Model 430
UTEC Ultra-Compact
Portable Meter Test Kit

Operations Manual

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About This Manual

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The operation of this equipment requires training and experience in electric meter testing. The information in this manual is designed to supplement existing knowledge and experience already attained and practiced by journeyman-level meter test technicians. Novice meter test technicians should not attempt to operate this equipment without first gaining the basic knowledge of meter testing and the application of meter testing equipment from a certified training course.

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About This Manual

The Model 430 Portable Meter Test Kit is designed as a stand-alone Kit. However, the equipment can also be used with optional Radian Research, Inc. PC-based software applications, including RR-PCSuite, RS-232-Link and WATT-Net software (see Section 7.2.2, Software for more information).

Use this operations manual for the Model 430 Portable Meter Test Kit to perform the tasks shown below.

Use the operations manuals for the relevant software applications to perform the tasks shown below.
1 Product Introduction and Specifications

This chapter provides an introduction to the Model 430 Portable Meter Test Kit and contains the following sections:

1.1 Overview
1.2 Product Features
1.3 Safety Information
1.4 Specifications

1.1 Product Overview

The Radian Research Model 430 Portable Meter Test Kit is designed for fast and accurate closed-link or open-link testing of electricity meters. The Model 430 combines the reliability of the Radian phantom load box with the advanced capabilities and accuracy of the Radian RD-20 or RD-21 reference or retrofit RM reference to yield a lightweight, easy-to-use test Kit.

The Model 430 Portable Meter Test Kit consists of the main component and is shown below with both the Radian RD and RM standards in Figure 1.

Figure 1. MODEL 430 Portable Meter Test Kit
1.2 Product Features

1.2.1 MODEL 430

The phantom load box of the Model 430 Portable Meter Test Kit offers the following features:

- Designed for open or closed-link testing of electricity meters
- Operates with Radian Research, Inc. RD-20 or RD-21 Dytronic Standard or a legacy RM Metronic Standard
- Test current adjustable from 0 to 120% of nominal value
- Power factor settings of 1.0 or 0.5 lag
- Individual or combinations of meter elements to be included in the test selectable from front panel controls
- Plug-removable test cables for easy connections to various service installations
- Polycarbonate-covered front panel for durability
- Lightweight
- Tests any electronic or mechanical standard, test board, or solid-state or induction meter
- Single-phase or polyphase testing
- Waterproof and dust proof rugged carrying case

1.2.2 Additional Functionality Using a RM-111 Automated Comparator (optional)

When used with the RM-111 Automated Comparator, a compact, easy-to-use, handheld instrument used to view and store test results from reference standards and billing meters, the Model 430 offers the following features:

- Calculates and displays results in percent registration or percent error
- Environment-resistant exterior
- Stores up to 20 meter and 12 standard test setups
- Stores results from up to 80 meter tests and 28 standard tests
- Meter pulse interface
- Low-battery indicator
- Optional on-site printing capabilities using the RM-RPP Portable Printer
- Optional software for data collection and device or test configuration
1.3 Safety Information

Review the information in this section to avoid injury and prevent equipment damage.

1.3.1 General Safety Summary

**WARNING**

- The operation of this equipment requires training and experience in electric meter testing. The information in this manual is designed to supplement existing knowledge and experience already attained and practiced by journeyman-level meter test technicians. Beginning meter test technicians **should not** attempt to operate this equipment without first gaining the basic knowledge of meter testing and the application of meter testing equipment from a certified training course.
- Operation of this equipment involves high voltage. **Always** wear the appropriate personal protective equipment and follow all safety precautions specified for high voltage activities.
- Follow proper grounding techniques when using this equipment.
- Follow all safety guidelines contained in this manual.

**CAUTION**

- **Do not** use this equipment for any purpose other than for which it was designed.
- **Do not** operate the equipment outside of the environmental conditions specified in this manual.
- **Do not** operate this equipment with covers or panels removed.
- Keep equipment surfaces clean and dry.
- Handle the Model 430 Portable Meter Test Kit with care; it is a precision instrument.
- Inspect the equipment before each use. Do not use the equipment if damage is observed.
- Use only test cables provided by Radian Research, Inc.
1.3.2 Symbols Found on the Equipment

The following safety symbols appear on the Model 430 Portable Meter Test Kit:

- Danger of electrical shock.
- Warning: Refer to manual.

1.3.3 Conventions Used in this Manual

The following conventions are used in this manual to highlight important information:

- **WARNING** Indicates an imminently hazardous situation that can result in death or a serious injury.

- **CAUTION** Indicates a potentially hazardous situation that can result in an injury or equipment damage.

- **NOTE** Indicates important information you should review before proceeding.
1.4 Specifications

1.4.1 MODEL 430 Portable Meter Test Kit

Operational

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltages</td>
<td>69, 120, 208, 240, 277, and 480 VAC, 60 Hz</td>
</tr>
<tr>
<td>Test currents</td>
<td>FL currents: 90*, 60*, 30, 20*, 15, 10, 5, and 2.5 A</td>
</tr>
<tr>
<td></td>
<td>PF currents: 90*, 60*, 30, 20*, 15, 10, 5, and 2.5 A</td>
</tr>
<tr>
<td></td>
<td>LL currents: 9*, 6*, 3, 2*, 1.5, 1, 0.5, and 0.25 A</td>
</tr>
<tr>
<td></td>
<td>* With use of the optional 50 Amp open link harness</td>
</tr>
<tr>
<td></td>
<td>(MODEL 430-15) or 90 Amp open link harness (MODEL 430-19)</td>
</tr>
<tr>
<td>Power factor</td>
<td>1.0 or 0.5 lag</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Based on RD or RM Standard</td>
</tr>
<tr>
<td>Element selection</td>
<td>Switch selectable as A, B, C, AB, AC, BC, ABC, 1X, 2X and 3X</td>
</tr>
<tr>
<td>Reference standard</td>
<td>Radian Research, Inc. RD-20, RD-21 or RM standard</td>
</tr>
<tr>
<td>Test method</td>
<td>Closed link or open link, depending on settings in Preferences menu</td>
</tr>
<tr>
<td></td>
<td>and test harness used; meter voltage clips must be closed during test</td>
</tr>
</tbody>
</table>

Physical

| Size                    | Height: 14.95 in (380 mm)                                              |
|                        | Width: 12.13 in (308 mm)                                               |
|                        | Length: 9.58 in (243 mm)                                               |
| Weight                 | 25 lbs (11.33 kg) including RD-2x Reference Standard                   |
| Warranty               | 2-year warranty against defects in material or workmanship; care plans|
|                        | are available to extend warranty                                       |

Electrical

| Breaker Switch         | 5 Amp Breaker Switch eliminates the need for fuses                    |
|                        | Reference standard: Contains internal fuses, not user accessible       |
### Environmental

<table>
<thead>
<tr>
<th></th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>−20º to 50º C (−4º to 122º F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5–95%</td>
</tr>
<tr>
<td>Shock and vibration</td>
<td>Any which is nondestructive</td>
</tr>
<tr>
<td>Water resistance</td>
<td>Airtight and watertight when case is closed but not when in operation</td>
</tr>
</tbody>
</table>

### Test Cables

<table>
<thead>
<tr>
<th>Materials of construction</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicone rubber insulated super flexible wire covered with tight woven nylon loom; remains flexible from −67º to 150º C</td>
<td>Includes ring at the meter end of the cable for attaching to the service box to support the weight of the cable</td>
</tr>
<tr>
<td>Length</td>
<td>6 ft (1.82 m)</td>
</tr>
</tbody>
</table>

### Test Cable Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL 430-02</td>
<td>Terminated with Cam-Lok (Ekstrom) adapters</td>
</tr>
<tr>
<td></td>
<td>Rated for 30 A</td>
</tr>
<tr>
<td>MODEL 430-04</td>
<td>Terminated with Multi-Amp 99800 Series plugs</td>
</tr>
<tr>
<td></td>
<td>Rated for 30 A</td>
</tr>
<tr>
<td>MODEL 430-05</td>
<td>Terminated with copper test clips (Mueller BU27C) and insulators</td>
</tr>
<tr>
<td></td>
<td>Rated for 30 A</td>
</tr>
<tr>
<td>MODEL 430-06</td>
<td>Unterminated - Rated for 30 A</td>
</tr>
<tr>
<td>MODEL 430-07</td>
<td>Terminated with copper test clips (Mueller BU48C) and insulators - Transformer rated for 20 A</td>
</tr>
<tr>
<td>MODEL 430-11</td>
<td>Adapts Cam-Lock (Ekstrom) current and potential terminations to Mueller 27C clips</td>
</tr>
<tr>
<td>MODEL 430-15</td>
<td>Terminated with Copper Test Clips and insulators, Rated 50A 1 phase open link cable, required when using 430 as 453 replacement</td>
</tr>
<tr>
<td>MODEL 430-19</td>
<td>Terminated with Copper Test Clips and insulators, Rated 90A 1 phase open link cable</td>
</tr>
<tr>
<td>MODEL 430-SC</td>
<td>(6 mm standards compare cable kit, includes adapters to compare against RD-23, RS-703 and RS-933): 2 current leads, 2 voltage leads, and 1 safety ground lead, marked and color coded by function. Green connector tied to equipment ground</td>
</tr>
</tbody>
</table>
### 1.4.2 RM-111 Automated Comparator (optional)

#### Input Port A

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-up</td>
<td>150 ohm/1000 ohm, user defined</td>
</tr>
<tr>
<td><strong>Maximum input voltage</strong></td>
<td>25 V, 500 W zener clamp at 33 V</td>
</tr>
<tr>
<td></td>
<td>(14.4 mA maximum zener current)</td>
</tr>
<tr>
<td><strong>Maximum frequency</strong></td>
<td>2.1 MHz/port</td>
</tr>
<tr>
<td><strong>Minimum input pulse width (Ports A and D)</strong></td>
<td>200 ns</td>
</tr>
</tbody>
</table>

#### Schmidt Trigger Levels for Port A

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum positive-going threshold</td>
<td>1.5 V</td>
</tr>
<tr>
<td>Minimum negative-going threshold</td>
<td>1.4 V</td>
</tr>
<tr>
<td>Minimum hysteresis</td>
<td>0.4 V</td>
</tr>
<tr>
<td>Maximum hysteresis</td>
<td>0.1 V</td>
</tr>
</tbody>
</table>

#### Physical

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>Height: 1.4 in (35 mm)</td>
</tr>
<tr>
<td></td>
<td>Width: 4.1 in (105 mm)</td>
</tr>
<tr>
<td></td>
<td>Length: 7.9 in (200 mm)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>0.85 lbs (0.39 kg)</td>
</tr>
<tr>
<td><strong>Enclosure</strong></td>
<td>Flame-resistant ABS plastic with polycarbonate label and keypad; keypad is good for one million cycles</td>
</tr>
</tbody>
</table>

#### Electrical

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power</strong></td>
<td>9 V battery</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>171 mW typical</td>
</tr>
</tbody>
</table>

#### Environmental

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature range</strong></td>
<td>−20° to 70° C (−4° to 158° F)</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>0–9%</td>
</tr>
<tr>
<td><strong>Shock and vibration</strong></td>
<td>Any which is nondestructive</td>
</tr>
<tr>
<td><strong>Water resistance</strong></td>
<td>Splash proof but not airtight or watertight</td>
</tr>
</tbody>
</table>
2 Operation Preparation

This chapter provides information on preparing to use your Model 430 Portable
Meter Test Kit and contains the following sections:

2.1 Getting Started

2.2 Operational Considerations

2.1 Getting Started

2.1.1 Thank You For Your Purchase

Thank you for purchasing this quality Radian Research, Inc. product. Radian
reference standards are recognized throughout the world for their unparalleled
accuracy, precision, and stability. We have taken every effort to ensure that your
Model 430 Portable Meter Test Kit reaches you in perfect condition.

Your satisfaction is very important to us, and your continued loyalty is greatly
appreciated. If for any reason your Radian product does not meet your expectations
of exceptional performance, please contact your sales representative or Radian
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Website: www.radianresearch.com
2.1.2 Preparing Equipment for Use

Follow these steps to prepare your Model 430 Portable Meter Test Kit for use:

1. **Unpack and inspect:**
   - Carefully remove the equipment from the packaging, and check for any signs of damage.
   
   If you observe any damage to the equipment, immediately notify the carrier and your sales representative.

2. **Verify the contents:**
   - The following items are included in your shipment:
     - MODEL 430
     - Calibration Report (if ordered with standard)
     - Getting Started Guide
     - Operations Manual on CD-ROM
     - Optional accessories

3. **Register your equipment** (see Section 2.1.3, Registering Your Equipment) to:
   - Activate the equipment warranty.
   - Receive firmware and software updates as well as product application notes from Radian Research, Inc.

   You **must** register your equipment at [www.radianresearch.com/reg](http://www.radianresearch.com/reg) to activate the two-year equipment warranty. **If you do not activate the warranty, the warranty period is limited to one year from date of purchase.**
2.1.3 Registering Your Equipment

Follow these steps to register your Model 430 Portable Meter Test Kit:


2. Complete the online form.
   - The model number is **MODEL 430**.
   - The serial number can be found on the nameplate as shown in Figure 2.

![Figure 2. Model 430 Portable Meter Test Kit Nameplate Containing Equipment Serial Number](image)
2.2 Operational Considerations

To protect the Model 430 Portable Meter Test Kit and ensure optimal performance, follow these guidelines:

- **Placement:** When placing the Model 430 for use, avoid very wet or dusty environments.

  The Model 430 Portable Meter Test Kit and the Automated Comparator are splash proof but not airtight or watertight.

- **Cooling:** When placing the Model 430 for use, do not block the top panel.
- **Power:** The Model 430 requires a source capable of providing at least 150 W of continuous power to operate properly.
3 Product Features

This chapter provides detailed information on the product features of the Model 430 Portable Meter Test Kit and contains the following sections:

3.1 MODEL 430 Components and Controls
3.2 RM-111 Automated Comparator Components and Controls
3.3 RD-2x Reference Standard Components and Controls

3.1 MODEL 430 Components and Controls

3.1.1 Top Panel Controls

Figure 3 shows the top panel of the Model 430. The components of the top panel are explained below.

Figure 3. MODEL 430 Portable Test Meter Kit Top Panel
1. **Line voltage on/off switch**: Used to turn the line voltage on and off.

   - **CAUTION**: Turn the line voltage on/off switch to OFF before connecting/disconnecting the test cable to or from the service voltage to avoid equipment damage.

   - **NOTE**: Internal fan will activate for 10 seconds after switching line voltage on. The fan is then temperature sensitive and may start or stop at any time.

2. **Line voltage indicator**: Indicator light that glows red when the 430 power is on and flashes red when a voltage fault is sensed.

3. **Supply voltage selector switch**: Used to select the supply voltage.

   - **CAUTION**: Always check the service voltage before connecting the test cable. Connecting the equipment to an improper voltage may trip the circuit breaker and can result in equipment damage.

4. **Tap output indicator**: Bar graph that displays the current tap output in percent.

5. **Test current Adjustment**: Used to adjust the test current from zero to approximately 110% of the tap value.

   - Use this adjustment to compensate the current value to match the impedance.
   - This adjustment is designed to achieve the nominal current tap value when set to approximately 75% of full rotation at the nominal supply voltage selected. This scaling will vary depending on the supply voltage.

   - **NOTE**: For more precise values refer to Comparator readout.

   - **CAUTION**: Having test current set at full rotation (more current than necessary for standard tests) for longer than 15 minutes could cause damage to the unit.
6. **Power factor selector switch**: Used to select the power factor (PF) or turn off the current circuit of the load.

<table>
<thead>
<tr>
<th>Switch position</th>
<th>Functionality</th>
</tr>
</thead>
</table>
| 1.0 PF          | • The current circuit is on.  
                   • The current sine wave is in phase with the voltage sine wave. |
| Off             | • The current circuit is off. |
| 0.5 PF          | • The current circuit is on.  
                   • The current sine wave lags the voltage sine wave by 60°.  
                   • This test position is also known as 50% power factor or lag test. |

7. **Test current tap selector switch**: Used to set the test current.

- Full load (FL) current values are in black.
- Light load (LL) current values are in red.

---

8. **Element selector switch**: When using a closed-link test cable. This switch is used to select the configuration of the test cable current circuits (A, B, and C). When using an open-link test cable, this switch is used to set the current multiplier.

- Closed-link test cable selections are in black.
- Open-link test cable selections are in red.

- For example (closed-link test cable):
  - Switch in the A position: Only the A test cable current leads are connected to the load’s current source. The B and C test cable current leads are bypassed.
  - Switch in the ABC position: The A, B, and C test cable current circuits are connected to the individual isolated current transformer (CT) secondaries.
  - If a test cable current circuit is not selected, the switch will bypass that current circuit. This feature eliminates the need to clip the test cable.

---

**CAUTION**

Set the Test Current Adjustment selector switch to zero before changing the tap value to avoid equipment damage.
current circuit leads together.

- For example (open-link test cable):
  - Switch in the (x1) position: The current selected on the Test Current Tap selector switch will be multiplied by 1.
  - Switch in the (x3) position: The current selected on the Test Current Tap selector switch will be multiplied by 3.

![CAUTION]

Set the Test Current Adjustment selector switch to zero before changing the position of the element selector switch to avoid equipment damage.

![WARNING]

Do not allow the unused test cable current circuit leads to contact the earth ground, service neutral, or phase voltages, as serious injury or equipment damage can occur.

### 3.1.2 Quick Connect Cable

Figure 4 shows the top panel of the Model 430. The quick connect connector is highlighted.

![Figure 4. MODEL 430 Portable Test Meter Kit]
9. **Test cable connector:** Connector for the test cable.

---

**CAUTION**

When operating this equipment, use only the test cable provided by Radian Research, Inc.

---

### 3.2 RM-111 Automated Comparator Components and Controls

Figure 5 shows the RM-111 Automated Comparator. The components are explained below.

![RM-111 Automated Comparator](image)

**Figure 5. RM-111 Automated Comparator**
3.2.1 Inputs and Outputs

**Communications ports A, B, C:** BNC connectors for **input** devices

**Communication port D:** BNC can be used for **input** or **output** devices

**Serial port:** Interface for communications with a personal computer or Radian Research, Inc. RM-RPP Portable Printer.

**Pickup port:** Interface for the Radian Research, Inc. RR-1H Infrared Optical Pickup, RR-DS Meter Disk Sensor, or the RR-KYZ Pulse Input Adapter (see Section 7.1, Operational Accessories).

3.2.2 Display and Keypad

1. **LCD display:** 16-character, 4-line liquid-crystal display.
2. **On/Off buttons:** Used to turn the power on and off.
   - The RM-111 Automated Comparator has a user-configurable power-saver feature (see Section 5.3.5, Preferences Sub-Menu). This feature is disabled during tests and when the unit is in the RS-232 mode.
3. **LCD button:** Used to adjust the display contrast.
   - To adjust the display contrast, press and hold the LCD button and use the up/down arrows to increase or decrease the contrast. Release the LCD button to return to the normal operating mode.
4. **Cancel button:** Used to “back out” of the displayed menu without changing parameters; similar to the escape key on a computer keyboard.
5. **Enter button:** Used to select a menu option or start or stop a test.
6. **Up/Down arrow buttons:** Used to move the cursor vertically to view menu options and results in the display.
   - If scrolling is required to view all menu options or results, an up or down arrow will appear on the right side of the display as shown in Figure 6.
7. **Left/Right arrow buttons:** Used to move horizontally within an entry field or scroll through result files.
   - If left or right movement is required to view all results, a left or right arrow will appear on the top of the display as shown in Figure 6.
8. **Yes/No buttons**: Used to set test parameters.

9. **Shift button**: Used to put the alphanumeric buttons in text mode.
   - Press the shift button again to return the alphanumeric buttons to the default mode, the number mode.
   - Press an alphanumeric button repeatedly to scroll through the letters associated with that button.

**Optical Sensor Meter Testing with the RM-111**
(Testing using the RR-DS, RR-1H, RM-1H or RR-KYZ.)

1. Make the appropriate connections so that the meter(s) under test (DUTs) and the RM or RD Primary Reference Standard(s) are powered from the same voltage and current source.
2. Apply test voltage, current, and auxiliary power.
   - Connect all standard pulse outputs to the RM-111.
   - The RM or RD Primary Reference Watthour Standard will output pulses continuously once auxiliary power, voltage and current have been applied.
   - To implement a demand and/or creep test to any meter test, set the desired time duration (minutes) in the Test Setup screen. Setting these parameters to zero will omit the test from the sequence.
3. Turn on the RM-111 and select the TEST SETUPS menu option. From the TEST SETUPS menu, select METER TEST. To create a new test setup, select Create. To edit an existing test setup, select Edit. To delete a test,
select Delete. The Test Setup screen contains all the necessary parameters to run a meter test. The arrow keys are used to move the cursor throughout this screen. Enter the appropriate value for each parameter:

Name - Enter a test setup name on the first line by typing over the current text (16 characters maximum).

Form: Enter the meter form.

KH - Enter the DUT Kh value.

Test by* – Select either Revs or Energy.

PriKh – Enter the primary reference standard(s) Kh value.

#Standards – Enter the number of reference standards that will be used.

Mode – If more than one reference standard is used, the user must choose between single-phase or polyphase modes of operation.

Ref Type – This defines the reference standard output pull-up value. Select Radian (150 ohm). Other is 1000 ohm.

#Inputs – Enter the number of current inputs used for the reference standard(s).

SER#1 – Enter a serial number for standard 1, if applicable.

SER#2 – Enter a serial number for standard 2, if applicable.

SER#3 – Enter a serial number for standard 3, if applicable.

Element – Enter the number of meter elements.

FL Revs – Enter the desired number of revolutions for the full load test (FL).

PF Revs – Enter the desired number of revolutions for the power factor test (PF).

LL Revs – Enter the desired number of revolutions for the light load test (LL).

FL WAVG – Enter the desired weight of the measured FL value in the weighted average calculation.

PF WAVG – Enter the desired weight of the measured PF value in the weighted average calculation.
**LL WAVG** – Enter the desired weight of the measured LL value in the weighted average calculation.

**Demand** – Enter the desired number of minutes for the demand test. To omit the demand test, enter zero.

**Pulses/Rev** – Enter the number of pulses (or equivalent pulses) per revolution of the meter under test. Use the calculations above and enter one pulse per Ke value.

**Creep Mins** – Enter the desired number of minutes to be used for the Creep test.

* The “**Test By:**” parameter input allows the user to select the type of tests – **Revs** or **Energy**.

  if **Energy** is selected, the “**FL Revs:**”, “**PF Revs:**”, and “**LL Revs:**” parameter inputs dynamically change to “**FL Wh:**”, “**PF Wh:**”, and “**LL Wh:**”. This allows a test to be stopped after a pre-set amount of energy has been accumulated by the DUT.

4. Press ENTER to exit the Test Setup screen.

5. From the Main Menu select RUN TESTS.

6. Select Test Meter.

7. Select the previously configured test setup.

8. The RM-111 will prompt the user to select either a Manual (RM-1S or RR-1S) test or a Pulse Sensor (RM-DS, RR-DS, RM-1H, or RR-1H) test. Select Pulse Sensor. Select BNC if using an RM-1H or RM-DS, or select Lemo if using an RR-1H or RR-DS.

9. If not already completed, follow the prompts on the RM-111 to make the appropriate connections. If using an RM-1H or RR-1H, see Figure 12.0 “Testing a Solid State Meter Using Calibration LED Output.” If using an RM-DS or RR-DS, see Figure 13.0 “Testing an Induction Meter Using an Edge Test.” The number of reference standards defined in the test setup determine how the ports are configured. If using the RM-1H or RM-DS, connect it to port A. If using the RR-1H or RR-DS, connect it to the PICKUP input. Connect the standards to ports B, C, and D.

10. Once connections are complete, press ENTER to start the test.
11. The RM-111 starts the ALIGN PULSE SENSOR TEST to allow for the pulse sensor to be checked. During this time, the disk rotates at full load current. When the 1H or DS sensor is properly connected, the LCD will show flashing segments that are synchronous with the sensor output. Press ENTER when alignment is achieved.

12. In this mode, the RM-111 counts the number of pulses from both the reference standard(s) and the sensor signal from the meter under test. While the test is in progress, the RM-111 display shows the meter registration as it accrues and also shows the the standards counting. When using a pulse sensor, the test automatically stops when the pulse sensor senses the last pulse.

13. The test is now complete. To process the results press ENTER.

14. To re-run the test select Re-Run Test. The pulses will be counted again and the new count will be displayed on the RM-111. Press ENTER to continue.

15. To display the calculated results select Show Results. The end count is displayed along with a down arrow icon in the lower right corner. This icon references the DOWN ARROW key on the RM-111 hand controller. By pressing the DOWN ARROW key the RM-111 displays the calculated results. Using the UP/DOWN ARROW keys the user can move between the watthour count and the calculated results.

16. To print the results connect the RM-RPP Remote Portable Printer to the SERIAL PORT on the RM-111. Turn the RM-RPP to the ON 1 position. Select Print Results. This will start the printing process. The printout is time/date stamped and includes both the watthour count and the calculated % Registration or % Error.

17. To save the results select Save Results. The RM-111 will prompt the user for the enabled parameters in the User Prompts menu and save the test results. The saved results also include the time and date stamp, and both the calculated results and the accumulated watthours during the test.
See section 4.3 for more on testing meters using the RM-111
3.3 RD-2x Reference Standard Components and Controls

Figure 8 shows the RD-2x Reference Standard. The components are explained below.

![RD-2x Reference Standard](image)

**Figure 8. RD-2x Reference Standard**

3.3.1 Inputs and Outputs

**Ports 1, 2, 3:** Can be configured for **input** or **output** devices

**Serial port:** Interface for communications with a personal computer or Radian Research, Inc. RM-RPP Portable Printer.

**Pickup port:** Interface for the Radian Research, Inc. RR-1H Infrared Optical Pickup, RR-DS Meter Disk Sensor, or the RR-KYZ Pulse Input Adapter (see Section 7.1, Operational Accessories).
3.3.2 Display and Keypad

**LCD display:** 16-character, 4-line liquid-crystal display.

**Startup Screen:** When the unit is first powered, a screen containing relevant information such as model number, serial number, calibration number and firmware version will appear.

![Keypad Image]

**Figure 9. RD-2x Keypad Used to Indicate Additional Menu Options or Results.**

**Keypad:** The RD-2x has an extensive menu structure that is facilitated through the use of its five button keypad. The RD-2x’s keypad will allow the user to navigate through the menu structure with ease. The up and down arrows will allow scrolling throughout any specific screen that has that capability. The ESC/left arrow/RESET button will allow the user to escape out of any screen and return to the previous. The ENTER/right arrow button will select any option on the screen that the cursor is pointing at. Lastly, the MODE button with toggle throughout the main screens on the RD-2x. These are the Instantaneous Metrics screen, Accumulating Metrics screen, Main Menu screen and Minimum & Maximum Measurements screens (if supported by model number). Please note that the model number designation of the standard will determine the extent of sub-menus that are available.
3.3.3 Configuring the RD-2x

The setup configuration of the RD-2x can be reached by entering the main menu, scrolling to Setup and pressing ENTER. Note that certain configuration options are dependent on the model of the RD-2x.

**Port 1 Function**
The functionality of Port 1 can be configured by selecting Port 1 and pressing ENTER. The user can scroll through three (3) options. Scroll to the functionality that is desired and then press ENTER.

*Start/stop/clear* will setup Port 1 for use with a snap-switch. The actuation of the snap-switch will start the accumulation of metrics, and subsequent actuations of the snap-switch will stop the accumulation of metrics, then reset the metrics to zero, then re-start the accumulation of metrics…etc.

*Clr-start/stop* will also setup Port 1 for use with a snap-switch. The actuation of the snap-switch will clear and then start the accumulation of metrics. Subsequent actuations of the snap-switch will stop the accumulation of metrics, then clear and re-start the accumulation of metrics, then stop the accumulation of metrics…etc.

*Pulse Output* will configure Port 1 of the RD-2x as an output. Port polarity is also selectable to configure Port 1 to output either negative or positive pulses. Note that when pulse output is selected, the measurement function and pulse constant for Port 1 will be the same as Port 2. However, Port 1 and Port 2 will always have opposite polarity.

**Port 2 Function**
The function of *Port 2* can be configured by selecting *Port 2* and pressing ENTER. The user can then scroll through and select whichever measurement function *Port 2* will output pulses. Once the measurement function is chosen by pressing ENTER, the pulse constant for that function can also be edited. If the default value is desired, then press ENTER to accept. If the default value is not desired, then press ESC to edit the value.
To edit the pulse constant value, use the left and right arrows to select which digit to edit and then use the up and down arrows to edit the digit. Scroll to the last digit and press ENTER to set the pulse constant. After the pulse constant is chosen, port polarity is selectable for the ports that are configured as outputs.

**Port 3 Function**
The function of Port 3 can be seen by selecting *Port 3* and pressing ENTER.

**Port Polarity**
The port polarity of each configured as an output is selectable by pressing ENTER at port polarity. Note that *Port 1* and *Port 2* must have opposite polarity.

**Measure Type**
By scrolling to *Measure Type* and pressing ENTER, the user can select between RMS and AVG measurements.

**Beep Enable**
By scrolling to *Beep Enable* and pressing ENTER, the user can choose whether they want to enable or disable the audible beep of the RD-2x.

**Backlight**
The backlight of the RD-2x’s display can be disabled by selecting *Backlight* and pressing ENTER. Scroll to NO and press ENTER to disable the backlight and scroll to ON and press ENTER to enable the backlight.

**Factory Default**
The factory default settings can always be re-initiated by selecting *Factory Default* and pressing ENTER.
Please note that the application information listed below is to describe testing procedures that utilize the RD-2x’s Built-In Comparator, Analog Sense and Harmonics options. If these options were not purchased, automated meter and standards testing can be accomplished by using an RM-111 Automated Comparator available from Radian Research.

### 3.3.4 Meter Testing

The RD-2x can be used in the field or in the laboratory to test meters where a high degree of accuracy is needed. The meter test can be actuated by using a snap-switch, the ENTER key on the keypad of the RD-2x, or the many sensors offered by Radian Research that will sense disk revolutions, infrared and visible calibration pulses, and KYZ signals.

**Meter Testing with a RD-2x Reference Standard and Optical Sensor**

(Testing using the RR-DS, RR-1H, RM-1H or RR-KYZ.)

**Step 1**
Make all appropriate connections so that the D.U.T. (Device Under Test) and RD-2x are powered by the same source. When connecting sensors, be careful to correctly align the red dots on both the sensor and the PICKUP terminal.

**Step 2**
Press MODE on the keypad until the main menu is reached. Press ENTER when the arrow is pointing to *Run Test*.

**Step 3**
Press the up and down arrows on the keypad until *Meter (Sensor)* is reached and press ENTER.

**Step 4**
Scroll through the test functions supported by the RD-2x and press ENTER when the correct function is displayed.
Step 5
Use the keypad on the RD-2x to select the correct pulse constant for the D.U.T. and press ENTER. If the correct pulse constant for the D.U.T. is not available, scroll until EDIT is displayed and press ENTER. Use the left and right arrows to select the digit of the pulse constant to edit and the up and down arrows to edit the digit. Once the correct constant is displayed, scroll to the far right of the constant to store the value for the test.

Step 6
Use the keypad on the RD-2x to select the number of pulses per equivalent revolution on the D.U.T. and press ENTER.

Step 7
Use the keypad on the RD-2x to select the correct number of elements of the D.U.T. and press ENTER.

Step 8
Use the keypad on the RD-2x to select the correct number of current inputs being utilized on the RD-2x and press ENTER.

Step 9
Make sure that the grid on the Align Disk Sensor screen is pulsing each time an equivalent disk revolution is occurring. Once correct sensor operation is ensured, press ENTER.

Step 10
Use the keypad on the RD-2x to select the desired number of test revolutions and press ENTER.

Step 11
The RD-2x will start the test when the next disk revolution is sensed. Once the correct number of revolutions have been accounted for, the test results will be displayed. The total amount of Watthours (or whichever function was chosen to test) will be displayed along with the D.U.T.’s percent registration and percent error.

Step 12
Press ENTER when the results are displayed and the user will be given the choice to Re-run Test, Print Results or Show Results.
Figure 10. Testing a Meter using an Optical Pickup
Figure 11. Testing a Meter using a RR-KYZ Pulse Input Adapter
4 Operations Overview

This chapter provides general instructions for using the Model 430 Portable Meter Test Kit and contains the following sections:

4.1 Setting Up the Model 430
4.2 Connecting the Model 430
4.3 Conducting a Test with the Model 430 and RM-111

4.1 Setting Up the Model 430

Follow these steps and refer to Figure to set up the Model 430 for use:

1. Put the selector switches on the Model 430 in the following positions:

<table>
<thead>
<tr>
<th>Selector Switch</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Voltage</td>
<td>OFF</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>Set to match the service voltage</td>
</tr>
<tr>
<td>Test Current Adjustment</td>
<td>Set to zero</td>
</tr>
<tr>
<td>Power Factor</td>
<td>OFF</td>
</tr>
<tr>
<td>Test Current Tap</td>
<td>Set to match the TA (test amps) of the meter</td>
</tr>
<tr>
<td>Elements</td>
<td>Set as required by the meter</td>
</tr>
</tbody>
</table>

(See Section 4.3, Conducting a Test with the 430)

2. Connect the optional RM-111 Port D to the connector on the front of the RD-2X standard labeled **Port 2**.

3. Connect the Quick Connect test cable to the Model 430.
4.2 Connecting the Model 430

Follow these steps to connect the Model 430 Portable Meter Test Kit for use:

1. Isolate the electricity meter from the service as follows:
   a. Open all voltage knife switches.
   b. Close all CT shorting switches.
   c. Open all CT loop switches.

2. Attach the green ground wire of the Model 430 test cable to the earth ground of the service.

---

**CAUTION**

Before energizing the Model 430, always attach the cable ground to the earth ground of the service. Failure to do so can result in equipment damage.
3. Connect the closed-link test cable to the electricity meter as follows:

<table>
<thead>
<tr>
<th>Test Cable Lead</th>
<th>Connect To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current +/-A</td>
<td>A-phase current polarity side</td>
</tr>
<tr>
<td>Current A</td>
<td>A-phase current return</td>
</tr>
<tr>
<td>Current +/-B</td>
<td>B-phase current polarity side</td>
</tr>
<tr>
<td>Current B</td>
<td>B-phase current return</td>
</tr>
<tr>
<td>Current +/-C</td>
<td>C-phase current polarity side</td>
</tr>
<tr>
<td>Current C</td>
<td>C-phase current return</td>
</tr>
<tr>
<td>Voltage +/-</td>
<td>A-phase voltage polarity side (auxiliary power and potential measurement)</td>
</tr>
<tr>
<td>Voltage</td>
<td>A-phase voltage return (auxiliary power and potential measurement)</td>
</tr>
</tbody>
</table>

Make all test cable connections to the meter side of the test switch or test block except the auxiliary power. Connecting any of the test cable leads (except the auxiliary power) to the service side of the test switch or test block can result in equipment damage or personnel injury.

4. Connect the Open-Link Test Cable to the electricity meter as follows:

The Model 430 Open-Link Test Cable is marked with color coded label bands near the connection end of the lead, as well as color coded connection insulators. The red lead is the high polarity side of the current or voltage circuit. The return lead for both current and voltage is color coded black. The high polarity current lead is connected to the high polarity of the ‘A’ phase current circuit of the Meter Under Test (MUT). For Series tests, the return of that current circuit is jumpered to the high polarity of the last current circuit and the return of the last current circuit is connected to the test cable current return lead (color coded black). Thus, all the current circuits of the MUT are connected in series. For individual element test, the test cable current leads are connected across the current circuits of interest.
The voltage (red band and insulator) is connected to the high polarity of ‘A’ phase voltage. The voltage return lead (black band and insulator) is connected to the return side of the ‘A’ phase voltage. If the MUT is a polyphase meter, the remaining potential circuits (B, C) are isolated from their respective current circuits by opening the voltage clip or test switch and are connected in parallel with the ‘A’ phase potential circuit.

<table>
<thead>
<tr>
<th>Component</th>
<th>Connect to</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-phase and C-phase voltage high sides of the electricity meter</td>
<td>A-phase voltage high side of the electricity meter using <strong>fused jumpers</strong></td>
</tr>
<tr>
<td>Black terminated voltage test cable lead</td>
<td>A-phase voltage return</td>
</tr>
<tr>
<td>B-phase and C-phase voltage returns of the electricity meter</td>
<td>A-phase voltage return of the electricity meter using <strong>fused jumpers</strong></td>
</tr>
</tbody>
</table>

**WARNING**

Failure to open the voltage clips on ‘B’ and ‘C’ phase before jumpering to ‘A’ phase will cause **A Phase-to-Phase Short**. This will cause permanent damage to the test kit and can result in injury to operating personnel. It is recommended that the jumper connections be made using a fused jumper lead.
4.3 Conducting a Test with the Model 430 and RM-111

WARNING
Before conducting a test with the Model 430, verify that the test cable and all test connections are securely connected. Failure to do so can result in equipment damage or personnel injury.

Follow these steps to conduct a test with the Model 430:

1. Measure the A-phase voltage present at the test switch, and set the Supply Voltage selector switch to this value.

2. Close the A-phase +/-voltage and A-phase voltage neutral knife switches.

CAUTION
Do not close the B-phase or C-phase voltage knife switches, as this will cause a phase-to-phase short that can result in equipment damage or personnel injury.

3. Turn the Line Voltage switch to ON. Verify that the Line Voltage indicator light is solid red (not flashing).

NOTE
Internal cooling fans will energize for 10 seconds and then remain off until internal temperature exceeds 45° C.

4. Press the ON button on the RM-111 to turn it on. Set up the Automated Comparator for the test to be conducted (see Section 6.1.2, Test Steps).

5. Connect the appropriate meter pulse pickup to the appropriate port on the RM-111, and mount the meter pulse pickup on the meter.

6. Set the Test Current Tap selector for the test being performed.

   Set the Power Factor switch to either 1.0 or 0.5.

7. Turn the Test Current Adjustment clockwise until the Tap Output indicator shows full current tap output, two bars illuminated in the center of the display.

NOTE
The RM-111 Automated Comparator can be used to achieve better accuracy of the test current set.
8. Conduct the meter test (see Section 6.1.2, Test Steps).

9. At the conclusion of each test-point or at the conclusion of the meter test reduce the Test Current Adjust counter-clockwise to zero before changing any other settings.

10. When the test is complete, do the following:

   a. Turn the Voltage Line selector to OFF.

   b. Open all the A-phase voltage knife switches.

   c. Disconnect the test cable voltage leads and fused jumpers.

   d. Disconnect the test cable current leads.

   e. Disconnect the green ground wire of the Model 430 Test Cable from the earth ground of the service.

   --

   ![WARNING]

   Always disconnect the ground connector last. Failure to do so can result in equipment damage or personnel injury.

   --
Figure 13. Testing with RM-111 and Optical Sensor
5 RM-111 Automated Comparator Menu

This chapter describes the menu structure of the RM-111 Automated Comparator and contains the following sections:

5.1 Menu Structure Overview
5.2 Navigating the Menu
5.3 Menus

For detailed information on the Radian Research, Inc. software applications that can be used with the Model 430, see the User manuals for those products.

5.1 Menu Structure Overview

Figure shows the menu structure of the RM-111. Steps for navigating the menu and the purpose of each menu item are explained in the sections below.

![RM-111 Automated Comparator Menu Structure](image)

Figure 14. RM-111 Automated Comparator Menu Structure
5.2 Navigating the Menu

Use one of the following methods to select a menu item:

- Use the number buttons on the keypad to enter the number of the desired menu item.
- Use the up/down arrow buttons to move the cursor to the desired menu item, and then press **ENTER**.

Follow these additional tips for navigating the menu:

- The RM-111 can display up to four menu items at one time. When a menu contains more than four items, a down arrow will appear in the lower right corner of the display as shown in Figure 15. Use the down arrow button to move down the menu.
- When you are at the bottom of the menu, an up arrow will appear in the upper right corner of the display. Use the up arrow button to move up the menu.

![Figure 15. Down Arrow Indicating Additional Menu Items](image)

To change the brightness of the display hold the LCD button down while in 4 preferences mode then use the up or down arrow buttons.

**NOTE**
5.3 Menus

5.3.1 Main Menu

<table>
<thead>
<tr>
<th>No.</th>
<th>Menu Item</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RUN TESTS</td>
<td>Select the test type</td>
</tr>
<tr>
<td>2</td>
<td>RESULTS</td>
<td>View, print, or delete test results</td>
</tr>
<tr>
<td>3</td>
<td>TEST SETUPS</td>
<td>Create, edit, or delete a test setup</td>
</tr>
<tr>
<td>4</td>
<td>PREFERENCES</td>
<td>Select user preferences</td>
</tr>
</tbody>
</table>

5.3.2 Run Tests Sub-Menu

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub-Menu Item</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Meter</td>
<td>Test all meters and test mechanical standards by pulse counting</td>
</tr>
<tr>
<td>2</td>
<td>Test Standard</td>
<td>Test all standards</td>
</tr>
</tbody>
</table>
### 5.3.3 Results Sub-Menu

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub-Menu Item</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>View Result</td>
<td>View test results.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The RM-111 stores up to 80 meter and 28 standard test results.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use the left/right arrow buttons to move from one set of results to another.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use the up/down arrow buttons to move within a single results field.</td>
</tr>
<tr>
<td>2</td>
<td>Print Results</td>
<td>Print results using the Radian Research, Inc. RM-RPP Portable Printer.</td>
</tr>
<tr>
<td>3</td>
<td>Delete Results</td>
<td>Delete one set of test results.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use the arrow buttons to select the results to be deleted.</td>
</tr>
<tr>
<td>4</td>
<td>Delete All</td>
<td>Delete all test results.</td>
</tr>
</tbody>
</table>

### 5.3.4 Test Setups Sub-Menu

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub-Menu Item</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Edit</td>
<td>Edit an existing meter or standard test setup</td>
</tr>
<tr>
<td>2</td>
<td>Create</td>
<td>Create a new meter or standard test setup</td>
</tr>
<tr>
<td>3</td>
<td>Delete</td>
<td>Delete a meter or standard test setup</td>
</tr>
</tbody>
</table>
5.3.5 Preferences Sub-Menu

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub-Menu Item</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RS-232 - Mode</td>
<td>Puts the RM-111 in a communication mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The RM-111 must be in RS-232 mode to upload or download test information and results using the available Radian Research, Inc. software applications.</td>
</tr>
<tr>
<td>2</td>
<td>Result Display</td>
<td>Select one of the following formats for the test results:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Percent registration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Percent error</td>
</tr>
<tr>
<td>3</td>
<td>Result Digits</td>
<td>Select the measurement resolution for the test results:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 1, 2, or 3 places to the right of the decimal point</td>
</tr>
<tr>
<td>4</td>
<td>Meter Sensor</td>
<td>Select one of the following sensor types</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Manual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Pulse</td>
</tr>
<tr>
<td>5</td>
<td>Kh Format</td>
<td>Select one of the following Kh formats for the test setup:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Wh / Pulse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Pulses / Wh</td>
</tr>
</tbody>
</table>
6 User Prompts

Specify test information that will be stored with the test results:

- **Voltage**: The service voltage of the meter under test
- **Test Amps**: The test amps of the meter under test
- **Form**: The form number of the meter under test
- **Test ID#**: The tester’s identification number, if applicable
- **Manufactur ID#**: The manufacturer’s identification number, if applicable
- **Beep.....**: Enable or disable the audible response of the RM-111
- **Corr Fact**: Multiplier to achieve 100% registration

* Open Link: adjust results for open link cable harness (meter current circuits use series connection) or closed link cable harness (meter current circuits use independent current connections)

7 Time/Date

View and set the time and date.

8 Power Saver

Adjust the time in minutes that elapses before the RM-111 turns off due to inactivity.

9 About

View the following device information:

- Model number
- Serial number
- Software/firmware revision number
6 Applications Information

This chapter explains how to test a solid-state meter using the Model 430 Portable Meter Test Kit and contains the following section:

6.1 Testing a Solid-State Meter Using Calibration LED Output

6.1 Testing a Solid-State Meter Using Calibration LED Output

6.1.1 Required Equipment

The following equipment is needed to conduct the test:

- Model 430 Portable Meter Test Kit
- RM-111 Automated Comparator (see Section 7.1, Operational Accessories)
- RR-1H Infrared Optical Pickup (see Section 7.1, Operational Accessories)

6.1.2 Test Steps

Follow these steps to conduct the test:

1. Set up the equipment as follows:
   a. Make the appropriate connections to the meter.
   b. Connect auxiliary power to the Model 430.
   c. Apply the test voltage and current.

2. On the RM-111, press ON to turn the unit on.

3. Using the RM-111, select the menu options 1 Run Tests and then 2 Test Meter (see Section 5.3.2, Run Tests Sub-Menu).

4. Adjust the Test Current Adjustment selector switch on the Model 430 until the appropriate current is achieved.

5. Press ENTER on the RM-111.
   - The RM-111 begins the Align Pulse Sensor Test to check the pulse sensor. During this time, the disk rotates at full load current.
   - When the sensor is properly aligned, the LCD will show flashing segments that are synchronous with the sensor output.
6. Press **ENTER** on the RM-111 when alignment is achieved to begin the test.
   - While the test is in progress, the RM-111 shows the meter registration as it accrues and the standard pulse count.

7. When the test is complete, press **ENTER** on the RM-111, and then select one of the following:

<table>
<thead>
<tr>
<th>Menu Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-Run Test</td>
<td>Re-run the test.</td>
</tr>
<tr>
<td>Show Results</td>
<td>Show the test results.</td>
</tr>
<tr>
<td>Save Results</td>
<td>Save the test results.</td>
</tr>
</tbody>
</table>
7 Accessories

This chapter describes the available accessories for use with the Model 430 Portable Meter Test Kit and contains the following sections:

7.1 Operational Accessories
7.2 Printer and Software

7.1 Operational Accessories

7.1.1 RM-111 Automated Comparator

The RM-111 Automated Comparator is the definitive test accessory for use with Radian reference standards. The RM-111 eliminates manual calculation and recordkeeping associated with two primary applications: field testing of watthour billing meters and laboratory testing of reference standards. Shown in Figure 16.

Figure 16. RM-111 Automated Comparator
7.1.2 Quick Connect Cable

The Quick Connect Cable provides a convenient method of connecting for testing. The cable eliminates manual wiring associated with connecting to the test kit and is equipped with clearly labeled leads; shown in Figure 17.

![Quick Connect Cable](image)

Figure 17. Quick Connect Cable

7.1.3 Infrared Optical Pickups

Senses the infrared pulses from the calibration LED of solid-state meters for automatic testing; shown in Figure 18.

Wide angular displacement allows for fast, non-critical alignment.

- Automatic gain control circuitry ensures proper operation in all ambient sunlight conditions.

<table>
<thead>
<tr>
<th>Model</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR-1H</td>
<td>Connected to Pickup port of the RM-111 Automated Comparator</td>
</tr>
</tbody>
</table>
7.1.4 RM-OA Optical Adapter

Used with solid-state meters whose infrared calibration pulses are emitted from the optical communications port; shown in Figure 19.

- Magnetically couples to the communications port of solid-state meters.
- Suction cup of the Radian Research, Inc. RM-1H Infrared Optical Pickup attaches to the clear polycarbonate cover of the RM-OA.
- Incorporates a rare-earth permanent magnet for exceptional holding power over the life of the product.
7.1.5 Pulse Input Adapters

Senses the KYZ output pulses of induction-type or solid-state meters; shown in Figure 20. Pulses are conditioned and fed to the RM-111 Automated Comparator for automatic testing of KYZ-equipped meters.

<table>
<thead>
<tr>
<th>Model</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR-KYZ</td>
<td>Connected to Pickup port of the Model 430</td>
</tr>
</tbody>
</table>

Figure 20. RR-KYZ Pulse Input Adapter
7.1.6 Meter Disk Sensors

Reflective pickup assembly used to sense the disk rotation of induction-type meters for automatic testing; shown in Figure 21.

<table>
<thead>
<tr>
<th>Model</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR-DS</td>
<td>Feed to Pickup port of the Model 430</td>
</tr>
</tbody>
</table>

Figure 21. RR-DS/sm, Meter Disk Sensor, Suction Mount Version
7.2 Printer and Software

7.2.1 RM-RPP Remote Portable Printer

Used to print test results from the RM-111 Automated Comparator; shown in Figure 22.

- Compact, lightweight printer that offers bi-directional printing, logic-seeking print, and multiple character formats.
- Powered by battery or the included AC adapter.
- Ideal tool for maintaining records and addressing billing complaints in the field.

Figure 22. RM-RPP Remote Portable Printer
7.2.2 Software

The following two Radian Research, Inc. software product are compatible with the Model 430 Portable Meter Test Kit:

- RR-PCSuite
- WATT-Net

These products offer the following features:

- PC-based
- Allow the user to create and save multiple test configurations and customize the content, format, and type of data retrieved
- Eliminate the need for manual data entry, manual calculations, and paper-based recordkeeping
- Allow data to be imported or exported

For more information on these products, contact your sales representative or visit the Radian Research, Inc. website at www.radianresearch.com.
8 Routine Maintenance and Service

This chapter contains the following sections:

8.1 Contact Information
8.2 Routine Maintenance
8.3 Service
8.4 Helpful Documentation and Resources

8.1 Contact Information

For questions related to maintenance and service, contact Radian Research, Inc.:

Radian Research, Inc.
3852 Fortune Drive
Lafayette, IN 47905 USA

Tel: (765) 449-5500
Fax: (765) 448-4614

Email: radian@radianresearch.com
Website: www.radianresearch.com
8.2 Routine Maintenance

The Model 430 Portable Meter Test Kit requires the following routine maintenance:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before each use</td>
<td>• Inspect the test cable for damage.</td>
</tr>
<tr>
<td></td>
<td>• Check the battery in the optional RM-111 Automated Comparator, and replace as needed.</td>
</tr>
<tr>
<td>Before storing the equipment</td>
<td>• Wipe exterior surfaces with a dry, soft cloth to remove dust and dirt.</td>
</tr>
<tr>
<td>Yearly</td>
<td>• Calibrate the reference standard.</td>
</tr>
</tbody>
</table>

NOTE: The RM-111 Automated Comparator is 100% digital and will remain within 0.0001% transfer error for life. It never needs to be calibrated.

8.2.1 Removal and Installation of RM or RD Standard

**Removal:** With no power connected or applied, carefully remove each of the ten cable connections from the Standard. Then lift it out of the case.

**Installation:** Hold the cables back while you place Standard into case. Line up the small button stud on the left side with the slot in the metal chassis and press the Standard down into it (RD only). Connect each of the ten cables as they are labeled and shown in the example of an RD below. Model 430 RM cables are labeled identically as the Model 430 RD cables.
8.3 Service

8.3.1 Service

The Model 430 Portable Meter Test Kit is serviceable only by Radian Research, Inc.

The Model 430 Portable Meter Test Kit produces high voltages and is serviceable only by Radian Research, Inc. Attempts to service the equipment by unqualified personnel can result in personnel injury.

8.3.2 Warranty Service

Radian Research, Inc. warrants that each product is free from defects in material and workmanship. Our obligation under this warranty is to repair or replace any instrument or component therein that, within two years after shipment and with normal use, proves to be defective upon examination.

To Obtain Warranty Service

All warranty returns must have a return materials authorization (RMA) number. To obtain an RMA, visit www.radianresearch.com/forms/RMA/RMA-form.html.

Follow these guidelines to ensure prompt warranty service:

- Radian Research, Inc. must authorize all warranty replacements.
- Ship returned items prepaid, fully insured, and in the original packing to minimize the possibility of damage.
- Radian Research, Inc. will not accept collect shipments and does not accept liability for damage caused by improper packing or handling during shipment.
- Include in the shipment a detailed description of the problem and the events that led up to the development of the problem.
- Radian Research, Inc. will pay local domestic surface freight costs to return the product to the customer. Radian will not pay for overnight or express shipping service.
Use the following address for warranty returns:

Radian Research, Inc.
3852 Fortune Drive
Lafayette, IN 47905 USA
Attn: MODEL 430 Service

8.3.3 After-Warranty Service

If after-warranty service by Radian Research, Inc. is needed:

- A purchase order is required.
- The owner must pay all shipping costs.
- If requested, Radian Research, Inc. can provide an estimate for the repair; however, if the repair is not made, the cost of labor required to obtain the estimate will be invoiced at the hourly repair rate.

To Obtain After-Warranty Service

All after-warranty service requests must have a return materials authorization (RMA) number. To obtain an RMA, visit www.radianresearch.com/forms/RMA/RMA-form.html. Payment information must also be provided (purchase order or credit card).

Please follow these guidelines to ensure prompt after-warranty service:

- Ship returned items prepaid, fully insured, and in the original packing to minimize the possibility of damage.
- Include in the shipment a detailed description of the problem and the events that led up to the development of the problem.
- Radian Research, Inc. will invoice return shipping costs to the customer.

8.4 Helpful Documentation and Resources

Visit the Radian web site at:
http://www.radianresearch.com/products/literature.html