

User's Manual

PMM 9010

EMI SIGNAL ANALYZER 10 Hz ÷ 30 MHz

EQUIPMENT SERIAL NUMBER

You can find the Serial Number on the rear panel of the instrument.

Serial Number is in the form: 0000X00000.

The first four digits and the letter are the Serial Number prefix, the last five digits are the Serial Number suffix. The prefix is the same for identical instruments, it changes only when a configuration change is made to the instrument.

The suffix is different for each instrument.

NOTE:

If the instrument is used in any other way than as described in this Users Manual, it may become unsafe

Before using this product, the related documentation must be read with great care and fully understood to familiarize with all the safety prescriptions.



To ensure the correct use and the maximum safety level, the User shall know all the instructions and recommendations contained in this document.

This product is a **Safety Class I** instrument according to IEC classification and has been designed to meet the requirements of EN61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use).


In accordance with the IEC classification, the battery charger of this product meets requirements **Safety Class II** and **Installation Category II** (having double insulation and able to carry out mono-phase power supply operations).









This product has a **Pollution Degree II** normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.





The information contained in this document is subject to change without notice.

EXPLANATION OF ELECTRICAL AND SAFETY SYMBOLS :

 You now own a high-quality instrument that will give you many years of reliable service. Nevertheless, even this product will eventually become obsolete. When that time comes, please remember that electronic equipment must be disposed of in accordance with local regulations. This product conforms to the WEEE Directive of the European Union (2002/96/EC) and belongs to Category 9 (Monitoring and Control Instruments). You can return the instrument to us free of charge for proper environment friendly disposal. You can obtain further information from your local Narda Sales Partner or by visiting our website at www.narda-sts.it.

	Warning, danger of electric shock		Earth
	Read carefully the Operating Manual and its instructions, pay attention to the safety symbols.		Unit Earth Connection
	Earth Protection		Equipotential

EXPLANATION OF SYMBOLS USED IN THIS DOCUMENT :

	DANGER	The DANGER sign draws attention to a potential risk to a person's safety. All the precautions must be fully understood and applied before proceeding.
	WARNING	The WARNING sign draws attention to a potential risk of damage to the apparatus or loss of data. All the precautions must be fully understood and applied before proceeding.
	CAUTION	The CAUTION sign draws attention against unsafe practices for the apparatus functionality.
	NOTE:	The NOTE draw attention to important information.

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SAFETY RECOMMENDATIONS AND INSTRUCTIONS

This product has been designed, produced and tested in Italy, and it left the factory in conditions fully complying with the current safety standards. To maintain it in safe conditions and ensure correct use, these general instructions must be fully understood and applied before the product is used.

- When the device must be connected permanently, first provide effective grounding;
- If the device must be connected to other equipment or accessories, make sure they are all safely grounded;
- In case of devices permanently connected to the power supply, and lacking any fuses or other devices of mains protection, the power line must be equipped with adequate protection commensurate to the consumption of all the devices connected to it;
- In case of connection of the device to the power mains, make sure before connection that the voltage selected on the voltage switch and the fuses are adequate for the voltage of the actual mains;
- Devices in Safety Class I, equipped with connection to the power mains by means of cord and plug, can only be plugged into a socket equipped with a ground wire;
- Any interruption or loosening of the ground wire or of a connecting power cable, inside or outside the device, will cause a potential risk for the safety of the personnel;
- Ground connections must not be interrupted intentionally;
- To prevent the possible danger of electrocution, do not remove any covers, panels or guards installed on the device, and refer only to NARDA Service Centers if maintenance should be necessary;
- To maintain adequate protection from fire hazards, replace fuses only with others of the same type and rating;
- Follow the safety regulations and any additional instructions in this manual to prevent accidents and damages.

EC Conformity Certificate

(in accordance with the Directives: EMC 89/336/EEC and Low Voltage 73/23/EEC)

This is to certify that the product: PMM 9010 Signal Analyzer

Produced by: NARDA S.r.l.
Safety Test Solution
Via Benessea 29/B
17035 Cisano sul Neva (SV) – ITALY

complies with the following European Standards :

Safety: CEI EN 60950 - CEI EN 60950/A4 – CEI EN 60950/A11

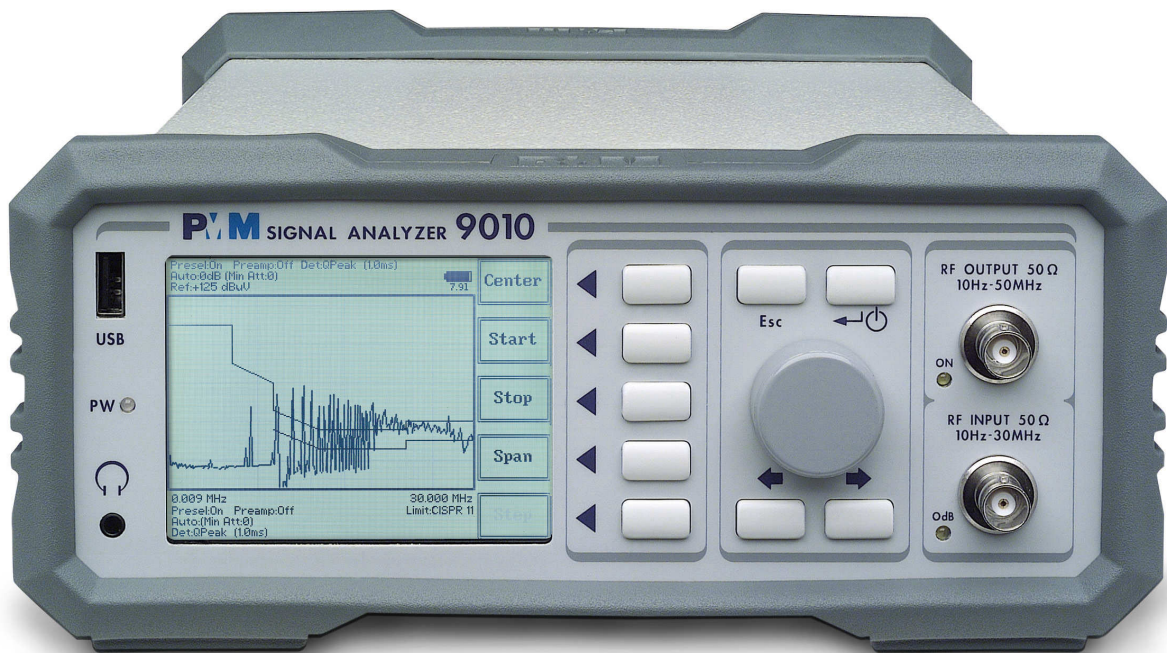
EMC: EN 61326-1 - EN 61326/A1

This product complies with the requirements of Low Voltage Directive 73/23/EEC, amended by 93/68/EEC, and with the EMC Directive EMC 89/336/EEC amended by 92/31/EEC, 93/68/EEC, 93/97/EEC.

NARDA S.r.l.

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1 – General Information



1.1 Documentation

Enclosed with this manual are:

- a service questionnaire to send back to NARDA in case an equipment service is needed
- an accessories checklist to verify all accessories enclosed in the packaging.

1.2 Operating Manual Changes

Instruments manufactured after the printing of this manual may have a serial number prefix not listed on the title page; this indicates that instruments with different Serial Number prefix may be different from those documented in this manual.

1.3 Introduction to PMM 9010

PMM 9010 is a powerful EMI receiver, fully CISPR 16-1-1, to measure conducted and radiated interferences from 10 Hz up to 30 MHz, or even up to 3 GHz when matched with PMM 9030 extension unit (optional). All measurements performed by the PMM 9010 are according to the most accepted standards like: IEC, CISPR, EN (EuroNorm), FCC, VDE,

Thanks to its built-in tracking generator, PMM 9010 is also suitable for designing, characterizing and testing RF filters, transducers and other components.

The PMM 9010 has been designed adopting an innovative philosophy made possible only in the recent years by the availability of superior technology components. This equipment is fully digital but the input preselector and attenuator – and, of course, the output stage of the internal reference tracking generator - and therefore combines into a pure EMI Receiver and Signal Analyzer the precision and accuracy of a numeric approach, with flexibility and user friendly approach typical of a modern instrument.

1.4 Instrument Items

PMM 9010 includes the following items:

- EMI Receiver from 10 Hz up to 30 MHz
- BP-01 Li-ion battery pack;
- External power supply/battery charger;
- Flexible black cover/accessories holding;
- BNC-BNC coaxial cable 2m length;
- RS232 cable, 2m;
- USB cable, 2m;
- Operating manual;
- PMM 9010 Utility Software on CD;
- Certificate of Compliance;
- Return for Repair Form.

1.5 Optional accessories

PMM 9010 can be used with several optional accessories, the most common being the following:

- PMM 9030 EMI Signal Analyzer 30 MHz - 3 GHz;
- 9010-BTA Serial Bluetooth Adapter;
- Single Channel Click option;
- L1-150: Single line LISN, 150A (50Ω//1 Ω+5μH);
- L2-16: Two lines, Single phase, 16A LISN, (50Ω//5 Ω+50μH);
- L3-32: Four lines, 3-phase, 32A LISN, (50Ω//5 Ω+50μH);
- L3-64: Four lines, 3-phase, 64A LISN, (50Ω//5 Ω+50μH);
- L3-100: Four lines, 3-phase, 100A LISN, (50Ω//5 Ω+50μH);
- L3-500: Four lines, 3-phase, 350A LISN, (50Ω//5 Ω+50μH);
- SHC-1: 35 dB CISPR Voltage probe, 1500Ω;
- SHC-2: 30 dB CISPR Voltage probe, 1500Ω;
- RA-01: Rod Antenna (10 kHz – 30 MHz).

1.6 Other accessories

Of course, the PMM 9010 can be used with other accessories available on the market, like:

- LISNs, any type;
- Antennas and Loops;
- Near Field Probes;
- Various TEM/GTEM Cells.

1.7 Main Specifications

Table 1-1 lists the PMM 9010 performance specifications.

The following conditions apply to all specifications:

- The ambient temperature shall be 0°C to 40°C

TABLE 1-1 Main Specifications	
Electrical Characteristics	Performance Limits
Frequency range	10 Hz to 30 MHz (CISPR-16-1-1 Full-Compliance from 9 kHz to 30 MHz)
Resolution	0,1 Hz
Frequency accuracy	< 1 ppm
RF input	Z _{in} 50 Ω, BNC fem.
VSWR ≥ 10 dB RF att.	< 1,2
VSWR 0 dB RF att.	< 2,0
Attenuator	0 dB to 35 dB(5dB steps)
Pulse limiter	Built in (selectable)
Preamplifier gain	20 dB (after preselector, selectable)
Max input level (without equipment damage)	
Sinewave AC voltage	137 dBμV (1 W)
Pulse spectral density	97 dBμV/MHz
Preselector	
One lowpass filter	< 9 kHz
Six bandpass filters	9 kHz to 150 kHz 150kHz to 500 kHz 500kHz to 3 MHz 3 MHz to 10 MHz 10 MHz to 20 MHz 20 MHz to 30 MHz
IF bandwidth	
3 dB bandwidth	3, 10, 30, 100, 300 kHz
CISPR 16-1-1 bandwidth (6 dB)	0,2 and 9 kHz


Noise level (preamplifier ON)	
9 to 150 kHz (200 Hz BW)	< -8 dB μ V (QP); < -15 dB μ V (AV)
150 kHz to 30 MHz (9 kHz BW)	< -4 dB μ V (QP); < -10 dB μ V (AV)
Measuring Detectors	Peak, Quasi-peak, Average, RMS, Smart Detector
Level measuring time	
Peak, Quasi-peak, Average, RMS (simultaneous detectors)	1 ms to 30 sec. (CISPR 16-1-1 default)
Display units	dBm, dB μ V (as stand-alone); dBm, dB μ V, dB μ V/m, dBmA, dBmA/m, dBpW (through 9010 SW Utility on PC)
Spectrum	
Span/division	From 100 Hz to 3 MHz
Measurement accuracy	S/N > 20 dB
10 Hz to 9 kHz	\pm 1,0 dB typical
9 kHz to 30 MHz	\pm 1,0 dB
Demodulation	Built-in AM demodulator (earphones jack output)
RF output (Tracking Generator)	Z _{out} 50 Ω , BNC fem.
Frequency range	10 Hz to 50 MHz
Level	60 dB μ V to 90 dB μ V (0,1 dB steps)
Level accuracy (10 Hz to 30 MHz)	\pm 0,5 dB
I/O Interface Out	USB 2.0 (rear); USB 2.0 (front; only for future implementation); RS-232; High Speed Optical Link (2 channels; 2nd channel for future implementation); User Port (for LISNs connection, etc.); Bluetooth through optional adapter; IEEE-488 (GPIB) optional
Operating temperature	0° to 40°C
Power supply	10 - 15 Volt DC, 2,5A; Li-Ion interchangeable battery (8 h operations, average)
Dimensions	235 x 105 x 335 mm
Weight	4,1 kg

1.8 Front Panel



Fig. 1-1 Front Panel

Legend from left to right:

- **USB** USB 2.0 connection port (future implementation only)
- **PW** Power led
Indicates the power status
-  Earphone connector
To listen to the demodulated signals
- **DISPLAY** Main display
To graphically show the instrument status
- **User keys** 5 command keys
To select the various available functions
- **Controls** Rotary Knob, Left and Right (decrease / increase) Arrow Keys; Esc; Enter/Switch Key
The Rotary Knob and the Arrows Keys can be used to increase and decrease the setting values; the Esc key allows to return to the previous status/display; the Enter/switch key is used to confirm a set value and to switch On and Off the equipment
- **Input and Output connectors**
Tracking Generator Output and Receiver Input
- **RF Output led "ON"**
Indicates when the internal generator is switched ON
- **RF Input led "0dB"**
Is ON when the input attenuator has been set to 0 dB; blinking when PMM 9030 is connected through fiber optic cable and properly communicating with 9010

1.9 Rear Panel

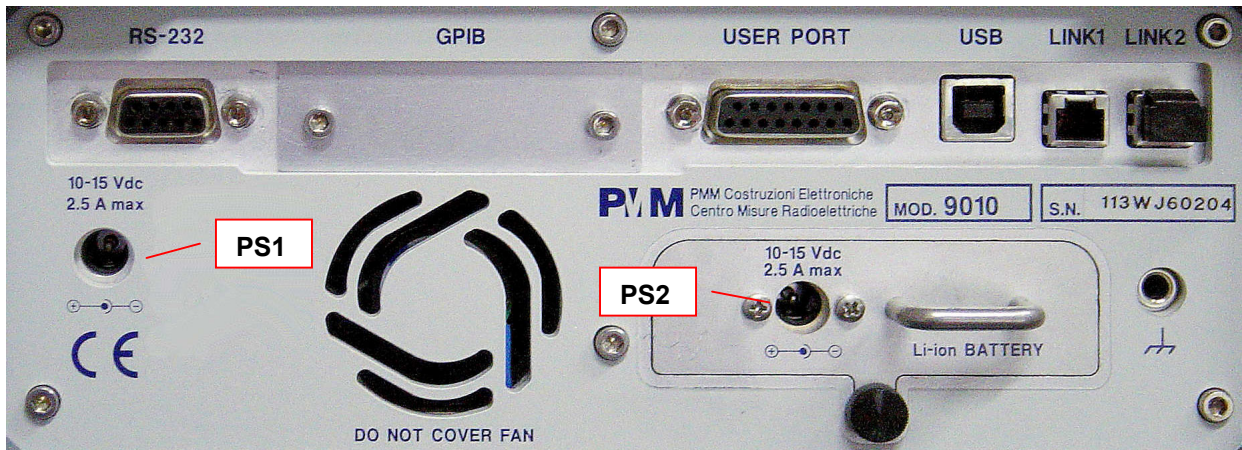


Fig. 1-2 Rear Panel

Legend from left to right:

- **RS232** 9 pin, DB9 connector
- **GPIB** IEEE488 I/O Port (optional)
- **USER PORT** User I/O Port
- **USB** Fully functional USB 2.0 Port
- **LINK1/LINK2** Optical link connectors for PMM equipments (Link 2 for future implementation)
- **Power Supply** Power Supply Inputs for use to power the apparatus and simultaneously charge its battery (PS1) and to simply charge the battery when it's out of the receiver (PS2).
- **Fan** Cooling Fan controlled by firmware
- **Replaceable Li-Ion Battery (Fig. 1-3) with main Battery Charger connector**
- **Earth ground connector**
- **Product Label and Serial Number**



Fig. 1-3 BP-01 Replaceable Battery

1.10 Functional Description

The PMM 9010 features a completely new receiver architecture based on the most recent DSP and RSP technology, as shown on the diagram below. The PMM 9010 diagram is shown in Fig. 1-4

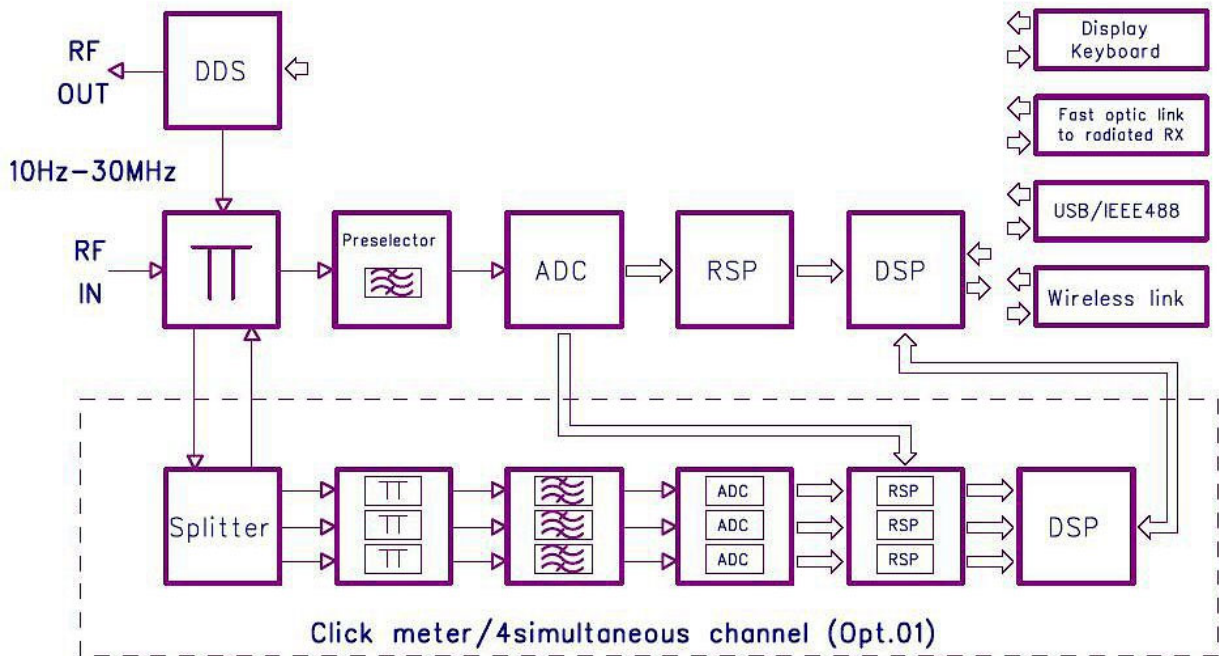


Fig. 1-4 PMM 9010 Functional BLOCK Diagram

1.11 Ultra fast measurement: a unique feature of the PMM 9010

In the CISPR band A (9 ÷ 150 kHz), the standards requires the use of a 200 Hz filter that is, by nature, a filter that implies a long measurement time: a complete scan may require even more than 10 minutes, depending the detector in use.

Thanks to its architecture and to the large internal memory capability, the PMM 9010 can take a "snapshot" of the whole band in just one second and, using a true built-in FFT capability, perfectly displays the complete band in all its details. Later on will be then possible to make the QuasiPeak evaluation of all the frequencies of interest after the measurements will be taken.

This feature is not only useful to greatly increase the productivity of the test lab, but also to make better and more comprehensive analysis in case the disturbance to be evaluated is somehow intermittent and with an irregular repetition rate; its analysis with a traditional receiver could be hardly made in a proper way (even if an FFT capability is available: this feature needs a very comprehensive design), as irregular pulses could be lost during a usual sweep.

To be noted that during the FFT analysis the PMM 9010 makes use of internal standard Gaussian filters in compliance with the norms, while in other cases it uses filters mathematically modelled to the perfection using a FIR technique.

1.12 Emission measurements

All electric and electronic devices are potential generators of Electro-Magnetic Interference (EMI).

The term EMI thus refers to the electromagnetic energy emitted by a device which propagates itself along cables or through the air and couples with other devices that are present in the surroundings.

These electromagnetic fields (conducted or radiated interferences) may generate interfering currents and voltages into nearby equipment and therefore can cause possible malfunctions.

In order to prevent and control such interferences there are nowadays a number of national and international standards, like IEC and CISPR, which specifies limits and methods of tests. Moreover, within the European Union the application of several European Norms on Electromagnetic Compatibility is enforced by law and therefore the commercialization and use of all the electric and electronic equipment is subject to the measurement of the EMC characteristics, which must be within well defined limits.

The design approach adopted for the PMM 9010 is that the instrument shall be innovative, full compliant with all the relevant standards and at the same time simple and reliable to use, to be the base building block for any possible emission system to measure and evaluate any electric or electronic device from the very first design stages to the final certification.

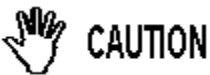
The need to precisely measure the conducted and radiated EMI noises forces the equipment manufactures to use reliable equipment to verify the limits imposed by the relevant standards and/or enforced by local rules.

In this view the PMM 9010 receiver is the ideal solution from prototype debugging to final certification, as it fully meets all the performance criteria dictated by these standards, although it remains small, lightweight and very easy to use.

The PMM 9010 Utility control software permits an immediate use of the instrument without any training or special difficulties: the operator can concentrate just on analyzing the measurement results.

Moreover, the PMM 9010 software has also been designed for a fast and easy installation on any PC with the Windows™ operating system and with at least one free USB or Serial Port.

The device under test (DUT) must be installed according to the procedures indicated in the constructor's manual and normal operating conditions respected.



Be sure not to overload PMM 9010: the input signal should not exceed the maximum level indicated in the main specifications in chapter 1. Also do not apply any signal to RF generator output connector.

2 - Installation

2.1 Introduction

This section provides the information needed to install your PMM 9010. It includes the information pertinent to initial inspection and power requirements, connections, operating environment, instrument mounting, cleaning, storage and shipment.

2.2 Initial Inspection

When receiving the equipment, first inspect the shipping cardbox for any damages.

If the shipping box is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

2.3 Packing and Unpacking

Verify the availability of all the shipped items with reference to the shipping check list enclosed with the Operating Manual.

Notify any damage to the forwarder personnel as well as to your NARDA Representative.



WARNING

To avoid further damage, do not turn on the instrument when there are signs of shipping damage to any portion of it.

2.4 Preparation for Use



WARNING

This is a Safety Class I apparatus, but it is also equipped with a protective/functional earth terminal on the rear panel. A good safety/functional ground connection should be provided before to operate the receiver.

2.5 Battery charger

The battery charger supplied with the receiver can work at either 50 Hz or 60 Hz with a supply voltage rated between 100 and 240 Volt.

It is supplied with different connectors to fit all the possible outlets in accordance with the various National standards.



Battery charger: DC, 10 - 15 V, ~ 2500 mA
=> DC Connector

2.5.1 To replace the mains connector of the battery charger

To replace the mains connector, simply remove the one installed on the battery charger sliding it off, and insert the one that fits the outlets in use.

2.5.2 To charge the internal battery

In order to guarantee the best autonomy of the internal battery, we recommend to fully recharge it before using the receiver.

To charge the battery, simply connect the battery charger to the mains power socket and then insert the DC output connector of the battery charger to the input **CHARGER** on the rear panel of the receiver.



ALWAYS connect the battery charger to the mains power BEFORE connecting the DC output to PMM 9010. The battery charger has an internal protective circuit that will not let it work if there is a load connected to the output connector before the connection to the mains is done.

2.5.3 Indication of the battery status on the screen and with PW led

The charge status of the battery is displayed on the top right-hand corner of the screen in most of the receiver modes. The symbol of a small battery will be filled up proportionally to the status of the battery charge.



When the battery is not under charge, the actual voltage value is displayed under the symbol and the length of the black bar filling the symbol indicates the available autonomy still remaining.



When the battery charger is connected to the PMM 9010 the indication "PWR" appears just below to the battery icon and the front panel **PW** led becomes yellow if the receiver is switched on and red if the receiver is off.

The battery charging is suspended or ends automatically when one of the following events occurs:

- the full capacity of the battery has been achieved,
- the internal temperature of the battery is higher then a preset safety threshold,
- the charging time limit has been exceeded.

Both during recharging and when charge is completed PMM 9010 is ready for use.



The PW led on the front panel blinks green when the battery voltage drops below 7,0V to warn the Operator that the instrument is running out of battery.

To prevent any damage to the battery, the PMM 9010 automatically switches off when the battery voltage falls below 6,5V.



In order to keep the batteries fully functional, it is crucial to have a complete recharge before storing them for periods longer than 4 months. Therefore, it is suggested to recharge the batteries at least every 4 months even when the receiver has not been used.

2.6 Environment

The operating environment of the receiver is specified to be within the following limits:

- Temperature +0° to +40° C
- Humidity < 90% relative
- Altitude 4000 meters

The instrument should be stored and shipped in a clean, dry environment which is specified to be within the following limitations:

- Temperature -40° to + 50° C
- Humidity < 95% relative
- Altitude 15.000 meters

2.7 Return for Service

If the instrument should be returned to NARDA for service, please complete the service questionnaire enclosed with the Operating Manual and attach it to the instrument.

To minimize the repair time, be as specific as possible when describing the failure. If the failure only occurs under certain conditions, explain how to duplicate the failure.

If possible, reusing of the original packaging to ship the equipment is preferable.

In case other package should be used, ensure to wrap the instrument in heavy paper or plastic.

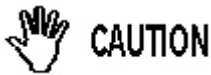
Use a strong shipping box and use enough shock absorbing material all around the equipment to provide a firm cushion and prevent movement in the shipping box; in particular protect the front panel.

Seal the shipping box securely.

Mark the shipping box FRAGILE to encourage careful handling.

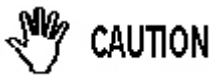
2.8 Equipment Cleaning

Use a clean, dry, non abrasive cloth for external cleaning of the equipment.



To clean the equipment do not use any solvent, thinner, turpentine, acid, acetone or similar matter to avoid damage to external plastic or display surfaces.

2.9 Equipment ventilation



To allow correct equipment ventilation ensure that the vent grids on the rear panel and on the bottom of the receiver are free by any obstructing object.

2.10 Hardware Installation

PMM 9010 is delivered from factory ready to use. Remove the receiver from its cardboard shipping box and keep the "ON" button pressed until the PW Led lights up (about 1 second), then release the button. To avoid unwanted starts, if the "ON" button is kept pressed for a too short time or for more then 2 seconds the instrument is switched automatically off.

After having been switched ON, the PMM 9010 boots with its internal BIOS and runs the firmware which manages the receiver.

At the beginning the instrument performs a diagnostic test to check if everything is working properly.

The boot sequence is very fast and the receiver is ready to use in a couple of seconds after having pressed the ON button.

Before to see the main menu on the LCD display, you will see all the front panel LED's flashing ON and OFF.

During the switch-on procedure the LCD displays the results of the autotest and the release – and date - of the loaded firmware: if the display shows "OK" it means that the PMM 9010 is working properly. When the sequence is completed the main screen shows the test results and the main functional keys on the right of the LCD display: the receiver is now ready to operate.

Connect the output of any LISN, or antenna, or absorbing clamp or any other transducers to the RF input.

When using a PMM LISN, it is possible to control from the receiver the lines of the LISN and automatically switch between them connecting a special cable between the User Port of the receiver and the LISN remote control input.

Push and keep pressed the "ON/OFF" button for more then 2 seconds to switch off the receiver.

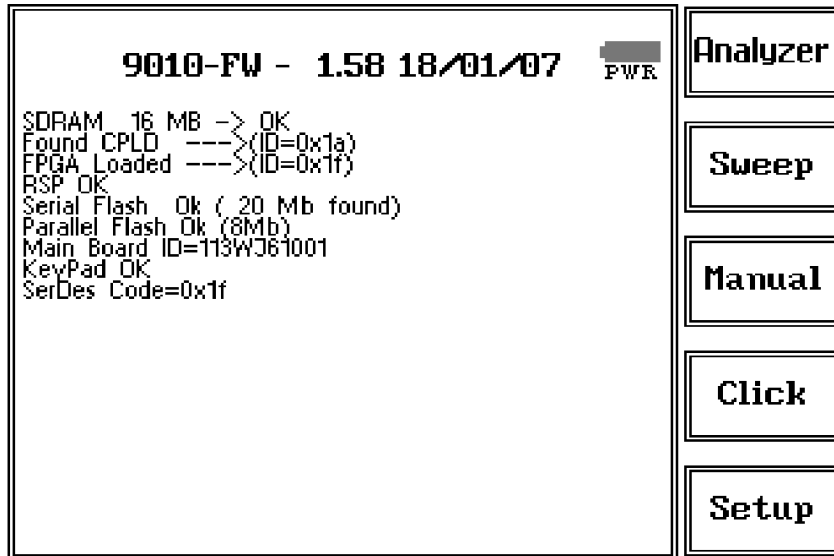


Fig. 2-1 PMM 9010 initial screen showing the results of the initial self-test and the five main function keys menu.

2.11 Using an Artificial Mains Network (AMN or LISN)

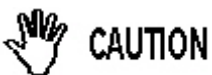
When the PMM 9010 receiver is connected to a LISN to perform conducted interference measurements of the EUT, the RF output of the LISN shall be connected to the RF input of the receiver. In order to switch automatically between the lines of the LISN, it shall be connected to the User Port of the receiver thanks to the dedicated cable supplied with the LISN . Using PMM 9010 Software Utility it is possible to carry out an automatic measurements on all mains lines and get the worst case.



In order to avoid the unwanted tripping of the protection devices, an insulation transformer shall always be used between the mains supply and a LISN.

2.12 Using the Pulse Limiter

The built in pulse limiter is a useful device to protect the input of the receiver from transient over voltages. Sometime the conducted disturbances entering the receiver through the LISN are too high - even if they cannot be seen on the PMM 9010 because they are out of measurement bandwidth - and the associate energy is high enough to damage the input circuit. The pulse limiter shall be used only as a protection of the input from unexpected pulses.



When using an external Artificial Mains Network, to reduce the probability of damages caused by transient voltage pulses always disconnect the PMM 9010 RF input before switching Equipment Under Test supply ON or OFF.

2.13 Using Current and Voltage Probes

When a LISN cannot be used – e.g. when measurements have to be made on terminals other than the mains ones, such as load or command terminals, sensitive to inserted capacities for example, or when LISNs of adequate current capabilities aren't available, or when the line voltage is too high – a current or voltage probe can be used.

The characteristics of these probes, and some advises on their uses, are given in §5 of CISPR 16-1-2.

The CISPR voltage probe contains a resistor with a minimum resistance of 1500 ohm, in series with a capacitor of negligible reactance vs. the resistance (in the 150 kHz to 30 MHz range), and it is insulated at least up to 1500V.

All these probes have an insertion loss and a frequency response that can be stored in the memory of the PMM 9010, so that the actual readings of the receiver can be automatically corrected by these characteristics values.

2.14 Using Antennas and other Transducers

In the frequency range from 10 Hz to 30 MHz any other transducer can be used to pick-up and measure RF conducted and radiated emissions, like active and passive loop antennas, rod antennas, near field probes etc.

The characteristics of these transducers are usually specified in the relevant standards (e.g. Military or Automotive Standards).

Their use with PMM 9010 is very easy, as it's enough to enter their response with the frequency into the memory of the receiver to have the readings automatically corrected. When the cable is not calibrated together with the transducer, even the cable loss can be entered.

2.15 The User Port

The PMM 9010 features on the rear panel a programmable User Port that can be used to drive external devices or, more generally, to output signals and data.

The User Port can easily be programmed and managed; the connector has the following hardware connection:

PIN #	Signal
1	IN3
2	IN1
3	+ 12 VDC (max 50 mA)
4	OUT 0
5	OUT 2
6	OUT 4
7	USR-MISO
8 and 9	IN 2
10	IN 0
11	GND
12	OUT 1
13	OUT 3
14	USR-MOSI
15	USR-CLK

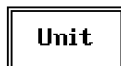
Data output (OUT 0 to OUT 4) and input (IN 0 to IN 3) are opto-coupled TTL level with max. 1 mA draining.

Every other detail about User Port functionality is described in a separate and more specific manual, available upon request.

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3 – Setup and Panel Instructions

3.1 Introduction



Press this function key in the main menu to enter in the **Setup** window, which allows the Operator to set the global parameters of the receiver, visualization options, etc.

The Setup function is divided into five sub windows:

- Display
- Autocal
- Unit
- Rf Out
- Panel

Always use Esc button to return to the previous view/condition.

3.2 Display

The **Display** setup has four function keys:

- **Inverse**: to reverse the text and background colors;
- **Style**: to switch between font style 0 and font style 1;
- **Key border**: to choose the style of the key borderlines between three different possibilities;
- **Contrast / Back Light** (toggle switch): to adjust the backlight and contrast settings by the rotary knob.

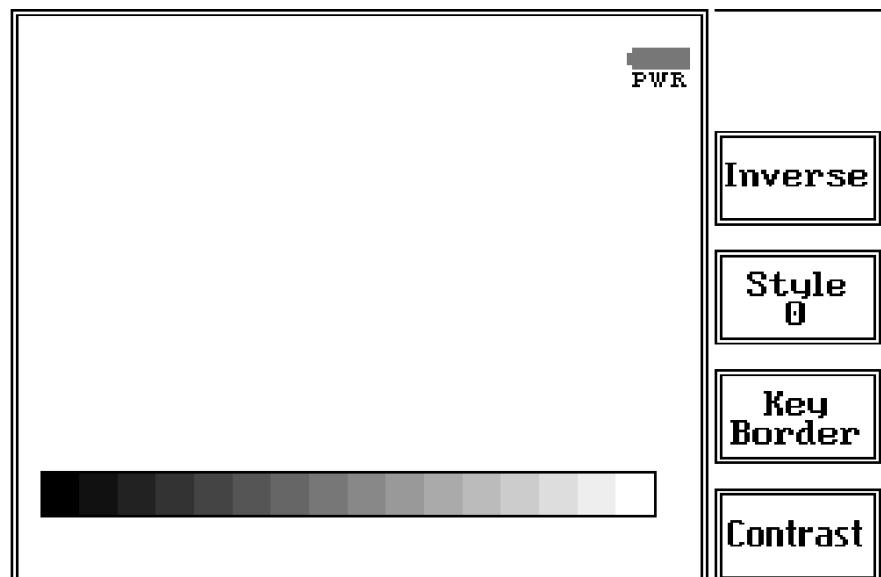
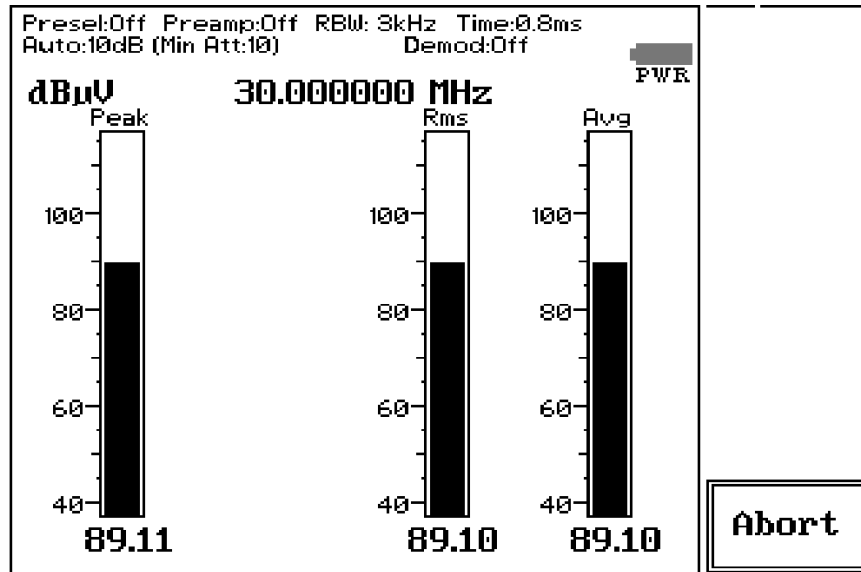


Fig. 3-1 Display setting

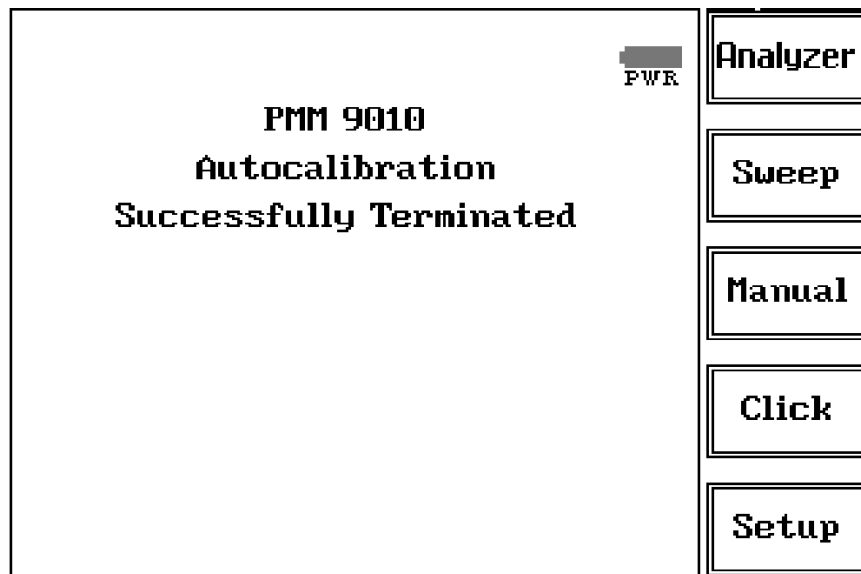
3.3 Autocal

Pressing the **Autocal** button PMM 9010 starts performing its automatic self-calibration, using the internal precise tracking generator as a reference. The connection between the internal tracking generator and the input of the receiver is done automatically inside the instrument.



To interrupt the self-calibration press the key **Abort**.

When the self-calibration is successfully finished a message is displayed:



In order to avoid any possible external influence, it is suggested to disconnect all cables from the PMM 9010 RF ports during the self-calibration process.

It is strongly recommended that the User launches the self-calibration every now and then, and every time the instrument is used in temperature-limit conditions.

NOTE

3.4 Unit



Entering in the **Unit** menu it is possible to change the indicated unit used to display the measured levels.

The available units are **dBμV** and **dBm**.

In a 50 Ohm system the relationship between dBm and dBμV is:

$$\text{dB}\mu\text{V} = \text{dBm} + 107$$

i.e., 0 dBm (1 mW) = 107 dBμV

3.5 RF OUT



The **tracking generator** is an internal, high stability and accuracy, 50 Ohm RF generator ranging from 10 Hz to 50 MHz.

Activating the **Tracking On** function the generator is always tuned at the same PMM 9010 measurement frequency and scans the range together with the receiver. This is the standard way a tracking generator works in all spectrum analyzers.

If the Tracking On function is disabled, the generator becomes a CW signal source tuned at the frequency set under the **RF OUT Freq** window.

As usual, to set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

Pressing 0 as the first figure the decimal dot appears automatically.

In both operating modes (tracking or fixed frequency) the output level can be set between 60,0 and 90,0 dBμV with 0,1dB steps using the **RF OUT Level** button.

If a higher or lower level is needed, the User shall adopt either an external amplifier or an external attenuator.

The tracking generator is extremely useful for several applications: first of all it is essential to calibrate the receiver itself thanks to the automatic internal routines specifically developed to this extent, then it can also be used to transform the PMM 9010 in a scalar network analyzer, helping a lot in designing and testing RF filters, active stages and a lot of other circuits.

3.6 Panel



The Panel function allows the User to store up to 2 different setups that can be recalled any time.

Pressing **Save #1** or **Save #2** the actual setup is stored in the internal memory; with the two **Recall** buttons the corresponding setup is loaded to the receiver.

Please remember each time one of the Save buttons is pressed, the stored set-up is overwritten by the new one: the saved setups are therefore kept memorized in the receiver until a new set-up is stored in the same memory.

The **Default** button can be used to load a default standard setup saved into the memory at the factory.

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4 - Sweep Mode Operating Instructions

4.1 Introduction



The **Sweep mode** is used to operate the PMM 9010 as a powerful scanning receiver. To enter in this mode it's enough to depress the Sweep soft key on the main screen, and immediately the scan setup window pops up and allows the operator to set the parameters for the scan.

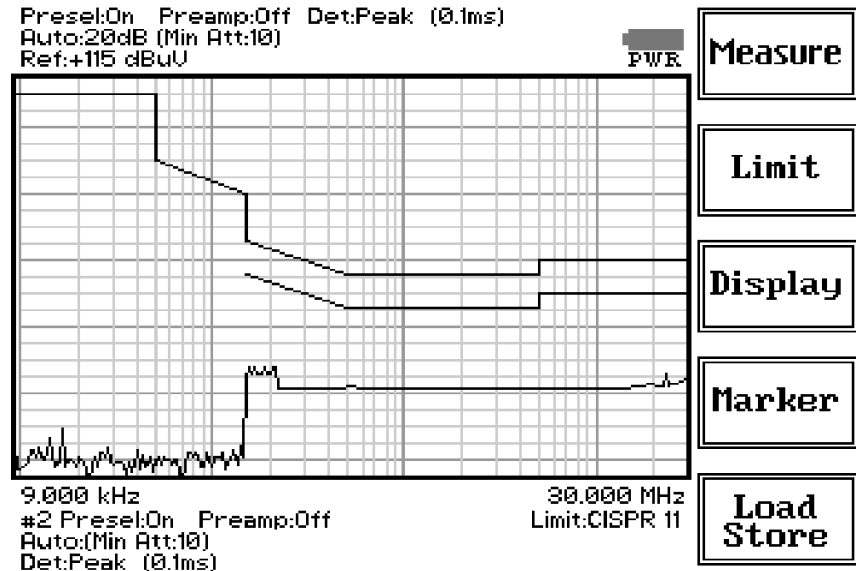


Fig. 4-1 Sweep

As for the Analyzer operating mode, all the relevant information are reported on the screen.

From the upper left corner, the User can see if the Preselector is ON or OFF; if the Preamplifier is ON or OFF; which detector is in use and the relevant hold time; if the function "Smart Detector" is activate and which one; if the input attenuation is Automatic or Manual and the set attenuation and if the Minimum attenuation is 10 dB or 0dB.

Just above the graph there is on the left the Reference level. During the scan, in the center above the graph the actual frequency measured and/or any other relevant operation (e.g. FFT, etc.).

Below the graph the start and the stop frequency, and loaded limits, if any.

When the sweep has been executed, on the bottom of the screen the most important sweep parameters are repeated.

If the graph has been loaded from the memory, just below the start frequency there is the symbol # followed by the memory position loaded (position number 2 in figure 4-1).

Please note that the information in the upper part above the graph refers to the next sweep to be done, while the information in the lower part, below the graph, concerns to the actual displayed data.

NOTE

Thanks to its digital architecture and to the clever design, the PMM 9010 receiver can make very fast measurements in the lower CISPR band using the 200 Hz filter, yet maintaining full compliance to the standards even in this very difficult condition.



The Sweep mode function is divided into five sub windows:

- Measure
- Limit
- Display
- Marker
- Load Store

Always use Esc button to return to the previous view/condition.

4.2 Measure

The **Measure** button is used to set the scan parameters and to run the sweep.



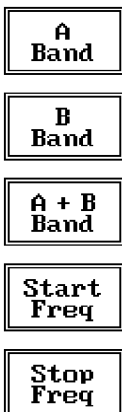
After having chosen the frequency band and set all the other parameters it is possible to run the measurement scan simply touching the **Exec Sweep** button.

To make subsequent sweeps with the same setting parameters, simply press **ReDo Sweep**. This key is particularly useful after having loaded a previously stored track (see 4.6), as with the Re Do Sweep the original settings are kept for the new measurement: it is extremely easy to make comparisons, for example, before and after a modification of the EUT.

Once the scan starts, it can be stopped at any time during the execution by the **Stop** function key that appears during the scan.

4.2.1 Frequency

The **Frequency** menu features five function buttons:



Pressing **A Band** the receiver will be set to scan the 9 - 150 kHz frequency band. The definition of band A is a given in CISPR.

Pressing **B Band** the receiver will be set to scan the 0,15 - 30 MHz frequency band. The definition of band B is a given in CISPR.

Pressing **A + B Band** the receiver will be set to scan the entire band from 9 kHz to 30 MHz.

Using these automatic band settings, the Frequency Step and Resolution Bandwidth are set automatically according to CISPR standard requirement.

The **Start** and **Stop** frequency buttons can be used to set any frequency interval for the measurement; to enter the frequency values press the corresponding function keys.

Pressing either one of these 2 keys the figures 0, 1, 2, 3, and 4 are selectable at first; with the right arrow key it is possible to select the figures from 5 to 9, and pressing again the right arrow key the units kHz, MHz and GHz becomes accessible, as well as the decimal dot and the Back Space. The left arrow key can be used as well to move back and forth from one screen to the other. Pressing 0 as the first figure the decimal dot appears automatically.

To set a given frequency it is therefore enough to edit the value with the soft keys and the left an right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

The figures entered appear in a small window just below the graph and the default unit is MHz.

4.2.2 Level



The Level function has 5 sub-menus, each one with several options..

Pressing the **Display** button it is possible to set two parameters: the visualized **Dynamic** range (chosen between 80, 100 and 120dB) and the **Reference Level**, that can be increased or reduced by steps of 5dB within the range +80 dB μ V to 135 dB μ V (-25 to +30 dBm).

The **Input** button opens a submenu which is dedicated to the setting of the input attenuator and to switch on-off the built-in preamplifier.

The PMM 9010 receiver takes automatically into account the settings of all the **Input** parameters and always displays the correct value of the level. The User is not required to make any correction to the readings.

4.2.2.1 Input: Attenuators and preamplifier



Being entered in the Input submenu, to increase or decrease the attenuation at the input, press **Att +** or **Att -**, and for each touch the attenuation is increased or decreased of 5 dB (preset value). Depressing either one of these keys force the receiver in manual attenuation.

When the input attenuation is 0dB (condition that can be achieved only if the Minimum Attenuation is set to 0 dB as well), the yellow led to the left of the input BNC connector is ON and indicates a warning status.

The **Min Att** button acts as a toggle switch: it selects or deselects the minimum attenuation of 10 dB. When the minimum attenuation is selected, the attenuator – doesn't matter if in automatic or in manual condition - cannot be lowered under 10 dB.

Unless specifically required by the test conditions, do not remove the minimum attenuation of 10 dB.

With the **Preamp** key it is possible to insert or exclude the built-in low noise preamplification of 20 dB.

The internal 20 dB preamplifier can be used when very weak signals have to be investigated. As already mentioned, with the preamplifier ON the receiver takes automatically care of the 20 dB gain when measuring the signals.

The **Att Auto** button is used to switch from the two conditions of manual or automatic attenuation setting.

Please note that the switching of the attenuators is relatively noisy and you can perceive it distinctly with a "click" for each switch operation.

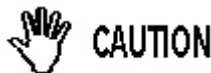
Using 0 dB attenuation PMM 9010 has no input protection.

This is a potentially dangerous condition for the input stage of the receiver.

Use 0 dB attenuation only if you are very sure that your input signal is less than 1 V (or 120 dB μ V).

Before to apply an unknown signal to PMM 9010 receiver, use an oscilloscope or a wide band RF voltmeter to measure it. In any case set Min. ATT at 10 dB and select the maximum available attenuation with preamplifier OFF.

If needed, add an external coaxial attenuator on the input signal line.



4.2.2.2 Misc

Presel

Pulse Limiter

RF OUT

Under the **Miscellaneous** functions menu it is possible to activate or exclude the **Preselector** filters, the **Pulse Limiter**, and also to enter in the **Tracking generator** menu pressing the **RF OUT** button.

The **Preselector** is composed by a group of filters automatically selected by the PMM 9010 while it is sweeping or anyway measuring. The aim of the preselector is to reduce the amount of out-of-band energy entering in the receiver, thus helping a lot in reducing intermodulation problems and similar undesired behaviors.

It can be set either ON or OFF with the associated button, and normally it should be always enabled.

On the top left corner of the screen the symbol "Off" or "On" will be displayed.

The **Pulse Limiter** is a very useful device to protect the input of the receiver from transient overvoltages. Doing conducted emission tests, quite often there are conducted disturbances (usually associated to switching operations in the EUT or along the line under test) which are too high and that propagates through the LISN up to the receiver. Sometime these disturbances cannot be seen on the receiver because they are out of measurement bandwidth, nevertheless the associated energy is high enough to damage the input attenuator and/or the Analog-to-Digital Converter of the PMM 9010 (the first mixer in a traditional receiver).

This pulse limiter has an integrated 10dB attenuator and a 30 MHz low-pass filter.

When the Pulse Limiter is selected, on the upper part of the screen the letters **P.L.** appear next the value of the Minimum Attenuation and the reading on the receiver is automatically corrected for the attenuation factor of the Pulse Limiter.

Pressing the **RF OUT** button the receiver enters the Tracking generator menu.

4.2.2.2.1 Tracking generator

RF OUT Freq

RF OUT Level

Tracking On

RF OUT On Off

The **tracking generator** is an internal, high stability and accuracy, 50 Ohm RF generator ranging from 10 Hz to 50 MHz.

Activating the **Tracking On** function the generator is always tuned at the same PMM 9010 measurement frequency and scans the range together with the receiver. This is the standard way a tracking generator works in all spectrum analyzers.

If the Tracking On function is disabled, the generator becomes a CW signal source tuned at the frequency set under the **RF OUT Freq** window.

As usual, to set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

Pressing 0 as the first figure the decimal dot appears automatically.

In both operating modes (tracking or fixed frequency) the output level can be set between 60,0 and 90,0 dB μ V with 0,1dB steps using the **RF OUT Level** button.

If a higher or lower level is needed, the User shall adopt either an external amplifier or an external attenuator.

The tracking generator is extremely useful for several applications: first of all it is essential to calibrate the receiver itself thanks to the automatic internal routines specifically developed to this extent, then it can also be used to transform the PMM 9010 in a scalar network analyzer, helping a lot in designing and testing RF filters, active stages and a lot of other circuits.

4.2.2.3 Detector



This menu allows the operator to select the most appropriate **detector** for the test.

In Sweep mode the Peak, Average, RMS (Root Mean Square) and Quasi-Peak detectors are available and can be selected via the appropriate button.

Hold time (ms)

The Hold Time (expressed in milliseconds) represents the time the receiver uses to “take a snapshot” of the incoming signal and to measure it with the chosen detector. When selecting a detector, the default hold time value is automatically loaded, but in some cases this time is not appropriate, e.g. when the interference signals have a low repetition rate. In this case the PMM 9010 sees a high input signal and therefore tries to set the proper attenuation automatically increasing the value or the input attenuators. However, when the input attenuation is set the signal is gone, so the receiver lowers the attenuation, but then a new peak arrives, and so on and so forth.

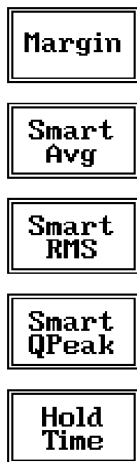
On the other hand, if the Hold Time is too high the PMM 9010 cannot properly follow the signals.

In this situation the **Hold Time** value should be manually set to find a correct compromise.

To set the **Hold Time** to the lowest possible value (this value dynamically depends from the measurement conditions), enter the figure 0; if a value lower than the allowed is entered, the lowest possible value is automatically selected.

The max. **Hold Time** that can be set is 30 sec (30.000 ms).

4.2.2.4 Smart Detector



The **Smart Detector** is an innovative special function implemented in the PMM 9010 receiver with the purpose of reducing the test time and increasing the productivity of the lab.

This function works only when at least one limit is loaded, therefore remember to enable a limit to run the Smart detector function.

Selecting one out of the three **Smart detectors** the receiver will execute the scan using at first the Peak detector and, if a peak value is found over the selected limit minus a **Margin** set with the specific button, the reading is re-measured and displayed with the chosen (AVG, RMS or QPeak) detector.

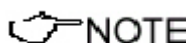
Obviously this way of operation results in a much faster scan sweep and moreover it immediately draws the attention of the test Engineer to the most critical points. The limit associated to the Margin is displayed as a bold black line and is automatically selected by the receiver depending which Smart detector is chosen; for example, if a Smart QP is selected, the associated QP limit line will be displayed as a bold black line.

The **Smart RMS** detector is disabled until a reference limit is defined by CISPR.

It is immediately clear that this function is very useful to dramatically reduce test time and increase the productivity of the test lab.

To deselect the Smart Detector function simply select a single detector.

The weighting time must be properly set in the Hold Time window to allow the Smart detectors functions to operate as intended.



4.2.3 Conversion factor

NO
Factor

NO
Factor

NO
Factor

NO
Factor

NONE

When using a transducer to make a measurement – a Voltage or Current Probe, an Antenna, etc. – there is always the need to add to the measured values the conversion factor of the transducer in use.

The Conversion factor may also take proper account of losses as cable loss, attenuators added externally to the receiver, etc.

The PMM 9010 can handle these factors in an automatic way and directly correct the readings.

The PMM 9010 can store in its internal non-volatile memory up to 4 different correction factors, and use them one at a time when recalled.

However, the **Conversion Factors** shall be created and loaded via the PMM 9010 Software Utility.

Press the relevant button to load the conversion factor, and **NONE** to unload it.

4.3 Limit

022

014

011

NONE

Each emission standard has one or more limits the User shall comply with. The PMM 9010 receiver has the possibility to load and activate one limit with the simple click of a button.

The preloaded standard limits refer to the most popular EMC emission standards: CISPR22, CISPR14 and CISPR11.

Other limits – or any custom designed limit – can be created, managed, selected and loaded through the PMM 9010 Software Utility running on a PC (and the test, of course, shall be handled via the PC software).

These additional custom limits cannot be stored in the memory of the PMM 9010, but only in the one of the PC where the 9010SW Utility is running.

The limits are shown on the scan display and they appear like a thin black line when the Smart Detector function is not enabled, while one of them appears in bold black when the Smart Detector function is active.

By pressing the NONE button all limits are deactivated.

4.4 Display

Pressing the **Display** button it is possible to set two parameters: the visualized **Dynamic** range (chosen between 80, 100 and 120dB) and the **Reference Level**, that can be increased or reduced by steps of 5dB within the range +80 dB μ V to 135 dB μ V (-25 to +30 dBm); see also 4.2.

4.5 Marker

Marker
OFF

Peak

Highest
7

Analyzer

Tune

Selecting this function a **Marker** is immediately enabled, and it appears on the screen as a small black pointing down arrow corresponding to the highest reading; simultaneously a small window shows up in the bottom left corner of the screen, indicating the actual frequency and level read by the marker.

The Marker function is not a simple search for the highest readings on the screen – it would be a useless exercise that would display a number of points all grouped together – but it's a true peak search that measures the degree of variation of the signal: a peak is so classified only if it “pops-up” from the adjacent signals with at least 5 dB difference in amplitude. Following this criterion, if the measured signal is a flat line no peaks will be found.

Selecting **Highest X** – where X represents the maximum number of markers found by the receiver during its sweep – few more markers are added, each one “diamond” shaped, defined as per the previous explanation. The maximum number of markers available is 10.

By using arrow keys it is possible to quickly move on markers from higher amplitude (left arrow) to lower amplitude (right arrow), i.e. if the highest is selected, pressing the right arrow key the 2nd highest is selected, then pressing again the same key the 3rd highest and so on and so forth. It is also possible to use the rotary knob to move from a marker to the next one.

The marker under analysis (main marker) is a black arrow pointing down, the others are diamond shaped.

Pressing the **Peak** button the marker returns to the highest reading.

In order to make easier and faster the evaluation of the more noisy signals, the User can now select either the **Analyzer** or the **Tune** function, entering respectively into a spectrum analysis of main marker position or in the manual mode evaluation of it. To operate this two conditions please refer to the appropriate section of this Operating Manual.

In manual mode, i.e. having selected **Tune** on the main marker, it is possible to navigate from one peak to the other just pressing the arrow keys, without to come back to the Sweep display and remaining in manual mode.

This is another unique feature of PMM 9010 to improve the productivity of the test lab and make easier the work of the test engineer.

The **Marker Off** exits from the marker function.

4.6 Load Store



Pressing this key allows the User to have access to the memory of the receiver and enables the storing up to a number of different configurations/sweeps that depends on the parameters set on the receiver (i.e. the number of measured points). For example, using standard CISPR parameters it is possible to store up to 15 sweeps on the A+B band.

Each new scan will be stored in the first available memory position thanks to the button **Store #x**, where x is the first available position. When all positions are occupied by a scan, this function is disabled until one of the previous scan is erased.

To load a stored trace, press the **Load #x** button until the proper scan is displayed; to unload a trace select the **Unload Trace** button.

Please note that the Load function is scanning the memory in a circular way, therefore all the occupied memory positions are shown in sequence. When the key shows "Load #4", it means the trace #3 is displayed and that the #4 will be loaded after the key is pressed, and so on and so forth.

To erase a trace, press the **Erase#x** button.

Due to the structure of the memory, it is possible to erase only the latest stored memory, with a sequence "LIFO" (Last In First Out), therefore after having erased the #x, the #(x-1) will be the trace to be erased. With reference to the example at the left, the last stored trace is the #4, and it is the first that will be erased. After that, the key will show "Erase #3", and so on and so forth.

A more advanced trace management could be done using the PMM 9010 Software Utility.



Turn Off the tracking generator, if it is not used, while you are in Scan Mode.

This prevents interferences and the measurements are more clean and accurate.

4.7 Ultra Fast FFT scan

The Ultra Fast FFT (Fast Fourier Transform), as described at §1.11, provides a "snapshot" of the whole band in just one second, what is useful for a more comprehensive analysis in case the disturbance to be evaluated is somehow intermittent and with an irregular repetition rate.

To activate this feature few settings have to be manually performed at first, as per the following:

- Peak detector
- ≤ 50ms Hold Time
- Band A sweep.

Once all these conditions are satisfied, the Sweep is performed in really "one second", what is very useful to soon realize overall behaviour of EUTs in a debugging phase, saving time and making it possible even in those cases where the EUT cannot stay ON for a long time without getting damaged (small electric motors, etc.)

Later on will be then possible to make the full-compliant Quasi-Peak evaluation of all the frequencies of interest after the measurements will be taken.

During such FFT analysis the PMM 9010 makes use of internal standard Gaussian filters still in compliance with the norms.

5 - Analyzer Mode Operating Instructions

5.1 Introduction



To enter in the **ANALYZER Mode** it's enough to depress the Analyzer soft key on the main screen.

In this mode the receiver works as a powerful Spectrum Analyzer and the display shows the "spectrum analysis" (span max 30 MHz) in the frequency domain of a signal tuned at a given frequency.

The analysis is done at the selected span frequency.

Using the marker facility the User can accomplish a very accurate measurement of the signals either in frequency as well as in level.

Entering **Analyzer Mode** from the main menu, the display will look like the following:

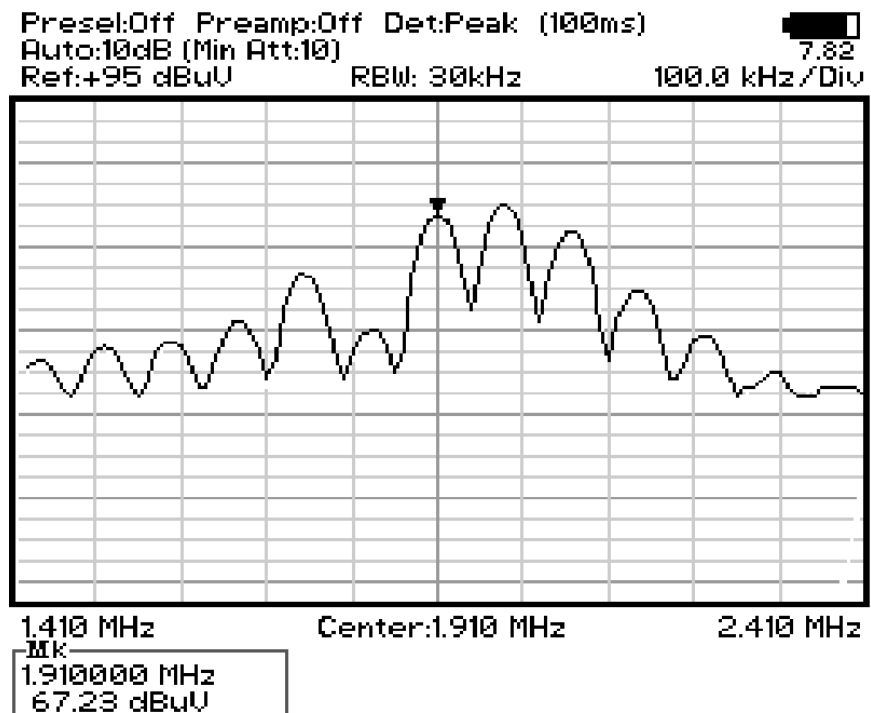


Fig. 5-1 Spectrum

NOTE

The SPAN per division is automatically managed by the equipment and divided by 10. The minimum SPAN is 100Hz per division.

On the screen of the Analyzer Mode all the relevant information are reported. From the upper left corner, the User can see if the Preselector is ON or OFF; if the Preamplifier is ON or OFF; which detector is in use and the relevant hold time; if the input attenuation is Automatic or Manual and the set attenuation and if the Minimum attenuation is 10 dB or 0dB.

Just above the graph, from left to right, there is the Reference level, the Resolution bandwidth and the span value.

Below the graph the start, center and stop frequency.

The bottom left corner is dedicated to the marker indication, with actual frequency and level of the marker.



The Spectrum mode function is divided into five sub windows:

- Frequency
- Resolution Bandwidth
- Level
- Marker
- Wide Mode

The fifth button is used to change the spectrum view to **wide screen mode**, as shown in the picture 5-1, and with the **Esc** button the original view can be restored.

Always use Esc button to return to the previous view/condition.

5.2 Frequency

Allows the User to set the tuning frequency and also the Span.



The **Center** frequency of the Spectrum window can be directly edited into the window or set by the arrow buttons or by the rotary knob, which frequency steps are set under the Manual mode.

Depressing the **Center** button the figures 0, 1, 2, 3, and 4 are selectable; with the right arrow key it is possible to select the figures from 5 to 9, and pressing again the right arrow key the units kHz, MHz and GHz becomes accessible, as well as the decimal dot and the Back Space. The left arrow key can be used as well to move back and forth from one screen to the other. Pressing 0 as the first figure the decimal dot appears automatically.

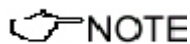
To set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

The figures entered appear in a small window just below the graph and the default unit is MHz, so 100 kHz = 0,1 MHz; 10 kHz = 0,01 MHz; 1 kHz = 0,001 MHz and 100 Hz = 0,0001 MHz.

Using the **Start** and **Stop** buttons it is possible to select any start and stop value in the frequency range 10 Hz to 30 MHz band.

Another method for setting the frequency is to enter the **Center** frequency and the appropriate **Span**.

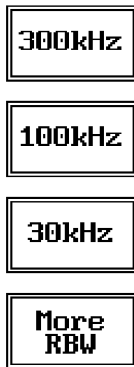
In this mode of operation the frequency step (spectrum resolution) is set automatically, therefore it cannot be changed manually.



In order to better analyze the signals close to the ends of the band and see them properly with any of the applicable filters, the receiver is able to go lower than 10 Hz and higher than 30 MHz.

The actual minimum frequency that can be displayed on the screen is 0 Hz, the maximum is 32 MHz.

5.3 RBW



The **Resolution Bandwidth** command is used to select the bandwidth of the measuring filter. Seven bandwidth filters are available:

- 200 Hz CISPR 16 shaped at -6dB
- 9 kHz CISPR 16 shaped at -6dB
- 3 kHz at -3dB
- 10 kHz at -3dB
- 30 kHz at -3dB
- 100 kHz at -3dB
- 300 kHz at -3dB

The three larger filters are selectable from the first RBW screen, and pressing the **More RBW** button it is possible to select all the other filters.

These filters are mathematically modeled using FIR (Finite Impulse Response) technique and they are exactly as required by the standards.

More filters will be available as an option for specific applications, e.g. to cover Military Standards requirements, etc.

5.4 Level



The Level function has 5 sub-menus, each one with several options.

Pressing the Display button it is possible to set two parameters: the visualized Dynamic range (chosen between 80, 100 and 120dB) and the Reference Level, that can be increased or reduced by steps of 5dB within the range +70 dB μ V to 105 dB μ V (-35 to 0 dBm).

The Input button opens a submenu which is dedicated to the setting of the input attenuator and to switch on-off the built-in preamplifier.

The PMM 9010 receiver takes automatically into account the settings of all the Input parameters and always displays the correct value of the level. The User is not required to make any correction to the readings.

5.4.1 Input: Attenuators and preamplifier



Being entered in the Input submenu, to increase or decrease the attenuation at the input, press **Att +** or **Att -**, and for each touch the attenuation is increased or decreased of 5 dB (preset value). Depressing either one of these keys force the receiver in manual attenuation.

When the input attenuation is 0dB (condition that can be achieved only if the Minimum Attenuation is set to 0 dB as well), the yellow led to the left of the input BNC connector is ON and indicates a warning status.

The **Min Att** button acts as a toggle switch: it selects or deselects the minimum attenuation of 10 dB. When the minimum attenuation is selected, the attenuator – doesn't matter if in automatic or in manual condition - cannot be lowered under 10 dB.

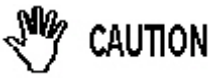
Unless specifically required by the test conditions, do not remove the minimum attenuation of 10 dB.

With the **Preamp** key it is possible to insert or exclude the built-in low noise preamplification of 20 dB.

The internal 20 dB preamplifier can be used when very weak signals have to be investigated. As already mentioned, with the preamplifier ON the receiver takes automatically care of the 20 dB gain when measuring the signals.

The **Att Auto** button is used to switch from the two conditions of manual or automatic attenuation setting.

Please note that the switching of the attenuators is relatively noisy and you can perceive it distinctly with a "click" for each switch operation.



Using 0 dB attenuation PMM 9010 has no input protection. This is a potentially dangerous condition for the input stage of the receiver.

Use 0 dB attenuation only if you are very sure that your input signal is less than 1 V (or 120 dB μ V).

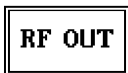
Before to apply an unknown signal to PMM 9010 receiver, use an oscilloscope or a wide band RF voltmeter to measure it. In any case set Min. ATT at 10 dB and select the maximum available attenuation with preamplifier OFF.

If needed, add an external coaxial attenuator on the input signal line.

5.4.2 OVER RANGE Message

An Over Range indication will automatically appear on the screen to inform the User that the levels of the measured signals in the spectrum window is too high: to avoid measuring errors and even damages to the receiver a higher attenuation shall be set.

5.4.3 Misc



Under the **Miscellaneous** functions menu it is possible to activate or exclude the **Preselector** filters, the **Pulse Limiter**, and also to set the **Tracking Generator**.

The **Preselector** is composed by a group of filters automatically selected by the PMM 9010 while it is sweeping or anyway measuring. The aim of the preselector is to reduce the amount of out-of-band energy entering in the receiver, thus helping a lot in reducing intermodulation problems and similar undesired behaviors.

In Analyzer mode the preselector is available only if the entire span falls in one filter band (see the main specification in chapter 1 to verify the frequency bands). In this situation on the display it will be shown: Preselector ON. If the span is larger than one filter only, on the display the symbol *** will appear instead.

It can be set either ON or OFF with the associated button, and normally it should be always enabled.

On the top left corner of the screen the symbol "Off" or "On" will be displayed.

The **Pulse Limiter** is a very useful device to protect the input of the receiver from transient overvoltages. Doing conducted emission tests, quite often there are conducted disturbances (usually associated to switching operations in the EUT or along the line under test) which are too high and that propagates through the LISN up to the receiver. Sometime these disturbances cannot be seen on the receiver because they are out of measurement bandwidth, nevertheless the associate energy is high enough to damage the input attenuator and/or the Analog-to-Digital Converter of the PMM 9010 (the first mixer in a traditional receiver).

This pulse limiter has an integrated 10dB attenuator and a 30 MHz low-pass filter.

When the Pulse Limiter is selected, on the upper part of the screen the letters P.L. appear next the value of the Minimum Attenuation and the reading on the receiver is automatically corrected for the attenuation factor of the Pulse Limiter.

Pressing the **RF OUT** button the receiver enters the Tracking generator menu.

5.4.3.1 Tracking generator

RF OUT
Freq

RF OUT
Level

Tracking
On

RF OUT
On Off

The **tracking generator** is an internal, high stability and accuracy, 50 Ohm RF generator ranging from 10 Hz to 50 MHz.

Activating the **Tracking On** function the generator is always tuned at the same PMM 9010 measurement frequency and scans the range together with the receiver. This is the standard way a tracking generator works in all spectrum analyzers.

If the Tracking On function is disabled, the generator becomes a CW signal source tuned at the frequency set under the **RF OUT Freq** window.

As usual, to set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

Pressing 0 as the first figure the decimal dot appears automatically.

In both operating modes (tracking or fixed frequency) the output level can be set between 60,0 and 90,0 dB μ V with 0,1dB steps using the **RF OUT Level** button.

If a higher or lower level is needed, the User shall adopt either an external amplifier or an external attenuator.

The tracking generator is extremely useful for several applications: first of all it is essential to calibrate the receiver itself thanks to the automatic internal routines specifically developed to this extent, then it can also be used to transform the PMM 9010 in a scalar network analyzer, helping a lot in designing and testing RF filters, active stages and a lot of other circuits.

This menu allows the Operator to select the most appropriate detector for the test.

5.4.4 Detector

Peak

Avg

RMS

Hold
Time

In Analyzer mode the Peak, Average and RMS (Root Mean Square) detectors are available and can be selected via the appropriate button.

Hold time

The Hold Time (expressed in milliseconds) represents the time the receiver uses to "take a snapshot" of the incoming signal and to measure it with the chosen detector. When selecting a detector, the default hold time value is automatically loaded, but in some cases this time is not appropriate, e.g. when the interference signals have a low repetition rate. In this case the PMM 9010 sees a high input signal and therefore tries to set the proper attenuation automatically increasing the value or the input attenuators. However, when the input attenuation is set the signal is gone, so the receiver lowers the attenuation, but then a new peak arrives, and so on and so forth..

On the other hand, if the Hold Time is too high the PMM 9010 cannot properly follow the signals.

In this situation the Hold Time value should be manually set to find a correct compromise.

To set the Hold Time to the lowest possible value (this value dynamically depends from the measurement conditions), enter the figure 0; if a value lower than the allowed is entered, the lowest possible value is automatically selected.

The max. Hold Time that can be set is 30 sec (30.000 ms).

5.4.5 Conversion factor



When using a transducer to make a measurement – a Voltage or Current Probe, an Antenna, etc. – there is always the need to add to the measured values the conversion factor of the transducer in use.

The Conversion factor may also take proper account of losses as cable loss, attenuators added externally to the receiver, etc.

The PMM 9010 can handle these factors in an automatic way and directly correct the readings.

The PMM 9010 can store in its internal non-volatile memory up to 4 different correction factors, and use them one at a time when recalled.

However, the **Conversion Factors** shall be created and loaded via the PMM 9010 Software Utility.

Press the relevant button to load the conversion factor, and **NONE** to unload it.

5.5 Marker



With this command the **Marker** function can be enabled.

Switching ON the marker it appears on the screen as a small black pointing down arrow, and simultaneously a small window shows up in the bottom left corner of the screen, indicating the actual frequency and level read by the marker.

Pressing the **Peak** button the marker will automatically move to the highest signal found in the span range in that given moment, and with the help of the **Center** button the frequency selected by the marker becomes the center frequency on the screen, making very easy any signal analysis.

5.6 ESC

This button allows to return to the previous view or condition.

6 - Manual Mode Operating Instructions

6.1 Introduction

Manual

The **MANUAL mode** is a very useful feature to manually control the receiver and to deeply investigate electrical signals modifying the parameters of receiver exactly as per the needs of the Test Engineer. It is possible, for example, to observe the signals exceeding the limits frequency by frequency; evaluating their levels measured simultaneously with 4 different detectors (Peak, QuasiPeak, Average and RMS); listening to them after a demodulation, etc.

To enter in **Manual Mode** press the key in the main menu, and immediately the first Manual window opens as follow.

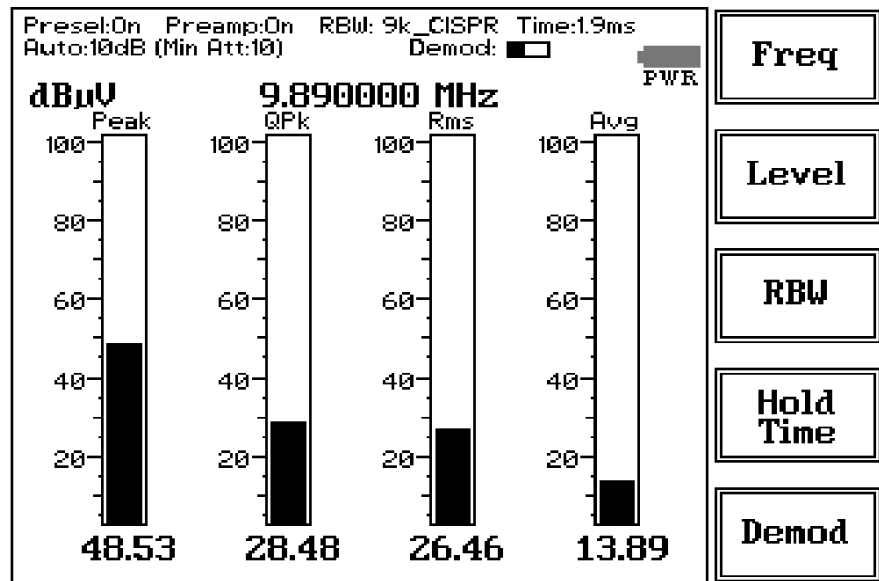


Fig. 6-1 Manual

In manual mode the levels corresponding to the detectors in use are displayed both in analogue and in digital format, and exactly as for the other operating modes, all the relevant information are reported on the screen.

From the upper left corner, the User can see if the Preselector is ON or OFF; if the Preamplifier is ON or OFF; the resolution bandwidth, the longest hold time associated to the detectors in use; if the input attenuation is Automatic or Manual and the set attenuation and if the Minimum attenuation is 10 dB or 0dB; if there a demodulation and the level of the volume, represented by a small black bar.

Then there are three or four vertical bars representing the detectors and indicating in analogue and digital (the figures below each bar) the level measured; on top of the bars the relevant detector, the unit in use and the tuned frequency. The analogue scale of the analogue bars is set automatically by the receiver.



The Manual mode function has five sub windows:

- Frequency
- Level
- Resolution Bandwidth
- Hold Time
- Demodulation

Always use Esc button to return to the previous view/condition.

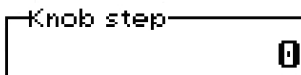
6.2 Frequency

Under this menu it is possible to set the tuning frequency and also the knob and the arrow keys steps.



The center Frequency of the reading can be directly edited into the **Tune** window or set by the left and right arrow buttons or by rotating the knob. The figures entered appear in a small window just below the graph and the default unit is MHz.

Having selected **Tune**, the figures 0, 1, 2, 3, and 4 are selectable at first; with the right arrow key it is possible to select the figures from 5 to 9, and pressing again the right arrow key the units kHz, MHz and GHz becomes accessible, as well as the decimal dot and the Back Space. The left arrow key can be used as well to move back and forth from one screen to the other. Pressing 0 as the first figure the decimal dot appears automatically. To set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

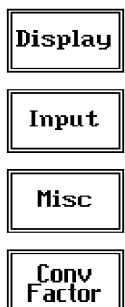


If **Knob** is selected, the small window below the bars indicate the step which is going to be selected. After having fixed the step size, rotate the knob and tune the desired frequency.

If **Arrow** is selected, the small window below the bars indicate the step which is going to be selected. After having fixed the step size, press the left and the right arrow keys to decrease or increase the frequency by the selected step.

6.3 Level

The Level function has 4 sub-menus.



Pressing the **Display** button it is possible to set two parameters: the visualized **Dynamic** range (chosen between 80, 100 and 120dB) and the **Reference Level**, that can be increased or reduced by steps of 5dB within the range +72 dB μ V to 107 dB μ V (-35 to 0 dBm).

The **Input** button opens a submenu which is dedicated to the setting of the input attenuator and to switch on-off the built-in preamplifier.

The PMM 9010 receiver takes automatically into account the settings of all the Input parameters and always displays the correct value of the level. The User is not required to make any correction to the readings.

6.3.1 Input: Attenuator and preamplifier



Being entered in the Input submenu, to increase or decrease the attenuation at the input, press **Att +** or **Att -**, and for each touch the attenuation is increased or decreased of 5 dB (preset value). Depressing either one of these keys force the receiver in manual attenuation.

When the input attenuation is 0dB (condition that can be achieved only if the Minimum Attenuation is set to 0 dB as well), the yellow led to the left of the input BNC connector is ON and indicates a warning status.

The **Min Att** button acts as a toggle switch: it selects or deselects the minimum attenuation of 10 dB. When the minimum attenuation is selected, the attenuator – doesn't matter if in automatic or in manual condition - cannot be lowered under 10 dB.

Unless specifically required by the test conditions, do not remove the minimum attenuation of 10 dB.

With the **Preamp** key it is possible to insert or exclude the built-in low noise preamplification of 20 dB.

The internal 20 dB preamplifier can be used when very weak signals have to be investigated. As already mentioned, with the preamplifier ON the receiver takes automatically care of the 20 dB gain when measuring the signals.

The **Att Auto** button is used to switch from the two conditions of manual or automatic attenuation setting.

Please note that the switching of the attenuators is relatively noisy and you can perceive it distinctly with a “click” for each switch operation.

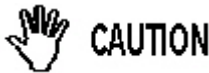
Using 0 dB attenuation PMM 9010 has no input protection.

This is a potentially dangerous condition for the input stage of the receiver.

Use 0 dB attenuation only if you are very sure that your input signal is less than 1 V (or 120 dB μ V).

Before to apply an unknown signal to PMM 9010 receiver, use an oscilloscope or a wide band RF voltmeter to measure it. In any case set Min. ATT at 10 dB and select the maximum available attenuation with preamplifier OFF.

If needed, add an external coaxial attenuator on the input signal line.



6.3.2 Misc



Under the **Miscellaneous** functions menu it is possible to activate or exclude the **Preselector** filters, the **Pulse Limiter**, and also to set the **Tracking generator**.

The **Preselector** is composed by a group of filters automatically selected by the PMM 9010 while it is sweeping or anyway measuring. The aim of the preselector is to reduce the amount of out-of-band energy entering in the receiver, thus helping a lot in reducing intermodulation problems and similar undesired behaviors.

It can be set either ON or OFF with the associated button, and normally it should be always enabled.

On the top left corner of the screen the symbol “Off” or “On” will be displayed.

The **Pulse Limiter** is a very useful device to protect the input of the receiver from transient overvoltages. Doing conducted emission tests, quite often there are conducted disturbances (usually associated to switching operations in the EUT or along the line under test) which are too high and that propagates through the LISN up to the receiver. Sometime these disturbances cannot be seen on the receiver because they are out of measurement bandwidth, nevertheless the associate energy is high enough to damage the input attenuator and/or the Analog-to-Digital Converter of the PMM 9010 (the first mixer in a traditional receiver).

This pulse limiter has an integrated 10dB attenuator and a 30 MHz low-pass filter.

When the Pulse Limiter is selected, on the upper part of the screen the letters **P.L.** appear next the value of the Minimum Attenuation and the reading on the receiver is automatically corrected for the attenuation factor of the Pulse Limiter.

Pressing the **RF OUT** button the receiver enters the **Tracking generator** menu.

RF OUT
Freq

The **tracking generator** is an internal, high stability and accuracy, 50 Ohm RF generator ranging from 10 Hz to 50 MHz.

RF OUT
Level

Activating the **Tracking On** function the generator is always tuned at the same PMM 9010 measurement frequency and scans the range together with the receiver. This is the standard way a tracking generator works in all spectrum analyzers.

Tracking
On

If the Tracking On function is disabled, the generator becomes a CW signal source tuned at the frequency set under the **RF OUT Freq** window.

As usual, to set a given frequency it is therefore enough to edit the value with the soft keys and the left an right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

RF OUT
On Off

Pressing 0 as the first figure the decimal dot appears automatically.

In both operating modes (tracking or fixed frequency) the output level can be set between 60,0 and 90,0 dB μ V with 0,1dB steps using the **RF OUT Level** button.

If a higher or lower level is needed, the User shall adopt either an external amplifier or an external attenuator.

The tracking generator is extremely useful for several applications: first of all it is essential to calibrate the receiver itself thanks to the automatic internal routines specifically developed to this extent, then it can also be used to transform the PMM 9010 in a scalar network analyzer, helping a lot in designing and testing RF filters, active stages and a lot of other circuits.

6.4 RBW



The **Resolution Bandwidth** command is used to select the bandwidth of the measuring filter. Seven bandwidth filters are available:

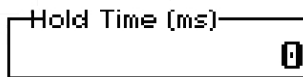
- 200 Hz CISPR 16 shaped at -6dB
- 9 kHz CISPR 16 shaped at -6dB
- 3 kHz at -3dB
- 10 kHz at -3dB
- 30 kHz at -3dB
- 100 kHz at -3dB
- 300 kHz at -3dB

The three larger filters are selectable from the first RBW screen, and pressing the **More RBW** button it is possible to select all the other filters. These filters are mathematically modeled using FIR (Finite Impulse Response) technique and they are exactly as required by the standards. More filters will be available as an option for specific applications, e.g. to cover Military Standards requirements, etc.

With the **Auto Cispr** function, the filter will be automatically selected, according to CISPR standard, depending on the tuned frequency.

When a non-CISPR filter is selected, the Quasi Peak detector is disabled.

6.5 Hold Time



The Hold Time (expressed in milliseconds) represents the time the receiver uses to “take a snapshot” of the incoming signal and to measure it with the chosen detector. When selecting a detector, the default hold time value is automatically loaded, but in some cases this time is not appropriate, e.g. when the interference signals have a low repetition rate. In this case the PMM 9010 sees a high input signal and therefore tries to set the proper attenuation automatically increasing the value or the input attenuators. However, when the input attenuation is set the signal is gone, so the receiver lowers the attenuation, but then a new peak arrives, and so on and so forth..

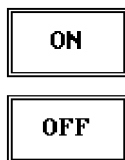
On the other hand, if the Hold Time is too high the PMM 9010 cannot properly follow the signals.

In this situation the Hold Time value should be manually set to find a correct compromise.

To set the Hold Time to the lowest possible value (this value dynamically depends from the measurement conditions), enter the figure 0; if a value lower than the allowed is entered, the lowest possible value is automatically selected.

The max. Hold Time that can be set is 30 sec (30.000 ms).

6.6 Demodulator



Switching ON the built-in AM demodulator, the volume can be adjusted with the rotating knob, and the level is shown by the black bar on the screen.

The demodulated signals can be heard with headphones or earphones connected to the front panel of the PMM 9010, or amplified and/or recorded by any suitable device.

An FM demodulator – or other demodulators - is not available for the time being in the frequency band covered by the PMM 9010.

Demod:

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7 – Applications

7.1 Measuring the EMI Voltage

ElectroMagnetic Interference (EMI) voltage measurements on power supply lines or on signal lines are carried out by means of "Coupling Networks" (e.g. LISNs) or other transducers (e.g. antennas, voltage probes). The frequency range is dictated by the applicable standard, however it is generally limited from 9 kHz to 30 MHz in commercial applications, while for measurements on other equipment/accessories - e.g. military, automotive, information technology and communication equipment (ITE), ISDN devices, etc. - the frequency range extends down to 20 Hz and up to 200 MHz, depending the relevant standards.

Nevertheless, the most common tests in the frequency range covered by PMM 9010 are certainly the conducted measurements done with the help of a LISN.

7.1.1 Measuring Principle with a LISN

In the case of a system with two floating conductors, the EMI voltages of the two conductors relative to each other and with reference to the ground form a vector system where three kind of RFI voltages are present (sometime EMI is also referred as RFI: Radio Frequency Interference). They are:

- Symmetrical (or differential mode) voltages. These RFI components are measured between the two conductors. They behave like the wanted signal on the forward and return lines.
- Asymmetrical (or common mode) voltages. These EMI components are measured between the electrical midpoint of the two conductor voltages and reference ground. Usually these are the components most likely to cause interference effects.
- Unsymmetrical voltages. These RFI components are measured from each line conductor and the reference ground. They consist of symmetrical and asymmetrical components. The measurement of these RFI voltages is the easiest to do and the most commonly performed.

Indeed, for practical reasons, Standards mostly specify the measurements of unsymmetrical voltages instead of the theoretically more meaningful common mode EMI, but the standard doesn't necessarily reflect the real life exactly as it is: it shall be a common practice reference aiming to create a database of fully comparable results.

See figure 7-1 for a graphic explanations of these differences between the EMI voltages.

Some Regulations require both measurement of symmetrical and asymmetrical RFI voltages, also defining separate and different limits for them.

7.1.2 Coupling Networks

Coupling Networks are electrical interfaces which allow to "transfer" the quantity to be measured (e.g. EMI voltages or currents) from the lines under test to the receiver.

Some types of Coupling Networks are: AMN (Artificial Mains Network), also known as "LISN" (Line Impedance Stabilization Network), Current Probe and Voltage Probe. Again, Fig. 7-1 also shows the AMN principle.

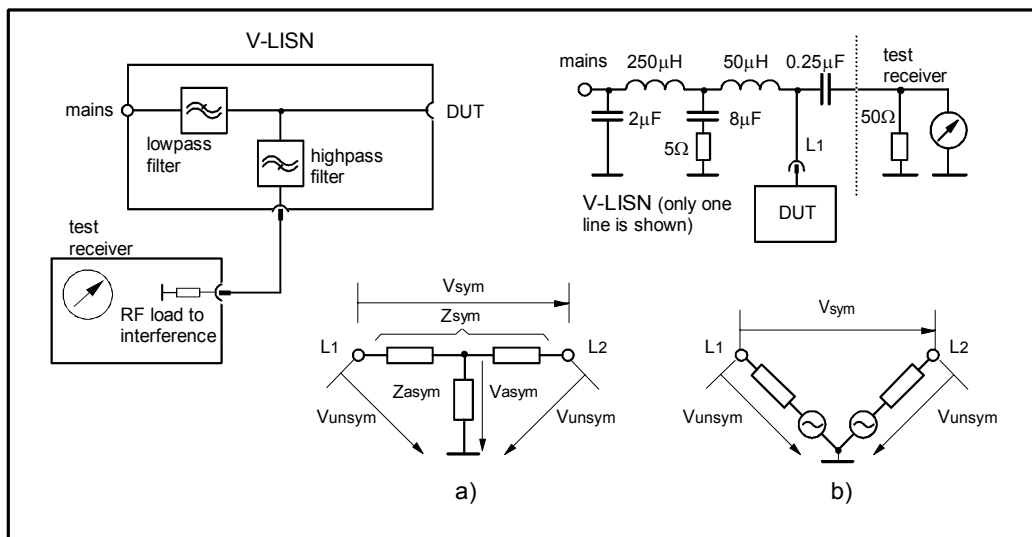


Fig. 7-1 AMN Principle: a) Δ -type or T-type LISN ; b) V-type LISN

7.1.2.1 AMN

AMNs are usually classified depending their configuration: V-type Networks, Δ -type Networks, T-type Networks.

- The V-type Network is used for measuring the unsymmetrical RFI voltage on AC and DC supply line. Standard impedances specified by CISPR and other international standards are $50\Omega // 50\mu\text{H} + 5\Omega$ and $50\Omega // 5\mu\text{H} + 1\Omega$.
- The Δ -type Network is used for measuring the symmetrical RFI voltage on balanced telecommunication lines. It is generally designed to permit switchover between symmetrical and asymmetrical RFI measurements. Its use is limited; Standards usually specify the T-type Network instead. The most common impedance for Δ -type Network is 150Ω .
- The T-type Network is used for measuring the asymmetrical RFI voltage on balanced (electrically symmetrical) audio frequency, control and data lines. Standard impedance is 150Ω as well.

An Artificial Mains Network shall be designed in order to:

1. terminate each line (power, signal, etc.) of the EUT (Equipment Under Test) with a standardized impedance;
2. permit the feeding of the EUT with the proper supply voltage and current or with the signal and data required for operations;
3. isolate the side of the test circuit where EMI voltages are measured against interference coming from mains network or from the auxiliary equipment supplying the EUT with the required data;
4. provide a suitable test point – to be connected to the test receiver - to pick up the RFI voltages from the conductor under test;
5. ensure that the impedance of the source (power, signal) is not varied in a significant way, otherwise EUT response to the interference may change.

7.1.2.2 Current Probe

Current Probes may be Clamp-on Probes or Fixed-ring Probes. Current Probes are used to measure differential or common mode RFI currents. In some cases it may be important to make a distinction between the two kinds of current flowing in a system.

RFI current measurements with Current Probes may be required, for example, when measuring EMI from shielded lines or from complex wiring systems, when finding interference sources among other sources in a system, when performing compliance to some Standards, etc.

7.1.2.3 Voltage Probe

Voltage Probes include Active Probes and Passive Probes. Active Probe has a very high input impedance $Z_{in} > 100 \text{ K}\Omega // < 10 \text{ pF}$. Passive Probe has a standard impedance $Z_{in} = 1,5 \text{ K}\Omega // < 10 \text{ pF}$.

Voltage Probe is used for measuring the unsymmetrical RFI voltage when it is not possible to carry out measurement by interconnecting an Artificial V-type Network. Such situation may occur, for example, when measuring on lines on which only small loads are permissible (control and signal lines), when measuring on a EUT (Equipment Under Test) which would not operate correctly using V-type LISN or a DUT (Device Under Test) requiring very high power supply current for which no V-type LISN is available.

For diagnostic or design purposes on high impedance circuits, Voltage Probe may be used to determine, for example, noisy components or conductors that cause interference on CMOS PC boards.

Some Regulations give statements when Voltage Probe are to be used and specify relevant setup and RFI voltage limits.

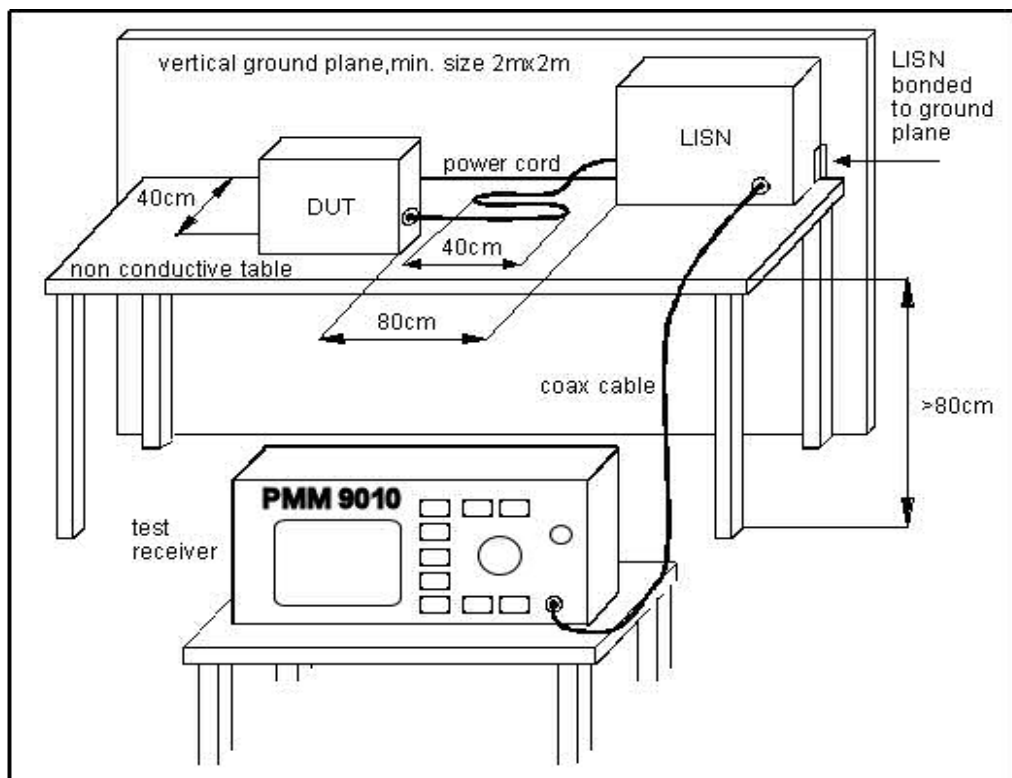


Fig. 7-2 Example of Test Setup for RFI Voltage Measurement

7.1.3 Test Setup

Fig. 7-2. shows an example of test setup for RFI voltage measurement. The DUT is placed 0,4 m from an horizontal or vertical earthed conducting surface of at least 2 m x 2 m in size.

A table top DUT is placed 0,8 m from the LISN and at least 0,8 m from any other earthed conducting surface. If the measurements are made in a shielded room, the DUT shall be placed 0,4 m from one of the walls of the room.

The LISN shall be bonded to the reference conducting surface.

A Floor standing DUT is placed 0,1 m above an horizontal earthed conducting surface of at least 2 m x 2 m in size. This size shall be exceeding by at least 0,5 m the projection of the DUT on the conducting surface. The power cable should be 1m long; longer cable should be centrally bundled for at least 40 cm.

DUTs without a PE (Protective Earth) conductor and manually operated DUTs shall be measured in conjunction with an auxiliary screen or an "Artificial Hand", as duly specified in the relevant standards.

All the details and information on the test setup are written on the latest version of the applicable Standard.

7.1.4 Guidance on a preliminary Measuring Procedure

A step-by-step example of a conducted test manually performed is the following:

1. Switch ON the PMM 9010 and enter in **Sweep** Mode pressing the relevant button;
2. Select **Display** and then **120dB**; Reference Level should be between 110 and 135 dB μ V; press **Esc**;
3. Touch the **Measure** key, then **Freq** and **A+B Band**;
4. Then **Level, Input** and set the Minimum Attenuation to 10 dB and the Attenuation is automatic; press **Esc**;
5. Select **Misc, Presel** and **Pulse Limiter** to enable the preselection and the protection of the input from voltage spikes; press **Esc**;
6. Enter in the **Detector** menu and select **Peak**; press **Esc** two times;
7. Connect a LISN or any other suitable transducer to the RF input, selecting the proper phase/line whenever applicable;
8. With the EUT switched OFF touch **Exec Sweep** and wait until the first scan has been finished;
9. Carry out an overview of the whole spectrum and check the by executing a pre-measurement with peak detector that the ambient RF disturbances are at least 20 dB below the desired emission levels;
10. If the ambient noises are low enough continue to the next step, otherwise take all the necessary steps to reduce the ambient disturbances (e.g. go to a shielded room, etc.);
11. Switch ON the EUT and then **Measure, Exec Sweep** again and wait until the scan has been finished;
12. Enter in the **Display** menu and adjust the Dynamic Range and the Reference Level to the most convenient visualization;
13. If the results are satisfactory select **Marker, Peak** and then either **Analyzer** or **Tune** to enter respectively in Spectrum Mode or in Manual Mode and deeply investigate the highest signals;
14. If the results of the scan need to be refined, select a **Limit**, if appropriate, and then **Measure, Level** and **Smart Detector** (if a limit has been loaded);
15. In the **Smart Detector** menu check the best combination among those listed; enter a **Margin**, if needed; press **Esc**;
16. **Exec Sweep** again and repeat from step #12.

7.1.5 Remarks and Hints for Measuring

To avoid errors caused by ambient interference, measurements should be carried out inside a properly shielded room. Different sites, like basements or other rooms with low ambient interferences, are often sufficient for a preliminary evaluation.

Conducted measurements do not strictly require any anechoic environment, while radiated tests may need it if so specified by the relevant standard.

Using the PMM 9010 SW Utility running on an external PC it is possible to make automatic measurements and to automatically select LISNs lines (with a PMM LISN), etc.

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8 - Updating firmware

8.1 Introduction

The PMM 9010 features a simple and user-friendly method for updating its internal firmware through a Personal Computer (PC). This section provides all the information required for easy updating.

8.2 System requirements

The minimum requirements to allow the software to operate properly are the following:

- 486 Processor or Pentium
- 16 Mb of RAM
- at least 10 Mb of free space on hard disk
- 1 free Serial Port (RS-232), or, alternatively, a USB/RS-232 Adapter with related driver
- Windows Operating System™ 95/98/2000/XP

8.3 Preparing the Hardware

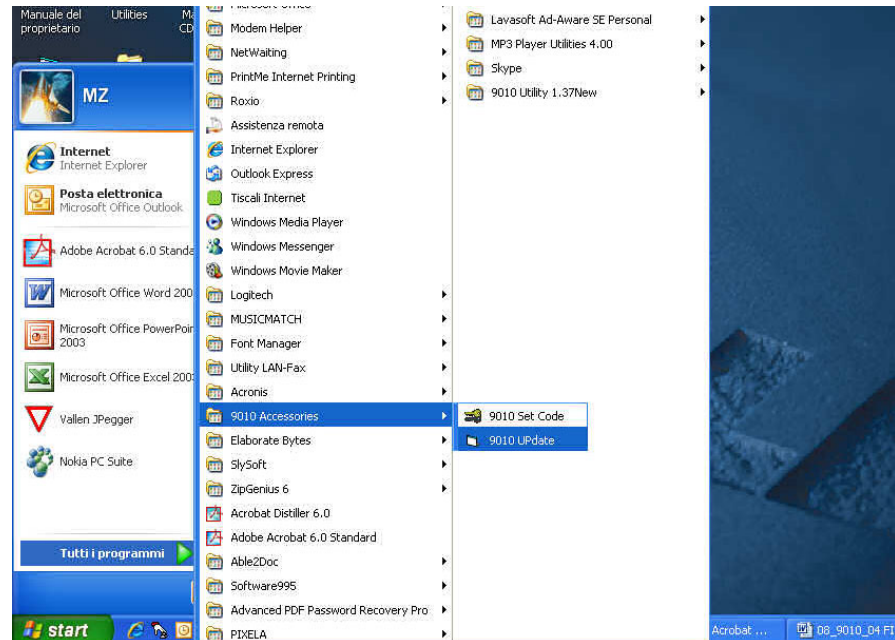
Connect the RS-232 cable supplied with PMM 9010 directly or through a USB/RS-232 Adapter separately purchased (once related driver has been properly installed), to the 9 pin socket situated on the back panel of PMM 9010 on one side and to a free RS232 port (or USB in case of Adapter's use) on the PC side.

The first free RS-232 port will be automatically detected by the Firmware Update Program during installation. In case of troubles please check port assignments on the PC through the Control Panel utility.

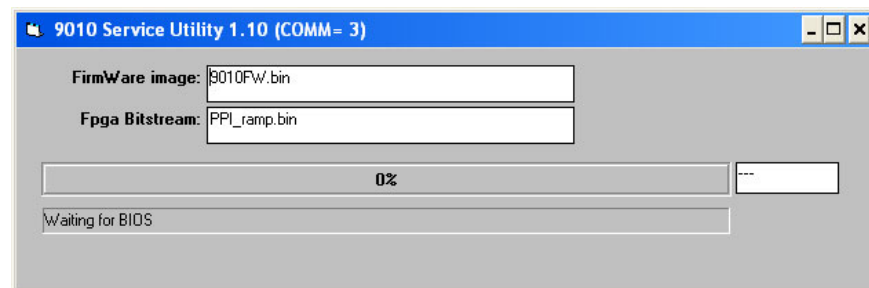
8.4 Software Installation

The Update Firmware Program is installed together with the PMM 9010 Software Utility, provided on a CD-Rom with PMM 9010 Receiver.

Once the PMM 9010 Software Utility has been installed in the PC, another item is created in the Programs list at Start Menu, which is “9010 Accessories”, from where the “9010 Update” program can be easily run



Click on “**9010 UPDATE**” (**9010UP.EXE**) once for running the update program, so getting the following window:



Please be sure the new FW file named “**9010FW.bin**” is stored in the same directory of the **9010UP.exe** file, otherwise just copy it there before performing the upgrade.

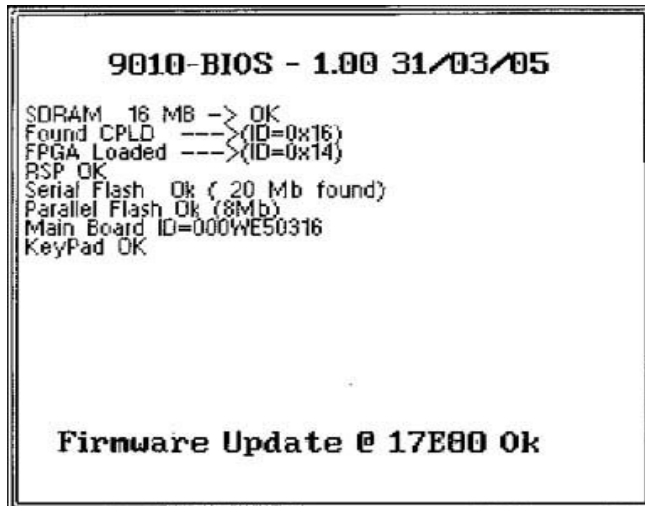
Be sure batteries of PMM 9010 and connected Laptop (PC) are fully charged before performing the FW Upgrade, otherwise the upgrade progress could not terminate properly. Alternatively, be sure to have both PMM 9010 and Laptop (PC) powered through their respective AC/DC power adapters. Anyway, even in case of failure, the internal BIOS will never be corrupted and you'll just need to repeat the procedure once more (this is a unique feature!).



8.5 To transfer data

To finally perform the Firmware Update, switch OFF the PMM 9010 at first, run the “9010 Update” to make the related window appearing with the “Waiting for BIOS” writing at the bottom, then switch ON the PMM 9010 and the FW download will begin automatically.

During the firmware storing procedure, a blue bar will progress from left to right in the window of the PC, showing percentage of downloading time by time until 100%. In the meanwhile on the 9010 display the BIOS page appears, showing again the updating status.



When FW download finishes, following message appears to show that everything was properly completed:



In case of failure, an error message is showed instead.

After Firmware Update is successfully completed, switch OFF and then ON again the PMM 9010, looking at screen.

Now at the top of the display a different FW Release Number and Date is showed after “9010-BIOS-...”, as per the following:

In case the release should not comply with what expected, just check about the FW file used during installation or get in contact with the nearest NARDA Local Distributor.

It is now possible to disconnect the cable connected to the PC, with the PMM 9010 receiver either switched On or Off.

NOTE

To obtain up-to-date Firmware or PC Utility for PMM 9010, the user can contact his NARDA agent or download it directly from Support area of EMC Product Range on the following Web Site: www.narda-sts.it.

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9 - Click Mode Operating Instructions (Option)

9.1 Introduction

Click

The **CLICK mode** allows the User to make in a fast, easy and fully automatic way a difficult test like the Discontinuous Disturbances measurement, as defined by current CISPR standards.

To enter in **Click Mode** press the key in the main menu, and immediately the first window opens as follow:

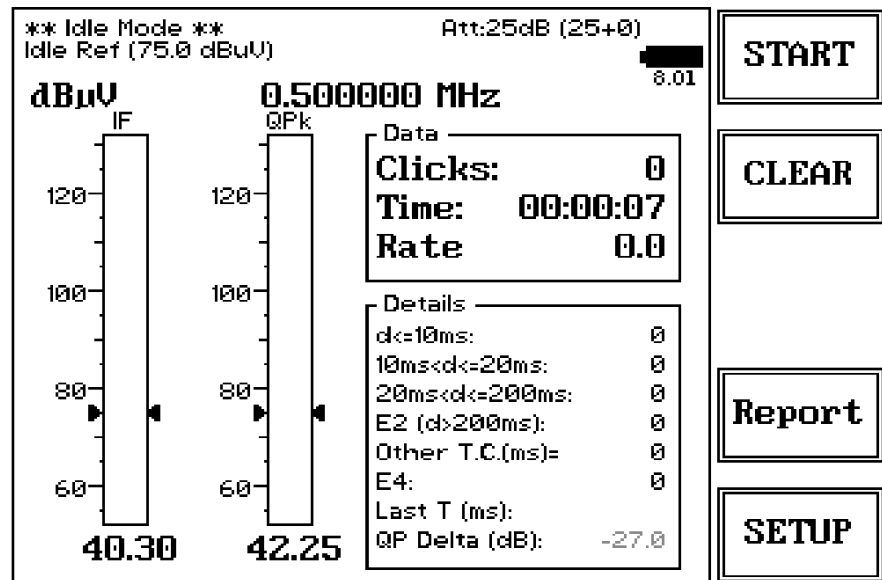


Fig. 9-1 Click

START

CLEAR

Report

SETUP

The Click mode function has four commands:

- Start
- Clear: cancel and reset all data to start an idle test;
- Report
- SETUP

Always use Esc button to return to the previous view/condition.

To increase test productivity the PMM 9010 has some very unique features: it allows skipping as many as 2 steps, as it may predict how many clicks would overcome the Lq limit and may also advice the User if the next step would fail.

Moreover, it makes a Qpeak measure and not a mere threshold comparison, as only a fully digital receiver can detect whether a Qpeak level came from an unsaturated signal or not: an analogue analyzer only have the final weighted Qpeak.

9.2 Introduction to the discontinuous disturbance (click) measurement

Mechanical or electronic switching procedures - e.g. those due to thermostats or program controls – may unintentionally generate broadband discontinuous disturbances with a repetition rate lower than 1 Hz.

Indeed, CISPR 16-2-1 and CISPR 14-1 define a discontinuous disturbance, also called “click, as a disturbance the amplitude of which exceeds the quasi-peak limit of continuous disturbance, the duration of which is not longer than 200 ms and which is separated from a subsequent disturbance by at least 200 ms. The durations are determined from the signal which exceeds the IF reference level of the measuring receiver.

A click may also contain a number of impulses; in which case the relevant time is that from the beginning of the first to the end of the last impulse.

The test procedures and the test setup for click measurement are indicated in CISPR 16-2-1 and in CISPR 14-1 standards.

It basically consists in the measurement of the number of clicks exceeding a certain level determined as function of the click number and duration.

Moreover, several “exceptions” shall be dealt with by the click analyzer in order to make the test as per the standard.

To better understand the click measurement process – automatically made by PMM 9010 - it could be useful also to know few more definitions:

- switching operation: one opening or closing of a switch or contact;
- minimum observation time T: the minimum time necessary when counting clicks (or switching operations) to provide firm evidence for the statistical interpretation of the number of click (or switching operations) per time unit;
- click rate N: number of clicks or switching operations within one minute (this figure is being used to determine the click limit);
- Click limit L_q : the relevant limit L for continuous disturbance for the measurement with the quasi-peak detector, increased by a certain value (offset) determined from the click rate N. The click limit applies to the disturbance assessed according to the upper quartile method;
- Upper quartile method: a quarter of the number of the clicks registered during the observation time T is allowed to exceed the click limit L_q . In the case of switching operations a quarter of the number of switching operations registered during the observation time T is allowed to produce clicks exceeding the click limit L_q .
- short click 1: a disturbance not longer than 10 ms;
- short click 2 (E3): a disturbance between 10 ms and 20 ms;
- click: a disturbance longer than 10 ms and not longer than 200 ms;
- other than click: a discontinuous disturbance longer than 200 ms.

With reference to the mentioned standards, a schematic process flow of the measurement is the following:

- Determination of the click rate N
- Pass/fail decision if instantaneous switching and if $N \geq 30$
- Check conformity to definitions
- Apply Exceptions (whenever applicable)
- Calculate Limit Quartile
- Measurement using Upper Quartile Method
- Pass/fail using Upper Quartile criterion
- Repeat for next frequency

As PMM 9010 manages all these steps in a completely automatic way, a detailed step by step description is here given before to describe each command and function.

9.2.1 Determination of the click rate

The first step of the measuring process is to determine the click rate N in the minimum observation time. This is done measuring the time needed to count up to 40 clicks or 40 switching operations; the maximum time allowed is anyway 2 hours (120 minutes), unless the cycle is determined by a program which needs additional time to be terminated.

Therefore, if the equipment has a cycle and in this cycle less than 40 clicks appear, then the cycle shall be repeated until 40 clicks are counted or until the observation time is 2 hours.

If the equipment has a cycle and in this cycle more than 40 clicks appear, the observation time is anyway determined by the cycle.

When the minimum observation time has been defined, it is possible to calculate the click rate N using the simple relationship:

$$N = \frac{n_1}{T}$$

where n_1 is the number of clicks measured and T is the minimum observation time.

However, in certain conditions – see CISPR 14-1 for further reference – the click rate N must be calculated using a different approach:

$$N = \frac{n_2 \cdot f}{T}$$

where n_2 is the number of switching operations and f is a factor dictated in the standard.

The click rate shall be determined at two frequencies: 150 kHz and 500 kHz.

9.2.2 Preliminary Conformity and Exceptions

Once the number of clicks – or switching operations – has been determined, then some preliminary controls can be made to verify if the rate is greater than 30 (fail conditions); if the measured clicks are conforming to the definition of the standard; if there are exceptions applicable.

Thanks to its digital architecture, PMM 9010 can easily record and store all the relevant parameters, keeping trace of all the events occurring during the test and allowing the User to postprocess all these data; PMM 9010 will also notify immediately the test results to the User.

9.2.2.1 Old and New exceptions

The “Click” test also requires to verify if exceptions E1 to E4 are applicable. While E1 and E2 are “old” exceptions easy to deal with, the new E3 and, in particular, E4 are calling for a new hardware structure: an old click analyzer is no longer compliant.

E3 is an additional counter, does not require additional memory and implies only minor changes in the test flow, thus can be implemented in a relatively easy way.

E4 is very demanding in terms of hardware requirements: a memory for storing each disturbance duration and interval is required in order to post-elaborate them, and it is mandatory to provide all the data in the test report. Moreover, as the application of E4 is conditional to the final click rate N - which in turn may prevent using E4 – the test flow significantly changes.

Only new analysers specifically designed – like the PMM 9010 - can successfully meet the requirements of the standard and be compliant with the new Click test criteria.

9.2.3 Calculate Limit Quartile

When the click rate N is determined it is possible to calculate the click limit L_q by increasing the relevant limit (quasi-peak) L for continuous disturbances with:

- 44 dB for $N < 0,2$, or
- $20 \log (30/N)$ dB for $0,2 < N < 30$

Therefore

$$L_q = L + 20 \cdot \text{Log} \frac{30}{N}$$

9.2.4 Measurement vs. L_q limit

Now the test can be done at the 4 fixed frequencies dictated by the standard: 150 kHz, 500 kHz, 1.4 MHz, 30 MHz, and the results compared with the limit L_q .

If less than 25% of the clicks measured exceeds the limit L_q , then the test is positive, otherwise it fails.

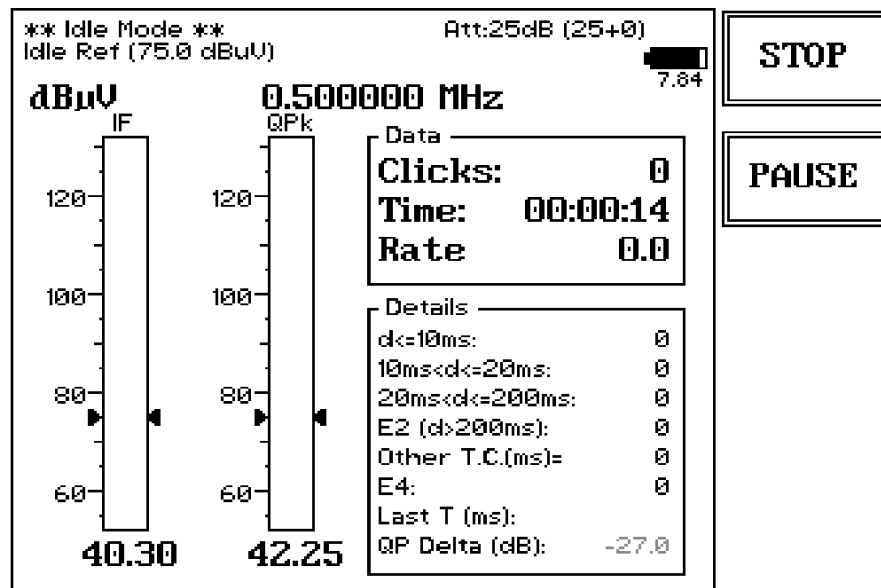
The PMM 9010 can now produce an extensive report with all the relevant data.

9.3 Start

As soon as the Setup has been done (see § 9.5), it is possible to start the test.

First of all the PMM 9010 will determine the click rate N, and – if all the conditions apply – after that the analyzer will immediately continue measuring the number of clicks exceeding the upper quartile limit L_q .

Simply select **Start**: the PMM 9010 will automatically take care of all the necessary steps, reporting at the end of the test all the relevant results.

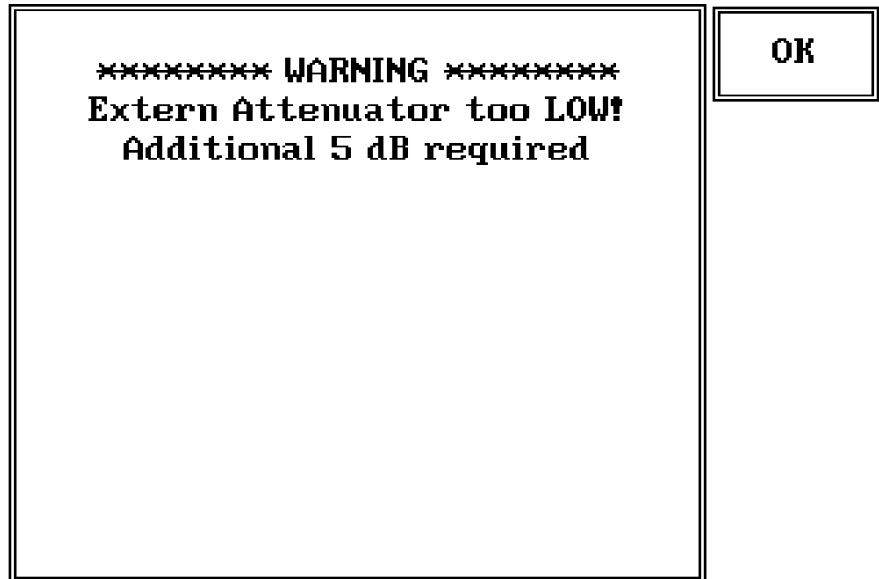


During the test, the evolution of the measurements can be continuously controlled in the Data and Details windows, where all the info are duly provided.

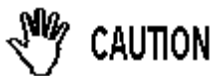
At any time it is possible to **Stop** the measure or to **Pause** it.

The PMM 9010 does the determination of the click rate at the two frequencies of 150 kHz and 500 kHz, and then it executes the test.

In certain conditions the analyzer may judge the input attenuation is not adequate: in that case a screen like the following appears and requires additional attenuation.



It's enough to touch **OK** to adjust the input attenuation to the optimum value and continue the test.



Please remember that the maximum input signal is 1 V (120 dB μ V), and that a click test may result in a potentially dangerous condition for the input stage of the receiver.

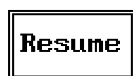
Before to apply an unknown signal to PMM 9010 receiver, use an oscilloscope or a wide band RF voltmeter to measure it.

If needed, add a coaxial attenuator to the input signal line (a 20dB external attenuator is always provided with PMM 9010-Click Option).

9.3.1 Stop and Pause



If Stop has been selected during a measurement, the test can then be aborted or it is possible to go immediately to the next step.



If Paused, the test can be resumed at any convenient time.

9.4 Report

After a Click test the PMM 9010 reports all the relevant data. Due to the complexity of the test and to the various conditions that may happen during the measurement, several reports may be issued. Here following some examples well representing the completeness and the accuracy of the analyzer.

9.4.1 Fail during determination of the click rate N

In case a fail is recorded during the determination of the click rate N at the frequency of 150 kHz, a report like the following is displayed (which is just an example with a not-realistic N number):

Lq Calculation										
Freq	Limit	10ms	20ms	0.2s	E4	o.t.c	Total	Time	N	+Lq
0.15	66.0	338	3	907	0	-14127	1249	2.9	428.5	FAIL

If the fail occurs during the determination of the click rate at 500 kHz, the report may be like this:

Lq Calculation										
Freq	Limit	10ms	20ms	0.2s	E4	o.t.c	Total	Time	N	+Lq
0.50	56.0	169	85	280	0	-7530	535	1.5	364.7	FAIL

Final Test Report										
Freq	Lq	10ms	20ms	0.2s	E4	o.t.c	Total	Time	Max	P/F
0.15	92.0	0	0	0	0	0	0	2.0	0	Pass

9.4.2 Report after a successful test with less than 5 instantaneous switching a one frequency

If the determination of the click rate N shows that at a given frequency (500 kHz in this examples) there are less than 5 instantaneous switching operations, there is no need of any further test at that frequency or frequencies (the investigation frequencies are 150 kHz for the interval from 150 to 500 kHz, and 500 kHz for the interval from 500 kHz to 30 MHz). In the example L_q is calculated for 150 kHz and no tests are done at the other frequencies as the number in instantaneous switching at 500 kHz during the observation time is less than 5.

Lq Calculation										
Freq	Limit	10ms	20ms	0.2s	E4	o.t.c	Total	Time	N	+Lq
0.15	66.0	0	0	0	(30)	600	1	1.0	1.0	29.5
0.50	56.0	0	0	0	0	0	0	1.0	0.0	PASS

Final Test Report										
Freq	Lq	10ms	20ms	0.2s	E4	o.t.c	Total	Time	Max	P/F
0.15	95.5	0	0	0	0	0	0	2.2	0	Pass

9.4.3 Report after a successful test at 4 frequencies

Here following the example of a report for a test done on all the defined frequencies.
All the relevant information is provided.

Lq Calculation										
Freq	Limit	10ms	20ms	0.2s	E4	o.t.c	Total	Time	N	+Lq
0.15	66.0	0	0	0	(50)	341	1	1.0	1.0	29.5
0.50	56.0	0	0	0	(24)	311	1	1.0	1.0	29.5

Final Test Report										
Freq	Lq	10ms	20ms	0.2s	E4	o.t.c.	Total	Time	Max	P/F
0.15	95.5	0	0	0	0	0	0	1.0	0	Pass
0.50	85.5	0	0	0	0	0	0	1.0	0	Pass
1.40	85.5	0	0	0	0	0	0	1.0	0	Pass
30.00	89.5	0	0	0	0	0	0	1.0	0	Pass

9.4.4 Report after a line search

When connected to a PMM LISN, the PMM 9010 can also automatically search for the worst line.
After having found the most noisy line, the analyzer start with the normal test flow (determination of N , etc.) measuring on the worst line.
An example of report when the worst line search has been requested is as follows:

Worst Line Search										
Line	Limit	10ms	20ms	0.2s	E4	o.t.c	Total	Time	N	Worst
L3-1	75.0	3	1	5	0	1203	9	1.0	9.1	X
L3-2	75.0	2	0	0	0	241	3	0.2	17.2	.
L3-3	75.0	1	0	0	0	0	1	0.1	10.5	.
L3-N	75.0	0	0	9	0	0	9	0.4	24.1	.

Lq Calculation										
Freq	Limit	10ms	20ms	0.2s	E4	o.t.c	Total	Time	N	+Lq
0.15	75.0	0	0	4	0	335	5	0.4	12.2	7.8
0.50	75.0	6	0	2	0	0	8	0.5	15.5	5.7

Final Test Report										
Freq	Lq	10ms	20ms	0.2s	E4	o.t.c.	Total	Time	Max	P/F
0.15	82.8	0	0	0	0	0	0	0.4	1	Pass
0.50	80.7	0	0	0	0	212	1	0.5	2	Pass
1.40	80.7	0	0	0	0	0	0	0.5	2	Pass
30.00	80.7	0	0	0	0	0	0	0.5	2	Pass

9.5 Setup

Due to the complexity of the discontinuous disturbance test, this panel is rather complex, as many parameters shall be defined. However, the PMM 9010 has been designed to be extremely user-friendly and to take care in a fully automatic way of all the necessary steps of the test.

Due to the fact that the standard fixes the frequencies at which the test shall be done, these frequencies are factory established and the User can vary the other parameters only.

From the main window select SETUP and the main Setup panel will be displayed.

The User can navigate through the different parameters rotating the control knob.

Click SETUP

Frequency 1:	0.150 MHz
Frequency 2:	0.500 MHz
Frequency 3:	1.400 MHz
Frequency 4:	30.000 MHz
Extern Att.:	0 dB
Limit:	CISPR 11
Calc N on:	Clicks
Factor f:	1.00
Stop on FAIL:	End of Step
Terminate on:	40 Clicks/Time
LINE:	NONE
Max Time:	120 min
Idle/Search Freq:	0.500 MHz
Idle lev:	75 dBuV
Smart Measure:	Yes

0
1
2
3
4

Extern Att. (dB)	0
------------------	---

9.5.1 External attenuator

In case an external attenuator is used to protect the input of the analyzer, the value of this attenuator can be entered, in order to have the PMM 9010 taking count of the value in all the calculation of the measured levels.

The way to enter the value of the attenuator is the same adopted in all the other modes (see for examples §4.1).

Extern Att. (dB)	0
------------------	---

A 20dB external attenuator is provided in the PMM 9010-Click Option kit, which has to be taken into account in this field when inserted at RF input.

9.5.2 Limit

Three most used limits are built-in into the analyzer: CISPR 14, CISPR22 and CISPR11.

Either one can be selected simply by pressing the relevant key.

The limit will be loaded and all the calculations will be done with reference to the selected limit.

9.5.3 Determination of N

As required by the standard, N may be determined either by counting the clicks, or by counting the switching operations.

Click SETUP	
Frequency 1:	0.150 MHz
Frequency 2:	0.500 MHz
Frequency 3:	1.400 MHz
Frequency 4:	30.000 MHz
Extern Att.:	0 dB
Limit:	CISPR 11
Calc N on:	Clicks
Factor f:	1.00
Stop on FAIL:	End of Step
Terminate on:	40 Clicks/Time
LINE:	NONE
Max Time:	120 min
Idle/Search Freq:	0.500 MHz
Idle lev:	75 dBuV
Smart Measure:	Yes

Clicks

Sw.Op.
+

Sw.Op.
-

Select **Clicks** if N has to be calculated on the number of clicks, or select **Sw.Op.+** or **Sw.Op.-** to determine N on the number of switching operations, going up and down the list of the available options in terms of switched current: 10mA; 20 mA; 50 mA; 100mA; 200mA; 500mA; 1A; 2A and 5A.

9.5.4 Factor f

f Factor

The applicable standard may require a certain factor f to be used to calculate the click rate N (see § 9.2.1). For example, table A2 of the CISPR14 gives the factor f for several products.

This factor depends from the nature of the EUT and shall be entered by the User in the normal way (see for example §4.1).

9.5.5 Stop on Fail

The Click test may be rather long, as the observation time and EUT cycle can take as long as 120 minutes.

In order to save time and increase productivity, the PMM 9010 can stop the test as soon as a fail condition is achieved.

Two options are therefore available: stop immediately as the fail condition occurs (Right away) or anyway at the End of Step.

Press Change to flip from one to the other option.

Click SETUP	
Frequency 1:	0.150 MHz
Frequency 2:	0.500 MHz
Frequency 3:	1.400 MHz
Frequency 4:	30.000 MHz
Extern Att.:	0 dB
Limit:	CISPR 11
Calc N on:	Clicks, 10mA
Factor f:	1.00
Stop on FAIL:	Right away
Terminate on:	40 Clicks/Time
LINE:	NONE
Max Time:	120 min
Idle/Search Freq:	0.500 MHz
Idle lev:	75 dBuV
Smart Measure:	No

Change

9.5.6 Terminate on

To define the automatic stop condition, it is possible to select between two options: 40 Clicks/Time and Time/Manually.

In the first case the stop of the step happens either after 40 clicks or after the defined time has elapsed; in the second case the step is not terminated when reaching 40 clicks (allowing thus testing EUTs which are commanded by a program) but only when the defined time has elapsed. It is always possible to stop the step manually.

it is also possible to stop the test manually.

Press Change to flip from one to the other option.

Click SETUP		Change
Frequency 1:	0.150 MHz	
Frequency 2:	0.500 MHz	
Frequency 3:	1.400 MHz	
Frequency 4:	30.000 MHz	
Extern Att.:	0 dB	
Limit:	CISPR 11	
Calc N on:	Clicks/Time	
Factor f:	1.00	
Stop on FAIL:	Right away	
Terminate on:	Time/Manually	
LINE:	NONE	
Max Time:	120 min	
Idle/Search Freq:	0.500 MHz	
Idle lev:	75 dBuV	
Smart Measure:	No	

9.5.7 Line

When using a PMM LISN, it's possible to select the Line on which to perform the test through the Setup Menu, just selecting "LINE" and accessing the related sub-menu, as per the following:

Click SETUP		Set
Frequency 1:	0.150 MHz	
Frequency 2:	0.500 MHz	
Frequency 3:	1.400 MHz	
Frequency 4:	30.000 MHz	
Extern Att.:	0 dB	
Limit:	CISPR 11	
Calc N on:	Clicks	
Factor f:	1.00	
Stop on FAIL:	End of Step	
Terminate on:	40 Clicks/Time	
LINE:	NONE	
Max Time:	120 min	
Idle/Search Freq:	0.500 MHz	
Idle lev:	75 dBuV	
Smart Measure:	Yes	

Default

In case a 3rd party LISN would be used, just leave "NONE" in the menu.

Once the PMM LISN sub-menu has been selected, a choice is available to define if to run the test on a specific Line (L1, L2, L3, N)

L2 PMM	<p style="text-align: center;">Click SETUP</p> <p>Frequency 1: 0.150 MHz Frequency 2: 0.500 MHz Frequency 3: 1.400 MHz Frequency 4: 30.000 MHz Extern Att.: 0 dB Limit: CISPR 11 Calc N on: Clicks Factor f: 1.00 Stop on FAIL: End of Step Terminate on: 40 Clicks/Time LINE: NONE Max Time: 120 min Idle/Search Freq: 0.500 MHz Idle lev: 75 dBuV Smart Measure: Yes</p>	L2 PMM
L3 PMM		L3 PMM
NONE		NONE

or to perform the test automatically on each test frequency, one Line after the other, in order to find the worst of them in terms of Emission

<p style="text-align: center;">Click SETUP</p> <p>Frequency 1: 0.150 MHz Frequency 2: 0.500 MHz Frequency 3: 1.400 MHz Frequency 4: 30.000 MHz Extern Att.: 0 dB Limit: CISPR 11 Calc N on: Clicks Factor f: 1.00 Stop on FAIL: End of Step Terminate on: 40 Clicks/Time LINE: L3-PMM L1 L2 L3 N Max Time: 120 min Idle/Search Freq: 0.500 MHz Idle lev: 75 dBuV Smart Measure: Yes</p>	L1
	L2
	L3
	N
	ALL

and finally execute the complete test on that specific Line only, so dramatically reducing time consumption.


9.5.8 Max Time

To define the duration of the test it's enough to enter the relevant time in minutes in the usual way.

Click MAX time (min) 


9.5.9 Idle Frequency

A frequency (0,15 – 0,5 – 1,4 – 30 MHz) can be selected for preliminary investigation in Idle Mode.

Idle freq 

9.5.10 Idle Level

An arbitrary Level for the Emission Limit can be chosen in Idle Mode, just to apply a certain tolerance in the debugging phase with respect to the limit which will be mandatory at the final test stage.

Idle lev. (dBuV) 

9.5.11 Smart Measure

The "Smart Measure" is a PMM 9010 unique feature which allows a relevant time saving in Click measuring approach.

It's usually very difficult to measure QuasiPeak values for pulsed signals, in a way that linearity of the receiver could normally not fulfill such a special measurement's requirement.

PMM 9010 can trace and memorize eventual saturation, instead, just got during automatic measurement test procedure, in a way that, in case no saturation conditions at all have been detected, the so got test result can be used directly to soon calculate the new limit Lq, without the need of repeating the test for it.

At the end of a Smart Measurement the operator can clearly define if the test has to be repeated with the new Lq Limit or if not repeating it at all in case of failure at this first step, so saving time and soon starting with further debugging of EUT.

The operator can face then 3 different situations:

- "No Smart", where such a function is not used at all;
- "Ask", where a saturation is detected and the operator is asked to decide if continuing anyway or not;
- normal "Smart Measure", where the measurement is normally performed until the end, i.e. the new Limit Lq is evaluated and the test is then performed taking such a new Limit into account.

9.6 Click option

The click option includes:

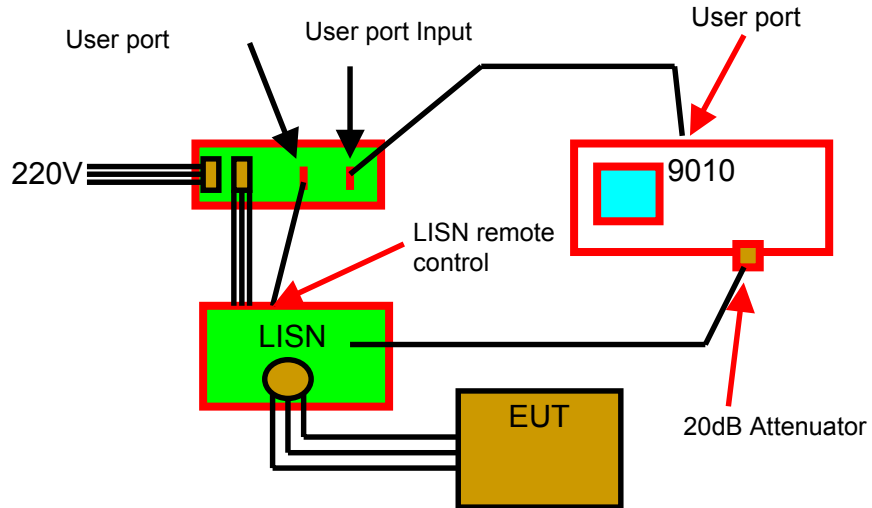
- Switching Operation Box;
- Power supply cable for the switching Box;
- EUT Power connector;
- User Port cable, 2m;
- 20 dB external coaxial attenuator;
- Activation Code

For quick reference look at the following picture.



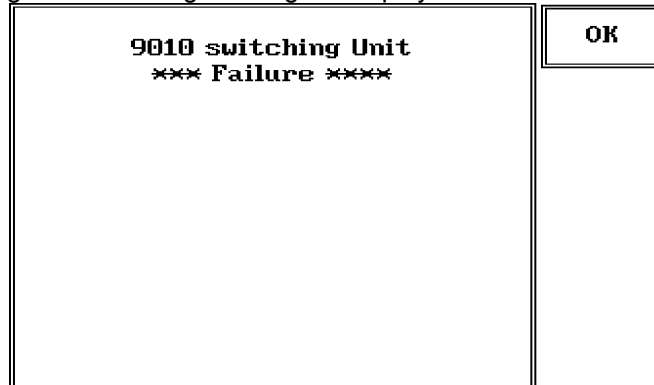
9.7 Test Set up

As required by the relevant standards, the discontinuous measurement (Click) test set up shall be the same adopted for continuous disturbances, therefore usually a LISN is used to sample the RF signal to be measured. In case the click rate N shall be determined counting the number of “Switching” operations, a proper unit called “Switching Box” shall be connected to the User Port of the PMM 9010. In this case the EUT Power Connector will be used to feed the EUT through the Switching Box and the hardware connection scheme will become then:



9.8 Diagnostic

In case the Switching Box unit is not connected – or anyway non properly functioning – the following message is displayed:



Three Leds are visible on the Switching Operation Box, with the following meaning:

TABLE 9-1 LED Status			
ERROR (Red)	DATA (Yellow)	POWER ON (Green)	Meaning
Blinking	Off	On	Condition at Power On, before attempting any access to the Box
Off	Off	On	Normal Condition after an access
Off	Blinking	On	Normal Usage with data transfer
On	Off	On	Error Condition (general)

In case of Error conditions please check both HW connections and SW settings at first, then call closest NARDA representative for help.

10 – PMM 9030 EMI Signal Analyzer 30 MHz - 3 GHz (Option)



10.1 Introduction to PMM 9030

The PMM 9030 is a powerful EMI receiver, fully CISPR 16-1-1, which extends capabilities of PMM 9010 to measure conducted and radiated interferences from 30 MHz up to 3 GHz. All measurements performed by the PMM 9030 are according to the most accepted standards like: IEC, CISPR, EN (EuroNorm), FCC, VDE,

The PMM 9030 has been designed adopting an innovative philosophy made possible only in the recent years by the availability of superior technology components. This equipment is a combination of digital and analogue circuitries to realize a true EMI receiver and signal analyzer with the precision and accuracy of a numeric approach added to the flexibility and easiness of use of a modern instrument.

The PMM 9030 has been conceived as a “smart extension unit” of the PMM 9010, to which the PMM 9030 shall be connected via high speed optic link.

10.2 Instrument Items

PMM 9030 includes the following items:

- EMI receiver from 30 MHz up to 3 GHz
- BP-01 Li-Ion battery pack;
- External power supply/battery charger;
- 20m Fiber Optic Cable;
- Antenna Holding/Support with adapters for various antennas;
- N-N adapter
- Operating Manual (included in PMM 9010 Manual);
- Certificate of Compliance.

10.3 Optional PMM accessories

PMM 9030 can be used with several optional accessories, the most common being the following:

- AS-02 : Antenna Set (biconic, log-periodic, tripod, 5 m coaxial cable, carrying case)
- RF-300 : Van Veen Loop
- SB-600 : Automatic Slide Bar for radiated power tests

10.4 Other accessories

Of course, the PMM 9030 can be used with any other accessories available on the market, like:

- Antennas and loops, any type;
- Near Field Probes;
- Various TEM and GTEM Cells.

10.5 Main Specifications

Table 10-1 lists the PMM 9030 performance specifications. The following conditions apply to all specifications:

- thanks to its analogue+digital architecture, the PMM 9030 needs only 15 minutes of warm-up period before to operate in full-compliance with specifications;
- the ambient temperature shall be 0°C to 40°C

TABLE 10-1 Main Specifications	
Electrical Characteristics	Performance Limits
Frequency range	30 MHz to 3 GHz (CISPR-16-1-1 Full-Compliance)
Resolution	100 Hz
Frequency Accuracy	< 2 ppm
RF input	Z _{in} 50 Ω, N fem.
VSWR ≥ 10 dB RF att.	< 1,2; <2 over 1 GHz
VSWR 0 dB RF att.	< 2,0
Attenuator	0 dB to 55 dB (5dB steps)
Preamplifier gain	10 dB (selectable)
Max input level (without equipment damage)	
Sinewave AC voltage	137 dBμV (1 W)
Pulse spectral density	97 dBμV/MHz
Preselector	
Three tracking filters;	30,0 MHz to 96,6 MHz 96,6 MHz to 311,0 MHz 311,0 MHz to 1,0 GHz
One highpass filter	> 1 GHz
IF bandwidth	
3 dB bandwidth	3, 10, 30, 100, 300 kHz, 1 MHz
CISPR 16-1-1 bandwidth (6 dB)	120 kHz

Noise level (preamplifier ON)

30 to 300 MHz (120 kHz BW)	< -1 dB μ V (QP); < -5 dB μ V (AV)
300 MHz to 3 GHz (120 kHz BW)	< 2 dB μ V (QP); < -2 dB μ V (AV)

Measuring Detectors

Peak, Quasi-peak, Average, RMS, Smart Detector

Level meas. time

Peak, Quasi-peak, RMS and Average (simultaneous detectors)	1 ms to 30 sec. (CISPR 16-1-1 default)
---	--

Display units

dBm, dB μ V (as stand-alone);
dBm, dB μ V, dB μ V/m, dBmA, dBmA/m, dBpW (through 9010 SW Utility on PC)

Spectrum

Span/division	Up to 300 MHz
----------------------	---------------

Measurement accuracy

S/N > 20 dB

30 to 1000 MHz	\pm 1,0 dB
1 to 3 GHz	\pm 1,5 dB

Demodulation

AM demodulator (through PMM 9010)

I/O Interface Out

High Speed Optical Link;
RS232 (service only)

Operating temperature

0° to 40°C

Power supply

10 - 15 Volt DC, 2,5A; Li-Ion interchangeable battery (4 h operations, average)

Dimensions

235 x 105 x 105 mm

Weight

2,0 kg

10.6 Front and Rear Panel



Fig. 10-1 Front and Rear Panels

Only the input N connector is available on the front panel.

All other interfaces and connections are on the rear panel.

Legend top-down, from left to right on the rear panel:

- Replaceable Li-Ion Battery with Battery Charger connector

- **OPTIC LINK** Optical link connector for PMM 9010

- **RS232** 9 pin, DB9 connector

- **ON** Power ON-OFF switch button

- **PW** Power ON/Communication led (Blinking Red at power-on until communication with PMM 9010 is established, then Fixed Green during normal communication)

- Product Label and Serial Number

10.7 Functional Description

The PMM 9030 features a completely new receiver architecture based on the most recent DSP technology, as shown on the diagram below. The PMM 9030 block diagram is shown in Fig. 10-2

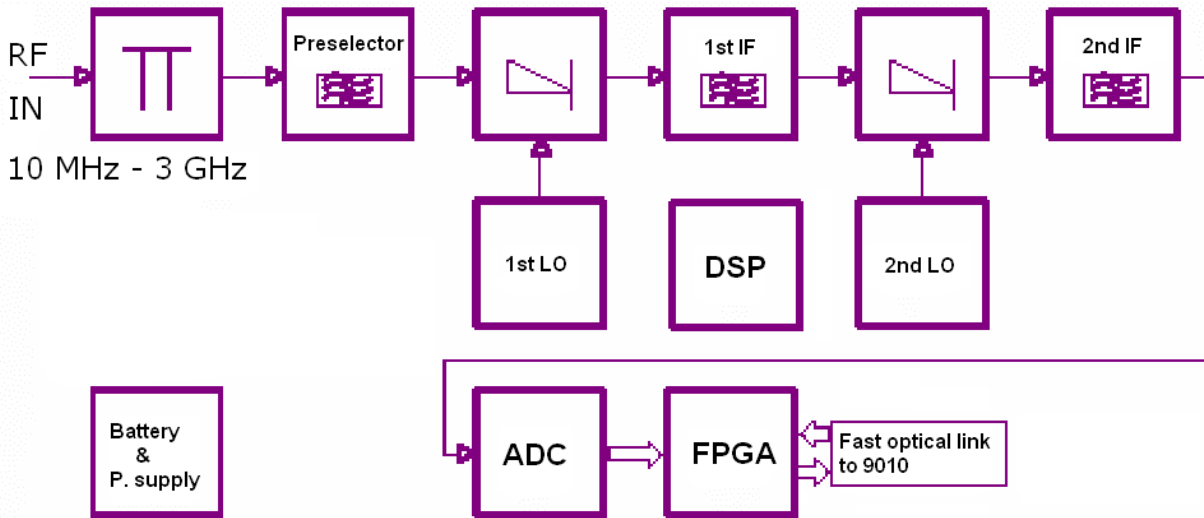


Fig. 10-2 PMM 9030 Functional BLOCK Diagram

10.8 No coaxial cable between the antenna and the receiver: a unique features of the PMM 9030

Thanks to its very limited dimensions and lightweight construction, the PMM 9030 can be connected directly to the antenna using the supplied antenna support/adaptor; the PMM 9030 is then linked to the PMM 9010 via the built-in high speed optical link. This is a very unique feature that makes the dream of all test engineers come true: no losses or mismatches between the antenna and the receiver, no more bulky cables full of ferrites, no more additional uncertainties due to the cables from the antenna to the receiver!

The Optical link, whose transfer rate is more than 2,5 Gb/s, and the proprietary transfer protocol help to ensure a communication almost error free and always reliable in all test measurement conditions.

A result of all these innovating features is that the PMM 9030 is extremely fast and a scan of the complete band up to 3 GHz can be performed in just 8 seconds: a terrific productivity increase in any test lab, in particular because these performances are obtained with no quality or performance compromises and with reduced uncertainties, compared to a traditional solution.

10.9 Emission measurements

All electric and electronic devices are potential generators of ElectroMagnetic Interference (EMI).

The term EMI thus refers to the electromagnetic energy emitted by a device which propagates itself along cables or through the air and couples with other devices that are present in the surroundings.

These electromagnetic fields (conducted or radiated interferences) may generate interfering currents and voltages into nearby equipment and therefore can cause possible malfunctions.

In order to prevent and control such interferences there are nowadays a number of national and international standards, like IEC and CISPR, which specifies limits and methods of tests. Moreover, within the European Union the application of several European Norms on Electromagnetic Compatibility is enforced by law and therefore the commercialization and use of all the electric and electronic equipment is subject to the measurement of the EMC characteristics, which must be within well defined limits.

The design approach adopted for the PMM 9030 is that the instrument shall be innovative, full compliant with all the relevant standards and at the same time simple and reliable to use, to be the base building block for any possible emission system to measure and evaluate any electric or electronic device from the very first design stages to the final certification.

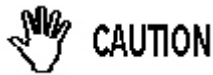
The need to precisely measure the conducted and radiated EMI noises forces the equipment manufactures to use reliable equipment to verify the limits imposed by the relevant standards and/or enforced by local rules.

In this view the PMM 9030 receiver is the ideal solution from prototype debugging to final certification, as it fully meets all the performance criteria dictated by these standards, although it remains small, lightweight and very easy to use.

The PMM 9010 Utility control software permits an immediate use of the instrument without any training or special difficulties: the operator can concentrate just on analyzing the measurement results.

Moreover, the PMM 9010 software has also been designed for a fast and easy installation on any PC with the Windows™ operating system and with at least one free USB or Serial Port.

The device under test (DUT) must be installed according to the procedures indicated in the constructor's manual and normal operating conditions respected.



Be sure not to overload PMM 9030: the input signal should not exceed the maximum level indicated in the main specifications in chapter 10. Also do not apply any signal to the 9010 input and generator output connectors.

10.10 - Installation

10.10.1 Introduction

This section provides the information needed to install your PMM 9030. It includes the information pertinent to initial inspection and power requirements, connections, operating environment, instrument mounting, cleaning, storage and shipment.

10.10.2 Initial Inspection

When receiving the equipment, first inspect the shipping cardbox for any damages.

If the shipping box is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

10.10.2.1 Packing and Unpacking

Verify the availability of all the shipped items with reference to the shipping check list enclosed with the Operating Manual.

Notify any damage to the forwarder personnel as well as to your NARDA Representative.



WARNING

To avoid further damage, do not turn on the instrument when there are signs of shipping damage to any portion of it.

10.10.3 Preparation for Use



WARNING

This is a Safety Class III apparatus, but it is also equipped with a protective/functional earth terminal on the rear panel. A good safety/functional ground connection should be provided before to operate the receiver.

10.10.4 Battery charger

The battery charger supplied with the receiver can work at either 50 Hz or 60 Hz with a supply voltage rated between 100 and 240 Volt.

It is supplied with different connectors to fit all the possible outlets in accordance with the various National standards.



Battery charger: DC, 10 - 15 V, ~ 2500 mA
=> DC Connector

10.10.4.1 To replace the mains connector of the battery charger

To replace the mains connector, simply remove the one installed on the battery charger sliding it off, and insert the one that fits the outlets in use.

10.10.4.2 To charge the internal battery

In order to guarantee the best autonomy of the internal battery, we recommend to fully recharge it before using the receiver.

To charge the battery, simply connect the battery charger to the mains power socket and then insert the DC output connector of the battery charger to the input **CHARGER** on the rear panel of the receiver.



NOTE

ALWAYS connect the battery charger to the mains power BEFORE connecting the DC output to PMM 9030. The battery charger has an internal protective circuit that will not let it work if there is a load connected to the output connector before the connection to the mains is done.

10.10.4.3 Indication of the battery status on the screen and with PW led



The charge status of the battery is displayed at the right and on the middle of the PM9010 screen when initializing the PMM 9030. The symbol of a small battery will be filled up proportionally to the status of the battery charge.

When the battery is not under charge, the actual voltage value is displayed under the symbol and the length of the black bar filling the symbol indicates the available autonomy still remaining.

When the battery charger is connected to the PMM 9030 the indication "PWR" appears just below to the battery icon and the front panel **PW** led becomes yellow if the receiver is switched on and red if the receiver is off.

The battery charging is suspended or ends automatically when one of the following events occurs:

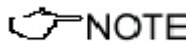
- the full capacity of the battery has been achieved,
- the internal temperature of the battery is higher then a preset safety threshold,
- the charging time limit has been exceeded.

Both during recharging and when charge is completed PMM 9030 is ready for use.



The PW led on the back panel blinks green when the battery voltage drops below 7,0V to warn the Operator that the instrument is running out of battery.

To prevent any damage to the battery, the PMM 9030 automatically switches off when the battery voltage falls below 6,5V.



In order to keep the batteries fully functional, it is crucial to have a complete recharge before storing them for periods longer than 4 months. Therefore, it is suggested to recharge the batteries at least every 4 months even when the receiver has not been used.



The PMM 9010 and the PMM 9030 have the same model of battery. It means they are perfectly exchangeable among the two equipment. To make an easy example, the 9010 could be installed in an instrument/control room and connected to the mains, to keep the battery at its highest charge. The PMM 9030 could be in the test chamber – connected to 9010 via fiber optic link - and running on its battery. When the battery of the 9030 is almost fully discharged, the User can stop the test, replace the battery of the 9030 with a charged battery (e.g. the one of 9010) and then restart the test.

10.10.5 Environment

The operating environment of the receiver is specified to be within the following limits:

- Temperature +0° to +40° C
- Humidity < 90% relative
- Altitude 4000 meters

The instrument should be stored and shipped in a clean, dry environment which is specified to be within the following limitations:

- Temperature -40° to + 50° C
- Humidity < 95% relative
- Altitude 15.000 meters

10.10.6 Return for Service

If the instrument should be returned to NARDA for servicing, please complete the service questionnaire enclosed with the Operating Manual and attach it to the instrument.

To minimize the repair time, be as specific as possible when describing the failure. If the failure only occurs under certain conditions, explain how to duplicate the failure.

If possible, reusing of the original packaging to ship the equipment is preferable.

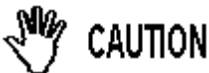
In case other package should be used, ensure to wrap the instrument in heavy paper or plastic.

Use a strong shipping box and use enough shock absorbing material all around the equipment to provide a firm cushion and prevent movement in the shipping box; in particular protect the front panel.

Seal the shipping box securely.

Mark the shipping box FRAGILE to encourage careful handling.

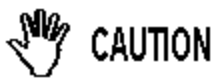
10.10.7 Equipment Cleaning



Use a clean, dry, non abrasive cloth for external cleaning of the equipment.

To clean the equipment do not use any solvent, thinner, turpentine, acid, acetone or similar matter to avoid damage to external plastic or display surfaces.

10.10.8 Equipment ventilation



To allow correct equipment ventilation ensure that the vent grids on the side panels and on the bottom of the receiver are free by any obstructing object.

10.10.9 Hardware Installation

PMM 9030 is delivered from factory ready to use as a companion of the PMM 9010.

Remove the receiver from its cardboard and install it where desired, e.g. directly on the antenna output connector (see detailed instruction later on in this manual), or anyway connect the output of your antenna or transducer device to the N connector on the front panel of PMM 9030 and immediately start to measure up to 3 GHz.

Remove the Optic Link protective cover pressing the small tab under the protective cover and gently pull it; keep it aside for future protection of the port on the receiver. Repeat the same operations for the Optical Link #1 on the PMM 9010.

Connect the Optic Fiber delivered with PMM 9030 to the PMM 9030 and to the PMM 9010 pushing the connector in the Optical port until a “click” can be heard; be sure the key of the connector is in the right orientation. Once fiber optic cable has been connected properly on both sides it’s possible to start in operating PMM 9030 together with PMM 9010.

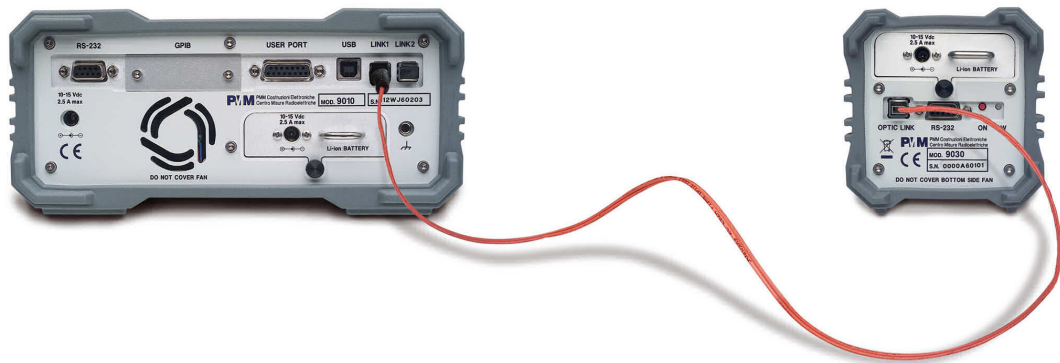


Fig. 10-3 PMM 9030 Fiber Optic Link to PMM 9010

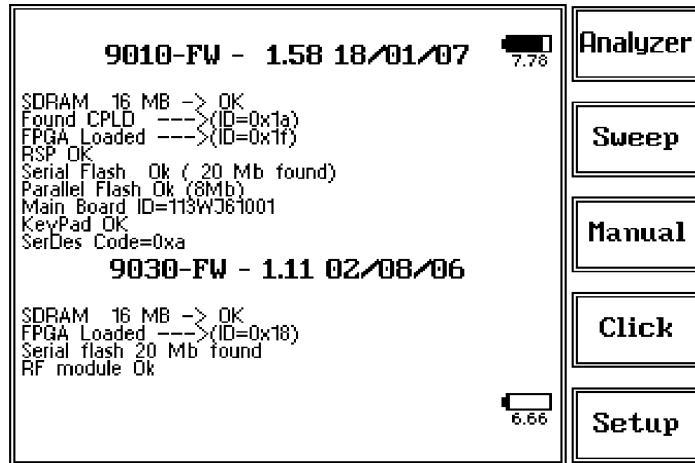
Switch ON the PMM 9030 keeping the “ON” small red button pressed until the PW Led lights up blinking in Red colour (about 1 second), then release the button. To avoid unwanted starts, if the “ON” button is kept pressed for a too short time or for more then 2 seconds the instrument is switched automatically off.

Push and keep pressed the “ON/OFF” button for more then 2 seconds to switch off the receiver.

After having been switched ON, the PMM 9030 boots with its internal BIOS and in matter of few tens of second runs the firmware which manages the receiver.

Now switch ON the 9010: a screen like the following should appear.

10.10.10 PMM 9010 + PMM 9030 initial screen



The PMM 9030 is now ready to work in conjunction with the PMM 9010.

10.10.11 LED on the PMM 9010 and on the PMM 9030

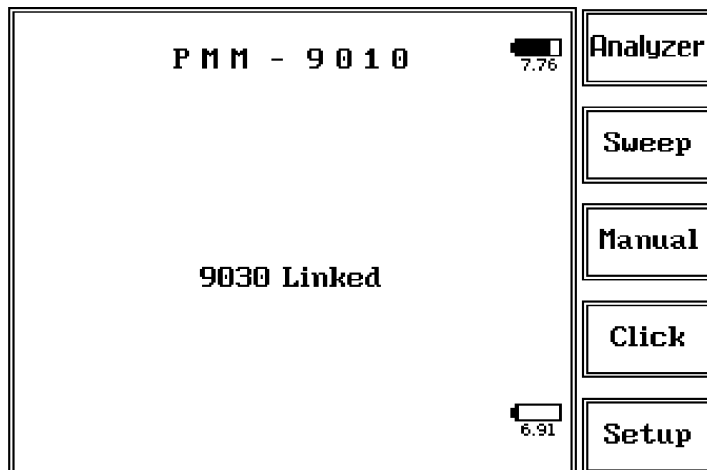
When the PMM 9030 is connected to PMM 9010, the yellow led next to the RF input of PMM 9010 ("0dB led") blinks to indicate that an expansion unit is connected and that this BNC input shall be kept free of any other connections.

The PW led on the back of the PMM 9030 remains on in fix green color, to indicate the connection is good and stable.

When for any reason the link between PMM 9010 and PMM 9030 is interrupted, the PW led on the PMM 9030 blinks red (as just after the power ON), to indicate there is a connection problem. After about 60 seconds in this condition, the PMM 9030 switches automatically OFF to save the battery.

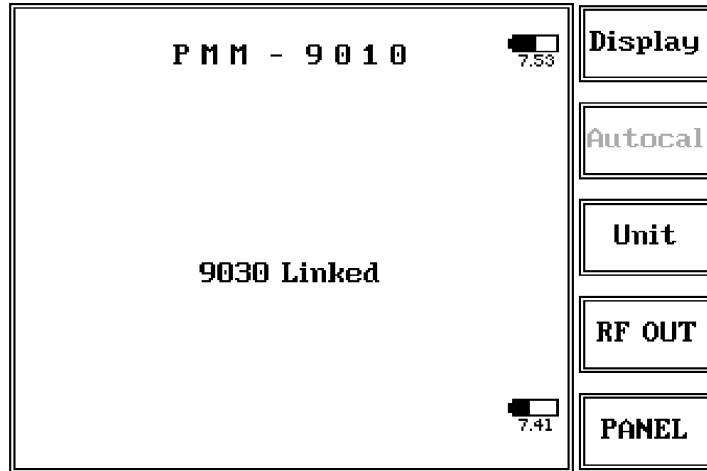
10.10.12 PMM 9010 + PMM 9030 main screen

After having selected any key and being returned to the main screen, the usual appearance of the main screen is as follows:



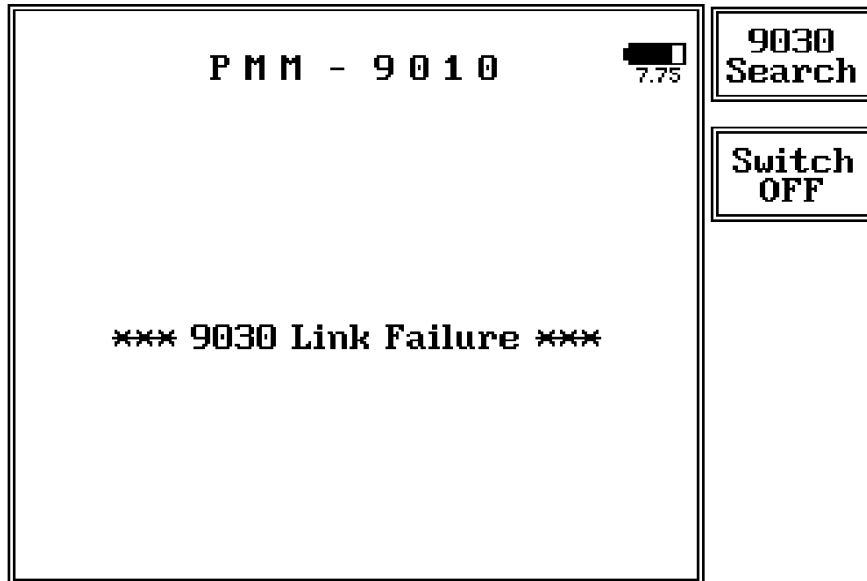
**10.10.13 PMM 9010 +
PMM 9030
Setup panel**

No changes in this panel, but that the Autocalibration function is no longer available in this condition.



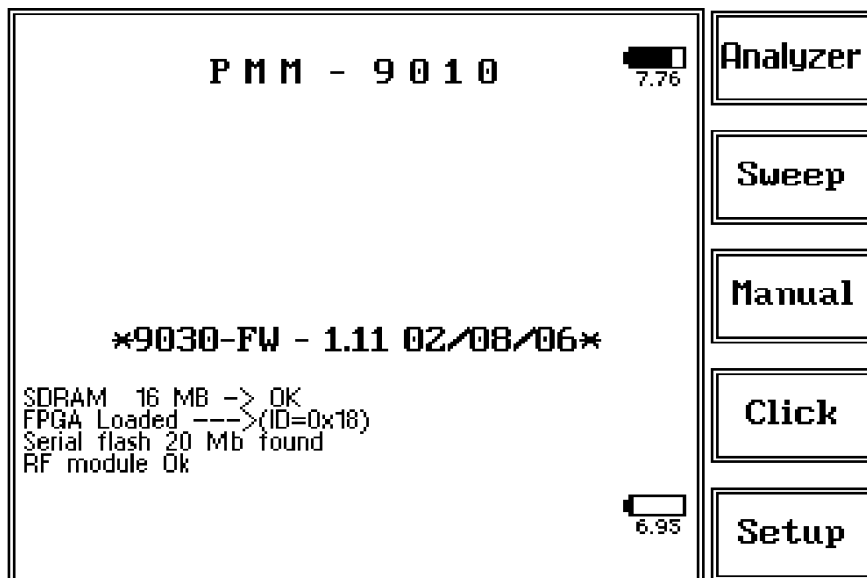
**10.10.14 PMM 9010 +
PMM 9030
Link failure**

When, for any reason, the optical connection between PMM 9010 and PMM 9030 is lost, a message is shown on the screen like the following:



In this case, press the button 9030 Search: if there are no changes, check the PMM 9030 and verify it is ON. Replace the battery if needed (almost all the occurrences of link failure are due to the battery too low) and switch ON again the PMM 9030.

A new screen like the following should be displayed:



10.10.15 Using an Antenna

In the frequency range from 30 MHz to 3 GHz two different antennas, a Biconic and a Log-Periodic can be used to pick-up and measure RF radiated emissions; alternatively, some Biconi-Log antennas are also available to cover the whole range without changing between two antennas, even if such a solution is mostly more expensive and the antenna size is usually bigger.

The really “unique” feature of PMM 9030 is that of allowing direct connection between antenna output connector and EMI receiver input, so dramatically increasing system immunity to environmental noise at detection side and completely cutting-off any capacitive coupling between antenna, ground plane and connectin cables.

In order to perfectly match antennas to PMM 9030, a dedicated Teflon Antenna Holder is also provided as a standard accessory, so balancing weight between receiver and antenna when attached to a tripod or antenna mast.

Such Antenna Holder comes with some spare parts plus nuts and bolts, which can be easily assembled with provided wrench, as per step-by-step operations in following pictures.

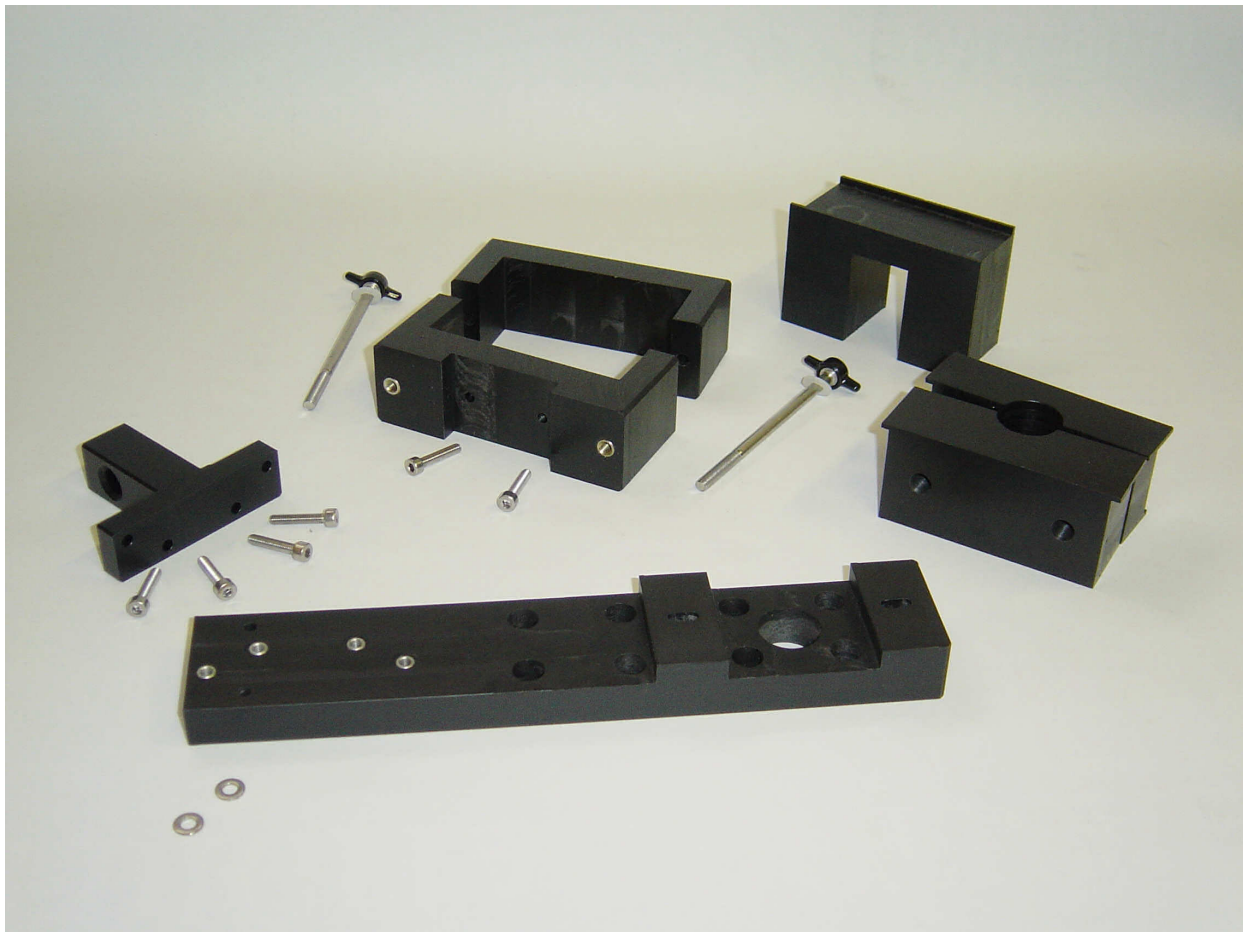


Fig. 10-4 PMM 9030 Antenna Holder spare parts

Assembling Steps (from left to right)

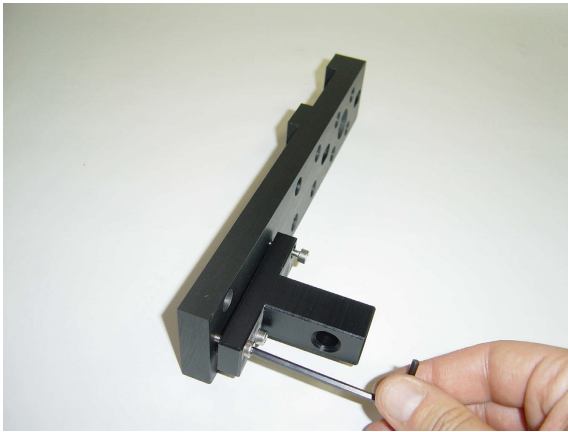


Fig. 10-5 Mounting the Tripod Joint

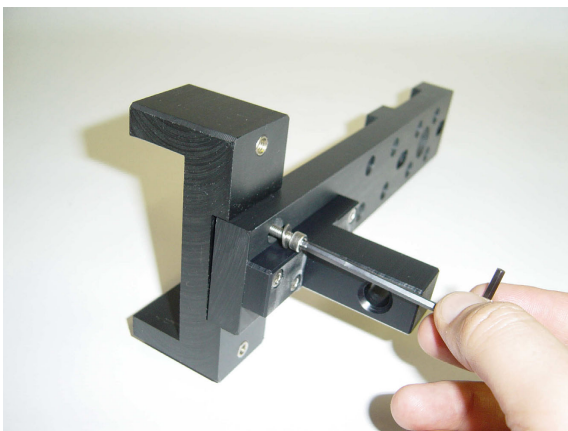


Fig. 10-6 Fixing the base of Antenna Holder

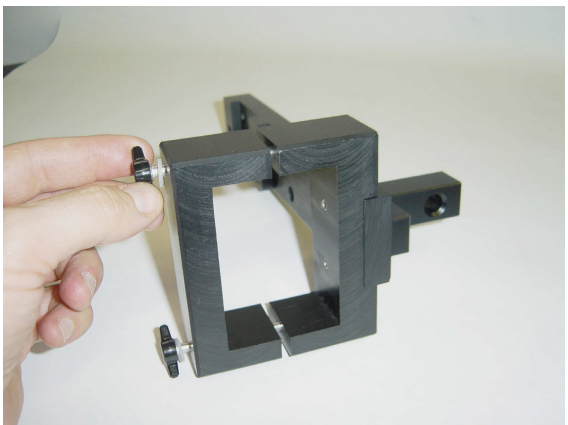
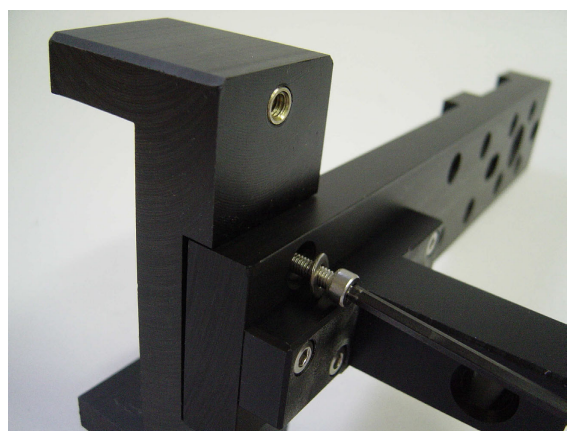


Fig. 10-7 Closing the Antenna Holder

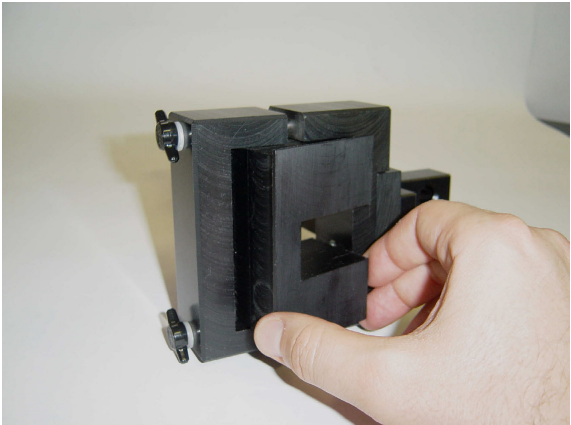


Fig. 10-8 Inserting the Adapter for PMM Log-Periodic

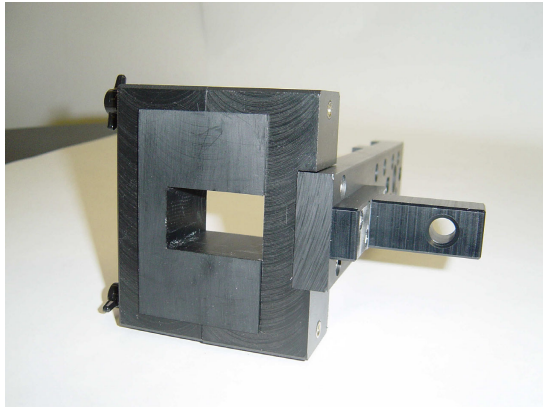


Fig. 10-9 Complete assembling

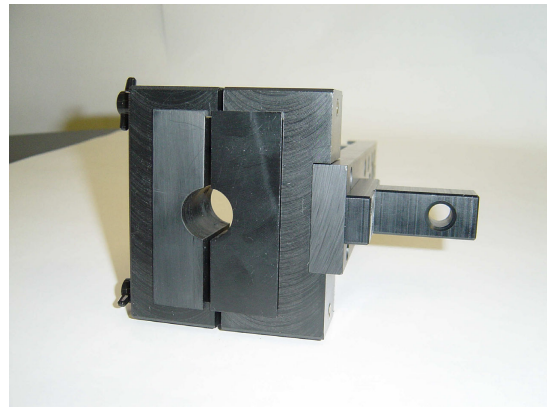


Fig 10-10 Complete assembling for other antennas

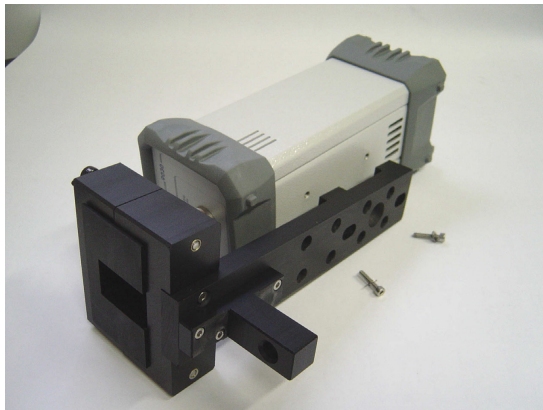


Fig. 10-11 Mounting the Antenna Holder on PMM 9030

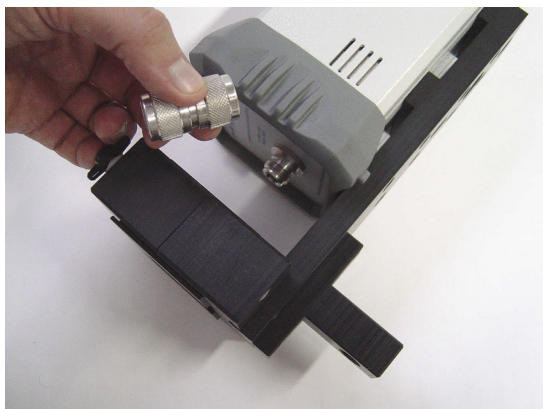


Fig. 10-12 Screwing the N-N Adapter for Antenna Matching



Fig. 10-13 Fixing onto the Tripod



Fig. 10-14 Attaching PMM LogPeriodic

10.11 - Analyzer Mode Operating Instructions

10.11.1 Introduction

Analyzer

To enter in the **ANALYZER Mode** it's enough to depress the Analyzer soft key on the main screen.

In this mode the receiver works as a powerful Spectrum Analyzer and the display shows the "spectrum analysis" (span max 3 GHz) in the frequency domain of a signal tuned at a given frequency.

The analysis is done at the selected span frequency.

Using the marker facility the User can accomplish a very accurate measurement of the signals either in frequency as well as in level.

Entering **Analyzer Mode** from the main menu, the display will look like the following:

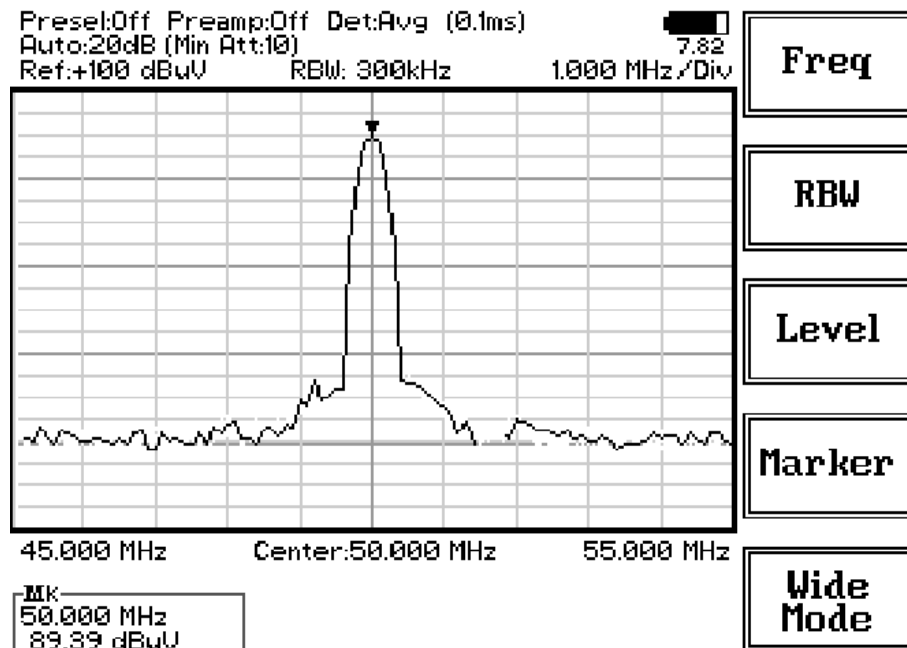


Fig. 10-15 Spectrum

NOTE

The **SPAN** per division is automatically managed by the equipment.

On the screen of the Analyzer Mode all the relevant information are reported. From the upper left corner, the User can see if the Preselector is ON or OFF; if the Preamplifier is ON or OFF; which detector is in use and the relevant hold time; if the input attenuation is Automatic or Manual and the set attenuation and if the Minimum attenuation is 10 dB or 0dB.

Just above the graph, from left to right, there is the Reference level, the Resolution bandwidth and the span value.

Below the graph the start, center and stop frequency.

The bottom left corner is dedicated to the marker indication, with actual frequency and level of the marker.



The Spectrum mode function is divided into five sub windows:

- Frequency
- Resolution Bandwidth
- Level
- Marker
- Wide Mode

The fifth button is used to change the spectrum view to **wide screen mode**, as shown in the picture 4-1, and with the **Esc** button the original view can be restored.

Always use Esc button to return to the previous view/condition.

10.11.2 Frequency

Allows the User to set the tuning frequency and also the Span.



The **Center** frequency of the Spectrum window can be directly edited into the window or set by the arrow buttons or by the rotary knob, which frequency steps are set under the Manual mode.

Depressing the **Center** button the figures 0, 1, 2, 3, and 4 are selectable; with the right arrow key it is possible to select the figures from 5 to 9, and pressing again the right arrow key the units kHz, MHz and GHz becomes accessible, as well as the decimal dot and the Back Space. The left arrow key can be used as well to move back and forth from one screen to the other. Pressing 0 as the first figure the decimal dot appears automatically.

To set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

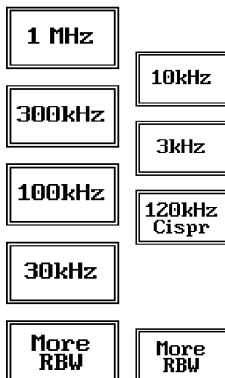
The figures entered appear in a small window just below the graph and the default unit is MHz, so 100 kHz = 0,1 MHz; 10 kHz = 0,01 MHz; 1 kHz = 0,001 MHz and 100 Hz = 0,0001 MHz.

Using the **Start** and **Stop** buttons it is possible to select any start and stop value in the frequency range 10 Hz to 3 GHz band.

Another method for setting the frequency is to enter the **Center** frequency and the appropriate **Span**.

In this mode of operation the frequency step (spectrum resolution) is set automatically, therefore it cannot be changed manually.

10.11.3 RBW



The **Resolution Bandwidth** command is used to select the bandwidth of the measuring filter. Seven bandwidth filters are available:

- 120 kHz CISPR 16 shaped at -6dB
- 3 kHz at -3dB
- 10 kHz at -3dB
- 30 kHz at -3dB
- 100 kHz at -3dB
- 300 kHz at -3dB
- 1 MHz at -3dB

The four larger filters are selectable from the first RBW screen, and pressing the **More RBW** button it is possible to select all the other filters.

These filters are mathematically modeled using FIR (Finite Impulse Response) technique and they are exactly as required by the standards.

More filters will be available as an option for specific applications, e.g. to cover Military Standards requirements, etc.

10.11.4 Level

The Level function has 5 sub-menus, each one with several options.



Pressing the **Display** button it is possible to set two parameters: the visualized **Dynamic** range (chosen between 80, 100 and 120dB) and the **Reference Level**, that can be increased or reduced by steps of 5dB within the range +55 dB μ V to 90 dB μ V (-50 to - 15 dBm).

The **Input** button opens a submenu which is dedicated to the setting of the input attenuator and to switch on-off the built-in preamplifier.

The PMM 9030 receiver takes automatically into account the settings of all the Input parameters and always displays the correct value of the level. The User is not required to make any correction to the readings.

10.11.4.1 Input: Attenuators and preamplifier



Being entered in the Input submenu, to increase or decrease the attenuation at the input, press **Att +** or **Att -**, and for each touch the attenuation is increased or decreased of 5 dB (preset value) up to the max attenuation available of 55 dB.

Depressing either one of these keys force the receiver in manual attenuation.

The **Min Att** button acts as a toggle switch: it selects or deselects the minimum attenuation of 10 dB. When the minimum attenuation is selected, the attenuator – doesn't matter if in automatic or in manual condition - cannot be lowered under 10 dB.

Unless specifically required by the test conditions, do not remove the minimum attenuation of 10 dB.

With the **Preamp** key it is possible to insert or exclude the built-in low noise preamplification of 10 dB.

The internal 10 dB preamplifier can be used when very weak signals have to be investigated. As already mentioned, with the preamplifier ON the receiver takes automatically care of the 10 dB gain when measuring the signals.

The **Att Auto** button is used to switch from the two conditions of manual or automatic attenuation setting.

Please note that the switching of the attenuators is relatively noisy and you can perceive it distinctly with a "click" for each switch operation.

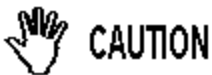
Using 0 dB attenuation PMM 9030 has no input protection.

This is a potentially dangerous condition for the input stage of the receiver.

Use 0 dB attenuation only if you are very sure that your input signal is less than 1 V (or 120 dB μ V).

Before to apply an unknown signal to PMM 9030 receiver, use an oscilloscope or a wide band RF voltmeter to measure it. In any case set Min. ATT at 10 dB and select the maximum available attenuation with preamplifier OFF.

If needed, add an external coaxial attenuator on the input signal line.



10.11.4.2 Misc

Presel

Pulse
Limiter

RF OUT

Under the **Miscellanea** functions menu it is possible to activate or exclude the **Preselector** filters and also to set the **Tracking Generator**.

The **Preselector** is composed by a group of filters automatically selected by the PMM 9030 while it is sweeping or anyway measuring. The aim of the preselector is to reduce the amount of out-of-band energy entering in the receiver, thus helping a lot in reducing intermodulation problems and similar undesired behaviors.

In Analyzer mode the preselector is available only if the entire span falls in one filter band (see the main specification in chapter 1 to verify the frequency bands). In this situation on the display it will be shown: Preselector ON. If the span is larger than one filter only, on the display the symbol *** will appear instead.

It can be set either ON or OFF with the associated button, and normally it should be always enabled.

On the top left corner of the screen the symbol "Off" or "On" will be displayed.

Pressing the **RF OUT** button the receiver enters the Generator menu.

10.11.4.3 Detector

Peak

Avg

RMS

Hold
Time

This menu allows the Operator to select the most appropriate detector for the test.

In Analyzer mode the Peak, Average and RMS (Root Mean Square) detectors are available and can be selected via the appropriate button.

Hold time

The Hold Time (expressed in milliseconds) represents the time the receiver uses to "take a snapshot" of the incoming signal and to measure it with the chosen detector. When selecting a detector, the default hold time value is automatically loaded, but in some cases this time is not appropriate, e.g. when the interference signals have a low repetition rate. In this case the PMM 9030 sees a high input signal and therefore tries to set the proper attenuation automatically increasing the value or the input attenuators. However, when the input attenuation is set the signal is gone, so the receiver lowers the attenuation, but then a new peak arrives, and so on and so forth..

On the other hand, if the Hold Time is too high the PMM 9030 cannot properly follow the signals.

In this situation the Hold Time value should be manually set to find a correct compromise.

To set the Hold Time to the lowest possible value (this value dynamically depends from the measurement conditions), enter the figure 0; if a value lower than the allowed is entered, the lowest possible value is automatically selected.

The max. Hold Time that can be set is 30 sec (30.000 ms).

10.11.4.4 Conversion factor

NO
Factor

NO
Factor

NO
Factor

NO
Factor

NONE

When using a transducer to make a measurement – a Voltage or Current Probe, an Antenna, etc. – there is always the need to add to the measured values the conversion factor of the transducer in use.

The Conversion factor may also take proper account of losses as cable loss, attenuators added externally to the receiver, etc.

The PMM 9030 can handle these factors in an automatic way and directly correct the readings.

The PMM 9030 can store in its internal non-volatile memory up to 4 different correction factors, and use them one at a time when recalled.

However, the **Conversion Factors** shall be created and loaded via the PMM 9010 Software Utility.

Press the relevant button to load the conversion factor, and **NONE** to unload it.

10.11.5 Marker

ON/OFF

Peak

Center

With this command the **Marker** function can be enabled.

Switching ON the marker it appears on the screen as a small black pointing down arrow, and simultaneously a small window shows up in the bottom left corner of the screen, indicating the actual frequency and level read by the marker.

Pressing the **Peak** button the marker will automatically move to the highest signal found in the span range in that given moment, and with the help of the **Center** button the frequency selected by the marker becomes the center frequency on the screen, making very easy any signal analysis.

10.11.6 ESC

This button allows to return to the previous view or condition.

10.12 - Sweep Mode Operating Instructions

10.12.1 Introduction

Sweep

The **Sweep mode** is used to operate the PMM 9030 as a powerful scanning receiver. To enter in this mode it's enough to depress the Sweep soft key on the main screen, and immediately the scan setup window pops up and allows the operator to set the parameters for the scan.

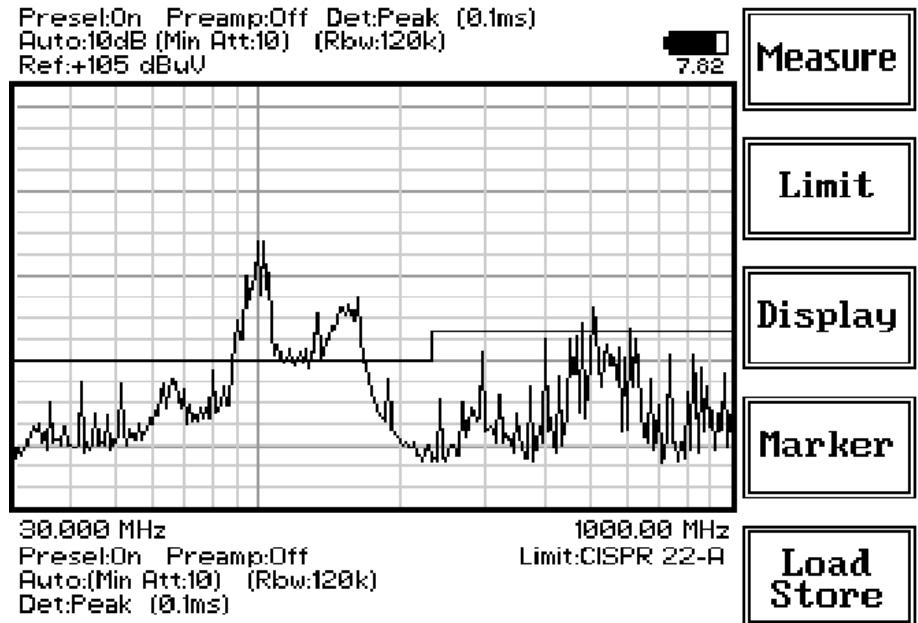


Fig. 10-16 Sweep

As for the Analyzer operating mode, all the relevant information are reported on the screen.

From the upper left corner, the User can see if the Preselector is ON or OFF; if the Preamplifier is ON or OFF; which detector is in use and the relevant hold time; if the function "Smart Detector" is activate and which one; if the input attenuation is Automatic or Manual and the set attenuation and if the Minimum attenuation is 10 dB or 0dB.

Just above the graph there is on the left the Reference level. During the scan, in the center above the graph the actual frequency measured and/or any other relevant operation.

Below the graph the start and the stop frequency, and loaded limits, if any.

When the sweep has been executed, on the bottom of the screen the most important sweep parameters are repeated.

If the graph has been loaded from the memory, just below the start frequency there is the symbol # followed by the memory position loaded (position number 2 in figure 10-16).

Please note that the information in the upper part above the graph refers to the next sweep to be done, while the information in the lower part, below the graph, concerns to the actual displayed data.

Measure

Limit

Display

Marker

Load Store

The Sweep mode function is divided into five sub windows:

- Measure
- Limit
- Display
- Marker
- Load Store

Always use Esc button to return to the previous view/condition.

10.12.2 Measure

Exec Sweep

Freq

Level

Conv Factor

Re Do Sweep

The **Measure** button is used to set the scan parameters and to run the sweep.

After having chosen the frequency band and set all the other parameters it is possible to run the measurement scan simply touching the **Exec Sweep** button.

To make subsequent sweeps with the same setting parameters, simply press **ReDo Sweep**. This key is particularly useful after having loaded a previously stored track (see 10.12.6), as with the Re Do Sweep the original settings are kept for the new measurement: it is extremely easy to make comparisons, for example, before and after a modification of the EUT.

Once the scan starts, it can be stopped at any time during the execution by the **Stop** function key that appears during the scan.

10.12.2.1 Frequency

C + D Band

E Band

C+D+E Band

Adv..ed

The **Frequency** menu features four function buttons:

With the **C+D Band** the receiver will be set to work in the 30 – 1000 MHz range. The definition of bands C (30-300 MHz) and D (300-1000 MHz) is a given in CISPR 16-1-1.

Pressing **E Band** the receiver will be set to scan the 1 - 3 GHz frequency band. The definition of band E (1-18 GHz) is a given in CISPR 16-1-1.

Pressing **C+D+E Band** the receiver will be set to scan the entire band from 30 MHz to 3 GHz.

Using these automatic band settings, the Frequency Step and Resolution Bandwidth are set automatically according to CISPR standard requirement.

For the Advanced option please see next paragraph.

Please note that to make effective the changes after having selected a band, the receiver needs to start its sweep.

10.12.2.2 Advanced



The **Advanced** submenu features five function buttons:

RBW Auto automatically adjust the resolution bandwidth to selected frequency range as per the CISPR standards.

The User can also decide which resolution bandwidth use simply selecting either one of the 2 bands available: **120 kHz** or **1 MHz**.

The **Start** and **Stop** frequency buttons can be used to set any frequency interval for the measurement; to enter the frequency values press the corresponding function keys.

Pressing either one of these 2 keys the figures 0, 1, 2, 3, and 4 are selectable at first; with the right arrow key it is possible to select the figures from 5 to 9, and pressing again the right arrow key the units kHz, MHz and GHz becomes accessible, as well as the decimal dot and the Back Space. The left arrow key can be used as well to move back and forth from one screen to the other. Pressing 0 as the first figure the decimal dot appears automatically.

To set a given frequency it is therefore enough to edit the value with the soft keys and the left an right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

The figures entered appear in a small window just below the graph and the default unit is MHz.

10.12.2.3 Level



The Level function has 4 sub-menus, each one with several options..

Pressing the **Display** button it is possible to set two parameters: the visualized **Dynamic** range (chosen between 80, 100 and 120dB) and the **Reference Level**, that can be increased or reduced by steps of 5dB within the range +55 dB μ V to 90 dB μ V (-50 to - 15 dBm).

The **Input** button opens a submenu which is dedicated to the setting of the input attenuator and to switch on-off the built-in preamplifier.

The PMM 9030 receiver takes automatically into account the settings of all the **Input** parameters and always displays the correct value of the level. The User is not required to make any correction to the readings.

With the PM9030 the function **Smart Detector** is not available.

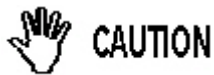
Using 0 dB attenuation PMM 9030 has no input protection.

This is a potentially dangerous condition for the input stage of the receiver.

Use 0 dB attenuation only if you are very sure that your input signal is less than 1 V (or 120 dB μ V).

Before to apply an unknown signal to PMM 9030 receiver, use an oscilloscope or a wide band RF voltmeter to measure it. In any case set Min. ATT at 10 dB and select the maximum available attenuation with preamplifier OFF.

If needed, add an external coaxial attenuator on the input signal line.



**10.12.2.3.1 Input:
Attenuators
and
preamplifier**



Being entered in the Input submenu, to increase or decrease the attenuation at the input, press **Att +** or **Att -**, and for each touch the attenuation is increased or decreased of 5 dB (preset value) up to the max attenuation available of 55 dB.
Depressing either one of these keys force the receiver in manual attenuation.

The **Min Att** button acts as a toggle switch: it selects or deselects the minimum attenuation of 10 dB. When the minimum attenuation is selected, the attenuator – doesn't matter if in automatic or in manual condition - cannot be lowered under 10 dB.

Unless specifically required by the test conditions, do not remove the minimum attenuation of 10 dB.

With the **Preamp** key it is possible to insert or exclude the built-in low noise preamplification of 10 dB.

The internal 10 dB preamplifier can be used when very weak signals have to be investigated. As already mentioned, with the preamplifier ON the receiver takes automatically care of the 10 dB gain when measuring the signals.

The **Att Auto** button is used to switch from the two conditions of manual or automatic attenuation setting.

Please note that the switching of the attenuators is relatively noisy and you can perceive it distinctly with a “click” for each switch operation.

10.12.2.3.2 Misc



Under the **Miscellaneous** functions menu it is possible to activate or exclude the **Preselector** filters and also to enter in the **Tracking generator** menu pressing the **RF OUT** button.

The Preselector is composed by a group of filters automatically selected by the PMM 9030 while it is sweeping or anyway measuring. The aim of the preselector is to reduce the amount of out-of-band energy entering in the receiver, thus helping a lot in reducing intermodulation problems and similar undesired behaviors.

It can be set either ON or OFF with the associated button, and normally it should be always enabled.

On the top left corner of the screen the symbol “Off” or “On” will be displayed.

Pressing the **RF OUT** button the receiver enters the Tracking generator menu.

10.12.2.3.3 Tracking generator



The **Tracking generator** is an internal, high stability and accuracy, 50 Ohm RF generator ranging from 10 Hz to 50 MHz.

It is a CW signal source tuned at the frequency set under the **RF OUT** Freq window.

As usual, to set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

Pressing 0 as the first figure the decimal dot appears automatically.

The output level can be set between 60,0 and 90,0 dBμV with 0,1dB steps using the **RF OUT** Level button.

If a higher or lower level is needed, the User shall adopt either an external amplifier or an external attenuator.

With the PMM 9030 the **Tracking On** function is not available.

10.12.2.3.4 Detector



This menu allows the operator to select the most appropriate **detector** for the test.

In Sweep mode the Peak, Average, RMS (Root Mean Square) and Quasi-Peak detectors are available and can be selected via the appropriate button.

Hold time (ms)

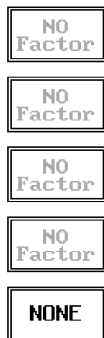
The Hold Time (expressed in milliseconds) represents the time the receiver uses to “take a snapshot” of the incoming signal and to measure it with the chosen detector. When selecting a detector, the default hold time value is automatically loaded, but in some cases this time is not appropriate, e.g. when the interference signals have a low repetition rate. In this case the PMM 9010 sees a high input signal and therefore tries to set the proper attenuation automatically increasing the value or the input attenuators. However, when the input attenuation is set the signal is gone, so the receiver lowers the attenuation, but then a new peak arrives, and so on and so forth. On the other hand, if the **Hold Time** is too high the PMM 9010 cannot properly follow the signals.

In this situation the Hold Time value should be manually set to find a correct compromise.

To set the **Hold Time** to the lowest possible value (this value dynamically depends from the measurement conditions), enter the figure 0; if a value lower than the allowed is entered, the lowest possible value is automatically selected.

The max. **Hold Time** that can be set is 30 sec (30.000 ms).

10.12.2.4 Conversion factor



When using a transducer to make a measurement – a Voltage or Current Probe, an Antenna, etc. – there is always the need to add to the measured values the conversion factor of the transducer in use.

The Conversion factor may also take proper account of losses as cable loss, attenuators added externally to the receiver, etc.

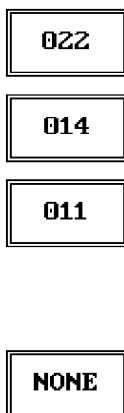
The PMM 9030 can handle these factors in an automatic way and directly correct the readings.

The PMM 9030 can store in its internal non-volatile memory up to 4 different correction factors, and use them one at a time when recalled.

However, the **Conversion Factors** shall be created and loaded via the PMM 9010 Software Utility.

Load the conversion factor with the relevant button, and **NONE** to unload it.

10.12.3 Limit



Each emission standard has one or more limits the User shall comply with. The PMM 9030 receiver has the possibility to load and activate one limit with the simple click of a button.

The preloaded standard limits refer to the most popular EMC emission standards: CISPR22, CISPR14 and CISPR11.

Other limits – or any custom designed limit – can be created, managed, selected and loaded through the PMM 9010 Software Utility running on a PC. These additional custom limits cannot be stored in the memory of the PMM 9030, but only in the one of the PC where the 9010SW Utility is running.

The limits are shown on the scan display and they appear like a thin black line .

By pressing the **NONE** button all limits are deactivated.

10.12.4 Display

Pressing the **Display** button it is possible to set two parameters: the visualized **Dynamic** range (chosen between 80, 100 and 120dB) and the **Reference Level**, that can be increased or reduced by steps of 5dB within the range +55 dB μ V to 90 dB μ V (-50 to - 15 dBm).

10.12.5 Marker

Marker
OFF

Peak

Highest
7

Analyzer

Tune

Selecting this function a **Marker** is immediately enabled, and it appears on the screen as a small black pointing down arrow corresponding to the highest reading; simultaneously a small window shows up in the bottom left corner of the screen, indicating the actual frequency and level read by the marker.

The Marker function is not a simple search for the highest readings on the screen – it would be a useless exercise that would display a number of points all grouped together – but it's a true peak search that measures the degree of variation of the signal: a peak is so classified only if it "pops-up" from the adjacent signals with a certain amount of dBs.

Following this criterion, if the measured signal is a flat line no peaks will be found.

Selecting **Highest X** – where X represents the maximum number of markers found by the receiver during its sweep – few more markers are added, each one diamond shaped, defined as per the previous explanation. The maximum number of markers available is 10.

By using arrow keys it is possible to quickly move on markers from higher (left arrow) to lower (right arrow), i.e. if the highest is selected, pressing the right arrow key the 2nd highest is selected, then pressing again the same key the 3rd highest and so on and so forth.

It is also possible to use the rotary knob to move from a marker to the next one.

The marker under analysis (main marker) is a black arrow pointing down, the others are diamond shaped.

Pressing the **Peak** button the marker returns to the highest reading.

In order to make easier and faster the evaluation of the more noisy signals, the User can now select either the **Analyzer** or the **Tune** function, entering respectively into a spectrum analysis of main marker position or in the manual mode evaluation of it. To operate this two conditions please refer to the appropriate section of this Operating Manual.

In manual mode, i.e. having selected **Tune** on the main marker, it is possible to navigate from one peak to the other just pressing the arrow keys, without to come back to the Sweep display and remaining in manual mode.

This is another unique feature of PMM 9030 to improve the productivity of the test lab and make easier the work of the test engineer.

The **Marker Off** exits from the marker function.

10.12.6 Load Store



Pressing this key allows the User to have access to the memory of the receiver and enables the storing up to a number of different configurations/sweeps that depends on the parameters set on the receiver. For example, using standard CISPR parameters it is possible to store up to 5 sweeps on the C+D+E bands (RBW120 kHz and 1 MHz, respectively).

Each new scan will be stored in the first available memory position thanks to the button **Store #x**, where x is the first available position. When all positions are occupied by a scan, this function is disabled until one of the previous scan is erased.

To load a stored trace, press the **Load #x** button until the proper scan is displayed; to unload a trace select the **Unload Trace** button.

Please note that the Load function is scanning the memory in a circular way, therefore all the occupied memory positions are shown in sequence. When the key shows "Load #4", it means the trace #3 is displayed and that the #4 will be loaded after the key is pressed, and so on and so forth.

To erase a trace, press the **Erase#x** button.

Due to the structure of the memory, it is possible to erase only the latest stored memory, with a sequence "LIFO" (Last In First Out), therefore after having erased the #x, the #(x-1) will be the trace to be erased. With reference to the example at the left, the last stored trace is the #4, and it is the first that will be erased. After that, the key will show "Erase #3", and so on and so forth.

A more advanced trace management could be done using the PMM 9010 Software Utility.



Turn Off the tracking generator, if it is not used, while you are in Scan Mode.

This prevents interferences and the measurements are more clean and accurate.

10.13 - Manual Mode Operating Instructions

10.13.1 Introduction

Manual

The **MANUAL mode** is a very useful feature to manually control the receiver and to deeply investigate electrical signals modifying the parameters of receiver exactly as per the needs of the Test Engineer.

It is possible, for example, to observe the signals exceeding the limits frequency by frequency; evaluating their levels measured simultaneously with 4 different detectors (Peak, QuasiPeak, Average and RMS); listening to them after a demodulation, etc.

To enter in **Manual Mode** press the key in the main menu, and immediately the first Manual window opens as follow.

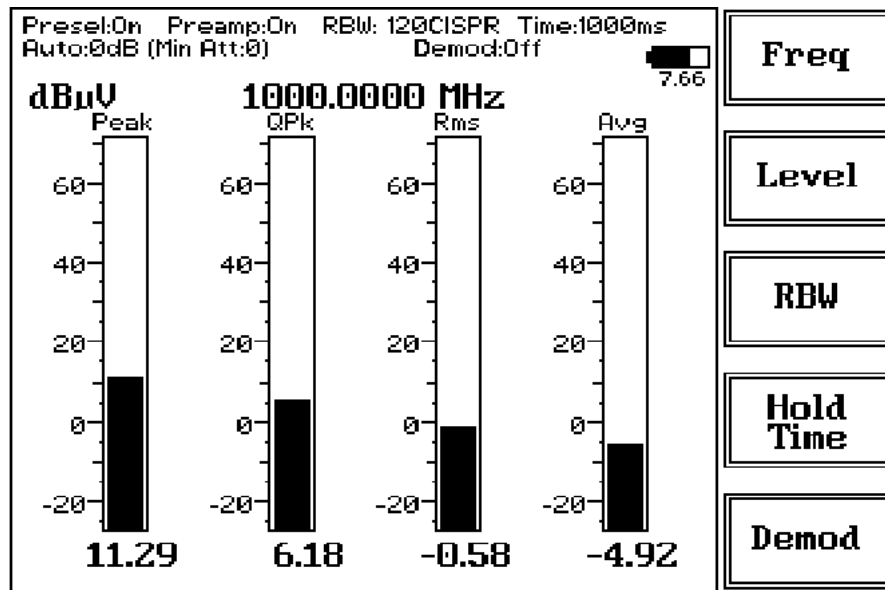


Fig. 10-17 Manual

In manual mode the levels corresponding to the detectors in use are displayed both in analogue and in digital format, and exactly as for the other operating modes, all the relevant information are reported on the screen.

From the upper left corner, the User can see if the Preselector is ON or OFF; if the Preamplifier is ON or OFF; the resolution bandwidth, the longest hold time associated to the detectors in use; if the input attenuation is Automatic or Manual and the set attenuation and if the Minimum attenuation is 10 dB or 0dB; if there a demodulation and the level of the volume, represented by a small black bar.

Then there are three or fours vertical bars representing the detectors and indicating in analogue and digital (the figures below each bar) the level measured; on top of the bars the relevant detector, the unit in use and the tuned frequency. The analogue scale of the analogue bars is set automatically by the receiver.

Freq

Level

RBW

Hold Time

Demod

The Manual mode function has five sub windows:

- Frequency
- Level
- Resolution Bandwidth
- Hold Time
- Demodulation

Always use Esc button to return to the previous view/condition.

10.13.2 Frequency

Tune

Knob

Arrow

Under this menu it is possible to set the tuning frequency and also the knob and the arrow keys steps.

The center Frequency of the reading can be directly edited into the **Tune** window or set by the left and right arrow buttons or by rotating the knob. The figures entered appear in a small window just below the graph and the default unit is MHz.

Having selected **Tune**, the figures 0, 1, 2, 3, and 4 are selectable at first; with the right arrow key it is possible to select the figures from 5 to 9, and pressing again the right arrow key the units kHz, MHz and GHz becomes accessible, as well as the decimal dot and the Back Space. The left arrow key can be used as well to move back and forth from one screen to the other. Pressing 0 as the first figure the decimal dot appears automatically. To set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

Knob step

If **Knob** is selected, the small window below the bars indicate the step which is going to be selected. After having fixed the step size, rotate the knob and tune the desired frequency.

If **Arrow** is selected, the small window below the bars indicate the step which is going to be selected. After having fixed the step size, press the left and the right arrow keys to decrease or increase the frequency by the selected step.

10.13.3 Level

Display

Input

Misc

Conv Factor

The Level function has 4 sub-menus.

Pressing the **Display** button it is possible to set two parameters: the visualized **Dynamic** range (chosen between 80, 100 and 120dB) and the **Reference Level**, that can be increased or reduced by steps of 5dB within the range +57 dB μ V to 92 dB μ V (-50 to -15 dBm).

The **Input** button opens a submenu which is dedicated to the setting of the input attenuator and to switch on-off the built-in preamplifier.

The PMM 9030 receiver takes automatically into account the settings of all the Input parameters and always displays the correct value of the level. The User is not required to make any correction to the readings.

10.13.3.1 Input:

Attenuator and preamplifier



Being entered in the Input submenu, to increase or decrease the attenuation at the input, press **Att +** or **Att -**, and for each touch the attenuation is increased or decreased of 5 dB (preset value) up to the max attenuation available of 55 dB.

Depressing either one of these keys force the receiver in manual attenuation.

The **Min Att** button acts as a toggle switch: it selects or deselects the minimum attenuation of 10 dB. When the minimum attenuation is selected, the attenuator – doesn't matter if in automatic or in manual condition - cannot be lowered under 10 dB.

Unless specifically required by the test conditions, do not remove the minimum attenuation of 10 dB.

With the **Preamp** key it is possible to insert or exclude the built-in low noise preamplification of 10 dB.

The internal 10 dB preamplifier can be used when very weak signals have to be investigated. As already mentioned, with the preamplifier ON the receiver takes automatically care of the 10 dB gain when measuring the signals.

The **Att Auto** button is used to switch from the two conditions of manual or automatic attenuation setting.

Please note that the switching of the attenuators is relatively noisy and you can perceive it distinctly with a "click" for each switch operation.

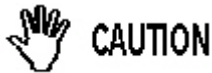
Using 0 dB attenuation PMM 9030 has no input protection.

This is a potentially dangerous condition for the input stage of the receiver.

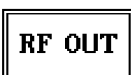
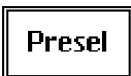
Use 0 dB attenuation only if you are very sure that your input signal is less than 1 V (or 120 dB μ V).

Before to apply an unknown signal to PMM 9030 receiver, use an oscilloscope or a wide band RF voltmeter to measure it. In any case set Min. ATT at 10 dB and select the maximum available attenuation with preamplifier OFF.

If needed, add an external coaxial attenuator on the input signal line.



10.13.3.2 Misc



Under the **Miscellaneous** functions menu it is possible to activate or exclude the **Preselector** filters and also to set the **Tracking generator**.

The **Preselector** is composed by a group of filters automatically selected by the PMM 9030 while it is sweeping or anyway measuring. The aim of the preselector is to reduce the amount of out-of-band energy entering in the receiver, thus helping a lot in reducing intermodulation problems and similar undesired behaviors.

It can be set either ON or OFF with the associated button, and normally it should be always enabled.

On the top left corner of the screen the symbol "Off" or "On" will be displayed.

Pressing the **RF OUT** button the receiver enters the **Tracking generator** menu.

RF OUT
Freq

RF OUT
Level

Tracking
On

RF OUT
On Off

The **Tracking generator** is an internal, high stability and accuracy, 50 Ohm RF generator ranging from 10 Hz to 50 MHz.

It is a CW signal source tuned at the frequency set under the **RF OUT** Freq window.

As usual, to set a given frequency it is therefore enough to edit the value with the soft keys and the left and right arrows, confirming the selections entering the units value (kHz, MHz or GHz).

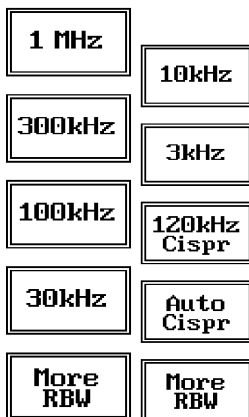
Pressing 0 as the first figure the decimal dot appears automatically.

The output level can be set between 60,0 and 90,0 dB μ V with 0,1dB steps using the **RF OUT** Level button.

If a higher or lower level is needed, the User shall adopt either an external amplifier or an external attenuator.

With the PMM 9030 the **Tracking On** function is not available.

10.13.4 RBW



The **Resolution Bandwidth** command is used to select the bandwidth of the measuring filter. Seven bandwidth filters are available:

- 120 kHz CISPR 16 shaped at -6dB
- 3 kHz at -3dB
- 10 kHz at -3dB
- 30 kHz at -3dB
- 100 kHz at -3dB
- 300 kHz at -3dB
- 1 MHz at -3dB

The four larger filters are selectable from the first RBW screen, and pressing the **More RBW** button it is possible to select all the other filters.

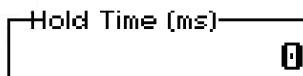
These filters are mathematically modeled using FIR (Finite Impulse Response) technique and they are exactly as required by the standards.

More filters will be available as an option for specific applications, e.g. to cover Military Standards requirements, etc.

With the **Auto Cisp** function, the filter will be automatically selected, according to CISPR standard, depending on the tuned frequency.

When a non-CISPR filter is selected, the Quasi Peak detector is disabled.

10.13.5 Hold Time



The Hold Time (expressed in milliseconds) represents the time the receiver uses to “take a snapshot” of the incoming signal and to measure it with the chosen detector. When selecting a detector, the default hold time value is automatically loaded, but in some cases this time is not appropriate, e.g. when the interference signals have a low repetition rate. In this case the PMM 9030 sees a high input signal and therefore tries to set the proper attenuation automatically increasing the value or the input attenuators. However, when the input attenuation is set the signal is gone, so the receiver lowers the attenuation, but then a new peak arrives, and so on and so forth.

On the other hand, if the Hold Time is too high the PMM 9030 cannot properly follow the signals.

In this situation the Hold Time value should be manually set to find a correct compromise.

To set the Hold Time to the lowest possible value (this value dynamically depends from the measurement conditions), enter the figure 0; if a value lower than the allowed is entered, the lowest possible value is automatically selected.

The max. Hold Time that can be set is 30 sec (30.000 ms).

10.13.6 Demodulator



Switching ON the built-in AM demodulator, the volume can be adjusted with the rotating knob, and the level is shown by the black bar on the screen.

The demodulated signals can be heard with headphones or earphones connected to the front panel of the PMM 9010, or amplified and/or recorded by any suitable device.

An FM demodulator – or other demodulators - is not available for the time being in the frequency band covered by the PMM 9030.

Demod:

Caro cliente

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Servizio richiesto: *Service needed:*

Solo taratura Riparazione Riparazione & Taratura Taratura SIT Altro:
 Calibration only Repair Repair & Calibration Certified Calibration Other:

Ditta:

Company:

Indirizzo:

Address:

Persona da contattare:

Technical contact person:

Telefono:

Phone n.

Modello:

Equipment model:

Numero di serie:

Serial n.

Accessori ritornati con l'apparecchiatura: **Nessuno** **Cavo(i)** **Cavo di alimentazione** **Altro:**
 Accessories returned with unit: **None** **Cable(s)** **Power cable** **Other:**

Sintomi o problemi osservati: *Observed symptoms / problems:*

Guasto: **Fisso** **Intermittente** **Sensibile a :** **Freddo** **Caldo** **Vibrazioni** **Altro**
 Failure: **Continuous** **Intermittent** **Sensitive to:** **Cold** **Heat** **Vibration** **Other**

Descrizione del guasto/condizioni di funzionamento:

Failure symptoms/special control settings description:

Se l'unità è parte di un sistema descriverne la configurazione:

If unit is part of system please list other interconnected equipment and system set up:

