

LRM 200

True DC MicroOhmmeter

QUICK START GUIDE



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Safety Guidelines and Precautions

The following Safety Guidelines and Precautions must be observed during all phases of testing, including setup, test hookups, testing, and test lead disconnection.

Do Not Service or Test Alone

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

Avoid Contact with High Voltage

Because electrical utility station environments contain high voltages and currents, there is always the possibility of personal contact with an unexpected lethal voltage generated by magnetic induction and/or electrostatic leakage from nearby live circuitry. When test units are connected to de-energized (“dead”) power lines, regardless of how short they are, always discharge the lines before attaching any test lead.

Because of the possibly deadly consequences of physical contact with such high-voltage lines, engineers and technicians must always treat electrical equipment and hookups as though a lethal condition will eventually occur. Therefore, no matter how unlikely it may seem, never assume anything about the safety of any test setup.

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

Do Not Test Inductive Winding Resistance

Because the LRM 200 produces test currents up to 200 Amperes, it is able to build up large magnetic fields in iron-core transformers. The interruption of such test currents can produce a high voltage spike that can cause severe injury, death, and/or equipment damage.

Therefore, do not attempt to measure the resistance of iron-core transformer windings (use only equipment specifically designed for that purpose).

Do Not Modify Test Equipment

Do not install substitute parts or perform any unauthorized modifications to the LRM 200 as they can add the risk of introducing additional or unknown hazards. To ensure that designed safety features are maintained, it is recommended that all LRM 200 repairs are performed by Power Diagnostic Instrument Company or by an authorized repair center. Unauthorized LRM 200 modifications can create unknown safety hazards and will void the manufacturer's warranty.

Follow the Manufacturer's Operating Procedures

Please do not deviate from the operating procedures provided in this manual. Any deviations may create safety hazards, damage the LRM 200, or cause test errors. Power Diagnostic Instrument Company assumes no liability for unsafe or improper use of the LRM 200.

1. Introduction

1.1. Applicability

This manual applies to the Power Diagnostic Instrument Company model LRM 200. This manual is the basic issue for the LRM 200 and does not supersede any published document.

1.2. General Description

The LRM 200 is a Digital Micro Ohmmeter for precisely measuring non-inductive resistances from 1 micro-ohm to 300 milliohms. Applications include resistance measurement of circuit-breaker contacts, bushing joints, or any other low resistance. It is field-portable, rugged, and easily operated by first-time users having little training (it's microprocessor-driven, which automates many functions). It has a full keyboard like any computer for entering test parameters and control functions, and a 640x320 pixel color display for displaying control-option menus, measured resistance values, and related identifying data. The LRM 200 has a built-in thermal printer which prints test data on 2.15" wide thermal paper.

Operation requires little more than connecting the test leads to an unknown resistance and selecting the test parameters. It requires no calculation of lead-loss, hand-written notes, or memorization of detailed routines. Operators select the test current (10 to 200 Amperes) and test time (5 to 60 seconds). The measured resistance data is then displayed and can be printed on the thermal printer. The measured resistance data can also be stored (up to 63 records of 96 readings each) in the unit's built-in FLASH EEPROM memory. Operators can recall the stored resistance-measurements and related data at a later time for review and printing and can also copy their test records to a USB Flash drive.

1.3. Functional Description

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

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

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

1.4. Furnished Test Accessories

The LRM200 is supplied with a power cord, a roll of 2.15" wide thermal printer paper, and one 33' (10 m) test cable set with quick-disconnect plugs to the unit and heavy-duty alligator clamps to the load. Heavy-duty welding-type C-clamps are also available as optional accessories (C-clamps allow test-lead connections to a wide variety of bushing sizes, bus bars, and many other junctions that require low-contact resistance).

2. Technical Specifications

Physical Specifications	Dimensions: 18"W x 7"H x 15"D (45.7 cm x 17.8 cm x 38.1 cm) Weight: 19.8 lbs. (8.9 Kg)
Resistance Reading Range	1 micro-ohm to 5 ohms (max 10 milliohms @ 200A and 5 ohms @ 1A)
Test Current Range	1A ~ 200A (selectable in 1A steps)
Resolution	0.1 $\mu\Omega$ ~ 999.9 $\mu\Omega$: 0.1 $\mu\Omega$ 1.000 m Ω ~ 9.999 m Ω : 1 $\mu\Omega$ 10.00 m Ω ~ 99.99 m Ω : 10 $\mu\Omega$ 100.0 m Ω ~ 999.9 m Ω : 0.1 m Ω
Typical Accuracy	$\pm(0.15\%$ of reading + 0.15% FS) at test current of 10~200 A
User Interface	Screen: Back-lit LCD color screen (800x480 pixels) viewable in bright sunlight and low-light Keypad: 44-key "QWERTY"-style back-lit keypad Printer: Built-in 2.5" thermal printer
Computer Interfaces	One USB PC interface One USB flash drive interface
PC Software	Windows®-based analysis software is included
Internal Test Record Storage	150 test records; each record can contain up to 75 readings
Input Power	100 ~ 240 Vac, 50/60 Hz
Temperature	Operating: -10°C to +50°C (+15°F to +122°F) Storage: -30°C to +70°C (-22°F to +158°F)
Humidity	90% RH @ 40°C (104°F) non-condensing
Altitude	2,000 m (6,562 ft) to full safety specifications
Included Cables	33 ft (10 m), #1 AWG test cables, power cord, ground cable, USB cable
Safety	Designed to meet IEC 61010 (1995), UL 61010-a, and CAS-C22.2 standards
Options	Shipping case, 15 ft (4.57 m) test cables, dual ground option
Warranty	Two year on parts and labor

3. Interface Overview

Below is an overview of the interface components of the LRM200. Please take some time to familiarize yourself with these components before using the LRM 200.

Figure 1:
LRM 200 Interface Overview



4. LRM 200 Cable Connections

The LRM 200 is supplied with a 33-foot (10.06 m) test cable set. Each set consists of a current-carrying cable and a voltage-sensing cable. The current cable is terminated with a 200 A male plug. The sensing cable is terminated with a 25 A banana plug. Insert the current cable plugs and voltage sensing plugs into their respective control-panel jacks as shown below.

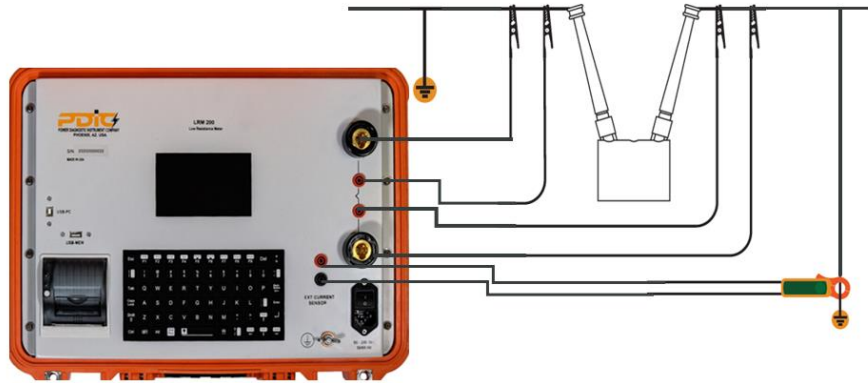
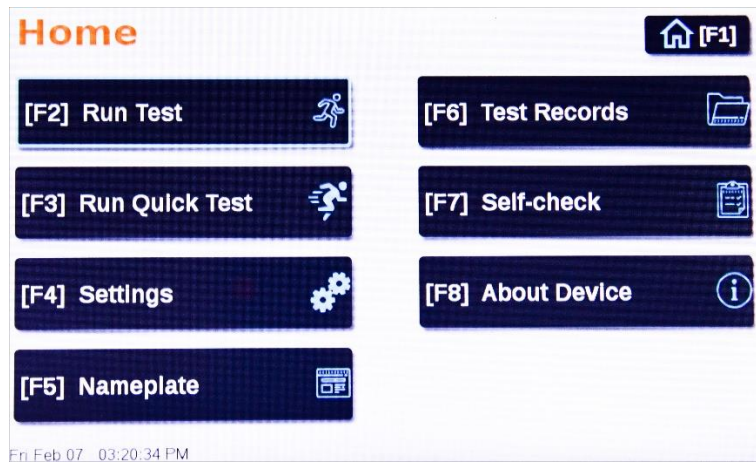


Figure 2:
Cable Connections Diagram

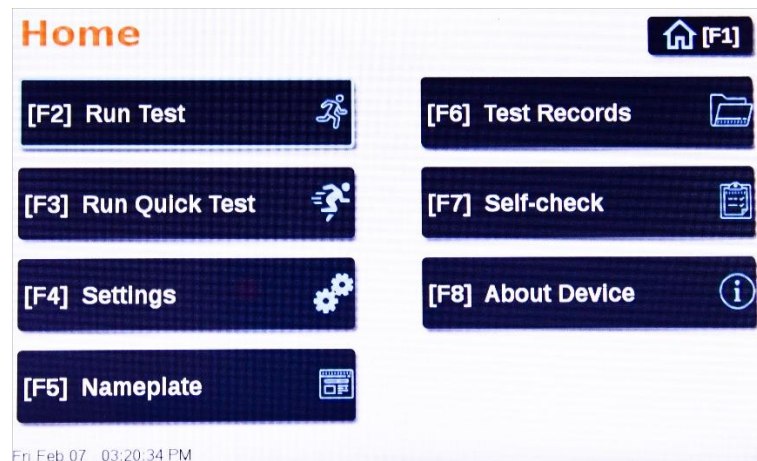
5. Operating Instructions

On power up, the Main Menu of the LRM 200 will be displayed as shown below:



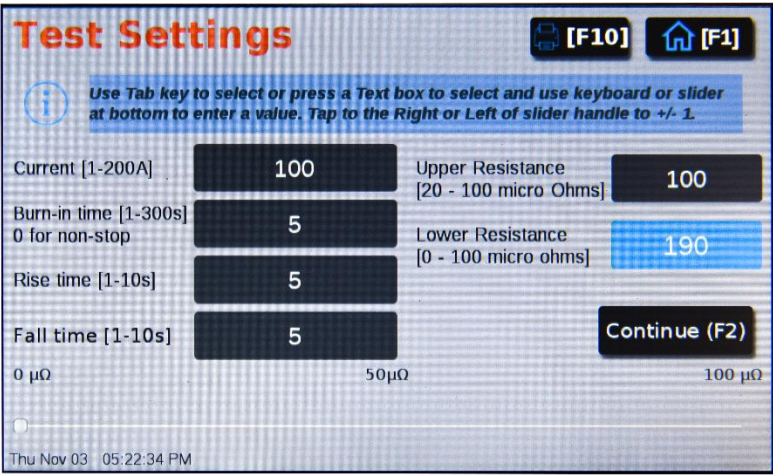
5.1. Setting the Current Date and Time

- a. Start from the Main Menu:



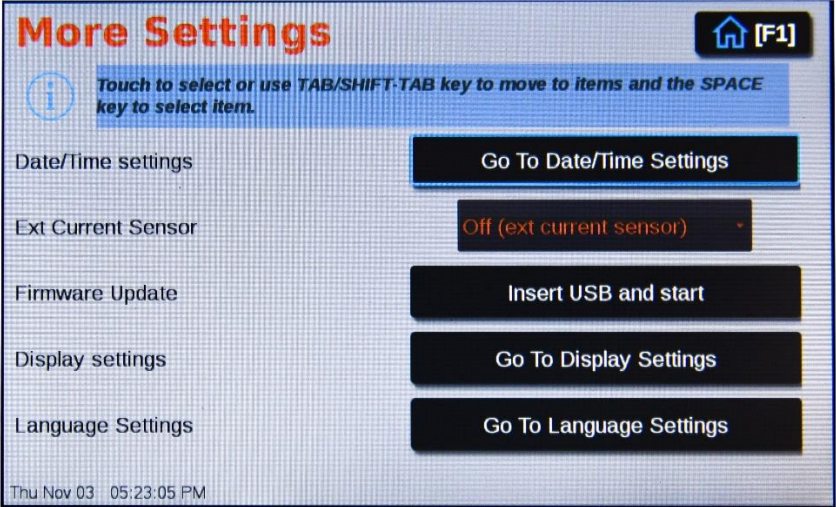
Press the [F4] key for the settings menu.

b. The settings menu will be displayed:



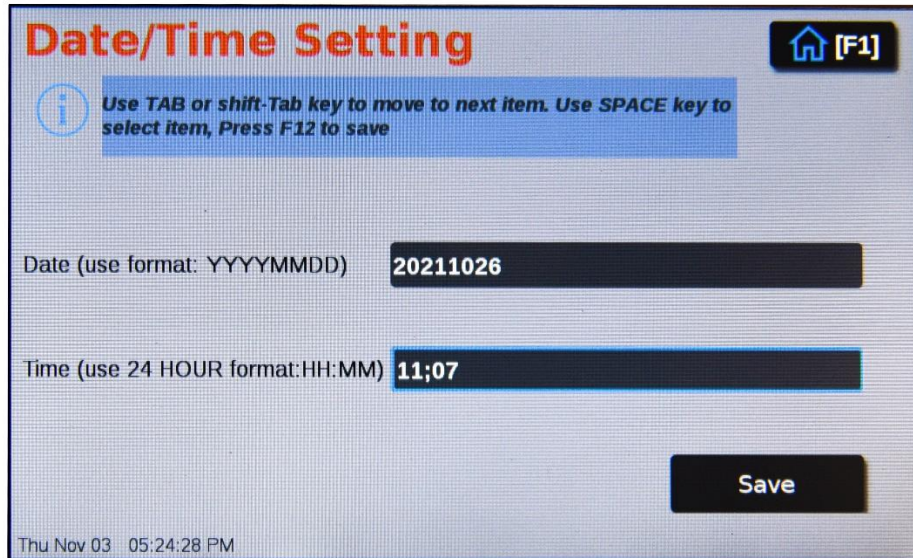
Press the **[TAB]** key to move to “More Settings” and then press the **[SPACEBAR]**.

c. The following screen will be displayed:



Press the **[TAB]** key to move to “Date/Time settings” and then press the **[SPACEBAR]**.

d. The following screen will be displayed:



Date/Time Setting [F1]

Use TAB or shift-Tab key to move to next item. Use SPACE key to select item, Press F12 to save

Date (use format: YYYYMMDD) 20211026

Time (use 24 HOUR format: HH:MM) 11:07

Save

Thu Nov 03 05:24:28 PM

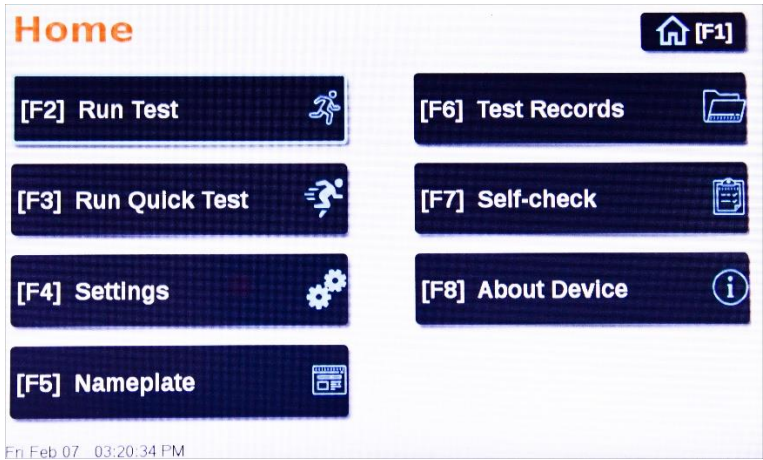
Use the [TAB] key to move to the item that you would like to change and press the [SPACEBAR]. Make any changes using the keypad and then press the [F12] key to save.

NOTE: To select the [F12] key, first hold down the [2nd Key] and then press the [F3] key.



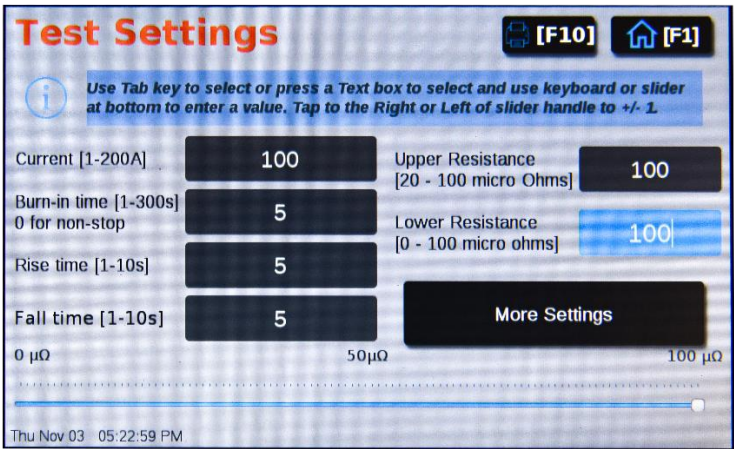
5.2. Setting Test Parameters

- a. To set the test parameters, start from the Main Menu:



Press the [F4] key for the settings menu.

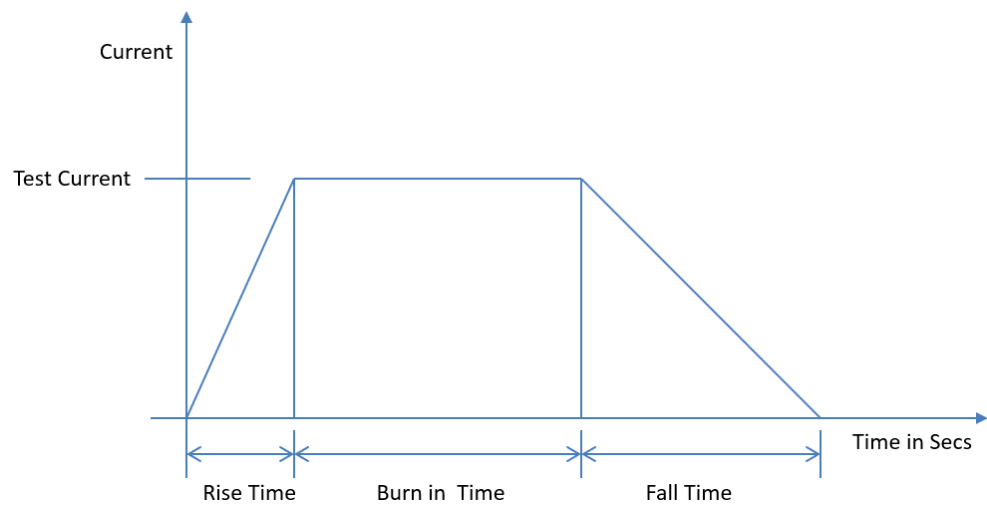
- b. The following screen will be displayed:



The test current, risetime, fall time and burn-in time can be set on this page. You can press the [TAB] key to navigate to the different fields and change the values using the keypad. After the test parameters are all set, press the [F1] key to return to the Main Menu.

The test parameters are explained in the following diagram.

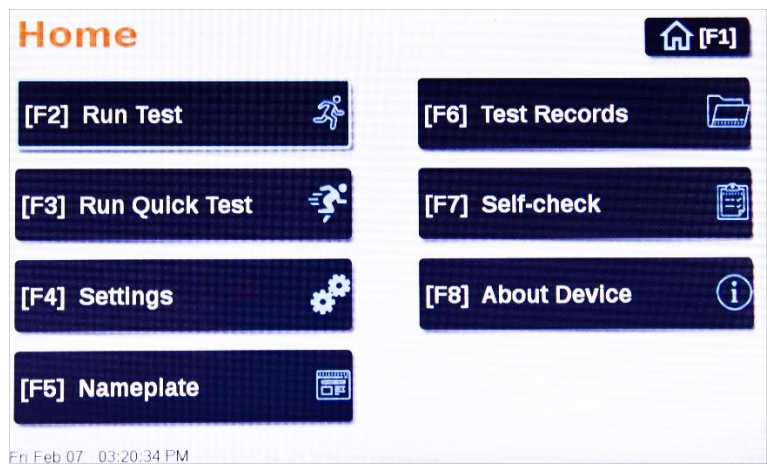
Figure 3:
Graphical Representation of
Test Parameters



5.3. Running a QuickTest

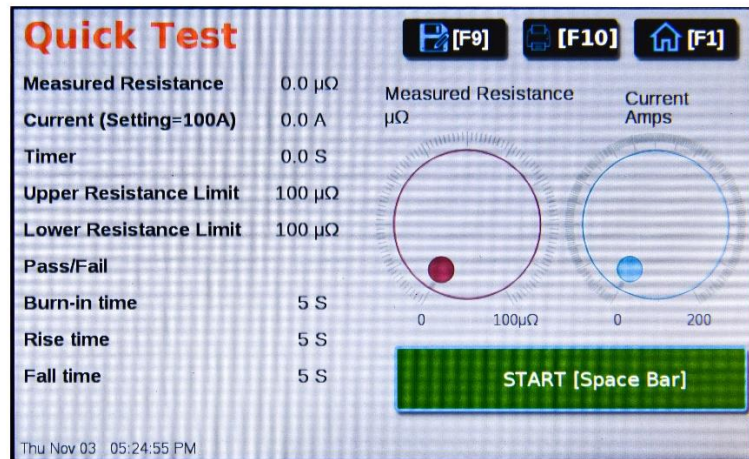
A quick test is used to make sure all the connections are made correctly. The test is performed using the parameters configured in step 5.2. Follow the steps below to perform a quick test.

- a. Start from the Main Menu:



Press the [F3] key for the settings menu.

- b. The following screen will be displayed:



- c. Press the [SPACEBAR] to start and end the test. Once stopped, the test can be re-started by pressing the [SPACEBAR] again.

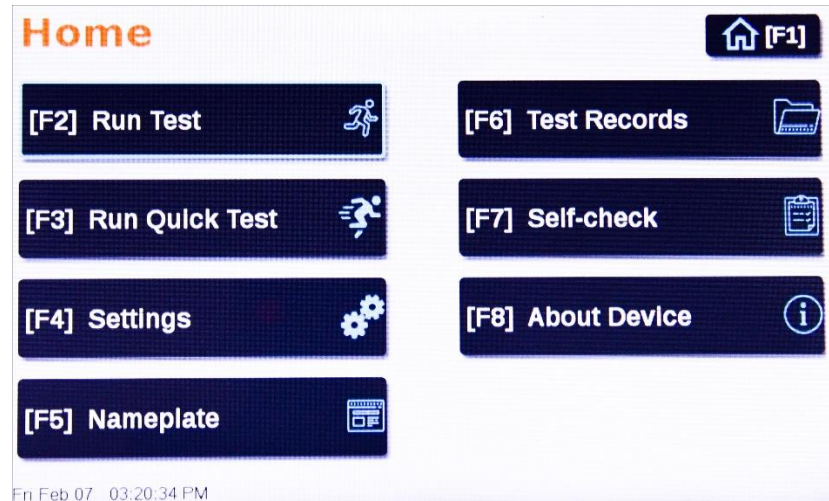
You can press the [F10] key to print the test results on the built-in thermal printer.

Press the [F1] key to return to the Main Menu.

5.4. Running a Test

To run a test, first configure the test parameters as outlined in section 5.2, then follow the steps below:

- a. Start from the Main Menu:



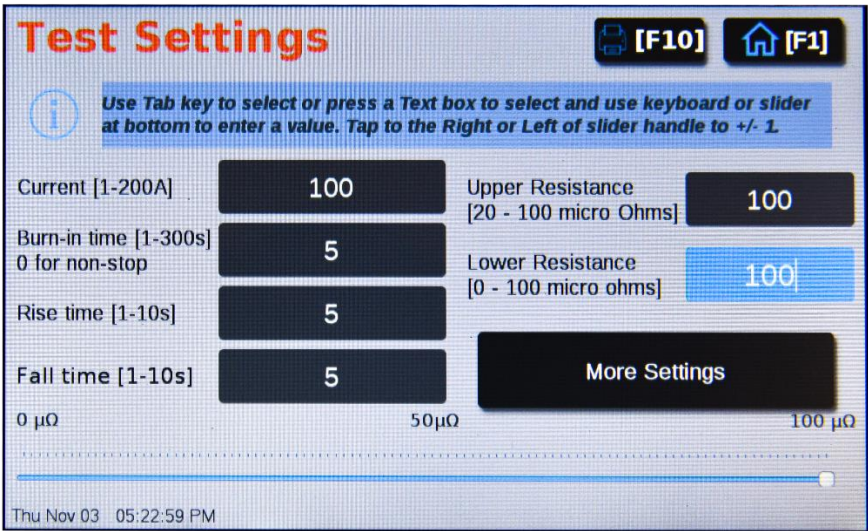
Press the [F2] key to run a test.

- b. The following screen will be displayed:

The screenshot shows the 'Nameplate' screen. At the top left is the word 'Nameplate' in orange. At the top right are two icons: a printer icon with '[F10]' and a home icon with '[F1]'. Below the title is a light blue banner with the text 'Use Tab key to select and change data.' Below this are several data entry fields. On the left, there are labels: 'Company Name', 'Station', 'Circuit', and 'Operator ID'. To the right of these labels are dark blue input boxes containing the text 'pdic', 'scottsdale', 's 1', and 'jg' respectively. Further to the right, there are labels: 'Apparatus Manufacturer', 'Apparatus Model', and 'Apparatus Serial Number'. To the right of these labels are dark blue input boxes containing the text 'abb', 'asdf', and '1234' respectively. At the bottom left, the date and time 'Fri Feb 07 03:24:02 PM' are displayed.

This screen is used to set the apparatus information. Use the [TAB] key to navigate between the fields and use the keypad to make any necessary changes, then press the [F2] key to continue.

c. The following screen will be displayed:

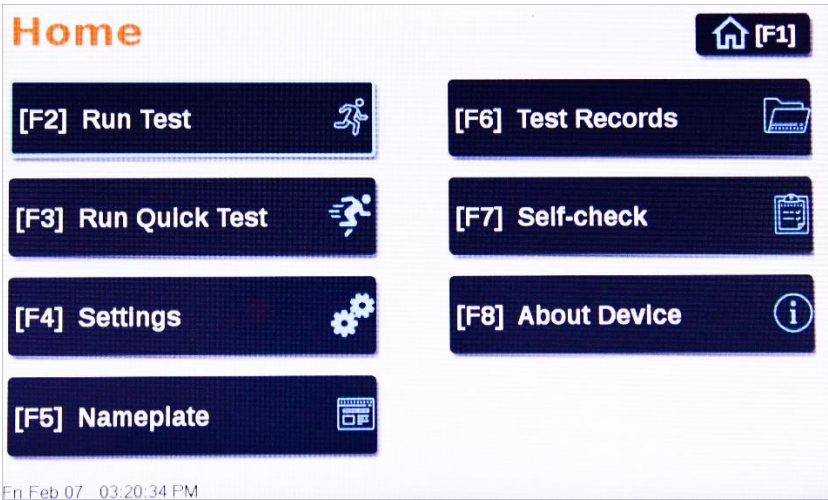


The test parameters can be changed here by pressing the [TAB] key and navigating to the setting that needs to be changed. Press the [SPACEBAR] to run the test.

5.5. Working with Test Records

Follow the steps below to work with test records stored in the unit’s memory:

a. Start from the Main Menu:



Press the [F6] key to access the Test Records menu.

b. The following screen will be displayed:



The number of test records will be displayed on this screen. Select the test record from the drop down menu then press the **[TAB]** key to select one of the functions on the right. Then press the **[SPACEBAR]** to execute the selected command. The following commands are available:

Copy all to USB - This command will copy all test records from the unit's internal memory to a USB Flash drive that is inserted in the unit's USB Mem port.

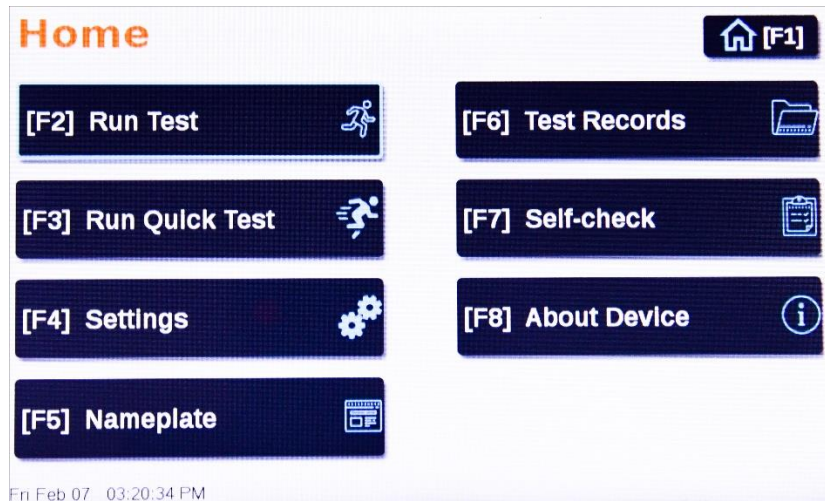
Delete - This command will delete the selected test record from the unit's internal memory.

Save to USB - This command will copy the selected test record from the unit's internal memory to a USB Flash drive that is inserted in the unit's USB Mem port.

5.6. Perform a Self-Check

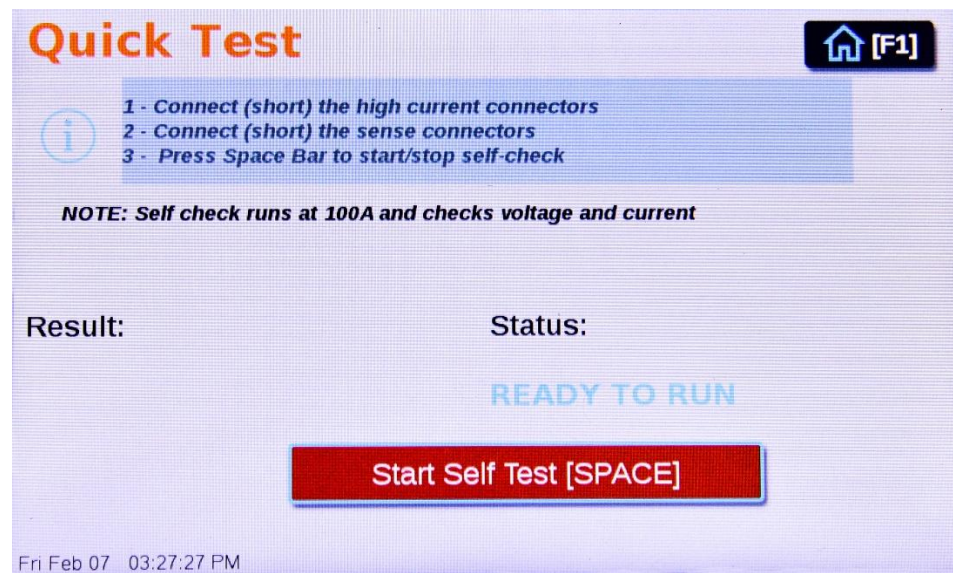
The LRM 200 has a self-check feature that can check the instrument to make sure that it is functioning properly. Follow the steps below to perform a self-check:

- a. Start from the Main Menu:



Press the **[F7]** key.

- b. The following screen will be displayed:



The screen prompts the user to short the high current terminals and the sense cable. Once connected, press the **[SPACEBAR]**. The LRM 200 will inject a 100 A current and check to make sure the instrument senses 100 A. If the unit senses the current correctly, a “Pass” message will be displayed; otherwise a “Fail” message will be displayed.

If the instrument fails this test, please contact the manufacturer for re-calibration or repair.

5.7. Viewing Detailed Instrument Information

You can view detailed information about your LRM 200 instrument by pressing the [F8] key from the Main Menu. The following screen will be displayed:

