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AVTM24-1J
Rev A
April 2006

Instruction Manual

DLRO®

Digital Low Resistance Ohmmeters
Catalog No. 247000 Series

Megger

Valley Forge Corporate Center
2621 Van Buren Avenue
Norristown, PA 19403-2329
U.S.A.

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www.megger.com

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DLRO®

Digital Low Resistance Ohmmeters
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The information presented in this manual is believed to be adequate for the intended use of the product. If the product or its individual instruments are used for purposes other than those specified herein, confirmation of their validity and suitability must be obtained from Megger. Refer to the warranty information below. Specifications are subject to change without notice.

WARRANTY
Products supplied by Megger are warranted against defects in material and workmanship for a period of one year following shipment. Our liability is specifically limited to replacing or repairing, at our option, defective equipment. Equipment returned to the factory for repair must be shipped prepaid and insured. Contact your MEGGER representative for instructions and a return authorization (RA) number. Please indicate all pertinent information, including problem symptoms. Also specify the serial number and the catalog number of the unit. This warranty does not include batteries, lamps or other expendable items, where the original manufacturer's warranty shall apply. We make no other warranty. The warranty is void in the event of abuse (failure to follow recommended operating procedures) or failure by the customer to perform specific maintenance as indicated in this manual.

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Table of Contents

1.0 10 Ampere Systems 1
Section A INTRODUCTION 1
Section B SAFETY PRECAUTIONS 3
Section C RECEIVING INSTRUCTIONS 5
Section D SPECIFICATIONS 7
Section E CIRCUIT DESCRIPTION 15
Section F CONTROLS AND CONNECTIONS 19
Section G OPERATING PROCEDURE 23
Section H APPLICATIONS 27
Section I MAINTENANCE 31
Section J FIELD REPLACEABLE PARTS LIST 33
Section K WARRANTY & REPAIR 35

2.0 100 Ampere System 37
Section A INTRODUCTION 37
Section B SAFETY 41
Section C DESCRIPTION & SPECIFICATIONS 43
Section D OPERATING PROCEDURE 47
Section E MAINTENANCE 51
Section G RECOMMENDED TEST LEADS 53
Section H WARRANTY and REPAIR 55
Section J FIELD REPLACEABLE PARTS LIST 57

-11 OPTION INPUT PROTECTION 59

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List of Figures

Figure 1: Cat. No. 247000 DLRO instrument without charger ... iii

Figure 2: Various DLRO Unit Combinations..... 6

Figure 3: Controls & Connections.....21

Figure 4: Typical Connections to a Test Sample. 25

Figure 5: Cat. No. 247101 DLRO consists of three elements: Left: 100A Current Source Center: Measuring Module Right: Charger Module for Measuring Module.....36

Figure 6: Arrangement for Making Measurements in the 100-Ampere Range.....49

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Figure 1: Catalog No. 247000 DLRO instrument without charger

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1.0
10 Ampere Systems

Section A
INTRODUCTION

Part 1.0 of this manual applies to a series of instruments; the principal models are Catalog Numbers 247000, 247001, 247002. Part 2.0 describes the 100 Ampere systems including catalog numbers 247100, 247101 and 247120.

The Catalog No. 247000 Digital Low Resistance Ohmmeter is a portable, rugged instrument that provides a direct-reading digital display of resistance in five ranges. It is powered by self-contained rechargeable batteries. A battery charger, operating from J1SV 50/60 Hz, is furnished in a separate package.

The Catalog No. 247001 is similar to Catalog No. 247000 except that it has a built-in, line-operated charger.

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The Catalog No. 247100 is a 100 Ampere Test System composed of a Catalog No. 247000 Measuring Module, and a Cat. No. 247120 100-amp power supply. The Catalog No. 24701 is also a 100 ampere test system.

The ohmmeter has four terminals for a Kelvin connection to the sample under test, and it is recommended that Biddle test leads shown in Bulletin 24-1 be used with this instrument.

Panel features include a two-position on-off switch that allows continuous or momentary operation, and on the rechargeable battery models a meter to indicate relative state of charge of the internal batteries.

A prop is provided to keep the lid in a partly open position so that it can be used as a sunshade when reading the digital display in bright sunlight.

The Catalog No. 247002 is similar to Catalog No. 247001 except that it has an extra 600 μΩ range.

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Section B
SAFETY PRECAUTIONS

SAFETY IS THE RESPONSIBILITY OF THE USER
La seguridad es la responsabilidad del operador

	**WARNING** **Do NOT connect this instrument to energized circuits.**

The Digital Low Resistance Ohmmeters have been designed and constructed to meet the requirements of ANSI/ISDA S82.01-1994. There is no shock hazard from the instrument itself and it may be used freely in wet or outdoor environments. The line-operated battery charger and the A.C. supply, however, should be used and maintained by trained personnel who are familiar with the usual precautions for handling line-operated equipment.

	**DO NOT USE IN EXPLOSIVE ATMOSPHERE (This includes poorly ventilated battery rooms and enclosures.)**

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Section C
RECEIVING INSTRUCTIONS

READ COMPLETELY BEFORE OPERATING

Your Digital Low Resistance Ohmmeter has been thoroughly tested and inspected to rigid specifications before being shipped and is ready for use. Check the equipment received against the packing list. Notify Megger, Norristown, PA 19403 of any shortage of materials. The instrument should be examined for damage received in transit. If any damage is found, file a claim with the carrier at once and notify Megger or its nearest representative giving a detailed description of the damages observed.

Charge batteries overnight before initial use of instrument. Refer to Section G for charging procedure. Check for correct operation of the instrument by connecting it to a resistor of known value. See Section G, Operating Procedure.

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Catalog No. 247000 with Charger



Catalog No. 247001



Catalog No. 247101with Charger

Figure 2: Various DLRO Unit Combinations

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Section D
SPECIFICATIONS

Ranges, Resolution, Accuracy & Test Current

RANGE	TEST CURRENT AMPERES (±20%)	RESOLUTION	LIMIT OF ERROR	
			1 year 15-35°C	1 year 0-50°C
0.000 -5.999 mO	10	1 µO	¼ % Rdg + 1 *lsd**	½ % Rdg + 1*lsd**
00.00 -59.99 mO	1	10 µO	¼ % Rdg + 1 *lsd**	½ % Rdg + 1*lsd**
000.0 -599.9 mO	0.1	100 µO	¼ % Rdg + 1 *lsd**	½ % Rdg + 1*lsd**
0.000 -5.999 O	0.01	1 µO	¼ % Rdg + 1 *lsd**	½ % Rdg + 1*lsd**
00.00 -59.99 O	0.001	10 µO	¼ % Rdg + 1 *lsd**	½ % Rdg + 1*lsd**
**(Least Significant Digit)*				

Zero Offset: Typically 0-1 count over 15-35°C. Full accuracy can be realized by using the Forward-Reverse switch to average the readings. An internal zero adjustment is also provided.

On-Off Control: Toggle switch energizes all circuits. Has momentary and lock positions.

Response Time (after On-Off switch is closed): 2 seconds to final reading.

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Interference Effects:	Error in item under test caused by line- frequency current of 0.1X test current: ±l lsd Error caused by 5-gauss line-frequency magnetic field: ±2 lsd Error caused by connection to ground or voltage to ground (assuming battery operation): None
Input Protection:	One volt peak may be applied between any two of the Rx terminals.
Effect of Inductive Test Item:	None except time constant delay. No damage caused by inductive kick, but see precautions in Section H.
Temperature Range:	Operating: 0-50°C (line supply, 0-40°C) Storage: -40°C to + 60°C
Display:	Red LED, 4 digits 0.5” high, decimal point, and negative (-) sign. Upper right hand segments of digits flash on overrange input

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Calibration Adjustments:	Internal zero and span adjustments for all ranges.
Test Lead Resistance Requirements:	Potential Leads (P1. P2): No limitations. Current Leads (C1, C2): each lead 20 milliohms nominal. Deviations affect test current but do not affect accuracy unless they are large compared to the measuring range.

Power Supply, Rechargeable System:

Battery Complement:	(internal batteries, nickel cadmium type): Display circuit, 4 cells size “D” (Eveready CH4 or Gould 4.0 SCB or G.E. #GCW 3.5 SB.) Measuring circuit, 2 cells, size “F”. (Gould 7.0 SCB).
Battery Condition Meter:	Shows state of charge of batteries. Switch selects either battery for test.

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Battery Charger: Separate charger unit plugs into receptacle on measuring unit. Full charge in 14 hours. Charging may be continued while instrument is operating. Fused, with UL listed 3-wire line cord and plug. Power requirements, 0.22 amps at 115 volts, 50/60 Hz; or 0.165 amps at 230 volts, 50/60 Hz.

Fuse ratings:
115V-0.2A Slow Blow
230V-0.1A Slow Blow

RANGE	CONTINUOUS OPERATING TIME BETWEEN CHARGES		CONTINUOUS OPERATING TIME WHILE ON CHARGE	
	MEASURING CIRCUIT BATTERY	DISPLAY BATTERY	MEASURING CIRCUIT BATTERY	DISPLAY BATTERY
6 mO	1 Hour	15 Hours	1 Hour	No Limit
60 mO	10 Hours	15 Hours	No Limit	No Limit
600 mO	100 Hours	15 Hours	No Limit	No Limit
6 O	1000 Hours	15 Hours	No Limit	No Limit
60 O	1000 Hours	15 Hours	No Limit	No Limit

Battery Life: Approximately 300 full charge-discharge cycles.

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Safety: Meets all applicable requirements of ANSI/ISA S82.01-1994. Highest voltage existing (except in charger primary and line supply primary) is 6 volts.

Case: The measuring unit and charger have rugged molded case with handles and removable hinged lids. The measuring unit lid can be used as a sun shield. The charger case has similar construction with additional space for storing test leads.

Test Lead Terminals: 5/16" diameter studs with wing nuts for spade or ring lugs.

Dimensions and Weights:			
Cat. No.	**Weight**		**Dimensions**
	lbs	kg	inches cm
247000	11	5.01	8-7/8W x 8-1/8D x 8-1/8H 22.4 x 20.6 x 20.6(Instrument)
247000-47	-	-	8-1/8W x 8-1/8D x 7-3/8H 22.4 x 20.6 x 18.8 (Charger)
247001	12.1	5.5	12W x 9 5/8D x 6 3/8H 30 x 24.5 x 16.2
247002	12.2	5.5	12W x 9 5/8D x 6 3/8H 30 x 24.5 x 16.2

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Catalog Numbers and Unit Combinations for 10-Ampere Systems

CATALOG No.	DESCRIPTION
247000	Instrument with Internal Rechargeable Batteries and separate 115V 50/60 Hz Charger Unit. Range: 0 to 60 Ohms in 5 ranges, 0 to 5.999 Milliohms lowest range (Note 1).
247000-3	Same as Cat. No. 247000 except with 100A adapter plug.
247000-47	Same as Cat. No. 247000 except with 230V-50/60 Hz charger.
247000-3-47	Same as Cat. No. 247000-47 except with 100A adapter plug.
247001	Same as Cat. No. 247000 except in single case.
247002	Same as Cat. No. 247001 except with an extra 600 μΩ range.

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Catalog Numbers and Unit Combinations for 10-Ampere Systems

CATALOG No.	DESCRIPTION
247100	See Part 2.0
247101	See Part 2.0
247120	See Part 2.0

NOTES:

Note 1: *Leads not included. (See Bulletin 24-1 for recommended test leads.)*

See Page 36 *for information concerning 100-Ampere systems.*

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Section E
CIRCUIT DESCRIPTION

Ra and RA' set the test current to the values listed in Section 0, Specifications; there is a pair of these resistors for each range. On the 6 mΩ 10A range, test current is also affected by the resistance of the test leads connected to the C1and C2 terminals. The instrument is designed to operate with current leads having a resistance of O.02Ω each. Using leads that have a resistance other than 0.02Ω will not affect the accuracy of the instrument, but will cause the test current to be different.

A digital meter, powered by four size D nickel cadmium cells, displays the ratio:

$$6 \times \frac{E_{IN}}{E_{REF}}$$

EIN is the voltage across Rx where the potential leads are connected.

(There are no length restrictions on the potential leads). E_{REF}. scaled down by divider RD-RE, is set by the range network and represents the current in Rx.

The calibration network on each range is set to produce, at the specified test current, nominally 60 mV at the E_{REF} input. Consider a test specimen, Rx of 1.5 milliohms and a test current of 10 amperes.

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The display would be:

$$6 \times \frac{0.0015\Omega \times 10A}{0.060V} = 1.500(m\Omega)$$

If the test current is reduced to 9 amperes:

$$6 \times \frac{0.0015\Omega \times 9A}{0.054V} = 1.500(m\Omega)$$

Thus the reading is independent of test current variations caused by changes in battery voltage, or by different test lead resistance.

The digital meter has an "auto-zero' circuit that normally holds any zero offset drift to one or two least counts, and a dual-slope integrating converter that is tuned to reject line frequency interference, either 50 Hz or 60 Hz.

The battery charger supplied with models having internal rechargeable batteries is a constant-current type specifically intended for use with nickel-cadmium batteries. There are two charging circuits: one that supplies 0.4A to charge the display battery, and another with two branches that supplies 0.7A to each of the two measuring circuit batteries. These current values are the battery manufacturers' recommended "ten-hour rates" and represent a safe charging level that will not damage the

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batteries, even if they are allowed to remain on charge indefinitely.

Charging currents are set at the factory and need readjustment only when batteries are replaced.

Zener diodes protect the instrument from damage caused by switching transients that may occur when measuring the resistance of inductive samples, and by 60 Hz pickup that may occur when measuring large equipment in high voltage switchyards.

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Section F
CONTROLS AND CONNECTIONS

Fig. 3 shows a front panel view of Catalog No. 247000 with functional parts and operating controls labeled.

S4, M1 Battery test meter M1 shows the relative state of charge of the internal rechargeable batteries. With S4 in the "Display" position Ml is connected to the battery that powers the digital meter. With S4 in the "measure' position, M1 is connected to the measuring circuit battery. This test is valid only when the instrument is operating and connected to a test specimen or with the C1and C2 leads shorted. When the pointer indicates in the red zone the batteries should be recharged.

S3 . The ON/OFF switch has two "ON" positions: a "lock" position for continuous operation, and a "momentary" spring-held position that helps conserve battery power when taking a series of readings on the high-current ranges.

S1 . The range switch selects one of five resistance ranges. Panel markings are full—scale values; nominal test currents are shown in parentheses.

M2 A 3½ digit red LED display shows the resistance of the specimen under test. It is direct reading with decimal points selected by a deck on the range switch.

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C1, P1, P2, C2 Four terminals with wing—nuts are provided for making a Kelvin connection to the specimen under test. Test current is available at the C1 and C2 terminals, and the actual resistance is measured between the points where leads connected to the P1 and P2 terminals are placed.

S2 The "forward-reverse" switch interchanges the P1 and P2 connections internally. In the "reverse" position, the digital meter sees a voltage of opposite polarity. The purpose is to enable an operator to average the forward and reverse readings if a zero offset error is suspected.

J2 The optional external power connector must have its jumper plug (chained to the instrument) in place while the instrument is in normal use. When charging the internal batteries, remove the jumper plug and connect the charger to J2.

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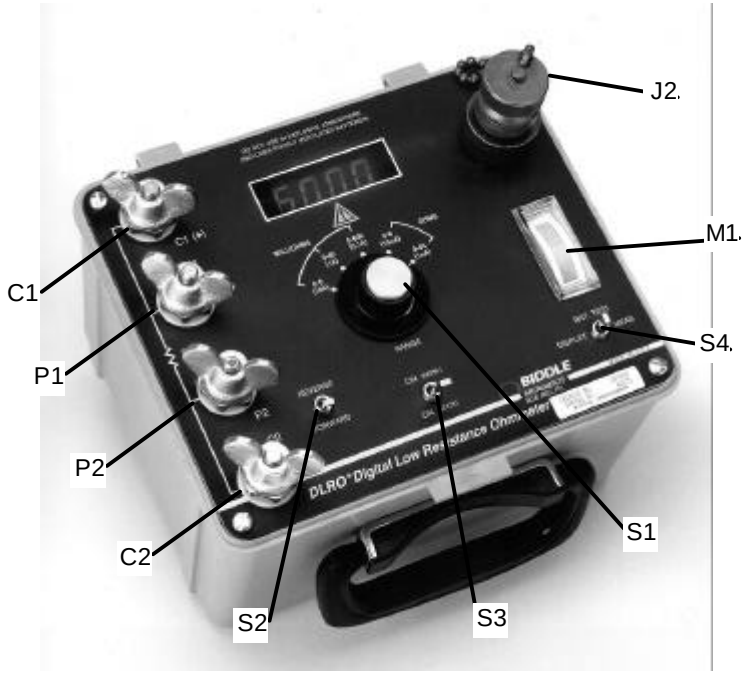


Figure 3: Controls & Connections

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Section G
OPERATING PROCEDURE

RECHARGEABLE BATTERY MODELS

- **Battery Check**

Before using the instrument, check the display and measuring circuit batteries. The battery test meter will indicate their relative state of charge. The battery test is valid only when the instrument is operating on the range that it is intended to be used, connected to a test specimen or with the C1 and C2 leads shorted. If the meter indicates in the red zone, charge the batteries for 14 hours or overnight.

- **Connections and Reading**

Connect the instrument to the test specimen as shown in Fig. 4. Set the ON/OFF switch to the "lock" position and choose the range that gives the highest stable reading. A blinking display indicates an off-scale condition. The digital meter is direct reading, with the range switch indicating the full-scale value and the units for the particular range in use. The "momentary" position of the ON/OFF switch is useful for conserving battery power when using the highest current range. Battery life details are given in Section D, Specifications.

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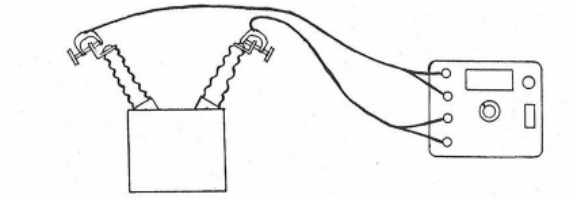
- **Very Low Resistance**

For full accuracy when reading below 0.1 mO, use the average of forward and reverse readings. Make the reverse reading by holding the “forward-reverse” switch in the “reverse” position. A minus ⇦sign will appear in the display when this switch is in the reverse position; disregard this when calculating the average.

- **Sunshade**

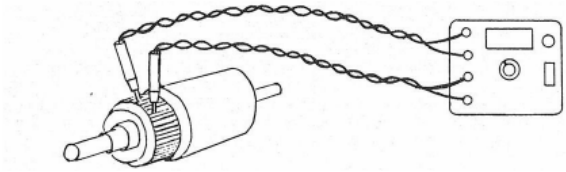
To aid in reading the digital display in bright sunlight, use the prop on the lid to hold it tilted partially open as a sunshade.

1. Using Duplex Clamp leads on a circuit breaker or transformer.



2. Using Duplex Hand Spikes on a motor commutator.

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3. Using Kelvin Clip leads.

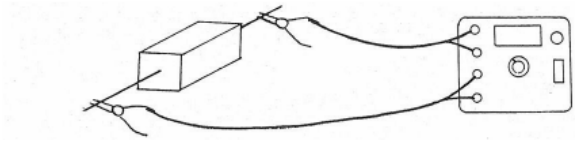


Figure 4: Typical Connections to a Test Sample.

4. Charging Batteries

To charge the batteries, remove the jumper plug from J2 and connect the output lead of the battery charger to J2. A pilot light on the charger will indicate when it is connected to an energized ac power line. Charging time for fully discharged batteries is 14 hours or overnight. The instrument may be used continuously (except on the 10A range, where battery life limitations apply) while its batteries are charging.

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Section H
APPLICATIONS

MEASURING CONTACT RESISTANCE OF CIRCUIT BREAKERS

Biddle Cat. No. 241004-18 Duplex clamp leads are recommended for this application. Connect the leads as shown in Fig, 3. For safety, one terminal of the sample must be grounded.

MEASURING WINDING RESISTANCE OF MOTORS and OTHER APPLICATIONS

	**WARNING** **When the test current through a transformer winding is switched off, the energy stored in the magnetic field must be dissipated. The DLRO instrument provides a path to harmlessly dissipate this energy when the current is interrupted by the On/ Off switch.**

It is not recommended to use a DLRO for measuring transformers and other large inductive devices. The transformer ohmmeter is specifically designed for inductive devices.

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For personnel safety and to protect the DLRO instrument, proceed as follows:

1. Firmly connect C1and C2 leads before switching the DLRO on.
2. Switch the DLRO off before disconnecting Cl or C2 connections.

MEASURING WINDING RESISTANCE OF ELECTRIC MOTORS

Fig.3B shows hand spikes being used to make contact with each commutator segment on a large motor.

OTHER APPLICATIONS

Other applications include resistance measurements of bolted bus bar joints, welded connections, rail joints in electric traction systems, bonding in RR pipeline and aerospace applications, etc. The particular application will determine the type of leads and connections needed. (See Biddle Bulletin 24-1 for leads recommended for use with this instrument.)

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INTERFERENCE

Alternating current interference in the sample under test can cause several digits fluctuation in a displayed reading. Interference can also be due to pickup in long test leads, especially in the vicinity of strong electric or magnetic fields. In these cases, fluctuation of the reading can sometimes be reduced by twisting the pairs of leads together.

If interference is causing fluctuation in the display, the correct reading is the average of the highest and lowest readings.

A DC voltage in the item under test, however small, will produce an error in the reading. Such a voltage can be caused by ground currents in grounded items such as rails, pipes, etc., or by chemical or thermo—electric EMF in items made of dissimilar materials. If DC voltage interference is reasonably steady, this effect can be eliminated by taking a second reading with leads interchanged (C1 with C2 and P1 with P2) and averaging the first and second readings. Actually, only the C leads need be moved; the P interchange can be made by using the forward-reverse switch on the instrument.

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When making a measurement of a totally new kind, interchange the C leads to determine whether there is any DC interference.

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Section I
MAINTENANCE

Remove the instrument from its case by removing the screws at each corner of the panel.

RECHARGEABLE BATTERIES

The internal rechargeable batteries may fail to hold a charge after several hundred charge-discharge cycles, resulting in shorter than normal service life. In addition to a low reading on the battery test meter, battery failure evidence is also given by a dim display and/or readings that appear unstable or fluctuate more than normal. If the batteries are suspect, a check should first be made of the contacts in the battery holders to ensure that they are clean. The contact buttons are made of stainless steel and are easily cleaned. To remove the batteries, remove their retainer straps. The cells can then be removed from their holders.

If battery replacement is necessary, use the type of batteries indicated in Section 3, Field Replaceable Parts List. Be sure to install them in their holders in the proper polarity, as indicated on the labels in the holders, and replace the retainer straps.

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After batteries are replaced, charging currents must be checked and, if necessary, readjusted to accommodate the characteristics of the new cells. Contact Megger for instructions.

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Section J
FIELD REPLACEABLE PARTS LIST

CAT. NOS. 247000, 247000-47

PART NO.	QTY.		DESCRIPTION
See Table	1		Battery Charger, complete
5026	4		Wing Nut
4690-5	1		Knob
15568-2	2	B2,B3	1.25V, Size F, 7 A.H. Nickel-Cadmium rechargeable battery (Gould 7.0 SCB or equivalent)
15568-1	4	B1	1.25V Size D, 4 A.H. Nickel-Cadnium rechargeable battery (Gould 4.0 SCB or equivalent)
15676	3		Battery Retainer Strap
See Table	1	F1	Fuse
4499	1	DS1	Lamp

CATALOG NOS.	247000	247000-47
Battery Charger Assembly	15572-1	15572-2
Fuse F1	2567-8, .2Amp Slow Blow	2567-15, .1Amp Slow Blow

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Catalog Nos. 247001, 247002

Part No.	Qty.		DESCRIPTION
5026	4		Wing Nut
25774	1		Knob (247001)
15568-2	2	B2, B3	1.25V, size F, 7 A.H. Nickel-Cadmium rechargeable battery (Gould 7.0 SCB or equivalent)
15568-1	4	B1	1.25V, size F, 4 A.H. Nickel-Cadmium rechargeable battery (Gould 4.0 SCB or equivalent)
15676	3		Battery Retainer Strap
See Table	1	F1	Fuse
4499	1	DS1	Lamp
25774-1	1		Knob (247002)

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Section K
WARRANTY & REPAIR

WARRANTY:

All products supplied by Megger are warranted against all defects in material and workmanship for a period of one year following shipment. Our liability is specifically limited to replacing or repairing, at our option, defective equipment. Equipment returned to the factory for repair will be shipped Prepaid and Insured. The warranty does not include batteries, lamps or tubes, where the original manufacturer's warranty shall apply. WE MAKE NO OTHER WARRANTY.

The warranty is void in the event of abuse or failure by the customer to perform specified maintenance as indicated in this manual, or if the instrument is connected to external power sources other than those specified in this manual.

REPAIRS

Megger maintains a complete instrument repair service. Should this instrument ever require repairs, we recommend it be returned to the factory for repair by our instrument specialists. When returning instruments for repairs, either in or out of warranty, they should be

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shipped Prepaid and Insured and marked for the attention. of the Instrument Service manager.



Figure 5: Cat. No. 247101 DLRO consists of three elements:
Left: 100A Current Source
Center: Measuring Module
Right: Charger Module for Measuring Module

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2.0
100 Ampere System

Section A
INTRODUCTION

The Catalog No. 247100 DLRO instrument is a digital low resistance ohmmeter designed specifically to measure very low resistance (zero to 600 micro-ohms) with a test current of 100 amperes. This capability is required by some standard methods of testing large switchgear. The Catalog No. 247100 DLR0 meets the requirements of such standards. Relevant extracts from two such standards are:

ANSI C37.09-1999
Test Procedure for AC High Voltage Circuit Breakers

> "09.5.14 Electrical Resistance of Current Path Test. The dc resistance of the current-carrying Circuit from terminal to terminal of each pole unit in the close position shall be measured with at least 100 amperes

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flowing in the circuit and shall not exceed the limit set for the rating by the manufacturer".

IEC 61166 Ed. 1.0, B:1993
High-Voltage Alternating-Current Circuit-Breakers

Part 4: Type Tests and Routine Tests

Paragraph 3.1 Measurement of the Résistance of the Main Circuit

"The resistance of each pole of the main circuit shall be measured for comparison between the circuit-breaker type-tested for temperature rise and all circuit-breakers of the same type subjected to the routine tests.

The measurement shall be made with dc by measuring the dc voltage drop, or resistance, across the terminals of each pole.

The current during the test shall have any convenient value between 100A and the rated normal current".

This 100-ampere test capability is achieved by adding a special current source and range module to a more general-purpose instrument, the Catalog No. 247000 DLRO, while retaining all the features of that instrument.

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This part of the manual covers only the 100-Ampere portion of the system. Refer to Part I for complete instructions for the basic Cat. No. 247000 instrument.

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Section B
SAFETY

SAFETY IS THE RESPONSIBILITY OF THE USER
La seguridad es la responsabilidad del operador



WARNING
Do NOT connect this instrument to energized circuits.

The line-operated 100-Ampere current source should be used and maintained by trained personnel who are familiar with the usual precautions for handling portable line-operated equipment. For protection against electrical shock the cabinet must be grounded, either by the line cord or by a separate wire.

In using the instrument take care to avoid skin burns caused by touching an overheated range module, undersize bead wire, poor connections, or small item under test. Overheating may occur if the tester is operated for more than the rated duty cycle.

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Section C
DESCRIPTION & SPECIFICATIONS

DESCRIPTION

The components of the measuring system are as follows:

1. Compact DLRO measuring module with rechargeable battery in molded case.
2. Battery Charger in similar molded case.
3. 100-Ampere DC current source having four test connection terminals used for the 100-Amp range.

All the above are parts of Catalog No. 247100. In addition, four test leads are required.

Complete information on the basic measuring module and charger is given in Part I.

Specifications covering the adaptation of this basic instrument for the 600 micro-ohm range as well as specifications covering the 100-Ampere source and range module are as follows:

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247100	Complete 100 Amp. system for 115V operation; includes 247000-3, 247120.
247100-47	Complete 100 Amp. system for 230V operation; includes 247000-3-47, 247120-47.
247101	Complete 100 Amp system for 115 V operation; includes 247001-3 & 247120
247101-47	Complete 100 Amp system for 230 V operation; includes 247001-3-47 & 247120-47
247120	100 Amp. Current Supply, 115V-50/60 Hz.
247120-47	100 Amp. Current Supply, 230V-50/60 Hz.

See Page 8 for information concerning 10-Ampere systems.

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Specifications

Measurement Data

RANGE	TEST CURRENT AMPERES	RESOLUTION	LIMIT OF ERROR	
			1 year 15-35°C	1 year 0-50°C
000.0 - 600.0 mO	100	0.1 µO	½ % Rdg + 2 *lsd**	1 % Rdg + 2 *lsd**
**(Least Significant Digit)*				

Response Time:	(After ON—OFF switch is closed): Ten seconds to final reading, maximum.
Duty Cycle and Ambient Temperature:	Ambient 50C: Continuous
100-Ampere Current Source and Range Module:	
Power Input:	120V, 60 Hz, 10A *(Cat. No. 247100)* 230V, 50/60 Hz, 10A *(Cat. No. 247100-47)*
Output:	1 Volt, 100A dc
Weight:	20- ½ pounds (9.3 kg)

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Dimensions:	13 ½" wide x 9 ½" deep x 7 1/2" high (34.2 x 29.1 x 19 cm)
Test Lead Requirements:	
Potential Leads (P1, P2):	No limitations.
Current Leads (C1, C2):	6.7 milliohms each. *Deviations will not affect accuracy, but resistance changes may result in less than 100A test current.*

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Section D
OPERATING PROCEDURE

FOLLOW THE SAFETY PRECAUTIONS OF SECTION B

MEASUREMENTS ON 600µO (100-Ampere) DLRO Range

1. Connections and Turn-On

Connect the test sample to the terminals as shown in Figure 13. Make sure the current connections are clean and tight.

Provide power for the display in the measuring module, either by pre-charging its internal battery or by connecting the charger or the line supply. Remove the small jumper plug on the measuring module and connect the cable from the power supply in its place. Remove any connections to the terminals on the measuring module.

Connect the power cord from the power supply unit to the line. Set the ON/OFF switch on the measuring module to the LOCK position. Turn the ON/OFF power supply switch ON.

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2. Test Current Adjustment

Test current indicated on the ammeter should be 100A. If adjustment is necessary, it can be made by the current adjustment knob. Fluctuations in test current may be caused by line voltage swings or poor connections.

3. Test Time

Reading will settle in ten seconds or less. Shut off power (Switch on supply to OFF) as soon as reading is complete.

CAUTION: BEWARE OF BURNS!

The current leads become warm after a few minutes of operation. Poor connections to the item under test or in the item under test itself if it is physically small or poorly cooled may result in a very hot item.

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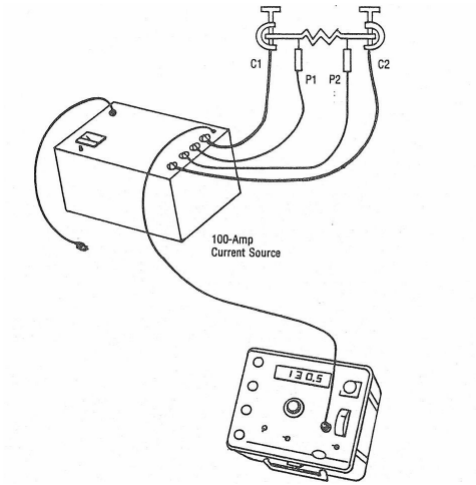


Figure 6: Arrangement for Making Measurements in the 100-Ampere Range

The maximum duty cycle for rated accuracy is:

At 50°C ambient: continuous.

4. Display

The display reads directly in micro-ohms regardless of the range switch setting on the instrument.

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MEASUREMENTS ON HIGHER RESISTANCE RANGES

To use the instrument on its other ranges, replace the small jumper plug in the panel. Operation is now as described for Cat. No. 247000 in Part 1.

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Section E
MAINTENANCE

Before calibrating the 600 micro-ohm range, be sure that the measuring module is calibrated as shown in Part I.

Connect the test leads to a resistance standard of about 100 micro-ohms which will tolerate 100 Amperes. A “Reichsanstalt” type standard is suggested. The calibration adjustment for the 600 micro-ohm range can be reached by a small screwdriver after carefully removing the power supply from the case. The unit is a close fit in the case and care must be used in removal or replacement in its case. Adjust so that the display indicates the value of the standard being measured.

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Section G
RECOMMENDED TEST LEADS

Megger test leads recommended for use with the 100-ampere range are as follows:

Potential Leads, Pair, with Single Hand Spikes:

Cat. No. 242021-7	5 ft. #14 AWG.
Cat. No. 242021-18	20 ft. #10 AWG.
Cat. No. 242021-30	31 ft. # 8 AWG.

Current Leads, Pair (6-7 milliohms each lead):

Cat. No. 242144-16	16 ft. AWG. with "C" clamp, approx. 8 lbs. each.
Cat. No. 242144-26	26 ft. AWG. with "C" clamp, approx. 17 lbs. each.

Combination Leads
(Pair of Comb. Potential & 100 Amp Current Leads):

Cat. No. 242104-2-16	16 ft. Duplex Clamp leads
Cat. No. 242104-26	26 ft. Duplex Clamp Leads.

NOTE:	*Contact Factory for Leads having special terminations, or for lengths not listed above.*

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Section H
WARRANTY and REPAIR

WARRANTY

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Prepaid and Insured and marked for the attention of the Instrument Service Manager.

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Section J
FIELD REPLACEABLE PARTS LIST

PART NO.	QTY		DESCRIPTION
4127-1	1		Input Cable

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-11 OPTION INPUT PROTECTION

The revised circuit does not degrade calibration or performance. The customer must use the same rating fuses as provided on original installation (one set of spare fuses supplied with instrument. The safety precaution *"Do Not Connect This Instrument To Energized Circuits"* remains in effect. This new option does not add any protection to the user. The input protection statement for this option will Change from one volt across any two of the Rx terminals to 30 volts peak. This voltage will cause one or two fuses to melt but will not degrade performance after new fuses are installed.

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