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# User's Manual

## LR-01

### LOGGER REPEATER

#### **EQUIPMENT SERIAL NUMBER**

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

Serial Number is in the form: 0000X00000.

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

The suffix is different for each instrument.

**NOTE:**

® Names and Logo are registered trademarks of Narda Safety Test Solutions GmbH – Trade names are trademarks of the owners.



If the instrument is used in any other way than as described in this User's Manual, it may become unsafe.

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

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




This product is a **Safety Class 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 power supply of this product meets requirements **Safety Class II** and **Installation Category II** (having double insulation and able to carry out mono-phase power supply operations).

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

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

**EXPLANATION OF ELECTRICAL AND SAFETY SYMBOLS :**

 You now own a high-quality instrument that will give you many years of reliable service. Nevertheless, even this product will 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](http://www.narda-sts.it).



Warning, danger of electric shock



Earth



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



Unit Earth Connection



Earth Protection



Equipotential

**EXPLANATION OF SYMBOLS USED IN THIS DOCUMENT :**



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



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



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



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



The NOTE sign draws attention to important information.

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**⚠ WARNING**

**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.

# Dichiarazione di Conformità *EC Declaration of Conformity*

In accordo alla Decisione 768/2008/EC, conforme alle direttive EMC 2014/30/UE, Bassa Tensione 2014/35/UE e RoHS 2011/65/UE, ed anche alle norme ISO/IEC 17050-1 e 17050-2.  
*In accordance with the Decision 768/2008/EC, compliant to the Directives EMC 2014/30/UE, Low Voltage 2014/35/UE and RoHS 2011/65/EU, also compliant to the ISO/IEC standard 17050-1 and 17050-2*

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

Indirizzo  
*Address* **Via Benessea, 29 / B; I-17035 Cisano sul Neva (SV) - Italy**

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

EMC:  
*EMC:* **EN 301 489-1 (V2.2.3); EN 301 489-17 (V3.2.4); IEC EN 61326-1 (2021)**

Sicurezza:  
*Safety:* **IEC EN 62368-1 (2020); EN 61010-1 (2010)**

Radio:  
*Radio:* **EN 300 328 (V2.2.2)**

Salute:  
*Health:* **IEC EN 62311:2020; IEC EN 62479:2010**

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

Descrizione  
*Description* **Ripetitore Registratore – Logger Repeater**

Modello  
*Model* **LR-01**

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

Apparecchiature Radio <i>RED</i>	<b>2014/53/EU</b>	Compatibilità Elettromagnetica <i>EMC</i>	<b>2014/30/EU</b>
Bassa Tensione <i>Low Voltage</i>	<b>2014/35/EU</b>	RoHS <i>RoHS</i>	<b>2011/65/EU</b>

Cisano sul Neva, 12 September 2022

Egon Stocca  
General Manager





# 1 – General information

## 1.1 Documentation

The following documents 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.

## 1.2 Introduction

LR-01 is a programmable logger repeater directly connected to a personal computer via optical fiber cable to USB adapter. It is also possible to connect to PCs via USB and Wi-Fi with dedicated software (see Chapter 4). With Bluetooth connection is available an App for mobile device (see Chapter 6). With its internal rechargeable battery, it measures electric and magnetic fields through more than 32 different probes and immediately records and plots the results. The probes can be attached to the dedicated heavy-duty connector on the LR-01 via the specific adapter, which also features excellent shielding properties and can therefore be used at very high field strengths without interference. In addition to the standard Narda Probes Manager software delivered with the Logger Repeater, the communication and control protocol is freely available so users can fully control the LR-01 with their usual test software.

LR-01 provides also programmable on-board acoustic, visual and vibration alarms. It is an ideal solution for EMC applications, in chambers and TEM/GTEM cells, and in EMF applications.

An optional Indoor Area Monitor kit makes it possible to easily transform the instrument into a performing very compact field monitoring station; please refer to paragraph 10.13 for further information.



**Fig. 1-1** LR-01 Adapter and Probes

## 1.3 Standard Accessories

Standard accessories included with LR-01 are:

- USB Cable – USB(A)/USB(C) 2m
- AC/DC Converter with plug adapters
- Cable, FO Duplex, RP-02, 10 m
- USB-OC Optical Converter
- Conical Tripod support
- LR-01 Software Media including User's Manual;
- Software Narda Probes Manager on Software Media
- User's Manual with Return Form for repair
- Checklist of the accessories
- Calibration Certificate

#### 1.4 LR01 Optional accessories

LR-01 accessories supplied separately (on charge):

- LR01-8053 Adapter
- LR01-8059 Adapter
- LR01 Connectors cover
- Cable, FO Duplex, RP-02, 20 m
- Cable, FO Duplex, RP-02, 40 m
- Carrying case
- EP-105 E-Field Sensor
- EP-183 E-Field Sensor
- EP-201 E-Field Sensor
- EP-300 E-Field Sensor
- EP-301 E-Field Sensor
- EP-330 E-Field Sensor
- EP-333 E-Field Sensor
- EP-33A E-Field Sensor
- EP-33B E-Field Sensor
- EP-33C E-Field Sensor
- EP-33M E-Field Sensor
- EP-408 E-Field Sensor
- EP-44M E-Field Sensor
- EP-645 E-Field Sensor
- EP-745 E-Field Sensor
- HP-032 H-Field Sensor
- HP-050 H-Field Sensor
- HP-051 H-Field Sensor
- HP-102 H-Field Sensor
- EP-1B-01 E-Field Sensor
- EP-1B-03 E-Field Sensor
- EP-1B-04 E-Field Sensor
- EP-1B-05 E-Field Sensor
- EP-1B-06 E-Field Sensor
- EP-1B-08 E-Field Sensor
- EP-3B-01 E-Field Sensor
- EP-4B-01 E-Field Sensor
- EP-4B-02 E-Field Sensor
- HP-1B-01 H-Field Sensor
- EHP-2B-01 E and H-Field Sensor
- EHP-2B-02 E and H-Field Sensor
- EHP-2B-03 E and H-Field Sensor
- EHP-2B-04 E and H-Field Sensor
- TT-01 Fiber Glass Telescopic Support
- TR-02A Tripod complete with joint
- Shoulder Sling, Neck Belt for LR-01 (Safety lanyard ¼" thread)
- Android, WearOS (Smartwatch) and iOS Utility

#### 1.5 LR01/IAM Optional accessories

LR01/IAM accessories supplied separately (on charge):

- LR01/IAM Indoor Area Monitor kit including:
  - Wall support bracket, 2 pcs. Washer and 2 pcs Screws M4x20mm
  - 1 pcs. Screws 1/4"x5/8
  - Radome, 3 pcs. plastic washer and 3pcs. Screws M4x10mm
  - 2.5mm and 3mm Allen Key
  - Software Media + User's Manual + Calibration Certificate
- Cable, DB15(m)/DB15(m), 1,8 m
- Ethernet cable, 5 m
- Cable, FO Duplex, RP-02, 20 m
- Cable, FO Duplex, RP-02, 40 m
- Power Over Ethernet
- Carrying case
- EHP-2B-05 E and H-Field Sensor
- EHP-2B-06 E and H-Field Sensor
- EHP-2B-07 E and H-Field Sensor
- EHP-2B-08 E and H-Field Sensor

**1.6 Main specifications** When not differently specified, the following specifications refers to an operating ambient temperature of 23°C and relative humidity of 50%.

<b>Table 1-1 Technical specifications</b>	
<b>Probe compatibility</b>	8053 and 8059 standards
<b>Interfaces</b>	Optical (RP-02), USB (USB(C)), WiFi (802.11 b/g/n), Bluetooth (5.0)
<b>Optical fiber connection</b>	Serial Optical Interface 115200 Baud RP02 connector up to 40 m (USB-OC)
<b>Sampling time</b>	Automatic from 0.3 s to 1 s <sup>(1)</sup>
<b>Internal log interval</b>	Settable from 1 sec to 1 hour, manually triggered, on adjustable threshold
<b>Max data storage capability</b>	Up to 250000 points
<b>Probe depending specifications</b>	Frequency range, Frequency flatness, Dynamic range, Resolution, Sensitivity, Accuracy, Overload, Measurement units, Detector, Sampling rate, Acquisition method
<b>GPS module</b>	Satellite System GPS + QZSS
<b>Supplementary data</b> Battery voltage and capacity Data & Time Temperature Humidity (relative) Pressure GPS coordinates Altitude Compass Speed Acceleration	Internal sensor for reporting and logging
<b>Warnings and Alarms</b>	Field, Probe, Temperature, Humidity, Battery
<b>Notifications</b>	Communications
<b>Alarms indication</b>	Acoustic, visual, vibration, data log
<b>Internal memory</b>	256 Mb
<b>Calibration</b> <sup>(2)</sup>	internal E <sup>2</sup> PROM
<b>Internal battery</b>	3.7 V / 1320 mAh Li-Ion, rechargeable
<b>Operating time</b> <sup>(3)</sup>	Stand alone mode up to 100 hours Optical mode <sup>(4)</sup> up to 60 hours BT mode <sup>(4)</sup> up to 20 hours WiFi mode <sup>(4)</sup> up to 10 hours
<b>Recharging time</b>	< 2.5 hours
<b>External supply</b>	5 VDC, I <sub>max</sub> 600 mA
<b>Firmware updating</b>	Through the optical link
<b>Self test</b>	Automatic at power on
<b>Operating temperature</b>	-20 to +55 °C
<b>Storage temperature</b>	-30 to +75°C
<b>Operating relative humidity</b> <sup>(5)</sup>	5 to 95 %
<b>Ingress protection</b>	Up to IP65 <sup>(6)</sup>
<b>Dimensions</b>	φ 54 mm, L 116 mm
<b>Weight</b>	300 g
<b>Tripod support</b>	Threaded insert 1/4"

Specification are subject to change without notice

- (1) Probe depending
- (2) Recommended re-calibration interval 24 month
- (3) Operating time depends on the driven probe, measure setting, and communication channel
- (4) Continuous communication worst case
- (5) Without condensation
- (6) With Area Monitor option

1.7 LR-01 panels

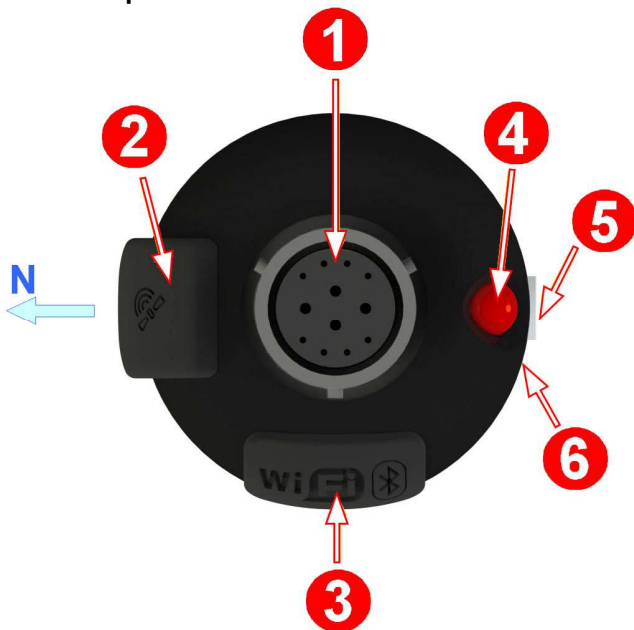


Fig. 1-2 Top panel

**Legend:**

- 1. Robust bayonet connector
- 2. GPS antenna
- 3. Wireless antennas
- 4. Visual alarm
- 5. Manual log button
- 6. Vibration alarm

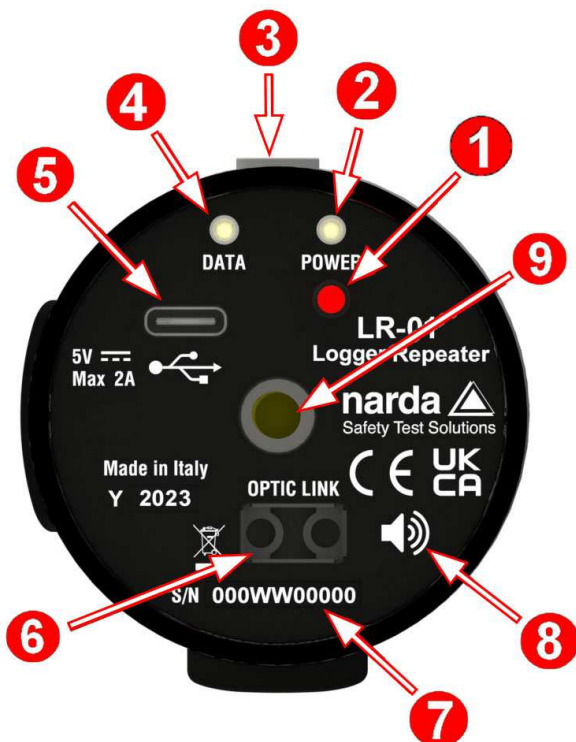


Fig. 1-3 Bottom panel

**Legend:**

- 1. ON/OFF button
- 2. Power ON LED
- 3. Manual log button
- 4. Status LED
- 5. USB-C connector
- 6. Fiber Optic connector
- 7. Serial Number
- 8. Acoustic alarm
- 9. Threaded insert UNC 1/4"



**NOTE** Compass heading 0 degrees (North) corresponds to the direction where the GPS antenna is located.

## 1.8 Field Probes

LR-01 can measure and log fields detected by many electric and magnetic field probes.

Both the probes of the 8059 family and the probes of the 8053 family are compatible with the Logger Repeater, by means of the appropriate adapter. In addition, a series of probes, aimed at the use of indoor area monitors has been developed, specifically for LR-01.

Narda EMF Area Monitor AMB-8059 has a set of electric and magnetic probes covering the frequency range from 10 Hz to 60 GHz.

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.

LR-01 measurement system is equipped with a series of electric and magnetic field probes in the frequency range from 500 kHz to 60 GHz



The following list shows the 8059 probes:

<b>TABLE 1-2 8059 Field Probes</b>		
<b>Field Probe</b>	<b>Range of frequency</b>	<b>Reading</b>
ELECTRIC FIELD PROBE EP-1B-01	100 kHz – 3 GHz	0.2 – 200 V/m
TRI-BAND ELECTRIC FIELD PROBE EP-3B-01	100 kHz – 3 GHz	0.2 – 200 V/m
MAGNETIC FIELD PROBE HP-1B-01	10 Hz – 5 kHz	50 nT – 200 $\mu$ T
QUAD-BAND ELECTRIC FIELD PROBE EP-4B-01	100 kHz – 3 GHz	0.03 – 200 V/m
ELECTRIC FIELD PROBE EP-1B-03	100 kHz – 7 GHz	0.2 – 200 V/m
QUAD-BAND ELECTRIC FIELD PROBE EP-4B-02	100 kHz – 7 GHz	(0.03) 0.2 – 200 V/m
ELECTRIC FIELD PROBE EP-1B-04	10 Hz – 5 KHz	5 V/m – 20 kV/m
ELECTRIC FIELD PROBE EP-1B-05	300 kHz – 18 GHz	0.5 – 800 V/m
ELECTRIC FIELD PROBE EP-1B-06	300 kHz – 40 GHz	0.5 – 800 V/m
ELECTRIC FIELD PROBE EP-1B-08	100 kHz – 8 GHz	0.2 – 200 V/m
ELECTRIC AND MAGNETIC FIELD SHAPED PROBE EHP-2B-01	E: 500 kHz – 9.25 GHz H: 20 MHz – 1 GHz	E: 0.1 (0.5) – 1000 % H: 0.3 (1.5) – 1000 %
ELECTRIC AND MAGNETIC FIELD SHAPED PROBE EHP-2B-02	E: 500 kHz – 60 GHz H: 20 MHz – 1 GHz	E: 0.1 (0.5) – 1000 % H: 0.3 (1.5) – 1000 %
ELECTRIC AND MAGNETIC FIELD SHAPED PROBE EHP-2B-03	E: 1.34 MHz – 9.25 GHz H: 1 MHz – 1 GHz	E: 0.1 (0.5) – 1000 % H: 0.3 (1.5) – 1000 %
ELECTRIC AND MAGNETIC FIELD SHAPED PROBE EHP-2B-04	E: 1.34 MHz – 60 GHz H: 1 MHz – 1 GHz	E: 0.1 (0.5) – 1000 % H: 0.3 (1.5) – 1000 %

With EHP-2B-XX weighted models of field probes, after selecting the desired limit, the meter gives the percentage of level referred to it. Probes belonging to this group allow measurements compensation based on frequency.

If the frequency of the signal to be measured is known, it is possible to apply an automatic flatness correction, and the LR-01 is also able to properly switch between linear and quadratic detection, as the selected standard requires, depending on the frequency. In other words, the field level evaluation becomes linear under 10 or 30 MHz, depending on the selected standard.



The following list shows the 8053 probes:

<b>TABLE 1-3 8053 Field Probes</b>		
<b>Field Probes</b>	<b>Frequency range</b>	<b>Level range</b>
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-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 $\mu$ T
MAGNETIC FIELD PROBE HP-051	10 Hz – 5 kHz	50 nT – 200 $\mu$ T



**The probes of the 8053 family have flatness compensation factors on board that can be applied when the signal source frequency is known, in order to make the measurement even more accurate.**

The following list shows the LR-01 specific probes, designed for indoor area monitor:

<b>TABLE 1-4 LR-01 Indoor Area Monitor Field Probes</b>		
<b>Field Probe</b>	<b>Range of frequency</b>	<b>Reading</b>
ELECTRIC AND MAGNETIC FIELD SHAPED PROBE EHP-2B-05	E: 500 kHz – 9.25 GHz H: 20 MHz – 1 GHz	E: 0.1 (0.5) – 1000 % H: 0.3 (1.5) – 1000 %
ELECTRIC AND MAGNETIC FIELD SHAPED PROBE EHP-2B-06	E: 500 kHz – 60 GHz H: 20 MHz – 1 GHz	E: 0.1 (0.5) – 1000 % H: 0.3 (1.5) – 1000 %
ELECTRIC AND MAGNETIC FIELD SHAPED PROBE EHP-2B-07	E: 1.34 MHz – 9.25 GHz H: 1 MHz – 1 GHz	E: 0.1 (0.5) – 1000 % H: 0.3 (1.5) – 1000 %
ELECTRIC AND MAGNETIC FIELD SHAPED PROBE EHP-2B-08	E: 1.34 MHz – 60 GHz H: 1 MHz – 1 GHz	E: 0.1 (0.5) – 1000 % H: 0.3 (1.5) – 1000 %



**NOTE**

The probes of this family are designed to achieve compact dimensions, useful for indoor area monitoring, therefore resulting a good compromise between size and performance.



**TABLE 1-5 Technical Specifications of 8059 Field Probes**

**ELECTRIC FIELD PROBE EP-1B-01**

<b>Frequency range</b>	0.1 – 3000 MHz
<b>Reading range</b>	0.2 – 200 V/m
<b>Overload</b>	600 V/m
<b>Dynamic range</b>	> 60 dB
<b>Linearity</b>	± 0.5 dB (0.5 to 100 V/m) @ 50 MHz
<b>Resolution</b>	0.01 V/m
<b>Sensitivity</b>	0.2 V/m
<b>Flatness @ 20V/m</b>	1 – 200 MHz ±0.8 dB 150 kHz - 3 GHz ±1.5 dB
<b>Anisotropy @ 6V/m</b>	± 0.8 dB @ 50 MHz (typical 0.6 dB)
<b>Rejection of magnetic field</b>	> 20 dB
<b>Temperature error</b>	0.1 dB/°C
<b>A/D conversion</b>	On board
<b>Calibration factors</b>	On board E <sup>2</sup> prom
<b>Temperature sensor</b>	On board
<b>Dimensions</b>	Length 450mm, diameter 55mm
<b>Weight</b>	180g



**Fig. 1-4 EP-1B-01 probe**

## **TRI-BAND ELECTRIC FIELD PROBE EP-3B-01**

	<b>Wide band</b>	<b>Low pass</b>	<b>High pass</b>
<b>Frequency range</b>	0.1 – 3000 MHz	0.1 – 862 MHz	933 – 3000 MHz
<b>Reading range</b>	0.2 – 200 V/m		
<b>Overload</b>	600 V/m		
<b>Dynamic range</b>	> 60 dB		
<b>Linearity</b>	± 0.5 dB (0.5 to 100 V/m) @ 50 MHz	± 0.5 dB (0.5 to 100 V/m)	± 0.5 dB (0.5 to 100 V/m)
<b>Resolution</b>	0.01 V/m		
<b>Sensitivity</b>	0.2 V/m		
<b>Flatness @ 20V/m</b>	1 – 200 MHz ±0.8 dB 150 kHz - 3 GHz ±1.5 dB	1 – 200 MHz ±0.8 dB 150 kHz - 862 MHz ±1.5 dB	933 – 3000 MHz ±1.5 dB
<b>Anisotropy @ 6V/m</b>	± 0.8 dB @ 50 MHz (typical 0.6 dB)		+/- 0.8 dB @ 1 GHz (typical 0.6 dB)
<b>Attenuation out of band</b>	Not applicable	933 MHz – 3 GHz > 23 dB (respect to 50 MHz)	0.1 – 862 MHz > 23 dB (respect to 1 GHz)
<b>Rejection of magnetic field</b>	> 20 dB		
<b>Temperature error</b>	0.1 dB/°C		
<b>A/D conversion</b>	On board		
<b>Calibration factors</b>	On board E <sup>2</sup> prom		
<b>Temperature sensor</b>	On board		
<b>Dimensions</b>	Length 450mm, diameter 55mm		
<b>Weight</b>	180g		



**Fig. 1-5 EP-3B-01 Probe**

## **MAGNETIC FIELD PROBE HP-1B-01**

<b>Frequency range</b>	10 Hz – 5 kHz
<b>Reading range</b>	50 nT – 200 $\mu$ T
<b>Overload</b>	> 1 mT
<b>Dynamic range</b>	> 72 dB
<b>Linearity</b>	$\pm$ 0.5 dB (200 nT to 100 $\mu$ T) @ 50 Hz
<b>Resolution</b>	1 nT
<b>Sensitivity</b>	50 nT
<b>Flatness @ 40 Hz - 1 kHz</b>	1 dB (typical 0.6)
<b>Anisotropy @ 50 Hz 3<math>\mu</math>T</b>	0.3 dB
<b>Rejection of electric field</b>	> 20 dB
<b>A/D Conversion</b>	On board
<b>Calibration factors</b>	On board E <sup>2</sup> prom
<b>Temperature sensor</b>	On board
<b>Dimensions</b>	Length 83 mm, diameter 53 mm
<b>Weight</b>	110g



**Fig. 1-6 HP-1B-01 Probe**

## **QUAD-BAND ELECTRIC FIELD PROBE EP-4B-01**

	<b>Wide band</b>	<b>EGSM 900 Band pass</b>	<b>EGSM 1800 Band pass</b>	<b>UMTS Band pass</b>
<b>Frequency range</b>	0.1 – 3000 MHz	925 – 960 MHz	1805 – 1880 MHz	2110 – 2170 MHz
<b>Level range</b>	0.2 – 200 V/m	0.03 – 30 V/m		
<b>Dynamic range</b>	> 60 dB	> 60 dB		
<b>Linearity</b>	± 0.5 dB (0.5 to 100 V/m)	± 0.5 dB (0.06 to 20 V/m)		
<b>Resolution</b>	0.01 V/m			
<b>Sensitivity</b>	0.2 V/m	0.03 V/m		
<b>Flatness @ 6 V/m</b>	1 – 200 MHz +/-0.8 dB 0.15 MHz - 3 GHz +/-1.5 dB	925 – 960 MHz +0.5 / -2.5 dB	1805 MHz – 1880 MHz +0.5 / -2.5 dB	2110 – 2170 MHz +0.5 / -2.5 dB
<b>Anisotropy @ 3 V/m</b>	± 0.8 dB @ 50 MHz (typical 0.6 dB)	± 0.8 dB (typical 0.6 dB) @ 942.5 MHz	± 0.8 dB (typical 0.6 dB) @ 1842.5 MHz	± 0.8 dB (typical 0.6 dB) @ 2140 MHz
<b>Out band attenuation</b>	not applicable	Rejection to 1842 GSM = 25 dB to 2140 UMTS = 25 dB	Rejection to 942 GSM = 15 dB to 2140 UMTS = 13 dB	Rejection to 942 GSM = 17 dB to 1842 GSM = 10 dB
<b>H filed rejection</b>	> 20 dB			
<b>Temperature error</b>	0°C+50°C = ± 0.3 dB		-20°C+0°C = - 0.1 dB / °C	
<b>Center frequency drift</b>	not applicable	40°C+60°C = ± 100 kHz	-20°C+40°C = -100 kHz / °C	
<b>A/D conversion</b>	On board			
<b>Calibration factors</b>	On board E <sup>2</sup> prom			
<b>Temperature sensor</b>	On board			
<b>Size</b>	Length 450 mm, diameter 55 mm			
<b>Weight</b>	210g			



**Fig. 1-7 EP-4B-01 probe**

## **ELECTRIC FIELD PROBE EP-1B-03**

<b>Frequency range</b>	0.1 – 7000 MHz
<b>Reading range</b>	0.2 – 200 V/m
<b>Overload</b>	600 V/m
<b>Dynamic range</b>	> 60 dB
<b>Linearity</b>	± 0.5 dB (0.5 to 100 V/m) @ 50 MHz
<b>Resolution</b>	0.01 V/m
<b>Sensitivity</b>	0.2 V/m
<b>Flatness @ 20V/m</b>	3 MHz - 200 MHz +/-0.8 dB 0.15 MHz - 3 GHz +/-1.5 dB 0.1 MHz - 6 GHz +/-2 dB
<b>Anisotropy @ 6V/m</b>	± 0.8 dB @ 50 MHz (typical 0.6 dB)
<b>Rejection of magnetic field</b>	> 20 dB
<b>Temperature error</b>	0.1 dB/°C
<b>A/D conversion</b>	On board
<b>Calibration factors</b>	On board E <sup>2</sup> prom
<b>Temperature sensor</b>	On board
<b>Dimensions</b>	Length 450mm, diameter 55mm
<b>Weight</b>	180g



**Fig. 1-8 EP-1B-03 probe**

## QUAD-BAND ELECTRIC FIELD PROBE EP-4B-02

	Wide band	EGSM 900 Band pass	EGSM 1800 Band pass	UMTS Band pass
Frequency range	0.1 – 7000 MHz	925 – 960 MHz	1805 – 1880 MHz	2110 – 2170 MHz
Level range	0.2 – 200 V/m	0.03 – 30 V/m		
Dynamic range	> 60 dB	> 60 dB		
Linearity	± 0.5 dB (0.5 to 100 V/m) @ 50 MHz	± 0.5 dB (0.1 to 20 V/m)		
Resolution	0.01 V/m			
Sensitivity	0.2 V/m	0.03 V/m		
Flatness @ 6 V/m	3 – 200 MHz +/-1.5 dB 0.15 MHz - 3 GHz +/-2 dB 0.1 MHz – 7 GHz +/- 3 dB	925 – 960 MHz +0.5 / -2.5 dB	1805 MHz – 1880 MHz +0.5 / -2.5 dB	2110 – 2170 MHz +0.5 / -2.5 dB
Anisotropy @ 3 V/m	± 0.8 dB @ 50 MHz (typical 0.6 dB)	± 0.8 dB @ 942.5 MHz (typical 0.6 dB)	± 0.8 dB @ 1842.5 MHz (typical 0.6 dB)	± 0.8 dB @ 2140 MHz (typical 0.6 dB)
Out of band attenuation	not applicable	Rejection to 1842 GSM = 25 dB to 2140 UMTS = 25 dB	Rejection to 942 GSM = 15 dB to 2140 UMTS = 13 dB	Rejection to 942 GSM = 17 dB to 1842 GSM = 10 dB
H filed rejection	> 20 dB			
Temperature error	0°C±50°C = ± 0.3 dB		-20°C±0°C = - 0.1 dB / °C	
Center frequency drift	not applicable	40°C±60°C = ± 100 kHz	-20°C±40°C = -100 kHz / °C	
A/D conversion	On board			
Calibration factors	On board E <sup>2</sup> prom			
Temperature sensor	On board			
Size	Length 450 mm, diameter 55 mm			
Weight	210g			



**Fig. 1-9** EP-4B-02 probe

## **ELECTRIC FIELD PROBE EP-1B-04**

<b>Frequency range</b>	10 Hz – 5 kHz
<b>Level range</b>	5 V/m – 20 kV/m
<b>Overload</b>	> 30 kV/m
<b>Dynamic range</b>	> 72 dB
<b>Resolution</b>	0.1 V/m
<b>Sensitivity</b>	5 V/m
<b>Flatness @ 100 V/m (40 Hz - 1 kHz)</b>	1 dB (typical 0,5 )
<b>Anisotropy @ 100 V/m</b>	0.5 dB @ 50 Hz
<b>Rejection of magnetic field</b>	> 20 dB
<b>A/D Conversion</b>	On board
<b>Calibration factors</b>	On board E <sup>2</sup> prom
<b>Temperature sensor</b>	On board
<b>Dimensions</b>	Length 77 mm, diameter 53 mm
<b>Weight</b>	110g



**Fig. 1-10** EP-1B-04 probe

## **ELECTRIC FIELD PROBE EP-1B-05**

<b>Frequency range</b>	0.3 MHz – 18 GHz
<b>Reading range</b>	0.5 – 800 V/m
<b>Overload</b>	1200 V/m
<b>Dynamic range</b>	> 64 dB
<b>Linearity</b>	±0.5 dB (±0.3 typical) (1.2 V/m to 200 V/m) @ 200 MHz
<b>Resolution</b>	0.01 V/m
<b>Sensitivity</b>	0.5 V/m
<b>Flatness @ 6 V/m</b>	1 MHz to 1 GHz ±1.5 dB 1 GHz to 12 GHz ±3 dB 12 GHz to 18 GHz ±4 dB
<b>Anisotropy @ 200 MHz</b>	±0.8 dB (typical 0.5 dB @ 930 and 1800 MHz)
<b>Rejection of magnetic field</b>	> 20 dB
<b>Temperature error</b>	0.02 dB/°C
<b>A/D conversion</b>	On board
<b>Calibration factors</b>	On board E <sup>2</sup> prom
<b>Temperature sensor</b>	On board
<b>Dimensions</b>	Length 450mm, diameter 55mm
<b>Weight</b>	180g



**Fig. 1-11** EP-1B-05 probe



## **ELECTRIC FIELD PROBE EP-1B-06**

<b>Frequency range</b>	0.3 MHz – 40 GHz
<b>Reading range</b>	0.5 – 800 V/m
<b>Overload</b>	1200 V/m
<b>Dynamic range</b>	> 64 dB
<b>Linearity</b>	±0.5 dB (±0.3 typical) (1.2 V/m to 200 V/m) @ 200 MHz
<b>Resolution</b>	0.01 V/m
<b>Sensitivity</b>	0.5 V/m
<b>Flatness @ 6 V/m</b>	1 MHz to 1 GHz ±1.5 dB 1 GHz to 12 GHz ±3 dB 12 GHz to 23 GHz ±4 dB 23 GHz to 40 GHz ±5 dB
<b>Anisotropy @ 200 MHz</b>	±0.8 dB (typical 0.5 dB @ 930 and 1800 MHz)
<b>Rejection of magnetic field</b>	> 20 dB
<b>Temperature error</b>	0.02 dB/°C
<b>A/D conversion</b>	On board
<b>Calibration factors</b>	On board E <sup>2</sup> prom
<b>Temperature sensor</b>	On board
<b>Dimensions</b>	Length 450mm, diameter 55mm
<b>Weight</b>	180g



**Fig. 1-12** EP-1B-06 probe

## **ELECTRIC FIELD PROBE EP-1B-08**

<b>Frequency range</b>	0.1 MHz – 8 GHz
<b>Reading range</b>	0.2 – 200 V/m
<b>Overload</b>	600 V/m
<b>Dynamic range</b>	> 60 dB
<b>Linearity</b>	±0.5 dB (0.5 V/m to 100 V/m) @ 50 MHz
<b>Resolution</b>	0.01 V/m
<b>Sensitivity</b>	0.2 V/m
<b>Flatness @ 20 V/m</b>	3 MHz - 200 MHz ±0.8 dB 0.15 kHz - 6 GHz ±2 dB 0.1 kHz - 8 GHz ±3 dB
<b>Anisotropy @ 6 V/m</b>	±0.8 dB (typical 0.6 dB @ 50 MHz)
<b>Rejection of magnetic field</b>	> 20 dB
<b>Temperature error</b>	0.1 dB/°C
<b>A/D conversion</b>	On board
<b>Calibration factors</b>	On board E <sup>2</sup> prom
<b>Temperature sensor</b>	On board
<b>Dimensions</b>	Length 450mm, diameter 55mm
<b>Weight</b>	180g



**Fig. 1-13** EP-1B-08 probe

**DUAL-BAND ELECTRIC AND MAGNETIC SHAPED FIELD PROBE EHP-2B-01**  
**For ICNIRP 1998 and SC6 2015 \***

		<b>Electric Field</b>		<b>Magnetic Field</b>	
<b>Frequency range</b>	<b>ICNIRP 1998</b>	<b>Occupational</b>	0.5 – 9250 MHz	20 – 1000 MHz	
		<b>General Public</b>			
	<b>SC6 2015</b>	<b>Controlled</b>	3 – 9250 MHz		
		<b>Uncontrolled</b>			
<b>Level range <sup>(1)</sup></b>	<b>Occupational / Controlled</b>		0.1 – 1000 %	0.3 – 1000 %	
	<b>General Public / Uncontrolled</b>		0.5 – 1000 %	1.5 – 1000 %	
<b>Overload</b>			2000 %		
<b>Linearity <sup>(2)</sup></b>			+/- 0.5 dB		
<b>Power (Amplitude) dynamic range</b>	<b>Occupational / Controlled</b>		40 (80) dB	35 (70) dB	
	<b>General Public / Uncontrolled</b>		33 (66) dB	28 (56) dB	
<b>Resolution</b>			0.01 %		
<b>Sensitivity</b>	<b>Occupational / Controlled</b>		0.1 %	0.3 %	
	<b>General Public / Uncontrolled</b>		0.5 %	1.5 %	
<b>Frequency flatness <sup>(3)</sup> (typ)</b>	<b>ICNIRP 1998</b>	<b>Occupational</b>	0.5 – 3 MHz +4/-2 dB	20 – 1000 MHz +/-3 dB	
		<b>General Public</b>	3 – 9250 MHz +/-3 dB		
	<b>SC6 2015</b>	<b>Controlled</b>	3 – 10 MHz +2/-3 dB		
		<b>Uncontrolled</b>	10 – 9250 MHz +/-3 dB		
			3 – 9250 MHz +/-3.5 dB		
<b>Anisotropy <sup>(4)</sup></b>			+/- 0.5 dB		
<b>Temperature error <sup>(4)</sup></b>			0.03 dB/°C	0.01 dB/°C	
<b>Temperature sensor</b>			On board		
<b>Field sensor</b>			Triaxial orthogonal dipoles	Triaxial orthogonal loops	
<b>A/D conversion</b>			On board		
<b>Calibration <sup>(5)</sup></b>			internal E <sup>2</sup> PROM		
<b>Operating temperature</b>			-20 to +55 °C		
<b>Operating relative humidity <sup>(6)</sup></b>			5 to 95 %		
<b>Storage temperature</b>			-30 to +75°C		
<b>Dimensions</b>			450 mm length, 55mm diameter		
<b>Weight</b>			200 g		

Specification are subject to change without notice

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

Note (1): Power density referred.

Note (2): At 50 MHz on related level range 6dB above the noise floor

Note (3): Relative to 10% of the standard limit

Note (4): At 50 MHz / 10% of the standard limit

Note (5): Recommended re-calibration interval 24 month

Note (6): Without condensation

(\*) All probes include on board A/D conversion, calibration factors on E<sub>2</sub>PROM, and temperature sensor



**Fig. 1-14 EHP-2B-01 probe**

**DUAL-BAND ELECTRIC AND MAGNETIC SHAPED FIELD PROBE EHP-2B-02**  
**For ICNIRP 1998 and SC6 2015 \***

			Electric Field	Magnetic Field
Frequency range	ICNIRP 1998	Occupational	0.5 MHz – 60 GHz	20 – 1000 MHz
		General Public	3 MHz – 60 GHz	
	SC6 2015	Controlled		
		Uncontrolled		
Level range <sup>(1)</sup>	Occupational / Controlled		0.1 – 1000 %	0.3 – 1000 %
	General Public / Uncontrolled		0.5 – 1000 %	1.5 – 1000 %
Overload			2000 %	
Linearity <sup>(2)</sup>			+/- 0.5 dB	
Power (Amplitude) dynamic range	Occupational / Controlled		40 (80) dB	35 (70) dB
	General Public / Uncontrolled		33 (66) dB	28 (56) dB
Resolution			0.01 %	
Sensitivity	Occupational / Controlled		0.1 %	0.3 %
	General Public / Uncontrolled		0.5 %	1.5 %
Frequency flatness <sup>(3)</sup> (typ)	ICNIRP 1998	Occupational	0.5 – 3 MHz +4/-2 dB 3 – 18000 MHz +/-3 dB 18 – 60 GHz +8/-1 dB	20 – 1000 MHz +/-3 dB
		General Public	3 – 10 MHz +2/-3 dB 10 – 18000 MHz +/-3 dB 18 – 60 GHz +8/-1 dB	
	SC6 2015	Controlled	3 – 9250 MHz +/-3.5 dB 9250 – 18000 MHz +6/0 dB	
		Uncontrolled	18 – 60 GHz +8/-1 dB	
Anisotropy <sup>(4)</sup>			+/- 0.5 dB	
Temperature error <sup>(4)</sup>			0.03 dB/°C	0.01 dB/°C
Temperature sensor			On board	
Field sensor			Triaxial orthogonal dipoles	Triaxial orthogonal loops
A/D conversion			On board	
Calibration <sup>(5)</sup>			internal E <sup>2</sup> PROM	
Operating temperature			-20 to +55 °C	
Operating relative humidity <sup>(6)</sup>			5 to 95 %	
Storage temperature			-30 to +75°C	
Dimensions			450 mm length, 55mm diameter	
Weight			200 g	

Specification are subject to change without notice

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

Note (1): Power density referred.

Note (2): At 50 MHz on related level range 6dB above the noise floor

Note (3): Relative to 10% of the standard limit

Note (4): At 50 MHz / 10% of the standard limit

Note (5): Recommended re-calibration interval 24 month

Note (6): Without condensation

(\*) All probes include on board A/D conversion, calibration factors on E2PROM, and temperature sensor



**Fig. 1-15 EHP-2B-02 probe**

**DUAL-BAND ELECTRIC AND MAGNETIC SHAPED FIELD PROBE EHP-2B-03**  
**For ICNIRP 2020 and FCC 96-326 \***

			Electric Field	Magnetic Field
Frequency range	ICNIRP 2020	Occupational General Public	5 – 9250 MHz	1 – 1000 MHz
	FCC 96-326	Occupational General Pop.	2 – 9250 MHz 1.34 – 9250 MHz	2 – 1000 MHz 1 – 1000 MHz
Level range <sup>(1)</sup>	Occupational		0.1 – 1000 %	0.3 – 1000 %
	General P.		0.5 – 1000 %	1.5 – 1000 %
Overload			2000 %	
Linearity <sup>(2)</sup>			+/- 0.5 dB	
Power (Amplitude) dynamic range	Occupational		40 (80) dB	35 (70) dB
	General P.		33 (66) dB	28 (56) dB
Resolution			0.01 %	
Sensitivity	Occupational		0.1 %	0.3 %
	General P.		0.5 %	1.5 %
Frequency flatness <sup>(3)</sup> (typ)	ICNIRP 2020	Occupational	5 – 9250 MHz +/-2 dB	1 - 200 MHz +3.5/-1 dB
		General Public		200 - 1000 MHz +3.5/-4 dB
	FCC 96-326	Occupational	2 – 9250 MHz +/-3 dB	2 – 1000 MHz +/-3 dB
		General Pop.	1.34 – 9250 MHz +/-3 dB	1 – 1000 MHz +/-3 dB
Anisotropy <sup>(4)</sup>			+/- 0.5 dB	
Temperature error <sup>(4)</sup>			0.03 dB/°C	0.01 dB/°C
Temperature sensor			On board	
Field sensor			Triaxial orthogonal dipoles	Triaxial orthogonal loops
A/D conversion			On board	
Calibration <sup>(5)</sup>			internal E <sup>2</sup> PROM	
Operating temperature			-20 to +55 °C	
Operating relative humidity <sup>(6)</sup>			5 to 95 %	
Storage temperature			-30 to +75°C	
Dimensions			450 mm length, 55mm diameter	
Weight			200 g	

Specification are subject to change without notice

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

FCC 96-326 considers the terms general population/uncontrolled and occupational/controlled.

Note (1): Power density referred.

Note (2): At 50 MHz on related level range 6dB above the noise floor

Note (3): Relative to 10% of the standard limit

Note (4): At 50 MHz / 10% of the standard limit

Note (5): Recommended re-calibration interval 24 month

Note (6): Without condensation

(\*) All probes include on board A/D conversion, calibration factors on E2PROM, and temperature sensor



**Fig. 1-16 EHP-2B-03 probe**

**DUAL-BAND ELECTRIC AND MAGNETIC SHAPED FIELD PROBE EHP-2B-04**  
**For ICNIRP 2020 and FCC 96-326 \***

		Electric Field	Magnetic Field
Frequency range	ICNIRP 2020	Occupational General Public	5 MHz – 60 GHz 1 – 1000 MHz
	FCC 96-326	Occupational General Pop.	2 MHz – 60 GHz 1.34 MHz – 60 GHz 1 – 1000 MHz
Level range <sup>(1)</sup>	Occupational	0.1 – 1000 %	0.3 – 1000 %
	General P.	0.5 – 1000 %	1.5 – 1000 %
Overload	2000 %		
Linearity <sup>(2)</sup>	+/- 0.5 dB		
Power (Amplitude) dynamic range	Occupational	40 (80) dB	35 (70) dB
	General P.	33 (66) dB	28 (56) dB
Resolution	0.01 %		
Sensitivity	Occupational	0.1 %	0.3 %
	General P.	0.5 %	1.5 %
Frequency flatness <sup>(3)</sup> (typ)	ICNIRP 2020	Occupational	5 – 9250 MHz +/-2 dB
		General Public	9250 – 18000 MHz +3/-2 dB 18 – 60 GHz +8/-1 dB
	FCC 96-326	Occupational	2 – 18000 MHz +/-3 dB 18 – 60 GHz +8/-1 dB
		General Pop.	1.34 – 18000 MHz +/-3 dB 18 – 60 GHz +8/-1 dB
1 – 200 MHz +3.5/-1 dB 200 – 1000 MHz +3.5/-4 dB			
2 – 1000 MHz +/-3 dB			
1 – 1000 MHz +/-3 dB			
Anisotropy <sup>(4)</sup>	+/- 0.5 dB		
Temperature error <sup>(4)</sup>	0.03 dB/°C		0.01 dB/°C
Temperature sensor	On board		
Field sensor	Triaxial orthogonal dipoles	Triaxial orthogonal loops	
A/D conversion	On board		
Calibration <sup>(5)</sup>	internal E <sup>2</sup> PROM		
Operating temperature	-20 to +55 °C		
Operating relative humidity <sup>(6)</sup>	5 to 95 %		
Storage temperature	-30 to +75°C		
Dimensions	450 mm length, 55mm diameter		
Weight	200 g		

Specification are subject to change without notice

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

FCC 96-326 considers the terms general population/uncontrolled and occupational/controlled.

Note (1): Power density referred.

Note (2): At 50 MHz on related level range 6dB above the noise floor

Note (3): Relative to 10% of the standard limit

Note (4): At 50 MHz / 10% of the standard limit

Note (5): Recommended re-calibration interval 24 month

Note (6): Without condensation

(\*) All probes include on board A/D conversion, calibration factors on E2PROM, and temperature sensor



Fig. 1-17 EHP-2B-04 probe

**TABLE 1-6 Technical Specifications of LR-01 and IAM Indoor Area Monitor Field Probes**

**DUAL-BAND ELECTRIC AND MAGNETIC SHAPED FIELD PROBE EHP-2B-05  
For ICNIRP 1998 and SC6 2015**

Frequency range	ICNIRP 1998	Occupational General Public	Electric Field 0.5 – 9250 MHz	Magnetic Field 20 – 1000 MHz
	SC6 2015	Controlled Uncontrolled	3 – 9250 MHz	
Level range <sup>(1)</sup>	Occupational / Controlled		0.1 – 1000 %	0.3 – 1000 %
	General Public / Uncontrolled		0.5 – 1000 %	1.5 – 1000 %
Overload	2000 %			
Linearity <sup>(2)</sup>	+/- 0.5 dB			
Power (Amplitude) dynamic range	Occupational / Controlled		40 (80) dB	35 (70) dB
	General Public / Uncontrolled		33 (66) dB	28 (56) dB
Resolution	0.01 %			
Sensitivity	Occupational / Controlled		0.1 %	0.3 %
	General Public / Uncontrolled		0.5 %	1.5 %
Frequency flatness <sup>(3)</sup> (typ)	ICNIRP 1998	Occupational	0.5 – 3 MHz +4/-2 dB	20 – 1000 MHz +/-3 dB
		General Public	3 – 9250 MHz +/-3 dB	
	SC6 2015	Controlled	3 – 10 MHz +2/-3 dB 10 – 9250 MHz +/-3 dB	
		Uncontrolled	3 – 9250 MHz +/-3.5 dB	
Anisotropy <sup>(4)</sup>	+/- 0.5 dB			
Temperature error <sup>(4)</sup>			0.03 dB/°C	0.01 dB/°C
Temperature sensor	On board			
Field sensor			Triaxial orthogonal dipoles	Triaxial orthogonal loops
A/D conversion	On board			
Calibration <sup>(5)</sup>	internal E <sup>2</sup> PROM			
Operating temperature	-20 to +55 °C			
Operating relative humidity <sup>(6)</sup>	5 to 95 %			
Storage temperature	-30 to +75°C			
Dimensions	165 mm length, 54mm diameter			
Weight	100 g			

Specification are subject to change without notice

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

Note (1): Power density referred.

Note (4): At 50 MHz / 10% of the standard limit

Note (2): At 50 MHz on related level range 6dB above the noise floor

Note (5): Recommended re-calibration interval 24 month

Note (3): Relative to 10% of the standard limit

Note (6): Without condensation

(\*) All probes include on board A/D conversion, calibration factors on E<sup>2</sup>PROM, and temperature sensor



**Fig. 1-18 EHP-2B-05 probe**

**DUAL-BAND ELECTRIC AND MAGNETIC SHAPED FIELD PROBE EHP-2B-06**  
**For ICNIRP 1998 and SC6 2015**

		Electric Field	Magnetic Field
Frequency range	ICNIRP 1998	Occupational General Public	20 – 1000 MHz
	SC6 2015	Controlled Uncontrolled	
Level range <sup>(1)</sup>	Occupational / Controlled		0.3 – 1000 %
	General Public / Uncontrolled		1.5 – 1000 %
Overload		2000 %	
Linearity <sup>(2)</sup>		+/- 0.5 dB	
Power (Amplitude) dynamic range	Occupational / Controlled		35 (70) dB
	General Public / Uncontrolled		28 (56) dB
Resolution		0.01 %	
Sensitivity	Occupational / Controlled		0.3 %
	General Public / Uncontrolled		1.5 %
Frequency flatness <sup>(3)</sup> (typ)	ICNIRP 1998	Occupational	20 – 1000 MHz +/-3 dB
		General Public	
	SC6 2015	Controlled	
		Uncontrolled	
Anisotropy <sup>(4)</sup>		+/- 0.5 dB	
Temperature error <sup>(4)</sup>		0.03 dB/°C	0.01 dB/°C
Temperature sensor		On board	
Field sensor		Triaxial orthogonal dipoles	Triaxial orthogonal loops
A/D conversion		On board	
Calibration <sup>(5)</sup>		internal E <sup>2</sup> PROM	
Operating temperature		-20 to +55 °C	
Operating relative humidity <sup>(6)</sup>		5 to 95 %	
Storage temperature		-30 to +75°C	
Dimensions		165 mm length, 54mm diameter	
Weight		100 g	

Specification are subject to change without notice

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

Note (1): Power density referred.

Note (2): At 50 MHz on related level range 6dB above the noise floor

Note (3): Relative to 10% of the standard limit

Note (4): At 50 MHz / 10% of the standard limit

Note (5): Recommended re-calibration interval 24 month

Note (6): Without condensation

(\*) All probes include on board A/D conversion, calibration factors on E<sub>2</sub>PROM, and temperature sensor



**Fig. 1-19 EHP-2B-06 probe**



**DUAL-BAND ELECTRIC AND MAGNETIC SHAPED FIELD PROBE EHP-2B-07**  
**For ICNIRP 2020 and FCC 96-326\***

			Electric Field	Magnetic Field
Frequency range	ICNIRP 2020	Occupational General Public	5 – 9250 MHz	1 – 1000 MHz
	FCC 96-326	Occupational General Pop.	2 – 9250 MHz 1.34 – 9250 MHz	2 – 1000 MHz 1 – 1000 MHz
Level range <sup>(1)</sup>	Occupational		0.1 – 1000 %	0.3 – 1000 %
	General P.		0.5 – 1000 %	1.5 – 1000 %
Overload			2000 %	
Linearity <sup>(2)</sup>			+/- 0.5 dB	
Power (Amplitude) dynamic range	Occupational		40 (80) dB	35 (70) dB
	General P.		33 (66) dB	28 (56) dB
Resolution			0.01 %	
Sensitivity	Occupational		0.1 %	0.3 %
	General P.		0.5 %	1.5 %
Frequency flatness <sup>(3)</sup> (typ)	ICNIRP 2020	Occupational	5 – 9250 MHz +/-2 dB	1 – 200 MHz +3.5/-1 dB
		General Public		200 – 1000 MHz +3.5/-4 dB
	FCC 96-326	Occupational	2 – 9250 MHz +/-3 dB	2 – 1000 MHz +/-3 dB
		General Pop.	1.34 – 9250 MHz +/-3 dB	1 – 1000 MHz +/-3 dB
Anisotropy <sup>(4)</sup>			+/- 0.5 dB	
Temperature error <sup>(4)</sup>			0.03 dB/°C	0.01 dB/°C
Temperature sensor			On board	
Field sensor			Triaxial orthogonal dipoles	Triaxial orthogonal loops
A/D conversion			On board	
Calibration <sup>(5)</sup>			internal E <sup>2</sup> PROM	
Operating temperature			-20 to +55 °C	
Operating relative humidity <sup>(6)</sup>			5 to 95 %	
Storage temperature			-30 to +75°C	
Dimensions			165 mm length, 54mm diameter	
Weight			100 g	

Specification are subject to change without notice

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

FCC 96-326 considers the terms general population/uncontrolled and occupational/controlled.

Note (1): Power density referred.

Note (2): At 50 MHz on related level range 6dB above the noise floor

Note (3): Relative to 10% of the standard limit

Note (4): At 50 MHz / 10% of the standard limit

Note (5): Recommended re-calibration interval 24 month

Note (6): Without condensation

(\*) All probes include on board A/D conversion, calibration factors on E2PROM, and temperature sensor



Fig. 1-20 EHP-2B-07 probe

**DUAL-BAND ELECTRIC AND MAGNETIC SHAPED FIELD PROBE EHP-2B-08**  
**For ICNIRP 2020 and FCC 96-326\***

		Electric Field	Magnetic Field	
Frequency range	ICNIRP 2020	Occupational General Public	5 MHz – 60 GHz	1 – 1000 MHz
	FCC 96-326	Occupational General Pop.	2 MHz – 60 GHz 1.34 MHz – 60 GHz	2 – 1000 MHz 1 – 1000 MHz
Level range <sup>(1)</sup>	Occupational		0.1 – 1000 %	0.3 – 1000 %
	General P.		0.5 – 1000 %	1.5 – 1000 %
Overload	2000 %			
Linearity <sup>(2)</sup>	+/- 0.5 dB			
Power (Amplitude) dynamic range	Occupational		40 (80) dB	35 (70) dB
	General P.		33 (66) dB	28 (56) dB
Resolution	0.01 %			
Sensitivity	Occupational		0.1 %	0.3 %
	General P.		0.5 %	1.5 %
Frequency flatness <sup>(3)</sup> (typ)	ICNIRP 2020	Occupational	5 – 9250 MHz +/- 2 dB	1 – 200 MHz +3.5/-1 dB
		General Public	9250 – 18000 MHz +3/-2 dB 18 – 60 GHz +8/-1 dB	200 – 1000 MHz +3.5/-4 dB
	FCC 96-326	Occupational	2 – 18000 MHz +/- 3 dB 18 – 60 GHz +8/-1 dB	2 – 1000 MHz +/- 3 dB
		General Pop.	1.34 – 18000 MHz +/- 3 dB 18 – 60 GHz +8/-1 dB	1 – 1000 MHz +/- 3 dB
Anisotropy <sup>(4)</sup>	+/- 0.5 dB			
Temperature error <sup>(4)</sup>		0.03 dB/°C		0.01 dB/°C
Temperature sensor	On board			
Field sensor		Triaxial orthogonal dipoles		Triaxial orthogonal loops
A/D conversion	On board			
Calibration (5)	internal E <sup>2</sup> PROM			
Operating temperature	-20 to +55 °C			
Operating relative humidity (6)	5 to 95 %			
Storage temperature	-30 to +75°C			
Dimensions	165 mm length, 54mm diameter			
Weight	100 g			

Specification are subject to change without notice

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

FCC 96-326 considers the terms general population/uncontrolled and occupational/controlled.

Note (1): Power density referred.

Note (2): At 50 MHz on related level range 6dB above the noise floor

Note (3): Relative to 10% of the standard limit

Note (4): At 50 MHz / 10% of the standard limit

Note (5): Recommended re-calibration interval 24 month

Note (6): Without condensation

(\*) All probes include on board A/D conversion, calibration factors on E2PROM, and temperature sensor

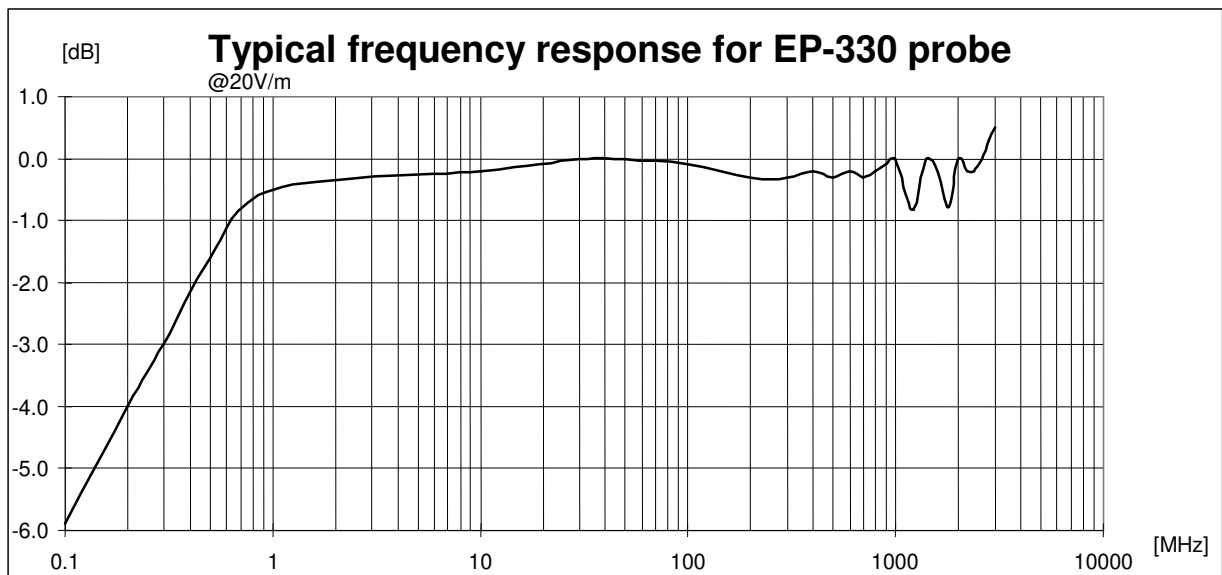


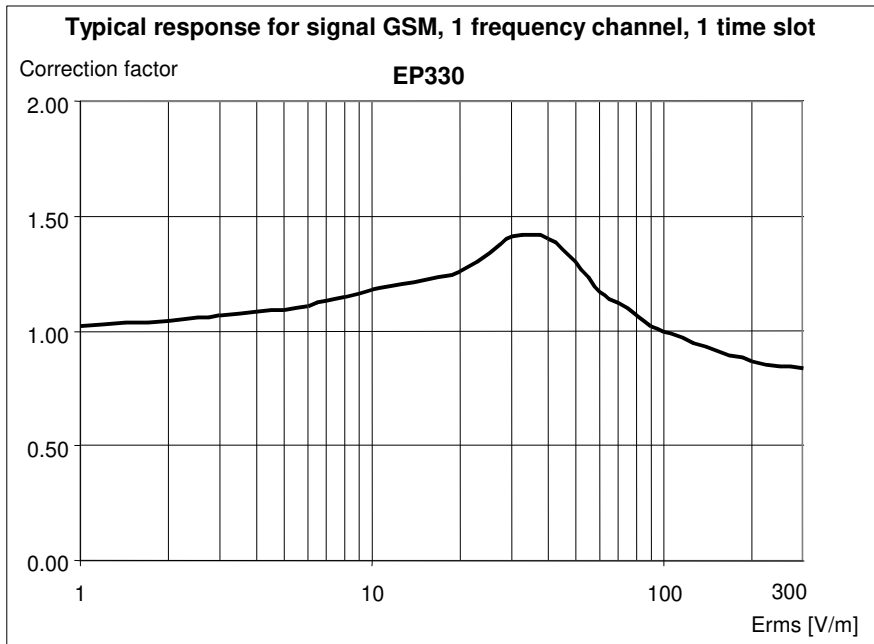
Fig. 1-21 EHP-2B-08 probe

**TABLE 1-7 Technical Specifications of 8053 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
Isotropy	± 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 <sup>2</sup> PROM
Size	317 mm length, 58 mm diameter
Weight	100 g

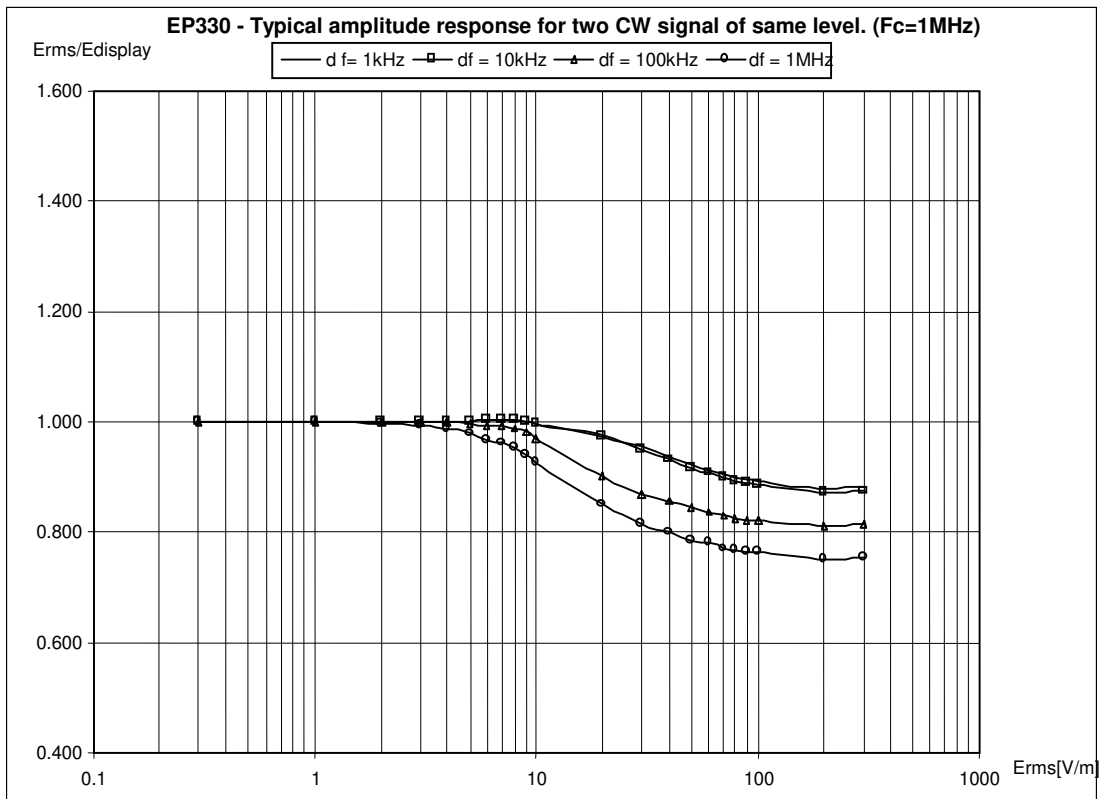




Erms [V/m]	Edisplay [V/m]	Correction factor
1	0.98	1.02
2	1.91	1.05
3	2.82	1.06
4	3.70	1.08
5	4.58	1.09
6	5.40	1.11
7	6.17	1.13
8	6.96	1.15
9	7.75	1.16
10	8.50	1.18
20	15.84	1.26
30	21.3	1.41
40	28.6	1.40
50	38.5	1.30
60	51.3	1.17
70	62.5	1.12
80	75.1	1.07
90	88.1	1.02
100	99	1.01
200	227	0.88
300	361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



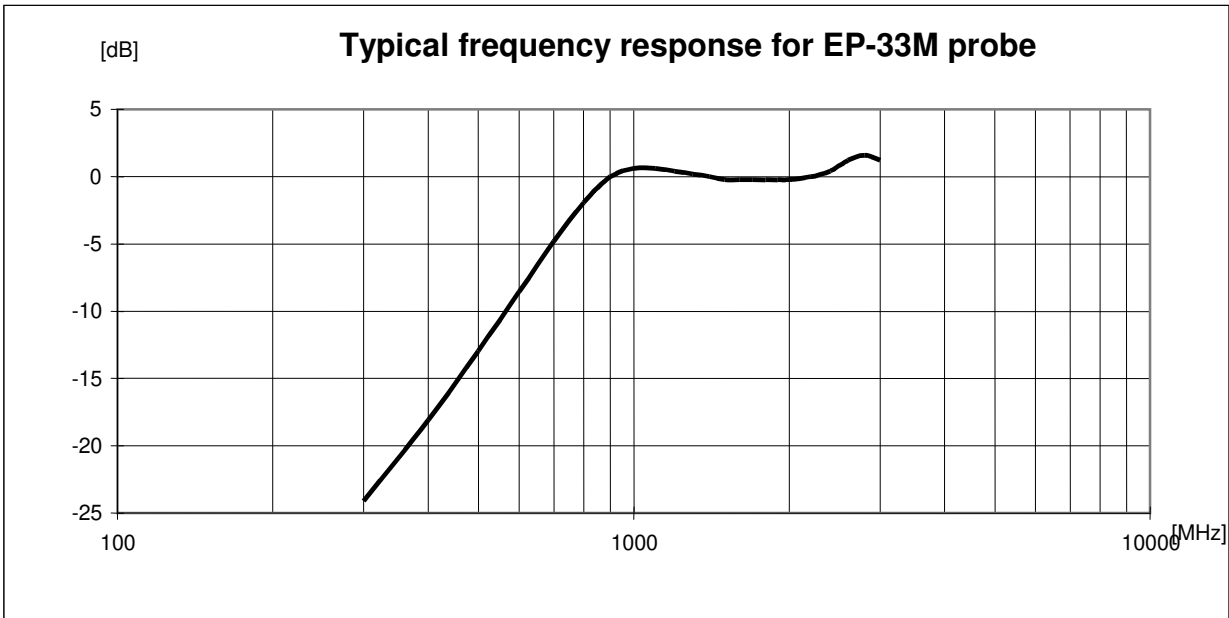
**This test is carried out with a signal currently used in laboratory for maximize the reading error to make a comparison of the performances of the probe with a common base. Actually the radio base station use eight time slots of each channel so the effective error of the measurement is negligible.**



**Fig. 1-22 EP-330 probe**

**ELECTRIC FIELD PROBE EP-33M**

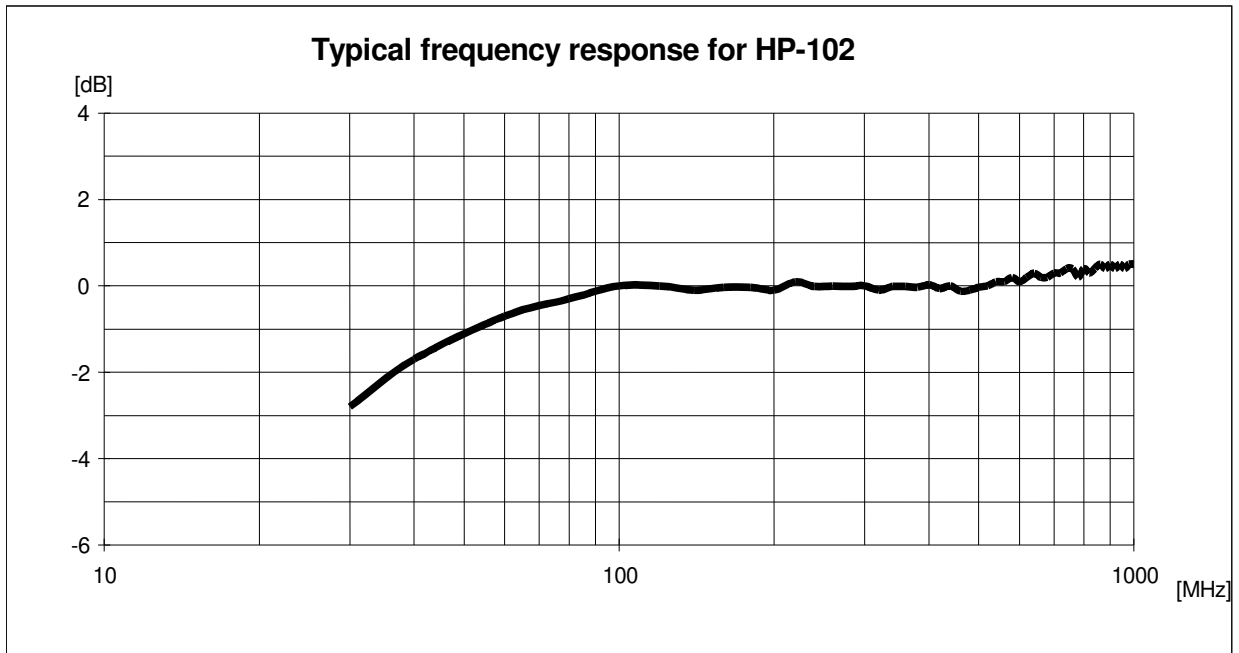
Frequency range	700 MHz - 3 GHz
Level range	0.3 - 300 V/m
Overload	> 600 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.3 V/m
Absolute error @ 930 MHz 20 V/m	± 1 dB
Flatness (900 MHz - 3 GHz)	± 1.5 dB
Isotropy	± 0.8 dB (typical ± 0.5 dB @ 930 and 1800 MHz)
H-field rejection	> 20 dB
Temperature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



**Fig. 1-23 EP-33M probe**

## **MAGNETIC FIELD PROBE HP-102**

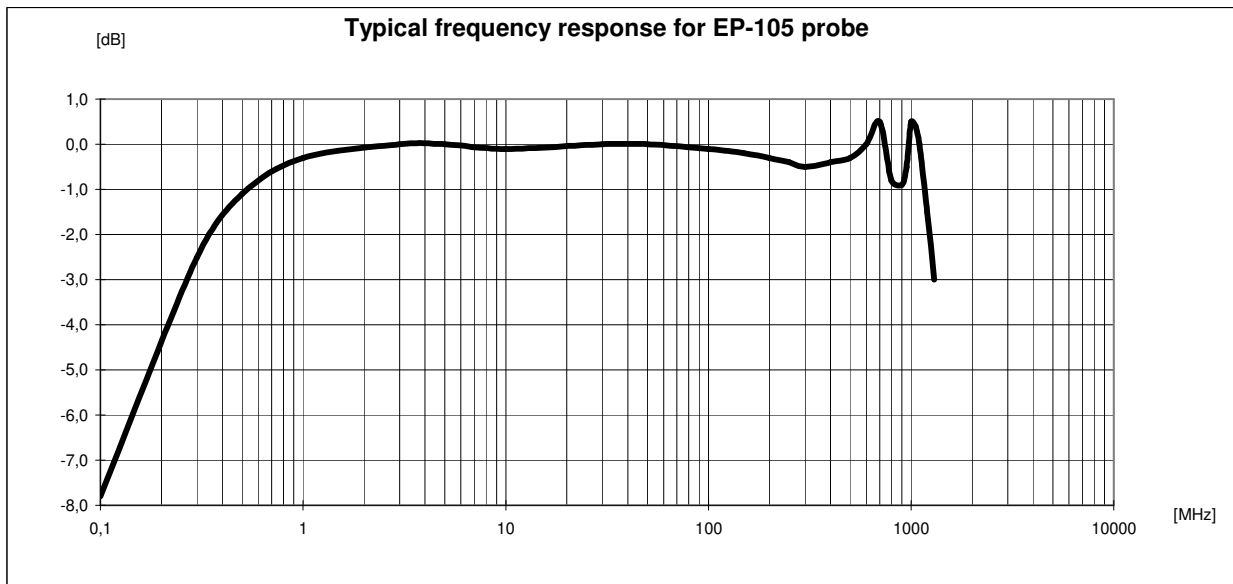
Frequency range	30 - 1000 MHz
Level range	0.01 - 20 A/m
Overload	> 40 A/m
Dynamic range	> 60 dB
Resolution	1 mA/m
Sensitivity	0.01 A/m
Absolute error @ 50 MHz 2 A/m	± 1 dB
Flatness (50 - 900 MHz)	± 1 dB
Isotropy	± 0.8 dB (typical ± 0.5 dB @ 930 MHz)
E-field rejection	> 20 dB
Temperature error	0.05 dB/°C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



**Fig. 1-24** HP-102 probe

## 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
Isotropy	± 0.8 dB (typical ± 0.5 dB @ 930 MHz)
H-field rejection	> 20 dB
Temperature error	0.05 dB/°C
Calibration	Internal into E <sup>2</sup> PROM
Size	350 mm length, 133 mm diameter
Weight	290 g

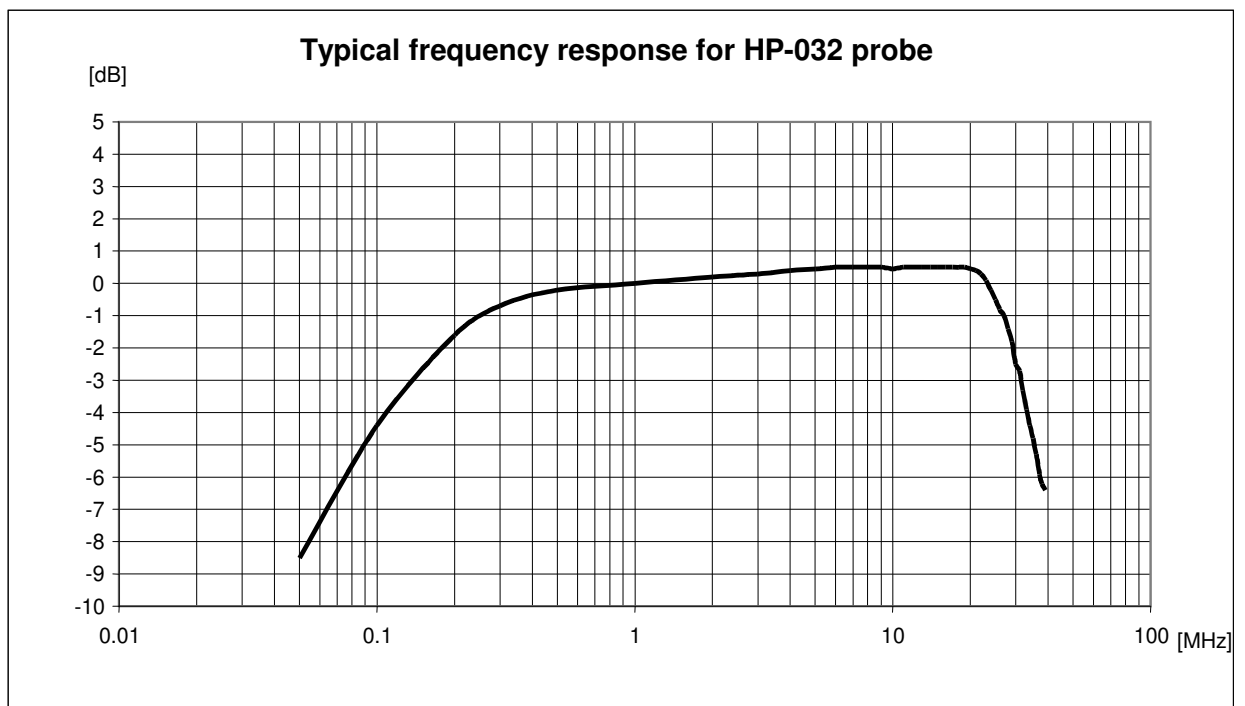


**Fig. 1-25** EP-105 probe



## **MAGNETIC FIELD PROBE HP-032**

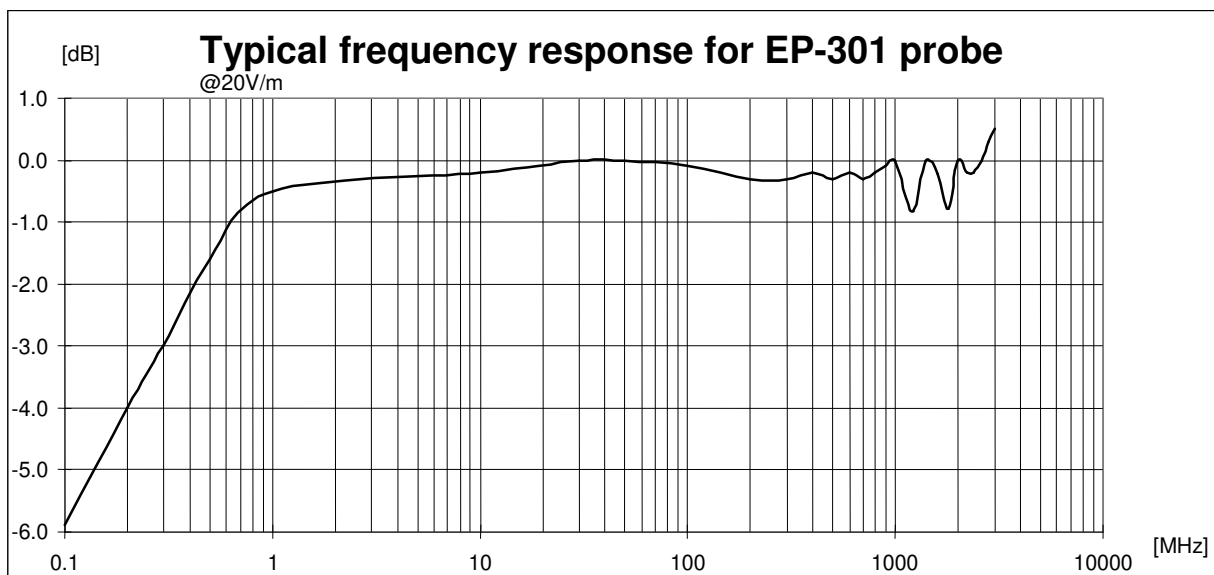
Frequency range	0.1 - 30 MHz
Level range	0.01 - 20 A/m
Overload	> 40 A/m
Dynamic range	> 60 dB
Resolution	1 mA/m
Sensitivity	0.01 A/m
Absolute error @ 1 MHz 2 A/m	± 1 dB
Flatness (1 -25 MHz)	± 1 dB
Isotropy	± 0.8 dB (typical ± 0.5 dB @ 1 MHz)
E-field rejection	> 20 dB
Temperature error	0.05 dB/°C
Calibration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



**Fig. 1-26** HP-032 probe

## ELECTRIC FIELD PROBE EP-301

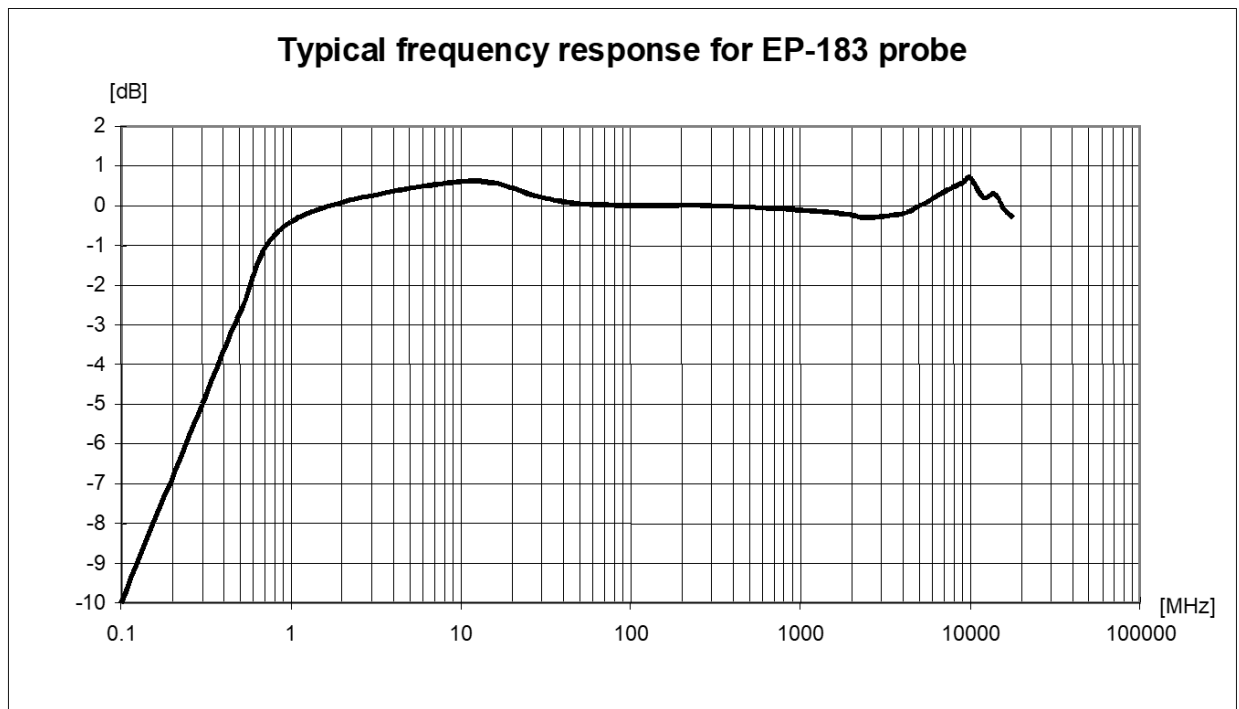
Frequency range	100 kHz - 3 GHz
Level range	1 – 1000 V/m
Overload	> 1200 V/m
Dynamic range	> 60 dB
Resolution	0.1 V/m
Sensitivity	1 V/m
Absolute error @ 50 MHz 20 V/m	± 0.8 dB
Flatness (10 - 300 MHz)	± 0.5 dB
Flatness (3 MHz - 1 GHz)	± 1.5 dB
Isotropy	± 0.8 dB (Typical ± 0.5 dB @ 930 and 1800 MHz)
H-field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



**Fig. 1-27** EP-301 probe

## **ELECTRIC FIELD PROBE EP-183**

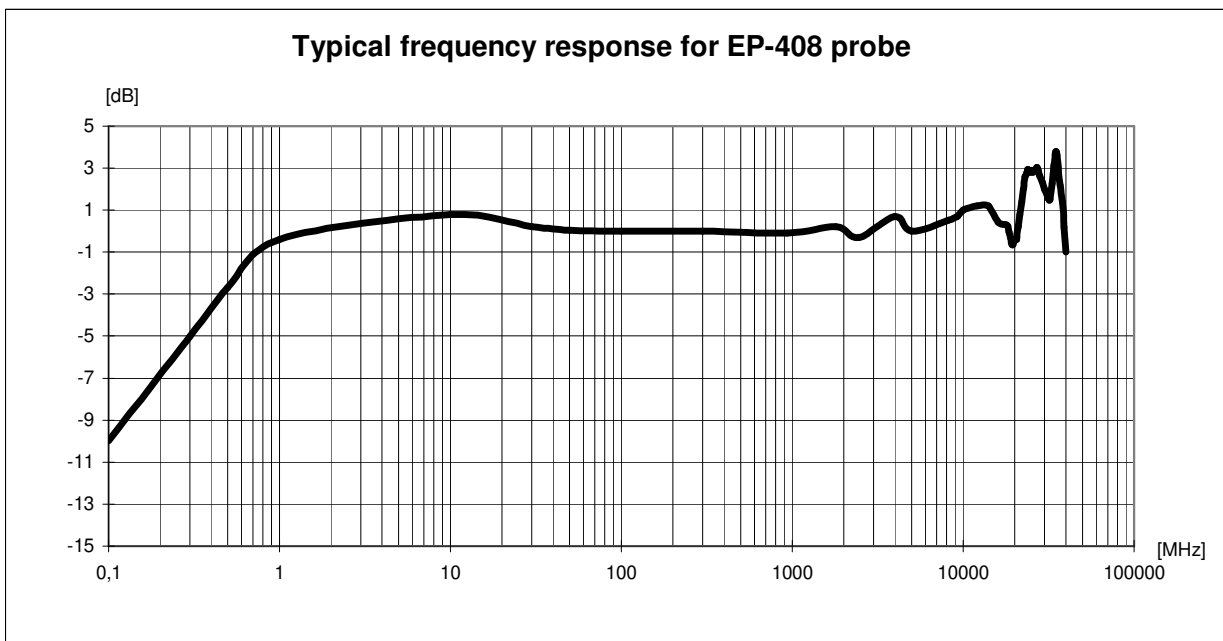
Frequency range	1 MHz - 18 GHz
Level range	0.8 - 800 V/m
Overload	> 1200 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.8 V/m
Absolute error @ 200 MHz 6 V/m	± 0.8 dB
Flatness (1 MHz - 1 GHz)	± 1.5 dB
Flatness (1 - 3 GHz)	± 2.0 dB
Flatness (3 - 18 GHz)	± 2.5 dB
Isotropy @ 200 MHz	± 0.8 dB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



**Fig. 1-28** EP-183 probe

## **ELECTRIC FIELD PROBE EP-408**

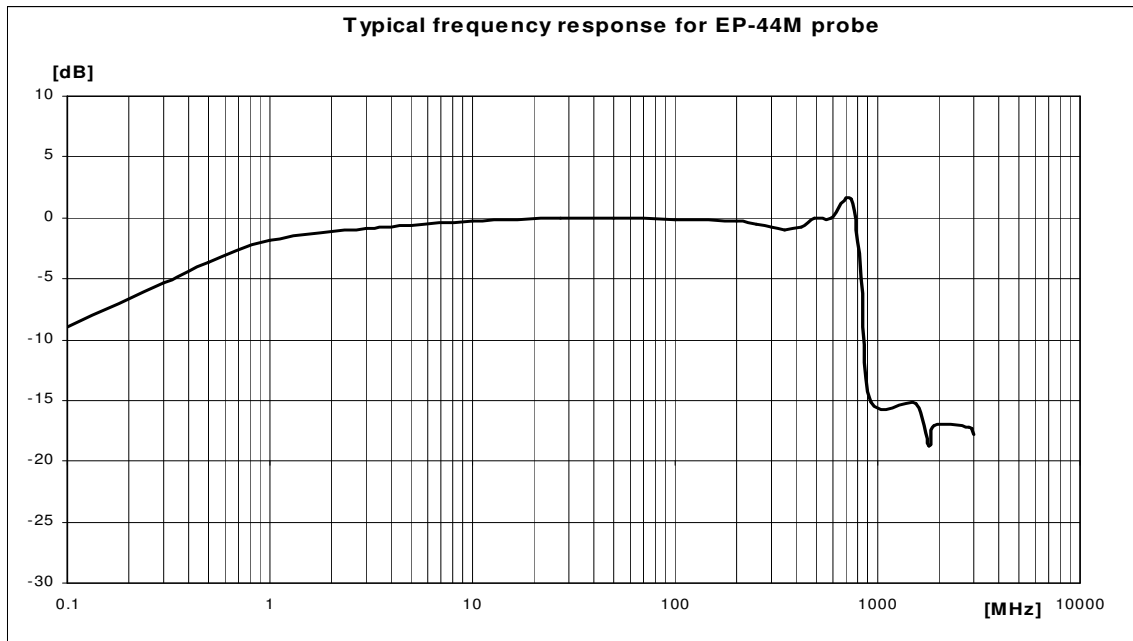
Frequency range	1 MHz - 40 GHz
Level range	0.8 - 800 V/m
Overload	> 1000 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.8 V/m
Absolute error @ 200 MHz 6 V/m	± 0.8 dB
Flatness (1 MHz - 1 GHz)	± 1.5 dB
Flatness (1 - 3 GHz)	± 2 dB
Flatness (3 - 18 GHz)	± 2.5 dB
Flatness (18 - 26.5 GHz)	± 3 dB
Flatness (26.5 - 40 GHz)	± 4 dB
Isotropy @ 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 <sup>2</sup> PROM
Size	317 mm length, 52 mm diameter
Weight	90 g



**Fig. 1-29 EP-408 probe**

## **ELECTRIC FIELD PROBE EP-44M**

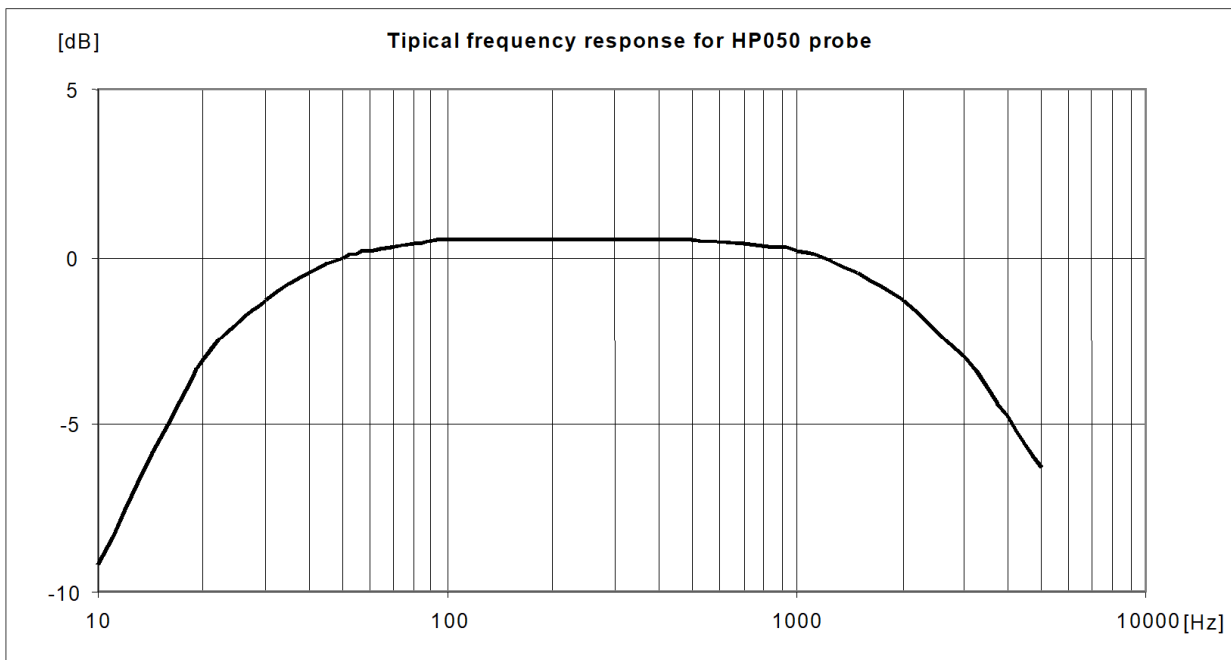
Frequency range	100 kHz - 800 MHz
Level range	0.25 - 250 V/m
Overload	> 500 V/m
Dynamic range	> 60 dB
Resolution	0.01 V/m
Sensitivity	0.25 V/m
Absolute error @ 50 MHz and 6 V/m	± 0.8 dB
Flatness	
(10 MHz - 200 MHz)	± 1.5 dB (typical ± 0.8 dB)
(200 MHz - 800 MHz)	± 2.0 dB (typical ± 1.5 dB)
Isotropy	± 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 <sup>2</sup> PROM
Size	317 mm length, 58 mm diameter
Weight	100 g



**Fig. 1-30 EP-44M probe**

## **MAGNETIC FIELD PROBE HP-050**

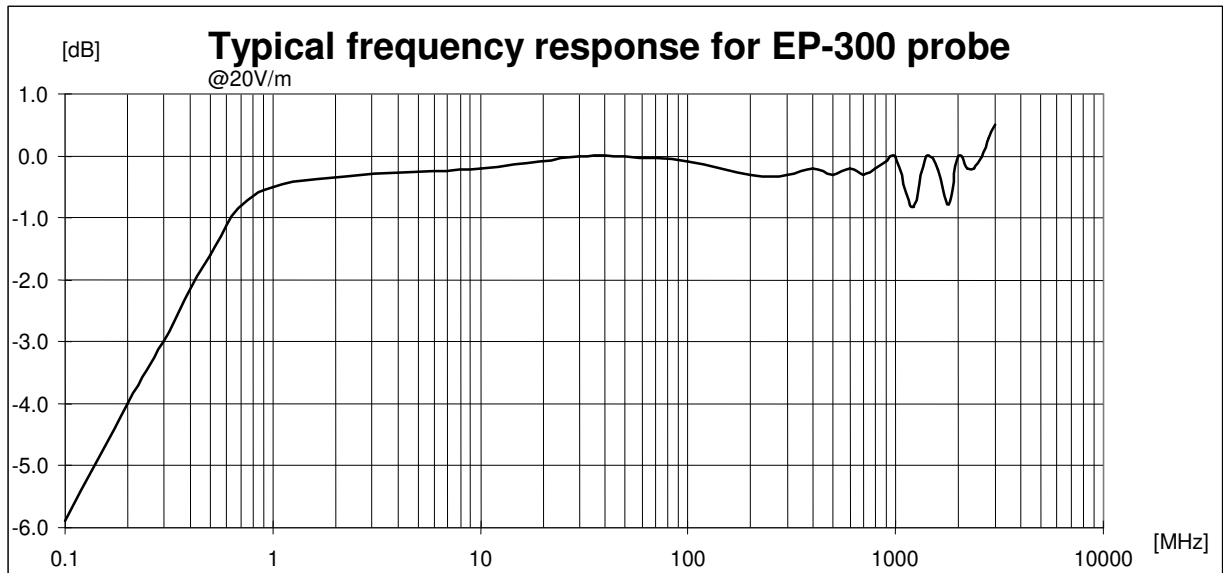
Frequency range	10 Hz – 5 kHz
Level range	10 nT – 40 $\mu$ T
Overload	400 $\mu$ T
Dynamic range	> 72 dB
Resolution	1 nT
Sensitivity	10 nT
Absolute error @ 50 Hz 200 nT 25 °C	$\pm$ 0.4 dB
Flatness (40 Hz – 1kHz)	$\pm$ 1 dB
Isotropy @ 50 Hz 200 nT	$\pm$ 0.3 dB
Electric field rejection	> 20 dB
Temperature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



**Fig. 1-31** HP-050 probe

## **ELECTRIC FIELD PROBE EP-300**

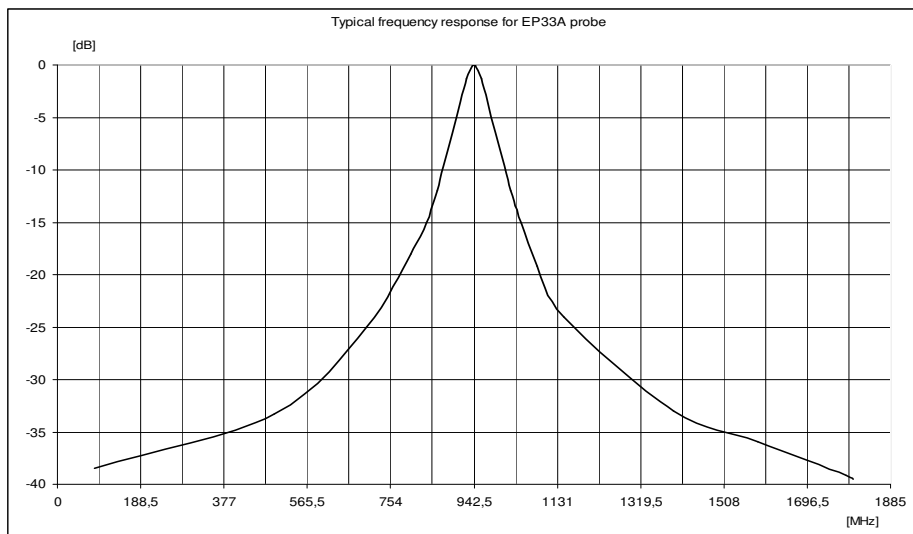
Frequency range	100 kHz - 3 GHz
Level range	0.1 - 300 V/m
Overload	> 600 V/m
Dynamic range	> 66 dB (typical >70 dB)
Resolution	0.01 V/m
Sensitivity	0.15 V/m (typical >0.1V/m)
Absolute error @ 50 MHz 20 V/m	± 0.8 dB
Flatness (10 - 300 MHz)	± 0.5 dB
Flatness (3 MHz - 3 GHz)	± 1.5 dB
Isotropy	± 0.8 dB (typical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



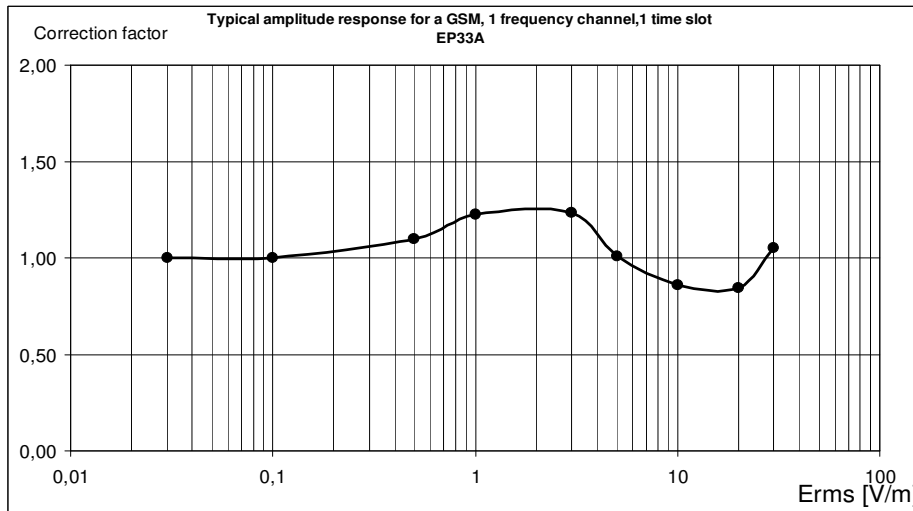
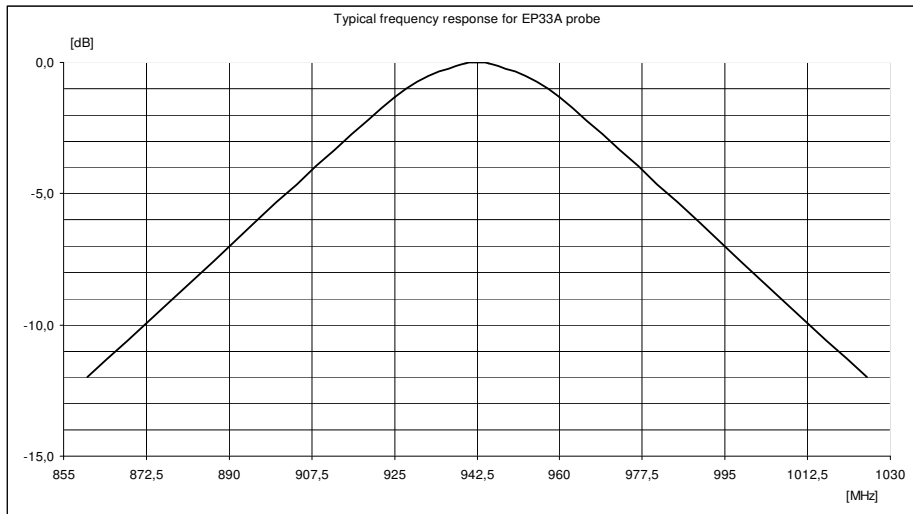
**Fig. 1-32** EP-300 probe

## 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
Isotropy	± 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 <sup>2</sup> PROM internal
Size	317 mm length, 58 mm diameter
Weight	100 g







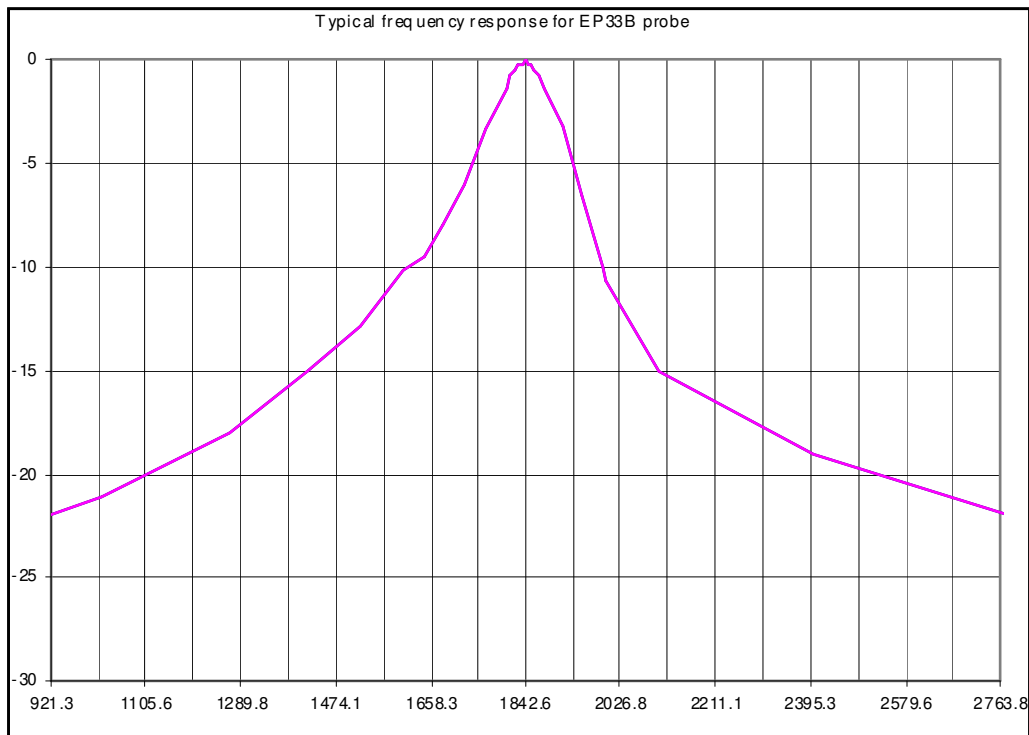
This test is carried out with a signal currently used in laboratory for maximize the reading error to make a comparison of the performances of the probe with a common base. Actually the radiobase station use eight time slots of each channel so the effective error of the measurement is negligible.

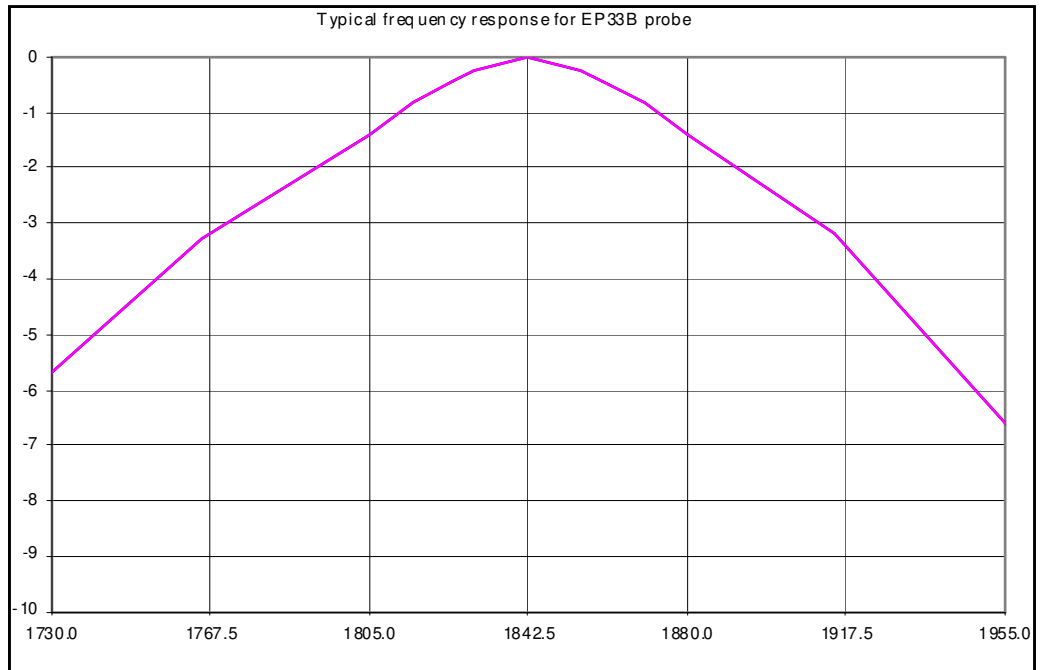


**Fig. 1-33** EP-33A probe

## **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 40°C ÷ 60°C = ± 100 kHz -20°C ÷ 40°C = -100 kHz/°C
Drift Frequency Vs Temperature	
Calibration	E <sup>2</sup> PROM internal
Size	317 mm length, 58 mm diameter
Weight	100 g

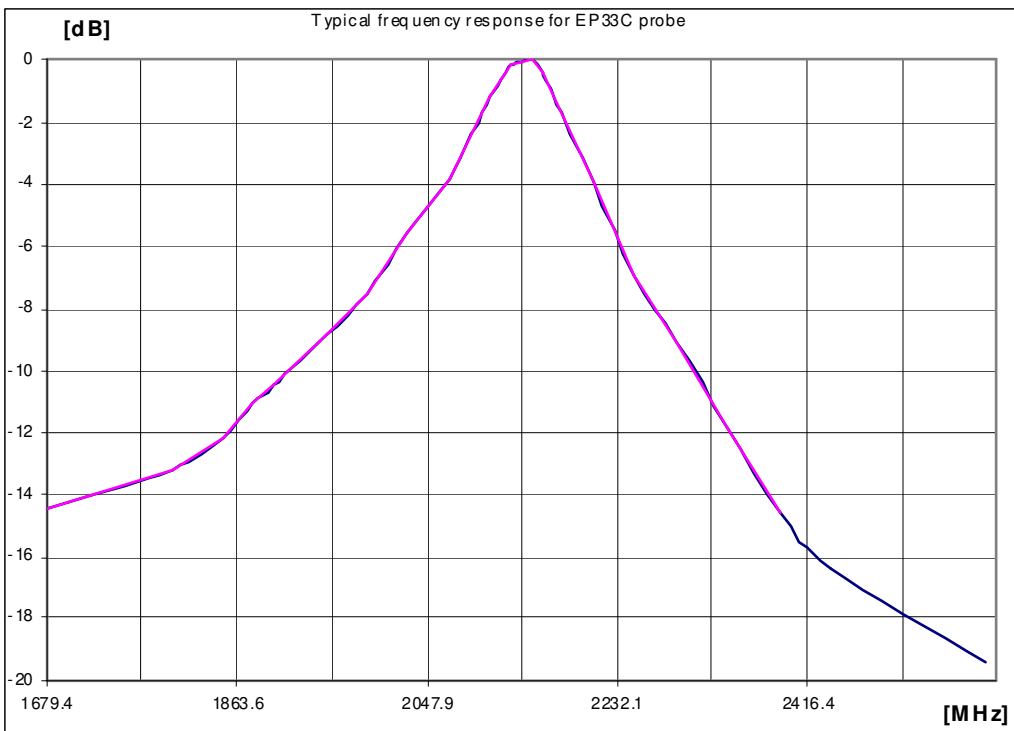


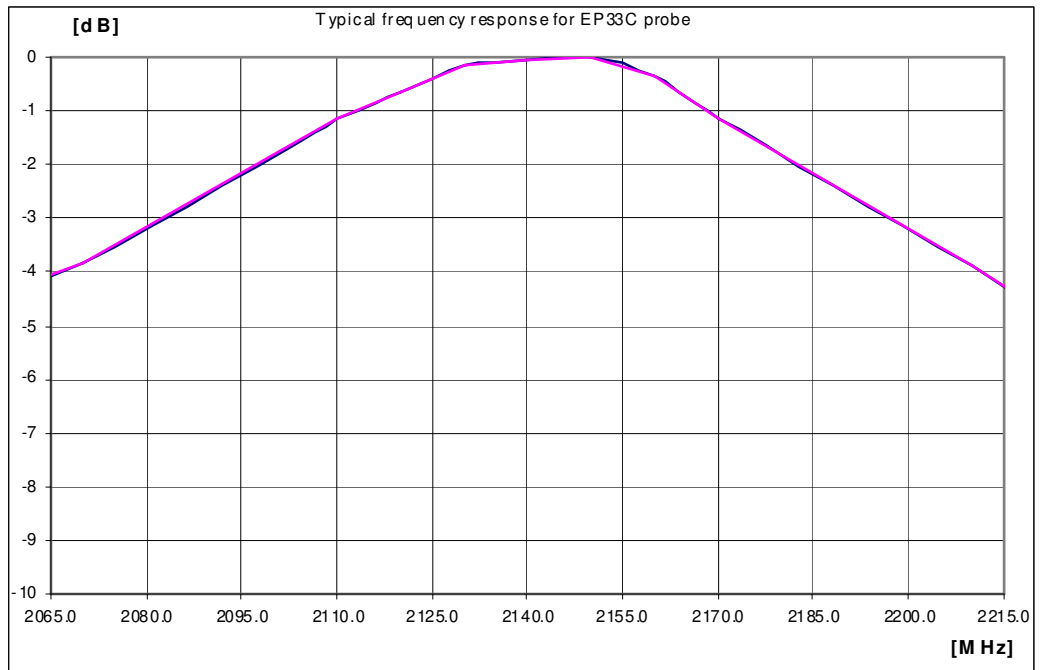


**Fig. 1-34** EP-33B probe

## **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 40°C ÷ 60°C = ± 100 kHz -20°C ÷ 40°C = -100 kHz/°C
Drift Frequency Vs Temperature	
Calibration	E <sup>2</sup> PROM internal
Size	317 mm length, 58 mm diameter
Weight	100 g

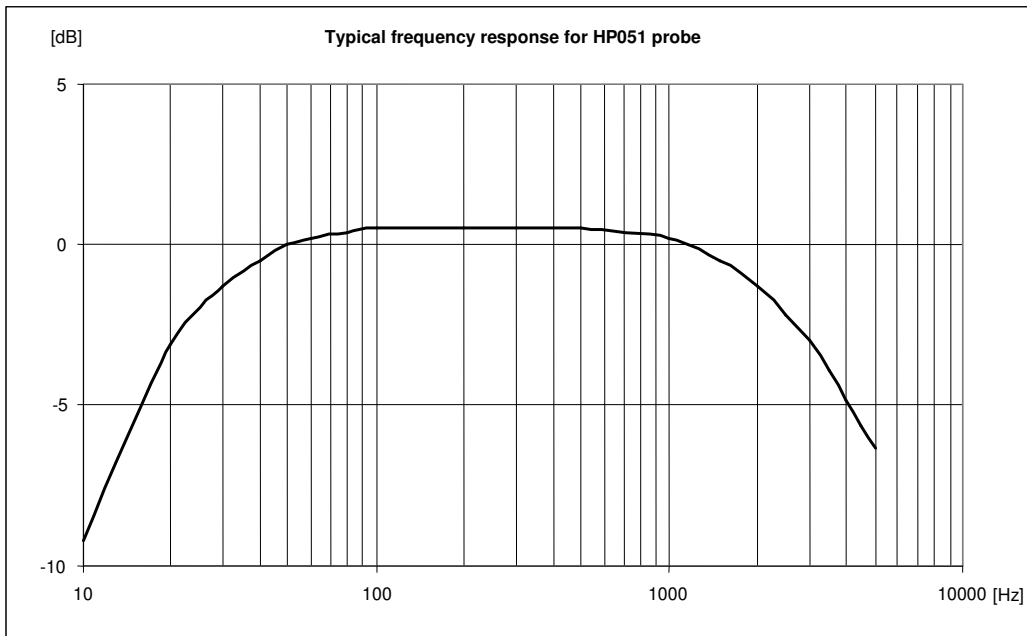




**Fig. 1-35** EP-33C probe

## **MAGNETIC FIELD PROBE HP-051**

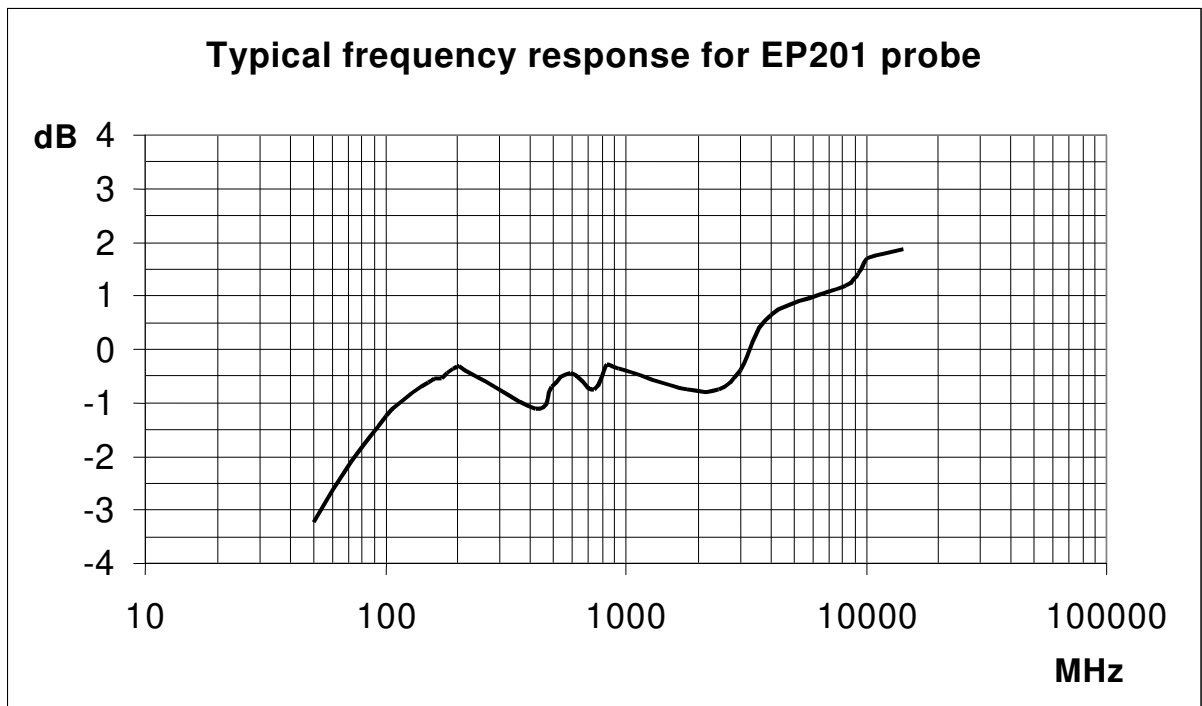
Frequency range	10 Hz – 5 KHz
Level range	50 nT – 200 $\mu$ T
Dynamic range	> 72 dB
Overload	400 $\mu$ T
Resolution	1 nT
Sensitivity	50 nT
Absolute error @ 50 Hz - 3 $\mu$ T - 25°C	$\pm$ 0.4 dB
Flatness @ 40 Hz – 1 KHz	$\pm$ 1 dB
Isotropy @ 50 Hz – 3 $\mu$ T	$\pm$ 0.3 dB
Electric field rejection	> 20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

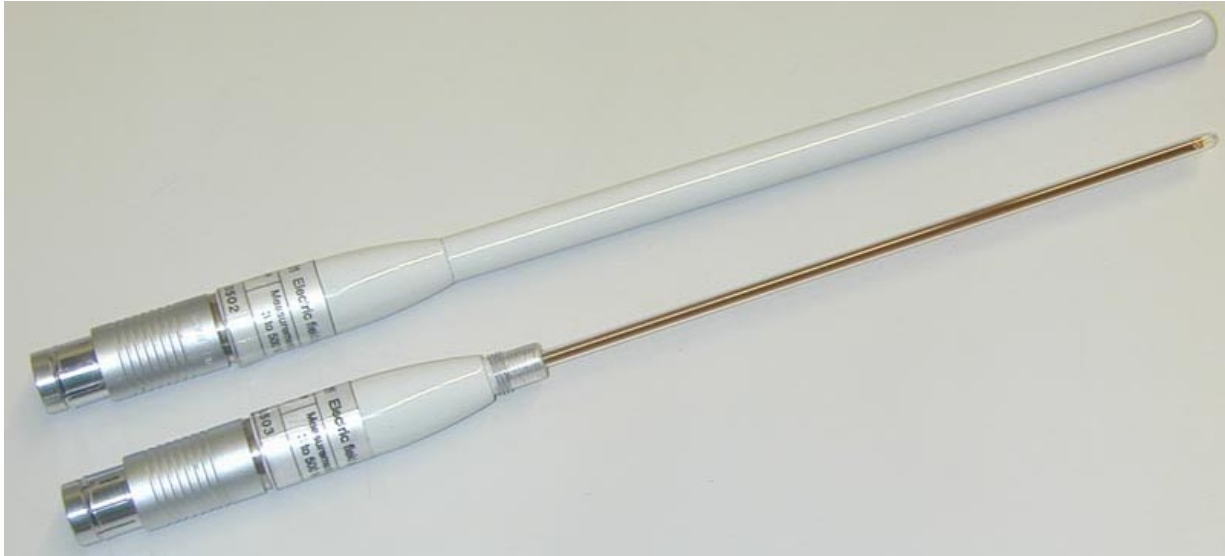


**Fig. 1-36** HP-051 probe

## **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)
Isotropy @ 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





**Fig. 1-37** EP-201 probe



**NOTE**

**LR-01 is able to identify all probe models whether they are plugged before or after switching on the unit.**



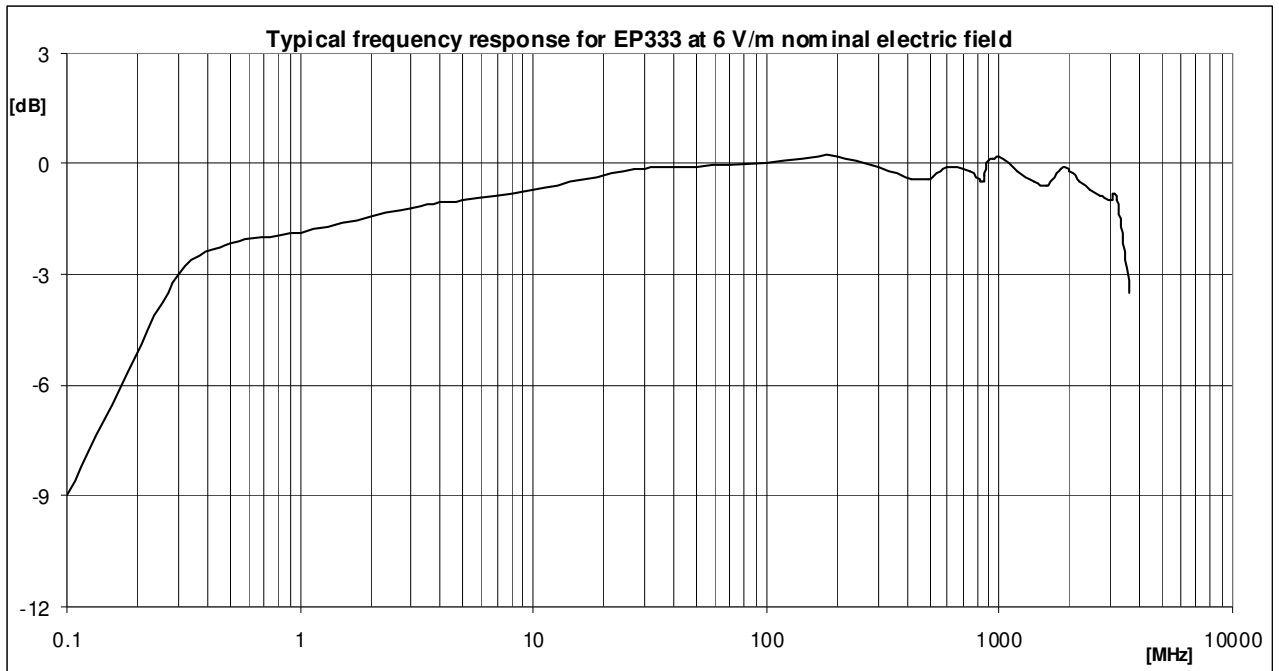
**NOTE**

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



## **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 signals with high crest factor for which traditional diode detectors tend to overestimate.

It is a particular diodes based detector circuitual configuration that allows high sensitivity compared to the RMS termocouple detectors.

Tests on COFDM signal (FFT8k, Constellation 64QAM, Crest factor 13dB, guard interval 1/32) have shown that the overestimation is less than 0.5 dB up to 75 V/m on the entire frequency range of the probe.



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



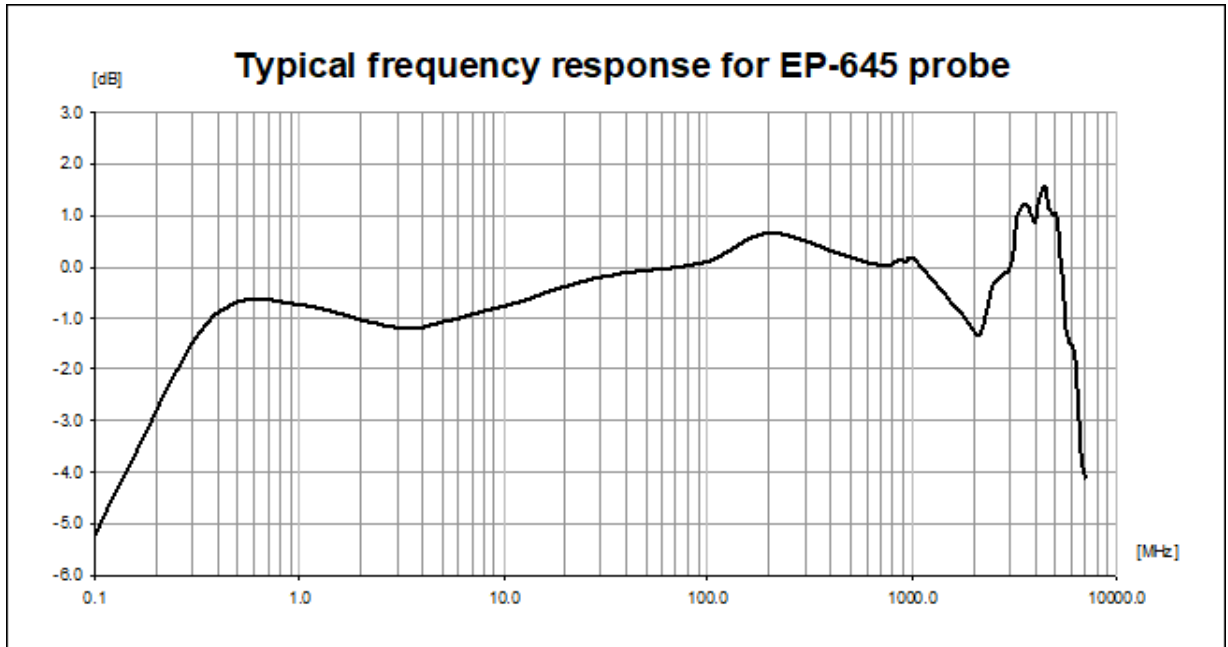
**LR-01 is able to identify all probe models whether they are plugged before or after switching on the unit.**



**Fig. 1-38 EP-333 probe**

**ELECTRIC FIELD PROBE EP-645**

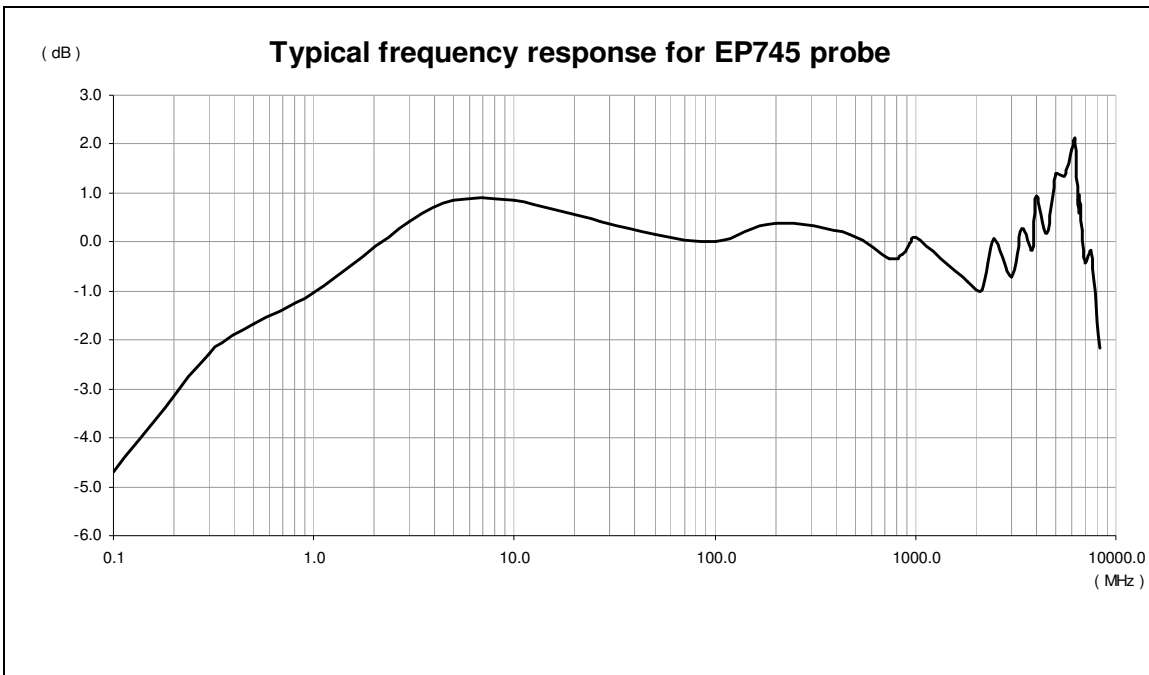
Frequency range	(0.1) 0.3 – 6500 MHz
Level range	0.35 – 450 V/m
Overload	900 V/m
Dynamic range	> 62 dB
Resolution	0.01 V/m
Sensitivity	0.35 V/m
Flatness	3 MHz – 10 MHz 1.5 dB 10 MHz – 1000 MHz 1.0 dB 1000 MHz – 3000 MHz 1.5 dB 3000 MHz – 5500 MHz 2.5 dB
Isotropicity	0.8 dB (typical 0.5 dB)
H-field rejection	> 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.



**Fig. 1-39** 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.



**Fig. 1-40 EP-745 probe**

## 2 - Installation and use

### 2.1 Introduction

This section provides the information required for installing and using the LR-01 Programmable Logger Repeater. 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.

#### NOTICE

**If the packaging or anti-shock material have been damaged, check that the contents are complete and that the repeater 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 -20° to +55° C
- Humidity < 95% relative

The repeater 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 -30° to + 75° C
- Humidity < 95% relative

### 2.4 Return for repair

When the repeater 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 repeater to ensure that it is compact and does not move around inside the package.

In particular, take every precaution to protect the front and rear 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 Instrument cleaning

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

#### NOTICE

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

## 2.6 Installation of the LR-01

Turn off the LR-01, connect the proper adapter to the upper round multipole connector and insert the field probe into the probe connector on the adapter, taking care that the key (red dot in case of 8053 family probes) is aligned.

Then, 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 provided USB-OC (taking care that the grip recess points towards the centre of the device) or any other of the available ports (for example: wired USB). Connect the converter to a PC port.



Fig. 2-1 LR-01 link with USB-OC

The USB-OC standard accessory connected to the LR-01 allows a 40m maximum fiber length. The standard length supplied is 10 m.

Both with the fiber optic and with the USB cable, the provided software automatically establishes the connection on the proper port, giving the User the possibility to choose the desired one when more than one instrument are connected at the same time.



The USB connection provides also the charging of the internal Li-ion battery. Please check the port shows enough current to guarantee this service.



Please, always use the supplied optical fibers, USB cables and chargers, since using not official parts could result in damaging the device.



In order to avoid interference and the risk of influencing measurements with internal RF module signals (BLE and Wi-Fi), LR-01 has been specially designed so that detections are taken when these devices are not radiating.

Just after running the program, the desired instrument must be chosen from the list.

The Narda Probe Manager is designed to manage many instrument models. As an example: LR-01 Logger Repeater, PMM EP600 series probes, Optical Repeater OR-03 .

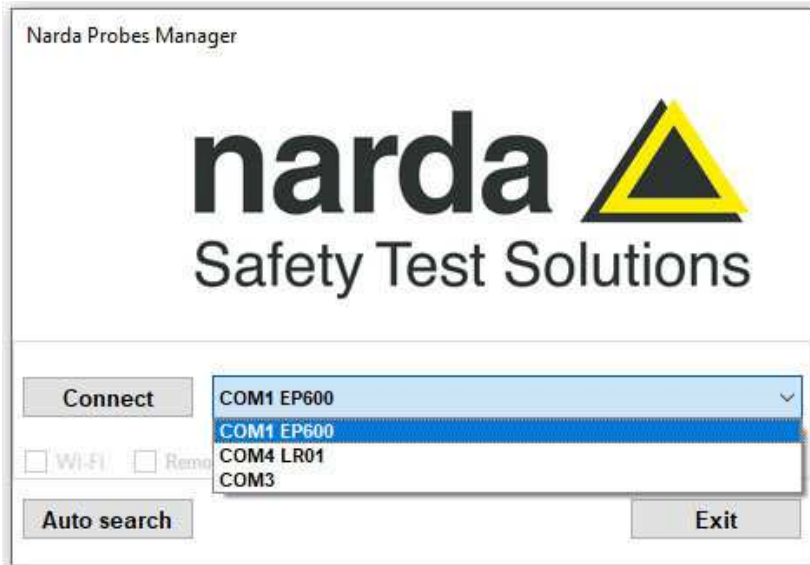
Whenever a port is tied up by a device which is not active or turned off at that time, the program may show it anyway and, if Connect is clicked, will therefore attempt to connect that device to that port. In this case, it is necessary to choose another port to connect to the meter desired.

- Click on the drop-down list to see all the available ports.



- Select, for example, the LR01 row and click Connect

The assigned COM port will be matched automatically .



- It is also possible to run the Auto search function, which will look for any connected device and will list them in the drop-down menu.





## 2.7 LR-01 on, Led status, Manual log button and Buzzer



Turn on LR-01 by pushing the red **POWER** button for a short while. The Data LED will show the following sequence, while the instrument performs a diagnostic test to check everything is working properly: briefly flash **green**, then goes **off**, then lights up **red** and then becomes **orange**; after that it begins **flashing green**, to indicate the instrument is ready to Log or communicate. Afterwards the led will provide the following information:

**TABLE 2-1 Led status**

LED	LED flashing speed	LED color	Description
DATA	Medium speed	Red	Probe not detected
	Solid	Orange	Loading probe
	Medium speed	Green	Probe loaded and read with a rate equal to the flashing period
	-	Off	Not expected with unit turned on
POWER	Medium speed	Green	Powered by USB with battery charge completed
	Medium speed	Orange	Powered by USB with battery under charging
	Medium speed	Red	Powered by internal battery, which is almost discharged
	-	Off	Powered by internal battery, sufficiently charged
VISUAL ALARM	Solid	Red	Alarm or warning threshold exceeded. If the log is in progress, the LED goes off for one second during the log. If the Log can be activated (AQ_ command with a rate other than 0), prolonged pressure (> 5 s) of the button recognized with the button pressed and not released (Log activated but not started yet).
	Low speed		If the Log can be activated (AQ_ command with a rate other than 0), press of the button before the actual recognition of the start of the log (pressing the button for less than 5 s).
	Fast speed		Button pressed when the Logger is disabled and it is not possible to activate it (AQ_ command with rate equal to 0).
	Single flash		Log acquisition, or (also accompanied by a short audible alarm) Logger start with deletion of the Logs previously saved in memory.
	Flashing (with rate dictated by the probe reading speed)		If the Log is in progress with acquisition not based on time (AQ_-1) and the alarm or warning threshold is continuously exceeded, the LED turns on during the log (and sound alarm always on).

 **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 some seconds before switching it on again.

 **NOTE**

LR-01 automatically turns OFF when after 30 min. the fiber optic has been disconnected or the communication with PC is not established.

 **NOTE**

The fiber optic of the LR-01 can be disconnected and reconnected while in use. The communication will be restarted automatically.

A manual button allows the user to start logging or measurement acquisition or reboot the instrument.

<b>Table 2-2 Manual log button status</b>	
<b>Manual log button</b>	<b>Description</b>
<b>Pressing for more than 5 s</b>	Logger start with deletion of the previously saved Logs (after setting the Logger by means of the AQ_ command). Pressing long enough is notified by the fixed LED lighting up (big red LED) until the button is released.
<b>Short pressing</b>	Logger measurement acquisition (after setting the Logger by means of the AQ_ command). The pressing is notified by the big red LED lighting up. It will turn off when the record is saved.
<b>Pressing while turning on the unit</b>	Reset to default settings with flash save and reboot of the instrument.

The meter is also equipped with a buzzer, useful for emitting sound alerts from the rear panel where indicated by the icon.

<b>Table 2-3 Buzzer status</b>	
<b>Buzzer</b>	<b>Description</b>
<b>Long sound</b>	Field level Alarm threshold exceeded.
<b>Short sound</b>	Logger starting.



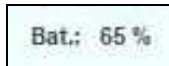
**Buzzer sound and vibration are not continuous but intermittent, 600ms on and 400ms off.**

## 2.8 Power supply and battery recharging

LR-01 has an internal rechargeable Lithium-ion battery that can be recharged with the USB battery charger supplied with it.

The AC/DC 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. International AC plug adapters are provided according to the various national standards and it can be easily removed from the battery charger to be replaced by a different one.

Ensure that the batteries are fully charged before using the Logger Repeater for longest battery operation time.



The battery status is reported by the Narda Probes Manager software and displayed in %. It shows the residual autonomy during measurements and the achieved autonomy during charging

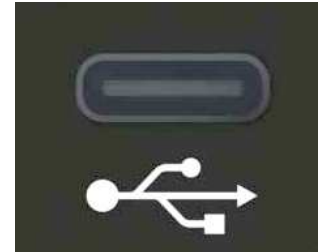


**ALWAYS** connect the battery charger to the power supply **BEFORE** connecting it to the LR-01.

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, 5 V, 600 mA max



Connector:



In order to safeguard the features of the batteries, it is crucial to have a 80% 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.



The minimum voltage level for operation is about 3,0 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 2,5 hours. When the recharge is complete, this is indicated by the Power Led of the LR-01, with a blinking green light.



To take reliable measurements, it is advisable to **ALWAYS** remove the battery charger from LR-01.

## 2.9 Install and Run Probes Manager sw

Install the Narda Probes Manager software and the program automatically installs the driver for USB optical converter. For further information, see chapter 3.

Run the Probes Manager software and the LR-01 led turns on low blinking **Green** (probe inserted) or **Red** (probe not inserted) light that means the correct communication with PC is established. For further information, see chapter 4.



**The software is able to manage the meter via an optical connection (fiber optic), via a wired connection (i.e. USB) and via Wi-Fi connection.**



**If the attempt to communicate over any of the available channels (fiber optic, Wi-Fi, USB) was not successful, the LR-01 will automatically switch off after about 30 minutes to preserve the battery charge.**

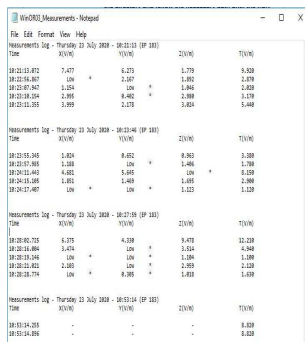


**The LR-01 cannot be connected to PC via Bluetooth. The BLE connection is available only for mobile device through the LR-01 Manager App; for further information, see chapter 6.**



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

## 2.10 Logger



Time	X(Y/Z)	Y(X/Y)	Z(X/Y/Z)
18:20:15.872	3.427	6.273	1.379
18:20:15.887	106	2.187	1.482
18:20:15.902	2.221	106	2.184
18:20:15.914	2.185	8.482	2.189
18:20:15.925	3.989	2.179	3.984

LR-01 is specially designed as a Logger to automatically collect measurements. It is capable of performing this function stand-alone. The Logger settings (rate and method) can be entered via the PC connection.

The storing rate can be set between 1 s minimum and 900 s maximum.

The Logger function can be enabled or disabled as wished. When properly set and enabled, it can be started by pressing the big button on the unit or via the PC.

The battery capacity and the internal flash memory amount are able to store quite long measurements.

A binary file is saved into the logger itself, and can be downloaded using the Narda Probes Manager software.

The communication protocol is also supplied, so that it is possible to develop a User's own software, in case this was necessary.

Please, refer to the Command Protocol chapter for further details about the communication protocol.



**The actual start of the Logger occurs by pressing the big button, on the unit, for more than 5 seconds, or sending the proper command via the PC. This event erases the entire memory and the previously acquired logs are deleted.**

The Log remains active until the unit is turned off or the maximum number of storable records is reached or the logger stop command is issued. This maximum number depends on the type of Log chosen; i.e. 250 thousand in compact mode and 125 thousand in extended.

### 2.10.1 Compact and Extended mode

It is possible to choose between a compact Log, with no position information, which allows to save up to 250k measurements, and an extended Log, complete of GPS data, allowing up to 125k measurements.

### 2.10.2 Average

The averaging type (Average or RMS) and time, for field measurements, can also be set.

If logging rate is lower than the averaging time, the instant value (or values, depending on the probe) is stored.



**When the logger acquires at button press, the instantaneous values are saved.**

### 2.10.3 Logger Method

The Logger can be armed to snap a measurement under the following situations:

- the alarm triggers the saving of the measurement record on a time basis;
- the alarm triggers the saving of the measurement record continuously;
- the alarm triggers the saving of one measurement record only when overpassing the threshold
- pressing the button triggers the saving of one measurement record;

## 2.11 LR-01 Applications

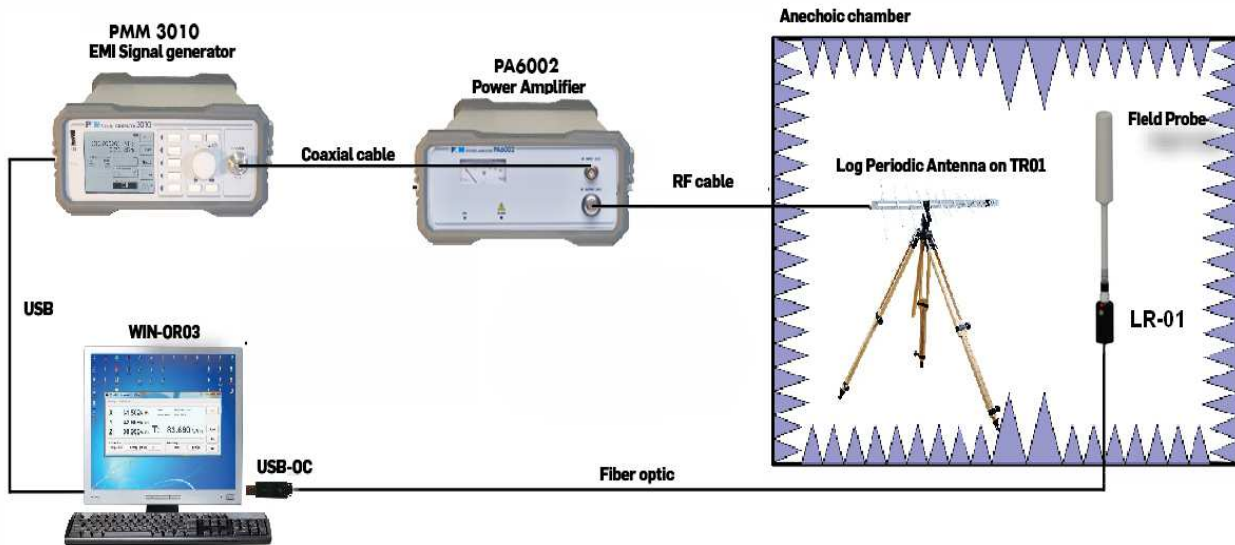


Fig. 2-2 Typical Immunity test irradiation configuration

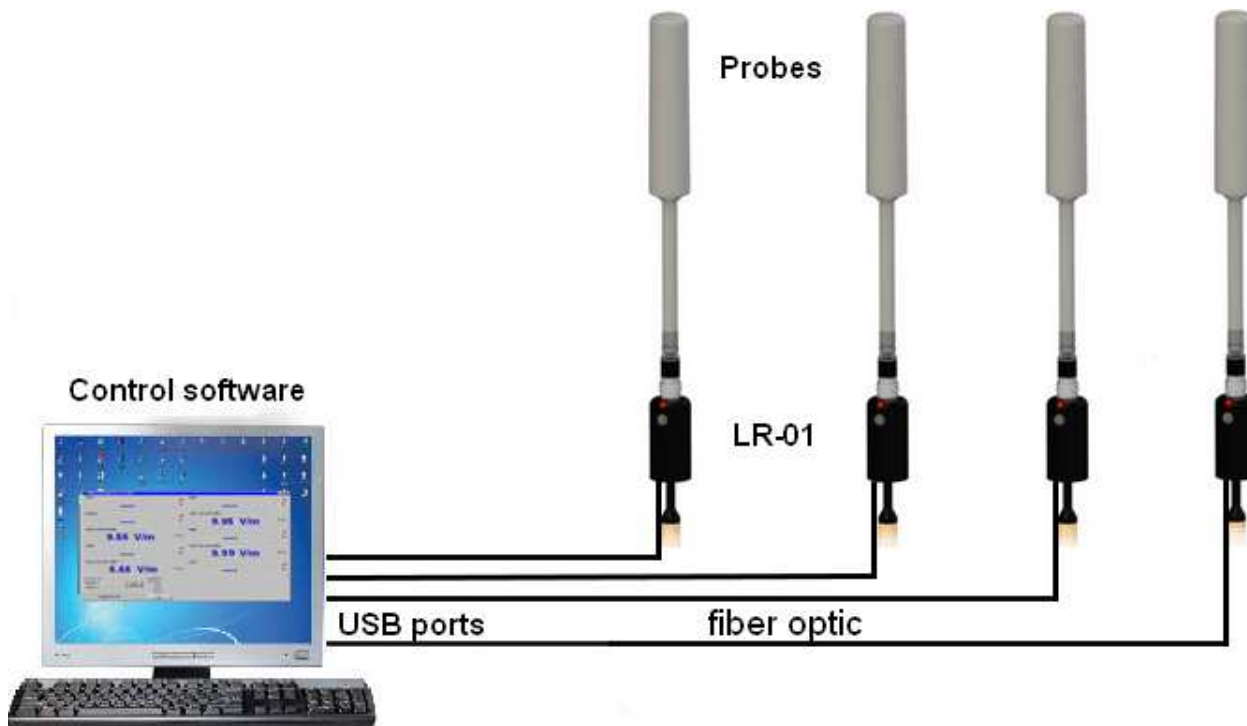


Fig. 2-3 LR-01 in a multi-probe configuration



For further information about the use of LR-01 Logger Repeater with the Narda Porbes Manager software, please refer to the chapter 4 of this Manual.



When measuring fields from transmitting aerials, it is important to place the probe with the supporting handle in line with the polarity of the aerial. This is to avoid any interference with the reading, especially when analysing signals of the megahertz range.

**NOTICE**

The probe used with the LR-01 have highly sensitive components. Do not insert the probe in fields which exceed the maximum limit allowed.

The internal diodes may be damaged whether the LR-01 is switched ON or OFF or regardless of whether the probe is connected to the instrument.



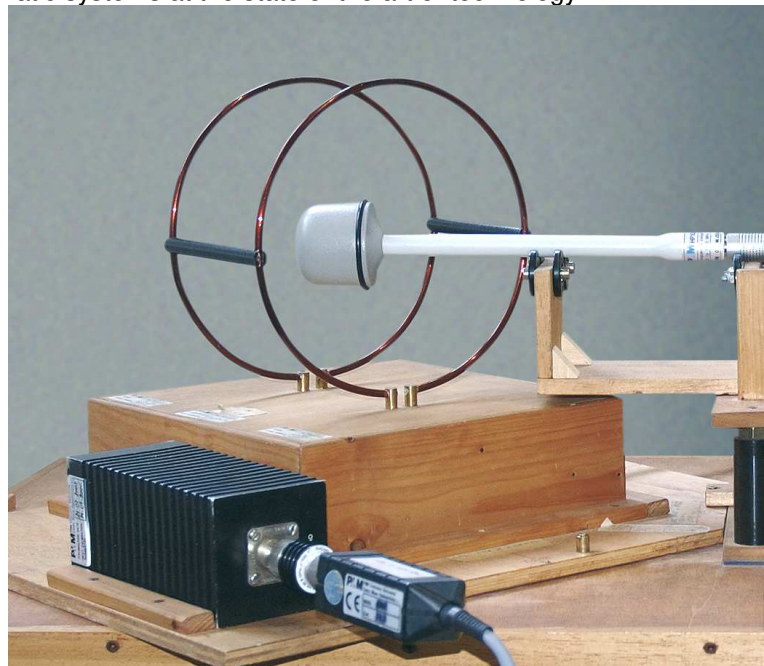
Some models of probe have flatness compensation factors on board that can be applied when the signal source frequency is known, in order to make the measurement even more accurate.



Shaped models of field probes are also available; after selecting the desired limit, the meter gives the percentage of level referred to it. Probes belonging to this group allow measurements compensation based on frequency.

If the frequency of the signal to be measured is known, not only it is possible to apply an automatic flatness correction but also LR-01 is able to properly evaluate field strength in a linear or quadratic way, as required by the selected standard, depending on the frequency. In other words, the field level evaluation becomes linear (stimulation effects) under 10 or 30 MHz, depending on the selected standard.

Each probe is individually calibrated with very high precision and accuracy automatic systems at the state of the art of technology.



**Fig. 2-4** Example of calibration of a magnetic field probe

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## **3 – Narda Probes Manager software installation**

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### **3.1 Introduction**

This chapter is the installation and operation guide of the PC Software Narda Probes Manager supplied with the LR-01 programmable Logger Repeater.

The Narda Probes Manager is a software instrument that integrates the LR-01 Logger Repeater and allows displaying the measured field level directly on a Personal Computer screen.

### **3.2 Hardware requirements**

To ensure the proper operations of the Narda Probes Manager software, the minimum hardware requirements of the Personal Computer are

- Processor Core i3
- 2 GB RAM
- 10 GB free space on hard disk;
- Windows Operating system™ Win7 and Win10



**To obtain firmware or program updates for LR-01, please contact your NARDA distributor or download it directly from the NARDA Web site <http://www.narda-sts.it>**

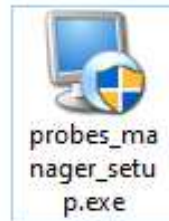
### 3.3 Installation

To install the Narda Probes Manager on PC from the supplied Software Media as follows:

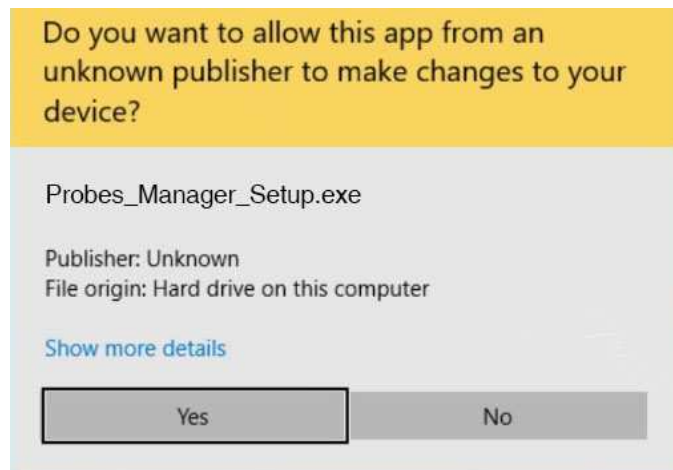


**Do not connect the LR-01 to the PC until the installation is completed.**

Browse the Software Media in Computer Resources and double click on the **Narda Probes Manager Setup.exe** file to start the installation



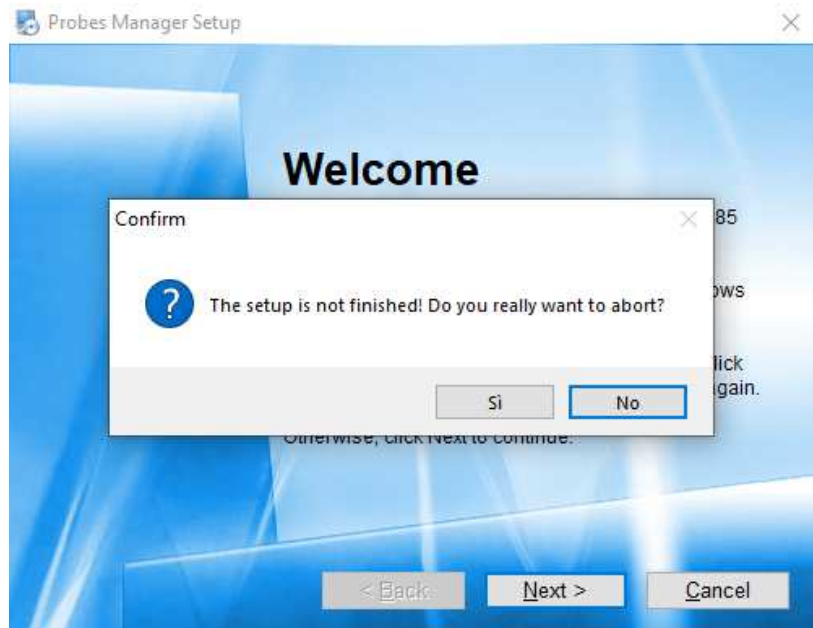
Click Yes when requested.



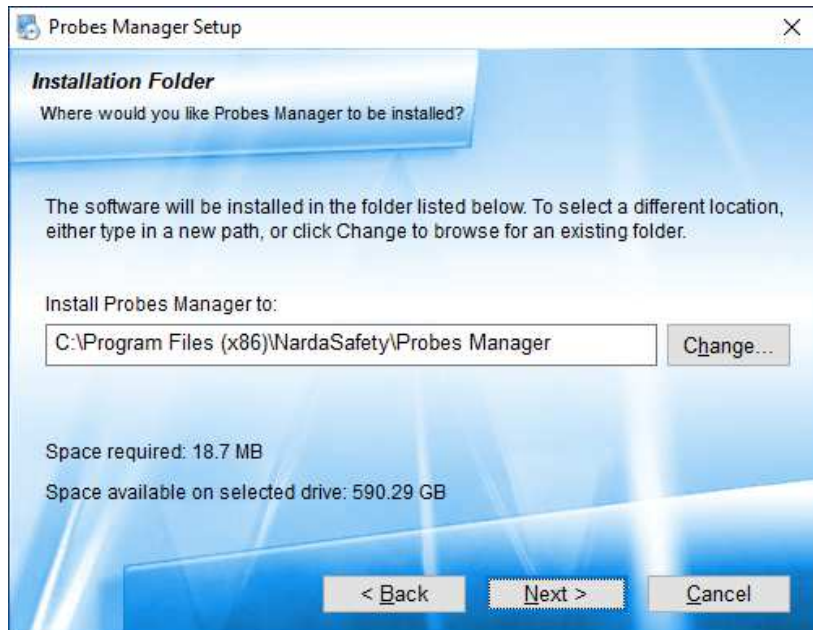
Please allow the installation as administrator, by clicking Yes when requested.

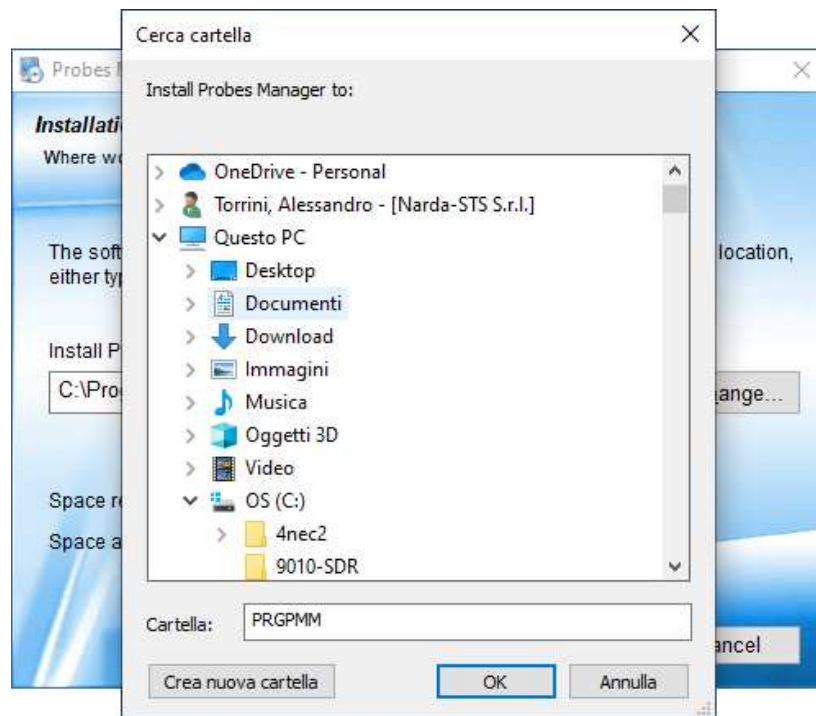


The installation can be aborted by clicking on **Cancel**:

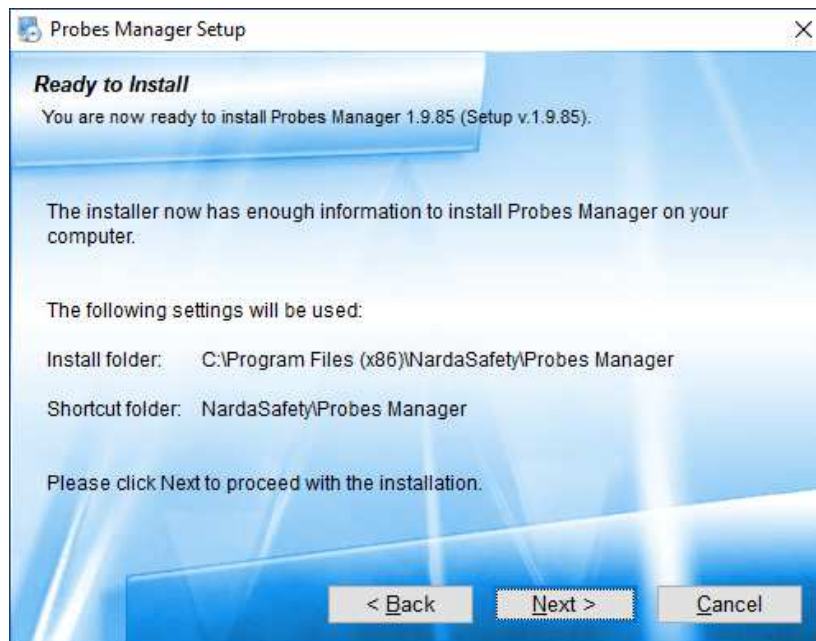


The installation folder must be specified. Click **Next** to confirm the default folder or **Change** to modify.

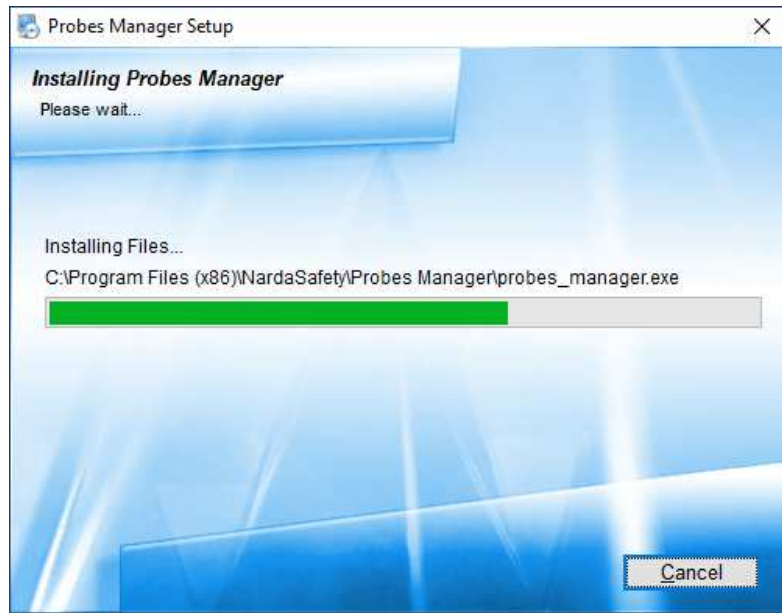




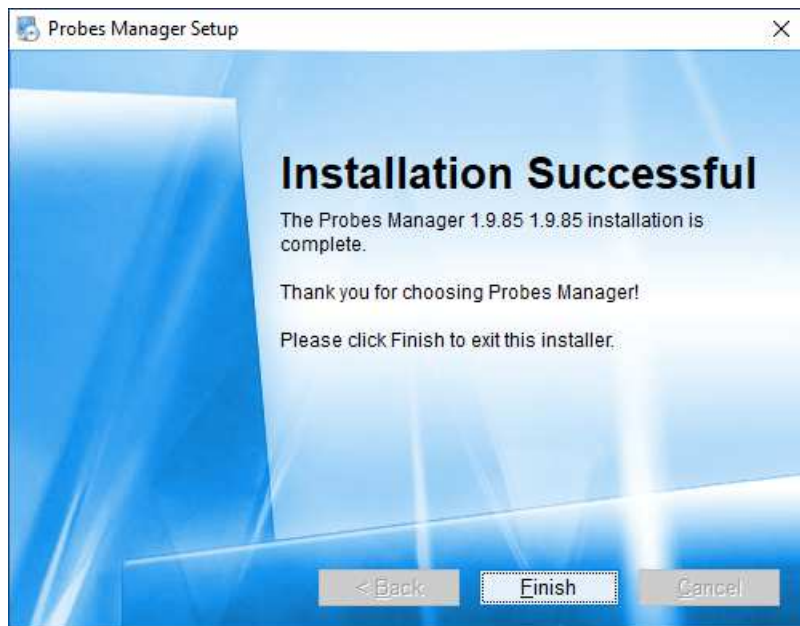
Click **Next** to proceed installing.



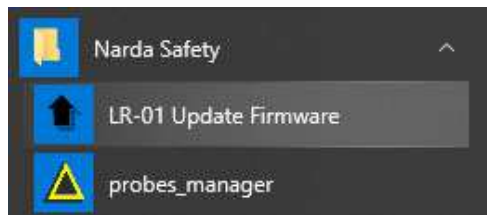
The installing status is displayed then:



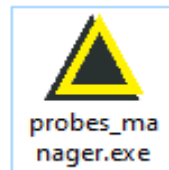
Click **Finish** to complete and exit the installer.



The folder **Narda Probes Manager** is created under **Programs\Narda Safety** with **Probes Manager** (see Chapter 4) and **LR-01 Update firmware** (see Chapter 5)



The **Probes\_Manager** icon will be available on desktop.



## 4 – Narda Probes Manager Operating instructions

### 4.1 Introduction

This section provides the information necessary to use the Narda Probes Manager software with the LR-01 programmable Logger Repeater.

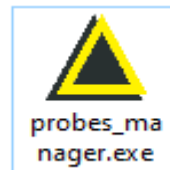


**To obtain firmware or program updates for LR-01, please contact your NARDA distributor or download it directly from the NARDA Web site <http://www.narda-sts.it>**

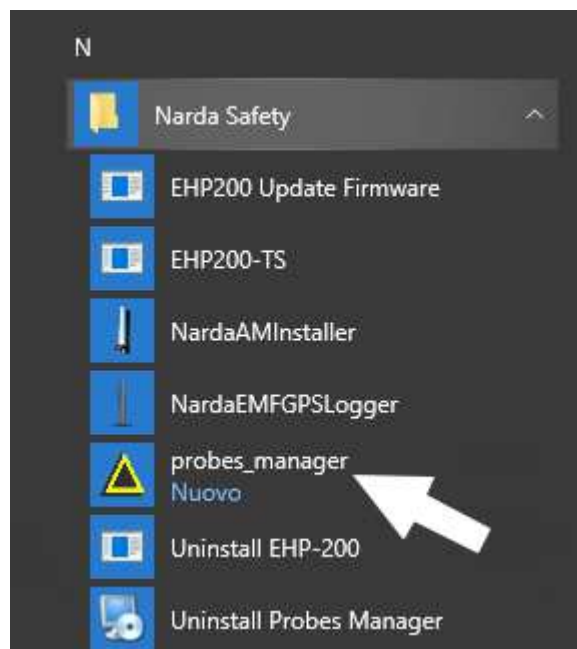


**Before starting Narda Probes Manager, it is recommended to limit the applications running on your computer.**

Connect the LR-01 to PC and click the icon on desktop.



Alternatively (Windows 10): **Start → All Programs → Narda Safety → Narda Probes Manager.**



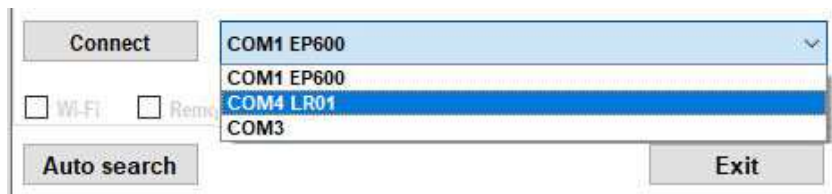
This window is displayed first.



The user can quickly change the desired communication channel by clicking onto the **Comm port** drop-down menu.



When the menu is opened, the communication port selector appears. It allows the user to choose among the available ports.



**Both when the USB wired connection or the USB-OC optical link is used, the device appears as a COMn port.**

With the button “Auto search”, the software detects the COM port to which LR01 is connected and display it on the menu port with its serial number.





If the unit is off, it can be remotely switched on via the fiber optic cable, using the software.

When needed, the User can tick the **Remote On using FO** box to switch on the LR-01 directly from the PC.

This can be very convenient for turning the instrument on and off from remote, when it is located far away or in places that are not easily accessible (i.e. inside anechoic chambers etc.).



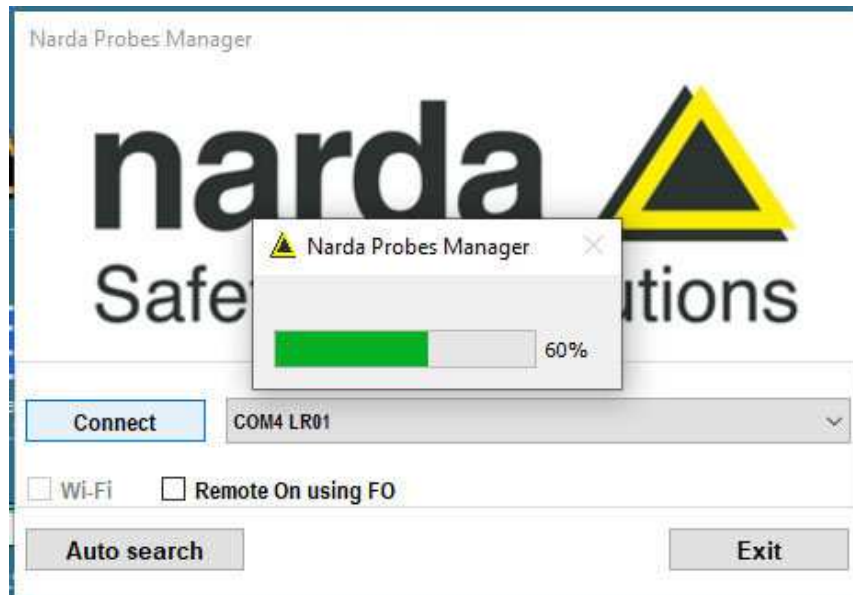
If the WiFi connection has been enabled previously (see §4.2.10.1.4 Communications at page 4-28), it will be possible to activate the corresponding communication, if desired, by ticking the relevant Wi-Fi box.



Click **Connect** to confirm.



Then, if the device is correctly found the connection progress bar is displayed.



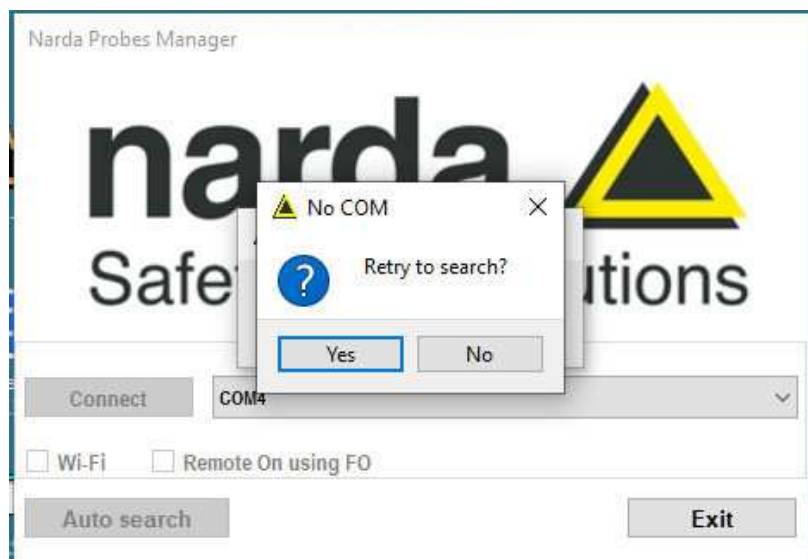
Then, the main window is displayed, showing the live measurements together with all other related information.



If the device was not available at the selected port, the Looking for devices indication appears.



The following message appears when LR-01 is not connected or the communication is not established:

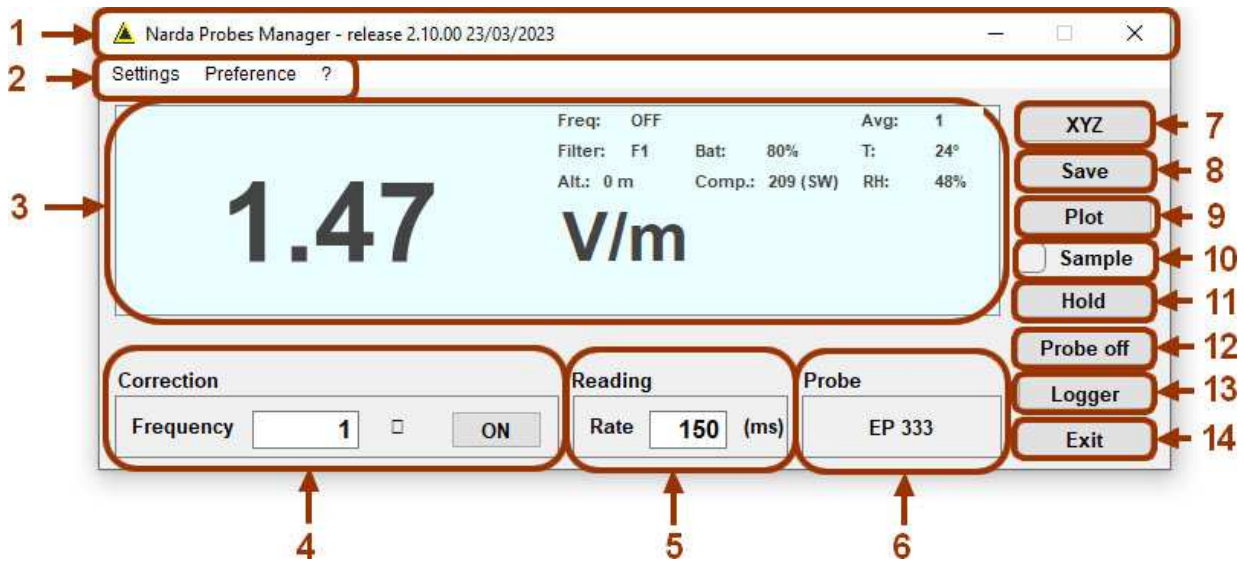


Select **NO** to quit the Narda Probes Manager.

Select **YES** to retry establishing the communication (check the LR-01 correct installation before).

## 4.2 Main window contents

Once connected the main window is displayed:

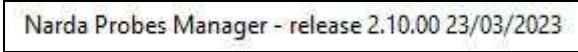


Commands description:

1. Title bar
2. Menu: Settings, Preference and ? tags ribbon
3. Measurements and parameters (main window)
4. Correction frequency setting in MHz
5. Reading rate in milliseconds (ms)
6. Probe type
7. Toggle between Total field value or contemporary X - Y – Z axis readings
8. Button to store the field value (every time the software starts the button is disabled)
9. Plot (graph view)
10. Sample indication
11. Hold/run readings
12. Probe off, turns off the connected unit
13. Logger function
14. To Exit and quit the program

#### 4.2.1 Title bar

The software release shown here.

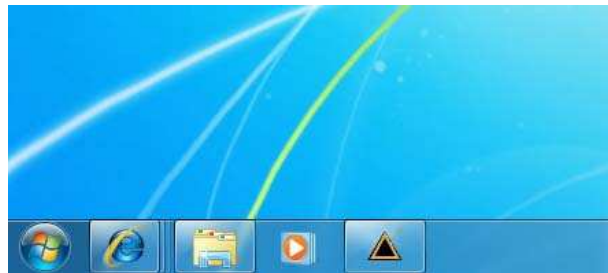


Narda Probes Manager - release 2.10.00 23/03/2023

The control buttons allow to minimize to icon, enlarge/restore the main window and exit the program:



When minimizing the main window the information is displayed in the Windows application bar at the bottom of screen.



The total field measurement remains displayed on desktop meanwhile (for more information see par. "Setting/Preference/Minimized UI").

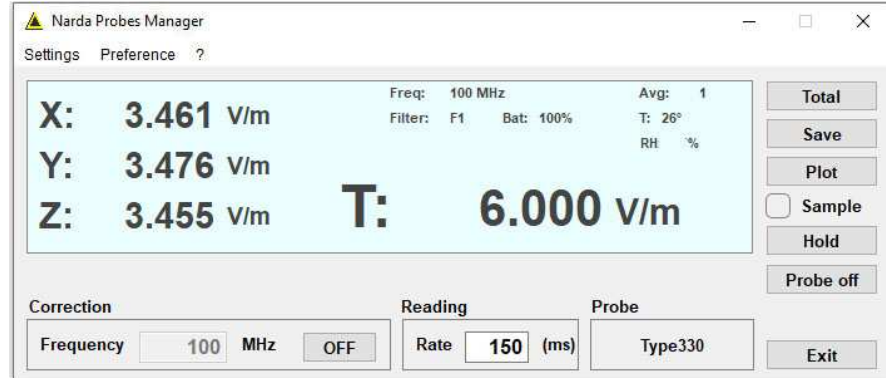


#### 4.2.2 Main window displayed measurements

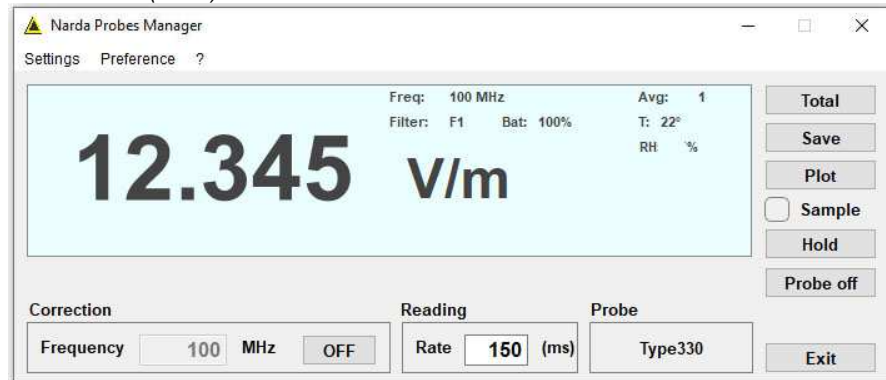
The measurements displayed in the main window are:

- **field values** as x - y - z or total (see par. “XYZ / TOT”).

##### Mode X - Y - Z



##### Mode Total (TOT)



- **Measuring unit** the electric or magnetic field measuring unit depend on the probe model connected; the value is displayed with three decimals. Min. value displayed: 0.010 V/m or A/m

- **Correction frequency** see par. “Frequency setting”  
Default: *Freq: 10.00 MHz*

- **Average and Filter** see par. “Settings”  
Default: *Avg: 1 Filter: 40 Hz*

- **Battery status** displayed in 5% steps. It shows the residual autonomy during measurements and the achieved autonomy during charging.



**Battery voltages below 5% of charge are displayed red.**

#### 4.2.2.1 Displayed technical data

In the upper right part of the screen, some technical data are shown.

<b>Freq:</b> OFF	<b>Avg:</b> 1	
<b>Filter:</b> F2	<b>Bat:</b> 80%	<b>T:</b> 24°
<b>Alt:</b> 0 m	<b>Comp.:</b> 209 (SW)	<b>RH:</b> 48%

They are:

- **Freq:** followed by the frequency chosen for correction, or OFF when disabled.
- **Avg:** followed by the number of measurements for averaging calculation.
- **Filter:** followed by the label related to the selected filter.
- **Bat:** followed by the charge percentage of internal rechargeable battery.
- **T:** followed by the temperature in degrees Celsius.
- **Alt:** followed by the relative altitude in meters.
- **Comp:** followed by the compass heading in degrees and cardinal points notation.
- **RH:** followed by the percentage of relative humidity.

Please refer to the related paragraph for further information about each item.

### 4.2.3 Frequency correction setting

This setting in MHz recalls the corresponding frequency correction factor stored in the LR-01 memory. It allows an extremely precise measurement of the field level at the selected frequency.



**The setting displayed at the first run is the default; the last setting will be displayed then.**

The frequency is displayed with two decimals, max. resolution of 0.01 MHz. Press the enter key to enter the set frequency value.

Correction  
Frequency  (MHz)

To disable the frequency correction, click OFF; the button toggles to ON for enabling the function when required.

Correction  
Frequency  (MHz)

## NOTICE

Only some models of probe allow the possibility of the flatness correction.



The chapter 1 of this manual includes the list of the field probes available and their technical specifications.



When entering the frequency correction value or enabling the function, the "Frequency value" will be updated according to the Reading Time setting.



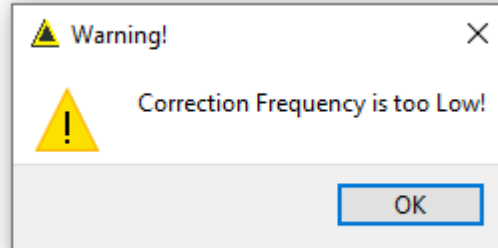
When entering the frequency correction value while in HOLD mode, the new value will be not displayed until the HOLD is released.



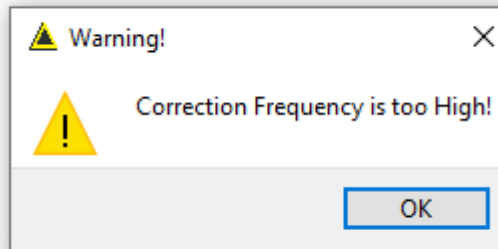


**The following messages will appear when entering frequencies out of the probe frequency range:**

If the frequency entered for correction is lower than the minimum admissible, the value will be set at the minimum available and the following message will be shown:

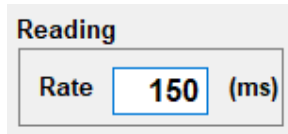


If the frequency entered for correction is higher than the maximum admissible, the value will be set at the maximum available and the following message will be shown:



#### 4.2.4 Reading Rate setting

It shows the time interval (in milliseconds) between subsequent readings. Setting resolution of 1 ms (0.001 s). Press the enter key to enter the set frequency value.



The setting displayed at the first run is the default; the last setting will be displayed then.



The minimum time interval between readings is in function of the filter setting. The table Filter (Settings/Filter) shows the minimum reading rate allowed.



The max. time interval between readings is 360 s regardless of the filter setting.

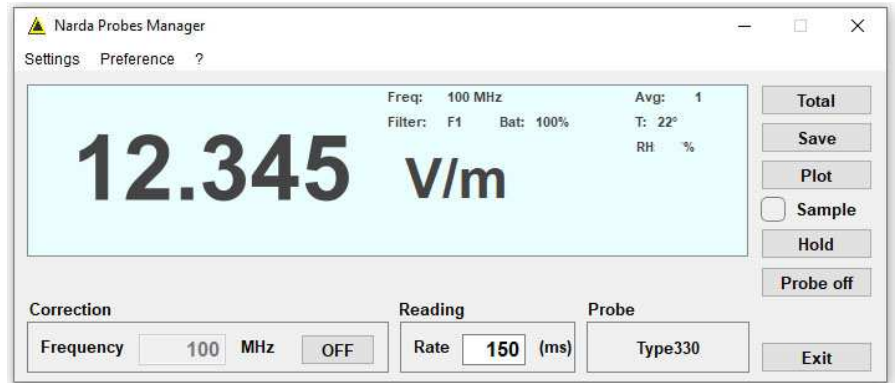
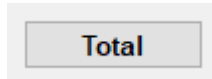


Entering a reading rate not allowed will cause a warning message to appear:

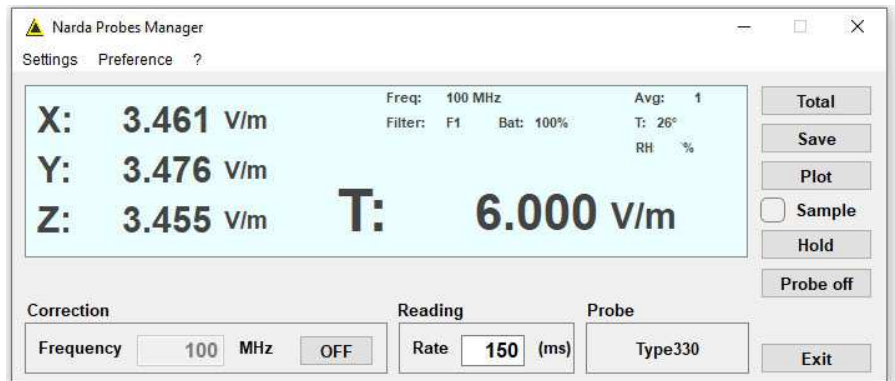
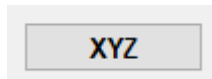


#### 4.2.5 XYZ / TOT

Button for selecting the x - y - z (**XYZ**) or Total mode (**TOT**).  
Max. display resolution: 0.001 V/m or A/m; the unit depends on the probe model.



Click on the XYZ button to toggle to Total mode.



If the field value of the probe is outside the nominal level range, the following messages are displayed:

**Ovr** : the field level is higher than 110% of the probe nominal maximum level (for example, 880 V/m for EP-183).

**!** : the field level is between 100% and 110% of the probe nominal maximum level (for example, from 800 to 880 V/m for EP-183). The symbol is close to the value.

**\*** : the field level is lower than probe nominal minimum level. The symbol is close to the value.

- For example, 0.8 V/m per EP-183 on the total;
- For example,  $0.8 / \sqrt{3}$  per EP-183 on the single axis.

**Low** : the field level is lower than 1/15 of the probe nominal minimum level.

- For example,  $0.8 / 15$  for EP-183 on the total;
- For example,  $0.8 / (15 \times \sqrt{3})$  for EP-183 on the single axis.

## NOTICE

**Only some models of probe allow the possibility to choose between showing the Total and the levels of the three independent Axis.**

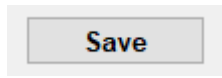


**The chapter 1 of this manual includes the list of the field probes available and their technical specifications.**



**The field value outside the nominal level range could be unreliable.**

#### 4.2.6 Save measurements



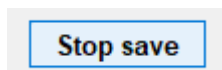
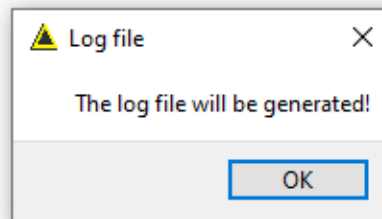
Click the Save softbutton in the main window to activate the Measurements Log.



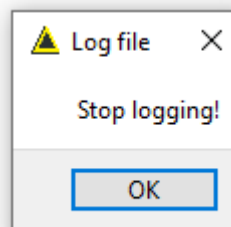
#### When the software starts, the function Measurements Log is disabled

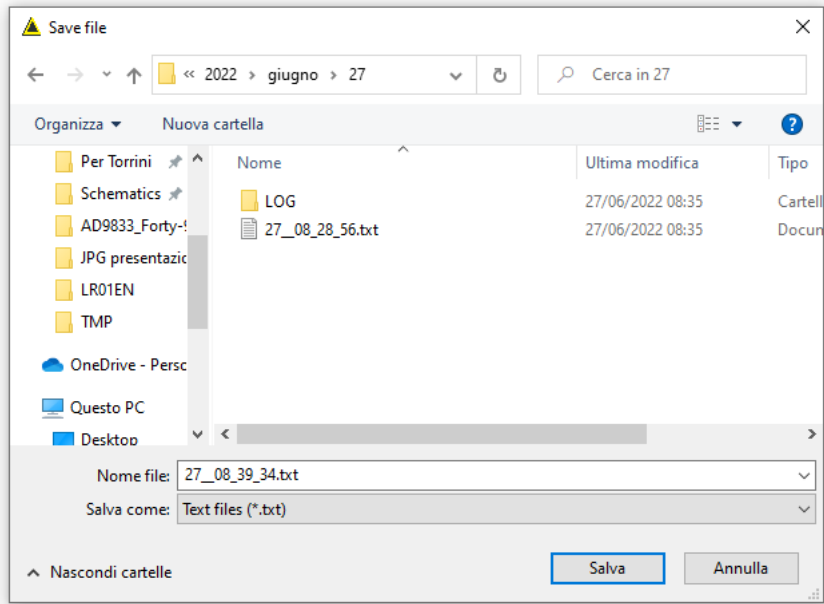
Every time the button **Save** is selected, a message pops up telling the Log file will be generated.

The field value is stored in a file named as *DAY\_Hour\_Minutes\_Seconds.txt* and located under the Documents folder: *..\Documents\NardaSafety\NardaProbesManager*



Clicking the button again causes the end of measurements log and the following message appears:





When the file is saved in TXT format and the table is opened, a huge amount of data are available

Measurements log - Thursday 23 July 2020 - 10:21:13 (EP 183)					
Time	X(V/m)	Y(V/m)	Z(V/m)	T(V/m)	
10:21:13.072	7.477	6.273	1.779	9.920	
10:22:56.867	LOW	2.167	1.892	2.870	
10:23:07.947	1.154	LOW	1.046	2.020	
10:23:10.154	2.995	0.402	2.980	3.170	
10:23:11.355	3.999	2.178	3.024	5.440	
Measurements log - Thursday 23 July 2020 - 10:23:46 (EP 183)					
Time	X(V/m)	Y(V/m)	Z(V/m)	T(V/m)	
10:23:55.345	1.024	0.652	0.963	3.380	
10:23:57.985	1.188	LOW	1.406	1.780	
10:24:11.443	4.681	5.645	LOW	8.150	
10:24:15.105	1.851	1.469	1.695	2.900	
10:24:17.407	LOW	LOW	1.123	1.120	
Measurements log - Thursday 23 July 2020 - 10:27:59 (EP 183)					
Time	X(V/m)	Y(V/m)	Z(V/m)	T(V/m)	
10:28:02.725	6.375	4.330	9.478	12.210	
10:28:16.004	3.474	LOW	3.514	4.940	
10:28:19.146	LOW	LOW	1.104	1.100	
10:28:21.021	2.103	LOW	2.959	2.120	
10:28:28.774	LOW	0.305	1.018	1.630	
Measurements log - Thursday 23 July 2020 - 10:53:14 (EP 183)					
Time	X(V/m)	Y(V/m)	Z(V/m)	T(V/m)	
10:53:14.255	-	-	-	8.820	
10:53:14.896	-	-	-	8.820	

If the field value measured is outside the nominal level range, the following messages are displayed with **Ovr**, or **!** or **\*** or **Low**. See the previous paragraph for further information.

For every working session (from starting to closing the software) the following headline will be created in the txt file:

```
Measurements log - Monday 20 July 2020 - 16:32:05 (EP 183)
Time          X(V/m)          Y(V/m)          Z(V/m)          T(V/m)
```

**dd/mm/yyyy:** working session date.

**(Probe model):** between brackets is reported the probe connected to the LR-01

**Time:** hour, minute, second of the start of the working session.

**Time:** hour, minute, second, thousandths of a second of the measurement acquisition

**X(unit) Y(unit) Z(unit):** field value on x, y and z axis. If the **XYZ** mode is not enable, each axis will be marked with a minus sign "-". Between brackets is reported the unit

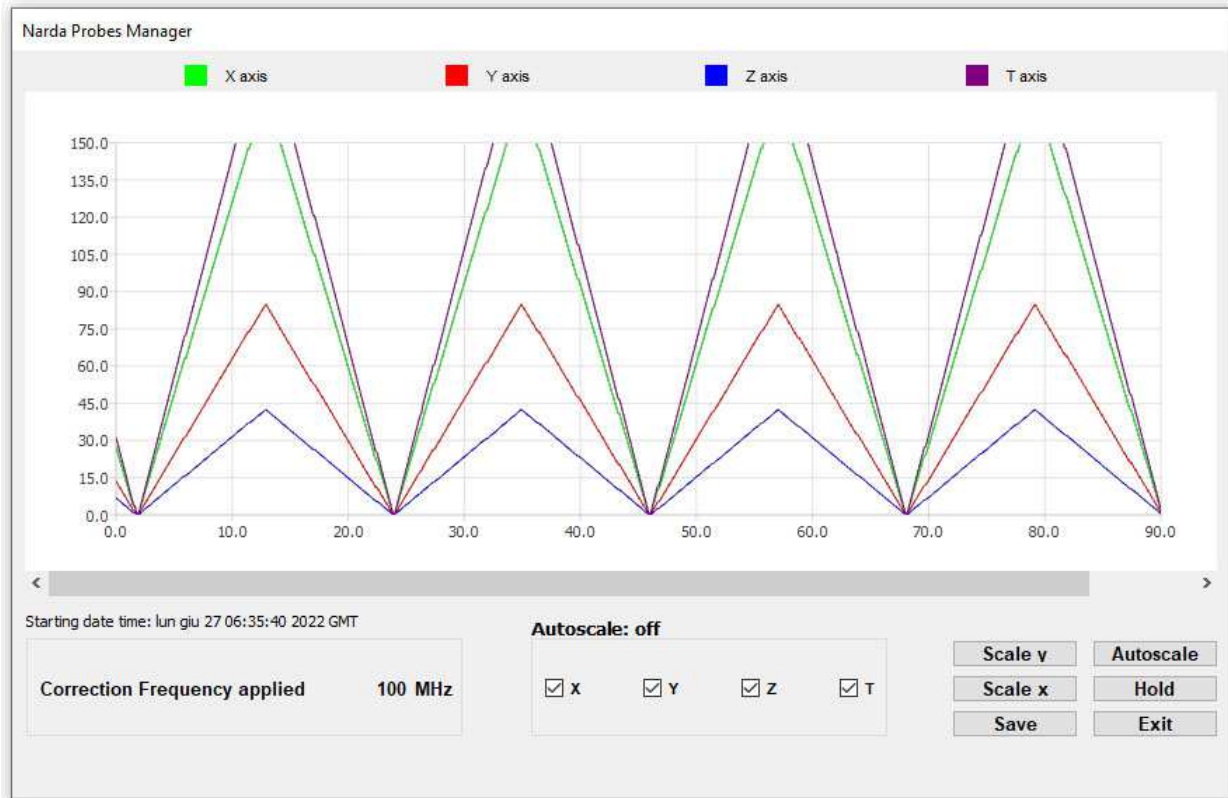
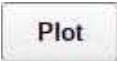
**T (unit).** Total field value; between brackets is reported the unit.



The recorded data can be viewed either as a graph or as a table. By using Word or Excel application, click the Open file command and select "Type of file": "all files"; then find the file to open starting from the directory and follow the necessary path until the file is found.

### 4.2.7 Plot

The **PLOT** function allows to show the field measured during the test in an intuitive graphical way; the plot represents the level versus time in seconds. Once selected the button **PLOT**, the graph will appear:



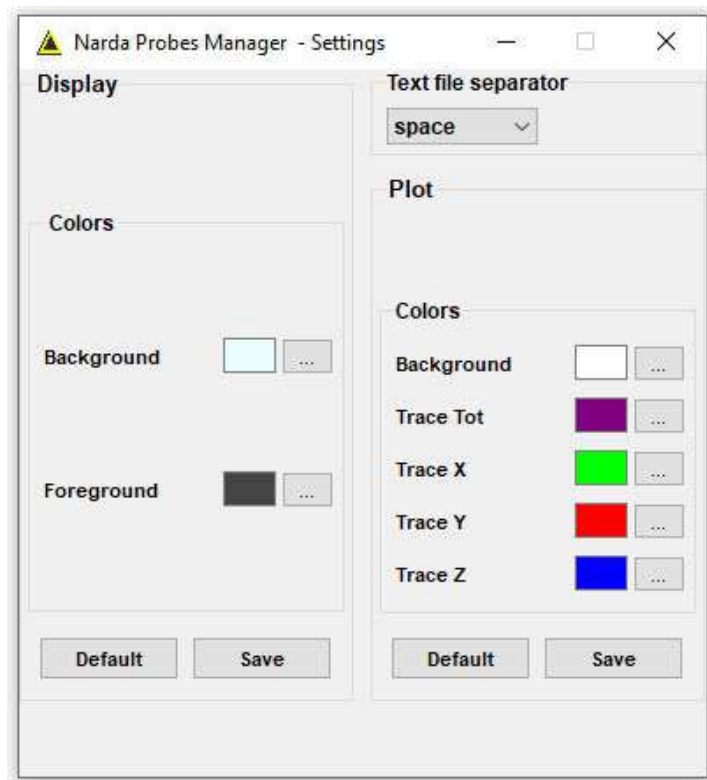
In Plot window it is possible to set the desired scales for both Time (x) and Level (y).

An Autoscale function is also available; it is activated as default.

Any available trace (X, Y, Z, Tot) can be shown or hidden as desired.




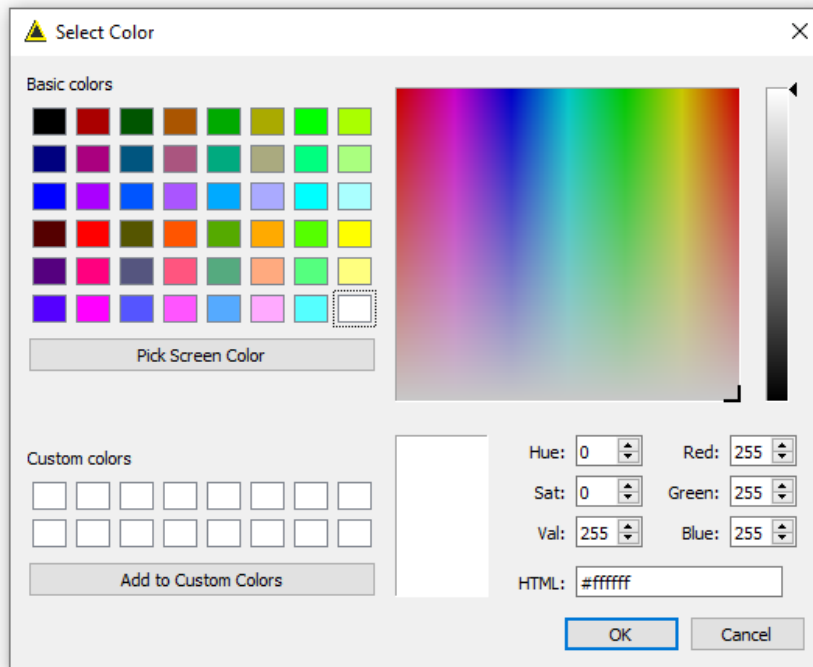
Use the menu **Settings** in the main window to customize the plot appearance:



- The character used as data separator when required by the table form (**Text file separator**);

- Different color combinations of the background, grid, labels and traces are listed under **Colors**. The choice is made by selecting the corresponding

 softbutton to be changed and then using the Color Palette window.



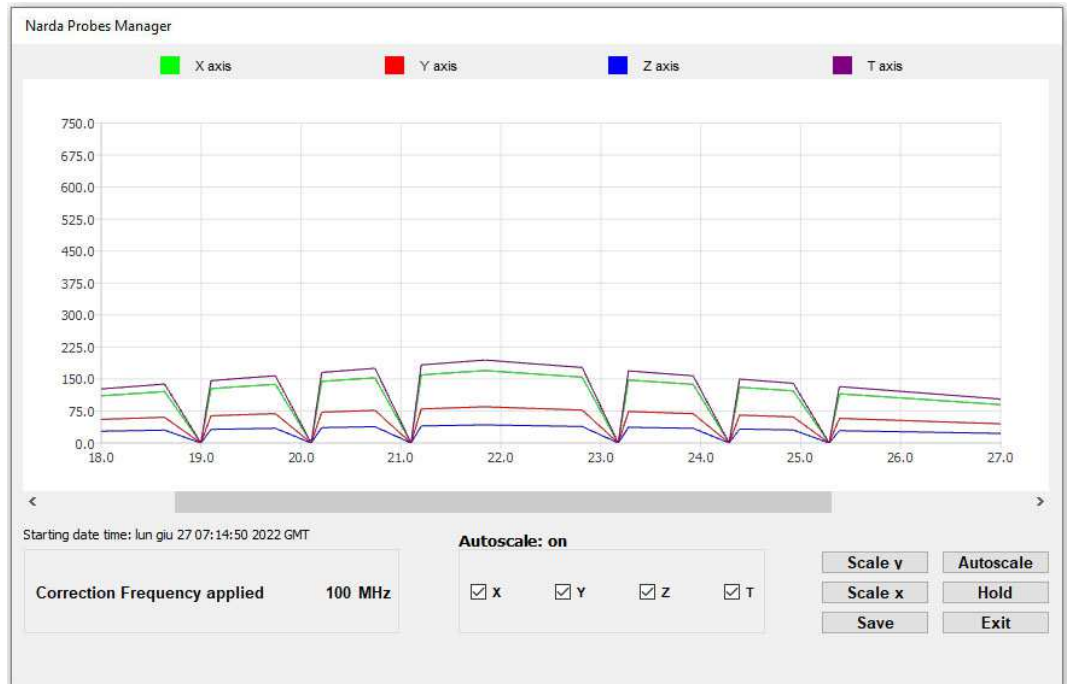
The new settings can be saved with **Save**. Otherwise, press **Default** button to completely restore the initial aspect.



The **Display** section allows to set the desired color of the main window.

**Plot**

Once modified the appearance of the graph, enter back again the Plot function to graph the analysis. In this case, it is done with Time/Div set to 1 s and default colors.

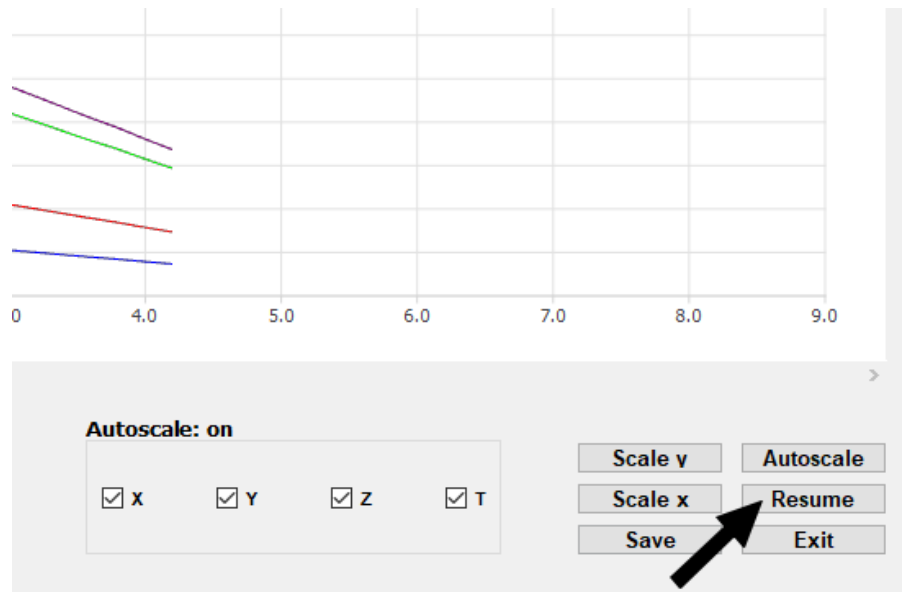


**Hold**

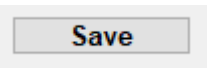
**Exit**

At any time, the graph can be paused or terminated by clicking the **Hold or Exit** button respectively.

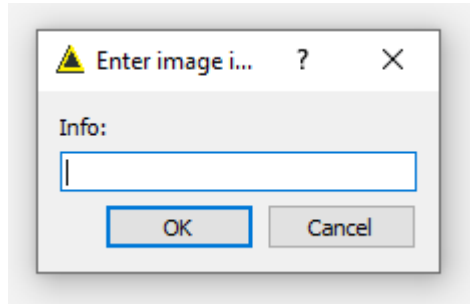
Once Hold is pressed, the button will be labelled as Resume to toggle the function.



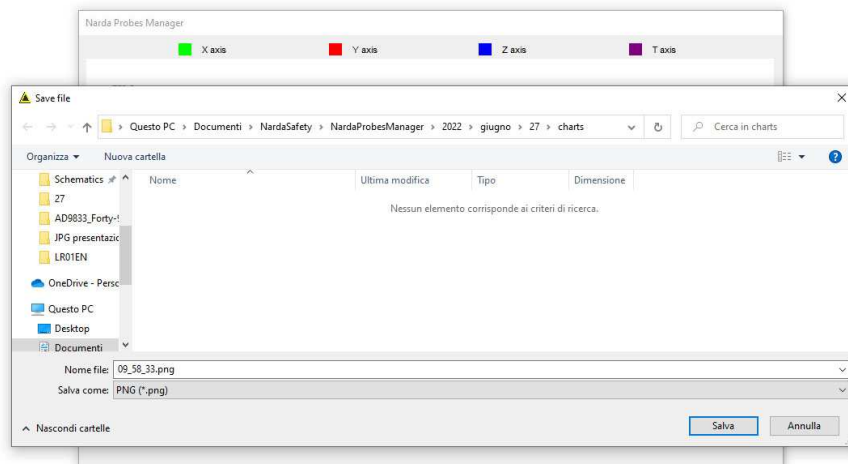
In pause mode, the field values detected during that interval can still be saved if the Measurements Log function was active.



The Save soft button allows to save the graph as an image. It is possible to add a text comment and, for this purpose, after clicking Save, the following box appears:

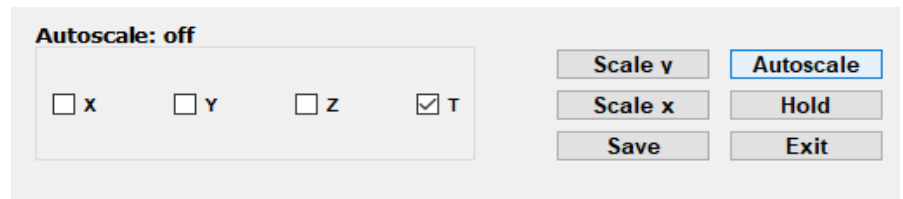


The file name and path can be specified as desired and the default is automatically shown.

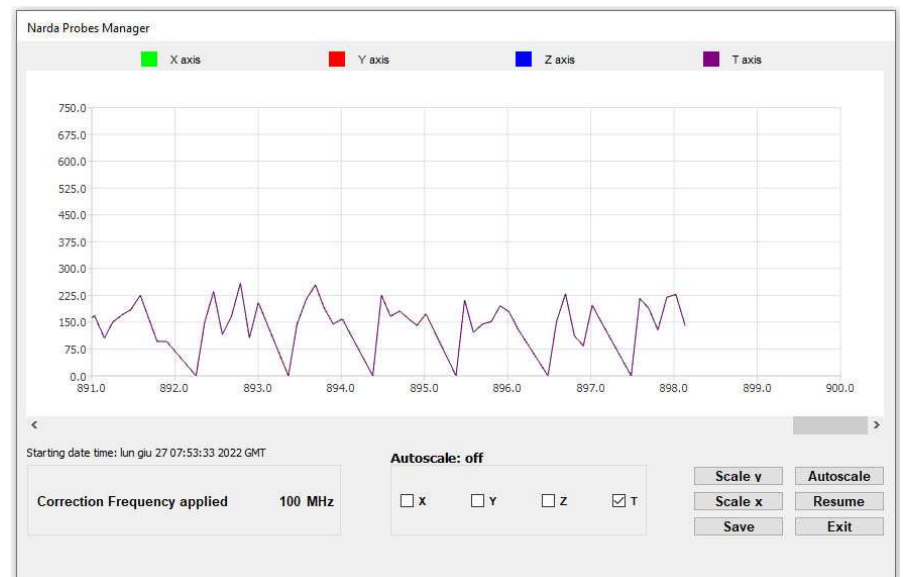
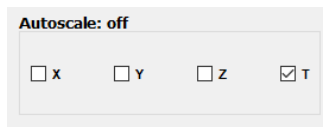


The file is saved in the well-known Portable Network Graphics **PNG** standard format, at high quality and complete of the comment line placed at the bottom of the image.

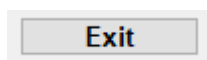
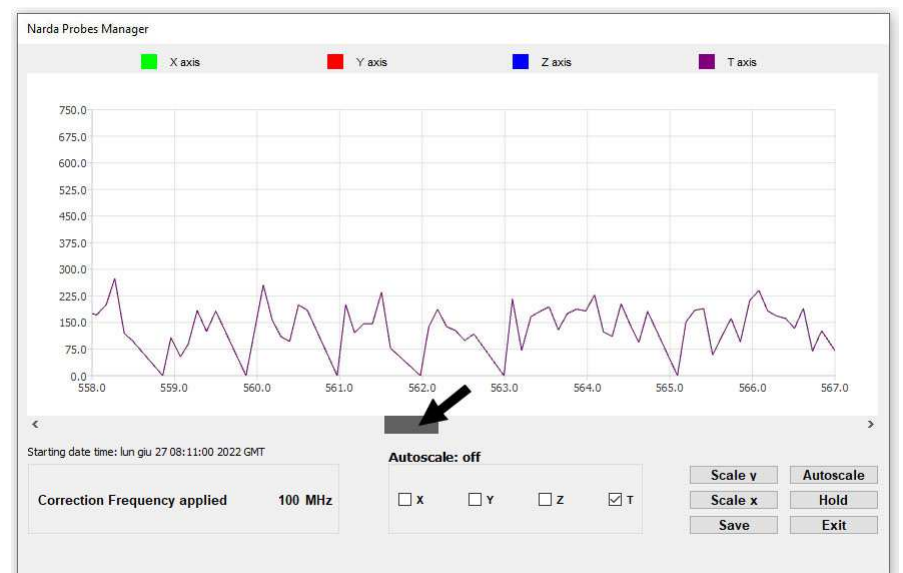
During the work session, the graph can be paused, resumed, the scales can be modified as desired, and the plot can be saved as an image.



Any single axis and Total trace can be shown or hidden at will.



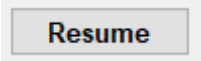
It is possible to scroll the track, along the time, by moving the cursor



When the test is over, the graph can be terminated clicking Exit button.

#### 4.2.8 HOLD / RUN

Press **Hold** to freeze the readings.  
Click the button to toggle from Hold to Resume.  
The button XYZ/TOT is active even when in Hold.



**Even if the program was closed (Exit) when in Hold mode, it will restart in Run mode.**

#### 4.2.9 EXIT

Press **EXIT** to end the program. The current settings are saved and will be recalled at the next start.

Message:

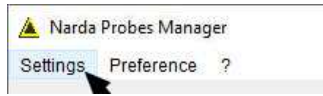


Press **YES** to close the software (the LR-01 will remain on).

Press **NO** to continue using the software

#### 4.2.10 Menu

Includes:

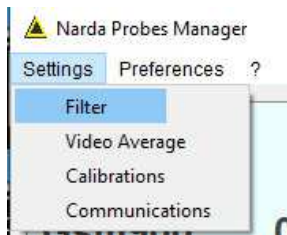


- **Settings:** set Average, Filter, Calibrations and Communications
- **Preference:** select program skin and enable the function **Minimized UI**
- **? (Info):** software and product information

#### 4.2.10.1 Settings

**Settings** options:

##### 4.2.10.1.1 Filter



- **Filter:** the LR-01 internal A/D converter feature digital filters to improve resolution and sensitivity, as well to reducing interferences. The filters can be selected according to the application requirements: from the faster (F1) to the slower (F4).

To set the required filter click on the corresponding line, which turns blue. The selected filter will be displayed in the main window.

**When selecting a new filter while in HOLD mode, the filter setting indication in the main window will be updated only after toggling to RUN mode.**



Filters		
	Filter(Hz)	Settling times(ms)
F1	80	150
F2	40	250
F3	20	450
F4	10	900

Exit

**Filter(Hz):** indication of the filter characteristics

- 80 Hz filter
- 40 Hz filter
- 20 Hz filter
- 10 Hz filter

**Settling time (ms):** time required for getting a complete reading:

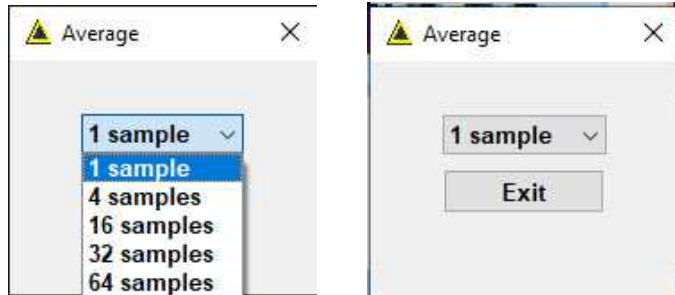
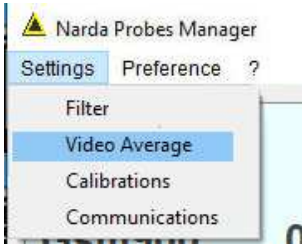
- 150 ms with 80 Hz filter
- 250 ms with 40 Hz filter
- 450 ms with 20 Hz filter
- 900 ms with 10 Hz filter

Normally a fast field measurement is required for faster response and better stability when the field probe controls as feedback for a preset field value the radiated power of a system composed by antenna and RF generator.

However, as faster the measurements as higher the noise is, with consequent reduction of sensitivity.

Slower measurements increase sensitivity but increase the response time and the power consumption.

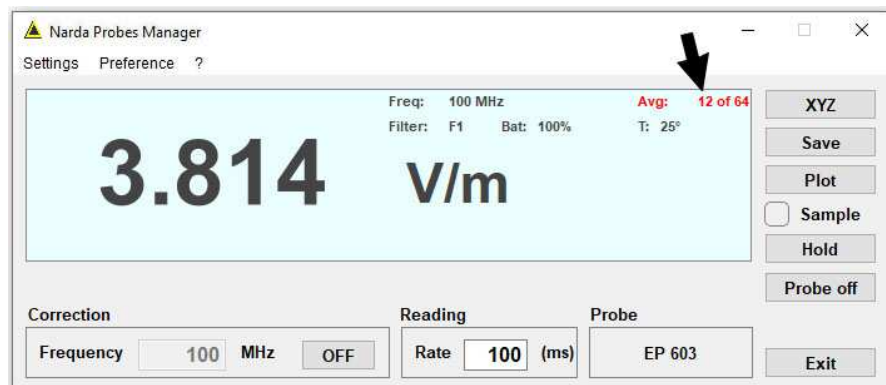
**4.2.10.1.2 Video Average** - **Video Average:** setting of the number (1, 4, 16, 32 or 64) of readings to calculate the arithmetic average (AVG).



When setting Average = 1, the readings are not averaged and the current measurements are displayed.



In the example, the average value of the last 16 field readings will be displayed. The “**Av**g” counter shows the progressing of the average calculation, updating according to the “Reading rate” time interval setting.



The message **AVG: OK** will be displayed shortly after completion of the averaging process, then followed by the indication of the preset averaging **Av**g: 16.

Then the process continues in moving Average mode: of the 16 readings block, the older is discarded and the latest is added at the speed of the Reading rate setting.

The process is restarted from the beginning when setting a different Average value.



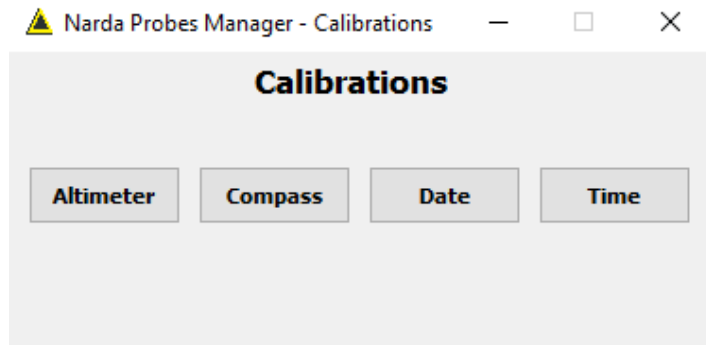
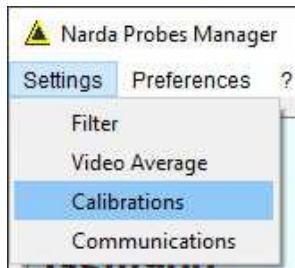
When toggling from TOT to XYZ mode the Average is reset to re-calculate the field values for each single axis.



When in HOLD mode, the new Average value is displayed in the main window and is updated only when the HOLD is released.



#### 4.2.10.1.3 Calibrations



**Calibrations** window allows to:

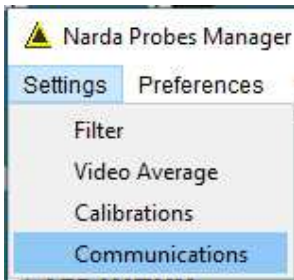
- set to zero the internal **Altimeter** reference,
- calibrate the internal **Compass** for more accuracy,
- set the internal Clock with the **Time** or **Date** of the PC.

The altimeter can be useful in applications where the height of measurements are relevant, such as, for example, along antennas masts.

**The Altimeter works in relative mode. It returns the difference, in meters, from the height where the device was calibrated. It is a barometric altimeter that allows higher accuracy, precision and resolution than GPS. It must be considered that it is subject to variations in atmospheric pressure and therefore it is necessary to calibrate it at each different measurement session.**



#### 4.2.10.1.4 Communications



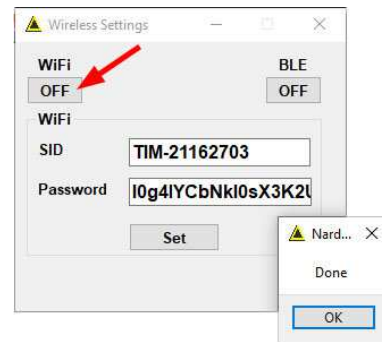
- Communications** window allows to:
- enable **WiFi** connection and connect to the network
  - enable **Bluetooth (BLE)** connection

**Prior to installing LR-01 where the WiFi connection is planned to be used, make sure that the point at which the meter will be placed is adequately covered by the WiFi network, thus allowing remote data communication.**

**The signal strength can be checked using any smartphone capable of indicating the intensity of the WiFi signal. It is also advisable to look for the point at which the signal shows its maximum and, eventually, rotate the meter along its vertical axis to face the Antenna toward to the point self.**

#### Wifi connection

- To enable the **WiFi** connection:
- Enter the name of the Wi-Fi network you intend to use (**SID**)
  - Enter the password of the Wi-Fi network (**Password**)
  - Click **Set** to save and confirm with **OK**



- Click on **OFF** and the button toggles to **ON** for enabling the function. Confirm with **OK** and the LR-01 will attempts to connect to the wireless network.

Once the link has been successfully established, the cable can be disconnected.

In the next connection, the user can enable the wireless communication by ticking  the WiFi box on Narda Probe Manager software (see Pag.4-3).

Instead in case of error, the following message is shown:



#### Bluetooth connection

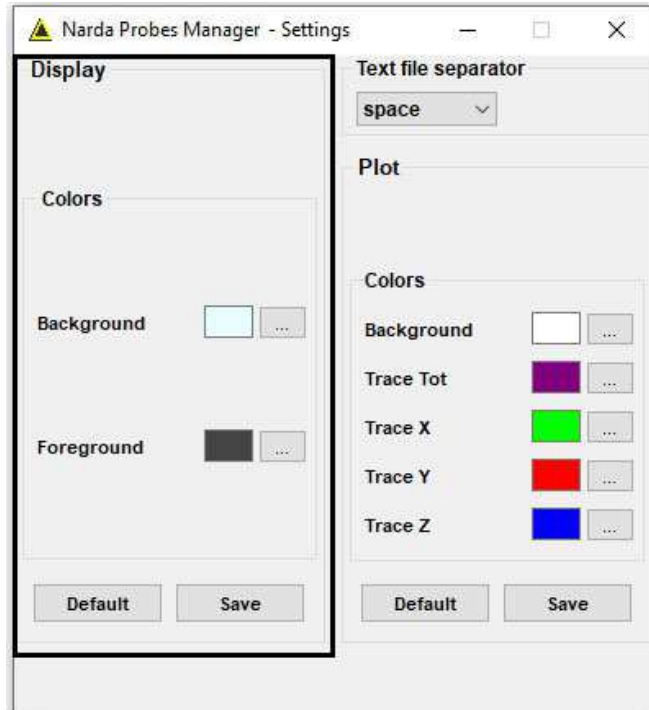
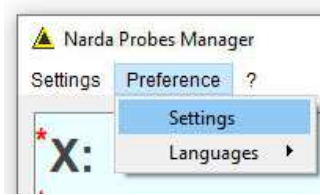
- To active the **Bluetooth (BLE)** connection simply click on **OFF** and the button toggles to **ON** for enabling the function. Click **Set** to save and confirm with **OK**


#### 4.2.10.2 Preference

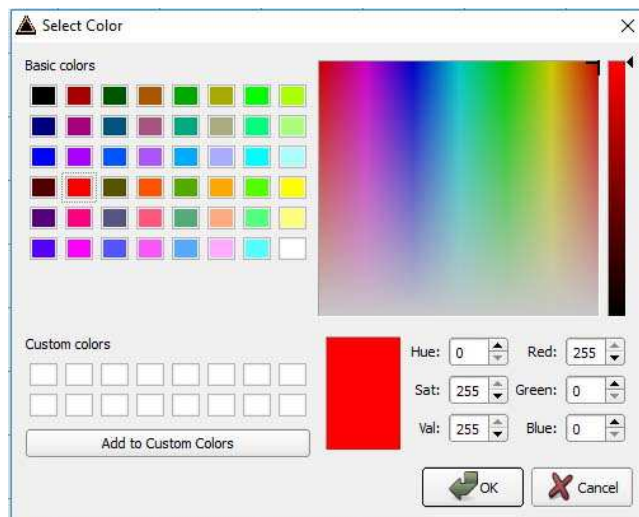
Functions of the **Settings** menu:

##### 4.2.10.2.1 Settings

- **Settings** → **Display**: Different color combinations of the background and text are listed under **Colors**.



The choice is made by selecting the corresponding  to be changed and then using the Color Palette window.



The new settings can be saved with **Save**. Otherwise, press **Default** button to completely restore the initial aspect.

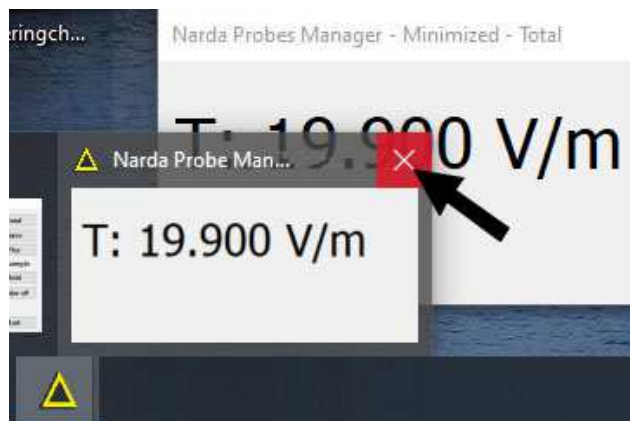
The **Plot** section allows to set the desired color of the plot; see §4.2.7 “Plot” for further information.

**Minimized UI (Unit Interface)** is always enabled, to keep the field readings displayed on desktop when minimizing the main window on the tray.



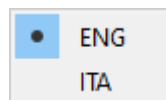
This window can be moved anywhere on the desktop, keeping its final position even at the next minimizing of the main window.

To close this window, go on the tray, click the Narda icon and click the X at the upper right corner of the minimized window.

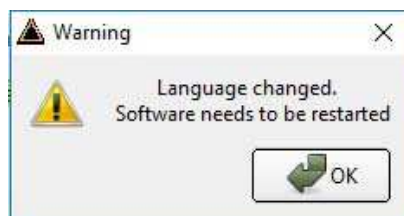


#### 4.2.10.2.2 Languages

- **Languages:** selection of different language of the main window among:



Once selected the new language, a message will appear:



Confirm with **OK** to restart the software with the new language.

### 4.2.10.3 Info button

Contents:



- **Info:** Software release;  
Probe model;  
Repeater model and firmware release;  
Repeater Serial Number;  
Latest Probe calibration.

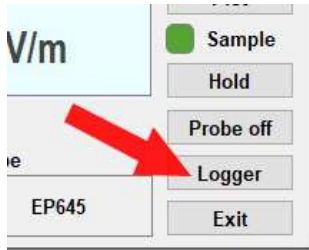


- **About:** Manufacturer information.



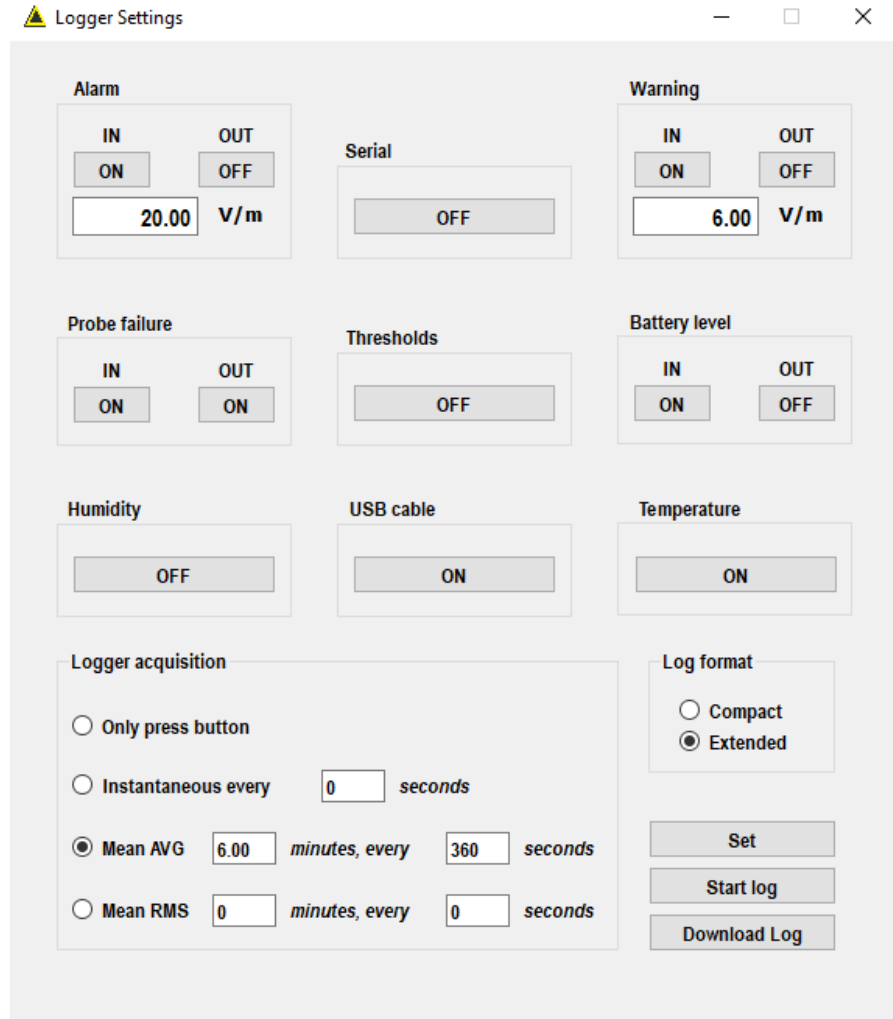
#### 4.2.11 Logger

Click the **Logger button** to enter the stand-alone logger setting page.



Logger function allows collecting measurements directly in the internal memory of the instrument. These measurements are kept even when the device is switched off, thanks to the large internal flash memory.

Narda Probes Manager software allows downloading these measurements in a simple and reliable way.



When entered in the Logger Settings page, the User can enable or disable all alarms and warnings available.

They are:

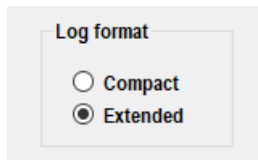
- **Level Alarm:** to set the field level threshold for Alarm notification and enable/disable triggering by exceeding and returning within the threshold.

- **Level Warning:** to set the field level threshold for Warning notification and enable/disable triggering by exceeding and returning within the threshold.

- **Probe failure:** to enable/disable probe failure and recovery notification.
- **Battery level:** to enable/disable battery level notification triggered by exceeding and returning within a factory preset threshold.
- **Humidity:** to enable/disable relative humidity warning triggered by exceeding a factory preset threshold.
- **USB cable:** to enable/disable the notification of the presence of an USB connection.
- **Temperature:** to enable/disable environment temperature warning triggered by exceeding a factory preset threshold.

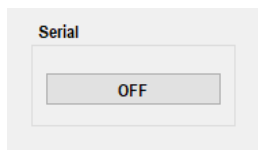
The Logger acquisition method can also be set, choosing among:

- **Only press button:** to take a measurement manually by pressing the big button located on the side of the unit. Each time the button is pressed, a measurement is stored in the internal memory.
- **Instantaneous every  $s$  seconds:** to automatically record measurements of the instantaneous field level, spaced  $s$  seconds each.
- **Mean AVG  $m$  minutes, every  $s$  seconds:** to automatically record measurements of the field level mean value (average over  $m$  minutes), spaced  $s$  seconds each.
- **Mean RMS  $m$  minutes, every  $s$  seconds:** to automatically record measurements of the field level quadratic mean value (Root Mean Square over  $m$  minutes), spaced  $s$  seconds each.

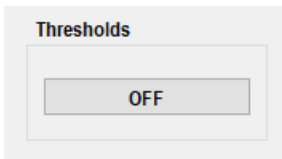


Also the Log format can be set, as:

- **Compact** where each record has a size of 32 bytes and does not contain position information. This mode allows to store up to 250 thousand measurements.
- **Extended** complete of GPS data. Each record takes 64 bytes. This mode allows to store up to 125 thousand measurements.

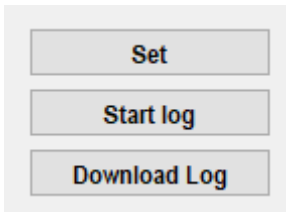


It is also possible to activate log data transmission via the **serial port** in addition to being stored in memory.



This software button has the function of enabling the logger data memorization only when at least one of the thresholds is exceeded.

When this function is active, the logger triggers only if an Alarm or Warning occurs.



**Set** button is used to save all logger parameters in the LR-01.

Its main use is if the User wants to start the logger manually with a long press of the side button.

**Start Log** is used to immediately start logging measurements with the parameters set in the window.

**Download Log** is used to download the measurements data stored in the device.

**NOTICE**

**Starting a new log, all the data of the previous one will be deleted.**



## 5 – Update Firmware

### 5.1 Update firmware

The LR-01 internal firmware can be updated easily by the user.

This section provides all the information required for firmware updating.

The Update Firmware Program is available after Narda Probes Manager package installation.

### 5.2 To run the update software

Turn off the LR-01 and connect it to a free USB port of the PC.

Click the icon on desktop.



Alternatively **Start** → **All Programs** → **Narda Safety** → **LR-01 Update Firmware**



### 5.3 To transfer data

Main window displayed after the updating program **LR-01 Update Firmware** has been run:

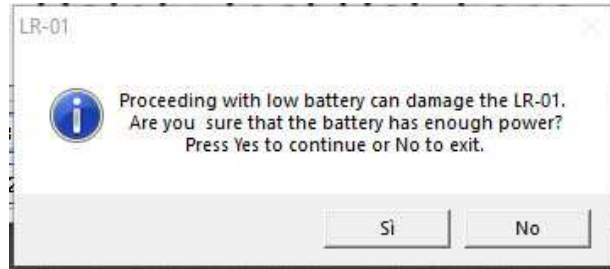


Select USB or RS232 communication port.

Before selecting RS232 port, choose the COM port used.



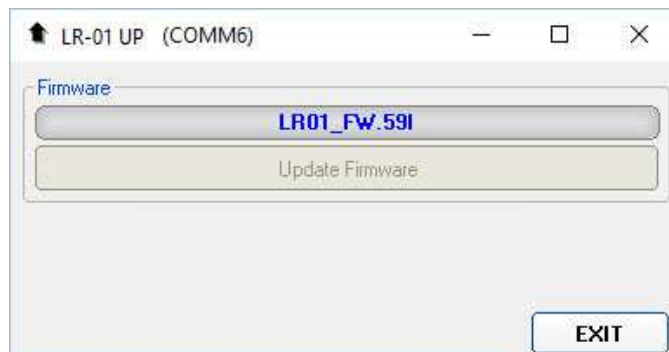
The User should check that the battery level is at least 3.9 V before starting the upgrade.



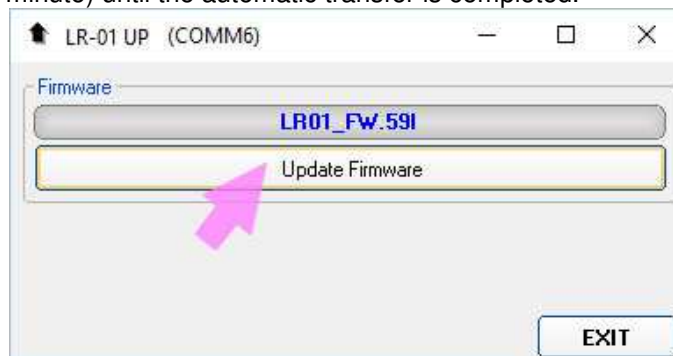
As soon as the connection is established, a message informs to turn the LR-01 **OFF** and turn it **ON** again; press **OK** to confirm.



The following window will appear:



The firmware components can be updated by this application. The Firmware is the main meter internal program and it is automatically stored within the Narda Probes Manager directory during software installation (see Chapter 4). To start the process simply select **Update Firmware** button, and wait (less than one minute) until the automatic transfer is completed.

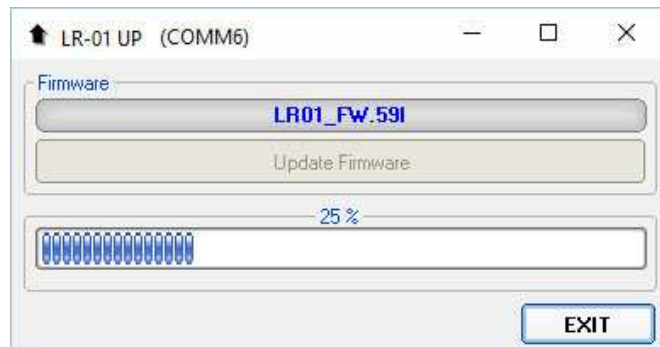




In case of problems in the data communication with the LR-01, the following message will be displayed.



During proper data transfer, a progressive bar is displayed.



At the end, a message informs if the update has been successfully performed.



Turn the LR-01 **OFF** (it could seem to be already OFF but it is not) and turn it **ON** again.

The LR-01 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 LR-01 meter either switched on or off.

Subsequently, when the meter is switched on again, the new version will be displayed in the Narda Probe Manager application software.



To obtain firmware or program updates for LR-01, please contact your NARDA distributor or download it directly from the NARDA Web site <http://www.narda-sts.it>

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## 6 – Uninstalling driver and software

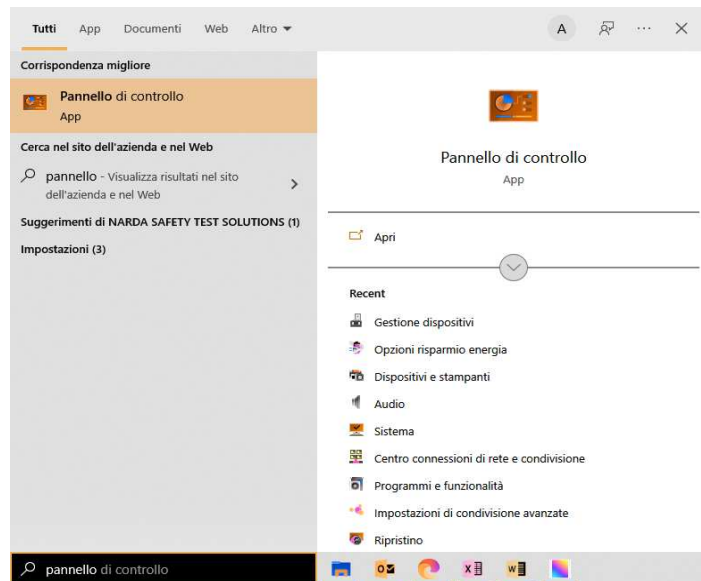
### 6.1 Uninstalling driver for the USB-OC for the USB-OC

It is possible to remove the USB-OC driver from the PC according to the following procedure:

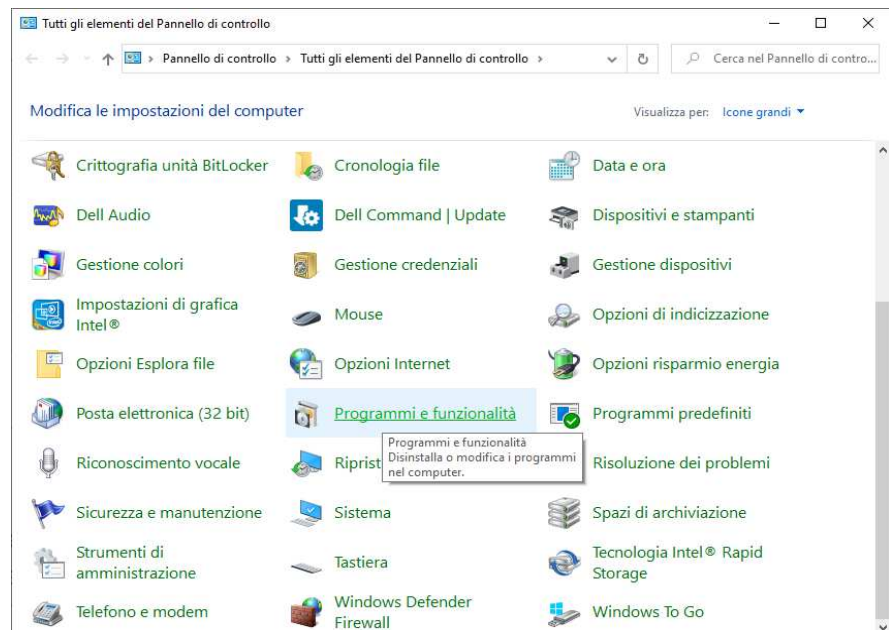
Open the Windows Control Panel.



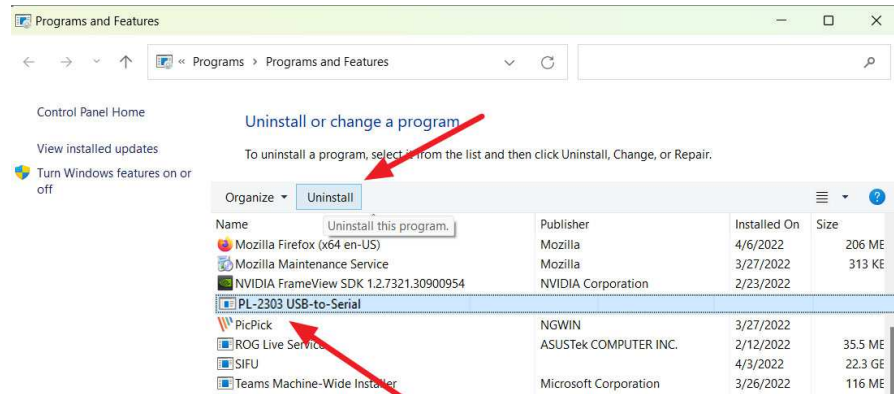
The following procedure shows how to remove the driver in Windows 10 environment. It may be different depending on the operating system in use.



Double click “Programs and Features”.




From the application list select “PL-2303 USB-to-Serial”, click “Uninstall” and follow the instructions.




**Fig. 6-1** Uninstalling USB-OC

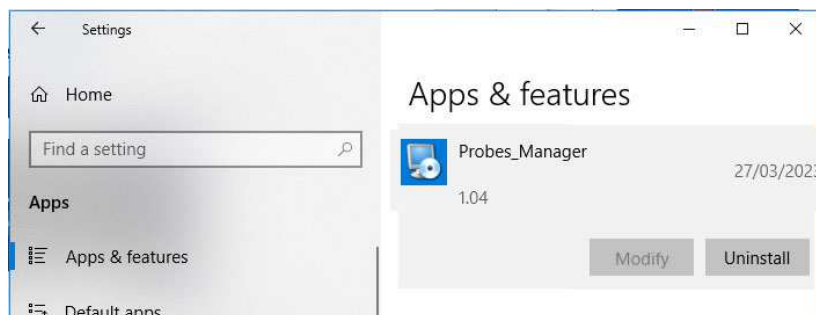
## 6.2 Uninstall Narda Probes Manager

Press **EXIT** to quit Narda Probes Manager, disconnect the LR01 from the PC and uninstall the software.

In Win7 click **Windows** , **NardaProbesManager**, then **Uninstall Probes\_Manager** and follow the instructions.



In Win10 click **Start** , **Settings**, **App&Features**, find and select **Probes\_Manager**, click **Uninstall** and follow the instructions.



### **NOTICE**

When asked if removing the shared files, answer **NO** to prevent other programs not to run correctly.

## 7 – LR01 Manager APP Operating instructions

### 7.1 Introduction

Narda introduces an innovative way to display EMF measurements information by LR01 in combination with a dedicated App for mobile device. This section provides the information necessary to use the LR01 Manager application with the LR-01 programmable Logger Repeater:

### 7.2 Installation

Download and install the LR01 Manager application on your device from Google or Apple store.  
Once the application is successfully installed, the LR01 Manager icon is displayed on home screen.



#### NOTICE

**Android release 10.0 or higher must be installed on the device to use the LR01 Manager App.**

#### NOTICE

**iOS release 11.0 or higher must be installed on the device to use the LR01 Manager App.**

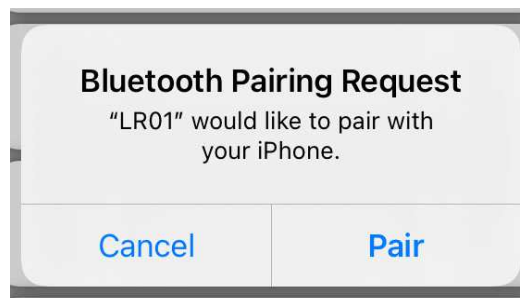
#### NOTICE

Make sure turning on Bluetooth wireless on LR01 and the device.  
**To active the Bluetooth communication on the LR01 the user must connect the meter to Narda Probe Manager software and enable the BLE function (see §4.2.10.1.4 Communications at Page 4-28).**

#### NOTICE

**If the App has already been installed, before starting the App make sure the software is not running to avoid communication errors.**

Clicking on the icon to run the application, the Bluetooth pairing request will appear. Select "Pair" to confirm.



### 7.3 LR01 Manager Main window

Once the link has been successfully established, the Main window is displayed, showing the live measurements together with all other related information.



**These are the basic operations to follow to work with the LR01 Manager. All additional information and explanations can be found on chapter 4.**

The screenshot shows the LR01 Manager main window interface. It features a yellow header bar with a menu icon (1) on the left and a play button (5) on the right. Below the header, there is a status bar displaying battery level (3.85V), temperature (25.4°C), humidity (20.6%), and altitude (0m). A technical data section (2) lists Date/Time (08/02/23 17:19:26), Last calibration date (06/11/99), Compass (5 (N)), and Accelerometer (2; -100; 25). A unit identifier bar (3) shows 'DemoUnit FW A3.6 12/22 000ZE20901 Probe: EP 301'. The main area (4) displays four measurement windows for Total, X, Y, and Z, all showing 0.00 V/m. At the bottom, a footer (6) contains the Narda logo, 'Safety Test Solutions', and 'LR01Manager v. 1.0.5'.

Commands description:

1. Menu
2. Technical data
3. Unit's identifier and Probe type
4. Measurements window
5. Logger button
6. Info



### 7.3.1 Menu

 **Device**

 **Settings**

 **Save**

Commands:

- **Device:** to display the Main window.
- **Settings:** allows to modify the LR-01 settings.
- **Save:** allows to take a photo of the site monitored and generates an email with attached the last working session log file and the picture.

#### 7.3.1.1 Settings

Settings		
Low Pass Filter	80 Hz	SEND
Data	08/02/2023	SEND
Time	17:19	SEND
Altitude Reset		SEND
Compass Calibration		SEND
KFR	OFF Hz	SEND
Sampling Time	1000 ms	SAVE

**Settings** window allows to:

- Set the internal digital **Filter**.
- Set the LR-01 internal clock with the **Date** and **Time** of the PC.
- Set to zero the internal **Altimeter** reference.
- Calibrate the internal **Compass Calibration** for more accuracy.
- Recall the **Frequency correction factor** (in Hz) stored in the LR-01 memory or OFF when disabled. When the KFR is ON the measured field value turns blue in the main window.



- **Sampling time:** Set the time interval (in milliseconds) between subsequent readings.

The new setting can be saved pressing the corresponding **Send** or **Save** button.

Select **Menu** button  and then **Device** to return to the Main window.

#### 7.3.2 Technical data

Bat. 3.85V	Tmp. 25.4°C	Hum. 20.6%	Alt. 0m
DateTime	Last calibration date		
08/02/23 17:19:26	06/11/99		
Compass	Accelerometer		
5 (N)	2; -100; 25		

In the upper part of the main screen, some technical data are shown.

- **Bat:** It shows the residual autonomy during measurements and the achieved autonomy during charging.
- **Tmp:** followed by the temperature in degrees Celsius.
- **Hum:** followed by the percentage of relative humidity.
- **Alt:** followed by the relative altitude in meters.
- **DateTime:** Date and time set on LR-01.
- **Last Calibration date:** Latest probe calibration.
- **Compass:** followed by the compass heading in degrees and cardinal directions.
- **Accelerometer:** Gravitational acceleration is expressed in hundredths of g for each of the three axes.

**7.3.3 Live Measurements** The live measurements displayed in the main window are:

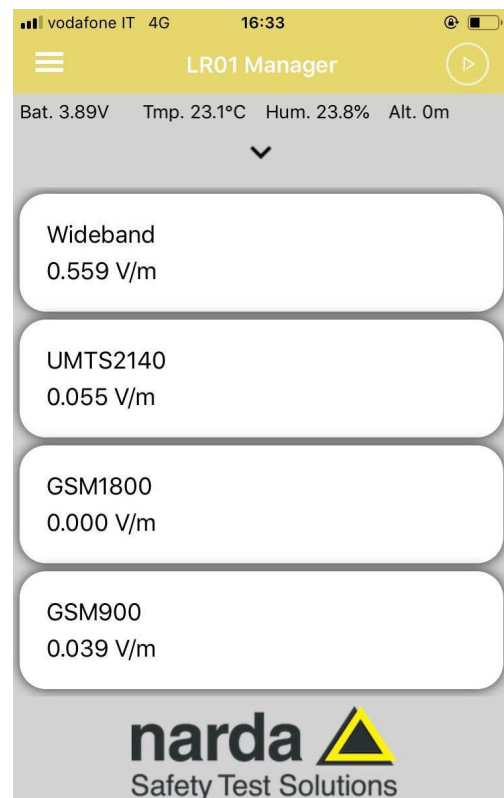
- **Field values** as X - Y - Z and/or Total.

Only some models of probe allow the possibility to show the Total and the levels of the three independent Axis.

For others type of probe, for example, in case of Quadriband probe the Wideband, UMTS2140, GSM1800 and GSM900 field probe value will be shown.

The chapter 1 of this manual includes the list of the field probes available and their technical specifications.

- **Measuring unit** the electric or magnetic field measuring unit depend on the probe model connected.




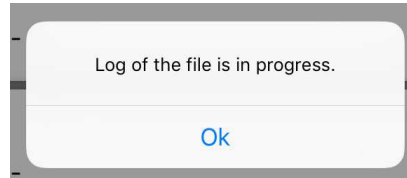
**These are the basic operations to follow to work with the LR01 Manager. All additional information and explanations can be found on chapter 4 .**

### 7.3.4 Logger and Save measurements

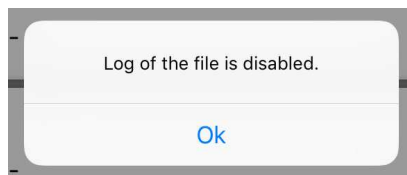


In addition to the live measurements, the LR01 Manager allows collecting measurements directly in the internal memory of the meter and saving in a simple and reliable way:

Click the button  in the upper-right main window to start the Measurements Log. The following message will appear:



Clicking the button again causes the end of measurements log and a message pops up telling:



## NOTICE

**Starting a new log, all the data of the previous one will be deleted.**

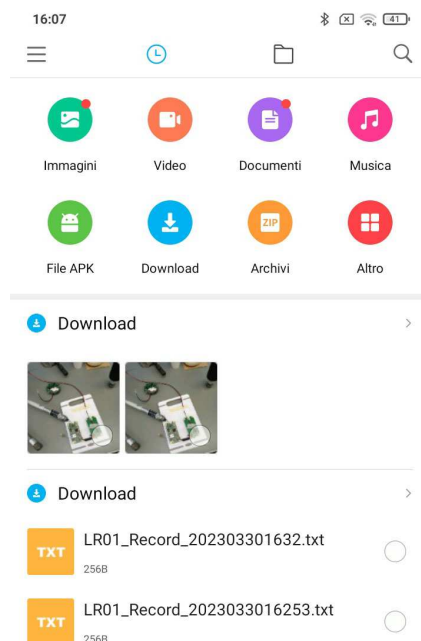


Save

After stopping the Log, the measurements acquired can be downloaded pressing the **Save** button (Menu → Save) otherwise will not be available anymore. This button allows to take a photo of the site monitored and generates an email with attached the .txt data log file and the picture.

## NOTICE

On Android device only, when the working session is stopped the data and, if taken, the picture are saved in the **Download** directory. A new **.TXT** file will be created with a specific name: **LR01\_Record\_yyyymmddhhmmss.txt**.



When the file is saved in .txt format and the table is opened, a huge amount of data are available. For every working session (from starting to closing logging) the following headline will be created in the txt file:

DemoUnit FW 1.00 03/23 000ZE20901 Probe: EP 333 - Unit: V/m - GPS: 44.0748283627698, 8.15976771948191 - Date: 28/03/2023					
Time	Total	X	Y	Z	

- Identification name (**Demounit**)
  - Firmware version and released data (**FW 1.00 03/23**)
  - LR-01 Serial Number (**000ZE20901**)
  - Probe connected to the LR-01 (**Probe EP333**)
  - Measurement unit (**Unit: V/m**)
  - Measurements GPS coordinates (**GPS: 44.07....., 8.15.....**)
  - Working session date in dd/mm/yyyy format (**Date: 28/03/2023**)
  - Hour, minute, second of the measurement acquisition (**Time**)
  - **TOTAL X Y Z**: Total and XYZ axis field value .
- Only some models of probe allow the possibility to show the Total and the levels of the three independent axis.

Example with EP-330 probe

DemoUnit FW 1.00 03/23 000ZE20301 Probe: EP-330 - Unit: V/m - GPS: 24.0743232, 12.0596932 - Date: 23/03/2023

Time	Total	X	Y	Z
20:32:12	0.232	0.032	0.005	0.039
20:32:13	0.406	0.011	0.040	0.035
20:32:14	0.222	0.022	0.003	0.035
20:32:15	0.123	0.037	0.001	0.037
20:32:16	0.050	0.030	0.004	0.050

Example with EP-4B-02 probe

DemoUnit FW 1.00 03/23 000ZE20901 Probe: EP-4B-02 - Unit: V/m - GPS: 44.0747558, 8.1596996 - Date: 30/03/2023

Time	Wideband	UMTS2140	GSM1800	GSM900
16:19:59	0.499	0.054	0.000	0.039
16:20:00	0.513	0.056	0.000	0.035
16:20:01	0.513	0.055	0.000	0.035
16:20:02	0.506	0.054	0.000	0.037
16:20:03	0.545	0.039	0.000	0.050



The recorded data can be viewed either as a graph or as a table using common software as an example Word or Excel application.

### 7.3.5 Info

Contents:

- Manufacturer information and Software release;



## 8 – Using of LR-01 with WearOS (Smartwatch) Operating instructions

### 8.1 Introduction

This section provides the information necessary to use the LR-01 programmable Logger Repeater with the optional Smartwatch.

### 8.2 Installation



Download and install the LR01 Manager application on your smartwatch from Google or Apple store.


Once the application is successfully installed, swipe **Upwards** on the watch screen the user will be able to view the LR01 Manager icon displayed on the **Apps screen**.



#### NOTICE

**WearOS release 3.0 or higher must be installed on the Smartwatch to use the LR01 Manager .**

#### NOTICE

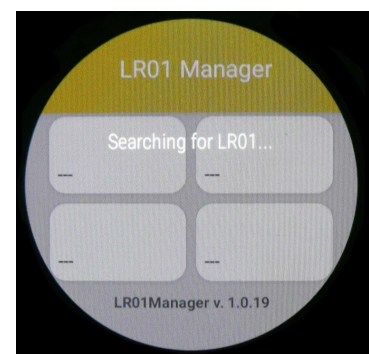
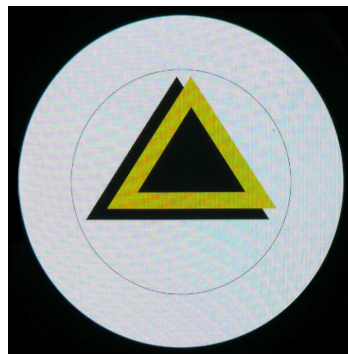
If the App has already been installed, tap on **Recent Apps**  and make sure the software is not running to avoid communication errors (see §8.3.4 Close the App).

#### NOTICE

Also make sure turning on Bluetooth wireless on LR01 and Smartwatch. **To active the Bluetooth communication on the LR01, the user must connect the meter to Narda Probe Manager software and enable the BLE function (see §4.2.10.1.4 Communications at Page 4-28).**

Turn on LR-01 and wait some seconds while the instrument performs a diagnostic test (see §2.7). After that it begins **flashing green**, to indicate the instrument is ready to communicate.

Tap on the LR01 Manger icon to run the application; a welcome screenshot will show for a few seconds, then the “Searching for LR01” indication appears.



### 8.3 Operations



These are the basic operations to follow to work with the LR01 Manager. All additional information and explanations can be found on chapter 4

#### 8.3.1 Live Measurements

Once the link has been successfully established, the Main window is displayed showing the live measurements together with software release.



The live measurements displayed in the main window are:

- **Field values** as X - Y - Z and/or Total.

Only some models of probe allow the possibility to show the Total and the levels of the three independent Axis.

For others type of probe, for example, in case of Quadriband probe the Wideband, UMTS2140, GSM1800 and GSM900 field probe value will be shown.

The chapter 1 of this manual includes the list of the field probes available and their technical specifications.

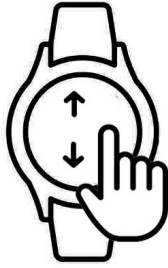
- **Measuring unit** the electric or magnetic field measuring unit depend on the probe model connected.



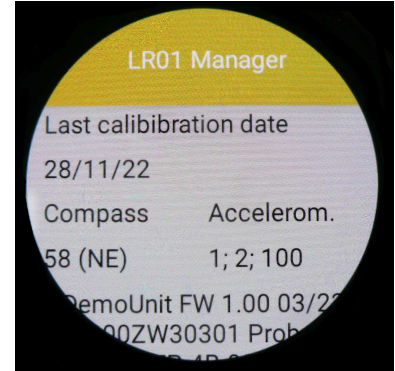
Swipe to the left or right to enter on **Technical data** or **Settings** panel; see the upcoming paragraph.

### 8.3.2 Technical data

Enter on the **Technical data** panel.



Swiping upwards or downwards on the screen, further technical data are shown:



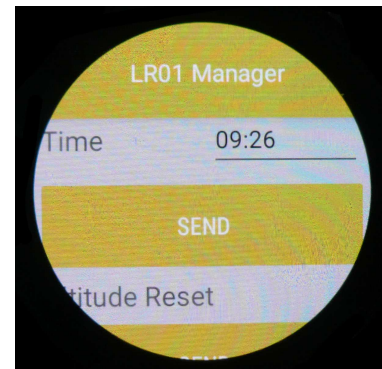
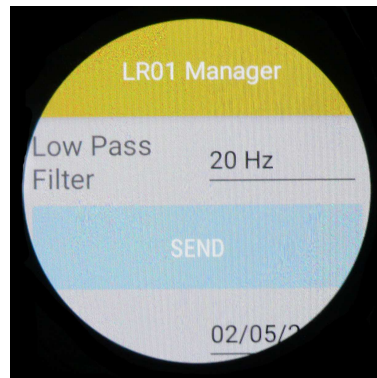
- **Bat:** It shows the residual autonomy during measurements and the achieved autonomy during charging.
- **Tmp:** followed by the temperature in degrees Celsius.
- **Hum:** followed by the percentage of relative humidity.
- **Alt:** followed by the relative altitude in meters.
- **DateTime:** Date and time set on LR-01
- **Last Calibration date:** Latest probe calibration
- **Compass:** followed by the compass heading in degrees and cardinal directions.
- **Accelerometer:** Gravitational acceleration is expressed in hundredths of g for each of the three axes.
- Unit's name followed by firmware and data release, Serial Number and Probe model

### 8.3.3 Settings



Enter on the **Settings** panel.

Swiping upwards or downwards on the screen, all settings are shown:

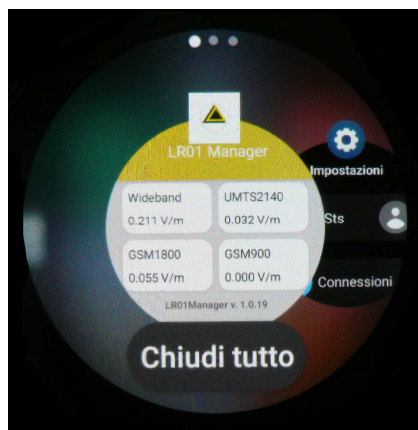


- Set the internal digital **Filter**
- Set the LR01 internal clock with the **Date** and **Time** of the PC
- Set to zero the internal **Altimeter** reference
- Calibrate the internal **Compass Calibration** for more accuracy
- Recall the **Frequency correction factor** (in Hz) stored in the LR-01 memory or OFF when disabled
- **Sampling time**: Set the time interval (in milliseconds) between subsequent readings

The new setting can be saved pressing the corresponding **Send** or **Save** button

### 8.4 Close the App

On the **Apps** screen, tap  (Recent apps).



Use the bezel or swipe left or right on the screen to move to the app to close.

Swipe upwards on the app to close it or Tap on **Close all** to close all running apps.



## 9 - Command protocol

### 9.1 Introduction

This chapter provides the information required to control the LR-01 programmable Logger Repeater via one of the communication ports (e.g. the fiber optic) connected to a PC and by means of user's own PC software applications.

The communication between the host and the LR-01 can be in wired USB, in optic USB (USB-OC) or wireless (Wi-Fi or Bluetooth).

Serial communication protocol is the following:

- Baud: 115200 (default, or other speeds selectable)
- Parity: NONE
- Length: 8 bit
- Bit Stop: 1

The commands have the following general format:

**#LRcommand\*** where:

**#LR** = opens the command string;

**?** = for query commands only;

**Command** = command string;

**\*** = closes the command string.



**#LR prefix is a wildcard to establish a communication with every LR-01 unit. To connect to a specific unit, a #nn should be used instead. Where nn is the address of the unit desired, which can be set by the SADR command.**

The commands available are divided into two main categories:

- **Query COMMANDs;**
- **Setting COMMANDs.**

Commands are made of ASCII strings delimited by the character “#” (0x23) and the character “\*” (0x2A).

The replies are terminated with <CR><LF> (0x0D)(0x0A).

An example to request the unit's name is as follows: **#LR?IDN\***

The answer is like: IDN=Cisano;000WE20501

Another example, to read the temperature at the unit with address 01:

**#01?TMP\***

The Baud Rate is set at 115200 baud as default.

To switch to one of the other speeds available, please refer to command SBDR.

It is possible to return to a 115200 bps by following the same procedure.

At power ON, LR-01 is automatically set to listen to both the USB and the optic port for incoming commands.

The optic port will be always available for communicating with the unit.

User's own software can ask for measurement data when desired or can switch the LR-01 to master mode where measurement data are continuously sent over the communication port, without the need of asking for each.

At any time the operation mode can be switched back to slave mode.

While operating in slave mode, LR-01 sends answers to the received commands, according to the communication protocol described below.

The LR-01 automatically turns off 30 minutes after receiving the last command, to save battery.



**Please, do not try any commands not covered in this manual, as random poking can cause the system to crash or lose data and calibrations.**

## 9.2 List of commands

**Table 9-1 Query COMMANDs**

Syntax	Function
?ADR	Requests the unit's address.
?ALR	Requests alarm threshold.
?ALT	Requests relative altitude.
?AQ_	Requests logger settings.
?AVG	Requests the averaging mode setting.
?BAT	Requests battery voltage.
?BDR	Requests optic port speed (baud rate).
?BLE	Requests the state of the BLE connection.
?CKG	Requests GPS status.
?CLK	Requests date and time.
?CPS	Requests compass and accelerometer readings.
?DCM	Requests the automatic communication setting at power on.
?GCS	Requests the Real Time Clock setting status.
?GPS	Requests position information.
?IAM	Requests the LR01/IAM output status.
?IAV	Requests the LR01/IAM release and date.
?IDN	Requests unit's identification.
?IDNF	Requests unit's extended identification.
?KFR	Requests the setting for the correction depending on the frequency.
?LFA[S]	Requests the latest average field value.
?LOG	Requests binary log file via wired connection.
?LPF	Requests Low Pass Filter setting for passive probes.
?LST	Requests Logger status.
?MAC	Requests the Wireless MAC address.
?MES	Requests the instantaneous field level.
?MESS	Requests the instantaneous field level with continuous transmission.
?MESR[v]	Requests the instantaneous field level + position and sensors data, continuous.
?MESf	Requests the instantaneous field level + position and sensors data.
?MESs	Disables continuous transmission activated by MESR[v] command.
?MSK	Requests the alarms mask.
?NET	Requests the list of the Wi-Fi available networks.
?PRB	Requests probe information.
?S/NO	Requests the unit's serial number.
?SID	Requests the stored Wi-Fi network name.
?SNS	Requests environment sensor data: temperature, relative humidity and pressure.
?SST	Requests the Wi-Fi signal level.
?STA	Requests all alarms status.
?STM	Requests masked alarms status.
?STS	Request the reference standard (for EHP-2B model probe only).
?TMP	Requests environment temperature and relative humidity.
?VST[V]	Requests power supply and battery charging status.
?WFI	Requests the state of the Wi-Fi connection.
?WLOG	Requests binary log file via wireless connection.
?WMEi[fv]	Requests % value related to i-th standard.
?WRN	Requests warning threshold.
?WVR	Requests firmware version of the internal Wi-Fi + BLE module.

**Table 9-2 Setting COMMANDs**

Syntax	Function
<b>SADRa</b>	Sets unit's address.
<b>SALRs</b>	Sets alarm threshold.
<b>SALT</b>	Resets the reference altitude.
<b>SAQ_x;t</b>	Sets the logger parameters.
<b>SAVGl;r</b>	Selects averaging mode.
<b>SBDR b</b>	Sets baud rate.
<b>SBLEx</b>	Switches Bluetooth ON or OFF.
<b>SCLDd.m.y</b>	Sets the RTC date.
<b>SCLT h.m.s</b>	Sets the RTC time.
<b>SCPCt</b>	Runs compass calibration.
<b>SDCMc</b>	Sets the preferred communication channel at power on.
<b>SGCSAh</b>	Automatic time set.
<b>SGCSM</b>	Manual time set.
<b>SGOF</b>	Switches OFF the GPS module.
<b>SGOFF</b>	Switches OFF the unit.
<b>SGOI</b>	Switches ON the GPS module.
<b>SIAMk para</b>	Set the LR01/IAM output and alarm(s)
<b>SIDN i</b>	Sets the units identifier.
<b>SKFR f</b>	Sets the frequency correction value and makes it active.
<b>SLPF f</b>	Selects the Low Pass Filter for passive probes.
<b>SLST l</b>	Instantly activates or deactivates the log.
<b>SMSKm</b>	Sets the warnings and alarms mask.
<b>SPWDp</b>	Sets Wi-Fi password.
<b>SREBOOT</b>	Reboots the unit.
<b>SRST</b>	Restores default configuration.
<b>SRSTR</b>	Restores default configuration and logger rate.
<b>SSIDi</b>	Sets Wi-Fi network ID.
<b>SSTSi</b>	Set the reference standard (for EHP-2B model probe only)
<b>SWFIx</b>	Wi-Fi connection.
<b>SWRN s</b>	Sets warning threshold.

### 9.3 Query commands

Using these commands the LR-01 can be queried with a series of requests to which the repeater responds.


Query commands are characterized by the character ? in the string.

**TABLE 9-1 Query commands**

<p><b>?ADR</b></p>	<p>This query command <b>#LR?ADR*</b> requests the unit's address that represents the additional prefix that can be set by the User to distinguish a specific unit. It will be accepted and recognized, by that specific unit only, in the same way as the default prefix "LR" which is always valid for all units.</p> <p>The reply is a string showing a number between 0 and 99.</p> <p>Example of reply: <b>ADR=00</b> which means that the address of the unit is 00.</p>
<p><b>?ALR</b></p>	<p>This query command <b>#LR?ALR*</b> requests the Alarm threshold.</p> <p>The reply provides the threshold in the current unit followed by the averaging time, in minutes.</p> <p>When the connected probe is a EHP-2B-xx, it returns the alarm threshold for the Electric Field.</p> <p>When the connected probe is a weighted model, the unit shown is %.</p> <p>Examples of reply: <b>ALR=6.0 uT; 6.00 min.</b> <b>ALR=25000.00%; 30.00 min.</b></p>
<p><b>?ALT</b></p>	<p>This query command <b>#LR?ALT*</b> requests the relative altitude.</p> <p>The reply provides the altitude in meters relative to the reference position which is acquired when the LR-01 is switched on or when the SALT command is sent or when a new Log begins.</p> <p>The adopted formula is: <math>alt=(2.0*1006.0)/(7.0*9.81)*Tk*LN(ref\_Press/cur\_Press)</math></p> <p>Example of reply: <b>ALT=30</b></p>
<p><b>?AQ_</b></p>	<p>This query command <b>#LR?AQ_*</b> requests the Logger settings.</p> <p>The reply format is: <b>AQ_=m; x; t</b> where:</p> <ul style="list-style-type: none"> <li>• <b>m</b> is the acquisition mode setting: <b>A=</b> AVG; <b>R=</b>RMS; <b>I=</b>Instantaneous</li> <li>• <b>x</b> represents the timing of the logger, in seconds, 1 s minimum and 900 s maximum. When x=0, the Logger is disabled. When x=-1, the Logger is triggered only by pressing the Button and, just in case, by the Alarm (please refer to MSK command).</li> <li>• <b>t</b> is the Logger type: <b>32</b> = compact, <b>64</b> = complete</li> </ul> <p>Example of reply: <b>AQ_=R; 30; 32</b> which means that the unit is set to store data every 30 seconds, the averaging is RMS and the Log is of the compact type where each record has a size of 32 bytes and does not contain position information.</p>

<b>?AVG</b>	<p>This query command <b>#LR?AVG*</b> requests the current averaging mode.</p> <p>The reply is as follows: <b>AVG=L;R</b> where: L is the storing rate in minutes R shows the acquisition mode setting: A= AVG; R=RMS; I=Instantaneous</p> <p>Example of reply: <b>AVG=15.00;A</b> which means that the unit is averaging over 15 minutes and the average is of the AVG type.</p>
<b>?BAT</b>	<p>This query command <b>#LR?BAT*</b> requests the current battery voltage.</p> <p>The reply provides the battery voltage in Volt with 10 mV resolution, formatted as <b>BAT=V.vv</b></p> <p>Example of reply: <b>BAT=3.82</b></p>
<b>?BDR</b>	<p>This query command <b>#LR?BDR*</b> requests the current Baud Rate of the optical port, where the code returned indicates:</p> <ul style="list-style-type: none"> <li>• 10: 9600 bps</li> <li>• 11: 38400 bps</li> <li>• 12: 57600 bps</li> <li>• else: 115200 bps</li> </ul> <p>Example of reply: <b>BDR=3</b> which means that the optic serial port is set to 115200 bps.</p>
<b>?BLE</b>	<p>This query command <b>#LR?BLE*</b> requests the status of the Bluetooth Low Energy module.</p> <p>The reply indicates: <b>BLE=ON</b> modulo acceso <b>BLE=OFF</b> modulo spento <b>BLE=WIFI</b> modulo acceso, ma in WIFI mode</p> <p>Example of reply: <b>BLE=OFF</b> which means that the internal BLE module is switched OFF.</p>
<b>?CKG</b>	<p>This query command <b>#LR?CKG*</b> requests the status of the GPS module.</p> <p>The reply indicates:</p> <ul style="list-style-type: none"> <li>• 2: GPS locked</li> <li>• 1: GPS connection in progress</li> <li>• 0: GPS switched OFF</li> <li>• -2: GPS not available</li> </ul> <p>Example of reply: <b>CKG=0</b></p>

<p><b>?CLK</b></p>	<p>This query command <b>#LR?CLK*</b> requests the date and time to the internal RTC.</p> <p>The reply provides the requested information formatted as: <b>CLK=HH.mm.ss;DD.MM.YY</b></p> <ul style="list-style-type: none"> <li>• HH: hours</li> <li>• mm: minutes</li> <li>• ss: seconds</li> <li>• DD: day</li> <li>• MM: month</li> <li>• YY: year (last two digits)</li> </ul> <p>Example of reply: <b>CLK=20.02.09;19.05.22</b></p>
<p><b>?CPS</b></p>	<p>This query command <b>#LR?CPS*</b> requests the compass and accelerometer readings.</p> <p>The reply is formatted as following: <b>Heading:</b> bearing (orientation); <b>G:</b>x; y; z</p> <p>Bearing is expressed in degrees and orientation as per the compass rose cardinal points. Gravitational acceleration is expressed in hundredths of g (cm/s<sup>2</sup>) for each of the three axes.</p> <p>Note: compass heading 0 (North) corresponds to the direction where the GPS antenna is located.</p> <p>Note: it is advisable to query this command at a rate lower than 3 times per second.</p> <p>Example of reply: <b>Heading: 35 (NE); G:-1; 100; 7</b></p>
<p><b>?DCM</b></p>	<p>This query command <b>#LR?DCM*</b> requests the setting for the preferred wireless communication channel at power on.</p> <p>If DCM=1 or DCM=2, the corresponding wireless communication channel will be kept active for 60 seconds. Any command received via the wireless channel will keep it active for another 60 seconds. Otherwise, at the end of this period, the communication is deactivated. This setting is saved in the internal flash memory.</p> <p>The reply provides the preferred channel at power on, as follows:</p> <ul style="list-style-type: none"> <li>• DCM=0 for wireless channel disabled at power on;</li> <li>• DCM=1 for Wi-Fi communication enabled at power on;</li> <li>• DCM=2 for BLE communication enabled at power on.</li> </ul> <p>Example of reply: <b>DCM=2</b> which means that each time the unit will be turned on, the BLE module will be activated.</p>
<p><b>?GCS</b></p>	<p>This query command <b>#LR?GCS*</b> requests the Real Time Clock setting status.</p> <p>The reply is as follows:</p> <ul style="list-style-type: none"> <li>• M for manual time setting (refer to SCLT and SCLD commands)</li> <li>• A:x for automatic time setting where x is the time zone (integer value between -12 and 12)</li> </ul> <p>Examples of reply: <b>GCS=M</b> which means that RTC is set manually <b>GCS=A:2</b> which means that RTC is set automatically and the time zone is +2 hours corresponding to the time zone of Rome during summertime.</p>

<p><b>?GPS</b></p>	<p>This query command <b>#LR?GPS*</b> requests the latest RMC and GGA NMEA phrases (NMEA 0183 ver 3.01) detected by the internal GPS module. RMC NMEA strings are reported in full, starting with <b>\$GPRMC</b> and/or <b>\$GNRMC</b>, and ending with the checksum followed by CR LF.  GGA NMEA strings are reported in full, starting with <b>\$GPGGA</b> and/or <b>\$GNGGA</b>, and ending with the checksum followed by CR LF.  When a position has not yet been acquired, the reply is:-----VOID  Example of reply: <b>\$GPRMC,154452.000,A,4404.4843,N,01047.9412,E,0.28,152.18,270122,,A*6E</b> <b>\$GPGGA,154453.000,4341.1507,N,01047.9413,E,1,7,1.00,6.2,M,47.8,M,,*5B</b>  The format for NMEA coordinates is ddmm.mmmm (d=degrees and m=minutes); The NMEA degrees minutes can be convert to decimal degree as follows: 4404.4843 → Take the NMEA Latitude position. 0.4843 * 60 = 29.058 → Multiply by 60 the NMEA Latitude second part. 440429.058 → The product is added to the NMEA Latitude first part for making 6 digits long first part. 04 * 60 = 240 → Take the second two digits of the first part and multiply by 60. (240+29.058)/3600=0.074738 → The product is added to the last first part and the total divided by 3600. 44+0.074738 → Add the result to the first two digits. The total is Latitude expressed in decimal degree.</p>
<p><b>?IAMk</b></p>	<p>This query command <b>#LR?IAMk*</b> requests the output status of the option LR01/IAM. The argument "k" can be as following:</p> <ul style="list-style-type: none"> <li>• k=B Request Buzzer status</li> <li>• k=1 Request A1 output status (Pin 2 and 8 on DB15 connector)</li> <li>• k=2 Request A2 output status (Pin 1 and 7 on DB15 connector)</li> <li>• k=R Request Relè output status (Pin 10,12,13,14,15 on DB15 connector)</li> </ul> <p>Example of reply with <b>#LR?IAMR*</b>: IAMR----- In this case any alarm is not enable on Relè output</p> <p>Examples of reply with <b>#LR?IAMB*</b>: IAMB-W----- In this case the Warning level alarm is enable on the Buzzer; whenever the level exceed the threshold set, an acoustic alarm will be emitted.</p> <p>If the "k" index entered is A, all four output status are provided. Examples of reply with <b>#LR?IAMA*</b> : IAMR--U----- IAM2----T----- IAM1---V----- IAMB-W-----</p> <p>If the index 'k' entered is not correct or the LR01/IAM is not present, the reply is: IAMK=ERR</p>
<p> <b>NOTE</b></p>	<p><b>See §10.13.4 for User's Port HD-15 female connector pinout list .</b></p>
<p><b>?IAV</b></p>	<p>This query command <b>#LR?IAV*</b> requests the LR01/IAM release version and date.  Examples of reply with <b>#LR?IAV*</b> <b>IAV:10;19/01/23</b>  If the LR01/IAM is not present, the reply is: <b>IAV:Fail</b></p>



<b>?IDN</b>	<p>This query command <b>#LR?IDN*</b> requests the unit's identifier.</p> <p>The reply provides the unit's name followed by the serial number, in the format: <b>IDN=name;S/N</b> where name is the identification string stored with command SIDN, and S/N is the serial number of the unit, factory stored.</p> <p>Example of reply: <b>IDN=Cisano;000WE20501</b></p>
<b>?IDNF</b>	<p>This query command <b>#LR?IDNF*</b> requests the extended unit's identifier .</p> <p>The reply provides the unit's name followed by additional information as follows:</p> <ul style="list-style-type: none"> <li>• name</li> <li>• model</li> <li>• firmware release</li> <li>• Serial Number</li> </ul> <p>A semicolon ; is used as separator between fields.</p> <p>The format is: <b>IDN=name;model;R.rr MM/YY;S/N</b> Where: Name is the identification string stored with command SIDN, Model is the type of the unit, R.rr shows the firmware version and MM/YY its date of release, S/N is the serial number of the unit, factory stored.</p> <p>Example of reply: <b>IDN=Cisano;LR01;A0.0 10/21;000WE20501</b> which identifies the unit named Cisano, model LR-01, with firmware version A0.0 released on October 2021. Its serial number is 000WE20501.</p>
<b>?KFR</b>	<p>This query command <b>#LR?KFR*</b> requests the setting for the correction depending on the frequency. The reply is:</p> <ul style="list-style-type: none"> <li>• KFR=OFF when the correction is not active</li> <li>• KFR=NA when the correction is not available</li> <li>• KFR=f;[fH] u when the correction is active for frequency f expressed in the unit u. if an Electric and Magnetic probe is connected, also the frequency for magnetic measurement is shown.</li> </ul> <p>Examples of reply: <b>KFR=6.500 MHz</b> <b>KFR=6.500;1.000 MHz</b></p>

<b>?LFA[S]</b>	<p>This query command <b>#LR?LFA*</b> requests the latest average field value. The reply provides the value (or values) with current unit, followed by the averaging period in minutes (the same as per AVG command).</p> <p>When a passive probe is installed, the command provides the field levels of the three axes, followed by the total value.</p> <p>When the special probe EP-333 (RMS type) is in use, the command provides the RMS level.</p> <p>When the Electric and Magnetic Field probe EHP-2B-xx is installed, the command provides the levels for both fields.</p> <p>Examples of reply:  <b>LFA= V/m;58.56;58.56;58.56;101.43;1 min.</b> which means that the average level for the latest 1 minute is 58.56 V/m for each of the three axes, X, Y, Z with a total of 101.43 V/m.  <b>LFA= V/m;1.23; 0.868 uT; 6 min.</b> which means that the average field level for the latest 6 minuts is 0.868 <math>\mu</math>T (H) and 1.23 V/m (E).</p>
<b>?LOG</b>	<p>This query command <b>#LR?LOG*</b> requests the binary Log file.</p> <p>NOTE: It works via USB and Optic port only. Please, refer to command ?WLOG to download data via one of the wireless connections.</p> <p>The reply starts with string <b>LOG_S</b> and is terminated by the string <b>LOG_E</b>. The first 128 bytes (LOG_S included) represent the header; the following data represent the records of 32 (or 64) bytes each.</p> <p>Please, refer to the binary Log file paragraph at the end of this chapter for further details about the binary file.</p>
<b>?LPF</b>	<p>This query command <b>#LR?LPF*</b> requests Low Pass Filter setting for passive probes.</p> <p>The reply is the index value, for the selected filter, related to the list:</p> <ul style="list-style-type: none"> <li>• 0: 10 Hz</li> <li>• 1: 20 Hz</li> <li>• 2: 40 Hz (default)</li> <li>• 3: 80 Hz</li> </ul> <p>Example of reply: <b>LPF=2</b> which means that a 40 Hz low pass filter is applied.</p>
<b>?LST</b>	<p>This query command <b>#LR?LST*</b> requests the Logger status.</p> <p>The reply is:</p> <ul style="list-style-type: none"> <li>• LST=1 Logger active</li> <li>• LST=0 Logger disabled</li> </ul> <p>Example of reply: <b>LST=1</b> which means that the Logger function is running.</p>
<b>?MAC</b>	<p>This query command <b>#LR?MAC*</b> requests the Wireless MAC address assigned by the manufacturer.</p> <p>Example of reply:  <b>MAC=60:8A:10:D2:71:02</b></p>

<b>?MES</b>	<p>This query command <b>#LR?MES*</b> requests the instantaneous (not averaged) field level.</p> <p>The reply is the elementary value for each band, in the format: Three-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;L;H;V/m</b>; where:</li> <li>• W is the wideband probe field level;</li> <li>• L is the low-pass probe field level (e.g. &lt; 862 MHz)</li> <li>• H is the high-pass probe field level (e.g. &gt; 933 MHz)</li> <li>• V/m is the measurement unit label</li> </ul> <p>Four-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;A;B;C;V/m</b>; where:</li> <li>• W is the wideband probe field level;</li> <li>• A is the band-1 probe field level (e.g. 2140 MHz)</li> <li>• B is the band-2 probe field level (e.g. 1800 MHz)</li> <li>• C is the band-3 probe field level (e.g. 900 MHz)</li> <li>• V/m is the measurement unit label</li> </ul> <p>Single-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;;V/m</b>; where:</li> <li>• W is the field level;</li> <li>• V/m is the measurement unit label</li> </ul> <p>Passive probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=T;X;Y;Z;U</b> where:</li> <li>• T is the Total field level;</li> <li>• X is the X axes field level;</li> <li>• Y is the Y axes field level;</li> <li>• Z is the Z axes field level;</li> <li>• U is the measurement unit label</li> </ul> <p>Electric and Magnetic probe EHP-2B-xx:</p> <ul style="list-style-type: none"> <li>• <b>MES=E;H;%</b>; where:</li> <li>• E. is the Electric field level;</li> <li>• H is the Magnetic field level;</li> <li>• % is the measurement unit label</li> </ul> <p>It should be noted that, due to the delay for data transfer from probe -&gt; unit -&gt; Optic, USB, wireless, the reading refers to the acquisition value of the previous sampling (minimum ≥ 3 seconds, maximum &lt; 6 seconds).</p> <p>Example of reply: <b>MES=10.76; ; V/m</b>;</p>
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<p><b>?MESS</b></p>	<p>This query command <b>#LR?MESS*</b> activates the continued issuing of the instantaneous (not averaged) field level.</p> <p>The reply is the elementary value for each band, like ?MES command, but with enabling for the continuous data transfer as soon as they are available, in the format:</p> <p>This command can be useful, for example, to be able to record separately all the elementary data used by the instrument.</p> <p>Three-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;L;H;V/m</b>; where:</li> <li>• W is the wideband probe field level;</li> <li>• L is the low-pass probe field level (e.g. &lt; 862 MHz)</li> <li>• H is the high-pass probe field level (e.g. &gt; 933 MHz)</li> <li>• V/m is the measurement unit label</li> </ul> <p>Four-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;A;B;C;V/m</b>; where:</li> <li>• W is the wideband probe field level;</li> <li>• A is the band-1 probe field level (e.g. 2140 MHz)</li> <li>• B is the band-2 probe field level (e.g. 1800 MHz)</li> <li>• C is the band-3 probe field level (e.g. 900 MHz)</li> <li>• V/m is the measurement unit label</li> </ul> <p>Single-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;;V/m</b>; where:</li> <li>• W is the field level;</li> <li>• V/m is the measurement unit label</li> </ul> <p>Passive probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=T;X;Y;Z;U</b> where:</li> <li>• T is the Total field level;</li> <li>• X is the X axes field level;</li> <li>• Y is the Y axes field level;</li> <li>• Z is the Z axes field level;</li> <li>• U is the measurement unit label</li> </ul> <p>Electric and Magnetic probe EHP-2B-xx:</p> <ul style="list-style-type: none"> <li>• <b>MES=E;H;%</b>; where:</li> <li>• E. is the Electric field level;</li> <li>• H is the Magnetic field level;</li> <li>• % is the measurement unit label</li> </ul> <p>The reply is terminated by the string "--&gt;" followed by date and time from the unit.</p> <p>Example of reply: <b>MES=7.81;4.42;4.65;7.81 V/m; 3.77V; ;; --&gt;28/01/22 09:26:36*</b></p> <p>Note: to disable the continuous transmission, simply send command <b>?MESSs</b></p>
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<p><b>?MESR[v]</b></p>	<p>This query command <b>#LR?MESR*</b> activates the continued issuing of the instantaneous (not averaged) field level with position (GPS) and other sensors (compass, thermometer, hygrometer, barometer, accelerometer) information.</p> <p>The reply is the elementary value for each band, like ?MES command, plus GPS (and sensors) information, with enabling for the continuous data transfer as soon as they are available, in the following format.</p> <p>This command can be useful, for example, to be able to record separately all the elementary data used by the instrument.</p> <p>Three-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;L;H;V/m</b>; where:</li> <li>• W is the wideband probe field level;</li> <li>• L is the low-pass probe field level (e.g. &lt; 862 MHz)</li> <li>• H is the high-pass probe field level (e.g. &gt; 933 MHz)</li> <li>• V/m is the measurement unit label</li> </ul> <p>Four-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;A;B;C;V/m</b>; where:</li> <li>• W is the wideband probe field level;</li> <li>• A is the band-1 probe field level (e.g. 2140 MHz)</li> <li>• B is the band-2 probe field level (e.g. 1800 MHz)</li> <li>• C is the band-3 probe field level (e.g. 900 MHz)</li> <li>• V/m is the measurement unit label</li> </ul> <p>Single-band probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=W;;V/m</b>; where:</li> <li>• W is the field level;</li> <li>• V/m is the measurement unit label</li> </ul> <p>Passive probe:</p> <ul style="list-style-type: none"> <li>• <b>MES=T;X;Y;Z;U</b> where:</li> <li>• T is the Total field level;</li> <li>• X is the X axes field level;</li> <li>• Y is the Y axes field level;</li> <li>• Z is the Z axes field level;</li> <li>• U is the measurement unit label</li> </ul> <p>Electric and Magnetic probe EHP-2B-xx:</p> <ul style="list-style-type: none"> <li>• <b>MES=E;H;%</b>; where:</li> <li>• E. is the Electric field level;</li> <li>• H is the Magnetic field level;</li> <li>• % is the measurement unit label</li> </ul>
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	<p>Following is the standard NMEA GPRMC and/or GNRMC string that reports the information:</p> <ul style="list-style-type: none"> <li>• Time (UTC)</li> <li>• Navigation receiver warning A = OK, V = warning</li> <li>• Latitude (deg. min North/South)</li> <li>• Longitude (deg. min East/West)</li> <li>• Speed over ground (Knots)</li> <li>• Course Made Good</li> <li>• Date (UTC)</li> <li>• Magnetic variation (deg)</li> <li>• Mandatory checksum</li> </ul> <p>Following is the standard NMEA GPGGA and/or GNGGA string that reports the information:</p> <ul style="list-style-type: none"> <li>• Time (UTC)</li> <li>• Latitude (deg. min North/South)</li> <li>• Longitude (deg. min East/West)</li> <li>• Position Fix</li> <li>• Satellites in use</li> <li>• Horizontal Dilution of Precision</li> <li>• MSL Altitude in m</li> <li>• Geoid Separation in m</li> <li>• Mandatory checksum</li> </ul> <p>The reply is terminated by the string "--&gt;" followed by date and time from the unit.</p> <p>Example of reply: <b>MES=10.66; ; V/m; 3.53V;</b>  <b>\$GPRMC,144550.000,A,4341.1465,N,01047.9383,E,1.38,185.31,280122,,,A*67</b>  <b>;\$GPGGA,144551.000,4341.1462,N,01047.9386,E,1,6,1.29,16.9,M,47.8,M,,*60</b>  <b>; --&gt;28/01/22 15:45:50*</b></p> <p>The NMEA degrees minutes can be convert to decimal degree (see ?GPS command).</p> <p>Note: to disable the continuous transmission, simply send command <b>?MESs</b></p> <p>Adding the "v" character, so that the command becomes <b>?MESRv</b>, it is possible to include in the automatic response string the additional values of heading (degrees), acceleration (g), temperature (° C) and humidity (%)</p> <p>Example of reply: <b>MES=10.68; ; V/m; 3.53V;</b>  <b>\$GPRMC,144457.000,A,4341.1494,N,01047.9397,E,0.21,191.83,280122,,,A*6F</b>  <b>;\$GPGGA,144458.000,4341.1493,N,01047.9397,E,1,6,1.30,16.4,M,47.8,M,,*63</b>  <b>;Heading: 164 (S); g:-15; 76; 68;24.95;36.41*; --&gt;28/01/22 15:44:57*</b></p>
<b>?MESf[v]</b>	Same as ?MESR[v] command but with single reply.
<b>?MESs</b>	<p>This query command <b>#LR?MESs*</b> disables the continuous data transmission set with ?MESS, ?MESR or ?MESRv commands.</p> <p>It produces a single reply as per the ?MES command.</p>

<p><b>?MSK</b></p>	<p>This query command <b>#LR?MSK*</b> requests the alarms Mask.</p> <p>The reply provides a string with every armed alarm, with the format:  <b>MSK=AWUVPTCawvp SERIAL ALRTRG</b>  where the meaning of the symbols is similar to the ?STA command, as follows:</p> <ul style="list-style-type: none"> <li>• A = Field Level exceeded Alarm;</li> <li>• W = Field Level exceeded warning;</li> <li>• U = USB cable connected Alarm;</li> <li>• V = Low Battery Alarm;</li> <li>• P = Probe failure Alarm;</li> <li>• T = OverTemperature Alarm;</li> <li>• C = Relative Humidity Alarm;</li> <li>• a = end of Field Level Alarm situation;</li> <li>• w = end of Field Level Warning situation;</li> <li>• v = end of Low Battery Alarm;</li> <li>• p = end of Probe Alarm;</li> <li>• SERIAL = Alarms or logger transmission enabled via the serial port</li> <li>• ALRTRG = any Alarm or warning triggers the Logger, if enabled.</li> </ul> <p>A dash “-“ means that specific Alarm (or warning) is not armed.</p> <p>The presence of the “SERIAL” string means that any Alarm will be transmitted via the serial port (optical and USB) formatted as the reply to ?STA command.  If the LOGGER is active, the presence of the “SERIAL” string means that the binary data, relating to each single acquisition, will be sent to the serial port.  The presence of the ALRTRG string means that, if the LOGGER is active, the alarm triggers the saving of the measurement record, either on a time basis (AQ_ with a rate greater than zero) or continuously (AQ_ with a rate of -1).</p> <p>Example: <b>MSK=AW-VPTCawvp</b> which means that all Alarms and warnings are armed, except for the USB cable connection Alarm. They are not sent automatically via the serial port. The Logger is not triggered by alarms.</p>
<p><b>?NET</b></p>	<p>This query command <b>#LR?NET*</b> requests the list of the Wi-Fi networks available.</p> <p>Note: to work, the command needs the module to have been powered up via the SWFI command. If not so, the unit replies with: <b>NET=ERR.</b></p> <p>Example of reply:  <b>NET=OK</b>  [ ] SSID:Redmi Note 8 Pro -41dB  [X] SSID:FRITZ!Box 7490 -79dB  [ ] SSID:DWR-921-B5BC -83dB  [ ] SSID:TP-LINK_F788 -67dB</p> <p>[X] mark indicates the default network but not the successful connection.</p> <p>Please refer to command ?WFI to find out the connection status.</p>

<b>?PRB</b>	<p>This query command <b>#LR?PRB*</b> requests information of the connected probe.</p> <p>The reply provides probe model, latest calibration date, measurement unit, divider in the following format:</p> <ul style="list-style-type: none"> <li>• <b>Three-band probe:</b> PRB=Name:Dd.Mm.Yy; Unit:Divider:Range:MinLevel:MinFreq:MaxFreq:CorrFreqUnit</li> <li>• <b>Four-band probe:</b> PRB=Name:Dd.Mm.Yy; Unit:Divider:Range:MinLevelWide:MinFreq:MaxFreq:CorrFreqUnit:4:MinLevelSubBand</li> <li>• <b>Single-band probe:</b> PRB=Name:Dd.Mm.Yy; Unit:Divider:Range:MinLevel:MinFreq:MaxFreq:CorrFreqUnit:S</li> <li>• <b>Electric and Magnetic probe EHP-2B-xx:</b> PRB=Name:Dd.Mm.Yy; Unit:Divider:RangeE:MinLevelE:MinFreqE:MaxFreqE:RangeH:MinLevelH:MinFreqH:MaxFreqH:CorrFreqUnit:S</li> </ul> <p>Note: If the correction in frequency is not available, CorrFreqUnit field will be “---”.</p> <p>Examples of reply:  <b>PRB=EP-3B-01:14.09.15; V/m:100.00:200.00:0.20:0.09:3000.00:MHz</b>  <b>PRB=EP-4B-02:08.07.19; V/m:10.00:200.00:0.10:0.09:3000.00:MHz:4:0.02</b>  <b>PRB=HP-1B-01:15.07.19; uT :100.00:200.00:0.04:9.99:5000.00:Hz :S</b>  <b>PRB=EP745:04.10.19; V/m:100.00:450.00:0.35:0.09:7000.00:MHz:S</b>  <b>PRB=EP645:15.07.09; V/m:10.00:360.00:0.01:0.09:3000.00:MHz:S</b>  <b>PRB=EHP-2B-03:12.09.22;%:10.00:1000.00:0.10:4.99:9250.00:1000.00:0.50:1.00:1000.00:MHz:S</b></p>
<b>?S/N0</b>	<p>This query command <b>#LR?S/N0*</b> requests the serial number of the unit.</p> <p>Example of reply: <b>S/N0=000WE20501</b></p>
<b>?SID</b>	<p>This query command <b>#LR?SID*</b> requests the Wi-Fi network Service Set Identifier, that is to say the name stored in memory.</p> <p>Reply: SID=stringSSID</p> <p>When a network name has not yet been stored, the <i>stringSSID</i> corresponds to DEMO_AP</p> <p>Example of reply: <b>SID=Redmi Note 8 Pro</b></p>



<p><b>?SNS</b></p>	<p>This query command <b>#LR?SNS*</b> requests data from the environmental sensor.</p> <p>The reply, in the format <b>SNS=T;H;P</b> provides:</p> <ul style="list-style-type: none"> <li>• T: Temperature, in Celsius degrees (°C)</li> <li>• H: Relative Humidity in percentage (%)</li> <li>• P: Atmospheric Pressure (hPa)</li> </ul> <p>Example of reply: <b>SNS=23.9;38.8;1013.6</b></p>
<p><b>?SST</b></p>	<p>This query command <b>#LR?SST*</b> requests the level of the signal for the wireless channel.</p> <p>The reply is in the format: SST=I where I is the RSSI value, expressed in dBm, for the wireless network which the unit is connected to. When no network is detected, or the unit is disconnected, it returns SST=ERR</p> <p>Example of reply: <b>SST=-67</b></p>
<p><b>?STA</b></p>	<p>This query command <b>#LR?STA*</b> requests the alarms status, regardless of the MSK setting.</p> <p>The reply provides a string showing the following labels: <b>STA=AWUVPTCawvp</b></p> <ul style="list-style-type: none"> <li>• W: Warning level exceeded;</li> <li>• A= ALARM threshold exceeded;</li> <li>• w= end of Warning situation;</li> <li>• a= end of Alarm situation;</li> <li>• P= Probe failure ALARM;</li> <li>• p= end of Probe Alarm;</li> <li>• V= Low Battery ALARM;</li> <li>• v= end of Low Battery Alarm;</li> <li>• T= OverTemperature ALARM;</li> <li>• U= USB Connection Warning;</li> <li>• C= Relative Humidity ALARM</li> </ul> <p>Note: each alarm is replaced by dash "-" when not active.</p> <p>Note: when an EHP-2B-xx probe is connected, "A" refers to the alarm in field E while "W" refers to the alarm in field H.</p> <p>Please, refer to ?MSK command for alarm masking.</p> <p>Example of reply: <b>STA=-W-V-----</b> which means that the alarms for Field level Warning and for Low Battery voltage are active. The probe has just detected a level exceeding the warning threshold and the battery voltage is lower than 3.0 V, that is to say it is almost exhausted.</p>

<p><b>?STM</b></p>	<p>This query command <b>#LR?STM*</b> requests the active alarms condition.</p> <p>The reply provides a string showing the active alarms (they must be activated by SMSK command) as following: STA=AWUVPTCawvp</p> <ul style="list-style-type: none"> <li>• W: Warning level exceeded;</li> <li>• A= ALARM threshold exceeded;</li> <li>• w= end of Warning situation;</li> <li>• a= end of Alarm situation;</li> <li>• P= Probe failure ALARM;</li> <li>• p= end of Probe Alarm;</li> <li>• V= Low Battery ALARM;</li> <li>• v= end of Low Battery Alarm;</li> <li>• T= OverTemperature ALARM;</li> <li>• U= USB Connection Warning;</li> <li>• C= Relative Humidity ALARM</li> </ul> <p>Note: each alarm is replaced by dash "-" when not active.</p> <p>Note: when an EHP-2B-xx probe is connected, "A" refers to the alarm in field E while "W" refers to the alarm in field H.</p> <p>Please, refer to ?MSK command for alarm masking.</p> <p>Example of reply: STA=-W-V----- which means that the alarms for Field level Warning and for Low Battery voltage are active. The probe has just detected a level exceeding the warning threshold and the battery voltage is lower than 3.0 V, that is to say it is almost exhausted.</p>
<p><b>?STS</b> (for EHP-2B model probe only)</p>	<p>This query command <b>#LR?STS*</b> requests the index of the standard for EHP-2B-xx probes.</p> <p>The reply is in the format: SST=i where i is index of the covered standards list.</p> <p>This value affects Alarms and Warnings, the value saved in the log and the reply to the ?MES command.</p> <p>Example of reply: <b>STS=1</b></p>
<p><b>?TMP</b></p>	<p>This query command <b>#LR?TMP*</b> requests temperature and humidity to the unit.</p> <p>The reply, in the format <b>TMP=T;H</b> provides:</p> <ul style="list-style-type: none"> <li>• T: Temperature, in Celsius degrees (°C)</li> <li>• H: Relative Humidity in percentage (%)</li> </ul> <p>Example of reply: <b>TMP=23.9;38.8</b></p>

<p><b>?VST[V]</b></p>	<p>This query command <b>#LR?VST*</b> requests the power supply status.</p> <p>The reply provides the code as follows:</p> <ul style="list-style-type: none"> <li>• 0 for battery supply</li> <li>• 1 for external supply connected and battery charge completed</li> <li>• 2 for external supply connected and battery under charging</li> </ul> <p>Example of reply: <b>VST=1</b> which indicates the external 5V supply is connected and the battery is fully charged.</p> <p>Note: it is possible to obtain the information including the description, issuing the command <b>#LR?VSTV*</b></p> <p>Example of reply: <b>VST=0 (Battery)</b></p>
<p><b>?WFI</b></p>	<p>This query command <b>#LR?WFI*</b> requests the status of the Wi-Fi module</p> <p>The reply is as follows:</p> <ul style="list-style-type: none"> <li>• <b>WFI=OFF</b> when the module is switched OFF;</li> <li>• <b>WFI=BLE</b> when the Bluetooth LE is active;</li> <li>• <b>WFI=ON</b>  <b>SSID</b> : stringSSID  <b>Signal Strenght</b> : dBm  <b>Local IP Address</b> : IPv4_Address:Port</li> </ul> <p>If no IP address has yet been assigned to the unit, or it has not been possible to connect to the network, Local IP Address shows “waiting for connection”.</p> <p>Examples of reply:  <b>WFI=ON</b>  <b>SSID : Redmi Note 11</b>  <b>Signal Strenght : -87</b>  <b>Local IP Address : 192.168.0.21:6666</b></p> <p>Which means that the unit is connected to the Redmi Note 11 Wi-Fi network. The radio signal strength is -87 dBm and the assigned IP address is 192.168.0.21. The connection is through the port 6666.</p>
<p><b>?WLOG</b></p>	<p>This query command <b>#LR?WLOG*</b> requests the binary Log file via wireless communication.</p> <p>NOTE: It works via BLE and Wi-Fi ports only. Please, refer to command ?LOG to download data via fiber optic or USB connection.</p> <p>The reply starts with string <b>LOG_S</b> and is terminated by the string <b>LOG_E</b>.  The first 128 bytes (LOG_S included) represent the header; the following data represent the records of 32 (or 64) bytes each.</p> <p>Please, refer to the binary Log file paragraph at the end of this chapter for further details about the binary file.</p>

<p><b>?WMEifv</b></p>	<p>This query command <b>#LR?WMEi*</b> requests the instantaneous % level related to the desired standard. This is only for EHP-2B-xx probes.</p> <p>l=1: Reference Standard (same reading as per ?MES command)  l=2: Standard 2  l=3: Standard 3  l=4: Standard 4</p> <p>The order of the standards is:  - for -01 and -02 models: ICNIRP98OCC, ICNIRP98GP, SC6CONTR, SC6UNCONTR.  - for -03 and -04 models ICNIRP2020OCC, ICNIRP2020GP, FCCCONTR, FCCUNCONTR.</p> <p>The reply is in the format:  <b>WME=E;H;%;*;</b> where:</p> <ul style="list-style-type: none"> <li>• E is the value for the Electric field;</li> <li>• H is the value for the Magnetic field</li> <li>• % is the measurement unit label</li> </ul> <p><b>WME=NA</b> for probes other than EHP-2B-xx</p> <p>Example of reply: <b>WME=45.96;2137.43;%;*;</b> which indicates the E field is at almost 46%,  H field is 2137% of the selected standard.</p> <p>By adding the <b>f</b> character after the index <b>i</b>, it is possible to include battery voltage and GPS data to the reply.</p> <p>Following is the standard NMEA GPRMC and/or GNRMC string that reports the information:</p> <ul style="list-style-type: none"> <li>• Time (UTC)</li> <li>• Navigation receiver warning A = OK, V = warning</li> <li>• Latitude (deg. min North/South)</li> <li>• Longitude (deg. min East/West)</li> <li>• Speed over ground (Knots)</li> <li>• Course Made Good</li> <li>• Date (UTC)</li> <li>• Magnetic variation (deg)</li> <li>• Mandatory checksum</li> </ul> <p>Following is the standard NMEA GPGGA and/or GNGGA string that reports the information:</p> <ul style="list-style-type: none"> <li>• Time (UTC)</li> <li>• Latitude (deg. min North/South)</li> <li>• Longitude (deg. min East/West)</li> <li>• Position Fix</li> <li>• Satellites in use</li> <li>• Horizontal Dilution of Precision</li> <li>• MSL Altitude in m</li> <li>• Geoid Separation in m</li> <li>• Mandatory checksum</li> </ul> <p>The reply is terminated by the string "--&gt;" followed by date and time from the unit.</p> <p>Example of reply: <b>WME=46.13;1969.20;%;*;3.78V;</b>  <b>\$GPRMC,162842.710,A,4341.1585,N,01047.9364,E,0.09,255.44,190822,,,A*69</b>  <b>;\$GPGGA,162842.710,4341.1585,N,01047.9364,E,1,9,0.99,38.3,M,47.8,M,,*6A</b>  <b>;-&gt;23/09/22 00:07:00*</b></p> <p>The NMEA degrees minutes can be convert to decimal degree (see ?GPS command)</p>
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	<p>Adding the “v” character, at the end of the command, so that it becomes <b>?WMEifv</b>, it is possible to include in the reply string the additional values of heading (degrees), acceleration (g), temperature (° C) and humidity (%)</p> <p>Example of reply: <b>WME=46.47;1930.61;%;*;3.79V; \$GPRMC,163230.000,A,4341.1574,N,01047.9386,E,0.01,25.87,190822,,D*54 ;GPGGA,163305.992,,,,,0,3,,,M,,M,,*4B ;Heading: 209 (SW); G:18; -97; 48;0.00;0.00*; --&gt;24/09/22 00:11:23*</b></p>
<b>?WRN</b>	<p>This query command <b>#LR?WRN*</b> requests the Warning threshold.</p> <p>The reply provides the threshold in the current unit followed by the averaging time, in minutes.</p> <p>When the connected probe is a EHP-2B-xx, it returns the alarm threshold for the Magnetic Field.</p> <p>When the connected probe is a weighted model, the unit shown is %.</p> <p>Examples of reply: <b>WRN=6.0 uT; 6.00 min. WRN=25000.00%; 30.00 min.</b></p>
<b>?WVR</b>	<p>This query command <b>#LR?WVR*</b> requests the firmware version of the WIFI+BLE WINC3400 internal module.</p> <p>The reply format is as follows: <b>WVR=Major.Minor.Patch BuildDate BuildTime</b></p> <p>Note: to work, the command requires that the module has been turned on via one of the two SBLE or SWFI commands. Otherwise, it returns the reply: <b>WVR=ERR.</b></p> <p>Example of reply: <b>WVR=1.3.1 Jun 28 2019 13:46:26</b></p>

**9.4 Setting commands**      These commands are intended for making settings on the LR-01.

<b>TABLE 8-2 Setting commands</b>	
<b>SADRa</b>	<p>This setting command sets the specific address for the unit. It represents the additional prefix that will be accepted and recognized by that specific unit only, in the same way as the default prefix "LR" which is always valid for all units.</p> <p>The reply is: ADR=OK if the command has been granted ADR=ERR if the command has been refused</p> <p>Note: the address must be a numeric, two digits, value between 00 and 99.</p> <p>Example: <b>#LRSADR00*</b> which means that the address of the unit will be 00.</p>
<b>SALRs</b>	<p>This setting command sets the Alarm threshold. Argument s is the threshold value, expressed in the current unit.</p> <p>When the connected probe is a EHP-2B-xx, it refers to the Electric Field. When the connected probe is a weighted model, the unit is %.</p> <p>The reply is the same as per ?ALR command.</p> <p>Example: <b>#LRSALR6*</b> which means the new Alarm threshold will be 6 in the current unit.</p>
<b>SALT</b>	<p>This setting command resets the reference altitude. Just after having issued the command, the altitude at that location will be 0 meters.</p> <p>The reply is: ALT=OK if the command has been granted ALT=ERR if the command has been refused</p> <p>Example: <b>#LRSALT*</b></p>


<p><b>SAQ_x;t</b></p>	<p>This setting command sets the Logger parameters.</p> <p>Argument <b>x</b> represents the storing rate, in seconds, 1 s minimum and 900 s maximum.</p> <p>If <b>x</b> is set to <b>-1</b>, the Logger is activated but the trigger event becomes the pressing of the button or, if enabled (SMSK L), the exceeding of the alarm threshold. In other words, when <b>x=-1</b> the logger does not have a fixed time rate. Please refer to command SMSK for the Alarm Mask and SALR for the field level threshold.</p> <p>If the Logger rate <b>x is greater than 0</b>, and the logger is armed on crossing the alarm threshold (SMSK L), the log is carried out with the predetermined time interval and only if the alarm threshold has been exceeded.</p> <p><b>x=0</b> disables the Logger.</p> <p>Argument <b>t</b> represents the Logger mode.</p> <ul style="list-style-type: none"> <li>• <b>t=32</b> selects the compact version of the log, with no position information. Each record occupies 32 bytes.</li> <li>• <b>t=64</b> selects the extended version of the log, complete of GPS data. Each record takes 64 bytes.</li> </ul> <p>The averaging time and type is the one set by SAVG command.</p> <p>If logging rate is lower than the averaging time (set by SAVG command), the instant value (or values, depending on the probe) is stored.</p> <p>When the logger is armed for pressing the <b>button</b>, the instantaneous values are saved.</p> <p>If it is set that the alarm is also generated on the <b>serial port</b> (S field in the SMSK command), the binary file corresponding to the record is sent to the serial port at the preset logger rate.</p> <p>Note: setting the Logger via the SAQ_ command does not correspond to the actual start of the Logger, which instead occurs by pressing the button for more than 5 seconds, or via the SLST 1 command. This event erases the entire memory and the previously acquired logs are deleted.</p> <p>The Log remains active until the unit is turned off or the maximum number of storable records is reached. This number depends on the type of Log chosen; i.e. 125k in compact mode and 250k in extended.</p> <p>The reply is the same as per ?AQ_ command.</p> <p>Example: <b>#LRSAQ_30;32*</b> which means that the logger is set to save a measurement every 30 seconds, of the compact type (32 bytes).</p>
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<p><b>SAVG</b>l;r</p>	<p>This setting command sets the averaging mode.</p> <ul style="list-style-type: none"> <li>• l is the time length in minutes, between 0.25 and 30 with 0.25 minutes resolution up to 1 minute; 1 minute up to 15 minutes and always 30 minutes over 15.</li> <li>• r is the averaging type. A for AVG, R for RMS or I for Instantaneous.</li> </ul> <p>The reply is the same as per ?AVG command.</p> <p>Note: if the instantaneous mode is set, the L parameter has no effect.</p> <p>Example: <b>#LRSAVG1;R*</b> which means the unit is set to average over 1 minute with a RMS average type.</p>
<p><b>SBDR</b> b</p>	<p>This setting command sets the optic serial port speed. The parameter b is a code for the bit rate; in details:</p> <ul style="list-style-type: none"> <li>• <b>b=10</b>: 9600 bps</li> <li>• <b>b=11</b>: 38400 bps</li> <li>• <b>b=12</b>: 57600 bps</li> <li>• <b>else</b>: 115200 bps</li> </ul> <p>The reply is: BDR=OK if the command has been granted BDR=ERR if the command has been refused</p> <p>Example: <b>#LRSBDR 10*</b> which means the optical port speed is set to 9600 bps.</p> <p>Default speed is 115200 bps. The parameter is kept also when the unit is switched OFF. Like other essential settings, it can be reset when the unit is turned on by keeping the button pressed.</p>
<p><b>SBLE</b>x</p>	<p>This setting command switches the internal BLE (Bluetooth Low Energy) module ON or OFF as following:</p> <ul style="list-style-type: none"> <li>• x = ON: switches the module ON and starts the "advertising" procedure, making the unit visible to other Bluetooth devices.</li> <li>• x = OFF closes any open channel and turns OFF the module.</li> </ul> <p>Once the pairing process has started, the password to connect is "123456".</p> <p>The reply BLE=OK indicates that the command has been granted.</p> <p>Example: <b>#LRBLEOFF*</b> which means that any open wireless channel will be closed and the module will be turned off.</p> <p>If the Wireless firmware release is older than 1.3.0, the reply is preceded by the string: <b>***WARNING LEGACY WIRELESS FIRMWARE***\r\n</b></p>



<p><b>SCLDd.m.y</b></p>	<p>This setting command sets the date of the Real Time Clock. Each parameter must be two digits, as following:</p> <ul style="list-style-type: none"> <li>• d is the day (01 to 31)</li> <li>• m is the month (01 to 12)</li> <li>• y is the year (00 to 99)</li> </ul> <p>The reply is the same as per ?CLK command.</p> <p>Example: <b>#LRSCLD31.05.22*</b> which means that the RTC date will be set to May, 31th 2022.</p>
<p><b>SCLTh.m.s</b></p>	<p>This setting command sets the time of the Real Time Clock. Each parameter must be two digits, as following:</p> <ul style="list-style-type: none"> <li>• h for hours (00 to 23)</li> <li>• m for minutes (00 to 59)</li> <li>• s for seconds (00 to 59)</li> </ul> <p>The reply is the same as per ?CLK command.</p> <p>Example: <b>#LRSCLT16.25.00*</b> which means that the RTC time will be set to 4:25 PM.</p>
<p><b>SCPCt</b></p>	<p>This setting command is used to start the compass calibration procedure.</p> <p>In order for the compass to be accurate, it must first be calibrated using the appropriate command where <b>t</b> is the calibration time in seconds. During this period, the unit must be oriented in all possible directions in order to extrapolate the magnetic offset. A count down is displayed on the terminal to help understanding both the frequency of the readings and the time left. Calibration is stored in the internal flash memory.</p> <p>A typical reply is: Compass found (code 0xC7): Magnetometer calibration: Please rotate the device next 30 seconds ( 90 Readings)</p> <pre> 89 88 87 ... 0 Calibration Done </pre> <p>Then calibration data for debug purposes are added.</p> <p>Note: compass heading 0 (North) corresponds to the direction where the GPS antenna is located.</p> <p>Example: <b>#LRSCPC30*</b> which means that the RTC time will be set to 4:25 PM.</p>

<p><b>SDCMc</b></p>	<p>This setting command selects the wireless communication channel active at power on, as follows:</p> <ul style="list-style-type: none"> <li>• c=0 to disable all wireless channels at power on;</li> <li>• c=1 to enable Wi-Fi module at power on;</li> <li>• c=2 to enable BLE module at power on.</li> </ul> <p>If DCM=1 or DCM=2, the corresponding wireless communication channel will be kept active for 60 seconds. Any command received via the wireless channel will keep it active for another 60 seconds. Otherwise, at the end of this period, the communication is deactivated.</p> <p>This setting is saved in the internal flash memory.</p> <p>Note: before any setting, with the unit blank, the communication is enabled, by default, on both channels.</p> <p>The reply DCM=OK indicates that the command has been granted.</p> <p>Example: <b>#LRSDCM1*</b> which means that each time the unit will be turned on, the Wi-Fi module will be automatically activated.</p>
<p><b>SGCSAh</b></p>	<p>This setting command selects the automatic RTC synchronization, taking advantage of the GPS signal.</p> <p>The argument h represents the time zone, an integer value in hours between -12 and 12. Please set your Country time zone and pay attention to the possible daylight saving time.</p> <p>The reply is:</p> <p>GCS=OK if the command has been granted</p> <p>GCS ERROR if the command has been refused (e.g. the value was out of range). In this case the RTC will be set for manual update.</p> <p>The success of the RTC update operation depends on the quality of the GPS signal received. Each time the clock update operation is successful, the complete list of all available events is updated with a string like: Auto Set:hh:mm:ss;dd/mm/yy</p> <p>Example: <b>#LRSGCSA2*</b> which sets the automatic RTC synchronization, using GPS module and a +2 hours time zone (Rome, in summer time).</p> <p>Note: the command for manual RTC setting is SGCSM</p>
<p><b>SGCSM</b></p>	<p>This setting command <b>#LRSGCSM</b> selects the manual RTC update. Choosing this mode, time and date must be set using SCLT and SCLD commands.</p> <p>The reply GCS=OK indicates that the command has been granted.</p> <p>Example: <b>#LRSGCSM*</b> which sets the manualc RTC setting.</p> <p>Note: the command for automatic RTC setting is SGCSA</p>

<b>SGOF</b>	<p>This setting command switches immediately off the internal GPS module.</p> <p>The reply GOF=OK indicates that the command has been granted.</p> <p>Example: <b>#LRSGOF*</b></p>
<b>SGOOFF</b>	<p>This setting command turns immediately off the unit.</p> <p>Note: since the instrument goes suddenly off after having received the command, no reply is returned.</p> <p>Example: <b>#LRSGOOFF*</b></p>
<b>SGOI</b>	<p>This setting command turns immediately on the internal GPS module. It will stay on up to the first FIX or until the timeout of 4 minutes will expire.</p> <p>The reply GOI=OK indicates that the command has been granted.</p> <p>Example: <b>#LRSGOI*</b></p>
<b>SIAMk para</b>	<p>The setting command <b>#LRSIAMk para*</b> set the output of the LR01/IAM and the alarm on which the output self works .</p> <p>The argument “k” can be as following:</p> <ul style="list-style-type: none"> <li>• k=B Set Buzzer</li> <li>• k=1 Set A1 output (Pin 2 and 8 of DB15 connector)</li> <li>• k=2 Set A2 output (Pin 1 and 7 of DB15 connector)</li> <li>• k=R Set Relè output (Pin 10,12,13,14,15 of DB15 connector)</li> </ul> <p>The parameter “para” allows the user to set which alarm should be enabled:</p> <ul style="list-style-type: none"> <li>• W= Warning level exceeded</li> <li>• A= ALARM threshold exceeded</li> <li>• P= Probe failure ALARM</li> <li>• V= Low Battery ALARM</li> <li>• T= OverTemperature ALARM</li> <li>• C= Relative Humidity ALARM</li> <li>• U= USB Connection Warning</li> </ul> <p>For example, the command <b>#LRSIAMB WT*</b> enable the Warning Level and Alarm OverTemperature on the Buzzer and provide the response: <b>AMB-W---T-----</b></p> <p>The dot ( - ) means the specific alarm is not active</p> <p>If the index ‘k’ entered is not correct or the LR01/IAM is not present, the reply is: <b>IAMK=ERR</b></p> <p> <b>NOTE</b> See §10.13.4 for User’s Port HD-15 female connector pinout list .</p>
<b>SIDN i</b>	<p>This setting command sets the unit’s identifier. Its maximum length is 20 characters.</p> <p>The reply is the same as per ?IDN command.</p> <p>Example: <b>#LRSIDN Cisano*</b> which means that the unit name will become Cisano.</p>

<p><b>SKFR f</b></p>	<p>This setting command sets the frequency for flatness correction. Argument f represents the frequency in Hz at which the correction is to be applied, or 0 whenever it is desired to disable the correction.</p> <p>In the case of an Electric and Magnetic probe, both correction frequencies are set to the indicated value. These values will then be adapted according to the frequency limits of the probe itself and therefore may differ.</p> <p>Each time a probe is inserted, the frequency correction is automatically disabled.</p> <p>The reply is: KFR=OK in case the correction in frequency was set successfully KFR=NA in case the correction in frequency was not available</p> <p>Example: <b>#LRSKFR 100000*</b> which enables the correction factor associated to the frequency of 1 MHz.</p>
<p><b>SLPF f</b></p>	<p>This setting command sets the Low Pass Filter for the passive probes. The argument f must be between 0 and 3 and represents the index of the following list of available filters:</p> <ul style="list-style-type: none"> <li>• 0: 10 Hz</li> <li>• 1: 20 Hz</li> <li>• 2: 40 Hz (default)</li> <li>• 3: 80 Hz</li> </ul> <p>The reply is: LPF=OK if the command has been granted LPF=ERR if the command has been refused</p> <p>Example: <b>#LRSLPF 2*</b> sets the filter to 40Hz, which is the fastest filter able to cut the disturbances coming from the mains network.</p>
<p><b>SLST l</b></p>	<p>This setting command activates or stops the Logger immediately. The argument l must be:</p> <ul style="list-style-type: none"> <li>• 0: stops the Log immediately</li> <li>• 1: starts the Log immediately</li> </ul> <p>Note: starting the Logger (l=1) causes the immediate deletion of the Log previously saved in memory. SLST 1 is equivalent to a prolonged pressure (longer than 5s) of the button.</p> <p>The Logger parameters must be set via the SAQ_ command before sending this starting command.</p> <p>Example: <b>#LRSLST 1*</b> starts the Logger, deleting the previous saved one. The reply is: <b>LST=OK</b> if the SLST 1 command has been granted</p> <p>Example: <b>#LRSLST 0*</b> stop the Logger. The reply is: <b>LST=OK\r\nLog Ended – SLST 0</b> if the SLST 0 command has been granted</p> <p>The reply is: <b>LST=SERR</b> when issuing a SLST 0 command while the unit was not running in Logger mode.</p>

<p><b>SMSKm</b></p>	<p>This setting command sets the Alarms and Warnings mask. The mask must contain the mnemonic symbols that represent the individual alarms as shown in the following table. They can be written in any order.</p> <ul style="list-style-type: none"> <li>• W = Warning level exceeded;</li> <li>• A = ALARM threshold exceeded;</li> <li>• w = end of Warning situation;</li> <li>• a = end of Alarm situation;</li> <li>• P = Probe failure ALARM;</li> <li>• p = end of Probe Alarm;</li> <li>• V = Low Battery ALARM;</li> <li>• v = end of Low Battery Alarm;</li> <li>• T = OverTemperature ALARM;</li> <li>• U = USB connected Warning;</li> <li>• C = Relative Humidity ALARM;</li> <li>• L = Logger activation;</li> <li>• S = Alarm notification via serial port enable.</li> </ul> <p>Note: do not add the corresponding label to disarm any specific alarm.</p> <p>Adding the S symbol, any Alarm will be transmitted via the serial port (optical and USB) formatted as the reply to ?STA command. If the LOGGER is active (AQ_ command), with the S label the binary data, relating to each single acquisition, will be sent to the serial port.</p> <p>Adding the L symbol, if the LOGGER is active, the alarm triggers the saving of the measurement record, either on a time basis (AQ_ with a rate greater than zero) or continuously (AQ_ with a rate of -1).</p> <p>Please, refer to ?STA command for reading alarm status.</p> <p>The reply is the same as per the ?MSK command.</p> <p>Examples:  <b>#LRSMSK*</b> disarms all alarms and warnings;  <b>#01SMSKAV*</b> tells unit 01 to arm the Field level Alarm and the Low Battery Alarm.</p>
<p><b>SPWDp</b></p>	<p>This setting command sets the password for the Wi-Fi connection. The security is under the standard WPA-PSK.</p> <ul style="list-style-type: none"> <li>• p = alphanumeric password up to 64 characters long.</li> </ul> <p>The parameter is kept when the unit is switched OFF.</p> <p>The reply PWD=OK indicates that the command has been granted.</p> <p>Example: <b>#LRSPWDP@\$\$w0rd*</b> which sets P@\$\$w0rd as the Wi-Fi password.</p>
<p><b>SREBOOT</b></p>	<p>This setting command forces the unit to reboot.</p> <p>Note: since the instrument goes suddenly in reset procedure after having received the command, no direct reply is returned. During restart, the unit outputs to the serial ports the results of the initial diagnostics.</p> <p>Example: <b>#LRSREBOOT*</b></p>

<p><b>SRST</b></p>	<p>This setting command restores the default configuration. The command resets the main parameters as follows:</p> <ul style="list-style-type: none"> <li>• All Alarms masked;</li> <li>• Averaging period of 6 minutes;</li> <li>• Running average cleared;</li> <li>• Averaging type: RMS;</li> </ul> <p>The reply RST=OK indicates that the command has been granted.</p> <p>Example: <b>#LRSRST*</b> restarts the unit.</p>
<p><b>SRSTR</b></p>	<p>This setting command restores the default configuration, logger rate included. The command resets the main and logger parameters as follows:</p> <ul style="list-style-type: none"> <li>• Logger rate of 6 minutes;</li> <li>• All Alarms masked;</li> <li>• Averaging period of 6 minutes;</li> <li>• Running average cleared;</li> <li>• Averaging type: RMS;</li> </ul> <p>The reply “Reset to Default Factory Setting and Reboot” indicates that the command has been granted, and is followed by the restarting diagnostics.</p> <p>Note: extreme attention must be used as this command invalidates any data already stored making them meaningless.</p> <p>Example: <b>#LRSRSTR*</b> resets the logger and restarts the unit.</p>
<p><b>SSIDi</b></p>	<p>This setting command sets the Wi-Fi network name for wireless 802.11 b/g/n connection. i is an alphanumeric string, up to 64 characters long.</p> <p>The parameter is kept also when the unit is switched OFF.</p> <p>The reply is: SID=OK if the command has been granted SID=ERR if the command has been refused</p> <p>Example: <b>#LRSSIDNardaWIFI*</b> which means that the SSID of the access point to connect to is NardaWIFI.</p>
<p><b>SSTSx</b> (for EHP-2B model probe only)</p>	<p>Set the reference standard for EHP-2B probe</p> <p>The format is as follows: <b>#LRSSTSx*</b> where <b>X</b> is an index that goes from 1 to 4:  “1” = Standard 1 (ICNIRP98OCC for EHP-2B-01/02/05/06 and ICNIRP2020OCC for 03/04/07/08)  “2” = Standard 2 (ICNIRP98GP for EHP-2B-01/02/05/06 and ICNIRP2020GP for 03/04/07/08)  “3” = Standard 3 (SC6CONTR for EHP-2B-01/02/05/06 and FCCCONTR for 03/04/07/08)  “4” = Standard 4 (SC6UNCONTR for EHP-2B-01/02/05/06 and FCCUNCONTR for 03/04/07/08)</p> <p>Example <b>#LRSSTS1*</b> returns the response: <b>#LRSSTS=OK*</b> confirming that the EHP-2B probe is set to Standard 1.</p> <p>This index represents the reference standard for alarms, warnings, report and ?MES command response.</p> <p>The index is permanent and stored in the Flash.</p> <p>If the index entered is not correct, the response string is: <b>STS=SERR</b></p>

<p><b>SWFix</b></p>	<p>This setting command switches the Wi-Fi module to the desired mode. The argument x can be as following:</p> <ul style="list-style-type: none"> <li>• x=ON: turns on the module and starts the connection procedure;</li> <li>• x=OFF: closes any connection and turns off the module, including BLE;</li> <li>• x = AP to make a Wi-Fi network where the unit acts as an access point (SSID DEMO_AP, no password)</li> </ul> <p>SSID and password must be set before with commands SSID and SPWD.</p> <p>The reply is: WFI=OK if the command has been granted WFI=ERR if the command has been refused</p> <p>Example: <b>#LRSWFION*</b> which turns on the module and starts the connection</p> <p>Note: when the connection is established (parameter ON) the reply is followed by the IP address assigned to the unit, as in the following example: <b>Wi-Fi IP is 192.168.0.9:6666</b></p> <p>If the Wireless firmware release is older than 1.3.0, the reply is preceded by the string: <b>***WARNING LEGACY WIRELESS FIRMWARE***\r\n</b></p>
<p><b>SWRNs</b></p>	<p>This setting command sets the Warning threshold. Argument s is the threshold value, expressed in the current unit.</p> <p>When the connected probe is a EHP-2B-xx, it refers to the Magnetic Field. When the connected probe is a weighted model, the unit is %.</p> <p>The reply is the same as per ?WRN command.</p> <p>Example: <b>#LRSWRN19.9*</b> which means the new Warning threshold will be 19.9 in the current unit.</p>

## 9.5 Log file

### Header

The binary file begins with a 128 bytes header, structured as follows:

- first 8 bytes are always 0x4C 0x4F 0x47 0x5F 0x53 0x20 0x0D 0x0A [0-7]
- 24 bytes reporting the serial number of the unit (if it is shorter, a zero-padding is performed) [8-31]
- 32 bytes showing the name of the probe (if it is shorter, a zero-padding is done) [32-63]
- 10 bytes carrying the calibration date of the probe [64-73]
- 1 bytes reserved [74]
- 1 bytes for Logtype of the Logger [75]
- 5 bytes reserved [76-80]
- 32 bytes reserved [81-112]
- 15 bytes reserved [113-127]

The LogType byte [75] encloses all the setting information.

A bit masking is needed to decode the settings, as follows:

(LogType & 1) is for the averaging mode (LSB)

- 0: Average (AVG)
- 1: Root Mean Squared (RMS)

(LogType & 2) is for compact or extended records

- 0: compact Log with 32 bytes records
- 2: extended Log with 64 bytes records, including position and speed data

(LogType & 4) is for averaged/instantaneous value

- 0: Average
- 4: Instantaneous value

(LogType & 8) is the Alarm activation flag

- 0: Log following an Alarm, disabled
- 8: Log following an Alarm, enabled

### Data

The Log file contains, from the 129th byte [128], the records made up of 32 (Compact Log) or 64 (Extended Log) bytes each. Every type of probe contains a specific data structure capable of expressing all the values measured during the log, recorded in the first 32 bytes. Please, refer to paragraph Log File Data for details. Any additional 32 bytes contain the position and speed data. Please, refer to the Additional GPS Structure description paragraph for details.

### End of Log file

The Log file ends with the checksum byte followed by the string "\r\nLOG\_E\r\n\r\n" (corresponding to 0x0D 0x0A 0x4C 0x4F 0x47 0x5F 0x45 0x0D 0x0A 0x0D 0x0A).

The checksum byte consists of the modulo 256 sum of the hexadecimal values of all the bytes sent, related to the data. In other words, all bytes that make up the measurement records, starting from [128] are added together.



**9.5.1 Log file data**

All figures in this document are **BIG ENDIANNES**.

**9.5.1.1 Passive Probes  
Structure description**

<b>Tot_avg</b>		<b>Tot_Peak</b>		<b>Reserved</b>			
Hi Byte 1	Lo Byte 2	Hi Byte 3	Lo Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
<b>Battery</b>	<b>Temp.</b>	<b>Alarm</b>	<b>PERTS</b>	<b>MISC</b>	<b>DateTime</b>		
Byte 9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
<b>X_avg</b>		<b>X_Peak</b>		<b>Y_avg</b>		<b>Y_Peak</b>	
Hi Byte 17	Lo Byte 18	Hi Byte 19	Lo Byte 20	Hi Byte 21	Lo Byte 22	Hi Byte 23	Lo Byte 24
<b>Z_avg</b>		<b>Z_Peak</b>		<b>Altitude</b>		<b>Seconds</b>	<b>RH</b>
Hi Byte 25	Lo Byte 26	Hi Byte 27	Lo Byte 28	Byte 29	Byte 30	Byte 31	Byte 32

**9.5.1.2 Single and Three  
Bands Active Probes  
Structure description**  
(Bands in red are present  
only for three band  
Probes)

<b>Wide_avg</b>		<b>Wide_Peak</b>		<b>Reserved</b>			
Hi Byte 1	Lo Byte 2	Hi Byte 3	Lo Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
<b>Battery</b>	<b>Temperature</b>	<b>Alarm</b>	<b>PERTS</b>	<b>MISC</b>	<b>DateTime</b>		
Byte 9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
<b>L_B_Avg</b>		<b>L_B_Peak</b>		<b>H_B_Avg</b>		<b>H_B_Peak</b>	
Hi Byte 17	Lo Byte 18	Hi Byte 19	Lo Byte 20	Hi Byte 21	Lo Byte 22	Hi Byte 23	Lo Byte 24
<b>Reserved</b>		<b>Reserved</b>		<b>Altitude</b>		<b>Seconds</b>	<b>RH</b>
Byte 25	Byte 26	Byte 27	Byte 28	Byte 29	Byte 30	Byte 31	Byte 32

**9.5.1.3 4-Bands Active  
Probes Structure  
description**

Wide_avg		Wide_Peak		Reserved			
Hi Byte 1	Lo Byte 2	Hi Byte 3	Lo Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Battery	Temperature	Alarm	PERTS	MISC	DateTime		
Byte 9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
2140_Avg		2140_Peak		1842_Avg		1842_Peak	
Hi Byte 17	Lo Byte 18	Hi Byte 19	Lo Byte 20	Hi Byte 21	Lo Byte 22	Hi Byte 23	Lo Byte 24
942_avg		942_Peak		Altitude		Seconds	RH
Hi Byte 25	Lo Byte 26	Hi Byte 27	Lo Byte 28	Byte 29	Byte 30	Byte 31	Byte 32

**9.5.1.4 EHP2B Electric  
Magnetic Active  
Probe Structure  
description**

E_avg		E_Peak		H_avg		H_Peak	
Hi Byte 1	Lo Byte 2	Hi Byte 3	Lo Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Battery	Temperature	Alarm	PERTS	MISC	DateTime		
Byte 9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
Reserved		Reserved		Reserved		Reserved	
Hi Byte 17	Lo Byte 18	Hi Byte 19	Lo Byte 20	Hi Byte 21	Lo Byte 22	Hi Byte 23	Lo Byte 24
Reserved		Reserved		Altitude		Seconds	RH
Byte 25	Byte 26	Byte 27	Byte 28	Byte 29	Byte 30	Byte 31	Byte 32

## 9.5.2 Field data

**Field data** are represented as 16 bit. Such a figure should be considered as a big-endian unsigned 15 bit integer multiplied by the typical probe divider (see dedicated **?PRB** command). In the particular case in which the figure is equal to **0xFFFF** then the value must be considered invalid (LR01 was not able to get a measure) and all the data (all 32 bytes) are meaningless.

If, for example, 16 bit figure named **Tot\_avg** is 0x0244 and the divider 100 then the **RMS** (or **AVG**) field strength value related to broadband channel will be 5.80 (0x0244 in decimal notation is 580).

---

Most significant bit (D15) **INFL** flag gives the information whether in the period the measurement was influenced (Bit High) or not (Bit Low) by external cable or disturbing activity. Therefore it is not part of field strength and has to be masked.

Indeed, this is just a flag which informs that the measure could have been influenced by the system itself.

---

**Bit 15 is INFL** flag which informs the user that the measurement could have been **influenced** by a sum of external issues such as Wireless transmission, charging cable, USB cable & activity.

**INFL** flag is the LR of all single flags which refer to its own disturbing part (see **PERTs** byte).

Note that the presence of this flag informs the measurement can be heavily disturbed and thus could not be reliable at all.

**Battery** is the voltage of the battery. The number should be considered as an unsigned 8 bit integer. To get the correct value of the battery voltage the following formula is used: **Volt = Voltage\*(0.132)**

If, for example, 8 bit figure named **Battery** is 0x1A (decimal 26) then the battery voltage will be 3.4 V

**Temp** is the Temperature recorded in the interval. The number should be considered as an unsigned 7 bit integer. In order to avoid negative figure an offset of 40 degrees centigrade is added thus, to get the correct value of the temperature, the following formula is used: **T Centigrade = Temp - 40.**

SPR Flag is a reserved one and should be masked (for example **Temp & 0x7F**).

If, for example, 8 bit figure named **Temp** is 0x3f (decimal 63) then the temperature will be 23°C

**Alarm** is the block of alarms recorded in the interval. Each bit should be considered individually as follows:

- Bit D07 When High it flags that the battery voltage was out of the safe limits.
- Bit D06 When High it flags that the relative humidity is out of working range.
- Bit D05 When High it flags that the temperature was out of working range.
- Bit D04 When High it flags that the USB cable was connected.
- Bit D03 Reserved
- Bit D02 When High it flags that a Probe failure was detected.
- Bit D01 When High it flags that the broadband field value overcame Warning threshold.
- Bit D00 When High it flags that the broadband field value overcame Alarm threshold.

**PERT** is the block of every single perturbing occurrence recorded in the interval. Each bit should be considered individually as follows:

- Bit D07 Reserved
- Bit D06 Reserved
- Bit D05 Reserved
- Bit D04 Reserved
- Bit D03 Reserved
- Bit D02 When High it flags that the USB connection was ON during sampling.
- Bit D01 When High it flags that the external Charger was connected by cable during sampling.
- Bit D00 Reserved

Note that the presence of one of the above flags indicates that the record has been perturbed by external influence and the result, in the best case, could be unreliable.

Figures **MISC** and **DateTimes** must be read together.

The 16 bit figure named **MISC** is shown as follows:

	D07	D06	D05	D04	D03	D02	D01	D00	D07	D06	D05	D04	D03	D02	D01	D00
MISC Byte 13/14	<b>Reserved</b>	<b>AVGPeriod_Dec</b> 2 bit uint	NOB		<b>AVGPeriod Min</b> 4 bit unsigned integer				<b>MONTHS</b> 7 bit unsigned integer							

This figure ( **MISC** ) should be considered as four different data as follows:

- Reserved. The Most significant bit is reserved.
- **AVGPeriod\_Dec** is a 2 bit unsigned integer which shows the decimal part of the interval value related to the time span used to get the average (RMS or AVG). This figure is expressed in 15s, i.e., 01 means 15s.
- **NOB** is a 2 bit unsigned integer which informs how many bands (fields for EHP2B) are present in the record.
- **AVGPeriod Min** is a 4 bit unsigned integer which shows the interval (expressed in minute) related to the time span used to get the average (RMS or AVG). An exception is **AVGPeriod** = 0 in which case the averaging time is 30 minute.
- **MONTHS** is a 7 bit unsigned integer which indicates how many months have been elapsed since 1<sup>st</sup> January 2022. Being the range limited to 127 the overlapping period is more than 10 years.

If, for example, **MISC** is **0x0083** then the meaning will be:

- **AVGPeriod**=1 (1 minute). Indeed ( **0x0083 >> 7** ) & **0xF** = **0x01**
- **MONTHS** =3 (April 2022). Indeed **0x0083 & 0x7F** = **0x03**

The 16 bit figure named **DateTime** is shown as follows:

	MI15	MI14	MI13	MI12	MI11	MI10	MI9	MI8	MI7	MI6	MI5	MI4	MI3	MI2	MI1	MI0
DateTime Byte 15/16	<b>DateTime</b>															

**DateTime** should be considered as a big-endian unsigned 16 bit integer and indicates how many minutes have been elapsed since the beginning of the current month (previous **MONTHS** data).

If, for example, **DateTime** is 0x95AE (decimal 38318) then the record will be related to the 27<sup>th</sup> of the month at 14:38.

Indeed :

$$\text{Day} = 1 + \text{Int}(\text{DateTime} / 1440) = 1 + \text{Int} ( 38318 / 1440 ) = 27$$

$$\text{Hour} = \text{Int}((\text{DateTime} \text{ Mod } (1440)) / 60) = \text{Int} ( ( 38318 \text{ Mod } (1440) ) / 60 ) = 14$$

$$\text{Minute} = (\text{DateTime} \text{ Mod } (1440)) \text{ Mod } 60 = ( 38318 \text{ Mod } ( 1440 ) ) \text{ Mod } 60 = 38$$

Merging the data with **MONTHS** we can get the full date of acquisition which is 14:38 27/04/2014. Time indications with second resolution is given in **Seconds**.

**Altitude** value is the relative Altitude and is expressed in m. This value is referred to the altitude measured when the log has started. The number should be considered as a 16 bit integer.

**Seconds** represent the time in seconds (modulo 60) at which the log has been saved. The number should be considered as an unsigned 8 bit integer.

**RH** value is the relative Humidity and is expressed in percent . The number should be considered as an unsigned 8 bit integer.

If, for example, 8 bit figure named **RH** is 0x32 (decimal 50) then the value of RH would be 50%

### 9.5.3 Additional GPS Structure description

<b>RES</b>	<b>RES</b>	<b>RES</b>	<b>Validity</b>	<b>Acceleration X</b>		<b>Acceleration Y</b>	
Byte 33	Byte 34	Byte 35	Byte 36	Byte 37	Byte 38	Byte 39	Byte 40
<b>Acceleration Z</b>		<b>RES</b>	<b>RES</b>	<b>Speed</b>		<b>Reserved</b>	
Hi Byte 41	Lo Byte 42	Hi Byte 43	Lo Byte 44	Hi Byte 45	Lo Byte 46	Hi Byte 47	Lo Byte 48
<b>Latitude int</b>		<b>Latitude Fract</b>		<b>Longitude int</b>		<b>Longitude Fract</b>	
degree Byte 49	minute Byte 50	Hi Byte 51	Lo Byte 52	degree Byte 53	minute Byte 54	Hi Byte 55	Lo Byte 56
<b>MSL Altitude</b>		<b>Heading</b>		<b>RES</b>	<b>RES</b>	<b>RES</b>	<b>RES</b>
Hi Byte 57	Lo Byte 58	Hi Byte 59	Lo Byte 60	Byte 61	Byte 62	Byte 63	Byte 64

**Validity** represents data validity – **0**:Valid **Else**:Unvalid.

**Acceleration X, Y, Z** expressed in hundredths of [g].

**Speed** value is expressed in tenths of knots, must be divided by 10 to get the speed in [kn]

**Position information** next page

**MSL Altitude** is the Mean Sea Level Altitude in tenths of meter, must be divided by 10 to get the altitude in [m]

**Heading** is the direction in tenths of degree, so 0° (or 360°) indicates a direction toward North

**9.5.3.1 Position Information** The 16 bit figure named **Latitude int** is shown as follows:

Byte 49/50	Degree	N/S	V	Minute
---------------	--------	-----	---	--------

The figure named **Latitude int** is made of 4 fields and represents the integer part of the GPS Latitude.

- **Degree** is a 8 bit unsigned integer which indicates the degree of latitude.
- **N/S** (D7) is a flag which indicates whether the latitude is North or South. When referred to North N/S=0 while if N/S=1 the latitude is South.
- **V** (D6) is a flag, which indicates whether data is valid, or not. When coordinates are valid V=0. When V=1 the GPS was not able to correctly get the position.
- **Minute** is a **6 bit** unsigned integer which indicates the minute integer part of latitude.

The 16 bit figure named **Latitude Fract** is shown as follows:

	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Byte 51/52	<b>Ten thousandths of a minute</b>															

The figure named **Latitude Fract** is a **Big-endian** unsigned 16 bit integer and indicates the fractionary part of the GPS Latitude and it is expressed in Ten-thousandths of a minute.

Merging the previous data **Latitude int** and this figure the full latitude can be obtained.

If, for example, **Latitude int=0x2c04** and **Latitude Fract=0x12a9** then the GPS latitude would be: 44 degree, 04.4777 minute North.

Indeed, 0x2c=44, 0x04=04 and 0x12a9=4777. N/S is 0 then the latitude is North.

The 16 bit figure named **Longitude int** is shown as follows:

Byte 53/54	Degree	E/W	res	Minute
---------------	--------	-----	-----	--------

The figure named **Longitude int** is made of 4 fields and represents the integer part of the GPS Longitude.

- **Degree** is a 8 bit unsigned integer which indicates the degree of latitude.
- **E/W** (D7) is a flag which indicates whether the Longitude is East or West. When referred to East E/W=0 while if E/W=1 the Longitude is West.
- **D6** is reserved and have to be masked out.
- **Minute** is a **6 bit** unsigned integer which indicates the minute integer part of Longitude.

The 16 bit figure named **Longitude Fract** is shown as follows:

	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Byte 55/56	<b>Ten thousandths of a minute</b>															

The figure named **Longitude Fract** is a **Big-endian** unsigned 16 bit integer and indicates the fractionary part of the GPS Longitude and it is expressed in Ten-thousandths of a minute.

Merging the previous data **Longitude int** and this figure the full Longitude can be obtained.

If, for example, **Longitude int=0x0809** and **Longitude Fract=0x16b3** then the GPS Longitude would be: 8 degree, 09.4777 minute East.

Note that position is valid only when **Flag V** of **Latitude int** is zero.

## 9.5.4 Battery Log File

### Header

The binary file begins with a 32 bytes header, structured as follows:

- The starting 8 bytes are always 0x4C 0x42 0x41 0x54 0x5F 0x53 0x20 0x20 [0-7]
- 24 bytes reporting the serial number of the unit (if it is shorter, a zero-padding is performed) [8-31]

### Data

The Log file contains, from the 32nd byte, the records consisting of 8 bytes each. The data are expressed in BIG ENDIANNESS .

Reserved		Battery	PERTS	Seconds	DateTime		
0x21 Byte 1	0xAB Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

**Battery** is the voltage of the battery. The number should be considered as an unsigned 8 bit integer. To get the correct value of the battery voltage the following formula is used: Volt = **Voltage\*(0.132)**  
If, for example, 8 bit figure named **Battery** is 0x1A (decimal 26) then the battery voltage will be 3.4 V

### PERTS

- Bit D2 When High it flags that the USB connection was ON during sampling.
- Bit D1 When High it flags that the external Charger was connected by cable during sampling.

**Seconds** represent the time in seconds (modulo 60) at which the log has been saved. The number should be considered as an unsigned 8 bit integer.

**DateTime** should be considered as a big-endian unsigned 16 bit integer and indicates how many minutes have been elapsed since the beginning of the current month (previous MONTHS data).  
If, for example, **DateTime** is 0x95AE (decimal 38318) then the record will be related to the 27<sup>th</sup> of the month at 14:38.

Indeed :

$$\text{Day} = 1 + \text{Int}(\text{DateTime} / 1440) = 1 + \text{Int}(38318 / 1440) = 27$$

$$\text{Hour} = \text{Int}((\text{DateTime} \text{ Mod } (1440)) / 60) = \text{Int}((38318 \text{ Mod } (1440)) / 60) = 14$$

$$\text{Minute} = (\text{DateTime} \text{ Mod } (1440)) \text{ Mod } 60 = (38318 \text{ Mod } (1440)) \text{ Mod } 60 = 38$$

### End of Log file

The Log file ends with the checksum byte made up of the modulo 256 sum of the hexadecimal values of all the bytes.

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## 10 - Accessories

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### 10.1 Introduction

This section provides information required for installing and using accessories of the LR-01 programmable Logger Repeater. 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.

### 10.2 Preliminary inspection

Inspect the packaging for any damage.

#### NOTICE

**If the packaging or anti-shock material have been damaged, check that the contents are complete and that the product 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.**

### 10.3 Work environment

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

- Temperature From -20°C to +55° C (0°C to 40°C for Battery Charger)
- Humidity From 5 to 95% relative

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

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

- Temperature From -30°C to + 75°C (-20°C to 60°C for Battery Charger)
- Humidity < 95% relative

### 10.4 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 product 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.

### 10.5 Cleaning

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

#### NOTICE

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

10.6

***USB-OC Optical USB Converter***

**10.6.1 Introduction**



USB-OC is an standard accessory of the LR-01 programmable Optical Repeater.

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 items up to the USB port of any Personal Computer to operate them in conjunction with specific application software and for firmware updating.

Either USB-OC or USB cable is indispensable for updating the internal firmware via a Personal Computer and update software is available on NARDA's Web site at: <http://www.narda-sts.it>

**10.6.2 Installation**

Insert USB-OC in the connector of a free USB port of the PC, connect the fiber optic coming from the repeater or other accessories paying attention to the locating key.

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 10-1 Technical specifications of the USB-OC Optical USB Converter**

<b>Max. length of the fiber optic</b>	40 m (standard 10 m; 2 to 40 m optional)
<b>USB Connector</b>	Type A Male



**NOTE**

The link between USB-OC and a HUB USB device or USB cable extension could not work properly. It is advisable to connect the USB-OC directly to the PC.



**Front view**

**Key:**

Fiber optic RP-02 connector



**Rear view**

**Key:**

USB Type A Male

**Fig. 10-1** USB-OC adapters

**Power supply**

USB-OC is powered directly from the USB port of the PC.

## 10.7

### ***LR01-8059 Adapter***

#### 10.7.1 Introduction



LR01-8059 Adapter is an optional accessory of the LR-01 Programmable Optical Repeater.

It provides the connection for the 8059 family of field probes. They are the probes developed for the AMB-8059 remote station which specifications and performances are described in chapter 1 of this manual.



**Fig. 10-2** LR-01 with its 8059 adapter

#### 10.7.2 Installation

Insert the LR01-8059 Adapter in the connector of the LR-01 Logger Repeater, paying attention to the position key and tightening the bayonet joint.

The adapter is self powered directly by the LR-01 and it shows a very low consumption. This means no maintenance is needed.

Then connect the desired field probe.



**Fig. 10-3** LR-01 with 8059 adapter e probe

**Table 10-2 Technical specifications of the LR01-8059 Adapter**

<b>Length</b>	64 mm
<b>Weight</b>	59 g
<b>Probe connector</b>	8 pin round with key



**Probe connector**

**Key:**

Connector for all AMB-8059 Probes models



**LR-01 connector**

**Key:**

Connector to LR-01 input

**Fig. 10-4** LR01-8059 Adapter connectors

## 10.8

### ***LR01-8053 Adapter***

#### **10.8.1 Introduction**

LR01-8053 Adapter is an optional accessory of the LR-01 Optical Programmable Repeater.

It provides the connection for the 8053 family of field probes. They are the probes developed for the Narda 8053 portable field meter, which specifications and performances are described in chapter 1 of this manual.



**Fig. 10-5** LR01 with its 8053 adapter

#### **10.8.2 Installation**

Insert the LR01-8053 Adapter in the connector of the LR-01 Logger Repeater, paying attention to the position key and tightening the bayonet joint.

The adapter is self powered directly by the LR-01 and it shows a very low consumption. This means no maintenance is needed.

Then connect the desired field probe.



**Fig. 10-6** LR-01 with 8053 adapter e probe

**Table 10-3 Technical specifications of the LR-01-8053 Adapter**

<b>Length</b>	74 mm
<b>Weight</b>	80 g
<b>Probe connector</b>	12 pin round with key



**Probe side panel**

Connector for all 8053 Probes models



**LR-01 side panel**

Connector to LR-01 input

**Fig. 10-7** LR-01-8053 Adapter connectors

## 10.9

### **TR-02A Tripod**

#### 10.9.1 Introduction



TR-02A is an Optional Accessory of the LR-01 Programmable Optical Repeater. It allows LR-01 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 8053-SN swivel supplied with the tripod.

**The design and materials of the TR-02A tripod have been specially selected to prevent it from disturbing the sensors and, therefore, the measurements taken.**

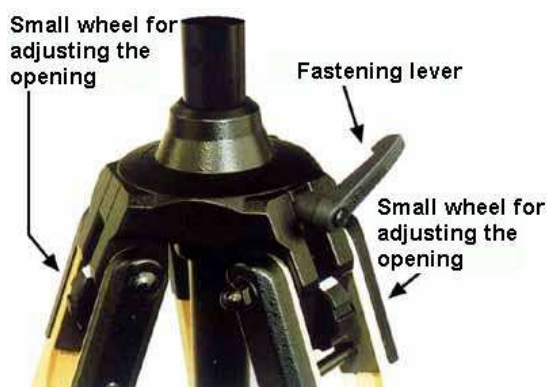
The height of the tripod can be adjusted by means of its extendable legs and it is furnished with special feet that are able to adapt to all surfaces thereby improving stability. The height of its central support can also be adjusted.

It is supplied with a small protective carrybag to make it easy to carry.

**Table 10-4 Technical specifications of the TR-02A Tripod**

• <b>Legs</b>	3 legs x 3 extendable sections
• <b>Transport size:</b>	76 x 12 x 12 cm
• <b>Minimum height:</b>	60 cm
• <b>Maximum height:</b>	180 cm
• <b>Weight</b>	2.8 kg
• <b>Load capacity:</b>	10 kg
• <b>Tripod support</b>	Threaded insert 1/4 "

Details of the mounting head of the central column of the support and its adjustments:



**Fig. 10-8 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 **Tripod Joint**:

- full height: 8 cm
- weight: 160 g
- load capacity: 10 kg
- Threaded insert 1/4 "

The adjustable swivel makes mounting and fastening the instrument easy as well as changing the angle in any directions via the locking knob.



**Fig. 10-9** LR-01 with 8053 adapter and probe on the TR-02A



10.10

***TT-01 Fiber Glass Telescopic Support***

**10.10.1 Introduction**

TT-01 is an Optional Accessory of the LR-01 Programmable Logger Repeater. It allows LR-01 Repeater to be easily supported during field measurements.

This device, on the top part of its container, has a screw to fix the relative apparatus.

**The design and materials of the TT-01 have been specially selected to prevent it from disturbing the sensors and, therefore, the measurements taken.**

Table 10-5 Technical specifications of the TT-01 Fiber Glass Telescopic Support	
• <b>Diameter</b>	32 mm
• <b>Minimum height:</b>	120 cm
• <b>Maximum height:</b>	420 cm
• <b>Weight</b>	500 g

TT-01 Fiber Glass Telescopic Support with soft carrying case.  
The height of the TT-01 can be adjusted extending the telescopic elements as desired.



**Fig. 10-10** TT-01 Fiber Glass Telescopic Support

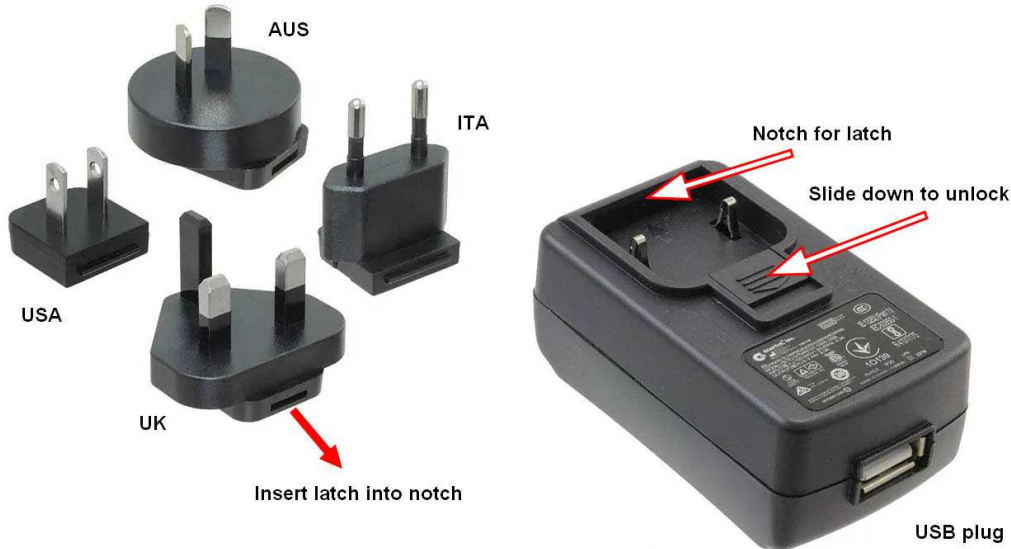
## ***AC/DC USB Power Supply and battery charger***

Wall plug regulated switchmode AC/DC power supply is a standard accessory of the LR-01 Programmable Logger Repeater.

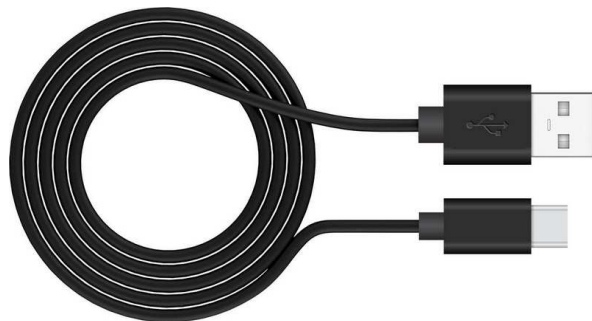
It is provided with the USB(A)/USB(C) cable to supply the LR-01 Logger Repeater and for charging the internal battery.

This is a Class II / Double insulated device for indoor use only.

Please, adopt the terminal suitable for your Country, following the brief instructions in the picture.



**Fig. 10-11** AC/DC Power Supply / battery charger



**Fig. 10-12** USB Cable – USB(A)/USB(C)

**Table 10-6 Technical specifications of the AC/DC Power Supply**

<b>Rated Input</b>	100 – 240 Vac; 50 – 60 Hz; 0,3 A
<b>Volt output:</b>	5.0 Vdc
<b>Max current:</b>	2.0 A
<b>Power:</b>	10 W
<b>Output connector</b>	USB-A Female; pin1=+V, pin2=NC; pin3=NC; pin4=GND

**Table 10-7 Technical specifications of the USB Cable – USB(A)/USB(C)**

<b>Input connector</b>	USB-A male
<b>Output connector</b>	USB-C male
<b>Max current:</b>	2.0 A
<b>Power:</b>	10 W
<b>Length</b>	2 m

10.12

## ***Shoulder sling***

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Equipment Strap - adjustable and Comfortable shoulder sling, neck belt is an Optional Accessory of the LR-01 Programmable Logger Repeater. It is provided to carry the Logger Repeater in a comfortable way.

The strap is equipped with a standard 1/4 " threaded bolt that screws into the bottom of the meter.

It can be configured and used as a neck belt or simply as a shoulder sling or wrist lanyard.



**Fig. 10-13** Shoulder sling

**Table 10-8 Technical specifications of the Shoulder Sling**

<b>Threaded bolt</b>	1/4 " standard
<b>Color:</b>	black
<b>Max Length</b>	2 m
<b>Load capacity</b>	> 2 kg



Detail of the standard 1/4 " threaded bolt

## ***LR01-IAM Indoor Area Monitor kit***

### **10.13.1 Introduction**

LR-01 Logger Repeater can be easily configured as an Area Monitor using special kit (LR01/IAM).

It is a compact, flexible, modern solution to to equip a room with a continuous monitoring system, allowing the adoption of EHP-2B-05, EHP-2B-06, EHP-2B-07 and EHP-2B-08 probe.

It can be installed wall mounted (upside down if roof mounted) and can become also outdoor suitable. The protective case made of material that is transparent to electromagnetic fields and designed to house the meter and the probe; the cylindrical-shaped diffuser ensures uniform distribution light when the visual red Led is on.



**Fig. 10-14** LR01-IAM Indoor Area Monitor kit - Wall mounted

<b>Table 10-9 Technical specifications of the LR01-IAM Indoor Area Monitor kit</b>	
<b>Interfaces</b>	Optical (RP-02), USB-C, WiFi (802.11 b/g/n), Bluetooth (5.0), Ethernet 10/100 BaseT (PoE), User's Port
<b>Optical fiber connection</b>	Serial Optical Interface 115200 Baud RP02 connector up to 40 m (USB-OC)
<b>External power supply</b>	5 VDC, I <sub>max</sub> 2A
<b>Operating temperature</b>	-20 to +55 °C
<b>Storage temperature</b>	-30 to +75°C
<b>Operating relative humidity</b>	5 to 95 %
<b>Ingress protection</b>	Up to IP65
<b>Dimensions</b>	Ø 86mm, Heigh 306mm, Wall distance 108mm
<b>Weight</b>	350g only the IAM kit. 800g total weight inclusive of LR-01 and compact probe.

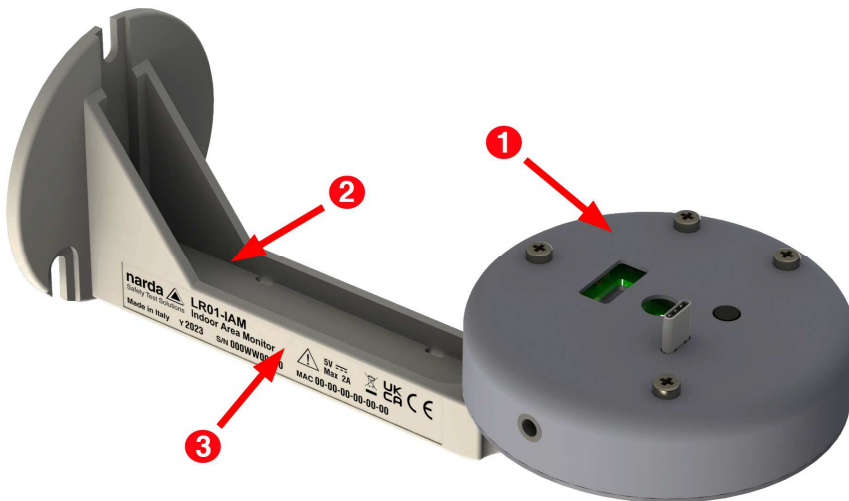
### 10.13.2 Description

The round shaped base encloses an interface circuit that makes the repeated USB port available, leaving room enough to connect an optic fiber and press the button.

It adds also a RJ45 Ethernet (with provision for PoE) and a programmable User's Port, as well as a buzzer to increase the range of the sound signal. The LR01/IAM has a MAC address assigned by the manufacturer and it is located externally on one side of the Wall bracket

It is designed to maintain compact dimensions, so that it is possible to install it almost everywhere and to monitor many situations, therefore a compromise compared to the classic monitoring units that follow the rigid rules illustrated in many known publications.

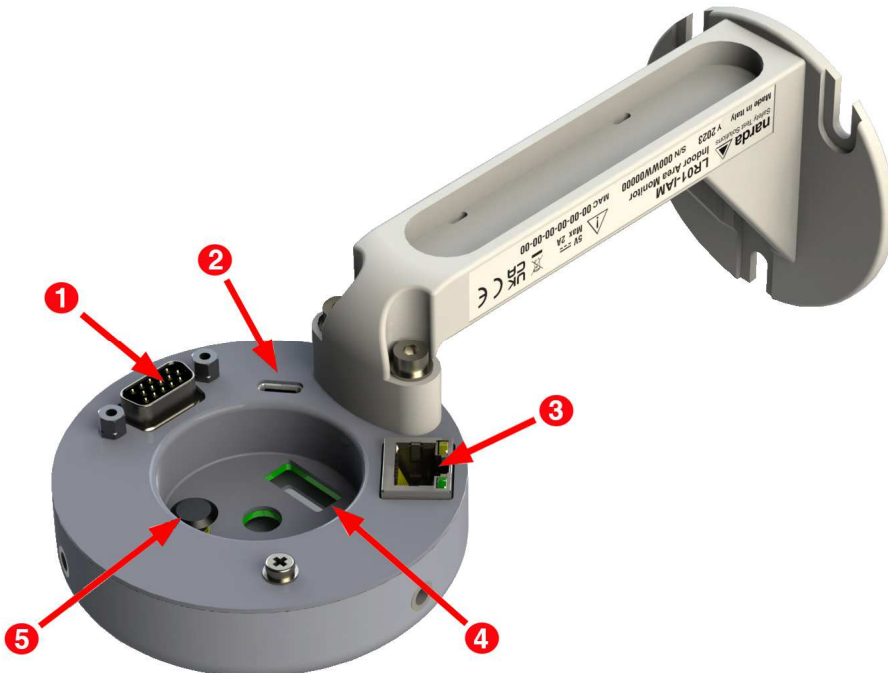
Power Over Ethernet, control PC software and smartphones/tablets application are also optionally available, as well as drivers for EMC specific softwares.



**Legend:**

- 1. Interface
- 2. Wall bracket
- 3. Identification label with Serial numer, MAC address and safety note

**Fig. 10-15** LR01-IAM Wall support bracket and Interface (top view)



**Legend:**

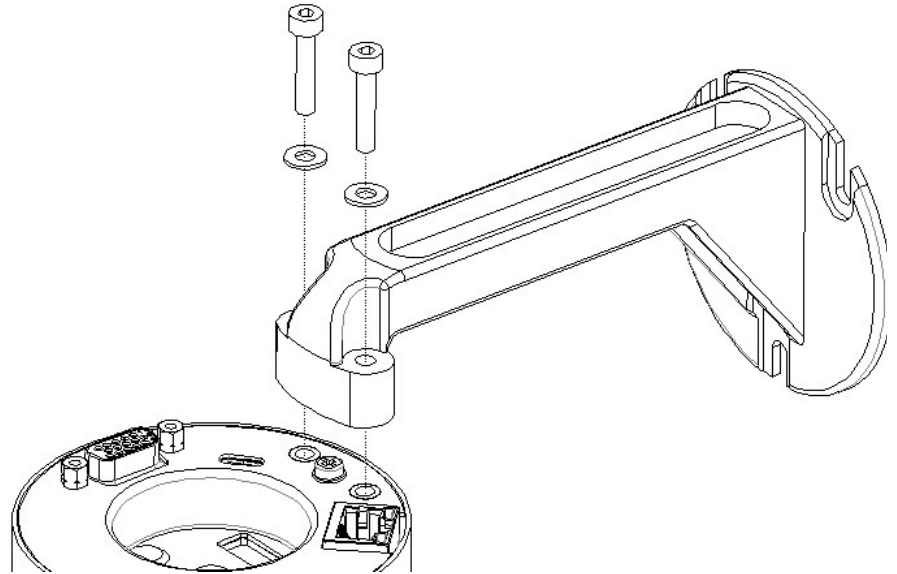
- 1. User Port (see 9.13.4)
- 2. USB-C connector
- 3. Ethernet 10/100 BaseT RJ45 connector (PoE ready)
- 4. Fiber Optic window
- 5. ON/OFF button

**Fig. 10-16** LR01-IAM Interface Connectors detail (bottom view)

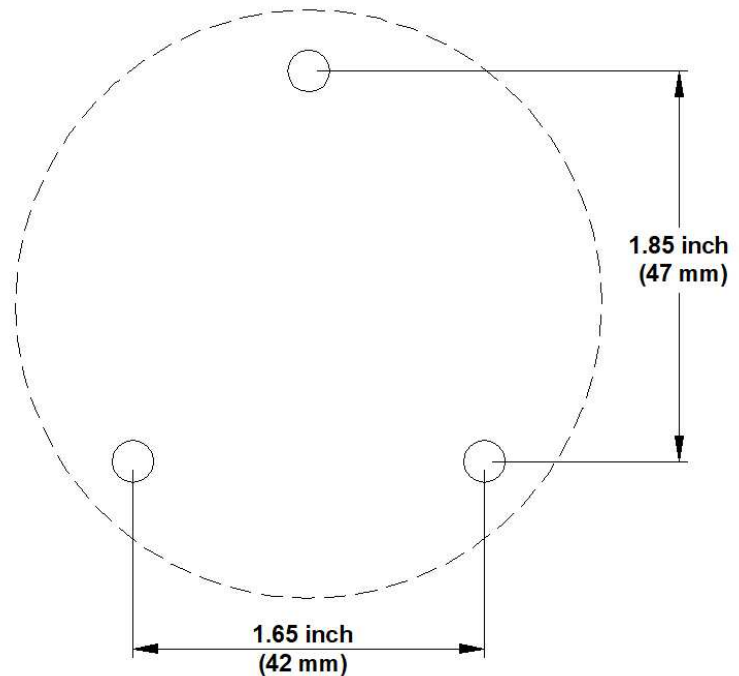
### 10.13.3 Installation

The LR01-IAM optional accessory is an easy to install kit to transform the LR01 Logger Repeater in a field monitoring station; follow the instructions below:

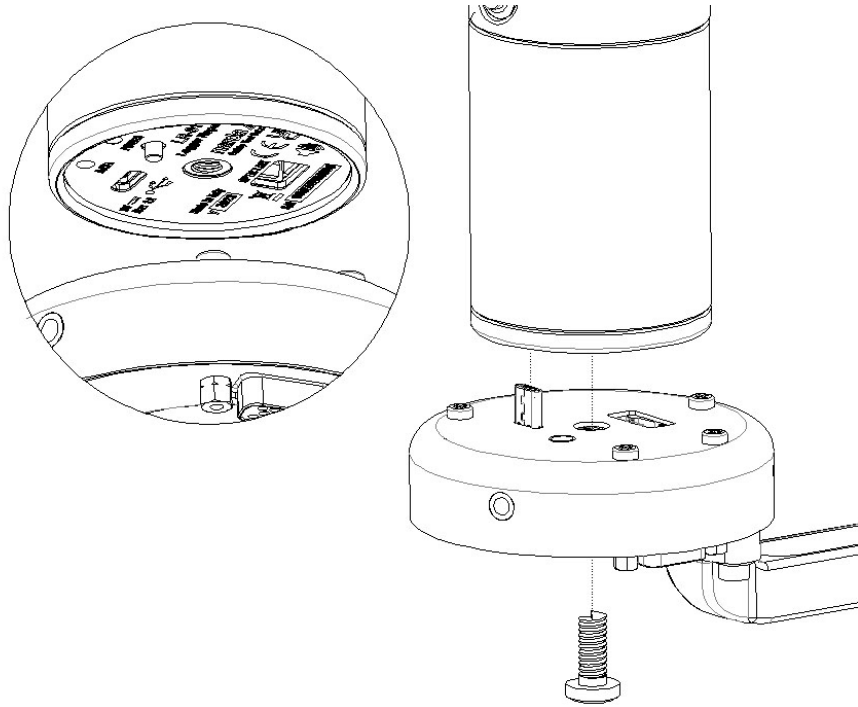
- Assembly the Wall support bracket to the LR01-IAM Interface with 2 pcs. socket head cup screws M4x20mm and washer using Allen key 3mm



- Fix the complete LR01-IAM on the site to be monitored. For a correct installation refers to the distance between holes shown on the picture below (mounting kit not included).



- Turn off the LR-01 and plug it into the USB-C connector located on the top of the LR01-IAM interface. Fix the meter to the base plate with the provided screws 1/4"x5/8



- Connect the EHP-2B-05 or EHP-2B-06 or EHP-2B-07 or EHP-2B-08 probe to the LR01 upper round multipole connector.

## NOTICE

**The LR01 in Indoor Area Monitor configuration works with EHP-2B-05 or EHP-2B-06 or EHP-2B-07 or EHP-2B-08 probe only.**

- Be sure that the LR01 is well connected and the probe connector is well locking.

- Configure the LR01 Logger Repeater through USB-C or Fiber Optic or Ethernet port located on the LR01-IAM bottom with Narda Probes Manager (see chapter 4) or custom software (see Chapter 9 for protocol). A programmable User's Port is available for external devices or trigger measurements under specific conditions (see 10.13.4).

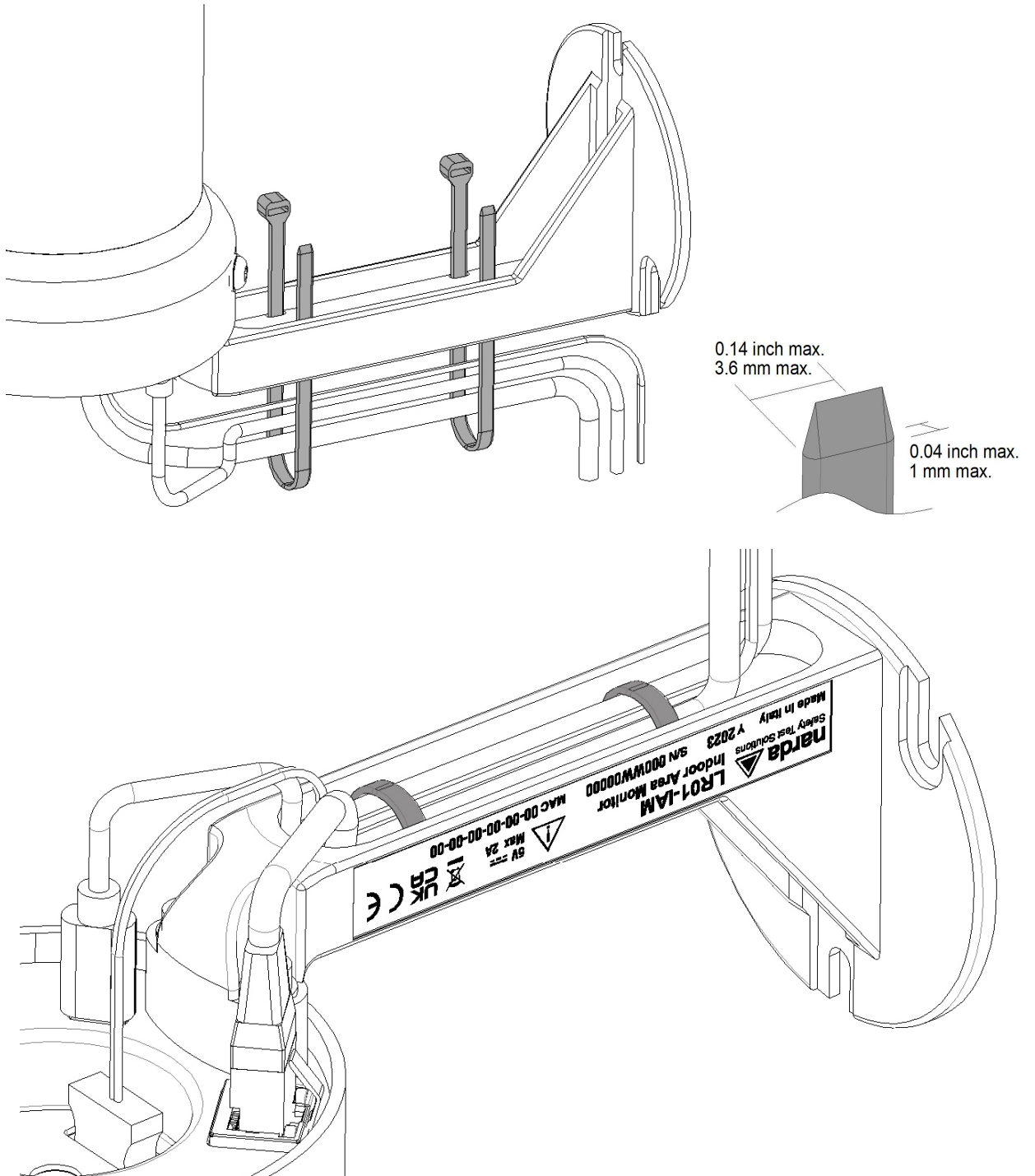
## NOTICE

**The DB15 and Ethernet cables are optional accessory. Please contact your local Narda distributor for details.**

- Install the protective cover to the LR01-IAM baseplate and tight the 3 pcs. button head screws M4x10mm and plastic washer using Allen key 2.5mm



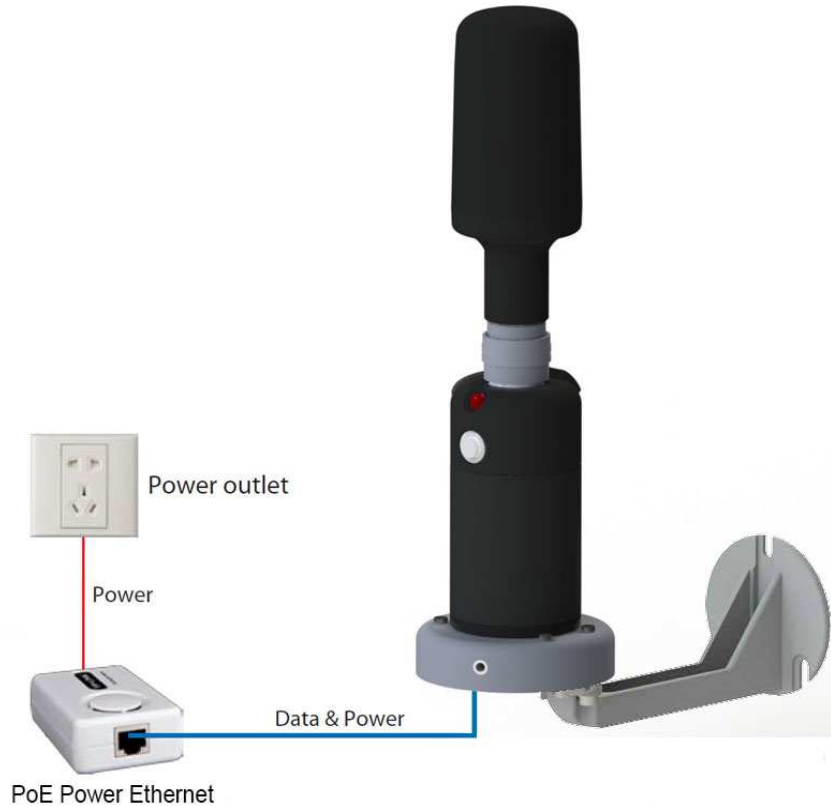
- The four oval shaped holes allow the user to fasten the cables to the wall bracket using 2 pcs plastic straps (not provided).



- Switch the unit on by pushing the button for a short while or directly from the software PC (see chapter 4).
- Start logging and download data.

**10.13.3.1 Use with Power Over Ethernet (optional)**

The optional Power Over Ethernet, such as TL-POE150S or equivalent products is available. It delivers power, data and network connection over the same cable to the LR01-IAM Indoor Area Monitor through the Ethernet port available on the bottom of the baseplate (Ethernet cable optional).

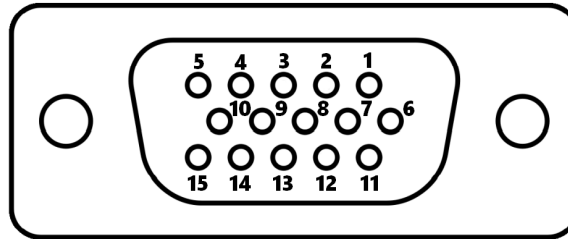


**Fig. 10-17** LR01-IAM with Power Over Ethernet

#### 10.13.4 LR01-IAM Ports

The LR01-IAM option is equipped with:

- USB-C connector for supply and communication;
- RJ45 connector for Ethernet LAN with PoE if necessary;
- RP02 Optic fiber
- DB-15 (HD-15) connector for the Programmable User's Port.



**Fig. 10-18** Programmable User's Port HD-15 female connector pinout

<b>1</b> OUT2 – Emitter	<b>6</b> +5 Volt power in/out	<b>11</b> GND
<b>2</b> OUT1 - Emitter	<b>7</b> OUT2 - Collector	<b>12</b> OUT4 N.O.
<b>3</b> IN1 - Kathode	<b>8</b> OUT1 - Collector	<b>13</b> OUT4 Com.
<b>4</b> IN2 - Anode	<b>9</b> IN2 - Kathode	<b>14</b> OUT4 N.C.
<b>5</b> IN1 - Anode	<b>10</b> OUT3 N.O.	<b>15</b> OUT3 Com.

There are two optocoupled inputs (IN1 and IN2), two optocoupled outputs (OUT1 and OUT2) and two relays output (OUT3 and OUT4).

Then there is a +5 V, 150 mA max protected input/output supply, and a ground pin.

#### 10.13.5 User's Port application examples

Input and output signals of the User's Port are optocoupled or relays protected and can be used to control external devices or to trigger measurements under specific conditions.

Port OUT3 shows a Normally Open contact of a relays, while port OUT4 has both the Normally Open and the Normally Closed contact of the same relays.

Port IN1 is wired to the LED of an optocoupler.

Port OUT1 and OUT2 are connected to the Collector and Emitter of the BJT from the optocoupler; simply connecting the Emitter to GND makes each of them common open collector outputs.

Typical examples are when interfacing: position sensors, movement sensors, interlock etc.

Another example could be the activation of an external powerful alarm siren.

10.14

***WearOS (Smartwatch)***

**10.14.1 Introduction**

The optional WearOS (Smartwatch) is a portable and compact device worn on the wrist and works with LR01 by Bluetooth connection allowing keeping your hands free and staying at a safe distance from the potentially dangerous field.

Thanks to a dedicated Application (LR01 Manager) installed on the WearOS the user can easily display EMF measurements, browse the technical data (battery level, altitude, etc) and change settings by simply tapping the screen.



**All additional information and explanations can be found on chapter 8**



**Fig. 10-19** WearOS (Smartwatch)

## **11 – Service**

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### **11.1 Miscellaneous messages**

There are some messages that are generated automatically in specific circumstances.

When the GPS module does not respond, the unit sends the string:

**GPS Not Available**

When the battery voltage is low, the unit sends the string:

**WRN: Low Battery**

When the battery voltage is deeply low, the unit sends the string:

**\*\*\*VOID BATTERY\*\*\*  
switching off**

Then, the unit is turned off.

When the unit does not receive any command for 30 minutes, and the Logger is not enabled, it sends the string:

**\*\*\*No ACTIVITY\*\*\*  
switching off**

Then, the unit is turned off.

## 11.2 Initial diagnostic

Just after turning on the unit, it sends automatically the initial diagnostic results during the boot sequence.  
The ASCII text is self-explained.

The following is an example where an Electric and Magnetic probe is connected to the LR-01.

```
#OR$OPTFRK*
```

```
LR01: FW A1.9 06/22, L A1.8 06/22, W A1.0  
Sensing Flash memories  
1 found  
1 Flash Memory sensed
```

```
SNS=27.7;42.9;1004.0 [Cel.Deg., %, hPa]  
Battery:4.20V  
RTC: + 17.6 ppm Cal Date:11.02.22-19.01.22  
USB:Disconnected  
Compass found (code 0xC7): Heading: 178 (S); G:5; 100; 100  
Check Probe...
```

```
Loading active probe
```

```
PRB=EHP-2B-  
01:08.06.22;%;100.00:1000.00:0.10:0.49:9250.00:1000.00:0.50  
:20.00:1000.00:MHz:S
```

Here is another example of the initial diagnostic text, with a single band passive probe connected to the LR-01.

```
#OR$OPTFRK*
```

```
LR01: FW A1.7 05/22, L A1.6 05/22, W A1.0
Sensing Flash memories
  1 found
1 Flash Memory sensed

SNS=26.8;49.8;703.2 [Cel.Deg., %, hPa]
Battery:3.86V
RTC: + 28.6 ppm Cal Date:31.12.31-23.15.39
USB:Disconnected
*** WRN: Compass not responding ***
Heading: 90 (E); G:0; 0; 0
Check Probe...
```

```
Loading passive probe
```

```
PRB=EP645:17.09.10;
V/m:100.00:300.00:0.25:0.09:3000.00:MHz:S
```

```
Calibrating...
Z Y X, G= 0
Z Y X, G= 1
Z Y X, G= 2
Z Y X, G= 3
Z Y X, G= 4
Z Y X, G= 5
Z Y X, G= 6
Z Y X, G= 7
Calibration OK
```

```
Checking Probe Diode...
Z 1.38:Ok
Y 1.62:Ok
X 1.40:Ok
```

```
F:10.0 Hz
Zero= 3BD93B:3B98DA:3BDE3B Scale=2DB32D 0
Zero= 3B9FBE:3BC43B:3B9FC0 Scale=2DDE64 1
Zero= 3BA13B:3B9FA7:3BA93B Scale=2D2D2D 2
Zero= 3B9F8C:3B933B:3B9F8F Scale=2DDE66 3
Zero= 3B4D3B:3BA455:3B453B Scale=2DFC2D 4
Zero= 3BADB5:3BC03B:3BADA2 Scale=2E08AF 5
Zero= 3B193B:3BC00A:3B453B Scale=2EF12E 6
Zero= 3BE33D:3B293B:3BE36B Scale=2F9C97 7
Decimal:
Zero= -1.34:Zero= -1.33:Zero= -1.34: Scale=-1.61 0
Zero= -1.33:Zero= -1.34:Zero= -1.33: Scale=-1.60 1
Zero= -1.34:Zero= -1.33:Zero= -1.34: Scale=-1.61 2
Zero= -1.33:Zero= -1.34:Zero= -1.33: Scale=-1.60 3
Zero= -1.34:Zero= -1.33:Zero= -1.34: Scale=-1.61 4
Zero= -1.33:Zero= -1.34:Zero= -1.33: Scale=-1.60 5
Zero= -1.34:Zero= -1.33:Zero= -1.34: Scale=-1.59 6
Zero= -1.33:Zero= -1.34:Zero= -1.33: Scale=-1.57 7
```

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