

# HD RANGER/ +


## TV & SATELLITE ANALYSER





## SAFETY NOTES


Read the user's manual before using the equipment, mainly "**SAFETY RULES**" paragraph.

The symbol  on the equipment means "**SEE USER'S MANUAL**". In this manual may also appear as a Caution or Warning symbol.

**WARNING AND CAUTION** statements may appear in this manual to avoid injury hazard or damage to this product or other property.

## MULTIMEDIA CONTENT



Throughout this manual are boxes with the symbol . It identifies a direct access to an explanatory video related to the function where it is. User has to click on this icon to watch the video.

All videos are in the PROMAX channel on YouTube, which is accessible through the PROMAX website at: [www.promaxelectronics.com](http://www.promaxelectronics.com)

## USER'S MANUAL VERSION

Version	Date	Software Version
1.6	February 2013	6.0
















**NOTE:** This user's manual describes operation for both models, **HD RANGER** and **HD RANGER+**. Differences between them are specified by an asterisk (\*).



## SAFETY RULES

- \* **The safety could not be assured if the instructions for use are not closely followed.**
- \* Use this equipment **connected only to systems with their negative of measurement connected to ground potential.**
- \* The **AL-103** external DC charger is a **Class I** equipment, for safety reasons plug it to a supply line with the corresponding **ground terminal**.
- \* This equipment can be used in **Overvoltage Category I** installations and **Pollution Degree 2** environments.  
External DC charger can be used in **Overvoltage Category II**, installation and **Pollution Degree 1** environments.
- \* When using some of the following accessories use only the specified ones to ensure safety.:
  - Rechargeable battery
  - External DC charger
  - Car lighter charger cable
  - Power cord
- \* Observe all **specified ratings** both of supply and measurement.
- \* Remember that voltages higher than **70 V DC** or **33 V AC rms** are dangerous.
- \* Use this instrument under the **specified environmental conditions**.
- \* When using the power adaptor, the **negative of measurement** is at ground potential.
- \* **Do not obstruct the ventilation system of the instrument.**
- \* Use for the signal inputs/outputs, specially when working with high levels, appropriate low radiation cables.
- \* Follow the cleaning instructions described in the Maintenance paragraph.

\* Symbols related with safety:

	DIRECT CURRENT		ON (Supply)
	ALTERNATING CURRENT		OFF (Supply)
	DIRECT AND ALTERNATING		DOUBLE INSULATION (Class II protection)
	GROUND TERMINAL		CAUTION (Risk of electric shock)
	PROTECTIVE CONDUCTOR		CAUTION REFER TO MANUAL
	FRAME TERMINAL		FUSE
	EQUIPOTENTIALITY		EQUIPMENT OR COMPONENT TO BE RECYCLED
			

## Descriptive Examples of Over-Voltage Categories

**Cat I** Low voltage installations isolated from the mains.

**Cat II** Portable domestic installations.

**Cat III** Fixed domestic installations.

**Cat IV** Industrial installations.

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# TV & SATELLITE ANALYSER

## HD RANGER/+



## 1 INTRODUCTION

### 1.1 Description

The new **HD RANGER/+** is the sixth generation of field meters that **PROMAX** launches. As each new generation, it represents an evolution from the previous, since it integrates the latest technological innovations and develops applications for the new demands and needs that have emerged in recent years.

The new **HD RANGER/+** has been created with the aim to make easy the user experience. From its ergonomic design and stylized lines to the reduction of keys and the easy use of its interface, everything has been designed so the user has a simple tool to use but powerful and useful.

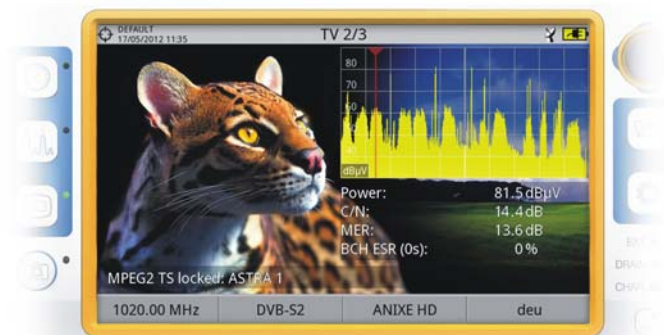


Figure 1.

The **HD RANGER/+** is a universal analyser that covers TV standards of the DVB family, as well as formats such as MPEG-2 or MPEG-4 and Dolby audio\*. There is also the possibility of an extension to work in fibre optics installations.

  
1 Digital Video Broadcasting Trademark of the DVB - Digital Video Broadcasting Project.

\* Dolby audio only available for **HD RANGER +**

Besides the basic functions of TV meter and spectrum analyser for terrestrial and satellite band, it provides additional tools, such as the detection of 4G signal interferences (some of its working frequencies are close to the TV bands), the diagrams constellations or the echoes detection.

The **HD RANGER/+** has an application to manage data generated at each installation. This feature helps the user to manage information generated so he can access it at any time or download it to a PC for further analysis.

The **HD RANGER/+** has been designed and developed entirely in the European Union. A multidisciplinary team of highly qualified professionals has dedicated effort and commitment to the development of a powerful, efficient and reliable tool. During the manufacturing process, all used materials have been subjected to a strict quality control.

In an effort to facilitate its work to professionals, our long experience ensures an after sales quality service, which includes updates and upgrades for free.



Figure 2.



[Click here to watch this video: Introducing the HD RANGER +](#)

## 2 SETTING UP

### 2.1 Package Content

Check that your package contains the following elements:

- **HD RANGER/+** Analyser.
- External DC charger.
- Mains cord for external DC charger.
- Car lighter charger.
- "F" Adapters (3 units).
  - "F" / H - BNC / H Adapter.
  - "F" / H - DIN / H Adapter.
  - "F" / H - "F" / H Adapter.
- Support belt and carrying bag.
- USB On-the-go (A) Male - Mini USB (B) Male cable.
- USB cable (A) Female - Mini USB (B) Male cable.
- 4V/RCA Jack Cable.
- Transport suitcase\*.
- Quick Start Guide.

**NOTE:** Keep the original packaging, since it is specially designed to protect the equipment. You may need it in the future to send the analyser to be calibrated.

\* Supplied only with the **HD RANGER +** model. Optional Accessory on request for **HD RANGER**.

## 2.2 Power

The **HD RANGER/+** is powered by a 7.2 V built-in rechargeable Li-Ion battery of high quality and long operation time.

This equipment can operate on battery or connected to the mains using a DC adapter. An adapter is also supplied to use with the power connector car (cigarette lighter).

### 2.2.1 First charge

The equipment comes with the battery half charged. Depending on the time elapsed from first charge and environmental conditions may have lost some of the charge. You should check the battery level. It is advisable a first full charge.

### 2.2.2 Charging the battery


Connect the DC power adapter to the equipment through the power connector on the left side panel (see figure 3).



**Figure 3.**

Then connect the DC power adapter to the mains via the mains cord. Ensure that your mains voltage is compatible with the adapter voltage.

For a **fast** charging of the battery is necessary to switch off the equipment.

If the equipment is ON, the battery charging will be slower, depending on the type of work you are doing. When connecting the equipment to the mains the mains connected symbol  appears inside the battery icon.

When the equipment is connected to the mains, the CHARGER indicator remains on. This indicator changes its colour according to the percentage of battery charge:

- RED** Less than 80% of charge.
- ORANGE** Between 80% and 90% of charge.
- GREEN** 100% full charge.

When switching on the equipment, the battery voltage is checked. If the tension is too weak to start, the LED EXT and DRAIN flashes and the equipment does not start up. In this case please charge the battery immediately.

### 2.2.3 Charge/discharge times

Average charging time with the equipment off (fast charge):

- 3 hours to achieve an 80% charge.
- 5 hours to achieve a 100% charge.

With the equipment on (slow charge):

- 5 hours to achieve an 80% charge.
- 8 hours to achieve a 100% charge.

Average discharge time (with external supply disabled):

- With the battery full charge the average battery time is 5:30 hours.
- With the battery at 80% charge the average battery time is 4 h.

### 2.2.4 Smart control battery

The built-in battery of the equipment is of the "smart" type, which means that reports its state of charge. This information is displayed inside the battery icon in the form of the average time available. In this way the user can know at any time the remaining battery level.

The remaining time charge that appears is calculated according to the work that has been doing. If you activate the external supply of the equipment, the average time would be reduced according to the increase in consumption that occurs.

### 2.2.5 Usage Tips

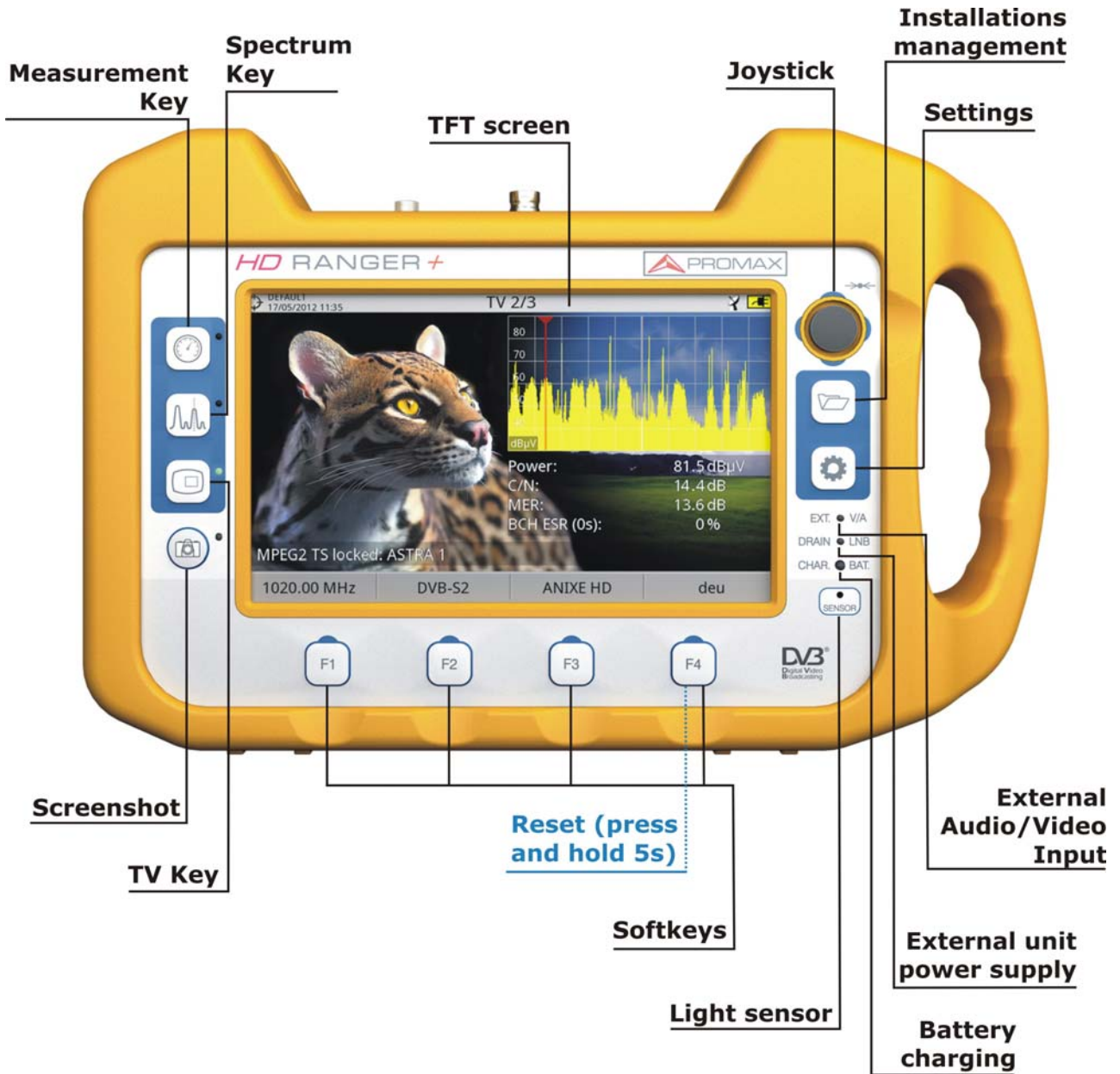
The battery is losing storage capacity as you go through its life. Contact your **PROMAX** distributor when necessary to replace the battery.

To prolong battery life the user should follow these tips:

- In case of providing a long inactivity period of the equipment it is advisable to make every 3 months a charge / discharge cycle and a subsequent partial charge (40% aprox.).
- It is advisable to keep it in a cool place and away from heat.
- You should avoid keeping the battery for a long period of time at full load or fully discharged.
- There is not necessary to wait to fully discharge before a charge because these batteries have no memory effect.

**2.3 Equipment Details**

■ **Front View**



**Figure 4.**

■ **Lateral view**

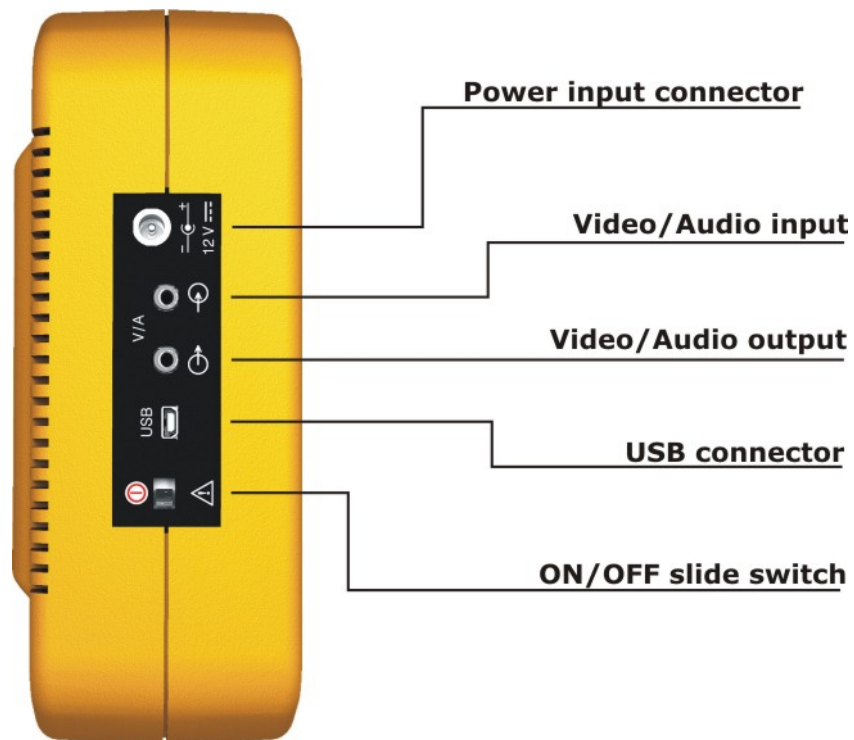


Figure 5.

■ **Top view**

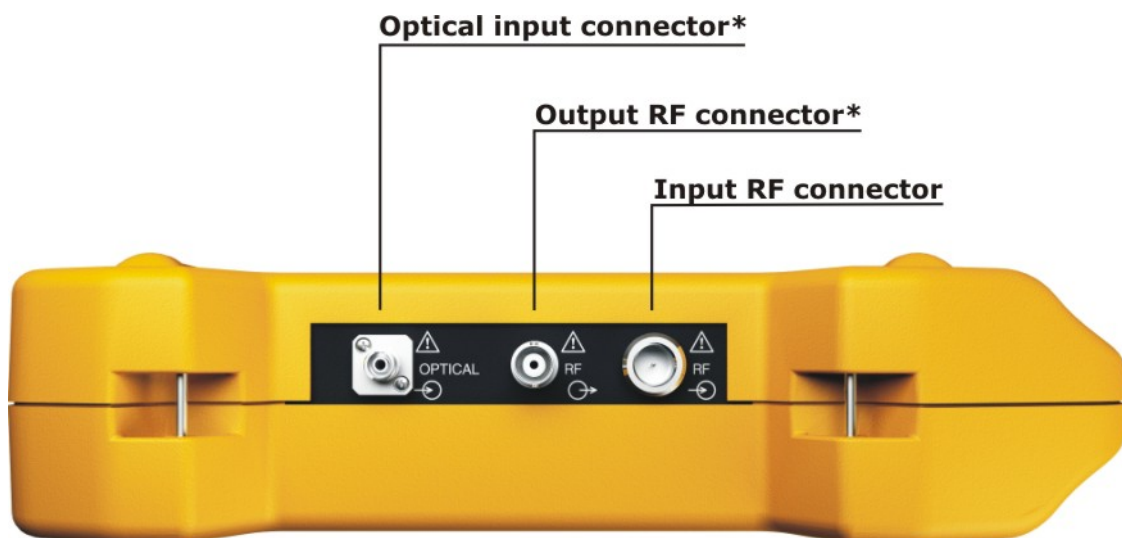


Figure 6.

\* Optical Option.

## 2.4 Switching On/Off the equipment

This analyser is designed for use as a portable equipment and it does not require any previous installation.


### ► Switching On:


- 1 Slide up for a while (approximately one second) the power slide switch located on the left side of the equipment.
- 2 When all indicators light up at once release the switch, which returns to its rest position.
- 3 The starting display picture appears and also a progress bar that indicates the system load.
- 4 After the system load, the last screen before shutdown appears.

### ► Switching Off:

- 1 Slide up for a while (approximately one second) the power slide switch located on the left side of the equipment.
- 2 When the screen goes off release the switch, which returns to its rest position.
- 3 The starting display picture appears and the progress bar showing the system shutdown progress.



















### ► Reset:

- 1 Press the  key for 5 seconds. The equipment automatically turns off. Use only in case of system crash.

In the **PREFERENCES** menu  (press 1s), APPEARANCE tab, option "Off" the user can activate the automatic shutdown option, selecting a waiting time (time without pressing any key) after which the equipment turns off automatically.

## 2.5 Screen Icons and Dialog boxes

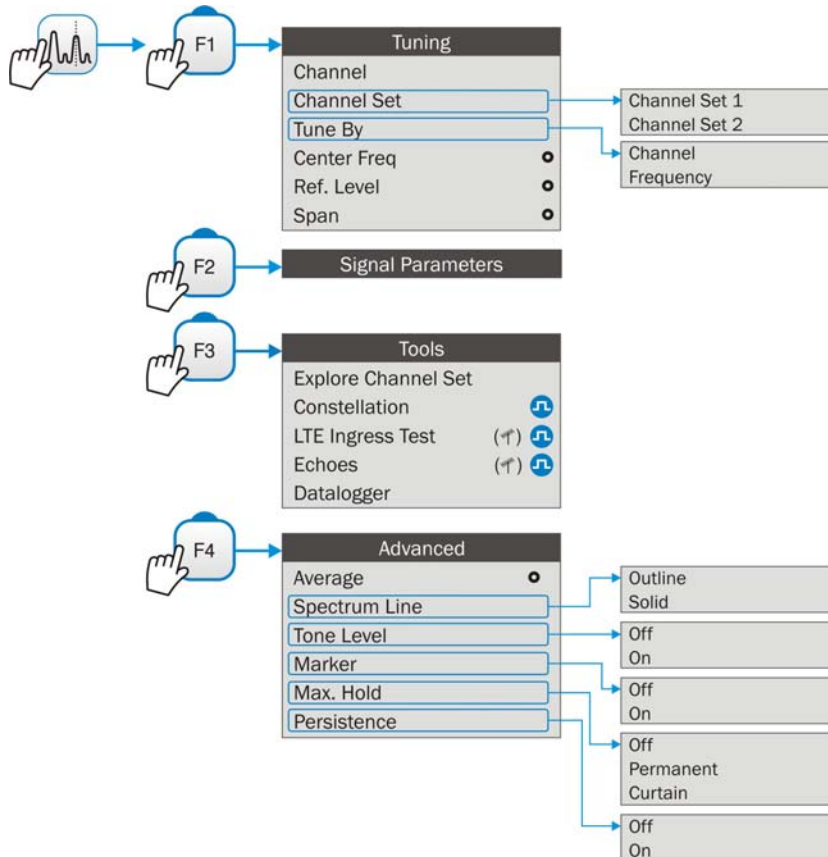
On the screen are some icons that provide useful information to the user about the current status of the instrument.

	Battery charging.		USB flash drive inserted.
	Battery not charging. Yellow level indicates charge left.		LTE filter enabled.
	Battery not charging, time left indicator.		Current installation.
	USB in serial port mode.		SATCR commands enabled.
	Satellite band.		Multi-function Joystick enabled. Two-letter code indicates the exact function:
	LNB power level.	 <b>FR</b> Frequency tuning.  <b>CH</b> Channel tuning.  <b>SP</b> Span change.  <b>MK</b> Marker moving.  <b>EC</b> Echo/zoom change.	
	Terrestrial band.		
	Compressed installation.		

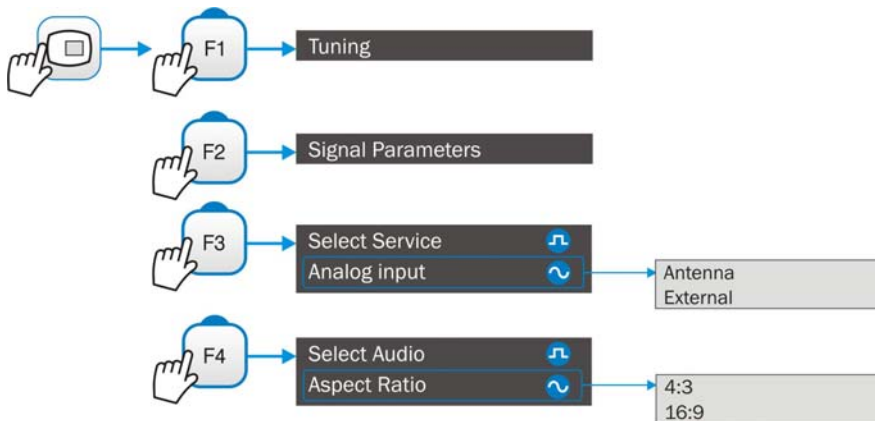
2.6 Menu Tree



SPECTRUM ANALYSER MENU



TV MENU



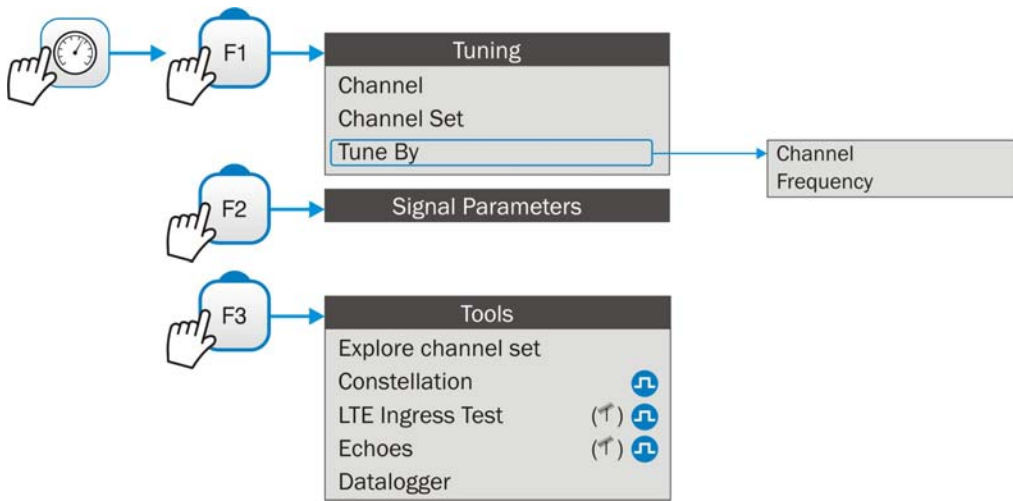
Only available for **digital channels**



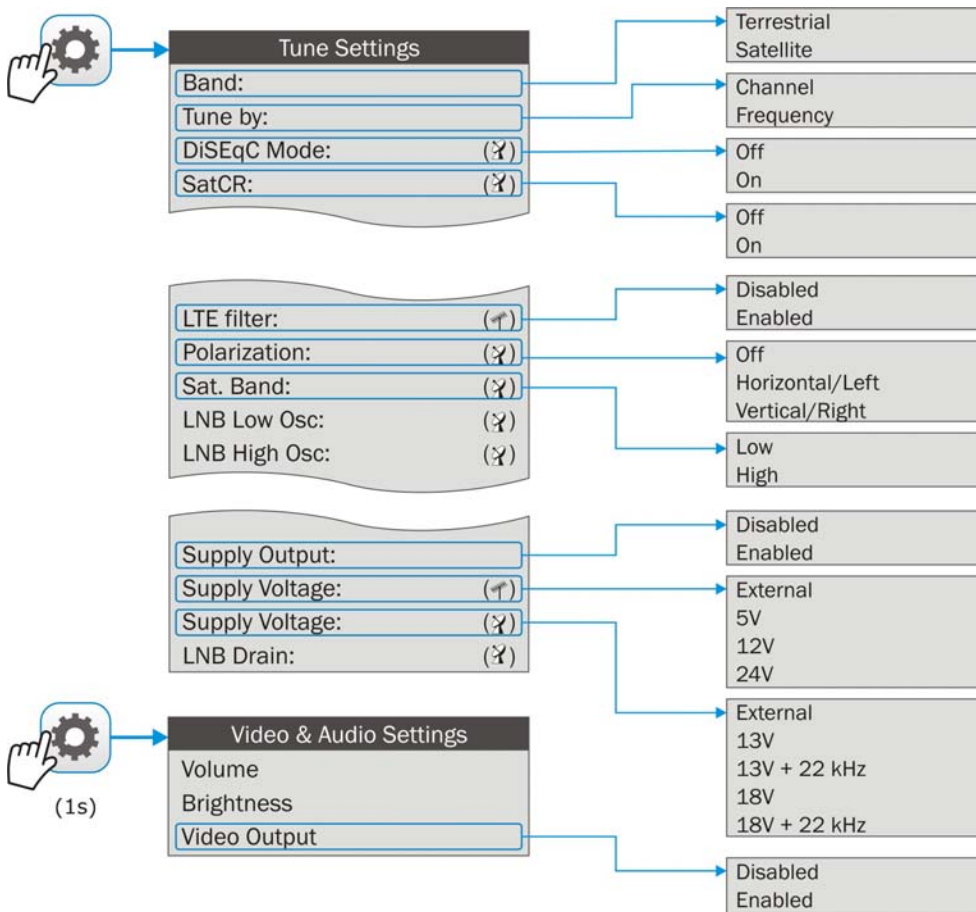
Only available for **analogue channels**



### MEASUREMENT MENU



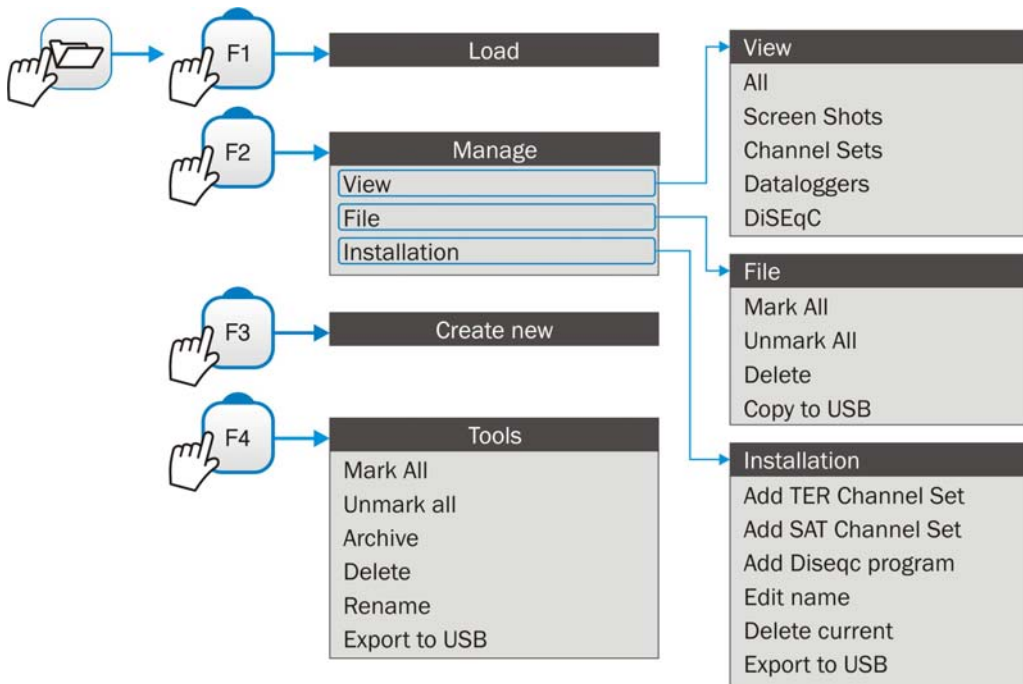
### SETTINGS MENU



Only available for **digital channels**



## INSTALLATIONS MANAGEMENT



## PREFERENCES MENU

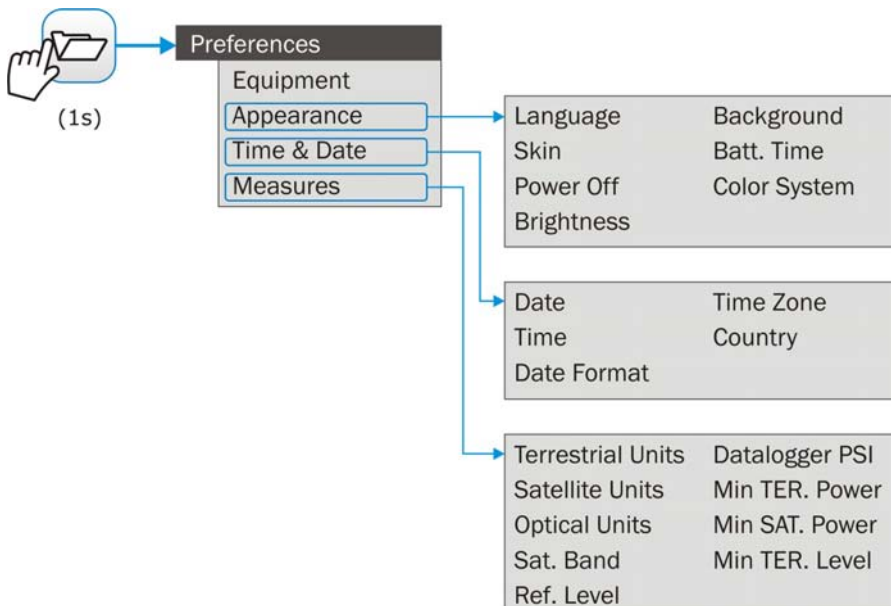


Figure 7.

## 2.7 Controls

The equipment has been designed to be an easy tool to use. For this reason the number of keys has been reduced and these are grouped by function.

For measurement and navigation through the menus, the equipment has a joystick, 4 programmable keys (softkeys) and 6 direct access keys (shortcut keys).

Next the use of each one of them is described:

### 2.7.1 Joystick

Joystick positions are five:



Figure 8.

In the **SPECTRUM ANALYSER** mode, the joystick is multifunctional, that is, each time you press its function changes. The user can see the active function according to the icon that is displayed at the upper right corner of the equipment, as shown in the image. The functions are:



**CH or FR:** Channel change (CH) or frequency (FR) change (according to the tune selected: tune by channel or tune by frequency).

**SP:** Span change.

**MK:** Marker moving (if marker is enabled).

Figure 9.

Using the ECHOES tool, the joystick is also multifunctional:

**CH or FR:** Channel (CH) change or frequency (FR) change (according to the tune selected: tune by channel or tune by frequency).

**EC:** Echo change.

According to the selected function, the joystick will do a specific action.



[Click here to watch this video: Navigating through the menus](#)

## 2.7.2 Keyboard shortcuts

### ► Function keys

On the left side there are 3 keys to access the most important functions of the equipment.



**Measurement key.**



**Spectrum Analyser key.**



**TV Mode Key.**

Pressing a key repeatedly provides access to a different view within the same function. For analogue signals only the first view of each function is available. The active function on screen is indicated by the LED next to the function key. Each view is shown at the top. When reaching the third view it returns to the first view.

Following there is an example of the views available for each function (examples extracted from a digital terrestrial signal):



Measurements



1/3

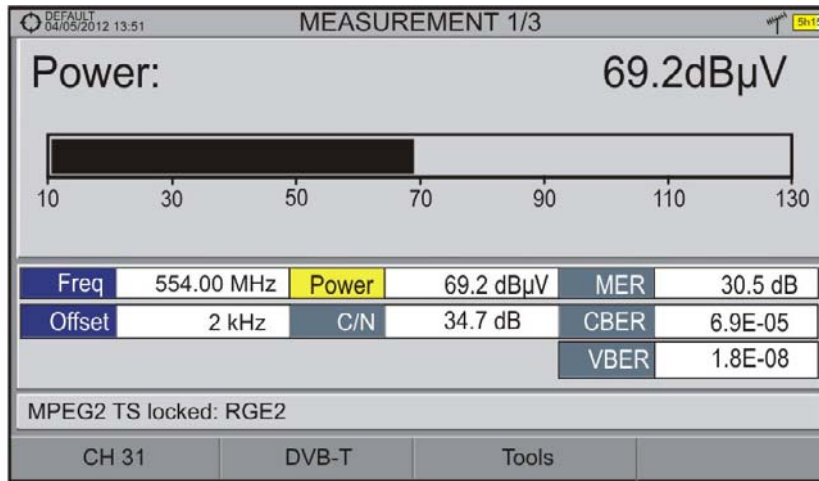


Figure 10. FULL MEASUREMENT



2/3

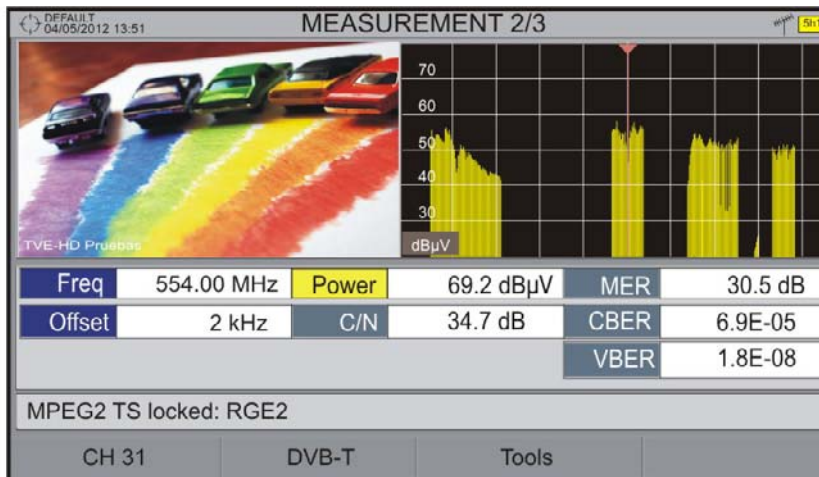


Figure 11. MEASUREMENT + TV + SPECTRUM



3/3

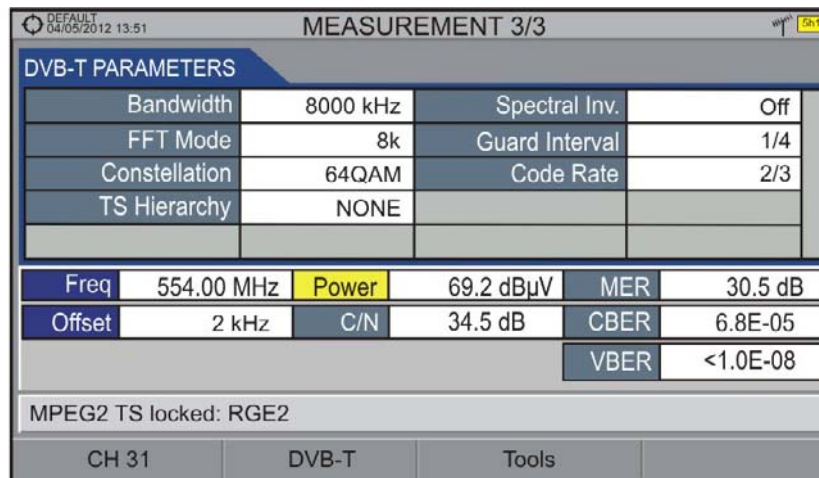


Figure 12. MEASUREMENT + PARAMETERS



Spectrum Analyser



1/3

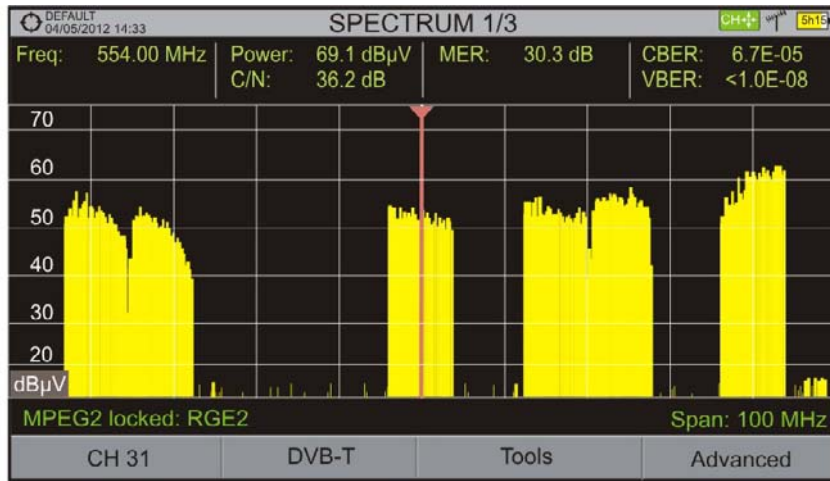


Figure 13. SPECTRUM + MEASUREMENT



2/3

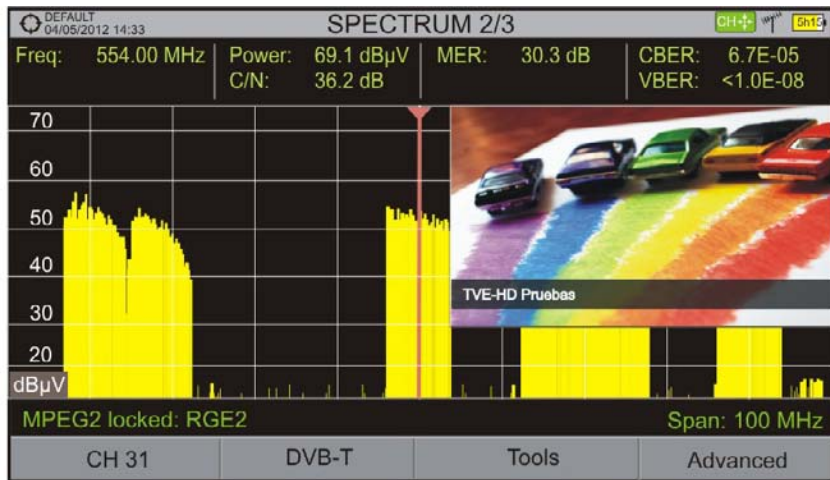


Figure 14. SPECTRUM + MEASUREMENT + TV



3/3

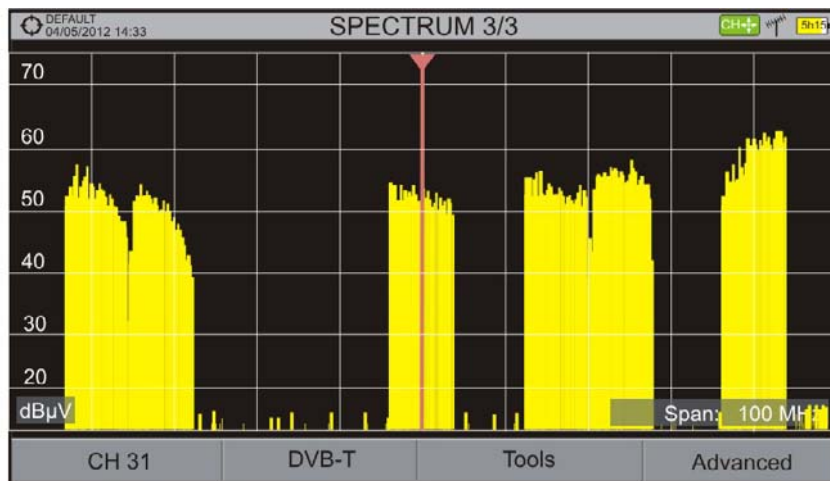


Figure 15. FULL SPECTRUM



TV Mode



1/3

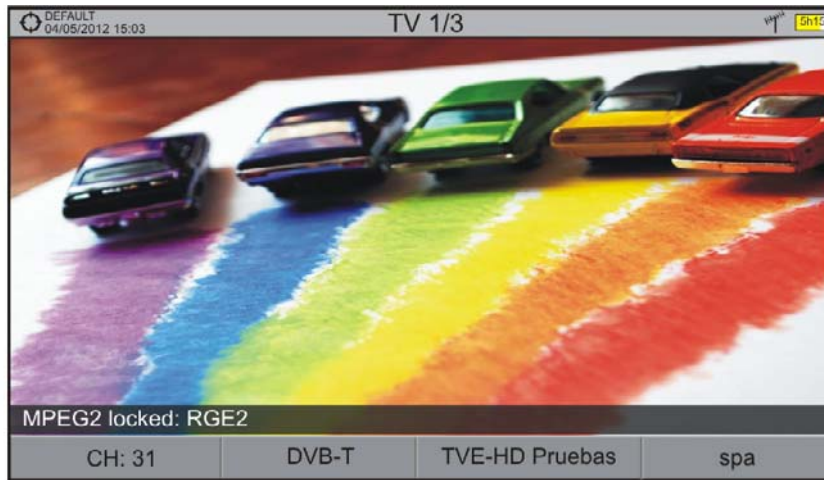


Figure 16. FULL TV



2/3

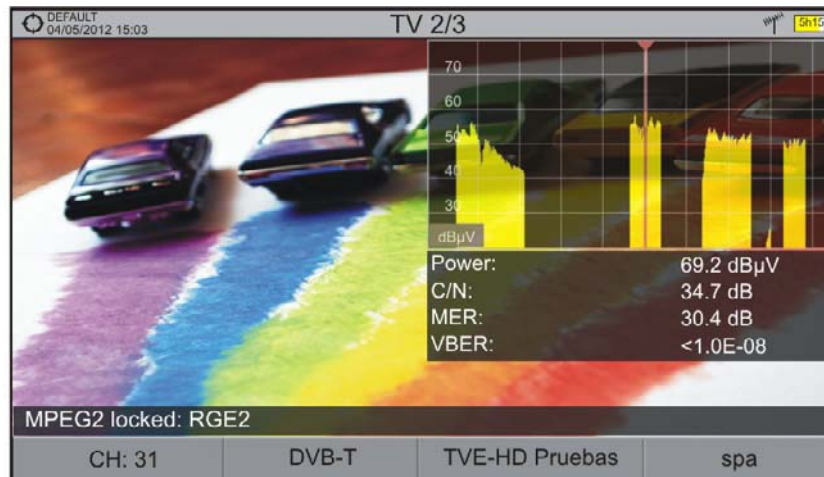


Figure 17. TV + SPECTRUM + MEASUREMENT



3/3

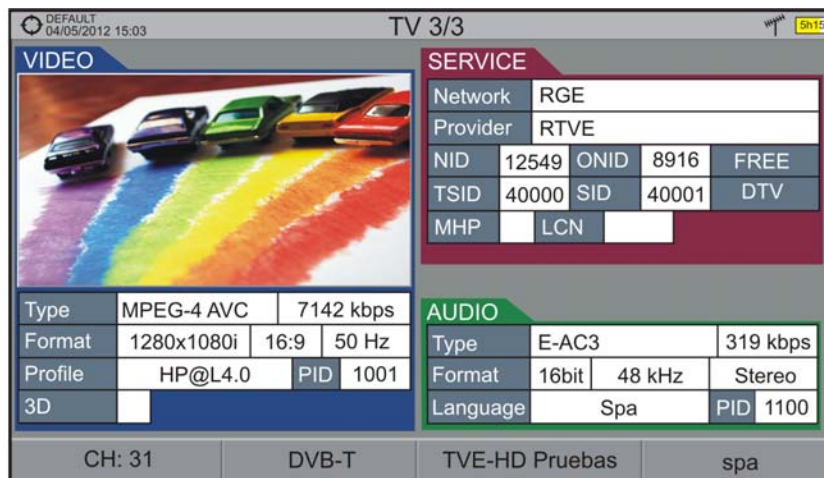


Figure 18. TV + SERVICE DATA



**Snapshot key**

This key captures the screen currently being displayed and stores it in the memory of the equipment in PNG format. This screen can be displayed on the same instrument and if desired, downloaded to a computer.

► **Management Keys**

There are two Management keys:





**Settings.** It accesses the menus to configure the equipment.



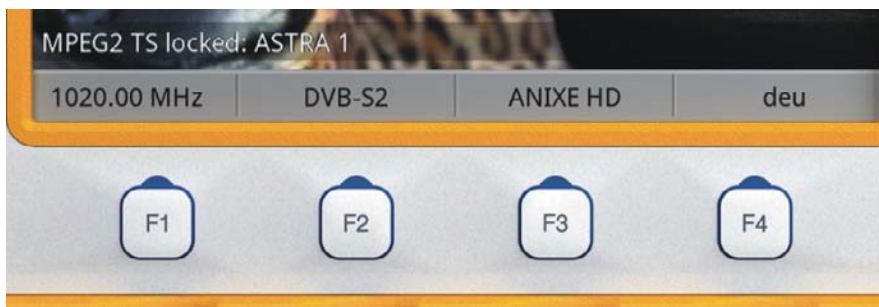
**Installations Manager.** It accesses the menus to check measurement data.

**2.7.3 Softkeys**

There are four programmable keys, also called softkeys, numbered from  to .

Each key provides access to a menu. This menu varies depending on the function the user is working on the meter.

The menu is displayed on each softkey at the bottom of the screen.



**Figure 19.**

## 2.7.4 Virtual Keyboard

When a user needs to enter or edit a file name (from an image, channel set, etc.), a screen with a virtual keyboard appears as shown at the figure.

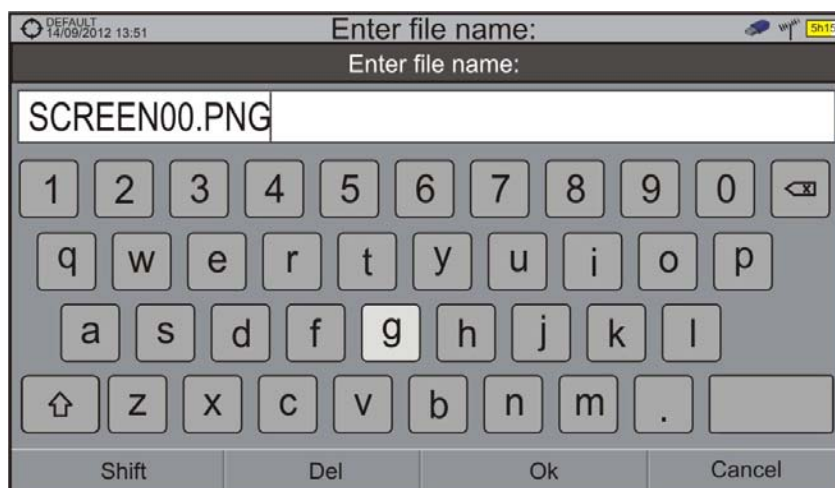


Figure 20.

To edit the file name user should follow these steps:

- 1 Using the joystick, place the cursor over the text box where the name appears.
- 2 Press the joystick to enter in edit mode.
- 3 Move the cursor to place it next to the letter that user wants to edit.
- 4 Move the joystick on the virtual keyboard to edit.

To delete a letter, move the cursor to the right side of the letter and then press the Delete key or (Del).

To enter an upper case letter press first or the key. To block upper case press or the key twice consecutively. To return to lower case press or the key again.

Keys with a point at the top right corner give access to special characters, by keeping pressed the joystick for one second on the key.

After editing press (Ok) to validate the name and continue the process or (Cancel) to cancel.



## 2.8 StealthID Function: Signal Auto-identification

The **StealthID** function of the *HD RANGER/+* is a signal identification function performed automatically by the equipment without any user intervention.

The equipment tries to identify the channel or frequency of the input signal it receives, and according to the band selected by the user, it applies identifying criteria according to the standards of that band. When the equipment recognizes in the input signal the identification parameters of a standard, it decodes the signal and shows the data of that signal on the screen.

The identification system tries to lock the first signal using the modulation defined in the channel set for that signal. If after five seconds it fails to lock with that modulation, it starts the wheel for automatic detection. If then it locks in a modulation other than indicated, it generates an internal temporary channel set to accelerate tuning the same channel later on.

Then, the user only has to follow these steps in order to identify a signal:

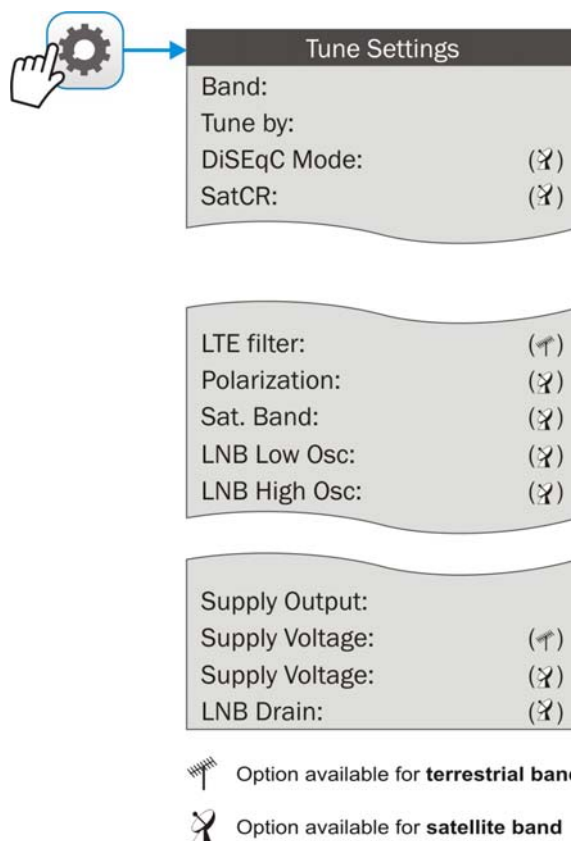
- 1 Press the Settings  key.
- 2 Select the band (terrestrial or satellite).
- 3 Select tuning (by channel or frequency).
- 4 Select a channel or frequency to identify.
- 5 The bottom of the screen shows the message "**Searching for signal**" and the standard transmission checking. Wait a few seconds for the equipment to identify the signal.
- 6 When the equipment identifies the signal a text shows the detected signal type.
- 7 Press  (Signal Parameters) to see the signal parameters.

## 2.9 Equipment Settings and Configuration

### 2.9.1 Tune Settings Menu

Press the Settings key  to access the settings menu.

Depending on the selected band, the menu may be different.



**Figure 21.**

A brief explanation of each option available on the menu:

► **Band** (available for satellite and terrestrial band)

It allows the user to select between terrestrial or satellite frequency band.



[Click here to watch this video: Switching satellite / terrestrial bands](#)

► **Tuning** (available for satellite and terrestrial band)

It allows the user to select between tuning by channel and tuning by frequency.

The channel tuning allows the cursor to jump from channel to channel when moving the joystick left or right or to jump to a specific channel of the selected channel set.

The frequency tuning allows the cursor to move along the frequency band in 50 kHz steps, or to select a specific frequency.



[Click here to watch this video: Tuning by channel or frequency](#)

► **External power supply** (available for terrestrial and satellite band)

It enables or disables the power supplied to external units such as preamplifiers for antennas in terrestrial television or LNBs and FI simulators in the case of satellite TV.

When this option is enabled the equipment applies at the output the voltage selected by the user in the Supply Voltage option (see below). When this option is disabled the equipment does not apply the voltage to the output but it will behave as if it did.

► **Supply voltages** (available for terrestrial and satellite band)

It selects the voltage to be applied to an external unit.

Available voltage options change depending on the selected band.

Voltage available for terrestrial band is: External, 5 V, 12 V and 24 V.

Voltage available for satellite band is: External, 13 V, 13 V + 22 kHz, 18 V, 18 V + 22 kHz.

In the External supply voltage option the power supplier to the external units is the power supplier of the antenna preamplifiers (terrestrial television) or the satellite TV receiver (collective or domestic).

► **LNB Drain** (available for terrestrial and satellite band)

The LNB drain option shows the voltage and current flowing to the external unit. If there is any problems (e.g. short circuit), an error message appears on the screen ('SHORTCIRCUIT'), a warning beep sounds and the equipment will not supply power. The equipment does not return to its normal operating state until the problem is solved. During this time the equipment checks every three seconds if there still the problem, warning with an audible signal.

The DRAIN LNB light indicator is lit if current is flowing to the external unit.

► **LTE Filter** (only available for terrestrial band)

It enables or disables the LTE filter (see [6.2](#) section: LTE Interference Test). When the LTE filter is enabled an icon will appear at the top right of the screen.

► **DiSEqC Mode** (only available for satellite band)

It enables or disables DiSEqC mode. DiSEqC (Digital Satellite Equipment Control) is a communication protocol between the satellite receiver and accessories of the satellite system (see section 7.4).

► **SatCR** (only available for satellite band)

It enables or disables the SatCR function (Satellite Channel Router) to control devices of a satellite TV installation that supports this technology (see section 7.4).

► **Polarization** (only available for satellite band)

It allows the user to select the signal polarization between Vertical/Right (vertical and circular clockwise) and Horizontal/Left (horizontal and circular anti-clockwise), or disable it (OFF). In tuning mode the Polarization option can not be changed.

► **Sat Band** (only available for satellite band)

It allows the user to select the High or Low band frequency for satellite channel tuning. In channel tuning mode the Band Sat can not be changed.


► **LNB Low Osc.** (only available for satellite band)

It defines the local oscillator frequency for the LNB low band.

► **LNB High Osc.** (only available for satellite band)

It defines the local oscillator frequency for the LNB high band (up to 25 GHz).

## 2.9.2 Video & Audio settings

Press the Settings key  for one second to access the Video & Audio settings menu.

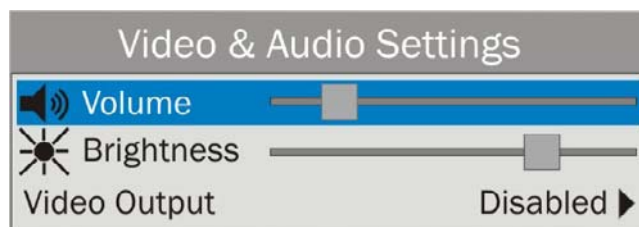


Figure 22.

A brief explanation of each option available on the menu:

► **Volume**

It increases or decreases the volume of the speaker audio output by moving the joystick to the right (+ volume) or left (- volume).


► **Brightness**

It increases or decreases the screen brightness by moving the joystick to the right (+ brightness) or left (- brightness).

► **Video Output**

It enables or disables the video output through the audio/video connector (see section 7.2 Connection of video/audio analogue output through the output V/A connector).

**2.9.3 Preferences Menu**

You access the Preferences menu by pressing the Installations Management key  for one second. The options are grouped as follows:

- **Equipment:** Equipment information (only read).
- **Appearance:** Equipment customization options.
- **Date & Time:** It allows the user to change date and time zone.
- **Measures:** It allows the user to choose between several units of measure among other parameters.

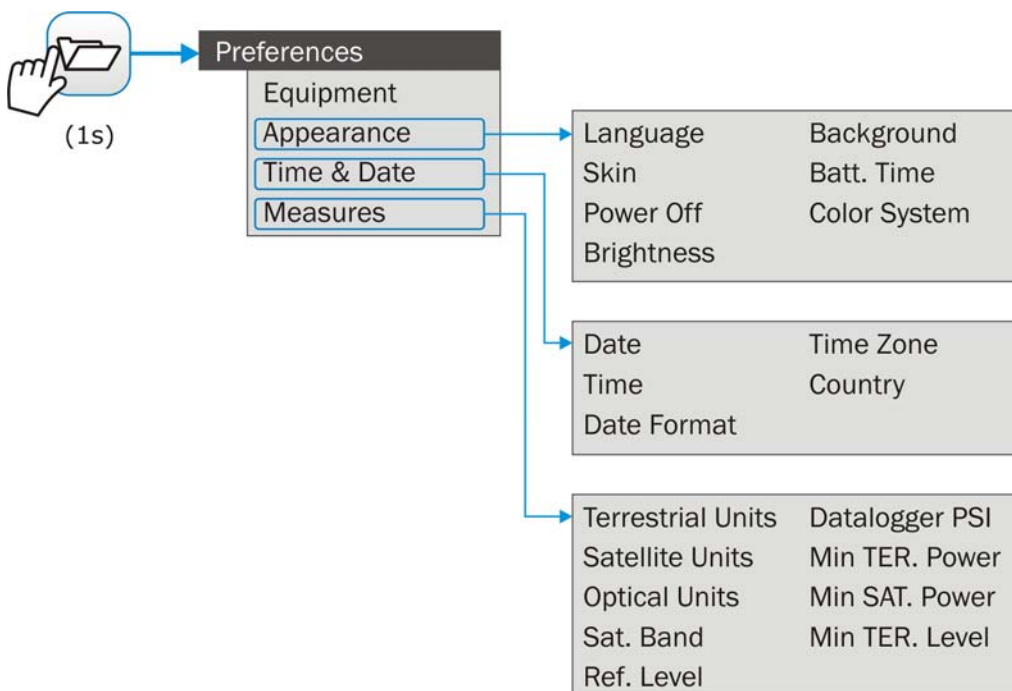


Figure 23.

A brief explanation of each option available on the menu:

► **Equipment options:**

- **Provider:** Provider's name.
- **Name:** Equipment's name.
- **Serial number:** Unique identification number for this equipment.
- **Release:** Version and date of the software installed on the equipment.
- **Flash:** Size of the flash memory installed on the equipment.
- **Free:** Free size of the flash memory installed on the equipment.

► **Appearance Options:**

- **Language:** Language used on menus, messages and screens. Available languages are: Spanish, Catalan, English, German, French, Czech, Italian, Norwegian, Polish, Russian and Slovak.
- **Skin:** Colours used on the screen. Available skin is grey.
- **Power Off:** It allows the user to select the time to power off, which is the time after which the equipment shuts down automatically unless user press any key.
- **Brightness:** In the current version only allows adjusting the brightness manually.
- **Background:** It allows the user to select the background colour on the display screen. Options available are: white, green, red, black and blue.
- **Battery Time:** It hides or shows the remaining battery time. Remaining battery time is displayed on the inside of the battery level icon.
- **Colour System:** The coding system used in analogue transmissions. Available options are: PAL 50 Hz, PAL 60 Hz, NTSC and SECAM.

► **Date Options:**

- **Date:** It allows the user to edit the date.
- **Time:** It allows the user to edit the time.
- **Date Format:** It allows the user to change the date format, which is the order in which is shown day (DD), month (MM) and year (YY).
- **Time Zone:** It allows the user to select the time zone where he is.
- **Country:** It allows the user to select the country where the equipment is. Then the parameters according to selected country are load.


► **Measures option:**

- **Terrestrial Units:** It allows the user to select the terrestrial measurement units for the signal level. Available options are: dBm, dBmV and dB $\mu$ V.
- **Satellite Units:** It allows the user to select the satellite measurement units for the signal level. Available options are: dBm, dBmV and dB $\mu$ V.
- **Optical Units:** It allows the user to select the optical measurement units for the signal level. Available options are: dBm, dBmV and dB $\mu$ V.
- **Satellite Band:** It allows the user to select the type of satellite band used.
- **Reference Level:** It allows the user to select the type of reference level adjustment between manual (modified by the user) or automatic (selected by the equipment).
- **Datalogger PSI:** If you select the option "Capture", when datalogger is working it captures the service list of each channel. This process slows the datalogger, but provides additional information that can be downloaded in XML files. To disable this option select "Don't capture".

- **Min. TER. Power:** It sets the minimum power for a terrestrial digital signal to be identified.
  
- **Min. SAT. Power:** It sets the minimum power for a satellite digital signal to be identified.
  
- **Min. TER. Level:** It sets the minimum level for a terrestrial analogue signal to be identified.

## 3 MEASUREMENT MODE

### 3.1 Introduction

On the panel left side, the equipment has three functions keys, which give direct access to the three most important functions. One of them is the key **MEASUREMENT** () that measures the signal received through the RF input connector.

The user should connect a signal to the input and select the band, whether terrestrial or satellite. Then the auto-identification function (also known as StealthID) locks the signal and demodulates it in real time, automatically detecting its characteristic parameters.

Having identified the signal, the equipment measures according to the signal type. All information about transponders or multiplex is automatically displayed without introducing any additional parameter identification.

Next there is a list of signals that the equipment can automatically detect. For more information about characteristics of each signal type refer to Annex 1: Signals description.

- Digital Terrestrial Television First Generation (DVB-T)
- Digital Terrestrial Television Second Generation (DVB-T2<sup>\*</sup>)
- Digital Satellite Television First Generation (DVB-S)
- Digital Satellite Television Second Generation (DVB-S2)
- Digital Cable Television First Generation (DVB-C)
- Digital Cable Television Second Generation (DVB-C2<sup>\*</sup>)
- Generic <sup>2</sup>
- Analogue terrestrial TV
- Analogue Cable TV
- Analogue Satellite TV
- Analogue Terrestrial FM

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\* Only available for **HD RANGER +**

<sup>2</sup> Special digital signal. The equipment does not demodulate it but measures its power and C/N ratio. It can be used for special signals as DAB/DAB + or COFDM modulation with narrow BW.

## 3.2 Operation

- 1 Connect the **RF** input signal to the equipment.
- 2 Select through the Tune Settings menu the frequency band (terrestrial or satellite).
- 3 Access the **MEASUREMENT** option by pressing the key.
- 4 Press again to display the next view.

Views for digital signals are:



### MEASUREMENT 1/3: FULL MEASUREMENT

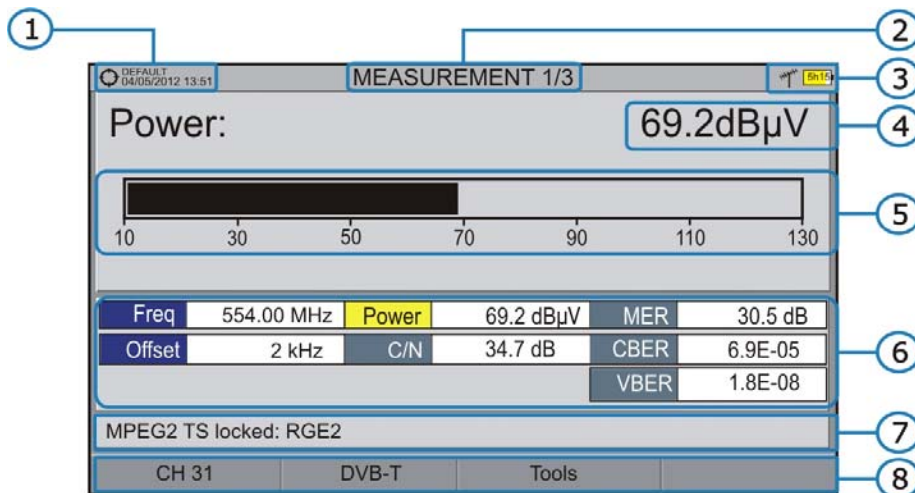


Figure 24.

- 1 Selected installation, date and time.
- 2 Number of view/total views.
- 3 Selected band, battery level.
- 4 Measurement value of the selected parameter.
- 5 Graphical measurement of the selected parameter.
- 6 Measurement values for the type of locked signal.
- 7 Signal status (searching/locked/multiplex name).
- 8 Softkeys menus.

► **Joystick up/down:** It changes selected parameter.



MEASUREMENT 2/3: MEASUREMENT + TV + SPECTRUM

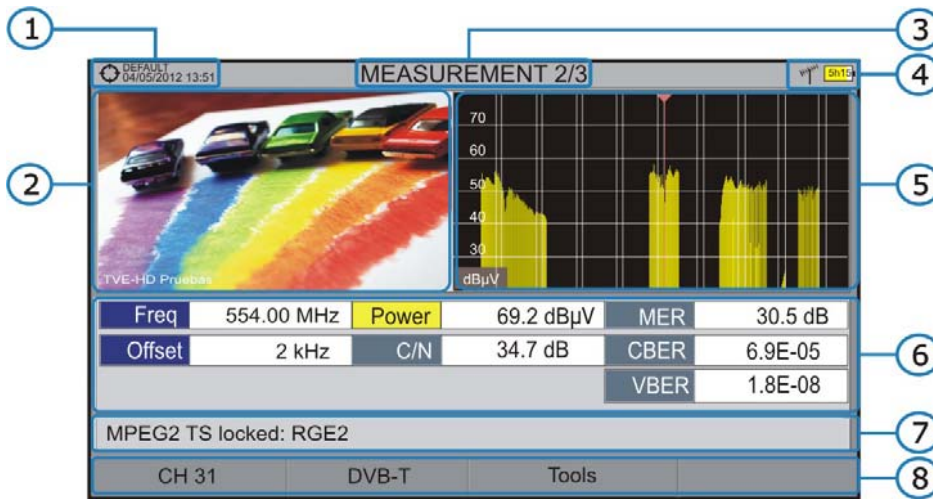


Figure 25.

- 1 Selected installation, date and time.
- 2 Image of the locked signal.
- 3 Number of view/total views.
- 4 Selected band, battery level.
- 5 Spectrum of the locked signal.
- 6 Measurement values for the type of locked signal.
- 7 Signal status (searching/locked/multiplex name).
- 8 Softkeys menus.

► **Joystick right/left:** It changes the selected channel/frequency.


**MEASUREMENT 3/3: MEASUREMENT + PARAMETERS**

MEASUREMENTS 3/3			
DVB-T PARAMETERS			
Bandwidth	8000 kHz	Spectral Inv.	Off
FFT Mode	8k	Guard Interval	1/4
Constellation	64QAM	Code Rate	2/3
TS Hierarchy	NONE		
Freq	554.00 MHz	Power	69.2 dB $\mu$ V
Offset	2 kHz	MER	30.5 dB
		C/N	34.5 dB
		CBER	6.8E-05
		VBER	<1.0E-08
MPEG2 TS locked: RGE2			
CH 31	DVB-T	Tools	

**Figure 26.**


- 1 Selected installation, date and time.
- 2 Number of view/total views.
- 3 Selected band, battery level.
- 4 Demodulation parameters of the locked signal.
- 5 Measurement values for the type of locked signal.
- 6 Signal status (searching/locked/multiplex name).
- 7 Softkeys menus.

► **Joystick right/left:** It changes the selected channel/frequency.

"Signals description" annex describes in detail the measurement parameters for each type of signal.

## 4 SPECTRUM ANALYSER MODE




### 4.1 Introduction

On the left side, the equipment has three function keys, which give direct access to the three most important functions. One of them is the **SPECTRUM ANALYSER** key  that displays the signal spectrum received through the RF input connector.

The Spectrum Analyser mode allows checking the signals on the frequency band, to visually identify any anomalies and to measure the signal and display the image tuned.

Thanks to the auto-identification or StealthID function, the system is constantly identifying the signal it receives. When it detects the signal type, it locks it and displays the information on screen.

### 4.2 Mode of operation

- 1 Connect the **RF** input signal to the equipment.
- 2 Select through the **Tune Settings** menu  the frequency band (terrestrial or satellite).
- 3 Access the **SPECTRUM ANALYSER** option by pressing the  key.
- 4 Press again  to display the next view.

Available views are:



### SPECTRUM 1/3: SPECTRUM + MEASUREMENT

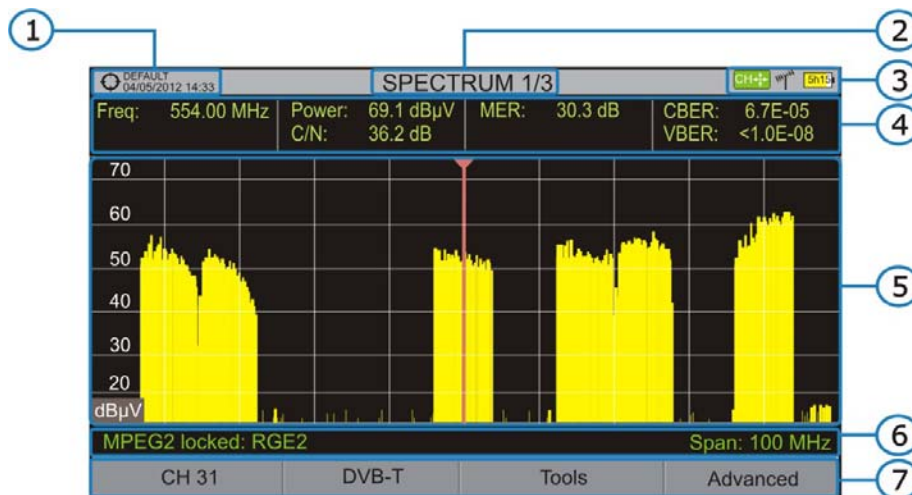


Figure 27.

- ① Selected installation, date and time.
- ② Number of view/total views.
- ③ Joystick active mode, selected band, battery level.
- ④ Measured values of the signal at the frequency/channel where is pointing the cursor.
- ⑤ Spectrum in the band with the selected span.
- ⑥ Signal status (searching/locked multiplex name/selected span).
- ⑦ Softkeys menus.

► **Joystick up/down:** It changes the reference level.

► **Joystick left/right** (depending on the joystick active mode):

**SP:** SPAN change.

**FR or CH:** Frequency change or channel change.

**MK:** Marker change.



SPECTRUM 2/3: SPECTRUM + MEASUREMENT + TV 

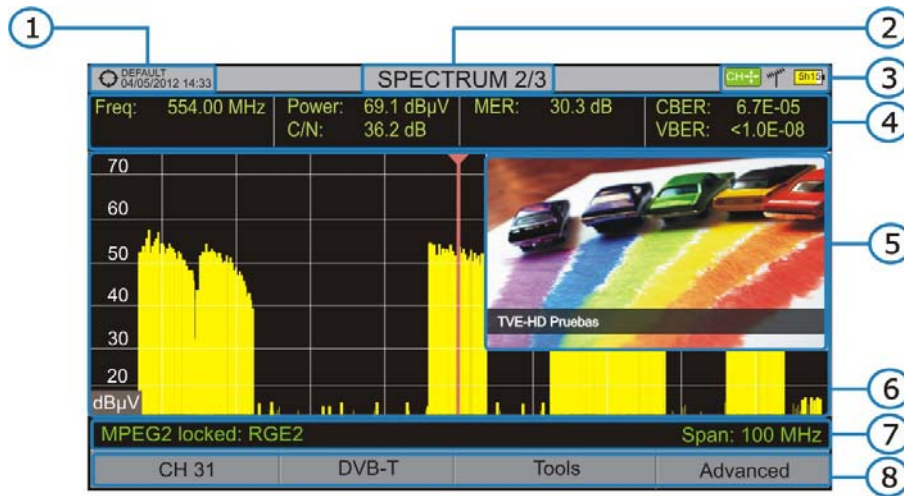


Figure 28.

- ① Selected installation, date and time.
- ② Number of view/total views.
- ③ Joystick active mode, selected band, battery level.
- ④ Measured values of the signal at the frequency/channel where is pointing the cursor.
- ⑤ Image of the tuned signal.
- ⑥ Spectrum in the band with the selected span.
- ⑦ Signal status (searching/locked/multiplex name/selected span).
- ⑧ Softkeys menus.


► **Joystick up/down:** It changes the reference level.

► **Joystick left/right** (depending on the joystick active mode):

**SP:** SPAN change.

**FR or CH:** Frequency change or channel change.

**MK:** Marker change.

\*  Only available for **digital channels**.



SPECTRUM 3/3: FULL SPECTRUM \*

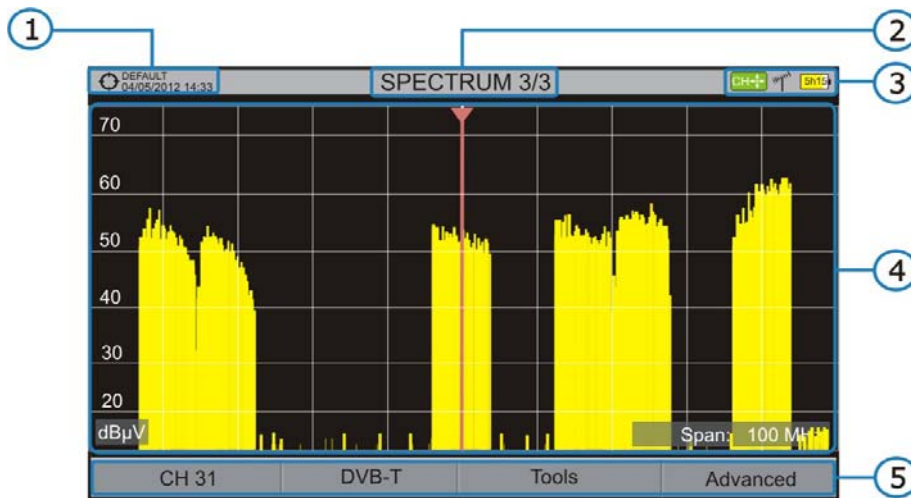



Figure 29.

- 1 Selected installation, date and time.
- 2 Number of view/total views.
- 3 Joystick active mode, selected band, battery level.
- 4 Spectrum in the band with the selected span.
- 5 Softkeys menus.

\*  Only available for **digital channels**.

4.3 Description in detail of the FULL SPECTRUM screen

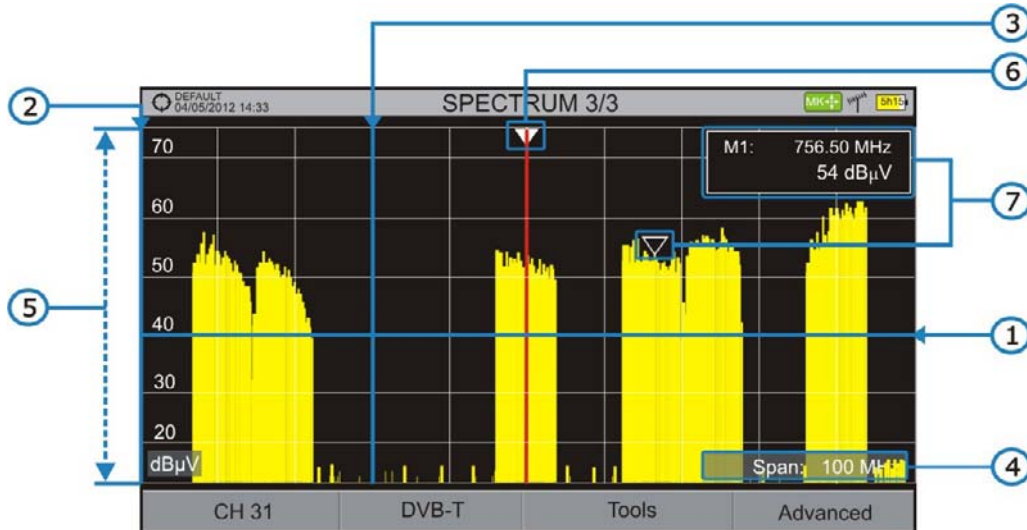


Figure 30.

1 **Horizontal reference line**

It indicates the signal level.

2 **Vertical axis**

It indicates the signal level.

3 **Vertical reference line**

It indicates the frequency.

4 **SPAN**

It is the frequency range displayed on the horizontal axis.

The current span value appears at the bottom right of the screen. To change use the joystick (left, right) in span mode (SP) or change it by the "span" Tuning menu (F1 key).

Span values available are: Full (full band), 500 MHz, 200 MHz, 100 MHz, 50 MHz, 20 MHz and 10 MHz.

5 **Reference Level**

It is the power range represented on the vertical axis.

To change use the joystick (up, down; 5 dB steps).

This equipment has an option to activate the automatic adjustment of the reference level, so it detects the optimal reference level for each situation. This option can be enabled or disabled through the **PREFERENCES** menu and **Measures** tab.

**6 Cursor**

Red vertical line that indicates position during the channel or frequency tuning.

To change frequency/channel use the joystick (left, right) in FR mode (tuning by frequency) or CH mode (tuning by channel).

**7 Marker**

It is a special cursor that can be placed on a given frequency to check the power in this point.

To change use the joystick (left, right) in MARKER (MK) mode.

This option can be enabled using the "MARKER" option from the Advanced menu (F4 key).

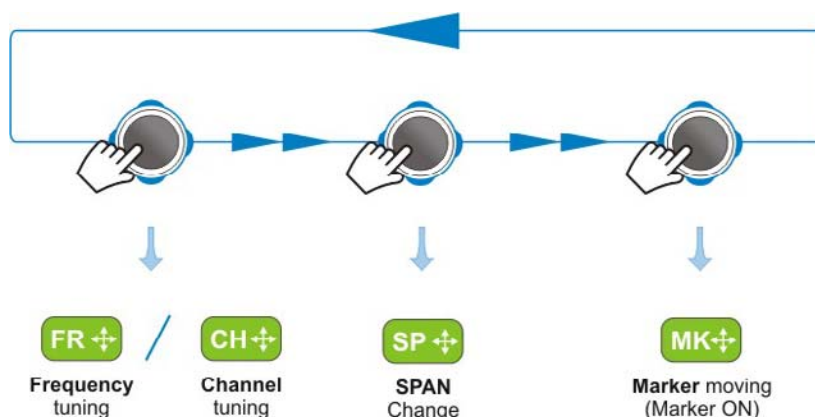
**4.4 Joystick Operation in SPECTRUM ANALYSER mode**

In the **SPECTRUM ANALYSER** mode, the joystick can make different actions depending on its active mode.

The active mode of the joystick appears as an icon at the top right of the screen. Available modes are:

- ▶ **Frequency tuning.**
- ▶ **Channel tuning.**
- ▶ **SPAN change.**
- ▶ **MARKER moving.**

To change the active mode press the joystick.



**Figure 31.**

Pressing left or right will take appropriate action according to the active mode.

Pressing up or down will change the reference level regardless the active mode.

The frequency or channel tuning mode will appear depending on the selected tuning type. Access the ADJUST menu to select the type of tuning.

To show the **MARKER** mode, it must be active.

Access the **ADVANCED** menu to activate the **MARKER**.

Pressing the joystick for 1 second, a box appears explaining the joystick modes available. From here user can also select the active mode.

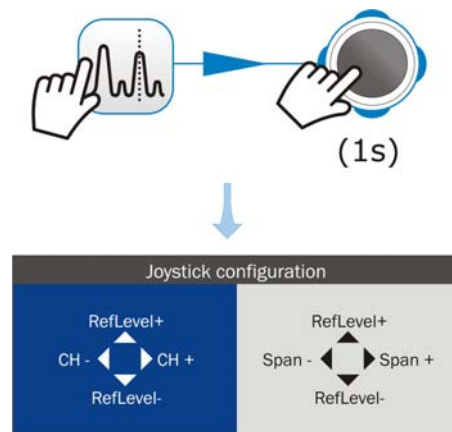


Figure 32.

#### 4.5 Menu options for the SPECTRUM ANALYSER

At the bottom of the screen four menus are accessible via the function keys.



- It displays the channel where is pointing the cursor and gives access to the tuning menu.
- It displays the selected transmission standard and gives access to the signal parameters menu.
- It displays the Tools menu.
- It displays the Advanced menu.

Next each one of these menus is described.

#### 4.5.1 F1: Tuning

Access by the function  key. It contains the options to tune a channel.

The tuning menu consists of the following options:


- ▶ **Channel/Frequency:** It displays the channel/frequency pointed by the cursor. Tuning type (channel/frequency) is selected by means of the "**Tune settings**" menu .
  - In case of tuning by channel, it allows selecting a channel from the active channel set:
    - 1 Place over the **Channel** option and press the joystick.
    - 2 A box appears with all channels of the active channel set and its frequency.
    - 3 Move the joystick on the box to select a channel.
    - 4 When finished press joystick to save the selected value or any function key to exit without saving.
    - 5 The cursor will place on the selected channel and it will appear on the  option.
  - The channel can be changed directly with the joystick in CH mode.
  - In case of **tuning by frequency**, the frequency can be edited:
    - 1 Place over the **Frequency** option and press the joystick.
    - 2 The option is highlighted in yellow to indicate it is in edit mode.
    - 3 Move the joystick left/right to move between the figures and up/down to change the figure.
    - 4 When finished press joystick to save the selected value or any function key to exit without saving.
  - The frequency can be changed directly with the joystick in **FR** mode.



[Click here to watch this video: Manual input of frequencies](#)

- ▶ **Central Frequency:** It displays the value of the central frequency on the screen. To edit:
  - 1 Place over the **Frequency option** and press the joystick.
  - 2 The option is highlighted in yellow to indicate it is in edit mode.
  - 3 Move the joystick left/right to move between the figures and up/down to change the figure.
  - 4 When finished press joystick to save the selected value or any function key to exit without saving.
  
- ▶ **Reference level:** It displays the reference level. To edit:
  - 1 Place over the **Reference Level** option and press joystick.
  - 2 The option is highlighted in yellow to indicate it is in edit mode.
  - 3 Move the joystick left/right to move between the figures and up/down to change the figure.
  - 4 When finished press joystick to save the selected value or any function key to exit without saving.
  - The **Reference Level** can be changed directly with the joystick up or down.
  
- ▶ **Span:** It shows the span, which is the frequency range displayed on screen. To edit:
  - 1 Place over the span option and press the joystick.
  - 2 The option is highlighted in yellow to indicate it is in edit mode.
  - 3 Move the joystick left/right to move between the figures and up/down to change the figure.
  - 4 When finished press joystick to save the selected value or any function key to exit without saving.
  - The span can be changed directly with the joystick in **SP** mode.

#### 4.5.2 F2: Signal Parameters

Access by the  function key. It allows selecting the standard transmission and displays the parameters for signal transmission.

This menu allows selecting the transmission standard:

► **Type of signal:** It displays the selected standard. It allows selecting another standard in the same band (terrestrial or satellite):

- 1 Place over the **Signal Type** option and press the joystick.
  - 2 It displays a menu at the right with the transmission standards.
  - 3 Move the joystick up / down to select a standard.
  - 4 When finished press joystick to select the standard or any function key to exit without selecting.
- The remaining transmission parameters are detected demodulating the locked signal.
  - In case of a DVB-S2 signal, there will be some special settings for this type of signal.

Physical Layer Scrambling or PLS is used in DVB-S2 as a way to improve data integrity. A number called the "scrambling sequence index" is used by the modulator as a master key to generate the uplink signal. This same number must be known by the receiver so that demodulation is possible.


Most satellite transponders use PLS 0 as a default value but there are some transponders that use other values.

If it is a multistream signal, it will appear an option that enables filtering by the input stream identifier (ISI) and to select the stream to demodulate.



[Click here to watch this video: DVB-S2 multi stream decoding](#)


#### 4.5.3 F3: Tools

Access by the  key. It shows the Tools menu. This menu can change depending on the type of selected standard. Tools are:

- ▶ **Constellation:** It displays the constellation of the locked signal.
- ▶ **LTE Ingress Test:** It enables the detection of signal interferences coming from mobile phones.
- ▶ **Echoes:** It detects the echoes that may appear due to the simultaneous reception of the same signal from several transmitters.
- ▶ **Datalogger:** It creates a file in which are stored measurements. This file belongs to the selected current installation.
- ▶ **Explore channel set:** It explores the selected channel set.

For more information about these features, see the "**Tools**" chapter.

#### 4.5.4 F4: Advanced

Access by the  function key. It allows selecting among several parameters to display the spectrum.

The advanced menu consists of the following options:

- ▶ **Average:** The user can select the amount of signal values to be used to set the average signal value to be displayed on screen. The larger the average value, the more stable the displayed signal appears.
- ▶ **Spectrum Line:** It defines the spectrum display. Outline option displays the spectrum outline. The Solid option displays the contour of the spectrum with solid background.
- ▶ **Tone Level:** This option produces a tone that changes according to the input level of the signal so the tone is sharper if the level increases and deeper if the level decreases.
- ▶ **Marker:** It allows enabling/disabling the marker. This marker is displayed on screen with the shape of an arrowhead, showing on screen some information about the frequency and power level where it points. You can move left/right by the joystick in **MK** mode (press the joystick until the icon **MK** appears).

- ▶ **Max. Hold.:** (Off/Permanent/Curtain). It allows the user to display the current signal with the maximum values measured for each frequency. The **OFF** option disables this function. The **Curtain** option displays the maximum values in blue for a moment with the current signal. The **Permanent** option maintains maximum signal on the screen. This option is especially useful for detecting sporadic noises.
- ▶ **Persistence:** When active, the signal is displayed on a coloured background. The signal prior to current signal persists for a while before disappearing so the user can see how the signal changes easily.

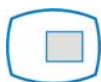
To select a parameter:

- 1 Place over the option and press the joystick.
- 2 The data field gets into the edit mode, indicated by the yellow background.
- 3 A menu is displayed at the right with some options or if it is numeric, a number gets a black background.
- 4 Move the joystick up/down to select one option. To move between figures press right/left and to change it press up/down.
- 5 When finished press joystick or any function key to exit.


#### 4.6 Location of a signal with the SPECTRUM ANALYSER

- 1 Connect the cable with the input signal to the **RF IN** input connector.
- 2 Press the **SPECTRUM** key. The spectrum of the signal is displayed.
- 3 Adjust the span (recommended value for a terrestrial signal 50 MHz and for a satellite signal 100 MHz). The current value of the span is at the right bottom of the screen.
- 4 Find the frequency of the signal by moving the joystick left or right to move sweeping the entire band.
- 5 If you know the channel change the tuning by frequency to tuning by channel. The channel mode allows you to navigate from channel to channel, using the selected channel set.
- 6 When the channel is locked information appears at the bottom left of the screen.
- 7 The equipment automatically detects transmission parameters of the signal and makes the corresponding measurements.

## 5 TV MODE





### 5.1 Introduction

On the left side of the front panel there are three functions, which give direct access to the three most important functions. One is the **TV MODE** key  which displays the resulting image from decoding received RF signal.

**TV MODE**, thanks to the StealthID function of automatic identification, automatically identifies and demodulates the TV signal received by the RF input, so the user can check the signal on the screen. It shows information about the channel and its services.

### 5.2 Operation

- 1 To access the **TV MODE** option, press the  key.
- 2 The screen shows the tuned signal demodulated.  
For digital carriers, the first service of the terrestrial multiplex or satellite transponder appears. In case the signal is scrambled the image will not appear.  
In the case of an analogue signal, tuned signal will appear.
- 3 To access the next view (if digital signal) of the **TV MODE**, press the  again. At the last view it will return back to the first.

Views are:



TV 1/3: FULL TV

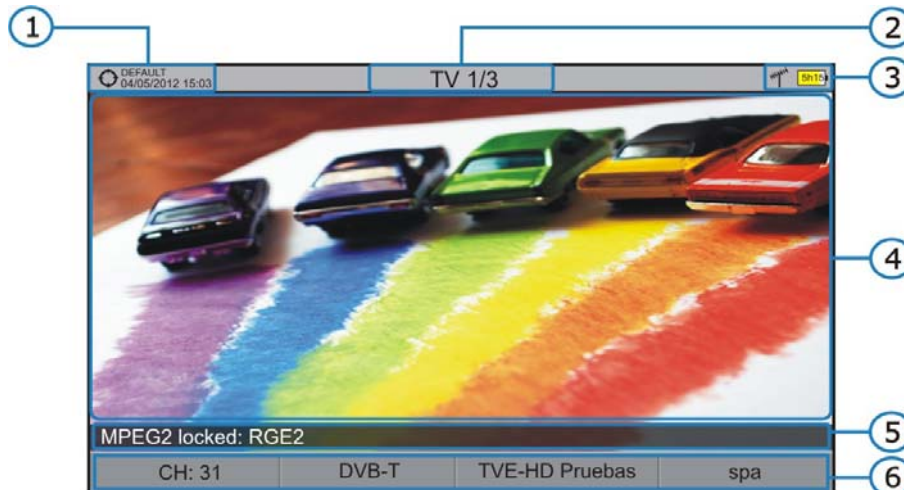


Figure 33.

- 1 Selected installation; date and time.
- 2 Number of view/total views.
- 3 Selected band, battery level.
- 4 Tuned service image.
- 5 Signal status (searching/locked/multiplex name).
- 6 Softkeys menus.

► **Joystick up/down:** It changes service.

► **Joystick left/right:** It changes channel/frequency (depending on the joystick active mode).



TV 2/3: TV + SPECTRUM + MEASUREMENT

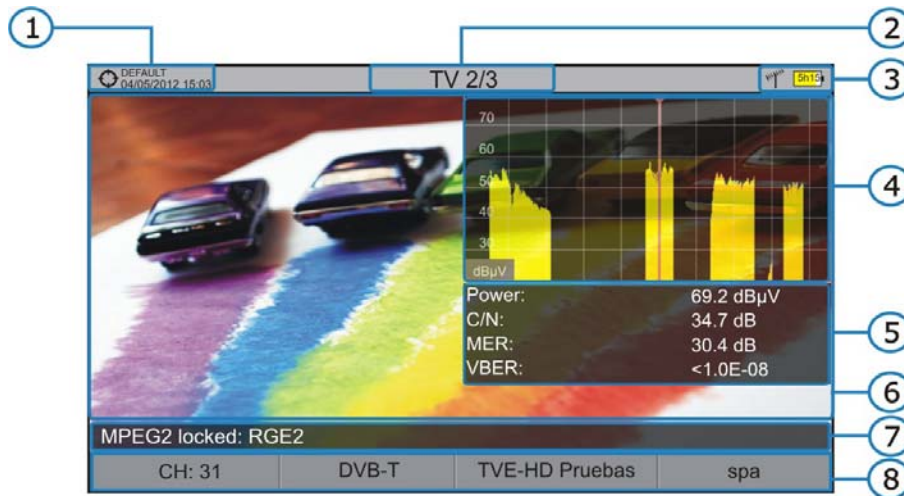
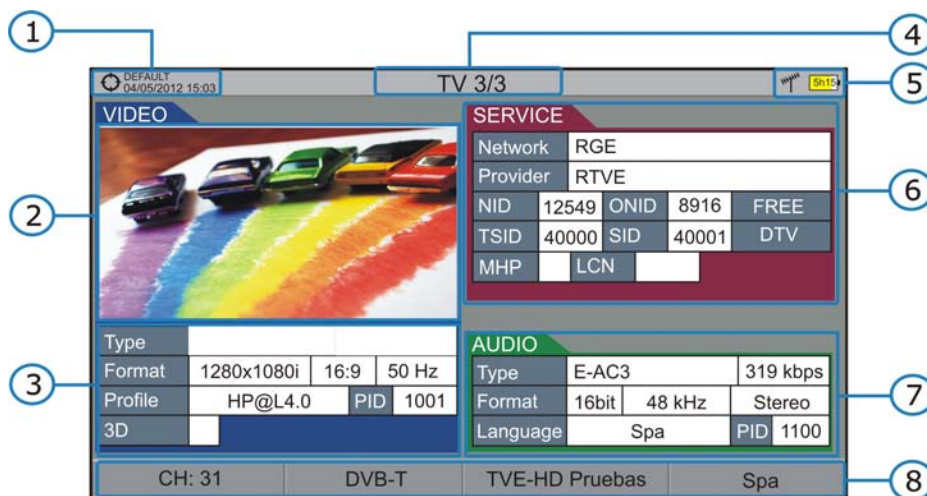


Figure 34.

- ① Selected installation; date and time.
- ② Number of view/total views.
- ③ Selected band, battery level.
- ④ Tuned service image.
- ⑤ Spectrum.
- ⑥ Measured values of the signal in the frequency/channel the cursor is pointing.
- ⑦ Signal status (searching/locked/multiplex name).
- ⑧ Softkeys menus.

► **Joystick up/down:** It changes service.

► **Joystick left/right:** It changes channel/frequency (depending on the joystick active mode).


**TV 3/3: SCREEN TV + SERVICE DATA**

**Figure 35.**

- 1 Selected installation; date and time.
- 2 Tuned service image.
- 3 Tuned service information.
  - ▶ **TYPE:** Encoding type and video transmission rate.
  - ▶ **FORMAT:** Resolution (horizontal x vertical), aspect ratio and frequency.
  - ▶ **PROFILE:** Profile level.
  - ▶ **PID:** Video program identifier.
  - ▶ **3D:** Application of 3D technology.
- 4 Number of view/total views.
- 5 Selected band; battery level.
- 6 Tuned service information.
  - ▶ **NETWORK:** Television distribution network (Terrestrial). Orbital position (Satellite).
  - ▶ **PROVIDER:** Program provider name.
  - ▶ **NID:** Network identifier where the signal is distributed.
  - ▶ **ONID:** Identifier of the original network where the signal originates.
  - ▶ **TSID:** Transport stream identifier.
  - ▶ **SID:** Service Identifier.
  - ▶ **MHP:** Interactive service.
  - ▶ **LCN:** Logic Channel Number. It is the first logic number assigned to the first channel in the receiver.
  - ▶ **FREE/SCRAMBLED:** Free/scrambled transmission.
  - ▶ **DTV/DS:** Standard type of transmission.

- 7 Tuned audio information.
  - ▶ **TYPE:** Type of audio encoding and transmission speed
  - ▶ **FORMAT:** Service audio format. Bit depth; sampling frequency; sound reproduction.
  - ▶ **LANGUAGE:** Broadcasting language.
  - ▶ **PID:** ID of the audio program.
- 8 Softkeys menus.

- ▶ **Joystick up/down:** It changes service.
- ▶ **Joystick left/right:** It changes channel/frequency (depending on the joystick active mode).

### 5.3 Menu Options for the TV MODE

#### 5.3.1 F1: Tuning

It displays the frequency or channel tuned.

It allows editing frequency or change channel in the active channel set (see how to select a frequency or channel on chapter [4.5.1](#)).

#### 5.3.2 F2: Signal Parameters

It shows the parameters of the tuned signal.






It displays the menu to select the standard of the channel plan (see how to select a standard on chapter [4.5.2](#)).

#### 5.3.3 F3: Service (digital signal)/Input (analogue signal)

- ▶ **Digital Signal**

It displays the list of services available in the multiplex tuned, with information about the service type and the identification number.

Icons that appear next to the service name identify the features of the service. The meaning is given in the following table:

	<b>Digital TV service</b>		<b>High Definition TV service</b>
	<b>Digital radio</b>		<b>Data</b>
	<b>Scrambled service</b>		

► **Analogue Signal**

It allows selecting the type of analogue input, between antenna and external.

To get an external analogue signal use the A/V input (see [figure 5](#)).

5.3.4 **F4: Audio (digital signal)/Aspect Ratio (analogue signal)**

► **Digital Signal**

It gives access to a list of available audio tracks in the selected service.

► **Analogue Signal**

It allows selecting the aspect ratio of the signal tuned (4:3; 16:9).

## 6 TOOLS

### 6.1 Constellation

#### 6.1.1 Description

The constellation diagram is a graphic representation of the digital symbols received over a period of time. There are different types of constellation diagrams according to the modulation type.

In the case of an ideal transmission channel without noise or interference, all symbols are recognized by the demodulator without errors. In this case, they are represented in the constellation diagram as well defined points hitting in the same area forming a very concentrated dot.

Noise and interferences cause the demodulator to not always read the symbols correctly. In this case hits are dispersed and create different forms which can visually determine the type of problem in the signal.




Each type of modulation is represented differently. A 16-QAM signal is shown on screen by a diagram of a total of 16 different zones and a 64-QAM signal is represented by a diagram of 64 different zones and so on.

The constellation diagram shows in different colours the density of hits and includes features to zoom, move and delete the display on screen.

#### 6.1.2 Operation

The constellation is available to all **DIGITAL** signals, both **TERRESTRIAL** and **SATELLITE**.

To access the **CONSTELLATION** tool:

- 1 Connect the **RF** input signal to the equipment.
- 2 Tune to a digital signal from satellite or terrestrial band.
- 3 Enter the **MEASUREMENT**  or **SPECTRUM** mode .
- 4 Press the  key (Tools).
- 5 Select **CONSTELLATION**.
- 6 The **CONSTELLATION** of the tuned signal appears.

Constellation screen description:

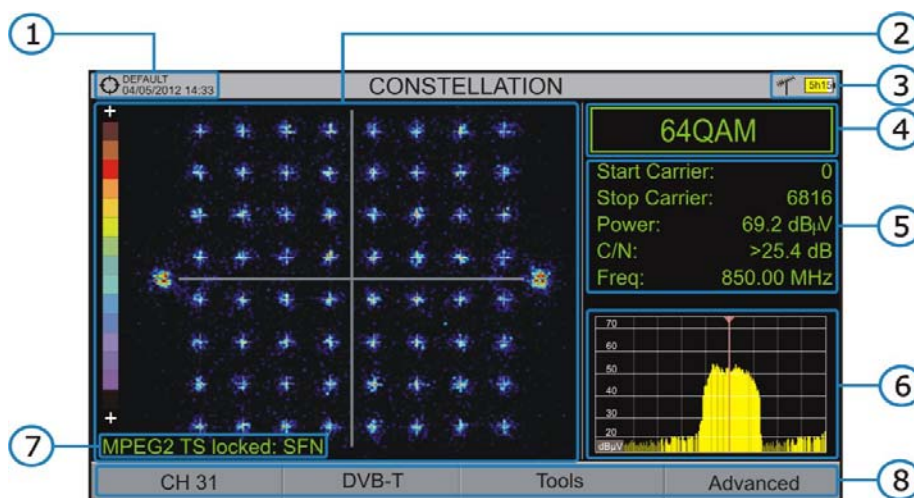


Figure 36.

- 1 Selected installation; date and time.
  - 2 Constellation window.  
The colour scale placed at the left side indicates the signal quality in a qualitative way by a gradation of colours proportional to the density of symbols concentrated in a given area. The colour scale ranges from black (no symbols) to red (highest density).  
Greater dispersion of the symbols indicates higher noise level or worse signal quality signal. If there is symbols concentration with respect to the full grid (see advanced menu for types of grid) this is indicative of good ratio signal/noise or absence of problems.
  - 3 Selected band, battery level.
  - 4 Constellation modulation.
  - 5 Data Window.  
The data shown are: Start Carrier, Stop Carrier, Power, C/N and frequency/channel.
  - 6 Spectrum of the tuned signal.  
Spectrum is displayed with the span selected at the **SPECTRUM** mode.
  - 7 Signal status (searching/locked/multiplex name).
  - 8 Softkeys menus.
- Joystick **Left/Right**: Frequency/Channel change (depending on the joystick active mode).

### 6.1.3 Menu Options for Constellation tool

On the bottom of the screen there are four menus accessible via the function keys.



It displays the channel / frequency where is pointing the cursor and accesses the tuning menu.



It displays the selected transmission standard menu and accesses the signal parameters.



It displays the Tools menu.



It displays the Advanced menu.

In the Advanced menu there are some options for the constellation configuration. They are:

#### ► Grid type:

- **Full Grid:** The grid where the constellation is displayed is a complete grid.
- **Cross Grid:** The grid where the constellation is displayed is made of crosses.

#### ► Start Carrier/Stop Carrier:

The transmission of any digital channel consists of about 8,000 carriers, of which 6,817 are useful. These are divided in signalling carriers and data carriers. This option allows selecting the range of carriers to be displayed between the first and last.

## 6.2 LTE Ingress test

### 6.2.1 Description





**Long Term Evolution** is a new standard for mobile networks. This mobile communication standard uses a frequency band close to the bands used by television. For this reason it can cause interferences.

The LTE Ingress Test identifies this type of interferences in a television distribution system, so that they can be compared on the same screen measurements with LTE filter and without LTE filter and thus if there is any interference it can be detected and take appropriate action to fix it.

## 6.2.2 Operation


The **LTE Ingress Test** input is available to all **DIGITAL TERRESTRIAL** signals.

To access the **LTE Ingress Test** tool:

- 1 Connect the **RF** input signal to the equipment.
- 2 Tune a digital signal of the terrestrial band.
- 3 Enter the **MEASUREMENT** mode  or **SPECTRUM** mode .
- 4 Press the  key (Tools).
- 5 Select the **LTE Ingress Test** mode.
- 6 Enable/disable the **LTE** filter pressing the key : Filter ON/OFF.



[Click here to watch this video: What is LTE?](#)

This function displays measurements obtained with LTE filter or without LTE filter. Measuring the signal with filter or without filter is not done simultaneously, but alternately, by means of the  key that enables or disables the filter.

The following describes the **LTE** display:

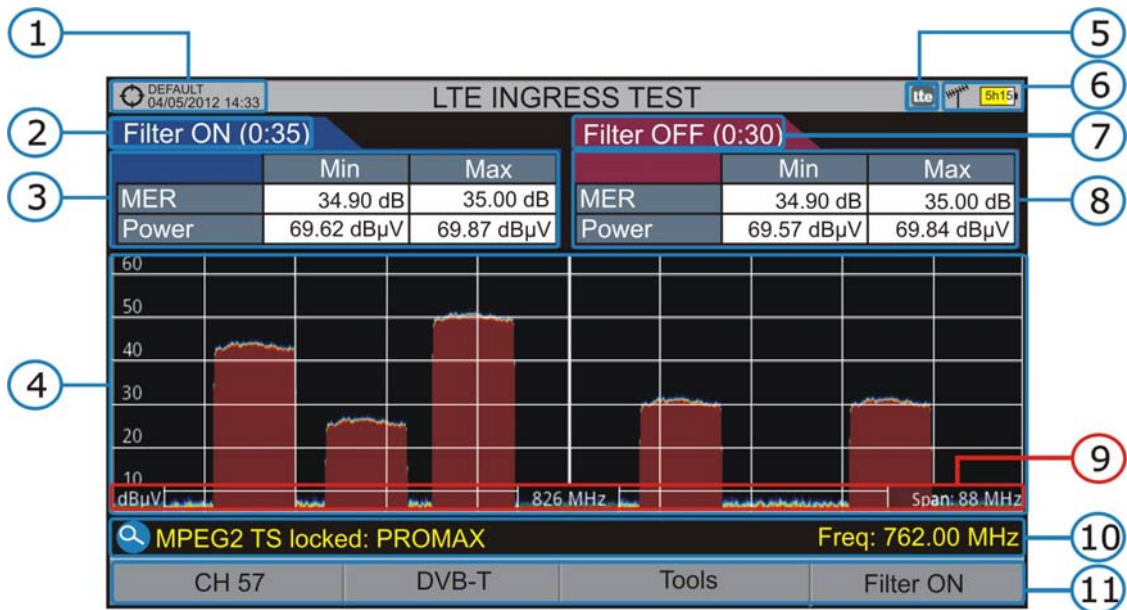


Figure 37.

- 1 Selected installation; date and time.
- 2 Elapsed time with filter ON.
- 3 Measurement with filter ON: MER (minimum, maximum) and power (minimum, maximum).
- 4 Signal with **LTE** filter enabled (ON) or disabled (OFF).
- 5 Identifier icon of the **LTE** filter ON.
- 6 Selected band; battery level.
- 7 Measuring time with filter OFF.
- 8 Measurement with filter OFF: MER (minimum, maximum) and power (minimum, maximum).
- 9 Measurement units/centre frequency/span.
- 10 Signal status (searching/locked/multiplex name).
- 11 Softkeys menus.

### 6.2.3 Menu options for the LTE Ingress Test tool

On the bottom of the screen there are four menus accessible via the function keys.



It displays channel/frequency and access the tuning menu. It allows selecting the channel where apply the LTE ingress test.



It displays the selected transmission standard menu and accesses the signal parameters.



It displays the Tools menu.



It enables (ON) / disables (OFF) the LTE filter.

## 6.3 Echoes

### 6.3.1 Description

The **Echoes** function shows the response in time of a digital terrestrial channel and therefore it can detect echoes that can occur due to the simultaneous reception of the same signal from several transmitters with different delays and amplitudes.




Another cause that may cause echoes is reflection of the signal on large objects, as buildings or mountains. This may be the explanation that having a good C/N and a good signal, the BER does not reach the minimum value.

With the **Echoes** function is possible to know the distance from where the equipment is to the transmitter or the object that caused the echo. Thus, the installer can minimise the effect that the echo may cause on the installation, reorienting the antenna and reducing the effect of received echoes.

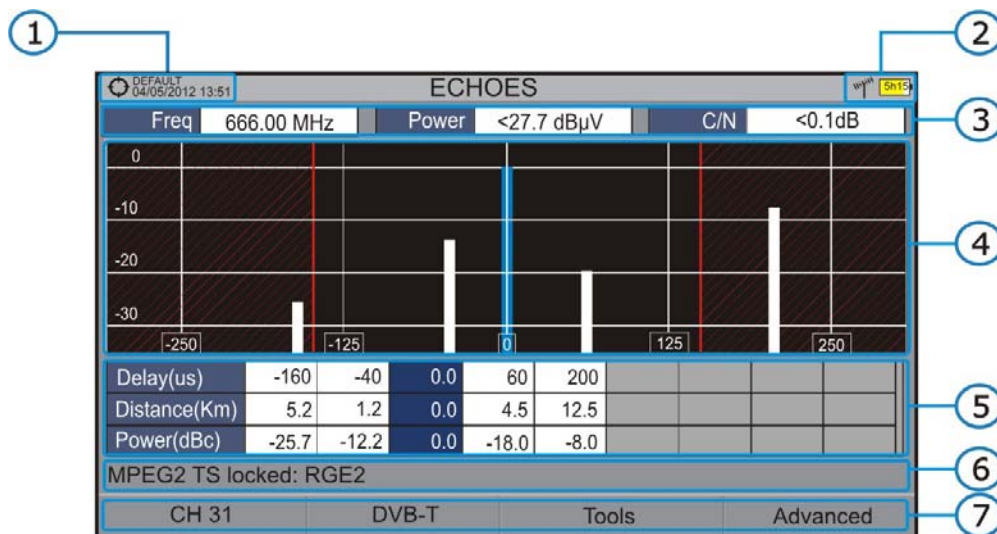
This function is only available for **DVB-T**, **DVB-T2** and **DVB-C2**. Therefore, previously have to configure the equipment for the reception of such signals.

### 6.3.2 Operation

Echoes function is available for **DVB-T**, **DVB-T2** and **DVB-C2** signals.

- 1 Connect the **RF** input signal to the equipment.
- 2 Tune a **DVB-T**, **DVB-T2** or **DVB-C2** digital signal at the terrestrial band.
- 3 Enter the **MEASUREMENT** mode  or **SPECTRUM** mode .
- 4 Press the  key (Tools).
- 5 Select **ECHOES**.
- 6 The **ECHOES** function of the tuned signal appears on screen.

The following describes the **ECHOES** screen:



**Figure 38.**

- 1 Selected installation; date and time.
- 2 Selected band, battery level.
- 3 Main signal data: Frequency, Power and C/N.
- 4 **ECHOES** Diagram.

The display shows a graphical representation of the echoes. The horizontal axis of the graph corresponds to the delay in receiving the echo on the main path (the stronger signal). The vertical axis represents the attenuation of the echo in dB on the main path.

- 5 Data box with main data regarding echoes.

In the list of echoes it shows the power, the delay in microseconds and the distance in kilometres to the echoes.

- 6 Signal status (searching / locked / multiplex name).
- 7 Softkeys menus.

- ▶ **Joystick left/right (CHANNEL mode):** It changes the channel.
- ▶ **Joystick left/right (ECHOES mode):** It moves cursor over the echoes window.
- ▶ **Joystick up/down (ECHOES mode):** It changes Zoom.

Remember to press the joystick to change the **ECHOES** mode to **CHANNEL** mode.

### 6.3.3 Menu Options for the Echoes tool

At the bottom of the screen there are four menus available via the function keys.



It displays the channel/frequency where is pointing the cursor and access the tuning menu.



It displays the selected transmission standard menu and accesses the signal parameters.



It displays the Tools menu.



It displays the Advanced menu. The ZOOM option changes the zoom on the echoes windows. Zooms are 1x, 2x, 4x and 8x.




## 6.4 Datalogger

### 6.4.1 Description

The Datalogger function stores automatically measurements in a file set by the user (name, channel set), and associated to a specific installation. User can store for each datalogger measurements taken at different test points of the selected installation. Measurements are made for all channels in the active channel set, both analogue and digital.

### 6.4.2 Operation

To create a new datalogger:

- 1 First select the installation on the Installations menu  and load it pressing the "Load" key . An installation contains the channel sets and DiSEqC commands selected by the user and it stores dataloggers and screenshots made while it is selected (more information in chapter [7](#) Installations Management).
- 2 Check the installation is selected. The name of the installation should appear on the upper left corner of the screen.
- 3 Enter the **MEASUREMENT** mode or the **SPECTRUM** mode.
- 4 Press the : Tools key.
- 5 Press on the "Datalogger" option.



- 6 It displays a menu with the "New ..." option and a list of all dataloggers at the selected installation.
- 7 Select "New ..." to create a new datalogger or select the file name of an existing datalogger if the user want to save data on a specific datalogger already existing.
- 8 If "New ..." is selected, a installation wizard shows how to create a new datalogger. Follow its instructions (F4: Next to move to the next screen, F3: Previous to move to the previous screen or F1: Cancel to cancel).
- 9 During the creation of a new datalogger using the wizard, the user can assign a name and select the channel sets. The channel sets are the ones available for the current installation. At least one channel set has to be selected, either terrestrial or satellite. The wizard also gives an option to select if during datalogger user wants to capture the list of services (it slows down the process but gives more information) and also if user wants a pause between channel sets (the process stops until the user resume it). At the end user has the option to open the new datalogger (by default, these last three options are enabled).
- 10 Once a new datalogger is created or selected an already existing one, it shows the datalogger viewer screen and measurements of test points can start.
- 11 If it is a new datalogger, in first place before starting the datalogger, user must create a new test point (see next section).



[Click here to watch this video: Datalogger](#)

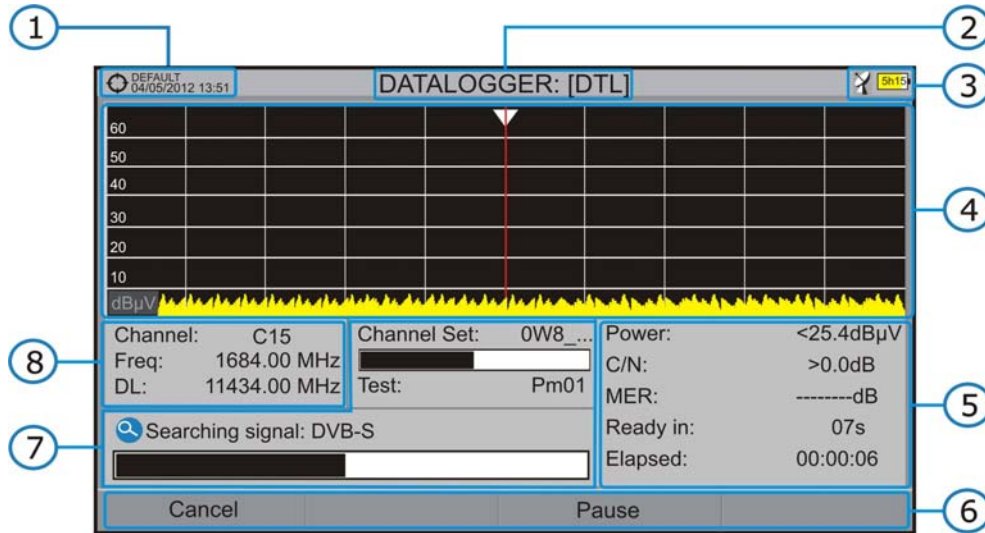
To start the datalogger:

- 1 After creating a new datalogger file or selecting an existing one, the user can start the datalogging process.
- 2 From the datalogger viewer screen, press the "Test point" key (F4) and from the menu select an existing test point using the "Go to ..." option or "Create new ..." to create a new test point. If a new test point is created, user has to give it a name.
- 3 Now datalogger is ready to start. Press the "Datalogger" key (F1) and select "Start".

- 4 During datalogger, it catches the list of available services of all channels in the channel set that are part of the datalogger (if this option was selected when creating the datalogger or if the "Datalogger PSI" option is enabled in the Preferences menu). If there is a change of channel set during datalogger there will be a pause (if this option was selected when creating the datalogger). User can pause and resume the datalogger process at any time by pressing on the key "Pause" .
- 5 At the end it saves the data and allows watching the results on screen by channel set. To change the channel set press on the  key. Datalogger can be saved on a PC using the PkUpdate software, available on the PROMAX website. Information about service lists are in the XML files, which can be downloaded to a PC.

► **Description of Datalogger screens**

The following describes the datalogger screen:



**Figure 39.**

- ① Selected installation; date and time.
- ② Current datalogger name.
- ③ Selected band; battery level.
- ④ Exploring the spectrum in real time.
- ⑤ Level/Power, C/N ratio, MER, time remaining to identify a channel, elapsed time since the start of the channel identification.
- ⑥ Softkey menus.



**Cancel**

It cancels the datalogger.



**Pause**

It pauses datalogger until the user resumes by pressing again.

- ⑦ Current channel set, progress bar in the current channel set, selected test point.
- ⑧ Channel, frequency and Downlink.

The following describes the display of data acquired:

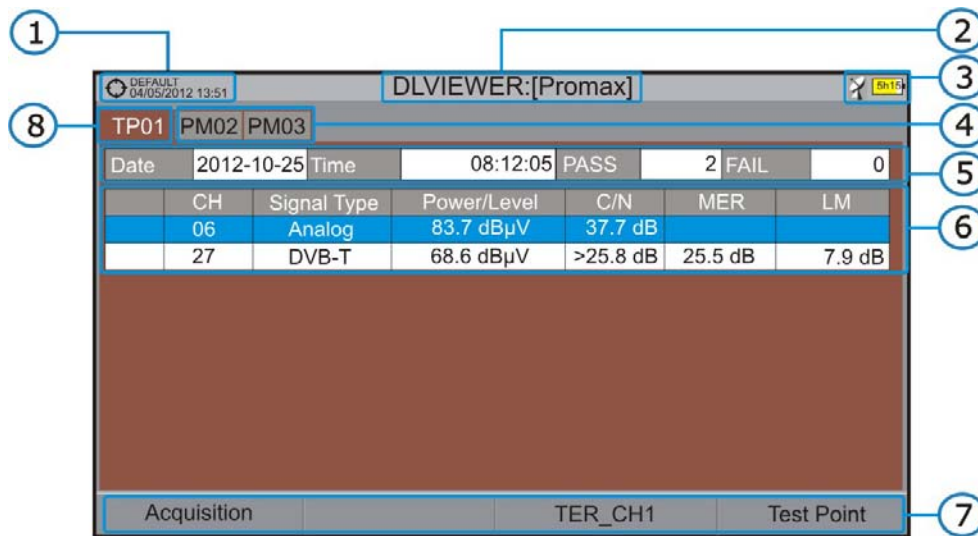


Figure 40.

- 1 Selected installation; date and time.
- 2 Current datalogger name.
- 3 Selected band; battery level.
- 4 Tab identifying each test point.
- 5 Date and time when the datalogger was created. Number of channels locked (PASS) or not locked (FAIL)
- 6 Data table with measurement data for each channel. In order from left to right: Colour identifying if the channel has been locked (WHITE) or not locked (RED) channel; signal type; power/level; Carrier/Noise (C/N) rate; MER; Link Margin.
- 7 Softkey menus. Move the joystick up or down to navigate along the measurement data. Press the joystick on a channel to display the signal parameters.



**Acquisition**

It contains two options:

- Start:** It starts the datalogger in the selected test point.
- Clear:** It deletes the data in the selected test point.


 F3

### Channel set

It displays a menu with the available channel sets to select the channel set whose data want to be displayed. Channel sets available are those that have been selected during the creation of the datalogger.


 F4

### Test Point

It contains four options:

**Jump to:** It allows selecting a test point.

**Create New...:** It creates a new test point.

**Delete current:** It deletes the current test point.

**Delete all:** It deletes all test points of the datalogger.


 8

Tab identifying the displayed test point.




## 6.5 Screenshot

### 6.5.1 Description





It captures the image that is appearing on screen at the moment of the keystroke.

### 6.5.2 Operation

#### ► Capture

- 1 Press the screenshot key  for one second when on screen appears the image to be captured. The LED next to key lights.
- 2 A progress bar shows the progress of the capture process. When finished, the image is captured and the LED is OFF.
- 3 Then the virtual keyboard appears with the default name assigned to the image.
- 4 Edit the name if necessary (see section [2.7.4](#)). Then press : OK to end the capture or : Cancel for cancellation.

## ► Display

- 1 To display the captured image click on the Installations Management key .
- 2 Select the installation where the screenshot was done and press : Manage.
- 3 Press : View. Select the "Screen Shots" option. This will limit the list to only screenshots.
- 4 It appears a list of all the screenshots.
- 5 Move the joystick up or down to find the image file to be displayed.
- 6 Leave the cursor on the image file to be displayed. It appears a progress bar that lasts a few seconds, depending on the image size. Then the screen capture appears.
- 7 To delete or copy the image to a USB stick, select the image or images by pressing the joystick, and then select the appropriate option from the menu : File.

## 6.6 Explore Channel Set

This option performs a scan of the selected channel set. It detects where active signals are in a channel set and in which channels of the current channel set signal is received. With this information it explores these channels with signal, looking for any broadcast and identifying the TV system used in that channel.

When accessing the **Explore Channel Set** option appears the following screen:

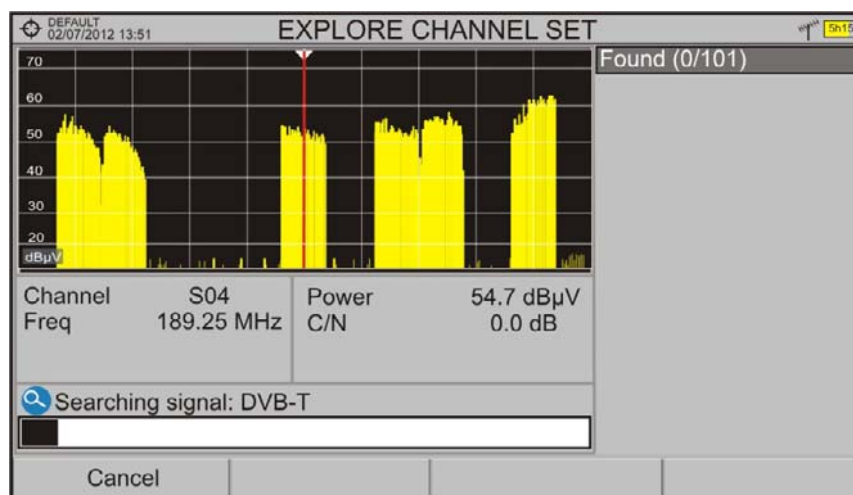


Figure 41.

After the exploration the following screen appears:

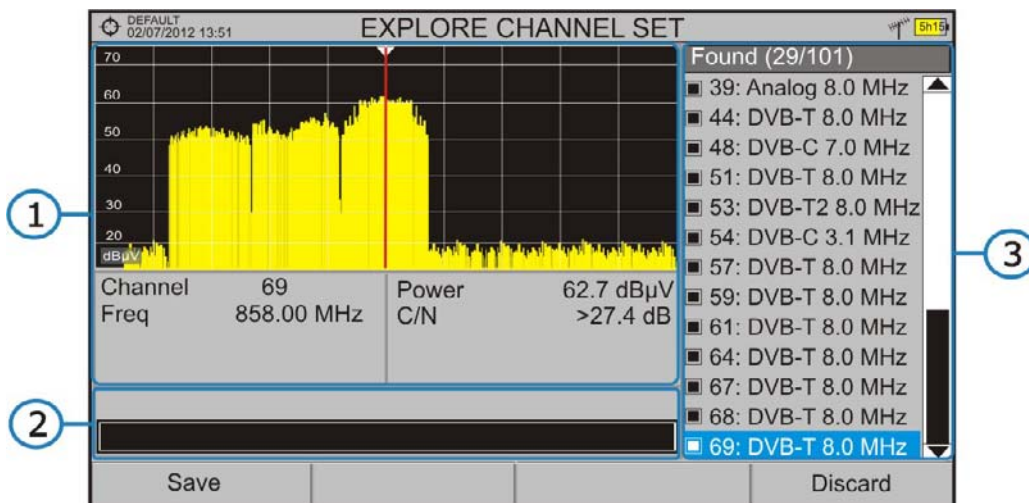


Figure 42.

The window is divided into three areas:

- 1 Spectrum and Measurement**

It shows the cursor scrolling through each of the channels of the channel set. On the bottom of the screen the channel and frequency appears next to the Power/Level and the C/N ratio.
- 2 Progress Bar**

It shows the signal type detected and the scan progress in real time. At the end a box shows a message informing the exploration process has finished.
- 3 Channel set**

At the end of the process it shows the channels that have been detected during the channel set exploration. In parentheses shows the number of detected channels to total channels of the channel set.

At the bottom are the function keys. They are detailed below.



**Cancel** (during the process):

This option appears only while performing the exploration process. It cancels the exploration before finish. When pressing, a confirmation message appears before cancelling.



**Save** (at the end of the process):

This option appears at the end of the exploration process. It saves the results obtained during the exploration. The name of the original channel set is assigned to the new one by default and the user can modify the name using the virtual keyboard that appears prior to saving. The new channel set is available through the Installation editor in the corresponding installation. After saving it becomes the selected channel set to work with.



**Skip** (during the process):

This option allows skipping the current channel and explore the next one in the channel set.



**Discard** (at the end of the process):

This option appears at the end of the exploration process. It discards the results obtained from the exploration.



[Click here to watch this video: Channel set exploration](#)



## 7 INSTALLATIONS MANAGEMENT

### 7.1 Description

The Installations Management is a program embedded in the equipment that allows the user to easily create a file (installation) to individually store and manage data for each installation. Measurements, channel sets, screenshots and any other data associated with the installation will be stored in the folder corresponding to that installation. These measures can then be displayed and downloaded to a PC.

If the user does not create any file installation, the equipment stores measurements in the installation file that is preinstalled by default (named "DEFAULT").

### 7.2 Operation

To access the Installations menu press the  key. It shows up a window with a list of all available installations. On the softkeys appears the options to manage these installations. To exit the list of installations press the key .

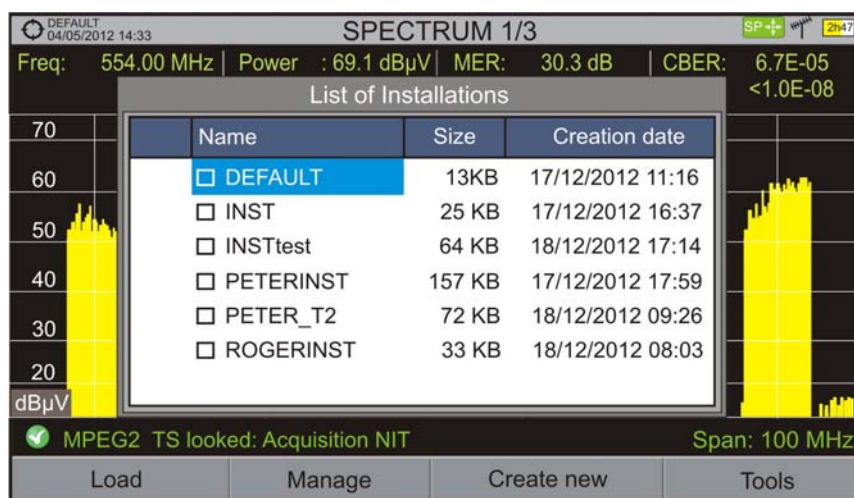








Figure 43.

There are the following options:

- **Load** : It loads the selected installation. To select a installation from the list, place the cursor on the installation and press the joystick, then press "Load"  to load it. Once loaded, the name of the installation appears on the upper left corner of the screen, accompanied by the symbol , that means that is the current installation. All measurements, screenshots, channel sets and other data will be stored in the current installation.
- **Manage** : It opens a window that displays all data of the current installation and from where they can be edited, changed or view (more details in section [7.3](#)).
- **Create new** : It creates a new installation with the data introduced by the user (more details in section [7.4](#)).
- **Tools** : It shows up a menu with some tools to use with the installations (see section [7.5](#)).

### 7.3 Installation Management

Press on the option **Manage**  to access to the **Installation manager** screen:

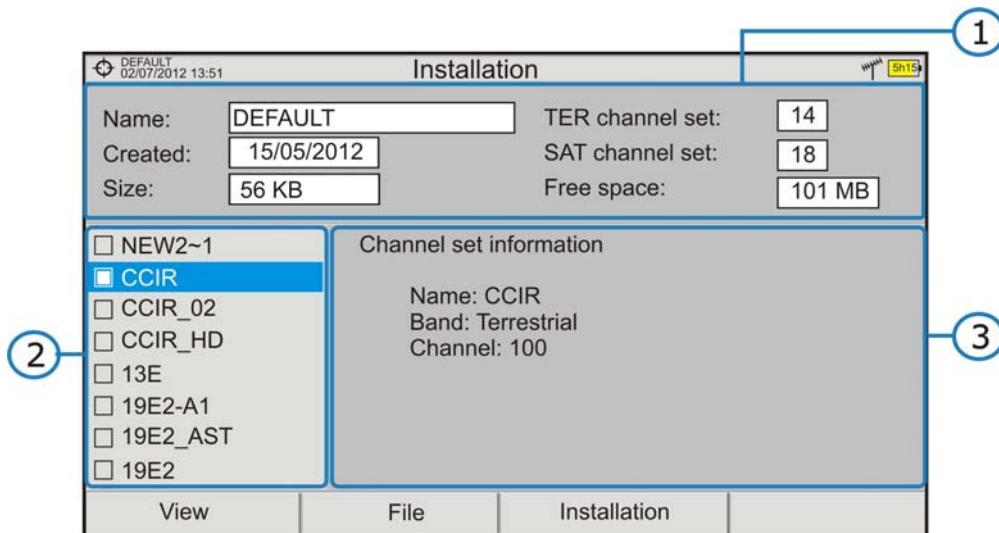


Figure 44.

The DEFAULT installation is the installation preinstalled on the equipment. It is like any other installation and it can load channel sets, DiSEqC programs, etc. This installation can not be deleted or renamed.

The window is divided into three fields:

### 1 Installation data

- It displays information about the installation using the following fields:
  - ▶ **Name:**  
Name of the current installation file.
  - ▶ **Created:**  
The date the current installation was created.
  - ▶ **Size:**  
Size of the current installation.
  - ▶ **TER Channel Sets:**  
It shows the number of terrestrial channel sets in the installation.
  - ▶ **SAT Channel Sets:**  
It displays the number of satellite channel sets in the installation.
  - ▶ **Free Space:**  
It displays the amount of memory available.

### 2 List of files area

It shows all channel sets, screenshots, dataloggers and DiSEqC commands available for the selected installation.

To move along this file list move the joystick up or down.

Any of these files can be selected or deselected by pressing the joystick.

### 3 Display area

It is the area where the file, on which the cursor is placed at the file list, is displayed. The file is displayed only if the cursor is placed for a moment.

In the case of displaying a channel set file, it shows the name, the band and the DiSEqC commands.

For a screenshot, it displays a thumbnail of the full screen, as captured.

In the case of displaying a datalogger or a DiSEqC command, it only shows the description of the file type.

The installation manager menu has four options linked with the softkeys. They are described below:



## VIEW

- ▶ **All:**  
On the list of files area it shows all type of files.
- ▶ **Screenshots:**  
On the list of files area it shows all available screenshots.
- ▶ **Channel Sets:**  
On the list of files area it shows all available channel sets.
- ▶ **Datalogger:**  
On the list of files area it shows all available dataloggers.
- ▶ **DiSEqC:**  
On the list of files area it shows all available DiSEqC commands.



## FILE

- ▶ **Mark All:**  
It marks all files on the list of files area.
- ▶ **Unmark All:**  
It deselects all files on the list of files area.
- ▶ **Delete:**  
It deletes all selected files on the list of files area.
- ▶ **Copy to USB:**  
It saves selected files on the list of files area to an USB stick connected to the equipment.



## INSTALLATION

- ▶ **Add TER Channel Set:**  
It adds a terrestrial channel set available in the equipment to the current installation.
- ▶ **Add SAT Channel Set:**  
It adds a satellite channel set available in the equipment to the current installation.
- ▶ **Add DiSEqC Program:**  
It adds a DiSEqC program available in the equipment to the current installation
- ▶ **Edit name:**  
It edits the name of the currently selected installation.
- ▶ **Delete current:**  
It deletes the name of the currently selected installation.
- ▶ **Export to USB:**  
It saves the current selected installations to an USB memory stick and displays a progress bar during the export process.

To get out from the Installation manager press any key to access MEASUREMENT, SPECTRUM or TV mode.




[Click here to watch this video: Installation manager](#)

## 7.4 Create a new installation


When selecting the option Create New  it runs the installation wizard that helps to create a new installation:

- 1 During the process, the user has the option to edit the default name assigned or import data from another installation.
- 2 The user can select the channel sets (terrestrial and satellite) that will be used in that installation. At least one for each band has to be selected.
- 3 For satellite channel sets the user can select the Diseqc commands associated to the installation and also the satellite band (Ku-Ka or C band) and the frequencies of the LNB Oscillator.
- 4 During the creation process the softkeys function are: Next (it goes to the next step), Previous (it goes to the previous step) or Cancel (it cancels the process).
- 5 When finish, the new installation created will be the current installation.

## 7.5 Tools

When pressing the Tools  option it shows a menu with some options to edit the installation files:

- ▶ **Mark All:**  
It selects all installations in the list of installations.
- ▶ **Unmark All:**  
It deselects all installations in the list of installations.

- ▶ **Archive:**  
It compresses (using the ZIP algorithm) the selected installations to save more space. A zipped installation shows a box icon  at the left side in the list of installations. A zipped installation can be loaded as anyone else, but the load time can be slightly higher because previously it is unzipped automatically.
- ▶ **Delete:**  
It deletes the selected installations and all the files associated to them.
- ▶ **Rename:**  
It edits the name of the installation selected in the list of installations.
- ▶ **Export to USB:**  
It saves installations selected in the list of installations to an USB stick connected to the instrument.

## 8 CONNECTING TO EXTERNAL DEVICES

The **HD RANGER/+** can interact with external devices, sharing information through its interfaces:

- 1 Input/output data interface via mini-USB connector to USB memory or PC.
- 2 Video/Audio analogue output interface via **V/A** connector output.
- 3 Video/Audio analogue input interface via **V/A** connector input.
- 4 DiSEqC interface via **RF** connector.


Next is described each of these interfaces and their interaction with external devices.





### 8.1 Mini-USB connector

The equipment has a female mini USB port that uses a USB media specific protocol called "On-the-Go" (OTG abbreviated). This type of communication allows the equipment to work in two different ways depending on the device connected to the USB port: as a server (host) or device (slave). More often, the **HD RANGER/+** will work as a host when connecting a USB memory and as slave when connecting to a computer. This feature makes the equipment in a much more versatile tool.

#### 8.1.1 Connecting the **HD RANGER/+** (host) to an USB memory (slave)

This connection allows the user to copy files (screenshots, channel sets, dataloggers, DiSEqC commands, installations) from the equipment to the USB stick by following these steps:

- 1 Connect the CC-045 cable (USB (A) Female - Mini USB (A) Male) to the mini-USB socket ([see figure 5](#)) of the equipment.
- 2 Connect the USB stick to the female port of the cable.
- 3 USB icon should appear on the top right corner of the equipment. This icon indicates that an USB stick has been detected at the port.
- 4 Press the Installations key  and select the installation where is the data to download.

- 5 Press the key : Manage to access the data of the selected installation.
- 6 Press : View to select the type of list to view (list of all the files, only screenshots, only channel sets, only dataloggers or only DiSEqC commands).
- 7 Select the files from the list to be copied on the USB memory stick, by pressing the joystick or by pressing : File and selecting "Mark All" (it selects all files on the list displayed).
- 8 Once files are selected press : File and select the "Copy to USB" option. This option is enabled only if it detects that there is an USB connected to the equipment and if any file has been selected.
- 9 It shows a progress bar and a message informing that files are being copied to the USB.
- 10 When finish you can remove the cable with the USB stick memory directly from the equipment and connect it to a computer to view the files copied.
- 11 Default files are copied to the root directory of the USB memory. Screenshots appear with PNG extension and channel sets with XML extension.

### 8.1.2 **Connecting a computer (host) to the HD RANGER/+ (slave)**


This connection allows the communication between the equipment and a computer via an USB cable or using the program NetUpdate4 of PROMAX.

NetUpdate4 program can be downloaded for free from the PROMAX website.

Connect the equipment to your computer using the cable CC-041 (mini USB male – USB male) supplied with the equipment.




## 8.2 V/A Output Connector

The V/A output connector allows connecting a video/audio analogue output signal. This connection allows you to switch between the image from the equipment to an auxiliary monitor by following these steps:

- 1 Connect the jack 4V cable to the video/audio output connector (see [figure 5](#)), ensuring that the plug is fully inserted.
- 2 Connect the opposite end (RCA connector) to the auxiliary monitor where video and audio of the equipment will be played.
- 3 Switch on the equipment and press the Settings key  for 1 second.
- 4 In the Video & Audio Settings menu, enable Video output.
- 5 Then, the image on the equipment disappears and the auxiliary monitor shows a message asking for confirmation to switch the image.
- 6 Press the joystick to accept and the image will appear on the auxiliary monitor. If you do not press the joystick after ten seconds the image will return to the equipment.

## 8.3 V/A Input Connector





The V/A input connector allows connecting a video/audio analogue input signal. This connection allows the user to view an image on the equipment screen coming from an external source by following these steps:

- 1 Connect the supplied jack 4V cable to the video/audio input connector (see [Figure 5](#)), ensuring that the plug is fully inserted.
- 2 Connect the opposite end (RCA connector) to the source of video/audio.
- 3 Switch on the equipment and select the terrestrial and analogue signal.
- 4 Select TV mode  and press : Input.
- 5 From the menu, select "External". A message shows that the external input has been selected.
- 6 After a few seconds, the input image will be displayed on screen.
- 7 With the option : Aspect, you can select the aspect ratio of the image, between 4:3 and 16:9.

## 8.4 RF Connector

### ► DiSEqC commands:

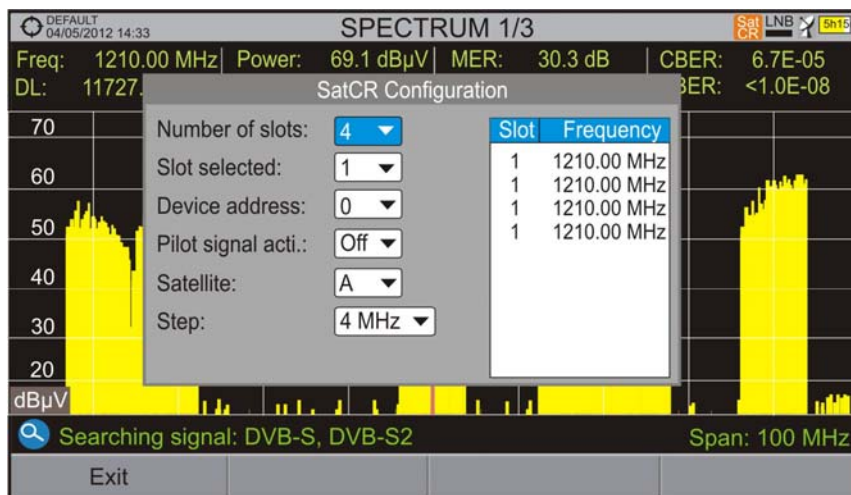
The RF connector allows controlling an antenna using DiSEqC commands. DiSEqC (Digital Satellite Equipment Control) is a communication protocol between the satellite receiver and the installation accessories of satellite (switches, LNBS, etc.) proposed by Eutelsat, in order to standardize the diversity of switching protocols (13 to 18 V, 22 kHz) and meet the needs of the installations for the reception of digital TV.

- 1 Connect the RF cable ([see Figure 6](#)) to the RF connector for the input signal of the equipment.
- 2 Press the Spectrum key  to access the spectrum analyser mode.
- 3 Press the Settings key  and select the satellite band.
- 4 Select the polarization (horizontal/vertical) and the satellite band (high/low).
- 5 If necessary, enable the Supply output and select the supply voltage for the LNB.
- 6 On the Settings menu, select the option DiSEqC mode.
- 7 Two new functions appear on the softkeys: Command  and Software .
- 8 Select the command or program and press the joystick to send it to the antenna. These commands or programs allow the user to control an antenna (for more information about DiSEqC commands and programs see [Annex 3](#)).

► **SatCR commands:**

By means of function SatCR it is possible to control the devices of a TV satellite installation that are compatible with the SatCR (Satellite Channel Router) technology, which allows to concentrate downlink frequencies (slots) by an only cable. By this way each user using a slot can tune and decode any signal present in the satellite.

- 1 Connect the RF cable ([see Figure 6](#)) to the RF connector for the input signal of the equipment.
- 2 Press the Spectrum key to access the Spectrum analyser mode.
- 3 Press the Settings key and select the satellite band.
- 4 Select the polarization (horizontal/vertical) and the satellite band (high/low).
- 5 If necessary, enable the Supply output and select the supply voltage for the LNB.
- 6 On the Settings menu, select the option SatCR. It appears the icon at the top right corner.
- 7 It appears the window with the configuration options.



**Figure 45.** SatCR command screen.

The screen shows the configuration options that user can modify: number of slots, slot selected, device address, pilot signal activation (when activating the SatCR device located in the headend, it emits a pilot signal with constant level for each downlink frequency to identify available channels), selected satellite and frequency step. In other box appears the frequencies corresponding to each slot.

## 9 SPECIFICATIONS

### 9.1 Specifications *HD RANGER +*

#### CONFIGURATION FOR MEASURING LEVEL AND POWER

<b>TUNING RANGE</b>	Digital frequency synthesis. Continuous tuning from 5 to 1000 MHz and from 950 to 2150 MHz (terrestrial and satellite respectively).
<b>Tuning modes</b>	Channel or frequency (IF or downlink at satellite band). Channel set configurable on demand.
<b>Resolution</b>	10 kHz.

#### RF INPUT

<b>Impedance</b>	75 $\Omega$ .
<b>Maximum signal</b>	130 dB $\mu$ V.
<b>Maximum input voltage</b>	
<b>DC to 100 Hz</b>	50 V rms (powered by the AL-103 power charger). 30 V rms (not powered by the AL-103 power charger).
<b>5 MHz to 2150 MHz</b>	140 dB $\mu$ V (protected up to 30 seconds).

#### DIGITAL SIGNALS MEASUREMENT

<b>TERRESTRIAL TUNING RANGE</b>	From 45 to 1000 MHz.
<b>SATELLITE TUNING RANGE</b>	From 950 to 2150 MHz.

#### MARGIN OF POWER MEASUREMENT

<b>COFDM</b>	From 35 dB $\mu$ V to 115 dB $\mu$ V.
<b>QAM</b>	From 35 dB $\mu$ V to 115 dB $\mu$ V.
<b>QPSK/8PSK</b>	From 35 dB $\mu$ V to 115 dB $\mu$ V.

## MEASUREMENTS

<b>DVB-T (COFDM)</b>	Power, CBER, VBER, MER (up to 35 dB), C/N and Link margin.
<b>Presentation</b>	Numeric and level bar.
<b>DVB-T2 (COFDM)</b>	Power, CBER, MER (up to 35 dB), C/N, LBER, BCH ESR, LDPC Iterations and Wrong Packets.
<b>Presentation</b>	Numeric and level bar.
<b>DVB-C (QAM)</b>	Power, BER, MER (up to 35 dB), C/N and Link margin.
<b>Presentation</b>	Numeric and level bar.
<b>DVB-C2 (COFDM)</b>	Power, CBER, MER (up to 35 dB), C/N, LBER, BCH ESR, LDPC Iterations and Wrong Packets.
<b>Presentation</b>	Numeric and level bar.
<b>DVB-S (QPSK)</b>	Power, CBER, VBER, MER (up to 30 dB), C/N and Link margin.
<b>Presentation</b>	Numeric and level bar.
<b>DVB-S2 (QPSK/8PSK)</b>	Power, CBER, LBER, MER (up to 30 dB), C/N, BCH ESR, Wrong Packets and Link Margin.
<b>Presentation</b>	Numeric and level bar.

## DVB-T SIGNAL PARAMETERS

<b>Carriers</b>	2k / 8k.
<b>Guard Interval</b>	1/4, 1/8, 1/16, 1/32.
<b>Code Rate</b>	1/2, 2/3, 3/4, 5/6, 7/8.
<b>Modulation</b>	QPSK, 16-QAM, 64-QAM.
<b>Bandwidth</b>	6, 7 and 8 MHz.
<b>Spectral inversion</b>	ON, OFF (AUTO).
<b>Hierarchy</b>	Indicates hierarchy mode.
<b>Cell ID</b>	Detected from transmitter station.
<b>TPS signalling</b>	Time slicing, symbol interleaver and MPE-FEC.

**DVB-T2 SIGNAL PARAMETERS**

<b>Carriers</b>	1k, 2k, 4k, 8k, 8k+ EXT, 16k, 16k+ EXT, 32k, 32k+ EXT.
<b>Guard Interval</b>	1/4, 19/256, 1/8, 19/128, 1/16, 1/32, 1/128.
<b>Bandwidth</b>	5, 6, 7 and 8 MHz.
<b>Spectral Inversion</b>	ON, OFF (AUTO).
<b>Pilot Pattern</b>	PP1-PP8.
<b>Code Rate PLP</b>	1/2, 3/5, 2/3, 3/4, 4/5, 5/6.
<b>PLP Constellation</b>	QPSK, 16QAM, 64QAM, 256QAM.
<b>PLP Constellation Rotation</b>	ON / OFF (AUTO).
<b>PLP ID</b>	0-256.
<b>ID CELL</b>	Detected from transmitter station.
<b>Network ID</b>	Detected from transmitter station.
<b>C2 System ID</b>	Detected from transmitter station.

**DVB-C SIGNAL PARAMETERS**

<b>Demodulation</b>	16/32/64/128/256 QAM.
<b>Symbol rate</b>	1800 to 7200 kbauds.
<b>Roll-off (<math>\alpha</math>) factor of Nyquist filter</b>	0.15.
<b>Spectral inversion</b>	ON, OFF (AUTO).

**DVB-C2 SIGNAL PARAMETERS**

<b>Carriers</b>	4k.
<b>Guard Interval</b>	1/64, 1/128.
<b>Bandwidth</b>	6 and 8 MHz.
<b>Spectral Inversion</b>	ON, OFF (AUTO).
<b>Code Rate PLP</b>	2/3, 3/4, 4/5, 5/6, 8/9, 9/10.
<b>PLP Constellation</b>	64QAM, 256QAM, 1kQAM and 4kQAM.
<b>Dslice ID</b>	0-256.
<b>PLP ID</b>	0-256.
<b>ID cell</b>	Detected from transmitter station.
<b>Network ID</b>	Detected from transmitter station.
<b>C2 System ID</b>	Detected from transmitter station.

## DVB-S SIGNAL PARAMETERS

<b>Symbol rate</b>	2 to 45 Mbauds.
<b>Roll-off (<math>\alpha</math>) factor of Nyquist filter</b>	0.35.
<b>Code Rate</b>	1/2, 2/3, 3/4, 5/6, 7/8.
<b>Spectral inversion</b>	ON, OFF (AUTO).

## DVB-S2 SIGNAL PARAMETERS

<b>Symbol rate (QPSK)</b>	2 to 45 MSps.
<b>Symbol rate (8PSK)</b>	2 to 45 MSps.
<b>Roll-off (<math>\alpha</math>) factor of Nyquist filter</b>	0.20, 0.25 and 0.35.
<b>Code Rate (QPSK)</b>	1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10.
<b>Code Rate (8PSK)</b>	3/5, 2/3, 3/4, 5/6, 8/9, 9/10.
<b>Spectral inversion</b>	ON, OFF (AUTO).
<b>Pilots</b>	Presence indication.

## TOOLS

### CONSTELLATION DIAGRAM

<b>Type of signal</b>	DVB-T, DVB-T2, DVB-C, DVB-C2, DVB-S and DVB-S2.
<b>Presentation</b>	I-Q graph.

### ECHOES ANALYSER MODE (DVB-T / DVB-T2 / DVB-C2)

<b>Measurement range</b>	Depends on the standard, carrier and guard interval.
<b>Delay</b>	0.1 $\mu$ s to 224 $\mu$ s. Typical configuration (DVB-T 8K, GI = 1/4).
<b>Distance</b>	0.3 km to 67.2 km. Typical configuration (DVB-T 8K, GI = 1/4).
<b>Power range</b>	0 dBc to -30 dBc. Typical configuration (DVB-T 8K, GI = 1/4).
<b>Time scale</b>	1/3 symbol period.

### DATALOGGER function<sup>1</sup> (Automatic measurement acquisition and storage)

<b>Stored data</b>	Signal type, modulation parameters, all measures available for the detected signal type, and time stamp.
<b>Timestamp</b>	Date and time at each measured channel.

### LTE INGRESS TEST

<b>Type of signal</b>	DVB-T, DVB-T2, DVB-C, DVB-C2.
<b>Presentation</b>	LTE band plus quality parameters for a selected TV channel.

<sup>1</sup> Using NetUpdate4 software application with a Windows PC platform.

**SAT IF TEST Function<sup>2</sup> (IF distribution network response for satellite band)**

**Test frequencies** 3 selectable pilots.

**ATTENUATION TEST Function<sup>3</sup> (Signal distribution network response for terrestrial band)**

**Test frequencies** 3 selectable pilots.

**VIDEO & AUDIO**

<b>Format</b>	MPEG-2 (MP@HL) (Main Profile High Level). MPEG-4 AVC H.264.
<b>Aspect Ratio</b>	16/9 or 4/3.
<b>SI /PSI data</b>	Service list and main PIDs.
<b>HD Video Resolution</b>	1080, 720 and 576, progressive or interlaced.
<b>Audio</b>	MPEG-1, MPEG-2, HE-AAC, Dolby Digital and Dolby Digital Plus.

**ANALOGUE SIGNALS MEASUREMENT**

**LEVEL MEASUREMENT**

<b>Measurement range</b>	
<b>Terrestrial TV &amp; FM bands</b>	15 dBµV to 130 dBµV (3.16 µV to 3.16 V).
<b>Satellite TV band</b>	20 dBµV to 130 dBµV (31.6 µV to 3.16 V).
<b>Attenuation scale</b>	Auto-range.
<b>Numerical indication</b>	Absolute value according to selected units.
<b>Graphical indication</b>	Analogue bar on screen.
<b>Measurement bandwidth</b>	100 kHz.
<b>Audible indicator</b>	Pitch sound. A tone with pitch proportional to signal strength.
<b>Accuracy</b>	
<b>Terrestrial bands</b>	±1.5 dB (25-120 dBµV, 45-1000 MHz) (22 °C ± 5 °C).
<b>Satellite band</b>	±1.5 dB (35-100 dBµV, 950-2050 MHz) (22 °C ± 5 °C).
<b>Out of range indication</b>	<, >.

**RF MEASUREMENTS**

<b>Terrestrial bands</b>	
<b>Analogue channels</b>	Level, Video-Audio ratio, Carrier-Noise ratio.
<b>Digital channels</b>	Channel power, Carrier-Noise ratio.
<b>Satellite band</b>	
<b>Analogue channels</b>	Level and Carrier-Noise ratio.
<b>Digital channels</b>	Channel power and Carrier-Noise ratio.

<sup>2</sup> Function to be used with RP-250 or RP-050 IF multiple pilot generator.

<sup>3</sup> Function to be used with RP-250 or RP-080 multiple pilot generator.

## SPECTRUM ANALYSER MODE

### Measurement range

**Satellite band** 10 dB $\mu$ V to 130 dB $\mu$ V (3.16  $\mu$ V to 3.16 V).

**Terrestrial bands** 10 dB $\mu$ V to 130 dB $\mu$ V (3.16  $\mu$ V to 3.16 V).

**Resolution filter** 100 kHz.

### Measurement bandwidth

**Terrestrial** 100 kHz.

**Satellite** 100 kHz.

### Span

**Terrestrial** Full span (full band) - 500 - 200 - 100 - 50 - 20 - 10 MHz selectable.

**Satellite** Full span (full band) - 500 - 200 - 100 - 50 - 20 - 10 MHz selectable.

**Markers** 1 with frequency and level indication.

**Reference level** 65 dB $\mu$ V to 135 dB $\mu$ V, adjustable in steps of 5 dB.

### Measurements

#### Terrestrial band

**Analogue channels** Level, C/N, V/A.

**Digital channels** Channel power, C/N, MER and BER (according to modulation type).

#### Satellite band

**Analogue channels** Level, C/N.

**Digital channels** Channel power, C/N, MER and BER (according to modulation type).

**Spectrum range** Span, dynamic range and reference level are variable by means of arrow cursors.

## ANALOGUE TV MONITOR DISPLAY

**Monitor** 7 inches TFT. Transmissive colour dot matrix type.

**Aspect ratio** 16:9.

**Dot format** 800 (R,G,B)(W)  $\times$  480(H) dots.

**Brightness** 700 cd/m<sup>2</sup>.

## TV STANDARD

**Colour system** PAL, SECAM and NTSC.

**Standard supported** M, N, B, G, I, D, K and L.

**Sensibility** 40 dB $\mu$ V for a correct synchronism.

**BASE BAND SIGNAL**

**VIDEO**

<b>Codecs Video</b>	DVB: MPEG-2 (MP@HL) (Main Profile High Level). MPEG-4 AVC H.264 (High Profile Level 4.1).
<b>V/A input</b>	Multipole jack (75 Ω).
<b>Sensibility</b>	1 Vpp (75 Ω) positive video.
<b>V/A output</b>	Multipole jack (75 Ω).

**SOUND**

<b>Input</b>	Same V/A multipole jack (75 Ω).
<b>Outputs</b>	Built in speaker, same multipole jack.
<b>Codecs Audio</b>	MPEG-1, MPEG-2, HE-AAC, Dolby Digital and Dolby Digital Plus.
<b>Demodulation</b>	According to the TV standard.
<b>De-emphasis</b>	50 μs, 75 μs (NTSC).
<b>Sound subcarrier</b>	Digital frequency synthesis according to the TV standard.

**USB INTERFACE**

“USB On-the-go” for remote control and file transfer.  
 Mass Storage Host: The equipment can read/write on Flash drives.  
 Serial port emulation.  
 USB CDC: (Communications Device Class).

**EXTERNAL UNIT POWER**

<b>SUPPLY</b>	Through the RF input connector.
<b>Terrestrial</b>	External or 5/12 and 24 V.
<b>Satellite</b>	External or 13/15/18 V (up to 500mA).
<b>22 kHz signal</b>	Selectable in satellite band.
<b>Voltage</b>	0.65 V ± 0.25 V.
<b>Frequency</b>	22 kHz ± 4 kHz.
<b>Maximum power<sup>4</sup></b>	At least 6 W for 13/15/18/24 V and 2.5 W for 5 V.
<b>DiSEqC GENERATOR<sup>5</sup></b>	According to DiSEqC 1.2 standard.

<sup>4</sup> If you select 5V, the maximum power shall not exceed 2.25 W (450 mA).

<sup>5</sup> DiSEqCTM is a trademark of EUTELSAT.

## POWER SUPPLY

<b>Internal Batteries</b>	7.2 V 13 Ah Li-Ion intelligent battery.
<b>Battery Operation Time</b>	> 5 hours in continuous mode (no EXT supply active).
<b>Recharging time</b>	3 hours up to 80% (instrument off).
<b>External Voltage</b>	12 V DC (using only PROMAX supplied accessories).
<b>Consumption</b>	35 W.
<b>Auto power off</b>	Programmable. After the selected amount of minutes without operating on any control. Deactivable.

## OPERATING ENVIRONMENTAL CONDITIONS

<b>Altitude</b>	Up to 2000 m.
<b>Temperature range</b>	From 5 to 45 °C (Automatic disconnection by excess of temperature).
<b>Max. relative humidity</b>	80 % (up to 31°C), decreasing lineally up to 50 % at 40 °C.

## MECHANICAL FEATURES

<b>Dimensions</b>	290 (W) x 185 (H) x 65 (D) mm.
<b>Weight</b>	1.9 kg (Total size: 3.487 cm <sup>3</sup> ).

## INCLUDED ACCESSORIES

<b>1x CC-046</b>	Jack 4V/RCA cable.
<b>1x CC-041</b>	Connection USB Cable On-the-go (A) Male – Mini USB (B) Male.
<b>1x CC-045</b>	USB Cable (A) Female – Mini USB (A) Male.
<b>1x AA-103</b>	Car lighter charger.
<b>1x AL-103</b>	External DC charger.
<b>1x AD-055</b>	"F"/H-BNC/H adapter.
<b>1x AD-056</b>	"F"/H-"DIN"/H adapter.
<b>1x AD-057</b>	"F"/H-"F"/H adapter.
<b>1x CA-005</b>	Mains cord.
<b>1x CB-083</b>	Rechargeable Li+ battery 7,2 V 13 Ah.
<b>1x DC-300</b>	Transport belt.
<b>1x DC-302</b>	Carrying bag.
<b>1x DC-230</b>	Transport suitcase.
<b>1x DG0094</b>	Quick Reference Guide.

## RECOMMENDATIONS ABOUT THE PACKING

It is recommended to keep all the packing material in order to return the equipment, if necessary, to the Technical Service.

## 9.2 Specifications *HD RANGER*

### CONFIGURATION FOR MEASURING LEVEL AND POWER

<b>TUNING RANGE</b>	Digital frequency synthesis. Continuous tuning from 5 to 1000 MHz and from 950 to 2150 MHz (terrestrial and satellite respectively).
<b>Tuning modes</b>	Channel or frequency (IF or downlink at satellite band). Channel set configurable on demand.
<b>Resolution</b>	10 kHz.

### RF INPUT

<b>Impedance</b>	75 $\Omega$ .
<b>Maximum signal</b>	130 dB $\mu$ V.
<b>Maximum input voltage</b>	
<b>DC to 100 Hz</b>	50 V rms (powered by the AL-103 power charger). 30 V rms (not powered by the AL-103 power charger).
<b>5 MHz to 2150 MHz</b>	140 dB $\mu$ V. (protected at least for 30 seconds).

### DIGITAL SIGNALS MEASUREMENT

<b>TERRESTRIAL TUNING RANGE</b>	From 45 to 1000 MHz.
<b>SATELLITE TUNING RANGE</b>	From 950 to 2150 MHz.

#### MARGIN OF POWER MEASUREMENT

<b>COFDM</b>	From 35 dB $\mu$ V to 100 dB $\mu$ V.
<b>QAM</b>	From 45 dB $\mu$ V to 110 dB $\mu$ V.
<b>QPSK/8PSK</b>	From 44 dB $\mu$ V to 114 dB $\mu$ V.

## MEASUREMENTS

<b>DVB-T (COFDM)</b>	Power, CBER, VBER, MER.
<b>Presentation</b>	Numeric and level bar.
<b>DVB-C (QAM)</b>	Power, BER, MER, C/N and Link margin.
<b>Presentation</b>	Numeric and level bar.
<b>DVB-S (QPSK)</b>	Power, CBER, VBER, MER (up to 30 dB), C/N and Link margin.
<b>Presentation</b>	Numeric and level bar.
<b>DVB-S2 (QPSK/8PSK)</b>	Power, CBER, LBER, MER (up to 30 dB), C/N, BCH ESR, Wrong Packets and Link Margin.
<b>Presentation</b>	Numeric and level bar.

## DVB-T SIGNAL PARAMETERS

<b>Carriers</b>	2k / 8k.
<b>Guard Interval</b>	1/4, 1/8, 1/16, 1/32.
<b>Code Rate</b>	1/2, 2/3, 3/4, 5/6, 7/8.
<b>Modulation</b>	QPSK, 16-QAM, 64-QAM.
<b>Bandwidth</b>	6, 7 and 8 MHz.
<b>Spectral inversion</b>	ON, OFF (AUTO).
<b>Hierarchy</b>	Indicates hierarchy mode.
<b>Cell ID</b>	Detected from transmitter station.
<b>TPS signalling</b>	Time slicing, symbol interleaver and MPE-FEC.

## DVB-C SIGNAL PARAMETERS

<b>Demodulation</b>	16/32/64/128/256 QAM.
<b>Symbol rate</b>	1800 to 7200 kbauds.
<b>Roll-off (<math>\alpha</math>) factor of Nyquist filter</b>	0.15.
<b>Spectral inversion</b>	ON, OFF.

## DVB-S SIGNAL PARAMETERS

<b>Symbol rate</b>	2 to 45 Mbauds.
<b>Roll-off (<math>\alpha</math>) factor of Nyquist filter</b>	0.35.
<b>Code Rate</b>	1/2, 2/3, 3/4, 5/6, 7/8.
<b>Spectral inversion</b>	ON, OFF (AUTO).

**DVB-S2 SIGNAL PARAMETERS**

<b>Symbol rate (QPSK)</b>	2 to 45 MSps.
<b>Symbol rate (8PSK)</b>	2 to 45 MSps.
<b>Roll-off (<math>\alpha</math>) factor of Nyquist filter</b>	0.20, 0.25 and 0.35.
<b>Code Rate (QPSK)</b>	1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10.
<b>Code Rate (8PSK)</b>	3/5, 2/3, 3/4, 5/6, 8/9, 9/10.
<b>Spectral inversion</b>	ON, OFF (AUTO).
<b>Pilots</b>	Presence indication.

**TOOLS**

**DATALOGGER function<sup>1</sup> (Automatic measurement acquisition and storage)**

<b>Stored data</b>	Signal type, modulation parameters, all measures available for the detected signal type, and time stamp.
<b>Timestamp</b>	Date and time at each measured channel.

**SAT IF TEST Function<sup>2</sup> (IF distribution network response for satellite band)**

<b>Test frequencies</b>	3 selectable pilots.
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**ATTENUATION TEST Function<sup>3</sup> (Signal distribution network response for terrestrial band)**

<b>Test frequencies</b>	3 selectable pilots.
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**VIDEO & AUDIO**

<b>Format</b>	MPEG-2 (MP@HL) (Main Profile High Level). MPEG-4 AVC H.264.
<b>Aspect Ratio</b>	16/9 or 4/3.
<b>SI/PSI data</b>	Service list and main PIDs.
<b>HD Video Resolution</b>	1080, 720 and 576, progressive or interlaced.
<b>Audio</b>	MPEG-1, MPEG-2, HE-AAC.

<sup>1</sup> Using NetUpdate4 software application with a Windows PC platform.  
<sup>2</sup> Function to be used with RP-250 or RP-050 IF multiple pilot generator.  
<sup>3</sup> Function to be used with RP-250 or RP-080 multiple pilot generator.

## ANALOGUE SIGNALS MEASUREMENT

### LEVEL MEASUREMENT

#### Measurement range

**Terrestrial TV & FM bands** 15 dB $\mu$ V to 130 dB $\mu$ V (3.16  $\mu$ V to 3.16 V).

**Satellite TV band** 20 dB $\mu$ V to 130 dB $\mu$ V (31.6  $\mu$ V to 3.16 V).

#### Attenuation scale

Auto-range.

#### Numerical indication

Absolute value according to selected units.

#### Graphical indication

Analogue bar on screen.

#### Measurement bandwidth

100 kHz.

#### Audible indicator

Pitch sound. A tone with pitch proportional to signal strength.

#### Accuracy

**Terrestrial band**  $\pm 1.5$  dB (25-120 dB $\mu$ V, 45-1000 MHz) (22 °C  $\pm$  5 °C).

**Satellite band**  $\pm 1.5$  dB (35-100 dB $\mu$ V, 950-2050 MHz) (22 °C  $\pm$  5 °C).

#### Out of range indication

<, >.

### RF MEASUREMENTS

#### Terrestrial bands

**Analogue channels** Level, Video-Audio ratio, Carrier-Noise ratio.

**Digital channels** Channel power, Carrier-Noise ratio.

#### Satellite band

**Analogue channels** Level and Carrier-Noise ratio.

**Digital channels** Channel power and Carrier-Noise ratio.

## SPECTRUM ANALYSER MODE

### Measurement range

**Satellite band** 10 dB $\mu$ V to 130 dB $\mu$ V (3.16  $\mu$ V to 3.16 V).

**Terrestrial bands** 10 dB $\mu$ V to 130 dB $\mu$ V (3.16  $\mu$ V to 3.16 V).

**Resolution filter** 100 kHz.

### Measurement bandwidth

**Terrestrial** 100 kHz.

**Satellite** 100 kHz.

### Span

**Terrestrial** Full span (full band) - 500 - 200 - 100 - 50 - 20 - 10 MHz selectable.

**Satellite** Full span (full band) - 500 - 200 - 100 - 50 - 20 - 10 MHz selectable.

**Markers** 1 with frequency and level indication.

**Reference level** 65 dB $\mu$ V to 135 dB $\mu$ V, adjustable in steps of 5 dB.

### Measurements

#### Terrestrial band

**Analogue channels** Level, C/N, V/A.

**Digital channels** Channel power, C/N, MER and BER (according to modulation type).

#### Satellite band

**Analogue channels** Level, C/N.

**Digital channels** Channel power, C/N, MER and BER (according to modulation type).

**Spectrum range** Span, dynamic range and reference level are variable by means of arrow cursors.

## ANALOGUE TV MONITOR DISPLAY

**Monitor** 7 inches TFT. Transmissive colour dot matrix type.

**Aspect ratio** 16:9.

**Dot format** 800  $\times$  (R,G,B) (W)  $\times$  480(H) dots.

**Brightness** 700 cd/m<sup>2</sup>.

## TV STANDARD

**Colour system** PAL, SECAM and NTSC.

**Standard supported** M, N, B, G, I, D, K and L.

**Sensibility** 40 dB $\mu$ V for a correct synchronism.

## BASE BAND SIGNAL

### VIDEO

<b>Codecs Video</b>	DVB: MPEG-2 (MP@HL) (Main Profile High Level). MPEG-4 AVC H.264 (High Profile Level 4.1).
<b>V/A input</b>	Multipole jack (75 $\Omega$ ).
<b>Sensibility</b>	1 Vpp (75 $\Omega$ ) positive video.
<b>V/A output</b>	Multipole jack (75 $\Omega$ ).

### SOUND

<b>Input</b>	Same V/A multipole jack (75 $\Omega$ ).
<b>Outputs</b>	Built in speaker, same multipole jack.
<b>Codecs Audio</b>	MPEG-1, MPEG-2, HE-AAC.
<b>Demodulation</b>	According to the TV standard.
<b>De-emphasis</b>	50 $\mu$ s, 75 $\mu$ s (NTSC).
<b>Sound subcarrier</b>	Digital frequency synthesis according to the TV standard.

## USB INTERFACE

"USB On-the-go" for remote control and file transfer.

Mass Storage Host: The equipment can read/write on Flash drives.

Serial port emulation.

USB CDC: (Communications Device Class).

## EXTERNAL UNIT POWER

<b>SUPPLY</b>	Through the RF input connector.
<b>Terrestrial</b>	External or 5/12 and 24 V.
<b>Satellite</b>	External 13/15/18 V (up to 500mA).
<b>22 kHz signal</b>	Selectable in satellite band.
<b>Voltage</b>	0.65 V $\pm$ 0.25 V.
<b>Frequency</b>	22 kHz $\pm$ 4 kHz.
<b>Maximum power<sup>4</sup></b>	At least 6 W for 13/15/18/24 V and 2.5 W for 5 V.
<b>DiSEqC GENERATOR<sup>5</sup></b>	According to DiSEqC 1.2 standard.

<sup>4</sup> If you select 5V, the maximum power shall not exceed 2.25 W (450 mA).

<sup>5</sup> DiSEqCTM is a trademark of EUTELSAT.

## POWER SUPPLY

<b>Internal Batteries</b>	7.2 V 13 Ah Li-Ion intelligent battery.
<b>Battery Operation Time</b>	> 5 hours in continuous mode (no EXT supply active).
<b>Recharging time</b>	3 hours up to 80% (instrument off).
<b>External Voltage</b>	12 V DC (using only PROMAX supplied accessories).
<b>Consumption</b>	35 W.
<b>Auto power off</b>	Programmable. After the selected amount of minutes without operating on any control. Deactivable.

## OPERATING ENVIRONMENTAL CONDITIONS

<b>Altitude</b>	Up to 2000 m.
<b>Temperature range</b>	From 5 to 45 °C (Automatic disconnection by excess of temperature).
<b>Max. relative humidity</b>	80 % (up to 31°C), decreasing lineally up to 50% at 40 °C.

## MECHANICAL FEATURES

<b>Dimensions</b>	290 (W) x 185 (H) x 65 (D) mm.
<b>Weight</b>	1.9 kg (Total size: 3.487 cm <sup>3</sup> ).

## INCLUDED ACCESSORIES

<b>1x CC-046</b>	Jack 4V/RCA cable.
<b>1x CC-041</b>	Connection USB Cable On-the-go (A) Male – Mini USB (B) Male.
<b>1x CC-045</b>	USB Cable (A) Female – Mini USB (A) Male.
<b>1x AA-103</b>	Car lighter charger.
<b>1x AL-103</b>	External DC charger.
<b>1x AD-055</b>	"F"/H-BNC/H adapter.
<b>1x AD-056</b>	"F"/H-"DIN"/H adapter.
<b>1x AD-057</b>	"F"/H-"F"/H adapter.
<b>1x CA-005</b>	Mains cord.
<b>1x CB-083</b>	Rechargeable Li+ battery 7,2 V 13 Ah.
<b>1x DC-300</b>	Transport belt.
<b>1x DC-301</b>	Carrying bag.
<b>1x DG0094</b>	Quick Reference Guide.

## OPTIONAL ACCESSORIES

<b>1x DC-230</b>	Transport suitcase.
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## RECOMMENDATIONS ABOUT THE PACKING

It is recommended to keep all the packing material in order to return the equipment, if necessary, to the Technical Service.

## 10 MAINTENANCE

### 10.1 Considerations about the Screen

This paragraph offers key considerations regarding the use of the colour screen, taken from the specifications of the manufacturer.

In the TFT display, the user may find pixels that do not light up or pixels that are permanently lit. This should not be regarded as a defect in the TFT. In accordance with the manufacturer quality standard, 9 pixels with these characteristics are considered admissible.

Pixels which are not detected when the distance from the surface of the TFT screen to the human eye is greater than 35 cm, with a viewing angle of 90° between the eye and the screen should not be considered manufacturing defects either.

It is advisable a viewing angle of 15° in the 6.00 o'clock direction in order to obtain the optimum visualization of the screen.

### 10.2 Cleaning Recommendations

The equipment consists of a plastic case and a TFT screen. Each element has its specific cleaning treatment.

#### ■ Cleaning the TFT screen

The TFT screen surface is VERY DELICATE. It has to be cleaned with a soft fabric cloth (cotton or silk), always making the same move from left to right and from top to bottom, without putting pressure on the screen.

The TFT screen has to be dry-cleaned or with a product specifically designed for TFT screens, by slightly dampening the cloth. NEVER use tap or mineral water, alcohol or conventional cleaning products, because they contain components that can damage the screen.

Turn off the equipment to locate dirt on the screen. After cleaning, wait a few seconds before turning on.

- **Cleaning the plastic case**

The equipment has to be disconnected before cleaning the case.

The case must be cleaned with a solution of neutral soap and water, using a soft cloth dampened with this solution.

Before use, the equipment has to be completely dry.

Never clean with abrasive soaps, chlorinated solvents or aromatic hydrocarbons. These products may degrade the case.



## ANNEX 1 SIGNALS DESCRIPTION

### A1.1 DIGITAL signals

#### A1.1.1 Digital TERRESTRIAL Television FIRST Generation (DVB-T standard/COFDM modulation)

##### DVB-T Parameters

▶ **Channel Bandwidth**

This parameter affects the frequency separation of the carriers. Its value is 6 MHz, 7 MHz or 8 MHz.

▶ **Spectral inversion**

It detects if the input signal has been inverted.

▶ **FFT Mode**

It defines the number of modulation carriers between values 2k, 4k and 8k.

▶ **Guard Interval**

This parameter is the dead time between symbols; its purpose is to detect problems due to multipath echoes. This parameter is expressed in terms of the symbol duration: 1/4, 1/8, 1/16, 1/32.

▶ **Constellation**

Modulation used by the carriers. It also defines the noise immunity of the system (QPSK, 16-QAM and 64-QAM).

▶ **Code rate**

Also known as Viterbi ratio. It defines the ratio between the number of data bits and the total number of bits transmitted (the difference corresponds to the number of control bits for the detection and recovery of errors).

▶ **TS Hierarchy**

The DVB-T standard gives the possibility of TDT transmissions with hierarchical levels, that is, the simultaneous transmission of the same program with different image qualities and levels of protection to different noises, so the receiver can switch to a signal of lesser quality when reception conditions are not optimal.

## DVB-T Measurements

- **Power**  
Measured power over the entire bandwidth of the channel.
- **C/N**  
Carrier/Noise ratio, where C is the received power of the modulated carrier signal and N is the received noise power. To measure it correctly the channel should be tuned at its centre frequency.
- **MER**  
Modulation error ratio with link margin (LM). The link margin indicates the safety margin respect to the MER level, measured for the degradation of the signal up to the QEF (Quasi Error Free) value. MER represents the ratio between the average power of the DVB signal and the average noise power of the signal constellation.
- **BER (VBER/CBER)**  
It is the system error rate. In a system of digital terrestrial signal reception, after the COFDM decoder two methods of error correction are applied. Each time an error correction is applied on the digital signal, the error rate changes, so if the error rate is measured at the demodulator output or after Viterbi or at the Reed-Solomon decoder output, different error rates are obtained.
- **CBER**  
BER measurement for digital signal before the error correction (BER before FEC).
- **VBER**  
BER measurement for digital signal after error correction (BER after Viterbi).

In order to have a reference about the image quality, it is considered that a system has good quality when it produces less than one un correctable error per hour of transmission. This border is called QEF (Quasi-English Error-Free,) and corresponds to one error rate after Viterbi equal to  $2 \times 10^{-4}$ , or 2 bit errors per 10.000.

This value is marked on the BER measurement bar after Viterbi. This the BER for acceptable signals should be to the left of this mark.

## A1.1.2

**Digital TERRESTRIAL Television SECOND Generation  
(DVB-T2 standard/COFDM modulation)****DVB-T2 Parameters****▶ Channel Bandwidth**

This parameter affects the frequency separation of the carriers. Its value is 6 MHz, 7 MHz or 8 MHz.

**▶ Spectral inversion**

It detects if the input signal has been inverted.

**▶ FFT Mode**

It defines the number of modulation carriers between values 1k, 2k, 4k, 8k, 8k + EXT, 16k, 16k + EXT, 32k, 32k + EXT.

**▶ Pilot Pattern**

There are several pilot patterns available from PP1 to PP8, which offer different features depending on the type of channel. Each pattern supports time and frequency variations up to the Nyquist limit. Limits depend on certain characteristics such as the receiver operation, if the interpolation is in frequency and time or just in time, and so on.

**▶ Guard Interval**

This parameter is the dead time between symbols; its purpose is to detect problems due to multipath echoes. This parameter is expressed in terms of the symbol duration: 1/4, 19/256, 1/8, 19/128, 1/16, 1/32, 1/128.

**▶ Constellation**

COFDM modulation with constellations QPSK, 16QAM, 64QAM, 256QAM.

**▶ Constellation rotation**

It detects if the constellation is rotated (ON) or not (OFF).

**▶ Code rate**

It defines the ratio between the number of data bits and the total number of bits transmitted (the difference corresponds to the number of control bits for the detection and recovery of errors).

**▶ PLP id**

It is the PLP identifier. In the case of PLP Single mode identifies the input stream (0-255). In the case of PLP Multiple mode clients can choose the PLP ID to view.

## DVB-T2 Measurements

### ■ Power

Measured power over the entire bandwidth of the channel.

### ■ C/N

(Carrier/Noise) where C is the received power of the modulated carrier signal and N is the noise power received. To measure it correctly the channel should be tuned at its centre frequency.

### ■ PLP id

It is the PLP identifier. In the case of PLP Single mode identifies the input stream (0-255). In the case of PLP Multiple mode clients can choose the PLP ID to view.

### ■ MER

Modulation Error ratio with indication of Link Margin (LM). The link margin indicates the safety margin respect to the MER level, measured for the degradation of the signal up to the QEF (Quasi Error Free) value. MER represents the ratio between the average power of the DVB signal and the average noise power of the signal constellation.

### ■ BER (CBER/LBER)

It is the bit error rate. There are two measurements related to BER:

#### ■ **CBER** (Channel Bit Error Rate):

BER of the signal after the COFDM demodulator and before applying the error correction or FEC (Forward Error Correction).

#### ■ **LBER** (LDPC Bit Error Rate):

BER after been applied the LDPC (Low-density parity-check) error correction.

In a digital signal reception (DVB-T2), after the COFDM decoder two methods of error correction are applied. DVB-T2 uses two codes to correct errors that are the LDPC (Low Density Parity Check) combined with the BCH (Bose-Chaudhuri - Hocquengham) to protect against high levels of signal noise and interferences. Next to the measurement LBER is shown the number of iterations LDPC, that is, the number of times the LDPC error correction decoder has to pass through the signal and the ESR (Error Second Ratio) after 20 seconds of the BCH decoder. This measure indicates the percentage of time with errors after the BCH. Error correction is internal with BCH and external with LDPC. The internal gives basic error correction with minimum load while the external gives error correction with a correction additional charge.

A1.1.3

**Digital SATELLITE Television FIRST Generation  
(DVB-S standard/QPSK modulation)****DVB-S Parameters**

- ▶ **Channel Bandwidth**  
It displays the channel bandwidth from 1.3 MHz to 60.75 MHz.
- ▶ **Spectral inversion**  
It detects if the input signal has been inverted.
- ▶ **Symbol Rate**  
It represents the number of times that the signal status changes in a period of time. The bandwidth is related to this parameter.
- ▶ **Roll-Off Factor**  
Roll-off factor of Nyquist filter. It indicates the excess of bandwidth over the ideal bandwidth
- ▶ **Constellation**  
QPSK modulation for constellations with DVB-S signals.
- ▶ **Code rate**  
Also known as Viterbi ratio. It defines the ratio between the number of data bits and the total number of bits transmitted (the difference corresponds to the number of control bits for the error detection and recovery). This value should be between 1/2, 2/3, 3/4, 5/6 and 7/8.

## DVB-S Measurements

- **Power**  
Measured power over the entire bandwidth of the channel.
- **C/N**  
Carrier/Noise ratio where C is the received power of the modulated carrier signal and N is the noise power received. To measure it correctly the channel should be tuned at its centre frequency.
- **MER**  
Modulation Error ratio with indication of Link Margin (LM). The link margin indicates the safety margin respect to the MER level, measured for the degradation of the signal up to the QEF (Quasi Error Free) value. MER represents the ratio between the average power of the DVB signal and the average noise power of the signal constellation.
- **BER (CBER/VBER)**  
It is the error rate. There are two measurements related to BER:
  - **CBER** (Channel Bit Error Rate):  
BER of the signal after the COFDM demodulator and before applying the error correction or FEC (Forward Error Correction).
  - **VBER** (Viterbi Bit Error Rate):  
Measurement of the BER for the digital signal after error correction (BER after Viterbi).

In a system for receiving digital satellite signals (DVB-S) after the QPSK decoder two methods of error correction are applied. Each time an error correction is applied on a digital signal its error rate changes, so if we measure the error rate at the output of the QPSK demodulator or after Viterbi or after the Reed-Solomon output decoder, the error rates obtained are different.

## A1.1.4

**Digital SATELLITE television signal of SECOND generation  
(DVB-S2 standard/QPSK/8PSK modulation)****DVB-S2 Parameters**

- ▶ **Channel Bandwidth**  
It displays the channel bandwidth from 1.3 MHz to 60.75 MHz.
- ▶ **Spectral inversion**  
It detects if the input signal has been inverted.
- ▶ **Symbol Rate**  
It represents the number of times the signal status changes in a period of time. The bandwidth is related to this parameter.
- ▶ **Roll-Off Factor**  
Roll-off factor of Nyquist filter. It indicates the excess of bandwidth over the ideal bandwidth.
- ▶ **Constellation**  
QPSK or 8PSK modulation for DVB-S2 signal constellation.
- ▶ **Code rate**  
It defines the ratio between the number of data bits and the total number of bits transmitted (the difference corresponds to the number of control bits for the error detection and recovery).
- ▶ **PLP id**  
It is the PLP identifier. In the case of PLP Single mode identifies the input stream (0-255). In the case of PLP Multiple mode clients can choose the PLP ID to view.

**DVB-S2 Measurements**

- **Power**  
Measured power over the entire bandwidth of the channel.
- **C/N**  
Carrier/Noise ratio where C is the received power of the modulated carrier signal and N is the noise power received. To measure it correctly the channel should be tuned at its centre frequency.

■ **MER**

Modulation Error ratio. MER represents the ratio between the average power of the DVB signal and the average noise power of the signal constellation.

Next to the MER appears the Link Margin (LM) measurement. The LM is equivalent to the noise margin (NM) and indicates the distance to the QEF (usually defined as a one lost packet per hour). The LM is measured in dB and its value corresponds to the safety margin that separates from the QEF. The greater is the LM better the quality signal. LM of negative values implies no reception or that video errors are starting to appear in the video or audio so clear. LM of 0 (zero) value will display a service and occasionally some artefact.

■ **BER (CBER/LBER)**

It is the bit error rate. There are two measurements related to BER:

■ **CBER** (Channel Bit Error Rate):

BER of the signal after the QPSK/8PSK demodulator and before applying the error correction or FEC (Forward Error Correction).

■ **LBER** (LDPC Bit Error Rate):

BER after applying LDPC error correction (Low-density parity-check).

This standard makes use of two codes to correct errors that are the LDPC (Low Density Parity Check) codes combined with BCH (Bose-Chaudhuri - Hocquengham) to protect against high levels of signal noise and interference. Each time you apply an error correction to the digital signal, the error rate changes, so if we measure the error rate at the output of the QPSK/8PSK demodulator or after LDPC (Low Density Parity Check) decoder or at the BCH decoder output, error rates obtained are different.

Next to the LBER measure appears ESR (Error Second Ratio). This measures indicates the percentage of time with errors after BCH. The error correction is internal with BCH or external with LDPC. The internal error correction provides basic minimum load while the outer error correction is an additional correction with load. It also measures the PER, which is the number of erroneous packets, that is packets received during the measurement time not correctable by the demodulator.

A1.1.5

**Digital CABLE television signal of FIRST generation  
(DVB-C standard/QAM modulation)**

**DVB-C Parameters**

- ▶ **Bandwidth channel**  
It displays the channel bandwidth up to 9.2 MHz.
- ▶ **Spectral inversion**  
It detects if the input signal has been inverted.
- ▶ **Symbol Rate**  
It represents the number of times the signal status changes in a period of time. The bandwidth is related to this parameter.
- ▶ **Roll-Off Factor**  
Roll-off factor of Nyquist filter. It indicates the bandwidth excess over the ideal bandwidth.
- ▶ **Constellation**  
Modulation used by the carriers. It also defines immunity to the system noise (16QAM, 32QAM, 64QAM, 128QAM and 256QAM).

## DVB-C Measurements

- **Power**  
Measured power over the entire bandwidth of the channel.
- **C/N**  
Carrier/Noise ratio where C is the received power of the modulated carrier signal and N is the noise power received. To measure it correctly the channel should be tuned at its centre frequency.
- **MER**  
Modulation Error ratio with indication of Link Margin(LM).The link margin indicates the safety margin respect to the MER level , measured for the degradation of the signal up to the QEF (Quasi Error Free) value. MER represents the ratio between the average power of the DVB signal and the average noise power of the signal constellation.
- **BER (CBER)**  
It is the system error rate. In a digital signal reception via cable, after the QAM demodulator an error correction method is applied, called Reed-Solomon. The error rate after correction is less than the error rate at the output of the QAM demodulator. For this reason the BER is given prior to error correction.
- **CBER**  
BER measurement for digital signal before the error correction (BER before FEC)

A1.1.6

**Digital CABLE television signal of SECOND generation  
(DVB-C2 standard/COFDM modulation)****DVB-C2 Parameters**

- ▶ **Channel Bandwidth**  
It is the channel bandwidth between 6 MHz, 7 MHz and 8 MHz.
- ▶ **Spectral inversion**  
It detects if the input signal has been inverted.
- ▶ **Guard Interval**  
It corresponds to the dead time between symbols; its purpose is to detect echoes due to multi-paths. This parameter is expressed in terms of the symbol duration: 1/64 or 1/128.
- ▶ **Constellation**  
COFDM modulation with constellations QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM. The constellation refers to all the selected PLP data.
- ▶ **Code rate**  
It defines the ratio between the number of data bits and the total number of bits transmitted (the difference corresponds to the number of control bits for the error detection and recovery): 2/3, 3/4, 4/5, 5/6, 8/9, 9/10.
- ▶ **DSLICE id**  
DSLICE identifier. A DSLICE is a data packet containing a group of several PLPs.
- ▶ **PLP id**  
PLP (Physical Layer Pipes) identifier. Layers are used by the system to transmit compressed data such audio, video and more.

## DVB-C2 Measurements

- **Power**  
Measured power over the entire bandwidth of the channel.
- **C/N**  
Carrier/Noise ratio where C is the received power of the modulated carrier signal and N is the noise power received. To measure it correctly the channel should be tuned at its centre frequency.
- **MER**  
Modulation Error ratio with indication of Link Margin(LM).The link margin indicates the safety margin respect to the MER level , measured for the degradation of the signal up to the QEF (Quasi Error Free) value. MER represents the ratio between the average power of the DVB signal and the average noise power of the signal constellation.
- **BER (CBER/LBER)**  
System error rate. In DVB-C2 makes use of two codes to correct errors that are the LDPC (Low Density Parity Check) codes combined with BCH (Bose - Chaudhuri - Hocquengham) to protect against high levels of signal noise and interferences. On screen, under LBER measurement the number of iterations LDPC is shown, that is, the number of times the LDPC decoder for error correction has to pass through the signal and the ESR (Error Second Ratio) that indicates the percentage of time with errors after the BCH. Error correction is internal with BCH or external with LDPC. The internal error correction provides basic minimum load while the outer error correction is a correction with additional load. Also the PER measurement is displayed, which is the number of erroneous packets, that is, packets received during the measurement time and not correctable by the demodulator.
- **CBER (Channel Bit Error Rate)**  
BER of the signal after passing through the COFDM demodulator and before applying the error correction or FEC (Forward Error Correction).
- **LBER (LDPC Bit Error Rate)**  
BER of the signal after applying the correction errors LDPC (Low-density parity-check).

## A1.2 ANALOGUE signals

### A1.2.1 Terrestrial band

#### Analogue TV

In the measurement of analogue signals in terrestrial band, measurements available are:

- ▶ **LEVEL**  
Indication of the carrier level of the tuned video.
  
- ▶ **C/N**  
Ratio between the modulated signal power and noise power for the same bandwidth (depending on TV standard). The modulation error ratio (MER), used in digital systems is analogue to the Signal-Noise (S/N) ratio in analogue systems. The Carrier level is measured by a quasi-peak detector (100 kHz BW). The noise level is measured with an average detector and corrected to refer it to the bandwidth equivalent to channel noise (according to its definition for the TV selected standard).
  
- ▶ **Video/Audio**  
Ratio between levels of the video carrier to audio carrier.

#### Analogue FM

In the analogue FM measurement mode signal, the display acts as an analogue indicator of signal representing the signal at the input. The equipment also demodulates the FM carrier (radio) and can be listened through the speaker.

**A1.2.2** **Satellite band****Analogue TV**

In the measurement mode of analogue signals in the satellite band, measures available are:

- ▶ **Level**  
Measurement of the tuned carrier level.
  
- ▶ **C/N**  
Ratio between the modulated signal power and noise power equivalent to the same bandwidth (as TV standard).The modulation error ratio (MER), used in digital systems is analogue to the Signal-Noise (S/N) ratio in analogue systems. The carrier level is measured by a quasi-peak detector (4 MHz BW).The noise level is measured with an average value detector (230 kHz) and corrected to refer it to the channel bandwidth.

## ANNEX 2 HOW TO POINT A DISH ANTENNA

### A2.1 INSTALLING A SATELLITE DISH USING HD RANGER/+

#### A2.1.1 A bit of history

That's it, a bit of history. First artificial satellite "Sputnik I" was launched 4th of October of 1957 by former Soviet Union. It was about the size of a basketball with a weight below 100 Kgrs but went down in history as the start point for the space age. For three weeks it was transmitting radio signals to the excited scientist on the ground that were gathering fundamental data for the launches to come.

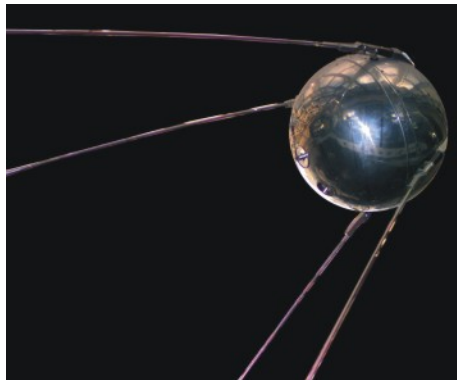


Figure A2.1.

The first telecommunications satellite was Telstar 1 launched in 1962. Some people refers to Echo 1 as the World's first in 1960 but it was a passive signal reflector as opposite to Telstar that carried electronics on board like today's satellites. It was also the first to use the modern transponder concept where the satellite "transposes" the up-link frequency (6,390 GHz in Telstar) to another down-link frequency (4,170 GHz in this case). Telstar 1 trans-mitter power was 3 Watts and the antenna was omnidirectional.



Figure A2.2.

The antenna used to receive the test transmission from Telstar 1 was a huge horn inside a bubble radome 48 metres high. Only four decades later we have broken all records and we have high power DBS geostationary satellites carrying a lot of digital transponders on board and we start to worry about space junk having thousands of satellites in orbit, plenty of them beyond its useful life. Satellites use highly efficient directional antennas and very high transmitters power, digital transponders, meaning in plain words that we can receive hundreds of TV channels with a small, fix, cheap, 60 cm dish.



Figure A2.3.

Modern broadcast satellites use geostationary orbits. This simply means that they could be seen from the ground hanging in the sky at the same exact position all the time and therefore receiving signals from them does not require complex steering systems. A piece of cake.

All we need to do to receive their signals with the enormous amount of programs they carry is to set up the satellite receiving antenna properly and to ensure that the signals are received with the proper quality levels...and here is where the **HD RANGER/+** comes into action.

#### A2.1.2 The basics

A professional installer will instantly tell us from the top of his head what to have in the to-do-list if we want to install a satellite dish properly. Surely the list will require us to select the proper mount kit and dish size from the numerous options available in the market, pick a good location for the dish, free of obstacles to the south (in the north hemisphere) or to the north (in the south hemisphere), etc.

Other than the mechanical bits and pieces the dish is made of two clearly differentiated parts, the reflector and the LNB.

The reflector is passive and simply reflects signals from the satellite in such a way that the beam is collimated to the LNB's mounting point.

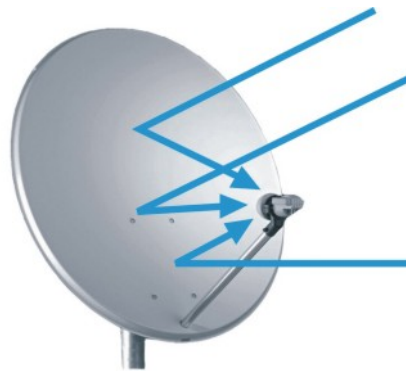


Figure A2.4.

The LNB (Low Noise Block-converter) is an active device fruit of the great evolution of RF circuit manufacturing and includes amplifiers, oscillators and frequency converters in a small low cost package. The first section is made of a device called *polarisation shifter* that receives one polarisation or the other depending on the supply voltage given to the LNB. This voltage is necessary to supply the active devices inside the LNB.

Signals broadcast from the satellites use two polarisations simultaneously. These can be LINEAR VERTICAL/HORIZONTAL or CIRCULAR LEFT/RIGHT depending on the type of transmitting antenna used in the satellite. The transponder frequencies for each polarisation are carefully selected to avoid interference to the other polarisation commonly referred to as the crossed polarisation. In general they are imbricate or in other words frequencies used in one polarisation are free in the crossed polarisation and viceversa.

	13 VDC	VERTICAL	CIRCULAR RIGHT
	18 VDC	HORIZONTAL	CIRCULAR LEFT

Modern universal LNB's use mostly linear polarisation and have also the capability to select a different input frequency range depending on a control signal called 22 kHz switching tone which is overlapped with the supply voltage.

SUPPLY VOLTAGE	POLARISATION	BAND
13 VDC	VERTICAL	LOW
18 VDC	HORIZONTAL	LOW
13 VDC + 22 kHz	VERTICAL	HIGH
18 VDC + 22 kHz	HORIZONTAL	HIGH

In other words our LNB will output a different set of satellite transponders depending on which supply voltage we use.



With this information in hand we can calculate the elevation and azimuth we should put on the dish to begin our coarse antenna alignment. There are formulas to do that but some websites are again quite useful. There are also free mobile applications, as Dish Aligner, which calculates the elevation and azimuth and also your current location determined by the GPS of the mobile phone. This one is especially interesting for you can select the satellite you want and then position yourself on a graphical map:

<http://science.nasa.gov/realtime/jtrack/3d/JTrack3D.html/>

For example if we take ASTRA (19E position) and select a location somewhere in Germany:

- Latitude: 50 degrees North
- Longitude: 12 degrees East

The required elevation and azimuth for the dish are:

- Azimuth: 170 degrees
- Elevation: 31 degrees

Elevation must be measured from the horizontal level (may be using an inclinometer) and azimuth from magnetic north (with a compass) there are some applications for smartphones, as mentioned above, that include compass and inclinometer, although it should be noted that the measurements made by mobile phone may be affected by interferences from the antenna itself. It is normally more practical to start with azimuth moving the dish horizontally and then look for the elevation.

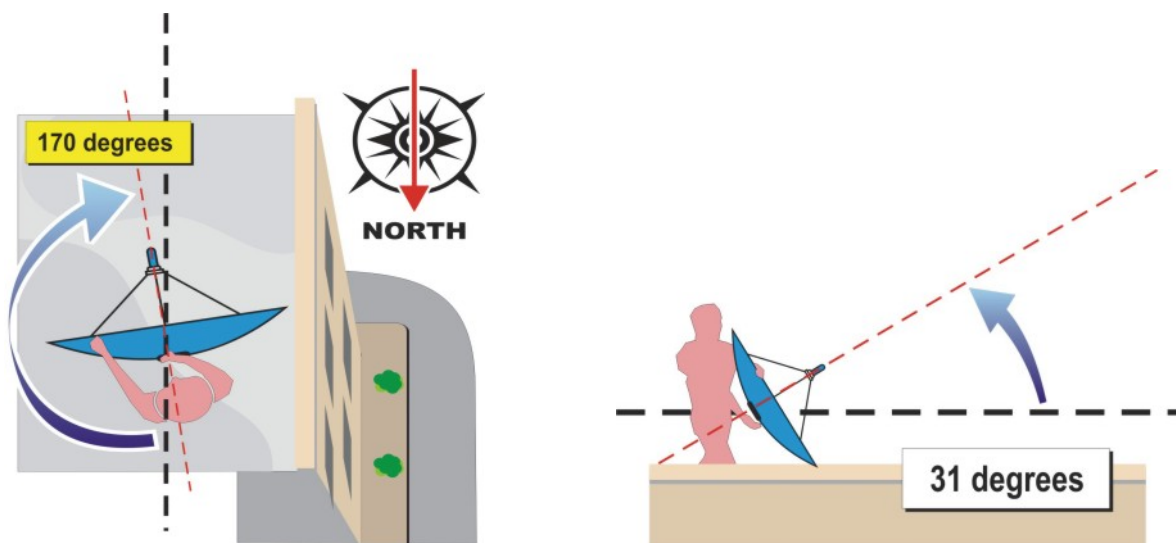


Figure A2.7.

#### A2.1.4 Knowing what satellite we are on

And the **HD RANGER/+** comes into action. Our dish is now more or less "looking" in the direction where we presume our "bird" is parked. With the **HD RANGER/+** connected to the output of the LNB we select satellite frequency range, antenna alignment mode, span of 200 MHz and set the power supply voltage to one of the possible values. We will take for example 13 VDC, which will take us to the VERTICAL polarisation and LOW band. We can use 80 dB $\mu$ V for the reference level for we can change that at pleasure depending on the amount of signal we get.

Something will come up on the **HD RANGER/+** screen. It will normally be a weak signal that may come from the desired satellite or from the neighbour ones for the dish is not properly tuned up yet. Swing the dish slightly horizontally and vertically until a decent signal is shown on the screen.

There we have a satellite but which one is it? Most probably the signals we are looking at are digital transponders from the unknown satellite. The **HD RANGER/+** can be operated in frequency or channel modes.

Tune any of those digital channels in frequency mode using the joystick and the markers shown on the screen. The **HD RANGER/+** will tell you what satellite and/or orbital position you are on in a matter of seconds !

If we are unlucky and this is not the satellite we want then we only need to move the dish slightly to pick the signal from the next satellite and repeat the process.

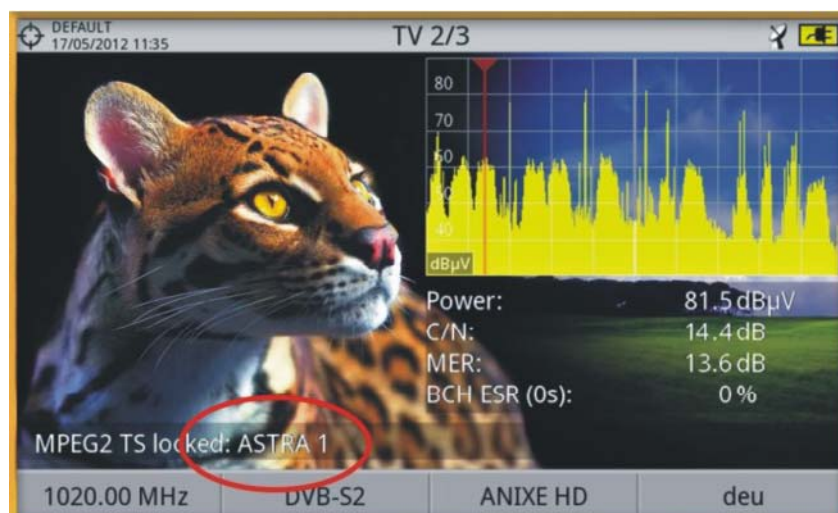


Figure A2. 8.

### A2.1.5 Fine tuning the dish

Once we know for certain that we are on *ASTRA 19E* it is time to make fine adjustments to the dish to optimise the alignment. There are two goals to achieve. On the one hand we want to receive the maximum amount of power possible and on the other hand we need to make sure we minimise the interference from the crossed polarisation.

In order to maximise the received signal power we need only to move the dish's azimuth and elevation very carefully ensuring that the display of the spectrum analyser show us the highest values possible.

As you move the dish's position you will see the signal change on the spectrum analyser. Cross-polarisation is adjusted by rotating the LNB on its axis. As you do so you will see on the *HD RANGER/+* screen how the channels interfering from the opposite polarisation go up and down the objective being to leave the LNB in such a position that those channels are as low as possible.

### A2.1.6 Testing signal quality

The *HD RANGER/+* is the ideal instrument for quick and effective checks of signal quality not only because it shows all measurements in one single screen but also because the meter doesn't require bothering configuration processes.

#### ► Option 1: Frequency mode

I can tune in frequency mode all channels coming up in the screen, all of them or the most representative ones only. We can move our cursor in frequency mode, in spectrum, through out the band. When we stop on a channel, the meter will acquire all the settings needed to measure the channel without bothering us. Then pressing the measurement button and voilà.

#### ► Option 2: Channel mode

I can select channel mode and a satellite channel table from the list. The *HD RANGER/+* has several of them preloaded but this can be changed using software application.

Once we select the desired table, *ASTRA 19E* in this case, we can browse the channels at once. There are channel tables grouped by polarisation or band or those with all channels in the satellite.

### A2.1.7 Look what we've got

The **HD RANGER/+** can also display the free to air programs available in the satellite. That is very practical not so much for the picture itself but for amount of interesting data related to the transponders we can display as well. This includes:

Tuned video information.

- ▶ **TYPE:** Encoding type and video transmission rate.
- ▶ **FORMAT:** Resolution (horizontal x vertical), aspect ratio and frequency.
- ▶ **PROFILE:** Profile level.
- ▶ **PID:** Video program identifier.
- ▶ **3D:** Application of 3D technology.

Tuned service information.

- ▶ **NETWORK:** Television distribution network (Terrestrial). Orbital position (Satellite).
- ▶ **PROVIDER:** Program provider name.
- ▶ **NID:** Network identifier where the signal is distributed.
- ▶ **ONID:** Identifier of the original network where the signal originates.
- ▶ **TSID:** Transport stream identifier.
- ▶ **SID:** Service Identifier.
- ▶ **MHP:** Interactive service.
- ▶ **LCN:** Logic Channel Number. It is the first logic number assigned to the first channel in the receiver.
- ▶ **FREE/SCRAMBLED:** Free/scrambled transmission.
- ▶ **DTV/DS:** Standard type of transmission.

Tuned audio information.

- ▶ **TYPE:** Type of audio encoding and transmission speed.
- ▶ **FORMAT:** Service audio format. Bit depth; sampling frequency; sound reproduction.
- ▶ **LANGUAGE:** Broadcasting language.
- ▶ **PID:** ID of the audio program.

At any time it is possible to display the SERVICE LIST pressing the F3 key and show all the programs and services available within the tuned channel. Selecting one particular channel or service becomes very intuitive.

## ANNEX 3 DiSEqC COMMANDS

### A3.1 DiSEqC introduction

The **DiSEqC™** (Digital Satellite Equipment Control) is an open protocol created by Eutelsat in 1997 as a communication standard between satellite TV receivers and external peripherals. The DiSEqC™ communications are based on the control commands, which travel combined with power voltage through the coaxial cable that leads the TV signal. The compatible peripherals and receivers detect these commands and react in agreement with such.

A **DiSEqC™** command is a digital command represented by a succession of binary messages: "0" and "1" obtained when modulating the 22 kHz signal.



The **DiSEqC™** usually is used in the satellite TV facilities in order to use different types of switchers, through the coaxial cable that leads the TV signal.

### A3.2 To begin: The Universal LNB

The Universal LNB is the simplest and most used LNB. This allows the signal reception coming from one single satellite.

TWIN (2 independent outputs), QUAD (4 independent outputs) and OCTO (8 independent outputs) versions exist in the market. Each output is independent from others and can be connected to a different receiver.

An universal LNB is controlled by means of a power voltage and a 22kHz signal, sent through the RF cable, which allows us to switch between the different bands and polarities, according to the following table:

'Standard'	'TWIN'	'QUAD'*	'OCTO'
			
1 satellite only 1 receiver	1 satellite only 2 receivers	1 satellite only 4 receivers	1 satellite only 8 receivers

Power	Band	Polarization(linear / circular)
13 V	Low	Vertical / Right
18 V	Low	Horizontal / Left
13 V + 22 kHz	High	Vertical / Right
18 V + 22 kHz	High	Horizontal / Left

\* Not to confuse with LNB Quattro used in collective facilities.

**Note:** The LNB accept a very wide range of values for these voltages, usually 10-14.5V (for 13V) and 15.5-20V (for 18V).

In the *HD RANGER/+*, the band and the polarisation selection can be done from different menus (all the different ways indicate dare equivalent):

Menu	Line
External units power supply	13 V, 18 V, 13 V+22kHz, 18 V+22kHz
Configuration	Band: High / Low Polarization: Vertical / Horizontal
DiSEqC	Band: High / Low Polarization: Vertical / Horizontal

### A3.3 DiSEqC™ around the world

The use of **DiSEqC™** devices requires to know previously which commands are acknowledged by these ones, since it will determine the wiring diagram of the different elements, as well as the way as they can be controlled. This information must be provided by the device manufacturer.

Following appear the **DiSEqC™** devices more usually installed in the individual and collective facilities.

### A3.4 In the individual facilities

#### A3.4.1 Tone-burst switcher (2 inputs – 1 output)

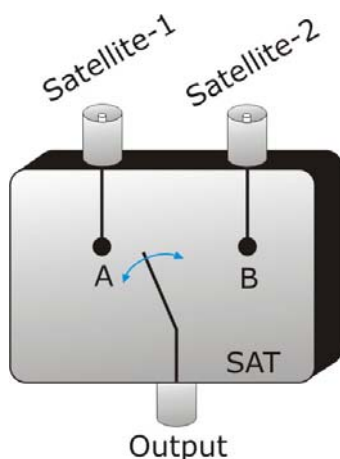


Figure A3. 1.

It is the simpler **DiSEqC™** switcher. This one uses the « SAT A/B » commands and allows to switch between two different Universal LNB:

Command	Selected input
SAT A	Satellite 1
SAT B	Satellite 2

These switchers are transparent to the LNB's (13V, 18V, 22 kHz) commutation commands. Then, once chosen the satellite with the SAT command, the corresponding LNB can be used in a normal way. (see Universal LNB).

**Note:** There are switchers of 2 inputs and 1 output in which other **DiSEqC™** commands are used, such as POSITION or OPTION, to allow more complex assemblies. Refer to the manufacturer technical information to make sure which are the commands to use.

**A3.4.2 Monobloc LNB**

A Monobloc LNB is a module composed by 2 Universal LNB connected by a Tone-burst switcher (2 inputs – 1 output). So, it can be managed in the same way.

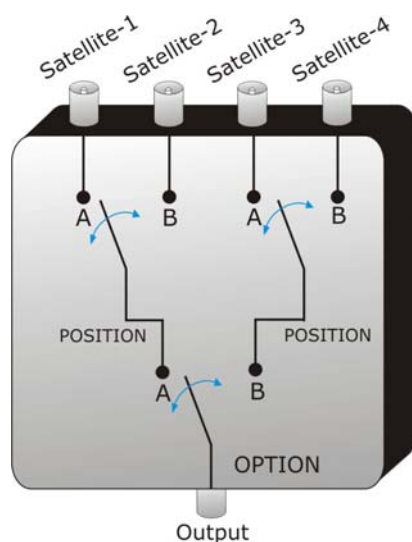
Also TWIN (2 independent outputs), QUAD (4 independent outputs) and OCTO versions exist (8 independent outputs). In this case, each output is controlled in a different way from the rest.

**Important:** If it is desired to use Monobloc LNB with **DiSEqC™** switchers, is necessary to make sure that these are compatible.



**Figure A3. 2.**

**A3.4.3 DiSEqC™ Switcher with 4 inputs and 1 output**



**Figure A3. 3.**

This switcher allows the signal reception from four independent Universal LNBs (coming from 4 different satellites) on a single receiver.

As it is possible to observe in the attached scheme, there are "OPTION" and "POSITION" switchers in cascade. In order to switch it, will be necessary to send an OPTION command and later a POSITION command that yields, therefore, a total of 4 possibilities.

Note: the manufacturers usually assure the compatibility with the Tone-burst commands (SAT A/B) so that the second stage can be switched as much using a «POSITION A/B» command as using a «SAT A/B» command. This allows us then to use the switcher like a Tone-burst type with 2 inputs and 1 output.

With the *HD RANGER/+*, it is very easy to use this type of switcher, because it incorporates a specific «OPT / POS»command:

<i>HD RANGER/+</i> Command	Combination of DiSEqC™ Commands send	Selected input
OPT/POS A-A	Option A + Position A	Satellite 1
OPT/POS A-B	Option A + Position B	Satellite 2
OPT/POS B-A	Option B + Position A	Satellite 3
OPT/POS B-B	Option B + Position B	Satellite 4

These switchers are transparent to the LNB's (13V, 18V, 22 kHz) switching commands. Then, once the satellite is chosen by means of the SAT command, the corresponding LNB can be used in a normal way. (see Universal LNB).

### A3.5 In the collective facilities

The most frequent satellite signal distribution system in the small collective facilities is the "BIS-switched". This technology implies to use the "Quattro" type LNBS (not to confuse with the "QUAD" type) and also supports specific multiswitches for this type of facilities.

A Quattro-LNB is a LNB with 4 outputs that provides in a separated way the four frequency bands (vertical low, vertical high, horizontal low and horizontal high). These four signal scan then be distributed in the building through multiswitches.



Figure A3. 4.

The signal is distributed in the network by means of **multi-outlet multiswitches**. The number of inputs and outputs is variable. The number of inputs depends on the number of satellites (LNB). Usually a multiswitch includes also an input for the TV terrestrial signal. The number of outputs depends on the number of terminals (receivers) that can be connected to the multiswitch. In addition, **multiswitch in cascade** incorporate pass connectors to be able to distribute the signal and thus to connect several multiswitch in cascade mode and therefore to give access to more users.

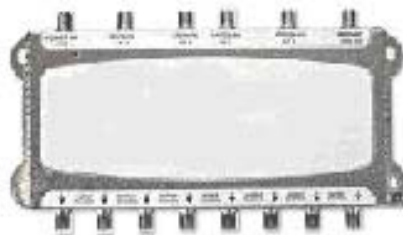


Figure A3. 5.

► Examples of multiswitch

	SAT Inputs	TER Inputs	Satellites	Terminals
Multiswitch 9/4	8	1	2	4
Multiswitch 5/16	4	1	1	16
Multiswitch 17/16	16	1	4	16
...	...	...	...	...

We will not consider the input of terrestrial TV, since this does not take part in the satellite signal. Also the following indicated examples do not show more than a single output. In the case of several outputs, the own operation scheme is reproduced for each one of them, because they are independent of the others.

**A3.5.1** Multiswitch (1 satellite)

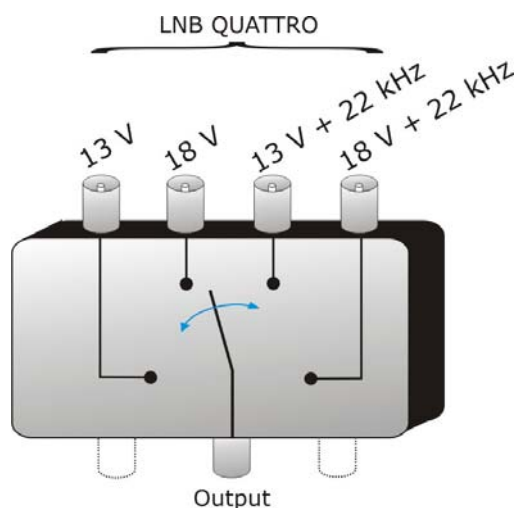


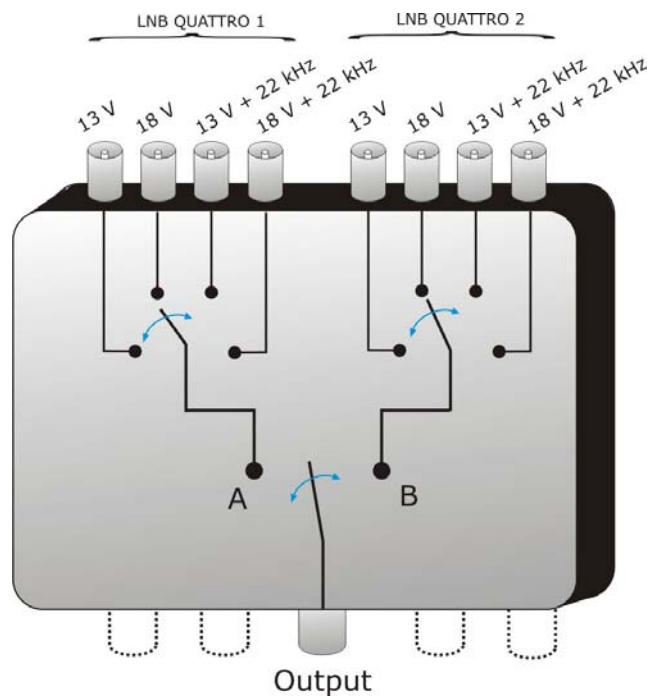
Figure A3. 6.

In the **DiSEqC™** menu of the **HD RANGER/+**, select the band and the polarisations desired and send the SAT A command, as it is indicated in the following table:

Band	Polarization	Command
Low	Horizontal	SAT A
Low	Vertical	SAT A
High	Horizontal	SAT A
High	Vertical	SAT A

**Very important:** Whenever you wish to change of band or polarisation, it is necessary to send the SAT A command at the same time, since multiswitch does not respond to the habitual switching commands for a LNB (13V/18V/+22kHz): it is necessary the complete **DiSEqC™** sequence to cause the commutation.

**A3.5.2 Multiswitch (2 Satellites)**



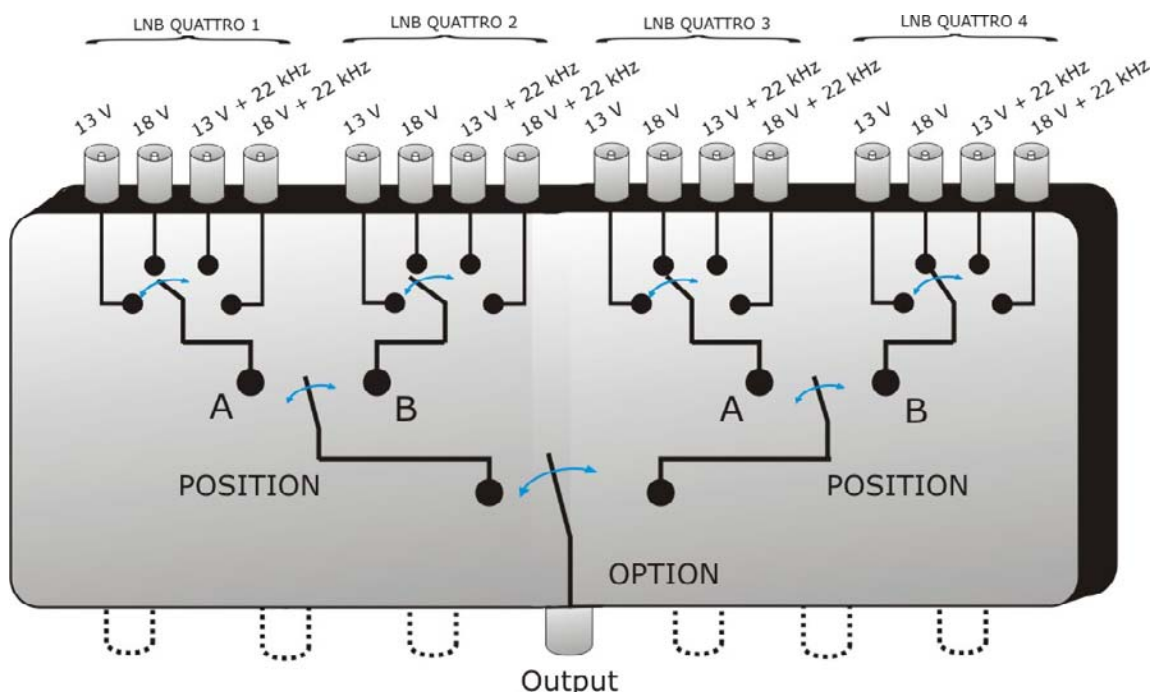
**Figure A3. 7.**

This type of multiswitch is used usually to switch the Astra 19° and Hotbird 13° satellites.

As in the previous case, if for a certain satellite it is desired to change of band or polarisation, it is not sufficient with changing the corresponding parameter, but in addition it is necessary to send the command SAT A/B corresponding to cause the switching (even if one does not change of satellite).

Band	Polarization	Command	Output
Low	Horizontal	SAT A	Satellite-1
Low	Vertical	SAT A	Satellite-1
High	Horizontal	SAT A	Satellite-1
High	Vertical	SAT A	Satellite-1
Low	Horizontal	SAT B	Satellite-2
Low	Vertical	SAT B	Satellite-2
High	Horizontal	SAT B	Satellite-2
High	Vertical	SAT B	Satellite-2

**A3.5.3 Multiswitch (4 Satellites)**



**Figure A3. 8.**

This type of multiswitch allows to distribute the signal coming from 4 different satellites. It uses a combination of OPTION, POSITION, Polarisation and Band commands. The TV Explorer allows to use easily this type of multiswitch thanks to the « OPT/POS » command, which sends the OPTION et POSITION commands in the necessary order. Like in the others multiswitch, if it's wanted to change of band or polarisation, if the satellite is even he himself, is necessary to send OPT/POS command to cause the commutation again.

Band	Polarization	Command	Satellite
Low	Horizontal	OPT/POS A-A	Satellite-1
Low	Vertical	OPT/POS A-A	Satellite-1
High	Horizontal	OPT/POS A-A	Satellite-1
High	Vertical	OPT/POS A-A	Satellite-1
Low	Horizontal	OPT/POS A-B	Satellite-2
Low	Vertical	OPT/POS A-B	Satellite-2
High	Horizontal	OPT/POS A-B	Satellite-2
High	Vertical	OPT/POS A-B	Satellite-2

Band	Polarization	Command	Satellite
Low	Horizontal	OPT/POS B-A	Satellite-3
Low	Vertical	OPT/POS B-A	Satellite-3
High	Horizontal	OPT/POS B-A	Satellite-3
High	Vertical	OPT/POS B-A	Satellite-3
Low	Horizontal	OPT/POS B-B	Satellite-4
Low	Vertical	OPT/POS B-B	Satellite-4
High	Horizontal	OPT/POS B-B	Satellite-4
High	Vertical	OPT/POS B-B	Satellite-4

**A3.6 DiSEqC programs and commands in the HD RANGER/ +**

► **Commands**

The **Commands** option allows executing any of the following commands:

COMMAND
SAT AB-A
SAT AB-B
SWITCH OPTION AB-A
SWITCH OPTION AB-B
DISABLE LIMITS
LIMIT EAST
LIMIT WEST
DRIVE ROTOR
GOTO
HALT
STORE
RECALCULATE
SWITCH 1A
SWITCH 1B
SWITCH 2A
SWITCH 2B
SWITCH 3A
SWITCH 3B
SWITCH 4A
SWITCH 4B
POWER
RESET
STANDBY

## ► Programs

There are eight predefined programs that execute basic functions to control an universal switch with two or four inputs. It also has more programs that control installations with 8 or 16 satellite antennas using SPAUN devices or switches Committed/Uncommitted. Whenever a **DiSEqC™** program is sent, the commands that correspond to the equipment status in relation to the Horizontal or Vertical polarization and High or Low frequency band are also sent. This allows assuring that the installation status is the one indicated by the equipment.

DiSEqC Programs		
16x1	LNB01	U1A2A/OpA_PoA
16x1	LNB02	U1A2A/OpA_PoB
16x1	LNB03	U1A2A/OpB_PoA
16x1	LNB04	U1A2A/OpB_PoB
16x1	LNB05	U1B2A/OpA_PoA
16x1	LNB06	U1B2A/OpA_PoB
16x1	LNB07	U1B2A/OpB_PoA
16x1	LNB08	U1B2A/OpB_PoB
16x1	LNB09	U1A2B/OpA_PoA
16x1	LNB10	U1A2B/OpA_PoB
16x1	LNB11	U1A2B/OpB_PoA
16x1	LNB12	U1A2B/OpB_PoB
16x1	LNB13	U1B2B/OpA_PoA
16x1	LNB14	U1B2B/OpA_PoB
16x1	LNB15	U1B2B/OpB_PoA
16x1	LNB16	U1B2B/OpB_PoB
8x1	LNB1	U1A/OptA_PosA
8x1	LNB2	U1A/OptA_PosB
8x1	LNB3	U1A/OptB_PosA
8x1	LNB4	U1A/OptB_PosB
8x1	LNB5	U1B/OptA_PosA
8x1	LNB6	U1B/OptA_PosB
8x1	LNB7	U1B/OptB_PosA
8x1	LNB8	U1B/OptB_PosB
	LNB4	(Sw1A-OptB-PosB)
	LNB8	(Sw1B-OptB-PosB)
		Position AB-A
		Position AB-A
		Sat A (Toneburst)
		Sat B (Toneburst)
		Switch Uncom.1/AA
		Switch Uncom.1/AB
		Switch Uncom.1/BA
		Switch Uncom.1/BB
		Switch Uncom.2/AA
		Switch Uncom.2/AB
		Switch Uncom.2/BA
		Switch Uncom.2/BB

## ANNEX 4 REMOTE CONTROL COMMANDS

### A4.1 Introduction

The design of *HD RANGER/+* based on a microprocessor, allows data to be exchanged between the equipment and a remote controller (usually a personal computer) via USB. By this way, data can be obtained from the equipment and also control it remotely. These data can be stored and subsequently processed for use in maintenance work. Furthermore, the remote control allows tracking and monitoring installations.

### A4.2 Protocol for communication between the *HD RANGER/+* and a PC

This protocol is controlled by software and is using a virtual serial port over an USB interface. Data and information are exchanged using messages consisting of ASCII alphanumerical characters. This method ensures easy carrying between different types of personal computers.

To activate the virtual serial port, a special driver must be installed. The driver is included with the purchased instrument.

#### ► Connections

The cable between the *HD RANGER/+* and the PC is supplied with the equipment.

You need at least **Windows XP** to work with *HD RANGER/+*. Drivers only work for Windows operative systems. What drivers do is to create a virtual COM port, so the software application can "see" the equipment.

### A4.3 Operation Mode

The **HD RANGER/+** accepts remote commands at any time, which the instrument is on. That is, it is not necessary to put the instrument in special remote control mode; rather, this mode is selected immediately when it detects a complete command during the time necessary for its execution. The protocol communication is as follows:

- 1.- **HD RANGER/+** transmits a XON code (11H) every second. The aim is to indicate to any possible remote device that the equipment is ready to receive data.
- 2.- At this moment, data streams can be sent it. Each data stream is composed by:
  - a. Stream beginning: '\*' (code 2AH).
  - b. Set of characters that describe data message.
  - c. CR (carriage return, code 0DH).
- 3.- Once a data stream has been sent, will be received a XOFF (code 13H) indicating that the transmission is stopped.
- 4.- Next, in case of correct message an ACK (acknowledge, code 06H) is expected or a NAK (not acknowledge, code 15H) in the opposite case.
- 5.- If the sent message requires answers it will be sent at this moment.
- 6.- Once completed the data stream transmission, the **HD RANGER/+** will send a XON (code 11H) indicating that already it is prepared to receive a new data stream.

A typical communication chronogram would be as follows:

	PC (REMOTE CONTROLLER)		<b>HD RANGER/+</b>
1)		<-----	XON
2)	*?TV<CR>	----->	
3)		<-----	XOFF
4)		<-----	ACK 5
5)		<-----	*TV0<CR>
6)	wait...		
7)		<-----	XON

(all characters are transmitted in ASCII code).

Commands should always be sent in capital letter and cannot be edited online, i.e., once a character is received it is stored in the *HD RANGER/+* buffer and cannot be rectified by sending an erase code.

Commands in remote control are divided into two groups, orders and interrogations. Orders modify a variable or the equipment status. Interrogations respond with information concerning equipment status or the value of a variable. For interrogative command, it is necessary to add the character '?' after the character '\*'.

#### A4.4 **Virtual Serial Port Configuration**

In order to ensure error-free communication between the computer and the *HD RANGER/+* you must programme following communication parameters into the control console via USB:

<b>Rate:</b>	115200 bits/s
<b>Data bits:</b>	8 bits
<b>Parity:</b>	No
<b>Stop Bits:</b>	1

**A4.5 Remote commands table**

Remote Commands	Short Description
<b>EQUIPMENT POWER OFF</b>	It shutdowns the equipment
<b>EQUIPMENT SN</b>	It provides the serial number of the equipment
<b>INSTALLATION</b>	It provides information about all the installations
<b>INSTALLATION CURRENT</b>	It provides information about the current installation
<b>INSTALLATION CURRENT CLEAR</b>	It removes all files of the current installation. The installation itself is not remove, only its contents
<b>INSTALLATION CURRENT REMOVE</b>	It removes the files of the same type in the current installation
<b>INSTALLATION DEFLATE</b>	It compresses the installation, if it exists. If is the current installation, it changes to DEFAULT installation before the compression
<b>INSTALLATION FILE</b>	It reads an "xml" file of the current installation and sends it to a PC
<b>INSTALLATION FILE ZIP</b>	It reads an "xml" file of the current installation and sends all the installation files zipped to a PC
<b>INSTALLATION INFLATE</b>	It decompresses the installation, if it exists
<b>INSTALLATION PC FILE</b>	It sends a file of the current installation to the PC
<b>INSTALLATION PC ZIP</b>	It sends a file from a PC to the equipment zipped with all files of the installation
<b>INSTALLATION REMOVE</b>	It removes an installation
<b>INSTALLATION ZIP</b>	It receives the installation from the host
<b>LNB</b>	It provides / configures the LNB output
<b>LTE</b>	It provides / configures the LTE filter status
<b>MEASURE</b>	It provides information of all active measurements
<b>MODE</b>	It provides / sets the operation mode of the equipment
<b>NAM</b>	It provides the program name
<b>PRINT SCREEN</b>	It makes a screenshot in PNG format
<b>RTC</b>	It provides / sets date and time
<b>SIGNAL</b>	It provides / configures the signal type
<b>SPECTRUM</b>	It configures the span and/or the reference level
<b>TUNE</b>	It provides / configures the frequency
<b>TUNE CH</b>	It provides / configures the channel
<b>TUNE PLAN</b>	It configures a channel set
<b>VER</b>	It provides the version of the main software application
<b>VIDEO</b>	It configures the video source

<b>Name</b>	<b>EQUIPMENT POWER OFF</b>
<b>Description</b>	It shutdowns the equipment
<b>Order</b>	*EQUIPMENT POWEROFF

<b>Name</b>	<b>EQUIPMENT SN</b>
<b>Description</b>	It provides the serial number of the equipment
<b>Question</b>	*?EQUIPMENT SN
<b>Response</b>	*EQUIPMENT SN = <i>equipment_resp</i>
	<i>equipment_resp</i> Description <i>equipment_resp</i>
	nnn Unique numeric code that identifies the equipment

<b>Name</b>	<b>INSTALLATION</b>
<b>Description</b>	It provides information about all the installations
<b>Question</b>	*?INSTALLATION <i>install</i>
<b>Response</b>	*INSTALLATION <i>install_resp</i>
	<i>install</i> <i>install_resp</i> Description <i>install_resp</i>
	<empty>      NUMBER=nn      Number (nn) of installations
	CURRENT      NAME=name      Name (name) of current installation
	TER-CH=nn      Number (nn) of terrestrial channel sets in the current installation
	SAT-CH=nn      Number (nn) of satellite channel sets in the current installation
	DISEQC=nn      Number (nn) of DISEQC programs in the current installation
	SCREEN=nn      Number (nn) of print screens in the current installation
	DATALOGGER=nn      Number (nn) of dataloggers in the current installation
	SP=nn      Number (nn) of spectrum captures in the current installation
	MER=nn      Number (nn) of captures MERxcarrier in the current installation
	ECHOES=nn      Number (nn) of echo captures in the current installation
	CONSTELLATION=nn      Number (nn) of constellation captures in the current installation
	NUMBER=nn      NAME=name      Name of the installation with index "nn"

Name	INSTALLATION CURRENT		
<b>Description</b>	It provides information about the current installation		
<b>Question</b>	*?INSTALLATION CURRENT <i>current=nn</i>		
<b>Response</b>	*INSTALLATION NAME= <i>current_resp</i>		
	<i>current</i>	Description <i>nn</i> (decimal value)	Description <i>current_resp</i>
	<empty>	<empty>	Available data from the current installation
	TER-CH	Terrest. channel set index	Terrestrial channel set name with "nn" index
	SAT-CH	Sat. channel set index	Satellite channel set name with "nn" index
	DISEQC_PROGRAM	DISEQC program index	DISEQC program name with "nn" index
	PNG	Print screen file index	Print screen file name with "nn" index
	DATALOGGER	Datalogger index	Datalogger name with "nn" index
	SPECTRUM	Capture index	Spectrum capture name with "nn" index
	CONSTELLATION	Constellation index	Constellation capture name with "nn" index
	ECHOES	Capture index	Echo capture name with "nn" index
	MER	Capture index	MER capture name with "nn" index
	NUMBER	Installation index	Installation name with "nn" index

Name	INSTALLATION CURRENT CLEAR
<b>Description</b>	It removes all files of the current installation. The installation itself is not remove, only its contents
<b>Order</b>	*INSTALLATION CURRENT CLEAR

<b>Name</b>	<b>INSTALLATION CURRENT REMOVE</b>	
<b>Description</b>	It removes the files of the same type in the current installation	
<b>Order</b>	*INSTALLATION CURRENT REMOVE <i>tag=name</i>	
	<i>tag</i>	Description <i>tag</i>
	SPECTRUM	Spectrum capture file
	TER-CH	Terrestrial channel set file
	SAT-CH	Satellite channel set file
	DISEQC_PROGRAM	DISEQC program file
	PNG	Print screens file
	CONSTELLATION	Constellation capture file
	ECHOES	Echo capture file
	MER	MER x carrier capture file
	DATALOGGER	Datalogger file
	SPECTROGRAM	Spectrogram file
	MEROGRAM	Merogram file
	TS	Transport stream file
	<i>name</i>	Description <i>name</i>
	<empty>	It removes all files belonging to the same type, which is determined by the <i>tag</i>
	abcd	It removes the file with name ("abcd") of the type indicated by the <i>tag</i>

<b>Name</b>	<b>INSTALLATION DEFLATE</b>	
<b>Description</b>	It compresses the installation, if it exists. If is the current installation, it changes to DEFAULT installation before the compression	
<b>Configuration</b>	*INSTALLATION NAME= name DEFLATE	
	<i>name</i>	Description <i>name</i>
	abcd	Name of the installation ("abcd")

<b>Name</b>	<b>INSTALLATION FILE</b>	
<b>Description</b>	It reads an "xml" file of the current installation and sends it to a PC	
<b>Question</b>	*?INSTALLATION CURRENT <i>tag=name</i> BLOCK= <i>bbbb</i>	
<b>Response</b>	*INSTALLATION SIZE= <i>size</i>	
	<i>tag</i>	Description <i>tag</i>
	SPECTRUM	It reads spectrum captures in the current installation
	TER-CH	It reads terrestrial channel sets in the current install
	SAT-CH	It reads satellite channel sets in the current install
	DISEQC_PROGRAM	It reads DISEQC programs in the current installation
	PNG	It reads print screens in the current installation
	CONSTELLATION	It reads constellation captures in the current install
	ECHOES	It reads echo captures in the current installation
	MER	It reads MER x carrier captures in the current install
	DATALOGGER	It reads datalogger in the current installation
	SPECTROGRAM	It reads spectrograms in the current installation
	MEROGRAM	It reads merograms in the current installation
	TS	It reads transport stream in the current installation
	<i>name</i>	Description <i>name</i>
	abcd	Name ("abcd") of the capture. In case of a DATALOGGER tag, the name could be the header file of a datalogger or the file name of a test point (datalogger.xml or datalogger/tp.xml).
	<i>bbbb</i>	Description <i>bb</i>
	nnn	Byte (nnn decimal) size to which the file will be divided to be send
	<i>size</i>	Description <i>size</i>
	nnn	File byte (nnn decimal) size when send

<b>Name</b>	<b>INSTALLATION FILE ZIP</b>	
<b>Description</b>	It reads an "xml" file of the current installation and sends all the installation files zipped to a PC	
<b>Question</b>	*?INSTALLATION CURRENT ZIP BLOCK= <i>bbbb</i>	
<b>Response</b>	*INSTALLATION SIZE= <i>size</i>	
	<i>bbbb</i>	Description <i>bb</i>
	<i>nnn</i>	Byte ( <i>nnn</i> decimal) size to which the file will be divided to be send
	<i>size</i>	Description <i>size</i>
	<i>nnn</i>	File byte ( <i>nnn</i> decimal) size when send

<b>Name</b>	<b>INSTALLATION INFLATE</b>	
<b>Description</b>	It decompresses the installation, if it exists	
<b>Configuration</b>	*INSTALLATION NAME= name INFLATE	
	<i>name</i>	Description <i>name</i>
	<i>abcd</i>	Name of the installation ("abcd")

Name	INSTALLATION PC FILE	
Description	It sends a file of the current installation to the PC.	
Order	*INSTALLATION CURRENT tag= <i>name</i> SIZE= <i>size</i> BLOCK= <i>bbbb</i>	
	<i>tag</i>	Description <i>tag</i>
	SPECTRUM	Spectrum captures files to the current installation
	TER-CH	Terrestrial channel sets files to the current install
	SAT-CH	Satellite channel sets files to the current instal.
	DISEQC_PROGRAM	DISEQC programs files to the current installation
	PNG	Print screens files to the current installation
	CONSTELLATION	Constellation captures files to the current install
	ECHOES	Echo captures files to the current installation
	MER	MER x carrier captures files to the current install
	DATALOGGER	Datalogger files to the current installation
	SPECTROGRAM	Spectrograms files to the current installation
	MEROGRAM	Merograms files to the current installation
	TS	Transport stream files to the current installation
	<i>name</i>	Description <i>name</i>
abcd	Capture name ("abcd").	
<i>size</i>	Description <i>size</i>	
nnn	File byte (nnn decimal) size when send	
<i>bbbb</i>	Description <i>bbbb</i>	
nnn	Byte (nnn decimal) size to which the file will be divided to be send	

<b>Name</b>	<b>INSTALLATION PC ZIP</b>	
<b>Description</b>	It sends a file from a PC to the equipment zipped with all files of the installation	
<b>Order</b>	*INSTALLATION ZIP NAME= <i>name</i> SIZE= <i>size</i> BLOCK= <i>bbbb</i>	
	<i>name</i>	Description <i>name</i>
	abcd	Name ("abcd") of the installation
	<i>size</i>	Description <i>size</i>
	nnn	Byte (nnn decimal) size of the file when send
	<i>bbbb</i>	Description <i>bbbb</i>
	nnn	Byte size (nnn decimal) of blocks that will be send from the ZIP file

<b>Name</b>	<b>INSTALLATION REMOVE</b>	
<b>Description</b>	It removes a installation	
<b>Order</b>	*INSTALLATION NAME= <i>name</i> REMOVE	
	<i>name</i>	Description <i>name</i>
	abcd	Installation name ("abcd")

<b>Name</b>	<b>INSTALLATION ZIP</b>	
<b>Description</b>	It receives the installation from the host	
<b>Configuration</b>	*INSTALLATION NAME= <i>name</i> ZIP	
	<i>name</i>	Description <i>name</i>
	abcd	Name of the installation ("abcd")

<b>Name</b>	<b>LNB</b>		
<b>Description</b>	It provides / configures the LNB output		
<b>Question</b>	*?LNB <i>Inb</i>		
<b>Response</b>	*LNB <i>Inb = Inb_resp</i>		
	<b><i>Inb</i></b>	<b>Description <i>Inb_resp</i></b>	
	OUTPUT	Current selected output	
	ENABLE	LNB enable (ON) or disabled (OFF)	
	VOLTAGE	Last measurement of the LNB output voltage	
	CURRENT	Last measurement of the LNB output current	
	AVAILABLE	Available output with the current configuration	
	UNDERVOLTAGE	Under voltage alarm	
	OVERCURRENT	Overvoltage alarm	
	SHORTCIRCUIT	Short circuit alarm	
	DRAINLED	LED DRAIN lit (ON) or not (OFF)	
<b>Configuration</b>	*LNB <i>Inb = Inb_conf</i>		
	<b><i>Inb</i></b>	<b><i>Inb_conf</i></b>	<b>Description <i>Inb_conf</i></b>
	ENABLE	ON	Enables the LNB.
	ENABLE	OFF	Disables the LNB.
	OUTPUT	nnn	LNB output voltage ( <i>nnn</i> must be one of the available options seen on the command *?LNB AVAILABLE)

<b>Name</b>	<b>LTE</b>	
<b>Description</b>	It provides/configures the LTE filter status	
<b>Question</b>	*?LTE	
<b>Response</b>	*LTE <i>Ite_resp</i>	
	<b><i>Ite_resp</i></b>	<b>Description <i>Ite_resp</i></b>
	ON	LTE filter enabled
	OFF	LTE filter disabled
<b>Configuration</b>	*LTE <i>Ite_conf</i>	
	<b><i>Ite_conf</i></b>	<b>Description <i>Ite_conf</i></b>
	ON	It enables the LTE filter
	OFF	It disables the LTE filter

<b>Name</b>	<b>MEASURE</b>	
<b>Description</b>	It provides information of all active measurements	
<b>Question</b>	*?MEASURE <i>measure</i>	
<b>Response</b>	*MEASURE <i>measure=measure_resp units</i>	
	<i>measure</i>	Description <i>measure_resp</i>
	<empty>	All the active measures
	POWER	Digital channel power
	LEVEL	Analogue channel level
	C/N	C/N of the measured channel (dB)
	V/A	Video/Audio carrier ratio
	MER	MER measurement value
	CBER	CBER measurement value
	VBER	VBER measurement value
	LBER	LBER measurement value
	LM	Link Margin value
	=	Measurement within scale
	<	Measurement under the value shown
	>	Measurement over the value shown
	<i>units</i>	Description <i>units</i>
	dB	Measurement units for C/N, V/A, MER
	dBm/dBuV/dBmV	Measurement units for POWER, LEVEL

<b>Name</b>	<b>MODE</b>	
<b>Description</b>	It provides/sets the operation mode of the equipment	
<b>Question</b>	*?MODE	
<b>Response</b>	*MODE <i>mode_resp</i>	
	<i>mode_resp</i>	Description <i>mode_resp</i>
	TV	TV mode
	TV+SP+MEASURE	TV mode with spectrum and measurements
	TV+PARAMETERS	TV mode with TS parameters
	SP	Spectrum mode
	SP+MEASURE	Spectrum mode with measurement
	SP+MEASURE+TV	Spectrum mode with TV and measurement
	MEASURE	Measurement mode.
	MEASURE+TV+SP	Measurement mode with TV and spectrum
	MEASURE+PARAMETERS	Measurement mode with demodulator parameters
	ECHOES	Echoes tool
	CONSTELLATION	Constellation tool
<b>Configuration</b>	*MODE <i>mode_conf</i>	
	<i>mode_conf</i>	Description <i>mode_conf</i>
	TV	TV mode
	TV+SP+MEASURE	TV mode with spectrum and measurements
	TV+PARAMETERS	TV mode with TS parameters
	SP	Spectrum mode
	SP+MEASURE	Spectrum mode with measurement
	SP+MEASURE+TV	Spectrum mode with TV and measurement
	MEASURE	Measurement mode
	MEASURE+TV+SP	Measurement mode with TV and spectrum
	MEASURE+PARAMETERS	Meas. mode with demodulator parameters
	ECHOES	Echoes tool
	CONSTELLATION	Constellation tool

<b>Name</b>	<b>NAM</b>	
<b>Description</b>	It provides the program name	
<b>Question</b>	*?NAM	
<b>Response</b>	*NAM <i>nam_resp</i>	
	<i>nam_resp</i>	Description <i>nam_resp</i>
	abc	It provides the program name "abc"

<b>Name</b>	<b>PRINT SCREEN</b>	
<b>Description</b>	It makes a screenshot in PNG format	
<b>Configuration</b>	*PRINT SCREEN= <i>printscreen_conf</i>	
	<i>=printscreen_conf</i>	Description <i>=printscreen_conf</i>
	<empty>	It gives a name by default
	=abc	It gives the name "abc"

<b>Name</b>	<b>RTC</b>		
<b>Description</b>	It provides/sets date and time		
<b>Question</b>	*?RTC <i>rtc</i>		
<b>Response</b>	*RTC <i>rtc=rtc_resp</i>		
	<i>rtc</i>	<i>rtc_resp</i>	Description <i>rtc_resp</i>
	TIME DATE  FORMAT	DATE=date TIME=time FORMAT=format hh:mm:ss DD/MM/YYYY DD/MM/YY MM/DD/YYYY YYYY/MM/DD	It shows current date, time and date format  Hours:minutes:seconds day/month/year day/month/year (last two digits) month/day/year year/month/day Selected format
<b>Configuration</b>	*RTC <i>rtc= rtc_conf</i>		
	<i>rtc</i>	<i>rtc_conf</i>	Description <i>rtc_conf</i>
	TIME DATE  FORMAT	hh:mm:ss  DD/MM/YYYY DD/MM/YY MM/DD/YYYY YYYY/MM/DD	Hours:minutes:seconds Date according to the selected format day/month/year day/month/year (last two digits) month/day/year year/month/day

Name	SIGNAL		
<b>Description</b>	It provides/configures the signal type		
<b>Question</b>	*?SIGNAL <i>signal</i>		
<b>Response</b>	*SIGNAL <i>signal=signal_resp</i>		
	<i>signal</i>	Description <i>signal_resp</i>	
	TYPE	Signal standard type	
	CR	Current code rate	
	BANDWIDTH	Signal bandwidth	
	SR	Signal symbol rate	
	SP	Spectral inversion enabled (ON) or disabled (OFF)	
	MODE	Measurement of the FFT in a COFDM modulation	
	GI	Measurement of the guard interval	
	CONSTELLATION	Constellation type	
	HIERARCHY	DVB-T hierarchy	
	COLOR	Type of colour coding	
	STANDARD	Analogue standard type	
	RATE	Field frequency	
<b>Configuration</b>	*SIGNAL <i>signal=signal_config</i>		
	<i>signal</i>	<i>signal_config</i>	Description <i>signal_config</i>
	TYPE	DVB-T	Terrestrial signal standard
		DVB-C	Cable signal standard
		ANALOG	Analogue signal standard
		DVB-S	Satellite signal standard
		DVB-S2	Satellite signal standard (2d generation)
	COLOR	PAL	PAL coding colour
		NTSC	NTSC coding colour
		SECAM	SECAM coding colour
	STANDARD	BG	Analogue standard type BG
		DK	Analogue standard type DK
		I	Analogue standard type I
		N	Analogue standard type N
		M	Analogue standard type M
		L	Analogue standard type L

<b>Name</b>	<b>SPECTRUM</b>		
<b>Description</b>	It configures the <i>span</i> and/or the reference level		
<b>Configuration</b>	*SPECTRUM <i>spectrum=spectrum_config</i>		
	<i>spectrum</i>	<i>spectrum_config</i>	Description <i>spectrum_config</i>
	REF	nn.n	Value (nn.n) of the reference level in units of the current band
	SPAN	nnnF	nnn= span value number F= Order of magnitude for the span. F values: <empty> = 1 K= 1 x 10 E3 M=1 x 10 E6 G=1 x 10 E9

<b>Name</b>	<b>TUNE</b>	
<b>Description</b>	It provides/configures the frequency	
<b>Question</b>	*?TUNE	
<b>Response</b>	*TUNE BAND= <i>band_resp</i> FREQ= <i>freq_resp</i>	
	<i>band_resp</i>	Description <i>band_resp</i>
	TER	Terrestrial band
	SAT	Satellite band
	<i>freq_resp</i>	Description <i>freq_resp</i>
	nnnK	nnn=Number value for the frequency; K= (kHz)
<b>Configuration</b>	*TUNE BAND= <i>band_conf</i> FREQ= <i>freq_conf</i>	
	<i>band_conf</i>	Description <i>band_conf</i>
	TER	Terrestrial band
	SAT	Satellite band
	<i>freq_conf</i>	Description <i>freq_conf</i>
	nnnF	nnn= Number value for the frequency F= Order of magnitude for the frequency F values: <empty> = 1 K= 1 x 10 E3 M=1 x 10 E6 G=1 x 10 E9

<b>Name</b>	<b>TUNE CH</b>		
<b>Description</b>	It provides/configures the channel		
<b>Question</b>	*?TUNE CH		
<b>Response</b>	*TUNE BAND= <i>band_resp</i> PLAN= <i>plan_resp</i> CH= <i>ch_resp</i>		
	<i>band_resp</i>	Description <i>band_resp</i>	
	TER	It means that channel belongs to the terrestrial band	
	SAT	It means that channel belongs to the satellite band	
	<i>plan_resp</i>	Description <i>plan_resp</i>	
	xyz	Alphanumeric code that identifies the channel set	
	<i>ch_resp</i>	Description <i>ch_resp</i>	
	xyz	Alphanumeric code that identifies the channel	
<b>Configuration</b>	*TUNE <i>ch_conf</i>		
	<i>ch_conf</i>	Description <i>ch_conf</i>	
	CH=xyz	"xyz" is an alphanumeric code that identifies a channel	
	CH NEXT	It increases +one channel	
	CH PREV	It decreases -one channel	

<b>Name</b>	<b>TUNE PLAN</b>		
<b>Description</b>	It configures a channel set		
<b>Configuration</b>	*TUNE PLAN= <i>plan_conf</i>		
	<i>plan_conf</i>	Description <i>plan_conf</i>	
	xyz	Alphanumeric code that identifies a channel set	

<b>Name</b>	<b>VER</b>		
<b>Description</b>	It provides the version of the main software application		
<b>Question</b>	*?VER		
<b>Response</b>	*VER <i>ver_resp</i>		
	<i>ver_resp</i>	Description <i>ver_resp</i>	
	x.yy.zzz	Alphanumeric code that identifies a version	

<b>Name</b>	<b>VIDEO</b>		
<b>Description</b>	It configures the video source		
<b>Configuration</b>	*VIDEO <i>video= video_conf</i>		
	<i>video</i>	<i>video_conf</i>	Description <i>video_conf</i>
	SOURCE	INTERNAL	It enables internal video source
		EXTERNAL	It enables external video source
	SYSTEM	PAL_50 Hz	It enables the video system selected
		PAL_60 Hz	It enables the video system selected
		NTSC	It enables the video system selected
		SECAM	It enables the video system selected

## ANNEX 5 MULTIMEDIA CONTENT

This is the list with all the multimedia content in the user's manual:

TITLE	PAGE	LINK
<b>Introducing the HD RANGER +</b>	1-2	<a href="http://youtu.be/XpNxIOSfkf0">http://youtu.be/XpNxIOSfkf0</a>
<b>Navigating through the menus</b>	2-15	<a href="http://youtu.be/Zm_QT-_qtY4">http://youtu.be/Zm_QT-_qtY4</a>
<b>Switching satellite/terrestrial bands</b>	2-22	<a href="http://youtu.be/ecv1P0Cf_fl">http://youtu.be/ecv1P0Cf_fl</a>
<b>Tuning by channel or frequency</b>	2-23	<a href="http://youtu.be/2Suh2xlvhdw">http://youtu.be/2Suh2xlvhdw</a>
<b>Manual input of frequencies</b>	4-40	<a href="http://youtu.be/81I5ezO4cgg">http://youtu.be/81I5ezO4cgg</a>
<b>DVB-S2 multi stream decoding</b>	4-42	<a href="http://youtu.be/xuv9ESed_Ak">http://youtu.be/xuv9ESed_Ak</a>
<b>What is LTE?</b>	6-54	<a href="http://youtu.be/ZNPeDC4K-YI">http://youtu.be/ZNPeDC4K-YI</a>
<b>Datalogger</b>	6-60	<a href="http://youtu.be/TUuHJBX0BQI?t=3m55s">http://youtu.be/TUuHJBX0BQI?t=3m55s</a>
<b>Channel set exploration</b>	6-67	<a href="http://youtu.be/TUuHJBX0BQI?t=2m54s">http://youtu.be/TUuHJBX0BQI?t=2m54s</a>
<b>Installation manager</b>	7-72	<a href="http://youtu.be/TUuHJBX0BQI">http://youtu.be/TUuHJBX0BQI</a>

