15/06/2016
www.elber.com
elber@elber.it

CPM

Portable Microwave Link

Digital Version

User Manual

Elber s.r.l.- Via Pontevecchio, 42W
16042 Carasco (GE) Italy

Phone +39-0185.35.13.33
Fax +39-0185.35.13.00


ELBER
CPM-R

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1. General Description.

The multi-channel CPM link is the latest product entirely designed and developed by Elber for mobile applications. The operational frequency of this equipment is between 2 and 15 GHz with frequency agility up to 500MHz.
The control units lodge a digital (COFDM) modulator/demodulator.
An external IF input is also available permitting the transmission of a different signal or of a *back up* signal. These characteristics permit the CPM link to be the ideal, fast mounting mobile link even in difficult weather scenarios.
The COFDM modulator and demodulator boards are integrated in the control units. Please refer to sections 4.1.3.5/4.1.5.5 for further information and specifications.
The control units can also lodge an encoder and a decoder board.
The encoding/decoding section is a MPEG-2 SD system, both 4:2:2 and 4:2:0 with low end-to-end latency capability (less than 100ms).
The encoder accepts CVBS or SDI as video input both as PAL or NTSC format. The 4 audio channels can be analog, AES3 or SDI-Embedded.
The decoder gives at the output both CVBS and SDI as PAL or NTSC format; audio is provided as analog audio, AES3 and digital SDI-embedded.
The link output power is either 1, 2 or 4 watts depending on the frequency band of the equipment.
The system consists of an aluminum tripod complete with a panoramic head, support base, parabola with illuminator and an RF head.
The control units can be indoor or outdoor.
The outdoor unit has the same mechanical structure of the RF Head and it’s connected to it by an RG-216 cable.
The equipment functionality and parameter monitoring could be done through the keypad and LCD display available on the front panel.
The indoor control unit is a standard 1U 19” rack mount suitably designed for the use in Outside Broadcasting Vans or similar equipped places. Alternatively, suitable *flight cases* are also available for external use.
The equipment functionality and parameter monitoring could be done through the keypad and LCD display available on the front panel.

2. Technical Specifications.

2.1. Transmitting head CPM/T/xx.

Centre Frequency	2 GHz ÷ 15 GHz
Frequency Span	500MHz max
Channel Spacing	Specified at ordering stage
Number of RF channels	Depending on channel spacing
Frequency Stability	± 20ppm (standard stability)
	± 2ppm (high)
IF/DC connector	LEMO(ERA.3T.275.CTL)
Output RF Power	
➢ **CPM/T/07**	+33 dBm ±1 dB
➢ **CPM/T/10**	+30 dBm ±1 dB
➢ **CPM/T/14**	+30 dBm ±1 dB
Output RF connector	N type Female
RF output Return Loss	> 20 dB
Spurious output content	< -65 dB
IF impedance	75 Ohm
Waterproof case	
Power Supply	DC: 22V ÷ 65V negative to ground
Maximum Power Consumption	65 W

2.2. Receiving head CPM/R/xx.

Centre Frequency	2 GHz ÷ 15 GHz
Frequency Span	500MHz
Channel Spacing	Specified at ordering stage
Noise Figure	< 5 dB
Number of RF channels	Depending on channel spacing
Frequency stability	± 20ppm (standard stability)
	± 2ppm (high)
IF/DC connector	LEMO (ERA.3T.275.CTL)
RF input connector	N type Female
RF Input Return Loss	> 20 dB
Image Rejection	> 75 dB
IF impedance	75 Ohm
Waterproof case	
Power Supply	DC: 22V ÷ 65V negative to ground
Maximum Consumption	40 W

2.3. Indoor Control Unit (TCU/RCU).

IF Frequency	70 MHz
IF/DC Connector	LEMO(ERA.3T.275.CTL)
Amplitude/frequency response 70 MHz	< 1 dB
Group Delay 70 MHz	< 5 ns
Control	Front Panel
Power Supply	AC: 230V/50Hz or 110V/60Hz
	DC: 22V ÷ 65V
Maximum Consumption	30 W
Width	482 mm
Length	44 mm
Depth	480 mm
Weight	4 Kg
Temperature Operation Range	-10°C÷60°C
Relative Humidity	0-95% non condensing

2.4. Outdoor Control Unit (TCU/RCU).

IF Frequency	70 MHz
IF/DC Connector	LEMO(ERA.3T.275.CTL)
Amplitude/frequency response 70 MHz	< 1 dB
Group Delay 70 MHz	< 5 ns
Control	Front Panel
Power Supply	AC: 110÷230V-50Hz/60Hz
	DC: +22V ÷ +65V
Maximum Consumption	30 W
Weight	4 Kg
Temperature Operation Range	-10°C÷60°C
Relative Humidity	0-95% non condensing

3. Installation Procedure.

1. Open the package box, using a cutting tool, ensuring no damage is done to the content. Verify any damage caused during transportation.
2. Check the package contents. The package should contain:
    a. CPM/T transmitting head.
    b. CPM/R receiving head.
    c. Two Tripods complete with Panoramic Heads.
    d. Two Feeders.
    e. Two Parabolic Dishes.
    f. TCU transmitting control unit.
    g. RCU reception control unit.
    h. Two AC power cords.
    i. Two DC power cords.
    j. Two RG-216 cables used to connect the RF heads with the control units.
    k. User Manual.

    The next figure shows an overview of the equipment.

Figure 1: Equipment Overview

3. Install the control units in a cabinet rack. The space required is 1 rack unit.

4. Verify that there is sufficient clearance on both sides of the equipment in order not to restrict air flow.
5. No heat sources should be placed too close to the equipment: the proper functioning is warranted for ambient temperature between -5°C to +60°C.
6. Install the power cord and connect to the primary power source.
7. Make the ground connection to the screw located on the rear of the equipment, to meet the EMC directives.
8. Assure of the right input voltage reading the data on the user manual or on the adhesive stickers, located on each equipment, that show the register number.
9. Open tripods locking the desired position using the appropriate brake (Figure 2).

Figure 2: Tripods installation

10. Insert the transmitting and receiving heads in the relative tripod (Figure 3), locking the position through the appropriate brake. (Figure 4).

Figure 3: Head insertion

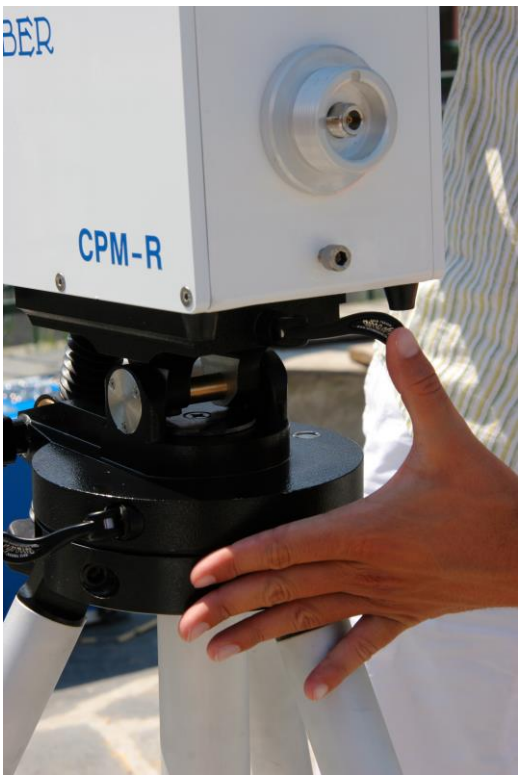


Figure 4: Head fixing

11. Fix the parabolic dish to the relative RF head as shown in the next figure.

Figure 5: Parabolic dish fixing

12. Screw the feeder to the RF head, so that the parabolic dish is locked (Figure 6).

Figure 6: Feeder installation

13. Orientate and incline the parabolic dishes for the pointing (Figure 7).

Figure 7: Parabola alignment

14. Connect the control units to the relative RF heads through the RG-216 cables (Figure 8 / Figure 9).

Figure 8: Connection of the control unit

Figure 9: Connection of the RF head

15. Switch on the power switch of the control units located on the rear of the equipment. The state and the operations of the device can be checked using the keyboard and the display following the instructions in the paragraph related to the user interface 4.2

4. Operational Theory.

4.1. Block Diagram.

4.1.1. Split system.

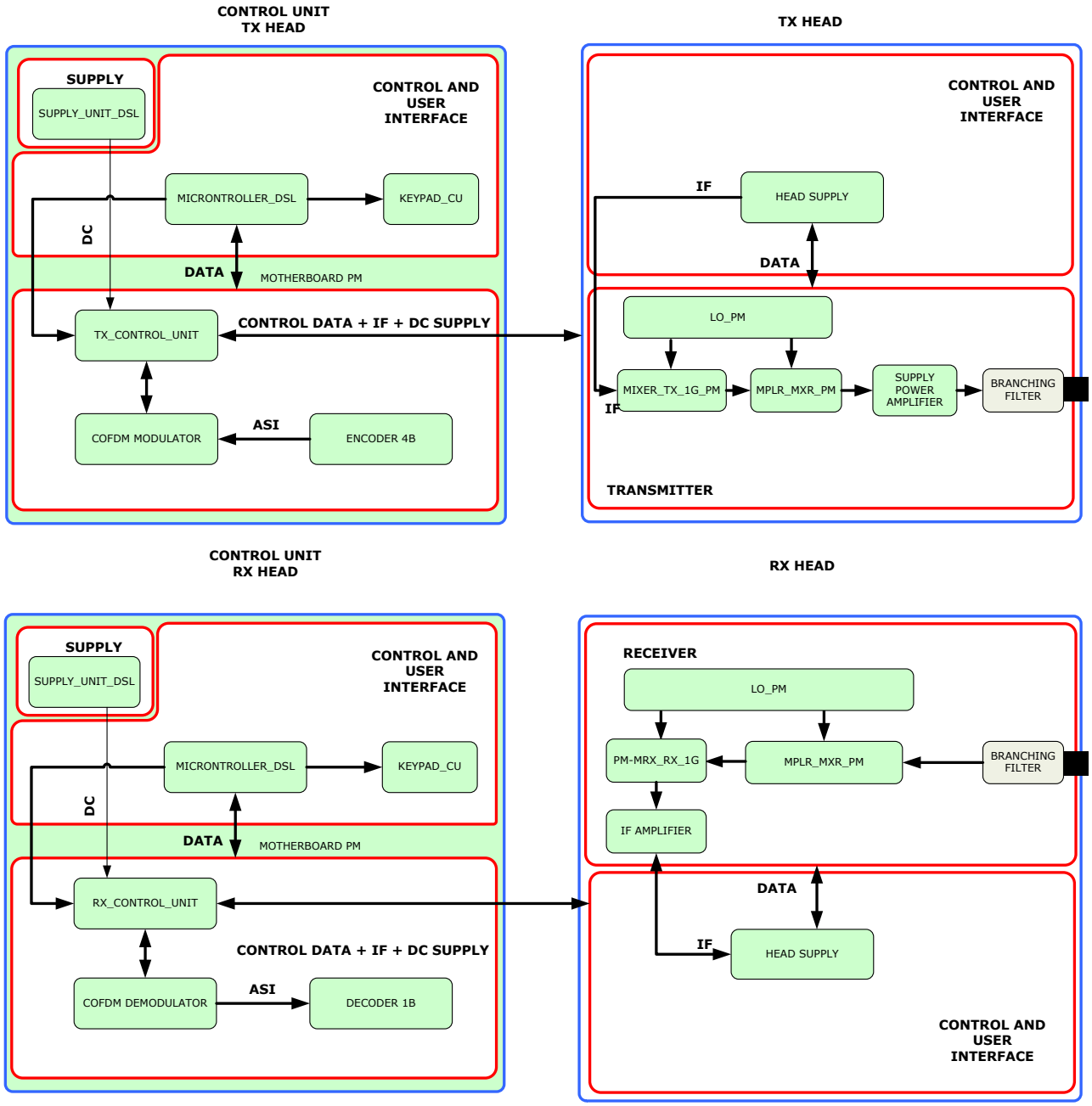


Figure 10: CPM Split version block diagram

4.1.2. Outdoor system.

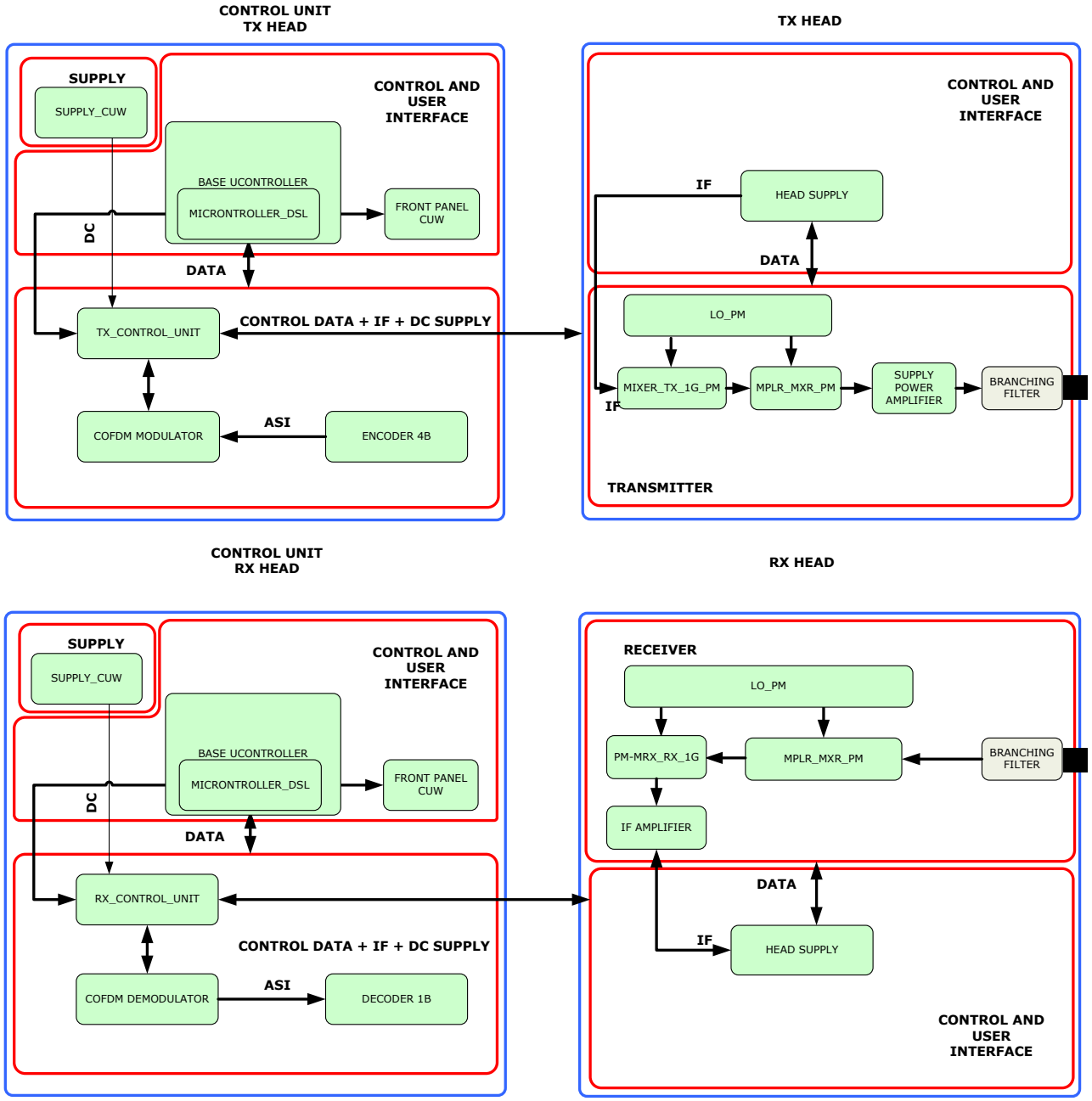


Figure 11: CPM outdoor version block diagram

As depicted in figure 10, the CPM split system is composed of four blocks:

1. Control Unit Tx Head
2. Tx Head
3. Control Unit Rx Head
4. Rx Head

Figure 12: Indoor TCU - Transmitting Head Control Unit

Figure 13: Indoor RCU - Receiving Head Control Unit

The connection between the control Unit and its respective RF head is effected through an RG-216 coaxial cable with LEMO connector at both ends. The connector is located at the back of the equipment.

4.1.3. Indoor Control Unit TX Head.

The indoor head control unit is composed of 6 different blocks as depicted in Figure 10:

1. Supply_Unit_DSL
2. Microcontroller_DSL
3. Keypad_CU
4. UCT
5. COFDM Modulator
6. Motherboard PM
7. Encoder VERS. 5

4.1.3.1. Supply_Unit_DSL.

The Transmitter control Unit (TCU) power supply can be:

A.C.	230 V +/-20% 50Hz
	115 V +/-10% 60Hz
D.C.	25 ÷ 65 V
Power	60W

The installed power supply protection fuse on the alternating current is 1.6 amps. An automatic switch is present between the two supplies. In case the A.C. current reaches a lower threshold, the input supply is switched to D.C. current. The switching occurs instantaneously without causing any power interruption of the equipment.
The D.C. voltage input connector is a 4 pin connector. The power cable must be connected to pin 2 and 4, independent of the polarity.
The D.C. input is galvanically isolated from the equipment earth.

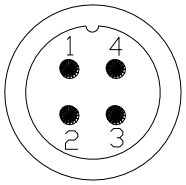


Figure 14: D.C. Power Connector.

4.1.3.2. Microcontroller_DSL.

The controller caters for the following functions:

- Programming of the transmission frequency.
- Programming of the correct output power *backoff* as necessary according to the digital modulation scheme used.(if the link is multichannel)
- Front panel keypad, display and Led management.
- Selection of the IF input (Internal/External).
- System equalization according to the coaxial cable length used between control unit and head.
- Programming and monitoring of optional boards such as COFDM modulator.
- Alarms management.

4.1.3.3. Keypad_CU.

The keypad board is installed directly on the front panel. It is composed of the 24x2 characters LCD display, the 16 Led and the 6 keys for menu scrolling and selection.

4.1.3.4. UCT.

The UCT board provides for a multiplexed output signal (on a SMB connector directly connected to the LEMO connector on the rear panel). This signal is composed of a 48Vdc power supply signal, a data sub-carrier for head control and IF at 70MHz which are all directed towards the transmitting head. Two IF inputs are available, selectable by the user, through a microcontroller controlled relay.
Input voltage polarity of the head is set by changing the position of the jumper connection on connector J18 and J19.

4.1.3.5. COFDM Modulator.

This board realizes a complete COFDM modulator with one ASI input signal and one 70 MHz IF output signal.

No tuning is required; all signal processing is performed digitally on FPGA.

An integrated ASI receiver accepts the ASI input stream and provides the output digital data to the following FPGA.

The FPGA is the core of this board: it realizes the complete DVB-T COFDM Modulator, providing the output IF samples to the following Tx DAC.

The modulator firmware permits to select different features, as follow:

- Setting of modulation scheme (QPSK; 16QAM; 64QAM)
- Setting of carriers (2k; 4k; 8k)
- Setting of the bandwidth (5-6-7-8 MHz).
- Setting of FEC (1/2; 2/3; ¾; 5/6; 7/8) and guard interval (1/4; 1/8; 1/16; 1/32)

According to the required data rate, modulation scheme, code rate and guard interval for a particular bandwidth please refer to the following tables:

Net data rates in the 6 MHz bandwidth.

Modulation	Inner code rate	Guard interval			
		1 / 4	1/8	1/16	1/32
QPSK	1/2	3.69	4.10	4.34	4.48
	2/3	4.92	5.47	5.79	5.97
	3/4	5.54	6.15	6.52	6.71
	5/6	6.15	6.84	7.24	7.46
	7/8	6.46	7.18	7.60	7.83
16-QAM	1/2	7.39	8.21	8.69	8.95
	2/3	9.85	10.94	11.58	11.94
	3/4	11.08	12.31	13.03	13.43
	5/6	12.31	13.68	14.48	14.92
	7/8	12.92	14.36	15.20	15.67
64-QAM	1/2	11.08	12.31	13.03	13.43
	2/3	14.77	16.41	17.38	17.90
	3/4	16.62	18.46	19.55	20.14
	5/6	18.46	20.51	21.72	22.38
	7/8	19.39	21.54	22.81	23.50

Net data rates in the 7 MHz bandwidth.

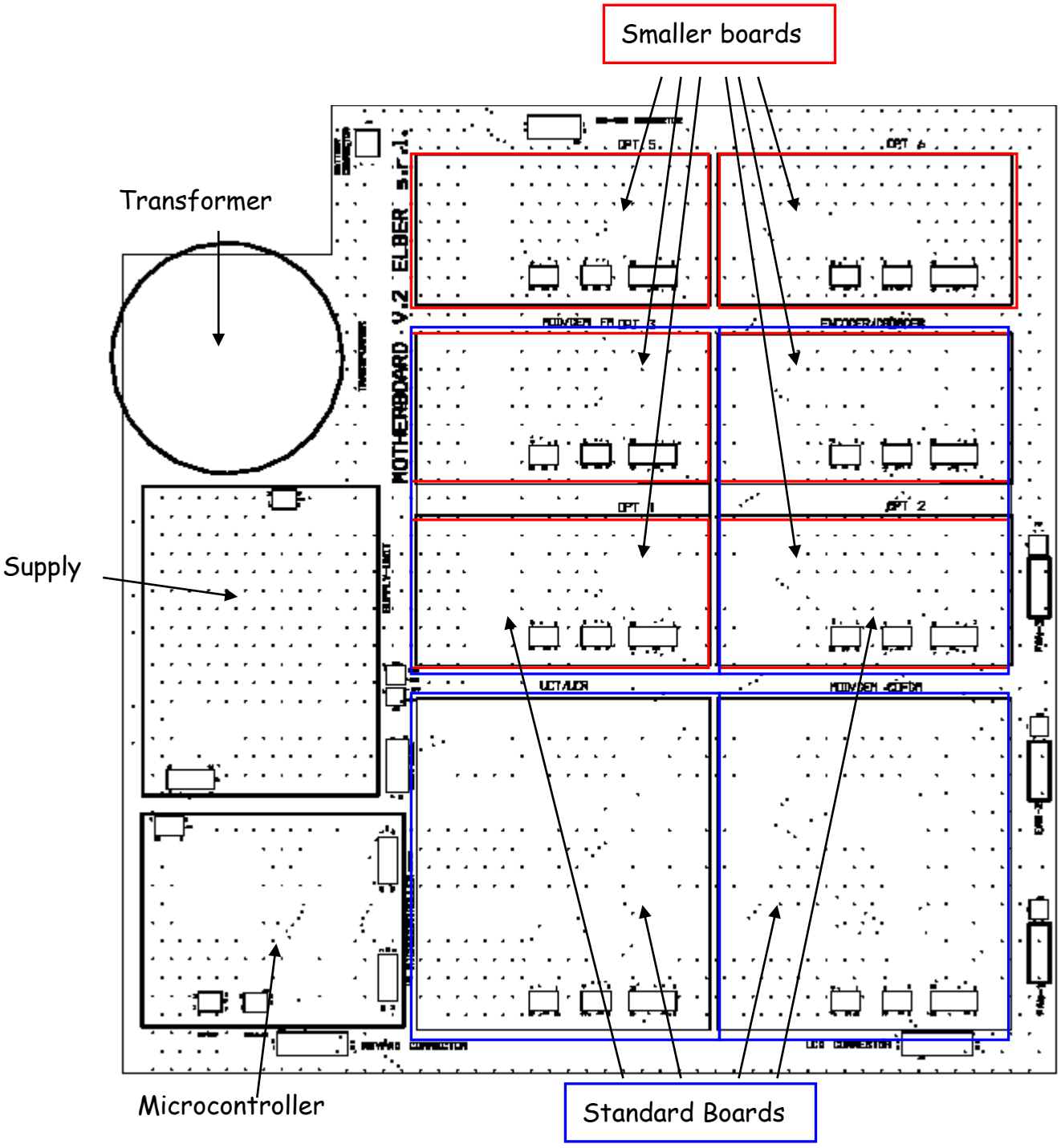
Modulation	Inner code rate	Guard interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	4.354	4.838	5.123	5.278
	2/3	5.806	6.451	6.83	7.037
	3/4	6.532	7.257	7.684	7.917
	5/6	7.257	8.064	8.538	8.797
	7/8	7.62	8.467	8.965	9.237
16-QAM	1/2	8.709	9.676	10.246	10.556
	2/3	11.612	12.902	13.661	14.075
	3/4	13.063	14.515	15.369	15.834
	5/6	14.515	16.127	17.076	17.594
	7/8	15.24	16.934	17.93	18.473
64-QAM	1/2	13.063	14.515	15.369	15.834
	2/3	17.418	19.353	20.491	21.112
	3/4	19.595	21.772	23.053	23.751
	5/6	21.772	24.191	25.614	26.39
	7/8	22.861	25.401	26.895	27.71

Net data rates in the 8 MHz bandwidth.

Modulation	Inner code rate	Guard interval			
		1 / 4	1/8	1/16	1/32
QPSK	1/2	4.98	5.53	5.85	6.03
	2/3	6.64	7.37	7.81	8.04
	3/4	7.46	8.29	8.78	9.05
	5/6	8.29	9.22	9.76	10.05
	7/8	8.71	9.68	10.25	10.56
16-QAM	1/2	9.95	11.06	11.71	12.06
	2/3	13.27	14.75	15.62	16.09
	3/4	14.93	16.59	17.56	18.10
	5/6	16.59	18.43	19.52	20.11
	7/8	17.42	19.35	20.49	21.11
64-QAM	1/2	14.93	16.59	17.56	18.10
	2/3	19.91	22.12	23.42	24.13
	3/4	22.39	24.88	26.35	27.14
	5/6	24.88	27.65	29.27	30.16
	7/8	26.13	29.03	30.74	31.67

4.1.3.6. Motherboard PM.

The PM motherboard is designed to house up to 4 standard size boards and 2 of reduced dimensions or 2 standards and 6 smaller sizes. It is also designed to incorporate the Microcontroller_DSL, Supply_DSL boards and the voltage transformer. The presence of the motherboard extensively reduces the use of interconnecting cables which would otherwise be very complex. It also provides for future upgrades.



4.1.3.7. Encoder VERS 5.

This board performs a MPEG-2 SD video and audio encoding, generating at the output an DVB-ASI TS signal.
It accepts as video input both CVBS and SDI input as PAL or NTSC format; the source and its video format to be encoded should be chosen by user interface.
The audio formats accepted are analog audio, AES3 and SDI-embedded.
For test purposes it's possible to use the internal BAR/TONE generator.
The coding profile can be MP@ML or 422P@ML and has to be chosen by user interface.
When base configuration with "low-delay" mode are chosen, a SP@ML profile will be automatically set.
In manual mode the SP@ML profile is not available.

4.1.4. Outdoor Control Unit TX Head.

The outdoor head control unit is composed of 6 different blocks as depicted in Figure 11:

1. Supply_CUW
2. Microcontroller_DSL
3. Base_ucontroller
4. Front panel CUW
5. UCT
6. COFDM Modulator
7. Encoder VERS 5

4.1.4.1. Supply_CUW.

The Outdoor control Unit power supply can be:

A.C.	230 V +/-20% 50Hz
	115 V +/-10% 60Hz
D.C.	25 ÷ 65 V
Power	60W

The installed power supply protection fuse on the alternating current is 1.6 amps. An automatic switch is present between the two supplies. In case the A.C. current reaches a lower threshold, the input supply is switched to D.C. current. The switching occurs instantaneously without causing any power interruption of the equipment.
The D.C. voltage input connector is a 4 pin connector. The power cable must be connected to pin 2 and 4, independent of the polarity.
The D.C. input is galvanically isolated from the equipment earth.

4.1.4.2. Microcontroller_DSL.

See par. 4.1.3.2.

4.1.4.3. Base_ucontroller.

This board let to use the same microcontroller board, adapting the connector pinout from the motherboard to the Outdoor control unit bus.

4.1.4.4. Front Panel CUW.

The Front panel CUW board is installed directly on the front panel. It is composed of the 16x2 characters LCD display and the 6 keys for menu scrolling and selection.

4.1.4.5. UCT.

See par. 4.1.3.4.

4.1.4.6. COFDM Modulator.

See par. 4.1.3.5.

4.1.4.7. Encoder VERS 5.

See par. 4.1.3.7.

4.1.5. Indoor Control Unit Rx Head.

The receiving head control Unit as depicted in Figure 10 is also composed of 6 different blocks:

1. Supply_Unit_DSL
2. Microcontroller_DSL
3. Keypad_CU
4. UCR
5. COFDM Demodulator
6. Motherboard PM
7. Decoder 1B

4.1.5.1. Supply_Unit_DSL.

Please refer to paragraph 4.1.3.1

4.1.5.2. Microcontroller_DSL.

The controller provides for the following functions:

- Programming of the receiving frequency.
- Front panel keypad, display and Led management.
- System equalization according to the coaxial cable length used between control unit and head.
- Programming and monitoring of optional boards such as COFDM demodulator.
- Alarms management

4.1.5.3. Keypad_CU.

The keypad board is installed directly on the front panel. It is composed of the 24x2 characters LCD display, the 16 Led and the 6 keys for menu scrolling and selection.

4.1.5.4. UCR.

The UCR board receives a 70MHz input from the RF head, to which it adds up the data sub carriers and the 48 V_{dc} signals. A 70 MHz filter followed by an equalization circuitry ensures a clean received signal.
Another equalization process allows adequately compensate for the distortions introduced by the cable. The most suitable equalization setting could be set through the use of the keypad and display.

4.1.5.5. COFDM Demodulator.

This board realizes a complete COFDM demodulator with one 70 MHz IF input signal and one ASI output signal.
No tuning is required; all signal processing is performed digitally on FPGA.
An integrated DVB-T tuner receives the 70 MHz IF signal and provides the output MPEG transport stream SPI data to the following FPGA.
The FPGA realizes a sort of buffer, providing the MPEG transport stream data to the following ASI transmitter.
The modulator firmware permits to select the bandwidth (5-6-7-8 MHz), according to the modulator setting.

4.1.5.6. Motherboard PM.

Please refer to paragraph 4.1.3.6.

4.1.5.7. Decoder VERS 5

This board performs a MPEG-2 SD video and audio decoding, accepting as input a standard DVB-ASI TS signal and giving at the output, after the decoding process, both composite video and SDI. The output video format should be chosen by user interface as PAL or NTSC. The board can also decode up to 4 audio channels, in analog, AES3 and SDI-Embedded format.
For test purposes it's possible to use the internal BAR/TONE generator.
It automatically detects the coding format: SP@ML with "low-delay" mode, MP@ML and 422P@ML are accepted.

4.1.6. Outdoor Control Unit Rx Head.

The outdoor head control unit is composed of 6 different blocks as depicted in Figure 11:

1. Supply_CUW
2. Microcontroller_DSL
3. Base_ucontroller
4. Front panel CUW
5. UCT
6. COFDM Demodulator
7. Decoder 1B

4.1.6.1. Supply_CUW.

See par. 4.1.4.1.

4.1.6.2. Microcontroller_DSL.

See par. 4.1.3.2.

4.1.6.3. Base_ucontroller.

See par. 4.1.4.3

4.1.6.4. Front Panel CUW.

See par. 4.1.4.4.

4.1.6.5. UCR.

See par. 4.1.5.4.

4.1.6.6. COFDM Demodulator.

See par.4.1.5.5.

4.1.6.7. Decoder VERS 5.

See par. 4.1.5.7.

4.1.7. TX Head.

The transmitting head is composed of 5 blocks:

1. HEAD_SUPPLY
2. MIXER_TX_1G_PM
3. MPLR_MXR_PM
4. LO_PM
5. SUPPLY POWER AMPLIFIER

4.1.7.1. HEAD_SUPPLY.

The HEAD_SUPPLY board directly installed on the counter-panel of the head, houses the LCD 24x2 display. Apart from providing for the separation of the 3 multiplexed signals that are transported over the RG-216 cable originating from the control unit, it also directs the signals to their respective board. The data carrier is directed to the LO_PM board on which the microcontroller chip is available. The 70MHz IF signal is routed to MIXER_TX_1G_PM board being the first converter, and finally the third signal i.e. 48V, is used to generate all the necessary power for the head boards.

4.1.7.2. MIXER_TX_1G_PM.

The 70MHz IF signal available at the input is filtered by a wide band 30MHz filter and then converted to the second IF value (1100 MHz). Such filtering can be useful to remove, from the output TX spectrum, noise originating from an analogue modulator that can be present on the IF input. Similarly, this filter is also necessary to remove spurious emissions present on the IF generated by a digital modulator.
The image frequency (located at an offset of 140MHz with respect to the 1100MHz value) is filtered through a 7 stage filter.
In the same block, a variable gain amplifier is also present, monitoring the power output and ensuring that the output power is at a suitable necessary level as programmed in the back off values.

4.1.7.3. MPLR_MXR_PM.

The MPLR_MXR_PM board converts the signal generated from the first up-converter to the operational frequency of the transmitter. The conversion is effected by a wide bandwidth passive diode mixer. On the output of the mixer, a band stop filter ensures that frequency aliases greater than 2200 MHz from the operational frequency are attenuated. The local oscillator signal is doubled before being sent to the mixer input.

4.1.7.4. LO_PM.

The LO_PM board contains a microcontroller that provides for the communication with the control unit and for the measurement acquisition of the various RF boards. Apart from this microcontroller, it also incorporates, in two different sections, the two circuits for the primary and secondary conversion.

The local oscillator for the primary conversion is made up of an L-band synthesizer; the PLL (*Phase Locked Loop*) controls the oscillator frequency at a low *phase noise*.

The operational frequency is fixed and its value (1170 MHz) is programmed by the controller during the system initialization stage utilizing data strings and I^2C channels. The oscillator is regularly checked to monitor the un/locked status.

The second conversion local oscillator utilizes a similar synthesizer to that used at 1170 MHz oscillator, using a highly stable TCXO as a reference.

The final frequency value is obtained using three wide bandwidth multiplying serial stages. The necessary level to correctly pilot the mixer is achieved utilizing different amplification stages equipped with GaAsFet. The same I^2C channels allow the controller to set the operational frequency and to periodically control the loop locked status.

4.1.7.5. Supply Power Amplifier.

The final amplification stage is composed of a single amplifier utilizing a wide bandwidth MMIC. At this same stage, a power monitoring component is used for the power output indication and for the ALC operation.

4.1.8. Rx Head.

The receiving head is composed of 5 blocks:

1. HEAD_SUPPLY
2. PM_MRX_RX_1G
3. MPLR_MXR_PM
4. LO_PM
5. IF_AMPLIFIER

4.1.8.1. HEAD_SUPPLY.

The HEAD_SUPPLY board, directly installed on the counter-plate of the head, houses the 24x2 LCD display. Apart from providing for the separation of the 3 multiplexed signals that are carried over the RG-216 cable, it also routes the appropriate signals to their respective board. The data sub-carrier is sent to the LO_PM board which contains the microcontroller. The 70 MHz IF received from the second converter PM_MXR_RX_1G is sent to the control unit for demodulation. The 48V supply is used to provide all the supply needed for all the head modules.

4.1.8.2. MPLR_MXR_PM.

The MPLR_MXR_PM converts the signal coming from the antenna to the first IF at 1100 MHz. The conversion is effected by a large bandwidth passive diode mixer. On the output of the mixer, a band stop filter ensures that frequency aliases greater than 2200 MHz from the operational frequency are attenuated. The local oscillator signal is doubled before being sent to the mixer input.

4.1.8.3. PM_MXR_RX_1G.

The 1st conversion signal (1100 MHz) is amplified and filtered (through a 7 cell filter similar to that used in the 1st up-converter stage of the transmitter) in order to remove unnecessary image frequencies before being converted to 70 MHz (2nd IF) and finally amplified. The 70 MHz signal successively passes through a fixed gain stage, phase equalization stage and finally a 70 MHz pass band filter.

4.1.8.4. LO_PM.

Please refer to paragraph 4.1.7.4.

4.1.8.5. IF_AMPLIFIER.

In the IF_AMPLIFIER board an IF amplification circuitry is introduced whose gain is controlled by the signal provided by the IF output level detector in such a way to stabilize the latter to the nominal value (AGC).

4.2. User interface (keypad + display).

The setup, control, and monitoring is provided through the navigation in the embedded software menu presented on a 24x2 alphanumeric display and operated by a six way keypad.

The six way keypad enables navigation through the various menus of the embedded system. The function of the keypad depends on the menu position. A short description follows:

Keys	**Configuration menu**		**Status menu**
	Position 1	*Other positions*	
UP	Previous menu		Previous menu
DOWN	Next menu		Next menu
RIGHT	Cursor scrolls one position to the right	Cursor scrolls one position to the right	Not used
LEFT	No use	Cursor scrolls one position to the left	No use
ENTER	Next Menu	Saves and applies changes	Next Menu
ESC	Displays Main Menu	Discard any changes	Displays Main Menu

Table 1: Menu Description.

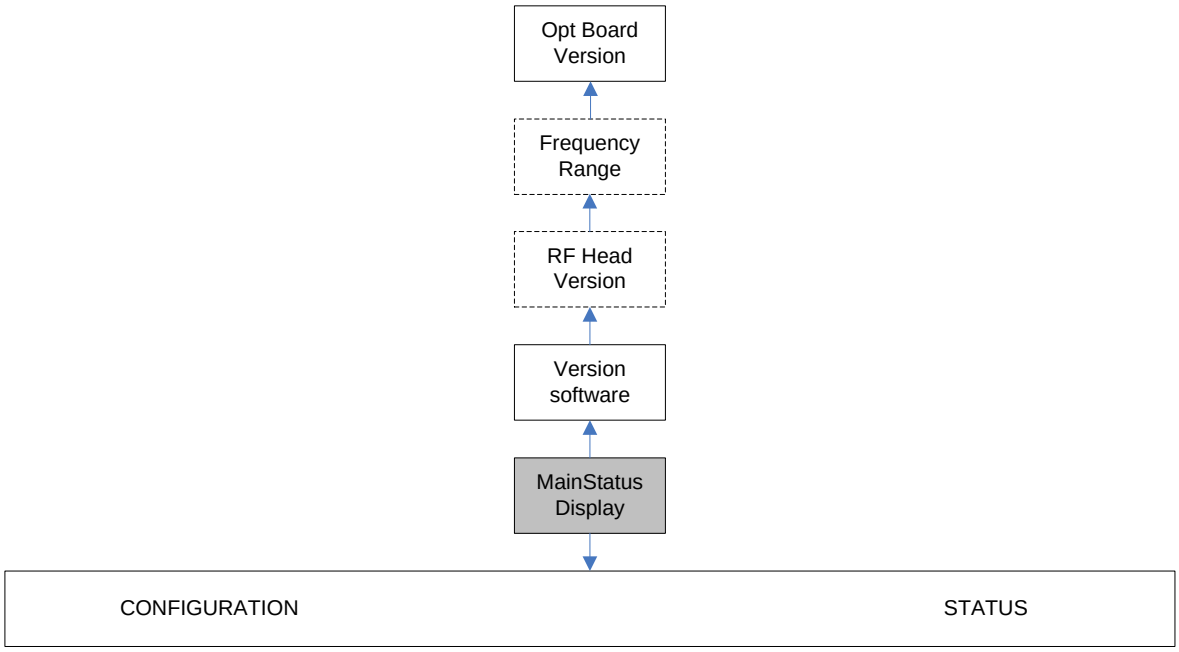


Figure 15: Menu Structure

Options	Description
Main Status Display	It shows the measured transmitted power of the CPM/T and the received field of the CPM/R.
Version Software	This is automatically displayed on both transmitter and receiver for 3 seconds after which the display shows again the main menu.
RF HEAD Version	The menu shows the head type to which the control unit is connected and the relative firmware version.
Frequency Range	It shows the frequency range of the equipment.
Opt. Board Version	Shows the version of optional boards installed such as the FM modulator and demodulator.
Configuration	The Configuration Menu option allows accessing to the System configuration parameters.
Status	The Configuration Menu option allows accessing to the System status parameters.

Table 2: Main Menu Description

4.2.1. Transmitter control unit.

4.2.1.1. Configuration menu (Indoor).

The configuration menu permits the user to change equipment parameters.

Figure 18Figure 16 shows the tree structure of the menu.

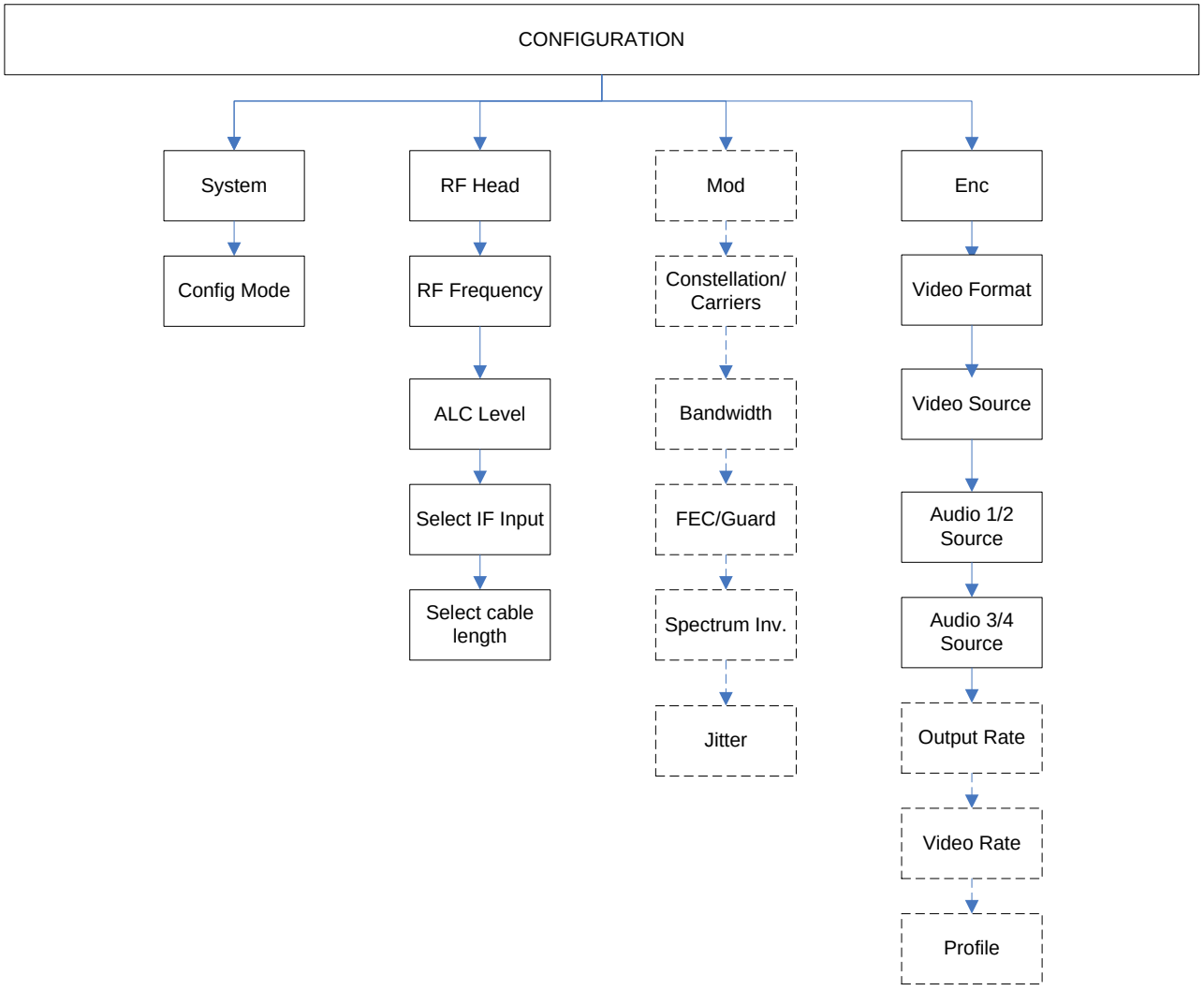


Figure 16: Indoor TCU configuration menu.

Option	Description
System	This option allows accessing to the System configuration parameters.
RF Head	It allows accessing to the RF Head configuration parameters.
Mod	This option allows accessing to the Modulator configuration parameters.
Enc	This option allows accessing to the Encoder configuration parameters.
Config Mode	This menu allows selecting equipment configuration mode. 7 different cases can be chosen: 1. QPSK FEC=5/6 Δ=1/4 2K Output 8000 Kbps Video 6500 Kbps MP@ML 2. 16QAM FEC=3/4 Δ=1/4 2K Output 14000 Kbps Video 12500 Kbps MP@ML 3. 16QAM FEC=2/3 Δ=1/32 2K Output 15500 Kbps Video 14000 Kbps 422P@ML 4. 64QAM FEC=2/3 Δ=1/4 2K Output 19500 Kbps Video 18000 Kbps 422P@ML 5. 16QAM FEC=2/3 Δ=1/4 2K Output 12000 Kbps Video 8000 Kbps SP@ML Low Delay 6. QPSK FEC=7/8 Δ=1/32 2K Output 8700 Kbps Video 4700 Kbps SP@ML Low Delay 7. Manual.
RF frequency	The frequency of equipment can be changed between the upper and lower limit. Upper and lower limits are shown in the Main Status display.
ALC level	Set-up the value of "back-off" for the transmitter output power. Range 0 dB / -15dB, step 1dB. Automatically set when a base configuration is chosen.
Select IF Input	It allows to select the IF source that can be either internal (COFDM modulator) or external.
Select Cable Length	It allows selecting the cable length so as to qualify the right equalization net.
Constellation/Carriers	Access permitted only in manual mode. Setting of modulation scheme (QPSK; 16QAM; 64QAM) and carriers (2k;4k;8k).
Bandwidth	Access permitted only in manual mode. It allows selecting the bandwidth (5-6-7-8 MHz).
FEC/Guard	Access permitted only in manual mode. Setting of FEC (1/2; 2/3; 3/4; 5/6; 7/8) and guard interval (1/4; 1/8; 1/16; 1/32)
Spectrum inv.	Access permitted only in manual mode. Spectrum inversion

Reduce Jitter	Access permitted only in manual mode. ASI De-jittering function enable/ disable.
Video Format	Select the video format (PAL or NTSC)
Video	Select the video source to be encoded (CVBS, SDI, BAR).
Audio 1/2	Select the audio 1 source to be encoded (Analog, SDI-EMB, AES3, TONE, MUTE).
Audio 3/4	Select the audio 2 source to be encoded (Analog, SDI-EMB, AES3, MUTE).
Output Rate	Access permitted only in manual mode. Set the encoder output rate. All MPEG-2 null packet inserted by the encoder will be removed by the COFDM modulator.
Video Rate	Access permitted only in manual mode. Set the encoder video rate.
Profile	Access permitted only in manual mode. Set the MPEG-2 coding profile: 1. MP@ML 2. 422P@ML * In manual mode the SP@ML profile is not available.

Table 3: Configuration Menu Description.

4.2.1.2. Status menu (Indoor).

The menu status permits the user to monitor the equipment status.

Figure 17 shows the menu status tree.

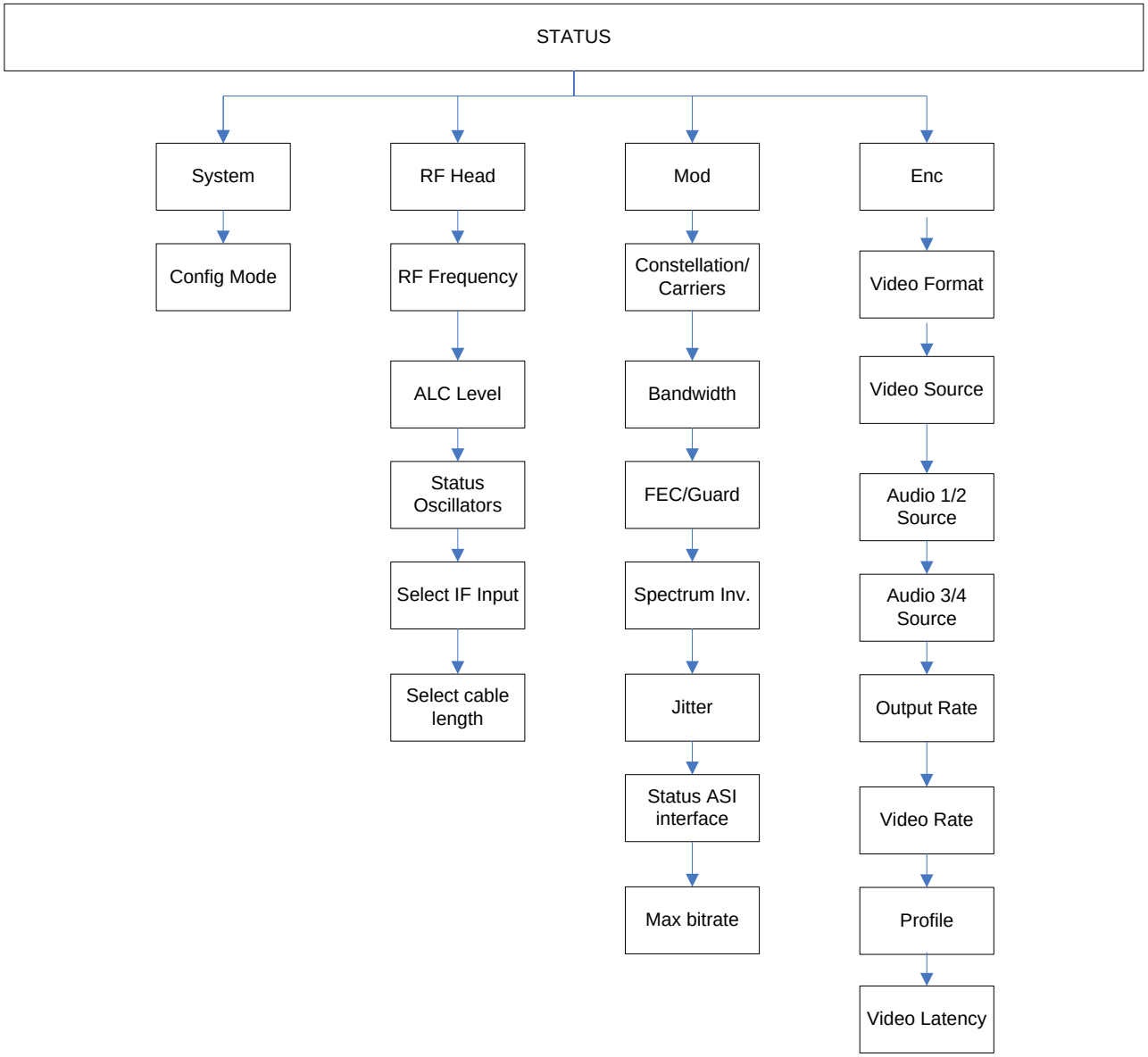


Figure 17: Indoor TCU Status menu.

Option	Description
System	This option allows to access to the System status parameters
RF Head	It allows to access to the RF Head status parameters
Mod	This option allows accessing to the Modulator status parameters.
Enc	This option allows accessing to the Encoder status parameters.
Config Mode	This menu allows viewing equipment configuration mode. 7 different cases can be chosen: 1. QPSK FEC=5/6 Δ=1/4 2K Output 8000 Kbps Video 6500 Kbps MP@ML 2. 16QAM FEC=3/4 Δ=1/4 2K Output 14000 Kbps Video 12500 Kbps MP@ML 3. 16QAM FEC=2/3 Δ=1/32 2K Output 15500 Kbps Video 14000 Kbps 422P@ML 4. 64QAM FEC=2/3 Δ=1/4 2K Output 19500 Kbps Video 18000 Kbps 422P@ML 5. 16QAM FEC=2/3 Δ=1/4 2K Output 12000 Kbps Video 8000 Kbps SP@ML Low Delay 6. QPSK FEC=7/8 Δ=1/32 2K Output 8700 Kbps Video 4700 Kbps SP@ML Low Delay 7. Manual.
Status RF frequency	It shows the frequency of the equipment
Status ALC	The menu shows the back-off value of the transmitter power. Range 0 dB / -15dB
Status IF Input	Shows the IF selected
Status Cable Length	It shows the selected cable length
Status Oscillators	Status of the oscillators: LOCK locked UNLOCK unlocked N/A not available
Constellation/Carriers	Shows modulation scheme (QPSK; 16QAM; 64QAM) and carriers (2k;4k;8k).
Bandwidth	Shows the selected bandwidth (5-6-7-8 MHz).
FEC/Guard	Status of FEC (1/2; 2/3; 3/4; 5/6; 7/8) and guard interval (1/4; 1/8; 1/16; 1/32)
Spectrum inv.	Status of Spectrum inversion
Jitter	Status of the ASI De-jittering function
Status ASI interface	Status ASI interface
Max bitrate	Shows the maximum bitrate that the modulator can transport.
Video Format	Shows the video format selected (PAL or NTSC).

Video	Shows the video source selected (CVBS, SDI, BAR).
Audio 1/2	Shows the audio 1 source selected
Audio 3/4	Shows the audio 2 source selected
Output Rate	Shows the encoder output rate. All MPEG-2 null packet inserted by the encoder will be removed by the COFDM modulator.
Video Rate	Shows the encoder video rate.
Profile	Shows the MPEG-2 coding profile chosen: 1. MP@ML 2. 422P@ML In manual mode the SP@ML profile is not available.
Video Latency	Shows the encoder-decoder video latency (LOW, NORMAL).

Table 4: Menu Description.

4.2.1.3. Configuration menu (Outdoor).

The configuration menu permits the user to change equipment parameters.

Figure 18 shows the tree structure of the menu.

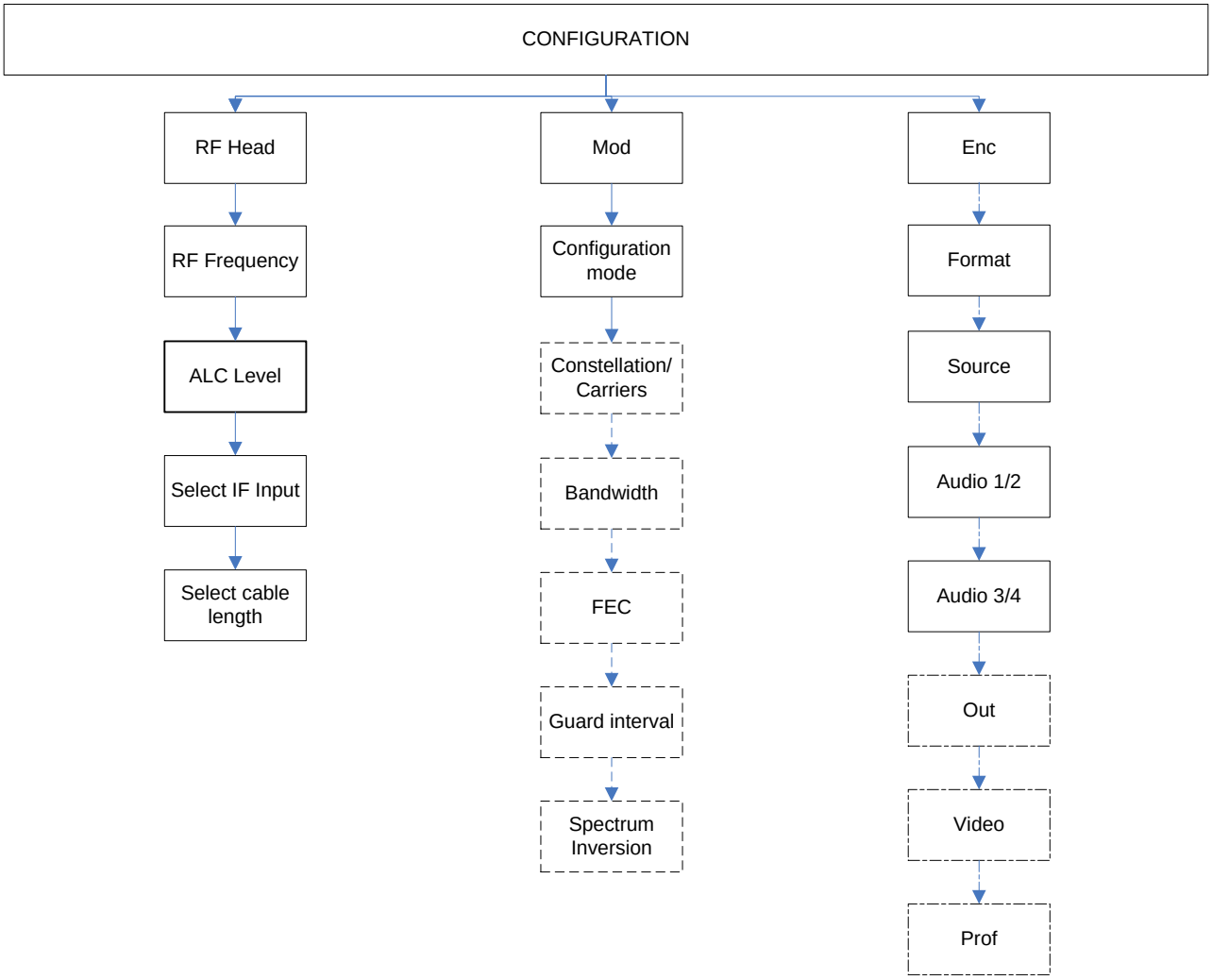


Figure 18: Outdoor TCU configuration menu.

Option	Description
RF Head	It allows accessing to the RF Head configuration parameters.
Mod	This option allows accessing to the Modulator configuration parameters.
Enc	This option allows accessing to the Encoder configuration parameters. It is available only if encoder is installed.
RF frequency	The frequency of equipment can be changed between the upper and lower limit. Upper and lower limits are shown in the Main Status display.
ALC level	Set-up the value of "back-off" for the transmitter output power. Range 0 dB / -15dB, step 1dB. Automatically set when a base configuration is chosen.
Select IF Input	It allows to select the IF source that can be either internal (COFDM modulator) or external.
Select Cable Length	It allows selecting the cable length so as to qualify the right equalization net.
Config Mode	This menu allows selecting equipment configuration mode. 7 different cases can be chosen: 1. QPSK FEC=5/6 Δ=1/4 2K Output 8000 Kbps Video 6500 Kbps MP@ML 2. 16QAM FEC=3/4 Δ=1/4 2K Output 14000 Kbps Video 12500 Kbps MP@ML 3. 16QAM FEC=2/3 Δ=1/32 2K Output 15500 Kbps Video 14000 Kbps 422P@ML 4. 64QAM FEC=2/3 Δ=1/4 2K Output 19500 Kbps Video 18000 Kbps 422P@ML 5. 16QAM FEC=2/3 Δ=1/4 2K Output 12000 Kbps Video 8000 Kbps SP@ML Low Delay 6. QPSK FEC=7/8 Δ=1/32 2K Output 8700 Kbps Video 4700 Kbps SP@ML Low Delay 7. Manual.
Constellation/Carriers	Access permitted only in manual mode. Setting of modulation scheme (QPSK; 16QAM; 64QAM) and carriers (2k;4k;8k).
Bandwidth	Access permitted only in manual mode. It allows selecting the bandwidth (5-6-7-8 MHz).
FEC	Access permitted only in manual mode. Setting of FEC (1/2; 2/3; 3/4; 5/6; 7/8)
Guard	Access permitted only in manual mode. Setting of guard interval (1/4; 1/8; 1/16; 1/32)

Spectrum inv.	Access permitted only in manual mode. Spectrum inversion
Format	Select the video format (PAL or NTSC)
Source	Select the video source to be encoded (CVBS, SDI, BAR).
Audio 1/2	Select the audio 1 source to be encoded (Analog, SDI-EMB, AES3, TONE, MUTE).
Audio 3/4	Select the audio 2 source to be encoded (Analog, SDI-EMB, AES3, MUTE).
Out	Access permitted only in manual mode. Set the encoder output rate. All MPEG-2 null packets inserted by the encoder will be removed by the COFDM modulator.
Video	Access permitted only in manual mode. Set the encoder video rate.
Prof	Access permitted only in manual mode. Set the MPEG-2 coding profile: 1. MP@ML 2. 422P@ML In manual mode the SP@ML profile is not available.

Table 5 : Configuration Menu Description.

4.2.1.4. Status menu (Outdoor).

The menu status permits the user to monitor the equipment status.

Figure 19 shows the menu status tree.

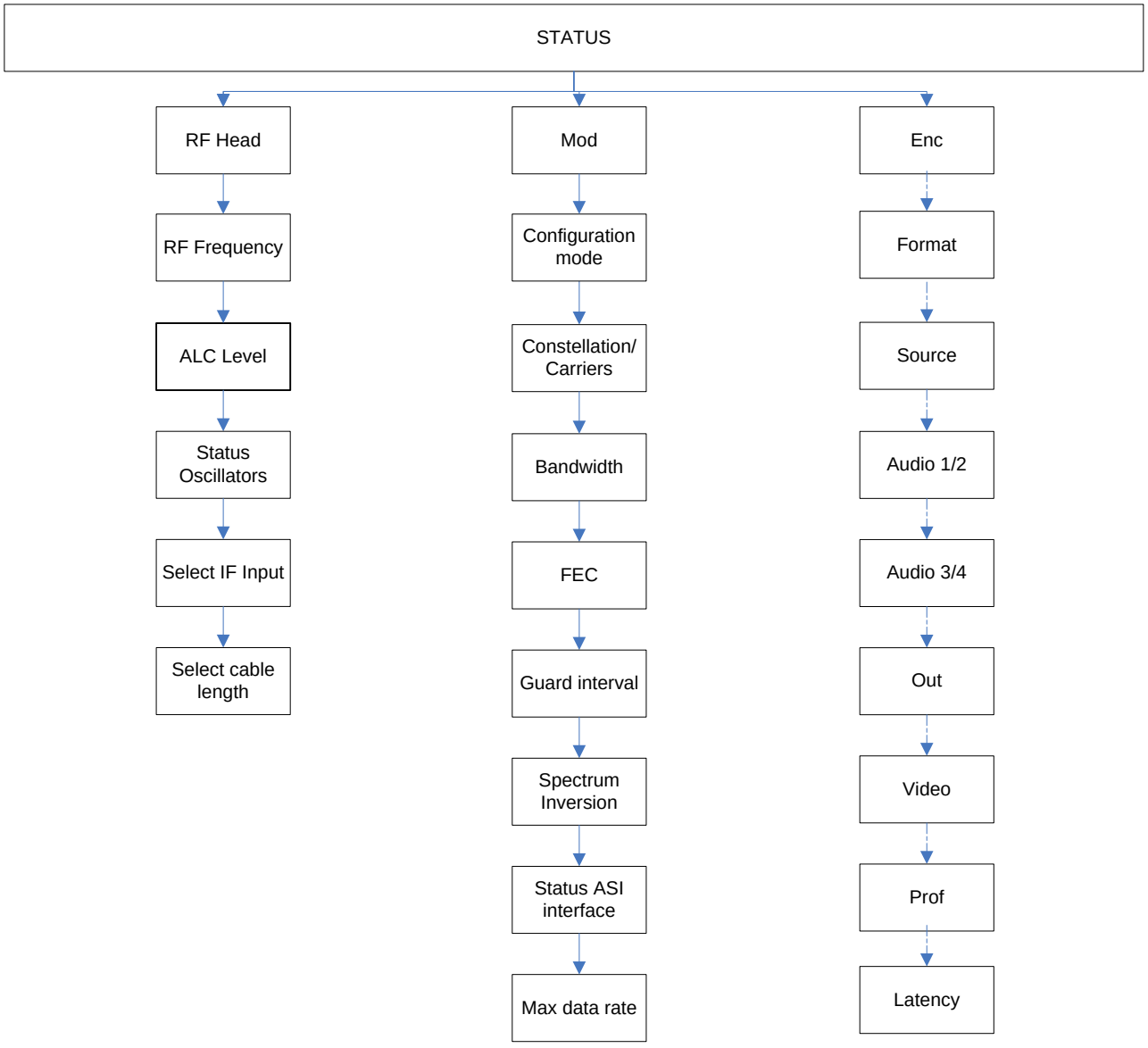


Figure 19: Outdoor TCU status menu.

Option	Description
RF Head	It allows accessing to the RF Head status parameters.
Mod	This option allows accessing to the Modulator status parameters.
Enc	This option allows accessing to the Encoder status parameters. It is available only if encoder is installed.
RF frequency	It shows the frequency of the equipment.
ALC level	The menu shows the back-off value of the transmitter power. Range 0 dB / -15dB.
Select IF Input	Shows the IF selected.
Select Cable Length	It shows the selected cable length.
Status Oscillators	Status of the oscillators: LOCK locked UNLOCK unlocked N/A not available
Config Mode	This menu allows selecting equipment configuration mode. 7 different cases can be chosen: 1. QPSK FEC=5/6 Δ=1/4 2K Output 8000 Kbps Video 6500 Kbps MP@ML 2. 16QAM FEC=3/4 Δ=1/4 2K Output 14000 Kbps Video 12500 Kbps MP@ML 3. 16QAM FEC=2/3 Δ=1/32 2K Output 15500 Kbps Video 14000 Kbps 422P@ML 4. 64QAM FEC=2/3 Δ=1/4 2K Output 19500 Kbps Video 18000 Kbps 422P@ML 5. 16QAM FEC=2/3 Δ=1/4 2K Output 12000 Kbps Video 8000 Kbps SP@ML Low Delay 6. QPSK FEC=7/8 Δ=1/32 2K Output 8700 Kbps Video 4700 Kbps SP@ML Low Delay 7. Manual.
Constellation/Carriers	Shows modulation scheme (QPSK; 16QAM; 64QAM) and carriers (2k;4k;8k).
Bandwidth	Shows the selected bandwidth (5-6-7-8 MHz).
FEC	Status of FEC (1/2; 2/3; 3/4; 5/6; 7/8).
Guard	Status of guard interval (1/4; 1/8; 1/16; 1/32).
Spectrum inv.	Status of Spectrum inversion.
Status ASI interface	Status ASI interface
Max data rate	Shows the maximum bitrate that the modulator can transport.

Format	Shows the video format (PAL or NTSC)
Source	Shows the video source selected (CVBS, SDI, BAR).
Audio 1/2	Shows the audio 1 source selected
Audio 3/4	Shows the audio 2 source selected
Out	Shows the encoder output rate. All MPEG-2 null packet inserted by the encoder will be removed by the COFDM modulator.
Video	Shows the encoder video rate.
Prof	Shows the MPEG-2 coding profile chosen: 1. MP@ML 2. 422P@ML In manual mode the SP@ML profile is not available.
Latency	Shows the encoder-decoder video latency (LOW, NORMAL).

Table 6: Menu Description.

4.2.2. Receiver control unit.

4.2.2.1. Configuration Menu (Indoor).

The configuration menu allows the user to change the equipment parameters. Figure 20 shows this configuration.

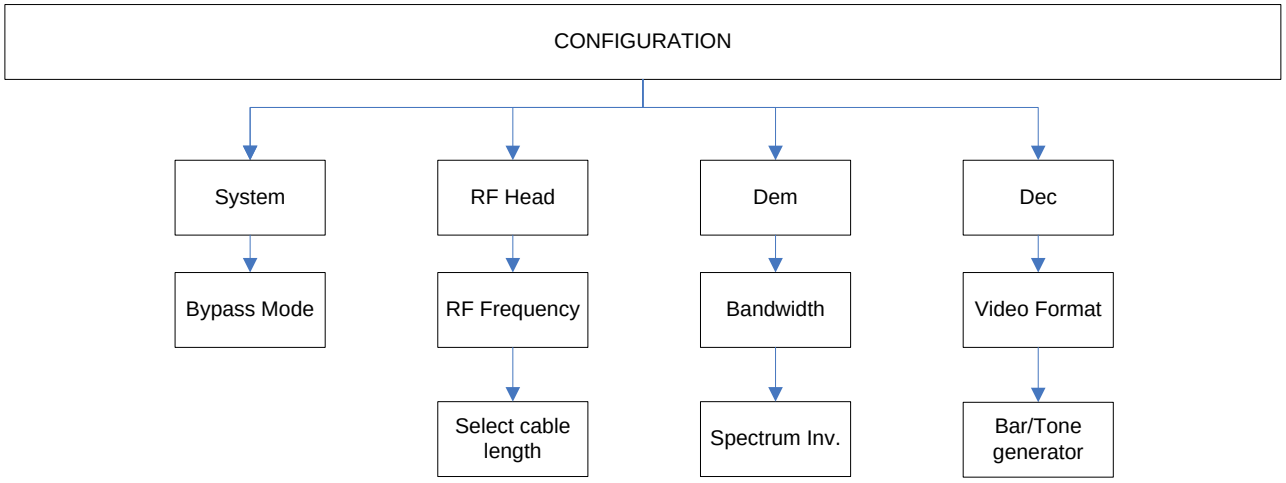


Figure 20: Indoor RCU configuration menu.

Options	Description
System	This option allows accessing to the System configuration parameters.
RF Head	It allows accessing to the RF Head configuration parameters.
Dem	This option allows accessing to the Demodulator configuration parameters.
Dec	This option allows accessing to the Decoder configuration parameters.
Bypass mode	Used for debug purposes.
RF frequency	The frequency of equipment can be set. Frequency span up to 500MHz; frequency resolution: 100KHz.
Select Cable Length	It allows selecting the cable length so as to qualify the right equalization net.
Bandwidth	It allows selecting the bandwidth of the COFDM signal(5-6-7-8 MHz).
Spectrum Inv.	Set spectrum inversion.
Video format	Set the output video format
Bar/tone generator	Set the internal video/audio generator (test purposes).

Table 7: Configuration Menu Description.

4.2.2.2. Status menu (Indoor).

The status menu permits the user to monitor the equipment performance.

Figure 21 shows the status tree menu.

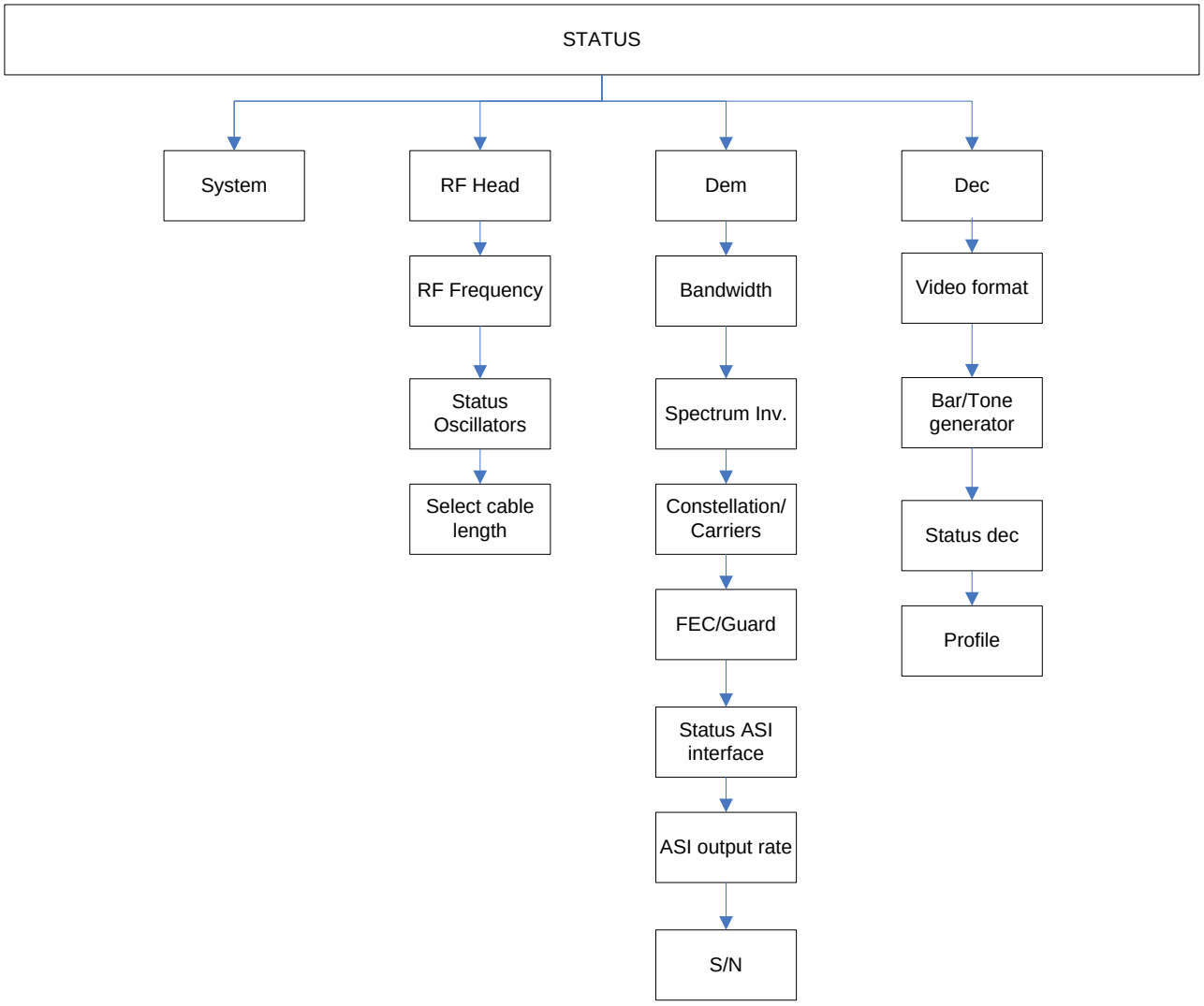


Figure 21: Indoor RCU status menu.

Option	Description
System	This option allows accessing to the System status parameters.
RF Head	It allows accessing to the RF Head status parameters.
Dem	This option allows accessing to the Demodulator status parameters.
Dec	This option allows accessing to the Decoder status parameters.
Status RF frequency	It shows the frequency of the equipment.
Status Oscillators	Status of the oscillators: LOCK locked UNLOCK unlocked N/A not available
Status Cable Length	It shows the set cable length
Bandwidth	Shows the selected bandwidth (5-6-7-8 MHz).
Spectrum inversion	Status of Spectrum inversion
Constellation/Carriers	Shows modulation scheme (QPSK; 16QAM; 64QAM) and carriers (2k;4k;8k).
Bandwidth	Shows the selected bandwidth (5-6-7-8 MHz).
FEC/Guard	Status of FEC (1/2; 2/3; 3/4; 5/6; 7/8) and guard interval (1/4; 1/8; 1/16; 1/32).
Status ASI interface	Status ASI interface.
ASI output data rate	Shows the DVB-ASI output data rate.
S/N	Shows the estimated S/N.
Video format	Shows the output video format
Bar/Tone generator	Shows if the internal video/audio generator (test purposes) is used.
Status Dec	Status of the decoder: LOCKED ASI locked UNLOCKED ASI unlocked N/A not used
Profile	Shows the MPEG-2 coding profile chosen: 1. MP@ML 2. 422P@ML 3. SP@ML low delay In manual mode the SP@ML profile is not available.

Table 8: Menu Description.

1.1.1.1. Configuration Menu (Outdoor).

The configuration menu allows the user to change the equipment parameters. Figure 20 shows this configuration.

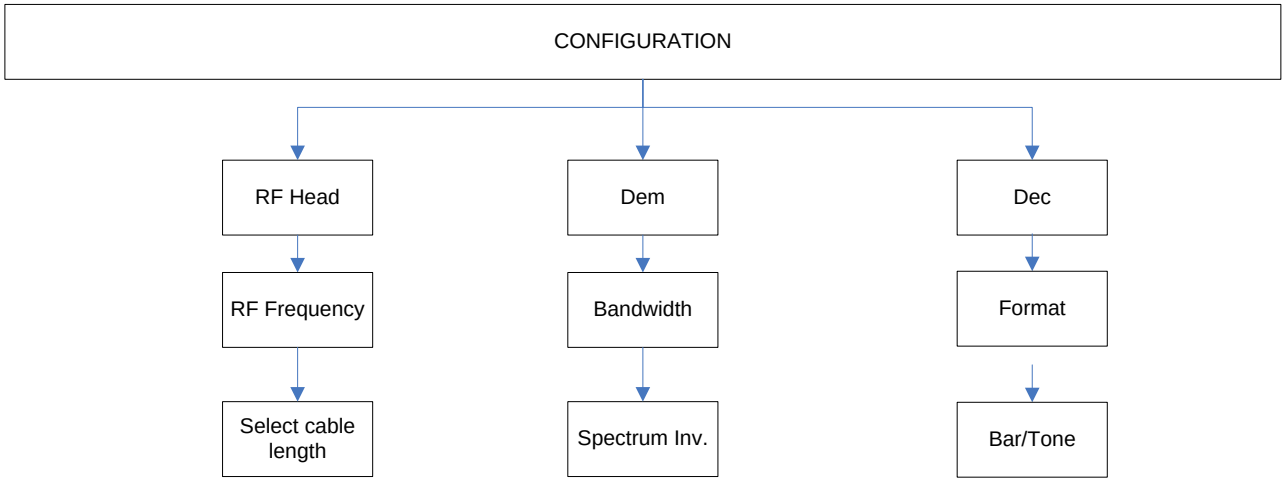


Figure 22: Outdoor RCU configuration menu.

Options	Description
RF Head	It allows accessing to the RF Head configuration parameters.
Dem	This option allows accessing to the Demodulator configuration parameters.
Dec	This option allows accessing to the Decoder configuration parameters. It is available only if decoder is installed.
RF frequency	The frequency of equipment can be set. Frequency span up to 500MHz; frequency resolution: 100KHz.
Select Cable Length	It allows selecting the cable length so as to qualify the right equalization net.
Bandwidth	It allows selecting the bandwidth of the COFDM signal(5-6-7-8 MHz).
Spectrum Inv.	Set spectrum inversion.
Format	Set the output video format
Bar/tone	Set the internal video/audio generator (test purposes).

Table 9: Configuration Menu Description.

1.1.1.2. Status menu (Outdoor).

The status menu permits the user to monitor the equipment performance.

Figure 21 shows the status tree menu.

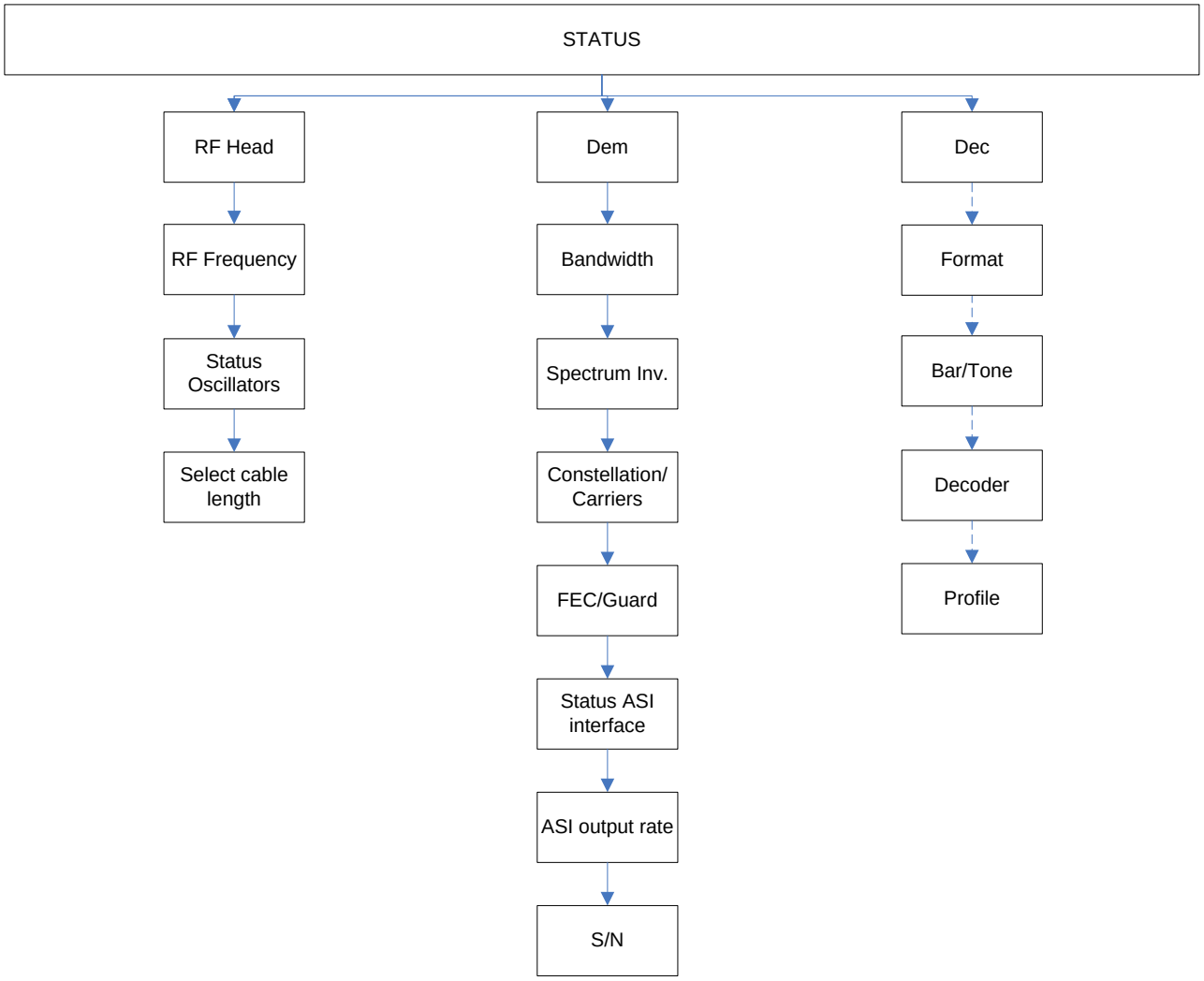


Figure 23: Outdoor RCU status menu.

Option	Description
System	This option allows accessing to the System status parameters.
RF Head	It allows accessing to the RF Head status parameters.
Dem	This option allows accessing to the Demodulator status parameters.
Dec	This option allows accessing to the Decoder status parameters. It is available only if decoder is installed.
Status RF frequency	It shows the frequency of the equipment.
Status Oscillators	Status of the oscillators: LOCK locked UNLOCK unlocked N/A not available
Status Cable Length	It shows the set cable length.
Bandwidth	Shows the selected bandwidth (5-6-7-8 MHz).
Spectrum inversion	Status of Spectrum inversion
Constellation/Carriers	Shows modulation scheme (QPSK; 16QAM; 64QAM) and carriers (2k;4k;8k).
Bandwidth	Shows the selected bandwidth (5-6-7-8 MHz).
FEC/Guard	Status of FEC (1/2; 2/3; 3/4; 5/6; 7/8) and guard interval (1/4; 1/8; 1/16; 1/32).
Status ASI interface	Status ASI interface.
ASI output data rate	Shows the DVB-ASI output data rate.
S/N	Shows the estimated S/N.
Format	Shows the output video format
Bar/Tone	Shows if the internal video/audio generator (test purposes) is used.
Decoder	Status of the decoder: LOCKED ASI locked UNLOCKED ASI unlocked N/A not used
Profile	Shows the MPEG-2 coding profile chosen: 1. MP@ML 2. 422P@ML 3. SP@ML low delay In manual mode the SP@ML profile is not available.

Table 10: Menu Description.

5. Equipment external description.

5.1. TCU.

5.1.1. Indoor.

5.1.1.1. Front panel.

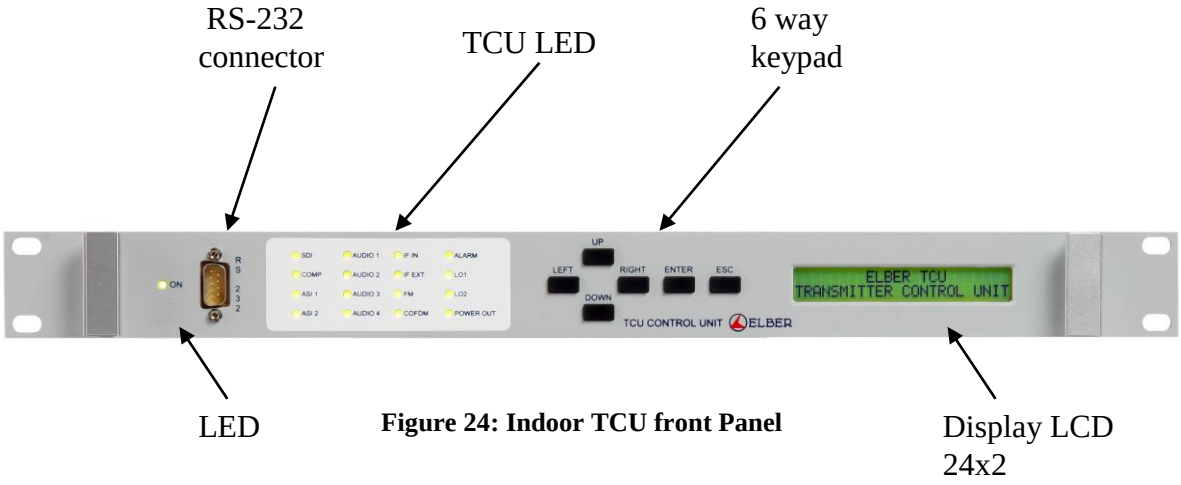


Figure 24: Indoor TCU front Panel

Indication LED and Controls.

Item	Description		
LED	Green: Unit switched on		
TCU LED	**GREEN**	**YELLOW**	**RED**
SDI	SDI present	Not used	SDI absent
COMP	CVBS present	Not used	CVBS absent
ASI1	ASI available	Not used	ASI not present or overrun
ASI2	Not used	Not used	Not used
AUDIO1	Not used	Not used	Not used
AUDIO2	Not used	Not used	Not used
AUDIO3	Not used	Not used	Not used
AUDIO4	Not used	Not used	Not used
IF IN	Enabled internal IF	Not used	Internal IF disabled
IF EXT	Enabled external IF	Not used	External IF disabled
FM	Not used	Not used	Not used
COFDM	COFDM modulator ready	Not used	COFDM modulator not ready
ALARM	No alarm detected	Not used	Alarm
LO1	1st Oscillator locked	Not used	1st Oscillator unlocked
LO2	2° Oscillator locked	Not used	2° Oscillator unlocked
POWER OUT	Output power OK	Not used	Low output power
6 button keypad	Keypad used for menu access		
LCD	Alphanumeric display 24×2		

Connectors description.

RS232: DB9 connector for *firmware* uploads.

- Pin 2: Reception
- Pin 3: Transmission
- Pin 5: Earth
- Other pins not connected

5.1.1.2. Back panel.

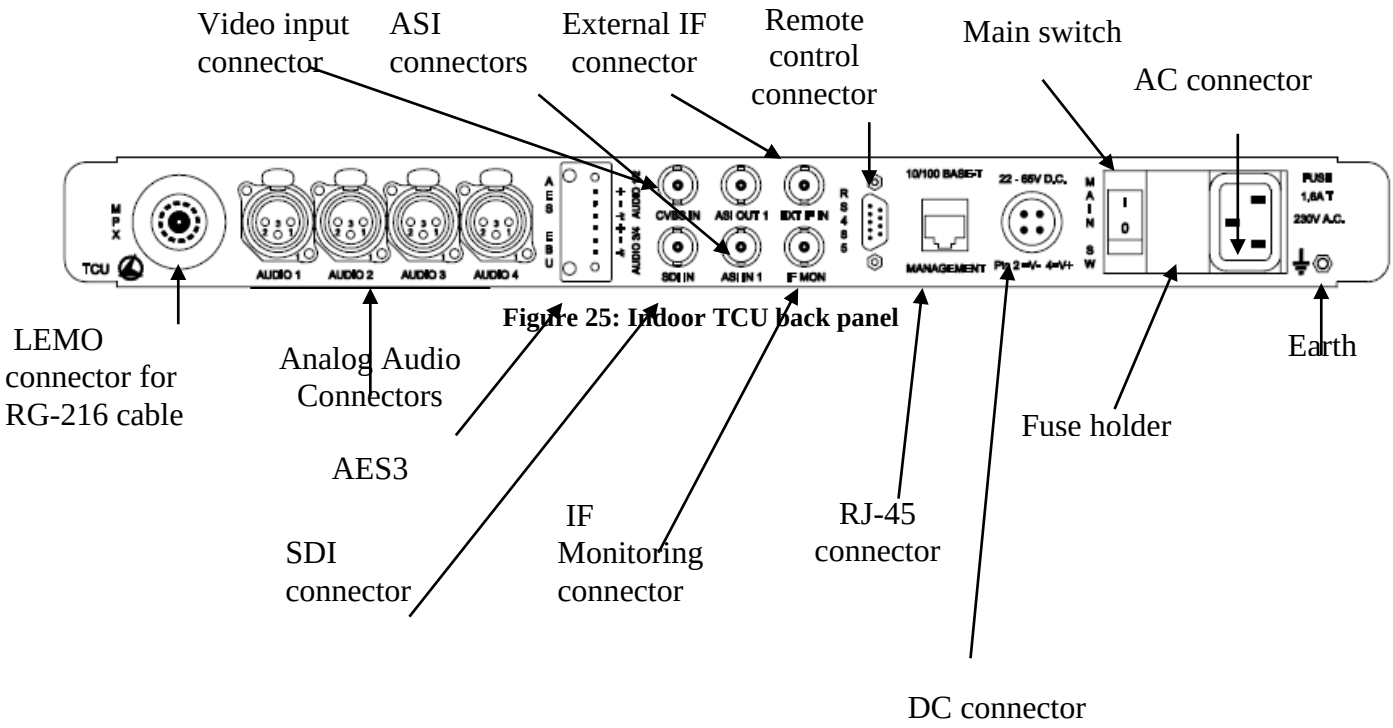


Figure 25: Indoor TCU back panel

Connectors Description.

<table>
<tr><th>Connector</th><th>Description</th></tr>
<tr><td>TCU Connectors</td><td>
<table>
<tr><th>Connector</th><th>Description</th></tr>
<tr><td>EXT IF IN</td><td>IF input connector (70MHz), type BNC</td></tr>
<tr><td>MUX</td><td>LEMO connector for RG-216 cable</td></tr>
<tr><td>ASI IN 1</td><td>ASI Input connector, type BNC</td></tr>
<tr><td>ASI OUT 1</td><td>ASI Output connector, type BNC</td></tr>
<tr><td>IF MON</td><td>IF monitoring connector type BNC</td></tr>
<tr><td>CVBS IN</td><td>Video Input connector, type BNC</td></tr>
<tr><td>SDI IN</td><td>SDI Input connector, type BNC</td></tr>
<tr><td>AES3</td><td>AES3 input connector</td></tr>
<tr><td>Audio 1</td><td>Analog audio 1 input L, XLR type</td></tr>
<tr><td>Audio 2</td><td>Analog audio 1 input R, XLR type</td></tr>
<tr><td>Audio 3</td><td>Analog audio 2 input L, XLR type</td></tr>
<tr><td>Audio 4</td><td>Analog audio 2 input R, XLR type</td></tr>
</table>
</td></tr>
<tr><td>Remote Control Connector</td><td>Pin 1: A 485
Pin 2: B 485
Pin 3: +5V
Pin 4: NOT USED
Pin 5: RESET
Pin 6: ALARM NORM OPEN
Pin 7: ALARM NORM CLOSED
Pin 8: ALARM COM
Pin 9: EARTH</td></tr>
<tr><td>DC Connector</td><td>25÷65V DC input</td></tr>
<tr><td>Main Switch</td><td>Equipment ON/OFF</td></tr>
<tr><td>Fuse</td><td>230V 1.6A</td></tr>
<tr><td>AC connector</td><td>230V 50/60Hz – 115V 50/60Hz</td></tr>
</table>

5.1.2. Outdoor.

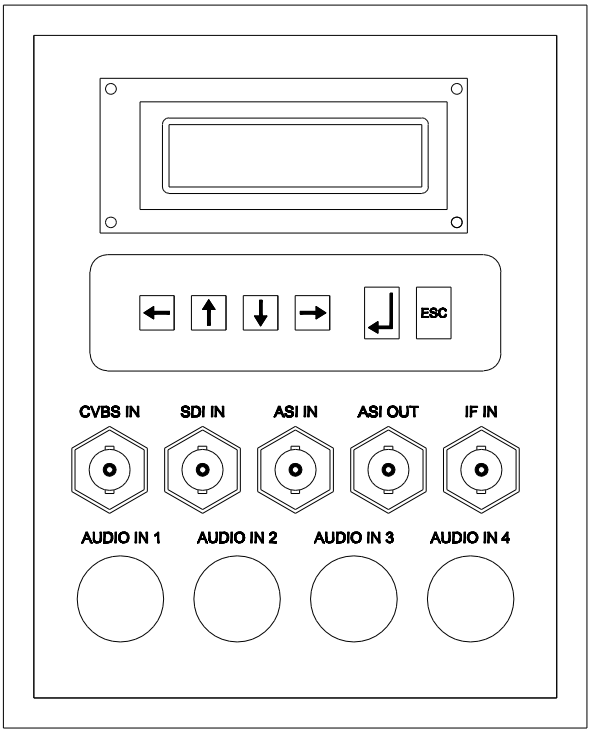


Figure 26: Outdoor TCU front panel

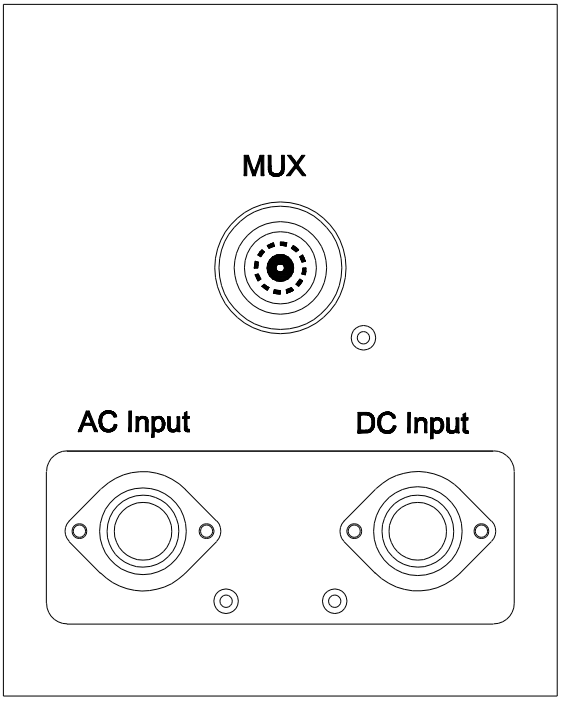


Figure 27: Outdoor TCU rear panel

Connectors description.

Item	Description
6 button keypad	Keypad used for menu access
LCD	Alphanumeric display 24×2
CVBS IN	Composite Video input
SDI IN	SDI audio embedded input
ASI IN	ASI input of the COFDM modulator (available if encoder is not installed)
ASI OUT	Regenerated ASI loopthrough
IF IN	External IF Input
AUDIO IN 1	Audio 1 input L, mini Lemo type
AUDIO IN 2	Audio 1 input R, mini Lemo type
AUDIO IN 3	Audio 2 input t L, mini Lemo type
AUDIO IN 4	Audio 2 input R, mini Lemo type
MUX	DC+IF+Control data for RF Head
AC input	4 pole waterproof AC connector
DC input	7 pole waterproof DC connector

5.2. RCU.

5.2.1. Indoor.

5.2.1.1. Front Panel.

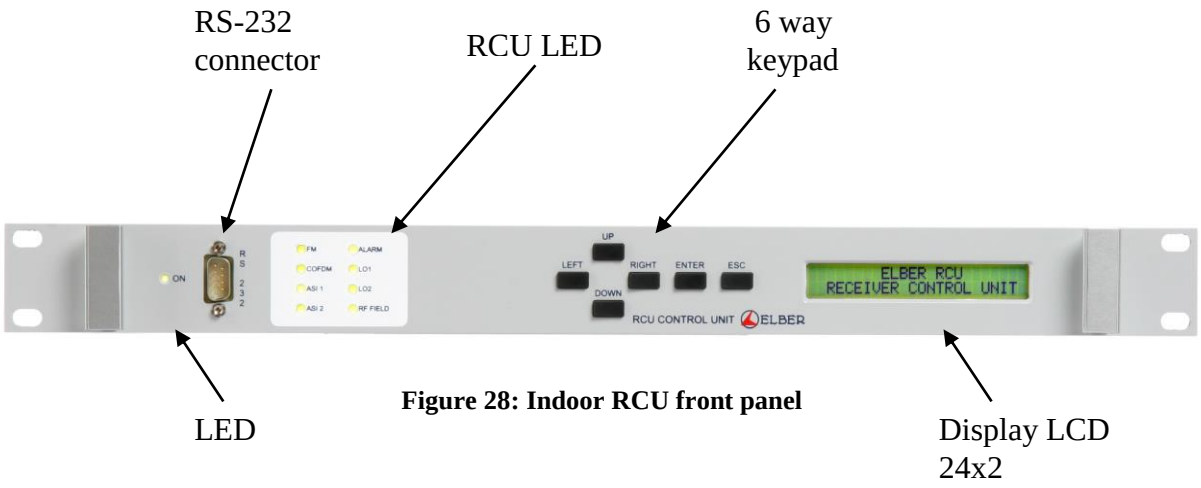


Figure 28: Indoor RCU front panel

Indication LED and Controls .

<table>
<tr><td>Item</td><td>Description</td></tr>
<tr><td>LED</td><td>Green: Unit switched on</td></tr>
<tr><td>LED RCU

FM
COFDM
ASI1
ASI2
ALARM
LO1
LO2
RF FIELD</td><td>
<table>
<tr><td>GREEN</td><td>RED</td></tr>
<tr><td>Not used</td><td>Not used</td></tr>
<tr><td>COFDM demodulator ready</td><td>COFDM demodulator not ready</td></tr>
<tr><td>ASI available</td><td>ASI not present or overrun</td></tr>
<tr><td>Not used</td><td>Not used</td></tr>
<tr><td>No alarm present</td><td>Alarm</td></tr>
<tr><td>1st Oscillator locked</td><td>1st Oscillator unlocked</td></tr>
<tr><td>2nd Oscillator locked</td><td>2nd Oscillator unlocked</td></tr>
<tr><td>Received field OK</td><td>Low received field (< -71 dBm)</td></tr>
</table>
</td></tr>
<tr><td>Six-Way Keypad</td><td>Keypad used to browse embedded software menu.</td></tr>
<tr><td>LCD</td><td>Alphanumeric display 24×2</td></tr>
</table>

Connector description.

RS232: DB9 connector for serial communication.

- Pin 2: Reception
- Pin 3: Transmission
- Pin 5: Earth
- Other pins not connected

5.2.1.2. Back panel.

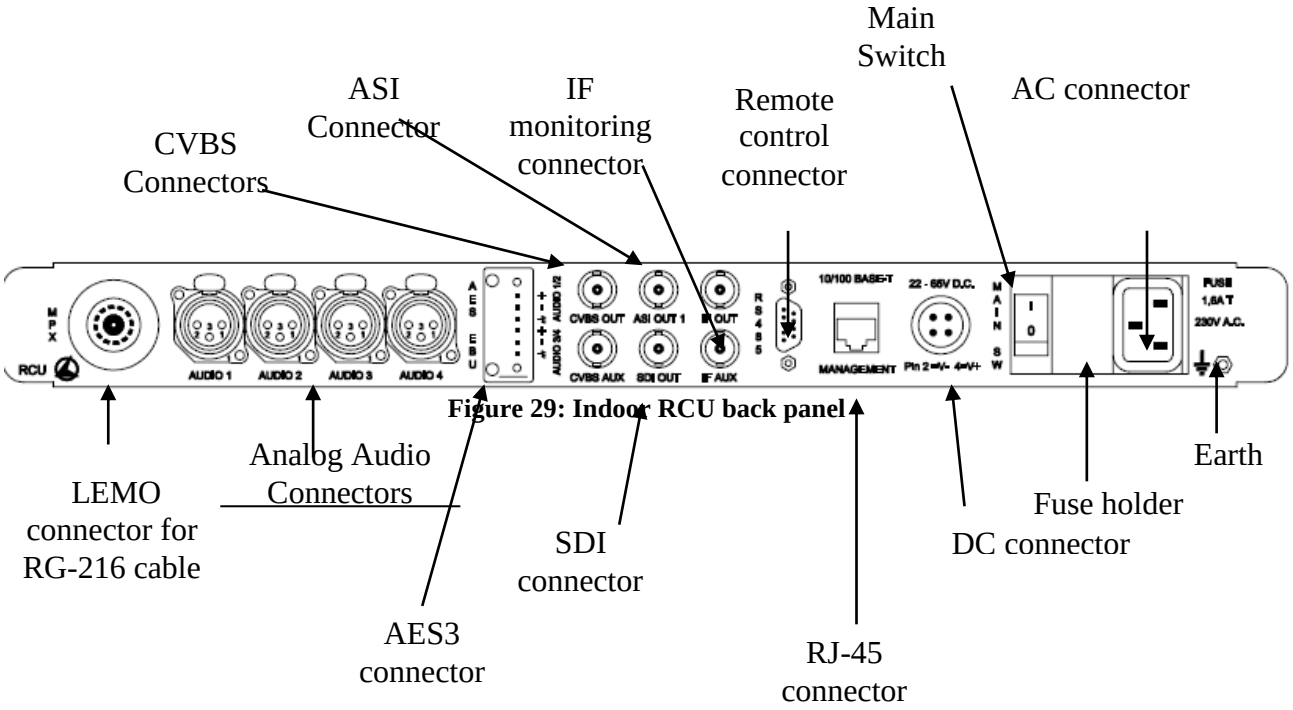


Figure 29: Indoor RCU back panel

Connectors description.

<table>
<tr><th>Connector</th><th>Description</th></tr>
<tr><td>RCU Connector</td><td>
<table>
<tr><th>Connector</th><th>Description</th></tr>
<tr><td>IF OUT</td><td>IF Output connector (70MHz), type BNC</td></tr>
<tr><td>MUX</td><td>LEMO connector for RG-216 cable</td></tr>
<tr><td>ASI OUT 1</td><td>ASI Output connector, type BNC</td></tr>
<tr><td>CVBS OUT</td><td>Video Output, type BNC</td></tr>
<tr><td>CVBS AUX</td><td>Auxiliary Video Output, type BNC</td></tr>
<tr><td>AES3</td><td>AES3 output connector</td></tr>
<tr><td>Audio 1</td><td>Analog audio 1 output L, XLR type</td></tr>
<tr><td>Audio 2</td><td>Analog audio 1 output R, XLR type</td></tr>
<tr><td>Audio 3</td><td>Analog audio 2 output L, XLR type</td></tr>
<tr><td>Audio 4</td><td>Analog audio 2 output R, XLR type</td></tr>
</table>
</td></tr>
<tr><td>Remote Control Connector</td><td>Pin 1: A 485
Pin 2: B 485
Pin 3: +5V
Pin 4: NOT CONNECTED
Pin 5: RESET
Pin 6: ALARM N. OPEN
Pin 7: ALARM N. CLOSED
Pin 8: ALARM COM
Pin 9: EARTH</td></tr>
<tr><td>DC connector</td><td>25 ÷ 65V DC input</td></tr>
<tr><td>Main Switch</td><td>Equipment ON/OFF</td></tr>
<tr><td>Fuse</td><td>230V 1.6A</td></tr>
<tr><td>AC connector</td><td>230V 50/60Hz 115 50/60Hz</td></tr>
</table>

5.2.2. Outdoor.

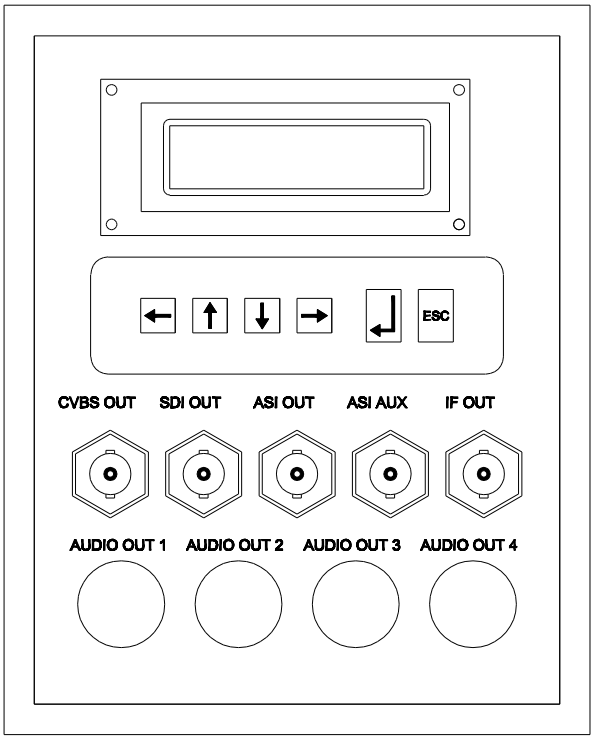


Figure 30: Outdoor RCU Front Panel

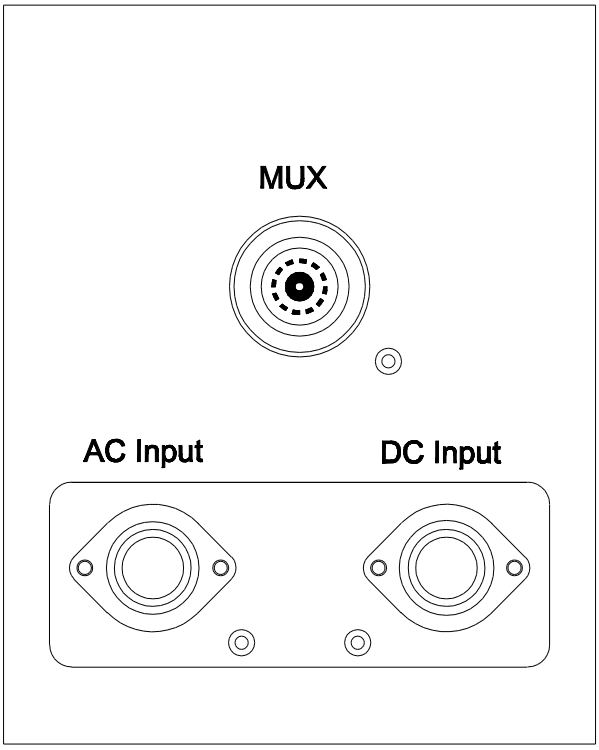


Figure 31: Outdoor RCU rear panel

Connectors description.

Item	Description
6 button keypad	Keypad used for menu access
LCD	Alphanumeric display 24×2
CVBS OUT	Composite Video output.
SDI OUT	SDI (audio-embedded) output.
ASI OUT	ASI output of the COFDM demodulator
ASI AUX	Auxiliary ASI output of the COFDM modulator (available only if decoder is not installed)
IF OUT	IF Output of the RCU
AUDIO OUT 1	Audio 1 output L, mini Lemo type
AUDIO OUT 2	Audio 1 output R, mini Lemo type
AUDIO OUT 3	Audio 2 output L, mini Lemo type
AUDIO OUT 4	Audio 2 output R, mini Lemo type