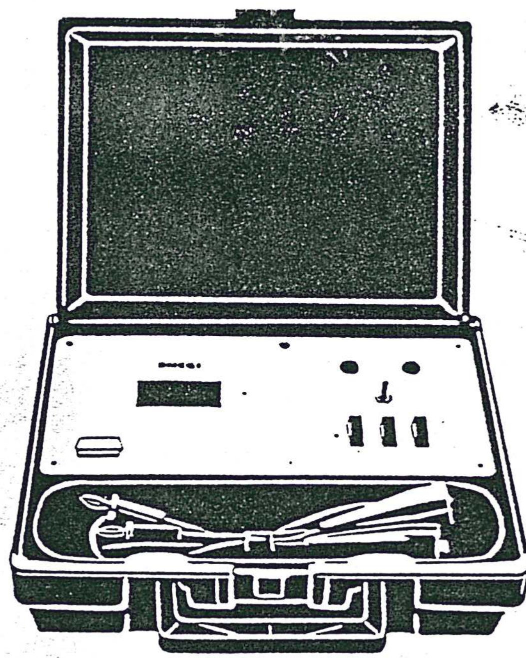
universal enterprises

DMEG1

OPERATING INSTRUCTIONS



UEi®

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DMEG1 OPERATING INSTRUCTIONS

WARNING: OBSERVE ALL SAFETY PRECAUTIONS WHEN MAKING MEASUREMENTS. TURN OFF POWER TO THE CIRCUIT UNDER TEST. SET THE DMEG1 CONTROLS, CONNECT THE TEST LEADS TO THE TESTER AND THEN TO THE CIRCUIT UNDER TEST.

The DMEG1 Insulation Resistance Tester is a precision electronic test instrument. Take this opportunity to read these instructions and familiarize yourself with the DMEG1, its features and its controls.

FEATURES

- Battery Operated
- Solid State Circuitry
- Automatic Zero Adjust
- Automatic Low Battery Indication
- Automatic Circuit Discharge
- LCD Display
- Three Ranges
- One Year Limited Warranty

INTRODUCTION

The DMEG1 Insulation Resistance Tester is a completely portable, self-contained, three range, solid state test instrument.

Power is provided by eight internal, standard 1.5V, size AA alkaline batteries. An electronically regulated constant voltage generator supplies the test voltage for the 2000MΩ range (1000V) and the 200MΩ range (500V). The internal batteries supply the power directly for the 0-200Ω low resistance (continuity) range.

This rugged precision instrument can locate intermittent shorts, defective electrical connections, insulation breakdowns or conductor failures due to the effects of temperature, moisture, abrasion, corrosion, or other environmental conditions.

SPECIFICATIONS

Ranges:
- 0-2000MΩ (1000 DCV test voltage)
- 0-200MΩ (500 DCV test voltage)
- 0-200Ω

Open Circuit Terminal Voltage: (refer to Chart 1)
- 0-1000MΩ: +950 DCV (approximately)
- 0-100MΩ: +480 DCV (approximately)
- 0-100Ω: + 5 DCV (approximately)

Short Circuit Terminal Current:
- 0-1000MΩ: 0.8 DCmA (approximately)
- 0-100MΩ: 0.6 DCmA (approximately)
- 0-100Ω: 1.7 DCmA (approximately)

Accuracy: ±3% of indicated value (approximately)

Batteries: Eight 1.5V, size AA alkaline batteries (NEDA #15A), included.

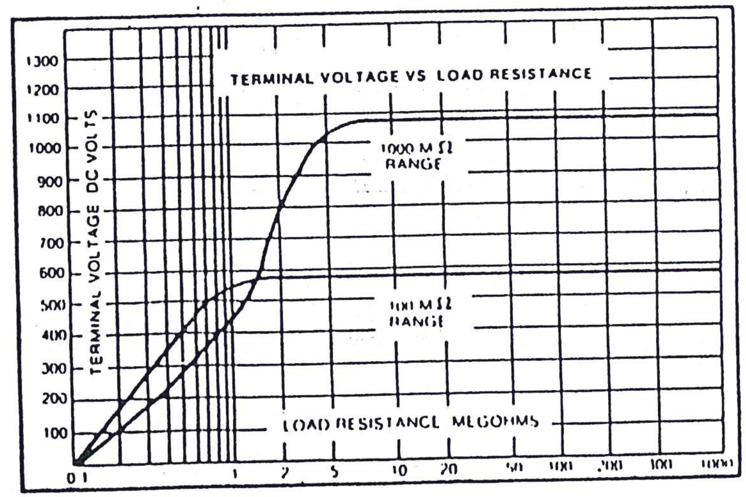


Chart 1

CONTROLS

Selector Switch

The SELECTOR switch is a three station push button switch and is used to select the range and function desired.

Position	Function
Ohms	This is the low resistance or "continuity" position. The main purpose of this position of the SELECTOR switch is to identify low resistance circuits such as motor run and start windings which may differ by only a few ohms. The OHMS position can also be used to check relay contact resistance.
200MΩ (500V)	In this position approximately 500 VDC is applied to the circuit under test when the TEST switch is pressed. The 0-200MΩ range is used primarily to test insulation resistances which have begun to degrade.
2000MΩ (1000V)	In this position approximately 1000 VDC is applied to the circuit under test when the TEST switch is pressed. This is the range which is normally used for preventive maintenance measurements on electrical equipment. Insulation resistance values in this application typically exceed 100MΩ.

Test Switch

The TEST switch is normally OFF, spring loaded, momentary action switch which "turns on" the DMEG1. The momentary action is a safety feature. The test voltage generated by the DMEG1 is automatically discharged when the TEST switch is released.

TYPICAL APPLICATIONS

Preventive Maintenace

One of the most effective applications, and one of the most overlooked applications, for the DMEG1 is in the field of preventive maintenance. For example, when the insulation properties of a hermetic compressor motor begins to fail it usually does so gradually at first. A routine, periodic monitoring of the insulation resistance of the start and run windings will usually show evidence of a potential burn out well in advance of the actual occurrence.

Trouble Shooting

Current leakage paths are difficult, if not impossible, to detect with a conventional multi-tester. The resistance of such leakage paths may be too high to measure with a multi-tester but still be low enough to cause inefficient operation, overheating, and other indications of operating problems.

Determining Moisture Content

The amount of insulation resistance, when drying out or baking transformers, motors, and generators is an excellent indicator of the amount of moisture remaining in the device. The insulation resistance reading will increase as the moisture is driven off. In this way optimum curing times can be determined.

OPERATION

CAUTION

Observe all safety precautions when the CONTROL switch is set to either the 200MΩ (500V) or the 2000MΩ (1000V) position. Connect the DMEG1 test leads to the circuit under test before operating the TEST switch. Do not touch the battery clip ends of the test leads when the TEST switch is in the TEST position.

Some electrical equipment, especially cables, may retain an electrical charge when disconnected from the line. It is a good practice to discharge such equipment with grounding straps, or other suitable devices, before touching or making connections. The DMEG1 automatically discharges the test circuits when the spring loaded TEST switch is released.

IMPORTANT

Remove all power to the circuit under test when making resistance measurements. If any voltage is present in the test circuit an erroneous reading will result.

General Instructions

Many factors will affect the measurement of insulation resistance. This is discussed in detail in the next chapter. Good housekeeping practices are of value not only for the routine operation of electrical equipment but also for the making of insulation resistance measurements. Dust, oil, grease, moisture, etc., may affect the test results by causing higher, or lower, readings. Points of measurement contact should be as clean as practicable.

Motors/Generators

Disconnect the motor from the line either by opening the main switch or by disconnecting the wires at the motor terminals. If the main switch is opened and measurements are made at the switch contacts, then the insulation resistance of all components between switch and motor will be measured simultaneously. If a fault is indicated it will be necessary to test each section separately.

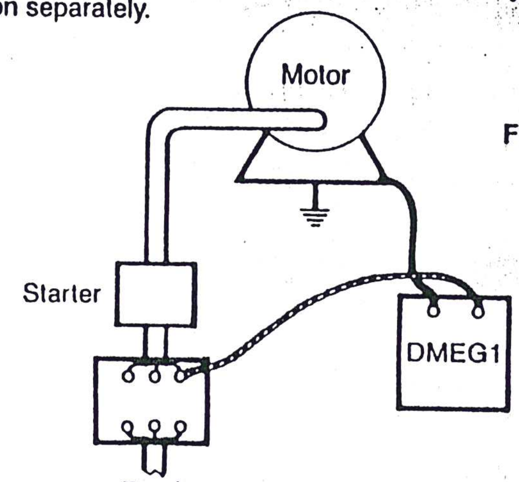


Figure 1

AC Devices: The basic test is to connect the red lead of the DMEG1 to one of the motor terminals, or wire, and the black lead to the frame or housing, see Figure 1. Start and run windings may be checked for correct resistance by setting the SELECTOR switch to OHMS and connecting one test lead to the common winding terminal and the other test lead to the start or run terminal.

DC Devices: Independent insulation tests may be carried out between the electrical sections of a DC generator, or motor, and ground. Separate the brushes from the commutator as in Figure 2 to isolate the brushes and field coil functions from the rotor. These separated sections may be easily tested independently of each other. This does not apply, however, when an overall insulation test is intended. In this case the brushes remain in contact with the commutator so that the three sections (brushes, coils and rotor) may be tested integrally.

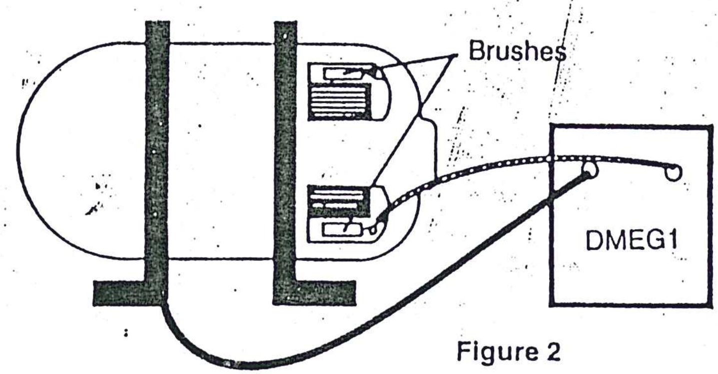


Figure 2

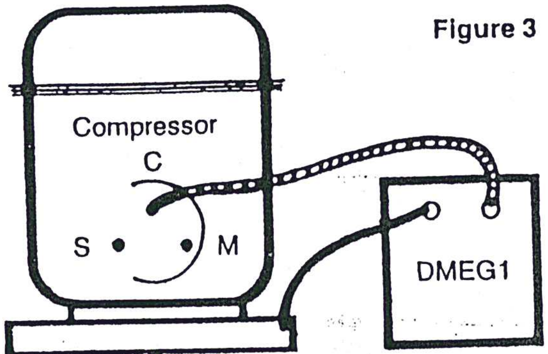
Hermetic Compressors

Most hermetic compressors utilize a three terminal block for making electrical connections to the sealed unit, refer to Figure 3. The connection may be made by an "umbilical" cord or a screw terminal, but the most common connection method is usually with a relay that pushes onto the S and M terminals and an overload protector that pushes onto the C terminal. Refer to the manufacturer's manual.

Shut off power to the unit under test and remove the connections to the compressor terminal block. Connect the red test lead of the DMEG1 to the C terminal and the black test lead to the frame, or ground. Measure the insulation resistance. Low values of insulation resistance may indicate the presence of contaminated refrigerant. Refer to the chapter on interpreting test results.

Winding continuity may be checked by setting the SELECTOR switch on OHMS. Check the start and run windings by measuring the resistance between the C terminal and the S or M terminal.

Figure 3

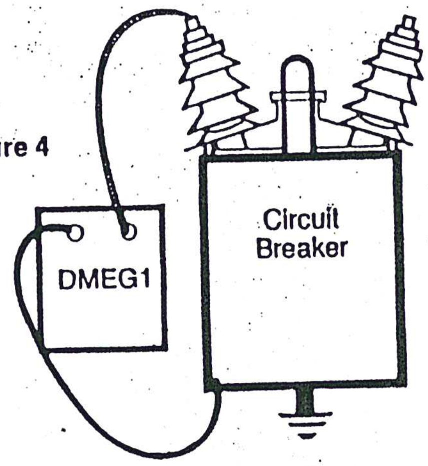


Measuring insulation resistance between common terminal and frame

rcuit Breakers and Switches

sconnect the circuit breaker or switch from the line. Trip or ıen the device and check the insulation resistance between ə pole terminals by connecting one test lead to one pole and ə other test lead to the remaining pole pair. Low values of sulation resistance may be caused by the presence of con- minants or by carbon arc lines in the insulator block. If the ıuse of the low readings is determined to be caused by ırbon arcing, the device should be replaced. Refer to gure 4.

Figure 4

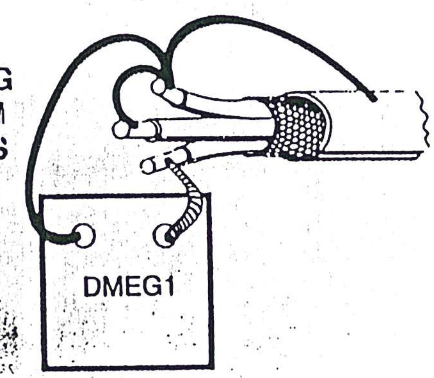


Cables

Disconnect the cable from the line. As a safety precaution, discharge the cable by shorting the individual leads to the sheath. This is especially necessary when testing coaxial cables. Disconnect the cable from the equipment to which the cable is attached. This will eliminate any influence of the equipment on the test readings.

Several types of insulation resistance measurements are normally made: lead to lead(s), lead to sheath, lead to ground, etc. As an example, when only one of the conductors in a multi-conductor cable is to be insulation tested, the conductor to be tested should be connected to the test lead of the DMEG1. All of the other conductors should be connected to the cable shield, which is then connected to the test lead.

FACTORS AFFECTING ACTUAL INSULATION RESISTANCE VALUES



Unlike most basic electrical measurements, such as voltage, current, and resistance, the actual insulation resistance of a device may differ from the measured value of insulation resistance. This is because the temperature at which the measurement is made, the relative humidity at the time of measurement, and the duration of the measurement may all affect the reading. It may be necessary to correct the measured insulation resistance value to arrive at a more true value of insulation resistance. The effects of these factors are discussed below.

Temperature

Most electrical insulation materials have a negative temperature coefficient. This means that the magnitude of insulation resistance decreases as the temperature at which the measurement is taken increases. For example, the insulation resistance of a transformer measured at 68°F may be three times the value of the same transformer measured at a temperature of 100°F.

If periodic measurements of a device are made at different temperatures then the temperature must be adjusted to a base value, usually 68°F. Otherwise, the insulation resistance of a device may appear to fluctuate widely (the sign of unstable or deteriorating insulation) when in reality the actual insulation resistance may be quite stable. Of course, if the insulation resistance measurements are always made at, or near, the same temperature then the use of temperature correction charts may be omitted.

Chart 2

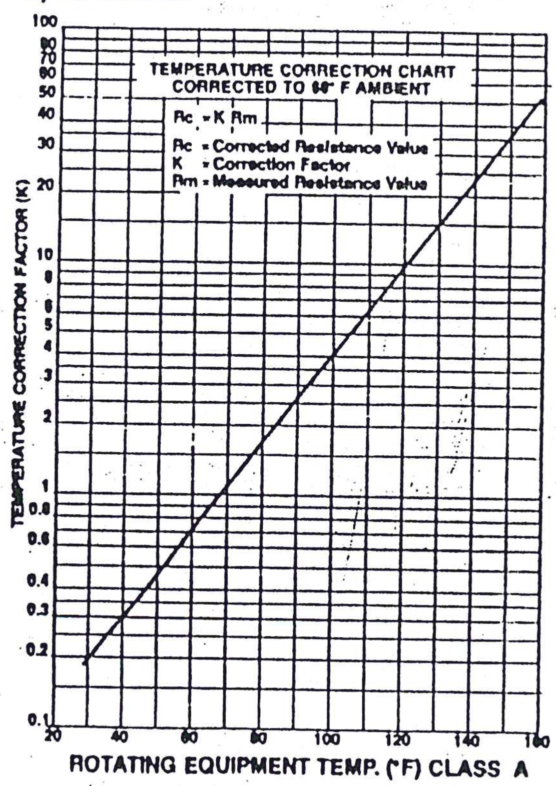
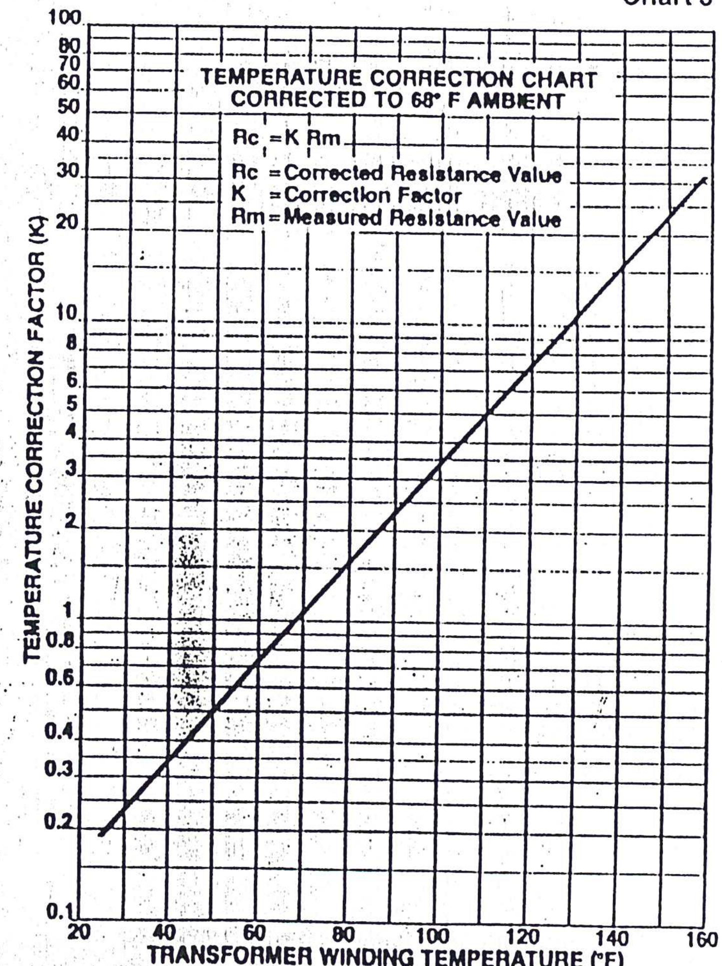


Chart 2 is a temperature correction chart for Class A rotating equipment. For example, if a reading of 100 Megohm were obtained at a temperature of 110°F then the corrected insulation resistance is Rc = KRm = 6 × 100 = 600 Megohms, where Rc is the corrected resistance, K is the temperature correction factor obtained from the graph, and Rm is the measured resistance. Chart 3 is a temperature correction chart for oil filled transformer windings.

Chart 3



Humidity
Measurements made in a humid environment will result in lower insulation resistance values than measurements taken in a dry environment. The geometry of the equipment will also have an influence on the measurements. For example, rotating machinery has many more leakage paths, especially on the commutators and armatures, where moisture can be trapped, than would a sealed transformer or shielded cable.

The best practice is to take insulation resistance measurements when the equipment is safely above the dew point. In this case, the effects of humidity can largely be ignored. However, it is always advisable to assure that the equipment be free of oil, dust, etc., which might affect the test results.

Time Duration of Measurement
The amount of time during which the test voltage is applied will also affect the reading. Typically, with good insulation, the measured value of insulation resistance will slowly increase as long as the test voltage is applied. This is due to the dielectric absorption effect of the applied DC voltage on the bulk insulation resistance. Refer to Figure 6 for a representative graph of insulation resistance as a function of the time during which the test voltage is applied.

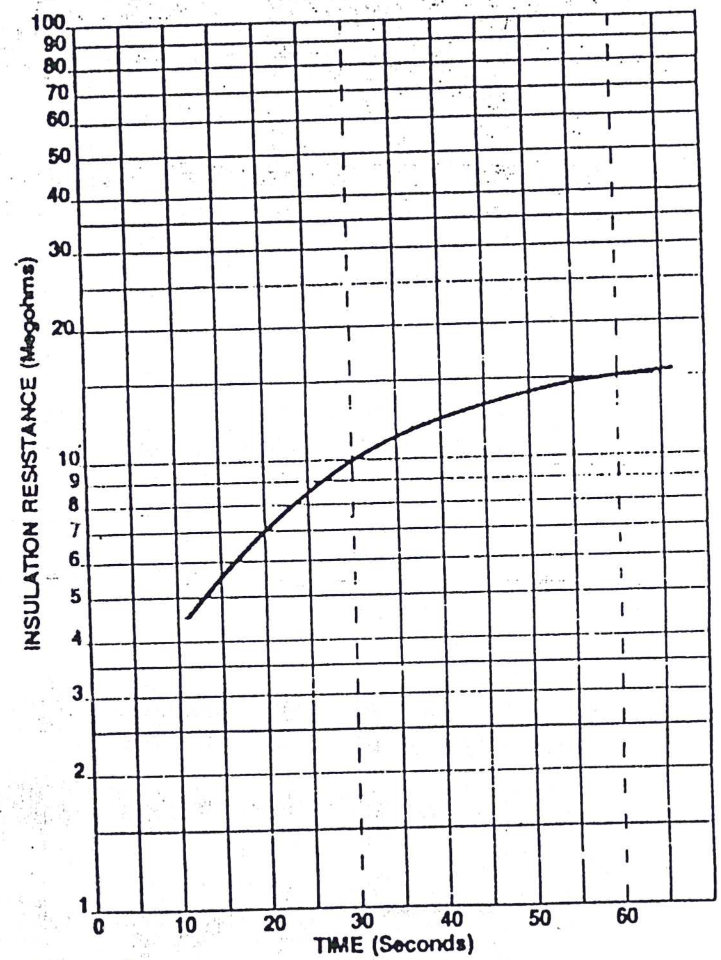


Figure 6

A standard test of insulation integrity is to measure the insulation resistance at 30 seconds and 60 seconds after the test voltage is applied. The ratio of the reading at 60 seconds to the reading at 30 seconds is called the Dielectric Absorption Ratio.

Typically, a ratio of 1.25 represents the borderline between an insulation resistance of questionable integrity and of fair integrity. A ratio of 1.6 and above is indicative of insulation of very good integrity.

The Dielectric Absorption Ratio method of testing insulation resistance is generally not affected by the temperature at which the measurements are taken. This is one of the advantages of this method. The Dielectric Absorption Ratio of the example shown in Figure 6 is 1.5.

INTERPRETATION AND RECORDING OF DATA

Periodic measurements of insulation resistance of a device, taken under the same conditions, generally result in much more meaningful results than measurements taken just once, or at random intervals. The measurement interval may be weekly, monthly, quarterly or yearly. This interval chosen will depend in general upon the conditions under which the device is operated and the cost of suffering an unexpected breakdown.

A device which operates under conditions of high temperatures, humidity, load and vibration should be tested more frequently than the same device which operates under less stressful conditions. A device breakdown which would result in expensive downtime, safety hazards, etc., should likewise be tested more frequently than the same device used in a much less critical application.

The following "rules" are guidelines which may be used to help determine whether a piece of equipment is operating normally or whether it should be pulled out of service and repaired or replaced. However, the equipment manufacturer's data on insulation resistance values and test procedures should be consulted, when available.

One Kilovolt/One Megohm Rule

This is an old, generalized rule that states that electrical equipment rated up to 1000 volts should have minimum insulation resistance of one-Megohm. Above 1000 volts rating the minimum insulation resistance should be one Megohm for each 1000 volts of rating. Note: This rule of thumb does not apply to the testing of hermetic compressors.

Trend Rule

Insulation Resistance Values	Interpretation
High and holding steady	Condition good
High but tapering off	Breakdown may be starting. Decrease test interval or repair equipment.
Moderately low and holding steady	May be all right. Depends on history of device. Should try to identify cause of low reading.
Low and declining	Failure probable in near future. Repair or replace.

Hermetic Compressor

Insulation Resistance Values	Interpretation
100 Megohms & above	Condition good
50 to 100 Megohms	Evidence of moisture in refrigerant. Check drier.
20 to 50 Megohms	Excessive moisture in refrigerant. Examine system.
Below 20 Megohms	Failure of system likely. Purge system.

Dielectric Absorption Ratio Rule

Ratio	Interpretation
Above 1.6	Condition good.
1.25 to 1.6	Condition moderately good
1.1 to 1.25	Condition questionable to unstable.

Recording Data

A package of Data Log Cards is supplied with the DMEG1. The use of these log cards will facilitate the recording and plotting of data necessary to monitor and evaluate the insulation resistance history and integrity of an individual piece of equipment.

Space is provided on the front of the card to record the equipment identity and to plot a graph of insulation resistance values from 0.1 to 1000 Megohms. Space is provided on the back of the card to record the supporting tabular data: date of measurement, reading, correction factor, corrected reading, temperature, relative humidity.

It is not necessary to make an entry in every column on the back of the Data Log Card each time a measurement is taken. However, the more data that is recorded the easier it will be to determine the reason for changes in the measured insulation resistance.

MAINTENANCE

The DMEG1 is a precision test instrument. Do not operate the DMEG1 where it will be subjected to high levels of temperature, humidity, or mechanical shock.

Batteries

The internal batteries supply the operating power for the DMEG1. To test for defective or weak batteries:

1. Press TEST switch.
2. LCD display will indicate "LO BAT".
3. If LCD does indicate "LO BAT" then replace batteries:
   a. Remove the six flat head screws which secure the DMEG1 front panel to the case back.
   b. Carefully remove the front panel to gain access to the battery compartment located in the case back.
   c. Remove the batteries and install eight new 1.5V, size AA alkaline batteries (stock no. AB8). Observe battery polarity as shown on the label below the battery holders.
   d. Before replacing the front panel, repeat steps 1-2 above, to verify that the LCD display does not indicate "LO BAT".
   e. Replace the front panel.

If the DMEG1 is to be stored, or left unused for long periods of time, remove the eight internal 1.5V batteries. This is a standard precaution with battery operated equipment and is intended to prevent damage to the equipment in the event the batteries begin to corrode or leak.

ACCESSORIES

	Stock No.
Batteries, 1.5V, size AA alkaline (set of 8)	AB8
Test Leads (set)	ATL15
Insulation Resistance Data Log Cards (pkg.)	ADC1

LIMITED ONE YEAR WARRANTY

This product is warranted to the purchaser against defects in material and workmanship for one year from the date of purchase.

What is covered: Repair parts and labor, or replacement at the company's option. Transportation charges to the purchaser.

What is not covered. Transportation charges to the company. Damages from abuse or improper maintenance, see operating instructions. Any other expense. Consequential damages, incidental damages, or incidental expenses, including damages to property. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

How to Obtain Warranty Performance: Attach to the product your name, address, description of problem, phone number and proof of date of purchase. Package and return to:

Service Center
Universal Enterprises, Inc.
5500 S.W. Arctic Drive
Beaverton, Oregon 97005

Implied Warranties: Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are limited in duration to one year from date of purchase. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

To the extent any provision of this warranty is prohibited by federal or state law and cannot be preempted, it shall not be applicable. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.