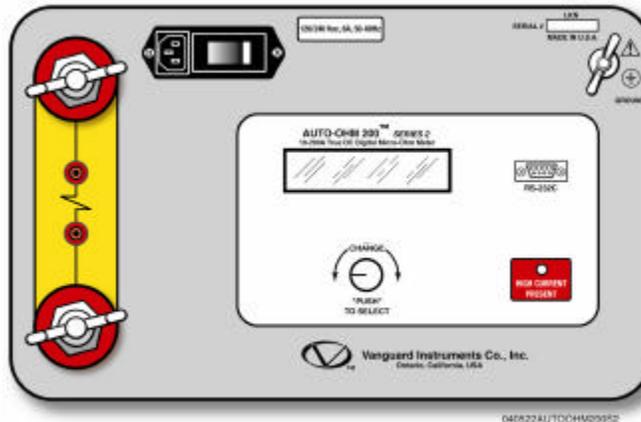
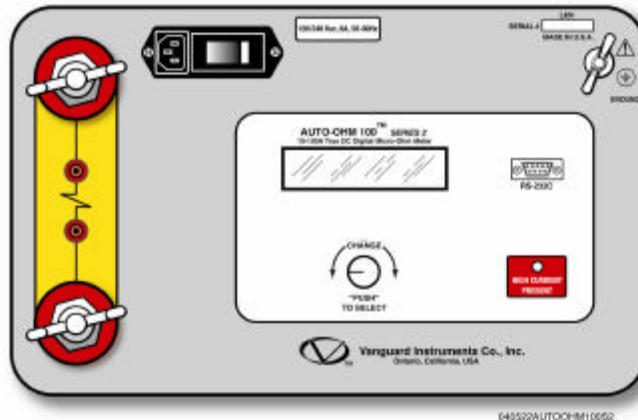

OPERATING INSTRUCTIONS
for the
AUTO-OHM 100/200 Series 2
10-100/200 Amperes True DC
Digital Micro Ohm Meter



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July 2004
Rev. 1

SAFETY SUMMARY

NOTICE

This manual applies to Models Auto-Ohm 100, and Auto-Ohm 200 Series 2. The operating procedures are virtually the same for all models; any differences are clearly described in the step-by-step procedures.

Follow Exact Operating Procedures

Any deviation from the procedures described in this operator's manual may create one or more safety hazards, damage the Auto-Ohm, or cause errors in the test results; Vanguard Instruments Co., Inc. assumes no liability for unsafe or improper use of the Auto-Ohm.

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

SAFETY WARNINGS AND CAUTIONS

This device shall be used only by **trained operators**.

All circuit breakers under test shall be off line and fully isolated.

Do Not Modify Test Equipment

Because of the risk of introducing unknown hazards, do not install substitute parts or perform any unauthorized modification to any Model Auto-Ohm Test unit. To ensure that all designed safety features are maintained, it is recommended that repairs be performed only by Vanguard Instruments Co. factory personnel or by an authorized repair service. Unauthorized modifications can cause serious safety hazards and will nullify the manufacturer's warranty.

Table of Contents

1.0 INTRODUCTION5
 1.1 Applicability5
 1.2 General Description.....5
 1.3 Functional Description5
 1.4 Furnished Test Accessories5
2.0 AUTO-OHM SPECIFICATIONS7
 2.1 Auto-Ohm 100 Series 2 Specifications7
 2.2 Auto-Ohm 200 Series 2 Specifications8
3.0 CONTROL AND DISPLAY9
 3.1 Auto-Ohm 100 Series 2 Front Panel9
 3.2 Auto-Ohm 200 Series 2 Front Panel 11
4.0 OPERATING VOLTAGES 13
5.0 CABLE CONNECTION 13
6.0 OPERATING THE AUTO-OHM 15
 6.1 Step-by-Step Procedures 15
 6.1.1 Precautions 15
 6.1.2 Preparations..... 15
 6.1.3 Run “Normal” Test Procedure 16
 6.1.4 Run Automatic Test Procedure 19
 6.1.5 Auto-Ohm Quick Test Procedure..... 21
 6.1.6 Contrast Adjustment 21
 6.1.7 Auto-Ohm Cal Check 21
 6.1.8 Display Previous Results 24

Table of Figures

Figure 1	Auto-Ohm 100/200 Current Cable.....	6
Figure 2	Auto-Ohm 100/200 Sensing cables	6
Figure 3	C-Clamp Cable	6
Figure 4	Auto-Ohm 100 Series 2 Control-Panel Controls and Display.....	9
Figure 5	Auto-Ohm 200 Series 2 Control-Panel Controls and Display.....	11
Figure 6	AUTO-OHM 100/200 Connection Diagram 1	13
Figure 7	AUTO-OHM 100/200 Connection Diagram 2.....	13
Figure 8	Step-by-Step Procedures for Auto-Ohm Operation.....	14
Figure 9	Main Menu	15
Figure 10	Test Type Menu <NORMAL>	16
Figure 11	Select 10A Menu.....	16
Figure 12	Select Custom Current Menu	16
Figure 13	Custom Current Menu	16
Figure 14	Burn-In Time Menu	17
Figure 15	Test Current & Burn-In Time	17
Figure 16	Current Ramp Message	17
Figure 17	Burn-in Menu.....	17
Figure 18	Test Current & Resistance Readings	18
Figure 19	Repeat Test Menu	18
Figure 20	Cable Error Message	18
Figure 21	Test Type Menu <AUTOMATIC>.....	19
Figure 22	Select 10A Menu.....	19
Figure 23	Select Custom Current Menu	19
Figure 24	Custom Current Menu	20
Figure 25	Select 50 Amperes Menu	20
Figure 26	Auto Test Mode Menu	20
Figure 27	Automatic Mode Test results.....	20
Figure 28	Quick Test Menu.....	21
Figure 29	Select Adjust Contrast Menu	21
Figure 30	Contrast Menu	21
Figure 31	100A Cal Check.....	22
Figure 32	Attach Short Bar Prompt.....	22
Figure 33	Calibration Connection	22
Figure 34	Current Ramp Message	22
Figure 35	Current-Ramp Error Message.....	23
Figure 36	Current Ramp Circuit Pass Message.....	23
Figure 37	Zero Circuit Test Message.....	23
Figure 38	Full-Scale Circuit Test Message	23
Figure 39	Measure Circuit Test Message.....	23
Figure 40	Cal Check Complete Message	24
Figure 41	Previous Results Menu	24
Figure 42	Select Reading Menus	24
Figure 43	Test Record Readout	24

AUTO-OHM 100/200 Series 2 Operating Procedures

1.0 INTRODUCTION

1.1 Applicability

This manual applies to the Model Auto-Ohm 100™ and Model Auto-Ohm 200™ (hereafter, Auto-Ohm), made by Vanguard Instruments Company.

1.2 General Description

The Auto-Ohm-100/200 Series 2 are the third generation micro-ohmmeters made by Vanguard Instruments Company. The Auto-Ohm 100/200 features microprocessor-controlled measuring of very low resistances; ranging from 1 micro-ohm to 300 milli-ohms with high accuracy. The Auto-Ohm is field-portable, rugged, and is easily operated by first-time users having a minimum of training. It features one-knob control and an LCD alpha/numeric display of the resistance measured. The one-knob control operation is logical and simple: **Turning the knob** scrolls through a menu of possible options (which display in sequence) and **pressing the knob** activates the selected function. As its name implies, the Auto-Ohm operation is automatic, requiring little more from the user than connecting it to an unknown resistance and selecting the desired functions and its options.. The Auto-Ohm stores the last 3 resistance measurements, which can be displayed during test.

1.3 Functional Description

The Auto-Ohm's operation is based on the electrical relationships described by Ohm's law: $R=V/I$, where I is a known current and V is the dc voltage measured across the unknown resistance (typically, a circuit breaker's contacts). Since the current (user selected) through the unknown resistance is known and the voltage across the unknown resistance is read by a precision voltmeter, the resistance read-out can be calculated using Ohm's law. The Auto-Ohm test voltage is supplied by a true DC power supply. A regulated constant-current source outputs the preset current selected by the user.

The true DC test current is selectable in 2-amp steps, from 10 to 100 amperes for the Auto-Ohm 100 and from 10 to 200 amperes for Auto-Ohm 200. Test current is automatically ramped up and down slowly, which virtually eliminates magnetically induced transients through the circuit-breaker current transformers. **The risk of inductively tripping a circuit breaker (bus differential relay) is virtually non-existent.** Voltmeter test leads run separately from the current-bearing test leads to the resistive load; thus, voltages are measured at the terminals of the resistance being tested, eliminating any $I \cdot R$ voltage drop error in the current cables. These Auto-Ohm features make very precise micro-ohm measurements possible without having to calculate compensations for current lead resistances errors.

1.4 Furnished Test Accessories

The Auto-Ohm is supplied with two 30-foot #2 AWG test cables with heavy-duty alligator clamps and two 30-foot voltage-sensing cables with alligator. A Ground cable, power cord and a cable bag are also included with each Auto-Ohm.

1.5 Optional Accessories

1. Heavy-duty welding-type C-clamps (Figure 3) are available as optional accessories. These C-clamps allow test lead connections to a wide variety of bushing sizes, bus bars, and conductors that require low-resistance test-lead contacts.
2. Light weight (#4 AWG) cables are also available upon request.
3. Custom cable lengths are available upon request.

AUTO-OHM 100/200 Series 2 Operating Procedures

4. An optional shipping case (which holds the Auto-Ohm and its cables) is also available.



Figure 1 Auto-Ohm 100/200 Current Cable



Figure 2 Auto-Ohm 100/200 Sensing cables



Figure 3 C-Clamp Cable

AUTO-OHM 100/200 Series 2 Operating Procedures

2.0 AUTO-OHM SPECIFICATIONS

2.1 Auto-Ohm 100 Series 2 Specifications

Auto-Ohm specifications and leading particulars are listed in Table 1.

Table 1 Auto-Ohm 100 Series 2 Specifications

MODEL	Auto-Ohm 100 Series 2
TYPE	Special-Purpose Test Equipment, Portable, Low Resistance-Ohmmeter
CONFIGURATION	Third-generation (improved design, superseding original model)
SIZE (inches)	16.8 Wide by 12.6 High by 10.6 Deep (42.7 Cm x 32 Cm x 30.5 Cm)
WEIGHT	Less than 15 pounds (6.8 Kg)
RESISTANCE RANGE	1 micro-ohm to 300 milli-ohms
TEST CURRENT RANGE	10 Amperes to 100 Amperes, Selectable in 2 ampere steps
DISPLAY	Backlit LCD, 2-lines high by 16 characters Wide
ACCURACY	± 1 % Reading, ± 1 Count
OPERATING POWER	8 amps, 90-230 Vac, 50/60 Hz, with built in 10A circuit breaker
UNIT PROTECTION ...	thermal-overload sensor and cutoff
INTERFACE	RS-232C Connector Port for PC Interface
ENVIRONMENT	Operating: 0°C to 55°C; Storage: -40°C to 65°C
FURNISHED ITEMS ...	One power cord, one ground cable, one 30-ft. current test lead cable, one 30-ft. sensing test lead cable, and one test-cable carrying bag
WARRANTY	One-Year Parts & Labor (Post-Warranty Service Contracts Available)

AUTO-OHM SPECIFICATIONS ARE SUBJECT TO UPGRADES AND MAY BE CHANGED WITHOUT PRIOR NOTICE.

AUTO-OHM 100/200 Series 2 Operating Procedures

2.2 Auto-Ohm 200 Series 2 Specifications

Table 2 Auto-Ohm 200 Series 2 Specifications

MODEL	Auto-Ohm 200 Series 2
TYPE	Special-Purpose Test Equipment, Portable, Low Resistance-Ohmmeter
CONFIGURATION	Third-generation (improved design, superseding original model)
SIZE (inches)	16.8 Wide by 12.6 High by 10.6 Deep (42.7 Cm x 32 Cm x 30.5 Cm)
WEIGHT	Less than 21 pounds (9.5 Kg)
RESISTANCE RANGE	1 micro-ohm to 300 milli-ohms
TEST CURRENT RANGE	10 Amperes to 200 Amperes, Selectable in 2 ampere steps
DISPLAY	Backlit LCD, 2-lines high by 16 characters wide
ACCURACY	± 1 % Reading, ± 1 Count
OPERATING POWER	8 amps, 90-230 Vac, 50/60 Hz, with built in 10A circuit breaker
UNIT PROTECTION ...	thermal-overload sensor and cutoff
INTERFACE	RS-232C Connector Port for PC Interface
ENVIRONMENT	Operating: 0°C to 55°C; Storage: -40°C to 65°C
FURNISHED ITEMS ...	One power cord, one ground cable, one 30-ft. current test lead cable, one 30-ft. sensing test lead cable, and one test-cable carrying bag
WARRANTY	One-Year Parts & Labor (Post-Warranty Service Contracts Available)

AUTO-OHM SPECIFICATIONS ARE SUBJECT TO UPGRADES AND MAY BE CHANGED WITHOUT PRIOR NOTICE.

3.0 CONTROL AND DISPLAY

3.1 Auto-Ohm 100 Series 2 Front Panel

The Auto-Ohm 100 Series 2 controls and displays are shown in the control-panel illustration, Figure 4. Pointing leader lines reference each item with an index number. Each index number is cross-referenced to a functional description in Table 3, which describes the function and purpose of each item on the control panel. Although the purpose of these controls and the display may seem obvious and intuitive, users should become familiar with them before attempting to use the Auto-Ohm 100 Series 2. First-time users should also review and become familiar with the Safety Summary on the front page.

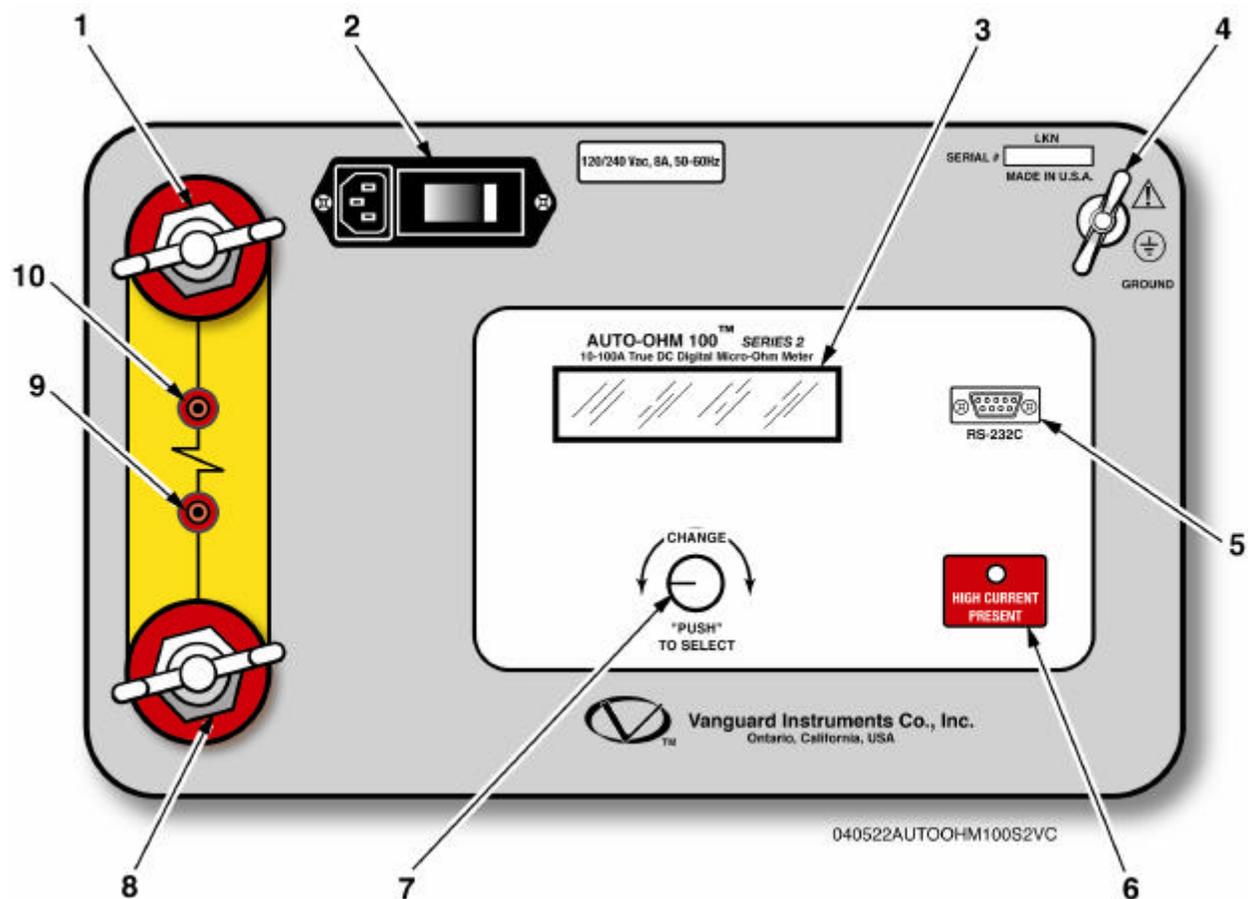


Figure 4 Auto-Ohm 100 Series 2 Control-Panel Controls and Display

Table 3 Functional Description of Auto-Ohm 100 Series 2 Controls and Display

Figure 1 Index #	Adjacent Panel Marking	Functional Description
1 & 8	(Wing Nut)	Current lead connectors
2	90-230 Vac, 8A, 50- 60 Hz	Input power connector with third-wire safety ground and built-in 10A circuit breaker.
3	no marking	LCD; 2-line by 16-character; back-lighted; displays menus of selections, operator entries, and test-measurement results.
4	GROUND (Wing Nut)	Auto-Ohm-100 Series 2 ground stud. Connect ground stud to substation ground using provided cable.
5	RS-232C	RS-232C interface port; 9-pin connector; female DB type. The data are set to 19,200 baud, 1 start bit, 8 data bits, and no parity bit; <div style="text-align: center;"> <u>PIN</u><u>SIGNAL</u> 2 Rx 3 Tx 5 Signal Gnd </div> This serial port is dedicated for factory calibration and software update.
6	HIGH CURRENT PRESENT	LED indicator, red; Lights when high-test-current is going through the test leads.
7	CHANGE "PUSH" TO SELECT	One-knob control (all Auto-Ohm menus and selections are controlled by this one control knob). <i>Turning this control knob scrolls through different menu options</i> (shown on an LCD), which display. <i>Pressing the knob selects</i> the displayed function, usually producing a new menu of selectable options. See Figure 8 for a summary of the step-by-step operating procedures.
9 & 10	(resistor symbol)	Voltage-sensing connector jacks (red).

AUTO-OHM 100/200 Series 2 Operating Procedures

3.2 Auto-Ohm 200 Series 2 Front Panel

The Auto-Ohm 200 Series 2 controls and displays are shown in the control-panel illustration, Figure 5. Pointing leader lines reference each item with an index number. Each index number is cross-referenced to a functional description in Table 4, which describes the function and purpose of each item on the control panel. Although the purpose of these controls and the display may seem obvious and intuitive, users should become familiar with them before attempting to use the Auto-Ohm 200 Series 2. First-time users should also review and become familiar with the Safety Summary on the front page.

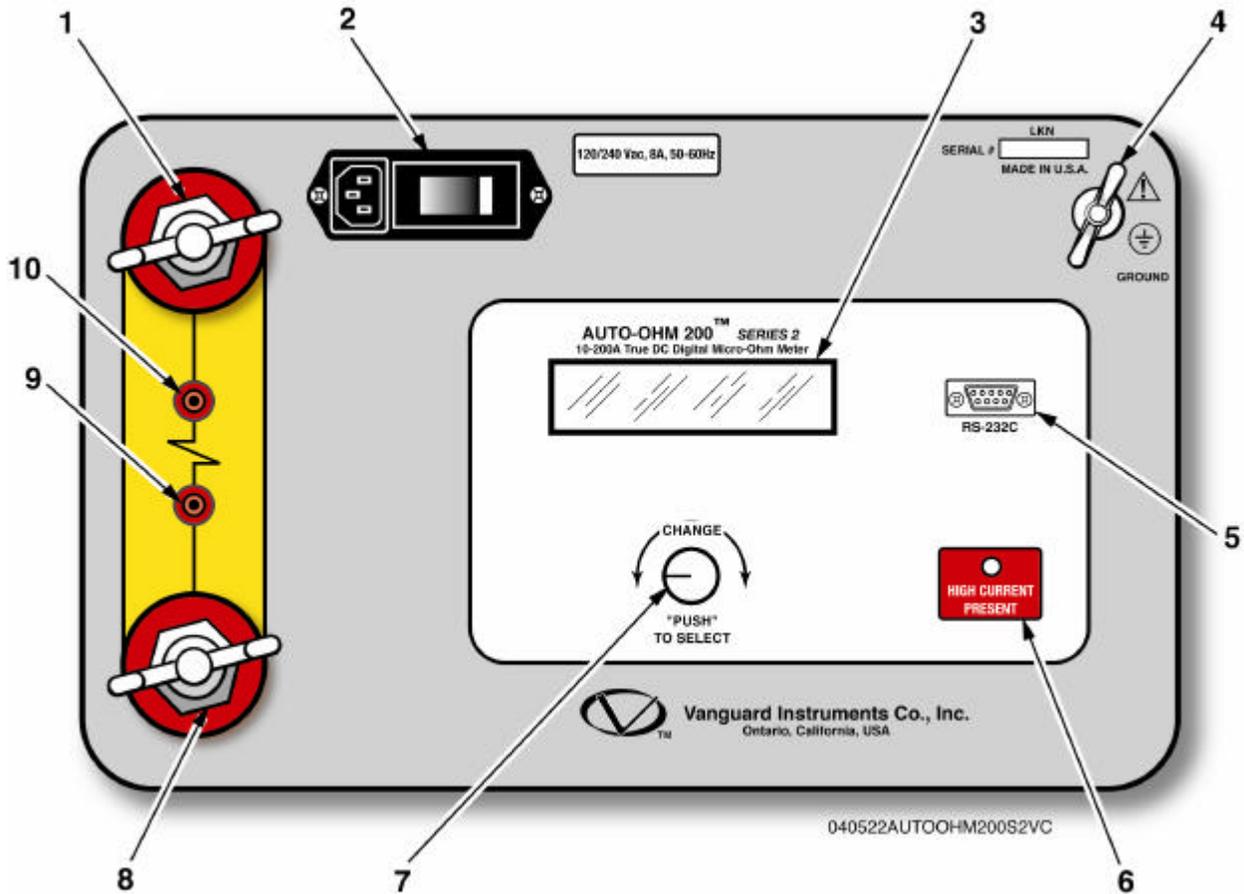


Figure 5 Auto-Ohm 200 Series 2 Control-Panel Controls and Display

Table 4 Functional Description of Auto-Ohm 200 Series 2 Controls and Display

Figure 1 Index #	Adjacent Panel Marking	Functional Description								
1 & 8	(Wing Nut)	Current lead connectors								
2	90-230 Vac, 8A, 50- 60 Hz	Input power connector with third-wire safety ground and built-in 10A circuit breaker.								
3	no marking	LCD; 2-line by 16-character; back-lighted; displays menus of selections, operator entries, and test-measurement results.								
4	GROUND (Wing Nut)	Auto-Ohm 200 Series 2 ground stud. Connect ground stud to substation ground using provided cable.								
5	RS-232C	RS-232C interface port; 9-pin connector; female DB type. The data are set to 19,200 baud, 1 start bit, 8 data bits, and no parity bit; <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;">Rx</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">Tx</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">Signal Gnd</td> </tr> </table> This serial port is dedicated for factory calibration and software update.	<u>PIN</u>	<u>SIGNAL</u>	2	Rx	3	Tx	5	Signal Gnd
<u>PIN</u>	<u>SIGNAL</u>									
2	Rx									
3	Tx									
5	Signal Gnd									
6	HIGH CURRENT PRESENT	LED indicator, red; Lights when high-test-current is going through the test leads.								
7	CHANGE “PUSH” TO SELECT	One-knob control (all Auto-Ohm menus and selections are controlled by this one control knob). <i>Turning this control knob scrolls through different menu options</i> (shown on an LCD), which display. <i>Pressing the knob selects</i> the displayed function, usually producing a new menu of selectable options. See Figure 8 for a summary of the step-by-step operating procedures.								
9 & 10	(resistor symbol)	Voltage-sensing connector jacks (red).								

AUTO-OHM 100/200 Series 2 Operating Procedures

4.0 OPERATING VOLTAGES

The Auto-Ohm operates voltages between 90-240Vac, 50/60Hz.

5.0 CABLE CONNECTION

The Auto-Ohm is supplied with 30-foot current-carrying cables and 30-foot voltage-sensing cables. Both cables are terminated with heavy-duty alligator clamps to connect to the device being tested. A typical cable connection for the Auto-Ohm to a device under test is shown in figure 6 and figure 7. To protect the Auto-Ohm against static discharge in the substation, always connect the unit's ground stud to the substation ground. It is also highly recommended to ground one side of the circuit breaker bushing during test to eliminate any static discharge to the Auto-Ohm.

NOTE

The sense input is not polarity sensitive. The sense cables may be connected to either input without affecting circuit operation.

Figure 6 AUTO-OHM 100/200 Connection Diagram 1

Figure 7 AUTO-OHM 100/200 Connection Diagram 2

13

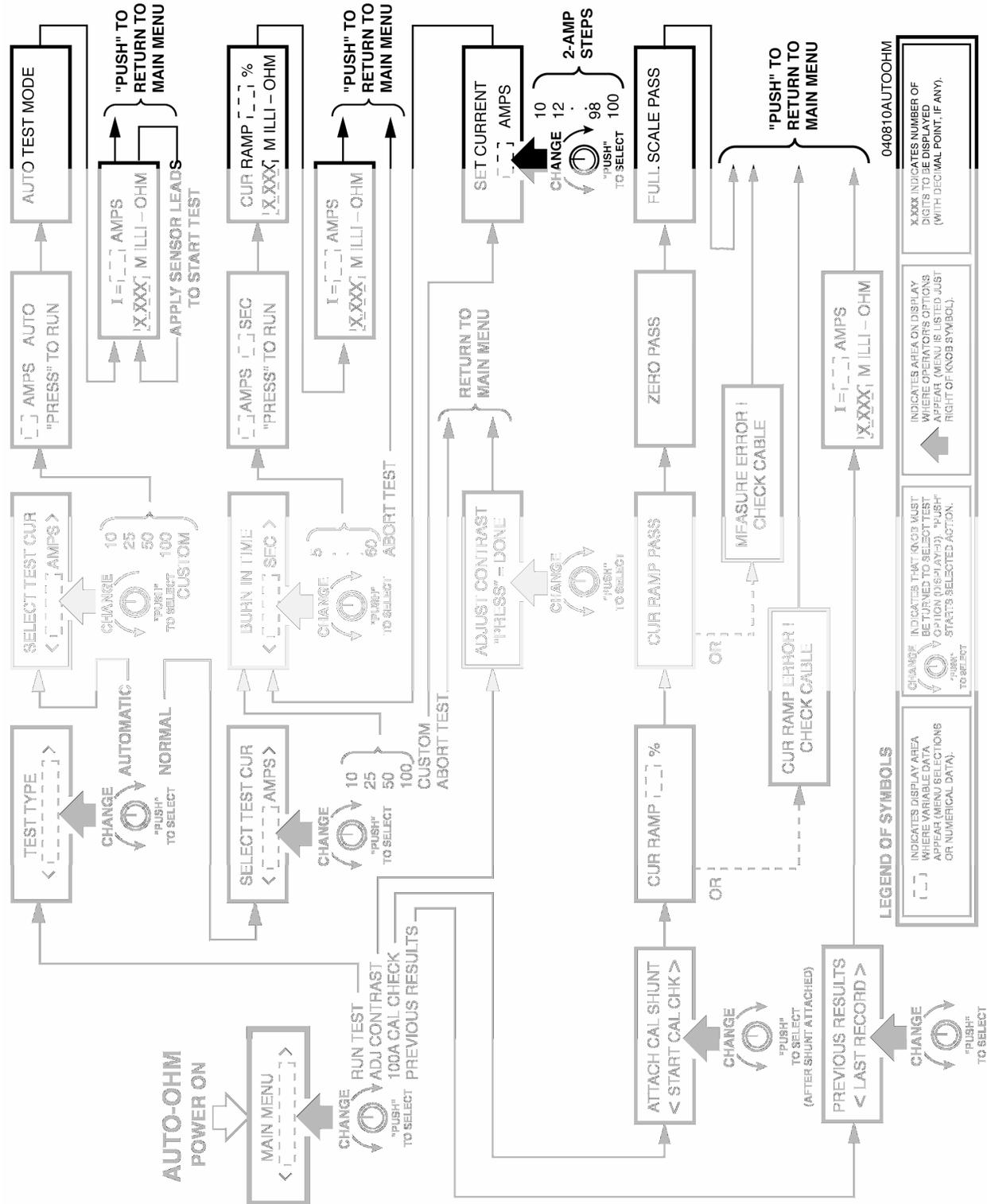


Figure 8 Step-by-Step Procedures for Auto-Ohm Operation

6.0 OPERATING THE AUTO-OHM

The Auto-Ohm is operated with one dual-function control knob. The operator turns the control knob to scroll through different menu selections on the display. When the desired option appears, it is selected by pressing the control knob like a pushbutton. Review figure 8 before proceeding with the step-by-step procedures that follow.

6.1 Step-by-Step Procedures

6.1.1 Precautions

CAUTION

Do not measure the resistance of inductive devices. This can generate unsafe high-voltage spikes (created by a collapsing magnetic field) if the test current is interrupted by detaching a test lead during a test. Do not touch or disconnect any test lead that is connected to a device under test while current is being conducted. ***Failure to heed this warning can result injury to the user and/or damage to the Auto-Ohm.*** The Auto-Ohm measures low, non-inductive resistances (e.g., breaker contacts and bus-bar junctions); If the resistance of an inductive device is needs to be measured, then the use of an instrument designed for that purpose is recommended (such as the WRM made by the Vanguard Instruments Company).

6.1.2 Preparations

- a. Ground Auto-Ohm to Substation ground.
- b. Plug the Auto-Ohm power cable into a power outlet.
- c. Connect current-cable lugs and voltage-sensing cable plugs to control-panel (Figure 4 & 5).
- d. Attach current test-cable clamps to opposite terminals of the resistive load being tested (Figure 6 & 7).
- e. Attach voltage-sensing clamps to the terminals of the resistive load. Sensing voltage clamps should be inside the current clamps.
- f. To turn on Auto-Ohm power, press the rocker switch to ON.

NOTE

All Auto-Ohm operations begin at the MAIN MENU, which appears after the initial boot-up (after configuration and software revision data display briefly.) The Main Menu display is shown below:



Figure 9 Main Menu

g. The main menu displays a list of four options, which appear in sequence as the control knob is turned. The four options of the Main-Menu list are: RUN TEST, ADJ CONTRAST, 100A CAL. CHECK, and PREVIOUS RESULTS.

h. When the option of choice appears in the Main Menu, press (or “Push”) the control knob to enter the selection and start that sequence. The step-by-step operating procedures to follow describe each of the selected options in the order listed above.

6.1.3 Run “Normal” Test Procedure

To run a test, *turn the control knob* until RUN TEST appears on the display, *then press the control knob* to begin the procedures for running a test.

The Test Type menu allows the user to select Normal Test or Automatic Test mode. Normal test mode allows the user to select test current and burn-in time. Press control knob when the Auto-Ohm displays <NORMAL> under Test Type menu.



Figure 10 Test Type Menu <NORMAL>

The SELECT TEST CURRENT menu will now appear on the Auto-Ohm’s display.



Figure 11 Select 10A Menu

a. This screen prompts the user to select the desired test current. Test current options are: 10, 25, 50, 100 Amp (for Auto-Ohm 100) or 10, 25, 50, 100, 200 Amp (for Auto-Ohm 200), CUSTOM, and ABORT TEST. Select the desired test current option by turning the control knob until the proper current level displays; then press the knob to enter that choice (in which case go to step d). If a smaller increment of current is desired, select CUSTOM (figure 12) and press the control knob and go to the next step.



Figure 12 Select Custom Current Menu

b. This menu allows the user to select any test current from 10 to 100 amperes (200 amperes for Auto-Ohm 200) in 2 amperes steps.



Figure 13 Custom Current Menu

AUTO-OHM 100/200 Series 2 Operating Procedures

c. Custom current is defaulted to 50AMPS for the Auto-Ohm 100 (100A for Auto-Ohm 200) in this menu. Turning the control knob clockwise or counter-clockwise will increment or decrement the current reading on the display. Turn the control knob until the desired current is displayed, then press the control knob to enter the desired current. The display will now show the BURN IN TIME menu (Figure 14).

NOTE

Selecting ABORT TEST causes the display to return to the Main Menu without making any selections.



Figure 14 Burn-In Time Menu

d. This menu selects the amount of time the burn-in current will be run through the test load before its resistance is measured. Burn-in time range is from 5 to 60 seconds (in 5-second steps). *The default burn-in time is set for 5 seconds.* Turn the control knob until the desired burn-in time appears in the display, then press the control knob to enter that time. Go to the next step.



Figure 15 Test Current & Burn-In Time

e. This display (above) shows the current and time that have been selected. If these are as the user intended, then press the control knob to accept the selections and begin the burn-in and measurement sequence. Go to the next step. Turning the knob in either direction will return the display to the Main Menu.



Figure 16 Current Ramp Message

f. This display (above) shows the current ramp percentage (of the test-level current). The Auto-Ohm will ramp the test current from 0 (zero) amperes to the selected test current level in 3 seconds. The test current is automatically ramped up and slowly, which virtually eliminates magnetically induced transients through the circuit breaker current transformers. When the current reaches 100%, the next display appears automatically. This display shows the resistance reading and the remaining burn-time of the test.



Figure 17 Burn-in Menu

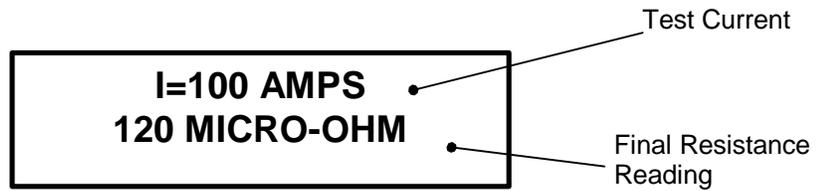


Figure 18 Test Current & Resistance Readings

g. The Auto-Ohm then ramps the test current back to zero. Figure 18 shows the final resistance measurement and the test current at which the resistance was measured. After the result is examined, press or turn the control knob for the Repeat Test menu.



Figure 19 Repeat Test Menu

h. To repeat the test, press then release control knob. The Auto-Ohm repeats test using the same test current and burn-in time settings.

To end the test mode, turn the knob to select <NO>. Press the control knob to return to the MAIN MENU.

From the Main Menu another test can be run. If all test have been completed, turn off power to the Auto-Ohm, disconnect test leads and power cable, and stow them. This completes the procedure for performing the NORMAL TEST procedure.

NOTE

A “Connection Error” message will be displayed on the Auto-Ohm LCD if the current cables or sense cables are not connected as shown in figure 6.0 & 7.0.



Figure 20 Cable Error Message

6.1.4 Run Automatic Test Procedure

The Test Type menu allows the user to select Normal Test or Automatic Test mode. In the Automatic test mode the user selects the test current; the measurement cycle is initiated when the sense leads are connected to the device under test. This feature is handy when the user wants to take resistance readings of multiple points.

To use the Automatic Test Mode the user must connect the current cables outside the two points where the measurement is to be made. The Auto-Ohm is then placed in the Automatic Test mode. The test will start as soon as the sense cables are connected to the two points of interest. The Auto-Ohm test current will ramp from zero to the selected test current. After a five second burn-in time, the Auto-Ohm current is ramped back to zero. The resistance reading is then displayed on the LCD. To start a new test, disconnect then reconnect the sense leads between the same or two new points of interest.

To select the Automatic mode, turn control knob in the Test Type menu until <AUTOMATIC> menu is displayed (Figure 21). Press control knob to select Automatic test mode.



Figure 21 Test Type Menu <AUTOMATIC>

The SELECT TEST CURRENT menu will now appear on the Auto-Ohm's display.



Figure 22 Select 10A Menu

a. This screen prompts the user to select the desired test current. Test current options are: 10, 25, 50, 100 Amp (for Auto-Ohm 100) or 10, 25, 50, 100, 200 Amp (for Auto-Ohm 200), CUSTOM, and ABORT TEST. Select the desired test current option by turning the control knob until the proper current level displays, then press the knob to enter that choice (in which case go to step d). If a smaller increment of current is desired, select CUSTOM (figure 23) and press the control knob and go to the next step.



Figure 23 Select Custom Current Menu

AUTO-OHM 100/200 Series 2 Operating Procedures

b. This menu allows the user to select any test current from 10 to 100 amperes (or 200 amperes for Auto-Ohm 200) in 2 amperes steps.



**SET CURRENT:
50 AMPS**

Figure 24 Custom Current Menu

c. Custom current is defaulted to 50AMPS for the Auto-Ohm 100 (100A for Auto-Ohm 200) in this menu. Turning the control knob clockwise or counter-clockwise will increment or decrement the current reading on the display. Turn the control knob until the desired current is displayed, then press the control knob to enter the desired current. The display will now show the selected test current (figure 25). Press the control knob to start the AUTO TEST mode (Figure 26).



**50 AMPS AUTO
"PRESS" TO RUN**

Figure 25 Select 50 Amperes Menu



AUTO TEST MODE

Figure 26 Auto Test Mode Menu

d. The Auto-ohm is ready to start testing when this menu is displayed. To start testing, connect the sense leads across the device under test. The test current is gradually ramped up and down with a 5 seconds burn in test time. Test results will be shown in as in figure 27.



**I=100 AMPS
120 MICRO-OHM**

Figure 27 Automatic Mode Test results

e. To initiate another test, disconnect and reconnect the sense leads to the device under test. To terminate the Automatic Test Mode, press Auto-Ohm control knob.

6.1.5 Auto-Ohm Quick Test Procedure

The Auto-Ohm Quick Test mode is a preset test that runs a test at 100 Amps for 5 seconds. To start a quick test, go to the RUN TEST option in the Main Menu. Press and hold the control knob for 2 seconds. A short beep will be heard at which point the knob must be quickly released. The Auto-Ohm will beep twice to acknowledge the quick test command has been accepted. Press then release the control knob again to initiate the test. The Auto-Ohm will run a 100A test with a 5-second burn in time (Figure 28 The test result will be displayed the same as Figure 27).



100 AMPS 5 SEC
"PRESS" TO RUN

Figure 28 Quick Test Menu

6.1.6 Contrast Adjustment

The purpose of this procedure is to adjust the darkness level of the alpha-numeric characters shown in the LCD display, in order to produce the best readability for the ambient light in the testing area. To adjust the contrast, turn the control knob to select the ADJ. CONTRAST option from the Main Menu.



MAIN MENU
<ADJ. CONTRAST>

Figure 29 Select Adjust Contrast Menu

- a. Press knob to select "ADJ. CONTRAST" mode. The following menu will be shown.



ADJUST CONTRAST
"PRESS" = DONE

Figure 30 Contrast Menu

- b. Turn the control knob until the contrast is suitable for the operator. Press the control knob to set the contrast. The display will return to the Main Menu. The contrast setting will be recalled each time the Auto-Ohm is turned on and remain until it is changed again using this procedure.

6.1.7 Auto-Ohm Cal Check

The purpose of the Calibration Check is to verify that the Auto-Ohm is operating within acceptable specifications by running a functional check on the Auto-Ohm electronics. To Run a CAL CHECK, turn the control knob to select the 100A CAL CHECK option from the Main Menu (see Figure 31).



Figure 31 100A Cal Check

a. Press the control knob to begin the calibration check. The following display appears.



Figure 32 Attach Short Bar Prompt

b. Attach the test leads to an unused bus bar (several inches apart, the spacing is not critical, since this is a functional check). See figure 33 for connection illustration. Press the control knob to start the test.

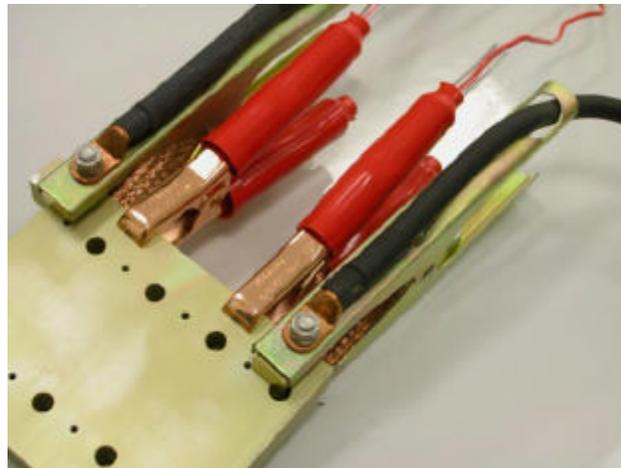


Figure 33 Calibration Connection

c. This display below (Figure 34) shows the current ramping status. When test current ramps to 100 %, this display is automatically replaced with either of the test-result displays of Figures 35 or 36.



Figure 34 Current Ramp Message

**CUR RAMP ERROR!
CHECK CABLES**

Figure 35 Current-Ramp Error Message

d. If the current did not ramp properly (test failed) the display above appears. Press the control knob to abort the test (restart the Cal Check when the problem is corrected).

**CURRENT RAMP CKT
"PASS"**

Figure 36 Current Ramp Circuit Pass Message

e. The above status display indicates the current ramped properly. The status displays of Figures 37 through 39 show for about 3seconds each as each test is made and passed. If any test fails, the status display will stop at the failed function and indicate "FAIL". The Auto-Ohm will continue to beep until the control knob is pressed. Once the problem has been fixed, the CAL CHECK can be rerun.

**ZERO CKT CHECK
"PASS"**

Figure 37 Zero Circuit Test Message

f. The Auto-Ohm checks the "ZERO" circuit. The "PASS" message displays as shown above.

**FSCL CKT CHECK
"PASS"**

Figure 38 Full-Scale Circuit Test Message

g. The "MEASURE CIRCUIT" is tested next. The "PASS" message displays is shown below:

**MEASURE CKT CHECK
"PASS"**

Figure 39 Measure Circuit Test Message

h. If all the calibration functions pass, the Auto-Ohm calibration complete message appears as shown in Figure 40.

**CAL CHECK DONE!
PRESS KEY.....**

Figure 40 Cal Check Complete Message

This completes the Calibration Check procedure. Press the control knob to return to the Main Menu.

6.1.8 Display Previous Results

The purpose of this procedure is to let an operator view the last 3 readings stored in the Auto-Ohm. To view previous results, turn the control knob to select the PREV RESULTS option from the Main Menu.

**MAIN MENU
<PREV RESULTS>**

Figure 41 Previous Results Menu

a. Press control knob to select this option. The user now can select any of the last three readings to be displayed. To select the reading, turn the control knob to one of the menus.

**PREVIOUS RESULTS
<LAST TEST>**

**PREVIOUS RESULTS
<SECOND TO LAST>**

**PREVIOUS RESULTS
<THIRD TO LAST>**

Figure 42 Select Reading Menus

b. When one of the prompts above displays, press the control knob to display its reading.

**I= 100AMPS
120.2 MICRO-OHM**

Figure 43 Test Record Readout

AUTO-OHM 100/200 Series 2 Operating Procedures

c. The above display shows the recorded test resistance (120.2 Micro-ohms) and the test current level (100 amps) at which it was measured. When the displayed record of resistance is reviewed and noted, press the control knob to return to the Main Menu. This ends the PREVIOUS RESULTS procedure.

This concludes the operating procedures for all of the Auto-Ohm functions.

APPENDIX A**Auto-Ohm Troubleshooting Guide**

Item	Symptom	Possible Problem	Solution
1	Reading is incorrect.	1. Poor connection at the test clips.	1. Check connections to ensure teeth of voltage-sensing and current clips are firmly in contact with the device under test.
2	“Cable Error” Message.	1. No test current going through the device under test. 2. Sensing cables problem.	1. Check current cable Connection to the device under test. 2. Check sensing cable connection. 3. Run Calibration Test.



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