SVP AEROSPACE

HDT-04 Transmitter Manual
Version V9.9.23
SW V9_1821112829056-02

Accessories included in this manual

AVS
Airborne Antenna

RTC-03
Remote Control

Auxiliary Cover
HDT-04

Contents

Chapter 13: Warranty
This chapter contains warranty considerations and conditions.

Annex A: AVS Airborne Antenna User's Guide

Annex B: Modulation Standards

Dear customer,

We would like to thank you for selecting this equipment and welcome you to the SVP's growing family of products.

We are sure that the addition of this equipment will cause you a complete satisfaction in your existing installation.

Please read these instructions carefully and keep them in hand in case you have to refer to them.

About this manual

This user's guide provides indications and explanations about how to set up the HDT-04 transmitter easily for the most common use cases.

This document is intended to help first time users:

- To find their way around the GUI.
- To understand the different possibilities of the HDT-04 transmitter.
- To set the HDT-04 for their specific configurations.

Symbols

The symbols that appear in this manual are:

An information message which indicates explanations for the proper operation of the equipment.

This symbol advises users that if they do not take, avoid or make specific actions, several damages could appear in the device.

In the places where this symbol appears it means that by pressing the Down button of the equipment the user can access to the next screen.

↵

This symbol means that pressing the OK button in the options where this symbol appears, the user can access to the submenu related to that option or can change the value of the parameter.

<>

These symbols mean that the parameter can be modified in the same screen with the right and left keys.

Important Notes

1. The HDT-04 transmitter is completely compatible with the DVB-T/T2 Standards, included in the European Standard ETSI EN300744 (DVB-T), ETSI EN300755 (DVB-T2).

2. It is important that when the transmitter is switched on, the selected RF output connection must have the suitable antenna or must be loaded.

3. The HDT-04 transmitter applies a MPEG-4 compression to either HDMI, composite video or SDI input signals. An MPEG-1 layer 2 compression is applied to the corresponding 4 analogue audio channels, the 2 stereo SDI embedded, the HDMI embedded and the AES digital audio signals. The resulting multiplexed signal is transmitted using COFDM modulation system.

4. If the RF output is set to DVB-T2 and the bandwidth selected is 1.7 MHz, then, the device automatically disables the Audio2 and it sets the bitrate of the Audio1 to 128 kbps.

5. Special care should be taken with SDI cables, quality and length, these are very important, especially when HD-SDI or 3G SDI signals are transmitted.

6. If any audio or data channel are not used in a transmission, they should be disabled, in order to assign that bitrate to the video and achieve a higher quality transmitted video signal.

7. Only authorized personnel should open the product and any repair or warranty will be invalidated if the seals are broken.

8. This device has been test under FCC rules only in the frequency range 2,025 - 2,180 MHz and following notes are only applicable to this range:

    a. This device complies with part 15 of the fcc rules. operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

    b. The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

    c. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
    - Reorient or relocate the receiving antenna.
    - Increase the separation between the equipment and receiver.
    -Connect the equipment into an outlet on a circuit different from that to

which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

Safe Operating Procedures

In this section the safety requirements are shown in order to ensure awareness of potential hazard to the personnel who is operating and maintaining the equipment.

FCC

This chapter has been made taking into account the OET bulletin 65, from August 1997, recommended by the FCC (Federal Communications Commission).

The HDT-04 Transmitter designed to provide services for broadcasting, will not create RF energy exceeding 1.0 mW/cm^2, the FCC limit for exposure. This is known as the Maximum Permissible Exposure (MPE) limit. This transmitter follows this law (with the AVS flexible antenna 4.5 dBi) as long as the distance between the antenna and the person is at least 58 cm for higher power transmitter of 15 Watts. SVP Broadcast Microwave, in accordance with the requirements set forth by the FCC, provides this information as a guide to the user. Next are shown the calculations made to obtain those values:

S = MPE in mW/cm^2 (milliwatts per square centimetres)

To follow the law, S maximum must be 1.0 mW/cm^2

$$S = \frac{EIRP}{4\pi \cdot R^2}$$

$$Rmin = \sqrt{\frac{EIRP}{4\pi}}$$

$$EIRP = P \cdot G$$

$$G = 10^{\frac{G\,(dBi)}{10}}$$

Where:

$EIRP$: Equivalent isotropically radiated power

G : Antenna gain in numeric value

P: Output power of the transmitter (mW)

R: Distance from the antenna to the transmitter (cm)

As a result, Maximum Permissible Exposure (MPE) limit is set on 66.9cm safety distance.

First Aid in Case of Electric Shock

DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS until the circuit is broken. SWITCH OFF. If this is not possible, PROTECT YOURSELF with DRY insulating material and pull the victim clear of the conductor.

If breathing has stopped, indicated by unconsciousness, lack of respiratory movements and a 'blue' look to cheeks, lips, ears and nails, START RESUSCITATION AT ONCE.

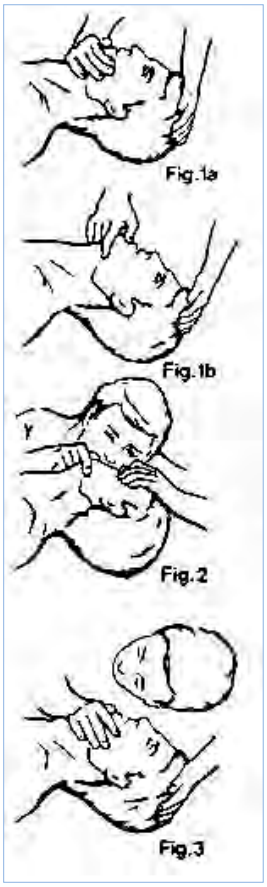
EMERGENCY RESUSCITATION – THE EXPIRED AIR METHOD
(Approved by the Royal Life Saving Society)

Chapter 1: If possible, lie the victim on his back with his head slightly higher than his feet. Clear the mouth and throat of any obvious obstruction.

Chapter 2: Kneel on one side of the victim, level with his head. LIFT THE JAW AND TILT THE HEAD BACK AS FAR AS POSSIBLE (Figs. 1a and 1b)

Chapter 3: One of the following may happen:

a) Breathing may begin and consciousness returns.
b) Breathing may begin but consciousness NOT returns. Turn the victim on his side and ensure that the airway is kept clear.
c) Breathing may return but be NOISY which means that the airway is not fully clear. Try to clear the airway.



Chapter 4: IF THERE NO SIGN OF BREATHING:

a) Check that the head is still tilted back.
b) Take a deep breath.
c) Pinch the victim's nose and blow firmly into his mouth (Fig. 2). As you do, the chest will RISE.
d) Turn your head away and take another breath, watching for the chest to FALL (Fig. 3).

Chapter 5: Start with four quick breaths and then continue with one breath every five seconds (i.e. 12 times a minute). This should be continued until the victim revives or a doctor certifies death.

Chapter 6: As consciousness returns the victim will start to breathe on his own, and a 'pink' colour replaces the 'blue' look: this is the time to stop resuscitation. Continue to hold his chin up and so keep the airway clear.

Chapter 7: In the case of injuries to the mouth, it may be necessary to use mouth-to-nose resuscitation. Seal the victim's mouth with your cheek and blow firmly into his nose, proceeding as above.

Chapter 8: In the case of severe facial injuries, it may be necessary to do a manual method of artificial respiration (Silvester-Brosch or Holger Nielsen). Briefly, these methods apply compression to ribcage with the victim lying on his back (S-B) or face down (H.N.) with associated movement of his arms up and out. The cycle of movement should take about five seconds, i.e. the normal breathing phase.

Chapter 9: Whatever the method, it is ESSENTIAL to commence resuscitation WITHOUT DELAY and to send for medical assistance immediately.

TREATMENT FOR BURNS

If the victim is also suffering from burns, then, without hindrance to resuscitation, observe the following:

a) DO NOT ATTEMP TO REMOVE CLOTHING ADHERING TO THE BURN.

b) If possible, alleviate the pain from the burnt part by immersing in cold water.

c) If help as available or as soon as resuscitation is no longer required, the wound should be covered with a DRY clean dressing.

d) Oil or grease in any form should not be applied.

e) If severely burnt, get the victim to hospital immediately.

Main Index

Chapter 1: Introduction

The HDT-04 is the new high-power transmitter developed by SVP Broadcast Microwave which provides an output power of 15 W in the frequency range of 2,000 to 2,400 MHz and 2,300 to 2,700 MHz, 10 W in the frequency range of 1,300 to 1,600 MHz, 1,700 to 2,200 MHz, 3,300 to 3,600 MHz and 4,400 to 5,000 MHz and output power of 5 W in the range of 5,000 to 5,300 MHz and 1,300 to 1,600 MHz.

Its feature H.264 encodes for 3G, high definition (HD) and standard definition (SD) signals with ultra-low latency. H.264 transmission is possible using 40% lower bitrate than conventional MPEG-2 systems.

This new generation transmitter accepts analogue video, 3G/HD/SD-SDI and HDMI video input signals. Analogue, SDI embedded, HDMI embedded and AES/EBU audio inputs are available as standard. User data and GPS data is transmitted over the data channels.

The ASI output enables the user to use the transmitter as a standalone encoder.

The HDT-04 transmitter performs DVB-T2 and DVB-T modulations.

Moreover, it expands the possibilities of COFDM digital links on the market using linearization technology to minimize distortion and to provide superior signal quality for complex multicarrier modulations.

Control, operation and monitoring of the HDT-04 transmitter are very friendly. All the parameters can be configured in field. A wide range of accessories allow using this equipment in many different applications.

An excellent design, mechanical and electronic assembly make the HDT-04 a robust and reliable solution.

For applications of high security, the HDT-04 transmitter has the option of AES-128 and AES-256 encryption.

Features

Input video signals, composite video, 3G–SDI, HD-SDI, SD-SDI or HDMI are MPEG-4 encoded, together with 4 analogue audios, 2 stereo AES/EBU channels, HDMI embedded or 4 digital audios embedded on the SDI signal. The video formats can be 1080p, 1080i, 720p, 576i or 480i. This transmitter also has a test pattern and a test tone generator available.

This device has a data channel available that allows transmitting user data, and second data channel is available to transmit integrated GPS data as well as a Transport Stream ASI input so it can be used as a repeater.

The encoder uses a H.264/MPEG-4 Part 10 video compression that provides output bitrates from 1 Mbps to 100 Mbps and a MPEG-1 Layer II audio compression which supplies different audio bit rates (128, 192, 256 or 384 Kbps).

Encoded signals can be encrypted using BISS-1, BISS-E, AES-128 and AES-256 (optionally) scrambling system. The encrypted signal will only be received by the receivers that have a valid descrambling key.

The transmitter system operation is very easy. It has a display and a keyboard which make possible the configuration and monitoring of every parameter of the equipment.

The equipment is fed with DC power supply from 9 to 36V. It has good harmonic rejection and isolator for protection against high VSWR.

It also has a waterproof radiator that dissipates heat through a fan. The fan is activated when the temperature exceeds 40ºC.

DVB-T2 features

This transmitter uses COFDM (Coded Orthogonal Frequency Division Multiplexing) modulation system (1K, 2K) which provides superior signal robustness and a higher link performance. This technology provides the operators efficient means to overcome the challenges of NLOS propagation and mobile channel propagation.

COFDM spread spectrum modulation system distributes the data over a large number of closely-spaced carriers, for example, 1705 carriers in 2K mode. The data is divided into several parallel data streams, one for each carrier, so that each carrier transports a lower data rate and the symbol duration is longer. Each carrier is then modulated with a QPSK, 16QAM, 64QAM or 256QAM scheme with a constellation rotation.

COFDM modulated signal, since it uses a low symbol rate modulation scheme (*i.e.* the symbols are relatively long compared to the channel time characteristics), suffers less from inter symbol interference caused by multipath propagation. As the duration of each symbol is long, it is feasible to insert a guard interval between the COFDM symbols, thus eliminating the inter symbol and co-channel interference. So, if one carrier's information is lost, only a small part of the whole information will be lost.

Besides, in COFDM the sub-carrier frequencies are chosen so that the sub-carriers are orthogonal to each other, thus cross-talk, the interference between the sub-channels, is eliminated. Furthermore, the orthogonality allows high spectral efficiency.

On the other hand, COFDM system is invariably used in conjunction with channel coding (forward error correction). The error correction code used in this equipment is Reed-Solomon coding, which is concatenated with LDPC, and there is an additional interleaving between the two layers of coding. Error correcting codes build redundancy into the transmitted data stream. This redundancy allows bits that are in error or even missing to be corrected at the receiver.

The European ETSI EN 300755 standard defines the following LDPC coding rates: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6. There is a compromise between the coding rate (signal robustness) and the transmitted bit rate. If the coding rate is higher the signal transmission is more robust (1/2 is the most robust) but the bit rate that the system is able to transmit is lower.

The modulation scheme used on each COFDM sub-carrier (QPSK, 16QAM, 64QAM and 256 QAM) is also thus related to the signal robustness and the transmitted bit rate. QPSK is the most robust and 256QAM is able to transport the highest bit rate.

Besides, the system can define 3 guard intervals: 1/8, 1/16 and 1/32. The guard interval is used to reduce inter symbol interferences due to the multipath propagation.

In addition, it also provides several bandwidths: 1.7, 5, 6, 7 and 8 MHz, for different applications.

The maximum bit rate achieved is 46 Mbps.

DVB-T features

The RF stage of the HDT-04 transmitter for DVB-T is the same as the one described for DVB-T2. The only differences are found in the modulation part, as it is commented below.

The HDT-04 transmitter uses COFDM (Coded Orthogonal Frequency Division Multiplexing) modulation system (2K mode).

The available modulations are: QPSK, 16QAM or 64QAM. Of them, the most robust one is QPSK and the one with the maximum bit rate is 64 QAM.

The European ETSI EN 300744 standard defines the following convolutional coding rates: 1/2, 2/3, 3/4, 5/6, 7/8.

The modulation scheme used on each OFDM sub-carrier (QPSK, 16QAM and 64QAM) is also thus related to the signal robustness and the transmitted bit rate. QPSK is the most robust and 64QAM is able to transport the highest bit rate.

Besides, the system can define 3 guard intervals: 1/8, 1/16 and 1/32.

Finally, the maximum bit rate achieved is 31.67 Mbps.

Chapter 2: Technical Features

RF Stage DVB-T2 and DVB-T

Frequency ranges:

1,300 – 1,600 MHz
1,700 – 2,200 MHz
2,025 - 2,180 MHz FFC Tested
2,000 – 2,400 MHz
2,300 – 2,700 MHz
3,300 – 3,600 MHz
4,400 – 5,000 MHz
5,000 – 5,300 MHz

Output Power:

	Low	Mid	High
1,300 – 1,600 MHz	30 dBm	37 dBm	40 dBm
1,700 – 2,200 MHz	30 dBm	37 dBm	40dBm
2,025 – 2,180 MHz	30 dBm	37 dBm	41.5 dBm
2,000 – 2,400 MHz	30 dBm	37 dBm	41.5 dBm
2,300 – 2,700 MHz	30 dBm	37 dBm	41.5 dBm
3,300 – 3,600 MHz	30 dBm	37 dBm	40 dBm
4,400 – 5,000 MHz	30 dBm	37 dBm	40 dBm
5,000 – 5,300 MHz	30 dBm	35 dBm	37 dBm

Harmonics suppression: 60 dB

Protection capabilities: Reverse power

Video:

Inputs:

3G-SDI SMPTE-425M-A (299M)
HD-SDI SMPTE-292M (299M)
SD-SDI SMPTE-259M (272M)
HDMI (1.4a)
Composite video (PAL/NTSC)

Formats:

1080p (1920x1080) – 23.98/24/25/ 29.97/30/50/59.94/60 Hz
1080i (1920x1080) – 50/59.94/60 Hz
720p (1280x720) – 23.98/24/25/29.97/ 30/50/59.94/60 Hz
576i (720x576) – 50 Hz
480i (720x480) – 59.94 Hz

Audio:

Input:	SDI embedded / HDMI embedded AES Digital / Analogue
Analogue:	2 Stereo / 4 Mono Line, Micro Dynamic and Micro with Phantom
SDI embedded:	1 Group (4 audio channels)
AES/EBU:	2 Stereo channels

User Data

Data channel:	RS 232
Data rate:	1,200 to 230,400 bps

Internal GPS Data

GPS Data channel:	Internal GPS Receiver
Antenna DC output:	5 VDC

ASI

Input and Output:	ASI Transport Stream (EN50083-9)
Extra Feature:	Remux (Optional)

Test Signals

Video:	Bars with a moving icon
Audio:	4 Audio tones

Encoder

Video compression:	H.264/MPEG-4 Part 10
Profile:	High 422, High, Main
Level:	3.0/3.1/3.2/4.0/4.1
Latency:	Ultra Low delay: 33 ms
Audio compression:	MPEG-1 Layer II

Audio bit rate:	128, 192, 256 or 384 Kbps
Extra Feature:	KLV Metadata embedded on SDI (Optional)

Encryption

BISS:	BISS-1 and BISS-E
AES:	AES-128 and AES-256 (Optional)

Modulation

DVB-T2:	COFDM 1K, 2K, 4K QPSK, 16 QAM, 64 QAM, 256 QAM Constellation rotation LDPC FEC: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 IG: 1/8, 1/16, 1/32 Bandwidth: 1.7, 5, 6, 7, 8 MHz Max. bitrate: 46.4 Mbps
DVB-T:	COFDM 2K mode QPSK, 16 QAM, 64 QAM FEC: 1/2, 2/3, 3/4, 5/6, 7/8 IG: 1/8, 1/16, 1/32 Bandwidth: 5, 6, 7, 8 MHz Max. bitrate: 31.67 Mbps

Control & Monitorization

Control Interfaces:	Front panel & display Web browser interface RTC-03 ARINC-429 (Optional)
Pre-sets:	7 user defined pre-sets
Monitoring:	Encoding, modulation, frequency and output power and alarms.

Power Supply

DC input:	9 – 36 VDC
Power Consumption:	130 W (2 GHz) 160 W (4-5 GHz)
Recovery time:	10.5 seconds

	(It is the time the equipment needs to recover an image in case of a cut in the power supply)
Weight on Wheel System (WoW)	

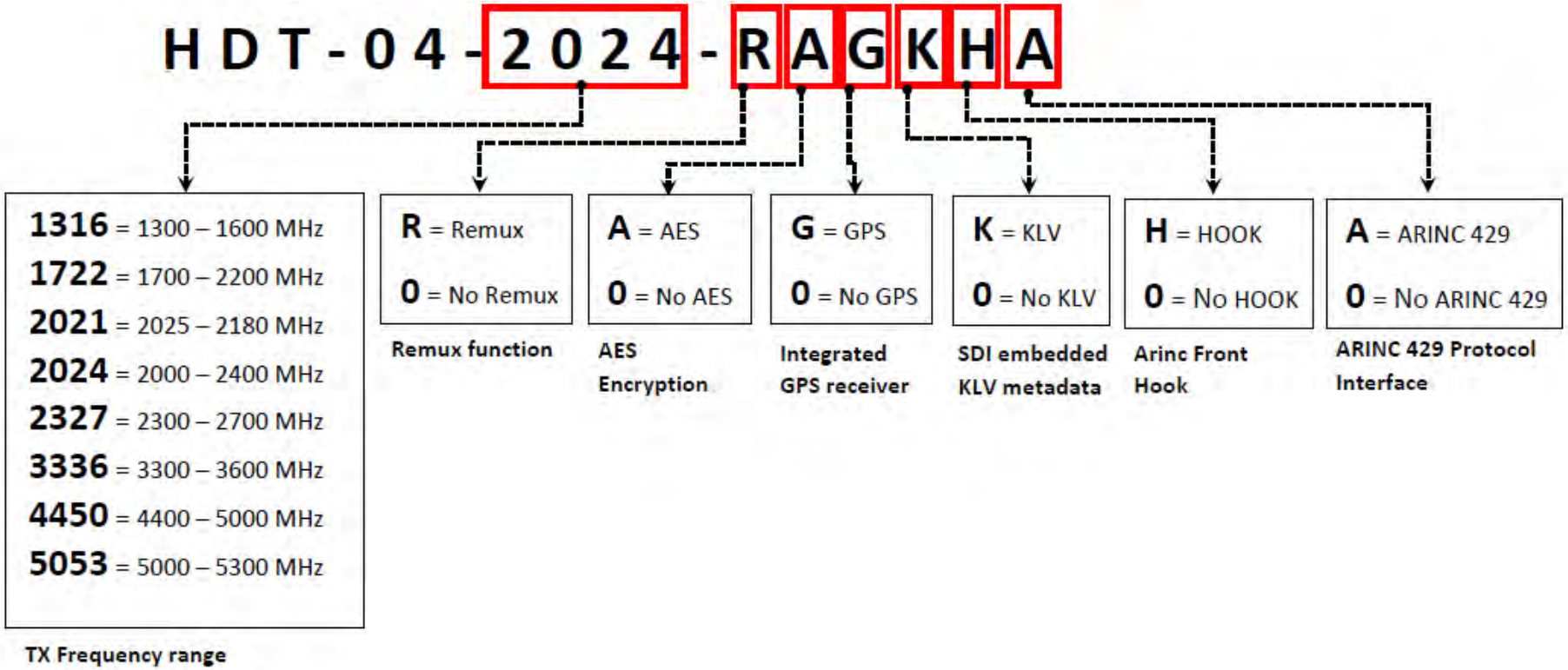
Mechanical

Size:	123.5 x 121.22 x 228.5 mm (WxHxD)
Weight:	3.3 kg

Environmental

Aeronautical:	RTCA / DO-160 compliant
Temperature range:	-20º to 50ºC

Chapter 3: How to Order



Chapter 4: Transmitter Operation and Menus

This fourth chapter provides the user all the necessary information to control, configure and operate the equipment properly.

4.1 Display

To turn the equipment on and off, press ON/OFF button.

When a video, audio or data input has been selected, a character connected to this input is displayed in the main screen.

Below, the main screen of the HDT-04 transmitter is shown.

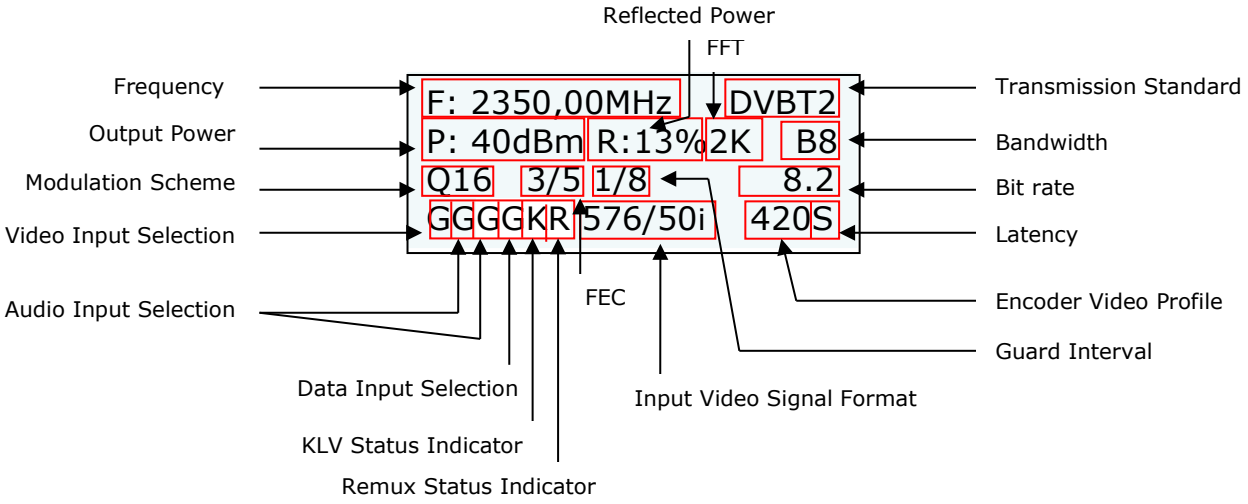


Figure 4.1: HDT-04 front panel / Main screen explanation

When an option is selected, the main screen displays these parameters:

- Frequency (MHz)
- Transmission Standard (DVB-T2, DVB-T)
- Output power (dBm)
- Reflected power
- FFT number of points
- Bandwidth (MHz)
- Modulation Scheme
- FEC

- Guard Interval

- Transmitted bit rate (Mbps)

- Video Input selection

  Possibilities: CVBS, HDMI, SDI, DVB-ASI Transport Stream or Generator. Behaviour of the corresponding character: If the character is static then it means presence of that signal. If the character blinks, then it means absence of that signal.

- Audio status indication: If audio 1 or 2 are not darkened then they are enabled. On the other hand, if audio 1 or 2 are darkened then they are disabled.

- Data status indication: If this field is not darkened then it means that data is enabled. On the other hand, if this value is darkened it means that data is disabled. Moreover, in case this field is static, its meaning is presence of the data whereas if this field is blinking, it means absence of the data.

- KLV status indicator: If this field is not darkened then it means that KLV metadata is enabled. On the other hand, if this value is darkened it means that metadata is disabled. Moreover, in case this field is static, its meaning is presence of the data whereas if this field is blinking, it means absence of the KLV metadata.

- Remux status indicator: This field indicates if Remux function is enabled or disabled.

- Input video signal format.

- Encoder Video Profile (4.2.0 or 4.2.2).

- Latency (Standard delay, Low delay or Super Low Delay)

  - Standard Delay (Lipsync < 10 ms)
  - Low delay (Lipsync < 10 ms) → 3 frame
  - Super Low Delay (Lipsync < 10 ms) → 2 frames
  - Ultra Low Delay (Lipsync = 20ms) → 1 frame

Below, the correspondence between the input and character displayed is shown.

Video	CVBS	C
	HDMI	H
	SDI	S
	ASI	A
	Test Pattern	G
Audio	Embedded	E
	AES/EBU	U
	Analogue	A
	Test Tone	G
Data	RS232	D
	GPS	G
KLV	KLV	K
Remux	Remux	R

Table 1: Correspondence between the input and the character displayed

4.2 LEDs

The HDT-04 transmitter has 5 Leds on its front panel that show the information detailed below.

The **ON / OFF** provides the following information:

- If the Led blinks in red, there is power into the unit, but it is turned off.
- The Led lights up in green when the equipment is turned on.

The **RF LED** provides the following information:

- The Led lights up in green when the equipment transmits RF signal, RF stage is active.

The **ALARM LED** provides the following information:

- The different alarms that can appear in the transmitter are:
  - Voltage High.
  - Voltage Low.
  - Temperature High.
  - Direct Power.
  - Reverse Power.
  - PA Not Forward
  - ASI Overflow.
  - No SDI Input.
  - No HDMI Input.
  - No CVBS Input.
  - No ASI Input.
  - No KLV.

The **REMOTE LED** provides the following information:

- The LED lights up when the remote control via Webserver has been established.

The **STATUS LED** provides the following information:

- The LED lights up when the transmitter is working properly.

Figure 4.2: front panel LED indication

4.3 Keyboard

4.3.1 ON/OFF Button

To switch the equipment on and off, press this button. When the equipment is turned on, the display will show the start-up message (model and version of the equipment), and then it will display the main screen.

If the power fails while the equipment is operating, it will restart automatically when the power returns, not being necessary to press the on/off button again.

Figure 4.3: ON/OFF button

4.3.2 OK Button

This button is used to:

- Enter to submenus and change parameters. So as to access to a submenu, OK button must be pressed. Moreover, in the fields where the enter symbol ↵ appears, by pressing the OK button the user can change the value of the selected parameter. Besides, so as to save the introduced value, the OK button must be pressed.

- In case of being in the main screen, pressing the OK button the user can access to the alarms screen where there are the different alarms that are taking place. So as to return to the main screen, the cross button must be pressed.

Figure 4.4: OK Button

4.3.3 Cross Button

This button is used to:

- Enter from the equipment main screen to the setup menu and vice versa.
- Exit equipment's submenus.
- This button allows the user to access to the main screen from the alarms screen.

Figure 4.5 Cross Button

4.3.4 Left and Right Button

These buttons are used to:

- Once the parameter to change has been selected, they are used to move the cursor towards the digit immediately on the left or right and to select a parameter from different options.

Figure 4.6: Left and Right buttons

4.3.5 Up and Down Button

- The up and down arrow buttons allow the navigation in the main menu and the rest of submenus. Using these buttons, the user can enter to the submenu or change a parameter. Once selected, the OK button must be pressed.
- These buttons are also used to change, for example, the frequency and PID parameter's values. Pressing up and down arrows the value of those parameters can be changed, increased or decreased respectively.

Figure 4.7: Up and Down buttons

By pressing the RF button, RF output is enabled or disabled. The RF LED indicates the status of the RF output. To enable or disable the RF output, just press the RF button. It is important that before pressing this button, the selected RF output must be conveniently loaded and there is no reflected signal.

In case the device is switched off with the RF output enabled then, when it is switched on again it is necessary to push again this button so as to enable this feature.

However, if power supply fails when RF output is enabled then, once power supply returns it is not necessary to push this button because RF output will continue being enabled.

Figure 4.8: RF On/Off button

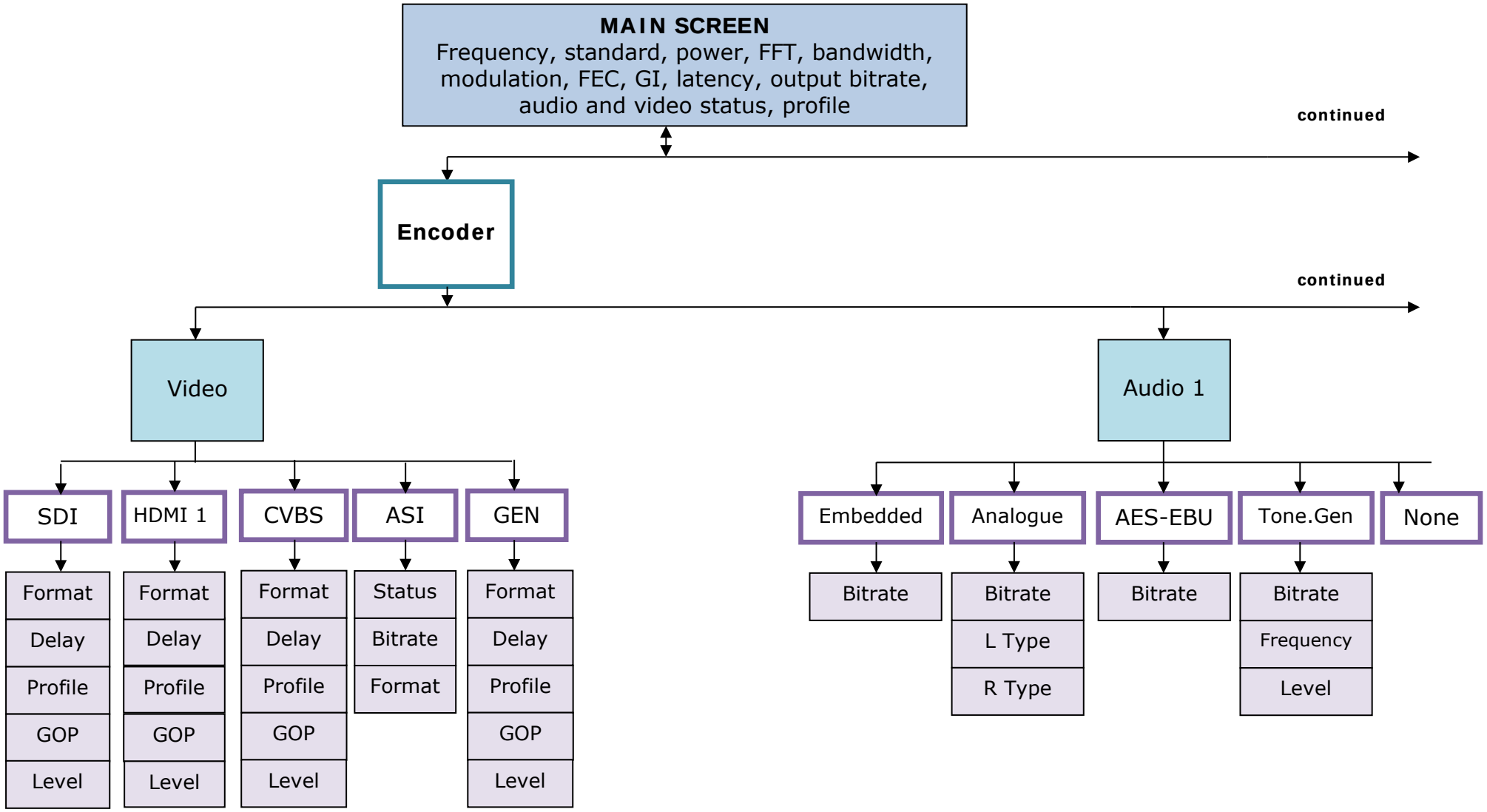
4.4 Menus Scheme

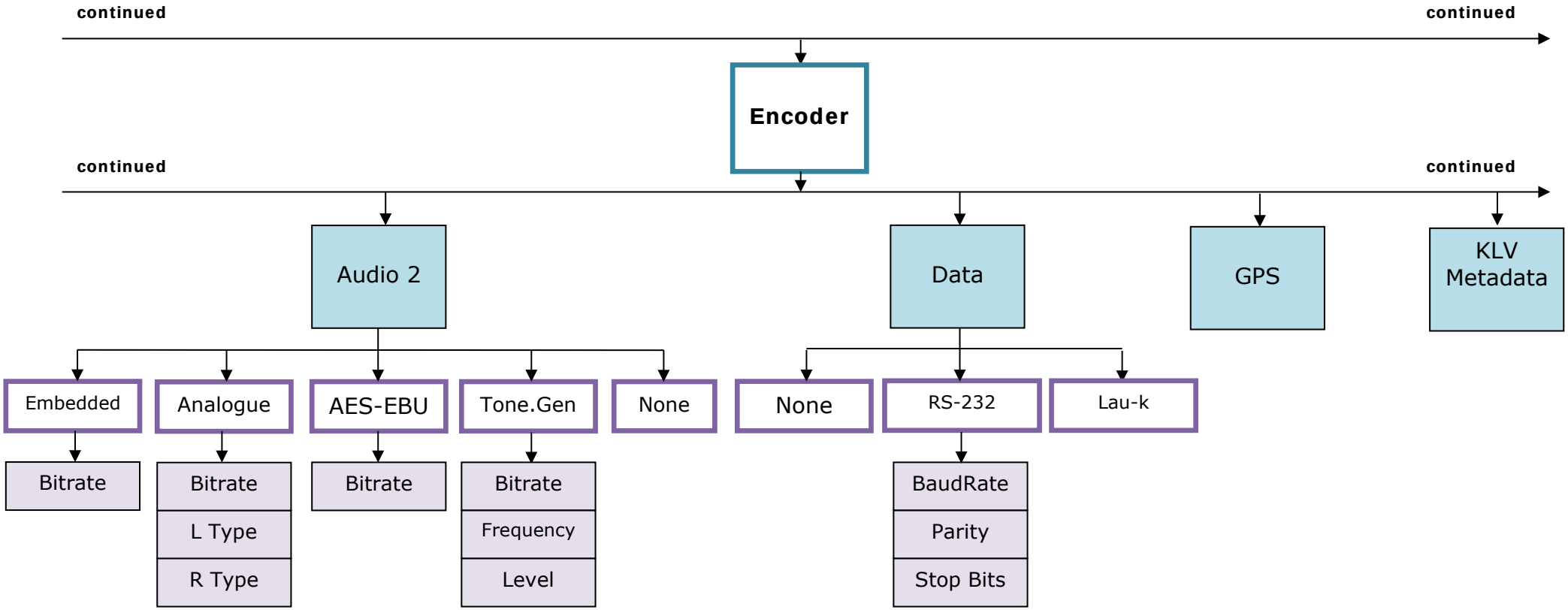
There is one menu in this transmitter that allows the user to change the transmitter's parameters and configure them.

To enter the menu of this equipment the cross button must be pressed. In case it is wanted to return to the main screen from the menu, the cross button must be pressed. Furthermore, in case of being in the submenus area, returning to the mainly screens are achieved by pressing the cross button as much times as it is needed.

In the next page it is shown a scheme that specifies the different menu options available.

HDT-04 MENU STRUCTURE




continued
continued
Encoder
continued
continued
Audio 2
Data
GPS
KLV Metadata
Embedded
Analogue
AES-EBU
Tone.Gen
None
None
RS-232
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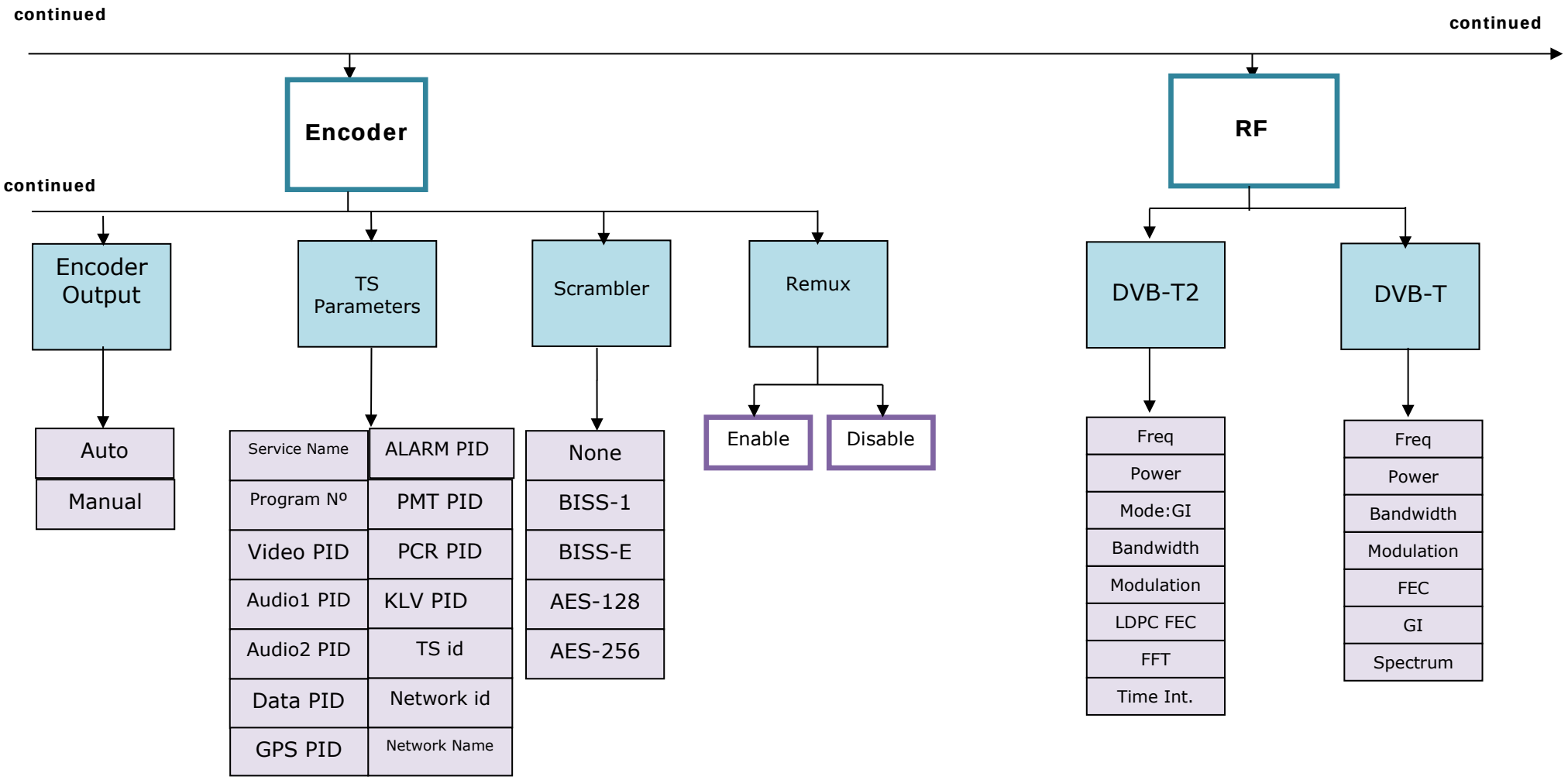
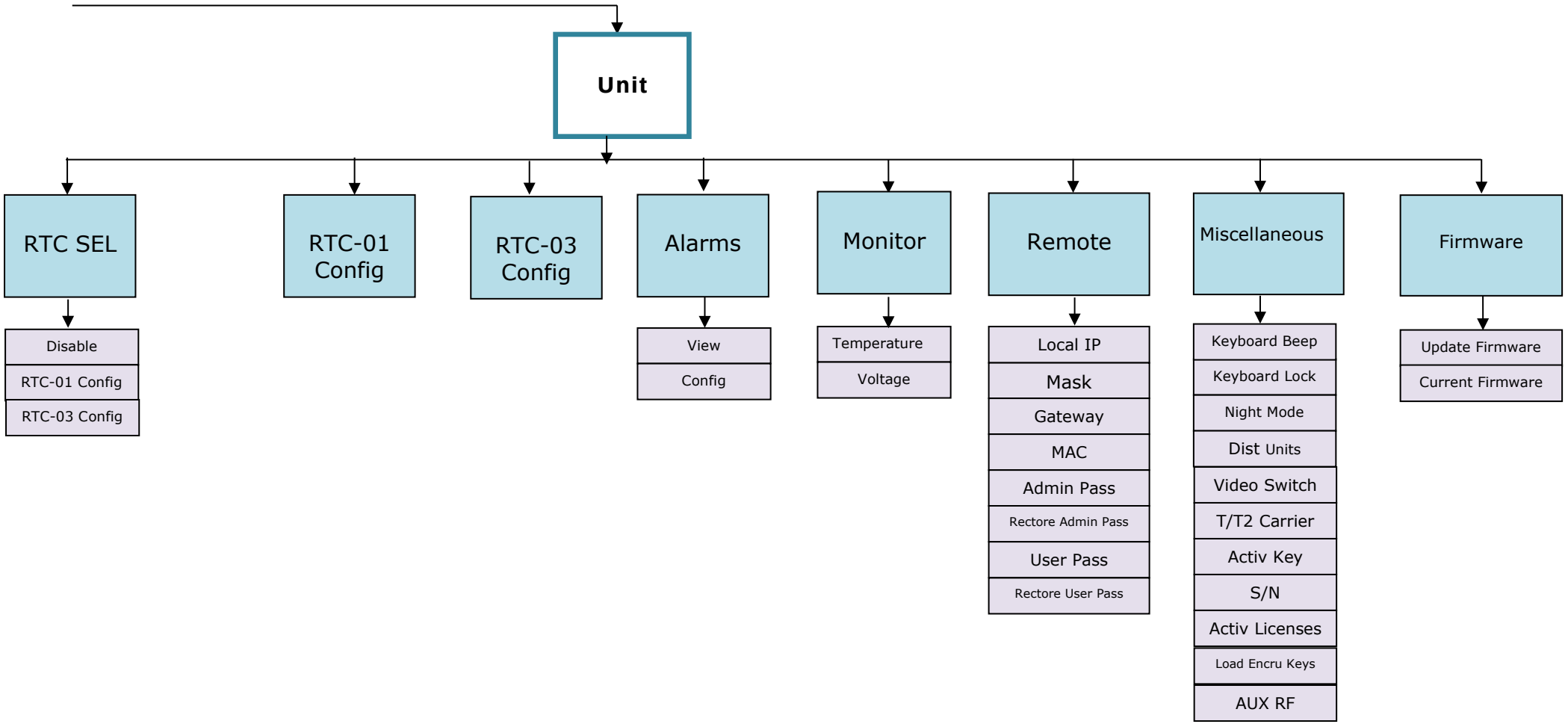
Bitrate
Bitrate
L Type
R Type
Bitrate
Bitrate
Frequency
Level
BaudRate
Parity
Stop Bits


continued
continued
Encoder
RF
continued
Encoder Output
TS Parameters
Scrambler
Remux
DVB-T2
DVB-T
Auto
Manual
Service Name
ALARM PID
Program Nº
PMT PID
Video PID
PCR PID
Audio1 PID
KLV PID
Audio2 PID
TS id
Data PID
Network id
GPS PID
Network Name
None
BISS-1
BISS-E
AES-128
AES-256
Enable
Disable
Freq
Power
Mode:GI
Bandwidth
Modulation
LDPC FEC
FFT
Time Int.
Freq
Power
Bandwidth
Modulation
FEC
GI
Spectrum

continued


Unit
RTC SEL
Disable
RTC-01 Config
RTC-03 Config
RTC-01 Config
RTC-03 Config
Alarms
View
Config
Monitor
Temperature
Voltage
Remote
Local IP
Mask
Gateway
MAC
Admin Pass
Rectore Admin Pass
User Pass
Rectore User Pass
Miscellaneous
Keyboard Beep
Keyboard Lock
Night Mode
Dist Units
Video Switch
T/T2 Carrier
Activ Key
S/N
Activ Licenses
Load Encru Keys
AUX RF
Firmware
Update Firmware
Current Firmware

4.5 Menu Navigation

This section contains a detailed description of each parameter that can be configured in the HDT-04 transmitter's MENU.

To enter the MENU, press the cross button in case of being in the main screen or in any submenu.

To select a parameter or a submenu, use the Up and Down arrows. Once selected it, press the OK button to access to a submenu or to edit a parameter. To exit from a submenu or a parameter, press the cross button.

Figure  means that to have access to the right image that button must be pushed.

Symbols <> mean that the parameter can be modified in the same screen with the right and left keys.

Symbol↵ means that pushing the OK button allows entering to the options of the submenu.

There are different types of parameters available:

- **Eligible:** When the user can choose between predetermined states. (They usually have the symbol <> near to them)

- **Editable:** When the user must enter a value in that option. (They usually have the symbol ↵ near them). So as to save the introduced value, the OK button must be pressed.

- **Reading:** When the value of that parameter is a monitored parameter that can't be changed.

To change a parameter, for example, the transmitted frequency, press the OK button in the desired option and then with the Up, Down buttons choose the value. Once the parameter is set, press the OK button to save the value.

Next, the different menus and submenus with the options and the different parameters are shown. Also, in each figure, example parameters are displayed.

4.6 Menu Structure

The following menu screen can be accessed by pressing the cross key from the monitoring menu.

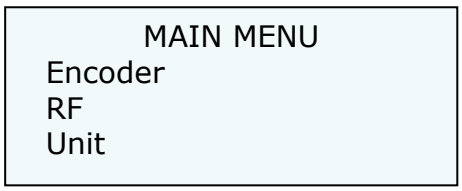


Figure 4.9: Menu

Encoder – All the parameters related to the video, audio and data inputs are configured here. Besides, all video, audio, multiplexing and data encoding parameters are accessed here.

RF – DVB-T2/T transmission parameters are set in this section.

Unit – Parameters related to the Web Server and other internal options of the transmitter are configured here, as well as other characteristics of the device.

4.6.1 Encoder Menu

By using the Up, Down arrow keys, select the **Encoder** option and press the OK key.

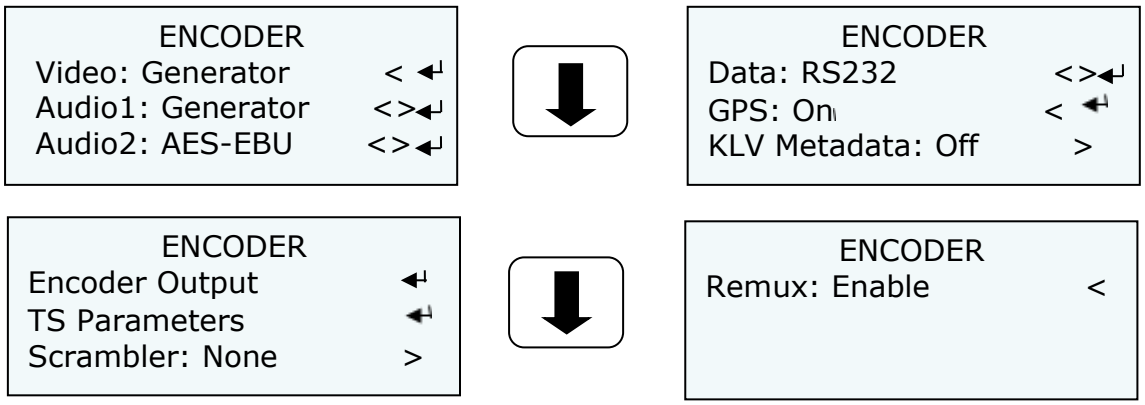


Figure 4.10:Encoder Menu

Line nº	Function
1	**Video:** In this field, the video input must be chosen with the Right and Left buttons. Once the video input has been selected, press the OK button so as to configure the parameters related to it. The available options are: ▪ SDI ▪ HDMI 1 ▪ HDMI 2 ▪ CVBS ▪ ASI ▪ Generator
2	**Audio 1:** In this field, the sort of audio signal introduced in the audio 1 input can be chosen with the right and left buttons. Once the audio 1 input has been selected, press the OK button so as to configure the parameters related to it. The available options are: ▪ None ▪ Embedded ▪ Analogue ▪ AES-EBU ▪ Generator
3	**Audio 2:** In this field, the sort of audio signal introduced in the audio 2 input can be chosen with the right and left buttons. Once the audio 2 input has been selected, press the OK button so as to configure the parameters related to it. The available options are: ▪ None ▪ Embedded ▪ Analogue ▪ AES-EBU ▪ Generator

4	**Data:** In this field, the sort of data input can be selected. The available options are: ▪ None ▪ 4K board ▪ RS-232
5	**GPS** (eligible parameter) (Optional): In this field, the GPS can be enabled. The GPS is an optional feature.
6	**KLV Metadata:** In this field, the KLV metadata can be enabled or disabled. When it is enabled, the transmitter transmits the KLV metadata which is embedded on SDI signal.
7	**Encoder Output:** In this field, the encoder output can be selected. The available options are: ▪ Auto: The bitrate is set by the modulation parameters. ▪ Manual: Pressing the OK button, the output bitrate can be configured.
8	**TS Parameters:** This file consists on the configuration of the parameters of the Transport Stream. In this option, the different program identifiers are configured.

	Scrambler: In this field, the encryption system can be chosen with right and left buttons.
9	The available options are: ▪ None ▪ BISS-1 (Uses an unencrypted key for the BISS key) ▪ BISS-E (Uses an encrypted key) ▪ AES-128 (128 bits key) ▪ AES-256 (256 bits key)
	Remux (optional) In this filed, Remux option can be activated.
10	The available options are: ▪ Enable ▪ Disable

Table 2:Encoder Menu

4.6.1.1 SDI Video Input

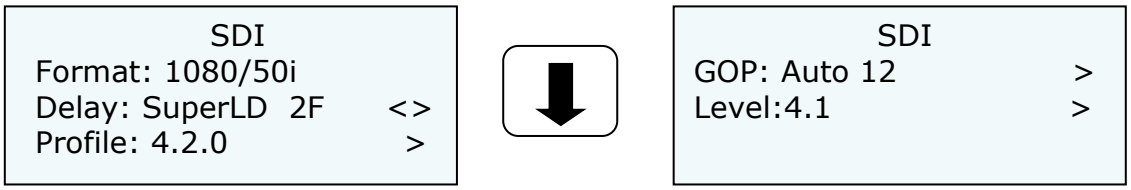


Figure 4.11: SDI Input Menu

Line nº	Function
1	**Format (SDI):** In this field, the format of the SDI input signal is displayed. (reading parameter) The available options are: ▪ **1080p** (1920x1080) – 23.98/24/25/29.97/30/50/59.94/60 Hz ▪ **1080i** (1920x1080) – 50/59.94/60 Hz ▪ **720p** (1280x720) – 23.98/24/25/29.97/30/50/59.94/60 Hz ▪ **576i** (720x576) – 50 Hz ▪ **480i** (720x480) – 59.94 Hz
2	**Delay:** In this field, the delay of the coding process is configured. So as to select the desired delay, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ Standard ▪ Super Low Delay (2 frames of delay) ▪ Ultra Low Delay (1 frame of delay)
3	**Profile:** In this field, the codification profile can be configured. So as to select the desired profile, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 4.2.0 ▪ 4.2.2
4	**GOP:** In this field, the group of figures parameter is displayed. It specifies the order in which intra and inter-frames are arranged. (eligible parameter) The available options are: ▪ Auto ▪ Manual (editable parameter)

	Level:
5	In this field, the level of the H.264 encoder can be configured. The available options are: • 4.0 • 4.1 • 4.2 (only available in 1080p-50/59.94/60 Hz video formats)

Table 3: SDI Input menu options

In case HDMI video input is selected, it is necessary to specify the format (1080p, 1080i, 720p). If another video input (SDI, CVBS or ASI) is selected, then the transmitter automatically captures its format and the frame rate. If the video format is changed, the time detection of this new format is less than 15 seconds.

4.6.1.2 HDMI Video Input

When HDMI input is selected, press OK button to access the video configuration menu. This input is ONLY compatible with video cameras, it doesn´t support laptop HDMI output or others. The video format is automatically detected. The parameter which are configured in this section are explained below

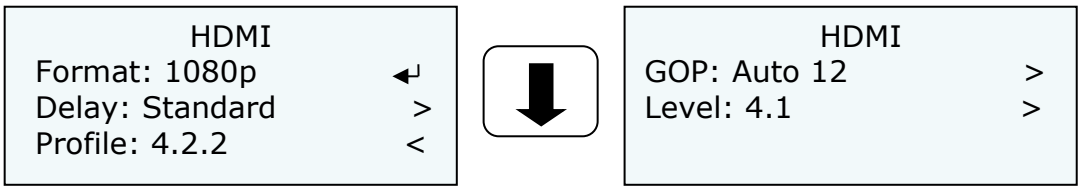


Figure 4.12: HDMI Input Menu

Line nº	Function
1	**Format:** In this field, the format of the HDMI input signal must be selected. So as to select a format, first, press the OK button so as to enter to the submenus where different formats available appear. Then, choose the desired option with the Up, Down keys. (eligible parameter) The available options are: ▪ 1080p ▪ 1080i ▪ 720p
2	**Delay:** In this field, the delay of the coding process is configured. So as to select the desired delay, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ Standard ▪ Super Low Delay (2 frames of delay) ▪ Ultra Low Delay (1 frame of delay)
3	**Profile:** In this field, the codification profile can be configured. So as to select the desired profile, press Right, Left arrows buttons. (editable parameter) The available options are: ▪ 4.2.0 ▪ 4.2.2
4	**GOP:** In this field, the group of figures parameter is displayed. It specifies the order in which intra- and inter-frames are arranged. (eligible parameter) The available options are: ▪ Auto ▪ Manual (editable parameter)

5	**Level:** In this field, the level of the H.264 encoder can be configured. The available options are: • 4.0 • 4.1 • 4.2 (only available in 1080p-50/59.94/60 Hz video formats)

Table 4: HDMI Input menu options

When HDMI video input is selected, it is necessary to specify the format (1080p, 1080i, 720p). If another video input (SDI, CVBS or ASI) is selected, then the transmitter automatically captures its format and the frame rate. If the video format is changed, the time detection of this new format is less than 15 seconds.

This video input is compatible with video cameras. Laptops, computers or other HDMI interfaces are not compatible.

4.6.1.3 CVBS Video Input

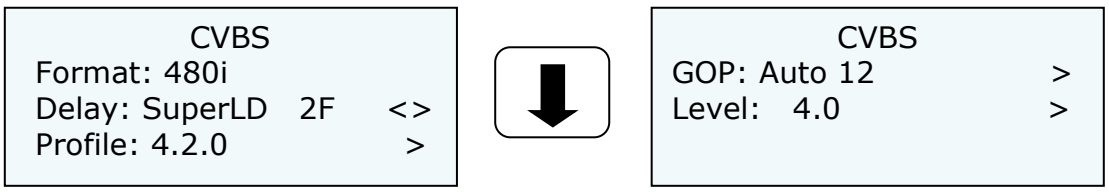


Figure 4.13: CVBS Input Menu

Line nº	Function
1	**Format (CVBS):** In this field, the format of the CVBS input signal is displayed. (reading parameter) The available options are: ▪ 480i ▪ 576i
2	**Delay:** In this field, the delay of the coding process is configured. So as to select the desired delay, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ Standard ▪ Super Low Delay (2 frames of delay) ▪ Ultra Low Delay (1 frame of delay)
3	**Profile:** In this field, the codification profile can be configured. So as to select the desired profile, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 4.2.0 ▪ 4.2.2
4	**GOP:** In this field, the group of figures parameter is displayed. It specifies the order in which intra- and inter-frames are arranged. (eligible parameter) The available options are: ▪ Auto ▪ Manual (editable parameter)

5	**Level:** In this field, the level of the H.264 encoder can be configured. The available options are: • 4.0 • 4.1 • 4.2 (only available in 1080p-50/59.94/60 Hz video formats)

Table 5: CVBS Input menu options

4.6.1.4 ASI Video Input

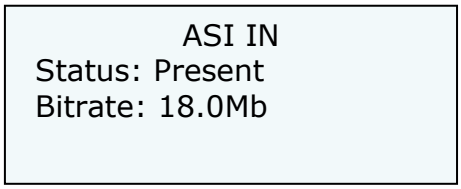


Figure 4.14: ASI Input Menu

Line nº	Function
1	**Status:** This field indicates if there is any ASI signal in the ASI input. In case there is an ASI signal, this field will display the word present. If there is no ASI signal then, no present will be displayed. (reading parameter) The available options are: ▪ Present ▪ No Present
2	**Bitrate:** In this option, the bitrate of the ASI input signal is shown. (reading parameter)

Table 6: ASI Input menu options

4.6.1.5 Generator Video Input

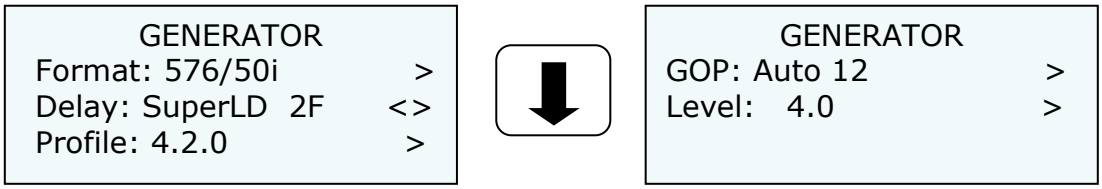


Figure 4.15: Generator Input Menu

Line nº	Function
1	**Format** (eligible parameter): In this field, the format of the generated video signal is configured. To select the desired format, press Right, Left arrows buttons. The available options are: • 1080p (1920x1080) – 25 Hz • 1080p (1920x1080) – 30 Hz • 1080i (1920x1080) – 50 Hz • 1080i (1920x1080) – 59.94 Hz • 1080i (1920x1080) – 60 Hz • 720p (1280x720) – 25 Hz • 720p (1280x720) – 30 Hz • 720p (1280x720) – 50 Hz • 720p (1280x720) – 59.94 Hz • 720p (1280x720) – 60 Hz • 480i (720x480) – 59.94 Hz • 576i (720x576) – 50 Hz
2	**Delay:** In this field, the delay of the coding process is configured. So as to select the desired delay, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ Standard ▪ Super Low Delay (2 frames of delay) ▪ Ultra Low Delay (1 frame of delay)
3	**Profile:** In this field, the codification profile can be configured. So as to select the desired profile, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 4.2.0 ▪ 4.2.2

4	**GOP:** In this field, the group of figures parameter is displayed. It specifies the order in which intra- and inter-frames are arranged. (eligible parameter) The available options are: ▪ Auto ▪ Manual (editable parameter)
5	**Level:** In this field, the level of the H.264 encoder can be configured. The available options are: • 4.0 • 4.1 • 4.2 (only available in 1080p-50/59.94/60 Hz video formats)

Table 7: Generator Input menu options

4.6.1.6 Audio1 Embedded

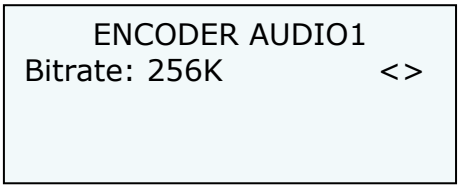


Figure 4.16: Audio Embedded Input Menu

Line nº	Function
1	**Bitrate:** In this option the bitrate for the codification of the audio signal 1 can be selected. So as to select the desired bitrate, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 128K ▪ 192K ▪ 256K ▪ 384K

Table 8: Audio Embedded Input menu options

If the video option selected is CVBS, ASI or Test Pattern generator, then, the option of audio embedded will be blinking because that configuration is not possible.

4.6.1.7 Audio1 Analogue

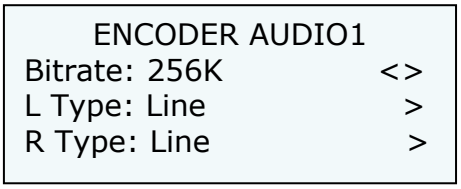


Figure 4.17: Audio Analogue Input Menu

Line nº	Function
1	**Bitrate:** In this option the bitrate for the codification of the audio signal 1 can be selected. So as to select the desired bitrate, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 128K ▪ 192K ▪ 256K ▪ 384K
2	**L Type:** In this field, the sort of signal of the audio 1 left channel introduced in the transmitter is selected. So as to choose the type of audio1, press Right, Left buttons. (eligible parameter) The available options are: ▪ Line ▪ Mic Dynamic ▪ Mic Phantom
3	**R Type:** In this field, the sort of signal of the audio 1 right channel introduced in the transmitter is selected. So as to choose the type of audio1, press Right, Left buttons. (eligible parameter) The available options are: ▪ Line ▪ Mic Dynamic ▪ Mic Phantom

Table 9: Audio Analogue Input menu options

4.6.1.8 Audio1 AES-EBU

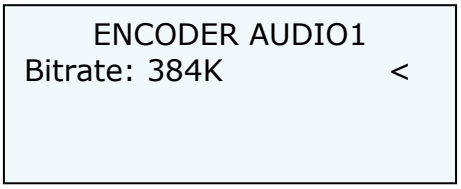


Figure 4.18: Audio AES-EBU Input Menu

Line nº	Function
1	**Bitrate:** In this option, the bitrate for the codification of the audio signal 1 can be selected. So as to select the desired bitrate, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 128K ▪ 192K ▪ 256K ▪ 384K

Table 10: Audio AES-EBU Input menu options

4.6.1.9 Audio1 Generator

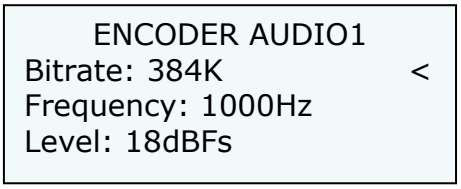


Figure 4.19: Audio Generator Input Menu

Line nº	Function
1	**Bitrate:** In this option, the bitrate for the codification of the audio signal 1 can be selected. So as to select the desired bitrate, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 128K ▪ 192K ▪ 256K ▪ 384K
2	**Frequency (Hz):** In this field, the frequency of the generated tone is displayed. (reading parameter)
3	**Level (dBFs):** In this field, the level in dBF of the generated tone is displayed. (reading parameter)

Table 11: Audio Generator Input menu options

4.6.1.10 Audio2 Embedded

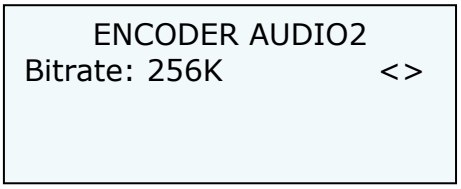


Figure 4.20: Audio Embedded Input Menu

Line nº	Function
1	**Bitrate:** In this option, the bitrate for the codification of the audio signal 2 can be selected. So as to select the desired bitrate, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 128K ▪ 192K ▪ 256K ▪ 384K

Table 12: Audio Embedded Input menu options

If the video option selected is CVBS, ASI or Test Pattern Generator then, the option of audio embedded will be blinking because that configuration is not possible.

4.6.1.11 Audio2 Analogue

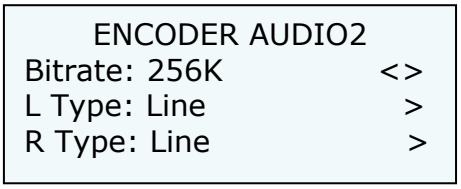


Figure 4.21: Audio Analogue Input Menu

Line nº	Function
1	**Bitrate:** In this option, the bitrate for the codification of the audio signal 2 can be selected. So as to select the desired bitrate, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 128K ▪ 192K ▪ 256K ▪ 384K
2	**L Type:** In this field, the sort of signal of the audio 2 left channel introduced in the transmitter is selected. So as to choose the type of audio2, press Right, Left buttons. (eligible parameter) The available options are: ▪ Line ▪ Mic Dynamic ▪ Mic Phantom
3	**R Type:** In this field, the sort of signal of the audio 2 right channel introduced in the transmitter is selected. So as to choose the type of audio2, press Right, Left buttons. (eligible parameter) The available options are: ▪ Line ▪ Mic Dynamic ▪ Mic Phantom

Table 13: Audio Input menu options

4.6.1.12 Audio2 AES-EBU

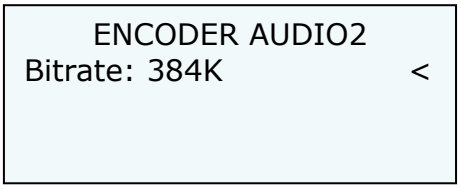


Figure 4.22: Audio AES-EBU Input Menu

Line nº	Function
1	**Bitrate:** In this option, the bitrate for the codification of the audio signal 2 can be selected. So as to select the desired bitrate, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 128K ▪ 192K ▪ 256K ▪ 384K

Table 14: Audio AES-EBU Input menu options

4.6.1.13 Audio2 Generator

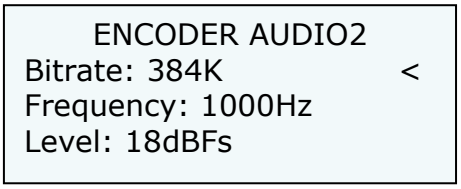


Figure 4.23: Audio Generator Input Menu

Line nº	Function
1	**Bitrate:** In this option, the bitrate for the codification of the audio signal 2 can be selected. So as to select the desired bitrate, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 128K ▪ 192K ▪ 256K ▪ 384K
2	**Frequency (Hz):** In this field, the frequency of the generated tone is displayed. (reading parameter)
3	**Level (dBFs):** In this field the level in dBF of the generated tone is displayed. (reading parameter)

Table 15: Audio Generator Input menu options

4.6.1.14 Data

To select the desired sort of data, press Right, Left buttons (eligible parameter).
The available options are:

- None
- RS232
- 4K Board

None

This option is selected when no data is sent to the transmitter.

RS232 Screen

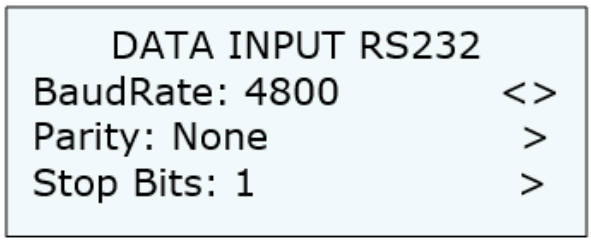


Figure 24: RS232 screen

Data option	Parameters
1	**Baudrate** (eligible parameter)**:** Select the baudrate at which data user is received (Baudrate options are: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400).
2	**Parity** (eligible parameter)**:** Select the same parity as the parity of the received data user signal (Parity options are None, Odd, Even).
3	**Stop Bits** (eligible parameter)**:** Select the same number of stop bits as the received data user signal has (Stop bit options are 1 or 2).

Table 16 RSR232 screen

Lau-K

This option is selected in order to control the Lau-K HEVC encoder from HDT-02 transmitter. Once the communication has been stabilized, the menus of the encoder would change automatically. Please go to chapter 6 to see the Lau-k operation.

4.6.1.15 GPS

If this option is selected, you can receive the GPS information from the internal GPS receiver using an external GPS antenna (which must be connected to the GPS Antenna Input). The antenna is fed directly from the transmitter at 5 V.

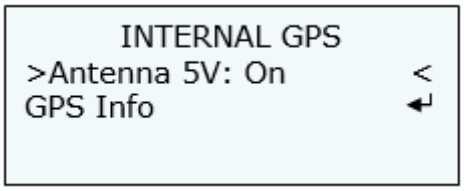


Figure 4.25: Internal GPS screen

The GPS info option screen shows the following information:

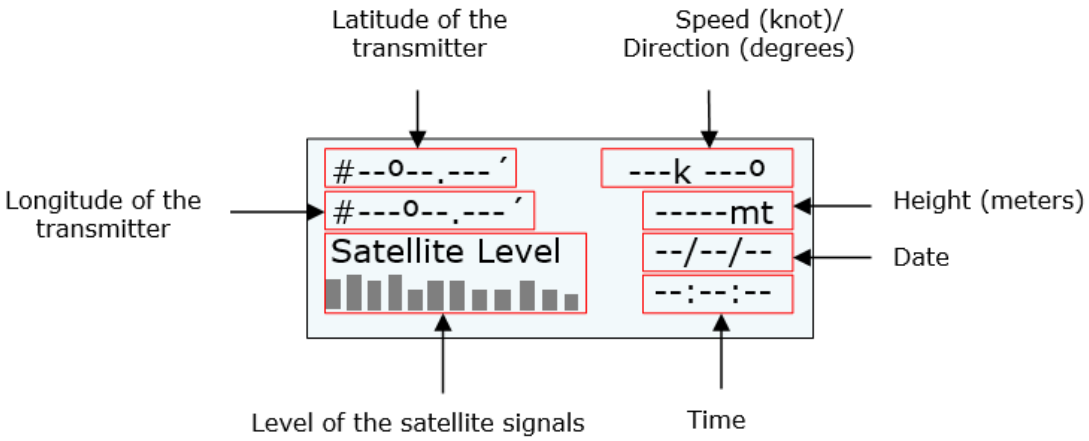


Figure 4.26: GPS Transmitter screen

- **Latitude of the transmitter:** The latitude position of the transmitter is specified.
- **Speed of the transmitter:** It shows the speed of the transmitter in knots.
- **Direction of the transmitter:** The direction of the transmitter is shown in this field.
- **Longitude of the transmitter:** The longitude position of the transmitter is specified.
- **Height of the transmitter:** The height of the transmitter from ground is specified in this value.
- **Satellite Level:** The level of each satellite signal received is shown in this field.
- **Date:** The updated date is shown.

4.6.1.16 KLV Metadata

When this option is ON, the KLV Metadata embedded on the SDI signal is sent through the radio link.
If KLV metadata is not embedded on SDI input, the HDT-02 Transmitter will show an alarm indicating that the KLV is not present.

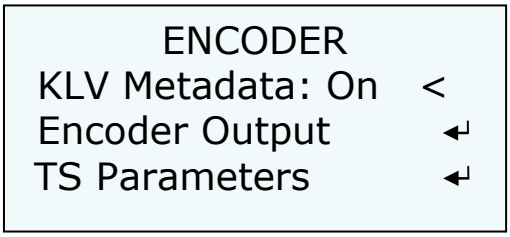


Figure 4.27: KLV Metadata option

Once that KLV is received at ground, using the TS over IP output of the receiver, KLV metadata can be monitored by a Mission Monitor program.

4.6.1.17 Encoder Output

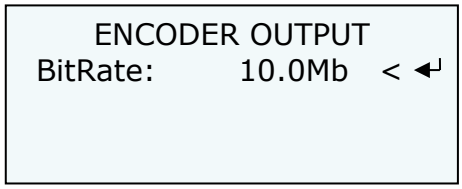


Figure 4.28: Encoder Output Menu

Line nº	Function
1	**BitRate:** In this field, the output bitrate is shown. In case it is wanted to select between an automatic bitrate or configure manually the bitrate, press Right, Left buttons. If manual configuration is selected then, press OK button so as to select the desired bitrate with the UP, Down keys. Press the OK button so as to save the introduced value. (eligible parameter) The available options are: ▪ Auto (The output bitrate is given by the modulation parameters) ▪ Manual (ASI out bitrate selectable when the transmitter is used only as encoder or while using Remux option)

Table 17: Encoder Output menu options

If the user selects the manual option, the first and second lines disappear on the main screen.

When the encoder output is in Manual, if you activate the RF, the encoder output changes to AUTO mode automatically.

4.6.1.18 TS Parameters

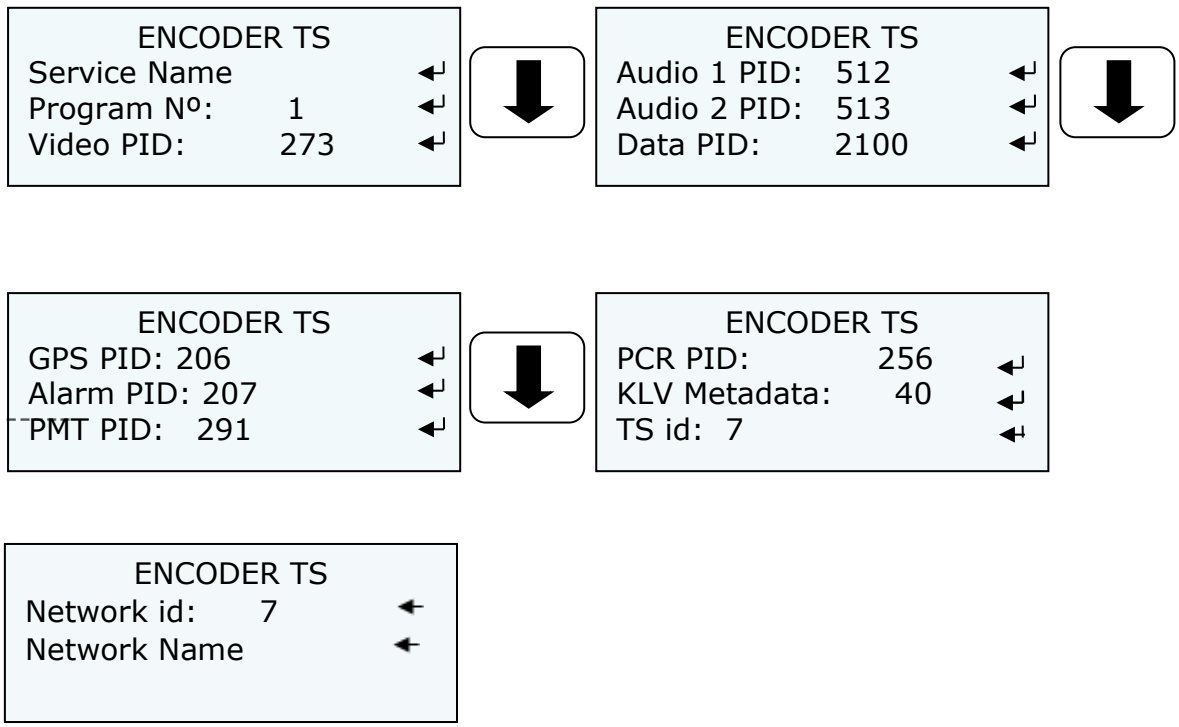


Figure 4.29: Encoder TS Menu

Line nº	Function
	Service Name:
1	Here the Service name must be entered. So as to change its value, first, press the OK button and then, with the UP, Down arrows select the desired letter. With the Right, Left keys, the user can select the character of the word. Press the OK button to save the introduced value. (editable parameter)
	Program Nº:
2	Here the program number must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)
	Video PID:
3	Here the video packet identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)
	Audio1 PID:
4	Here the audio1 packet identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)
	Audio2 PID:
5	Here the audio2 packet identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)
	Data PID:
6	Here the data packet identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)

7	**GPS PID** (editable parameter)**:** Here the GPS packet identifier must be entered. To change its value, first press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value.
8	**ALRM PID** (editable parameter)**:** Here the Alarm packet identifier must be entered. To change its value, first press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value.
9	**PMT PID:** Here the program map tables packet identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)
10	**PCR PID:** Here the program clock reference packet identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)
11	**KLV Metadata:** Here the KLV metadata identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)
12	**TS id:** Here the Transport Stream identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)
13	**Network id:** Here the Network identifier must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired number. Press the OK button to save the introduced value. (editable parameter)

	Network Name:
14	Here the Network name must be entered. So as to change its value first, press the OK button and then, with the UP, Down arrows select the desired letter. With the Right, Left keys, the user can select the character of the word. Press the OK button to save the introduced value. (editable parameter)

Table 18: Encoder TS menu options

4.6.1.19 Scrambler

By using the Right and Left arrow keys, select the **Scrambler** option and press the OK key.

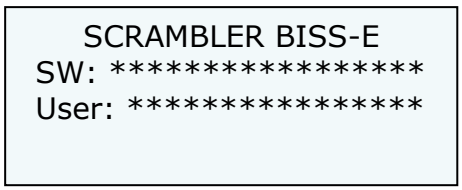


Figure 4.30: Scrambler Menu

Line nº	Function
1	**Mode:** So as to choose the desired encryption, press the Right, Left keys. (eligible parameter) The available options are: ▪ None ▪ BISS-1 (Uses an unencrypted key for the BISS key) ▪ BISS-E (Uses an encrypted key) ▪ AES-128 (128 bits key) ▪ AES-256 (256 bits key)
2	**SW:** In this field, the SW password must be introduced, which is valid for BISS-1, AES 128, AES 256 and BISS-E encryption. (editable parameter)
3	**User:** In this field, the User password must be introduced, which is valid only for BISS-E encryption. (editable parameter)

Table 19: Scrambler menu options

So as to introduce the key in the **BISS-1 option**, follow these steps:

1. Choose the BISS-1 option in the Mode field.
2. Go one field down (SW) and press the OK button so as to be allowed to introduce the key.
3. With Left and Right buttons select one field and with UP, Down buttons choose one value from 0 to 9 or A to F.
4. Press the OK button to set the key.

So as to introduce the key in the **BISS-E option**, follow these steps:

1. Choose the BISS-E option in the Mode field.
2. Go one field down (SW) and press the OK button so as to be allowed to introduce the key.
3. With Left and Right buttons select one field and with UP, Down buttons choose one value from 0 to 9 or A to F.
4. Press the OK button to set the key.
5. Go another field down (User) and press the OK button so as to be allowed to introduce the User.
6. With Left, Right buttons select one field and with UP and Down buttons choose one value from 0 to 9 or A to F.
7. Press the OK button to set the User.

So as to introduce the key in the **AES-128 option**, follow these steps:

1. Choose the BISS-1 option in the Mode field.
2. Go one field down (SW) and press the OK button so as to be allowed to introduce the key.
3. With Left and Right buttons select one field and with UP, Down buttons choose one value from 0 to 9 or A to F. 128 bits in total.
4. Press the OK button to set the key.

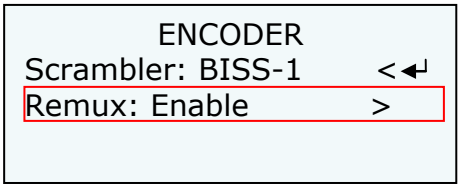
So as to introduce the key in the **AES-256 option**, follow these steps:

1. Choose the BISS-1 option in the Mode field.
2. Go one field down (SW) and press the OK button so as to be allowed to introduce the key.
3. With Left and Right buttons select one field and with UP, Down buttons choose one value from 0 to 9 or A to F. 256 bits in total.
4. Press the OK button to set the key.

The encryption is activated in the modulator and in the ASI output.

4.6.1.20 Remux (optional)

Remux option allows the transmitter to send up to 8 services multiplexed in one TS. The TS must be introduced in the ASI input.



Please, make sure that the TS parameters are different for each services. Then, the Encoder Output changes to manual bitrate when you enable Remux option. The modulator bitrate must be set to support the total bitrate; Manual bitrate + ASI input bitrate must be lower than the bitrate configured in the modulator.

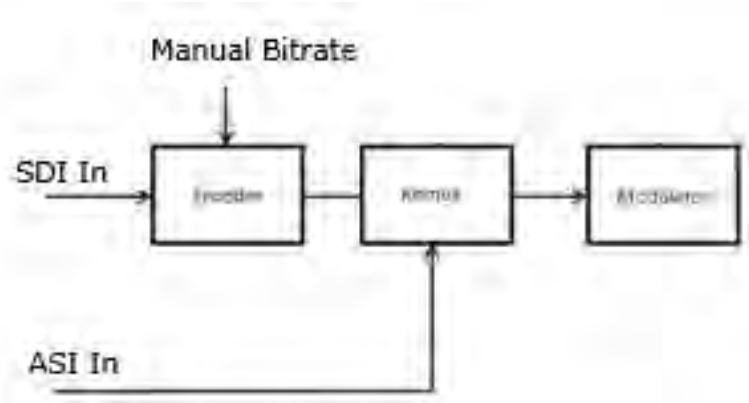


Figure 4.32: Remux work diagram

ASI input bitrate must be known.

You must configure the Modulator bitrate to be greater than the sum of the Manual Encoder bitrate plus ASI Input bitrate.

4.6.2 RF Menu

By using the Up, Down arrow keys, select the **RF** option and press the OK key.

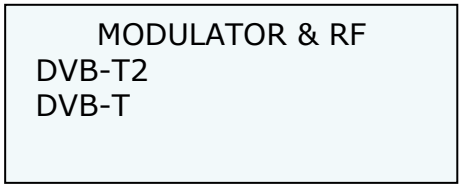
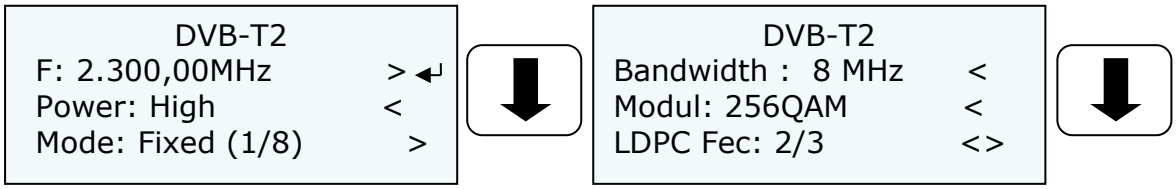


Figure 4.33: RF Menu

4.6.2.1 DVB-T2



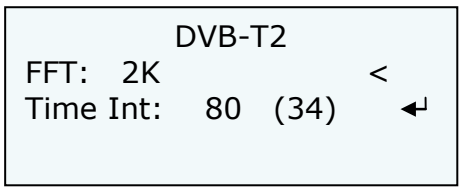


Figure 4.34: DVB-T2 Menu

Line nº	Function
1	**Frequency:** Select the frequency at which the signal is going to be transmitted.
2	**Power:** The output power is selectable here, the possible values are: ▪ Low ▪ Mid ▪ High * The power level of these values depends on the frequency band of the HDT-04. The information about the output power is given on page 16 of this manual.
3	**Mode:** Here the operation mode can be chosen. Use Right, Left buttons to select the desired value. The available options are: • Fixed 1/8: The guard Interval is configured to 1/8 and the receiver automatically detects the operation mode working on Fixed mode (packet switching reception). • Fixed 1/32: The guard Interval is configured to 1/32 and the receiver automatically detects the operation mode working on Fixed mode (packet switching reception). • Mobile 1/16: The guard Interval is configured to 1/16 and the receiver automatically detects the operation mode working on Mobile mode (MRC Diversity reception).
4	**Bandwidth:** Here the bandwidth of the transmitted signal can be chosen. Use Right, Left buttons so as to select the desired value. (eligible parameter) The available options are: ▪ 1.7 MHz ▪ 5 MHz ▪ 6 MHz ▪ 7 MHz ▪ 8 MHz

	Modulation: Here the constellation of the modulation can be chosen. Use the Right, Left buttons so as to select the desired constellation. (eligible parameter)
5	The available options are: ▪ QPSK ▪ 16QAM ▪ 64QAM ▪ 256QAM
	LDPC Fec: Here the value of the Forward Error Correction can be chosen. Use
6	the Right, Left buttons so as to select the desired value. (eligible parameter) The available options are: ▪ 1/2 ▪ 3/5 ▪ 2/3 ▪ 3/4 ▪ 4/5 ▪ 5/6
	FFT size: Here the number of FFT points can be chosen. Use Right, Left
7	buttons so as to select the desired buttons. (eligible parameter) The available options are: ▪ 1K ▪ 2K ▪ 4K
	Time Interleaving: This option indicates the number of time interleaver blocks per interleaving frame. (editable parameter) The user must select, in how many time interleaver blocks (TI_blocks) an interleaving frame is split.
8	Only the time interleaver mode 0 (TIME_IL_TYPE=0) is supported, so one interleaving frame always equates to exactly one OFDM frame. To desactivate the time interleaver, this parameter must be set to 0. To configure this option, press the OK button and then select with the Up and Down buttons the desired value.

Table 20: DVB-T2 menu option

4.6.2.2 DVB-T2 Maximum Bitrates

These maximum values are reached under the following conditions: 8 MHz channel, 8K mode, G.I.=1/128.

Modulation Scheme	Code Rate	Bit Rate (Mbps)
QPSK	1/2	7.0
	3/5	8.4
	2/3	9.4
	3/4	10.5
	4/5	11.3
	5/6	11.7
16 QAM	1/2	14.5
	3/5	17.5
	2/3	19.4
	3/4	21.8
	4/5	23.3
	5/6	24.3
64 QAM	1/2	21.5
	3/5	25.9
	2/3	28.8
	3/4	32.4
	4/5	34.6
	5/6	36.0
256 QAM	1/2	29.0
	3/5	34.9
	2/3	38.8
	3/4	43.7
	4/5	46.6
	5/6	48.6

Table 21: DVB-T2 Maximum Bitrate

4.6.2.3 DVB-T

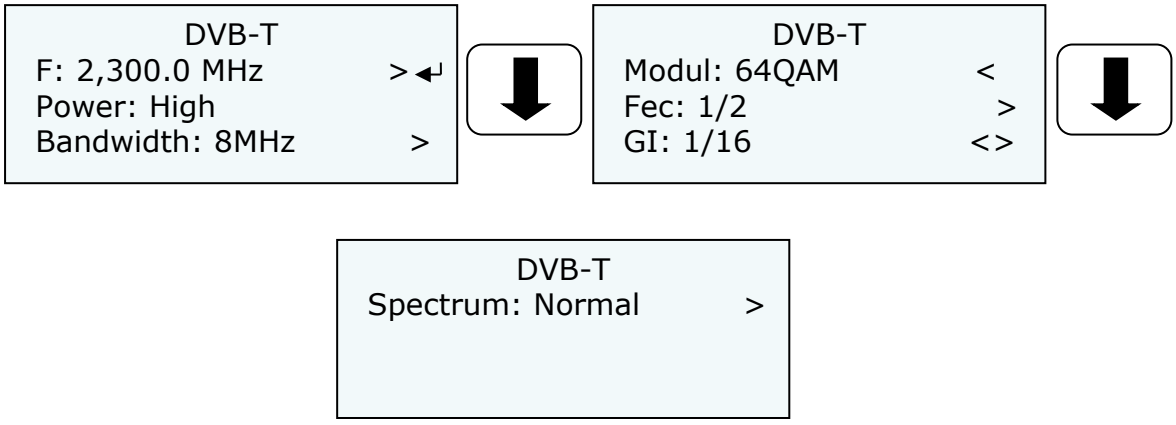


Figure 4.35: DVB-T Menu

Line nº	Function
1	**Frequency:** Select the frequency at which the signal is going to be transmitted.
2	**Power:** The output power is selectable here, the possible values are: ▪ Low ▪ Mid ▪ High * The power level of these values depends on the frequency band of the HDT-04. The information about the output power is given on page 16 of this manual.
3	**Bandwidth:** Here the bandwidth of the transmitted signal can be chosen. Use Right, Left buttons so as to select the desired value. (eligible parameter) The available options are: ▪ 5 MHz ▪ 6 MHz ▪ 7 MHz ▪ 8 MHz
4	**Modulation:** Here the constellation of the modulation can be chosen. Use Right, Left buttons so as to select the desired constellation. (eligible parameter) The available options are: ▪ QPSK ▪ 16QAM ▪ 64QAM

5	**Fec:** Here the value of the Forward Error Correction can be chosen. Use Right, Left buttons so as to select the desired value. (eligible parameter) The available parameters are: ▪ 1/2 ▪ 2/3 ▪ 3/4 ▪ 5/6 ▪ 7/8
6	**GI:** Here the Guard Interval value can be chosen. Use Right, Left buttons so as to select the desired value. (eligible parameter) The available options are: ▪ 1/8 ▪ 1/16 ▪ 1/32
7	**Spectrum:** Here the type of the spectrum is configured. Inverted spectrum is just another method to help preventing signal theft. Use Right, Left buttons so as to select the desired option. (eligible parameter) The available options are: ▪ Normal ▪ Invert

Table 22: DVB-T menu options

4.6.2.4 DVB-T Useful Bitrate

In this point, the useful bitrates are given for the 4K mode in the following tables and cover the 8 MHz, 7 MHz and 6 MHz channels.

In the following tables, the values in italics are approximate values for the given channel bandwidth.

Modulation	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*	*15,61*	*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*

Table 23: Useful bitrate (Mbit/s) for non-hierarchical systems in 8 MHz channels

Modulation	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	6,830	7,037
	3/4	6,532	7,257	7,684	7,917
	5/6	7,257	8,064	8,538	8,797
	7/8	7,620	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	15,240	16,934	17,930	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	26,390
	7/8	22,861	25,401	26,895	27,710

Table 24: Useful bitrate (Mbit/s) for non-hierarchical systems in 7 MHz channel

Modulation	Code rate	Guard interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	*3,732*	*4,147*	*4,391*	*4,524*
	2/3	*4,976*	*5,529*	*5,855*	*6,032*
	3/4	*5,599*	*6,221*	*6,587*	*6,786*
	5/6	*6,221*	*6,912*	*7,318*	*7,540*
	7/8	*6,532*	*7,257*	*7,684*	*7,917*
16-QAM	1/2	*7,465*	*8,294*	*8,782*	*9,048*
	2/3	*9,953*	*11,059*	*11,709*	*12,064*
	3/4	*11,197*	*12,441*	*13,173*	*13,572*
	5/6	*12,441*	*13,824*	*14,637*	*15,080*
	7/8	*13,063*	*14,515*	*15,369*	*15,834*
64-QAM	1/2	*11,197*	*12,441*	*13,173*	*13,572*
	2/3	*14,929*	*16,588*	*17,564*	*18,096*
	3/4	*16,796*	*18,662*	*19,760*	*20,358*
	5/6	*18,662*	*20,735*	*21,955*	*22,620*
	7/8	*19,595*	*21,772*	*23,053*	*23,751*

Table 25: Useful bitrate (Mbit/s) for non-hierarchical systems in 6 MHz channels

Modulation	Inner Code Rate	Guard interval			
		1 / 4	1 / 8	1 / 16	1 / 32
QPSK	1 / 2	3.110	3.456	3.659	3.770
	2 / 3	4.147	4.608	4.879	5.027
	3 / 4	4.665	5.184	5.189	5.655
	5 / 6	5.184	5.760	6.099	6.283
	7 / 8	5.443	6.048	6.404	6.598
16-QAM	1 / 2	6.221	6.912	7.318	7.540
	2 / 3	8.294	9.216	9.758	10.053
	3 / 4	9.331	10.368	10.978	11.310
	5 / 6	10.368	11.520	12.197	12.567
	7 / 8	10.886	12.096	12.807	13.195
64-QAM	1 / 2	9.331	10.368	10.978	11.310
	2 / 3	12.441	13.824	14.637	15.080
	3 / 4	13.996	15.551	16.466	16.965
	5 / 6	15.551	17.279	18.296	18.820
	7 / 8	16.329	18.143	19.211	19.793

Table 26: Useful bitrate (Mbit/s) for non-hierarchical systems in 5 MHz channels

4.6.3 Unit Menu

By using the Up, Down arrow keys, select the **Unit** option and press the OK key.

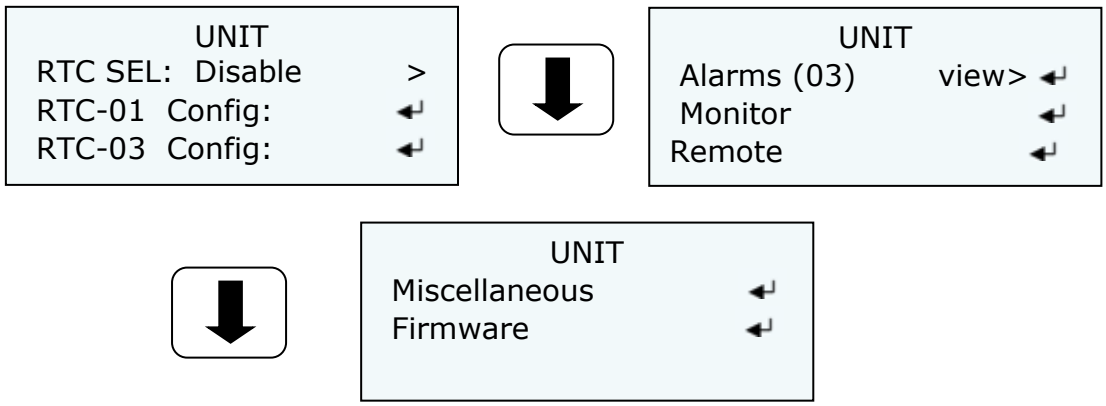


Figure 4.36:Unit Menu

4.6.3.1 Profile

In the RTC selection option, use the Right and Left buttons to select with remote control is going to be connected, RTC-01 or RTC-03, or disable it. Once you have selected the correct RTC model, press OK button to access to the profiles mode.

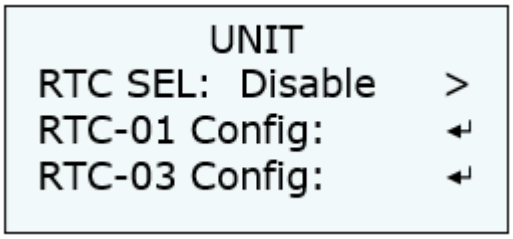


Figure 4.37:Unit Profile Menu

- Disable:

  The HDT-04 transmitter works without the Profile option.

- RTC-01:

  Select this option when RTC-01 is used.

- RTC-03:

  Select this option when the RTC-03 is used.

4.6.3.1.1 RTC-01 Remote Control Screen

When we enter in the RTC-01 profile, the profile selection screen will appear:

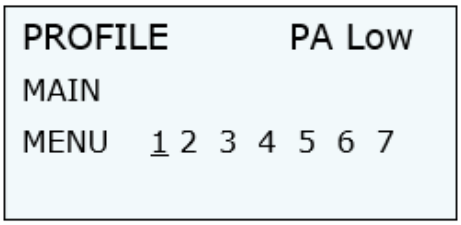


Figure 4.38: Profile Selection

This screen enables the user to choose one of the profiles that have been previously configured.

If one of the profiles is selected, a line under the profile number will appear and the device will be ready to work in that configuration. To access the profile and see its configuration, the down button must be pressed for a short time.
It is also possible to access to the main screen of a profile. By pressing the up button for a short time.

Alarms are displayed if you press OK button for a short time.

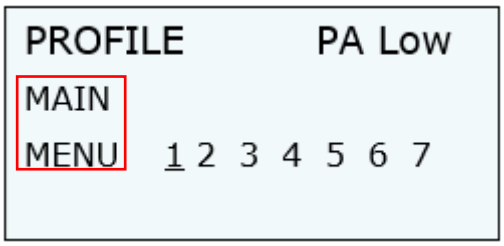


Figure 4.39: Profile selected

To return to the Main menu click on MAIN MENU.

After entering the Main menu, the parameters can be configured from the Web Server.

4.6.3.1.2 RTC-03 Remote Control Screen

When we enter in the RTC-03 profile, the channel selection screen will appear:

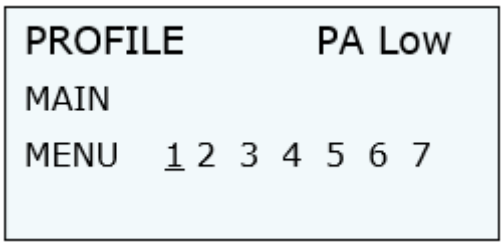


Figure 4.40: Profile Selection

This screen enables the user to choose one channel from the channel group that has been previously configured.

If one of the channels is selected, a line under the channel number will appear and the device will be ready to work in that configuration. To access to the channel and see its configuration, the down button must be pressed for a short time.
It is also possible to access to the main screen of a channel by pressing up button for a short time.
Alarms are displayed if you press OK button for a short time.
The output power configured on the RTC-03 is shown on the main screen of the channel selection.

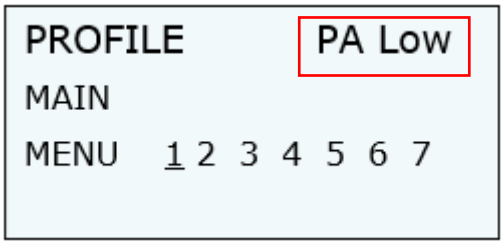


Figure 4.41: Profile selected

To return to the Main menu and change the HDT-02 configuration, press Main Menu. You will get out of the remote operation mode.

While the user is controlling the Transmitter via a Remote control, Web Server is not accessible.

4.6.3.2 RTC-01 Config

In this option, RTC-01 presets can be configured. Select RTC-01 Config option and then by pressing the OK button, the available profiles will be displayed. There are seven profiles available and can be enabled or disabled.

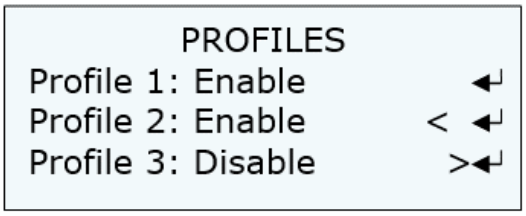
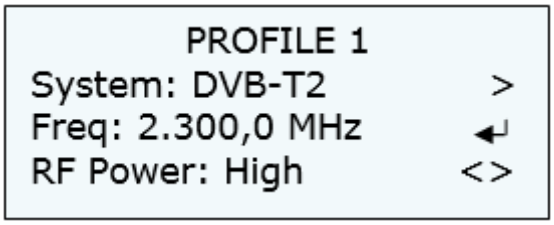
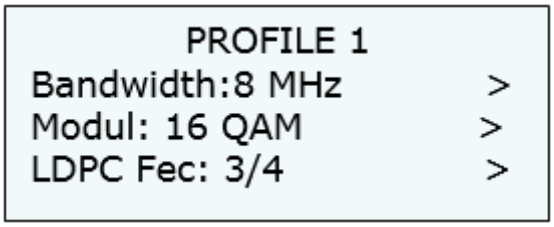
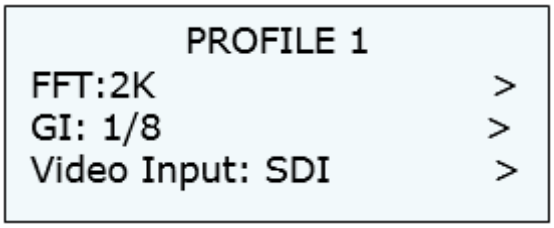


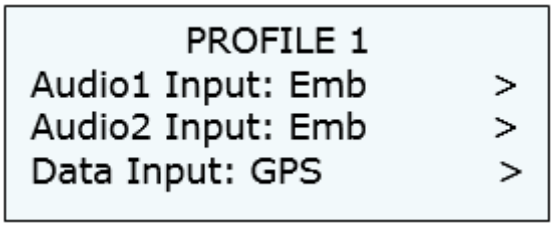
Figure 4.42: Profile Config Menu

Select a profile and then press the OK button to configure the parameters related to it:








PROFILE 1
Audio1 Input: Emb >
Audio2 Input: Emb >
Data Input: GPS >
PROFILE 1
GPS:On < Ant5V: On ↵
KLV Metadata: Off >
Video Delay: Std >
PROFILE 1
GPS:On < Ant5V: On ↵
KLV Metadata: Off >
Video Delay: Std >
PROFILE 1
Program Nº: 2 ↵
Video PID: 200 ↵
Audio1 PID: 201 ↵
PROFILE 1
Audio2 PID: 202 ↵
Data PID: 203 ↵
GPS PID: 206 ↵
PROFILE 1
Alarm PID:207 ↵
PMT PID:204 ↵
PCR PID:205 ↵

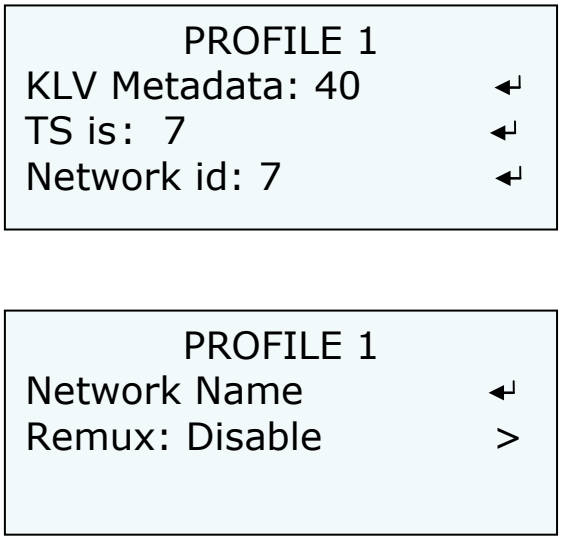


Figure 4.43: Profile 1 Menu

Line nº	Function
1	**System:** Select the type of the transmission system with the Right and Left buttons. (eligible parameter) There are two options available: • DVB-T2 • DVB-T
2	**Frequency:** Select the frequency at which the signal is going to be transmitted. Press the OK button and with Up, Down keys configure the desired value. (editable parameter)
3	**Power:** Output power is fixed to high on the profiles.
4	**Bandwidth:** Select the desired bandwidth with the Right and Left buttons. (eligible parameter) There are five options available: • 1.7 MHz (Only DVB-T2) • 5 MHz • 6 MHz • 7 MHz • 8 MHz
5	**Modulation:** In this field, the modulation must be chosen with the Right and Left buttons. (eligible parameter) The available options are: • QPSK • 16QAM • 64QAM • 256QAM (Only DVB-T2)
6	**LDPC Fec:** Select the desired FEC value with the Right and Left buttons. (eligible parameter) The available options are: • 1/2 • 3/5 • 2/3 • 3/4 • 4/5 • 5/6 • 7/8

7	**FFT:** Select the desired FFT value with the Right and Left buttons. (eligible parameter) The available options are: • 1K • 2K • 4K All options are not available with all modulation parameters.
8	**Guard Interval:** Select the desired GI value with the Right and Left buttons. (eligible parameter) The available options are: • 1/8 • 1/16 • 1/32
9	**Video Input:** In this field, the video input must be chosen with the Right and Left buttons. (eligible parameter) The available options are: • SDI • HDMI • CVBS • ASI • Generator
10	**Audio1 Input**: In this field, the sort of audio signal introduced in the audio 1 input can be chosen with right and left buttons. (eligible parameter) The available options are: • Embedded • Analogue • AES-EBU • Tone.Gen • None

11	**Audio2 Input:** In this field, the sort of audio signal introduced in the audio 2 input can be chosen with right and left buttons. (eligible parameter) The available options are: • Embedded • Analogue • AES-EBU • Tone.Gen • None
12	**Data Input:** In this field, the data input must be chosen with the Right and Left buttons. (eligible parameter) The available options are: • RS-232 • 4K board • None
13	**GPS:** In this field, the GPS data can be enabled or disabled using Right and Left buttons. The available options are: • On • Off **ANT 5V:** In this field, you can activate 5V to feed the GPS antenna by pressing Ok button.
14	**KLV Metadata:** In this field, the KLV metadata can be enabled or disabled.
15	**Video Delay:** In this field, the delay of the coding process is configured. To select the desired delay, press Right, Left arrows buttons. (eligible parameter) The available options are: • Standard • Super Low Delay (2 frames of delay) • Ultra Low Delay (1 frame of delay)

16	**Video Profile:** In this field, the codification profile can be configured. To select the desired profile, press Right, Left arrows buttons. (eligible parameter) The available options are: • 4.2.0 • 4.2.2
17	**Scrambler:** Select the desired encryption with the Right and Left buttons. (eligible parameter) There are five options available: • None • Biss-1 • Biss-E • AES-128 (optional) • AES-256 (optional)
18	**Service Name**: Set the name of the service. (editable parameter)
19	**Program Number:** Here the program number must be entered. (editable parameter)
20	**Video PID:** Here the video packet identifier must be entered. (editable parameter)
21	**Audio 1 PID:** Here the audio 1 packet identifier must be entered. (editable parameter)
22	**Audio 2 PID:** Here the audio 2 packet identifier must be entered. (editable parameter)
23	**Data PID:** Here the data packet identifier must be entered. (editable parameter)
24	**GPS PID:** Here the GPS data packet identifier must be entered. (editable parameter)
25	**Alarm PID:** Here the Alarm data packet identifier must be entered. (editable parameter)
26	**PMT PID:** Here the program map tables packet identifier must be entered. (editable parameter)
27	**PCR PID:** Here the program clock reference packet identifier must be entered. (editable parameter)
28	**KLV Metadata:** Here the KLV Metadata packet identifier must be entered.

29	**TS id:** In this field the Transport Stream identifier must be set. (editable parameter)
30	**Network id:** In this option the network identifier must be specified.
31	**Network Name:** Specify the name of the network. (editable parameter)
32	**Remux:** You can enable or disable Remux mode with Right and Left buttons.

Table 27: Profile menu options

4.6.3.3 RTC-03 Config

In this option, a profile can be configured. Select RTC-03 Config option and then by pressing the OK button, the available profiles will be displayed. There are seven profiles available and can be enabled or disabled.

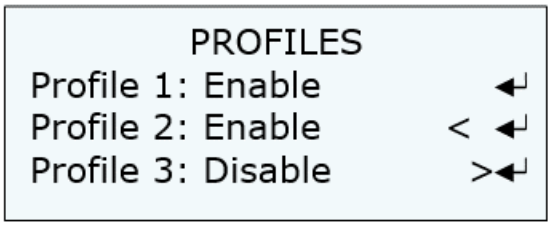
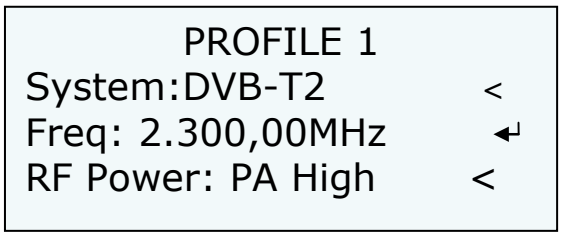
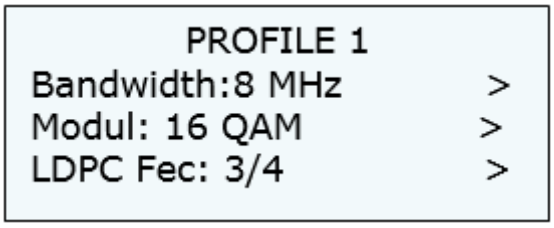
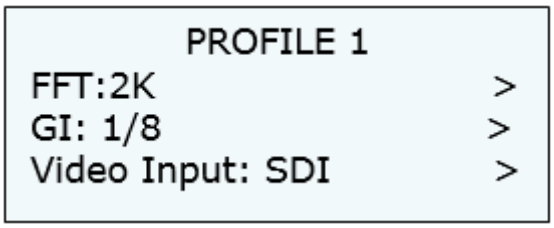


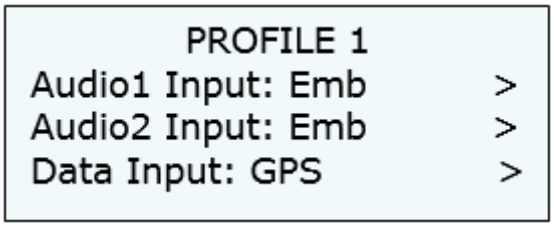
Figure 4.44: Profile Config Menu

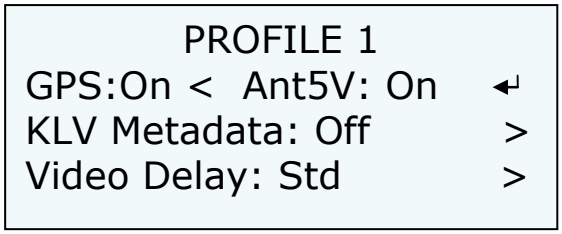
Select a profile and then press the OK button to configure the parameters related to it:

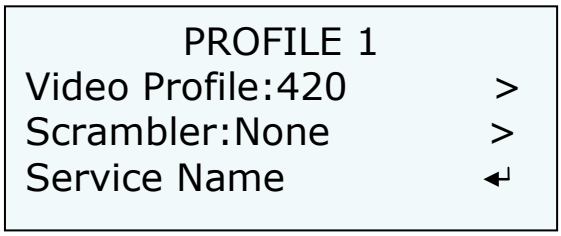


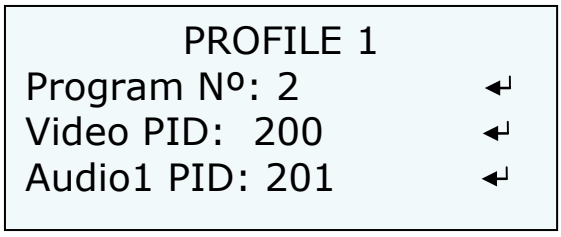


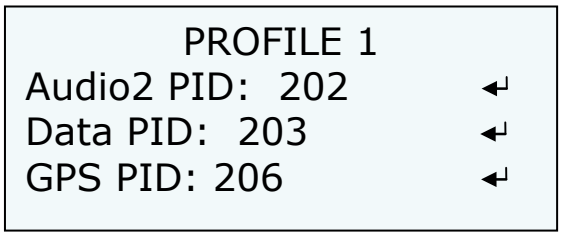


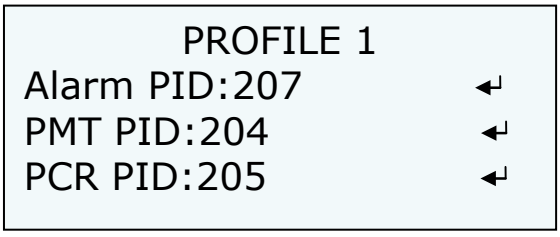



PROFILE 1
GPS:On < Ant5V: On ↵
KLV Metadata: Off >
Video Delay: Std >


PROFILE 1
Video Profile:420 >
Scrambler:None >
Service Name ↵


PROFILE 1
Program Nº: 2 ↵
Video PID: 200 ↵
Audio1 PID: 201 ↵


PROFILE 1
Audio2 PID: 202 ↵
Data PID: 203 ↵
GPS PID: 206 ↵


PROFILE 1
Alarm PID:207 ↵
PMT PID:204 ↵
PCR PID:205 ↵

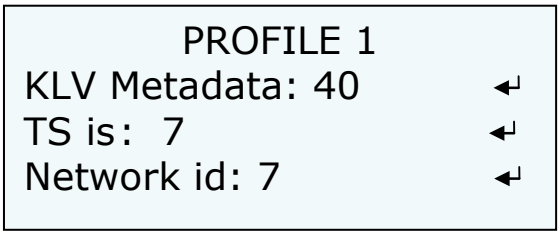

PROFILE 1
KLV Metadata: 40 ↵
TS is: 7 ↵
Network id: 7 ↵

Figure 4.45: Profile 1 Menu

Line nº	Function
1	**System** (eligible parameter)**:** Select the type of the transmission system with the Right and Left buttons. There are two options available: • DVB-T2 • DVB-T
2	**Frequency** (editable parameter)**:** Select the frequency at which the signal is going to be transmitted. Press the OK button and with Up, Down keys configure the desired value.
3	**RF Power:** Select the output power with the Right and Left buttons. There are three options available: • LOW • MID • HIGH When the transmitter is controlled via the RTC-03 or RS-485 operation, the output power is controlled remotely by the external device and not by the configuration on the profile.
4	**Bandwidth** (eligible parameter)**:** Select the desired bandwidth with the Right and Left buttons. There are five options available: • 1.7 MHz (Only DVB-T2) • 5 MHz • 6 MHz • 7 MHz • 8 MHz
5	**Modulation** (eligible parameter)**:** In this field, the modulation must be chosen with the Right and Left buttons. The available options are: • QPSK • 16QAM • 64QAM • 256QAM (Only DVB-T2)

6	**LDPC Fec** (eligible parameter)**:** Select the desired FEC value with the Right and Left buttons. The available options are: • 1/2 • 3/5 • 2/3 • 3/4 • 4/5 • 5/6 • 7/8
7	**FFT** (eligible parameter)**:** Select the desired FFT value with the Right and Left buttons. The available options are: • 1K • 2K • 4K All options are not available with all modulation parameters.
8	**Guard Interval** (eligible parameter)**:** Select the desired GI value with the Right and Left buttons. The available options are: • 1/4 • 1/8 • 1/16 • 1/32
9	**Video Input** (eligible parameter)**:** In this field, the video input must be chosen with the Right and Left buttons. The available options are: • SDI • HDMI1 • HDMI2 • CVBS • ASI • Generator

10	**Audio1 Input** (eligible parameter)**:** In this field, the sort of Audio signal introduced in the Audio 1 input can be chosen with right and left buttons. The available options are: • Embedded • Analogue • AES-EBU • Tone.Gen • None
11	**Audio2 Input** (eligible parameter)**:** In this field, the sort of Audio signal introduced in the Audio 2 input can be chosen with right and left buttons. The available options are: • Embedded • Analogue • AES-EBU • Tone.Gen • None
12	**Data Input** (eligible parameter)**:** In this field, the data input must be chosen with the Right and Left buttons. The available options are: • RS-232 • 4k Board • None
13	**GPS:** In this field, the GPS data can be enabled or disabled using Right and Left buttons. The available options are: • On • Off **ANT 5V:** In this field, you can activate 5V to feed the GPS antenna by pressing Ok button.
14	**KLV Metadata** (eligible parameter)**:** In this field, the KLV metadata can be enabled or disabled.

15	**Video Delay** (eligible parameter)**:** In this field, the delay of the coding process is configured. To select the desired delay, press Right, Left arrows buttons. The available options are: • Standard • Super Low Delay (2 frames of delay) • Ultra Low Delay (1 frame of delay)
16	**Video Profile** (eligible parameter)**:** In this field, the codification profile can be configured. To select the desired profile, press Right, Left arrows buttons. The available options are: • 4.2.0 • 4.2.2
17	**Scrambler** (eligible parameter)**:** Select the desired encryption with the Right and Left buttons. There are five options available: • None • Biss-1 • Biss-E • AES-128 (optional) • AES-256 (optional)
18	**Service Name** (editable parameter): Set the name of the service.
19	**Program Number** (editable parameter): Here the program number must be entered.
20	**Video PID** (editable parameter): Here the video packet identifier must be entered.
21	**Audio 1 PID** (editable parameter): Here the Audio 1 packet identifier must be entered.
22	**Audio 2 PID** (editable parameter): Here the Audio 2 packet identifier must be entered.
23	**Data PID** (editable parameter): Here the data packet identifier must be entered.

24	**GPS PID** (editable parameter): Here the GPS packet identifier must be entered.
25	**ALARM PID** (editable parameter): Here the Alarms packet identifier must be entered.
26	**PMT PID** (editable parameter): Here the program map tables packet identifier must be entered.
27	**PCR PID** (editable parameter): Here the program clock reference packet identifier must be entered.
28	**KLV Metadata** (editable parameter): Here the KLV Metadata packet identifier must be entered.
29	**TS id** (editable parameter): In this field the Transport Stream identifier must be set.
30	**Network id** (editable parameter): In this option the network identifier must be specified.
31	**Network Name** (editable parameter): Specify the name of the network.
32	**Remux:** You can enable or disable remux mode with Right and Left buttons.

Table 28: Profile menu options

4.6.3.4 Alarms

In this section, you can View and Configure the Alarms shown by the Transmitter. You can select view or configure an alarms by pressing Left and Right arrows.
The alarm screen can be accessed by pressing the OK button from the main screen as well. To return to the main screen from the alarm screen, the Cross button must be pressed.
The different alarms that configured in the transmitter are:

- High Voltage
- Low Voltage
- High Temperature
- ASI Overflow: this alarm means that the input bit rate is higher than the one that can be modulated due to the parameters configured (constellation, FEC, GI...).
- No SDI Input: Video source is not connected.
- No HDMI Input: Video source is not connected.
- No CVBS Input: Video source is not connected.
- No ASI Input: ASI source is not connected.
- No Audio 1 Input: Audio source is not connected.
- No Audio 2 Input: Audio source is not connected.
- No GPS: GPS source is not connected.
- No RS232: : RS232 data source is not connected.
- No KLV
- PA No Forward
- PA Rev High
- PA Volt Low
- PA Temp High
- WeightOnWheels
- TS video Error

4.6.3.5 Monitor

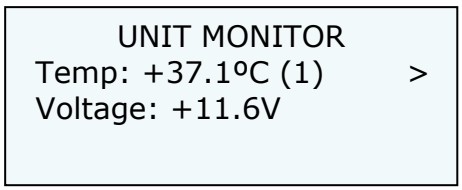


Figure 4.46: Unit Monitor Menu

- **Temperature:**

In this field, the internal temperature of the device is displayed. With the Right, Left keys, the user can select if the temperature is shown in ºC or in ºF.

- **Voltage:**

In this field, the voltage of the transmitter is shown. (reading parameter)

4.6.3.6 Remote

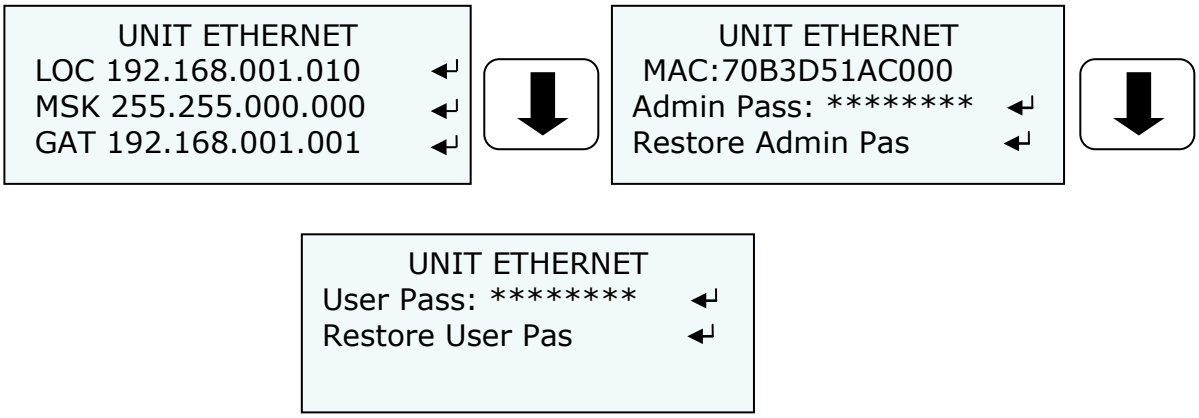


Figure 4.47: Unit Remote Menu

Line nº	Function
1	**Local IP:** In this option it can be set the IP address of the device in case it is wanted to control the device remotely. So as to change the IP address first press OK button and then, with the Up and Down keys select the desired number. So as to change from one character to another, press Right and Left keys. Press the OK button so as to save the introduced value. (editable parameter)
2	**Subnet Mask:** Here it can be written the Subnet Mask address of the device. So as to change the Subnet Mask address first press the OK button and then, with the Up and Down keys select the desired number. So as to change from one character to another, press Right and Left keys. Press the OK button so as to save the introduced value. (editable parameter)
3	**Gateway:** In this option, the address of the Gateway must be written. So as to change the Gateway address first press OK button and then, with the Up and Down keys select the desired number. So as to change from one character to another, press Right and Left keys. Press the OK button so as to save the introduced value. (editable parameter)
4	**MAC ADDRESS** The MAC address of the device is shown. (reading parameter)
5	**Admin Pass:** The administrator's password is introduced. It can be set an own password which is a list of 8 digits. To set the password, press the OK button and the use the Up and Down button to establish the desired value, the press Right and Left buttons to change other digits. Finally press the OK button to save the introduced values.
6	**Restore Admin Pass:** This option enables to restore the default administrator password (00000000).

7	**User Pass:** The user's password is introduced. It can be set an own password which is a list of 8 digits. To set the password, press the OK button and then use the Up and Down button to establish the desired value, the press Right and Left buttons to change other digits. Finally press the OK button to save the introduced values.
8	**Restore User Pass:** This option enables to restore the default user password (00000000).

Table 29: Unit Remote menu options

4.6.3.7 Miscellaneous

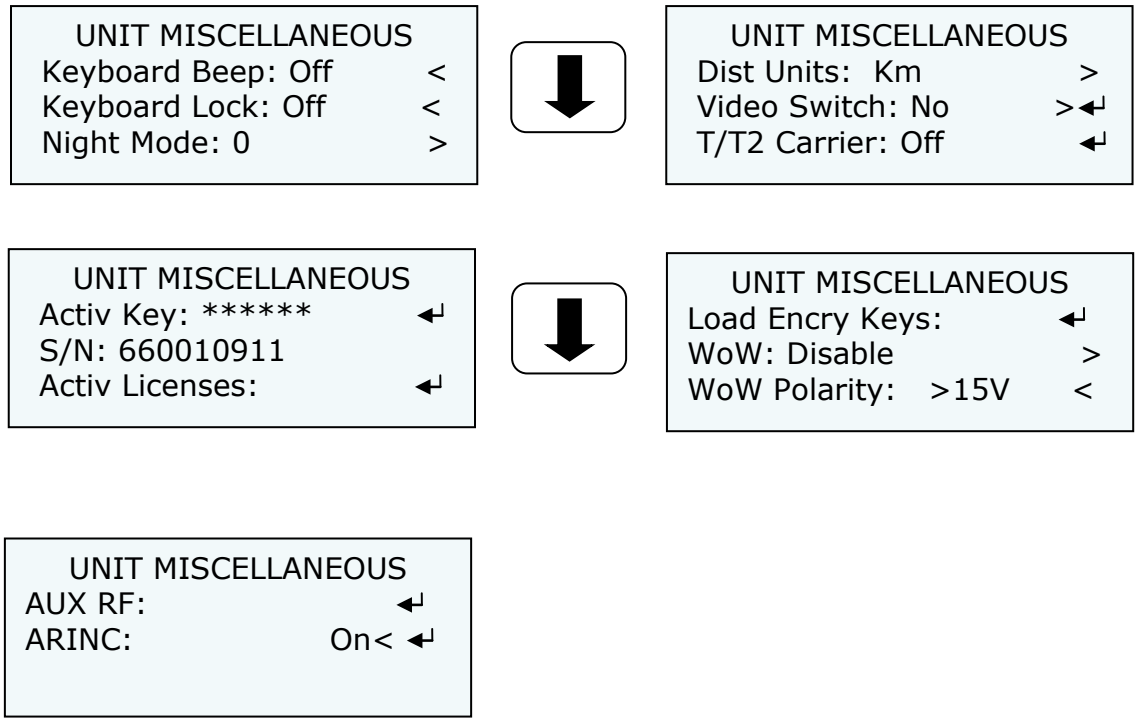


Figure 4.48: Miscellaneous Menu

Line nº	Function
1	**Keyboard Beep:** If the On option is selected then, each time a key is pressed a beep sound will appear. If the Off option is selected then, there will be no sound when a key is pressed. (eligible parameter) The available options are: ▪ On ▪ Off
2	**Keyboard Lock:** If the On option is selected and then, the buttons of the equipment remain for 5 minutes without being pressed, a message will appear in the screen saying that the keyboard is locked. Pressing the cross button, the keyboard can be unlocked. If the Off option is selected there will be no messages in the screen. The available options are: ▪ On ▪ Off
3	**Night Mode:** There are four possible states for the night mode. If night mode is in state 0 then the light in the screen will shine more than if it is in state 1. If the state is three then, the light in the screen will be the lowest of the four possible states. (eligible parameter) The available options are: ▪ 0 ▪ 1 ▪ 2 ▪ 3
4	**Distance Units:** If miles is selected then, all the distances will be in miles and the same occurs if kilometres is selected. (eligible parameter) The available options are: ▪ Kilometres ▪ Miles

5	**Video switch:** This option permits you to automatically switch the input signal source once the configured time for the signal source has ended. The configured video sources are changed in a looped sequence.
6	**T/T2 Carrier:** The RF output is carrier only without modulation, the available options are: • On: The carrier is shown for 1 minute • Off: The option is disabled.
7	**Activation Key** In this field, you can activate your license. You can set the activation key by pressing the up and down buttons. It must have 8 alphanumeric characters.
8	**S/N** In this field the serial number of the device is shown (reading parameter).
9	**Activ Licenses:** In this field you can enter the license code for the following optional features: • AES • KLV • Remux • Internal GPS Once the code has been introduced, the licence is enabled on the unit. You can use this menu to check which licenses are enabled on this unit. **For a new license code, please contact us.**
10	**Activation Key** (editable parameter)**:** In this field, you can activate your license. You can set the activation key by pressing the up and down buttons. It must have 8 alphanumeric characters.

11	**WoW Weight on Wheels** (eligible parameter)**:** The available options are: • On: Wow is enabled. When the aircraft lands the RF is automatically disconnected. • Off: The option is disabled.
12	**WoW Weight on Wheels Polarity** (eligible parameter)**:** The available options are: • >15 VDC • <15 VDC
13	**AUX RF:** In this field, by pressing the OK button you can select between the following options for the auxiliary band of the transmitter: • Disabled (Standard High Power Transmitter) • AUX RF (by default it is 1.9 to 2.8 GHz) (Other auxiliary bands under request, please contact us) • L-band *When L-band or Aux RF are selected, the main menu of RF menu changes automatically to configure these parameters.
14	**ARINC (Optional):** The available options are: • On: ARINC data reception is enabled. If you press OK you can enable or disable GPS labels. • Off: The option is disabled.

Table 30: Unit Miscellaneous menu options

4.6.3.7.1 ARINC-429 (Optional)

The HDT-04 can be remotely configured via ARINC-429 commands.
It features can also be used to transmit GPS frames through the ARINC 429 interface.

There are 4 labels that can be sent to the transmitter; Latitude, Longitude, Height and RF.

Three of these labels are for GPS management and are sent to the receiver through the transmitter's GPS channel.

For these labels the data format is defined by the ARINC standard:

Label Code (Octal)	Name	Units	Range	Sig Bits	Resolution
310	Latitude	Deg/180	0-180N/0-180S	20	0.000172
311	Longitude	Deg/180	0-180E/0-180W	20	0.000172
204	Altitude	Feet	131072	17	31.3

Table 31: ARINC 429 GPS labels

The label code can be modified in the transmitter setup menu. The user can also read the value received or enable/disable the reception of this data.

RF label for controlling some parameters of the transmitter is also available. The parameters that can be controlled are:

- Profile Selection.
- RF On/Off.
- Standby.
- PA power.

The format designed for the RF label is:

Bit 32: Parity bit (odd parity).
Bits 31-29: Profile select (0 to 7)
Bit 28: RF On/Off (1 On, 0 Off)
Bit 27: Standby (1 standby, 0 On)
Bits 26-25: PA power (0 Low, 1 Mid, 2 High)
Bits 24-8: Reserved.
Bits 7-0: Label (371 octal)

4.6.3.8 Firmware

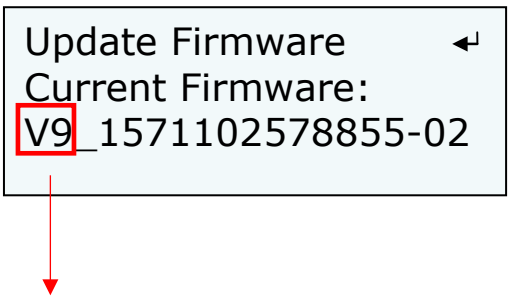


Figure 4.49:Firmware Menu

Line nº	Function
1	**Update Firmware:** This field is the one for updating the version of the device. So as to update the equipment properly, follow the instructions below.
2	**Current Firmware:** In this field, the number of the version installed in the device is shown. The characters which describe the number of the version are the one inside the red box shown in the figure above. The rest of the characters are important for the manufacturer but are not important for the user.

Table 32: Firmware menu options

Next, the necessary steps to make a successful update are explained.

1) The latest firmware is allocated in the website of SVP Broadcast Microwave. So as to access to the firmware file, first enter www.svpbm.com in your web browser.

2) Click on the Support tab.

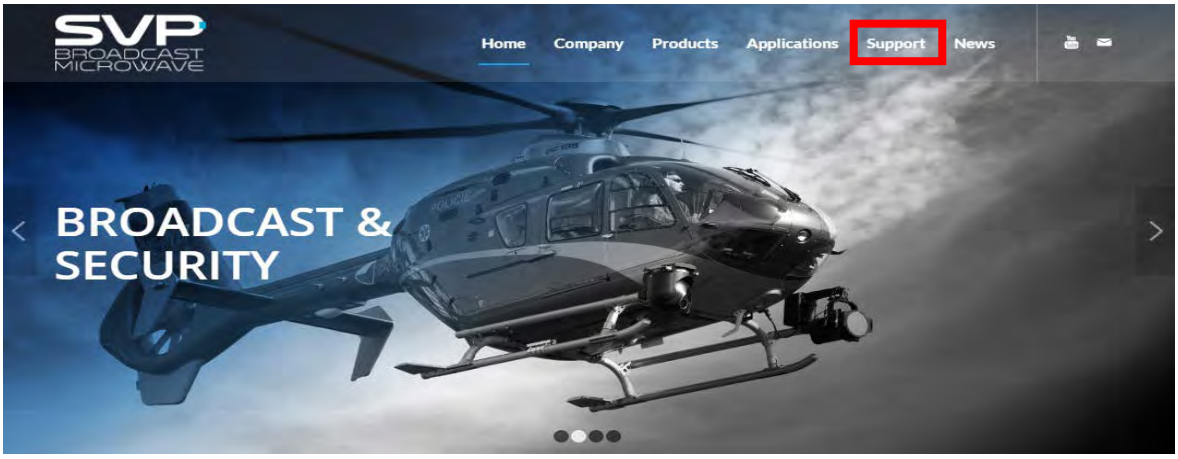


Figure 4.50: Updating firmware step 2

3) Click on Firmware.

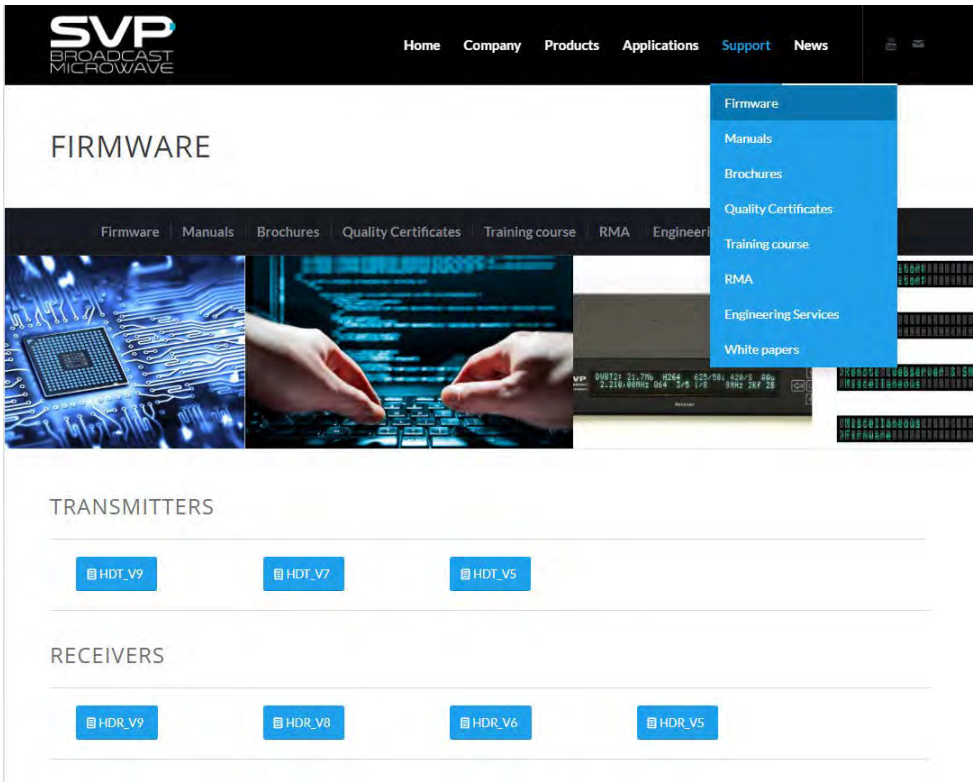


Figure 4.51: Updating firmware step 3

4) Go to TX_Firmware.

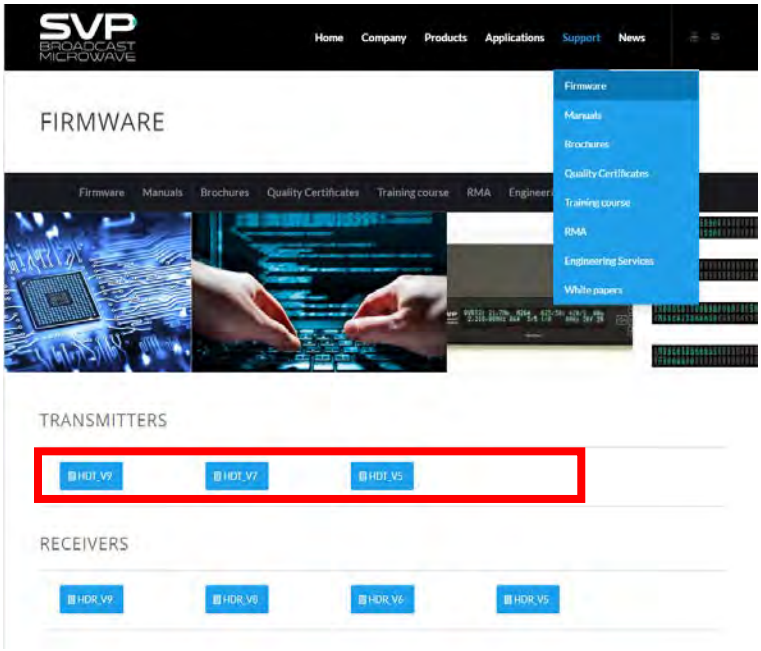


Figure 4.52: Updating firmware step 4

5) Press the version of the transmitter model needed (version of the equipment) so as to download the file.

To verify the version of the transmitter, go to firmware field and then look at the current firmware to check the number of the version installed in the device (the first two digits).

Figure 4.53: Updating firmware step

6) Once the firmware file has been downloaded, save it in a USB device.

In the USB device, the only file that can be allocated inside it is the firmware file of the device to be updated.

7) With the equipment completely powered off (**with no power supply**), insert the USB device in the USB connector, situated in the rear panel.

Before introducing the USB device, remove the power supply of the equipment.

8) Now, switch on the device.

9) Go to Unit menu. In case of being in the main screen, press cross button so as to access to the menu. There, with the Up, Down buttons, select the Unit option.

10) Select Firmware by pressing the OK button.

11) Select Check USB Memory with the OK button.

12) Now, automatically the device updates the firmware. The screens which are shown below display the different steps that the device makes while the updating process is taking place.

Don't power off the device during the updating process.

Chapter 5: GPS Application

5.1 Introduction

The HDT-04 transmitter has an integrated GPS receiver, it is needed to connect an external GPS antenna to the SMA connector, this antenna can be active or passive.

Once the information is kept inside the device, it can be sent to the HDR receiver. If the signal arrives correctly to the receiver system, then the HDR will have all the GPS data available and this receiver device will be able to calculate the direction, distance and positioning of the transmitter.

The HDR receiver also includes another feature that consists of an output RS232 connection which allows watching through Google Maps application the position of the transmitter in real time.

Figure 5.1: HDT-04 transmitter with the GPS antenna

5.2 Main Screen

Next it is explained the value of the data field which appears in the main screen of the HDT-04 transmitter.

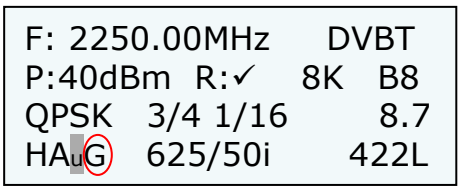


Figure 5.2: Main Screen

The data status field indicates with a darkened X that it is disabled. When this parameter is enabled and blinkers, this means that there is nothing connected to the data input. When this field alternates the value between 'g' and 'G', it means that it is trying to get the GPS satellites. If the 'G' does not vary, then it is connected to the satellites.

5.3 GPS Transmitter Screen

When an external GPS receiver is connected, to access the GPS screen, go to the encoder option in the menu. Once inside this option, go to the Data field and choose GPS External. Press the OK button and then the GPS screen appears.

When the internal GPS receiver is being used, to access the GPS screen, go to the encoder option in the menu. Once inside this option, go to the Data field and choose GPS Internal. Go to GPS info and press the OK button.

The format of the GPS coordinates used is decimal minutes as shown in the next example:

N43º02.032'
W023º03.023'

Next there the different field meanings are shown.

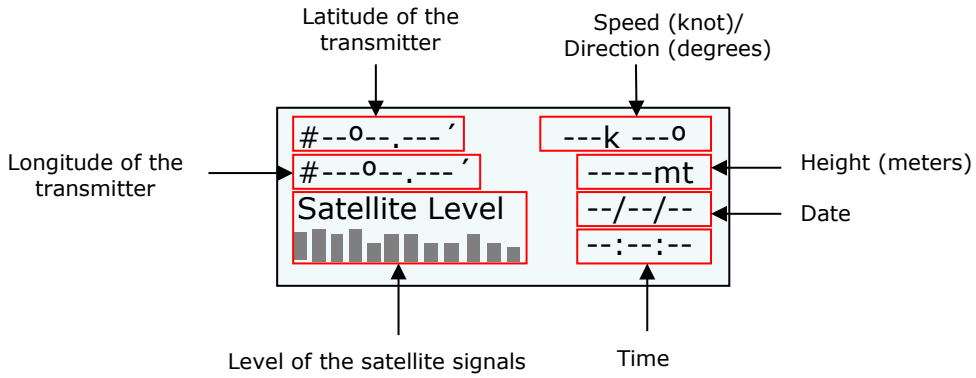


Figure 5.3: GPS transmitter screen

- **Latitude of the transmitter:** It specifies the latitude position of the transmitter.
- **Speed of the transmitter:** It shows the speed of the transmitter in knot.
- **Direction of the transmitter:** The direction of the transmitter is shown in this field.
- **Longitude of the transmitter:** It specifies the longitude position of the transmitter.
- **Height of the transmitter:** The height of the transmitter from ground is specified in this value.

- **Satellite Level:** The level of each satellite signal received is shown in this field.
- **Date:** The updated date is shown.

5.4 Application Example 1 – Constant Positioning

Suppose the transmitter device is on an aeroplane and the constant positioning of the vehicle is wanted to be known. This is achievable with the next items:

- HDT-04 transmitter
- GPS antenna
- HDR-108 receiver

With the GPS antenna connected to the HDT-04 transmitter, positioning of the aeroplane is achieved once the GPS system is connected to the necessary satellites. Data obtained in the transmitter is the positioning of the aeroplane. Next, this GPS data is sent to the HDR-108 receiver. When this signal arrives to the receiver, the HDR-109 shows in its screen some GPS values like:

- Transmitter positioning
- Transmitter direction
- Distance from receiver to transmitter

Above this paragraph a picture of this system is shown:

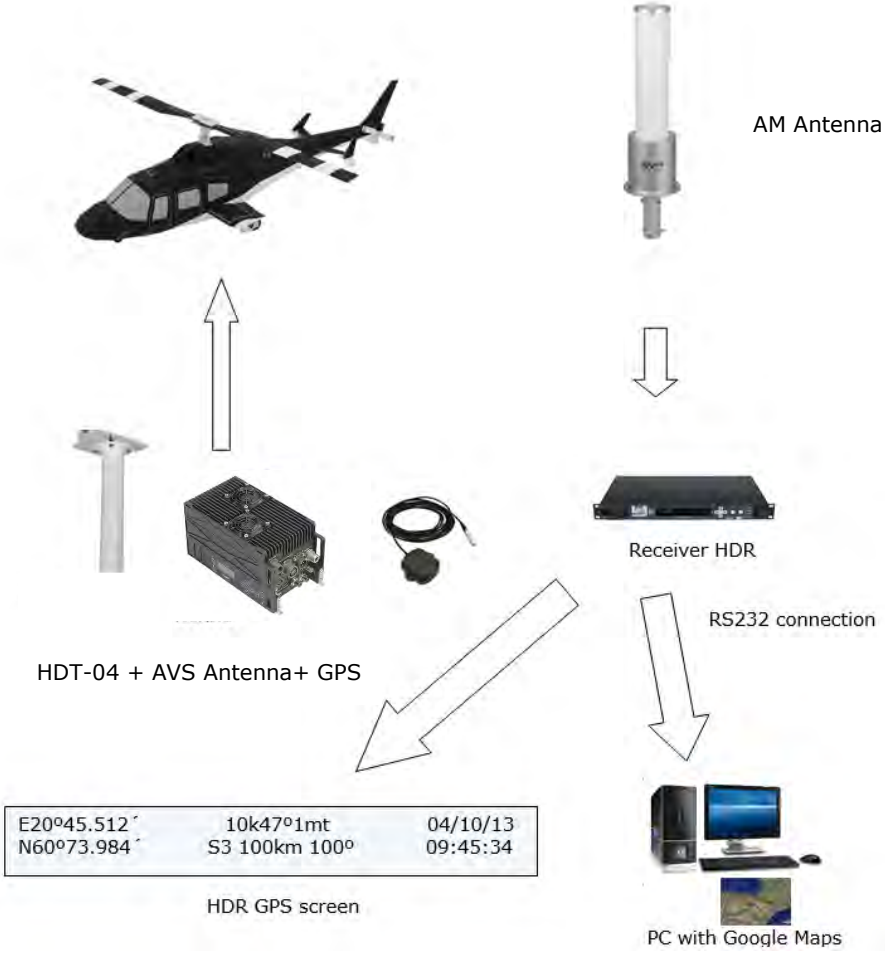


Figure 5.4: PS system example 1 picture

Chapter 6: Lau-K Application

6.1 Introduction

This chapter describes the control and operation of a transmitter when we connect an external Lau-k family encoder to it.

Once communication via the data channel is established between the transmitter and the encoder, the transmitter Encoder menu will automatically change to control the Lau-K encoder.

6.2 4K SDI video encoding

Once the device is connected to the Lau-K encoder, the transmitter encoder menu will show the following options:

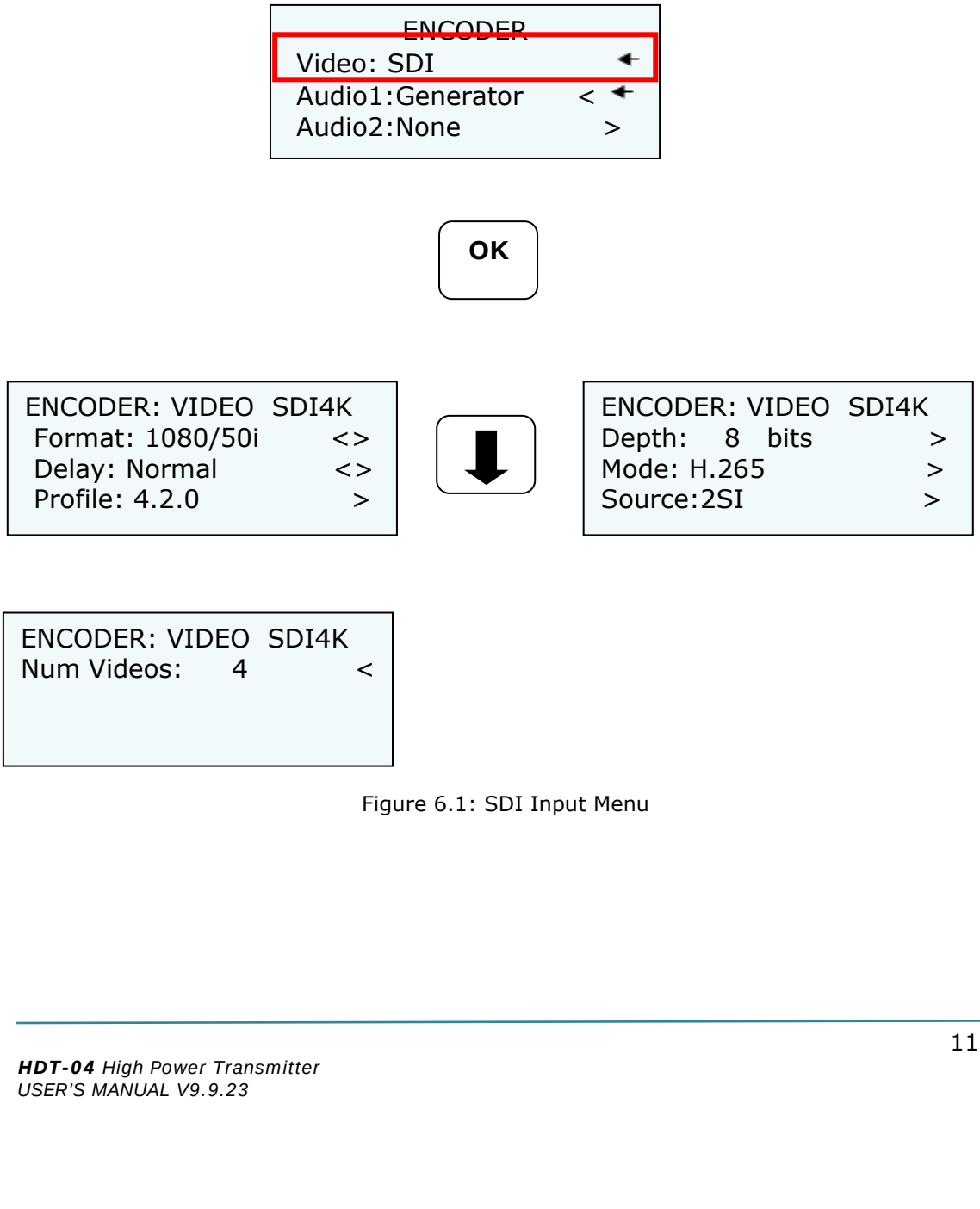


Figure 6.1: SDI Input Menu

Line nº	Function
1	**Format (SDI):** In this field, the format of the SDI input signal is displayed. (reading parameter) The available options are: ▪ 2160p - 23.98/24/25/29.97/30/50/59.94/60 ▪ 720p - 50/59.94/60 ▪ 1080i - 50/59.94/60 ▪ 1080p - 23.98/24/25/29.97/30/50/59.94/60 ▪ 480i - 29.97 ▪ 576i - 25
2	**Delay:** In this field, the delay of the coding process is configured. So as to select the desired delay, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ Normal ▪ Low Delay ▪ Ultra Low Delay
3	**Profile:** In this field, the video chroma format can be configured. So as to select the desired profile, press Right, Left arrows buttons. (eligible parameter) The available options are: ▪ 4.2.0 ▪ 4.2.2
4	**Depth:** In this field, the video bit depth can be configured. (eligible parameter) The available options are: ▪ 8 bits ▪ 10 bits

5	**Mode:** In this field, the mode of the encoder can be configured. The available options are: • H.265 • H.264 • Mpeg2
6	**Source:** In this field, the input format can be configured. The available options are: • 2SI (2 sample interleave) • SQD (Square Division)
7	**Num of Video:** In this field, the number of video inputs can be configured. The available options are: • 0 • 4 (4 HD videos simultaneously transmitted)

Table 33: 4K SDI Input menu options

Chapter 7: Web Server

7.1 Introduction

This equipment can be controlled by the use of a PC connected at the rear panel Ethernet connector.

To enable the browser interface correctly, the IP address, Subnet Mask, Gateway, User Password and Administrator Password need to be set correctly on this unit. Next, the steps so as to setup network parameters are shown:

1. Go to Unit -> Remote.

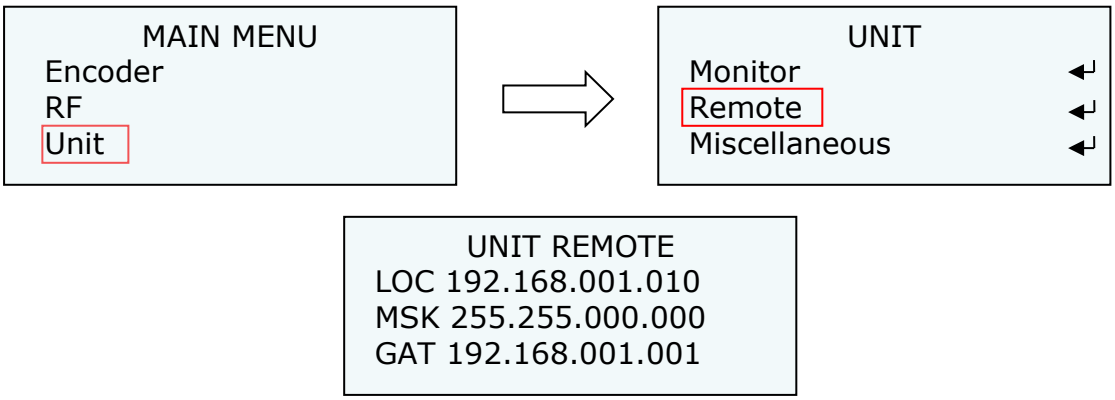


Figure 7.1: Web Server screen

2. Select LOC option and set an IP address. So as to change the IP address first press the OK button and then, with the Up, Down keys select the desired number. So as to change from one character to another, press Right, Left keys. Press the OK button so as to save the introduced value.

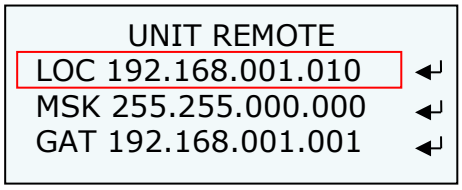


Figure 7.2: Local IP

3. Select MSK option and set the Subnet Mask address. So as to change the Subnet Mask address first press OK button and then, with the Up, Down keys select the desired number. So as to change from one character to another, press Right, Left keys. Press the OK button so as to save the introduced value.

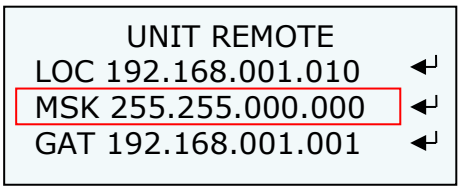


Figure 7.3: Subnet Mask

4. Select GAT option and set the Gateway address. So as to change the Gateway address first press the OK button and then, with the Up, Down keys select the desired number. So as to change from one character to another, press Right, Left keys. Press the OK button so as to save the introduced value.

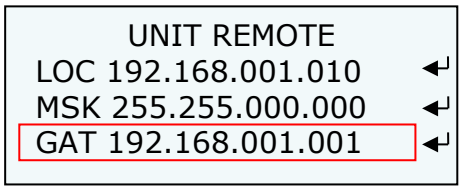


Figure 7.4: Gateway

5. Select Admin Pass option and set the administrator's password. If it is wanted to access to the Webserver directly without setting any password, the Admin Pass must be set to 0 (00000000). However, if it is wanted to set an administrator's password, it is necessary to introduce 8 digits. In this way, with this password, the administrator can access to the Webserver and make any configuration, modification or monitoring.

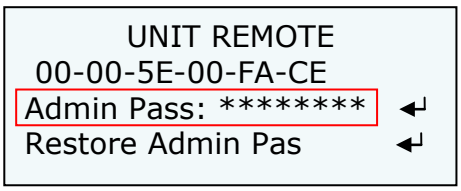


Figure 7.5: Admin Pass

6. Select Restore Admin Pass option to restore de default value of the administrator's password.

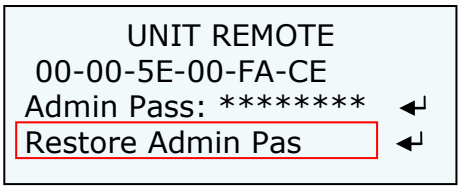


Figure 7.6:Restore Admin Pass

7. Select User Pass option and set the user's password. If it is wanted to access to the Webserver directly without setting any password, the User Pass must be set to 0 (00000000). However, if it is wanted to set a user's password, it is necessary to introduce 8 digits. In this way, with this password, the user can access to the Webserver and make any monitoring.

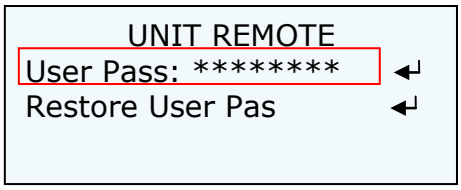


Figure 7.7: Restore Admin Pass

8. Select Restore User Pass option to restore de default value of the administrator's password.

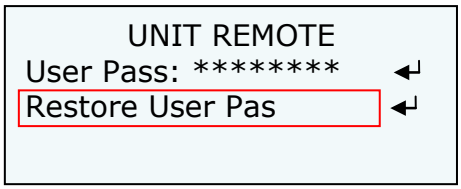


Figure 7.8: 8 Restore User Pass

Once the IP, Subnet Mask, Gateway, Admin Pass, Restore Admin Pass, User Pass and Restore User Pass are set and the laptop or PC is connected to the HDT-04, open the web browser and tip the IP given to the transmitter.

Press the enter button in your computer and then the main screen will appear.

7.2 Web Page Overview

The main menu is set in the upper position of the screen. Once an option is chosen, it is possible to change any parameter allowed or to see the values of some options.

In order to modify an editable parameter, introduce the new one and press enter button. Then the change will be set in the transmitter device. Moreover, to modify an eligible parameter, select the new one and the change will appear in the transmitter.

Next several screens of the web server and their features are shown.

7.2.1 ENCODER

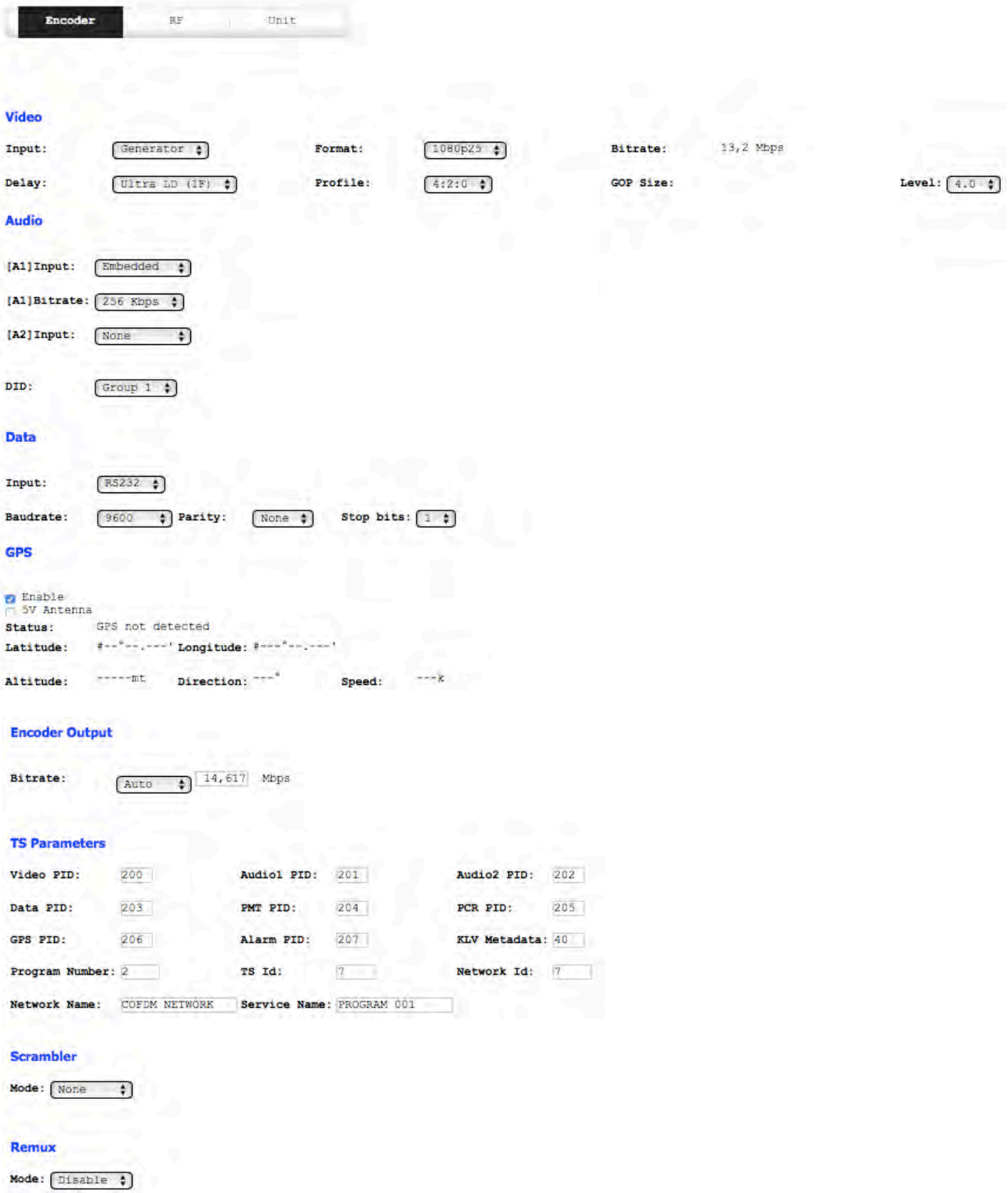


Figure 7.9: Web Server Encoder screen

Video

- **Input:**

  Select the type of the video input. The video input options available are SDI, HDMI, CVBS, ASI and Test Pattern. (eligible parameter)

- **Format:**

  Here the format of the video input signal is displayed. If there is no video input, then the message 'not detected' is displayed. (reading parameter)

- **Bitrate:**

  In this field the bitrate of the input signal in Mbps is displayed. (reading parameter)

- **Delay:**

  In this field, the delay of the coding process is configured. The available options are Standard Delay, Low Delay, Super Low Delay or Ultra Low Delay. (eligible parameter)

- **Profile:**

  In this field, the codification profile can be configured. The available options are 4:2:0 and 4:2:2. (eligible parameter)

- **GOP Size:**

  In this field, the group of figures parameter is displayed. It specifies the order in which intra- and inter-frames are arranged. (eligible parameter)

  The available options are:

  - Auto
  - Manual (editable parameter)

  Then the GOP size can be configured. The available options are (3, 6, 9, 12, 15, 18, 21, 24, 27, and 30).

Audio

- **[A1] Input:**

  Select the type of signal introduced in the audio 1 input. The audio input options available are Embedded, Analogue, AES-EBU, Test Tone and None. (eligible parameter)

- **[A1] Bitrate:**

  Select the bitrate for the coding process of the audio 1 signal. The available options are 128, 192, 256 and 384 Kbps. (eligible parameter)

- **[A2] Input:**

  Select the type of signal introduced in the audio 2 input. The audio input options available are Embedded, Analogue, AES-EBU, Test Tone and None. (eligible parameter)

- **[A2] Bitrate:**

  Select the bitrate for the coding process of the audio 2 signal. The available options are 128, 192, 256 and 384 Kbps. (eligible parameter)

- **[A1] L Type:**

  In this field, the sort of signal of the audio 1 left channel introduced in the transmitter is selected. (eligible parameters)

  The available options are:

  - Line
  - MIC Dynamic
  - MIC Phantom

- **[A2] L Type:**

  In this field, the sort of signal of the audio 2 left channel introduced in the transmitter is selected. (eligible parameters)

  The available options are:

  - Line
  - MIC Dynamic
  - MIC Phantom

- **[A1] R Type:**

  In this field, the sort of signal of the audio 1 right channel introduced in the transmitter is selected. (eligible parameters)
  The available options are:

- Line
- MIC Dynamic
- MIC Phantom

- **[A2] R Type:**

  In this field, the sort of signal of the audio 2 right channel introduced in the transmitter is selected. (eligible parameters)

  The available options are:

  - Line
  - MIC Dynamic
  - MIC Phantom

Data

- **Input:**

  Select the type of data introduced to the device. The available options are None, GPS and RS232. (eligible parameter)

RS-232

If the RS-232 connection is selected, it is needed to configure the next parameters so as to achieve a successful communication:

- **Baudrate:**

  Choose the baudrate of the RS-232 connection. The available options are 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600. (eligible parameter)

- **Parity:**

  Select the parity for the RS-232 connection. The available options are None, ODD and Even. (eligible parameter)

- **Stop Bits:**

  Establish the number of stop bits for the RS-232 connection. The available options are 1 and 2. (eligible parameter)

GPS

If GPS data is selected and the GPS antenna is connected to the device, then different parameters as shown in chapter 4 appear:

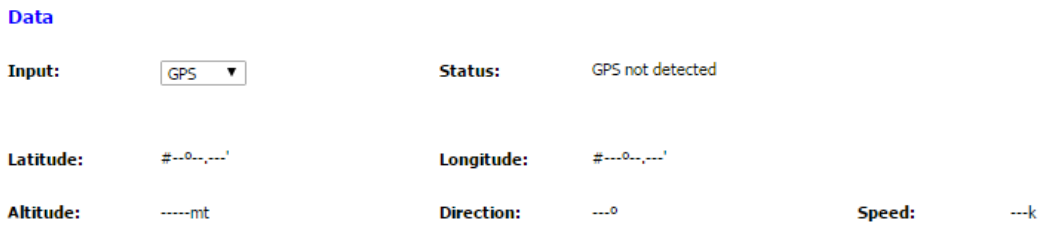


Figure 7.10: Web Server GPS screen

If the GPS is connected the status field will show "GPS data verified" message and if it is not connected, the status field will be "GPS not detected".

The format of the GPS coordinates used is decimal minutes as shown in the next example:

N43º02.032'

W023º03.023'

- **Status:**

  The status of the GPS input is displayed in this field. (reading parameter)

- **Latitude:**

  It specifies the latitude position of the transmitter. (reading parameter)

- **Longitude:**

  It specifies the longitude position of the transmitter. (reading parameter)

- **Altitude:**

  The height of the transmitter from ground in meters is specified in this value. (reading parameter)

- **Direction:**

  The direction in degrees of the transmitter is shown in this field. (reading parameter)

- **Speed:**

  The speed of the transmitter in km/h is shown in this field. (reading parameter)

TS Parameters

- **Video PID:**

  Here the video packet identifier must be entered. (editable parameter)

- **Audio 1 PID:**

  Here the audio 1 packet identifier must be entered. (editable parameter)

- **Audio 2 PID:**

  Here the audio 2 packet identifier must be entered. (editable parameter)

- **Data PID:**

  Here the data packet identifier must be entered. (editable parameter)

- **PMT PID:**

  Here the program map tables packet identifier must be entered. (editable parameter)

- **PCR PID:**

  Here the program clock reference packet identifier must be entered. (editable parameter)

- **Program Number:**

  Here the program number must be entered. (editable parameter)

- **TS id:**

  In this field the Transport Stream identifier must be set. (editable parameter)
- **Network id:**

In this option the network identifier must be specified. (editable parameter)

- **Network Name:**

  Specify the name of the network. (editable parameter)

- **Service Name:**

  Set the name of the service. (editable parameter)

Output

- **TS Bitrate Mode:**

  The bitrate mode can be automatic or manual. In case automatic mode is selected, the device configures automatically the video bitrate depending on the modulation, FEC, IG, BW used, so as to the video bitrate can be always the maximum allowed. SVP advises to use the automatic mode when the signal is transmitted through RF. Manual mode is useful when the device is used as an encoder so as to configure the desired output bitrate in the ASI output. (eligible parameter)

- **TS Bitrate:**

  If the bitrate mode is manual, select the bitrate. (editable parameter)

When editable parameters are being set in the Web Server and new values are being introduced, the text remains in red colour until the enter button is pressed. When the enter button is pressed, the new values are saved, and the text will appear in black colour. It is necessary to press the enter button to keep and save the new values on the screen.

Scrambler

If you want an encryption system, it can be chosen here.

- **None:**

  None encryption

- **BISS-1:**

  Uses an unencrypted key for the BISS key

- **BISS-E:**

  Uses an encrypted key

- **AES-128:**

  Uses an encrypted key of 128 bits

- **AES-256:**

  Uses an encrypted key of 256 bits

Remux (Optional)

- **Mode:**

  Here you can enable or disable Remux mode, when de enable mode is selected, Transport Stream Bitrate mode is always manual.

- **Program Number:**

  Here you should configure the program number.

- **PMT PID:**

  Here you can set ASI input PID number.

7.2.2 RF

Figure 7.11: Web Server MOD_RF screen (DVB-T)

- **System:**

  In this field the transmission standard can be chosen. The available options are DVB-T2 and DVB-T. (eligible parameter)

- **RF Status:**

  Select ON in case of wanting to activate the RF transmission or press OFF button so as to deactivate it. (eligible parameter)

7.2.2.1 DVB-T

- **Frequency:**

  Introduce the frequency at which the signal is being transmitted. (editable parameter)

- **Power:**

  Select the Output Power of the transmitted signal. The available options are Low, Mid and High. (eligible parameter)

- **Bandwidth:**

  Enter the transmitted signal bandwidth. The available options are 5, 6, 7, 8 MHz. (eligible parameter)

- **Modulation:**

  Select the constellation of the transmitted signal. The available options are QPSK, 16QAM, 64QAM. (eligible parameter)

- **FEC:**

  Select the FEC value for the transmitted signal. The available options are 1/2, 2/3, 3/4, 5/6, 7/8. (eligible parameter)

- **GI:**

  Select the guard interval of the transmitted signal. The available options are 1/4, 1/8, 1/16, 1/32. (eligible parameter)

- **Spectrum:**

  Here the type of the spectrum is configured. Inverted spectrum is just another method to help prevent signal theft. (eligible parameter)

  The available options are normal or invert.

- **Bitrate:**

  The bitrate of the transmitted signal is displayed in this field. (reading parameter)

When editable parameters are being set in the Web Server and new values are being introduced, the text remains in red colour until the enter button is pressed. When the enter button is pressed, the new values are saved, and the text will appear in black colour. It is necessary to press the enter button to keep and save the new values on the screen.

7.2.2.2 DVB-T2

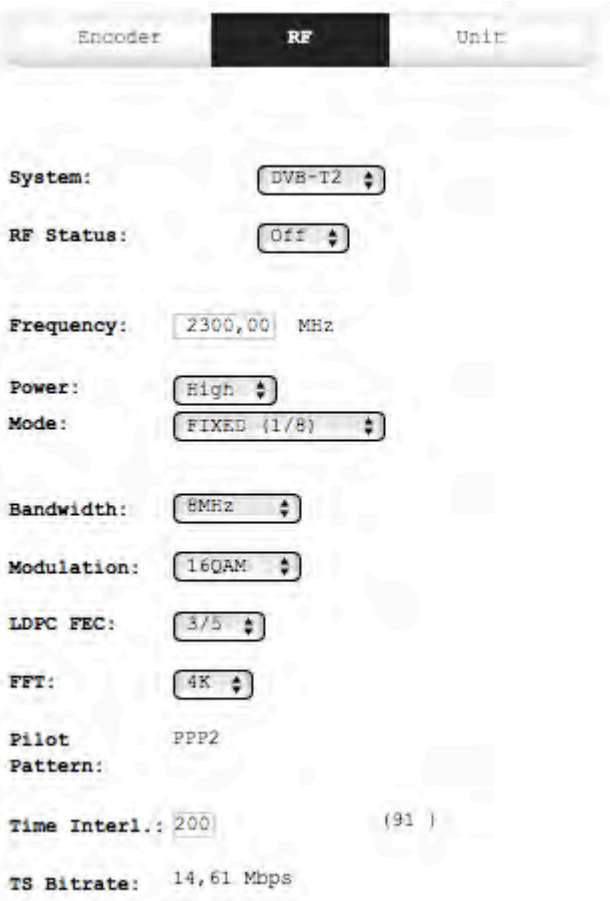


Figure 7.12: Web Server RF screen (DVB-T2)

- **Frequency:**

  Introduce the frequency at which the signal is being transmitted. (editable parameter)

- **Power:**

  Select the Output Power of the transmitted signal. The available options are Low, Mid and High. (eligible parameter)

- **Mode:**

  Select the guard interval of the transmitted signal. The available options are 1/8, 1/16, 1/32. (eligible parameter)

- **Bandwidth:**

  Enter the transmitted signal bandwidth. The available options are 1.7, 5, 6, 7, 8 MHz. (eligible parameter)

- **Modulation:**

  Select the constellation of the transmitted signal. The available options are QPSK, 16 QAM, 64 QAM, 256 QAM. (eligible parameter)

- **LDPC FEC:**

  Select the FEC value for the transmitted signal. The available options are 1/2, 3/5, 2/3, 3/4, 4/5, 5/6. (eligible parameter)

- **FFT:**

  Specify the FFT mode. The available options are 1K, 2K (eligible parameter)

- **Pilot Pattern:**

  This field indicates the scattered pilot pattern used for the data OFDM symbols. The available options are between PP1 and PP8. (reading parameter)

- **Time Interleaving:**

  This option indicates the number of time interleaver blocks per interleaving frame. (editable parameter)

  The user must select, in how many time interleaver blocks (TI_blocks) an interleaving frame is split.

  Only the time interleaver mode 0 (TIME_IL_TYPE=0) is supported, so one interleaving frame always equates to exactly one OFDM frame. To desactivate the time interleaver, this parameter must be set to 0.

  To configure this option, press the OK button and then select with the Up and Down buttons the desired value.

- **TS Bitrate:**

  The bitrate of the transmitted signal is displayed in this field. (reading parameter)

When editable parameters are being set in the Web Server and new values are being introduced, the text remains in red colour until the enter button is pressed. When the enter button is pressed, the new values are saved, and the text will appear in black colour. It is necessary to press the enter button to keep and save the new values on the screen.

7.2.3 UNIT

Figure 7.13: Web Server UNIT screen

LEDs Status (reading parameters)

- ON/OFF:
  - If the Led is off the equipment is not being fed.
  - The Led lights up in green when the equipment is turned on.
  - If the Led is orange, the equipment is in standby mode.
- RF:
  - If the Led is off the equipment does not transmit RF signal.
  - The Led lights up in green when the equipment transmits RF signal, that is, RF stage is active.
- ALARM:
  - The Led lights up in red when any alarm occurs.
- STATUS:

  The Led lights up when a change in the configuration of the device is being processed.

Alarms (reading parameter)

In this option, different alarms which are present in the device are shown.

Alarms Configuration (eligible parameter)

In this option, the alarms to be shown can be selected.
The different alarms that can be configured to be shown are:

- High Voltage
- Low Voltage
- High Temperature
- ASI Overflow: this alarm means that the bit rate at the ASI input is higher than the one that can be modulated due to the parameters configured (constellation, FEC, GI...).
- No SDI Input: SDI source is not connected.
- No HDMI Input: HDMI source is not connected.
- No CVBS Input: CVBS source is not connected.
- No ASI Input: ASI source is not connected.
- No Audio 1 Input: Audio source is not connected.
- No Audio 2 Input: Audio source is not connected.
- No GPS: GPS source is not connected.
- No RS232: RS232 data source is not connected.
- No KLV

- PA No Forward
- PA Rev High
- PA Volt Low
- PA Temp High
- WeightOnWheels
- TS Error

Monitor

- **Voltage:**

  In this field, the voltage of the transmitter is shown. (reading parameter)

- **Temperature:**

  In this field, the internal temperature of the device is displayed. (reading parameter)

Configuration

- **Webserver Address**

  In this option it can be set the IP address of the device in case it is wanted to control the device remotely. So as to change the IP address, introduce the desired number and then press enter button to save the introduced value. (editable parameter)

- **Webserver Subnet**

  Here it the Subnet Mask address of the device can be written. So as to change the Subnet Mask address, introduce the desired value and then press enter button to save it. (editable parameter)

- **Webserver Gateway**

  In this option, the address of the Gateway must be written. So as to change the Gateway address, introduce the desired value and then press enter button to save it. (editable parameter)

- **Webserver MAC**

  In this field, the MAC address of the device is shown

- **Standby Mode**

  In this option the user can turn on or turn off the device pressing On or Standby options. (eligible parameters)

- **Night Mode:**

  If the night mode is OFF then, the light in the screen will shine more than if the night mode is ON. (eligible parameter)

- **Admin Password**

  In this field, the administrator's password is introduced. It can be set an own password which is a list of 8 digits. Then, to save the introduced value, press Enter button. Moreover, there is the option to restore the default administrator password (00000000).

- **User Password**

  In this field, the user's password is introduced. It can be set an own password which is a list of 8 digits. Then, to save the introduced value, press Enter button. Moreover, there is the option to restore the default user password (00000000).

Miscellaneous

- **Night Mode:**

  If the night mode is OFF then, the light in the screen will shine more than if the night mode is ON. (eligible parameter)

- **S/N:**

  In this field, the serial number of the device is displayed. (reading parameter)

- **Firmware:**

  In this field, the number of the version installed in the device is displayed. (reading parameter)

When editable parameters are being set in the Web Server and new values are being introduced, the text remains in red colour until the enter button is pressed. When the enter button is pressed, the new values are saved, and the text will appear in black colour. It is necessary to press the enter button to keep and save the new values on the screen.

Firmware Update

In this field, the user can upload the firmware .SVP file and upgrade the firmware remotely.

Chapter 8: Block Diagram

8.1 Introduction

In this chapter, the block diagram of the HDT-04 transmitter is explained.

This diagram has several parts related to the HDT-04 internal performance which are shown in blocks with different inputs and outputs.

In the first part, the video, audio 1 and audio 2 encoder inputs, and GPS input (both internal and external) go to the multiplexer to obtain in this way one common output signal. Then, the signal passes through the BISS-1/E or AES-128/256 scrambler which encrypts the signal at the transmitter to make the message unintelligible at a receiver not equipped with an appropriately set descrambling device.

The ASI transport stream can be scrambled in Operational Mode 1 or Mode E, with a Session Word. This is an ultimate solution for reliable and interoperable protection of the communication. The user can choose between None, BISS- 1or BISS-E options for the encryption, AES 128 and AES 256 are optional featured. As it is explained in the manual, if None option is selected the signal will not be encrypted.

Once the signal has passed the BISS-1/E block, it passes through the DVB-T/T2 modulator. In this part, the signal is modulated according to the requirements needed and a digital signal is obtained. The next step is to go to the DAC converter to obtain an analogue signal. There are two DAC blocks. The first one provides a 70 MHz output and the other one goes to the Quadrature Modulator which is a general technique of modulating employing a VCO & PLL system. Thanks to the VCO & PLL block, the system frequency can be configured, and then, in the output of the Quadrature Modulator block, the RF signal is obtained.

The next block consists of a variable attenuator that controls the output power.

Then, the DVB-T/T2 RF output goes through several attenuators and amplifiers. Thanks to this stage, an RF output of 2000 to 2400 MHz is obtained.

Finally, the FPGA Controller is explained, which is responsible for controlling all the system. This block controls the remote control (RTC), the temperature and the voltage. It also has an USB and Ethernet control connection.

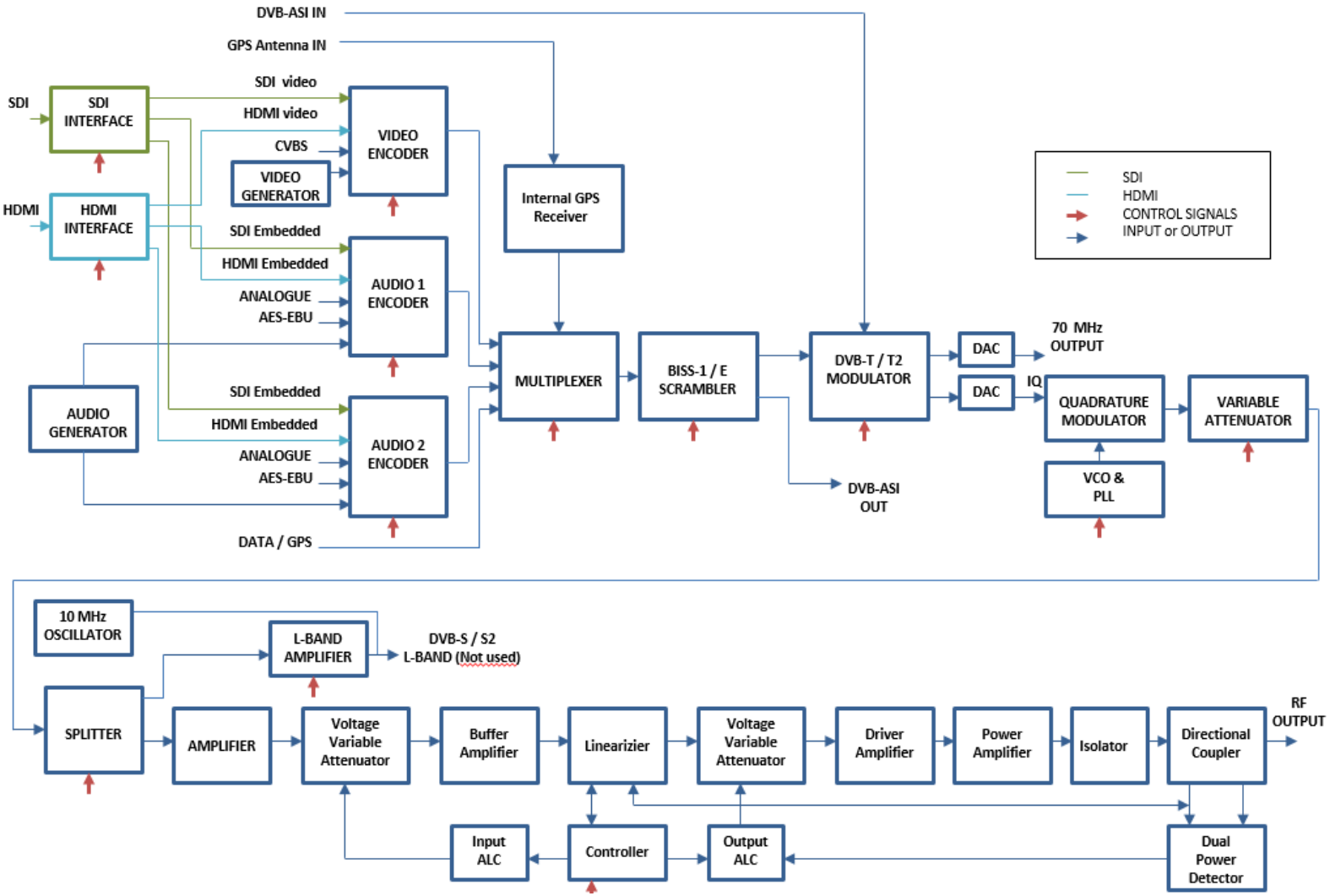


Figure 8.1: HDT-04 Block Diagram

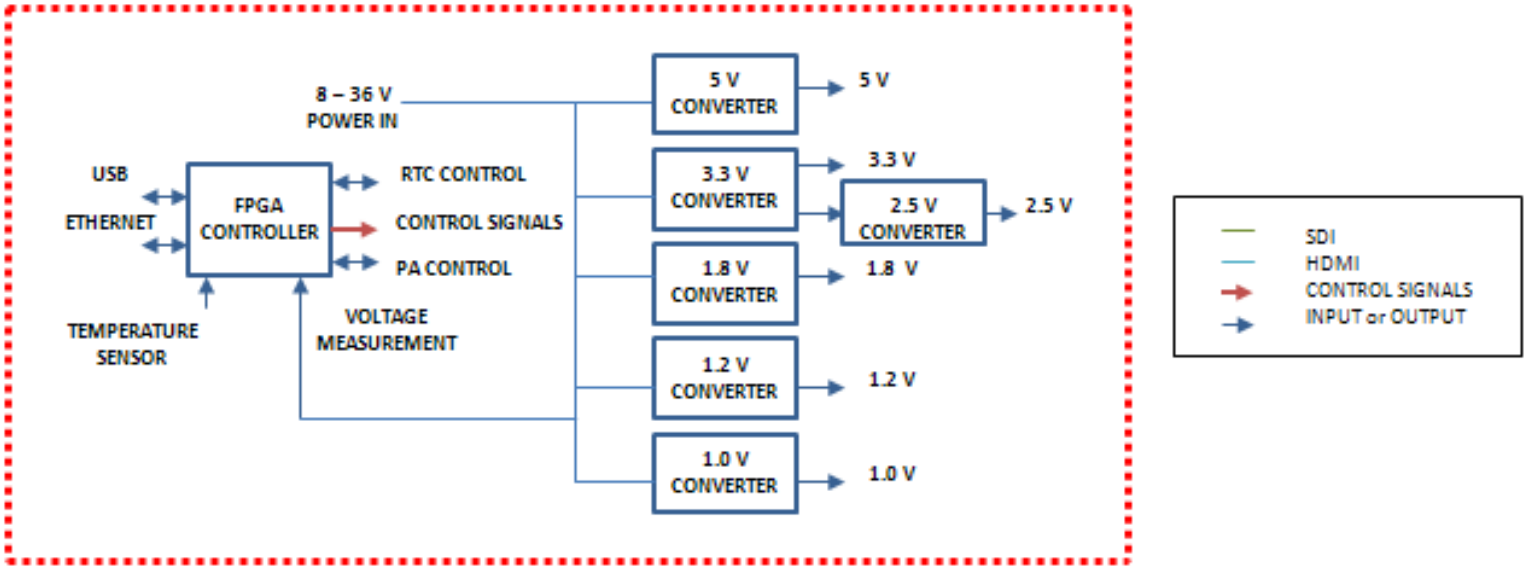


Figure 8.2: HDT-04 Block Diagram

Chapter 9: Equipment Installation

9.1 Introduction

This chapter provides important information for the transmitter system installation such as connections available in the rear and front panel of the HDT-04 transmitter and their pinout, connectors needed and the accessories which are available with the transmitter device.

9.2 Connections

All the input/output connections of the transmitter are shown in the figure below:

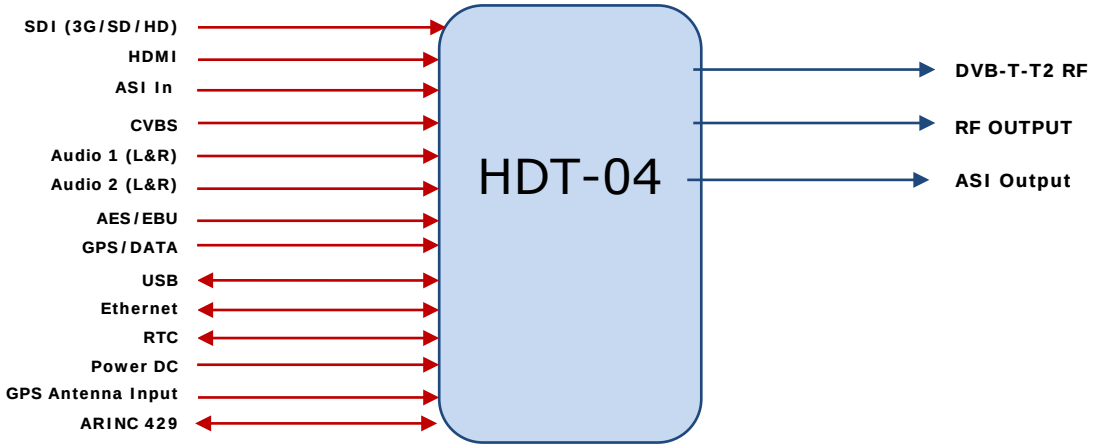


Figure 9.1: HDT-04 Connections

The following figures show the HDT-04 front and rear panel. Connections mentioned in the upper figure are shown below.

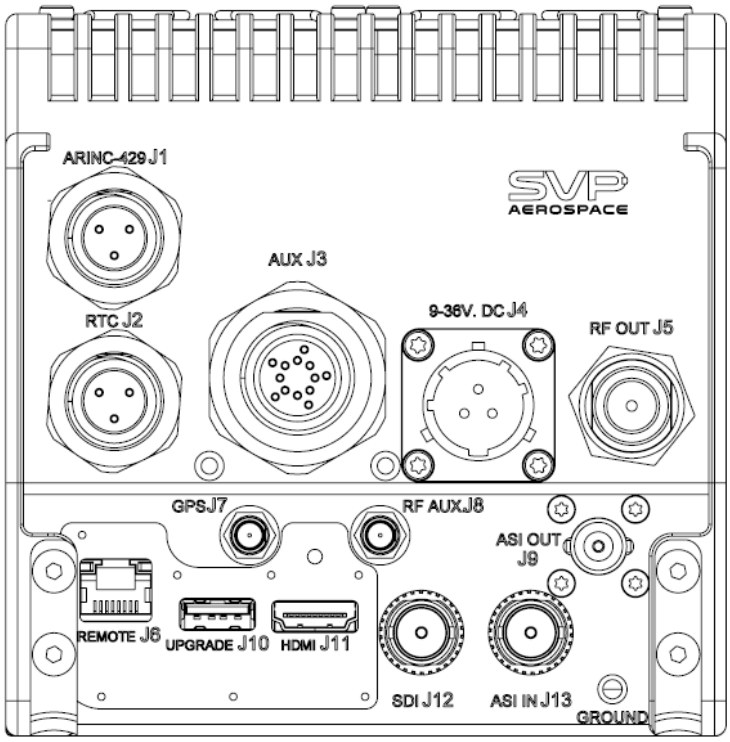
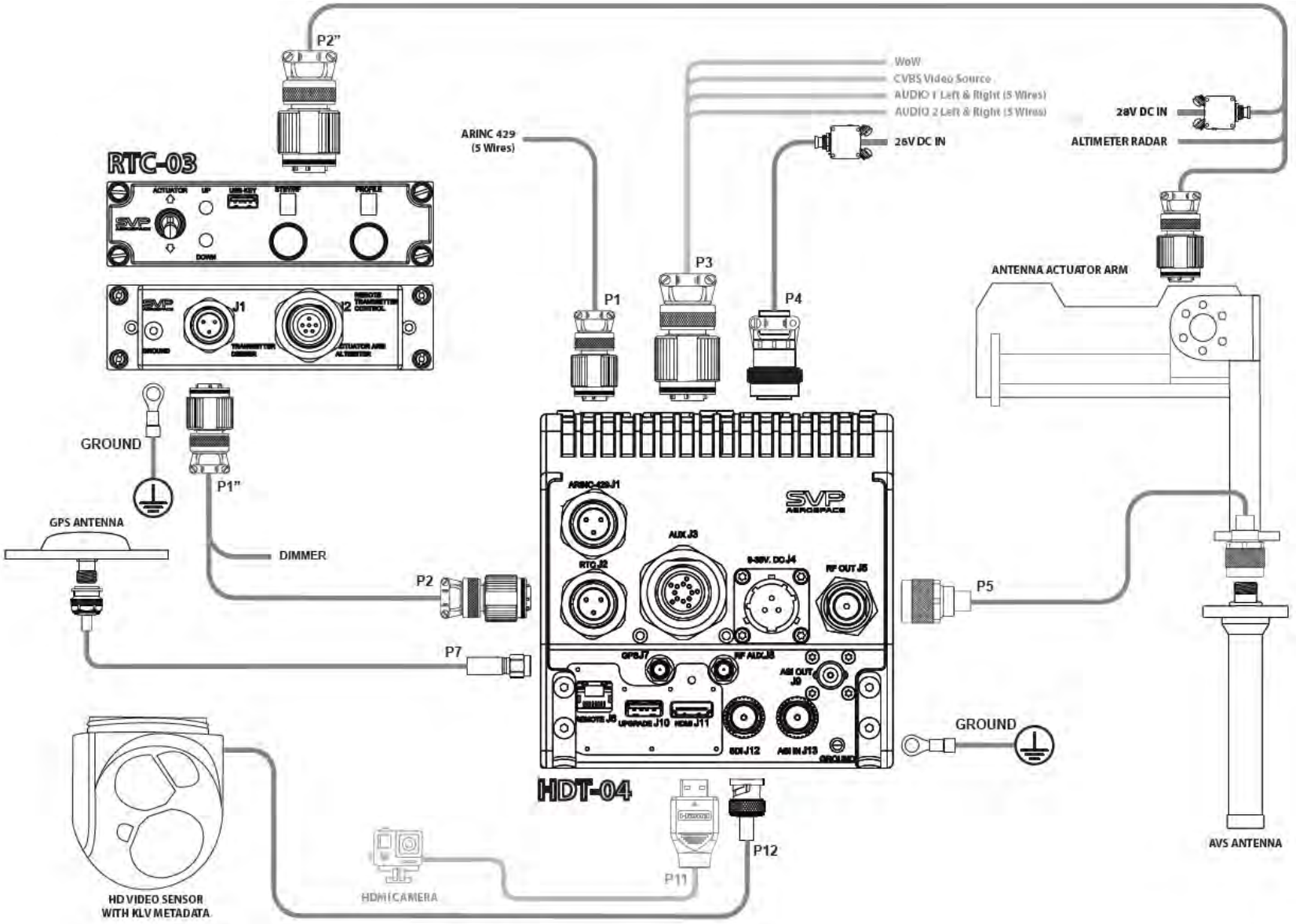


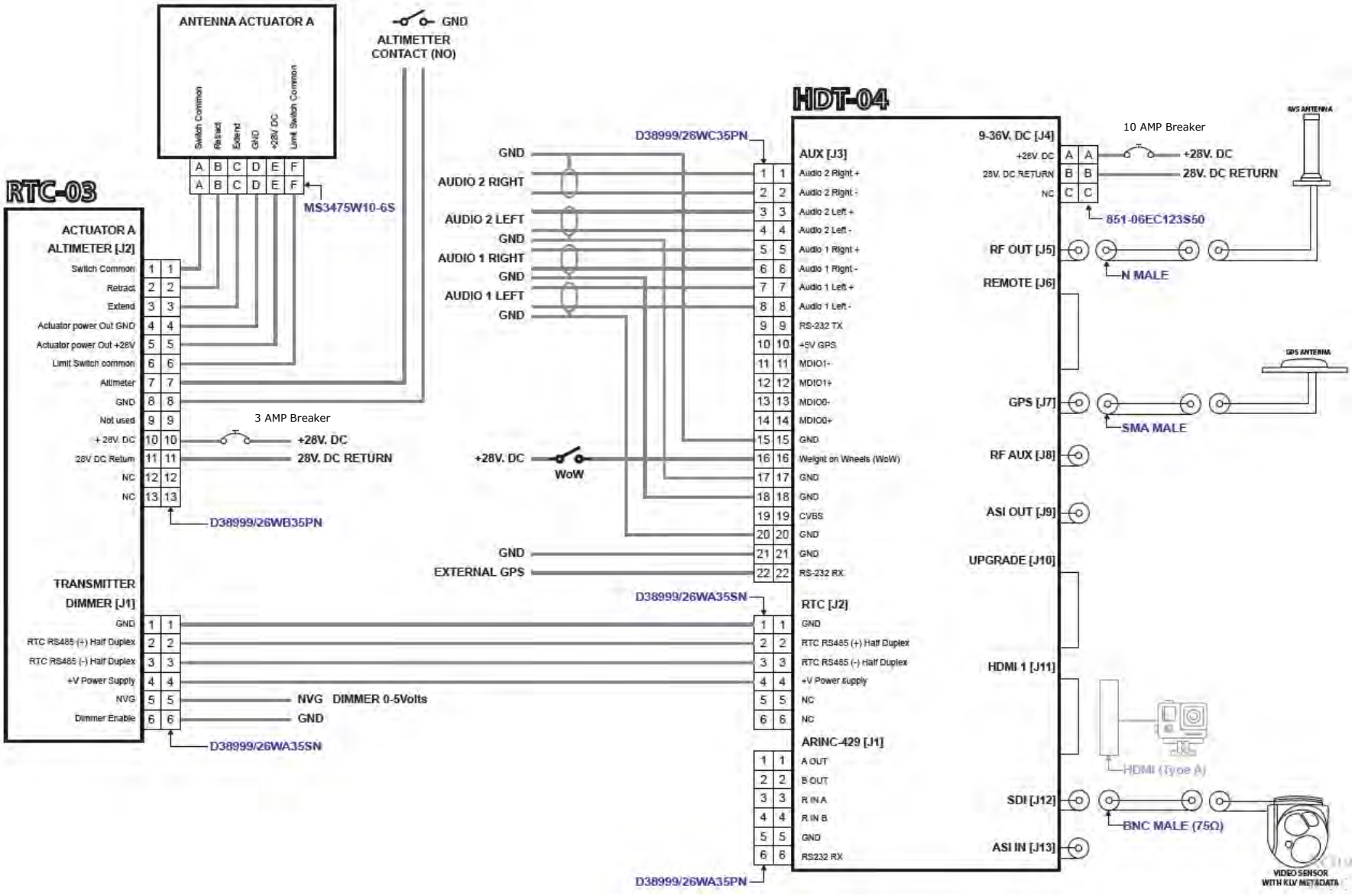
Figure 9.2: HDT-04 front panel

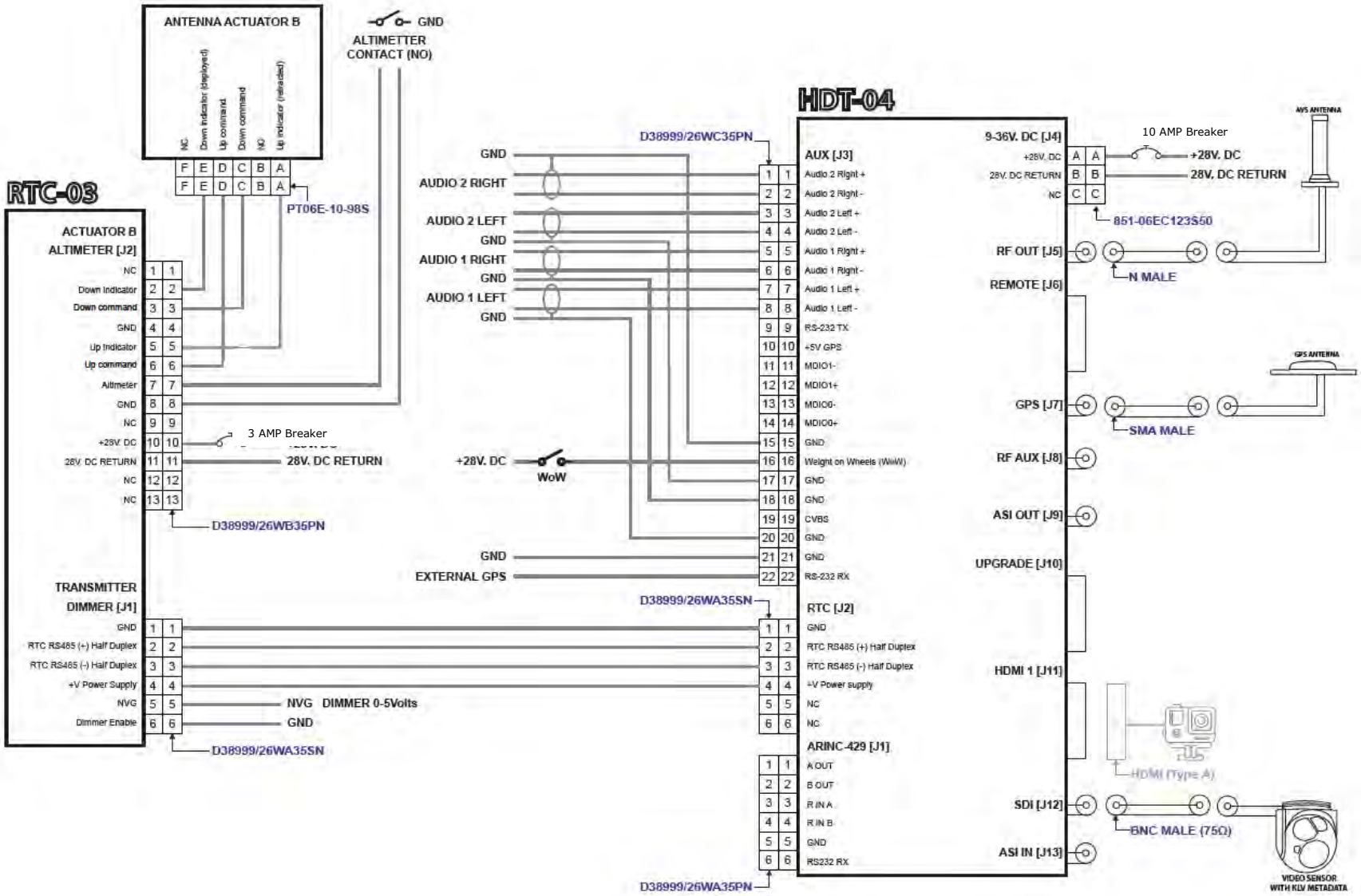
Jack number	Features
J1	ARINC 429
J2	RTC
J3	AUX
J4	9-36 V. DC
J5	RF OUTPUT
J6	REMOTE
J7	GPS
J8	RF AUX
J9	ASI OUT
J10	UPGRADE
J11	HDMI
J12	SDI
J13	ASI IN

Table 34: Connectors Jack number

Note: The ground connection is grounded in the equipment, size is M3x8mm, the unit includes M3x8 screw and grower washer.


P2"
RTC-03
J1
J2
ARINC 429
(5 Wires)
WoW
CVBS Video Source
AUDIO 1 Left & Right (5 Wires)
AUDIO 2 Left & Right (5 Wires)
28V DC IN
28V DC IN
ALTIMETER RADAR
P1
P3
P4
ANTENNA ACTUATOR ARM
GROUND
P1"
GPS ANTENNA
DIMMER
P2
P7
P5
HDT-04
GROUND
HD VIDEO SENSOR
WITH KLV METADATA
HDMI CAMERA
P11
P12
AVS ANTENNA


ANTENNA ACTUATOR A
Switch Common
Retract
Extend
GND
+28V DC
Limit Switch Common
A B C D E F
A B C D E F
MS3475W10-6S
GND
ALTIMETTER
CONTACT (NO)
RTC-03
ACTUATOR A
ALTIMETER [J2]
Switch Common
Retract
Extend
Actuator power Out GND
Actuator power Out +28V
Limit Switch common
Altimeter
GND
Not used
+ 28V. DC
28V DC Return
NC
NC
3 AMP Breaker
+28V. DC
28V. DC RETURN
D38999/26WB35PN
TRANSMITTER
DIMMER [J1]
GND
RTC RS485 (+) Half Duplex
RTC RS485 (-) Half Duplex
+V Power Supply
NVG
Dimmer Enable
NVG DIMMER 0-5Volts
GND
D38999/26WA35SN
D38999/26WC35PN
GND
AUDIO 2 RIGHT
AUDIO 2 LEFT
GND
AUDIO 1 RIGHT
GND
AUDIO 1 LEFT
GND
+28V. DC
WoW
GND
EXTERNAL GPS
D38999/26WA35SN
HDT-04
AUX [J3]
Audio 2 Right +
Audio 2 Right -
Audio 2 Left +
Audio 2 Left -
Audio 1 Right +
Audio 1 Right -
Audio 1 Left +
Audio 1 Left -
RS-232 TX
+5V GPS
MDIO1-
MDIO1+
MDIO0-
MDIO0+
GND
Weight on Wheels (WoW)
GND
GND
CVBS
GND
GND
RS-232 RX
RTC [J2]
GND
RTC RS485 (+) Half Duplex
RTC RS485 (-) Half Duplex
+V Power Supply
NC
NC
ARINC-429 [J1]
A OUT
B OUT
R IN A
R IN B
GND
RS232 RX
D38999/26WA35PN
9-36V. DC [J4]
+28V. DC
28V. DC RETURN
NC
10 AMP Breaker
+28V. DC
28V. DC RETURN
851-06EC123S50
RF OUT [J5]
N MALE
REMOTE [J6]
GPS [J7]
SMA MALE
RF AUX [J8]
ASI OUT [J9]
UPGRADE [J10]
HDMI 1 [J11]
HDMI (Type A)
SDI [J12]
BNC MALE (75Ω)
ASI IN [J13]
VIDEO SENSOR
WITH KLV METADATA


ANTENNA ACTUATOR B
NC
Down Indicator (deployed)
Up command
Down command
NO
Up Indicator (retracted)
F E D C B A
F E D C B A
PT06E-10-98S
GND
ALTIMETTER CONTACT (NO)
RTC-03
ACTUATOR B ALTIMETER [J2]
NC
Down Indicator
Down command
GND
Up Indicator
Up command
Altimeter
GND
NC
+28V. DC
28V. DC RETURN
NC
NC
3 AMP Breaker
28V. DC RETURN
D38999/26WB35PN
TRANSMITTER DIMMER [J1]
GND
RTC RS485 (+) Half Duplex
RTC RS485 (-) Half Duplex
+V Power Supply
NVG
Dimmer Enable
NVG DIMMER 0-5Volts
GND
D38999/26WA35SN
HDT-04
D38999/26WC35PN
GND
AUDIO 2 RIGHT
AUDIO 2 LEFT
GND
AUDIO 1 RIGHT
GND
AUDIO 1 LEFT
GND
+28V. DC
WoW
GND
EXTERNAL GPS
AUX [J3]
Audio 2 Right +
Audio 2 Right -
Audio 2 Left +
Audio 2 Left -
Audio 1 Right +
Audio 1 Right -
Audio 1 Left +
Audio 1 Left -
RS-232 TX
+5V GPS
MDIO1-
MDIO1+
MDIO0-
MDIO0+
GND
Weight on Wheels (WoW)
GND
GND
CVBS
GND
GND
RS-232 RX
D38999/26WA35SN
RTC [J2]
GND
RTC RS485 (+) Half Duplex
RTC RS485 (-) Half Duplex
+V Power supply
NC
NC
ARINC-429 [J1]
A OUT
B OUT
R IN A
R IN B
GND
RS232 RX
D38999/26WA35PN
9-36V. DC [J4]
+28V. DC
28V. DC RETURN
NC
10 AMP Breaker
+28V. DC
28V. DC RETURN
851-06EC123S50
AVS ANTENNA
RF OUT [J5]
N MALE
REMOTE [J6]
GPS ANTENNA
GPS [J7]
SMA MALE
RF AUX [J8]
ASI OUT [J9]
UPGRADE [J10]
HDMI 1 [J11]
HDMI (Type A)
SDI [J12]
BNC MALE (75Ω)
ASI IN [J13]
VIDEO SENSOR WITH KLV METADATA

9.2.1 9-36V. DC Power Supply [J4]

In this section, technical features about the power supply connections available and the connectors needed are described.

The equipment is powered by a DC source from 9 to 36 V extended range. If the input voltage of the equipment is out of that range, the LED of the equipment blinks green and red showing an alarm.

The DC power supply is connected to the equipment via a 3 pin Amphenol connector.

Power supply connection technical features

Item	Features
Connector label	9-36V. DC
Part number E.g. (HDT-04 connector)	851-02E123P50 (Souriau)
Part number E.g. (cable connector)	851-06EC123S50 (Souriau)
Input voltage range	9-36 V. DC

Table 35: Power supply connection technical features

Table Power supply connector pinout

Pin	Description
A	+28V. DC IN
B	28V DC RETURN
C	Not used

Table 36: Power supply connection pinout

9.2.2 RF output [J5]

The antenna is directly connected to the female N-type connector on the front panel of the HDT-04 transmitter.

RF connection technical features

Item	Features
Connector label	RF OUT
Connector type	N female
Impedance	50 Ω
Output power	Maximum: 10 W or 15 W

Table 37: RF Output connector characteristics

9.2.3 Remote[J6]

The transmitter can be controlled remotely via Ethernet webserver.

Remote technical features

Item	Features
Connector label	Remote
Connector type	RJ-45

Table 38: Remote connector characteristics

9.2.4 GPS Antenna Input [J7]

When the internal GPS is used, the GPS antenna must be connected to this input. The equipment feed the antenna at 5 V.

Item	Features
Connector label	GPS
Connector type	SMA female
Impedance	50 Ω
Output voltage	5V

Table 39: GPS antenna connector characteristics

9.2.5 RF Auxiliar output [J8]

The Auxiliary frequency band is output here with a maximum output power of 100 mW, depending of the frequency used.

Item	Features
Connector label	RF AUX
Connector type	SMA female
Impedance	50 Ω
Output power	Maximum: 100 mW

Table 40: RF Auxiliary output connector characteristics

9.2.6 DVB-ASI Transport Stream

9.2.6.1 ASI Input [J13]

The HDT-04 transmitter has a DVB-ASI input and output compatible with the EN50083 standard, available on an insulated 75 Ω BNC connector.

ASI IN connection technical features

Item	Features
Connector label	ASI IN
Connector type	BNC
Impedance	75 Ω
Standard	EN50083-9
Maximum Bitrate	216 Mbps

Table 41: DVB-ASI Transport Stream input connection features

9.2.6.2 ASI Output [J9]

ASI output signal type uses 75Ω BNC connector. This connector is placed on transmitter's front panel.

It is important that 75 Ω connectors are used. This is because the female output connector of the HDT-04 unit may be damaged and because of an impedance mismatch.

ASI connection technical features

Item	Features
Connector label	ASI OUT
Connector type	BNC female
Impedance	75 Ω
Standard	EN50083-9
Maximum Bitrate	100 Mbit/s

Table 42: DVB-ASI Transport Stream output connection features

9.2.7 SDI [J12] / HDMI [J11]

The HDT-04 transmitter incorporates a HDMI input to allow the connection of new devices.

SD-SDI digital video input is compatible with SMPTE-259M Standard, HD-SDI digital video input signal type is SMPTE-292M compliant and 3G-SDI digital video input signal type is SMPTE-425M compliant.

In chapter 4: transmitter's Menus and Operation, it is explained in detail how to choose the type of video input signal.

HDMI connection technical features

Item	Features
Connector Label	HDMI
Connector type	Type A

Table 43: HDMI input signal connection features

SDI connection technical features

Item	Features
Connector Label	SDI
Connector type	Female BNC
Impedance	75 Ω
Input Level	800 mVpp nominal ±10%
Standards	SMPTE-259M and SMPTE-272M SMPTE-292M and SMPTE-299M SMPTE-425M
Bitrate	SD: 270 Mbit/s HD: 1485 Mbit/s 3G: 3 Gbit/s

Table 44: SDI input signal connection features

9.2.8 ARINC-429 connection [J1]

So as to provide a remote control of the transmitter, it has been added ARINC-429 interface. Control ARINC-429 commands are sent from a computer to the transmitter for a remote operation of the HDT-04. This feature can also be used to transmit GPS frames through the ARINC 429 interface.

ARINC-429 connection technical features

Item	Features
Connector Label	ARINC-429
Connector type	MIL-DTL-38999 Series 3
Part number (equipment)	D38999/24WA35SN

Table 45: ARINC 429 connection technical features

Pinout of the cable connector (ARINC-429)

Pin	Description
1	A OUT (ARINC 429 BUS TX)
2	B OUT (ARINC 429 BUS TX)
3	R IN A (ARINC 429 BUS RX)
4	R IN B (ARINC 429 BUS RX)
5	GND
6	RS232 RX

Table 46: ARINC 429 cable connector pinout

9.2.9 RTC connection [J2]

So as to provide the remote control of the transmitter, it has been added a RTC input. Connections are made using MIL-DTL-38999 Series 3 connector on equipment's front panel. This feature can be used, for example, when the pilot of a helicopter wants to modify some transmission parameters.

The RTC is supplied by the transmitter device to the device input power supply.

RTC connection technical features

Item	Features
Connector Label	RTC
Connector type	MIL-DTL-38999 Series 3
Part number (equipment)	D38999/24WA35PN
Part number (cable)	D38999/26WA35SN

Table 47: RTC connection technical features

Pinout of the cable connector (RTC)

Pin	Description
1	GND
2	RTC RS485 (+) Half Duplex
3	RTC RS485 (-) Half Duplex
4	+V Power Supply (RTC)
5	NC
6	NC

Table 48: RTC cable connector pinout

9.2.10 Aux [J3]

The HDT-04 transmitter has an Auxiliary connector by using MIL-DTL-38999 Series 3 connector on equipment's front panel.

AES/EBU and analogue audio input technical features

Item	Features
Connector Label	AUX
Connector type	MIL-DTL-38999 Series 3
Part number (equipment)	D38999/24WC35SN
Part number (cable)	D38999/26WC35PN

Table 49: AES/EBU and analogue audio input connection technical features

Pinout of the cable connector

Pin	Description
1	Audio 2 Right+
2	Audio 2 Right-
3	Audio 2 Left+
4	Audio 2 Left-
5	Audio 1 Right+
6	Audio 1 Right-
7	Audio 1 Left+
8	Audio 1 Left-
9	RS-232 TX
10	+5V GPS
11	MDIO1-
12	MDIO1+
13	MDIO0-
14	MDIO0+
15	GND
16	Weight on Wheels (WoW)
17	GND
18	GND
19	CVBS
20	GND
21	GND
22	RS-232 RX

Table 50: Audio - Ethernet cable connector pinout

Weight on Wheels System (WoW)
Pin 16 of this connector is prepared for automatically shut down the transmission when the aircraft lands.
We have 2 WoW options in the Unit / Miscellaneous menu.

If we select <15V.:

- If the WoW input detects a voltage higher than 15V, it will be able to transmit.
- If the WoW entry is on air, it will not be able to stream.
- If the WoW input is GND, it will not be possible to transmit.

If we select >15V.:

- If the WoW input detects a voltage higher than 15V, it will not be able to stream.
- If the WoW entry is on the air, it will be able to stream.
- If the WoW input is GND, you will be able to transmit.

9.2.11 UPGRADE connection [J10]

Thanks to the USB connection, it is possible to update directly from an external USB device the firmware of the HDT-04 transmitter. The connector is type A.

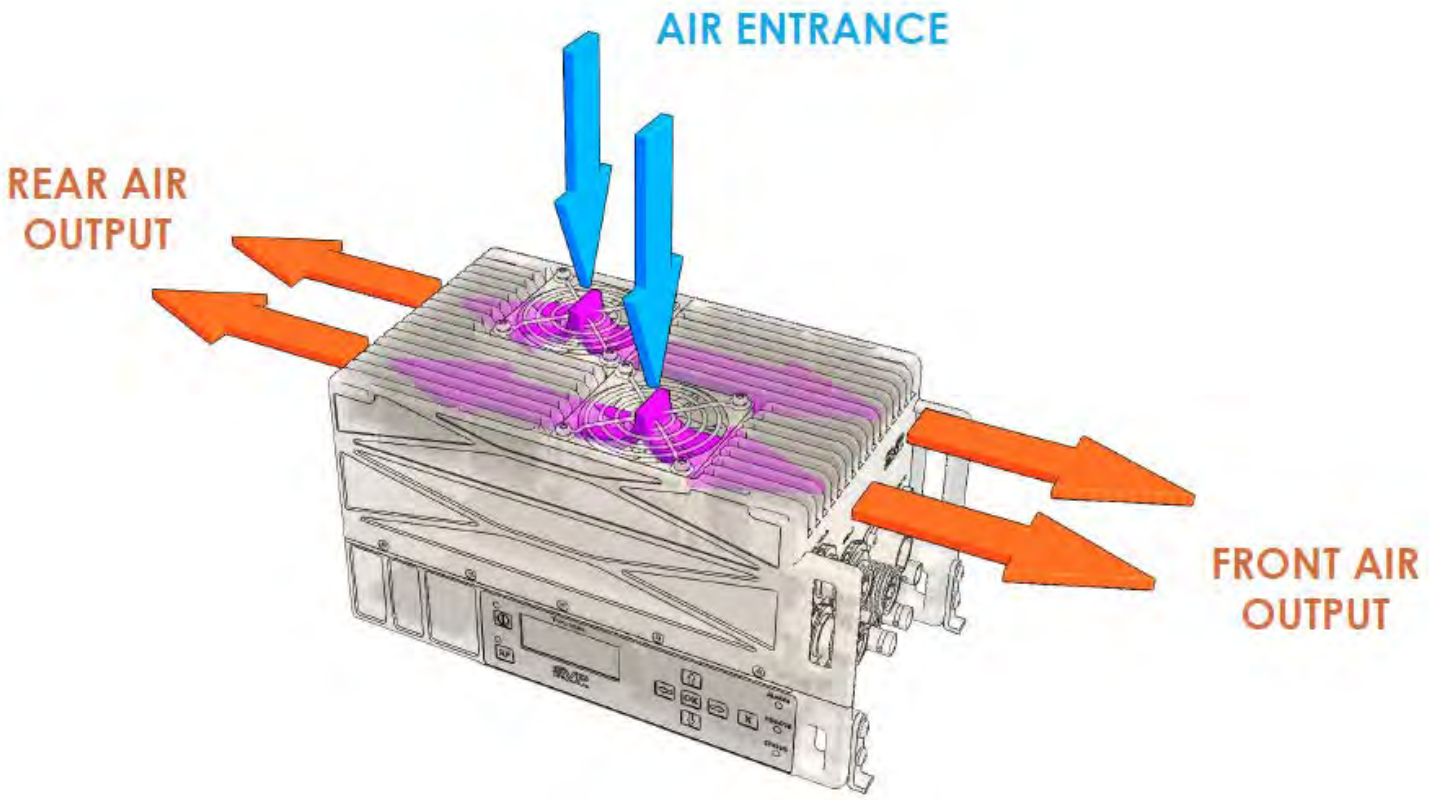
USB connection technical features

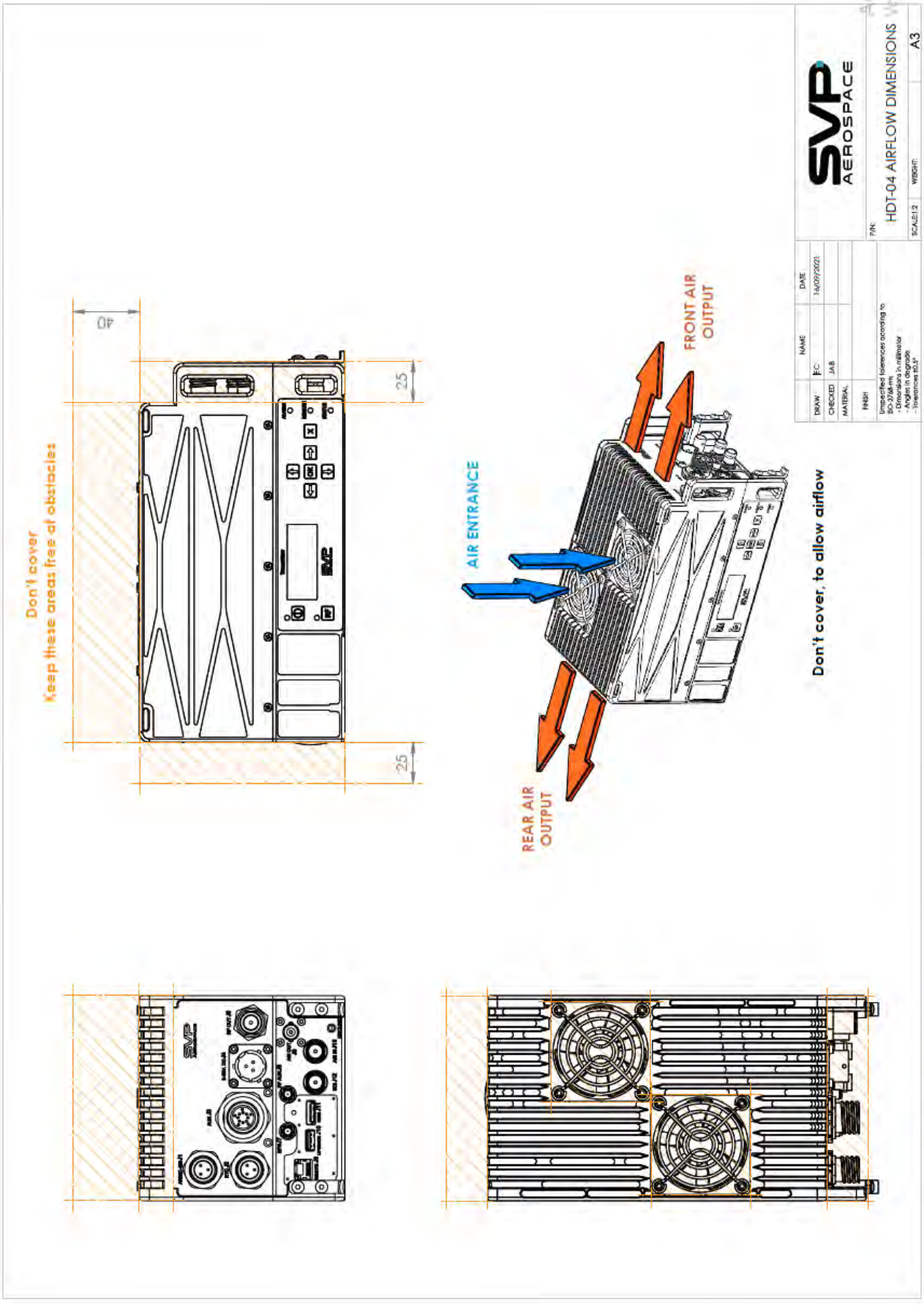
Item	Features
Connector Label	UPGRADE
Connector type	Type A

Table 51: USB connection technical features

9.3 AIRFLOW

The following considerations should be taken into account during installation:




HDT-04 AIRFLOW DIMENSIONS
SVP AEROSPACE
A3
40
25
25
Don't cover
Keep these areas free of obstacles
FRONT AIR OUTPUT
AIR ENTRANCE
REAR AIR OUTPUT
Don't cover, to allow airflow

Chapter 10: Remote Control

10.1 Introduction

The RTC-03 equipment is compact lightweight Remote Controller for SVP Broadcast Microwave transmitters. They can control the HDT-04 and the HDT-02 Transmitters.

Thanks to this equipment, the user can control the transmitter remotely in an easy and comfortable way. The RTC-03 front panel consists of several switch which allow the user to configure and modify different features such as the actuator arm state (up/down), the level of the RF and the profile selected.

This equipment is especially useful in applications where the HDT-02 or HDT-04 Transmitter is mounted away from the operator and the parameters can't be modified directly from the front panel.

10.2 RTC-03

10.2.1 Remote Control Operation

This chapter provides the user with all the necessary information to control and operate the equipment properly.

Figure 10.1: RTC-03-A and RTC-03-B front view

Figure 10.2: RTC-03-0 front view

There are several buttons in the front panel of the device that allows the control of the HDT-02 and HDT-04 Transmitter remotely.

- Actuator

  This Up/Down switch is used to control the antenna actuator in different systems. With this switch, it is possible to move the antenna up and down remotely. It has also two LEDs to indicate the status of the actuator (Up or Down).

- Standby/RF

  To select the amplifier output power level or leave it in standby mode please move this selector.

  - Standby "."
  - RF Off "o"
  - Low power "L"
  - Medium power "M"
  - High power "H"

- Profiles

  With this button, the user can choose between different profiles which have been configured previously. There are seven profiles available. Each profile has different features related to the type of transmission system, the frequency at which the signal is going to be transmitted, the bitrate, the type of video input, the type of Audio 1 and Audio 2 inputs, the video delay and the codification profile.

10.2.2 Connections

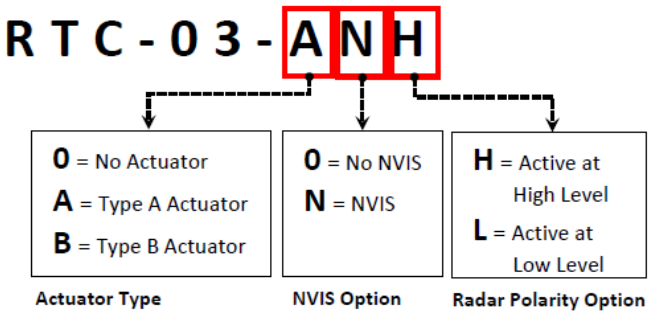
This chapter provides important information such as connections available in the remote control and the connectors needed.

Figure 10.3: RTC-03-A and RTC-03-B rear view

Figure 10.4: RTC-03-0 rear view

Note: The ground connection is grounded in the equipment, size is M3x8mm, the unit includes M3x8 screw and grower washer.

How to Order:



10.2.2.1 Transmitter Dimmer Connector [J1] (NVIS Option)

This connector is used for the communication between [J1] HDT-04 Transmitter and the RTC-03 Remote Control.

Transmitter Dimmer connection technical features

Item	Features
Connector label	TRANSMITTER DIMMER
Connector type	MIL-DTL-38999 Series 3 D38999/24
Part number E.g. (RTC-03 connector)	D38999/24WA35PN
Part number E.g. (cable connector)	D38999/26WA35SN

Table 52: Transmitter Dimmer connector technical features

Transmitter Dimmer connector pinout

Pin	Description
1	GND
2	RTC RS485 (+) Half Duplex
3	RTC RS485 (-) Half Duplex
4	+V Power Supply (RTC)
5	NVG Dimmer
6	Dimmer Enable

Table 53: Transmitter Dimmer connector pinout

Pin 6 of Dimmer Enable has the function of enabling the external Dimmer. For this purpose, you have to connect Pin 6 from J1 to GND.
Please note that NVIS Dimmer signal is 0 to 5 Volts.
When pin 6 is not connected to GND, the brightness is controlled manually. That means the brightness is controlled by pushing STBY/RF button while rotating it, it has 9 levels of brightness. To set a level, keep pushed the button until the level number is steady.

10.2.2.2 Actuator Arm Altimeter Connector [J2]

This connector is used for the communication between [J2] HDT-04 Transmitter and the actuator arm. This connector has different pinouts depending on the internal selection of the actuator type; type A or Type B as described below.

Actuator Arm Altimeter connection technical features

Item	Features
Connector label	ACTUATOR ARM ALTIMETER
Connector type	MIL-DTL-38999 Series 3 D38999/24
Part number E.g. (RTC-03 connector)	D38999/24WB35SN
Part number E.g. (cable connector)	D38999/26WB35PN

Table 54: Actuator Arm Altimeter connection technical features

RTC-03 connection to Type A actuator (P/N: RTC-03-A)

RTC-03 PIN	Description
1	Switch common
2	Retract
3	Extend
4	Actuator power Out GND
5	Actuator power Out +28V
6	Limit Switch common
7	Altimeter
8	GND
9	Not Used
10	+ 28V. DC (only when using actuator)
11	28V DC Return (only when using actuator)
12	NC
13	NC

Table 55: Connector pinout for Type A actuator

RTC-03 connection to Type B actuator (P/N: RTC-03-B)

Pin	Description
1	Not Used
2	Down indicator
3	Up command
4	GND Chassis
5	Up indicator
6	Down command
7	Altimeter
8	GND
9	Not Used
10	+ 28V. DC (only when using actuator)
11	28V DC Return (only when using actuator)
12	NC
13	NC

Table 56: Connector pinout for Type B actuator

The equipment supports two polarity options to automatically retract the arm, this is made based on the altimeter radar signal. There are two optionsm this should be defined in the P/N when ordering the remote control. Low level (bring pin 7 to GND), or high level (bring pin 7 to + 28V DC).

For the altimeter radar, H and L means the polarity of the signal delivered by the altimeter radar. If it is High, it means that it is active at +28V signal and if it is Low, it is active at 0V.

10.2.3 Alarms

The RTC-03 Remote Control shows transmitter alarms. When there is an alarm there will be a point in the profile screen.

10.3 RS-485 Operation

10.3.1 PC Control Operation

The HDT-04 can be controlled remotely from a computer via RS-485 commands using the RTC connector.
The port must be configured as; 8 bits, 1 stop bit, no parity and 9600bps.

In the transmitter you need to select the RTC-03 remote control.

First you need to check the transmitter configuration by sending the following command:
0x7D 0x04 0x01 0xB8 CHK 0x7D

The transmitter answers a message with the following format:

0x7D 0x07 0x22 WW XX YY ZZ CHK 0x7D

The bytes WW XX YY ZZ can be seen as a 32 bit word. In this word the meaning of the bits are (MSB first)
31-26 => not of interest
25-20 => profile enable/disable
- Bit 25 => Profile 7 enable/disable
- Bit 24 => Profile 6 enable/disable
- Bit 23 => Profile 5 enable/disable
- Bit 22 => Profile 4 enable/disable
- Bit 21 => Profile 3 enable/disable
- Bit 20 => Profile 2 enable/disable

19 => PA at HIGH POWER
18 => PA at LOW POWER
17 => PA at MEDIUM POWER
16-9 => not of interest
8 => RF status (0:OFF 1:ON)
7 => ON/OFF status (1:OFF 0:ON)
6-0 => selected profile
- Bit 6 => Profile 7 selected
- Bit 5 => Profile 6 selected
- Bit 4 => Profile 5 selected
- Bit 3 => Profile 4 selected
- Bit 2 => Profile 3 selected
- Bit 1 => Profile 2 selected
- Bit 0 => Profile 1 selected

CHK is the XOR of all the previous bytes, excluding the first byte with value 0x7D.

The message that you can send from the PC to the transmitter to change its configuration must have the following format:

0x7D 0x07 0x23 WW XX YY ZZ CHK 0x7D

The bytes WW XX YY ZZ can be seen as a 32 bit word. In this word the meaning of the bits are (MSB first)

26-24 => profile select
- Profile 1 => 001
- Profile 2 => 010
- Profile 3 => 011
- Profile 4 => 100
- Profile 5 => 101
- Profile 6 => 110
- Profile 7 => 111

27 => ON/OFF (0:OFF 1:ON)
28 => RF ON/OFF (0:OFF 1:ON)
29 => PA at LOW POWER
30 => PA at MID POWER
31 => PA at HIGH POWER
23-0 => not interesting

CHK must be set to the XOR of all the previous bytes, excluding the first byte with value 0x7D.

The transmitter will answer a message with the following format:

0x7D 0x07 0x32 WW XX YY ZZ CHK 0x7D

The bytes WW XX YY ZZ can be seen as a 32 bit word. In this word the meaning of the bits are (MSB first)
31-26 => not of interest
25-20 => profile enable/disable
- Bit 25 => Profile 7 enable/disable
- Bit 24 => Profile 6 enable/disable
- Bit 23 => Profile 5 enable/disable
- Bit 22 => Profile 4 enable/disable
- Bit 21 => Profile 3 enable/disable
- Bit 20 => Profile 2 enable/disable

19 => PA at HIGH POWER
18 => PA at LOW POWER
17 => PA at MEDIUM POWER
16-9 => not of interest
8 => RF status (0:OFF 1:ON)
7 => ON/OFF status (1:OFF 0:ON)
6-0 => selected profile
- Bit 6 => Profile 7 selected
- Bit 5 => Profile 6 selected
- Bit 4 => Profile 5 selected
- Bit 3 => Profile 4 selected

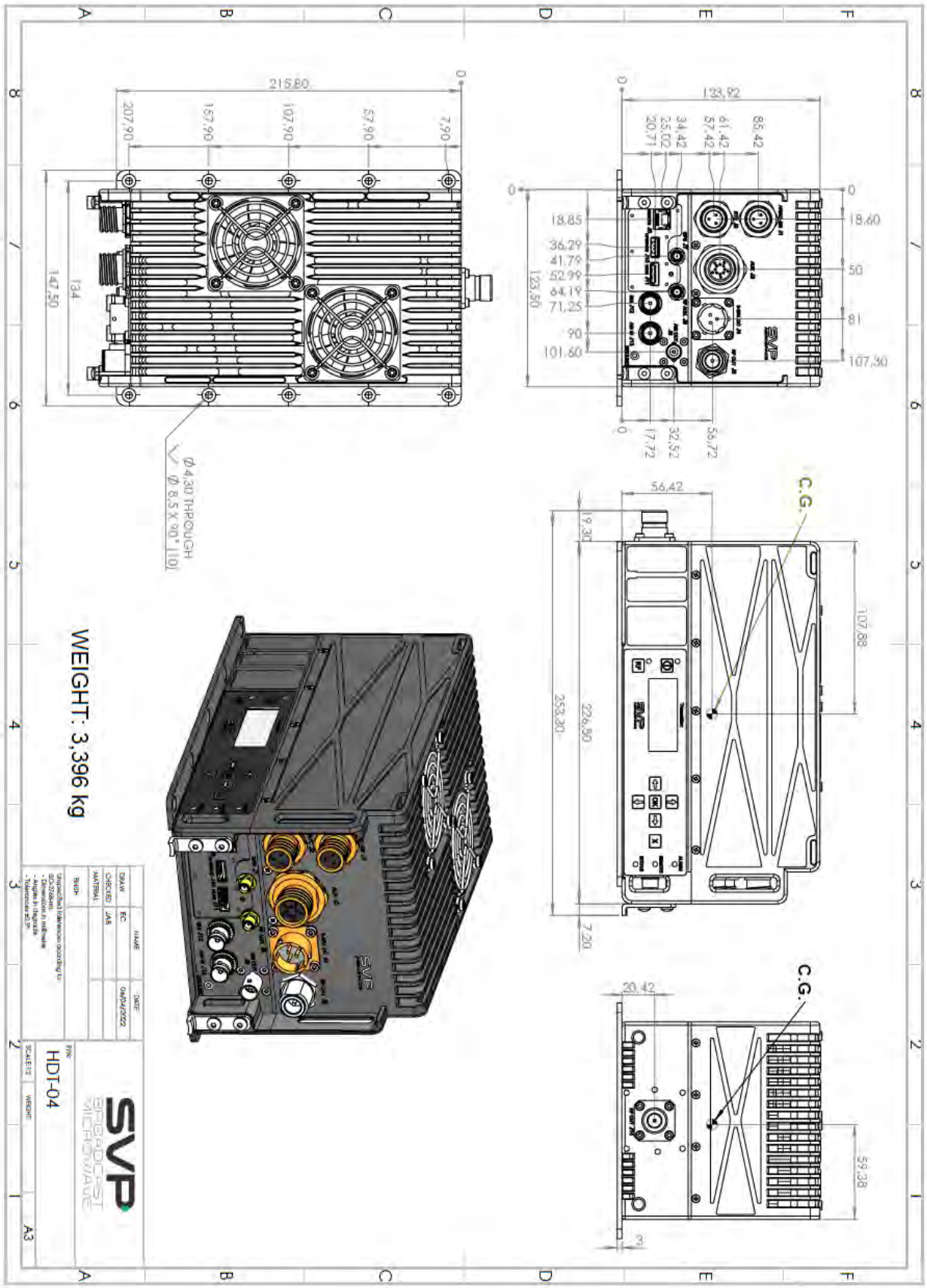
Bit 2 => Profile 3 selected
Bit 1 => Profile 2 selected
Bit 0 => Profile 1 selected

An important note to keep in mind. As the communication is half-duplex, and the master is the transmitter, to send a command to the transmitter you must wait to receive a message first, wait 20 ms, and send only one message.

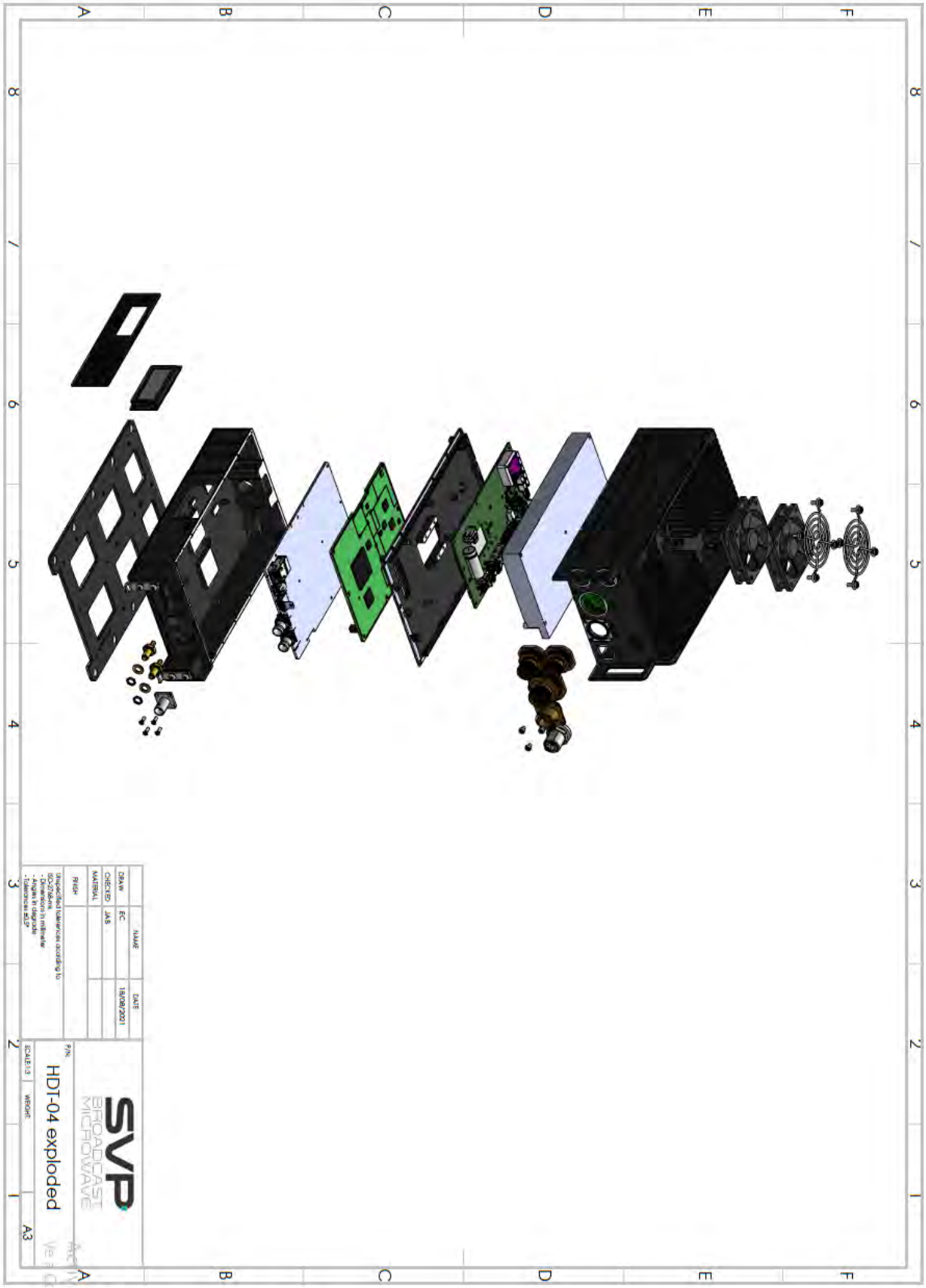
Chapter 11: Mechanical Dimensions

In this chapter, the mechanical drawing of the units described in this manual are included.

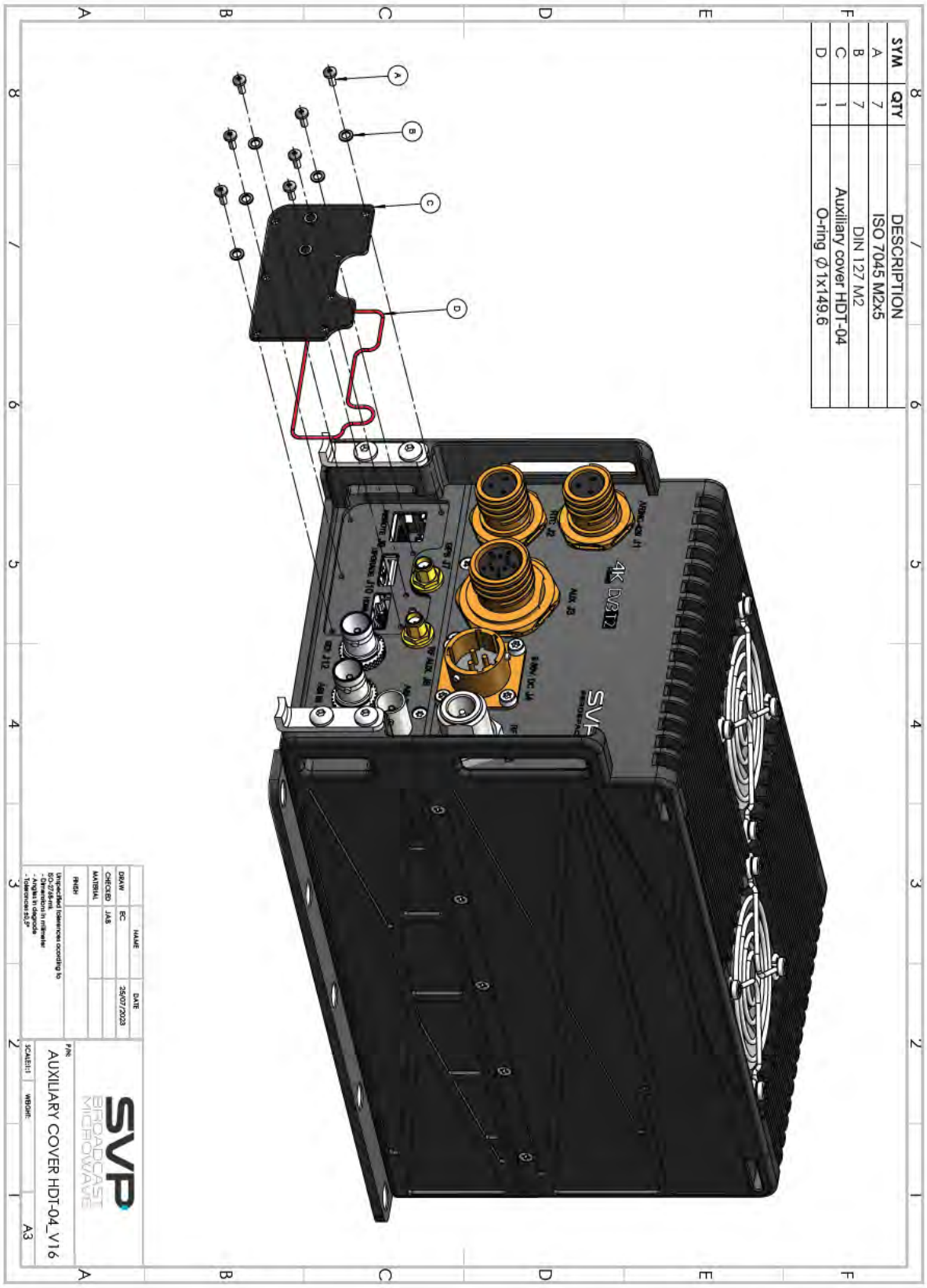
11.1 HDT-04


215,80
207,90
157,90
107,90
57,90
7,90
147,50
134
Ø 4,30 THROUGH
Ø 8,5 X 90° [10]
133,92
85,42
61,42
57,42
34,42
25,02
20,71
18,85
36,29
41,79
52,99
64,19
71,25
90
101,60
123,50
18,60
50
81
107,30
17,72
32,52
56,72
56,42
19,30
253,30
226,80
107,88
7,20
C.G.
20,42
59,38
3
WEIGHT: 3,396 kg
HDT-04
SVP
BROADCAST MICROWAVE
A3

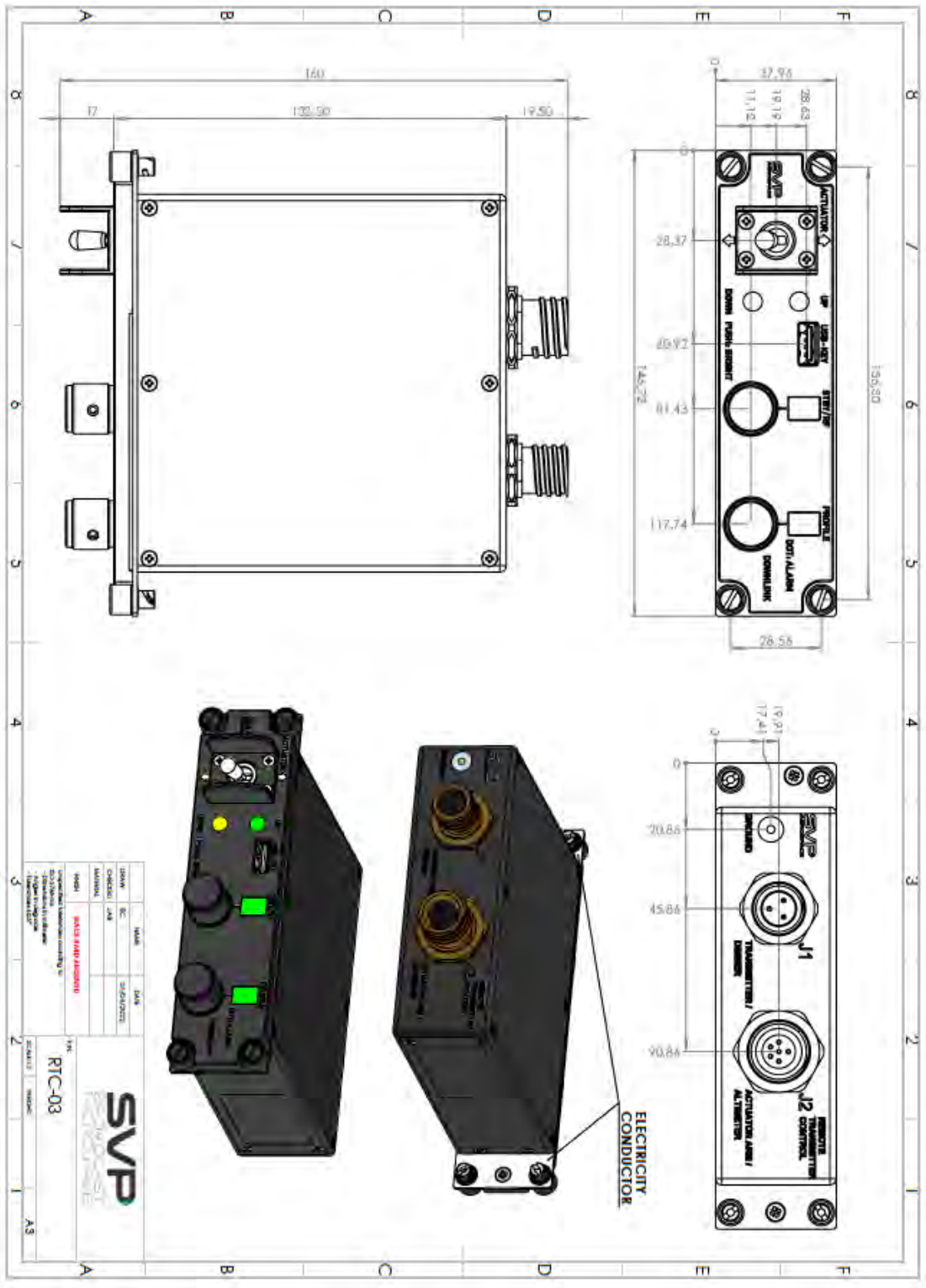
11.2 HDT-04 Exploded View Drawing



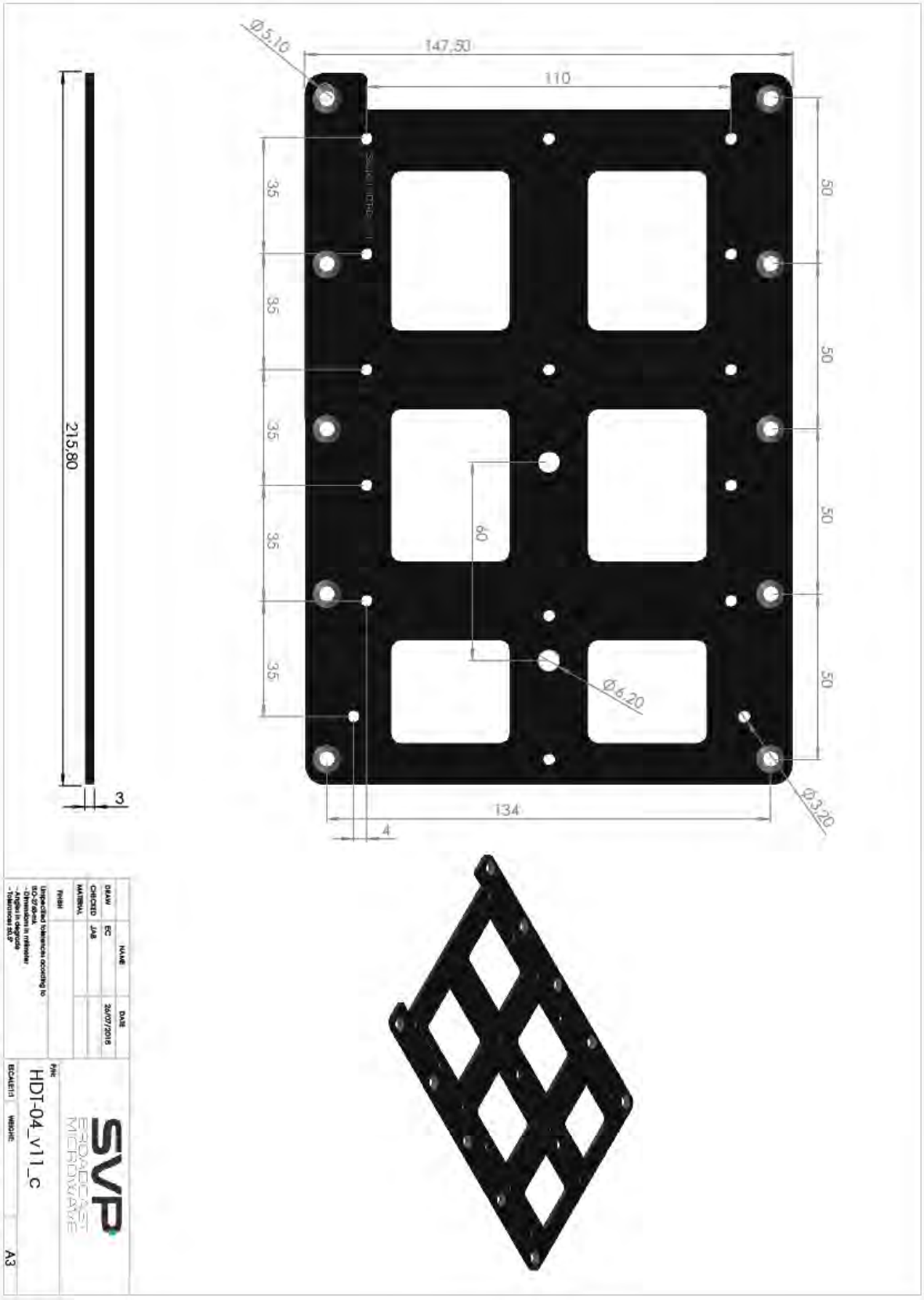
11.3 AUXILIARY COVER HDT-04_V16



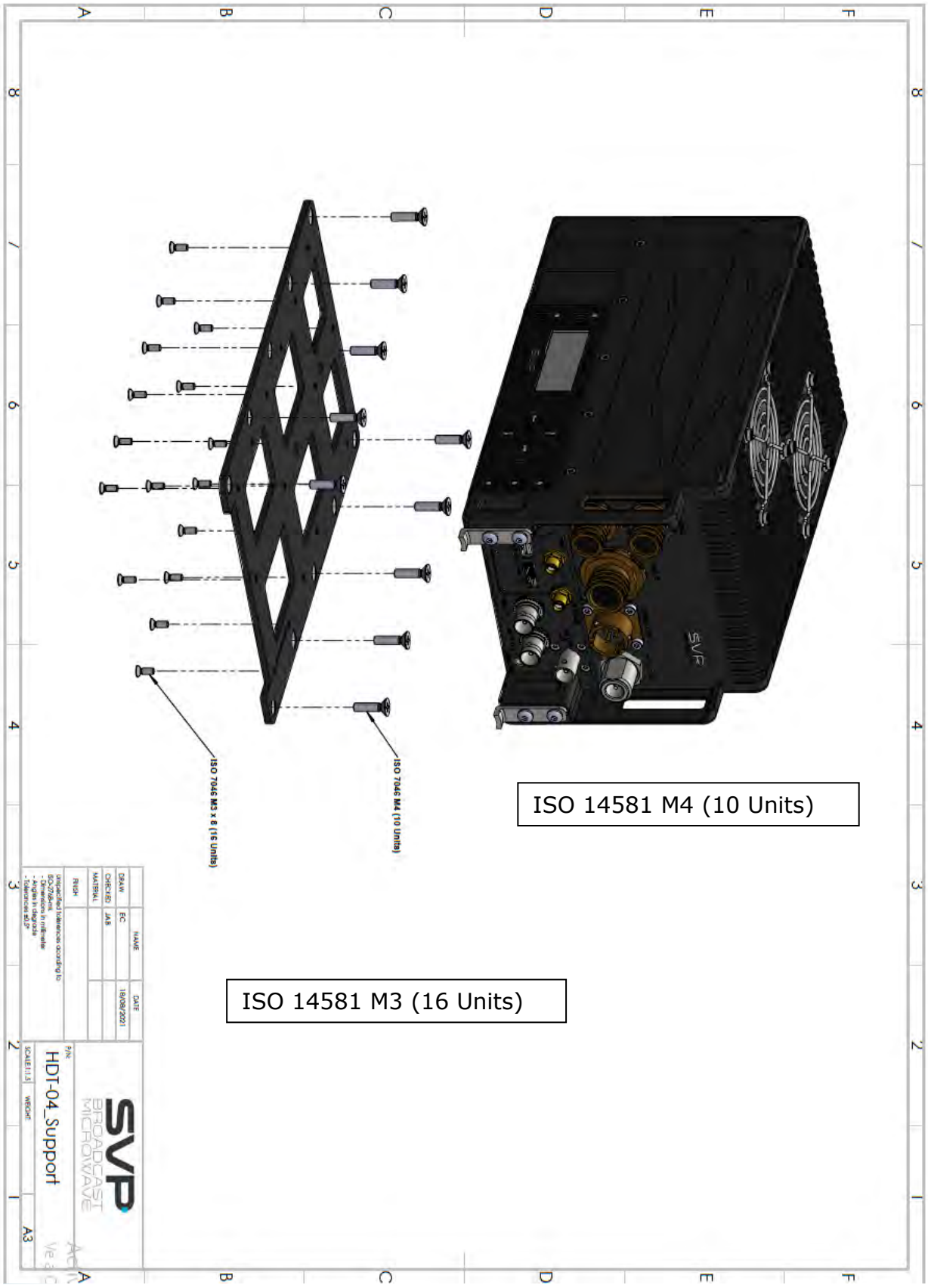
11.4 RTC-03



11.5 CLTX-04


Ø5.10
147.50
110
35
35
35
35
35
50
50
50
50
50
215.80
60
Ø6.20
Ø3.20
134
4
3
HDT-04_v11_c
A3

11.6 CLTX-04 Support Installation



Chapter 12: Preventive Maintenance

In order to ensure system longevity, it is highly recommended that the following preventive maintenance procedures be done at the appropriate time.

12.1 Maintenance Schedule

Procedure	Yearly	Each 6 months	Prior each use
Inspect Mounting Hardware (HDT-04)	✓		
Inspect Wiring (helicopter installation)	✓		
Inspect control (RTC-01) and RF (Antenna) cables		✓	
Inspect the screws of antenna mount			✓
Please check funs life	√		

Hours of life of the fans are 70,000 hours in conditions of 40 degrees and 65% humidity. The durability is 8 years with continuous operation.

12.2 Maintenance Procedures

As a pre-flight inspection:

- Inspect mounting hardware to ensure all components are secure.
- Inspect cables and connections.

12.3 Spare Parts

The HDT-04 downlink system has no user replaceable parts. Contact SVP Broadcast Microwave for all service and repair inquiries.

Contact email: info@svpbm.com

Note: Any attempts to service individual components may void the warranty.

Chapter 13: Warranty

13.1 Warranty information

Under recommended use and service, all SVP Broadcast Microwave products are warranted against defects in material and workmanship to twenty-four (24) months from the date of original shipment.

SVP Broadcast Microwave's obligation is limited to repairing or replacing, at our plant, products, which prove to be defective during the warranty period. Under no circumstances shall the warranty be transferred or assigned to any third party unless consent in writing has first been obtained from SVP Broadcast Microwave. SVP Broadcast Microwave shall not be under any liability for warranty in respect to any equipment, which shall be sold by the Customer to any third party unless otherwise agreed in writing.

SVP Broadcast Microwave is not liable for consequential damage resulting from the use of SVP Broadcast Microwave equipment.

13.2 Claim for damage in shipment

Your unit should be inspected and tested as soon as it is received. Claims for damage should be filed with carrier.

13.3 Return procedures

All claims under warranty must be made promptly after occurrence of circumstances giving rise to the claim and must be received within the applicable warranty period by SVP Broadcast Microwave or its authorized representative. SVP Broadcast Microwave reserves the right to reject any warranty claim not promptly reported. After expiration of the applicable warranty period, products are not subject to adjustment.

Before any Product is returned for repair and / or adjustment, authorization from SVP Broadcast Microwave for the return and instructions as to how and where the Product should be shipped must be obtained. The Product type, serial numbers, and a full description of the circumstances giving rise to the warranty claim should be included. Such information will help establish the cause of failure and expedite adjustment or repair.

Important

Any Product returned without complete information will be considered not to have met all contractual requirements. Information required includes (as a minimum): Model Number, Serial Number, Description, Hours of Use, Type of Failure, and Operating Conditions during failure.

Annex A: AVS Airborne Antenna User's Guide

A.1 Description

The **AVS** vertically polarized omni linear antennas are designed for applications requiring extra strength, particularly for vehicle roof applications (to withstand tree branch impacts) and for fixed-wing aircraft installations (to withstand higher wind speeds than a helicopter operation).

These collinear antennas compliment SVP slimline omni antenna range, similarly featuring highly efficient, wideband groundplane independent 2 tier arrays of balanced centre-fed collinear dipoles.

High performance with consistent gain and radiation pattern across their wide operating bands results from a unique conical dipole and double isolating choke design preventing stray currents on the feed system.

Figure A.1: AVS Airborne Omni Linear Antenna

A.2 Technical Specifications

- **AVS-206**

Item	Features
Frequency band	2 GHz
Bandwidth	200 MHz
Gain	6 dBi
Polarization	Vertical
Elevation B/W	27º
Azimuth B/W	360º
Return Loss	14 dB Typical (1.7 to 1 VSWR)
Connector	N female
Length	311 mm (approx.)
Colour	White
Radom	Fibreglass

Table 57: AVS-206L antenna technical features

- **AVS-406**

Item	Features
Frequency range	4 – 6 GHz
Bandwidth	300 MHz
Gain	6 dBi
Polarization	Vertical
Elevation B/W	27º
Azimuth B/W	360º
Return Loss	14 dB Typical
Connector	N female
Diameter	177.8 mm (approx.)
Colour	White
Radom	Fibreglass

Table 58: AVS-406L antenna technical specifications

Figure A.2: AVS Airborne Omni Linear Antenna

Annex B: Modulation Standards

This chapter describes the DVB-T/T2 standards, as well as their features and the differences between them.

B.2 DVB-T

DVB-T is a technical standard that specifies the framing structure, channel coding and modulation for digital terrestrial television (DTT) broadcasting. It is a flexible system that allows networks to be designed for the delivery of a wide range of services, from HDTV to multichannel SDTV, fixed, portable, mobile, and even handheld reception.

B.2.1 How Does It Work

DVB-T, in common with almost all modern terrestrial transmission systems, uses OFDM (orthogonal frequency division multiplex) modulation. This type of modulation, which uses a large number of sub-carriers, delivers a robust signal that has the ability to deal with very severe channel conditions.
DVB-T has technical characteristics that make it a very flexible system:

- 3 modulation options (QPSK, 16QAM, 64QAM).
- 5 different FEC (forward error correction) rates.
- 4 Guard Intervals.
- Choice of 2k or 8k carriers.
- Can operate in 6, 7 or 8MHz channel bandwidths.

Using different combinations of the above parameters a DVB-T network can be designed to match the requirements of the network operator, finding the right balance between robustness and capacity.

B.3 DVB-T2

DVB-T2 is the world's most advanced digital terrestrial television (DTT) system, offering more robustness, flexibility and at least 50% more efficiency than any other DTT system. It supports SD, HD, UHD, mobile TV, or any combination thereof.

B.3.1.1 How Does It Work

Like its predecessor, DVB-T2 uses OFDM (orthogonal frequency division multiplex) modulation with a large number of subcarriers delivering a robust signal, and offers a range of different modes, making it a very flexible standard. DVB-T2 uses the same error correction coding as used in DVB-S2 and DVB-C2: LDPC (Low Density Parity Check) coding combined with BCH (Bose-Chaudhuri-Hocquengham) coding, offering a very robust signal. The number of carriers, guard interval sizes and pilot signals can be adjusted, so that the overheads can be optimised for any target transmission channel.

B.3.1.2 DVB-T2 New Features

The DVB-T2 standard has several improvements in comparison with the DVB-T standard.

FEC coding

In the error correction stage, the DVB-T2 standard implements a combination of LDPC codes with BCH codes. LDPC codes allow a close performance to Shannon limit and the BCH codes are used so as to eliminate the floor error of the LDPC codes.

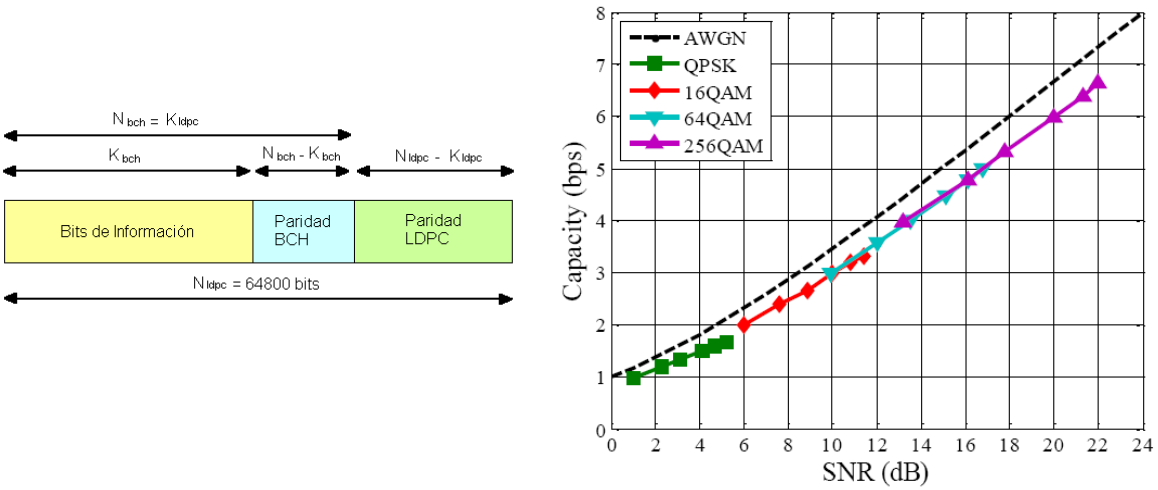


Figure B.1: LDPC and BCH codes

Constellation Rotation

This new feature consists on a rotation of some degrees of the constellation. With this rotation, dependence between the I and Q components of the signal is achieved. This means that with only one component (the I or the Q one) it is possible to know exactly the symbol to which it belongs to.
This new feature provides additional robustness for low order constellations.

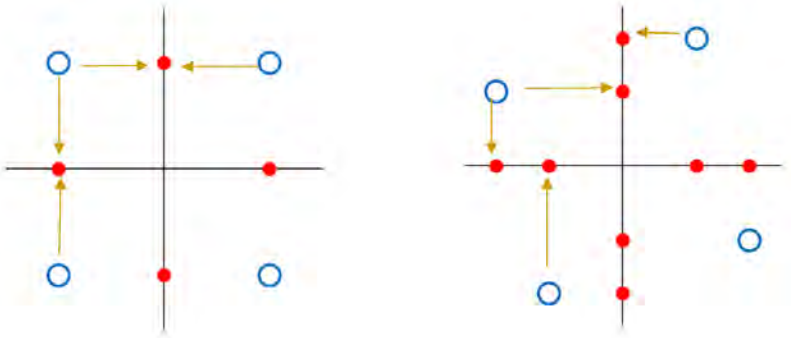


Figure B.2: Constellation Rotation

B.3.2 DVB-T vs DVB-T2

Next, it is shown a comparison table between the two existing DVB terrestrial standards. The new features of the DVB-T2 standards respect to the DVB-T are in bold.

	DVB-T	**DVB-T2** (new/improved options in **bold**)
FEC	Convolutional Coding + Reed Solomon 1/2, 2/3, 3/4, 5/6, 7/8	LDPC + BCH 1/2, **3/5**, 2/3, 3/4, **4/5**, 5/6
Modes	QPSK, 16QAM, 64QAM	QPSK, 16QAM, 64 QAM, **256 QAM**
Guard Interval	1/4, 1/8, 1/16, 1/32	1/4, **19/128**, 1/8, **19/256**, 1/16, 1/32, **1/128**
FFT Size	2k, 8k	**1k**, 2k, **4k**, 8k, **16k**, **32k**
Scattered Pilots	8% of total	**1%, 2%, 4%,** 8% of total
Continual Pilots	2.0% of total	**0.4% - 2.4%** (0.4% - 0.8% in 8k–32k)
Bandwidth	6, 7, 8 MHz	**1.7, 5**, 6, 7, 8, **10** MHz
Typical data rate (UK)	24 Mbit/s	**40 Mbit/s**
Max. Data rate (@20 dB C/N)	31.7 Mbit/s (using 8 MHz)	**45.5 Mbit/s** (using 8 MHz)
Required C/N ratio (@24 Mbit/s)	16.7 dB	**10.8 dB**

Table 59 DVB-T vs DVB-T2

Glossary

AES/EBU	Audio Engineering Society/European Broadcasting Union
ACPR	Adjacent Channel Power Ratio
APSK	Amplitude and phase-shift keying or asymmetric phase-shift keying (APSK)
ASI	Asynchronous Serial Interface
BNC	Bayonet Neill-Concelman
BR	BitRate
CA-BISS	Conditional Access-BISS
COFDM	Coded Orthogonal Frequency Division Multiplexing
DC	Direct current
DVB-T	Digital Video Broadcasting – Terrestrial
DVB-T2	Digital Video Broadcasting – Terrestrial Second Generation
ETSI	European Telecommunications Standards Institute
EVM	Error Vector Magnitude

FEC	Forward Error Correction
FFT	Fast Fourier transform
GPS	Global Positioning System
HD	High Definition
HDMI	High-Definition Multimedia Interface
HDR	High Definition Receiver
HDT	High Definition Transmitter
IF	Intermediate Frequency
IG	Interval Guard
IP	Internet Protocol
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
LD	Low Delay
MPEG	Moving Picture Experts Group
NLOS	Non-Line of Sight
PAL	Phase Alternating Line
PID	Packet Identification

QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase-Shift Keying
RF	Radio Frequency
RTC	Remote Control
SD	Standard Delay
SDI	Serial Digital Interface
TFT	Thin-Film Transistor
TS	Transport Stream
UDP	User Datagram Protocol
USB	Universal Serial Bus

Certificate of Conformance
Declaración de Conformidad

Certificate No. / *Nº de declaración: S 160315*
Description / *Descripción*: **HDT-04 H.264 High Power Transmitter**
Model / *Modelo:* HDT-04

The equipment has been designed and tested to meet the following standards applicable to the 1999/5/CE directive:
El equipo ha sido diseñado y analizado para satisfacer las siguientes normas aplicables a la normativa 1999/5/CE:

Safety / *Seguridad*

EN 60215	Security rules for radioelectric emmission equipments *Reglas de seguridad para equipos de emisión radioeléctrica*
EN 60950-1	Article 3.1a (Electric Security). *Artículo 3.1a (Seguridad Eléctrica)*

Electromagnetic Compatibility / *Compatibilidad Electromagnética*

EN 301 489-1&3:	Article 3.1b (Electromagnetic Compatibility) *Artículo 3.1b (Compatibilidad Electromagnética)*
EN 50 130-1:	Article 3.1b (Electromagnetic Compatibility) *Artículo 3.1b (Compatibilidad Electromagnética)*
EN 300220-3:	Article 3.2 (Protection and good use of the spectrum) *Artículo 3.2 (Protección y buen uso del espectro)*
EN 61000-3 (2-3):	Electromagnetic emission (harmonics and fluctuations). *Emisión electromagnética (armónicos y fluctuaciones).*
EN 55022:	Electromagnetic emission (conducted and radiated Class B). *Emisión electromagnética (conducida y radiada Clase B).*
EN 61000-4 (2-3-4-5-6-11):	Electromagnetic immunity.

Manufacturer / *Fabricante*

SVP Broadcast Microwave S.L.
Uralde, 2 Iurreta 48215 Vizcaya SPAIN
VAT/NIF: ES B95136719

Certified by / *Certificado por*

Juan Antonio Burgos
Technical Manager

Date / *Fecha* 16/03/2015

SVP Broadcast Microwave
Uralde, 6 - 2 / 48 215 IURRETA - Bizkaia
Tel: 94 620 37 22 - Fax: 94 620 43 50

SVP BROADCAST MICROWAVE

Certificate of Conformance
Declaración de Conformidad

Certificate No. / *Nº de declaración: S 150414*
Description / *Descripción*: **RTC-01 Remote Control**
Model / *Modelo:* RTC-01

The equipment has been designed and tested to meet the following standards applicable to the 1999/5/CE directive:
El equipo ha sido diseñado y analizado para satisfacer las siguientes normas aplicables a la normativa 1999/5/CE:

Safety / *Seguridad*

EN 60215	Security rules for radioelectric emmission equipments *Reglas de seguridad para equipos de emisión radioeléctrica*
EN 60950-1	Article 3.1a (Electric Security). *Artículo 3.1a (Seguridad Eléctrica)*

Electromagnetic Compatibility / *Compatibilidad Electromagnética*

EN 301 489-1&3:	Article 3.1b (Electromagnetic Compatibility) *Artículo 3.1b (Compatibilidad Electromagnética)*
EN 50 130-1:	Article 3.1b (Electromagnetic Compatibility) *Artículo 3.1b (Compatibilidad Electromagnética)*
EN 300220-3:	Article 3.2 (Protection and good use of the spectrum) *Artículo 3.2 (Protección y buen uso del espectro)*
EN 61000-3 (2-3):	Electromagnetic emission (harmonics and fluctuations). *Emisión electromagnética (armónicos y fluctuaciones).*
EN 55022:	Electromagnetic emission (conducted and radiated Class B). *Emisión electromagnética (conducida y radiada Clase B).*
EN 61000-4 (2-3-4-5-6-11):	Electromagnetic immunity. *Inmunidad electromagnética.*

Manufacturer / *Fabricante*

SVP Broadcast Microwave S.L.
Uralde, 2 Iurreta 48215 Vizcaya SPAIN
VAT/NIF: ES B95136719

Certified by / *Certificado por*

Juan Antonio Burgos
Technical Manager

SVP Broadcast Microwave
Uralde, 6 - 2 / 48 215 IURRETA - Bizkaia
Tel: 94 620 37 22 - Fax: 94 620 43 36

Date / *Fecha* 15/04/2014

CTA

TEST CERTIFICATE

Project Name: **SVP Environmental Testing**

Product:

Description	SVP S/N
HDT-04	970010515
HDT-02	920291214
PA-10	300190615
RTC-01	980091214

Trade Mark: **SVP BROADCAST MICROWAVE**

Tested on request of: **SVP BROADCAST MICROWAVE, S.L.**

Standard (s): **RTCA-DO 160 G: December 8 2010**

Performed tests:

- Section 4.0 Temperature and altitude. Category A1.
- Section 5.0 Temperature variation. Category C.
- Section 6.0 Humidity. Category A.
- Section 7.0 Operational Shock and crash Safety. Category A
- Section 8.0 Vibration. Category U2.

Test certificate based on the test report: **Code: V.15.006-INR-01, Dated: 17/06/2015**

Miñano, a 17 de Junio de 2015

CTA IZAGA UGARRIZA, JOSEBA (FIRMA)

Joseba Izaga, *HALT manager*

CTA MADRUGA ANGULO, OSCAR (AUTENTICACIÓN) 2015.06.17 15:04:27 +02'00'

Oscar Madruga, *Head of Production Department*

Notes

Final note

SVP Broadcast Microwave S.L. is constantly striving to improve all of its products.

Therefore, we ask you to understand that modifications may occur in designs, equipment and technology. Consequently, no responsibility can be derived from the information, illustrations or descriptions contained in this manual.

The texts, illustrations and instructions in the manual are based on the existing situation when the manual is published.

SVP Broadcast Microwave reserves the right to make changes to this manual and to the equipment without prior notice.

C/ Zubiaurre 7 bajo
48215 Iurreta
Vizcaya – Spain

Tel: (+34) 94620 3722

info@svpbm.com
www.svpbm.com