CABLE TV ANALYZER

PROMAX-6

1 GENERAL INFORMATION

1.1 Description

The **PROMAX-6** is an **advanced model signal level meter** designed for the installation and maintenance of reception and distributions systems for **analogue and digital** television signals. Its frequency range makes it into an excellent instrument for **FM radio**, **collective TV** (MATV) and **cable TV applications** (CATV), including the **sub-band** (return channel).

The **PROMAX-6** can carry out all the measurements necessary for ensuring good operation of any installation within the **5 to 862 MHz** range as it incorporates the basic functions for signal analysis in an accurate, sturdy, economical and easy to use device. It can carry perform the following types of measurements:

Analogue channels:
- Carrier level meter
- Carrier to Noise (C/N) ratio meter
- Video to Audio (V/A) ratio meter

Digital channels:
- Channel power meter
- Carrier to Noise (C/N) ratio meter

All the measurements for both analogue and digital channels are direct, i.e. **PROMAX-6** automatically carries out all the necessary corrections in accordance with the type of signal to be measured.

The **PROMAX-6** is the result of intensive work in research and the experience of more than thirty years in the development of instrumentation for television. It enables the measurement of the signal level with a high degree of accuracy; it incorporates a series of functions for evaluating the picture quality.

Its design, **based on a control system with an intelligent microprocessor**, provides the user with easy-to-use advanced features. The digital control system allows the user to make most of the necessary operations automatic in order to optimize the measurement process; for example, continuous frequency **synthesis**, correction of linearity and flatness errors, the proper selection of attenuators and automatic cut-off if the instrument remains inactive for a certain period of time. To enhance its features, it allows a plan of up to 239 channels.

Its accuracy and reliability satisfy the requirements of the most demanding users.

The signal level measured is shown numerically on an LCD display in absolute values. It is also equipped with a **computer connection** which allows one to personalize the configuration of the instrument.

The instrument is powered by an external rechargeable battery and it is safe to use outdoors.

The implementation of all these functions in an instrument weighing only half a kilo, makes the **PROMAX-6** an incomparable work tool.

Every detail has been carefully studied to achieve the best possible balance between its features and its operability. The result is an easy-to-handle piece of equipment with advanced functions, which may be used even by non-specialized personnel.

1.2 Specifications 

Tuning

Tuning range	From 5 to 862 MHz
Tuning mode	By channels or frequency
Channel plan	CCIR [1] [2]
Frequency	62.5 kHz resolution
Indication	LCD alphanumeric display with back lighting

Level measurement

Measurement	
Analogue channels	Level measurement associated with video carrier
Digital channels	Power measurement on the equivalent bandwidth for QAM signals (7 or 8 MHz).
Measurement range	
Analogue channels	From 25 to 120 dBµV (-35 dBmV to 60 dBmV) [3]
Digital channels	From 34 to 129 dBµV (-26 dBmV to 69 dBmV)
Readout	Digital in dBµV (or dBmV[1] [2]). 1 dB resolution
IF bandwidth	230 kHz ± 50 kHz
Input impedance	75 Ω
Audible indicator	Tone which varies with the signal level
Accuracy	
Analogue channels	± 2 dB (from 0 to 40 ºC) [4] for negative video modulation[4].
Digital channels	± 3 dB (from 0 to 40 ºC) for 8 MHz bandwidth channels.

Video/Audio (Analogue channels)

Measurement	Ratio of video to audio carrier levels
Range	From 0 to 40 dB
Audio subcarrier frequency	
Standard	5.5 MHz [1] [2]
Variable	4 - 9 MHz
Accuracy	± 2 dB (from 0 to 40 ºC) for FM audio carrier [5]

Carrier-to-Noise

Measurement	
Analogue channels	Ratio between carrier level and the channel's noise level.
Digital channels	Ratio between the power level of the channel and the noise level outside it or between adjacent channels.
Measurement range	
Analogue channels	40 - 50 dB (input level > 60 dBµV)[6]
Digital channels	15 - 40 dB (input level 80 dBµV)
Accuracy	± 3 dB (45 - 862 MHz), ± 4 dB (5 - 45 MHz)

Sound

Demodulation	AM / FM
Output	Internal speaker / external headphones

Power supply

NiCd battery	7.2 V - 0.8 Ah
Low battery indicator	Indication on the display
Battery life	1 hour and 45 minutes (30% on/off)
Automatic cut-off	Cut-off after approximately 12 minutes of non-use
Mains to charger adapter	230 V / 50-60 Hz / 12 W minimum (EUROPE and other countries).
Battery charger	By fast external charger. 12-16 VDC / 12 W
Equipment consumption	4.7 W

Environmental conditions

This equipment could be used on the following environmental conditions, in this conditions the specifications could also be applied.

- Altitude: up to 2000 metres
- Temperature range: from 5ºC to 40ºC
- Maximum relative humidity 80% (up to 31ºC), decreasing lineally up to 50% at 40ºC.
- Degree of protection provided by the enclosure: IP-23 (tested for safety according to IEC529 and IEC1010-1).

Mechanical features

Dimensions	70 W (90 on the display) x 218 H x 50 D mm
Weight	580 g. (including battery)

(1) Under request carried out at the factory. (See option OPT-006-61)

(2) May be configured by PC by means of the RM-006 program. (See optional accessories).

(3) There may be certain frequencies where the symbol "<" appears at levels higher than 25 dBµV (maximum 28 dB). This is due to the automatic correction of the frequency response.
The value measured remains correct, although the accuracy becomes ±3 dB

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

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

(6) See appendix E

Accessories included

AL-012	EUROPE and other countries 230 V / 50-60 Hz mains adaptor (basic version only).
AL-022	USA and CANADA 120 V / 50-60 Hz mains adaptor (only with the OPT-006-1).
AL-032	UK 230 V / 50-60 Hz mains adaptor (only with the OPT-006-2)
AL-042	Australia 240 V / 50-60Hz mains adaptor (only with the OPT-006-3)
AL-052	Japan 100 V / 50-60 Hz mains adaptor (only with the OPT-006-4)
AA-012	Car supply adapter cable
DC-234	Carrier case
DC-286	Carrier belt
AD-057	F/h - F/h input adaptor
AD-058	F/m - F/h rapid adaptor
CC-030	F/m - F/m (1m) coaxial cable
CB-410	Battery charger module
CB-038	7.2 V, 0.8 Ah NiCd rechargeable battery

Options

OPT-006-1	Substitute mains adapter for AL-022
OPT-006-2	Substitute mains adapter for AL-032
OPT-006-3	Substitute mains adapter for AL-042
OPT-006-4	Substitute mains adapter for AL-052
OPT-006-61	Change channel tables, units of measurement, etc. (Carried out under request in the factory).

Optional accessories

AD-055	F/h - BNC/h adaptor
AD-056	F/h - IEC/h adaptor
DC-284	Rubber holster
CB-038	7.2 V, 0.8 Ah NiCd rechargeable battery
RM-006	Programming pack. Enables the change, by means of a PC, of the channel tables, measurement units (dBµV, dBmV) etc.

2 SAFETY RULES 

* Use this equipment connected **only to devices or systems with their common at ground potential**.

* Use this equipment in **Category I** installations and **Pollution Degree 2** environments

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

  Power adaptor
  Rechargeable battery
  Cigarette lighter adaptor
  Battery charger

* Observe all **specified ratings** both of supply and measurement

* Use this instrument under the **specified environmental conditions**

* **The user is only authorized to** carry out the following maintenance operations:

  Battery replacement

  On the Maintenance paragraph the proper instructions are given

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

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

3 INSTALLATION

3.1 Power supply

The **PROMAX-6** is an portable instrument powered by a built-in 7.2 V NiCd rechargeable battery. Before taking any measurement, the user should make sure that the battery is fully charged (use the charge/discharge charger supplied with the instrument).

3.1.1 Recharging the battery

The battery charger has an automatic safety circuit to prevent any possible damage to the unit as a result of defective batteries.

The instrument is equipped with a 230 V / 50-60 Hz mains adaptor for Europe and other countries to power the battery charger. (See accessories to place an order for other types of adapters.)

1) Connect the cable from the mains adapter to the charger. Connect the adapter to the mains. Insert the battery in the charger **once** the adapter-charger **is connected to the mains**.

2) **Discharge the battery prior to carrying out the charging process** in order to eliminate any possible residual charge. In order to do so, press button A situated on the right (see figure 1). At this point, a small yellow light comes on and the process of discharging is under way. When discharging is completed, the charger automatically sets the process of charging underway.

3) The **charging process** lasts for two and a half hours. When the process is completed, the three red indicators will light up. At the same time, an indicator will flash and an acoustic alarm will sound for 90 seconds, indicating that the charging process has been successfully completed.

4) After this period, if the battery is not removed from the charger it will remain in permanent **minimum charge mode.** A green LED will flash until the battery is removed.

CAUTION

1) **Before using the charger, make sure that the adapter is suitable for the mains voltage. An indicator will light up when the adapter is connected to the mains and the charger is connected.**

2) **This charger is designed for charging Ni-Cd batteries.**

3) **In order to prolong the lifetime of the batteries, it is advisable not to remove it from the charger while the charging process is still under way.**

4) **The mains adapter and the battery charger are designed for indoor use.**

5) **When using the battery first time, it is advisable to carry out two charging and discharging processes into the charger itself, in order to eliminate any possible memory effect, accumulated during the period it has been in storage.**

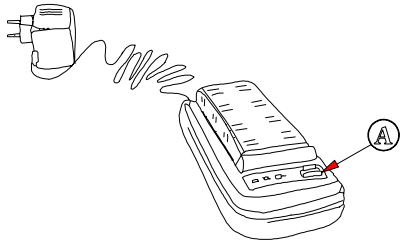


Figure 1.- CB-410 battery charger and mains adapter.

3.2 Installing the battery

Attaching the battery

⚠ Use **CB-038** batteries only.

To attach the battery, position it on the base of the arrows found on the back of the instrument. Slide the battery until you hear a click and it remains fixed, as shown in the figure 2.

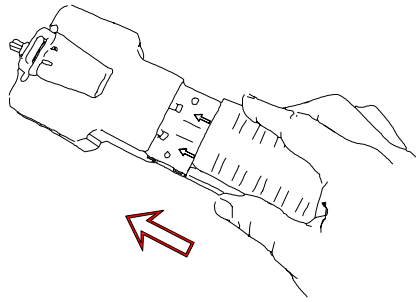


Figure 2.- Installation of the CB-038 battery.

Removing the battery

The battery is accessible from the back of the instrument. To disconnect the battery, press the tab found at one end of it (1) and move the battery to separate it from the body of the instrument (2). The battery will be released from its holder. Then slide the battery out, as shown in figure 3.

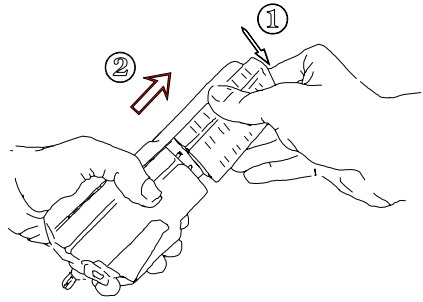


Figure 3.- Removing the battery.

3.3 Installation and start-up

The **PROMAX-6** has been designed for use as portable equipment. When the battery is installed and the instrument is connected, the version of the instrument and the channel plan which it has stored will appear on the display for a few moments.

When this indication appears, the instrument is in channel tuning mode. By means of the program RM-006, one can select the starting up of the instrument in one of the three tuning modes: FREQ or CHAN.

When the ON/OFF key [12] is pressed, the instrument is then in "automatic cut-off" mode; in other words, the device is automatically disconnected when twelve minutes in operation have gone by without a key being pressed.

The automatic cut-off mode can be deactivated by holding down the ON/OFF key for one or two seconds when the device is connected. The indicator "manual power off" will appear on the display.

If the battery is low (at a voltage of less than 6.5 V), a blinking **LOW BATTERY** message will appear on the display [3]. When the voltage is lower than 6.0 V, the instrument disconnects.

A fully charged battery can power the equipment non-stop for more than an hour and a half. At 30% stop/start of intermittent operation, the battery can power it for up to five hours. When the LOW BATTERY indicator appears, the battery must be recharged.

When a fully discharged battery is installed, it is possible that, due to residual charges, the **PROMAX-6** may start up. In this case, the instrument will automatically disconnect before the message LOW BATTERY appears on the display.

4 OPERATING INSTRUCTIONS

4.1 Description of the controls and elements

Front Panel

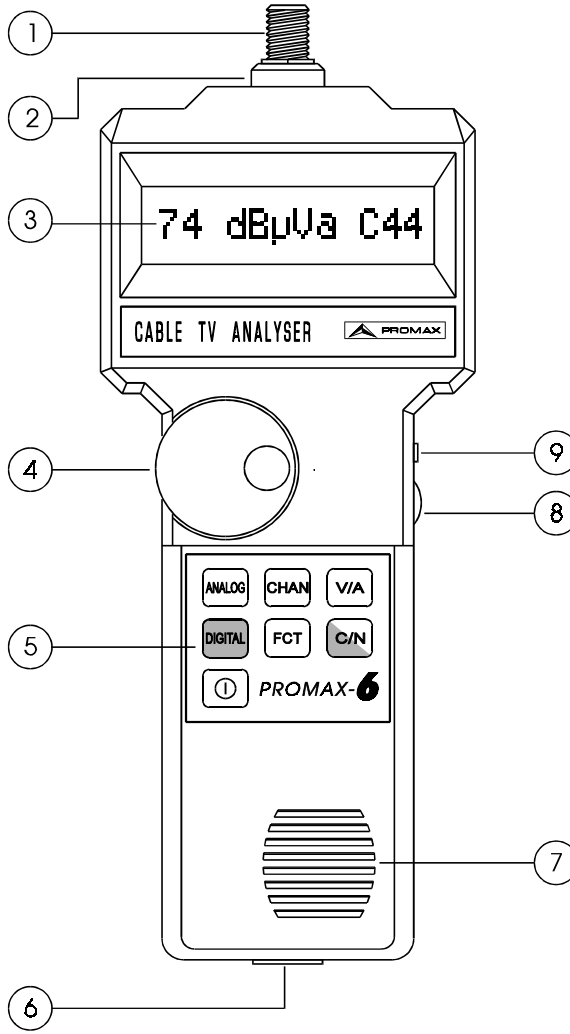


Figure 4.- Front view.

[1] F-F (or F-BNC or F-IEC) adaptor

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

[2] "F" male base connector

[3] Alphanumeric display with back lighting. Indicates the level, the measurement mode (analogue or digital channels), tuning (frequency / channel), the sound system and the measurements of the video/audio and carrier/noise ratios.

[4] Rotary switch. Used for continuous tuning control or for selecting the various options associated with each key.

[5] Keyboard. Seven keys for selecting the functions

[6] Connection to computer (for option RM-006)

0CA2170 specific connection cable supplied with option RM-006

 **Do not connect any cable other than that supplied by the manufacturer with option RM-006, otherwise the instrument may suffer serious damage.**

[7] Loudspeaker

[8] Volume control

[9] External headphones connector

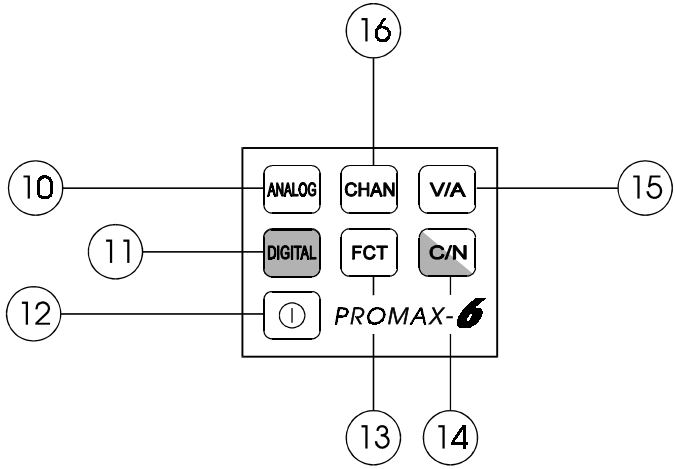


Figure 5.- PROMAX-6 keyboard

[10] ANALOG

Measurement selector for analogue channels. When this measurement mode is selected, an "**a**" appears on the display to the right of the units.

[11] DIGITAL

Measurement selector for QAM modulated digital channels. When this measurement mode is selected, an "**d**" appears on the display to the right of the units.

[12]

ON/OFF. Connects / disconnects the instrument and allows the user to select automatic or manual cut-off.

[13] FCT

Special functions

F1: Sound AM / FM / LEVEL / OFF
F2: Sound subcarrier tuning from 4 - 9 MHz
F3: Frequency shift with respect to the main frequency for measuring the C/N ratio on digital channels.

[14] 

Measurement of the carrier/noise ratio on analogical ("a") and digital ("d") channels. Press this key to measure the carrier-to-noise ratio of the signal, once the video carrier level is stabilized.

[15] 

Measurement of the video-to-audio ratio (only on analogue channels). Press this key to measure the video-to-audio ratio of the signal, once the video carrier level is stabilized.

[16] 

Tuning mode: frequency or channel. Press this key to select among tuning by frequency or channel.

4.2 Operating instructions

4.2.1 Tuning mode selection CHAN

The **PROMAX-6** has two different tuning modes:

By frequencies: From 5 to 862 MHz in steps of 62.5 kHz, using the rotary switch. The values displayed are given in MHz, with a two-decimal resolution.

By channels: The channel plan in the CCIR standard or may be established under request (OPT-006-61), or be configured by the user (RM-006), with a maximum of 239 channels.

To pass from one mode to the other push the **CHAN** key [16].

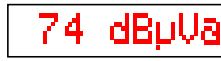
Example 1: Changing from channel mode to frequency mode.

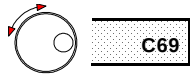
This procedure can be useful in discovering the real frequency in MHz of the selected channel. The example illustrates finding the frequency which corresponds to channel 44.

CHAN

Example 2: To change the frequency value from 62.25 MHz up to 850 MHz.

Due to the high resolution of the instrument (62.5 kHz) it is not very efficient to move through all the bands in frequency mode. A satisfactory solution is to use the channel mode to make substantial changes in frequency, as is shown in the example below.





The selection of the channel situated in a frequency close to the desired frequency.

Note: *When changing from frequency to channel, if the frequency tuned does not correspond to any channel, the* ***PROMAX-6*** *will search for the channel nearest to this frequency and will remain tuned to this channel. This operation may take several seconds.*

4.2.2 Measurement mode: Analogue or digital channels

The **ANALOG** [10] and **DIGITAL** [11] keys can be used to define the type of channel to be measured: analogical or digital, respectively.

When the analogical channel measurement mode is selected, an '**a**' appears on the display to the right of the units. Likewise, when the digital channel measurement mode is selected, a '**d**' appears on the display to the right of the units.

The measurements possible for each type of channel are as follows:

Analogue channels:
- Carrier level meter
- Carrier to Noise (C/N) ratio meter
- Video/Audio (V/A) ratio meter

Digital channels:
- Channel power meter
- Carrier to Noise /C/N) ratio meter

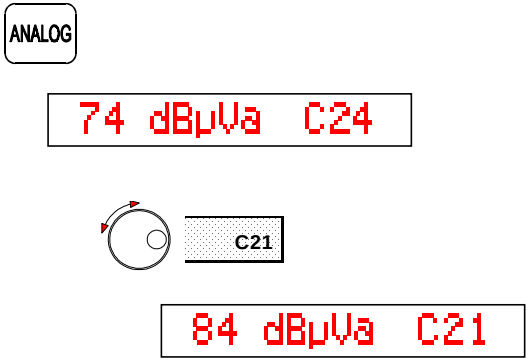
Note: Channel denomination and frequency can be modified via the PC using the RM-006 software.

4.2.3 Measurements on analogue channels

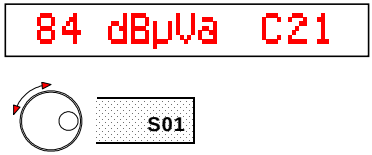
4.2.3.1 Carrier level measurement (analogue channels)

- Select the analogue channels measuring mode as it is explained in point 4.2.2.
- Select the desired tuning mode and tune the signal to be measured in the manner explained in point 4.2.1.
- Wait until the measured value is stabilized. Read the value shown on the display. The units will be given in dBµV (dBmV using the option OPT-006-61, or by means of the customization program RM-006).
- The direct read range of the instrument is from 25 to 120 dBµV, and within this range the measurement is completely automatic. The microprocessor calculates the attenuation value corresponding to the proper measurement range. When the signal level being measured is lower/equal than the sensitivity or higher/equal than the saturation level of the instrument, the symbols "<" or ">" will appear, respectively.
- When the tuning is carried out by channels, it is possible that the broadcasting station deviates a few kHz with respect to the channel frequency. If this variation is higher than 40 kHz, tune again using this time the frequency mode, to obtain a more correct level reading.

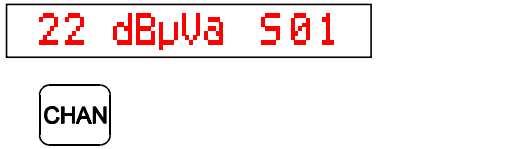
Example 3. Measuring the video carrier level in channel 21 (CCIR standard).



Example 4. Measuring the commercial FM carrier (105.00 MHz)



Channel S01 is nearest to the desired frequency



Example 5. Measuring a signal outside the measurement range. The sound subcarrier in channel 44 (655.25 MHz + 5.5 MHz = 660.75 MHz).

* The noise level of the instrument is situated between 5 and 7 dBµV. This means that the instrument can measure signals between 10 and 20 dBµV. The sign "<" appears to indicate that in this area it is possible that specified accuracy may not be complied with, but in most cases a measurement valid for all purposes is given.

4.2.3.2 Measure of the V / A ratio (analogue channels)

This function allows the user to measure the ratio of the signal levels of the video carrier of an analogue channel and the corresponding audio carrier of the same channel. In addition, there is an automatic demodulation of the sound in FM or AM, in accordance with the option selected, as explained in Point 4.2.5.1.

Follow the steps below to take this measurement:

1) Select the analogue channels measuring mode

2) Tune the desired video carrier and wait a few seconds until the read level is stabilized.

3) Press the **V/A** [15] key

4) Wait until the measurement is stabilized (3 seconds maximum)

Example 6. Measuring the V/A ratio for the following signal

Video frequency = C55 (743.25 MHz)
Video carrier level = 74 dBµV (14 dBmV)

Audio subcarrier frequency = 5.5 MHz
Audio carrier level = 64 dBµV (4 dBmV)

Leave the V/A mode simply by pressing any key or turning the rotary switch.

4.2.3.3 Measurement of the C/N ratio (analogue channels)

This function allows the user to measure the ratio of the video carrier level to the noise level present in the channel.

Follow the steps listed below to take this measurement.

1) Select the analogue channels measuring mode.

2) Tune the video carrier in the channel and wait a few moments until the read level is stabilized.

3) Press the **C/N** [14] key

4) Wait a few seconds until the measurement is stabilized (maximum 10 seconds).

When the **C/N** [14] key is pressed, the instrument automatically takes a series of measurements in order to arrive at the closest approximation to the noise level. The time of approximation is a function of the content of the picture that is being transmitted and of the C/N value itself.

When the noise level is lower than the sensitivity of the instrument, a limit value ">" will appear on the display, indicating that the C/N value the user is trying to measure is greater than this limit value.

Example 7. Measuring the C/N ratio for the following signal

Video carrier level = 82 dBµV (22 dBmV)
Real C/N ratio = 42 dB

C/N ratio measured = 42 dB ± error (see Appendix E)

Display shown after a 5-second wait.

Leave the C/N mode simply by pressing any key or turning the rotary switch.

Example 8. Measuring the C/N ratio of high-quality signals

Video carrier level = 113 dBµV (53 dBmV)
Real C/N ratio = 62 dB

C/N ratio measured > 50 dB

The C/N measurement ranges and the accuracy of the measurement are described in Appendix E.

Example 9. Measuring the C/N ratio of low level signals. (<70 dBµV)

The C/N ratio measurement dynamic is proportional to the video carrier level. So, when the video carrier level is lower than 70 dBµV, the C/N measurement dynamic does not surpass 50 dB (see Appendix E). If the C/N ratio to be measured is higher than this value, the instrument will indicate it by means of the symbol **>**.

Video carrier level = 65 dBµV
Real C/N ratio = 48 dB

C/N ratio measured > 44 dB

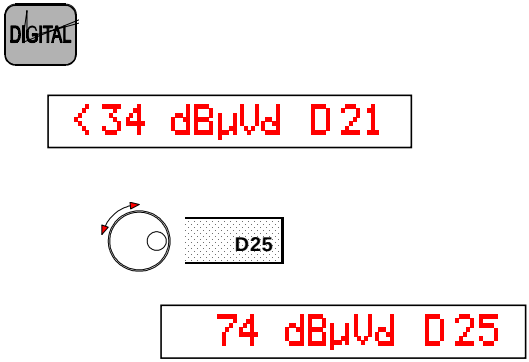
4.2.4 Measurement of digital channels

4.2.4.1 Power measurement of digital channels

PROMAX-6 directly provides the power measurement for QAM digital channels with a bandwidth of 7 or 8 MHz as described below:

- Select digital channel measurement mode in accordance with section 4.2.2.
- Select the desired tuning mode and tune the desired signal in accordance with section 4.2.1.
- Wait for the measured value to stabilise. Read the vale displayed. Units will be expressed in dBµV (dBmV using option OPT-006-61 or by means of the personalisation program RM-006).
- The direct reading range covers from 34 up to 129 dBµV and all measurements within this range are entirely automatic. The microprocessor calculate the attenuation value for the suitable measurement range. When the signal level to be measured is lower/equal to the sensitivity or is higher/equal to the equipment's saturation level, the signs "<" or ">" appear, respectively.

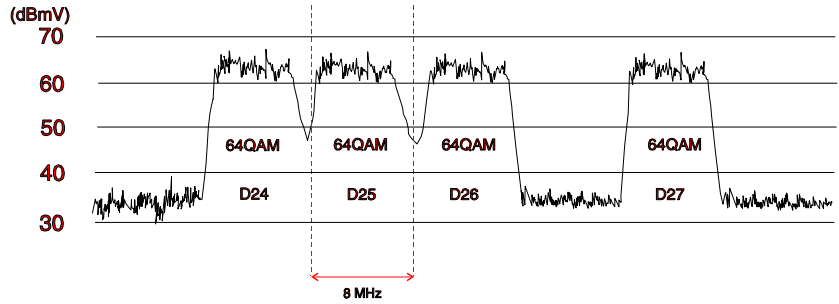
Example 10. Measurement of power level of a digital channel (D25)



4.2.4.2 Measurement of the C/N ratio (digital channels)

The C/N function allows to measure automatically the ratio between the power level of the digital channel and the noise level outside the channel being studied. When pressing the **C/N** [14] key, the **PROMAX-6** automatically measures the channel power level, the noise level outside the channel (at a lower frequency than the main carrier and defined through the **F3** function) and shows the value of the C/N ratio in the display.

Next figure shows that when measuring the C/N ratio it is necessary to check if there is an adjacent channel at the lower frequencies, in order to do not confuse the noise level with the adjacent channel signal. To select the optimum shift frequency in each case, function F3 has been incorporated.



An easy way to check if there is an adjacent channel at the lower frequencies consists of making a level measurement at a frequency **8 MHz** lower to the main frequency of the channel being studied and comparing if level is similar to the power level of the channel under study (there is an adjacent channel) or the level drops off significantly (there is no adjacent channel).

As a resume, and taking previous figure as an example, in the case there is no adjacent channel at the lower frequencies (channels D24 or D27) noise level measurement should be taken outside the channel at a frequency **4.5 MHz** lower than the studied channel main carrier. Otherwise, if there exists an adjacent channel at the lower frequencies (D25 or D26) the best approximation consists of making the noise level measurement in the separation between the studied channel and its lower adjacent channel, where the modulation contents is minimum.

4.2.4.2.1 F3 function: Frequency shift for the C/N measurements

To select the frequency shift in the C/N measurement, press the **FCT** [13] key, then use the rotary encoder to select the **F3** function and press the **FCT** key [13] again. Turn the rotary encoder until the desired shift is displayed. Lastly, press the **FCT** [13] key again to select the shift.

This parameter is defined at factory as **4.5 MHz**; this shift allows to make C/N measurements directly when there is no adjacent channel at the lower frequencies.

4.2.4.2.2 Measuring the C/N ratio with no adjacent channels present.

To perform this measurement, proceed as follows:

1) Select the digital channel measurement mode.

2) Tune the main carrier of the channel and wait a few moments until the reading level stabilises.

3) Select the frequency shift of the noise level measurement by means of the **F3** function to **4.5 MHz** with respect to the main carrier. 4.5 MHz is the value predetermined at factory for this parameter, so if it has not been modified through the F3 function it will not be necessary to redefine it now.

4) Press the **C/N** [14] key.

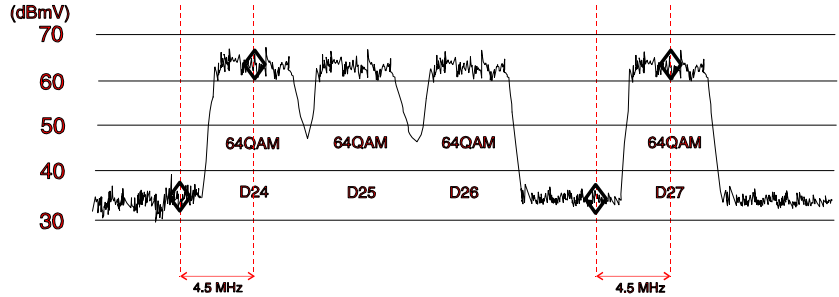
5) Wait until the reading stabilises (10 seconds maximum).

When the **C/N** [14] key is pressed, the equipment performs a series of automatic measurements so as to come as close as possible to the real value of the noise level. The time this takes depends on the content of the image that is being transmitted and the C/N value itself.

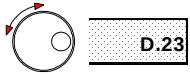
When the noise level is lower than the equipment's sensitivity, a limit value ">" is displayed to indicate that the C/N value to be measured is greater than this limit value.

Example 11. Measurement of the C/N ratio for channel D24 (no adjacent channel).

Channel power level = 74 dBµV (14 dBmV)
Real C/N ratio = 32 dB

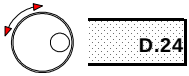


Measured C/N ratio = 32 dB ± error (see appendix F)



(D23, channel adjacent to D24)

(No adjacent channel)



Display appears after about 5 seconds.

C/N mode can be exited by simply pressing any key or turning the rotary encoder.

4.2.4.2.3 Measurement of the C/N ratio with adjacent channels present

To perform this measurement, proceed as follows:

1) Select the digital channel measurement mode.

2) Tune the main carrier of the channel and wait a few moments until the reading level stabilises.

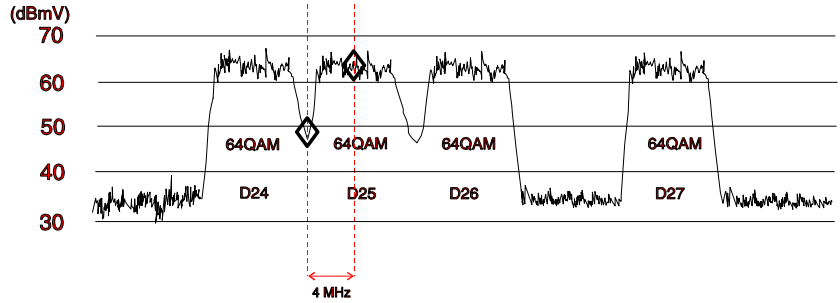
3) Select the frequency shift of the noise level measurement by means of the **F3** function to a frequency where the modulation content is minimum (about **4 MHz**).

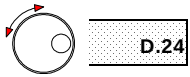
4) Press the **C/N** [14] key.

5) Wait until the reading stabilises (10 seconds maximum).

Example 12. Measurement of the C/N ratio for channel D25 (with adjacent channel).

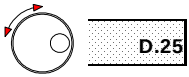
Channel power level = 74 dBµV (14 dBmV)





(D24, channel adjacent to D25)

(Adjacent channel present)



(Frequency shift selection)

Display appears after about 5 seconds.

4.2.5 Function key FCT

The FCT key enables the user to access a menu with 3 configuration functions: **F1**, **F2** and **F3** (the last one explained in the C/N ratio measurement for digital channels paragraph).

4.2.5.1 F1 function: Sound demodulation

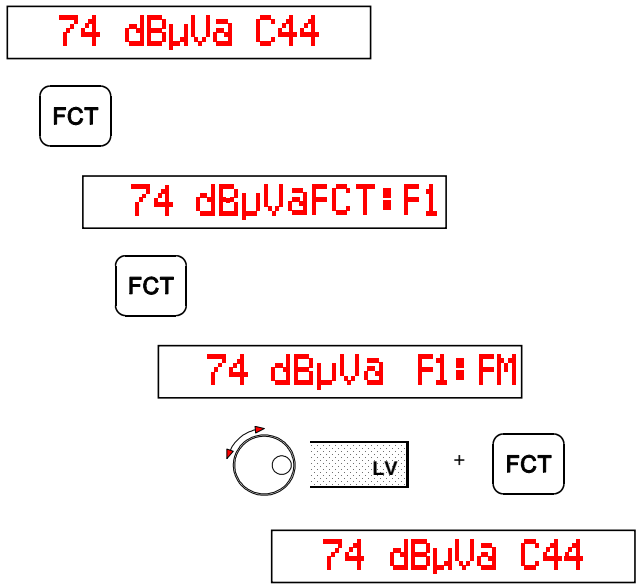
This function selects three kinds of sound demodulation together with the disconnection of the sound itself.

FM: FM sound
AM: AM sound
LV: The speaker emits a tone whose frequency varies as a function of the signal level received.
OFF: Sound not selected

The demodulation of both AM and FM is effected on the carrier tuned.

To select the type of sound, press the **FCT** key [13], select the F1 function and turn the rotary switch until the desired type of sound is displayed. Press the **FCT** key [13] again to activate the desired mode.

Example 13. Changing the sound from FM to LV



The diagram below shows the order of selection using the rotary switch of the FCT (F1) function.

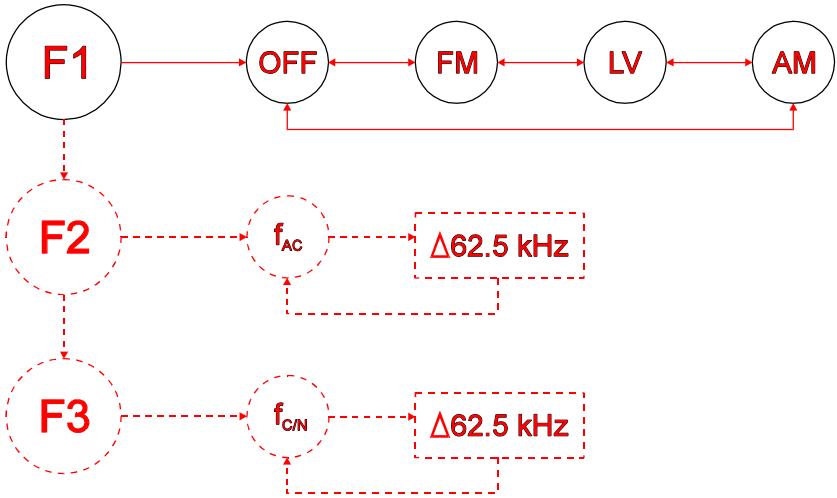


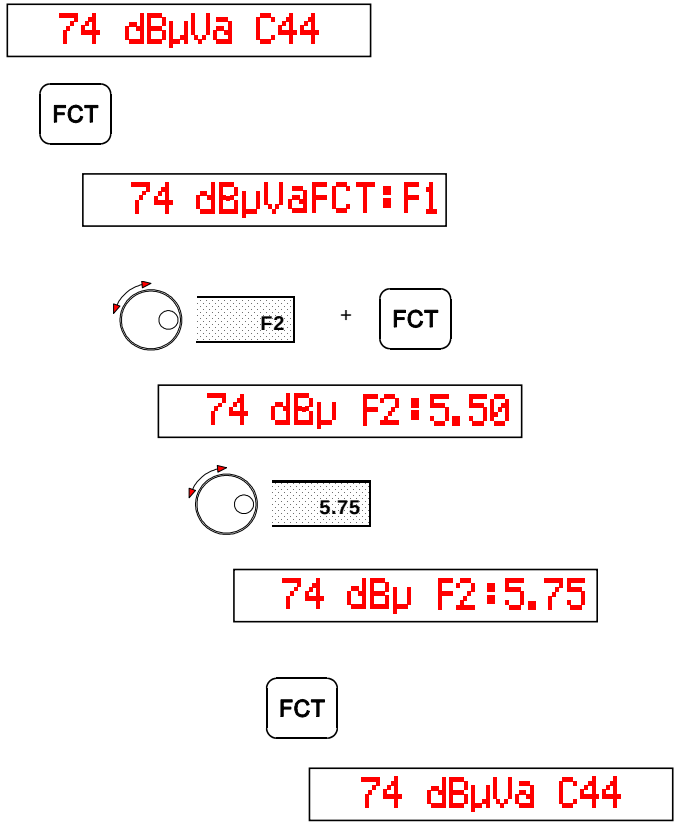
Figure 6.- F1 function menu.

4.2.5.2 F2 function: Sound subcarrier

This function enables the user to vary the frequency of the sound subcarrier from 4 to 9 MHz, in 62.5 kHz steps.

This function is necessary if the user wants to vary the frequency of the sound subcarrier related to the measurement of the V/A ratio (see Point 4.2.3.2). The instrument takes as the default frequency the value configured in the factory (or a customized configuration through RM-006). However, with the F2 function the user can vary the sound subcarrier value manually, from 4 to 9 MHz.

Example 14. Changing the sound subcarrier frequency from the standard value to 5.74 (Zweiton Stereo).



The diagram below shows the order of selection using the rotary switch of the FCT (F2) function.

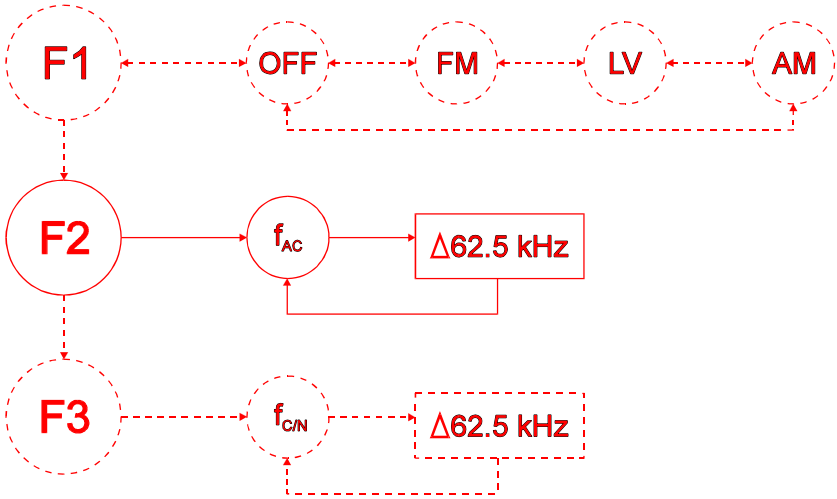


Figure 7.- Menu of the F2 function.

Note: The new value chosen in functions F1, F2 and F3 only remain in the memory until the battery is removed. When the battery is removed the instrument undergoes a RESET and the values configured through the F1, F2 and F3 functions are lost. When the battery is reconnected, the instrument adopts the factory-configured values or those programmed by means of RM-006.

4.3 Connection to the computer

The system may be connected to a PC by means of the connection cable which is supplied with option RM-006.

Do not connect any cable other than that supplied by the manufacturer with option RM-006, 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-6** to connection [6] and the other end to the parallel port of your computer. (See the RM-006 operation manual for further information).

5 MAINTENANCE 

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

5.1 Instructions for returning by mail

Instruments returned for repair or calibration, either within or outwith 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 authorized agents or by personnel qualified in the servicing of instruments.

5.2.1 Cleaning the cover

CAUTION

To clean the cover, remove the battery from its housing.

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.

APPENDIXES

APPENDIX A
MEASUREMENT OF THE VIDEO CARRIER LEVEL (C_L)
- ANALOGUE CHANNELS-

A) Negative Video Modulation (PAL/NTSC)

The measurement of the video carrier level is carried out taking the modulation peak as the measurement value, this being the maximum value of the signal during the line synchronism. The system requires a minimum length of time in order to make this measurement, since it has to detect the peak of the modulated signal.

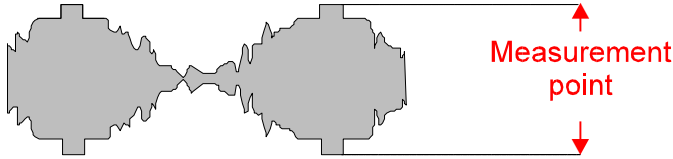


Figure 8.- Measurement of the video carrier level.

The typical values between which the video carrier level fluctuates are:

- In the transmission line: From 70 to 100 dBµV (From 10 to 40 dBmV)
- In the user's terminal: From 60 to 80 dBµV (From 0 to 20 dBmV)

b) Positive Video Modulation (SECAM)

On this type of modulation, the line synchronism is defined by a minimum carrier level. The maximum signal level (measurement point) is variable in time, and it is a function of the picture that is being transmitted. It could vary from 10 dB among white and black image; nevertheless white signals, Video Insertion Test (VIT), are transmitted in the sweep pulses, which reduce this margin to 4 dB approximately.

Due to this fact, and the small duration of the VIT, when we measure levels of SECAM signals, it is advisable to add 2 dB to the quantity showed on the display, in order to obtain a more precise measurement in its average value.

APPENDIX B
MEASUREMENT OF THE ADJACENT CHANNEL LEVEL

The user can obtain the ratio of the video carrier amplitudes of two consecutive channels.

$$C_{VL1} - C_{VL2} \text{ (dB)}$$

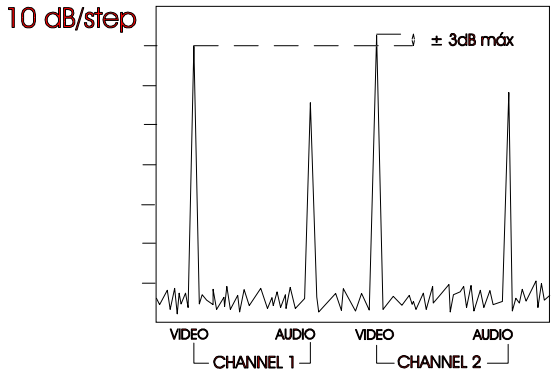


Figure 9. Measurement of the adjacent channel level.

Differences of more than three dB between carriers of adjacent channels may cause problems of interference in reception.

APPENDIX C
MEASUREMENT OF THE RELATIVE VIDEO / AUDIO LEVEL (V/A) -ANALOGUE CHANNELS-

$$V / A = A_L - V_L \text{ (dB)}$$

The user can measure the existing ratio of the amplitudes of the video-to-audio carriers.

Although this process depends on the standard used, it is usual to consider that a properly transmitted PAL channel should have a sound subcarrier 13 dB below the video carrier.

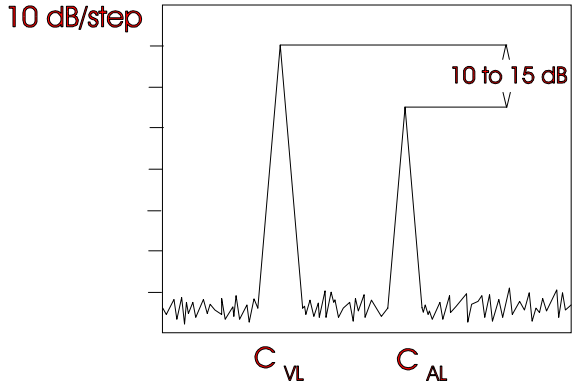


Figure 10.- Measurement of the relative video/audio ratio.

These specifications ensure that there is no interference in the same or the adjacent channel.

APPENDIX D
CARRIER NOISE MEASUREMENT (C/N) -ANALOGUE CHANNELS-

The carrier-to-noise ratio is a measurement of the signal quality. The power of the noise measured changes according to the resolution filter utilized. However, in TV it is usual to refer the noise level to a bandwidth of 5 MHz. If the measurement is reduced to a different bandwidth, the user must apply a simple correction. The **PROMAX-6** takes the measurements in a noise bandwidth of 5 MHz.

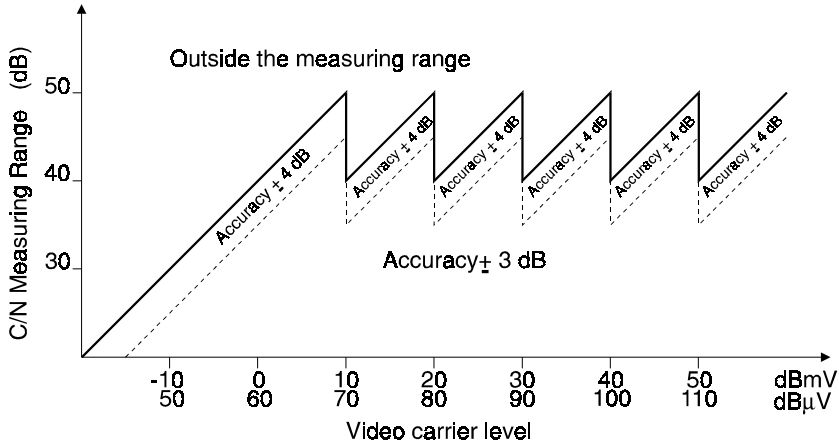
$$C/N = C_L - N_L \text{ (dB)}$$

N_L: depends on the measurement bandwidth

$$N_L = N_{measured\ L} + 10 \log (BWx / BW_{measured})$$

There is some standards that determine the minimum **C/N** value in an installation. In general greater values than **40 dB** are considered good quality signals. Lower than 40 dB you can see "**snow**" or graininess at the display.

APPENDIX E
CARRIER/NOISE MEASUREMENTS (C/N) -ANALOGUE CHANNELS-



Example:

Suppose that the video carrier level in a channel, for instance the 45, is of 25 dBmV, from the diagram we can deduce that the measurement range is of 45 dB.

Thus, if when we carry out the measurement the C/N ratio is 54 dB the display will show.

C/N> 45dBa C45

on the other hand, if C/N=42 dB we will see on the display:

C/N= 42dBa C45

APPENDIX F
CARRIER TO NOISE RATIO FOR 64-QAM DIGITAL CHANNELS (C/N)

For a 64-QAM DBV-C digital signal with a bandwidth of 8 MHz, the C/N ratio must be better than **20 dB**. Measurements lower than this value will correspond to signals with a no acceptable quality.

Justification and example

The basic parameter which describes the quality of a digital signal is the ratio of the number of erroneous bits to the total number of bits transmitted. This parameter is known as **BER** (Bit Error Rate).

The DBV Group (Digital Video Broadcasting) defines a '*quasi error free transmission'* (ETR290 Measurements Group ETR 290) as that with less than 1 error event per transmission hour. For a 64 QAM DBV-C transmission, the pre-FEC error (Forward Error Correction) must be <1.E-4.

In digital transmissions, as there is not one carrier, it is better to speak in E_b/N_o terms. The relation between E_b/N_o and the C/N is given by the following equation:

$$C/N\ (dB) = \frac{E_b}{N_o}(dB) + 10 * \log\left(R_s * \frac{\log_2(M)}{BW}\right)$$

Where :

E_b	=	Energy per bit
N_o	=	Noise power in a 1 Hz bandwidth
R_s	=	Symbol rate
M	=	Number of points of the constellation
BW	=	Bandwidth

For DVB-C, 64 QAM, Rs=6.875 Mbaud, BW=8 MHz,

$C/N\ (dB) = E_b / N_o\ (dB) + 7.12.$

For a BER of 1E-4, $E_b/N_o \approx 16$ dB. Therefore C/N ≈ 23 dB.