



L3HARRIS

narda
Safety Test Solutions

NARDA
Safety
Test
Solutions
S.r.l. Socio Unico

<http://www.narda-sts.it>

Sales & Support:
Via Rimini, 22
20142 - Milano (MI)
Tel.: +39 02 581881
Fax: +39 02 58188273

Manufacturing Plant:
Via Benessea, 29/B
17035 Cisano sul Neva (SV)
Tel.: +39 0182 58641
Fax: +39 0182 586400



User's Manual

PMM FR4003

FIELD RECEIVER

From 9 kHz up to 30 MHz

SERIAL NUMBER OF THE INSTRUMENT

You can find the Serial Number on the front 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.

Document FR4003EN-91010-2.22 – Copyright © NARDA 2019


NOTE:

© Names and Logo are registered trademarks of Narda Safety Test Solutions GmbH and L3 Communications Holdings, Inc. – Trade names are trademarks of the owners.

 If the instrument is used in any other way than as described in this User’s 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 power supply 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).

It complies with the requirements of **Pollution Class II** (usually only non-conductive pollution). However, occasionally it may become temporarily conductive due to condense on it.


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 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 :

 The **DANGER** sign draws attention to a serious risk to a person’s safety, which, if not avoided, will result in death or serious injury. All the precautions must be fully understood and applied before proceeding.

 The **WARNING** sign indicates a hazardous situation, which, if not avoided, could result in death or serious injury. All the precautions must be fully understood and applied before proceeding.

 The **CAUTION** sign indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

 The **NOTICE** sign draws attention to a potential risk of damage to the apparatus or loss of data.

 The **NOTE** sign draws attention to important information.

Contents

Explanation of electrical and safety symbols	Page
General safety considerations and instructions	II
EC Declaration of Conformity	VIII
EC Declaration of Conformity	IX
1. General Information	Page
1.1 Documentation.....	1-1
1.2 Operating Manual changes.....	1-1
1.3 Introduction to PMM FR4003.....	1-2
1.4 Instrument Items.....	1-3
1.5 Optional accessories.....	1-3
1.6 Main Specifications.....	1-4
1.7 Front Panel.....	1-6
1.8 Rear Panel.....	1-7
1.9 Functional Description.....	1-8
1.10 Ultra fast measurement: a unique feature of the PMM 9010F.....	1-8
1.11 Emission measurement.....	1-9
2 Installation	Page
2.1 Introduction.....	2-1
2.2 Initial Inspection.....	2-1
2.3 Unpacking.....	2-1
2.4 Preparation for Use.....	2-7
2.5 Battery Charger.....	2-7
2.5.1 To replace the mains connector of the battery charger.....	2-7
2.5.2 To charge the internal battery.....	2-7
2.5.3 Indication of the battery status on the screen and with PW led.....	2-8
2.6 Environment.....	2-8
2.7 Return for Service.....	2-9
2.8 Equipment Cleaning.....	2-9
2.9 Equipment ventilation.....	2-9
2.10 Hardware Installation.....	2-9
2.11 Using an Artificial Mains Network (AMN or LISN).....	2-10
2.12 Using Pulse Limiter.....	2-10
2.13 Using Current and Voltage Probes.....	2-10
2.14 Using Antennas and other Transducers.....	2-11



	Page
3 FR4003 with 9010F Fast	
3.1 Introduction to PMM 9010F.....	3-1
3.1.1 Preliminary operation.....	3-2
3.1.2 Principle of Operation.....	3-4
3.2 Sweep Mode.....	3-4
Ultra Fast FFT scan.....	3-4
3.2.1 Measure.....	3-5
3.2.1.1 Frequency.....	3-5
3.2.1.2 Level.....	3-6
3.2.1.3 Input Attenuators and Preamplifier.....	3-6
3.2.1.4 Misc.....	3-7
3.2.1.5 RF Output Generator.....	3-7
3.2.1.6 Detector.....	3-8
3.2.1.7 Conversion factor.....	3-9
3.2.2 Limit.....	3-9
3.2.3 Display.....	3-9
3.2.4 Marker.....	3-10
3.2.5 Load – Store.....	3-11
3.3 Analyzer Mode.....	3-12
3.3.1 Frequency.....	3-13
3.3.2 RBW.....	3-14
3.3.2.1 Additional RBW Filters.....	3-14
3.3.2.2 MIL-STD-461E or RMS-AVG Activation Procedure (option).....	3-15
3.3.3 Level.....	3-16
3.3.3.1 Input Attenuators and Preamplifier.....	3-16
3.3.3.2 OVER RANGE Message.....	3-17
3.3.3.3 Misc.....	3-17
3.3.3.3.1 Signal Generator.....	3-18
3.3.3.4 Detector.....	3-18
3.3.3.5 Conversion Factor.....	3-19
3.3.4 Marker.....	3-19
3.4 Setup – Unit.....	3-19
3.5 Manual Mode.....	3-20
3.5.1 RBW Selection.....	3-20
3.5.2 MIL Filters.....	3-20
3.5.3 Hold Time.....	3-21
3.6 Operating Manual Changes.....	3-21

4 PMM Emission Suite software	Page
4.1 FR4003 Operation method.....	4-1
4.2 Sweep mode.....	4-1
4.2.1 Scan tab.....	4-2
4.2.2 Factors.....	4-2
4.2.3 Frequency.....	4-2
4.2.4 Detector, Hold time and Limit.....	4-3
4.2.5 RBW.....	4-4
4.2.6 Min Att.....	4-4
4.2.7 Preamp.....	4-4
4.2.8 Preselector.....	4-4
4.2.9 Prompt start.....	4-4
4.2.10 Ancillary.....	4-4
4.2.11 Worst.....	4-5
4.2.12 Undo.....	4-5
4.2.13 Factors.....	4-6
4.2.14 HPF and HiZ receiver.....	4-6
4.2.15 Execute.....	4-6
4.3. Analyzer Mode.....	4-7
4.3.1 Introduction.....	4-8
4.3.2 Analyzer Mode Tab Settings.....	4-8
4.3.2.1 Detector.....	4-8
4.3.2.2 Frequency.....	4-8
4.3.2.3 Marker.....	4-8
4.3.2.4 Max Hold, Hold When Done.....	4-9
4.3.2.5 Tune Manual @.....	4-9
4.3.3 Analyzer Mode Global Test Settings.....	4-9
4.3.3.1 BW IF.....	4-9
4.3.3.2 Limits.....	4-10
4.3.3.3 Battery.....	4-10
4.3.3.4 Factors.....	4-10
4.3.3.5 HPF and HiZ receiver.....	4-11
4.3.3.6 Exit.....	4-11
4.4 Manual Mode.....	4-12
4.4.1 Manual Mode Tab Settings.....	4-13
4.4.1.1 Parameter.....	4-13
4.4.1.2 Detector.....	4-13
4.4.2 Manual Mode Global Test Settings.....	4-14
4.4.2.1 Factors.....	4-14
4.4.2.2 BW IF.....	4-14
4.4.2.3 Attenuator – Min Att.....	4-15
4.4.2.4 Over Range.....	4-15
4.4.2.5 Limits.....	4-15
4.4.2.6 Battery.....	4-15
4.4.2.7 HPF and HiZ receiver.....	4-15
4.4.2.8 Exit.....	4-15
4.4.3 Manual Mode Graph.....	4-16
4.5 RMS-AVG Detector.....	4-16
4.5.1 Introduction.....	4-16
4.5.2 RMS-AVG Definition.....	4-16
4.5.3 RMS-AVG Activation Procedure (option).....	4-17
4.5.4 C-AVG Definition.....	4-18



5 Utility, Calibration and Stand-Alone mode.	Page
5.1 FR4003 Utility.....	5-1
5.1.1 Connection.....	5-4
5.1.2 Preferences.....	5-5
5.1.3 Tools.....	5-5
5.1.3.1 Internal Generator.....	5-6
5.1.3.2 Cap Meter.....	5-6
5.1.3.3 Auto-Calibration.....	5-9
5.1.3.4 F.O. link to 9010F.....	5-11
5.1.4 Information.....	5-12
5.2 Mode.....	5-13
5.2.1 Analog mode.....	5-13
5.2.2 Hiz mode.....	5-14
5.2.3 Front panel buttons.....	5-14
6. Applications	Page
6.1 How it works.....	6-1
6.2 Power switch.....	6-1
6.3 ESD risks.....	6-1
6.4 Principles of operation.....	6-1
6.5 Antenna Factor.....	6-1
6.6 Procedure of Calibration.....	6-1
6.7 Measuring the EMI Voltage.....	6-2
6.8 Related products	6-2
7. Updating firmware and Activation code Utility	Page
7.1 Introduction.....	7-1
7.2 System requirements	7-1
7.3 Preparing the Hardware.....	7-1
7.4 Software installation.....	7-1
7.5 To transfer data.....	7-6
7.6 9010 WrDongle utility	7-8
8. Remote control	Page
8.1 Introduction.....	8-1
8.2 Communication.....	8-1
8.3 Protocol.....	8-1
8.4 Format.....	8-1
8.5 Remote swich-on.....	8-1
8.6 Auto switch-off.....	8-1
8.7 List of commands.....	8-2
8.7.1 QUERY Commands.....	8-5
8.7.2 SETTING Commands.....	8-10
8.7.3 IDLE Commands.....	8-25
8.7.4 Analyzer Reply.....	8-28
8.7.4.1 Reply example.....	8-28
8.8 Special notes for FFT method.....	8-30
9 Accessories	Page
9.1 Introduction	9-1
9.2 Preliminary inspection	9-1
9.3 Work environment	9-1
9.4 Return for repair	9-1
9.5 Cleaning	9-1
9.6 PMM TR-01A Set (optional).....	9-2
9.6.1 TR-01A Set.....	9-2
9.6.2 FR4003 installation on TR-01 wooden tripod.....	9-4
10. Packaging Instruction	Page
10.1 Introduction.....	10-1
10.2 Packaging Instruction	10-1

Figures

Figure		Page
1-1	Front Panel.....	1-6
1-2	Rear Panel.....	1-7
1-3	BP-02 Replaceable battery.....	1-7
1-4	PMM FR4003 Functional Block Diagram.....	1-8
2-1	Antenna parts and assembly.....	2-11
3-1	9010F Initial screen.....	3-2
3-2	Sweep.....	3-5
3-3	Spectrum.....	3-13
4-1	Operation method.....	4-1
4-2	Sweep mode screen.....	4-1
4-3	Analyzer mode window.....	4-7
4-4	Manual mode window.....	4-11
9-1	PMM TR01 Wooden Tripod.....	9-2
9-2	Adjustable joint.....	9-2
9-3	Column strengthner.....	9-3
9-4	Soft carrying case.....	9-3
9-5	FR4003 parts and assembly.....	9-4

Tables

Table		Page
1-1	Main Specifications.....	1-4
9-1	PMM TR-01 Wooden tripod with extension Specifications	9-2
9-2	Column strengthner Specifications.....	9-3
9-3	Soft carrying case Specifications.....	9-3

⚠ WARNING**SAFETY RECOMMENDATIONS AND INSTRUCTIONS**

This unit has been designed, produced and tested in Italy, according to IEC 348 standard and has left the manufacturer's premises in a state fully complying with the safety standards; in order to maintain the unit in a safe state and to ensure safe operation, the following instructions must be reviewed and fully understood before operation.

- When the unit is to be permanently cabled, first connect an uninterruptible protective earth ground conductor before making any other connections.
- If the unit is to be connected to other equipment or accessories, prior to energizing either units, verify that a common ground exists between them.
- For permanently cabled unit without built-in fuses, automatic circuit breakers or similar protective facilities, the power supply line shall be provided with fuses or protections rated to the unit.
- Verify that the unit is set to match the available mains voltage and correct fuse rating is installed before applying power.
- The Safety Class I units provided with disconnectible AC supply cable and plug, may only be operated from a power socket with protective earth ground connection.
- Any interruption or loosening of the protective earth ground conductor, either inside or outside the unit or in an extension cable will cause a potential shock hazard that could result in personal injury.
- The protective earth ground conductor shall not be interrupted intentionally.
- To avoid electrical shock do not remove protections or covers of the unit , refer to qualified NARDA Servicing Center for maintenance of the unit.
- To maintain adequate protection against fire hazard, replace fuses only with others of the same type and rating;
- Observe safety regulations and rules and also the additional safety instructions specified in this manual for prevention of accidents.

Dichiarazione di Conformità *EC Declaration of Conformity*

In accordo alla Decisione 768/2008/EC, conforme alle direttive EMC 2014/30/UE, Bassa Tensione 2014/35/UE e RoHS 2011/65/UE, ed anche alle norme ISO/IEC 17050-1 e 17050-2.

In accordance with the Decision 768/2008/EC, compliant to the Directives EMC 2014/30/UE, Low Voltage 2014/35/UE and RoHS 2011/65/EU, also compliant to the ISO/IEC standard 17050-1 and 17050-2

Il costruttore
The manufacturer **narda Safety Test Solutions S.r.l. Socio Unico**

Indirizzo
Address **Via Benessea, 29 / B**

I-17035 Cisano sul Neva (SV) - Italy

sulla base delle seguenti norme europee armonizzate, applicate con esito positivo:
based on the following harmonized European Standards, successfully applied:

EMC - Emissioni:
EMC - Emission: **EN 61326-1 (2013)**

EMC - Immunità:
EMC - Immunity: **EN 61326-1 (2013)**

Sicurezza:
Safety: **CEI EN 61010-1 (2010)**

dichiara, sotto la propria responsabilità, che il prodotto:
declares, under its sole responsibility, that the product:

Descrizione
Description **FIELD RECEIVER**

Modello
Model **PMM FR4003**

è conforme ai requisiti essenziali delle seguenti Direttive:
conforms with the essential requirements of the following Directives:

Bassa Tensione
Low Voltage **2014/35/EU**

Compatibilità Elettromagnetica
EMC **2014/30/EU**

RoHS
RoHS **2011/65/EU**

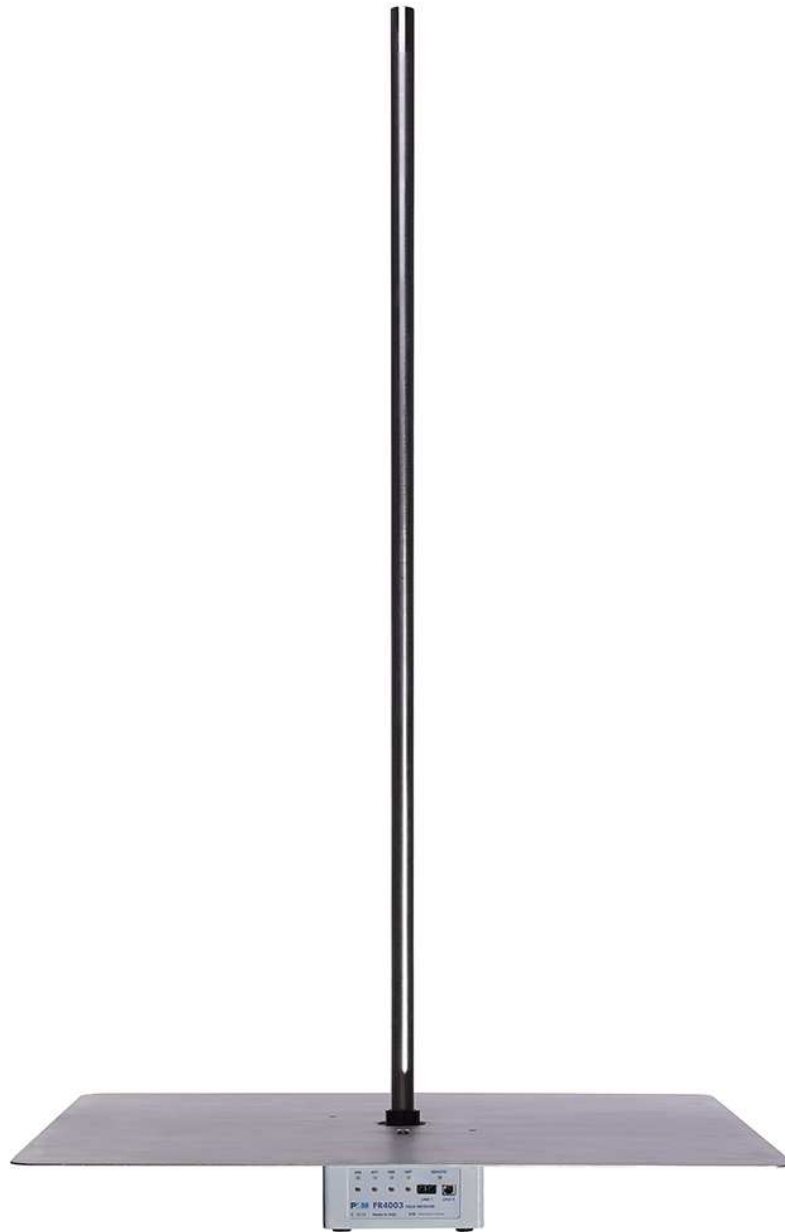
Cisano sul Neva, 03 May 2017

Egon Stocca
General Manager



This page has been intentionally left blank

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 FR4003

PMM FR4003 is not only a simple Rod Antenna but incorporates also a powerful EMI receiver, fully CISPR 16-1-1, to measure conducted and radiated interferences from 9 kHz up to 30 MHz, and can increase its performances when matched with PMM 9010F units (optional). All measurements performed by the PMM FR4003 are according to the most accepted standards like: IEC, CISPR, EN (EuroNorm), FCC, VDE, MIL-STD, RTCA/DO etc.

Thanks to its built-in tracking generator, PMM FR4003 is also able to perform a self-calibration procedure and to check its good operation at any time.

It is, at the same time, a traditional active Rod Antenna, with a RF analog output, and a versatile EMI receiver, already internally matched to the antenna itself.

The PMM FR4003 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 FR4003 includes the following items:

- Field Receiver from 9 kHz up to 30 MHz
- 1000mm Rod;
- 600 x 600 mm counterpoise;
- 4 pieces Pan head machine screw X shaped M5x12mm;
- BP-02 Li-ion battery pack;
- External power supply/battery charger;
- Intern. AC plug adapters (Australia, UK, USA);
- Italian AC plug adapter;
- 50 Ω to Rod capacitance fixture for CISPR calibration;
- 15 pF fixture for capacitance meter calibration;
- MIL-STD 40mm Rod extension;
- 10 m plastic optic fiber for PC;
- USB-OC Optical Converter;
- Carrying case;
- Reversible screwdriver;
- Operating manual;
- PMM FR4003 Utility Software on Software Media;
- Certificate of Calibration;
- Return for Repair Form.

1.5 Optional accessories

PMM FR4003 can be used with several optional accessories, the most common being the following:

- 9010/FO-20 High speed fiber optic cable (20 m)
- 9010/FO-50 High speed fiber optic cable (50 m)
- 9010/FO-100 High speed fiber optic cable (100 m)
- Plastic fiber optic for PC (10 m)
- Plastic fiber optic for PC (20 m)
- Plastic fiber optic for PC (40 m)
- USB-fiber optic adapter
- TR-01A set (TR01 60-180 cm wooden column extendable tripod, column strengthener, soft carrying case)
- BP-02 Li-Ion battery pack

1.6 Main Specifications

Table 1-1 lists the PMM FR4003 performance specifications.

The following conditions apply to all specifications:

- The ambient temperature shall be -10°C to 60°C

TABLE 1-1 Main Specifications			
Frequency range	9 kHz to 30 MHz		
Resolution	1 Hz		
Frequency accuracy	< 1 ppm		
RF input	High impedance N f.		
Attenuator	Built-in 0 dB to 30 dB (10 dB steps)		
HPF	Built-in 9 kHz or 150 kHz HPF (selectable)		
Preamplifier	Built-in 20 dB gain (selectable)		
Max input level	BNC analog output (1dB compression point @ 1MHz) (SD Spectral Density)	Internally processed signal (SD Spectral Density with Preselector ON)	
100/104 cm rod (Preamp OFF, Att 30 dB)	380 V/m CW 137 dB μ V/m/MHz SD	38 V/m CW 128 dB μ V/m/MHz SD	
N input (50 Ω term. Preamp OFF, Att 10 dB)	137 dB μ V CW 103 dB μ V/MHz SD	117 dB μ V CW 94 dB μ V/MHz SD	
Damage level	500 V/m CW (Min. Att. 20 dB)		
Noise level	100/104 cm rod	N input (50 Ω term)	
Preamp ON, Att 0 dB, 10 kHz RBW Manual Mode, Tune 1 MHz	13 dB μ V/m PK 2 dB μ V/m AVG DANL -38 dB μ V/m(Hz)	-1 dB μ V PK -12 dB μ V AVG DANL -52 dB μ V(Hz)	
Spurious response	< -10 dB μ V (Att 0 dB, 50 Ω termination AVG, Hold time 10 ms, RBW auto)		
Measurement accuracy	9 kHz to 30 MHz \pm 0,8 dB		
Preselector	Two Bandpass filters:	9 kHz to 30 MHz	150 kHz to 30 MHz
	Five bandpass filters:	9 kHz to 5,67 MHz 11,19 MHz to 16,71 MHz 22,23 MHz to 30 MHz	5,67 MHz to 11,19 MHz 16,71 MHz to 22,23 MHz
Internal Receiver	Fully digital. Operates both in conjunction with 9010F receiver and in stand-alone.		
IF bandwidth	3, 10, 30, 100, 300 kHz		
6 dB bandwidth	200 Hz, 9 kHz (CISPR 16-1-1) 1, 10 kHz (MIL-STD-461)		
Level measuring time	CISPR 16-1-1 as default.		
(Hold time)	0,2 ms to 120 s		
Detectors	Peak, Quasi-Peak, Average, RMS, RMS-Average (Optional), C-Average Smart Detector function		
Sweep time	FFT mode	Swept mode	
9 kHz to 150 kHz (RBW 200 Hz CISPR) 10 kHz to 150 kHz (RBW 1 kHz MIL) 150 kHz to 30 MHz (RBW 9 kHz CISPR) 150 kHz to 30 MHz (RBW 10 kHz MIL)	Analyzer hold time lowest Receiver hold time 1s	Analyzer hold time lowest	Receiver hold time 1s
	1,1s 7s	110s	1600s
	0,4s 4s	6s	595s
	2,8s 22s	23s	6200s
	2,8s 22s	46s	12400s
Antenna Factor	At BNC auxiliary analog output		
	0 dB/m (Att 0dB, PreAmp ON)		

Analog output.	50 Ω BNC f.															
Internal generator	Tracking & CW generator (for auto calibration, capacitance meter and field source)															
Frequency range	9 kHz to 30 MHz															
Frequency resolution	1 Hz															
Level range	65 to 95 dBμV															
Level resolution	1 dB															
Level accuracy	0,3 dB															
Internal capacitance meter																
Range	0 to 100 pF															
Resolution	0,01 pF															
Calibration	Automatic (Calibration fixtures included)															
Auto test	Automatic at power on															
Auto calibration	Through internal generator and matching network															
Optic Fiber connection	RP-02 series serial optical interface 115 kbaud 9010F series high speed optical interface															
PC softwares	PMM Emission suite – PMM FR4003 Utility															
Display units	dBm, dBμV, dBμA, dBpW, dBμV/m, dBμA/m, dBpT															
With PMM Emission Suite SW	80 to 200 dB selectable dynamic range															
Standard conformity	CISPR 16-1-1, MIL-STD 461G full compliant on board receiver. CISPR 12, CISPR 25, MIL-STD 461G, DO-160 full compliant rod antenna															
FW updating	Through the optical link via USB															
Power supply	7,4 V – 7,8 Ah Li-Ion rechargeable & interchangeable battery (8h avg. Operating time 4h avg. Charging time) 100 - 240 Vac / 50 – 60 Hz to 12 Vdc – 2.5 A universal adapter/charger.															
Recommended calibration interval	24 months (calibration data stored in the internal EEPROM)															
Operating temperature	-10° to 60°C															
Storage temperature	-30° to 75°C															
Operating humidity	0 to 98% (Without condensation)															
Tripod support	Threaded insert UNC ¼"															
Dimensions and weights (Overall WxDxH)	<table border="0"> <tr> <td>Receiver</td> <td>134 x 285 x 84 mm</td> <td>2,40 kg</td> </tr> <tr> <td>Counterpoise</td> <td>600 x 600 x 1,5 mm</td> <td>4,15 kg</td> </tr> <tr> <td>Rod (Ø20 x 1000mm)</td> <td>φ29 x 1020 mm</td> <td>0,50 kg</td> </tr> <tr> <td>Rod extension (40mm)</td> <td>φ20 x 47 mm</td> <td>0,05 kg</td> </tr> <tr> <td>TOTAL (w rod ext.)</td> <td>600 x 600 x 1122 mm</td> <td>7,10 kg</td> </tr> </table>	Receiver	134 x 285 x 84 mm	2,40 kg	Counterpoise	600 x 600 x 1,5 mm	4,15 kg	Rod (Ø20 x 1000mm)	φ29 x 1020 mm	0,50 kg	Rod extension (40mm)	φ20 x 47 mm	0,05 kg	TOTAL (w rod ext.)	600 x 600 x 1122 mm	7,10 kg
Receiver	134 x 285 x 84 mm	2,40 kg														
Counterpoise	600 x 600 x 1,5 mm	4,15 kg														
Rod (Ø20 x 1000mm)	φ29 x 1020 mm	0,50 kg														
Rod extension (40mm)	φ20 x 47 mm	0,05 kg														
TOTAL (w rod ext.)	600 x 600 x 1122 mm	7,10 kg														
Standard accessories	50 Ω to rod capacitance fixture for CISPR calibration; 15 pF fixture for capacitance meter calibration; MIL-STD 40mm rod extension, 600x600 mm counterpoise, battery pack; AC adapter/charger; PC softwares; 20 m high speed optic fiber for 9010F receiver; 10 m plastic optic fiber for PC; USB-optical adapter; carrying case; certificate of calibration; operating manual.															

1.7 Front Panel



Fig. 1-1 Front Panel

Legend from left to right:

- **ON** Push Button Power On Led; indicates the power status
- **ATT** Push Button Attenuator Led; indicates the attenuator status
It is off when the attenuator has been set to 0 dB
it blinks shortly when the attenuator has been set to 10 dB
it blinks half on and half off when set to 20 dB and
it is permanently ON when set to 30 dB
- **PRE** Push Button Preamplicifier Led; indicates the preamplicifier status
- **HPF** Push Button HPF Led; indicates the 150 kHz high pass filter status
- **REMOTE LED** Remote Led; indicates the remote control status
- **LINK 1** The RP-02 connector for the plastic optic fiber, for PC connection
- **LINK 2** The connector for PMM 9010F fast optic fiber connection
- **Product Label and Serial Number**



In case ATT, PRE and HPF Led blinks at the same time, an FR4003 auto-calibration must be performed; for further information see § 5.1.3.3

1.8 Rear Panel

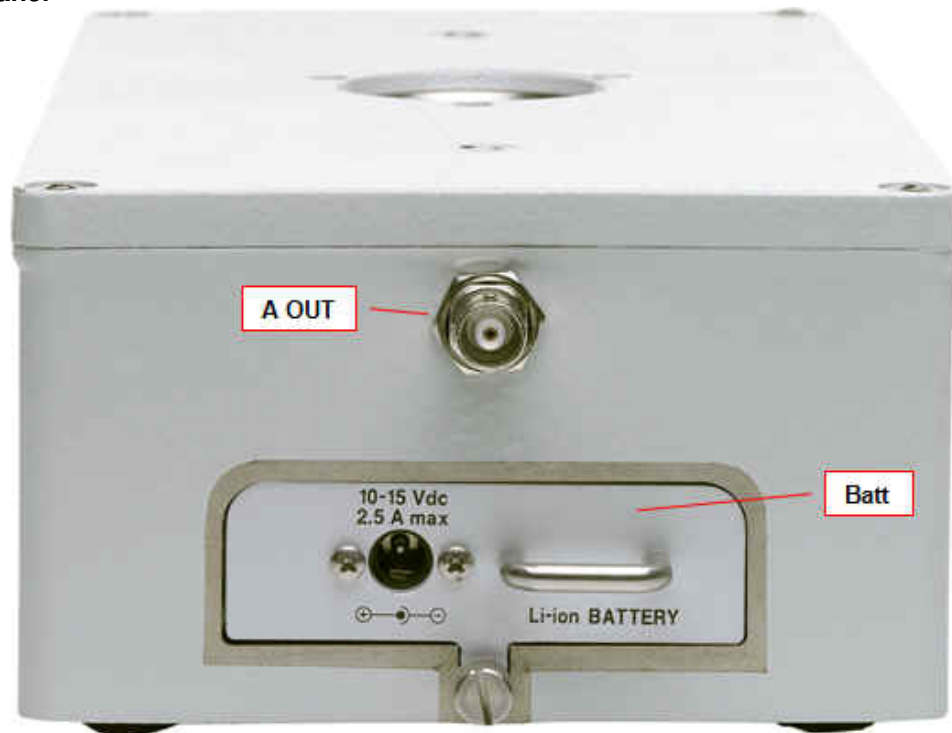


Fig. 1-2 Rear Panel

Legend from left to right:

- **A OUT** Analog Output, BNC female connector, 50 Ω
- **Batt** Rechargeable Battery, PMM BP-02, with charger connector. The battery can be easily replaced or charged separately from the unit.
- **Power Supply** Power Supply input to charge the battery.



Fig. 1-3 BP-02 Replaceable Battery

1.9 Functional Description

The PMM FR4003 features a completely new receiver architecture based on the most recent DSP and RSP technology, as shown on the diagram below.

The PMM FR4003 diagram is shown in Fig. 1-4

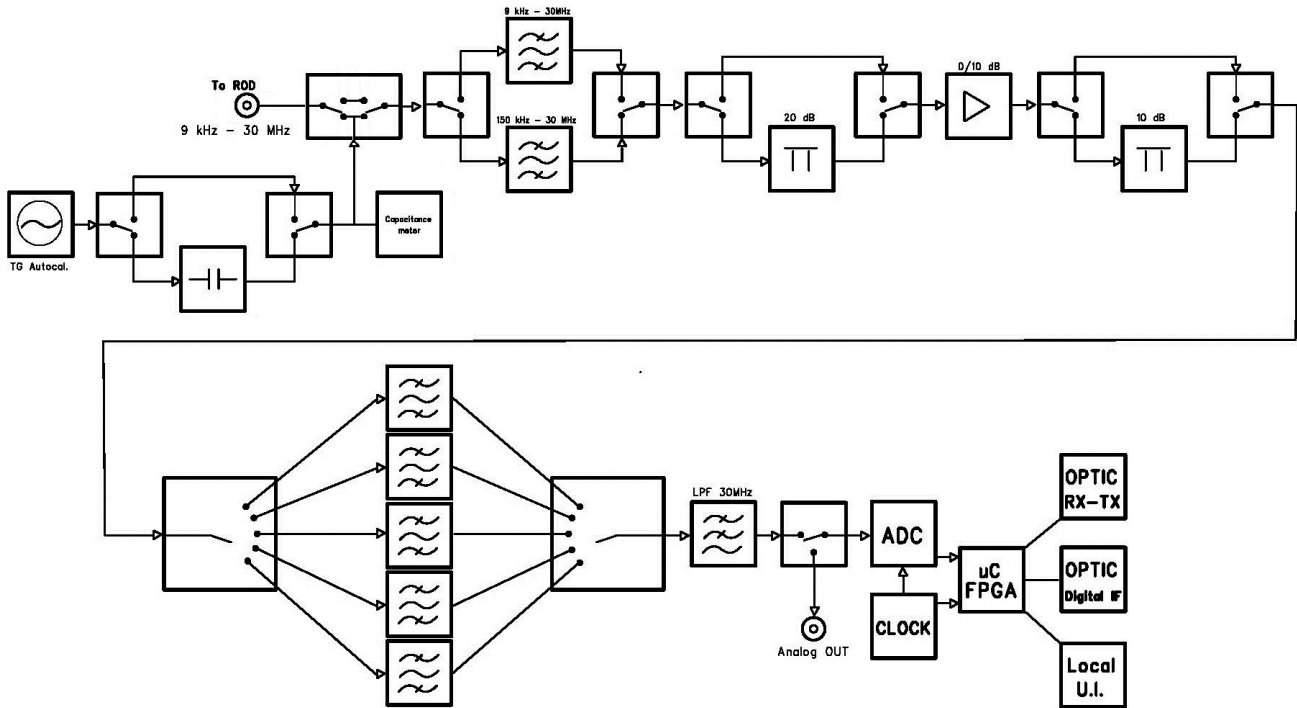


Fig. 1-4 PMM FR4003 Functional BLOCK Diagram

1.10 Ultra fast measurement: a unique feature of the PMM 9010F

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 on the detector in use.

Also the B band takes a long time since it involves many frequency steps. Thanks to its architecture and to the large internal memory capability, the combination of PMM FR4003 and 9010F can take a “snapshot” of the whole band in just one second and, using a true built-in FFT capability, perfectly show 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 FR4003 and 9010F make use of internal standard Gaussian filters, compliant to the standards, while in other cases it uses filters mathematically modelled to the perfection using a FIR technique.

1.11 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 FR4003 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 FR4003 Field 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 FR4003 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 FR4003 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 FR4003: the input signal should not exceed the maximum level indicated in the main specifications in chapter 1.

Also do not apply any signal to the rear RF output connector.

This page has been intentionally left blank

2 - Installation

2.1 Introduction

This section provides the information needed to install your PMM FR4003. 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.

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



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

2.3 Unpackaging

Remove the packaging tape.



Open the shipment box and remove the rectangular cover.



Remove the two square foam inserts placed above the counterpoise.



Remove the counterpoise from its custom foam insert holding on one side **(do not use the central hole)**.



Remove the 1000 rod from its custom foam insert



Remove the Carrying case from its custom foam insert



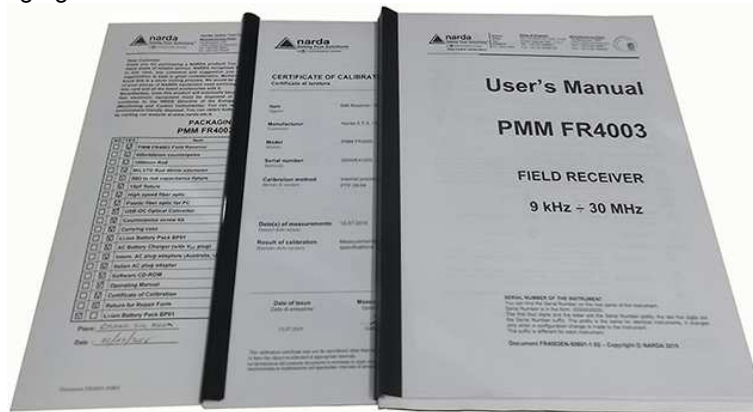
Place the carrying case on a stable surface.



Open the carrying case and remove the Operating manual, Certificate of Calibration and Packaging Check list.



Verify the availability of all the shipped items with reference to the Packaging Check list.



Remove the 9010F and PC fiber optic.



Remove the calibration and counterpoise screw kit, the USB-OC Optical Converter, Software Media and the 40mm rod extension enclosed into the bag.



Remove the battery charger and all AC plug adapters enclosed into the bag.



2.4 Preparation for Use This is a Safety Class I apparatus.

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 insert the DC output connector of the battery charger to the input **CHARGER** on the rear panel of the receiver.

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.



Nowadays there are restrictions on the shipment of hazardous materials, eg. some types of lithium batteries.

Please, check the proper, safe, shipping mode, with the help of your courier, in the case the product is equipped with batteries.

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 surfaces.

2.9 Equipment Ventilation



To allow correct equipment ventilation ensure that the instrument is operated without being covered by insulating materials (i.e. bags etc.).

2.10 Hardware Installation

PMM FR4003 is delivered from factory almost ready to use.

Remove the receiver and the BP-02 Li-ion battery pack from its cardboard shipping box, insert the battery (1), install the counterpoise (3) fixing it to the receiver box (2) with the two supplied screws (5). Please refer to figure 2-2.

Install the monopole (6) screwing its N connector to the receiver unit.

Push the "ON" button; the PW Led lights up immediately. To avoid unwanted starts, if the "ON" button is kept pressed for more than 2 seconds, the instrument is switched automatically off.

After having been switched ON, the PMM FR4003 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 less than five seconds after having pressed the ON button.

The receiver is now ready to operate.

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



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

2.11 Using an Artificial Mains Network (AMN or LISN)

When the PMM FR4003 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 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

When the level of the disturbance is high or unknown, it is advisable to insert a pulse limiter between the LISN or Probe and the RF input of the receiver. The 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 FR4003, because they are out of measurement bandwidth, and the associated energy is high enough to damage the input circuitry. 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 FR4003 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 FR4003, 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 9 kHz 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, different rod antennas (the rod supplied with the unit is already equipped with two lengths, to cover more standards), 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 FR4003 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.

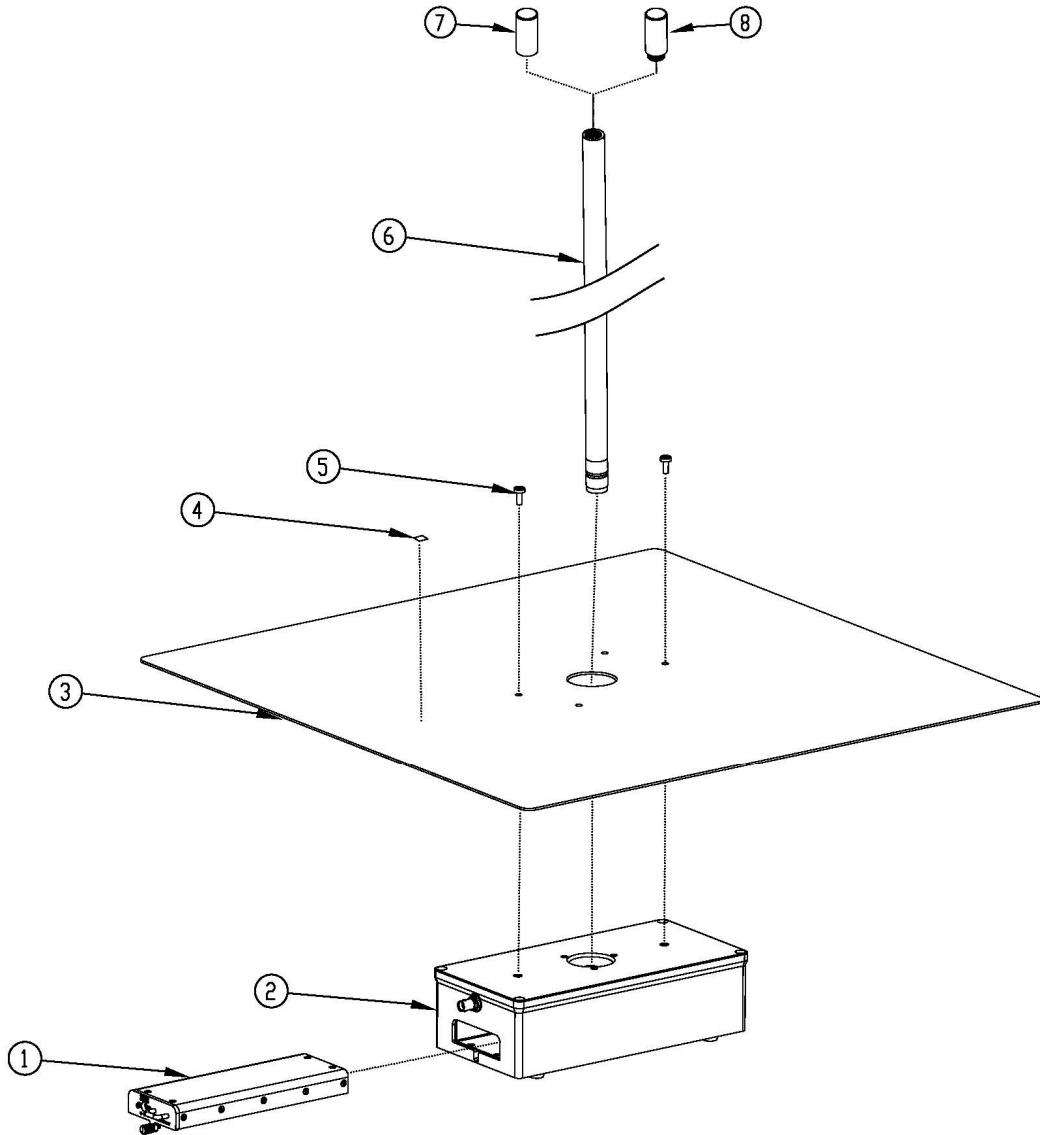


Fig. 2-1 Antenna parts and assembly

1 – BP-02 Li-ion battery pack	5 – n°2 Cylindrical Screws M5x12mm
2 – FR4003 Field Receiver	6 – 1000mm Rod
3 – 600 x 600 mm counterpoise	7 – Vinyl cap
4 – Electrostatic charges warning label	8 – MIL-STD 40mm Rod extension



To Install the FR4003 on the TR-01 optional accessory see chapter 9

This page has been left blank intentionally

3 – FR4003 with 9010F Fast



3.1 Introduction to PMM 9010F

The PMM 9010F(Fast) is a powerful EMI receiver, fully compliant to CISPR 16-1-1, intended for measuring conducted and radiated interferences from 10 Hz up to 30 MHz, or even up to 3/6/18 GHz when matched with PMM 9030/9060/9180 extension unit (optional, future implementation). All measurements performed by the PMM 9010F are according to the most accepted standards like: IEC, CISPR, EN (EuroNorm), FCC, VDE, MIL-STD...

The PMM 9010F design adopts 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 generator - thus combining accuracy and reliability in an unique modern, user-friendly EMI receiver and signal analyzer.

3.1.1 Preliminary operation

To use PMM FR4003 with PMM 9010F, please follow the procedure:

- Make sure the FR4003 is updated at the latest firmware version by the FR4003 Utility.



To use the FR4003 with 9010F it's necessary the release 1.19 or higher

- Make sure the 9010F is updated at the latest firmware version by initial screen after switching the receiver on.



To use the 9010F with FR4003 it's necessary the release 1.46 or higher

- If needed, active the MIL-STD RBW filters and RMS-AVG function on PMM 9010F (see §3.3.2.2 activation procedure).
- Active the "F.O. link to 9010F" function on the FR4003 using the FR4003 Utility (see chapter 5). Once enabled, do not switch the FR4003 off and wait for the Attenuator Led to start blinking.
- Make sure the FR4003 output and 9010F input are connected through BNC cable.
- Make sure the FR4003 and 9010F (LINK 1) are connected through the fast orange optic fiber.
- Switch on the 9010F unit by pressing its power button.
- Check the initial screen showing the results of the starting self-test.

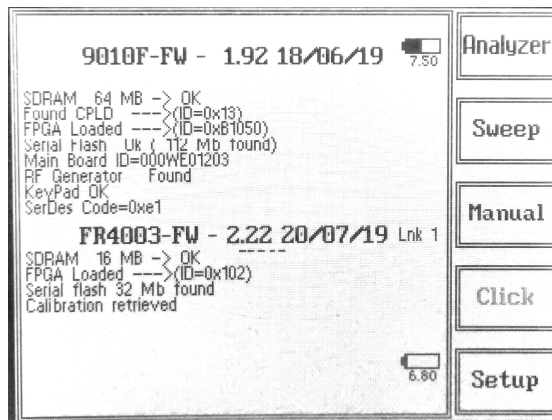


Fig. 3-1 PMM 9010F initial screen showing the results of the initial self-test and the releases of the firmware and FPGAs.



In case ATT, PRE and HPF Led blinks at the same time, an FR4003 auto-calibration must be performed; for further information see § 5.1.3.3



Please do not touch the Display of 9010F while using FR4003, in order to prevent measured E-field from being affected by wrong contribution through human body radiation

3.1.2 Principle of operation

The 9010F is a real-time gapless receiver based on FFT (Fast Fourier Transform) which evaluates N frequencies in a single shot.

Real time means that the FFT calculation must be as fast as the incoming data are sampled to achieve the result that no data are missed.

FFT itself would be not adequate for full compliant measurements without preventing:

- Aliasing effect, by adopting an appropriate input filter which suppresses the frequencies beyond the Nyquist limit.
- Spectrum leakage, due to the fact that observation of the input signal must be limited to a finite interval (an infinite series of subsequent finite intervals in our method). An appropriate time-windowing function is applied so that the spreading or leakage of the spectral components away from the correct frequencies is negligible.
- Picket fence effect, related to the resolution bias error that may cause in an FFT spectrum the peaks to be measured too low and the valleys too high in level. This phenomenon is avoided by adding a certain number of overlapped FFTs, calculated in parallel over almost the same input samples.

Thanks to these techniques the PMM 9010F has no gaps and detects any CISPR pulse even at the lowest repetition rates.

The 9010F processes 6 detectors x 1024 frequencies x 16 FFTs at once.

In this way it is possible, for example, to carry out a complete fully CISPR 16.1.1 compliant measurement with 2-second hold time over the A band (9 -150 kHz with a 200Hz RBW filter) in less than 8sec.



Be sure not to overload both PMM FR4003 and PMM 9010F: the input signals should not exceed the maximum levels indicated in the main specifications in chapter 1.

Also, do not apply any signal to RF generator output connectors.



Please refer to the Operating Manual of the 9010F for further information.

3.2 Sweep Mode



The **Sweep mode** is used to operate the PMM 9010F as a scanning EMI receiver. To enter this mode press the Sweep soft key on the main screen to set the parameters for the scan. All the automatic settings (RBW, frequency step, etc.) refer to the CISPR standard.

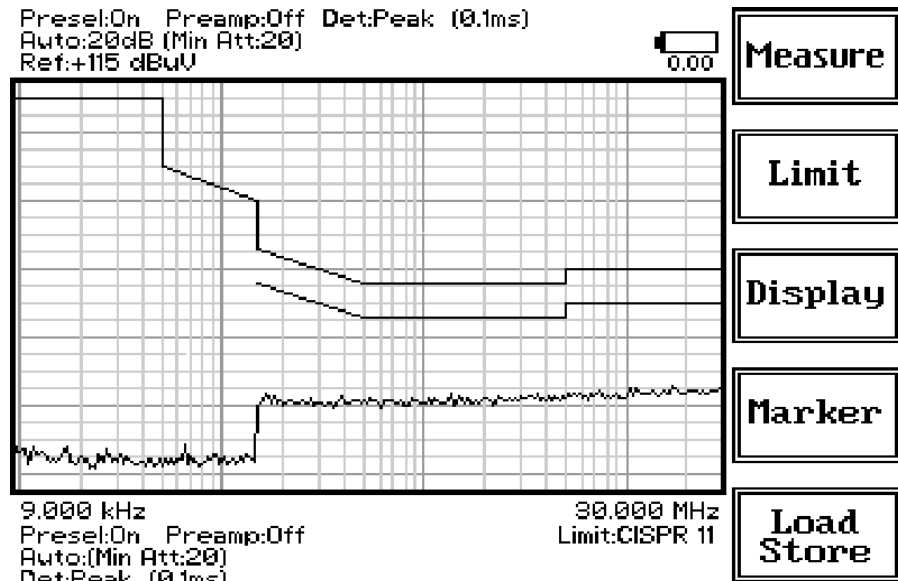


Fig. 3-2 Sweep

Ultra Fast FFT scan

The Ultra-Fast FFT (Fast Fourier Transform), as described in PMM 9010F User's Manual, allows for assessing the EUT emissions across the whole spectrum in very short time and in full compliance mode, thus avoiding the preliminary debugging phases. The Ultra-Fast FFT scan is also particularly suitable for those EUT that cannot stay ON for a long time without getting damaged (e.g. small electric motors, etc.) while maintaining the capability of performing a full-compliant Quasi-Peak evaluation of all the frequencies.

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 input attenuation is Automatic or Manual and the set attenuation and if the Minimum attenuation is 0, 10 or 20 dB.

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.

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.



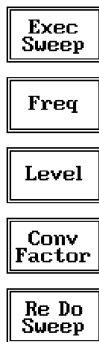
The Sweep mode function is divided into five sub windows:

- Measure
- Limit
- Display
- Marker
- Load Store

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

3.2.1 Measure

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



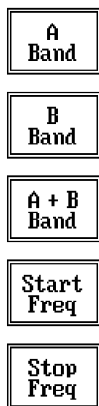
After having set the frequency band and the other parameters press the **Exec Sweep** button to run the sweep.

To make subsequent sweeps with the same setting parameters, simply press **ReDo Sweep**. This key is particularly useful to make comparisons e.g. before and after EUT modification after having loaded a previously stored track (see § 3.2.5), as with the Re Do Sweep the original settings are kept for the new measurement.

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

3.2.1.1 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.

In this way 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 a 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.

3.2.1.2 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 9010F 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.

3.2.1.3 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 10 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 the minimum attenuation among 0, 10, 20 and 30 dB. When a minimum attenuation is selected, the attenuator – doesn't matter if in automatic or in manual condition - cannot be lowered under that value.

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 automatically takes into account 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.

The "click" you may perceive is the auto-attenuator switching.



In case an OVERLOAD indication occurs it is necessary to set a higher attenuation.



Using 0 dB attenuation the receiver has no input protection.

This is a potentially dangerous condition for the input stage.

Use 0 dB attenuation only if you are very sure that your input signal is less than the maximum allowed in the main specification.

Before to apply an unknown signal to the 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.



3.2.1.4 Misc



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

The **Preselector** is composed by a group of filters automatically selected by the PMM 9010F 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 Signal Generator menu.

3.2.1.5 RF Output Generator



The **RF Output generator** is an internal, high stability and accuracy, 50 Ohm RF generator ranging from 9 kHz to 30 MHz.

NOTE: Due to the Ultra Fast FFT technology of the PMM 9010F the Tracking function is disabled; thus the generator consists of a CW signal source tuned at the frequency set under the **RF OUT Freq** window.

As usual, to set a given frequency it is 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.

The internal generator is also used for self-calibration of the PMM FR4003.



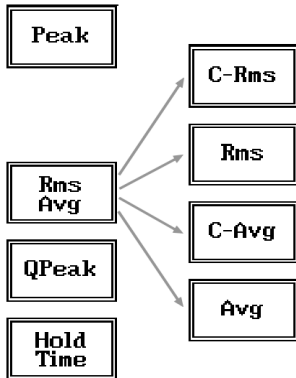
Turn Off the RF Output generator, if it is not used, while you are in Scan Mode.

This prevents interferences, battery wasting, and the measurements are more clean and accurate.

3.2.1.6 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. In some cases e.g. when the interference signals have a low repetition rate setting a longer Hold Time may be necessary for preventing the auto-attenuator to continuously switching up and down

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 120 sec.



The C-RMS (CISPR RMS-Average) detector is a payment special function implemented in the PMM 9010F receiver.

RMS-Average detector is manufactured under license of Rohde & Schwarz GmbH & Co. KG.

The RMS-Average detector, according to the CISPR 16-1-1 standard, supplies a reading of the input signal that is weighted, for repeated pulses, such that for a constant indication, the relationship between amplitude and repetition frequency is in accordance with the following rule:

the Amplitude is proportional to (repetition frequency)^{-1/2}

The value is the maximum level during the measurement time (Hold Time) and the averaging is carried out with a lowpass filter of the 2nd order to simulate a mechanical instrument.

The calibration is in reference to the RMS value of an unmodulated sinewave signal.



To enable the RMS-AVG Detector, use the 9010 Set code Utility. Please refer to the 9010F User’s Manual for any further information.



3.2.1.7 Conversion factor

NO Factor

NO Factor

NO Factor

NO Factor

NONE

When using a transducer– a Voltage or Current Probe, an Antenna, etc. – its conversion factor must be added to the measured values.

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

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

The PMM 9010F 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 9010F Software Utility.

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

3.2.2 Limit

022

014

011

Custom

NONE

Each emission standard has one or more limits the User shall comply with. The PMM 9010F receiver has the possibility to load and activate one limit with a simple push 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 9010F 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 9010F, but only in the one of the PC where the 9010FSW 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.

3.2.3 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 dBµV to 135 dBµV (-25 to +30 dBm); see also 3.2.1.

3.2.4 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 9010F 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.



3.2.5 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 9010F Software Utility.



Turn Off the RF Output generator, if it is not used, while you are in Scan Mode.
This prevents interferences, battery wasting, and the measurements are more clean and accurate.

3.3 Analyzer Mode



To enter in the **ANALYZER Mode** press the Analyzer soft key on the main screen.

In this mode the receiver works as a Spectrum Analyzer maximizing the sweep speed.

The analysis is done at the selected span frequency.

The marker provides accurate measurement of the signals frequency and level; **Analyzer Mode** display:

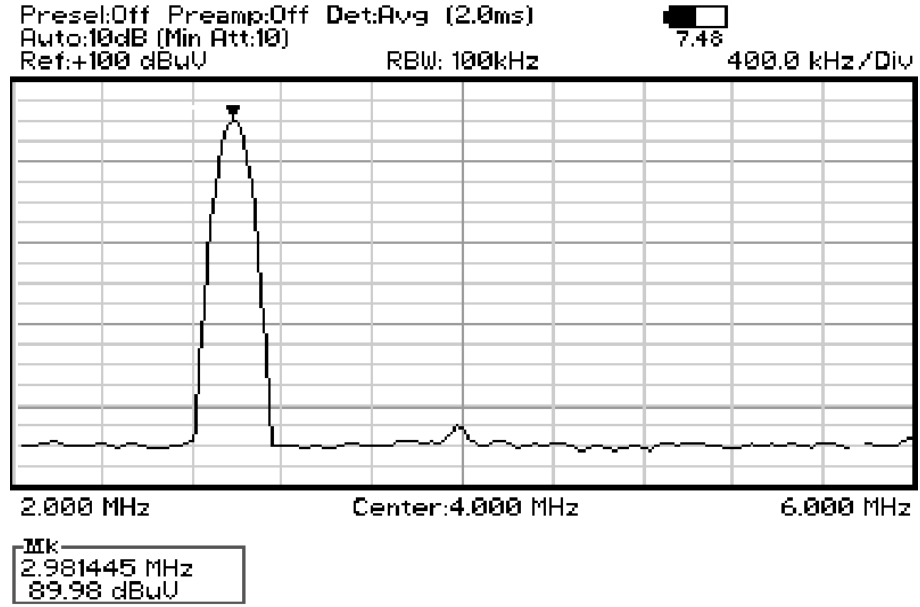


Fig. 3-3 Spectrum



The SPAN per division is automatically calculated over 10 divisions. 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.

- Freq
- RBW
- Level
- Marker
- Wide Mode

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 3-2, and with the **Esc** button the original view can be restored.

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



3.3.1 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.

3.3.2 RBW

300kHz

100kHz

30kHz

More
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 -6dB
- 10 kHz at -6dB (MIL)
- 30 kHz at -6dB
- 100 kHz at -6dB
- 300 kHz at -6dB

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 for specific applications, e.g. to cover Military Standards requirements, etc.:

- 10 Hz MIL at -6dB (Option)
- 100 Hz MIL at -6dB (Option)
- 1 kHz MIL at -6dB

3.3.2.1 Additional RBW Filters

PMM 9010F and FR4003 have been designed to allow the use of many RBW filters.

MIL-STD-461E requires the application of proper RBW Filters.

To have these additional RBW Filters available it is necessary to enable the related Option (see "MIL-STD-461E Activation procedure" paragraph in the 9010F User's Manual).

It is recommended the upgrade of the Units to the latest Firmware available. Please refer to corresponding chapter of the User's Manual to find the instructions concerning how to upgrade the internal firmware.

**3.3.2.2 MIL-STD-461E
or RMS-AVG
Activation
Procedure
(option)**

To enable the MIL-STD-461E Filters or RMS-AVG function use the Upgrading utility (WrDongle.exe).



For further information on software installation, refer to the “Updating firmware and Activation code Utility” chapter.

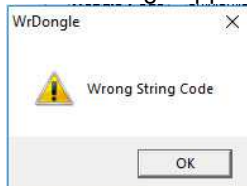
Click on “**Upgrading utility**” (WrDongle.exe) once for running the Set code program, so getting the following window:



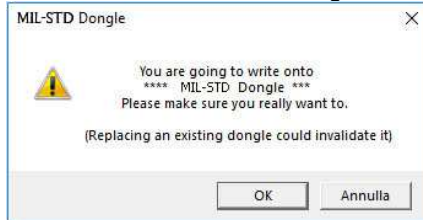
Copy the 40 Digit Serial Code in the Dongle Code Window and select the button below related to the specific option.



This message appears when the Dongle code is not valid.



It will be shown the following message; press **OK** to confirm.



The software will inform that the Dongle Code has been successfully stored; Press **Ok** to close the program.



Always cycle OFF and ON the receiver to properly initialize the function.

3.3.3 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 9010F 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.

3.3.3.1 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 10 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 the minimum attenuation among 0, 10, 20 and 30 dB. When a minimum attenuation is selected, the attenuator – doesn't matter if in automatic or in manual condition - cannot be lowered than that value.

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 both PMM FR4003 and PMM 9010F 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).

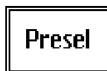
Before to apply an unknown signal to the receiver, use an oscilloscope or a wide band RF voltmeter to measure it. In any case set Min. ATT at 10 dB and select the maximum available attenuation with preamplifier OFF.

If needed, add more attenuation.

3.3.3.2 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.

3.3.3.3 Misc



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

The **Preselector** is composed by a group of filters automatically selected by the PMM 9010F 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 Signal generator menu.

3.3.3.3.1 Signal generator

RF OUT
Freq

RF OUT
Level

Tracking
OFF

RF OUT
On Off

The **signal generator** is an internal, high stability and accuracy, 50 Ohm RF generator ranging from 9 kHz to 30 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.

The signal 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 FR4003 in an emitting antenna, helping a lot in calibrating and testing systems, other antennas etc.

3.3.3.4 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 9010F 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 9010F 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 120 sec.



3.3.3.5 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 9010F can handle these factors in an automatic way and directly correct the readings.

The PMM 9010F 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 9010F Software Utility.

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

3.3.4 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.



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

3.4 Setup - Unit

dBm

dBuV

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 Manual Mode



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 3 different detectors (Peak, RMS and Average); listening to them after a demodulation, etc.

To enter in **Manual Mode** press the key in the main menu.

3.5.1 RBW Selection

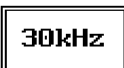
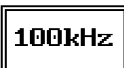


The Manual mode function has five sub windows:

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

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

3.5.2 MIL Filters



The **Resolution Bandwidth** command is used to select the bandwidth of the measuring filter.

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.

Three additional bandwidth filters are now available:

- 10 Hz MIL at -6dB (Option)
- 100 Hz MIL at -6dB (Option)
- 1 kHz MIL at -6dB

When a non-CISPR filter is selected, the Quasi Peak, C-RMS and C-AVG detectors are disabled.



3.5.3 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 or when the standard impose a proper measurement time.

In this case, it could happen that the PMM FR4003 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 9010F 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 120 sec (120.000 ms).



Be sure not to overload PMM FR4003: 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.



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



PMM 9010F can be remotely controlled also when it is working with its options such as FR4003 and MIL Filters.

3.6 Operating Manual Changes



Instruments manufactured after the printing of the User’s 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 the manual itself.

This page has been intentionally left blank

4 – PMM Emission Suite software



4.1 FR4003 Operation method

Please refer to the **PMM Emission Suite User’s Manual** for general information about the usage of the software.

The PMM FR4003 can operate as a powerful EMI receiver and can be swept step by step or FFT. The software automatically performs all operations for setting the receiver in the selected method.

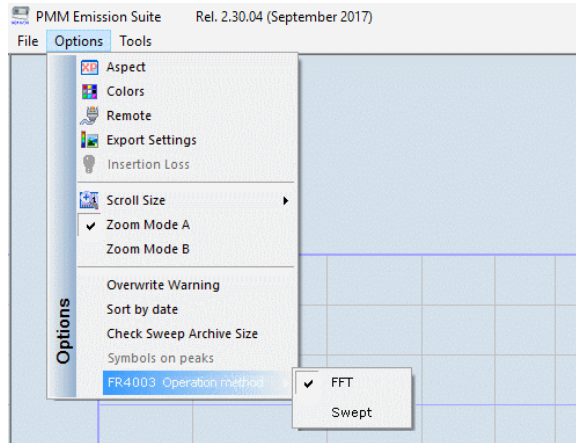
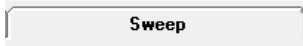


Fig. 4-1 Operation method

4.2 Sweep mode



To switch into the **Sweep Mode** simply select the proper “Sweep” Tab. Entering in the new operating mode, the main screen will look like in fig. 4-2. Please note that the information in the Sweep sheet refer to the next sweep to be done, while the information in the Sweep Archive card, the first on the left, concerns the actual displayed data. All the automatic settings (RBW, frequency step, etc.) refer to the CISPR standard.

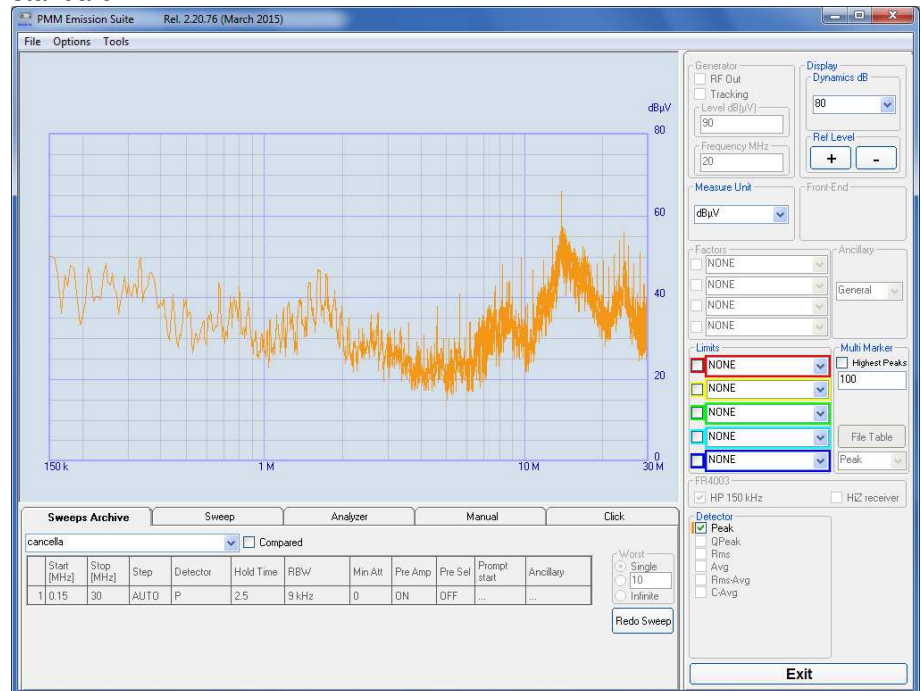
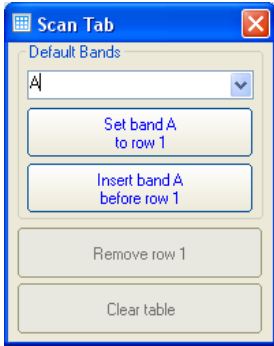


Fig. 4-2 Sweep mode screen

4.2.1 Scan tab



There are three different way to start a new work section:

- Highlight the name of the Sweep Sample, enter a new name and confirm by pressing ENTER.
- Select one of the rows with the “right mouse click” (the selected line will be highlighted and the Scan Tab window will appear), select **Clear Table** to delete all the settings and confirm with **OK**, then right click on the mouse to start selecting the default bands for each new row according to CISPR and Military (Mil Scan) standard requirements.
- You could also quickly use the same parameters of a previous Sweep test stored in the Sweeps Archive Tab and if necessary to change some of them; to modify the existing Sweep Test, enable the **Scan Tab** of the selected row and set a new band or make a copy of the row or delete the row self or delete all table).

4.2.2 Factors



Geometrical antenna factors for FR4003 are preloaded during the PMM Emission Suite installation, both for the 100 cm and for the 104 cm rods. To activate the desired factor, scroll the drop-down menu, select the proper file and tick the corresponding box. On the right, the program shows the actual correction factor in dB.

Before running the measurement, make sure you have selected the desired factor.

With the auto-calibration, the FR4003 is able to apply an internal correction, which compensates the response of the specific receiver, so that the measurements are always very accurate. For further information see § 5.1.3.3



4.2.3 Frequency

Start - Stop

Start [MHz]	Stop [MHz]
0.009	0.15

The **Start** and **Stop** frequency (expressed in MHz) can be used to set any frequency interval for the measurement.

Using the default settings, the **Start** and **Stop** frequency are set automatically according to CISPR standard requirements:

The **Step** function is used to set the steps of the Sweep; it includes:

- **Step Hz**: if **AUTO** is active the frequency steps are set automatically for best matching with RBW filters in the selected frequency range. Otherwise the step can be changed manually; the Steps specified will correspond to the movements of the Marker along the curve during the Zoom modes. Be sure manually set Step will not be larger than selected RBW filter's width to not lose a meaningful part of the measured signal.

Step



- **Frequency Table**: the sweep can be focused exactly on the points entered in the Frequency Table; you can also set a definable Span typing the numbers of steps around each frequency point in the table where to perform the measurement. .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;

4.2.4 Detector, Hold time and Limit

Detector	Hold Time
S P Q C	1000

Detector

Smart Detector

Peak

QPeak

Rms

Avg

Rms-Avg

C-Avg

Hold Time QPeak (ms)

Peak Scan Hold Time (ms)

Margin (dB)

Limits QPeak

55011bqp

Limits C-Avg

c22bqp3m

Detectors

The Detector box allows the operator to select the most appropriate detectors for the test; in Sweep mode the Smart Detector(S), Peak(P), Qpeak(Q), RMS(R), Average(A), Rms-Avg(N), and C-Avg(C) detectors are available.

The **Smart Detector** is an innovative special function implemented in the PMM 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 the **Smart Detector** the receiver will execute the scan using mainly the Peak detector (with its **Peak Scan Hold Time**) and, if a peak value is found over the selected limit minus a **Margin** (set with the specific box), the measurement is performed with the others (up to 2 at max) chosen detectors and the corresponding **Hold time** (typically 1000ms). 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.

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 at each tuned frequency. 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 Receiver 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.

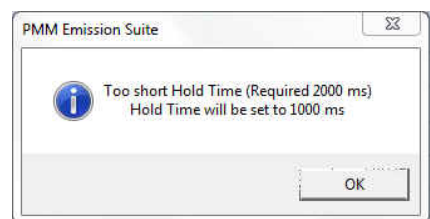
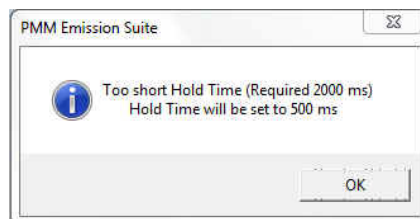
On the other hand, if the Hold Time is too short the receiver cannot properly follow the signals.

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

To set the Hold Time to the lowest possible value (this value dynamically depends on the measurement conditions) enter 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).

The default setting of QP is 1000 ms; of C-AVG is 1500 ms. These settings guarantee the optimal operation of the said detectors as requested by the CISPR standards: lower values would provide less accurate or in some cases wrong results. Anyway, it is possible to set shorter Hold Time values down to 500 ms for QP and 1000 ms for C-AVG to speed up the tests in pre-evaluation.





The Smart Detector function is not available with PMM 9010F since it is already fast enough to perform the full measurement.

Limit

Each emission standard has one or more limits the User shall comply with. The box allows to load and activate one limit with the simple click of the mouse; the preloaded standard limits refer to the most popular EMC emission standards.

Other limits – or any custom designed limit – can be created and managed through the Limits Tool in the tool menu (see General functions chapter). These additional custom limits cannot be stored in the memory of the Receiver, but only in the one of the PC where the Software is running. The limit is displayed as a colorful horizontal bold line on the graph area.

4.2.5 RBW

RBW
200 Hz

The **Resolution Bandwidth** is used to select the bandwidth of the measuring filter. Several bandwidth filters are available for specific applications, e.g. to cover Military Standards requirements

4.2.6 Min Att

Min Att
10

The **Min Att** is used to set the minimum attenuation at the input. The minimum attenuation that can be selected is 0, 10, 20 or 30 dB.

When the input attenuation is 0 dB in the PMM Receiver (condition that can be achieved only if the Minimum Attenuation is set to 0 dB as well), the yellow led named ATT blinks rapidly, indicating a warning status.

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

4.2.7 Preamp

Pre Amp
OFF

With the **Preamp** 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.

4.2.8 Preselector

Pre Sel
ON

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; normally it should be always enabled.

4.2.9 Prompt start

Prompt start
Starting

With the **Prompt start** you can assign a label to the sweep; a message will be displayed at the start of each; only the first 8 characters will be shown in the setting box.

4.2.10 Ancillary

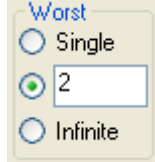
Ancillary
N, L1, L2.

Through the **Ancillary** box it is possible to select the lines or the axes of the accessory activated in the **Global Test Settings** and show on the graph all the responses.



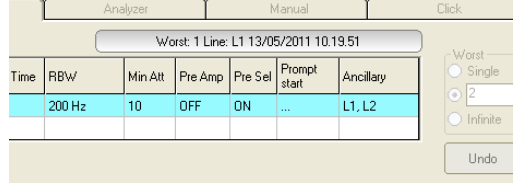
It is important not forget to manually change BNC cable connection at LISN device's Line or switch the Antenna axis before starting the next sweep; a message will be displayed at the start of each sweep. For Antennas the resulting action will be only the addition of an Horizontal or Vertical notice stored with measurement settings, i.e. no control of rotation will be output for each antenna polarization,

4.2.11 Worst

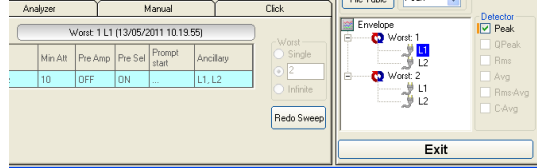


In the **Worst** box you can define the number of sweeps for each line or axis to be performed automatically one after the other; at the end of the test the software retains and displays the maximum measured level at each frequency as Envelope, while every sweep will always be maintained for deeper investigation on the most noisy conditions.

During the test it will be shown the date and the time of the sweep in progress just above the Sweep Tab Setting.

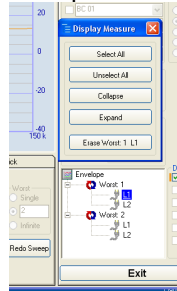


At the end of the test, all the sweeps will be stored and displayed in chronological sequence below the Envelope.

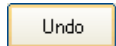


With the left mouse click you can select the single line/axis or the envelope to be showed on the graph area; for each sweep date and time of creation will be shown..

You can also use the right mouse click to flexibly select and manage stored sweeps.



4.2.12 Undo



Once the Sweep settings are defined, they can always be resumed through UNDO button.

4.2.13 HPF and HiZ Rec

FR4003
 HP 150 kHz HiZ receiver

The FR4003 internal receiver is equipped with a useful **High Pass Filter** to cut any signal under 150 kHz.

Selecting the HiZ (**High impedance**) receiver, the unit behaves as a RF tuned voltmeter. In this case, it is possible to add an external load to adapt the input to the desired impedance, using a T connector.

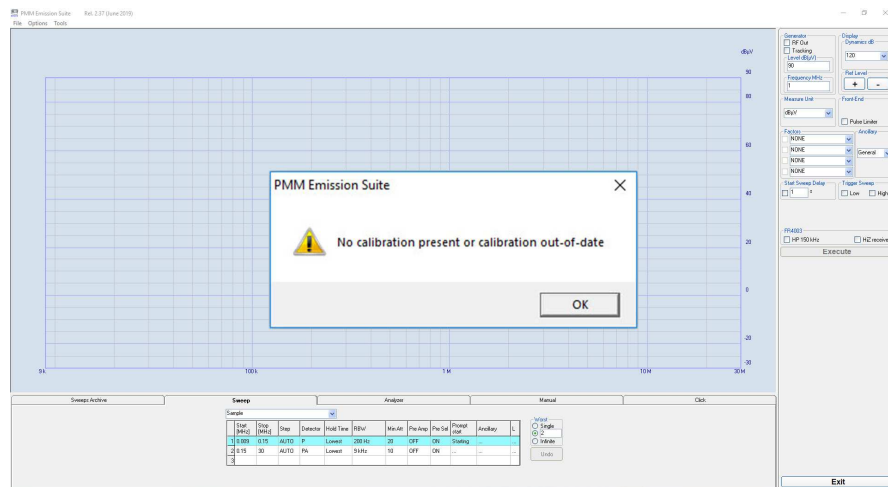
4.2.14 Execute

Execute



After having chosen the frequency band and set all the other parameters it is possible to run the measurement with button **Execute**.

If the calibration is not present on FR4003 (the ATT, PRE and HPF Led blinks at the same time), the following message will popup. In this case an FR4003 auto-calibration must be performed; for further information see § 5.1.3.3.



Battery
 FR4003
 7.11

Stop Pause

Exit

Once the scan starts, the button Execute toggles on a **Battery** status box. When the battery is charging the status **Charging** is shown on the inside of the battery symbol and a yellow bar runs along it. Instead, when the battery is not under charge, the actual voltage value is displayed and the length of the bar filling the symbol indicates the remaining available autonomy.

Select **Stop** and **Pause** to interrupt or suspend the Sweep at any time during the execution.

Select **Exit** to close the program.

Using 0 dB attenuation PMM FR4003 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 lower than the maximum allowable for such a test condition. Before to apply an unknown signal to PMM FR4003 field 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 to the input signal line.



It is suggested to turn off the Generator, if not necessary, to achieve the maximum sensitivity and reduce battery wasting.

4.3 Analyzer Mode

In this mode the receiver works as a powerful Spectrum Analyzer. The analysis is done at the selected span frequency.

Entering **Analyzer Mode** the main screen will look like the following:

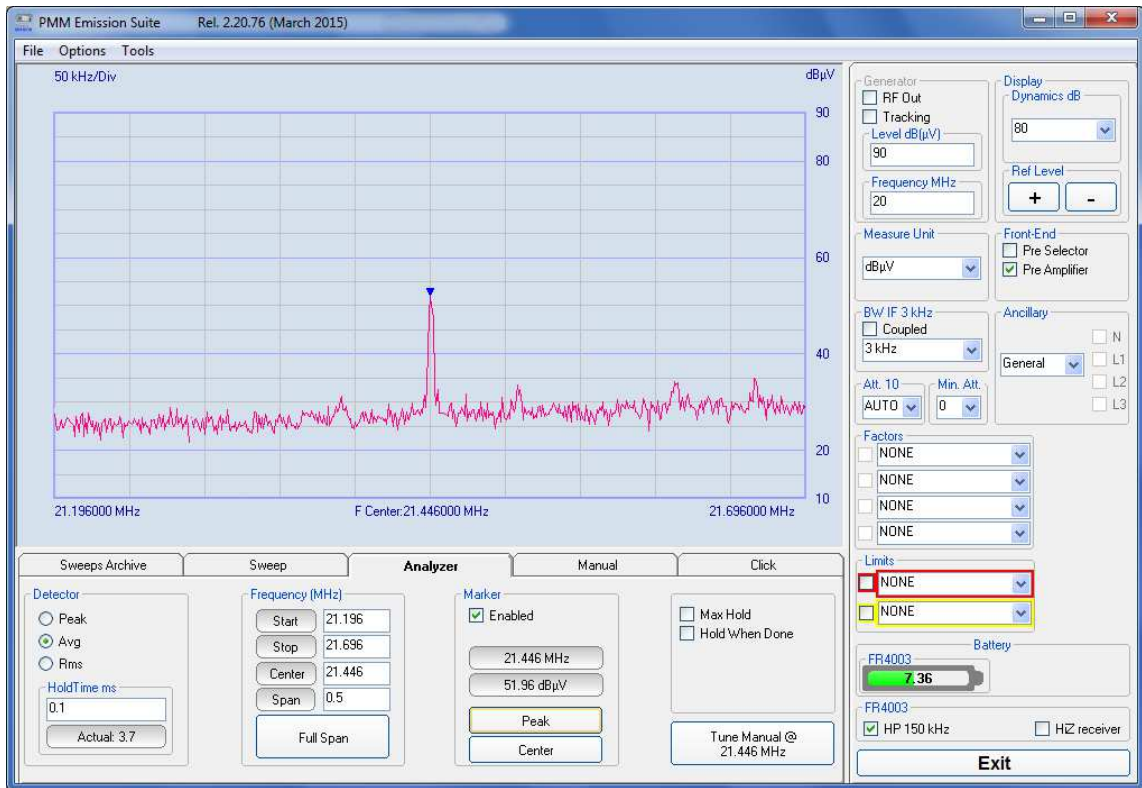
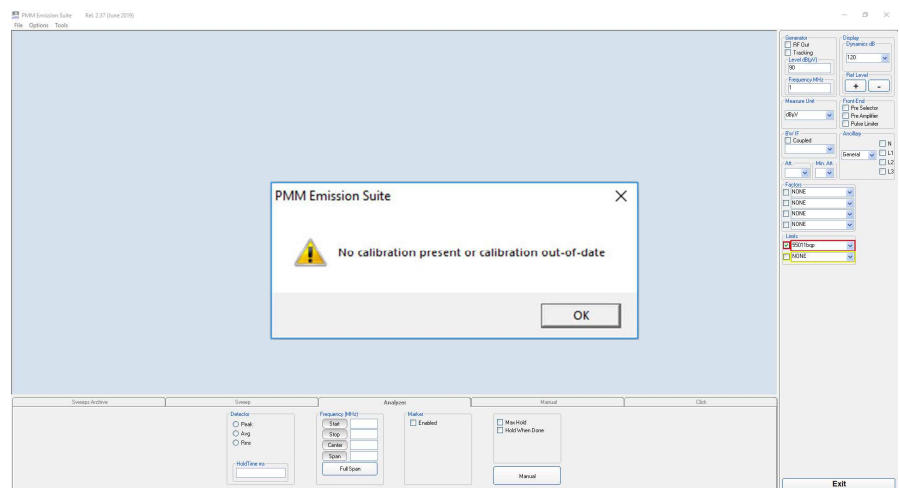


Fig. 4-3 Analyzer mode window



If the calibration is not present on FR4003 (the ATT, PRE and HPF Led blinks at the same time), the following message will popup. In this case an FR4003 auto-calibration must be performed; for further information see § 5.1.3.3.



To switch into the Analyzer Mode, simply select the proper “**Analyzer**” Tab.

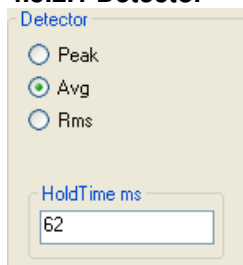
After that you can start defining the settings included in the **Analyzer Tab** and in the **Global Test Settings**.

4.3.1 Introduction

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.

4.3.2 Analyzer Mode Tab Settings

4.3.2.1 Detector



Detector

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 box.

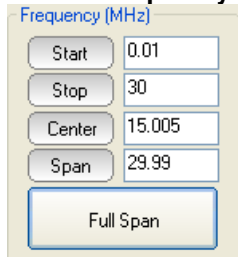
Hold time

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 last hold time value set 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 Receiver 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 Receiver cannot properly follow the signals.

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

To set the Hold Time to the lowest possible value enter 0; the max. Hold Time that can be set is 1 sec (1000 ms).

4.3.2.2 Frequency



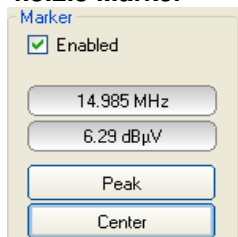
Allows the User to set the tuning frequency and also the Span.

Using the **Start** and **Stop** it is possible to select any start and stop value in the frequency range.

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

The **Full Span** button shows the "spectrum analysis" in the whole frequency domain.

4.3.2.3 Marker

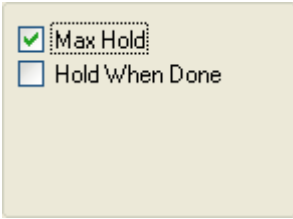


With this box the **Marker** function can be enabled.

When activated it appears on the area graph as a small pointing down arrow; simultaneously two small windows appears in the Marker box showing 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.

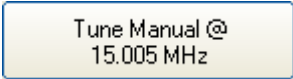
**4.3.2.4 Max Hold
Hold When Done**



Max Hold: the maximum level of each frequency step is retained and displayed since the Max Hold function has been activated. Every spectral line or axis is therefore updated only if the new value is greater than the previously displayed one showing thus the Maximum of each spectral line or axis since the Max hold function was activated.

Hold When Done: stops acquisition to allow data analysis as soon as the line or axis has been measured. When this function is active it's also possible to save the final graph in a picture through the File/Save Image menu.

4.3.2.5 Tune Manual @



To deeply investigate and control the center Frequency, select the **Tune Manual @** button (the value of the frequency shown depends on the center frequency set), you will then enter the Manual Mode where the levels corresponding to the detectors (Peak, AVG, and RMS) in use will be displayed both in analogue and in digital format; a similar button will allow to go back to the Analyzer Mode.

For further information see Manual Mode paragraph included in this chapter.

**4.3.3 Analyzer Mode
Global Test
Settings**

4.3.3.1 Factors

Geometrical antenna factors for FR4003 are preloaded during the PMM Emission Suite installation, both for the 100 cm and for the 104 cm rods. To activate the desired factor, scroll the drop-down menu, select the proper file and tick the corresponding box. On the right, the program shows the actual correction factor in dB.



Before running the measurement, make sure you have selected the desired factor.



With the auto-calibration, the FR4003 is able to apply an internal correction, which compensates the response of the specific receiver, so that the measurements are always very accurate.

4.3.3.2 BW IF

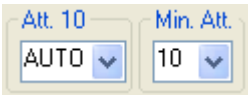


The **Resolution Bandwidth** command is used to select the bandwidth of the measuring filter. Several bandwidth filters are available:

- 10 Hz (MIL STD option when in conjunction with PMM 9010F)
- 100 Hz (MIL STD option when in conjunction with PMM 9010F)
- 200 Hz CISPR 16 shaped at -6dB
- 9 kHz CISPR 16 shaped at -6dB
- 1 kHz (MIL STD)
- 3 kHz
- 10 kHz (MIL STD)
- 30 kHz
- 100 kHz
- 300 kHz



If **Coupled** is active the Resolution Bandwidth will be set automatically in order to the Span.



The attenuator **Att.** is used to increase or decrease the attenuation at the input; it cannot be lowered than the value of the minimum attenuation **Min. Att.** selected.

The input attenuation of 0 dB is a condition that can be achieved only if the Minimum Attenuation is set to 0 dB as well.



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

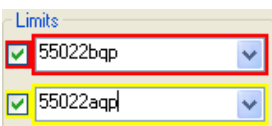
The **Att** AUTO is used to switch between the two conditions of manual or automatic attenuation setting.

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



To avoid continuous switching between two attenuators in case of highly variable signals it's strongly recommended to manually select the highest of the two attenuation values.

4.3.3.3 Limits



Each emission standard has one or more Limits the User shall comply with. The box allows to load and activate one limit with the simple click of the mouse; the preloaded standard limits refer to the most popular EMC emission standards.

Other limits – or any custom designed limit – can be created and managed through the Limits Tool in the tool menu (see General functions chapter).

These additional custom limits cannot be stored in the memory of the Receiver, but only in the one of the PC where the Software is running.

The limit is displayed as a colorful horizontal bold line on the graph area.

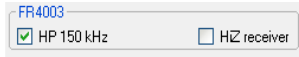
4.3.3.4 Battery



The status of the battery is displayed in the **Battery** box.

The actual voltage value is displayed and the length of the bar filling the symbol indicates the remaining autonomy.

4.3.3.5 HPF and HiZ Rec The FR4003 internal receiver is equipped with a useful **High Pass Filter** to cut any signal under 150 kHz.



Selecting the HiZ (**High impedance**) receiver, the unit behaves as a RF tuned voltmeter. In this case, it is possible to add an external load to adapt the input to the desired impedance, using a T connector.

4.3.3.6 Exit Select **Exit** to close the program.



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



In order to better analyze the signals close to the end of the band and see them properly with any of the applicable filters, the receiver is able to go higher than 30 MHz. The actual maximum frequency that can be displayed on the screen is 30.1 MHz.

4.4 Manual Mode

The **MANUAL** mode is a very useful feature to manually control the parameters of receiver exactly as per the needs of the Test Engineer and deeply investigate signals.

It is possible, for example, to observe the signals exceeding the limits frequency by frequency, evaluating their levels measured simultaneously with different detectors (Peak, QuasiPeak, RMS-Avg, C-Avg, RMS, Average), etc.

Entering in **Manual Mode**, the main screen will look like the following:

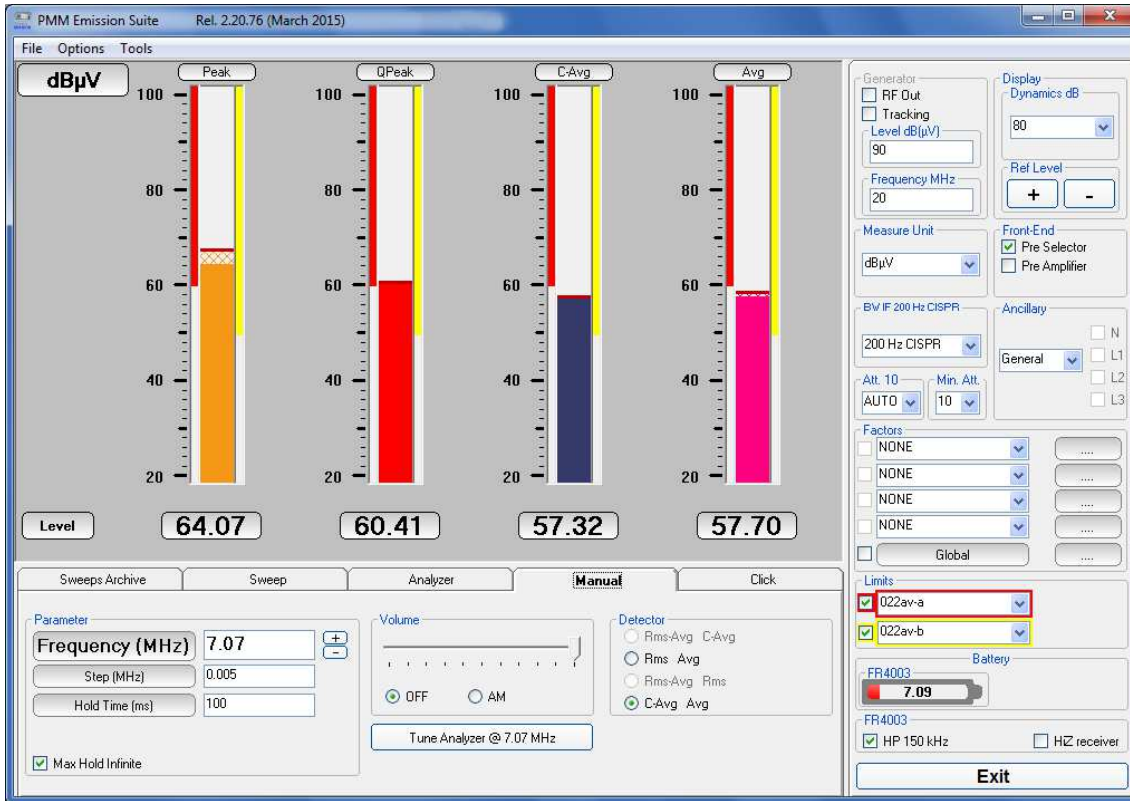
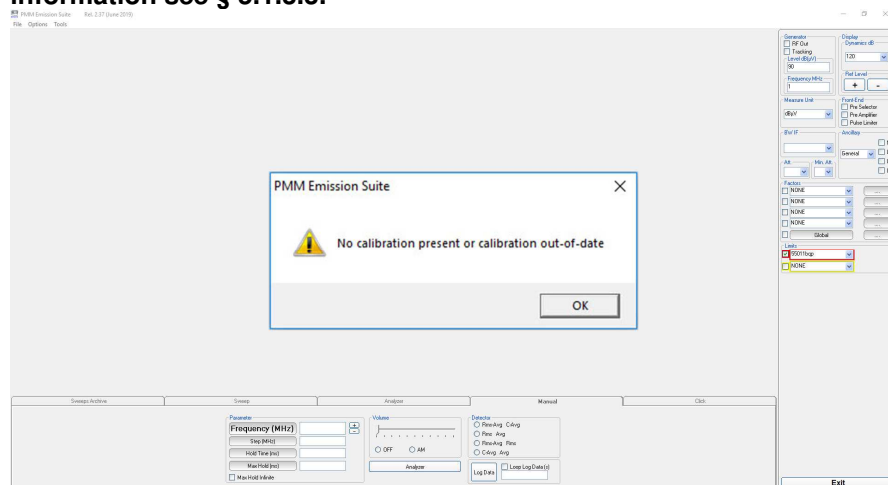


Fig. 4-4 Manual mode window



If the calibration is not present on FR4003 (the ATT, PRE and HPF Led blinks at the same time), the following message will popup. In this case an FR4003 auto-calibration must be performed; for further information see § 5.1.3.3.



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 graph area.

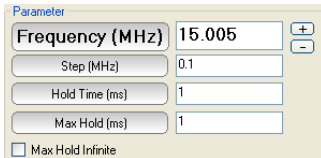
The three or four vertical bars represent the detectors and indicate in analogue and digital the level measured; on top of the bars the relevant detector and the unit in use; the numerical levels are shown below each of them. The analogue scale of the analogue bars is set automatically by the software.

To switch into the operating Manual Mode, simply select the proper “Manual” Tab.

After that you can start to define the settings included in the **Manual Tab** and in the **Global Test Settings**:

4.4.1 Manual Mode Tab Settings

4.4.1.1 Parameter



After having fixed the **Step** size (max. value 30.1), press the left and the right arrow keys to decrease or increase the frequency by the selected step. The center Frequency of the reading can also be directly edited into the **Frequency** window. The default unit is MHz.

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 the detector is selected, the last hold time value set 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 Receiver 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 Receiver cannot properly follow the signals.

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

To set the Hold Time to the lowest possible value enter 0; the max. Hold Time that can be set is 20 sec (20.000 ms).

Max. Hold (ms)

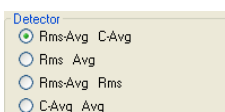
The Max. Hold (expressed in milliseconds) represents the time the software uses to display the maximum level measured in the Hold Time set.

The max. Hold that can be set is 20 sec (20.000 ms).

Max. Hold Infinite

If the Max. Hold. Infinite is activated the software shows the maximum level until a bigger value is measured; in this case the Max. Hold is disabled.

4.4.1.2 Detector



In the **Detector** window you can choose the most useful couple of detectors to add to the default Peak and QPeak Detector; it will be disabled when a non-CISPR filter is selected.

4.4.2 Manual Mode Global Test Settings

4.4.2.1 Factors

Geometrical antenna factors for FR4003 are preloaded during the PMM Emission Suite installation, both for the 100 cm and for the 104 cm rods.

To activate the desired factor, scroll the drop-down menu, select the proper file and tick the corresponding box.

On the right, the program shows the actual correction factor in dB.

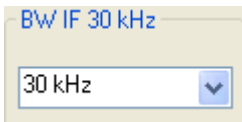


Before running the measurement, make sure you have selected the desired factor.



With the auto-calibration, the FR4003 is able to apply an internal correction, which compensates the response of the specific receiver, so that the measurements are always very accurate.

4.4.2.2 BW IF



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

- AUTO CISPR
- 10 Hz (MIL STD option when in conjunction with PMM 9010F)
- 100 Hz (MIL STD option when in conjunction with PMM 9010F)
- 200 Hz CISPR 16 shaped at -6dB
- 9 kHz CISPR 16 shaped at -6dB
- 1 kHz (MIL STD)
- 3 kHz
- 10 kHz (MIL STD)
- 30 kHz
- 100 kHz
- 300 kHz



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 Peak, RMS, and AVG detector are only enabled; the Detector window will be disabled.

4.4.2.3 Att. - Min. Att



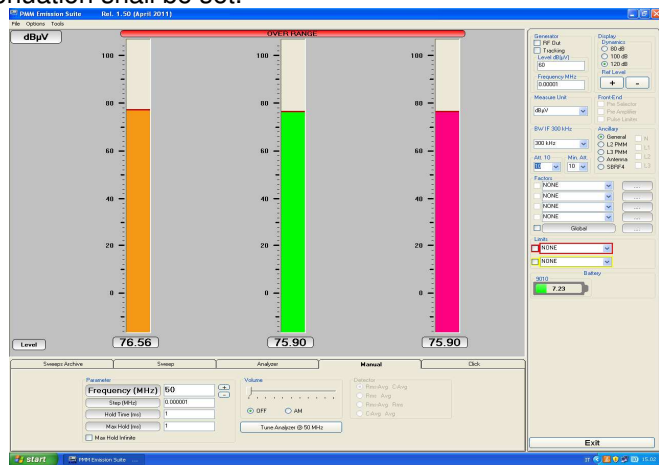
The attenuator **Att.** is used to increase or decrease the attenuation at the input; it cannot be lowered than the value of the minimum attenuation **Min. Att.** selected; the value selected will be shown next to **Att.** label. To set the input attenuation of 0 dB the Minimum Attenuation must be set to 0 dB as well.

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

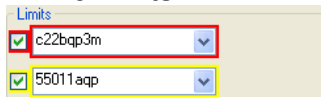
The **Att** AUTO is used to switch from the two conditions of manual or automatic attenuation setting. Please note that the switching of the attenuators is relatively noisy and you can perceive it distinctly with a “click” for each switch operation.

4.4.2.4 Over Range

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



4.4.2.5 Limits



Each emission standard has one or more limits the User shall comply with. The box allows to load and activate one limit with the simple click of the mouse; the preloaded standard limits refer to the most popular EMC emission standards.

Other limits – or any custom designed limit – can be created and managed through the Limits Tool in the tool menu (see General functions chapter). These additional custom limits cannot be stored in the memory of the Receiver, but only in the one of the PC where the Software is running. The limit is displayed as a colorful vertical thick line that appears on the top of the analogic bar just below the detectors label.

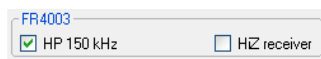
4.4.2.6 Battery



The status of the battery is displayed on the **Battery** box.

The actual voltage value is displayed and the length of the bar filling the symbol indicates the available autonomy.

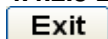
4.4.2.7 HPF and HiZ Rec



The FR4003 internal receiver is equipped with a useful **High Pass Filter** to cut any signal under 150 kHz.

Selecting the HiZ (**High impedance**) receiver, the unit behaves as a RF tuned voltmeter. In this case, it is possible to add an external load to adapt the input to the desired impedance, using a T connector.

4.4.2.8 Exit



Select **Exit** to close the program.

4.4.3 Manual Mode Graph 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.



It is suggested to turn off the Generator to achieve the maximum sensitivity.

**4.5 RMS-AVG
Detector**



4.5.1 Introduction

PMM FR4003 has been designed to allow the use of many kinds of detectors. CISPR Standard has introduced the application of two detectors that are derived from the Root Mean Squared and from the Average ones. To have these two additional detector available it is recommended the upgrade of the Unit to the latest Firmware available. Please refer to the proper chapter of this User's Manual to find the instructions concerning how to upgrade the internal firmware.

**4.5.2 RMS-AVG
Definition**

The RMS-Average detector is a payment special function implemented in the PMM FR4003 receiver.



RMS-Average detector is manufactured under license of Rohde & Schwarz GmbH & Co. KG.

The RMS-Average detector, according to the CISPR 16-1-1 standard, supplies a reading of the input signal that is weighted, for repeated pulses, such that for a constant indication, the relationship between amplitude and repetition frequency is in accordance with the following rule:

the Amplitude is proportional to (repetition frequency)^{-1/2}
 The value is the maximum level during the measurement time (Hold Time) and the averaging is carried out with a lowpass filter of the 2nd order to simulate a mechanical instrument.
 The calibration is in reference to the RMS value of an unmodulated sinewave signal.

**4.5.3 RMS-AVG
Activation
Procedure
(option)**

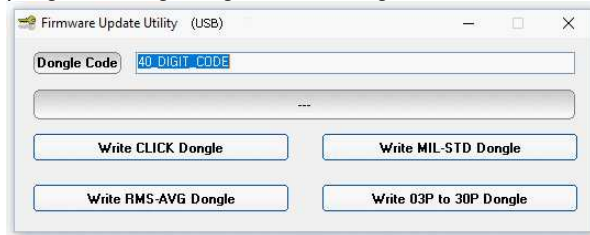


To enable the RMS-AVG Detector use the 9010 Set code Utility.



For further information on software installation refer to the “Updating firmware and Activation code Utility” chapter.

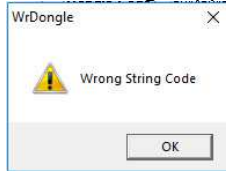
Click on “Upgrading utility” (WrDongle.exe) once for running the Set code program, so getting the following window:



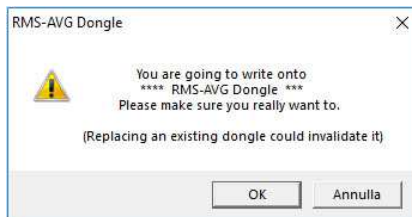
Copy the 40 Digit Serial Code in the Dongle Code Window and select the **Write RMS-AVG Dongle** button.



This message appears when the Dongle code is not valid.



It will be shown the following message; press OK to confirm.



The software will inform that the Dongle Code has been successfully stored. Press Ok to close the program.



Always cycle OFF and ON the receiver to properly initialize the function

4.5.4 C-AVG

Definition

CISPR 16-1-1 defines the Average detector as designed to indicate the weighted average value of the maximum value of the envelope of the signal passed through the pre-detector stages:

up to 1000 MHz, is defined as the response of the measuring receiver to pulses of repetition rate n Hz and impulse area of $1,4/n$ mVs emf at 50Ω source impedance that shall be equal to the response to an unmodulated sine-wave signal at the tuned frequency having an emf with rms value of 66 dBμV.

The value of n shall be 25 for Band A and 500 for Band B.

The average detector is useful to measure narrowband signals to overcome problems associated with either modulation content or the presence of broadband noise.

When the Average is measured according to CISPR 16-1-1, the maximum value of the linear mean envelope during the measurement interval is shown.

The detector is used, for example, to measure pulsed sinusoidal signals with a low pulse repetition rate. It is calibrated with the rms value of an unmodulated sinewave signal. Averaging is carried out with lowpass filters of the 2nd order (simulating a mechanical instrument).



Be sure not to overload PMM FR4003: 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 output connector.



After the activation, the RMS-AVG detector becomes the sixth available one and usable as any of the others.

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

The Hold Time is the measurement time the receiver takes to value the input signal and form result weighted by the selected detector.

When using the **C-Avg** (CISPR-Average) or the **C-RMS** (CISPR-RMS) detector, since for definition they are characterized by a long time constant, the minimum measurement time should be set long enough to allow a correct measurement.

For this reason, **when unknown signal are to be measured, the Hold Time should be at least 1000ms** to correctly weight signals pulsed at a rate of 5 Hz or faster.

With the Peak, RMS and AVG detectors the smallest settable measurement time depends on the RBW.

If several detectors are used contemporarily the Hold Time should be set to meet the requirement of the slowest one, so that the results of the measurement are correct for all them.

When a frequency change or an attenuation variation occurs, PMM FR4003 waits automatically the time needed to the internal circuits to overcome the transient before the measurement time starts again.

5 – Utility, Calibration and Analog mode

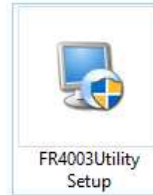
5.1 FR4003 Utility



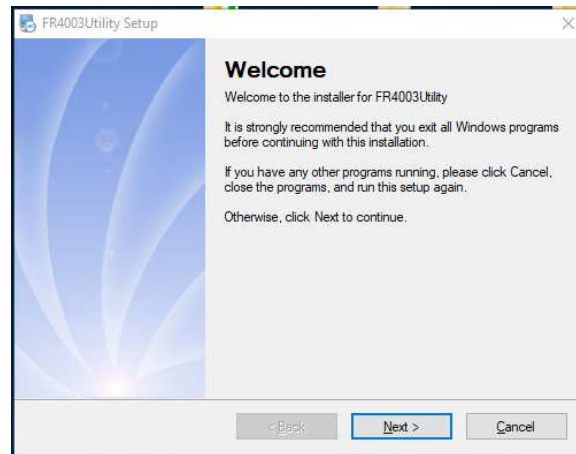
The FR4003 Utility software is the tool to set the Rod Antenna parameters when used in analog mode, without taking advantage of the internal receiver, and enable the connection with the PMM 9010F. It is also useful to perform the autocalibration of the antenna itself, by employing both the internal receiver and the signal generator.

To install the FR4003 Utility on PC from the supplied Software Media proceed as follows:

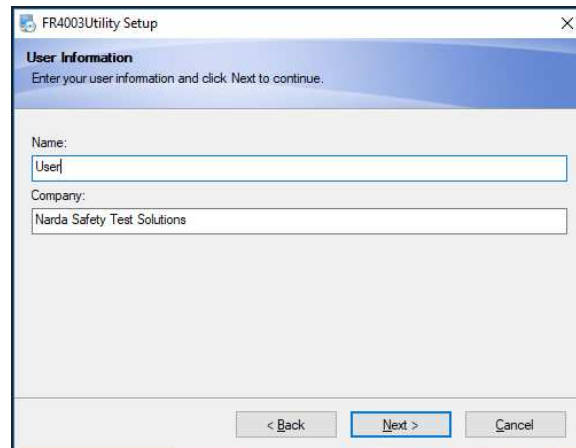
In Computer Resources, browse the Software Media. To start the installation double click on the **FR4003Utility Setup** icon.



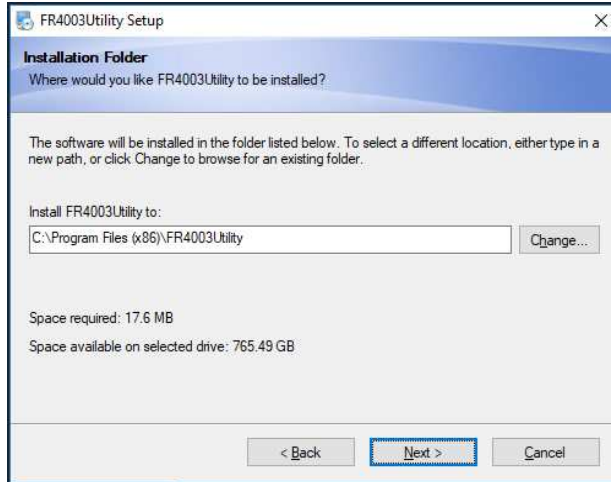
Follow set-up program instructions. The installation can be aborted by clicking on **Cancel**.



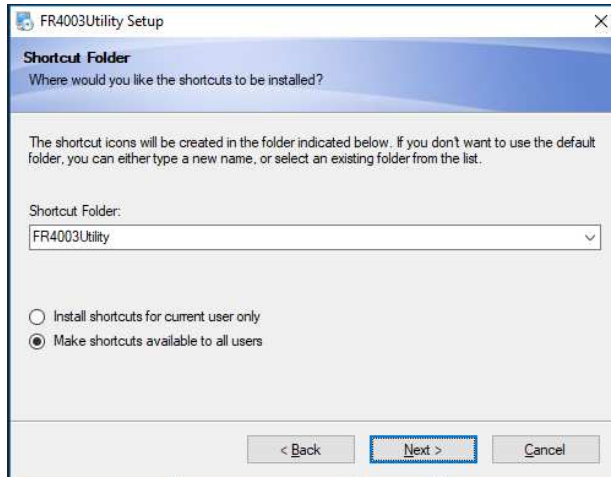
The User information must be specified (blank field are not allowed).



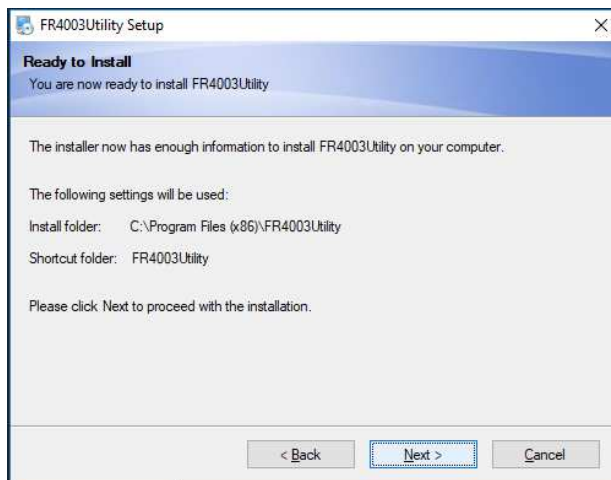
The installation folder must be specified. Click **Next** to confirm the default folder (recommended) or **Change** to modify.



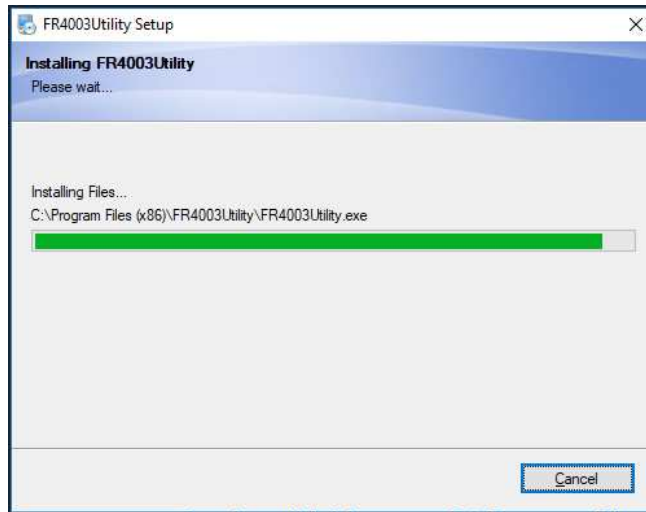
Make FR4003 utility available to **user only** or **all users**.



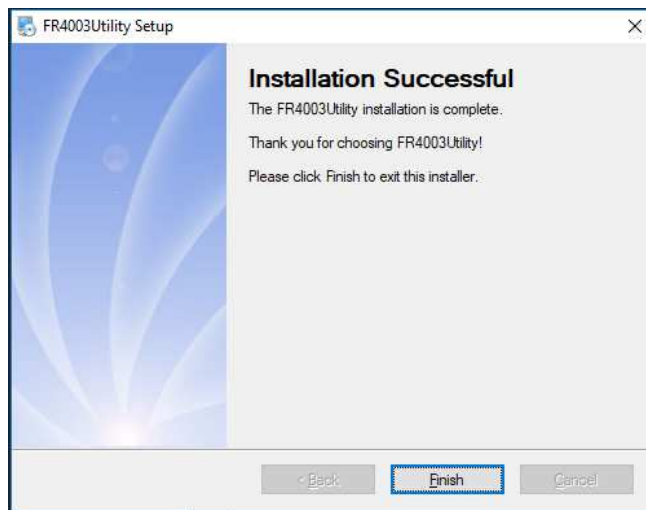
Click **Next** to proceed installing



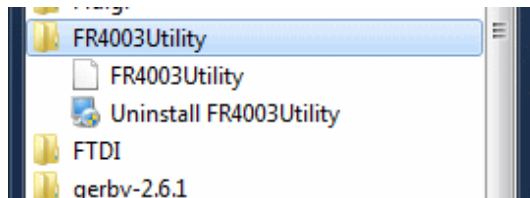
The installing status is displayed then



Click **Finish** to complete and exit the installer. The folder **FR4003Utility** is created under **Programs** with the icon **FR4003Utility** on desktop.



Once the utility is correctly installed, it can be run by simply clicking onto the FR4003Utility icon. The FR4003 must be connected to the PC, using the provided USB optical converter and the plastic optical fiber.



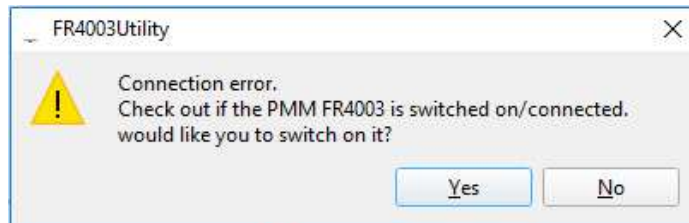
The cover screen appears, showing two buttons, one to connect to the Field Receiver and the other to exit.



5.1.1 Connection

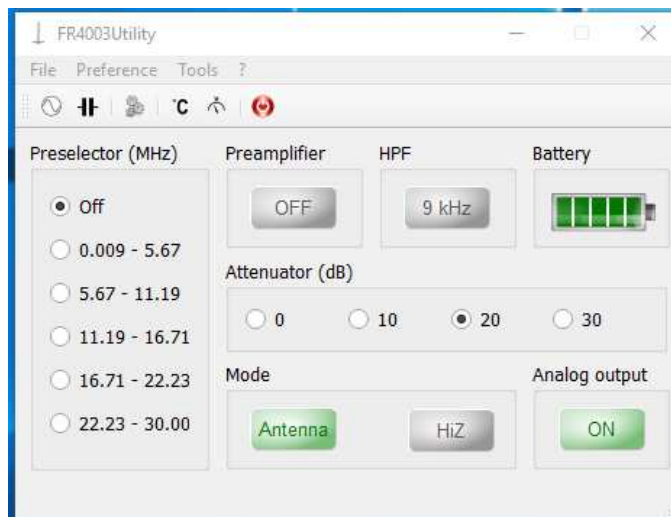
Press the Connect button and wait for the connection establishment.

If the process fails, a warning message, like the following, appears.



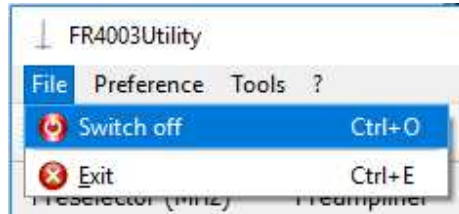
The antenna can also be switched on remotely via the utility.

When everything is ok, the main screen is shown.



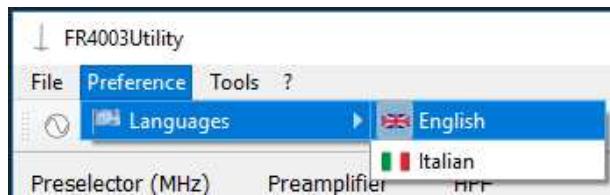


Under the **File** menu there are the buttons useful to switch the Field Receiver off, and to exit the program.



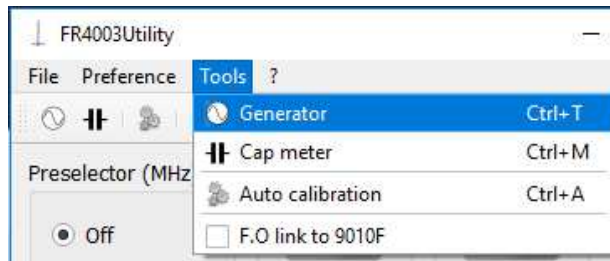
5.1.2 Preferences

The program language can be chosen under the preferences menu.



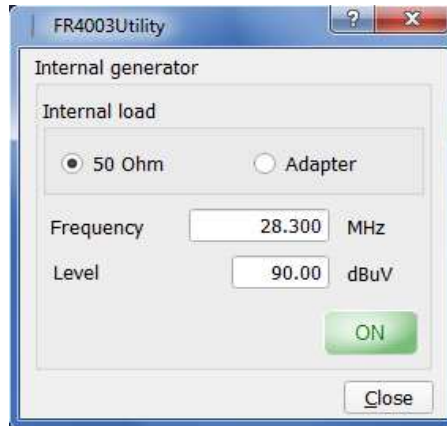
5.1.3 Tools

The Tools menu includes the buttons to setup the **Internal Generator**, the **Capacitance Meter**, run the **Auto-Calibration** and enable/disable the **link to 9010F**.



5.1.3.1 Internal Generator

Click the Internal Generator icon to open the corresponding window, where it is possible to set all the signal generator parameters, such as the **Load**, **Frequency** and **Level**.
A colored button allows to activate and deactivate the signal.



5.1.3.2 Cap meter

The Capacitance Meter is a special tool useful to check the intrinsic capacitance of the Rod or any other transducer connected to the N input.



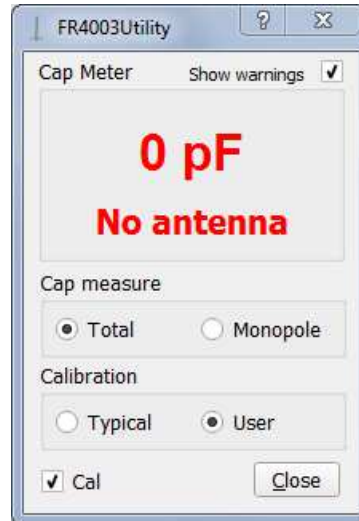
Clicking on **Show Warning** cell (✓) to show the status of the device connected to the N input

In the Cap measure box, select the **Monopole** radio button to exclude the parasitic capacitance due to the input connector and circuitry.

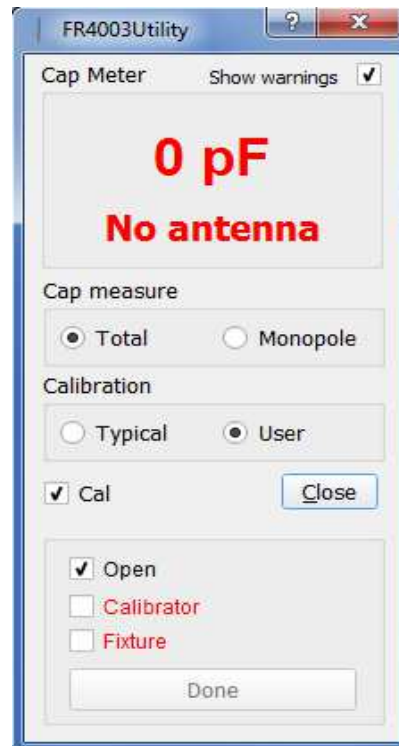
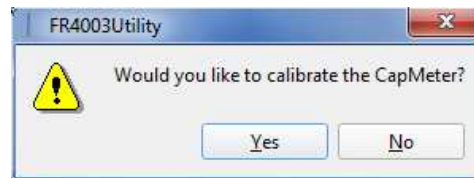
The Calibration box contains two radio buttons to choose between a typical or the specific calibration factors.



When a **User Calibration** has not yet been performed the receiver requests to run the Cap meter calibration procedure.
Such a calibration can be run at any time by clicking onto the **Cal** cell (✓) that appears after having selected the **User** radio button.



A message pops up asking for the confirmation if the User is sure about running the calibration procedure.

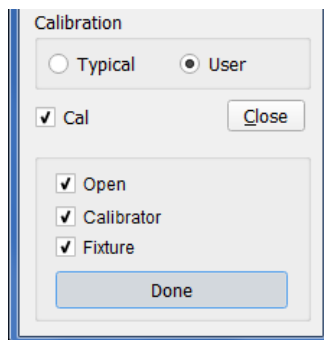


Once the calibration has started, please follow the steps below:

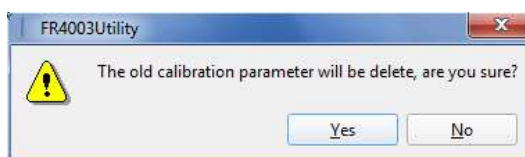
- 1) Make sure no device (antenna, cable, adapter) is connected to the N input
- 2) Click the **Open** box and wait for the measurement is taken.
- 3) When the Open text becomes black, connect the 50 Ω to Rod (Calibrator) fixture and click the **Calibrator** box, then wait again for the measurement is taken.
- 4) When the Calibrator text becomes black, connect the 15 pF fixture (Fixture) and click the **Fixture** box, then wait again for the measurement is taken.
- 5) Now the User can complete the procedure and store the calibration data by clicking onto the **Done** button.

50 Ω to Rod capacitance fixture for CISPR calibration.

15 pF fixture for capacitance meter calibration.

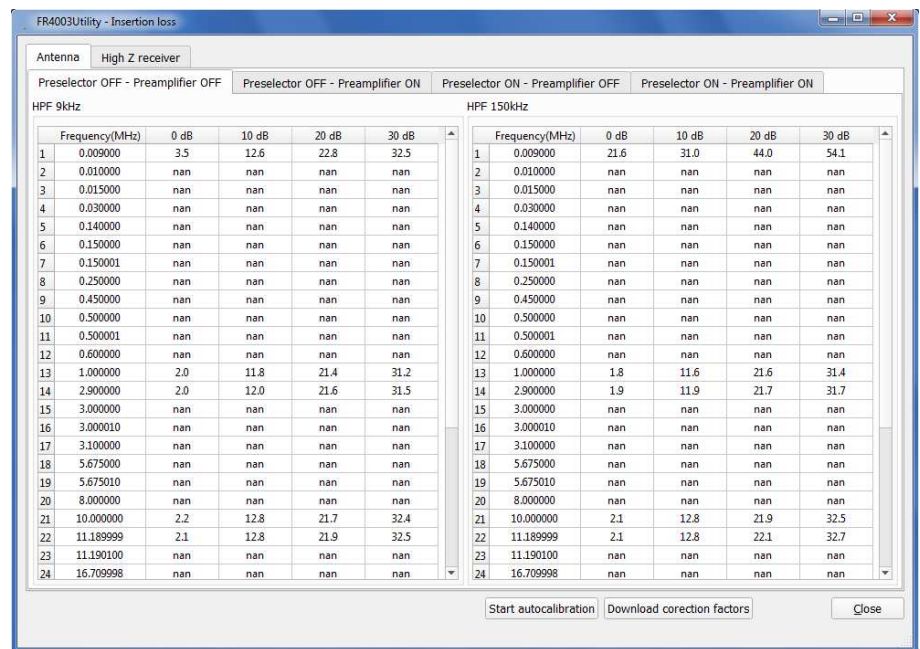


In the end a message pops up, asking for the confirmation to overwrite the existing calibration data with the new ones.

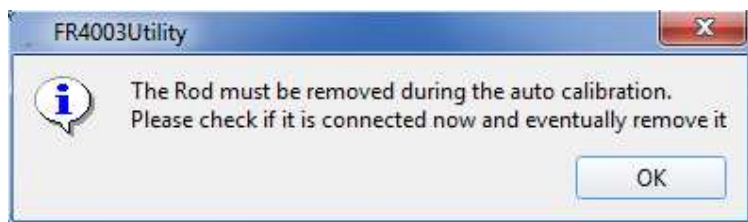


5.1.3.3 Auto-Calibration For user's needs or when an upgrade firmware has been performed, an auto-calibration is requested:

To run the Auto-Calibration, simply click onto the corresponding icon or **Tools** menu → Auto-calibration .
The following window appears.



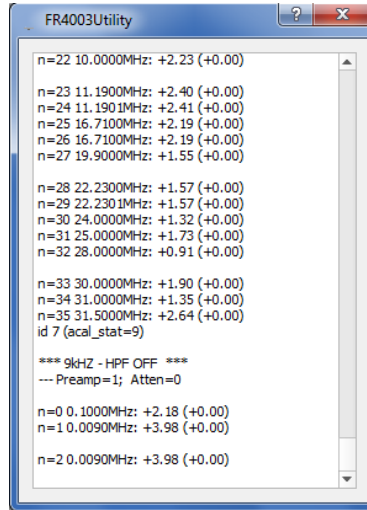
Then, please click **Start auto calibration**



If the Rod antenna, or anything else is connected to the N input, the receiver is able to detect it and the following message will popup.



If the calibration starts correctly, a window opens showing the progress of the procedure.



The calibration routines take a couple of minutes to complete.



If the auto-calibration has not been successfully completed, the ATT, PRE and HPF Led will blink at the same time once switched FR4003 on. In this case an auto-calibration must be repeat.

The resulting tabled values are the calibration factors the User needs to adopt when using the antenna in Analog mode. For example the **Preselector OFF – Preamplifier ON section - 0 dB attenuation** is the typical condition of a Rod antenna.

By summing the value contains on **“0 db”** column and the factors preloaded on PMM Emission Suite at corresponding frequency (menù **Tools → Factors → Load**), it is possible to get the Antenna factor.

FR4003Utility - Insertion loss

Antenna High Z receiver

Preselector OFF - Preamplifier OFF Preselector OFF - Preamplifier ON

HPF 9kHz

	Frequency(MHz)	0 dB	10 dB	20 dB	30 dB
1	0.009000	-7.4	2.4	10.7	20.4
2	0.010000	-7.5	2.1	10.2	19.9
3	0.015000	-8.1	0.8	8.5	18.3
4	0.030000	-8.4	-0.0	7.4	17.1

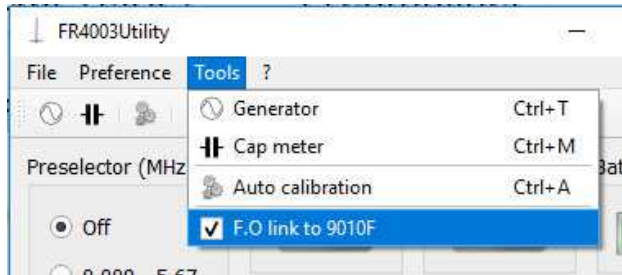
Factors: FR4003_Ch100

	Frequency MHz	Level dB
1	0.0086	6.02
2	0.009	6.02
3	0.01	6.02
4	0.015	6.02

For getting the electric field at each frequency, the user must add the resulting Antenna Factor to the receiver measurement.

5.1.3.4 F.O. link to 9010F

The F.O. link to 9010F function allows to enable the FR4003 connection with PMM 9010F. Activate it by clicking onto the **F.O. link to 9010F** cell (✓) and wait for the Attenuator Led to start blinking.



Close FR4003 utility without switching the FR4003 off and connect the field receiver to 9010F (for further information see chapter 3).



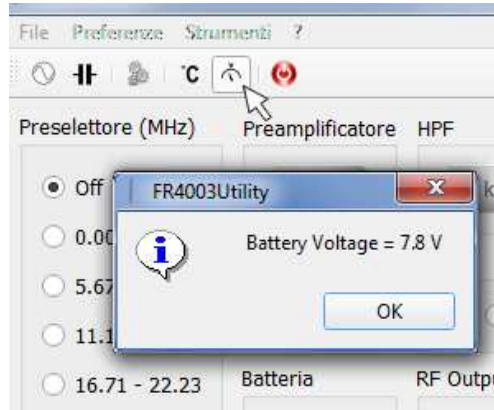
Click on to disable the function; the FR4003 will be reset automatically. Wait for the Attenuator Led to start blinking.

The function is disabled once the FR4003 is switched off.

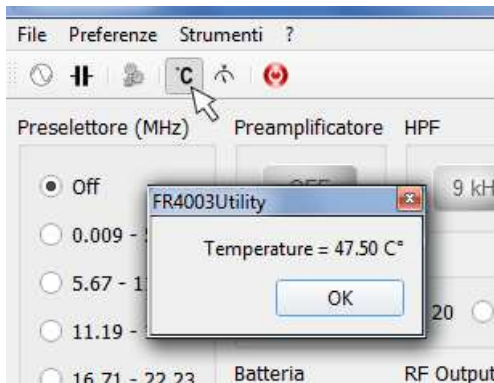
5.1.4 Information

Clicking the desired icon it is possible to read some interesting information and telemetries of the instrument.

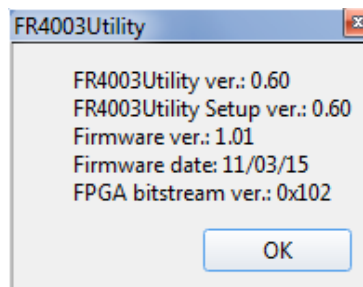
It is available the reading of the voltage of the rechargeable and replaceable battery.



The temperature of the internal circuitry is also available, and displayed in degrees Celsius.



Clicking onto the ? (information) icon, the following useful window appears, showing the versions of all the softwares and firmwares.



This function is very helpful, for example after a firmware upgrade, to check if everything has gone as expected.

5.2 Mode

In the FR4003 Utility, it is possible to set the instrument as a standard Rod antenna or as HiZ (high impedance) receiver.

5.2.1 Analog mode

When the FR4003 is to be used as a simple Rod Antenna, without taking advantage of the internal compliant receiver, the Utility can be used to set properly each of the available parameters. After that, the instrument can be operated stand-alone as for the controller, simply unconnecting the PC, since the settings are maintained.

The screen below shows a typical setting for an analog mode usage with:

- Mode **Antenna** enabled
- Analog output enabled
- Preselector filter not active (Off)
- Preamplifier activated (+20 dB)
- 150 kHz High Pass Filter not active (off)
- No attenuation (0 dB)

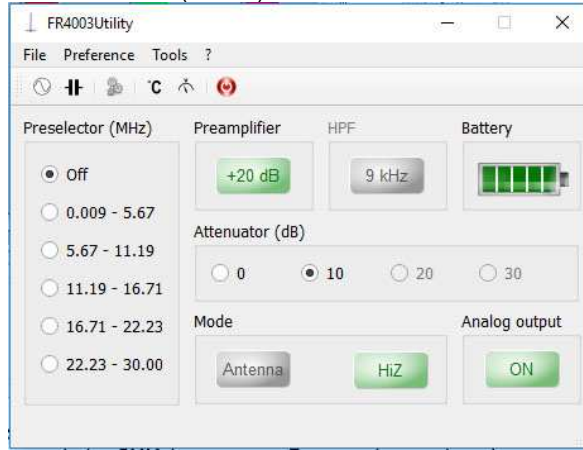


The settings can be modified also without the need of a PC connection, using the buttons on the front panel of the PMM FR4003.

5.2.2 HiZ mode

In HiZ Receiver mode, the instrument behaves as a RF tuned voltmeter. The screen below shows a typical setting for an Hiz mode usage with:

- Mode **Hiz** enabled
- Analog output enabled
- Preselector filter not active (Off)
- Preamplifier activated (+20 dB)
- Attenuation activated (10 dB)



The settings can be modified also without the need of a PC connection, using the buttons on the front panel of the PMM FR4003.

5.2.3 Front panel buttons

- ON** Press the ON button for a short time to switch on the unit. Keep the ON button pressed for a few seconds to switch off the unit. The ON/OFF status is indicated by the corresponding Led lamp.
- ATT** Press this button to select the desired output attenuation.
 Led Off = 0 dB
 Fast blink = 10 dB
 Slow blink = 20 dB
 On = 30 dB
- PRE** Press this button to toggle the Preamplifier ON and OFF
- HPF** Press this button to toggle between the 9 kHz HPF and the 150 kHz HPF.

6 – Applications

6.1 How it works

PMM FR4003 is an active, high sensitivity Electric field receiving antenna. It has a built in preamplifier. It works as a short monopole over a ground plane. Its intrinsically high impedance within the covered frequency band is transformed and normalized by the internal preamplifier.

6.2 Power switch

To turn the unit on and off push the red button located on the front panel of the box, aligned with the led named “ON”.

6.3 ESD risks

**With preamplifier on avoid ESD effects.
The static charge carried by test personnel can damage the FET.**

6.4 Principles of operation

The most important assumption to be done concerns the length of the monopole. If it is short enough, and it means less than 1/8 wavelength at the higher frequency of the covered band, the current distribution over the antenna can be approximated to be linear.

The 1m length makes easy to calculate the field strength that is usually measured as Volts per meter. It is only necessary to take in count of the effective length of the antenna that is a half of its physical length. This means that a +6dB must be added to antenna factor when electric field strength is measured. In the meantime this length corresponds to a 1/8 wavelength at the frequency of about 37MHz, so it is possible to use it up to more than 30MHz. The ideal situation to use a rod antenna is when it operates in reference to an infinite ground plane. The small box containing the preamplifier should be connected to the real ground. If the case is not well grounded important reading differences can appear.

By selecting the 150 kHz High Pass Filter the input becomes intrinsically protected from low-frequency disturbance signals (for example: Main Power 50/60 Hz).



Please do not touch the Display of 9010F while using FR4003, in order to prevent measured E-field from being affected by wrong contribution through human body radiation

6.5 Antenna Factor

PMM FR4003 is furnished together with its individual antenna factor calibration data.

The antenna factor is the ratio of the field strength in which the antenna is immersed to the voltage coming out of the unit.

A typical value for Rod antenna factor is about 0 dB/m.

If, for example, the output of the antenna is +44dB μ V, and the antenna factor is 0 dB/m at the radiated frequency, the electric field magnitude is:
+54 +0 = **+54 dB μ V/m** corresponding to **0.0005 V/m**.

6.6 Procedure of Calibration

PMM FR4003 is calibrated in accordance with the equivalent capacitive substitution method, using equipment which certifications traceability to national and international standards are reported on the antenna certificate itself.

6.7 Measuring the EMI Voltage

ElectroMagnetic Interference (EMI) voltage measurements on power supply lines or on signal lines are carried out by means of Antennas, voltage probes or "Coupling Networks" (e.g. LISNs). 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 on the relevant standards.

Nevertheless, the most common tests in the frequency range covered by PMM FR4003 are certainly the conducted measurements, done with the help of a Rod antenna or a LISN.

Selecting the HiZ (**High impedance**) receiver, the unit behaves as a RF tuned voltmeter. In this case, it is possible to add an external load to adapt the input to the desired impedance, using a T connector.

6.8 Related products

The possible options are:

- L2-16B: single phase AMN, 16A;
- L3-32: four lines, 3-phase, 32A LISN, (50Ω//5 Ω+50μH);
- L3-64: four lines, 3-phase, 63A LISN, (50Ω//5 Ω+50μH);
- L3-64/690: four lines, 3-phase, 63A LISN, (50Ω//5 Ω+50μH);
- L3-100: four lines, 3-phase, 100A LISN, (50Ω//5 Ω+50μH);
- L1-150M: single line LISN, 150A (50Ω//1 Ω+5μH);
- L1-150M1: single line LISN, 150A (50Ω//1 Ω+5μH);
- L1-500: single phase, 500A LISN, (50Ω//5 Ω+50μH);
- L3-500: four lines, 3-phase, 500A LISN, (50Ω//5 Ω+50μH);
- L2-D: Delta LISN for telecom, 2A, 150Ω
- SBRF4 RF Switching Box (Switching Box for LISNs and Loop Antennas)
- LISN Service Kit (AC-BNC adapter for LISNs verification and calibration)
- SHC-1/1000: 35 dB CISPR Voltage probe, 1500Ω;
- SHC-2/1000: 30 dB CISPR Voltage probe, 1500Ω;
- BC-01: Biconical Antenna (30 – 200 MHz)
- BL-01: Biconical Log Periodic Antenna 30 MHz to 6 GHz
- DR-01: Double-ridged Horn Antenna 6 to 18 GHz
- LP-02: Log Periodic Antenna 200 MHz to 3 GHz
- LP-03: Log Periodic Antenna 800 MHz to 6 GHz
- LP-04: Log Periodic Antenna 200 MHz to 6 GHz
- VDH-01: Van der Hoofden Test Head 20 kHz to 10 MHz
- TR-01: Antenna Tripod
- Antenna Set AS-02 (BC01+LP02+TR01)
- Antenna Set AS-03 (BC01+LP02+LP03+TR01)
- Antenna Set AS-04 (BC01+LP04+TR01)
- Antenna Set AS-05 (BC01+LP04+DR01+TR01)
- Antenna Set AS-06 (BC01+LP02+LP03+DR01+TR01)
- Antenna Set AS-07 (BL01+TR01)
- Antenna Set AS-08 (BL01+DR01+TR01)
- CTK-01: Set of active Near Probes Credence Tecn.
- GTEM Cells
- RF-300 : Van Veen Loop
- TRF-1 : Balanced to unbalanced transformer
- 7010 Emission precompliance system 150kHz-1000MHz
- 9010F/9030/9060/9180 EMI Receivers 10Hz-18GHz
- 8053 System for the measurement of electromagnetic fields

7 – Updating firmware and Activation code Utility

7.1 Introduction

The PMM FR4003 features a simple and user-friendly method for updating its internal firmware through a Personal Computer (PC). The “WrDongle” embedded in the FW Upgrade Tool is used for the **Options** activation procedure. This section provides all the information required for easy updating.

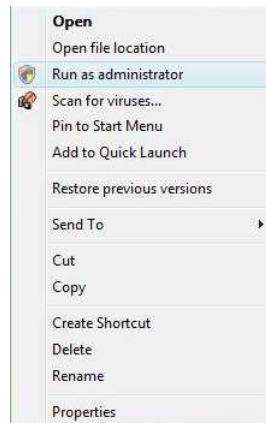
7.2 System requirements

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

- Processor: Pentium or equivalent
- 256 MB RAM
- At least 64 MB of free space on hard disk
- 1 free USB port
- Windows Operating system™ XP/Vista/Win7/Win8



The User must have administrator privileges to install the software in Windows Vista, 7 and 8; right click on the program .exe file and click on “Run as administrator” to temporarily run the program or application as an administrator until close it (Windows also allows to mark an application so that it always runs with administrator rights).



7.3 Preparing the Hardware

Turn off the PMM FR4003 and connect the optic fiber from the USB-OC, connected to the PC, to the FR4003 LINK 1 port. The USB-optical converter and the plastic optic fiber are supplied with the apparatus. The USB driver must be already installed properly.

The first free USB 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.

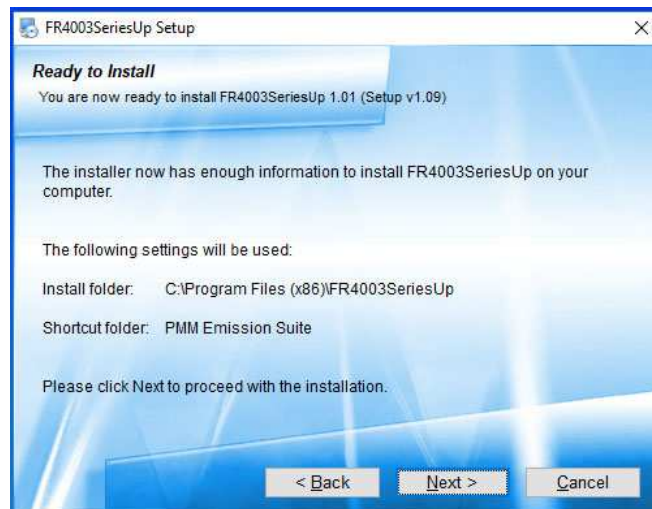
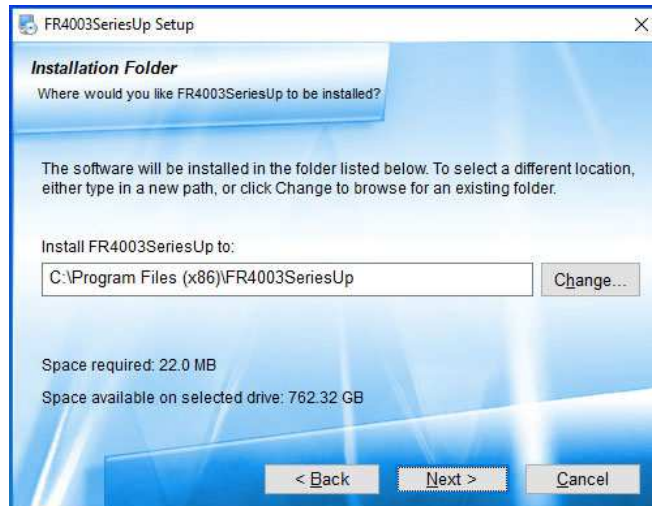
7.4 Software Installation

The Update Firmware and WrDongle executable programs are provided together with the FR4003 Software Utility, stored on Software Media and included in PMM FR4003 Field Receiver package; anyway it’s always possible to check for newer releases and download them from the official NARDA Italy Web Site Support page.

Run the FR4003SeriesUp Setup.

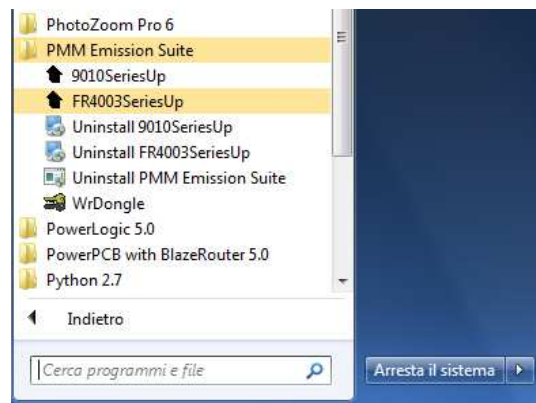


Then, please follow the on-screen indications.





Once the **FR4003SeriesUp Setup** has been installed in the PC, another item is created in the Programs list at Start Menu, which is “**PMM Emission Suite**”, from where the “**FR4003SeriesUp**” and “**WrDongle**” programs can be easily run.



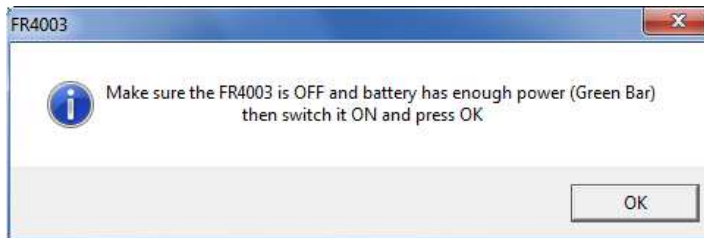
To obtain firmware or software updates for FR4003, please contact your NARDA distributor or download it directly from the NARDA Web site: www.narda-sts.it.

PMM software is now installed in your PC, you can remove it, if needed, simply running the proper “Uninstall” application.

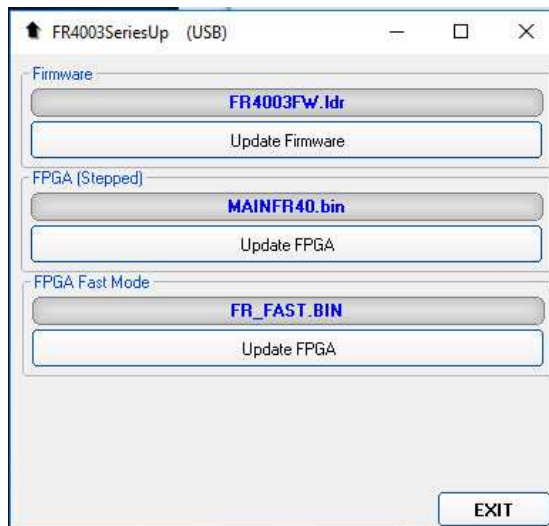
Click on “**FR4003SeriesUp**” (**FR4003SeriesUp.exe**) once for running the update program, so getting the following window:



Now, press the USB key, and follow the instructions.



Three firmware components can be updated by this application: Firmware which is the receiver internal program, FPGA (swept method) to update the internal programmable logic and FPGA (FFT method) to update the internal programmable logic.



The **FR4003FW.LDR** file required for Firmware updating, the **FR4003.BIN** file for FPGA (swept method) and the **FR_FAST.BIN** file for FPGA (FFT method) are automatically stored in the same directory of the **FR4003SeriesUp.exe**, otherwise just copy them there before performing the upgrade.

Be sure the batteries of PMM FR4003 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 FR4003 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 will just need to repeat the procedure once more (this is a unique feature!).

Should FW Upgrade procedure stop before reaching the 100% completion, that will have not to be considered a trouble but simply an intermediate step: in this case please switch OFF and ON the receiver and repeat the FW Upgrade procedure once more until the end.

Always cycle power OFF and ON again after every FW Upgrade.

Usually the communication with the FR4003 unit is established automatically through a USB port, which driver enables a virtual COM port.

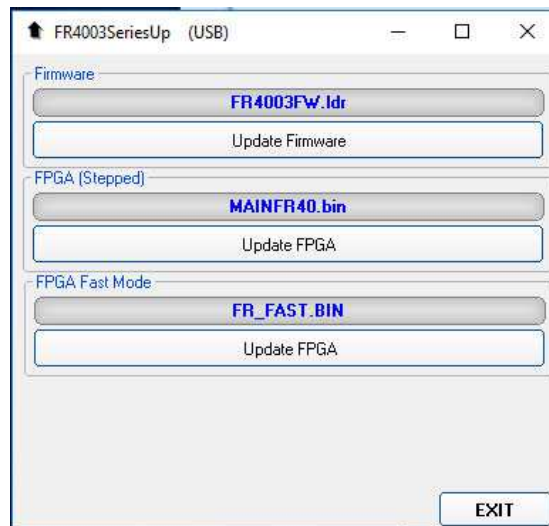


When a specific serial port channel is to be used, please choose the desired COM port by pressing the arrow to the right of the name



Press **RS232** button to set the com port.

The program will display the following window:

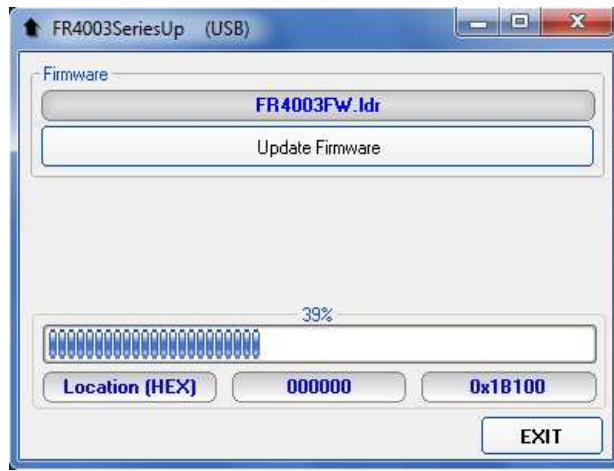


7.5 To transfer data

Before starting the procedure, it is important that the FR4003 is switched off. Otherwise, an error message is showed.



To start the process simply switch PMM FR4003 on, select **Update Firmware** or **Update FPGA** button, and wait until the automatic transfer is completed.



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%.



The upload of the Firmware takes less than 2 minutes, and the upload of the FPGA about 11 minutes in ideal conditions. The time can be longer depending on connection reliability and computer speed.

When FW (same for FPGA) download finishes, following message appears to show that everything was properly completed:



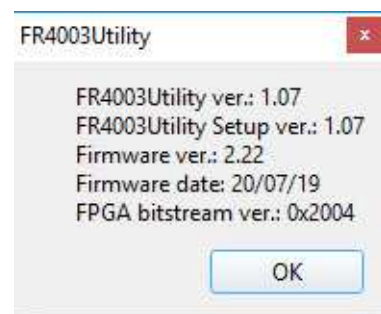
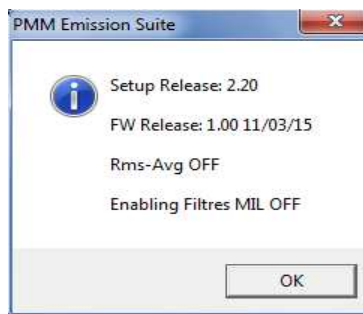
In case of failure, an error message is showed instead.



After Firmware Update is successfully completed, an FR4003 auto-calibration must be performed; for further information see § 5.1.3.3

Switch OFF and then ON again the PMM FR4003.

The FW release and Options status can be visualized with the PMM Emission Suite software (under the menu **Tools**, by clicking on **Info**) or PMM FR4003 Utility (clicking onto the ? icon)



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 FR4003 field receiver either switched On or Off.



To obtain up-to-date Firmware or PC Utility for PMM FR4003, the User can contact his NARDA distributor or download it directly from Support area of EMC Product Range on the following Web Site: www.narda-sts.it.



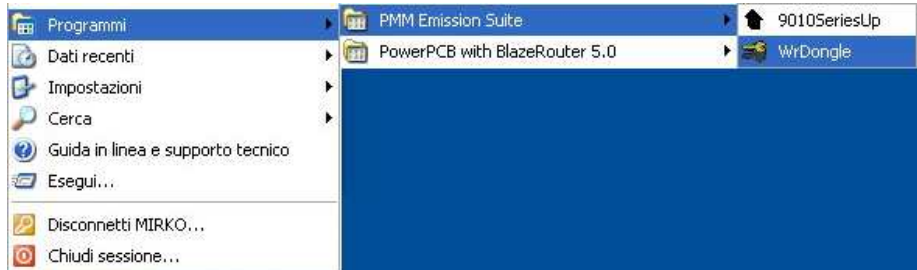
After having upgraded the internal firmware of the unit it is suggested to perform the Auto-calibration procedure as described in chapter 3.

7.6 WrDongle utility

The **WrDongle** utility allows to enable the function ordered such Options using the **40 Digit Activation Code** received from NARDA Italy.

Turn on the PMM FR4003 and connect it to a free USB port of the PC.

Browse for All Programs from the Start Menu and reach the “**WrDongle**” executable link:

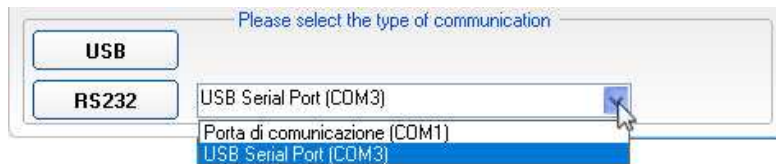


Main window displayed after the program **WrDongle** has been run:



Select **USB** (or **RS232**) communication port.

When a specific serial port channel is to be used, please choose the desired COM port by pressing the arrow to the right of the name



Press **RS232** button to set the com port.

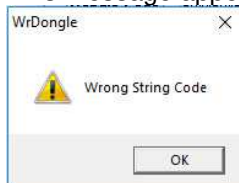
Click on “**Upgrading utility**” (**WrDongle.exe**) once for running the Set code program, so getting the following window:



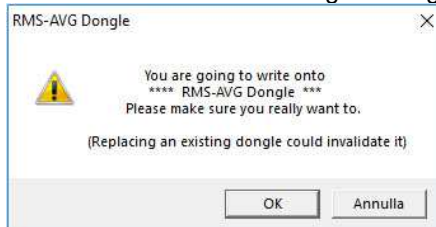
Copy the 40 Digit Serial Code in the Dongle Code Window and select the button below related to the specific option.



This message appears when the Dongle code is not valid.



It will be shown the following message; press OK to confirm.



The software will inform that the Dongle Code has been successfully stored. Press Ok to close the program.



Always cycle OFF and ON the receiver to properly initialize the function.



For further information on activation procedure, refer to the “RMS-AVG detector” paragraph.

This page has been left blank intentionally

8 – Remote control

8.1 Introduction

PMM FR4003 has been designed to allow remote control operations through an optic fiber connected to the port labeled “LINK 1”.

The User can control the receiver both via a RS232 serial port, using an optional 232-optical converter, or via an USB port, using an USB-optical converter.

8.2 Communication

Half duplex communication is implemented. The serial optical port consists in a RP02 connector, with two channels fiber, one for transmit and one for receive.

Standard communication is implemented at 115200 bit/sec with 8 bit words, one start bit, one stop bit and no parity
(**115200 N 8 1**).

8.3 Protocol

Be aware that only the PC can send the commands. PMM FR4003 will answer when is inquired only.

The communication uses strings with variable byte width. The characters used inside the strings are in ASCII format (00 - 127) at 7 bits. The most significant bits are ignored in reception and set to 0 during transmission. Every string starts with the special character “#” and stops with “*”.

8.4 Format

Commands are made of ASCII string delimited character “#” (0x23) and the character “*” (0x2A)

Replies are terminated with <CR><LF> (\r\n)

8.5 Remote switch-on

The PMM FR4003 can be switched on by PC Fiber Optic connection sending the string **0X0F** repeated at least some hundreds of times.

8.6 Auto switch-off

The PMM FR4003 can be switched off manually, by keeping the power button pressed for a few seconds or sending the proper remote command.

It is also programmed to self-turning off under certain circumstances:

1) In case of remote command, after 60sec since the last command has been received

2) No remote commands:

- a) If no action is performed (no key is pressed, no command sent), after 10 min since it was switched on.
- b) If some action is performed (key is pressed), after 30 min since the last action
- c) Pressing **ATT** and **PRE** button at the same time disables the auto-off until the FR4003 is switched off manually. (notice that all led stay on until both buttons remain pressed).
- d) When the charge level of the battery drops below a safety threshold

It is important to note that the last action is the one that prevails; so, for example, a remote command restores the Auto-off time of 60 seconds even if a key was previously pressed.



Commands are split into Query and Setting commands.

8.7 List of commands

Query COMMANDs

Syntax	Function
?AAT*	Sends back a string expressing the Attenuator status for Analyzer mode
?ACE*	Sends back a string expressing the Center frequency for analyzer mode
?ADT*	Sends back a string expressing the detector used for Analyzer mode
?AHT*	Sends back a string expressing the Hold Time for Analyzer mode
?AOP*	Sends back a string expressing the Stop frequency for analyzer mode
?APA*	Sends back a string expressing the Preamplifier status for Analyzer mode
?APS*	Sends back a string expressing the Preselector status for Analyzer mode
?ART*	Sends back a string expressing the Start frequency for analyzer mode
?ASP*	Sends back a string expressing the Span frequency for analyzer mode
?BAT*	Sends back a string containing the battery information
?BCD*	Sends back a string expressing whether the Optic-Fibre Downconverter is linked and ready
?CAL*	Sends back a string expressing the status of calibration
?CFA*	Sends back the ID of the conversion factor
?CRA*	Tells whether RMS-AVG detector is available
?DET*	Reports the five detector for manual mode
?IDN*	Requests model, release and date of firmware
?MAF*	Requests the tuning frequency for manual mode
?MAT*	Requests the Attenuator status for Manual mode
?MHT*	Requests the Hold Time for manual mode
?MIL*	Sends back a string telling whether MIL Filters are available
?MOD*	Sends back a string expressing the status Input Mode
?MPA*	Sends back a string expressing the Preamplifier status for Manual mode
?MPS*	Sends back a string expressing the Preselector status for Manual mode
?RBW*	Sends back a string expressing the selected RBW
?S/N*	Requests Serial Number internally stored by manufacturer
?SAT*	Sends back a string expressing the Attenuator status for Sweep mode
?SDT*	Sends back a string expressing the detector used for Sweep mode
?SHT*	Sends back a string expressing the HOLD TIME for Sweep mode
?SOP*	Sends back a string expressing the Stop frequency, in exponential notation, for Sweep mode
?SPA*	Sends back a string expressing the Preamplifier status for Sweep mode
?SPS*	Sends back a string expressing the Preselector status for Sweep mode
?SRT*	Sends back a string expressing the Start frequency for Sweep mode
?TAT*	Requests the MinAtt value
?TGA*	Sends back a string expressing the attenuation level of FR4003 Built-In Generator
?TGF*	Sends back a string expressing the tuning frequency for the FR4003 Built-In Generator
?TGS*	Sends back a string expressing the FR4003 Built-In Generator status
?UHT*	Requests the actual Hold Time currently or lastly used

Syntax	Setting COMMANDs Function
ASBK	Aborts a sweep currently in progress
ASPA	Suspends a sweep currently in progress
ASRE	Resumes a sweep previously paused
CHGS	Sets the FR4003 for Swept operation method
SA30A	Switches the 30 dB attenuator on the FR4003 according to 'A', 'B', N
SAAT a	Sets Attenuator for Analyzer Mode
SADT b	Sets the Detector for Analyzer Mode.
SAFF start,stop	Sets both Start and Stop frequency for Analyzer mode.
SAGO	Sets the FR4003 in Analyzer mode
SAHT h	Sets Hold Time for Analyzer mode.
SAOP f	Sets the Stop frequency for Analyzer mode
SAPA a	Switches Preamplifier for Analyzer Mode On or OFF
SAPS a	Switches Preselector, for Analyzer Mode On or OFF
SART f	Sets the Start frequency for Analyzer mode
SCFA n	Activates the conversion factor stored in the 9010
SCFE n, name	Saves the conversion factor (made by SCFW).
SCFW n, freq; lev	Creates a conversion factor frequency by frequency.
SGTX n	Enables FR4003 to operate along with the receivers 9010 and 9010F
SHPF a	Switches the 150 kHz High Pass Filter on the FR4003 On or OFF
SLDW n, freq; levq, leva	Sets the custom double value limit frequency by frequency
SLIC n, name	Names the custom limit and storing it onto the SoftKey
SLIE name	Names the custom limit and making it active or deactivating it.
SLII n	Recall and load into FR4003 the built-in limit indexed by n
SLIM n	Sets the Margin to be used with Smart Detector function
SLIW n, freq; lev	Sets the custom limit frequency by frequency
SMAF f	Sets the tuning frequency for manual mode
SMAN	Sets the FR4003 in manual mode
SMANP	Sets the FR4003 in manual mode and sets the default value
SMAT a	Sets Attenuator for Manual Mode.
SMHT h	Sets Hold Time for manual mode
SMODA	Set the input Mode
SMPA a	Switches Preamplifier, for Manual Mode, On or OFF
SMPS a	Switches Preselector, for Manual Mode, On or OFF
SNOF	Disables the automatic switch OFF
SOFF	Switches the FR4003 OFF.
SRBW b	Sets RBW
SSDO	Triggers a sweep based on set parameters.
SSDT b	Sets the detector for Sweep Mode.
SSFD	Sets parameters and triggers a sweep
SSFW n, freq	Creates a Frequency-Scan-Tab frequency by frequency
SSHT h	Sets hold time for Sweep mode
SSOP f	Sets the Stop frequency for Sweep mode
SSPA a	Switches Preamplifier, for Sweep Mode, On or OFF
SSPS a	Switches Preselector, for Sweep Mode, On or OFF
SSRT f	Sets the Start frequency for Sweep mode
SSTP	Stops abruptly a running sweep in Analyzer mode
STAT b	Sets MinAtt
STGA A	Sets the output level of FR4003 Built-In Generator
STGF f	Sets the tuning frequency for FR4003 Built-In Generator when STGT OFF
STGL I	Sets the output level of FR4003 Built-In Generator
STGS a	Switches the FR4003 Built-In Generator On or OFF
STGT a	Changes FR4003 Built-In Generator tracking mode On or OFF
SUPP n	Outputs on the User Port bit by bit the argument n

IDLE COMMANDs

Syntax	Function
?IA1	Sends back a string expressing current Att10 status
?IAT	Sends back a string expressing the current Attenuator status.
?IAE	Sends back a string expressing the current 20dB Extra Attenuator status.
?ICM	Sends back a string expressing current CAP-METER status.
?IHP	Sends back a string expressing current 150kHz High-Pass filter status.
?IPA	Sends back a string expressing current Preamplifier status
?IPS	sends back the status of Preselector as follows: IPS=index where index is:
?IRO	Sends back a string expressing current RF-OUT to BNC connector status.
?ITG	sends back a string expressing the current internal Tracking Generator to the mode status
SIA1 a	Switches 10dB attenuator On or OFF
SIAE a	Switches 20dB EXTRA Attenuator to the value indicated by a
SIAT a	Sets Attenuator to the value indicated by a
SIDC a	Switches the CAP-METER On or OFF
SIHP a	Switches the 150kHz High-Pass filter On or OFF .
SIPA a	Switches Preamplifier On or OFF
SIPS a	selects the preselector to the index (a) as follows:
SIRO a	Switches the RF-OUT to BNC connector On or OFF
SITG a	Switches the internal Tracking Generator to the mode indicated by a

8.7.1 QUERY

Commands	Description
?AAT	<p>This query command #?AAT * sends back a string expressing the Attenuator status for Analyzer mode. The reply is made of 2 fields:</p> <ul style="list-style-type: none"> • AAT =AUTO (FR4003 automatically selects the most suitable attenuator to get best dynamic range) or AAT =MAN (operator selects manually the attenuator) • Value (in dB) of current attenuator <p>Example of reply: AAT =AUTO; 10 which means that the Attenuator is now switched to 10dB automatically by FR4003</p>
?ACE	<p>This query command #?ACE* sends back a string expressing the Center frequency, in exponential notation, for analyzer mode. Unit is fixed MHz. Example of reply: ACE = 1.500000e+07 which means that the Center frequency in Analyzer mode is 15MHz</p>
?ADT	<p>This query command #?ADT * sends back a string expressing the detector used for Analyzer mode. The reply can be:</p> <ul style="list-style-type: none"> • ADT =Peak • ADT =Avg • ADT =Rms
?AHT	<p>This query command #?AHT* sends back a string expressing the HOLD TIME for Analyzer mode. Unit is fixed ms. Example of reply: AHT= 1000 ms which means that the hold time in Analyzer mode is 1000ms (or 1s)</p>
?AOP	<p>This query command #?AOP* sends back a string expressing the Stop frequency, in exponential notation, for analyzer mode. Unit is fixed MHz. Example of reply: AOP = 3.000000e+07 which means that the Stop frequency in Analyzer mode is 30MHz</p>
?APA	<p>This query command #?APA * sends back a string expressing the Preamplifier status for Analyzer mode. The reply is either:</p> <ul style="list-style-type: none"> • APA =Off (Preamplifier in Analyzer Mode is OFF) • APA =On (Preamplifier in Analyzer Mode is ON)
?APS	<p>This query command #?APS * sends back a string expressing the Preselector status for Analyzer mode. The reply can be:</p> <ul style="list-style-type: none"> • APS =Off (Preselector in Analyzer Mode is OFF) • APS =On (Preselector in Analyzer Mode is ON) • APS =*** (Preselector in Analyzer Mode is OFF because the span overlaps its single range)
?ART	<p>This query command #?ART* sends back a string expressing the Start frequency, in exponential notation, for analyzer mode. Unit is fixed MHz. Example of reply: ART = 1.500000e+07 which means that the start frequency in Analyzer mode is 15MHz</p>
?ASP	<p>This query command #?ASP* sends back a string expressing the Spanfrequency, in exponential notation, for analyzer mode. Unit is fixed MHz. Example of reply: ASP = 3.000000e+07 which means that the Span frequency in Analyzer mode is 30MHz</p>

?BAT This query command **#?BAT*** sends back a string containing the battery information.

BAT=V.vv;Flag

Where **V.vv** is the voltage of FR4003 battery and is expressed in Volt. When the FR4003 is under recharge, V.vv becomes the string *******

Flag can have both '1' or '0' value and it is intended for knowing whether the value has been refreshed since it was last read. When Flag is '1' it means that the battery voltage has been updated while when it is '0' means that the value is the same as it was read before.

Here are some example:

- **BAT=8.12;1** (FR4003 battery is 8.12V and the values have been updated)
- **BAT=***;0** (FR4003 is powered and information are the same as last reading)

?BCD This query command **#?BCD *** sends back a string expressing whether the Optic-Fibre Downconverter (3, 6 or 18 GHz) is linked and ready. The reply is always:

- **BCD=Off** (The Downconverter is not available)

?CAL The query command **#?CAL *** sends back a string expressing the status of calibration.

Replies can be:

- **CAL=OK** (the stored calibration is up-to-date)
- **CAL=MIS** (no calibration present or calibration out-of-date)

?CFA This query command **#?CFA*** sends back a string in the format **CFA=n,(LABEL)** where **n** is the ID of the conversion factor as shown in FR4003 menu and **LABEL** is its temporary name as it was last labelled. If No conversion factor is active the reply is:

CFA= NONE

Example of reply: **CFA=1,(PROBE)** means that conversion factor 1 is active and it was last named as PROBE

?CRA This query command **#?CRA*** sends back a string telling whether RMS-AVG detector is available.

Reply is:

- **CRA=N/A** if RMS-AVG detector is NOT available
- **CRA=OK** if RMS-AVG detector is available

?DET This query command **#?DET*** sends back a string reporting the five detector for manual mode. Unit is fixed dBµV. Each value is separated by a semicolon. The order is Peak; Qpeak; RMS;AVG;C-RMS;C-AVG.

In case Qpeak is not available (RBW other than 200Hz, 9kHz [only for Band B] ,120kHz) Qpeak field is replaced by the string "----".

In case C-RMS or C-AVG is not available (RBW other than 200Hz, 9kHz,120kHz,1MHz) respective field is replaced by the string "----".

An additional string "OVER;" is appended at the end whenever an over range condition occurred

Example of reply: **DET=23.22;17.09;16.23;11.36,16.01,15.50;**

(which means Peak=**23.22**; Qpeak=**17.09**; RMS=**16.23**;AVG=**11.36**;C-RMS=**16.01**;C-Avg=**15.50**)

Example of reply (No Cispr filter selected, over range shown):

DET=17.20;-----;11.98;9.57;-----;-----;OVER;

- ?IDN** This query command **#?IDN*** sends back a string containing information about model, release and date of firmware.
 Note that two <LF> are appended to the string before the terminator
 Example of reply: **IDN=FR4003-FW - 1.12 20/10/059<LF><LF>** (swept method)
 Example of reply: **IDN=FR4003F-FW - 1.12 20/10/059<LF><LF>** (FFT method)
- ?MAF** This query command **#?MAF*** sends back a string expressing the tuning frequency, in exponential notation, for manual mode. Unit is fixed MHz.
 Example of reply: **MAF= 1.500000e+07** which means that the tuned frequency in manual mode is 15MHz
- ?MAT** This query command **#?MAT *** sends back a string expressing the Attenuator status for Manual mode. The reply is made of 2 fields:
- **MAT=AUTO** (FR4003 automatically selects the most suitable attenuator to get best dynamic range) or **MAT=MAN** (the operator selects manually the attenuator)
 - **Value** (in dB) of current attenuator
- Example of reply: **MAT=AUTO; 10** which means that the Attenuator is now switched to 10dB automatically by FR4003
- ?MHT** This query command **#?MHT*** sends back a string expressing the HOLD TIME for manual mode. Unit is fixed ms.
 Example of reply: **MHT= 1000 ms** which means that the hold time in manual mode is 1000ms (or 1s)
- ?MIL** This query command **#?MIL*** sends back a string telling whether MIL Filters are available.
 Reply is:
- **MIL=N/A** if MIL Filters are NOT available
 - **MIL=OK** if MIL Filters are available
- ?MOD** This query command **#?MOD *** sends back a string expressing the status Input Mode which can be either A (Antenna mode) or H (HiZ Receiver).
 Replies can be:
- **MOD =A** (Antenna Mode)
 - **MOD=H** (Antenna Mode)
- ?MPA** This query command **#?MPA *** sends back a string expressing the Preamplifier status for Manual mode. The reply is either:
- **MPA=Off** (Preamplifier in Manual Mode is OFF)
 - **MPA =On** (Preamplifier in Manual Mode is ON)
- ?MPS** This query command **#?MPS *** sends back a string expressing the Preselector status for Manual mode. The reply is either:
- **MPS=Off** (Preselector in Manual Mode is OFF)
 - **MPS =On** (Preselector in Manual Mode is ON)

- ?RBW** This query command **#?RBW *** sends back a string expressing the selected RBW. The reply is made of 3 fields:
1. **RBW=AUTO** (FR4003 automatically selects the suitable RBW according the tuned frequency) or **RBW=MAN** (Operator selects manually the RBW)
 2. **Id** identify the RBW as follows:
 - **1 →300kHz**
 - **2 →100kHz**
 - **3 →30kHz**
 - **4 →10kHz (MIL-STD-461)**
 - **5 →3kHz**
 - **6 →9kHz (Cispr 16-1)**
 - **7 →200Hz (Cispr 16-1)**
 - **22 → 1kHz (MIL-STD-461)**
 3. **RBW NickName** (a mnemonic name)
- Example of reply: **RBW=AUTO 6 (9k_CISPR)** which means that selection is automatically made by 9010F, the RBW id is 6 (**9kHz (Cispr 16-1)**). (**9k_CISPR**) is the nickname to quickly identify it
- ?S/N** This query command **#?S/N*** sends back a string containing serial number internally stored by manufacturer.
 Example of reply: **S/N=000WE50327**
- ?SAT** This query command **#?SAT *** sends back a string expressing the Attenuator status for Sweep mode. The reply is made of 2 fields:
- **SAT =AUTO** (FR4003 automatically selects the most suitable attenuator to get best dynamic range)
 - Value (in dB) of current attenuator
- Note: In Sweep mode the Attenuator is always forced to AUTO
- Example of reply: **SAT =AUTO; 10** which means that the Attenuator is now switched to 10dB automatically by FR4003
- ?SDT** This query command **#?SDT *** sends back a string expressing the detector used for Sweep mode. The reply is made of several field representing the mode and, in case of smart detector function, the limit name and margin on which the smart detector is based:
- **SDT =Peak**
 - **SDT =QPeak**
 - **SDT =Avg**
 - **SDT =Rms**
 - **SDT =C-Rms**
 - **SDT =C-Avg**
 - **SDT=Smart QPeak (CISPR 22-A +0dB)**
- ?SHT** This query command **#?SHT*** sends back a string expressing the HOLD TIME for Sweep mode. Unit is fixed ms.
 Example of reply: **SHT= 1000 ms** which means that the hold time in Sweep mode is 1000ms (or 1s)
 Note that the Hold Time is automatically changed when detector is set to Smart mode. In this case when the command **SSDT** is received the Hold Time = Min(Hold Time, 1000). If one wants to set it lower than 1000 in smart mode, the user should send the holdtime command (**SSHT**) later than **SSDT** command.

- ?SOP** This query command **#?SOP*** sends back a string expressing the Stop frequency, in exponential notation, for Sweep mode. Unit is fixed MHz.
Example of reply: **SOP = 3.000000e+07** which means that the Stop frequency in Sweep mode is 30MHz
- ?SPA** This query command **#?SPA *** sends back a string expressing the Preamplifier status for Sweep mode. The reply is either:
- **SPA =Off** (Preamplifier in Analyzer Mode is OFF)
 - **SPA =On** (Preamplifier in Analyzer Mode is ON)
- ?SPS** This query command **#?SPS *** sends back a string expressing the Preselector status for Sweep mode. The reply can be:
- **SPS =Off** (Preselector in Analyzer Mode is OFF)
 - **SPS =On** (Preselector in Analyzer Mode is ON)
- ?SRT** This query command **#?SRT*** sends back a string expressing the Start frequency, in exponential notation, for Sweep mode. Unit is fixed MHz.
Example of reply: **SRT = 1.500000e+07** which means that the start frequency in Sweep mode is 15MHz
- ?TAT** This query command **#?TAT *** sends back a string expressing MinAtt value. The reply is a string representing the minimum reachable value of attenuator in dB
Example of reply: **TAT=10** which means that MinAtt is 10dB
- ?TGA** This query command **#?TGA *** sends back a string expressing the attenuation level of FR4003 Built-In Generator. Unit is dB.
Example of reply: **TGA = 10.0** which means that the output level of FR4003 Built-In Generator attenuated by 10.0 dB
- ?TGF** This query command **#?TGF *** sends back a string expressing the tuning frequency, in exponential notation, for the FR4003 Built-In Generator. Unit is fixed MHz.
Example of reply: **TGF = 1.500000e+07** which means that the tuning frequency for 9010F Built-In Generator (**when is not tracking**) is 15MHz
- ?TGS** This query command **#?TGS *** sends back a string expressing the FR4003 Built-In Generator status. The reply is either:
- **TGS=Off** (FR4003 Built-In Generator is OFF)
 - **TGS =On** (FR4003 Built-In Generator is ON)
- ?UHT** This query command **#?UHT*** sends back a string expressing the actual hold time currently or lastly used
Example of reply: **UHT=1.9ms**

**8.7.2 SETTING
Commands**
Behaviour

ASBK	<p>This command aborts a sweep currently in progress previously started by command SSDO or SSFD. The reply is either:</p> <ul style="list-style-type: none"> • SBK=OK which means the sweep has been stopped and all setting commands are available again. In case the sweep was triggered by SSDO, with partial data, data are available for uploading by the command “?FSF 0” • SBK=SERR which informs that the sweep was not in need to be stopped
ASPA	<p>This command suspends a sweep currently in progress previously started by command SSDO or SSFD. There is no reply unless a sweep is not in progress in which case the reply is:</p> <ul style="list-style-type: none"> • SPA=SERR which informs that the sweep was not in need to be paused
ASRE	<p>This command resumes a sweep previously paused by command ASPA. There is no reply unless a sweep is not in progress in which case the reply is:</p> <ul style="list-style-type: none"> • SRE=SERR which informs that the sweep was not in need to be resumed
CHGS	<p>This setting command sets the FR4003 for Swept operation method. After the command has been received, the FR4003 restarts sending diagnostic messages which end with CHGS=OK; this is procedure take about 4 seconds.</p> <p>The Remote LED blinks fastly.</p> <p>Note: Once switched OFF, the PMM FR4003 returns to FFT method.</p>
SA30A SA30B SA30N	<p>This setting command switches the 30 dB attenuator on the FR4003, according to the last character, which can be ‘A’, ‘B’, or anything else.</p> <p>Command SA30A switches a 30dB attenuator ranging from 9kHz upto 30 MHz, while Command SA30B switches a 30dB attenuator ranging from 150kHz upto 30 MHz. Command SA30N (‘N’ or any other character that is not ‘A’ and ‘B’) switches the 30dB attenuator OFF.</p> <p>The reply can be SA30=A, SA30=B or SA30=OFF which feeds back the status of the attenuator, or SA30=SERR if the command has been ignored.</p> <p>Example: #SA30A*</p>
SAAT a	<p>This setting command sets Attenuator, for Analyzer Mode, to the value indicated by (a) which can range 0 to 30 in step of 10dB. Automatic Attenuator feature is disabled. If (a) is a negative figure then the Automatic Attenuator feature is turned on. The reply is AAT=OK which acknowledges the command has been granted or AAT=SERR if the command has been ignored.</p> <p>Example: #AAT10* (set attenuator to 10dB and disable Automatic Attenuator feature)</p> <p>Example: #AAT-1* (Enable Automatic Attenuator feature)</p>

- SADT b** This setting command sets the detector for Analyzer Mode. The argument (b) should be a index representing the detector as follows:
- **1 →Peak**
 - **2 →Avg**
 - **3 →Rms**
- The reply is **SADT =OK** which acknowledges the command has been granted or **SADT =SERR** if the command has been ignored.
 Example: **#SADT1*** sets the detector to Peak for Analyzer Mode
- SAFF start,stop** This setting command sets both Start and Stop frequency for Analyzer mode. The strings (Start and Stop) can be in exponential form and should be expressed in Hz. The reply is **AFF=OK** which acknowledges the command has been granted or **AFF =SERR** if the command has been ignored.
- Example: **#SAFF 150e3,30e6*** Sets the Start frequency to 150kHz and Stop frequency to 30MHz for Analyzer mode
- SAGO** This setting command puts the FR4003 in Analyzer mode. The reply is always **SAGO=OK**, which acknowledges the command has been granted, followed by an array, variable in size, representing the reply. Please refer to “**Analyzer Reply**” section for details of the response.
 The FR4003 goes to Analyzer mode.
 Example: **#SAGO***
- SAHT h** This setting command sets hold time for Analyzer mode. The string (h) should be expressed in ms. The reply is **AHT=OK** which acknowledges the command has been granted or **AHT =SERR** if the command has been ignored.
 Example: **#SAHT1500*** Sets the hold time, for Analyzer mode, to 1500 ms (or 1.5s)
- SAOP f** This setting command sets the Stop frequency for Analyzer mode. The string (f) can be in exponential form and should be expressed in Hz. The reply is **AOP=OK** which acknowledges the command has been granted or **AOP =SERR** if the command has been ignored.
- Example: **#SAOP 10e6*** Sets the Stop frequency, for Analyzer mode, to 10MHz
- SAPA a** This setting command switches Preamplifier, for Analyzer Mode, according the parameter (a) which can be either **On** or **OFF**.
 The reply is **APA=OK** which acknowledges the command has been granted or **APA =SERR** if the command has been ignored.
 Example: **#SAPAON***
 Example: **#SAPAOFF***
- SAPS a** This setting command switches Preselector, for Analyzer Mode, according the parameter (a) which can be either **On** or **OFF**.
 The reply is **APS=OK** which acknowledges the command has been granted or **APS =SERR** if the command has been ignored.
 Example: **#APSON***
 Example: **#APSOFF***
- SART f** This setting command sets the Start frequency for Analyzer mode. The string (f) can be in exponential form and should be expressed in Hz. The reply is **ART=OK** which acknowledges the command has been granted or **ART =SERR** if the command has been ignored.
- Example: **#SART 150e3*** Sets the Start frequency, for Analyzer mode, to 150kHz

SCFA n This setting command activates the conversion factor stored in the FR4003 (if any) where **n** is the ID of the conversion factor.
 If **n** is not in the range 1 to 4 no conversion factor is active
 The reply is:
CFA=OK (OFF) in case there is not active conversion factor
CFA=OK in case the conversion factor is active

SCFE n, name This setting command is used for saving the conversion factor (made by **SCFW**).
 The command is made of the string:

- **FCE** (the command itself),
- **n** which is the index:
 - From 1 to 4 saves into permanent memory
 - 0 uses the factor temporarily
- **name** which is a string representing the name of it

This command is intended for creating a conversion factor into PMM FR4003. For further information see command **SCFW**.

When the command is received the conversion factor is checked and, if data (frequency and level) are coherent, the command is granted by replying **SCFW =OK** otherwise the replay is **SCFW =SERR**

Example: **#SCFE 2,Probe*** checks the data previously loaded by **SCFW** commands, names it as "Probe" and saves it as #2.

SCFW n, freq; lev This setting command is used for creating a conversion factor frequency by frequency. It consists of three fields as follows:

- **n** Is the index of frequency being written and it should range from 0 to 499
- **freq** Is the frequency, expressed in Hz (exponential notation allowed), being written
- **lev** Is the level of the limit and is expressed in dB

The procedure to creating a conversion factor on PMM FR4003 is the following:

- Send as many commands as the frequency points of limit are in upwards order.
- Terminate (and make it active) by sending the command **SFCE**

Here is an example how to make a custom limit on PMM FR4003:

- **#SFCW 0, 150e3; -1 *** Send the first line 150kHz -1 dB
- **# SFCW 1, 500e3; 0 *** Send the second line 500kHz 0 dB
- **# SFCW 2, 1e6; 1.2 *** Send the third line 1MHz +2 dB
- **# SFCW 3, 2e6; 1.1 *** Send the fourth line 2MHz +1.1 dB
- **# SFCW 4, 30e6; 1 *** Send the fifth line 30MHz +1 dB
- **#SCFE 2,Probe*** Save it permanently as #2 into FR4003 and name it as "PROBE"

Note that all the higher indexes in the conversion factor are cleared. Therefore, a conversion factor must be made upwards otherwise all points, having a higher index previously written, are cleared.

It is **responsibility of the user to make sure** the data sent are correct and coherent.

The reply is **SCFW =OK** which acknowledges the command has been granted or **LCFW =SERR** if the command has been ignored.

SGTX n This setting command **#SGTX n*** enables FR4003 to operate along with the receivers 9010 and 9010F. There are three modes of setting according to 'n' parameter:

- n=100. The 9010/9010F link is enabled but only temporarily. Once the FR4003 is switched OFF or changed to fast mode, this setting, being volatile, is lost.
- n=536. The 9010/9010F link is enabled permanently. Consequently, even the FR4003 is switched OFF this setting remains active
- any other value of 'n' will disable the 9010/9010F link.

Note that this command is working only when the FR4003 is in "Swept Mode".

The reply is GTX=OK

SHPF a This setting command switches the 150 kHz High Pass Filter on the FR4003 according to parameter (a) which can be either **On** or **Off**.
 The reply is **HPF=OK** which acknowledges the command has been granted or **HPF=SERR** if the command has been ignored.
 Example: **#SHPF ON***

SLDW n, freq; levq, leva This setting command is used for setting the custom double value limit frequency by frequency. It consists of four fields as follows:

- **n** Is the index of frequency being written and it should range from 0 to 15
- **freq** Is the frequency, expressed in Hz (exponential notation allowed), being written
- **levq** Is the level of the limit which refers to QPeak and is expressed in dB μ V
- **leva** Is the level of the limit which refers to the alternate detector and is expressed in dB μ V

The purpose of this command is to have a double value limit that can be used along with smart detector function when sweeping by the command **SSFD**:

The procedure to set a custom double value limit on PMM FR4003 is the following:

- Send as many commands as the frequency points of limit are, in upwards order.
- Terminate (and make it active) by sending the command **SLIE**

Here is an example how to make a custom limit on PMM FR4003:

- **#SLDW 0, 150e3; 66,56 *** Send the first line 150kHz 66 dB μ V
- **#SLDW 1, 500e3; 56,46 *** Send the second line 500kHz 56 dB μ V
- **#SLDW 2, 5e6; 56,46 *** Send the third line 5MHz 56 dB μ V
- **#SLDW 3, 5e6; 60,50 *** Send the fourth line 5MHz 60 dB μ V
- **#SLDW 4, 30e6; 60,50 *** Send the fifth line 30MHz 60 dB μ V

- **#SLIE Custom Double *** Send the name and make the limit active

Note that all the higher indexes in the limit are cleared. Therefore, a limit must be made in upwards order otherwise all points, having a higher index previously written, are cleared.

It is **responsibility of the user to make sure** the data sent are correct and coherent.

The reply is **SLDW =OK** which acknowledges the command has been granted or **LDW =SERR** if the command has been ignored.

SLIC n, name	<p>This setting command is used for naming the custom limit and storing it onto the SoftKey. The command is made of</p> <ul style="list-style-type: none"> • n which is the index from 1 to 4 which saves into permanent memory • name which is a string representing the name of it <p>This command is intended for making a custom limit into PMM FR4003. For further information see command SLIW. When the command is received the limit is checked and, if data (frequency and level) are coherent, the command is granted by replying SLIC =OK otherwise the replay is SLIC =SERR</p> <p>Example: # SLIC 1, MyLimit* checks the data previously loaded by SLIW commands, names the limit as "MyLimit" and stores it on SofKey 1</p>
SLIE name	<p>This setting command is used for naming the custom limit and making it active or deactivating it. The command is made of the string LIE (the command itself) and a string which represents the name of the limit it will be shown. Sending a LIE with no argument (Limit name) deactivates all limit active, if any. This command is intended for making a custom limit into the PMM FR4003. For further information see command SLIW. When the command is received the limit is checked and, if data (frequency and level) are coherent, the command is granted by replying SLIW =OK otherwise the replay is SLIW =SERR</p> <p>Example: # SLIE Custom Limit* checks the data previously loaded by SLIW commands, names the limit as "Custom Limit" and activates it Example: # SLIE * deactivates any limits</p>
SLII n	<p>This setting command recall and load into FR4003 the built-in limit indexed by n. The argument (n) should be a index representing the limit as follows:</p> <ul style="list-style-type: none"> • 0 → "CISPR 22-A" • 1 → "CISPR 22-B" • 2 → "CISPR 14-1" • 3 → "CISPR 14-2" • 4 → "CISPR 14-3" • 5 → "CISPR 14-4" • 6 → "CISPR 11" <p>Special index is as follows :</p> <ul style="list-style-type: none"> • -1 → Unloaded <p>The reply is SLII =OK which acknowledges the command has been granted or SLII =SERR if the command has been ignored. Example: # SLII 1* loads the limit → "CISPR 22-B"</p>
SLIM n	<p>This setting command sets the Margin to be used with Smart Detector function. The argument (n) in the range of -20 to 20. The reply is LIM =OK which acknowledges the command has been granted or LIM =SERR if the command has been ignored. Example: #SLIM 2* Sets the threshold of smart detector to 2 dB below the limit.</p>

- SLIW n, freq; lev** This setting command is used for setting the custom limit frequency by frequency. It consists of three fields as follows:
- **n** Is the index of frequency being written and it should range from 0 to 31
 - **freq** Is the frequency, expressed in Hz (exponential notation allowed), being written
 - **lev** Is the level of the limit and is expressed in dB μ V
- The procedure to set a custom limit on FR4003 is the following:
- Send as many commands as the frequency points of limit are, in upwards order.
 - Terminate (and make it active) by sending the command **SLIE**
- Here is an example how to make a custom limit on PMM FR4003:
- #SLIW 0, 150e3; 66 * Send the first line 150kHz 66 dB μ V
 - #SLIW 1, 500e3; 56 * Send the second line 500kHz 56 dB μ V
 - #SLIW 2, 5e6; 56 * Send the third line 5MHz 56 dB μ V
 - #SLIW 3, 5e6; 60 * Send the fourth line 5MHz 60 dB μ V
 - #SLIW 4, 30e6; 60 * Send the fifth line 30MHz 60 dB μ V
- #SLIE Custom CISPR 14-1 * Send the name and make the limit active
- Note that all the higher indexes in the limit are cleared. Therefore, a limit must be made in upwards order otherwise all point, having a higher index previously written, are cleared.
- It is **responsibility of the user to make sure** the data sent are correct and coherent.
- The reply is **SLIW =OK** which acknowledges the command has been granted or **LIW =SERR** if the command has been ignored.
- SMAF f** This setting command sets the tuning frequency for manual mode. The string (f) can be in exponential form and should be expressed in Hz. The reply is **MAF=OK** which acknowledges the command has been granted or **MAF=SERR** if the command has been ignored.
- When the command is granted, the FR4003 goes to manual mode automatically
- Example: **#SMAF150e3*** Sets the manual frequency to 150kHz
- SMAN** This setting command puts the FR4003 in manual mode. The reply is always **MAN=OK** which acknowledges the command has been granted.
- The FR4003 goes to manual mode.
- Example: **#SMAN***
- SMANP** This setting command puts the FR4003 in manual mode and sets the default value to the following settings:
- RBW Automatic
 - Attenuator Automatic
 - MinAtt=10 dB
 - Preselector On
 - Preamplifier OFF
 - Hold Time =1000ms
 - Pulse Limiter = OFF
 - TG=OFF
- The reply is always **MANP=OK** which acknowledges the command has been granted.
- The FR4003 goes to manual mode.
- Example: **#SMANP***

SMAT a	<p>This setting command sets Attenuator, for Manual Mode, to the value indicated by (a) which can be 0 in step of 10 dB. Automatic Attenuator feature is disabled. If (a) is a negative figure then the Automatic Attenuator feature is turned on. The reply is MAT=OK which acknowledges the command has been granted or MAT =SERR if the command has been ignored.</p> <p>When the command is granted the FR4003 goes to manual mode automatically.</p> <p>Example: #SMAT 10* (set attenuator to 10dB and disable Automatic Attenuator feature)</p> <p>Example: #SMAT -1* (Enable Automatic Attenuator feature)</p>
SMHT h	<p>This setting command sets hold time for manual mode. The string (h) should be expressed in ms. The reply is MHT=OK which acknowledges the command has been granted or MHT =SERR if the command has been ignored.</p> <p>When the command is granted the FR4003 goes to manual mode automatically.</p> <p>Example: #SMHT 1500* Sets the hold time, for manual mode, to 1500 ms (or 1.5s)</p>
SMODA SMODH	<p>These setting commands #SMODA* and #SMODH* set the input Mode which can be either A (Antenna mode) or H (HiZ Receiver).</p> <p>Replies can be:</p> <ul style="list-style-type: none"> • MOD=OK (Mode has been set) • MOD=SERR (Unknown mode)
SMPA a	<p>This setting command switches Preamplifier, for Manual Mode, according the parameter (a) which can be either On or OFF.</p> <p>The reply is MPA=OK which acknowledges the command has been granted or MPA =SERR if the command has been ignored.</p> <p>When the command is granted the FR4003 goes to manual mode automatically.</p> <p>Example: #SMPA ON*</p> <p>Example: #SMPA OFF*</p>
SMPS a	<p>This setting command switches Preselector, for Manual Mode, according the parameter (a) which can be either On or OFF.</p> <p>The reply is MPS=OK which acknowledges the command has been granted or MPS =SERR if the command has been ignored.</p> <p>When the command is granted the FR4003 goes to manual mode automatically.</p> <p>Example: #SMPS ON*</p> <p>Example: # SMPS OFF*</p>
SNOF	<p>This command disables the automatic switch OFF. After this command is granted the FR4003 will not switch OFF automatically and it will require a manual intervention.</p> <p>The replay is NOF=OK</p>
SOFF	<p>This command switches the FR4003 OFF.</p> <p>There is no reply, and the instrument goes suddenly off.</p> <p>Example: #SOFF* turns FR4003 off.</p>

SRBW b

This setting command sets RBW. The argument (b) should be a string representing the RBW as follows:

- **0** **RBW is Automatic** so that the FR4003 automatically selects the suitable RBW according to the tuned frequency
- **1** **300kHz**
- **2** **100kHz**
- **3** **30kHz**
- **4** **10kHz (MIL-STD-461)**
- **5** **3kHz**
- **6** **9kHz (Cispr 16-1)**
- **7** **200Hz (Cispr 16-1)**
- **22** **→ 1kHz (MIL-STD-461)**

The reply is **RBW =OK** which acknowledges the command has been granted or **RBW =SERR** if the command has been ignored.

Example: **#S RBW 3*** sets the RBW to 30kHz and disables Auto RBW mode

Example: **#S RBW 0*** turn the RBW mode in Automatic

SSDO SSDOC SSDOD SSDOE

This command triggers a sweep based on set parameters. After this command has been received all parameters concerning the sweep are checked out and, if coherent, a sweep starts otherwise the related error is notified and the sweep is not triggered.

The RBW is set to AutoCISPR. When in Downconverter Mode if the special case are issued the RBW is as follows:

- ☞ **SSDOC** --> Force to have 120kHz RBW Cispr throughout the sweep
- ☞ **SSDOD** --> Force to have 120kHz RBW Cispr throughout the sweep
- ☞ **SSDOE** --> Force to have 1 MHz RBW throughout the sweep

During the sweep, for each step tuned, the PMM FR4003 sends a character 0x2E ("."). At the end, if not aborted by as the command **ASBK**, the string "SWP_END" is sent to notify that the sweep has been done and available for uploading by the command "**?FSF 0**".

NOTE that all setting commands are ignored while the sweep is on while query commands are granted as well as the command **ASBK** which allows aborting the current sweep.

The reply is

- **SDO=OK** if the sweep is started or
- **SDO=ERR 1** if there is an error in start or stop frequencies
- **SDO=ERR 2** if Smart detector is set but not active limit

SSDT b

This setting command sets the detector for Sweep Mode. The argument (b) should be a character representing the detector as follows:

- **P** **→Peak**
- **Q** **→QuasiPeak**
- **A** **→Avg**
- **R** **→Rms**
- **N** **→C-Rms**
- **C** **→C-Avg**

Optionally, the character '**S**' may precede to activate the Smart Mode detector. Thus, if Smart Qpeak is desired the command should be **#SSDT SQ***

The reply is **SSDT =OK** which acknowledges the command has been granted or **SSDT =SERR** if the command has been ignored.

Example 1: **#SSDTP*** sets the detector to Peak for Sweep Mode

Example 2: **#SSDTSA*** sets the detector to Smart Average for Sweep Mode

SSFD
FreqStart;
FreqStop;
FreqStep;
Detector;
HoldTime;
Rbw;
MinAtt;
Preamp;
Preselector;
ScanHoldT

Note: Please look at §8.8 for further details related to FFT operation method

Arguments are as follows:

- **FreqStart** = Sweep Start Frequency expressed in Hz
- **FreqStop** = Sweep Stop Frequency expressed in Hz
- **FreqStep** = Sweep Step Frequency expressed in Hz
 - If **FreqStep** > 0 then a standard sweep, tuned step by step, is made
 - If **FreqStep** < 0 (typical = -1) then the step will be set to AUTO
 - If **FreqStep** = 0 then the sweep will be made by tuning all the frequencies which are listed in Frequency-Scan-Tab (which it must have been written previously by command **SSFW**).
- **Detector**. In **non –smart mode**, any combination of the following detectors can be used and combined. All the detectors set will be measured and sent out. However, in **Smart Mode** only one detector at time, in addition to PEAK which is always present, can be set.
 - **Non Smart Mode** (All detectors can be indicated at once). Order is not important.
 - **P →Peak**
 - **Q Peak**
 - **N C-Rms**
 - **A →Avg**
 - **R →Rms**
 - **C →C-Avg**
 - **Smart Mode** (No more than 2 detectors can be indicated at once)
 - **S → Smart Mode** (this must be the first in the string)
 - **Q Peak**
 - **N C-Rms**
 - **A →Avg**
 - **R →Rms**
 - **C →C-Avg**
- **HoldTime** = Hold Time for each step and it is expressed in ms. Note that in case of Smart Mode HoldTime is used only when the disturbance is measured again by the alternative detector as minimum time, depending on the Rbw set, is used for the fast scan.
- **Rbw**. This is the index of Rbw to be used for the scan. Neither automatic selection, nor automatic switch is performed. The user must issue a suitable Rbw index. Index are as follows:
 - **1 →300kHz**
 - **2 →100kHz**
 - **3 →30kHz**
 - **4 →10kHz (MIL-STD-461)**
 - **5 →3kHz**
 - **6 →9kHz (Cispr 16-1)**
 - **7 →200Hz (Cispr 16-1)**
 - **22 → 1kHz (MIL-STD-461)**

(Continued)

SSFD

FreqStart;

FreqStop;

FreqStep;

Detector;

HoldTime;

Rbw;

MinAtt;

Preamp;

Preselector;

ScanHoldT

- **MinAtt** = Minimum attenuation allowed during sweeping. This parameter ranges from 0 (no limitation) to the maximum the FR4003 can set. This parameter is normally used to avoid switching up the sensitivity in order to either protect the input from high spikes or to prevent switching down the attenuation when, for instance, the limit is so high that it would be only waste of time.

Note: In Sweep mode the Attenuator is always forced to AUTO

- **Preamp.** This Parameter switches the Preamplifier On or Off according to its content as follows.
 - **On.** It turns ON the preamplifier.
 - **Off.** It turns Off the preamplifier.
- **Preselector.** This Parameter switches the Preselector On or Off according to its content as follows.
 - **On.** It turns ON the Preselector.
 - **Off.** It turns Off the Preselector.
- **ScanHoldT** = Hold Time used in Smart Mode when tuning for Peak for each step and it is expressed in ms. Note that this is used only in case of Smart Mode and not in standard sweep. This parameters is not compulsory and can be omitted if not required. I case it is not present, minimum time is taken.

This command triggers a free sweep (no automatic items are selected) based on the provided parameters. After this command has been received, all parameters issued in the command itself are checked out and, if coherent, a sweep starts otherwise the related error is notified and the sweep is not triggered.

Moreover, using the Frequency-Scan-Tab, the user has the capability of tuning only those frequencies which are suspected skipping thus the remainder. Hence, saving a lot of time.

After the command has been received, the FR4003 replies by sending a string which reflects the status of parameter check as follows:

- **SFD=OK<RC><LF>** No error in parameters and sweep started.
- **SFD=ERR 1<RC><LF>** An Error was found in **start** or **stop** frequencies. Errors can be one of the following:
 - Start Frequency lower than minimum allowed frequency
 - Stop Frequency higher than maximum allowed frequency
 - Start Frequency higher than Stop Frequency
- **SFD=ERR 2<RC><LF>** An Error was found in **step** frequency. Step is either
 - Too small.
 - Is equal to zero (use of Frequency-Scan-Tab) but there are less than two frequencies in the table
- **SFD=ERR 3<RC><LF>** An Error was found in **detector**. Errors can be one of the following:
 - Invalid Detector or no detector found. Detectors must be indicated by 'P','Q','R','A','N' and 'S' only
 - Smart Mode selected but no active limit
 - Smart Mode selected but no alternative detector
 - Smart Mode selected but more than two alternative detector indicated

(Continued)

SSFD

FreqStart;

FreqStop;

FreqStep;

Detector;

HoldTime;

Rbw;

MinAtt;

Preamp;

Preselector;

ScanHoldT

- **SFD=ERR 4<RC><LF>** An Error was found in **HoldTime** value. **HoldTime** is either too big (>10s) or negative.
- **SFD=ERR 5<RC><LF>** An Error was found in **RBW**. Errors can be one of the following:
 - Unsuitable RBW for the active unit (for instance 200Hz Rbw while Downconverter is active)
 - Unsuitable RBW for the detector previously selected (for instance 100kHz Rbw and QuasiPeak selected).
- **SFD=ERR 6<RC><LF>** An Error was found in **MinAtt** value. Errors can be one of the following:
 - **MinAtt** value is negative
 - **MinAtt** value is higher than maximum available attenuation
 - **MinAtt** value is not in step of 5
- **SFD=ERR 7<RC><LF>** An Error was found in **Preamp** string. **Preamp** string can be either **ON** or **OFF** only. String is not case sensitive.
- **SFD=ERR 8<RC><LF>** An Error was found in **Preselector** string. **Preselector** string can be either **ON** or **OFF** only. String is not case sensitive.

Once the sweep is started, the FR4003 sends the value of each detector chosen in the command. Each detector is made of a Little Endian 16 bit integer which represents the value of that particularly tuned frequency. The value is expressed in **hundredth of dBm**. Therefore, for each step, there will be a packet of **n** detectors (**n * 2** bytes).

The order of detectors is fixed and is not related to the order issued in the command. For instance, PAQ is equivalent to QAP as well as RA is same as AR. The order of detector is as follows (from the first to the last):

1. Peak (which is always present)
2. QPeak (QuasiPeak)
3. RMS
4. AVG (Average)
5. C-RMS
6. C-AVG

Special meaning has the value **NOLEVEL, -32700** (Hex 8044), which informs that the detector has not been measured. This happens, for example, in Smart mode where the alternative detector is taken only for those frequencies the Peak was above the limit.



(Continued)

SSFD

FreqStart;

FreqStop;

FreqStep;

Detector;

HoldTime;

Rbw;

MinAtt;

Preamp;

Preselector;

ScanHoldT

FFT will be used, as opposed to standard sweep step by step, when the following conditions are matched:

- o Detector is either
 - o Peak (only) and HoldTime < 50ms or
 - o SMART and an alternate detector.
- o Stop frequency <= 150kHz
- o Span (Stop frequency - Start frequency) >= 5 kHz
- o Step frequency = 50Hz
- o RBW = 200Hz

After having terminated all steps and sent all data, the string **SFD_END<RC><LF>** is then sent informing the user there are no more data left.

Any started sweep can be stopped by sending the command **ASBK** which abruptly terminates it.

In case the sweep was prematurely terminated by the command **ASBK**, the end of sweep (which will not contain all expected data) is **SBK=OK<RC><LF>**

Here is an example of the command:

#SSFD 1e6;10e6;10e3;PAR;0;6;10;OFF;ON*

Which triggers a sweep from 1 MHz to 10 MHz using a step of 5 kHz. Detectors are Peak, AVG and RMS. The hold time will be the minimum suitable (automatically adjusted by the unit). RBW is 9kHz. MinAtt is 10 dB which means that the attenuator will not switch below 10 dB attenuation. Preamplifier is OFF while the Preselector is turned on.

Here, for each step there will be a packet of 3 detectors per step (Peak, AVG and RMS in this order) counting thus 6 bytes (3 * 2) per step.

Here is another example:

#SSFD 9e3;150e3;50;SPQ;1000;7;10;OFF;ON;100*

Which triggers a sweep from 9kHz to 150kHz using a step of 50 Hz. Detector is Smart QuasiPeak using a hold time of 1s in re-measuring those frequencies which value was over the limit scanned using 100ms holdtime . RBW is 200Hz. MinAtt is 10 dB which means that the attenuator will not switch below 10 dB attenuation. Preamplifier is OFF while the Preselector is turned on.

In this case, as all the needed conditions are matched ,FFT is used to perform the Peak scan.

Here, for each step there will be a packet of 2 detectors per step (Peak and QuasiPeak in this order) counting thus 4 bytes (2 * 2) per step. Of course, most of QuasiPeak value will be populated by **NOLEVEL** as QuasiPeak will be measured only for few frequencies (the ones which value is above the limit).

SSFW n, freq This setting command is used for creating a Frequency-Scan-Tab frequency by frequency. It is made of two fields as follows:

- **n** Is the index of frequency being written and it should range from 0 to 99
- **freq** Is the frequency, expressed in Hz (exponential notation allowed), being written

The procedure to make and use a Frequency-Scan-Tab on PMM FR4003 is the following:

- Send as many commands **SSFW** as frequency points of table are in upwards order.
- Send the command **SSFD** with step size set to zero

Here is an example how to make a Frequency-Scan-Tab on FR4003:

- **#SSFW 0, 150e3 *** Set the first freq to 150kHz
- **#SSFW 1, 500e3 *** Set the second freq to 500kHz
- **#SSFW 2, 5e6*** Set the third freq to 5MHz
- **#SSFW 3, 6e6*** Set the fourth freq to 6MHz
- **#SSFW 4, 30e6 *** Set the fifth freq to 30MHz

Note that all the higher indexes in the Frequency-Scan-Tab are cleared. Therefore, a Frequency-Scan-Table must be made in upwards order. All points, having a higher index previously written, are cleared.

Note that only the present frequencies will be tuned and measured as all remaining will be completely neglected. Hence, it is **responsibility of the user to make sure** the data sent are correct and coherent.

The reply is **SSFW =OK** which acknowledges the command has been granted or **SSFW =SERR** if the command has been ignored.

SSHT h This setting command sets hold time for Sweep mode. The string (h) should be expressed in ms. The reply is **SHT=OK** which acknowledges the command has been granted or **SHT=SERR** if the command has been ignored.

Note that the Hold Time is automatically changed when detector is set to Smart mode. In this case when the command SSDT is received the Hold Time = Min (Hold Time, 1000). If one wants to set it lower than 1000 in smart mode, the user should send the hold time command (SSHT) later than SSDT command.

Example: **#SSHT1500*** Sets the hold time, for Sweep mode, to 1500 ms (or 1.5s)

SSOP f This setting command sets the Stop frequency for Sweep mode. The string (f) can be in exponential form and should be expressed in Hz. The reply is **SOP=OK** which acknowledges the command has been granted or **SOP =SERR** if the command has been ignored.

Example: **#SSOP 10e6*** Sets the Stop frequency, for Sweep mode, to 10MHz

SSPA a This setting command switches Preamplifier, for Sweep Mode, according the parameter (a) which can be either **On** or **OFF**.

The reply is **SPA=OK** which acknowledges the command has been granted or **SPA =SERR** if the command has been ignored.

Example: **#SSPA ON***

Example: **#SSPA OFF***

- SSPS a** This setting command switches Preselector, for Sweep Mode, according the parameter (a) which can be either **On** or **OFF**.
 The reply is **SPS=OK** which acknowledges the command has been granted or **SPS =SERR** if the command has been ignored.
 Example: **#SPS ON***
 Example: **#SPS OFF***
- SSRT f** This setting command sets the Start frequency for Sweep mode. The string (f) can be in exponential form and should be expressed in Hz. The reply is **SRT=OK** which acknowledges the command has been granted or **SRT =SERR** if the command has been ignored.
 Example: **#SSRT 150e3*** Sets the Start frequency, for Sweep mode, to 150kHz
- SSTP** This setting command stops abruptly a running sweep in Analyzer mode. The reply is always **STP=OK**, which acknowledges the command has been granted
- STAT b** This setting command sets MinAtt to the value indicated by (b) which range from 0dB to the maximum the FR4003 can set and must be in step of 10dB. The reply is **TAT=OK** which acknowledges the command has been granted or **TAT =SERR** if the command has been ignored.
- Note: In Sweep mode the Attenuator is always forced to AUTO
- Example: **#STAT 10***
- STGA A** This setting command sets the output level of FR4003 Built-In Generator. The string (A) should be expressed in dB.
 Although Attenuation has no limit it should be noted that the higher the attenuation the coarser the resolution. Therefore it should be limited to 40- 50 dB.
 The reply is **TGA=OK** which acknowledges the command has been granted or **TGA =SERR** if the command has been ignored.
 Example: **# STGA 10.5*** Sets the attenuation of FR4003 Built-In Generator to 10.5dB.
- STGF f** This setting command sets the tuning frequency for FR4003 Built-In Generator when is not tracking (STGT OFF). The string (f) can be in exponential form and should be expressed in Hz.
 Frequency should range between 9 kHz and 30 MHz inclusive.
 The reply is **TGF=OK** which acknowledges the command has been granted or **TGF =SERR** if the command has been ignored.
 Example: **#STGF 150e3*** Sets the tuning frequency, for FR4003 Built-In Generator, to 150kHz
- STGL I** This setting command sets the output level of FR4003 Built-In Generator. The string (I) should be expressed in dB μ V.
 Level should range between 65 and 95 inclusive
 The reply is **TGL=OK** which acknowledges the command has been granted or **TGL =SERR** if the command has been ignored.
 Example: **# STGL 85.5*** Sets the output level of the FR4003 Built-In Generator to 85.5dB μ V.
- STGS a** This setting command switches the FR4003 Built-In Generator; according the parameter (a) which can be either **On** or **OFF**.
 The reply is **TGS =OK** which acknowledges the command has been granted or **TGS =SERR** if the command has been ignored.
 Example: **# TGS ON***
 Example: **# TGS OFF***

STGT a This setting command changes FR4003 Built-In Generator tracking mode; according the parameter (a) which can be either **On** or **OFF**.
When tracking mode is ON the FR4003 Built-In Generator is tuned on the same receiver frequency. When tracking mode is OFF the FR4003 Built-In Generator is tuned at the frequency previously set by command STGF
The reply is **TGT =OK** which acknowledges the command has been granted or **TGT =SERR** if the command has been ignored.
Example: **# TGT ON***
Example: **# TGT OFF***

SUPP n This setting command #SUPP n* outputs on the User Port bit by bit the argument n .
Each Pin has its own contribution according to its index as follows:

OUT0= 2⁰
OUT1= 2¹
OUT2= 2²
OUT3= 2³
SupplyOFF=2⁴

Thus, the argument sent is the sum of each weighted contribution
The reply is UPP=OK which acknowledges the command has been granted or UPP=SERR if the command has been ignored (IE argument >31).

- Example: SUPP 5 will set:
- user port pins OUT0 and OUT2 to high level
 - user port pins OUT1 and OUT3 are low level
 - User Port Power Supply (+12V) ON

8.7.3 IDLE Commands The **Idle** commands are specific for the PMM FR4003 Field Receiver and related to its behavior as active Rod antenna. Query and setting commands are described together.

Description

- ?IA1** This query command **#?IA1*** sends back a string expressing current Att10 status. The reply is either:
- IA1=Off (10dB attenuator is OFF)
 - IA1 =On (10dB attenuator is On)
- ?IAT** This query command **#?IAT*** sends back a string expressing the current Attenuator status. The reply is: IAT=MAN; Value (in dB) of current attenuator
- Example of reply: IAT=MAN; 10 which means that the Attenuator is now switched to 10dB.
- ?IAE** This query command **#?IAE*** sends back a string expressing the current 20dB Extra Attenuator status. The reply reflects its status
- Example of reply: **IAE=150k** which means that 20dB Extra Attenuator 150kHz is enabled.
- ?ICM** This query command **#?ICM*** sends back a string expressing current CAP-METER status. The reply is either:
 ICM=Off : (The CAP-METER is ON)
 ICM=On : (The CAP-METER is OFF)
- ?IHP** This query command **#?IHP*** sends back a string expressing current 150kHz High-Pass filter status. The reply is either:
- IHP=Off (150kHz High-Pass filter is OFF)
 - IHP=On (150kHz High-Pass filter in Manual Mode is ON)
- ?IPA** This query command **#?IPA*** sends back a string expressing current Preamplifier status. The reply is either:
- IPA=Off (Preamplifier is OFF)
 - IPA =On (Preamplifier is ON)
- ?IPS** This query command **#?IPS *** sends back the status of Preselector as follows:
 IPS=index where index is:
- 0: OFF
 - 1: 9kHz-5.67MHz
 - 2: 5.67MHz-11.19MHz
 - 3: 11.19MHz-16.71MHz
 - 4: 16.71MHz-22.23MHz
 - 5: 22.23MHz-30MHz
- Example of reply: IPS=5 that the Preselector is set to 22.23MHz-30MHz
- ?IRO** This query command **#?IHP*** sends back a string expressing current RF-OUT to BNC connector status. The reply is either:
- IRO=Off (RF-OUT ADC)
 - IRO=On (RF-OUT to BNC connector)

- ?ITG** This query command #?IAE * sends back a string expressing the current internal Tracking Generator to the mode status. The reply reflects its status and can be:
- ITG=Off
 - ITG= TGout
 - ITG=TGIN
- For details on TG Mode please read the relative documentation.
- SIA1 a** This setting command immediately switches then 10dB attenuator according to the parameter (a) which can be either On or OFF.
 The reply is IA1=OK which acknowledges the command has been granted or IPA =SERR if the command has been ignored.
 Example: #SIA1ON*
 Example: #SIA0OFF*
- SIAE a** This setting command immediately switches 20dB EXTRA Attenuator to the value indicated by the index (a) as follows:
- 0: 20dB Extra Attenuator OFF
 - 1: Enabled 20dB Extra Attenuator 9kHz
 - 2: Enabled 20dB Extra Attenuator 150kHz
- The reply is IAE=OK which acknowledges the command has been granted or IAE=SERR if the command has been ignored.
- Example: #IAE1* (Switches the 20dB Extra Attenuator 9kHz)
- SIAT a** This setting command immediately sets Attenuator to the value indicated by (a) can range 0 to 30 in step of 10. The reply is IAT=OK which acknowledges the command has been granted or IAT =SERR if the command has been ignored.
- Example: #IAT10* (set attenuator to 10dB)
- SIDC a** This setting command immediately switches the CAP-METER according to the parameter (a) which can be either On or OFF.
 The reply is ICM=OK which acknowledges the command has been granted or ICM=SERR if the command has been ignored.
 Example: #SICMON* The CAP-METER is ON
 Example: #SIROFF* CAP-METER is OFF
- SIHP a** This setting command immediately switches the 150kHz High-Pass filter according to the parameter (a) which can be either On or OFF.
 The reply is IHP=OK which acknowledges the command has been granted or IHP=SERR if the command has been ignored.
 Example: #SIHPON*
 Example: #SIPAOFF*
- SIPA a** This setting command immediately switches Preamplifier according to the parameter (a) which can be either On or OFF.
 The reply is IPA=OK which acknowledges the command has been granted or IPA =SERR if the command has been ignored.
 Example: #SIPAON*
 Example: #S IPA OFF*

SIPS a

This setting command immediately selects the preselector to the index (a) as follows:

- 0: OFF
- 1: 9kHz-5.67MHz
- 2: 5.67MHz-11.19MHz
- 3: 11.19MHz-16.71MHz
- 4: 16.71MHz-22.23MHz
- 5: 22.23MHz-30MHz

The reply is **IPS=OK** which acknowledges the command has been granted or **IPS=SERR** if the command has been ignored.

Example: **#IPS 1*** (Switches the Preselector OFF)

SIRO a

This setting command immediately switches the RF-OUT to BNC connector according to the parameter (**a**) which can be either **On** or **OFF**.

The reply is **IRO=OK** which acknowledges the command has been granted or **IRO=SERR** if the command has been ignored.

Example: **#SIROON*** The output has been switched to BNC Connector

Example: **#SIROOFF*** The output has been switched to internal ADC

SITG a

This setting command immediately switches the internal Tracking Generator to the mode indicated by the index (**a**) as follows:

- 0: TG is OFF
- 1: TG mode OUT
- 2: TG mode IN

The reply is **ITG=OK** which acknowledges the command has been granted or **ITG=SERR** if the command has been ignored.

Example: **#ITG1*** (Switches internal Tracking Generator to mode OUT)

For details on TG Mode please read the relative documentation.

8.7.4 Analyzer reply The PMM FR4003 replies to the command “**SAGO**” sending back an array of bytes which contains all the information needed to draw a sweep. Typically, the user should first send the PMM FR4003 all the setting commands to insure the receiver is correctly set on the wanted parameters and then read the reply. Just as an example, the user could send the following commands:

8.7.4.1 Reply example

#SAAT -1*	Set Attenuator Automatic mode
#SAPA Off*	Switch Preamplifier OFF
#SPLM a*	Switch Pulse Limiter OFF
#SAFF 150e3,30e6*	Sets the Start frequency to 150kHz and Stop frequency to 30MHz
#SAHT 2*	Sets the hold time to 2 ms
#SADT 2*	Sets the detector to AVG
.....	More Command
.....	More Command
#SAGO *	Start Sweep in Analyzer Mode



NOTE The PMM FR4003 replies by sending a 48 bytes header followed by a variable size array of integer (the size depends on frequency settings) as follows:

HEADER			
ID Byte	Value	Meaning	
1	A	The first 8 Bytes are just a fixed header and acknowledge the command	
2	G		
3	O		
4	=		
5	O		
6	K		
7	0x13 (CR)		
8	0x10 (LF)		
9	Start Frequency	Little Endian 32 bit Float figure representing the start frequency of sweep	
10			
11			
12			
13	Stop Frequency	Little Endian 32 bit Float figure representing the Stop frequency of sweep	
14			
15			
16			
17	Sep Frequency	Little Endian 32 bit Float figure representing the step frequency of sweep	
18			
19			
20			
21	Reserved	...	
...	...		
26	...		
27	Attenuator		Little Endian 16 bit integer representing the attenuator used
28			
29	Reserved	...	
...		
48			

<p>***** End of Header ***** (continued)</p> <p>From here all figures represent the level referred to the tuned frequency And are expressed in hundredth of dBm</p>		
49	Level Fstart	Little Endian 16 bit integer representing the level referred to start frequency.
50		
51	Level Fstart	Little Endian 16 bit integer representing the level referred to start frequency
52	+Fstep	plus step frequency
51	Level Fstart	Little Endian 16 bit integer representing the level referred to start frequency
52	+2*Fstep	plus 2 * step frequency
....
....
nn	Level Fstop	Little Endian 16 bit integer representing the level referred to Stop frequency
nn+1		



The number of levels replied is calculated by the formula $1+(Fstop-Fstart)/Fstep$. However, because of the different approximation in managing floating point figures, please note that the number of received levels may slightly differ specially with big difference in (Fstop-Fstart).

It is always possible to terminate a sweep before its natural end by sending the command SSTOP.

8.8 Special notes for FFT method

Programming differences between Swept and FFT operation.



NOTE

When switched ON the PMM FR4003 runs in FFT method. For changing from FFT to Swept operation send the setting command #CHGS*

Swept and FFT communication protocols are very similar one each other, with some improvements and extensions.

General

The query command #?IDN* sends back a string containing "FR4003F....." and information about release as usual.

Analyzer Mode

- **Be aware! To achieve the best performance, transfer data and process time must be fast enough to be congruent with FR4003F.**

As the sweep data are contained in the header, the fact that the step used is different from the FR4003 does not affect the interpretation of the data that remains the same.

Sweep Mode

- With SSFD command the step is always ignored and forced to AUTO (when step is > 0)
- Once the sweep is started, the FR4003F **sends back an array of 32 bytes where the first 4 bytes are a Little Endian 32 bit floating point figure representing the step of sweep.** Then the value of each detector chosen in the command step by step will follow. Each detector is made of a Little Endian 16 bit integer which represents the value of that particularly tuned frequency. The value is expressed in hundredth of dBm. Therefore, for each step, there will be a packet of n detectors (n *2 bytes).
- The Smart Detector can not be used.

9 - Accessories

9.1 Introduction

This section provides the information required for installing and using the accessories of the PMM FR4003 Field Receiver.

Information is included regarding initial inspection, power requirements, interconnections, work environment, assembly, cleaning, storage and shipment.

The following general information is applicable to all accessories.

9.2 Preliminary inspection

Inspect the packaging for any damage.



If the packaging or anti-shock material have been damaged, check that the contents are complete and that the meter has not suffered electric or mechanical damage.

Check that all the Accessories are there against the checklist found with the apparatus.

Inform the carrier and NARDA of any damage that has occurred.

9.3 Work environment

Unless otherwise specified, the work environment of the Accessories, must come within the following conditions:

- Temperature From -10°C to +60° C
- Humidity (without condensation) < 98% relative

The Accessories must be stored in a clean and dry environment, free from dust, acids and humidity.

The storage environment must come within the range of the following conditions:

- Temperature From -30°C to + 75° C
- Humidity (without condensation) < 98% relative

9.4 Return for repair

When the Accessories need to be returned to NARDA for repair, please complete the questionnaire appended to this User's Manual, filling in all the data that will be useful for the service you have requested.

For reducing the period of time required for the repairs, it is necessary to be as specific as possible in describing the problem. If the problem only occurs in certain circumstances, please describe in detail how it happens.

If possible it is better to reuse the original packaging; making sure that the apparatus is wrapped in thick paper or plastic.

Otherwise, use strong packaging by using a sufficient quantity of shock absorbent material around all sides of the meter to ensure that it is compact and does not move around inside the package.

In particular, take every precaution to protect the front panels.

Finish the package by sealing it up tightly.

Apply a FRAGILE label to the package to encourage greater care in its handling.

9.5 Cleaning

Use a dry, clean and non-abrasive cloth for cleaning the instruments.



Do not use solvents, acids, turpentine, acetone or other similar products for cleaning the devices in order to avoid damaging them.

9.6

PMM TR-01A Set (optional)

9.6.1 TR-01A Set

Using the TR-01A Set, the antenna height can be adjusted so that the counterpoise is level with the ground plane height (80-90 cm, or 100 cm above the floor, depending on the standard); or, the antenna can be lowered so that the center point of the rod element is 120 cm above the chamber floor, as required by MIL-STD-461G.

The PMM TR-01A Set includes:

- TR-01 Tripod Wooden tripod with extension
- Column strengthener
- Soft carrying case

TABLE 9-1 PMM TR-01 Wooden tripod with extension Specifications

Characteristics	Performance Limits
• Legs	3 legs x 3 sections extensible
• Transportation width:	76 x 12 x 12 cm
• Minimum height:	60 cm
• Maximum height:	180 cm
• Weight	2,8 kg
• Load capacity:	10 kg



Fig. 9-1 PMM TR01 Wooden Tripod

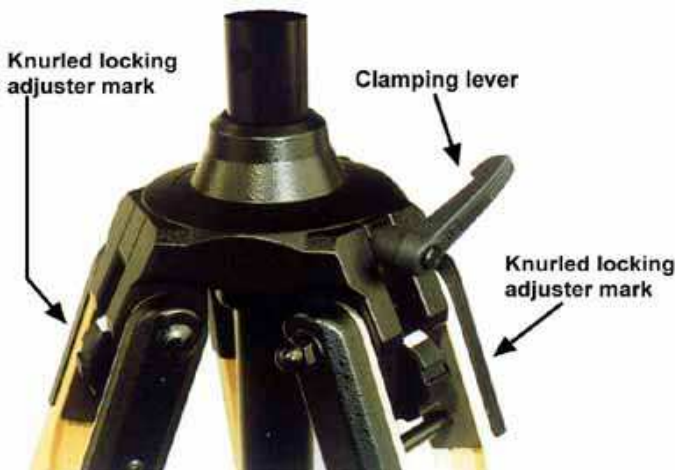


Fig. 9-2 Adjustable joint

It is possible to adjust legs spread at tree different angles, the adjustment is made rotating the knurled locking adjuster by selecting the corresponding marker on the knurled locking adjuster:

- 20° spread: knurled locking adjuster white mark;
- 45° spread: knurled locking adjuster red mark;
- Variable spread: knurled locking adjuster unmarked.

The central mast can be adjusted and fixed with the clamping lever.

TABLE 9-2 Column strengthner Specifications

- | | |
|-----------------|-------------|
| • Dimensions | Ø50 x 80 mm |
| • Weight | 184 g |
| • Load capacity | 10 kg |

The Column strengthner allows to mount the FR4003 on the PMM TR-01 Wooden tripod with extension



Fig. 9-3 Column strengthner

TABLE 9-3 Soft carrying case Specifications

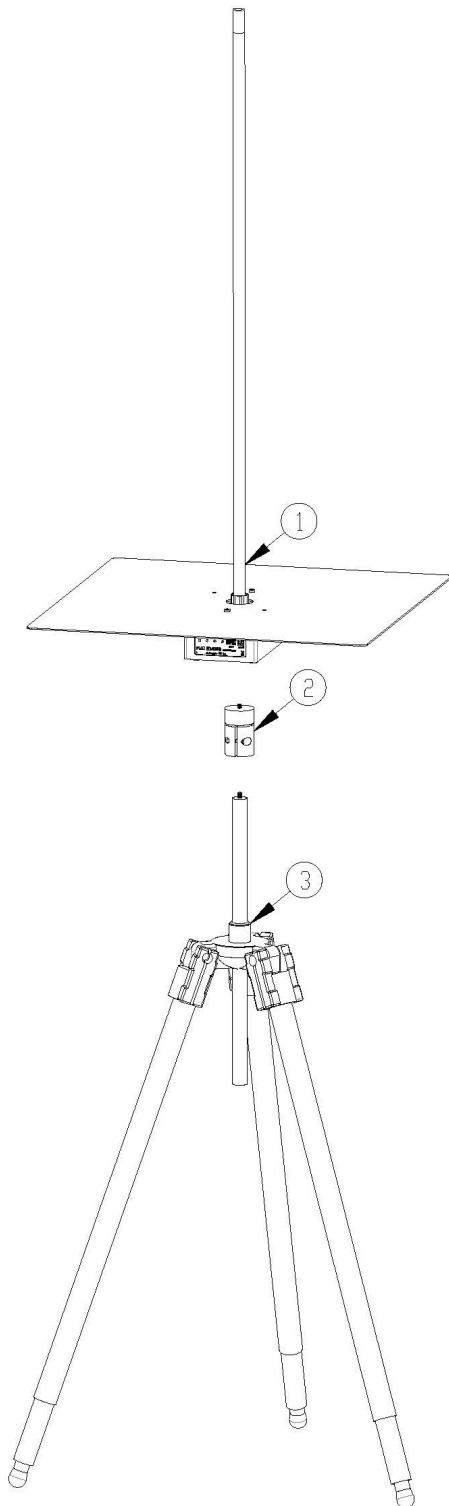
- | | |
|--------------|---------------|
| • Dimensions | Ø160 x 900 mm |
|--------------|---------------|

The Soft carrying case allows to carry the TR-01A Set on the site



Fig. 9-4 Soft carrying case

**9.6.2 FR4003 installation
on TR-01A Wooden
tripod**

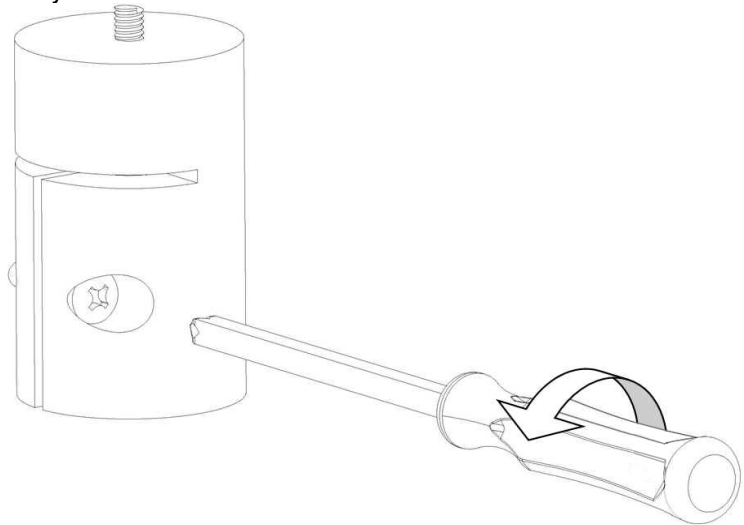


Legend:

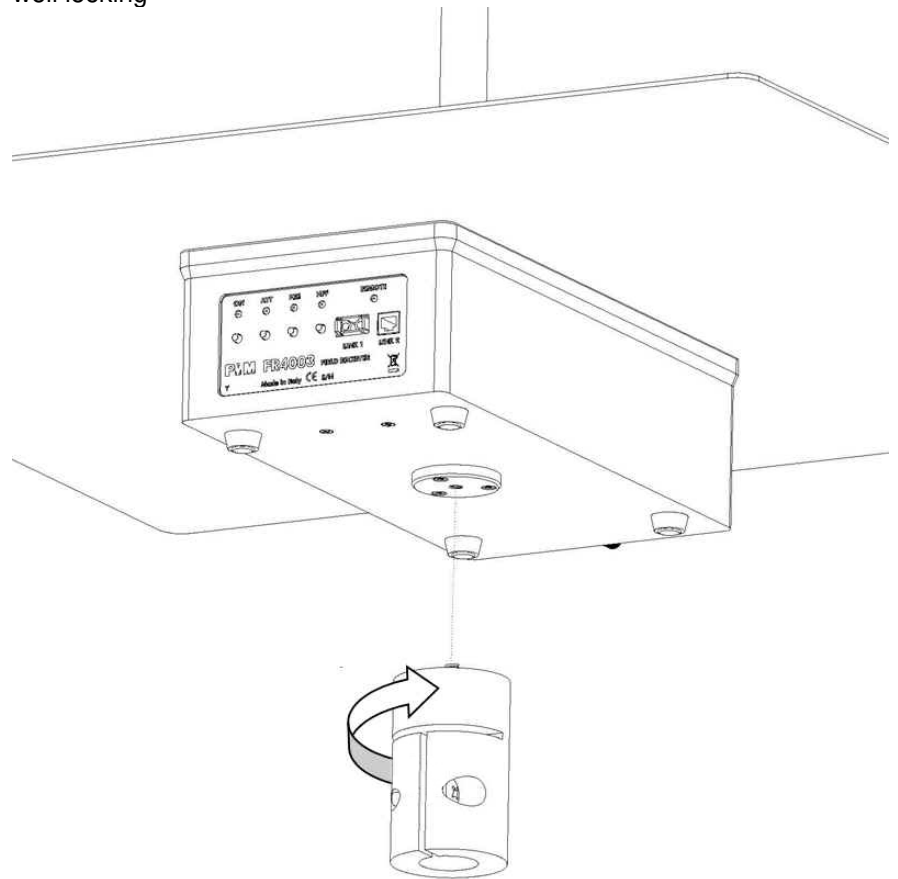
- 1 – FR4003
- 2 – Column strengthener
- 3 – PMM TR01 Wooden Tripod

Fig. 9-5 FR4003 parts and assembly

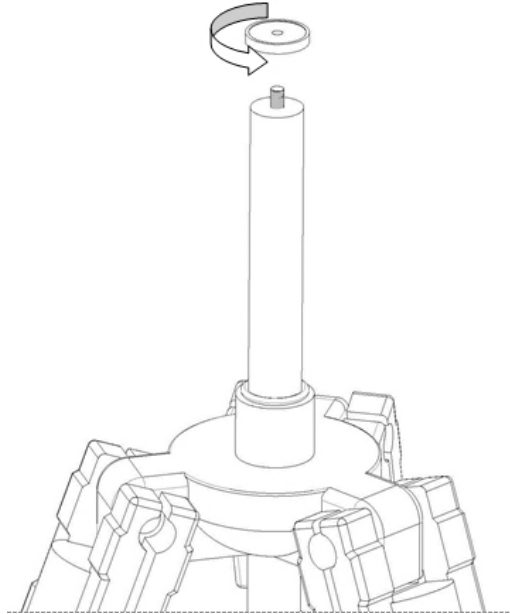
Unscrew the pan-head screw from Column strengthener without losing it completely.



Screw the Column strengthener on the FR4003 bottom; be sure that it is well locking

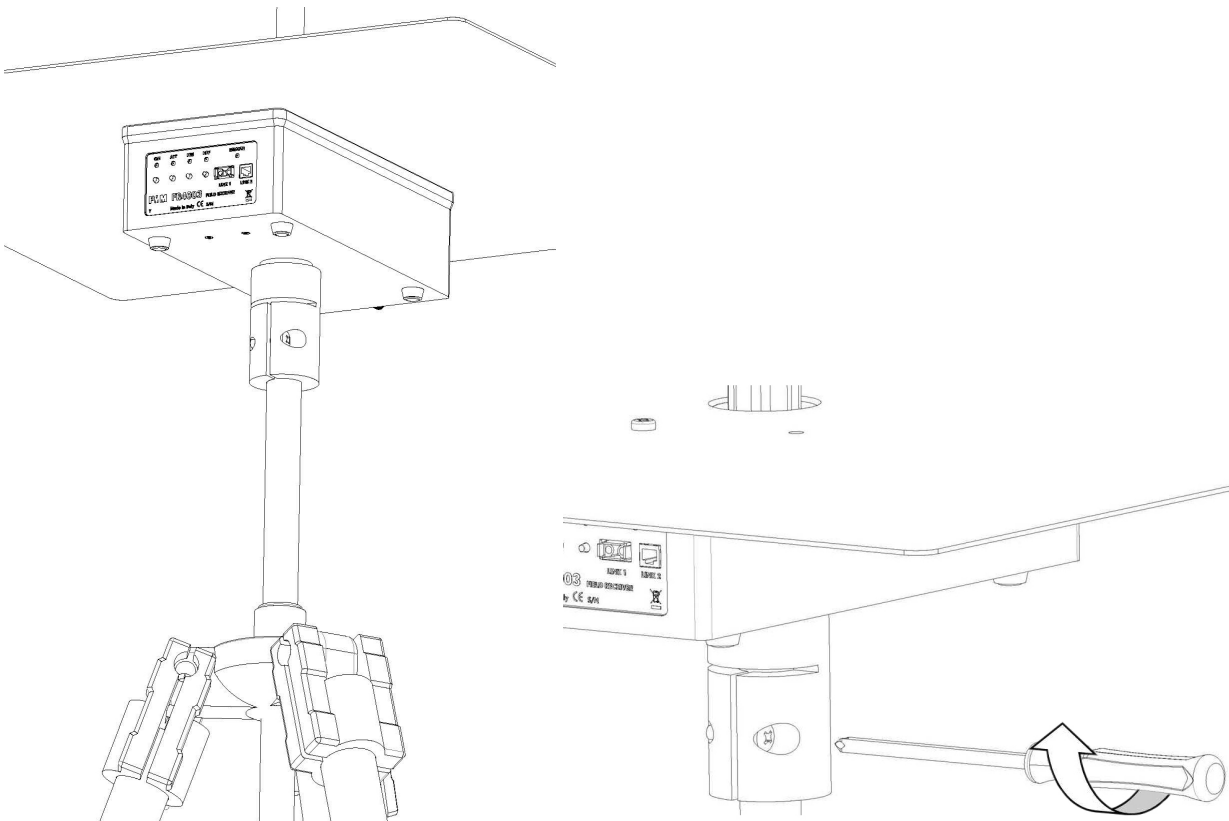


Unscrew the plastic washer removing it completely from the TR-01.



Install the PMM TR-01 Wooden Tripod on the site.

Insert the Column strengthener (fixed to FR4003) on the wooden extension and make sure it is fully inserted, then screw the pan-head screw (be sure that it is well locking).



10 – Packaging Instructions

10.1 Introduction

This section provides the information useful for a correct packaging in case the unit has to be returned for service to the factory or whenever you need to prepare the PMM FR4003 unit for shipment.

The unit includes parts that are sensitive to mechanical shocks as well as heavy ones like the counterpoise. It is therefore suggested to follow carefully the packing instructions to avoid damages due to the shipment.

10.2 Packaging instructions

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

Remove the BP-02 Li-ion battery pack from the receiver.



Insert the receiver and the battery on its cardboard shipping box.



Insert the battery charger and all AC plug adapters into the bag and place it into the carrying case as shown



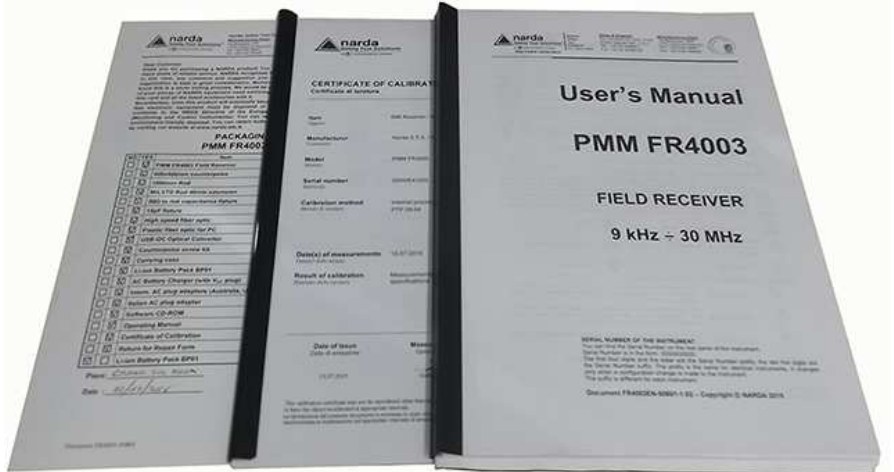
Insert the calibration and counterpoise screw kit, the USB-OC Optical Converter, the 40mm rod extension and Software Media into the bag and place it into the carrying case as shown



Place the 9010F and PC fiber optic into the carrying case as show:



Place the Operating manual, Certificate of Calibration and Packaging Check list into the carrying case as shown:





Close the carrying case.



Place the carrying case on its custom foam insert



Place the 1000 Rod on its custom foam insert



Place the counterpoise on its custom foam insert holding on one side (**do not use the central hole**).





Place the two square foam inserts above the counterpoise and cover all items with the rectangular one .



Close the box with packaging tape.



**L3HARRIS**

NARDA
Safety
Test
Solutions
 S.r.l. Socio Unico

Sales & Support:
 Via Rimini, 22
 20142 - Milano (MI)
 Tel.: +39 02 581881
 Fax: +39 02 58188273

Manufacturing Plant:
 Via Benessea, 29/B
 17035 - Cisano sul Neva (SV)
 Tel.: +39 0182 58641
 Fax: +39 0182 586400

<http://www.narda-sts.it>**Mod. 18-1****Caro cliente**

grazie per aver acquistato un prodotto NARDA! Sei in possesso di uno strumento che per molti anni ti garantirà un'alta qualità di servizio. NARDA riconosce l'importanza del Cliente come ragione di esistenza; ciascun commento e suggerimento, sottoposto all'attenzione della nostra organizzazione, è tenuto in grande considerazione. La nostra qualità è alla ricerca del miglioramento continuo. Se uno dei Suoi strumenti NARDA necessita di riparazione o calibrazione, può aiutarci a servirla più efficacemente compilando questa scheda e accludendola all'apparecchio.

Tuttavia, anche questo prodotto diventerà obsoleto. In questo caso, ti ricordiamo che lo smaltimento dell'apparecchiatura deve essere fatto in conformità con i regolamenti locali. Questo prodotto è conforme alle direttive WEEE dell'Unione Europea (2002/96/EC) ed appartiene alla categoria 9 (strumenti di controllo). Lo smaltimento, in un ambiente adeguato, può avvenire anche attraverso la restituzione del prodotto alla NARDA senza sostenere alcuna spesa. Può ottenere ulteriori informazioni contattando i venditori NARDA o visitando il nostro sito Web www.narda-sts.it.

Dear Customer

thank you for purchasing a NARDA product! You now own a high-quality instrument that will give you many years of reliable service. NARDA recognizes the importance of the Customer as reason of existence; in this view, any comment and suggestion you would like to submit to the attention of our service organization is kept in great consideration. Moreover, we are continuously improving our quality, but we know this is a never ending process. We would be glad if our present efforts are pleasing you. Should one of your pieces of NARDA equipment need servicing you can help us serve you more effectively filling out this card and enclosing it with the product.

Nevertheless, even this product will 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.

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:*

