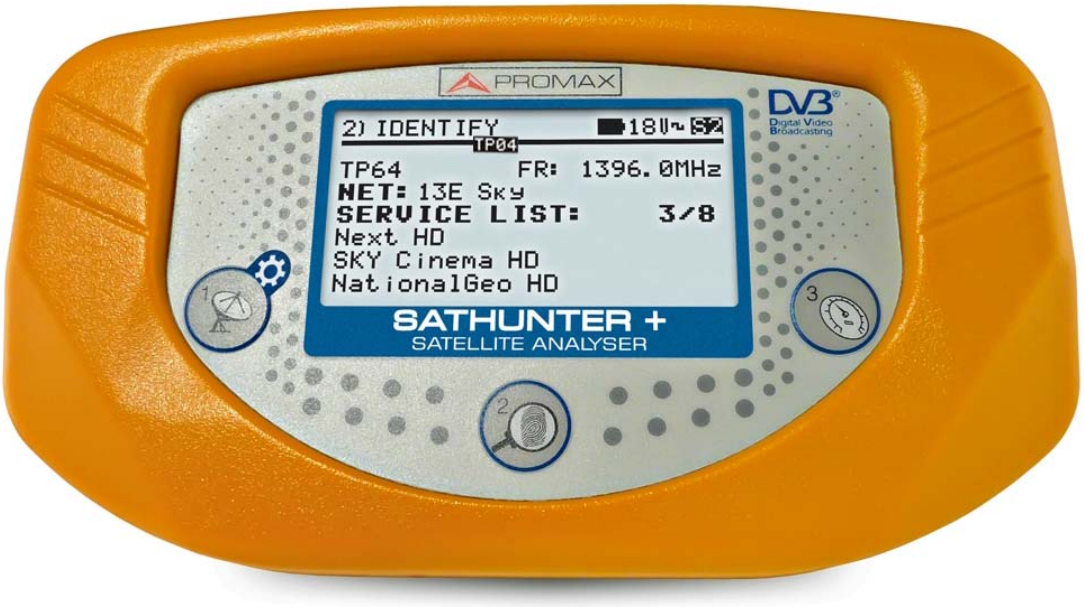
SATHUNTER+

SATELLITE HUNTER



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PROMAX

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.

USER'S MANUAL VERSION

Version	Date	Firmware Version
1.2	June 2024	v4.6.246
1.1	October 2018	v4.6.246

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 mains adaptor is a **Class I equipment**. For safety reasons it must be plugged to supply power lines with their ground.

* This equipment can be used in **Overvoltage Category I** installations and **Pollution Degree 2** environments.

* The mains adaptor must be used only indoors. It can be used in **Overvoltage Category II** facilities and **Pollution Degree 1** environments.

* When using some of the following accessories **use only the specified ones** to ensure safety.

  Mains power adapter.
  Car lighter adapter.
  Mains 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**.

* The user is not allowed to perform changes inside the equipment. Any change on the equipment must be done exclusively by specialized staff.

* When the equipment is powered by the AC adaptor, the negative of the measurement will be at the ground voltage.

* Do not obstruct the ventilation system of the equipment.

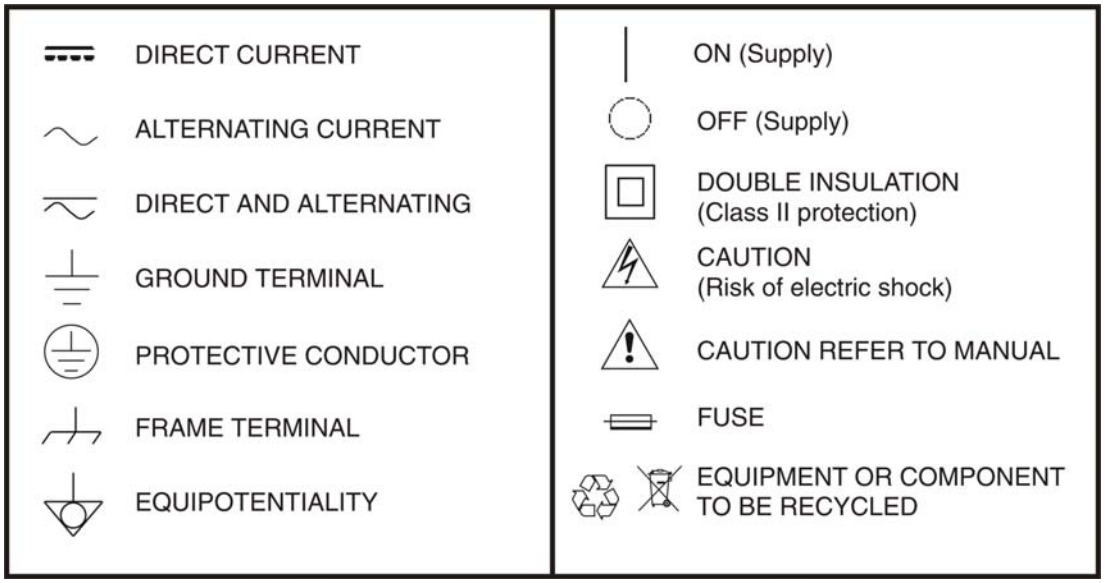
* Use appropriate low-level radiation cables for input / output signals, especially on high level signals.

* Follow the **cleaning instructions** described in the Maintenance paragraph.

CAUTION

The battery used can present danger of fire or chemical burn if it is severely mistreat. Do not disassembly, cremate or heat the battery above 100 °C under no circumstances.

* Symbols related with safety:



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.

TABLE OF CONTENTS

SATELLITE HUNTER
SATHUNTER+

1 GENERAL

1.1 Description

The consolidation of Digital TV boosted the installation of "Direct To Home" satellite TV systems. The continuous release of new packages or 'bouquets' and services such as Internet require new simplified installation procedures that are capable of guaranteeing the quality of the signal received.

Because of the wide range of services offered by current satellites and the increasing in the amount of signals, we have developed new tests, improving the ones available in classic satellite detectors and meters.

The SATHUNTER+ is the answer to the need for an installation tool that allow making the job in a fast way and it includes all necessary measurements to secure the quality of reception. There is a need to discern among satellites, to adjust the antenna and to check the quality of the digital signal.

The SATHUNTER+ has been designed to guarantee the maximum number of installations with the best quality, helping the installer to evaluate the results.

The equipment determines if the quality of the signal is enough for reception. For that, it is based on the internal BER measurement and the modulation error ratio (MER).

The SATHUNTER+ processes all the information and gives to the installer **just the information he requires**, making his work as easy as possible.

The SATHUNTER+ is very easy to use and it guides the user through three steps, enabling to localize the satellite, guaranteeing its identification and accurately adjusting the receiver antenna to obtain the best quality of signal.

At the SATHUNTER+, the measurement to determinate the quality of the signal is the MER, which is directly related to the BER (Bit Error Rate). The instrument displays 'CBER' and "MER" on the display in graphic bars and alphanumeric data.

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

The instrument is a useful tool when installing either a specific service or satellite, or a series of services or satellites. Its specific use is determined by the configuration of the instrument, which may depend on the country or geographical area.

The SATHUNTER+ has been specially designed to stand rough working conditions. It includes a back-light display and offers a long battery life.

2 INSTALLATION

2.1 Power Supply

The SATHUNTER+ is a portable instrument powered by a lithium rechargeable battery. The instrument comes with a mains adapter in order to connect it to the mains for operation and battery charging.

2.1.1 Operation using the Mains Adapter

Connect the mains adapter to the SATHUNTER+ using the external power connector 12 V [4] (see Figure 6.-) located on the right side panel. Connect the adapter to the mains and it will automatically start the battery charging process. The equipment will emit an acoustic indication. It will also display information about the battery charging (see "*2.1.3 Battery Charging*") on the screen. When the battery is already charged, the instrument will automatically disconnect. To stop the charging process, press any of the three keys [1], [2] or [3] for more than 2 s (the battery-charging screen will disappear).

To start operation, keep any of the three instrument keys [1], [2] or [3] pressing down for more than 1 s. The instrument will start up. The battery charging process will stop until the equipment starts up. The charging process will be slower when the equipment is on.

CAUTION	Before using the mains adapter, make sure that it is the appropriate one for your mains system: Mains power adapter model AL-101B. The mains adapter is exclusively designed for indoor use.

2.1.2 Operation Using Batteries

The instrument is powered by a 7.4 V and 2.2 Ah Li-Ion battery.

In order to the equipment works using the battery, you need only press any instrument key ([1], [2] or [3]), for more than 1 s. With the battery fully charged, the SATHUNTER+ has an approximate autonomy of 80 minutes in continuous operation and at the worst conditions (powering a universal LNB and identifying a signal).

When the battery is flat, you will hear an acoustic indication and the screen will show the message "**BATTERY LOW**". Afterwards, if the battery is not charging yet, it will show the message "**VERY LOW BATTERY**" and it will emit a warning acoustic indication. If it is not immediately connected to the mains, the instrument will automatically switch off.

2.1.3 Battery Charging

To fully charge the battery with the SATHUNTER+ switched off, connect the mains adapter to the external power supply input 12 V ⎓ [4] (see Figure 6.-). Then connect the adapter to the mains. The charging process will start automatically. The instrument will emit an acoustic indication and the display will show the battery voltage level, the charge percentage and for how long the battery has been charging

Figure 1. Battery charging.

When charging is completed, the instrument is automatically disconnected from the mains and it will emit two acoustic indications. At the same time the display will show how long the battery has been charging.

The charging time depends on the state of the battery. If the battery is completely flat, the charging process will take around 100 minutes. When the battery is fully charged, the instrument will disconnect automatically. The charging process must be carry out in a range of temperatures between 5 ºC and 40 ºC.

IMPORTANT NOTE

At starting the battery charging process and using the instrument for a long period of time, it could be observed a heating of the instrument. This heating is normal in the power margin that must be dissipated, according to the battery charge status and the LNB consumption.

IMPORTANT NOTE

If the equipment is operating and the voltage adapter is connected, the charging process will be longer. It will depend on the consumption.

2.2 Installation and Start-Up

The SATHUNTER+ has been designed for using as a portable instrument.

If you press any key ([1], [2] or [3]), for one second approximately, the instrument will start up in "Auto Power OFF" mode. It means that the instrument will automatically switch off if you do not press any key during 5 minutes. If you wish to cancel the automatic power off, you have to keep pressing down any key for five seconds when starting up the instrument, until it appears the message "Manual Power Off" on the display.

On starting up, you will see the instrument presentation screen (see Figure 2.-).

Figure 2. Instrument presentation screen.

Next, a screen will display the instrument's name, company and user names (editable by software) and the current version of firmware (Figure 3.-).

Figure 3. Company, name of the equipment and version of firmware.

Finally, it will be shown the Detect function (1> DETECT) screen.

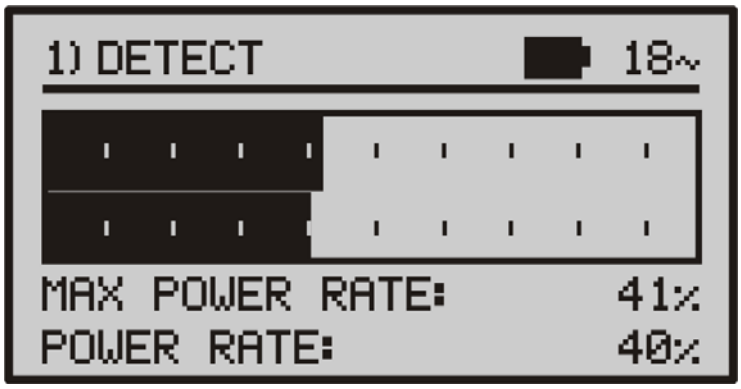


Figure 4. Detect function screen.

The top line of this screen is the same one for all functions of the equipment. Next it will be explained the icons and messages that can appear depending on the situation.

At the top left corner it is shown the active function. There are three different options: 1) DETECT, 2) IDENTIFY and 3) ADJUST.

When using the instrument, it may appear on the display some messages and icons depending on the situation at that time. These are detailed below:

Message	Description
"LOW BATTERY"	-
"VERY LOW BATTERY"	The equipment will be switched off automatically.
"LNB SHORT CIRCUIT"	The LNB can be shortcut.
"LNB OVER CURRENT"	The LNB has a high consumption.
"MANUAL POWER OFF"	The instrument has to be switched off by hand.
"AUTO POWER OFF"	The instrument will switched off after five minutes of inactivity.
"BATTERY MODE"	-
"UPDATE MODE"	-
“NETWORK NOT FOUND”	-
“SERVICES NOT FOUND”	-
“LNB NOT DETECTED”	Power leve lis below the minimum necessary to detect a LNB (this value can be adjusted by software, usually 10 %).

Message	Description
"FULL BATTERY"	-
"MPEG-2 NOT DETECTED"	It is not detecting the Transport Stream signal MPEG-2.
"LOADING NETWORK"	-
"LOADING SERVICES"	-
"HIGH TEMPERATURE"	The running temperature is too high. The equipment must be switched off for a while. If the problem persists, contact with the technical support.

At right corner of the top line, next to the messages, the following icons could be appear:

Icon	Description
	Charging battery.
	Battery state.
18 / 13 /OFF	LNB power supply (13 V, 18 V or OFF).
	22 KHz signal activated.
	The DVB-S, DVB-S2 or DSS has not been synchronized.
	The DVB-S, DVB-S2 or DSS has been synchronized
	Manual Power Off.
USB	USB connected to the PC.

3 OPERATING INSTRUCTIONS

3.1 Description of the Controls and Elements

Front panel

Figure 5. Front panel.

1 **DETECT**

This key activates the **Detect** function for the satellite signal. It can also switch ON the equipment. With a long press on the **Detect** screen you access the **Setup** menu. With a long press on the **Identify** or **Adjust** screen you move to the Test Point 1 (**TP1**).

2 **IDENTIFY**

This key activates the identification function in order to detect a satellite and check if is one of the already memorised by the instrument. The screen shows the 48 first services, the orbital position and the network. With a short press you go to the next **Test Point**. With a long press you go to the previous **Test Point**. It can also switch ON or OFF the equipment.

3 **ADJUST**

This key activates the precision adjustment function in order to adjust accurately the antenna for optimum signal reception. This function measures the POWER, LINK MARGIN, MER, CBER, LBER and VBER. (These last two measures are configurable by software). With a short press you go to the next **Test Point**. With a long press you go to the previous **Test Point**. It can also switch ON or OFF the equipment.

Side panels

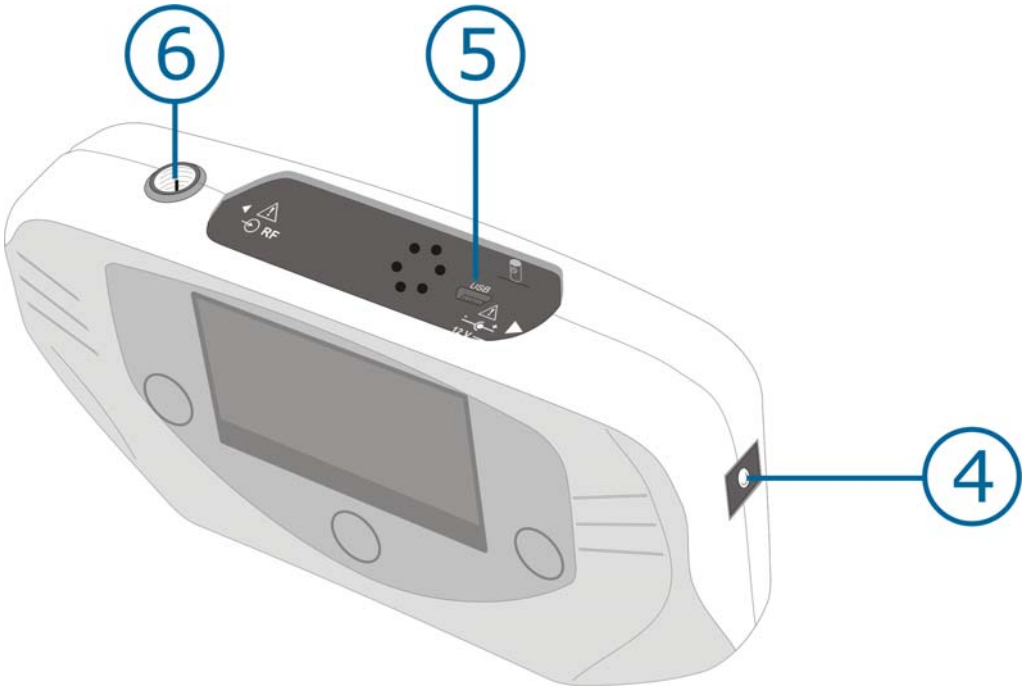


Figure 6. Side panels.

4 12 V ⎓ **External 12 V power input.**

5 **DATA.**

USB connector for data transfer, in order to calibrate and configurate the instrument using a PC.

6 **RF. RF signal input.**

Maximum level 120 dBµV. Universal connector for F/F or F/BNC adapter, input impedance of 75 Ω.

3.2 Setup menu

To access the setup menu, from the **DETECT** screen, press and hold the key [1] for 1 s. approximately until appears the setup screen (Fig. 7.-).

Figure 7. Setup Menu.

Once inside, to move along the setup menu, press:

CANCEL [1]: To exit the setup menu.

OPTION [2]: To move along the setup options.

SELECT [3]: To move among the available values of a menu option.

Available setup options are:

► **START SPECTRUM** It shows the signal spectrum on the satellite band.

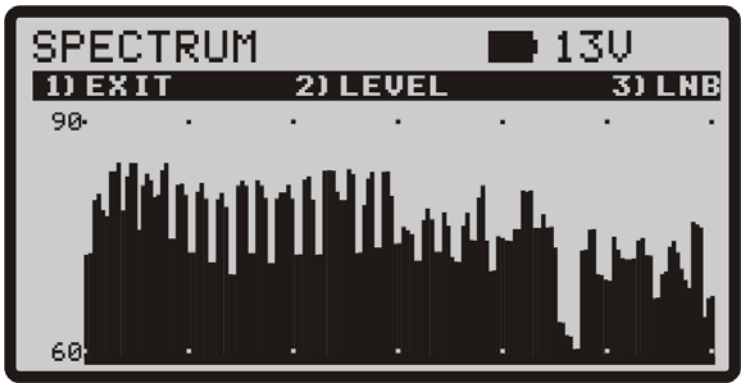


Figure 8. Function SPECTRUM.

Pressing the key **EXIT** it returns to the Setup menu.

Pressing the key **LEVEL** it moves the vertical axis of representation. It moves from 40-70 to 70-100 dB.

Pressing the key **LNB** it changes the LNB power (13 V, 13 V +22 kHz, 18 V, 18 V + 22 kHz).

- ► **SELECT MEASURE** It allows you to select what measurement you want displayed on a bar at the screen **ADJUST**. You can choose between **MER** and **LM** (Link Margin).

- ► **SOUND CONTROL** There are three different options: **ON**, **OFF** and **BEEP**. The option **ON** emits a sound that varies in tone depending on the input power and also sounds a beep when pressing a key. The option **OFF** does not emit any sound. The option **BEEP**, emits a beep every time you press a key but does not sound the power detector.

- ► **BACKLIGHT MODE** Actives (**ON**) or disables (**OFF**) the back-light of the screen. The **AUTO** option actives the back-light when the user is pressing keys. After one minute without using the instrument, the back-light turns off.

- ► **CONTRAST LCD** Allow you to chose between four contrast levels.

- ► **CONFIRM & EXIT** After making changes in the setup menu, you should use this option to confirm and apply the values and exit the setup menu.

3.3 Antenna Adjustment for Optimum Reception

The SATHUNTER+ has been designed to adjust the orientation of a satellite antenna in order to achieve the optimum reception of a digital satellite signal from a previously memorised one.

The adjustment process consists of three steps:

1. Satellite detection and location: **1> DETECT**
2. Identification of a located satellite: **2> IDENTIFY**
3. Precise antenna adjustment for optimum signal quality. **3> ADJUST**

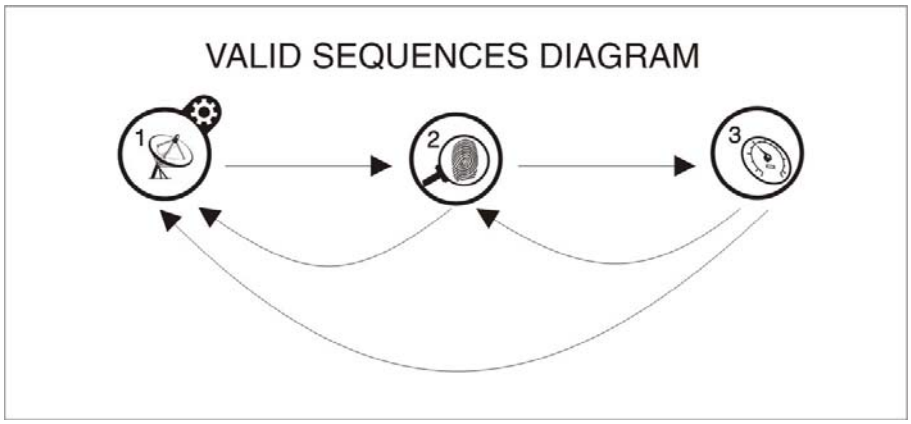


Figure 9. Valid Sequences Diagram.

During the whole process the instrument checks the state of the cable, the connector and the LNB. Therefore, if it detects that the noise level is below a reference level (standard value: 10 %), it will be shown the message "***LNB NOT DETECTED***" at the bottom of the screen. On the other hand, if the signal power is higher than the threshold the equipment will emit a variable frequency tone to help the user in order to position the antenna and detect the maximum signal power.

If the LNB power supply voltage falls 1 V below the nominal value, the instrument will show the message "***LNB SHORTCIRCUIT***" and will temporarily switch off the power supply to prevent overloads. After one second, the power supply will switch on again, and it will check if the short circuit has disappeared.

This may occur due to a temporary fall in the voltage when connecting or disconnecting the instrument from the rest of the installation. The message may also appear when the power supply is overloaded because of using a LNB with excessive consumption.

3.3.1 Satellite Detection and Location (1> DETECT)

This function is directly accessed on starting the instrument. If it is not the active function, press key [1] to select it.

The purpose of this function is to detect when the antenna is pointing at a satellite (detection).

In order to do this, connect the instrument to the low-noise amplifier that is located at the focus of the parabolic antenna. On the screen you will see two horizontal bars that can vary depending on the power signal. The upper horizontal bar keeps the maximum value measured during tracking. The lower horizontal bar shows the signal power in real time. In addition to these bars, there is an audible signal that varies depending on the power signal, from low tone (low power) to high tone (high power)

Figure below shows the display of SATHUNTER+ in detect mode. Among the data shown, there is the voltage average supplied to the LNB and if it is being applied the 22 kHz signal.

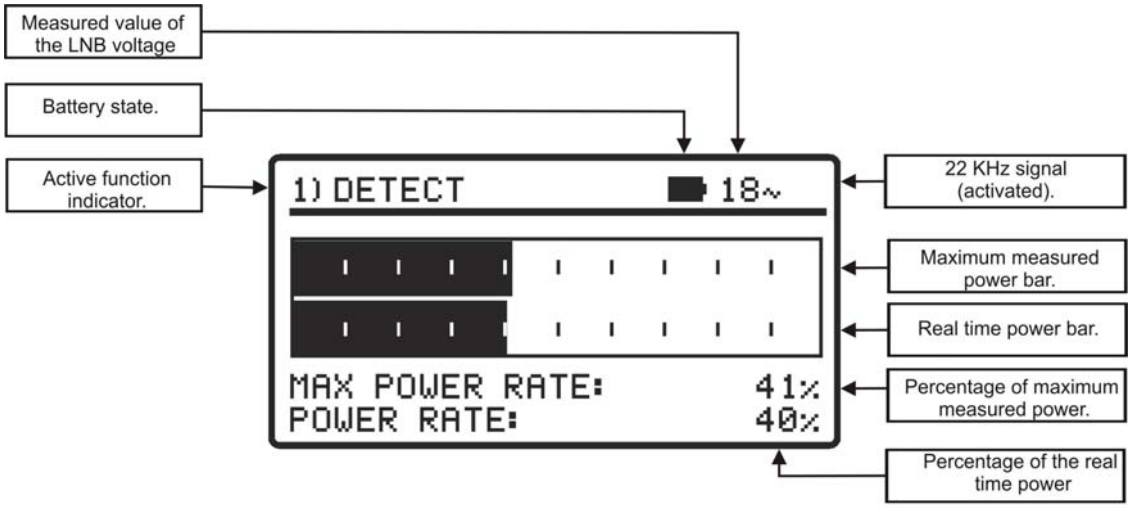


Figure 10. DETECT function.

If no signal is detected, the display will show horizontal bars at minimum level and the percentage of power rate at 0 %. There will not be either audible signal and it will appear the message "***LNB NOT DETECTED***".

3.3.2 Satellite Identification (2 > IDENTIFY)

Once a satellite has been detected (by localising a power maximum), you should check if the received signal corresponds to anyone of the memorised satellites. Select the satellites identification function **2> IDENTIFY** by pressing ke [2].

The identification system is based on a database of satellites previously loaded to the equipment. Consult the configuration sheet supplied with the instrument for further information on satellites that the instrument can detect.

The instrument can memorise up to fifty combinations of frequencies and polarizations (50 test points).Frequency measurements are configurable by software. They can be shown as a FR (intermediate frequency) or DL (Downlink frequency). The number of active points (selectable) can be also configured. A greater or lesser number of satellites can be identified depending on the number of active points and how many you want to assign to each satellite. Therefore, for example, if we assign one frequency and the two possible polarizations to each satellite (i.e. 2 points for each satellite) and they are activated 14 points, the instrument will be able to identify a total amount of 7 satellites. See the configuration sheet delivered with the instrument for further information. Each test point has a name up to 8 letters assigned to it. It will be shown on the display when is selected.

NOTE

We advise to assign two test points to each satellite, the first one with vertical polarization and the second one with horizontal polarization in order to guarantee the identification of the satellite.

The key [2] enables you, as you can see at figure 11, to change the selected test point in a sequential way. Each time you press shortly this key it advances to the next test point. If you press longer (1 s.) this key it goes back to the previous test point. If you want to go to the first test point (TP1) you should press the key [1] for 1 s.

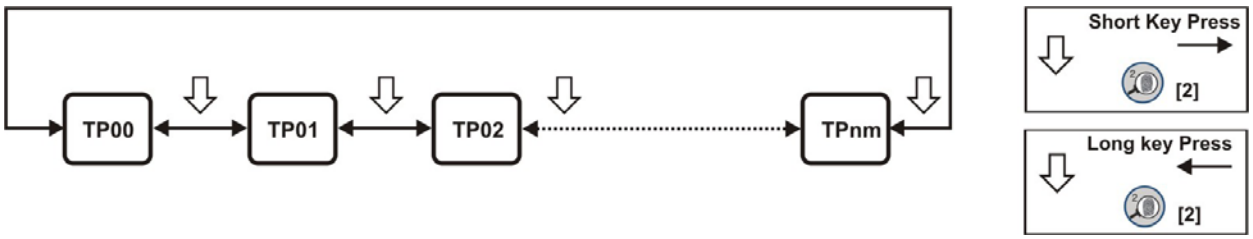


Figure 11. Rotation of active test points.

When you select a satellite test point, the name (four letters maximum) and frequency assigned to that point is displayed.

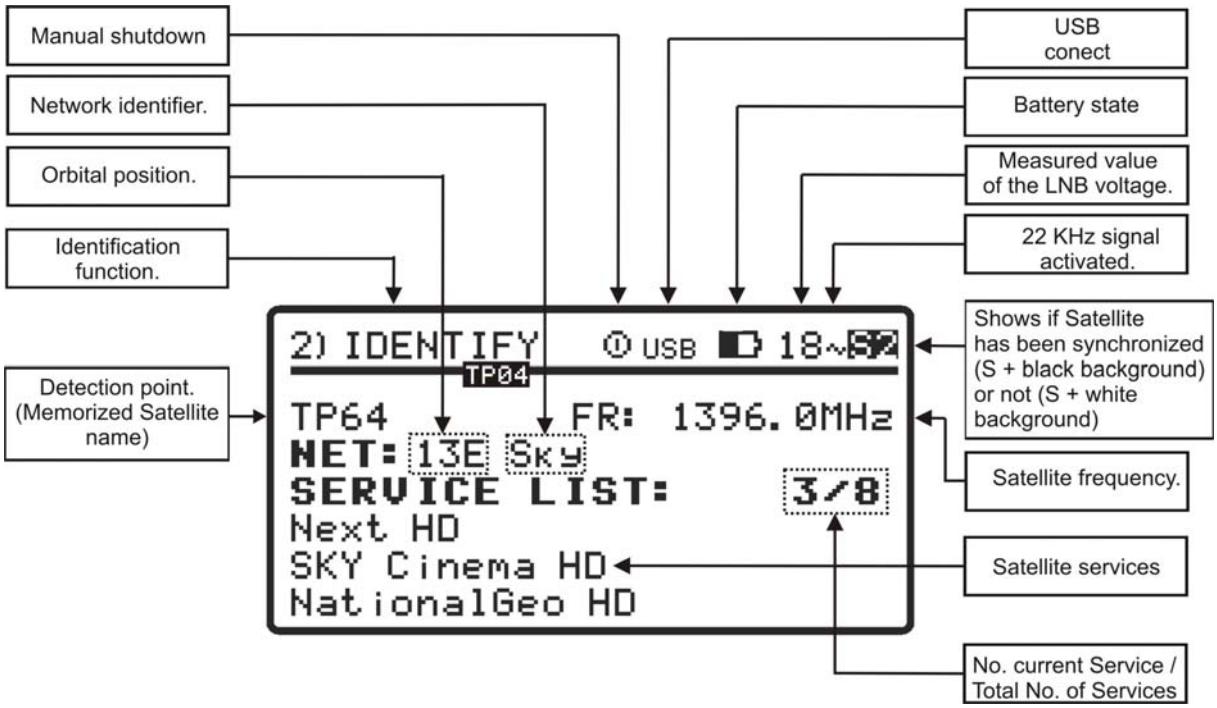


Figure 12. Satellite identification screen.

Afterwards, if it is detected a signal with a valid transport stream at the frequency (or frequencies) assigned to this satellite, the instrument will show at the top right corner the symbols S **DVB-S**, S2 **DVB-S2** or DS **DSS** depending on the selected transport stream. Additionally it will attempt to obtain, the Network, the first 48 services and the orbital position of the satellite the antenna is pointing at. When this information is detected, it will be shown on the display. Sometimes this could cause a reduction in the amount of identifying text characters.

NOTE: For DSS, the TS information is not available.

ATTENTION

The signal provider is the exclusive responsible in the accuracy of the orbital position. PROMAX ELECTRONICA, S.A. only extracts and shows the information contained in the detected signal.

At first, it could be that the equipment could not detect a signal with a valid transport stream and therefore it will appear the S, S2 or DS symbol at the top right corner and the name of the test point memorised. If later on, the equipment achieves to synchronize, it will update the services list and the colour of the symbol shown will change to S, S2 o DS.

3.3.3 Antenna Adjustment for Optimum Signal Quality (3> ADJUST)

Once the antenna has been positioned in order to receive the maximum power and you have checked that the antenna is pointing the right satellite, the antenna and the LNB have to be adjusted to achieve the maximum MER level, and therefore the best quality at reception.

The adjustment (**ADJUST**) function shows the information regarding the signal quality. You should select the **3> ADJUST** function pressing the key . [3]. When it detects a signal with a valid transport stream, the SATHUNTER+ shows briefly the network name and orbital position at the top line of the screen. When it is locked to the signal, it shows the symbol S, S2 o DS depending on the satellite signal detected. This function measures the ratio between the DVB average power and the noise average in a constellation (MER). It also measures the error rate in a DVB signal, before the correction process (CBER). Once all the measurements are done (approximately after 5 s), they will be displayed on the screen in a graphical and alphanumerical way (see figure 13). At the top line of the screen it keeps displaying the battery level, the measured LNB voltage and whether the 22 kHz signal is present or not.

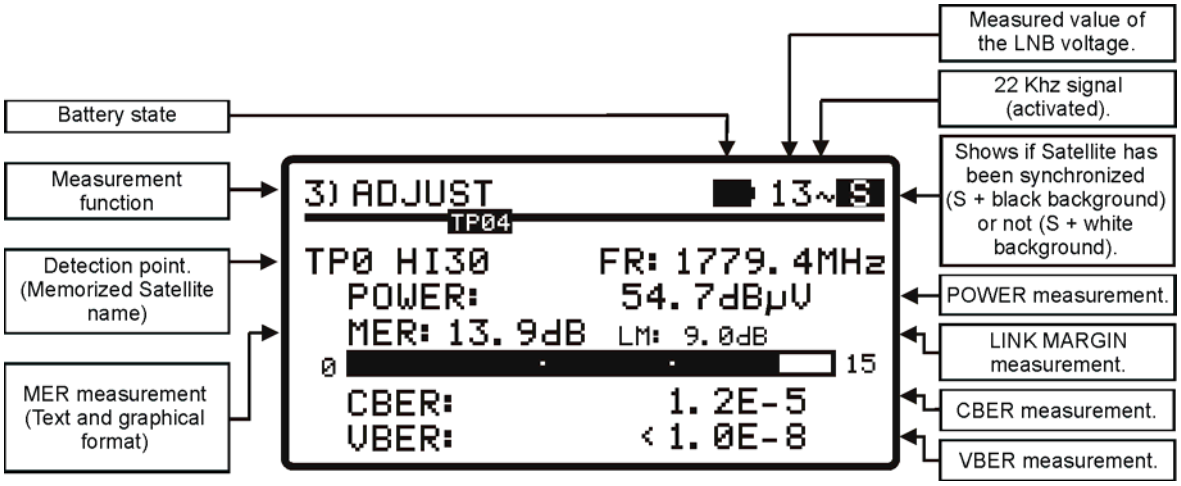


Figure 13. Adjust function screen.

Measure units of power can be configured by software. Available values are: dBµV, dBmV or dBm.

The **LINK MARGIN** measurement (**LM**) measures the reception quality of the data link (in dBs) between the satellite and the receiving antenna. A positive value indicates the signal is correct. The higher the value, the greater the operating margin for future adverse conditions. A zero value indicates it is about to lose the link. Negative values means pixelaciones or signal loss.

If the signal cannot be locked, it is shown the Signal to Noise Ratio (SNR). SNR is a measure that means there is a signal, but the equipment cannot locked it for some reasons (wrong parameters settings, not supported standard, etc.). Anyway, this measure can help to orientate the dish. If eventually the equipment can lock the signal, the MER will replace the SNR.

Once the antenna is well positioned, if you wish to measure the MER on other *transponders* of the same satellite that are memorised in the instrument, you can change the test point by pressing the key [3] until you select the right one. If you wish to measure the MER for other satellites memorised in the instrument, before that you have to orientate correctly the antenna and then, change satellite pressing the key [3]. The variation between satellites and transponders depends on how you set the table of channels loaded into the SATHUNTER+.

In addition, the SATHUNTER+ can measure the **VBER** for **DVB-S** or **DSS** and the **LBER** for **DVB-S2** (see figures 14 and 15). In order to do this, the SATHUNTER+ should be configured using the **PROMAX** software.

Figure 14.- DVB-S measurements with **VBER**.

Figure 15.- DVB-S2 measurements with **LBER.**

As time goes by, the **DVB-S**, **DVB-S2** and **DSS** demodulator circuit tends to measure better, due to it includes an input signal tracking and an adaptation algorithm. Therefore, to ensure a good quality at reading signal, you should wait for some additional measurements.

If moving the antenna the MER value exceeds the quality reference (configurable by software), the instrument will emit a high-pitched audible signal and the word MER will become bold (**MER**). If the MER value is below the quality reference then the instrument will emit a low-pitched audible signal and the word "MER" will not change.

NOTE: For the final step of precise adjustment and the optimisation of the signal quality, it is important to select the most critical test point. This will guarantee the quality for the other points with better conditions.

To switch off the instrument, press any of the instrument keys  [2] or  [3]) for more than two seconds.

3.4 Instrument Configuration

The various parameters and information stored in the SATHUNTER+ can be modified using the PC program "**CONFIGURATION SOFTWARE FOR SATHUNTER+**". This program is supplied with the instrument.

The program allows you to define the number of test points, the different parameters for each point and the user and company's name.

Once the instrument has been configured, it has to be rebooted in order to apply the changes.

All the necessary information for configuring the instrument and for using the "**CONFIGURATION SOFTWARE FOR SATHUNTER+**" program can be found in the manual accompanying the program.

CONTROL PROGRAM (PC)

NOTE:

To update the software version and user's manual access the **PROMAX** web page:

www.promaxelectronics.com

4 SPECIFICATIONS

4.1 General Specifications

TUNING	
Frequency range	950 MHz TO 2150 MHz.
Measurement points	50 maximum.
RF INPUT	
Impedance	75 Ω.
Connector	Universal, including BNC, DIN and F interchangeable adapter.
Level range	40 dBµV to 110 dBµV.
Maximum signal level	120 dBµV.
DVB-S SIGNAL PARAMETERS	
Symbol rate	2 to 45 Mbauds.
Roll-off (α) factor of Nyquist filter	0.35.
Code Rate	1/2, 2/3, 3/4, 5/6, 7/8.
Spectral inversion	Selectable: ON, OFF.
DVB-S2 SIGNAL PARAMETERS	
Symbol rate (QPSK)	2 to 45 Mbauds.
Symbol rate (8PSK)	2 to 45 Mbauds.
Roll-off (α) factor of Nyquist filter	0.20, 0.25 y 0.35.
Code Rate (QPSK)	1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10.
Code Rate (8PSK)	3/5, 2/3, 3/4, 5/6, 8/9, 9/10.
Spectral inversion	Selectable: ON, OFF.
DSS SIGNAL PARAMETERS	
Symbol rate	22 Mbauds.
Roll-off (α) factor of Nyquist filter	0,20.
Code Rate	1/2, 2/5, 6/7.
Spectral inversion	Selectable: ON, OFF.
DVB-S / S2 / DSS MEASURES	
POWER	40 to 100 dBµV (accuracy ± 3 dB)
MER	0 to 25 dB.
CBER	1E-6 to 1E-1.
Link Margin	Typically between 0 – 10 dB.
SNR	0 to 25 dB.
DVB-S / DSS MEASURES	
VBER	1E-8 to 1E-3.
DVB-S2 MEASURES	
LBER	1E-8 to 1E-3.
Spectral inversion	Definable by user.
Quality level for acceptance	Definable by user.
Initial values	MER = 5 dB.
Displayed information (only for DVB-S/S2; for DSS the information of the transport stream is not available)	Satellite's Azimuth and orbital position if it is detected. Service name, (the 48 first services) and network, if it is detected. Visual indication of DSS, DVB-S or DVB-S2 synchronized signal.
Configuration of test points	By USB 2.0 connection to PC. (Cable and program included).

EXTERNAL UNITS POWER SUPPLY	Through the RF input connector.
Output voltage	18 V, 13 V ± 1 V.
Maximum output current	300 mA.
22 kHz signal	Selectable.
Voltage	0.6 V ± 0.2 V.
Frequency	22 kHz ± 4 kHz.
BACK-LIGHT DISPLAY	Automatic.
POWER SUPPLY	
Battery	7.4 V 2.2 Ah Li-Ion battery.
Low battery indication	Acoustic indication and a message on the display.
Charger	Built-in. It disconnects the powering when the charging process ends.
Autonomy	80 min. typically, powering a universal LNB and identifying a signal continuously.
Charging time	100 min. approx. starting from a complete discharge (instrument off), within the margin of tolerated temperatures.
Temperature of start charging	Between 5 and 45 ºC. Outside this range of temperatures, the charger will not initiate the charging process. At high ambient temperatures, the charging process will not be carried out in continuous mode because the charger circuit has a heat-protection device that disconnects this circuit when it is over 45 ºC, returning to connect itself when it is above 40 ºC.
Mains Adapter	100 - 240 V/50-60 Hz (included).
External	
Voltage	12 V DC.
Consumption	20 W.
OPERATING ENVIRONMENTAL CONDITIONS	
NOTE: Equipment specifications are set in these environmental operating conditions. Operation outside these specifications are also possible. Please check with us if you have specific requirements.	
Altitude	Up to 2000 m.
Temperature range	From 5 °C to 40 °C.
H Max. relative humidity	80 % (up to 31 ºC), decreasing lineally up to 50 % at 40 ºC.
MECHANICAL FEATURES	
Dimensions	180 mm (A) x 95 mm (Al) x 50 mm (Pr).
Weight	480 gr.
INCLUDED ACCESSORIES	
AL-0122	Mains power adapter 100 – 240 V.
AA-012	Car lighter adapter.
AD-055	"F"/H- BNC / H adapter.
AD-056	"F"/H- DIN / H adapter.
AD-057	"F"/H-"F"/H adapter.
RM-011	CD-ROM with user's manual and software + USB 2.0 connector cable.
DC-270	**SATHUNTER+** Carrying suitcase.
DC-271	**SATHUNTER+** Carrying belt.
OPCIONAL ACCESSORIES	
DC-269	**SATHUNTER+** case.
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.	

5 MAINTENANCE ⚠

5.1 Instructions for returning by mail

Instruments returned for repair or calibration, either within or out of the warranty period, should be sent with the following information: Name of the Company, name of the contact person, address, telephone number, receipt (in the case of coverage under warranty) and a description of the problem or the service required.

5.2 Cleaning Recommendations

CAUTION
To clean the cover, take care the instrument is disconnected.

CAUTION
Do not use scented hydrocarbons or chlorized solvents. Such products may attack the plastics used in the construction of the cover.

The cover should be cleaned by means of a light solution of detergent and water applied with a soft cloth.

Dry thoroughly before using the equipment again.

CAUTION
Do not use alcohol or its derivates for the cleaning of the front panel and particularly the viewfinders. These products can attack the mechanical properties of the materials and diminish their useful time of life.

5.3 Fuses

Fuses not replaceable by the user.

F001: FUS SMD 2,5 A T 125 V.