

Agilent L4611A PRM-36 Radio Test Set

Direct replacement for the AN/PRM-34 Radio Test Set that tests *Single Channel Ground and Airborne Radio System (SINCGARS)* radios and other tactical radios that operate up to 512 MHz.

User's and Service Guide

Edition, July 30, 2010

L4611-90002



Agilent Technologies

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A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

WARNING

- Use the Agilent Technologies L4611A PRM-36 Radio Test Set for its intended purpose only. Use in any way other than as instructed in this guide could result in a hazard.
 - Refer to the battery vendor's Material Safety Data Sheet (MSDS) for hazards and safe handling instructions related to the battery.
 - Never use a battery charger with the L4611A PRM-36 RTS or its non-rechargeable battery.
 - Follow the battery manufacturer's instructions for safe disposal.
-

CAUTION

- Except for the 6 VDC battery (BA-5372/U), there are no operator serviceable parts inside.
- Refer all servicing to qualified service personnel. Servicing is required when the device does not operate normally.
- The L4611A PRM-36 RTS is not shipped with the required 6 VDC battery (BA-5372/U). Only use the specified battery.
- Follow battery installation instructions. Observe the polarity markings on the battery cover. Protect sensitive electronics from ESD damage: do not touch the battery contacts during replacement.

Refer to ["Step 4. Become Familiar with One Button Operation Modes"](#) on page 11.

1 Getting Started

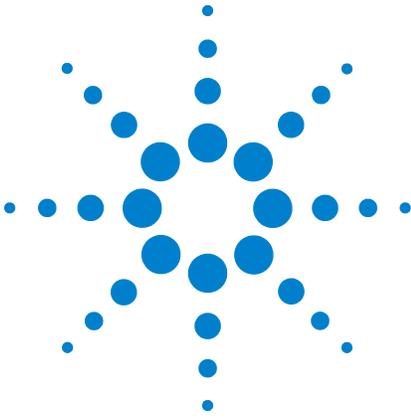
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1 Getting Started

The Agilent Technologies L4611A PRM-36 Radio Test Set is easy to use and quickly performs the required checks to assure that the radio being tested is operational.

In this section, verify that all of the items were in the shipping container, become familiar with the various components of the L4611A PRM-36 RTS, learn how to install or replace the battery, and follow a step-by-step set of instructions that tests both the transmitter and the receiver functions of a *Single Channel Ground and Airborne Radio System (SINCGARS)* radio as well as many other tactical radios that operate up to 512 MHz.

["Step 1. Verify the Shipping Contents"](#) on page 8

["Step 4. Become Familiar with One Button Operation Modes"](#) on page 11

["Step 3. Become Familiar with L4611A PRM-36 RTS Parts"](#) on page 10

["Step 4. Become Familiar with One Button Operation Modes"](#) on page 11

["Step 5. Test a Radio's Receiver and Transmitter"](#) on page 12

After testing a radio, read through the descriptions of the various messages that could be displayed on the LCD display and what they mean.

["Understanding LCD Display Backlight Brightness Adjustments"](#) on page 14

["Understanding LCD Display Messages"](#) on page 15



Step 1. Verify the Shipping Contents

Verify that the following items were shipped with the L4611A PRM-36 RTS. If any of the items are missing or damaged, refer to "Agilent Sales and Service Offices" on page 56.

Battery Sold Separately!
The L4611A PRM-36 RTS uses a single 6 VDC battery.

NOT INCLUDED
Battery, 6 VDC, BA-5372/U,
Lithium Manganese Dioxide

Description	Quantity	Part Number
User's and Service Guide (This Document)	1	Agilent L4611-90002
Radio Test Set 	1	Agilent L4611A PRM-36 RTS
Weatherproof Transit Case 	1	Ameripack Inc., Explorer 2209 http://www.ameripack.com
Cable, RG-58C Coaxial, BNC (m) to BNC (m), 18 inch (1.5 ft) 	1	L-com, Inc. CC58C-1.5 http://www.l-com.com
Cable, RG-58C Coaxial, BNC (m) to BNC (m), 48 inch (4.0 ft) 	1	L-com, Inc. CC58C-4 http://www.l-com.com
Load, BNC (f), 50 Ohm, 50 Watt, Convection-Cooled Dry Termination 	1	Bird Technologies Group, 50-T-FB http://birdtechnologies.thomasnet.com
Adapter, L-Shaped, BNC (f) to BNC (m) 	2	Agilent 1250-0076

Step 2. Install or Replace the Battery

NOTE

One 6 VDC battery (BA-5372/U) is required to operate the L4611A PRM-36 RTS.

Only install or replace the battery with a BA-5372/U or equivalent.

Tip: The 6 VDC battery (BA-5372/U) is the same battery used in many tactical radios for memory backup.

Battery Sold Separately!

The L4611A PRM-36 RTS uses a single 6 VDC battery.

NOT INCLUDED

Battery, 6 VDC, BA-5372/U,
Lithium Manganese Dioxide

To install or replace the 6 VDC battery (BA-5372/U)

- 1 Locate the battery door on the back of the L4611A PRM-36 RTS.
- 2 Turn the two “thumb screws” CCW to remove the battery door.
- 3 Insert the 6 VDC battery (BA-5372/U). Refer to [Figure 1](#) when inserting the battery to insure the + and – polarity of the battery matches the + and – markings on the L4611A PRM-36 RTS battery door cover and inside the battery compartment.
- 4 Re-install the battery door cover and securely tighten the two “thumb screws” CW.

Figure 1 Battery Installation and Replacement



Step 3. Become Familiar with L4611A PRM-36 RTS Parts



Table 1 L4611A PRM-36 RTS Parts Identification

ID	Description	Function
1	Antenna connector	<p>Connection to the antenna, or to a 50 Ω load (termination).</p> <p>While in Transmitter Test mode, the Antenna connector is used to measure reflected reverse power from a radio antenna.</p> <p>While in Receiver Test mode, the Antenna connector is not used.</p>
2	Radio connector	<p>Connection to the radio's Antenna connector.</p> <p>While in Transmitter Test mode, the Radio connector is used to measure the radio output frequency and forward power.</p> <p>While in Receiver Test mode, the Radio connector is used to output (transmit) a complex FM modulated signal from 30 MHz to 512 MHz (at 5 MHz intervals and -97 dBm of output power) that is modulated with both 150 Hz and 900 Hz audio tones; these audio tones are used to test the squelch and receiver circuits of the <i>Radio Under Test</i>.</p>
3	LCD Display	Displays mode, status, and measurement results.
4	RF Connector Cover	Protects the Antenna and Radio RF connectors when not in use.
5	On/Off Button	Powers On and Off the L4611A PRM-36 RTS and switches modes.

Step 4. Become Familiar with One Button Operation Modes

See "Step 5. Test a Radio's Receiver and Transmitter" on page 12.

To Test a Radio's Receiver and Transmitter

- 1 Connect the antenna port of a Radio to Radio connector on RTS.
- 2 Connect the Antenna connector on RTS to an antenna or the supplied 50 Watt, 50 ohm, termination.
- 3 Tune the Radio to a test channel.
- 4 Press/Release the RTS On/Off button.
- 5 Press/Hold the RTS On/Off button.
- 6 Listen for an audio tone from the Radio.
- 7 Release the RTS On/Off button.
- 8 Key the microphone on the Radio (PTT).
- 9 Read the test results on RTS.

See "Understanding LCD Display Backlight Brightness Adjustments" on page 14.

To Adjust the RTS Display Backlight

- 1 Press/Release the RTS On/Off button 1 time to enter Standby mode.
- 2 Press/Hold the RTS On/Off button for 5 seconds and the display changes to indicate that Backlight Brightness Mode can be selected:
 - If the On/Off button is released, the RTS returns to Standby mode and is ready to test another radio.
 - If the On/Off button is momentarily released, pressed again, and held, the RTS enters Backlight Brightness Mode.

Hold the On/Off button of the RTS until the desired level of backlight brightness is displayed. The brightness level will continue cycling until a selection is made.

The **RTS Firmware Version** is displayed after a setting is selected in Backlight Brightness Mode.

To Turn Off Power to the RTS

Press/Release the RTS On/Off button 2 times (quickly) to turn power off to the RTS.

Step 5. Test a Radio's Receiver and Transmitter

Radio Under Test is used to describe a Single Channel Ground and Airborne Radio System (SINCGARS) radio as well as many other tactical radios that operate up to 512 MHz.

Radio Test Set (RTS) is used to describe the Agilent Technologies L4611A PRM-36 Radio Test Set.

Quick Steps...

Test Radio's Receiver and Transmitter

1. Connect antenna port of Radio to Radio connector on RTS
2. Connect Antenna connector on RTS to the supplied 50 Watt, 50 ohm termination

Test Radio's Receiver

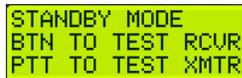
3. Tune Radio to a test channel
4. Press/Release RTS On/Off button
5. Press/Hold RTS On/Off button
6. Listen for audio tone from Radio
7. Release RTS On/Off button

Test Radio's Transmitter

10. Key microphone on Radio (PTT)
11. Read test results on RTS

To test a radio's receiver

1. Connect the antenna port of the *Radio Under Test*, using the cabling and adapters provided, to the Radio connector of the *Radio Test Set*.
2. Connect the Antenna connector of the *Radio Test Set* to the supplied 50 ohm termination.
3. Tune the *Radio Under Test* to a test channel that is between 30 MHz to 510 MHz (at 5 MHz intervals); this would correspond to a channel such as 30, 35, 40... 80, 85, 90..., 500, 505, or 510 MHz.
4. Press the *Radio Test Set's* On/Off button momentarily and then release it. The *Radio Test Set* performs a self test, a battery test, and then enters Standby mode.



- Standby Mode
- Push the button to test receiver.
- Key the microphone to test transmitter.

5. Press/Hold the On/Off button of the *Radio Test Set*.

The *Radio Test Set* performs a self test, a battery self test, and then automatically switches to Receiver Test mode.

While in Receiver Test mode, the Radio connector is used to output (transmit) a complex FM modulated signal from 30 MHz to 510 MHz (at 5 MHz intervals and -97 dBm of output power) that is modulated with both 150 Hz and 900 Hz audio tones; these audio tones are used to test the squelch and receiver circuits of the *Radio Under Test*.

6. Listen for an audio tone on the *Radio Under Test's* headset or handset.
 - If an audio tone is heard, the *Radio Under Test's* receiver circuitry is working correctly.
 - If an audio tone is not heard, the *Radio Under Test's* receiver circuitry may not be working correctly and further troubleshooting may be needed on the *Radio Under Test*.

7. Release the On/Off button of the *Radio Test Set*.

When the On/Off button is released, the *Radio Test Set* automatically switches back to Standby mode.

To conserve battery power, the *Radio Test Set* powers off automatically after 15 seconds of inactivity.

Radio Under Test is used to describe a Single Channel Ground and Airborne Radio System (SINCGARS) radio as well as many other tactical radios that operate up to 512 MHz.

Radio Test Set (RTS) is used to describe the Agilent Technologies L4611A PRM-36 Radio Test Set.

To conserve battery power, the Radio Test Set powers off automatically after 15 seconds of inactivity.

To test a radio's transmitter

- 8 If continuing from the previous procedure, titled "To test a radio's receiver", this connection was already made.

Otherwise, connect the antenna port of the *Radio Under Test*, using the cabling and adapters provided, to the Radio connector of the *Radio Test Set*.

- 9 If continuing from the previous procedure, titled "To test a radio's receiver", this connection was already made.

Otherwise, connect the Antenna connector of the *Radio Test Set* to the supplied 50 ohm termination.

- 10 Key the microphone on the *Radio Under Test*; Push-To-Talk (PTT).

When the *Radio Test Set* senses RF power, it automatically switches to Transmitter Test mode and measures the *transmitted output frequency* and *forward power* as received at the Radio connector from the *Radio Under Test*, and the *reflected reverse power* at the Antenna connector from the antenna.

If the *Radio Test Set* fails to automatically switch to Transmitter Test mode and make measurements, verify the *Radio Under Test* is set to high power (Hi Pwr). Additionally, the *Radio Under Test*'s transmitter may not be putting out RF power or the RF power being sensed by the *Radio Test Set* may be lower than the power required (1 Watt) to make the *Radio Test Set* automatically switch to Transmitter Test mode. (Before troubleshooting or repairing the *Radio Under Test*, Agilent suggests verifying that the cables being used during testing are not causing this problem.)

- 11 Read the test results on the *Radio Test Set*'s LCD display.

The *Radio Test Set*'s LCD display should indicate that the *Radio Under Test* is operating correctly with an LCD display similar to the following:

<pre>FREQ 234.567 MHz FWD 23.4 WATTS RVS 0.5 WATTS</pre>	<p>Radio Under Test</p> <p>- Transmitted Output Frequency</p> <p>- Forward Power</p> <p>Antenna</p> <p>- Reflected Reverse Power</p>
--	--

If other messages are displayed, refer to "Understanding LCD Display Messages" on page 15.

Understanding LCD Display Backlight Brightness Adjustments

See also "To Adjust the RTS Display Backlight" on page 11.

To adjust the LCD display backlight brightness

- 1 Press the *Radio Test Set's* On/Off button momentarily and then release it. The *Radio Test Set* performs a self test, a battery test, and then enters Standby mode.
- 2 Press/Hold the On/Off button of the *Radio Test Set* for 5 seconds and the display changes to indicate that Backlight Brightness Mode can be selected:
 - If the On/Off button is simply released, the *Radio Test Set* returns to Standby mode and is ready to test another radio.
 - If the On/Off button is momentarily released, pressed again, and held, the *Radio Test Set* enters Backlight Brightness Mode.

Continue to Hold the On/Off button of the *Radio Test Set* until the desired level of backlight brightness is displayed.

The backlight brightness level will continue cycling until a selection is made, the selection is retained even without battery power applied or when a battery is being replaced.

```
RELEASE BUTTON  
AT DESIRED LEVEL  
---> BRIGHT
```

BRIGHT is the highest level of display backlight brightness that can be set.

```
RELEASE BUTTON  
AT DESIRED LEVEL  
---> SEMIBRIGHT
```

SEMI-BRIGHT is in between the **NORMAL** and **BRIGHT** display backlight brightness level.

```
RELEASE BUTTON  
AT DESIRED LEVEL  
---> NORMAL
```

NORMAL is the default level of display backlight brightness that is set when the L4611A PRM-36 RTS is delivered.

```
RELEASE BUTTON  
AT DESIRED LEVEL  
---> DIM
```

DIM is the lowest level of brightness that can be set without turning off the display backlight.

```
RELEASE BUTTON  
AT DESIRED LEVEL  
---> OFF
```

OFF is used to turn off the display backlight.

Understanding LCD Display Messages

The L4611A PRM-36 RTS performs several self tests and checks several internal parameters at power on to help assure proper operation.

Although the self tests help assure that the L4611A PRM-36 RTS is operating properly, they cannot check everything. If additional problems are suspected with the L4611A PRM-36 RTS, please refer to [Chapter 2, Service](#) for more information.

All possible LCD display messages for normal and abnormal conditions are displayed as follows:

```
SENDING RCVR TEST
PTT TO TEST XMTR
```

While in **Receiver Test mode**, the Radio connector is used to output (transmit) a complex FM modulated signal from 30 MHz to 510 MHz (at 5 MHz intervals and -97 dBm of output power) that is modulated with both 150 Hz and 900 Hz audio tones; these audio tones are used to test the squelch and receiver circuits of the *Radio Under Test*.

SENDING RCVR TEST means that the L4611A PRM-36 RTS is sending the receiver test signal on the Radio connector.

PTT TO TEST XMTR means that when the *Radio Under Test's* push-to-talk (PTT) switch is pressed, it transmits a signal. If the signal is 1 Watt or greater, the L4611A PRM-36 RTS enters Transmitter Test mode and confirms that the *Radio Under Test* is transmitting properly.

```
STANDBY MODE
BATTERY HAS LESS
THAN 15 MIN LEFT
```

BATTERY LOW < 15 MIN OP LEFT means that there are less than 15 minutes of operation time remaining before the battery no longer has enough power to produce a valid test on a Radio Under Test.

In normal use, a low-battery warning message is displayed after about 50 hours of testing time. If the L4611A PRM-36 RTS is used with a battery low warning, eventually a message is displayed that the battery must be replaced.

```
FREQ 234.567 MHz  
FWD 23.4 WATTS  
RVS 0.5 WATTS
```

While in **Transmitter Test mode**, the L4611A PRM-36 RTS measures the output frequency and forward power of a *Radio Under Test* as received at the L4611A PRM-36 RTS Radio connector, and the reflected reverse power from the antenna at the Antenna connector.

FREQ is the transmitter output frequency being measured at the Radio connector.

FWD is the transmitter forward power being measured at the Radio connector.

RVS is the reflected reverse power being measured from the antenna at the Antenna connector.

```
BATTERY TOO LOW  
MUST REPLACE NOW
```

BATTERY TOO LOW MUST REPLACE NOW means that the battery *must* be replaced.

```
TEMPERATURE TOO  
HIGH. UNABLE TO  
OPERATE.
```

TEMPERATURE TOO HIGH. UNABLE TO OPERATE and **TEMPERATURE TOO LOW. UNABLE TO OPERATE** means that operation at these temperatures cannot be guaranteed, so no measurements are made.

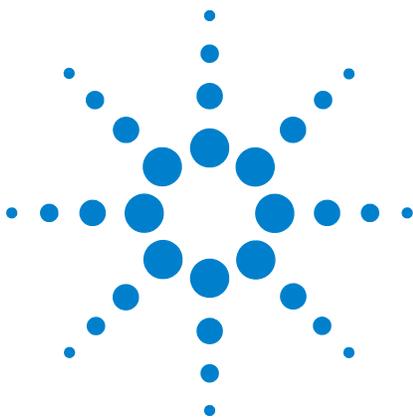
```
TEMPERATURE TOO  
LOW. UNABLE TO  
OPERATE.
```

One of these warning messages is displayed when the L4611A PRM-36 RTS becomes hotter or colder than its specified operating temperature range, $-20\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$.

```
INTERNAL ERROR  
RETURN RTS  
FOR REPAIR
```

INTERNAL ERROR RETURN RTS FOR REPAIR means that when the L4611A PRM-36 RTS ran self tests, the self tests failed or there was an abnormal internal condition detected.

Because the L4611A PRM-36 RTS could not meet all of its specifications, it must be sent for service as soon as possible.



2 Service

- “Protect Against Electrostatic Discharge (ESD)” on page 18
- “Troubleshooting” on page 19
 - “Check the Basics” on page 19
 - “Check Beyond the Basics” on page 20
 - “Replaceable Parts List” on page 21
 - “Removal Procedures” on page 23
 - “Replacement Procedures” on page 28
- “L4611A PRM-36 RTS Performance Tests” on page 35
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 - “Amplitude Accuracy of Comb Generator Output” on page 47
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 - “Amplitude Accuracy Test (Forward Power)” on page 50
 - “Amplitude Accuracy Test (Reverse Power for 10 and 20 Watts)” on page 52
 - “Amplitude Accuracy Test (Reverse Power for 1 and 3 Watts)” on page 54
- “Contacting Agilent Sales and Service Offices” on page 56



Protect Against Electrostatic Discharge (ESD)

Electrostatic Discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation using two types of static-safe workstation protection:

- conductive table - mat and wrist-strap combination
- conductive floor - mat and heel-strap combination

Both types, when used together, provide a significant level of ESD protection. Of these two, only the table with mat and wrist-strap combination provides adequate ESD protection when used alone. To insure user safety, the static-safe accessories must provide at least 1 M Ω of isolation from ground.

Handling of Electronic Components and ESD

The assemblies in this instrument are very susceptible to damage from ESD. Perform troubleshooting procedures only at a static-safe workstation and wear a grounding strap.

Always handle a printed circuit board assembly by its edges. This reduces the possibility of ESD damage to components and prevents contamination of exposed plating.

The possibility of unseen damage caused by ESD is present whenever components are transported, stored, and used. The risk of ESD damage can be greatly reduced by close attention to how all components are handled.

- Perform work on all components at a static-safe workstation.
- Keep static-generating materials at least one meter away from all components.
- Store or transport components in static-shielding containers.

Troubleshooting

NOTE

The Agilent Technologies L4611A PRM-36 Radio Test Set was designed as a direct replacement for the AN/PRM-34 Radio Test Set. Maintenance and testing is outlined in this chapter.

General Support Maintenance

General support maintenance is limited to replacement of the case components, two RF cables, and one PC assembly.

After replacement of the PC assembly, adjustments are not required as the PC assembly is shipped from Agilent fully calibrated.

After completion of any general support maintenance, perform all of the ["L4611A PRM-36 RTS Performance Tests"](#) on page 35.

Check the Basics

Display Check that the LCD display is not cracked or severely scratched.

Antenna and Radio Connector Check that connectors are not bent or damaged.

Test Set Remove all cables connected to the Radio connector and Antenna connector. Power on the L4611A PRM-36 RTS, automatically run the built in self test, and verify the results of the self test.

NOTE

When the L4611A PRM-36 RTS is powered on, it performs a self test, a battery test, and then enters Standby mode.

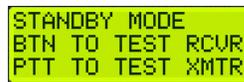
Cleaning If cleaning is necessary, use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt internal cleaning.

Check Beyond the Basics

The L4611A PRM-36 RTS is simple to troubleshoot as it contains a single PC board assembly and two RF connector assemblies.

If there is a self test error

- 1 Remove all cables connected to the Radio connector and Antenna connector.
- 2 Press the L4611A PRM-36 RTS's On/Off button momentarily and then release it. The L4611A PRM-36 RTS performs a self test, a battery test, and then enters Standby mode.



- Standby Mode
- Push the button to test receiver.
- Key the microphone to test transmitter.

- If the L4611A PRM-36 RTS fails the built-in self test, replace the battery and perform the self test again. To change the battery, refer to "Step 4. Become Familiar with One Button Operation Modes" on page 11.
- If the L4611A PRM-36 RTS fails the self test with a new battery installed, replace the PRM-36 PC assembly.

If there is a forward power error

- Inspect the two RF cables for damage and replace if necessary. Refer to item 6 and 7 in the [Figure 1](#) on page 21.
- If the forward power results are still incorrect after replacing the cables, replace the PRM-36 PC assembly.

If there is a reverse power error

- Inspect the two RF cables for damage and replace if necessary. Refer to item 6 and 7 in the [Figure 1](#) on page 21.
- If the reverse power results are still incorrect after replacing the cables, replace the PRM-36 PC assembly.

Replaceable Parts List

L4611A PRM-36 RTS Replaceable Parts List

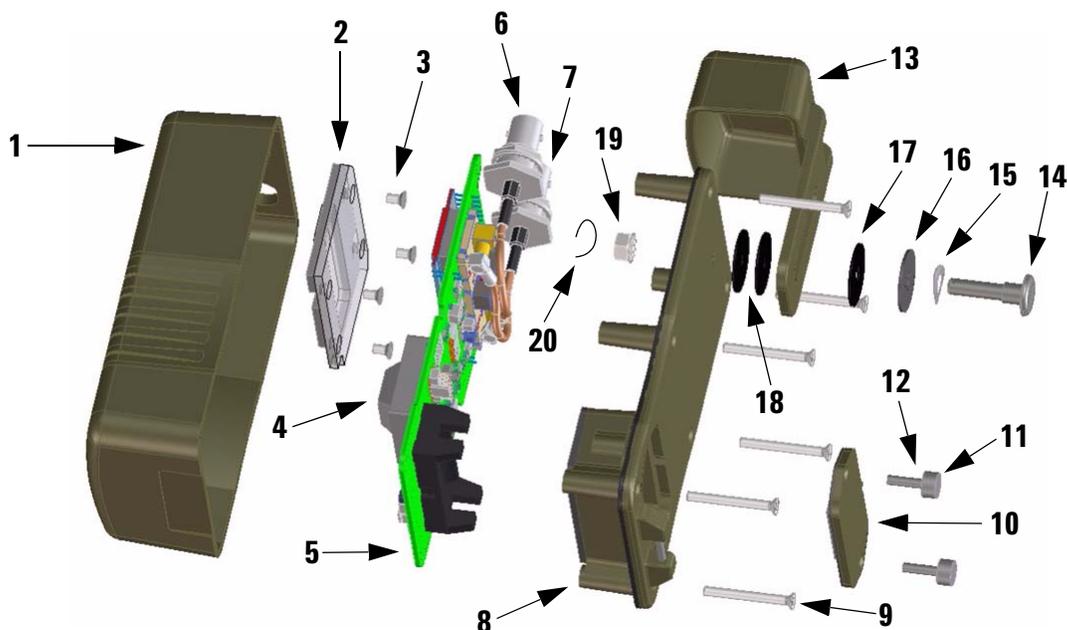


Figure 1 L4611A PRM-36 RTS Replaceable Parts List

Item	Qty	Description	Part Number
1	1	Front case	L4611-20101
2	1	Lens with gasket	L4610-60201
3	4	Screw, M3 x 0.5 x 5 mm	0515-1521
4	1	On/Off Button ¹	
5	1	PRM-36 PC assembly	L4611-60001
6	1	RF cable, BNC to MCX (Radio Side, Right Connector)	L4611-60101
		When viewing the PRM-36 PC assembly from the coupler side, the Radio cable goes in the right connector on the coupler.	
7	1	RF cable, BNC to MCX (Antenna Side, Left Connector)	L4611-60102
		When viewing the PRM-36 PC assembly from the coupler side, the Antenna cable goes in the left connector on the coupler.	

2 Service

8	1	Rear case with gaskets	L4611-60202
9	6	Screw, M3 x 0.5 x 27.5 mm	0515-1862
10	1	Battery door assembly ²	L4611-60203
11	2	• Battery door thumb screws ³	
12	2	• Battery door rubber o-rings for the thumb screws ³	
13	1	Protective cap	L4610-20104
14	1	Shoulder screw, M5 x 0.8	L4611-20010
15	1	Spring washer, 6.7 mm ID	3050-2361
16	1	Flat washer, 6.5 mm ID	L4610-20011
17	1	Nylon washer, 6.5 mm ID	L4610-20013
18	2	Nylon washer, 5.1 mm ID	L4610-20014
19	1	Locknut, M5 x 0.8 mm	0535-0081
20	1	Safety wire, 0.813 mm (0.032") stainless steel (Use with Item 14.) See " (Optional.) Safety Wire Replacement " on page 32.	L4611-20011

1 The On/Off Button is part of the PRM-36 PC assembly.

2 If the battery requires changing, refer to "[Step 1. Verify the Shipping Contents](#)" on page 8 and "[Step 4. Become Familiar with One Button Operation Modes](#)" on page 11.

3 The battery door thumb screws and rubber o-rings are part of the battery door assembly.

Removal Procedures

The following removal procedures are shown in a sequential order:

["Step 1. Battery Removal"](#) on page 24

["Step 2. Rear Cover Removal"](#) on page 25

["Step 3. RF Cable Removal"](#) on page 26

["Step 4. PRM-36 PC Assembly Removal"](#) on page 27

["Step 5. Lens Assembly with Gasket Removal"](#) on page 27

Tools Required

- 14 mm (9/16") nut driver or socket wrench
- T10 Torx driver
- Needle nose pliers

To re-assemble the L4611A PRM-36 RTS,
see the ["Replacement Procedures"](#) on page 28.

Step 1. Battery Removal

NOTE

One BA-5372/U battery is required to operate the L4611A PRM-36 RTS. Only install or replace the battery with a BA-5372/U or equivalent.

Tip: The BA-5372/U battery is the same battery used in many radios for memory backup.

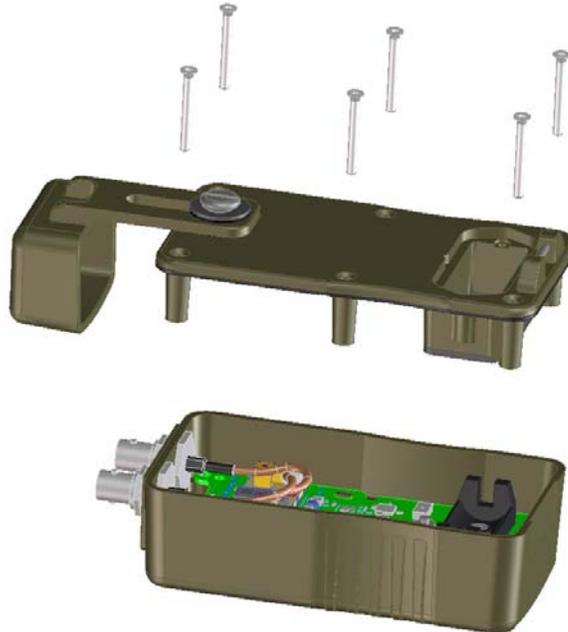
Figure 2 Battery Installation and Replacement



- 1 Locate the battery door on the back of the L4611A PRM-36 RTS.
- 2 Turn the two “thumb screws” CCW to remove the battery door.
- 3 Remove the BA-5372/U battery.

Step 2. Rear Cover Removal

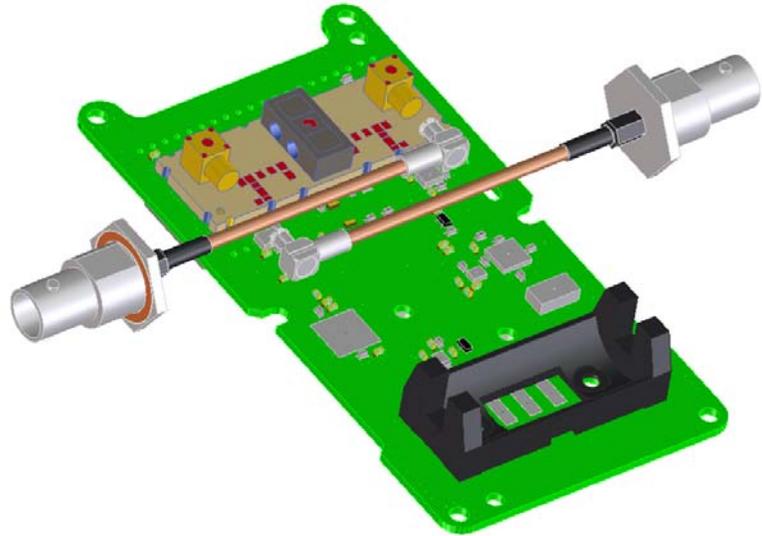
Figure 3 Rear Cover Screw Locations



- 1 Using the T10 driver, remove the six (p/n 0515-1862) M3 screws for the rear cover.
- 2 Slide the BNC connector protective cap all the way up and remove the cover.

Step 3. RF Cable Removal

Figure 4 MCX Connector Location



- 1 Use a 14 mm (9/16") socket wrench or driver to remove the BNC nuts and star washers that secure the BNC connectors to the top of the case.
- 2 Use needle nose pliers to unsnap the two RF cable connectors from the PRM-36 PC assembly MCX connectors. (Wiggle the connector from side-to-side while gently pulling the connector free.)

CAUTION

Do not pull on the cables or attempt to unscrew the connector! Use needle nose pliers on the cable's gold plated connector. Be very careful not to damage any parts of the PRM-36 PC assembly while removing the connectors.

- 3 Remove the RF cable assemblies.

Step 4. PRM-36 PC Assembly Removal

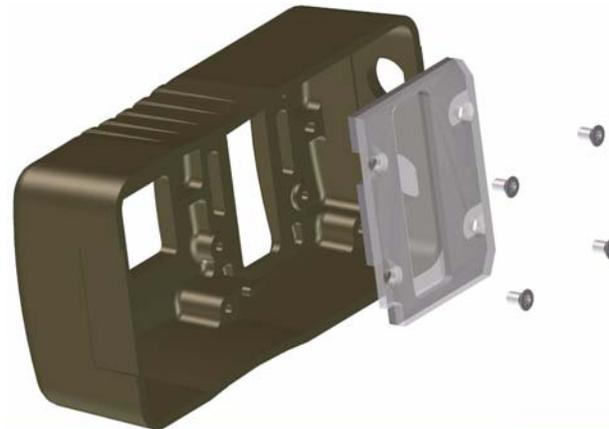
The screws attaching the rear cover are also the screws used to secure the PRM-36 PC assembly to the front case. Once the rear cover and RF cables have been removed, carefully lift the PRM-36 PC assembly out of the enclosure.

Step 5. Lens Assembly with Gasket Removal

NOTE

This step is not necessary when replacing the PRM-36 PC Assembly.

Figure 5 Lens Assembly with Gasket Removal



Use a T10 driver to remove the four (p/n 0515-1521) M3 screws that secure the lens assembly to the front case.

Replacement Procedures

The following replacement procedures are shown in reverse order from the ["Removal Procedures"](#) on page 23. For example, the lens assembly must be replaced prior to installing the PRM-36 PC assembly, RF cables assemblies, and rear cover.

The following replacement procedures are shown in a sequential order:

["Step 1. Lens Assembly with Gasket Replacement"](#) on page 29

["Step 2. PRM-36 PC Assembly Replacement"](#) on page 30

["Step 3. RF Cable Replacement"](#) on page 31

["Step 4. Adjusting Friction on the Sliding Cap"](#) on page 32

["Step 5. Rear Cover Replacement"](#) on page 33

["Step 6. Battery Replacement"](#) on page 34

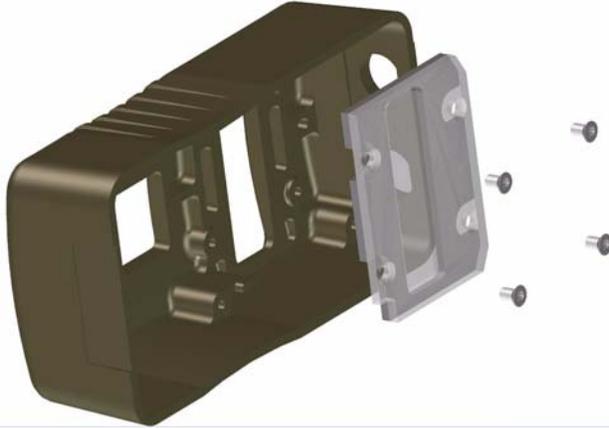
Tools Required

- needle nose pliers
- 14 mm (9/16") nut driver or socket wrench
- T10 Torx driver

To disassemble the L4611A PRM-36 RTS, see the ["Removal Procedures"](#) on page 23.

Step 1. Lens Assembly with Gasket Replacement

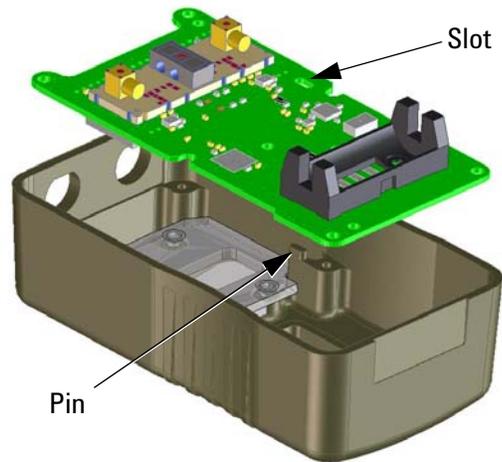
Figure 6 Lens Assembly with Gasket Replacement



- 1 Blow out the enclosure with air to remove any debris.
- 2 Install the lens assembly inside the front cover enclosure as shown in [Figure 6](#).
- 3 Press down firmly at top and bottom of lens assembly to compress the gasket, while installing four (p/n 0515-1521) M3 screws. Use a T10 driver and torque to 8 inch-pounds.

Step 2. PRM-36 PC Assembly Replacement

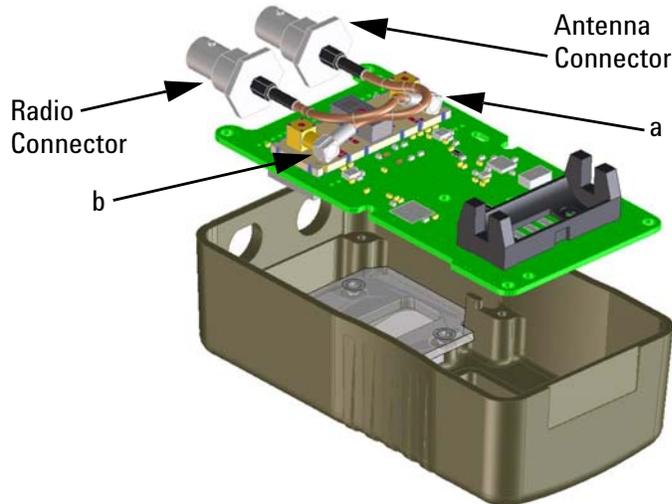
Figure 7 PRM-36 PC Assembly Slot Location



Place the PRM-36 PC assembly into the enclosure using the slot in the board as a guide. This slot fits over the mating oval pin in the case casting.

Step 3. RF Cable Replacement

Figure 8 Connect the RF Cable Connectors to MCX Connectors



- 1 Connect the Coax cable connectors to the MCX connectors.
 - a Install the Radio RF Cable (L4611-60101) by sliding the BNC end through the Radio D-Hole (in the top of the case) and then snapping the MCX plug into the MCX connector on the right (when viewing from the top; labelled "a" in [Figure 8](#)).
 - b Install the Antenna RF Cable (L4611-60102) by sliding the BNC end through the Antenna D-hole (in the top of the case) and then snapping the MCX plug into the MCX connector on the left (when viewing from the top; labelled "b" in [Figure 8](#)). The Antenna cable is longer and crosses behind the Radio side cable.

Figure 9 BNC Washer and Nut Location



- 2 Install the BNC star-washers and nuts to the BNC connectors at the top of the front case. Tighten with a 14 mm (9/16") hex socket wrench. Torque to 40 inch-pounds.

Step 4. Adjusting Friction on the Sliding Cap

- 1 With the rear cover off, the interior jam nut should be loosened enough such that the shoulder screw can be tightened/loosened as necessary to achieve the desired friction on the cap slide.
- 2 Hold the screw while the jam nut is tightened to approximately 42 in-lbs.

NOTE

Once set, the nut should not need to be readjusted unless the nylon washers are excessively worn (the spring washer will keep pressure applied even with some wear to the nylon washers). If the jam nut is not tightened appropriately, or the shoulder screw is tightened further without securing the jam nut, the nut could become loosened and not properly maintain tightness of the shoulder screw.

The Safety Wire (Item 20 in [Figure 1](#)) should not be removed unless it is damaged or the Shoulder Screw (Item 14 in [Figure 1](#)) needs to be removed for maintenance.

(Optional.) Safety Wire Replacement

Figure 10 (Optional) Safety Wire Replacement



To remove a Safety Wire, untwist the wire and pull it through the hole in the Shoulder Screw.

(Do not reuse Safety Wire.)

To install Safety Wire, thread a piece of Safety Wire through the Shoulder Screw, twist the Safety Wire three full turns (or more), and wrap the Safety Wire around the Shoulder Screw. Cut off any excess.

Step 5. Rear Cover Replacement

Figure 11 Rear Cover Screw Locations



- 1 Place rear cover onto the front case enclosure.
- 2 Install six (p/n 0515-1862) M3 screws and torque to 8 inch-pounds using a T10 driver.

Step 6. Battery Replacement**NOTE**

One BA-5372/U battery is required to operate the L4611A PRM-36 RTS. Only install or replace the battery with a BA-5372/U or equivalent.

Tip: The BA-5372/U battery is the same battery used in many radios for memory backup.

Figure 12 Battery Door

- 1 Locate the battery door on the back of the L4611A PRM-36 RTS.
- 2 Turn the two “thumb screws” CCW to remove the battery door.
- 3 Insert the BA-5372/U battery.

Refer to [Figure 12](#) when inserting the battery to insure the + and – polarity of the battery matches the + and – markings on the L4611A PRM-36 RTS battery door cover and inside the battery compartment.

- 4 Re-install the battery door cover and securely tighten the two “thumb screws” CW.

L4611A PRM-36 RTS Performance Tests

Performance Tests are designed to provide the highest level of confidence that the L4611A PRM-36 RTS being tested conforms to published, factory-set specifications. These performance tests are designed to test an L4611A PRM-36 RTS when operating within the temperature range defined by its specifications.

All performance tests must be run after a repair.

List of Performance Tests

- ["Battery Current Draw Tests"](#) on page 39
- ["Modulation Tones Accuracy"](#) on page 44
- ["Amplitude Accuracy of Comb Generator Output"](#) on page 47
- ["Frequency Accuracy Test"](#) on page 49
- ["Amplitude Accuracy Test \(Forward Power\)"](#) on page 50
- ["Amplitude Accuracy Test \(Reverse Power for 10 and 20 Watts\)"](#) on page 52
- ["Amplitude Accuracy Test \(Reverse Power for 1 and 3 Watts\)"](#) on page 54

NOTE

To properly complete all performance tests on the L4611A PRM-36 RTS, Agilent recommends that each piece of test equipment used in any of the performance test setups be calibrated according to their individual calibration requirements or whenever a problem is suspected.

The specific calibration interval of each piece of test equipment depends upon the accuracy required and must take into account all *Measurement Uncertainty Analysis* for each piece of test equipment used in a test configuration.

Measurement Uncertainty Analysis includes the amount of variation in a measurement that is due to using different pieces of test equipment.

Specified Power Measurement Accuracy

The specified power measurement accuracy of the L4611A PRM-36 RTS is $\pm 20\%$, which can be expressed as $+0.79$ dB, -0.96 dB. Normally, the accuracy of the L4611A PRM-36 RTS will be well within that specification, but inaccuracies in the performance test instruments and test setup can cause an L4611A PRM-36 RTS that meets its specification to appear to be out of tolerance. It is important to use test setups that have been calibrated and have measurement accuracy within 0.2 dB, or $\pm 5\%$ of true power.

Factors that can contribute to inaccuracies include, but are not limited to:

- Loss in cabling and connectors between the directional coupler and the L4611A PRM-36 RTS that are not properly compensated can contribute to inaccuracies.
- Inaccuracy in the coupling factor of the directional coupler contributes to inaccuracies. The directional coupler should be calibrated for the coupling factor between the output power and the forward coupled power at each measurement frequency. Calibration of loss in the connectors and cabling between the directional coupler and the L4611A PRM-36 RTS being tested can be compensated by including these cables and connectors in the directional coupler calibration.
- Inaccuracy in the RF power meter connected to the directional coupler's forward coupled power port can contribute to inaccuracies. Be sure, for example, to properly account for the frequency calibration of the power measuring sensor.
- Harmonic content in the RF power amplifier that may be measured by the RF power meter, but not by the L4611A PRM-36 RTS can contribute to inaccuracies. This can be a significant source of error and may be more prevalent when the power amplifier is operating near its maximum power output.

Test Equipment Required for Performance Tests

Test Equipment Required	Recommended Model	Critical Specifications
Spectrum Analyzer	Agilent N9020A Option 526 and P26 spectrum analyzer or equivalent	<ul style="list-style-type: none"> Frequency Range: 30 to 512 MHz Modulation Measurement: Capable of measuring the net power of the FM-modulated signal and capable of reporting the frequencies and deviations of FM modulation components.
Spectrum Analyzer Application Software	Agilent N9063A analog demodulation application or equivalent	<ul style="list-style-type: none"> Frequency Range: 30 to 512 MHz Modulation Measurement: Capable of measuring the net power of the FM-modulated signal and capable of reporting the frequencies and deviations of FM modulation components.
10 MHz Reference		<ul style="list-style-type: none"> 10 MHz Reference with Frequency Accuracy ± 0.1 ppm
Signal Generator	Agilent N5182A MXG signal generator or equivalent	<ul style="list-style-type: none"> Frequency Range: 30 to 512 MHz Power Output: +10 dBm Spurious and Harmonic Output: Content at least 30 dB below the carrier level Frequency Accuracy at least 0.1 ppm Locked to 10 MHz Reference
Power Meter	Agilent E4419B power meter or equivalent	<ul style="list-style-type: none"> Frequency Range: 30 to 512 MHz
Power Sensor	Agilent E9304A power sensor or equivalent	<ul style="list-style-type: none"> Frequency Range: 30 to 512 MHz Power Accuracy: Better than 2%, in conjunction with the Power Meter that is used over a range of powers from -20 dBm to +7 dBm
RF Power Amplifier	Amplifier Research Model 100W1000B or equivalent	<ul style="list-style-type: none"> Frequency Range: 30 to 512 MHz Power Output: 0.1 W to 50 W Contribute no more than -30 dBc of Spurious and Harmonics
Dual Directional Coupler	Werlatone C1795-10 dual directional coupler or equivalent	<ul style="list-style-type: none"> Frequency Range: 30 to 512 MHz Maximum Applied Power: 50 W Coupling Factor: 40 dB

2 Service

Power Supply	DC Power Supply	<ul style="list-style-type: none">• Voltage Output:<ul style="list-style-type: none">• Adjustable from 3 VDC to 7 VDC with an adjustability of 0.05 VDC.• Current Output: 50 mA
Volt Meter Current Meter	Agilent U3401A Digital Multimeter or equivalent	<ul style="list-style-type: none">• DC Voltage Measurements:<ul style="list-style-type: none">• Up to 7 V with 0.01 V resolution and 0.02 V accuracy or better.• Current Measurements:<ul style="list-style-type: none">• 20 μA with 0.1 μA resolution and 0.2 μA accuracy or better• 50 mA with 0.1 mA resolution and 0.2 mA accuracy or better
Termination	Convection-Cooled Dry Termination for Antenna connector (Refer to "Step 1. Verify the Shipping Contents" on page 8.)	<ul style="list-style-type: none">• Power: 50 W
3 dB Power Attenuator	3 Watt, Bi-Directional Attenuators or equivalent	<ul style="list-style-type: none">• Power: 3 W

Battery Current Draw Tests

This performance test measures the battery current draw when the L4611A PRM-36 RTS is in each of the following modes of operation: Off, Standby mode, Receiver Test mode, or Transmitter Test mode.

- To learn how to change between Standby mode, Receiver Test mode, and Transmitter Test mode, refer to ["Step 5. Test a Radio's Receiver and Transmitter"](#) on page 12.
- To learn how to change the Backlight Brightness mode, refer to ["Understanding LCD Display Backlight Brightness Adjustments"](#) on page 14.

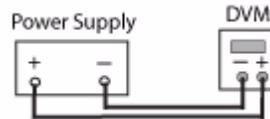
Table 1 Battery Current Draw at +5.5 VDC (Typical Characteristics)

Battery Current Draw when L4611A PRM-36 RTS is:	All values measured at +5.5 VDC	Measured Value
Off	0.05 μ A, Typical (< 1.0 μ A Max after 1 minute)	
With Backlight Brightness mode set to Off :		
Standby mode	< 4.4 mA, Typical	
Receiver Test mode	< 11.0 mA, Typical	
Transmitter Test mode	< 8.6 mA, Typical	
In Standby mode with Backlight Brightness mode set to:		
Dim	Add 0.7 mA	
Normal	Add 1.6 mA	
Semi-bright	Add 2.4 mA	
Bright	Add 7.5 mA	

Step 1. Adjust the DC Power Supply and Set Up Test Equipment

- 1 Remove the battery from the L4611A PRM-36 RTS.
Refer to “Step 1. Battery Removal” on page 24.
- 2 Turn power off to the DC power supply.
- 3 Connect the DC power supply to a DVM, as shown in Figure 13.
- 4 Turn power on to the DC power supply and adjust the DC power supply to +5.5 VDC.

Figure 13 Connect DC Power Supply to a DVM and Adjust to +5.5 VDC



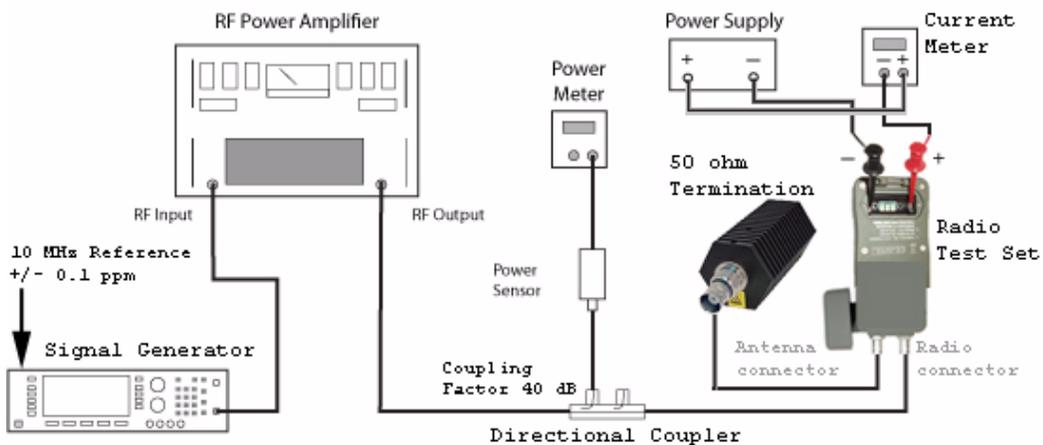
- 5 Turn power off to the DC power supply.
- 6 Disconnect the DVM from the DC power supply.
- 7 With power off to the DC power supply, connect the DC power supply to the L4611A PRM-36 RTS battery contacts as shown in Figure 14.
- 8 Connect a Current Meter in series with the DC power supply.

NOTE

Note that the current meter is connected in series with the DC power supply and is between the (+) output of the DC power supply and the (+) connection of the L4611A PRM-36 RTS battery contacts. This connection allows the current meter to measure the current draw through the L4611A PRM-36 RTS.

Since the (-) terminal of the battery holder is not case ground, it is important to note that the test leads from the power supply and current meter should not contact the L4611A PRM-36 RTS’s case.

Figure 14 Battery Current Draw Test Setup



Step 2. Measure Battery Current Draw in Power Off Mode

- 1 Turn power on to the DC power supply and wait 60 seconds.
- 2 Read/Measure the current draw with the L4611A PRM-36 RTS powered Off.

NOTE

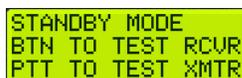
Note that when measuring the current draw with the L4611A PRM-36 RTS powered Off, you must wait at least 60 seconds before reading the current meter because the capacitors across the battery power leads in the L4611A PRM-36 RTS take time to charge up. During the first several seconds, the current is higher than it is after 60 seconds and typically goes down even more after that.

Step 3. Measure Battery Current Draw in Standby Mode

- 1 Turn power on to the DC power supply.

The DC power supply should already be on from the previous steps. It had previously been adjusted to +5.5 VDC. (See "[Step 1. Adjust the DC Power Supply and Set Up Test Equipment](#)" on page 40.)

- 2 Press the L4611A PRM-36 RTS's On/Off button momentarily and then release it. The L4611A PRM-36 RTS performs a self test, a battery test, and then enters Standby mode.



- Standby Mode
- Push the button to test receiver.
- Key the microphone to test transmitter.

- 3 Verify that the display is easily legible and the L4611A PRM-36 RTS displays STANDBY MODE as shown above.
- 4 Read/Measure the current meter.

Note that to conserve battery power, the L4611A PRM-36 RTS powers off automatically after 15 seconds of inactivity, so the battery current draw measurement must be made before the L4611A PRM-36 RTS powers off. If the L4611A PRM-36 RTS powers off automatically before you have time to read the battery current draw measurement on the current meter, simply press the L4611A PRM-36 RTS's On/Off button momentarily and release it. The L4611A PRM-36 RTS performs a self test, a battery test, and then enters Standby mode which should allow additional time to read the battery current draw.

Current Meter Full Scale Range -

To make measurements, set the current meter on a 200 mA full scale range, or equivalent. Currents are specified only to 0.1 mA resolution.

This is required because if the current meter is in autorange mode, it may, for an instant, disconnect the path for current while changing ranges. This disconnection time may be long enough to incorrectly cause the L4611A PRM-36 RTS to switch into bad-battery fatal error mode.

Step 4. Measure Battery Current Draw in Receiver Test Mode

- 1 Turn power on to the DC power supply.

The DC power supply should already be on from the previous steps. It had previously been adjusted to +5.5 VDC. (See " [Step 1. Adjust the DC Power Supply and Set Up Test Equipment](#)" on page 40.)

- 2 Press/Hold the On/Off button of the L4611A PRM-36 RTS.
- 3 Read/Measure the current draw.

The L4611A PRM-36 RTS performs a self test, a battery self test, and then automatically switches to Receiver Test mode.

Current Meter Full Scale Range -
To make measurements, set the current meter on a 200 mA full scale range, or equivalent. Currents are specified only to 0.1 mA resolution.



Transmitting in Receiver Test Mode
Push-To-Talk to test the transmitter.

Step 5. Measure Battery Current Draw in Transmitter Test Mode

- 1 Connect the signal generator with the power amplifier to L4611A PRM-36 RTS's Radio connector.
- 2 Set the signal generator and RF power amplifier to the following settings. Verify the power setting with the directional coupler and power meter as shown in [Figure 14](#).

In this test setup, a signal at 2 Watts is used to simulate the signal that a Radio Under Test would produce when its microphone is keyed.

Signal Generator		Read/Measure the current draw.
Power	Frequency	
2 Watts (33 dBm)	30 MHz	
	512 MHz	

- 3 Read/Measure the current draw.

Current Meter Full Scale Range -
To make measurements, set the current meter on a 200 mA full scale range, or equivalent. Currents are specified only to 0.1 mA resolution.

Receiver Test Mode (L4611A PRM-36 RTS is Transmitting)

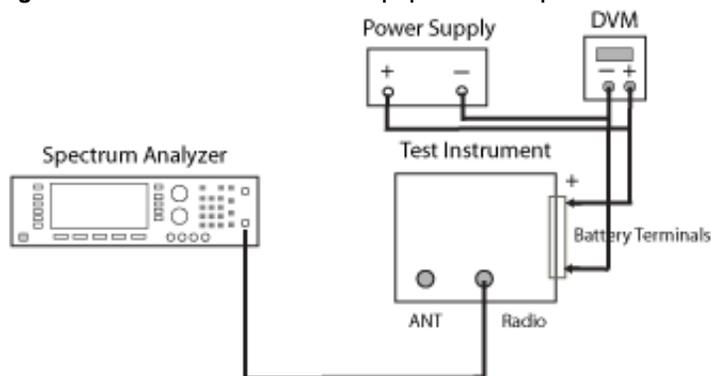
This performance test measures the power level of the comb signals being generated by the L4611A PRM-36 RTS.

The L4611A PRM-36 RTS performs a self test, a battery self test, and then automatically switches to Standby mode. Press/Hold the On/Off button to enter Receiver Test mode. While in Receiver Test mode, the Radio connector is used to output (transmit) a complex FM modulated signal from 30 MHz to 510 MHz (at 5 MHz intervals and -97 dBm of output power) that is modulated with both 150 Hz and 900 Hz audio tones; these audio tones are used to test the squelch and receiver circuits of the *Radio Under Test*.

While in Receiver Test mode, connect the supplied 50 ohm termination to the Antenna connector.

RF output carrier frequency	30 MHz to 512 MHz in 5 MHz intervals (simultaneous) with the exception of RF output carrier frequency 282.5 MHz
RF output carrier frequency (exception)	-60 dBm ± 3 dB at 282.5 MHz carrier (exception)
RF output level and accuracy	-97 dBm ± 3 dB, each carrier 30 MHz to 512 MHz in 5 MHz intervals

Figure 15 Receiver Test Mode Equipment Setup



NOTE

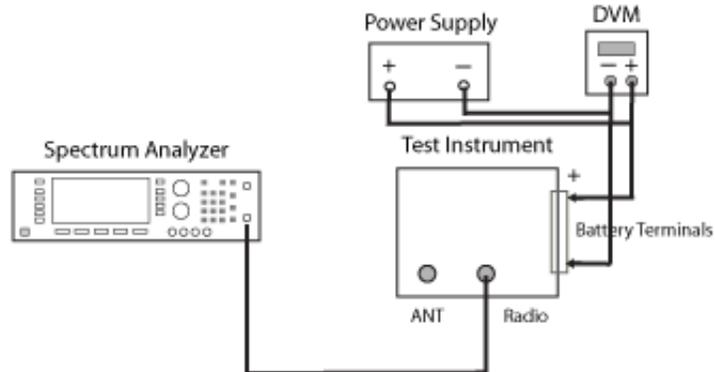
The L4611A PRM-36 RTS automatically powers off after 15 seconds of inactivity.

During this test, press/hold the On/Off button to keep the L4611A PRM-36 RTS powered on and transmitting.

Modulation Tones Accuracy

This performance test measures the Modulation Rate and FM Deviation of the 900 Hz and 150 Hz complex FM modulated audio tones that are produced during Receiver Test mode at various frequencies; these audio tones are used to test the squelch and receiver circuits of the *Radio Under Test*.

Figure 16 ModulationTones Accuracy Equipment Setup



NOTE

The L4611A PRM-36 RTS automatically powers off after 15 seconds of inactivity.

During this test, Press/Hold the On/Off button to keep the L4611A PRM-36 RTS powered on and transmitting.

- 1 Connect the equipment as shown in [Figure 16](#).
- 2 Connect the supplied 50 ohm termination to the Antenna connector.
- 3 Power on the L4611A PRM-36 RTS.
- 4 Set the spectrum analyzer as follows:
 - a Press Preset.
 - b From the Mode Setup menu, press Restore Mode Defaults.
 - c From the Amplitude menu, select More / Internal Preamp / Low Band / Attenuation 0 dB.
 - d Set the Amplitude Reference Level to -40 dBm.
 - e From the Mode menu, set to Analog Demod.
 - f From the Measure menu, press FM.
 - g From the Amplitude menu, set the Attenuator to 0 dB.
 - h From the Frequency menu, set the AF Stop Frequency to 1 kHz and the Center Frequency to 275 MHz.

NOTE

Use 275 MHz as the test center frequency unless the amplitude of the signal at 282.5 MHz is higher than the amplitude of the signal at 275 MHz. If the amplitude of the signal at 282.5 MHz is higher, use 282.5 MHz as the test center frequency.

Changing the test center frequency may be required because the modulation should be measured at a frequency which provides a good signal-to-noise ratio. The modulation on each of the multiples of 5 MHz is identical and also identical to the modulation on an output signal at 282.5 MHz. The amplitude of the signal at 282.5 MHz is not specified, but is typically several dB higher than the amplitude of the signals at multiples of 5 MHz.

- i Meas Setup / Filters / Low Pass Filter / 300 Hz / Bandpass Filter / Off.
 - j Sweep Control / Demod Wfm Sweeptime / 15 ms
- 5 Push and Hold the button on the L4611A PRM-36 RTS.
 - k Read the Modulation Rate and FM Deviation that is displayed on the spectrum analyzer for 150 Hz and enter these values below.
 - l Meas Setup / Filters / Low Pass Filter / Off / Bandpass Filter / CCITT.

- 6 Push and Hold the button on the L4611A PRM-36 RTS.
 - m Read the Modulation Rate and FM Deviation that is displayed on the spectrum analyzer for 900 Hz and enter these values below.

Frequency	Measured Value
275 MHz	
150 Hz Modulation Rate	
150 Hz FM Deviation (Pk-Pk)/2	
900 Hz Modulation Rate	
900 Hz FM Deviation (Pk-Pk)/2	
Peak Composite Deviation (This is the sum of the 150 Hz FM Deviation + 900 Hz FM Deviation above)	

Amplitude Accuracy of Comb Generator Output

The L4611A PRM-36 RTS generates a comb of signals at a level of $-97 \text{ dBm} \pm 3 \text{ dBm}$. This performance test measures the output of this comb of signals from 30 MHz to 512 MHz in 5 MHz steps to verify proper operation.

- 1 Connect the equipment as shown in [Figure 15](#), “Receiver Test Mode Equipment Setup,” on page 43.
- 2 Set the spectrum analyzer as follows:
 - a Press Preset.
 - b From the Mode Setup menu, press Restore Mode Defaults.
 - c From the Amplitude menu, set the Internal Preamp to Low Band and Attenuation to 0 dB.
 - d Set the Amplitude Reference to -40 dBm .
 - e Set the Frequency Span to 20 kHz.
 - f From the Mode menu, set Analog to Demod.
 - g From the Frequency menu, set the Center Frequency to measure the frequencies in the table below.
 - h Power on the L4611A PRM-36 RTS and read the Carrier Power that is displayed on the spectrum analyzer. Enter this value in the Measured Power column below.
 - i Repeat [step g](#) for each frequency measurement.

Frequency	Measured Power
30 MHz	
60 MHz	
85 MHz	
225 MHz	
275 MHz	
400 MHz	
510 MHz	

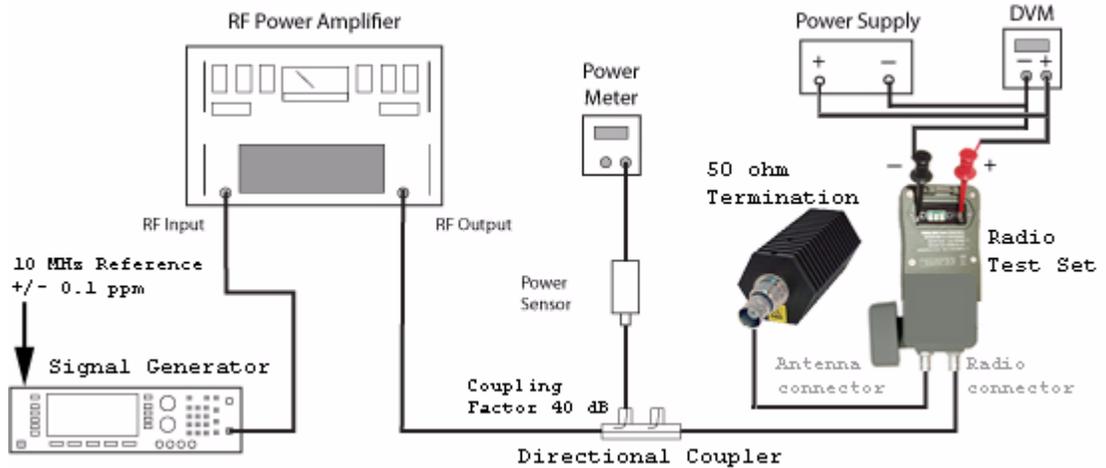
Transmitter Test Mode (L4611A PRM-36 RTS is Receiving)

This performance test verifies that the L4611A PRM-36 RTS is capable of measuring (receiving) the output of a radio.

While in Transmitter Test mode, the Radio connector is used to measure the radio output frequency and forward power, and the Antenna connector is used to measure reflected reverse power from a radio antenna.

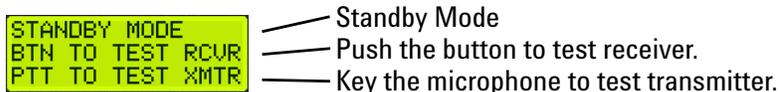
Frequency Displayed Resolution	1 kHz
RF Power <ul style="list-style-type: none"> • Power Measurement • Resolution • Accuracy 	<ul style="list-style-type: none"> • 1.0 W to 50 W • 0.1 W • $\pm 20\%$ of reading
Absolute Maximum Input Power	<ul style="list-style-type: none"> • 60 W into a 50 ohm load at 20% duty cycle, maximum 60 seconds on time • 60 W into any load at 5% duty cycle, maximum 10 seconds on time

Figure 17 Transmitter Test Setup



Frequency Accuracy Test

- 1 Connect the equipment as shown in [Figure 17](#).
- 2 Set the Agilent N5182A MXG signal generator and RF power amplifier to output the following selected frequencies (30 MHz, 60 MHz, 88 MHz, 225 MHz, 275 MHz, 400 MHz, and 512 MHz) at 2 Watts.
- 3 Use the power meter (connected via the coupler) to verify the signal generator output power.
- 4 Press the L4611A PRM-36 RTS's On/Off button momentarily and then release it. The L4611A PRM-36 RTS performs a self test, a battery test, and then enters Standby mode.



- 5 The L4611A PRM-36 RTS automatically switches to Transmitter Test Mode as soon as it detects the signal on the Radio connector that is coming from the signal generator.
- 6 For each signal generator frequency, enter the measured frequency of the L4611A PRM-36 RTS in the following table.

Signal Generator Frequency	Frequency Measured by the L4611A PRM-36 RTS
30 MHz	
60 MHz	
88 MHz	
225 MHz	
275 MHz	
400 MHz	
512 MHz	

Amplitude Accuracy Test (Forward Power)

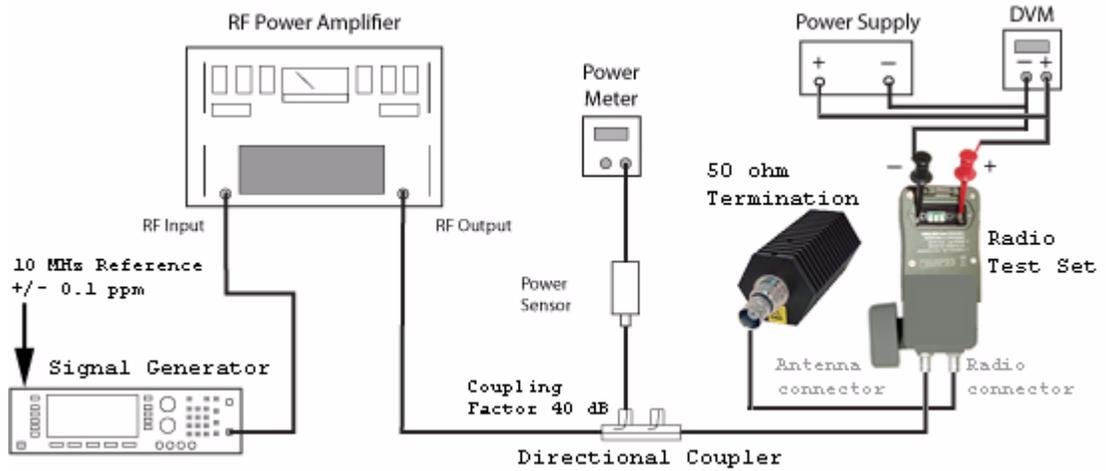
- 1 Set the Agilent N5182A MXG signal generator and RF power amplifier to 1, 3, 10, 30, and 50 Watts.
- 2 Use the power meter (connected via the coupler) to verify the signal generator output power.
- 3 For each power level and frequency, enter the measured amplitude of the L4611A PRM-36 RTS in the following two tables.

Receiver Power	Frequency	Measured Forward Power
1 Watt	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	
3 Watts	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	

Receiver Power	Frequency	Measured Forward Power
10 Watts	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	
30 Watts	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	
50 Watts	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	

Amplitude Accuracy Test (Reverse Power for 10 and 20 Watts)

Figure 18 Reverse Power Test Setup for 10 and 20 Watts



- 1 Connect the equipment as shown in [Figure 18](#).
- 2 Connect the signal generator output to the L4611A PRM-36 RTS Antenna connector.
- 3 Connect a 50 ohm load to the Radio connector.

NOTE

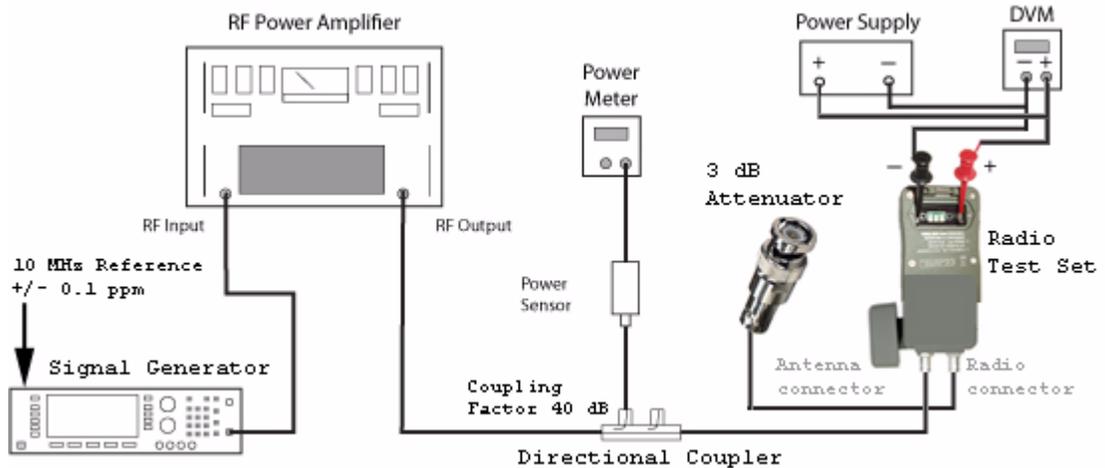
The 50 ohm load is being changed from the previous equipment configurations!

- 4 Set the Agilent N5182A MXG signal generator and RF power amplifier to 10 and 20 Watts.
- 5 Use the power meter (connected via the coupler) to verify the signal generator output power.
- 6 For each power level and frequency, enter the measured amplitude shown on the L4611A PRM-36 RTS.

Receiver Power	Frequency	Measured Reverse Power
10 Watts	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	
20 Watts	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	

Amplitude Accuracy Test (Reverse Power for 1 and 3 Watts)

Figure 19 Reverse Power Test Setup for 1 and 3 Watts



- 1 Connect the equipment as shown in [Figure 19](#).
- 2 Connect the signal generator output to the L4611A PRM-36 RTS Antenna connector.
- 3 Connect a 3 dB attenuator to the Radio connector.

NOTE

The 3 dB attenuator is being changed from the previous equipment configurations!

- 4 Set the Agilent N5182A MXG signal generator and RF power amplifier to 1 and 3 Watts.
- 5 Use the power meter (connected via the coupler) to verify the signal generator output power.
- 6 For each power level and frequency, enter the measured amplitude shown on the L4611A PRM-36 RTS.

NOTE

When testing the reverse power (RVS power) response of the L4611A PRM-36 RTS, there must be sufficient forward power (FWD power) to cause the L4611A PRM-36 RTS to switch to the Transmitter Test mode and to ensure an accurate frequency display.

Although rated frequency accuracy is not guaranteed in this setup for RVS power measurements, the displayed frequency should differ from the applied frequency by no more than 1 MHz. Typically the L4611A PRM-36 RTS will not “see” enough FWD power if the load is accurately 50 ohms and the applied RVS power is 1 Watt or 3 Watts. Therefore, for measurement at 1 Watt and 3 Watts in this mode, you should use a mismatched load that returns RF power toward the L4611A PRM-36 RTS’s RADIO connector. An ideal load is a 3 dB power attenuator whose output port is left unterminated, as shown in [Figure 19](#).

Receiver Power	Frequency	Measured Reverse Power
1 Watt	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	
3 Watts	30 MHz	
	60 MHz	
	88 MHz	
	225 MHz	
	275 MHz	
	400 MHz	
	512 MHz	

Agilent Sales and Service Offices

Contacting Agilent Sales and Service Offices

Assistance with test and measurement needs, and information on finding a local Agilent office are available on the Internet at:

<http://www.agilent.com/find/contactus>

You can also purchase L4611A PRM-36 RTS accessories or documentation items on the Internet at: <http://www.agilent.com/find/L4611A>

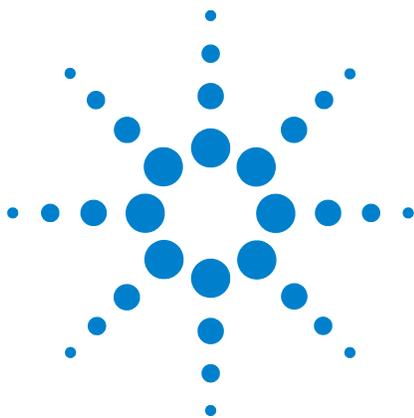
If you do not have access to the Internet, contact your local Agilent Technologies sales office.

Returning an L4611A PRM-36 RTS to Agilent Technologies

To return your instrument to Agilent Technologies for servicing, follow these steps:

- 1 Gather as much information as possible regarding the instrument's problem.
- 2 Call the phone number listed on the Internet (<http://www.agilent.com/find/contactus>) that is specific to your geographic location. If you do not have access to the Internet, contact your local Agilent Technologies sales office.
- 3 After sharing information regarding the instrument and its condition, you will receive information regarding where to ship it for repair.
- 4 Ship the L4611A PRM-36 RTS in the original factory packaging materials, if available, or use similar packaging to properly protect the L4611A PRM-36 RTS.

In any correspondence or telephone conversation, refer to the Agilent Technologies L4611A PRM-36 Radio Test Set by its model number and full serial number. With this information, the Agilent representative can determine whether your unit is still within its warranty period.



3 Specifications

Specification Definitions

Agilent Technologies warrants that the following specifications will be met under the following instrument operating conditions.

Specifications describe the performance of parameters covered by the product warranty $-20\text{ }^{\circ}\text{C}$ (-4 degrees F) to $+55\text{ }^{\circ}\text{C}$ ($+131$ degrees F), unless otherwise noted.

Typical indicates performance within specification that 80% of the units exhibit with an 80% confidence level over the temperature range of 20 to $30\text{ }^{\circ}\text{C}$. Typical specifications are not covered by product warranty.



General Specifications

RF connectors	2 BNC connectors, Antenna and Radio, 50 Ω impedance
Frequency range	30 MHz to 512 MHz
Frequency accuracy	± 2 kHz
Battery current draw <ul style="list-style-type: none"> Off With Backlight Brightness mode set to Off: <ul style="list-style-type: none"> Standby mode Receiver Test mode Transmitter Test mode In Standby mode with Backlight Brightness mode set to: <ul style="list-style-type: none"> Dim Normal Semi-bright Bright 	<p>All values are measured at 5.5 V at the battery holder terminals</p> <ul style="list-style-type: none"> 0.05 μA, Typical (< 1.0 μA Max after 1 minute) < 4.4 mA, Typical < 11.0 mA, Typical < 8.6 mA, Typical Add 0.7 mA Add 1.6 mA Add 2.4 mA Add 7.5 mA
Low battery indications <ul style="list-style-type: none"> "Replace Soon" "Replace Now" (inoperable) 	<p>All values are Typical</p> <ul style="list-style-type: none"> 4.6 VDC to 4.7 VDC < 4.6 VDC
Battery type	6 VDC, BA-5372/U (user replaceable)
Environment <ul style="list-style-type: none"> Operating temperature Operating humidity Storage temperature Maximum altitude 	<ul style="list-style-type: none"> -20 $^{\circ}$C (-4 $^{\circ}$F) to +55 $^{\circ}$C (+131 $^{\circ}$F) 95% RH at 40 $^{\circ}$C (104 $^{\circ}$F) maximum -30 $^{\circ}$C (-22 $^{\circ}$F) to +70 $^{\circ}$C (158 $^{\circ}$F) 12 km (40,000 ft)
Warm-up time	< 1 second
Regulatory approval	Refer to the L4611A PRM-36 RTS Declaration of Conformity (see web page: regultions.corporate.agilent.com)
Suggested calibration interval	The L4611A PRM-36 RTS is designed to meet published specifications for five years.
Expected life	10 years

Receiver Test Mode: L4611A PRM-36 RTS Source Specifications

RF output carrier frequency	30 MHz to 512 MHz in 5 MHz intervals (simultaneous)
RF output level and accuracy	-97 dBm \pm 3 dBm, each carrier
RF modulation <ul style="list-style-type: none"> • FM composite signal • Tone frequency accuracy • FM deviation 	<ul style="list-style-type: none"> • 150 Hz + 900 Hz dual tones • \pm2 Hz • 1.75 kHz peak \leq deviation \leq 3.5 kHz peak, or equivalent (1.75 kHz peak is the minimum and 3.5 kHz peak is the maximum)

Transmitter Test Mode: L4611A PRM-36 RTS Receiver Specifications

Frequency Displayed Resolution	1 kHz
RF Modulation <ul style="list-style-type: none"> • Power Measurement • Resolution • Accuracy 	<ul style="list-style-type: none"> • 1.0 W to 50 W • 0.1 W • \pm20% of reading
Absolute Maximum Input Power	<ul style="list-style-type: none"> • 60 W into a 50 ohm load at 20% duty cycle, maximum 60 seconds on time • 60 W into any load at 5% duty cycle, maximum 10 seconds on time

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