3M™ Ground Pro
Ground Integrity Meter

Model CTM051

User's Guide

3M

3M™ Ground Pro Ground Integrity Meter Model CTM051

Safety Information

Read, understand, and follow all safety information contained in these user instructions prior to use of the **3M Ground Pro Ground Integrity Meter Model CTM051**. Retain these user instructions for future reference.

EXPLANATION OF SIGNAL WORD CONSEQUENCES	
⚠ **WARNING:**	Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury and/or property damage.
⚠ **CAUTION:**	Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury and/or property damage.
NOTICE:	Indicates a potentially hazardous situation, which, if not avoided, may result in property damage.

⚠ WARNING

To reduce the risks associated with environmental contamination:

- When working with the automated equipment, always observe safety precautions as recommended by equipment manufacturer and your company's practices

⚠ CAUTION

To reduce the risks associated with environmental contamination:

- Dispose of the monitor in accordance with local, state, and federal regulations

NOTICE

To reduce the risks associated with property damage:

- Periodically check that the indicator is functioning properly

FCC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Industry Canada

This Class A digital apparatus complies with Canadian ICES-003.

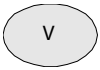
The 3M™ Ground Pro Ground Integrity Meter is a comprehensive instrument that measures the ground connection of your equipment in accordance with ANSI 6.1 and ANSI/ESDA S.20.20 standards. In addition to measuring ground impedance, it also measures AC and DC voltage on the ground as well as the presence of high-frequency noise or electromagnetic interference (EMI) on the ground, alerting you to possible functionality problems, such as tool lockups, erratic behavior and parametric errors.

Controls and Indicators

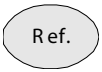
Turns the power on and off. Hold for a few seconds to turn the unit off. Also resets some parameters.

Switches the unit into impedance measurement mode.

Switches the unit into high-frequency noise (EMI) measurement mode.

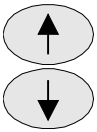


Switches the unit into AC and DC voltage measurement mode.



Sets up the reference for measurements and alarms.

Freezes the display/and shows the maximum measured value.



Adjusts the scale for some parameters and adjusts reference values.

Display backlight on/off

Brief Tour of your 3M™ Ground Pro Ground Integrity Meter

Please refer to the rest of this User's Guide for detailed explanations of each control, indicator and connection.

Overview

The 3M™ Ground Pro™ Ground Integrity Meter measures several important parameters of ground integrity: ground impedance, voltage, and high-frequency noise (EMI) on a ground.

Ground connectivity is measured in accordance with ANSI 6.1, ANSI/ESDA S.20.20 and other standards. More specifically, it is measured as AC impedance in a way that is immune to parasitic voltages and currents on a ground.

In addition to monitoring the ground connection, the Ground Pro measures high-frequency voltage (EMI) on the ground that is often present in a factory environment. Such interference causes problems with the operation of equipment.

The Ground Pro also measures AC and DC voltage on the ground in case of miswiring.

General

Power

Ground Pro uses a 9V alkaline battery. Do not use any other battery. If you are not using your Ground Pro for an extended period of time, remove the battery from the unit in order to prevent damage caused by a possible battery leakage.

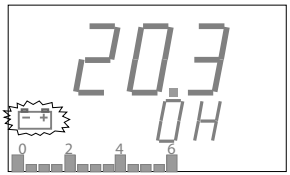
Note: Not all batteries labeled similarly have the same performance. Often an off-brand alkaline battery has only 50% to 60% of the capacity of the leading brand-name battery.

Installing the Battery

Slide off the battery door at the back of the Ground Pro and attach the 9V battery to the battery clips. Observe the polarity of the battery. Re-install the battery door.

Low-Battery Indicator

When battery voltage gets low (less than 20% capacity remains), the low battery indicator on the display appears. At this point it is a good idea to install a new battery to assure optimal performance.



Low-Battery Indication

Turning Unit On and Off

ON

Press the **Power/C** button. The battery voltage will be displayed for a moment in both volts and percentage of the full capacity. If the battery voltage is too low even to indicate low-voltage status on the display or if the self-diagnostic fails, you will hear a beep and the unit will shut itself off. If the battery is completely "dead," there may not even be a beep. Please replace the battery.

OFF

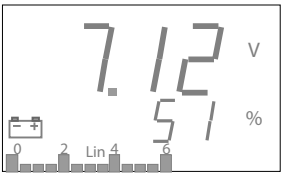
Press the **Power/C** button for at least two seconds. The 3M™ Ground Pro Ground Integrity Meter will turn off.

Automatic Power Off

In order to save battery life, the Ground Pro has an automatic power-off (APO) feature that will turn off the Ground Pro off after approximately 10 minutes if no buttons are pressed. You can disable or enable APO by depressing the F button several times until you get to the screen shown to the right. You can then enable or disable APO using the Up and Down arrow buttons. Please keep in mind that with APO disabled, the battery life will be shorter.

Checking the Battery Voltage

Press the F button several times until you get to the following screen. The upper display shows the battery voltage, and the lower display shows the percentage of usable battery life left.



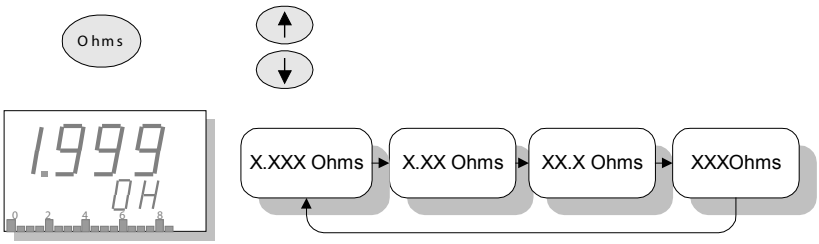
Impedance Measurements

Depress the Ohms button to go into ground impedance mode. You should see a screen similar to the one shown on the right. The impedance mode is indicated by "OH" on the bottom display line.

Impedance Screen

Scaling

The 3M™ Ground Pro Ground Integrity Meter has four different scales for measuring ground impedance. Choose the appropriate scale for your measurements using the Up and Down arrow buttons.



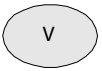
Auto-Zeroing Test Leads

Test leads offer added impedance and may alter measurement results, especially at a lower scale. In order to take impedance of test leads into account, short the ends of the test leads together and depress the Function button (F) until you see the screen shown on the right. In a few seconds, this screen will disappear and you will hear a short beep. The Ground Pro will return to normal measurement mode. Now when the test leads are shorted together, the display should show zero Ohms, even though the test leads may have some impedance. The correction factor will be saved in non-volatile memory.

If the test leads are not shorted properly or become accidentally disconnected during this process, auto-zero will fail and you should hear a long beep before the display returns to the impedance measurement screen. In this case you will need to repeat this process again.

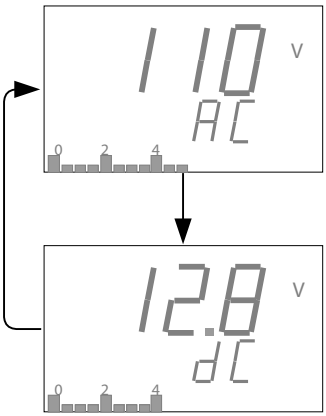
Voltage Measurements

The presence of voltage on a ground is never desirable. The 3M™ Ground Pro Ground Integrity Meter can measure both AC and DC voltages on a ground.



AC Voltage

Press the V button once. The Ground Pro will switch to AC voltage measurement mode and you should see a screen similar to one on the right. You can adjust the measurement scale using the Up and Down arrow buttons.

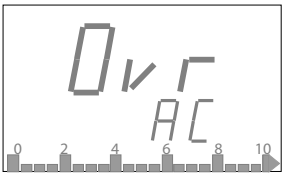


DC Voltage

Press the V button again to switch to DC voltage measurement mode. You should see a screen similar to the one on the right. As in AC mode, you can adjust the measurement scale using the Up and Down arrow buttons.

Overload

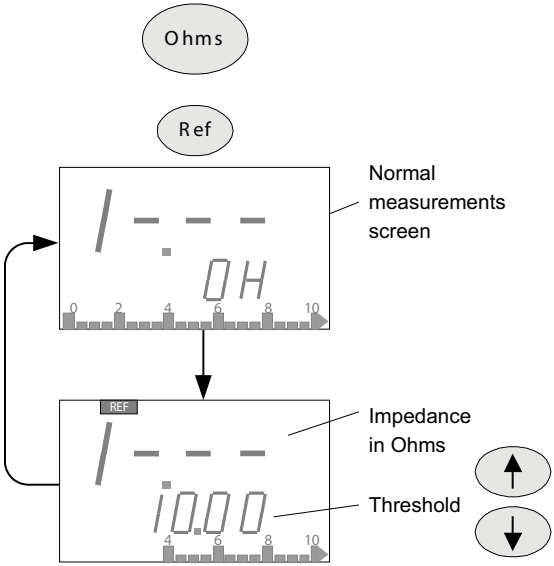
If voltage on the ground is above the maximum level on a particular scale, you should see an overload indicator such as the one on the right. In such a case, go to the next scale using the Up arrow button.



Using Reference with Voltage Measurements

Using Reference with Impedance Measurements

The Reference function helps to set limits at which an audio alarm sounds to indicate that the measured impedance is below the specified limit. Unlike a regular multimeter, the 3M™ Ground Pro Ground Integrity Meter allows you to specify an exact impedance value at which the instrument will provide an audio indication.

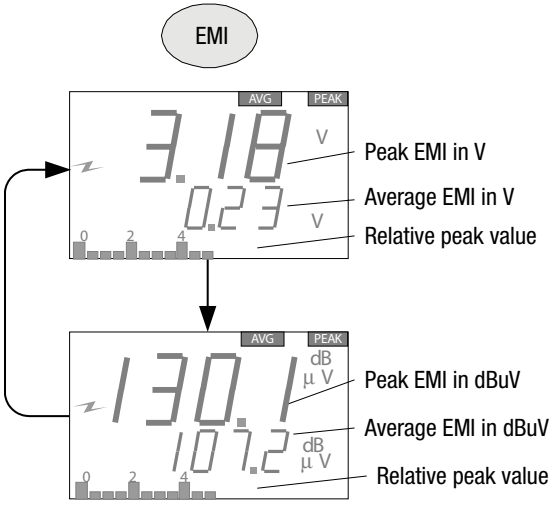


In Impedance mode, depress the Ref. button. You should see a screen similar to the one on the right with the REF indicator on. The top line of the display shows the current impedance value (in this example it is an open circuit) and the bottom line shows the reference level. Adjust the reference level by using the Up and Down arrow buttons. Now when the impedance is below the reference value, you should hear a beep. The reference value is set for a particular range - you may need to readjust it for a different range. The reference value will be saved in the internal non-volatile memory.

EMI Measurements

High frequency noise (EMI) on a ground causes equipment malfunction and damage to sensitive components. The 3M™ Ground Pro Ground Integrity Meter measures high-frequency noise on a ground in a wide frequency and dynamic range.

High-frequency noise is measured in two different units — volts and dBuV. The latter is a logarithmic measure of voltage where 0dB is referenced to 1uV.



In order to measure EMI on a ground, press the EMI button. The screen will show the average value of the high-frequency signal in Volts on the top display line and the magnitude of the envelope peak of the signal (i.e. transients or spikes) on the bottom line. By pressing the EMI button one more time you can switch to dBuV units, as shown above.

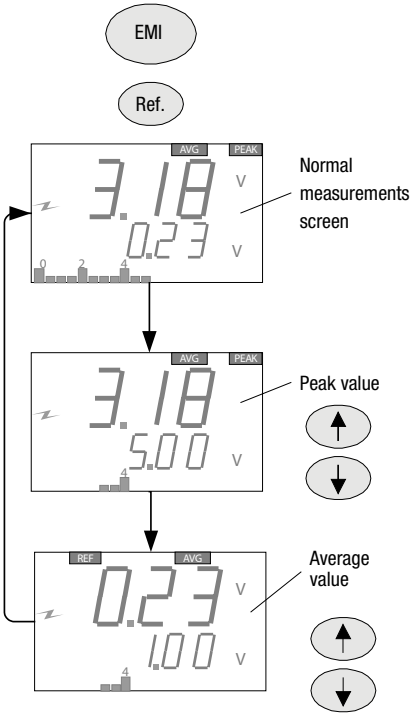
Autoscale

The Ground Pro uses autoscaling in EMI mode — no scale switching is necessary.

Using Reference with EMI

Reference mode is helpful if you wish to hear an audio alarm whenever the EMI signal exceeds a certain level. In order to use this mode, depress the REF button while in any of the EMI screens. You should see the REF indicator at the top of the display. The bottom line of the display will now show the reference value of the average signal instead of the peak value of the signal. Adjust the reference level using the Up and Down arrow buttons. Now whenever the average value of the EMI signal exceeds this reference level, an audio alarm will sound.

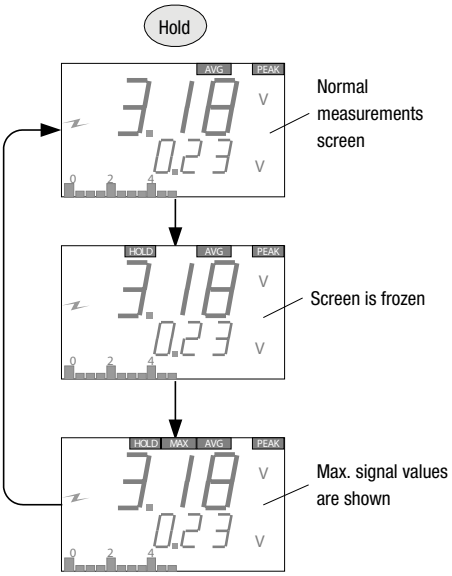
By depressing the REF button again, you can adjust the reference level for the peak signal as shown on the right.



Hold Function

Pressing the Hold button once while in any measurement mode will cause the 3M™ Ground Pro Ground Integrity Meter to enter the Hold mode. The display will freeze, showing the value at the moment the button was pressed. Pressing the Hold button a second time the display will show the maximum value of the signal accumulated from the moment of pressing the button.

Please note that if you power down the Ground Pro while in any of these modes, it will collect the maximum value of the measured parameter for as long as this mode



is active. Please note that if you power down the 3M™ Ground Pro Ground Integrity Meter while in any of these modes, it will remain in the same mode when the unit is powered up again.

Pressing the Hold button one more time puts the Ground Pro back into regular mode.

Specifications

Impedance	
Range	0.001 – 1.999 Ohms Automatic auto-zero for test leads
EMI (noise on ground)	
Bandwidth	9kHz – 450MHz
Measurement Range	80 dBuV – 140 dBuV 10 mV – 10 RMS
Measurement Type	Average Envelope Peak
Voltage on Ground	
AC (50 – 500 Hz)	0.001 – 270 V RMS
DC	0.001 – 400 V
Reference	
Individual reference setting for each parameter	
Hold	
Hold, Hold Max	
General	
Power	Battery 9V Alkaline
Dimensions (approx.)	4.5” x 3.6” x 1.1” 114 mm x 92 mm x 28 mm

All specifications are subject to change without notice.

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Regulatory Information

China RoHS

Electronic Industry Standard of the People's Republic of China, SJ/T11363-2006, Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products

This symbol, per Marking for the Control of Pollution Caused by Electronic Information Products, SJ/T11364-2006, means that the product or part does contain a substance, as detailed in the chart below, in excess of the following maximum concentration values in any homogeneous material: (a) 0.1% (by weight) for lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers; or (b) 0.01% (by weight) for cadmium. Unless otherwise stated by 3M in writing, this information represents 3M's best knowledge and belief based upon information provided by third party suppliers to 3M.

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产品中有毒有害物质或元素的名称及含量
Name and Content of Hazardous Substances or Elements

部件名称 (Part or Component Name)	有毒有害物质或元素 (Hazardous Substances or Elements)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
电容引脚 (Termination in capacitor)	×	○	○	○	○	○
电位器中的电阻油墨 (Resistor ink in potentiometer)	×	○	○	○	○	○
二极管焊接部 (Solder in diode)	×	○	○	○	○	○
二极管电镀 (Finish in diode)	×	○	○	○	○	○
印刷电路板焊盘/安装孔 (Terminations in PCBs)	×	○	○	○	○	○
电阻引脚 (Terminations in resistors)	×	○	○	○	○	○
电阻电镀部 (Plating in resistors)	×	○	○	○	○	○
连接器 (Connector)	×	○	○	○	○	○
三极管 (Transistor)	×	○	○	○	○	○
电感器 (Inductor)	×	○	○	○	○	○
电磁干扰滤波器 (EMI filter)	×	○	○	○	○	○
装置的焊接部 (Solder in instrument)	×	○	○	○	○	○
IC焊接部 (Solder in IC)	×	○	○	○	○	○

部件名称 (Part or Component Name)	有毒有害物质或元素 (Hazardous Substances or Elements) 铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
蜂鸣器焊接部 (Solder in buzzer)	×	○	○	○	○	○
音频插孔 (Audio jack)	×	○	○	○	○	○

"○: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。(Indicates that this hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.)

×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。(Indicates that this hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.)"

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