

ANALOGUE AND DIGITAL TV LEVEL METER PRODIG-2

1 GENERAL

1.1 Description

The **PRODIG-2** is a portable instrument of **small scale** and **minimum weight**, ideal for the starting and maintenance of **analogue (MATV)** and **digital (TDT) terrestrial TV** installations. It gives a measurement of the **Level** and the **C/N** ratio for analogue signals and a measurement of **Power** and the **C/N** ratio for digital signals. In addition, it has an output for the **6 dB margin test** which is very important in digital TV installations, as it allows correct operation to be guaranteed with a safety margin over the threshold level.

One of the main features of this device is that it is **easy to use**: tuning is done by channel, the equipment identifies whether the tuned channel is analogue or digital and adjusts all the measurement parameters automatically, shows the Level (for analogue, Level/Power Mode of Measurement) Level and C/N (for analogue, Level/Power and C/N Mode of Measurement), Power (for digital, Level/Power Mode of Measurement) or Power and C/N (for digital, Level/Power and C/N Mode of Measurement) measurements numerically and graphically. In the Level/Power and C/N Mode of Measurement also shows whether the tuned channel meets the pre-established quality criteria in the user outlet (indication OK).

To facilitate measurement, the **PRODIG-2** has graphic screen; the backlighting of the screen being activated automatically according to the light conditions. The **acoustic level/power indication** function allows the antenna to be orientated without needing to look constantly at the screen. All the functions are selected by a single control which can be manipulated by a single finger.

The standard channel plan of the device incorporates the following channel tables: CCIR, STD L, OIRT and FCC. The users can ask PROMAX ELECTRONICA for a special channel plan through option 61.

The **PRODIG-2** also enables external units to be powered with voltages of 12, 15, 18 and 24 V (OPT-202-16).

The **PRODIG-2** is powered by rechargeable batteries or can be connected to the mains through the external DC adapter supplied.

1.2 Specifications¹



TUNING

Digital frequency synthesis. Tuning by channel from 45 to 862 MHz. Standard channel plan: CCIR, OIRT, STD L and FCC. Special channel plan on request (OPT-202-61).

MEASUREMENT

Measurement margin

Analogue signals

30 dB μ V to 120 dB μ V

Digital signals

30 dB μ V to 120 dB μ V

Maximum signal throughout the entire band

130 dB μ V

Accuracy

Power / Level

± 2 dB (22°C \pm 5°C)

C/N

± 3 dB (22°C \pm 5°C)

Channel identification

Automatic: Analogue or Digital

Measurements

Analogue channels

Level and Carrier-to-Noise ratio

Digital channels

Channel Power and Carrier-to-Noise ratio

Reading

Autorange

Numerical

Absolute value calibrated in dB μ V

Graphic

Graphic bar calibrated with marks for minimum and maximum recommended level/power.

Acoustic level indication

Tone varying with signal level/power

Overrange indication

\uparrow , \downarrow

Diagnosis of measured signal quality

OK indication on the screen when signal satisfies:

Analogue signals

Level

Between 60 and 80 dB μ V

C/N

≥ 42 dB

Digital signals

Power

Between 45 and 60 dB μ V

C/N

≥ 26 dB

RF INPUT

¹ PROMAX ELECTRONICA follows a policy of continuous research. For this reason the specifications may be modified without previous notice.

Connector	BNC female
Impedance	75 Ω
Maximum input voltage 5 MHz to 862 MHz	130 dB μ V

**OUTPUT FOR 6 dB
MARGIN TEST**

	Calibrated output, with attenuation of 6 dB over the RF input and DC coupled.
Tolerance	± 1 dB
Maximum voltage	24 V DC

EXTERNAL UNITS POWERING

Voltage	Through the RF input connector (OPT-16) External (OFF) or 12/15/18/24 V
Maximum current 12/15/18 V	350 mA
24 V	250 mA

POWER SUPPLY**Internal**

Battery	NiCd 7.2 V - 2.5 Ah
Autonomy	8 hours approximately in continuous use (V_{EXT} OFF)
Charging time	12 hours starting from total discharge
Battery charger	Incorporated

External

Voltage	10 - 14 V
Maximum consumption	13 W

OPERATING ENVIRONMENTAL CONDITIONS

Altitude	Up to 2000 m
Temperature range	From 5 to 40 ° C
Max. relative humidity	80 % (up to 31°C), decreasing lineally up to 50% at 40° C.

MECHANICAL FEATURES

Dimensions	197 (W) x 87 (H) x 190 (D) mm
Weight	2.6 kg

INCLUDED ACCESSORIES

- AL-012** EUROPE and other countries 230 V / 50-60 Hz mains power adapter (basic version only).
- AL-022** USA and CANADA 120 V / 50-60 H mains power adapter (only with the OPT-202-1).
- AL-032** UK 230 V / 50-60 Hz mains power adapter (only with the OPT-202-2)
- DC-256** PRODIG-2 Carrying case
- AD-050** BNC/male - TV/female IEC input adapter
- ZB-075** 75 Ω BNC load
- CB-073** NiCd rechargeable battery 7.2 V, 2.5 Ah.(Included inside the unit)

OPTIONAL ACCESSORIES

- AT-20C** 20 dB attenuator
- AA-012** Car cigarette lighter adapter cable

OPTIONS

- OPT-202-01** Substitute mains power adapter with AL-022 (USA and Canada 120 V / 50-60 Hz)
- OPT-202-02** Substitute mains power adapter with AL-032 (UK 230 V / 50-60 Hz)
- OPT-202-16** External units powering
- OPT-202-61** Channel plan defined by the user.

2 SAFETY RULES

2.1 General

- * Use this equipment connected **only to systems with their negative of measurement connected to ground potential.**
- * This equipment can be used in **Overvoltage Category I** installations and **Pollution Degree 2** environments.
- * When using some of the following accessories **use only the specified ones** to ensure safety.

Rechargeable batteries
External DC adapter

- * Observe all **specified ratings** both of supply and measurement.
- * Remember that voltages higher than **60 V DC** or **30 V AC rms** are dangerous.
- * Use this instrument under the **specified environmental conditions.**
- * **The user is only authorized to** carry out the following maintenance operations:

Batteries replacement

On the Maintenance paragraph the proper instructions are given.

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

- * Use for the signal inputs/outputs, specially when working with high levels, appropriate low radiation cables.
- * Follow the **cleaning instructions** described in the Maintenance paragraph.

* Symbols related with safety

	DIRECT CURRENT
	ALTERNATING CURRENT
	DIRECT AND ALTERNATING
	GROUND TERMINAL
	PROTECTIVE CONDUCTOR
	FRAME TERMINAL
	EQUIPOTENTIALITY
	ON (Supply) / OFF (Supply)
	DOUBLE INSULATION (CLASS II protection)
	CAUTION (Risk of electric shock)
	CAUTION (Refer to manual)
	FUSE

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 **PRODIG-2** is powered by a rechargeable battery. The equipment is supplied with an external DC adapter so that the **PRODIG-2** can be connected to the electricity mains for operation and for recharging the battery.

3.1.1 Operating through the External DC Adapter

Connect the external DC adapter to the **PRODIG-2** by means of the external power input [7] located in the side panel. Connect the DC adapter to the mains, this will start battery charge. Then press the rotary selector [1] on the **PRODIG-2**. In these conditions the equipment comes into operation. When the equipment is connected to the mains through the DC adapter, the light indicator **CHARGE** [2] remains on.

CAUTION

- 1) *Before using the charger, make sure that the adapter is suitable for the mains voltage.*
- 2) *The mains adapter is designed for indoor use.*

3.1.2 Operating by Battery

For the equipment to operate by battery, simply press the rotary selector [1]. With the battery fully charged, the **PRODIG-2** has an approximate life of eight hours of uninterrupted operation.

If the battery is discharged, low battery indication will appear on the screen and the equipment will then automatically switch off.

When the battery level falls to a specific threshold, before the low battery indication appears, the screen lighting is deactivated, thus extending the usable time in extreme situations.

3.1.2.1 Charging the Battery

To charge the battery fully, with the **PRODIG-2** switched off, connect external DC adapter to the external power input [7]. Then connect the adapter to the mains. The charge time depends on the state of the battery. If the battery is very low the charging time will be about 12 hours. The light indicator **CHARGE** [2] stays on while the equipment is connected to the DC adapter.

3.2 Installation and Starting up

The **PRODIG-2** TV signal meter is designed for use as a portable equipment.

To switch on, press the rotary selector [1]. A screen like the one described in section '4.2 *Indications on Screen*' will appear. If when switching on the equipment the rotary selector [1] is kept pressed for a few seconds, the configuration screen is accessed (see section '4.4 *Unit Configuration*').

4 INSTRUCTIONS FOR USE

4.1 Description of the Controls and Elements

Front Panel

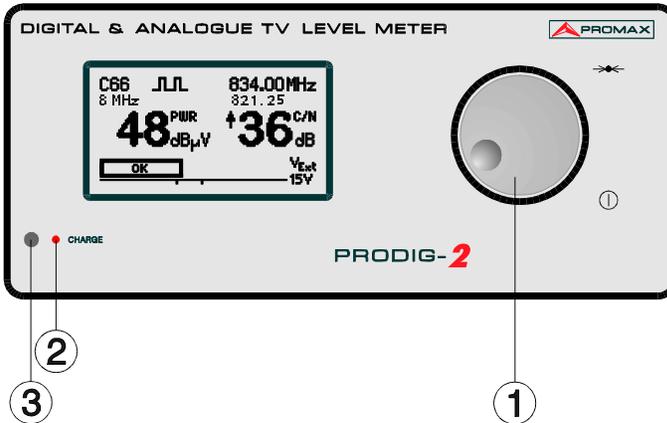


Figure 1.- Front panel.

- [1] Button and selector. Functions:
Switching on and off.
Tuning selection.
Configuration parameters selection.
- [2] **CHARGE**. Luminous indicator showing connection to the external adapter.
- [3] Sensor for control of the screen backlighting.

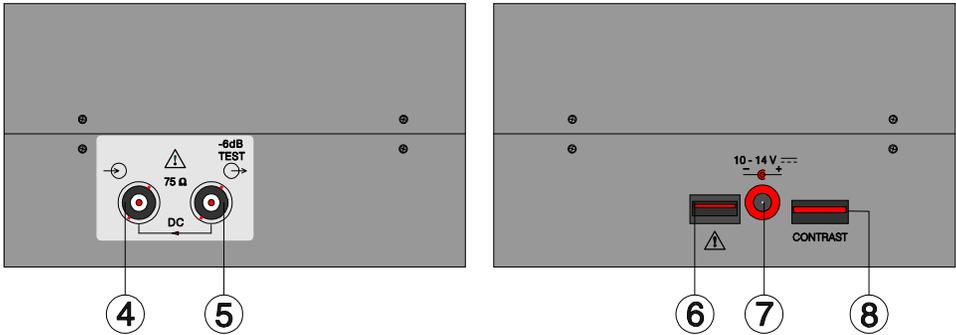


Figure 2.- Side panels.

[4]  RF signal input

Maximum level 130 dB μ V. BNC female connector. Input impedance 75 Ω .

ATTENTION 

Note the importance to protect the RF  [4] input signal with an accessory to avoid introducing the powering voltages added to the signal.

[5] -6 dB TEST  Calibrated output for 6 dB margin test.

ATTENTION 

This output is DC coupled to the RF input [4] to permit to power active accessories from the receiver under test. Maximum applicable voltage is 24 V DC.

[6] Connector for calibration purposes and loading channel plans.

[7] Connector for external power source.

[8] **CONTRAST**. Adjusts screen contrast.

4.2 Indications on the Screen

The next figure shows the position and meaning of the indications appearing on the screen of the **PRODIG-2**.

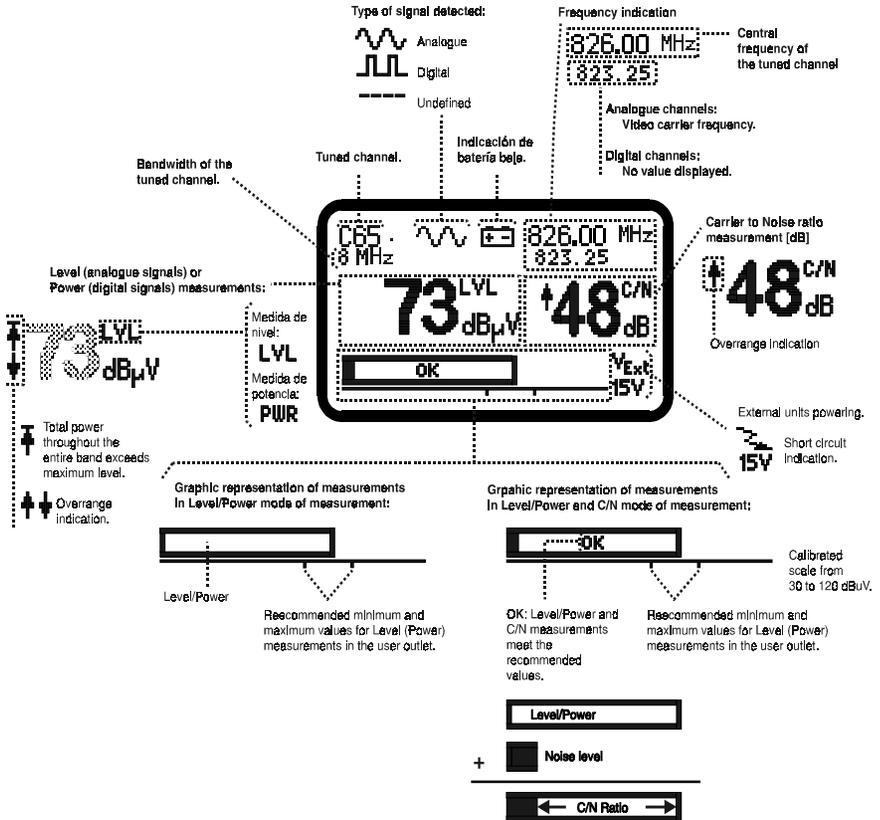


Figure 3.- Indications on screen.

The representation of the level/power or C/N measurement may appear greyed due to different circumstances: it is not possible to identify the channel as analogue or digital or power throughout the band is over the maximum permitted value.

4.3 Making the Measurements

Turn the rotary selector [1] to tune the channel desired (to change the channel table see section '4.4. Configuration of the Equipment').

If the tuned channel is analogue, the central frequency of the channel and the tuning frequency of the channel (video carrier frequency) are displayed and if the tuned channel is digital, only the tuning frequency (central frequency of the channel) is displayed.

If it is not possible to identify the channel as analogue or digital, the undefined type of channel indication is displayed and all the parameters of the measurement are adjusted as if the channel was digital.

The **PRODIG-2** have two modes of measurement (Level/Power mode of measurement and C/N mode of measurement), detects the type of channel tuned (analogue or digital) and shows automatically the Level (analogue channel) or the Power (digital channel).

4.3.1 Level/Power Mode of Measurement

In this mode **PRODIG-2** measures the Level (LVL, analogue channel) of the video carrier at the modulation peak of the TV channel (in dB μ V) or the Power (PWR, digital channel) of TDT channel (consult appendix 1). Two dashes are displayed in the C/N measurement field

The representation of the level/power or C/N measurement may appear greyed because it is not possible to identify the channel as analogue or digital (in this case, the undefined type of channel indication is displayed and all the parameters of the measurement are adjusted as if the channel was digital) or power throughout the band is over the maximum permitted value.

In the lower part of the screen the measurement is shown graphically by means a horizontal bar over a white background. The recommended minimum and maximum readings for level/power are marked on the horizontal axis of this bar. The recommended values for TV signals in the user outlet are shown in appendix 2.

In this mode the Level/Power acoustic indication can be activate/deactivate. The activation of the acoustic indication facilitates the search for the maximum signal without the need for the screen to be observed continuously. The deactivation of the acoustic indication allows the unit to perform the measurement faster and facilitates the search for the maximum signal because now it takes less time for you to know the signal response to the antenna reorientation.

4.3.2 Level/Power and C/N Mode of Measurement

In this mode PRODIG-2 measures the Level (LVL, analogue channel) of the video carrier at the modulation peak of the TV channel (in dB μ V) or the Power (PWR, digital channel) of TDT channel (consult appendix 1) and the C/N ratio.

If the channel is an analogue channel, the C/N measurement value corresponds to the ratio of the video carrier level with respect to the noise level. If the channel is a digital channel this measurement corresponds to the ratio of the channel power with respect to the noise power

In the lower part of the screen both measurements are shown graphically by means of 2 superimposed horizontal bars. The outer bar (white background) shows the level/power of the TV channel, while the inner one (black background) represents the noise level. The difference between them (that is, the white background) is the C/N ratio.

The recommended minimum and maximum readings for level/power are marked on the horizontal axis of this bar. When the level/power measured is between these margins and the C/N ratio is greater than the minimum recommended, the indication **OK** appears.

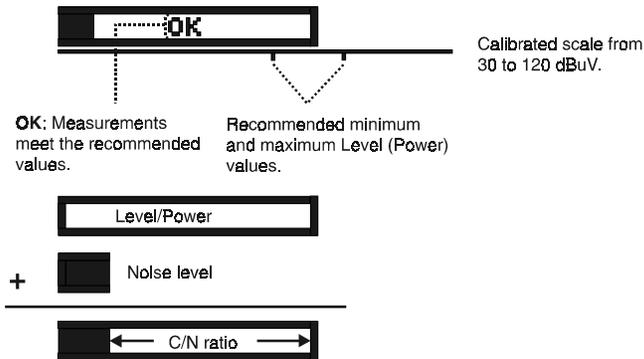


Figure 4.- Graphic representation of the measurements.

The recommended values for TV signals in the user outlet are shown in appendix 2.

4.4 Unit Configuration

The configuration screen allows modification of the following parameters:

- Activation/Deactivation of the automatic switching off function.
- Selection of the voltage supply to external units between 12 V, 15 V, 18 V, 24 V, OFF (standard voltages).
- Selection of the measurement mode between one of the two available modes: Level/Power measurement (with or without acoustic indication) or Level/Power and C/N measurement.
- Selection of channel table between CCIR, STD L, OIRT and FCC (standard channel plan)

To access the configuration screen of the **PRODIG-2**, with the equipment switched off, press the rotary selector [1] until the following screen appears:

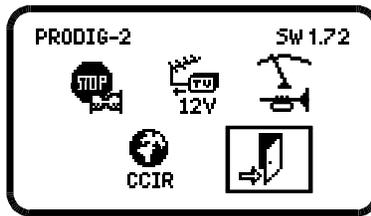


Figure 5.- Configuration screen.

In the upper right part is shown the version of the equipment.

To select a configuration parameter, turn the rotary selector [1] until the corresponding icon appears in a square. Then press the rotary selector [1] to change the configuration in a sequential form.

Remark: In the case that the **PRODIG-2** does not detect the external units power module (OPT-202-16) this icon will appear greyed and it will not be selectable.

To exit from the configuration screen, turn the rotary selector [1] until the exit icon



appears in a square and then press. This will give access to the measurement screen.

4.4.1 Power Off Mode



Automatic power off: After about 15 minutes without the rotary selector having been used, the equipment will automatically disconnect.



Manual power off: To switch off the device, press the rotary selector.

4.4.2 External Units Powering (OPT-202-16)

The **PRODIG-2**, by means of the OPT-202-16 option, can incorporate a external units power module. Through this module it is possible to supply external units with the following standard voltages:



The indication **OFF** deactivates the voltage to the external units.

Remark: In the case that the **PRODIG-2** does not detect the external units power module (OPT-202-16) this icon will appear greyed.

4.4.3 Selecting the Active Channel Table

The standard option of **PRODIG-2** incorporates the following channel tables:



CCIR

CCIR channel table.



STD L

STD L channel table.



OIRT OIRT channel table.



FCC FCC channel table.

By means of the option 61 it is possible to request a special channel plan (set of channel tables). At the end of the manual the standard channel tables are detailed.

Remark: In the case that the **PRODIG-2** only has one channel table stored in memory (because the customer has requested it) this icon will appear greyed.

4.4.4 Selecting the Mode of Measurement

This submenu allows to select the measurements performed by the unit (modes of measurement): Level/Power and C/N measurement (Level/Power and C/N mode of measurement) or, Level/Power measurement only (Level/Power mode of measurement). In the late mode of measurement the Level/Power acoustic indication can be activate/deactivate



C/N Measurement of the signal Level/Power and C/N.



Only Level/Power measurement. This function allows the unit to perform the measurement faster and facilitates the search for the maximum signal because now it takes less time for you to know the signal response to the antenna reorientation.



Level/Power measurement and Level/Power acoustic indication. This function facilitates the search for the maximum signal without the need for the screen to be observed continuously.

5 MAINTENANCE

5.1 Replacing the Battery

The battery (CB-073) needs to be replaced when it is found that its capacity after charging has considerably reduced. To replace the battery, follow the steps detailed below:

1. Turn off the **PRODIG-2**.
2. Remove the top cover. To do this remove the 4 securing screws.
3. Remove the battery securing screws.
4. Disconnect the battery cable from the main board.
5. Replace the battery with a new one.
6. Connect the battery to the main board. The connector allows only one position.
7. Replace the battery securing screws.
8. Replace and secure the top cover with the 4 screws.

5.2 Cleaning Recommendations

CAUTION

To clean the cover, be sure the unit is turned off.

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

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.

5.3 Internal Fuses that Cannot be Replaced by the User

The following fuse can only be replaced by specialised personnel. The position identification and specification are as follows:

F1,	2.5 A T 125 V SMD
F12,	0.5 A Raychem multifuse

Appendix 1. Measurement of Power on a Digital Channel

The principal characteristic of digital TV signals is that they distribute their energy throughout the channel band (in a similar way to a noise signal), that is to say, they do not possess a differentiated carrier. On the other hand, analogue signals concentrate the greater part of the power around the video carrier. Given this difference in the nature of digital signals as against analogue signals, the measurement method cannot be the same: a suitable detector for signals of a "noise nature" must be used and the spectral distribution of the signal throughout the width of the channel band must be taken into account.

Specifically, Digital Terrestrial TV signals use the **COFDM** modulation which is specially immune to interference by multi-route propagation (which in analogue television produces "double images" and "ghost images"). The COFDM modulation modulates the signal through 1697 carriers (system 2k) or 6817 (system 8k) distributed throughout the width of the channel band.

The measurement of power of a digital signal (**PWR**) corresponds to the RMS voltage of the whole of the carriers (2k or 8k), not to the level of one individual COFDM carrier.

Appendix 2. Recommended Values for the Level and C/N Ratio

Table 1 shows the recommended values for the measurements of Level, Power and C/N in the user intake to guarantee correct reception of the TV signal. The **PRODIG-2** has been programmed for these values, so that the indication **OK** appears on the measurement bar when both requirements (Level or Power and C/N) are satisfied, according to the modulation of the signal detected: analogue or digital.

Measure. / Modulation	ANALOGUE	DIGITAL
Level / Power	60...80 dB μ V	45...60 dB μ V
C/N	≥ 42 dB	≥ 26 dB

Table 1.- Measurements recommended in the user intake.

Appendix 3. Six dB Margin Test

A characteristic of digital TV signals is the existence of a threshold level above which the quality of the signal rapidly becomes good and below which quality degrades rapidly. That is to say, when the digital signal degrades, the visualisation of the image does not worsen gradually, as happens with analogue signals, but suddenly. This phenomenon is known as *Threshold* or *Digital Cliff*.

The **margin** is defined as the amount by which the level can reduce with respect to the normal operation level before arriving at the threshold, after which the image disappears suddenly. The level of signal in the receiver may vary for many reasons, therefore it is very important when guaranteeing the reliability of the installation to ensure that this margin is not very small. The minimum margin value recommended is **6 dB**. An easy and economical way to check the margin is to insertion a 6 dB attenuator into the line.

To carry out this test, insert the **PRODIG-2** between the user intake and the digital signal receiver, connecting the signal from the antenna to the RF input  [4], and the RF output [5]  to the digital receiver. Verify that the image is correct under these conditions.

Appendix 4. C/N Ratio Measurement

The measurement procedure of the C/N ratio depends on the channel type on which the measurement is going to be taken (analogue or digital channel). The **PRODIG-2** detects automatically if the channel is analogue or digital and measures this ratio. If it is not possible to identify the channel as analogue or digital, the undefined type of channel indication is displayed and all the parameters of the measurement are adjusted as if the channel was digital.

Measuring C/N in analogue channels.

In analogue channels, the C/N ratio corresponds to the quotient between the video carrier level and the noise level.

The video carrier level is measured using the peak detector for the duration of the line pulse.

The equivalent noise level is obtained by measuring the noise level between adjacent channels using the average detector.

Measuring C/N in digital channels.

In digital channels this measurement corresponds to the ratio between the channel power and the noise power.

The channel power is measured at the centre of the channel using the average detector.

The equivalent noise power is obtained by measuring the noise power between adjacent channels using the average detector.

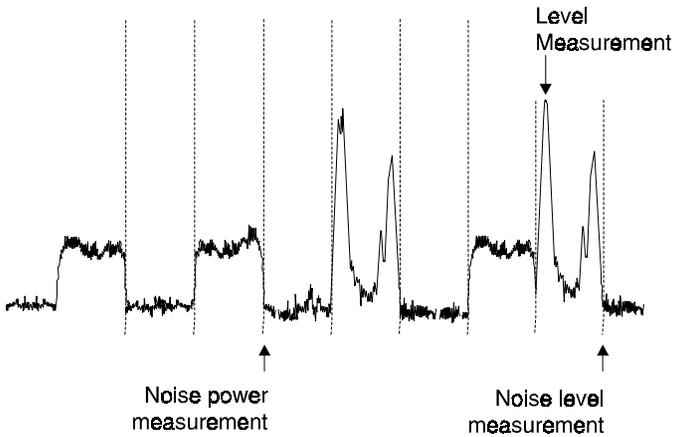


Figure 6.- C/N Measurement.

Appendix 5. Standard Channel Tables

Remark:

The tuning frequency of a channel depends whether it is analogue or digital, corresponding to the video carrier frequency if it is analogue or to the channel central frequency if it is digital. Next tables show the tuning frequency for the analogue case. At the end of the table appears the channel bandwidth in order to be able to calculate the channel central frequency.

CCIR

Ch.	Freq.										
C02	48,25	C09	203,25	S24	327,25	S41	463,25	C37	599,25	C54	735,25
C03	55,25	C10	210,25	S25	335,25	C21	471,25	C38	607,25	C55	743,25
C04	62,25	C11	217,25	S26	343,25	C22	479,25	C39	615,25	C56	751,25
S01	105,25	C12	224,25	S27	351,25	C23	487,25	C40	623,25	C57	759,25
S02	112,25	S11	231,25	S28	359,25	C24	495,25	C41	631,25	C58	767,25
S03	119,25	S12	238,25	S29	367,25	C25	503,25	C42	639,25	C59	775,25
S04	126,25	S13	245,25	S30	375,25	C26	511,25	C43	647,25	C60	783,25
S05	133,25	S14	252,25	S31	383,25	C27	519,25	C44	655,25	C61	791,25
S06	140,25	S15	259,25	S32	391,25	C28	527,25	C45	663,25	C62	799,25
S07	147,25	S16	266,25	S33	399,25	C29	535,25	C46	671,25	C63	807,25
S08	154,25	S17	273,25	S34	407,25	C30	543,25	C47	679,25	C64	815,25
S09	161,25	S18	280,25	S35	415,25	C31	551,25	C48	687,25	C65	823,25
S10	168,25	S19	287,25	S36	423,25	C32	559,25	C49	695,25	C66	831,25
C05	175,25	S20	294,25	S37	431,25	C33	567,25	C50	703,25	C67	839,25
C06	182,25	S21	303,25	S38	439,25	C34	575,25	C51	711,25	C68	847,25
C07	189,25	S22	311,25	S39	447,25	C35	583,25	C52	719,25	C69	855,25
C08	196,25	S23	319,25	S40	455,25	C36	591,25	C53	727,25		

Channel bandwidth: C02 to S20 7.0 MHz
S21 to C69 8.0 MHz

STDL

Ch.	Freq.	Ch.	Freq.	Ch.	Freq.	Ch.	Freq.	Ch.	Freq.	Ch.	Freq.
FA	47,75	C13	240	C22	479,25	C34	575,25	C46	671,25	C58	767,25
FB	55,75	C14	288	C23	487,25	C35	583,25	C47	679,25	C59	775,25
FC1	60,50	D01	303,25	C24	495,25	C36	591,25	C48	687,25	C60	783,25
FC	63,75	D02	315,25	C25	503,25	C37	599,25	C49	695,25	C61	791,25
C05	176	D03	327,25	C26	511,25	C38	607,25	C50	703,25	C62	799,25
C06	184	D04	339,25	C27	519,25	C39	615,25	C51	711,25	C63	807,25
C07	192	D05	351,25	C28	527,25	C40	623,25	C52	719,25	C64	815,25
C08	200	D06	363,25	C29	535,25	C41	631,25	C53	727,25	C65	823,25
C09	208	D07	375,25	C30	543,25	C42	639,25	C54	735,25	C66	831,25
C10	216	D08	387,25	C31	551,25	C43	647,25	C55	743,25	C67	839,25
C11	224	D09	399,25	C32	559,25	C44	655,25	C56	751,25	C68	847,25
C12	232	C21	471,25	C33	567,25	C45	663,25	C57	759,25	C69	855,25

Channel bandwidth: 8.0 MHz

OIRT

Ch.	Freq.	Ch.	Freq.	Ch.	Freq.	Ch.	Freq.	Ch.	Freq.	Ch.	Freq.
1	49,75	10	207,25	S25	343,25	22	479,25	39	615,25	56	751,25
2	59,25	11	215,25	S26	351,25	23	487,25	40	623,25	57	759,25
3	77,25	12	223,25	S27	359,25	24	495,25	41	631,25	58	767,25
4	85,25	SK11	231,25	S28	367,25	25	503,25	42	639,25	59	775,25
5	93,25	SK12	239,25	S29	375,25	26	511,25	43	647,25	60	783,25
SK1	111,25	SK13	247,25	S30	383,25	27	519,25	44	655,25	61	791,25
SK2	119,25	SK14	255,25	S31	391,25	28	527,25	45	663,25	62	799,25
SK3	127,25	SK15	263,25	S32	399,25	29	535,25	46	671,25	63	807,25
SK4	135,25	SK16	271,25	S33	407,25	30	543,25	47	679,25	64	815,25
SK5	143,25	SK17	279,25	S34	415,25	31	551,25	48	687,25	65	823,25
SK6	151,25	SK18	287,25	S35	423,25	32	559,25	49	695,25	66	831,25
SK7	159,25	S19	295,25	S36	431,25	33	567,25	50	703,25	67	839,25
SK8	167,25	S20	303,25	S37	439,25	34	575,25	51	711,25	68	847,25
6	175,25	S21	311,25	S38	447,25	35	583,25	52	719,25	69	855,25
7	183,25	S22	319,25	S39	455,25	36	591,25	53	727,25		
8	191,25	S23	327,25	S40	463,25	37	599,25	54	735,25		
9	199,25	S24	335,25	21	471,25	38	607,25	55	743,25		

Channel bandwidth: 8.0 MHz

F C C

Ch.	Freq.										
A02	55,25	C15	477,25	C28	555,25	C41	633,25	C54	711,25	C67	789,25
A03	61,25	C16	483,25	C29	561,25	C42	639,25	C55	717,25	C68	795,25
A04	67,25	C17	489,25	C30	567,25	C43	645,25	C56	723,25	C69	801,25
A05	77,25	C18	495,25	C31	573,25	C44	651,25	C57	729,25	C70	807,25
A06	83,25	C19	501,25	C32	579,25	C45	657,25	C58	735,25	C71	813,25
A07	175,25	C20	507,25	C33	585,25	C46	663,25	C59	741,25	C72	819,25
A08	181,25	C21	513,25	C34	591,25	C47	669,25	C60	747,25	C73	825,25
A09	187,25	C22	519,25	C35	597,25	C48	675,25	C61	753,25	C74	831,25
A10	193,25	C23	525,25	C36	603,25	C49	681,25	C62	759,25	C75	837,25
A11	199,25	C24	531,25	C37	609,25	C50	687,25	C63	765,25	C76	843,25
A12	205,25	C25	537,25	C38	615,25	C51	693,25	C64	771,25	C77	849,25
A13	211,25	C26	543,25	C39	621,25	C52	699,25	C65	777,25	C78	855,25
C14	471,25	C27	549,25	C40	627,25	C53	705,25	C66	783,25		

Channel bandwidth: 6.0 MHz

TABLE OF CONTENTS

1 GENERAL	27
1.1 Description	27
1.2 Specifications	28
2 SAFETY RULES	31
2.1 General	31
2.2 Descriptive Examples of Over-Voltage Categories	33
3 INSTALLATION	35
3.1 Power Supply	35
3.1.1 Operating through the External DC Adapter	35
3.1.2 Operating by Battery	35
3.1.2.1 Charging the Battery	36
3.2 Installation and Starting up	36
4 INSTRUCTIONS FOR USE	37
4.1 Description of the Controls and Elements	37
4.2 Indications on the Screen	39
4.3 Making the Measurements	40
4.3.1 Level/Power Mode of Measurement	40
4.3.2 Level/Power and C/N Mode of Measurement	41
4.4 Unit Configuration	42
4.4.1 Power Off Mode	43
4.4.2 External Units Powering	43
4.4.3 Selecting the Active Channel Table	43
4.4.4 Selecting the Mode of Measurement	44
5 MAINTENANCE	45
5.1 Replacing the Battery	45
5.2 Cleaning Recommendations	45
5.3 Internal Fuses that Cannot be Replaced by the User	46
Appendix 1. Measurement of Power on a Digital Channel	47
Appendix 2. Recommended Values for the Level and C/N Ratio	47
Appendix 3. Six dB Margin Test	48
Appendix 4. C/N Ratio Measurement	48
Appendix 5. Standard Channel Tables	50