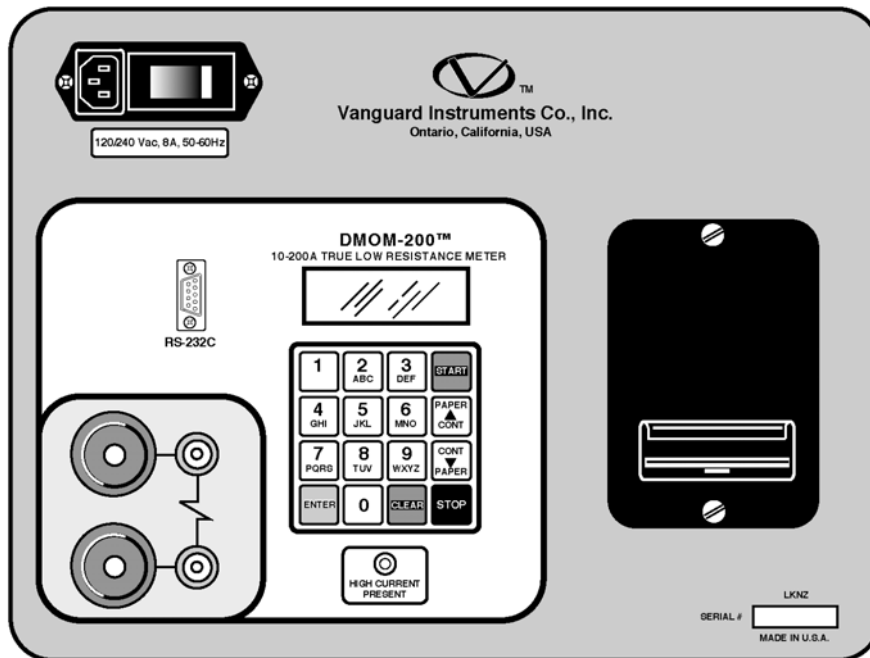

OPERATING PROCEDURES
for the
MODEL DMOM-200™
10-200 Amperes True DC
Digital Micro-Ohm Meter
Part Number VIC-9000-100



dmom200.010607



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AUGUST 2001
REV. 0

SAFETY SUMMARY

The following safety precautions must be observed during all phases of test set-up, test hookups, testing, and test-lead disconnects.

Do Not Service or Test Alone

Do not perform test procedures or service unless another person is also present who is capable of rendering aid and resuscitation.

Avoid Contact with High Voltage

Because electrical utility station environments contain high voltages and currents, there is always the possibility of personal contact with an unexpected lethal voltage generated by magnetic induction and/or electrostatic leakage from nearby live circuitry. When test units are connected to deenergized (“dead”) power lines, regardless of how short they are, always discharge the lines before attaching any test lead. Because of the possibly deadly consequences of physical contact with such high-voltage lines, engineers and technicians must always treat electrical equipment and hookups as though a lethal condition will eventually occur.

Therefore, no matter how unlikely it may seem, never assume anything about the safety of any test setup.

Ensure the safety of personnel by checking first-hand to eliminate all possible hazards!

Do Not Test Inductive Winding Resistance

Because the DMOM-200™ produces test currents up to 100 amperes, it is able to build up large magnetic fields in iron-core transformers. The interruption of such test currents can produce a high voltage spike that can cause severe injury, death, and/or equipment damage. Therefore, do not attempt to measure the resistance of iron-core transformer windings (use equipment designed specifically for that purpose).

Do Not Modify Test Equipment

Because of the added risk of introducing additional or unknown hazards, do not install substitute parts or perform any unauthorized modification to the DMOM-200™. To ensure that designed safety features are maintained, it is recommended that all DMOM-200™ repairs be done at Vanguard Instruments Company or by an authorized repair-service. Unauthorized DMOM-200™ modifications can create unknown safety hazards and will void the warranty.

Follow Exact Operating Procedures

Any deviation from the operating procedures described in this manual may create one or more safety hazards, damage the DMOM-200™ or cause test errors; Vanguard Instruments Co. assumes no liability for unsafe or improper use of the DMOM-200™.

TABLE OF CONTENTS

Safety Summary

1.0 INTRODUCTION	1
1.1 Applicability	1
1.2 Supersedure Notice	1
1.3 General Description	1
1.4 Functional Description.....	1
1.5 Furnished Test Accessories	1
2.0 DMOM-200™ Specifications	2
3.0 CONTROLS AND INDICATORS.....	3
4.0 PRETEST SETUP	5
4.1 Operating Voltages	5
4.2 DMOM-200™ Printer Paper.....	6
4.3 DMOM-200™ Cable Connections	6
5.0 OPERATING PROCEDURES.....	7
5.1 Operating Overview.....	7
5.2 Preparation	7
5.3 Keying-in Data Characters.....	7
5.4 Run Test Procedure.....	10
5.5 Enter ID Procedure	13
5.6 Review Record Procedure	15
5.7 Restore Record Procedure	17
5.8 Print Test Record Directory Procedure.....	19
5.9 Test Record Procedure.....	20
5.10 Computer Interface Procedure	21
5.11 Set Clock Procedures	21
5.12 Calibration Check	22

Appendix A DMOM-200™ Troubleshooting Guide

Appendix B DMOM-200™Cable Accessories

LIST OF TABLES

Table 1.0 DMOM-200™ Specifications and Leading Particulars	2
Table 2.0 DMOM-200™ Controls and Indicators	4
Table 3.0 Voltage Selection	5
Table 4.0 Run Test Procedure (Measure an Unknown Resistance).....	10
Table 5.0 Run Setup Procedure (test-record, site, and equipment identification)	13
Table 6.0 Review Record Procedure	15
Table 7.0 Restore Record Procedures	17
Table 8.0 Print Test Record Directory	19
Table 9.0 Erase Test Record Procedure	20
Table 10.0 Computer Interface Procedures	21
Table 11.0 Set Clock Procedures	21
Table 12.0 Calibration Check Procedure	22

LIST OF FIGURES

Figure 1.0 DMOM-200™ Control Panel (Controls and Indicators)	3
Figure 2.0 90 to 130Vac Jumper Setting	5
Figure 3.0 210 to 240Vac Jumper Setting	5
Figure 4.0 DMOM-200™ Cable Connection	6
Figure 5.0 Step-by-Step Procedures for DMOM-200™ Operations	8
Figure 6.0 Typical DMOM-200™ Tabulated Report Printout	12
Figure 7.0 Typical Directory Printout	19
Figure 8.0 Bus Bar Connection	23

1.0 INTRODUCTION

1.1 Applicability

This manual applies to the Model DMOM-200™, part number VIC-9000-100, which is made by Vanguard Instruments Company.

1.2 Supersedure Notice

This manual is the basic issue for the Model DMOM-200™ and does not supersede any published document.

1.3 General Description

The DMOM-200™ is a Digital Micro-Ohm Meter for precisely measuring non-inductive resistances from 1 micro-ohm to 300 milliohms. Applications include resistance measurement of circuit-breaker contacts, bushing joints, or any other low resistance. It is field-portable, rugged, and easily operated by first-time users having little training (its microprocessor-driven, which automates many functions). It has a 16-key pushbutton pad for entering test parameters and control functions, and a 4-line by 20-character LCD readout for displaying control-option menus, measured resistance values, and related identifying data. The DMOM-200™ has a built-in thermal printer, which prints test data on 2.5-inch-wide thermally sensitive paper.

Operation requires little more than connecting the test leads to an unknown resistance and selecting the test parameters; It requires no calculation of lead-loss, handwritten notes, or the memorizing of detailed routines. Operators select the test current (10 to 200 amperes) and test time (5 to 60 seconds). Measured resistance data is displayed and can be printed on the thermal printer. The measured resistance data can also be stored (up to 63 records of 96 readings each) in FLASH EEPROM memory; Operators can recall the stored resistance-measurements and related data at a later time for review and printing.

1.4 Functional Description

DMOM-200™ operation is based on the electrical relationships described by Ohm's law: $R=V/I$, where I is a known test current and V is the voltage across the unknown resistance (e.g., breaker contacts). Since the test current through the unknown resistance is known and voltage across it is read by the microprocessor, the resistance is calculated using Ohm's law.

The DMOM-200™ test voltage is supplied by a filtered direct-current power supply. A precisely regulated constant-current source controls the current ramps up/down time and the test current. The dc test current (10 to 200 amps) slowly ramps up/down, which virtually eliminates magnetically induced transients; thus, the *risk of inductively tripping a circuit-breaker's bus differential relay is virtually non-existent.*

DMOM-200™ voltmeter test leads are run separately from the current-bearing test leads to the resistive load; thus, voltages are measured at the terminals of the resistance being measured, eliminating error from the I•R voltage drop in the test current cables. The DMOM-200™ makes precise micro-ohm measurements possible without calculating compensation for test-current-lead resistance errors.

1.5 Furnished Test Accessories

The DMOM-200™ is supplied with a power cord, a roll of 2.5-inch-wide printer paper, and one 35-foot test cable set with quick-disconnect plugs to the unit and heavy-duty alligator clamps to the load. Heavy-duty welding-type C-clamps (see Appendix B) are also available as optional accessories (C-clamps allow test-lead connection to a wide variety of bushing sizes, bus bars, and many other junctions that require low-contact resistance).

2.0 DMOM-200™ SPECIFICATIONS

Table 1.0 DMOM-200™ Specifications and Leading Particulars

MODEL	DMOM-200™ (part number VIC-9000-100)
TYPE	Special-purpose test equipment, portable; 100-ampere, Digital Micro-Ohm Meter
POWER	85 to 132 V ac or 200-240 V ac (selectable), 50/60 Hz
SIZE (inches)	16.8 wide by 12.6 high by 10.6 deep
WEIGHT	Less than 21 lbs
TEST CURRENT	10 to 200 amperes
RESISTANCE READING RANGE ...	1 micro-ohm to 300 milliohms
ACCURACY	±1% reading, ± 1 count
DISPLAY	LCD, 4-line by 20-character, back lighted
CONTROLS	Keypad: 10 number keys and 6 function keys
COMPUTER INTERFACE	RS-232C
PRINTER	Thermal printer (prints on 2.5-inch-wide thermal paper)
ENVIRONMENT	Operating: 0°C to 55°C; Storage: -40°C to 65°C
FURNISHED	One power cord, one 35-foot test cable set, One cable bag
EXPENDABLES	Paper, thermally sensitive, 2.5-inch wide roll (VIC part # TP-3)
WARRANTY	One-year warranty on parts and labor; post warranty service contracts available

NOTE:

- THE ABOVE SPECIFICATIONS ARE VALID AT NOMINAL OPERATING VOLTAGE AND AT A TEMPERATURE OF 25°C (77°F)
- DMOM-200™ SPECIFICATIONS MAY BE UPGRADED AND CHANGED WITHOUT PRIOR NOTICE.

3.0 CONTROLS AND INDICATORS

(See Figure 1.0 and refer to Table 2.0).

The DMOM-200™ controls and indicators are shown in a panel illustration (see Figure 1.0). Pointing leader lines reference each item in the figure with an index number. Each index number is cross-referenced to a functional description in Table 2.0, which describes the purpose of each item on the

control panel. Although the purpose of these controls and the display may seem obvious, users should become familiar with them before attempting to use the DMOM-200™. However, accidental misuse of the controls will usually cause no serious loss of data or equipment damage. First-time users should review and become familiar with the Safety Summary located in the front section of this manual.

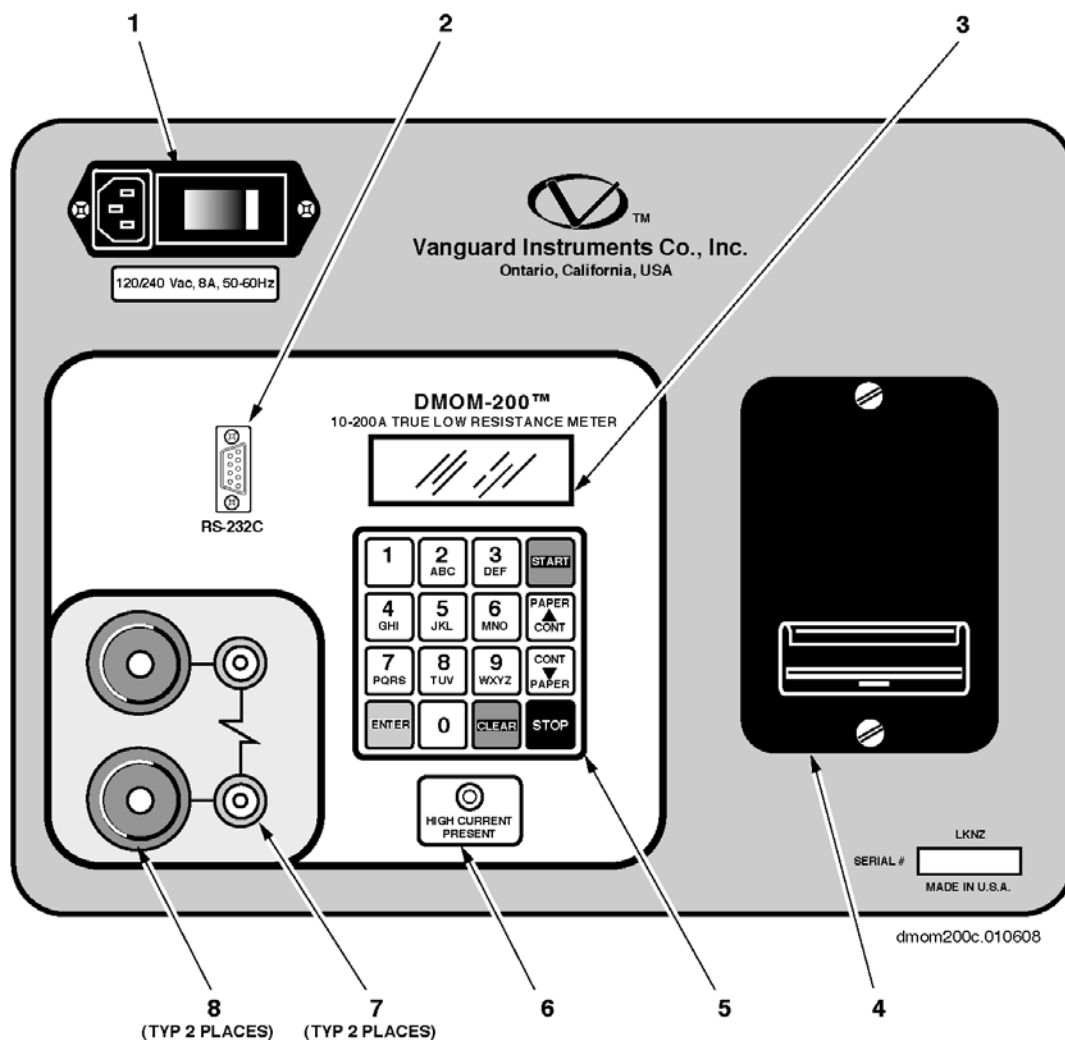


Figure 1.0 DMOM-200™ Control Panel (Controls and Indicators)

Table 2.0 DMOM-200™ Controls and Indicators

Fig. 1 Index	PANEL MARKING	FUNCTIONAL DESCRIPTION								
1	ON/OFF	Input power connector with third-wire safety ground and 10A built-in circuit breaker.								
2	RS-232C	Connector, 9-pin; Serial interface-port connector (female DB type) to allow the DMOM-200™ to be controlled by an IBM-compatible PC. <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><u>PIN</u></td> <td style="text-align: center;"><u>SIGNAL</u></td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">Tx</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">Rx</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">Signal Gnd</td> </tr> </table>	<u>PIN</u>	<u>SIGNAL</u>	2	Tx	3	Rx	5	Signal Gnd
<u>PIN</u>	<u>SIGNAL</u>									
2	Tx									
3	Rx									
5	Signal Gnd									
3	(no marking)	Display, back-lighted liquid crystal (LCD); 4-line by 20-character; sunlight readable; displays test menus (operator options), status, and test results (See Figure 2 for operating displays of control steps in logical flow sequence).								
4	(no marking)	Built-in thermal printer; prints test result data on 2.5-inch-wide thermal paper.								
5	(no overall marking; keys are individually marked—see Figure 1)	Operating key-pad controls; 10 alpha-numeric keys and 6 function keys (i.e., START, STOP, CLEAR, ENTER, & CONTRAST/PAPER positioning \wedge & \vee).								
6	HIGH CURRENT PRESENT	Warning indicator; red LED; Lights when high current is running through the test leads.								
7	(no marking)	Voltage-sensing test-lead plug-in sockets (2), red; reads voltage at test load.								
8	(no marking)	Test-current lead plug-in sockets (2), red; conducts up to 100 amperes through unknown resistances.								

3.1 DMOM-200™ LCD Contrast Control

To Darken the LCD display, press and hold the “Paper \wedge Contrast” switch for two seconds; to lighten the LCD display, press and hold the “Paper \vee Contrast” switch for two seconds.

3.2 DMOM-200™ Printer Control

To advance printer paper, press “Paper \wedge Contrast” switch once. Paper will advance from printer. Press “Paper \vee Contrast” switch once, paper will advance backward from printer.

3.3 RS-232C Computer-Interface port

An IBM PC software package is supplied with each DMOM-200™ allows the user to retrieve test records stored in the DMOM-200™ memory.

PRETEST SETUP

4.1 Operating Voltages

The DMOM-200™ operating voltages are selectable between 90-130Vac, 50/60Hz or 210-240, 50/60Hz. Voltage selection is set

by the placement of jumpers on the power terminal block as listed in Table 3.0 below and Figures 2.0 and 3.0.

Table 3.0 Voltage Selection

VOLTAGE SELECTION	TERMINAL BLOCK JUMPERS
90-130Vac	Brown to blue & yellow to green
210-240Vac	Blue to yellow

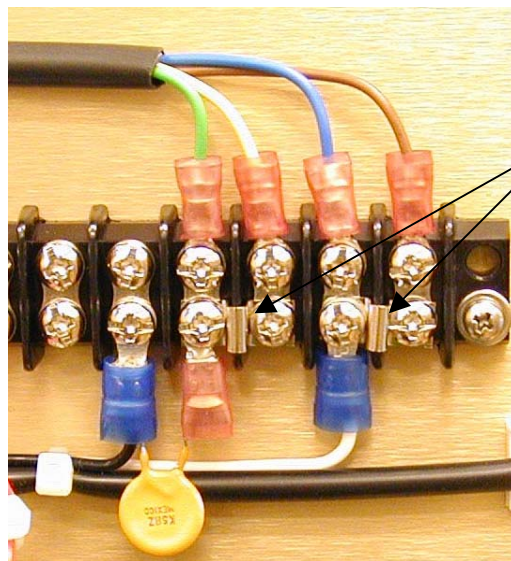


Figure 2.0 90 to 130Vac Jumper Setting

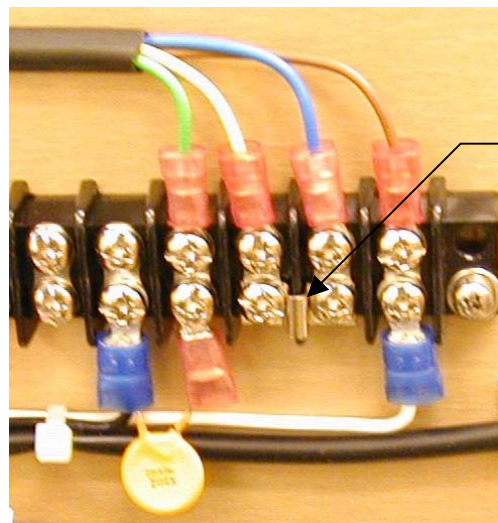


Figure 3.0 210 to 240Vac Jumper Setting

4.2 DMOM-200™ Printer Paper

The DMOM-200™ printer uses 2.5-inch wide thermal paper for printing test results. We recommend that to maintain the highest quality printing and to avoid paper jamming, use paper supplied by our factory. Paper can be ordered from two sources, as follows:

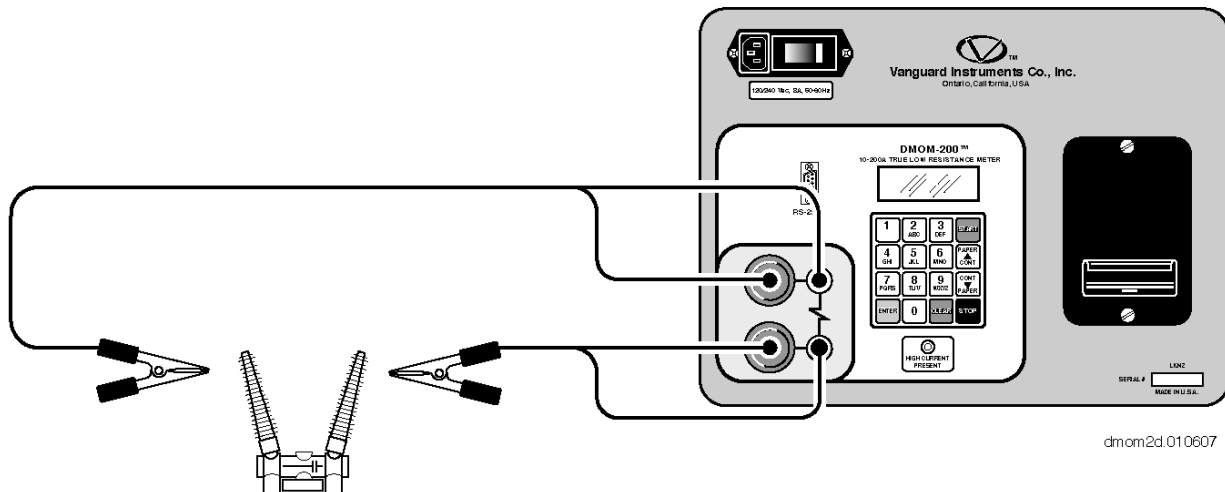
Vanguard Instruments Co, Inc.
 1710 Grevillea Court
 Ontario, CA 91761
 Tel: 909-923-9390
 Fax: 909-923-9391
 Part Number: TP-3 Paper

OR

BG Instrument Co.
 Route 1, Box 258
 Mead, WA 99201
 Tel: 509-893-9881
 Fax: 509-893-9803
 Part Number: TP-3 paper

4.3 DMOM-200™ Cable Connections

The DMOM-200™ is supplied with a 35-foot test cable set. Each cable consists of a current-carrying cable and a voltage-sensing cable. The current-carrying cable is terminated with a 100-ampere male plug. The sensing cable is terminated with a 25-ampere female plug. Insert the current-cable plugs and voltage-sensing plugs into their respective control-panel jacks (see Figure 4.0 below). Ensure that *voltage plugs (smaller)* are inserted into jacks adjacent to their companion current jacks (larger).



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Figure 4.0 DMOM-200™ Cable Connection

4.0 OPERATING PROCEDURES

(Refer to Tables 4.0 through 12.0)

5.1 Operating Overview

(See Figure 5.0, for step-by-step flow.)

Procedures for operating the DMOM-200™ are presented in tabular format, with a different table for each of the main menus (START and SETUP) procedures. Each procedural step is indexed by number and indicates an operator action, followed by a description of the result or what should be observed to confirm the action (setting the stage for the next step). All operations are described in step-by-step sequences and begin with the start menu (shown below):

START MENU

1. RUN TEST	06/11/01
2. SETUP	12:23:01
3. CAL CHECK	

Item 1 on this menu (RUN TEST) is the procedure for measuring an unknown resistance. Item 2 (SETUP) is for record identification in the DMOM-200™. Item 2 (SETUP) expands into a menu of support functions. Item 3 (CAL CHECK) is a performance-verification procedure for checking key circuit functions (refer to table 11). All operator procedures begin with the START MENU and may continue on the SETUP MENU, with each step-by-step procedure presented in tabular form.

SETUP MENU

1. ENTER ID
2. REVIEW RECORD
3. RESTORE RECORD
4. NEXT PAGE

The SETUP MENU lists 4 user options: Item 1 (ENTER ID) is used to specify identification record data (please observe instructions in note 2 on Figure 5.0, Step-by-Step Procedures for DMOM-200™

Operations). Item 2 (REVIEW RECORD) is used to review store records. Item 3 (RESTORE RECORD) is used to erase or restore test records or to print a directory of test records in stored memory. Item 4 (NEXT PAGE) is used to put the DMOM-200™ under PC control or to set the time and date clock.

5.2 Preparation

Plug unit power plug into power service outlet. Set unit main power switch to ON position. Plug test-lead cable plugs into red jacks on control panel (ensure current and voltage-sensing cables are plugged into companion jacks). Connect current and voltage-sensing test lead clamps to opposite terminals of resistance to be measured.

5.3 Keying-in Data Characters

Unless otherwise prompted by the display, keyed-in data is loaded by pressing the ENTER key (which also changes the display to go to the next screen). When using the alpha/numeric keys (like telephone dial-in pushbuttons; see item 5 of Figure 1.0) to specify data characters: Press the key once to set the number marked on the key. Press the key a second time to set the first letter marked on the key. Press the key a third time to select the second letter marked on the key. Press the key a fourth time to select the third letter marked on the key.

Additional key presses will repeat the selection cycle (e.g., 2, A, B, C, 2 . . .). When the character of choice is selected, press the ^ key to advance to next character space; press the v key to back-space. Press CLEAR to delete a selected character (cursor must be on character to be deleted). Again, press the "ENTER" key to load all character selections.

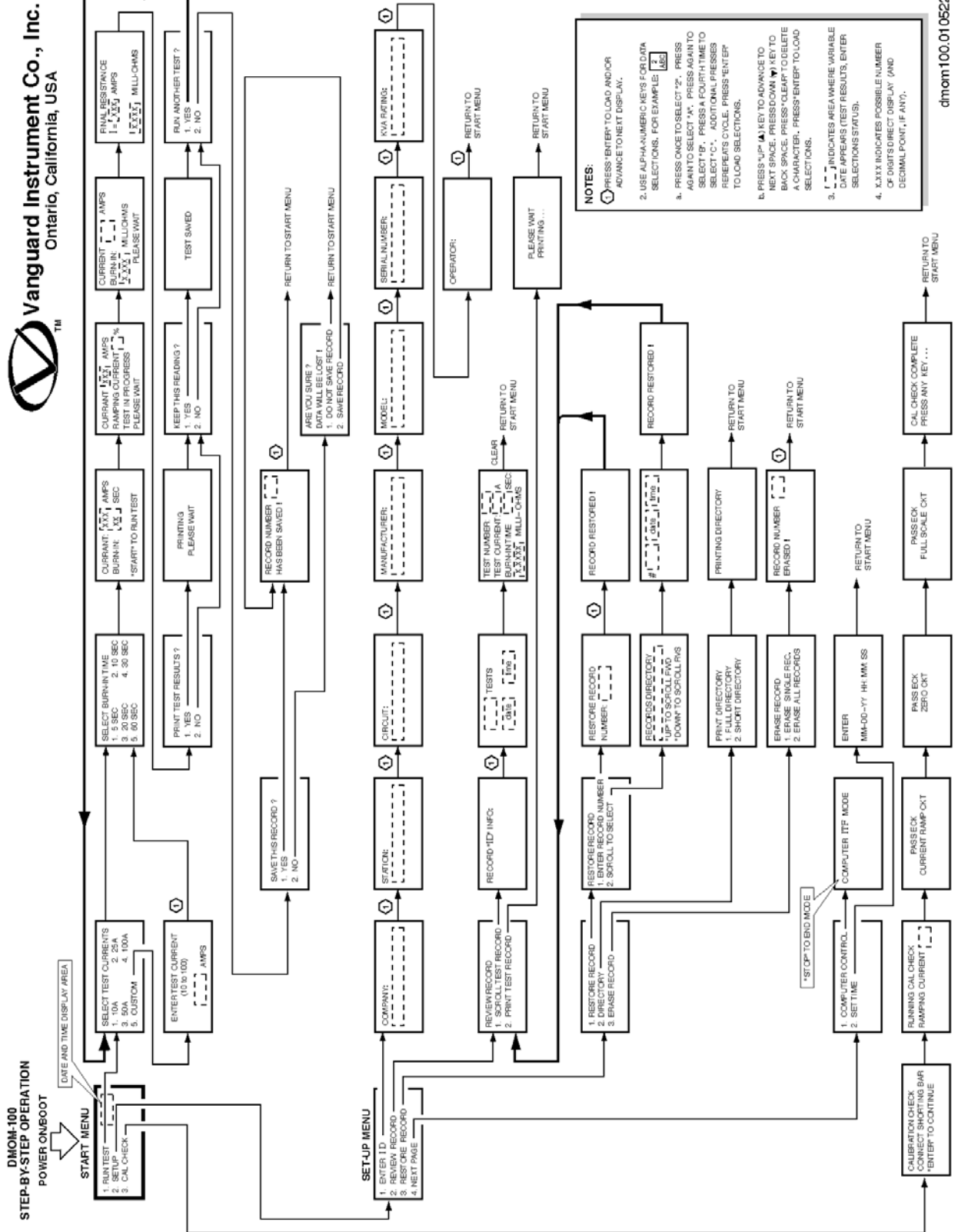


Figure 5.0 Step-by-Step Procedures for DMOM-200™ Operations

5.4 Run Test Procedure

The following procedure describes the steps to measure an unknown resistance.

NOTE

The red HIGH CURRENT PRESENT indicator will begin flashing when the test current are applied to resistance load.

Table 4.0 Run Test Procedure (Measure an Unknown Resistance)

STEP	ACTION	DMOM-200™ DISPLAY
4-1	Begin RUN TEST procedure: Press key no. 1 on START MENU. "SELECT TEST CURRENT" menu appears.	<div style="border: 1px solid black; padding: 5px;"> <p>SELECT TEST CURRENT:</p> <p>1. 10A 2. 25A</p> <p>3. 50A 4. 100A</p> <p>5. CUSTOM</p> </div>
4-2	Select test current: Press key for desired test current. If a test current is other than listed in items 1 thru 4, then press key # 5 for user-defined (CUSTOM) test current and go to step 4-2a. If menu items 1 thru 4 were pressed, then SELECT BURN-IN TIME menu appears. Go to step 4-3. <p style="text-align: center;">NOTE</p> Select 5-second burn-in time in this example.	<div style="border: 1px solid black; padding: 5px;"> <p>SELECT BURN-IN TIME:</p> <p>1. 5 SEC 2. 10 SEC</p> <p>3. 20 SEC 4. 30 SEC</p> <p>5. 60 SEC</p> </div>
4-2a	Custom select burn-in current level entry by pressing numeric keys, then press ENTER and go to step 4-3. <p style="text-align: center;">NOTE</p> For this example, we used 100A test current.	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">ENTER TEST CURRENT</p> <p style="text-align: center;">(10 to 200)</p> <p style="text-align: center;">100 AMPS</p> </div>
4-3	Select burn-in time by pressing the key (1 - 6) that corresponds to desired burn-in time (see display on step 4-2). Display of selected test current and burn-in time appears.	<div style="border: 1px solid black; padding: 5px;"> <p>CURRENT: 100 AMPS</p> <p>BURN - IN: 5 SEC</p> <p>"START" TO RUN TEST</p> </div>
4-4	Press START key to run resistance measurement test. Display of ramping current and percent of ramp level displays with the notice TEST IN PROGRESS. When test current has ramped up to the specified level (current is at 100%), the test result display appears automatically.	<div style="border: 1px solid black; padding: 5px;"> <p>CURRENT: 100 AMPS</p> <p>RAMPING CURRENT 10%</p> <p>TEST IN PROGRESS</p> <p>PLEASE WAIT</p> </div>
4-5	Automatic; no operator action required. Current, burn-in time, and resistance measurement changes on the display during burn-in. At the end of burn-in time, final resistance measurement displays.	<div style="border: 1px solid black; padding: 5px;"> <p>CURRENT: 100 AMPS</p> <p>BURN-IN: 5 SEC</p> <p>500.5 MICRO-OHMS</p> <p>PLEASE WAIT</p> </div>

Table 4.0 Run Test Procedure (Measure an Unknown Resistance)
(Continued)

STEP	ACTION	DMOM-200™ DISPLAY
4-6	Automatic; no operator action required. At the end of burn-in time final resistance displays. Press the “ENTER” key to go to next display.	<div style="border: 1px solid black; padding: 5px;"> <p>FINAL RESISTANCE I= 100 AMPS 500.5 MICRO-OHMS</p> </div>
4-7	Automatic: Print test result option display.	<div style="border: 1px solid black; padding: 5px;"> <p>PRINT RESULTS? 1. YES 2. NO</p> </div>
4-8	Printing option: When the “PRINT TEST RESULTS?” displays, press #1 key to print. Typical print out is shown in Figure 6.0. If no printout is needed, then go to next step.	<div style="border: 1px solid black; padding: 5px;"> <p>PRINTING PLEASE WAIT</p> </div>
4-9	Automatic; No operator action is required. When test report completes printing, “KEEP THIS READING?” displays.	<div style="border: 1px solid black; padding: 5px;"> <p>KEEP THIS READING? 1. YES 2. NO</p> </div>
4-10	“KEEP THIS READING?” If the tested resistance measurement is to be stored in test record buffer, press # 1 key (YES). If no record of the test is to be stored in memory, then press # 2 key (NO).	<div style="border: 1px solid black; padding: 5px;"> <p>TEST SAVED</p> </div>
4-11	Automatic; No operator action is required. “RUN ANOTHER TEST?” displays.	<div style="border: 1px solid black; padding: 5px;"> <p>RUN ANOTHER TEST? 1. YES 2. NO</p> </div>
4-12	If another test needs to be run, then press #1 key (YES). Beginning test options (SELECT TEST CURRENT:) menu displays (return to step # 4-1). If another test is <i>not</i> needed, then press #2 key (NO) and go to step 4-14.	<div style="border: 1px solid black; padding: 5px;"> <p>SELECT TEST CURRENT: 1. 10A 2. 25A 3. 50A 4. 100A 5. CUSTOM</p> </div>
4-13	Return to step #1 to setup for another test (repeat sequence from step 4-1 to step 4-11).	Step 4-1 thru 4-11 displays repeat.

Table 4.0 Run Test Procedure (Measure an Unknown Resistance)
(Continued)

STEP	ACTION	DMOM-200™ DISPLAY
4-14	“SAVE THIS RECORD?” displays when another test was not selected in step 4-12. Test record contains all the reading taken in this test.	<div style="border: 1px solid black; padding: 5px;"> <p>SAVE THIS TEST RECORD? 1. YES 2. NO</p> </div>
4-15	<p>To save this record, press key #1 (YES). If test record is <i>not</i> to be saved, press key #2 (NO) and go to step 4-17.</p> <p style="text-align: center;">NOTE</p> <p>A test record is saved in Flash EEPROM. A record number will be automatically assigned to the record by the DMOM-200™. (The Test record was assigned #2 in this example).</p>	<div style="border: 1px solid black; padding: 5px;"> <p>RECORD NUMBER 2 HAS BEEN SAVED!</p> </div>
4-16	When record is saved (record # shows on display), press ENTER to return to START MENU, which presents options for all step-by-step operating procedures.	<div style="border: 1px solid black; padding: 5px;"> <p>1. RUN TEST 06/11/01 2. SETUP 12:24:01 3. CAL CHECK</p> </div>
4-17	Pressing key #2 (NO) on SAVE THIS TEST RECORD (see step 4-14) causes the ARE YOU SURE? Prompt (shown at right).	<div style="border: 1px solid black; padding: 5px;"> <p>ARE YOU SURE? DATA WILL BE LOST! 1. DO NOT SAVE RECORD 2. SAVE RECORD</p> </div>
4-18	In response to ARE YOU SURE? If key #1 is pressed, test record will be erased from working buffer and display returns to “START MENU”. If key #2 is pressed, the test record will be saved in Flash EEPROM. Test record number assigned to this record will also be displayed. Exit the RECORD SAVED display by pressing ENTER, which returns display to the START MENU.	<div style="border: 1px solid black; padding: 5px;"> <p>1. RUN TEST 2. SETUP 3. CAL CHECK</p> </div>

This ends the RUN TEST procedure.

TEST RESULTS	
DATE: 06/07/01	TIME: 09:57:02
COMPANY:	VANGUARD INSTRUMENTS
STATION:	SHOP
CIRCUIT:	1710 GREVILLEA CT
MFR:	VIC
MODEL:	ABC
S/N:	123456
KVA RATING:	45 MVA
OPERATOR:	HAI
TEST CURRENT: 100 AMPS	
BURN-IN TIME: 5 Seconds	
TEST RESULT: 500.3 MICRO-OHMS	
NOTES: _____	
TEST CURRENT: 50 AMPS	
BURN-IN TIME: 5 Seconds	
TEST RESULT: 500.3 MICRO-OHMS	
NOTES: _____	
DATE: 06/07/01	TIME: 09:57:45

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 SERIAL NUMBER: 90013

Figure 6.0 Typical DMOM-200™ Tabulated Report Printout

5.5 Enter ID Procedure

This procedure allows the user to enter the equipment identification to the test record.

Table 5.0 Run Setup Procedure (test-record, site, and equipment identification)

STEP	ACTION	DMOM-200™ DISPLAY
5-1	Press key # 2 (SETUP MENU) on START MENU to go to Setup menu (shown at right).	<div style="border: 1px solid black; padding: 5px;"> <p>1. ENTER ID 2. REVIEW RECORD 3. RESTORE RECORD 4. NEXT PAGE</p> </div>
5-2	On SETUP MENU, press #1 key (ENTER ID) to begin identification entry (begins with “COMPANY” display). Note: Other setup options go to the following procedural tables: 1. Review Record procedure in Table 6.0 2. Restore Record Procedure in Table 7.0 3. NEXT PAGE procedures.	<div style="border: 1px solid black; padding: 5px;"> <p>COMPANY:</p> </div>
5-3	Enter utility COMPANY name using alpha/ numeric keypad. When the COMPANY name is keyed in, press ENTER to load keyed data and go to STATION identification display.	<div style="border: 1px solid black; padding: 5px;"> <p>STATION:</p> </div>
5-4	Enter utility STATION name using alpha/ numeric keypad. When STATION name is keyed in, press ENTER to load keyed data and go to CIRCUIT identification display.	<div style="border: 1px solid black; padding: 5px;"> <p>CIRCUIT:</p> </div>
5-5	Enter utility CIRCUIT name using alpha/ numeric keypad. When CIRCUIT name is keyed in, press ENTER to load keyed data and go to MANUFACTURER identification display.	<div style="border: 1px solid black; padding: 5px;"> <p>MANUFACTURER:</p> </div>
5-6	Enter tested item’s MANUFACTURER name using alpha/numeric keys. When the manufacturer’s name is keyed in, press ENTER to load keyed data and go to MODEL identification display.	<div style="border: 1px solid black; padding: 5px;"> <p>MODEL:</p> </div>

**Table 5.0 Run Setup Procedure (test-record, site, and equipment identification)
(continued)**

STEP	ACTION	DMOM-200™ DISPLAY						
5-7	Enter test item's MODEL using alpha/numeric keypad. When item's MODEL is keyed in, press ENTER to load keyed data and go to SERIAL NUMBER identification display.	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> SERIAL NUMBER: </div>						
5-8	Enter test item's SERIAL NUMBER using alpha/numeric key pad. When serial number is keyed in, press ENTER to load keyed-in data and go to KVA RATING display.	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> KVA RATING: </div>						
5-9	Enter test items KVA RATING using alpha/numeric keypad. When KVA RATING is keyed in, press ENTER to load keyed-in data and go to OPERATOR identification display.	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> OPERATOR: </div>						
5-10	Enter test OPERATOR name, using alpha/numeric keypad. When OPERATOR name is keyed in, press ENTER to load keyed-in data and return to START MENU display.	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">1. RUN TEST</td> <td style="text-align: right; padding: 2px;">06/11/01</td> </tr> <tr> <td style="padding: 2px;">2. SETUP</td> <td style="text-align: right; padding: 2px;">12:26:01</td> </tr> <tr> <td style="padding: 2px;">3. CAL CHECK</td> <td></td> </tr> </table> </div>	1. RUN TEST	06/11/01	2. SETUP	12:26:01	3. CAL CHECK	
1. RUN TEST	06/11/01							
2. SETUP	12:26:01							
3. CAL CHECK								

This completes the ENTER ID procedure.

5.6 Review Record Procedure

This procedure describes steps to review a test record residing in DMOM-200™ working memory. The user can view the record on the LCD display or from a thermal printout.

NOTE

To review a test record stored in Flash EEPROM, the user must first restore test record from Flash EEPROM to working memory (see paragraph 5.7)

Table 6.0 Review Record Procedure

STEP	ACTION	DMOM-200™ DISPLAY
6-1	On START MENU, press key #2 (SETUP) to select SETUP MENU (shown at right).	<div style="border: 1px solid black; padding: 5px;"> <p>1. ENTER ID 2. REVIEW RECORD 3. RESTORE RECORD 4. NEXT PAGE</p> </div>
6-2	Press key#2 (REVIEW RECORD) on SETUP MENU, which displays the REVIEW RECORD menu options.	<div style="border: 1px solid black; padding: 5px;"> <p>REVIEW RECORD</p> <p>1. SCROLL TEST RECORD 2. PRINT TEST RECORD</p> </div>
6-3	If test-result records are to be printed out on paper, press #2 key (PRINT TEST RECORD) on the REVIEW RECORD display. Test records print out as the printing notice displays. When printout of test records is complete, display returns to START MENU, which ends the procedure for this branch of the SETUP procedure.	<div style="border: 1px solid black; padding: 5px;"> <p>PLEASE WAIT PRINTING . . .</p> </div>
6-4	If records are to be viewed in sequence (scrolled), press key #1 (SCROLL TEST RECORDS) on the REVIEW RECORD display. Scroll through test records (use ^ and v keys to scroll). When record of interest appears, stop scrolling and press ENTER.	<div style="border: 1px solid black; padding: 5px;"> <p>RECORD ID INFO:</p> <p>1710 VIC ABC</p> </div>
6-5	When the scrolled data record of interest displays, press ENTER key. Selected test record ID displays the selected test record number. When it is confirmed that the correct test record ID has been selected, press ENTER to display the number of tests in the record, the time and date of the selected test.	<div style="border: 1px solid black; padding: 5px;"> <p>2 TESTS</p> <p>06/11/01 17:27:00</p> </div>

Table 6.0 Review Record Procedure (continued)

STEP	ACTION	DMOM-200™ DISPLAY
6-6	<p>When the record number, with the time and date of the test, displays and is noted, press the ENTER key: Display lists full data of the test, including test number, test current, burn-in time, and the measured resistance value.</p> <p style="text-align: center;">NOTE</p> <p>The test record in this example contains 2 tests.</p>	<div style="border: 2px solid black; padding: 5px; text-align: center;"> <p>TEST NUMBER: 1 TEST CURRENT: 100A BURN - IN TIME: 5 Sec 500.3 MICRO-OHMS</p> </div>
6-7	<p>Press ^ key to advance to next test. Press v key to return to previous test.</p>	<div style="border: 2px solid black; padding: 5px; text-align: center;"> <p>TEST NUMBER: 2 TEST CURRENT: 50A BURN - IN TIME: 5 Sec 500.1 MICRO-OHMS</p> </div>
6-8	<p>Press STOP to return to START MENU. This completes the review record procedure.</p>	<p>Display returns to START MENU.</p>

5.7 Restore Record Procedure

This procedure describes the steps to recall a test record stored in the DMOM-200™ Flash memory.

Table 7.0 Restore Record Procedures

STEP	ACTION	DMOM-200™ DISPLAY
7-1	On START MENU, press #2 key (SETUP) to display the SETUP MENU.	1. ENTER ID 2. REVIEW RECORD 3. RESTORE RECORD 4. NEXT PAGE
7-2	On SETUP MENU, press #3 key (RESTORE RECORD) to display menu of options (Restore Record, Directory, Erase Record).	1. RESTORE RECORD 2. DIRECTORY 3. ERASE RECORD
7-3	Press #1 key (RESTORE RECORD) to display menu of restore records options.	RESTORE RECORD 1. ENTER RECORD NUMBER 2. SCROLL TO SELECT
7-4	Press key #1 (ENTER RECORD NUMBER) to display prompt to enter record number to restore. Press key #2 (SCROLL TO SELECT) and go to step 7-6 for Records Directory display.	RESTORE RECORD NUMBER:
7-5	When record number has been keyed in, press ENTER to restore the selected record. When the display confirms that the record is restored (brief display time) display returns to REVIEW RECORD options menu (resume procedure at step 7-9 in Table 7.0).	RECORD RESTORED!
7-6	In the RESTORE RECORD menu, press key #2 to display a scrolled Records Directory.	RECORDS DIRECTORY “UP TO SCROLL FWD “DWN” TO SCROLL RVS
7-7	In the Records Directory, use ^ and v keys to scroll through the directory listings of test records. When the test record of interest displays, press the ENTER key to display the record number and the time and date of the selected test.	#1 06/11/01 17:27:00 1710 VIC

Table 7.0 Restore Record Procedures (Continued)

STEP	ACTION	DMOM-200 DISPLAY
7-8	Press ENTER key again to restore selected test record. A Record Restored confirmation displays, after which the display returns to REVIEW RECORD (resumes by returning to step 7-9).	<p>RECORD RESTORED!</p>
7-9	Test ENTER key again to display REVIEW RECORD option.	<p>REVIEW RECORD</p> <p>1. SCROLL TEST RECORD</p> <p>2. PRINT TEST RECORD</p>
7-10	Press key #1 to display data on LCD (see step 6-5). Press key #2 to print test record.	

This completes the Restore Record Procedure.

5.8 Print Test Record Directory Procedure

This procedure describes the steps to print the test record directory that is stored in the DMOM-200™ Flash EEPROM.

Table 8.0 Print Test Record Directory

STEP	ACTION	DMOM-200™ DISPLAY
8-1	On the RESTORE RECORD display (step 7-2), press key #2 (DIRECTORY) to go to a print menu of print options.	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">PRINT DIRECTORY</p> <p>1. FULL DIRECTORY 2. SHORT DIRECTORY</p> </div>
8-2	<p>PRINT DIRECTORY choice is to print either a FULL DIRECTORY or a SHORT DIRECTORY. Regardless of which choice is selected, the PRINTING DIRECTORY notice displays as the selected directory prints out a paper copy. When printout is completed, display returns to the START MENU. This ends the directory procedures.</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">The Short directory printout lists the last 10 test records stored in Flash EEPROM memory.</p>	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">PRINTING DIRECTORY</p> </div>

TEST DIRECTORY
RECORD NUMBER: 2 DATE/TIME: 06/07/01 09:57:45 NUMBER OF TESTS: 4 STATION: SHOP CIRCUIT: 1710 GREVILLEA CT MFR: VIC MODEL: ABC S/N: 123456
RECORD NUMBER: 1 DATE/TIME: 06/07/01 09:55:19 NUMBER OF TESTS: 2 STATION: SHOP CIRCUIT: 1710 GREVILLEA CT MFR: VIC MODEL: ABC S/N: 123456

Figure 7.0 Typical Directory Printout

5.9 Test Record Procedure

This procedure describes the steps to delete a test record or all test records stored in the DMOM-200™ Flash EEPROM.

Table 9.0 Erase Test Record Procedure

STEP	ACTION	DMOM-200™ DISPLAY
9-1	On the RESTORE RECORD display (step 7-2), press key #3 (ERASE RECORD) to display an ERASE RECORD menu of options (shown at right).	<div style="border: 1px solid black; padding: 5px;"> <p>ERASE RECORD 1.ERASE SINGLE RECORD 2. ERASE ALL RECORDS</p> </div>
9-2	On the ERASE RECORD menu display, press key #1 to erase a single record.	<div style="border: 1px solid black; padding: 5px;"> <p>ERASE RECORD NUMBER: XX</p> </div>
9-3	When this selection is made, the user shall enter record number then press ENTER key to confirm. Press ENTER key again to return to main menu. <p style="text-align: center;">NOTE Press STOP key to abort.</p>	<div style="border: 1px solid black; padding: 5px;"> <p>RECORD NUMBER: XX ERASED!</p> </div>
9-4	Press key #2 to erase all records. Press ENTER key to confirm. <p style="text-align: center;">NOTE Press STOP key to abort.</p>	<div style="border: 1px solid black; padding: 5px;"> <p>ERASE ALL RECORDS! Are you SURE? “ENTER” TO CONTINUE</p> </div>
9-5	Press ENTER key to confirm.	<div style="border: 1px solid black; padding: 5px;"> <p>ERASING RECORDS PLEASE WAIT</p> </div>
9-6	Press ENTER key to return to main menu.	<div style="border: 1px solid black; padding: 5px;"> <p>RECORDS ERASED!</p> </div>

5.10 Computer Interface Procedure

This procedure describes the steps to put the DMOM-200™ in computer interface.

Table 10.0 Computer Interface Procedures

STEP	ACTION	DMOM-200™ DISPLAY
10-1	Press key #4 (NEXT PAGE) on the SETUP MENU to display the COMPUTER CONTROL interface (ITF) and SET TIME options menu.	<div style="border: 1px solid black; padding: 5px;"> <p>1. COMPUTER CONTROL 2. SET TIME</p> </div>
10-2	Press key #1 (COMPUTER CONTROL) to place the DMOM-200™ under an external PC's control. PC software permits DMOM-200™ test record to be transferred to the PC. To end the PC control, press the STOP key, which will restore control to the keypad and return to the START MENU display.	<div style="border: 1px solid black; padding: 5px;"> <p>COMPUTER ITF MODE</p> </div>

5.11 Set Clock Procedures

This procedure describes the steps to set the DMOM-200™ real time clock.

Table 11.0 Set Clock Procedures

STEP	ACTION	DMOM-200™ DISPLAY
11-1	When key #4 (NEXT PAGE) is pressed on the SETUP MENU, the COMPUTER CONTROL interface (ITF) and SET TIME options menu displays.	<div style="border: 1px solid black; padding: 5px;"> <p>1. COMPUTER CONTROL 2. SET TIME</p> </div>
11-2	On the first NEXT PAGE menu, press key #2 (SET TIME) to go to steps for setting the time and date clock.	<div style="border: 1px solid black; padding: 5px;"> <p>ENTER MM-DD-YY HH-MM-SS</p> </div>
11-3	Enter month, day, year, hour, minute, and second for real-time clock. Display will now return to the START MENU.	

This completes the Set Clock procedure.

5.12 Calibration Check

This procedure describes the steps to perform the calibration check on the DMOM-200™.

Table 12.0 Calibration Check Procedure

STEP	ACTION	DMOM-200™ DISPLAY
12-1	The calibration check is a functional verification self-test of the DMOM-200™. This procedure begins by pressing key #3 on the START MENU, which displays a calibration check prompt to attach test lead clips to a shorting bar (See Figure 8.0).	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>CALIBRATION CHECK</p> <p>CONNECT SHORTING BAR</p> <p>“ENTER” TO CONTINUE</p> </div>
12-2	When test lead clips are attached to a shorting bar, press ENTER key to proceed with self-testing process. The self-test feature checks ramping current and displays current at each point in a continuous ramp. When the ramp flattens, the remaining self-check automatically sequences without operator control. If any circuit fails (does not pass), then do not measure any resistance until the problem is corrected.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>RUNNING CAL CHECK...</p> <p>RAMPING CURRENT: xx%</p> </div>
12-3	Automatic; no operator action required.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>RUNNING CAL CHECK...</p> <p>CURRENT RAMP CKT</p> <p>“PASS”</p> </div>
12-4	Automatic; no operator action required.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>RUNNING CAL CHECK...</p> <p>ZERO CKT CHECK</p> <p>“PASS”</p> </div>
12-5	Automatic; no operator action required.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>RUNNING CAL CHECK...</p> <p>FSCALE CKT CHECK</p> <p>“PASS”</p> </div>
12-6	Automatic; no operator action required.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>RUNNING CAL CHECK...</p> <p>MEAS CKT CHECK</p> <p>“PASS”</p> </div>
12-7	Automatic; no operator action required.	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>RUNNING CAL CHECK...</p> <p>RAMPING CURRENT: xx%</p> </div>

Table 12.0 Calibration Check Procedure (Continued)

STEP	ACTION	OBSERVE RESULT
12-8	Automatic; no operator action required.	CAL CHECK COMPLETE PRESS ANY KEY
12-9	Press any key to end CAL CHECK.	Display returns to START MENU.

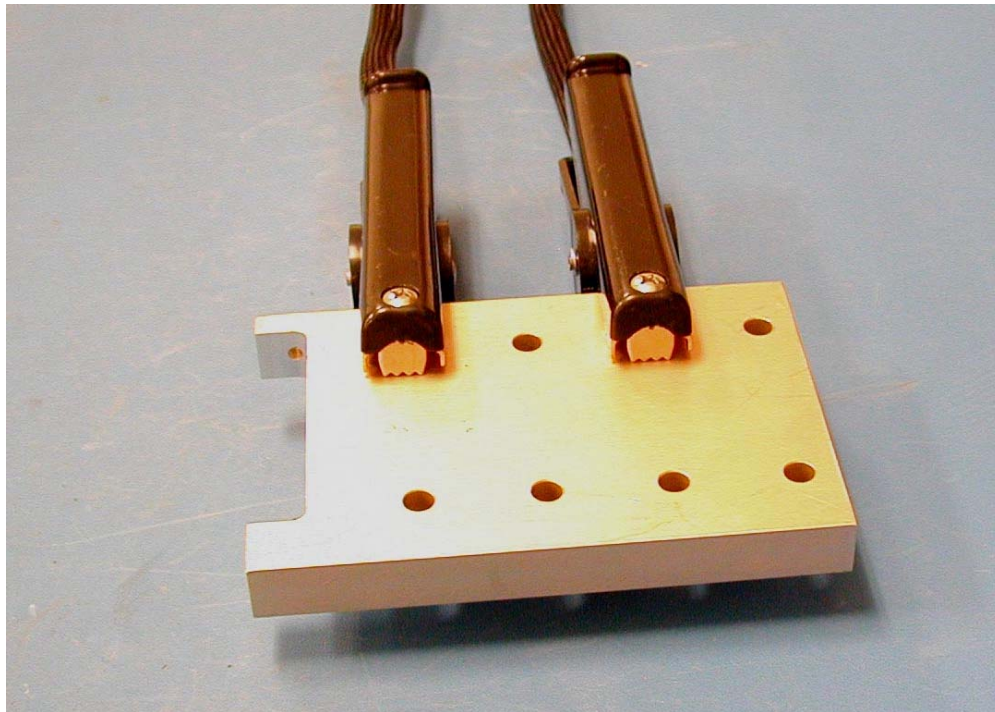


Figure 8.0 Bus Bar Connection

APPENDIX A

DMOM-200™ Troubleshooting Guide

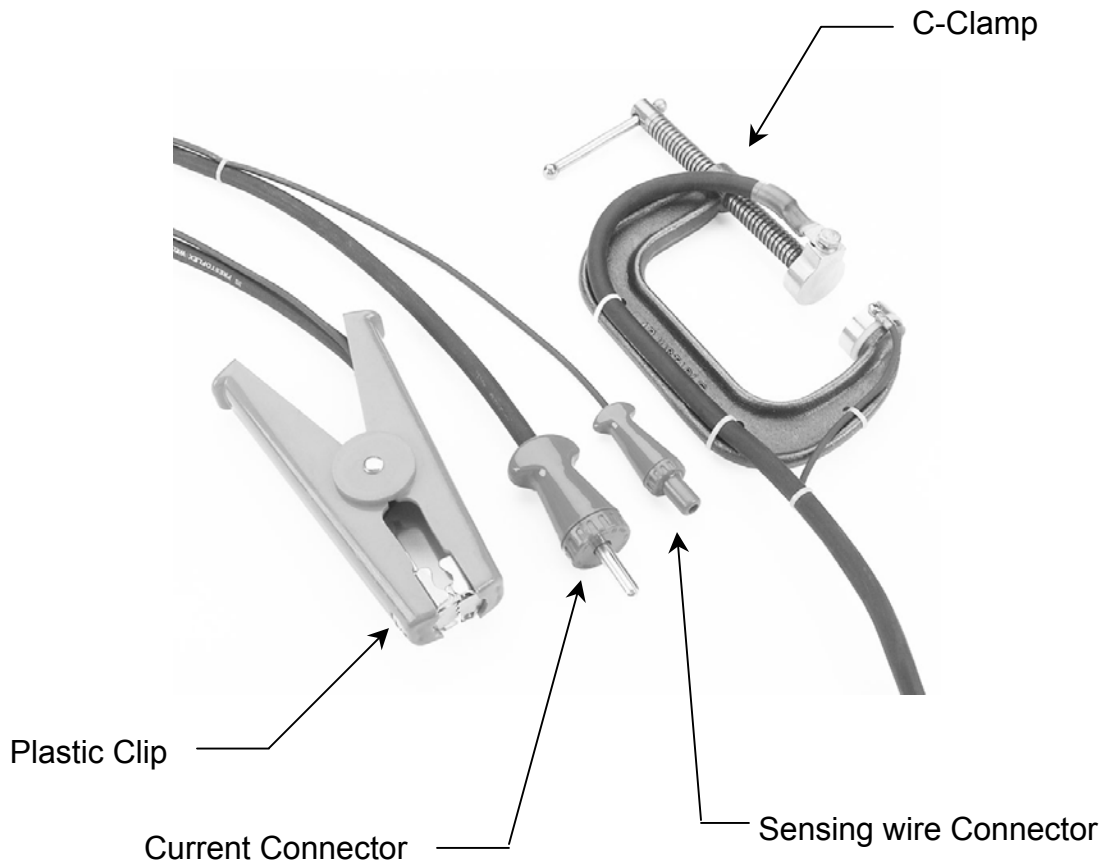
Item	Symptom	Possible Problem	Solution
1	Reading is incorrect.	1. Poor connection at the Clips. 2. Broken sensing lead.	1. Check connection to make sure sensing and current teeth are touching the device under test (DUT). 2. Inspect sensing cables.
2	No Test Current. (Current % read zero) and resistance reading=0	1. No test current going through DUT. 2. Drive circuit not working.	1. Check Connection to DUT. 2. Run Calibration Test.
3	Have test current but resistance reading = 0.	1. Broken sense leads. 2. Reverse sense leads.	1. Inspect sense leads.

NOTE: DUT=Device Under Test

APPENDIX B

DMOM-200™ Cable Accessories

Plastic Quick-Disconnect Clip, C-Clamp, Current Connector, and Sensing-Wire Connector





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