narda Safety Test Solutions®
an L3 Communications Company
http://www.narda-sts.it

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

Sales & Support:
Via Leonardo da Vinci, 21/23
20090 Segrate (MI) - ITALY
Tel.: +39 02 2699871
Fax: +39 02 26998700

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

User's Manual

PMM 8053B

SYSTEM FOR THE ELECTROMAGNETIC FIELDS MEASUREMENT

SERIAL NUMBER OF THE INSTRUMENT
You can find the Serial Number on the bottom cover of the instrument.
The Serial Number is in the form: 000XY00000.
The first three digits and the two letters 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 8053BEN-20717-3.16 – Copyright © NARDA 2007

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 Users Manual, it may become unsafe

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

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

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

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

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.

KEY TO THE ELECTRIC AND SAFETY SYMBOLS:

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

Warning, danger of electric shock

Earth

Read carefully the Operating Manual and its instructions, pay attention to the safety symbols.

Unit Earth Connection

Earth Protection

Equipotential

KEY TO THE SYMBOLS USED IN THIS DOCUMENT

DANGER — **The DANGER sign draws attention to a potential risk to a person's safety. All the precautions must be fully understood and applied before proceeding.**

WARNING — **The WARNING sign draws attention to a potential risk of damage to the apparatus or loss of data. All the precautions must be fully understood and applied before proceeding.**

CAUTION — **The CAUTION sign draws attention against unsafe practices for the apparatus functionality.**

NOTE: — **The NOTE draw attention to important information.**

Contents

	Page
Safety requirements and instructions…	X
EC Conformity Certificate…	XI

1 General information	**Page**
1.1 Documentation	1-1
1.2 PMM 8053B Introduction	1-1
1.3 Standard accessories	1-1
1.4 Optional accessories	1-1
1.5 Main specifications	1-2
1.6 Field probes	1-3
1.7 Front panel of PMM 8053B	1-40
1.8 Side panel of PMM 8053B	1-40

2 Installation and use	**Page**
2.1 Introduction	2-1
2.2 Preliminary inspection	2-1
2.3 Work environment	2-1
2.4 To return for repair	2-1
2.5 To cleaning the meter	2-1
2.6 To install and use PMM 8053B	2-2
2.7 RF signals of dangerous fields	2-2
2.8 Battery charger	2-2
2.8.1 To substitute the mains connector	2-2
2.8.2 To check the internal batteries	2-3

3 Instructions for use **Page**
3.1 Introduction……..... 3-1
3.2 To switch on…..... 3-1
3.3 Main menu…..... 3-2
3.3.1 Data about the probe…..... 3-3
3.3.2 Status box…..... 3-3
3.3.3 Digital reading…..... 3-4
3.3.4 Analog bar…..... 3-4
3.3.5 Main Function keys…..... 3-5
3.4 UNIT..... 3-5
3.5 MODE..... 3-6
3.5.1 ABS/% Mode……..... 3-6
3.5.2 MIN-MAX/AVG – MIN-MAX/RMS 3-6
3.5.3 PLOT Mode…… 3-7
3.5.4 DATA logger ……..... 3-8
3.5.4.1 To begin storing data…… 3-9
3.5.4.2 To enter a comment…….... 3-11
3.6 To control the LCD display ……..... 3-12
3.7 SET function…..... 3-13
3.7.1 Alarm function…..... 3-14
3.7.2 Linear average AVG or quadratic average RMS..... 3-15
3.7.3 Freq function …….... 3-16
3.7.4 Plot function……..... 3-16
3.7.5 Serial function……..... 3-16
3.7.6 Logger function……..... 3-17
3.7.6.1 Over limit……..... 3-18
3.7.6.2 Manual mode……..... 3-19
3.7.6.3 Data change…….... 3-20
3.7.6.4 1s Fix…….... 3-20
3.7.6.5 xxxs Def…… 3-21
3.7.6.6 xxxs Def LP…… 3-22
3.7.6.7 AVG (RMS) 6 min-6…… 3-22
3.7.6.8 AVG (RMS) 6 min-1…… 3-23
3.7.6.9 Memory property…….... 3-24
3.7.7 Log end function…….... 3-25
3.7.8 Bar function……..... 3-25
3.7.9 Filter function…..... 3-25
3.7.10 Auto OFF function…..... 3-26
3.7.11 Time function…..... 3-26
3.7.12 Date function…..... 3-26

4 Applications **Page**
4.1 What is electrosmog?……..... 4-1
4.2 Observations about the risks 4-1
4.3 Measurement of power distribution lines……..... 4-1
4.4 Measurement of telecommunications transmitters…..... 4-2
4.5 Spatial average..…….... 4-3
4.6 Long-term acquisition…..... 4-3
4.7 dB to % error conversion…….... 4-4

5 Data transfer – 8053 Logger Interface **Page**
5.1 Introduction 5-1
5.2 System requirements 5-1
5.3 Software installation 5-2
5.4 Icon of 8053 Logger Interface software 5-3
5.5 Hardware installation 5-4
5.6 To run the Logger Interface software 5-10
5.7 To transfer data 5-11
5.8 To save data 5-12
5.9 To process data with Word for WINDOWS 5-13
5.10 To process data with EXCEL 5-14

6 Updating Firmware **Page**
6.1 Introduction 6-1
6.2 System requirements 6-1
6.3 To install the software 6-1
6.4 Icon of PMM 8053B software 6-1
6.5 To install the hardware 6-1
6.6 To run the Update software 6-1
6.7 To transfer data 6-2

7 8053-SW02 Data acquisition Software **Page**
7.1 Introduction to 8053-SW02 Software 7-1
7.2 Main specifications 7-2
7.3 Software installation 7-3
7.4 Commands description 7-6
7.5 Tool bar commands 7-8
7.6 Graphic window 7-19
7.7 Status bar 7-20
7.8 Using SW02 with SB-04 7-21
7.8.1 To use more then one SB-04 7-23
7.9 To use GPS module 7-24
7.10 Example of using two probes without GPS 7-36
7.11 Limit activation 7-38
7.12 8053B data downloading 7-39
7.13 Using SW02 with 8053B 7-39
7.13.1 Logger Interface 7-40
7.13.2 Data acquisition 7-41
7.13.3 Limit 7-42

8 EHP-50C, EHP-50E Electric and Magnetic field Analyzer **Page**

8.1 EHP-50C Introduction 8-1
8.1.1 EHP-50C Main Specifications 8-2
8.1.2 Isotropic E&H field analyzer EHP50C typical uncertainty and anisotropy..... 8-3
8.1.2.1 Typical uncertainty of EHP50C 8-3
8.1.2.2 Explication Notes 8-4
8.1.3 Anisotropy 8-5
8.1.4 EHP-50C Panel 8-6
8.1.5 Standard Accessories of PMM EHP-50C 8-6
8.1.6 Optional Accessories of PMM EHP-50C 8-6
8.1.7 Installation of EHP-50C to 8053B 8-7
8.1.8 Battery management 8-8
8.1.9 EHP-50C connected to 8053B 8-9
8.1.10 Avoiding measuring errors 8-10
8.1.11 EHP-50C measuring modes 8-11
8.1.12 Electric or Magnetic fields selection 8-12
8.1.13 MODES of operations 8-12
8.1.14 ABS/% mode 8-12
8.1.15 MIN-MAX/AVG-MIN-MAX/RMS modes 8-13
8.1.16 SPECT Mode 8-13
8.1.17 MARKER function in SPECT mode 8-15
8.1.18 LOGGER function with the MARKER 8-15
8.1.19 Data logger mode 8-16
8.1.20 Power supply - battery recharging of EHP-50C 8-16
8.1.21 Using EHP-50C with a UMPC or PC 8-17
8.2 EHP-50E Introduction 8-18
8.2.1 EHP-50E Main Specifications 8-19
8.2.2 Anisotropy 8-20
8.2.3 EHP-50E Panel 8-21
8.2.4 Standard Accessories of PMM EHP-50E 8-21
8.2.5 Optional Accessories of PMM EHP-50E 8-21
8.2.6 Installation of EHP-50E to 8053B 8-22
8.2.7 EHP-50E connected to 8053B 8-23
8.2.8 Avoiding measuring errors 8-24
8.2.9 EHP-50E measuring modes 8-25
8.2.10 Electric or Magnetic fields selection 8-26
8.2.11 MODES of operations 8-26
8.2.12 ABS/% mode 8-26
8.2.13 MIN-MAX/AVG-MIN-MAX/RMS modes 8-27
8.2.14 SPECT Mode 8-27
8.2.15 MARKER function in SPECT mode 8-29
8.2.16 LOGGER function with the MARKER 8-29
8.2.17 Data logger mode 8-30
8.2.18 Power supply - battery recharging of EHP-50E 8-30
8.2.19 Using EHP-50E with a UMPC or PC 8-31

9 EHP-200A Electric and Magnetic field analyzer **Page**
9.1 Introduction…….. 9-1
9.2 EHP-200A Main specification…..…….. 9-2
9.3 EHP-200A Main specification with 8053B…….. 9-3
9.4 EHP-200A Panel……... 9-4
9.5 EHP-200A Standard accessories…..…..…. 9-4
9.6 EHP-200A Optional accessories.……..…..…. 9-4
9.7 Installation of EHP-200A ……..…. 9-5
9.8 EHP-200A connected to 8053B……..…. 9-6
9.9 Avoiding measurements errors…… 9-7
9.10 Main menù…… 9-8
9.11 To control the LCD display…..…… 9-8
9.12 SET function…… 9-8
9.13 Electric or Magnetic fields selection…… 9-9
9.14 MODES of operation…… 9-9
9.15 ABS% mode…….....…… 9-9
9.16 MIN-MAX/AVG e MIN-MAX/RMS modes.…… 9-9
9.17 FULL SPAN mode…… 9-9
9.18 Data Logger mode…… 9-10
9.19 Power supply and battery recharging of EHP-200A…. 9-11
9.20 Using EHP-200A with a UMPC or Personal computer. 9-12

10 EP600/EP601/EP602 Electric field probe **Page**
10.1 Introduction…… 10-1
10.2 Specifications EP600……... 10-2
10.3 Frequency Response for EP600 ..…… 10-3
10.4 Specifications EP601…… 10-4
10.5 Frequency Response for EP601 ..…… 10-5
10.6 Specifications EP602 …… 10-6
10.7 Frequency Response for EP602 …… 10-7
10.8 Housing and connectors …… 10-8
10.9 Standard accessories…….. 10-8
10.10 Options……... 10-8
10.11 EP600/EP601/EP602 connected to 8053B …… 10-9
10.12 Preventing measurement errors……... 10-11
10.13 Connection of fiber optic extension FO-EP600/10… 10-12
10.14 EP600/EP601/EP602 installation on the conical holder …… 10-13
10.15 EP600/EP601/EP602 installation on tripod PMM TR-02 …… 10-14
10.16 EP600 CHARGER…….. 10-15
10.17 EP600/EP601/EP602 with 8053B ..…… 10-18
10.17.1 Operational modes……..…. 10-18
10.17.2 Preliminary operations…… 10-19
10.17.3 Display of the values of the field…… 10-20
10.17.3.1 ABS/% mode…… 10-20
10.17.3.2 MIN-MAX/AVG and MIN-MAX/RMS…….. 10-20
10.17.4 Graph display data……... 10-21
10.17.4.1 PLOT mode…… 10-21
10.17.5 Store and display data…… 10-21
10.18 Operating PMM EP600/EP601/EP602 with PC …….. 10-22

11 Accessories **Page**
11.1 Introduction…… 11-1
11.2 Preliminary inspection…… 11-1
11.3 Work environment…….. 11-1
11.4 Return for repair…….. 11-1
11.5 Cleaning…… 11-1
11.6 Power supply and battery chargers…….. 11-2
11.7 OR-03 Optical Repeater……..…… 11-3
11.8 USB-OC Optical USB Converter……... 11-7
11.9 8053-OC Optical Converter.....…….…… 11-9
11.10 8053-OC-PS Power Supply……... 11-11
11.11 8053-Cal Calibration Probe.....…….. 11-13
11.12 8053-ZERO Zeroing Calibrator.....…..…..... 11-15
11.13 8053-RT Trigger…….....……..…….. 11-17
11.14 TR-02A Tripod…….....…….. 11-19
11.15 TT-01 Fiber Glass Telescopic Support…… 11-21
11.16 8053-GPS Global Positioning System…….... 11-23
11.17 SB-04 Switching Control Box…..…….. 11-31
11.18 Other accessories…….. 11-37

12 Measuring electromagnetic fields **Page**
12.1 Introduction..... 12-1
12.1.1 Quantities to be considered..... 12-1
12.2 Dosimetric measurements..... 12-1
12.3 Exposure measurements..... 12-1
12.4 Characteristics of the sources..... 12-1
12.5 Measurement apparatus..... 12-1
12.6 General requirements..... 12-2
12.7 Probes..... 12-2
12.8 Cables..... 12-2
12.9 Measurement units..... 12-2
12.10 Broad band apparatus…….. 12-2
12.11 Narrow band apparatus…..…..... 12-2
12.12 Type of apparatus ……..…..... 12-2
12.13 Diode apparatus.....…..... 12-3
12.13.1 Spurious responses.....…..... 12-3
12.14 Bolometric apparatus…..…..... 12-4
12.15 Thermocouple apparatus.....…..... 12-4
12.16 Spurious responses due to the apparatus..... 12-4
12.16.1 Cable coupling……..…..... 12-4
12.16.2 Thermoelectric effect on coupling cables……..... 12-4
12.16.3 Coupling between the probe and conductors..... 12-4
12.16.4 Static fields.....…… 12-5
12.16.5 Outside bandwidth responses..... 12-5
12.16.6 Calibration of the apparatus…..…... 12-5
12.17 Measurement procedures…….... 12-5
12.17.1 Preliminaries..... 12-5
12.17.2 Near fields and far fields…..…….. 12-6
12.17.3 Operational tests of the measurement apparatus... 12-6
12.17.4 Disturbed fields..... 12-6
12.18 Measurement of far fields.....…… 12-6
12.18.1 Initial measurements..... 12-7
12.18.2 Multiple sources..... 12-7
12.18.3 Near radiative fields..... 12-7
12.18.4 Presentation of results…..... 12-7

13 8053B programming commands **Page**
13.1 Introduction…….. 13-1
13.2 List of commands…….. 13-2

Figures

Figure	Page	
1-1	8053B Front panel	1-40
1-2	8053B Side panel	1-40
5-1	8053B link with USB-OC	5-4
5-2	8053B link with 8053-OC	5-4
8-1	EHP-50C Block diagram	8-1
8-2	3D mesh measurements of magnetic probe	8-5
8-3	EHP-50C Panel	8-6
8-4	EHP-50E Panel	8-21
9-1	EHP-200A Panel	9-4
10-1	EP600/EP601/EP602	10-1
10-2	EP600 Frequency Response	10-3
10-3	EP601 Frequency Response	10-5
10-4	EP602 Frequency Response	10-7
10-5	Plastic housing	10-8
10-6	Optical connectors	10-8
10-7	EP600/EP601/EP602 with FO-EP600/10 extension	10-12
10-8	EP600/EP601/EP602 mounted on conical holder	10-13
10-9	EP600/EP601/EP602 on TR-02A	10-14
10-10	EP600/EP601/EP602 on TR-02A with PMM 8053-SN	10-14
10-11	AC adapter	10-15
10-12	EP600 CHARGER	10-15
10-13	EP600 CHARGER components	10-16
10-14	EP600/EP601/EP602 on EP600 CHARGER	10-17
11-1	OR-03 Panel	11-5
11-2	USB-OC Adapters	11-7
11-3	8053-OC Panel	11-9
11-4	8053-OC-PS Connector	11-11
11-5	8053-CAL Connector	11-13
11-6	8053-ZERO Zeroing Calibrator	11-15
11-7	8053-RT Connector	11-18
11-8	TR-02A Tripod	11-19
11-9	TT-01 Fiber Glass Telescopic Support	11-21
11-10	8053-GPS Panel	11-25
11-11	SB-04 Front panel	11-33
11-12	SB-04 Rear panel	11-33

Tables

Table		Page
1-1	Technical Specifications of the 8053B ……	1-2
1-2	Technical Specifications of the Field probes	1-4
7-1	8053-SW02 Requirements and specifications.....	7-2
8-1	Technical Specifications of EHP-50C.....	8-2
8-2	Technical Specifications of EHP-50E.....	8-19
9-1	Technical Specifications of EHP-200A Field Analyzer……..	9-2
9-2	Technical Specifications of EHP-200A Selective probe…...	9-3
10-1	Specifications of the electric field probe EP600……	10-2
10-2	Specifications of the electric field probe EP601……	10-4
10-3	Specifications of the electric field probe EP602……	10-6
10-4	EP600 CHARGER Led status - Start up phase ……	10-17
10-5	EP600 CHARGER Led status - Charger phase ….....	10-17
11-1	Technical Specifications of OR-03.....……	11-3
11-2	Technical Specifications of USB-OC.....	11-7
11-3	Technical Specifications of 8053-OC.....	11-9
11-4	Technical Specifications of 8053-OC-PS.....	11-11
11-5	Technical Specifications of 8053-CAL.....	11-14
11-6	Technical Specification of 8053-ZERO.....	11-16
11-7	Technical Specification of 8053-RT…….....	11-18
11-8	Technical Specifications of TR-02A.....….....	11-19
11-9	Technical Specifications of TT-01.....….....	11-21
11-10	Technical Specifications of 8053-GPS.....	11-24
11-11	Technical Specifications of SB-04.....….....	11-32

SAFETY RECOMMENDATIONS AND INSTRUCTIONS

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

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

EC Conformity Certificate

(in accordance with the ISO/IEC standard 17050-1 and 17050-2**)**

This is to certify that the product: PMM 8053B Portable Field Meter

Produced by: Narda Safety Test Solutions
Via Benessea 29/B
17035 Cisano sul Neva (SV) – ITALY

complies with the following European Standards:
Safety: CEI EN 61010-1 (2001)
EMC: EN 61326-1 (2007)

This product complies with the requirements of Low Voltage Directive 2006/95/CE and with EMC Directive 2004/108/CE.

Narda Safety Test Solutions

1 – General information

1.1 Documentation

The following Appendices are included in this Manual:

- A questionnaire to be sent to NARDA together with the apparatus should service be required.
- A checklist of the Accessories included in the shipment.

This Manual includes the description of the Accessories of the system for the measurement of electromagnetic fields.

1.2 PMM 8053B Introduction

PMM 8053B is a versatile and expandable test system suitable for measuring electric and magnetic fields relating to electrosmog.
The system consists of various electric and magnetic field probes and of a compact and portable meter equipped with a wide LCD display, 4 simple function keys (which allow different actions and settings, in accordance with the selected menu), internal rechargeable batteries and RS232 and fiber optic interfaces. The system also has a wide range of Accessories, which have been designed for all the needs of the tests.

1.3 Standard accessories

The standard accessories included with PMM 8053B are:

- Soft Carrying Case;
- Serial Cable (1.5m long);
- USB-RS232 Converter
- Battery Charger;
- Downloading & firmware update Program Disk;
- 8053-SW02 Data acquisition software
- User's Manual;
- Calibration Certificate;
- Return for Repair Form.

1.4 Optional accessories

The following accessories may be ordered separately:

- FO-8053/10 Fiber Optic Cable (10m);
- FO-8053/20 Fiber Optic Cable (20m);
- FO-8053/40 Fiber Optic Cable (40m);
- FO-8053/80 Fiber Optic Cable (80m);
- FO-10USB Fiber Optic Cable (10m);
- FO-20USB Fiber Optic Cable (20m);
- FO-40USB Fiber Optic Cable (40m);
- TT-01 Fiber Glass Telescopic Support;
- TR-02A Tripod with Swivel;
- OR-03 Programmable Optical Repeater;
- SB-04 Switching Control Box;
- 8053-CC Rigid Carrying Case;
- 8053-CA Car Adapter;
- 8053-BC Additional Battery Charger;
- 8053-OC Optical Converter;
- 8053-OC-PS Power Supply
- USB-OC Optical Converter;
- 8053-GPS GPS Unit;
- 8053-RT Remote Trigger;
- 8053-CAL Calibration Probe;
- 8053-ZERO Zeroing Calibrator for 8053.

1.5 Main specifications

Table 1-1 lists the specifications of PMM 8053B. The specifications of all accessories are listed in the Chapter on Accessories.
The following conditions apply to all specifications:

- Temperature for use must be between -10°C and +40°C.

TABLE 1-1 – Technical Specifications of PMM 8053B General Purpose Field Meter

Frequency Range	
Frequency range	1 Hz - 40 GHz (depending on the probe)
Dynamic range	>140 dB (depending on the probe)
Operating range	|
Resolution	| Depending on the probe (See Table 1-2)
Sensitivity	|
Units	V/m, kV/m, μW/cm², mW/cm², W/m², A/m, nT, μT, mT;
LCD Display	
Field measured	X, Y, Z in absolute values, percent and total.
Time	Internal clock in real time
Probe	Display of the model and date of calibration
Graphic bar	The analog bar displays: - real time value with respect to full scale; - field versus time (in linear or logarithmic form) with automatic time scaling; - alarm threshold.
Measuring function	
Time of complete acquisition (Total time for 3 axes)	150 ms with 80 Hz filter 250 ms with 40 Hz filter 450 ms with 20 Hz filter 900 ms with 10 Hz filter
Internal memory	Up to 32.700 measurements (up to 8.100 standard memory, up to 21.600 extended memory)
Alarm	Variable threshold from 0 to 100% of full scale. Internal sound with blinking symbol on the display and output signal on RS-232 connectors when the level is greater than the alarm threshold
Functions	Minimum, Maximum and Averaging
Averaging mode	Arithmetic, quadratic (RMS), manual, rolling and spatial
Averaging time	Definable 30 sec, 1, 2, 3, 6,10,15, 30 min or manual
Data acquisition (Logger)	Sampling mode (1, 10-900 sec/sample), data change, over the limit, average on 6 min, manual, spectrum (with EHP-50C)
General specifications	
Output	LCD display 72x72mm 128x128 pixel, RS232 (with cable or fiber optic)
Input	Direct through Fischer connector or via fiber optic connector
Internal battery	Rechargeable at NiMH (5 x 1.2 V)
Operational time	24 hours normal mode, 48 hours (in SAVE MODE function: display off)
Recharge time	< 4 hours (15 minutes charge for 1 hour of use)
External power supply	DC, 10 - 15 V, I = about 500 mA
Interfaces	RS232 (remote control, calibration and firmware update)
Software/Firmware	Upgrade available via Internet at the Web site: www.narda-sts.it
Autotest	Automatic during switch-on of all functions; automatically checks every individual diode
Calibration	Inside the built-in E²PROM of the probe
Conformity	With Directives 89/336 and 73/23 and the amendments to them CEI 211-6 and 211-7
Operating temperature	From -10 to +40°C
Storage temperature	From -20 to +70°C
Size (WxHxD)	108 x 240 x 50 mm
Weight	1.07 kg
Tripod support	Threaded insert ¼"

1.6 Field probes

PMM 8053B measurement system is complete with a series of electric and magnetic field probes in the frequency range from 5 Hz to 40 GHz.

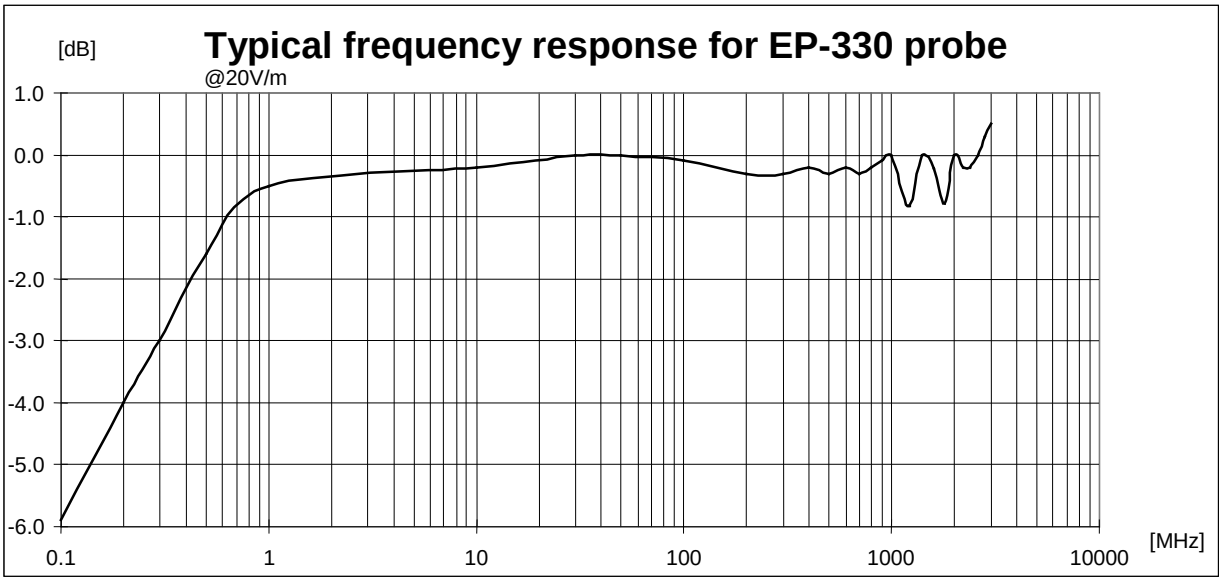
Field Probes	Frequency range	Level range
Electric Field Probe EP-105	100 kHz - 1000 MHz	0.05 - 50 V/m
Electric Field Probe EP-300	100 kHz - 3 GHz	0.1 - 300 V/m
Electric Field Probe EP-330	100 kHz - 3 GHz	0.3 - 300 V/m
Electric Field Probe EP-301	100 kHz - 3 GHz	1 - 1000 V/m
Electric Field Probe EP-333	100 kHz – 3.6 GHz	0.15 - 300 V/m
Electric Field Probe EP-183	1 MHz – 18 GHz	0.8 - 800 V/m
Electric Field Probe EP-408	1 MHz – 40 GHz	0.8 - 800 V/m
Electric Field Probe EP-44M	100 kHz - 800 MHz	0.25 - 250 V/m
Electric Field Probe EP-33M	700 MHz - 3 GHz	0.3 - 300 V/m
Electric Field Probe EP-33A	925 MHz - 960 MHz	0.03 - 30 V/m
Electric Field Probe EP-33B	1805 MHz - 1880 MHz	0.03 - 30 V/m
Electric Field Probe EP-33C	2110 MHz - 2170 MHz	0.03 - 30 V/m
Electric Field Probe EP-201	60 MHz – 12 GHz	3 – 500 V/m
Electric Field Probe EP-600	100 kHz – 9.25 GHz	0.14 – 140 V/m
Electric Field Probe EP-601	10 kHz – 9.25 GHz	0.5 – 500 V/m
Electric Field Probe EP-602	5 kHz – 9.25 GHz	1.5 – 1500 V/m
Electric Field Probe EP-645	100 kHz – 6.5 GHz	0.35 – 450 V/m
Electric Field Probe EP-745	100 kHz – 7 GHz	0.35 – 450 V/m
Magnetic Field Probe HP-032	0.1 - 30 MHz	0.01 - 20 A/m
Magnetic Field Probe HP-102	30 - 1000 MHz	0.01 - 20 A/m
Magnetic Field Probe HP-050	10 Hz – 5 kHz	10 nT – 40 μT
Magnetic Field Probe HP-051	10 Hz – 5 kHz	50 nT – 200 μT
Electric and Magnetic Field Analyzers EHP-50C	5 Hz – 100 kHz	10 mV/m – 100 kV/m 1 nT – 10 mT
Electric and Magnetic Field Analyzers EHP-50E	1 Hz – 400 kHz	5 mV/m – 100 kV/m 0.3 nT – 10 mT
Electric and Magnetic Field Analyzers EHP-200A	9 kHz – 30 MHz (*)	0.1 V/m – 1000 V/m 3 mA/m – 300 A/m (*)

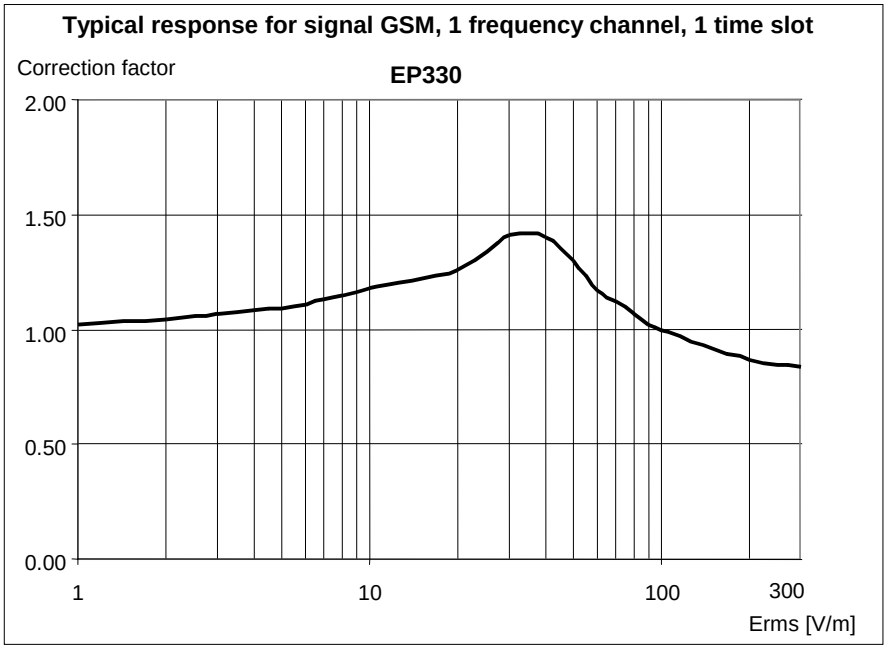
(*) The values depends on the setting of the magnetic field. See EHP200A specifications.

TABLE 1-2 Technical Specifications of the Field Probes

ELECTRIC FIELD PROBE EP-330

Frequency range	100 kHz - 3 GHz
Level range	0.3 - 300 V/m
Overload	> 600 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.3 V/m
Absolute error @ 50 MHz 20 V/m	± 0.8 dB
Flatness (10 - 300 MHz)	± 0.5 dB
Flatness (3 MHz - 3 GHz)	± 1.5 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB @ 930 and 1800 MHz)
H-field rejection	>20 dB
Temperature error	20°C ÷ 60°C = ±0.1 dB 0°C ÷ 20°C = -0.05 dB/°C -20°C ÷ 0°C = -0.15 dB/°C
Calibration	Internal into E^2PROM
Size	317 mm length, 58 mm diameter
Weight	100 g

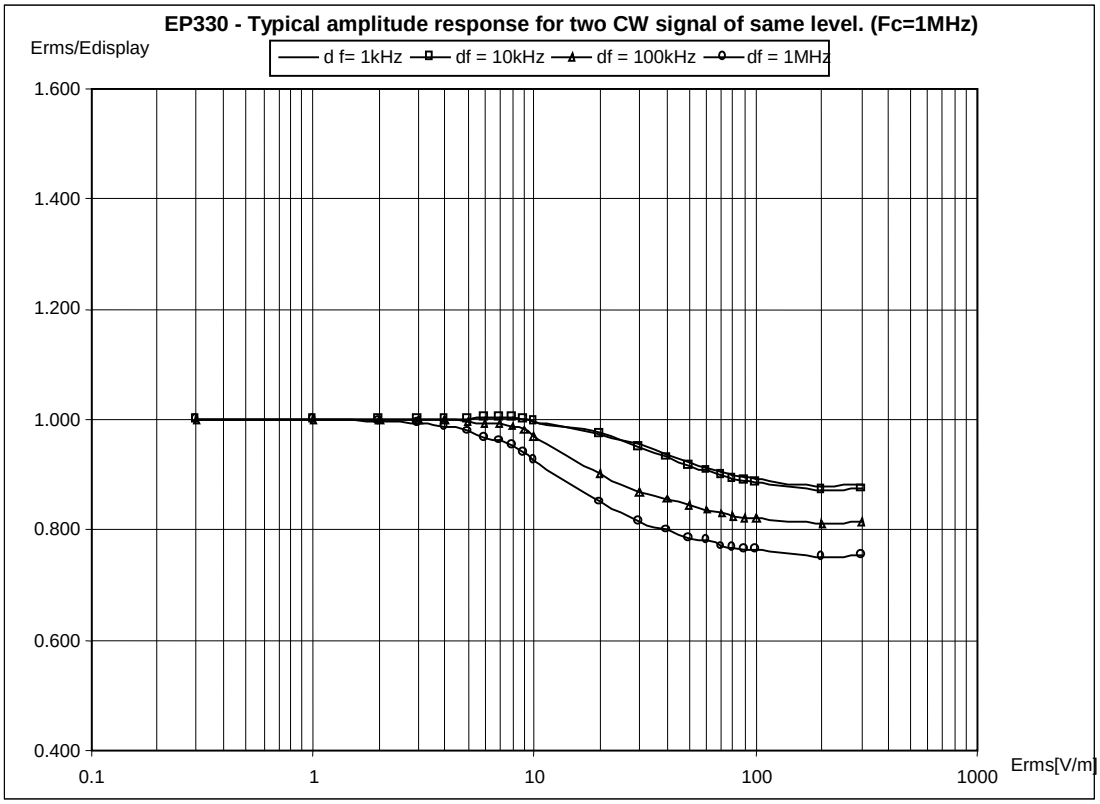




Erms [V/m]	Edisplay [V/m]	Correction factor
1	0.98	1.02
2	1.91	1.05
3	2.82	1.06
4	3.70	1.08
5	4.58	1.09
6	5.40	1.11
7	6.17	1.13
8	6.96	1.15
9	7.75	1.16
10	8.50	1.18
20	15.84	1.26
30	21.3	1.41
40	28.6	1.40
50	38.5	1.30
60	51.3	1.17
70	62.5	1.12
80	75.1	1.07
90	88.1	1.02
100	99	1.01
200	227	0.88
300	361	0.83

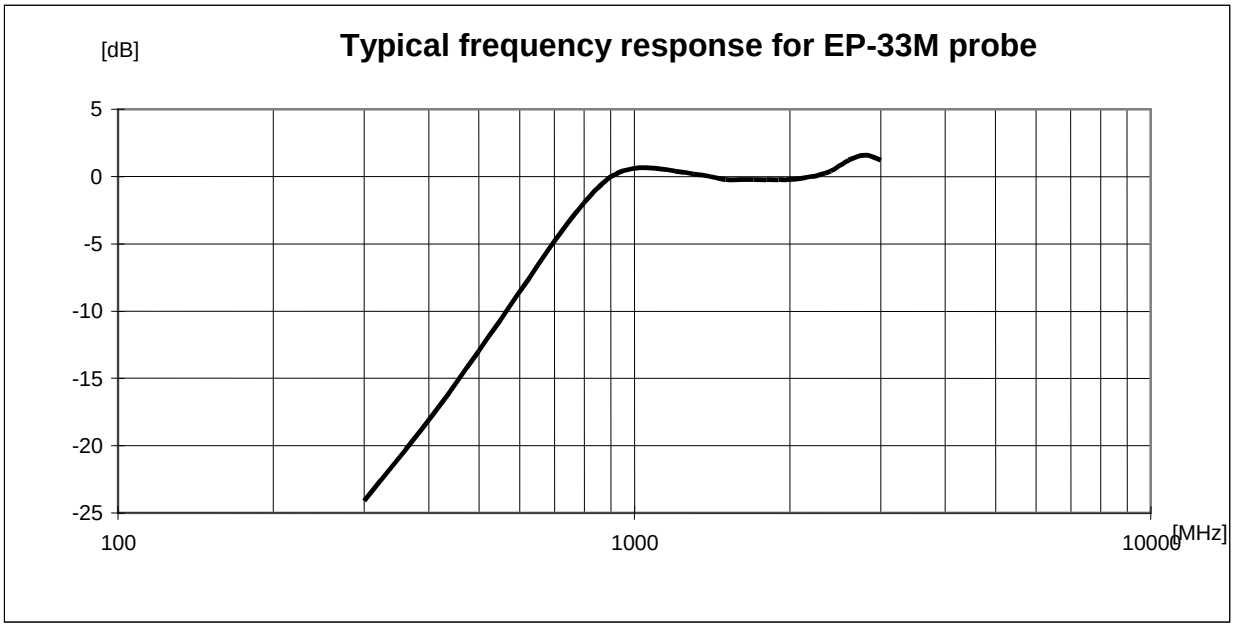
WARNING

This test is carried out with a signal currently used in laboratory for maximize the reading error to make a comparison of the performances of the probe with a common base.
Actually the radiobase station use eight time slots of each channel so the effective error of the measurement is negligible.


EP330 - Typical amplitude response for two CW signal of same level. (Fc=1MHz)
Erms/Edisplay
d f= 1kHz
df = 10kHz
df = 100kHz
df = 1MHz
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.1
1
10
100
1000
Erms[V/m]

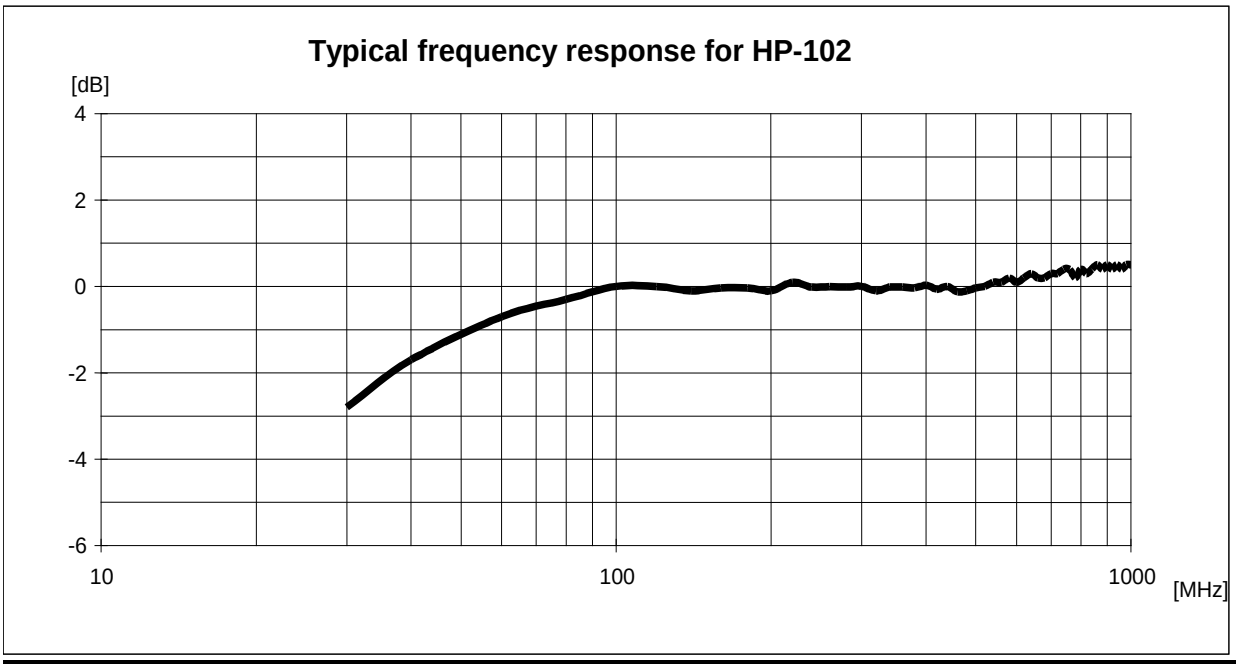
ELECTRIC FIELD PROBE EP-33M

Frequency range	700 MHz - 3 GHz
Level range	0.3 - 300 V/m
Overload	> 600 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.3 V/m
Absolute error @ 930 MHz 20 V/m	± 1 dB
Flatness (900 MHz - 3 GHz)	± 1.5 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB @ 930 and 1800 MHz)
H-field rejection	> 20 dB
Temperature error	0.05 dB/°C
Calibration	Internal into E^2PROM
Size	317 mm length, 58 mm diameter
Weight	100 g



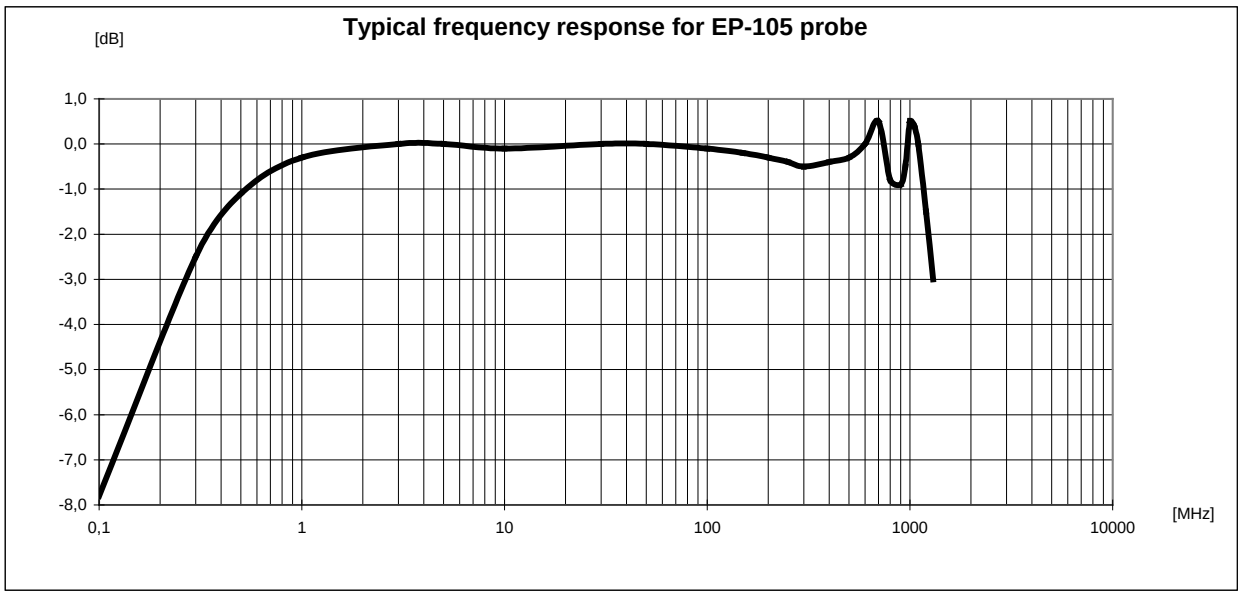
MAGNETIC FIELD PROBE HP-102

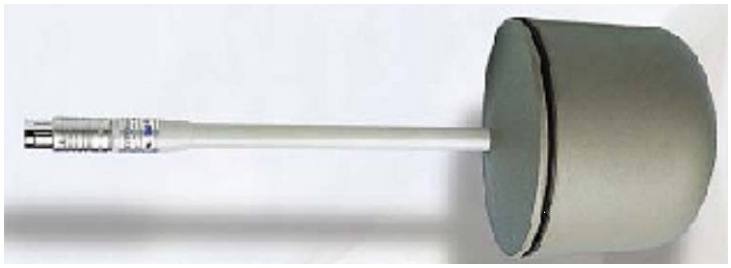
Frequency range	30 - 1000 MHz
Level range	0.01 - 20 A/m
Overload	> 40 A/m
Dynamic range	> 60 dB
Resolution	1 mA/m
Sensitivity	0.01 A/m
Absolute error @ 50 MHz 2 A/m	± 1 dB
Flatness (50 - 900 MHz)	± 1 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB @ 930 MHz)
E-field rejection	> 20 dB
Temperature error	0.05 dB/°C
Calibration	Internal into E^2PROM
Size	317 mm length, 58 mm diameter
Weight	110 g



ELECTRIC FIELD PROBE EP-105

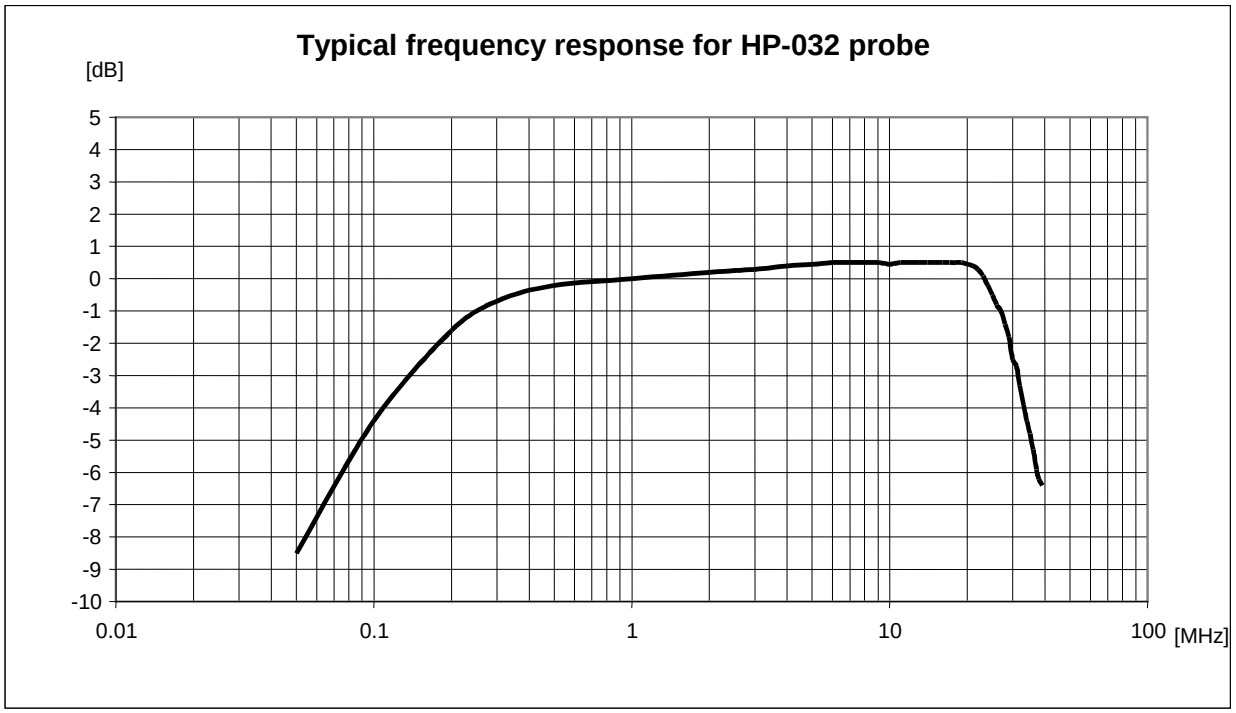
Frequency range	100 kHz - 1000 MHz
Level range	0.05 - 50 V/m
Overload	> 100 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.05 V/m
Absolute error @ 50 MHz 6 V/m	± 0.8 dB
Flatness (10 - 300 MHz)	± 0.5 dB
Flatness (300 kHz - 1 GHz)	± 1 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB @ 930 MHz)
H-field rejection	> 20 dB
Temperature error	0.05 dB/°C
Calibration	Internal into E^2PROM
Size	350 mm length, 133 mm diameter
Weight	290 g

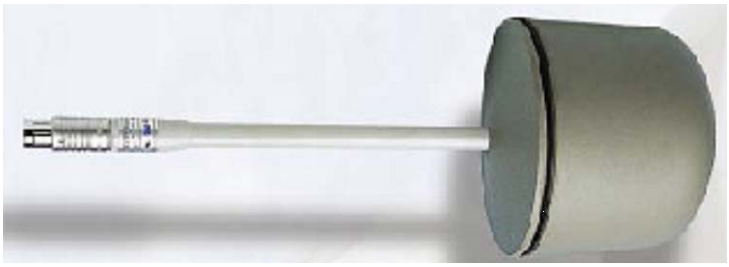




MAGNETIC FIELD PROBE HP-032

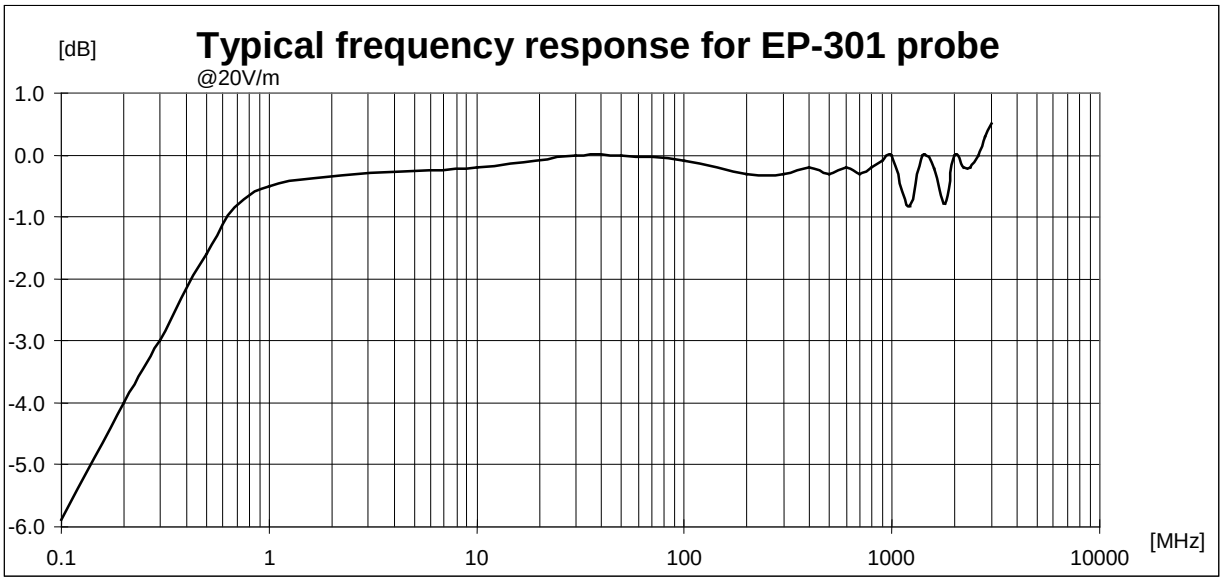
Frequency range	0.1 - 30 MHz
Level range	0.01 - 20 A/m
Overload	> 40 A/m
Dynamic range	> 60 dB
Resolution	1 mA/m
Sensitivity	0.01 A/m
Absolute error @ 1 MHz 2 A/m	± 1 dB
Flatness (1 -25 MHz)	± 1 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB @ 1 MHz)
E-field rejection	> 20 dB
Temperature error	0.05 dB/°C
Calibration	Internal into E^2PROM
Size	350 mm length, 133 mm diameter
Weight	400 g





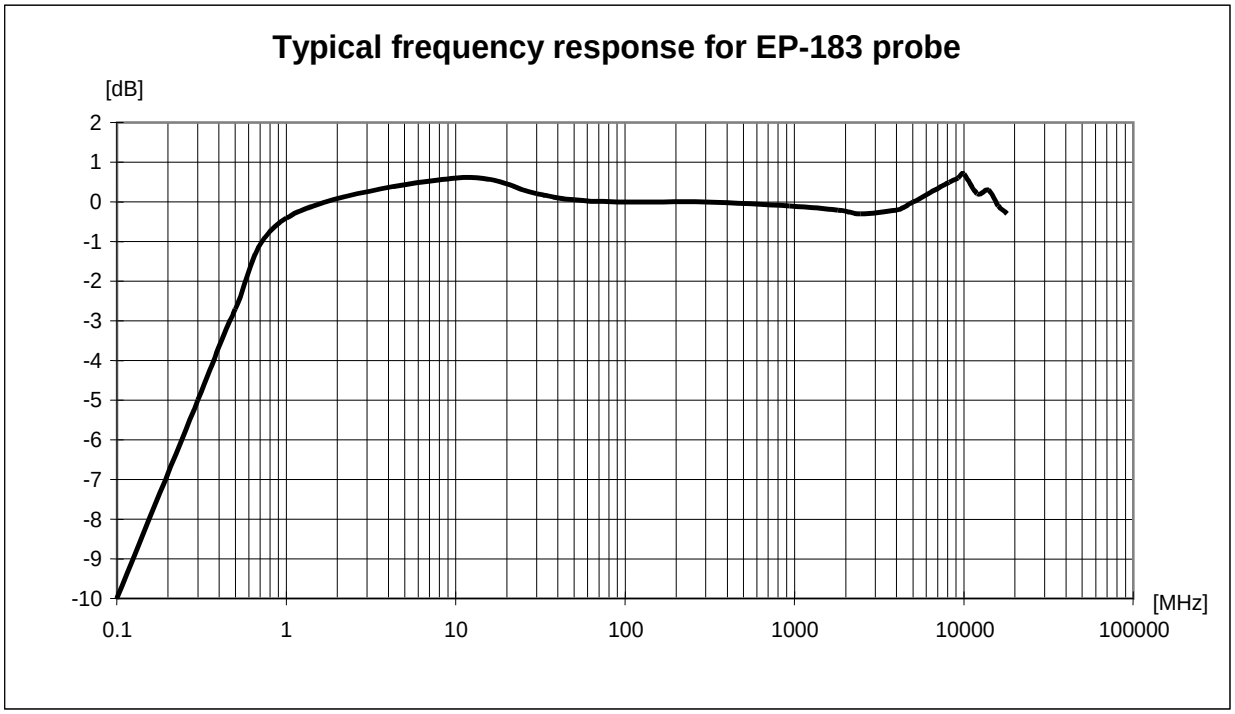
ELECTRIC FIELD PROBE EP-301

Frequency range	100 kHz - 3 GHz
Level range	1 – 1000 V/m
Overload	> 1200 V/m
Dynamic range	> 60 dB
Resolution	0.1 V/m
Sensitivity	1 V/m
Absolute error @ 50 MHz 20 V/m	± 0.8 dB
Flatness (10 - 300 MHz)	± 0.5 dB
Flatness (3 MHz - 1 GHz)	± 1.5 dB
Isotropicity	± 0.8 dB (Typical ± 0.5 dB @ 930 and 1800 MHz)
H-field rejection	> 20 dB
Temperature error	0.05 dB/°C
Calibration	Internal into E^2PROM
Size	317 mm length, 58 mm diameter
Weight	100 g



ELECTRIC FIELD PROBE EP-183

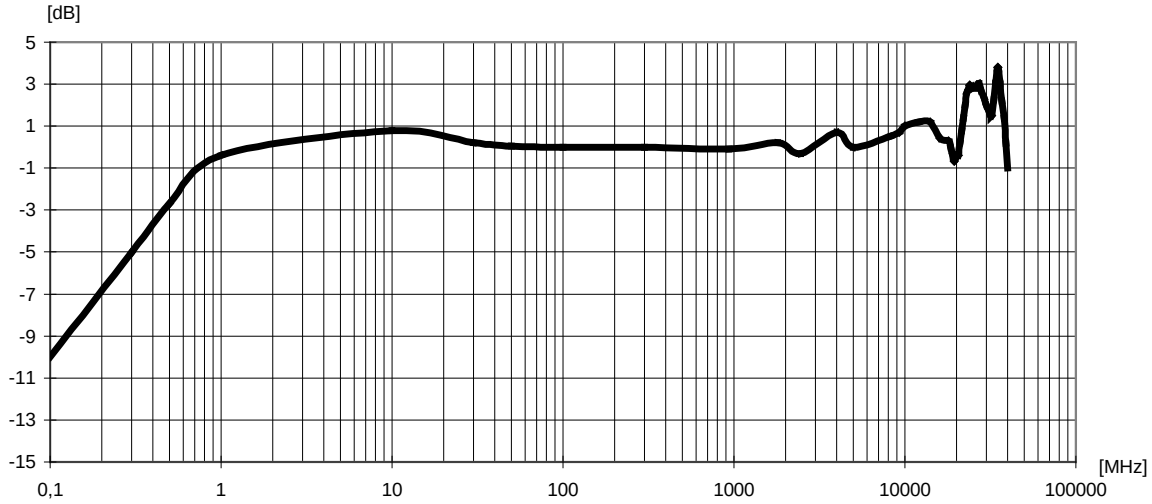
Frequency range	1 MHz - 18 GHz
Level range	0.8 - 800 V/m
Overload	> 1200 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.8 V/m
Absolute error @ 200 MHz 6 V/m	± 0.8 dB
Flatness (1 MHz - 1 GHz)	± 1.5 dB
Flatness (1 - 3 GHz)	± 2.0 dB
Flatness (3 - 18 GHz)	± 2.5 dB
Isotropicity @ 200 MHz	± 0.8 dB (typical ± 0.5 dB @ 930 and 1800 MHz)
H-field rejection	> 20 dB
Temperature error	0.02 dB/°C
Calibration	Internal into E^2PROM
Size	317 mm length, 50 mm diameter
Weight	90 g



ELECTRIC FIELD PROBE EP-408

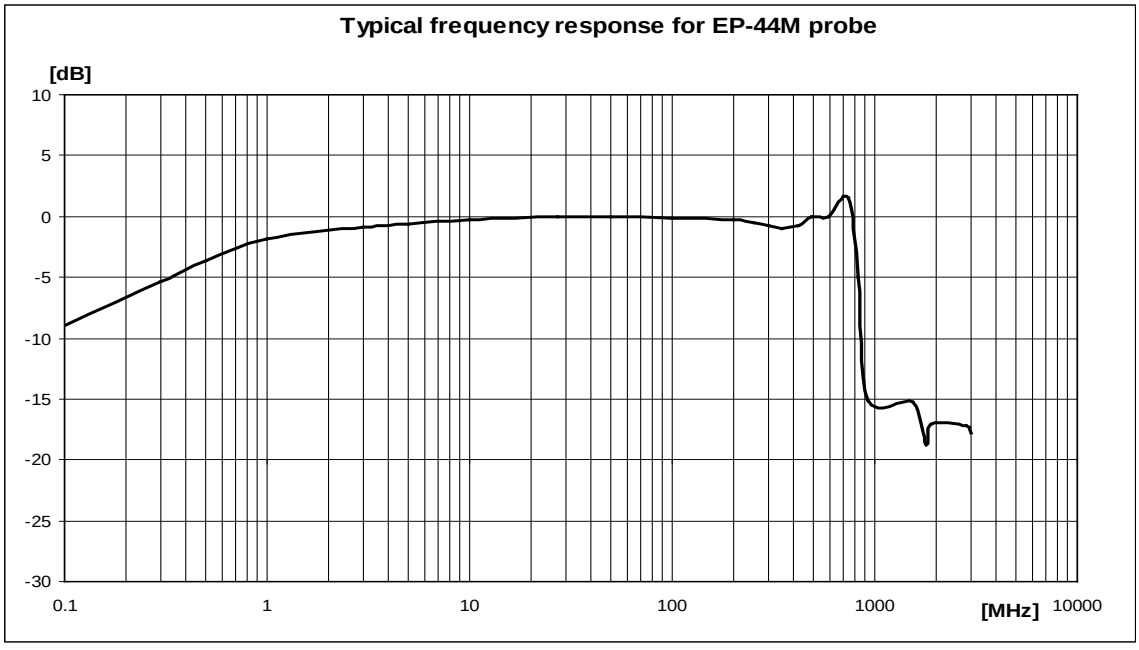
Frequency range	1 MHz - 40 GHz
Level range	0.8 - 800 V/m
Overload	> 1000 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.8 V/m
Absolute error @ 200 MHz 6 V/m	± 0.8 dB
Flatness (1 MHz - 1 GHz)	± 1.5 dB
Flatness (1 - 3 GHz)	± 2 dB
Flatness (3 - 18 GHz)	± 2.5 dB
Flatness (18 - 26.5 GHz)	± 3 dB
Flatness (26.5 - 40 GHz)	± 4 dB
Isotropicity @ 200 MHz	± 0.8 dB (typical ± 0.5 dB @ 930 and 1800 MHz)
H-field rejection	> 20 dB
Temperature error	0.02 dB/°C
Calibration	internal into E^2PROM
Size	317 mm length, 52 mm diameter
Weight	90 g

Typical frequency response for EP-408 probe



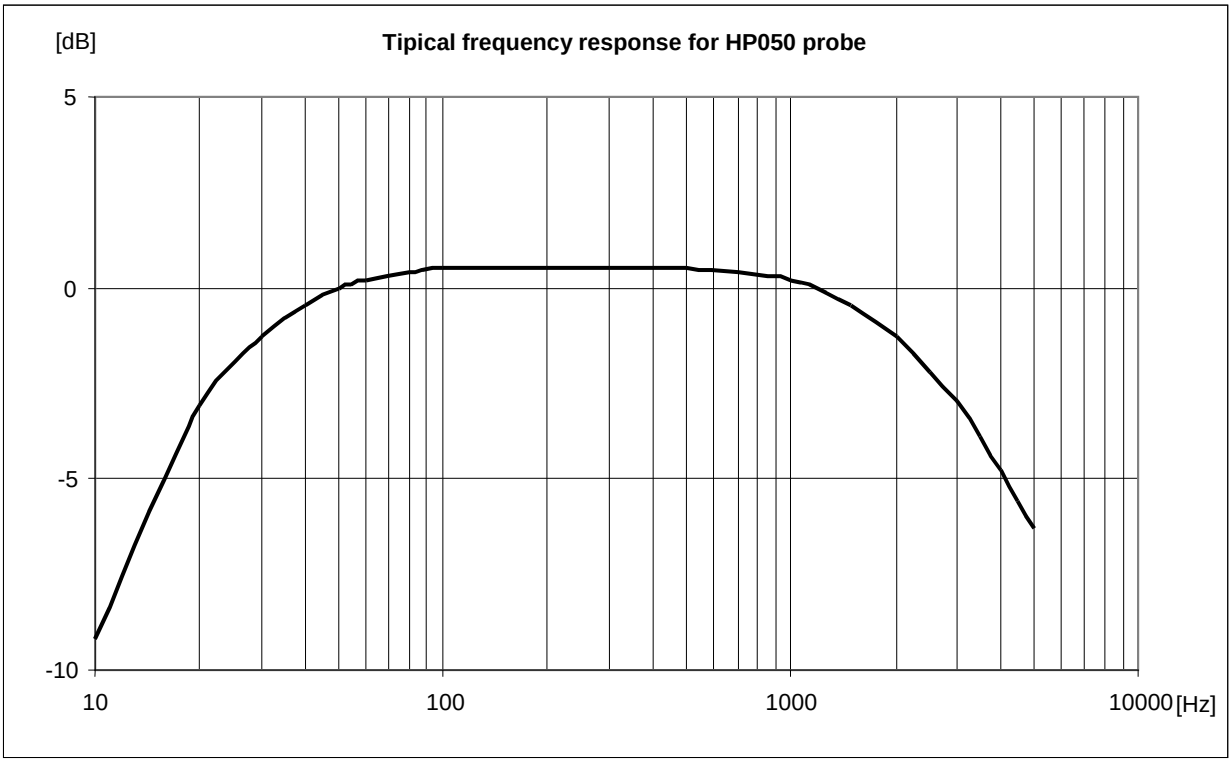
ELECTRIC FIELD PROBE EP-44M

Frequency range	100 kHz - 800 MHz
Level range	0.25 - 250 V/m
Overload	> 500 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.25 V/m
Absolute error @ 50 MHz and 6 V/m	± 0.8 dB
Flatness	
(10 MHz - 200 MHz)	± 1.5 dB (typical ± 0.8 dB)
(200 MHz - 800 MHz)	± 2.0 dB (typical ± 1.5 dB)
Isotropicity	± 0.8 dB (typical ± 0.5 dB @ 740 MHz)
Out band attenuation respect to 50 MHz	
900 MHz – 3 GHz	> 12 dB (typical >15 dB)
H-field rejection	> 20 dB
Temperature error	0.02 dB/°C
Calibration	Internal into E^2PROM
Size	317 mm length, 58 mm diameter
Weight	100 g



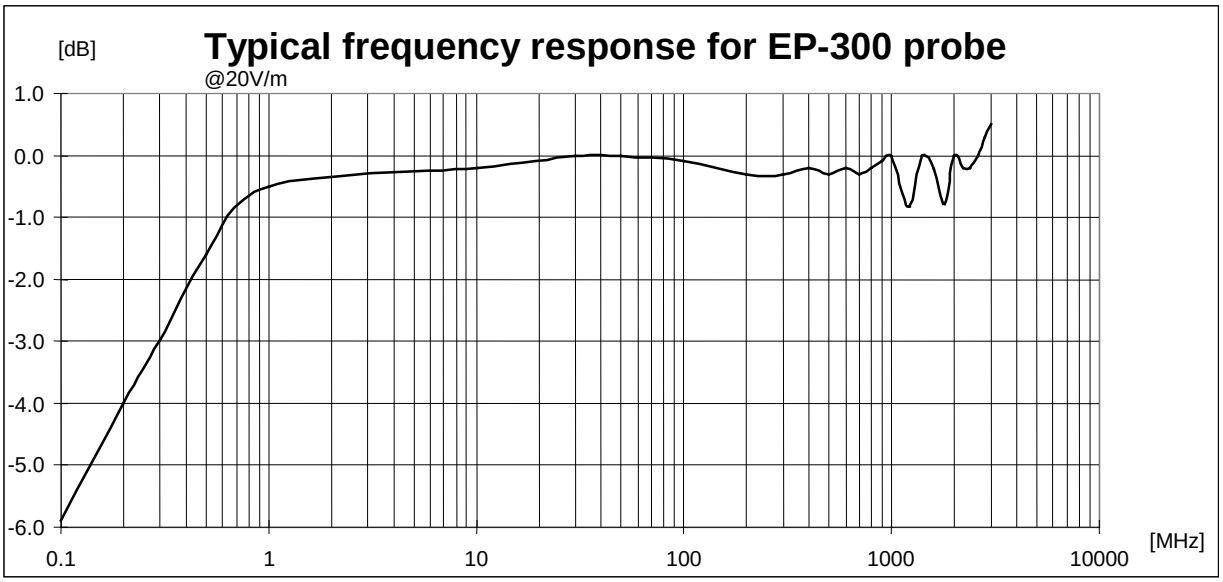
MAGNETIC FIELD PROBE HP-050

Frequency range	10 Hz – 5 kHz
Level range	10 nT – 40 µT
Overload	400 µT
Dynamic range	> 72 dB
Resolution	1 nT
Sensitivity	10 nT
Absolute error @ 50 Hz 200 nT 25 °C	± 0.4 dB
Flatness (40 Hz – 1kHz)	± 1 dB
Isotropicity @ 50 Hz 200 nT	± 0.3 dB
Electric field rejection	> 20 dB
Temperature error	0.015 dB/°C
Calibration	Internal into E^2PROM
Size	350 mm length, 133 mm diameter
Weight	400 g



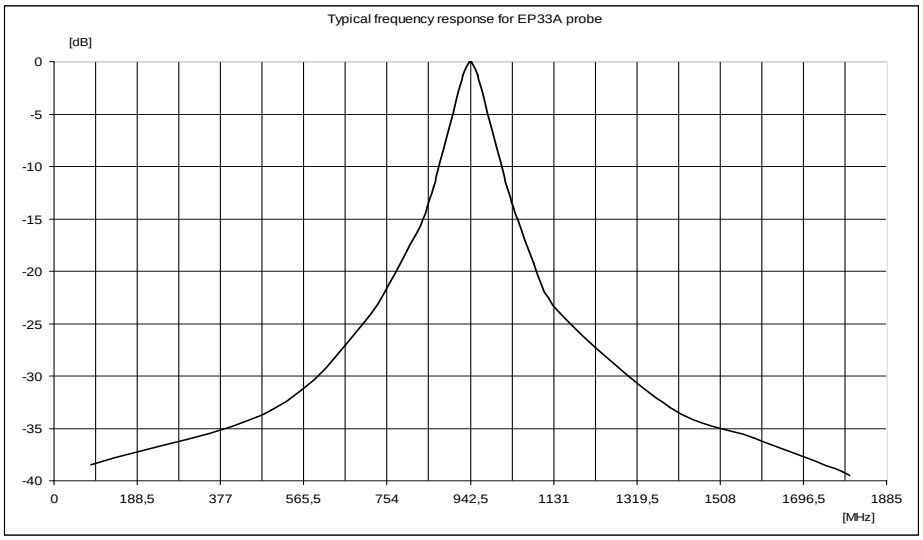
ELECTRIC FIELD PROBE EP-300

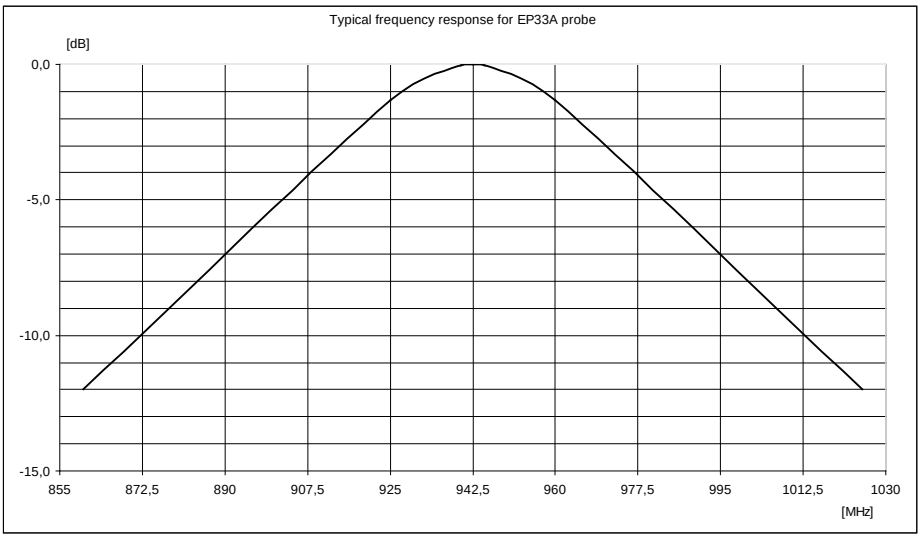
Frequency range	100 kHz - 3 GHz
Level range	0.1 - 300 V/m
Overload	> 600 V/m
Dynamic range	> 66 dB (typical >70 dB)
Resolution	0.01 V/m
Sensitivity	0.15 V/m (typical >0.1V/m)
Absolute error @ 50 MHz 20 V/m	± 0.8 dB
Flatness (10 - 300 MHz)	± 0.5 dB
Flatness (3 MHz - 3 GHz)	± 1.5 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB @ 930 and 1800 MHz)
H-field rejection	>20 dB
Temperature error	20°C ÷ 60°C = ± 0.1 dB 0°C ÷ 20°C = -0.05 dB/°C -20°C ÷ 0°C = -0.15 dB/°C
Calibration	Internal into E^2PROM
Size	317 mm length, 58 mm diameter
Weight	100 g

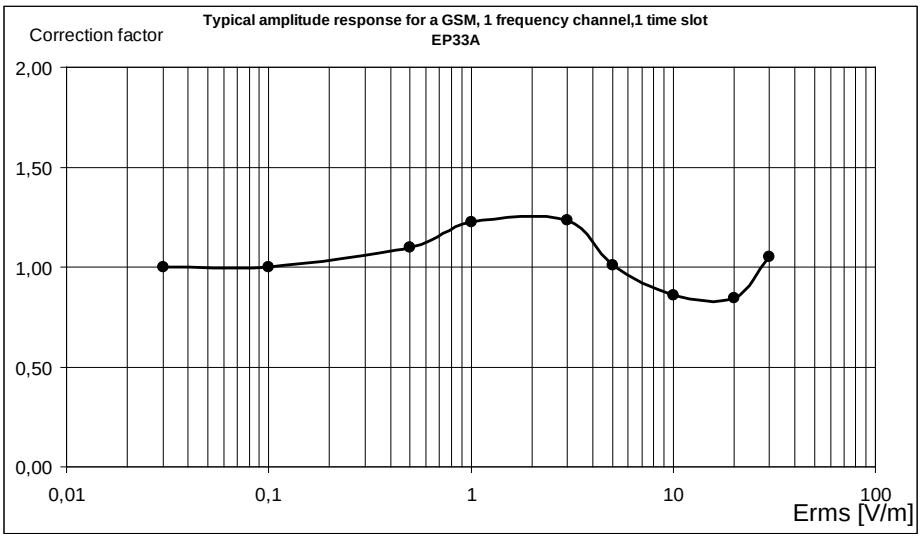


ELECTRIC FIELD PROBE EP-33A

Frequency range	925 MHz - 960 MHz
Level range	0.03 – 30 V/m
Overload	> 120 V/m
Dynamic range	> 60 dB
Resolution	0.001 V/m
Sensitivity	0.03 V/m
Absolute error @ 942.5 MHz and 2 V/m	± 1 dB
Flatness (925 - 960 MHz)	+ 0.2 dB / -1.8 dB
OFF Band attenuation respect to 942.5 MHz	
860 MHz	> 10 dB
1025 MHz	> 10 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB)
Rejection to H field	> 20 dB
Temperature error	0°C ÷ 60°C = ± 0.2 dB
	-20°C ÷ 0°C = -0.1 dB/°C
Drift Frequency Vs Temperature	40°C ÷ 60°C = ± 100 kHz
	-20°C ÷ 40°C = -100 kHz/°C
Calibration	E^2PROM internal
Size	317 mm length, 58 mm diameter
Weight	100 g





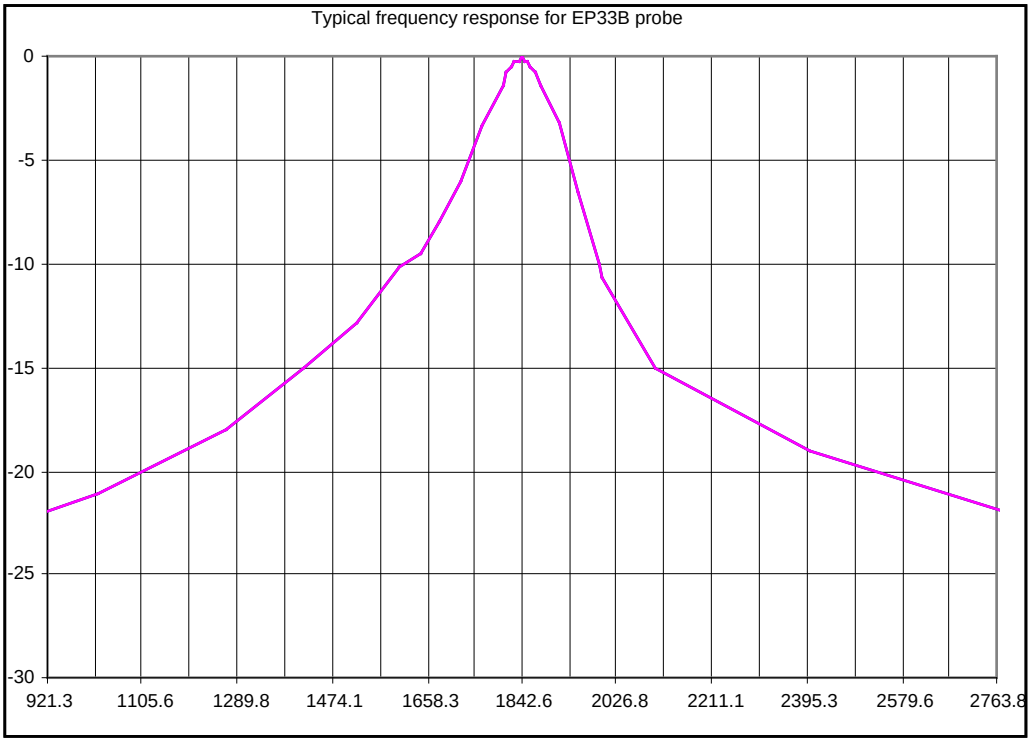


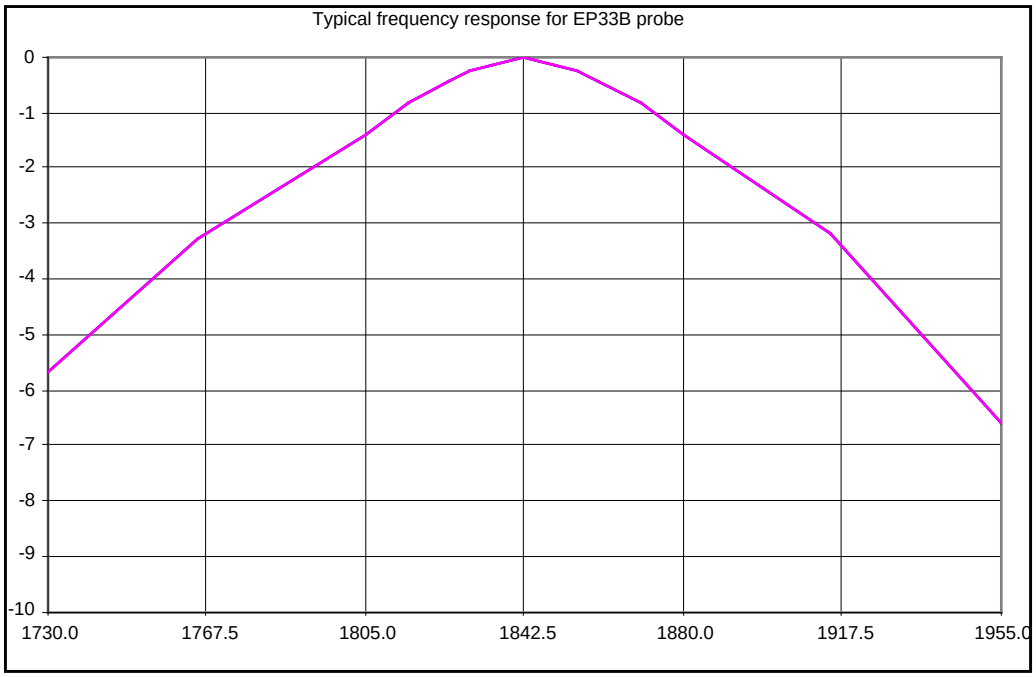
WARNING

This test is carried out with a signal currently used in laboratory for maximize the reading error to make a comparison of the performances of the probe with a common base.
Actually the radiobase station use eight time slots of each channel so the effective error of the measurement is negligible.

ELECTRIC FIELD PROBE EP-33B

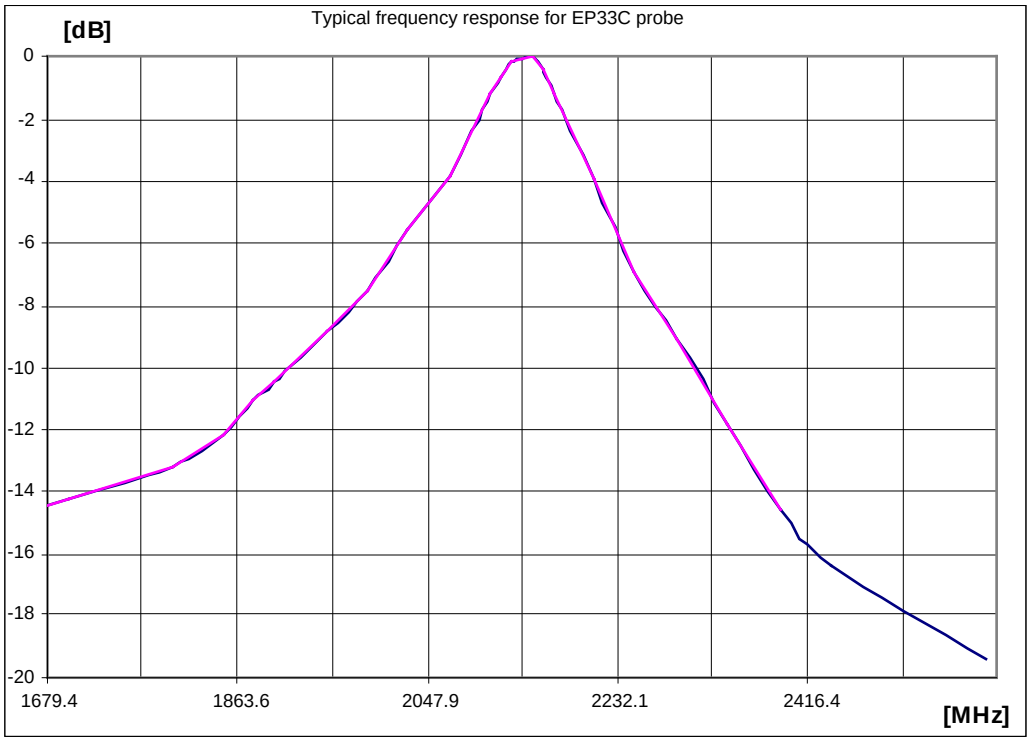
Frequency range	1805 MHz – 1880 MHz
Level range	0.03 – 30 V/m
Overload	> 120 V/m
Dynamic range	> 60 dB
Resolution	0.001 V/m
Sensitivity	0.03 V/m
Absolute error @ 1842.5 MHz and 2 V/m	± 1 dB
Flatness (1805 - 1880 MHz)	+ 0.2 dB / -1.8 dB
OFF Band attenuation respect to 1842.5 MHz	
1580 MHz	> 10 dB
2010 MHz	> 10 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB)
Rejection to H field	> 20 dB
Temperature error	0°C ÷ 60°C = ± 0.2dB
	-20°C ÷ 0°C = -0.1 dB/°C
Drift Frequency Vs Temperature	40°C ÷ 60°C = ± 100 kHz
	-20°C ÷ 40°C = -100 kHz/°C
Calibration	E^2PROM internal
Size	317 mm length, 58 mm diameter
Weight	100 g

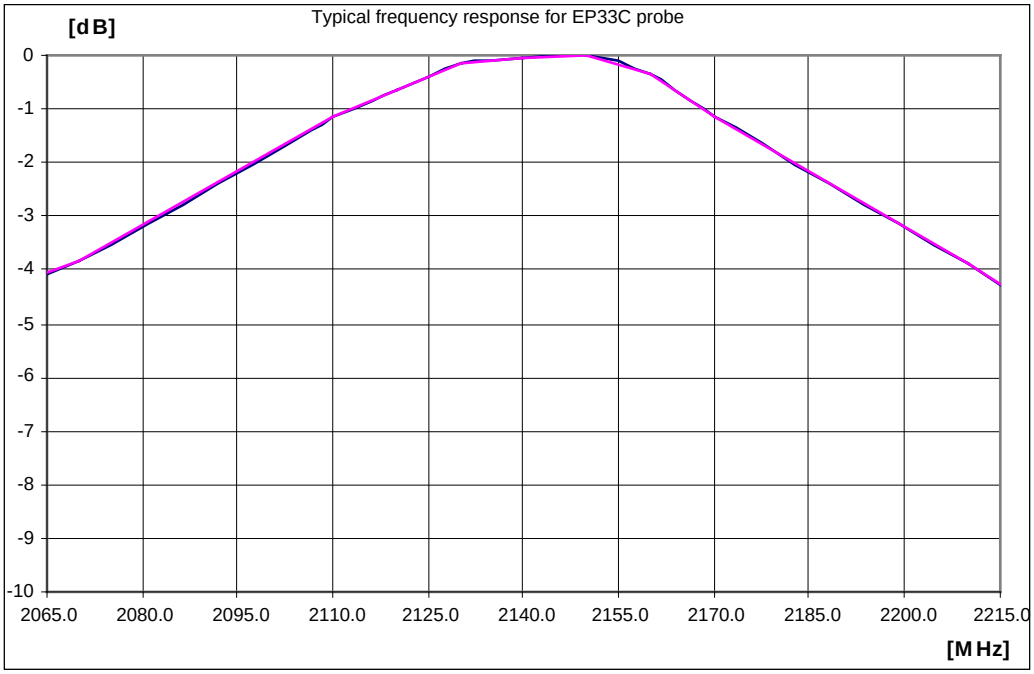



Typical frequency response for EP33B probe
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
1730.0
1767.5
1805.0
1842.5
1880.0
1917.5
1955.0

ELECTRIC FIELD PROBE EP-33C

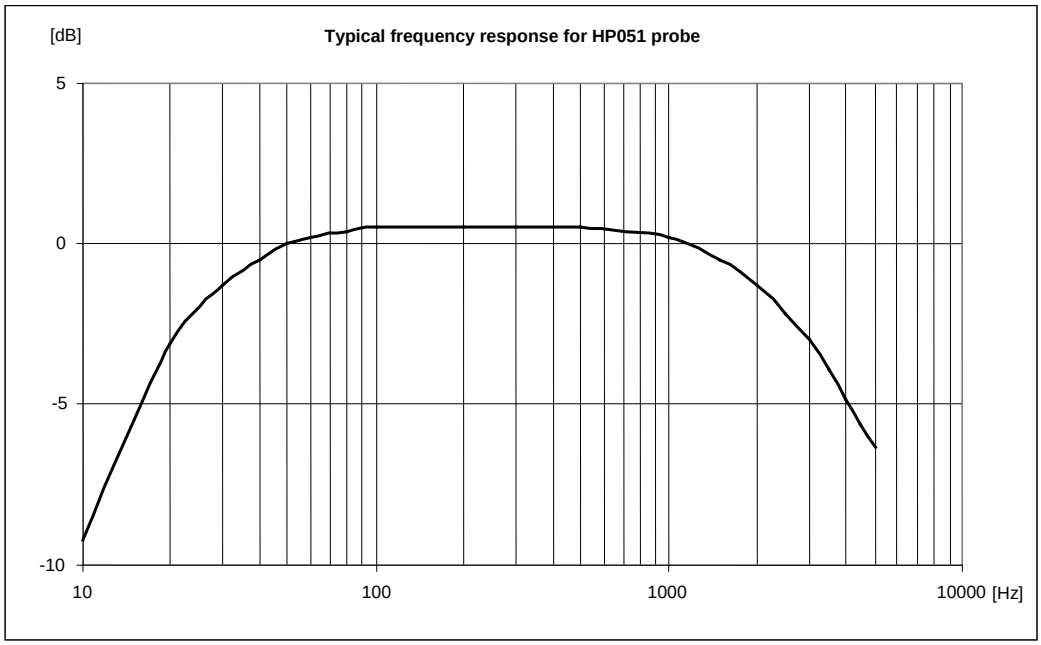
Frequency range	2110 MHz – 2170 MHz
Level range	0.03 – 30 V/m
Overload	> 120 V/m
Dynamic range	> 60 dB
Resolution	0.001 V/m
Sensitivity	0.03 V/m
Absolute error @ 2140 MHz and 2 V/m	± 1 dB
Flatness (2110 - 2170 MHz)	+ 0.2 dB / -1.8 dB
OFF Band attenuation respect to 2140 MHz	
1880 MHz	> 10 dB
2320 MHz	> 10 dB
Isotropicity	± 0.8 dB (typical ± 0.5 dB)
Rejection to H field	> 20 dB
Temperature error	0°C ÷ 60°C = ± 0.2dB
	-20°C ÷ 0°C = -0.1 dB/°C
Drift Frequency Vs Temperature	40°C ÷ 60°C = ± 100 kHz
	-20°C ÷ 40°C = -100 kHz/°C
Calibration	E^2PROM internal
Size	317 mm length, 58 mm diameter
Weight	100 g

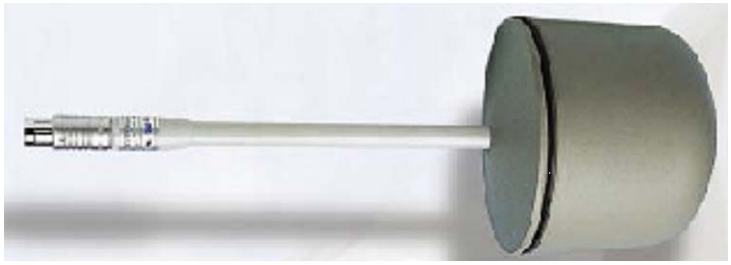



Typical frequency response for EP33C probe
[dB]
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
2065.0
2080.0
2095.0
2110.0
2125.0
2140.0
2155.0
2170.0
2185.0
2200.0
2215.0
[MHz]

MAGNETIC FIELD PROBE HP-051

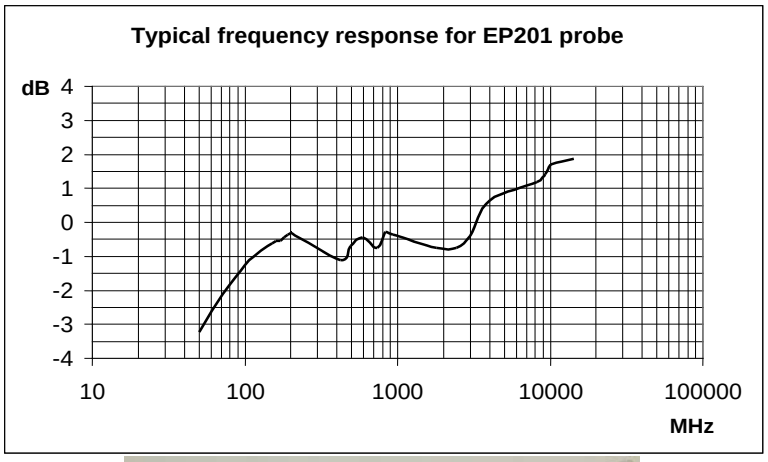
Frequency range	10 Hz – 5 KHz
Level range	50 nT – 200 µT
Dynamic range	> 72 dB
Overload	400 µT
Resolution	1 nT
Sensitivity	50 nT
Absolute error @ 50 Hz - 3 µT - 25°C	± 0.4 dB
Flatness @ 40 Hz – 1 KHz	± 1 dB
Isotropicity @ 50 Hz – 3 µT	± 0.3 dB
Electric field rejection	> 20 dB
Calibration	Internal into E^2PROM
Temperature error	0.015 dB/°C
Size	350 mm length, 133 mm diameter
Weight	400g





ELECTRIC FIELD PROBE EP-201

Frequency range	60 MHz – 12 GHz
Level range	3 – 500 V/m
Overload	> 1000 V/m
Dynamic range	> 45 dB
Resolution	0.1 V/m
Sensitivity	8 V/m (instantaneous measurement with filter 10 Hz) 3 V/m (RMS or AVG 30 sec with filter 10 Hz)
Flatness @ 40 V/m	± 1.5 dB (150 MHz – 9.25 GHz) ± 3 dB (60 MHz – 12 GHz)
Isotropicity @ 40 V/m @ 200 MHz	± 0.6 dB
H-field rejection	> 20 dB
A/D Conversion	one converter for every axis
Calibration	On board EEPROM
Microcontroller	On board
Volume sensor	3 mm diameter sphere
Size tube	180mm length x 4 mm diameter
Size	300 mm length x 18 mm diameter
Weight	85 g



WARNING

The passive probes are identified by the 8053B or OR03 whether they are plugged before or after switching on the unit.
The active probes EP333 and EP201 (with internal conversion) are identify by the 8053B or OR03 only if they are plugged before switching on.

WARNING

To use the EP201 it's necessary the Firmware release 3.05 or higher

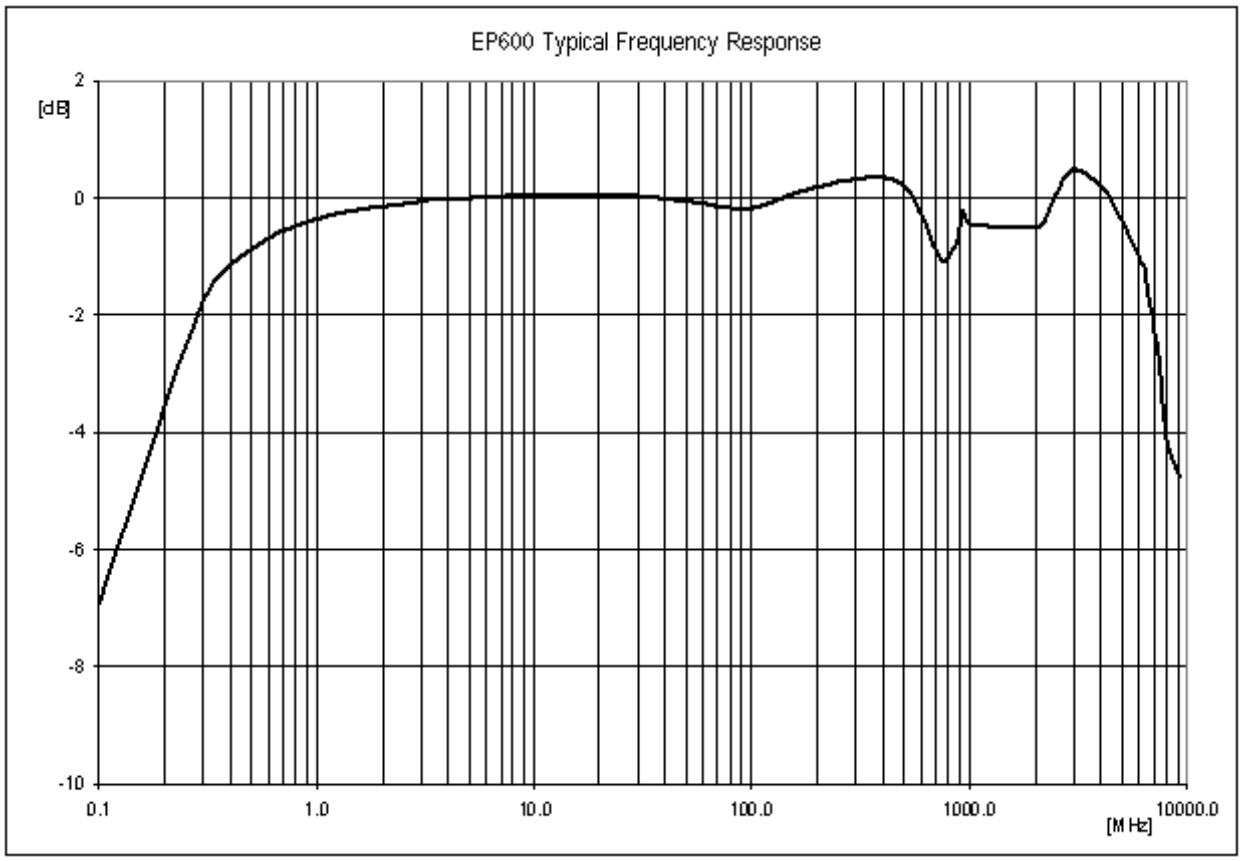
NOTA

A more accurate measurement with EP333 and EP201 probes is achieved setting the filter to 10Hz.

ELECTRIC FIELD PROBE EP-600

Frequency range	100 kHz – 9.25 GHz
Level range	0.14 – 140 V/m
Overload	> 300 V/m
Dynamic range	60 dB
Linearity	0.4 dB @ 50 MHz/0.3 – 100 V/m
Resolution	0.01 V/m
Sensitivity	0.14 V/m
Flatness	1 – 150 MHz 0.8dB 0.5 – 6000 MHz 1.6 dB 0.3 – 7500 MHz 3.2 dB (With frequency correction OFF) 0.3 – 7500 MHz 0.4 dB (Typical with frequency correction ON)
Isotropicity	0.5 dB (0.3 dB typical @ 50 MHz)
Sensors	Six monopoles
X/Y/Z reading	Simultaneous sampling of the components
Battery reading	10 mV res.
Temperature reading	0.1 °C res.
Internal data memory	Serial number Date calibration Calibration Factor SW release.
Battery	Panasonic ML621S 3V 5mA/h rechargeable Li-Mn
Operation time	80 h @ 0.4 S/sec 28 Hz filter 60 h @ 5 S/sec 28 Hz filter
Recharge time	48h for maximum autonomy
Dimensions	17 mm sphere 17 mm sensor 53 mm overall
Weight	23g including FO weight (1m)
Operating temperature	-10° - +50°
Software for PC	YES
Optical fiber connector	HFBR-0500
Tripod adapter	¼ - 20 UNC female

To use the EP600 it's necessary the Firmware release 3.02 or higher.

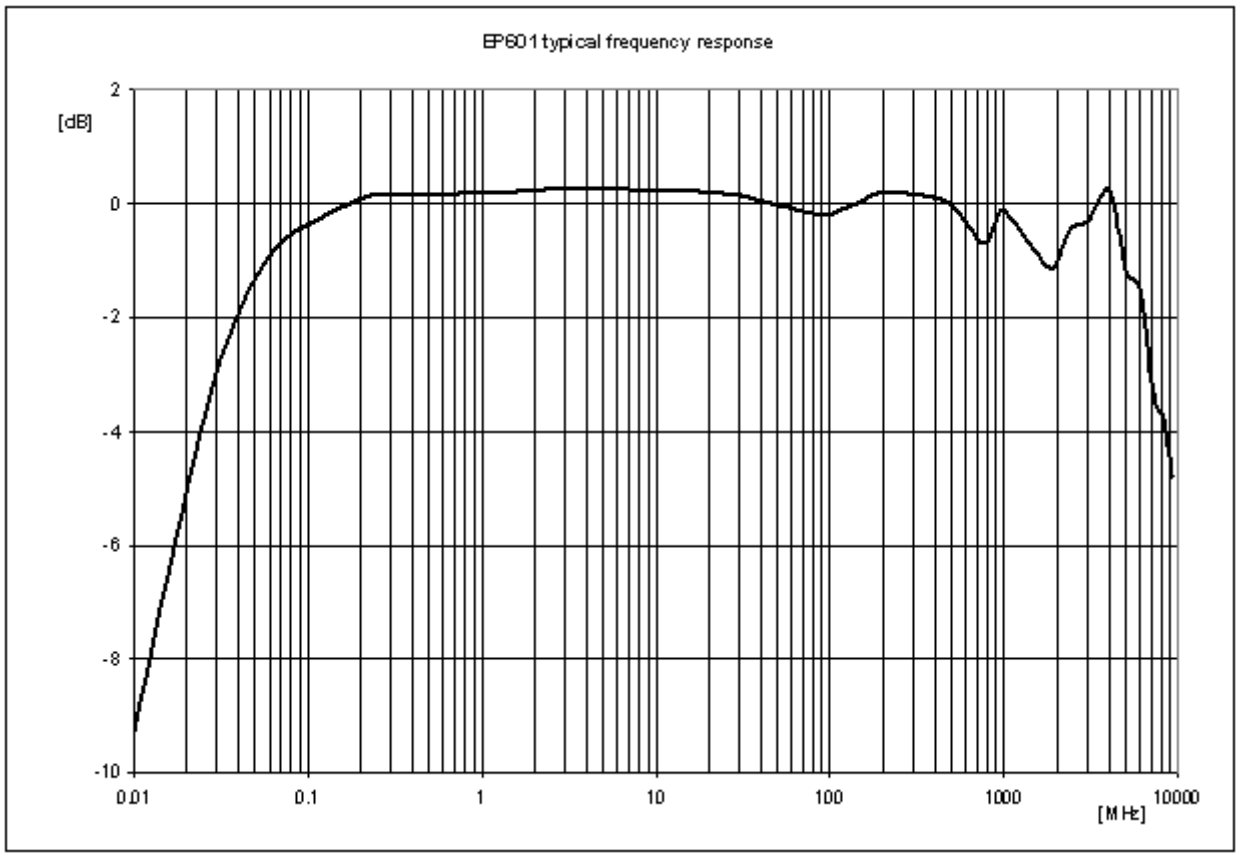

EP600 Typical Frequency Response
[dB]
2
0
-2
-4
-6
-8
-10
0.1
1.0
10.0
100.0
1000.0
10000.0
[MHz]

X
Z

ELECTRIC FIELD PROBE EP-601

Frequency range	10 kHz – 9.25 GHz
Level range	0.5 – 500 V/m
Overload	> 1000 V/m
Dynamic range	60 dB
Linearity	0.4 dB @ 50 MHz/1 – 500 V/m
Resolution	0.01 V/m
Sensitivity	0.5 V/m
Flatness	0.1 – 150 MHz 0.4dB 0.05 – 6000 MHz 1.6 dB 0.03 – 7500 MHz 3.2 dB (With frequency correction OFF) 0.05 – 7500 MHz 0.4 dB (Typical with frequency correction ON)
Isotropicity	0.5 dB (0.3 dB typical @ 50 MHz)
Sensors	Six monopoles
X/Y/Z reading	Simultaneous sampling of the components
Battery reading	10 mV res.
Temperature reading	0.1 °C res.
Internal data memory	Serial number Date calibration Calibration Factor SW release.
Battery	Panasonic ML621S 3V 5mA/h rechargeable Li-Mn
Operation time	80 h @ 0.4 S/sec 28 Hz filter 60 h @ 5 S/sec 28 Hz filter
Recharge time	48h for maximum autonomy
Dimensions	17 mm sphere 17 mm sensor 53 mm overall
Weight	23g including FO weight (1m)
Operating temperature	-10° - +50°
Software for PC	YES
Optical fiber connector	HFBR-0500
Tripod adapter	¼ - 20 UNC female

To use the EP601 it's necessary the Firmware release 3.02 or higher.

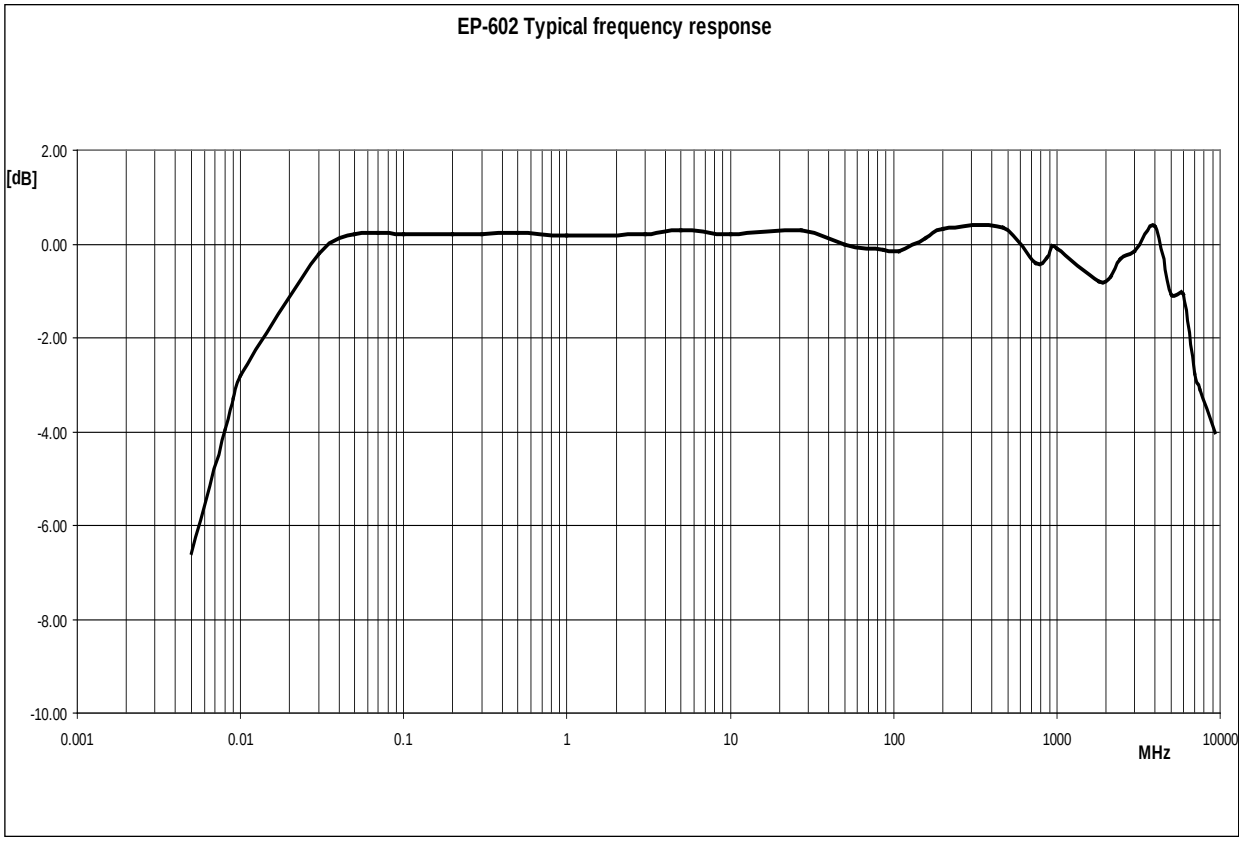

EP601 typical frequency response
[dB]
2
0
-2
-4
-6
-8
-10
0.01
0.1
1
10
100
1000
10000
[MHz]

X
Z

ELECTRIC FIELD PROBE EP-602

Frequency range	5 kHz – 9.25 GHz
Level range	1.5 – 1500 V/m
Overload	> 3000 V/m
Dynamic range	60 dB
Linearity	0.4 dB @ 50 MHz/2.5 – 1000 V/m
Resolution	0.01 V/m
Sensitivity	1.5 V/m
Flatness	0.1 – 150 MHz 0.4dB 0.05 – 6000 MHz 1.6 dB 0.03 – 7500 MHz 3.2 dB (With frequency correction OFF) 0.05 – 7500 MHz 0.4 dB (Typical with frequency correction ON)
Isotropicity	0.5 dB (0.3 dB typical @ 50 MHz)
Sensors	Six monopoles
X/Y/Z reading	Simultaneous sampling of the components
Battery reading	10 mV res.
Temperature reading	0.1 °C res.
Internal data memory	Serial number Date calibration Calibration Factor SW release.
Battery	Panasonic ML621S 3V 5mA/h rechargeable Li-Mn
Operation time	80 h @ 0.4 S/sec 28 Hz filter 60 h @ 5 S/sec 28 Hz filter
Recharge time	48h for maximum autonomy
Dimensions	17 mm sphere 17 mm sensor 53 mm overall
Weight	23g including FO weight (1m)
Operating temperature	-10° - +50°
Software for PC	YES
Optical fiber connector	HFBR-0500
Tripod adapter	¼ - 20 UNC female

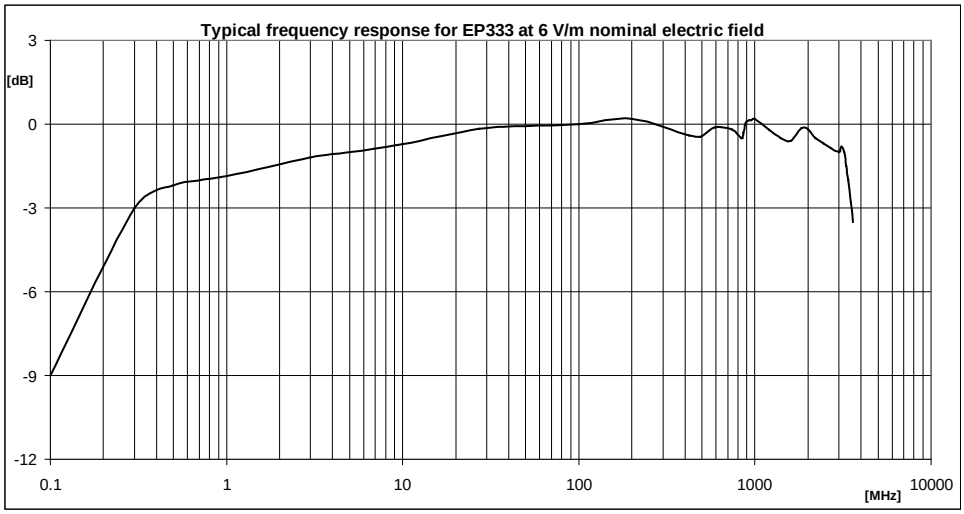
To use the EP602 it's necessary the Firmware release 3.16 or higher.


EP-602 Typical frequency response
[dB]
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
0.001
0.01
0.1
1
10
100
1000
10000
MHz

X
Z

ELECTRIC FIELD PROBE EP-333 TRUE RMS

Frequency range	0.1 – 3600 MHz
Level range	0.15 – 300 V/m
Overload	600 V/m
Dynamic range	> 66 dB
Resolution	0.01 V/m
Sensitivity	0.15 V/m
Flatness	0.3 MHz – 3500 MHz 3.0 dB 3.5 MHz – 3200 MHz 1.5 dB 20 MHz – 500 MHz 0.75 dB
Isotropicity	0.8 dB (typical 0.5 dB)
H-field rejection	> 20 dB
Calibration	On board EEPROM
Temperature error	20°C ÷ 60°C ±0.1 dB 0°C ÷ 20°C -0.05 dB/°C -20°C ÷ 0°C -0.15 dB/°C
Size	385 mm length 133 mm diameter
Weight	293 g.



The EP-333 has been developed for RMS measurement of digital signal with high crest factor for which traditional diode detectors overestimate.
It is a particular diodes based detector circuital configuration that allows high sensitivity compared to the RMS termocouple detectors.
Test on COFDM signal (FFT8k, Constellation 64QAM, Crest factor 13dB, guard interval 1/32) have shown that the overestimation is less than 0.5dB up to 75 V/m on all frequency range of the probe.

WARNING

The passive probes are identified by the 8053B or OR03 whether they are plugged before or after switching on the unit.
The active probes EP333 and EP201 (with internal conversion) are identify by the 8053B or OR03 only if they are plugged before switching on.

WARNING

To use the EP201 it's necessary the 8053B Firmware release 3.05 or higher

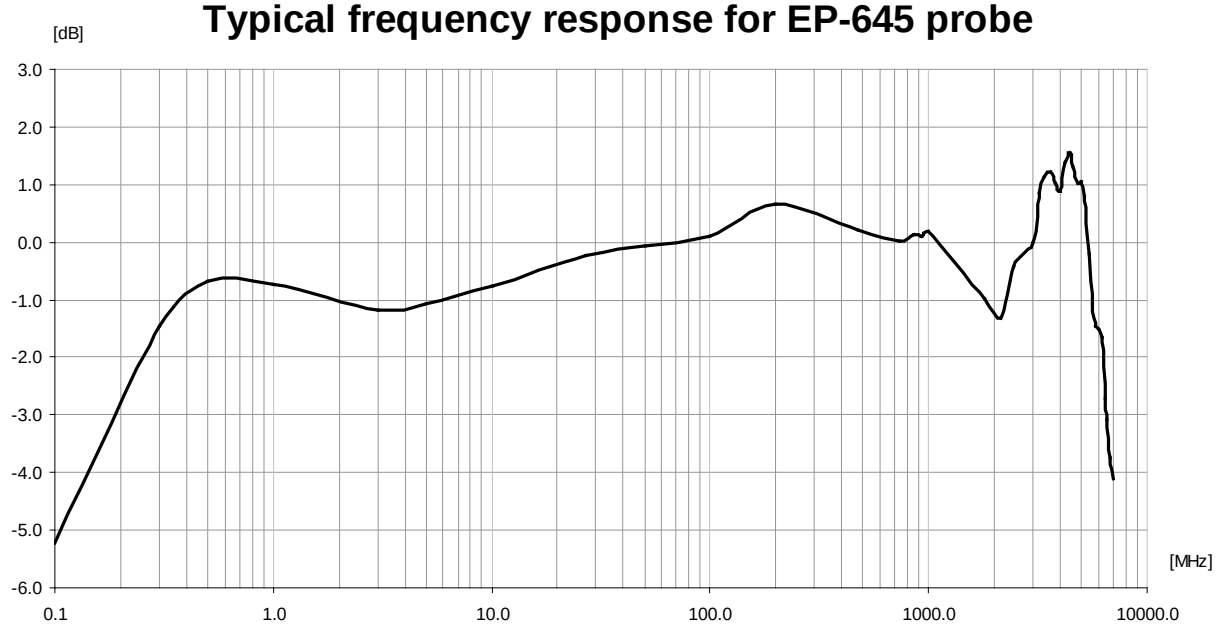
WARNING

To use the EP201 it's necessary the OR03 Firmware release 2.11 or higher

ELECTRIC FIELD PROBE EP-645

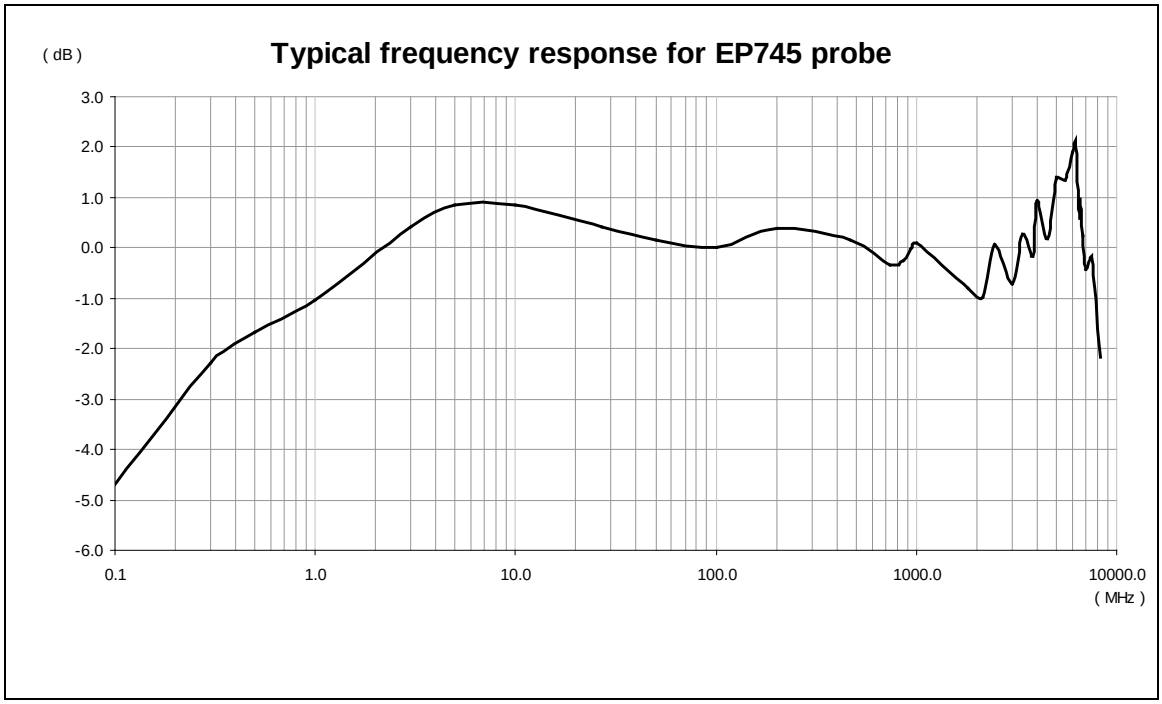
Frequency range	(0.1) 0.3 – 6500 MHz
Level range	0.35 – 450 V/m
Overload	900 V/m
Dynamic range	> 62 dB
Resolution	0.01 V/m
Sensitivity	0.35 V/m
Flatness	3 MHz – 10 MHz 1.5 dB 10 MHz – 1000 MHz 1.0 dB 1000 MHz – 3000 MHz 1.5 dB 3000 MHz – 5500 MHz 2.5 dB
Isotropicity	0.8 dB (typical 0.5 dB)
H-field rejection	> 20 dB
Calibration	On board EEPROM
Temperature error	20°C ÷ 60°C ±0.1 dB 0°C ÷ 20°C -0.05 dB/°C -20°C ÷ 0°C -0.15 dB/°C
Size	317 mm length 58 mm diameter
Weight	100 g.

Typical frequency response for EP-645 probe



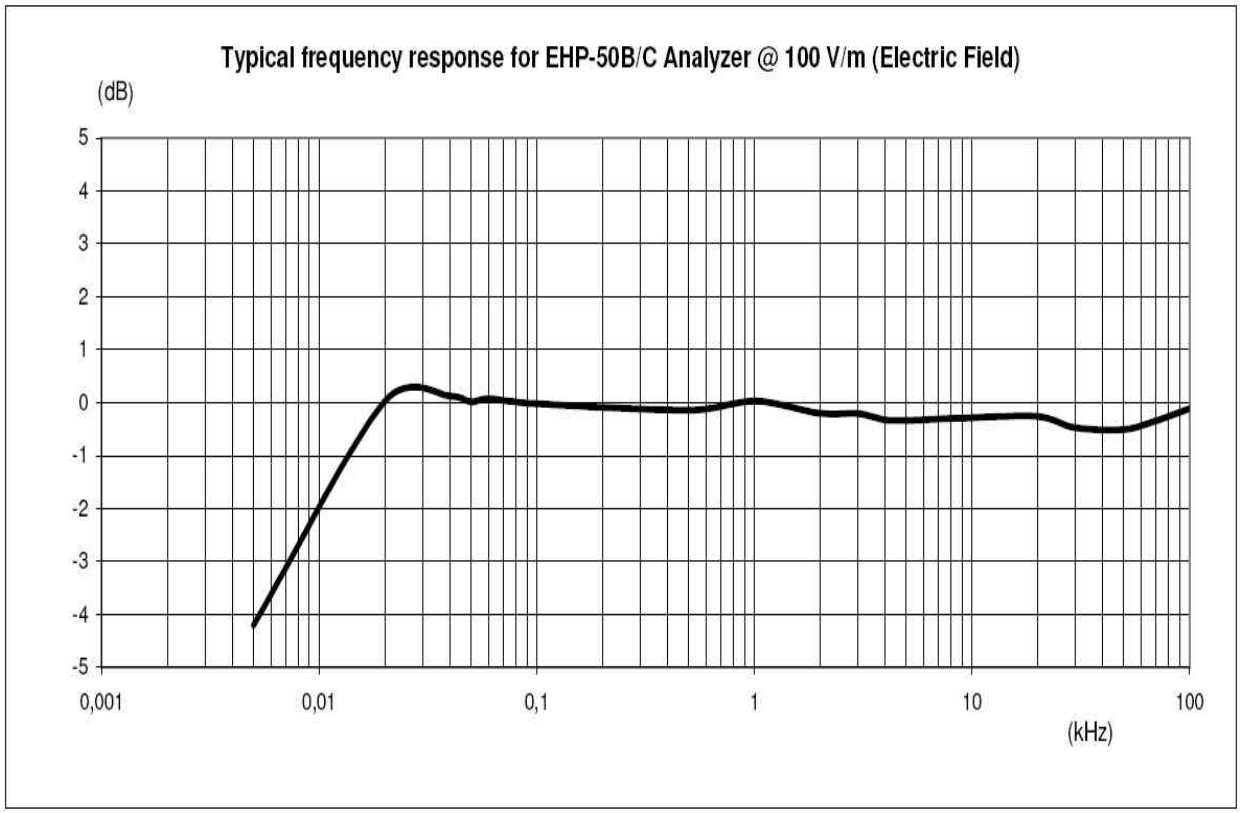
ELECTRIC FIELD PROBE EP-745

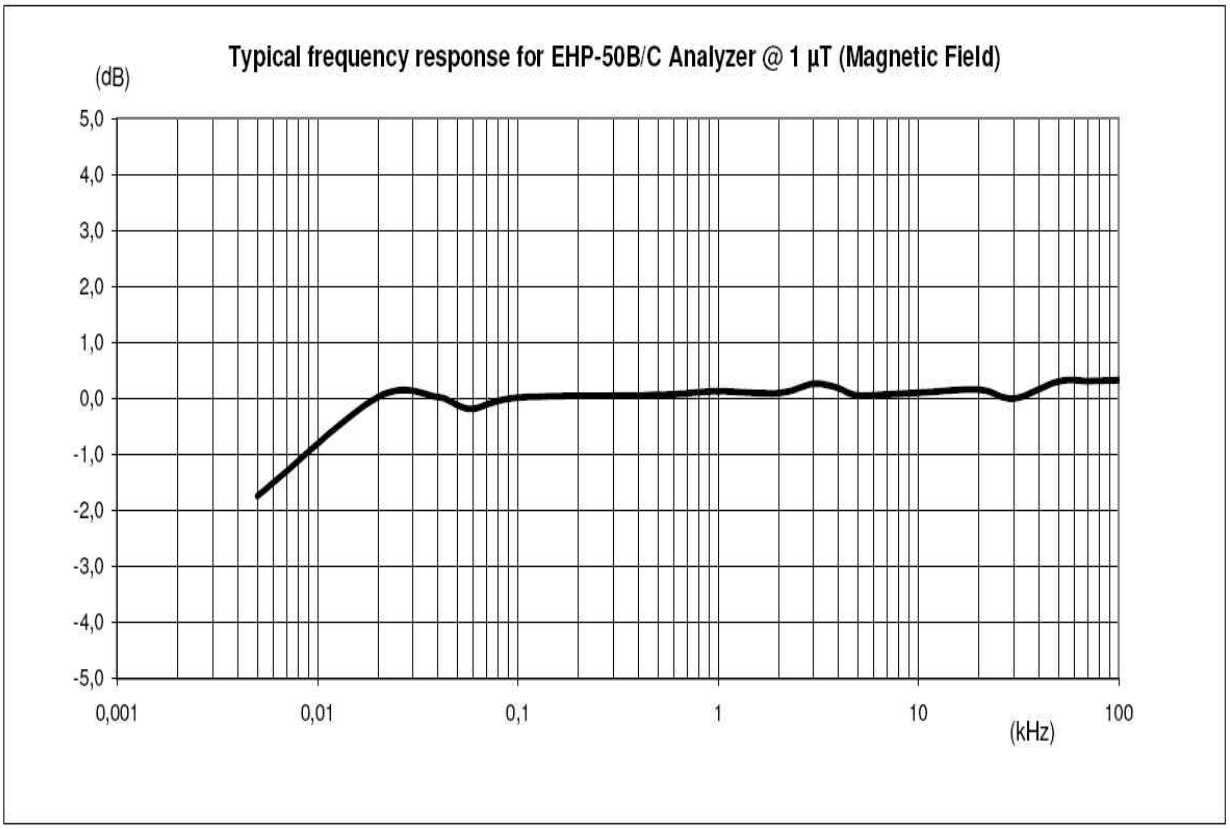
Frequency range	0.1 – 7000 MHz
Level range	0.35 – 450 V/m
Overload	900 V/m
Dynamic range	> 62 dB
Resolution	0.01 V/m
Sensitivity	0.35 V/m
Flatness	3 MHz – 10 MHz 1.5 dB 10 MHz – 1000 MHz 1.0 dB 1000 MHz – 3000 MHz 1.5 dB 3000 MHz – 6000 MHz 2.5 dB
Isotropicity	0.8 dB (typical 0.5 dB)
H-field rejection	> 20 dB
Calibration	On board EEPROM
Temperature error	20°C ÷ 60°C ±0.1 dB 0°C ÷ 20°C -0.05 dB/°C -20°C ÷ 0°C -0.15 dB/°C
Size	317 mm length 58 mm diameter
Weight	100 g.



ELECTRIC AND MAGNETIC FIELD ANALYZER EHP-50C

	Electric field	Magnetic field
Frequency range	5 Hz – 100 kHz	
Level range	0.01 V/m – 100 kV/m	1 nT – 10 mT
Overload	200 kV/m @ 50 Hz	20 mT @ 50 Hz
Dynamic	> 140 dB	
Resolution	0.001 V/m on 8053B Display 0.1 V/m with 8053B Data logger	1 nT on 8053B display or internal data logger 10 nT with 8053B Data logger
Sensitivity	0.01 V/m	1 nT
Absolute error	± 0.5 dB (@ 50Hz and 1kV/m)	± 0.5 dB (@ 50 Hz and 0.1 mT)
Flatness (40 Hz – 10 kHz)	± 0.5 dB	± 0.5 dB
Isotropicity	**(see § 8.4)**	
Linearity @ 50 Hz	± 0.2 dB (1 V/m – 100 kV/m)	± 0.2 dB (200 nT – 10 mT)
Internal memory	1440 data with 1 minute storing; 2880 data with 30 sec storing. The data can be transferred only to PC	
Internal data logger	1 measurement every 30 or 60 seconds	
FFT	Real time FFT analysis	
SPAN	100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 10 kHz, 100 kHz	
Start frequency	1.2 % of the SPAN	
Stop frequency	Equal to the SPAN	
E-field rejection	---	> 20 dB
H-field rejection	> 20 dB	---
Calibration	Internal into E^2PROM	
Temperature deviation (referred to 23°C)	+/- 0.05 dB between -10 and +23°C, at 40% of relative humidity + 0.01 dB/°C between +23 and +50°C, at 40% of relative humidity	
Humidity deviation (referred to 40%)	+/- 0.05 dB between 20% and 50%, at the temperature of +23°C + 0.05 dB/% between 50% and 80%, at the temperature of +23°C	
Size	92 x 92 x 109 mm	
Weight	525 g	
Tripod support	Threaded insert ¼"	
Internal battery	Rechargeable NiMH batteries (5 x 1.2 V)	
Operating time	>10 hours in normal mode >150 hours in low-power mode 24 hours with internal data logger (SPAN higher than 200 Hz) in stand alone mode of operation	
Recharging time	< 4 hours	
External DC supply	DC, 10 - 15 V, I = about 200 mA	
Fiber optic connection	Up to 40 meters (USB-OC) Up to 80 meters (8053-OC)	
Firmware update	Update available through the USB or RS232 port	
Autocheck	Automatically when switched on	
Operational temperature	-10°C to +50°C	
Storage temperature	-20°C to +70°C	


Typical frequency response for EHP-50B/C Analyzer @ 100 V/m (Electric Field)
(dB)
5
4
3
2
1
0
-1
-2
-3
-4
-5
0,001
0,01
0,1
1
10
100
(kHz)


Typical frequency response for EHP-50B/C Analyzer @ 1 µT (Magnetic Field)
(dB)
5,0
4,0
3,0
2,0
1,0
0,0
-1,0
-2,0
-3,0
-4,0
-5,0
0,001
0,01
0,1
1
10
100
(kHz)

ELECTRIC AND MAGNETIC FIELD ANALYZER EHP-50E

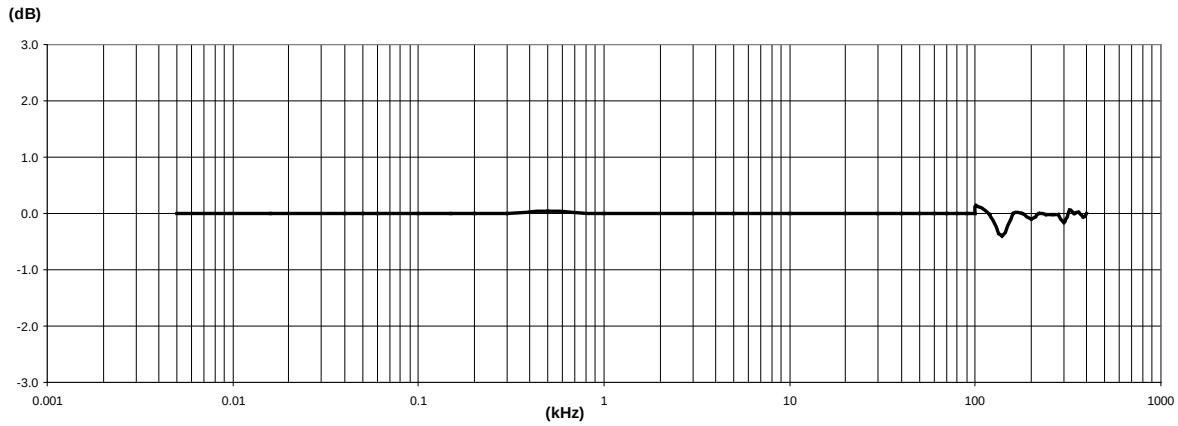
EHP-50E Main Specifications When not differently specified the following specifications are referred to operating ambient temperature 23°C and relative humidity 50%.

Technical specifications of the EHP-50E Electric and Magnetic Field Analyzer			
	Electric Field	**Magnetic Field**	**AUX input (MMCX Zin 1kΩ)**
Frequency range	1 Hz ÷ 400 kHz		
Measurement range (1)	5 mV/m ÷ 1 kV/m 500mV/m ÷ 100 kV/m (146 dB)	0.3 nT ÷ 100 µT 30 nT ÷ 10 mT (150 dB)	30 nV ÷ 10 mV 3 uV ÷ 1 V (150 dB)
Overload	200 kV/m	20 mT	2V
Dynamic range	106 dB	110 dB	110 dB
Resolution (2)	1 mV/m with 8053B 0.1 mV/m with EHP-TS SW 1 mV/m Stand alone	1 nT with 8053B 0.1 nT with EHP-TS SW 1 nT Stand alone	0.1 nV with EHP-TS SW
Displayed average noise level (3) **Isotropic result** **Single axis**	 5 mV/m 3 mV/m	 0.3 nT 0.2 nT	 30 nV
Flatness (@ 100 V/m, 2 µT, 5mV) **(5 Hz ÷ 40 Hz)** **(40 Hz ÷ 100kHz)**	 0.8 dB 0.35 dB	 0.8 dB 0.35 dB	 0.8 dB 0.35 dB
Anisotropicity (typ)	0.54 dB	0.12 dB	---
Linearity (referred to 100 V/m and 1 µT)	0.2 dB (1 V/m ÷ 1 kV/m)	0.2 dB (200 nT ÷ 10 mT)	0.2 dB (10 µV ÷ 1 V)
Internal memory	Up to 24 hours regardeless the logging rate.		
Internal data logger	1 measurement every 30 or 60 seconds		
Spectrum analysis method	FFT		
Acquisition method	Simultaneous three axis acquisition		
SPAN	100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 10 kHz, 100 kHz, 400 kHz (500Hz to 100kHz in Stand Alone mode)		
Start frequency	1Hz with SPAN 100 Hz; 1.2 % of the SPAN with wider SPAN		
Stop frequency	Equal to the SPAN		
Rejection to E fields	---	> 20 dB	---
Rejection to H fields	> 20 dB	---	---
Calibration	internal E^2PROM		
Typical temperature deviation **@ 55 Hz referred to 23°C** **(@ 50% of relative humidity when applicable)**	$-4x10^{-3}$ dB/°C within -20 +55 °C	$-8x10^{-3}$ dB/°C within -20 +23 °C $+13x10^{-3}$ dB/°C within +23 +55 °C	---
Typycal relative humidity deviation **@ 55 Hz referred to 50% (@ 23 °C)**	$+11x10^{-3}$ dB/% within 10 50 % $+22x10^{-3}$ dB/% within 50 90 %	$-7x10^{-3}$ dB/% within 10 50 % $+10x10^{-3}$ dB/% within 50 90 %	---
Dimensions	92 x 92 x 109 mm		
Weight	550 g		
Tripod support	Threaded insert ¼"		
Internal battery	3.7 V / 5.4 Ah Li-Ion, rechargeable		
Operating time	>9 hours in standard mode 24 hours in stand alone mode		
Recharging time	< 6 hours		
External supply	10 ÷ 15 VDC, I = approx. 500 mA		
Optical fiber connection	up to 40 m (USB-OC) up to 80 m (8053-OC)		
Firmware updating	through the optical link by USB or RS232		
Self test	automatic at power on		
Operating temperature	-20 to +55 °C		
Operating relative humidity (4)	0 to 95 %		
Charging temperature	0 to +40°C		
Storage temperature	-30 to +75°C		

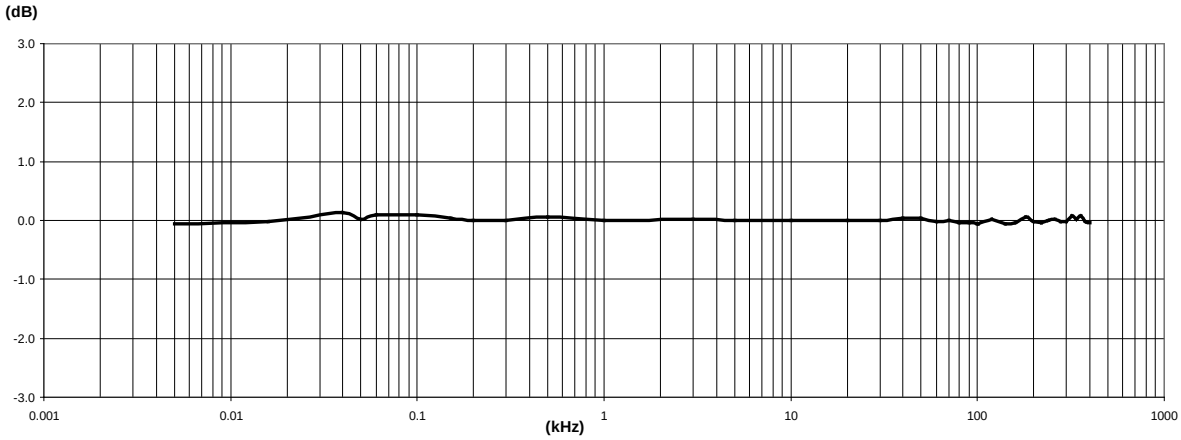
(1) For each single axis. Ranges to be selected manually
(2) For the lower measurement range
(3) DANL is frequency and SPAN depending. The specified best performance is referred to f ≥ 50 Hz and SPAN ≤ 1 kHz
(4) Without condensation

Specification are subject to change without notice

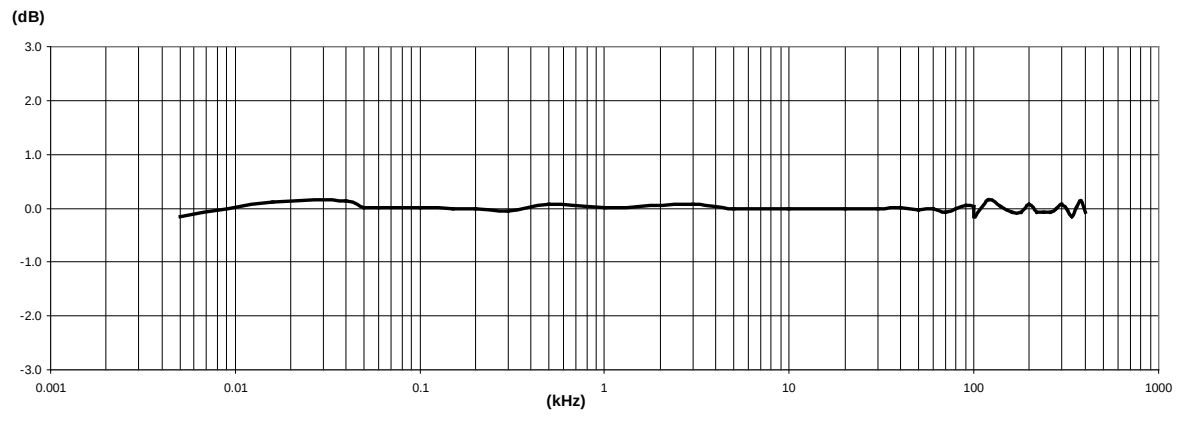
Typical frequency response for EHP-50E Analyzer @ -20dBm (AUX Input)



Typical frequency response for EHP-50E Analyzer @ 100V/m (Electric Field)



Typical frequency response for EHP-50E Analyzer @ 2µH (Magnetic Field)



ELECTRIC AND MAGNETIC FIELD ANALYZER EHP-200A

EHP-200A Technical specifications

	Electric Field	Magnetic Field Mode A	Magnetic Field Mode B	AUX Input
Frequency range	9 kHz ÷ 30 MHz	9 kHz ÷ 3 MHz	300 kHz ÷ 30 MHz	9 kHz ÷ 30 MHz
Measurement range **@10kHz RBW** with preamplifier ON	 0,1 ÷ 1000 V/m 0,02 ÷ 200 V/m	 30 mA/m ÷ 300 A/m 6 mA/m ÷ 60 A/m	 3 mA/m ÷ 30 A/m 0.6 mA/m ÷ 6 A/m	 -80 ÷ 0 dBm -94 ÷ -14 dBm
Dynamic range	> 80 dB			
Measurement range	> 94 dB			
Resolution	0.01 V/m	1 mA/m	0.1 mA/m	0.01 dB
Sensitivity @10kHz RBW **(*)** with preamplifier ON	0.1 V/m 0.02 V/m	30 mA/m 6 mA/m	3 mA/m 0.6 mA/m	-80 dBm -94 dBm
Flatness	0,5 dB 100 kHz – 27 MHz @ 20 V/m	0,8 dB 150 kHz – 3 MHz @ 166 mA/m	0,8 dB 300 kHz – 27 MHz @ 53 mA/m	0,4 dB @ -20dBm
Anisotropicity @1MHz	0.8 dB			---
Linearity @1MHz	0,5 dB from FS to –60 dBFS			
SPAN	0 to FULL SPAN			
RBW	1 kHz – 3 kHz – 10 kHz – 30 kHz – 100 kHz – 300 kHz			
Rejection to E fields	---	> 20 dB		---
Rejection to H fields	> 20 dB	---		---
Calibration	internal E^2PROM			
Temperature error	0,02 dB/°C			
Dimensions	92 x 92 x 109 mm			
Weight	580 g			
Preamplifier	selectable ON/OFF, 14dB			
Units	V/m, A/m, uT, mW/cm^2, W/m^2			
Internal battery	3,7 V – 5,55 Ah Li-Ion, rechargeable			
Operation	> 12 hours			
Recharging time	< 8 hours			
External supply	10 ÷ 15 VDC, I = approx. 560 mA			
Optical fiber connection	up to 40 m (USB-OC) up to 80 m (8053-OC)			
Firmware updating	through the optical link			
Self test	automatic at power on			
Operating temperature	-10 to +50°C			
Storage temperature	-20 to +70°C			

(*) The maximum sensitivity is achieved with the filter to 10 kHz

EHP-200A Technical specifications with 8053B

	Electric Field	Magnetic Field Mode A	Magnetic Field Mode B
Frequency range	50 kHz ÷ 550 kHz 500 kHz ÷ 30 MHz	50 kHz ÷ 550 kHz 500 kHz ÷ 3 MHz	300 kHz ÷ 800 kHz 500 kHz ÷ 30 MHz
Measurement range **@10kHz RBW** with preamplifier ON	 0,1 ÷ 1000 V/m 0,02 ÷ 200 V/m	 30 mA/m ÷ 300 A/m 6 mA/m ÷ 60 A/m	 3 mA/m ÷ 30 A/m 0.6 mA/m ÷ 6 A/m
Dynamic range	> 80 dB		
Measurement range	> 94 dB		
Resolution	0.01 V/m	1 mA/m	0.1 mA/m
Sensitivity @10kHz RBW **(*)** with preamplifier ON	0.1 V/m 0.02 V/m	30 mA/m 6 mA/m	3 mA/m 0.6 mA/m
Flatness	0,5 dB 100 kHz – 27 MHz @ 20 V/m	0,8 dB 150 kHz – 3 MHz @ 166 mA/m	0,8 dB 300 kHz – 27 MHz @ 53 mA/m
Anisotropicity @1MHz	0.8 dB		
Linearity @1MHz	0,5 dB from FS to –60 dBFS		
SPAN	50 kHz to FULL SPAN		
RBW	1 kHz – 3 kHz – 10 kHz – 30 kHz – 100 kHz – 300 kHz		
Rejection to E fields	---	> 20 dB	
Rejection to H fields	> 20 dB	---	
Calibration	internal E^2PROM		
Temperature error	0,02 dB/°C		
Dimensions	92 x 92 x 109 mm		
Weight	580 g		
Preamplifier	selectable ON/OFF, 14dB		
Units	V/m, A/m		
Internal battery	3,7 V – 5,55 Ah Li-Ion, rechargeable		
Operation	> 12 hours		
Recharging time	< 8 hours		
External supply	10 ÷ 15 VDC, I = approx. 560 mA		
Optical fiber connection	Up to 80 m		
Firmware updating	through the optical link		
Self test	automatic at power on		
Operating temperature	-10 to +50°C		
Storage temperature	-20 to +70°C		

(*) The maximum sensitivity is achieved with the filter to 10 kHz

1.7 Front panel of PMM 8053B

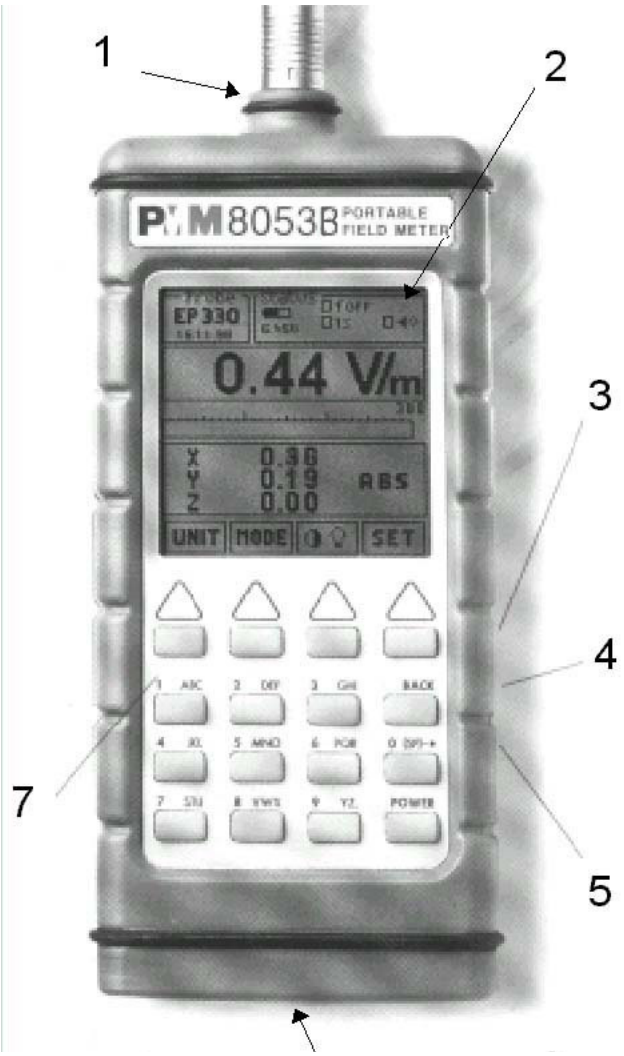


Fig. 1-1 Front panel

Key:

1. Probe connector;
2. Display;
3. Fiber optic Input/Output for additional probes or USB or RS232 interface via fiber optic link;
4. RS232 interface;
5. Battery charger input, from 10 to 15V DC, 500mA;
6. Securing screws to tripod;
7. Alphanumeric keyboard;

1.8 Side panel of PMM 8053B

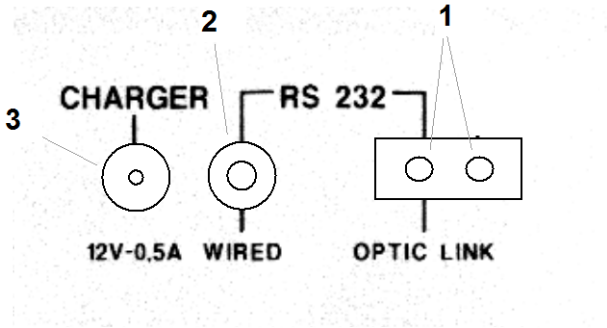


Fig. 1-2 Side panel

Key:

1. Connection to OR-02/OR-03 Optical repeaters, GPS, EHP-50C or EHP200A fiber optic link;
2. Wired RS232 interface for direct connection to the PC;
3. Battery charger connector (12V, 0.5A)

2 - Installation and use

2.1 Introduction

This section provides the information required for installing and using the PMM 8053B General Purpose Field Meter. For information regarding the use of the accessories, see Chapters 8, 9 and 10 of this Manual.
Information is included regarding initial inspection, power requirements, interconnections, work environment, assembly, cleaning, storage and shipment.

2.2 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.

2.3 Work environment

The work environment of the Accessories, must come within the following conditions:

- Temperature — From -10°C to +40°C
- Humidity — < 90% relative

The meter must be stored in a clean and dry environment, free from acid dusts and humidity.
The storage environment must come within the range of the following conditions:

- Temperature — From -20°C to + 70°C
- Humidity — < 95% relative

2.4 To return for repair

When the meter needs 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.

2.5 To clean the meter

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

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

2.6 PMM 8053B To install and use

The PMM 8053B General Purpose Field Meter can work only with PMM isotropic probes within wide range and frequency fields and its accessories. Installation of PMM 8053B is very easy. Simply insert the probe into the special connector at the top of the apparatus and switch it on.

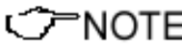
The probe may be connected to the apparatus whether it is switched on or off without damage. To avoid damage to the probe connector, the spigot (red dot), found in the external part of the probe connector, must be put facing the front part of the meter.

To connect or disconnect the probe, hold onto the metallic connector. When inserting or removing the probe, holding on to the support or the head may cause damage to the probe.

When measuring fields emitted from transmitting antennas, it is important to place the probe with the handle of the support perpendicular to the polarisation of the antenna to avoid interference with the measurement (normally the probe should be positioned in horizontal). This is especially so when analysing signals in the range of few megahertz.

2.7 RF signals of dangerous fields

The probe of PMM 8053B uses highly sensitive components.



Do not insert the probe in an electric or magnetic field that is higher than the maximum permitted for the probe in use, even if you do not perform any measurement.

Whether the PMM 8053B is switched on or off or even if the probe is not connected to the meter, damage may be caused to the internal diodes when strong fields radiate the probe.

2.8 Battery charger

The battery charger supplied with the meter can work at either 50 Hz or 60 Hz with a supply voltage range between 100 and 240 Volt.
It is supplied with different connectors to the supply mains in accordance with the various national standards.

2.8.1 To substitute the mains connector

To substitute the mains connector, simply remove the one installed on the battery charger and replace it with the one that is in compliance with its use.

2.8.2 To check the internal batteries

If the internal batteries are to have the greatest autonomy, we recommend that a full recharging cycle be carried out before using the meter.
To do this, go through the following procedure:

- Connect the battery charger to the power socket
- Link the output connector of the battery charger to the input **CHARGER** on the side panel of the meter
- PMM 8053B will switch on automatically, after making a sound produced by the internal buzzer, the display will be activated and the meter will start its auto-check and begin the procedure for recognising the probes.
- The main window will therefore be activated and the status of the charge (**CHG**) of the battery will be displayed in the **STATUS** box

Indications of the battery in the STATUS box:
The status of the charge of the battery is displayed in the top left-hand corner of the **STATUS** box. The symbol of a small battery will be filled up proportion to the status of the battery charge.
The battery charger will be automatically stopped when one of the following occurs and a small connector will be displayed relating to a letter indicating the end of the recharging cycle.
Display of the following letters means:

V – The voltage of the batteries has reached 1.45 V/element (7.25 total), and therefore the recharging cycle is complete.

H – The recharging cycles has lasted for more than 4 hours.

T – The temperature of the batteries, compared to the temperature stored after ten minutes recharging, has increased more than 10 °C, or the temperature of the battery has reached 65 °C.

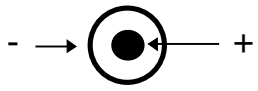
When the recharging cycle is finished, the PMM 8053B is ready for use.

NOTE

To avoid damage to the batteries, when the T symbol appears, the recharging cycle is stopped automatically.
To finish the recharging cycle wait for about ten minutes for the batteries to cool down then reconnect the battery charger.

Battery charger: DC, 10 - 15 V, ~ 500 mA

Connector:



NOTE

ALWAYS connect the battery charger to the mains power BEFORE connecting the DC output to PMM 8053B. The battery charger has an internal protective circuit that will not let it work if there is a load connected to the battery charger before the connection to the mains is activated.

NOTE

In order to safeguard the features of the batteries, it is crucial to have a complete recharge before storing them for periods longer than 4 months. Therefore, it is warmly suggested recharging the batteries at least every 4 months even though the device has not been used.

During measurement, it is necessary to disconnect the battery charger as it introduces noise into the measurements equal to about 0.3% of the full scale of the probe in use, when there is no field.
For example, using a EP-330 probe, which has a full scale of 300 V/m, the noise N introduced by the battery charger is equal to:

$$N = \frac{300\ V/m \times 0{,}3}{100} = 0{,}9\ V/m$$

WARNING

This phenomenon rapidly reduces with the increase of intensity of the field applied to the probe. An actual field of 1.5 V/m may be indicated as equal to 1.8 V/m while an actual field of 6 V/m may be indicated as equal to 6.1 V/m. In all cases the recharging cable must be kept far away from the probe as well as from the sources of the field itself.

Recharging does not produce any error when the probe is installed at least a few meters away from PMM 8053B meter via PMM OR02/03 Optical Repeaters.

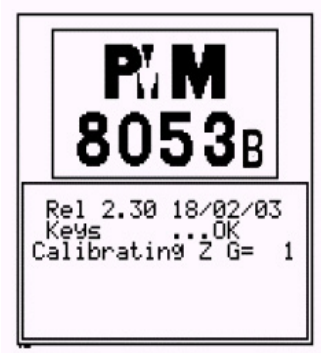
3 – Instructions for use

3.1 Introduction

The PMM 8053B General Purpose Field Meter is designed to be simple and rapid in use and, therefore, able to be used even by personnel with little expertise with this type of meter.
The commands are entered through a 16-key alphanumeric keyboard and the relative software functions are displayed on a wide liquid crystal display.
The upper four keys of the alphanumeric keyboard are used for directly selecting the desired function indicated on the corresponding bar of the menu of the LCD display.
Some panels enable the user to simply select the function by shifting up and down the commands with the arrows on the menu bar.
A command is generally automatically repeated, either in a constant or increasing manner according to the selected command, by holding the keys down.
The remaining 12 keys of the alphanumeric keyboard are used for entering various kinds of data according to the chosen set-up.
The **BACK** key enables the user to return to the previous operation.
The **POWER** key allows the meter to be switched on or off.

3.2 To switch-on

Once the probe is inserted the meter can be switched on by pressing the **POWER** key. A long beep will confirm that the meter has been switched on.



The set-up routine will then be run and the following information will appear on the display:

1. Version and date of the firmware;
2. Control state of the keyboard;
3. Autocalibration of the input stage;
4. Control of the integrity of probe.

NOTE

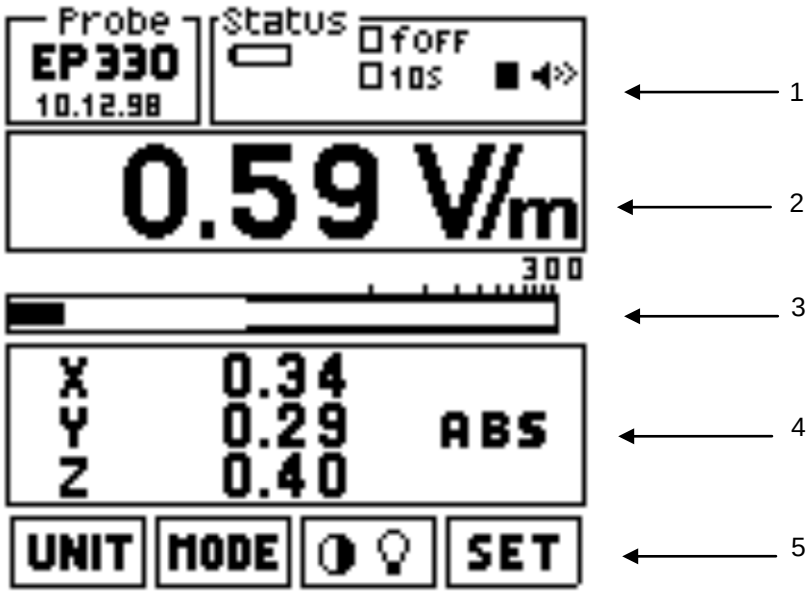
If the probe has not been previously connected to the meter Step 4 will not be performed and the word "NONE" will appear in the "Probe" box in the main window. If, instead, the probe is not working properly the word "FAIL" will appear in relation to the non-functioning axis (e.g., Z:OK, Y:FAIL, X:OK) and a beep will be emitted.
To use 8053B with EHP-50C is mandatory to have the 8053 firmware 2.30 or higher. To use it with EHP-50E the 8053 firmware 3.16 or higher is required.

NOTE

The time required for the internal calibration of the meter depends on the noise filter chosen. If the filter is set at 10 or at 20 Hz, the calibration process will take longer than with higher frequencies.
For normal use, we recommend setting the filter at 40 Hz.

3.3 Main menu

Once the set-up routine has been completed, the meter will display the window of the main menu:



This window is divided into lines which mean the following:

1. The top line is subdivided into two boxes:
   1a) The box on the left displays the type of probe that is connected and the date of calibration or any accessory and the status of the charge of its batteries;
   1b) The box on the right displays the general status of the various parameters and setting that will be explained in greater detail later;
2. The second line from the top displays the digital value of the reading, according to the current **UNIT**;
3. The third line from the top displays the analog value of the reading, and its display can be in either linear or logarithmic format;
4. The fourth line displays various data in accordance with the set **MODE**;
5. The last line on the bottom displays the functions assigned to the four top keys.

Other Informations found in the various boxes are described in more detail in the next paragraphs.

3.3.1 Data about the probe

The box at the top on the left, labelled **Probe**, displays the type of probe connected to the meter and, for probes with internal E^2PROM, the date of calibration also appears.
When no probes are connected, the word **NONE** appears.
The example of the EP330 probe linked to the 8053B via the OR03 Optical Repeater, displays the status of the batteries of the OR03.

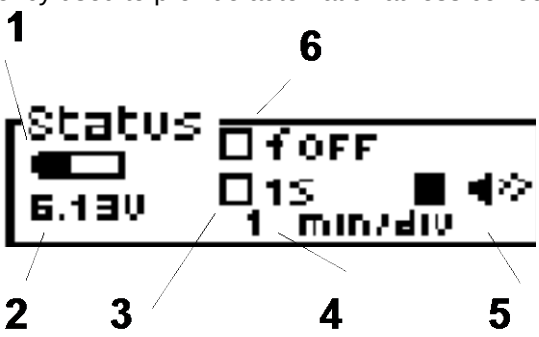
NOTE

Only NARDA can update correctly the calibration factors in the E^2PROM.
NARDA calibration services are recommended to achieve the best performances from the system

3.3.2 Status box

The box at the top on the right, labelled the **Status** box, displays the general status referring to the various parameters and setting of the meter as set out in the following:

1. Status of the battery charge;
2. Voltage of the battery;
3. Acquisition time of the **Data logger** or storage mode;
4. Plotting time (**Plot**) or the number of data samples acquired (**Sample**);
5. Alarm indicator (**Alarm**) and the setting of the alarm level;
6. Frequency used to provide automatic flatness correction.



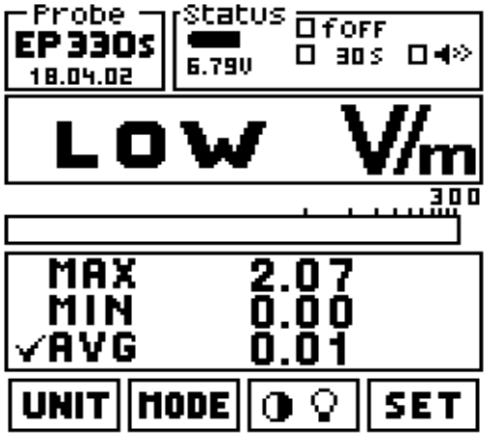
3.3.3 Digital reading

Depending on the selected measurement unit, the meter will display the field measured by the probe.

This indication is calculated according to the following formula which uses every single axis value:

$$V/m_{tot} = \sqrt{E_x^2+E_y^2+E_z^2}$$

When the field intensity is lower then the specific sensitivity of the probe in use, the word **LOW** will appear on the display like in the following window:

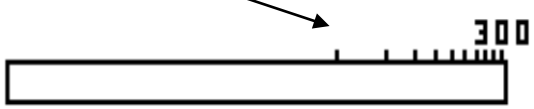


NOTE

If 8053B is turned on keeping the Key 5 depressed (an keyboard error will appear during the turn on procedure, it should be ignored), it is possible to read all fields starting from about 0 V/m. Of course these very low values are affected by a high errors and should not be used for any evaluation purpose.

3.3.4 Analog bar

The intensity of the measured field is also displayed in analog form. The analogical reading may be set either in logarithmic or linear format.
From menu **SET** move the pointer on **Bar** and selected **Linear** o **Logarithmic**
Also a TAG is provided to indicate that the alarm is ON and it is located proportionally.



3.3.5 Main Function keys

The function keys enable the user to select all the operational modes. When the PMM 8053B is switched on the following menu appears:

The relative functions are:

select a different measurement units

select a different operational or storage mode The **MODE** key runs the **SAVE-MODE** function of the data logger

change the contrast and intensity of the display

enter the main settings of the meter and select other secondary functions

3.4 UNIT

By activating the **UNIT** key, the user can select the measurement unit he desires, depending on the installed probe.
When an electric field probe is installed, the following units of measurement can be selected:

- **V/m, A/m, mW/cm^2, W/m^2**

When using EHP-50, the units are: V/m, kV/m, µT and mT.
When using HP-050/051 the unit is in µT.

NOTE

Any time the user decides to use a non-primary but derived measurement unit, the following warning will be displayed: WARNING Correlated UNIT to notify the user that the result displayed is derived from an internal calculation and not directly from a measurement, the conversion is valid in far-field conditions.
The applied formulas are:

$$\mathbf{H}(A/m) = \mathbf{E}(V/m)/377(Ohm)$$

$$\mathbf{S}(W/m^2)=\mathbf{E}(V/m) \times \mathbf{H}(A/m)$$

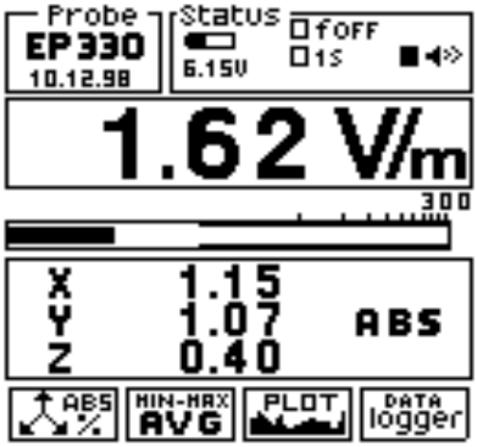
Using the **BACK** key enables the user to return to the main menu.

3.5 MODE

By pressing **MODE**, the PMM 8053B allows different modes for acquiring, storing and displaying data to be used.

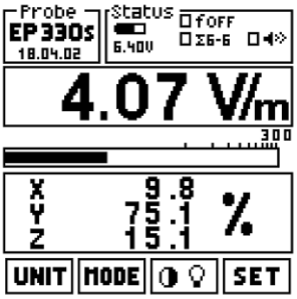
NOTE

By pressing MODE with the DATA Logger ON, the display of 8053B will switch off after about 90 seconds. In this modality 8053B can store data for about 40 hours. When you press any key the display switch on and then switch off again after 90 seconds to preserve the battery charge.
The window displayed will be:



The low power mode is used together with Logger xxxs Def and also when using EHP-50C and EHP-50E.
In this mode the display will turn off during the acquisition.

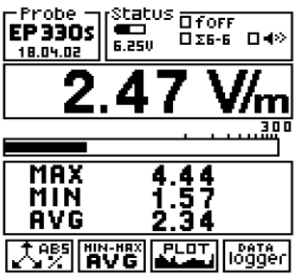
3.5.1 ABS/% mode



In this operational mode, PMM 8053B displays the absolute value of the three vector components of the measured field or by pressing a second time the same key, 8053B displays the percentage value.

The total value is calculated as described in par. 3.3.3.

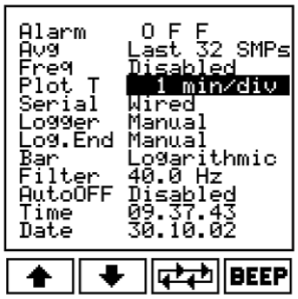
3.5.2 MIN-MAX/AVG MIN-MAX/RMS



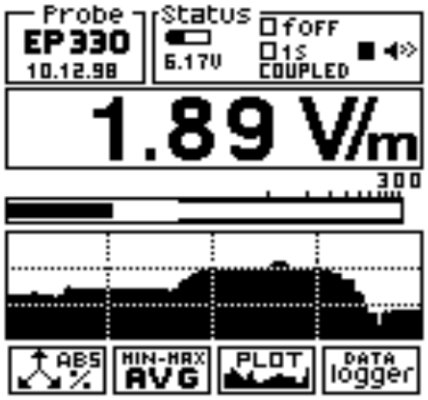
In this operational mode, the maximum and minimum values as well as the average value expressed as an arithmetic (**AVG**) or as a quadratic (**RMS**) average can be displayed.

To select the type of averaging (**AVG** or **RMS**), use the **SET** operational mode.
In **SET** mode, it is possible to select among several averaging period. See paragraph. 3.7.2 and 3.7.6.7-8.

3.5.3 PLOT mode



In **PLOT** mode, PMM 8053B acquires data and displays it in relation to time. The display is similar to that in the following example:



This example uses the **COUPLED** mode

This field versus time function is designed in order to verify the stability of the field while the time goes by, showing a graphic display very simple to understand. This graph cannot be saved or printed. The selected time scale is shown in the box at the top on the right. Selection is made in the **SET** mode in correspondence to the **PLOT T** line**.** The following selections can be made:

- **Coupled (the fastest mode; the speed depends from the Filter)**
- **1 min/division**
- **2 min/division**
- **10 min/division**
- **30 min/ division**
- **60 min/ division (4 hours to complete the plotting)**

NOTE

3.5.4 DATA logger

In the **DATA logger** mode, the user can store the data of the measurements taken and saved in a file. The DATA logger function will collect data from any probes connected directly to 8053B or by using the optical repeaters OR-02 or OR-03, or using the EHP-50C and EHP-50E. It does not collect any data when using GPS module. In **SET** menu, the user can define the sample rate, the different acquisition modes, and how long the measurement will take. All the generated files are numbered progressively and contain:

- the date and time when the measurement began
- the average value
- the value of each single data stored
- the user's comment

As soon as the **DATA logger** key is pressed, the first file appears on the display with the available commands on the line below.
This is an example of the display:

1. The first line indicates the number of the file (in this case 1) and the entire time taken to carry out the measurement (in this case 11 seconds);
2. The second line displays the date of the measurement;
3. The third line shows the time when the measurement began;
4. The fourth line displays the average value calculated (AVG or RMS);
   By shifting with the arrows, the individual readings taken are displayed, point-by-point according to the logger time selected in the SET menu.
   In the Time line, the time relating to each measurement will be displayed.
5. The fifth line indicates the comment entered by the user.
   To enter a comment, press an alphanumeric key and then press ↵.

The function keys have the following commands:

RUN begins data acquisition

selects previous data

selects subsequent data

selects a different file

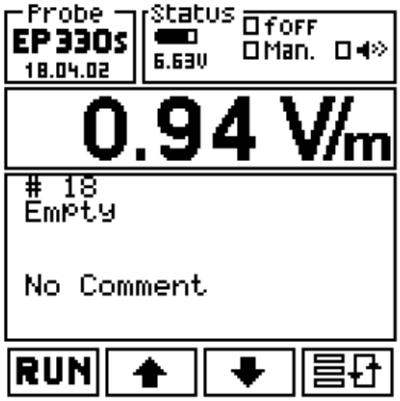
NOTE **By holding the arrow keys down, the user can shift between stored data and data shown on the display.**

The same occurs by pressing to select stored files.

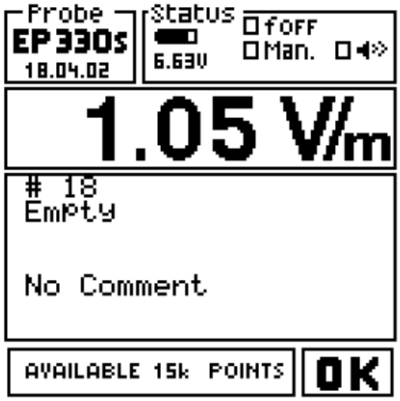
3.5.4.1 To begin storing data

To begin a new measurement and new data acquisition, press the shift key

(at the bottom on the right side) for selecting an next empty record as seen in the following example:



Then press the **RUN** key to start the measurement. Before beginning the measurement, 8053B will display the number of records still available for storage and will wait for the user to confirm by pressing the **OK** key.



Now, press **OK** to start the acquisition.

After 90 seconds that the logger has been run, if 8053B is in the menu MODE (the default menu at the beginning of logger), the display switch-off (SAVE-MODE function). The supply current is reduced about 40-45%. Display will switch on in the following way:

NOTE

- At the pressure of any key (excluding POWER key). In this case the key's function isn't execute (to avoid doing a wrong function)
- At the end of acquisition time.

The display isn't switch off if the menu is different by MODE
In this situation is possible to leave the device ON over the 90 seconds presets after the last key pressure.

WARNING

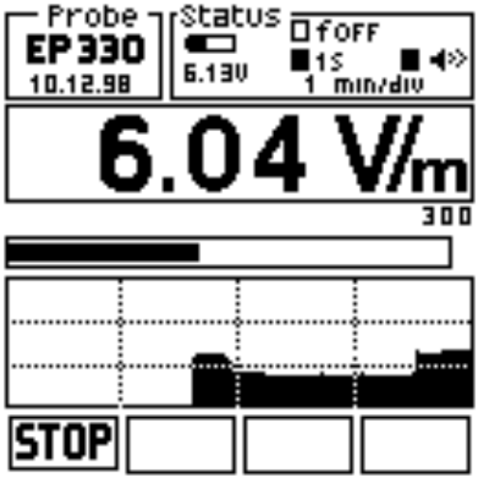
Pay attention to do not press the power key when you switch on the display to the SAVE-MODE function.

NOTE

If the user overwrites a record that has already been stored, all subsequent records will be deleted. For example, the user has already stored records 1 to 4 with four different measurements. Having then begun another measurement going to record # 2, records # 2, 3 and 4 will be deleted and the new measurement will be stored in record # 2.

NOTE

The user can quit data acquisition manually by pressing the STOP key or automatically after a certain period of time defined in the SET menu by selecting Log. End.
Data acquisition can, nevertheless, be stopped at any moment, independently of the set time of acquisition, by pressing the STOP key.



3.5.4.2 To enter a comment

Any time data are stored, up to 40 characters of text can be linked to the measurement for identifying the place where the measurement was taken or other useful information.
To enter a comment, use the alphanumeric keyboard.
The following is an example:

Edit keys have the following meanings:

shift the cursor to the right

shift the cursor to the left

go back a space deleting the character on the left

enter the added text

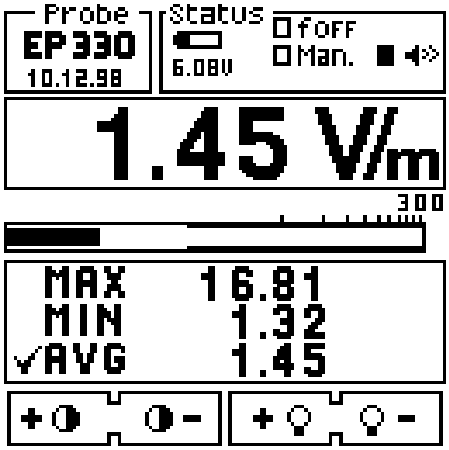
PMM 8053B has an alphanumeric keyboard of which 11 keys are used for entering (numeric or alphabetic) data, for making comments or for recording the locality where the measurements were taken.
For each key, there is a choice among 4 characters. The first time the key is pressed, the first character will be selected, pressing the key twice in quick succession, the second character will be selected and so on, pressing it four times will select the following corresponding number, after which come the same letters in lower case.
The **0 (SP)-*** has four functions: 0, blank space, - e *.

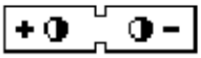
NOTE

It is necessary to press the key very quickly to select the following character or number, otherwise the editor will move on to the next.

3.6 To control the LCD display

This key gives the user the possibility of adjusting the contrast and lighting of the LCD display to adapt it to the light in the environment or to be able to see it better.
The display will show the following:





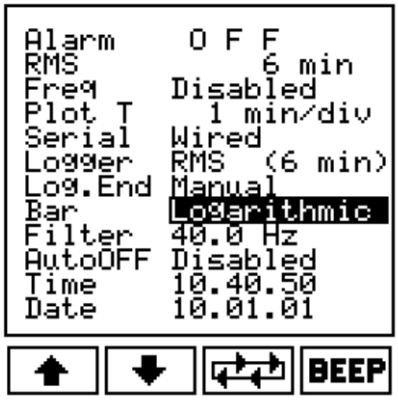
This function regulates contrast. Press + o – to increase or decrease it.

This function regulates the back lighting. Press + o – to lighten or darken it.

By pressing the **BACK** key the user can return to the Main Menu at any time.

3.7 SET function

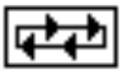
Pressing the SET key permits the user to enter a window where he can select the main parameters and settings for the measurements.
The following menu is displayed:



The available function keys for selecting any functions are the following:

To go up in selecting. The selected function has a black background.

To go down in selecting. The selected function has a black background.



To select the desired setting by rotating among those that are available. Each time this key is depressed a new function will appear in sequence.

This key is used to change from RMS to AVG averaging mode. It appears only when average is selected.

To turn ON or OFF the Alarm or Frequency.
This key appears only when Alarm or Freq are selected.

To enable/disable the beep when the keys are pressed and during logger sessions (with the exception of the initial beep when the meter is switched on).

3.7.1 Alarm function

This function can be used in defining the alarm level or to be used with Over Limit feature.
When the field being measured exceeds the set alarm threshold, the following functions are enabled:

1. The buzzer is activated and a small blinking symbol appears near the symbol of the loudspeaker.
2. The set alarm threshold will be displayed on the analog bar with a darker band that shows whether the measurement is above or below the set limit.
3. PMM 8053B is enabled to acquire date if the **Logger mode** function is set on **Over Limit.**
4. Depending on the **Serial** setting (see **Serial function** paragraph) alarm signal will be available to the optical or wired connector.

To set the threshold value, it is necessary to type it in with the alphanumeric keyboard and then press the **Enter** key. At this point the alarm can be enabled or disabled on the set threshold by pressing the **ON-OFF** key.

NOTE

This function allows the user to be acoustically warned when the field exceeds a certain threshold without the need to look at the display; it is interesting for example during the pre-analysis of any device under test.
It is also a good way to perform long acquisitions without wasting memory space by saving useless data. The field will be logged into the memory only if it exceeds the setted threshold, and both the level and the time of the measurement are saved.

WARNING

If you are using any EHP-50 with an alarm above 300 V/m and then another probe is connected with lower full scale (e.g. EP-330), the alarm will be always beeping.
It is necessary to enter SET and define a new alarm according with the new range of the used probe or turn OFF the alarm function.

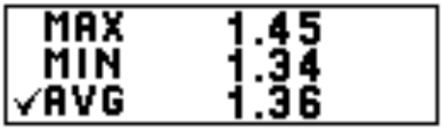
3.7.2 Linear average AVG or quadratic average RMS

All the average measurements taken by PMM 8053B will be made depending on the **AVG** or **RMS** selection.
To select **AVG** or **RMS** use the key at the bottom on the right in the **SET** function.

Both averages will be calculated on the basis of the following settings:

- **Last 32 samples**
- **30 sec**
- **1 min**
- **2 min**
- **3 min**
- **6 min**
- **10 min**
- **15 min**
- **30 min**

The Average value is displayed in the main window together with the Maximum and Minimum values. After PMM 8053B has acquired a sufficient number of data or the time set in this menu has elapsed, the average measurement will appear in the main display with a small ν symbol as shown in the following example.



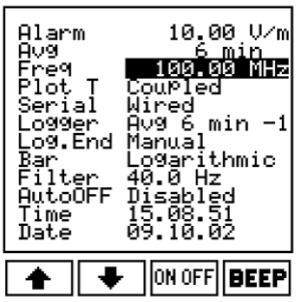
After the ν symbol is appeared the shown average is the rolling averaging.

PMM 8053B will re-start to calculate a new averaging, which will overwrite the previous one, every time the MIN-MAX/AVG (or MIN-MAX/RMS) key is pressed; the accumulated averaged value will be displayed after the ν symbol.
This value can not be saved into the internal memory of 8053B.
The number of samples used to perform the average calculation will depend from the Filter selected. For example, if the Filter is set to 10Hz the 8053B will collect less data than when using faster filter like 80 Hz.

☞NOTE

By using the Data logger, the sample rate is always timed by the selected acquisition time. At the end of an acquisition, the number of data collected, used to calculate the averaging value will be different from the number of samples used to perform MIN-MAX/AVG.
The result will be a different Average value calculated by the Data Logger compared with the average value displayed on 8053B.
Only if the field will remain stable (same value for all the time required by the Data logger), the results will be the same.

3.7.3 Freq function



By entering the known frequency value, PMM 8053B will correct the measurement taken by using the corresponding correction factor included in an internal table of the probe. This enables an extremely precise measurement of the field level at the selected frequency to be given.
The selected frequency will be displayed in the **Status** box of the main window.

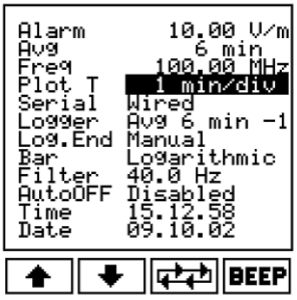
The frequency will always be entered in MHz except for HP-050/051 probe, which is in Hz.

This function will not appear when using EHP-50 analyzers.

NOTE

This function can only be used when 8053B is measuring a field generated by a single frequency (e.g. inside an anechoic chamber) or you are very close to the broadcast transmitter.

3.7.4 Plot function

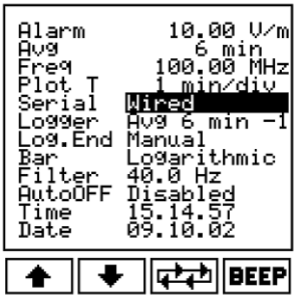


This function shows the intensity of a field over a period of time. The possible time scales are:

- **coupled** (where the speed of the reading depends on the selected filter)
- **1 min/div**
- **2 min/div**
- **10 min/div**
- **30 min/div**
- **60 min/div**.

This display can not be printed or saved. It offers only graphic overview of the field variation versus time.

3.7.5 Serial function



This function is used to transfer data to a PC or to acquire data from an optical repeater, probes with built-in optical repeater or GPS module. As an alternative it is possible to send the **Alarm** status to the Wired or Optical connector.
The choices are:

- **Wired** ➔ via a wire.
- **Optical** ➔ via fiber optic link.
- **Alarm Wire** ➔ Alarm output to TX terminal of Jack connector:
  - Alarm OFF: TX terminal voltage as IDLE (or SPACE) status of RS-232 standard (~ -9V)
  - Alarm ON: TX terminal voltage as MARK status of RS-232 standard (~ +9V)

NOTE

The TX signal corresponds to pin 2 of the DB9f connector and pin TIP of the jack 2.5mm.

- **Alarm OPT** ➔ Alarm output to TX terminal of optical connector. The operation is similar to the preceding one but the alarm signal is fed through the optical fiber. In normal condition the output LED is off, it will turn ON as soon as the alarm threshold is exceded.

When using optical link to the PC, it is necessary to use the USB-OC or 8053-OC.

NOTE

When using Optical link the Wired port is disconnected. Therefore you can not get data to the PC while you are using any EHP-50 or OR-02/OR-03 or GPS module.

3.7.6 Logger function

With this Logger function, PMM 8053B can be used as data acquisition system. It can acquire data and save field measurements for long periods, storing the date and time of each measurement. Furthermore, given that the internal memory is dynamically indexed, many groups of measurements – even those acquired in different ways with different probes – can be stored. Each group can be identified with a user's comment of 40 characters together with the date and the time that the measurement began.
To meet the widest possible needs, PMM 8053B has various modes for storing data:

1. **Over Limit** data are sampled every second and stored for the whole time during which the value is higher than the limit set with the Alarm function.

2. **Manual** data are stored every time the **GET** key is pressed.

3. **Data change** data is stored either when the value is 25% higher or lower than the previous one or after an hour has elapsed since the last variation.

4. **1s Fix** the highest field value logged during the span of one second is stored.

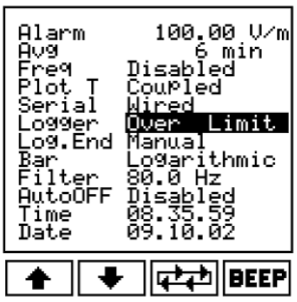
5. **xxxs Def** the highest value logged during the span of xxx seconds defined by the user, the value (between 10 and 900 seconds) can be set with the alphanumeric keyboard.

6. **xxxs Def LP** this is the Low Power mode, only to be used with the EHP50A/B/C/E probes which works like the xxxs Def mode, except that the probe is placed on Stand By between one measurement and another reducing energy consumption to a minimum and therefore increasing the autonomy of the batteries of EHP50A/B/C/E.

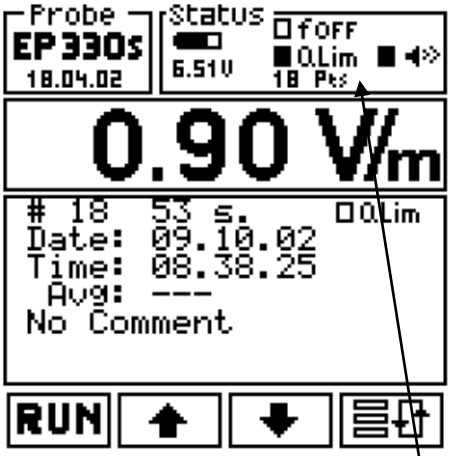
7. **AVG/RMS (6 min-6)** the AVG or RMS average value logged during a 6-minute span is stored (the stored value will be AVG or RMS depending on the selected mode).

8. **AVG/RMS (6 min-1)** the AVG or RMS average value logged during a 6-minute span is stored. After this period of time, the operation is repeated minute by minute, excluding the values red in the first minute and adding those read in the next up until the last (the stored value will be AVG or RMS depending on the selected mode).

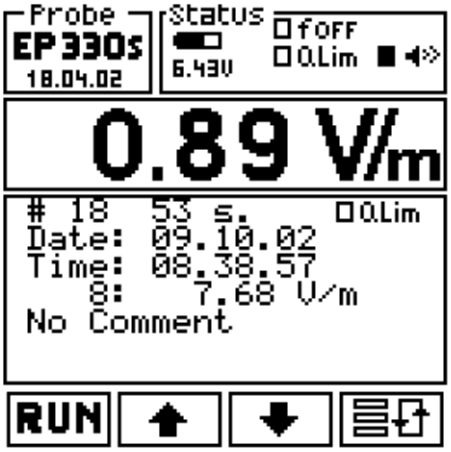
3.7.6.1 Over Limit



This function is quite useful to get only the data exceeding the threshold defined by the user with the Alarm function.
8053B performs about one measurement every second and stores the field values for the whole time during which the value is higher than the limit.
When an acquisition, by using Data Logger, has been performed PMM 8053B will show the following display:

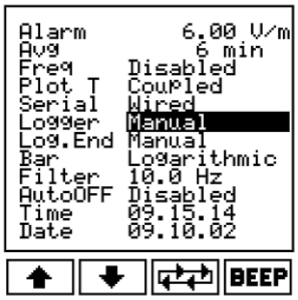


In the Status window are shown: the function **O.Lim** enabled and the number of the acquired points (in this example 18 points).
The Average function is not enabled because the measured data have no time relationship each other.
Depressing the arrows UP and Down, it is possible to see each individual measurements.



In this example the record # 8 shows 7.68 V/m.

3.7.6.2 Manual mode



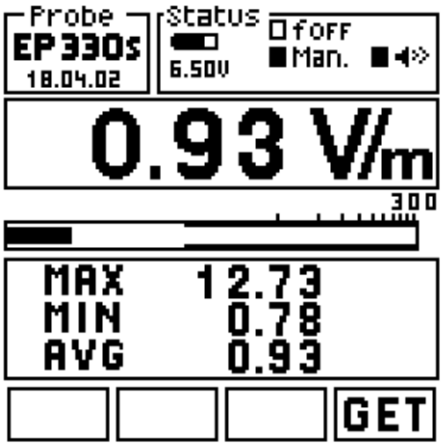
This mode of operation is useful to perform mapping over a specific territory.
For example, under power lines towers is possible to built a map of the fields versus the distance from the center of the tower by using 8053-RT connected to a metric wheel. Each time the wheel performs one turn, it will activate a signal connected to 8053-RT and the remote trigger will activate the **GET** command.

In Manual mode, the time (date and hour) of measurement for each field value will also be stored.

To use the Manual option, take the following steps:

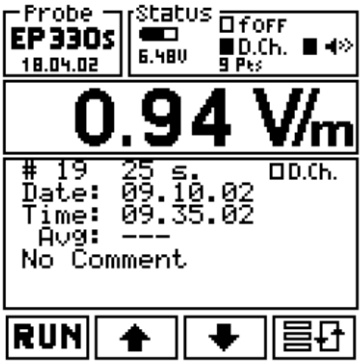
- **In SET mode, select Logger and then Manual.**
- **Exit SET mode with the BACK key.**
- **Select MODE and then Data Logger (the Data Logger automatically goes to the last saved record), to select a new measurement record press the key.**
- **Then press RUN and confirm the beginning of manual measuring by pressing OK.**
- **At this point, measurements can be acquired manually by pressing the GET key or via the 8053-RT Trigger accessory. To quit storage in the current record press BACK and then STOP.**

NOTE



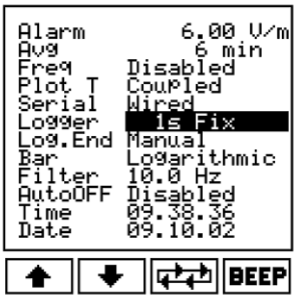
3.7.6.3 Data change

This function is used to control the stability of the broadcaster transmitters. In this mode of operation the 8053B stores fields and the time when the value is 25% higher or lower the previous one.

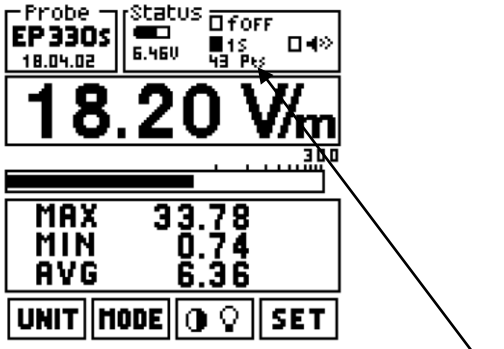


Also in this mode of operation the Average function is disabled.

3.7.6.4 1s Fix



This mode allows 8053B to store the data at 1 second interval. The sample rate is defined by the Filter, for example with 40 Hz filter 8053B performs 3 measurements/sec. The highest value of these measurements will be saved into the internal memory of 8053B.

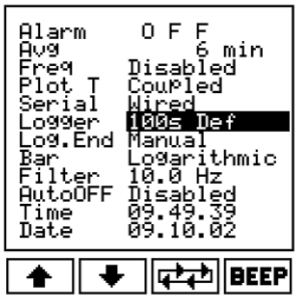


NOTE

The display shows, also, the number of points stored (e.g. 43 Pts = 43 points).

This mode should not be used with EHP-50A/B/C/E because it is too fast compare with the time to perform the FFT analysis of ELF probe.

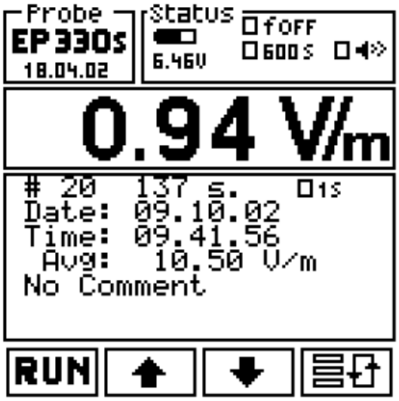
3.7.6.5 xxxs Def



In this mode the user can apply for any storing interval from 10 to 900 sec. To replace the old number with a new one, simply type over the new storing interval and press the key ↵.

If it is necessary to modify the number before making it valid with enter key or cancel the operation, to use **ESC** or **BACK SPACE** keys.

After depressing ↵ the 8053B will return to the main display showing the new time interval (in this example 600 sec).



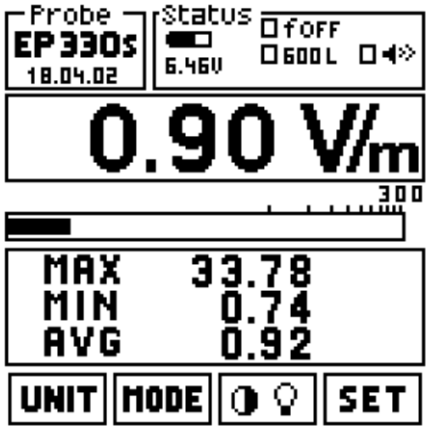
NOTE

Now 8053B is ready to perform a new data acquisition. Also in this mode of operation, 8053B will perform a number of measurements according to Filter speed and will store the highest value of all data measured over 600 seconds interval (in this example).

3.7.6.6 xxxs Def LP

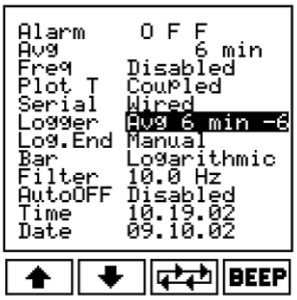
This mode works like the xxxs Def mode, except that the probe is placed in Stand-By between one measurement and another reducing energy consumption to a minimum and therefore increasing the autonomy of the batteries of EHP50A/B/C/E. See chapter 8 for more details.

In the main menu, 8053B will show the symbol **L** near to the storing interval number.



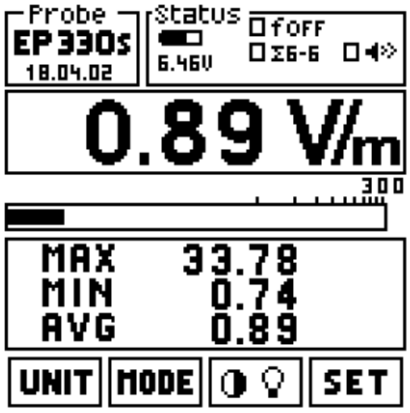
In this example, only one measurement is taken every 600 seconds.
By using this option with other probes, the apparatus acts in the same way as for the xxxs **Def** option.

3.7.6.7 Avg(RMS) 6min-6



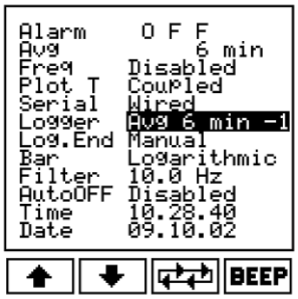
In this mode of operation, 8053B acquires data for 6 minutes and then calculates the average value (Linear or quadratic according to **AVG** or **RMS** selection) and stores the result inside its internal memory. This operation will be repeated every 6 min until the Log. End reaches its value or the Data logger is manually terminated.

The symbol **Σ6-6** is shown on main display.



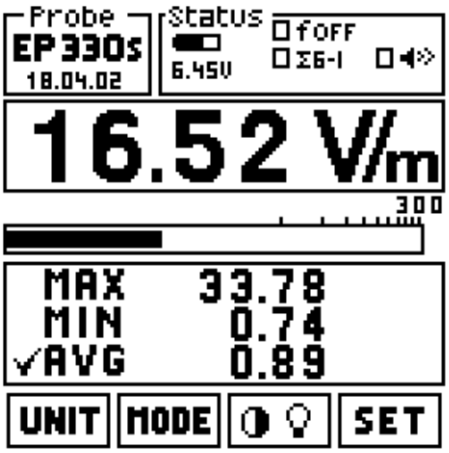
The Data logger memory will be filled up with field's values equidistant of 6 min. Each value is the result of the averaging over 6 min.

3.7.6.8 AVG(RMS) 6min-1



This mode of operation performs the rolling 6 minutes averaging with 1 min. resolution. 8053B will store in the first record the value averaged over 1 min; the second record will have the average value over 2 min; the third record will have the average value over 3 min and so on.
After 6 min, 8053B will store the 6 minutes average. Then 8053B will start a new computation excluding the values red in the first minute and adding those read in the next up until the last (the stored value will be **AVG** or **RMS** depending on the selected mode).

The symbol **Σ6-1** is shown on main display.



The internal memory of the Data Logger will be filled up with values equidistant of 1 min. Each of them is the average value over the last 6 minutes.

3.7.6.9 Memory property The 8053B has a 16kB standard memory, and a 52kB. The following table is refer to standard memory:

Mode	Sampler	Data saved	Occupied space Bytes	Max Data Points	Max storage time
Sampling 1 s	Unconditional every second	Only values (Peak within 1 s)	Header (88)+2*N	>26000	>7h 13’
Sampling xxx s (10 - 900 s)	Unconditional every xxx seconds	Only values (Peak within xxx s)	Header (88)+2*N	>26000	72h 13’ – 6500h
AVG 6 min.	Unconditional every 360 seconds	Only values (AVG of 6 min))	Header (88)+2*N	>26000	>2600h
RMS 6 min.	Unconditional every 360 seconds	Only values (RMS of 6 min))	Header (88)+2*N	>26000	>2600h
Data change	25% of the variation or every hour	Values and time of each one	Header (88)+4*N	>13000	Up to 539 day lim. From Max Data Point
Over the LIMIT	every second while the field is above the limit	Values and time of each one	Header (88)+4*N	>13000	>3 hours over the limit
Manual	Manual	Values and time of each one	Header (88)+4*N	>13000	----------

The number of records able to be stored in PMM 8053B can easily be calculated as follows:

NOTE

53248/(88(header) + occupied space)
For example, up to 578 records (each with its comment, date and time) with data acquired manually (16300/92) can be stored.

When data storage begins in an already occupied group, all the data stored previously will be overwritten and therefore lost. This means that if the user needs to keep groups of data that have already been stored, he will need to carry out a new acquisition in a new record following the last one that was used.

3.7.7 Log. End function

This function determines how much time will be required for data acquisition. The possible choices are:

- **Manual** acquisition will be stopped manually
- **1 min** acquisition will stop after 1 minute
- **2 min** acquisition will stop after 2 minutes
- **4 min** acquisition will stop after 4 minutes
- **6 min** acquisition will stop after 6 minutes
- **12 min** acquisition will stop after 12 minutes
- **20 min** acquisition will stop after 20 minutes
- **30 min** acquisition will stop after 30 minutes
- **60 min** acquisition will stop after 60 minutes

NOTE

It is, nevertheless, possible to quit data acquisition in all operational modes by pressing STOP.
To store data for a time longer then one hour it is necessary to choose the Manual end mode or connect the 8053B to a PC running 8053-SW02 data acquisition software.

3.7.8 Bar function

This is used to select the linear or logarithmic scale for the analog bar.

3.7.9 Filter function

PMM 8053B has a low-pass filter to reduce noise during measuring. One of the following can be selected:

- **10 Hz**
- **20 Hz**
- **40 Hz** is the default filter
- **80 Hz**

Acquisition time can vary depending on the selected filter:

- 900 ms with 10 Hz filter
- 450 ms with 20 Hz filter
- 250 ms with 40 Hz filter
- 150 ms with 80 Hz filter

This filter is not used with EHP-50A/B/C/E.

NOTA

A more accurate measurement with EP333 and EP201 probes is achieved setting the filter to 10Hz.

NOTE

The selection of the filter will modify the following functions:

- **PLOT Coupled mode: the scroll rate will become slow with 10Hz filter but faster with 80Hz;**
- **AVG or RMS mode: the number of samples used for the calculation will change;**
- **Logger mode: the number of samples from which to pick the worst value (the highest) will change.**

3.7.10 AutoOFF function

PMM 8053B can be switched off either manually or automatically after it has been on for a defined period without the need to press any keys:

- **Disabled** manual switch-off
- **10 min** PMM 8053B will be switched off after 10 minutes
- **60 min** PMM 8053B will be switched off after 1 hour

This function is important for reducing battery consumption.

NOTE

If the Logger function is active, that is, if the meter is storing data, the AutoOFF function is automatically deactivated until the end of the programmed acquisition.

3.7.11 Time function

This function allows the user to set the internal clock.
Use the alphanumeric keyboard to enter the time in the following format: **hh.min.sec**.

Then press Enter to activate the set value.

3.7.12 Date function

This function allows the user to set the date in the internal calendar.
Use the alphanumeric keyboard to enter the date in the following format: **day.month.year**.

Then press Enter to activate the set value.

Control of the date in PMM 8053B is in full conformity with the Year 2000.

4 - Applications

4.1 What is electrosmog?

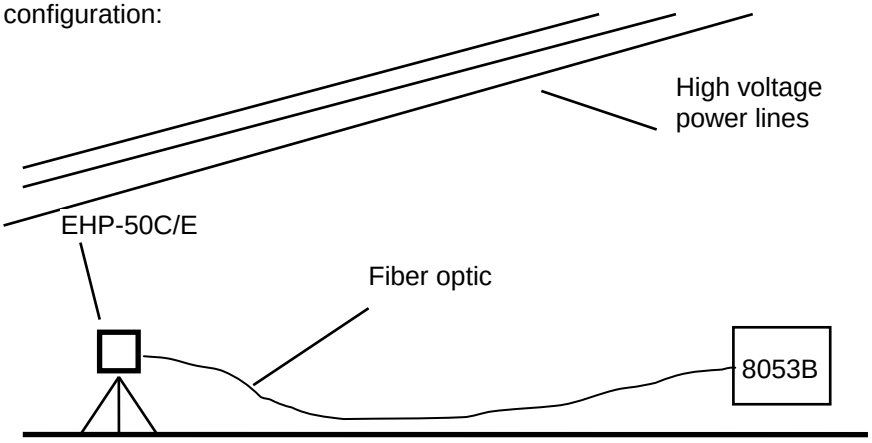
Electrosmog is a popular term used to describe any phenomenon or problem associated with artificially generated electric or magnetic pollution.
Any electric or electronic device may cause an environmental risk.
All motors, electronic workstations, AM or FM broadcasting transmitters, TVs, electric ovens, manufacturing machinery, cellular telephones and stations can generate potentially hazardous electric or magnetic fields.

4.2 Observations about the risks

Anybody, both at work and elsewhere, can be exposed to sufficiently strong fields to be harmful to their health.
Various studies throughout the world confirm the risks involved in being radiated by strong electric or magnetic fields. A great deal has been written on the subject and doctors agree with these studies.
In fact, IEC, CENELEC, ICNIRP and many national organisations are currently taking electrosmog and its eventual consequences into consideration. New standards are in the phase of being drafted and applied for protecting workers and citizens all over the world.

4.3 Measurement of power distribution lines

All high voltage power systems have the potential for generating hazardous electric and magnetic fields. With the EHP-50C and EHP-50E or the magnetic field probes HP-050/051, the electric and magnetic strength of these fields can be measured. The following is the recommended configuration:



Thanks to its spectrum analysis function with EHP-50C or EHP-50E it is possible to store into the memory only the contribution given by the high voltage lines taking out of the measurement other not interesting frequencies.
Additionally with xxxDef LP mode it is allowed to log measurements for very long periods.

NOTE

To achieve the better sensitivity it is necessary to set the Highest mode on the analyzer.
Also, in Spectrum mode is possible to store only one specific frequency.

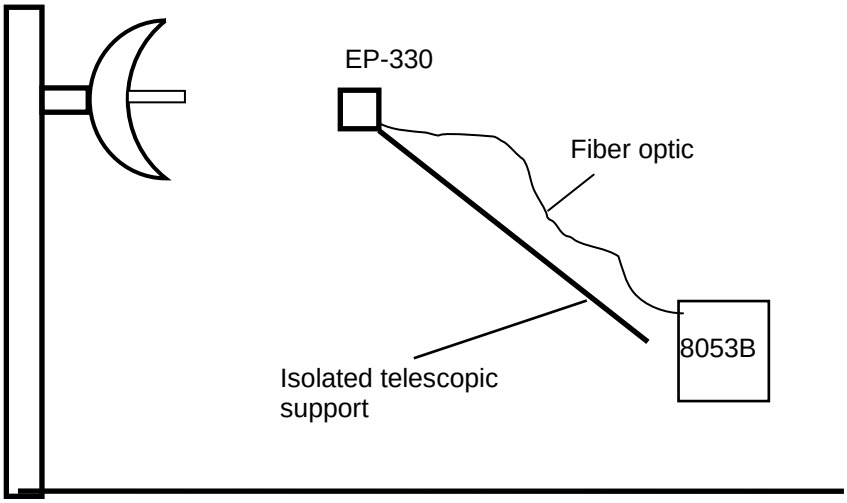
Using EHP-50C or EHP-50E

The new EHP-50C and EHP-50E offer a Stand-alone mode of operation and thanks to its internal memory is possible to perform a long term acquisition without connecting it to the 8053B.
With EHP-50C/E it is possible to collect data every 1 minute or every 30 seconds for 24 hours. Later on, it is possible to download all collected data to any PC by using the provided PMM software.
See Chapter 8.

4.4 Measurement of telecommunications transmitters

Nowadays public and private transmitting stations cover virtually the entire country.
Unless protective measures are taken, these high power-transmitting stations may be a potential risk for those who live nearby to them or who are involved in work on their service and maintenance.
Thanks to its light weigh and acoustic alarm feature, PMM 8053B can easily be used to monitor these electromagnetic fields to ensure that they do not exceed safety thresholds.
If the strength of a field in the vicinity of a transmitter needs to be measured, we recommend the use of the telescopic support in order to stay at a safe distance from the potentially dangerous field.

Insert the EP-XXX or HP-XXX probe into the Optical Repeater and connect the fiber optic to the input of PMM 8053B. Mount the Optical Repeater and the probe on the telescopic support. It can be extended as far as 4 meters.
Using the **SET** command, then select the **Alarm** function, typing in the highest value provided for.
Place the probe near the radio station and listen for the buzzer of the PMM 8053B. When it starts buzzing, this means that the strongest field allowed for has been reached. Press **MODE** and select the **DATA logger** mode, press **RUN** and then **OK**.
Move the probe, via the telescopic support, all around the area involved in the measurement so the data can be stored.
To stop data acquisition in the Manual mode, press **STOP**. Otherwise, data acquisition will be stopped after the period of time selected with the **SET** menu.



NOTE

When measuring fields emitting from transmitting antennas, it is important to place the probe with the handle of the support perpendicular to the polarisation of the antenna to avoid interference with the measurement. This is especially so when analysing signals in the range of megahertz. For A.M. application the probe should be positioned horizontal.

4.5 Spatial average

When fields that may radiate human beings are measured, different measurements from different heights off the ground must be taken. The field may vary unexpectedly from ground situated higher up (for example, up to 2 m).
Most of the time an average of all the measured positions must be calculated. PMM 8053B can do this automatically.
Select the **SET** menu and then Logger with **Log End** in **Manual**.
Press **MODE** and select **DATA Logger**, press **RUN** and then **OK**.
Now PMM 8053B is ready to acquire all the field values every time **GET** is pressed. Place the probe on the ground and **GET** for the first reading; lift up the probe and press **GET** for every new position of the probe, press **BACK** and then **STOP** to stop:
To display the acquired data, press the Up or Down arrows for see each record.
Then add for storage the user's comment about where the measurement was taken.

NOTE **Each time data are stored, PMM 8053B displays the total number of points acquired.**

4.6 Long-term acquisition

When long-term acquisition is required, the **Over Limit** or **Data change** functions can be used or data can be stored every 1, 10 or up to 900 seconds defined by the user. Also a rolling averaging over 6 minutes is implemented.
By selecting **Over Limit,** data can only be acquired when the signal exceeds the limits (previously set through the **Alarm** function); by selecting **Data change** data will be stored any time there is a change of over 25% in the field. It is possible with these operational modes to save a large amount of the memory available in PMM 8053B and only the most important data will be acquired.
By using 8053-SW02 data acquisition software with any PC, is possible to perform measurement for an extremely long period of time.

During every acquisition, PMM 8053B displays the minimum, maximum and average values.
The average result will depend on the selection made in the Average function. Either RMS or AVG may be selected.

NOTE **After 32 acquisitions or after a chosen period of time, PMM 8053B displays the average value with the ν symbol next to it to inform the user that the average has been calculated.**
Each time the MIN-MAX/AVG key is pressed, PMM 8053B will begin calculating a new average overwriting the previous one.
Once the data are stored, by using Data Logger software is possible to download to the PC all captured data.

NOTE **For 50/60 Hz applications, the EHP-50C and EHP-50E offer 24 hours continuous acquisition in stand-alone mode. This solution will not depend upon 8053B usage. The collected data will be transferred to the PC for reporting.**

4-7 dB to % error coversion

To convert the error expressed in dB in % use the following formula:

Error calculation in % from an error X in dB

$$\left(1 - 10^{\frac{X\ dB}{20}}\right) x100 = \text{error in\%}$$

Ex: 1.5 dB = 18.8%
2.0 dB = 25.9%

5 - Data transfer
8053-Logger Interface

5.1 Introduction

PMM 8053B offers a simple and user-friendly method for transferring acquired data to a Personal Computer (PC). This section provides all the information necessary for transferring the data with ease.

NOTE

Please, use the release 2.23 or following.

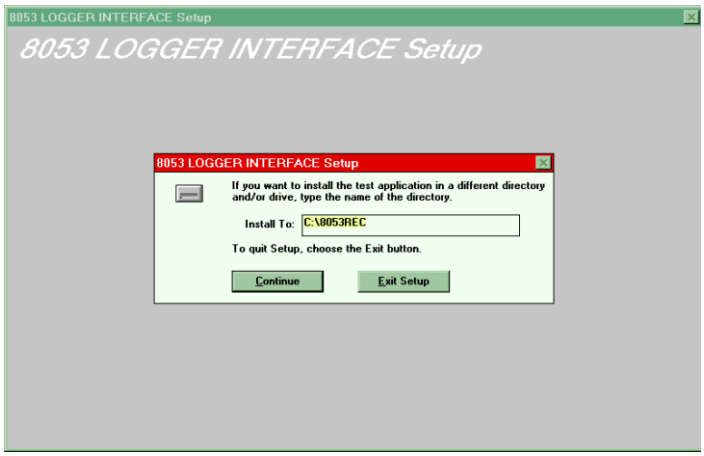
5.2 System requirements

For the software to operate properly, the user's Personal Computer should be equipped with the following:

- 486 Processor or Pentium
- 16 Mb of RAM
- At least 2 Mb of free space on hard disk
- 1 free USB or RS232 port
- Windows Operating system™ 3.11/95/98/XP/2000/Win7

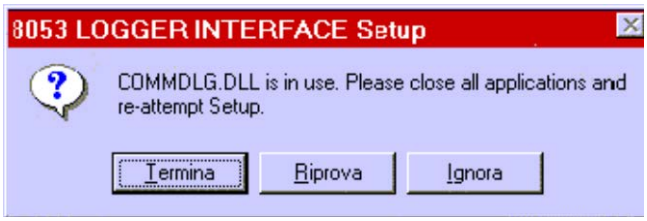
5.3 Software installation

The software must be installed before connecting PMM 8053B to the PC. Insert the software disk into the drive, open Program Manager and run the **Setup.exe** file. After a few seconds the program will ask the user to choose the directory in which he wishes to install it. The default directory proposed by the program is **8053REC**. To install the program in a different directory, type in the new name and press **Continue**.



NOTE

During installation, the program installs several system files that are necessary for it to operate properly; if these files have already been loaded during previous installations, the following window will appear:

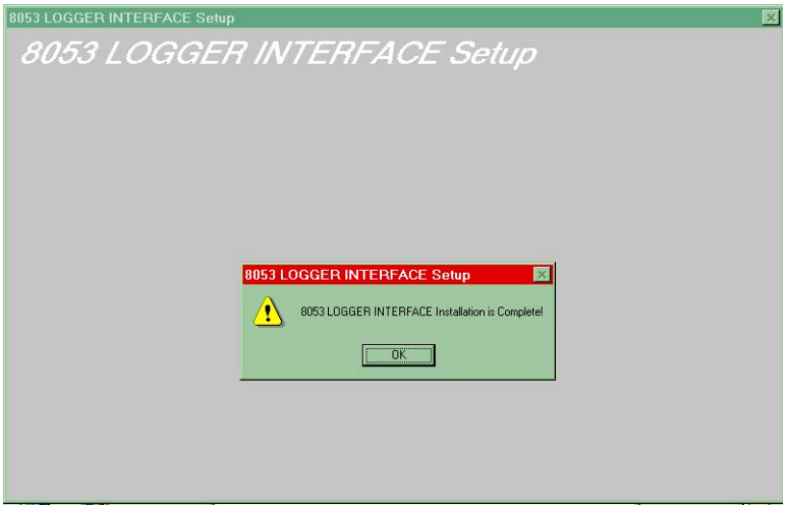


In this case press **IGNORE** to continue.

NOTE

In some cases, a message may appear informing the user that the SETUP1 file cannot be copied. Go to the WINDOWS™ directory and rename the existing file with a new name and start the installation process over again.

When installation is complete, the software displays a window which informs the user that the program has been successfully installed. Press **OK** to continue.



5.4 Icon of 8053 LOGGER INTERFACE software

Once installation is complete, Program Manager displays the program's icons. The Update Firmware program of PMM 8053B will be installed together with the data transfer program. Select and press **8053 LOGGER INTERFACE** twice to run the data transfer software.

5.5 Hardware installation

Connect the RS232 cable, supplied with PMM 8053B, to the Wired socket situated on the side panel of PMM 8053B and to a free RS232 port of the PC, and carry out the following procedure:

- Switch PMM 8053B on;
- Press **SET**;
- Log on **Serial**;
- Select the Wired function;
- Press **Back**.

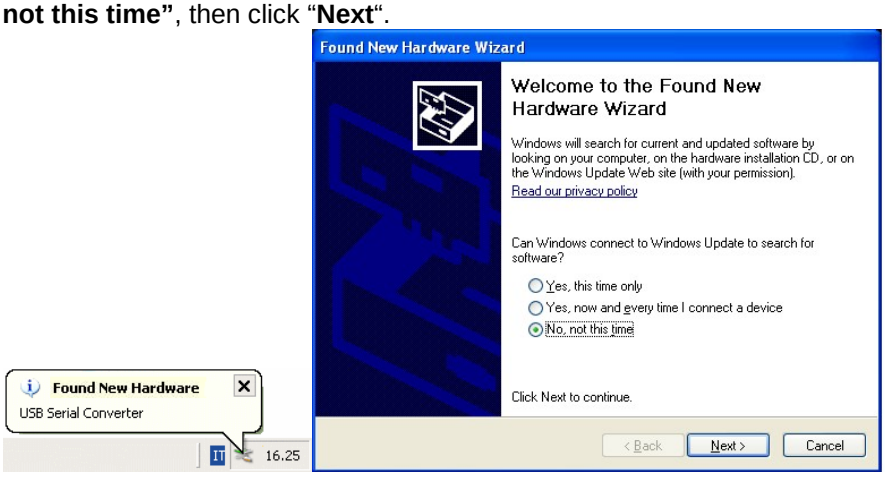
It is also possible to connect 8053B to the PC via an optical link. In this case 8053B has to be set to **Optical** and the USB-OC or 8053-OC has to be used.

Fig. 5-1 8053B link with USB-OC

Fig. 5-2 8053B link with 8053-OC

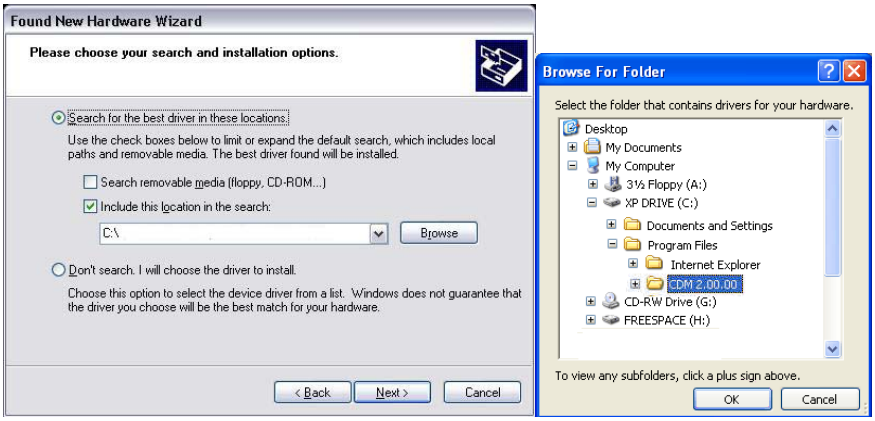
NOTE **8053B should be OFF.**

Connecting the USB-OC the first time, Windows opens the "**Found New Hardware Wizard"**. If it asks to connect to Windows Update, select "**No, not this time"**, then click "**Next**".



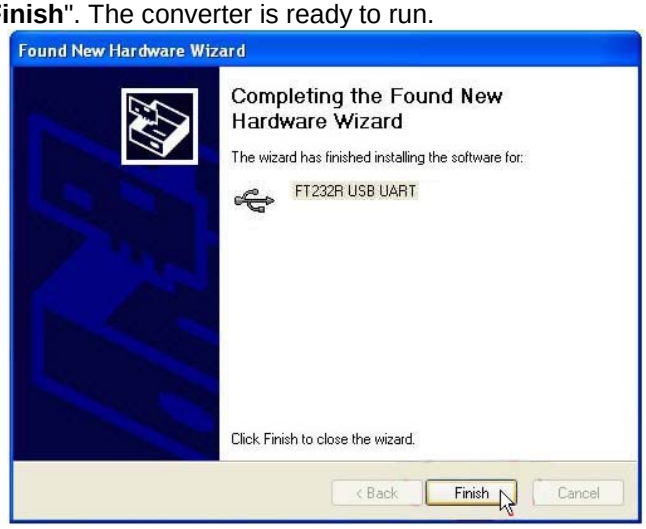
You may select "**Install from a list or specific location (Advanced)**".

In the search dialog, specify the FT232R USB UART driver located in the folder and click Next.



Please wait while the wizard install the software.

When the "**Completing the Found New Hardware**" message appears, click on "**Finish**". The converter is ready to run.

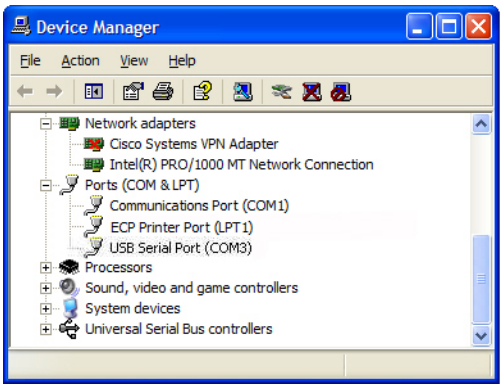


NOTE

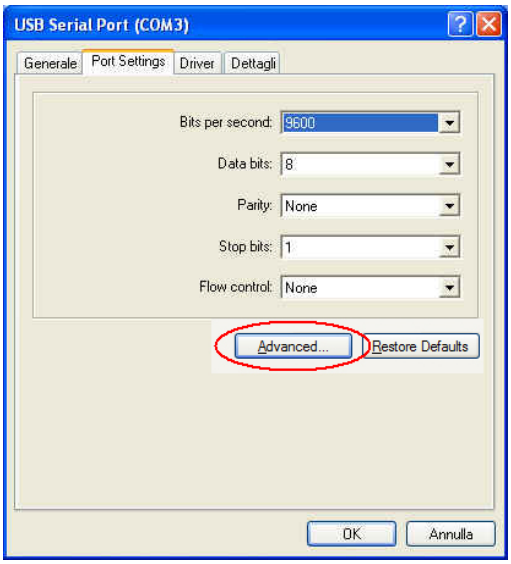
With USB-OC the program doesn't establishes automatically the connection on the first COM port that is not in use. In this case, it is necessary to "force" the serial port by the following procedure:

- Open the **Device Manager** (using **Start** > **Control Panel** > **System** > **Hardware** > **Device Manager**). The COM driver for the USB-OC is located under **Ports (COM & LPT) – USB Serial Port (COMx)**.

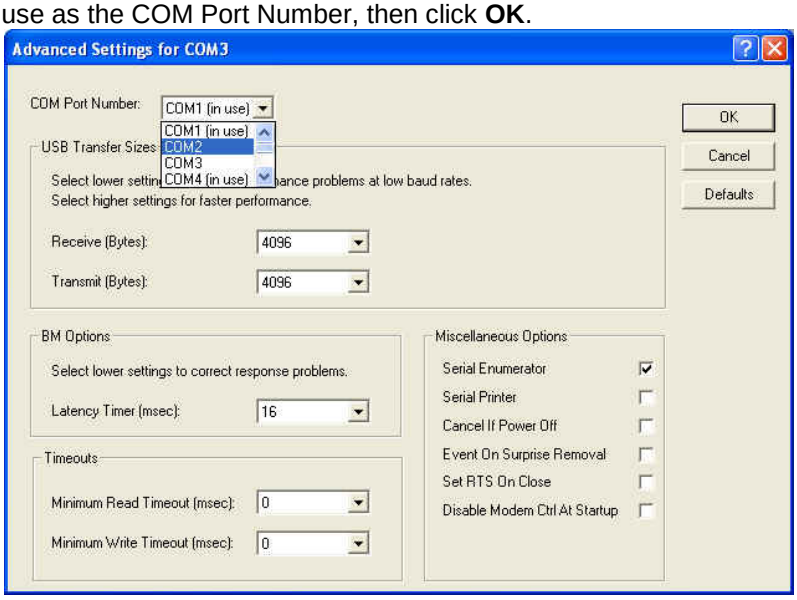
COMx stands for the COM port selected by the driver.
If the driver is listed as a different COMx port, you must change the port settings as described below.



- To change the **COMx** port, double click on **Ports (COM & LPT)** > **USB Serial Port** to open the Properties dialog. Select the **Port Settings** tab and click on the **Advanced** button.

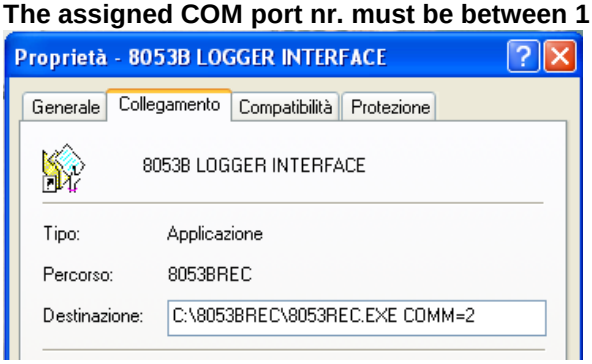


- On the Advanced Settings dialog, select the first COM port that is not in use as the COM Port Number, then click **OK**.



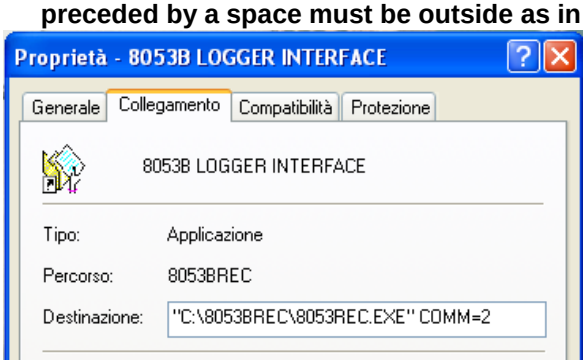
- Select the icon **8053 LOGGER INTERFACE** with the right mouse button;
- Select **Properties**;
- Add the command **COMM=N** preceded by a space (in capital letters) at the end of the Destination field where N indicates the serial port to be used; for example, if the 8053B is connected to port 2, add the command COMM=2.

NOTE **The assigned COM port nr. must be between 1 and 9.**



NOTE

- **In some operating system the Destination field is enclosed in double quotation marks (“); in this case, the command COMM=N, preceded by a space must be outside as in the example below;**



- Then confirm by selecting **Apply**

NOTE

Usually the program automatically establishes the connection on the first RS232 port that is not in use at that time, in the following order, COM1, COM2, COM3, etc.

NOTE

The energy available on the DB9 connector of some PC model could be not sufficient to guarantee a link with 8053-OC. In this case, is necessary use 8053-OC-PS between the converter and PC.

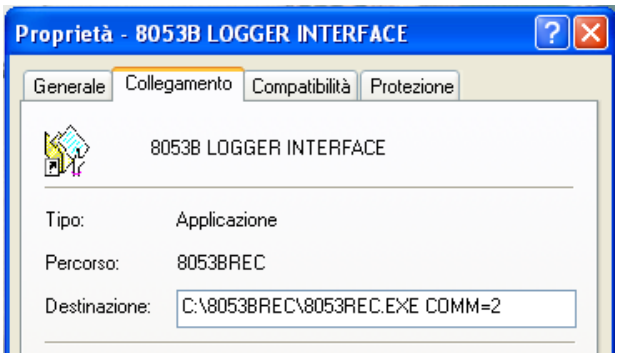
NOTE

Instead, whenever a port is tied up by a device (for example, a modem), which is not at that time active or is turned off, the program recognises that it is free and will therefore attempt to connect PMM 8053B to this port. In this case, it is necessary to "force" the next serial port by using the following procedure:

- Select the icon **8053 LOGGER INTERFACE** with the right mouse button;
- Select **Properties**;
- Add the command **COMM=N** preceded by a space (in capital letters) at the end of the Destination field where N indicates the serial port to be used; for example, if the 8053B is connected to port 2, add the command COMM=2.

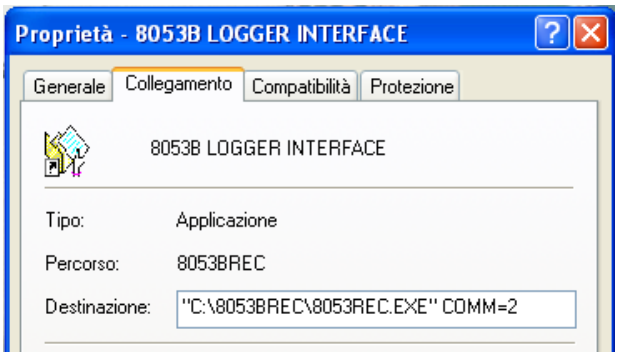
NOTE

The assigned COM port nr. must be between 1 and 9.



NOTE

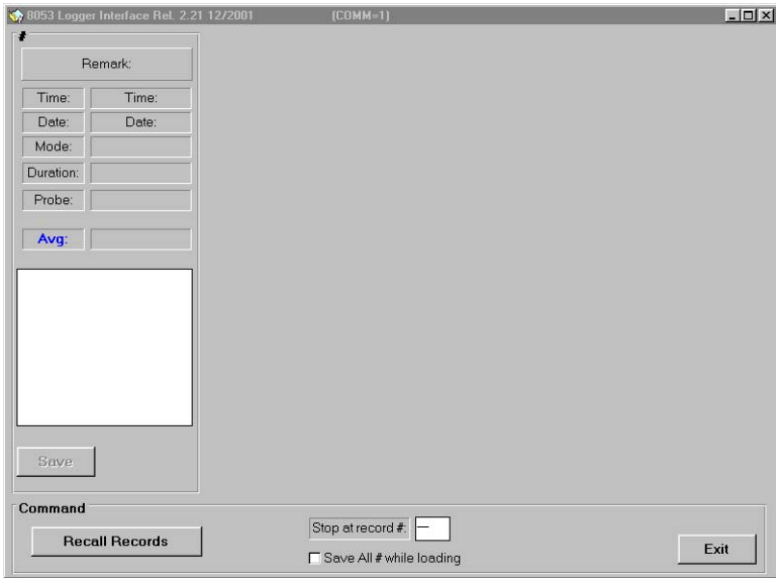
- **In some operating system the Destination field is enclosed in double quotation marks ("); in this case, the command COMM=N, preceded by a space must be outside as in the example below;**



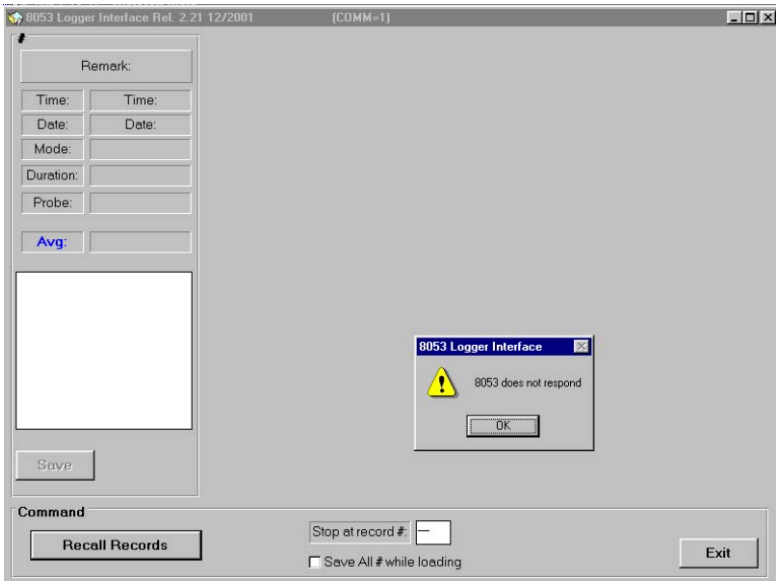
- Then confirm by selecting **Apply**

5.6 To run the LOGGER INTERFACE software

As soon as the 8053 **LOGGER INTERFACE** transfer program has been run the main window will be displayed.



If the user attempts to transfer the data before connecting PMM 8053B to his PC or PC is using a wrong RS232 port, an error message will appear.



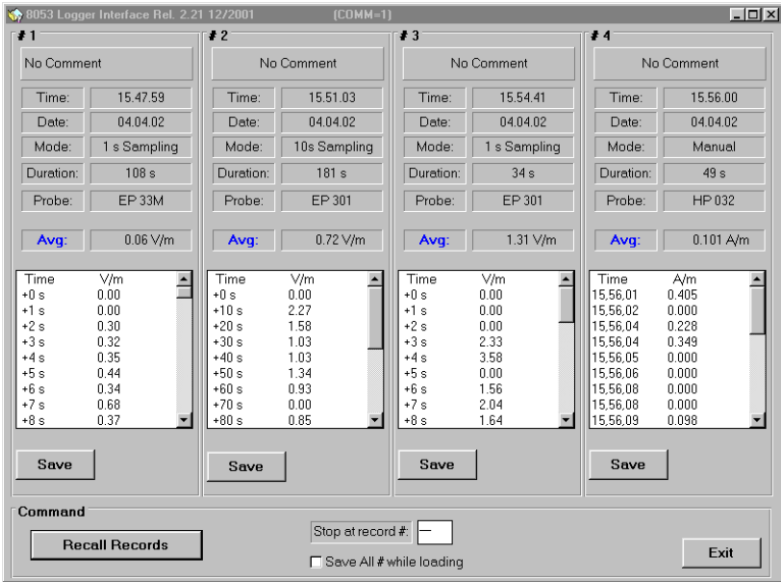
Fix the problem and try again.

WARNING

Only connect the PC to PMM 8053B by using the cable supplied with the meter. For a good communication, 8053B requires only TX and RX to be used. The Baud rate, polarity and Bit stop are automatically assigned.

5.7 To transfer data

To transfer data stored in PMM 8053B to the PC, press the virtual key **Recall Records** and wait a few seconds until data transfer is completed. When it is complete, a window similar to the following will appear on the screen:



PMM 8053B will always shows the last four records stored. For example, if 5 records have been saved in PMM 8053B, the program will transfer the last four (2, 3, 4 and 5).
However, if the user wishes to transfer the first four records, he will need to type the number 4 in the small window **Stop at record #.**
Every record will display the following:

- The number of the record;
- The date and time of the beginning of the measurement;
- The acquisition mode;
- The duration of acquisition;
- The type of probe used;
- The average value calculated with **RMS** or **Avg** function (if this feature is available for this specific acquisition mode);
- All the values measured and stored (use the up and down arrow for displaying the whole record);
- The Save key for saving the date in a file.

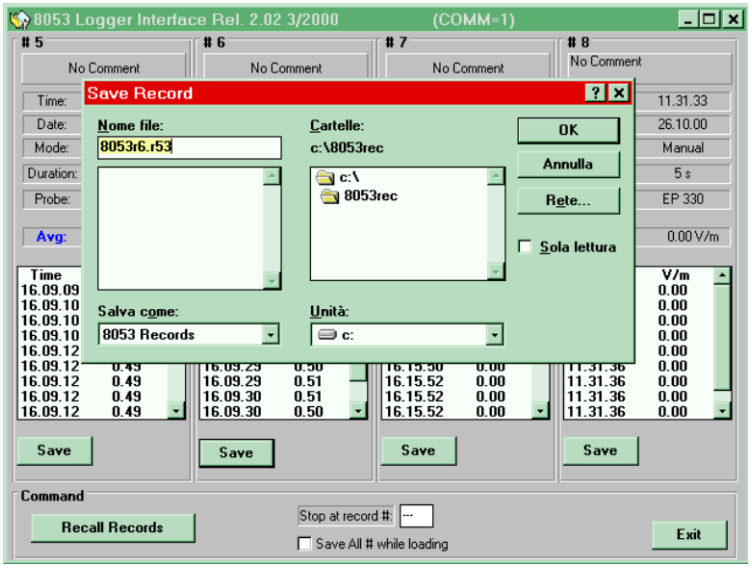
Depending on the mode selected during data acquisition, PMM 8053B also stores the date and time associated with the measured value.

NOTE

For example, in Data Change, Over the Limit and Manual modes, PMM 8053B stores the absolute time; in this case the average calculation is not performed.
While in 1s Fix or xxxs Def modes, PMM 8053B only stores the relative time.

5.8 To save data

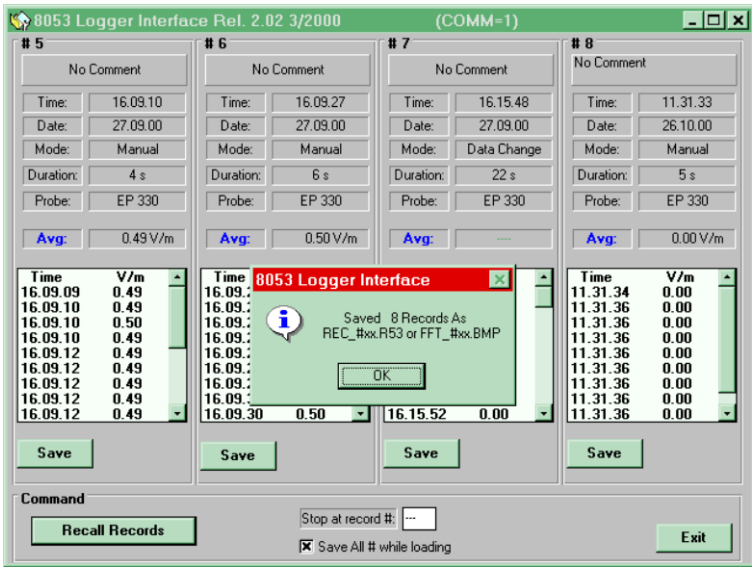
When data needs to be handled or saved, call up the save menu by pressing the **Save** button. The program will display the following window:



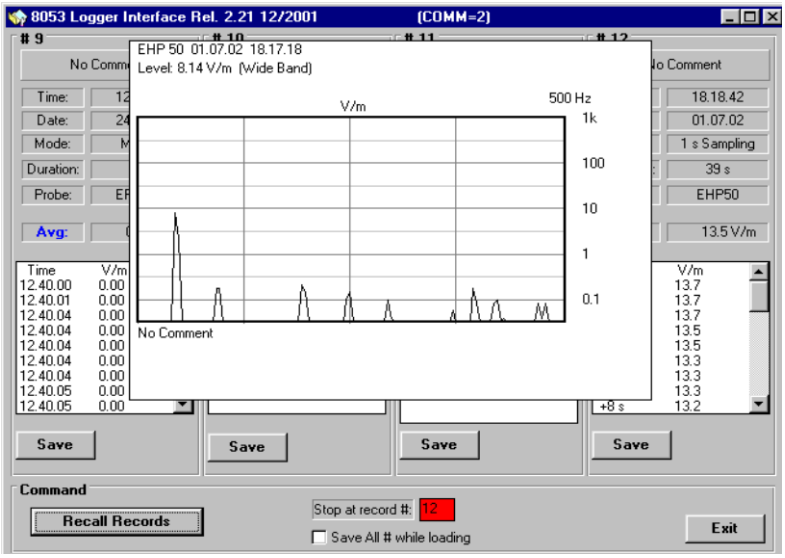
NOTE

All saved files with numerical data must have the extension .r53 while those with pictures of spectrum analysis must have the extension .BMP.

It is possible to save all the stored records at the same time by selecting the frame **Save All # while loading**
The files corresponding to each record will be created with the name 8053recx.r53 or **Fft_xxx.BMP** in the 8053REC folder.



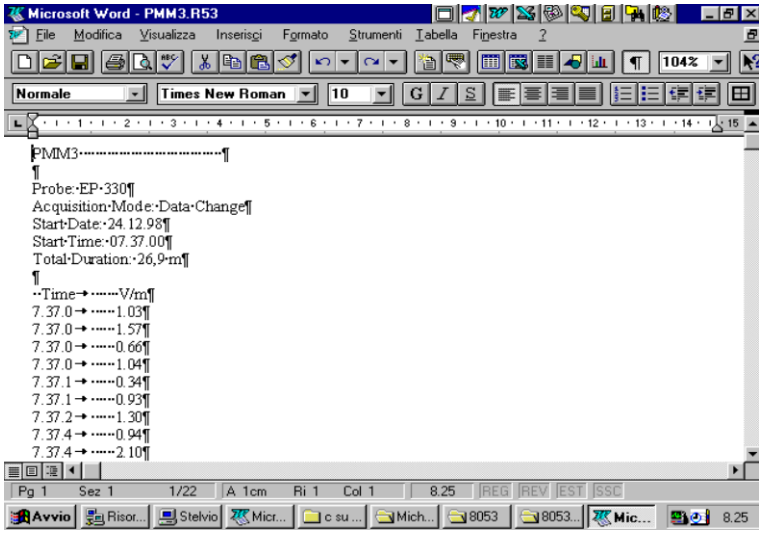
If 8053B has some Spectrums stored in its internal memory, after the downloading is possible to expand the Spectrum window positioning the mouse close to the button **Save** related to such spectrum.



A big spectrum image will appear on the display. The Spectrum can be saved only with BITMAP format; therefore these files can only be manipulated as an image file.

5.9 To process data with WORD for WINDOWS

All saved records are ready for reading or handling with any word processing program. By using Word for Windows the user will have a display similar to the one in the following example:

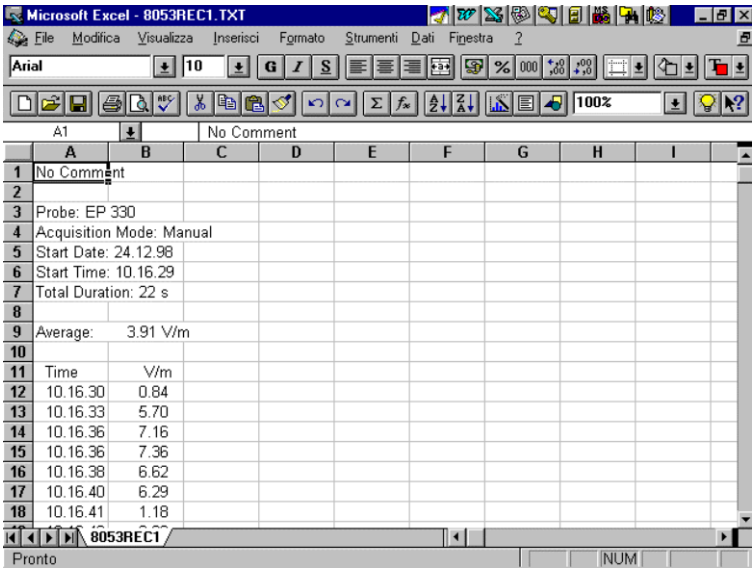


NOTE

When using Word for Windows, the format conversion TEXT ONLY must be used. To open the files it is necessary to look into the directory where the transfer software has been installed. The files containing spectrum analysis can be inserted with Word function: Insert Image from File.

5.10 To process data with EXCEL

All saved records can be handled with EXCEL or other spreadsheet programs. In this case, it is sufficient to open the file by selecting the directory where the data has been transferred for obtaining the following display:



NOTE

When opening a file, use the property Type of File: All Files because 8053 software does not create XLS file format but a compatible one with .r53 extension.

6 - Updating firmware

6.1 Introduction

PMM 8053B contains a simple and user-friendly method for updating its internal firmware through a Personal Computer (PC). This section provides all the information required for easy updating.

6.2 System requirements

For the software to operate properly, the user's Personal Computer should be equipped with the following:

- 486 Processor or Pentium
- 16 Mb of RAM
- at least 10 Mb of free space on hard disk
- 1 free serial port
- Windows Operating System™ 95/98/XP/2000

6.3 To install the software

The Update Firmware Program is installed together with the data transfer utility, as explained in Chapter 5 of this Manual.

6.4 Icon of PMM 8053 software

Once the software has been installed in the PC, the following window will be displayed. Press **UPDATE 8053 Firmware** twice for running the update program.

6.5 To install the hardware

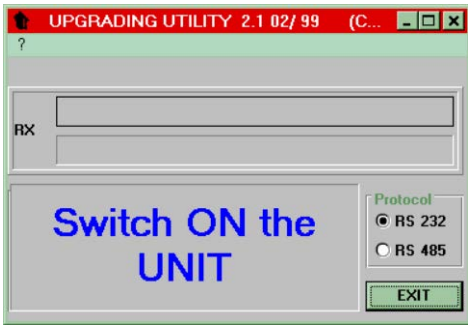
Connect the RS232 cable, supplied with PMM 8053B, to the Wired socket situated on the side panel of PMM 8053B and to a free RS232 port on the PC.

NOTE

8053B should be OFF.

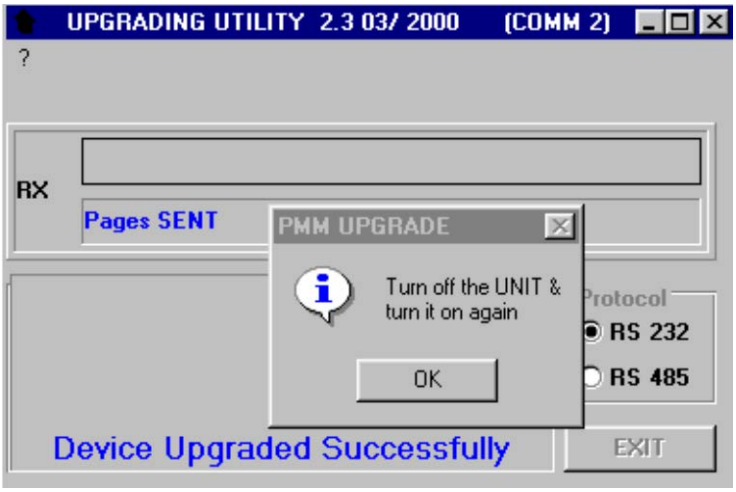
6.6 To run the update software

As soon as the updating program **UPDATE 8053 Firmware** has been run, the main window will be displayed:



6.7 To transfer data

To run the Update Firmware program, simply switch PMM 8053B on and wait (few minutes) until the automatic transfer is completed.
At the end, if the update has been successfully performed, the following window will appear:



Turn **OFF** 8053B (it seems already OFF but it is not) and turn it **ON** again to see if the new firmware release has been downloaded.

PMM 8053B is now updated with the new version of the internal firmware.
It is now possible to disconnect the cable connected to the PC, with the PMM 8053B meter either switched on or off.
Subsequently, when the meter is switched on again, the new version of the firmware will be displayed in the set-up window of PMM 8053B

☞NOTE

To obtain updating of the firmware or programs for PMM 8053B, the user can contact his NARDA agent or download it directly from the following Web site: http://www.narda-sts.it

7 – 8053-SW02
Data acquisition Software

7.1 Introduction to PMM 8053-SW02 Software

8053-SW02 Software is a computer tool, which integrates itself with the system of the PMM 8053B General Purpose Field Meter or it is used to drive the automatic switching box SB-04.
By mean of a simple interface between the meter and the User's personal computer and software, based on the Windows™ Operating System, PMM SW02 software broadens the flexibility of use of PMM 8053B system by facilitating the acquisition, storage, and graphic and numeric display of the data collected.

PMM SW02 software (release 1.72) has the following basic functions:

- It scans the readings taken with PMM 8053B or with SB-04 and records the data at sampling intervals of one second for the of time defined by the user.
- It generates a visual alarm of the PC screen if the field exceeds the alarm threshold value defined by the user;
- It reverses the polarity of the voltage coming out from pin 4 of the serial port used to drive 8053B or SB-04 in case you exceed the threshold of alarm;
- It allows the readings that have been taken to be saved, at the same time, as both an envelope and as an individual data and, on later occasions, to be retrieved and analysed.
- It permits the data of the measurements stored in the Logger of PMM 8053B to be transferred to PC and saved in files and be graphically displayed.
- It makes a graphic representation of the envelope of the stored and/or saved readings, permitting moment by moment analysis of values with the aid of a marker.
- It permits the measured values to be compared with the limits imposed by the user.
- It permits the readings in progress to be graphically and numerically displayed in real time.
- The files saved on disk, related to the measurements taken, are recorded with the date and time of measurement and any other useful reference information added by the user, enabling a measurement database to be created very easily. Furthermore, they lend themselves to additional processing with other external programs or spreadsheets, such as Excel™.
- A simple user interface based on the Windows™ Operating System makes its use intuitive and user-friendly.
- The connection between the meter and the computer via serial cable (used for the connection with 8053B or SB-04) or via fiber optics (only when using 8053B or OR03), guarantees maximum security and flexibility in link-up in all operating conditions.

7.2 Main specifications

Table 7-1 defines the main requirements and specifications of the PMM 8053-SW02 Software.

TABLE 7-1 Requirements and Specifications

To allow the software operate properly, the user's personal computer should be equipped as follows:

- Pentium processor
- 16 Mb of RAM
- At least 10 Mb of free space on the hard disk
- 1 free USB or RS232 port
- Windows™ 95/98 Operating System or Windows™XP/2000

Software Specifications:

- **Sampling period:** 1 second
- **Recording time:** definable by the user and expressed in minutes
- **Data storage:** total field and individual data (X, Y and Z axis)
- **File format:** proprietary
- **Exported files:** BMP or TXT formats
- **Averaging:** RMS or Arithmetic averaging over 6 min
- **Compare mode:** two graphs
- **Vertical Scale:** linear or logarithmic
- **Limit:** user definable with warning visual alarm when exceeding the limit
- **Special functions:** Zoom mode, Marker, Print
- **Display property of the envelope:** highest field in the time span able to be represented by a single pixel.
- **Number of points stored internally:** 1024
- **Downloading of the 8053B memory into the PC**

7.3 Software installation

The SW02 program can be downloaded from Internet at www.narda-sts.it Apart from being able to download any updates, the Software is also provided with a special disk for installing it.
To start installing the Software, take the following steps:

- switch on the PC with the Windows™ operating system;
- insert the PMM SW02 disk in the disk drive;
- select the "**Run**" function from the Main Menu ("Start");
- type the command "**A:SETUP**" and press <Enter>.

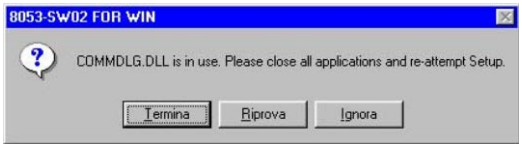
During installation, the program will ask the user to chose the directory in which he wishes to install it.
Reply **OK** to confirm the default directory **C:\8053SW02**, or type in a new name.
The display on the screen will be similar to the following:

8053-SW02 Setup

Click on **Continue** to continue installing the program or **Exit Set-up** to quit the procedure.

NOTE

During installation, the program installs several system files that are necessary for it to operate properly. If these files have already been loaded during previous installations, the following window will appear:

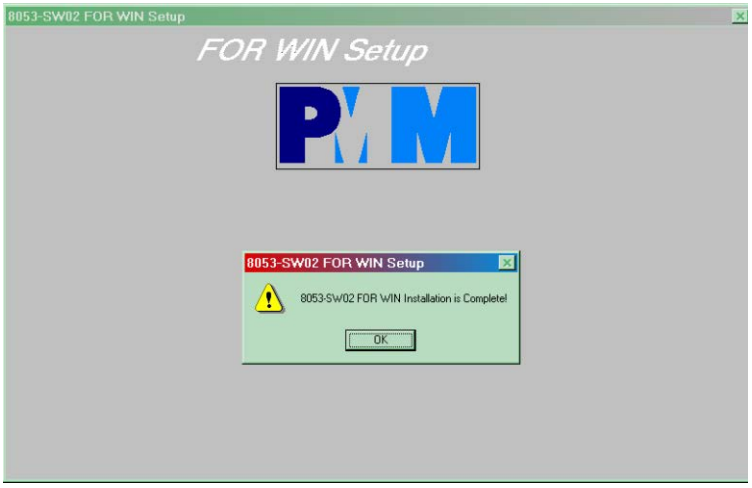


In this case, press **IGNORE** to continue.

NOTE

In some cases, a message may appear informing the user that the SETUP1 file cannot be copied. Go to the WINDOWS directory and rename the existing file with a new name and start the installation process over again.

When installation is complete, the software displays the following window which informs the user that the program has been successfully installed.



Click on **OK** to end the installation.
Once the program has been installed properly, the **8053-SW02 FOR WIN** icon will be created like the one in the following example:

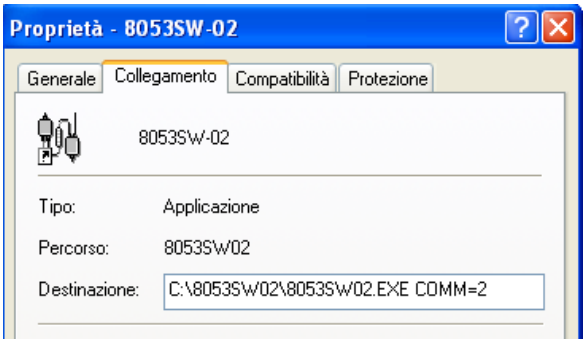
NOTE

Usually, the program automatically identifies the serial port to use, selecting the first one available that is not in use at that time (in numeric order, COMM1, COMM2, etc.).
If the user wishes to "force" a particular serial port into use, it is necessary to adopt the following procedure:

- Select the icon **8053 LOGGER INTERFACE** with the right mouse button;
- Select **Properties**;
- Add the command **COMM=N** preceded by a space (in capital letters) at the end of the Destination field where N indicates the serial port to be used; for example, if the 8053B is connected to port 2, add the command COMM=2.

NOTE

The assigned COM port nr. must be between 1 and 9.



NOTE

- **In some operating system the Destination field is enclosed in double quotation marks (“); in this case, the command COMM=N, preceded by a space must be outside as in the example below;**

- Then confirm by selecting **Apply**

It is now possible to link either SB-04 or 8053B to the computer through the serial cable.
PMM 8053B can be connected in the two following ways:

1) directly through the serial cable supplied with PMM 8053B (PMM 8053B must be configured on: **Wired**);

2) by using the USB-OC or 8053-OC Optical Converter between the first free port on the computer and the fiber optic. Connect the fiber optic between the **Optic Link** connection of the Optical Converter and the **Optic Link** connection of PMM 8053B. The Optical Converter will be powered directly from the port of the computer.
PMM 8053B must be configured on: serial **Optical**.
See paragraph 5.5 for USB-OC installation

To start the program

Switch PMM 8053B or PMM SB-04 on and the accessories connected to it.
The program is now ready to be used.

NOTE

The Software is continuously communicating with the port of the computer. If no reply is received from PMM SB-04 or from PMM 8053B (for example, the RS232 connectors or the fiber optic are not connected properly, or PMM 8053B is switched off, etc.) the following functions will automatically be disabled:

- analog bar
- data acquisition
- download records
- EHP-50C or EHP-50E is missed or OFF

The corresponding virtual keys will be displayed in grey.

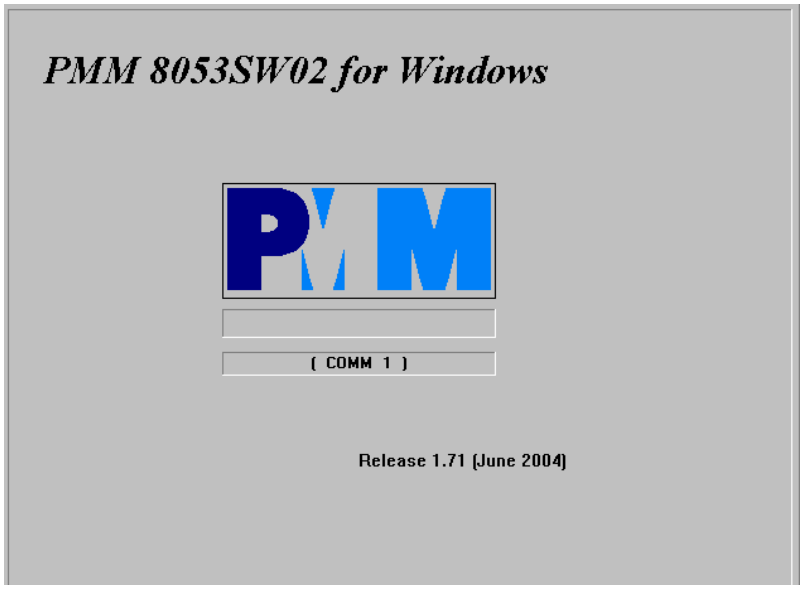
NOTE

Whenever there is no reply during a measurement, acquisition automatically goes into pause so no data will be lost.

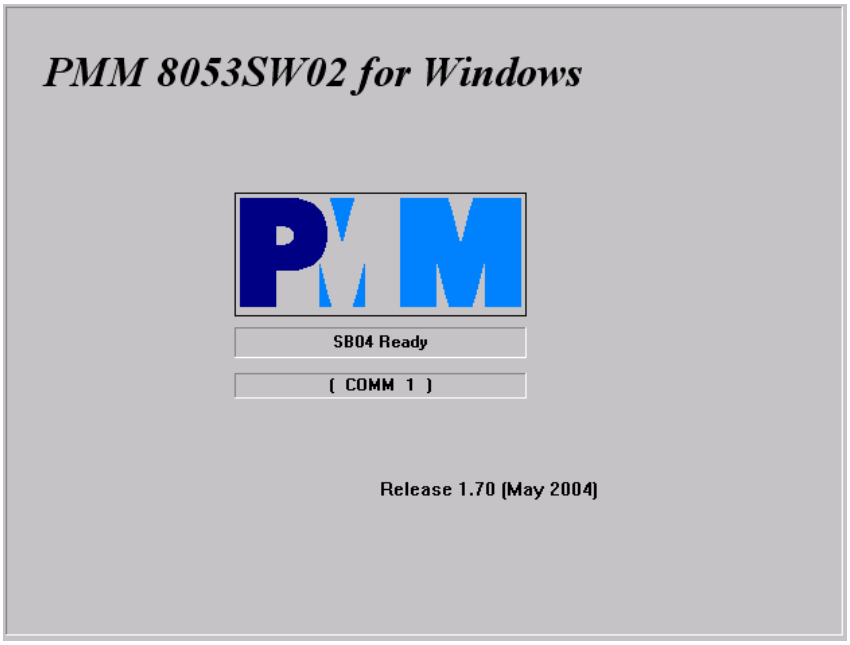
7.4 Commands description

To run the software, double click with the mouse, on the following icon:

According to the setup of the system, the PC will display various messages during the start of the program:

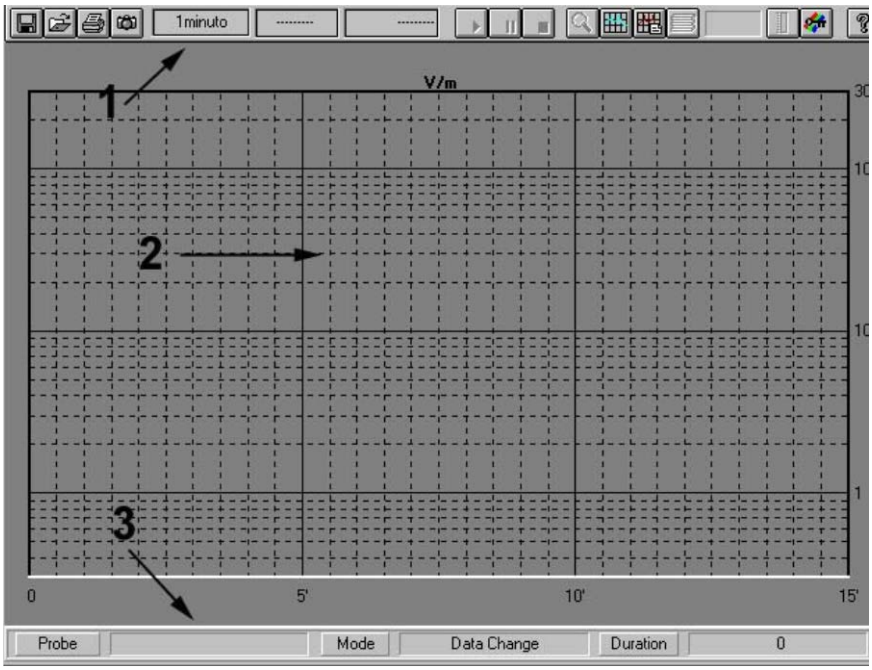


If SB-04 is connected and switched on, the **SB-04 Ready (COMM N)** message will be displayed in the window. In this case, there is proper communication between the PC and SB-04.

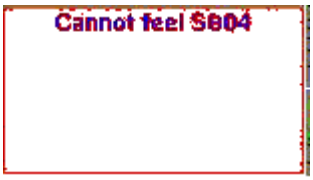


After the main window has been completed, the user enters the program which is displayed in 3 separate sectors:

- At the top, the tool bar is displayed (1)
- In the centre, the graphics data presentation window is displayed (2)
- At the bottom, the status bar is displayed (3)



If communication is interrupted during data acquisition, a red box in which "**CANNOT FEEL SB-04**" is written will appear on the screen:



7.5 Tool bar

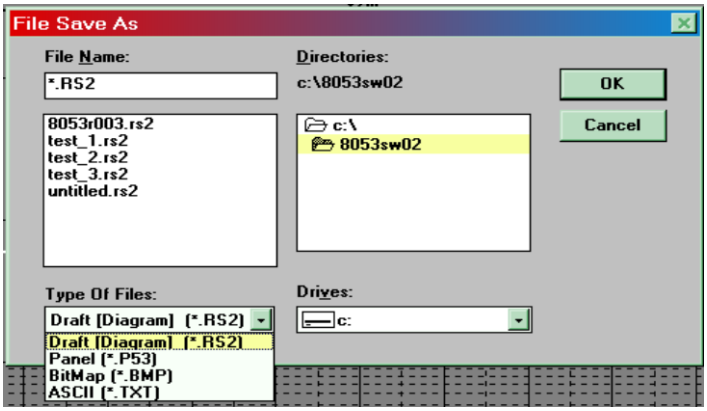
Description of the tool bar:

Save Files:

Saves measurement files in the four following formats:

1. **Draft [Diagram] (*.RS2)** (Default). A file for future re-processing of the recorded measurements. In this case, several files are saved in proprietary format.
2. **Panel (*P53)** A file with the ***.P53** extension which contains the current settings selected with the **Setup** key is saved. This allows the user, in the future, to easily retrieve the setup he prefers. (Usually, the program starts with the setup stored in the default.P53 file).
3. **BitMap (*.BMP)** A graphic bitmap file based on the diagram displayed at that time is saved.
4. **ASCII (*.TXT)** A text file containing all the available measurements is saved:
   - Time and intensity of the field;
   - Time, fields and co-ordinates and precision for devices equipped with GPS.

By clicking on **Save Files,** the following window will be displayed:

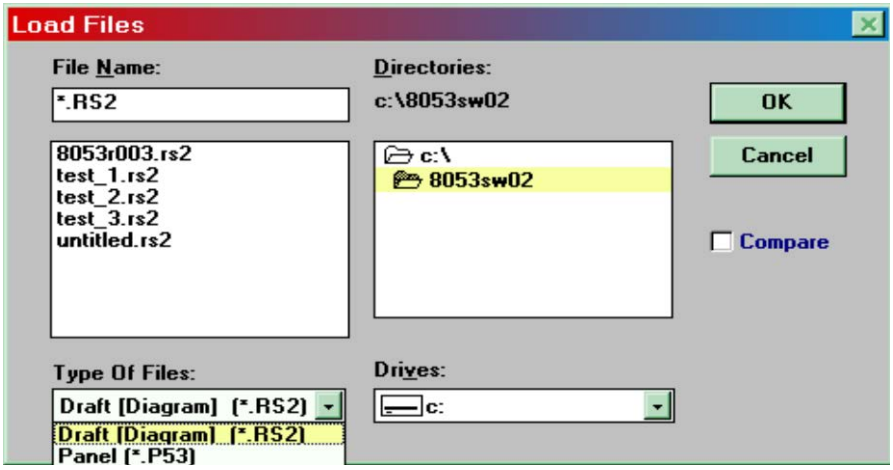


This window allows the user to select the type of file to be saved, the drive and the directory and the name of the file. By pressing OK**,** the file will be saved, by pressing Cancel**,** the operation will be cancelled.

Open Files:

Loads measurement files saved on previous measurements (*.RS2). Also is possible to loads setup files (*.P53) previously stored.

By clicking on Open **Files**, the following window will be displayed:



This window allows the user to select the name of the file to load as well as the drive and directory where it is to be stored. By pressing **OK,** the file will be loaded, by pressing **Cancel,** the operation will be cancelled.

NOTE

By selecting Compare, the user can also load a new file over the file that has just been loaded, superimposing the graphic display of one on the other, thereby enabling him to compare the graphics of different measurements.

Print:

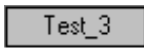
Prints the current display on an on-line printer.
Each trace is converted into a bitmap and printed in the colours of the palette selected in **Setup**.
By clicking on **Print**, the following window will be displayed where the user can select the type of printer and modify its settings:

NOTE

Always select Horizontal orientation.

ClipBoard:

Constructs the bitmap corresponding to the current measurement displayed and copies it in the Clipboard of Windows. In this way, the user can paste images directly on other active software without creating data exchange files. This operation may be useful in adding graphic images of the recorded measurements to test reports or other documents written with a Word Processor, such as, for example, Word per Windows™. Each trace is converted into a bitmap and copied with the colours of the palette selected in **Setup**.



The name of the displayed measurement or the in process measurement is displayed in this box. It is usually automatically updated with the LOAD command and should be changed manually, if necessary, before any new measurement is taken.
To change it, place the cursor in the box, highlight the name given there and type over it with the new name that has been selected.

These boxes display:

- The time that has passed from the start of the measurement to that remaining until the end, while the reading is in course
- The time and date of the start of the reading of the measurement in every other case.

These boxes can be edited manually so that times and dates different from those given automatically can be inserted.

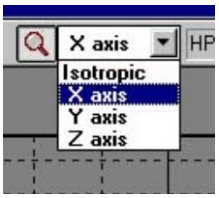
Date and time are those of the measurement and not of the file.

These keys allow the user to start, to pause and to quit in advance the recording of the measurement.

Zoom Mode:

When Zoom **Mode** is activated, the displayed measurement can be enlarged horizontally (ZOOM), resulting in sharper definition. It also activates the **Marker** function.
Once the following options have been selected in setup,

after pressing **Zoom Mode,** the following window will be displayed



which allows the user to move the marker on the graphics of the X or Y or Z axes or also on the graphics of the total values resulting from the following formula:

$$V/m_{tot} = \sqrt{E_x^2+E_y^2+E_z^2}$$

When the display of the single axes is not activated, the marker will only be activated on the trace of the total value.
To activate **Zoom,** select **Zoom Mode**, then, with the mouse, place the triangle of the Marker on the starting point and, by keeping the left mouse button pressed down; drag the **Marker** to the point and the end of the segment to be enlarged. During this operation, two vertical bars will be displayed to help make the selection. On releasing the mouse button, the selected segment of the trace will be immediately enlarged.
To return to the normal display, deselect **Zoom Mode**.

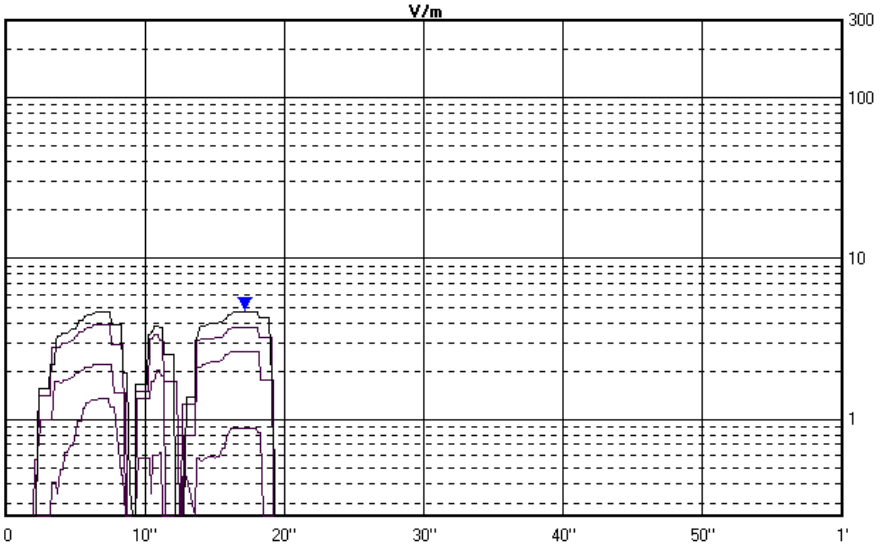
NOTE

The minimum segment of the trace that can be selected is of 120 seconds (2 minutes. Greater enlargement would only put additional space between the measurement points without adding any significant information. If the user attempts to zoom on a segment that is less than 2 minutes, an error message will appear.

Zoom Mode enables the **Marker** to be activated. It is represented by a coloured arrow that can be placed, with the mouse, along the displayed graphic trace.
In this case, the status bar at the bottom of the screen,

will display the following values: **TIME** (that has passed since the start of the measurement) and field **LEV** (total or single axis) relative to the current position of the Marker.

This function gives a detailed analysis of the graphics and the relative values that have been stored.



NOTE **When Zoom Mode is active, the other commands, with the exception of Save, Print, ClipBoard and Help will be automatically disabled.**

NOTE **When Zoom Mode is active, files can only be saved in BMP format.**

Redraw: Allows the user to refresh the screen and redraw the diagram. Sometimes this function is quite useful if the PC has not enough memory.

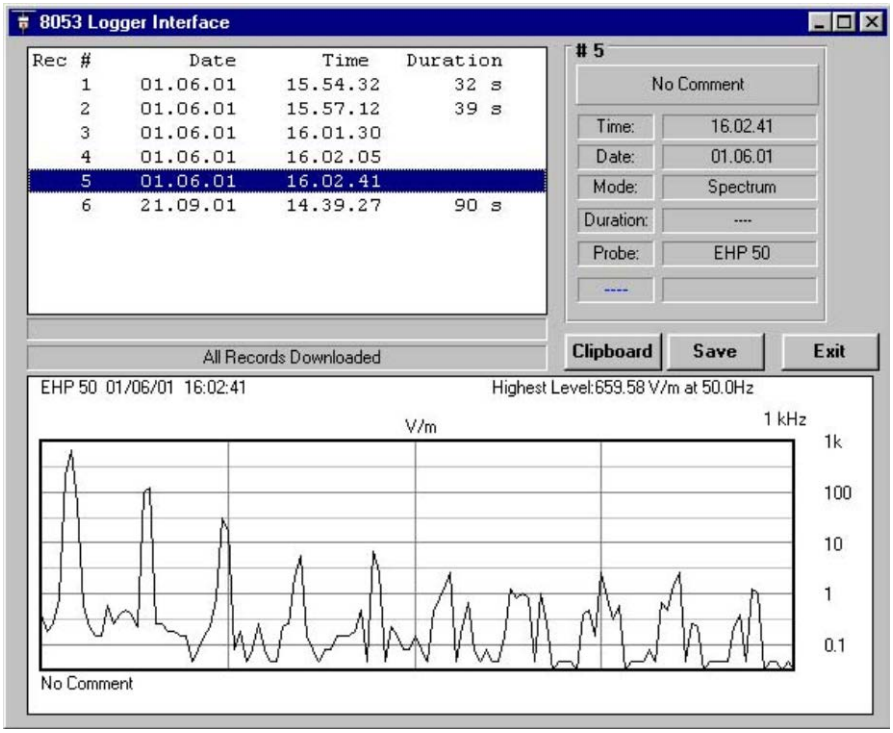
Comment: Displays the box containing the user's comment, that can be typed or modified for up to a **maximum of 1024 characters**.

NOTE **In the print-out of the graphics or the bitmap, the comment will only be reproduced when this key is active.**

Rcl Records:

This allows the user to display the parameters of all the records of measurements stored in PMM 8053B and to convert the selected ones into the same format as the direct acquisition.
This function allows the user to download the data stored in the logger of the PMM 8053B General Purpose Field Meter, as can already be done with the Logger Interface programme supplied with the meter. It also allows each record to be saved in direct acquisition format (**.RS2)** and displayed and analysed graphically with the PMM SW02 software.

By activating **Rcl Records**, the following window will be displayed:



On the left side of the window, the records downloaded from PMM 8053B are displayed.
On the right, the parameters of the selected records are displayed.
The **Clipboard** key is only activated when a spectrum of EHP-50C or EHP-50E is saved in the logger. In this case, the graphics will be saved in the Notes of Windows as a Bitmap image and can be pasted without needing to use data exchange files.
With **Save,** the selected record will be saved.

NOTE

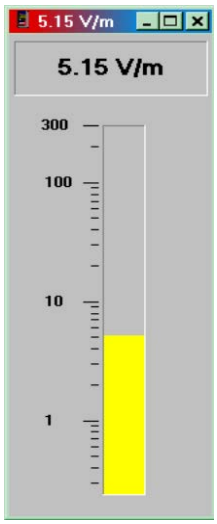
It should be noted that, as most of the acquisition modes of PMM 8053B are discontinuous, the data that is not present will, obviously, not be recorded. For example, in a *data change mode* record in which the field has been acquired at 10 minutes and the next one after an hour, a line that goes from point to point will nevertheless be displayed. Also the Marker it will not provide an intermediate value apart from the two acquisitions.

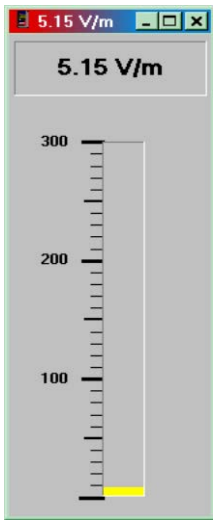
EP 330

This box shows the active probe used for the measurement.

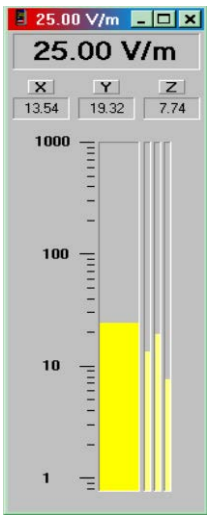
Field Meter:

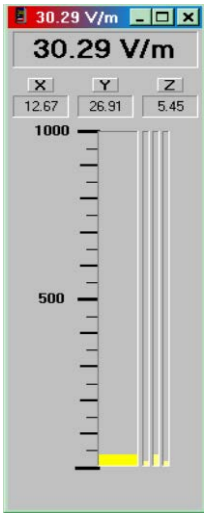
This allows the user to display an analog bar of the reading, which can remain active all the time.
When it is reduced to an icon, it still records the value of the measured field.
If **X-Y-Z Axis** in the **Setup** window is deselected, only the bar relating to the total isotropic value will be displayed.

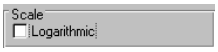




If **X-Y-Z Axis** in the **Setup** window is selected, the bars and the values of the single X-Y-Z components will be displayed as well as the total isotropic value.



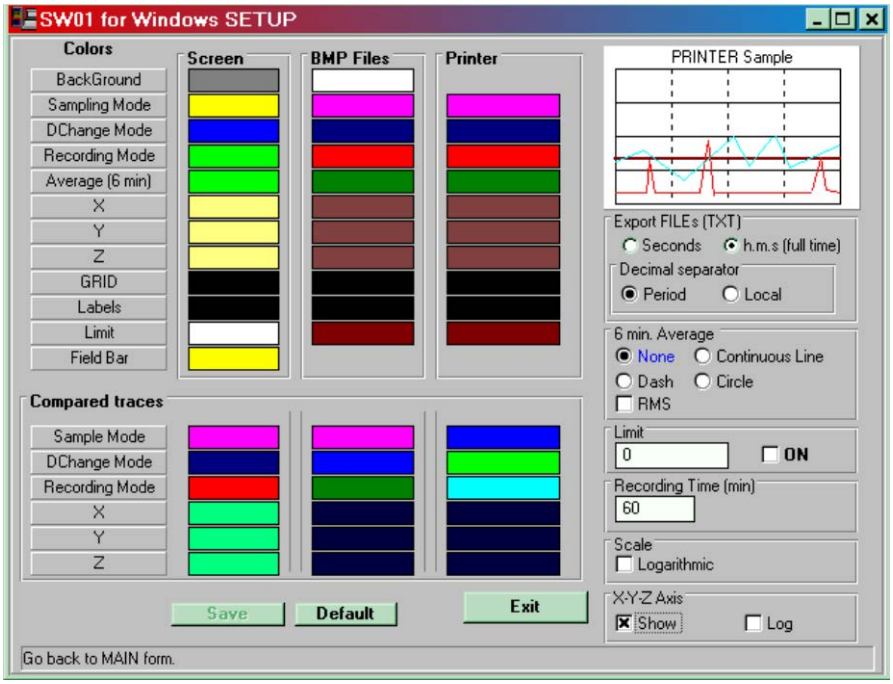




In this window, the values of the field measured by PMM 8053B are displayed in both numeric and analog form with a logarithmic or linear scale. (The user makes this selection in Setup)

Setup:

With the **Setup** key, the user is given access to the main setup window of the program.
The current setup can be varied at any time; the new setup selected can be saved in a file so it can be retrieved again later.
The Setup window is similar to the following:



Colors

On the left side of the window, the colours and the palettes of every trace can be varied according to the user's preferences; the selection of the colours is divided among the screen, the file bitmap and the printer of the graphics.

Compared traces

It is also possible to differentiate the colours of the compared traces.
When the colours are changed, the new configuration can be saved with Save.
The **Default** key will retrieve the colours set up as default colours by the program.

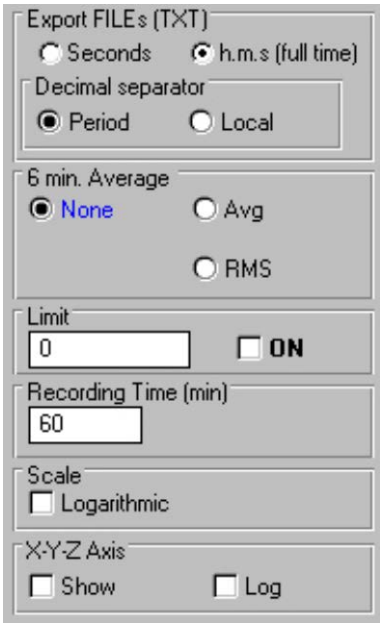
SCREEN Sample

The small graph at the top on the right is a sample of what the screen, the saved graphics and the printed-out will look like with the selected colours.

NOTE

The Exit key closes the Setup window keeping the selected settings for the current measurement. If the user wishes to maintain this setup for measurements to be taken later, the new configuration can be saved in a file by pressing Save Files.
If the user saves the new configuration with the name "Default", it will automatically be retrieved every time the program is opened.

Misc.



On the right of the window, the setup can be added to through the Misc**.** window.

This is divided into 6 parts:

1. Export mode of *.TXT file
2. 6 min. Average
3. Activating and setting the limit
4. Recording time
5. Scale of the analog bar and the graphics window
6. Logging and displaying the X-Y-Z axis

Export FILEs (TXT)

This allows the user to select the way in which text files will be exported, whether they are to go directly into documents or to be processed further with other external programs or spread sheets, such as Excel:

- **Seconds** displays the time in seconds that has passed since the start of the recording so they can easily be interpreted in external spread sheets.
- **h.m.s (full time)** sets out the hour, minutes and seconds format that have passed since recording began so the data can be understood immediately.

Decimal separator

This option includes:

- **Period** sets the point (.) as the decimal separator
- **Local** sets the international Windows value as decimal separator

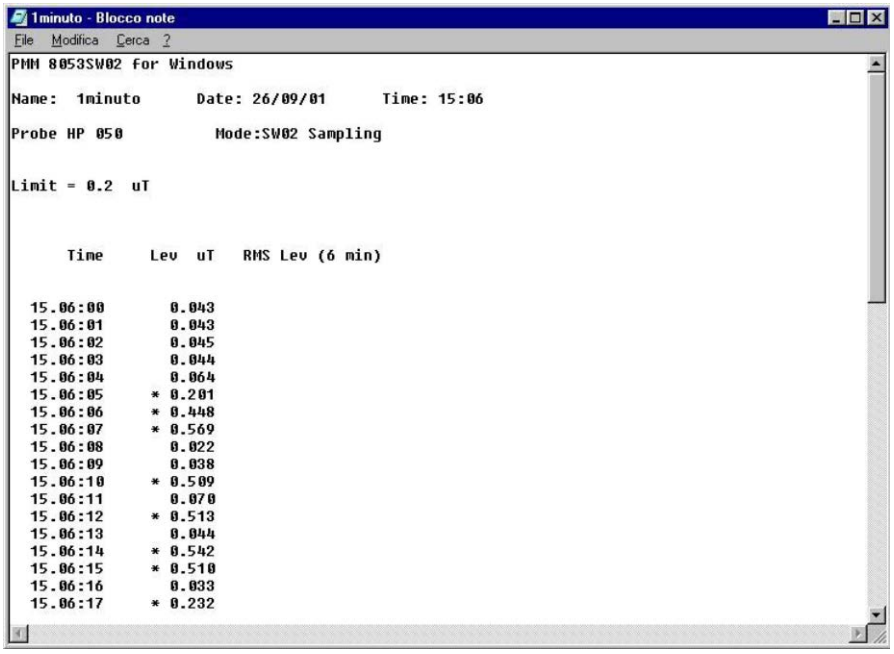
6 min. Average

This allows the user to set the measurement modes on a 6 minute average:

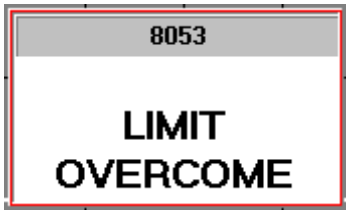
- **None** disables the function
- **Avg** calculates the average arithmetically $(d_1+d_2+...+ d_n)/n$.
- **RMS** when this flag è enabled, instead of being arithmetic, the average is quadratic: $\sqrt{\ }\ (d_1^2+d_2^2+...+ d_n^2)/n$.

Limit

Traces a horizontal line on the diagram of the value set in the box. It can be disabled or enabled by activating ON.
By displaying the data found in the graph previously saved in **txt** format, it will be noted that the higher values than the set value (graphically represented with a horizontal line), are marked with a * on their left, to indicate that the measurement at that moment has exceeded the limit.

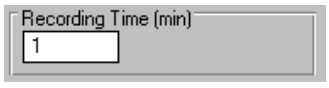


With Limit is ON, the software will display a message if the field exceeds the defined limit.



Recording Time (min)

Determines the recording time of the next measurement expressed in minutes.



Scale

Selects the scale displayed on the analog bar and in the graphics data presentation window between logarithmic or linear.

X-Y-Z Axis

This option adds the possibility of recording and displaying not only the total (isotropic) field but also the single X-Y-Z axis components.
The functionality of this option is complete as the single X-Y-Z axis components can also be displayed, zoomed, measured with a marker, captured as a .BMP, printed, compared and saved in ASCII as a table.

- **Log** enables PMM 8053B to read the single axis components and it must be selected in order to be able to record a measurement that includes them. When it is deselected, the measurement and the files that are saved will only be composed of the total value.
- **Show** enables the traces relating to the single components to be displayed (only if they have previously been acquired with Log having been selected). The possibility offered by this option is useful when the user only wishes to display the isotropic value, for greater clarity, whenever the axis components are not required. The X-Y-Z traces also appear for the COMPARE function permitting, in this way, the user to have 8 traces at the same time (1 isotropic value + 3 axis components for each record). To obtain clarity and to distinguish the traces, each single trace has its own colour that can be selected in the Setup window.

When **Show** is selected, both the digital values and the bars relating to the single axis components can be displayed on the analog bar.

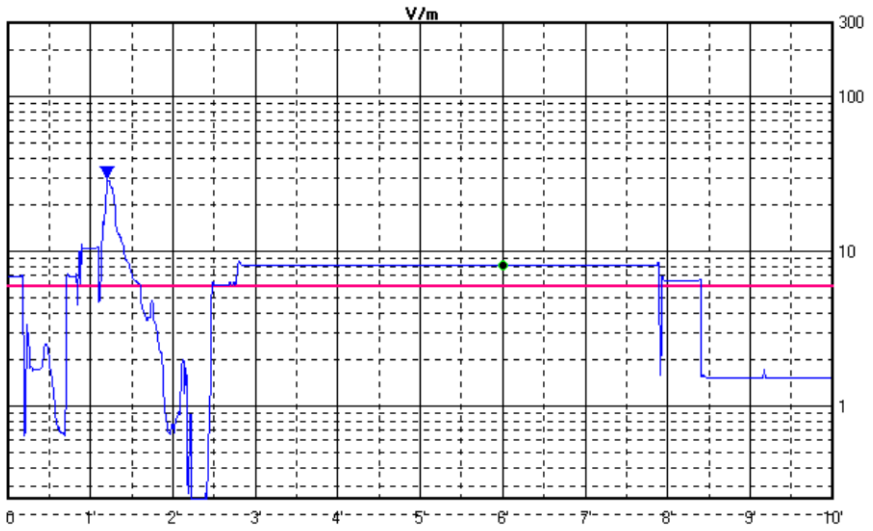
The **Marker** function can be used on the X-Y-Z axis components.
The user can change the reference trace of the **Marker** by selecting the trace he desires by means of a list found next to the Zoom key.

When the measurement is saved in tabular form (an ASCII table) with the **"Save as TXT"** command, if **Show** is selected, three additional columns show the values of the X-Y-Z axis fields.

The following are the only limits with regard to the X-Y-Z traces:
1. The X-Y-Z traces relating to the compared measurement do not appear if the duration of the two measurements is different. In this case, the four traces of the main measurement and the isotropic trace of the measurement that is to be compared will be displayed.
2. When, in **Compare** mode, the traces have been enlarged with the Zoom**,** they cannot be saved as .BMP files nor printed.

7.6 Graphics window

The central part of the main window of the PMM SW02 program displays the data presentation graphics window.



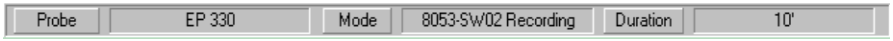
The user is able to select between either the logarithmic or linear scale through the **Setup**. The trace of the value of the isotropic field and the three X-Y-Z axis components can also be displayed by selecting Show and **Log** through the Setup.

When **Zoom Mode** is activated a small triangle with its vertex at the bottom will highlight the position of the **Marker**.

A horizontal line, in a colour selected in the Setup, highlights the set limit thereby allowing it to be easily compared with the logged graph.

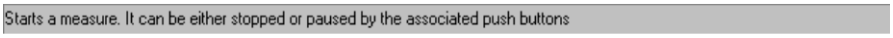
7.7 Status bar

The bottom part of the main window of the PMM SW02 program displays the status bar.
This bar provides useful information about how the program works.
It also provides detailed and immediate help regarding the meaning of the commands and the options on which the mouse is placed.
The following are some examples:



Current operational mode

Values relating to the position of the Marker



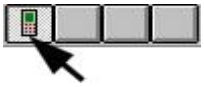
Description of the **Start Measure** key

7.8 Using SW02 with SB-04

After the 8053-SW02 has been started, the led of the Devices of SB-04 will switch on in a sequence from 1 to 4 until all peripherals are identified. Then the main window, in the second row, will displays the devices connected to the SB-04 with the relative release firmware and date of implementation.

Connection of peripherals. The four boxes indicate the peripherals connected to the various ports of SB-04. In this example, they are empty because no peripheral is connected to the device.
When there are one or more devices connected to SB-04, the figures of the devices connected to the Switching Control Box will appear in the boxes.

To enable it, click, with the mouse, on the box corresponding to the peripheral selected.



By simply positioning the mouse on top of a box, without clicking, the name of the corresponding Device will appear.

NOTE

To activate, at any time, the scanning of the SB-04 ports to search for the connected devices, click on one of the free buttons indicated above. This operation takes place when the user connects another device different from those already activated previously or when one of the connected peripheral is switched off unintentionally.

Setting the parameters of the devices. Through this button, the user can set the parameters of the devices connected to SB-04. It is only possible, with this function, to interact when the box corresponding to the device connected to SB-04 is enabled.

Battery charge indicator. Indicates the level of the charge of the battery.

When, SB-04 has no peripherals connected or no button has been selected corresponding to the device, the level of the battery will indicate the state of the battery charge of SB-04 itself.

Instead, if at least one peripheral is connected and the relative button has been selected, the level of the battery of the corresponding to the enabled device will be indicated.

If the peripheral or SB-04 is being charged, the word CHARGING will appear in place of the battery indicator.

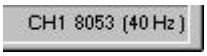
If the battery is charged, it will be green whilst; if it is almost expired, the bar will turn red.

By placing the pointer of the mouse on the icon of the battery, the absolute voltage of the battery in Volts will be given.

Device indicator. Next to the battery indicator, a line appears which, according to the circumstances, may display the different parameters:

When no peripheral is connected to SB-04 or no button corresponding to a device has been selected, this line displays the device connected to the PC (SB-04), the release of the FW (for example, 1.15) and the date of implementation (30/01/01).

Instead, when a peripheral is connected and enables the corresponding box, this line will display the port on which the peripheral is connected (CH1 will correspond to Device 1), the type of device connected to SB-04 (8053) and the main parameter (for example, a 40Hz filter).

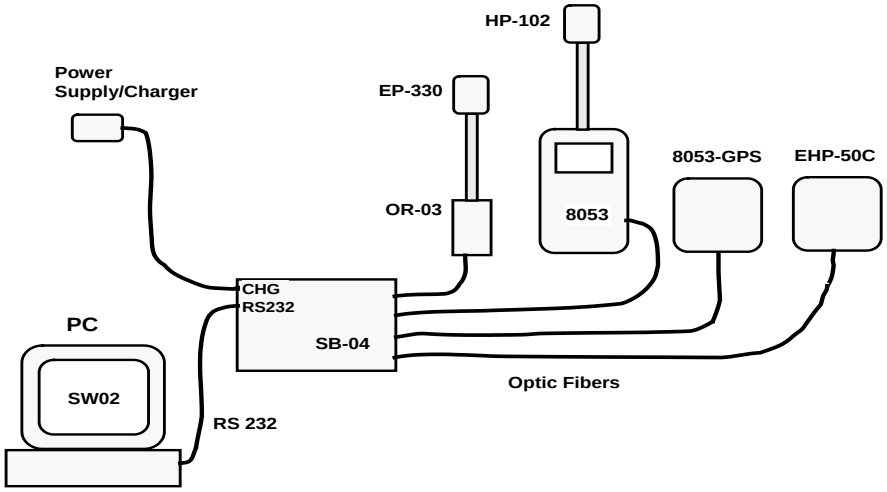


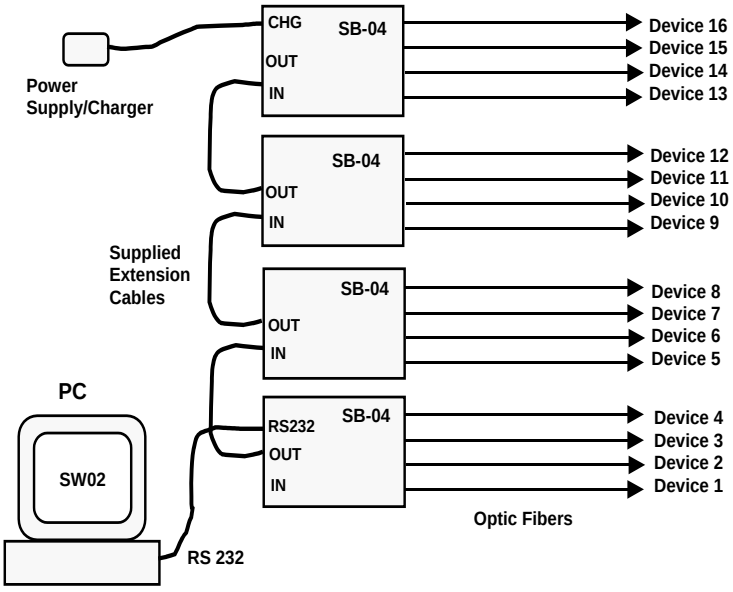
7.8.1 To use more than one SB-04

When the user wishes to take measurements with more than four probes, it is possible to connect up to 4 x SB-04, in daisy chain, and to use up to 16 devices. The SB-04 are connected each other via the special expansion ports with the provided cable.
PMM SB-04 can work together with the PMM 8053B General Purpose Field Meter and its entire series of accessory probes, and/or with the optical repeaters OR-02 or OR-03, and/or with GPS, and/or with EHP-50C/E.
PMM SB-04 allows the user to take field measurements with up to 16 probes connected at the same time, either placed at different measuring locations and/or working on different frequencies and full scale ranges by using a single RS232 port to the PC.
Two internal microcontrollers check all operations, interfacing, and data acquisition and graphic presentation driven by 8053-SW02 software.

To install and use PMM SB-04

The PMM SB-04 Switching Control Box can operate in conjunction with various probes in a wide range of frequencies and levels. The PMM 8053B meter can also be connected to it.
Some examples of connections are illustrated in the following:

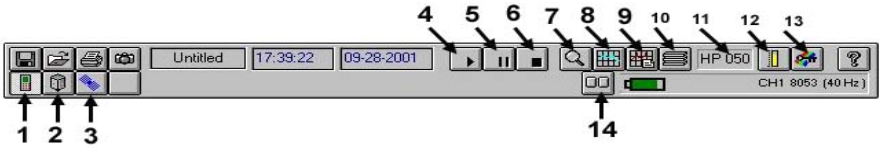




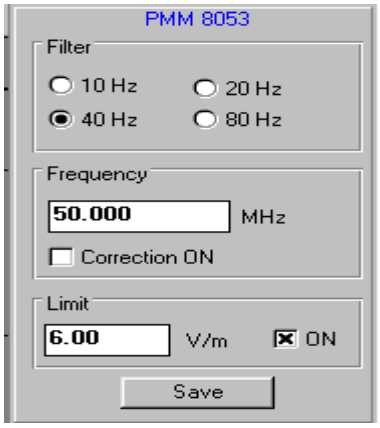
7.9 Example of operation with GPS

This example shows how to use SB-04 with three devices connected **(8053B, EHP-50C/E, 8053-GPS).** After starting the 8053-SW02 program, the main window will display the 3 devices connected to SB-04 (they will be displayed in the corresponding boxes) and will be automatically set-up with the different configurations relating to the connected apparatus.

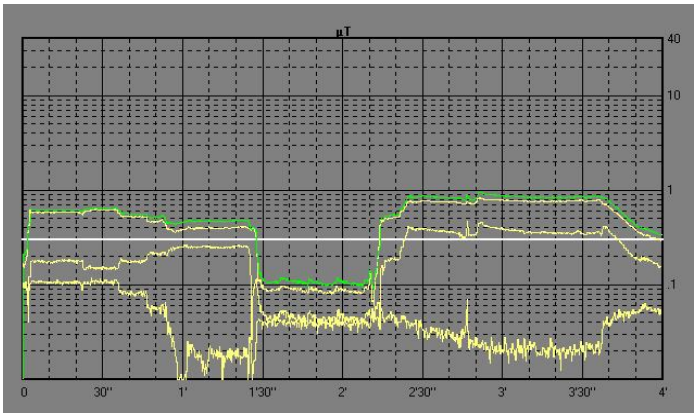
Device1 Button. This button allows the peripheral to be selected (8053 with the relative probe) connected on the Device1 port of SB-04.



By selecting the **Device 1 (1) icon**, within which the PMM 8053 icon appears, PMM 8053B and its probe **(HP050) (11)** used for the measurement will be activated, and **Start Measure (4)**, **Rcl Records (10)**, **Field Meter (12)** and Device **Setup (14)** will be activated.
Before beginning to take the measurement, the user, through the Setup **(13)** button, can set the characteristics of the graph (within which the **SHOW** and **LOG** options must be set, in a proper way, in the **X, Y, Z Axis** window), whilst with Device **Setup (14)** the main parameters of PMM 8053B (Filter, Frequency, Correction ON and Limit) can be modified. To save the settings, press **Save** and, to exit, press Device **Setup (14)** a second time.



Once the settings of PMM 8053B have been setup and saved, start measuring by pressing **Start Measure (4)**;

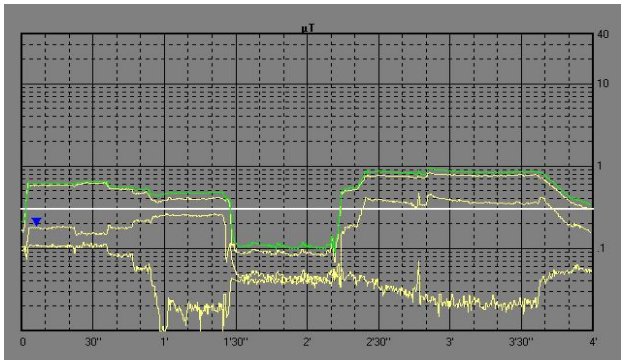


The acquisition process could be:

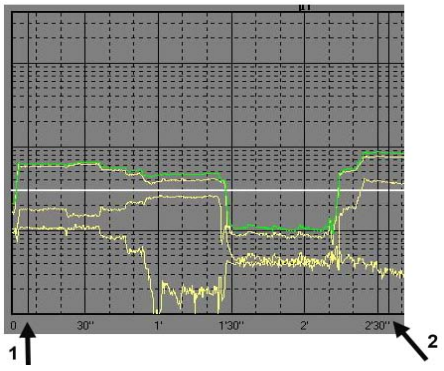
- paused with **Pause (5)** key;
- stopped with **Stop (6)** key.

When the acquisition is stopped, the **Zoom Mode (7)** and the **Setup (13)** button are enabled**.**

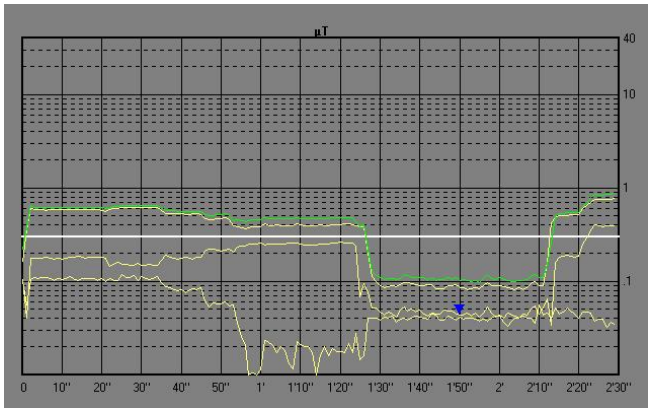
By selecting the **Zoom Mode (7)** button, the user can move the Marker (indicated in the Figure with the blue triangle) on the graph of the X or Y or Z axis or on the graph of the total isotropic value and horizontally enlarge the displayed measurement (ZOOM) thereby obtaining greater definition.



The zoom will be activated by placing (on the previously selected axis) the triangle of the **Marker,** with the mouse, on the starting point (arrow *1*) and, by keeping the left button of the mouse pressed down, drag the **Marker,** for a period of not less than 2 minutes, in order to display the two vertical bars that help to select the end point of the trace the user wishes to enlarge (arrow *2*).



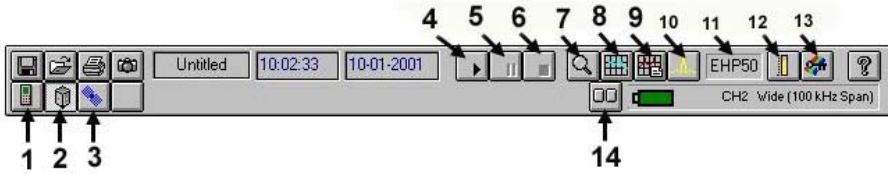
Releasing the button of the mouse will immediately enlarge the segment of the selected trace.



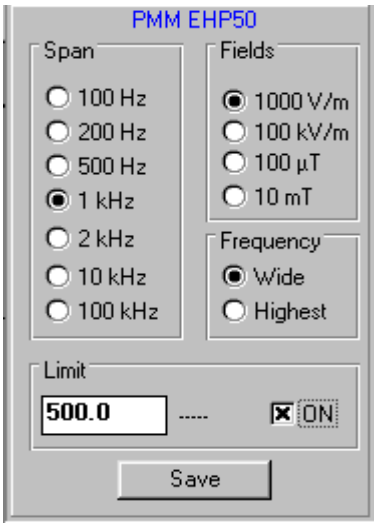
To return to the normal display, deselect Zoom **Mode (7)**.

EHP-50C/E commands

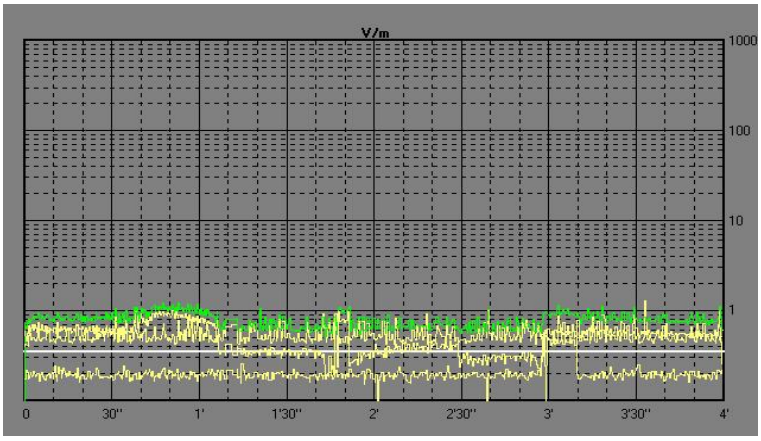
Device2 Button. This button allows the user to select the peripheral (EHP-50C/E) connected to the Device2 port of SB-04.



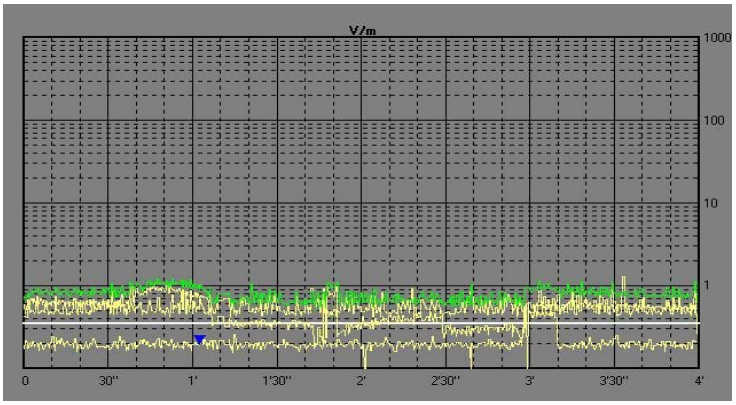
By selecting the **Device 2 (2) icon**, within which the EHP-50C/E icon appears, EHP-50C/E will be activated and its probe used for the measurement **(EHP-50C/E itself) (11)** displayed, and **Start Measure (4)**, **Spectrum Mode (10)**, **Field Meter (12)** and Device **Setup (14)** will be activated.
Before beginning to take the measurement, the user, through the Setup **(13)** button, can set the characteristics of the graph (within which the **SHOW** and **LOG** options must be set, in a proper way, in the **X, Y, Z Axis** window), whilst with Device **Setup (14)** the main parameters of EHP-50C/E (Span, Fields, Frequency and Limit) can be modified. To save the settings, press **Save** and, to exit, press Device **Setup (14)** a second time.



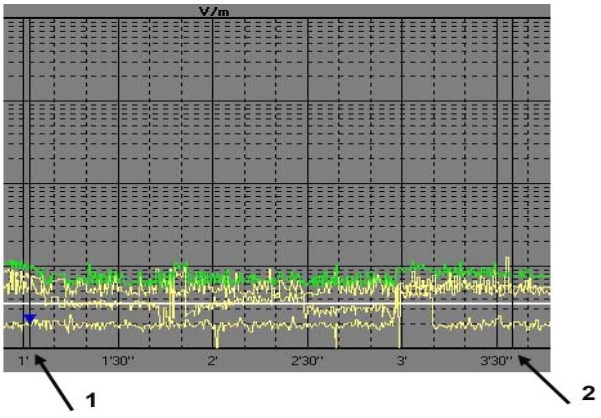
Once set and saved the settings, start measuring by pressing **Start Measure (4);**



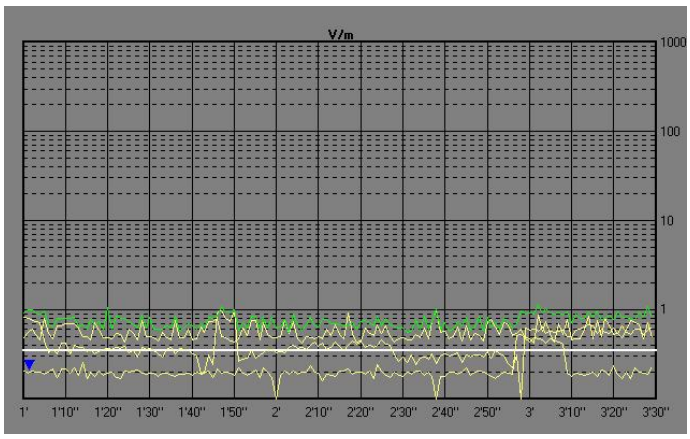
Once the measurements have been taken, the Pause **(5), Stop (6)** keys **and the Zoom Mode (7)** button will be enabled and the Setup **(13)** button disabled**.** By selected **Zoom Mode (7)**, the marker can be moved on the graph of the X or Y or Z axis or on the total level and the displayed measurement (ZOOM) enlarged horizontally, with greater definition. It will also activate the **Marker** function, already illustrated in previous paragraphs



which involves placing (on the previously selected axis) the blue triangle of the Marker**,** with the mouse, on the starting point and, by keeping the left button of the mouse pressed down, drag the **Marker,** for a period of not less than 2 minutes, in order to display the two vertical bars that help to select the end point of the trace the user wishes to enlarge.

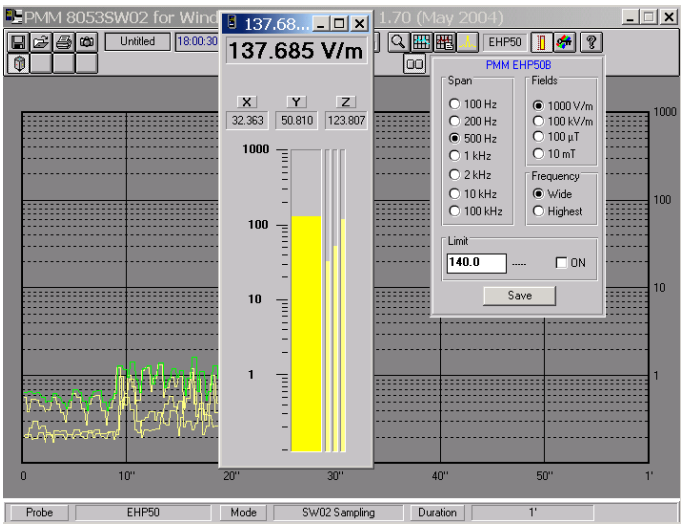


Releasing the button of the mouse will immediately enlarge the segment of the selected trace.



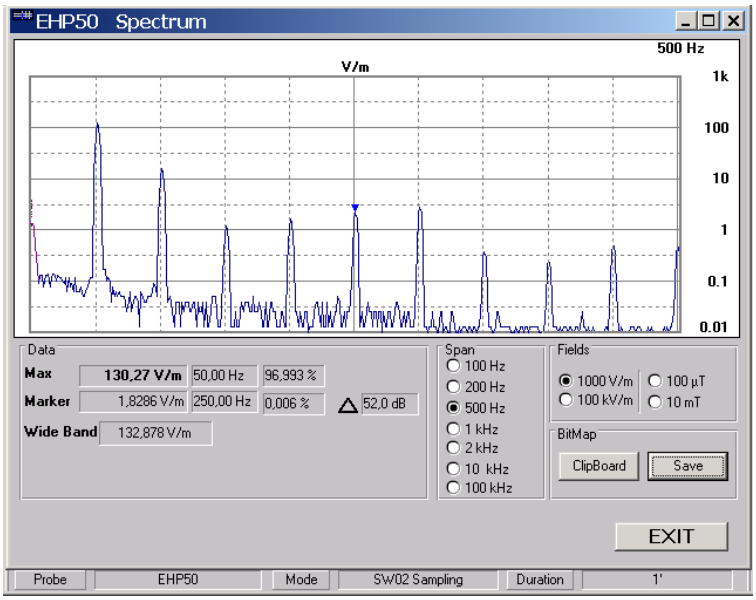
To return to the normal display, deselect Zoom **Mode (7)**.

Once the measurements have been taken, with the **Fields Meter (12)** key, the level of the field can be noted. The display show the single axis components and the total value.

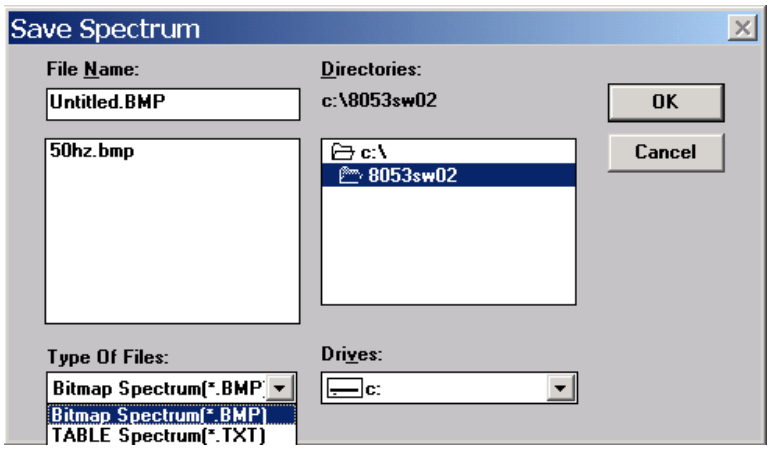


The total value will be dependent by the selected Span. If the dominant component is out of the Span, you measure a very low value.

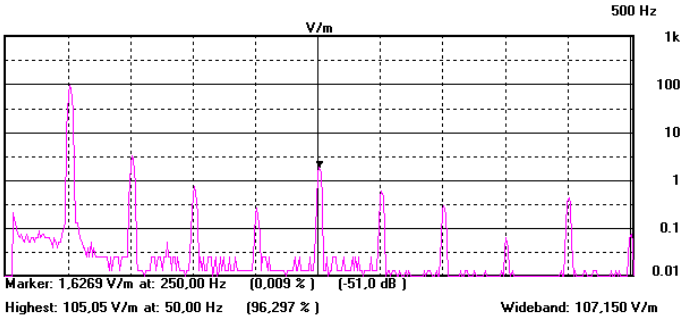
With **Spectrum Mode (10),** the spectrum of EHP-50C/E can be displayed immediately and the relative Span and Fields set-up. Then, with **Clipboard**, the single graph can be captured. With **Save**, the graph can be saved in BMP format under which the highest value (**Highest**), the value corresponding to the position of the (**Marker**) and the bandwidth for the measurement (**wideband** or **highest**) will be displayed. Obviously, it will all be expressed in the previously selected unit of measurement.



With **Save**, the graph can be saved in BMP or TXT format under which the highest value (**MAX**), the value corresponding to the position of the (**Marker**) and the bandwidth for the measurement (**wideband** or **highest**) will be displayed.



If the file is saved in BMP format the result will be:

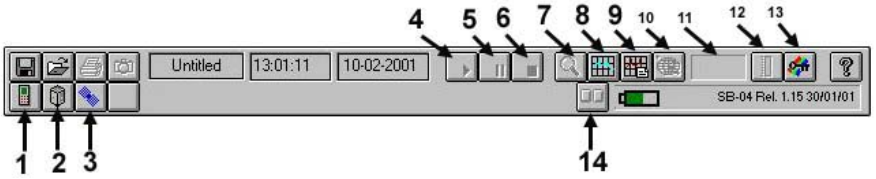


Saving the file into TXT format, it is possible to built up a table with all frequencies and the associated levels, like in the following example, where the file was opened with WORD application:

```
EHP50 Spectrum  06-23-2004   17.22.26
  Hz                 V/m

5,00               0,1345
6,25               0,0941
7,50               0,0672
8,75               0,0941
10,00              0,0672
11,25              0,0941
12,50              0,0672
13,75              0,0672
15,00              0,0672
16,25              0,0672
17,50              0,0807
18,75              0,0941
20,00              0,0672
21,25              0,0538
22,50              0,0672
23,75              0,0807
25,00              0,0672
26,25              0,0807
26,25              0,0807
27,50              0,0672
28,75              0,0672
30,00              0,0672
31,25              0,0672
32,50              0,0672
33,75              0,0672
35,00              0,0672
36,25              0,0538
37,50              0,0538
38,75              0,0538
40,00              0,0538
41,25              0,0538
42,50              0,0672
43,75              0,0807
45,00              0,1076
46,25              0,1210
47,50              11,7916
48,75              68,8538
50,00              111,0454
```

Device3 Button. This button allows the third peripheral (in the example: 8053-GPS) to be selected connected on the Device3 port of SB-04.

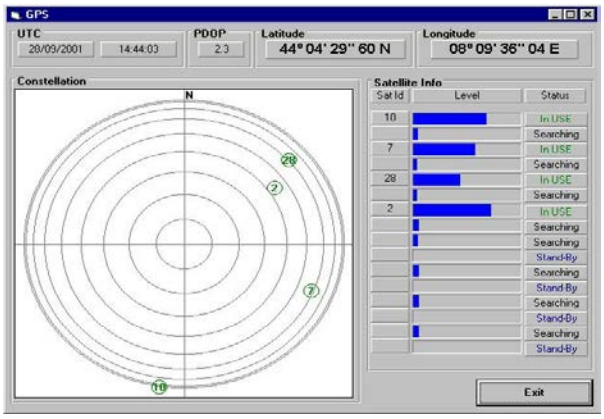


By selecting the **Device 3 (3) icon**, within which the Satellite icon appears, PMM 8053-GPS will be activated and in **Active probe (11)** the word **Unlock** will appear if the GPS is searching for the exact position. **Start Measure (4)**, **Pause (5)**, **Stop (6)**, **Zoom Mode (7)**, **Fields Meter (12)** e **Device Setup (14) will** be disabled whilst **Satellites (10)** will be enabled.

At the moment in which the device is locked on and recognises a valid position for the measurement, the word **LOCK** will appear in **Active probe (11).**

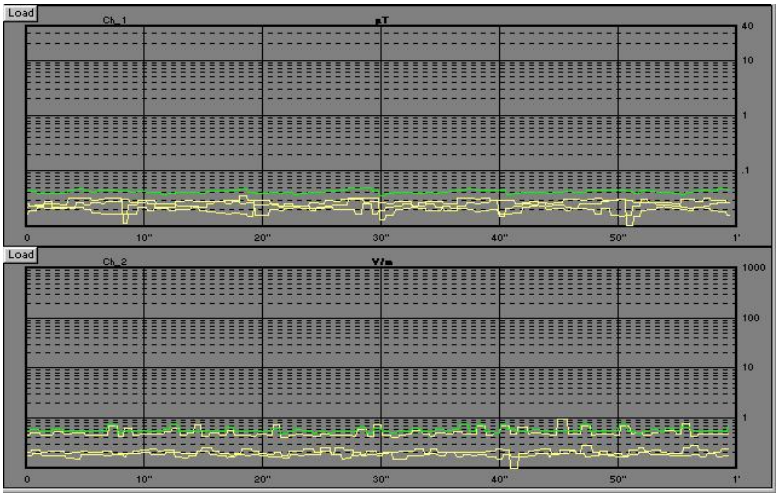
Measurements can only be taken in this last case. In fact, **Start Measure (4), Zoom Mode (7), Fields Meter (12) and the Device Setup (14)** will be enabled.
Before beginning to take the measurement, the user, through the Setup **(13)** button, can set the characteristics of the graph (within which the **SHOW** and **LOG** options must be set, in a proper way, in the **X, Y, Z Axis** window).

With the Satellites **(10)** button, the following window will appear:

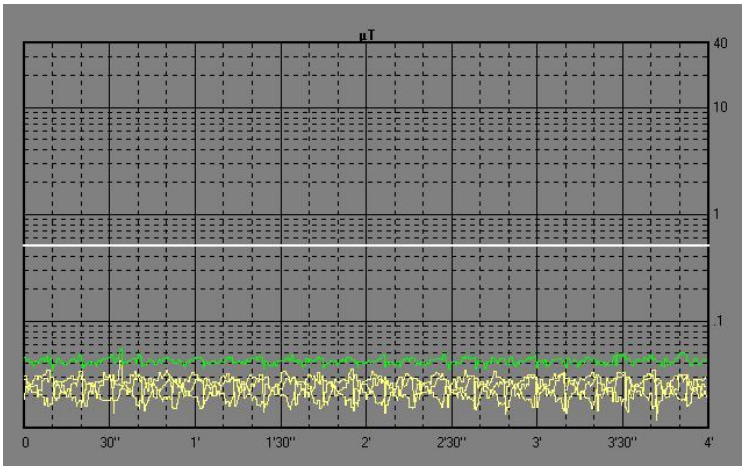


The line at the top displays the information received (date-time, quality of the readings, position): *UTC* with the relative date and time, *PDOP*, *Latitude* e *Longitude*. At the bottom, on the left, the constellation (*Constellation*) will be displayed which shows the position of the satellites (which are identified with a small circle and their identification number) taking as a reference point the cardinal point North (N). Instead, beside the constellation, the most important information regarding each satellite (*Satellite Info*) will be displayed, or, in other words, the identification number (*Sat Id*), the level of the signal received (*Lev*) and the actual status (*Status*) that may be: ***Searching*** (written in black) when searching for the Satellite, ***WEAK*** (written in red) indicating that the satellite has been found but the signal is weak, ***Decoding*** (written in light green) when the GPS is decoding the satellite, ***StandBy*** (written in blue) when it is on standby and ***In USE*** (written in dark green) when the satellite has been hocked onto. Click on **Exit** to return to the main window of the measurements.

After checking the number, position and status of the satellites, the setup, with the corresponding **Device Setup (14),** the main settings of the probes connected to SB-04; re-select once again the button relating to the GPS and then start taking measurements by pressing the **Start Measure (4)** button which will enable the Pause **(5)** and **Stop (6)** keys.

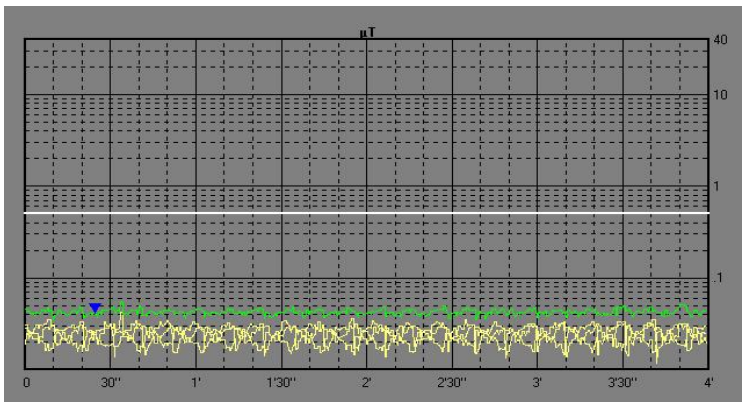


Once the measurements have been taken, the main window will display both graphs. By clicking on the Load key, the selected graph can be enlarged within the whole main window.

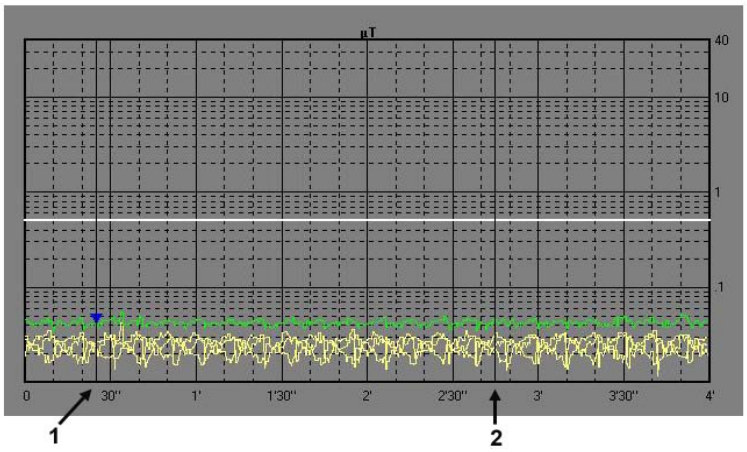


In this way, Zoom **Mode (7)** will be activated and the user can move the Marker on the graph of the X or Y or Z axis or on the graph of the module and horizontally enlarge the displayed measurement (ZOOM) thereby obtaining greater definition.

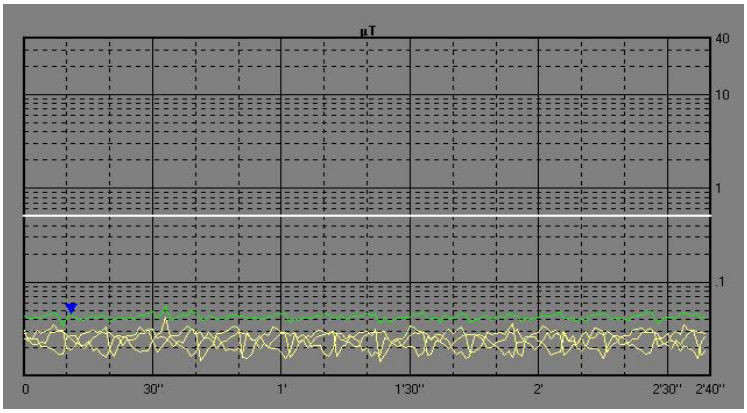
The **Marker** function will also be activated. This involves positioning (on the previously selected axis) the triangle of the Marker, with the mouse, to obtain detailed information about the stored measurements, moment by moment.



To activate the zoom, follow the instructions given above, by pointing the **Marker** on the starting point and, by keeping the left button of the mouse pressed down, drag the **Marker,** for a period of not less than 2 minutes, in order to display the two vertical bars (indicated in the graph below with the numbers 1 and 2) that help to select the end point of the trace the user wishes to enlarge.

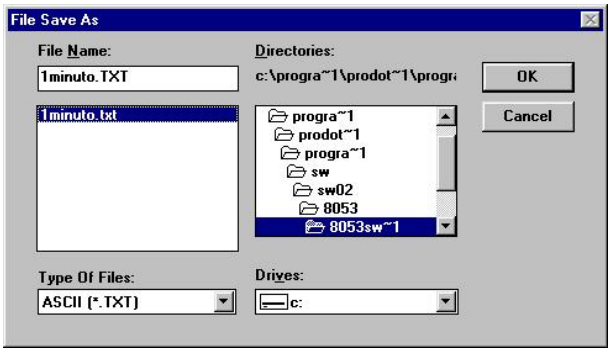


Releasing the button of the mouse will immediately enlarge the segment of the selected trace.

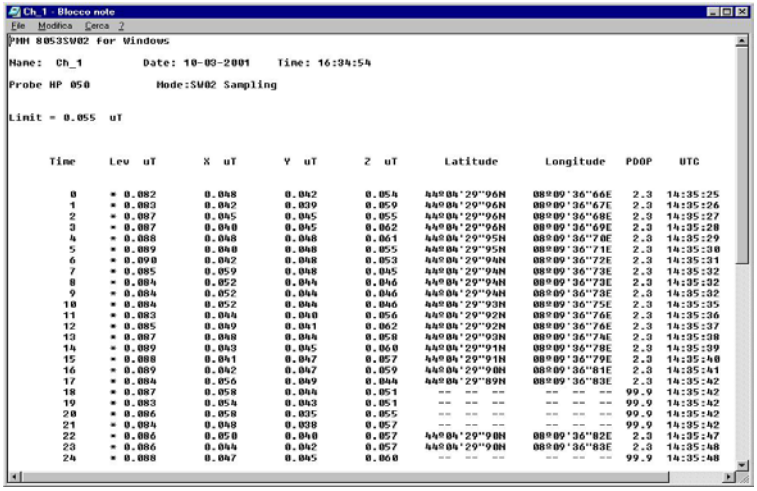


To return to the normal display, deselect **Zoom Mode (7)**.

Only the active graph can be saved by clicking on the *Save Files* icon. Then, after entering the *File Save As* window, type the name of the file followed by the ***.RS2*** (Draft) or ***.P53*** (Panel) or ***.Bmp*** (BitMap) or ***.Txt*** (ASCII) extension. If the file is not to be given a name, it will be saved in default with the name corresponding to the channel to which it is connected (if CH1 is the Device being used, the file will be named CH1.txt).



Apart from the levels logged with the probe, information regarding the position in which the probe is to be found is also saved in the file. Therefore, when the file is retrieved in TXT format *(ASCII format),* the user will find a page *with* not only the data of the logged level, but also data relating to the GPS or, in other words, the Latitude, Longitude, PDOP and UTC (Universal Time Co-ordinated, or the date-time group corresponding to the meridian of Greenwich).



Ch_1 - Blocco note

File Modifica Cerca ?

PMM 8053SW02 For Windows

Name: Ch_1 Date: 10-03-2001 Time: 16:34:54

Probe HP 050 Mode:SW02 Sampling

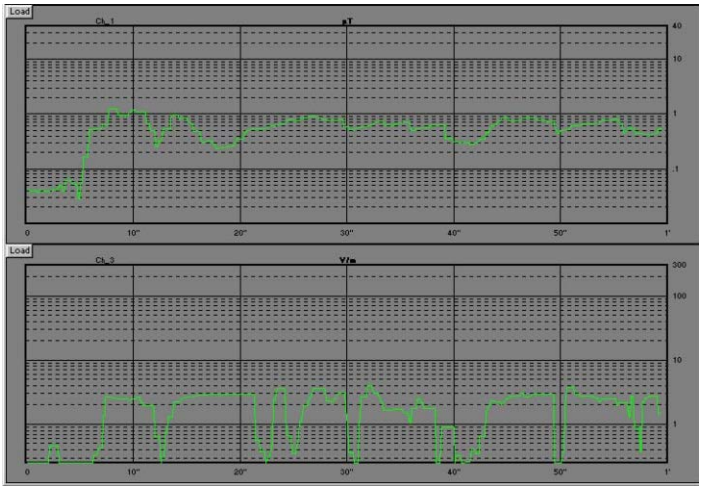
Limit = 0.055 uT

Time	Lev uT	X uT	Y uT	Z uT	Latitude	Longitude	PDOP	UTC
0	* 0.082	0.048	0.042	0.054	44°04'29"96N	08°09'36"66E	2.3	14:35:25
1	* 0.083	0.042	0.039	0.059	44°04'29"96N	08°09'36"67E	2.3	14:35:26
2	* 0.087	0.045	0.045	0.055	44°04'29"96N	08°09'36"68E	2.3	14:35:27
3	* 0.087	0.048	0.045	0.062	44°04'29"96N	08°09'36"69E	2.3	14:35:28
4	* 0.088	0.048	0.048	0.061	44°04'29"95N	08°09'36"70E	2.3	14:35:29
5	* 0.089	0.040	0.048	0.055	44°04'29"95N	08°09'36"71E	2.3	14:35:30
6	* 0.090	0.042	0.048	0.053	44°04'29"94N	08°09'36"72E	2.3	14:35:31
7	* 0.085	0.059	0.048	0.045	44°04'29"94N	08°09'36"73E	2.3	14:35:32
8	* 0.084	0.052	0.044	0.046	44°04'29"94N	08°09'36"73E	2.3	14:35:32
9	* 0.084	0.052	0.044	0.046	44°04'29"94N	08°09'36"73E	2.3	14:35:32
10	* 0.084	0.052	0.044	0.046	44°04'29"93N	08°09'36"75E	2.3	14:35:35
11	* 0.083	0.044	0.040	0.056	44°04'29"92N	08°09'36"76E	2.3	14:35:36
12	* 0.085	0.049	0.041	0.062	44°04'29"92N	08°09'36"76E	2.3	14:35:37
13	* 0.087	0.048	0.044	0.058	44°04'29"92N	08°09'36"76E	2.3	14:35:38
14	* 0.089	0.043	0.045	0.060	44°04'29"91N	08°09'36"78E	2.3	14:35:39
15	* 0.088	0.041	0.047	0.057	44°04'29"91N	08°09'36"79E	2.3	14:35:40
16	* 0.089	0.042	0.047	0.059	44°04'29"90N	08°09'36"81E	2.3	14:35:41
17	* 0.084	0.056	0.049	0.044	44°04'29"89N	08°09'36"83E	2.3	14:35:42
18	* 0.087	0.058	0.044	0.051	-- -- --	-- -- --	99.9	14:35:42
19	* 0.083	0.054	0.043	0.051	-- -- --	-- -- --	99.9	14:35:42
20	* 0.086	0.058	0.035	0.055	-- -- --	-- -- --	99.9	14:35:42
21	* 0.084	0.048	0.038	0.057	-- -- --	-- -- --	99.9	14:35:42
22	* 0.086	0.058	0.048	0.057	44°04'29"90N	08°09'36"82E	2.3	14:35:47
23	* 0.086	0.044	0.042	0.057	44°04'29"90N	08°09'36"83E	2.3	14:35:48
24	* 0.088	0.047	0.045	0.060	-- -- --	-- -- --	99.9	14:35:48

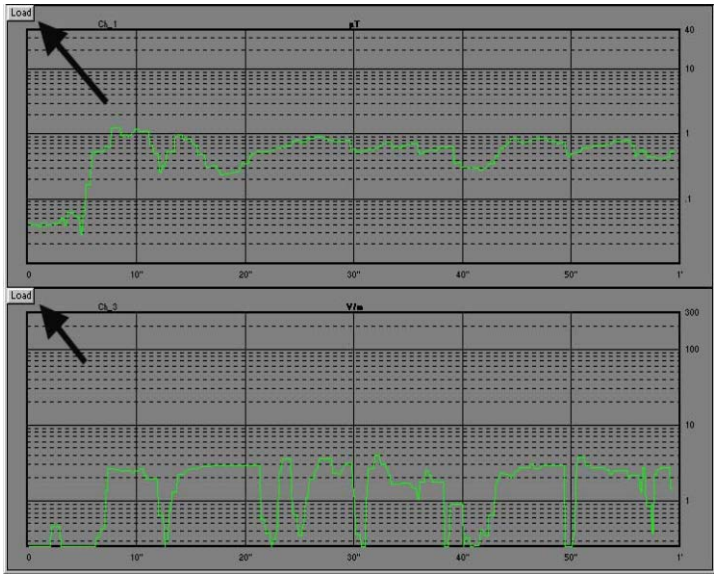
During the measuring, the signal may become weak and, as a result, the GPS goes into *Unlock*. In this case, measuring will continue until it is finished without any problems. In fact, within the data file (saved in Txt format), within the seconds corresponding to this state, the levels measured by the respective axes are recorded. Instead, at the height of the longitude and latitude, three traces are recorded (which indicates that it is impossible for the GPS to read the co-ordinates) whilst the PDOP, indicating the weakening of the precision of the position, takes on the highest value (in this case, the highest value is 99.9). The smaller this value is, the greater the measurement is to be considered precise.

7.10 Example of operation with 2 probes without GPS

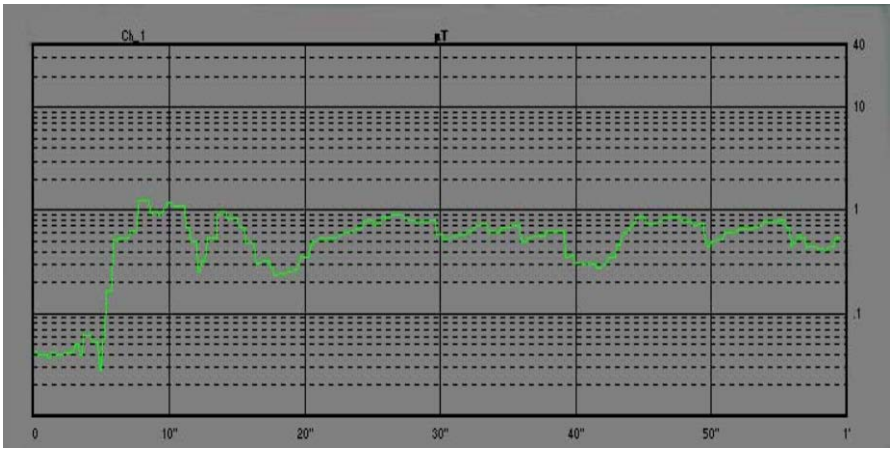
When two or more probes are connected to SB-04, at the moment in which the **Start Measure (4)** button is pressed, two or more graphs will appear in the main window. To start all the probes taking measurements, the **Start Measure (4), Zoom Mode (7)**, **Redraw (8)**, **Comment (9)**, **Setup (13)** and the **data recording (10)** (whose icon changes according to the type of probe selected) buttons will be disabled. Once acquisition is completed, only the **Zoom Mode (7)** will remain disabled and the following graphs will appear in the main window:



To save both graphs (there can be up to a maximum number of 16), click on the icon; after entering the *File Save As* window, type the name of the file (File Name) followed by the ***.BS2*** extension (Set Of Draft) that contains the full set of diagrams, select the correct subdirectory where it is to be stored, check the exact driver and click on Ok. To save only one graph, click on the key (situated at the top on the left of each graph);



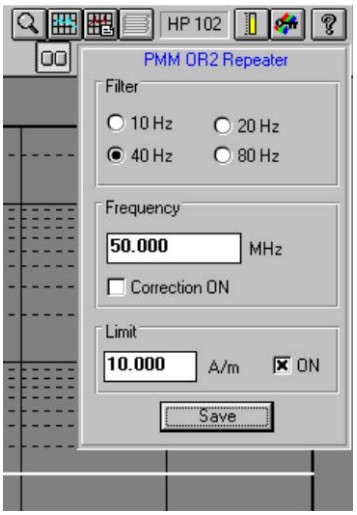
in this way, the main window of the entire graph selected will be displayed.



Only the active graph will be saved by clicking on the Save *Files* icon after entering the *File Save As* window, type the name of the file (File Name) followed by ***.RS2*** (Draft) or ***.P53*** (Panel) o ***.Bmp*** (BitMap) or ***.Txt*** (ASCII) extension. If the file is not to be given a name, it will be saved in default with the name corresponding to the channel to which it is connected (if CH1 is the Device being used, the file will be named CH1.txt).
When the Load key is pressed to start displaying or saving a single graph, the Start **Measure (4)**, the **Field Meters (12)**, the **probe (11)** and the data **recording (10)** (whose icon changes according to the type of probe) buttons will be disabled. Furthermore, the Load key will disappear, in place of the *Open Files* button, the Back to Block key will appear which allows the user to return to the multi-graphic mode.

7.11 Limit activation

When the Limit function is enabled, it is possible to define for each probe a different limit like the following example.



When the field measured by any probe exceeds each individual limit, the 8053-SW02 software will do the following:
-generate a visual alarm on the PC screen
-the voltage present at pin 4 of the serial port connected to the SB-04 will reverse the polarity.
The message will be:

The top grey area will show the probe used and to which channel the probe or the Optical repeater is connected to.

7.12 8053B data downloading through the internal Logger interface

Once the measurements have been taken, the data stored in the logger of the PMM 8053B can be downloaded through the Logger Interface program supplied with the instrument and also by using this software. Then, with the **Rcl Records (10)** button, the downloaded data can be retrieved and saved in direct acquisition format (**.RS2)** and displayed and analysed graphically with the PMM SW02 software.
Furthermore, the graphics corresponding to the records belonging to the Spectrum mode, can be captured in BMP format with the Clipboard key.

7.13 Using SW02 with 8053B

Once the connection has been made, select and click, with the mouse, on the icon.

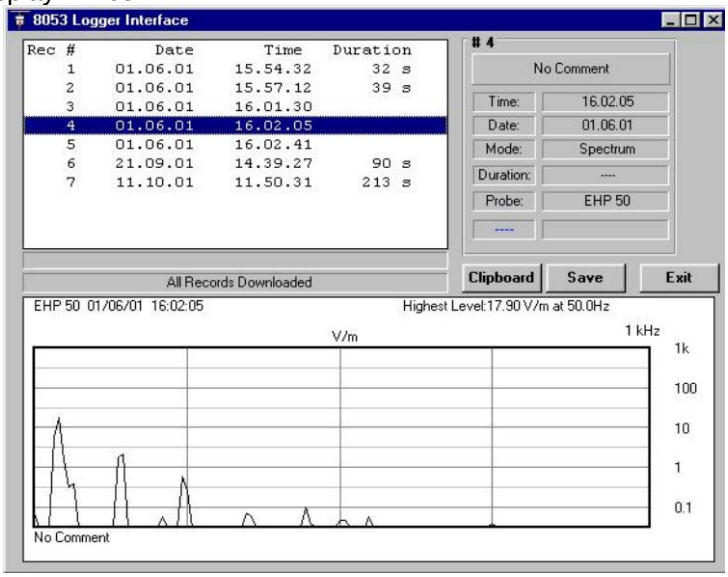
which will activate the main window of the program.
Depending upon the operating system in use, the icon could be as follows:

Please use the appropriate RS232 port where the 8053B is connected to.

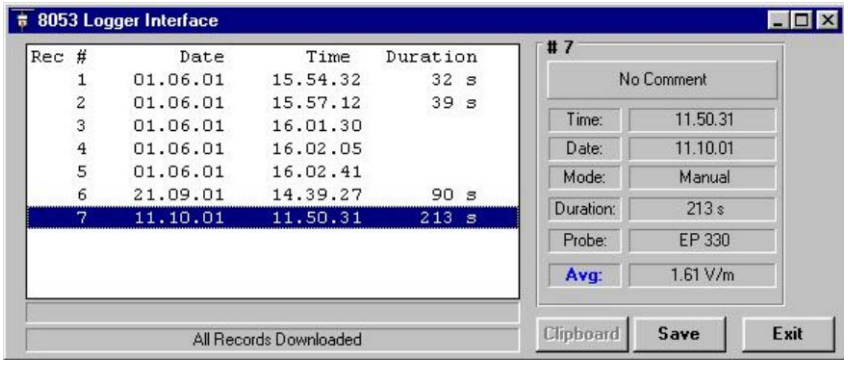
7.13.1 Logger Interface

The Logger **Interface** function is used to transfer all data stored into 8053B memory to the PC. If an EHP-50C or EHP-50E has been used and one or more spectrum analysis have been stored in it, the Logger interface allows to transfer all spectrum files, in Bit map format, to the PC.

In order to see the records found into PMM 8053B memory, press **RCL Records**, which, after scanning, the software will display all the records with the relative mode, which will change according to the setup carried out at the time of measurement and the corresponding date of creation. If the software finds an acquisition where 8053B spectrum mode has been used, the display will be:

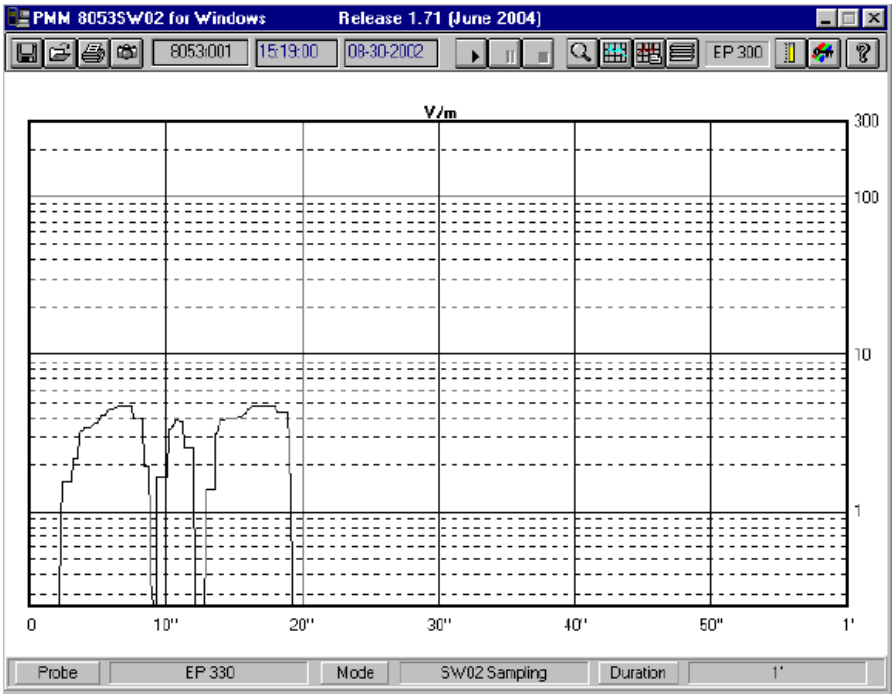


the **Clipboard** button will be enabled so that the graph in .**BMP** can be copied in the Notes of Windows.
In all other acquisition modes, the **Clipboard** button will be disabled.

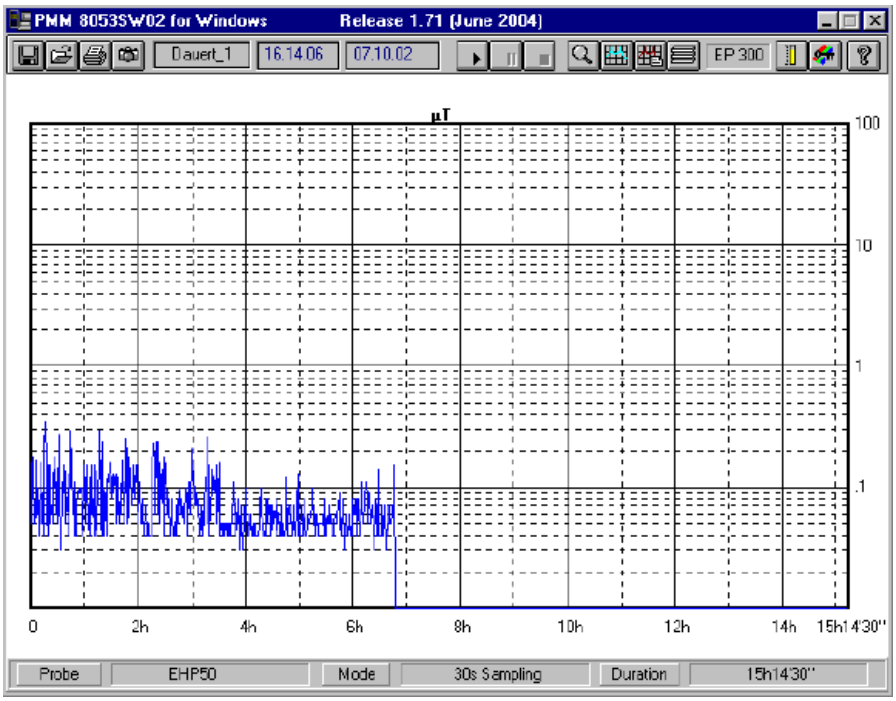


Later, this file, containing the graph of the measurements taken can be retrieved with the same program.

7.13.2 Data acquisition

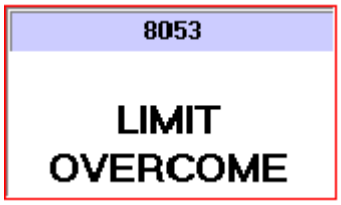


When 8053B is properly connected to the PC, it is possible to start the data acquisition by pressing **Play**. This will give the user the possibility of seeing the trend in the values acquired by the probe in a given period of time; after which he can proceed with the operations described in the previous Chapters.



7.13.3 Limit

If the limit function has been selected from the Setup menu, the software will show a message each time the measured field exceeds the limit.

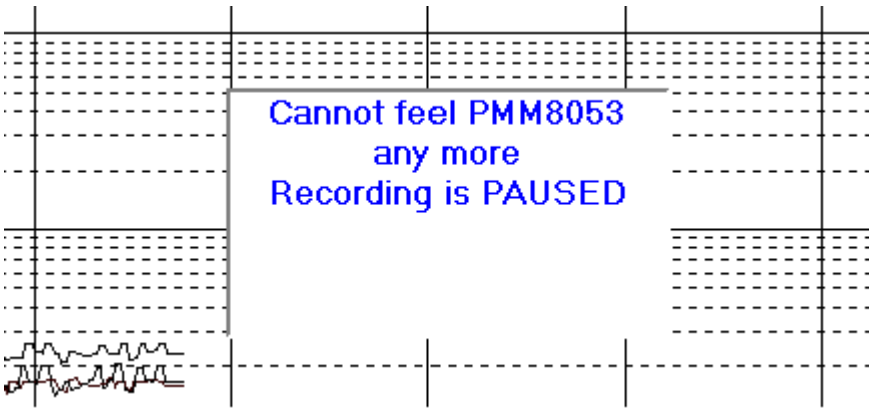


Simultaneously with this message, the software 8053-SW02 will change the voltage polarity presents on pin 4 of the serial port used to drive 8053B.

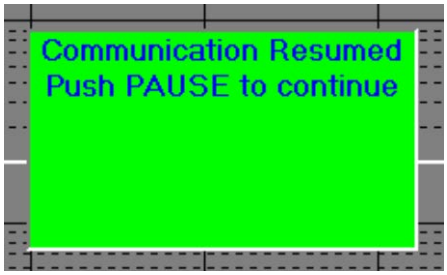
NOTE

This signal could be used to turn ON/OFF any external devices connected to pin 4 of RS232 of the PC.

If for any reason, the serial communication between PC and 8053B is interrupted, the following message appears on the screen:



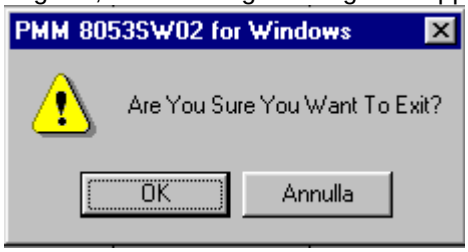
If the serial communication will be established again, the following message will appear:



Push PAUSE to continue the acquisition.

Exit the program

When exiting the program, the following message will appear:



Push OK to exit the program**.**

8 - EHP-50C, EHP-50E Electric and Magnetic Field Analyzer

8.1 EHP-50C Introduction

This section explains the installation and use of the EHP-50C Electric and Magnetic Field Analyzer. EHP-50C is a low frequency electric and magnetic isotropic field probe-analyzers, providing an advanced technology solution for field measurements from a few V/m (or nT) to thousands V/m (or mT), in the 5 Hz to 100 kHz range including X, Y and Z axes measurements with a powerful spectrum analyzer built in.
EHP-50C has an mode of operation that allows it to be used in stand alone mode over 24 hours of continuous data collection. It can be used connected with 8053B or SB-04.
EHP-50C include an E^2PROM, that stores the calibration data, the frequency and level calibration tables, and an internal optical repeater that allows the 8053B field meter to be connected via a fiber optic link.
The spectral analysis of the signals, obtained through a powerful DSP (Digital Signal Processor), is performed on seven different Span values and is displayed on the display of 8053B. By using a Marker it is possible to obtain the precise measurement of the frequencies and levels.
EHP-50C is managed internally with a microprocessor (CPU module) that controls all its main functions, from the charging of the batteries to the serial communication with the DSP unit. The Electric or Magnetic field is picked up by the three probes on the X, Y and Z axes. A Digital/Analog conversion follows which transforms the signal into numeric information processed by a Digital Signal Processing unit.
EHP-50C is housed in a small cubic container. On the bottom part of it, there is the panel for the fiber optic connection, supplied with the Analyzer, the screws for fitting the isolated extension, the connector for the battery charger, the ON/OFF button and the LED for checking on its functioning.

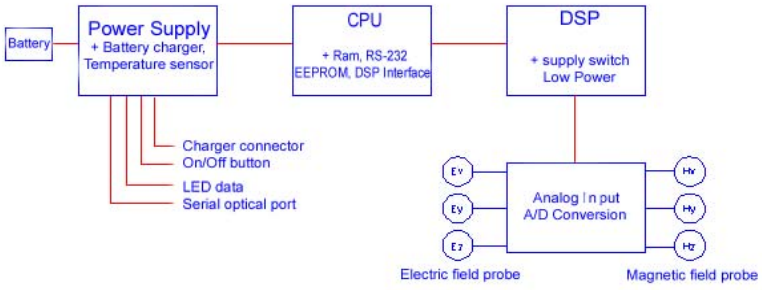


Fig. 8-1 Block diagram of the PMM EHP-50C Analyzer

The magnetic sensor system is composed by three magnetic loops positioned orthogonal each other. The electric sensor system is composed by three orthogonal parallel capacitors and installed on opposite side of the magnetic loops.

8.1.1 EHP-50C Main specifications

The following conditions apply to all specifications:

- The ambient temperature for use must be between -10°C and 50° C.

Table 8-1 Technical specifications of the PMM EHP-50C Electric and Magnetic Field Analyzer

	Electric field	Magnetic field
Frequency range	5 Hz – 100 kHz	
Level range	0.01 V/m – 100 kV/m	1 nT – 10 mT
Overload	200 kV/m @ 50 Hz	20 mT @ 50 Hz
Dynamic	> 140 dB	
Resolution	0.001 V/m on 8053B Display 0.1 V/m with 8053B Data logger	1 nT on 8053B display or internal data logger 10 nT with 8053B Data logger
Sensitivity	0.01 V/m	1 nT
Absolute error	± 0.5 dB (@ 50 Hz and 1 kV/m)	± 0.5 dB (@ 50 Hz and 0.1 mT)
Flatness (40 Hz – 10 kHz)	± 0.5 dB	± 0.5 dB
Isotropicity	**(see § 8.4)**	
Linearity @ 50 Hz	± 0.2 dB (1 V/m – 100 kV/m)	± 0.2 dB (200 nT – 10 mT)
Internal memory	1440 data with 1 minute storing; 2880 data with 30 sec storing. The data can be transferred only to PC	
Internal data logger	1 measurement every 30 or 60 seconds	
FFT	Real time FFT analysis	
SPAN	100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 10 kHz, 100 kHz	
Start frequency	1.2 % of the SPAN	
Stop frequency	Equal to the SPAN	
E-field rejection	---	> 20 dB
H-field rejection	> 20 dB	---
Calibration	Internal into E^2PROM	
Temperature deviation (referred to 23°C)	+/- 0.05 dB between -10 and +23°C, at 40% of relative humidity + 0.01 dB/°C between +23 and +50°C, at 40% of relative humidity	
Humidity deviation (referred to 40%)	+/- 0.05 dB between 20% and 50%, at the temperature of +23°C + 0.05 dB/% between 50% and 80%, at the temperature of +23°C	
Size	92 x 92 x 109 mm	
Weight	525 g	
Tripod support	Threaded insert ¼"	
Internal battery	Rechargeable NiMH batteries (5 x 1.2 V)	
Operating time	>10 hours in normal mode >150 hours in low-power mode 24 hours with internal data logger (SPAN higher than 200 Hz) in stand alone mode of operation	
Maximum operating distance	80 meters via fiber optic	
Recharging time	< 4 hours	
External DC supply	DC, 10 - 15 V, I = about 200 mA	
Fiber optic connection	Up to 40 meters (USB-OC) Up to 80 meters (8053-OC)	
Firmware update	Update available through the USB or RS232 port	
Autocheck	Automatically when switched on	
Operational temperature	-10°C to +50°C	
Storage temperature	-20°C to +70°C	

8.1.2 Isotropic E&H field analyzer EHP-50C typical uncertainty and anisotropy

8.1.2.1 Typical uncertainty of the EHP-50C

The uncertainties stated in this document have been determined according to EA-4/2 [4].
They were estimated as expanded uncertainty obtained multiplying the standard by the coverage factor k=2, corresponding to a confidence level of about 95%.
The total uncertainty of the probe derived from typical contributions of linearity, anisotropy, frequency response, temperature, relative humidity and with/without contribution of uncertainty of calibration.

Magnetic probe (1)	Magnetic flux density range	Total expanded uncertainty (k=2)	
		Without contribution of uncertainty of calibration U_{EHP50C} (%)	With contribution of uncertainty of calibration U_T (%)
Frequency at 50Hz	0.1µT to < 0.3µT	4.1	4.2 (2)
	0.3µT to < 10.0µT	3.3	3.5 (2)
	10.0µT to < 100µT	3.7	4.3 (3)
	100µT to 500µT	4.1	4.8 (4)
Frequency from 40 to 10kHz	0.1µT to < 0.3µT	6.5	6.7 (5)
	0.3µT to > 10.0µT	6.1	6.3 (5)

(1) The temperature range is from -10°C to 23 °C and relative humidity is from 20% to 50%
(2) (5) The uncertainty of calibration used is 1,5%
(3) The uncertainty of calibration used is 2,0%
(4) The uncertainty of calibration used is 2,7%

Electric probe (6)	Electric field range	Total expanded uncertainty (k=2)	
		Without contribution of uncertainty of calibration U_{EHP50C} (%)	With contribution of uncertainty of calibration U_T (%)
Frequency at 50Hz	10 V/m to 500 V/m	7.8	8.2 (7)
	10 V/m to < 100 kV/m	8.4	8.8 (8)
Frequency from 40 to 10kHz	10 V/m to < 500 V/m	9.5	9.9 (8)

(6) The temperature range is from -10°C to 23 °C and relative humidity is from 20% to 50%
(7) The uncertainty of calibration used is 2,0%
(8) The uncertainty of calibration used is 2,5%

8.1.2.2 Explication Notes

a) If we have the certificate with different values of the uncertainty of calibration, in order to calculate the total expanded uncertainty U_T , the uncertainty of calibration has to be taken into account::

$$U_T = \sqrt{(U_{EHP\ 50\,C})^2 + (U_{Cal})^2}$$

b) When the environmental temperature is higher than 23 °C the contribute due to the temperature must be added quadratically to the uncertainty.

Example: if the temperature is 38°C we get a variation of 15°C in comparison to 23°C, corresponding to a variation of 0.15 dB (0.01dB/°C) equivalent to 1,74% and therefore the standard uncertainty is 1% (=0,0174/ $\sqrt{3}$).

Assuming an expanded uncertainty U_T =4.2%,

$U_{TOT} = \sqrt{\left(\frac{0.042}{2}\right)^2 + (0.01)^2} = 0.0465$ is obtained.

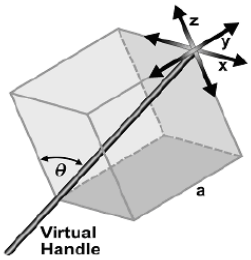
A similar calculation can be made in case the relative humidity overcomes 50%.

8.1.3 Anisotropy

1) The IEEE 1309-2005 [3] defined the anisotropy (A) as the maximum deviation from the geometric mean of the maximum response and minimum response when the probe is rotated around the ortho-axis (e.g. "virtual handle") as shown in the example in figure below.

$$A = 20 \cdot \log_{10}\left(\frac{S_{max}}{\sqrt{S_{max} \cdot S_{min}}}\right) \text{dB} \qquad \text{equation (1)}$$

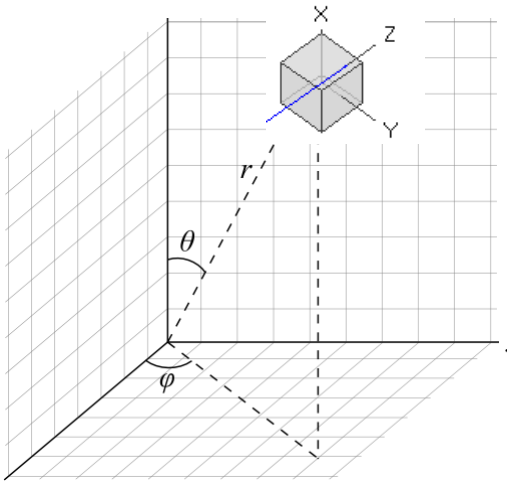
where S is the measured amplitude in field strength units.



$$\theta = \sin^{-1}\left(\frac{\sqrt{2}\,a}{\sqrt{3}\,a}\right) = 54.7^{\circ}$$

2) The IEC 61786 [2] "Measurement of low-frequency magnetic and electric fields with regards to exposure of human beings - special requirements for instruments and guidance for measurements" don't define the anisotropy and suggest, for three-axis probes, the calibration of each axis when each element is aligned with the incident field.
The calibration should also be checked for a specific orientation where approximately there is the same indication for each one of the three axis (XYZ measurement).
Following this suggestion some laboratories find the minimum and the maximum values of the X,Y,Z and XYZ measure and calculate the anisotropy using equation (1).

3) We calculated the anisotropy with equation (1) but with 3D mesh measurements to cover 4π steradian.



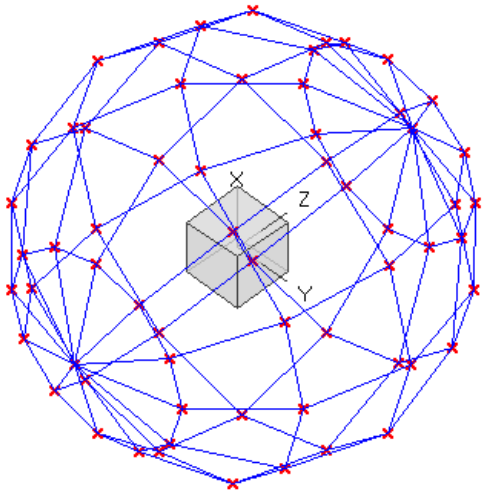


Fig. 8-2 3D mesh measurements of magnetic probe

Each x marker in the fig.1 indicates the coordinates surface of the spherical coordinates (r, θ, φ).
The anisotropy is evaluated with 30 degree steps for θ and φ, and r shows the calibration factor at each position.
The typical value of anisotropy is 1,4% (0.12 dB) for magnetic probe and 6,5% (0,54 dB) for electric probe.
The anisotropy calculated in this way is worse respect to other cases above described and it is more representative of the reality.

8.1.4 EHP-50C Panel

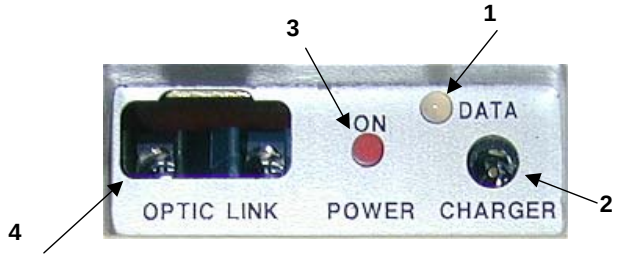


Fig. 8-3 Panel of PMM EHP-50C

Key:

1. Led

2. Battery charger connector

3. ON/OFF button

4. Fiber optic connector

8.1.5 Standard Accessories of PMM EHP-50C

- FO-10USB Fiber optic cable (10m);
- 8053-BC Battery charger;
- USB-OC Optical to USB converter;
- Plastic support
- Optical shorting loop
- Mini tripod
- Software for PC for data downloading
- Calibration certificate
- User manual

8.1.6 Optional Accessories of PMM EHP-50C

The following accessories may be ordered as options:

- PMM SB-04 Switching Control Box;
- FO-10USB Fiber optic cable (10m)
- FO-20USB Fiber optic cable (20m)
- FO-40USB Fiber optic cable (40m)
- FO-8053/10 Fiber optic cable (10m);
- FO-8053/20 Fiber optic cable (20m);
- FO-8053/40 Fiber optic cable (40m);
- FO-8053/80 Fiber optic cable (80m);
- 8053-BC Additional battery charger;
- 8053-OC Optical to RS232 converter;
- USB-OC Optical to USB converter;
- TR-02A Tripod;
- TT-01 Telescopic support with carrying bag.

8.1.7 Installation of EHP-50C to 8053B

To install EHP-50C, connect the fiber optic supplied with it, to the connector labeled **OPTIC LINK** taking care that the spigot matches the housing, and the other end of the fiber optic to the **OPTIC LINK** connector of PMM 8053B.

PMM EHP-50C can now be switched on by pressing the Red **POWER** button for one second.
In this moment 8053B and EHP-50C will start to communicate each other. EHP-50C will download all the internal data to 8053B and on the display is possible to see the probe model EHP-50C and its internal firmware release.

To use EHP-50C you need to update 8053B to the firmware release 2.30 or higher.

NOTE

Pressing the POWER down button for more than 4 seconds forces the hardware of the apparatus to shut down. In this case, it is necessary to wait several seconds before switching it on again.

When switched on, the three-color LED labeled **ON DATA** will provide the following information about how the apparatus is functioning:
After switching on the analyzer, the **ORANGE** LED lights up for about ½ a second as an auto-check, after this the **Green** light comes on which means that the firmware has been downloaded.

Blinking speed	Colour LED	Meaning
Changes depending on the SPAN	Green	Communication with 8053B in progress and correct
Medium	Red	8053B disconnected or error in communication
Fast	Orange	Recharging battery
Fast	Green	Battery recharging completed

NOTE

PMM EHP-50C can be switched off manually by pressing the Red POWER button. If the attempt to communicate is not successful or if the fiber optic is not connected to PMM 8053B, EHP-50C will automatically switch it off after 60 seconds in order to keep the battery charged.

WARNING

To guarantee compatibility with PMM EHP-50C the firmware of the 8053B must be updated to Version 2.30 or later.
Updates of the software and firmware of the Accessories can be downloaded from the Web site www.narda-sts.it or requested directly from NARDA Sales Centers.

EHP-50C stand alone mode

After the shorting optical loop has been inserted and EHP-50C is turned ON, the led will flash every half second to inform that it is ON with red and green light. After about one minute, the led will flash rapidly for about 30 seconds informing that the acquisition process will start soon. To avoid measurement error you should go away far from the probe.
Every second the led will flash shortly with orange color.
After every minute (or 30 sec) the led will become green for the time requested by the analyzer to perform one measurement. The time that the led remain green will depend by the selected SPAN. Lower Span requires longer measurement time.

8.1.8 Battery management

EHP-50C has more efficient battery management than the old EHP-50 model that allows measurements to be taken in **Logger** mode with over one week's autonomy.

During the time the Data Logger - Low Power is being used, the Analyzer stays on for the minimum period necessary (Time ON) and correctly takes a measurement and transfers it to the internal non volatile memory of the PMM 8053B, after which it goes into a state of low consumption until the next measuring point. The delay between measurements may be set between a minimum of 10 seconds and a maximum of 900 seconds (15 minutes).

The Table below illustrates the autonomy of the batteries with measurement settings every minute and every 5 minutes. The longer the delay between one measurement and the next, the longer the battery charge lasts.

		LOW POWER MODE		STAND ALONE MODE	
Span	**Normal functioning Autonomy (hours)**	**Logger Mode 60s Autonomy (hours)**	**Logger Mode 300s Autonomy (hours)**	**30s Sample**	**60s Sample**
100 Hz	>11	>24	>72	---	---
200 Hz	>11	>36	>110	---	---
500 Hz	>10	>48	>130	>24	>24
1 kHz	>10	>72	>150	>24	>24
2 kHz	>9	>65	>150	>24	>24
10 kHz	>6	>60	>130	>24	>24
100 kHz	>9	>72	>150	>24	>24

The Table summaries the time of autonomy of the batteries of the Analyzer depending on its mode of operation.

8.1.9 EHP-50C connected to 8053B

EHP-50C is linked to PMM 8053B meter via the fiber optic link; to activate the connection, set-up PMM 8053B in the following way:

1. Press the SET key to open a window where the main parameters and measurement settings can be selected.
2. Log on SERIAL
3. Select OPTICAL

(See Chapter 3 on "Instructions for Use" in this Manual for further details)

NOTE

This setting enables 8053B to automatically link up to and recognize EHP-50C via the fiber optic connection. With this setting, the serial connection via cable (Wired) is disabled.

Connect EHP-50C to 8053B with the fiber optic supplied with it and switch it on by pressing the Red button on the panel.
The connection and recognition procedure will begin automatically, information about the connection, revision data and data about the Analyzer's firmware will be briefly displayed in the data box of 8053B.

WARNING

Do not pull the fiber optic by holding onto the cable but use the connector so that the head does not get damaged.
Be very careful to avoid dirt and other particles getting into the transducers of the fiber optic.

Once the proper connection has been made, data regarding the correct functioning of the Analyzer and the charge status of its internal batteries, will be displayed with the words **EHP 50** in the box labeled **Rep.ter** at the top on the left of 8053B.

NOTE

The fiber optic of the EHP-50C Analyzer can be disconnected and reconnected while in use. In this case, communication will be re-established automatically.
If the Analyzer is disconnected for more than 60 seconds, it will automatically switch itself off in order to keep the battery charged.
It Is not possible to perform field measurement while EHP-50C are connected to the battery charger.

8.1.10 Avoiding measurement errors

To avoid disturbing the measurements in progress, the user or other persons or mobile vehicles should stay at least 5 meters away from the Analyzers. We also recommend that the probe be set up a long way from metal objects or masses.

WARNING

To perform correct measurements, the tripod TR-02A to hold EHP-50C is mandatory. Using an unsuitable support could influence the measurements that have been taken and, therefore, determine incorrect results. We recommend always using the isolated extension support supplied with EHP-50C for supporting the Analyzer.
We also recommend that the TR-02A optional tripod be used for positioning EHP-50C at the height set out in the reference standards for the measurement in progress and that this configuration is always maintained so that the measurements taken can be repeated.

NOTE

The intensity of the measured field mainly depends on its voltage and the geometry of the system under examination as well as the distance between the conductors and the measurement points. In the vicinity of cables, the reading of the field value may be very high and vary with the location of the probe.
From the definition of the potential difference between to points:

$$V_{21} = -\int_{r_1}^{r_2} \overline{E}\, dr$$

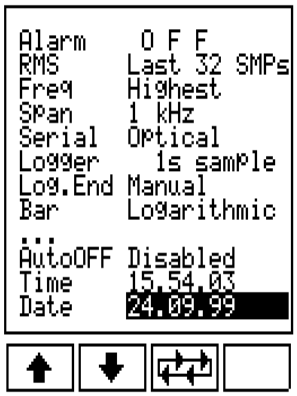
It is evident that, keeping the potential difference constant as the distance between the two points under examination decreases, the intensity of the field necessarily increases.
For example: the intensity of the electric field between two armatures of a parallel-plate capacitor situated at a distance of 0.1 m and having a potential difference of 100 V is equal to:

$$E = \frac{100V}{0{,}1m} = 1\,KV/m$$

It should be noted that a voltage of 100 V, in these conditions, generates a field of 1000 V/m. It is, therefore, possible, in the vicinity of 220 V conductors, that there may be a field, which is much higher than 220 V/m.

8.1.11 EHP-50C measurement modes

EHP-50C Analyzer carry out two main kinds of measurements: total frequency contribution or selective measurement.

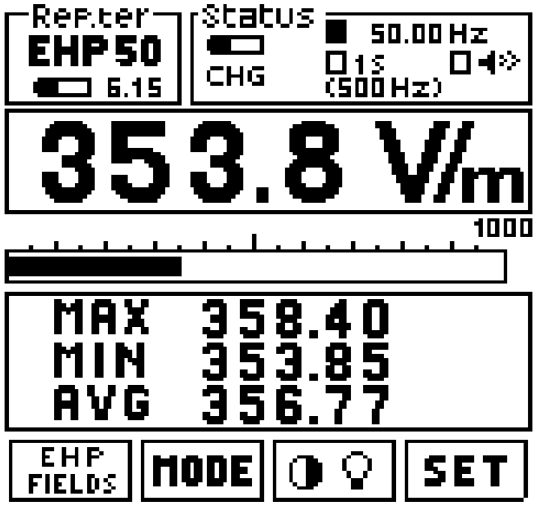


1. **Wideband**:
   Measures all the components in the selected spectrum (Span) (fundamental, harmonics and any other disturbances found, including the probe noise floor; see table). The result will be a number that represents the total field. This mode is used in high field environmental.
2. **Highest**:
   Measures only the highest level found within the Span; (the frequency will be displayed at the top on the right in the **Status** box of PMM 8053B). In case of extremely low field, EHP-50C always measure only the internal noise. This mode is used in low field environmental.
3. **Spectrum**:
   Measures only the frequency pointed by the Marker; (the frequency will be displayed at the top on the right in the **Status** box of PMM 8053B). This mode is used, like with a spectrum analyzer, to measure and to store each individual frequency selected by using the Marker.

The three different measurement modes can be selected in the following way:

1. Pressing the **SET** key enables the user to open a window where the main parameters and measurement settings can be selected.
2. Log on **Freq**
3. Select **Wideband** or **Highest** then push **BACK** key
4. Enter **Mode** and select **Spectrum** then **Marker ON**

The main menu shows:



8.1.12 Electric or Magnetic fields selection

It is possible to select the measurement of the Electric Field (**E)** or Magnetic Field (**H)** with two different full scale values.
For the **E** Electric field there are:

1k = 1000 V/m
100k = 100 kV/m

For the **H** Magnetic Field there are:

100µ = 100 µT
10m = 10 mT

NOTE

Sometimes, when measuring very low fields on lower band and EHP-50C is later switched to the higher band, the new reading could be much higher then the previous measurement. The main reason is because the internal noise level of the Analyzer is different between the two ranges: it is higher in the high range. In this case would be better to use Highest Mode of operation instead of Wideband.

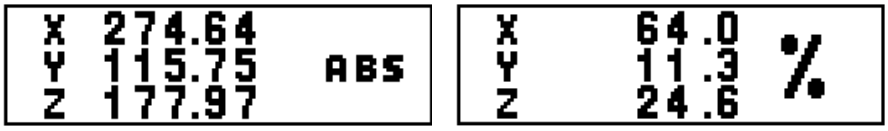
8.1.13 MODES of operations

The possible operational modes are:

- **ABS %**
- **MIN-MAX RMS or AVG**
- **SPECT**
- **Data logger**

8.1.14 ABS/% mode

In this operational mode, PMM 8053B displays the three vectorial components of the measured field in absolute and percent values.



NOTE

Due to EHP-50C geometry (positions of the magnetic and electric probes), when rotating the probe of 180° the results could be different if you are very close to the source.

8.1.15 MIN-MAX/AVG MIN-MAX/RMS modes

In this operational mode, the maximum and minimum field values measured as well as the average field value expressed as arithmetic (AVG) or as a quadratic (RMS) average can be displayed.
The average in **AVG** or **RMS** mode can be selected in the **SET** operational mode.

$$\textbf{AVG} = \frac{1}{T}\int_0^T \left|E_{(t)}\right| dt$$

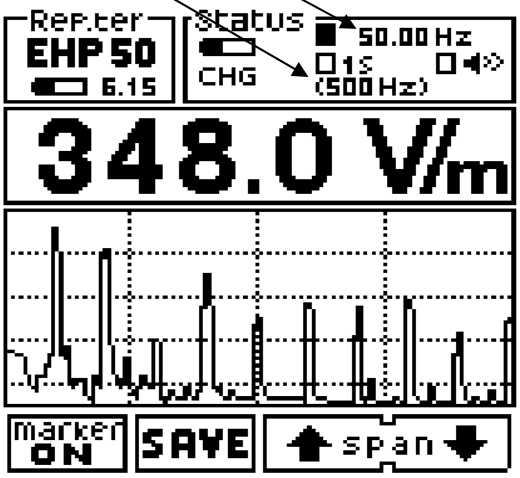
$$\textbf{RMS} = \sqrt{\frac{1}{T}\int_0^T \left|E_{(t)}\right|^2 dt}$$

The time used to calculate the averaging value is defined with **SET** function. See Chapter 3.7.2.

8.1.16 SPECT Mode

In this mode, EHP-50C perform an FFT (Fast Fourier Transform) analysis among the selected **Span** and show the results on 8053B display.
The highest signal **frequency** is displayed in the first line:

The set value of the **Span** is displayed in brackets in the Status box.



EHP-50C has 100 dB of dynamic and offers a display with 5 divisions.

NOTE

The possible commands are:

- **Marker ON: used to find the higher levels or to measure a specific frequency or to acquire data with the Data Logger only at one frequency.**
- **SAVE: used to save the graph of the Spectrum in BITMAP format and download it later on to the PC using Data Logger Interface software or 8053-SW02 Acquisition software.**
- **SPAN: used to change the frequency observation window (Span) between seven different values, by using the arrows UP and Down.**

SPAN	Acquisition time	Hz Resolution
1. 100 Hz	4.1 s	0.24
2. 200 Hz	2.0 s	0.49
3. 500 Hz	0.8 s	1.22
4. 1 kHz	0.4 s	2.44
5. 2 kHz	0.2 s	4.88
6. 10 kHz	40.96 ms	24.41
7. 100 kHz	4.096 ms	244.14

The **Span** can also be set in the following way:
1. Press the **SET** key.
2. Log on **Span**
3. Select the desired spectrum

☞NOTE

The Span that is selected indicates the maximum frequency of the spectrum within which EHP-50C will take measurements.
The minimum frequency is about 1.2% of the selected Span and, in any case, it is never less than 5 Hz.
(For example: Span = 10 kHz the minimum frequency measured is about 120 Hz, Span = 2 kHz the minimum frequency is about 24 Hz, Span = 200 Hz minimum frequency = 5 Hz).
To measure a field at 50 Hz, it is necessary to set a ≤ 2 kHz span.

EHP-50C frequency and spurious levels Table according to the Span

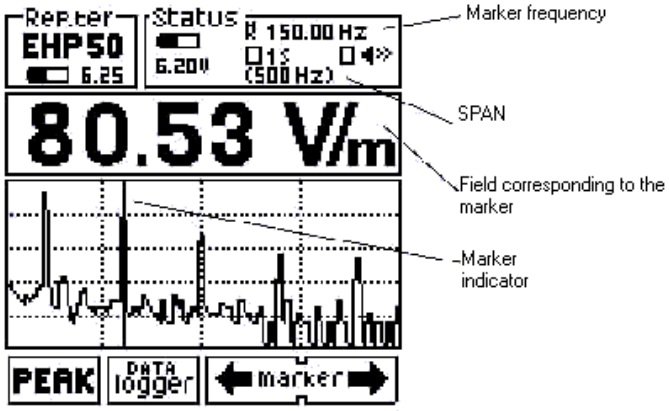
Frequency Span	Frequency Range	Electric Field Sensitivity f.s. = 1000 V/m		Magnetic Field Sensitivity f.s. = 100 uT	
		Highest Mode	Wideband Mode	Highest Mode	Wideband Mode
100 Hz	5 Hz ÷ 100 Hz	< 20 mV	< 20 mV/m	< 10 nT	< 10 nT
200 Hz	5 Hz ÷ 200 Hz	< 50 mV/m	< 50 mV/m	< 10 nT	< 20 nT
500 Hz	6 Hz ÷ 500 Hz	< 100 mV/m	< 200 mV/m	< 30 nT	< 50 nT
1 kHz	12 Hz ÷ 1 kHz	< 200 mV/m	< 200 mV/m	< 30 nT	< 50 nT
2 kHz	25 Hz ÷ 2 kHz	< 100 mV/m	< 200 mV/m	< 30 nT	< 50 nT
10 kHz	120 Hz ÷ 10 kHz	< 200 mV/m	< 200 mV/m	< 30 nT	< 50 nT
100 kHz	1.2kHz÷100 kHz	< 200 mV/m	< 500 mV/m	< 30 nT	< 50 nT

8.1.17 MARKER function in SPECT mode

The **MARKER** is available in **SPECT** mode by selecting the **marker ON** function key. This mode of operation is used to measure a specific frequency contribution like in a normal Spectrum analyzer.
On activating the marker, a vertical bar is displayed in the spectrum box that indicates the frequency on which to place the marker. This frequency is displayed with a numeric value in the **Status** box at the top on the right of the display of PMM 8053B, and it can be changed within the set spectrum via the ⇐ **marker** ⇒ keys.
The **PEAK** function is also available which enables the marker to be automatically positioned on the strongest signal shown within the set spectrum.
In presence of an extremely low field, the **PEAK** function will search for the highest value. Sometimes this value will correspond to the internal electric noise of the EHP-50 analyzers. To move the marker for searching the desired frequency to measure.

8.1.18 LOGGER function with the MARKER

From Version 2.30 of PMM 8053B firmware, it is possible with the EHP-50C to record (Logger) only the field corresponding to an user's frequency defined by the **Marker**.
To access this function, all the user needs to do is to enter the **SPECTRUM** menu and then **MARKER**; place the marker on the desired frequency and press the new **Data Logger** key.
From this point on the firmware behaves exactly as if it had reached this point from the **MODE** menu; which means that all the modes of the Data **Logger** are operational.
The **MK** symbol next to the frequency reminds the user that he is measuring in selective mode.
The width of the filter is to be considered as 1/80 of the selected span; for example, a span of 10kHz will have a filter 125Hz wide whereby a marker positioned on 9500Hz will measure in a band from 9435Hz to 9565. It should be remembered that the slope of the filter is very high meaning that even if the signal is shifted by a few Hertz from the side, it will undoubtedly be outside the band.



☞NOTE

When the MARKER function is used to take measurements, the level of the field displayed corresponds to that measured on the frequency of the MARKER.

8.1.19 Data logger mode

In **DATA logger** mode, the user can store the measurements that have been taken and save them in a file. Depending on selection of **Highest** or **Wideband**, EHP-50C will store the highest signal or the total contribution of all frequencies covered by the selected **SPAN**.
All the generated files are numbered progressively and contain:

1. time duration
2. Logger settings
3. date and time when the measurement began
4. average value
5. value of each single datum stored
6. user's comment.

NOTE

If you are inside the spectrum and Marker is on, the data logger will acquire only data corresponding to the frequency pointed by the marker.
The use of the different Data logger modes is explained in detail in Chapter 3 in this Manual

WARNING

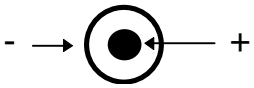
When the DATA Logger Low Power mode is in use, PMM 8053B must be switched on the whole time and linked to the EHP-50C Analyzer for the entire measurement session. If it is switched off or disconnected from the EHP-50C Analyzer, to return to normal operation, it must be reset by pressing the Power button down for at least 5 seconds, in this case the data of the measurement in progress will be lost.

8.1.20 Power supply and battery recharging of PMM EHP-50C

See the indication at the beginning of section 8 of this Manual for general instructions regarding the power supply of PMM EHP-50C.
EHP-50C has an internal rechargeable NiMH battery that can be recharged with the battery charger supplied with it (the battery charger is the same as that of PMM 8053B).
If the internal batteries are to have the greatest autonomy, we recommend that a full recharging cycle should be carried out before using the Analyzer.

NOTE

ALWAYS connect the battery charger to the power supply BEFORE connecting it to the EHP-50C.
The battery charger has an internal protective circuit that will limit the output of current if there is any load when connecting to the mains.
Always remove the shorting loop connector when recharging EHP-50C.
Battery charger:
output: DC, 10 - 15 V, ~ 500 mA



Connector:

NOTE

In order to safeguard the features of the batteries, it is crucial to have a complete recharge before storing them for periods longer than 4 months. Therefore, it is warmly suggested recharging the batteries at least every 4 months even though the device has not been used.

NOTE

The minimum voltage level for operation, displayed by the indicator, is about 5.3 V. The batteries must be recharged for lower voltages. Below such voltage the analyzer will turn OFF automatically.

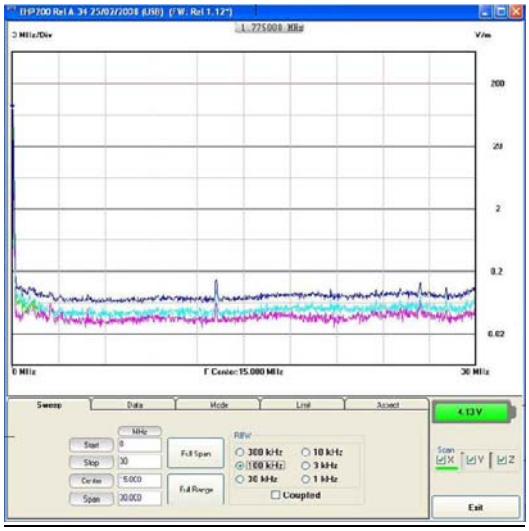
The time required for recharging the batteries is about 4-5 hours. When the recharge is complete, this is indicated by the Led of the EHP-50C, with a rapidly blinking Green light.

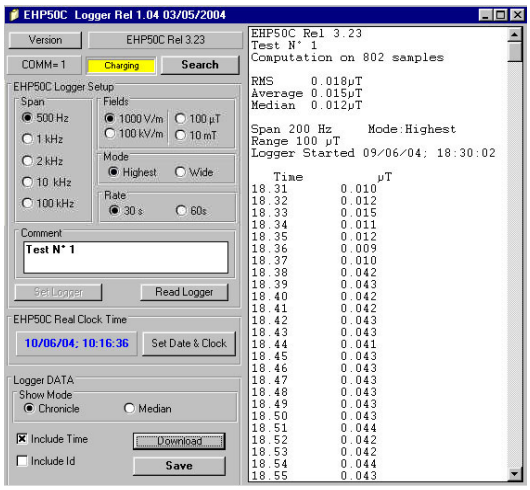
NOTE

To take measurements ALWAYS remove the battery charger from the EHP-50C Analyzer otherwise the system does not work.

8.1.21 Using EHP-50C with a UMPC or Personal Computer

EHP-50C can be linked to a UMPC or Personal Computer to easily show spectrum and measured data.





NOTE **Refer to the user manual and documentation for more information about installation, configuration and use of the equipment.**

8.2 EHP-50E Introduction

This section explains the installation and use of the EHP-50E Electric and Magnetic Field Analyzer. EHP-50E is a low frequency electric and magnetic isotropic field probe-analyzers, providing a state of the art technology solution for field measurements from a few mV/m (or tenths of nT) to hundreds of kV/m (or mT), in the 1 Hz to 400 kHz range including X, Y and Z axes simultaneous measurements with a powerful spectrum analyzer built in.
EHP-50E has an mode of operation that allows it to be used in stand alone mode over 24 hours of continuous data collection. It can be used connected with 8053B or SB-04.
EHP-50E include a Flash Memory, that stores the calibration data, the frequency and level calibration tables, and an internal optical repeater that allows the 8053B field meter to be connected via a fiber optic link.
The spectral analysis of the signals, obtained through a powerful FPGA and DSP (Digital Signal Processor), is performed on eight different Span values and shown on the display of the 8053B. By using a Marker it is possible to obtain the precise measurement of the frequencies and levels.
EHP-50E is managed internally with a microcontrolles (DSP module) that controls all its main functions, from the charging of the batteries to the serial communication with the DSP unit. The Electric or Magnetic field is picked up by the three probes on the X, Y and Z axes. A Digital/Analog conversion follows which transforms the signal into numeric information processed by a Digital Signal Processing unit.

EHP-50E is housed in a small cubic container. On the bottom part of it, there is the panel for the fiber optic connection, supplied with the Analyzer, the screws for fitting the isolated extension, the connector for the battery charger, the ON/OFF button and the LED for checking on its functioning.

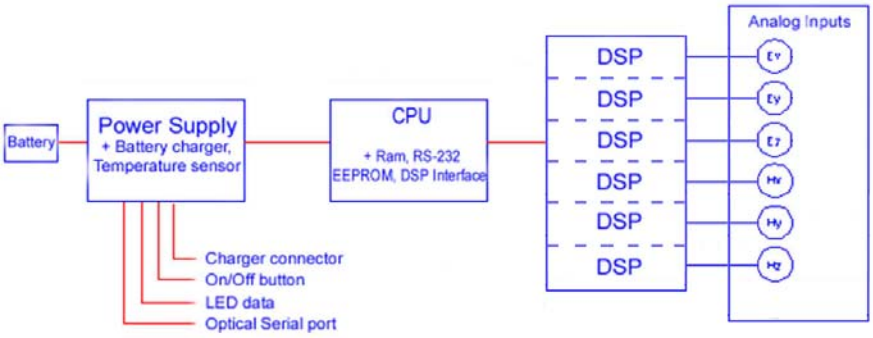


Fig. 8-4 Block diagram of the PMM EHP-50E Analyzer

The magnetic sensor system is composed by three magnetic loops positioned orthogonal each other. The electric sensor system is composed by three orthogonal parallel capacitors and installed on opposite side of the magnetic loops.

8.2.1 EHP-50E Main specifications

When not differently specified the following specifications are referred to operating ambient temperature 23°C and relative humidity 50%.

Table 8-2 Technical specifications of the EHP-50E Electric and Magnetic Field Analyzer

	Electric Field	Magnetic Field	AUX input (MMCX Zin 1kΩ)
Frequency range	1 Hz ÷ 400 kHz		
Measurement range (1)	5 mV/m ÷ 1 kV/m 500mV/m ÷ 100 kV/m (146 dB)	0.3 nT ÷ 100 µT 30 nT ÷ 10 mT (150 dB)	30 nV ÷ 10 mV 3 uV ÷ 1 V (150 dB)
Overload	200 kV/m	20 mT	2V
Dynamic range	106 dB	110 dB	110 dB
Resolution (2)	1 mV/m with 8053B 0.1 mV/m with EHP-TS SW 1 mV/m Stand alone	1 nT with 8053B 0.1 nT with EHP-TS SW 1 nT Stand alone	0.1 nV with EHP-TS SW
Displayed average noise level (3) **Isotropic result** **Single axis**	 5 mV/m 3 mV/m	 0.3 nT 0.2 nT	 30 nV
Flatness (@ 100 V/m, 2 µT, 5mV) **(5 Hz ÷ 40 Hz)** **(40 Hz ÷ 100kHz)**	 0.8 dB 0.35 dB	 0.8 dB 0.35 dB	 0.8 dB 0.35 dB
Anisotropicity (typ)	0.54 dB	0.12 dB	---
Linearity (referred to 100 V/m and 1 µT)	0.2 dB (1 V/m ÷ 1 kV/m)	0.2 dB (200 nT ÷ 10 mT)	0.2 dB (10 µV ÷ 1 V)
Internal memory	Up to 24 hours regardeless the logging rate.		
Internal data logger	1 measurement every 30 or 60 seconds		
Spectrum analysis method	FFT		
Acquisition method	Simultaneous three axis acquisition		
SPAN	100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 10 kHz, 100 kHz, 400 kHz (500Hz to 100kHz in Stand Alone mode)		
Start frequency	1Hz with SPAN 100 Hz; 1.2 % of the SPAN with wider SPAN		
Stop frequency	Equal to the SPAN		
Rejection to E fields	---	> 20 dB	---
Rejection to H fields	> 20 dB	---	---
Calibration	internal E^2PROM		
Typical temperature deviation **@ 55 Hz referred to 23°C** (@ 50% of relative humidity when applicable)	$-4x10^{-3}$ dB/°C within -20 +55 °C	$-8x10^{-3}$ dB/°C within -20 +23 °C $+13x10^{-3}$ dB/°C within +23 +55 °C	---
Typycal relative humidity deviation **@ 55 Hz referred to 50%** (@ 23 °C)	$+11x10^{-3}$ dB/% within 10 50 % $+22x10^{-3}$ dB/% within 50 90 %	$-7x10^{-3}$ dB/% within 10 50 % $+10x10^{-3}$ dB/% within 50 90 %	---
Dimensions	92 x 92 x 109 mm		
Weight	550 g		
Tripod support	Threaded insert ¼"		
Internal battery	3.7 V / 5.4 Ah Li-Ion, rechargeable		
Operating time	>9 hours in standard mode 24 hours in stand alone mode		
Recharging time	< 6 hours		
External supply	10 ÷ 15 VDC, I = approx. 500 mA		
Optical fiber connection	up to 40 m (USB-OC) up to 80 m (8053-OC)		
Firmware updating	through the optical link by USB or RS232		
Self test	automatic at power on		
Operating temperature	-20 to +55 °C		
Operating relative humidity (4)	0 to 95 %		
Charging temperature	0 to +40°C		
Storage temperature	-30 to +75°C		

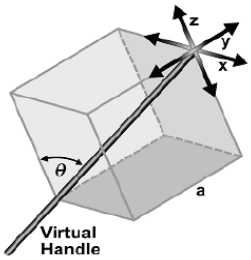
(1) For each single axis. Ranges to be selected manually
(2) For the lower measurement range
(3) DANL is frequency and SPAN depending. The specified best performance is referred to f ≥ 50 Hz and SPAN ≤ 1 kHz
(4) Without condensation
Specification are subject to change without notice

8.2.2 Anisotropy

1) The IEEE 1309-2005 [3] defined the anisotropy (A) as the maximum deviation from the geometric mean of the maximum response and minimum response when the probe is rotated around the ortho-axis (e.g. "virtual handle") as shown in the example in figure below.

$$A = 20 \cdot \log_{10}\left(\frac{S_{max}}{\sqrt{S_{max} \cdot S_{min}}}\right) \text{dB} \qquad \text{equation (1)}$$

where S is the measured amplitude in field strength units.



$$\theta = \sin^{-1}\left(\frac{\sqrt{2}\,a}{\sqrt{3}\,a}\right) = 54.7^{\circ}$$

2) The IEC 61786 [2] "Measurement of low-frequency magnetic and electric fields with regards to exposure of human beings - special requirements for instruments and guidance for measurements" don't define the anisotropy and suggest, for three-axis probes, the calibration of each axis when each element is aligned with the incident field.
The calibration should also be checked for a specific orientation where approximately there is the same indication for each one of the three axis (XYZ measurement).
Following this suggestion some laboratories find the minimum and the maximum values of the X,Y,Z and XYZ measure and calculate the anisotropy using equation (1).

3) We calculated the anisotropy with equation (1) but with 3D mesh measurements to cover 4π steradian.

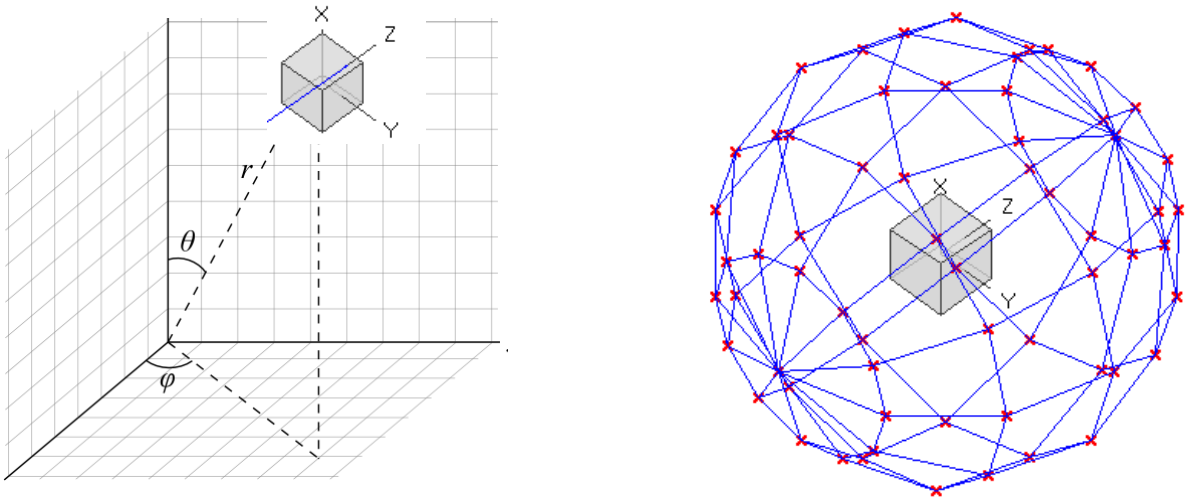


Fig. 8-2 3D mesh measurements of magnetic probe

Each x marker in the fig.1 indicates the coordinates surface of the spherical coordinates (r, θ, φ).
The anisotropy is evaluated with 30 degree steps for θ and φ, and r shows the calibration factor at each position.
The typical value of anisotropy is 1,4% (0.12 dB) for magnetic probe and 6,5% (0,54 dB) for electric probe.
The anisotropy calculated in this way is worse respect to other cases above described and it is more representative of the reality.

8.2.3 EHP-50E Panel

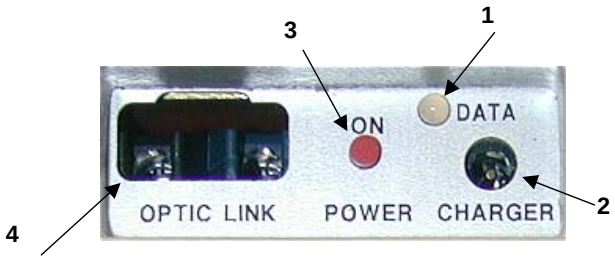


Fig. 8-4 Panel of PMM EHP-50E

Key:

5. Led

6. Battery charger connector

7. ON/OFF button

8. Fiber optic connector

8.2.4 Standard Accessories of PMM EHP-50E

- FO-10USB Fiber optic cable (10m);
- 8053-BC Battery charger;
- USB-OC Optical to USB converter;
- Plastic support
- Optical shorting loop
- Mini tripod
- Software for PC for data downloading
- Calibration certificate
- User manual

8.2.5 Optional Accessories of PMM EHP-50E

The following accessories may be ordered as options:

- FO-10USB Fiber optic cable (10m)
- FO-20USB Fiber optic cable (20m)
- FO-40USB Fiber optic cable (40m)
- FO-8053/10 Fiber optic cable (10m);
- FO-8053/20 Fiber optic cable (20m);
- FO-8053/40 Fiber optic cable (40m);
- FO-8053/80 Fiber optic cable (80m);
- 8053-BC Additional battery charger;
- 8053-OC Optical to RS232 converter;
- USB-OC Optical to USB converter;
- TR-02A Tripod;
- TT-01 Telescopic support with carrying bag.

8.2.6 Installation of EHP-50E with PMM 8053B

To install the EHP-50E, connect the fiber optic supplied with it, to the connector labeled **OPTIC LINK** taking care that the spigot matches the housing, and the other end of the fiber optic to the **OPTIC LINK** connector of PMM 8053B.

PMM EHP-50E can now be switched on by pressing the Red **POWER** button for one second.
In this moment the 8053B and EHP-50E will start to communicate each other. EHP-50E will download all the internal data to 8053B and on the display it is possible to see the probe model EHP-50E and its internal firmware release.

To use the EHP-50E you need to update the 8053B to the firmware release 3.16 or higher. (The picture on the left is simply an example)

NOTE

Pressing the POWER down button for more than 4 seconds forces the hardware of the apparatus to shut down. In this case, it is necessary to wait several seconds before switching it on again.

When switched on, the three-color LED labeled **ON DATA** will provide the following information about how the apparatus is functioning:
After switching on the analyzer, the **ORANGE** LED lights up for about ½ a second as an auto-check, after this the **Green** light comes on which means that the firmware has been downloaded.

Blinking speed	Colour LED	Meaning
Changes depending on the SPAN	Green	Communication with 8053B in progress and correct
Medium	Red	8053B disconnected or error in communication
Fast	Orange	Recharging battery
Fast	Green	Battery recharging completed

NOTE

PMM EHP-50E can be switched off manually by pressing the Red POWER button. If the attempt to communicate is not successful or if the fiber optic is not connected to PMM 8053B, EHP-50E will automatically switch it off after 60 seconds in order to keep the battery charged.

WARNING

To guarantee compatibility with PMM EHP-50E the firmware of the 8053B must be updated to Version 3.16 or later.
Updates of the software and firmware of the Accessories can be downloaded from the Web site www.narda-sts.it or requested directly from NARDA Sales Centers.

EHP-50E stand alone mode

After the shorting optical loop has been inserted and EHP-50E is turned ON, the led will flash every half second to inform that it is ON with red and green light. After about one minute, the led will flash rapidly for about 30 seconds informing that the acquisition process will start soon. To avoid measurement error you should go away far from the probe.
Every second the led will flash shortly with orange color.
After every minute (or 30 sec) the led will become green for the time requested by the analyzer to perform one measurement. The time that the led remain green will depend by the selected SPAN. Lower Span requires longer measurement time.

8.2.7 EHP-50E connected to 8053B

EHP-50E is linked to PMM 8053B meter via the fiber optic link; to activate the connection, set-up PMM 8053B in the following way:

4. Press the SET key to open a window where the main parameters and measurement settings can be selected.
5. Log on SERIAL
6. Select OPTICAL

(See Chapter 3 on "Instructions for Use" in this Manual for further details)

NOTE

This setting enables 8053B to automatically link up to and recognize EHP-50E via the fiber optic connection. With this setting, the serial connection via cable (Wired) is disabled.

Connect EHP-50E to 8053B with the fiber optic supplied with it and switch it on by pressing the Red button on the panel.
The connection and recognition procedure will begin automatically, information about the connection, revision data and data about the Analyzer's firmware will be briefly displayed in the data box of 8053B.

WARNING

Do not pull the fiber optic by holding onto the cable but use the connector so that the head does not get damaged.
Be very careful to avoid dirt and other particles getting into the transducers of the fiber optic.

Once the proper connection has been made, data regarding the correct functioning of the Analyzer and the charge status of its internal batteries, will be displayed with the words **EHP 50** in the box labeled **Rep.ter** at the top on the left of 8053B.

NOTE

The fiber optic of the EHP-50E Analyzer can be disconnected and reconnected while in use. In this case, communication will be re-established automatically.
If the Analyzer is disconnected for more than 60 seconds, it will automatically switch itself off in order to keep the battery charged.
It Is not possible to perform field measurement while EHP-50E are connected to the battery charger.

8.2.8 Avoiding measurement errors

To avoid disturbing the measurements in progress, the user or other persons or mobile vehicles should stay at least 5 meters away from the Analyzers. We also recommend that the probe be set up a long way from metal objects or masses.

WARNING

To perform correct measurements, the tripod TR-02A to hold EHP-50E is mandatory. Using an unsuitable support could influence the measurements that have been taken and, therefore, determine incorrect results. We recommend always using the isolated extension support supplied with EHP-50E for supporting the Analyzer.
We also recommend that the TR-02A optional tripod be used for positioning EHP-50E at the height set out in the reference standards for the measurement in progress and that this configuration is always maintained so that the measurements taken can be repeated.

NOTE

The intensity of the measured field mainly depends on its voltage and the geometry of the system under examination as well as the distance between the conductors and the measurement points. In the vicinity of cables, the reading of the field value may be very high and vary with the location of the probe.
From the definition of the potential difference between to points:

$$V_{21} = -\int_{r_1}^{r_2} \overline{E}\, dr$$

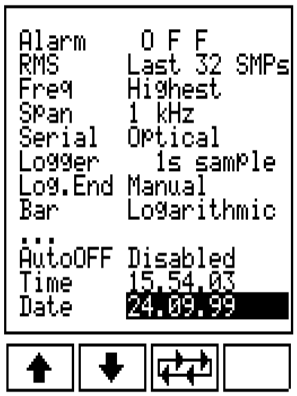
It is evident that, keeping the potential difference constant as the distance between the two points under examination decreases, the intensity of the field necessarily increases.
For example: the intensity of the electric field between two armatures of a parallel-plate capacitor situated at a distance of 0.1 m and having a potential difference of 100 V is equal to:

$$E = \frac{100V}{0{,}1m} = 1\,KV/m$$

It should be noted that a voltage of 100 V, in these conditions, generates a field of 1000 V/m. It is, therefore, possible, in the vicinity of 220 V conductors, that there may be a field, which is much higher than 220 V/m.

8.2.9 EHP-50E measurement modes

EHP-50E Analyzer carry out two main kinds of measurements: total frequency contribution or selective measurement.

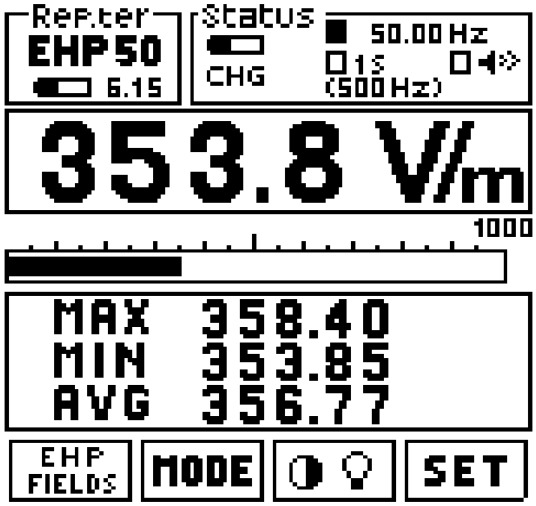


4. **Wideband**:
   Measures all the components in the selected spectrum (Span) (fundamental, harmonics and any other disturbances found, including the probe noise floor; see table). The result will be a number that represents the total field. This mode is used in high field environmental.
5. **Highest**:
   Measures only the highest level found within the Span; (the frequency will be displayed at the top on the right in the **Status** box of PMM 8053B). In case of extremely low field, EHP-50E always measure only the internal noise. This mode is used in low field environmental.
6. **Spectrum**:
   Measures only the frequency pointed by the Marker; (the frequency will be displayed at the top on the right in the **Status** box of PMM 8053B). This mode is used, like with a spectrum analyzer, to measure and to store each individual frequency selected by using the Marker.

The three different measurement modes can be selected in the following way:

5. Pressing the **SET** key enables the user to open a window where the main parameters and measurement settings can be selected.
6. Log on **Freq**
7. Select **Wideband** or **Highest** then push **BACK** key
8. Enter **Mode** and select **Spectrum** then **Marker ON**

The main menu shows:



8.2.10 Electric or Magnetic fields selection

It is possible to select the measurement of the Electric Field (**E)** or Magnetic Field (**H)** with two different full scale values.
For the **E** Electric field there are:

1k = 1000 V/m
100k = 100 kV/m

For the **H** Magnetic Field there are:

100µ = 100 µT
10m = 10 mT

NOTE

Sometimes, when measuring very low fields on lower band and EHP-50E is later switched to the higher band, the new reading could be much higher then the previous measurement. The main reason is because the internal noise level of the Analyzer is different between the two ranges: it is higher in the high range. In this case would be better to use Highest Mode of operation instead of Wideband.

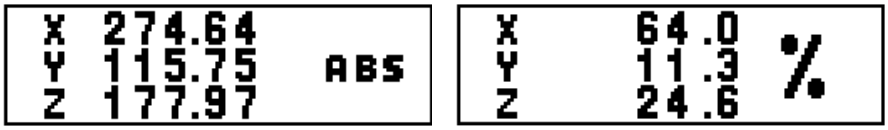
8.2.11 MODES of operations

The possible operational modes are:

- **ABS %**
- **MIN-MAX RMS or AVG**
- **SPECT**
- **Data logger**

8.2.12 ABS/% mode

In this operational mode, PMM 8053B displays the three vectorial components of the measured field in absolute and percent values.



NOTE

Due to EHP-50E geometry (positions of the magnetic and electric probes), when rotating the probe of 180° the results could be different if you are very close to the source.

8.2.13 MIN-MAX/AVG MIN-MAX/RMS modes

In this operational mode, the maximum and minimum field values measured as well as the average field value expressed as arithmetic (AVG) or as a quadratic (RMS) average can be displayed.
The average in **AVG** or **RMS** mode can be selected in the **SET** operational mode.

$$\textbf{AVG} = \frac{1}{T}\int_0^T \left|E_{(t)}\right| dt$$

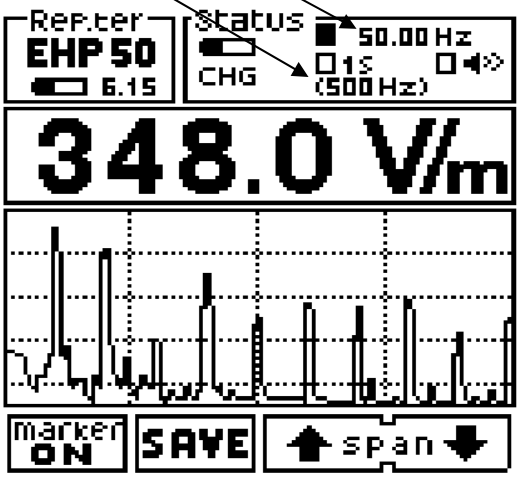
$$\textbf{RMS} = \sqrt{\frac{1}{T}\int_0^T \left|E_{(t)}\right|^2 dt}$$

The time used to calculate the averaging value is defined with **SET** function. See Chapter 3.7.2.

8.2.14 SPECT Mode

In this mode, EHP-50E perform an FFT (Fast Fourier Transform) analysis among the selected **Span** and show the results on 8053B display.
The highest signal **frequency** is displayed in the first line:

The set value of the **Span** is displayed in brackets in the Status box.



EHP-50E has 100 dB of dynamic and offers a display with 5 divisions.

NOTE

The possible commands are:

- **Marker ON: used to find the higher levels or to measure a specific frequency or to acquire data with the Data Logger only at one frequency.**
- **SAVE: used to save the graph of the Spectrum in BITMAP format and download it later on to the PC using Data Logger Interface software or 8053-SW02 Acquisition software.**
- **SPAN: used to change the frequency observation window (Span) between seven different values, by using the arrows UP and Down.**

SPAN	Acquisition time	Hz Resolution
1. 100 Hz	4.1 s	0.24
2. 200 Hz	2.0 s	0.49
3. 500 Hz	0.8 s	1.22
4. 1 kHz	0.4 s	2.44
5. 2 kHz	0.2 s	4.88
6. 10 kHz	40.96 ms	24.41
7. 100 kHz	4.096 ms	244.14
8. 400 kHz	1.024 ms	976.56

The **Span** can also be set in the following way:

4. Press the **SET** key.
5. Log on **Span**
6. Select the desired spectrum

The Span that is selected indicates the maximum frequency of the spectrum within which EHP-50E will take measurements.
The minimum frequency is about 1.2% of the selected Span and, in any case, it is never less than 1 Hz.
(For example: Span = 10 kHz the minimum frequency measured is about 120 Hz, Span = 2 kHz the minimum frequency is about 24 Hz, Span = 200 Hz minimum frequency = 2 Hz).
To measure a field at 50 Hz, it is necessary to set a ≤ 2 kHz span.

NOTE

EHP-50E typical frequency and spurious levels Table according to the Span

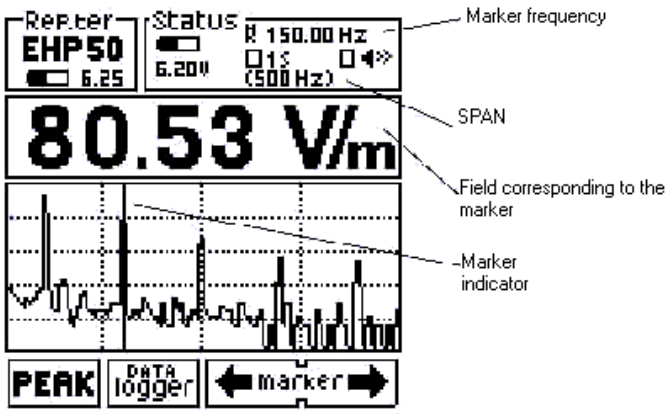
Frequency Span	Frequency Range	Electric Field Sensitivity f.s. = 1000 V/m		Magnetic Field Sensitivity f.s. = 100 uT	
		Highest Mode	Wideband Mode	Highest Mode	Wideband Mode
100 Hz	1 Hz ÷ 100 Hz	< 0.15 V/m	< 0.40 V/m	< 30 nT	< 30 nT
200 Hz	2 Hz ÷ 200 Hz	< 0.30 V/m	< 0.30 V/m	< 30 nT	< 30 nT
500 Hz	6 Hz ÷ 500 Hz	< 0.30 V/m	< 0.30 V/m	< 30 nT	< 30 nT
1 kHz	12 Hz ÷ 1 kHz	< 0.40 V/m	< 0.50 V/m	< 30 nT	< 40 nT
2 kHz	25 Hz ÷ 2 kHz	< 0.40 V/m	< 0.50 V/m	< 30 nT	< 40 nT
10 kHz	120 Hz ÷ 10 kHz	< 0.30 V/m	< 0.30 V/m	< 40 nT	< 40 nT
100 kHz	1.2kHz÷100 kHz	< 0.30 V/m	< 0.40 V/m	< 30 nT	< 40 nT
400 kHz	4.8kHz÷400 kHz	< 0.80 V/m	< 1.00 V/m	< 40 nT	< 80 nT

8.2.15 MARKER function in SPECT mode

The **MARKER** is available in **SPECT** mode by selecting the **marker ON** function key. This mode of operation is used to measure a specific frequency contribution like in a normal Spectrum analyzer.
On activating the marker, a vertical bar is displayed in the spectrum box that indicates the frequency on which to place the marker. This frequency is displayed with a numeric value in the **Status** box at the top on the right of the display of PMM 8053B, and it can be changed within the set spectrum via the ⇐ **marker** ⇒ keys.
The **PEAK** function is also available which enables the marker to be automatically positioned on the strongest signal shown within the set spectrum.
In presence of an extremely low field, the **PEAK** function will search for the highest value. Sometimes this value will correspond to the internal electric noise of the EHP-50 analyzers. To move the marker for searching the desired frequency to measure.

8.2.16 LOGGER function with the MARKER

With the EHP-50E it is possible to record (Logger) only the field corresponding to an user's frequency defined by the **Marker**.
To access this function, all the user needs to do is to enter the **SPECTRUM** menu and then **MARKER**; place the marker on the desired frequency and press the new **Data Logger** key.
From this point on the firmware behaves exactly as if it had reached this point from the **MODE** menu; which means that all the modes of the Data **Logger** are operational.
The **MK** symbol next to the frequency reminds the user that he is measuring in selective mode.
The width of the filter is to be considered as 1/80 of the selected span; for example, a span of 10kHz will have a filter 125Hz wide whereby a marker positioned on 9500Hz will measure in a band from 9435Hz to 9565. It should be remembered that the slope of the filter is very high meaning that even if the signal is shifted by a few Hertz from the side, it will undoubtedly be outside the band.



☞NOTE

When the MARKER function is used to take measurements, the level of the field displayed corresponds to that measured on the frequency of the MARKER.

8.2.17 Data logger mode

In **DATA logger** mode, the user can store the measurements that have been taken and save them in a file. Depending on selection of **Highest** or **Wideband**, EHP-50E will store the highest signal or the total contribution of all frequencies covered by the selected **SPAN**.
All the generated files are numbered progressively and contain:

7. time duration
8. Logger settings
9. date and time when the measurement began
10. average value
11. value of each single datum stored
12. user's comment.

NOTE

If you are inside the spectrum and Marker is on, the data logger will acquire only data corresponding to the frequency pointed by the marker.
The use of the different Data logger modes is explained in detail in Chapter 3 in this Manual

WARNING

When the DATA Logger Low Power mode is in use, PMM 8053B must be switched on the whole time and linked to the EHP-50E Analyzer for the entire measurement session. If it is switched off or disconnected from the EHP-50E Analyzer, to return to normal operation, it must be reset by pressing the Power button down for at least 5 seconds, in this case the data of the measurement in progress will be lost.

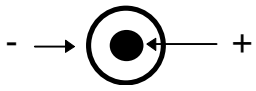
8.2.18 Power supply and battery recharging of PMM EHP-50E

See the indication at the beginning of section 8.1 of this Manual for general instructions regarding the power supply of PMM EHP-50E.
EHP-50E has an internal rechargeable Li-Ion battery that can be recharged with the supplied battery charger (the battery charger is the same as that of PMM 8053B).
If the internal batteries are to have the greatest autonomy, we recommend that a full recharging cycle should be carried out before using the Analyzer.

NOTE

ALWAYS connect the battery charger to the power supply BEFORE connecting it to the EHP-50E.
The battery charger has an internal protective circuit that will limit the output of current if there is any load when connecting to the mains.
Always remove the shorting loop connector when recharging EHP-50E.
Battery charger:
output: DC, 10 - 15 V, ~ 500 mA

Connector:



NOTE

In order to safeguard the features of the batteries, it is crucial to have a complete recharge before storing them for periods longer than 4 months. Therefore, it is warmly suggested recharging the batteries at least every 4 months even though the device has not been used.

NOTE

The minimum voltage level for operation, displayed by the indicator, is about 3.3 V. The batteries must be recharged for lower voltages. Below such voltage the analyzer will turn OFF automatically.

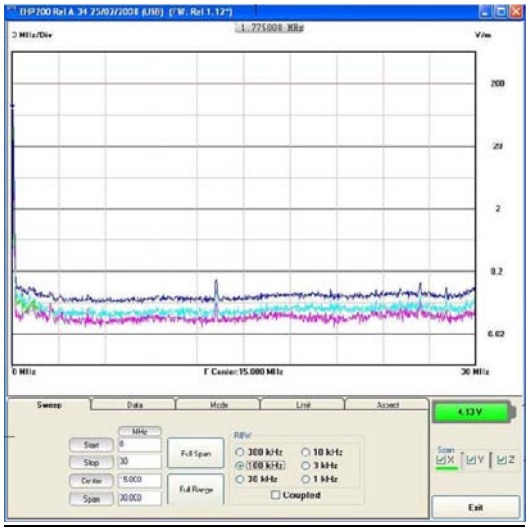
The time required for recharging the batteries is about 4-5 hours. When the recharge is complete, this is indicated by the Led of the EHP-50E, with a rapidly blinking Green light.

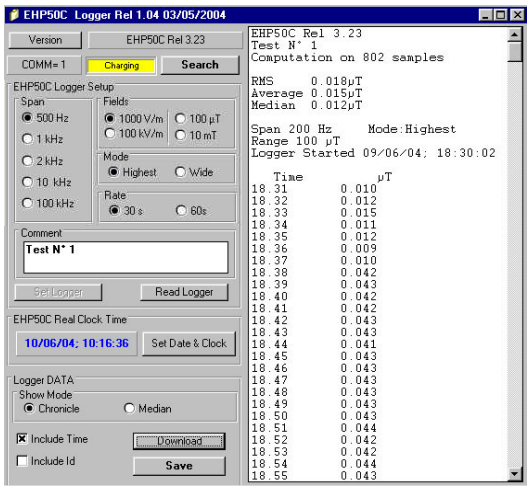
NOTE

To take measurements ALWAYS remove the battery charger from the EHP-50E Analyzer otherwise the system does not work.

8.2.19 Using EHP-50E with a UMPC or Personal Computer

EHP-50E can be linked to a UMPC or Personal Computer to easily show spectrum and measured data.





NOTE **Refer to the user manual and documentation for more information about installation, configuration and use of the equipment.**

This page has been left blank intentionally

9 - EHP-200A
Electric and Magnetic Field Analyzer

9.1 Introduction

This section explains installation and use of the EHP-200A Electric and Magnetic Field Analyzer

EHP-200A is an electric and magnetic isotropic field probe-analyzer, providing an advanced technology solution in the 9 kHz to 30 MHz range. Measurements are given separately for the 3-axis, or total value (peak and average), with exceptional flatness and linearity.

When connected to 8053B, the EHP-200A works as a selective probe with definable span; when controlled by PC, it has also the function of spectrum analyzer.

EHP-200A is managed internally with a microprocessor (CPU module) that controls all its main functions, from the charging of the batteries to the serial communication. The Electric or Magnetic field is picked up by the three probes on the X, Y and Z axes. A Digital/Analog conversion follows which transforms the signal into numeric information processed by a digital unit.

EHP-200A is housed in a small cubic case. Bottom: optical fiber connector, extension rod screw, battery charger connector, auxiliary RF input, ON/OFF button and operation LED.

The magnetic sensor system is composed by three orthogonal magnetic loops. The electric sensor system is composed by three orthogonal parallel capacitors installed on the opposite side of the magnetic loops.

9.2 EHP-200A Main specifications

The following conditions apply to all specifications:

- Operating ambient temperature must be between -10°C and 50° C.

Table 9-1 Technical specifications of the EHP-200A Electric and Magnetic Field Analyzer

	Electric Field	Magnetic Field Mode A	Magnetic Field Mode B	AUX Input
Frequency range	9 kHz ÷ 30 MHz	9 kHz ÷ 3 MHz	300 kHz ÷ 30 MHz	9 kHz ÷ 30 MHz
Measurement range **@10kHz RBW** with preamplifier ON	 0,1 ÷ 1000 V/m 0,02 ÷ 200 V/m	 30 mA/m ÷ 300 A/m 6 mA/m ÷ 60 A/m	 3 mA/m ÷ 30 A/m 0.6 mA/m ÷ 6 A/m	 -80 ÷ 0 dBm -94 ÷ -14 dBm
Dynamic range	> 80 dB			
Measurement range	> 94 dB			
Resolution	0.01 V/m	1 mA/m	0.1 mA/m	0.01 dB
Sensitivity @10kHz RBW **(*)** with preamplifier ON	0.1 V/m 0.02 V/m	30 mA/m 6 mA/m	3 mA/m 0.6 mA/m	-80 dBm -94 dBm
Flatness	0,5 dB 100 kHz – 27 MHz @ 20 V/m	0,8 dB 150 kHz – 3 MHz @ 166 mA/m	0,8 dB 300 kHz – 27 MHz @ 53 mA/m	0,4 dB @ -20dBm
Anisotropicity @1MHz	0.8 dB			---
Linearity @1MHz	0,5 dB from FS to –60 dBFS			
SPAN	0 to FULL SPAN			
RBW	1 kHz – 3 kHz – 10 kHz – 30 kHz – 100 kHz – 300 kHz			
Rejection to E fields	---	> 20 dB		---
Rejection to H fields	> 20 dB	---		---
Calibration	internal E^2PROM			
Temperature error	0,02 dB/°C			
Dimensions	92 x 92 x 109 mm			
Weight	580 g			
Preamplifier	selectable ON/OFF, 14dB			
Units	V/m, A/m, uT, mW/cm^2, W/m^2			
Internal battery	3,7 V – 5,55 Ah Li-Ion, rechargeable			
Operation	> 12 hours			
Recharging time	< 8 hours			
External supply	10 ÷ 15 VDC, I = approx. 560 mA			
Optical fiber connection	up to 40 m (USB-OC) up to 80 m (8053-OC)			
Firmware updating	through the optical link			
Self test	automatic at power on			
Operating temperature	-10 to +50°C			
Storage temperature	-20 to +70°C			

(*) The maximum sensitivity is achieved with the filter to 10 kHz

9.3 EHP-200A Main Specifications with 8053B

The following conditions apply to all specifications:

- Operating ambient temperature must be between -10°C and 50° C.

Table 9-2 Technical specifications of the EHP-200A Electric and Magnetic Selective Probe

	Electric Field	Magnetic Field Mode A	Magnetic Field Mode B
Frequency range	50 kHz ÷ 550 kHz 500 kHz ÷ 30 MHz	50 kHz ÷ 550 kHz 500 kHz ÷ 3 MHz	300 kHz ÷ 800 kHz 500 kHz ÷ 30 MHz
Measurement range **@10kHz RBW** with preamplifier ON	 0,1 ÷ 1000 V/m 0,02 ÷ 200 V/m	 30 mA/m ÷ 300 A/m 6 mA/m ÷ 60 A/m	 3 mA/m ÷ 30 A/m 0.6 mA/m ÷ 6 A/m
Dynamic range	> 80 dB		
Measurement range	> 94 dB		
Resolution	0.01 V/m	1 mA/m	0.1 mA/m
Sensitivity @10kHz RBW **(*)** with preamplifier ON	0.1 V/m 0.02 V/m	30 mA/m 6 mA/m	3 mA/m 0.6 mA/m
Flatness	0,5 dB 100 kHz – 27 MHz @ 20 V/m	0,8 dB 150 kHz – 3 MHz @ 166 mA/m	0,8 dB 300 kHz – 27 MHz @ 53 mA/m
Anisotropicity @1MHz	0.8 dB		
Linearity @1MHz	0,5 dB from FS to –60 dBFS		
SPAN	50 kHz to FULL SPAN		
RBW	1 kHz – 3 kHz – 10 kHz – 30 kHz – 100 kHz – 300 kHz		
Rejection to E fields	---	> 20 dB	
Rejection to H fields	> 20 dB	---	
Calibration	internal E^2PROM		
Temperature error	0,02 dB/°C		
Dimensions	92 x 92 x 109 mm		
Weight	580 g		
Preamplifier	selectable ON/OFF, 14dB		
Units	V/m, A/m		
Internal battery	3,7 V – 5,55 Ah Li-Ion, rechargeable		
Operation	> 12 hours		
Recharging time	< 8 hours		
External supply	10 ÷ 15 VDC, I = approx. 560 mA		
Optical fiber connection	Up to 80 m		
Firmware updating	through the optical link		
Self test	automatic at power on		
Operating temperature	-10 to +50°C		
Storage temperature	-20 to +70°C		

(*) The maximum sensitivity is achieved with the filter to 10 kHz

9.4 EHP-200A Panel

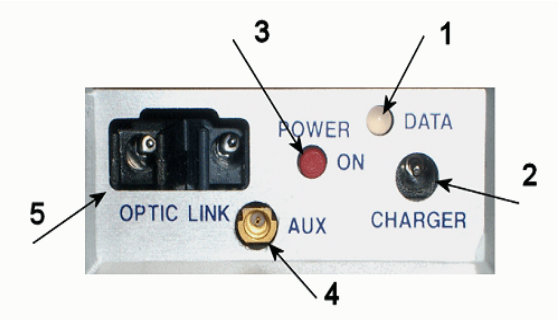


Fig. 9-1 EHP-200A Panel

Key:

1. Led
2. Battery charger connector
3. ON/OFF button
4. AUX input connector MMCX male type
5. Fiber optic connector

9.5 EHP200A Standard accessories

- USB-OC Optical-USB converter;
- FO-10USB Cable, fiber optic 10m;
- FO-8053/10 Cable, fiber optic 10m
- 8053-BC battery charger;
- 8053-SC Soft carrying case, holds basic unit and accessories including 8053-Display;
- international AC plug adapter;
- Plastic rod support, 50cm;
- Mini tripod, bench top;
- PC software (it doesn't allow the data download and the programming);
- Certificate of calibration;
- Operating Manual

9.6 EHP200A Optional accessories

The following accessories can be ordered separately:

- FO-10USB Cable, fiber optic 10m
- FO-20USB Cable, fiber optic 20m
- FO-40USB Cable, fiber optic 40m
- FO-8053/10 Cable, fiber optic 10m
- FO-8053/20 Cable, fiber optic 20m;
- FO-8053/40 Cable, fiber optic 40m;
- FO-8053/80 Cable, fiber optic 80m
- 8053-CC rigid case;
- 8053-CA car adapter;
- 8053-BC additional battery charger;
- 8053-OC Optical RS232 converter;
- USB-OC Optical-USB converter;
- 8053-OC-PS Power Supply;
- TR-02A wooden tripod 1-2m with soft carrying bag;
- TT-01 telescopic mast.

WARNING

Updates of the software and firmware of the EHP-200A can be downloaded from the Web site www.narda-sts.it or requested directly from NARDA Sales Centers.

9.7 Installation of EHP-200A

To install EHP-200A, connect the supplied fiber optic to the **OPTIC LINK** connector taking care that the spigot matches the housing. Connect the other end of the fiber optic to the **OPTIC LINK** connector of the 8053B.

Turn on EHP-200A by pushing the Red **POWER** button for one second.

NOTE

Pressing the POWER down button for more than 4 seconds forces the hardware of the apparatus to shut down. Then, it is necessary to wait several seconds before switching it on again.

When switched on, the three-color **ON DATA** LED will provide the following information:
After switching on the analyzer, the **ORANGE** LED lights up for about ½ second as an auto-check, after that the **Green** light starts blinking which means that the firmware has been correctly downloaded.

Blinking speed	Colour of the LED	Meaning
Medium	Green	Communication with 8053B or PC in progress and correct
Medium	Red	8053B or PC disconnected or error in communication
FIX	Green	Recharging battery
Off	Off	Battery recharging completed

NOTE

The EHP-200A can be switched off manually by pressing the Red POWER button. If the attempt to communicate is not successful or if the fiber optic is not connected to the PC, the EHP-200A will automatically switch off after about 30 minutes to preserve the battery charge.

WARNING

To guarantee compatibility 8053B/EHP-200A, the firmware of the 8053B must be updated to Version 3.13 or later and the EHP-200A firmware must be 1.20 o later.
Updates of the software and firmware of the Accessories can be downloaded from the Web site www.narda-sts.it or requested directly from NARDA Sales Centers.

9.8 EHP-200A connected to 8053B

EHP-200A is linked to PMM 8053B meter via the fiber optic link; to activate the connection, set-up PMM 8053B in the following way:

1. Press the **SET** key to open a window where the main parameters and measurement settings can be selected.
2. Log on **SERIAL**
3. Select **OPTICAL**

(See Chapter 3 on "Instructions for Use" in this Manual for further details)

NOTE

This setting enables 8053B to automatically link up to and recognize EHP-200A via the fiber optic connection. With this setting, the serial connection via cable (Wired) is disabled.

Connect EHP-200A to 8053B with the fiber optic supplied with it and switch it on by pressing the Red button on the panel.
The connection and recognition procedure will begin automatically, information about the connection, revision data and data about the Analyzer's firmware will be briefly displayed in the data box of 8053B.

WARNING

Do not pull the fiber optic by holding onto the cable but use the connector so that the head does not get damaged.
Be very careful to avoid dirt and other particles getting into the transducers of the fiber optic.

Once the proper connection has been made, data regarding the correct functioning of the Analyzer and the charge status of its internal batteries, will be displayed with the words **EHP 200A** in the box labelled **Rep.ter** at the top on the left of 8053B.

NOTE

The EHP-200A can be switched off manually by pressing the Red POWER button. If the attempt to communicate is not successful or if the fiber optic is not connected to the PC, the EHP-200A will automatically switch off after about 20 minutes to preserve the battery charge.

9.9 Avoiding measurement errors

To avoid disturbing the measurements in progress, the user or other persons or mobile vehicles should stay at least 5 meters away from the Analyzers. We also recommend to set up the probe away from metal objects or masses.

WARNING

To perform correct measurements, the tripod TR-02A to hold EHP-200A is mandatory. Using an unsuitable support could influence the measurements that have been taken and, therefore, determine incorrect results. We recommend always using the isolated extension support supplied with EHP-200A for supporting the Analyzer.
We also recommend TR-02A optional tripod for positioning EHP-200A at the height defined by the reference standards.
The same configuration should be always maintained for best measurement reproducibility.

NOTE

Field strength mainly depends on voltage and geometry of the system under examination as well as on the distance between conductors and measurement point. In the vicinity of cables the measured field may be very high and vary with the location of the probe.
From the definition of the potential difference between to points:

$$V_{21} = -\int_{r_1}^{r_2} \overline{E}\, dr$$

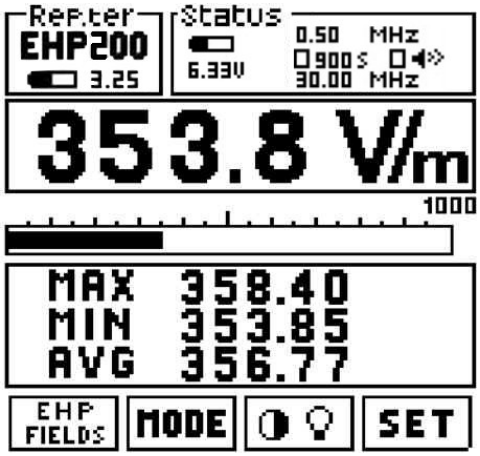
It is evident that, keeping the potential difference constant as the distance between the two points under examination decreases, the intensity of the field necessarily increases.
For example: the intensity of the electric field between two armatures of a parallel-plate capacitor situated at a distance of 0.1 m and having a potential difference of 100 V is equal to:

$$E = \frac{100V}{0{,}1m} = 1\,KV/m$$

It should be noted that a voltage of 100 V, in these conditions, generates a field of 1000 V/m

9.10 Main menu

The main menu shows:



9.11 To control the LCD Display

This key allows the user to adjust the LCD display brightness and contrast for best readability in any light condition. For more information see chapter 3.

9.12 SET function

Main settings and measurement parameters can be accessed by pressing the **SET** key.

The following menu is displayed:

It is possible to set the frequency range with **Start** e **Stop** parameters.

WARNING

Due to the filter Bandwidth adopted for wide frequency span (>500kHz), the Start frequency is limited to 500kHz to avoid the 0 Hz spurious signal to be included in the measurement result calculation. To set a lower Start frequency, down to 50kHz, the Stop frequency must be limited to 550kHz so that frequency Span (Stop-Start) doesn't exceed 500kHz (in this case the filter Bandwidth is narrow enough to cut off the DC component).

NOTE

In practise, the whole frequency range of EHP-200A is divided in two different ranges: from 50kHz to 550kHz and from 500kHz to 30MHz.
For other parameters, please see chapter 3.

9.13 Electric or Magnetic fields selection

Pressing the **EHP FIELDS** key the user enters a window where the different fields (Electric, Magnetic A and Magnetic B) can be selected; the various limits and range are set automatically (See table 9-1 for details about **Ha** and **Hb** magnetic field ranges).
It is also possible to activate the preamplifier; the full scale value showed on the bar graph will be updated accordingly.

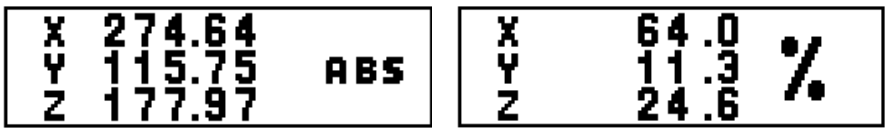
9.14 MODES of operation

The operating modes available are:

- **ABS %**
- **MIN-MAX RMS or AVG**
- **FULL SPAN**
- **Data logger**

9.15 ABS/% mode

In this operational mode the meter shows the three vector components of the measured field in absolute or percent values.



NOTE

In close proximity of an electromagnetic source, where the field gradient is high, the measurement result changes if the probe is rotated. This effect happens because, due to the geometry of the sensors inside the probe, the distance from the field source and the sensors changes slightly with rotation.

9.16 MIN-MAX/AVG MIN-MAX/RMS modes

In this operational mode, the maximum and minimum field values as well as the average field value expressed as arithmetic (AVG) or as a quadratic (RMS) average are displayed.
The average mode (**AVG** or **RMS)** can be selected in the **SET** menu.

AVG = $\frac{1}{T}\int_0^T \left|E_{(t)}\right| dt$

RMS = $\sqrt{\frac{1}{T}\int_0^T \left|E_{(t)}\right|^2 dt}$

The averaging time is defined in the **SET** menu. See Chapter 3.7.2.

9.17 FULL SPAN mode

FULL SPAN mode allows to set the EHP200A in full frequency range

9.18 Data logger mode

In **DATA logger** mode, the user can store the measurements that have been taken and save them in a file.
All the generated files are numbered progressively and contain:

1. time duration
2. Logger settings
3. measurement start date and time
4. average value
5. value of each single datum stored
6. user's comment.

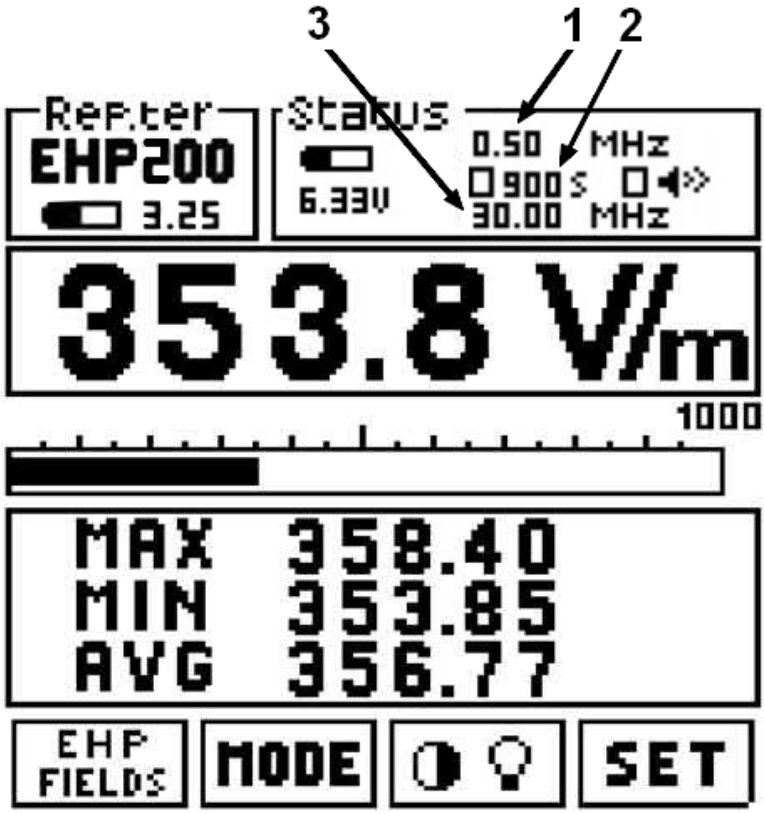
When the DATA Logger Low Power mode is in use, PMM 8053B must be switched on the whole time and linked to the EHP-200A for the entire measurement session. If it is switched off or disconnected from the EHP-200A, to return to normal operation, it must be reset by pressing the Power button down for at least 5 seconds, in this case the data of the measurement in progress will be lost.

In **DATA logger** mode, the display shows:

1) The START frequency;

2) Data acquisition mode:
(900s mode, the 8053B stores the date every 900 seconds)

3) The STOP frequency.



9.19 Power supply and battery recharging of EHP-200A

See the indication at the beginning of this section for general instructions regarding the power supply of EHP-200A.
EHP-200A has an internal rechargeable Li-Ion battery that can be recharged with the provided battery charger (the battery charger model is the same provided with PMM 8053B).

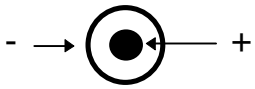
For greatest autonomy, a full recharging cycle is recommended before using the Analyzer.

☞NOTE

ALWAYS connect the battery charger to the mains BEFORE connecting it to the EHP-200A.
The battery charger has an internal protective circuit that will limit the output of current if there is any load when connecting to the mains.

Battery charger:
output: DC, 10 - 15 V, ~ 560 mA

Connector:



☞NOTE

The minimum voltage level for operation, displayed by the indicator, is about 3.3V. The batteries must be recharged for lower voltages. Below such voltage the analyzer will turn OFF automatically.

The time required for recharging the batteries is less than 8 hours. When the recharge is complete, the Led is off.

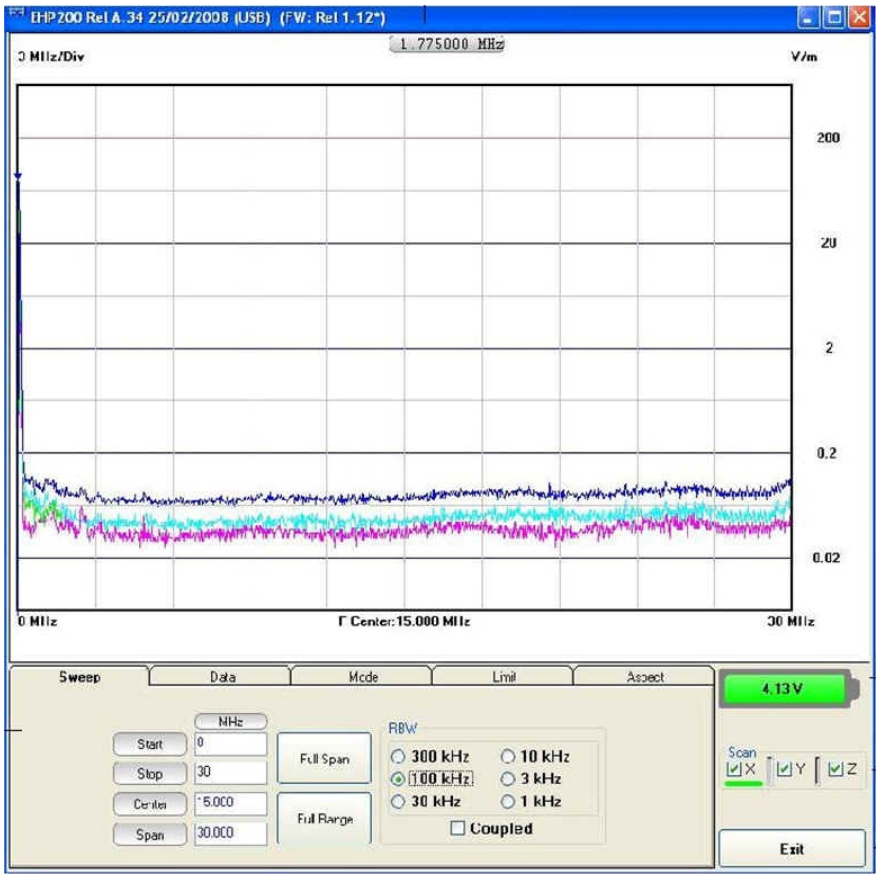
The battery autonomy is about 12 hours, according to the settings.

☞NOTE

To take measurements ALWAYS remove the battery charger from the EHP-200A Analyzer otherwise the system does not work.

9.20 Using EHP-200A with a UMPC or Personal Computer

EHP-200A can be linked to a UMPC or Personal Computer to easily show spectrum and measured data.



NOTE

Refer to the user manual and documentation for more information about installation, configuration and use of the equipment.

10 - EP600/EP601/EP602
Electric field probe

10.1 Introduction

The EP600/EP601/EP602 is a diode-type, three-axis technology-edge isotropic sensor of electric fields: from 0.14 to 140 V/m in the frequency range 100 kHz - 9.25 GHz (EP600) and from 0.5 to 500 V/m in the frequency range 10 kHz - 9.25 GHz (EP601) and from 1.5 to 1500 V/m in the frequency range 5 kHz - 9.25 GHz (EP602).
The spherical plastic housing includes: 6 orthogonal cones (one for each monopole) that allow for an easy identification of the electric field vectors; the ON/OFF button and LED; the battery and the charger connector.

A plastic fiber optic (not removable) is fixed to the EP600/EP601/EP602 housing; at its extremity two connectors compatible with PMM devices allow for connection to PC (via optical adapter) or to the hand-held meter PMM 8053B to display the measurements and to set the proper filter for optimizing noise reduction, sampling time and battery autonomy. The hand-held meter PMM 8053B allows for storing the measurements and then, via PC, to convert the same in text format.

The EP600/EP601/EP602 includes an E^2PROM that stores serial number, calibration data, calibration factors and Firmware version.
Three Analog/Digital converters – one for each axis - read the electric field simultaneously; the sensors consist in 6 monopoles mounted orthogonally. Another Analog/Digital converter internal to the microcontroller provides the battery voltage and temperature measurements.
The EP600/EP601/EP602 is supplied by an internal rechargeable battery capable of up to 80 hours of operation.

Fig. 10-1 EP600/EP601/EP602

Document 8053BEN-20717-3.16 - © NARDA 2007

10.2 Specifications EP600

This condition applies to all specifications:

- The operating ambient temperature range must be -10° to 50 °C.

TABLE 10-1 Specifications of the electric field probe PMM EP600

Frequency range	100 kHz – 9.25 GHz
Level range	0.14 – 140 V/m
Overload	> 300 V/m
Dynamic range	60 dB
Linearity	0.4 dB @ 50 MHz/0.3 – 100 V/m
Resolution	0.01 V/m
Sensitivity	0.14 V/m
Flatness	1 – 150 MHz 0.8dB 0.5 – 6000 MHz 1.6 dB 0.3 – 7500 MHz 3.2 dB (With frequency correction OFF) 0.3 – 7500 MHz 0.4 dB (Typical with frequency correction ON)
Isotropicity	0.5 dB (0.3 dB typical @ 50 MHz)
Sensors	Six monopoles
X/Y/Z reading	Simultaneous sampling of the components
Battery reading	10 mV res.
Temperature reading	0.1 °C res.
Internal data memory	Serial number Date calibration Calibration Factor SW release.
Battery	Panasonic ML621S 3V 5mA/h rechargeable Li-Mn
Operation time	80 h @ 0.4 S/sec 28 Hz filter 60 h @ 5 S/sec 28 Hz filter
Recharge time	48h for maximum autonomy
Dimensions	17 mm sphere 17 mm sensor 53 mm overall
Weight	23g including FO weight (1m)
Operating temperature	-10° - +50°
Software for PC	YES
Optical fiber connector	HFBR-0500
Tripod adapter	¼ - 20 UNC female

10.3 Frequency Response EP600

Typical values:

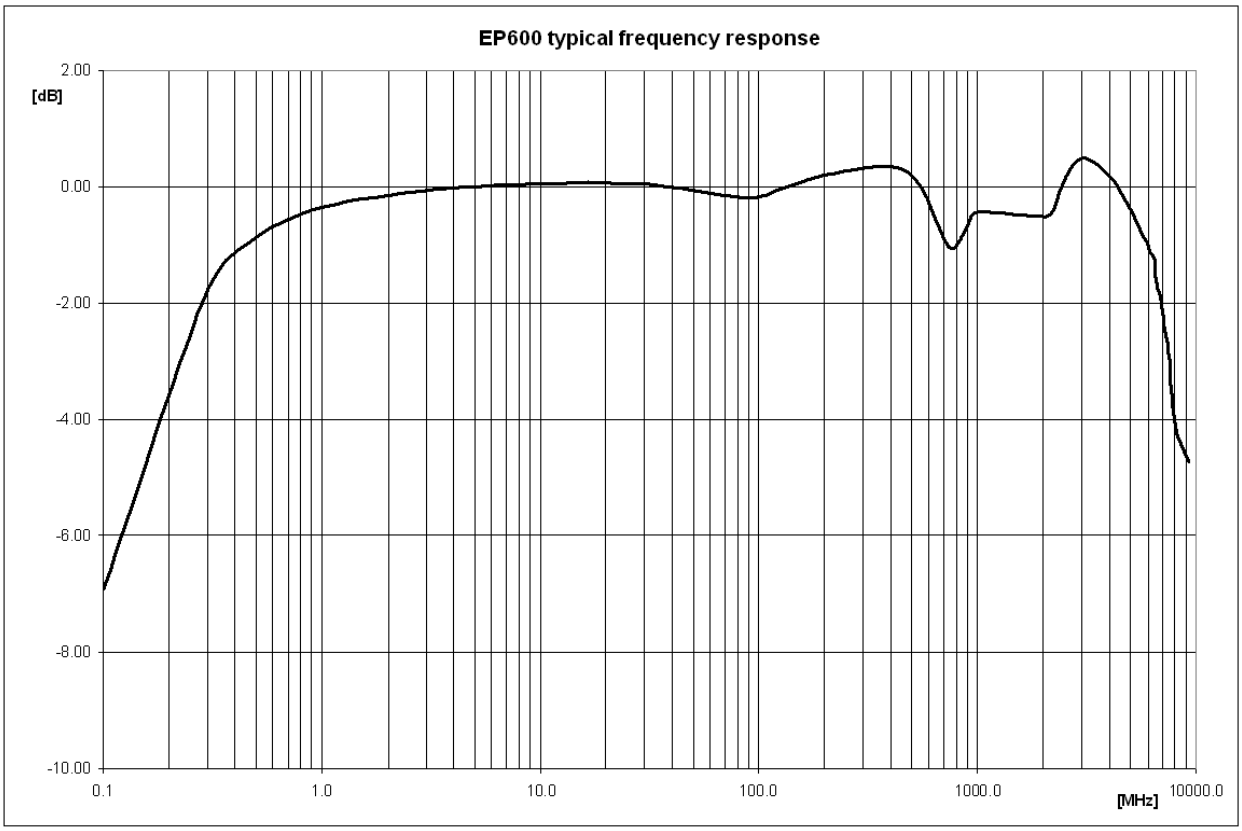


Fig. 10-2 EP600 Frequency Response

10.4 Specifications EP601

This condition applies to all specifications:

- The operating ambient temperature range must be -10° to 50 °C.

TABLE 10-2 Specifications of the electric field probe PMM EP601

Frequency range	10 kHz – 9.25 GHz
Level range	0.5 – 500 V/m
Overload	> 1000 V/m
Dynamic range	60 dB
Linearity	0.4 dB @ 50 MHz/1 – 500 V/m
Resolution	0.01 V/m
Sensitivity	0.5 V/m
Flatness	0.1 – 150 MHz 0.4dB 0.05 – 6000 MHz 1.6 dB 0.03 – 7500 MHz 3.2 dB (With frequency correction OFF) 0.05 – 7500 MHz 0.4 dB (Typical with frequency correction ON)
Isotropicity	0.5 dB (0.3 dB typical @ 50 MHz)
Sensors	Six monopoles
X/Y/Z reading	Simultaneous sampling of the components
Battery reading	10 mV res.
Temperature reading	0.1 °C res.
Internal data memory	Serial number Date calibration Calibration Factor SW release.
Battery	Panasonic ML621S 3V 5mA/h rechargeable Li-Mn
Operation time	80 h @ 0.4 S/sec 28 Hz filter 60 h @ 5 S/sec 28 Hz filter
Recharge time	48h for maximum autonomy
Dimensions	17 mm sphere 17 mm sensor 53 mm overall
Weight	23g including FO weight (1m)
Operating temperature	-10° - +50°
Software for PC	YES
Optical fiber connector	HFBR-0500
Tripod adapter	¼ - 20 UNC female

10.5 Frequency Response EP601

Typical values:

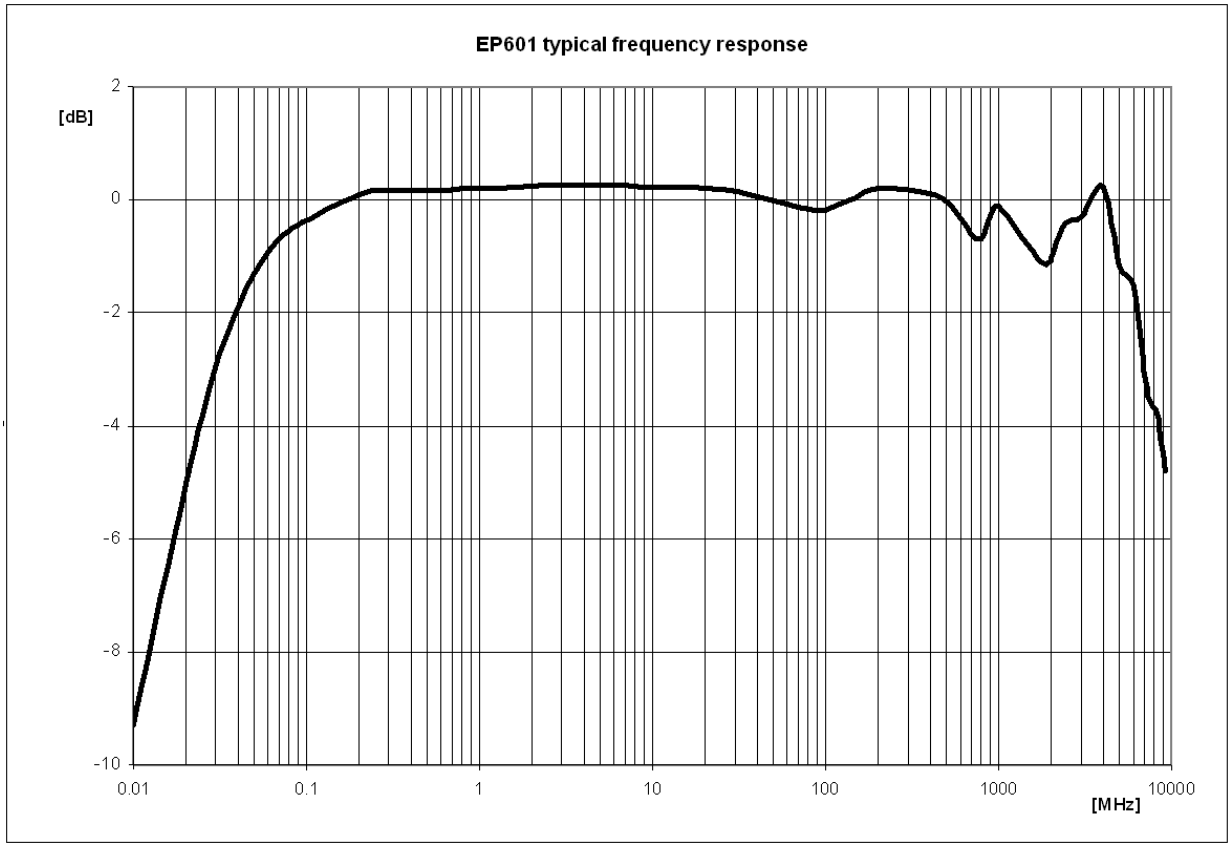


Fig. 10-3 EP601 Frequency Response

10.6 Specifications EP602

This condition applies to all specifications:

- The operating ambient temperature range must be -10° to 50 °C.

TABLE 10-3 Specifications of the electric field probe PMM EP602

Frequency range	5 kHz – 9.25 GHz
Level range	1.5 – 1500 V/m
Overload	> 3000 V/m
Dynamic range	60 dB
Linearity	0.4 dB @ 50 MHz/2.5 – 1000 V/m
Resolution	0.01 V/m
Sensitivity	1.5 V/m
Flatness	0.1 – 150 MHz 0.4dB 0.05 – 6000 MHz 1.6 dB 0.03 – 7500 MHz 3.2 dB (With frequency correction OFF) 0.05 – 7500 MHz 0.4 dB (Typical with frequency correction ON)
Isotropicity	0.5 dB (0.3 dB typical @ 50 MHz)
Sensors	Six monopoles
X/Y/Z reading	Simultaneous sampling of the components
Battery reading	10 mV res.
Temperature reading	0.1 °C res.
Internal data memory	Serial number Date calibration Calibration Factor SW release.
Battery	Panasonic ML621S 3V 5mA/h rechargeable Li-Mn
Operation time	80 h @ 0.4 S/sec 28 Hz filter 60 h @ 5 S/sec 28 Hz filter
Recharge time	48h for maximum autonomy
Dimensions	17 mm sphere 17 mm sensor 53 mm overall
Weight	23g including FO weight (1m)
Operating temperature	-10° - +50°
Software for PC	YES
Optical fiber connector	HFBR-0500
Tripod adapter	¼ - 20 UNC female

10.7 Frequency Response EP602

Typical values:

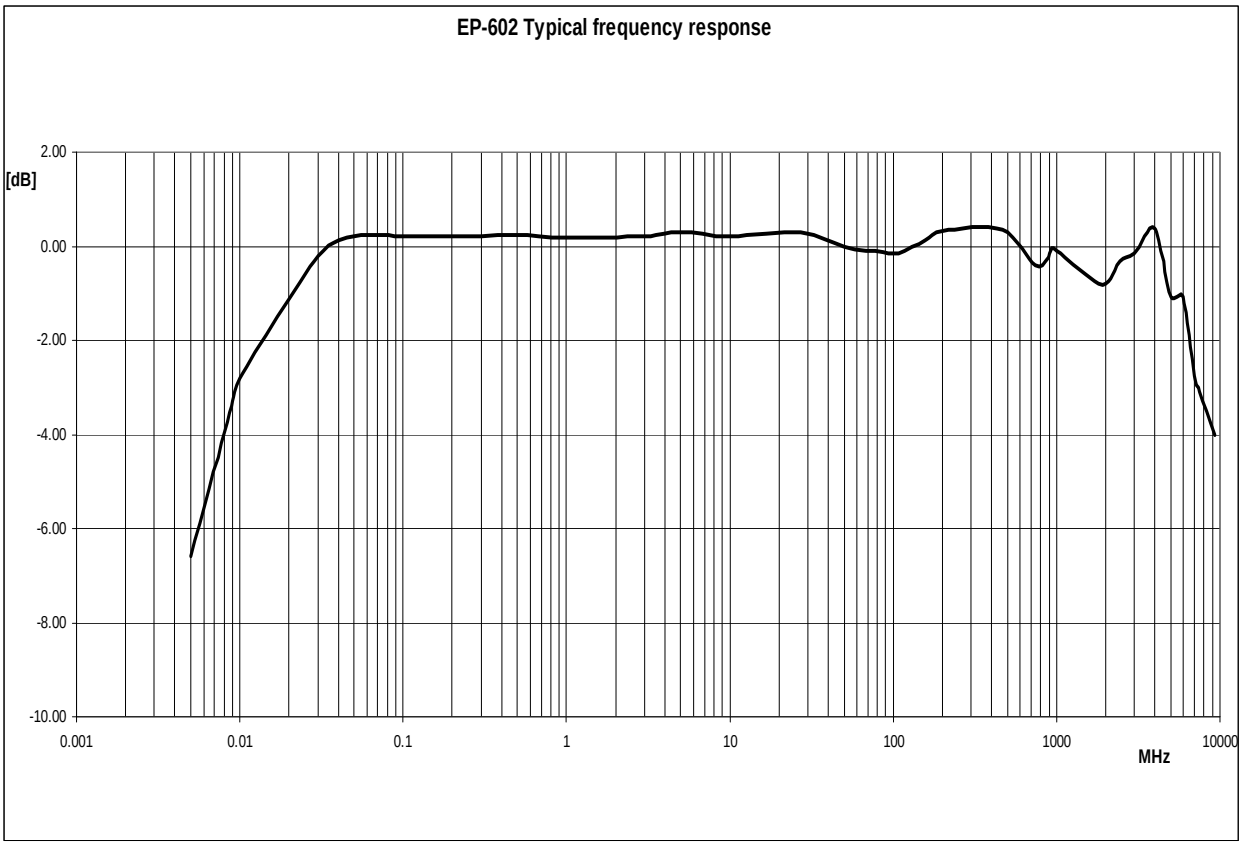


Fig. 10-4 EP602 Frequency Response

10.8 Housing and connectors

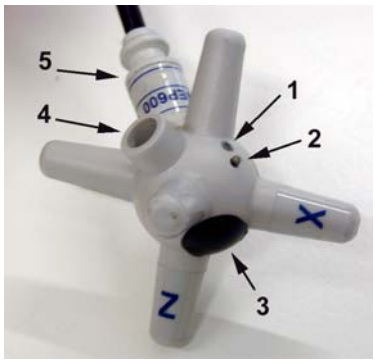


Fig. 10-5 Plastic housing

1. ON-OFF Led
2. ON-OFF pushbutton
3. Battery compartment and closure
4. Charger connector receptacle
5. Fiber optic holder and ID label

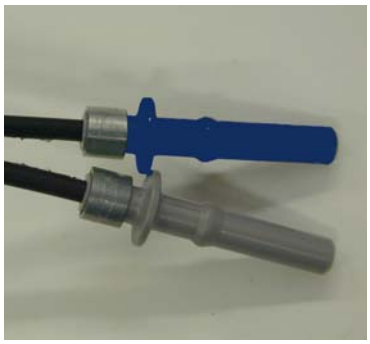


Fig. 10-6 Optical connectors

BLUE = Transmitter

GREY = Receiver

10.9 Standard accessories

Accessories and documents supplied with PMM EP600/EP601/EP602:

- Battery charger EP600 CHARGER
- AC adapter EP600 CHARGER
- International plugs (Australia, UK, USA, Italy)
- Fiber optic adapter, Blue
- Fiber optic adapter, Grey
- Fiber optic cable FO-EP600/10 (length: 10m)
- Optical-RS232 converter 8053-OC
- USB-RS232 converter
- Tripod mounting adapter
- Mini tripod
- Nylon adapter ¼'' Withworth
- Carrying case
- Software CD-ROM
- Operating Manual
- Calibration Certificate
- Service form

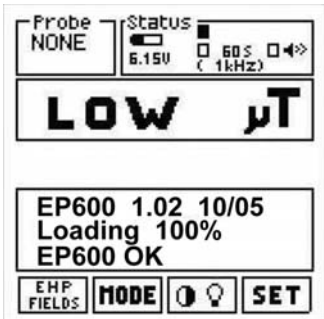
10.10 Options

Options to order separately:

- PMM 8053B Hand-held metering unit
- PMM SB-10 Switching Control Box
- Fiber optic cable FO-EP600/10 (length: 10m)
- Fiber optic cable FO-EP600/20 (length: 20m)
- Fiber optic cable FO-EP600/40 (length: 40m)
- Optical-RS232 converter 8053-OC
- 8053-OC-PS Power Supply
- TR-02A tripod
- TT-01 Telescopic extension

10.11 EP600/EP601/EP602 connected to 8053B

To install EP600/EP601/EP602, connect the two fiber optic connectors to the extension using the two optic adapters; connect the connector to the **OPTIC LINK** connector of the 8053B.



EP600/EP601/EP602 is linked to PMM 8053B meter via the fiber optic link; to activate the connection, set-up PMM 8053B in the following way:

1. Press the **SET** key to open a window where the main parameters and measurement settings can be selected.
2. Log on **SERIAL**
3. Select **OPTICAL**

(See Chapter 3 on "Instructions for Use" in this Manual for further details)

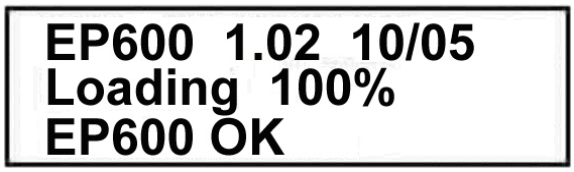
This setting enables 8053B to automatically link up to and recognize EP600/EP601/EP602 via the fiber optic connection. With this setting, the serial connection via cable (Wired) is disabled.

To guarantee compatibility with EP600/EP601/EP602, the firmware of the 8053B must be updated to Version 3.06 or later.
Updates of the software and firmware of the Accessories can be downloaded from the Web site www.narda-sts.it or requested directly from NARDA Sales Centers.

If the attempt to communicate is not successful or if the fiber optic is not connected to the 8053B, the EP600/EP601/EP602 will automatically switch off after about 30 seconds to preserve the battery charge.

The PMM EP600/EP601/EP602 can be switched ON by shortly pressing the pushbutton, after that the LED is sequentially turned on with **green, red and blue indications** as a test for the same; then the LED will blink **red,** this meaning the EP600/EP601/EP602 is ready for the operation.

The connection and recognition procedure will begin automatically, information about the connection, revision data and data about the EP600/EP601/EP602's firmware will be briefly displayed in the data box of 8053B.



WARNING

Do not connect/disconnect the optic fibre by applying force to the fiber optic cable directly: this may damage the optical connection. Always hold the connectors with your fingers firmly to connect/disconnect the optic fibre.
Presence of dust, dirt or particles of any nature on the optical connecting surfaces must be carefully prevented.

Once the proper connection has been made, data regarding the correct functioning of the probe and the charge status of its internal batteries, will be displayed with the words **EP600** or **EP601** in the box labelled **Rep.ter** at the top on the left of 8053B.

10.12 Preventing measurement errors

To prevent influencing the field measurements the operator, vehicles etc. should stay away of 5 meters from the field sensor; the same should not be located near metallic or conductive surfaces and objects.

From the definition of difference of potential between two points:

$$V_{21} = -\int_{r_1}^{r_2} \overline{E}\, dr$$

☞NOTE

We obtain that, with constant difference of potential, when the distance between the two given points diminishes, the field strength increases.
Example: the field strength present between the two plates of a condenser at a distance of 0,1 m and with 100 V applied is of:

$$E = \frac{100V}{0{,}1m} = 1\,KV/m$$

To remark that a voltage of 100 V applied in these conditions produces a field strength of 1000 V/m, i.e. much higher than the applied voltage.

10.13 Connection of fiber optic extension FO-EP600/10

The 10 m extension FO-EP600/10 is supplied with the PMM EP600/EP601/EP602 as standard accessory, together with the two fiber optic adapters – grey and blue (see picture below).

ATTENZIONE

Do not connect/disconnect the optic fibre by applying force to the fiber optic cable directly: this may damage the optical connection. Always hold the connectors with your fingers firmly to connect/disconnect the optic fibre.
Presence of dust, dirt or particles of any nature on the optical connecting surfaces must be carefully prevented.

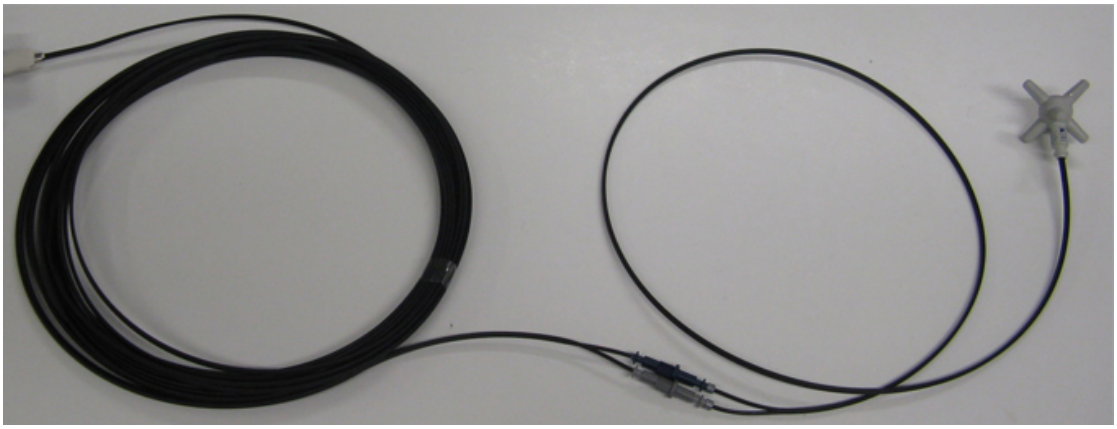


Fig. 10-7 EP600/EP601/EP602 with FO-EP600/10 extension

10.14 EP600/EP601/EP602 installation on the conical holder

Unexpected variations of the probe position may vary the field measurements. Make sure the probe is steadily installed by using the recommended standard or optional accessories.

Using the conical holder supplied with the PMM EP600/EP601/EP602 as support for the same is essential for correct measurements.
An inadequate support might significantly influence the measurements results; hence it is highly recommended to make use of the supplied conical holder as support for the probe.

Fig. 10-8 EP600/EP601/EP602 mounted on conical holder

10.15 EP600/EP601/EP602 installation on tripod PMM TR-02

It is recommended to make use of the optional tripod PMM TR-02 to position the PMM EP600/EP601/EP602 as required by the reference standards. Maintaining the same hardware configuration contributes to improve the measurement repeatability (see chapter “Accessories”).
Fix the conical holder to the tripod TR-02A by means of the screw at the top or by means of the swivel PMM 8053-SN.

Fig. 10-9 EP600/EP601/EP602 on TR-02A

Fig. 10-10 EP600/EP601/EP602 on TR-02A with PMM 8053-SN

10.16 EP600 CHARGER

The probe EP600/EP601/EP602 internal circuitry is supplied by a rechargeable Li-Mn internal battery to recharge by means of the battery charger EP600 CHARGER connected to the mains by means of the supplied adapter.
The EP600 CHARGER is intended for this application only; any other use or application is strictly forbidden.

EP600 CHARGER is intended for operation on desk; its special design allows for keeping the probe under charging in correct and safe position. Inside the EP600 CHARGER a microprocessor controls and checks the recharging operation.
The LED shows the charging status.

The adapter supplied with the EP600 CHARGER works with mains voltages from 100 to 240 VAC, 50/60 Hz.
Different socket adapters are supplied with.

Fig. 10-11 AC adapter

Fig. 10-12 EP600 CHARGER

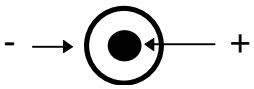
Description:

1 – Spring holder
2 – Charging connector
3A – Charging status Led
3B – DC Supply connector

Fig. 10-13 EP600 CHARGER components

Output: DC, 10 - 15 V, ~ 500 mA

Connector polarity:



NOTE **Attempting to charging batteries of different types or dry cells may cause explosion of the same and is strictly forbidden.**

NOTE **The internal battery of EP600/EP601/EP602 can be replaced by the Factory only. In case of failure or incorrect operation please contact the Dealer.**

NOTE **The minimum voltage level for proper operation is of 2,05V; lower voltages do require recharging the battery.**

NOTE **It is recommended to fully recharge the battery before long-term storage of the probe; a full recharge shall be performed every 4 months since then.**

NOTE **The max. battery autonomy is of approx. 80 hours, according to the filter setting.**

NOTE **When making measurements with PMM EP600/EP601/EP602 the power supply must be ALWAYS removed.**

NOTE **A first complete charging cycle is recommended to achieve the max autonomy.**

NOTE **Connect the AC adapter to the EP600 CHARGER first, then to the mains**

Fig. 10-14 EP600/EP601/EP602 on EP600 CHARGER

Table 10-4 EP600 CHARGER Led status - Start up phase		
Fix	Green	The EP600 CHARGER is supplied but without load (battery not present or disconnected).
Fix	Red	The charging circuit is overloaded (the output is OFF for 30 seconds before attempting a new charging cycle).

Table 10-5 EP600 CHARGER Led status - Charger phase		
Blinking	Green	The battery is under charge
Fast Blinking	Red	Charge ended for maximum time limit reached [60 hours]
Slow Blinking	Orange	Charge ended for maximum time limit reached without 12 hours of stabilisation.
Fast Blinking	Orange	Charge ended for maximum time limit reached with 12 hours of stabilisation.

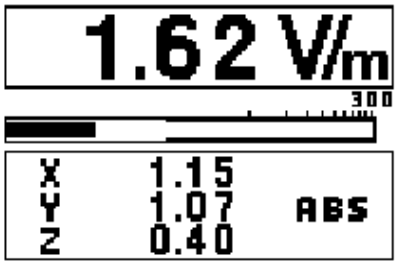
NOTE **The complete charging cycle is of 48 hours; the charge is completed when the Led of EP600 CHARGER blinks orange.**

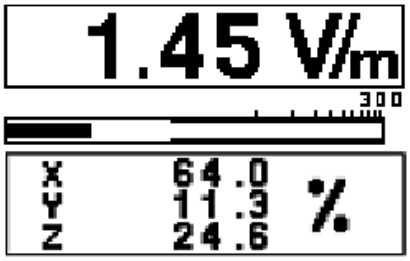
10.17 EP600/EP601/EP602 with 8053B

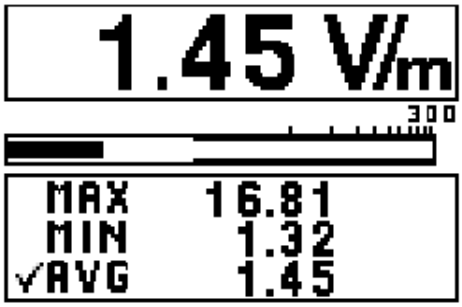
The PMM 8053B allows different modes for acquiring, storing and displaying EP600/EP601/EP602 data.

10.17.1 Operational modes

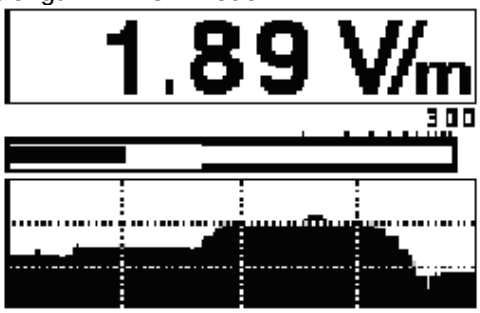
The different modes are:
- Display of field strength in **ABS/%, MIN-MAX/AVG, MIN-MAX/RMS** modes.



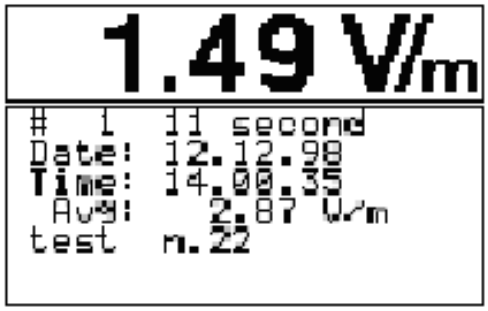




- Graph of field strength in **PLOT** mode**.**

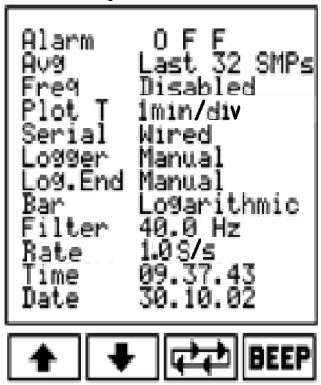


- Field strength data recording in **Data Logger** mode



10.17.2 Preliminary operations

Before to start the measurements, use the **SET** function to enter the main settings of the EP600/EP601/EP602 and select other functions.



Alarm: This function can be used in defining the alarm level with the acoustical warn.

Freq: By entering the known frequency value, PMM 8053B will correct the measurement taken by using the corresponding correction factor included in an internal table of the EP600/EP601/EP602.

Bar: This is used to select the linear or logarithmic scale for the analog bar.

Filter: PMM EP600/EP601/EP602 has a low-pass filter to reduce noise during measuring.
It is possible choose between 28Hz, 8Hz, 4Hz, 3.2Hz e 2.3Hz filter; in this frequencies the signal is attenuated of 3dB. Obviously this setting affects the performance:

- o Power consumption (narrower is the filter, higher power consumption)
- o Resolution (narrower is the filter, good resolution)
- o Noise (narrower is the filter, lower noise)

The 4Hz filter offers a good rejection to 50Hz; this frequency has a notch of –80dB (for example, the 2.3Hz filter has a notch of –67dB).

Rate: It is possible choose between four different rate: 5, 2, 1, 0.4 sample per second. This setting affects the power consumption.

NOTA

When the EP600/EP601/EP602 is connected to 8053B, the "AutoOFF" function is substituted by the "Rate" in the SET menu. It represents the sampling frequency of the probe.

Time: This function allows the user to set the internal clock.

Date: This function allows the user to set the date in the internal calendar.

After to have used **SET** menu, the user can select the measurement unit he desires with the **UNIT** key.

NOTA

For more information about the functions see chapter 3.

10.17.3 Display of the values of the field

The 8053B display the value of the field in **ABS/%, MIN-MAX/AVG o MIN-MAX/RMS** mode**.**

10.17.3.1 ABS/% mode

In this operational mode, PMM 8053B displays the absolute value of the three vector components of the measured field or by pressing a second time the same key, 8053B displays the percentage value.

The total value is calculated as described in par. 3.3.3.

10.17.3.2 MIN-MAX/AVG MIN-MAX/RMS

In this operational mode, the maximum and minimum values as well as the average value expressed as an arithmetic (**AVG**) or as a quadratic (**RMS**) average can be displayed.

To select the type of averaging (**AVG** or **RMS**), use the **SET** operational mode.
In **SET** mode, it is possible to select among several averaging period. See paragraph. 3.7.2 and 3.7.6.7-8.

AVG: All average measurements is designed in order to the **AVG** setting (arithmetic average) o **RMS** (quadratic average). Use the button on the low right corner to select **AVG** or **RMS**. Both will be designed in order to the time.

10.17.4 Graph display data

In **PLOT** mode, PMM 8053B acquires data and displays it in relation to time.

10.17.4.1 PLOT mode

Before to use the **PLOT mode.**, to set the time interval displayed in the graph in the **SET** menu.

PLOT T: This field versus time function is designed in order to verify the stability of the field while the time goes by, showing a graphic display very simple to understand. This graph cannot be saved or printed. The selected time scale is shown in the box at the top on the right. Selection is made in the **SET** mode in correspondence to the **PLOT T** line**.**

10.17.5 Store and display data

With this Logger function, PMM 8053B is used as EP600/EP601/EP602 data acquisition system.
During the data storage, it also possible to display it in the values or in the graph.

NOTA

Make sure that the date and the time are correct.

To use the **Data Logger** mode, it is necessary to enable it in the menu **SET**:

Logger:. It can acquire data and save field measurements for long periods, storing the date and time of each measurement .

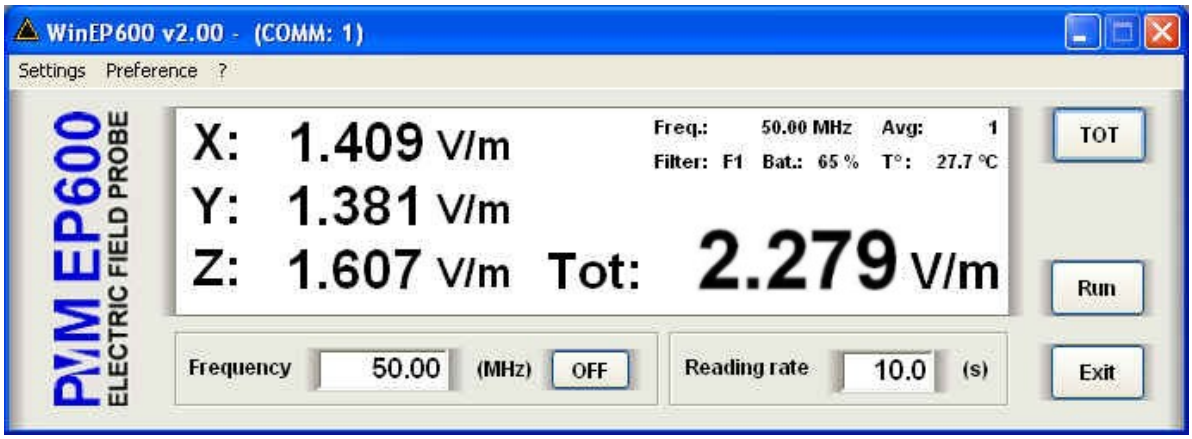
NOTA

To save the battery is possible to use the "Definibile Low Power" mode which save measure one sample only for each memorization.

Log. End: This function determines how much time will be required for data acquisition**.**

10.18 Operating PMM EP600/EP601/EP602 with PC

The EP600/EP601/EP602 can be connected and operated by the Personal Computer.



NOTE

For further information on configuration and operation with Personal Computer, please refer to the operation manual supplied with it.

11 - Accessories

11.1 Introduction

This section provides the information required for installing and using the accessories of the PMM 8053B General Purpose Field Meter.
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.

11.2 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.

WARNING

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.

11.3 Work environment

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

- Temperature — From -10°C to +40° C
- Humidity — < 90% 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 -20°C to + 70° C
- Humidity — < 95% relative

11.4 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.

11.5 Cleaning

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

WARNING

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

11.6 Power supply and battery chargers

All the accessories of PMM 8053B have a power system, which is autonomous from the mains and is supplied by either internal rechargeable batteries or directly from other devices to which they are connected.
The following accessories are powered by internal rechargeable NiMH batteries:

- EHP-50C
- EHP-50E
- SB-04
- 8053-GPS
- OR02
- OR03

The following accessories are powered directly from the PMM 8053B:

- 8053-CAL
- 8053-RT
- 8053-ZERO

USB-OC and 8053-OC are powered directly from the port of the PC.

Both PMM 8053B and the accessories use the same battery charger supplied with the meter.

The 8053-BC battery charger can be used with a power frequency at either 50 Hz or 60 Hz with a supply voltage between 100 and 240 AC Volt.

It can be supplied with different connectors to the supply mains in accordance with the various national standards
The connector to the mains supply is fitted to the battery charger, to substitute it just disconnect it and fit the new connector.

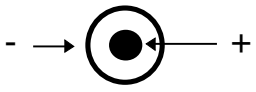
To have the greatest autonomy, a full recharging cycle should be carried out before using the Accessories.

☞NOTE

ALWAYS connect the battery charger to the power supply BEFORE connecting to the Charge input of the Accessories.
The battery charger has an internal protective circuit that will break the output of current if there is a charge in output when connecting to the mains.

Battery charger:
output: DC, 10 - 15 V, ~ 500 mA

Connector:



☞NOTE

In order to safeguard the features of the batteries, it is crucial to have a complete recharge before storing them for periods longer than 4 months. Therefore, it is warmly suggested recharging the batteries at least every 4 months even though the device has not been used.

☞NOTE

Updates of the software and firmware of the Accessories can be downloaded from the Web site www.narda-sts.it or requested directly from NARDA Sales Centres.

11.7 *PMM OR-03 Optical Repeater*

Introduction

All the probes of PMM 8053B can be used with the OR-02 Optical Repeater or OR-03 (Programmable Optical Repeater), which enables the probe to be distanced from the meter by extending the link via a fiber optic connector or by using the probe within a shielded environment keeping the meter on the outside.

Main specifications

The following Table lists the specifications of PMM OR-03.
The following conditions apply to all the specifications:

- The ambient temperature for use must be between -10° and 40° C.

Table 11-1 Technical Specifications of the OR-03 Optical Repeater

General specifications	
Output	fiber optic connector (length of fiber: 40 m with USB-OC) (length of fiber: 80 m with 8053-OC)
Input	Fischer connector for the probe Connector for the battery charger
Compatibility	with all the probes of PMM 8053B
Internal batteries	rechargeable NiMH battery (5 x 1.2 V)
Operating time	> 48 - 72 hours (depending on the Filter selected) 10 Hz filter > 72 hours 20 Hz filter > 61 hours 40 Hz filter > 53 hours 80 Hz filter > 48 hours
Recharging time	< 4 hours
External DC supply	DC, 10 - 15 V, I = about 300 mA
Autocheck	automatic for all the functions when switched on and when connecting to the meter; automatic check of every single diode sensor of the probe
Operational temperature	from –10°C to +40°C
Storage temperature	from –20°C to +70°C
Size (WxHxD)	130 mm x 55 mm diameter
Weight	270 g
Tripod support	threaded insert ¼"

Standard Accessories supplied

Battery charger	8053-BC
Fiber optic cable (10 m)	FO-10USB
Support for tripod	
Software diskette	WINOR03 (only supplied with OR03 – see user's manual WINOR03)
Optical converter	USB-OC

NOTA

A more accurate measurement with EP333 and EP201 probes is achieved setting the filter to 10Hz.

Installation and use of OR-03

PMM OR-03 has an internal battery that can be recharged with the battery charger supplied with it (the battery charger is the same as that of 8053B).
OR-03 Optical Repeaters are housed in a small cylindrical container; the connector of the probe is installed on the flat upper part; on the lower part, there is the connection for the fiber optic, supplied with the OR-03, the screws for the housing of the extension or tripod, the connector for the battery charger, the power button and the LED for checking on how it is operating.

The Optical Repeaters can be switched on and off by briefly pressing the Red **POWER** button.

NOTE

Pressing the POWER button down for more than 4 seconds forces the hardware of the apparatus to shut down. In this case, it is necessary to wait several seconds before switching it on again.

When switched on, the two-colour LED labelled **ON DATA** will provide the following information about how the apparatus is functioning
On switching on the apparatus the **Red** LED lights up for about ½ a second as an auto-check; after this the **Green** light comes on for about 3 seconds, which confirms that the firmware has been downloaded. Then the diodes of the probe are tested which lasts about 13 seconds.

Blinking Speed	Colour of LED	Meaning
Slow	Green	Communication with 8053B in progress and correct (with probe inserted)
Slow	Red	Communication with 8053B in progress and correct (without probe inserted)
Medium	Green	8053B disconnected or error in communication (with probe inserted)
Medium	Red	8053B disconnected or error in communication (without probe inserted)
Fast	Orange	Recharging battery
Fast	Green	Battery recharging completed
Fixed	Green	Repeater calibration in progress and diodes of the probe OK
Fixed	Red	Repeater calibration in progress and at least one of the diodes of the probe open or malfunctioning

NOTE

If the attempt to communicate is not successful, the OR-03 Optical Repeater will automatically switch itself off after 15 minutes.

To install, insert the probe in the special connector on the top of it, connect the fiber optic supplied with the apparatus into the connector labelled **OPTIC LINK** taking care that the spigot is facing outwards, and the other end of the fiber optic into the **OPTIC LINK** connector of PMM 8053B.

Instructions for use of PMM OR-03

OR-03 is linked and communicates with the 8053B meter via the fiber optic connection; to activate the connection, set-up PMM 8053B in the following way:

1. Press the **SET** key to open a window where the main parameters and measurement settings can be selected.
2. Log onto **SERIAL**
3. Select **OPTICAL**

See Chapter 3 on "Instructions for Use" in this Manual for further details and OR-03 user manual.

NOTE

This setting enables 8053B to automatically link up to and recognise the Optical Repeater and the probe currently in use via the fiber optic connection. WITH THIS SETTING THE SERIAL CONNECTION VIA CABLE (Wired) IS DISABLED.

Connect PMM OR-03 to PMM 8053B with the fiber optic supplied and switch it on by pressing the Red **POWER** button on the panel.

WARNING

Do not pull the fiber optic by holding onto the cable but use the connector so that the head does not get damaged.
Be very careful to avoid dirt and other particles getting into the transducers of the fiber optic.

Once the proper connection has been made, data regarding the correct functioning of the Optical Repeater, the charge status of its internal batteries, as well as the type of probe linked to the Repeater will be displayed in the box labelled **Rep.ter** at the top on the left of PMM 8053B.

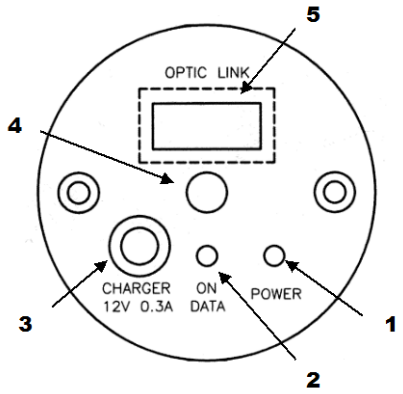


Fig. 11-1 OR-03 Panel

Key:

1. On/Off button;
2. Led indicator;
3. Connector of the battery charger (12V - 0,3A);
4. Securing screws for the support;
5. Fiber optic connection.

This page has been left blank intentionally

11.8 *USB-OC Optical USB Converter*

Introduction

USB-OC is an accessory of the PMM 8053B General Purpose Field Meter. It converts the signals of some of the system's accessories, which are only connected via fiber optic, into USB-compatible signals. It, therefore, makes it possible to link the following Accessories up to the USB port of any Personal Computer for updating the firmware:

- OR-02/OR-03 Optical Repeaters
- EHP-50C Electric and Magnetic Field Analyzers
- 8053-GPS Global Positioning System

USB-OC is indispensable for updating the internal firmware of the above-mentioned accessories via a Personal Computer and the relative update software is available free-of-charge on NARDA's Web site at: http://narda-sts.it

Installation

Insert USB-OC in the connector of a free USB port of the PC, connect the fiber optic coming from the probe or other Accessories treating the locating key with care.

Considering the very low consumption of the device, the power required by USB-OC is taken directly from the USB port of the PC. This means no maintenance is needed.

Table 11-2 Technical specifications of the USB-OC Optical USB Converter	
Max. length of the fiber optic	40 m
USB Connector	Type A Male

NOTE **The link between USB-OC and HUB USB device or USB cable extension could not work properly. Connect the USB-OC to the PC directly.**

Front view

Key:

Fiber optic connector

Rear view

Key:

USB Type A Male

Fig. 11-2 USB-OC adapters

Power supply

USB-OC is powered directly from the USB port of the PC.

This page has been left blank intentionally

11.9 PMM 8053-OC Serial Optical Converter

Introduction

PMM 8053-OC is an accessory of the PMM 8053B General Purpose Field Meter.
It converts the signals of some of the system's accessories, which are only connected via fiber optic, into RS-232-compatible signals. It, therefore, makes it possible to link the following Accessories up to the serial port of any Personal Computer for updating the firmware:

- PMM OR-02/OR-03 Optical Repeaters
- PMM EHP-50C Electric and Magnetic Field Analyzers
- PMM 8053-GPS Global Positioning System

PMM 8053-OC can be used as an alternative to USB-OC converter for updating the internal firmware of the above-mentioned accessories via a Personal Computer equipped with RS-232 port and the relative update software available free-of-charge on NARDA's Web site at www.narda-sts.it.

Installation

Insert PMM 8053-OC in the connector of a free serial port of the PC, connect the fiber optic coming from the probe or other Accessories treating the locating key with care.
Considering the very low consumption of the device, the power required by PMM 8053-OC is taken directly from the serial port of the PC. This means no maintenance is needed.

Table 11-3 Technical specifications of the PMM 8053-OC Serial Optical Converter	
General specifications	
Max. length of the fiber optic	80 m
RS 232 Connector	9 pin DB9

NOTE **The energy available on the DB9 connector of some PC model could be not sufficient to guarantee a good link with 80 meter fibre.**

Front panel

Key:

1 – Fiber optic connector

Rear panel

1 - RS232 female DB9 connector

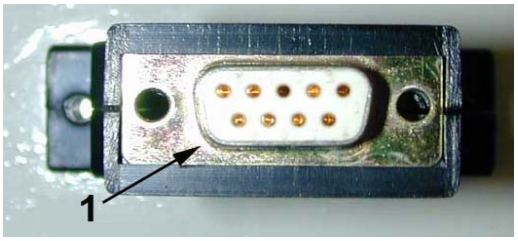


Fig. 11-3 8053-OC Panels

Power supply

PMM 8053-OC is powered directly from the serial port of the PC.

This page has been left blank intentionally

11.10 *8053-OC-PS Power Supply*

Introduction

8053-OC-PS is an accessory of the PMM 8053B General Purpose Field Meter.

8053-OC-PS is indispensable for some PC model don't have sufficient energy on the Serial Port to guarantee a link with 8053-OC.

Installation

Insert 8053-OC-PS in the connector of a free serial port of the PC or serial cable and connect the 8053-OC to 8053-OC-PS. To supply the 8053-OC-PS with 230Vac - 9Vdc Wall Adapter. Connect the fiber optic coming from the probe or other Accessories to 8053-OC.

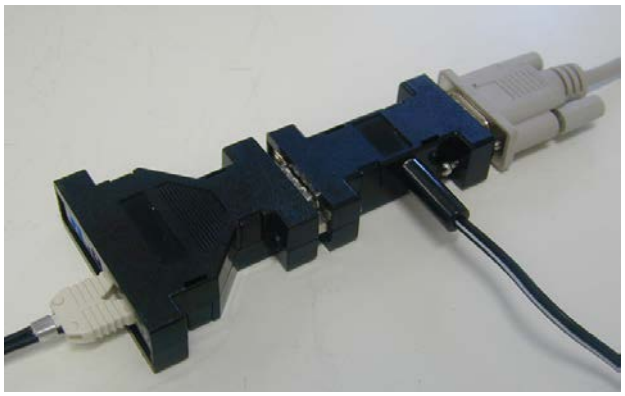


Table 11-4 Technical specifications of the 8053-OC-PS Power Supply	
RS 232 Connectors	9 pin DB9

Front panel

RS232 male DB9 connector

Rear panel

RS232 female DB9 connector

Side panel

Supply male connector

Fig. 11-4 8053-OC-PS Connectors

Power supply

8053-OC-PS is powered through 230Vac - 9Vdc Wall Adapter.

This page has been left blank intentionally

11.11 *PMM 8053-CAL Calibration Probe*

Introduction

PMM 8053-Cal is a useful accessory for checking that the PMM 8053B General Purpose Field Meter is working properly
It checks the absolute reading, the efficiency of the connection, the recognition system of the probe and the internal system for calculating the total field values.

PMM 8053-Cal is supplied with a Certificate of Calibration.

Installation

Insert PMM 8053-Cal in the connector of the probe paying attention to the position of the locating key.
For proper use, to disable the **Freq** function.

In the window at the top on the left of the display of PMM 8053B, the word CALIB will appear which indicates that PMM 8053-Cal has been correctly recognised by the meter.

Functioning

PMM 8053-Cal simulates that there is a probe linked to PMM 8053B generating three voltage reference values equivalent to 57.7 V/m on each axis.

The total field value read by PMM 8053B, if it is functioning properly, should be:

100 V/m ± 2 % (98 - 102 V/m)

This derives from: $V/m_{\ total} = \sqrt{x^2 + y^2 + z^2}$

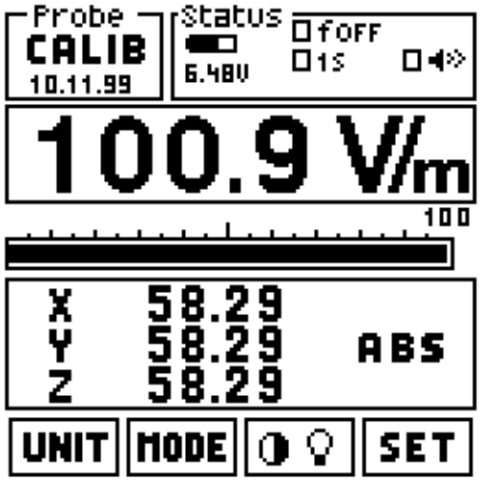


Fig. 11-5 Example of the display of PMM 8053B with PMM 8053-Cal.

Power supply PMM 8053-Cal is directly powered from PMM 8053B.

Table 11-5 General features of the PMM 8053-CAL	
General features	
Size (WxD):	60 x 18mm
Weight:	54 g
Power supply:	5 V (from PMM 8053B)
8053 connector:	Fischer 12 poles, probe type

11.12 *PMM 8053-ZERO Zeroing Calibrator*

Introduction

The PMM 8053-ZERO is a useful accessory for minimizing the offset of the three axes of 8053B, OR02 and OR03. It is particulary needed in conjunction with the EP-300 probe working at lower field levels. It also verifies the connection efficiency, the probe recognition system and the offset system of the 8053B, OR02 and OR03.

Installation

Insert the PMM 8053-ZERO in the probe connector paying attention to the insertion position key.

In the window on the top left of the PMM 8053B Display, the word ZERO will appear which indicates that the meter has correctly recognized PMM 8053-ZERO.

Functioning

Before starting the procedure to minimize the offset, set the filter in the menu keeping in count that lower is the value higher is precision of the result.
Every time that 8053B detects the device “ZERO” plugged into the connector, it starts a countdown from 200 V/m to 1.0 V/m then gets measure value.
When the display shows “LOW” replace Zero Calibrator with the probe.
If the 8053B is supplied, the 8053-ZERO is not active.
The device can be plugged or unplugged without cause errors to the 8053B.

Every time that the device is plugged, the countdown start to 200 V/m. When it is unplugged the countdown stops.

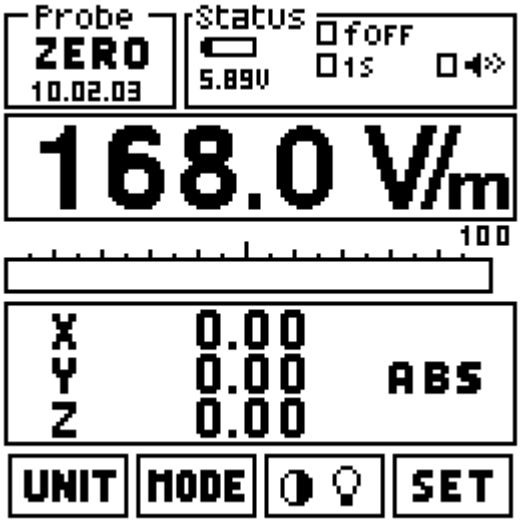


Fig. 11-6 Example of the display of PMM 8053B with PMM 8053-ZERO.

Power supply PMM 8053-ZERO is powered directly from PMM 8053B.

Particulars notes OR02 and OR03 to execute the Zeroing calibration, should be connected either to:

- PMM 8053B (OR02/OR03)
- 8053-SW02 + SB04 (OR02/OR03)
- WIN03 (only OR03)

Without this connection, the OR02/OR03 cannot execute the autooffset. With the WIN03 connection, you will read “0.00” instead of “LOW”.

Table 11-6 Features of PMM 8053-ZERO Zeroing Calibrator

General features	
Size (WxD):	59 x 18
Weight:	54 g
Power supply:	5 V (from PMM 8053B)
8053 connector:	12 Fischer poles, probe type
PMM 8053B Firmware	from Version 2.30
PMM OR02/OR03 Firmware	from Version 2.10

Dispositive on endowment With EP-300

11.13 *PMM 8053-RT Trigger*

Introduction

PMM 8053-RT is an accessory of the 8053B General Purpose Field Meter. It enables an external trigger to be linked to 8053B so that the acquisition can be synchronised and, therefore, automatically record the field value within a record.

When the 8053-RT trigger is used, the measuring probe will be linked to 8053B via fiber optic in the case of the EHP-50C probe, or via the OR-02/OR-03 Optical Repeaters for the other probes.

Installation and use

The 8053-RT interface is mounted, in SMD miniaturised technology inside a Fischer connector that will be linked to the connector of the probes of 8053B meter.

Considering the very low consumption of the device, the power required by 8053-RT is taken directly from 8053B.

A bipolar jack is situated on the opposite side to the connector: linking the two poles of this jack produces the impulse that activates acquisition by the logger on 8053B.

To activate this function, it is sufficient to:

- Put the logger function on manual.
- Insert the special interface (8053-RT) into the connector.
- Have an active repeater (EHP-50C or OR02/OR-03).
- Activate the logger

In this way, with every impulse, acquisition of the field associated with the relative instant (with the resolution of 1 second) occurs in exactly the same way as it would by pressing the sotfkey "**GET**". In this regard, it should be noted that this key continues to function in parallel.

The interface accepts impulses created by both mechanical contacts and relay reed (typical of impulse-generator counters) from the NPN Open-collector output (typical of the PROXIMITY SWITCH) and is capable of getting ON-periods around 30 ms.

Whenever it is necessary to use a shielded-conductor cable for linking up to the 8053-RT interface, keep in mind that the earth on the jack is connected to the left pin looking at the connector from above (see Figure).

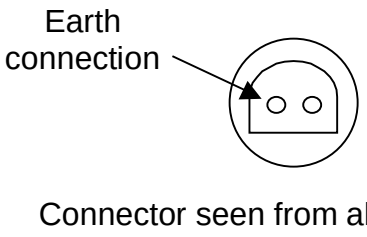
The impulse must meet the following conditions:

- TON (closed contact or PROXIMITY ON) >= 30ms.
- TOFF (open contact or PROXIMITY OFF) >= 350ms.
- T (total time TON+TOFF) >= 1000ms.

Table 11-7 Features of PMM 8053-RT Trigger	
General features	
Size (WxHxD):	18 x 60 x 18
Weight:	53 g
Power supply:	5 V (from PMM 8053B)
8053 connector:	12 Fischer poles, probe type
External trigger connector	anti-inversion male bipolar Jack
PMM 8053B Firmware	from Version 2.08
Resolution of the trigger	1 second
Time of closed contact	>= 30ms
Time of open contact	>= 350ms
Trigger time:	transition from closed to open contact

Accessories supplied with 8053-RT Trigger
Detachable female bipolar jack connector

Connector of PMM 8053-RT



Connector seen from above

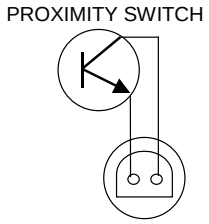


Fig. 11-7 8053-RT Trigger

Power supply PMM 8053-RT is directly powered from PMM 8053B.

11.14 *PMM TR-02A Tripod*

Introduction

PMM TR02A is an Optional Accessory of the PMM 8053B General Purpose Field Meter which allows PMM 8053B or other Accessories like PMM EHP-50C Analyzer or PMM OR-02/OR-03 Optical Repeater with their relative probes to be easily supported during field measurements.
Each of these instruments has a securing screw, usually placed on the bottom part of its container, that enables it to be easily and quickly put into place through the PMM 8053-SN swivel supplied with the tripod.

The design and materials of the PMM TR-02A tripod have been specially selected to prevent it from disturbing the sensors and, therefore, the measurements taken.

The height of the tripod can be adjusted by means of its extendable legs and it is furnished with special feet that are able adapt to all surfaces thereby improving stability. The height of its central support can also be adjusted.

It is supplied with a small protective carrybag to make it easy to carry.

Table 11-8 Technical specifications of the PMM TR-02A Tripod

Specifications	
• 3 legs x 3 extendable sections	
• Transport size:	76 x 12 x 12 cm
• Minimum height:	60 cm
• Maximum height:	180 cm
• Weight	2.8 kg
• Load capacity:	10 kg
• Tripod support	Threaded insert ¼ “

Details of the mounting head of the central column of the support and its adjustments:

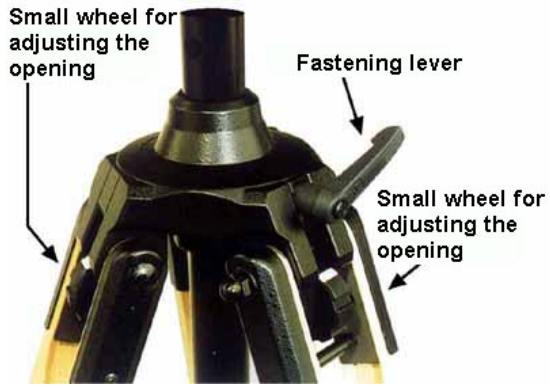


Fig. 11-8 TR-02A Tripod

The angle for opening each leg into three different positions can be adjusted by using special small adjustable wheels:

- fixed opening of 20°: White adjustment indicator is visible (as in the Figure);
- fixed opening of 45°: Red adjustment indicator is visible;
- variable opening: no indicator is visible.

The central support can be adjusted and blocked by means of a special fastening lever.

Details of the swivel for fastening to the **PMM 8053-SN**:

- full height: 8 cm
- weight: 160 g
- load capacity: 10 kg
- Threaded insert ¼ “

The adjustable swivel makes mounting and fastening the instrument easy as well as changing the angle in any directions via the locking knob.

11.15 *PMM TT-01 Fiber Glass Telescopic Support*

Introduction

PMM TT-01 is an Optional Accessory of the PMM 8053B General Purpose Field Meter which allows EHP-50C Analyzer or PMM OR-03 Optical Repeater with their relative probes to be easily supported during field measurements.

This device, on the top part of its container, has a screw to fix the relative apparatus.

NOTE

The design and materials of the PMM TT-01 have been specially selected to prevent it from disturbing the sensors and, therefore, the measurements taken.

Table 11-9 Technical specifications of the PMM TT-01 Fiber Glass Telescopic Support	
Specifications	
• Diameter	32 mm
• Minimum height:	120 cm
• Maximum height:	420 cm
• Weight	500 g

PMM TT-01 Fiber Glass Telescopic Support with soft carrying case

The height of the TT-01 can be adjusted.

Fig. 11-9 TT-01 Fiber Glass Telescopic Support

Details of the mounting:

This figure shows the TT-01. An Optical Repeater with his probe is fixed on the top.

11.16

PMM 8053-GPS Global Positioning System

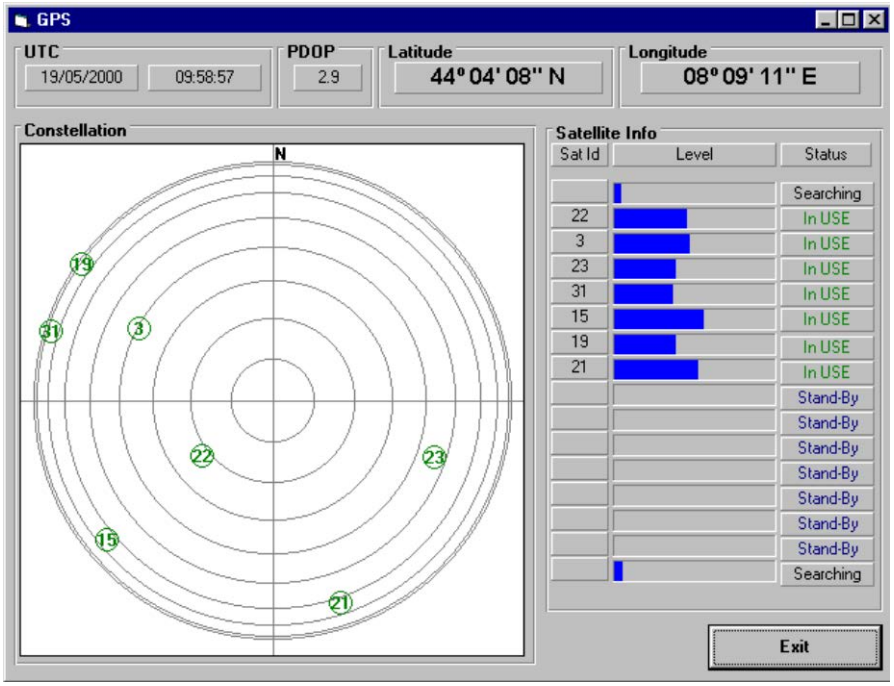
Introduction

PMM 8053-GPS is an Optional Accessory of the PMM 8053B system that enables the co-ordinates of the positions where measurements are taken to be displayed on the display of the PMM 8053B meter.

It is especially useful in mapping a field over an area as the user can accurately assign the position of each measurement taken.

When the system is mobile, at a speed exceeding 3 km an hour, the speed of movement and the direction in degrees (compass function) are also available.

PMM 8053-GPS can be used with the PMM SW02 Data Acquisition Software and with the SB-04 Switching Control Box, in which case the program displays further accessory data relating to the satellites of the GPS system, useful for verifying the location of antennas.
The following Figure is an example of the data that is displayed:



Example of the screen with the SW02 software.

The levels of all the single channels received are recorded graphically as well as the identifier of the satellites in use and their position in the constellation. The date and universal time co-ordinated (UTC), latitude and longitude and PDOP (Position Dilution Of Precision - the smaller the number is the more accurate the measurement is) are also displayed.

This information is not necessary for normal operation, but is useful in verifying the status of the 8053-GPS system.

Main specifications

The following Table lists the specifications of the PMM 8053-GPS.
The following conditions apply to all specifications:

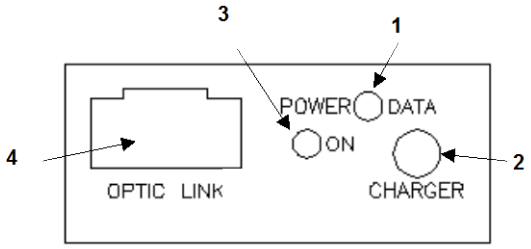
- The ambient temperature for use must be between -10° and 40° C.

Table 11-10 Technical specifications of the PMM 8053-GPS Global Positioning System

General specifications		
Control Software	Internal within the PMM 8053B (from Version 2.08) or the PMM SW02 (from Version 1.40)	
	SA On, PDOP =2.5	**SA Off, PDOP < 2.5**
Precision of Horizontal indication	100 m	< 23 m
Precision of Vertical indication	56 m	< 23 m
Precision of Time indication	340 ns	< 340 ns
Simultaneously managed satellites	8 in view	
Resolution	1" time and 0.01" of ° lat/.long (corresp. to abt 0.3m/lat and 0.2m/lon)	
Internal battery	rechargeable NiMH batteries (5 x 1.2 V)	
Operating time	> 12 hours	
Recharging time	< 4 hours	
External DC supply	DC, 10 - 15 V, I = about 400 mA	
Fiber optic connection	up to 40 meters	
Firmware update	update available through the serial port	
Autocheck	automatically when switched on	
Operational temperature	-10°C to +40°C	
Storage temperature	-20°C to +70°C	
Size (WxHxD)	100 mm x 100 mm x 115mm	
Weight	700 g	
Geodetic System	WGS-84	

Standard Accessories included

- FO-8053/10 Fiber optic cable (10m);
- 8053-BC Battery charger;
- International power supply adapter;
- Italian power supply adapter;



Key:

1. Led status
2. Battery charger connector
3. On/Off button
4. Fiber optic connector

Fig. 11-10 8053-GPS Panel

Installation and use of PMM 8053-GPS

See section 7.1 of this Chapter for general instructions regarding the power supply of the PMM 8053-GPS.

To install PMM 8053-GPS, take the following steps:

- Connect the fiber optic supplied with it to the connector labelled **OPTIC LINK** taking care that the spigot matches the housing, and the other end of the fiber optic to the **OPTIC LINK** connector of PMM 8053B or of PMM SB-04.
- Switch on PMM 8053B
- Set PMM 8053B in **Optical** communication mode
- Switch on PMM 8053-GPS by pressing the Red button labelled **ON**.

When switched on, the two-colour LED labelled **ON DATA** will provide the following information about how the apparatus is working:

On switching on the apparatus, the **ORANGE** LED lights up for about ½ a second as an auto-check; after this the **Green** light comes on which means that the firmware has been downloaded.

Colour	Frequency	Meaning
RED	High	GPS searching for satellites and less then 3 satellites locked on. **NON VALID POSITION**
RED	Low	GPS searching for and 3 or more satellites locked on. **NON VALID POSITION**
GREEN	Low	GPS with a sufficient number of satellites locked on. **VALID POSITIONING**
Functioning under recharge		
ORANGE	High	Battery is recharging
GREEN	High	Battery is recharged

NOTE

Pressing the POWER button down for more than 4 seconds forces the hardware of the apparatus to shut down. In this case, it is necessary to wait several seconds before switching it on again

NOTE

To switch off manually, press the POWER button.
If the attempt to communicate is not successful or if the fiber optic is not connected to PMM 8053B or to SB-04, PMM 8053-GPS will automatically switch itself off after 20 minutes in order to keep the battery charged.
The following Table summarises how the auto-switch off works:

Event (mode)	Delay in switch-off	Scope
Switch on (MASTER)	20 minutes	Enables satellites to be locked on without necessarily consuming the energy of the apparatus linked to it.
Communication with 8053B (MASTER)	1 minute	Once the connection is established it saves the battery of the GPS by switching it off quickly when the 8053B is switched off
Communication with SW02 via the SB-04 (SLAVE)	3 minutes	Allows brief interruptions of the SW02 (for example in the SPECTRUM display) without interrupting the GPS, but switching it off fairly quickly if it is not being used.
Pressing the ON/OFF button for at least 100ms (MASTER/SLAVE)	20 minutes	Manually delays switch off that permits the GPS to remain active in the absence of apparatus connected to it.

WARNING

To guarantee compatibility the firmware of the PMM 8053B General Purpose Field Meter must be updated to Version 2.08 or later and PMM SW02 software to Version 1.40 or later.
Updates of the software and firmware of the Accessories can be downloaded from the Web site www.narda-sts.it or requested directly from NARDA Sales Centres.

NOTE

PMM 8053B can also measure fields with the PMM 8053-GPS Accessory linked to it. In this case PMM 8053B will only display the total reading while, in connection with the reading of the measurement axes, the position logged by the GPS system will be displayed. The sole mode that can be selected is the Data Logger mode.

Functioning

The GPS module communicates in serial in fiber optic in two different modes: as **MASTER** or as **SLAVE**. The MASTER mode is the mode that is automatically set when the system is switched on and it remains that way until a command is recognised. When this occurs, as for example on the request for the Firmware version, the GPS disactivates the MASTER mode and enters the SLAVE mode: the GPS no longer sends any data on its own but waits for a command requesting it.
The MASTER mode is designed to enable it to be used with PMM 8053B. In fact, it is possible by connecting the fiber optic to PMM 8053B to read not only the total value of the measurement in progress but also the data relative to the GPS on the display.
This data is displayed in the middle part of the display of PMM 8053B on three lines (those that usually indicate the components of the axes of the field or the trace of the time graph). With the GPS in operation, therefore, with a sufficient number of valid satellites (at least 3) the following will appear:

1. In the first line, the **latitude** in degrees, minutes and seconds.
2. In the second line, the **longitude** displayed in the same manner.
3. The third line, instead, records different kinds of information depending on the status of the GPS as follows:
   - If the GPS has not yet locked on as many satellites as it needs, “Searching” or “Decoding” appears followed by the number of satellites on which the receiver is trying to operate.
   - With the GPS correctly locked on and the velocity more than 3 Km/h, the velocity is indicated followed in brackets by the direction in degrees (compass function).
   - With the GPS correctly locked on and the velocity less than 3 Km/h, the number of satellites used for the calculation is displayed.

Naturally when the third line displays “Searching” or “Decoding” the displayed position refers to the last valid position.

Concept of the correct functioning of GPS in both SLAVE and MASTER

Every time the receiver decodifies a satellite, it acquires not only the data strictly necessary for calculating the position but also information about the immediate future of the satellite itself. In practice, each satellite communicates both the ephemeres and the almanac so that for the entire period under consideration the receiver knows what and when it receives. This means that the more time passes, the more information the receiver acquires and the more readily it is able to change satellite each time it proves necessary (an obsolete satellite, a satellite obscured by an obstacle, etc.). It is obvious, therefore, that the probability of losing sufficient lock on is greater the less the span has been since the first lock on (an obstacle could cover the indispensable third satellite). On the contrary, a receiver left on for several hours would know which satellite to expect if it lost the one in use (in this case, the obstacle would cover a replaceable or even a redundant satellite).
For these reasons, especially in cases where occultation of the sky is easy (as, for example, in a city or in narrow valleys), it is advantageous to wait a little longer than strictly necessary to obtain lock on in such a way as to be able to rapidly change to alternative satellites.
PMM 8053-GPS is able to store satellite almanac information even when it is switched off. In this way, the system is able to update the position data much more rapidly when it is switched on again.

Notes on the operation of the GPS navigation system

GPS (Global Positioning System), also known as the Navstar system, was conceived by the U.S. Ministry of Defence as a universal means for determining with precision the exact point (broadside) where a receiver is to be found on earth. Applications of the GPS system are not limited to military uses but are also available for civilian uses.

The GPS system is composed of three components: the space segment, the control segment and the user segment.

The constellation of satellites making up the GPS system was completed in 1993. It has 24 operational satellites and another three satellites ready to intervene whenever there is a breakdown. The satellites operate in circular 20,200 km orbits from earth with a 12-hour orbit period repassing the same terrestrial observation point about every 24 hours. There are six orbital planes on which the satellites rotate, with 60° spacing between them and an inclination angle of about 55° to the equatorial plane: It is, therefore, possible to “see” five to eight satellites world-wide.

Each satellite of the GPS system in orbit transmits on two L band frequencies. L1 at 1575.42 MHz transports the signal for course positioning and a time signal while L2 at 1227.60 MHz, transports the signal for precise positioning. The two L band frequencies are phase modulated through the use of two different codes: the C/A code and the P code that serve to make the positioning precise.

Naturally receivers for military purposes are able to receive both L1 and L2 signals and can decodify both the C/A code and the P code. The precision of such a system is high because it is only affected by errors of the system itself and therefore, by the stability of the frequency of the satellites and the receiver, delays due to propagation in the ionosphere and in the troposphere.

The U.S. Department of Defense (DOD), in order to diminish the precision of the GPS system for civilian use, made it possible to decodify only the C/A code. This restriction is identified with the acronym **SA** (Selective Availability). The RMS error for the GPS system for civilian uses is about 340 nanoseconds and covers about **95%** (in the remaining 5% the error may be far greater). This error in time brings an error in position equal to **100 meters in horizontal and 156 meters in vertical**.

However, the geometry the satellites themselves introduce has to be added to this error. This additional contribution to imprecision is identified with the acronym DOP (Dilution Of Precision). The DOP is inversely proportional to the volume of the tetrahedron formed by the receiver and four satellites at five angles. It is evident from this fact that there is an advantage in being able to receive (~see~) a larger number of satellites than the four required for the calculation because **it is possible to select the four most suitable satellites on which to operate**.

Receivers for civilian uses, therefore, need to have sufficient features to avoid invalidating the system. On the other hand, however, significantly better performance would not bring any benefits with it because, as we have just seen, it would not improve the precision of the positioning. Normally the features of GPS receivers on the market are listed leaving aside SA and can in this way mislead the user. In fact, a receiver stated to have an accuracy of, for example, 20 meters only means it would be able to obtain that precision if the U.S. Department of Defense (DOD) were to disactivate **SA**. However, unfortunately, as we all know, SA is just about always active. Instead, a much more useful feature of a receiver for improving the positioning performance is that which is called «**8 in VIEW**» or «**ALL in VIEW**» which permits more than four or even all the satellites visible at one time to be received and, therefore, allows the user to select the four most suitable for diminishing the **DOP.**

The system consists of furnishing the GPS with a radio receiver for differential signals. Thanks to the corrections transmitted in real time from a base station that is, therefore, capable of knowing the entity of the disturbance of each satellite, the GPS can provide the position in a much more precise way, with an error that can be as little as less than a meter. In this case, the precision is obviously mainly determined by that of the base station, by the promptness in updating the corrections and the stability of the frequency (jitter) of the receiver. Usually, the correction data is furnished with standard protocols so that the service can be used throughout the world – a service that, it should not be forgotten, almost always has to be paid for. It is to be noted that with this system post-corrections can also be made. In fact, apart from the position co-ordinates and the time they refer to, it is enough to know the identifiers of the satellites used for the calculation to be able to go back to the individual errors and, therefore, obtain correct co-ordinates.

From the description given here, it can be seen that the GPS system for civilian uses is now accessible for all kinds of uses and is very useful. Despite intentional degradation, the precision of the system is more than enough for the majority of uses.

Acquisition time

When the GPS receiver is able to correctly receive eight satellites, the times necessary for decodifying the data regarding position and time are as set out in the following Table:

Hot Start :	**7 - 20 s**	(after having lost the correct reception, time and position with the ephemeris and almanac)
Warm Start :	**33 - 50 s**	(after having switched off and then switched on again, time and position without the ephemeris and with the almanac)
Cold Start :	**35 - 60 s**	(the first time it is switched on or at least 2 days after it has been switched off, time and position without the ephemeris and without the almanac)

NOTE

Stopping intentional degradation of the accuracy of GPS data as of 1 May 2000.

On 1 May 2000, the Government in the United States decided to temporarily suppress the intentional degradation of the GPS system (also known as SA).

From this date, the accuracy of the positioning system has increased considerably. In fact, the system is affected only by errors due to the PDOP and to ranges of satellites and receivers.

This page has been left blank intentionally

11.17 *PMM SB-04 Switching Control Box*

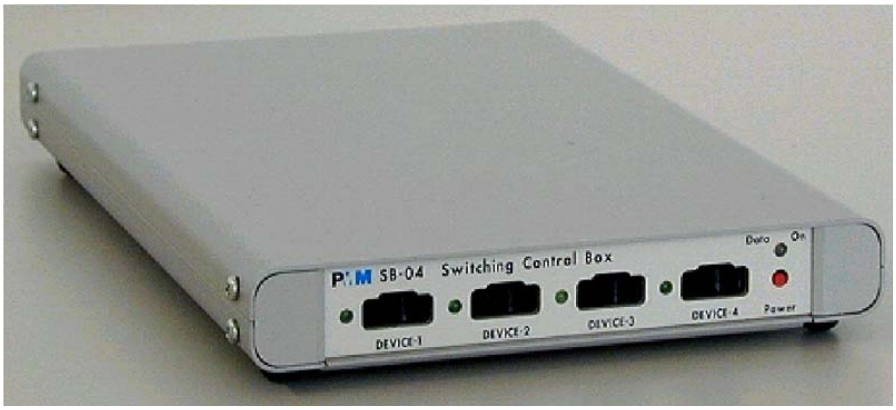
Introduction

PMM SB-04 Switching Control Box is a versatile and expandable Accessory designed to operate with the PMM 8053B system for measuring electric and magnetic fields.
PMM SB-04 can work together with the PMM 8053B General Purpose Field Meter and its whole series of accessory probes and analyzers.
PMM SB-04 allows the user to take field measurements with up to 16 probes connected at the same time, either placed in different measuring points and/or working on different frequencies and full scale ranges
Two internal microcontrollers check all operations interfacing the measured data with PMM SW-02 Data Acquisition and Graphics Presentation Software, running on the user's PC.
A PMM SB-04 enables the user to connect up to four devices via fiber optic to the PC by a single RS232 connection.
Up to four SB-04 can be interconnected for the purpose of acquiring and storing measurements coming from a maximum of 16 measuring devices.

Standard Accessories

The following are the standard Accessories supplied with the PMM SB-04:

- RS232 serial cable with 9/25 pin adapter (2 m);
- SB-04 - SB-04 Expansion cable;
- 8053-BC Battery charger;
- 8053-SW02 Acquisition software, without hardware key;
- User's Manual;
- Certificate of Compliance;
- Return for Repair Form;
- Protective covers for the fiber optic ports;



Main specifications

The following Table lists the main specifications.
The following conditions apply to all specifications:

- The ambient temperature for use must be between -10°C and 40°C.

TABLE 11-11 Technical Specifications of PMM SB-04

Connections

Up to 4 devices via fiber optic.

Connection with the RS232 serial port to a PC for remote operations and for updating the Firmware.

Expandable up to 4 SB-04 through the integrated expansion port for a total of 16 connected devices.

General specifications

Compatibility	with all the probes of PMM 8053B via PMM OR02/OR-03 Optical Repeater or directly (when the probe has its own internal optical repeater).
Internal batteries	rechargeable NiMH batteries (5 x 1.2 V)
Autonomy	> 10 hours
Recharging time	< 12 hours
External DC supply	DC, 10 - 15 V, I = about 200 mA
Connections in fiber optic	up to 80 m.
Internal Firmware update	able to be loaded by the user through the serial port
Autocheck	automatically when switched on
Conformity	to Directives 89/336 and 72/23.
Operational temperature	from –10°C to +40°C
Storage temperature	from –20°C to +70°C
Size (H x W x D)	25 x 148 x 220 mm
Weight	900 g

Optional Accessories

The following Accessories may be ordered as optionals:

- See 8053B OR02/OR03 accessories

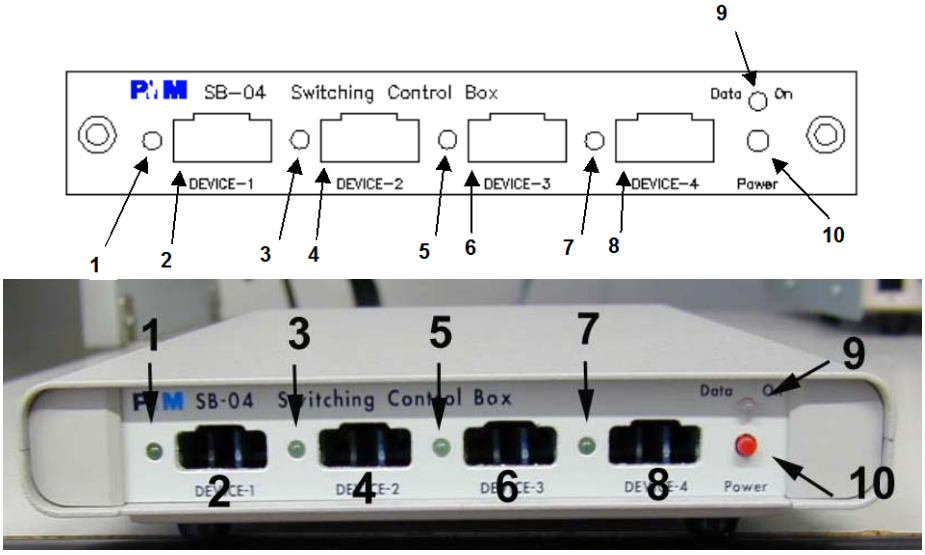


Fig. 11-11 Front panel

Key:

1. Device-1 Led;
2. Device-1 fiber optic connector;
3. Device-2 Led;
4. Device-2 fiber optic connector;
5. Device-3 Led;
6. Device-3 fiber optic connector;
7. Device-4 Led;
8. Device-4 fiber optic connector;
9. Data On Led;
10. On/Off button;

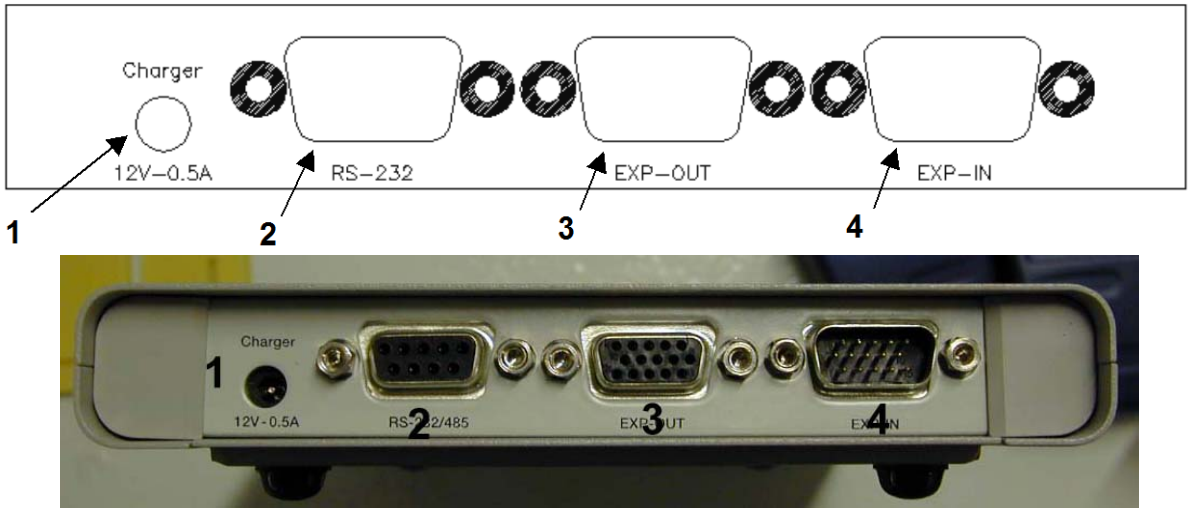


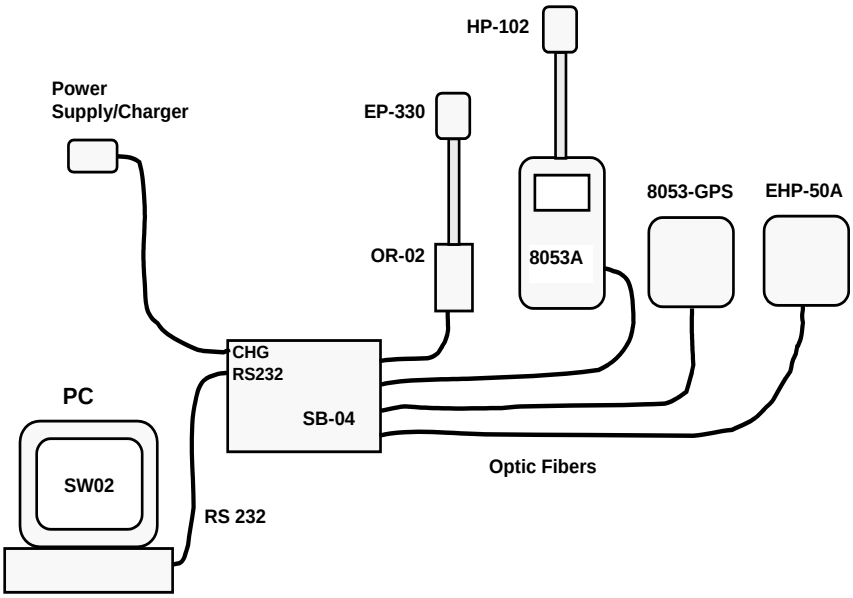
Fig. 11-12 Rear panel

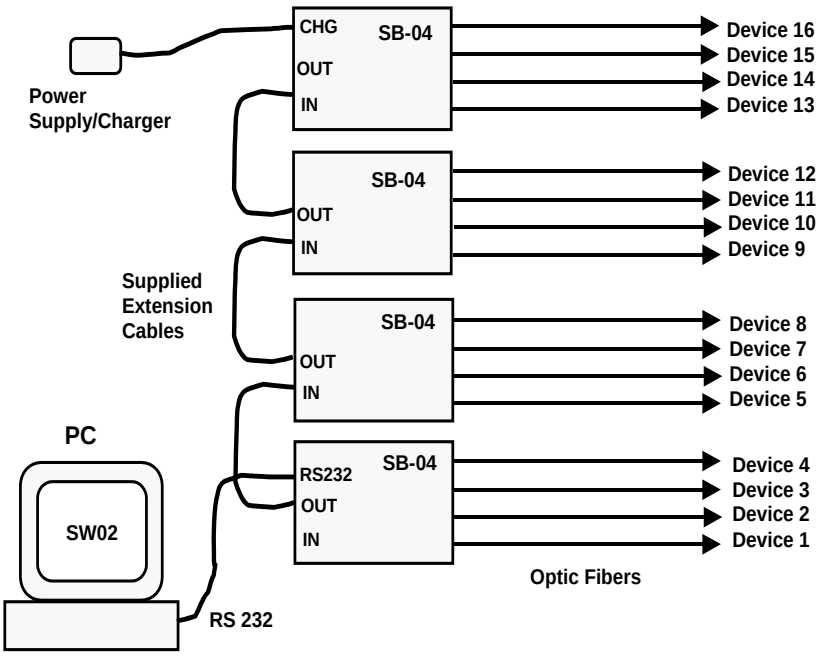
Key:

1. Battery charger Connector (12V, 0,5A);
2. RS 232 Connector
3. Expansion out Connector;
4. Expansion in Connector.

System configuration

The PMM SB-04 Switching Control Box can operate in conjunction with various sensors in a wide range of frequencies and levels. The PMM 8053B meter can also be connected to it.
Some examples of connections are illustrated in the following:





Power supply and battery recharging of PMM SB-04

See the indication at the beginning of this section for general instructions regarding the power supply of PMM SB-04.

PMM SB-04 has an internal rechargeable NiMH battery that can be recharged with the battery charger supplied with it (the battery charger is the same as that of PMM 8053B).

If the internal batteries are to have the greatest autonomy, we recommend that a full recharging cycle should be carried out before using the apparatus.

NOTE

ALWAYS connect the battery charger to the power supply BEFORE connecting it to the SB-04.
The battery charger has a internal protective circuit that will break the output of current if there is a charge in output when connecting to the mains.

Battery charger:
output: DC, 10 - 15 V, ~ 500 mA

Connector:

NOTE

The PMM SB-04, which may be used, without distinction, with both the battery charger connected or disconnected, will be respectively powered by the mains or internal batteries.

To switch SB-04 on or off, press the Red POWER button on the front panel of the apparatus.

NOTE

Pressing the POWER button down for more than 4 seconds forces the hardware of the apparatus to shut down. In this case, it is necessary to wait several seconds before switching it on again.

After being switched on, the two-colour LED labelled **ON DATA** will provide the following information about power supply:

Power supply	LED blinking	Colour	LED DATA ON Information
Batteries	Low speed	Green	The SB-04 is switched on and in normal use, the voltage of the battery exceeds 5.9 V.
Batteries	Low speed	Red	The voltage of the batteries is less than 5.9 V, the batteries need to be recharged.
Power supply	High speed	Green	The SB-04 is switched on and in normal use, the batteries are charged.
Power supply	High speed	Yellow	The SB-04 is switched on and in normal use, the batteries are being recharged.

NOTE

When SB-04 is connected to the Battery Charger, it switches on automatically and the POWER button to switch it off is disabled as long as the Battery Charger is connected.

NOTE

When the SB-04 is battery powered and no data transfer with the control software is in progress, it automatically switches itself off after 350 seconds (5 minutes) in order to keep the battery charged.

Installation

To install the SB-04 connect the fiber optic supplied with it to the **DEVICE-X** input on the front panel being careful to place the spigot in the right direction, then connect the other side of the fiber optic to the **OPTIC-LINK** connector of the measuring device, that may be a probe with an incorporated optical link or PMM 8053B for probes without optical links.

NOTE

Every DEVICE-X connection has a LED diode near to it.
When the device is connected and switched on the LED blinks indicating that the connection has been made properly.

The following connections are to be found on the back panel:

- **Charger** of the Battery charger/Power supply connector – to recharge or supply power to PMM SB-04;
- **RS 232/485** – to connect to a free serial port of a PC via the serial cable supplied;
- **EXP-OUT** – to connect to the **EXP-IN** connector of the next PMM SB-04 (when required) with the extension cable supplied.

The battery charger can be connected or disconnected, depending on the type of power supply the user wishes to use.

NOTE

When more than one PMM SB-04 is in use, up to 4 in all, each one can be charged or powered by a single power supply.
The battery charger can be connected, without distinction, to any SB-04.
The voltage of the power supply will be propagated to all the devices via the extension cable.

To switch PMM SB-04 on or off press the Red **POWER** button on the front panel.

Use of PMM SB-04

On completion of the set-up of the desired measurement, start PMM SW-02 Data Acquisition and Graphic Presentation Software on the control Personal Computer. See chapter 7.

WARNING

To avoid damage to the connection ports of the fiber optics due to the accumulation of dust or dirt and to avoid disturbance to its operation through external luminous sources, always leave the protective covers on the ports that are not in use.

11.18

Other Accessories

Other Accessories are available on request with the PMM 8053B General Purpose Field Meter, such as: two different kinds of carrying cases for protecting the meter and probes against shocks, a car adapter and 12 V battery charger.

This page has been left blank intentionally

12 – Measuring Electromagnetic Fields

12.1 Introduction

The procedures and methods described here apply to sources of electromagnetic fields used in the industrial, medical, research, domestic and telecommunications sectors, operating within the frequency range from 10 kHz to 300 GHz.

NOTE

The information given here is based on the CEI 211-6/7 Guidelines.

12.1.1 Quantities to be considered

Measurements of electromagnetic fields for protective purposes can be of two types:
1) dosimetric measurements: these are useful in assessing the energy absorbed by the human organism exposed to radiation.
2) exposure measurements: these are useful in assessing the quantities characterising the electromagnetic field that the organism is exposed to.

12.2 Dosimetric measurements

The biological effects of electromagnetic fields are linked to the quantity of energy deposited within a biological system during exposition.
The physical quantities correlated to the biological effect are the SAR and the density of the current induced within the organism.
The former of the two quantities (the SAR) is generally used for frequencies higher than 10 MHz, while the density of the current is used for lower frequencies.

12.3 Exposure measurements

Usually the intensity of electromagnetic fields is measured indirectly by using the following quantities which characterise an electromagnetic wave:

- intensity of the electric field E (expressed in V/m);
- intensity of the magnetic field (expressed in A/m);
- magnetic induction B (expressed in mT), used for ELF fields;
- power density S (expressed in W/m^2).

The choice of one of these three quantities depends on the characteristics of the source and the point at which the measurements are taken.

12.4 Characteristics of the sources

The main characteristics of the sources of electromagnetic fields are:

- Type of radio frequency generator, type of field emitted, output power;
- Operating frequency and any harmonic frequencies;
- Type of modulation and its characteristics;
- Type of antennas;
- Polarization.

The information is to be taken into consideration for all sources that influence the field to be measured at the point of interest.

12.5 Measurement apparatus

Electromagnetic fields can be measured in two different ways:

- broadband with devices that, within a certain range, have an independent response (sensibility) to the frequency. These devices give no indication of the frequency or of one or more sources;
- narrow band with the use of devices that give a precise indication of the frequency of the source.

12.6 General Requirements

Apparatus for the measurement of emissions are divided into two categories:

- meters for directly measuring E or H parameters
- temperature meters.

☞NOTE **The apparatus must be chosen after careful analysis of the frequencies to be measured and of the E or H field values.**

☞NOTE **The basic components of a device are:**

- **the probe, constituted by its sensor and transducer;**
- **cables;**
- **acquisition and processing unit.**

12.7 Probes

Measurement probes must generally meet the following conditions:

- to respond to a single parameter and not respond in any significant way to spurious components (for example, respond to the E field, without degrading the measurement when there are magnetic fields). This means having a high rejection level.
- to be of a size that does not greatly disturb the field where the probe is;
- to have links from the probe to the measurement unit that do not disturb in any significant way the field where the probe is;
- the behaviour of the probes in relation to environmental parameters needs to be understood.

12.8 Cables

The cables must:

- be used to transfer the signal of the probe to the measurement unit;
- not influence the measurement in any considerable way;
- not couple the signal with the circuitry or acquisition components;

These can be internal or there may be none at all when the probe is part of the apparatus itself or when the probe is linked via fiber optic.

12.9 Measurement units

The measurement and processing units must:

- transform the signals coming from the probes into one of the quantities under consideration
- provide data in quantitative terms
- give its own data to a PC for further analysis and recording.

12.10 Broad band apparatus

These instruments are made up of the following elements:

- the electric or magnetic field probe;
- the transducer that transforms the probe's response into a signal proportional to E (or E^2), or H or (H^2) or the temperature;
- the cable (or better still the fiber optic);
- the measurement and processing unit.

12.11 Narrow band apparatus

This type of instrumentation is constituted by:

- the probe that responds to the intensity of the electric or magnetic field
- the transducer that transforms the probe's response into a signal proportional to the fields to be measured;
- the cable;
- the measurement and processing unit.

12.12 Type of apparatus

Usually the apparatus is divided into the following classes:

1) diode
2) bolometric
3) thermocouple

12.13 Diode apparatus

Usually these devices are constituted by small antennas clamped to single or multiple diodes.
These devices can be of two types:

- isotropic
- non isotropic

Isotropic devices are constituted by multiple diodes with their antenna elements usually configured orthogonal for the purpose of adding up all the components of the electromagnetic wave and they allow the field value to be measured independently of the polarization and direction of the field of incidence.
Non-isotropic devices usually use a diode in combination with a small antenna (dipole).
These devices do not provide an overall reading but the acquired value depends on the orientation of the probe itself. However, they can provide an indication of the direction of the polarization of the electromagnetic wave.
Diode detectors have a linear and quadratic detection region. At low input power, the output voltages are proportional to the square of the field (E^2 or H^2) and therefore to the power density. With an increase in the intensity of the field, the response becomes linear until it reaches saturation.
The measurement unit gives a measurement proportional to the square of the input signal and therefore of the power density.
This apparatus, obviously, also provides for the measurement of the electric or magnetic field in the eventuality that there may be a situation involving a flat wave, a condition that is not always true.
These devices usually measure the value of the peak of the signal, even though they provide the effective value (RMS).
When there are amplitude modulation signals (AM), diode devices indicate the average value of the envelop of the voltage and therefore an adequate correction factor is required depending on the kind of modulation.
Diode devices, depending on their design, may be influenced by the temperature around them unless they have internal techniques for thermal compensation.
Output variations with the surrounding temperature can be in the order of 1/20 of dB/ºC.

12.13.1 Spurious responses

When using diode probes, possible effects due to spurious signals must be kept in mind. These include: :

- **Multiple sources**. The diodes only act as quadratic law detectors when there are small signals. If there are two or more rather strong signals, the apparatus reads a higher value than the real one.
- **Spurious modulation**. At high levels, the response of the diode changes from a quadratic law to a linear one. Therefore, when there are pulsated signals with a low duty cycle, this causes the apparatus to read a higher value that the real average level. This is very important for radar applications.
- **Sensitivity to light**. Schottky diodes, used as detectors in some probes, are sensitive to light and infrared energy. In these cases, it is advisable to take the measurements out of direct light.
- **Disturbing agents**. Field probes can be influenced by metal infrastructures or other conductors. It is, therefore, necessary to ensure that these foreign bodies are sufficiently far away from the probe.

12.14 Bolometric apparatus

These instruments mainly measure the temperature of a thermistor due to energy cession by radio frequency. The thermistor is usually inserted as one of the elements of an electric bridge.
This method is used very little because it is extremely sensitive to variations in ambient temperature.

12.15 Thermocouple apparatus

Generally, thin film thermocouple devices are used as detection elements. They respond very well according to a proportional quadratic law to the square of the electric field.
The hot and cold junctions are so close that they are not influenced by changes in the external temperature. Their limitation arises out of the difficulty in measuring a lot of signals because overheating occurs within the thermometer which produces a great number of errors.

12.16 Spurious responses due to the apparatus

In this section, several constructive and operational situations relating to the apparatus are examined which may result in erroneous measurements caused by spurious effects.

12.16.1 Cable coupling

At frequencies lower than 1 MHz, the impedance of small dipoles considerably increases and the amount of the quantity of their resistance can come close to the resistance of the cables usually used for connection to the measurement unit. The cables themselves may then become elements that pick up and, therefore, provide an RF signal to the measurement unit, which is higher than the real value.
This effect can be minimised by orienting the cables, during the measurement, in a radiant to the source or, in other words, by pointing the probe towards the energy source. The constructive solution generally recommended is to use rigid cables whose path is known. The use of flexible cables can determine the short circuiting of some of the field lines. At present, the most frequently adopted solution for linking the probe to the measurement unit is via fiber optic.

12.16.2 Thermoelectric effect on the coupling cables

High impedance conductors do not generally produce uniform electric resistance over their entire length. Eventually, differences in resistance have as a consequence differences in the dissipation of power, especially when there are strong electric fields. Such thermoelectric voltage that is generated in the junctions is able to falsify the real measurement.

12.16.3 Coupling between the probe and conductors

When too close to metal surfaces, there can be direct (capacitive or inductive) coupling with the elements of the probe, despite their small size. This coupling does not relate to the RF field, the object of the measurement, but is often due to the low frequency fields that are present, typically those at 50 Hz due to power lines.
Keeping in mind that sensitive dipoles are about 100 mm or less, the uncertainty of the measurement due to problems with coupling can be kept within 1 dB if the following distances are maintained between the probe and any metal surface:

- 300 mm for frequencies in the 10 kHz - 100 kHz range
- 250 mm for frequencies in the 100 kHz - 3 MHz range
- 150 mm for frequencies in the 3 MHz - 10 MHz range
- 100 mm for frequencies > 10 MHz

12.16.4 Static fields

The elements of the probe are at high impedance and the input circuits of the measurement unit have a high gain. Therefore, every mechanical movement of the probe can increase or decrease the reading of the field to be measured. For this reason, it is advisable to place the probe in a stable position.

12.16.5 Outside bandwidth responses

Usually outside bandwidth frequencies for electric field probes have little influence on the measurement.
On the contrary, magnetic field probes can have outside bandwidth resonance frequencies that can considerably falsify the field measurement..

12.16.6 Calibration of the apparatus

All the apparatus used for measuring must have a currently validated Certificate of Calibration. A list of simple steps to take in checking that it is operating are set out in the following:

12.17 Measurement procedures

Measurement procedures must follow a protocol that enables the maximum information to be gathered in the various phases, for the purpose of minimising:

- risks for the technician taking the measurements who must not be exposed to dangerous fields
- measurement errors
- interference
- damage to the apparatus.

12.17.1 Preliminaries

Before beginning to measure potentially dangerous electromagnetic fields, it is important to determine the greatest possible number of characteristics known about the sources and their probable propagation.
This knowledge will result in a better assessment of the distribution of the field in terms of the best choice of the apparatus and test procedures.
Checking the source and its characteristics may include the following data:

- type of generator and power generated
- frequency or frequencies of the carrier(s)
- characteristics of the modulation
- polarization of the transmitting antennas
- duty cycle, width of the impulse and the frequency of repetition of impulse transmissions
- type of antenna and its properties (gain, physical dimensions, lobes of radiation, etc.)
- the number of sources including every signal outside the bandwidth of the probe being used.

In evaluating propagation, the following should be kept in mind:

- the distance between the source and the measurement point
- the existence of absorbent, reflecting or deviating objects, capable of influencing the intensity of the field

With the characteristics defined above, it is possible to estimate the intensity of the fields to be measured and, therefore, to start measuring by using, to begin with, the least sensitive probe (to avoid overheating the probe and, therefore, damaging it), substituting it subsequently with a more sensitive one. If the field to be measured comes from an intentional source (transmitter), it is necessary to evaluate the major lobe of radiation.
If the measurement is taken in order to identify possible sources of loss, empirical measurements should be taken by initially using the least sensitive probe operating at a fixed distance from the source and moving the probe itself around the surface of the source of the loss.

12.17.2 Near fields and far fields

Before beginning the measurement, it is necessary to define the extension of the region of the near field and the far field relating to the source under examination.
In the zone of the near-reactive field (that is, close to the antenna) the measurements of the intensity of the field are suspect due to big errors in measurements.
For distances between $\lambda/2$ and $D^2/2\lambda$, where D is the largest dimension (height or width) of the antenna, including all its reflecting or directing), the field is called near-radiative field. In this case, the electric and magnetic components of the field to be evaluated must be measured separately.
After these distances, a zone of the far field is found where it may be enough to evaluate only one of the two quantities.

12.17.3 Operational tests on the measurement apparatus

Several simple checks enable measurements to be made with confidence in the accurate results that are obtained.

- check that the probe is working properly
- if the probe is isotropic, check that the reading is independent from the orientation of the probe
- change the direction of the cables of the probe if these are flexible
- if possible, compare the measurements with a second device
- compare the reading on the apparatus with an approximate theoretical calculation
- repeat the tests after the reading has been ascertained, to show that no damage has been inadvertently done to the apparatus while in use.

12.17.4 Disturbed fields

Exposure limits always refer to undisturbed fields, that is, without the presence of the human body.
Therefore, measurements have to be taken without the user disturbing the measured field.
Always use an optical repeater and a fiber optic to distance the probe from the measurement unit in the user's possession or manage the measurement automatically through a personal computer that collects the data furnished by the measurement unit.

12.18 Measurement of far fields

The measurement of the intensities of a field in the state of a linearly polarized flat wave, whose source, position, frequency and direction of the polarization are known, can be taken by using one of the devices described above, keeping in mind that the limitations that each individual device may have.
Temporal and spatial distribution of the measurements must describe the pattern of the fields.
When single measurements are taken rather than continuous monitoring, at least eight points for a uniformly distributed wave length must be examined.
During the mounting or fastening of the antenna or probe, care must be taken to avoid reflections or alterations in the field due to the supports of the instruments or to the user's body. The cables must, as far as possible, be perpendicular to the electric field wave in order to avoid errors in measurement due to coupling the field with the cables that link the probe to the measurement unit.

12.18.1 Initial measurements

Initial measurements must be taken at the height of one meter from the ground, or 1 meter from the level of the feet, if the area of interest is above ground level.
If the radiant source is a very powerful antenna, the field close to the ground will depend on the height because of ground reflections. The measurement of these fields distributed in the space must be measured if they are of interest. In an extreme case, it may be necessary to take measurements from ground level up to a height of 2 meters, in the points where people could be present.
.

12.18.2 Multiple sources

When fields emitted from more than one source with unknown characteristics have to be measured, a broadband isotropic probe is needed. Having to consider phenomena of stationary waves and the interaction of multiple fields, it is necessary to take measurements in the volume of the space of the zone of interest.
It is advisable to use an optical repeater and, whenever this is not possible, to ensure that the cables of a probe linking it to the measurement unit are high impedance.
This solution will eliminate errors due to reflections and other effects of interception by the cables.
Metal cables must be oriented perpendicularly to the electric field vector keeping in mind that it is difficult to know the correct position when the polarization is not known.

12.18.3 Near radiative fields

The accurate measurement of near fields depends on whether a probe with an electrically small antenna system is available as there are high gradients in near fields and spatial resolution is critical.
If the probe is big (for example, the effective opening is bigger than a quarter of the wave length of the measured signal), it will measure a spatially indirect field. Furthermore, a small antenna system produces minimum disturbance in the measurement of the field under examination.
Unless the polarization of the field is known, an isotropic probe must be used. The cables, the user and the measurement unit may all be sources of errors.

12.18.4 Presentation of results

Measurement results must be indicated in terms of E and/or H fields, respectively in V/m to A/m. If possible, the power density of the equivalent plane wave can be indicated, stating whether it was derived from the measurement of an electric or magnetic field.

This page has been left blank intentionally

13 - 8053 Programming Commands

13.1 Introduction

Any 8053B field meter can be connected to a PC via RS232 cable or via optical fiber. If using the fiber one USB-OC or 8053-OC is required.
PMM 8053B commands allow the user to query for data and to send commands to it.

The serial transmission between the host and the PMM 8053B is in USB or RS232 standard:

- Baud 9600
- Parity NONE
- Length 8 bit
- Bit STOP 1

The commands have the following syntax:
#00Command(parameters)* where:

= command string start character;
00 = zero zero (**00**) always present;
Command = command string;
(parameters) = setting parameter (where needed);
***** = command string end character.

13.2 Commands The following commands are available

Command	Meaning	Example
#00?T*	**Inquiry on Total Field.** The answer contains the Total field measured at the moment of the request. Returned Value takes into account correction factor if related function has been activated.	Example: **#00?T*** Response: **#nnnn*** "**nnnn**" is the field value in scientific annotation and without measuring unit. The measuring unit in unexpressed and it is always the one implicit with the probe. Practical Example: **#4.025***
#00?X*	**Request for X component** of the total field. Frequency correction is taken into account if related function has been activated.	Example: **#00?X*** Response: **#nnnn*** "**nnnn**" is the field value in scientific annotation and without measuring unit. The measuring unit in unexpressed and it is always the one implicit with the probe. Practical Example: **#1.25 e-2***
#00?Y*	**Request for Y component** of the total field. Frequency correction is taken into account if related function has been activated.	Example: **#00?Y*** Response: **#nnnn*** "**nnnn**" is the field value in scientific annotation and without measuring unit. The measuring unit in unexpressed and it is always the one implicit with the probe. Practical Example: **#2.846***
#00?Z*	**Request for Z component** of the total field. Frequency correction is taken into account if related function has been activated.	Example: **#00?Z*** Response: **#nnnn*** "**nnnn**" is the field value in scientific annotation and without measuring unit. The measuring unit in unexpressed and it is always the one implicit with the probe. Practical Example: **#2.847***
#00V*	**Requests the PMM 8053B FIRMWARE version,** with feedback	Example: **#00V*** Response: **#PMM8053B; 2.30 18/02/03***
#00v*	**Requests the PMM 8053B FIRMWARE version,** without feedback	Example: **#00v*** NO feedback.
#00F nnn*	**Sets the frequency correcting value and makes it active.** **After this command an acknowledgment string is sent back from the meter as feedback.** The <nnn> item represents the frequency in MHz. When <nnn> is out of the probe's frequency range, the correction is disabled.	Example: **#00F 102.5*** Response: **#00F102.5*** **Note that you need to leave a blank space between the character F and the frequency value**
#00f nnn*	**Sets the frequency correcting value and makes it active.** The <nnn> item represents the frequency in MHz. When <nnn> is out of the probe's frequency range, the correction is disabled.	Example: **#00f 102.5*** NO feedback. **Note that you need to leave a blank space between the character F and the frequency value**

narda Safety Test Solutions
an L3 Communications Company
http://www.narda-sts.it

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

Sales & Support:
Via Leonardo da Vinci, 21/23
20090 Segrate (MI) - ITALY
Tel.: +39 02 2699871
Fax: +39 02 26998700

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

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

☑ **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:

Suggerimenti / Commenti / Note:
Suggestions / Comments / Note: