# UDT-02 Transmitter Manual

**V1.1**

**SW: V1_9809980813-06**

# Accessories included in this manual:

PA / PA Ultralinear
Power Amplifier

RTC-04
Remote Control

AVF Flexible Antenna

Cellular Datalink
Antenna

# Contents

### *Annex A: PA Power Amplifiers*

This annex explains the main characteristics of SVP Broadcast Microwave's PA Power Amplifiers.

### *Annex B: AVF Flexible Antenna User's Guide*

The different flexible antennas and its characteristics are explained in this chapter.

### *Annex C: Modulation Standards*

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

## 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 give 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 UDT-02 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 UDT-02.
- To configure the UDT-02 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.

It advises users that if they do not take, avoid or make specific actions, damage 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 the submenu related to that option or can change the value of the parameter.

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

## Important Notes

- The UDT-02 HEVC UHD Multiband Transmitter is completely compatible with the DVB-T/T2 Standards, included in the European Standard ETSI EN300744 (DVB-T) and ETSI EN300755 (DVB-T2).
- It is important to note that when the transmitter is switched on, the selected RF output connection must be connected to a suitable antenna or charged.
- It features HEVC, H.264 and Mpeg-2 encoding for 12G, high definition (HD) and standard definition (SD) signals with ultra-low latency. HEVC allows the same video quality, reducing file sizes by up to 50% compared to its predecessor, the H.264.
- The UDT-02 HEVC UHD Multiband Transmitter is available from 1 GHz to 8 GHz, for the DVB-T2 and DVB-T.
- The equipment's maximum output power for the DVB-T2/T is 100 mW in 2 GHz frequency band, (selectable from -5 to +20 dBm).
- Special care should be taken with SDI cables, quality and length, as these are very important, especially when 12G signals are transmitted.
- 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.
- Only authorized personnel should open the unit and any repair or warranty will be invalidated if the seals are broken.

# 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 UDT-02 HEVC 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 AVF flexible antenna 3 dBi) as long as the distance between the antenna and the person is at least 4 cm. In the case the PA-5 (5 W Power Amplifier), the minimum distance is 28.2 cm and if PA-10 (10 W Power Amplifier) is used, the minimum distance is 39.9 cm. 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

$G\,(dBi)$: Antenna gain in dBi

P: Output power of the transmitter (W)

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

1. UDT-02 Transmitter with AVF antenna (3 dBi)

   G = 3

   $P_{max}$ = 100 mW

   EIRP = 200 mW

   **$R_{min}$ = 4 cm = 1.57 in**

2. UDT-02 Transmitter + PA-5 (5 W) with AVF antenna

   G = 3

   $P_{max}$ = 5000 mW

   EIRP = 10000 mW

   **$R_{min}$ = 28.2 cm = 11.1 in**

3. UDT-02 Transmitter + PA-10 (10 W) with AVF antenna

   G = 3

   $P_{max}$ = 10000 mW

   EIRP = 20000 mW

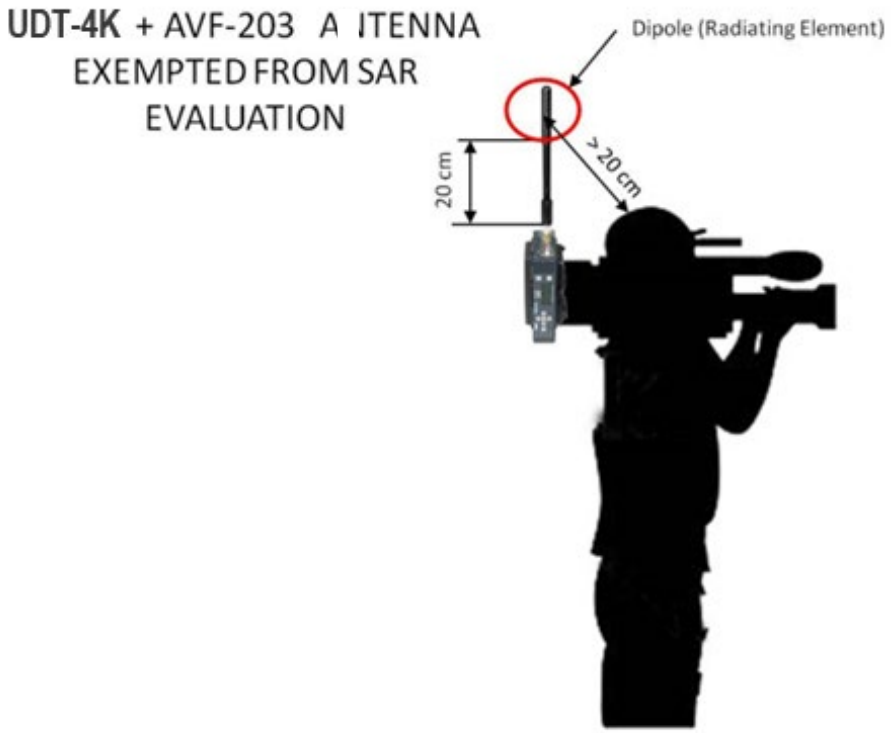
   **$R_{min}$ = 39.9 cm = 15.7 in**

# Declaration of RF Exposure Compliance for Exemption from Routine Evaluation Limits

## SAR Evaluation – AVF-203 antenna

As shown in the point number 2.5.1 from the RSS-102 Radio Standard Specification, **SAR evaluation is not required if the separation distance between the user and the radiating element of the device is more than 20 cm.**

The equipment, which consists of the UDT-02 Transmitter with the AVF-203 antenna fixed to it, fulfils this requirement. As shown in the figure below, the distance between the device's radiating element (situated at the top of the antenna) and the nearest part of the user's body is further than 20 cm in length. If the length from the radiating element to the bottom of the antenna is 20 cm, then the distance between the nearest part of the user's body and the radiating element will be higher than 20 cm. As the camera user always uses the camera in the same way and the antenna is fixed to the camera, the distance is always maintained.




**Conclusion: This equipment is exempted from SAR evaluation.**

## RF Exposure Evaluation

As shown in the point number 2.5.2 from the RSS-102 Radio Standard Specification, **RF exposure evaluation is required** if the separation distance between the user and the device's radiating element is lower than 20 cm, **except when the device operates as follows**:

- **Below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W.**
- **At or above 1.5 GHz and the maximum e.i.r.p. is equal to or less than 5 W.**

Due to the fact, this equipment is going to operate above 1.5 GHz and the maximum e.i.r.p. is 200 mW (with the AVF-203 antenna), this equipment is exempted from the RF exposure evaluation. When this equipment is operating below 1.5 GHz, it is also exempted from the RF exposure evaluation because the maximum e.i.r.p. (200mW) is lower than 2.5 W.

**Conclusion: This equipment is exempted from the RF exposure evaluation.**

# First Aid in Case of Electric Shock

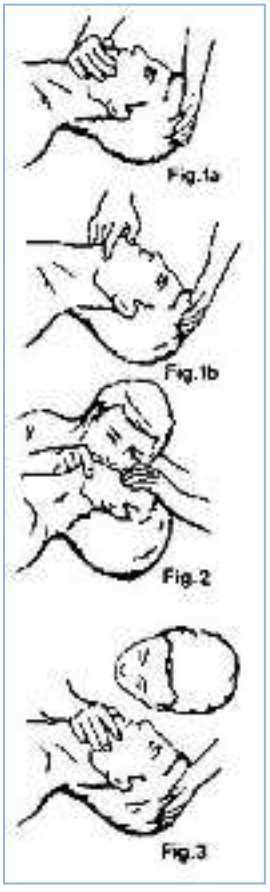
DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS until the circuit is broken. SWITCH OFF. If this is not possible, PROTECT YOURSELF with DRY insulating material and pull the victim clear of the conductor.

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)

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.
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)
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.
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).
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.




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.
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.

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.
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:

1. DO NOT ATTEMP TO REMOVE CLOTHING ADHERING TO THE BURN.
2. If possible, alleviate the pain from the burnt part by immersing in cold water.
3. If help as available or as soon as resuscitation is no longer required, the wound should be covered with a DRY clean dressing.
4. Oil or grease in any form should not be applied.
5. If severely burnt, get the victim to hospital immediately.

# Chapter 1: Introduction

The UDT-02 is the multifunction and multiband transmitter developed by SVP Broadcast Microwave. The features of this equipment, achievable only by SVP, make this transmitter the most advanced in the market to date.

Its feature HEVC encodes for 12G video quality signals with ultra-low latency. HEVC transmission is possible using 50% lower bitrate.

This new generation transmitter accepts one 12G signal or four 3G/HD/SD-SDI video input signals.

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

The UDT-02 Transmitter performs DVB-T2 and DVB-T modulations with a frequency band from 1 GHz to 3 GHz and optionally 1 to 8 GHz wide band. DVB-T enables compatibility with nearly all types of receivers. DVB-T2 modulation outperforms DVB-T modulation and offers much higher data rate, which renders a higher signal quality or much more robust signal than other modulations, achieving longer and more complex links.

Control, operation and monitoring of the UDT-02 Transmitter are very friendly. All the parameters of the transmitter can be configured in field. Furthermore, 7 presets are configurable for quick equipment set up. A wide range of accessories allows the use of this equipment in many different applications.

## General Features

This transmitter features HEVC, H.264 and Mpeg-2 encoding for 12G, high definition (HD) and standard definition (SD) signals with ultra-low latency. HEVC allows the same video quality, reducing file sizes by up to 50% compared to its predecessor, the H.264.

Among the improvements of this new transmitter is the ability to transmit one 4K UHD signal with HDR at 10-bit 4:2:2 quality or 4 simultaneous 1080p50/59HD signals.

It optionally includes integrated Bidirectional camera control with Tally.

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

It has a display and a keyboard which makes the configuration and monitoring of every parameter of the equipment possible.

The equipment is fed with DC power supply from 10 to 36V. It can be powered through DC power supply connector or through the battery mount (optional).

Its excellent design, mechanical and electronic assembly make the UDT-02 a robust and reliable solution.

## DVB-T2 features

It is available from 1 GHz to 8 GHz through three different output bands, being 100 mW the maximum output power in the range 1 to 3 GHz and 50mW in the range between 3 and 8 GHz. High quality components have been used to achieve the best output signal quality.

The UDT-02 digital camera transmitter uses COFDM (Coded Orthogonal Frequency Division Multiplexing) modulation system (1K, 2K, 4K) which provides superior signal robustness and a higher link performance. This technology provides operators with efficient means to overcome the challenges of NLOS propagation and mobile channels 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, 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. Moreover, the rotated constellation technique is applied in order to improve the link performance.

A COFDM modulated signal, as it uses a low symbol rate modulation scheme (*i.e.* where the symbols are relatively long compared to the channel time characteristics), suffers less from intersymbol interference (ISI) 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 intersymbol and co-channel interference. So, if one carrier's information is lost, only a small part of the whole information would be lost.

Besides, in COFDM, the sub-carrier frequencies are chosen so that the sub-carriers are orthogonal to each other, meaning that cross-talk, interference,

between the sub-channels is eliminated. 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 in 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.

Used modulation scheme of each COFDM sub-carrier, QPSK, 16QAM, 64QAM and 256 QAM is also connected with signal robustness and transmitted bit rate. QPSK is the most robust and 256QAM is able to transport a higher bit rate.

Besides the system can define 4 guard intervals: 1/4, 1/8, 1/16 and 1/32. The guard interval is used to reduce intersymbol interferences due to the multipath propagation.

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

To summarize, with all these characteristics, the maximum bit rate achieved is 46 Mbps.

**DVB-T features**

The RF stage of the UDT-02 Transmitter is the same as the DVB-T2 one. The difference is found in the modulation part as it is commented below.

The UDT-02 digital camera transmitter uses COFDM (Coded Orthogonal Frequency Division Multiplexing) modulation system (2K mode).

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

Used modulation scheme of each COFDM sub-carrier, QPSK, 16QAM and 64QAM, is also connected with signal robustness and transmitted bit rate. QPSK is the most robust and 64QAM is able to transport a higher bit rate.

Besides the system can define 4 guard intervals: 1/4, 1/8, 1/16 and 1/32.

In conclusion, with all these characteristics, the maximum bit rate achieved is 31.67 Mbps.

# Chapter 2: Technical features

**RF Stage DVB-T2 and DVB-T:**

| | |
|---|---|
| Frequency Range: | 1 to 3 GHz |
| | 3 to 4 GHz (Optional) |
| | 4 to 8 GHz (Optional) |
| Max. Output Power: | 100 mW (1GHz to 3 GHz Selectable from -5 to +20 dBm ) |
| | 50mW (3 GHz to 8 GHz) |

**Modulation:**

| | |
|---|---|
| DVB-T2: | COFDM 1K, 2K, 4K |
| | QPSK, 16QAM, 64QAM, 256QAM |
| | 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 |
| | QPSK, 16QAM, 64QAM |
| | 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 |

**Video:**

| | |
|---|---|
| Inputs: | 1 x 12G-SDI |
| | 4 x 3G, HD, SD-SDI (Optional) |
| Formats: | 2160p–23.98/24/25/29.97/30/50/59.94/60 Hz |
| | 1080p–23.98/24/25/29.97/30/50/59.94/60 Hz |
| | 1080i–50/59.94/60 Hz |
| | 720p-23.98/24/25/29.97/30/50/59.94/60 Hz |
| | 576i–50 Hz |
| | 480i–59.94 Hz |

**Audio:**

| | |
|---|---|
| Quantity: | 16 channels (8 pairs) |
| Formats: | Embedded or Analogue |
| Analogue Input: | 2 pair Line / Mic level |
| Analogue Max. Level: | 24dBu (Balanced) |
| Phantom Power: | 48V Phantom Power |

**Test Signals:**

| | |
|---|---|
| Video: | Bars |
| Audio: | 16 Audio tones |

**Data Channels:**

| | |
|---|---|
| Data channel: | User data / GPS data |
| Data rate: | 1,200 to 57,600 bps |

**ASI:**

| | |
|---|---|
| Input and Output: | ASI Transport Stream |
| Remux: | ASI Remux (Optional) |

**Encryption:**

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

**Encoder:**

| | |
|---|---|
| Video compression: | HEVC, H.264 and MPEG2 |
| Latency: | UHD 59p = 66ms |
| Encoder+Decoder | UHD 50p = 75ms |
| | FHD 59p = 55ms |
| | FHD 50p = 70ms |
| | FHD 59i = 83ms |
| | FHD 50i = 98ms |
| Profile: | 4:2:2/4:2:0, 8/10-bit |
| Output Bitrate: | 1 Mbps – 90 Mbps |
| Audio Encoder: | MPEG-1 Layer1, MPEG-1 Layer2 and AAC-LC |

## Control and Monitorization of the device:

| | |
|---|---|
| Control Interfaces: | Front panel and display |
| | Web Server interface |
| | RTC-04 via cable |
| Monitoring: | Encoding parameters |
| | Demodulation parameters |
| | Frequency and output level |
| | Alarms and warnings are sent to the receiver via RF |
| Presets | 7 user define presets |

## Power Supply:

| | |
|---|---|
| DC input: | 10 to 36 V |
| | By batteries Anton-Bauer or V (Needs to be specified at the time of order) |
| Consumption: | 35 W |

## Mechanical:

| | |
|---|---|
| Size: | 196 x 102 x 48,5 mm |
| Weight: | 1.2 kg (With V-mount battery interface) |

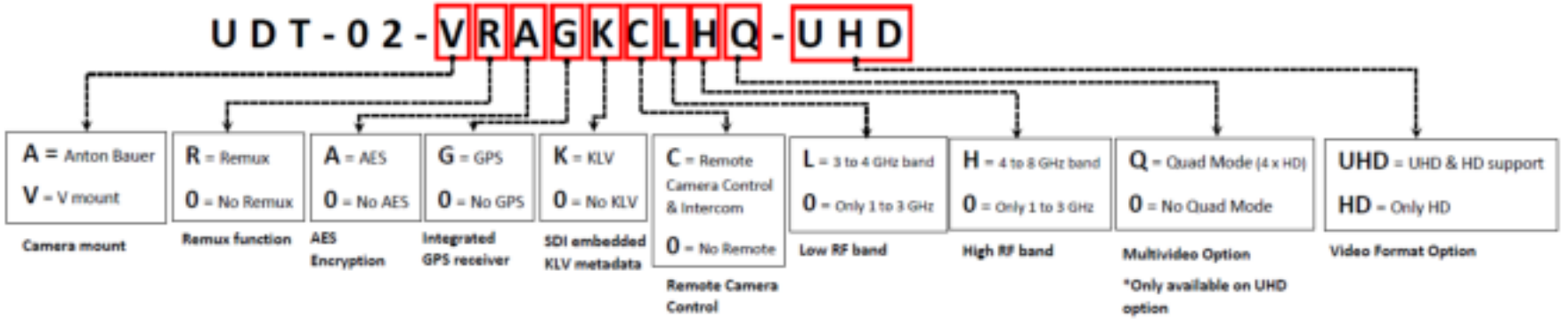
## Environmental:

| | |
|---|---|
| Temperature range: | -20 to 45 ºC |

## Bidirectional camera control (Optional):

| | |
|---|---|
| Frequency range: | 403 to 473 MHz |
| Output Power: | 100 mW |
| Compatibility: | Panasonic and Sony |
| Tally: | Tally RED, Tally GREEN and On Camera |

# Chapter 3: How to order



# Chapter 4: Transmitter Operation and Menus

This section 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 on the main screen.

Next, the main screen of the UDT-02_HEVC Transmitter is shown.

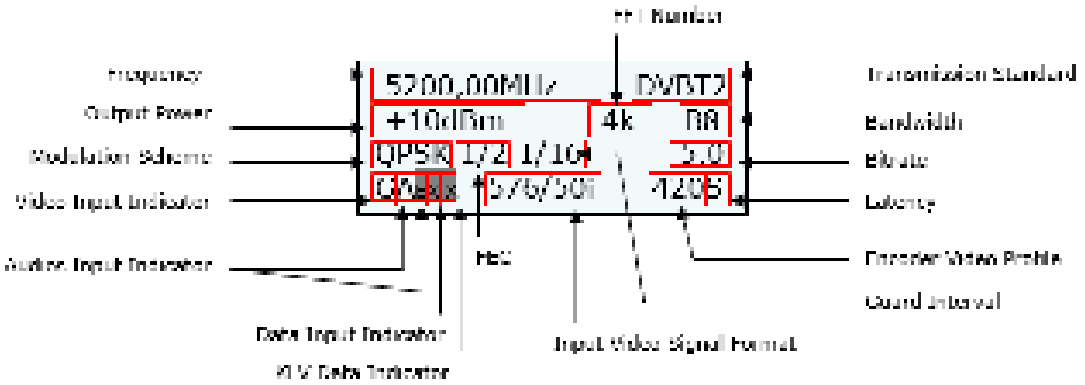



Figure 4.1: UDT-02 front panel / Main screen explanation

Once an option has been selected, the main screen appears and these parameters are displayed:

- Frequency (MHz)
- Transmission Standard (DVB-T2, DVB-T,…)
- Output power (dBm). 3 options available:
  - Variable power range from -5 to 20 dBm (DVB-T/T2).
  - High power which means that the output power is 20 dBm.
  - Low power which means that the output power is 14 dBm.
- Bandwidth (MHz)
- Modulation Scheme
- FEC (Forward Error Correction)
- Guard Interval
- Transmitted bitrate (Mbps)

- Video Input selection

  Possibilities: 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.

- Audios status indication: If Audio 1 or 2 is not darkened then it is enabled. On the other hand, if Audio 1 or 2 is darkened then it is 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. However, when this field is static, its meaning is presence of the data whereas if this field is blinking, it means absence of the data.
- KLV Metadata status indication: 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 data is disabled. Moreover, when this field is static, its meaning is presence of the data whereas if this field is blinking, it means absence of the data.
- Input video signal format.
- Encoder Video Profile (4.2.0 or 4.2.2).
- Latency (Standard Delay, Low Delay or Super Low Delay)
  - Normal Delay
  - Low Delay
  - Ultra Low Delay

Next, the linkages between the input and the character on screen is shown:

| | | |
|---|---|---|
| **Video** | SDI | S |
| | ASI | A |
| | Test-Pattern | G |
| **Audio** | Embedded | E |
| | Analogue | A |
| | Test-Tone | G |
| **Data** | RS232 | D |
| | GPS | G |
| **KLV** | | K |
| **Remux** | | R |

Table 4.1: Linkages between the input and the character displayed

## 4.2 LEDs

The UDT-02 Transmitter has 5 LEDs on its front panel that show the information detailed below.

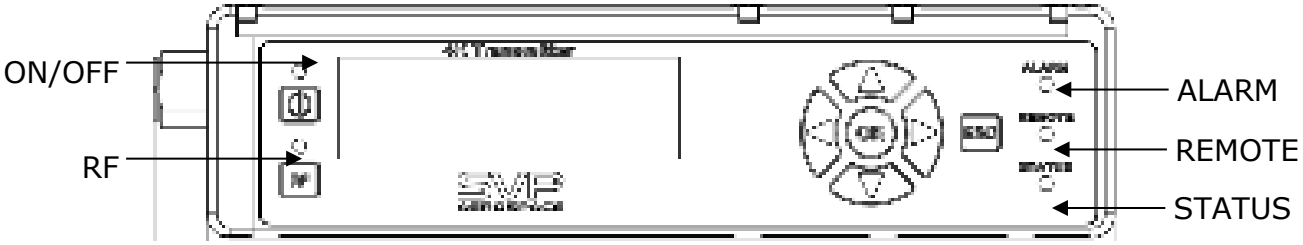



Figure 4.2: UDT-02 front panel LED indication

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

- If the LED is off, the equipment is not being fed.
- If the LED flickers in red, the equipment is being fed but it is turned off.
- The Led lights up in green when the equipment is turned on.

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

- If the LED is off, the equipment does not transmit RF signal.
- The LED lights up in green when the equipment transmits RF signal, RF stage is active.

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

- The LED lights up in red when any alarm occurs.
- The different alarms that can appear in the transmitter are:
  - Voltage High.
  - Voltage Low.
  - Temperature High.
  - ASI Overflow: This alarm means that the input bitrate is higher than the one that can be modulated due to the configured parameters (constellation, FEC, GI...).
- The different warnings that can appear in the transmitter are:
  - No SDI /ASI Input.
  - No GPS.
  - No KLV.

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

- The LED lights up in blue when the user is connected remotely to the device (through the Web Server).

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

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

## 4.3 Front panel

The UDT-02 camera transmitter is configured following the menus structure on the display. The front panel has 8 buttons to enter and exit the equipment's control menus and submenus and to navigate through them. The function of each button is detailed in the following sections.

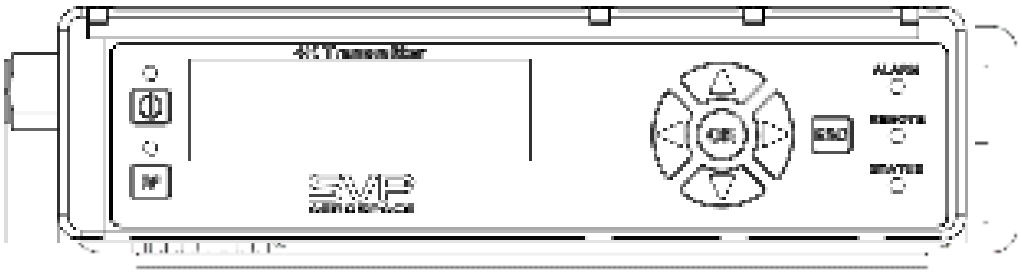


Figure 4.3: UDT-02 front panel

### 4.3.1 ON/OFF Button

To switch the equipment on and off, press this button. When the equipment is turned on, 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 4.4: ON/OFF button

### 4.3.2 OK Button

This button is used to:

- Enter to submenus and change parameters. 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. To save the introduced value, the OK button must be pressed.
- When the main screen, pressing the OK button the user can access to the alarms screen where the different alarms that are taking place are. To return to the main screen, the cross button must be pressed.


Figure 4.5: 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 the main screen from the alarms screen.

Figure 4.6: Cross button

### 4.3.4 Left and Right Button

These buttons are used to:

- To move the cursor towards the digit immediately on the left or right and to select a parameter from different options.

Figure 4.7: Left and Right buttons

### 4.3.5 Up and Down Button

- The up and down arrow buttons allow the navigation on 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 4.8: Up and Down buttons

### 4.3.6 RF Button

By pressing the RF button, RF output is enabled or disabled. The RF LED indicates the status of the RF output. 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 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 4.9: RF On/Off button

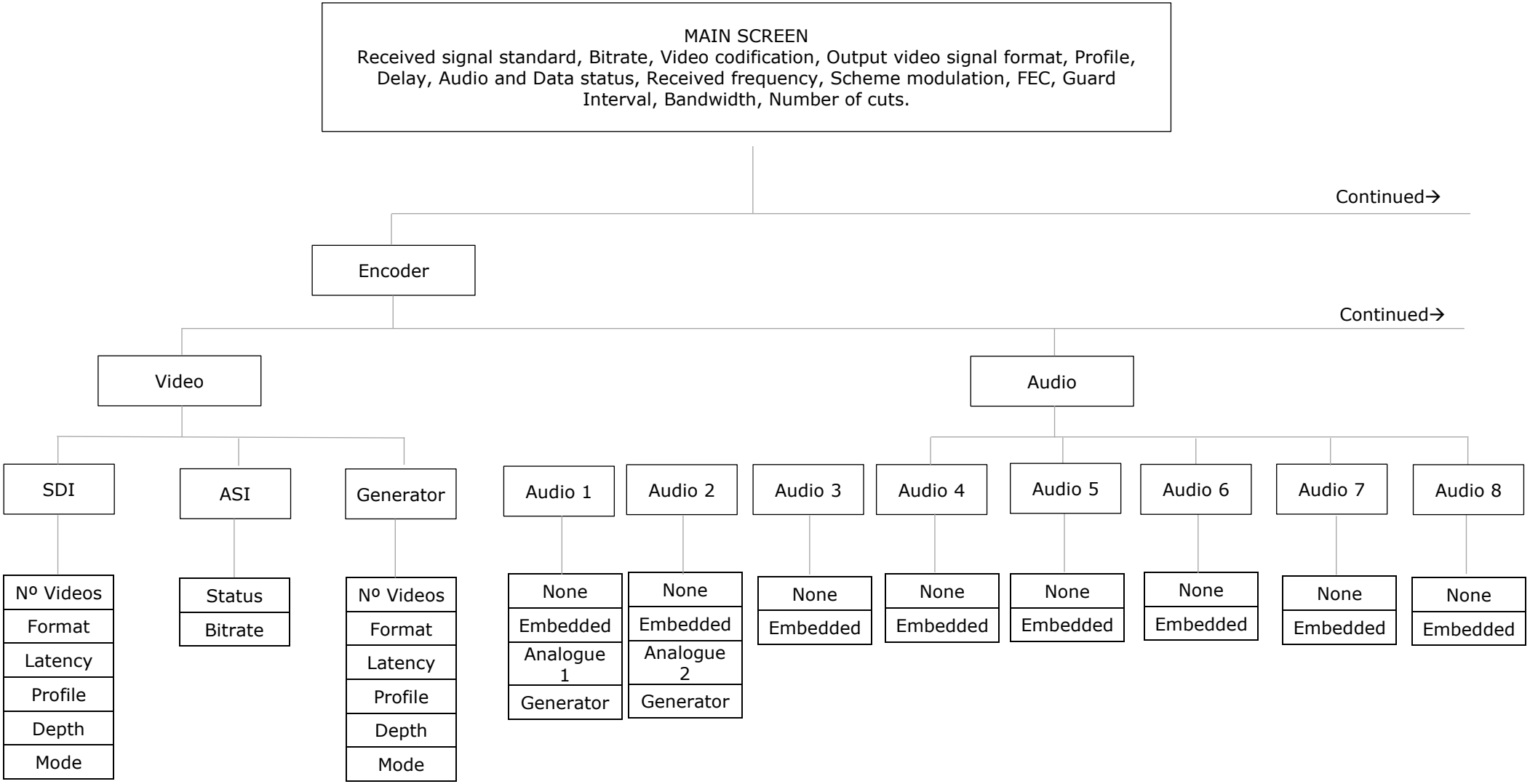
## 4.4 Menu Scheme

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 you want to return to the principal screen from the menu, the cross button must be pressed. Furthermore, in the case of being in the submenus area, returning to the main screens is achieved by pressing the cross button as many times as it is needed.

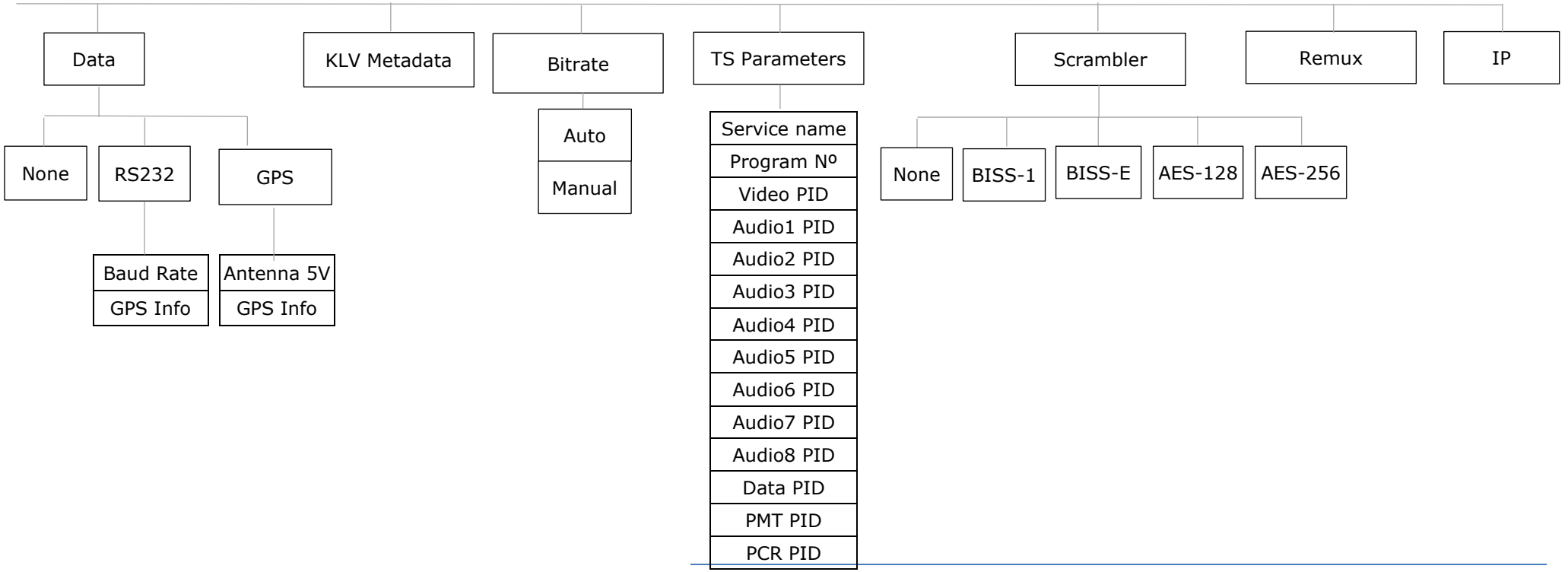
On the next page, a scheme that specifies the different menu options available are shown.


MAIN SCREEN
Received signal standard, Bitrate, Video codification, Output video signal format, Profile, Delay, Audio and Data status, Received frequency, Scheme modulation, FEC, Guard Interval, Bandwidth, Number of cuts.
Continued→
Encoder
Continued→
Video
Audio
SDI
ASI
Generator
Audio 1
Audio 2
Audio 3
Audio 4
Audio 5
Audio 6
Audio 7
Audio 8
Nº Videos
Format
Latency
Profile
Depth
Mode
Status
Bitrate
Nº Videos
Format
Latency
Profile
Depth
Mode
None
Embedded
Analogue 1
Generator
None
Embedded
Analogue 2
Generator
None
Embedded
None
Embedded
None
Embedded
None
Embedded
None
Embedded
None
Embedded

←Continued

Continued→

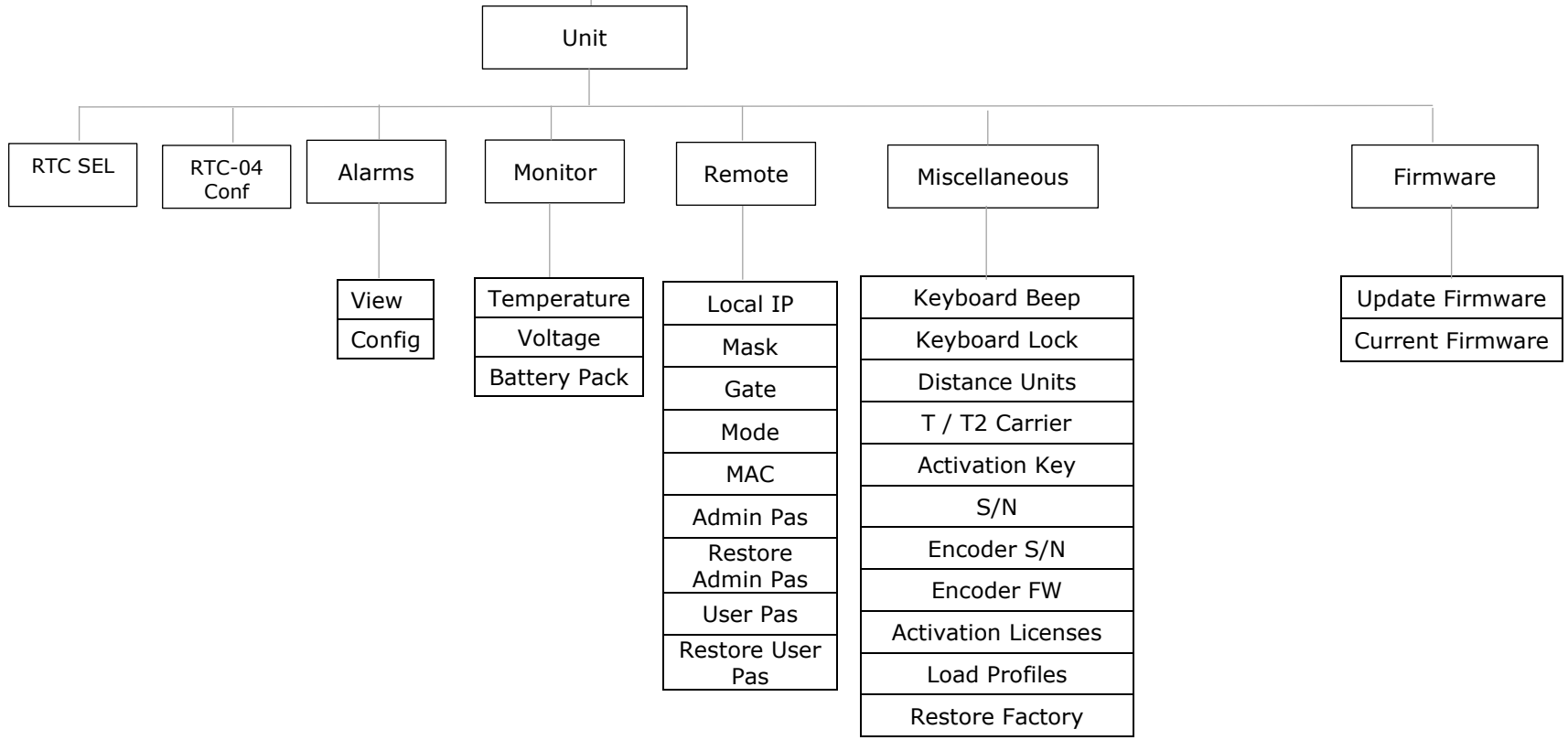
←Continued



←Continued

Continued→

←Continued


Unit
RTC SEL
RTC-04 Conf
Alarms
Monitor
Remote
Miscellaneous
Firmware
View
Config
Temperature
Voltage
Battery Pack
Local IP
Mask
Gate
Mode
MAC
Admin Pas
Restore Admin Pas
User Pas
Restore User Pas
Keyboard Beep
Keyboard Lock
Distance Units
T / T2 Carrier
Activation Key
S/N
Encoder S/N
Encoder FW
Activation Licenses
Load Profiles
Restore Factory
Update Firmware
Current Firmware

## 4.5 Menu Navigation

This section contains a detailed description of each parameter that can be configured in the UDT-02 HEVC camera transmitter via the menu.

To enter the menu, press the Cross button in the case of being on the principal screen or in any submenu.

To select a parameter or a submenu use Up, Down arrows. Once selected press OK button to access to a submenu or to edit a parameter. To exit a submenu or a parameter press 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 on the same screen with the right and left keys.
>
> Symbol ↲ means that pushing the OK button allows entering to the options of the submenu.

Several types of parameters are available:

- **Eligible:** When the user can choose between predetermined states. (They have the symbols <> near them)
- **Editable:** When the user can enter a value in that option. (The ↲ symbol is displayed on the right of the name). 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 available are explained. Furthermore, in each figure, example parameters are shown.

## 4.6 Menu Structure

The main menu is used to access the main parameters of the transmitter which are explained below.

The following menu screen can be accessed by pressing the Cross key from the main screen.

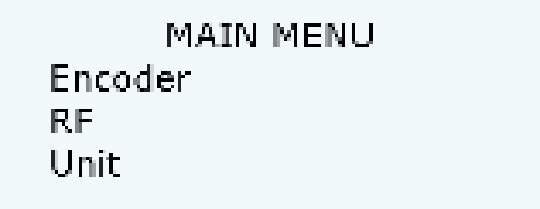



Figure 4.10: Main Menu

- **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.

### 4.6.1 Encoder Menu

The Encoder menu allows the configuration of the video, Audio and data input and KLV metadata selection. On this menu, the encoder can be configured to output the bitrate set manually or auto. If auto is selected, the bitrate is set by the modulation parameters automatically (bandwidth, modulation, FEC, GI, FTT number).

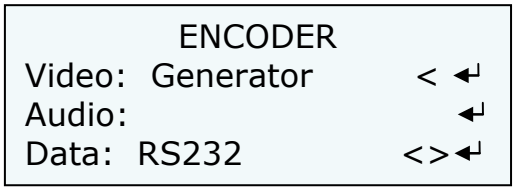
The PID assignment for each data transmitter is made in the Encoder menu.

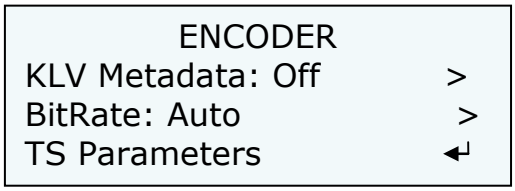
The encryption is enabled or disabled here, and the key of the encryption selected is set inside the encryption menu.

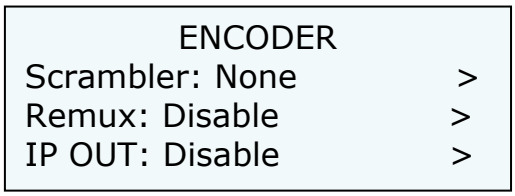
In addition, you can send up to 8 different videos (1 SDI input+ 7 ASI input) by using the Remux option, which can be enabled in this menu.

Next, is explained how to configure each parameter.

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




| Line nº | Function |
|---|---|
| 1 | **Video** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• SDI<br>• ASI<br>• Generator |

| | |
|---|---|
| 2 | **Audio 1** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• None<br>• Embedded<br>• Analogue 1<br>• Generator |
| 3 | **Audio 2** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• None<br>• Embedded<br>• Analogue 2<br>• Generator |
| 4 | **Audio 3** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• None<br>• Embedded<br>• Generator |
| 5 | **Audio 4** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• None<br>• Embedded<br>• Generator |

| | |
|---|---|
| 6 | **Audio 5** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• None<br>• Embedded<br>• Generator |
| 7 | **Audio 6** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• None<br>• Embedded<br>• Generator |
| 8 | **Audio 7** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• None<br>• Embedded<br>• Generator |
| 9 | **Audio 8** (eligible parameter)**:**<br>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 to configure the parameters related to it.<br>The available options are:<br>• None<br>• Embedded<br>• Generator |
| 10 | **Data** (eligible parameter)**:**<br>In this field, the sort of data input can be selected.<br>The available options are:<br>• None<br>• RS232<br>• GPS |
| 11 | **KLV Metadata** (eligible parameter) (Optional)**:**<br>In this field, the KLV metadata can be enabled. This feature is optional. |

| | |
|---|---|
| 12 | **BitRate** (eligible parameter)**:**<br>In this field, the encoder output bitrate mode can be selected.<br>The available options are:<br>• Auto<br>• Manual Bitrate (editable parameter) |
| 13 | **TS Parameters** (editable parameters)**:**<br>This field consists of the configuration of the parameters of the Transport Stream. In this option, the different program identifiers are configured. |
| 14 | **Scrambler** (eligible parameter)**:**<br>In this field, the encryption system can be chosen with right and left buttons.<br>The available options are:<br>• None<br>• BISS-1<br>• BISS-E<br>• AES-128 (Optional)<br>• AES-256 (Optional) |
| 15 | **Remux** (eligible parameter) (Optional)**:**<br>In this field, remux option can be activated. This feature is optional. |
| 16 | **IP Out** (eligible parameter) (Optional)**:**<br>In this field, IP Out option can be activated. This feature is optional. |

Table 4.2: Encoder Menu

#### 4.6.1.1 SDI Video Input

When SDI input is selected, press OK button to access the video configuration menu. The video format is automatically detected. The parameters which are configured in this section are explained below.

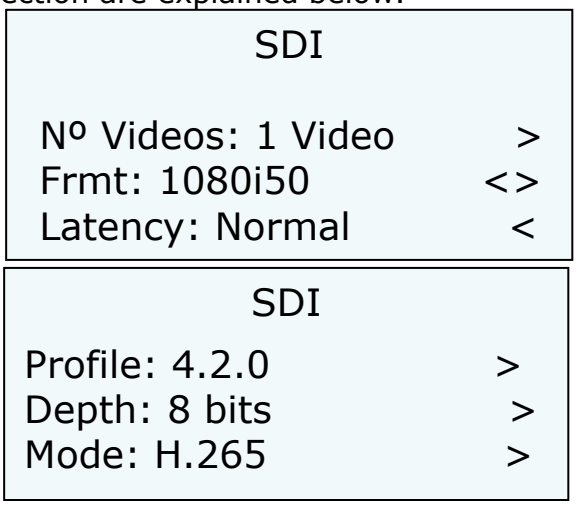



Figure 4.11: SDI Input Menu

| Line nº | Function |
|---|---|
| | **Nº Videos:** |
| | In this field, the number of videos is selected. |
| 1 | The available options are: |
| | • 1 Video. Standard mode for single HD/UHD operation. |
| | • 4xHD. Flexible video input format and 4x HD operation. |

**Format:**

In this field, the video format is selected.

The available options are:

2

- 480i59
- 576i50
- 480p59
- 576p50
- 720p50
- 720p59
- 720p60
- 1080i50
- 1080i59
- 1080i60
- 1080p23
- 1080p24
- 1080525
- 1080p29
- 1080p30
- 1080psf23
- 1080psf24
- 1080psf25
- 1080psf29
- 1080psf30
- 1080p50
- 1080p59
- 1080p60
- 2160p23
- 2160p24
- 2160p25
- 2160p29
- 2160p30
- 2160p50S12
- 2160p59S12
- 2160p60S12
- 4KDCIp23
- 4KDCIp24
- 4KDCIp25
- 4KDCIp29
- 4KDCIp30
- 4KDCIp50
- 4KDCIp59

| | |
|---|---|
| | • 4KDCIp60<br>• 2160p50DL6<br>• 2160p59DL6<br>• 2160p60DL6 |
| 3 | **Latency Mode:**<br>In this field, the latency mode is selected.<br>The available options are:<br>• Normal. Highest video quality per bitrate with typical end to end latency of 800-2000ms.<br>• Low. Compromise between video quality, bitrate and latency with typical end to end latency of 200-1000ms.<br>• Ultra Low. Requires the most bitrate but with typical end to end latency of a few frames, HEVC mode only. |
| 4 | **Profile** (eligible parameter)**:**<br>In this field, the chroma format is selected.<br>The available options are:<br>• 4:2:0 Lowest bitrate required.<br>• 4:2:2 Recommended for interlaced applications, and highest picture quality. |
| 5 | **Bit Depth:**<br>In this field, the bit depth is selected.<br>The available options are:<br>• 8-bit. Lowest bitrate required.<br>• 10-bit. Recommended for HDR applications, and highest picture quality. |
| 6 | **Encoding Mode:**<br>In this field, the Encoding mode is selected.<br>The available options are:<br>• H.265 HEVC. Highest video quality per bitrate, and lowest latency options.<br>• H.264 AVC. Greater compatibility with legacy systems, and low latency option.<br>• MPEG-2. Not recommended unless specifically required, limited to 8-bit 4:2:0 1080p30 |

Table 4.3: SDI Input menu options

#### 4.6.1.2 ASI Video Input

When ASI input is selected, the signal is directly sent to the modulator.

This input is also used for Remux. When Remux option is enabled, the second video which is going to be sent must be connected to the ASI input, but the selected video input must be SDI (according to the inserted video input for the first channel to be remuxed) but not ASI.

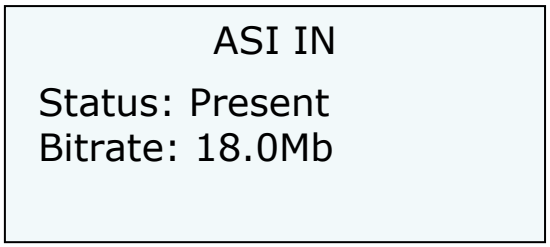



Figure 4.12: ASI Input Menu

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

Table 4.4: ASI Input menu options

#### 4.6.1.3 Generator Video Input

In this section the video generator can be configured, this option is used for tests when there is no video source.

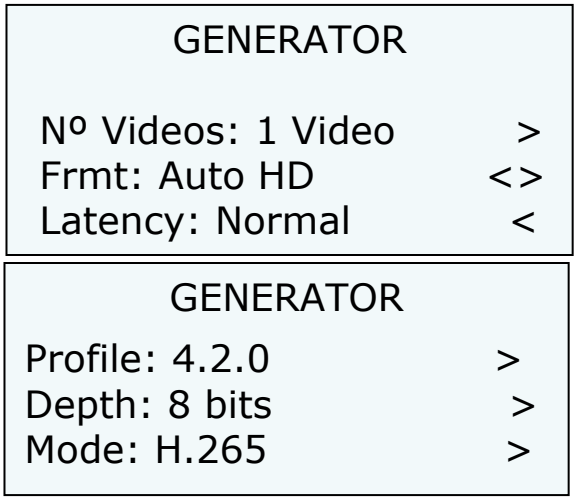



Figure 4.13: ASI Main Screen

| Line nº | Function |
|---|---|
| | **Nº Videos:** |
| | In this field, the number of videos is selected. |
| 1 | The available options are: |
| | • 1 Video. Standard mode for single HD/UHD operation. |
| | • 4xHD. Flexible video input format and 4x HD operation. |

**Format:**

In this field, the video format is selected.

The available options are:

2

- 480i59
- 576i50
- 480p59
- 576p50
- 720p50
- 720p59
- 720p60
- 1080i50
- 1080i59
- 1080i60
- 1080p23
- 1080p24
- 1080525
- 1080p29
- 1080p30
- 1080psf23
- 1080psf24
- 1080psf25
- 1080psf29
- 1080psf30
- 1080p50
- 1080p59
- 1080p60
- 2160p23
- 2160p24
- 2160p25
- 2160p29
- 2160p30
- 2160p50S12
- 2160p59S12
- 2160p60S12
- 4KDCIp23
- 4KDCIp24
- 4KDCIp25
- 4KDCIp29
- 4KDCIp30
- 4KDCIp50
- 4KDCIp59

| | |
|---|---|
| | • 4KDCIp60<br>• 2160p50DL6<br>• 2160p59DL6<br>• 2160p60DL6 |
| 3 | **Latency Mode:**<br>In this field, the latency mode is selected.<br>The available options are:<br>• Normal. Highest video quality per bitrate with typical end to end latency of 800-2000ms.<br>• Low. Compromise between video quality, bitrate and latency with typical end to end latency of 200-1000ms.<br>• Ultra Low. Requires the most bitrate but with typical end to end latency of a few frames, HEVC mode only. |
| 4 | **Profile** (eligible parameter)**:**<br>In this field, the chroma format is selected.<br>The available options are:<br>• 4:2:0 Lowest bitrate required.<br>• 4:2:2 Recommended for interlaced applications, and highest picture quality. |
| 5 | **Bit Depth:**<br>In this field, the bit depth is selected.<br>The available options are:<br>• 8-bit. Lowest bitrate required.<br>• 10-bit. Recommended for HDR applications, and highest picture quality. |
| 6 | **Encoding Mode:**<br>In this field, the Encoding mode is selected.<br>The available options are:<br>• H.265 HEVC. Highest video quality per bitrate, and lowest latency options.<br>• H.264 AVC. Greater compatibility with legacy systems, and low latency option.<br>• MPEG-2. Not recommended unless specifically required, limited to 8-bit 4:2:0 1080p30 |

Table 4.5: Generator Input menu options

#### 4.6.1.4 Audio Embedded 1 to 8

When Embedded Audio is selected, it means that the transmitted Audio is catch from the video input selected, where the Audio is embedded. There are up to 8 pairs of embedded audio.

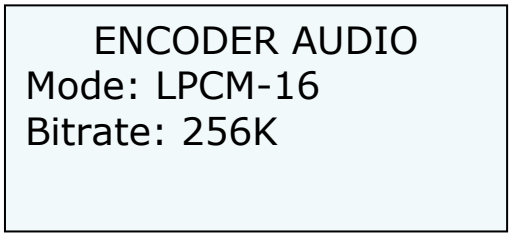



Figure 4.14 : Audio Embedded Input Menu

| Line nº | Function |
|---|---|
| 1 | **Audio Stream Encoding Mode:**<br>In this field, the audio stream encoding mode 1 to 8 is selected.<br>The available options are:<br>• LPCM. Ultra Low latency uncompressed audio or data. Bit depth requirements may vary for data, typically 20-bit for Dolby pass-through.<br>• MPEG-1 L1. Ultra Low latency compressed audio.<br>• MPEG-1 L2. Low Latency compressed audio, Low/Normal latency modes use a higher quality codec on streams 1-4.<br>• AAC-LC. Highest audio quality per bitrate, using with Ultra Low latency mode will increase video latency. Only audios 1 to 4. |
| 2 | **Audio Stream Bitrate (Kb/s):**<br>In this field, the audio stream bitrate, currently information only which depends on the encoding mode. |

Table 4.6: Audio Embedded Input menu options

#### 4.6.1.5 Audio Analogue 1 or 2

When Analogue Audio is selected, the Audio is catch from the external Audio input. The cable from Lemo 5 to XLR-4 is needed, this cable is provided together with the transmitter. There are 2 pairs of analogue audio.

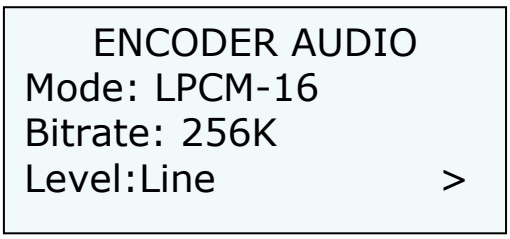



Figure 4.15 : Audio Embedded Input Menu

| Line nº | Function |
|---|---|
| 1 | **Audio Stream Encoding Mode:**<br>In this field, the audio stream encoding mode 1 to 8 is selected.<br>The available options are:<br>• MP1 L1. Ultra Low latency compressed audio.<br>• MP1 L2. Low Latency compressed audio, Low/Normal latency modes use a higher quality codec on streams 1-4.<br>• AAC. Highest audio quality per bitrate, using with Ultra Low latency mode will increase video latency. |
| 2 | **Audio Stream Bitrate (Kb/s):**<br>In this field, the audio stream bitrate, currently information only which depends on the encoding mode. |
| 3 | **Level:**<br>In this field, the type of analogue audio input can be selected.<br>The available options are:<br>• Line.<br>• Micro Dynamic.<br>• Micro Phantom.<br>• Variable. |

Table 4.7: Audio Embedded Input menu options

#### 4.6.1.6 Audio Generator 1 to 8

This Audio tone can be used for tests when an Audio source is not available.

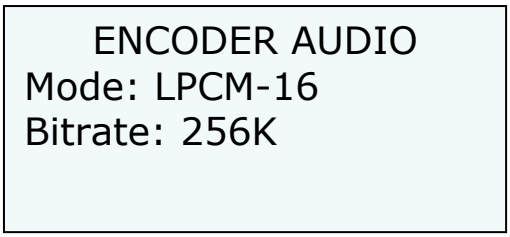



Figure 4.16 : Audio Embedded Input Menu

| Line nº | Function |
|---|---|
| 1 | **Audio Stream Encoding Mode:**<br>In this field, the audio stream encoding mode 1 to 8 is selected.<br>The available options are:<br>• MP1 L1. Ultra Low latency compressed audio.<br>• MP1 L2. Low Latency compressed audio, Low/Normal latency modes use a higher quality codec on streams 1-4.<br>• AAC. Highest audio quality per bitrate, using with Ultra Low latency mode will increase video latency. |
| 2 | **Audio Stream Bitrate (Kb/s):**<br>In this field, the audio stream bitrate, currently information only which depends on the encoding mode. |

Table 4.8: Audio Embedded Input menu options

#### 4.6.1.7 Data

To select the desired sort of data, press Right, Left buttons (eligible parameter).

The available options are:

- None
- RS232
- GPS

##### 4.6.1.7.1 None

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

##### 4.6.1.7.2 RS232 Screen

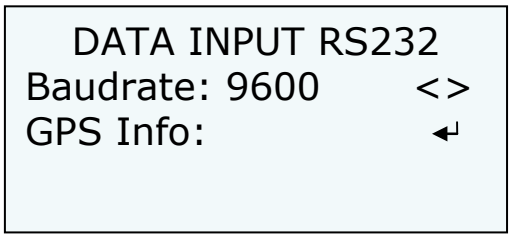



Figure 4.29: RS232 Input Menu

| Data option | Parameters |
|---|---|
| 1 | **Baudrate** (eligible parameter)**:**<br>Select the baudrate at which data user is received (Baudrate options are: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200). |
| 2 | **GPS Info:** (eligible parameter)**:**<br>When GPS data is transmitted, GPS position is shown in this menu. |

Table 4.9: RS232 Parameters

#### 4.6.1.7.3 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). This information is sent to receiver. The antenna is fed directly from the transmitter at 5 V.

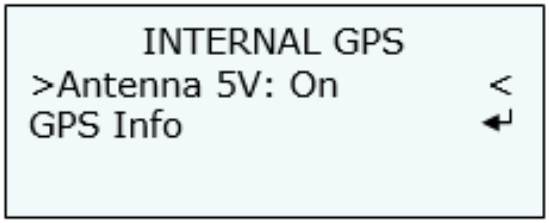



Figure 4.17:Internal GPS Main screen

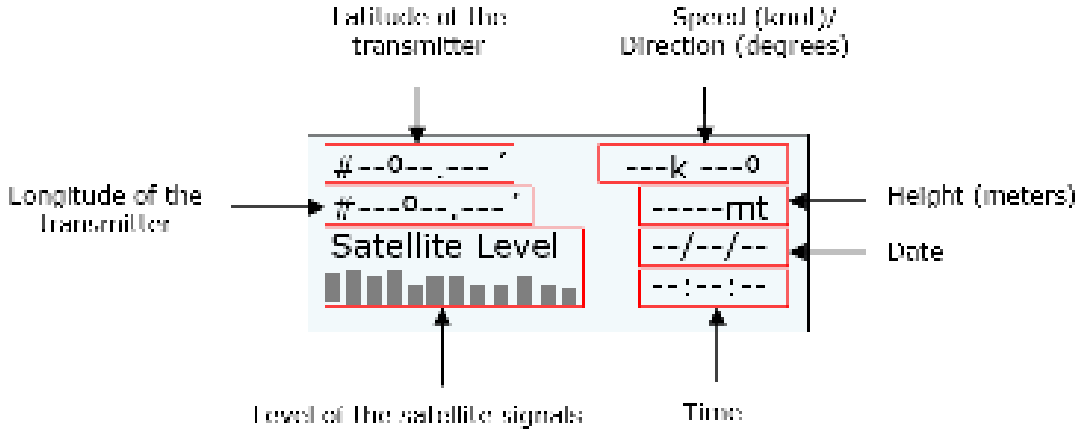



Figure 4.18: GPS Transmitter screen

The GPS info option screen shows the following information:

- **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 (Optional)

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 UDT-02 Transmitter will show an alarm indicating that the KLV is not present.

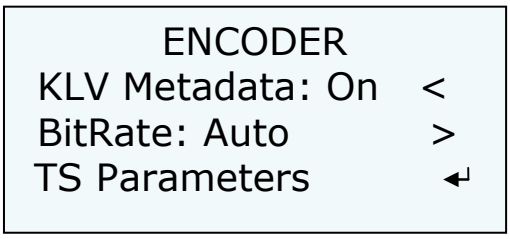



Figure 4.19: KLV Metadata option

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 Bitrate

The encoder output option allows the configuration of the transport stream bitrate. When you use the transmitter's ASI output, the output bitrate can be set manually on this screen. When the RF is enabled, the modulator starts working and the output bitrate is set by the modulation parameters, changing automatically to Auto mode.

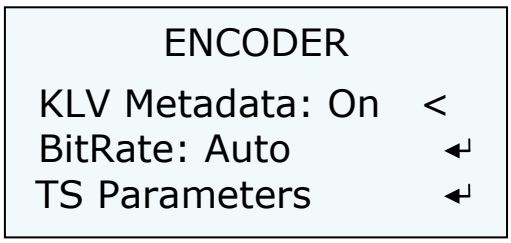



Figure 4.20: Encoder Output Menu

| Line nº | Function |
|---|---|
| 1 | **Bit Rate** (eligible parameter)**:**<br>In this field, the output bitrate is shown. When 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 to select the desired bitrate with the UP, Down keys. Press the OK button to save the introduced value.<br>The available options are:<br>• Auto<br>• Manual (editable parameter) |

Figure 4.21: 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

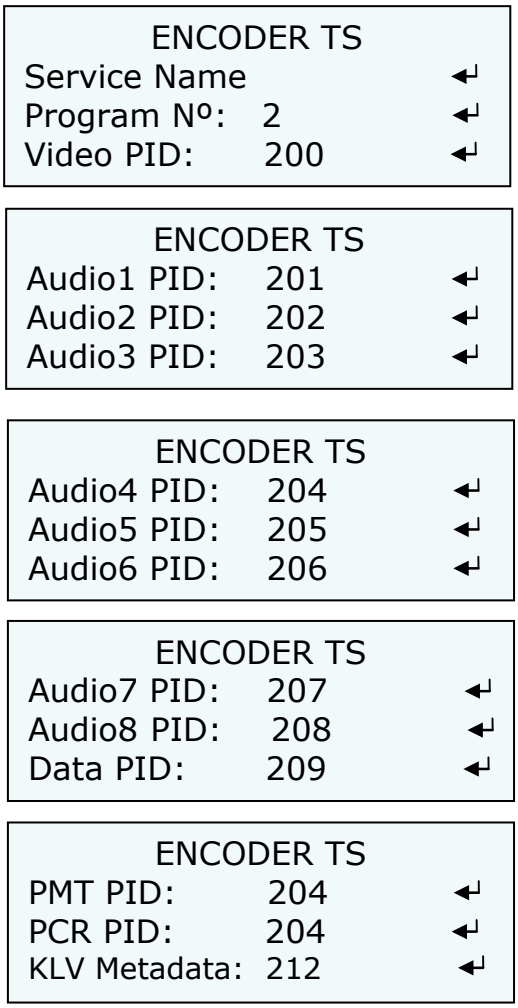



Figure 4.22: TS Parameters Menu

| Line nº | Function |
|---|---|
| 1 | **Service Name** (editable parameter)**:**<br>Here the Service name must be entered. 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. |
| 2 | **Program Nº** (editable parameter)**:**<br>Here the Program number 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. |
| 3 | **Video PID** (editable parameter)**:**<br>Here the Video 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. |

| | |
|---|---|
| 4 | **Audio 1 PID** (editable parameter)**:**<br>Here the Audio1 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. |
| 5 | **Audio 2 PID** (editable parameter)**:**<br>Here the Audio2 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. |
| 6 | **Audio 3 PID** (editable parameter)**:**<br>Here the Audio1 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. |
| 7 | **Audio 4 PID** (editable parameter)**:**<br>Here the Audio2 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 | **Audio 5 PID** (editable parameter)**:**<br>Here the Audio1 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 | **Audio 6 PID** (editable parameter)**:**<br>Here the Audio2 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. |
| 10 | **Audio 7 PID** (editable parameter)**:**<br>Here the Audio1 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. |
| 11 | **Audio 8 PID** (editable parameter)**:**<br>Here the Audio2 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. |
| 12 | **Data PID** (editable parameter)**:**<br>Here the Data 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. |
| 13 | **PMT PID** (editable parameter)**:**<br>Here the Program Map Tables 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. |

| | |
|---|---|
| 14 | **PCR PID** (editable parameter)**:**<br>Here the Program Clock Reference 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. |
| 15 | **KLV PID** (editable parameter)**:**<br>Here the KLV Metadata 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. |

Table 4.10: Encoder TS menu options

#### 4.6.1.19 Scrambler

In this section the signal can be encrypted with different encryption methods.

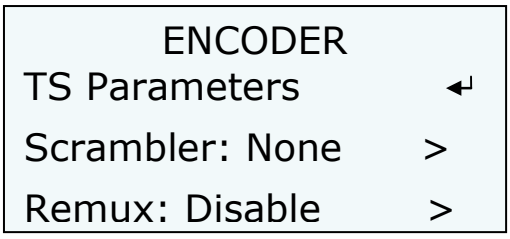



Figure 4.23: Scrambler menu

| Line nº | Function |
|---|---|
| 1 | **Mode** (eligible parameter)**:**<br>To choose the desired encryption, press the Right, Left keys.<br>The available options are:<br>• None<br>• BISS-1<br>• BISS-E<br>• AES-128 (Optional)<br>• AES-256 (Optional) |

Table 4.11: Scrambler menu options

To introduce the key of the encryption, follow these steps:

1. Choose the correct encryption.
2. Press the OK button 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.

#### 4.6.1.20 Remux (Optional)

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

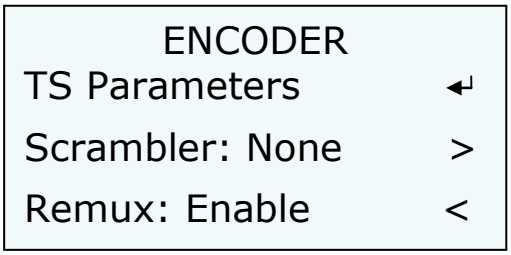



Figure 4.24: Remux menu screen

Please, make sure that the TS parameters are different for all services. When the Remux option is enabled, the Encoder Output is changed to manual bitrate mode. 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.

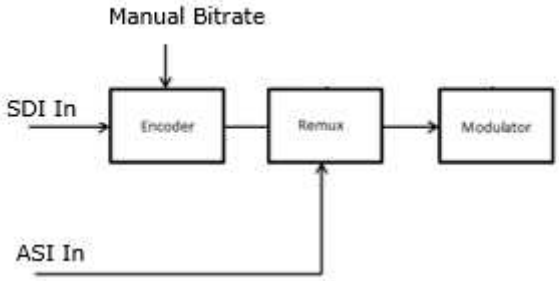



Figure 4.25: Remux work diagram

**ASI bitrate must be known.**

**You must configure it to have ASI input Bit rate plus NTT encoder Bit rate minor than modulator total Bit rate.**

### 4.6.2 RF Menu

#### 4.6.2.1 DVB-T2

Here we can change different parameters of the T2 modulation. Some of these parameters affect the output bitrate of the modulator and the characteristics of the link: more robustness or more bitrate.

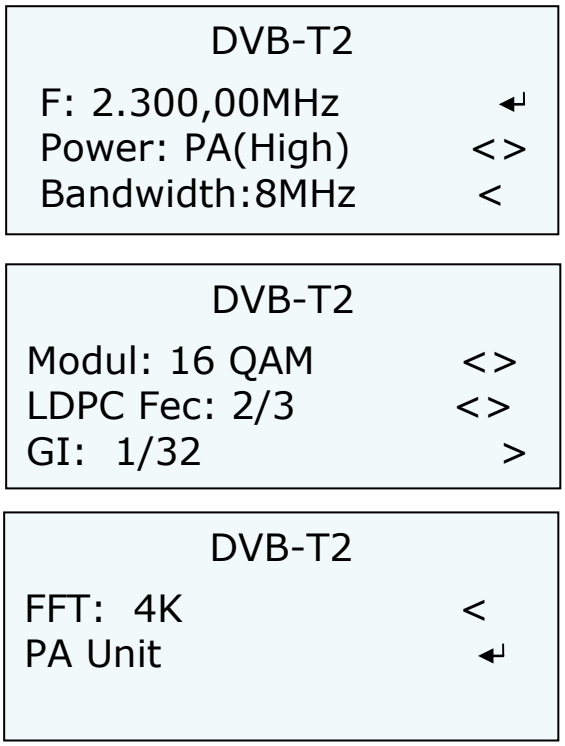



Figure 4.26: DVB-T2 Menu

| Line nº | Function |
|---|---|
| 1 | **Frequency** (editable parameter)**:** Select the frequency at which the signal is going to be transmitted. To establish the frequency value first, press the OK button and then, with the Up, Down arrow buttons select the desired value. To save the introduced value, press the OK button. |

| | |
|---|---|
| 2 | **Power** (eligible parameter)**:**<br>The output power can be selected with the Right and Left buttons.<br>The available options are:<br>• Manual (from -5 to 20 dBm) (without precorrection):<br>To establish the output power value, first press the OK button and then, with the Up, Down buttons select the desired value. To save the introduced value, press the OK button (editable parameter).<br>• Low (10 dBm) (precorrection until 4Ghz)<br>• High (20 dBm) (precorrection until 4Ghz)<br>• PA (Low)<br>• PA (Mid)<br>• PA (High)<br>Power is automatically configured to PA mode when there is communication between the UDT-02 and the PA. Then, the output power can be selected using Left and Right buttons. The output power indicated as Low, Mid and High will depend on the PA model used. |
| 3 | **Bandwidth** (eligible parameter)**:**<br>Here the bandwidth of the transmitted signal can be chosen. Use Right, Left buttons to select the desired value.<br>The available options are:<br>• 1.7 MHz<br>• 5 MHz<br>• 6 MHz<br>• 7 MHz<br>• 8 MHz |
| 4 | **Modulation** (eligible parameter)**:**<br>Here the constellation can be chosen. Use the Right, Left buttons to select the desired constellation.<br>The available options are:<br>• QPSK<br>• 16QAM<br>• 64QAM<br>• 256QAM |

| | |
|---|---|
| 5 | **LDPC FEC** (eligible parameter)**:**<br>Here the value of the Forward Error Correction can be chosen. Use the Right, Left buttons to select the desired value.<br>The available options are:<br>• 1/2<br>• 3/5<br>• 2/3<br>• 3/4<br>• 4/5<br>• 5/6 |
| 6 | **Guar Interval** (eligible parameter)**:**<br>Here the operation mode can be chosen. Use Right, Left buttons to select the desired value.<br>The available options are:<br>• 1/8<br>• 1/32<br>• 1/16 |
| 7 | **FFT Mode** (eligible parameter)**:**<br>Here the number of FFT points can be chosen. Use Right, Left buttons to select the desired buttons.<br>The available options are:<br>• 2K<br>• 4K |
| 8 | **PA Unit** (reading parameter)**:**<br>In this field, all the parameters measured in the PA are shown when there is communication between the transmitter and the power amplifier. |

Table 4.12: DVB-T2 menu option

#### 4.6.2.2 DVB-T

Here we can change different parameters of the DVB-T modulation. Some of these parameters affect the output bitrate of the modulator and the characteristics of the link: more robustness or more bitrate.

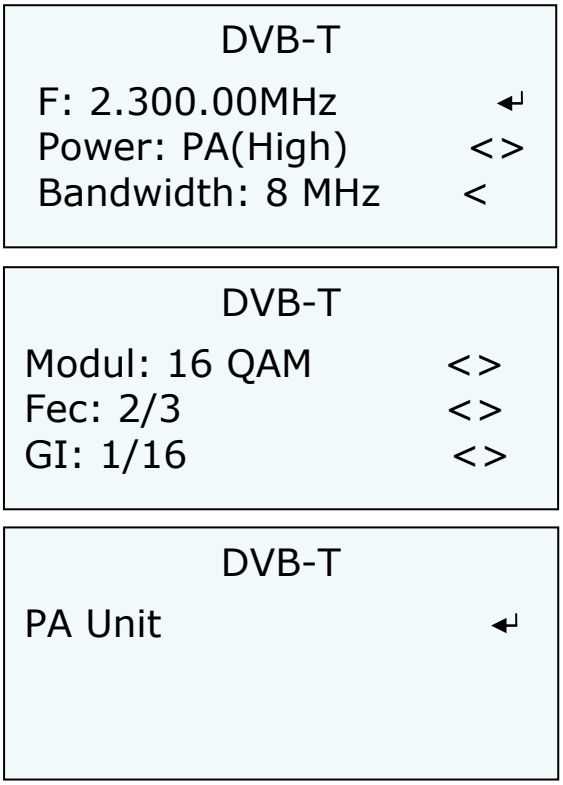



Figure 4.27: DVB-T Menu

With these parameters the modulation parameters in DVB-T are configured. This is how we can vary the robustness and the bitrate of the link.

| Line nº | Function |
|---|---|
| 1 | **Frequency** (editable parameter)**:**<br>Select the frequency at which the signal is going to be transmitted. To establish the frequency value, first press the OK button and then, with the Up, Down arrow buttons select the desired value. To save the introduced value, press the OK button. |
| 2 | **Power** (eligible parameter)**:**<br>The output power can be selected with the Right and Left buttons.<br>The available options are:<br>• Manual (from -5 to 20 dBm), (without precorrection):<br>To establish the output power value, first press the OK button and then, with the Up, Down buttons select the desired value. To save the introduced value, press the OK button (editable parameter).<br>• Low (10 dBm), (with precorrection)<br>• High (20 dBm), (with precorrection)<br>• PA (Low)<br>• PA (Mid)<br>• PA (High)<br>Power is automatically configured to PA mode when there is communication between the UDT-02 and the PA. Then, the output power can be selected using Left and Right buttons. The output power indicated as Low, Mid and High will depend on the PA model used. |
| 3 | **Bandwidth** (eligible parameter)**:**<br>Here the bandwidth of the transmitted signal can be chosen. Use Right, Left buttons to select the desired value.<br>The available options are:<br>• 5 MHz<br>• 6 MHz<br>• 7 MHz<br>• 8 MHz |
| 4 | **Modulation** (eligible parameter)**:**<br>Here the constellation can be chosen. Use Right, Left buttons to select the desired constellation.<br>The available options are:<br>• QPSK<br>• 16QAM<br>• 64QAM |

| | |
|---|---|
| 5 | **FEC** (eligible parameter)**:**<br>Here the value of the Forward Error Correction can be chosen. Use Right, Left buttons to select the desired value.<br>The available parameters are:<br>• 1/2<br>• 2/3<br>• 3/4<br>• 5/6<br>• 7/8 |
| 6 | **GI** (eligible parameter)**:**<br>Here the Guard Interval value can be chosen. Use Right, Left buttons to select the desired value.<br>The available options are:<br>• 1/32<br>• 1/16<br>• 1/8 |
| 7 | **PA Unit** (reading parameter)**:**<br>• In this field, all the parameters measured in the PA are shown when there is communication between the transmitter and the power amplifier. |

Table 4.13: DVB-T menu option

#### 4.6.2.3 Symbol Rate calculation

To calculate the symbol rate needed for a determined bandwidth, the next equation must be implemented:

$$SR = \frac{BW}{(1 + Rolloff)}$$

Where:

SR: Symbol Rate in Msymb/s

BW: Bandwidth in MHz

Next, a table is shown as an example of the Symbol Rate values for a determined Bandwidth of 28 MHz.

| Bandwidth (MHz) | Roll-off | Symbol Rate (Msymb/s) |
|---|---|---|
| 28 | 0.20 | 23.33 |
| 28 | 0.25 | 22.4 |
| 28 | 0.35 | 20.74 |

Table 4.14: Symbol Rate calculation

### 4.6.3 Unit Menu

In this section, the Remote Control is configured.

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

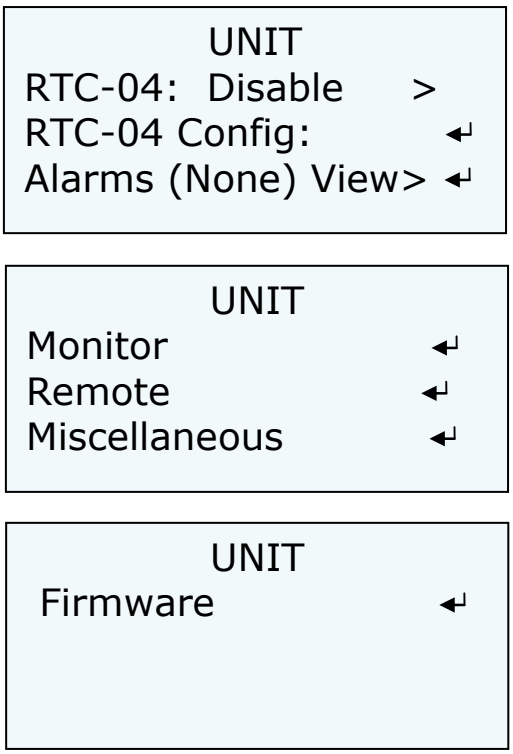



Figure 4.28: Unit Menu

#### 4.6.3.1 RTC Selection

In the Profile option, use the Right and Left buttons to select RTC-04 when the Remote Control is going to be connected, or disable it. Once you have selected, press OK button to access to the profiles mode.

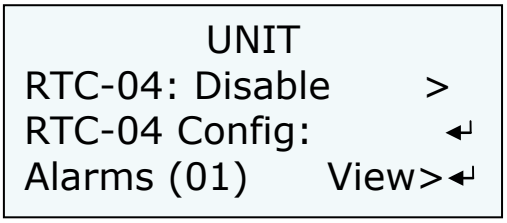



Figure 4.29: Unit Profile Menu

- Disable:

  The UDT-02 Transmitter works without the Profile option.
- RTC-04:

  Select this option when the NVIS RTC-04 is used.

#### 4.6.3.2 RTC-04 Remote Control Screen

When we enter in the RTC-04 profile, the channel selection screen will appear:

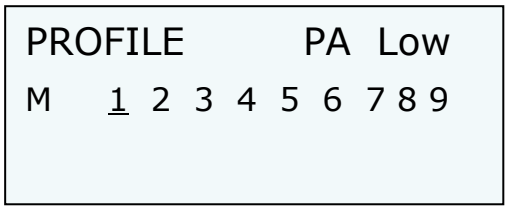



Figure 4.30: Profile Selection

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

The output power configured on the RTC-04 is shown on the main screen of the channel selection.

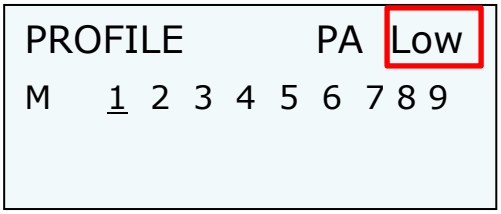



Figure 4.31: Profile selected

To return to the Main menu and change the UDT-02 configuration, press MAIN MENU. You will get out of remote control operation.

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

#### 4.6.3.3 RTC-04 Config

In this option, a profile can be configured. Select RTC-04 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.

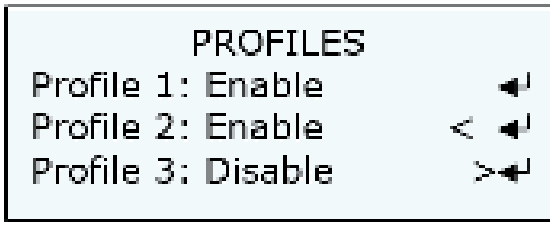
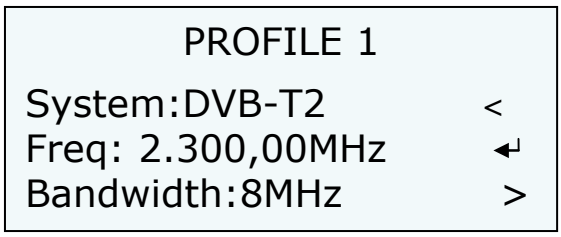
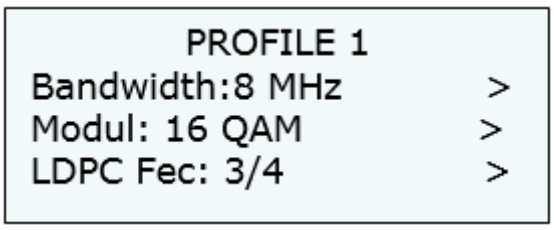
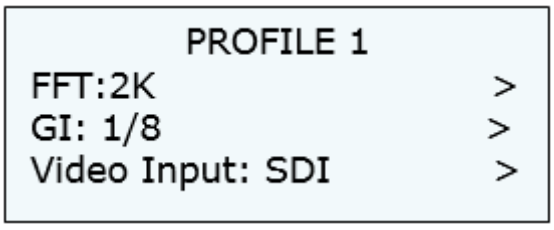


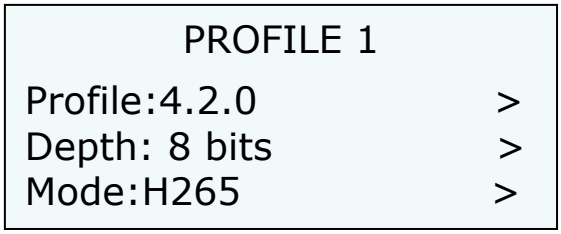

Figure 4.32: Profile Config Menu

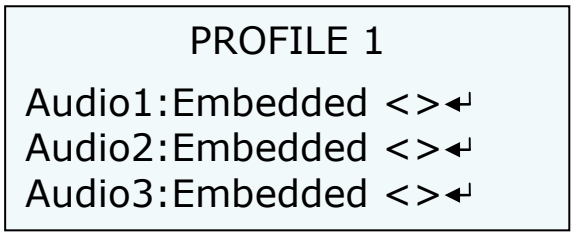
Select a profile and then press the OK button to configure the parameters related to it:

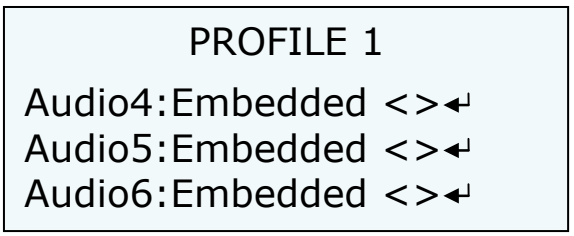


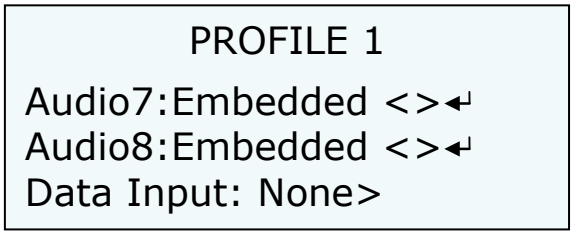



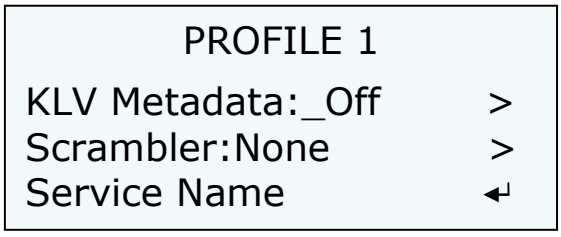



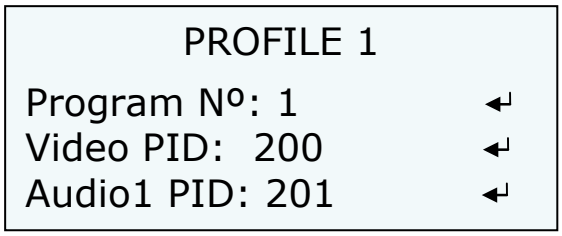


PROFILE 1
Profile:4.2.0 >
Depth: 8 bits >
Mode:H265 >


PROFILE 1
Audio1:Embedded <>↵
Audio2:Embedded <>↵
Audio3:Embedded <>↵


PROFILE 1
Audio4:Embedded <>↵
Audio5:Embedded <>↵
Audio6:Embedded <>↵


PROFILE 1
Audio7:Embedded <>↵
Audio8:Embedded <>↵
Data Input: None>


PROFILE 1
KLV Metadata:_Off >
Scrambler:None >
Service Name ↵


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

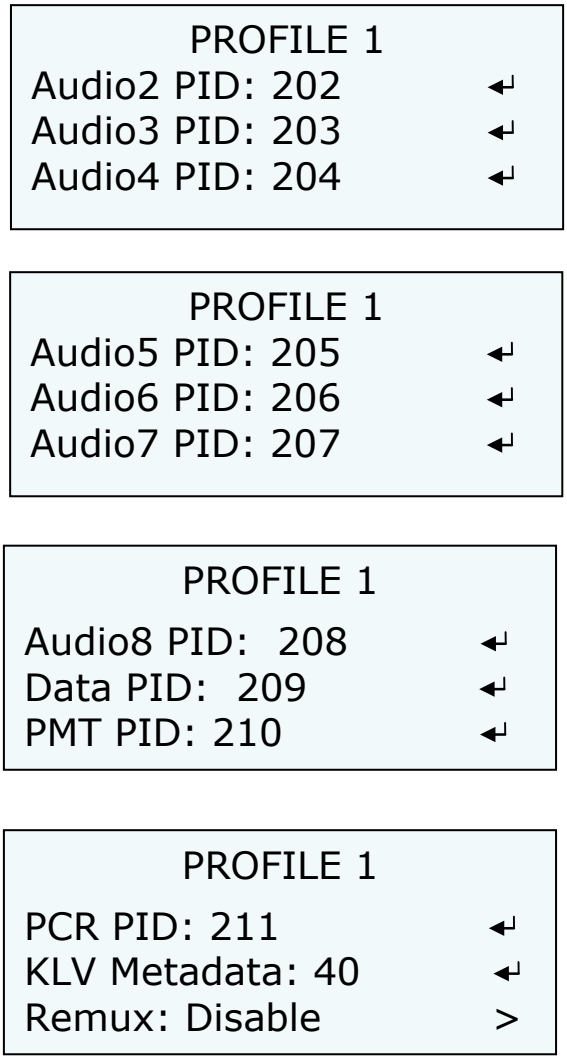



Figure 4.33: Profile 1 Menu

| Line nº | Function |
|---|---|
| 1 | **System** (eligible parameter)**:**<br>Select the type of the transmission system with the Right and Left buttons.<br>There are two options available:<br>• DVB-T2<br>• DVB-T |
| 2 | **Frequency** (editable parameter)**:**<br>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 | **Bandwidth** (eligible parameter)**:**<br>Select the desired bandwidth with the Right and Left buttons.<br>There are five options available:<br>• 1.7 MHz (Only DVB-T2)<br>• 5 MHz<br>• 6 MHz<br>• 7 MHz<br>• 8 MHz |
| 4 | **Modulation** (eligible parameter)**:**<br>In this field, the modulation must be chosen with the Right and Left buttons.<br>The available options are:<br>• QPSK<br>• 16QAM<br>• 64QAM<br>• 256QAM (Only DVB-T2) |
| 5 | **LDPC Fec** (eligible parameter)**:**<br>Select the desired FEC value with the Right and Left buttons.<br>The available options are:<br>• 1/2<br>• 3/5<br>• 2/3<br>• 3/4<br>• 4/5<br>• 5/6<br>• 7/8 |

| | |
|---|---|
| 6 | **FFT** (eligible parameter)**:**<br>Select the desired FFT value with the Right and Left buttons.<br>The available options are:<br>• 1K<br>• 2K<br>• 4K<br>All options are not available with all modulation parameters. |
| 7 | **Guard Interval** (eligible parameter)**:**<br>Select the desired GI value with the Right and Left buttons.<br>The available options are:<br>• 1/4<br>• 1/8<br>• 1/16<br>• 1/32 |
| 8 | **Video Input** (eligible parameter)**:**<br>In this field, the video input must be chosen with the Right and Left buttons.<br>The available options are:<br>• SDI<br>• ASI<br>• Generator |
| 9 | **Number oof Videos** (eligible parameter)**:**<br>In this field, the number of video inputs must be chosen with the Right and Left buttons.<br>The available options are:<br>• 1 video<br>• 4 x HD |

**Format:**

In this field, the video format is selected.

The available options are:

10

- 480i59
- 576i50
- 480p59
- 576p50
- 720p50
- 720p59
- 720p60
- 1080i50
- 1080i59
- 1080i60
- 1080p23
- 1080p24
- 1080525
- 1080p29
- 1080p30
- 1080psf23
- 1080psf24
- 1080psf25
- 1080psf29
- 1080psf30
- 1080p50
- 1080p59
- 1080p60
- 2160p23
- 2160p24
- 2160p25
- 2160p29
- 2160p30
- 2160p50S12
- 2160p59S12
- 2160p60S12
- 4KDCIp23
- 4KDCIp24
- 4KDCIp25
- 4KDCIp29
- 4KDCIp30
- 4KDCIp50

| | |
|---|---|
| 11 | **Latency** (eligible parameter)**:**<br>In this field, the delay of the coding process is configured. To select the desired delay, press Right, Left arrows buttons.<br>The available options are:<br>• Normal<br>• Low<br>• Ultra Low |
| 12 | **Video Profile** (eligible parameter)**:**<br>In this field, the codification profile can be configured. To select the desired profile, press Right, Left arrows buttons.<br>The available options are:<br>• 4.2.0<br>• 4.2.2 |
| 13 | **Bit Depth:**<br>In this field, the bit depth is selected.<br>The available options are:<br>• 8-bit. Lowest bitrate required.<br>10-bit. Recommended for HDR applications, and highest picture quality. |
| 14 | **Encoding Mode:**<br>In this field, the Encoding mode is selected.<br>The available options are:<br>• H.265 HEVC. Highest video quality per bitrate, and lowest latency options.<br>• H.264 AVC. Greater compatibility with legacy systems, and low latency option.<br>• MPEG-2. Not recommended unless specifically required, limited to 8-bit 4:2:0 1080p30 |
| 15 | **Audio1-2 Input** (eligible parameter)**:**<br>In this field, the sort of Audio signal introduced in the Audio 1 or audio 2 input can be chosen with right and left buttons.<br>The available options are:<br>• Embedded<br>• Analogue<br>• Tone.Gen<br>• None |

| | |
|---|---|
| 16 | **Audio3-8 Input** (eligible parameter)**:**<br>In this field, the sort of Audio signal introduced in the Audio 3-8 input can be chosen with right and left buttons.<br>The available options are:<br>• Embedded<br>• Tone.Gen<br>• None |
| 17 | **Data Input** (eligible parameter)**:**<br>In this field, the data input must be chosen with the Right and Left buttons.<br>The available options are:<br>• RS-232<br>• GPS<br>• None |
| 18 | **KLV Metadata** (eligible parameter)**:**<br>In this field, the KLV metadata can be enabled or disabled. |
| 19 | **Scrambler** (eligible parameter)**:**<br>Select the desired encryption with the Right and Left buttons.<br>There are five options available:<br>• None<br>• Biss-1<br>• Biss-E<br>• AES-128 (optional)<br>• AES-256 (optional) |
| 20 | **Service Name** (editable parameter):<br>Set the name of the service. |
| 21 | **Program Number** (editable parameter):<br>Here the program number must be entered. |
| 22 | **Video PID** (editable parameter):<br>Here the video packet identifier must be entered. |
| 23 | **Audio 1-8 PID** (editable parameter):<br>Here the Audio 1 packet identifier must be entered. |
| 24 | **Data PID** (editable parameter):<br>Here the data packet identifier must be entered. |
| 25 | **PMT PID** (editable parameter):<br>Here the program map tables packet identifier must be entered. |
| 26 | **PCR PID** (editable parameter):<br>Here the program clock reference packet identifier must be entered. |
| 27 | **KLV Metadata** (editable parameter):<br>Here the KLV Metadata packet identifier must be entered. |

| | |
|---|---|
| 28 | **Remux:**<br>You can enable or disable remux mode with Right and Left buttons. |

Table 4.15: 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 the 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 and warnings that can be configured in the transmitter 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 ASI Input: ASI source is not connected.
- No GPS: GPS source is not connected.
- No KLV
- Encoder Fault
- PA No Forward
- PA Rev High
- PA Volt Low
- PA Temp High
- WeightOnWheels

#### 4.6.3.5 Monitor

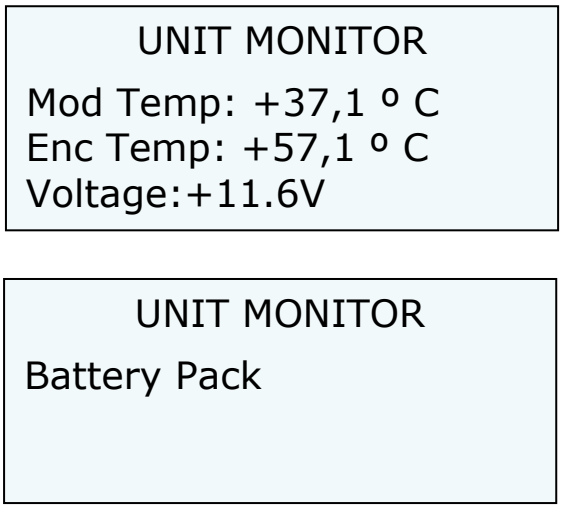



Figure 4.34: Unit Monitor Menu

- **Temperature** (reading parameter):

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. Moreover, the value which is between square brackets means the speed of the fans (values from 1 to 4) where 1 means that the fans are stopped and value 4 that they are at the maximum speed.

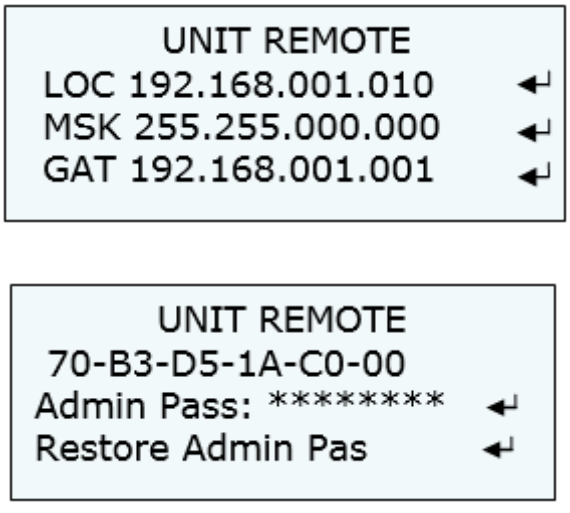
- **Voltage** (reading parameter):

In this field, the voltage of the transmitter is shown.

- **Battery Pack** (reading parameter):

In this field, the percentage of the battery is shown.

#### 4.6.3.6 Remote



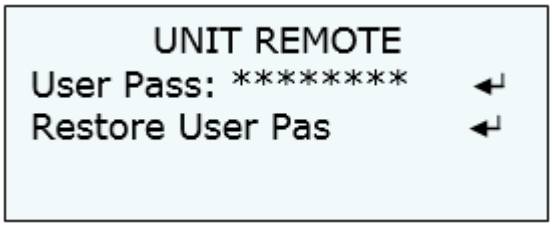



Figure 4.35: Unit Remote Menu

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

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

Table 4.16: Unit remote menu options

### 4.6.3.7 Miscellaneous

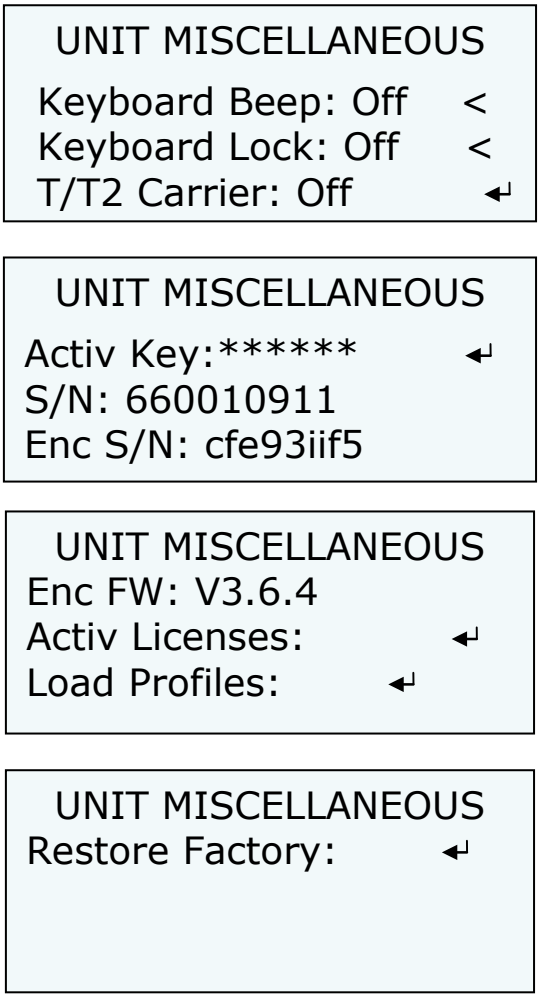


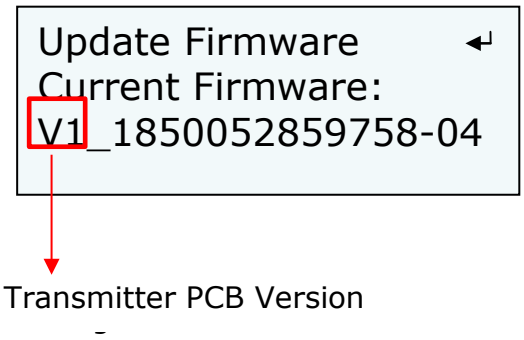

Figure 4.36: Miscellaneous Menu

| Line nº | Function |
|---|---|
| 1 | **Keyboard Beep** (eligible parameter)**:**<br>If the On option is selected, each time a key is pressed a beep sound will appear. If the Off option is selected, there will be no sound when a key is pressed.<br>The available options are:<br>• On<br>• Off |
| 2 | **Keyboard Lock** (eligible parameter)**:**<br>If the On option is selected and the buttons of the equipment remain for 5 minutes without being pressed, a message will appear on the screen saying that the keyboard is locked. By pressing the cross button, the keyboard can be unlocked. If the Off option is selected there will be no messages on the screen.<br>The available options are:<br>• On<br>• Off |
| 3 | **T/T2 Carrier** (eligible parameter)**:**<br>The available options are:<br>• On: The carrier (without modulation) is shown for 1 minute.<br>• Off: The option is disabled. |
| 4 | **Activation Key** (editable parameter)**:**<br>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. |
| 5 | **S/N** (reading parameter)**:**<br>In this field the serial number of the device is shown. |
| 6 | **Encoder S/N** (reading parameter)**:**<br>In this field the serial number of the Encoder device is shown. |
| 7 | **Encoder FW** (reading parameter)**:**<br>In this field the FW of the Encoder device is shown. |

| | |
|---|---|
| 8 | **Activ Licenses:**<br>In this field you can enter the license code for the following optional features:<br>• AES<br>• KLV<br>• Remux<br>• Internal GPS<br>• 3-4 GHz band<br>• 4-8 GHz band<br>• Cam control<br>• 4 x HD<br>• ARINC<br>• IP<br>• UHD<br><br>Once the code has been introduced, the licence is enabled on the unit.<br>You can use this menu to check which licenses are enabled on this unit.<br>For a new license code, please contact us. |
| 9 | **Load profiles:**<br>In this field you can load profiles from a USB. |
| 10 | **Restore Factory:**<br>In this field you can restore to factory configuration. |

Table 4.17: Unit Miscellaneous menu options

#### 4.6.3.8 Firmware




| Line nº | Function |
|---|---|
| 1 | **Update Firmware:**<br>In this field you can update the version of the device. To update the equipment properly, follow the instructions below. |
| 2 | **Current firmware:**<br>In this field, the number of the version installed in the device is shown. The characters which describe the number of the version are 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 4.18: Firmware menu options

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

1. The latest firmware can be found on the website of SVP Broadcast Microwave. To access the firmware file, first enter www.svpbm.com in your web browser.
2. Click on the Support tab.


Figure 4.38 Updating firmware step 2

3. Click on Firmware.


Figure 4.39: Updating firmware step 3

4. Go to TX_Firmware.


Figure 4.40: Updating firmware step 4

5. Press the version of the transmitter model (version of the equipment) 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 installed in the device (the first two digits).


Figure 4.41: Updating firmware step 5

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 powered off (**with no power supply**), insert the USB device in the USB connector, placed 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. From the main screen, press cross button to access the menu. There, with the Up, Down buttons, select the Unit option.
10. Select Firmware by pressing the OK button.
11. Select Update Firmware with the OK button.

**Don’t power off the device during the updating process.**

# Chapter 5: Web Server

## 6.1 Introduction

This equipment can be controlled from 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 to setup network parameters are shown:

1. Go to Unit -> Remote

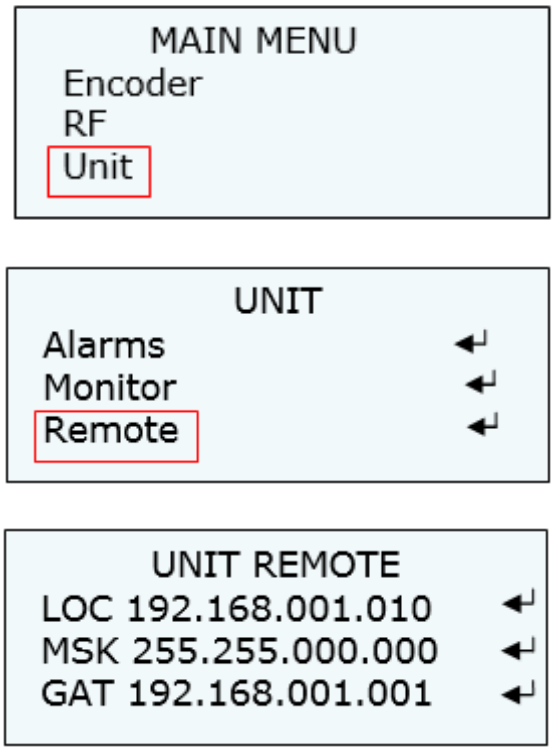



Figure 5.1: Web Server screen

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

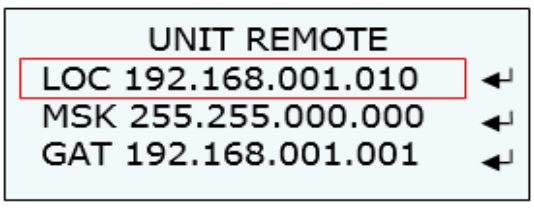



Figure 5.2: Local IP

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

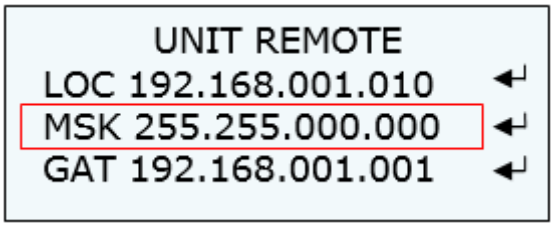



Figure 5.3: Subnet Mask

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

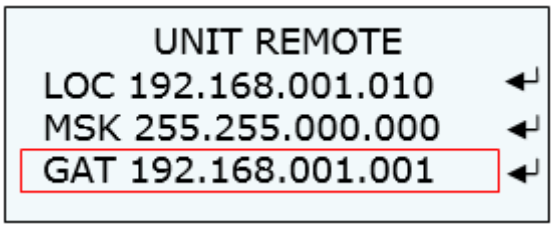



Figure 5.4: Gateway

5. Select Admin Pass option and set the administrator's password. To access to the Webserver directly without setting any password, the Admin Pass must be set to 0 (00000000). However, if you want 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.

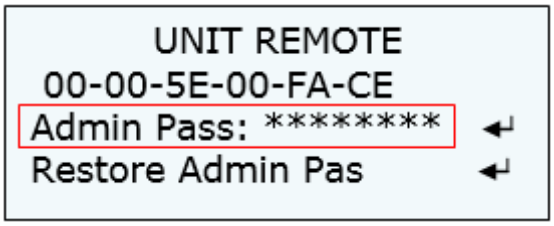



Figure 5.5: Admin Pass

6. Select Restore Admin Pass option to restore the default value of the administrator's password (00000000).

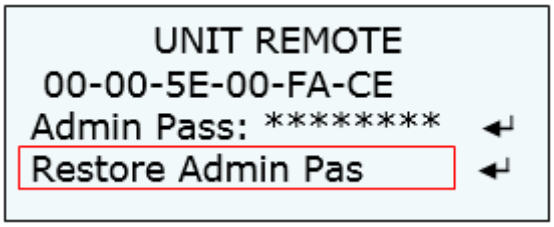



Figure 5.6: Restore Admin Pass

7. Select User Pass option and set the user's password. If you want to access the Webserver directly without setting any password, the User Pass must be set to 0 (00000000). However, if you want 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, but without changing anything.

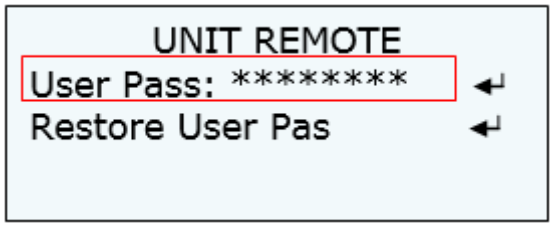



Figure 5.7: User Pass

8. Select Restore User Pass option to restore the default value of the administrator's password (00000000).

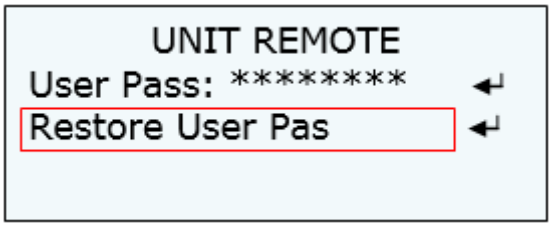



Figure 5.8: Restore User Pass

Once the IP, Subnet Mask, Gateway, Admin Pass and User Pass are set and the laptop or PC is connected to the UDT-02 HEVC, open the web browser and type in the Local IP configured in the transmitter.

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

## 6.2 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.

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.

### 6.2.1 ENCODER


Figure 5.9: Web Server Encoder screen

#### 6.2.1.16 Video

- Input (eligible parameter):

  Select the type of the video input. The video input options available are SDI, ASI and Generator.

- Format (reading parameter):

  Here the format of the video input signal is displayed. If there is no video input then the message 'not detected' is displayed.

- Bitrate (reading parameter):

  In this field, the user can see the bitrate in Mbps assigned by the encoder to the video input signal.

  However, if the introduced signal is ASI, this field indicates the input bitrate of this ASI signal.

- Delay (eligible parameter):

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

- Profile (eligible parameter):

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

- GOP (eligible parameter):

  In this field, the Group Of Pictures parameter is displayed. It specifies the order in which intra and inter-frames are arranged.

  The available options are:

  - Auto
  - Manual

- Level (eligible parameter):

  In this field, the level of the HEVC 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)

#### 6.2.1.17 Audio

- [A1] Input (eligible parameter):

  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.

- [A1] Bitrate (eligible parameter):

  Select the bitrate for the coding process of the Audio 1 signal. The available options are 128, 192, 256 and 384 Kbps.

- [A2] Input (eligible parameter):

  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.

- [A1] L Type (Analogic) (eligible parameters):

  This field is only configurable if analogic audio signals are introduced.

  The user can select the sort of signal of the Audio 1 left channel introduced in the transmitter.

  The available options are:

  - Line
  - MIC Dynamic
  - MIC Phantom

- [A1] R Type (Analogic) (eligible parameters):

  This field is only configurable if analogic audio signals are introduced.

  The user can select the sort of signal of the Audio 1 right channel introduced in the transmitter.

  The available options are:

  - Line
  - MIC Dynamic
  - MIC Phantom

#### 6.2.1.18 Data

- Input (eligible parameter):

  Select the type of data introduced to the device. The available options are None, RS232 and 4k board.

##### 6.2.1.18.1 RS-232

If the RS-232 connection is selected, the next parameters must be configured to achieve a successful communication:

- Baudrate (eligible parameter):

  Choose the baudrate of the RS-232 connection. The available options are 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400.

- Parity (eligible parameter):

  Select the parity for the RS-232 connection. The available options are None, Odd and Even.

- Stop Bits (eligible parameter):

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

#### 6.2.1.19 GPS (Optional)

If GPS is enabled, then different parameters are shown:


Figure 5.10 Web Server GPS screen

If GPS is enabled and the GPS antenna is connected, the status field will show "GPS data verified" message. Nevertheless, if the transmitter does not detect any GPS input signal, the status field will show "GPS not detected".

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

N43º02.032’

W023º03.023’

- Status (reading parameter):

  The status of the GPS input is displayed in this field.

- Latitude (reading parameter):

  It specifies the latitude position of the transmitter.

- Longitude (reading parameter):

  It specifies the longitude position of the transmitter.

- Altitude (reading parameter):

  The height of the transmitter from ground in meters is specified in this value.

- Direction (reading parameter):

  The direction in degrees of the transmitter is shown in this field.

- Speed (reading parameter):

  The speed of the transmitter in km/h is shown in this field.

#### 6.2.1.20 KLV Metadata (Optional)

When this option is ON, the KLV Metadata embedded on the SDI signal is sent through the radio link.

#### 6.2.1.21 Encoder output

- TS Bitrate Auto (eligible parameter):

  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, in order to the video bitrate can be always the maximum allowed. SVP advises the use of the automatic mode when the signal is transmitted through RF. Manual mode is useful when the device is used as an encoder to configure the desired output bitrate in the ASI output.

- TS Bitrate Manual (editable parameter):

  If the bitrate mode is manual, select the bitrate.

#### 6.2.1.22 TS Parameters

- Video PID (editable parameter):

  Here the video packet identifier must be entered.

- Audio 1 PID (editable parameter):
  Here the Audio 1 packet identifier must be entered.
- Audio 2 PID (editable parameter):
  Here the Audio 2 packet identifier must be entered.
- Data PID (editable parameter):
  Here the data packet identifier must be entered.
- PMT PID (editable parameter):
  Here the program map table packet identifier must be entered.
- PCR PID (editable parameter):
  Here the program clock reference packet identifier must be entered.
- GPS PID (editable parameter):
  Here the GPS packet identifier must be entered.
- ALARM PID (editable parameter):
  Here the Transmitter Alarms identifier must be entered.
- KLV Metadata (editable parameter):
  Here the KLV packet identifier must be entered.
- Program Number (editable parameter):
  Here the program number must be entered.
- TS id (editable parameter):
  In this field the Transport Stream identifier must be set.
- Network id (editable parameter):
  In this option the network identifier must be specified.
- Network Name (editable parameter):
  Specify the name of the network.
- Service Name (editable parameter):
  Set the name of the service.

When editable parameters are being set in the Web Server and new values are being introduced, the text remains in RED until the enter button is pressed. When the enter button is pressed, the new values are saved, and the text will appear in BLACK. It is necessary to press the enter button to save the new values in the transmitter.

#### 6.2.1.23 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 (optional)
- AES 256 (optional)

#### 6.2.1.24 Remux (Optional)

- Mode (eligible parameter):

  Here you can enable or disable the Remux mode. When the enable mode is selected, Transport Stream Bitrate mode is always manual so that the user can configure the output bitrate of the TS from the internal NTT encoder. You must configure it considering that the ASI input Bit rate plus the NTT encoder Bit rate must be minor than modulator total Bit rate.

### 6.2.2 RF


Figure 5.10 Web Server RF screen (DVB-T)

- System (eligible parameter):

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

- RF Status (eligible parameter):

  Select ON to activate the RF transmission or press OFF button to deactivate it.

#### 6.2.2.16 DVB-T

- Frequency (editable parameter):

  Introduce the frequency at which the signal is being transmitted.

- Power (eligible parameter):

  Specify the power at which the signal is being transmitted (Variable, Low, High and PA).

- Bandwidth (eligible parameter):

  Enter the transmitted signal bandwidth. The available options are 5, 6, 7 and 8 MHz.

- Modulation (eligible parameter):

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

- FEC (eligible parameter):

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

- GI (eligible parameter):

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

- Spectrum (eligible parameter):

  Here the spectrum type is configured. Inverted spectrum is just another method to help prevent signal theft.

  The available options are normal or invert.

- Bitrate (reading parameter):

  In this field it is displayed the bitrate of the transmitted signal according to the modulation parameters used.

When editable parameters are being set in the Web Server and new values are being introduced, the text remains in RED until the enter button is pressed. When the enter button is pressed, the new values are saved, and the text will appear in BLACK. It is necessary to press the enter button to save the new values in the transmitter.

### 6.2.2.17 DVB-T2

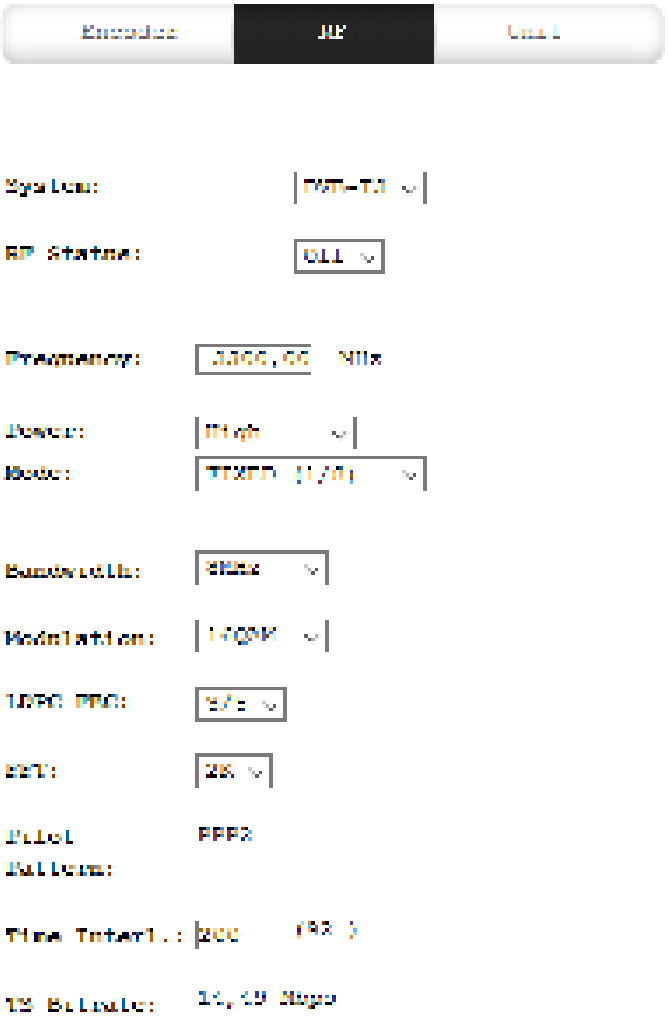


Figure 5.11: Web server RF screen (DVB-T2)

- Frequency (editable parameter):

  Introduce the frequency at which the signal is being transmitted.

- Power (eligible parameter):

  Specify the power at which the signal is being transmitted (Variable, Low, High and PA).

- Mode (eligible parameter):

  Select the guard interval of the transmitted signal. The available options are 1/8, 1/16 and 1/32.

- Bandwidth (eligible parameter):

  Enter the transmitted signal bandwidth. The available options are 1.7, 5, 6, 7 and 8 MHz.

- Modulation (eligible parameter):

  Select the constellation of the transmitted signal. The available options are QPSK, 16 QAM, 64 QAM and 256 QAM.

- LDPC FEC (eligible parameter):

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

- FFT (eligible parameter):

  Specify the FFT mode. The available options are 1K, 2K and 4K.

- Pilot Pattern (reading parameter):

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

- Time Interleaving (editable parameter):

  This option indicates the number of Time Interleaving Blocks (TI blocks) per interleaving frame.

  The user must select, in how many TI blocks an interleaving frame is split.

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

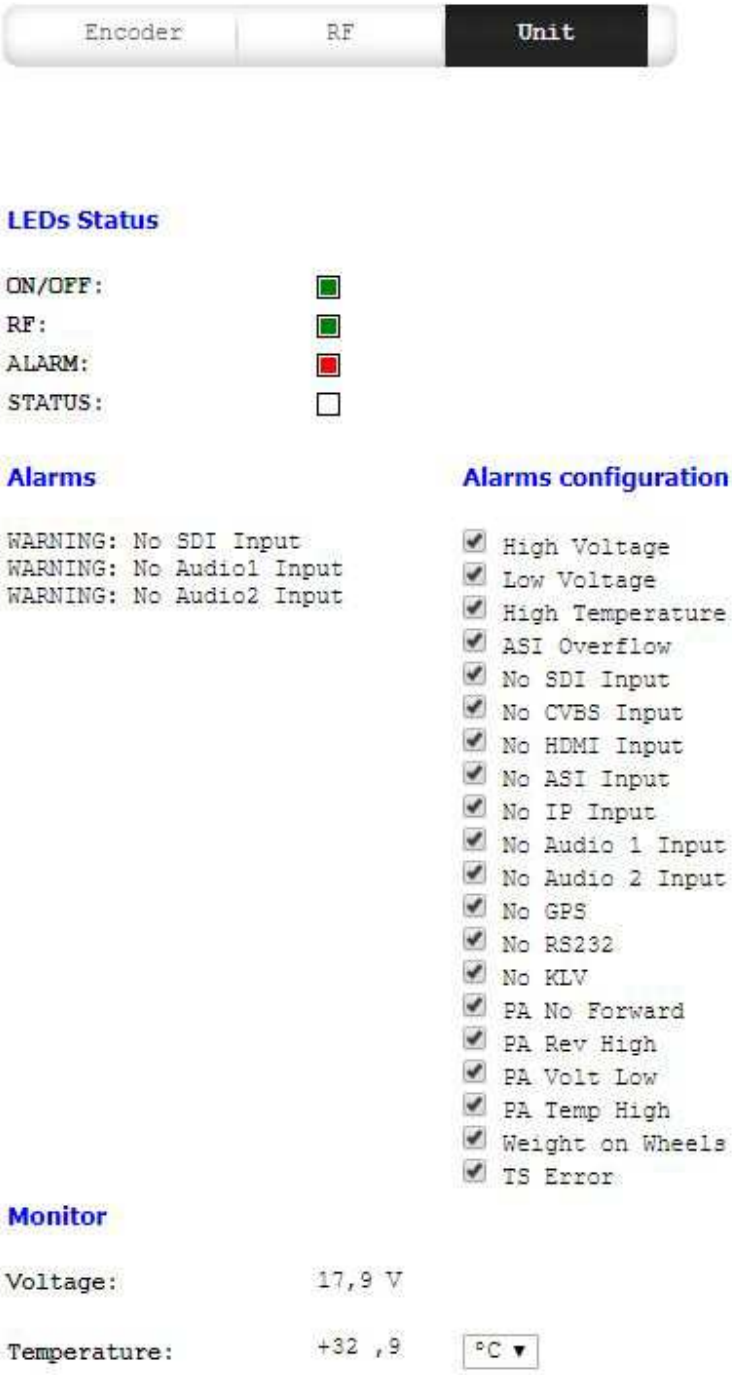
  Press the OK button and then select the Up and Down buttons to configure the desired value.

- TS Bitrate (reading parameter):

  In this field it is displayed the bitrate of the transmitted signal according to the modulation parameters used.

When editable parameters are being set in the Web Server and new values are being introduced, the text remains in RED until the enter button is pressed. When the enter button is pressed, the new values are saved, and the text will appear in BLACK. It is necessary to press the enter button to save the new values in the transmitter.

## 6.2.3 UNIT


Encoder
RF
Unit
LEDs Status
ON/OFF:
RF:
ALARM:
STATUS:
Alarms
WARNING: No SDI Input
WARNING: No Audio1 Input
WARNING: No Audio2 Input
Alarms configuration
High Voltage
Low Voltage
High Temperature
ASI Overflow
No SDI Input
No CVBS Input
No HDMI Input
No ASI Input
No IP Input
No Audio 1 Input
No Audio 2 Input
No GPS
No RS232
No KLV
PA No Forward
PA Rev High
PA Volt Low
PA Temp High
Weight on Wheels
TS Error
Monitor
Voltage:
17,9 V
Temperature:
+32 ,9
°C

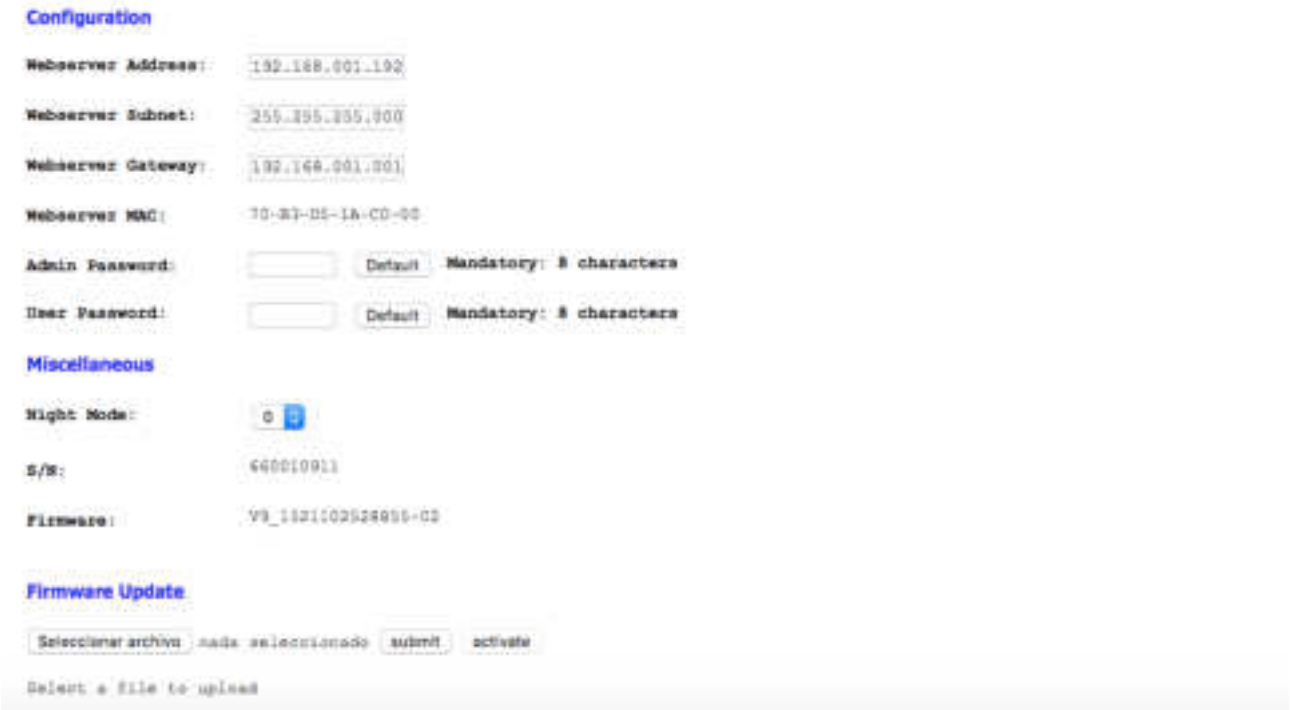



Figure 5.12: Web Server UNIT screen

#### 6.2.3.16 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.

#### 6.2.3.17 Alarms (reading parameter)

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

#### 6.2.3.18 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 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

#### 6.2.3.19 Monitor

- Voltage (reading parameter):

  In this field, the power supply voltage of the transmitter is shown.

- Temperature (reading parameter):

  In this field, the internal temperature of the device is displayed.

#### 6.2.3.20 Configuration

- Webserver Address (editable parameter)

  In this option the IP address of the device can be set if you want to control the device remotely. To change the IP address, introduce the desired number and then press enter to save the introduced value.

- Webserver Subnet (editable parameter)

  Here the Subnet Mask address of the device can be written. To change the Subnet Mask address, introduce the desired value and then press enter to save it.

- Webserver Gateway (editable parameter)

  In this option, the address of the Gateway must be written. To change the Gateway address, introduce the desired value and then press enter to save it.

- Webserver MAC (reading parameter)

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

- Standby Mode (eligible parameter)

  In this option the user can turn off or on the device by pressing On or Standby options.

- Admin Password (editable parameter):

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

- User Password (editable parameter):

  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. There is the option to restore the default user password (00000000).

#### 6.2.3.21 Miscellaneous

- Night Mode (eligible parameter):

  There are four possible states for the night mode. If the night mode is in state 0 then the light on the screen will be brighter than if it is in state 1. If the state is 3 then, the light on the screen will be the dimmest of the four possible states.

- S/N (reading parameter):

  In this field, the serial number of the device is displayed.

- Firmware (reading parameter):

  In this field, the number of the version installed in the device is displayed.

When editable parameters are being set in the Web Server and new values are being introduced, the text remains in RED until the enter button is pressed. When the enter button is pressed, the new values are saved, and the text will appear in BLACK. It is necessary to press the enter button to save the new values in the transmitter.

#### 6.2.3.22 Firmware Update

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

## 6.3 Web Page Setup Notes

For the data to be refreshed correctly, you may need to change some settings on your browser.

Please follow these instructions carefully.

**For Google Chrome:**

1. Click on the Chrome menu  situated in the toolbar of the browser.
2. Select tools.
3. Choose the option Delete navigation data.
4. Choose the option empty cache.
5. Click on Delete navigation data.

**For Internet Explorer:**

1. From the Tools menu, select Internet Options.

2. In the General tab, click on the Settings button in the Browsing History section.
3. Select 'Every time I visit the webpage' then click the OK button.
4. Click the OK button.

**For Mozilla Firefox:**

1. Open a new tab, in the address bar enter about:config.
2. In the Filter box, enter disk.
3. Set the value for 'browser.cache.disk.enable' to false (double click to change the setting).
4. Close the about:config tab.

# Chapter 6: Equipment Installation

## 6.1 Introduction

This chapter provides important information for the transmitter system installation such as connections available in the rear and front panel of the UDT-02 Transmitter and their pinout, needed connectors and the accessories which are available with the transmitter device.

## 6.2 Connections

Every connection of the UDT-02 camera transmitter is on the rear panel, except for the RF antenna connections that are on the front panel.

All the Lemo part numbers and pinout refer to the connector of the UDT-02. The pinout is shown as it is seen in the UDT-02.

In all the Lemo connectors, the pin number one is circled and the succeeding pins are in counter clockwise order.

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

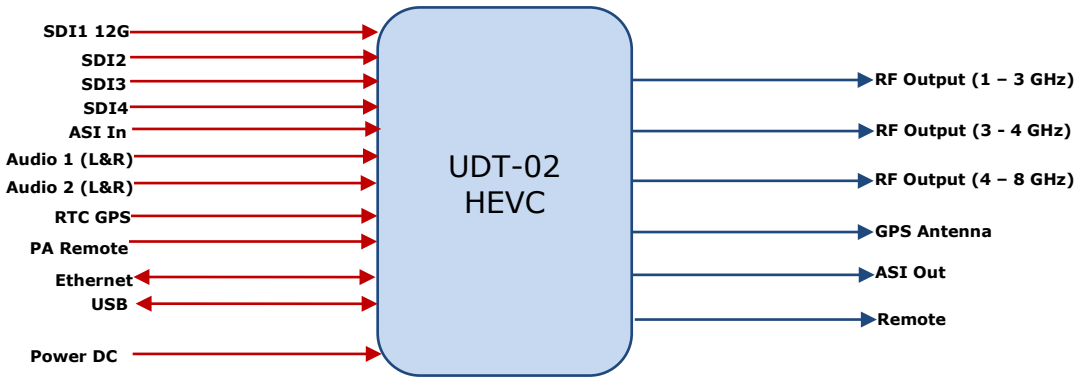



Figure 6.1: UDT-02 connections

The following figures show the UDT-02 front and rear panel. Connections mentioned in the upper figure are shown below.

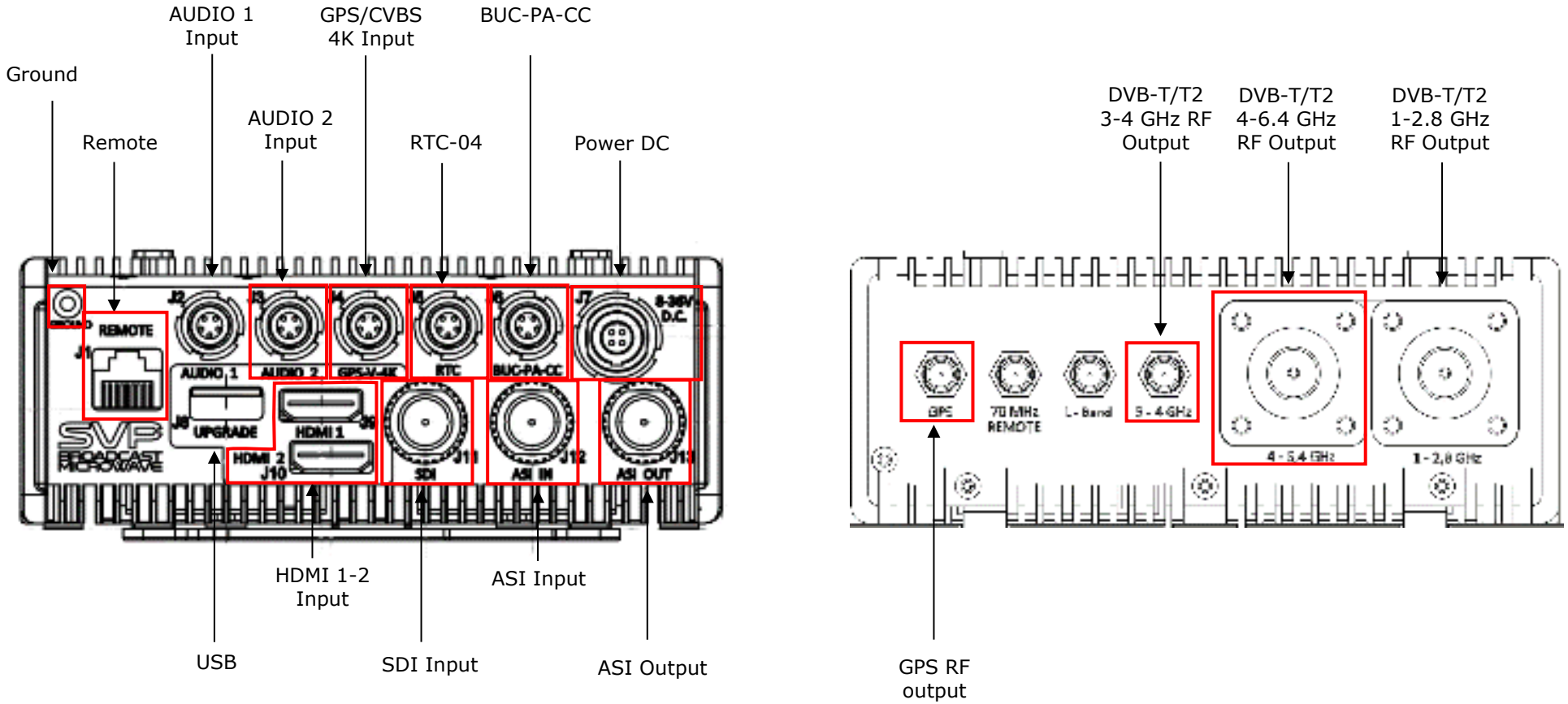



Figure 8.2: Rear and front view of the UDT-02

## 6.2.1 Power supply

The equipment is powered by a DC source from 8 to 36 V. 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 power source of the UDT-02 should be the same as the one used for the PA. Both should be turned on and off simultaneously. They must use the same breaker.

The DC power supply is connected to the equipment via a 4 pin Lemo 1B connector.

**Power supply connection technical features**

| Item | Features |
|---|---|
| Connector label | 8-36V D.C. |
| Connector type | 4 pin Lemo 1B |
| Part number (UDT-02) | ECG.1B.304 |
| Part number (cable connector) | FGG.1B.304.CLAD52 |
| Input voltage range | 8-36 V. |
| Consumption | 20 Watt. |

Table 6.1: Power supply connection technical features

**Pinout**

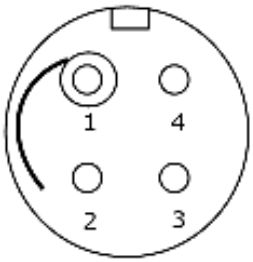



Figure 6.2: Connector pinout

| Pin | Description |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | + VCC |
| 4 | + VCC |

Table 6.2: Power supply connector pinout

## 6.2.2 PA CAMERA Connector

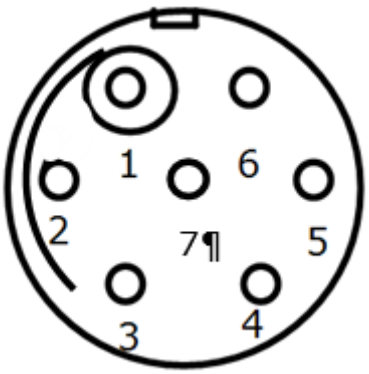
The UDT-02 Transmitter incorporates an input to control remotely the PA-10 Power Amplifier.

**PA CAMERA Connector technical features**

| Item | Features |
|---|---|
| Connector Label | PA CAMERA |
| Connector type | 7 pin Lemo 0B |
| Part number (UDT-02) | ECG.0B.307.CLV |
| Part number (cable connector) | FGG.0B.307.CLAZ |

Table 6.3: PA CAMERA Connector features

**Pinout of the connector**




| Pin | Description |
|---|---|
| 1 | GND |
| 2 | TX (-) |
| 3 | TX (+) |
| 4 | Weight on Wheels (WoW) |
| 5 | PA ON/OFF |
| 6 | RX (+) |
| 7 | RX (-) |

Table 6.4 PA CAMERA connector pinout

### 6.2.2.1 PA Remote Control Cable pinout

If the transmitter is configured to be used with PA Power Amplifiers, the communication and control is made through a RS232 port. The pinout of the cable which interconnects the UDT-02 Transmitter and PA Power Amplifier is indicated in the following table:

**UDT-02 to PA Control Cable pinout**

| **BUC-PA-CC Cable Connector (Lemo FGG.0B.307)** | **PA Remote Cable Connector (JD38999/26WA35SN Amphenol)** |
|---|---|
| Pin 1 | Pin 1 |
| Pin 2 | Pin 6 |
| Pin 5 | Pin 5 |
| Pin 7 | Pin 2 |

Table 6.5: UDT-02 to PA Control Cable pinout

## 6.2.3 RTC-DATA

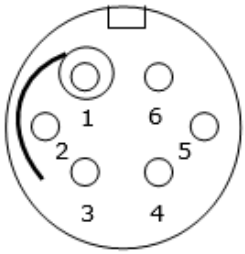
This connection is mainly used to allow to transfer RS232 user data or to connect to the RTC remote control.

**RTC-DATA connection technical features**

| Item | Features |
|---|---|
| Connector Label | RTC-DATA |
| Connector type | 6 pin Lemo 0B |
| Part number (UDT-02 connector) | ECG.0B.306.CLV |
| Part number (Cable connector) | FGG.0B.306.CLAZ |

Table 6.6: RTC-DATA connection technical features

**Pinout of the cable connector (Watched from the soldering side)**




| Pin | Description |
|---|---|
| 1 | GND |
| 2 | RTC - (RS-485 (-)) |
| 3 | DATA TX (RS-232) |
| 4 | RTC + (RS-485(+)) |
| 5 | +V DC |
| 6 | DATA RX (RS-232) |

Table 6.7: RTC-DATA cable connector pinout

## 6.2.4 Video inputs

For transmission of 12G signals, video SDI 1 connector must be used. SDI 2, SDI 3 and SDI 4 are used for multivideo HD formats.

**SDI connection technical features**

| Item | Features |
|---|---|
| Connector Label | SDI 1 12 Gb/ SDI 2/ SDI 3/ SDI 4 |
| Connector type | Female HD-BNC |
| Impedance | 75 Ω |
| Input Level | 800 mVpp nominal ±10% |
| Standards | SMPTE-259M and SMPTE-272M<br>SMPTE-292M and SMPTE-299M<br>SMPTE-425M |

Table 6.8: SDI input signal connection features

**ASI IN connection technical features**

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

Table 6.9: ASI Transport Stream input connection features

## 6.2.5 Audio inputs

The UDT-02 Transmitter has four possible Analogue Audio inputs:

- 2 Audio inputs to insert 2 stereo or 4 mono analogue (mic phantom, mic dynamic and line) signals where connections are made using two 5 pin Lemo 0B connectors on equipment's rear panel.
- 1 input to insert either 8 Audios embedded on a SDI signal where connections are made with a BNC connector on equipment's rear panel.

Embedded Audio signals must be compliant with SMPTE-272M standard when embedded on SD-SDI video signal, with SMPTE-299M standard when embedded on HD-SDI video signal and with SMPTE-425M standard when embedded on 3G-SDI video signal.

**Analogue Audio input technical features**

| Item | Features |
|---|---|
| Audio channel number | 4 |
| Connector labels | AUDIO 1<br>AUDIO 2 |
| Connector type | 5 pin Lemo 0B |
| Part number (UDT-02 connector) | ECG.0B.305.CLV |
| Part number (Cable connector) | FGG.0B.305.CLAZ |

Table 6.10: Analogue Audio input connection technical features

**Pinout of the cable connector (Watched from the soldering side)**


| Pin | Description |
|---|---|
| 1 | A1L+ |
| 2 | A1L- |
| 3 | GND |
| 4 | A1R+ |
| 5 | A1R- |

Table 6.11: Analogue Audio cable connector pinout

## 6.2.6 Remote

This connection allows the user to monitor and setup any parameter of the transmitter through Web Browser. The connector used is a RJ-45.

**Remote connection technical features**

| Item | Features |
|---|---|
| Connector Label | REMOTE |
| Connector type | RJ-45 |

Table 6.12: Ethernet remote connection technical features

## 6.2.7 UPGRADE (USB)

Through the USB connection, it is possible to update the firmware of the transmitter directly from an external USB device.

**USB connection technical features**

| Item | Features |
|---|---|
| Connector Label | USB |
| Connector type | Type A |

Table 6.13: USB input connection technical features

## 6.2.8 RF output

The antenna or Power Amplifier is directly connected to the female N-type or SMA-type connectors on the front panel of the UDT-02 camera transmitter. There are up to six connectors available, each one for a different frequency band (type N for the 1-2.8 GHz band, type SMA for 3-4 GHz band, type N for 4-8 GHz band and SMA connector for GPS antenna)

**RF connection technical features**

| Item | Features |
|---|---|
| Connector label | 1-3 GHz |
| Connector type | N female |
| Output frequency range | 1 to 3 GHz |
| Impedance | 50 Ω |
| Output power | Maximum: 100 mW |

| Item | Features |
|---|---|
| Connector label | 3-4 GHz |
| Connector type | SMA female |
| Output frequency range | 3 to 4 GHz |
| Impedance | 50 Ω |
| Output power | Maximum: 100 mW |

| Item | Features |
|---|---|
| Connector label | 4-8 GHz |
| Connector type | N female |
| Output frequency range | 4 to 8 GHz |
| Impedance | 50 Ω |
| Output power | Maximum: 100 mW |

| Item | Features |
|---|---|
| Connector label | GPS Antenna |
| Connector type | SMA female |
| Impedance | 50 Ω |

| Item | Features |
|---|---|
| Connector label | REMOTE |
| Connector type | SMA female |
| Impedance | 50 Ω |

Table 6.14: RF output connections characteristics

## 6.2.9 ASI output

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

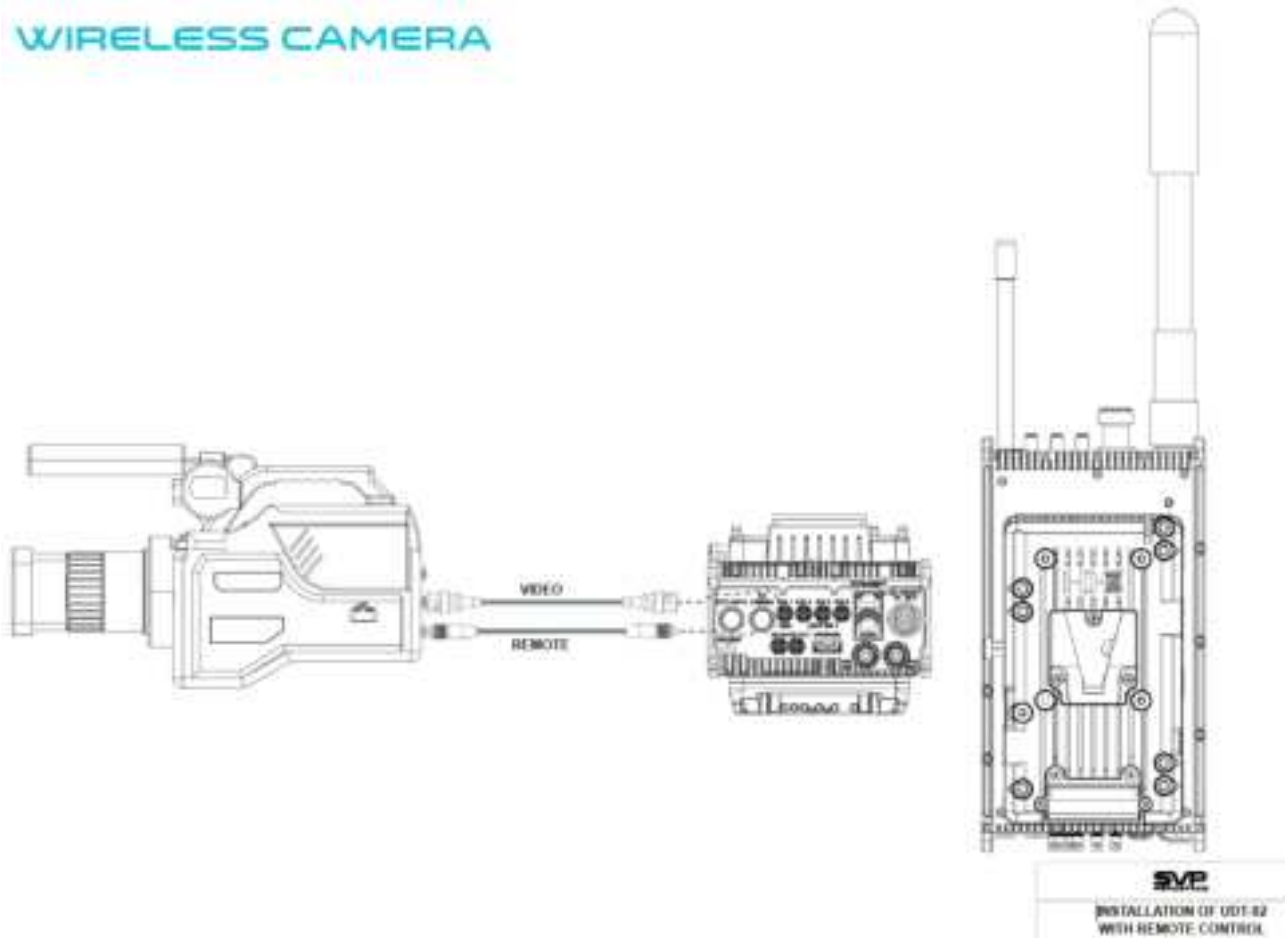
It is important that 75 Ω connectors are used. This is because the female output connector of the UDT-02 unit could be damaged because of an impedance mismatch.

**ASI connection technical features**

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

Table 6.15: DVB-ASI Transport Stream output connection features

## 6.3 Integrated wireless camera control installation diagram



## 6.4 Mechanical Accessories

In this section, different short of accessories of the UDT-02 HEVC Transmitter are shown.

The accessories required by the customer must be defined when the transmitter is ordered.

### 6.4.1 Battery Fastening

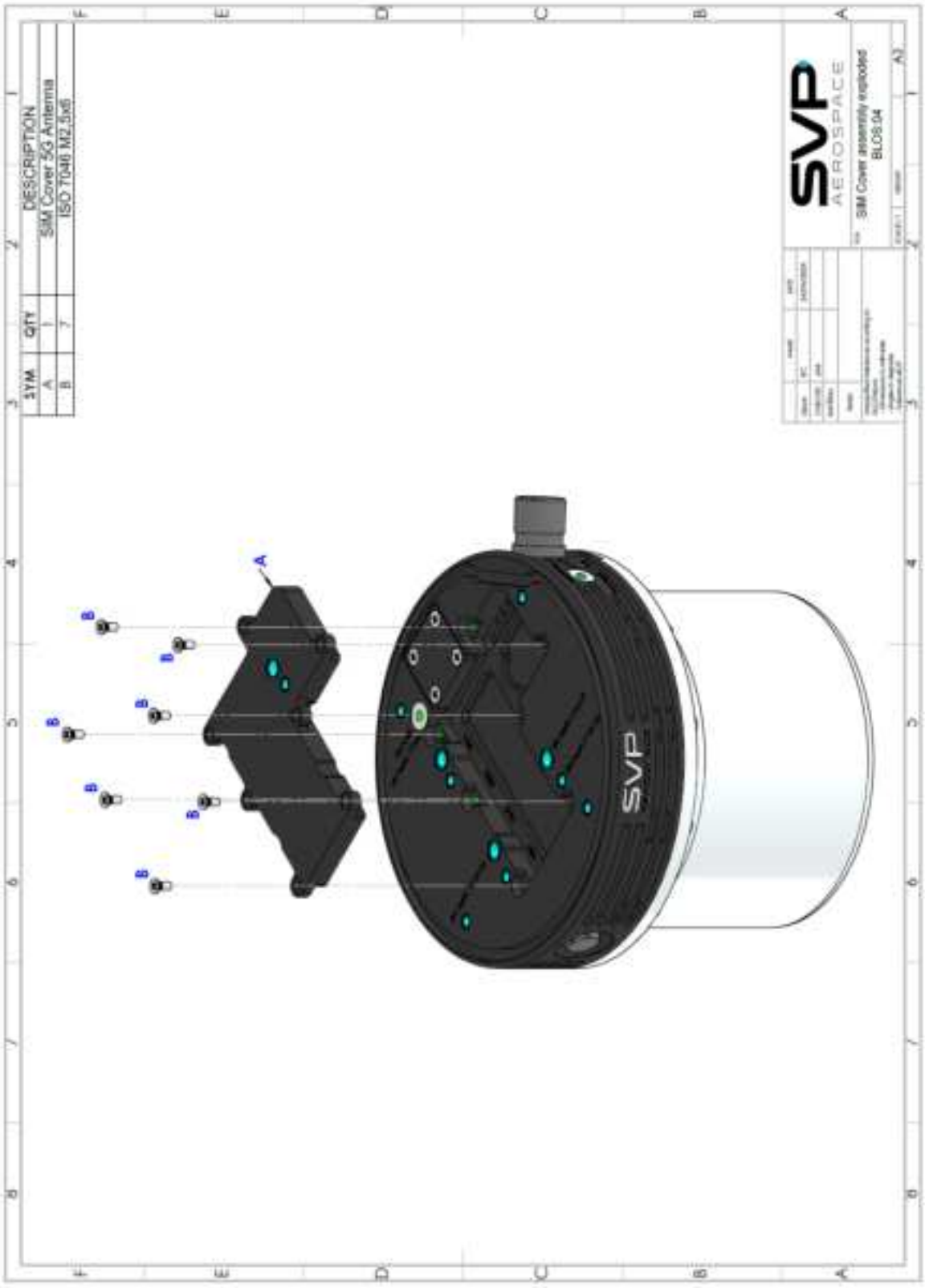
This item allows the connection to the battery (V type or Anton Bauer) to the transmitter's case (optional).

The type of the battery fastening must be defined when the transmitter is ordered.

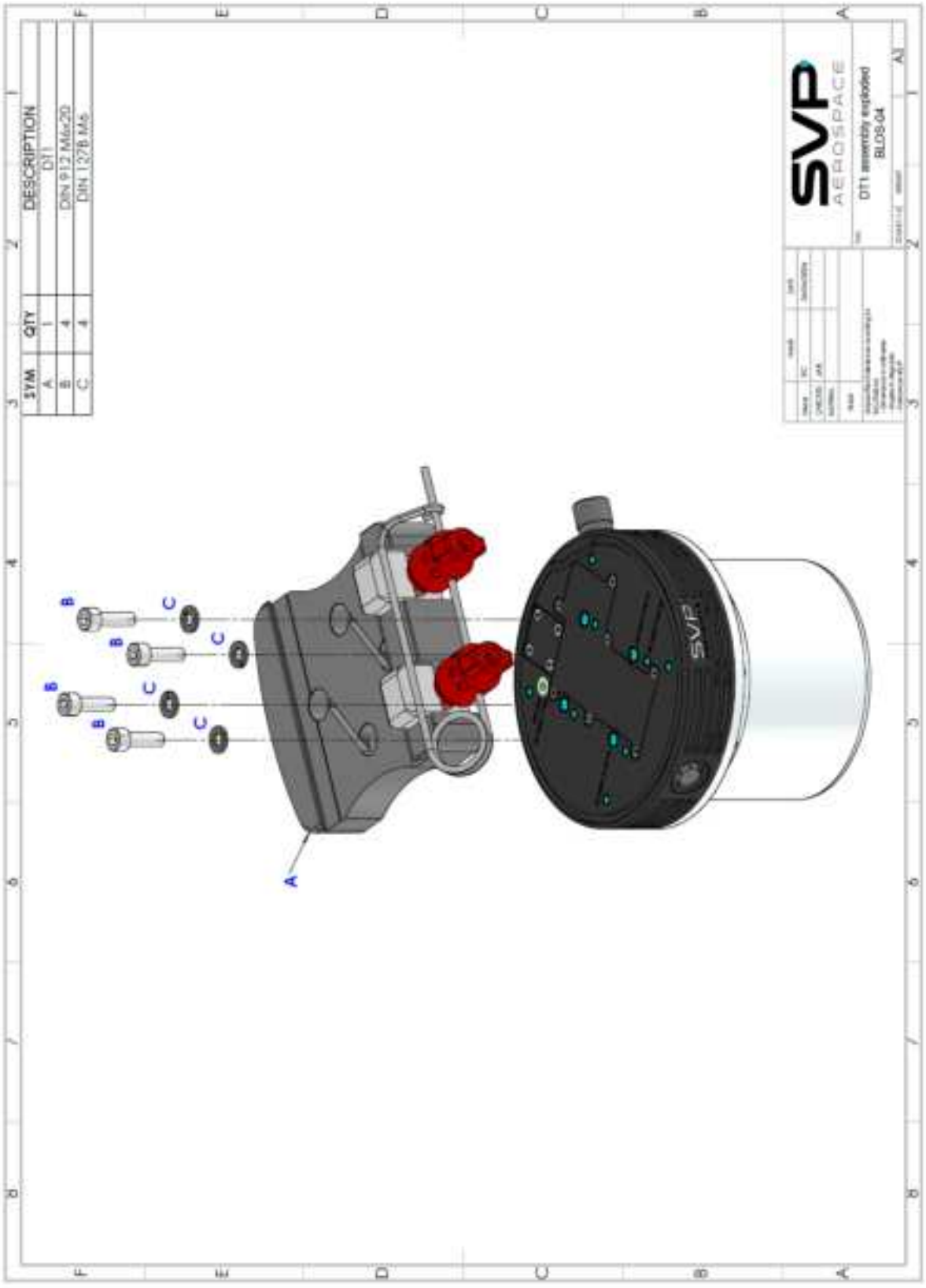
Figure 6.3: V type battery fastening

## 6.5 5G Antenna

### 6.5.1 CELLULAR DATALINK Antenna SIM Cover



## 6.5.2 CELLULAR DATALINK Antenna : AIRFILM CAMERA SYSTEMS DT-1-1 Assembly



# Chapter 7: Remote Control

## 7.1 Introduction

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

Thanks to this equipment, the user can control the transmitter remotely in an easy and comfortable way. The RTC-04 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, the profile selected and enable or disable encryption.

From the RTC-04 the user can record video on an USB drive or can charge profiles automatically on an USB port.

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

Additionally, when used with a 5G Antenna, we can select between 5G DATA transmission (5G antenna is only used for DATA) or 5G VIDEO (5G antenna is used for video transmission backup).

## 7.2 RTC-04

### 7.2.1 Remote Control Operation

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

Figure 7.1: RTC-04 front view

There are several buttons in the front panel of the device that allows the control of the UDT-02 and UDT-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).

In order to disable the actuator function, please you hold down the PROFILE button and press the Actuator DOWN button for 3 seconds.

- Standby/RF

  To select the amplifier output power level or leave it in standby mode please move this selector. The options available are:

  - 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.

- LEDS

  There are 4 LEDS that can be used for different purposes; Crypto, REC, 5G and 5G Video.

  In order to access the configuration mode, first press PROFILE button for about 2 seconds.

  One of the LEDs will start blinking, move UP or Down using PROFILE button and select the option that you want to configure.

  Press PROFILE button to change the configuration.

  Press PROFILE button for 2s to get out of configuration mode.

  Configuration options are:

  - Encyption:
    - ON
    - OFF
  - REC (Video recording on USB drive):
    - ON
    - OFF

- 5G:
  - ON (Only data is transmitter over bidirectional 5G antenna)
  - OFF
- 5G video:
  - ON (Video is sent over the 5G antenna as video backup)
  - OFF

## 7.2.2 Connections

This chapter provides important information such as connections available in the Remote Control and the connectors needed.


Figure 7.2: RTC-04 rear view

### 7.2.2.1 Transmitter Dimmer Connector

This connector is used for the communication between (J1) UDT-02 Transmitter and the RTC-04 Remote Control.

**Transmitter Dimmer connection technical features**

| Item | Features |
|---|---|
| Connector label | TRANSMITTER DIMMER J1 |
| Connector type | MIL-DTL-38999 Series 3<br>D38999/24 |
| Part number E.g. (RTC-04 connector) | D38999/24WA35PN |
| Part number E.g. (cable connector) | D38999/26WA35SN |

Table 7.1: Transmitter Dimmer connection technical features

**Transmitter Dimmer connector pinout**

| Pin | Description |
|---|---|
| 1 | GND |
| 2 | RTC RS485 (+) Half Duplex |
| 3 | RTC RS485 (-) Half Duplex |
| 4 | +V Power Supply |
| 5 | NVG Dimmer |
| 6 | Dimmer Enable |
| 7 | Not Used |
| 8 | USB+ REC |
| 9 | USB- REC |

Table 7.2: Transmitter Dimmer connector pinout

### 7.2.2.2 Actuator Arm Altimeter Connector

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 J2 |
| Connector type | MIL-DTL-38999 Series 3<br>D38999/24 |
| Part number E.g. (RTC-04 connector) | D38999/24WB35SN |
| Part number E.g. (cable connector) | D38999/26WB35PN |

Table 7.3: Actuator Arm Altimeter connection technical features

**RTC-04 connection to Type A actuator**

| 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 |
| 11 | 28V DC Return |
| 12 | Not Used |
| 13 | Not Used |

Table 7.4: Connector pinout for Type A actuator

To automatically retract the actuator by the altimeter radar alarm, short pins 7 and 8 of this connector.

**RTC-04 connection to Type B actuator**

| 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 |
| 11 | 28V. DC Return |
| 12 | Not Used |
| 13 | Not Used |

Table 7.5: Connector pinout for Type B actuator

To automatically retract the actuator by the altimeter radar alarm, short pins 7 and 8 of this connector.

## 7.2.2.3 Alarms

The RTC-04 Remote Control shows transmitter alarms. When there is an alarm there will be a point in the profile screen.

## 7.3 RS-485 Operation

### 7.3.1 PC Control Operation

The UDT-02 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-04 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

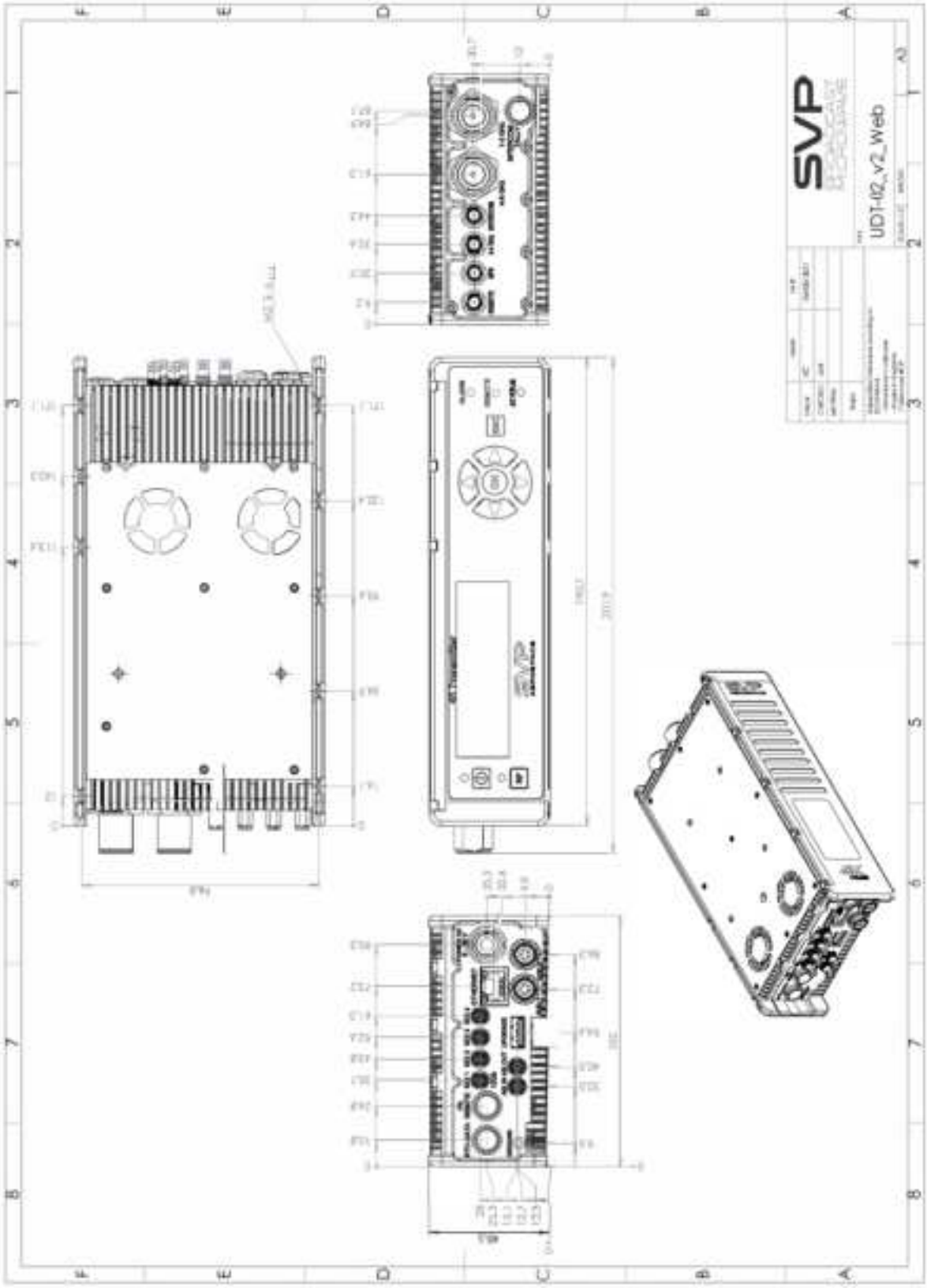
Bit 6 => Profile 7 selected
Bit 5 => Profile 6 selected
Bit 4 => Profile 5 selected
Bit 3 => Profile 4 selected
Bit 2 => Profile 3 selected
Bit 1 => Profile 2 selected
Bit 0 => Profile 1 selected

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.

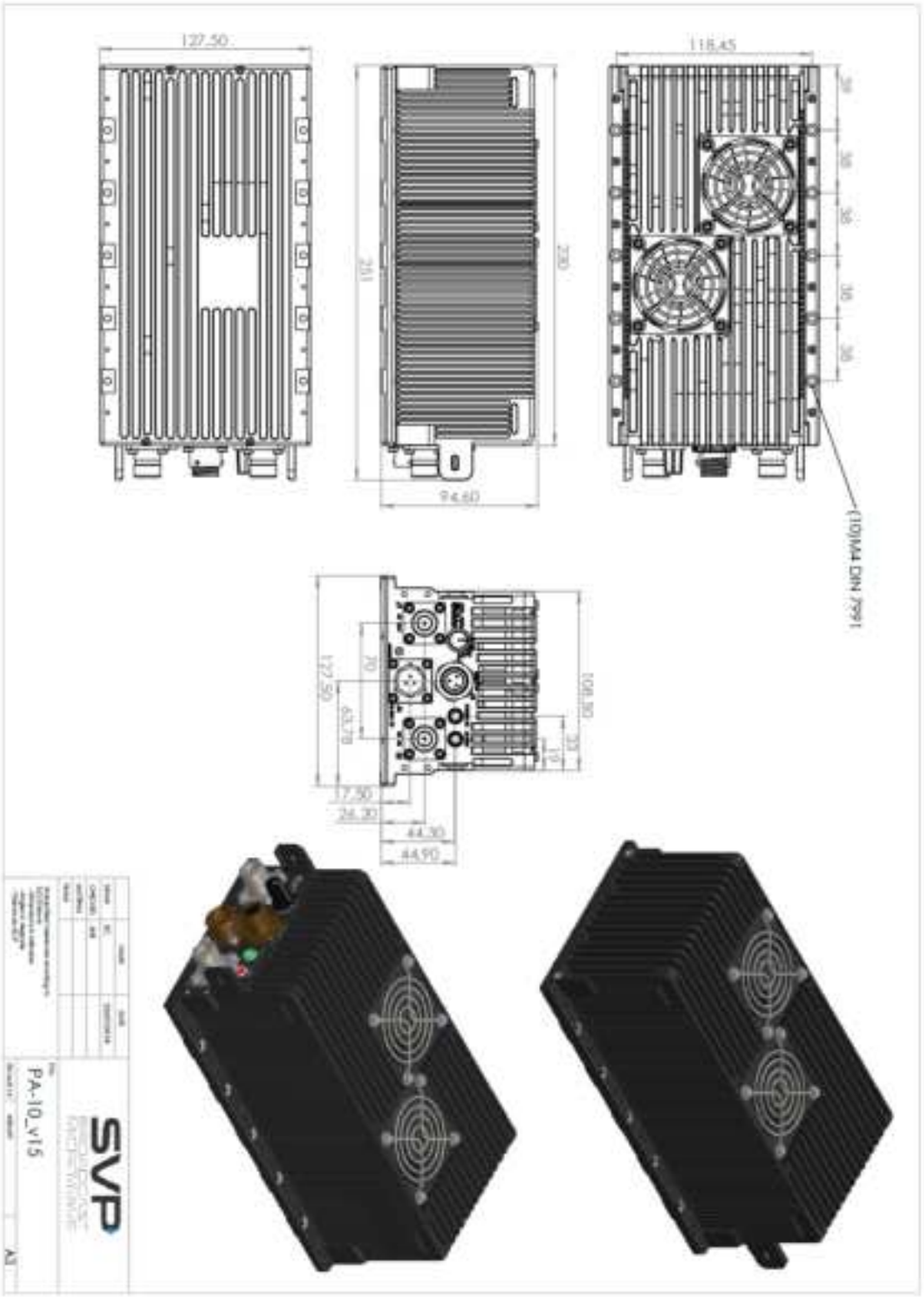
# Chapter 8: Mechanical Dimensions

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

## 8.1 UDT-02 Transmitter

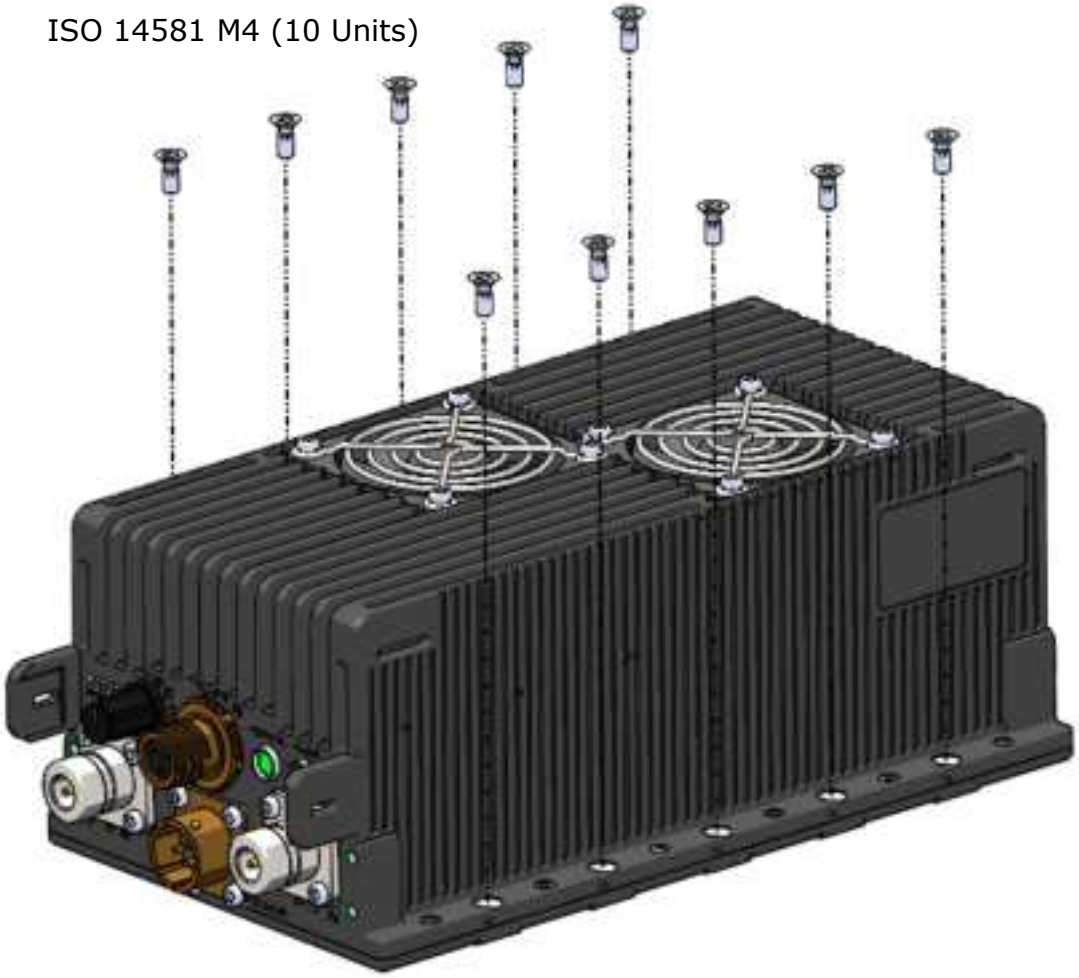


## 8.2 PA Standard and PA Ultralinear Power Amplifiers

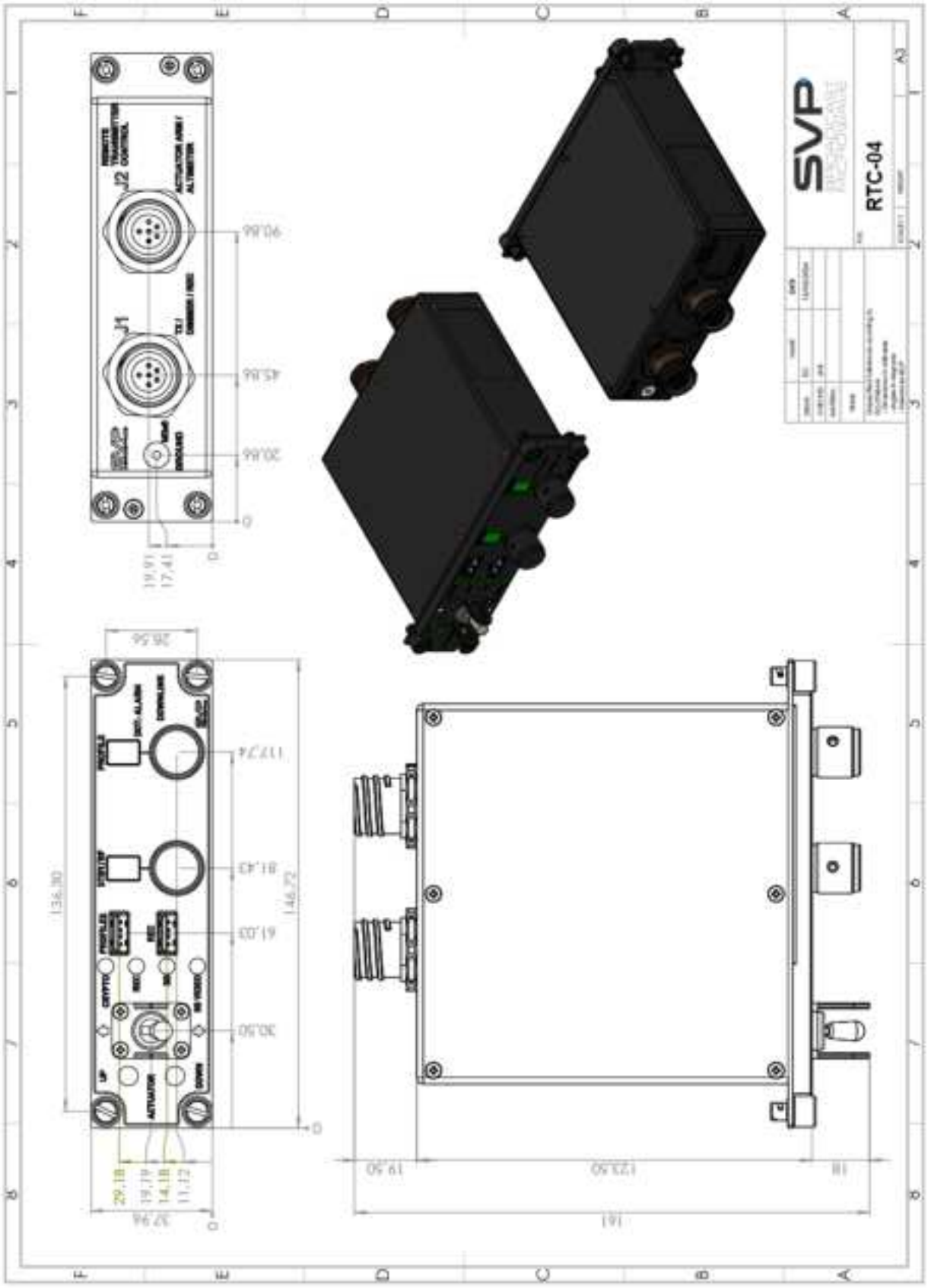


## 8.3 PA Standard and PA Ultralinear Power Amplifiers Installation

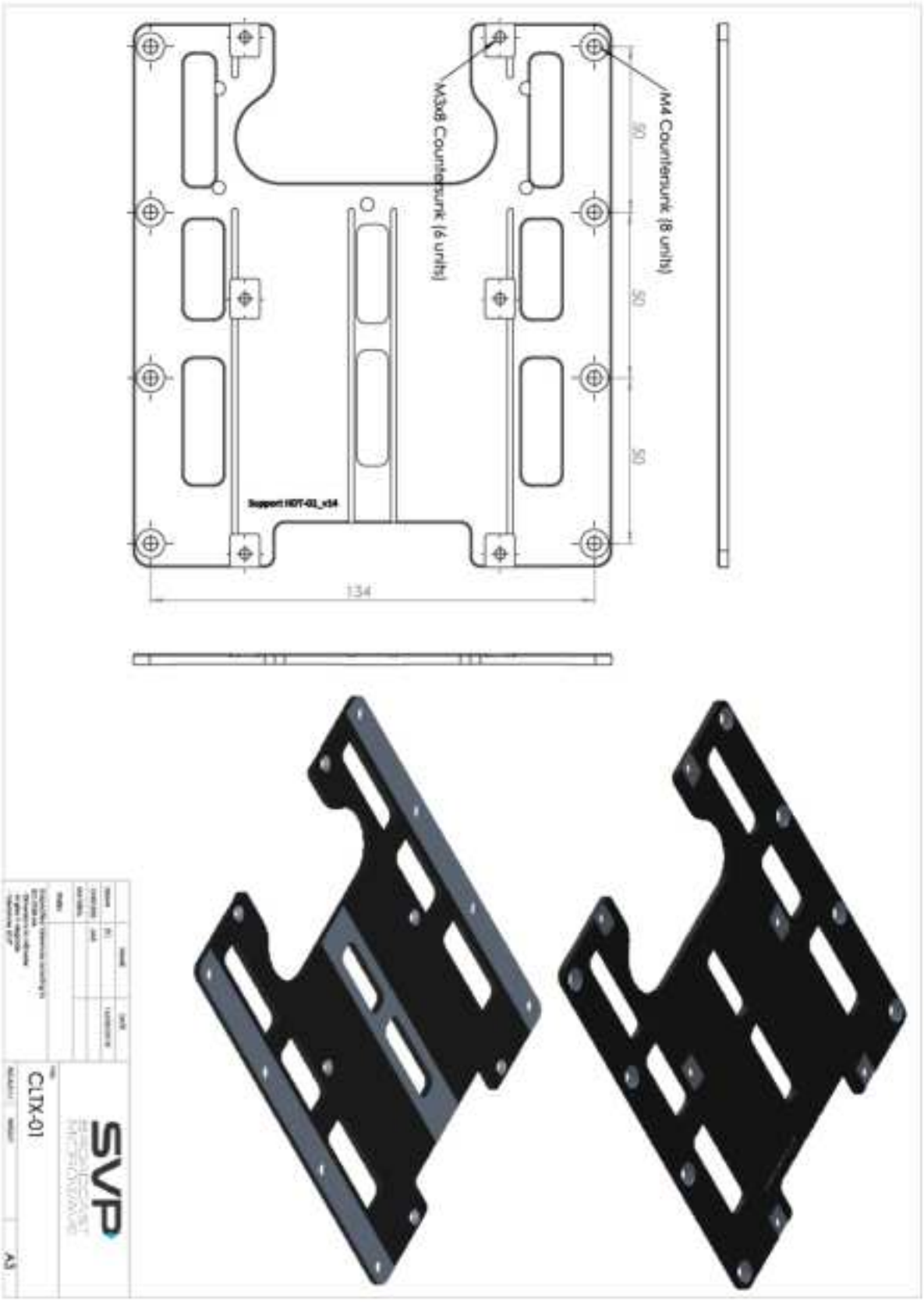
ISO 14581 M4 (10 Units)



## 8.4 RTC-04 Remote Control

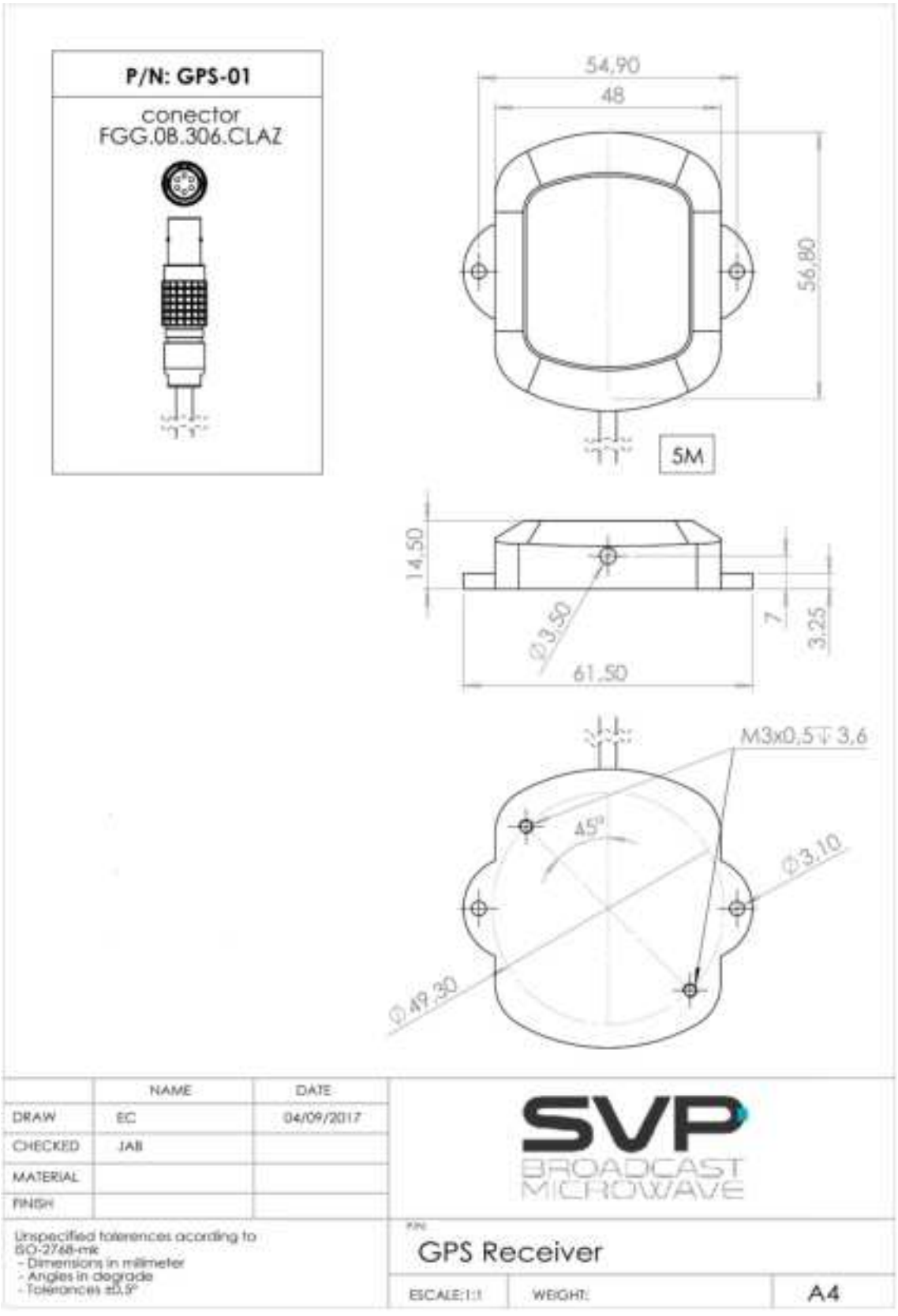


## 8.5 CLTX-01 Support

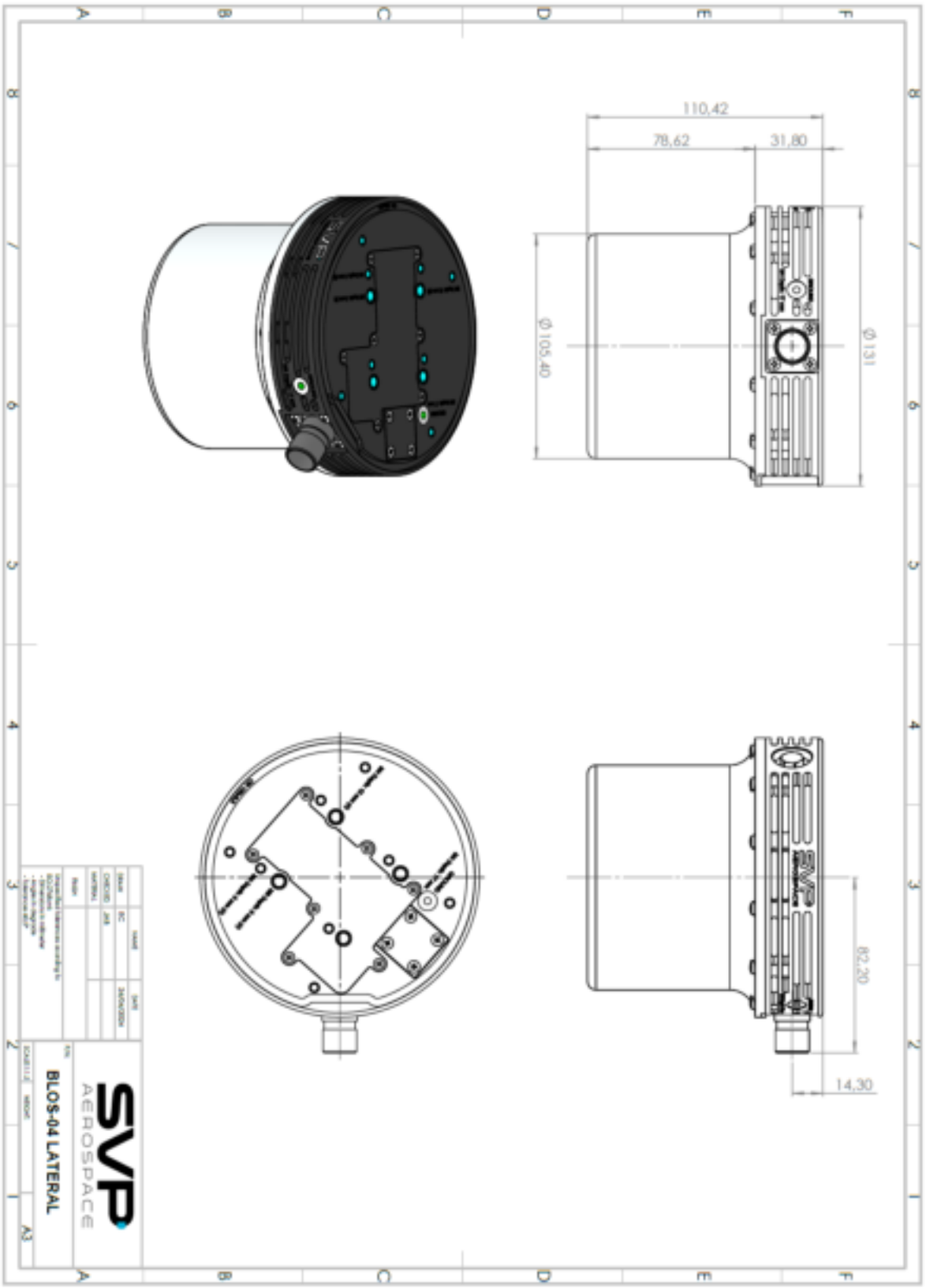


## 8.6 CLTX-02 Support Installation

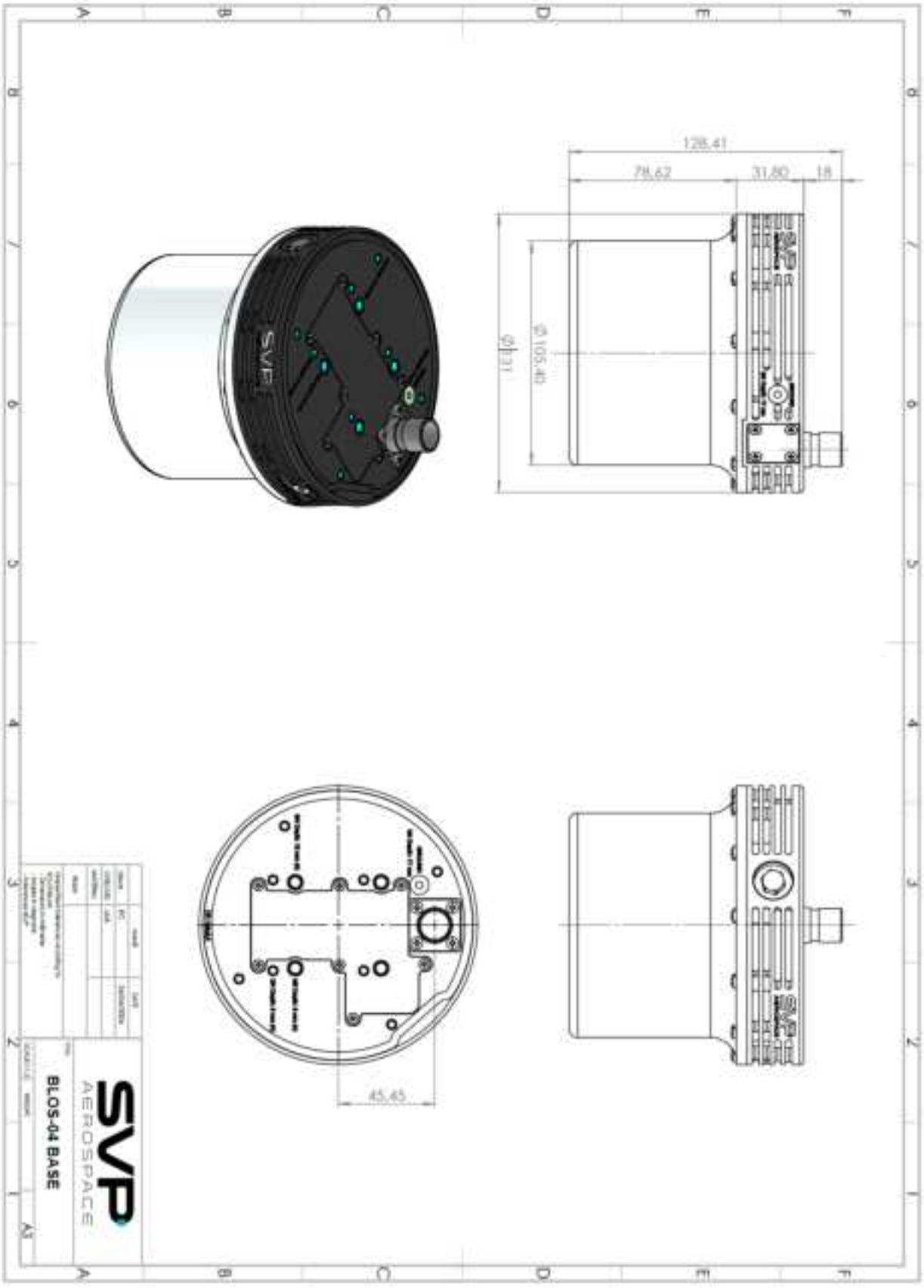
## 8.7 GPS-01 Antenna & Receiver



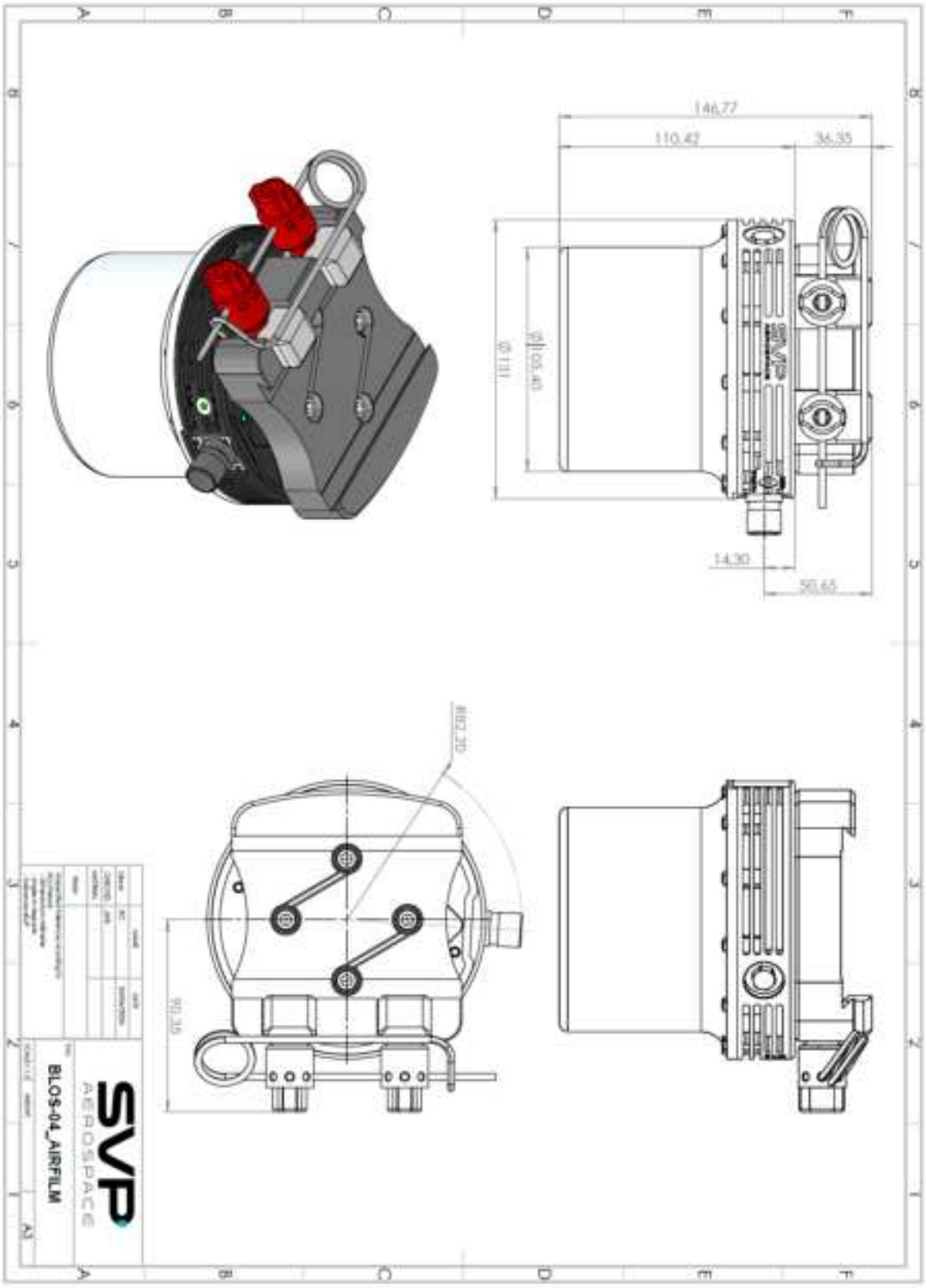
## 8.8 CELLULAR DATALINK Antenna General



## 8.9 CELLULAR DATALINK Antenna Base



# 8.10 CELLULAR DATALINK Antenna with AIRFILM



# Chapter 9: Preventive Maintenance

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

## 9.1 Maintenance Schedule

| Procedure | Yearly | Quarterly | Monthly | Prior each use |
|---|---|---|---|---|
| Inspect wiring | ✓ | | | |
| Inspect the cables connection | | ✓ | | |
| Inspect the antenna connection | | | ✓ | ✓(*) |

Table 10.1. Maintenance Schedule table

**(*) If the UDT-02 installation is constantly changed, prior to each use make sure the RF output is loaded.**

## 9.2 Maintenance Procedures

Quarterly, the following inspections should be done:

- Inspect antenna installation to ensure all components are secure and in good conditions.
- Inspect cables and connections.

## 9.3 Spare Parts

The transmitter 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 make the warranty void.

# Chapter 10: Warranty

## 10.1 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.

## 10.2 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.

## 10.3 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.

## 10.4 Transportation and packaging

Any Product returned for examination must be sent prepaid via the means of transportation indicated as acceptable by SVP Broadcast Microwave. SVP Broadcast Microwave reserves the right to reject any warranty claim on any item that has been altered or has been shipped by non-acceptable means of transportation. Returned Products should be carefully packed and unless otherwise indicated, shipped to:

SVP Broadcast Microwave
Zubiaurre 7
48215 Iurreta
Vizcaya
Spain

## 10.5 Authorization for evaluation

When any Product is returned for examination and inspection, or for any other reason, Customer and its shipping agency shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, notwithstanding any defect or nonconformity in the Product. By returning a Product, the owner grants SVP Broadcast Microwave permission to open and inspect the returned Product to determine the cause of failure, and SVP Broadcast Microwave's determination with regard hitherto shall be final.

If it is found that the Product has been returned without cause and is still serviceable, the Customer will be notified and the Product returned with appropriate inspection charges billed, at SVP Broadcast Microwave's discretion, to the Customer.

# Annex A: PA Standard and PA Ultralinear Power Amplifiers

## Important Notes

1. Read the instructions carefully before connecting the machine.
2. In our effort to improve our products constantly, we may change their specifications without prior notice.
3. Use high quality, low loss cables and connectors to ensure proper functioning of the equipment's features.
4. This equipment is to be installed and operated by qualified personnel only.
5. The equipment has a two-year warranty that covers any failure or manufacturing defect, providing it is not handled by anyone other than SVP Broadcast Microwave personnel and the warranty seal has not been broken.

# A.1 Introduction

The PA Power Amplifier expands the possibilities of COFDM digital links on the market. Low intermodulation and high reliability make these Amplifiers especially interesting for broadcast and airborne applications.

This PA can be controlled from the UDT-02 remotely thanks to the RS-232 communication.

An excellent design, mechanical and electronic assembly make the PA a robust and reliable solution.


Figure A.1: PA Power Amplifiers

# A.2 PA Ultralinear & PA

## A.2.1 Technical Specifications

### PA Ultralinear

| Item | Features |
|---|---|
| Max. Output power | 15 W linear in 2.0 to 2.4 GHz<br>10 W linear in 2.3 to 2.7 GHz<br>10 W linear in 3.3 to 3.6 GHz |
| Selectable output power level | 3 output power levels selectable |
| Frequency range | 2,000 – 2,400 MHz<br>2,300 – 2,700 MHz<br>3,300 – 3,600 MHz |
| Input level | +13 dBm to +20 dBm (ALC) |
| Shoulders rejection | >40dB @ 10 Watts<br>>35dB @ 15 Watts |
| I/O Impedance | 50 ohm, >10 dB return loss |
| Supply Voltage | 9 to 36 VDC |
| Power consumption | 80 W |
| Operating temperature range | -20ºC to +50ºC |
| Mechanical dimensions | 251x 127.5 x 94.6 mm |
| Weight | 2.5 kg |
| P/N | PA-15-2024U<br>PA-10-2324U<br>PA-10-3336U<br>Arinc front Hook versions:<br>PA-15-2024UH<br>PA-10-2324UH<br>PA-10-3336UH |

Table A.1 PA Ultralinear Main Characteristics

## PA Standard

| Item | Features |
|---|---|
| Frequency range/Max power | 1.3 to 1.55 GHz for 10W<br>1.7 to 2.2 GHz for 10W<br>4.4 to 5 GHz for 10W<br>5.0 to 5.3 GHz for 10W<br>6.4 to 7.0 GHz for 5 W<br>6.8 to 7.3 GHz for 1.5W |
| Input level | +13 dBm to +20 dBm with ALC |
| Harmonics suppression | >60 dB typ. |
| I/O Impedance | 50 ohm, >10 dB return loss |
| Supply Voltage | 9 to 36 VDC |
| Power consumption | 80 W to 125 W |
| Operating temperature range | -20ºC to +50ºC |
| Mechanical dimensions | 251x 127.5 x 94.6 mm |
| Weight | 2.5 kg |
| P/N | PA-10-1315<br>PA-10-1722<br>PA-10-4450<br>PA-10-5053<br>PA-5-6470<br>PA-2-6873 |

Table A.2 PA Standard Main Characteristics

## A.2.2 Block Diagram

This section provides the block diagram of the PA Ultralinear and PA Standard Power Amplifiers showing the internal performance of the device.

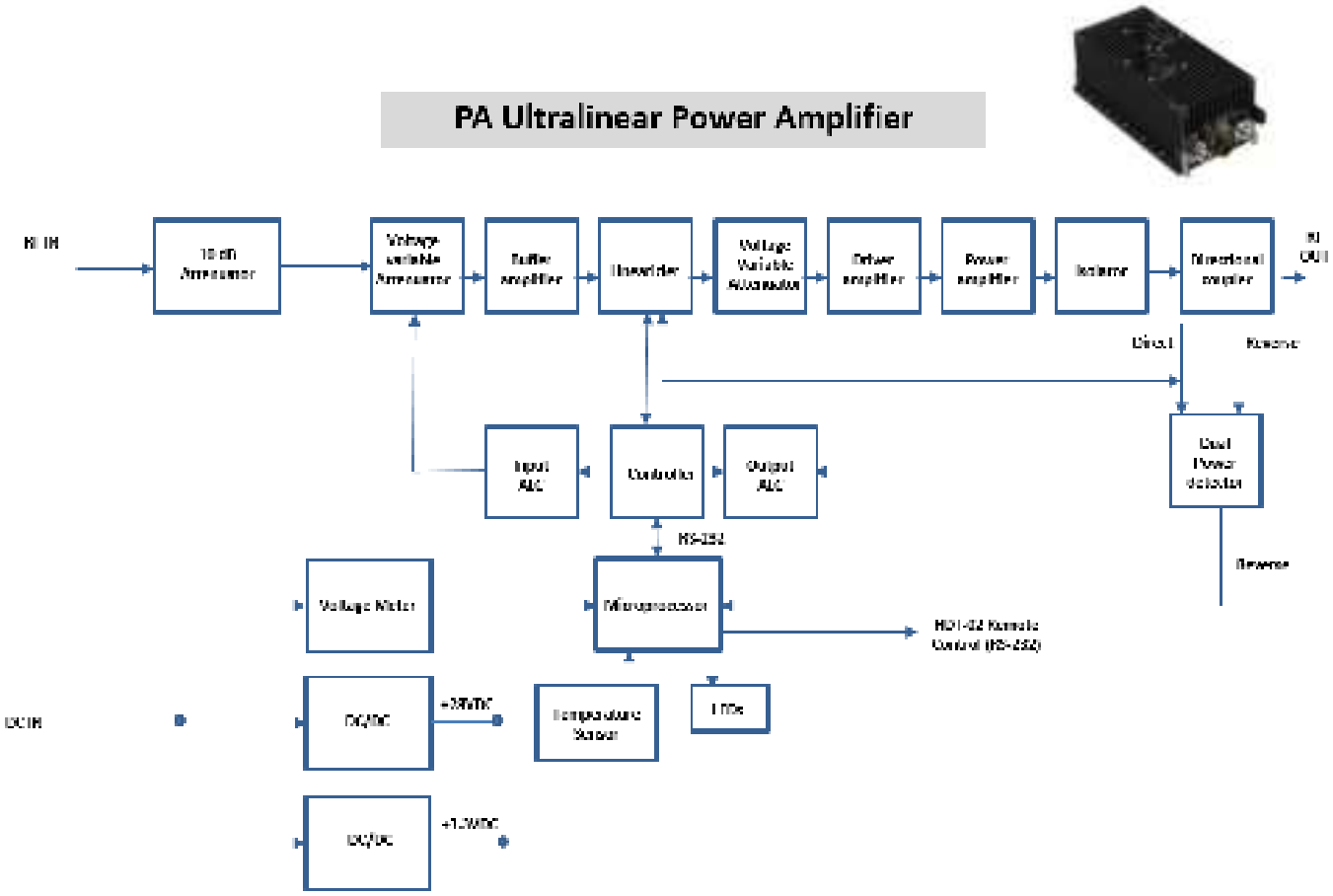



Figure A.2: PA Ultralinear Block Diagram

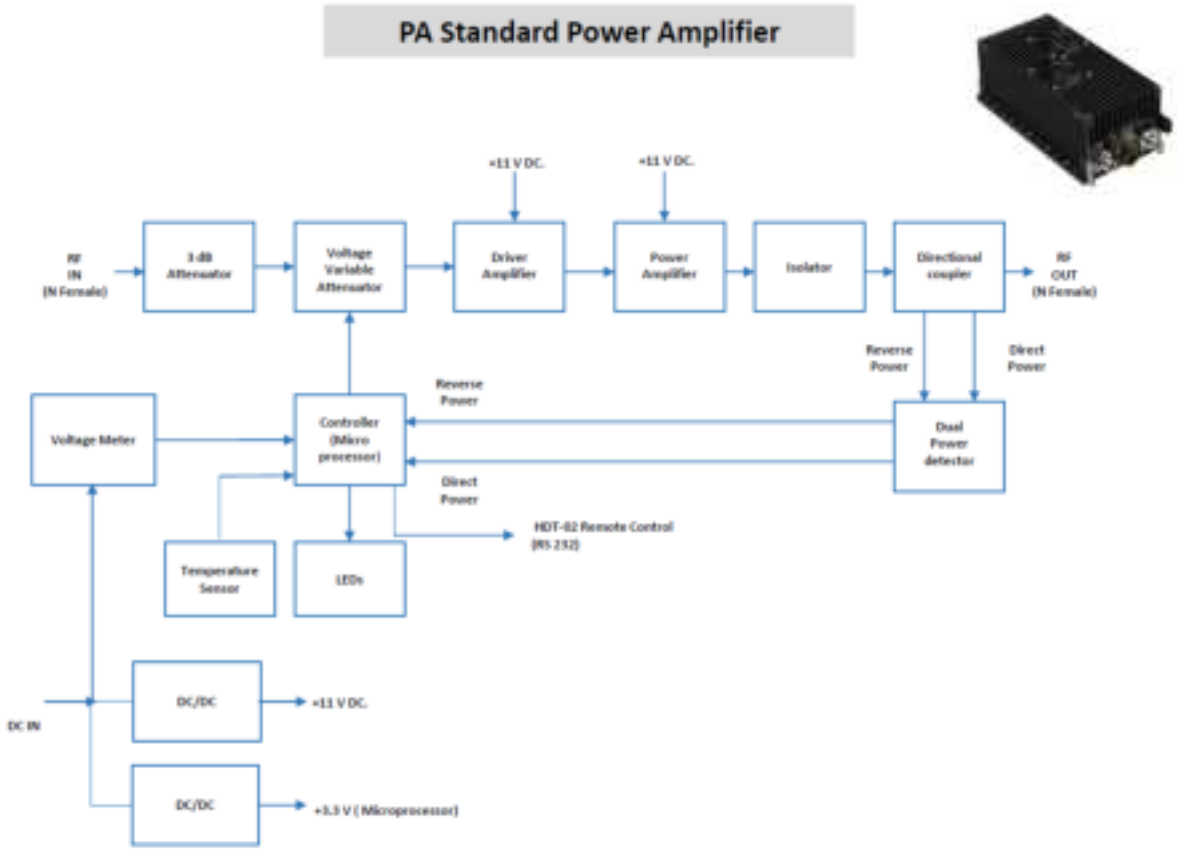



Figure A.3: PA Standard Block Diagram

## A.2.3 Equipment Installation

### A.2.3.1 Introduction

This section provides information for the Power Amplifiers installation such as connections available in the front panel of the PA Amplifiers and their pinout, and connectors needed.

### A.2.3.2 Connections

The connections of the PA Power Amplifier are distributed on the front panel of the device.

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

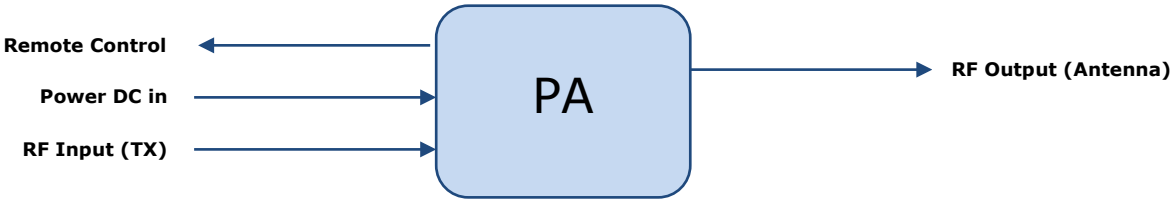



Figure A.4: PA Connections

#### A.2.3.2.1 Power supply

The equipment is powered by a DC source from 9 to 36 V.

**Power supply connection technical features**

| Item | Features |
|---|---|
| Connector label | 9-36V D.C. |
| Connector type | MIL-DTL-26842 Series 2<br>MS3112E |
| Connector Part number (PA connector) | SOURIAU 851-02E123P50 |
| Connector Part number (cable connector) | SOURIAU 851-06EC123S50 |
| Input voltage range | 9-36 V. |
| Consumption | Max 125 W |

Table A.3: Power supply connection technical features

**Pinout of the connector**

| Pin | Description |
|---|---|
| A | VCC |
| B | RETURN |
| C | Not Used |

Table A.4: Power supply cable connector pinout

#### A.2.3.2.2 Remote Control

The PA Power Amplifiers incorporate an input to be controlled remotely by a UDT-02 Transmitter.

This Remote Control allows switch ON/OFF, send the Power Direct, Power Reverse and Alarms to the UDT-02 Transmitter and enable the configuration of the output power.

**Remote Control connection technical features**

| Item | Features |
|---|---|
| Connector Label | REMOTE |
| Connector type | MIL-DTL-38999/24 |
| Connector Part number (PA connector) | JD38999/24WA35SN (Amphenol) |
| Connector Part number (cable connector) | D38999/26WA35PN (Amphenol) |

Table A.5: Remote Control connection features

**Pinout of the connector**

| Pin | Description |
|---|---|
| 1 | Return of RS232 and PA ON/OFF |
| 2 | RS232 (RX) |
| 3 | Not Used |
| 4 | Not Used |
| 5 | PA ON/OFF (0 to 3.3 VDC) |
| 6 | RS232 (TX) |

Table A.6 Remote Control connector pinout

#### A.2.3.2.2.1 Remote Control Cable Pinout (UDT-02 to PA)

The Remote Control cable which connects the BUC-PA-CC (Lemo 7) with the Remote (D38999) connector on the amplifier has the following pinout:

**Pinout of the control cable from UDT-02 to PA**

| BUC-PA-CC Cable Connector (Lemo FGG.0B.307) | PA Remote Cable Connector (JD38999/26WA35SN Amphenol) |
|---|---|
| Pin 1 | Pin 1 |
| Pin 2 | Pin 6 |
| Pin 5 | Pin 5 |
| Pin 7 | Pin 2 |

Table A.6: Remote Control Cable Pinout

#### A.2.3.2.3 RF input

Here, the RF signal which comes from the UDT-02 Transmitter is connected.

**RF IN connection technical features**

| Item | Features |
|---|---|
| Connector label | RF IN (TX) |
| Connector type | N female |
| Impedance | 50 Ω |

Table A.7 RF IN connection features

#### A.2.3.2.4 RF output (Antenna)

The antenna is directly connected to the female N-type connector of the PA Power Amplifiers. One circulator is integrated in the RF output to protect the amplifier from the possible damage suffered by the reflected power.

**RF OUT connection technical features**

| Item | Features |
|---|---|
| Connector label | RF OUT (Antenna) |
| Connector type | N female |
| Impedance | 50 Ω |

Table A.8 RF OUT connections characteristics

### A.2.3.3 Thermal Protections

The PA Power Amplifier has an IP65 radiator that dissipates heat throughout a fan. The fan is activated when temperature exceeds 50ºC.

### A.2.3.4 Connection Guide

For the installation of the PA amplifier, these items are needed:

- PA Power Amplifier
- UDT-02 Transmitter
- RF cable with N male to N male type connector.
- Remote Control cable (6 pin MIL-DTL-38999 to 7 pin Lemo)
- Antenna

The UDT-02 Transmitter is powered throughout the Lemo 1B connector and the Power Amplifier is powered throughout the SOURIAU connector. The input level is indicated in each connector's label.

The UDT-02 Transmitter is connected to the Power Amplifier throughout the BUC-PA-CC connector and RF out connector.

The Amplifier's RF OUT connector must be connected to the antenna, please do not disconnect the antenna while the amplifier is transmitting.

If a ground connection is needed for the installation, there is a M4 screw on the front side of the amplifier which allows grounding at low impedance.

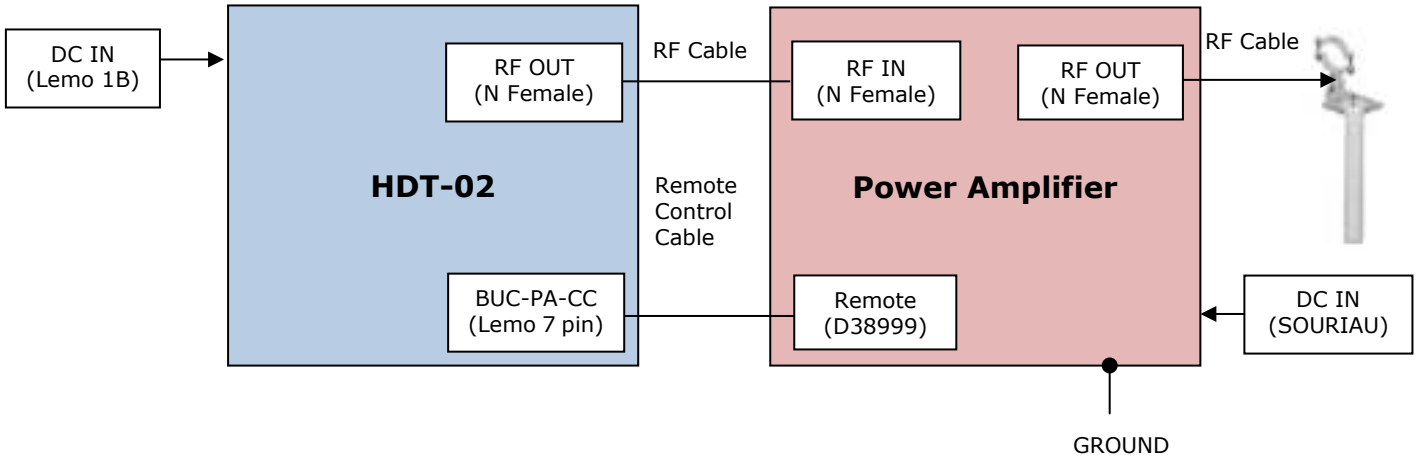



Figure A.5: Installation scheme

## A.3 Quick User Guide

The new Power Amplifiers allow the user to control automatically the power that these devices provide.

When the POWER DC LED lights in Green on the amplifier, indicates that the PA is activated from the transmitter. To activate the amplifier, the RF button on the transmitter must be ON.

If the power supply is not correct, the POWER DC LED on the amplifier blinks. The different alarms are explained in section A.3.2 Alarms.

ALARM LED shows the status of the device. If there is any alarm, the LED will indicate which alarm is present by lighting up RED in different sequences for each alarm (blinking in different time intervals). All the alarms are explained in section A.3.2. Alarms.

The equipment is fed with DC power supply from 9 to 36V. It is powered through DC power supply connector. Furthermore, for a long operating temperature range, the fans start running at 50ºC.

### A.3.1 PA Configuration

The following menu screen and figures show the different steps that must be followed when the connection between the UDT-02 transmitter and the PA amplifier is established.

First, connect the two equipment as it is shown below:

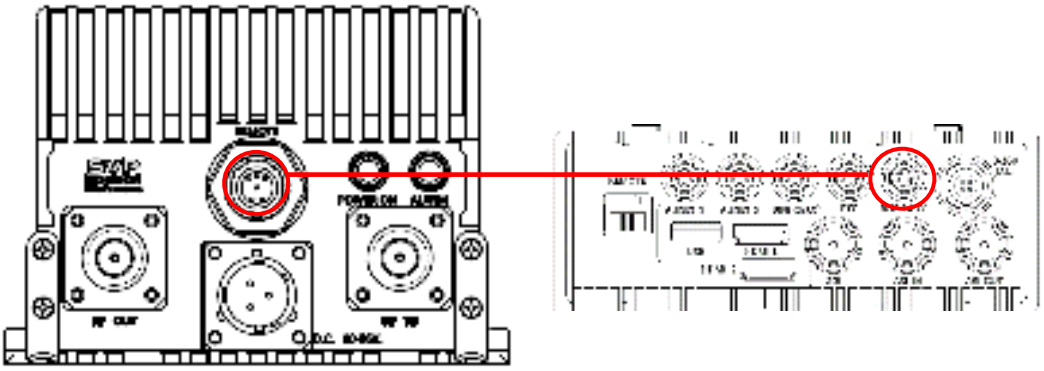


Figure A.6: Connection between the UDT-02 and the PA

The RF ON button must be pressed to allow the communication between the UDT-02 transmitter and the PA amplifier.

Once the connection is established, go to the main menu of the UDT-02 Transmitter pressing the cross button and select the RF option:

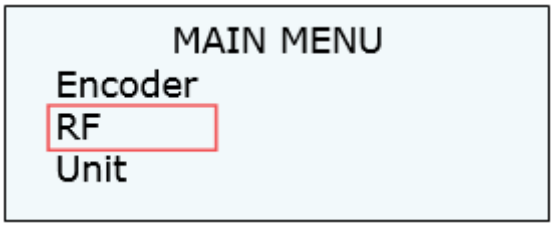



Figure A.7: Main Menu

Go to DVB-T or DVB-T2 option and press the OK button to configure the parameters related to the PA amplifier.

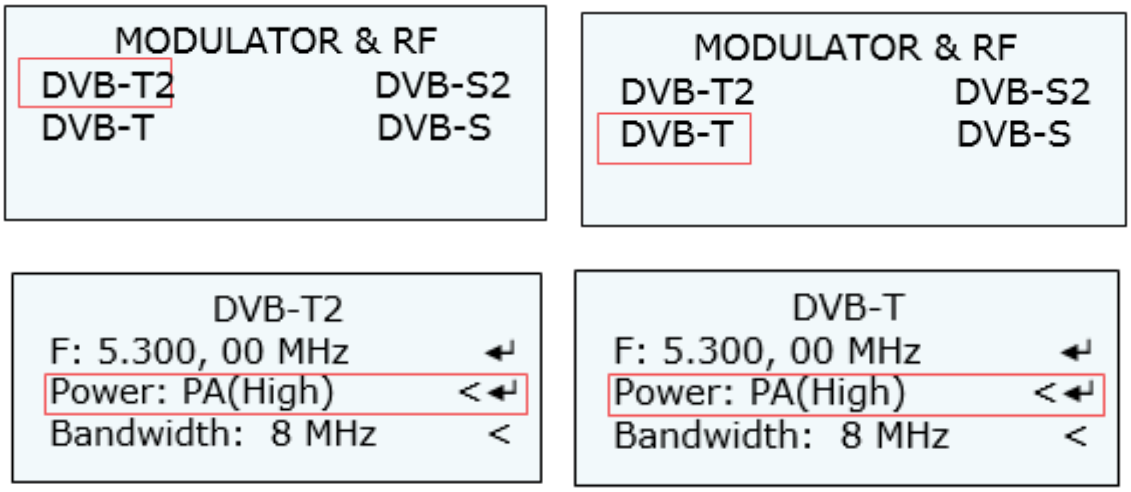



Figure A.8: DVB-T2 and DVB-T Menu

If there is communication between the UDT-02 and the PA, the "Power" parameter will be automatically configured to PA, and the other options will disappear from the menu. Then, the output power of the PA can be automatically configured by pressing Left and Right buttons.The available options are:

- Low
- Mid
- High

The output level of these parameters will depend on the amplifier's maximum output power.

Finally, return to the main screen and two new parameters will appear in the second line of the screen.

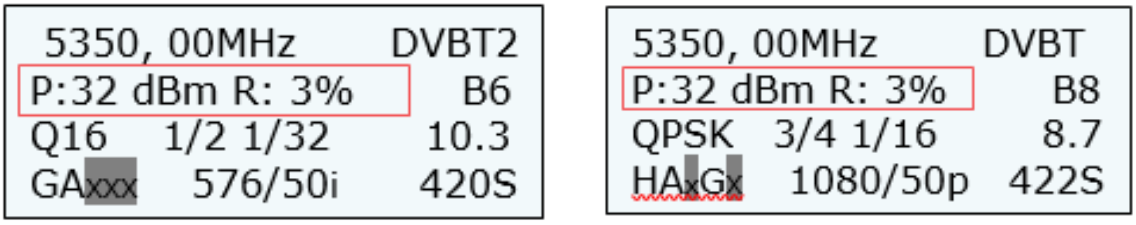



Figure A.9: DVB-T2 and DVB-T main screen

The meaning of these parameters is shown below:

- **P:** The level of the transmitted power measured in dBm.
- **R:** The reverse power percentage.

If the RF button is OFF, these parameters blink on the main screen. To transmit, press the RF button.

### A.3.2 Alarms

If there is an alarm, the alarm type is indicated by the amplifier's LEDs. The LED will blink in different time sequences to indicate which alarm is present on the device.

The different alarms related to the PA amplifier are indicated by the sequences indicated below.

On the **ALARM** LED:

- Forward Power Alarm: There is not direct power or it is very low. The alarm sequence starts with one small blink followed by one longer blink.
- Reverse Power Alarm: The reverse power is too high, please check the antenna connectors and cables. The alarm sequence starts with 2 small blinks followed by one longer blink.
- Voltage Alarm: The voltage is too high or too low, please check POWER DC LED. The alarm sequence starts with 3 small blinks followed by one longer blink.
- High Temperature Alarm: The temperature is too high. The alarm sequence starts with 4 small blinks followed by one longer blink.

On the **POWER DC** LED:

- While the LED is continuously ON in green, there is no alarm.
- If the LED blinks slowly, the input power is below the DC power supply range.
- If the LED blinks fast, the input power is above the DC power supply range.
- When the LED remains switched off for long, but sometimes blinks. It means that the amplifier has been switched off remotely by the UDT-02 or by the RTC-04 Remote Control.

Anyway, when the **POWER DC** LED is on, the amplifier is powered.

**HIGH TEMPERATURE** Protection:

The amplifier, as protection against overheating, checks the operation of the fans. In this way we protect the amplifier from breakage by overheating. The alarms for breakage of fans will behave as follows:

- If one fan stops working, High Temperature alarm is displayed on both the transmitter and the ALARM LED of the amplifier.
- If the two fans stop working, as a protection measure the amplifier will **turn off** automatically, to avoid any overheating.

# Annex B: AVF Flexible Antenna

## B.1 Description

AVF antenna, which is a linear omnidirectional flexible antenna, is suitable for the 1.3 to 7.5 GHz frequency band. It is very useful for mobile camera links and it is the most appropriate antenna for live broadcast.

The design of this antenna makes it very suitable for transmission when using a camera transmitter, because the radiating element is above the cameraman's head. Besides, its radiation pattern, a wide vertical beamwidth and an omnidirectional horizontal beamwidth, makes it possible to maintain the signal as the camera position changes. So, the use of this antenna offers an important advantage: there is no need to position the antenna and the cameraman can move freely.

This antenna has 3dBi gain and the operating frequency range is from 1.3 to 7.5 GHz. It is made of brass, stainless steel and Teflon.

The figure below shows the AVF flexible antenna:

Figure B.1: AVF flexible antenna

## B.2 Technical Specifications

| Item | Feature |
|---|---|
| Frequency range | 1.3 to 7.5 GHz (Different bands available) |
| Gain | 3 dBi |
| Polarization | Linear (Vertical) |
| Beamwidth | 76ºV and Omnidirectional H |
| Bandwidth | Depends on the frequency range |
| Connector | N male |
| Temperature | -30º a +70ºC |
| Size / Weight | 330mm x D22mm / 158 gr. (AVF-103)<br>300mm x D22mm / 158 gr. (AVF-X03)<br>400mm x D22mm / 212 gr. (AVF-X03LB) |
| Order Information | AVF-103 (1.2 to 1.55 GHz)<br>AVF-203 (2.0 to 2.7 GHz)<br>AVF-303 (3.0 to 3.7 GHz)<br>AVF-403 (4.4 to 5.9 GHz)<br>AVF-603 (6.0 to 7.5 GHz) |

Table B.1: AVF flexible antenna technical features

The figure below shows antenna adaptation:

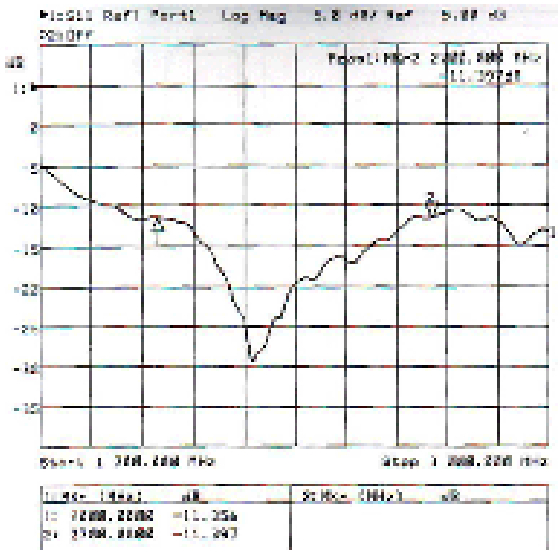


Figure B.2: S11 parameter measurement

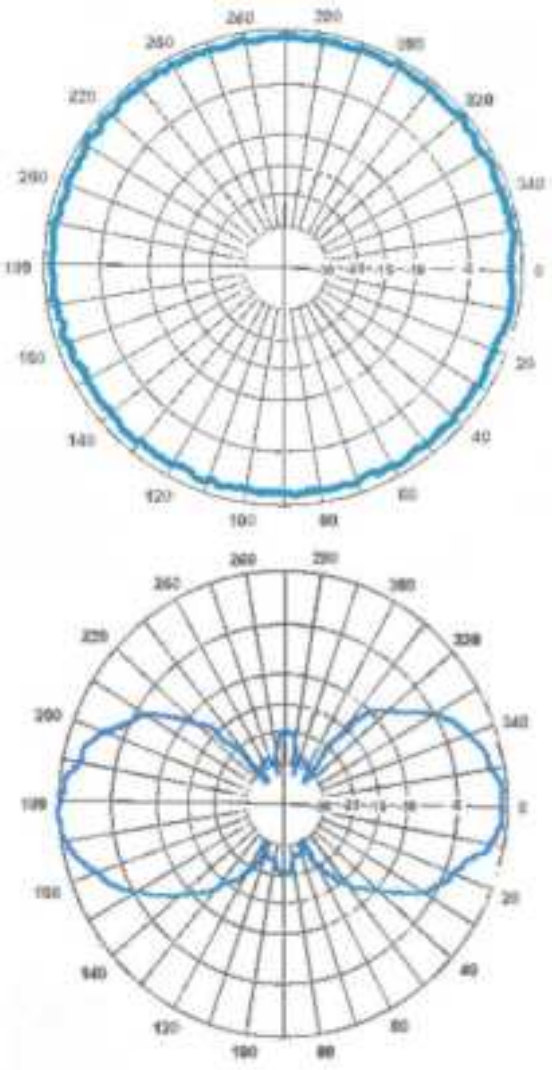


Figure B.3: Horizontal and Vertical Radiation patterns

# Annex C: Modulation Standards

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

## C.1 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.

### C.1.1 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.

## C.2 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.

### C.2.1 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.

### C.2.2 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 to eliminate the floor error of the LDPC codes.

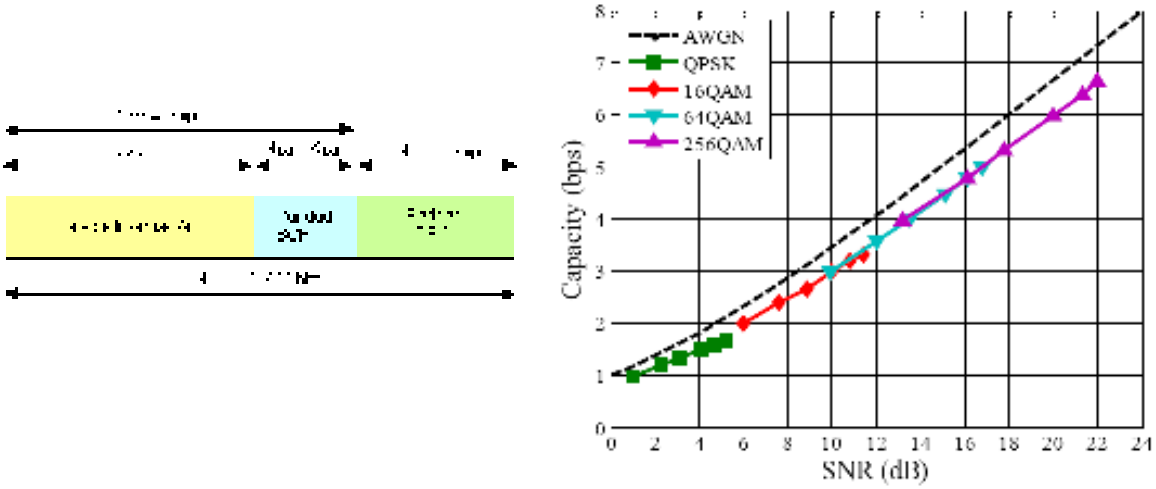



Figure C.1: LDPC and BCH codes

**Constellation Rotation**

This new feature consists of 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) it is possible to know exactly the symbol to which it belongs.

This new feature provides additional robustness for low order constellations.

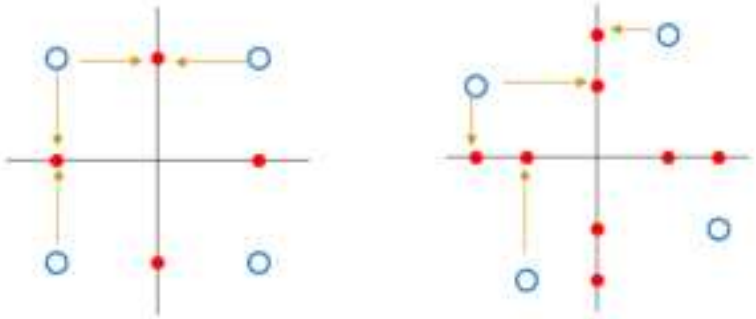


Figure C.2: Constellation Rotation

### C.2.3 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 C.1: DVB-T vs DVB-T2

# Glossary

| | |
|---|---|
| **AES/EBU** | Audio Engineering Society/European Broadcasting Union |
| **AM** | Multisectorial Antenna |
| **APSK** | Amplitude and phase-shift keying or asymmetric phase-shift keying |
| **ASI** | Asynchronous Serial Interface |
| **BNC** | Bayonet Neill-Concelman |
| **BR** | BitRate |
| **CA-BISS** | Conditional Access-BISS |
| **COFDM** | Coded Orthogonal Frequency Division Multiplexing |
| **DC** | Direct current or Down Converter |
| **DVB-T** | Digital Video Broadcasting – Terrestrial |
| **DVB-T2** | Digital Video Broadcasting – Terrestrial Second Generation |
| **ETSI** | European Telecommunications Standards Institute |
| **FEC** | Forward Error Correction |
| **FFT** | Fast Fourier transform |
| **GPS** | Global Positioning System |
| **HD** | High Definition |
| **HDMI** | High-Definition Multimedia Interface |
| **HDR** | UHDReceiver |
| **HDT** | UHDTransmitter |
| **IF** | Intermediate Frequency |
| **IG** | Interval Guard |
| **IP** | Internet Protocol |
| **IP3** | 3rd order Intermodulation Product |
| **LCD** | Liquid Crystal Display |

| | |
|---|---|
| **LD** | Low Delay |
| **LED** | Light-Emitting Diode |
| **LNA** | Low Noise Amplifier |
| **MPEG** | Moving Picture Experts Group |
| **NLOS** | No Line of Sight |
| **PAL** | Phase Alternating Line |
| **PLL** | Phase Locked Loop |
| **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 |
| **UHF** | Ultra High Frequency |
| **USB** | Universal Serial Bus |
| **VSWR** | Voltage Standing Wave Ratio |

# Notes

# Final note

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