PROMAX-27

CABLE TV & DATA ANALYSER

PROMAX

NOTAS SOBRE SEGURIDAD

Antes de manipular el equipo leer el manual de instrucciones y muy especialmente el apartado PRESCRIPCIONES DE SEGURIDAD.

El símbolo ⚠ sobre el equipo significa "CONSULTAR EL MANUAL DE INSTRUCCIONES". En este manual puede aparecer también como símbolo de advertencia o precaución.

Recuadros de ADVERTENCIAS Y PRECAUCIONES pueden aparecer a lo largo de este manual para evitar riesgos de accidentes a personas o daños al equipo u otras propiedades.

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.

REMARQUES À PROPOS DE LA SÉCURITÉ

Avant de manipuler l'appareil, lire le manuel d'utilisation et plus particulièrement le paragraphe **"PRESCRIPTIONS DE SÉCURITÉ"**.

Le symbole ⚠ sur l'appareil signifie **"CONSULTER LE MANUEL D'UTILISATION"**. Dans ce manuel, il peut également apparaître comme symbole d'avertissement ou de précaution.

Des encadrés **AVERTISSEMENTS ET PRECAUTIONS** peuvent apparaître dans ce manuel pour éviter des risques d'accidents affectant des personnes ou des dommages à l'appareil ou à d'autres biens.

TABLE OF CONTENTS

English

TV CABLE / DATA ANALYSER
PROMAX-27

1 GENERAL

1.1 Description

The **PROMAX-27** is a portable analyser for the configuration, installation and maintenance of interactive video services and high-speed data networks over TV coaxial networks based on **DOCSIS 2.0** and **EuroDOCSIS** standard. On the other hand, can also analyse services based on IP protocol transmitted by these same networks, such as Voice IP, IPTV or the Internet.

The **PROMAX-27** 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-27** 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-27** 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 a serial output for connecting to a printer or computer and thus obtains reports of the taken measures or access the **PROMAX** server for updating.

Here are some of the most important functions the **PROMAX-27** 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.

English

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-27** 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-27, 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.

The **PING** function performs an analysis of standard Internet traffic, such as browsing websites, emails or instant messaging. To check the quality of service, it uses the quality of service defined as **BE** (Best Effort) based on the standard **DOCSIS / EuroDOCSIS.**

In short, implementation of all these functions into an light instrument of one kilo and a half weight, ergonomic design and robust, makes **PROMAX-27** into an unparalleled tool at fieldwork.

1.2 Specifications ⚠

TUNING	
Tuning range	From 5 to 862Hz.
MODEM mode	From 53 to 855 MHz
Tuning mode	By channels 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.
Indication	Graphic LCD display with automatic back lighting.
Channel frequency offset	± 2,5 MHz.
GENERATOR	
Carriers frequency range	5 – 60 MHz
Resolution	100 kHz

Accuracy	< ± 5 kHz.
Carrier level	60 to 112 dBµV (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.

BROADBAND POWER LEVEL MEASUREMENT

Measuring range	From 70 to 120 dBµV (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	Video carrier signal level measurement .
Digital channels	Power measurement in the channel bandwidth by integration method.
Measuring range	From 25 to 120 dBµV. (From -35 dBmV to 60 dBmV)
Maximum input level	
From 5 to 862 MHz	120 dBµV. (60 dBmV[1])
DC to 60 Hz	60 V DC or RMS
Readout	Digital in dBµV, dBmV or dBm and analogue through a graphic bar. 1 dB resolution
IF bandwidth	230 kHz ± 50kHz
Input impedance	75 Ω
Accuracy	
Analogue channels	± 2 dB (from 5 to 40 °C) for negative video modulation [2]
Digital channels	± 3 dB (from 5 to 40 °C) for 8 MHz bandwidth channels.

DIGITAL SIGNALS MEASUREMENT

MER (Modulation error ratio)	
Measurement range	22 dB to 42 dB for QAM 64 / 256.
Accuracy	± 2 dB.
BER (Bit error rate)	
Measured before RS decoding	
Measurement range	10 E-2 to 10 E-10.

1 *Because of safety reasons, the maximum input power over the entire band is limited up to 120 dBµV. 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:*
$L_T = L+10 \log N$ (L_T: total level , L: mean level of one channel, N: 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.*

English

Constellation Diagram	ITU-J83 (Annex A/B/C) and DOCSIS/EuroDOCSIS compliant signals.
Lock range	-10 dBmV to 60 dBmV.
Symbol rate	
Measurement range	1000 to 7000 Msym/s for QAM 16/64/256.
Datalogger	Power level, BER, MER and constellation diagram can be stored, for data dumping to printer or PC.
Modulation type	QAM 16/32/64/128/256 ITU J83 annex A/B/C and QPSK.
Bandwidth	Selectable.
Frequency tuning	62.5 kHz.

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	0.1 – 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 dBµV. > 50 dB for input level > 70 dBµV.
Digital channels	> 30 dB for input level > 60 dBµV.
Accuracy	± 2 dB (45 – 862 MHz) ± 3 dB (5 – 45 MHz).

CABLE MODEM	DOCSIS / EuroDOCSIS 1.0, 1.1, 2.0.

TV/MODEM DATALOGGER FUNCTION

Max. number of loggers	50 (TV) - 30 (MODEM).
Number of channels/logger	140.
Measurements	
TV analogue 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, MER and constellation diagram).

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

SCAN

Span	Variable: 10, 30, 100, 300 MHz and full band (from 5 to 862 MHz depending on channel plan).
Dynamic range	Variable from 20 to 120 dBuV in 10 dB steps

SPECTRUM ANALYSER

Span	From 1 to 100 MHz (1, 5, 15, 30, 50, 100 MHz).
Reference level	Variable from 20 to 120 dBµV in 10 dB steps.
Analysed band	From 5 to 862 MHz.
Detector	Peak or average.
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.
Average detector	
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.
Low battery indication	Graphic indication on the display: .
Autonomy	Approximately 3 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	AI-103: 100 to 240 V AC / 50-60 Hz / 12 V DC (EUROPE and other countries).

ENVIRONMENTAL CONDITIONS

This equipment could be used on the following environmental conditions, on these conditions the specifications could be also applied:

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.

English

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
AA-12	Car lighter adapter cable
AD-057	F/female - F/female input adapter.
AD-058	F/male - F/female rapid adapter.
CC-030	F/male - F/male (1m) coaxial cable.
0 FD0462	Protective bag.
CA-005	Mains cord

OPTIONAL ACCESSORIES

AD-055	F/female - BNC/female adapter.
AD-056	F/female - IEC/female adapter.
CI-023	Portable serial printer.
CC-209	Data transfer cable to PC or printer.
RM-027	Remote control software for **PROMAX-27.**
AT-20C	20 dB attenuator.

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**.

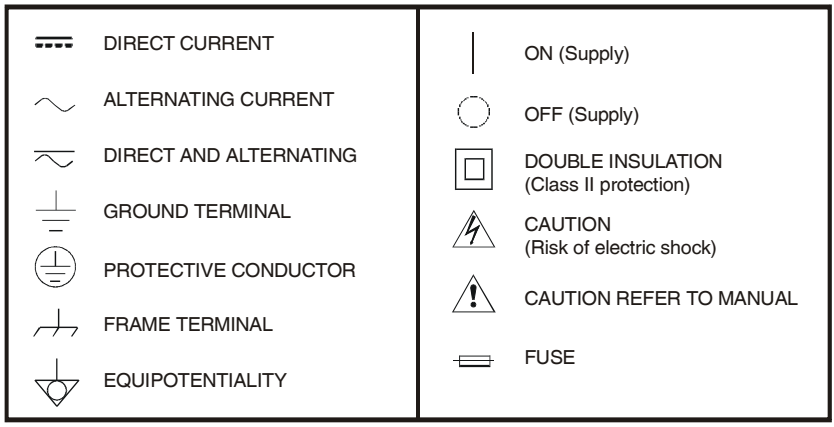
* **The user is not authorised to manipulate** inside the instrument:

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

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

English

* Symbols related with safety:



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-27** 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.

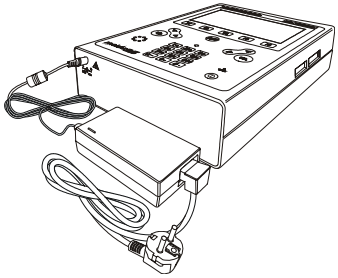


Figure 1.- PROMAX-27 and mains adapter.

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

English

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 putting in operation

The **PROMAX-27** has been designed for using as portable equipment.

A fully charged battery can power the instrument for over three 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-27** 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.

3.2.1 Adjusting contrast

LCD Adjustment contrast is done via the dial (see Figure 2.- [5]) located at the right side panel of the instrument.

By turning the dial is possible to adjust the screen contrast to get the best display in any environmental condition. By turning counter-clockwise, the contrast decreases. By turning clockwise, it increases. The new value of contrast is kept when the instrument turns off.

4 OPERATING INSTRUCTIONS

4.1 Description of the controls and elements

Front panel

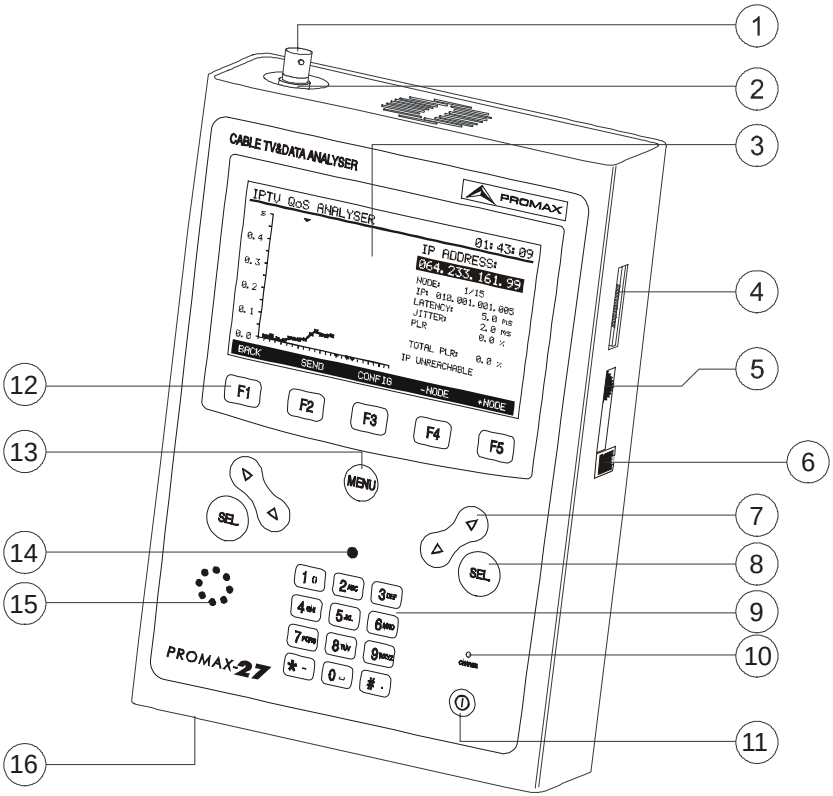


Figure 2.- Front panel view.

[1] F-F (or F-BNC or F-IEC) adapter.

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

[2] "F" male base connector.

[3] Graphic display with back lighting.

English

[4] Connection to computer or printer.

CC-209 specific connection cable.

Do not connect any cable different than the one supplied by the manufacturer, otherwise the instrument may suffer serious damage.

[5] Contrast Adjustment

[6] LAN connector (ETHERNET)

[7] 

Navigation buttons / Cursor keys.

[8] 

Selection button.

[9] Alphanumeric keypad, 12 keys for data entry.

[10] Battery charge indicator.

[11] 

On/Off key.

[12] 

SOFTKEYS, 5 programmable keys.

[13] 

Main menu Shortcut key.

[14] Ambient light detector.

[15] Loudspeaker.

[16] DC power input adaptor.

4.2 Operation Instructions

The five main functions of **PROMAX-27** are accessible from the initial menu, pressing the key (MENU) [13]:

1. **MODEM MODE:** This option allows you to check the response of a data transmission system DOCSIS / EuroDOCSIS. It works on both uplink and downlink. It can store and display the measures obtained from the constellation in QAM modulation. It also performs tests on applications using IP protocol over cable (for details see **4.2.3** and **4.2.4)**.
2. **TV MODE:** This option has three submenus: Analog TV, Digital TV and SLM(Signal Level Meter). In these modes we can make the analysis of analog carrier and digital video carrier, as well as the demodulation of the audio carrier (for details see **4.2.5**).
3. **GENERATOR MODE:** This option allows you to generate a signal test to check the upstream traffic (for details see **4.2.6**).
4. **CONFIG MODE:** In this menu you can set basic parameters of the analyser (for details see **4.2.2**).
5. **SETUP MODE:** This menu allows you to introduce basic data concerning the system such as time, date and language among others (for details see **4.2.1**).

To access any of these menus, press (MENU) [13] to access the start menu and then press the corresponding key (**[F1]**, **[F2]**, **[F3]**, **[F4]**, **[F5]**) that are found in the lower frame selection [12].

Pressing the hotkey (MENU) [13] the instrument will always lead to the start menu, regardless submenu in which we are.

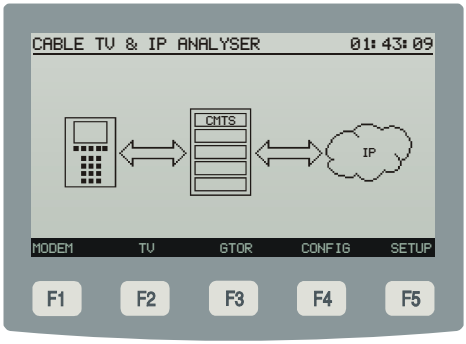


Figure 3.- Main menu with **SOFTKEYS** or programmable keys.

English

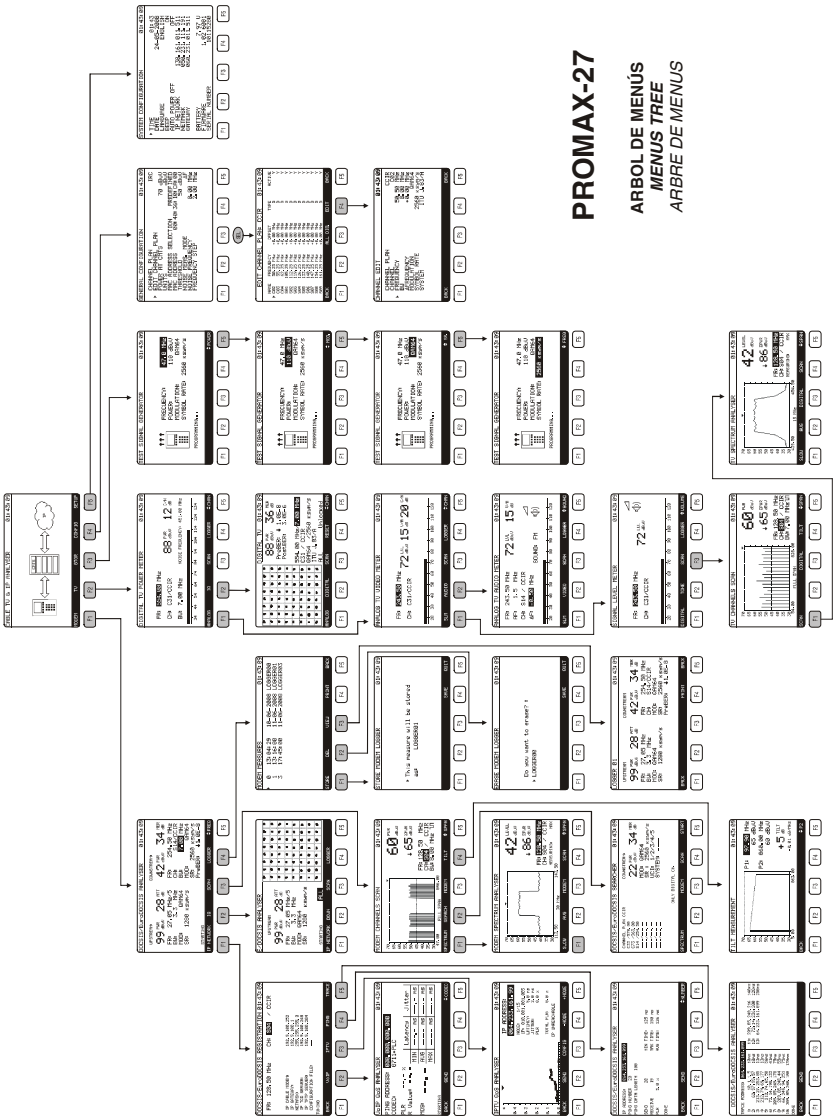


Figure 4.- General view of menu tree. (See quick reference guide).

4.2.1 SETUP Mode

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

1.- Press key MENU [13].

2.- Press softkey **SETUP** [F5].

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

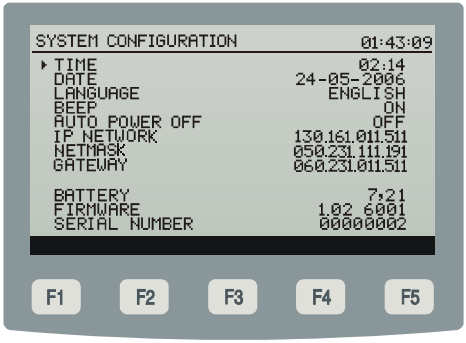


Figure 5.- SETUP Screen.

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 SEL [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 SEL [8] to save changes.

5.- To exit Configuration Mode and return to the main menu, press again the **MENU** key MENU [13]

English

Modifiable parameters are next:

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 allows you to active (ON) or to disable (OFF) the auto power off function. With this feature active, the instrument will automatically disconnect after ten minutes without pressing any key.

f) IP NETWORK
It is the number used to identify the instrument within the network. You should use the alphanumeric keypad to enter numbers that compose the IP address. You should use the key #. to write a point between numbers.

g) NETMASK
It is the number used to define the netmask. You should use the alphanumeric keypad to enter numbers that compose the netmask address. You should use the key #. to write a point between numbers.

h) GATEWAY
It is the number used to define the gateway. You should use the alphanumeric keypad to enter numbers that compose the gateway address. You should use the key #. to write a point between numbers.

Paragraphs **f**, **g** and **h** are needed to configure the Ethernet network connection.

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

- **BATTERY:** Indicates the battery charge in voltage.
- **FIRMWARE:** Indicates control program version.
- **SERIAL NUMBER**: It is a 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 MENU [13]

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

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

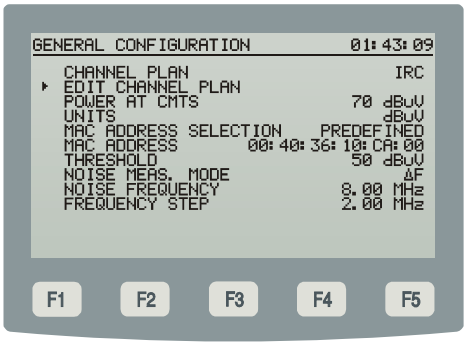


Figure 6.- **CONFIG** menu.

This menu allows you 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 SEL [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 SEL [8] to save changes.

English

5.- To exit Configuration Mode and return to the main menu, press again the **MENU** key (MENU) [13]

Modifiable parameters are next:

a) CHANNEL PLAN
It allows you to select 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 may get into the option **EDIT** (for details refer to section **4.2.2.1**).

c) POWER AT CMTS
It defines the minimum level of signal that should receive the CMTS. It accepts values between 20 and 120 dBµV. It is editable by curso or alphanumeric keypad.

d) UNITS
It allows you to select measurement units to be used among **dBmV**, **dBµV** and **dBm**.

e) MAC ADDRESS SELECTION
It validates the **MAC** code (Media Access Control address) which will be used to identify you computer. This is a direction that identifies the instrument in a unique way. There are two options: **PREDEFINED**, that uses the MAC address defined by default and appears in the field **MAC ADDRESS** or **MANUAL** that allows you to modify the MAC address, defining the address we want.

f) MAC ADDRESS
It allows you to enter the MAC code that will be used to identify the equipment.

g) 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. At the **SEARCH** function will not be searched channels below the threshold value.

h) 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 **i**); **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.

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

j) STEP FREQUENCY
This option allows you to select the step frequency at the frequency tuning modes and at the GENERATOR mode.

4.2.2.1 EDIT CHANNEL PLAN

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

1.- Press key MENU [13].

2.- Press softkey **[F5]** (**SETUP**)

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].

It appears the screen with the configuration parameters (figure 7).

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.

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).

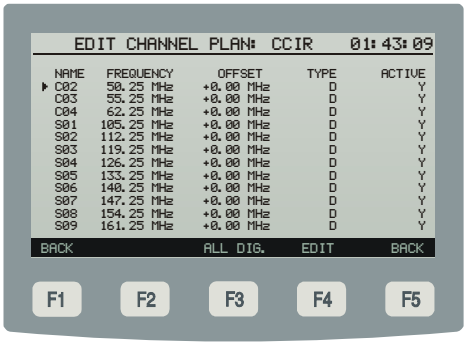


Figure 7.- Channel Plan Editor.

English

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

BACK [F1] and [F5]: To return to the previous general configuration screen **CONFIG**.

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, you will access to the **CHANNEL EDIT mode** (Figure 8.-) to configure the parameters of the analogical or digital channel.

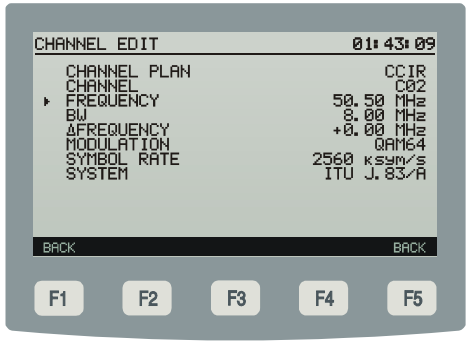


Figure 8.- **CHANNEL EDIT** menu

Next we explain with details the menu of the **CHANNEL EDIT.**

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

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): The frequency that the audio signal is transmitted. No editable.

MODULATION
(only for digital channels): You 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 used you should choose the proper annex among following ones: ITU J.83 / A, ITU J.83 / B, ITU J.83 / C.

In order to modify the rest of features of the channel plan, you will need the RM-027 software.

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]**.**

4.2.3 MODEM Mode

To access the **MODEM** mode in order to measure downstream, upstream and services over IP :

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- It appears the initial screen in **MODEM** mode (Figure 9.-).

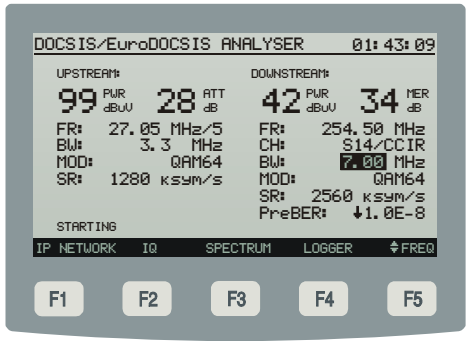


Figure 9.- Initial **MODEM** Screen.

To change between displaying downstream data or the constellation diagram press **IQ / DOWN** [F2].

To enable or disable the constellation diagram press the selection key [8]

The measurement of power in digital channels is done by a method of integration, with a bandwidth defined by the channel or the user.

The uplink, (UPSTREAM) shows the channel that the equipment uses in the communication with the CMTS (Cable Modem Termination System).

The screen shows measurements for both upstream and downstream, where:

Downstream:

- **PWR:** Channel power.
- **MER:** Modulation Error Ratio.
- **PreBER:** Digital signal Error Ratio.
- **FR:** Frequency.
- **CH:** Channel and active channel plan.
- **MOD:** Modulation.
- **SR:** Symbol Rate.

Upstream:

- **PWR:** Uplink level power.
- **ATT:** Attenuation until CMTS.
- **FR:** Frequency.

- **BW:** Bandwidth.
- **MOD:** Modulation.
- **SR:** Symbol Rate.

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

IP NETWORK [F1]**:** It reports about data network (refer to section **4.2.4**).

DOWN / IQ [F2]: Pressing this key you can switch between downstream data report and downstream constellation (refer to section **4.2.3.1**).

SPECTRUM / SCAN [F3]: Goes to **SPECTRUM** function (refer to section **4.2.3.4**) / **SCAN** function (refer to section **4.2.3.3**).

REGISTER [F4]: Through this function you can store measurements in the memory of the instrument for later viewing, printing or transfer to a PC (refer to section **4.2.3.5**).

FREQ / BW / CHAN [F5]: Pressing this key you can navigate among editable parameters. To edit a value use the Cursor keys or the alphanumeric keypad, as appropriate. In this case you can edit: **FREQ**, is the frequency of the tuned channel; **BW**, is the bandwidth; **CHANNEL**, is the name of the tuned channel. By this way you can change the tuned channel and measure other signals.

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

4.2.3.1 CONSTELLATION DIAGRAM (IQ)

To access the IQ (Constellation Diagram) function;

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **IQ** [F2].

It is the graphic representation of the Constellation Diagram (Figure 10.-) for DVB-QAM digital signal. For details see Appendix B "*Principle of QAM Modulation. The constellation Diagram"*.

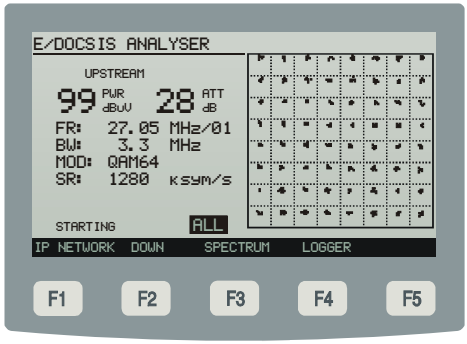


Figure 10.- Constellation Diagram.

Measurements displayed on the screen:

PWR:	Uplink level power.
ATT:	Attenuation until CMTS.
FR:	Carrier frequency and UCI.
BW:	Signal bandwidth.
MOD:	Modulation.
SR:	Symbol rate.

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] you can change quadrant of the constellation:

The initial option **ALL** represents the whole diagram.

Options **Q1, Q2, Q3, Q4** show each one of the four quadrants.

Options **ZQ1, ZQ2, ZQ3** and **ZQ4** show a zoom in of each quadrant.

Pressing the selection key [8] it switches between viewing and hiding the constellation diagram.

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

IP NETWORK [F1]: Registers into the network it reports about data network (refer to section **4.2.4**).

DOWN / IQ [F2]: It switches between downstream data viewing (refer to section **4.2.3.1**) and downstream constellation viewing.

SPECTRUM / SCAN [F3]: It shows the **SPECTRUM** screen (refer to section **4.2.3.4**) / **SCAN** screen (refer to section **4.2.3.3**).

LOGGER [F4]: Through this function you can store measurements in the memory of the instrument for later viewing, printing or transfer to a PC (refer to section **4.2.3.5**).

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

English

4.2.3.2 SEARCH function

To access the **SEARCH** function:

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **SPECTRUM / SCAN** [F3].

4.- Press softkey **SCAN** [F4] (if coming from **SPECTRUM** screen).

5.- Press softkey **SEARCH** [F2].

The **SEARCH** function identifies potential channels where you can make a ranging (determination of scope) with a number. The number of these identifiers, as well as its order it will determinate the time that may takes in adjust the emission power (ranging).

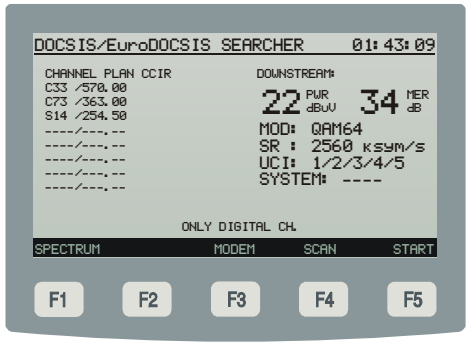


Figure 11.- SEARCH function.

Measurements shown on the screen (Figure 11.-) are:

PWR:	Input power.
MER:	Imodulation Error Ratio.
MOD:	Modulation used to codify the signal.
SR:	Symbol rate.
UCI:	Upstream Channel Identification.
SYSTEM:	It is the system used to send the signal.

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

SPECTRUM [F1]:	Returns to **SPECTRUM** screen (refer to section **4.2.3.4**).
MODEM [F3]:	Returns to the **MODEM** screen (refer to section **4.2.3**).
SCAN [F4]:	Returns to the **SCAN** screen (refer to section **4.2.3.3**).
START [F5]:	Starts searching for channels.

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

4.2.3.3 SCAN function

To access the **SCAN** function

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **SPECTRUM / SCAN** [F3].

4.- Press softkey **SCAN** [F4] (if coming from **SPECTRUM** screen).

The **SCAN** function shows numerically the level of the channel where the cursor, which is at the top of the screen, is pointing (Figure 12.-).

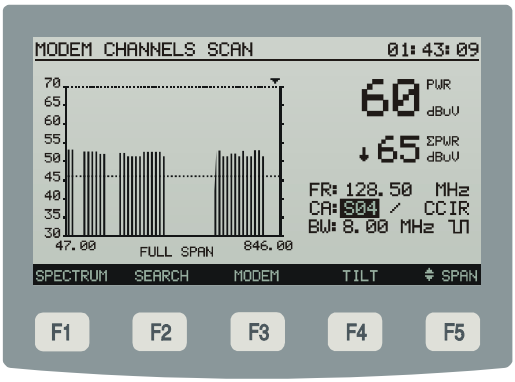


Figure 12.- SCAN function.

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.

English

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

SPECTRUM [F1]: It leads to the **SPECTRUM** screen (refer to section **4.2.3.4**).

SEARCH [F2]: It makes an exploration of all channels **DOCSIS / EuroDOCSIS** presents at the frequency band of the active channel plan (refer to section **4.2.3.2**).

MODEM [F3]: Returns to the main screen **MODEM** (refer to section **4.2.3**).

TILT [F4]: Goes to TILT test (refer to section **4.2.3.6**).

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. Possible values are 10, 30, 100, 300 MHz and MAX SPAN.

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

4.2.3.4 SPECTRUM function

To access the **SPECTRUM** function:

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **SPECTRUM / SCAN** [F3].

4.- Press softkey **SPECTRUM** [F1] (if coming from **SPECTRUM** screen).

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 13.-).

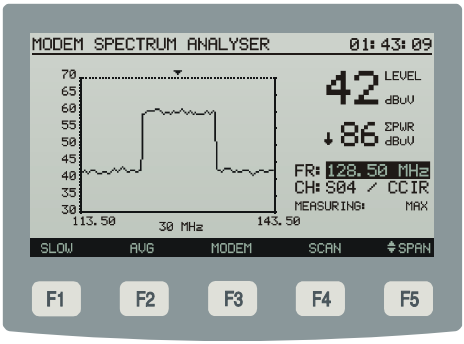


Figure 13.- SPECTRUM function in **MODEM** mode.

At the **SPECTRUM** function, the meter represents the spectrum of frequencies where the marker is. It provides an agile analysis of the whole band.

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.

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

SLOW / FAST [F1]:	It can be changed the scanning speed.
AVG / MAX / PEAK [F2]:	It can be changed the measurement mode. The current mode appears below the selected channel. In the **AVERAGE** option it makes an average of values; 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.
MODEM [F3]:	It leads to the **MODEM** screen (refer to section **4.2.3**).
SCAN [F4]:	It goes to the **SCAN** screen (refer to section **4.2.3.3**).

English

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.

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

4.2.3.5 LOGGER function.

To access the **LOGGER** function:

1.- Press key MENU [13].

2.- Press key **MODEM** [F1].

3.- Press key **LOGGER** [F4].

Using the **LOGGER** function in **MODEM** mode you can obtain a record of the measurements taken for both Upstream and Downstream.

Data stored are next:

Downstream:

- Power
- MER and BER
- Channel frequency.
- Symbol rate.

Upstream:

- Power checking
- Attenuation until CMTS
- Bandwidth and Frequency
- Symbol rate

The **PROMAX-27** can store in its memory up to 30 acquisitions or loggers in MODEM mode. These measurements are stored for later viewing, printing or transfer to a PC.

On the left side of the screen (Figure 14.-), 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.

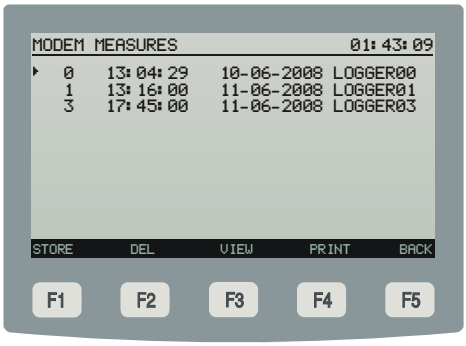


Figure 14.- List of stored *loggers*.

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:

STORE [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 you to access the data stored in the selected logger (Figure 15.-)

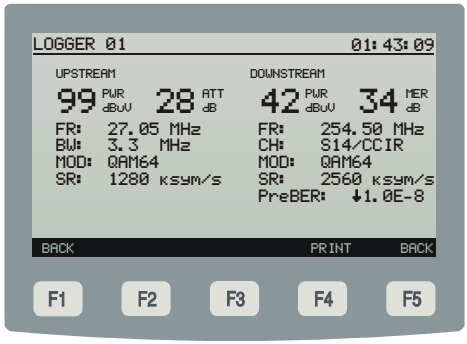


Figure 15.- Logger Viewing in **MODEM** mode.

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

Pressing **[F4]** displayed logger data will be print.

PRINT [F4]: It prints the selected log (Figure 16.-) (refer to section **4.3**).

```
************************
*        PROMAX-27       *
************************
  00:01:38   01-01-2006

************************
         UPSTREAM
************************

 PWR: 91 dBuV
 ATT: 21 dB
 FR: 27.05 MHz
 BW: 3.2 MHz
 SR: 2560 ksym/s

************************
        DOWNSTREAM
************************

 PWR: 82 dBuV
 MER: 32 dB
 FR: 303.00 MHz
 CH: C37 / IRC
 SR: 5057 ksym/s
 BER: <1.0E-8
```

Figure 16.- Print example.

BACK [F5]: It returns to the previous screen **MODEM**.

4.2.3.6 TILT function

To access the **TILT** function:

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **SPECTRUM / SCAN** [F3].

4.- Press softkey **SCAN** [F3] (if coming from **SPECTRUM** screen).

5.- Press softkey **TILT** [F4].

The **TILT** test is a utility to equalize the line. Typically, **CATV** networks transmit two pilot signals at the beginning and at the end of the band. These two pilots 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 amplifiers in order to compensate these losses and ensure a flat response across the band.

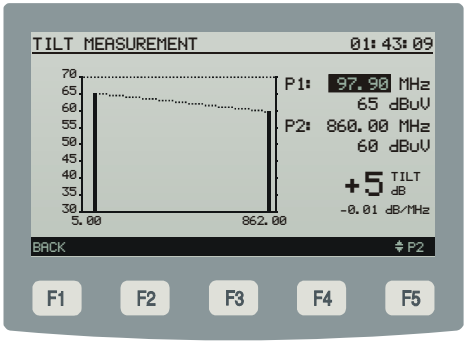


Figure 17.- TILT Screen

At the bottom of the screen (Figure 17.-) you will see next options:

BACK [F1]: To return to the previous menu.

PILOT 1 / PILOT 2 [F2]: Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. **PILOT 1**, is used to define the first reference frequency, **PILOT 2**, is used to define the second reference frequency. If using Cursor keys to define the frequency, it will be by steps selected in **STEP FREQUENCY** (see paragraph **4.2.2**). If using alphanumeric keypad, press **SELECT** to save values and finish.

4.2.4 REGISTERED Mode – IP NETWORK Functions

In order to use the **REGISTERED** mode functions is necessary to register the instrument in the network, configuring the information needed to identify it, such as **IP**, **Netmask** and **Gateway** (refer to section **4.2.1**). If you are not registered in the network you will be able to access these functions but they will be disabled.

To access the **REGISTERED** mode, in order to analyse network services.

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **IP NETWORK** [F1].

4.- The instrument starts the registration process in the CMTS of the NETWORK. On the display it will appear the word "TUNING" during the process. You must wait a few minutes until it is registered. If registration process is right, it will display the word "DONE" on the screen. Failure in registration process will be displayed as an "ERROR IN REGISTRATION".

It is displayed the **REGISTERED** mode screen. At the bottom menu it is shown each one of functions that you may use (Figure 18.-).

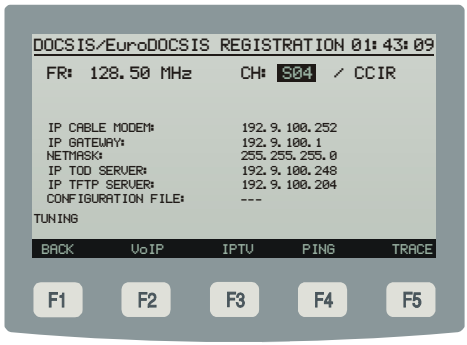


Figure 18.- Registered mode Screen.

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

BACK [F1]: Back to the previous screen **MODEM.**

VoIP [F2]: It checks the VoIP service (refer to section **4.2.4.1**).

IPTV [F3]: It checks the TV over IP service (refer to section **4.2.4.2**).

PING [F4]:	It checks the packet transmission over the cable (refer to section **4.2.4.3**).
TRACE [F5]:	It shows the route taken by packets across an IP network, from the instrument to the host (refer to section **4.2.4.4**).

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

4.2.4.1 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-27** 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-27**, performs an exhaustive analysis of the network based on parameters set by **UGS**, which will ensure the best quality service.

English

To access the **VoIP** function:

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **RED IP** [F1].

4.- The instrument starts the registration process in the CMTS of the NETWORK. On the display it will appear the word "TUNING" during the process. You must wait a few minutes until it is registered. If registration process is right, it will display the word "DONE" on the screen. Failure in registration process will be displayed as an "ERROR IN REGISTRATION".

5.- Pres softkey **VoIP** [F2].

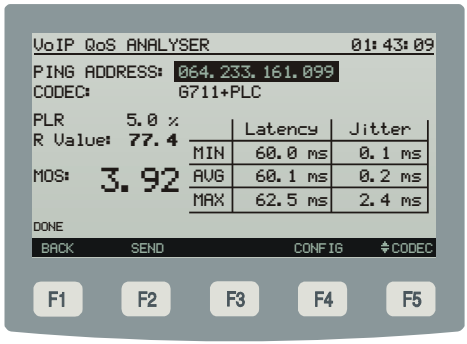


Figure 19.- VoIP Screen.

On the screen (Figure 19.-) are displayed next data:

IP ADDRESS: Address where PING is send.

PLR (Packet Loss Rate): Is the percentage of lost packets over total sent packets.

CODEC: Type of encoding used for signal transmission.

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.

If the device is not properly registered in the network, at the bottom of the screen it will display the warning message "Register Error".

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

BACK [F1]: To return to the previous screen (**REGISTERED**).

SEND [F2]: To send the ping.

CONFIG [F4]: You will access to VoIP settings. Among them there are: Ping data length, ping number, unsolicited grant size, grants per interval, nominal grant interval, tolerated grand jitter. Use the cursor to move among parameters and the selection key [8] to enter and save them.

CODEC / ADDRESS [F5]: Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. You can change the **PING ADDRESS** or the **CODEC**. When selecting IP address, if you use the cursor keys you will access to last IP entered by the user.

4.2.4.2 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-27** 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 than 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-27**, 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.

To access to **IPTV** function:

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **IP NETWORK** [F1].

4.- The instrument starts the registration process in the CMTS of the NETWORK. On the display it will appear the word "TUNING" during the process. You must wait a few minutes until it is registered. If registration process is right, it will display the word "DONE" on the screen. Failure in registration process will be displayed as a "ERROR IN REGISTRATION".

5.- Press softkey **IPTV** [F3].

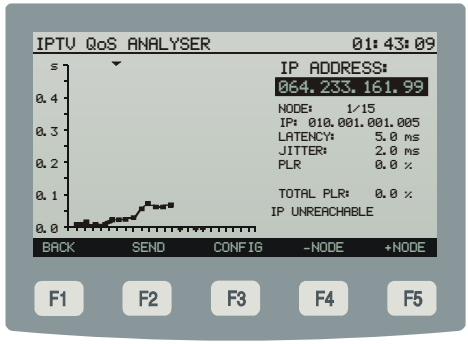


Figure 20.- IPTV screen.

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

PING 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.

If the device is not properly registered in the network, at the bottom of the screen it will display the warning message "Register Error".

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

BACK [F1]:	To return to the previous screen (**REGISTERED mode**).
SEND [F2]:	To send the testing ping.
CONFIG [F3]:	You will access to **IPTV** settings (**Nominal Polling Interval).**
+NODE [F4]:	Moves the cursor to the right, going to the next node.
–NODE [F5]:	Moves the cursor to the left, going to the previous node.

4.2.4.3 PING

Description of 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 provides 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 standard Internet traffic, such as browsing websites, emails or instant messaging, the quality of service defined as **BE** (Best Effort) is the most appropriate. **BE** is one of the four services **QoS** defined in **DOCSIS / EuroDOCSIS**, and is designed to work on a "first come, first served" basis.

To perform the **PING** test, a **PING** (Packet Internet Grouper) is sent. It is about transmitting data packets point to point between **PROMAX-27** serving as cable modem and another remote point access to the network that answer to the transmission. These PING are a set data packets with a request and response echo. This way it can be checked the status of the connection with the test point to verify.

From the obtained data it is displayed a **BE** report, the PLR and latency. The results shown indicate what problems must be identified and resolved and those ones that may be caused by problems at headers or **IP**.

In short, the **PING** function of the **PROMAX-27**, performs an exhaustive analysis of the network based on parameters set by **BE**, 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.

To access the **PING** function:

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **IP NETWORK** [F1].

4.- The instrument starts the registration process in the CMTS of the NETWORK. On the display it will appear the word "TUNING" during the process. You must wait a few minutes until it is registered. If registration process is right, it will display the word "DONE" on the screen. Failure in registration process will be displayed as an "ERROR IN REGISTRATION".

5.- Press softkey **PING** [F4].

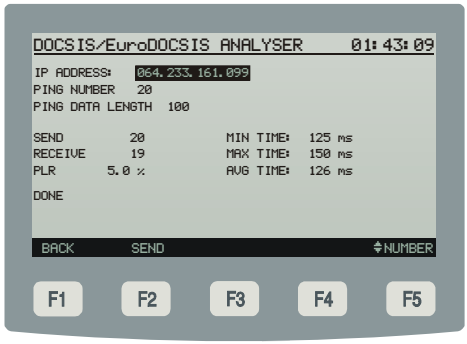


Figure 21.- PING report.

Data shown on the screen (Figure 21.-) are:

PING ADDRESS: It indicates the remote address of the device or the access point to verify. This is an editable field.

PING NUMBER: It indicates the number of **PING** attempts.

PING DATA LENGHT: It indicates the length of the PING sent in bytes.

SEND: It indicates the number of sent **PING** packets.

RECEIVE: It indicates the number of **PING** packets received.

PLR (Packet Lost Rate): Is the percentage of lost packets over total sent packets.

MIN TIME: It indicates the minimum time that a PING has been sent and received back.

MAX TIME: It indicates the maximum time that a PING has been sent and received back.

AVG TIME: It indicates the average time in which PINGs were sent and received back.

If the device is not properly registered in the network, at the bottom of the screen it will display the warning message "Register Error".

At the bottom of the screen appears following options:

BACK [F1]: Return to the previous screen **REGISTER**.

SEND [F2]: Sends the PING.

NUMBER / LENGTH / IP [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 **PING** number, its **LENGHT** or its **NUMBER**. When selecting IP address, if you use the cursor keys you will access to last IPs entered by the user.

4.2.4.4 TRACEROUTE

Description of Service

Traceroute is a service that shows you the route over the network between two systems, listing all the intermediate routers a connection must pass through to get to its destination.

This function can help you determine why a connection to a given server might be poor, and can offer help you figure out where exactly the problem is.

It also shows you how systems are connected to each other, letting you see how your ISP connects to the Internet as well as how the target system is connected.

To access the **TRACEROUTE** function:

1.- Press key MENU [13].

2.- Press softkey **MODEM** [F1].

3.- Press softkey **IP NETWORK** [F1].

4.- The instrument starts the registration process in the CMTS of the NETWORK. On the display it will appear the word "TUNING" during the process. You must wait a few minutes until it is registered. If registration process is right, it will display the word "DONE" on the screen. Failure in registration process will be displayed as an "ERROR IN REGISTRATION".

5.- Press softkey **TRACE** [F5].

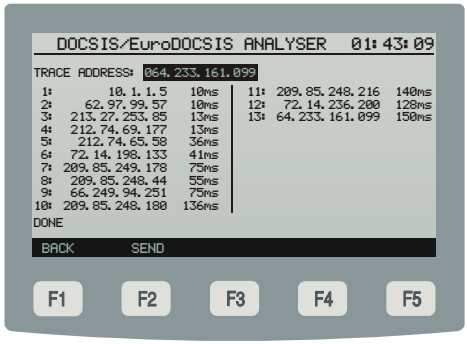


Figure 22.- TRACEROUTE Screen.

Each line on the screen (Figure 22.-) shows each system or router in the path between the instrument and the target system. Each line shows the system's IP address and time in millisecond that is how long it took a packet to get from the instrument to that system and back again.

If the device is not properly registered in the network, at the bottom of the screen it will display the warning message "Register Error".

At the bottom of the screen appears following options:

BACK [F1]: Return to the previous screen **REGISTER.**

SEND [F2]: Sends the PING.

4.2.5 TV Mode

To access the **TV** mode for **CATV** measurement:

1.- Press key MENU [13].

2.- Press softkey **TV** [F2].

The TV function includes three different operation modes: Analogue, Digital and SLM (Signal Level Meter). Next we explain measurements of each mode.

Analog TV Video Meter:

- Video carrier level.
- Carrier / Noise Ratio (C/N).
- Video / Audio Ratio (V/A).

Digital TV Power Meter:

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

Signal Level Meter (SLM):

- Select the Tone, AM, FM and volume regulation.
- Power level Channel.

Once in TV mode, to change the measurement mode you should press the softkey **[F1]**.

MNS / DIGITAL / ANALOGUE [F1]**:** Changes among the three TV measurement modes.

At the top of the screen you can read in which mode you are.

Next we are going to explain each one.

English

4.2.5.1 TV DIGITAL mode

To access this measurement mode from TV mode, press **[F1]** until you see at the top of the screen "**DIGITAL TV POWER METER**" (Figure 23.-).

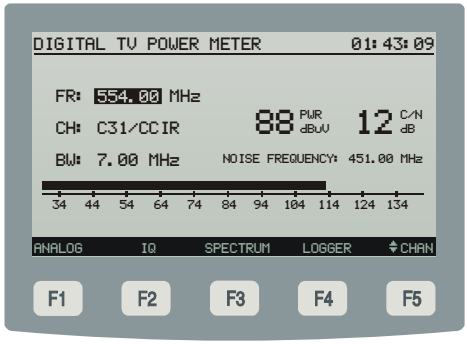


Figure 23.- Digital TV measurement screen

Measures on the screen are:

PWR:	Power received from the signal.
C/N:	Carrier / Noise Ratio.
NOISE FREQUENCY:	Noise frequency.
FR:	Channel tuned frequency.
CA:	Channel and plan channel.
BW:	Bandwidth.

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

MNS / DIGITAL / ANALOG [F1]:	Changes among the three TV measurement modes.
IQ [F2]:	It shows a Constellation Diagram for the digital signal in the whole range of measurement (refer to section **4.2.5.1.1**) (for details see appendix B 'Principle of QAM Modulation. The Constellation Diagram').
SPECTRUM / SCAN [F3]:	It leads to **SPECTRUM** mode (refer to section **4.2.5.4.2**) / **SCAN** mode (refer to section **4.2.5.4.1**).
LOGGER [F4]:	Through this function you can store measurements in the memory of the instrument for later viewing, printing or transfer to a PC (refer to section **4.2.5.4.3**).

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".

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

4.2.5.1.1 CONSTELLATION DIAGRAM function

To access the **IQ** function (**CONSTELLATION DIAGRAM**):

1.- Press key MENU [13].

2.- Press key **TV** [F2].

3.- Go to "**DIGITAL TV POWER METER**" mode, pressing key [F1].

4.- Press key **IQ** [F2].

It be displayed the Constellation Diagram (Figure 24.-)

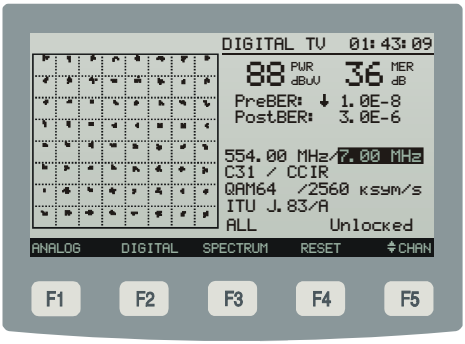


Figure 24.- Constellation diagram and measurements of a digital channel.

Measures displayed on this screen are next:

PWR:	Power input level.
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:

ANALOG [F1]:	It leads to TV Analog mode.
DIGITAL [F2]:	It leads to previous screen (TV digital mode).
SPECTRUM / SCAN [F3]:	It goes to **SPECTRUM** mode (refer to section **4.2.5.4.2**) / **SCAN** mode (refer to section **4.2.5.4.1**).
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 analog, it will appear a warning message on the screen. The message will be "Warning: CXX is defined as ANALOGUE".

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

4.2.5.2 TV ANALOGUE mode

To access this measurement mode from TV mode, press the softkey **[F1]** until you see at the top of the screen "**ANALOG TV VIDEO METER**" (Figure 25.-).

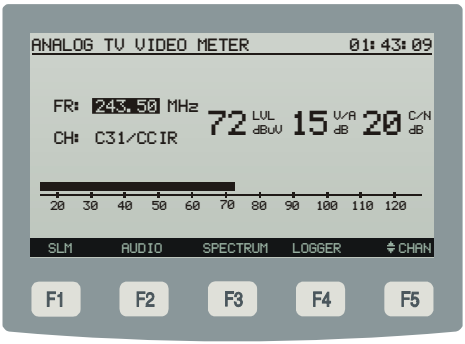


Figure 25.- Analog TV Video Meter mode.

In the case you tuned an analogue carrier signal, measurements on the screen will be next:

LVL:	Power received from the signal.
V/A:	Video / Audio Ratio.
C/N:	Carrier / Noise Ratio.
FR:	Channel tuned frequency.
CH:	Channel and plan channel.

English

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

SLM [F1]:	It leads to SLM mode.
AUDIO [F2]:	It gets a demodulated audio signal (refer to section **4.2.5.2.1**).
SPECTRUM / SCAN [F3]:	It goes to **SPECTRUM** mode (refer to section **4.2.5.4.2**) / **SCAN** mode (refer to section **4.2.5.4.1**).
LOGGER [F4]:	Through this function you can store measurements in the memory of the instrument for later viewing, printing or transfer to a PC (refer to section **4.2.5.4.3**).
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".

4.2.5.2.1 AUDIO function

To access the **AUDIO** function:

1.- Press key MENU [13].

2.- Press softkey **TV** [F2].

3.- Press softkey [F1] until you find **ANALOG** mode.

4.- Press softkey **AUDIO** [F2].

In analogue mode the **PROMAX-27** allows obtaining a **demodulated audio signal** and showing its characteristics.

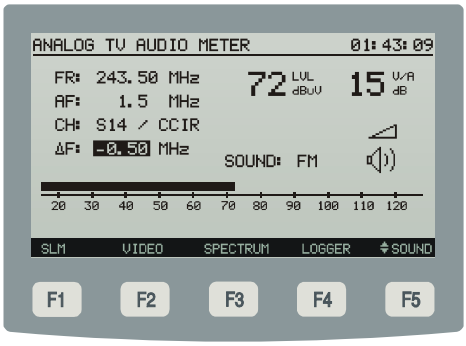


Figure 26.- Analogue Audio Signal Measurement

Measurements shown on the screen (Figure 26.-) are:

FR:	Signal tuned frequency.
CH:	Channel and plan channel.
LVL:	Audio carrier level.
AF:	Audiocarrier frequency.
V/A:	Video / Audio Ratio.
ΔF:	Audio carrier Offset.

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

SLM [F1]: It leads to Signal Level Meter screen.

VIDEO [F2]: It returns to previous screen (**ANALOG TV VIDEO METER**).

SPECTRUM / **SCAN** [F3]: It goes to **SPECTRUM** mode (refer to **4.2.5.4.2**) / **SCAN** mode (refer to section **4.2.5.4.1**).

LOGGER [F4]: Through this function you can store measurements in the memory of the instrument for later viewing, printing or transfer to a PC (refer to **4.2.5.4.3**).

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 video 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.

English

4.2.5.3 SLM mode

To access the Signal Level Meter from TV mode, press **[F1]** until you see at the top of the screen "**SIGNAL LEVEL METER**" (see Figure 27.-).

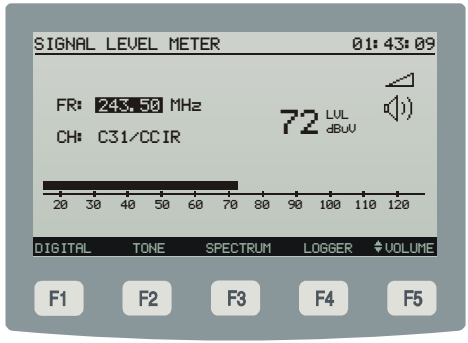


Figure 27.- SIGNAL LEVEL METER screen.

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.
FR:	Channel tuned frequency.
CH:	Channel and plan channel.

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

DIGITAL [F1]: It leads to the Digital TV Power Meter.

TONE / AM / FM / OFF [F2]: 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.

SPECTRUM / SCAN [F3]: It goes to **SPECTRUM** function (refer to section **4.2.5.4.2**) / **SCAN** function (refer to section **4.2.5.4.1**).

LOGGER [F4]: Through this function you can store measurements in the memory of the instrument for later viewing, printing or transfer to a PC (refer to section **4.2.5.4.3**).

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.

4.2.5.4 COMMON FUNCTIONS in TV mode

Next we are going to explain the functions that are common to the three TV modes.

4.2.5.4.1 SCAN function

To access the **SCAN** function:

1.- Press key MENU [13].
2.- Press softkey **TV** [F2].
3.- Press softkey [F1] to select the mode you want to work **DIGITAL** / **ANALOG** / **SLM**.
4.- Press softkey **SPECTRUM** / **SCAN** [F3].
5.- Press key **SCAN** [F4] (if coming from **SPECTRUM** screen).

This function is the same one than the **SCAN** function in **MODEM** mode. For more details refer to section **4.2.3.3**.

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

SPECTRUM [F1]: It leads to the **SPECTRUM** screen (refer to section **4.2.5.4.2**).

DIGITAL [F3]: Returns to the main screen "**DIGITAL TV POWER METER**" (refer to section **4.2.5.1**).

TILT [F4]: It leads to TILT screen (refer to section **4.2.5.4.4**).

English

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. Possible values are 10, 30, 100, 300 MHz and MAX SPAN.

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

4.2.5.4.2 SPECTRUM function

To access the **SPECTRUM** function:

1.- Press key (MENU) [13].

2.- Press softkey **TV** [F2].

3.- Press softkey [F1] to select the mode you want to work **DIGITAL** / **ANALOG** / **SLM**.

4.- Press softkey **SPECTRUM / SCAN** [F3].

5.- Press softkey **SPECTRUM** [F1] (if coming from **SCAN** screen).

This function is the same one than the **SPECTRUM** function in **MODEM** mode. For more details refer to section **4.2.3.4**.

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

SLOW / FAST [F1]: It can be changed the scanning speed.

AVG / MAX / PEAK [F2]: It can be changed the measurement mode. The current mode appears below the selected channel. In the **AVERAGE** option it makes an average of values; 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.

DIGITAL / ANALOG / SLM [F3]: It leads to the first screen of the measurement mode (This option changes regarding to the screen you come).

SCAN [F4]: It goes to the **SCAN** screen (refer to section **4.2.5.4.1**).

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.

NOTE:

Access to the function SCAN / SPECTRUM switches depending on the type of tuning you are doing.

In case you are tuning a signal using frequency, it will be displayed the SPECTRUM function first.

In case you are tuning a signal using the predefined channels from the channel plan, it will be displayed the SCAN function first.

English

4.2.5.4.3 LOGGER function

To access the **LOGGER** function:

1.- Press key MENU [13].

2.- Press softkey **TV** [F2].

3.- Press softkey **LOGGER** [F4].

LOGGER function in TV mode takes measurements exploring every channel on TV, both digital and analog, which are in the frequency band of the active channel plan (Figure 29.-):

- 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 BER measurement.
- Symbol rate.

The **PROMAX-27** 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, printing or transfer to a PC.

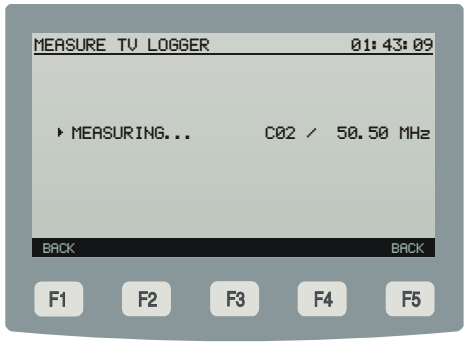


Figure 28.- Measuring data

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.

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

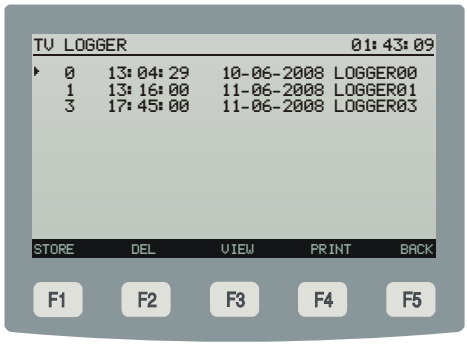


Figure 29.- List of TV stored loggers.

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

STORE [F1]: Measurements corresponding to channels of the channel plan selected are will be score in a logger.

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 (Figure 30.-).

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

Pressing [**F4**] displayed logger data will be print.

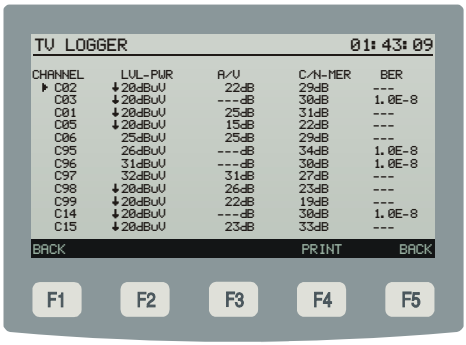


Figure 30.- TV logger

PRINT [F4]: It prints the selected log (Figure 31.-) (refer to section **4.3**).

```
*****************************
*          PROMAX-27        *
*****************************
 00:01:38          01-01-2006
*****************************
           TV LOGGER
*****************************

  CH LVL-PWR A/V C/N-MER BER

  C02 35dBuV 22dB 29dB  ---
  C03 28dBuV ---  30dB <1.0E-8
  C01 29dBuV 25dB 31dB  ---
  C05 34dBuV 15dB 22dB  ---
  C06 41dBuV 25dB 29dB  ---
  C95 33dBuV ---  34dB <1.0E-8
```

```
C96 27dBuV ---  30dB <1.0E-8
C97 19dBuV 31dB 27dB  ---
C98 24dBuV 26dB 23dB  ---
C99 26dBuV 22dB 19dB  ---
C14 28dBuV ---  30dB <1.0E-8
C15 24dBuV 23dB 33dB  ---
C16 24dBuV 22dB 16dB  ---
C17 27dBuV ---  31dB <1.0E-8
C18 27dBuV ---  28dB <1.0E-8
C19 24dBuV 19dB 26dB  ---
C20 27dBuV ---  31dB <1.0E-8
C21 27dBuV ---  31dB <1.0E-8
C22 37dBuV ---  27dB <1.0E-8
C07 24dBuV 25dB 14dB  ---
C08 24dBuV 23dB 30dB  ---
C09 37dBuV ---  30dB <1.0E-8
C10 37dBuV ---  28dB <1.0E-8
C11 37dBuV ---  35dB <1.0E-8
C12 37dBuV ---  14dB <1.0E-8
```

Figure 31.- Print Example.

BACK [F5]: It returns to the previous screen **TV LOGGER**.

4.2.5.4.4 TILT function

To access the **TILT** function:

1.- Press key MENU [13].

2.- Press softkey **TV** [F2].

3.- Press softkey **SPECTRUM / SCAN** [F3].

4.- Press softkey **SCAN** [F3] (if coming from **SPECTRUM** screen).

5.- Press softkey **TILT** [F4].

This function is the same one than the **TILT** function in **MODEM** mode. For more details refer to section **4.2.3.6.**

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

BACK [F1]: To return to the previous menu.

PILOT 1 / PILOT 2 [F2]: Pressing this key you can navigate among editable parameters. To change them, use the Cursor keys or the alphanumeric keypad as appropriate. **PILOT 1**, is used to define the first reference frequency, **PILOT 2**, is used to define the second reference frequency. If using Cursor keys to define the frequency, it will be by steps selected in **STEP FREQUENCY** (see paragraph **4.2.2**). If using alphanumeric keypad, press **SELECT** to save values and finish.

4.2.6 TEST SIGNAL GENERATOR mode.

To access the **TEST SIGNAL GENERATOR** mode:

1.- Press key MENU [13].

2.- Press softkey **GTOR** [F3].

It is displayed the TEST SIGNAL GENERATOR screen (Figure 32.-).

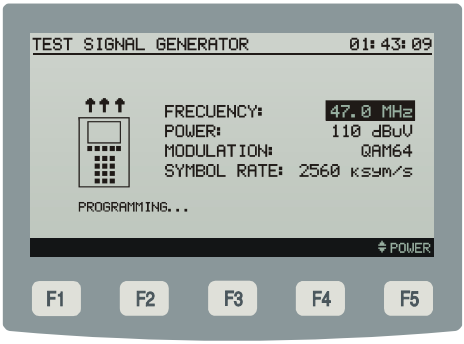


Figure 32.- Setting parameters of the test signal.

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.

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

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 dBμV; **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.

English

4.3 CONNECTING TO DEVICES.

The **PROMAX-27** permits the connection to a PC or to a serial printer for data transfer, by means of the connection cable model **CC-PX27.**

Do not connect any cable other than that supplied by the manufacturer, otherwise serious damage may be caused to the equipment.

1) Prior to connecting the equipment to a PC, disconnect both from their respective power supplies.

2) Connect the end of the connection cable corresponding to the **PROMAX-27** to connector [4] and the other end to the serial port of your computer or printer.

Once the computer or printer has been connected, select on the **PROMAX-27** the **LOGGER** operation mode. If **PRINT** function is selected data will be dumped to the remote unit through the serial port.

The communication parameters used by the **PROMAX-26+**, and which therefore must be defined on the remote unit (PC) are the following:

Rate	57600 bauds
Data bits	8 bits
Parity	None
Stop bits	1

The remote control software **RM-027** (optional accessory) permits to carry out from a computer the following options:

1) **CHANNELS PLAN PROCESSOR**: Modify, add or delete channel plans.

2) **DATALOGGER**: Permits to edit and to save all the measurement contained in a logger.

3) **UPGRADE**: Allows updating the **PROMAX-27** software version.

5 MAINTENANCE

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

5.1 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.

5.2 Method of maintenance

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

5.2.1 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.

CAUTION

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

CAUTION

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.

English

5.3 Components which user can not replace

5.3.1 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

APPENDIXES

APPENDIX A.- MEASUREMENT OF THE MODULATION ERROR RATIO (MER).

Analogue and digital carriers are very different in terms of the signal content and the power distribution over the channel. Therefore need to be measured differently.

The amount of distortion in a system is related to the total power of all of the carriers making accurate power measurements critical for optimum performance.

Instruments such as signal level meters that are designed to measure only analogue carriers will not accurately measure digital carriers.

Modulation error ratio (**MER**), used in digital systems is analogous to Signal/Noise (**S/N**) measurement used in analogue systems. **MER** represents the ratio of the error power to the average power in an ideal **QAM** signal. Ideally you should have at least 4 or 5 dB of margin from the **MER** where significant errors occur, to allow for system degradation. **MER** measurements are useful for early detection of non-transient (noise) impairments, such as system noise and the second and third order beats (**CSO** and **CTB**). This measurement takes in account not only amplitude noise, but also phase noise.

To determine the **MER** of a signal is a key part of determining the margin from failure of the digital system. Unlike analogue systems where you can see degradations in Carrier/Noise (**C/N**) performance, a poor **MER** is not noticeable on the picture right up to the point of system failure.

MER is defined as follows, expressed in dB:

$$20\log\frac{RMS\ error\ magnitude}{average\ symbol\ magnitude}\ (dB)$$

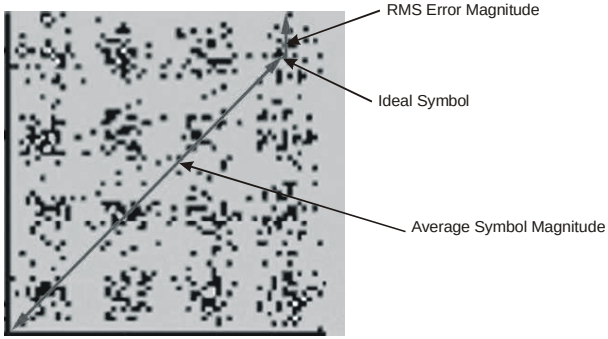


Figure 33.- Modulation error ratio (**MER**).

English

64 QAM set decoders require better than **23 dB MER** to operate. To allow for system degradation, a margin of at least **3** or **4** dB is preferred. However, **QAM 256** set decoders require better than **28 dB MER** to operate with margins of **3 dB** at least. Typically the maximum **MER** displayed on portable analysers is about **34 dB**.

MER was chosen as the preferred measurement for cable TV because of it's similar to the analogue Carrier/Noise (**C/N**) measurement expressed in dB that most people from cable industry are familiar with.

APPENDIX B.- PRINCIPLE OF QAM MODULATION. THE CONSTELLATION DIAGRAM

The modulation process implies to transfer the information contained in a signal to a high frequency carrier. Modulation **QAM**, in concrete uses modulation in quadrature consisting of two carriers each one of the same frequency, one called-**I** (in phase) and another out of phase 90° called **Q** (quadrature).

Each one of them is modulated in amplitude and phase by a portion of the digital input signal. The two modulated signals are combined then and they are transmitted as a single waveform. The receiver only needs to invert the process for generating a digital output that can be processed to produce images or another useful information also.

The number of levels used in the modulation of each carrier determines the number of possible symbols and, consequently, the number of bits that can be transmitted in a certain bandwidth. The **DVB-C** standard allows 5 types of modulation: **16 QAM**, **32 QAM**, **64 QAM**, **128 QAM** and **256 QAM**.

For example, if four amplitude levels are applied to each one of the carriers, each signal could reach the value of -3.0, -1.0, +1.0, +3.0 at a given instant in time, so we have 16 possible combinations. This is known as **16 QAM**. Extending the previous exposition to four amplitudes, it allows us to generate 8 states for each carrier and 64 possible combinations (**64 QAM**).

These digital signals can be visualized graphically by means of the **Constellation Diagram**. If one imagines on an axis the possible states of the first carrier (signal-**I** or signal in phase) we would obtain the image in figure 34.

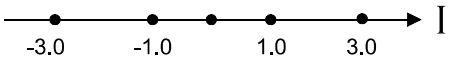


Figure 34.- Signal-**I** states.

Figure 35.- Signal-**Q** states.

Figure 35 shows the other signal (**Q** in quadrature) on a vertical axis to consider the 90° phase change.

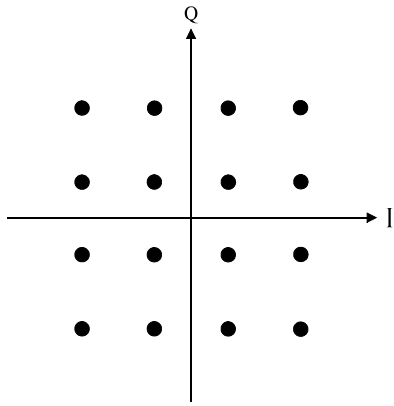


Figure 36.- I-Q states combination

Figure 36 shows the combination of these two signals. This image constitutes the Constellation Diagram of the modulated digital signal.

APPENDIX C.- FREQUENCY OFFSET ADJUSTMENT FOR TUNING ANALOGUE AND DIGITAL CHANNELS.

It is possible to introduce an offset of the tuning central frequency for the channels defined in each channel plan using the **ΔFCH** parameter (± 2.5 MHz). Therefore, it is possible to adapt the measures to irregular tunings, due to small displacements on channel central frequencies that are defined by the standard channel plan.

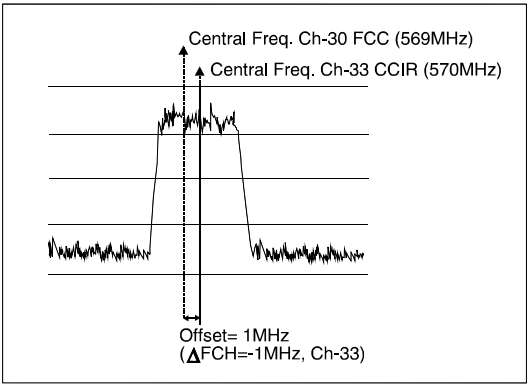


Figure 37.- Frequency offset on the tuning central frequency.

Taking as example the previous figure, if we suppose that in the configuration parameters of the digital channel (CH-33) a frequency offset equals to 1 MHz has been defined for the channel tuning frequency (ΔFCH = -1MHz), although the central frequency corresponding to channel 30 (569 MHz) does not match with the defined one for the current CCIR channel plan (CH-33, 570 MHz), it will be possible to take measures corresponding to the Docsis normative for the standard FCC channel plan (CH-30, 569 MHz) with no need to modify the current channel plan or to enter a new one.

English