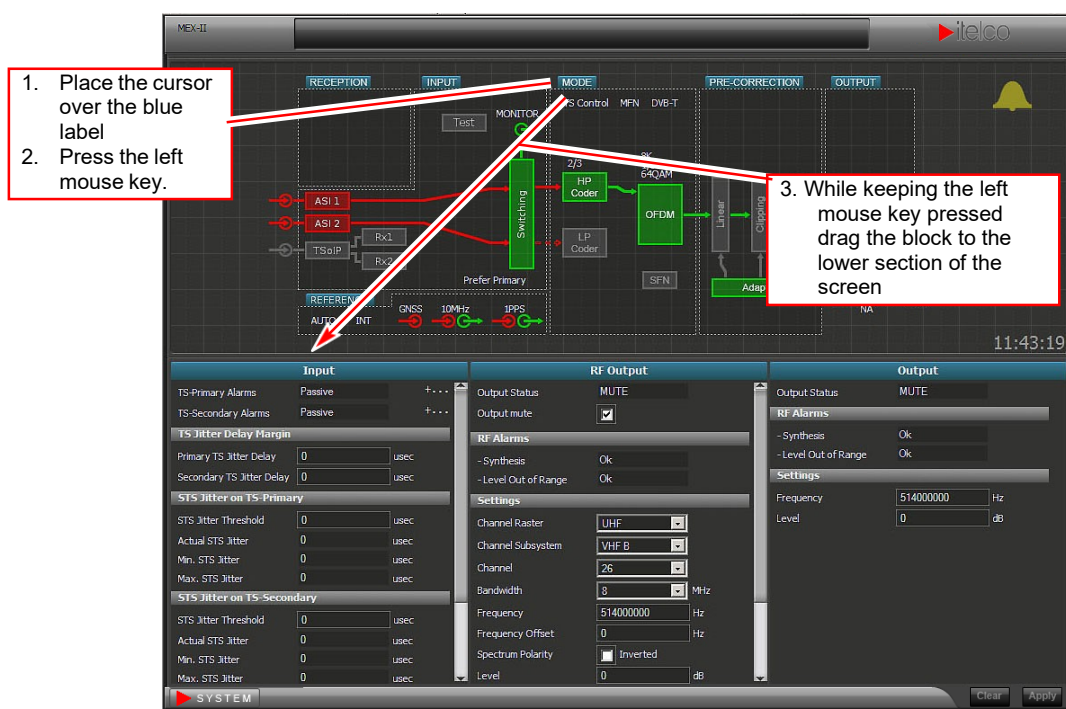




### 2.5.2.2 Parameter control for Main Function Block

To access the control panel for a main function block (for example 'Mode' block) proceed as follows:

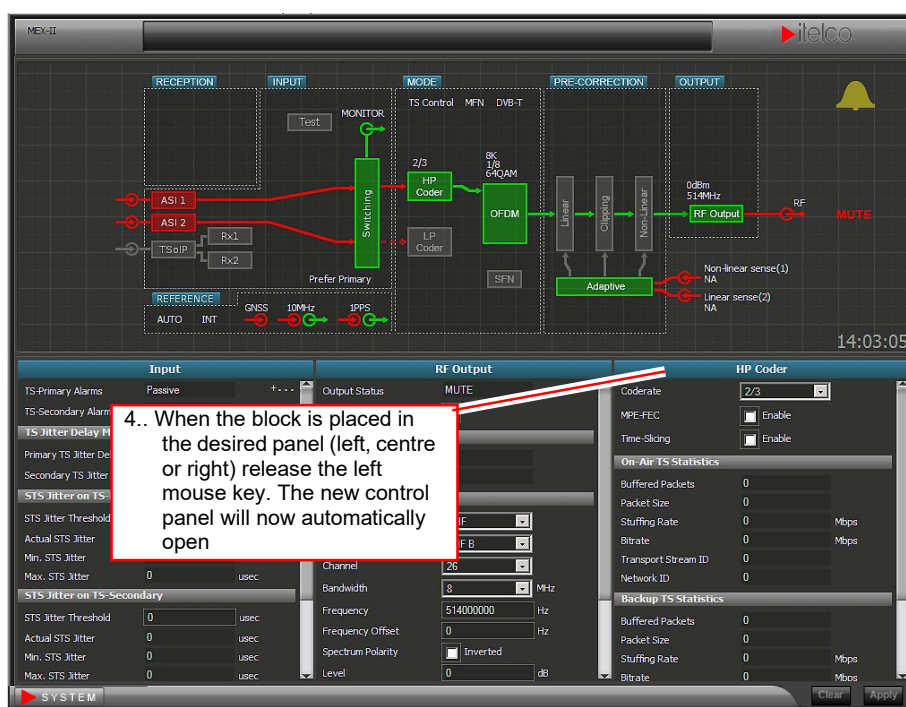
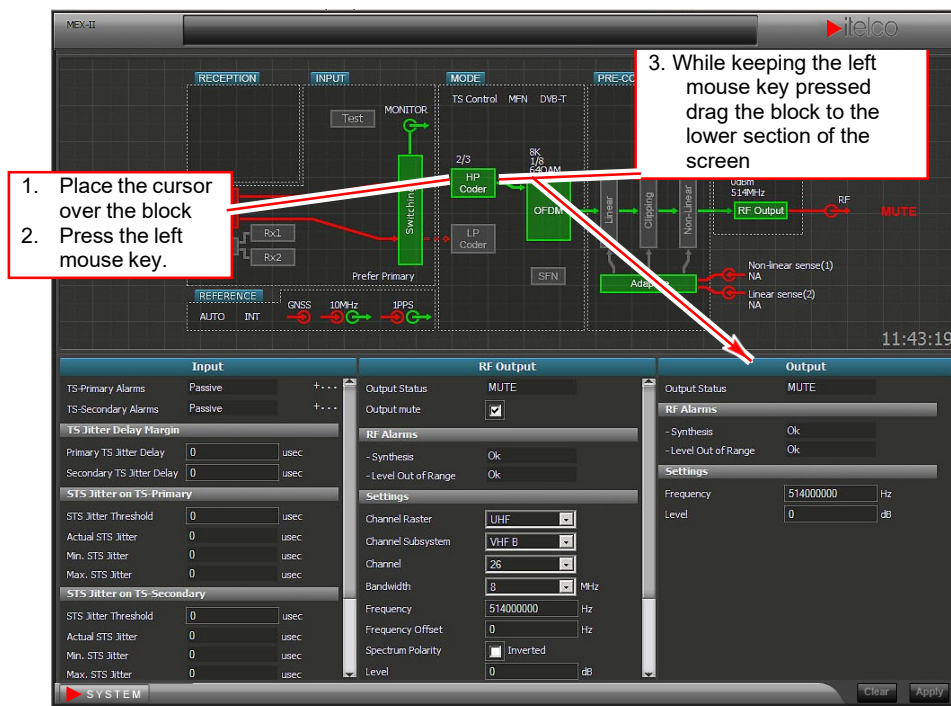
1. Place the cursor over the blue label of the block of interest (for example 'Mode' block).
2. Press the left mouse button.
3. While keeping the left mouse button pressed drag the block to the lower section of the screen.
4. When the block has been dragged to the lower section release the left mouse button. The control panel that is associated with the block will now open in place of the panel over which the block was dropped. The block may freely be dropped in any of the three panels (left, center or right) in accordance with the preferences.



### 2.5.2.3 Parameter control for Specific Function Block

To access the control panel for a specific function block (for example 'HPA Coder' block) proceed as follows:

1. Place the cursor over the block of interest (for example 'HPA Coder' block).
2. Press the left mouse button
3. While keeping the left mouse button pressed drag the block to the lower section of the screen
4. When the block has been dragged to the lower section release the left mouse button. The control panel that is associated with the block will now open in place of the panel over which the block was dropped. The block may freely be dropped in any of the three panels (left, center or right) in accordance with the preferences.

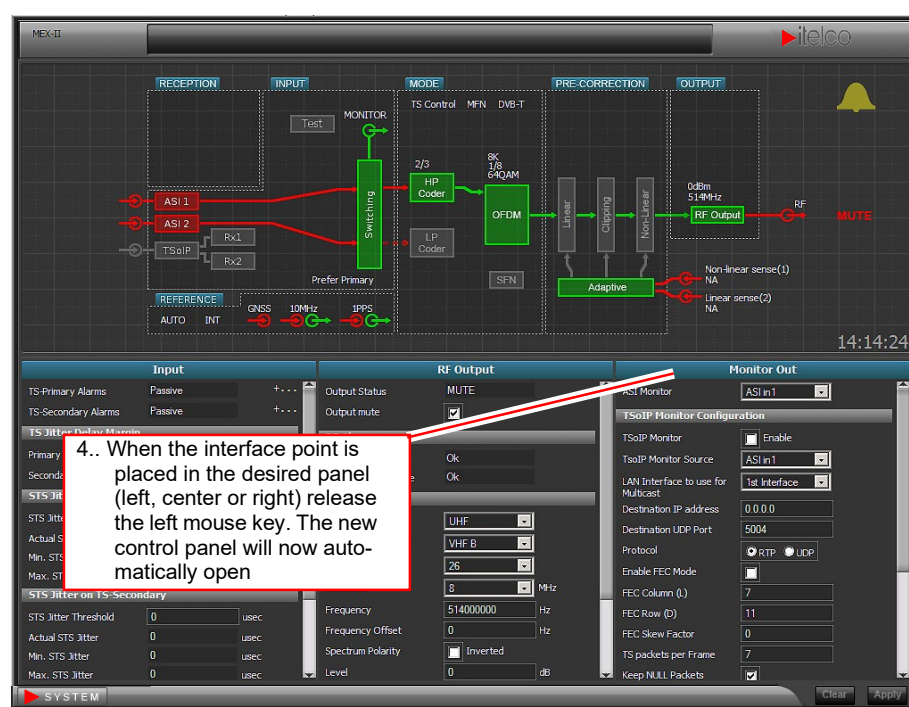
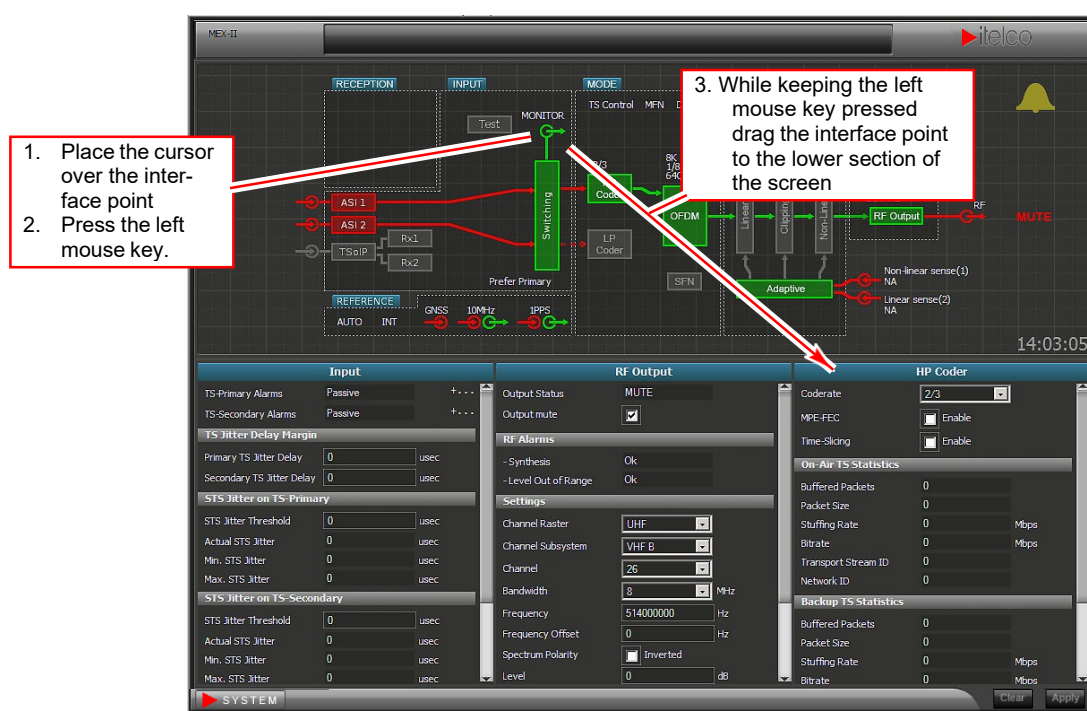


### 2.5.2.4 Parameter control for Interface point

To access the control panel for a specific Interface point (for example 'RF Monitor' of Input) proceed as follows:

1. Place the cursor over the block of interest (for example 'RF Monitor' of Input).
2. Press the left mouse button
3. While keeping the left mouse button pressed drag the 'Interface point' to the lower section of the screen

When the 'Interface point' has been dragged to the lower section release the left mouse button. The control panel that is associated with the connection point will now open in place of the panel over which the Interface point was dropped. The Interface point may freely be dropped in any of the three panels (left, centre or right) in accordance with the preferences.





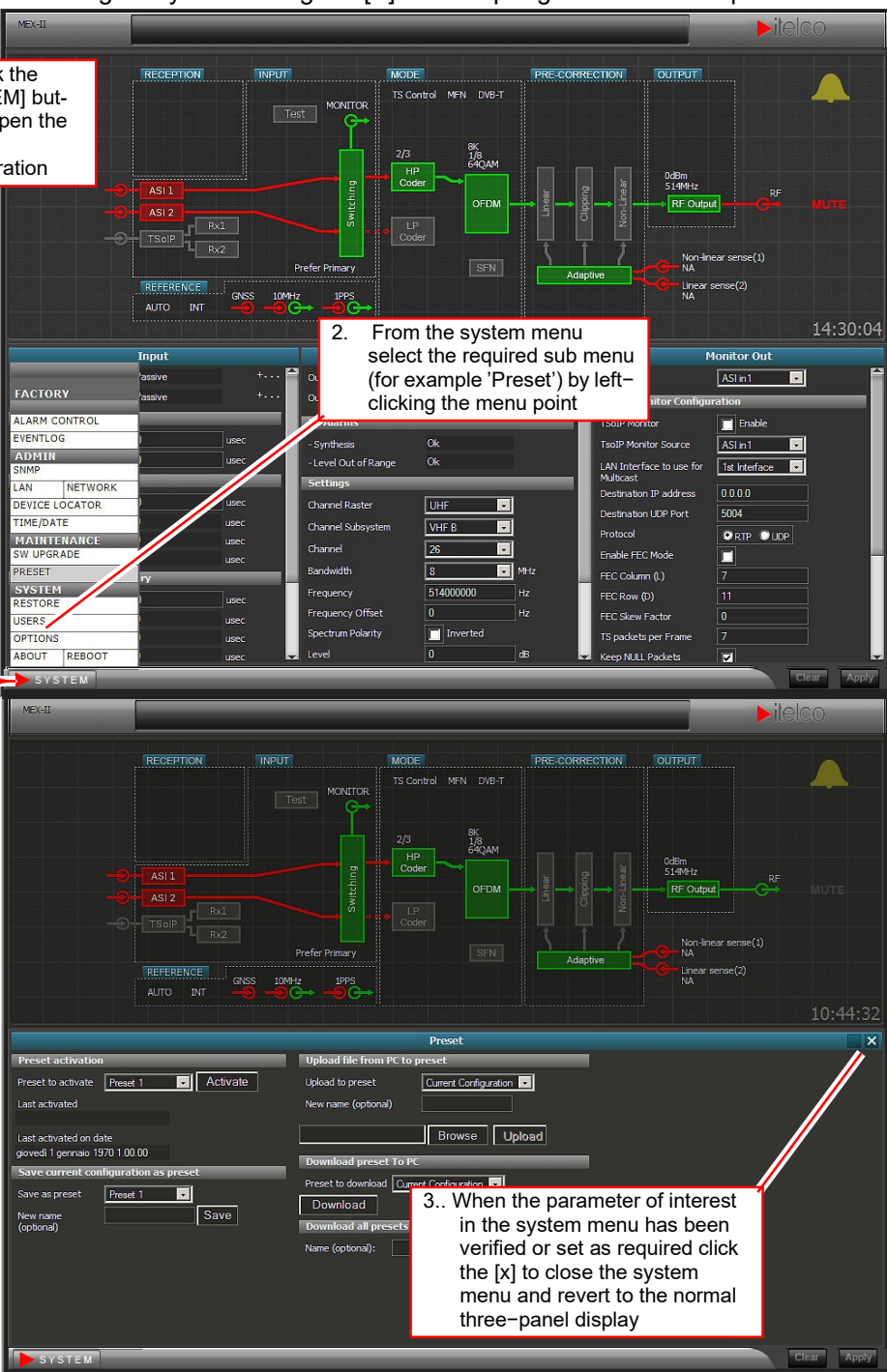


## 2.5.3 System menu

### 2.5.3.1 Access to system parameters

A number of system oriented parameters can be accessed by left-clicking the [System] button located in the lower-left corner of the web page. To access a specific system (for example saving or loading a device preset) proceed as follows:

1. Left click the [System] button. A menu including the various choices will now open up above the [system] button.
2. From the menu select the required function (for example 'Preset' management) by left clicking the point in the menu. *Be sure the cursor “” changes to index-finger “”.*
3. The corresponding control panel will now open up in the lower section of the screen in place of the three regular control panels.
4. When the setting of interest has been verified/changed as required the “System” control panel is closed again by left clicking the [X] in the top-right corner of the panel.



The first screenshot shows the main MEX-II interface with a sidebar menu on the left. A red box highlights the 'SYSTEM' button at the bottom of the sidebar. A red arrow points from this box to the second screenshot. The second screenshot shows the 'SYSTEM' menu open, displaying various system parameters and settings. A red box highlights the 'Preset' option in the menu. A red arrow points from this box to the third screenshot. The third screenshot shows the 'Preset' management panel, which includes options for preset activation, upload, and download. A red box highlights the 'X' button in the top-right corner of the panel, indicating how to close it.

1. Left-click the [SYSTEM] button to open the system configuration

2. From the system menu select the required sub menu (for example 'Preset') by left-clicking the menu point

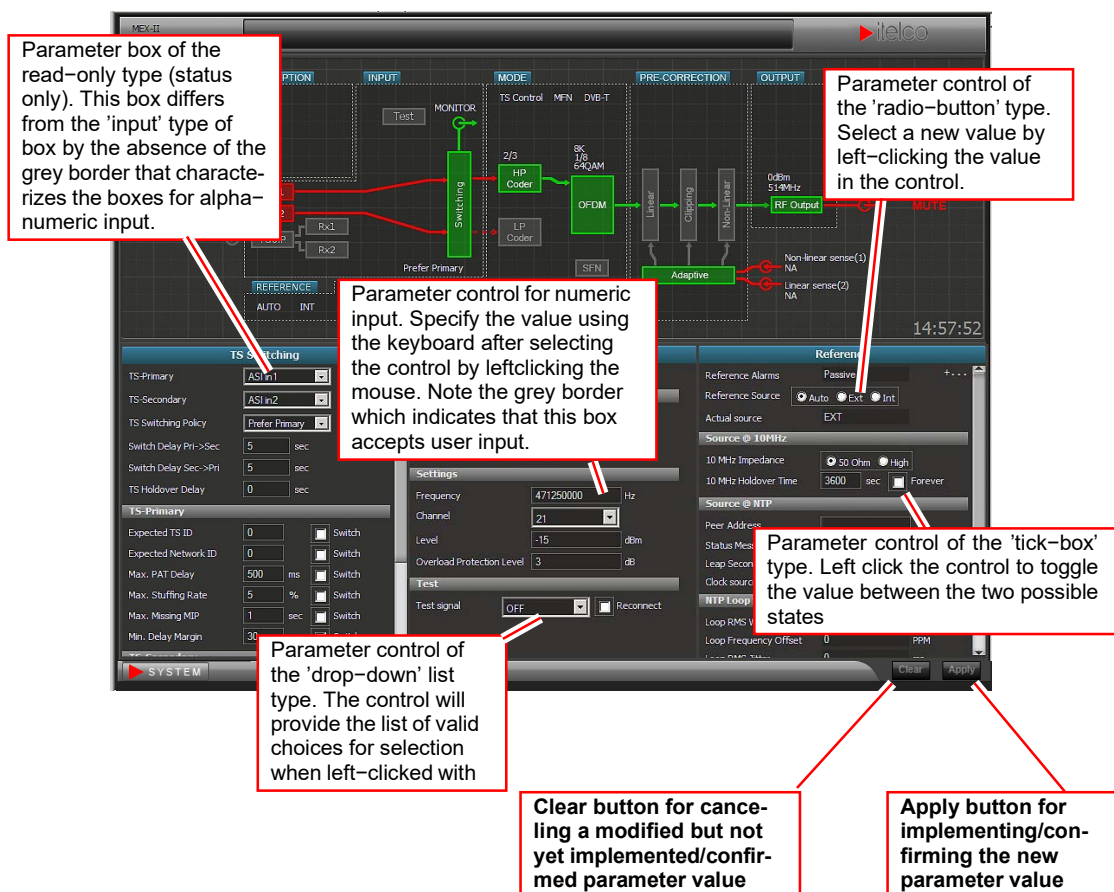
3. When the parameter of interest in the system menu has been verified or set as required click the [x] to close the system menu and revert to the normal three-panel display



### 2.5.3.2 Setting of a parameter value

To change the setting of a specific user parameter, proceed as follows:

1. If not already available for modification move the functional block in which the parameter resides to the control panel in the lower section of the screen as described above.
2. Place the cursor over the location in the control panel where the parameter of interest resides and click the left mouse button to set the point in focus. Depending on the type of input set the new value as required. The input can be 'alpha-numeric for input by keyboard' or based on a drop-down list holding the valid choices or based on a tick-box or radio-button system. Notice that some fields are status shows only (read only) and that it consequently isn't possible to access these fields for parameter change.
3. When the new value has been specified the border of the field in question will be presented in a light blue color to indicate that a new value has been specified but not yet implemented/confirmed.
4. To implement/confirm the new value move the cursor to [Apply] button and click the left mouse button to confirm the entry.
5. When the new value has implemented/confirmed the light blue border around the parameter input field will return to the normal black color.



### 2.5.3.3 The System menu

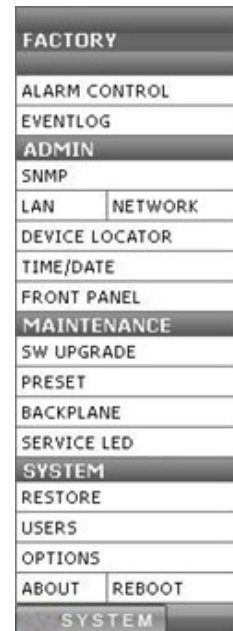
The System menu (pictured on the right) gives access to system wide configurations subject to the user login level (see the next paragraph for more on user login level). It is divided into sections containing several sub-menus pertaining to the different sections. In the top of the system menu the current username of the current user logged in is displayed. The figure below shows the system menu as displayed for the factory user, which is the highest level user.

#### “System” section

The System section contains information and configuration options for the modulator system.

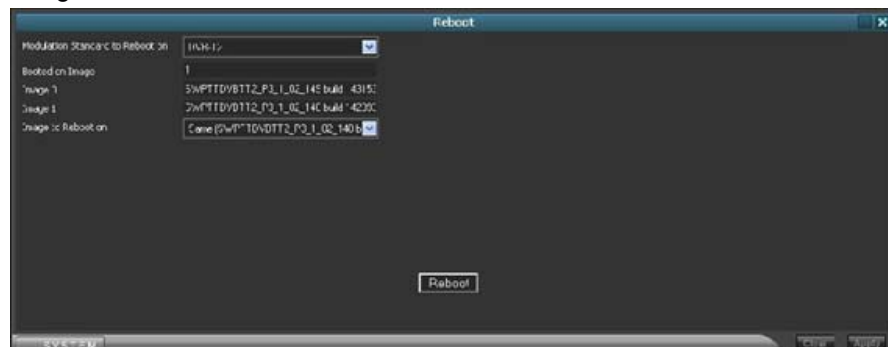
**About** The menu displays general information about the modulator device, such as the device's serial number, the software versions installed, IP and MAC addresses as well as information on hardware modules.

In this menu, the user is also able to view or download version and status report (*the status report is intended for factory internal use e.g. in relation to support issues and is thus encrypted*).



		About	
Serial Number	2300591	FW1 Version	2.242
Booted Image	SWPTTDCVBT2_F3_1_Q2_153 build	FW2 Version	3.0
Booted Image Install Date	Fri Jun 5 09:50:44 2015	FW3 Version	3.1171
Other Image	SWPTTDCVBT2_F3_1_Q2_151 build	FW4 Version	3
Other Image Install Date	Thu Jun 4 13:45:35 2015	Hardware Version	2.06
System Version		Hardware ID	30016e5b3d
Eth0 MAC Address	CD 13:53:00:5a:2a	HW Platform	3
Eth1 MAC Address	CD 13:53:00:5a:2b	Calibration Date	2/4/2014, 12:16:19
Eth2 MAC Address	CD 13:53:00:5a:2c	Calibration Version	1.08
Eth3 MAC Address	CD 13:53:00:5a:2d	Uptime	3 days, 00:49:09
Local LAN IP Address/Mask	10.1.120.50 / 255.255.0.0	In Operation	250 days, 21:15:35
2nd Local LAN IP Address/Mask	10.2.120.50 / 255.255.0.0	Unmuted Operation	25 days, 21:47:12
3rd Local LAN IP Address/Mask	10.3.120.50 / 255.255.0.0	Number Of Beeps	3
4th Local LAN IP Address/Mask	10.4.120.50 / 255.255.0.0	QVSS SW Version	AV01_3.2C_3323_1304 201.00
5th Local LAN IP Address/Mask	10.5.120.50 / 255.255.0.0	Preconnector	107
Default Gateway IP Address	10.1.1.61	OptPower	107

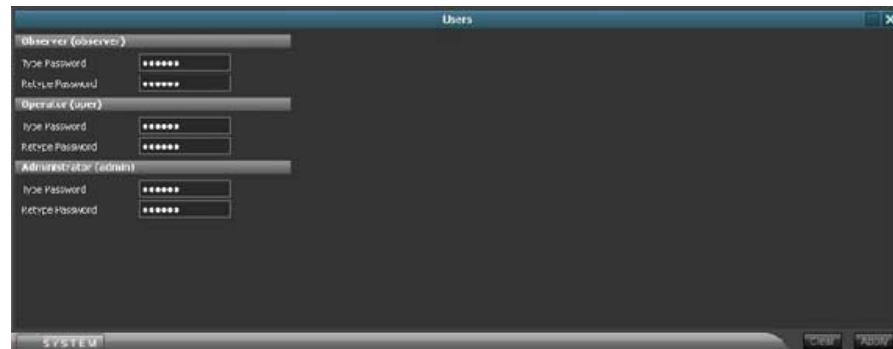
**Reboot** The menu allows the user to change modulation standard pertaining to the specific software build<sup>8</sup>. The modulator may have up to two software images loaded (image 0 and image 1) of which only one image will always be the current which is displayed in 'Booted on Image' field. In case of a reboot action the user may choose to reboot on either of the software images if more than one image are installed.



**Options** In the **Options** menu optional software is displayed pertaining to the modulator device's software configuration. An option code can be entered to unlock software options if these have been purchased



**User's** The **Users** menu allows the user to set or change passwords for different users.



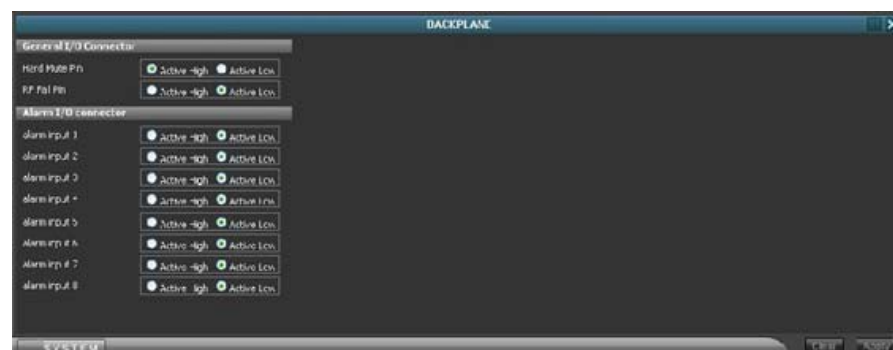
**Restore** The **Restore** menu allows the user to restore the modulator device to its factory settings.

### **“Maintenance” section**

The Maintenance section contains user configurable options pertaining to the service- and maintenance of the modulator device.

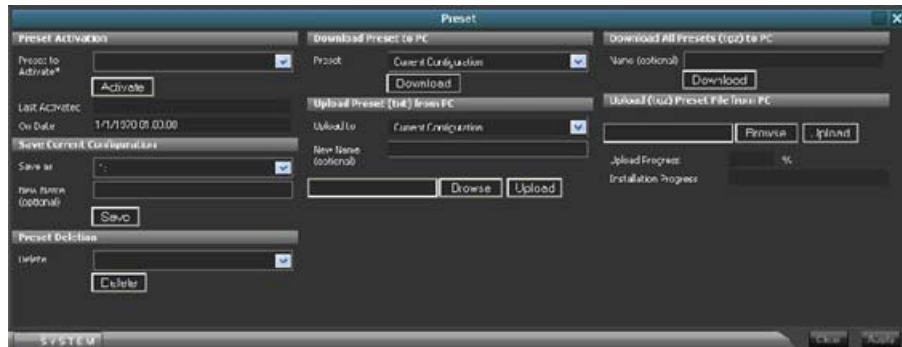
**Service Led** The menu allows the user to lit the service led on the front panel, e.g. indicating to a service technician at the site of installation that the device needs attendance.



**Backplane** The menu gives the user the possibility of switching the general and alarm I/O connectors between 'Active Low' and 'Active High'.

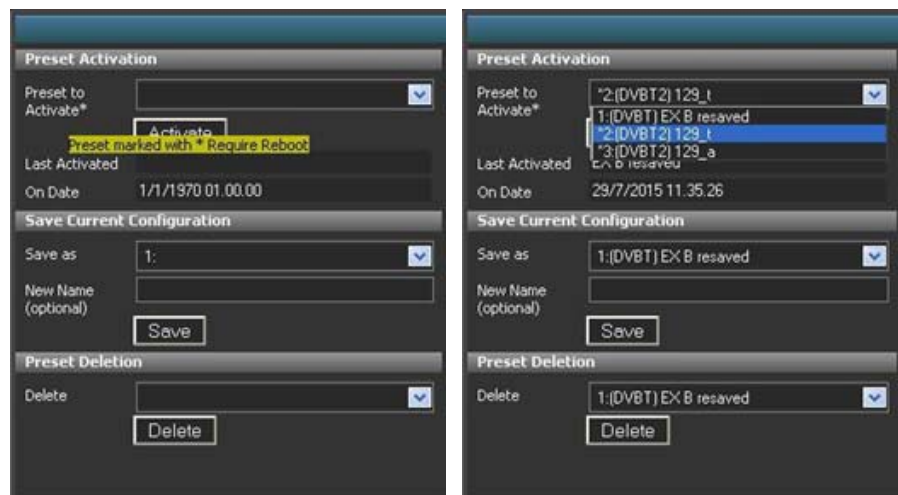


**Preset** In the **Preset** menu the user can save up to 10 presets with individual preset names. Presets can also be up- or downloaded from/to a PC or deleted from the modulator device. An option exists to Download all existing presets in a single archive file (.tgz). This archive file can then be distributed (uploaded) to other modulator devices allowing for quick update of the preset configuration if needed. All presets saved to an archive file will instantly be available after being uploaded to a modulator device.

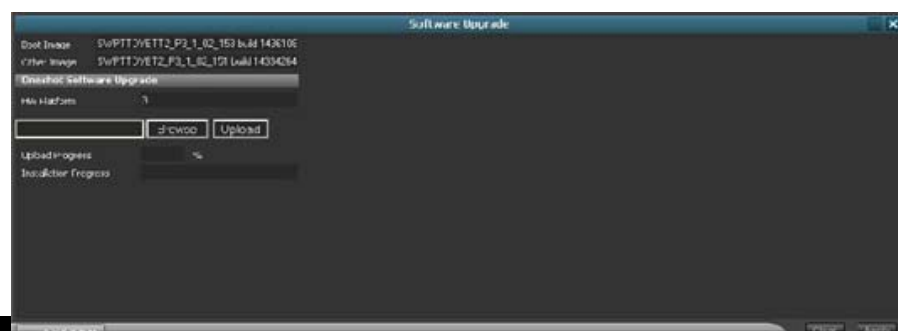
Saved presets that appear in the drop-down lists in the Preset menu, will be shown with their respective modulation standards in a parenthesis before the optional preset name. *More details on para 2.11.*



If a saved preset differs from the current modulation standard, this is indicated by an asterisk prefix (\*) in front of the preset name in the  Preset to Activate  drop-down list. Activating a preset with a different modulation standard requires a reboot of the modulator device.



**Software Upgrade** The menu allows the user to upload a software image to install, upgrade (or downgrade) the modulator device. This will not effect the current image 'Boot Image' – but only the 'Other Image'. After completion of the software update the two images will shift place so that the just updated image will be the one the device reboots on after installation ( refer to paragraph 2.10).



## “Admin” section

**Front panel** The menu provides the user the ability to configure the front panel settings.

The remote (Webservice, SNMP, SCPI) or local access can be switched on and the local access mode timeout can be set.

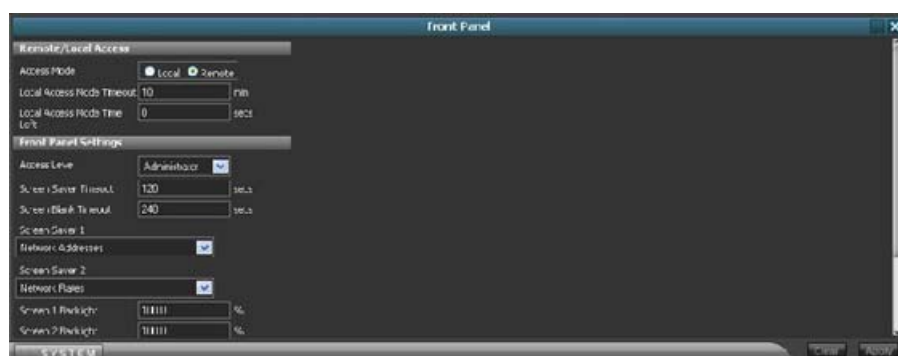
Access level for local mode can be set to Factory, Administrator, Operator or Observer respectively which will then effect what a user at the installation site is able to configure from the front panel.

There are three choices for screen saver settings for each display. These are:

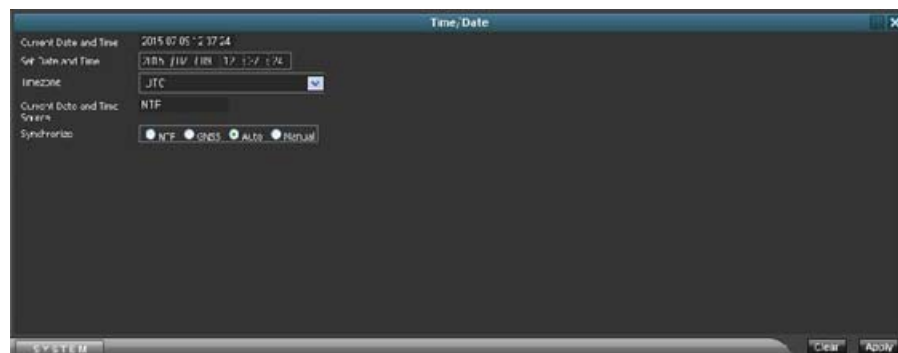
- Alarm overview
- Network addresses
- Network rates

Times for screen saver timeout and when the display turns off (blank) as well as individual backlight setting for each display are also user configurable.

Finally, a tick box for testing the front panel LEDs is present. If active the frontpanel LEDs (except for the power led), will flash continually until the tick box is checked off.



**Time/Date** In this menu the modulator system time can be set to a wide range of time-zones. It can also be manually configured or synchronized via NTP, GNSS, or automatically.



**Device Locator** The device locator function will generate and display a listing of all modulator units visible in the network address space to which this modulator unit is connected.

**LAN** Settings pertaining to the LAN (Local Area Network) can be configured in the **LAN** menu



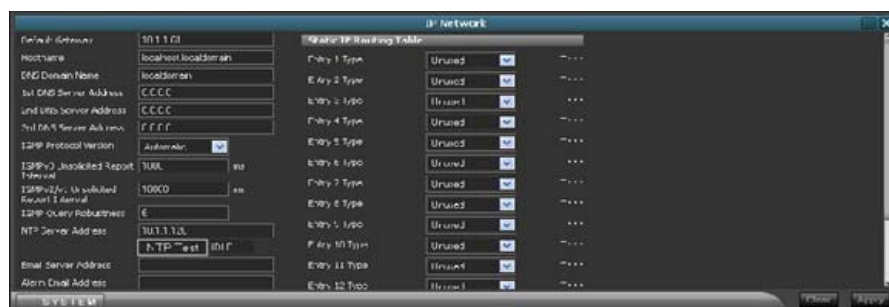
In the LAN configuration panel under the heading *N<sup>th</sup> Interface* the following parameters can be configured:

- **Physical Ethernet:** this field associates any of the LAN interfaces with any of the physical interfaces
- **Static IP Address:** this field is used for specifying the IP address for the *N<sup>th</sup> Interface* when static address mode is used (DHCP mode disabled).
- **IP Netmask:** this field is used for specifying the netmask for the *N<sup>th</sup> Interface* when static address mode is used (DHCP mode disabled).
- **Multicast IP address:** this field is used for specifying the multicast address for the *N<sup>th</sup> Interface*. The expansion (+...) link allows access to configuring source filter (include sources or exclude sources) in accordance with IGMP V3.
- **DHCP Mode:** This tick box is used for enabling/disabling the DHCP mode for the *N<sup>th</sup> Interface*.
- **VLAN Enable:** This tick box and the numeric entry field are used for enabling VLAN mode for the *N<sup>th</sup> interface*. VLAN should only be enabled if the unit is deployed and managed in a VLAN environment. The unit will not be accessible in VLAN mode unless the PC and other equipment interfacing the unit is also in VLAN mode.
- **SNMP Service:** This tick box is used for enabling/disabling SNMP control of modulator through *N<sup>th</sup> Interface*.
- **SCPI Service:** This tick box is used for enabling/disabling SCPI control of modulator through *N<sup>th</sup> Interface*.
- **TSolP Service:** This tick box is used for enabling/disabling TSolP traffic to modulator through *N<sup>th</sup> Interface*.
- **RIP Service:** This tick box is used for enabling/disabling Routing Information Protocol (RIP) for the *N<sup>th</sup> Interface*

*Note: Webservice control of modulator is always enabled for the 1<sup>st</sup> Interface and cannot be disabled through user control.*



**Network** General network settings can be configured in the **Network** menu



The **IGMP protocol** version to be used by the TSolP function by multicast mode can be auto-detected or set explicitly through user control. To configure the 'IGMP protocol' use the IGMP Protocol Version control field (drop-down list) to select between auto selection of protocol or static operation with either protocol version 1, 2 or 3

The **NTP (Network Time Protocol)** server IP address can be entered in the NTP Server Address field. The modulator offers the ability to test if the device can lock to the NTP peer. To do this click the NTP Test button after having entered the IP address or domain name for the NTP server. If the modulator is able to lock to the NTP server, it will state the message 'OK', otherwise it will state 'Failed'. If no test has been performed the NTP test message field will show 'IDLE' even if NTP synchronization is obtained. Please consult the event log to see the status of NTP synchronization.

Setting up **email alarm notifications** is also done in the Network menu. This is described independently in the Alarm System section.

It is possible to change the modulator device's **web service port number** (for the Webservice) if this is desired. Default Webservice port number is 80.

**Port number, serial interface and baud rate for SCPI communication** are also configurable through the Network menu.

**SNMP** SNMP (Simple Network Management Protocol) can be configured in the **SNMP** menu.



From the SNMP menu it is possible to view or download the general- as well as the specific device MIB text as a text file.

If desired the SNMP port number can be changed. The default port number for the protocol is 161.

Community strings for read-only, read-write and trap can be changed independently to authenticate messages between SNMP management software and the SNMP agent (the modulator device). Default community strings are:

- Read-only community : **public**
- Read-write community : **private**
- Trap community : **private**

Further parameters that can be set in the SNMP menu are:

- **SysName \*** should be set to the *fully-qualified domain name (FQDN)* for the managed device. In other words, it's the hostname associated with the managed device's IP address. The RFC 1213 definition is as follows:

```
O sysName OBJECT-TYPE
SYNTAX DisplayString (SIZE (0..255))
ACCESS read-write
STATUS mandatory
DESCRIPTION
    "An administratively-assigned name for
    this managed node. By convention, this
    is the node's fully-qualified domain
    name."
```

```
::= { system 5 }
```

*\* Note: Setting of the SysName variable in the modulator device is optional.*

- **SysLocation \*** is the physical location for the device being monitored. Its definition in RFC 1213 is:

```
O sysLocation OBJECT-TYPE
SYNTAX DisplayString (SIZE (0..255))
ACCESS read-write
STATUS mandatory
DESCRIPTION
    "The physical location of this node
    (e.g., 'rack unit 4, 3rd floor, instal-
    lation site')."
```

```
::= { system 6 }
```

*\* Note: The SysLocation will also be displayed in the top left corner of the modulator Webservice. Setting of the SysName variable in the modulator device is optional.*

- **SysContact \*** is defined similarly to SysLocation:

```
O sysLocation OBJECT-TYPE
SYNTAX DisplayString (SIZE (0..255))
ACCESS read-write
STATUS mandatory
DESCRIPTION
    "The textual identification of the con-
    tact person for this managed node, toge-
    ther with information on how to contact
    this person."
```

```
::= { system 4 }
```

*\* Note: Setting of the SysName variable in the modulator device this object is optional.*

- **SysDescription \*** is an optional textual description of the entity:

```
O sysLocation OBJECT-TYPE
SYNTAX DisplayString (SIZE (0..255))
ACCESS read-write
STATUS optional
DESCRIPTION
    "This value could include the name and
    version identification this managed
    node's hardware revision, software ope-
    rating-system (e.g., 2.06, P3_1_02_153
    build 1436107656')."
```

*\* Note: The SysDescription will also be displayed in the About system menu in the modulator Webservice. Setting of the SysName variable in the modulator device is optional.*

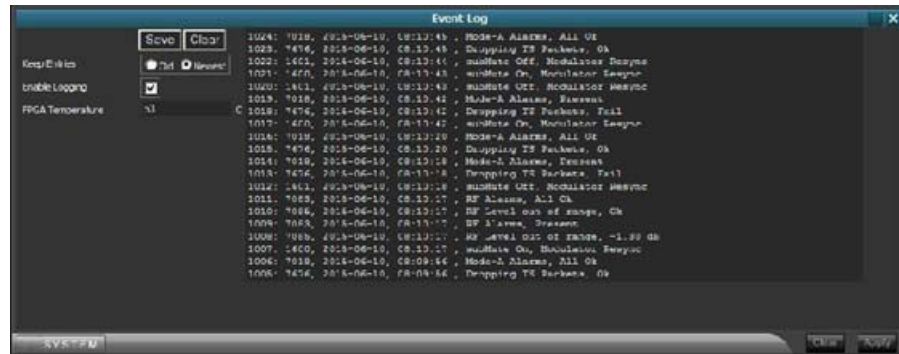


## “Eventlog”

The **Eventlog** menu shows the most recent system events and alarms that are set to be logged in the **Alarm Control** menu. The full eventlog can be viewed and downloaded as a text file. It is also possible to clear the current logged events or entirely disabling logging

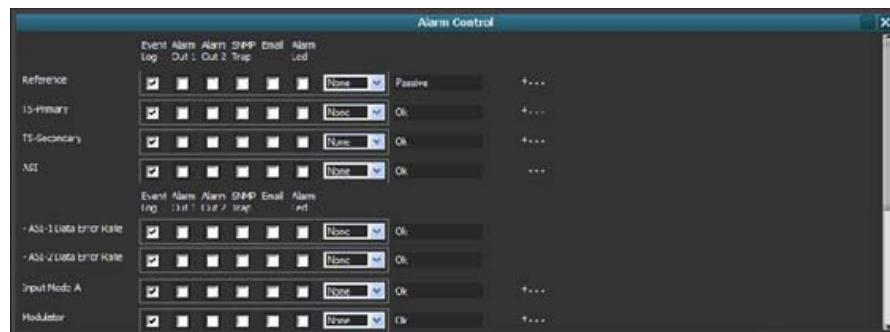
There are two logging modes available:

- “FIFO” Logging mode, when the log is First In First Out, rolling window.
- “FULL” Logging mode, when the log is full, keep the eldest log entries.



## “Alarm Control”

The **Alarm Control** allows the user to configure in array of alarms in the modulator device. The alarm system is described in the next para. 2.5.3.4.



### 2.5.3.4 Alarms system

The following paragraphs describe the Alarm System and the events and alarms that can be raised for the modulator device. The modulator Webservice interface is used for illustrative purposes. The specific controls of interest regarding the Alarm System are mainly the “Event Log” and the “Alarm Control” found in the System menu.

#### a. Description of the Alarm system elements

A general feature of the modulator is the ‘Alarm System’. Alarms are raised if certain conditions are present. This document describes these conditions.

Alarms and events can be signaled to the user either via the Webservice interface, an SNMP Manager (\*), an email messaging system, or it can be indicated by an alarm led on the front panel (see paragraph 7.2 for more on alarm notifications).

A number of system oriented parameters pertaining specifically to the alarm settings can be accessed by left-clicking the [System] button located in the lower-left corner of the Webservice. To access the “Alarm Control” management or the Event Log proceed as follows:

1. Left-click the [System] button. A menu with various choices will now open up above the [System] button.
2. From the menu select the required sub-menu (Alarm Control) by left-clicking the point in the menu.
3. The corresponding control panel will now open up in the lower section of the screen.

(\*) A software program using the Simple Network Management Protocol

#### a.1. Group alarms and sub-alarms

The alarm system consist of a number of group alarms, which contain a number of sub-alarms greater than or equal to one. For example the Reference group alarm contains the following sub-alarms:

- Internal 10 MHz Loss
- External 10 MHz Loss
- External 10 MHz Reference Holdover
- External 1PPS Loss
- External 1PPS Reference Holdover
- NTP Synchronization Loss

A group alarm always reflects the state of its sub-alarms e.g. if a sub-alarm is active the group alarm will display an active state.

It is possible to configure an action for the group alarm itself. This enables the possibility of having a group alarm in ‘Active’ state even if all its sub-alarms are summarised to a state of ‘Passive’ (see paragraph a.3. for more on alarm states). If all sub-alarms are ignored, the group alarm will always reflect the state ‘Ok’.

Below is pictured group alarms in the ‘Alarm Control’ window. Clicking on the “+” sign left of the group alarm expands the corresponding sub-alarms.

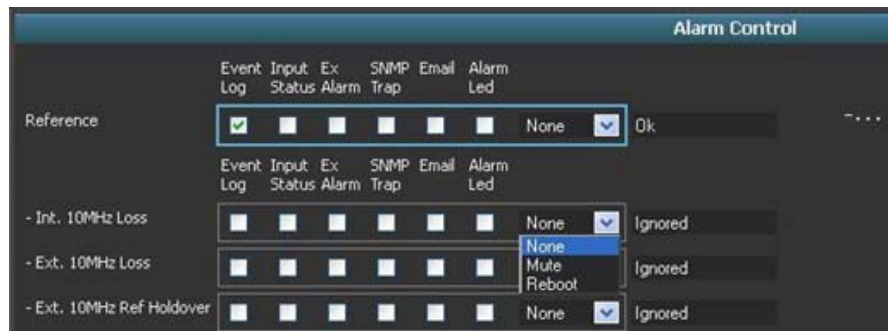
Alarm Control									
	Event Log	Alarm Out 1	Alarm Out 2	SNMP Trap	Email	Alarm Led			
Reference	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok	+...
TS-Primary	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok	+...
TS-Secondary	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok	+...
ASI	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok	+...
Input Mode-A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok	+...
Modulator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok	+...
SFN	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok	+...
RF	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok	+...
GNSS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Passive	+...

### a.2. Alarm actions

The Alarm System allows to setup an array of actions bound to every alarm – both group alarms and sub-alarms. These actions are:

1. Event Log – If an alarm is raised it will be written to the event log.
2. Input Status (see paragraph 2.5.3.5).
3. Exciter Alarm – If an alarm is raised a logic output exciter alarm is activated.
4. SNMP Trap – If an alarm is raised a notification can be sent to up to five SNMP Manager trap destinations (see paragraph b.2.).
5. Email – If an alarm is raised an email notification can be sent to an email address (see paragraph b.3.).
6. Alarm led – If an alarm is raised the front panel alarm led will be lit (see paragraph b.4.).
7. Mute – If an alarm is raised the output signal can be muted.
8. Reboot – if an alarm is raised the exciter/modulator can be rebooted.

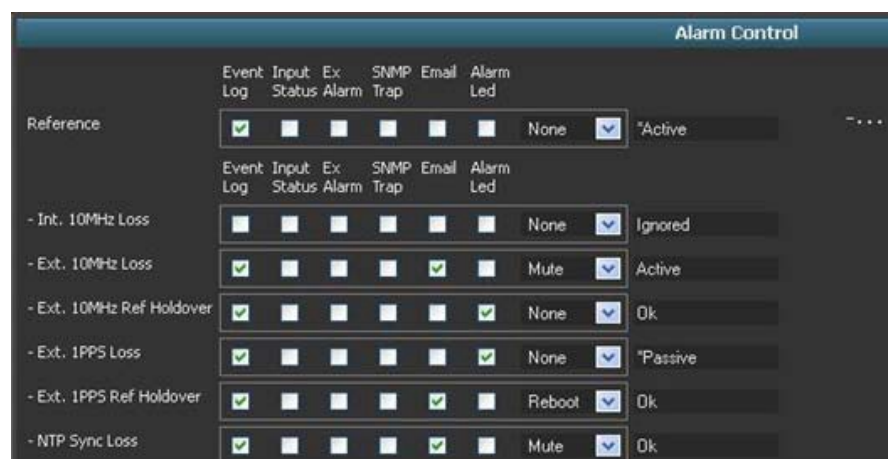
If no actions are activated for a sub-alarm it is in a state of 'Ignored'. The group alarm will still report the 'OK' status even if all its sub-alarms are in an 'Ignored' state.



### a.3. Alarm states

An alarm can be:

- **OK** – when no alarm is present.
- **Ignored** – when no action is present and is setup only for event logging and/or front panel alarm LED, and nothing else.
- **Passive** – When an alarm is present and is setup only for event logging and/or front panel alarm led, and nothing else.
- **Active** – When an alarm is present and is set to react on 'Input Status' or 'External Alarm' or 'SNMP Trap' or 'Email' or 'Mute' or 'Reboot' or any combination hereof.



In the picture above is shown how the different alarm states are signaled.

Below is described how these alarm states are instigated in reference to the different alarm action configurations:

- The Int. 10MHz Loss sub-alarm is in an 'Ignored' state since no action is configured for this alarm
- The Ext. 10MHz Loss sub-alarm is in an 'Active' state since it is configured to react on either of Input Alarm, Ex Alarm, SNMP Trap or Email (in this case email). It also causes the output signal to be muted because the mute alarm action is set.
- The Ext. 10MHz Ref Holdover sub-alarm is in an 'OK' state, no alarm is present.
- The Ext. 1PPS Loss sub-alarm is in an 'Passive' state. External 1PPS loss is occurring but since it is not configured to react on either of Input Alarm, Ex Alarm, SNMP Trap or Email, the state remain passive. However an asterisk (\*) is prefixed in front of the Passive alarm state. This signals that the alarm led on the frontpanel is lit indicating an alarm is raised.
- The Ext. 1PPS Ref Holdover sub-alarm is in an 'OK' state. It is configured to notify the user by way of email if an alarm is raised and then instigate a reboot action.
- The NTP Sync Loss sub-alarm is in an 'OK' state. It is configured to notify the user by way of email if an alarm is raised and then instigate a mute action.
- As a result of the sub-alarm configurations and states, the Reference group alarm is in an '\*Active' state and signaling that the front panel alarm led is lit. No actions are configured for the group alarm itself.



## b. Alarm signaling and notifications

The Alarm System supports several ways of actively notifying users if an alarm is raised. These are described in the paragraphs below.

### b.1. Webservice

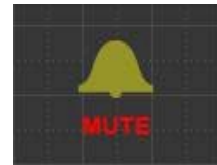
In the top right corner in modulator's Webservice resides the alarm and mute signaling. Together they signal the combinations of alarm being present/absent and mute on/off. These and their conditions are described below. If no alarm is present or in an active state and output is not muted it is signaled as in the example in the figure on the right.



If an alarm is present and active and the output is not muted i.e. there is one or more active alarms but their alarm actions are not set to 'Mute'. This is illustrated in the example in the figure on the right.



If no alarm is present or one or more alarms are in passive state but the output is muted it is signaled as in figure on the right.



Finally, if at least one alarm is present and in active state and the output is muted it is signaled as in the example in figure on the right.



### b.2. SNMP

An SNMP (Simple Network Management Protocol) management software program, can be configured to automatically receive notifications, if alarms are raised. SNMP allows a network client (in this case the modulator device) to send an unsolicited or asynchronous trap (notification) to a network management system in version 2 of the protocol, SNMPv2. Up to five different trap destination IP addresses can be set up in the device's system SNMP menu. To setup an SNMP trap enter the system SNMP menu in the Webservice as follows:

1. Left-click the [System] button. A menu with various fields will now open up above the [System] button.
2. From the menu select the SNMP function by left-clicking the point in the menu.
3. The corresponding control panel will now open up in the lower section of the screen.

The following picture shows an example of setting up an SNMP trap destination address. In the case above an IP address of 10.1.118.1 (for the SNMP Management software) is provided along with the default port number, typically port 162.

SNMP	
View General Device MIB Text	<input type="button" value="View"/> <input type="button" value="Save"/>
View Specific Device MIB Text	<input type="button" value="View"/> <input type="button" value="Save"/>
SNMP Server Port Number	161
Read-only Community	public
Read-write Community	private
Trap Community	private
Trap Destination Address	10.1.118.1
Trap Destination Port Number	162
2nd Trap Destination Address	0.0.0.0
2nd Trap Destination Port Number	162
3rd Trap Destination Address	0.0.0.0
3rd Trap Destination Port Number	162
4th Trap Destination Address	0.0.0.0
4th Trap Destination Port Number	162
5th Trap Destination Address	0.0.0.0

In order to activate the sending of trap notification the specific SNMP trap alarms must be activated in the system Alarm Control in the modulator Webservice.

The following picture shows an example of how to activate SNMP trap alarms in the Alarm Control. In the case above SNMP trap alarms have been activated for Reference sub-alarms: Ext. 10MHz Loss, Ext. 1PPS Loss, NTP Sync Loss, which are all active in this case.

Alarm Control							
Reference	Event Log	Input Status	Ex Alarm	SNMP Trap	Email	Alarm Led	
Reference	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	None	Active
- Int. 10MHz Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok
- Ext. 10MHz Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	None	Active
- Ext. 10MHz Ref Holdover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok
- Ext. 1PPS Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	None	Active
- Ext. 1PPS Ref Holdover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	Ok
- NTP Sync Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	None	Active

### b.3. Email

It is possible to configure the modulator device to send email notifications when alarms are triggered. This is accomplished through the setting of an email server IP address and an email address in the system Network. To setup an email notification enter the system Network menu in the Webservice as follows:

1. Left-click the [System] button. A menu with various fields will now open up above the [System] button.
2. From the menu select the SNMP function by left-clicking the point in the menu.

Locate the “Email Server Address” field and “Alarm Email Address” and fill in the fields accordingly.

Email Server Address	10.10.1.118
Alarm Email Address	info@itelco-electrosys.com

*Note: it is not possible to configure the device to use encryption methods such as SSL and it does not support advanced authentication methods.*

The following picture shows how to activate email alarm notifications in the Alarm Control. In this example email notifications have been activated for the following Reference sub-alarms: Ext. 10MHz Loss, Ext. 1PPS Loss, NTP Sync Loss, which are all active in this case.

	Event Log	Input Status	Ex Alarm	SNMP Trap	Email	Alarm Led	
Reference	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None <input type="button" value="v"/> Active
- Int. 10MHz Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None <input type="button" value="v"/> Ok
- Ext. 10MHz Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None <input type="button" value="v"/> Active
- Ext. 10MHz Ref Holdover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None <input type="button" value="v"/> Ok
- Ext. 1PPS Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None <input type="button" value="v"/> Active
- Ext. 1PPS Ref Holdover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None <input type="button" value="v"/> Ok
- NTP Sync Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None <input type="button" value="v"/> Active



#### b.4. Alarm LED

When an Alarm Led option in the Webservice's system Alarm Control is activated and the corresponding alarm is present, the front panel alarm led is lit indicating that one or more alarms are present.

Alarm LEDs are indicated with an asterisk (\*) in the Webservice Alarm Control if pre-sent. An Alarm Led is considered a passive alarm, such as also Event Log

Alarm Control									
Reference	Event Log	Input Status	Ex Alarm	SNMP Trap	Email	Alarm Led			
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None	<input type="button" value="v"/>	*Passive
- Int. 10MHz Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="button" value="v"/>	Ok
- Ext. 10MHz Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None	<input type="button" value="v"/>	*Passive
- Ext. 10MHz Ref Holdover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="button" value="v"/>	Ok
- Ext. 1PPS Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None	<input type="button" value="v"/>	*Passive
- Ext. 1PPS Ref Holdover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	None	<input type="button" value="v"/>	Ok
- NTP Sync Loss	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	None	<input type="button" value="v"/>	*Passive

alarms.

In the example of picture above the alarm led should be lit on the front panel (notice the presence of the asterisk (\*)) since the following Reference sub-alarms are pre-sent: Ext. 10MHz Loss, Ext. 1PPS Loss, NTP Sync Loss, which are all Passive in this case, due to no alarm actions are configured (actions for the alarms are set to "None").



### c. Event log descriptions

The individual events and alarms are documented in *paragraph 2.5.3.5*. Each are described in a table format where the header row cells indicate the Event ID or Alarm ID (for alarms, the Alarm ID is followed by a specific Alarm Number in parenthesis), followed by the general event or alarm text, which will be shown in the event log.

In the main cell of the table a description of the event or alarm is given.

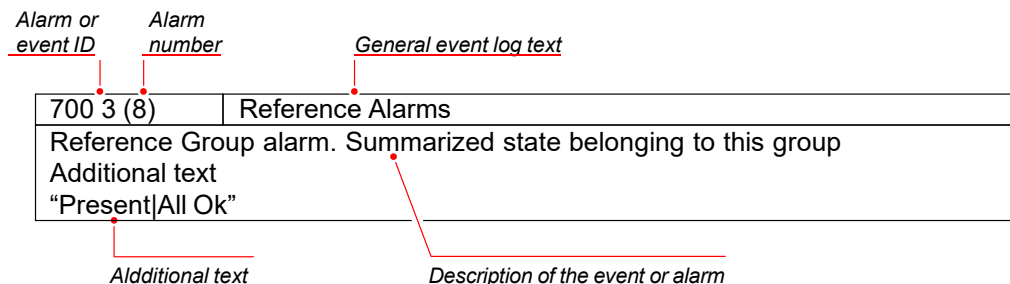
If any additional text is available for the event or alarm it is stated under the description.

Additional text for an group alarm will always show the general state of the group alarm:

“Present” if one or more alarms are raised either in one or more of its sub-alarms. “All OK” if no alarms are raised in any of its sub-alarms.

Additional text for sub-alarms can be a multitude of informational text pertaining to the specific nature of the sub-alarm.

The Figure below shows how the event and alarm description is organized in a table format. See *paragraph 2.5.3.5* for all event and alarm descriptions.



The diagram shows a table with the following structure:

<u>Alarm or event ID</u>	<u>Alarm number</u>	<u>General event log text</u>
700	3 (8)	Reference Alarms
Reference Group alarm. Summarized state belonging to this group		
Additional text		
"Present All Ok"		

Labels with arrows pointing to the table:

- Alarm or event ID points to '700'.
- Alarm number points to '3 (8)'.
- General event log text points to 'Reference Alarms'.
- Additional text points to the 'Additional text' row.
- Description of the event or alarm points to the 'Reference Group alarm...' row.

The Figure below shows the same information as it is displayed in the Webservice's Event Log (*the first number in the event entry is the event log number*).

```
1024: 7003, 23/06/2015, 15:04:29 , Reference Alarms, Present
```

### 2.5.3.5 Events and alarms

#### • Event Description/System events

1010	Reboot
A system reboot event holds following extra description Additional text: "Operator Request" "New modStd" - Reboot because of, new modulation Standard "New Options" – Reboot because of new options installed and or taken into use "Restore" – Reboot because of a system restore "SW RebootType" – Reboot because of a software upgrade (or downgraded) "Expired Options" – Reboot if one or more options are in use and expires "Alarm(<number>) <Text-description>"	
1211	Preset Recalled
System Preset Recalled, by user Additional text: "<Preset-name>"	
1212	Preset Stored
Preset stored with a given name. Additional text: "<Preset-name>"	
1213	Preset Deleted
As a consequence of deleting a preset this entry is to be found in the eventlog Additional text: "<Name of deleted preset>"	
1411	Log Cleared
When eventlog is cleared, this will be the only log entry	
1415	Logging
Additional text: "ON" - Eventlog is turned ON "OFF" - Eventlog is turned OFF	
1416	New Logmode
Additional text: "FIFO" - Logging mode, When the log is First In First Out, rolling window. "FULL" - Logging mode, When the log is full, keep eldest log entries	
1502	Date/Time adjusted
Event entries if changes are made to the synchronization mode for date/time. Additional text: "MANUAL GPS NTP AUTO"	
1503	Timezone adjusted
Additional text: "<Timezone>"	
1600	subMute On
System muted, because of ... see Appendix A for mute reasons	
1601	subMute Off
System unmuted, because of ... see Appendix A for mute reasons	
1702	Scheduled Preset Activation
Triggered when activation is initiated. Additional text: "<Preset-name>"	

1703	Scheduled SW upgrade
Triggered when scheduled upgrade is initiated.	
1704	Scheduled Reboot
Triggered when scheduled reboot is initiated.	
1705	Scheduled Mute Control
Triggered when scheduled mute is initiated.	
7089	Actual RefClk Changed
The actual reference clock used has changed. Additional text: "<Actual Reference Clock>"	
7460	SW upgrade has succeeded
Software installed successfully. An automatic reboot is about to be effectuated Additional text: "rebooting"	
7461	SW upgrade failed
Software failed because of Tarball corrupted or not compatible with hardware platform.	
7462	SW upgrade ignored
Software upgrade ignored for Scheduled action, as system is up to date.	
7666	Invalid IA Data received on T2MI
This alarm is raised if the IA packet received from the T2 gateway is malformed or has illegal length fields or data fields.	
7710	GPIO AGC Off
Indicates a state change of hardware line. Additional description: "YES" "NO"	
7711	GPIO Ex. No Use
Indicates a state change of hardware line. Additional description: "YES" "NO"	
7712	GPIO Input Status
Indicates changed state for the 'Input Status' logic output line located in the rear panel. The 'Input Status' output signals as default 'Fail' state by failure of the potential input TS sources versus the selected switching policy. The sources are the user defined 'Primary input' and 'Secondary input'; the switching policy can be Primary only, Secondary only, Any Available and Prefer Primary. Input Status will indicate 'Fail' if Primary and Secondary input sources are missing under the switching policies Any Available and Prefer Primary and if the corresponding input is failing by input policy Primary Only and Secondary Only. Additional description: "Fail" "OK"	
7800	Network Link Changed
The state of a network interface (Ethernet) has changed. This is reported, whenever an interface goes up or down, or when the speed/duplex changes. Additional text: "Eth<0 1 2 3 4>: UP: 1 Gbps" "Eth<0 1 2 3 4>: UP: 100 Mbps/<Half Duplex Full Duplex>" "Eth<0 1 2 3 4>: UP: 10 Mbps/<Half Duplex Full Duplex>" "Eth<0 1 2 3 4>: DOWN"	

• **Event Description – alarms/*Modulator alarms***

7700 (3)	Modulator Alarms
Modulator Group alarm. Summarized state of alarms belonging to this group Additional text: "<Present All Ok>"	
7076 (80)	SFN Resync Error
Additional text: "Fail" - "Ok" -	

• **Event Description – alarms/*ASI TS primary alarms***

7001 (5)	TS Primary Alarms
Primary TS Group alarm. Summarized state of alarms belonging to this group Additional text: "Present All Ok"	
7021 (21)	TS Primary Sync Loss
The synchronization of the Primary TS depends on the number of correct sync bytes necessary for the device to synchronize and on the number of distorted sync bytes, which the system cannot cope with. Five consecutive correct sync bytes are sufficient for sync acquisition. Two or more consecutive corrupted sync bytes will raise the sync loss alarm. Additional text: "Fail" - Sync loss "Ok" - No sync loss	
7651 (23)	TS Primary T2 MI Validation Error
T2-MI on primary input represents an invalid combination of T2 transmission parameters. For details about the specific violation please consult either: ·the Webservice's parameter validation window (drag the 'Mode' block to the lower half of Webservice) or ·retrieve the mode validation text string by sending SCPI query T2:MI:VALM? over serial interface or ethernet:port4000 or ·retrieve the mode validation message through SNMP get object ModeT2MIPParameterValidationMessage OID2.90 Additional text: "Fail" – If validation error "Ok" – If no validation errors	
7652 (24)	TS Primary T2 MI L1 Error
T2-MI L1 on primary input is rejected as invalid or missing. For details about the specific violation please consult either: ·The Webservice's parameter validation window (drag the 'Mode' block to the lower half of Webservice) or ·Retrieve the mode validation text string by sending SCPI query T2:MI:VALM? over serial interface or ethernet:port4000 or ·Retrieve the mode validation message through SNMP get object ModeT2MIPParameterValidationMessage OID2.90 Additional text: "Present" - T2-MI L1 present, ok "Missing" - T2-MI L1 missing	
7653 (25)	TS Primary T2 MI Timestamp Error
Triggered if a T2-MI timestamp packet is missing. Additional text: "Present" - T2-MI timestamp is present " Missing" - T2-MI timestamp missing	

7103 (28)	TS Primary Buffer Pool
Triggered if the input to the primary buffer pool exceeds its limit when the DSP for any reason cannot pass TS packets on to the FPGA. Additional text: "Exceeded Normal"	

• **Event Description – alarms/ASI TS secondary alarms**

7002 (6)	TS Secondary Alarms
Secondary TS Group alarm. Summarized state of alarms belonging to this group Additional text: "Present All Ok"	

7029 (32)	TS Secondary Sync Loss
The synchronization of the Secondary TS depends on the number of correct sync bytes necessary for the device to synchronize and on the number of distorted sync bytes, which the system cannot cope with. Five consecutive correct sync bytes are sufficient for sync acquisition. Two or more consecutive corrupted sync bytes will raise the sync loss alarm. Additional text: "Fail" - Sync loss "Ok" - No sync loss	

7661 (34)	TS Secondary T2 MI Validation Error
T2-MI on secondary input represents an invalid combination of T2 transmission parameters. For details about the specific violation please consult either: ·The Webservice's parameter validation window (drag the 'Mode' block to the lower half of Webservice) or ·Retrieve the mode validation text string by sending SCPI query T2:MI:VALM? over serial interface or ethernet:port4000 or ·Retrieve the mode validation message through SNMP get object ModeT2MIPParameterValidationMessage OID2.90 Additional text: "Fail" – If validation error "Ok" – If no validation errors	

7662 (35)	TS Secondary T2 MI L1 Error
T2-MI L1 on secondary input is rejected as invalid or missing. For details about the specific violation please consult either: - The Webservice's parameter validation window (drag the 'Mode' block to the lower half of Webservice) or Retrieve the mode validation text string by sending SCPI query T2:MI:VALM? over serial interface or ethernet:port4000 or ·Retrieve the mode validation message through SNMP get object ModeT2MIPParameterValidationMessage OID2.90 Additional text: "Present" - T2-MI L1 present, ok "Missing" - T2-MI L1 missing	

7663 (36)	TS Secondary T2 MI Timestamp Error
Triggered if a T2 timestamp packet is missing. Additional text: "Present" - T2-MI timestamp is present "Missing" - T2-MI timestamp missing	

7104 (39)	TS Secondary Buffer Pool
Triggered if the input to the secondary buffer pool exceeds its limit when the DSP for any reason cannot pass TS packets on to the FPGA. Additional text: "Exceeded Normal"	

• **Event Description – alarms/*SFN alarms***

7082 (7)	SFN Alarms
SFN Group alarm. Summarized state of alarms belonging to this group Additional text: "Present All Ok"	

7669 (92)	Primary Delay Margin too Small for Seamless and Holdover
Additional text: "Fail" - "Ok" -	

7707 (93)	Primary Delay Margin is Negative
Triggered if SFN data arrives too late to the modulator for transmission. Additional text: "Fail" - Data arriving too late "Ok" – Data arrives in time	

7671 (94)	Secondary Delay Margin too Small for Seamless and Holdover
Additional text: "Fail" - "Ok" -	

7708 (95)	Secondary Delay Margin is Negative
Triggered if SFN data arrives too late to the modulator for transmission. Additional text: "Fail" - Data arriving too late "Ok" – Data arrives in time	

• **Event Description – alarms/*Reference alarms***

7003 (8)	Reference Alarms
Reference Group alarm. Summarized state of alarms belonging to this group Additional text: "Present All Ok"	

7072 (76)	Ext. 1PPS Loss
If External 1PPS signal is not available this alarm is raised. Additional text: "Fail" - No external 1PPS available "Ok" - External 1PPS available	

7073 (77)	Int. 10MHz Loss
If Internal 10MHz signal is not available this alarm is raised. Additional text: "Fail" - No internal 10 MHz available "Ok" - Internal 10 MHz available	

7074 (78)	Ext. 10MHz Loss
If External 10MHz signal is not available and EXT is chosen as reference this alarm is raised. Additional text: "Fail" - No external 10 MHz available "Ok" - External 10 MHz available	

7088 (89)	NTP Sync
If NTP (Network Time Protocol) is used to obtain a clock, the NTP Sync log entry will state if the device is locked to a reference clock or if it is not. If for some reason synchronization fails, this occurrence will also be stated in the eventlog. Additional text: "LOCKED UNLOCKED peer <IP-ADDRESS>" "NTP Sync, Fail"	

7118 (109)	Ext. 10MHz holdover
If External 10MHz signal is lost, holdover event is triggered. Time range is configurable. Additional text: "Triggered Ok"	

7119 (110)	Ext. 1PPS holdover
If External 1PPS signal is lost, holdover event is triggered. Time range is configurable. Additional text: "Triggered Ok"	

• **Event Description – alarms/*RF alarms***

7083 (9)	RF Alarms
RF Group alarm. Summarized state of alarms belonging to this group. Additional text: "Present All Ok"	

2701 (44)	Overload Protection
If the output level exceeds more than 3dB from configured this alarm is triggered.	

7079 (79)	AGC RF Level Range
If the AGC regulation exceeds either below –2dB or above 0,7dB relative set to level this alarm is triggered. Additional text: "Exceeded" - Exceeded maximum configured range "Normal" - Normal operation "AGC RF Level Range, <value in dB>"	

7084 (86)	RF Synthesis Error
Only valid for older hardware. Cannot occur in modulator devices.	

7085 (87)	RF Level out of range
If the RF level is either below or above set threshold this alarm is triggered indicating the current level. Additional text: "RF Level out of range, <value> dB" "OK"	

• **Event Description – alarms/GNSS alarms**

7007 (10)	GNSS Alarms
GNSS Group alarm. Summarized state of alarms belonging to this group. Additional text "Present All Ok"	
7096 (98)	GNSS Unlocked
If GNSS signal is lost, and holdover time range exceeded, event becomes "UNLOCKED". Additional text: "Unlocked Locked"	
7106 (107)	GNSS Antenna Fault
Antenna fault involves checking current usage (<2mA) and report alarm if no antenna is present. Additional text: "Triggered Ok"	
7105 (108)	GNSS holdover
If GNSS signal is lost, holdover event is triggered. Time range is configurable. Additional text: "Triggered Ok"	

• **Event Description – alarms/TSolP alarms**

7009 (12)	TSolP Alarms
TS over IP Group alarm. Summarized state of alarms belonging to this group. Additional text: "Present All Ok"	
7480 (115)	TSolP RX1 Package Error Ratio
Triggered if the set package error ratio is exceeded. Number of dropped packed as a percentage of received packets. Dropped packets are the sum of RTP-TS-Stream dropped packets and dropped packets on the two FEC streams. Dropped packets are calculated from sequence number gaps in the RTP headers.	
7482 (117)	TSolP RX2 Package Error Ratio
Triggered if the set package error ratio is exceeded. Number of dropped packed as a percentage of received packets. Dropped packets are the sum of RTP-TS-Stream dropped packets and dropped packets on the two FEC streams. Dropped packets are calculated from sequence number gaps in the RTP headers.	
7484 (119)	TSolP RX1 Signal
Additional text: "Fail" - If signal loss "Ok" - If signal is present	
7486 (121)	TSolP RX2 Signal
Additional text: "Fail" - If signal loss "Ok" - If signal is present	



• **Event Description – alarms/*External alarms***

7010 (13)	Ext. Alarms
External Group alarm. Summarized state of alarms belonging to this group Additional text: "Present All Ok"	

1330 (72)	Alarm #1 Input
Triggered if extern alarm input 1 is activated. Input is user configurable active high, active low. Additional text: "Fail Ok"	

1331 (73)	Alarm #2 Input
Triggered if extern alarm input 2 is activated. Input is user configurable active high, active low. Additional text: "Fail Ok"	

1332 (74)	Alarm #3 Input
Triggered if extern alarm input 3 is activated. Input is user configurable active high, active low. Additional text: "Fail Ok"	

1333 (75)	Alarm #4 Input
Triggered if extern alarm input 4 is activated. Input is user configurable active high, active low. Additional text: "Fail Ok"	

• **Event Description – alarms/*HW monitor alarms***

7011 (14)	HW Monitor Alarms
Hardware monitor Group alarm. Summarized state of alarms belonging to this group. Additional text: "Present All Ok"	

7620 (156)	Main Board FPGA Temperature
"Exceeded" - If temperature >75 degree Celsius "Normal" - If below	

7621 (157)	Main Board CPU Temperature
"Exceeded" - If temperature >100 degree Celsius "Normal" - If below	

7622 (158)	Main Board Temperature
"Exceeded" - If temperature >73 degree Celsius "Normal" - If below	

7623 (159)	Left Chassis Fan
"Fail" - Fan stopped "Ok" - Fan running	

7624 (159)	Right Chassis Fan
"Fail" - Fan stopped "Ok" - Fan running	

7626 (162)	Backplane Temperature
"Exceeded" - If temperature >80 degree Celsius "Normal" - If below	

• **Event Description – alarms/*Communication alarms***

7019 (15)	Communications Alarms
Communications Group alarm. Summarized state of alarms belonging to this group. The alarms in this group pertain to communication lines (LAN, RS-232, RS-485) state. Additional text: "Present All Ok"	

7810 (55)	ETH0 Conn. State
The state of physical network interface ETH0 is not the configured expected value. Additional text: "Failure  Ok"	

7811 (56)	ETH1 Conn. State
The state of physical network interface ETH1 is not the configured expected value. Additional text: "Failure Ok"	

7812 (57)	ETH2 Conn. State
The state of physical network interface ETH2 is not the configured expected value. Additional text: "Failure Ok"	

7813 (58)	ETH3 Conn. State
The state of physical network interface ETH3 is not the configured expected value. Additional text: "Failure Ok"	

7814 (59)	ETH4 Conn. State
The state of physical network interface ETH4 is not the configured expected value. Additional text: "Failure Ok"	

• **Event Description – alarms/*ASI alarms***

7013 (16)	ASI Alarms
ASI Group alarm. Summarized state of alarms belonging to this group. Additional text: "Present All Ok"	

7490 (113)	ASI-1 Data Error Rate
Triggered if data rate exceeds data error alarm limit. Limit is user configurable. Additional text: "<value> bps Normal"	

7491 (114)	ASI-2 Data Error Rate
Triggered if data rate exceeds data error alarm limit. Limit is user configurable. Additional text: "<value> bps Normal"	

• **Event Description – alarms/*Internal alarms***

7014 (18)	Internal Alarms
Internal Group alarm. Summarized state of alarms belonging to this group. Additional text: "Present All Ok"	
7500 (132)	Reference Status
Internal event, which triggers an alarm in the device. Default alarm action is reboot. Additional text: "No OCXO Calibration found" "Bad OCXO Calibration found"	
7501 (133)	Synthesize Status
Only valid for older hardware. Cannot occur in modulator device.	
7502 (134)	Upconverter Status
Internal event, which triggers an alarm in the device. Default alarm action is reboot. The hex value in the additional text refers to an internal hardware status. Additional text: "V500 <hexvalue>"	
7503 (135)	Downconverter Status
Internal event, which triggers an alarm in the device. Default alarm action is reboot. The hex value in the additional text refers to an internal hardware status. Additional text: "Downconverter Status, pll1 = <hexvalue>" - If failure "OK" - If normal operation	
7504 (136)	Main board Status
Will be triggered if any of the temperature sensors V19 or V504 can't be read. This alarm is intended for HW errors that are directly related to backplane, IO controller, reference system, up converter or down converter. Most such errors will prevent linux from starting but not the temperature sensors.	
7505 (137)	Main board Battery
Will be triggered if the battery has too low voltage left to keep the RTC running correctly. This alarm is only generated, when booting and have 2 side effects: 1) The date/time is reset to a well-known date. (But updated by GPS/NTP as per user settings) 2) The reboot between the two software images will not work. Only image 0 is used. It is recommended to replace the battery as soon as possible.	
7507 (139)	DSP Status
Internal event, which triggers an alarm in the device. Default alarm action is reboot. Is the DSP up and running? Additional text: "State = <0 1 2>" 0=OK, 1=HALTED, 2=DEAD	
7510 (142)	GNSS Status
If GPS module is installed and option is 'used' and it is not possible to communicate with the module this alarm is raised. Additional text: "Comm error"	

7514 (146)	Ethernet port Status
Additional text: "FAILED, Physical Eth<0 1 2 3 4>"	

7649 (182)	PLL Out of lock
Internal event, which triggers an alarm in the device. Default alarm action is reboot. The hex value in the additional text refers to an internal hardware status. Additional text: "PLL Out of lock, pll3 = <hexvalue>" - If failure "OK" - If normal operation	

• **Event Description – alarms/Mode-A alarms**

7018 (20)	Mode-A Alarms
DVB-T2 Mode-A Group alarm. Summarized state of alarms belonging to this group. Additional text: "Present All Ok"	

7675 (192)	TS Bitrate is larger than the Max. PLP Datarate
If the TS bitrate exceeds the maximum PLP datarate this alarm is triggered.	

7676 (193)	Dropping TS Packets
Triggered as a consequence of Alarm 7675. Additional text: "Fail" – If TS packets are dropped "Ok" – If no TS packets are dropped	

7677 (194)	Parameter Validation Error
For details about the specific validation error please consult either: ·The Webservice's parameter validation window (drag the 'Mode' block to the lower half of Webservice) or ·Retrieve the mode validation text string by sending SCPI query T2:MODEA:VALMSG? over serial interface or ethernet:port 4000 or ·Retrieve the mode validation message through SNMP get object ModeT2ModeAPParameterValidationMessage OID2.115 Additional text: "Fail" – If validation error "Ok" – If no validation errors	

- **subMute-A reasons**

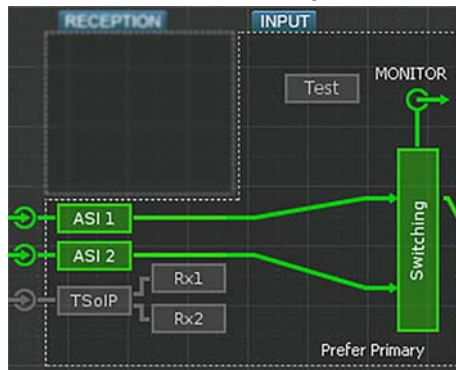
The following is a list of all additional text information for all product variations pertaining to subMute On (event ID 1600) and subMute Off (event ID 1601) alarms.

outp:mute:reas:desc? 0	"Unknown"
outp:mute:reas:desc? 1	"Startup"
outp:mute:reas:desc? 2	"Network change"
outp:mute:reas:desc? 3	"IFFT change"
outp:mute:reas:desc? 4	"Constellation change"
outp:mute:reas:desc? 5	"DVB-H change"
outp:mute:reas:desc? 6	"Ofreq change"
outp:mute:reas:desc? 7	"Bandwidth change"
outp:mute:reas:desc? 8	"Recall Preset"
outp:mute:reas:desc? 9	"Test signal"
outp:mute:reas:desc? 10	""
outp:mute:reas:desc? 11	""
outp:mute:reas:desc? 12	"Ext. Mute"
outp:mute:reas:desc? 13	"PCR Offset change"
outp:mute:reas:desc? 14	"TXID change"
outp:mute:reas:desc? 15	"TS switch"
outp:mute:reas:desc? 16	"No TS Sync"
outp:mute:reas:desc? 17	"MIP Data HP"
outp:mute:reas:desc? 18	"MIP Time Offset"
outp:mute:reas:desc? 19	"MIP Freq Offset"
outp:mute:reas:desc? 20	"MIP Data LP"
outp:mute:reas:desc? 21	"SFN RefINT"
outp:mute:reas:desc? 22	"Hier mode change"
outp:mute:reas:desc? 23	"Coderate HP change"
outp:mute:reas:desc? 24	"Coderate LP change"
outp:mute:reas:desc? 25	"Guard Interval change"
outp:mute:reas:desc? 26	"TS-Control change"
outp:mute:reas:desc? 27	"Deep Interleaver change"
outp:mute:reas:desc? 28	"MPE/FEC HP change"
outp:mute:reas:desc? 29	"MPE/FEC LP change"
outp:mute:reas:desc? 30	"Timeslicing HP change"
outp:mute:reas:desc? 31	"Timeslicing LP change"
outp:mute:reas:desc? 32	"Keep NULL Packets change"
outp:mute:reas:desc? 33	"Power Level change"
outp:mute:reas:desc? 34	"Demodulator follow change"
outp:mute:reas:desc? 35	"Load Channel Filters"
outp:mute:reas:desc? 36	"Squelch"
outp:mute:reas:desc? 37	"Overload"
outp:mute:reas:desc? 38	"Load Ecam"
outp:mute:reas:desc? 39	"Config Ecam"
outp:mute:reas:desc? 40	"Rmode"
outp:mute:reas:desc? 41	"Powerdown"
outp:mute:reas:desc? 42	"ScheduledAction"
outp:mute:reas:desc? 43	"User Request"
outp:mute:reas:desc? 44	"SFN Resync"
outp:mute:reas:desc? 45	"IF Low"
outp:mute:reas:desc? 46	"1PPS Timing"
outp:mute:reas:desc? 47	""
outp:mute:reas:desc? 48	""
outp:mute:reas:desc? 49	""
outp:mute:reas:desc? 50	""
outp:mute:reas:desc? 51	""
outp:mute:reas:desc? 52	""
outp:mute:reas:desc? 53	""
outp:mute:reas:desc? 54	""
outp:mute:reas:desc? 55	"SFN Hold"

outp:mute:reas:desc? 56	"SFN Search"
outp:mute:reas:desc? 57	"Time/Date Sync"
outp:mute:reas:desc? 58	"SFN delay too low"
outp:mute:reas:desc? 59	"DVBT-2 option not enabled"
outp:mute:reas:desc? 60	"DVBT option not enabled"
outp:mute:reas:desc? 61	"Modulator Resync"
outp:mute:reas:desc? 62	"alarm"
outp:mute:reas:desc? 63	"Mode-A Parameter Validation Error"
outp:mute:reas:desc? 64	"Mode-A Unsupported Feature"
outp:mute:reas:desc? 65	"New IF output level"
outp:mute:reas:desc? 66	"SFN Configuration Mismatch"
outp:mute:reas:desc? 67	"ISDB-T option not enabled"
outp:mute:reas:desc? 68	"ATSC option not enabled"

## 2.5.4 Description of the main function block

### 2.5.4.1 Main function block: Input



Dragging the main function Input block to the lower section of the webservice page reveals the top level status parameters for the Input function.

The Input main function block contains information on TS-Primary and TS-Secondary alarms, such as a general alarm status. However, clicking the “+...” expands a detailed list of alarms such as Sync loss, T2MI Validation Error, L1 Current missing. The main function block also lists the PIDs of the primary and secondary input transport streams when available.

Input		
TS-Primary Alarms	Ok	-...
- Sync Loss	Ok	
- T2MI Validation Error	Ok	
- L1 Current Missing	Ok	
- Timestamp Missing Error	Ok	
- Buffer Pool	Ok	
TS-Secondary Alarms	Ok	+...
PID Lists		
Primary		
0, 1, 16, 17, 18, 20, 4098, 4211, 4221, 8191		
Secondary		
4096, 8191		

Contents of the Input block

### 2.5.4.1.1 ASI 1 and ASI 2

ASI –1 and ASI–2 specific function blocks display status information about the inputs of TS in ASI format. For example if Data Error Rate is present, Sync Detector Status, line Status. The two configuration parameters 'Synchronization Timeout' and 'Data Error Alarm Limit' are user controlled.

The ASI–1 and ASI–2 specific function blocks

### 2.5.4.1.2 TsoIP Rx1 and TsoIP Rx2

The modulator supports two separate TsoIP receivers (Rx1 and Rx2) for delivery of TS input in ASI format. To prepare the modulator for TsoIP input at least one receiver must be configured with respect to the following parameters:

- Association with one of the LAN interfaces.
- Port number for the TsoIP traffic.
- Protocol.
- Multicast or unicast operation.
- Enabling of the receiver TS output.

The TsoIP receiver configuration panel is opened by dragging the associated specific function block Rx1 and/or Rx2 from the block schematic in the upper half of the PT3000 Webservice to the configuration section in the lower half of the Webservice.

The TsoIP Rx1 and TsoIP Rx2 specific function blocks

The *LAN interface* to which the TsoIP receiver shall be linked must be specified through the associated menu in the TsoIP Rx1/Rx2 control panel. Proceed as follows:

1. In the TsoIP RxN control panel select the LAN interface to be linked to the TsoIP receiver by means of the drop-down list.
2. Click 'Apply' to confirm the selection.

*Note: The selected LAN interface should be enabled for TsoIP traffic in the separate LAN configuration menu (please refer to paragraph 2.5.3.3).*



The **port number** through which the TSolP stream shall be received must be specified through the associated menu in the TSolP Rx1/Rx2 control panel. Proceed as follows:

1. In the TSolP RxN control panel specify the port number in the associated numeric input field.
2. Click 'Apply' to confirm the selection.

The **transport protocol** for the TSolP stream must be specified through the associated menu in the TSolP Rx1/Rx2 control panel. Proceed as follows:

1. In the TSolP RxN control panel select between RTP and UDP or AUTO as required in the associated field.
2. Click 'Apply' to confirm the selection.

The mode (**unicast or multicast**) for the TSolP receiver must be specified through the associated menu in the TSolP Rx1/Rx2 control panel. Proceed as follows:

1. In the TSolP RxN control panel the user may select Multicast Reception mode by ticking the associated tick box. The box must be un-ticked for unicast operation.
2. Click 'Apply' to confirm the selection.

The TSolP receiver **Rx1 / Rx2 must be explicitly enabled** by the user before it will deliver TS output. The receiver is enabled through the associated menu in the TSolP Rx1/Rx2 control panel. Proceed as follows:

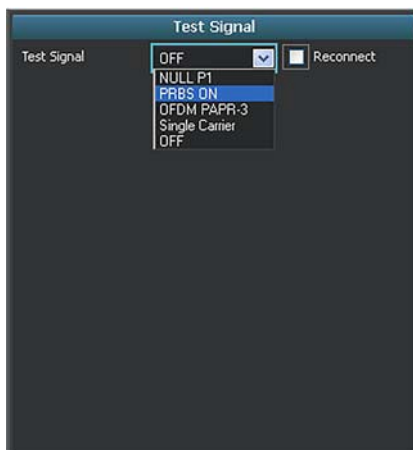
1. In the TSolP RxN control panel the user may specify the status for the TSolP receiver (enabled or disabled). To enable the receiver a tick mark should be set in the associated tick box. To disable the receiver un-tick the box.
2. Click 'Apply' to confirm the selection.

When configured accordingly the TSolP can be selected as primary or secondary input source in the Switching specific function. For more on the Switching block and setting the input source, please refer to paragraph 2.5.4.1.4.

For information on selecting the IGMP protocol version to be used by the TSolP function by multicast mode, please refer to paragraph 2.5.4.1.4.

### 2.5.4.1.3 . Test

The Test function block provides the possibility to generate direct different test signals. This cannot be used when network mode is SFN. Following test signals can be generated:



*The Test Signal specific function block*

#### 2.5.4.1.4 Switching

The Test function block provides the possibility to generate direct different test signals. This cannot be used when network mode is SFN. Following test signals can be generated:

The image shows three panels of the 'TS Switching' configuration window. The left panel displays 'Modulator Statistics' with fields for Main Buffer Fill Level, Main Buffers, Reserve Buffers, Free Buffers, Main TS Bitrate, Main TS Stuffing Rate, Main T2MI Bitrate, and Reserve TS Bitrate. The middle panel shows 'TS Jitter Delays - M/FN' and 'Main Modulator Delays' with fields for Prim. TS Jitter Delay, Sec. TS Jitter Delay, Current Modulator Delay, Max. Modulator Delay, and Min. Modulator Delay. The right panel shows 'Main DVB-T2 SFN Delay' and 'Reserve DVB-T2 SFN Delay' with fields for BB to TimeStamp Delay, Dejitter Buffer Delay, Processing Delay, Local Delay, SFN Margin, and Emission Time.

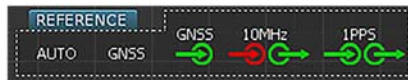
The Switching specific function block

#### 2.5.4.1.5 Interface Points in Input/Monitor

The image shows two panels of the 'Monitor Out' configuration window. The left panel displays 'ASI Monitor' and 'TSoIP Monitor Configuration' with fields for ASI Monitor, TSoIP Monitor, TSoIP Monitor Source, LAN Interface For Multicast, Destination IP Address, Destination UDP Port, Protocol, Enable FEC Mode, FEC Column (L), FEC Row (D), FEC Skew Factor, TS Packets per Frame, and Keep All IP Packets. The right panel shows 'Monitor Out' with fields for Enable FEC Mode, FEC Column (L), FEC Row (D), FEC Skew Factor, TS Packets per Frame, Keep NULL Packets, TOS/DSCP Field, TTL, Transmit UDP Checksum, Artificial Error Rate, and TSoIP Monitor Statistics.

The Monitor Interface point

### 2.5.4.2 Main function block: Reference



*The Reference main function block*

The Reference Source field defines the input reference synchronization source. If the value AUTO is chosen, the source is chosen automatically between available sources. The order of choice is GPS → EXT10MHz → INT. If the value EXT is chosen, the external clock is chosen as source. If the value INT is chosen, the internal clock is chosen as source. If the value GPS is chosen, the GNSS 1PPS clock is chosen as source.

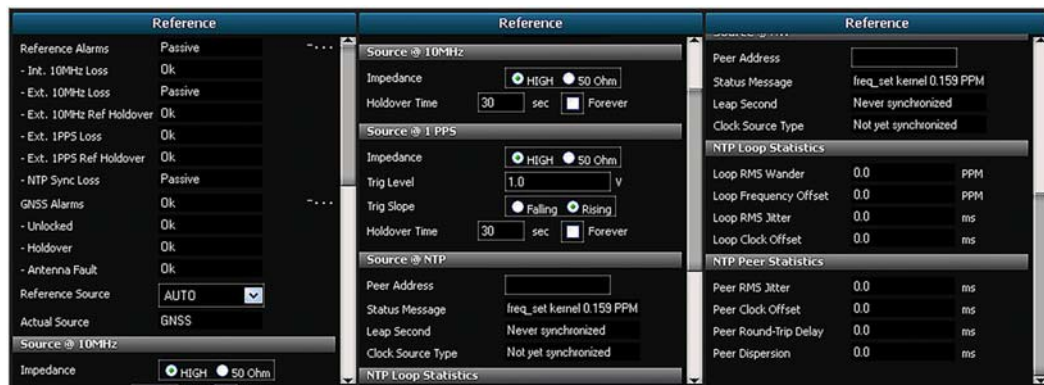
When the PT3000 device is in operation with external reference applied, the internal reference frequency is locked to external 10MHz reference using a PLL with approximately 10Hz loop bandwidth. If no 10MHz reference is present (e.g. using GNSS), the internal reference is locked to the 1PPS information using a lower bandwidth PLL.

When loss of external reference input is detected, a hold-over mode is entered that keeps the internal reference frequency at a value based on the averaged frequency previous to the reference loss.

When 10MHz external reference reappears, a soft locking algorithm starts to avoid rapid frequency changes that would unlock demodulators.

If 1PPS signal is present, the adjustment of the internal reference would use this first to align the internal 1PPS to the external. Then the internal 10MHz is compared with external 10MHz using a digital PLL. If the frequency difference is more than 0,2ppm, the internal 10MHz changes with a rate of 75ppb/s. At smaller frequency difference, a low bandwidth digital PLL is used.

When the frequency and phase are aligned, the control is handed over to a precision analog PLL.



*Contents of Reference block*

## 2.5.4.2.1 Interface points in Reference

### 2.5.4.2.1.1 GNSS

GNSS		GNSS	
GNSS Alarms	Ok	Use COMPASS Satellites	<input type="checkbox"/>
- Unlocked	Ok	Avg. SNR of Visible Sats	21.7 dB
- Holdover	Ok	Visible Satellites	14
- Antenna Fault	Ok	Tracked Satellites	8
Use GPS Satellites	<input checked="" type="checkbox"/>	Status	Locked
Use GLONASS Satellites	<input type="checkbox"/>	Unit State	Normal
Use GALILEO Satellites	<input type="checkbox"/>	Active Antenna	<input checked="" type="checkbox"/>
Use COMPASS Satellites	<input type="checkbox"/>	Antenna Voltage	5V
Avg. SNR of Visible Sats	21.7 dB	Time	11/06/2015 16:02:17.00
Visible Satellites	14	Longitude	12 26 21 E
Tracked Satellites	8	Latitude	55 40 23 N
Status	Locked	Altitude	18.2 m
Unit State	Normal	Cable Delay*	0.0 ns
Active Antenna	<input checked="" type="checkbox"/>	GPS Holdover Time	30 sec <input type="checkbox"/> Forever
Antenna Voltage	5V		

The GNSS interface point

### 2.5.4.2.1.2 Reference 10MHz

Reference 10MHz	
Reference 10MHz Alarms	
- Internal	Ok
- External	Passive
- Holdover	Ok
Settings	
Impedance	<input checked="" type="radio"/> HIGH <input type="radio"/> 50 Ohm
Holdover Time	30 sec <input type="checkbox"/> Forever

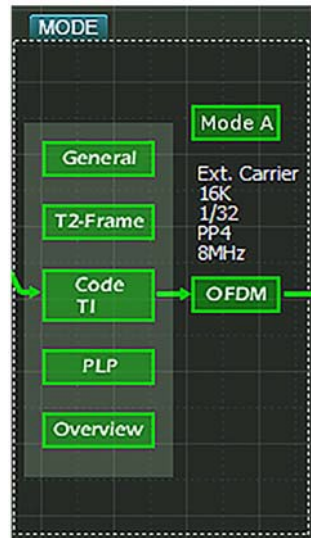
The 10MHz interface point

### 2.5.4.2.1.3 Reference 1PPS

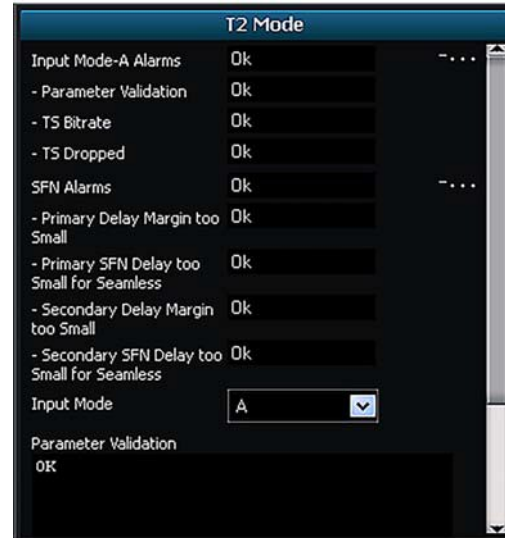
Reference 1PPS	
Reference 1PPS Alarms	
- External	Ok
- Holdover	Ok
Settings	
Impedance	<input checked="" type="radio"/> HIGH <input type="radio"/> 50 Ohm
Holdover Time	30 sec <input type="checkbox"/> Forever
Trig Level	1.0 V
Trig Slope	<input type="radio"/> Falling <input checked="" type="radio"/> Rising

The 1PPS interface point

### 2.5.4.3 Main function block: Mode



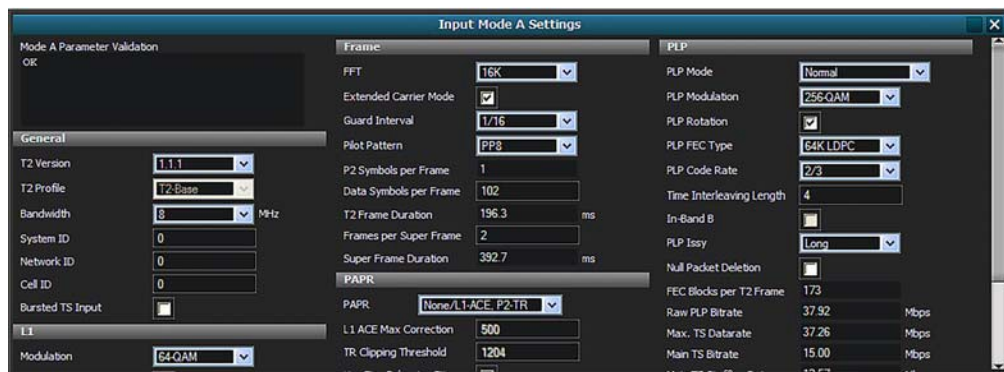
The Mode main function block



Content of the Mode block

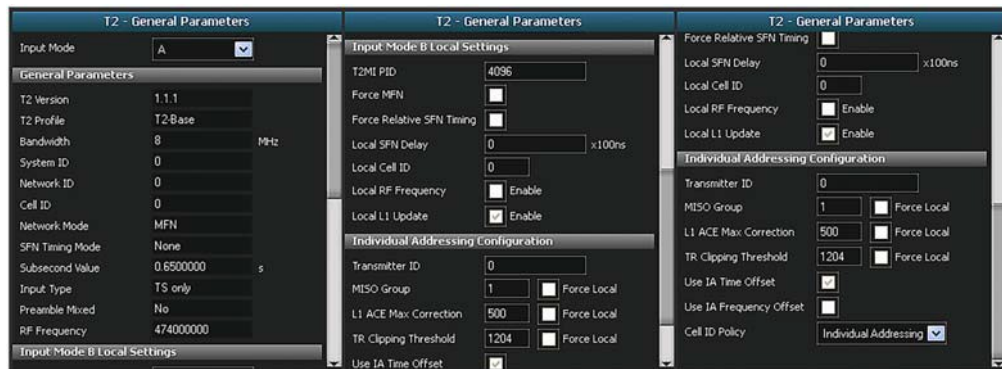
#### 2.5.4.3.1 Specific function blocks in Mode

##### Input Mode A (B)



Content of the Mode A specific function block

##### T2 – General Parameters



Content of the T2 General Parameters block





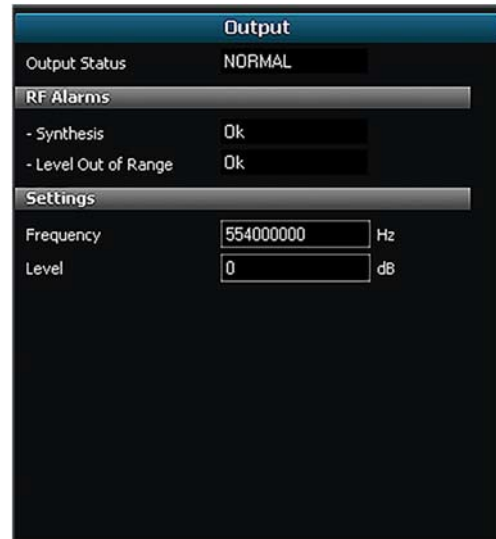
#### 2.5.4.4 Main function block: Pre-Correction

Refer to paragraph 2.6 – “Precorrection Procedure”.

#### 2.5.4.5 Main function block: Output



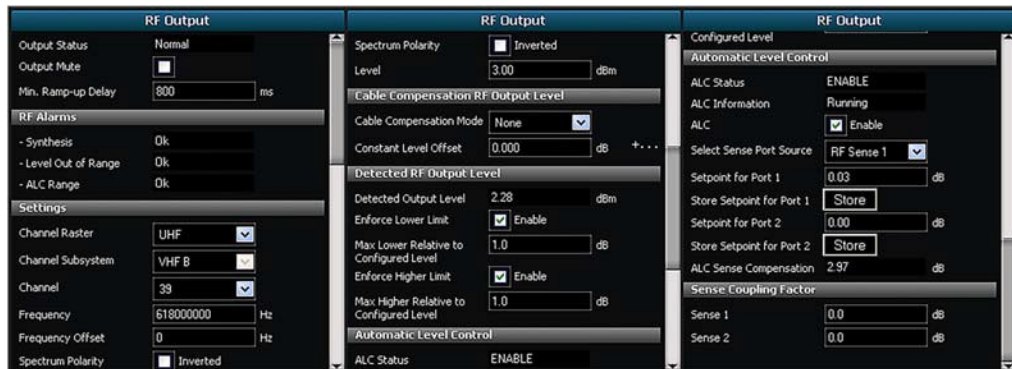
The Output main function block



Contents of the Output block

#### 2.5.4.5.1 Specific function blocks in Output

##### RF Output



Contents of the RF Output specific function block

#### 2.5.4.5.2 Interface points in Output

##### RF Output signal



The Output signal interface point

The Output signal interface point gives a quick overview of mute reasons and alarms:

- Mute reasons.
- Active alarms.
- Passive alarms

2.5.4.6 Main function block: Power

Dragging the main function “HPA” block to the lower section of the webservice page reveals the top level status parameters for the RF amplifier section of the unit or of the HPAs if present.



The Power main function block

HPA Status			
OPERATION MODE :	LOCAL	POWER OUT :	OK
TRANSMISSION :	ON	REFLECTED (TRIP 0/4) :	OK
FORWARD :	40.9 dBm		
FORWARD :	12.3 Watt		
REFLECTED :	0 Watt		
TOT. CURRENT (48V) :	2.08 Ampere		
HEAT SINK TEMP :	32 Celsius		
EXT. INTERLOCK :	CLOSED		

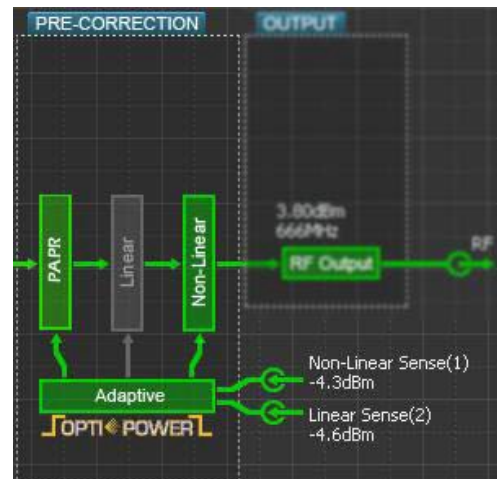
The information displayed is relevant to the status of amplifier stage of the unit, or to the HPA(s) of a transmitter driven by the exciter unit. The picture refers to the case of an exciter that drives only one amplifier module

If the communication between the modulator and the amplifier stage(s) is lacking, the event is highlighted by a red tag.



## 2.6 PRECORRECTION PROCEDURE

The Pre-Correction main function block gives a graphical illustration of the Non-Linear and Linear sense inputs. In the Web-service these inputs will appear in green color if the level is within the valid range for the respective input. If the level is marginal relative to the required max/min limits the input will be shown in yellow color. If the level is outside the valid range the input is shown in red color. For optimal result the corrector should only be operated with input levels in the 'green' state. Performance with 'yellow' input state is not guaranteed. *The adaptive precorrector cannot be used when the level is in the 'red' state.*



Dragging the Pre-Correction main function block to the status/control panel in the lower half of the Webservice will bring up:

Precorrector	
Power Level Fine Adjust	0.00 dB
<b>Sense Coupling Factor</b>	
Sense 1	0.0 dB
Sense 2	0.0 dB

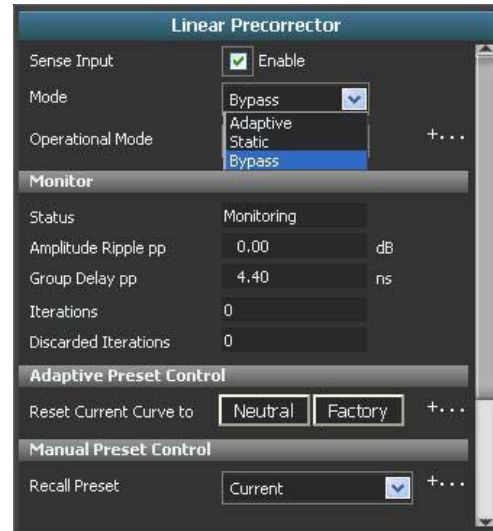
## 2.6.1 Specific function blocks in Pre-Corrector

### 2.6.1.1 Linear Precorrector

The linear precorrector system can operate in three different modes. The required mode is selected by opening the Mode drop-down list shown in the figure below.

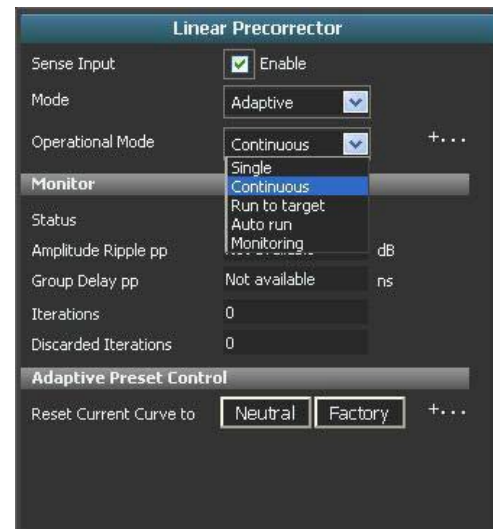
The available modes are:

- **Adaptive:** the current adaptive linear precorrector characteristic is applied and maintained according to the adaptive precorrector operational mode selected (see below for details).
- **Static:** the currently loaded manual linear precorrector characteristic is applied to the RF output. The manual precorrector characteristics must be generated and uploaded by means of the PC software package IMD Buster McTwo. The curve format used by the manual precorrector system is incompatible with the curves used and generated by the adaptive system.
- **Bypass:** no precorrection applied (block is bypassed)



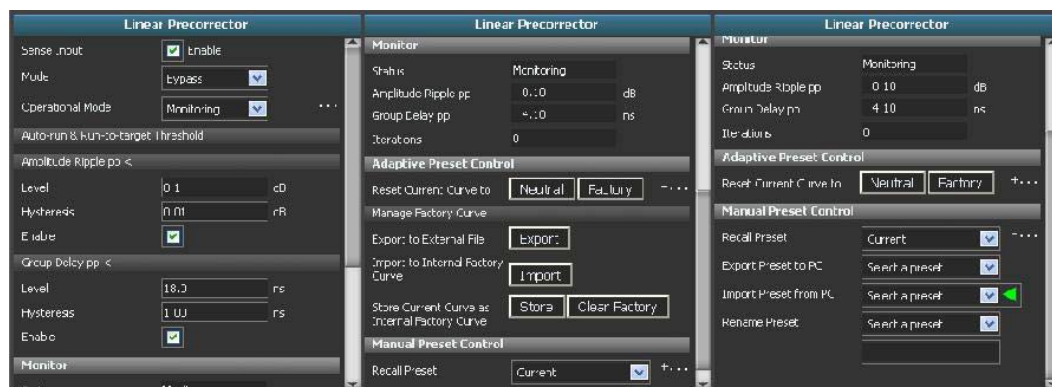
The adaptive linear corrector can operate in five different modes. The required mode is selected by opening the Operational Mode drop-down list. The available modes are:

- **Single:** returns to monitoring mode after completion of one iteration
- **Continuous:** the instantaneous adaptive precorrector characteristic is applied to the RF output. The precorrector algorithm runs continuously.
- **Run to target:** the instantaneous adaptive precorrector characteristic is applied to the RF output. The precorrector algorithm will run until the set threshold value is obtained for the upper respectively the lower RF spectrum shoulder.
- **Auto run:** The instantaneous adaptive precorrector characteristic is applied to the RF output. The precorrector algorithm will run until the set threshold value is obtained for the upper respectively the lower RF spectrum shoulder. The adaptive precorrector algorithm will be automatically restarted in case the upper and/or lower shoulder performance subsequently drops below the set threshold.
- **Monitoring:** The characteristic based on the last completed adaptive iteration is applied. No further update to the characteristic will be made.



### 2.6.1.2 Non-Linear Precorrector

Contents of the Non-Linear Precorrection specific function block.

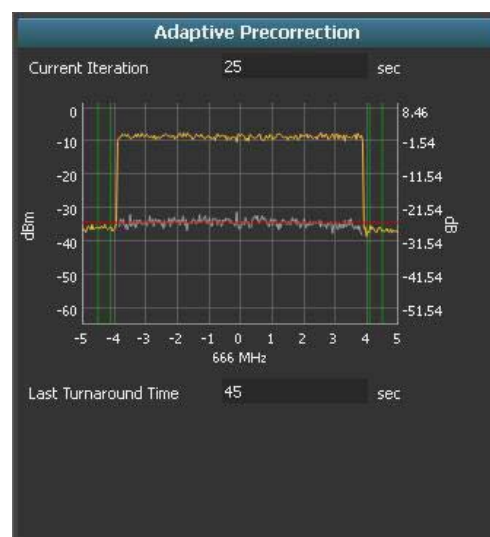


### 2.6.1.3 Adaptive Precorrection

The Adaptive Precorrection specific function block provides various statistics concerning the adaptive process.

The following information is available:

- **Current Iteration:** displays the time elapsed for the ongoing iteration (data collection and analysis) for the adaptive process. The elapsed time may accumulate continuously in the event that the sense input is invalidated and thereby preventing successful data collection and analysis.
- **Bad Linear Sense Cnt:** accumulated count of the number of times the data collection from the linear sense port has failed for reasons other than level out of range (typically due to application of an invalid type of spectrum on the sense port). Under normal conditions this counter is '0'.
- **Bad Non-Linear Sense Cnt:** accumulated count of the number of times the data collection from the non-linear sense port has failed for reasons other than level out of range (typically due to application of an invalid type of spectrum on the sense port). Under normal conditions this counter is '0'.
- A graphical IMD presentation.
- **Last Turnaround Time:** displays the recorded time consumption for the last completed iteration (data collection/analysis/curve implementation). The iteration time may typically vary from less than 10 seconds up to about one minute depending on the signal characteristic and the type of adaptive correction running. The shortest iteration time is noted when only the non-linear adaptive precorrector is running. The iteration time is increased when the adaptive linear precorrector process is running.



### 2.6.1.4 PAPR

Contents of the PAPR specific function block.

The image shows a software interface for configuring PAPR (Peak-to-Average Power Ratio) reduction. It consists of two main panels side-by-side.

**Left Panel: PAPR**

- T2 PAPR Reduction: None/L1-ACE, P2-TR
- Clipping**
  - Clipping: 6.00 dB
  - Mode: Adaptive (dropdown menu)
- Adaptive Mode**
  - Operational Mode: Continuous (dropdown menu)
  - Clip Filter: 100 %
- Static Mode - Clipping**
  - Clip Filter: 50 %
- Monitor - Clipping Output**
  - Status: Auto applying
  - MER: 31.3 dB
  - Upper Shoulder: -33.1 dB
  - Lower Shoulder: -32.8 dB
  - PAPR: 6.1 dB
  - Iterations: 1691


**Right Panel: PAPR**

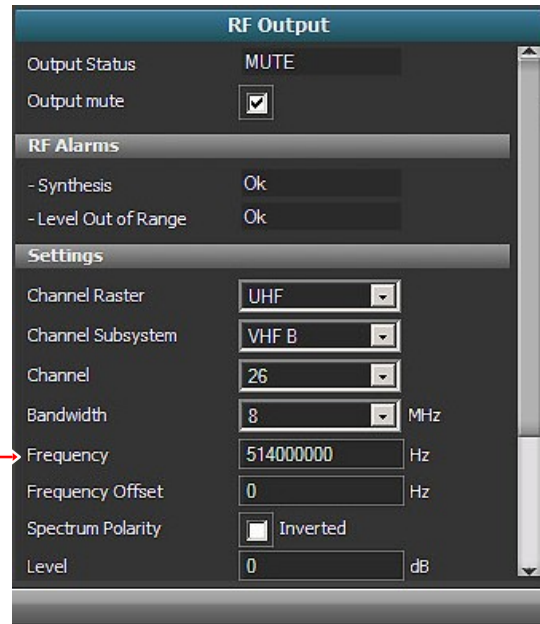
- Monitor - Clipping Output**
  - Status: Auto applying
  - MER: 31.3 dB
  - Upper Shoulder: -33.1 dB
  - Lower Shoulder: -32.8 dB
  - PAPR: 6.1 dB
  - Iterations: 1691
- Adaptive Preset Control**
  - Reset Current Curve to: Neutral, Factory, ...
  - Manage Factory Curve
    - Export to External File: Export
    - Import to Internal Factory Curve: Import
    - Store Current Curve as Internal Factory Curve: Store, Clear Factory

## 2.7 CHANGING THE TRANSMISSION CHANNEL (FREQUENCY)

Changing the transmission channel (frequency) is allowed via web service; operate as follows:

1. Place the cursor over 'RF Output' block and press the left mouse button keeping it pressed.
2. Now drag 'RF Output' block to the lower section of the screen and release the left mouse button.
3. Digit the wanted value of the frequency in "Frequency" field of 'RF Output' block.
4. To implement/confirm the new value move the cursor to [Apply] button and click the left mouse button to confirm the entry.

 **NOTE!**  
*If the unit drives the amplifier section of a transmitter, access "Settings" menu and execute: "\*Save settings" to store the datum. This operation sends the new frequency set to the amplifier modules.*

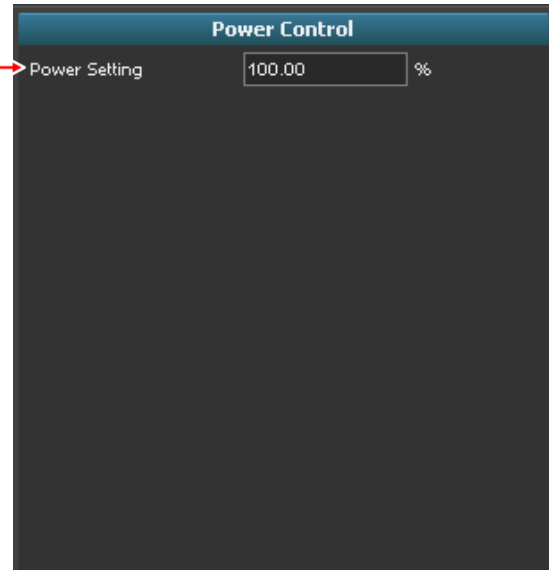


RF Output	
Output Status	MUTE
Output mute	<input checked="" type="checkbox"/>
RF Alarms	
- Synthesis	Ok
- Level Out of Range	Ok
Settings	
Channel Raster	UHF
Channel Subsystem	VHF B
Channel	26
Bandwidth	8 MHz
Frequency	514000000 Hz
Frequency Offset	0 Hz
Spectrum Polarity	<input type="checkbox"/> Inverted
Level	0 dB

## 2.8 REGULATION OF RF OUTPUT POWER

The RF output power of the unit can be set via web service; operate as follows:

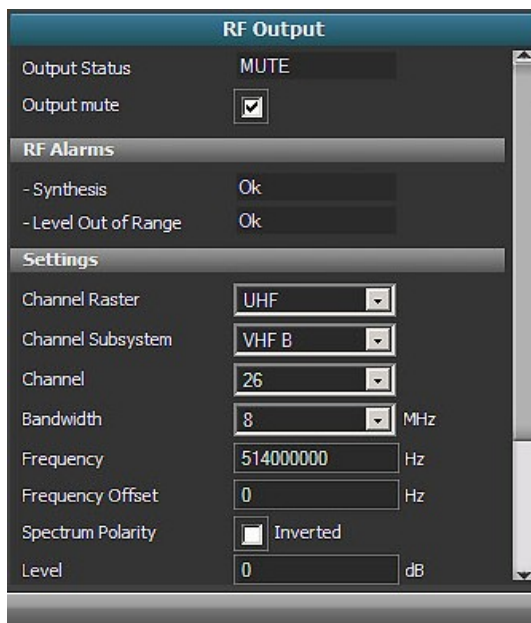
1. Place the cursor over 'POWER' block and press the left mouse button keeping it pressed.
2. Now drag 'POWER' block to the lower section of the screen and release the left mouse button.
3. Digit the wanted value of the output level (in %) on "Power setting" field of 'Power Control' block.
4. To implement/confirm the new value move the cursor to [Apply] button and click the left mouse button to confirm the entry.



## 2.9 SWITCHING-ON/OFF THE UNIT REMOTE OPERATION

Switching-on/off the unit via Webservice function is performed on 'Output mute' checkbox:

1. ☒ putting a tick on the checkbox, the unit is switched-off; the 'Output status' field shows 'MUTE'
2. ☐ removing the tick on the checkbox, the unit is switched-on; the 'Output status' field shows 'UNMUTE'.



RF Output	
Output Status	MUTE
Output mute	<input checked="" type="checkbox"/>
RF Alarms	
- Synthesis	Ok
- Level Out of Range	Ok
Settings	
Channel Raster	UHF
Channel Subsystem	VHF B
Channel	26
Bandwidth	8 MHz
Frequency	514000000 Hz
Frequency Offset	0 Hz
Spectrum Polarity	<input checked="" type="checkbox"/> Inverted
Level	0 dB

## 2.10 SOFTWARE UPDATES

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It is possible to update the software of the digital modulator and of the “Interconnection Board” (p/n 4050012410).

Updates require 2 different procedures that are provided respectively in paragraphs 2.10.1 – “*Modulator updating*” and 2.10.2. – “Software updating of “*Interconnection Board*” (p/n. 4050012410)”.

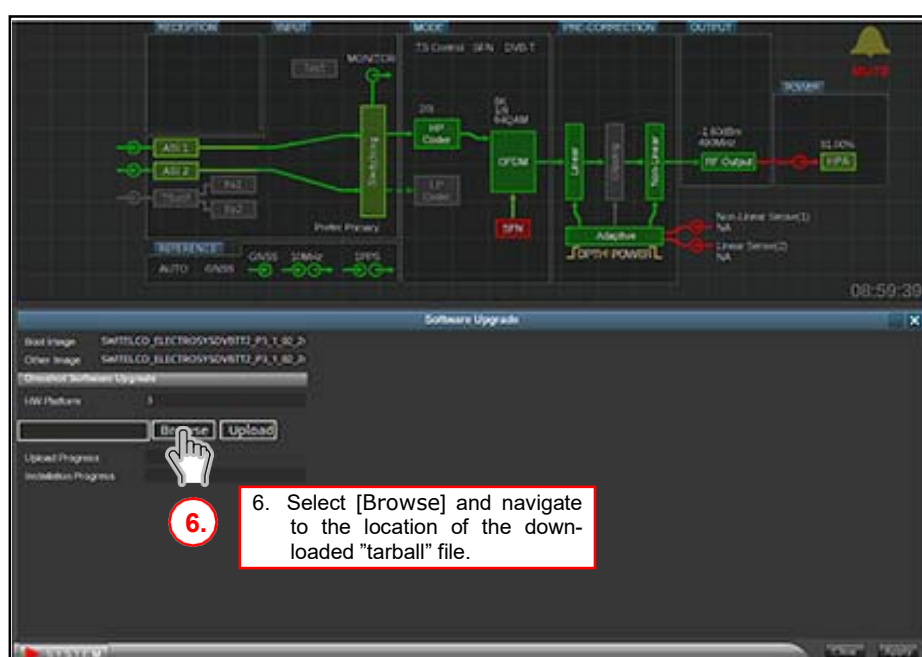
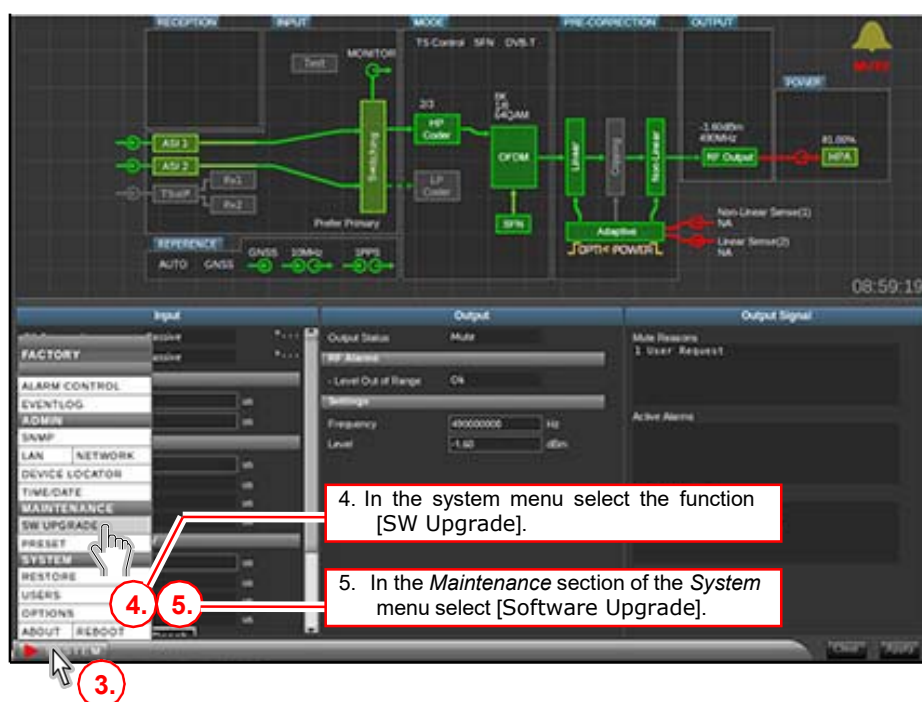
*The software update of the “Interface Board” card requires a dedicated software “CMI / PIB USB Field Utility – v.1.0” supplied on request.*

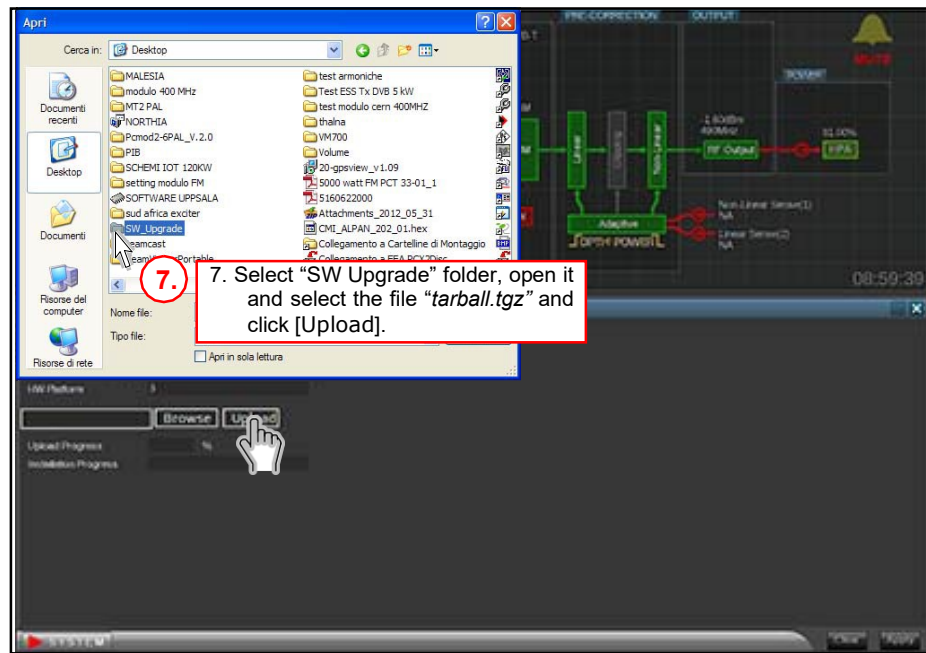


### 2.10.1 Modulator updating

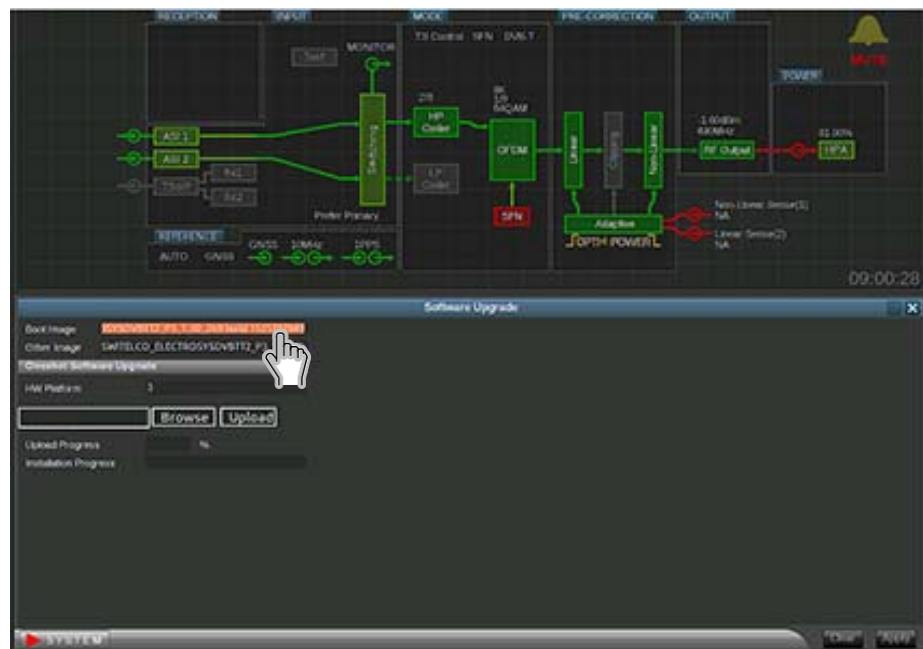
Software/Firmware (SW/FW) update of the modulator is carried out over the *Ethernet interface*. The update is based on a so-called “tarball” file that contains the SW/FW images defining the specific product version (i.e.: a DVB-T2 modulator, an ATSC modulator or an ISDB-T modulator). The typical size of the “tarball” is about 16MByte. The update procedure is as follows:

1. Download the “tarball” file from the FTP site to a folder (i.e.: “SW Upgrade”) on your local network or to the PC that you are using explicitly for managing the modulator.
2. Connect to the Webservice interface of the modulator unit as described in paragraph 2.5.1.
3. In the lower left corner of the Webservice graphical user interface you will find the [System] button. Click this button to open the system menu.





8. The loading of the new SW/FW should now start automatically. The progress can be monitored from the Webservice interface. A number of steps including uploading, unpacking and verifying and deleting files will pass automatically (the processing time is several minutes).
9. When the loading of new SW/FW is completed the unit will automatically reboot. After the reboot the new SW/FW version is active.
10. Repeat steps 4 to 7 again and, after the second restart, check that the versions loaded in the "Boot Image" and "Other Image" fields are the same



The active SW/FW version can be verified after the reboot via the [About] function in the [System] menu.

## 2.10.2 Software updating of “Interconnection Board” (p/n. 4050012410)

### 2.10.2.1 General Information and application

Itelco “CMI/PIB USB Field Utility – v.1.0” software allows a complete firmware upgrade of the “Interconnection Board” (p/n. 4050012410).

The firmware operation upgrade is controlled by a user friendly graphical user interface (GUI) application running over Microsoft Windows operative systems 32 and 64 bit (up to Window 7).

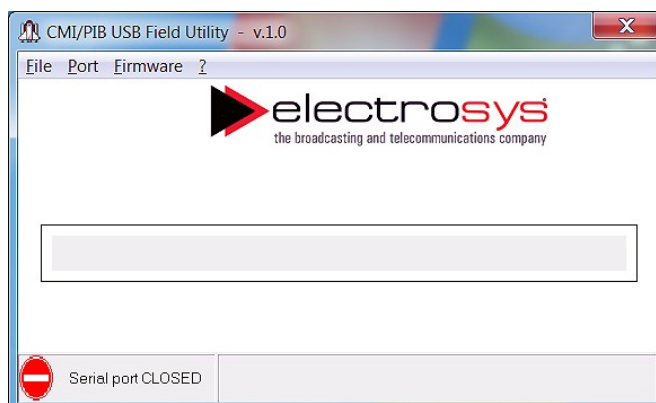
At the end of the update operations, the board will restart automatically.

### 2.10.2.2 Connection of the unit to the PC

The USB port on front panel of the unit ([1] in Fig. 2.1) must be connected to any USB port of the PC where “CMI/PIB USB Field Utility – v.1.0” software has been installed. Operate as follows to establish the PC connection to the unit.

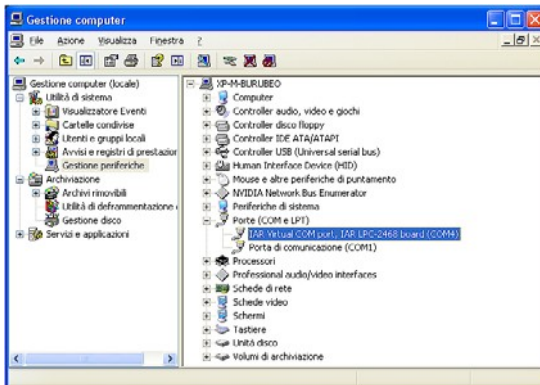


Fig. 2.5 – Software start

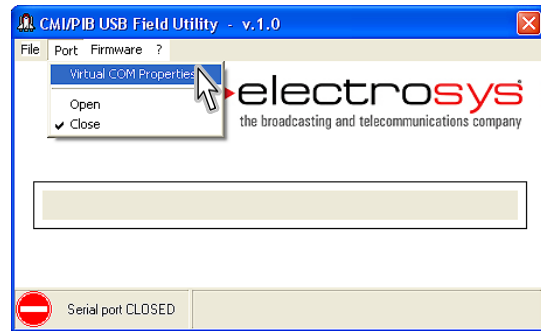


1. Double click on the software icon: the following dialog box opens.

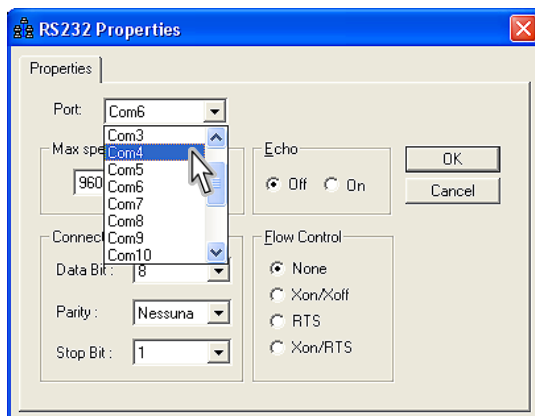
The lower left corner of the box shows the indication “Serial port CLOSED”



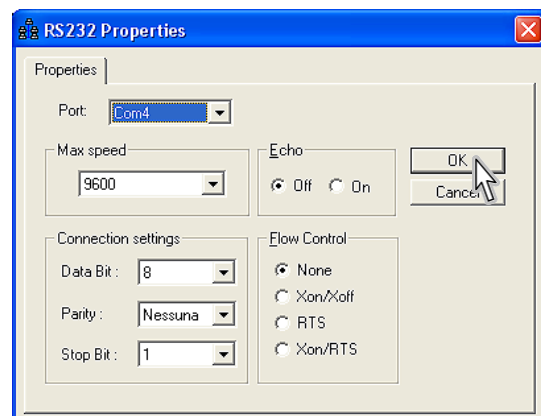
2. Open "Device Manager" to check which serial port is selected for the connection to the unit (in this example is port "COM4").



3. On Port menu select "Virtual Port Property" to open the dialog box "RS232 Property"



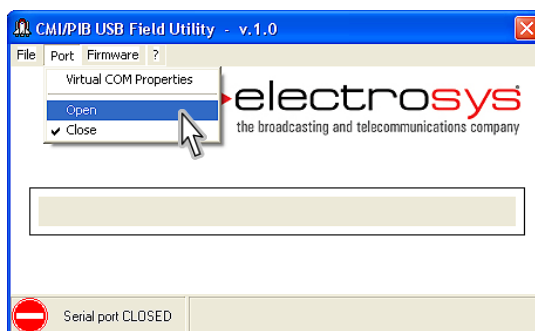
4. On "Port" field select "COM4" port.



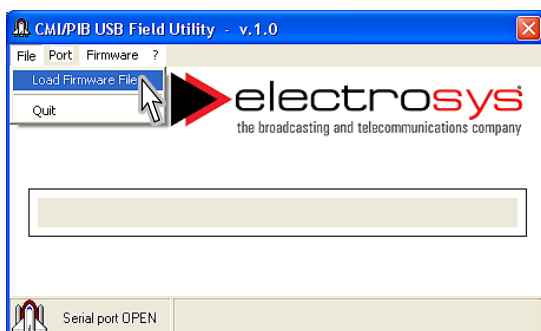
5. Now click "OK".

### 2.10.2.3 Loading the new firmware

At this point the serial connection between the PC and the unit is fixed and you need to select the updated firmware file.

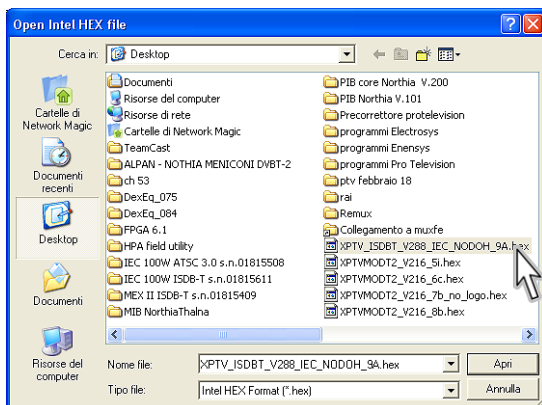


6. On "Port" field select "Open"

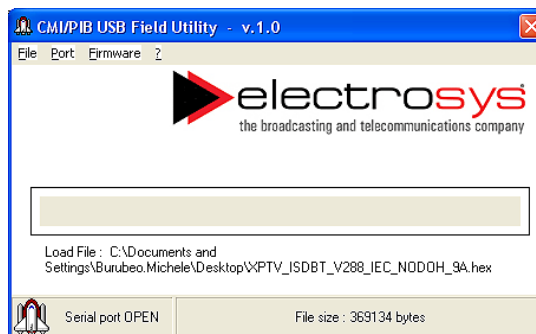


7. The lower left corner of the dialog box now shows "Serial Port OPEN".

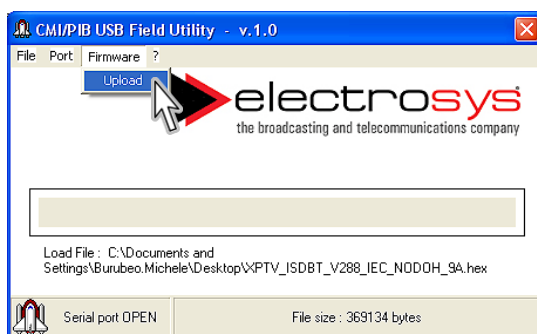
On "Port" field select "Load Firmware File".



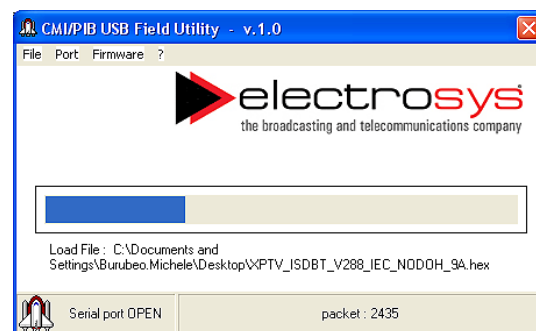
8. The dialog box opens. Now browse to the wanted file (in this example is "XPTV\_ISDBT\_V288\_IEC\_NODOH\_9A.hex" on the desktop) and click "OPEN".



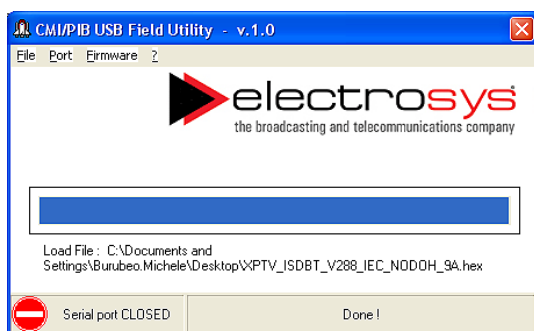
9. The dialog box shows the file name and its size.



10. On "PFirmware" field select "Upload".



11. The firmware uploading starts. A graphic bar shows the progress of the firmware loading.



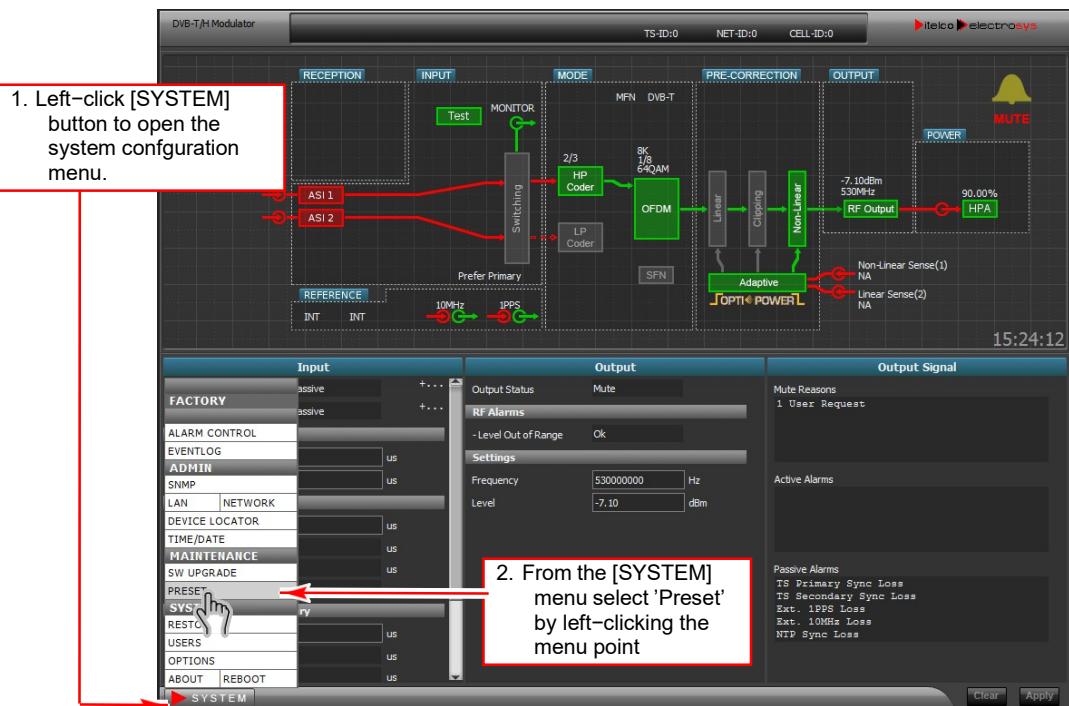
12. At the end of the loading the serial port is disconnected and the logic board is restarted automatically.



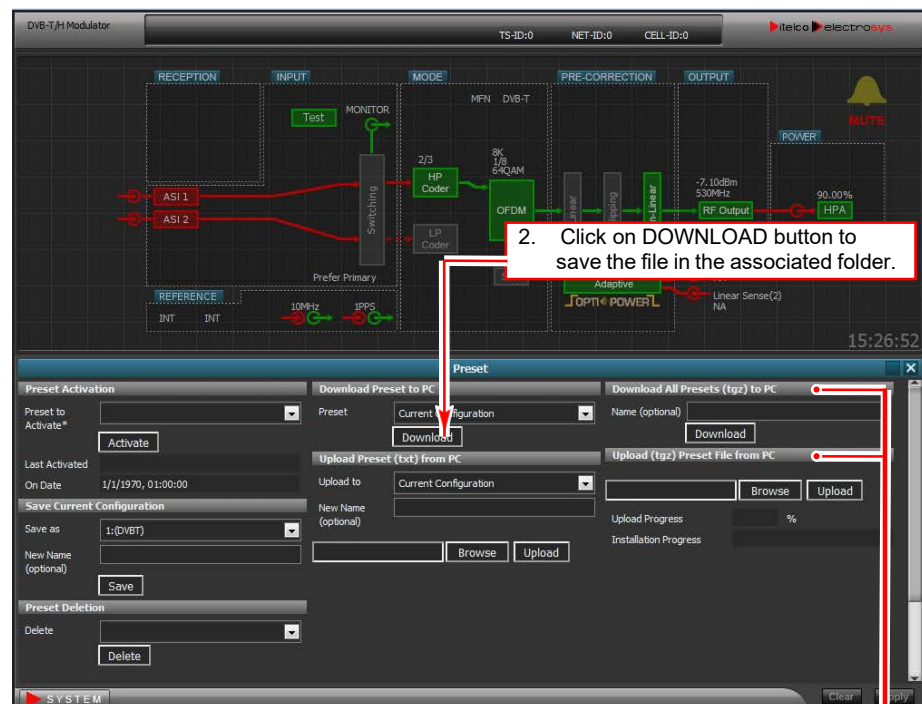
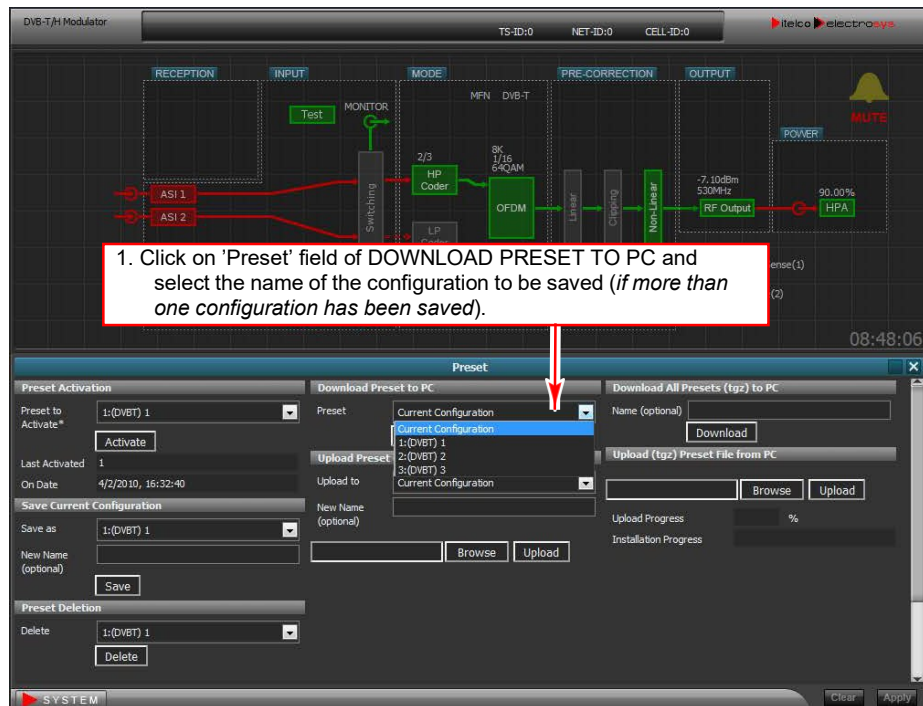
## 2.11 SAVING THE CONFIGURATIONS

It is possible saving different configuration of the unit settings both on the *flash memory* of the unit and on *file*. Saving the configuration on *file* can be used to restore in case of emergency. You can save more than one configuration on different files.

### 2.11.1 Saving the configuration on the *flash memory* of the unit

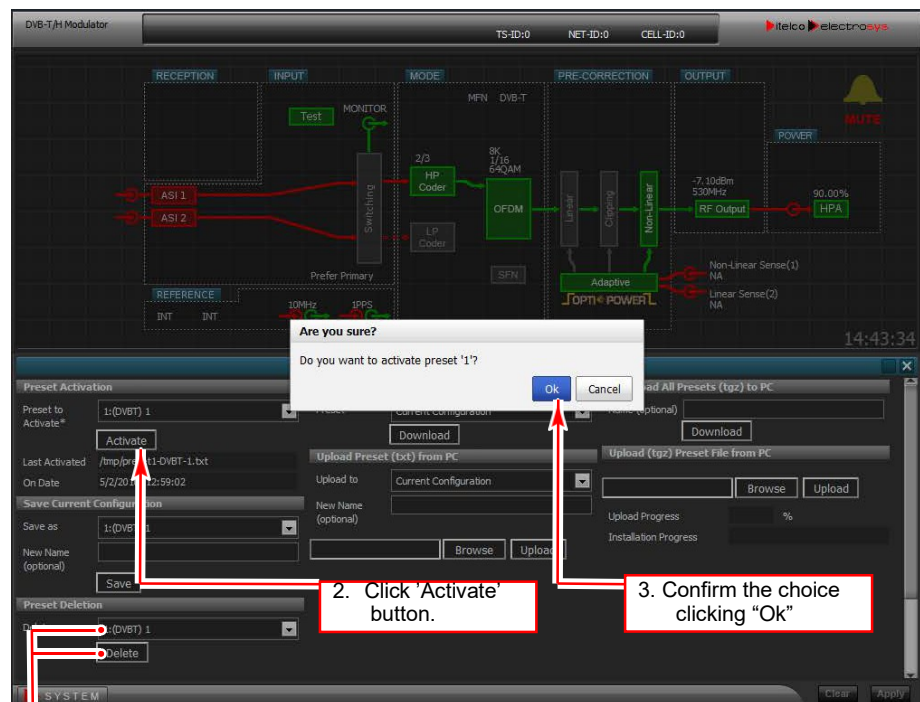
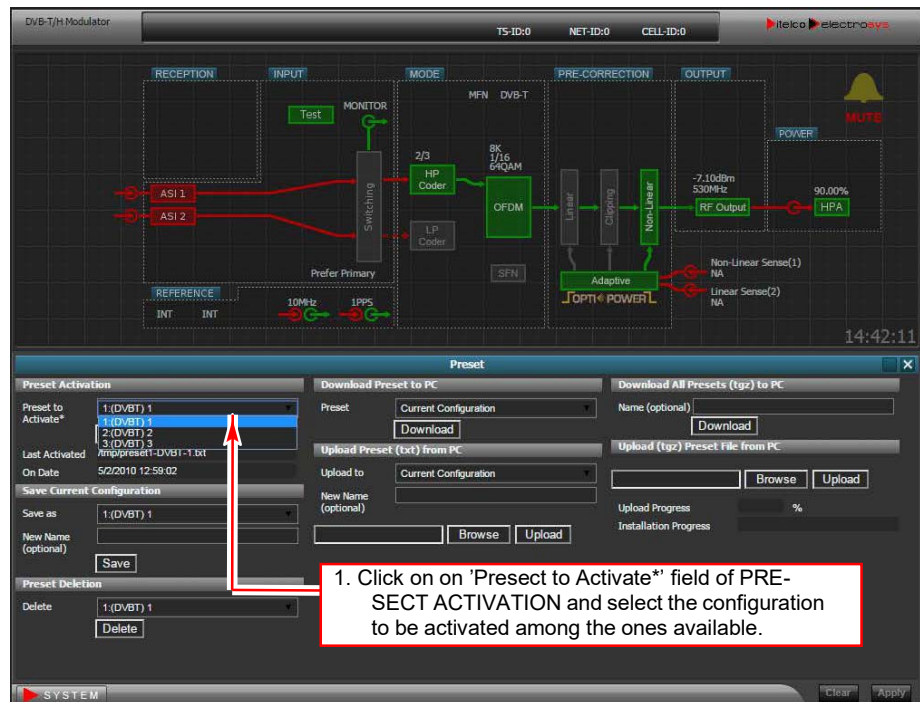


### 2.11.2 Saving the configuration on file



**NOTE** You can save or load different configuration files in a single zipped file

### 2.11.3 Activating/deleting a saved configuration





**NOTE** You can delete a configuration selecting it and clicking 'Delete'. A confirmation is requested.



## 2.12 CHANGING THE MODULATOR STANDARD

Changing the modulator standard from “DVB-T” to “DVB-T2” is performed from “Reboot” web page. This system parameter can be accessed by left-clicking on the [System] button located in the lower left corner of the web page (see par. 2.5.3 for more details).

Click on  of “Modulation Standard to Reboot on”: a drop-down menu is displayed with the possible options. Select the standard to be set and click on the “Reboot” button to apply the change.

1. Click on  button and select “Reboot”
3. Click on “Modulation Standard” button and select the new standard to be set
2. Click on “Reboot” to apply the new setting



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### **3. MAINTENANCE**

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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 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.

#### 3.1.3 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 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 *Air Filters*

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

#### 2 *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.

### 3.2.1 Preventive maintenance Table

The preventive maintenance actions have been grouped according to periodicity; Tab. 3.1 gives the summary of periodical checks. The table is divided into four columns. The first column indicates the periodicity of the preventive maintenance. The second describes the function to be checked or the operation to be carried out. The third column contains applicable notes and/or references. The fourth column shows the time needed to carry out the maintenance procedure to allow planning of preventive maintenance for the whole Equipment.

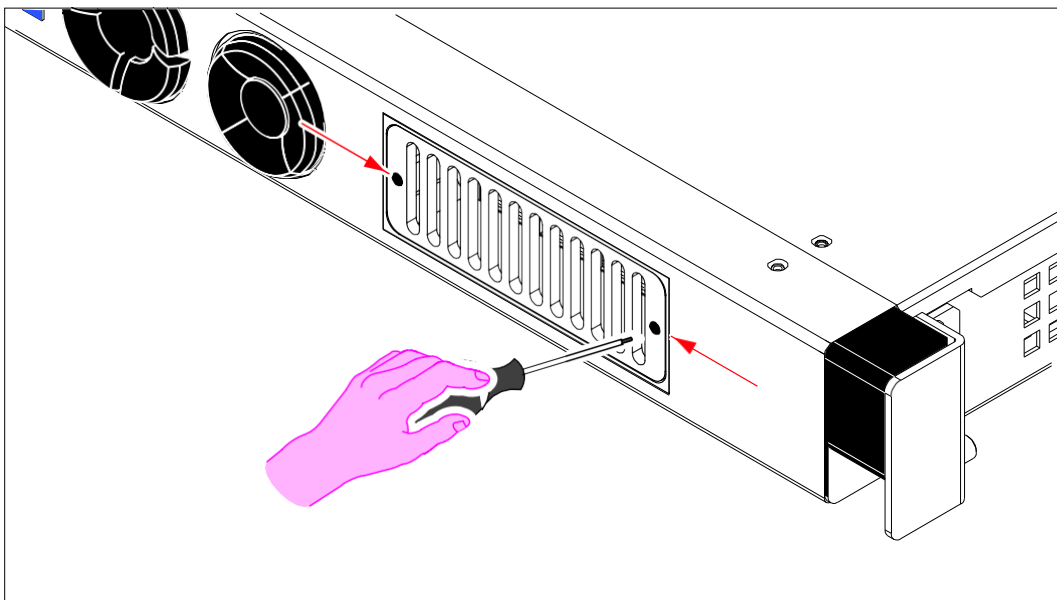
Tab. 3.1 – Summary of periodic checks				
REF.	PERIODICITY	TYPE OF SERVICING	REFERENCE FOR THE EXECUTION	ESTIMATED EXECUTION TIME
1	2-weekly	Cleaning or replacement of the air filter ( <i>very dusty environments</i> )	Chapt. 3: para.3.2 step 1 and para. 3.2.2 (for replacement).	20 min.
2	Monthly	Cleaning of the air filter ( <i>normal environments</i> )	Chapt. 3: para.3.2 step 1	20 min.
3	Monthly	Checking of the forward and reflected powers	On MEX display ( <i>default screenshot</i> ).	1 min.

### 3.2.2 Cleaning/replacing of the air filter

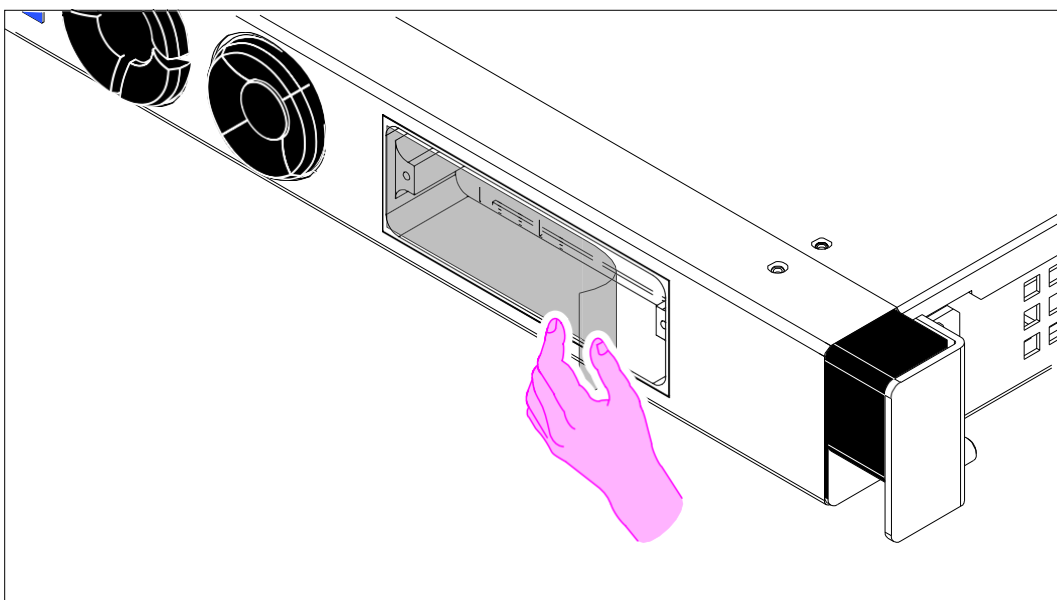
For the cleaning/replacing of the air filter it is necessary to extract the unit from the rack. Once it has been taken away, put it on a table.

No special tools are necessary to carry out the operations, only a *torx screwdriver* (T10 type) is required.

Operate as indicated here below:



1. Completely unscrew the two screws (3MA, pointed out by the red arrows) on the grid of the front panel and take it away.



2. Remove and clean the air filter according the indication of Para 3.2 – “Preventive Maintenance”, step 1).
3. Put the filter back in its place after cleaning (or after replacing) and put the grid of the front panel back in its place.

### 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 displays, LEDs.
- Failure conditions detected by operative personnel.

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

#### 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.

#### 3.4.1 Maintenance procedures for RF stage

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

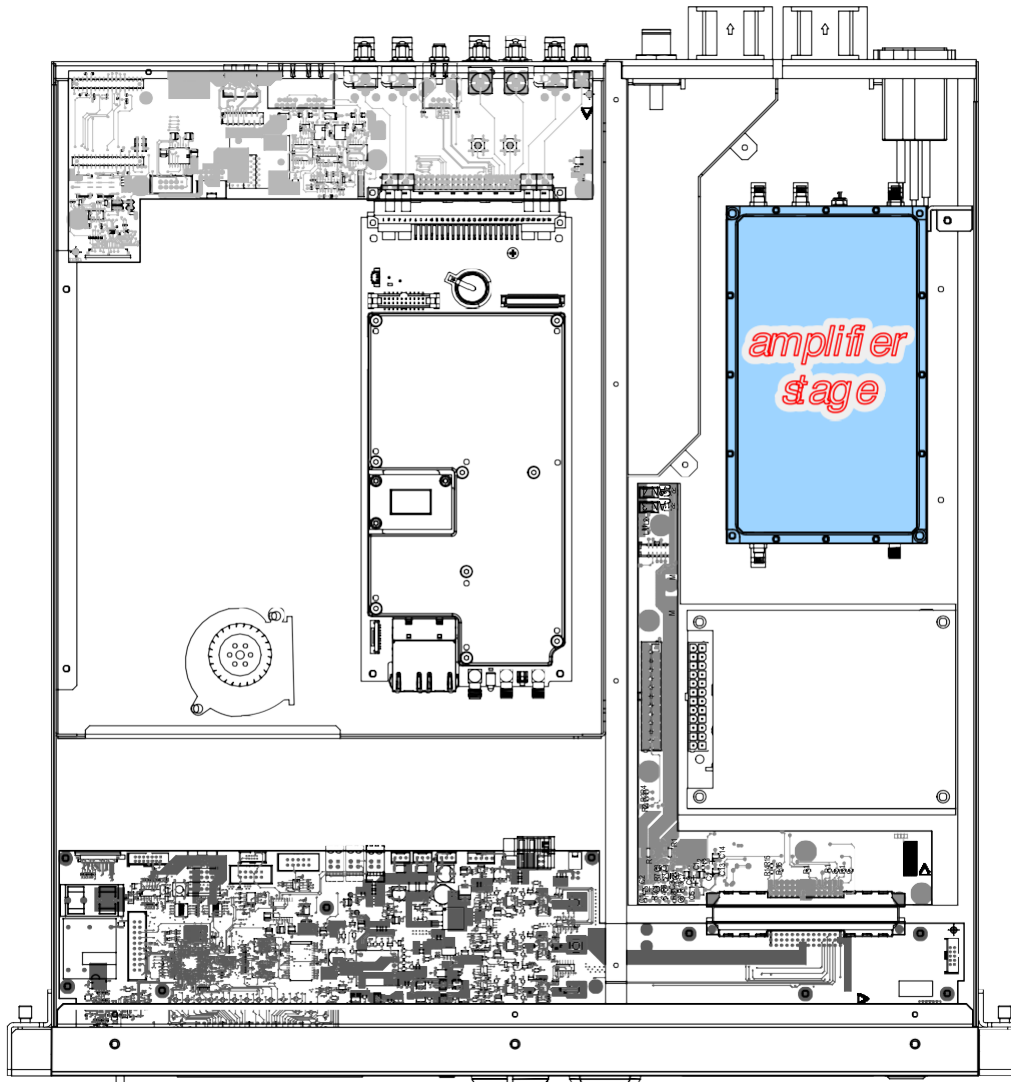


Fig. 3.1 – MEX II final stages arrangement (bottom view)

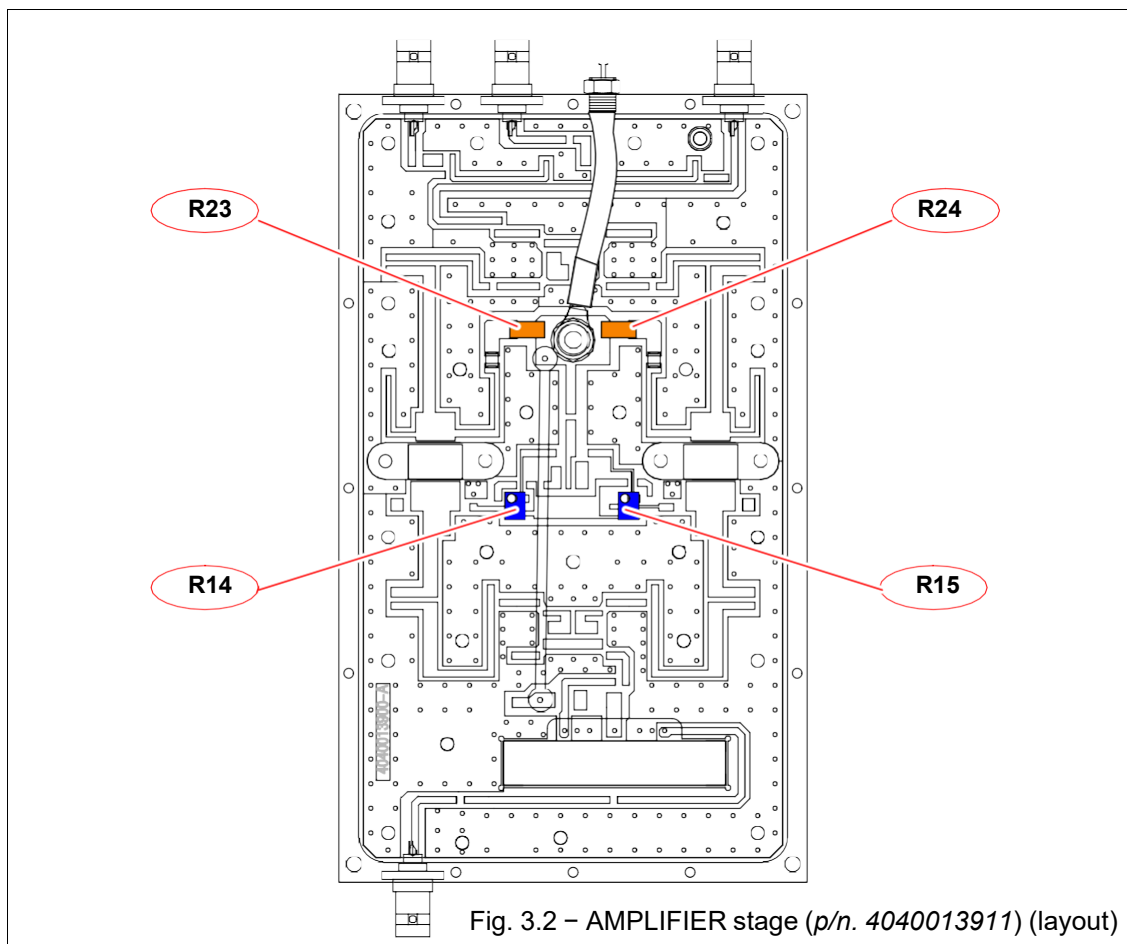
### 3.4.2 Necessary test equipment and preliminary operations

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 push "**STOP**" key on unit front panel ([5] on Fig. 2.1).

### 3.4.3 Functional checks of "RF AMPLIFIER UHF MEX DVB-T2" p/n. 4040013911

Remove the top cover of the unit in order to access the *amplifier stage*; 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. 3.2.

Tab. 3.2 – Functional checks on RF AMPLIFIER UHF MEX DVB-T2 stage			
checking	measure point / component	measurements	regulation
Transistors power supply	T1, T2 "drain"	$26V_{DC} \pm 0.3V_{DC}$	
T1 biasing (quiescent curr.)	R23	0.045mV	rotate R14 and R15 completely anticlockwise (minimum of the current); adjust R14 in order to read on digital voltmeter a drop voltage of 0.045mV corresponding to a quiescent current of 450mA
T2 biasing (quiescent curr.)	R24	0.045mV	adjust R15 in order to read on digital voltmeter a drop voltage of 0.045mV corresponding to a quiescent current of 450mA



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1. **APPENDICES**

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**A ... “ETHERNET INTERFACE” USER’S GUIDE**

**B ... SAFETY PRECAUTIONS**

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# ***“ETHERNET INTERFACE”*** **USER’S GUIDE**

**ETHERNET INTERFACE USER'S GUIDE**

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## ETHERNET INTERFACE USER'S GUIDE

### 1.1 INTRODUCTION

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

- HTTP
- Telnet
- SNMP

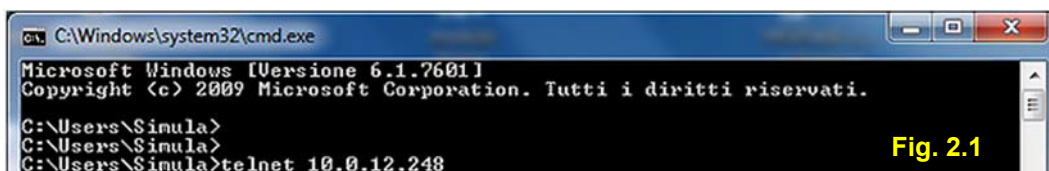
### 1.2 TELNET PROTOCOL

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

### 1.3 OPENING A TELNET SESSSION

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

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



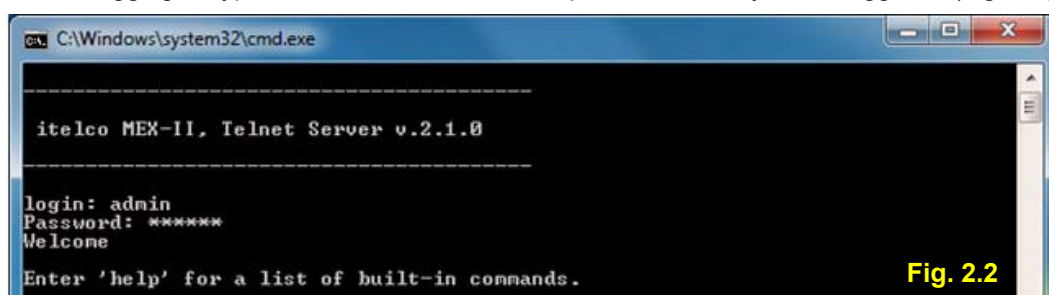
```

C:\Windows\system32\cmd.exe
Microsoft Windows [Versione 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. Tutti i diritti riservati.

C:\Users\Simula>
C:\Users\Simula>
C:\Users\Simula>telnet 10.0.12.248
  
```

Fig. 2.1

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



```

C:\Windows\system32\cmd.exe

-----
itelco MEX-II, Telnet Server v.2.1.0
-----

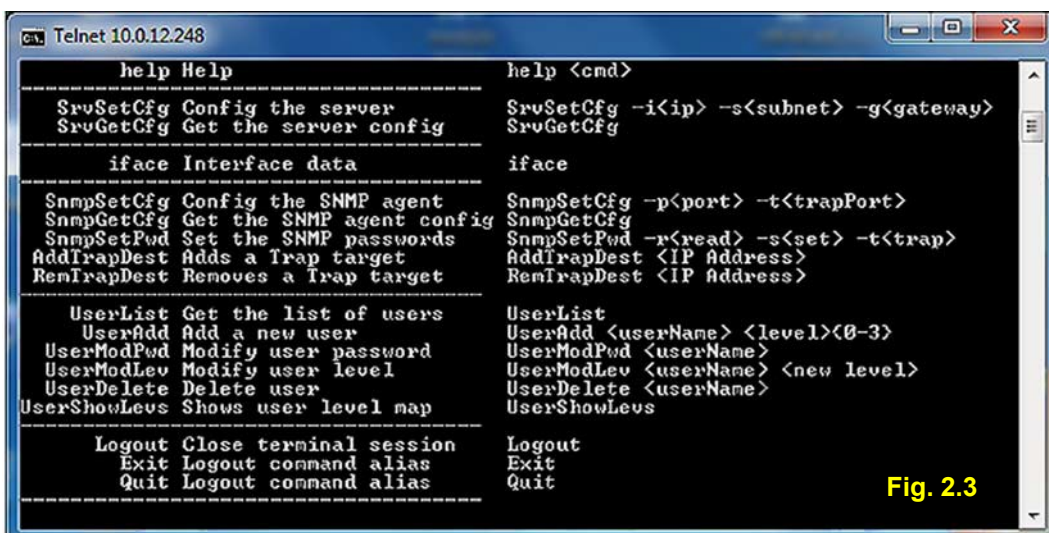
login: admin
Password: *****
Welcome

Enter 'help' for a list of built-in commands.
  
```

Fig. 2.2

### 1.4 HELP

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



```

Telnet 10.0.12.248

-----
help Help
-----
SrvSetCfg Config the server
SrvGetCfg Get the server config
-----
iface Interface data
-----
SnmpSetCfg Config the SNMP agent
SnmpGetCfg Get the SNMP agent config
SnmpSetPwd Set the SNMP passwords
AddTrapDest Adds a Trap target
RemTrapDest Removes a Trap target
-----
UserList Get the list of users
UserAdd Add a new user
UserModPwd Modify user password
UserModLev Modify user level
UserDelete Delete user
UserShowLevs Shows user level map
-----
Logout Close terminal session
Exit Logout command alias
Quit Logout command alias
-----

help <cmd>
SrvSetCfg -i<ip> -s<subnet> -g<gateway>
SrvGetCfg
iface
SnmpSetCfg -p<port> -t<trapPort>
SnmpGetCfg
SnmpSetPwd -r<read> -s<set> -t<trap>
AddTrapDest <IP Address>
RemTrapDest <IP Address>
UserList
UserAdd <userName> <level><0-3>
UserModPwd <userName>
UserModLev <userName> <new level>
UserDelete <userName>
UserShowLevs
Logout
Exit
Quit
  
```

Fig. 2.3

## 1.5 COMMANDS

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

- IP address
- Subnet
- Gateway

### 1.5.1 Changing the server IP address, Subnet and Gateway

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

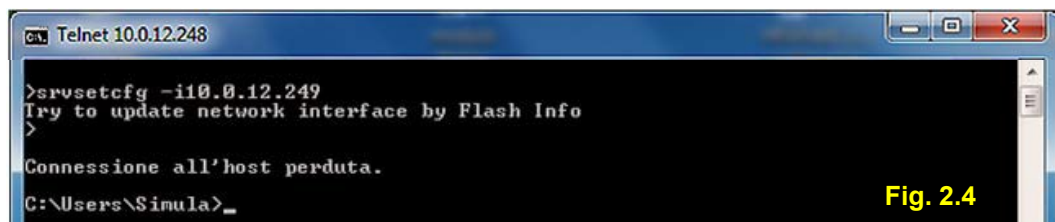
- `"SrvSetCfg -i<new IP>"`  
↑ *type the new address here*
- `"SrvSetCfg -s<new subnet>"`  
↑ *type the new subnet here*
- `"SrvSetCfg -g<new gateway>"`  
↑ *type the new gateway here*

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

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

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

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

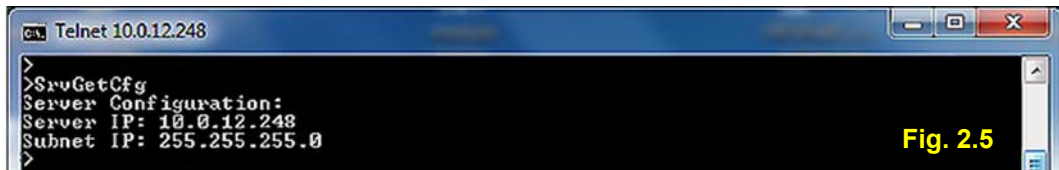


#### NOTE!

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

### 1.5.2 Getting the server configuration

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



### 1.5.3 About server parameters commands

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

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

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

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

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

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

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

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

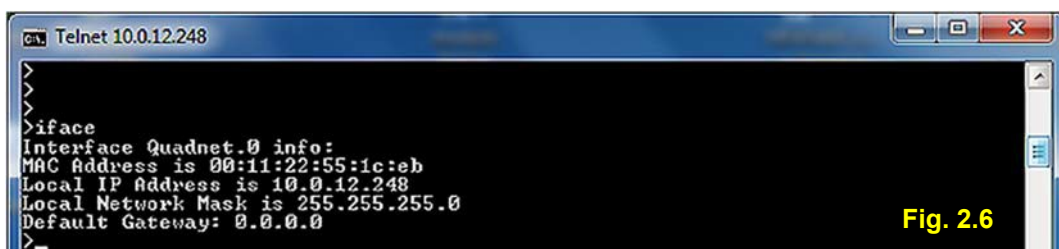
- *HTTP* page (R/W) for reading information and sending commands to the equipment (supervisory system).
- *SNMP*. The SNMP access is managed with the community table. Then this table will have a description.

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

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

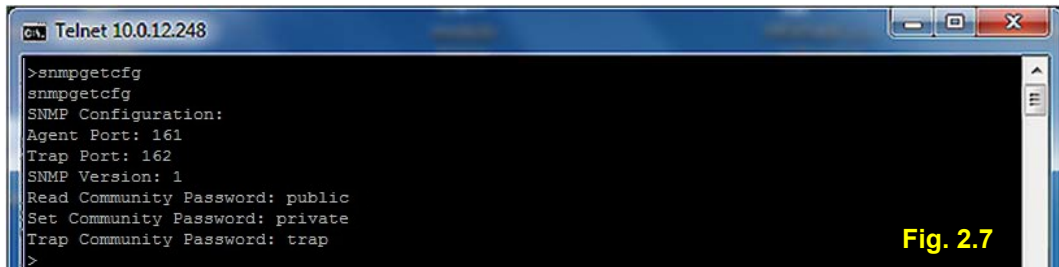
### 1.5.4 Getting the interface data

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



### 1.5.5 Snmp agent

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



```

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

```

**Fig. 2.7**

### 1.5.6 The SNMP community management

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

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

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

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

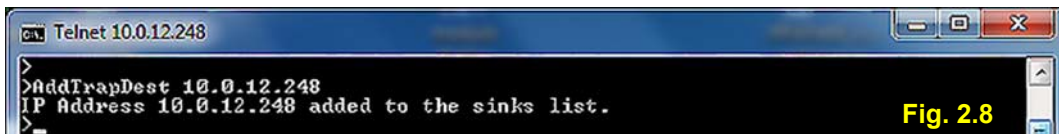
↑
↑
↑

type the new pwd of read only community here
type the new pwd of read/write community here
type the new pwd of trap receiver community here

### 1.5.7 Adding/Removing a trap destination

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

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



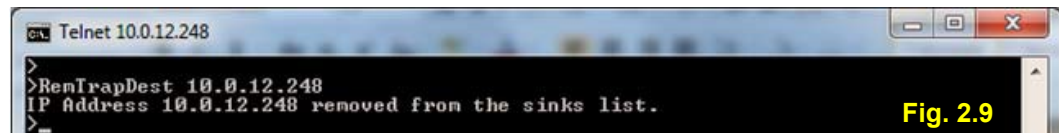
```

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

```

**Fig. 2.8**

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



```

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

```

**Fig. 2.9**

### 1.5.8 User List

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



```

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

```

Fig. 2.10

### 1.5.9 Adding/Deleting a User

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

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

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

↑ type new user here
↑ type the level here

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

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



```

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

```

Fig. 2.11

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



```

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

```

Fig. 2.12

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

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



#### NOTE!

Take note of the password of user "admin".

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

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

#### WARNING!

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

### 1.5.10 Modifying the User Password and/or level

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

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

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

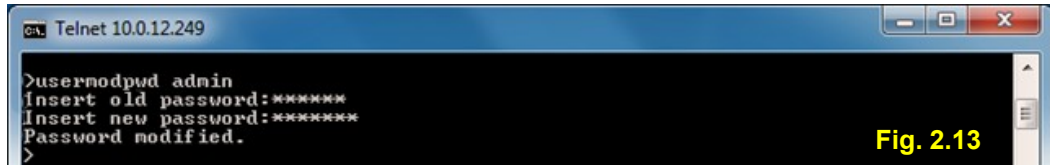


Fig. 2.13

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

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



Fig. 2.14

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

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



Fig. 2.15

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

No encryption is provided (no SSL ecc.).

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

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

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

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

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

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

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

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

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

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

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

#### 1.5.12 Closing terminal session

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



#### NOTE!

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



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# **SAFETY PRECAUTIONS**

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

## 1 INTRODUCTION

### 1.1 Application notes

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

### 1.2 Purpose

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

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

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

### 1.3 General

Itelco® equipment has been designed and manufactured taking into due consideration:

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

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

#### **WARNING!**

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

#### **CAUTION!**

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

#### **NOTE!**

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

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

## 2 SAFETY OPERATIONS

### 2.1 Introduction

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

#### KEEP AWAY FROM LIVE CIRCUIT

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

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

#### DO NOT SERVICE OR ADJUST ALONE

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

### 2.2 Electric shock

Factors affecting electric shock consequence are:

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

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

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

### 2.3 Rescue

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

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

### 2.4 Resuscitation

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

## 2.5 Emergency First Aid instructions

### WARNING!

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

OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE  
ALL SAFETY REGULATION.

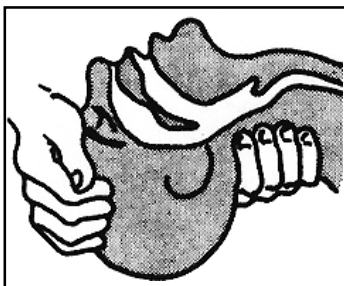
DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE  
THE EQUIPMENT WITH THE VOLTAGES APPLIED.

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

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

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

### 2.5.1 Rescue breathing



1. Find out if the person is breathing.

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

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

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

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

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

**LOOSEN CLOTHING  
KEEP WARM**

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

## 2.5.2 Burns

### SKIN REDDENED:

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

### SKIN BLISTERED OR FLESH CHARRED:

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

### EXTENSIVE BURN-SKIN BROKEN:

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

## 3 SPECIFICATION ON HANDLING AND DISPOSAL OF BERYLLIA DEVICES

### 3.1 Handling

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

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

### 3.2 Disposal

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

The disposal procedure is divided into two categories:

- Electrically faulty, but not mechanically damaged.

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

- 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 <sup>(1)</sup>.

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 over currents.*

*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.*



## **5. WIRING DIAGRAMS**

WIRING  
DIAGRAMS

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