


PROMAX-37

CABLE TV & DOCSIS 3.0 ANALYSER



SAFETY INSTRUCTIONS

Before using this equipment, read the instruction manual and especially the SAFETY section.

The symbol  on the equipment means "SEE USER MANUAL". In this manual may also appear as a symbol of warning or caution.

Warning and Caution statements may appear in this manual in order to avoid hazard to persons or damage to equipment or other property.

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CABLE TV & DOCSIS 3.0 ANALYSER

PROMAX-37

1 GENERAL

1.1 Description

The **PROMAX-37** is an analyser for the installation, configuration and maintenance of interactive video and data services at high speed over TV networks based on the **EuroDOCSIS** and **DOCSIS 3.0** standard. It also allows the qualification of **VoIP** and **IPTV** services.

The **PROMAX-37** incorporates the most advanced functions in accordance with the updates to the latest version of the **DOCSIS 3.0** protocol, including channel bonding technology, which are the latest technology implemented by operators in the cable data networks.

The **PROMAX-37** has all the functions necessary for an easy installation of any service offered by cable. In addition, its intuitive menu, its adjusted weight and strength, makes it ideal for fieldwork. The instrument is powered by an internal rechargeable battery.

In the design of the **PROMAX-37** it has dedicated particular attention on making a practical and precise instrument, as easy to use. A simple alphanumeric keypad that incorporates soft-keys allowing direct access to different modes of operation and once there, through the ambidextrous navigation and selection keys it's easy to modify any parameter of the measure.

All this makes the **PROMAX-37** in a magnificent tool for installing and maintaining HFC (Hybrid Fibber Cable) / CATV, analog and digital systems. Being also very useful for testing DOCSIS / EuroDOCSIS data transmission systems.

In addition, the instrument provides an output for connecting to a computer and thus obtains reports of the taken measurements or access the **PROMAX** server for updating.

Here are some of the most important functions the **PROMAX-37** integrates.

The **Power meter function**, across the frequency band, is very useful in assessing the possible saturation of inputs of CATV amplifiers.

The **Meter Level function** will take measures both analog channels (C / N ratio, level of carrier, V / A ratio) and digital (Power, VER, MER, Constellation ...).

The **Register** function allows you to take and store up to 100 measurements acquisitions in memory, each one of them can get to store up to 140 channels, with all the measurements taken in the analysis of data transmission. The acquired measures can be reviewed, transferred to a PC or printed anytime.

The **Frequency Scan** function shows the level of all active channels in the channel plan through a bar chart.

By the **Generator Function**, it is possible to create a test signal that allows you to equalize properly the transmission band (upstream).

As **Spectrum Analyser** function provides an analysis of the whole band, allowing change the reference level and the span among others.

As **Analyser Data Systems for DOCSIS / EuroDOCSIS**, the **PROMAX-37** allows you to measure downstream, upstream and the constellation.

The **VoIP function** performs a network analysis based on quality service parameters established by the operation mode **UGS** (Unsolicited Grant Service) for data packets transmission, which is based on **DOCSIS / EuroDOCSIS** standard. Therefore, those will ensure the best call quality.

PROMAX-37, as **IPTV services analyser**, performs a comprehensive analysis of the network based on the quality of service (**QoS**) named **rtPS** (real time Polling Service), which is one of the quality services defined by **DOCSIS / EuroDOCSIS** standard. That will ensure the best quality of TV over cable.

This analyser is capable of measuring systems using channel bonding that has been introduced in **DOCSIS 3.0**, so user can verify the operation of a cable network that uses this technology in both directions.

In short, implementation of all these functions into an light instrument of one kilo and a half weight, ergonomic design and robust, makes **PROMAX-37** into an unparalleled tool at fieldwork.

1.2 Specifications

TUNING	
Tuning range	From 5 to 1000 Hz.
MODEM mode	From 90 to 1000 MHz.
Tuning mode	By channel or by frequency.
Channel plan	10 channel plans, each one with a maximum of 140 channels.
Factory start-up channel plans	CCIR, EIA, HRC, IRC, OIRL, UK, AUNAD, ST2L, AUST, ONO.
Resolution	10 kHz.
Display	Graphic LCD display with backlighting.
Channel frequency offset	$\pm 2,5$ MHz.

GENERATOR	
Carriers frequency range	From 5 to 85 MHz.
Resolution	100 kHz.
Accuracy	$< \pm 5$ kHz.
Carrier level	60 to 115 dB μ V (selectable in 1 dB steps).
Signal level resolution	1 dB.
Signal level accuracy	± 3 dB.
Modulation	QPSK, 8QAM, 16QAM, 32QAM, 64QAM.
Symbol Rate	From 160 to 5120 ksym/s.
Sweeper	From 5 to 85 MHz.

BROADBAND POWER LEVEL MEASUREMENT	
Measuring range	From 70 to 120 dB μ V (from 10 dBmV to 60 dBmV ¹).
Bandwidth	From 5 to 1000 MHz.
Resolution	1 dB.
Accuracy	± 3 dB (from 5 to 40 °C).

LEVEL MEASUREMENT	
Measurement:	
Analogue channels Digital channels	Video carrier signal level measurement. Power measurement in the channel bandwidth by integration method.
Measuring range	From 25 to 120 dB μ V (from -35 dBmV to 60 dBmV).
Maximum input level:	
From 5 to 862 MHz DC to 60 Hz	120 dB μ V (60 dBmV ¹). 60 V DC or RMS.
Readout	Digital in dB μ V, dBmV or dBm and analogue through a graphic bar. 1 dB resolution.
IF bandwidth	230 kHz \pm 50kHz.
Input impedance	75 Ω .
Accuracy:	
Analogue channels Digital channels	\pm 2 dB (from 5 to 40 °C) for negative video modulation ² . \pm 2 dB (from 5 to 40 °C) for 8 MHz bandwidth channels.

DIGITAL SIGNALS MEASUREMENT	
MER (Modulation error ratio):	
Measurement range Accuracy	From 22 dB to 40 dB for QAM 64 / 256. \pm 2 dB.
BER (Bit error rate) measured before RS decoding:	
Measurement range	From 10 E-2 to 10 E-10.
Constellation Diagram	ITU-J83 (Annex A/B/C) signals.
Lock range	From -10 dBmV to 60 dBmV (50 to 110 dB μ V).
Symbol rate:	
Measurement range	From 1000 to 7000 Msym/s for QAM 16/64/256.
Datalogger	Power lever, BER and MER for each digital channel, to send to PC.
Modulation type	QAM 16/32/64/128/256 ITU J83 annex A/B/C and QPSK.
Bandwidth	Selectable.
Frequency tuning	62.5 kHz.

¹ Because of safety reasons, the maximum input power over the entire band is limited up to 120 dB μ V. The equivalent power level for a group of channels of similar levels is related with the input power level over the entire band according to the following expression:

$$L_T = L + 10 \log N \quad (L_T: \text{total level}, L: \text{mean level of one channel}, N: \text{number of channels present}).$$

For higher input power levels, the use of an external attenuator of 20 dB is recommended.

² For the positive video modulation (L standard) it can vary from 0 to -2 dB among white and black image.

VIDEO / AUDIO RATIO MEASUREMENT (ANALOGUE CHANNELS)	
Measurement	Ratio of video to audio carrier levels.
Measurement range	From 0 to 30 dB.
Audio subcarrier frequency:	
Variable	From 0.1 to 9.9 MHz.
Accuracy	± 2 dB (from 5 to 40 °C) for FM audio carrier ³ .

CARRIER / NOISE RATIO MEASUREMENT	
Measurement:	
Analogue channels	Ratio between carrier level and the channel's noise level.
Digital channels	Ratio between the channel power and the noise level. The frequency where noise is measured is user definable in absolute or relative value. In the relative mode, the unit takes as default frequency offset the value BW/2 + 0.5 MHz.
Measurement range:	
Analogue channels	40-50 dB for input level between 60 and 70 dB μ V.
Digital channels	> 50 dB for input level > 70 dB μ V. > 30 dB for input level > 60 dB μ V.
Accuracy	± 2 dB (45 – 862 MHz) ± 3 dB (5 – 45 MHz).
CABLE MODEM	DOCSIS / EuroDOCSIS 1.1, 2.0, 3.0 8x4.


TV/MODEM DATALOGGER FUNCTION	
Max. number of loggers	50 (TV) - 30 (MODEM).
Number of channels /loggers	140.
Measurements:	
TV analog channels	Level, C/N and V/A.
TV digital channels	Power, BER and MER.
Data digital channels	Upstream and Downstream parameters (Power level, attenuation, frequency, bandwidth, modulation, symbol rate, BER and MER).

SCAN	
Span	Variable: 10, 30, 100, 300 MHz and full band.
Dynamic range	Variable from 20 to 120 dB μ V in 10 dB steps.

³ For the AM audio carrier (L standard), it can vary from 0 to -3 dB below the V/A value.

SPECTRUM ANALYSER	
Span	From 1 to 100 MHz (1, 5, 15, 30, 50, 100 MHz).
Reference level	Variable from 20 to 120 dB μ V in 10 dB steps.
Analysed band	From 5 to 862 MHz.
Detector	Peak or Maximum.
Bandwidth	200 kHz.
Resolution:	
Peak detector	
Span 100 MHz	900 kHz.
Span 50 MHz	450 kHz.
Span 30 MHz	280 kHz.
Span 15 MHz	140 kHz.
Span 5 MHz	50 kHz.
Span 1 MHz	10 kHz.

AUDIO	
Demodulation	AM/FM.
Output	Internal loudspeaker.

POWER SUPPLY	
Li-Ion battery	7.4 V - 4.8 Ah.
Battery indication	Graphic indication on the display: 
Autonomy	Approximately 4 hours.
Automatic power-off	Power-off after approximately 10 minutes of non-use.
Battery charge	By fast internal charger.
Equipment consumption	22 W.
Mains to charger adapter	Al-103: From 100 to 240 V AC / 50-60 Hz / 12 V DC (EUROPE and other countries).

ENVIRONMENTAL CONDITIONS	
This equipment can be used on the following environmental conditions. Specifications are applied within these conditions.	
Altitude	Up to 2000 metres.
Temperature range	From 5 °C to 40 °C.
Maximum relative humidity	80 % (up to 31 °C), decreasing lineally up to 50 % at 40 °C.

MECHANICAL FEATURES	
Dimensions	160 W x 230 H x 50 D mm.
Weight	1.4 kg (including battery and protective bag).

INCLUDED ACCESSORIES	
AL-103	DC external adapter.
AD-057	F/female - F/female input adapter.
AD-058	F/male - F/female rapid adapter.
CA-005	Mains cord.
CC-041	USB cable (A) male – mini (B) male.
DC-298	Protective bag.
0 DG0134	PROMAX-37 Quick reference guide
	Remote control software for PROMAX-37 (downloadable from PROMAX website at: www.promaxelectronics.com).

OPTIONAL ACCESSORIES	
AA-103	Car lighter adapter cable.
AD-055	F/female – BNC/female adapter.
AD-056	F/female – IEC/female adapter.
AT-20C	20 dB attenuator.
CC-030	F/male - F/male (1m) coaxial cable.
DC-229	Transport suitcase.

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.	

2 SAFETY RULES















2.1 Generals

- * **The safety could not be assured if the instructions for use are not closely followed.**
- * Use this equipment connected **only to devices or systems with their common at ground potential.**
- * This equipment can be used in **Over-Voltage Category I** installations and **Pollution Degree 2** environments.

Use the mains adapter in **Over-Voltage Category II** installations and **Pollution Degree 1** environments. It is for **INDOOR USE**.
- * When using some of the following accessories **use only the specified ones** to ensure safety.
 - Power adapter
 - Car cigarette lighter adapter
 - Mains cord
- * Observe all **specified ratings** both of supply and measurement.
- * Use this instrument under the **specified environmental conditions**.
- * **The user is not authorised to manipulate** inside the instrument:

Any change on the equipment should be carried out by qualified personnel.
- * 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

2.2 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.

3 INSTALLATION

3.1 Power Supply

The **PROMAX-37** is a portable instrument supplied by a built-in Li-Ion battery. Before taking any measurement, we must ensure that the battery is charged.

3.1.1 Charging the battery

The instrument is supplied with a mains adapter in order to power or charge the instrument.

There are two situations that can arise in the battery charging process:

- 1) **Stopped Instrument:** When connecting the external power it will start a rapid charging cycle, whose duration will depend on the battery status. It will take three hours for a discharged battery. The charging indicator on the front panel [10] will remain lit in amber colour during this period. At the end of charging and in full charge, the indicator will be green.
- 2) **Instrument in operation:** When connecting the charger, it will start a charging process in a lower regime and therefore longer. At the end of charging and in full charge, the indicator will change from amber to green colour.

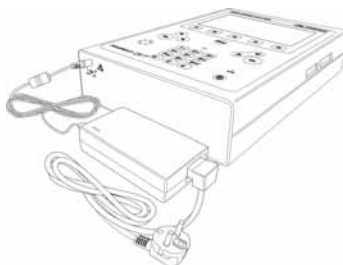


Figure 1.- **PROMAX-37** and mains adapter.



Before using the power adapter, make sure that the adapter is suitable for the mains voltage.


3.1.2 Recommendations using the battery

If anticipating a long period of inactivity of the instrument, it is advisable to store it with battery fully charged and at temperatures below 25 °C.

It is advisable in these cases doing every 3 months a cycle of charging / discharging and a subsequent half charge (i.e. 50 %).

3.2 Installation and starting up

The **PROMAX-37** has been designed for using as portable equipment.

A fully charged battery can power the instrument for over four hours. When displaying the low battery indicator on the screen () , the battery must be recharged.

When starting up with a very low level battery, may be the **PROMAX-37** could start up, because of residual energy remaining at the battery, but the equipment will be disconnected automatically **before** displaying on the screen the low level battery indicator.

4 OPERATING INSTRUCTIONS

4.1 Description of Controls and Elements

Front panel

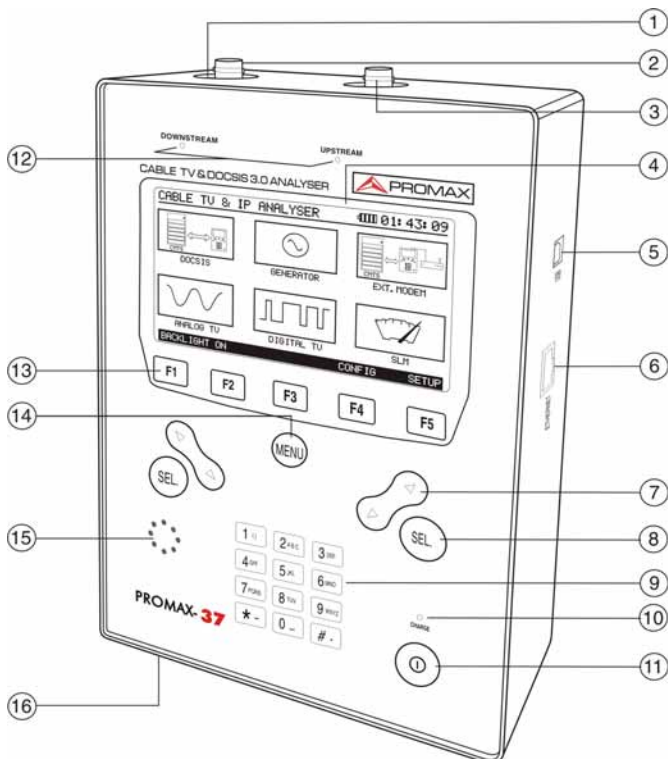


Figure 2.- Front panel view.

- [1] "F" male base connector for Downstream input.
- [2] F-F (or F-BNC or F-IEC) adapter.



Maximum input voltage level 60 VAC rms / 50-60 Hz.

- [3] "F" male base connector for Upstream input.

- [4] Graphic display with backlighting (F1: ON / OFF).
- [5] USB mini-B female connector for connection to a computer.
- [6] Ethernet connector for connection to a data network.



[7]

Navigation buttons / Cursor keys.



[8]

Selection button.

- [9] Alphanumeric keypad with 12 keys for data entry.

- [10] Battery charge indicator.



[11]

On/Off key.

- [12] **LEDS:**

Downstream:

It indicates that a Downstream signal has been detected (regardless of the input used). If blinking it indicates that the test generator is transmitting a signal.

Upstream:

It indicates that a Upstream signal has been detected (regardless of the input used).



[13]

SOFTKEYS, 5 programmable keys for function selection.



[14]

Main menu shortcut key.

- [15] Loudspeaker.

- [16] DC power input adaptor.

4.2 Operating Instructions

The six main functions of **PROMAX-37** are accessible from the initial menu, pressing the key  [14]:

1. DOCSIS

ANALYSER 3.0:

This function allows checking the response of a **DOCSIS/EURODOCSIS** data transmission system. It works for both **Upstream** and **Downstream**. It can store measurements and display a QAM constellation modulation. It can test applications that use VoIP or IPTV protocol, if the cable modem can be registered in the network.

2. GENERATOR:

This function generates a test signal for testing Upstream traffic and, on the other hand, it can analyse the test signal at the opposite end. It also has a Sweep mode, which makes a sweep within a frequency range selected by the user

3. EXTERNAL MODEM:

This function connects the equipment to an external cable modem. It extracts a sample of the Downstream and Upstream signal, displaying their spectrums on screen.

4. ANALOGUE TV:





This function performs an analysis of analogue video and audio carriers.

5. DIGITAL TV:

This function performs an analysis of QAM digital carriers for the standard:
- DVB-C (ITU J83 A).
- ITU J83 B/C.

6. SLM (Signal Level Meter):

This function measures the level power of the received signal.

To access any of these menus, press  [14] key to access the start menu and then press the cursor  [7] key until the selected option remains shaded. Then press  [14] or  [8].


At the bottom of the screen the following options are displayed:

CONFIG [F4]:

This menu sets work basic parameters (for details see section [4.2.2](#)).

SETUP [F5]:

This menu sets the initial configuration of the equipment, entering basic data related to the internal system, as time, date and language among others (for details see section [4.2.1](#)).

Pressing the shortcut key  [14] the instrument will always lead to the start menu, regardless the submenu in which the user is.

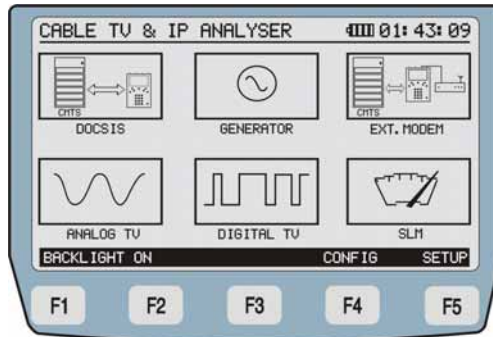
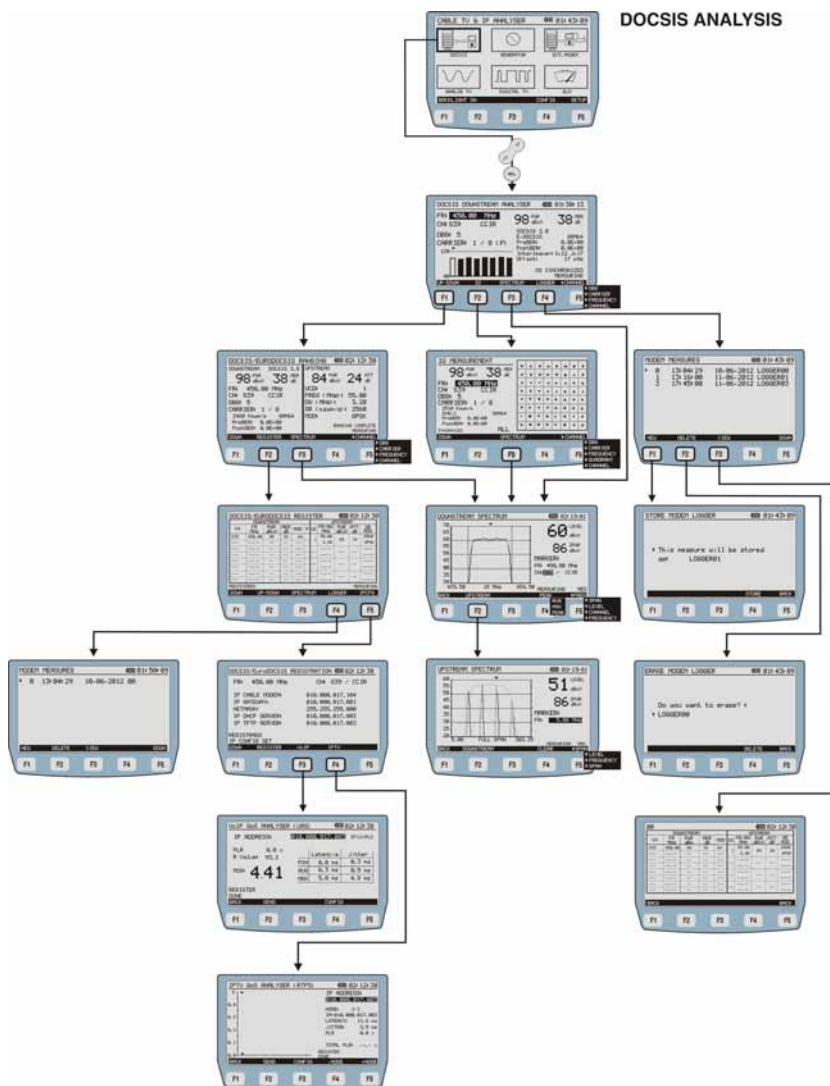
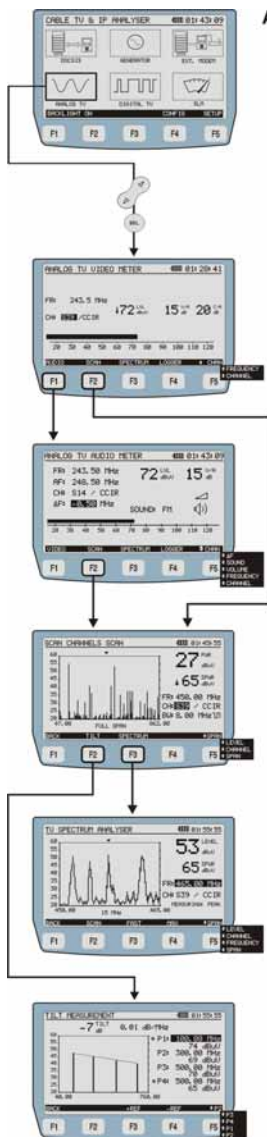
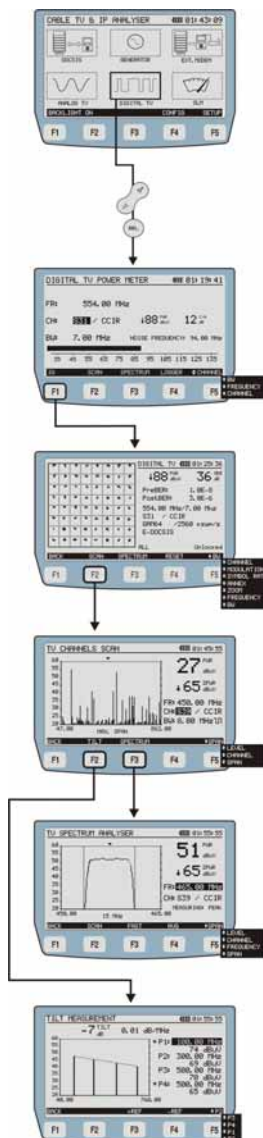


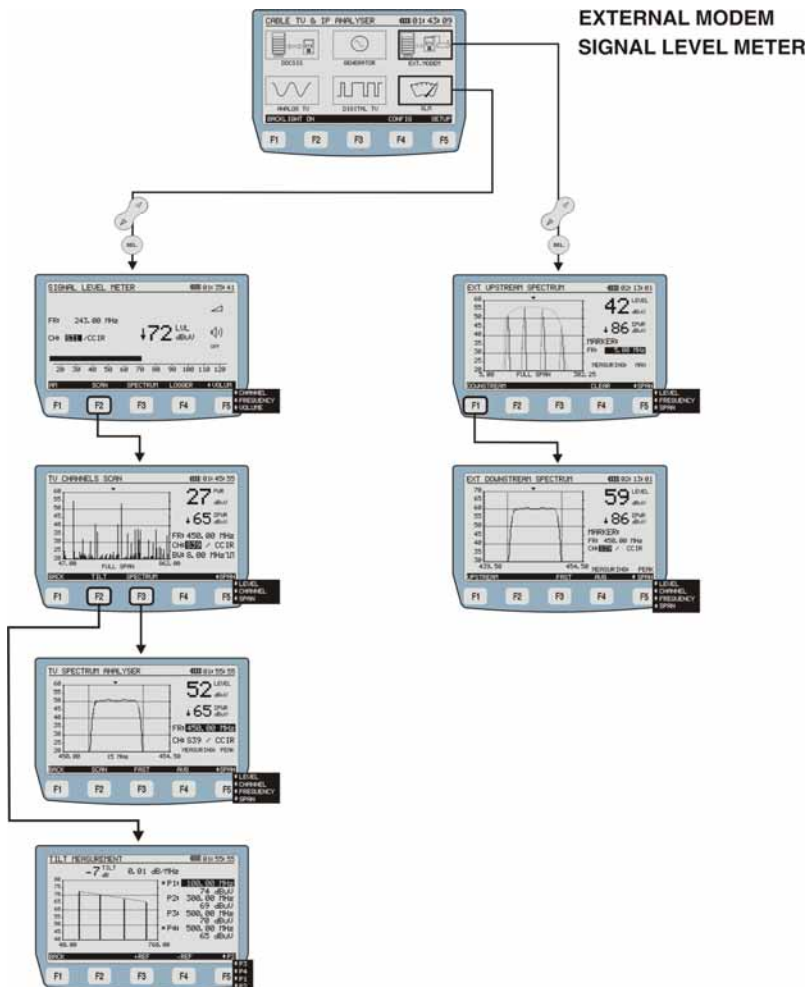
Figure 3.- Main menu with **SOFTKEYS** or programmable keys.



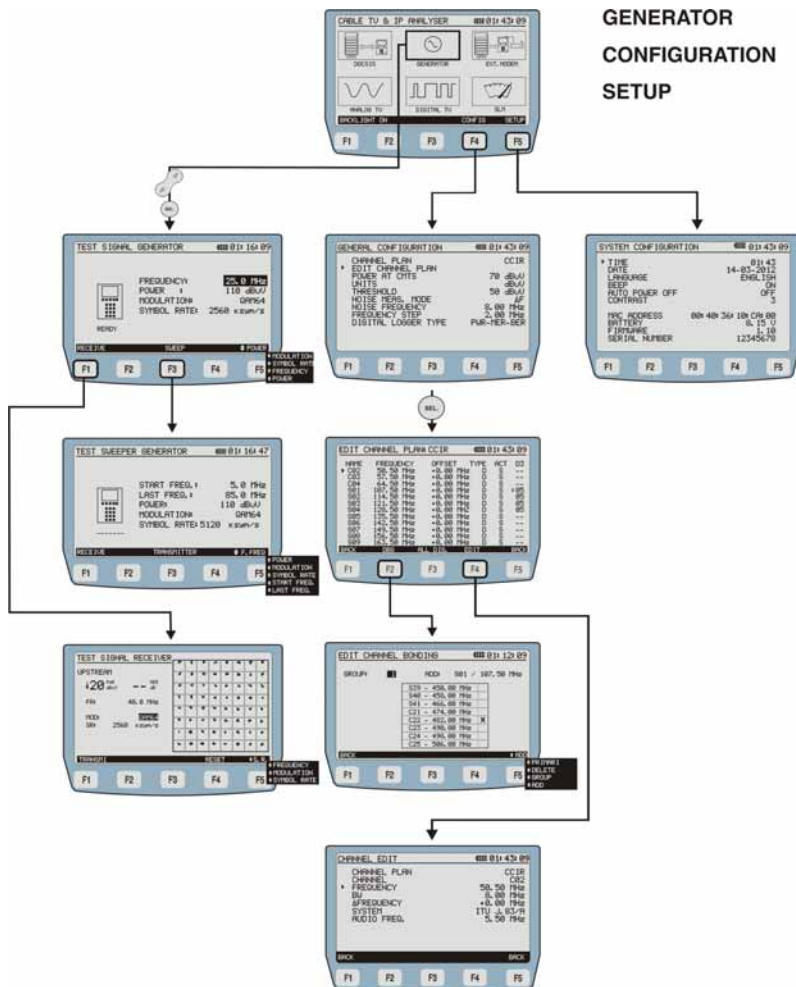
ANALOG TV


DIGITAL TV





GENERATOR CONFIGURATION SETUP



4.2.1 SETUP Mode

To access the **SETUP** mode for configuring system:

- 1.- Press  [14] key.
- 2.- Press **SETUP** [F5] softkey.

It will appear a screen with the configuration parameters of the system (Figure 5).

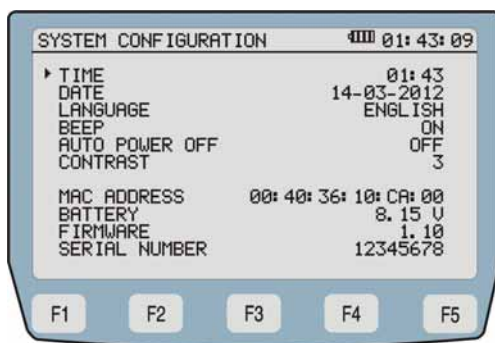







Figure 5.- SETUP Screen.

To change the status or value of a parameter:


- 1.- Use the cursor keys  [7] to scroll along the menu.
- 2.- Go to the parameter you want to modify and press the selection key  [8].
- 3.- The cursor will move next to the parameter value. Now you can change that value using the cursor or the alphanumeric keypad (depending on the case).
- 4.- After you have made your changes, press again the selection key  [8] to save changes.
- 5.- To exit Configuration Mode and return to the main menu, press again the **MENU** key  [14]

Modifiable parameters are:

a) HOUR

It indicates the current time. Enter hour and minutes by alphanumeric keypad. To enter the symbol “:” between hours and minutes, you should use the key , which is in the alphanumeric keypad.

b) DATE

It indicates the current date in European notation (dd-mm-yy). Enter the day, month and year by the alphanumeric keypad. To enter the hyphen symbol between numbers, press key  that is in the alphanumeric keypad.

c) LANGUAGE

The language selected is the language usually used on the menus. Use the cursor keys to scroll through available languages (English, Spanish, German and Portuguese).

d) BIP

This parameter enables (**ON**) or disables (**OFF**) the acoustic indicator that beeps when you press any key.

e) AUTO POWER OFF

This setting enables (**ON**) or disables (**OFF**) the auto power off function. With this feature enabled, the instrument will automatically disconnect after ten minutes without pressing any key.

f) CONTRAST

This option adjusts the screen contrast level from 0 (minimum contrast) to 9 (maximum contrast). The new contrast value is kept when the computer shuts down.

At the bottom of the screen it appears the following information (no editable):

- **MAC ADDRESS:** It shows the **MAC** code (Media Access Control address), which is a physical address that identifies this equipment in a unique way in a network.
- **BATTERY:** It shows the battery charge in voltage.
- **FIRMWARE:** It shows the control program version.
- **SERIAL NUMBER:** It shows the unique identifier number for the instrument.

4.2.2 CONFIG Mode

To access the **CONFIG** mode for setting the general configuration of the system:

- 1.- Press key  [14].
- 2.- Press softkey **CONFIG** [F4].

It appears the screen with configuration parameters (Figure 6.-).

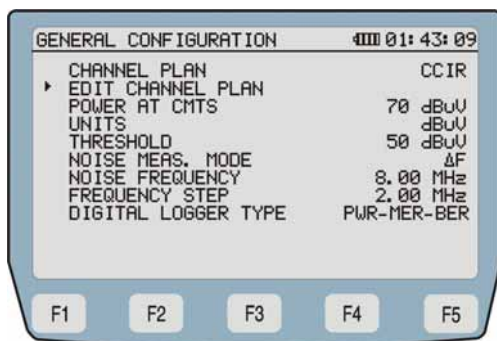





Figure 6.- CONFIG menu.

This menu allows the user to set the parameters in order to the instrument can take the TV digital and analog measurements, as well as the data analysis for Upstream and Downstream.

To change a parameter:

- 1.- Use the cursor keys  [7] to scroll through the menu.
- 2.- Go to the parameter you want to modify and press the selection key  [8].
- 3.- The cursor will move next to the parameter value. Now you can change that value using the cursor or the alphanumeric keypad (depending on the case).
- 4.- After you have made your changes, press again the selection key  [8] to save changes.

5.- To exit Configuration Mode and return to the main menu, press again the

MENU key  [14]

Modifiable parameters are next:

a) CHANNEL PLAN

It allows selecting the channel plan among the ten ones stored by default in the instrument: CCIR, EIA, HRC, IRC, OIRL, UK, AUNAD, ST2L, AUST, ONO.

b) EDIT CHANNEL PLAN

With this option you can edit the active channel plan. Through this option you can get into the option **EDIT CHANNEL PLAN** (for details refer to section [4.2.2.1](#)) and **EDIT CHANNEL BONDING** (for details refer to section [4.2.2.2](#)).

c) POWER AT CMTS


It defines the minimum level of signal that should receive the CMTS. It accepts values between 20 and 120 dB μ V. It is editable by cursor or alphanumeric keypad.

d) UNITS

It allows you to select measurement units to be used among **dBmV**, **dB μ V** and **dBm**.

e) THRESHOLD

It defines the minimum level of signal to detect. It is editable by the cursor

keys  [7] and the alphanumeric keypad. At the **SCAN** function, the threshold is represented in the chart by a dotted line. All measures below the threshold value will not appear on screen. At the **LOGGER** function will not be measured channels below the threshold value.

f) NOISE MEASUREMENT MODE

It measures the noise level. It is only applicable to digital channels. There are three ways to measure noise: **FREC** (Absolute), where noise level is measured at the frequency noise defined at field **NOISE FREQUENCY** (see paragraph **g**), **ΔF** (Relative), where is added the value defined in the field **NOISE FREQUENCY** to the tuner frequency and **BW/2**, where is added the value defined in **NOISE FREQUENCY** to the frequency of half the bandwidth of the tuned channel.

g) NOISE FREQUENCY

(Only for digital channels) Frequency at which is measured the level of noise for digital channels.

h) STEP FREQUENCY




This option allows you to select the step frequency at the frequency tuning modes and at the **GENERATOR** mode.

i) DIGITAL LOGGER TYPE

It allows users to select between two different logger types for the DIGITAL TV function. The PWR-MER-BER logger stores all measurement data for each channel. The PWR logger saves only power for each channel and therefore it is faster.

4.2.2.1 Edit Channel Plan

To access the **EDIT CHANNEL PLAN** menu:

- 1.- Press key  [14].
- 2.- Press the **CONFIG** softkey [F4].
- 3.- Use the cursor keys  [7] to scroll along the menu.
- 4.- Go to the parameter "**EDIT CHANNEL PLAN**" and press the selection key  [8].

The attached figure (Figure 7.-) shows an example of a channel plan. At the top of the screen appears the name of the selected plan channel (CCIR in the attached figure). Along the screen are listed the channels belonging to the channel plan. The maximum number of channels that a plan channel could have is 140.

One or more channels can be grouped to make a Docsis 3.0 group and therefore in order to apply the measurement criteria according to this protocol. The Docsis group name to which the channel belongs appears in column D3. If an asterisk appears next to the group name, it indicates that it is a primary channel.

From left to right are the following columns:

- | | |
|-------------------|---|
| NAME: | It identifies the channel name. |
| FREQUENCY: | It identifies the frequency associated to the channel (MHz). |
| OFFSET: | It shows the displacement of the tuning frequency in MHz. |
| TYPE: | It indicates whether the channel is defined as analog (A) or digital (D). |

- ACTIVE:** It indicates whether the channel is active (Y) or not (N).
- D3:** It indicates if this channel belongs to a Docsis 3.0 group.

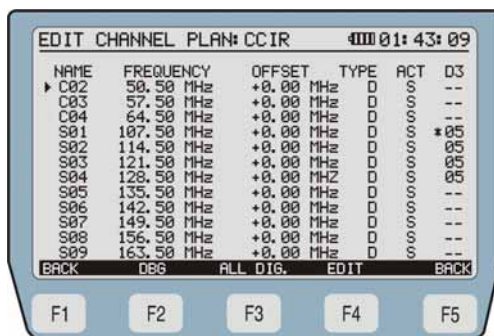




Figure 7.- Channel Plan Editor.

To move along the channels you should use the cursor key  [7].

To edit a selected channel you should press the key  [8] for moving between the channel values.

If you want to edit a value you should use the alphanumeric keypad or the cursor key.

At the bottom of the screen it appears the following options:

- BACK** [F1] and [F5]: To return to the previous general configuration screen **CONFIG**.
- DBG** [F2]: When you press this option, it access the **EDIT CHANNEL BONDING** function in order to add or remove channels in the group that forms the Channel Bonding (see section [4.2.2.2](#)).
- ALL D. / ALL A** [F3]: If you select this option you could change the type of signal defined in all channels to digital or analogue, as appropriate.
- EDIT** [F4]: When selecting this option, user access the **CHANNEL EDIT mode** to configure the parameters of the analogical or digital channel (see next section).

Next are explained in detail the **CHANNEL EDIT** menu.

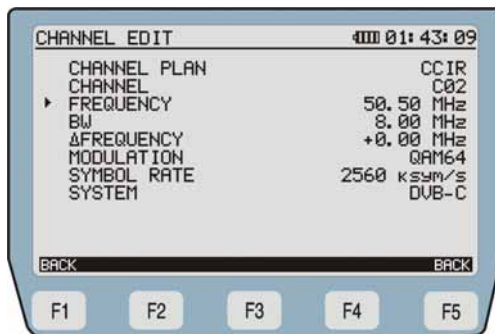


Figure 8.- CHANNEL EDIT menu

Depending on whether is an analogue or digital channel, the parameters will be different. Following is described each one.

CHANNEL PLAN: Name of the channel plan where is the active channel. No editable.

CHANNEL: Name of the channel. It allows you to navigate among existing channels.

FREQUENCY: Is the frequency related to the channel (Not editable).

BW: Bandwidth (Not editable).

OFFSET

(only for analogue channels): It may vary between -2.5 and +2.5 MHz.

SYSTEM

(only for analogue channels): System type and communication standard. It can be selected among systems PAL / SECAM / NTSC and standards B/G, D/K, L, I, M, N.

AUDIO FREQUENCY

(only for analogue channels): Frequency at which the audio signal is transmitted (Not editable).

MODULATION

(only for digital channels): User can select among QPSK, QAM16, QAM32, QAM64, QAM128, QAM256 modulation.

SYMBOL RATE

(only for digital channels):

This value may be between 1000 and 7000 sym/s.

SYSTEM

(only for digital channels):

Depending on the modulation, user can choose the proper annex among DVB-C, ITU J.83 / B or ITU J.83 / C.

In order to modify the rest of features of the channel plan, it is necessary the PC software (download at www.promaxelectronics.com).

To return to the previous menu (**EDIT CHANNEL PLAN**) press key **BACK** [F1] or [F5]

To exit the menu **EDIT CHANNEL PLAN** and return to the previous screen (**CONFIG**) press key **BACK** [F1] or [F5].


4.2.2.2 Channel Bonding Edition

To access the **Edit Channel Bonding** menu:

1.- Press the **MENU**  [14]. key

2.- Press the **CONFIG** [F4] softkey.

3.- Use the cursor keys  [7] to scroll along the menu.

4.- Go to the "**EDIT CHANNEL PLAN**" parameter and press the selection key  [8].

5.- Press the **DBG** [F2] softkey.

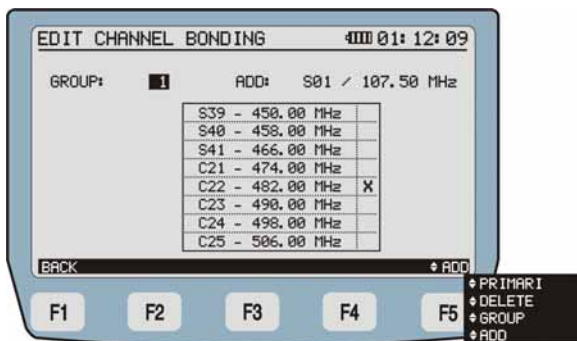


Figure 9.- **EDIT CHANNEL BONDING** menu.

A box appears with the channels that form the selected group.

Each time a user presses [F5] the edition field switches. The selected field stays in black background. Editable fields are:

- ADD:** It adds a channel to the selected group of channels that form the "channel bonding". If the channel is already in the group or the group already has 8 channels, it will beep and will not add it. To pass channel to channel press the CURSOR key. After selecting the channel press SEL to add it to the group.
- PRI:** It allows selecting the channel or channels that will be primary in the group. The primary channels are shown with an X at the right column. To pass channel to channel press the CURSOR key. After selecting the channel, press SEL to select it as primary. To deselect press SEL again.
- DEL:** It deletes a channel from the selected group. To pass channel to channel press the CURSOR key. After selecting the channel press SEL to delete it from the group.
- GROUP:** It allows selecting one of the 10 available groups for "channel bonding". User can create up to 10 channel groups per channel plan. A particular channel can only belong to one group. If a channel is added to a second group it will be deleted from the first one.

To return to the previous menu (**EDIT CHANNEL PLAN**) press key **BACK** [F1].

To exit the menu **EDIT CHANNEL PLAN** and return to the previous screen (**CONFIG**) press key **BACK** [F1] or [F5].

4.3 Functions

4.3.1 DOCSIS ANALYSIS function

This function allows you to analyse the response of a **DOCSIS / EURODOCSIS 3.0** transmission system. It works for both Downstream and Upstream.

4.3.1.1 DOWNSTREAM ANALYSIS function

By accessing the function **DOWNSTREAM ANALYSIS** the following screen appears:

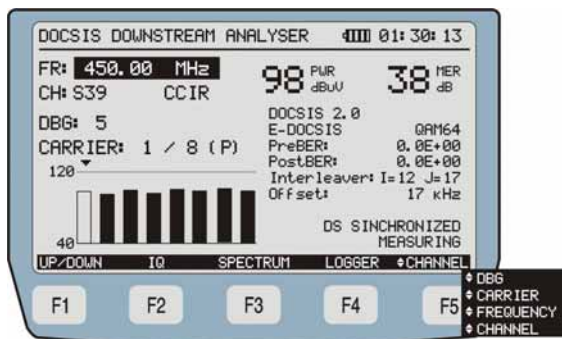


Figure 10.- DOWNSTREAM Analyser menu

When getting into this function, the user must wait several seconds while the modem is initialized.

The display shows measurements made at the selected Downstream channel.

If the selected channel belongs to a DBG (Downstream Bonding Group), then a bar graph shows each carrier power of the DBG. An arrow on a carrier bar indicates the carrier of the selected channel. If it is a primary channel it displays a "p" in parentheses.

At the bottom of the screen the following options are displayed:

- UP/DOWN [F1]:** It makes a RANGING on the Upstream and Downstream channel (see section [4.3.1.2](#)).
- IQ [F2]:** It displays the selected channel data and displays the Downstream Constellation (see section [4.3.1.4](#)).
- SPECTRUM [F3]:** It goes to the SPECTRUM function (see section [4.3.1.5](#)).
- LOGGER [F4]:** By means of this function you can store measurements in memory for later viewing or transfer to a PC (see section [4.3.1.6](#)).

CHANNEL/DBG/

CARRIER/FREQ [F5]:

By pressing this softkey, user navigates among the editable parameters. To edit a value use the Cursor keys or the alphanumeric keypad as appropriate. User can change: **FREQ**, frequency where the signal is measured; **CHANNEL**, is the name of the tuned channel belonging to the selected plan; **DBG**, channel bonding group; **CARRIER**, DBG selected carrier.

4.3.1.2 DOCSIS / EURODOCSIS Ranging

The **RANGING** function identifies channels where is possible to make a ranging with a number. The number of these identifiers and their order will determine the time it may take to adjust the power with which it is send / received (see Figure 11.-). Ranging is made on Downstream and Upstream.

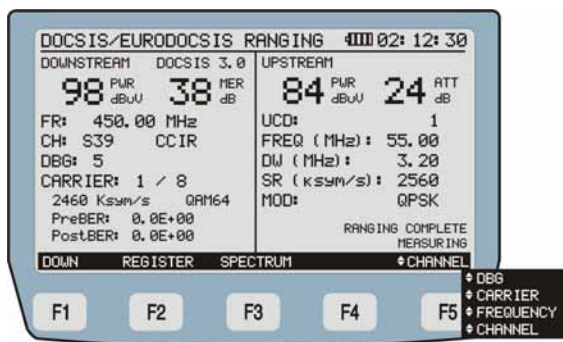


Figure 11.

At the bottom of the screen the following options are displayed:

DOWN [F1]:

It goes back to the **DOWNSTREAM Analyser** screen(see section [4.3.1.1](#)).

REGISTER [F2]:

The cablemodem is registered in the network (see section [4.3.1.3](#)).

SPECTRUM [F3]:

It goes to the **SPECTRUM** function (see section [4.3.1.5](#)).

CHANNEL/DBG**/CARRIER/FREQ [F5]:**

By pressing this softkey, user navigates among the editable parameters. To edit a value use the Cursor keys or the alphanumeric keypad as appropriate. User can change: **FREQ**, frequency where the signal is measured; **CHANNEL**, is the name of the tuned channel belonging to the selected plan; **DBG**, channel bonding group; **CARRIER**, DBG selected carrier.

4.3.1.3 DOCSIS / EURODOCSIS 3.0 Register

The cable modem is registered on the network. Channels Downstream and Upstream are shown registered. To use with applications that use VoIP and IPTV is necessary to register the cable modem on the network.

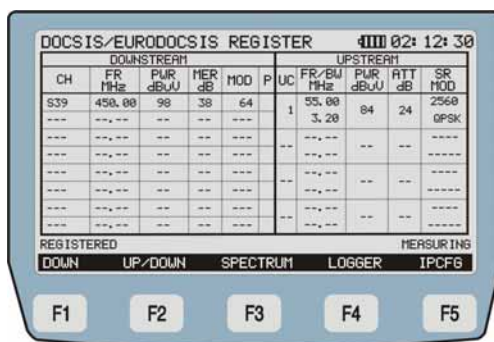


Figure 12.

At the bottom of the screen the following options are displayed:

DOWN [F1]:

It goes back to the **DOWNSTREAM Analyser** screen (see section [4.3.1.1](#)).

UP/DOWN [F2]:

It makes a **RANGING** on the Upstream and Downstream channel (see section [4.3.1.2](#)).

SPECTRUM [F3]:

It goes to the **SPECTRUM** function (see section [4.3.1.5](#)).

LOGGER [F4]:

It saves a datalogger that stores a table with values as it appears when the cable modem is registered on the network.

IPCFG [F5]:

If the equipment is properly registered in the network CMS, user is able to use the following options of the registered mode (see section **REGISTERED Mode**).

- VoIP Analyser
- IPTV Analyser

4.3.1.4 CONSTELLATION DIAGRAM (IQ)

It is the graphic representation of the **Constellation Diagram** for a **DVB-QAM** digital signal:

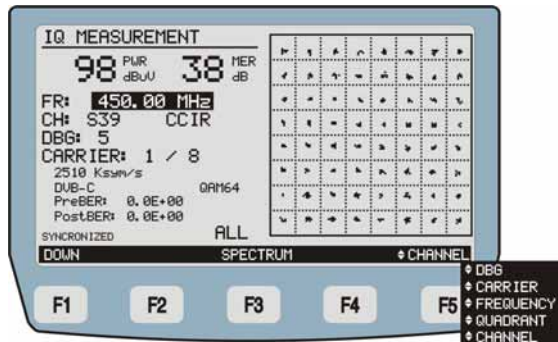



Figure 13.- Constellation Diagram.

At the bottom of the screen, next to the lower left corner of the diagram, it is indicated what quadrant is represented on screen. Using the cursor keys  [7] user can change the constellation quadrant: The initial option **ALL** represents the whole diagram.

Options **Q1**, **Q2**, **Q3**, **Q4** show each one of the four main quadrants. Options **ZQ1**, **ZQ2**, **ZQ3** and **ZQ4** show a zoom in of each quadrant.

At the bottom of the screen are shown the following options:

DOWN [F1]:

It goes back to the **DOWNSTREAM Analyser** screen.

SPECTRUM [F3]:

It goes to the **SPECTRUM** function.

**CHANNEL/DBG
/CARRIER/FREQ
/ZOOM[F5]:**

By pressing this softkey, user navigates among the editable parameters. To edit a value use the Cursor keys or the alphanumeric keypad as appropriate. User can change: **FREQ**, frequency where the signal is measured; **CHANNEL**, it is the name of the tuned channel belonging to the selected plan; **DBG**, channel bonding group; **CARRIER**, DBG selected carrier; **ZOOM**, to select the area to zoom in.

4.3.1.5 SPECTRUM function

The **SPECTRUM** function performs a spectrum graph at the highest resolution. By this way, interferences can be detected, both in active channels and adjacent ones (Figure 14.).

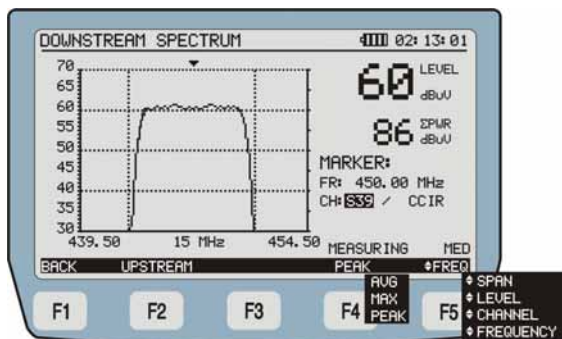


Figure 14.- SPECTRUM function.

At the **SPECTRUM** function, the meter represents the spectrum of frequencies where the marker is. It provides an agile analysis of the whole band. Both **DOWNSTREAM** and **UPSTREAM** spectrums can be represented.

Data on the screen are:

- PWR:** Power received from signal.
- ΣPWR:** It indicates the summation of power signals along the frequency band (from 5 to 1000 MHz).
- FR:** Channel frequency.

CH: Selected channel and active plan channel.

MEASURING: It is the measurement it is using (maximum, peak or average).

At the bottom of the screen you will see next options:

BACK [F1]: It goes back to the **CONSTELLATION DIAGRAM** screen.

MAX / PEAK / AVG [F4]: It can be changed the measurement mode. The current mode appears below the selected channel. In the **MAX HOLD** option, it keeps the maximum values measured due to impulsive signals, remaining on the screen with dotted lines; **PEAK** option uses as reference the peak values; **AVERAGE**, it is the average of the measured values. The active mode appears under the selected channel.

**LEVEL / CHAN /
FREQ / SPAN [F5]:** Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. It can be edited the **LEVEL**, to change the margin of the power on the vertical axis of the graph, **CHANNEL**, to change the channel we are analysing; **FREQUENCY**, to change the frequency; **SPAN**, to change the frequency range shown on the horizontal axis of the graph. Possible values are 1/5/15/30/50/100 MHz.

4.3.1.6 **LOGGER** function

Using the **LOGGER** function user can obtain a record of the measurements taken.

The **PROMAX-37** can store in its memory up to 30 acquisitions or loggers. These measurements are stored for later viewing or transfer to a PC.

On the left side of the screen (Figure 15.-), you can see the recording number, followed by time and date it was saved and the name given. The instrument automatically assigns a sequential name to the file or reuses a name of a removed file.

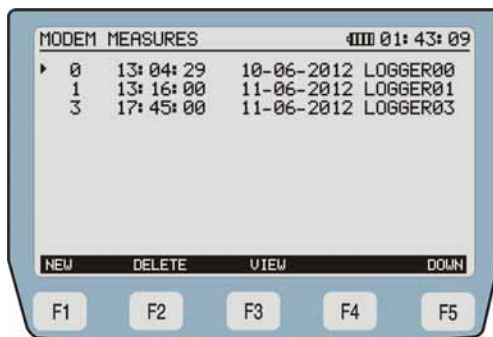


Figure 15.- List of stored *loggers*.

If there are not files stored, it will be shown the message “**EMPTY LOGGER**”.

At the bottom of the screen you will see next options:

- NEW [F1]:** Measurements corresponding to channels of the channel plan selected are stored in a logger.
- DEL [F2]:** It deletes the logger that the cursor is pointing at. System requires confirmation. To confirm delete press F4. To cancel press F5.
- VIEW [F3]:** It allows the user to access the data stored in the selected logger (Figure 16.-).
- BACK [F5]:** It returns to the previous screen.

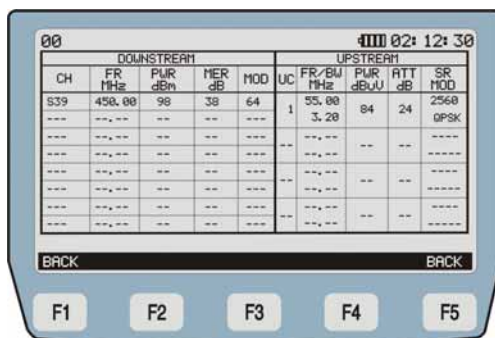


Figure 16.- Logger Viewing.

Pressing [F1] or [F5] you will return to the previous screen (**LOGGER**).

4.3.1.7 REGISTERED Mode

In order to use the **REGISTERED** mode functions is necessary to register the instrument in the network.

When the equipment is registered, the option **IPCFG** accesses the register information screen. From here, user can access the functions available (Figure 17 and 18).

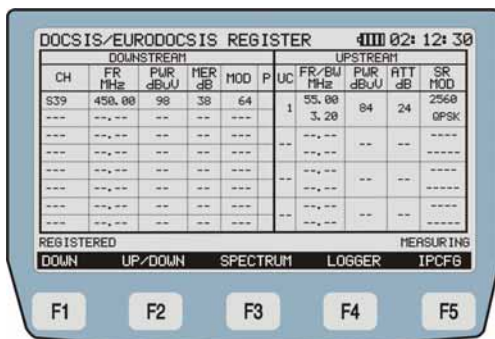


Figure 17.- Registered mode.

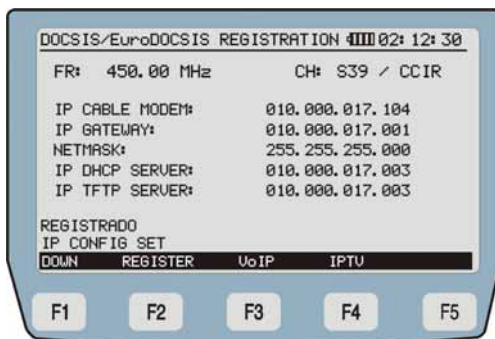


Figure 18.- Registered mode.

At the bottom of the screen it will appear these options:

- | | |
|-----------------------|---|
| DOWN [F1]: | It goes back to the DOWNSTREAM Analyser screen. |
| REGISTER [F2]: | It goes back to the REGISTER screen. |
| VoIP [F3]: | It checks the VoIP service (refer to section 4.3.1.7.1). |
| IPTV [F4]: | It checks the TV over IP service (refer to section 4.3.1.7.2). |

Next we are going to explain each one of functions you can use in register mode: VoIP and IPTV.

4.3.1.7.1 VoIP

Service Description

To implement the basic telephony service in CATV networks is necessary to consider the profile of a demanding customer used to the quality of traditional telephone networks. To meet those expectations must be maintained almost the quality of the traditional service.

The protocol DOCSIS / EuroDOCSIS uses the concept of service flows for traffic transmitted between cable modem and CMTS. A service flow is a one-way packets flow that provide a specific service quality. Traffic is classified in a service flow, and each service flow has its own set of parameters, named QoS.

QoS (Quality of Service) are technologies that ensure the transfer of certain amount of data at a time, ensuring a good quality of service.

There are four types of QoS defined, depending on the type of data to transmit: UGS (Unsolicited Grant Service), rtPS (real time Polling Service), nrtPS (non real time Polling Service) and BE (Best Effort).

In the case of **VoIP**, voice over IP, the type UGS is the most suitable, because it is designed for applications that generate fixed-size packets on a periodic basis. In this type, CMTS provides a fixed-size grant to a service flow at fixed intervals without additional polling or interaction.

The **PROMAX-37** allows the user to establish a service flow to verify the quality of service based on type UGS type. Flow services are used to verify the network between the test point and the CMTS. It analyses parameters that can affect the quality of communication, among them latency, jitter, lost packets, MOS and R-value.

In short, the VoIP function of the **PROMAX-37**, performs an exhaustive analysis of the network based on parameters set by UGS, which will ensure the best quality service.

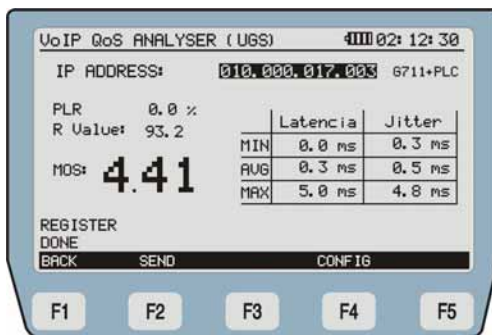


Figure 19.- VoIP Screen.

On the screen (figure 19) are displayed next data:

- IP ADDRESS:** Address where PING is send.
- CODEC:** Type of encoding used for signal transmission.
- PLR (Packet Loss Rate):** Is the percentage of lost packets over total sent packets.
- R-VALUE:** It shows a number, or score, that is used to quantitatively express the subjective quality of speech in communications systems. Can range from 1 (worst) to 100 (best).
- MOS (Mean Opinion Score):** It is a numerical indication of the perceived quality of received media after compression and/or transmission. The MOS is expressed as a single number in the range 1 to 5, where 1 is lowest perceived quality, and 5 is the highest perceived quality.
- LATENCY:** It is the time delay, between initial input and output due to transport or processing. It shows the minimum, average and maximum measurement.
- JITTER:** It is an unwanted variation of one or more characteristics of a periodic signal. Jitter may be seen in characteristics such as the interval between successive pulses, or the amplitude, frequency, or phase of successive cycles. Are shown the minimum, average and maximum measurements.

At the bottom menu it is shown each one of functions that you may use.

BACK [F1]:	It returns to the previous screen.
SEND [F2]:	It sends a ping.
CONFIG [F4]:	<p>It gives access to parameters related with the VoIP service. They are:</p> <p>PING settings:</p> <ul style="list-style-type: none">PING data length.PING number. <p>Quality of service UGS (Unsolicited Grant Services) settings:</p> <ul style="list-style-type: none">Enable UGS (ON/OFF);Unsolicited Grant Size;Grants per Interval;Nominal Grant Interval;Tolerated Grant Jitter;Codec. <p>Use the cursor to move among parameters and the selection key [8] to enter and save them.</p>

4.3.1.7.2 IPTV

Description of Service

IPTV (Internet Protocol Television) is a system where a digital TV service is distributed on a network infrastructure using the IP protocol.

The protocol **DOCSIS / EuroDOCSIS** uses the concept of service flows for traffic transmitted between cable modem and **CMTS**. A service flow is a one-way packets flow that provide a specific service quality. Traffic is classified in a service flow, and each service flow has its own set of parameters, named **QoS**.

QoS (Quality of Service) are technologies that ensure the transfer of certain amount of data at a time, ensuring a good quality of service.

In the case of IPTV, the type **rtPS** (Real-Time Polling Service) is the most suitable. **rtPS** is one of the four **QoS** defined in **DOCSIS / EuroDOCSIS**, and is designed to support service flows with real-time traffic that generates variable-size data packets on a periodic basis and has inflexible latency and throughput requirements, as in the case of video **MPEG**. This service requires more demand to CMTS than the UGS type, but supports variable grant sizes for an optimum efficiency in data transport.

The **PROMAX-37** allows the user to establish a service flow to verify the quality of service based on type **rtPS**. Flow services are used to verify the network between the test point and the **CMTS**. It analyses parameters that can affect quality signal, like latency, jitter, lost packets and trace route, which trace the route of sent packets on a graph. This will be useful to detect possible bottlenecks.

In short, the **IPTV** function of the **PROMAX-37**, performs an exhaustive analysis of the network based on parameters set by **rtPS**, which will ensure the best quality service. The deep knowledge about network conditions will guide you during installation and will help you solving problems that may arise.

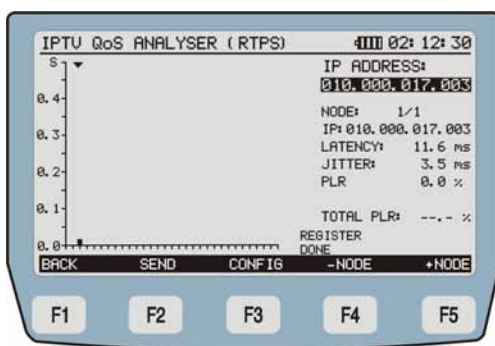


Figure 20.- IPTV screen.

On screen (Figure 20.-) are shown different measurements:

- IP ADDRESS:** Address where PING is send. When selecting IP address, if you use the cursor keys you will access to last IPs entered by the user.
- NODE:** Indicates the node where you are connected.
- IP:** Indicates the IP where you are sending the PING.
- LATENCY:** It is the time delay, between initial input and output due to transport or processing. It shows the minimum, average and maximum measurement.
- JITTER:** It is an unwanted variation of one or more characteristics of a periodic signal. Jitter may be seen in characteristics such as the interval between successive pulses, or the amplitude, frequency, or phase of successive cycles.
- PLR (Packet Loss Rate):** Is the percentage of lost packets over total sent packets.
- TOTAL PLR:** It shows the total number of lost packets.

At the bottom of the screen is shown the following options:

- BACK** [F1]: It returns to the previous screen (**REGISTERED mode**).
- SEND** [F2]: It sends the testing ping.
- CONFIG** [F3]: It gives access to IPTV settings:
- Enable RTPS (ON/OFF)
 - Nominal Polling Interval.
- NODE** [F4]: Moves the cursor to the left, going to the previous node.
- + NODE** [F5]: Moves the cursor to the right, going to the next node.

4.3.2 GENERATOR function

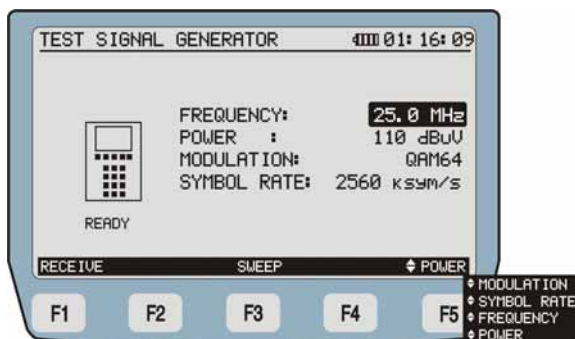


Figure 21.- Test signal generator.

This function creates a test signal to check the upstream traffic.

The instrument recovers the configuration of the last work session and shows it on the screen.

The user can detect when it is generating and transmitting the test signal because the Downstream LED blinks.

At the bottom of the screen you will see next options:

RECEIVER [F1]: It measures and shows a diagram of the received constellation.

SWEEPER [F2]: It sweeps in a range of frequencies, which are user configurable within a range from 5 to 85 MHz, in order to search for RF signals emissions. Power, modulation and symbol rate are also configurable.

POWER / MOD. / S.R. / FREQ [F5]: Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. **POWER**, for changing the power signal level, the margin of values are from 60 to 110 dB μ V; **MOD** for changing the type of modulation of the signal, the possible values are QAM8, QAM16, QAM32, QAM64 and QPSK.; **S.R.**, for changing the symbol rate of the pilot signal, the possible values are: 160, 320, 640, 1280, 2560 and 5120. **FREQ**, for changing the frequency of a pilot signal, the margin of possible values are from 5 MHz to 50 MHz.

4.3.3 EXTERNAL MODEM function

This function connects the equipment to an external cable modem. It extracts a sample of the Downstream and Upstream signal displaying their spectrums on screen.

When accessing the EXTERNAL MODEM function, it appears the following screen:

- **UPSTREAM SPECTRUM Analysis**

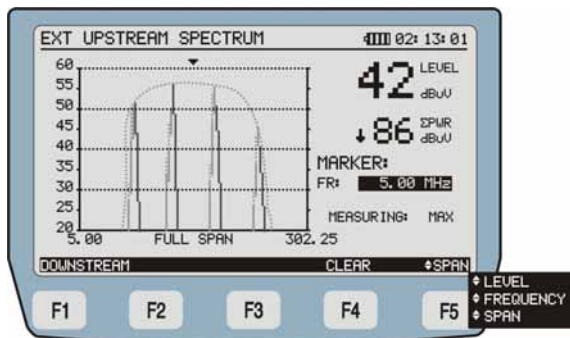


Figure 22.- SPECTRUM function.

At the bottom of the screen you will see next options:

DOWNSTREAM [F1]: It shows the **DOWSTREAM SPECTRUM** (see next section).

DEL[F4]: It deletes the spectrum diagram.

LEVEL / FREQ / SPAN [F5]: Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. It can be edited the **LEVEL**, to change the margin of the power on the vertical axis of the graph, **FREQUENCY**, to change the frequency; **SPAN**, to change the frequency range shown on the horizontal axis of the graph. Possible values are 1/5/15/30/50/100 MHz.

- **DOWNSTREAM SPECTRUM Analysis**

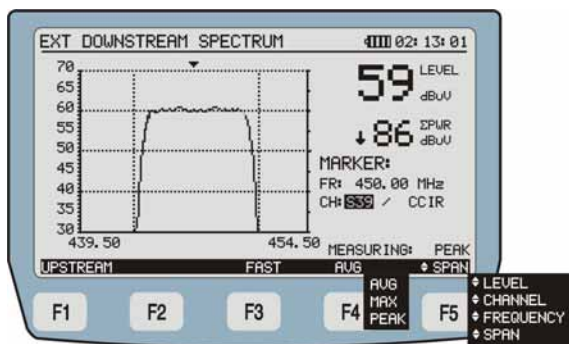


Figure 23.- SPECTRUM function.

At the bottom of the screen you will see next options:

UPSTREAM [F1]: It shows the **UPSTREAM SPECTRUM** (see next section).

FAST / SLOW [F3]: It allows changing the sweep speed.

MAX / PEAK / AVG [F4]:

It can be changed the measurement mode. The current mode appears below the selected channel. In the **MAX HOLD** option, it keeps the maximum values measured due to impulsive signals, remaining on the screen with dotted lines; **PEAK** option uses as reference the peak values; **AVERAGE**, it is the average of the measured values. The active mode appears under the selected channel.

**LEVEL / CHAN /
FREQ / SPAN [F5]:**

Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. It can be edited the **LEVEL**, to change the margin of the power on the vertical axis of the graph, **CHANNEL**, to change the channel we are analysing; **FREQUENCY**, to change the frequency; **SPAN**, to change the frequency range shown on the horizontal axis of the graph. Possible values are 1/5/15/30/50/100 MHz.

4.3.4 TV DIGITAL function

This function shows some values of the digital TV signal received, making these measurements:

- Channels Power by Integration.
- Carrier / Noise Ratio (C/N).
- Bit Error Rate (BER).
- Modulation Error Ratio (MER).
- Constellation Diagram.

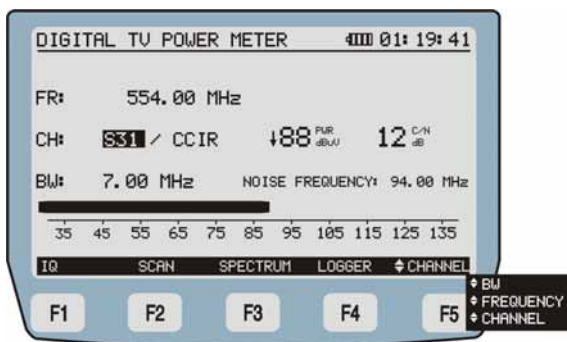


Figure 24.- Digital video carriers measurement screen.

Measures on the screen are:

PWR:	Power received from the signal. (It appears on numerical and graphical mode).
C/N:	Carrier / Noise Ratio.
FR:	Channel tuned frequency.
CH:	Channel and plan channel.
BW:	Bandwidth.

At the bottom of the screen you will see next options:

IQ [F1]:	It shows a Constellation Diagram for the digital signal in the whole range of measurement (refer to section 4.3.4.1)
SCAN [F2]:	It gives access to the SCAN mode (refer to section 4.3.4.4).
SPECTRUM [F3]:	It show TV digital signal spectrum.
LOGGER [F4]:	Through this function you can store measurements in the memory of the instrument for later viewing or transfer to a PC (see section 4.3.4.2). It is possible to select between two types of datalogger (see paragraph 4.2.2 Configuration mode).
CHAN / BW / FREQ [F5]:	Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. FREQ for changing the frequency value of the tuned channel, BW for changing the bandwidth and CHANNEL for changing the channel of the channel plan.

If channel you are analysing is defined as analogue, it will appear a warning message on the screen. The message will be "Warning: CXX is defined as ANALOGUE".

4.3.4.1 CONSTELLATION DIAGRAM function

It shows the **Constellation Diagram** function (see next figure):

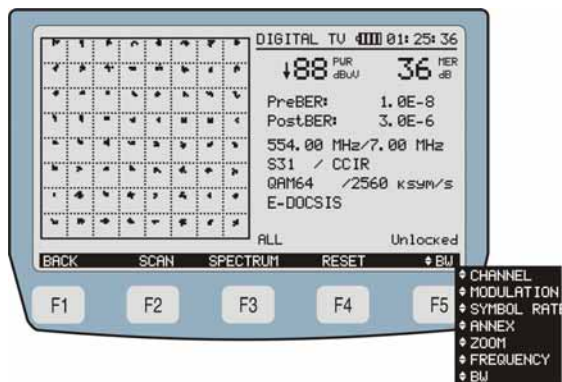


Figure 25.- Constellation diagram and measurements of a digital channel.

Measures displayed on this screen are next:

- PWR:** Power input level. (It appears on numerical and graphical mode).
- MER:** Modulation Error Ratio.
- PreBER:** Measurement before correction.
- PostBER:** Measurement after correction.
- Locked / Unlocked:** It shows whether the signal is locked or not.

At the bottom of the screen you will see next options:

- BACK [F1]:** It returns to TV Digital function.
- SCAN [F2]:** It goes to **SCAN** mode (see [4.3.4.4](#) section).
- SPECTRUM [F3]:** It goes to **SPECTRUM** mode (see section [4.3.1.5](#)).
- RESET [F4]:** It does a reset of the signal and measures again.

**BW / CHAN / MOD / S.R. /
ANNEX / QUADR /
FREQ [F5]:**

Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. **BW**, to change bandwidth; **CHANNEL** to change channel from de plan channel; **MOD**, to define modulation (QPSK, QAM16, QAM32, QAM32u, QAM64, QAM128, QAM256); **S.R.**: to define symbol rate; **ANNEX**, to define the standard of application (A / B / C); **QUADRANT**, to select the displayed quadrant (Q1, Q2, Q3, Q4, ZQ1, ZQ2, ZQ3, ZQ4, ALL). The ZQx option makes a zoom in over each quadrant. Pressing the selection key [8] you can switch between viewing or hiding the constellation diagram; **FREQUENCY**, to change frequency.

If channel we are analysing is defined as analogue, it will appear a warning message on the screen. The message will be "Warning: CXX is defined as ANALOGUE".

4.3.4.2 **LOGGER** function

LOGGER function in TV mode takes measurements exploring every channel on TV, both **digital and analogue**, which are in the frequency band of the active channel plan:

- Signal level measurement (LVL) for analogue channels or power (PWR) for digital channels.
- Audio-Video ratio (A/V) measurement in analogue channels.
- Carrier-noise ratio (C/N) measurement in analogue channels or MER in digital channels.
- Digital channel pre-BER measurement.
- Symbol rate.

User can select a quick datalogger (which only stores the power for each channel) for the digital TV function (see section [4.2.2](#) Configuration Mode).

The **PROMAX-37** can store in its memory up to 50 acquisitions or loggers in **TV** mode and analyse up to 140 channels in each one. These measurements are stored for later viewing or transfer to a PC.

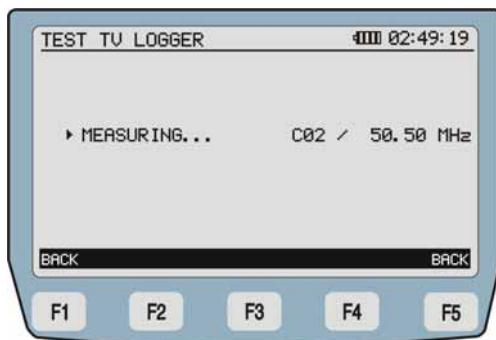


Figure 26.- Measuring data

On the left side of the screen, you can see the record number, followed by time and date was saved and the name given. The instrument automatically assigns a sequential name to the file or reuses a name of a removed file.



Figure 27.- List of TV stored loggers.

If there are not files stored, it will be shown the message **"EMPTY LOGGER"**.

At the bottom of the screen you will see next options:

- NEW [F1]:** Measurements corresponding to channels of the channel plan selected in the configuration menu are stored in a logger (see section [4.2.2](#)).
- DEL [F2]:** It deletes the logger that the cursor is pointing at. System requires confirmation. To confirm deleting press softkey [F4]. To cancel press [F5].

VIEW [F3]:

It allows you to access the data stored in the selected logger (see figure 28). Pressing [F1] or [F5] you will return to the previous screen **LOGGER**.

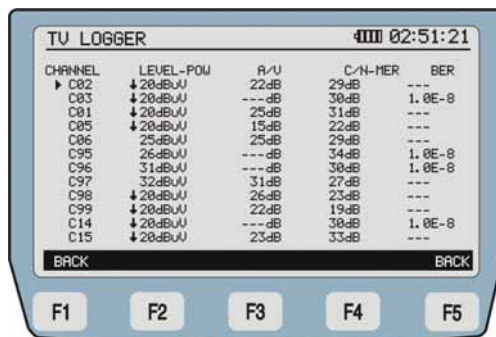


Figure 28.- TV logger

4.3.4.3 TILT function

The **TILT** test is a utility to equalize the line. **TILT** is the difference in amplitudes between the minimum and maximum frequency that the system can compensate. Typically, **CATV** networks transmit two pilot signals at the beginning and at the end of the band. These two pilots and two more are the ones that can be tuned simultaneously on the screen. By this way you can evaluate the losses slope and therefore readjust equalizers of the amplifiers in order to compensate these losses and ensure a flat response along the band.

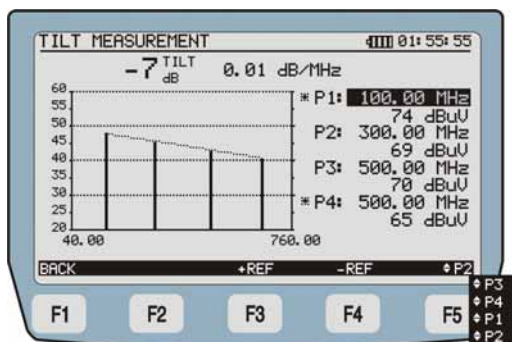


Figure 29.- TILT Screen.

By activating the **TILT** function, the screen shows the inclination of the whole band.

The data on the screen are:

TILT:	Inclination in dB.
dB / MHz:	Inclination rate in dB per MHz.
* P1 / * P4:	End pilot signal. Pilot signal frequency, power and trend.
P2 / P3:	Intermediate pilot signal. Pilot signal frequency, power and trend.

At the bottom of the screen (Figure 29) there are these options:

BACK [F1]:	To return to the previous menu.
REF + [F3]:	It moves up the reference margins of the power vertical axis (from 80 to 120 dB).
REF - [F4]:	It moves down the reference margins of the power vertical axis (from 20 to 60 dB).
P1/P2/P3/P4 [F5]:	It allows changing the frequency values of the pilots. Pressing this key you go through pilots values. P1 to define the first reference frequency, P2 to define the second reference frequency, etc ... To modify the settings use the cursor or the alphanumeric keypad. If using the arrow keys to change the frequency, the steps are defined in the Frequency Steps setting (see 4.2.2). If you use the alphanumeric keypad to define the frequency, press SELECT to save the changes.

4.3.4.4 SCAN function

The **SCAN** function shows numerically the level of the channel where the cursor, which is at the top of the screen, is pointing (Figure 30).

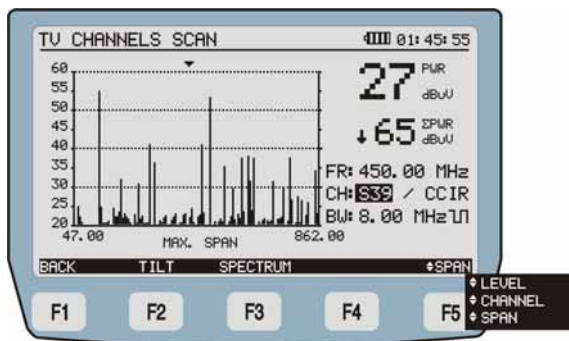


Figure 30.- SCAN function.

Measurements displayed on the screen:

- PWR:** It indicates the signal power.
- ΣPWR:** It indicates the summation of power signals along the frequency band (from 5 to 1000 MHz).
- FR:** Carrier intermediate frequency.
- CH:** Shows the channel and active plan channel.
- BW:** Bandwidth of the signal.
- :** Indicates whether the selected channel is digital or analogue.

The dotted line at the graph indicates the threshold level, below which will not show any power signal.

At the bottom of the screen are shown the following options:

- BACK [F1]:** It returns to the previous screen.
- TILT [F2]:** It goes to TILT test (see section [4.3.4.3](#)).
- SPECTRUM [F3]:** It shows the TV signal spectrum.

**LEVEL / CHAN /
SPAN [F5]:**

Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. It can be edited the **LEVEL**, to change the margin of the power on the vertical axis of the graph, **CHANNEL**, to change the channel we are analysing; **SPAN**, to change the frequency range shown on the horizontal axis of the graph.

4.3.5 TV ANALOGUE function

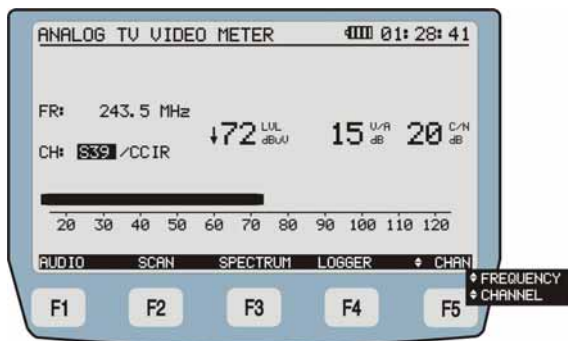


Figure 31.- Analogue TV Video Meter mode.

In the case you tuned an analogue carrier signal, measurements on screen are:

- LVL:** Power received from the signal. (It appears on numerical and graphical mode).
- V/A:** Video / Audio Ratio.
- C/N:** Carrier / Noise Ratio.
- FR:** Channel tuned frequency.
- CH:** Channel and plan channel.

At the bottom of the screen you will see next options:

- AUDIO [F1]:** It gets a demodulated audio signal (see section [4.3.5.1](#)).
- SCAN [F3]:** It goes to **SCAN** mode (see section [4.3.4.4](#)).
- SPECTRUM [F3]:** It shows TV signal spectrum.
- LOGGER [F4]:** Through this function user can store measurements in the memory of the instrument for later viewing or transfer to a PC.
- CHAN / FREQ [F5]:** Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. **FREQ** for changing the frequency value of the tuned channel, **CHANNEL** for changing the channel of the channel plan.

If channel we are analysing is defined as digital, it will appear a warning message on the screen. The message will be "Warning: CXX is defined as DIGITAL".

4.3.5.1 AUDIO function

In analogue mode the **PROMAX-37** allows obtaining a **demodulated audio signal** and showing its characteristics.

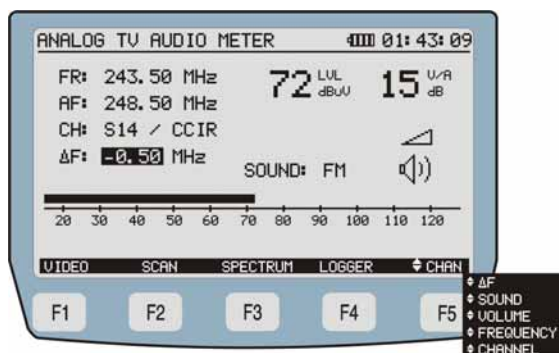


Figure 32.- Analogue Audio Signal Measurement

Measurements shown on the screen are:

FR:	Signal tuned frequency.
AF:	Audiocarrier frequency.
CH:	Channel and plan channel.
LVL:	Audio carrier level. (It appears on numerical and graphical mode).
V/A:	Video / Audio Ratio.
ΔF:	Audio carrier Offset.

At the bottom of the screen is shown the following options:

VIDEO [F1]:	It returns to previous screen (Analogue TV video meter).
SCAN [F2]:	It goes to SCAN mode (see section 4.3.4.4).
SPECTRUM [F3]:	It shows TV signal spectrum.
LOGGER [F4]:	Through this function you can store measurements in the memory of the instrument (it appears on numerical and graphical mode) for later viewing or transfer to a PC.
FREQ / CHAN / ΔF / SONIDO / VOL [F5]:	Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. FREQ for changing the frequency value of the audio carrier; CHANNEL for changing the tuned channel; ΔF for changing the offset of the audio carrier; SOUND for changing the type of signal (AM / FM / OFF); VOLUME for increase or decrease the sound volume heard by the instrument speaker.

4.3.6 SLM (Signal Level Meter) function

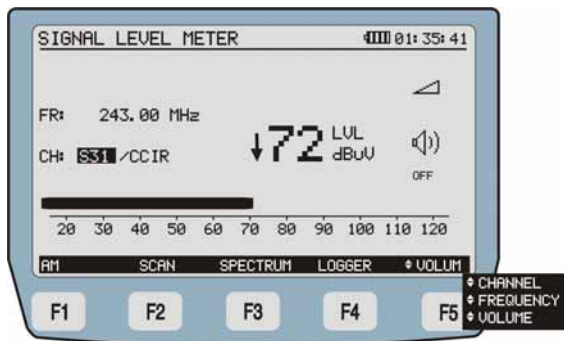


Figure 33.- SIGNAL LEVEL METER screen.

The **SLM** mode (Signal Level Meter) provides the power level of the tuned channel in a numerical way and in a graph bar with a resolution of one dB. By the loudspeaker it will emit a pitch tone, which changes relating to the level.

In this mode, measures on the screen are next:

- LVL:** Power signal level. (It appears on numerical and graphical mode).
- FR:** Channel tuned frequency.
- CH:** Channel and plan channel.

At the bottom of the screen are these options:

TONE / AM / FM /

OFF [F1]:

Pressing this key you can navigate among these four options. These options are for change the sound heard by the speaker of the instrument. With **TONE** you will heard a tone, which changes depending on the signal; **FM**, to listen to Frequency Modulation radio signal; **AM**, to listen to Amplitude Modulation radio; **OFF**, to mute speaker.

SCAN [F2]:

It goes to **SCAN** function (refer to section [4.3.4.4](#)).

SPECTRUM [F3]:

It shows TV signal spectrum.

LOGGER [F4]:

Through this function you can store measurements in the memory of the instrument for later viewing or transfer to a PC.

**FREQ / VOLUME /
CHAN [F5]:**

Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. **FREQ** for changing the frequency value of the tuned channel, **VOLUME** to increase or decrease the sound volume heard by the speaker of the instrument, **CHANNEL** for changing the channel of the channel plan.

4.4 Connecting to a computer

The **PROMAX-37** allows connection to a PC for data transfer, by means of the USB cable.

If there is any error during transmission, it will appear a message on **PROMAX-37** screen.

The remote control software (download from www.promaxelectronics.com) allows connecting to a personal computer with these options:

- 1) **CHANNEL PLAN EDITOR:** It modifies, adds or deletes channel plans.
- 2) **DATALOGGER:** It allows editing and saving all the measurement contained in a logger.
- 3) **UPGRADE:** It allows updating the **PROMAX-37** software version.

5 CONTROL SOFTWARE PROMAX-37

5.1 Description

This software is an application that allows the communication between a computer and the instrument **PROMAX-37**.

It allows you to carry out simply and quickly the following operations:

- Transmit / Receive / Modify / Save **Channel plans**.
- Create / Edit **Channel plans**.
- **Upgrade** the main firmware of the instrument.
- Open / Receive / Save / Print measure acquisitions get by the logger tool.

5.2 Hardware and software Requirements

In order to use the program, your computer system need to meet the next requirements:

- **Hardware Requirements**

Minimal Configuration:

- * IBM Computer compatible Pentium or higher.
- * 10 Mbytes of available space on the hard drive.
- * Mouse.
- * USB port available.

- **Software Requirements**

This software runs under Windows® Operative System.

5.3 Installation

5.3.1 Software Installation

To install the program, read the following instructions.

1. Download the file from the download area at **PROMAX** website.
2. Unzip the file and double click on the setup file.
3. The install wizard will start automatically, which will help you during the installation process.
4. The installation program creates, by default, a new directory in **C:\Program Files\PROMAX\PROMAX-37 Software**, where it copies all files of the application. It also puts a shortcut on the desktop.
5. Double click on the shortcut icon **PROMAX-37** on the desktop to run the program.
6. In the section “*INSTRUCTIONS FOR USING THE CONTROL SOFTWARE*” it is explained in detail the program operation.

5.4 Legal conditions

Read the contract carefully in its entirety before you install the program. Installing the program means that you have accepted the following terms and conditions.

1. **SUBJECT.** The subject matter of this Contract is the grant to the end user by **PROMAX ELECTRONICA, S. L.** a non-exclusive and non-transferrable personal license to use this version of the program for an indefinite period of time.
2. **LICENCE.** The Licence of Use granted hereby refers exclusively to the end user, who shall be considered legitimised to use the program only.
3. **OWNERSHIP OF THE SOFTWARE.** The end user acknowledges that the program referred to in this Contract is the exclusive property of **PROMAX ELECTRONICA, S. L.** The end user may only acquire the personal and non-transferrable right to use the software that is the subject matter of this Contract for the purposes herein expressed.

Since the program granted is protected by industrial and intellectual copyright, infringements by the user of these aforementioned obligations will give rise to the corresponding liabilities in accordance with the legislation in force.

4. **RESOLUTION.** The licence or authorisation of use is granted for an indefinite period of time. However, in the event of non-compliance by the end user with any of the clauses hereof, the Contract may as of right be terminated without any legal formality.
5. **EXPLANATORY PROVISION.** Notwithstanding the accuracy of the software granted, **PROMAX ELECTRONICA, S. L.** is fully exempt of liability for consequences arising from any possible omission existing in the program or from improper use by the end user of any of the information it contains and generates. Nor can **PROMAX ELECTRONICA, S. L.** be held liable for the suitability or accuracy of the data obtained for particular purposes or functions, since the only obligation of the latter, under this Contract, is the provision of means and not of results.
6. **FINAL CLAUSE.** The use of this software referred to herein signifies the tacit and unconditional acceptance of its conditions.
7. **JURISDICTION.** Both parties, explicitly waiving any rights that may correspond to them, agree to submit all controversies that may arise from this Contract to the jurisdiction and competence of the Judges ad Courts of Barcelona.

5.4.1 Connection between the **PROMAX-37** and a PC.

The connection between the **PROMAX-37** and a **PC** is done via the data transmission cable **USB to mini-USB** supplied with the instrument.

Connect the **USB** connector to a free **USB** port of your PC. Connect the other end to the **mini-USB** port of the **PROMAX** instrument.

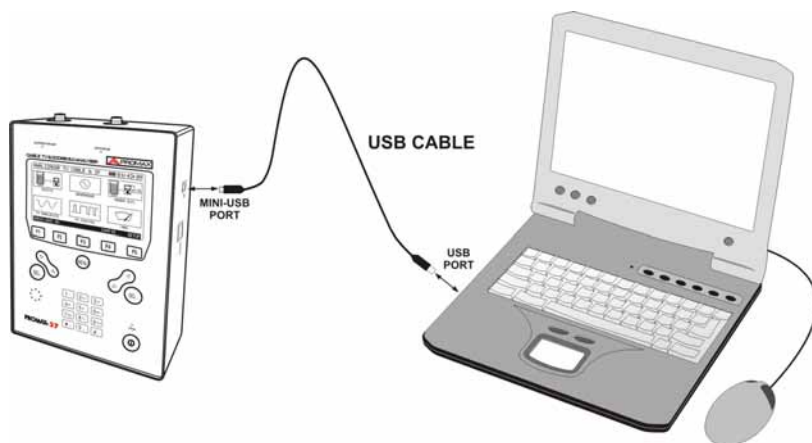


Figure 34.- Connection between the **PROMAX-37** and a **PC**.

6 INSTRUCTIONS FOR USING THE CONTROL SOFTWARE

6.1 Start

Follow next steps in order to start using the **PROMAX-37** Control Software:

1. Check the **PROMAX-37** is ON.
2. Check the **USB** connection cable between the **PROMAX-37** and the computer.
3. Run the software by double clicking on the icon **PROMAX-37** on the desktop.
4. The main window appears.

LEGAL NOTICE

In any case **PROMAX ELECTRONICA, S. L.** responsible for data loss or other damages that may cause this program directly or indirectly. Although we put our efforts in developing a useful and reliable product, it is understood that the use of the program and data and information generated with it are the sole responsibility of the user.

6.2 Main window

The main window, as shown in the figure below, has several different areas which are detailed next:

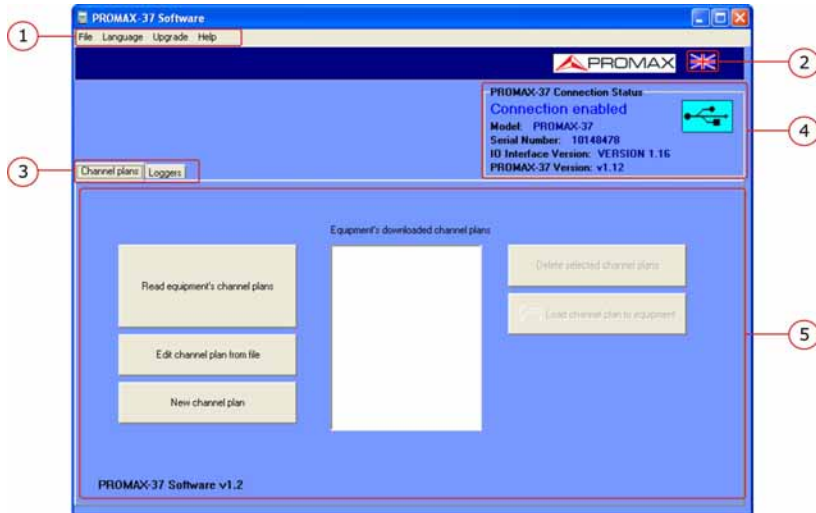


Figure 35.- Main window.

1.- Menu Bar

These are the menus of the program (see next section).

2.- Language in use

It shows a flag identifying the selected language.

3.- Active function selection tab

There are two tabs corresponding to each one of the two functions that are available in the program. They are: channel plans and loggers. When clicking on one of these tabs, you access a window where you can view the corresponding function.

4.- Connection Status

It shows data about the model, serial number and firmware. Only when the connection is successful (see figure below):



Figure 36.- Connection enabled.

If the connection fails you will see the next figure:

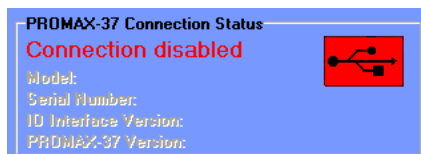


Figure 37.- Connection disabled.

5.- Display Window.

Depending on the selected tab it will appear the channel plan window or the logger window. Each window contains some options to manage its function.

6.3 Menu bar

The menu bar has these options:

- File:** It contains the option to exit the program.
- Language:** It contains the options to select the language in use.
- Upgrade:** It contains the options to update the firmware of the instrument and to put the clock on time.
- Help:** It contains help information, contact details and version.

On the next sections each one of these menus are explained.

6.3.1 File

This menu contains the **Close** option.

The **Close** option exits the program (without confirmation).

6.3.2 Language

It allows the user to select between **Spanish**, **English** or **Catalan**.

The active language is identified by a flag at the right side of the tool bar.

6.3.3 Upgrade

The Upgrade menu has three options:

The **Input-output interface** allows the user to update the device interface, that are the menu options and screens of the equipment by means of update files which can be obtained from the **PROMAX** website. Clicking on this option opens a browser window in order to select the file to update the equipment.

The **Firmware** option allows the user to update the firmware of the equipment through update files that can be obtained from the **PROMAX** website. Clicking on this option opens a browser window in order to select the file to update the equipment.

The option **Set to Time** allows you to synchronise time from the computer to the instrument.

VERY IMPORTANT

Before proceeding with the update the user must check the battery level is full charge. Do not disconnect the **USB** port while it is updating.

6.3.4 Help

The menu **Help** contains three options:

The option **Contents** shows information about the software.

The option **About PROMAX-37** shows information about equipment and contact details.

The option **About this software** shows information about the software version and contact details.

6.4 Channel plan management

To access the options for creating and editing channel plans, the user has to select the "**Channel plans**" tab and the following window will appear:



Figure 38.-

To enable all the options, the connection to the **PROMAX-37** must be established.

The options available, using the buttons on screen, are:

Read equipment's channel plans:

It connects and downloads the channel plan of the equipment, that are displayed in the central window. Clicking on one of these channels plan, it opens a window that allows editing.

Edit channel plan from file:

It allows editing a channel plan that is saved in a file.

Clicking on this button it opens a browser window that lets the user to select a file with channel plans. Then, it opens a window to edit the channel plan.

New channel plan:

It creates a new channel plan for later use on your equipment. Clicking on this button it opens a window to edit channel plans. For more information refer to the next section.

Delete selected channel plans:

It deletes the channel plans that are selected.

Load channel plan to equipment:

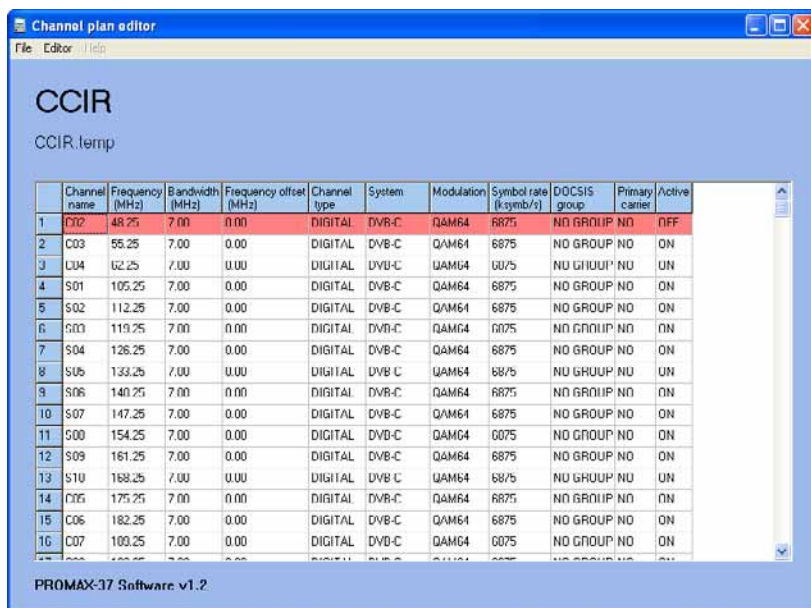
It allows the user to load a new channel plan on the equipment. Clicking on the button it opens a browser window that lets you select the datalogger file with the channel plan to send to the equipment.

6.4.1 New Channel plan / Channel plan Edition

To create a new channel plan, click on the button "New channel plan".

To edit a channel plan, previously downloaded from the equipment, double-click on the name of the channel plan.

When editing or creating a new channel plan, it opens a window as shown in the following figure:



	Channel name	Frequency (MHz)	Bandwidth (MHz)	Frequency offset (MHz)	Channel type	System	Modulation	Symbol rate (k symb/s)	DCSIS group	Primary carrier	Active
1	C02	48.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	OFF
2	C03	55.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
3	C04	62.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
4	S01	105.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
5	S02	112.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
6	S03	119.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
7	S04	126.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
8	S05	133.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
9	S06	140.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
10	S07	147.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
11	S08	154.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
12	S09	161.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
13	S10	168.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
14	C05	175.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
15	C06	182.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON
16	C07	189.25	7.00	0.00	DIGITAL	DVB-C	QAM64	6875	NO GROUP	NO	ON

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Figure 39.-

In the case of a new channel plan, rows are empty except for the first.

The channel plan table is composed of a main column where all channels of the channel plan are numbered and a header row with the parameters that define each channel. To modify a parameter double click on it. Parameters are:

Name:	Name that identifies the channel.
Frequency (MHz):	Channel Frequency.
Bandwidth:	Bandwidth of the channel (between 0.3 and 9.99 MHz).
Frequency Offset:	It indicates the offset for the tuning frequency of the channel in MHz (between -2 and 2 MHz).
Channel Type:	Click on this box to switch between Analogue / Digital. Depending on the selected type, some parameters change.
System:	DVB-C, ITU J.83 / B, ITU J.83 / C (for digital signals), PAL, SECAM, NTSC and standards B / G, D / K, L, I, M, N (for analogue signals).
Modulation: (digital signals only)	You can select among these modulations: QPSK, QAM16, QAM32, QAM64, QAM128, QAM256, QAM32u, QAM8.
Symbol rate (digital signals only)	
Group:	It indicates the Docsis 3.0 group where the channel belongs among the ten groups available.
Main Carrier:	It allows to select the first channel with the main carrier.
Active:	It shows whether the channel is active (ON) or not (OFF). The rows for the inactive channels have red background.

To insert or delete a channel the user must click on the number that indicates the row corresponding to the channel. A popup menu appears with these options: **"Insert Channel"** and **"Delete Channel"**.

If **"Insert channel"**, it generates a new line with default data that can be edited.

If **"Delete Channel"**, it deletes the whole row that defines the channel.

At the top window there is the menu bar with the menus **"File"** and **"Editor"**. The following are the options contained in each menu and their description:

The **"File"** menu contains the following options:

- New Channel plan:** It creates a new channel table, deleting the previous table.
- Save Channel plan:** It saves the current channel plan (file with extension "c37").
- Save Channel plan as:** It saves the current channel plan and the file name can be defined.
- Load Channel plan:** It loads a selected channel plan (must have extension "c37").
- Close:** It exits the editing channel plan with a warning window and option to previous save.

The **"Editor"** menu contains the following options:

- Sort:** It sorts the channels in ascending order using the frequency field value.
- Active all channels:** It enables all channels by changing the "Active" field to ON.
- Unactive all channels:** It disables all channels by changing the "Active" field to OFF. Disabled channels have red background.
- All Digital:** It changes the "Channel type" to DIGITAL status in all channels.
- All Analog:** It changes the "Channel type" to ANALOG status in all channels.

6.5 Records Management

To access the options for viewing and printing loggers, user should select the **"Loggers"** tab and the following window is displayed:

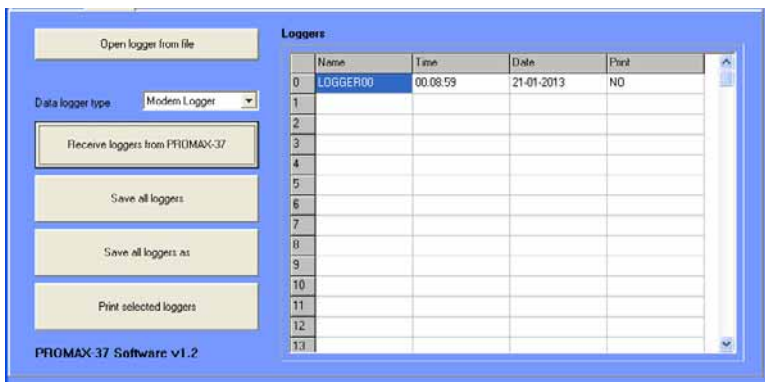


Figure 40.-

Available options, using the buttons displayed on the screen, are:

Open logger from file:

It opens a previously saved data file and displays it on screen. Each datalogger corresponds to a file. Modem dataloggers have the "logds" extension. TV dataloggers have the "logtv" extension.

Datalogger Type:

It allows the user to select the type of datalogger to manage (explained below). User can select between Modem dataloggers and TV dataloggers.

Receive loggers from PROMAX-37:

It receives dataloggers for the selected type from the equipment and they are listed in the table of loggers.

Save all loggers:

It saves all dataloggers listed in the table inside the program folder by default. Modem dataloggers are saved with the extension "logds". TV dataloggers are saved with the extension "logtv". Each datalogger corresponds to a file.

Save all loggers as:

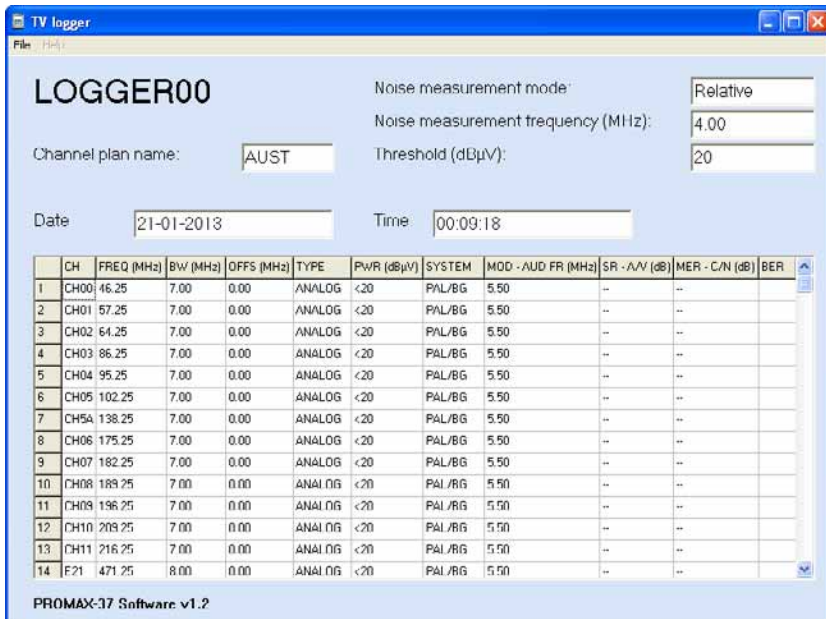
It saves all dataloggers listed in the table with the option to edit the name of each datalogger file and select the folder where to save them. Only will be saved the dataloggers of the type selected. Each datalogger corresponds to a file. Modem dataloggers are saved with the extension "logds". TV dataloggers are saved with the extension "logtv".

Print selected loggers:

It prints the dataloggers from the list whose field **"Print"** is in **"YES"** status.

6.5.1 Registration Detail

If you double-click on one of the dataloggers in the list a window appears with the details of all measures of that datalogger as shown in the following figure. From this screen the datalogger can be saved or print.



The screenshot shows a window titled "TV logger" with a menu bar (File, Help) and a toolbar. The main area displays the following information:

- LOGGER00** (Title)
- Noise measurement mode:** Relative
- Noise measurement frequency (MHz):** 4.00
- Channel plan name:** AUST
- Threshold (dBμV):** 20
- Date:** 21-01-2013
- Time:** 00:09:18

Below this information is a table with 14 columns: CH, FREQ (MHz), BW (MHz), OFFS (MHz), TYPE, PWR (dBμV), SYSTEM, MOD - AUD FR (MHz), SR - A/V (dB), MER - C/N (dB), and BER. The table contains 14 rows of data for channels CH00 through CH14.

CH	FREQ (MHz)	BW (MHz)	OFFS (MHz)	TYPE	PWR (dBμV)	SYSTEM	MOD - AUD FR (MHz)	SR - A/V (dB)	MER - C/N (dB)	BER
1	CH00	46.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
2	CH01	57.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
3	CH02	64.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
4	CH03	86.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
5	CH04	95.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
6	CH05	102.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
7	CH5A	138.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
8	CH06	175.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
9	CH07	182.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
10	CH08	189.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
11	CH09	196.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
12	CH10	209.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
13	CH11	216.25	7.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--
14	F21	471.25	8.00	0.00	ANALOG	<20	PAL/8G	5.50	--	--

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Figure 41.-

7 MAINTENANCE

This part of the manual describes the maintenance procedures and the location of faults.

7.1 Instructions for returning by mail

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

7.2 Method of maintenance

The method of maintenance to be carried out by the user consists of cleaning the cover. All other operations should be carried out by authorised agents or by personnel qualified in the servicing of instruments.

7.2.1 Cleaning the cover.

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 system again.

To clean the contacts, use a dry cloth. Do not use a wet or damp cloth.

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

7.3 Components which user can not replace

7.3.1 Not replaceable fuses by user

To be replaced by qualified personnel. Its position identifier and characteristics are:

F001 y F002: FUS 7 A T 125 V



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