MULTISTANDARD TV AND SAT LEVEL METER

MC-944B

1 GENERAL INFORMATION

1.1 Description

The **MC-944B** is the **most advanced model** of the PROMAX TV and satellite level meters. The range of frequencies covered makes it an excellent instrument for **FM radio, and ground, cable, and satellite TV applications.** Its accuracy and reliability will meet the needs of the most demanding users. Since it is a multi-standard instrument, it can be used efficiently in any country in the world.

Its design featuring a **microprocessor-based intelligent control system** enables the user to adapt its advanced capabilities with **remarkable ease**.

A modern **μP** automatically handles a large part of the operations necessary to optimize the process of measurement: for example, continuous frequency **synthesis,** the correction of linearity and flatness errors, the appropriate selection of the attenuators, and the automatic cut-off after the device has been inactive for a certain period of time. To enhance its convenience of use, it has **99 memory locations** to store the various configurations of the instrument.

The signal level measured is indicated numerically on an LCD display in absolute values and, optionally, on an analogue bar shown on the monitor picture.

The selection of the sound subcarrier is automatic, depending on the standard, or tunable in the 4 to 9 MHz range. It incorporates, besides, a NICAM decoder which supplies an indication of the error rate and the type of NICAM received.

The **MC-944B** is a highly advanced instrument, where the level measurement is just one of the many functions it has. Teletext, Spectrum Analyzer function, display the line synchronizing pulse, are just a few options of the possibilities it offers.

The **MC-944B includes the main TV standards: M, N, BG, I, DK and L,** adapting, besides the own parameters of the standard, the automatic correction system to obtain, always, a precise measure of the input signal level. An IF input (38.9 MHz) allows the user to measure special signals, for example, in cable TV. It is also equipped with a **EUROCONNECTOR** with audio/video input/output. The satellite video output in base band allows the use of D2-MAC decoders and others.

The instrument is powered by a rechargeable battery, and it is possible to supply different voltages to the external unit, **(13 / 15 / 18 / 24 V** ground TV and **13 / 15 / 18 / 13 + 22 kHz / 15 + 22 kHz / 18 + 22 kHz V** satellite TV).

It incorporates a RS-232C interface, which allows the connection with a personal computer for the data collection or the remote control of the equipment, or the connection to a printer, to print the measurements.

1.2 Specifications ⚠️

TUNING	Digital frequency synthesis. Continuous tuning from 45 to 862 MHz and from 950 to 2050 MHz.

Spectrum bands

VHF	LOW band	48 - 169 MHz
	HIGH band	175 - 448 MHz
UHF	UHF band	455 - 856 MHz
SAT	SAT TV 1st IF	950 - 2050 MHz
FM	FM band	87 - 109 MHz
IF input	38.9 MHz	
Indicator	LCD alphanumeric display	
Resolution	62.5 kHz in TV and FM	
	500 kHz in SAT	

Automatic search	
Memory	99 configurations

LEVEL MEASUREMENT

Measurement range

Terrestrial TV & FM bands

	20 dBμV to 130 dBμV (10 μV to 3.16 V)
SAT TV band	40 dBμV to 120 dBμV (100 μV to 1 V)
SPECTRUM mode	
SAT band	30 dBμV to 110 dBμV (31.6 μV to 316 mV)
Terrestrial bands	20 dBμV to 130 dBμV (10 μV to 3.16 V)
Reading	Auto-range or manual selection
Digital	Absolute value calibrated in dBμV, dBmV, dBm, V
Analogue	Relative value: analogue bar on the screen

Attenuators

TV	0 to 100 dB, AUTO (20 dB steps)
SAT	0 to 60 dB, AUTO (20 dB steps)
Input impedance	75 Ω (BNC)
IF bandwidth	300 kHz (TV) ■ 27 MHz (SAT)
Audible indicator	A tone that varies with the level of the signal

Accuracy

TV	± 1 dB (30 dBμV to 120 dBμV and 48.25 MHz to 861 MHz) (22º C ± 5º C).
SAT	± 1 dB (40 dBμV to 100 dBμV) (22º C ± 5º C)
RF output	75 Ω (BNC)
Insertion losses	Typical 22 dB, with 20 dB RF INPUT attenuator selected.

Maximum admissible	
RF input	
From DC to 30 MHz	50 V rms
From 48 to 2050 MHz	130 dBμV
Video input	3 Vpp

MONITOR DISPLAY

CRT	B/W, 5 ½ inches
Synchronism and Burst	Display through displacement of the picture
Spectrum function	Variable span in selected band
Type of monitor	B/W TV, according to the standards M,N,B,G,I,D,K,L
Sensitivity	40 dBμV for the correct synchronism

50/60 Hz automatic synchronism

SAT	Selection of frame frequency between 50 and 60 Hz.
TV	Selection according to the standard

VIDEO SIGNAL

External video input	BNC, Euroconnector (automatic selection)
Sensitivity	1 Vpp (75 Ω) positive video
Video output	BNC, Euroconnector (75 Ω)
Base band video SAT output	
	BNC, 1 Vpp (75 Ω)

IF OUTPUT	BNC (75 Ω)

SOUND

Input	Euroconnector
Output	Speaker, Euroconnector, external headphone
Demodulation	AM/FM and TV, selectable
Subcarrier	Digital frequency synthesis
Variable	From 4 to 9.0 MHz, 10 kHz resolution
Fixed	According to the standard selected: 4.50, 5.50, 5.80, 6.00, 6.50, 6.65, 5.74, AM, FM, LV, OFF.

TELETEXT	Decodes at 1.0 level

INTERFACE RS-232C

POWER TO LNB   Through the input RF connector

Ground TV	External or 13/15/18/24 V
Satellite TV	External or 13/15/18 V
22 kHz	Selectable
Voltage	0.6 V ±0.2
Frequency	22 kHz ±4
Max. Power	5 W

POWER SUPPLY

Battery	12 V / 6 Ah
Autonomy	Better than 1 h. in SAT + LNB mode
	Better than 2 h. in Terrestrial TV
Mains	95 to 250 V AC/50-60 Hz
Consumption	50 W

OPERATING ENVIRONMENTAL CONDITIONS

Max. altitude	2000 m
Temperature range	From 5 to 40 ºC
Max. relative humidity	80 % (up to 31 ºC), decreasing lineally up to 10% at 40 ºC.

MECHANICAL FEATURES

Dimensions	W. 305 x H. 145 x D. 334 mm
Weight	Approx. 11.5 kg

ENGLISH

ACCESSORIES INCLUDED
Carrying bag
Power cord CA-005
75 Ω load
Viewing Hood
Battery CB-068
2 coaxial adaptors
1 spare fuse 2.5A, F 250V

OPTIONAL ACCESSORIES
Portable printer

2 SAFETY RULES

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

* This is a **class I** equipment, for safety reasons plug it to a supply line with the corresponding **ground terminal**.

* This equipment can be used in CATEGORY II installations and Pollution Degree 2 environtments.

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

Rechargeable battery
Power cord

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

* Remember that voltages higter than 60V DC or 30V AC rms are dangerous

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

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

Replace the battery
Replace a fuse of the specified type and value

On the Maintenance paragraph the proper instructions are given. Any other change on the equipment should ve carried out by qualified personnel.

* **Do not obstruct the ventilation system** of the instrument

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

ENGLISH

* Symbols related with safety:

DIRECT CURRENT

ALTERNATING CURRENT

DIRECT AND ALTERNATING

GROUND TERMINAL

PROTECTIVE CONDUCTOR

FRAME TERMINAL

EQUIPOTENTIALITY

ON (Supply)

OFF (Supply)

DOUBLE INSULTATION PROTECTED
(Class II Protection)

CAUTION
(Risk of electric shock)

CAUTION REFER TO ACOMPANYING DOCUMENTS

FUSE

3 INSTALLATION

3.1 Power Supply

The **MC-944B** is a portable instrument powered by a 12 volt built-in battery. Before taking any measurements, the battery charge must be checked. If it is low (a voltage lower than 11.0 V), a blinking LOW BATTERY message will appear on the display [14]. When the voltage is lower than 10.8 V, a VERY LOW BATTERY message will appear.

If the battery is very weak, the battery cut-off circuit will prevent the device from functioning. In such a situation the battery must be recharged immediately. If the battery is completely discharged, it is advisable to recharge the battery for a period of half and hour before putting the instrument into operation again.

3.1.1 Operating on the electrical mains supply

Although the device is designed for use as portable equipment, it can also operate when connected to the mains power supply.

Connect the device to the mains and press the power-on switch ① [20]. The field meter is now in operation and the battery will slowly recharge.

⚠ ***The instrument can be powered by mains voltages of 95 to 250 V AC 50-60 Hz without a voltage selector.***

3.1.2 Operating on the battery

For the device to operate on the battery, disconnect the power cable and press the power-on switch ① [20]. The fully charged battery can power the equipment for more than one hour non-stop, and depending on the mode of operation, it can be powered for up to three hours. When the LOW BATTERY indicator appears, the battery must be recharged immediately.

NOTE
When operating on the battery the MC-944B has no protection fuses accessible to the user. The power-supply system has a set of electronic safety devices to ensure its proper functioning. If the instrument stops functioning, it must be taken directly to the nearest technical assistance service to be checked.

3.1.2.1 Charging the battery

To fully recharge the battery, connect the device to the mains supply **without pressing** the power-on switch ① [20]. The length of time it takes to recharge it depends on the condition of the battery. If it is very low (the LOW BATTERY indicator has lit) the recharging period is 7 hours. The LINE [22] indicator should remain lit.

IMPORTANT
The lead battery of the instrument must be kept fully charged during periods when it is not in use. To ensure the best results, the battery must always be fully charged. If the equipment is in storage or is used only occasionally for a long period of time, it is ABSOLUTELY NECESSARY to check the full-charge functions periodically (every six months, for example), and to compensate for the self-discharging effect of the battery. The rate at which a fully charged battery self-discharges depends on the temperature. For example, at an ambient temperature of 20º C, the battery suffers a 50% loss after 16 months, and at 40º C it loses the same charge in only 5 months. If the battery remains very weak for a period of several days, it cannot be recharged since the plates are sulphated and must be replaced.

3.2 Installation and start-up

The **MC-944B** field meter is designed for use as a portable device. A carrying case is supplied to simplify transport and to allow the user to take measurements conveniently in any type of installation.

When the ① [20] key is pressed, the instrument is in the "automatic power-off" mode; that is, the device is automatically disconnected fifteen minutes after the last time a key has been pressed.

Automatic power-off mode may be deactivated by holding down the ① [20] key for one or two seconds when turning the instrument on. The MANUAL POWER OFF indicator appears on the display.

4 OPERATING INSTRUCTIONS

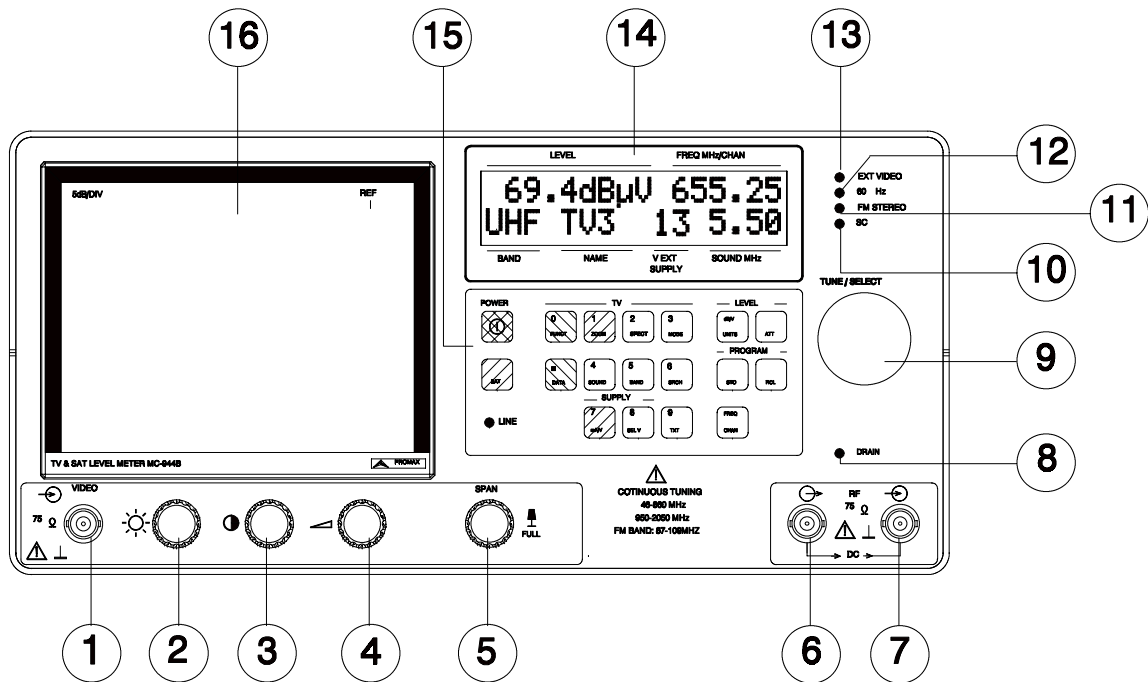## 4.1 Description of the controls and elements

Front Panel

Figure 1.- Front panel.

[1]   ⊖ VIDEO. Standard signal input of 1 Vpp external video; 3 Vpp maximum level. The signal is detected automatically and the monitor switches for the screen display of the external video.

[2]   ☼ Control of the CRT brightness.

[3]   ◑ Control of the CRT contrast.

[4]   ◁ Control of the sound volume.

[5]   SPAN: The spectrum mode controls the amplitude of the frequency sweep. When pulled out, FULL SPAN, the sweep of the entire band is selected.

[6]   RF ⊖→ RF output to the internal unit. The power is supplied to the LNB or antenna amplifier through this connector. BNC connector with an output impedance of 75 Ω.

WARNING ⚠

When supplying the External Unit (LNB) through the Internal Unit (Receiver), make sure that the cable connected to the RF ⟳ [6] connector corresponds to the Internal Unit, and that the RF ⟲ [7] connector is connected to the External Unit. If the Internal Unit is connected to RF ⟲ [7] and an External Unit voltage is selected, the MC-944B and the Internal Unit will be connected to the opposite power supplies, which may damage one of the two pieces of equipment.

[7]   RF ⟲. RF signal input. Maximum level: 130 dBμV. BNC connector with an input impedance of 75 Ω.

ATTENTION ⚠

Note the importance to protect the RF ⟲ [7] input signal with an accessory to block 50 Vpp AC, used in CATV cables (needed to feed the amplifiers) and remote mode.

[8]   DRAIN. A light indicator signifying that the **MC-944B** is powering the External Unit.

[9]   TUNE/SELECT. Rotary selector. Used for continuous tuning control or to select the options associated to each key.

[10]   SC. A light indicator which indicates that a sound carrier at the selected frequency has been detected in the tuned transmission.

[11]   FM STEREO. A light indicator which indicates that a stereo FM transmission has been tuned.

[12]   60 Hz. A light indicator which indicates that a 60 Hz frame frequency has been selected.

[13]   EXT VIDEO. A light indicator which lights up when an external video signal is present through either the ⟲ VIDEO [1] connector or through the EUROCONNECTOR [46].

[14]   Alphanumeric display with two line of sixteen characters and back lighting. It indicates the level, frequency/channel, band, name of the broadcasting station, LNB power supply voltage, the sound system, etc.

[15]   Keyboard. 18 keys for function selection and numerical data input.

[16]   SCREEN. Cathode ray tube of the monitor.

Keyboard
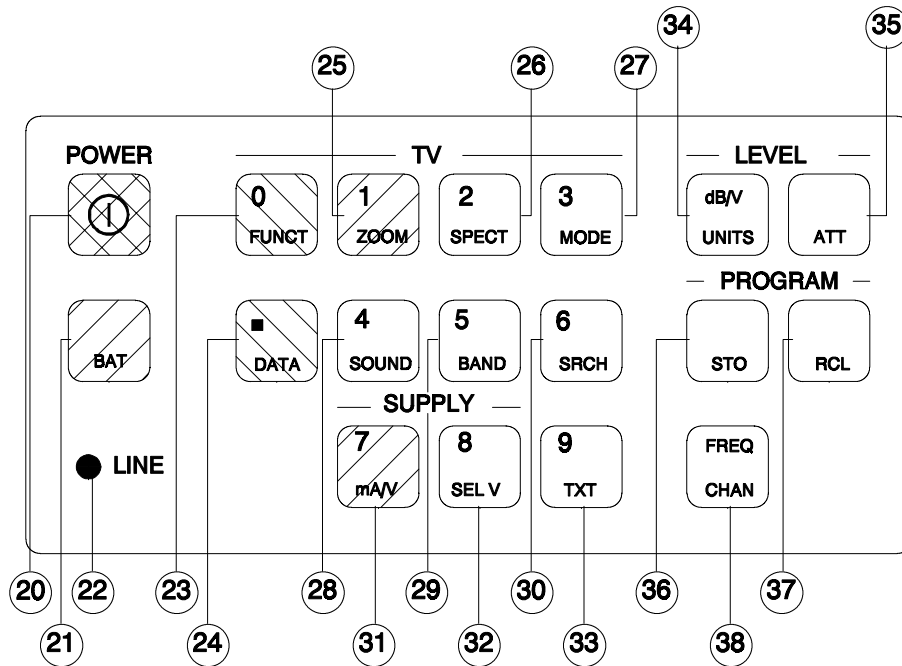
Figure 2.- Keyboard.

Each key is coded with the colour indicating the related type of operation:

Red: On and off. Maximum priority.
Green: Alphanumeric data entry. This switches the keyboard in such a way that successive pressing of the keys is interpreted according to the numerical value associated with each key.
Blue: Momentary operation. This is only active while the key is held down.
Grey: An operation which requires selection with the dial selector of one option among all possible choices.

[20]   POWER ⓘ. This turns on the instrument, and the user can select either manual or automatic power-off.

[21]   BAT. This indicates the battery power on the display [14] in volts.

[22]   LINE. Light indicator which indicates whether the instrument is connected to the mains.

[23]   FUNCT/0. Function selector. 0 in the FUNCTION or DATA modes.

[24]   DATA/. This enables the user to select the desired channel or frequency using the keyboard. Decimal point in the DATA mode.

[25]   ZOOM/1. This amplifies the picture horizontally. Number 1 in the FUNCTION or DATA mode.

[26]   SPECT/2. Let commutation between TV function mode and spectrum mode. Number 2 in the FUNCTION or DATA modes.

[27] MODE/3. This key selects the operating mode of the **MC-944B** monitor. The following different modes are available:

TV: Monitor operating as a conventional **television set.**

TV+LV: Monitor operating as a conventional television set, with a level indicator on the upper part of the screen (the analogue bar).

TV+LV+SY: Monitor operating as a conventional **television set**, with a **level indicator** and the **line synchronizing** pulse displayed on the screen. The line synchronizing pulse appears with a lateral displacement of the picture if a TV carrier is tuned, or if there is an external video signal input through the VIDEO ⊖ [1] connector or the Euroconnector [40]. The analogue bar level indicator shown on the screen has been calibrated and corresponds to the value indicated in the display.

LV: Indication of the signal level on the screen (the analogue bar).

OFF: Deactivates the monitor.

AGC TV: Operation of the tuner with **automatic gain control**. This mode reduces the signal intermodulation with a level higher than 85 dBμV. In this operation mode it is not possible to display the input level measurement, since the gain of the tuner varies as a function of the input level.

Number 3 in the FUNCTION or DATA modes

[28] SOUND/4. This selects the type of sound. The options available in each case depend on the band and the standard selected.

4.50: Sound carrier 4.50 MHz above the picture carrier.
5.50: Sound carrier 5.50 MHz above the picture carrier.
5.74: Selects the second carrier in DUAL or STEREO transmissions, at 5.74 MHz of the picture carrier.
5.80: Sound carrier 5.80 MHz above the picture carrier.
6.00: Sound carrier 6.00 MHz above the picture carrier.
6.50: Sound carrier 6.50 MHz above the picture carrier.
6.65: Sound carrier 6.65 MHz above the picture carrier.
7.02: Sound carrier 7.02 MHz above the picture carrier.

TUNE: Allows the user to tune the sound carrier manually, within a range of 4.00 to 9.00 MHz of the picture carrier in 10 kHz intervals.
NICA: Nicam decodying.
AM: AM demodulation.
FM: FM demodulation.
LV: Tone whose frequency varies with the input signal level.
OFF: Suppresses the audition of the sound carrier in the speaker and headphones.

Number 4 in the FUNCTION or DATA modes

[29] BAND/5. Selects the band.

⚠ Although the tuning is continuous between 45 and 862 MHz and between 950 and 2050 MHz, a band select is included which limits the spectrum display to the commercial bands presently in use and to select a few special cases, such as FM or IF.

VLO: VHF LOW. From 48 to 169 MHz.
VHI: VHF HIGH. From 175 to 448 MHz.
UHF: UHF. From 455 to 856 MHz.
SAT: Satellite TV. From 950 to 2050 MHz.
IF: Intermediate frequency 38.9 MHz.
FM: FM. From 87 to 109 MHz.

Number 5 in the FUNCTION or DATA modes

[30] SRCH/6. This is the transmission search function. Starting at the present frequency or channel, it searches until finding a transmission with an adequate level. In channel mode, the level of comparison is fixed at 51.2 dBμV. In frequency mode, the comparison is in analogue form, and the detector circuits determine whether the input signal quality is adequate.

The SEARCH function halts the search process when the end of the present band is reached, if it is in frequency mode, or when any key is pressed. The sound is deactivated during the search process. This function cannot be used in the FM and IF band.

Number 6 in the FUNCTION or DATA modes

[31] mA/V/7. This indicates on the display [14] the voltage and current being supplied to the LNB or external amplifier.

Number 7 in the FUNCTION or DATA modes

[32] SEL V/8. This selects the voltage supplied to the LNB or external amplifier by the **MC-944B**. The possible voltages are: EXT - 13 V - 15 V - 18 V - 24 V (ground TV) and EXT - 13 V - 15 V - 18 V - 13 V + 22 kHz - 15 V + 22 kHz -18 V + 22 kHz (satellite TV). In the EXT position the **MC-944B** supplies no voltage to the LNB, so that it may be supplied by an external power source through the RF ↪ [6] connector.

Number 8 in the FUNCTION or DATA modes

[33] TXT/9. This selects the Teletext information. As the Teletext circuit is optional, this function is activated only if the μP detects its presence.

Number 9 in the FUNCTION or DATA modes

[34] dB/V UNITS. This selects the units of measurement in which the signal level is shown on the display [14]. The units may be linear (μV, mV, V) or logarithmic (dBμV, dBmV, dBm).

ENGLISH

[35] ATT. This selects the attenuation in the RF input, from 0 to 100 dB in intervals of 20 dB. There is also an AUTO position that selects the most appropriate attenuation according to the input signal level, in order to centre the reading value in the optimum scale.

[36] STO. This stores a configuration in the memory.

[37] RCL. This retrieves a configuration from the memory.

[38] FREQ CHAN. This switches the display [14] indicator between channel and frequency. In channel mode the selection of the tuning frequency is adjusted to the selected channel set (CCIR, OIRT, etc.).
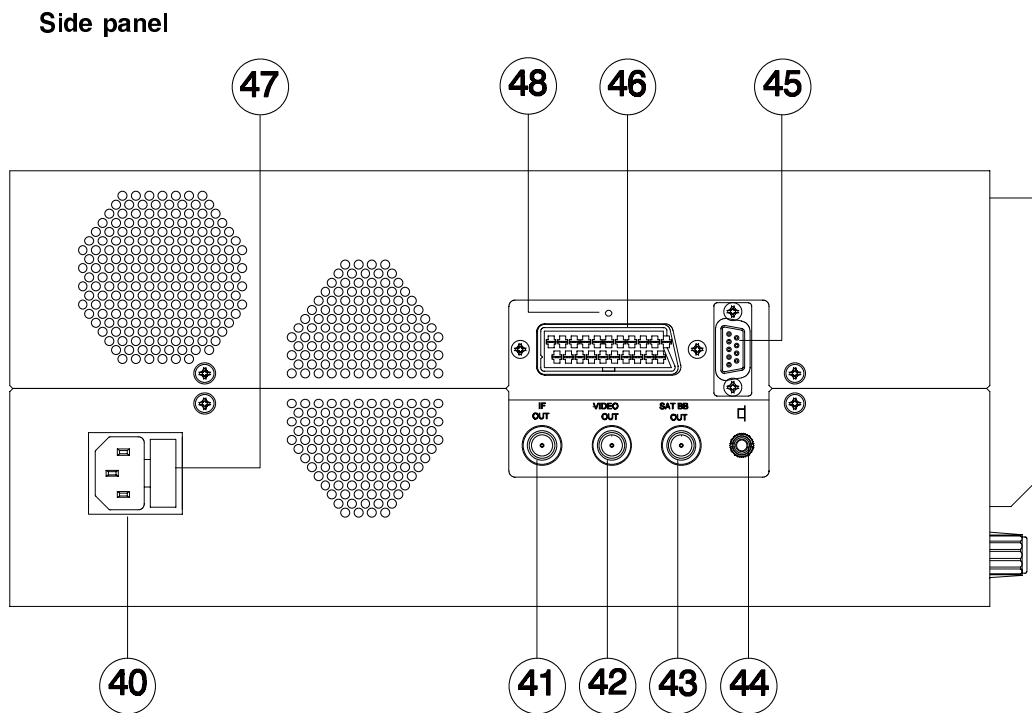
Side panel

Figure 3.- Side panel.

[40] Mains input for voltages of 95 to 250 V 50-60 Hz.

[41] IF OUT. IF output at 38.9 MHz. BNC connector with an output impedance of 75 Ω.

[42] VIDEO OUT. Composite video output with an amplitude of 1 Vpp and positive polarity. In the SAT band it is possible to work with positive and negative video signals. The correct selection of this function enables the user to view signals of either polarity. BNC connector with an output impedance of 75 Ω.

WARNING ⚠️

This signal should not be connected at circuit points with voltage, only to standard video signal inputs with 75 Ω impedance. Any damage to the instrument as a result of ignoring this precaution is not covered in the warranty.

[43]   SAT BB OUT. Base band satellite signal output without eliminating the triangular modulation dispersal or Buergg. BNC connector with an output impedance of 75 Ω.

[44]   Output jack for monaural sound (compatible with mono or stereo headphones).

[45]   RS-232C connector. Enables the remote control of the **MC-944B** from a personal computer, as well as data dumping to a printer.

[46]   Euroconnector.

[47]   Fuse holder. Support for the mains fuse.

[48]   RESET buttom
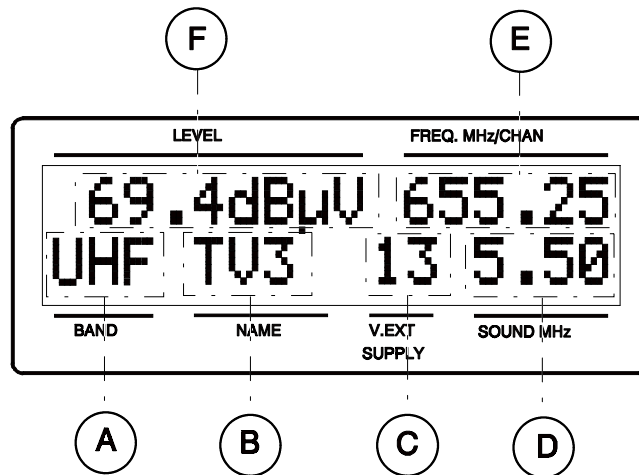
Display

Figure 4.- Display.

        The alphanumeric display consists of two lines. The top line provides the principal information.

[E]   Working frequency or channel.
[F]   Input signal level.

        The second line provides supplementary information.

[A]   Present RF band.
[B]   Name assigned to the configuration memory. This information is only displayed if there has been no change in the parameters of the selected configuration.
[C]   LNB or external unit voltage supply.
[D]   Type of sound or frequency of the selected carrier.

The numbers [17], [18], [19], [39] do not correspond to any part of the instrument and have purposely been omitted from this list.

Possibly, other error messages or indications for the user may appear on the lower line.

4.2 Using the MC-944B

4.2.1 Selection of the RF band

Press the BAND/5 [29] key. By turning the TUNE/SELECT [9] dial, the user can select the RF band. Pressing the BAND/5 [29] key again activates the selected band.

Although the tuning is continuous between 45 and 862 MHz and between 950 and 2050 MHz, a band selection is included which limits the spectrum display to the commercial bands presently in use and to select a few special cases, such as FM or IF.

The following are the selectable bands:

Name	Corresponding band	Frequency (MHz)
VLO	VHF LOW	48 to 169
VHI	VHF HIGH	175 to 448
UHF	UHF	455 to 860
SAT	SATELLITE TV	950 to 2050
IF	Intermediate frequency	38.9
FM	FM	87 to 109

Table 1.- Frequency bands.

4.2.2 Automatic transmission search

When the SEARCH/6 [30] key is pressed, a search starts from the present frequency or channel and continues until finding a transmission with an adequate level. In channel mode, the level of comparison is set at 51.2 dBµV. In frequency mode, the comparison is in analogue form, and the detector circuits determine whether the input signal quality is adequate.

The SEARCH function halts the search process when the end of the present band is reached, if it is in frequency mode, or when any key is pressed. In channel mode, the process halts when the last channel of the selected set is reached (see "Appendix A: Channel frequency tables"). The sound is deactivated during the search process.

This function cannot be used in the FM and IF band. In the SAT band, the search process is only used in the frequency mode function.

4.2.3 Frequency selection

There are two methods for selecting the frequency:

1. **With the TUNE/SELECT [9] dial**. Select the frequency display on the display [14] of the **MC-944B** (FREQ./CHAN [38] key). With the TUNE/SELECT [9] dial, select the desired frequency (tuning is continuous from 45 to 862 MHz and from 950 to 2050 MHz).

2. **Entering through the keyboard.** Select the frequency display on the display [14] of the **MC-944B**. Press the DATA/. [24] key. Then introduce the desired frequency value in MHz with the numerical keyboard, with one decimal place. The **MC-944B** will calculate the tunable frequency that is closest to the value introduced and it will appear on the display. If the frequency introduced corresponds to a band other than the programmed band, the band will be upgraded to the correct value for the new frequency.

4.2.4 Channel selection

There are two methods for selecting the channel:

1. **With the TUNE/SELECT [9] dial**. Select the channel display on the display [14] of the **MC-944B** (FREQ./ CHAN [38] key). With the TUNE/SELECT [9] dial, select the desired channel.

2. **Input through the keyboard.** Select the channel display on the display [14] of the **MC-944B**. Press the DATA/. [24] key. Then introduce the code of the desired channel value with the numerical keyboard.

   Each channel has a three-digit code number assigned to it. Normally, this code coincides with the assigned channel number (see appendix A). If the three digits are pressed, the new channel will be upgraded.

   (Assuming CCIR channels).

   Example 1: Selection of channel 23 (UHF)

   DATA/. - 0 - 2 - 3

   Example 2: Selection of cable channel S23

   DATA/. - 1 - 2 - 3

4.2.5 Selection of the TV mode

Press the MODE/3 [27] key. By turning TUNE/SELECT [9], the user can choose the function of the monitor. Pressing the MODE/3 [27] key again activates the selected display mode.
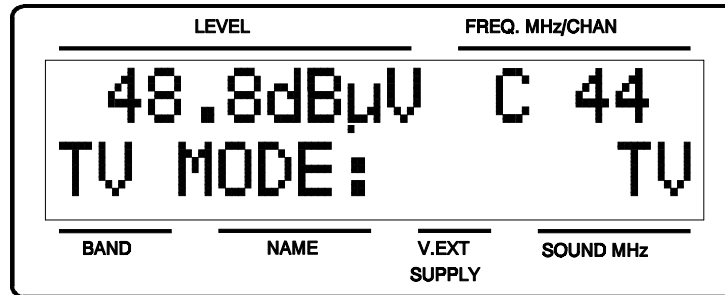

Figure 5.- Selection of the display mode.

In addition to operating as a television set, the **MC-944B** monitor can act as an analogue level indicator, as a spectrum analyzer, and can display the line synchronizing pulse just as it would appear on the screen of an oscilloscope.

The basic modes available are:

TV: Monitor operating as a conventional television set.

TV+LV: Monitor operating as a conventional television set, with a level indicator on the upper part of the screen (the analogue bar).

TV+LV+SY: Monitor operating as a conventional television set, with a level indicator and the line synchronizing pulse displayed on the screen.

LV: Indication of the signal level on the screen (the analogue bar).

OFF: Deactivates the monitor.

AGC TV: Tunner operation with automatic gain control. This mode reduces the signal inetrmodulation with a level higher than 85 dBμV . In this operating mode it is not possible to display the input level measurement, since the tuner gain varies as a function of the input level.
                The main utility of this new operation mode lies in the possibility of improving the image quality in situations close to tuner saturation.
                If a STORE is executed in this operating mode, the storage level is zero.
                When executing a RECALL (no matter what TV mode the user is in) of a memory saved in the AGC TV mode, the AGC TV message will be displayed in the level field until the user ceases to press the RECALL key.

4.2.5.1 Operation as a spectrum analyzer

To select the Spectrum Analyzer function, press the SPECT/2 [26] key.

The spectrum analyzer function allows the user to discover the signals present in each band of the area he is working in quickly and easily.

The frequency spectrum analysis may be conducted in the entire band selected in FULL SPAN mode, or in the proximity of the present tuning frequency in variable SPAN mode.

A vertical base bar appears on the left side of the monitor screen and the lobes representing the signals are shown horizontally, with the higher frequencies in the upper section of the screen and the lower frequencies in the lower section. The distance with respect to the base bar or the amplitude of the lobe represents its power and indicates the level measured with the field meter when tuning each frequency.
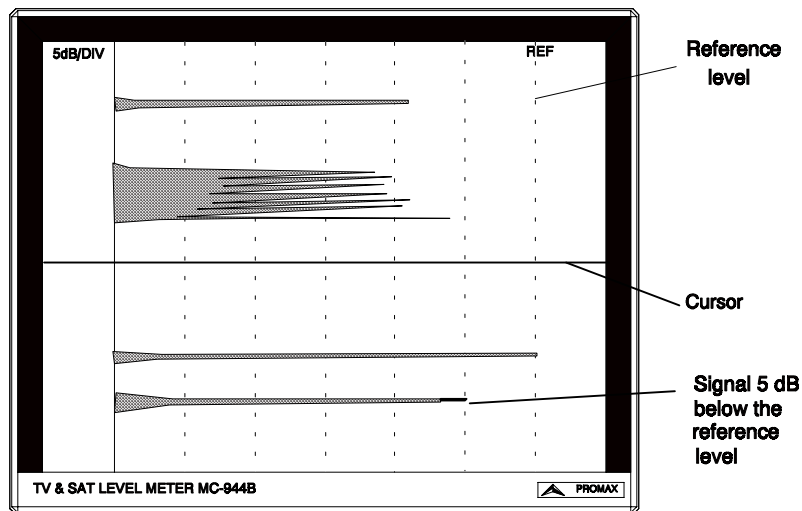

Figure 6.- Spectrum analyzer.

When SPECTRUM is selected, the display eliminates the level indication to display a reference value (REF. LV), which corresponds to a marker on the screen. This reference level is 70 dBµV and it can be modified using the ATT [35] key. The subdivisions that appear on the screen represent 5 dB each. In the spectrum mode the presentation of the tuning frequency remains deactivated on the display [14].

Select the FULL SPAN mode by pulling out the SPAN control [5]; the frequency spectrum analysis is executed in the entire band selected. A black horizontal line or marker representing the present tuning frequency appears on the screen. As the user moves the TUNE/SELECT control [9], the marker will move through the entire spectrum, allowing an approximate pre-tuning of the frequency corresponding to the lobe that coincides with the marker.

For the variable SPAN function, the SPECTRUM mode is selected by leaving the SPAN [5] potentiometer in the rest position (pressed in). The frequency spectrum analysis is conducted in the proximity of the tuning frequency and can reach zero SPAN. In this case, the entire screen corresponds to the same tuning frequency.

By choosing a specific SPAN and varying the tuning with the TUNE-SELECT [9] control, the user can slowly sweep the entire band of the selected frequencies.

When the SPECT/2 [26] key is pressed again, the **MC-944B** returns to the normal operating mode, the monitor displays the tuned frequency and the display indicates the value of the frequency or channel at the position of the cursor and the level measured at that point.

One of the applications of the **MC-944B** operating as a spectrum analyzer is in the search for the best orientation and position of the receiving antenna. This is particularly important in UHF, because such high frequencies are involved, with wavelengths ranging from 35 cm to 65 cm, if the antenna is shifted only a few centimetres, the relationship between the picture, chrominance and sound carrier frequencies change, affecting the quality of the picture in the receiver.

If there is an excess in the sound carrier, tearing or "moire" may appear on the screen due to the frequency beats between the sound, chrominance and the picture frequencies.

If there is a chrominance carrier defect, then the television colour amplifier must function at maximum gain, which could result in noise appearing all over the television screen, with points of colour that disappear when the saturation control is reduced; in an extreme case, loss of colour may occur.

4.2.5.2 Operation in SYNC mode

This function displays the line synchronizing pulse corresponding to a tuned signal on the monitor.

To select the SYNC (synchronizing) function, press the MODE/3 [27] key and use the TUNE/SELECT [9] dial to choose TV + LV + SY. Then press the MODE/3 [27] key again.

The monitor is divided into three sections. In the top section an analogue bar appears which indicates the level of the signal received. On the lower left the line synchronizing pulse is represented as it would appear on the display of an oscilloscope. In the lower right the TV picture is shown, shifted to the right.

With the SYNC function the user can analyze the amplitude and quality of the line synchronizing pulse of a television signal. This allows the optimum orientation of the antenna, eliminating indirect reception beams that cause double images. In addition, this function will detect any antenna amplifier saturation that may be caused by a signal excess, as well as a faulty adjustment of the bandwidth caused by a lack of chroma in the amplitude of the burst.
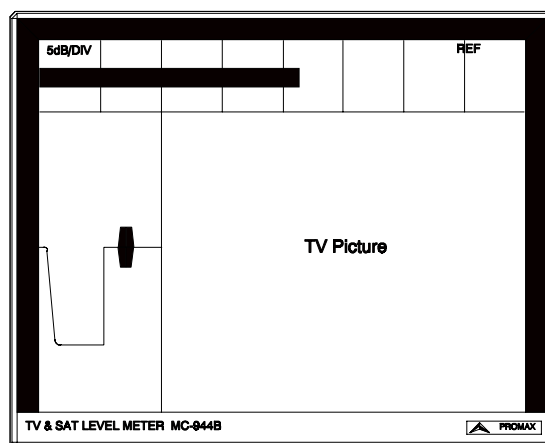

Figure 7.- Line synchronism + Level + TV.

4.2.6 Configuration memory

To facilitate measurement, the **MC-944B** is able to store up to 99 configurations in an internal memory. In this way, it is possible to select the most common transmissions in a working area with their corresponding configurations quickly and easily.

If the battery is changed, the stored configurations are saved indefinitely. The present configuration of the instrument is saved only as long as the battery remains connected.

The following parameters are stored in each configuration:

> The name of the program
> The frequency or channel number
> The band
> The input signal level at the time the configuration was saved
> The measurement units of the level
> Channel/frequency tuning mode
> Type of sound and/or frequency of the carrier

4.2.6.1 Storing a configuration

To store a particular configuration, follow this procedure:

1. Input the parameters of the desired configuration in the **MC-944B** (frequency/channel, band, etc.).

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2. Press the STO [36] key. The indication STO >> 01 will appear on the display [14]. With the TUNE/SELECT [9] dial or with the numerical keyboard, select the memory number in which the configuration will be stored. During the process of adjusting the instrument, a single initial configuration is stored in all the memories by default.

   If a configuration is stored in a memory location already containing information, the old data will be lost.

3. Assign a name to the memory location (optional). Press the DATA/. [24] key and use the TUNE/SELECT [9] dial to choose the first letter of the name. Once it is selected, press the DATA/. [24] key again and choose the second character. Repeat this process up to a maximum of four characters.

4. Finally, press STO [36] and the configuration will be stored. If any other key is pressed, an error will be indicated and the memory will not be updated.

4.2.6.2 Retrieving a configuration

Press the RCL [37] key. The indication REC >> 01 will appear on the display [14] and the name, if exists, assigned to that memory. With the TUNE/SELECT [9] dial or with the numerical keyboard, indicate the configuration to be retrieved (a number between 1 and 99). Pressing the RCL [37] key again will retrieve the configuration. As has already been indicated, a signal measurement level is stored in each memory location. This value can be displayed by pressing the RCL [37] key when retrieving the content of the memory.

If the user wishes to store a new reading associated with a memory location (e.g. 5), he must input RCL 5 followed by STO 5:

> RCL [37]
> TUNE/SELECT [9]
> RCL [37]
> STO [36]
> TUNE/SELECT [9]
> STO [36]

4.2.7 Measurement units selection

Push key dB/V [34]. Tunning TUNE/SELECT [9] let it choose measurement presentation units either dBμV, dBmV, dBm or linear units (μV, mV or V).

4.2.8 Selecting the attenuators

Press the ATT [35] key. By turning the TUNE/SELECT [9] dial selector, the user can select the attenuation in the RF ⊝ [7] input, from 0 to 100 dB in TV or from 0 to 60 dB in SAT, in intervals of 20 dB. Press the ATT [35] key again to activate the selected attenuation.

There is an AUTO position which selects the most appropriate attenuation as a function of the input signal level, in order to centre the value of the reading in the optimum scale.

If the spectrum analyzer mode (SPECTRUM) is selected, this key affects the reference level. (see section 4.2.5.1).

WARNING
The use of the attenuator automatic selection mode, is limited by the signal maximum level applied at the input of the equipment. If a sudden signal level variation is produced at the RF input, and it is beyond the total signal levels of:

> *TV: 95 dBµV*
> *SAT: 105 dBµV*

(typical values) the tune circuit may become out of control (PLL synthesized) giving as a result wrong level readings.

If this situation occurs, disconnect the input signal and select an attenuation of 60 dB or higher.

Similar effects can be observed when at the RF input appears an important number of carriers with a high level. To be able to determinate the equivalent level of a carrier group (with similar levels) at the RF input, it is possible to use the expression:

$$L_t = L + 10 \log N$$

L_t: total level
L: average level of the carrier group
N: number of carriers

So, if there are ten carriers with a level near to 85 dBµV, its equivalent level will be:

$$85 \ dB\mu V + 10 \log 10 = 95 \ dB\mu V$$

Observe that in this case if automatic attenuation mode is selected, loss of tuning by overload of the RF input may occur besides other effects such as tuner saturation and generation of intermodulation products that will mask the spectrum visualization.
The global result of this effects is, in the automatic attenuation mode, the difficulty to find the correct measurement scale or the presentation of incorrect measurements.

4.2.9 Selection of the sound mode

Press the SOUND/4 [28] key. By turning the TUNE/SELECT [9] dial, the user can chose the type of sound. Pressing the SOUND/4 [28] key again activates the selected sound type. Table 2 shows the possible sound types.

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When the LV function is selected, the speaker of the **MC-944B** emits a tone whose frequency depends on the level of the signal received. This is very useful when installing antennas, since the user can locate the peak signal without having to look continually at the display of the field meter, and therefore he can devote his full attention to the orientation process.

Selecting the AM and FM options enables the user to hear signals resulting from AM or FM modulation.

Type	Function	Band
4.50	Sound carrier 4.5 MHz above the picture carrier	Terrest.
5.50	Sound carrier 5.5 MHz above the picture carrier	Terrest.
5.74	Selects the second carrier in DUAL or STEREO transmissions, at 5.74 MHz of the picture carrier	Terrest.
5.80	Sound carrier 5.8 MHz above the picture carrier	SAT
6.00	Sound carrier 6.0 MHz above the picture carrier	Terrest.
6.50	Sound carrier 6.5 MHz above the picture carrier	Terrest. SAT
6.65	Sound carrier 6.65 MHz above the picture carrier	SAT
7.02	Sound carrier 7.02 MHz above the picture carrier	SAT
TUNE	Allows the manual tuning of the sound carrier, within a range of 4.00 to 9.00 MHz of the picture carrier	Terrest. SAT
NICA*	NICAM decodying	Terrest.
AM	AM demodulation	FM/TER
FM	FM demodulation	FM/TER
LV	Tone whose frequency varies with the signal level	All
OFF	Suppresses the sound	All

Table 2.- Sound modes.

* Note: *Once you have selected the NICAM option in the display, information about the type of NICAM and the rate error is shown, under the following pattern:*

"N" + error + type

error = qualitaty indication of the error rate:

"<": error rate < 1e-5
"5": 1e-5 < error rate < 1e-4
"4": 1e-4 < error rate < 1e-3
"3": 1e-3 < error rate < 2.7 e-3
">": error rate > 2.7 e-3

type = NICAM type:

"--": no NICAM is detected
"du": dual NICAM
"st": stereo NICAM
"mo" mono NICAM

4.2.10 The external amplifier or LNB power supply

To take measurements in satellite receiving systems, the LNB located in the focus of the receiving parabolic antenna must be powered. The **MC-944B** has two modes of operation for supplying this power. It is also possible to power the mast amplifiers in ground TV installations.

⚠ RF input

From DC up to 30 MHz

Maximum input: 50 V rms

4.2.10.1 EXT power supply

The **MC-944B** is connected in series in the line that links the LNB with the domestic or the SMATV master TV satellite receiver, as shown in Figure 8.

In this configuration the EXT position of the LNB voltage selector of the **MC-944B** is selected, and the receiver of SAT TV (household or master) supplies the power to the LNB.
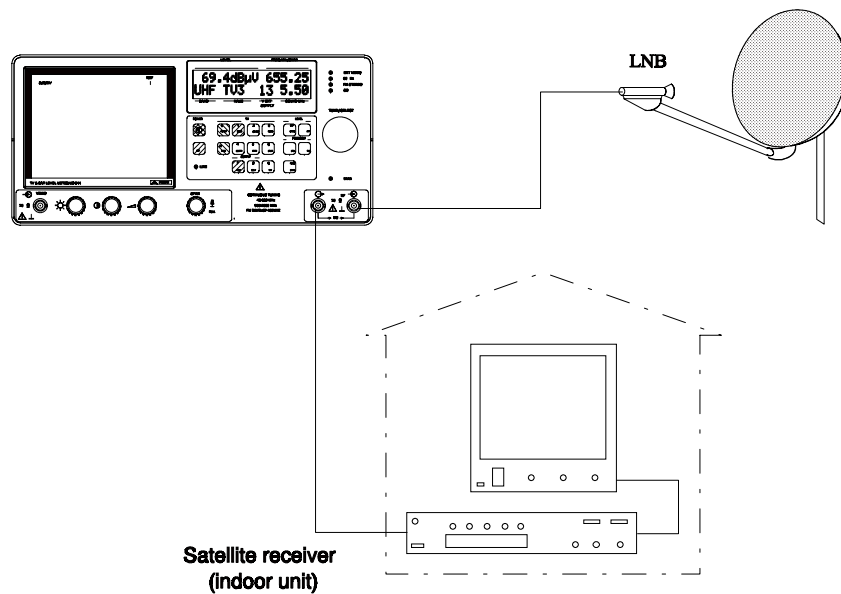
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Figure 8.- EXT power supply of the LNB.

WARNING

When supplying the external unit through the internal unit, make sure that the cable connected to the RF ⟳ [6] connector corresponds to the internal unit, and that the RF ⟳ [7] connector is connected to the external unit. If the internal unit is connected to RF ⟳ [7] and an external unit voltage is selected, the MC-944B and the internal unit will be connected to the opposite power supplies, which may damage one of the two pieces of equipment.

4.2.10.2 Internal power supply

The **MC-944B** can supply the voltage needed to power the External Unit. In this case, the user can select several power voltages from the panel, depending on whether it is a ground or satellite band. The maximum load is 5 W, in continuous loading.

Type of Television	Power voltages
SATELLITE	EXT, 13 V, 15 V, 18 V *
GROUND	EXT, 13 V, 15 V, 18 V, 24 V

Table 3.- Power voltages to the LNB or external unit.

* The supply voltage in satellite allows to superpose a square signal of 22 kHz with the object to realise switching functions. This signal becomes active when you select the wanted polarization option by underlining it.
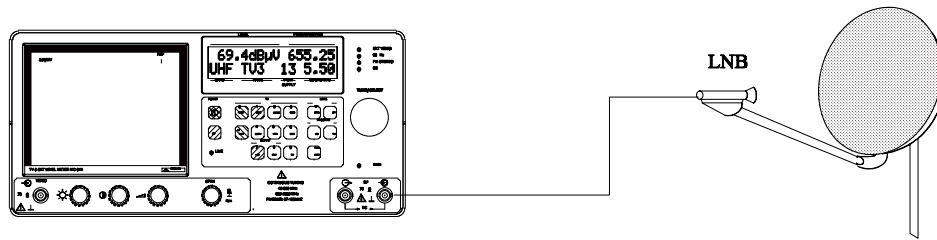
Figure 9.- Power supplied by the **MC-944B**.

It is possible to supply the double band LNB's and the LNB's with polarity switching by changing the power voltage.

The DRAIN [8] indicator lights when current is flowing to the LNB. If any kind of problem occurs (e.g., a short circuit), an error message appears on the display [14] and the instrument ceases to supply power. The **MC-944B** does not return to its normal operating state until the problem has been solved.

When the mA/V/7 [31] key is held down, the lower line of the display [14] indicates the real voltage and current being supplied to the LNB. This measurement is taken even when an external supply has been selected.
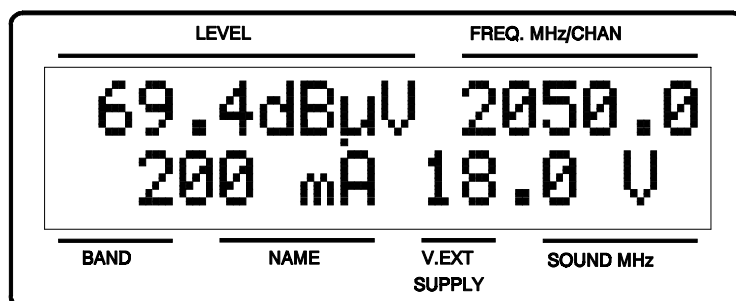

Figure 10

WARNING

When the LNB is powered with one of these voltages, particulary 18 V or 24 V, it is not advisable for the instrument to function for more than three minutes non-stop. Since the total consumption is very high, the duration of the battery charge is shortened considerably. It is advisable to disconnect the instrument when it is not taking measurements.

4.2.10.3 Selecting the voltage supplied to the LNB or external unit

Press the SEL V/8 [32] key and use the TUNE/SELECT [9] dial to select the voltage supplied to the LNB or external unit. Press the SEL V/8 [32] key again to activate the selected voltage.

4.2.11 ZOOM function

Pressing the ZOOM/1 [25] key amplifies the picture horizontally. In this way, the user can note defects in the picture that otherwise would be difficult to see.

4.2.12 Teletext

When the TXT/9 [33] key is pressed, Teletext information appears on the monitor if a transmitter with this information is tuned. The first page to appear on the screen is always page 100. If Teletext data is received, a counter located on the upper edge of the screen indicates the page that is being processed. Using the DATA/. [24] key and then the three figures that correspond to the page number, the user can choose the page of Teletext to be displayed.

If the page requested is not included in the Teletext service of the transmitter, the search will continue indefinitely. In such a situation the user can halt the search process, either by exiting the Teletext function through the TXT/9 [33] key or by entering a new page number after pressing the DATA/. [24] key.

The Teletext function is especially valuable for the final optimization process in TV installations. Any interference or reception through indirect beams generates digital in the digital information of the Teletext, which are highly visible as erroneous characters on the screen.

4.2.13 Selection of advanced functions

The FUNCT/0 [23] key enables the user to execute advanced functions, such as selecting the TV standard or finding out the software version.

To select a particular function, press the FUNCT/0 [23] key and then the number of the desired function on the numerical keyboard. Two figures must be input, although the first one may be '0'. In the present version the control program allows the user to select the advanced functions shown in the table 4.

Ten functions may be selected:

| Function	Name	Selectable values
00	STD TV *	B/G - D/K - I - L - M - N
01	MODE	REMOTE MODE
02	VERSION	Indication of software version
03	CH SET *	OIRT - CCIR - STD L - FCC
04	TUNE BW	NARROW - BROAD
05	VIDEO **	POSITIVE - NEGATIVE
06	BEEP	ON - OFF
07	F SAT **	50 Hz - 60 Hz
08	SEL. MEM.	Selects memories to print
09	PRINT	Print selected memories

Table 4.- Configuration functions.

*   Terrestrial TV
** Satellite TV

4.2.13.1 Selection of the TV standard

Select the 00 function (see section 4.2.13). By turning the TUNE/SELECT [9] dial selector, the user can select the desired standard. Pressing the FUNCT/0 [23] key again confirms the standard.

This selection only concerns the reception of ground TV signals.
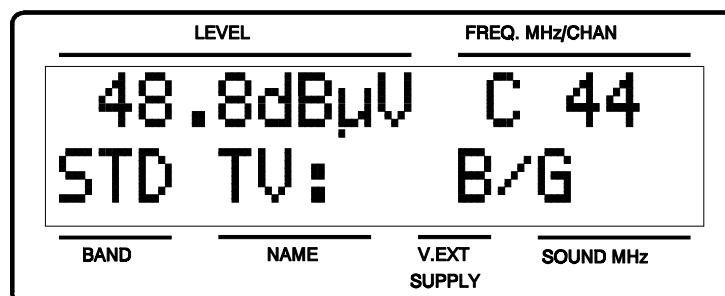
Figure 11.- Selection of the TV standard.

System	Lines/ frame	Channel Bandwidth	Video/sound separation	Video mode	Audio mode
B	625/50	7 MHz	5.5 MHz	Neg	FM
D	625/50	8 MHz	6.5 MHz	Neg	FM
G	625/50	8 MHz	5.5 MHz	Neg	FM
H	625/50	8 MHz	5.5 MHz	Neg	FM
I	625/50	8 MHz	6.0 MHz	Neg	FM
K	625/50	8 MHz	6.5 MHz	Neg	FM
L	625/50	8 MHz	6.5 MHz	Pos	AM
M	525/60	6 MHz	4.5 MHz	Neg	FM
N	625/50	6 MHz	4.5 MHz	Neg	FM

Table 5.- Selectable standards and their characteristics.

4.2.13.2 Selection of Remote Mode using keyboard

To control the **MC-944B** from a personal computer, the instrument must be switched to a state in which it is ready to receive the commands sent through the RS-232C connector. This mode of operation is called remote mode.

Press the FUNCTION/0 key followed by "0" and "1". It automatically enters REMOTE MODE. The instrument will remain in this mode until the FUNCTION/0 [23] key is pressed again.

Section 5 provides instructions for controlling the **MC-944B** from a computer and a description of the commands to be used.

4.2.13.3 Software version

When the 02 function is selected (see section 4.2.13), the instrument control software version appears on the display.

4.2.13.4 Selection of the channel set

Four channel sets are stored in the **MC-944B** to adapt the instrument to each country or selection area. These channel sets correspond to international organizations, such as the CCIR, the OIRT or the FCC.

Select the 03 function (see section 4.2.13). By turning the TUNE/SELECT [9] dial selector, the user can select the desired channel set. Pressing the FUNCT/0 [23] key again confirms the selection.

The available channel sets are:

CCIR - OIRT - STD L - FCC

See in Appendix A the list of frequencies to each standard.

4.2.13.5 Selection of the sound bandwidth

Select the 04 function (see section 4.2.13). By turning the TUNE/SELECT [9] dial selector, the user can choose between NARROW band and BROAD band tuning. Pressing the FUNCT/0 [23] key again activates the selected mode. The choice between NARROW and BROAD band tuning depends on the bandwidth used by the transmission. The main application of this option is in satellite TV.

The values of the two possibilities are:

NARROW: 150 kHz
BROAD: 280 kHz

4.2.13.6 Selection of the video polarity

Select the 05 function (see section 4.2.13). By turning the TUNE/SELECT [9] dial, the user can choose between POSITIVE and NEGATIVE polarity. Pressing the FUNCT/0 [23] key again activates the selected polarity.

This option affects signal reception in the SAT (satellite) band.

4.2.13.7 Activating/deactivating the audible indicators

The **MC-944B** is equipped with a built-in speaker that emits a tone each time a key is pressed or the TUNE/SELECT [9] dial is turned (except when changing the frequency). This tone can be activated or deactivated at will.

Select the 06 function (see section 4.2.13). By turning the TUNE/SELECT [9] dial selector, the user can choose between sound ON (activated) and sound OFF (deactivated). Pressing the FUNCT/0 [23] key again activates the selected function.

4.2.13.8 Selection of frame frequency (SAT)

The frame frequency of satellite transmissions can be 50 or 60 Hz. The 07 function, allows the user to select the appropriate frequency for each transmission.

Select the 07 function (see section 4.2.13). By turning the TUNE/SELECT [9] dial selector, the user can choose either 50 Hz or 60 Hz. When the FUNCTION/0 [23] key is pressed again, the selected frequency is activated. When a TV STD is selected, this parameter is upgraded to the correct value (e.g. Standard M selects a frequency of 60 Hz).

4.2.13.9 Selection and printing of memories

The printer connection allows to obtain, on site, printing for a preprogrammed measurement sequence. This is a simple and effective way to get an installation archive for a given place or get documentation related with level measurement, for further analysis.

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The installation procedure is reduced only, to connect the provided cable to the **MC-944B** serial connector. Before this operation, turn the power off of both equipments.

The **MC-944B** serial connector is placed at the side panel, as shown in the figure 3 (connector [45]).

The RS-232C connector allows us the remote control of the **MC-944B** from a personal computer, and the data dumping to a printer. (See section 5.8).

The printer related functions are numbers **'08'** y **'09'** To select a particular function, press the FUNCT/0 key in the **MC-944B** and then, the number of the desired function on the numeric keypad. Two digits must be input, although the first one is a '0'.

The printing of the measurement process, takes place in three steps. At the first one, the user determines the frequencies and measurement conditions, by configuring **MC-944B** for each situation to measure. The different settings must be stored at consecutive memory positions (any free number between 01 and 99).

The next step is to use the **Function 08** to store the initial and final memory numbers to use for the measurement sequence (i.e. for memory 01 to 19) This values will be memorized until they will be modify using the same function or by doing a RESET or by battery disconnection.

Finally, use the **Function 09** to start the measurement sequence, as follows:

1) Retrieve the configuration stored at the first specified memory.

2) Make the level measurement related to the main carrier.

3) Make the level measurement of the sound carrier, it depends on the current TV standard.

4) Calculate the difference between the two carriers.

5) The results are printed with a 24 columns format, as shown in the next figure.

PROMAX   MC-944B

Fr C MHz	Lv C dBμV	Fr S MHz	Lv S dB

LOCATION:
TEST P:
DATE:
TIME:
SIGNATURE:

< 02 >   TV3   Ch   40

623.25	84.1	5.50	- 13

< 03 >   Ch   45

663.25	< 21	5.50	- 14

< 04 >   TV1   Ch   50

703.25	< 20	5.50	- 12

4.2.13.9.1 Selection of printing memories

When execute the **Function 08**, it appears in the **MC-944B** second line of the alphanumeric display, the message **"FIRST MEMORY: 01"**. Now introduce the two digits corresponding to the number of the first memory to use at the measurement sequence. Afterwards appears the message **"LAST MEMORY: 01"** and introduce two digits of the last memory position to use in the measurement sequence. Note this values will be stored in non-volatile memory for later use in all the callings to the function 09.
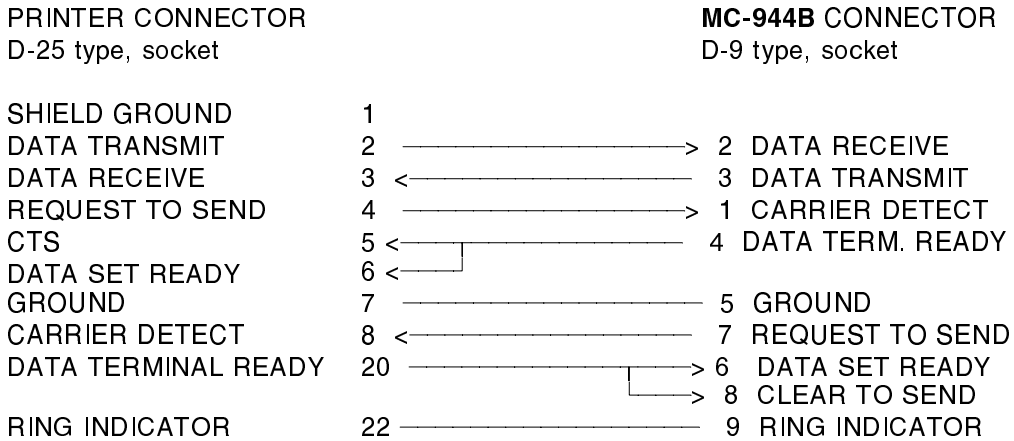
4.2.13.9.2 Printing process

When execute the **Function 09**, the **MC-944B** will start the measurement sequence and printing. The second line of the alphanumeric display shows the equipment status, by displaying the blinking message **"PRINTING..."**.

If there is no printer connected, the message **"NO PRINTER"** appears on the display.

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4.2.13.10 Connection of the MC-944B to a serial printer

The hardware and the control lines of the RS-232C serial port of the **MC-944B** have been designed for connection with a printer of the CI-23 type. In this case the connection between the **MC-944B** and the printer can be made through a data transfer cable with the following connection:

```
PRINTER CONNECTOR                                MC-944B CONNECTOR
D-25 type, socket                                D-9 type, socket

SHIELD GROUND          1
DATA TRANSMIT          2  ──────────────────>  2 DATA RECEIVE
DATA RECEIVE           3 <──────────────────   3 DATA TRANSMIT
REQUEST TO SEND        4  ──────────────────>  1 CARRIER DETECT
CTS                    5 <────┐────────────    4 DATA TERM. READY
DATA SET READY         6 <────┘
GROUND                 7  ──────────────────   5 GROUND
CARRIER DETECT         8 <──────────────────   7 REQUEST TO SEND
DATA TERMINAL READY   20  ──────────────┐───> 6 DATA SET READY
                                        └───> 8 CLEAR TO SEND
RING INDICATOR        22  ──────────────────   9 RING INDICATOR
```

In a case when the user opts for the connection to another serial printer, the handshake used by the **MC-944B** must be present.

- The following parameters are used for prinnting through the serial port:

  - 9600 bauds
  - 8 bits
  - No parity
  - 2 stop bits

- The control lines used are:

  - DATA TRANSMIT (pin 3, **MC-944B**)
    To send dato to the printer.

  - CLEAR TO SEND (pin 8, **MC-944B**)
    Data transfer control. Data are sent only when this line is active.

  - DATA TERMINAL READY (pin 4, **MC-944B**)
    This line is permanently active in order to indicate the establishment of the communication.

4.2.13.11 Bandwith satellite filter switching (FUNCT 10)

The **Function 10** lets the bandwith satellite filter switching switching between 18 MHz and 27 MHz.

5 DESCRIPTION OF THE INPUTS AND OUTPUTS

5.1 RF input

The RF input is through the RF ⊖ [7] connector on the front panel. The peak signal level should never exceed 130 dBμV. This is a BNC connector, and the input impedance is of 75 Ω.

5.2 RF output

The RF output to the receiver or internal unit is the RF ⊖ [6] connector on the front panel. This is a BNC connector, and the output impedance is of 75 Ω.

This connector allows the flow of a DC voltage from the internal unit which powers the LNB, without interrupting the RF. Therefore, it is possible to take measurements and still receive signals. The user must take account of the fact that at the output through this connector, the signal is attenuated in approximately 20 dB (see the specifications).

5.3 IF OUT output

This is a 38.9 MHz IF output. It is a BNC connector, and the output impedance is of 75 Ω.

5.4 Composite video input

The composite video input is the VIDEO ⊖ [1] connector on the front panel. This is a BNC connector and the input impedance of 75 Ω.

ATTENTION
Maximum level in this input should not surpass 3 Vpp

5.5 Composite video output (BNC)

The composite video output is through the VIDEO OUT [42] connector on the side panel. This signal has a positive polarity and negative synchronisms, in a black level of 0 V. It is a BNC with an output impedance of 75 Ω.

WARNING ⚠
This signal should not be connected at any circuit points with voltage, only to standard video signal inputs with 75 Ω impedance. Any damage to the instrument as a result of ignoring this precaution is not covered in the warranty.

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5.6 SAT BB OUT output

Through this BNC connector located on the side panel of the **MC-944B**, a base band TV signal is obtained without eliminating the low frequency triangular modulation known as "Energy dispersal". This signal, obtained directly from the tuner is an appropriate D2-MAC detector circuit input. The detector output can be introduced in the VIDEO ⊖ [1] video input to monitor the channel detected. This is a BNC connector, and the output impedance is of 75 Ω.

5.7 Euroconnector (DIN EN 50049)
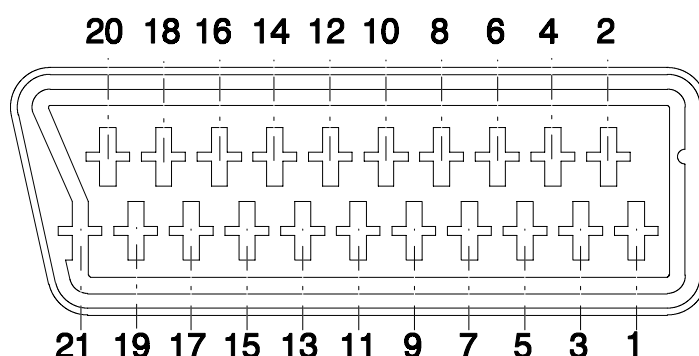
Figure 12.- Euroconnector (external view).

Also known as SCART connector or PERITEL connector (in conformity with standard NF-C92250). The signals in this connector are the following:

PIN No.	SIGNAL	CHARACTERISTICS
1	Right channel audio output	
2	Right channel audio input	
3	Left channel audio output	
4	Audio grounding	
5	Blue grounding (B)	
6	Left channel audio input	
7	Blue output (B)	
8	Switching voltage	(not connected)
9	Green grounding (G)	
10	Digital bus interface	(not connected)
11	Green output (G)	
12	Digital bus interface	(not connected)
13	Red grounding (R)	
14	Digital bus reserved	(not connected)
15	Red output (R)	
16	Blanked signal	(not connected)
17	Composite video grounding	
18	Blanked return	(not connected)
19	Composite video output	
20	Video input	
21	Connector shield grounding	

Table 6.- Description of the Euroconnector.

5.8 RS-232C Interface

Through the RS-232C connector it is possible the control of the **MC-944B** through a remote controller (personal computer), the printers connection, etc. The signals in this connector are described in Table 7.
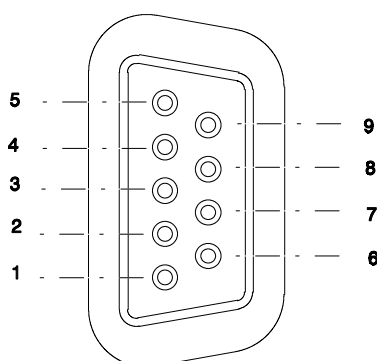
Figure 13.- RS-232C connector. External view.

PIN No.	SIGNAL	CHARACTERISTICS
1	Carrier detect	(not connected)
2	Data Receive (RxD)	
3	Data Transmit (TxD)	
4	Data Transmission Ready (DTR)	Set at +12 V
5	Connector grounding (GND)	
6	Data Send Ready (DSR)	(not connected)
7	Request to Send (RTS)	
8	Clear to Send (CTS)	
9	Ring Indicator	(not connected)

Table 7.- Description of the RS-232C connector.

5.9 Headphones output

It is located on the side panel of the instrument. It is an Jack connector compatible with mono or stereo headphones. The output is monaural except for the NICAM case, where the audition can be momo, stereo or dual, depending on the received NICAM. When this output is used, the speaker of the **MC-944B** is automatically deactivated.

If the user has selected the LV sound mode (see section 4.2.9), a tone is emitted whose frequency depends on the level of the signal received. This is very useful when installing antennas, since the user can locate the peak signal without having to look continually at the display of the field meter, and therefore he can devote his full attention to the orientation process.

As a modulated signals monitor: the user can hear the signals resulting from AM or FM modulation by selecting the appropriate sound mode (see section 4.2.9).

In both cases, control ◁ [4] enables the user to vary the sound volume.

6 REMOTE CONTROL WITH A PC

6.1 Introduction

The **MC-944B** has a RS-232C connector that allows the data interchange between the instrument and a remote controller, thus making possible data collection or control from a personal computer (configuration, memory setting, ...)
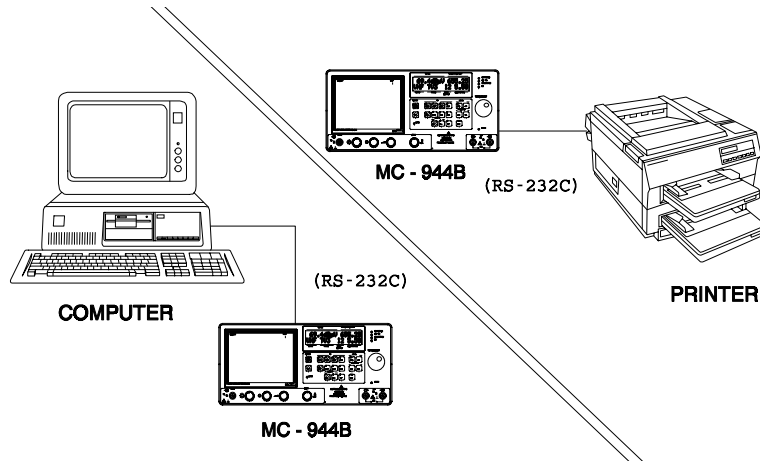

Figure 14.- RS-232C.

6.2 Communication protocol between MC-944B and a personal computer

This protocol is software controlled and uses a RS-232C link. The data and information is interchanged by using messages described in alphanumeric ASCII characters. This method ensures easy portability between different kinds of personal computers.

Communication Parameters: by using the RS-232C serial communication protocol, the following parameters must be selected at the **Remote Controller** (personal computer) in order to enable error free communication at both sides:

> 9600 bauds
> 7 bits per character
> No Parity
> 2 Stop bits

The connection cable uses only the pin 3 (TxD output) 2 (RxD input) and GND, and using several control codes (XON-XOFF) and (ACK-NAK) for software protocol implementation.

The steps for use the **MC-944B** in remote control mode are as follows:

1) Put the **MC-944B** in remote mode by using the **FUNCTION 01** feature (see section 6.3).

2) The **MC-944B** will issue a **XON** (11H) control code (each 1 s approx) to indicate to the remote controller that it's ready for remote operation; more exactly, for message reception.

3) At this time, the remote controller can send a message frame to the **MC-944B**. Each message frame is composed by the following fields:

    a) Frame header: '*' character with hex code 2AH.
    b) Message contents: string of ASCII characters that determine the kind of message and data transferred.
    c) End of frame code: carriage return character with hex code 0DH.

4) After each frame, the **MC-944B** will send an **XOFF** code (13H) asserting the message reception and stopping the data flow from the remote controller side.

5) At this time the **MC-944B** processor will evaluate the message format and/or data values. If the message frame is correct, the processor will execute the received command and, after completion, an acknowledge code **ACK** (06H) will be sent to the remote controller.

In case of any data or format error detection, a not acknowledge code **NAK** (15H) is sent indicating to the remote controller the error situation. If, after the frame evaluation, an error is detected, the **MC-944B** doesn't change its state nor modifies any functional parameter, and remains waiting for the next message frame.

6) If the command issued inside the message frame needs any kind of response from the **MC-944B**, this response will follow the **ACK** code.

7) After the command is completely executed and answered, the **MC-944B** sends again an **XON** code, going back to the step 3.

Example:

REMOTE CONTROLLER		**MC-944B**
1)	<——	XON
2) *?B<CR>	——>	
3)	<——	XOFF
4)	<——	ACK
5)	<——	*B3<CR>
6) ...wait...		
7)	<——	XON

(all characters are in ASCII code)

Command Format: the structure of each message frame depends on the command sent. For each command the message has a strictly defined fields that must be strongly observed for command success. As previously indicated, the **MC-944B** command processor has a message recognition algorithm that discards and completely ignores the format erroneous frames. Also these frames that are recognized as well structured ones but are not consistent with the instrument status are rejected by ignoring them and issuing a **NAK** code. For example, if you try to set a 5.5 MHz sound carrier when the FM band is selected, even if the message format is correct, a **NAK** code will be issued.

For all message frames, take as a rule, that all alphabetic characters must be uppercase; all commands or data issued in lowercase will lead to a **NAK** message and will not be executed.

6.3 Selection of Remote Mode

When the **MC-944B** is turned on, you can select the remote mode using keyboard and FUNCTION 01 (see section 4.2.13.2). However, you can select also the remote mode from remote controller if the **MC-944B** is turned off. The sequence is:

1) Send any character from remote controller to **MC-944B**.

2) **MC-944B** will turn on and will select automaticly remote mode (this operation will remain about 2 seconds), and return a XON control code (11H) each second, approximately.

3) Now, you have 5 seconds to send a frame to the **MC-944B**. The equipment will turn off if you don't send any frame in this period of time. You can select any frame except ***Zd1d2d3** (see section 6.4).

NOTE: During the turn on transient and before the MC-944B selects remote mode, it is possible to detect some activity at RS-232C bus.

6.4 Command reference

The basic commands of the **MC-944B** are the following:

B	RF band selection
A	attenuation selection
F	synthesized frequency selection
T	TV standard selection
I	SAT video mode selection
C	TV channel number selection
H	select a channel set
O	return to local mode
S	set sound mode
M	store memory information contents
E	set TV display mode
X	select LNB supply voltage
Y	write a message to the **MC-944B** display
P	restores the display to its normal operation mode
J	sets the sound filter bandwidth
Z	sets teletext
QS	sets spectrum mode
QF	sets frame frequency in SAT band
QU	sets units in level measuring
QM	sets the equipment with the contents of "n" memory
QT	turn off the equipment
?c	ask the **MC-944B** for an internal information. The **c** parameters is defined as follows, depending of the kind of information requested:

B	current band
A	attenuation value
F	current synthesized frequency
V	software version
T	current TV standard
I	returns the SAT video mode
L	current input signal level

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C	current channel number
H	returns the selected channel set
S	current sound mode
E	current TV display mode
X	current LNB supply voltage
M	returns selected memory number contents
QS	returns spectrum function state
QV	returns program version (both µC)
QU	returns measurement units
QB	returns battery voltage
QL	returns LNB supply voltage
QI	returns the current value supplied to LNB

All characters must be understood based on a 7 bit ASCII code. Those fields indicated as a lowercase letters are variables and the exact contents must be selected depending on the actual sense of the message.

Bd: Band selection

d:	'1':	UHF	(450.00 to 860.00 MHz)
	'2':	VLO	(46.00 to 169.93 MHz)
	'3':	VHI	(170.00 to 449.93 MHz)
	'4':	FM	(87.00 to 109.00 MHz)
	'5':	IF	(38.9 MHz)
	'6':	SAT	(950.0 to 2050.0 MHz)

Example: *select SAT band ->   *B6<CR>*

Ad: Select the attenuator value

d:	'1':	0 dB
	'2':	20 dB
	'3':	40 dB
	'4':	60 dB
	'5':	80 dB
	'6':	100 dB
	'7':	AUTO

(options 1...6 force the attenuator control to a fixed mode)

Example: *fix attenuators to 100 dB -> *A6<CR>*

Fca1a2b1b2: Selects de band and synthesized frequency. Because the **MC-944B** has different synthesis circuits, a band parameter is used to select between them.

c: band indicator

c= 'S': satellite band
c= 'T': terrestrial bands (VLO, VHI and UHF)
c= 'M': FM band
c= 'I': IF pseudoband (38.9 MHz). In this case the remaining frame information must be present but will be ignored, because the unique frequency value allowed.

a1a2b1b2: value for PLL divider (ASCII coded)

a: PLL byte high
   a1: nibble high
   a2: nibble low

b: PLL byte low
   b1: nibble high
   b2: nibble low

The synthesized frequency is related to the PLL divider value by the following expressions:

f=0.125*ab - 479.5 (satellite band)
f=0.0625*ab - 38.875 (terrestrial band)

(Units are in MHz and **ab** values in hexadecimal)
(38.875 & 479.5: theoretical IF values)

Example: *program a frequency of 90.5 MHz in FM band, from the remote controller ->*   **FM0816<CR>*

Td: Modify the TV standard

d: '1':   B/G
   '2':   D/K
   '3':   I
   '4':   L
   '5':   M
   '6':   N

Example: *select D/K standard ->*   **T2<CR>*

Id: Select a SAT video mode.

d: '1':   video positive (V+)
   '2':   video negative (V–)

Example: *select V+ mode ->*   **I1<CR>*

Cn1n2: Selects a standard TV channel by number. The channel number must be a valid one for the current valid set, if not, a **NAK** will be issued.

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n: channel number (hex value)

n1: nibble high
n2: nibble low

Example: *select the decimal channel number 33 ->   *C21<CR>*

Hn: Select a set of channels

n: channel set code

'1': CCIR
'2': STANDARD L
'3': FCC
'4': OIRT

Example: *select the CCIR channel set ->   *H1*

O: Put the **MC-944B** in local mode

Example: **O<CR>*

Stn1n2n3: Select the sound type.

t: hex code for sound type

'1':   AM
'2':   FM
'3':   LV
'4':   OFF
'5':   TUNE
'6':   4.50
'7':   5.50
'8':   5.74 DUAL second carrier
'9':   6.00
'A':   6.50
'B':   6.50, STD L demodulation
'C':   5.80
'D':   6.65
'E':   NICAM
'F':   7.02

n1n2n3: Hex value for the PLL divider (in ASCII code). If the selected sound
mode isn't TUNE, the PLL divider value has no sense, so this field is
discarded, but must be present.

n1: most significative nibble
n2
n3: less significative nibble

The synthesized frequency is related to the PLL divider value by the following expression:

f=0.01*n - 10.7 (MHz)   (n decimal value)

Example: *synthesize a 5.5 MHz. in TUNE mode ->   *S5654<CR>*

Mp1p2n1n2n3n4f1f2f3f4f5l1l2l3l4uds1s2s3s4: Store the complete information for a program memory.

p: program memory number

p1: nibble high
p2: nibble low

n: program name

n1,n2,n3 and n4:   printable 7 bits ASCII code (codes between 20H and 7FH).

f: frequency or channel number

frequency:
f1: band code
f2..f5: PLL divider
(with the same format as in **'F'** command)

channel:
f1..f3: don't care
f4f5: channel number (with the same format as in **'F'** command)

l: level value

l1: overrange or underrange indicator
l2..l4: level hex value in tenths of dBμV
(see the appropriate format in command ***?L**)

u: code for display [14] level units

u='B' logarithmic units (dB)
u='V' linear units (V)

d: channel/frequency mode

d='C' channel display [14] mode
d='F' frequency display [14] mode

s: sound mode

s1: sound code option
s2..s4: sound PLL divider value
(with the same format as in **'S'** command)

Example: *store, in program memory 6, the a broadcasting station named 'ADKJ' transmitting at 455.25 MHz in the UHF band. Display frequency in dB units. Sound carrier fixed to 5.50 MHz, and with a memorized level value of 60 dBμV -> *M06ADKJT1EE2=258BF7000<CR>.*

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Ed: TV mode selection command

d: '1': OFF
'2': TV
'3': TV+LV
'4': TV+LV+SY
'5': LV
'6': AGC TV

Example: *programming TV+LEVEL mode: *E3<CR>*

Xd: Select the LNB supply voltage

d: '1': EXT
'2': 13V
'3': 15V
'4': 18V
'5': 24V
'6': 13V + 22 kHz
'7': 15V + 22 kHz
'8': 18V + 22 kHz

Example: *Select external LNB supply voltage -> *X1<CR>*

Ys1...s16: Shows a text string s1...s16, ASCII coded, in the inferior line of the **MC-944B** display [14]. As with other commands, all 16 characters must be sent, filling with blancs, if needed, for those positions not used. If less than 16 characters are sent, other raw nonsense data should be displayed.

Example: **Y REMOTE MODE <CR>*

P: Restores the second display [14] line to its normal operation. This command is useful after a previously issued **'Y'** command, to retrieve the information usually displayed in the second line of **MC-944B**.

Example: **P<CR>*

Jd: In TUNE selection, sets the band width of sound filter.

d: 1 (NARROW)
2 (BROAD)

Example: **J1<CR>*

Zd1d2d3: Sets Teletext
d: Page
d1: Most significant decimal digit
d2:
d3: Least significant decimal digit

If page = 0, then quit Teletext mode.

Q...   Indicates extended command

QSd: Sets spectrum mode
         1: Spectrum mode OFF
         2: Spectrum mode ON

QFd: Sets frame frequency in SAT band
         1: 50 Hz
         2: 60 Hz

QUd: Sets units in level measuring
         1: dBµV
         2: dBmV
         3: dBm
         4: Linear

QMn1n2:   Sets the equipment with the contents od "n" memory
         n: Hexadecimal memory number
         n1: High nibble
         n2: Low nibble

QT: Turn off the equipment

QWd: Select satellite filter.

d: '1': 18 MHz
    '2': 27 MHz

?c: Ask to the **MC-944B** for a specific information related to the equipment status or information about the selectable options.

c: 'B':   returns the selected band (see the answer format in **'B'** command explanation).

         Example: *?B<CR>   answer ->   *B2<CR>

    'A':   returns the attenuator position (see the answer format in **'A'** command explanation).

         Example: *?A<CR>   answer ->   *A3<CR>

    'F':   after issuing this command, the **MC-944B** returns the synthesized frequency value (answer format as in **'F'** command).

         Example: *?F<CR>   answer ->   *FM0816<CR>

'V':   returns the software version, with the following format: Vd1.d2d3, where:

d1: most significative digit
d2:
d3: less significative digit

Example: *?V<CR>   answer ->   *V1.00<CR>

'T':   returns the TV standard selected (answer format as in **'T'** command)

Example: *?T<CR>   answer ->   *T1<CR>

'I':   returns SAT video mode (answer format as in **'I'** command)

Example: *?I<CR>   answer ->   *I2<CR>

'L':   returns the current measured level, with the following format: Lcn1n2n3, where:

c: overrange/underrange character indicator

'=': normal reading
'>': overrange
'<': underrange

n: level hex value, in tenths of dBµV

n1: most significative nibble
n2
n3: less significative nibble

Example: *?L<CR>   answer ->   *L=355<CR>   (i.e. 85.3 dBµV)

Note: *The reading of the content of a memory with a level 0, means that the memory was recorded when the instrument was in AGC TV mode.*

'C':   returns the synthesized TV channel (answer format as in **'C'** command)

Example: *?C<CR>   answer ->   *C21<CR>

'H':   returns the selected channel set (see answer format in **'H'** command)

Example: *?H<CR>   answer ->   *H1<CR>

'S':   returns the sound type (see answer format in **'S'** command)

Example: *?S<CR>   answer *S7000<CR>

In NICAM, the message that sends the **MC-944B** is:

* SE0d1d2 <CR>

where

d1 = error	d2 = type
1: "<"	1: "--"
2: "5"	2: "mo"
3: "4"	3: "st"
4: "3"	4: "du"
5: ">"	

Example: *?S<CR>   answer   *SE024<CR>

The the NICAM sound option is selected and it is detecting DUAL mode, with an error rate between 1e-5 and 1e-4.

'E':   returns the selected TV mode (answer format as in **'E'** command)

Example: *?E<CR>   answer ->   *E2<CR>

'X':   returns the LNB supply voltage (see answer format in **'X'** command)

Example: *?X<CR>   answer ->   *X1<CR>

'M':   returns the information contents into the given program memory number. The asking message format is: Mn1n2, where:

n1: nibble high
n2: nibble low
(answer format as in **'M'** command)

Example: *?M06   answer ->   *M06ADKJT1EE2=258BF7000<CR>

'QS': returns spectrum function state (see spectrum format)

Example: *?QS<CR> answer *QS1<CR>

'QV': returns QVd1.d2/t1.t2 program version
            d: version of main μC
            t: version of secondary μC

            d1/t1: most significant decimal digit
            d2/t2: least significant decimal digit

Example: *?QV<CR>   answer   *QV2.4/2.0<CR>

'QU': returns measurement units (see measurement units format).

Example: *?QU<CR> answer   *QU1<CR>

'QB': returns battery voltage in hexadecimal, in volt tenths.

    Example: *?QB<CR> answer *QB7C<CR> (12.4 V)

'QL': returns LNB supply voltage in hexadecimal, in volt tenths.

    Example: *?QL<CR> answer *?QL9A<CR> (15.4 V)

'QI': returns the current value supplied to LNB in hexadecimals, where each unit is 2 mA.

    Example: *?QI<CR> answer *?QI5C<CR> (184 mA)

'?QW' returns the satellite filter selected

    Example: *?QW<RET> answer *QW2

Note
MC-944B has a system detection of incompatible options, and therefore it will only accept the options described in this section when they are compatible. For example, if you try to adjust the sound class = 5.5 when you have previously selected the FM band, you will get NOT ACKNOWLEDGE as an answer.

7 MAINTENANCE

7.1 Replacing the fuses

7.1.1 Replacing the mains fuse

The fuse compartment is placed in the mains base (see fig. 3).

To substitute the fuse disconnect the power cord. With an appropiate screwdriver remove the fuse compartment cover.

Substitute the melt fuse for another of 2,5A F 250V.

7.1.2 Internal fuses which user cannot replace

F1   DC/DC conversor 6A T 250V
F1   Battery load   2A F 250V

7.2 Replacing the Battery

The average life of the battery is 4 years if it has been kept in optimum operating conditions. Therefore, it must be replaced every four years or whenever the capacity of the fully-charged battery is noticeably diminished. To change the battery, follow the procedure indicated in Figure 15.
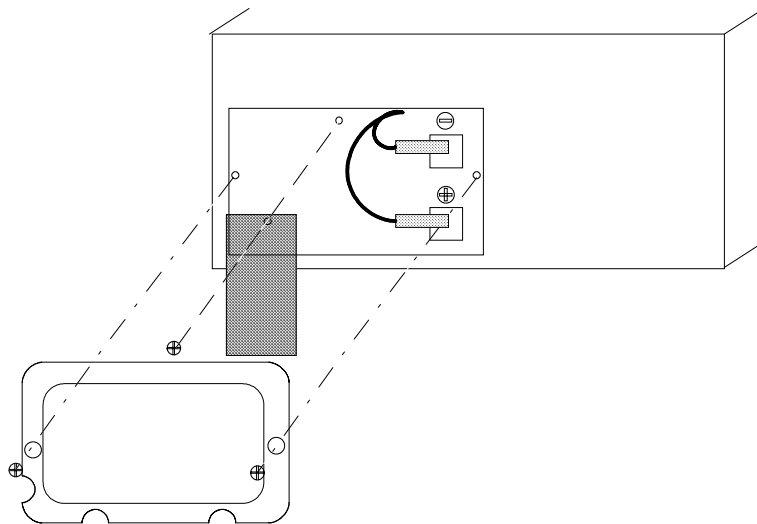
Figure 15.- Replacing the battery.

- Remove the attachment screws from the top cover of the battery compartment which is located in the rear of the device.

- Remove the battery compartment cover.

- Remove the screw from the attachment flange of the battery and take it out.

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- Disconnect the connection terminals of the battery and replace it with a new one. Take care with the polarity (red-positive, black-negative) of the terminals.

- Insert the attachment flange again and tighten the screw.

- Replace the rear cover and attach it with the corresponding screws.

WARNING ⚠️

Avoid any type of short circuit among the cables connected to the battery, since the resulting high current may cause serious damage to the instrument.

7.3 Cleaning the cover

> **CAUTION**
>
> **To clean the cover, take care the instrument is disconnected**

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

The cover should be cleaned by means of a light solution of detergent and water applied with a soft cloth. Dry thoroughly before using the system again.

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