

# Auto-Ohm 200 S4

## True DC Digital Micro-Ohmmeters

### USER'S MANUAL



**Vanguard Instruments**  
A DOBLE COMPANY



TEL: (909) 923-9390  
FAX: (909) 923-9391

July 2020  
Revision 1.0

# SAFETY SUMMARY

## FOLLOW EXACT OPERATING PROCEDURES

Any deviation from the procedures described in this user's manual may create one or more safety hazards, damage the Auto-Ohm 200 S4, or cause errors in the test results. Vanguard Instruments assumes no liability for unsafe or improper use of the Auto-Ohm 200 S4. The following safety precautions must be observed during all phases of test setup, test hookups, testing, and test lead disconnection.

## SAFETY WARNINGS AND CAUTIONS

The Auto-Ohm 200 S4 shall be used only by trained operators. All circuit breakers under test shall be off-line and fully isolated.

## SERVICE AND REPAIR

- Do not install substitute parts or perform any unauthorized modification to any Auto-Ohm 200 S4 test unit.
- Repairs must be performed only by Vanguard Instruments factory personnel or by an authorized repair service provider. Unauthorized modifications can cause safety hazards and will void the manufacturer's warranty.

## EQUIPMENT RATINGS

**IP Rating:** The enclosure for Auto-Ohm 200 S4 has an IP rating of 32.

**Pollution Degree:** The Auto-Ohm 200 S4 has a pollution rating of 2.

**Operating Voltage:** The Auto-Ohm 200 S4 is rated for use with an operating voltage of 120V or 240V, auto-ranging  $\pm 10\%$  of selected voltage.

**Power Cord:** The Auto-Ohm 200 S4 is supplied with a 16 AWG, 16A power cord with a NEMA 5-15P plug. Replacement cable shall have the same or better rating and is available through the manufacturer.

## VENTILATION REQUIREMENTS

The Auto-Ohm 200 S4 must be operated with the enclosure lid open.

## SAFETY SYMBOLS



Indicates that caution should be exercised



Indicates location of chassis ground terminal

## CLEANING

To clean the Auto-Ohm 200 S4:

- Disconnect all cables and turn the unit off.
- Use a soft, lint-free cloth to wipe all surfaces clean.
- Avoid getting moisture in openings and connectors.
- Don't use any cleaning products or compressed air.

## TABLE OF CONTENTS

CONVENTIONS USED IN THIS DOCUMENT .....	2
1.0 INTRODUCTION .....	3
1.1 General Description and Features .....	3
1.3 Cables and Accessories .....	5
1.4 Technical Specifications .....	7
1.5 Auto-Ohm 200 S4 Controls and Indicators .....	8
2.0 PRE-TEST SETUP .....	9
2.1 Operating Voltages .....	9
2.2 LCD Screen Contrast Control.....	9
3.0 OPERATING PROCEDURES .....	10
3.1 Connection Diagrams.....	10
3.3 Setting the Interface Language.....	12
3.4 Testing Procedures .....	13
3.4.1. Entering Test Record Header Information .....	13
3.4.2. Performing a Test .....	16
3.4.3. Performing a Quick Test .....	27
3.5 Working With Test Records .....	31
3.5.1. Viewing the Contents of the Working Memory .....	31
3.5.2. Saving Test Results to a Test Record .....	33
3.5.3. Restoring a Test Record From Flash EEPROM.....	35
3.5.4. Restoring a Test Record From a USB Flash Drive .....	39
3.5.5. Copying Test Records to a USB Flash Drive .....	42
3.5.6. Viewing the Test Record Directory.....	45
3.5.7. Erasing Test Records from the Flash EEPROM .....	47
3.5.8. Erasing Test Records from a USB Flash Drive.....	51

LIST OF TABLES

Table 1. Auto-Ohm 200 S4 Technical Specifications..... 7

LIST OF FIGURES

Figure 1. Furnished Current and Sense Combination Cables (P/N 8000-0076-SLEEVED) ..... 5

Figure 2. Optional Cable with C-Clamp ..... 5

Figure 3. Optional Hand Spike ..... 6

Figure 4. Auto-Ohm 200 S4 Controls and Indicators ..... 8

Figure 5. Typical Auto-Ohm 200 S4 Connection Diagram ..... 10

Figure 6. Typical Auto-Ohm S4 Connection Diagram with Dual Ground Option..... 10

Figure 10. Sample Auto-Ohm 200 S4 Printout..... 26

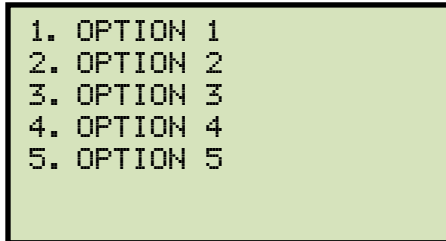
Figure 11. Sample Auto-Ohm 200 S4 Printout (with Dual Ground Option) ..... 26



## CONVENTIONS USED IN THIS DOCUMENT

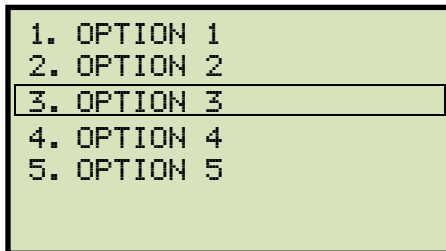
This document uses the following conventions:

- A key, switch, or knob on the Auto-Ohm 200 S4 is indicated as **[KEY]**, **[SWITCH]**, **[KNOB]**.
- Menu names are referenced as "MENU NAME"
- Auto-Ohm 200 S4 screen output is shown as:



```
1. OPTION 1
2. OPTION 2
3. OPTION 3
4. OPTION 4
5. OPTION 5
```

- When instructions are provided, the menu item that should be selected is outlined with a rectangle as shown below (option 3 should be selected):



```
1. OPTION 1
2. OPTION 2
3. OPTION 3
4. OPTION 4
5. OPTION 5
```

- Warning messages are indicated as:



- Important notes are indicated as:



## 1.0 INTRODUCTION

### 1.1 General Description and Features

The Auto-Ohm 200 S4 is Vanguard's fifth generation, microprocessor-based, true DC micro-ohmmeter. It is designed for testing EHV circuit-breaker contact resistances, bushing contact joints, welding joints, or for any low-resistance measuring application. This high current and very lightweight (16.8 lbs/ 7.6 Kg) micro-ohmmeter is designed to meet the IEEE C57.09-1999 (5.15) requirement for testing circuit breaker contact resistance.

The Auto-Ohm 200 S4 can accurately measure resistance values from 1 micro-ohm to 5 ohms. A 0.1 micro-ohm resolution is possible with current greater than 5A. The Auto-Ohm-200 S4 applies a selectable true DC test current from 1A to 200A to the resistance load to be tested. The Auto-Ohm 200 S4 controls the test current's rise and fall rates. The test current rise and fall rate can be selected from 5 seconds to 10 seconds. An "Auto Test" mode is also available and can be initiated simply by applying the sense cables' leads across the two points of interest in the current path. This feature is very convenient when measuring a sequence of several resistance values in a circuit breaker contact. The Auto-Ohm 200 S4 can also compare test results against preset limits and determine if a test passed or failed, and a "Pass" or "Fail" flag is displayed accordingly.

Since a true DC current (with controlled rise/fall time) is passed through the circuit breaker contact, no magnetic transient is induced into the breaker's current transformers. This feature greatly reduces the risk of inductively trip-ping a breaker control (bus differential relay).

With the Dual Ground option, the Auto-Ohm 200 S4 can also measure the circuit breaker contact resistance with both sides of the breaker bushing being grounded. When a test current is applied to a circuit breaker with both sides grounded, some of the test current flows through the safety ground cables. Using an external current sensor, the Auto-Ohm 200 S4 measures and eliminates this current from the total test current. The Auto-Ohm 200 S4 then calculates the actual resistance value of the circuit breaker.

The Auto-Ohm 200 S4 features a back-lit 128 x 64 pixel LCD screen that is viewable in both direct sunlight and low-light levels. The resistance readings are displayed on the LCD screen in micro-ohms or milliohms. The unit is operated via a convenient 44-key "QWERTY" keypad on the front panel. The Auto-Ohm 200 S4 can store 128 records of 64 readings internally, and up to 999 test records on an external USB Flash drive. Test header information (Company, Substation, circuit breaker ID's) can also be entered using the 44-key keypad and is stored with each test record.

The Auto-Ohm 200 S4 can also be configured with an optional 2.5" wide thermal printer that can be used to print test reports in the field.

Windows® based (XP/Vista/7/10) analysis software is provided with each unit and can be used to analyze test records. Using this software, the user can retrieve test records (from the unit's USB Flash drive), analyze test results, and print test results on a desktop printer. Test records can also be exported to PDF, Excel, and XML formats.

The Auto-Ohm 200 S4 is furnished with a 30-ft test (#1 AWG) cable set. A 15-ft test cable set is also available as an option. Test cables are terminated with heavy duty welding type clamps. The test current and voltage sense cables are isolated and fastened to the clamp jaws. This feature allows for a simple connection to the circuit breaker bushing. An optional voltage sense cable and probe can be used to measure resistance in small access locations. Optional heavy-duty, welding type C-clamps are also available allowing the user to connect the test leads to a wide variety of bushing sizes, bus-bars, or large conductors.



### 1.3 Cables and Accessories



Figure 1. Furnished Current and Sense Combination Cables (P/N 8000-0076-SLEEVED)



Figure 2. Optional Cable with C-Clamp



**Figure 3. Optional Hand Spike**

## 1.4 Technical Specifications

**Table 1. Auto-Ohm 200 S4 Technical Specifications**

<b>TYPE</b>	Portable Micro-Ohmmeter
<b>PHYSICAL SPECIFICATIONS</b>	<b>Dimensions:</b> 18" W x 7" H x 15" D (45.7cm x 17.8cm x 38.1cm) <b>Weight:</b> 19.8 lbs (8.9 Kg)
<b>INPUT POWER</b>	100-240 Vac, 50/60Hz
<b>RESISTANCE READING RANGE</b>	1 micro-ohm to 5 ohms (max 10 milliohms @ 200A and 5 ohms @ 1A)
<b>TEST CURRENT RANGE</b>	1A – 200A (selectable in 1A steps) Thermally protected DC power supply
<b>RESOLUTION</b>	0.1 $\mu\Omega$ – 999.9 $\mu\Omega$ : 0.1 $\mu\Omega$ 1.000 m $\Omega$ – 9.999 m $\Omega$ : 1 $\mu\Omega$ 10.00 m $\Omega$ – 99.99 m $\Omega$ : 10 $\mu\Omega$ 100.0 m $\Omega$ – 999.9 m $\Omega$ : 0.1m $\Omega$
<b>TYPICAL ACCURACY</b>	$\pm(0.15\%$ of reading + 0.15% FS) at test current of 10-200A
<b>DISPLAY</b>	Back-lit LCD screen (128 x 64 dots)
<b>KEYPAD</b>	Rugged, 44-key "QWERTY" membrane keypad
<b>PRINTER</b>	Optional built-in 2.5" wide thermal printer
<b>INTERNAL TEST RECORD STORAGE</b>	128 test records. Each record can contain up to 64 readings.
<b>EXTERNAL TEST RECORD STORAGE</b>	Up to 999 test records on external USB Flash drive
<b>PC SOFTWARE</b>	Windows-based analysis software is included with purchase price
<b>COMPUTER INTERFACE</b>	One USB Flash drive interface
<b>COMPLIANCE</b>	<b>Electromagnetic Compatibility (EMC):</b> FCC Part 15; ICES-003; EN61326-1:2013; EN55011 Class A Group 1; EN61000-4-2,3,4,5,6,8,11  <b>Environmental:</b> IEC 60068-2-1,2,27,30,55  <b>Safety:</b> IEC/EN 61010-1:2010
<b>TEMPERATURE</b>	<b>Operating:</b> -10°C to +50°C (+15°F to +122°F) <b>Storage:</b> -30°C to +70°C (-22°F to +158°F)
<b>HUMIDITY</b>	90% RH @ 40°C (104°F) non-condensing
<b>ALTITUDE</b>	2,000 m (6,562 ft) to full safety specifications
<b>OPTIONS</b>	shipping case, 15 ft test cables, C-clamp set, hand spike set, dual ground option, built-in thermal printer option
<b>CABLES</b>	30 ft (9.1 m), #1 AWG test cables, power cord, ground cable
<b>WARRANTY</b>	One year on parts and labor

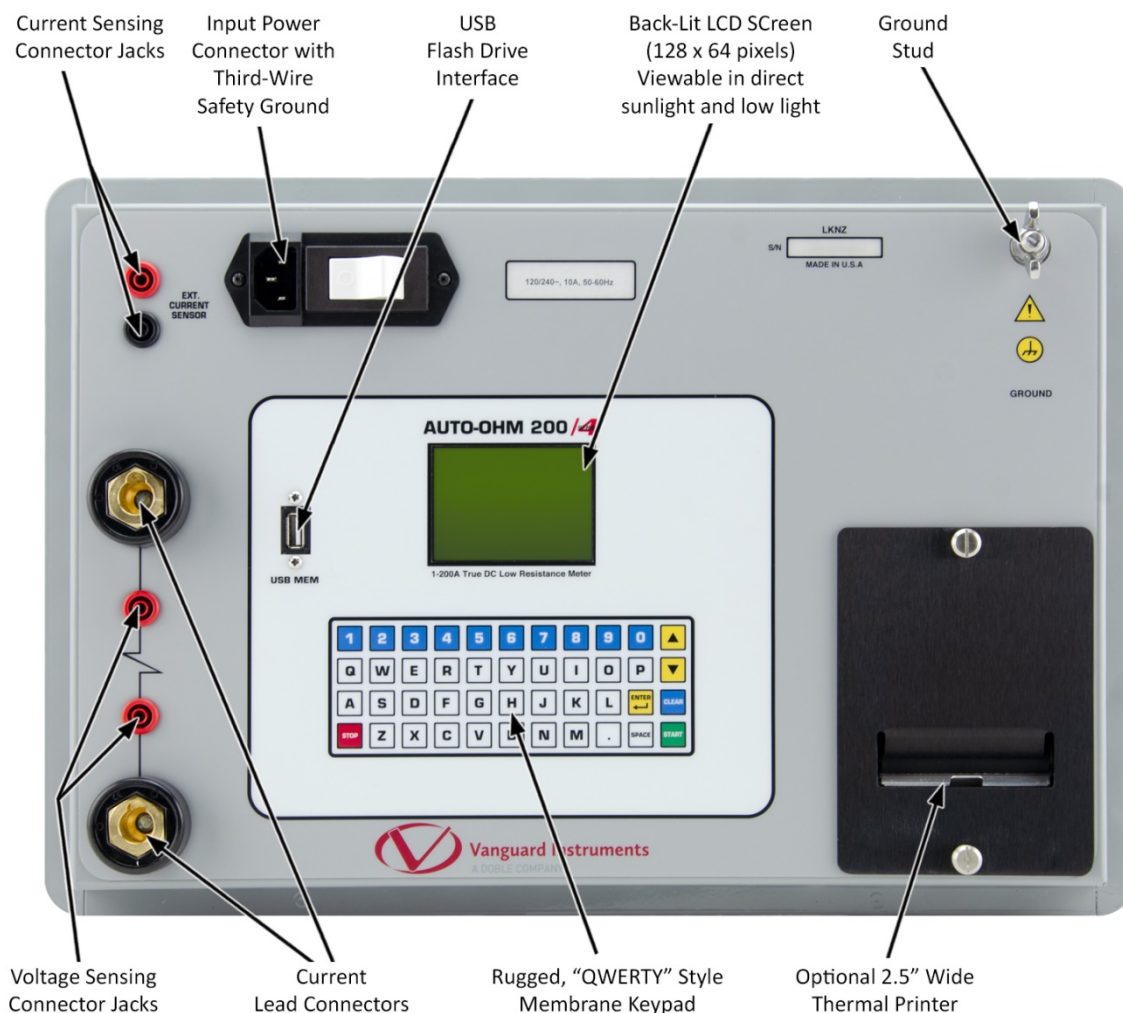


### NOTE

The above specifications are valid at nominal operating voltage and at a temperature of 25°C (77°F). Specifications may change without prior notice.

## 1.5 Auto-Ohm 200 S4 Controls and Indicators

The Auto-Ohm 200 S4's controls and indicators are shown in Figure 5. The purpose of the controls and indicators may seem obvious, but users should familiarize themselves with them before using the Auto-Ohm 200 S4. Accidental misuse of the controls will usually cause no serious harm. Users should also familiarize themselves with the safety summary information found on the front page of this User's Manual.



**Figure 4. Auto-Ohm 200 S4 Controls and Indicators**

## 2.0 PRE-TEST SETUP

### 2.1 Operating Voltages

The Auto-ohm 200 S4 operate on voltages between 120-240 Vac, 50/60 Hz.

### 2.2 LCD Screen Contrast Control

To increase the LCD screen contrast, press and hold the **【^】** key for two seconds. Release the button when the desired contrast level has been reached.

To decrease the LCD screen contrast, press and hold the **【v】** key for two seconds. Release the button when the desired contrast level has been reached.

### 2.3 Safety Ground

Always ground the Auto-Ohm 200 S4 to the substation ground before connecting test cables to the circuit breaker.

### 2.4 Printer Paper

The Auto-Ohm 200 S4's optional built-in thermal printer uses 2.5-inch wide thermal paper for printing test results. To maintain the highest print quality and to avoid paper jams, the use of thermal paper supplied by Vanguard Instruments is highly recommended. Additional paper can be ordered from the following sources:

#### **Vanguard Instruments**

1520 S. Hellman Avenue

Ontario, CA 91761

Tel: 909-923-9390

Fax: 909-923-9391

Part Number: VIC TP-3 paper

#### **BG Instrument Co.**

13607 E. Trent Avenue

Spokane, WA 99216

Tel: 509-893-9881

Fax: 509-893-9803

Part Number: VIC TP-3 paper

### 3.0 OPERATING PROCEDURES

#### 3.1 Connection Diagrams

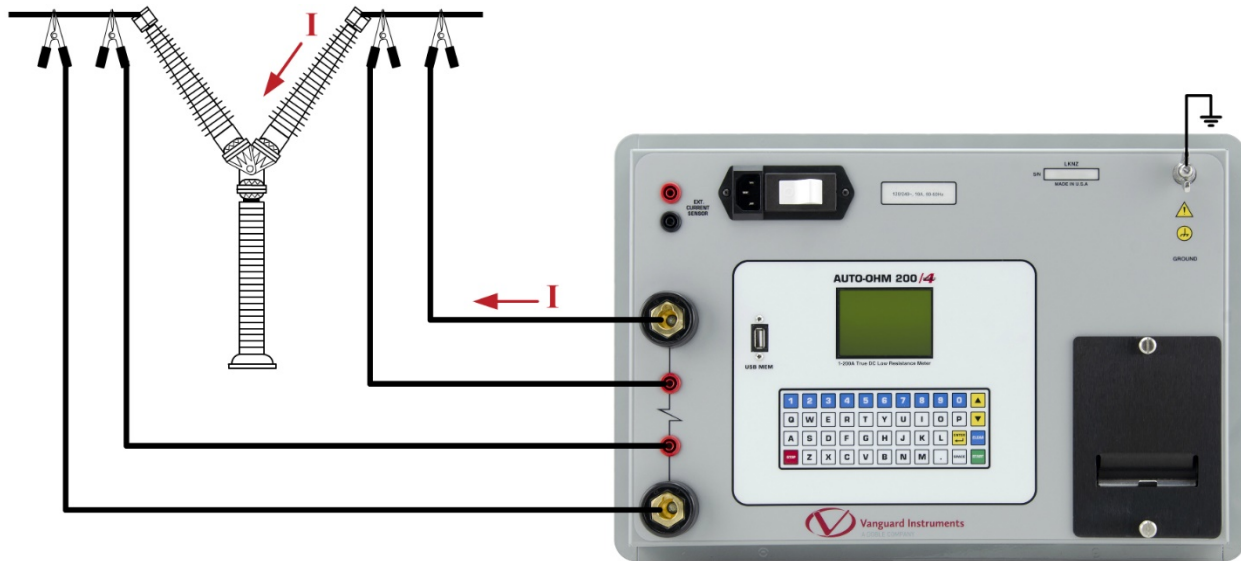


Figure 5. Typical Auto-Ohm 200 S4 Connection Diagram

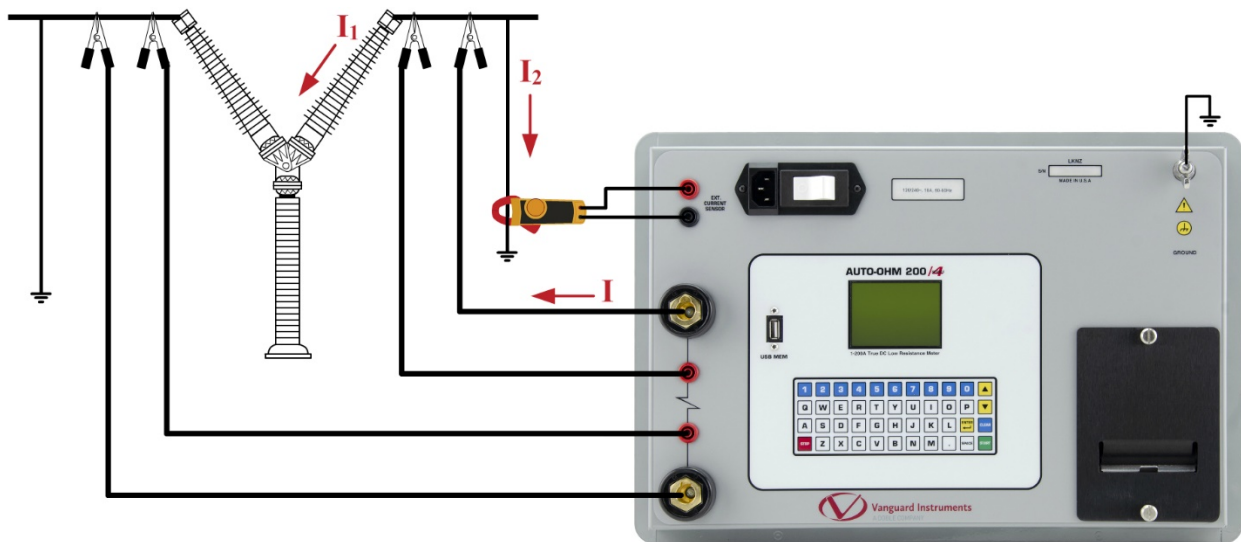
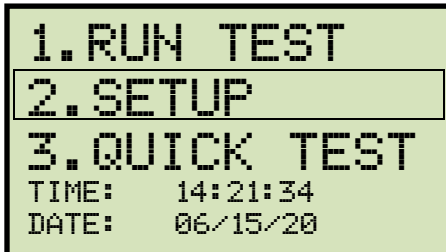


Figure 6. Typical Auto-Ohm S4 Connection Diagram with Dual Ground Option

### 3.2 Setting the Date and Time

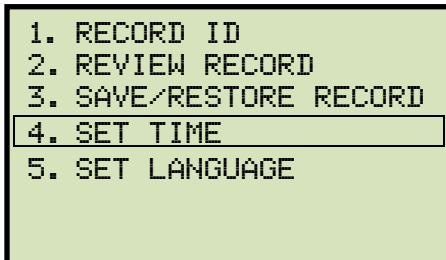
To set the date and time:

- a. Start from the "START-UP" menu:



Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



Press the **[4]** key (*SET TIME*)

- c. The following screen will be displayed:



Type in the date using the keypad. The following screen will be displayed:

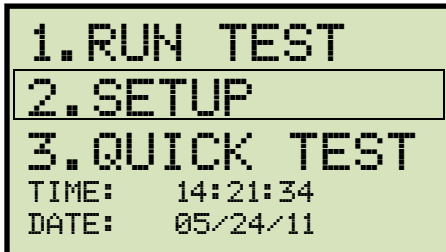


Enter the time using the alpha-numeric keypad. When the time has been entered, you will be immediately returned to the "START-UP" menu.

### 3.3 Setting the Interface Language

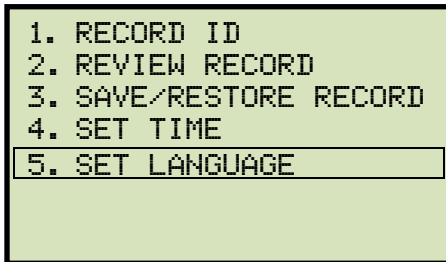
Follow the steps below to set the interface language (English, Spanish, or Turkish):

- a. Start from the "START-UP" menu:



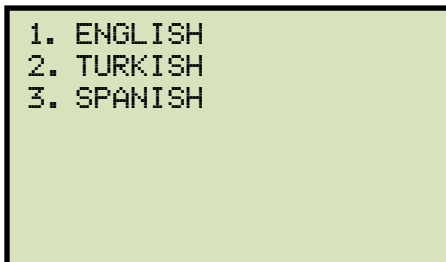
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



Press the **[5]** key (*SET LANGUAGE*).

- c. The following screen will be displayed:



Select the preferred interface language by pressing the corresponding key on the keypad (**[1]**, **[2]**, or **[3]**). The interface language will be set and a confirmation screen will be displayed as shown below:



Press any key to return to the "START-UP" menu.

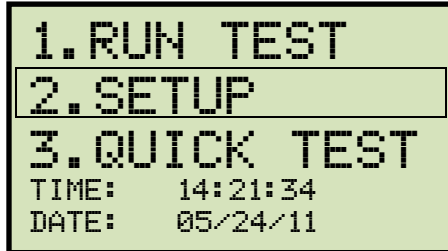


### 3.4 Testing Procedures

#### 3.4.1. Entering Test Record Header Information

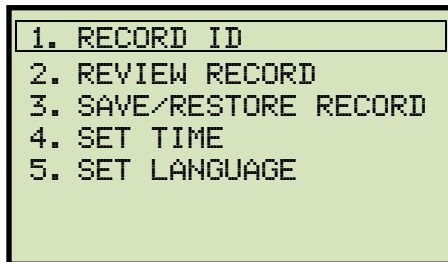
You can enter the test record header information before performing tests. The record header includes identifying information such as the company, station, circuit, manufacturer, etc. Once the header information has been set, it will apply to all subsequent test records. Follow the steps below to enter the test header information:

- a. Start from the "START-UP" menu:



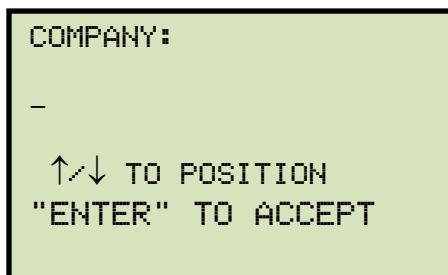
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



Press the **[1]** key (*RECORD ID*).

- c. The following screen will be displayed:



Type the company name using the keypad. Press the **[ENTER]** key when you are done typing the company name.

- d. The following screen will be displayed:

```
STATION:
-
↑/↓ TO POSITION
"ENTER" TO ACCEPT
```

Type the station name using the keypad and then press the **[ENTER]** key.

- e. The following screen will be displayed:

```
CIRCUIT:
-
↑/↓ TO POSITION
"ENTER" TO ACCEPT
```

Type the circuit information using the keypad and then press the **[ENTER]** key.

- f. The following screen will be displayed:

```
MANUFACTURER:
-
↑/↓ TO POSITION
"ENTER" TO ACCEPT
```

Type the manufacturer name using the keypad and then press the **[ENTER]** key.

- g. The following screen will be displayed:

```
MODEL:
-
↑/↓ TO POSITION
"ENTER" TO ACCEPT
```

Type the circuit breaker's model information using the keypad and then press the **[ENTER]** key.

- h. The following screen will be displayed:

```
SERIAL NUMBER:
-
↑/↓ TO POSITION
"ENTER" TO ACCEPT
```

Type the circuit breaker's serial number using the keypad and then press the **[ENTER]** key.

- i. The following screen will be displayed:

```
KVA:
-
↑/↓ TO POSITION
"ENTER" TO ACCEPT
```

Type the circuit breaker's KVA rating using the keypad and then press the **[ENTER]** key.

- j. The following screen will be displayed:

```
OPERATOR:
-
↑/↓ TO POSITION
"ENTER" TO ACCEPT
```

Type the operator's name using the keypad and then press the **[ENTER]** key. All header information will be saved, and you will be returned to the "START-UP" menu.

### 3.4.2. Performing a Test

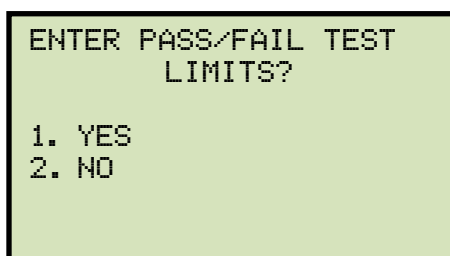
Follow the steps below to perform a test:

- a. Start from the "START-UP" menu:



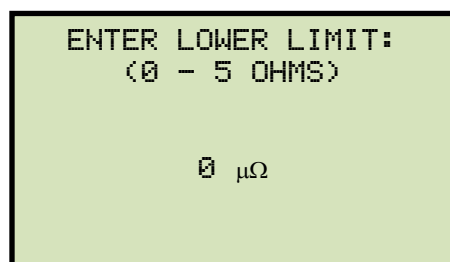
Press the **[1]** key (*RUN TEST*).

- b. The following screen will be displayed:

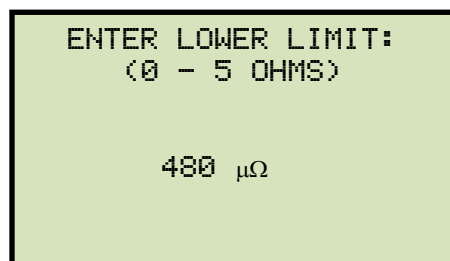


1. *YES*

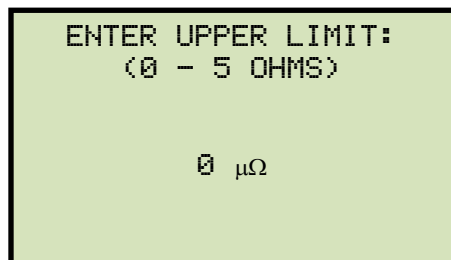
Press the **[1]** key (*YES*) if you would like to set the passing resistance range for a test. The following screen will be displayed:



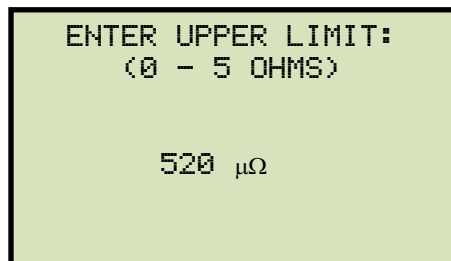
Enter the lower resistance limit for a passing test using the keypad. The screen will be updated as shown below:



Press the **[ENTER]** key. The following screen will be displayed:



Enter the upper resistance limit for a passing test using the keypad. The screen will be updated as shown below:



Press the **[ENTER]** key. **Continue to step c.**

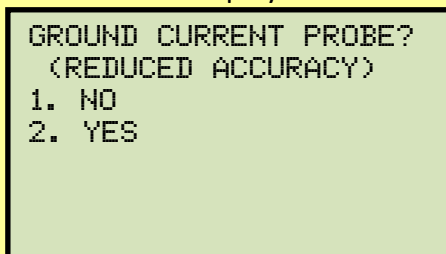
## 2. NO

Press the **[2]** key (*NO*) if you do not want to enter the passing resistance range for a test. **Continue to step c.**



### NOTES

If using an Auto-Ohm 200 S4 with the Dual Ground option, the following screen will be displayed before the screen shown in step c:

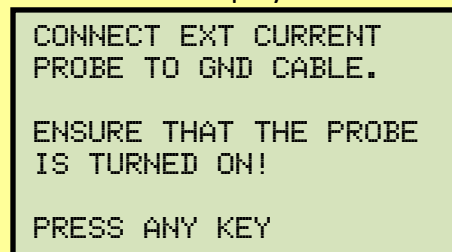


## 1. NO

Press the **[1]** key (*NO*) if you are not using a current probe and do not want to use the Dual Ground option. **Continue to step c.**

## 2. YES

Press the **[2]** key (*YES*) if you have connected an external current probe and would like to use the Dual Ground option. The following screen will be displayed:



Connect the external current probe to the ground cable and then turn on the probe. **Press any key and continue to step c.**

- c. The following screen will be displayed:

```
1. NORMAL TEST
2. AUTOMATIC TEST
```

The Auto-Ohm 200 S4 provides a convenient automatic test mode that can be used to perform multiple tests without having to restart each test manually. When performing an automatic test, the Auto-Ohm will sense when cables are disconnected and re-connected and will initiate the test 2 seconds after sensing a re-connection.

Press the **[1]** key (*NORMAL TEST*) if you would like to perform a normal test. **Continue to step d.**

Press the **[2]** key (*AUTOMATIC TEST*) if you would like to perform an automatic test. **Continue to step d.**

- d. The following screen will be displayed:

```
SELECT TEST CURRENT:
1. 10A
2. 25A
3. 50A
4. 100A
5. 200A
6. CUSTOM
```

Select the test current by pressing the corresponding numeric key on the keypad. If the test current you would like to use is not listed, press the **[6]** key (*CUSTOM*) and then enter a value from 1A to 200A

If you had selected the normal test mode, **continue to step e.**

If you had selected the automatic test mode, **continue to step f.**



**NOTE**

For an automatic test, the burn-in time is 5 seconds and cannot be changed.

- e. The following screen will be displayed:

```
SELECT BURN-IN TIME:
1.  5 SEC
2. 10 SEC
3. 20 SEC
4. 30 SEC
5.  1 MIN   6.  2 MIN
7.  5 MIN   8. CONT.
```

Select the burn-in time by pressing the corresponding numeric key on the keypad.



Option **[8]** (*CONT.*) will run the test continuously.

**NOTE**

- f. The following screen will be displayed:

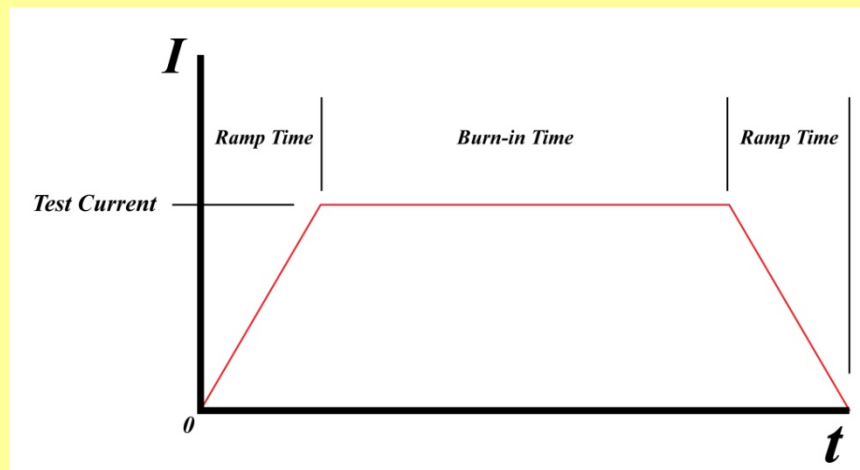
```
SELECT RAMP TIME:
1.  5 SEC
2. 10 SEC
3. 20 SEC
4. 30 SEC
```

Select the ramp time by pressing the corresponding numeric key on the keypad.



The ramp time is the time to raise the current from 0A to the test current and also the time to lower the current from the test current to 0A.

**NOTE**



- g. The test parameters summary screen will be displayed as shown below:

```
TEST PARAMETERS

CURRENT:  50 AMPS
BURN-IN:  AUTO
RAMP:      5 SEC

"START" TO RUN TEST
```

Press the **[START]** key to start the test.

- h. The following screen will be displayed temporarily:

```
AUTO TEST MODE
```

The screen will be updated as shown below while the current is being ramped up:

```
RAMPING CURRENT
12.30A  27%

TEST IN PROGRESS...
```

Once the current is ramped up to the selected test current, the initial test results will be displayed and the burn-in sequence will be initiated. The following screen will be displayed if the continuous burn-in time was NOT selected in step e:

```
BURNING IN: 04

497  $\mu\Omega$ 
50.01 A

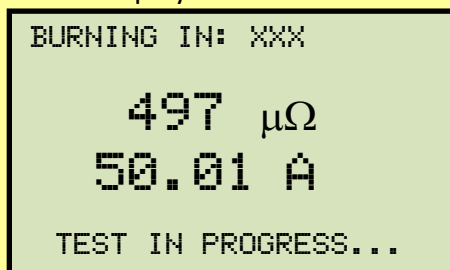
TEST IN PROGRESS...
```





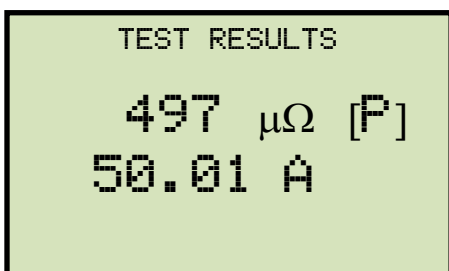
## NOTE

If the continuous burn-in option was selected in step e, the following screen will be displayed:



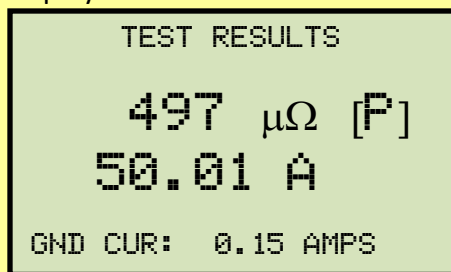
The unit will continue measuring the resistance and current and will display the values on the screen. To stop running the test, press the **[STOP]** key.

- i. The current will then be ramped down and then the final test results will be displayed as shown below:



## NOTES

- A Pass/Fail ([P] or [F]) will be displayed if you had entered a passing resistance range in step b.
- If you had selected the automatic test mode in step c, you can now disconnect the cables and re-connect them as needed. A test will be initiated automatically 2 seconds after the re-connection is sensed.
- If the Dual Ground option was used, the ground current will also be displayed as shown below:

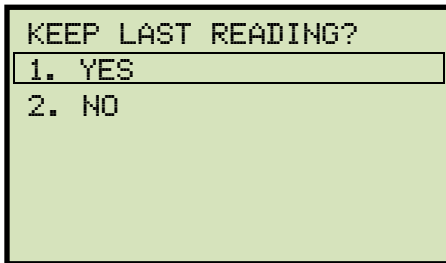


Press the **[STOP]** key to continue.

If you had selected the normal test option, **continue to step j.**

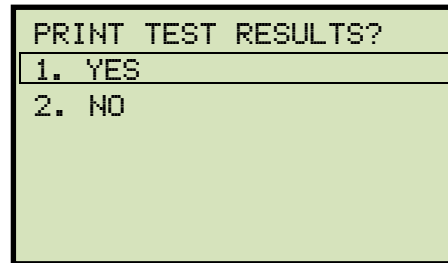
If you had selected the automatic test option, **continue to step k.**

- j. The following screen will be displayed:

**Auto-Ohm 200 S4 without Printer**

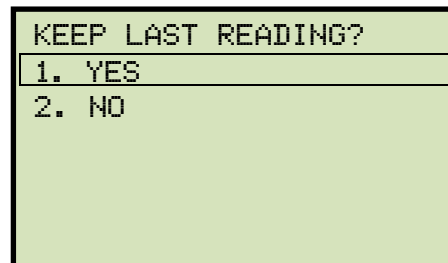
```
KEEP LAST READING?
1. YES
2. NO
```

Press the **[1]** key (YES) to save the reading.

**Auto-Ohm 200 S4 with Printer**

```
PRINT TEST RESULTS?
1. YES
2. NO
```

Press the **[1]** key (YES) to print the test results on the unit's built-in thermal printer (sample test results printouts are shown in Figure 10 and Figure 11). The following screen will be displayed:

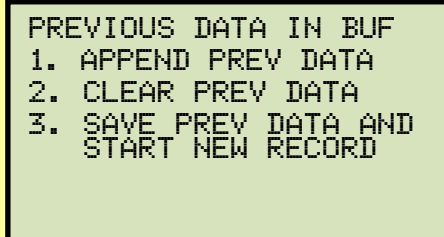


```
KEEP LAST READING?
1. YES
2. NO
```

Press the **[1]** key (YES) to save the reading.

**NOTES**

If you had saved a test reading before the current test, the data will still be in the unit's working memory. The following screen will be displayed:



```
PREVIOUS DATA IN BUF
1. APPEND PREV DATA
2. CLEAR PREV DATA
3. SAVE PREV DATA AND
  START NEW RECORD
```

3. *APPEND PREV DATA*

Press the **[1]** key (*APPEND PREV DATA*) to append the current test reading to the previous test record.

4. *CLEAR PREV DATA*

Press the **[2]** key (*CLEAR PREV DATA*) to erase the previous reading from the test record and replace it in the working memory with the current test reading.

5. *SAVE PREV DATA AND START NEW RECORD*

Press the **[3]** key (*SAVE PREV DATA AND START NEW RECORD*) to save the previous test reading in a test record and then create a new test

record for the current reading.

The following screen will be displayed:

```
==> TEST#1 SAVED <==
```

Press any key to continue.

The following screen will be displayed:

```
RUN ANOTHER TEST?  
1. YES  
2. NO
```

Press the **[2]** key (*NO*).

The following screen will be displayed:

```
SAVE THIS RECORD?  
1. YES  
2. NO
```

Press the **[1]** key (*YES*) to save the test record.

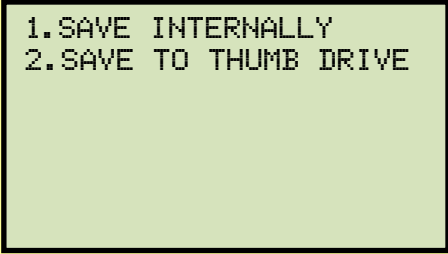
The following screen will be displayed:

```
SHOT NUMBER 001  
HAS BEEN SAVED!
```



#### NOTES

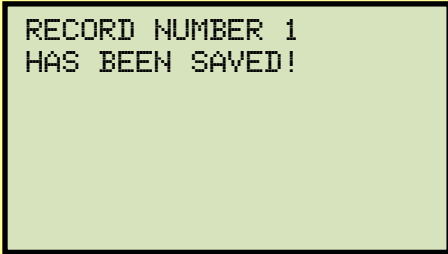
If a USB flash drive is connected to the unit, the following screen will be displayed instead:



```
1.SAVE INTERNALLY
2.SAVE TO THUMB DRIVE
```

1. *SAVE INTERNALLY*


Press the **[1]** key (*SAVE INTERNALLY*) to save the test record to the unit's Flash EEPROM. The following screen will be displayed:



```
RECORD NUMBER 1
HAS BEEN SAVED!
```

2. *SAVE TO THUMB DRIVE*

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test record to the connected USB Flash drive. The following screen will be displayed:



```
REC_000 SAVED TO
THUMB DRIVE
```

Press any key to return to the "START-UP" menu.

k. The following screen will be displayed:



```
SAVE THIS RECORD?
```

1. YES

2. NO

Press the **[1]** key (*YES*) to save the test record.

The following screen will be displayed:

A screenshot of a screen with a light green background and a black border. The text "SHOT NUMBER 001" is on the first line, and "HAS BEEN SAVED!" is on the second line, both in a monospaced font.



#### NOTES

If a USB flash drive is connected to the unit, the following screen will be displayed instead:

A screenshot of a screen with a light green background and a black border. It displays a menu with two options: "1. SAVE INTERNALLY" on the first line and "2. SAVE TO THUMB DRIVE" on the second line, both in a monospaced font.

#### 1. *SAVE INTERNALLY*

Press the **[1]** key (*SAVE INTERNALLY*) to save the test record to the unit's Flash EEPROM. The following screen will be displayed:

A screenshot of a screen with a light green background and a black border. The text "RECORD NUMBER 1" is on the first line, and "HAS BEEN SAVED!" is on the second line, both in a monospaced font.

#### 2. *SAVE TO THUMB DRIVE*

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test record to the connected USB Flash drive. The following screen will be displayed:

A screenshot of a screen with a light green background and a black border. The text "REC\_000 SAVED TO" is on the first line, and "THUMB DRIVE" is on the second line, both in a monospaced font.

Press any key to return to the "START-UP" menu.

TEST RESULTS	
DATE:05/11/20	TIME:08:38:10
COMPANY: STATION: CIRCUIT: MFR: MODEL: S/N: KVA RATING: OPERATOR:	
TEST NUMBER: 1 TEST CURRENT: 100 AMPS RAMP TIME: 5 Seconds BURN-IN TIME: 5 Seconds	
RESULTS:	
CURRENT:	100.00 AMPS
RESISTANCE:	100 uOhms [P]
LOWER RES LIMIT:	95 uOhms
UPPER RES LIMIT:	105 uOhms
NOTES: _____	
DATE:05/11/20	TIME:08:38:10

Figure 7. Sample Auto-Ohm 200 S4 Printout

REC NUMBER 15	
TEST RESULTS	
DATE:05/11/20	TIME:10:07:05
COMPANY: STATION: CIRCUIT: MFR: MODEL: S/N: KVA RATING: OPERATOR:	
TEST NUMBER: 1 TEST CURRENT: 10 AMPS RAMP TIME: 5 Seconds BURN-IN TIME: 5 Seconds	
RESULTS:	
CURRENT:	10.00 AMPS
RESISTANCE:	56 uOhms
GND CURRENT:	0.12 AMPS
NOTES: _____	

Figure 8. Sample Auto-Ohm 200 S4 Printout (with Dual Ground Option)

### 3.4.3. Performing a Quick Test

A quick test can be performed without having to enter the test current, the burn-in time, and the ramp time. For a quick test, a current of 100A is used, and the burn-in time and ramp time are both set to 5 seconds. The Quick Test mode should not be used if the circuit breaker is connected to dual grounds (if the unit has the Dual Ground option).

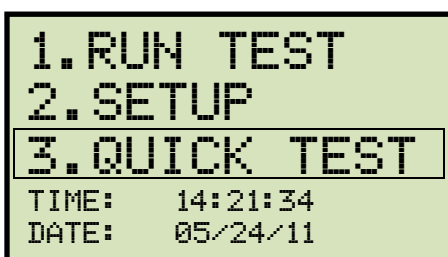


The Quick Test mode should not be used if the circuit breaker is connected to dual grounds because the Auto-Ohm will not monitor the external current probe current.

**NOTE**

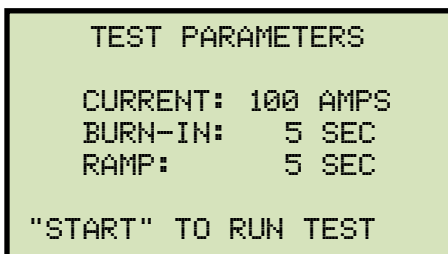
Use the steps below to perform a quick test:

- a. Start from the "START-UP" menu:



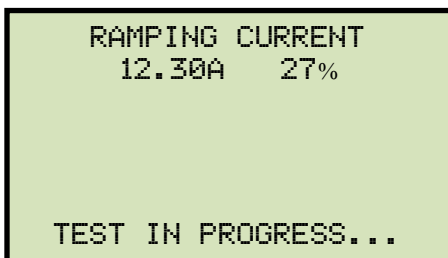
Press the **[3]** key (*QUICK TEST*)

- b. The following screen will be displayed

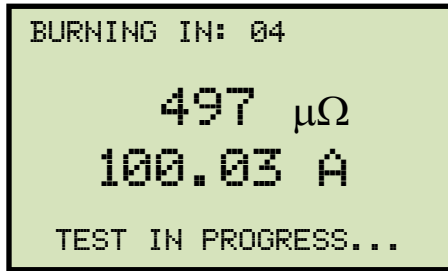


Press the **[START]** key.

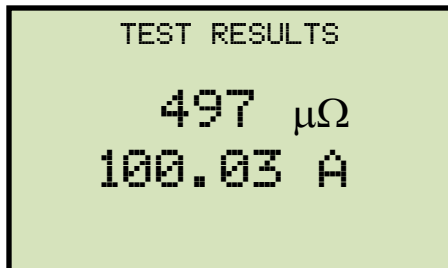
- c. The unit will start ramping up the current to 100A. The following screen will be displayed:



Once the current has reached 100A, the initial test results will be displayed and the burn-in sequence will be initiated. The following screen will be displayed:



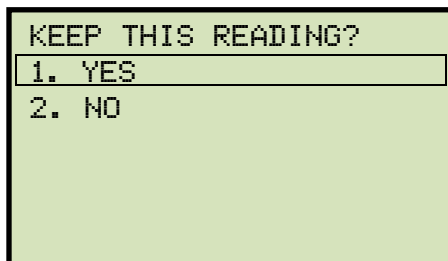
The current will then be ramped down and then the final test results will be displayed as shown below:



Press any key to continue.

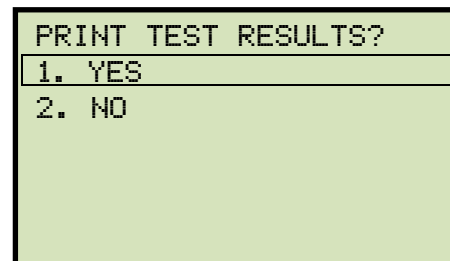
- d. The following screen will be displayed:

**Auto-Ohm 200 S4 without Printer**

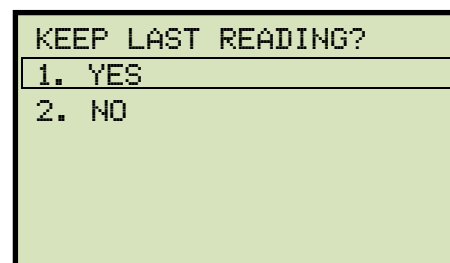


Press the **[1]** key (YES) to save the reading.

**Auto-Ohm 200 S4 with Printer**



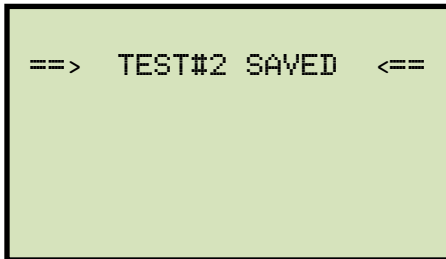
Press the **[1]** key (YES) to print the test results on the unit's built-in thermal printer. The following screen will be displayed:



Press the **[1]** key (YES) to save the reading.

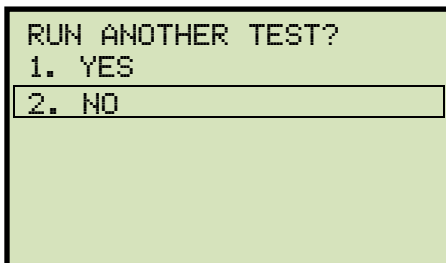


- e. The following screen will be displayed:

A green rectangular screen with a black border. The text "=="> TEST#2 SAVED <==" is displayed in a monospaced font at the top of the screen.

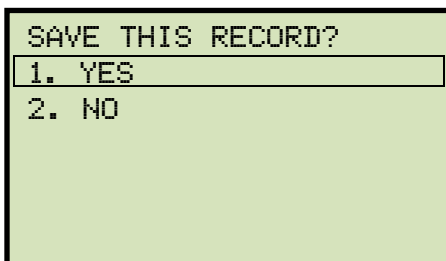
Press any key to continue.

- f. The following screen will be displayed:

A green rectangular screen with a black border. The text "RUN ANOTHER TEST?" is at the top. Below it are two options: "1. YES" and "2. NO". The option "2. NO" is highlighted with a black rectangular box.

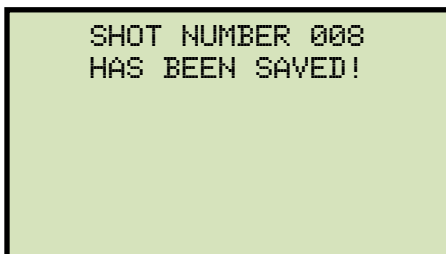
Press the **[2]** key (NO).

- g. The following screen will be displayed:

A green rectangular screen with a black border. The text "SAVE THIS RECORD?" is at the top. Below it are two options: "1. YES" and "2. NO". The option "1. YES" is highlighted with a black rectangular box.

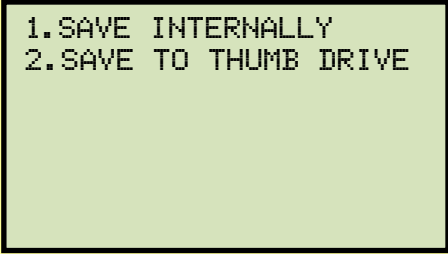
Press the **[1]** key (YES) to save the test record.

- h. The following screen will be displayed:

A green rectangular screen with a black border. The text "SHOT NUMBER 008" is on the first line, and "HAS BEEN SAVED!" is on the second line.

#### NOTES

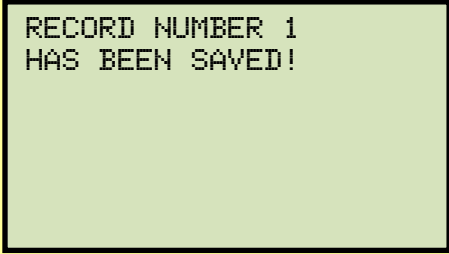
If a USB flash drive is connected to the unit, the following screen will be displayed instead:



```
1.SAVE INTERNALLY
2.SAVE TO THUMB DRIVE
```

*1. SAVE INTERNALLY*


Press the **[1]** key (*SAVE INTERNALLY*) to save the test record to the unit's Flash EEPROM. The following screen will be displayed:



```
RECORD NUMBER 1
HAS BEEN SAVED!
```

*2. SAVE TO THUMB DRIVE*

Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test record to the connected USB Flash drive. The following screen will be displayed:



```
REC_000 SAVED TO
THUMB DRIVE
```

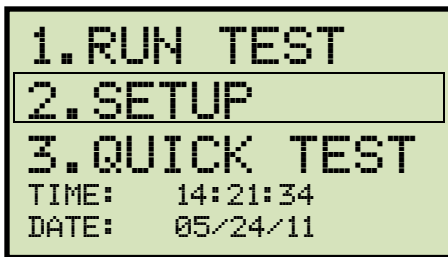
Press any key to return to the "START-UP" menu.

### 3.5 Working With Test Records

#### 3.5.1. Viewing the Contents of the Working Memory

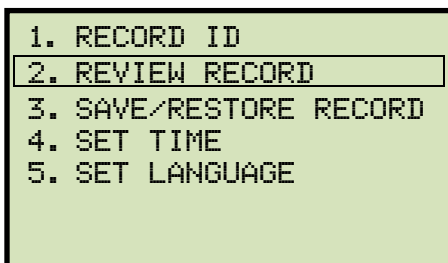
Whenever a test is performed and the reading is kept, the data is temporarily stored in the Auto-Ohm's working memory. You can view the test reading in the unit's working memory using the steps below:

- a. Start from the "START-UP" menu:



Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:

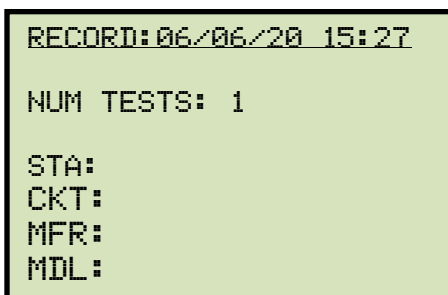


Press the **[2]** key (*REVIEW RECORD*).

- c. The following screen will be displayed:

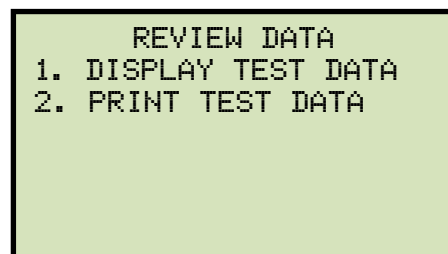
##### Auto-Ohm 200 S4 without Printer

The basic test record information will be displayed as shown:



Press the **[v]** key. The test record details will be displayed as shown below:

##### Auto-Ohm 200 S4 with Printer



1. *DISPLAY TEST DATA*

Press the **[1]** key (*DISPLAY TEST DATA*) to display the test results on the unit's LCD screen. The basic test record information will be displayed as shown:

```
TEST NUMBER: 1
TEST CURRENT: 25A
RAMP: 5S    BURN: 5S

CUR: 25.01A
RES: 497μΩ
```

Press the **[STOP]** key to return to the "START-UP" menu.

```
RECORD: 06/06/20 15:27

NUM TESTS: 1

STA:
CKT:
MFR:
MDL:
```

Press the **[V]** key. The test record details will be displayed as shown below:

```
TEST NUMBER: 1
TEST CURRENT: 25A
RAMP: 5S    BURN: 5S

CUR: 25.01A
RES: 497μΩ
```

Press the **[STOP]** key to return to the "START-UP" menu.

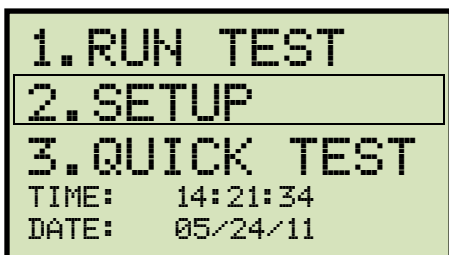
## 2. PRINT TEST DATA

Press the **[2]** key (*PRINT TEST DATA*) to print the test results on the unit's built-in thermal printer. The test results will be printed and you will be returned to the "START-UP" menu.

### 3.5.2. Saving Test Results to a Test Record

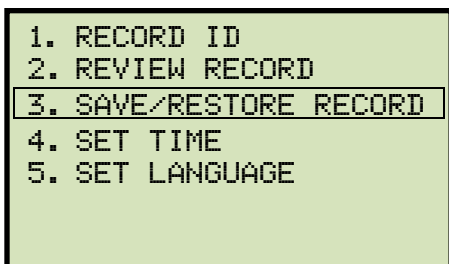
After performing a test, the user is presented the option to save the test results to the unit's Flash EEPROM or to a USB Flash Drive. If the test results are not saved immediately after performing a test, they will still remain in the working memory and can be saved later, as long as a new test has not been performed and the unit has not been turned off. Follow the steps below to save the test results from the working memory to a test record (the following procedure can also be used to re-save a restored test record to a new memory location or to a USB Flash Drive):

- a. Perform a test or restore a test record to the working memory (see section 3.5.3 and 3.5.4), and then start from the "START-UP" menu:



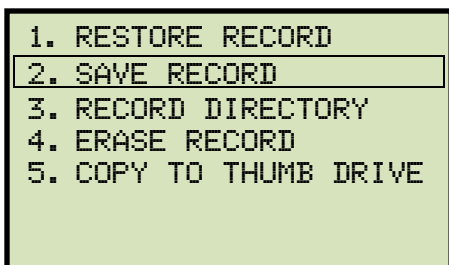
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



Press the **[3]** key (*SAVE/RESTORE RECORD*)

- c. The following screen will be displayed:



Option 5 (*COPY TO THUMB DRIVE*) will be listed only if a USB Flash drive is connected to the Auto-Ohm.

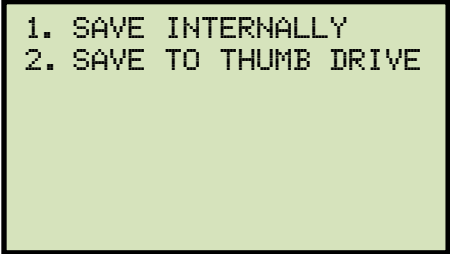
**NOTE**

Press the **[2]** key (*SAVE RECORD*).

If a USB Flash drive is connected to the unit, continue to step d.

If a USB Flash drive is NOT connected to the unit, continue to step e.

d. The following screen will be displayed:



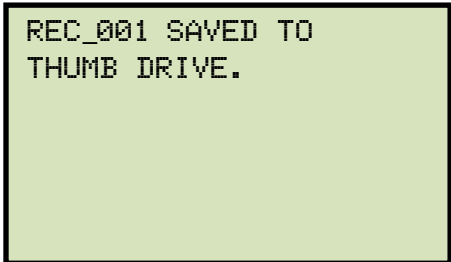
```
1. SAVE INTERNALLY
2. SAVE TO THUMB DRIVE
```

1. *SAVE INTERNALLY*

Press the **[1]** key (*SAVE INTERNALLY*) to save the test record to the unit's Flash EEPROM. **Continue to step e.**

2. *SAVE TO THUMB DRIVE*

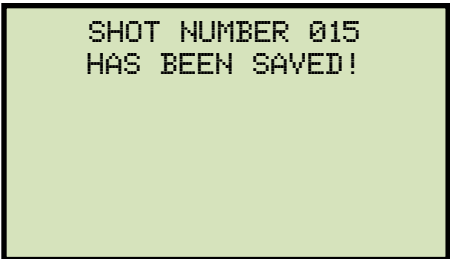
Press the **[2]** key (*SAVE TO THUMB DRIVE*) to save the test record to the connected USB Flash drive. The following screen will be displayed:



```
REC_001 SAVED TO
THUMB DRIVE.
```

Press any key to return to the "START-UP" menu.

e. The following screen will be displayed:



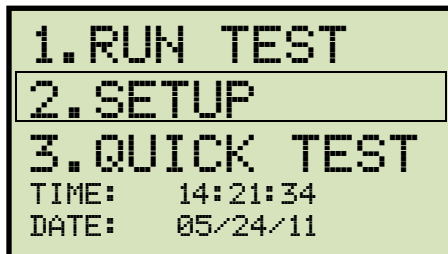
```
SHOT NUMBER 015
HAS BEEN SAVED!
```

Press any key to return to the "START-UP" menu.

### 3.5.3. Restoring a Test Record From Flash EEPROM

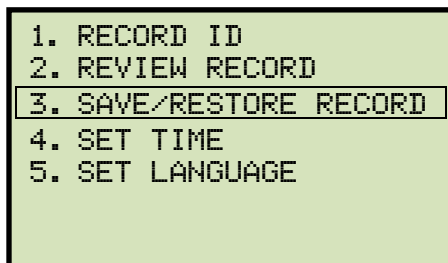
Use the steps below to restore a test record from the Auto-Ohm's internal Flash EEPROM to the working memory:

- a. Start from the "START-UP" menu:



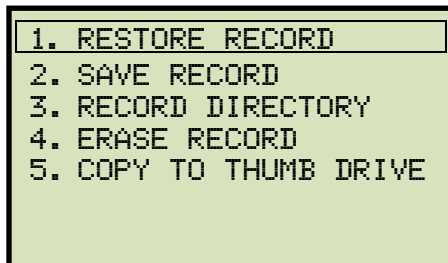
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



Press the **[3]** key (*SAVE/RESTORE RECORD*).

- c. The following screen will be displayed:

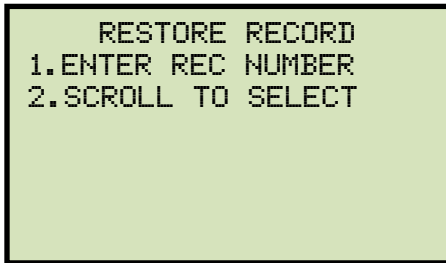


Option 5 (*COPY TO THUMB DRIVE*) will be listed only if a USB Flash drive is connected to the unit.

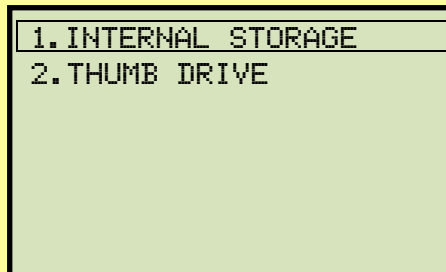
**NOTE**

Press the **[1]** key (*RESTORE RECORD*).

- d. The following screen will be displayed:

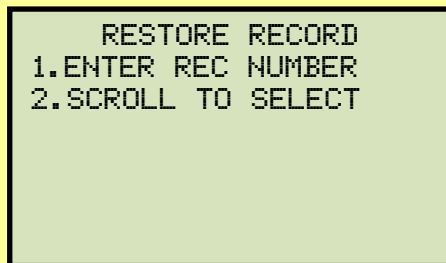
**NOTE**

If you have a USB Flash drive inserted in the unit's "USB MEM" port, the following screen will be displayed instead of the above screen:



Press the **[1]** key (*INTERNAL STORAGE*).

The following screen will be displayed:



Continue with the steps below.

1. *ENTER RECORD NUMBER*

Press the **[1]** key (*ENTER RECORD NUMBER*) if you know the record number that you would like to restore.

- 1.1. The following screen will be displayed:



Type the record number using the alpha-numeric keypad and then press the **[ENTER]** key.



- 1.2. The following screen will be displayed:

```
RECORD RESTORED!  
REVIEW RECORD?  
1.YES  
2.NO
```

Press the **[1]** key (YES) to display the test record.

- 1.3. The basic information about the restored test record will be displayed as shown:

```
RECORD: 06/06/20 15:15  
  
NUM TESTS: 1  
  
STA:  
CKT:  
MFR:  
MDL:
```

Press the **[v]** key. The test record details will be displayed as shown:

```
TEST NUMBER: 01  
TEST CURRENT: 25A  
RAMP: 5S BURN: 5S  
  
CUR: 25.01A  
RES: 497 $\mu\Omega$ 
```

Press the **[STOP]** key to return to the "START-UP" menu. The restored test record will remain loaded in the working memory.

## 2. SCROLL TO SELECT

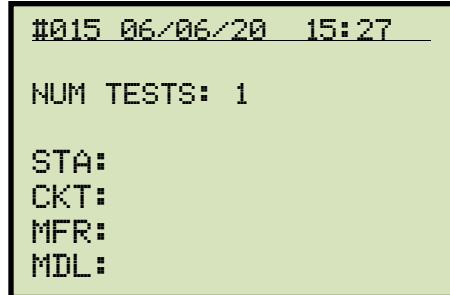
Press the **[2]** key (SCROLL TO SELECT) to scroll through a directory of the stored test records.

- 2.1. The following screen will be displayed:

```
RECORDS DIRECTORY  
  
"UP" TO SCROLL FWD  
"DOWN" TO SCROLL RVS  
  
"ENTER" TO SELECT
```

Press the **[^]** button or the **[v]** key to display the next or previous test record, respectively.

The basic test record information will be displayed as shown:



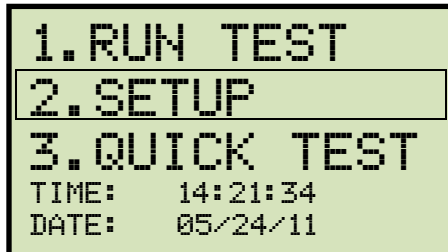
```
#015 06/06/20 15:27  
NUM TESTS: 1  
STA:  
CKT:  
MFR:  
MDL:
```

When you have located the test record that you would like to restore, press the **[ENTER]** key. **Continue to step 1.2 on page 37.**

### 3.5.4. Restoring a Test Record From a USB Flash Drive

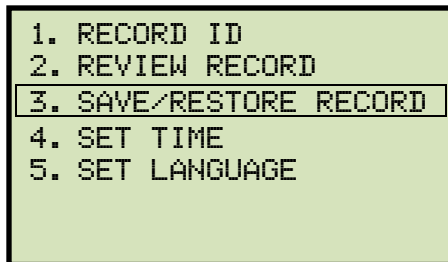
Use the steps below to restore a test record from a USB Flash drive to the Auto-Ohm's working memory:

- a. Make sure the USB Flash drive containing the test record(s) is inserted in the Auto-Ohm's USB Flash drive port ("USB MEM" port). Then start from the "START-UP" menu:



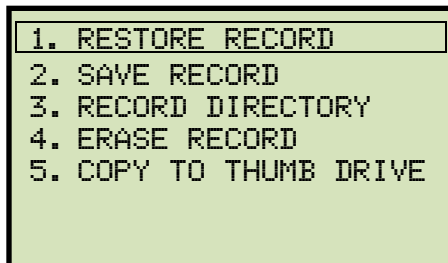
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



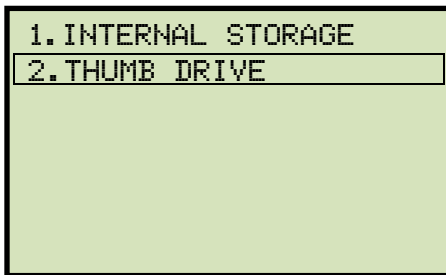
Press the **[3]** key (*SAVE/RESTORE RECORD*)

- c. The following screen will be displayed:



Press the **[1]** key (*RESTORE RECORD*).

- d. The following screen will be displayed:



```
1.INTERNAL STORAGE
2.THUMB DRIVE
```

Press the **[2]** key (*THUMB DRIVE*).

- e. The following screen will be displayed:

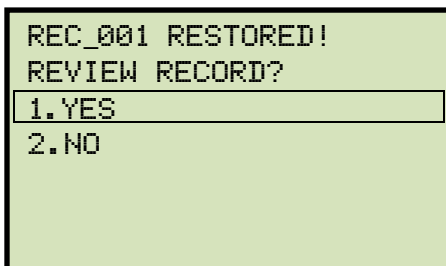


```
RESTORE THUMB DRIVE

REC_ _
```

Type the record number that you would like to restore using the alpha-numeric keypad and then press the **[ENTER]** key.

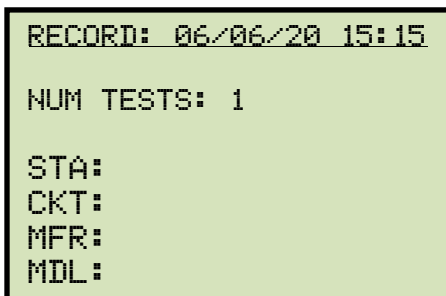
- f. The test record will be restored to the unit's working memory and the following screen will be displayed:



```
REC_001 RESTORED!
REVIEW RECORD?
1.YES
2.NO
```

Press the **[1]** key (*YES*) to display the restored test record.

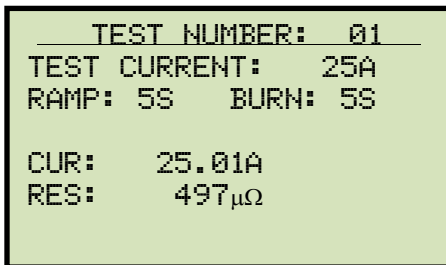
- g. The basic information about the restored test record will be displayed as shown below:



```
RECORD: 06/06/20 15:15
NUM TESTS: 1

STA:
CKT:
MFR:
MDL:
```

Press the **[V]** key. The test record details will be displayed as shown below:



```
TEST NUMBER: 01
TEST CURRENT: 25A
RAMP: 5S    BURN: 5S

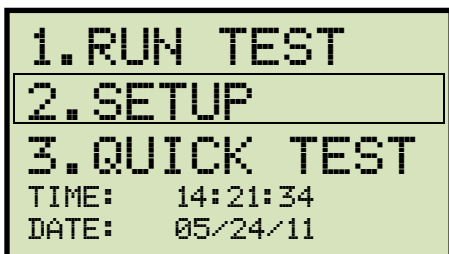
CUR: 25.01A
RES: 497μΩ
```

Press the **[STOP]** key to return to the “START-UP” menu. The restored test record will remain loaded in the working memory.

### 3.5.5. Copying Test Records to a USB Flash Drive

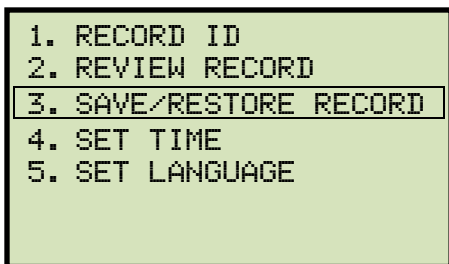
Use the steps below to copy one or all test records from the unit's Flash EEPROM to a connected USB Flash drive:

- a. Make sure a USB Flash drive is connected to the unit's "USB MEM" port, and then start from the "START-UP" menu:



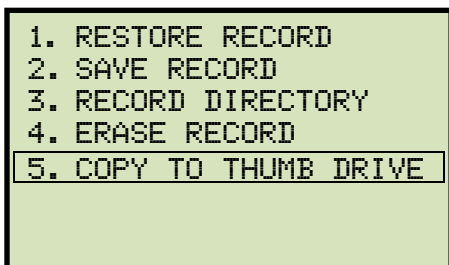
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



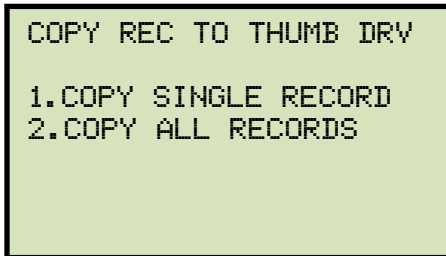
Press the **[3]** key (*SAVE/RESTORE RECORD*).

- c. The following screen will be displayed:



Press the **[5]** key (*COPY TO THUMB DRIVE*).

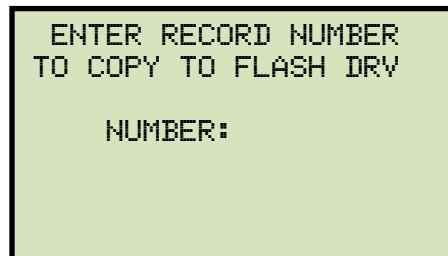
- d. The following screen will be displayed:



```
COPY REC TO THUMB DRV  
  
1.COPY SINGLE RECORD  
2.COPY ALL RECORDS
```

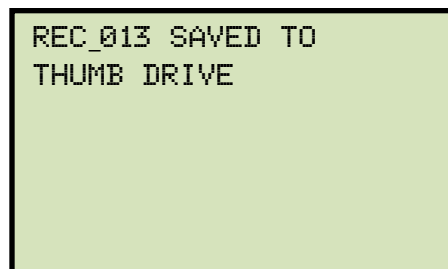
1. *COPY SINGLE RECORD*

Press the **[1]** key (*COPY SINGLE RECORD*) to copy a single test record from the unit's Flash EEPROM to the connected USB Flash drive. The following screen will be displayed:



```
ENTER RECORD NUMBER  
TO COPY TO FLASH DRV  
  
NUMBER:
```

Type the record number using the alpha-numeric keypad and then press the **[ENTER]** key. The test record will be copied to the USB Flash drive and the following screen will be displayed:

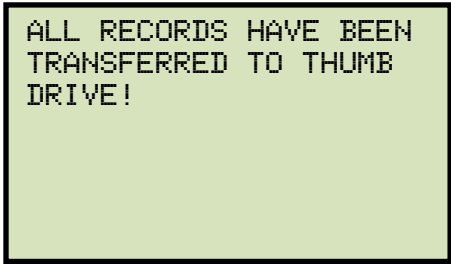


```
REC_013 SAVED TO  
THUMB DRIVE
```

Press any key to return to the "START-UP" menu.

## 2. COPY ALL RECORDS

Press the **[2]** key (*COPY ALL RECORDS*) to copy all test records from the Auto-Ohm's Flash EEPROM to the connected USB Flash drive. All test records will be copied from the unit to the connected USB Flash drive. The following screen will be displayed when the process is finished:

A rectangular LCD screen with a black border. The background is a light green color. The text is displayed in a black, monospaced, all-caps font. The text is arranged in three lines: "ALL RECORDS HAVE BEEN", "TRANSFERRED TO THUMB", and "DRIVE!".

```
ALL RECORDS HAVE BEEN  
TRANSFERRED TO THUMB  
DRIVE!
```

Press any key to return to the "START-UP" menu.



### 3.5.6. Viewing the Test Record Directory

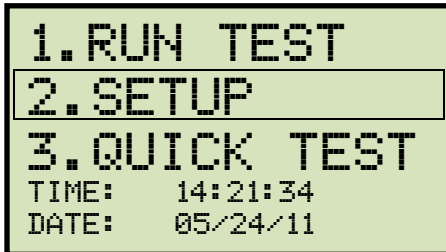


The instructions below apply to Auto-Ohm 200 S4 units without the built-in thermal printer option. For units that include the printer, the test record directory cannot be viewed

**NOTE**

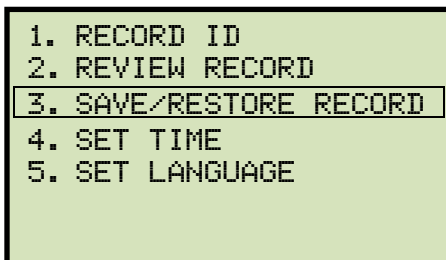
Use the steps below to browse through a directory of the test records stored in the Auto-Ohm's Flash EEPROM memory:

- a. Start from the "START-UP" menu:



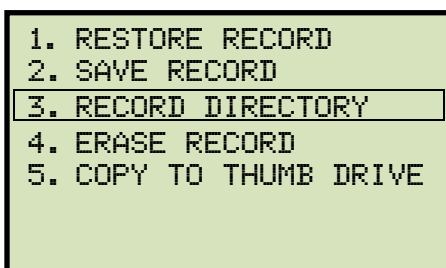
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



Press the **[3]** key (*SAVE/RESTORE RECORD*).

- c. The following screen will be displayed:



Option 5 (*COPY TO THUMB DRIVE*) is listed only if a USB Flash drive is connected to the unit.

**NOTE**

Press the **[3]** key (*RECORD DIRECTORY*).

- d. The following screen will be displayed:

```
RECORDS DIRECTORY

"UP" TO SCROLL FWD
"DWN" TO SCROLL RVS
```



If you have a USB Flash drive inserted in the unit's "USB MEM" port, the following screen will be displayed instead of the above screen:

**NOTE**

```
1.INTERNAL DIRECTORY
2.THUMB DRIVE DIR
```

Press the **[1]** key (*INTERNAL DIRECTORY*) to view the record directory of records stored in the unit's internal memory.

Press the **[2]** key (*THUMB DRIVE DIR*) to view the record directory of records stored on the connected Flash drive.

Continue with the steps below.

Press the **[^]** or **[v]** key to scroll through the test record directory. The test record header will be displayed as shown:

```
#8      08/26/11 07:42

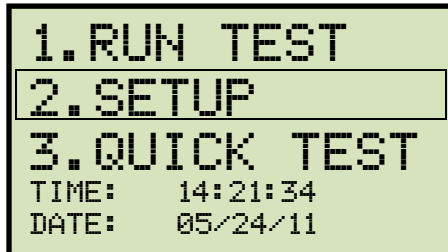
NUM TESTS: 1
```

You can continue to scroll through the record directory by pressing the **[^]** and **[v]** keys. Press the **[STOP]** key to return to the "START-UP" menu.

### 3.5.7. Erasing Test Records from the Flash EEPROM

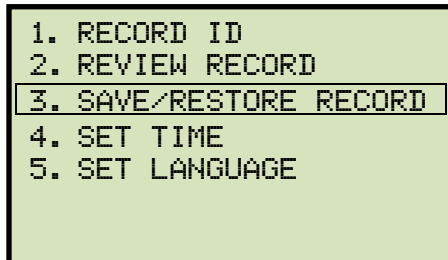
Follow the steps below to erase test records from the Flash EEPROM

- a. Start from the "START-UP" menu:



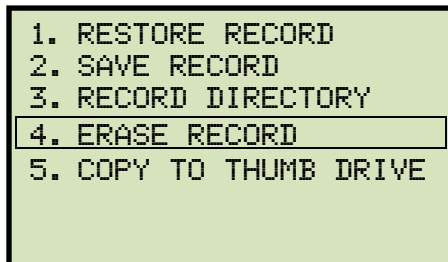
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



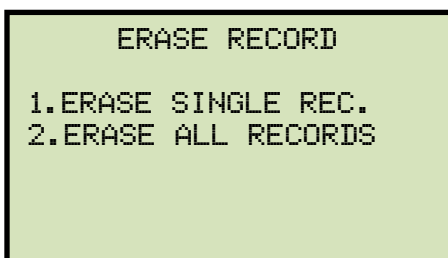
Press the **[3]** key (*SAVE/RESTORE RECORD*).

- c. The following screen will be displayed:



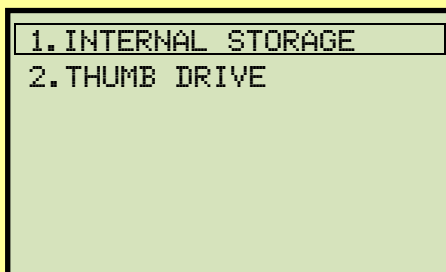
Press the **[4]** key (*ERASE RECORD*).

- d. The following screen will be displayed:



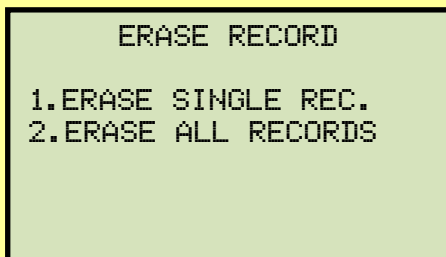
If you have a USB Flash drive inserted in the unit's "USB MEM" port, the following screen will be displayed instead of the above screen:

**NOTE**



Press the **[1]** key (*INTERNAL STORAGE*).

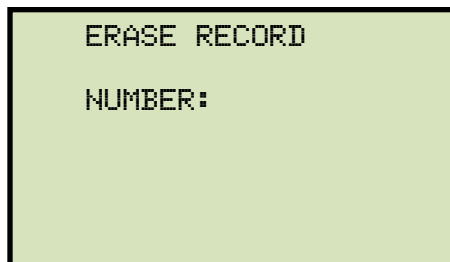
The following screen will be displayed:



Continue with the steps below.

**1. ERASE SINGLE REC.**

Press the **[1]** key (*ERASE SINGLE REC.*) to erase a single test record from the unit's internal Flash EEPROM. The following screen will be displayed:



**NOTE**

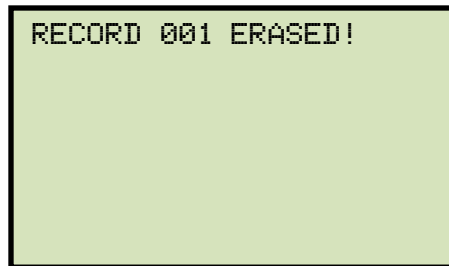
You can cancel the process and return to the "START-UP" menu by pressing the **[STOP]** key.

Type the record number that you would like to erase using the alpha-numeric keypad and then press the **[ENTER]** key. If you do not know the test record number, you can first view the test record directory using the instructions in section 3.5.6.

The following screen will be displayed while the record is being erased:

A green rectangular screen with a black border. The text "ERASING RECORD" is on the first line and "PLEASE WAIT..." is on the second line, both in a monospaced font.

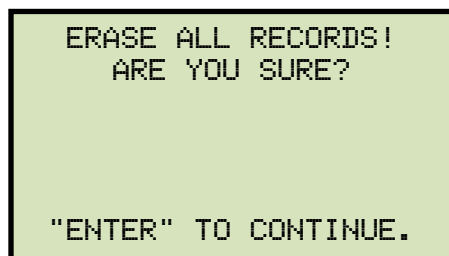
The following screen will be displayed when the test record has been completely erased:

A green rectangular screen with a black border. The text "RECORD 001 ERASED!" is displayed in a monospaced font.

Press any key to continue. You will be returned to "START-UP" menu.


## 2. ERASE ALL RECORDS

Press the **[2]** key (*ERASE ALL RECORDS*) to erase all the test records from the unit's internal Flash EEPROM. The following warning screen will be displayed:

A green rectangular screen with a black border. The text "ERASE ALL RECORDS!" is on the first line, "ARE YOU SURE?" is on the second line, and "'ENTER' TO CONTINUE." is on the third line, all in a monospaced font.

You can press the **[STOP]** key to cancel the process and return to the "START-UP" menu.


Press the **[ENTER]** key to proceed with deleting all the test records from the unit's Flash EEPROM. The following screen will be displayed during the erasure process:



ERASING RECORDS  
PLEASE WAIT...

A screenshot of a green rectangular screen with a black border. The text 'ERASING RECORDS' is displayed on the first line, and 'PLEASE WAIT...' is displayed on the second line. Both lines are centered horizontally.

The following screen will be displayed when all test records have been completely erased:



RECORDS ERASED!

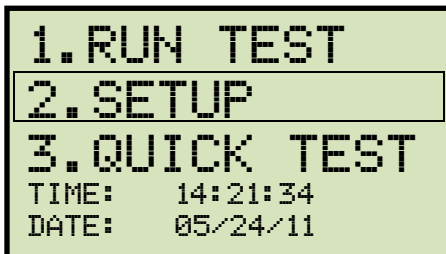
A screenshot of a green rectangular screen with a black border. The text 'RECORDS ERASED!' is displayed on the first line, centered horizontally.

Press any key to return to the "START-UP" menu.

### 3.5.8. Erasing Test Records from a USB Flash Drive

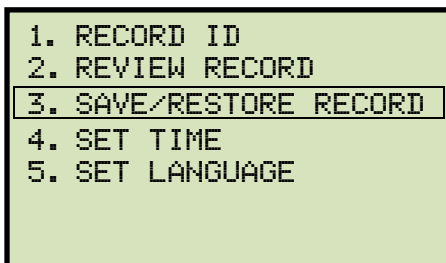
Follow the steps below to erase test records from a USB Flash drive:

- a. Make sure a USB Flash drive is connected to the unit's "USB MEM" port, and then start from the "START-UP" menu:



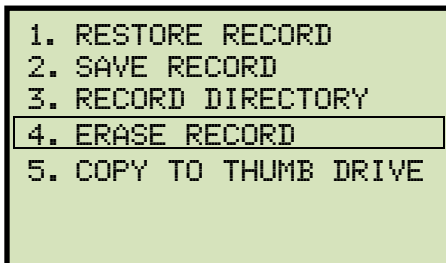
Press the **[2]** key (*SETUP*).

- b. The following screen will be displayed:



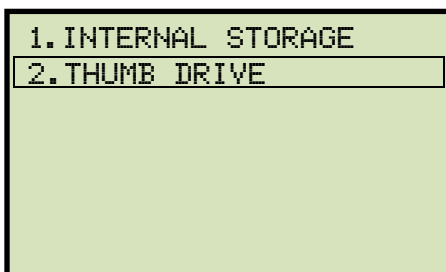
Press the **[3]** key (*SAVE/RESTORE RECORD*).

- c. The following screen will be displayed:



Press the **[4]** key (*ERASE RECORD*).

- d. The following screen will be displayed:



Press the **[2]** key (*THUMB DRIVE*).

- e. The following screen will be displayed:

```
ERASE RECORD
1.ERASE SINGLE REC
2.ERASE ALL RECORDS
```

1. *ERASE SINGLE REC.*

Press the **[1]** key (*ERASE SINGLE REC*) to erase a single test record from the connected USB Flash drive. The following screen will be displayed:

```
ERASE THUMB DRIVE
REC_ _
```

Type the record number that you would like to erase using the alpha-numeric keypad and then press the **[ENTER]** key. The test record will be erased from the USB Flash drive and the following screen will be displayed:

```
THUMB DRIVE REC_001
ERASED!
```

Press any key to continue. You will be returned to the beginning of step e. Press the **[STOP]** key to return to the "START-UP" menu.

2. *ERASE ALL RECORDS*

Press the **[2]** key (*ERASE ALL RECORDS*) to delete all test records from the connected USB Flash drive. The following warning screen will be displayed:

```
ERASE ALL RECORDS!
ARE YOU SURE?

"ENTER" TO CONTINUE.
```



Press the **[STOP]** key if you do not want to erase all the test records. You will be returned to the "START-UP" menu.

Press the **[ENTER]** key to proceed with deleting all the test records from the connected USB Flash drive. The following screen will be displayed when all the records have been erased:



Press any key to return to the "START-UP" menu.



**Vanguard Instruments**  
A DOBLE COMPANY



**1520 S. Hellman Ave • Ontario, CA 91761 • USA**

**Phone: 909-923-9390 • Fax: 909-923-9391**

**[www.vanguard-instruments.com](http://www.vanguard-instruments.com)**

**Copyright © 2021 by Doble Engineering Company**

**Auto-Ohm 200 S4 User's Manual • Revision 1.0 • June 9, 2021 • TA**