

**MILLIOHM
ACCESSORY HEAD
Model AMR1**

OPERATOR'S MANUAL



Description

The AMR1 milliohm accessory head measures very low resistances (ohms), from 2 ohms down to 1 milliohm. It supplies current at the test point and measures the resistance (ohms) between two points.

Applications

Measuring milliohms can enable the technician to determine if there are winding-to-winding shorts in a motor, transformer, or any other electrical equipment with coils of wire. Electrical shorts between windings can indicate that the insulation is failing. That can affect the performance of the equipment. The resistance of a winding is relatively low, usually well below 10 ohms. A winding-to-winding short allows the current to bypass one or more turns of the coil causing the overall resistance to go down. A technician can detect a winding to winding short by comparing the resistance measured with what the resistance should be as determined by earlier measurements, data from the manufacturer, or his own experience.

The AMR1 accessory head also can be used to measure the resistance of contact points in relays and other switches.

How to use

1. Disconnect power to device being tested.
2. Connect AMR1 to COM and VOLTS/OHMS jacks on the meter. Slide on "stick" meter or connect to most other meters using ADL2 test leads or AHDL1 adapter handle.
3. Set meter to mVDC.
3. Connect AMR1 to test points and select ON. The RED LED indicates that test current is flowing. If the RED LED doesn't come on, the battery may be low or the resistance between the points is much higher than two ohms. Check the clips to make sure they're connected. The meter will display milliohms.
4. For precision measurements, slide switch to OFFSET and subtract that number from the ON position.

OFFSET adjustment

1. After completing steps 1 through 3 in "How to use," connect the AMR1 to the test points and select "OFFSET" switch position. The RED led will remain off.
2. Locate hole on right side of accessory head. Insert a small flathead screwdriver and adjust the multi-turn trimming potentiometer until the display reads zero.

Specifications

Conversion ratio: 1milliom/mVDC
Range: 1 milliohm to 2 ohms
Resolution: 1 milliohm
Accuracy: +/-2% of reading +/-2milliohms
Test current: 50mADC
Battery life: 10 hours typical

How it works

The effect of the leads must be minimized to measure very low resistance . The AMR1 has kelvin clip leads which provide the test current directly at the points of measurement. Each clip has two contacts. One contact on each clip is to supply a precision constant current. The other contacts are to measure the voltage drop generated across the coil by the constant current. The AMR1 then calculates the resistance and converts it to a mVDC signal at a rate of 1mV/milliohm. The kelvin clips are gold plated for low contact resistance. An offset adjustment may be needed to subtract the effects of small voltages generated due to the interaction of the contacts with the test point. Those voltages may be different from one test point to the next and may be different at different temperatures.

Trouble shooting

If the red LED isn't on, current isn't flowing. Check the battery. Check the contact points. Check the wires where they attach to the kelvin clips. Test the resistance with a DMM to see if it's over two ohms.

If the meter displays overload on 2000mVDC range (usually OL or a 1 in leftmost position), the measurement is above 2 ohms and the AMR1 will not make the measurement.

How does it relate to a megger?

A megger measures the insulation resistance between the coil and ground by supplying a very high voltage to break down the insulation and measuring the resultant current. The resistance measured is very high. Typical measurements are 50 megohms (50 million ohms). You can't test winding-to-winding insulation with a megger because the wire would short out the supplied voltage. You can only determine if there is a short that enables current to bypass part of the coil. A milliohm meter measures resistance low enough to see this resistance change. Both measurements can be used to determine the health of the insulation, but in different ways.

W WARNING
Disconnect all power from device being tested before testing.

Paper clip test

To demonstrate how the AMR1 works, try the paper clip test. Straighten out a paper clip and then wind it in a spiral. Connect the AMR1 to the two ends and take a reading. Then pinch two of the "windings" of the paper clip together and take a reading. The current path will bypass the wire between the two contact points simulating a winding-to-winding short. Compare the two measurements.

Why a DMM won't usually work

A DMM cannot tell the difference between a coil with and without a winding-to-winding short because the difference in resistance isn't big enough. The smallest resistance value a DMM can display is 0.1 ohms (100 milliohms). If the winding-to-winding shorts enable the current to bypass enough of the windings, a DMM may be able to see the resistance change. The AMR1 milliohm meter can see the loss of even a single turn.

One Year Limited Warranty

This head is warranted to the original purchaser against defects in material and workmanship for a period of one year from the date of purchase. During the warranty period, Fieldpiece will replace or repair the defective unit, subject to verification of the defect. This warranty does not apply to defects resulting from abuse, neglect, accident, unauthorized repair, alteration, or unreasonable use.

ANY IMPLIED WARRANTIES ARISING OUT OF THE SALE OF A FIELDPIECE INSTRUMENT PRODUCT, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE ABOVE. FIELDPIECE SHALL NOT BE LIABLE FOR LOSS OF USE OF THE INSTRUMENT OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, OR ECONOMIC LOSS, OR FOR ANY CLAIM OR CLAIMS FOR SUCH DAMAGE, EXPENSES, OR ECONOMIC LOSS.

State laws vary. The above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Obtaining service

Call Fieldpiece (714-992-1239) for an RMA# and send freight prepaid to:
Fieldpiece Instruments
231 East Imperial Highway #250
Fullerton, CA 92835

For warranty service, include proof of purchase date. For out of warranty service, include a check or money order for \$20. We will send you a reconditioned and calibrated accessory head.

Fieldpiece Instruments, Inc.
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