SAFETY SUMMARY

FOLLOW EXACT OPERATING PROCEDURES
Any deviation from the procedures described in this User’s Manual may create one or more safety hazards, may damage the RFD-200 S2, or cause errors in the test results. Vanguard Instruments Company, Inc. assumes no liability for unsafe or improper use of the RFD-200 S2.

All safety precautions provided in this manual must be observed during all phases of testing including test preparation, test lead connection, actual testing, and test lead disconnection.

SAFETY WARNINGS AND CAUTIONS
Only trained operators shall use this device. All devices under test shall be off-line and fully isolated.

DO NOT MODIFY TEST EQUIPMENT
To avoid the risk of introducing additional or unknown hazards, do not install substitute parts or perform any unauthorized modification to any RFD-200 S2 test unit. To ensure that all designed safety features are maintained, it is highly recommended that repairs be performed only by Vanguard Instruments Company factory personnel or by an authorized repair service provider. Unauthorized modifications can cause safety hazards and will void the manufacturer’s warranty.
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CONVENTIONS USED IN THIS DOCUMENT

This document uses the following conventions:

- A key, switch, input, or knob on the RFD-200 S2 is indicated as [KEY], [SWITCH], [INPUT], [KNOB].
- RFD-200 S2 LCD screen output is shown as:

  | OmS | 0.0CY |
  | V Mtr: | -0.003 V |
  | Int I: | 0.080 A |
  | Ext I: | -0.001A |

- Warning messages are indicated as:

  ![Warning Icon] Warning message

- Important notes are indicated as:

  ![Note Icon] Note details
1.0 INTRODUCTION

1.1 General Description and Features

The RFD-200 S2 is a portable relay test set that delivers performance verification testing of electromechanical, electronic, and microprocessor-based protective relays in their operating installations. The RFD-200 S2 is a rugged test set suitable for testing a variety of protection relays operated in both indoor and outdoor environments. The unit’s ergonomic design and intuitive control panel layout make it ideal for first-time users who have little or no training.

**AC Current Source**

An AC current source with three outputs (10A, 40A, and 100A) provides test current to relays. The current source output can be programmed to synchronize with the RFD-200 S2’s timer. After a test is completed, the test current is turned off and the current reading is latched and displayed on the LCD screen. This feature reduces the possibility of overheating the relay coils.

**Built-in Power Resistors**

The RFD-200 S2 features five built-in power resistors for fine current adjustment.

**AC Voltage Source**

An AC voltage source is available for testing relays up to 250 Vac. The AC voltage source output can be programmed to synchronize with the RFD-200 S2’s timer.

**DC Voltage Source**

A 0 – 300 Vdc voltage source is also available for testing purposes.

**Built-in Digital Timer**

The RFD-200 S2’s digital timer features independent start and stop trigger inputs designed to measure the time between event transitions and to display the elapsed time in both milliseconds and cycles. The RFD-200 S2’s timer has three different trigger input modes – Internal Trigger, Dry-Contact, or Wet-Contact. In Internal Trigger Mode, the timer can start or stop by sensing the application or removal of the unit’s voltage or current source. In Dry-Contact Mode, the timer can be triggered by detecting a change in state of the dry-contact input. Similarly, in Wet-Contact Mode, it can be triggered by detecting a change in state of the voltage input.

**Auxiliary AC/DC Power Supplies**

The RFD-200 S2 provides three power supplies (24 Vdc, 124 Vdc and 240 Vac) for powering solid-state or microprocessor-based relays.
RFD-200 S2 Ampere Meters

The test current is displayed on the unit’s back-lit LCD screen that is viewable in both bright sunlight and low-light levels. The current measuring range is from 0.00 to 250 A. A second ampere meter is also available and can be used to read an external current input. The external current input is rated at 6A max and is protected by a circuit-breaker.

RFD-200 S2 Volt Meter

One volt meter input (0 to 600 V input range) is available on the RFD-200 S2. This input uses the true RMS for AC measurement method.

1.2 Furnished Accessories

The MCCB-250 comes furnished with the following:

- One power cord
- One set of 8-foot current cables
- One 8-foot timer start cables
- One 8-foot timer stop cables
- One 8-foot voltage cables
- One ground cable
- One cable carrying duffel bag
1.3 RFD-200 S2 Technical Specifications

Table 1. RFD-200 S2 Technical Specifications

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Portable relay test set</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT POWER</td>
<td>100 – 120 Vac or 200 – 240 Vac (factory pre-set), 50/60 Hz</td>
</tr>
<tr>
<td>PHYSICAL SPECIFICATIONS</td>
<td>Dimensions: 16.8&quot;W x 12.6&quot;H x 12&quot;D (42.7 cm x 32.0 cm x 30.5 cm); Weight: 35 lbs (15.9 kg)</td>
</tr>
<tr>
<td>AMPERE METER INPUT RANGES</td>
<td>Internal input range: 0 – 250 A; Accuracy: 2% of reading ± 10 mA, External AC input range: 0 – 6A; Accuracy: 1% of reading ± 10mA External DC input range: 0 – 6A; Accuracy: 0.5% of reading ± 1 count Measurement Method: True RMS for AC</td>
</tr>
<tr>
<td>VOLT METER INPUT RANGE</td>
<td>0 – 600.0V; AC accuracy: 1% of reading ± 1 count; DC accuracy 0.5% of reading ± 1 count Measurement Method: True RMS for AC</td>
</tr>
<tr>
<td>AUXILIARY POWER SUPPLIES</td>
<td>24 Vdc @ 1 A, 124 Vdc @ 0.25 A, 240 Vac @ 0.125 A</td>
</tr>
<tr>
<td>SAFETY</td>
<td>Designed to meet IEC61010 (1995), UL61010A-1, CSA-C22.2 standards</td>
</tr>
<tr>
<td>ENVIRONMENT</td>
<td>Operating: -10°C to 50°C (15°F to +122°F); Storage: -30°C to 70°C (-22°F to +158°F)</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Transportation case</td>
</tr>
<tr>
<td>WARRANTY</td>
<td>One year on parts and labor</td>
</tr>
</tbody>
</table>

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.
### Table 2. RFD-200 S2 Output Specifications

<table>
<thead>
<tr>
<th>Range</th>
<th>No-Load Voltage</th>
<th>Load Voltage</th>
<th>Load Current</th>
<th>Load/Unload Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 A</td>
<td>90 Vac</td>
<td>75 Vac</td>
<td>10 A</td>
<td>2 min / 15 min</td>
</tr>
<tr>
<td>40 A</td>
<td>25 Vac</td>
<td>20 Vac</td>
<td>40 A</td>
<td>1 min / 15 min</td>
</tr>
<tr>
<td>100 A</td>
<td>10 Vac</td>
<td>7.25 Vac</td>
<td>100 A</td>
<td>1 min / 15 min</td>
</tr>
<tr>
<td>100 A</td>
<td>10 Vac</td>
<td>3 Vac</td>
<td>250 A</td>
<td>1 sec / 5 min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>No-Load Voltage</th>
<th>Load Voltage</th>
<th>Load Current</th>
<th>Load/Unload Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 Vac</td>
<td>260 Vac</td>
<td>240 Vac</td>
<td>3 A</td>
<td>10 min / 45 min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>No-Load Voltage</th>
<th>Load Voltage</th>
<th>Load Current</th>
<th>Load/Unload Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 Vdc</td>
<td>300 Vdc</td>
<td>250 Vdc</td>
<td>2A</td>
<td>10 min / 45 min</td>
</tr>
</tbody>
</table>

### Table 3. RFD-200 S2 Timing Accuracy

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 9.999 sec</td>
<td>1 ms</td>
<td>± (1 ms + 0.01%)</td>
</tr>
<tr>
<td>10.00 to 99.99 sec</td>
<td>10 ms</td>
<td>± (10 ms + 0.01%)</td>
</tr>
<tr>
<td>100.00 to 999.999 sec</td>
<td>100 ms</td>
<td>± (100 ms + 0.01%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 9.999 cycles</td>
<td>0.1 cycle</td>
<td>± (0.1 cycle + 0.01%)</td>
</tr>
<tr>
<td>1,000 to 49,999 cycles</td>
<td>1 cycle</td>
<td>± (1 cycle + 0.01%)</td>
</tr>
</tbody>
</table>
1.4 Controls and Indicators

The RFD-200 S2’s controls and indicators are shown in Figure 1. A leader line with an index number points to each control and indicator, which is cross-referenced to a functional description in Table 4. The table describes the function of each item on the control panel. The purpose of the controls and indicators may seem obvious, but users should become familiar with them before using the RFD-200 S2. Accidental misuse of the controls will usually cause no serious harm. Users should also be familiar with the safety summary found on the front page of this User’s Manual.

Figure 1. RFD-200 S2 Controls and Indicators
Table 4. Functional Descriptions of RFD-200 S2 Controls and Indicators

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Panel Markings</th>
<th>Functional Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COM</td>
<td>Current source common terminal</td>
</tr>
<tr>
<td>2</td>
<td>100A</td>
<td>100A current source terminal</td>
</tr>
<tr>
<td>3</td>
<td>40A</td>
<td>40A current source terminal</td>
</tr>
<tr>
<td>4</td>
<td>10A</td>
<td>10A current source terminal</td>
</tr>
<tr>
<td>5</td>
<td>0-250 Vac 3A</td>
<td>AC voltage source terminals</td>
</tr>
<tr>
<td>6</td>
<td>0-300 Vdc 3A</td>
<td>DC voltage source terminals</td>
</tr>
<tr>
<td>7</td>
<td>EXT INPUT CURRENT 6A MAX</td>
<td>External current input terminals</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Power resistor array</td>
</tr>
<tr>
<td>9</td>
<td>110-120 Vac 12A, 50-60 Hz</td>
<td>Power switch with built-in circuit breaker</td>
</tr>
<tr>
<td>10</td>
<td>GROUND</td>
<td>Ground terminal</td>
</tr>
<tr>
<td>11</td>
<td>VOLTAGE INPUT 600V MAX</td>
<td>External voltage input terminals</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Back-lit LCD screen (20 characters by 4 lines), viewable in bright sunlight and low-light levels</td>
</tr>
<tr>
<td>13</td>
<td>RS-232</td>
<td>RS-232C (serial) port for factory firmware programming and diagnostics</td>
</tr>
<tr>
<td>14</td>
<td>OUTPUT CONTROL</td>
<td>Voltage and current source control knob</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>RFD-200 S2 timer, current source and voltage source control buttons</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>External current input circuit breaker</td>
</tr>
<tr>
<td>17</td>
<td>CONTRAST</td>
<td>LCD screen contrast control button</td>
</tr>
<tr>
<td>18</td>
<td>240 VAC .125A</td>
<td>240 Vac power supply fuse (1/8 A)</td>
</tr>
<tr>
<td>19</td>
<td>124 VDC .25A</td>
<td>124 Vdc power supply fuse (1/4 A)</td>
</tr>
<tr>
<td>20</td>
<td>24 VDC 1A</td>
<td>24 Vdc power supply fuse (1A)</td>
</tr>
<tr>
<td>21</td>
<td>PWS SELECT</td>
<td>Auxiliary power supply selection button</td>
</tr>
<tr>
<td>22</td>
<td>240-260 VAC</td>
<td>240 Vac power supply output terminals</td>
</tr>
<tr>
<td>23</td>
<td>124-136 VDC</td>
<td>124 Vdc power supply output terminals</td>
</tr>
<tr>
<td>24</td>
<td>24-28 VDC</td>
<td>24 Vdc power supply output terminals</td>
</tr>
<tr>
<td>25</td>
<td>ON/OFF</td>
<td>Power supply ON/OFF button</td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>Timer STOP method selection button</td>
</tr>
<tr>
<td>27</td>
<td>TIMER STOP</td>
<td>Timer STOP input terminals</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td>Timer START method selection button</td>
</tr>
<tr>
<td>29</td>
<td>TIMER START</td>
<td>Timer START input terminals</td>
</tr>
<tr>
<td>30</td>
<td>METER SELECT</td>
<td>Internal/external current display selection button</td>
</tr>
</tbody>
</table>
2.0 FUNCTIONAL DESCRIPTION

2.1 RFD-200 S2 Auxiliary Power Supply

The RFD-200 S2 provides 3 auxiliary power supplies (24 Vdc, 124 Vdc, 240 Vac) for powering electronic relays. Each power supply is fuse-protected. The power supply outputs are controlled by the auxiliary power supply [ON/OFF] button (item 25 in Figure 1). The LED next to the [ON/OFF] button is illuminated when the power supply output is turned on.

Only one auxiliary power supply can be selected at a time. The [PWS SELECT] button (item 21 in Figure 1) is used to select the power supply. The active power supply is indicated by an illuminated LED above the corresponding voltage label.

2.2 RFD-200 S2 Current and Voltage Sources

The RFD-200 S2 front panel offers three AC current source terminals (100A, 40A, 10A). Only one current source should be used at a time. The [METER SELECT] button is used to select whether to display the current generated by the RFD-200 S2 or the current input at the [EXT INPUT CURRENT] terminals. The [RFD-200 CURRENT] LED will be illuminated when an internal RFD-200 current source is in use and the output current is displayed on the LCD. The internal current is labeled as “Int I:” on the LCD screen as shown below:

Two isolated voltage sources are also available, one 0-250 Vac and one 0-300 Vdc. Both the current and voltage sources are controlled by the [OUTPUT CONTROL] knob (item 14 in Figure 1).
2.3 Control Switches

2.3.1. Voltage and Current Source Output Controls

The RFD-200 S2’s voltage and current source outputs are controlled by the [UP ARROW] and [DOWN ARROW] buttons (item 15 in Figure 1). There are four control settings for the voltage/current sources:

- **START-ON**
  When this mode is selected, the RFD-200 S2 turns on the voltage/current sources and starts the timer.

- **OFF**
  When this mode is selected, the voltage/current sources are turned off and the timer is stopped.

- **ON**
  In this mode, both the voltage and current sources are turned on and remain on until turned off by the user.

- **START-OFF**
  In this mode, the RFD-200 S2 turns off the voltage/current sources and starts the timer.

The selected mode is indicated by an illuminated LED next to the label.

The voltage and current source settings are controlled by the [OUTPUT CONTROL] knob.

2.3.2. LCD Contrast Control

To change the LCD screen’s contrast, press and hold the [CONTRAST] button (item 17 in Figure 1). The screen contrast will increase until it reaches the darkest setting. Then it will return to the lightest setting and begin increasing the contrast again. Release the [CONTRAST] button when the desired contrast level has been reached. The contrast setting will be stored in the RFD 200 S2’s memory.
2.4 Timer Start and Timer Stop Inputs

The RFD-200 S2’s built-in timer displays the test results in both milliseconds and cycles.

There are three selections for the [TIMER START] input:

- INTERNAL
  Timer starts when voltage/current sources are turned on or off (user selects Start-On mode or Start-Off mode).

- DRY
  A change in state of a dry contact input after the user has selected the Start-On mode or Start-Off mode will start the timer.

- WET
  A change in state of a wet contact input after the user has selected the Start-On mode or Start-Off mode will start the timer.

There are three selections for the [TIMER STOP] input:

- INTERNAL
  Timer stops when the user selects OFF mode.

- DRY
  A change in state of a dry contact input after the timer has started will stop the timer.

- WET
  A change in state of a wet contact input after the timer has started will stop the timer.

1. A voltage level from 20 to 255 Vac/dc is considered as “ON”. Voltage less than 10 Vac/dc is considered as “OFF”. The input is not polarity sensitive.

2. The dry contact input detects contact closed (shorted) or contact opened.

3. Applying a voltage to the timer “Dry” contact input may damage the RFD-200 S2.

2.5 RFD-200 S2 Power Resistors

Five power resistor connections are available on the RFD-200 S2. A finer control of the current output can be achieved by connecting one or more resistors in series with the current source.
2.6  RFD-200 S2 External Voltage Input
One external voltage input is available on the RFD-200 S2. Maximum input voltage is 600V. The external voltage is labeled as “V Mtr:” on the LCD screen as shown below:

![External Voltage Input](image.png)

2.7  RFD-200 S2 External Current Input
The RFD-200 S2 features one external current input. The maximum input current is 6A. The external current is labeled as “EXT I:” on the LCD screen as shown below:

![External Current Input](image.png)

**NOTE**
The **[EXT INPUT CURRENT]** LED must be illuminated in order to display the external current on the LCD screen.
3.0 OPERATING PROCEDURES

3.1 Setting the Voltage or Current Source

Use the steps below to set the voltage or current source:

a. Ensure that the RFD-200 S2 output is off. When the unit is first turned on, the output will be off by default.

inning. When the unit is first turned on, the output will be off by default.

b. Connect the device under test (DUT) to an RFD-200 S2 voltage or current output. If the RFD-200 S2 voltage source is used, the voltage can be monitored using the RFD-200 S2’s [EXTERNAL VOLTAGE INPUT]. To monitor the voltage, connect the RFD-200 S2 voltage source output to the RFD-200 S2’s [VOLTAGE INPUT] terminals.

c. Turn the [OUTPUT CONTROL] knob counter-clockwise to the zero position (until the knob will no longer turn).

d. Select ON by pressing the [DOWN ARROW] key in the control mode area. The [ON] LED will be illuminated and the unit will start beeping.

e. Turn the [OUTPUT CONTROL] knob clockwise up to the desired voltage or current. The voltage or current settings will be displayed on the LCD screen as shown below.

```
0mS  0.0Cy
V Mtr: -0.004 V
Int I: 1.390 A
TMR: Dual Input
```
3.2 Setting the RFD-200 S2 for a Time Delay Test

Use the steps below to measure an over-current relay time delay:

a. Connect the RFD-200 S2 current source output across the relay coil as shown in Figure 2.

b. Select INTERNAL for the [TIMER START] input by pressing the [LEFT ARROW] key in the TIMER START section until the [INTERNAL] LED light is illuminated. When the RFD-200 S2 is first turned on, this mode will be selected by default.

c. Connect the [TIMER STOP] input across the relay dry contact output as shown in Figure 2.

d. Select DRY for the [TIMER STOP] input by pressing the [LEFT ARROW] key in the TIMER STOP section until the [DRY] LED light is illuminated. When the unit is first turned on, this mode will be selected by default.

e. Set the test current (see section 3.1).

f. Turn off the current source by selecting OFF from the control mode area.
g. Select START-ON from the control mode area.

The RFD-200 S2’s timer will start when it energizes the coil voltage, and it will stop when the relay dry contact changes state. The elapsed time will be displayed during the test in seconds and cycles on the LCD screen:

h. The [TEST COMPLETE] LED and the data on the LCD screen will flash when the test has finished (a change of state in the [TIMER STOP] input is detected):

The time delay will be displayed on the LCD screen in milliseconds and cycles. The injected test current is also displayed on the LCD screen. A typical test results screen is shown below (actual screen will be flashing):
Figure 2. Typical Over Current Relay Connection
3.3 Using the RFD-200 S2’s Timer to Test Circuit Breaker Response Time

Use the steps below to use the RFD-200 S2’s timer to measure the opening time of a circuit breaker. The timer will start when the RFD-200 S2 detects the voltage being applied to the circuit breaker trip coil. The timer will stop when the RFD-200 S2 detects that the circuit breaker contact has opened.

a. Connect the [TIMER START] input to the circuit breaker coil terminals as shown in Figure 3.

b. Select WET for the [TIMER START] input. The timer will start when the trip coil is energized.

c. Connect the [TIMER STOP] input to the circuit breaker dry contact as shown in Figure 3.

d. Select DRY for the [TIMER STOP] input. The timer will stop when the circuit breaker contact is opened.

e. Turn the [VOLTAGE CONTROL] knob counter-clockwise to zero (until it can no longer be turned).

f. Select START-ON from the control mode area.

g. Open the circuit breaker. The RFD-200 S2’s timer will start when the circuit breaker coil voltage is detected, and it will stop when the circuit breaker contact has opened.

h. The [TEST COMPLETE] LED will be illuminated when the test has finished. The time will be displayed on the LCD screen in milliseconds and cycles.
Figure 3. Typical Circuit Breaker Timing Connection
3.4 Using the RFD-200 S2’s Timer in Single Input Mode

The RFD-200 S2’s timer can also be started and stopped with only the [TIMER START] input. This feature is handy for measuring the time duration of the [TIMER START] input when it changes states and then returns to the previous state as shown below:

\[
\text{Time Duration} \quad \text{Measured} \quad \text{CLOSE}
\]

\[
\text{OPEN} \quad \text{CLOSE}
\]

This feature works only with the DRY or WET mode of the [TIMER START] input.

To select the single input mode, press and hold the [TIMER STOP ARROW] key for 2 seconds. The following screen will be displayed momentarily:

![Trigger Mode Set To Single Input]

Use the steps below to measure the time a relay contact remains open:

a. Press and hold the [TIMER STOP ARROW] key for 2 seconds to select Single Input Mode.

b. Connect the [TIMER START] inputs to the relay’s (Normally Closed) contact.

c. Select DRY mode for the [TIMER START] input.

d. Select START-ON from the control mode area.

e. Energize the relay coil to open the relay’s Normally Closed contact. The RFD-200 S2’s timer will start and the time will be displayed on the LCD screen.

f. De-energize the relay coil to close the relay contact. The RFD-200 S2’s timer will stop and the time will be displayed on the LCD screen.
g. Press and hold the [TIMER STOP ARROW] key for 2 seconds to return the RFD-200 S2’s timer to dual input mode. The following screen will be displayed momentarily:

```
Trigger Mode Set
To Dual Input
```
3.5 Using the RFD-200 S2 to Plot a Current Transformer Excitation Curve

Use the steps below to find the excitation curves of a current transformer (CT):

a. Connect the RFD-200 S2 AC voltage source to the CT secondary winding in series with the external current input as shown in Figure 4.

b. Connect the RFD-200 S2 AC voltage source to the RFD-200 S2 external voltage meter as shown in Figure 4.

c. Select ON from the control mode area.

d. Slowly raise the AC test voltage. Observe and record the excitation voltage and current displayed on the LCD screen.

e. Continue to raise the test voltage and record the excitation voltage and current readings.

f. When the excitation current reaches saturation (from 1.5A to 2.0A), lower the voltage to zero.

g. You can now plot the CT excitation curves using the collected voltage and current readings.
Figure 4. Typical CT Excitation Test Connection
3.6 Using the RFD-200 S2 to Measure CT Primary and Secondary Currents

Use the steps below to measure the CT primary and secondary currents with the RFD-200 S2:

a. Connect the RFD-200 S2 current source through the CT primary current path as shown in Figure 5.

b. Connect the CT secondary winding to the RFD-200 S2 [EXT INPUT CURRENT] input as shown in Figure 5.

c. Turn on internal and external current display on the RFD-200 S2 by pressing the [METER SELECT] key. You may have to press the key a few times till both the [RFD-200 CURRENT] and the [EXT INPUT CURRENT] LED’s are illuminated.

d. Select ON from the control mode area.

e. Raise the test current to the desired setting.

f. The primary and secondary current readings will be displayed on the LCD screen as shown below:

```
0mS  0.0CY
V Mtr:  -0.003 V
Int I:  100.00 A
Ext I:  5.000 A
```

```
0mS  0.0CY
V Mtr:  -0.003 V
Int I:  100.00 A
Ext I:  5.000 A
```

NOTE

The CT turns ratio can be calculated using the primary and secondary current readings.

g. Return the test current to zero.
h. Select OFF from the control mode area.
Figure 5. Typical CT Turns Ratio Test Connection