Agilent E4915A/E4916A Crystal Impedance / LCR Meter
Service Manual

SERIAL NUMBERS

This manual applies directly to instruments with serial number prefix
"JP1KD" and above, and whose firmware is version 1.0 and above.

Agilent Technologies

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Manual Printing History

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates that are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

February 1997 .... Preliminary (part number: E4915-90100)

July 1998 .... First Edition (part number: E4915-90110)

June 2000 .... Second Edition (part number: E4915-90110)

Aug 2000 .... Third Edition (part number: E4915-90120)

Typeface Conventions

Bold	Boldface type is used when a term is defined. For example: **icons** are symbols.
Italics	Italic type is used for emphasis and for titles of manuals and other publications.
	Italic type is also used for keyboard entries when a name or a variable must be typed in place of the words in italics. For example: `copy` *filename* means to type the word `copy`, to type a space, and then to type the name of a file such as `file1`.
`Computer`	Computer font is used for on-screen prompts and messages.
(HARDKEYS)	Labeled keys on the instrument front panel are enclosed in ◯.
SOFTKEYS	Softkeys located to the right of the LCD display or keys on the computer display are enclosed in .

Contents

Figures

Tables

1

General Information

Introduction

This manual contains technical information concerning the adjustment, performance test, and servicing of the E4915A/E4916A Crystal Impedance / LCR Meter.

Organization of Service Manual

- *Adjustments and Performance Tests* provides instructions for adjustments and performance tests of the instrument after repair or replacement of an assembly.

- *Replaceable Parts* provides part numbers and illustrations of the replaceable assemblies and miscellaneous chassis parts, together with ordering information.

- *Replacement Procedure* provides procedures to disassemble portions of the instrument when certain assemblies are to be replaced.

- *Board Configuration* provides information on the jumper or bit switch settings of board assembly.

- *Post Repair Procedures* contains a table of adjustments/performance tests and other verification procedures to be performed after repair or replacement of each assembly.

- *Appendices* contains performance test record and messages.

Instruments Covered by Manual

Agilent Technologies uses a two-part, ten character serial number which is stamped on the serial number plate (see Figure 1-1) attached to the rear panel. The first five letters are the serial prefix and the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a change is made to the hardware of the E4915A/E4916A. The suffix, however, is assigned sequentially and is unique to each instrument. The contents of this manual apply to instruments with the serial number prefixes listed under Serial Numbers on the title page.

Figure 1-1. Serial Number Plate

An instrument manufactured after the printing date of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates that the instrument is different from those described in this manual. The manual for a new instrument may be accompanied by a yellow *MANUAL CHANGES* supplement or have a different manual part number. The *MANUAL CHANGES* supplement contains "change information" that explains how to adapt the manual to newer instruments.

In additions to change information, the supplement may contain information for correcting errors (Errata) in the manual. To keep this manual as current and accurate as possible, Agilent Technologies recommends that you periodically request the latest *MANUAL CHANGES* supplement. The supplement for this manual is identified by this manual's printing data and its supplement are available from Agilent Technologies. If the serial prefix or number of an instrument is lower than that on the title page of this manual, see Appendix C, Manual Changes.

For information concerning serial number prefixes not listed on the title page or in the *MANUAL CHANGE* supplement, contact the nearest Agilent Technologies office.

Table of Service Test Equipment

The first part of Table 1-1 lists all of the equipment required to verify, adjust, and troubleshoot the E4915A/E4916A and perform the operator's check. The table also notes the use and critical specifications of each item, and the recommended models.

Note	*Adjustments and Performance Tests can be done only at Agilent Technologies service centers. For details, contact to Agilent Technologies Kobe Instrument Division.*

In addition to test equipment listed in Table 1-1, the following tools are also required:

■ Pozidriv screwdrivers, pt size #2 (medium)
■ Pozidriv screwdrivers, pt size #1 (small)
■ Open end wrench, 7/32 inch
■ Hex socket, 7/32 inch
■ Flat edge screwdriver
■ Hex key, 0.063 inch across flats

Table 1-1. Recommended Test Equipment

Equipment	Critical Specifications	Recommended Model	Qty	Use[1]
Personal Computer	Windows NT($\geq$3.51) or Windows 95		1	P, A
Software	HP VEE ($\geq$4.0)		1	P, A
GPIB Card	No substitute	82350/82340 /82341	1	P, A
Frequency Counter	Frequency: 1 MHz to 180 MHz Accuracy: < 0.25 ppm	5334B Opt.010	1	P, A
Power Meter	No substitute	436A Opt.022, 437B, or 438A	1	P, A
Power Sensor	Frequency: 1 MHz to 180 MHz Power: +5 dBm to -20 dBm	8482A	1	P, A
PI Network Test Fixture	No substiture	41900A	1	A
Impedance Probe Kit (for Opt.001)	No substitute	E4916A Opt.001	1	A
Termination	50 Ω Termination BNC type	11593A	4	P, A
Program	Adjustments/Performance Test Program (3.5 inch)		1	P, A
Attenuator Pad	20 dB, Impedance 50 Ω, N(m)-N(f)	8491A Opt.020	1	P, A
Cables	50 Ω N(m)-N(m), 61 cm	11500B	1	P, A
	50 Ω BNC(m)-BNC(m), 30 cm	Agilent P/N 8120-1838	3	P, A
	GPIB Cable	10833A/B/C	3	P, A
	50 Ω, N(m)-BNC(f)	Agilent P/N 1250-1476	3	P, A
	50 Ω, N(f)-BNC(m)	Agilent P/N 1250-1477	4	P, A
Power Splitter	Freq. Range: < 180 MHz, Two-way	11667A	1	P, A

1 P: Performance Tests, A: Adjustments, T: Troubleshooting

2

Adjustments and Performance Tests

Introduction

This section describes the Adjustments and Performance Tests required for the E4915A/E4916A Crystal Impedance / LCR Meter to operate within its specifications. These adjustments and performance tests should be performed along with periodic maintenance to keep the E4915A/E4916A in optimum operating condition. The recommended calibration period is 12 months.

Note	■ *Adjustments and Performance Tests can be done only at Agilent Technologies service centers. For details, contact to Agilent Technologies Kobe Instrument Division.*
	■ To ensure proper results and correct instrument operation, Agilent Technologies suggests a 30 minute warm-up and stabilization period before performing any of the following Adjustments/Performance Tests.

Safety Considerations

This manual contains NOTEs, CAUTIONs, and WARNINGs which must be followed to ensure the safety of the operator and to keep the instrument in a safe and serviceable condition. The adjustments and performance tests must be performed by qualified service personnel.

Warning	Any interruption of the protective ground conductor (inside or outside the instrument) or disconnection of the protective ground terminal can make the instrument dangerous. Intentional interruption of the protective ground system for any reason is prohibited.

The removal or opening of covers, or removal of parts other than those which are accessible by hand will expose circuits containing dangerous voltage levels.

Remember that the capacitors in the E4915A/E4916A can remain charged for several minutes even though the E4915A/E4916A is off and unplugged.

Required Controller

Performing adjustments requires the following controller:

Windows PC (Personal Computer)

OS   Microsoft® Windows NT® ($\geq$3.51) or Windows 95®

Software   HP VEE ($\geq$4.0)

GPIB Card   82350, 82340, or 82341

Software Requirements

The adjustments/performance tests require the E4915A/E4916A Adjustment/Performance Test Program. Contact to Agilent Technologies Kobe Instrument Division to get the latest adjustment program.

Required Test Equipment

Required equipment for performing the adjustments and performance tests is listed in Table 2-1. Use only calibrated test equipment when performing the adjustments and performance tests for the E4915A/E4916A.

Table 2-1.
Required Test Equipment for Adjustment and Performance Tests

Equipment	Critical Specifications	Model	Qty
Power Meter	No substitute	436A, 437B, or 438A	1
Power Sensor	Frequency: 1 MHz to 180 MHz Power: +5 dBm to −20 dBm	8482A	1
Frequency Counter	Frequency: 1 MHz to 180 MHz Accuracy: < 0.25 ppm	5334B Opt.010	1
PI Network Test Fixture	No substiture	41900A	1
Impedance Probe Kit (for Opt.001)	No substitute	E4916A Opt.001	1

Order of Adjustments and Performance Tests

Perform the operations in order of the page numbers.

Note   To perform adjustments and performance tests, it is **not** necessary to remove the outer cover.

Performing Adjustments and Performance Tests

The adjustments and performance tests are as follows:

1. Pre-check and Source Linearity Calibration (PRE_CHECK)
2. Oscillator Calibration (OSC_CAL)
3. Source Level Accuracy and Source Power Linearity Test (OSC_TEST)[1]
4. Frequency Accuracy Test (FREQ_ACCY)[1]
5. Through Calibration (THRU_CAL)
6. Receiver Test (RECEIVER)
7. Isolation Test (ISOLATION)
8. Open Calibration with PI Test Fixture (OPEN_CAL)
9. Short Calibration with PI Test Fixture (SHORT_CAL)
10. Load Calibration with PI Test Fixture (LOAD_CAL)
11. Load Test with PI Test Fixture (LOAD_TEST)
12. Open Calibration with Impedance Probe (OPEN_CAL_001)[2]
13. Short Calibration with Impedance Probe (SHORT_CAL_001)[2]
14. Load Calibration with Impedance Probe (LOAD_CAL_001)[2]
15. Load Test with Impedance Probe (LOAD_TEST_001)[2]

1 Performance Tests. 2 E4916A with Option 001 only.

Setting Up the System

Performing adjustments and performance tests requires the system described in this section.

The hardware setup is shown in Figure 2-1.

Windows NT PERSONAL COMPUTER

POWER METER

HP-IB Cables

HP E4915A/E4916A

FREQUENCY COUNTER
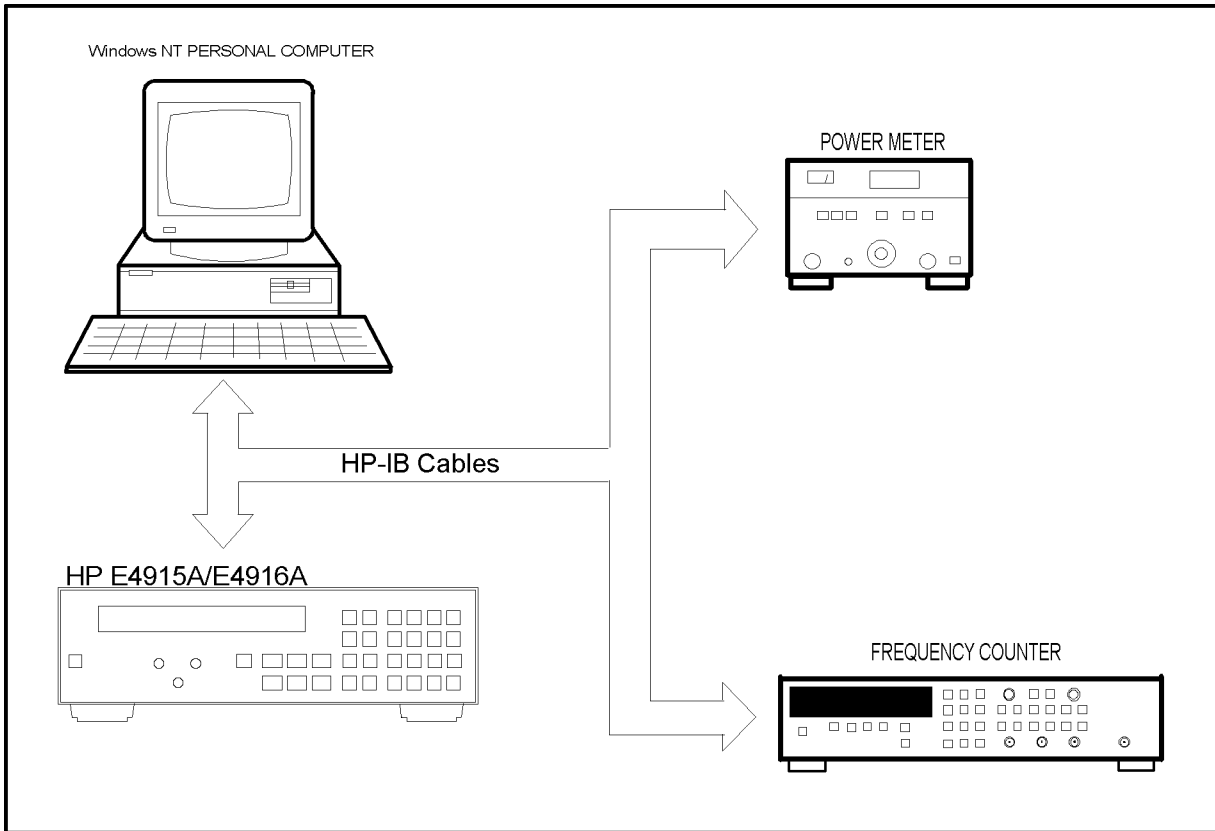
C7S03008

Figure 2-1. Hardware Setup for Adjustments/Performance Tests

Preparation for Using the Adjustment/Performance Test Program

To use the E4915A/E4916A adjustment/performance test program, it is first necessary to install an GPIB Card. This section describes how to install it.

Installing an GPIB Card (82340 or 82341)

Install an GPIB Card in your computer (see the GPIB Card manual). The select code of the GPIB Card should be set to "7". The GPIB Card should be the 82340 or the 82341A. Other GPIB Cards can not be used in the Windors NT environment.

Installing HP VEE for Windows NT

Install the HP VEE for Windows NT in your computer (see the HP VEE for Windows NT manual).

After installing HP VEE for Windows NT, run the *I/O Config* utility in the *HP VEE for Windows NT* group to check that the GPIB Interface Board is correctly installed.

Note	The GPIB card may not work properly if the default IRQ (Interrupt Request) value for the GPIB card is used for other device in your PC. Changing the IRQ value for the GPIB card may solve this problem:
	1. Run the *I/O Config* utility.
	2. Select `gpib7 GPIB0` in the `Configured Interfaces` box and click `Edit ...`.
	3. Change the value in the `IRQ Line:` and click `OK`.
	4. Click `OK` to exit the utility.
	The new IRQ value should be carefully selected in order not to affect other devices in your PC.

Installing Adjustment/Performance Test Program into Your PC

1. Make a copy of the program file "E4915_16.EXE" in a directory of your harddisk drive.

2. Double-click the filename on the Windows' Filemanager to start extracting the self-extracting archive.

3. You will be prompted to enter directory name for installing the program files. Click [OK] to use default home directory (`C:\E4915_16`).

4. Confirm that you get several new directories and files under the designated directory.

Getting Started

1. Start the HP VEE on your PC.

2. Load the adjustment program file into the HP VEE as follows:

   a. Pull down the `File` menu from the `HP VEE` window and select `Open`.

   b. Select the file `C:\E4915_16\ADJUST.VEE`.

   c. Click `OK`.

Note

👉

You may be asked GPIB addresses of the test equipment during the program loading. Enter the address for each equipment. Enter `0` as the address for the equipment which are not used for the adjustments/performance tests. The GPIB address for each test equipment can be changed in the adjustment/performance test program.

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3. Click `Start` button on the Adjustment/Performance Test Program screen.

4. In the "Setup" window, modify the settings if required.

5. Click `OK`.

6. Modify the calibration factor of the HP 8482A in the window.

7. Click `OK`.

8. Select the model number and click `OK`.

9. Enter the serial number of the E4915A/E4916A exactly. For example,

   JP1KD00123

10. Mark installed options of the E4915A/E4916A. The installed options can be confirmed on the rear pannel of the E4915A/E4916A, or when you turn the E4915A/E4916A ON, you can see the installed options before the E4915A/E4916A starts measurement.

Note

👉

The installation status of the E4916A Option 001 Add Impedance Probe cannot be confirmed on the rear pannel or the power-on message. You have to ask the user if the Impedance Probe is used with the E4916A.

---

11. Click `OK`.

```
                    List Box
  INSTALL_FW
  WRITE_ID
  PRE_CHECK
  OSC_CAL
  OSC_TEST
  FREQ_ACCY
  THRU_CAL
  RECEIVER
  ISOLATION
  OPEN_CAL
  SHORT_CAL
  LOAD_CAL
  LOAD_TEST
  OPEN_CAL_001
  SHORT_CAL_001
  LOAD_CAL_001
  LOAD_TEST_001

      OK        Cancel    Select All   Clear All
```
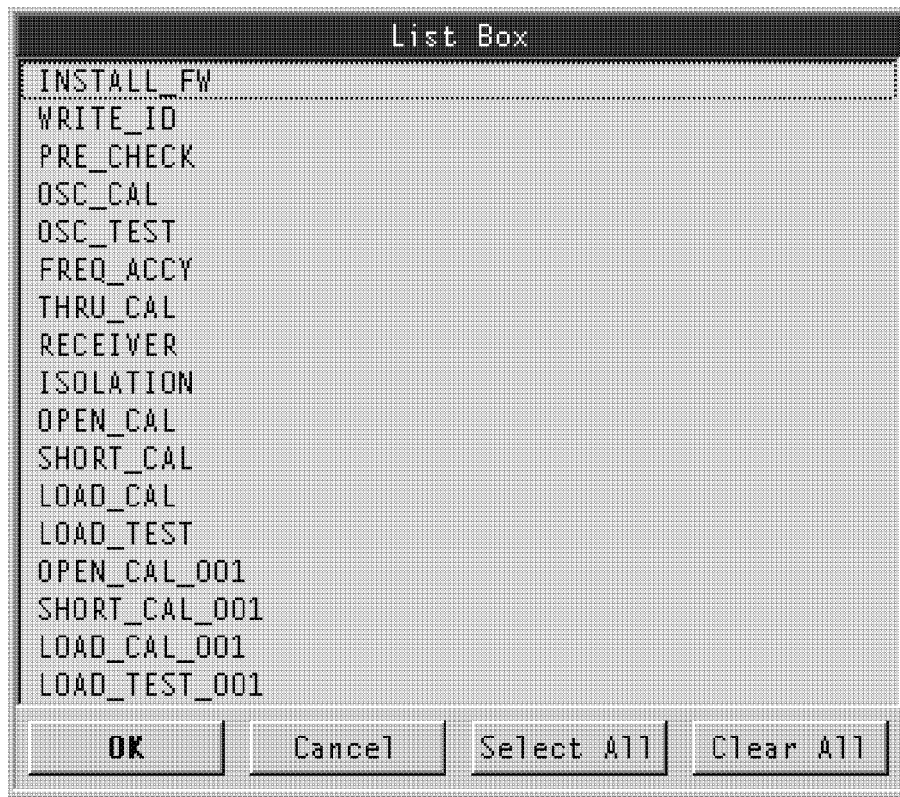
Figure 2-2. List Box

Note

"INSTALL_FW" is used to install new firmware into the E4915A/E4916A.
"WRITE_ID" is used to write required identification data into the internal
memory of the E4915A/E4916A. See *Post Repair Procedure* for details. **Those
procedures are not needed to perform for periodic calibration.**

Note

Performance Test Data is saved as follows:

Directory   C:\E4915_16\DATA_15A
                   C:\E4915_16\DATA_16A
Filename   SNxxxxx

("xxxxx" shows the last 5 digits of the serial number)

1. Pre-check and Source Linearity Calibration (PRE_CHECK)

Note   *Once this calibration is performed, all of the calibration data stored in the E4915A/E4916A will be lost. You must perform the whole adjustments and performance tests to obtain the complete calibration data.*

Required Equipment

Attenuator Pad 20dB	8491A Opt.020
N(f)-BNC(m) Adapter	PN 1250-1477
N(m)-BNC(f) Adapter	PN 1250-1476,
	E4915A: 1ea, E4916A: 4ea
BNC(m)-BNC(m) Cable, 30 cm	PN 8120-1838,
	E4915A: 1ea, E4916A: 3ea
Power Splitter	11667A (E4916A)

Procedure

1. Connect the equipment as shown in Figure 2-3.
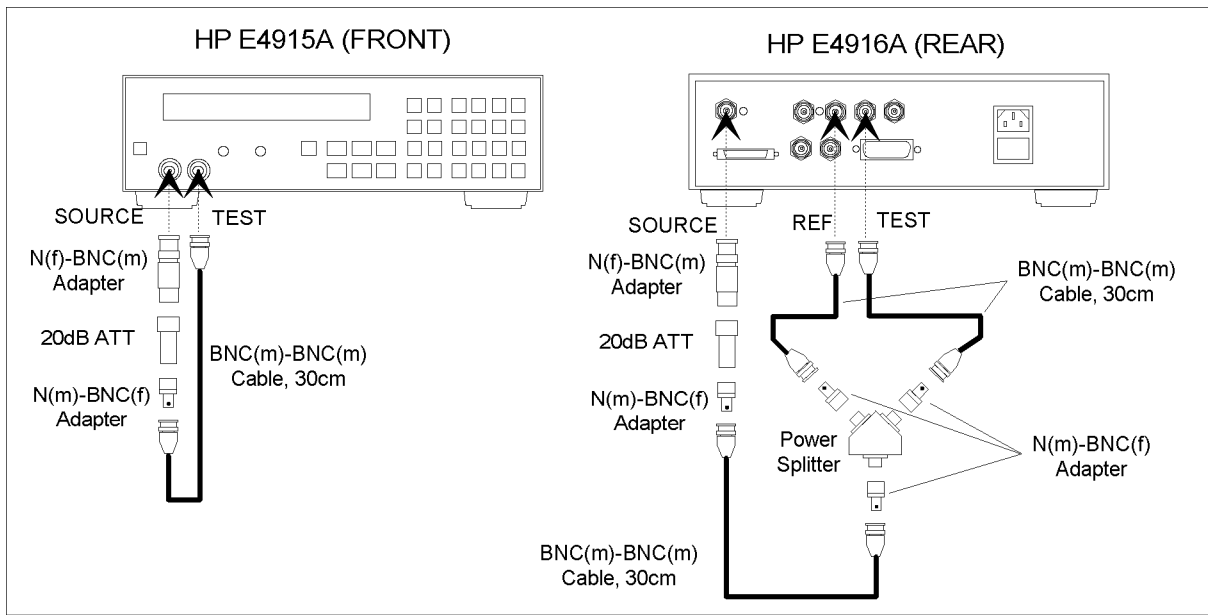
LES02003

Figure 2-3. Pre-check and Source Linearity Calibration Setup

2. Select "PRE_CHECK" and click OK in the list box of the program display.

3. Following the program instructions, complete this procedure.

2. Oscillator Calibration (OSC_CAL)

Required Equipment

Power Meter   436A, 437B, or 438A
Power Sensor   8482A
N(f)-BNC(m) Adapter   PN 1250-1477

Procedure

1. Connect the equipment as shown in Figure 2-4.
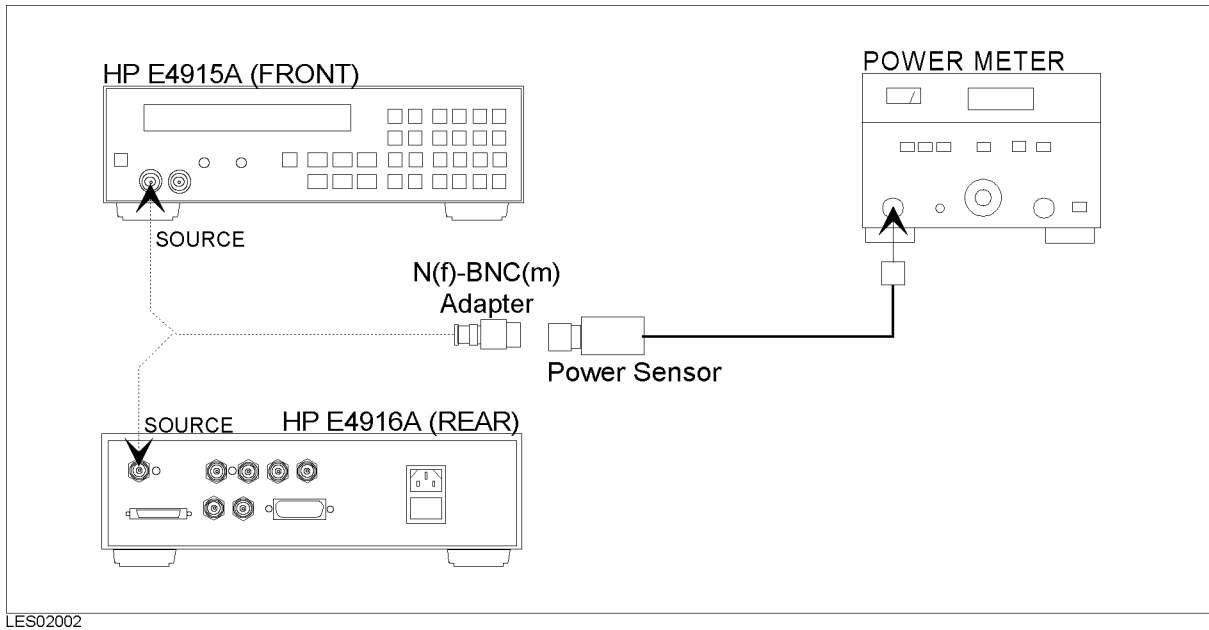
Figure 2-4. Oscillator Calibration Setup

2. Select "OSC_CAL" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

3. Source Level Accuracy and Source Power Linearity Test (OSC_TEST)

Note	■ E4915A does not require performing the Source Power Linearity Test. The program will skip the Source Power Linearity Test for the E4915A.
	■ Source Level Accuracy and Source Power Linearity Test are performance tests. The test data of those tests are saved in the `C:\E4915_16\DATA_15A\SNxxxxx` or `C:\E4915_16\DATA_16A\SNxxxx` file.

Specification

Level Accuracy:	±2 dB (10 MHz or 50 MHz, −5 dBm output level)
	±3 dB (1 MHz to 180 MHz, −5 dBm output level)
Power Lineality	±2 dB (relative to −5 dBm output level at 10 MHz)

Required Equipment

Power Meter	436A, 437B, or 438A
Power Sensor	8482A
N(f)-BNC(m) Adapter	PN 1250-1477

Procedure

1. Connect the test equipment as shown in Figure 2-5.

LES02002
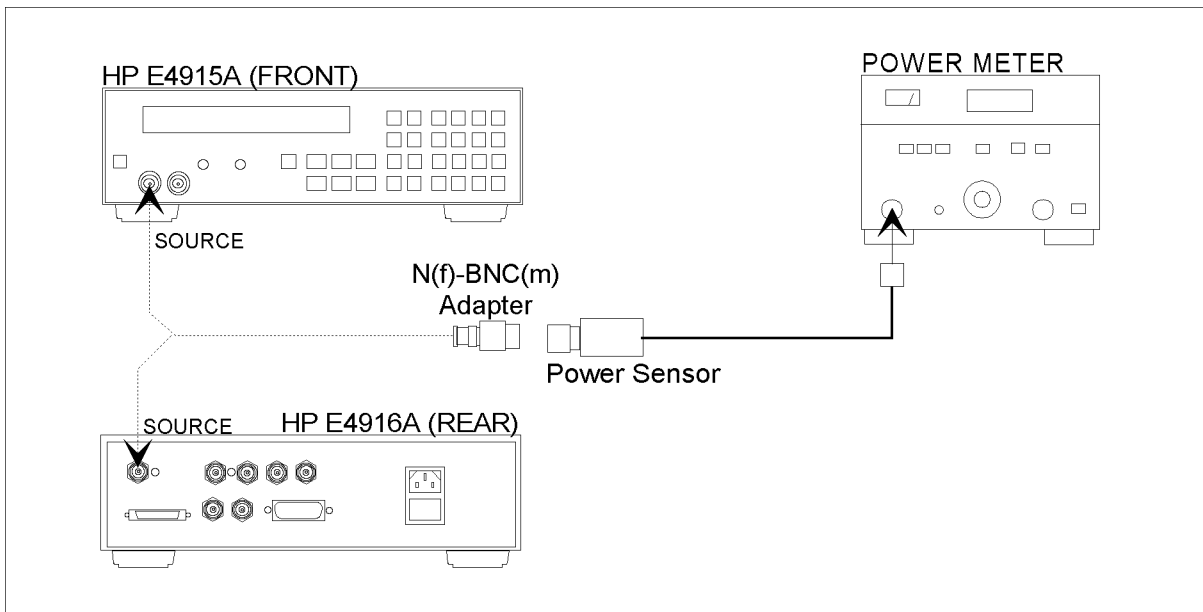
Figure 2-5. Source Level Accuracy and Source Power Linearity Test Setup

2. Select "OSC_TEST" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

4. Frequency Accuracy Test (FREQ_ACCY)

Note

Frequency Accuracy Test is a performance test. The test data of the Frequency Accuracy Test is saved in the `C:\E4915_16\DATA_15A\SNxxxxx` or `C:\E4915_16\DATA_16A\SNxxxx` file.

Specification

Frequency Accuracy: ±20 ppm at 23±5 °C

Required Equipment

Frequency Counter   5334B Opt.010
BNC(m)-BNC(m) Cable, 61 cm   PN 8120-1839

Procedure

1. Connect the equipment as shown in Figure 2-6.

LES02001
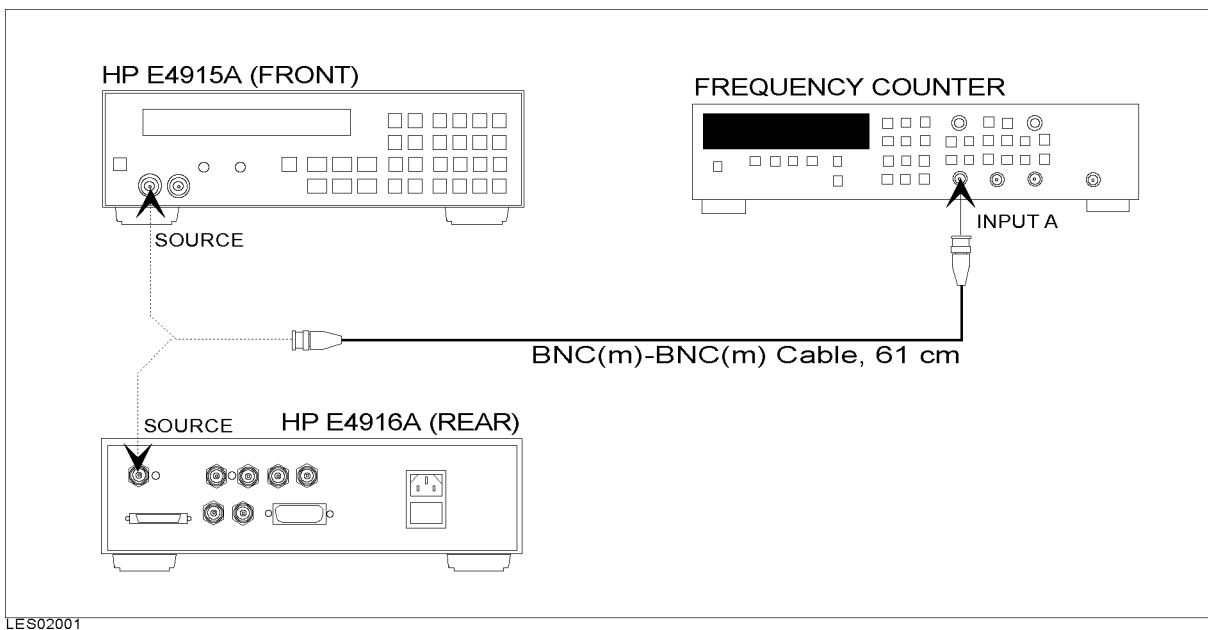
Figure 2-6. Frequency Accuracy Test Setup

2. Select "FREQ_ACCY" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

5. Through Calibration (THRU_CAL)

Required Equipment

Attenuator Pad 20dB   8491A Opt.020
N(f)-BNC(m) Adapter   PN 1250-1477
N(m)-BNC(f) Adapter   PN 1250-1476,
                                   E4915A: 1ea, E4916A: 4ea
BNC(m)-BNC(m) Cable, 30 cm   PN 8120-1838,
                                   E4915A: 1ea, E4916A: 3ea
Power Splitter   11667A (E4916A)

Procedure

1. Connect the equipment as shown in Figure 2-7.
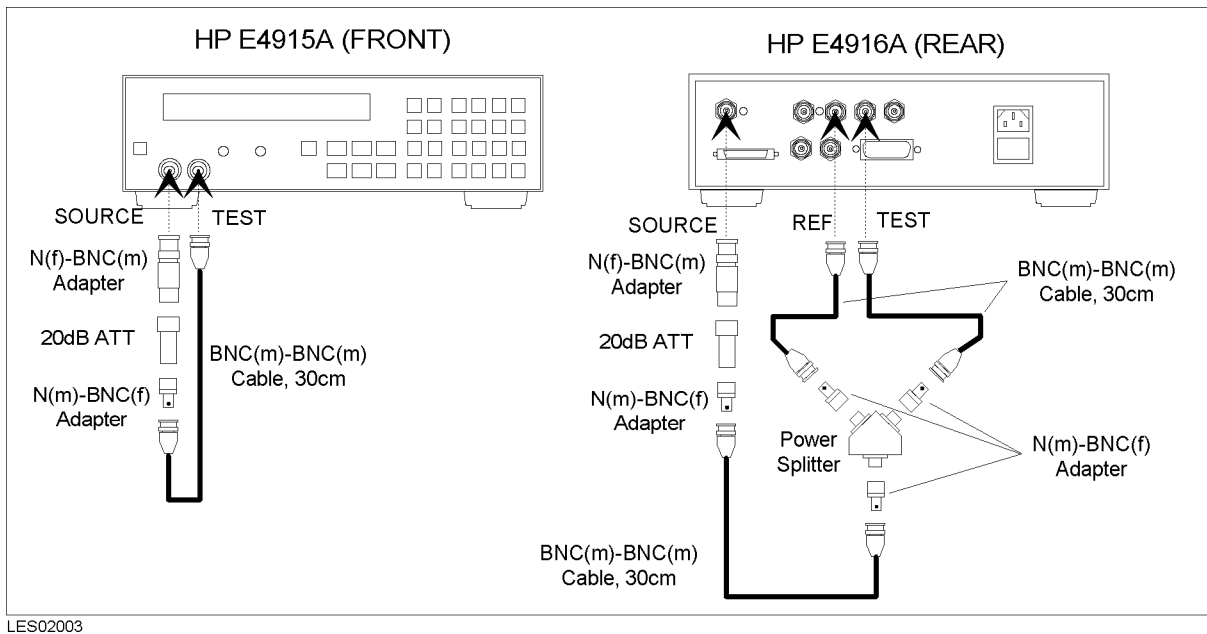
Figure 2-7. Through Calibration Setup

LES02003

2. Select "THRU_CAL" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

6. Receiver Test (RECEIVER)

Note

Receiver Test is a function test. The test result (Pass or Fail) should be transcribed to the Function Test Record.

Required Equipment

Attenuator Pad 20dB	8491A Opt.020
N(f)-BNC(m) Adapter	PN 1250-1477
N(m)-BNC(f) Adapter	PN 1250-1476,
	E4915A: 1ea, E4916A: 4ea
BNC(m)-BNC(m) Cable, 30 cm	PN 8120-1838,
	E4915A: 1ea, E4916A: 3ea
Power Splitter	11667A (E4916A)

Procedure

1. Connect the equipment as shown in Figure 2-8.

LES02003
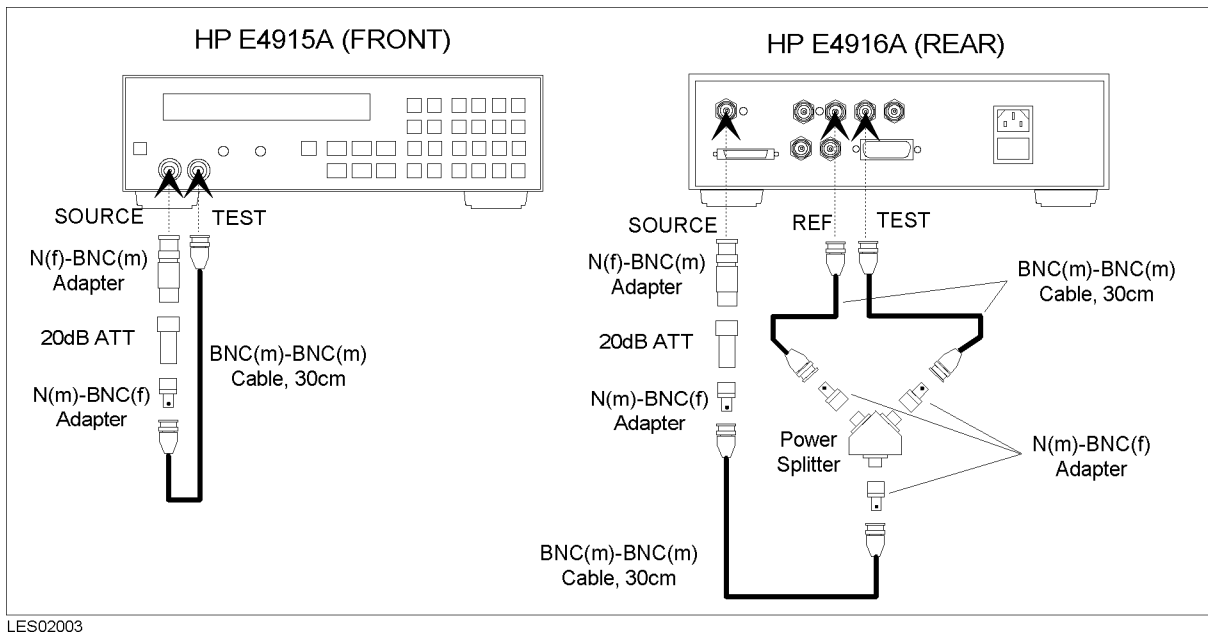
Figure 2-8. Receiver Test Setup

2. Select "RECEIVER" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

7. Isolation Test (ISOLATION)

Required Equipment

50 Ω Termination BNC Type   11593A,
                                                     E4915A: 2ea, E4916A: 4ea

Procedure

1. Connect the equipment as shown in Figure 2-9.

LES02004
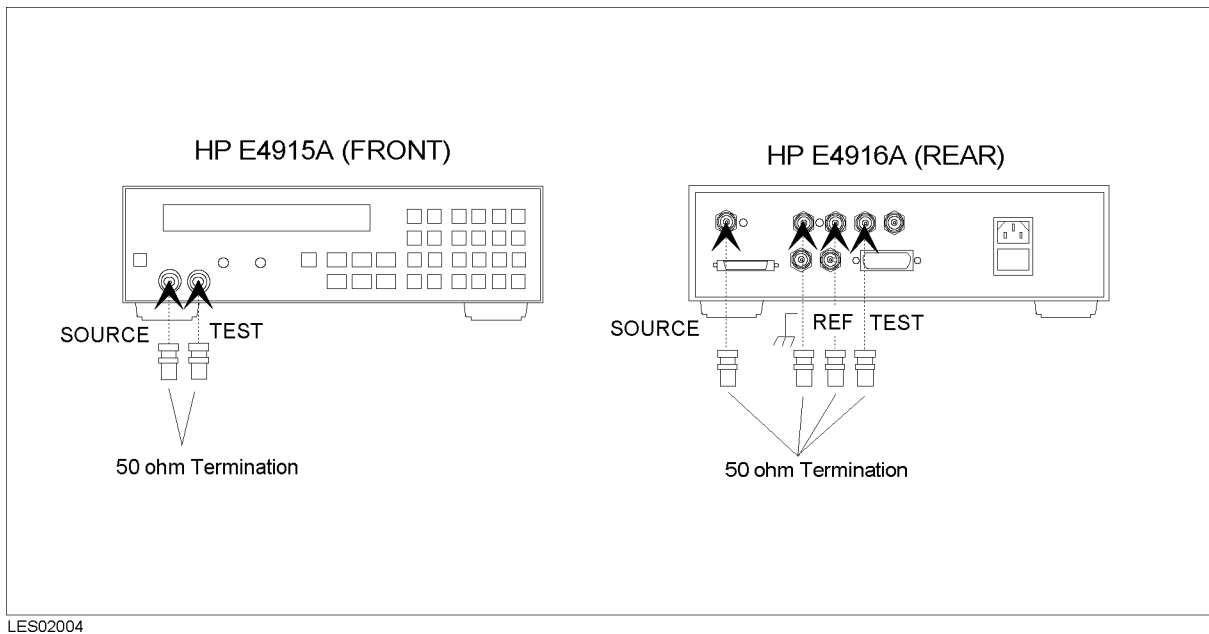
Figure 2-9. Isolation Test Setup

2. Select "ISOLATION" and click `OK` in the list box of the program display.

3. Following the program instructions, complete the procedure.

8. Open Calibration with PI Test Fixture (OPEN_CAL)

Required Equipment

PI-Network Test Fixture   41900A
BNC(m)-BNC(m) Cable, 30 cm   PN 8120-1838, 2 ea

Procedure

1. Connect the equipment as shown in Figure 2-10.

LES02005
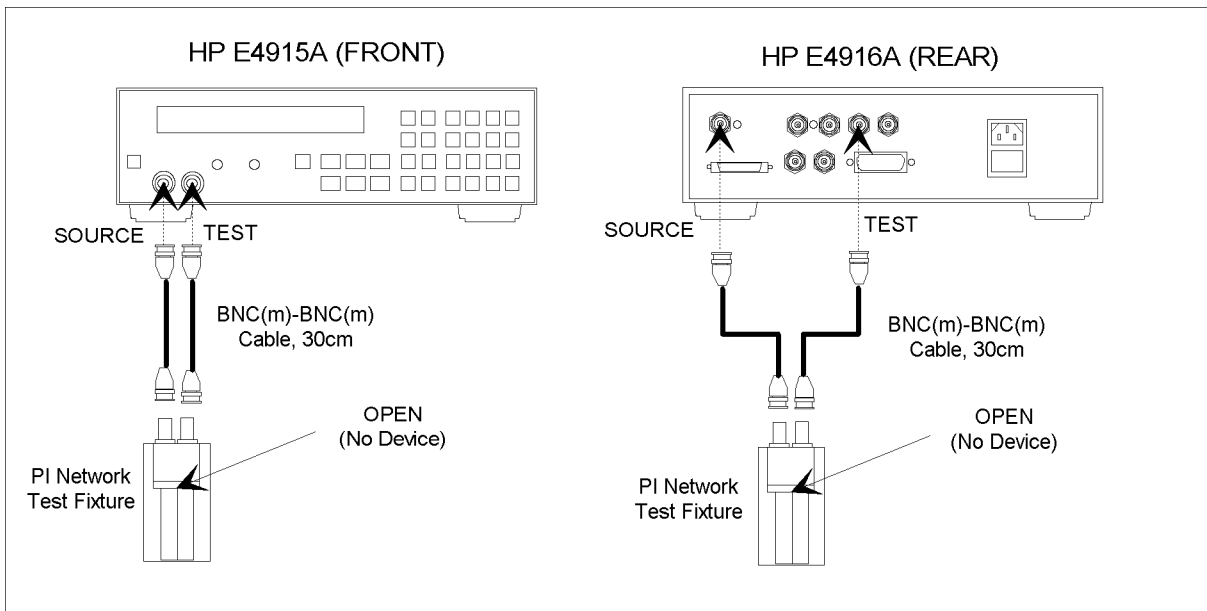
Figure 2-10. Setup for Open Calibration with PI-Network Test Fixture

2. Select "OPEN_CAL" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

9. Short Calibration with PI Test Fixture (SHORT_CAL)

Required Equipment

PI-Network Test Fixture   41900A
BNC(m)-BNC(m) Cable, 30 cm   PN 8120-1838, 2 ea

Procedure

1. Connect the equipment as shown in Figure 2-11.

LES02006
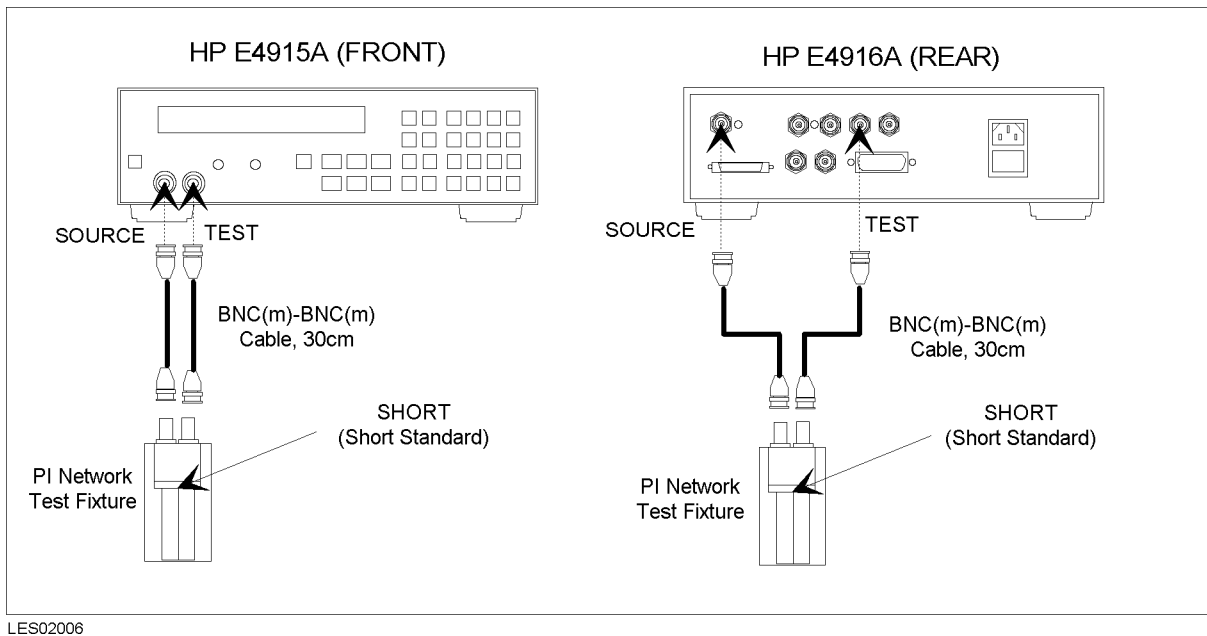
Figure 2-11. Setup for Short Calibration with PI Test Fixture

2. Select "SHORT_CAL" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

10. Load Calibration with PI Test Fixture (LOAD_CAL)

Required Equipment

PI-Network Test Fixture   41900A
BNC(m)-BNC(m) Cable, 30 cm   PN 8120-1838, 2 ea

Procedure

1. Connect the equipment as shown in Figure 2-12.
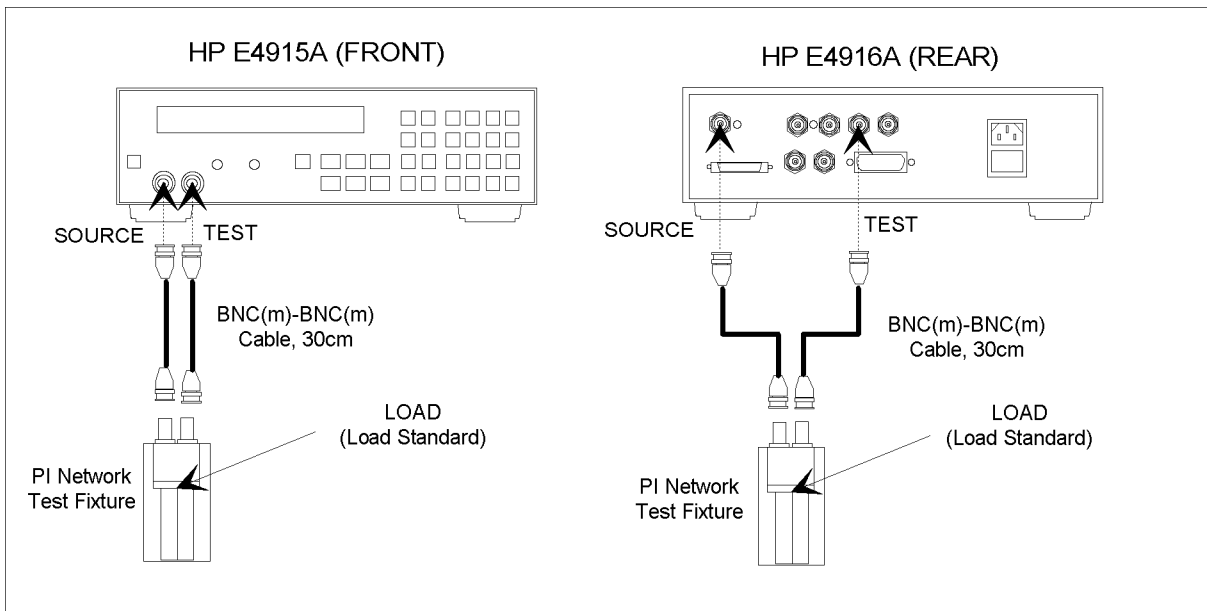
LES02007

Figure 2-12. Setup for Load Calibration with PI Test Fixture

2. Select "SHORT_CAL" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

11. Load Test with PI Test Fixture (LOAD_TEST)

Required Equipment

PI-Network Test Fixture   41900A
BNC(m)-BNC(m) Cable, 30 cm   PN 8120-1838, 2 ea

Procedure

1. Connect the equipment as shown in Figure 2-13.

LES02007
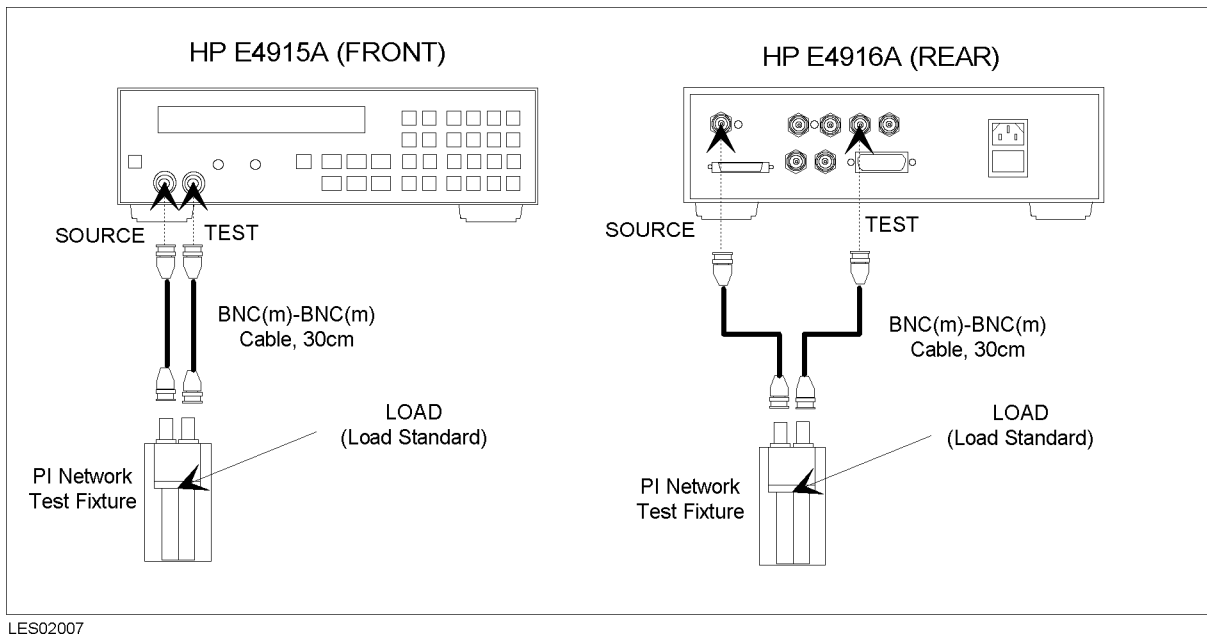
Figure 2-13. Load Test with PI Test Fixture Setup

2. Select "LOAD_TEST" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

12. Open Calibration with Impedance Probe (OPEN_CAL_001)

Required Equipment

Impedance Probe Kit   E4916A Opt.001

Procedure

1. Connect the equipment as shown in Figure 2-14.

LES02008
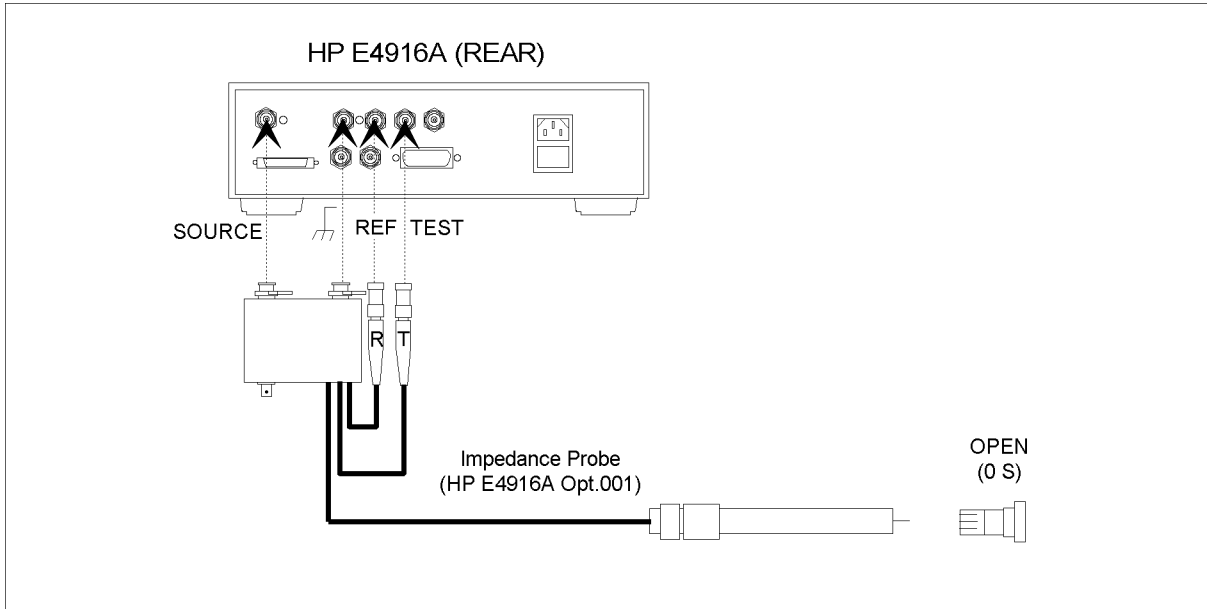
Figure 2-14. Setup for Open Calibration with Impedance Probe

2. Select "OPEN_CAL_001" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

13. Short Calibration with Impedance Probe (SHORT_CAL_001)

Required Equipment

Impedance Probe Kit   E4916A Opt.001

Procedure

1. Connect the equipment as shown in Figure 2-15.

LES02009
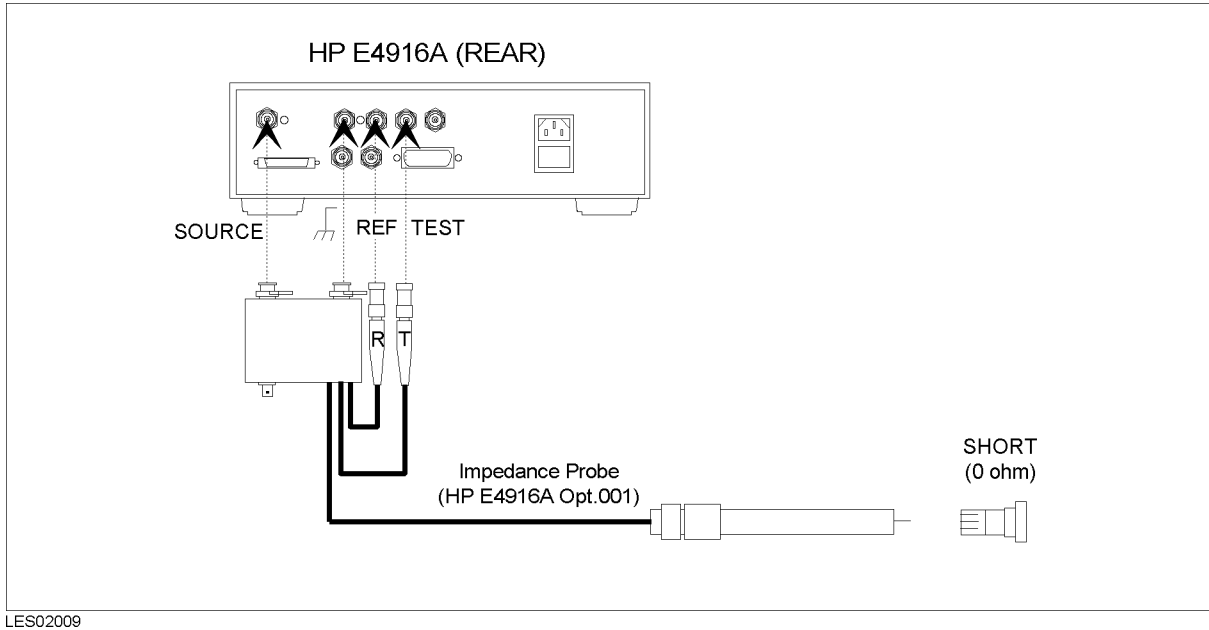
Figure 2-15. Setup for Short Calibration with Impedance Probe

2. Select "SHORT_CAL_001" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

# 14. Load Calibration with Impedance Probe (LOAD_CAL_001)

Required Equipment

Impedance Probe Kit   E4916A Opt.001

Procedure

1. Connect the equipment as shown in Figure 2-16.

LES02010
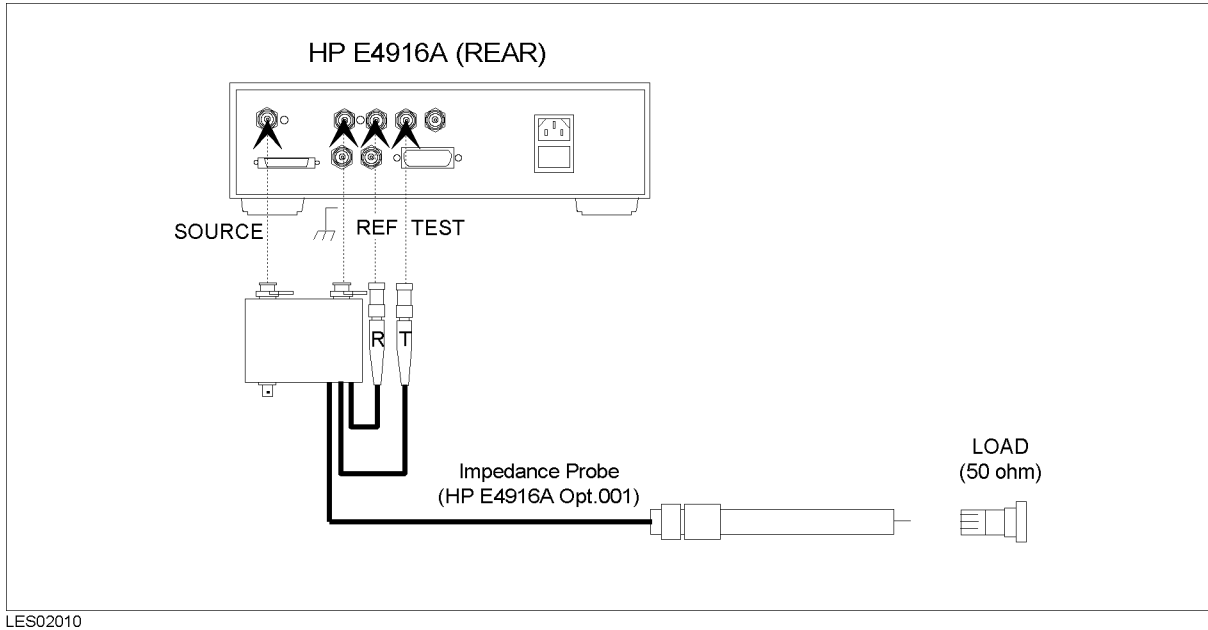
Figure 2-16. Setup for Load Calibration with Impedance Probe

2. Select "LOAD_CAL_001" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

15. Load Test with Impedance Probe (LOAD_TEST_001)

Required Equipment

Impedance Probe Kit   E4916A Opt.001

Procedure

1. Connect the equipment as shown in Figure 2-17.

LES02010
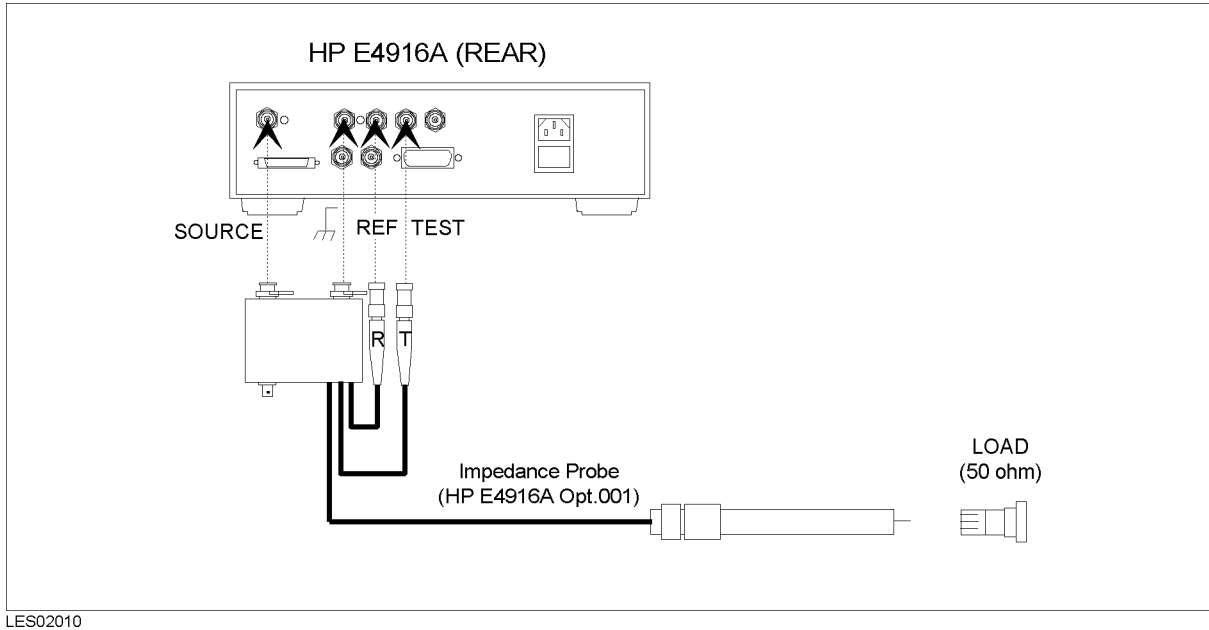
Figure 2-17. Setup for Load Test with Impedance Probe

2. Select "LOAD_TEST_001" and click OK in the list box of the program display.

3. Following the program instructions, complete the procedure.

Completing the Performance Test Record

The performance test data can be obtained through the following file:

Model	Filename
E4915A	C:\E4915_16\DATA_15A\SNxxxxx
E4916A	C:\E4915_16\DATA_16A\SNxxxxx

("xxxxx" shows the last 5 digits of the E4915A/E4916A's serial number)

The performance test record should be completed as follows:

1. Start a Windows' text editor application such as "Word Pad." The "Word Pad" icon is in the Windows' Accessory group.

2. Pull down the File menu from the editor application and select Open.

3. Select All Files (*.*) in the Type entry line.

4. Select the file C:\E4915_16\DATA_15A\SNxxxxx or C:\E4915_16\DATA_16A\SNxxxxx and click Open.

5. Find the lines which include PTR (Performance Test Record) and transcribe the test results to the *Performance Test Record*.

Completing the Function Test Record

Transcribe the test result (Pass or Fail) for the receiver test to the Function Test Record.

3

Troubleshooting

Introduction

This chapter describes troubleshooting procedures to determine a faulty assembly of the E4915A/E4916A.

1. Check the System Failure

A system failure can be caused by a problem in the E4915A/E4916A and its accessories or out of the E4915A/E4916A (in a peripheral or programming). To verify the operation of the E4915A/E4916A alone, perform the following procedure.

1. Disconnect everything from the E4915A/E4916A: All test fixtures, GPIB cable, and RF cables.

2. Perform the *2. Inspect the Power On Sequence* in this chapter.

3. Perform the *3. Troubleshoot the Power Supply* in this chapter.

4. Perform the *4. Troubleshoot the Fan* in this chapter.

5. Perform the *5. Perform the Self Test* in this chapter.

6. Perform the *6. Inspect the Adjustment/Performance Test Results* in this chapter.

7. Perform the *7. Inspect the Rear Panel Feature* in this chapter.

If the E4915A/E4916A has passed all of the checks in steps 2 through 7 but it still making incorrect measurements or unexpected operations, suspect the accessories. Accessories such as PI Test Fixture or Impedance Probe, calibration devices, can all induce system problems.

2. Inspect the Power On Sequence

Check the Fan

Turn the E4915A/E4916A power on. Inspect the fan on the left side.

■ The fan should be rotating and audible.

In case of unexpected results, check AC line power to the E4915A/E4916A. Check the fuse (rating listed on the rear panel). If the problem persists, continue with the *3. Troubleshoot the Power Supply* section.

Check the Front Displays

Turn on the E4915A/E4916A and watch for the following events in this order:

1. Beep is sounding and the Comparator Pass/Fail LEDs turn on for a while (E4916A).
2. The E4915A/E4916A displays `Memory Test Proceeding` for several seconds.
3. The E4915A/E4916A displays the model number, firmware revision, installed option (except for Option 001), and firmware revision date.
4. The E4915A/E4916A displays the copyright information.
5. The E4915A/E4916A displays the current measurement mode (for example, `Xtl`) at the lower left of the display, and other measurement information at other display area.

Note	When the E4915A/E4916A cannot obtain measurement results because of some inappropriate setups (including no fixture connection), the E4915A/E4916A may display some status messages like `W69:Out of Srch Rng` even if the E4915A/E4916A is properly operating.

In case of unexpected results, continue with *5. Perform the Self Test* section.

3. Troubleshoot the Power Supply

Use this procedure when the fan is not rotating and the LCD display is not turned on.

Measure the Output Voltages of Power Supplies

If all output voltages are within the limits, the power supply is verified with 100% confidence.

a. Turn the E4915A/E4916A power off.

b. Remove the outer cover of the E4915A/E4916A.

c. Remove the output cable assembly from the power supply CN4 and CN5.

d. Turn the E4915A/E4916A power on.

e. Measure the output voltages at the V4 (to GND G3), V3 (to GND G2), V2 (to GND G2), V1 (to GND G1) pins using a voltmeter with a small probe.

LES04001
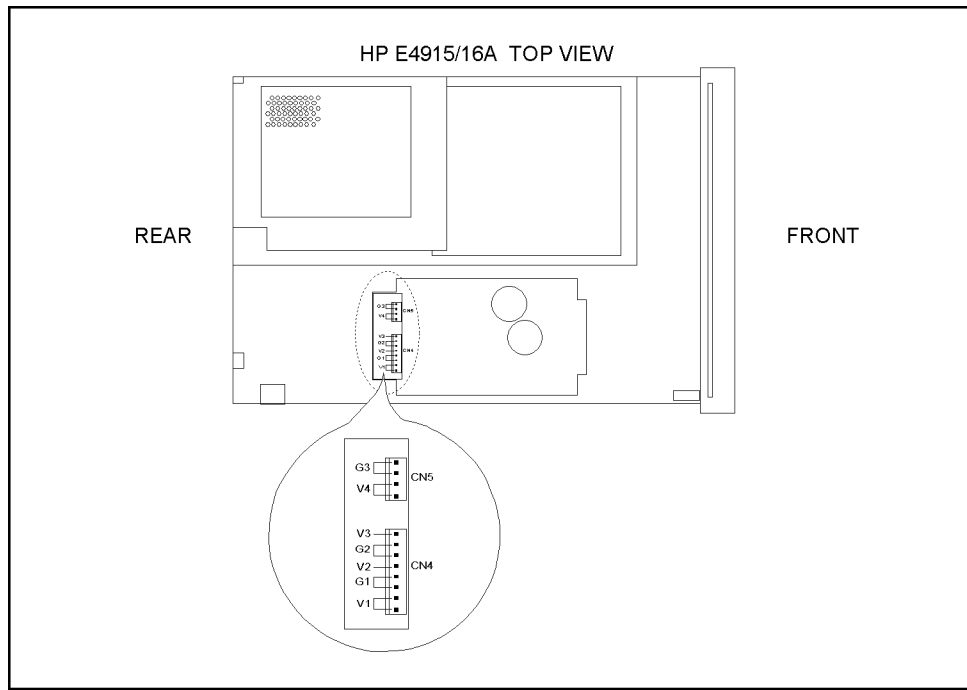
Figure 3-1. Power Supply Output Pins

Table 3-1. Power Supply Output Voltages

Connector Pin	Output Voltage	Range
V4 to G3(GND)	+24 V	+21.6 V to +26.4 V
V3 to G2(GND)	−15 V	−13.5 V to −16.5 V
V2 to G2(GND)	+15 V	+13.5 V to +16.5 V
V1 to G1(GND)	+5 V	4.5 V to +5.5 V

f. If the output voltages are unexpected, replace the power supply.

g. If these are good, the power supply is verified.

h. Reconnect the cable assembly to the power supply.

4. Troubleshoot the Fan

Perform the following procedure if the fan is not rotating.

Troubleshoot the Fan

a. Turn the E4915A/E4916A power off.

b. Remove the outer cover of the E4915A/E4916A.

c. Remove the fan power cable from the A1J15.

d. Turn the E4915A/E4916A power on.

e. Check the output voltage of the fan power at A1J15 ($+24$ V $\pm 10\%$).

f. If the output voltage is good, replace the fan.

5. Perform the Self Test

1. Turn the E4915A/E4916A power on and wait until the measurement mode and other information are displayed.

2. Press (Blue) (System).

3. Press (⇑⇒) or (⇐⇓) several times until Self Test is displayed at the lower right of the LCD.

4. Press Self Test softkey.

5. Select YES using (⇑⇒) or (⇐⇓) key and press (Enter).

If an error message appears on the LCD, replace the A1 Main Board.

6. Inspect the Adjustment/Performance Test Results

When you want to test the individual E4915A/E4916A specifications and other analog performance, perform the adjustments and performance tests in accordance with the *Adjustments and Performance Tests* chapter.

Troubleshoot Suspicious Functional Group

Table 3-2 lists the functional groups to suspect first when an adjustment/performance test fails. If an adjustment/performance test fails, you should check the function groups as shown in the table. The following table lists some typical cases. In a few cases, other groups may actually be faulty.

Table 3-2.
Functional Group to Suspect When an Adjustment/Performance Test Fails

Test	A1 Main	A2 Sub
Pre-check and Source Linearity Calibration	√	√
Oscillator Calibration	√	√
Source level Accuracy and Source Power Linearity Test		√[1]
Frequency Accuracy Test	√	
Through Calibration	√	√
Receiver Test	√	√
Isolation Test	√	√
Open Calibration with PI Test Fixture		√[2]
Short Calibration with PI Test Fixture		√[2]
Load Calibration with PI Test Fixture		√[2]
Load Test with PI Test Fixture		√[2]
Open Calibration with Impedance Probe		√[2]
Short Calibration with Impedance Probe		√[2]
Load Calibration with Impedance Probe		√[2]
Load Test Impedance Probe		√[2]

1 Only if the source power linearity test result at higher output level fails.

2 Only if the calibration/test results with PI test fixture fail and calibration/test results with impedance probe pass, or the calibration/test results with PI test fixture pass and calibration/test results with impedance probe fail.

7. Inspect the Rear Panel Feature

Check the GPIB Interface

If the unexpected operations appear when controlling the E4915A/E4916A with an external controller, perform the following checks to verify the problem is not with the controller.

- Compatibility, must be HP 9000 series 200/300/700, see the manuals of the controller and the BASIC system.
- GPIB interface hardware must be installed in the controller, see the manuals of the controller and the BASIC system.
- I/O and GPIB binaries loaded, see the manuals of the BASIC system.
- Select code, see the manuals of the BASIC system.
- GPIB cables, see the manuals of the BASIC system.
- Programming syntax, see the manuals of the BASIC system.
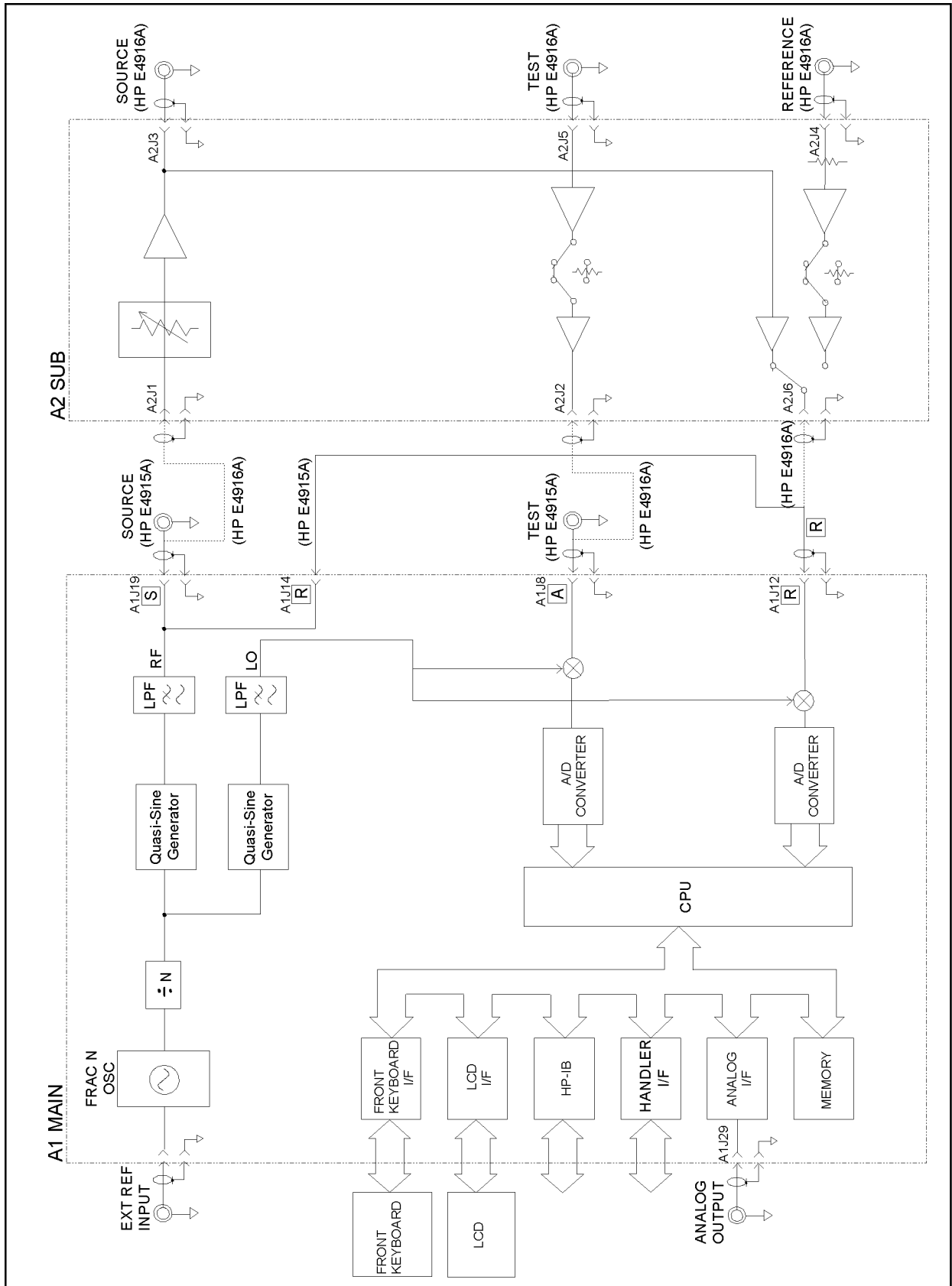
LES04002

Figure 3-2. E4915A/E4916A Simplified Block Diagram

4

Replaceable Parts

Introduction

This chapter contains information for ordering replaceable parts. Replaceable parts include major assemblies and all chassis hardware. In general, parts of major assemblies are not included.

Replaceable Parts List

Replaceable parts tables list the following information for each part.

1   Agilent Technologies part number.
2   Part number check digit (CD).
3   Part quantity as shown in the corresponding figure. There may or may not be more of the same part located elsewhere in the instrument.
4   Part description, using abbreviations.
5   A typical manufacturer of the part in a five-digit code (refer to the Manufacture Code List).
6   The manufacturer's part number.

Table 4-1. Manufacturers Code List

Mfr #	Name	Location	Zipcode
00779	AMP INC	HARRISBURG PA US	17111
06383	PANDUIT CORP	TINLEY PARK IL US	60477
12881	METEX CORP	EDISON NJ US	08817
12697	CLAROSTAT MFG CO INC	DOVER NH US	03820
16428	COOPER INDUSTRIES INC	HOUSTON TX US	77210
28480	AGILENT TECHNOLOGIES HQ	PALO ALTO CA US	94304
28520	HEYCO MOLDED PRODUCTS	KENTWORTH NJ US	07033
73734	FEDERAL SCREW PRODUCTS CO	CHICAGO IL US	60618
75915	LITTELFUSE INC	DES PLAINES IL US	60016
76381	3M CO	ST PAUL MN US	55144
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN IL US	60126

Ordering Information

To order a part listed in the replaceable parts table, quote the Agilent Technologies part number (with a check digit), indicate the quantity required, and address the order to the nearest Agilent Technologies office. The check digit will ensure accurate and timely processing of the order.

To order a part that not listed in the replaceable parts table, include the instrument model number, the description and function of the part, and the quantity of parts required. Address to order to the nearest Agilent Technologies office.

Direct Mail Order System

Within the USA, Agilent Technologies can supply parts through a direct mail order system. Advantages of using this system are:

1. Direct ordering and shipment from the Agilent Technologies Parts Center in Mountain View, California.

2. No maximum or minimum on any mail order (there is a minimum order amount for parts ordered through a local Agilent Technologies office when the orders require billing and invoicing).

3. Prepaid transportation (there is a small handling charge for each order).

4. No invoices.

To provide these advantages, a check or money order must accompany each order.

Mail order forms and specific ordering information are available through your local Agilent Technologies office, addresses and phone numbers are located at the back of this manual.

Table 4-2. List of Reference Designators

A	: assembly	MP	: mechanical part
B	: motor	P	: plug
BT	: battery	Q	: transistor
C	: capacitor	R	: resistor
CP	: coupler	RT	: thermistor
CR	: diode	S	: switch
DL	: delay line	T	: transformer
DS	: device signaling (lamp)	TB	: terminal board
E	: misc electronic part	TP	: test point
F	: fuse	U	: integrated circuit
FL	: filter	V	: vacuum, tube, neon bulb, photocell, etc.
J	: jack	VR	: voltage regulator
K	: relay	W	: cable
L	: inductor	X	: socket
M	: meter	Y	: crystal

Table 4-3. List of Abbreviations

A	: amperes	N/C	: normally closed
A.F.C.	: automatic frequency control	NE	: neon
AMPL	: amplifier	NI PL	: nickel plate
B.F.O	: beat frequency oscillator	N/O	: normally open
BE CU	: beryllium copper	NPO	: negative positive zero (zero temperature coefficient)
BH	: binder head	NPN	: negative-positive-negative
BP	: bandpass	NRFR	: not recommended for field replacement
BRS	: brass	NSR	: not separately replaceable
BWO	: backward wave oscillator	OBD	: order by description
CCW	: counter-clockwise	OH	: oval head
CER	: ceramic	OX	: oxide
CMO	: cabinet mount only	P	: peak
COEF	: coefficient	PC	: printed circuit
COM	: common	p	: pico
COMP	: composition	PH BRZ	: phosphor bronze
COMPL	: complete	PHL	: Philips
CONN	: connector	PIV	: peak inverse voltage
CP	: cadmium plate	PNP	: positive-negative-positive
CRT	: cathode-ray tube	P/O	: part of
CW	: clockwise	POLY	: polystyrene
DE PC	: deposited carbon	PORC	: porcelain
DR	: drive	POS	: position(s)
ELECT	: electrolytic	POT	: potentiometer
ENCAP	: encapsulated	PP	: peak to peak
EXT	: external	PT	: point
F	: farads	PWV	: peak working voltage
f	: femto	RECT	: rectifier
FH	: flat head	RF	: radio frequency
FIL H	: fillister head	RH	: round head or right hand
FXD	: fixed	RMO	: rack mount only
G	: giga	RMS	: root-mean square
GE	: germanium	RWV	: reverse working voltage
GL	: glass	S-B	: slow-blow
GRD	: ground(ed)	SCR	: screw
H	: henries	SE	: selenium
HEX	: hexagonal	SECT	: section(s)
HG	: mercury	SEMICON	: semiconductor
HR	: hour(s)	SI	: silicon
Hz	: hertz	SIL	: silver
IF	: intermediate freq.	SL	: slide
IMPG	: impregnated	SPG	: spring
INCD	: incandescent	SPL	: special
INCL	: include(s)	SST	: stainless steel
INS	: insulation(ed)	SR	: split ring
INT	: internal	STL	: steel
k	: kilo	TA	: tantalum
LH	: left hand	TD	: time delay
LIN	: linear taper	TGL	: toggle
LK WASH	: lock washer	THD	: thread
LOG	: logarithmic taper	TI	: titanium
LPF	: low pass filter	TOL	: tolerance
m	: milli	TRIM	: trimmer
M	: meg	TWT	: traveling wave tube
MET FLM	: metal film	μ	: micro
MET OX	: metallic oxide	VAR	: variable
MFR	: manufacturer	VDCW	: dc working volts
MINAT	: miniature	W/	: with
MOM	: momentary	W	: watts
MTG	: mounting	WIV	: working inverse voltage
MY	: "mylar"	WW	: wirewound
n	: nano	W/O	: without

Major Assemblies
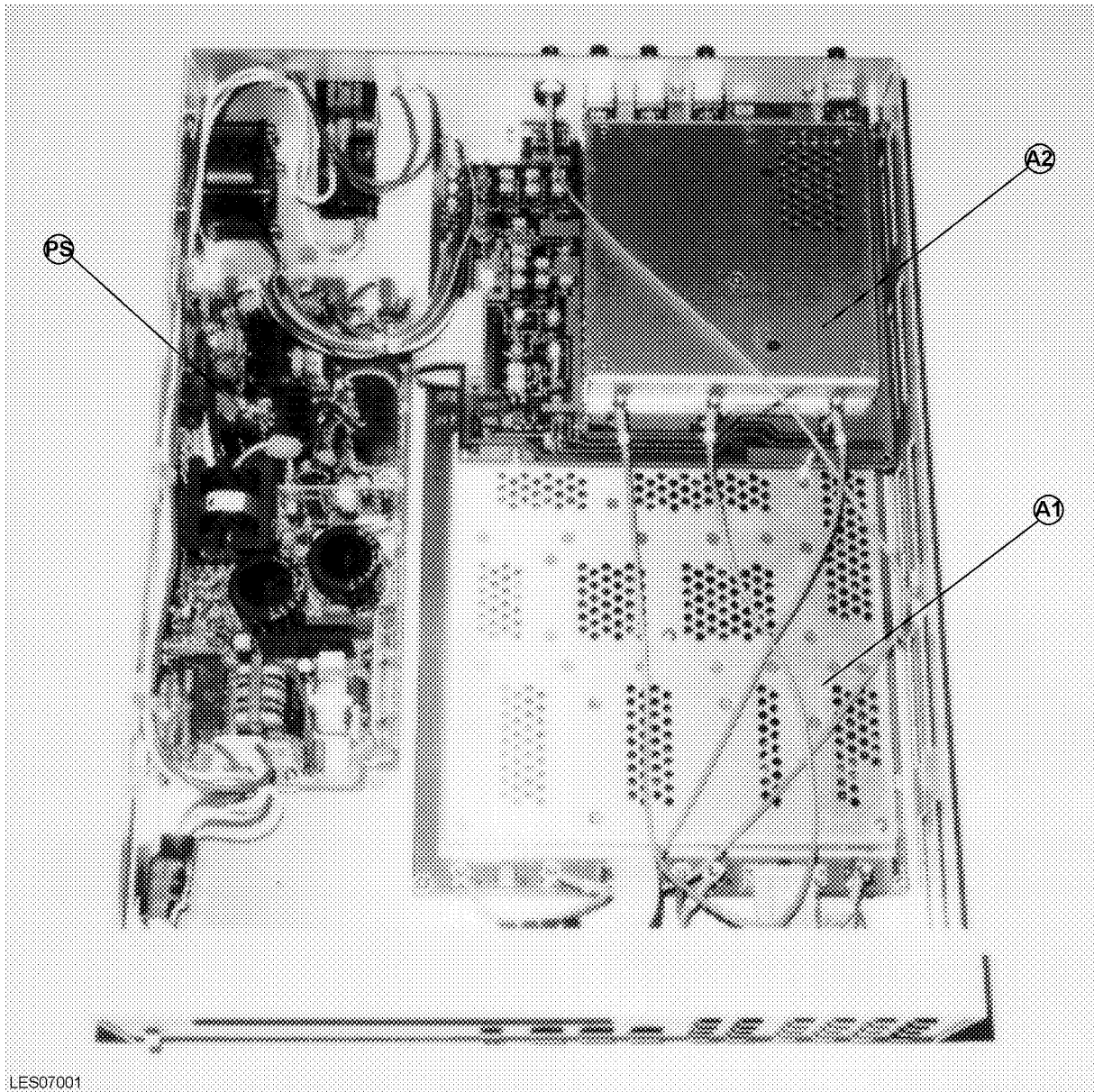
Figure 4-1. Major Assemblies (Top View)

Table 4-4. Major Assemblies

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1	See Figure 4-2	0	1	A1 Main Board	–	–
A2	See Figure 4-3	9	1	A2 Sub Board (E4916A)	–	–
PS	See Figure 4-4	7	1	Power Supply Assembly	–	–
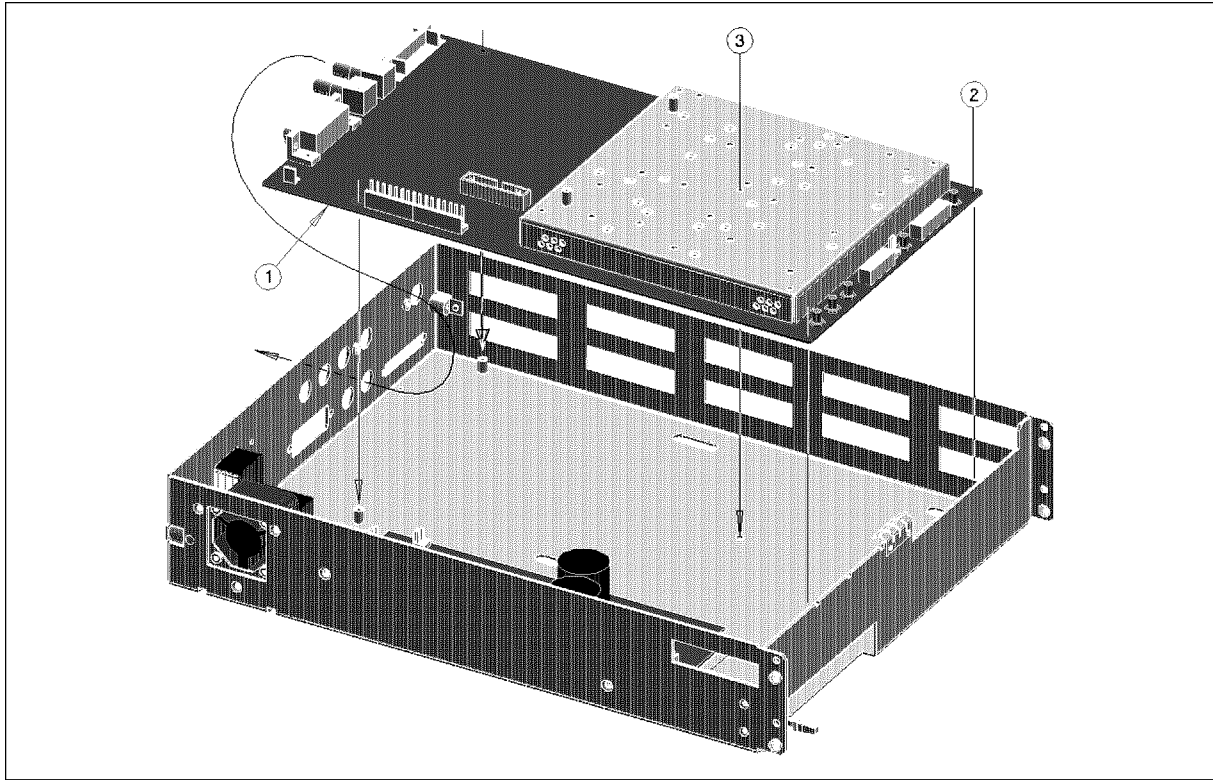
LES07002

Figure 4-2. A1 Main Board

Table 4-5. A1 Main Board

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-66521[1]	3	1	A1 Main Board	28480	E4915-66521
	E4915-69521[1]	9	1	A1 Main Board (rebuilt exchange)	28480	E4915-69521
	E4915-00631	5	1	Shield Case (Top)[2]	28480	E4915-00631
	E4915-00651	5	1	Shield Case (Bottom)[2]	28480	E4915-00651
	0515-1550	8	4	Screw M4L8 PH[2]	28480	0515-1550
2	0515-1550	8	4	Screw M3L8 PH	28480	0515-1550
3	0515-0990	3	1	Screw M3X0.5	28480	0515-0990
	2190-0584	5	1	Washer LK HLCL	28480	2190-0584

1 When you replace the old A1 Main Board (Agilent P/N E4915-66501 or E4915-69501) with this new board (Agilent P/N E4915-66521 or E4915-69521), you must update the firmware revision to REV 2.02 or above.

2 The A1 Main Board (Agilent P/N E4915-66521 or E4915-69521) is furnished with those shield cases and screws. Order those parts when you replace those parts only.
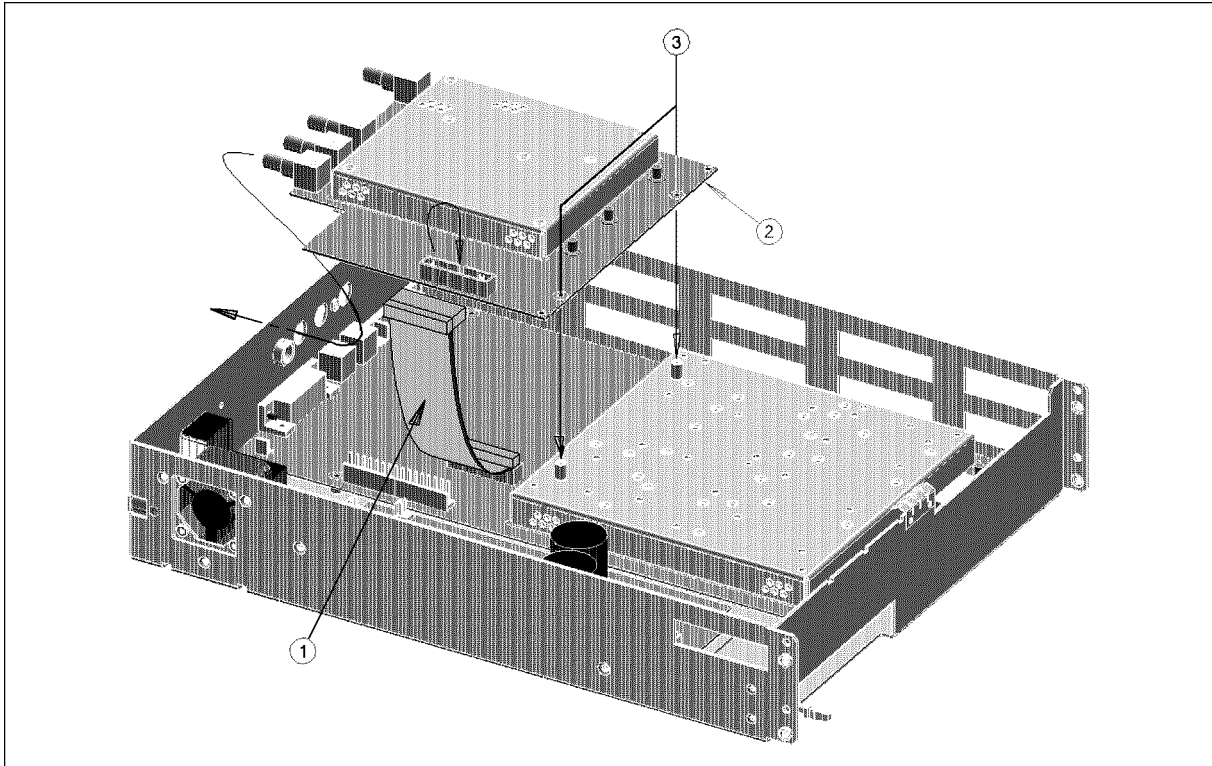
LES07003

Figure 4-3. A2 Sub Board (E4916A)

Table 4-6. A2 Sub Board (E4916A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-61611	0	1	Flat Cable Assembly	28480	E4915-61611
2	E4916-66502	3	1	A2 Sub Board	28480	E4916-66502
	E4916-00631	5	1	Shield Case (Top)[1]	28480	E4916-00631
	E4916-00632	5	1	Shield Case (Bottom)[1]	28480	E4916-00632
	0515-0914	1	5	Screw Mach M3x0.5[1]	28480	0515-0914
3	0515-1550	8	2	Screw M3L8 PH	28480	0515-1550

1 The A2 Sub Board (p/n E4915-66502) is furnished with those shield cases and screws. Order those parts when you replace those parts only.
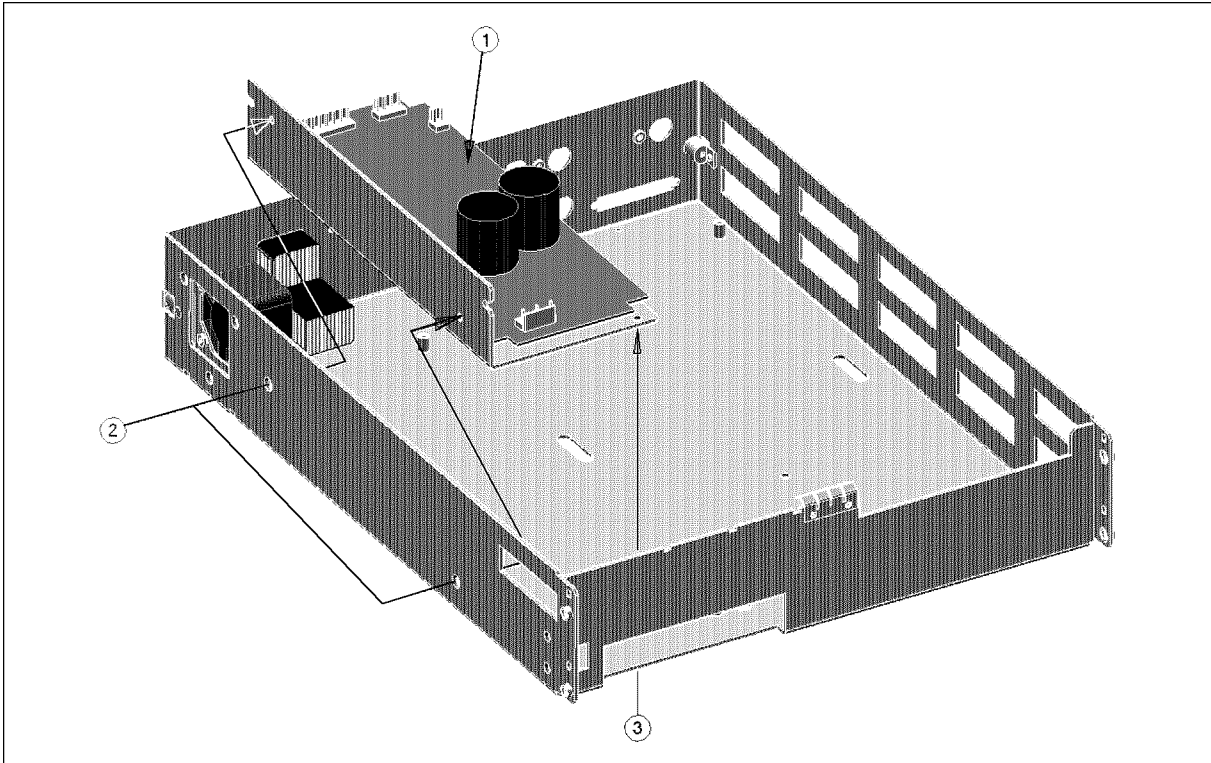
LES07004

Figure 4-4. Power Supply Assembly

Table 4-7. Power Supply Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0950-3174	8	1	Power Supply Assembly	28480	0950-3174
2	0515-1012	9	2	Screw FL M4L8	28480	0515-1012
3	0515-2079	2	1	Screw M4X8	28480	0515-2079

Front Assemblies
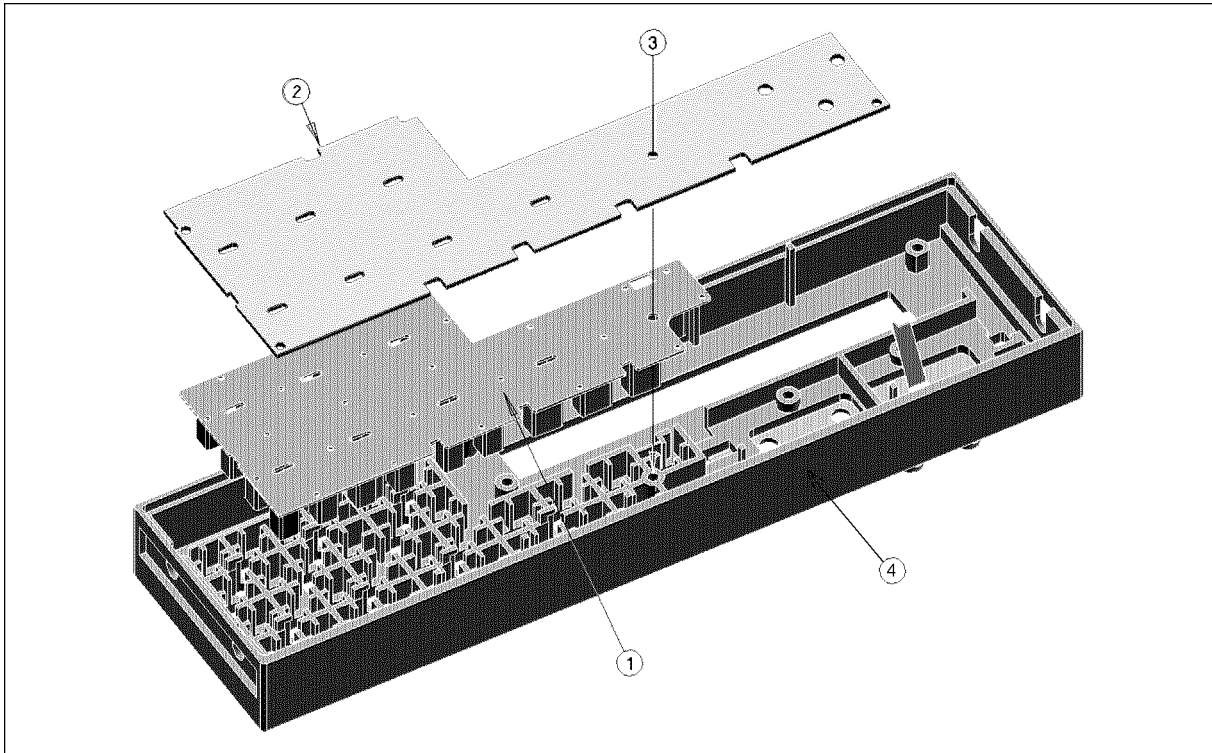
LES03001

Figure 4-5. Key Board Assemblies

Table 4-8. Key Board Assemblies

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-25101	3	1	Rubber Key	28480	E4915-25101
2	E4915-66504	7	1	Key Board	28480	E4915-66504
3	0515-1550	6	1	Screw M3L8 PH	28480	0515-1550
4	04263-40001	7	1	Front Bezel	28480	04263-40001
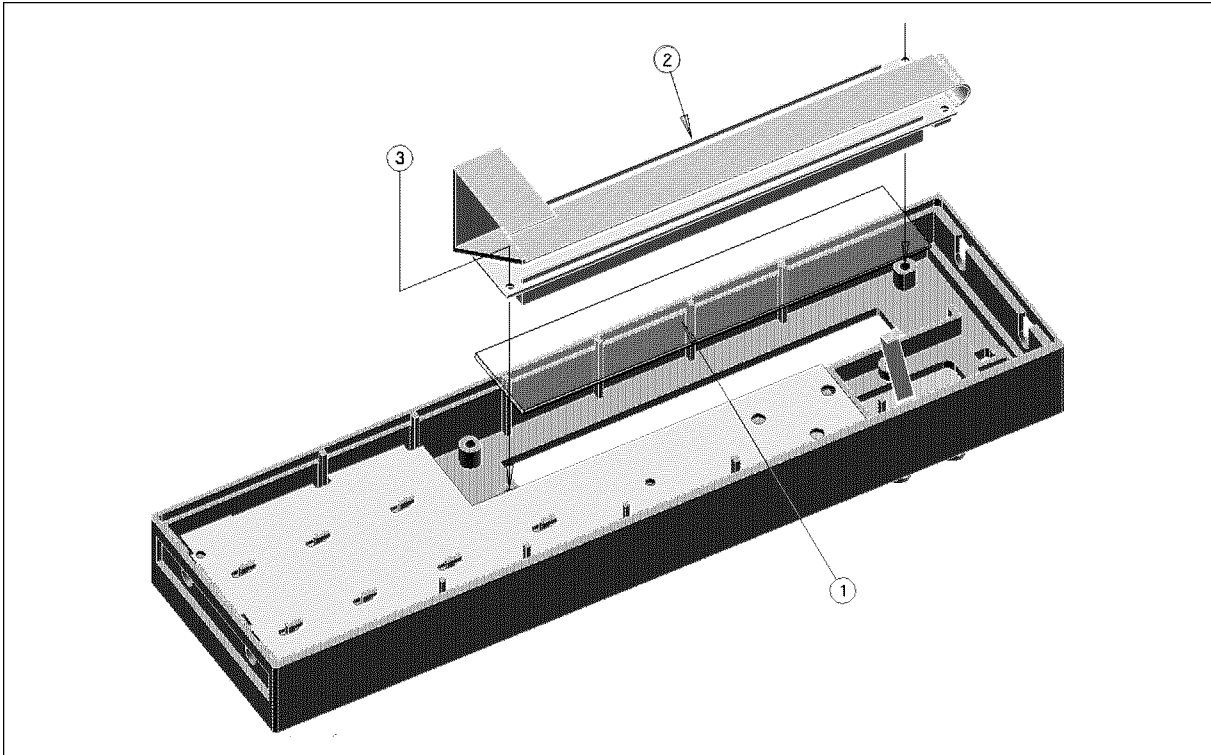
LES07006

Figure 4-6. LCD Assemblies

Table 4-9. LCD Assemblies

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	04263-25003	7	1	LCD Filter[1]	28480	04263-25003
2	04263-61010	9	1	LCD Display	28480	04263-61010
3	0515-1550	0	2	Screw M3L8 PH	28480	0515-1550

1 Check the reflection of each surface. A side whose reflection image is clear should be at upper side in Figure 4-6. A side whose reflection image is dim should be at lower side in Figure 4-6.
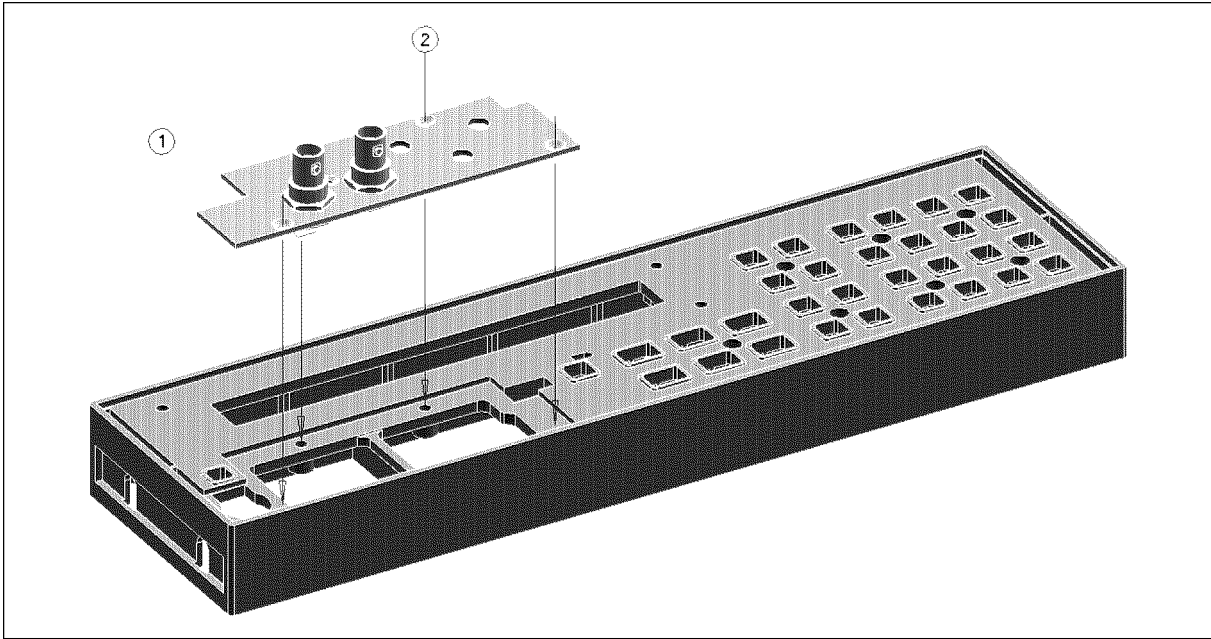
LES03002

Figure 4-7. Screws for Front Connector Assembly (E4915A)

Table 4-10. Front Connector Assemblies (E4915A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	See Figure 4-9	5	1	Front Connector Assembly	–	–
2	0515-0914	4	4	Screw Mech M3X0.6	28480	0515-0914
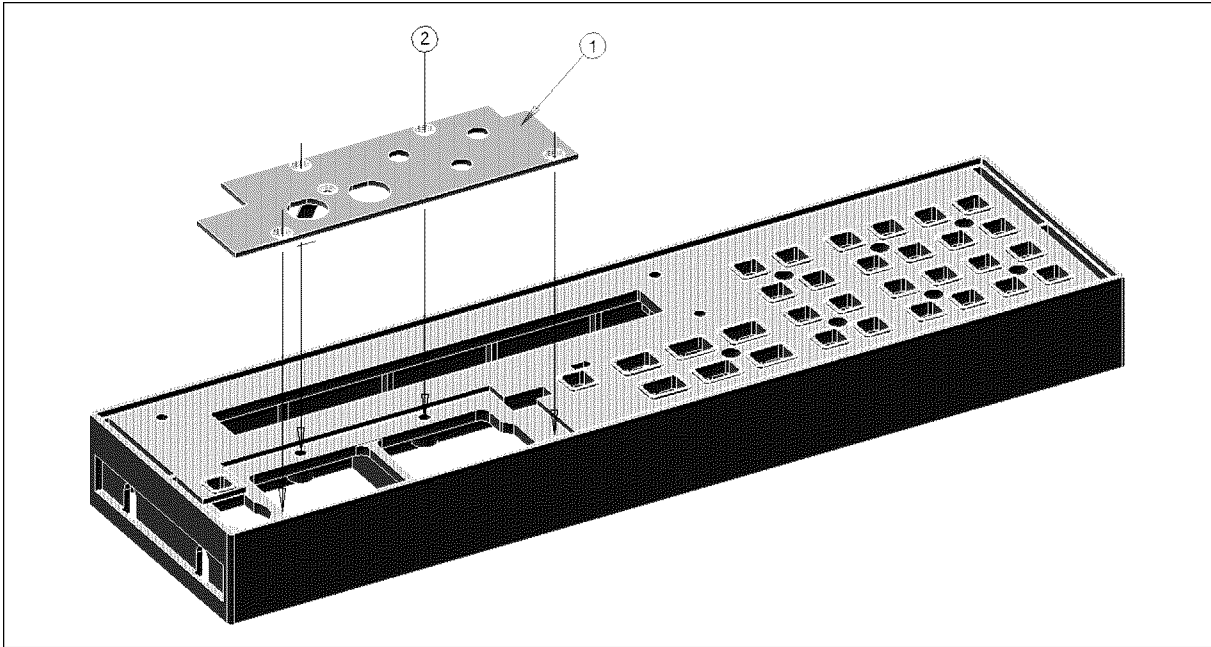
LES03003

Figure 4-8. Front Plate (E4916A)

Table 4-11. Front Plate (E4916A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-00605	5	1	Sub Panel	28480	E4915-00605
2	0515-0914	1	4	Screw Mach M3X0.6	28480	0515-0914
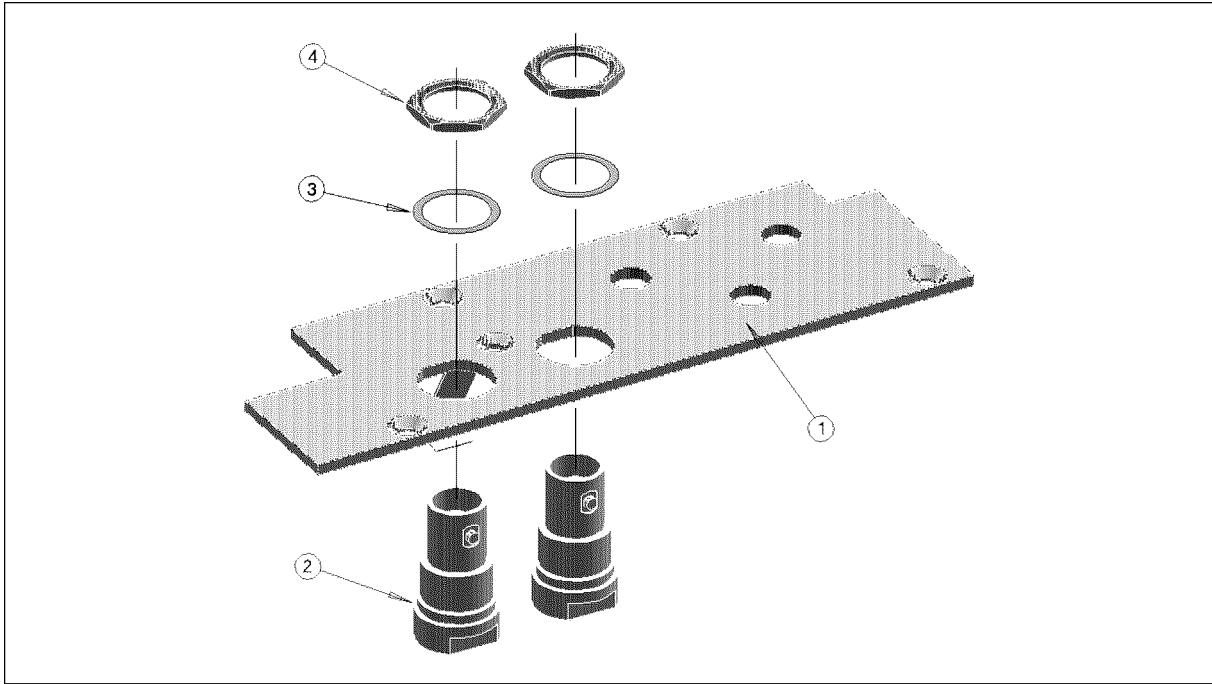
LES07009

Figure 4-9. Front Connector Assembly - RF Connectors (E4915A)

Table 4-12. Front Connector Assembly (E4915A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-00605	0	1	Sub Panel	28480	E4915-00605
2	1250-0252	4	2	Connector RF BNC	28480	1250-0252
3	2190-0102	1	2	Washer LK INTL T	28480	2190-0102
4	2950-0035	9	2	Nut HEX DBL CHAM[1]	28480	2950-0035

1 Tool: 9/16 inch Torque Wrench. Torque: 35 kgfcm.
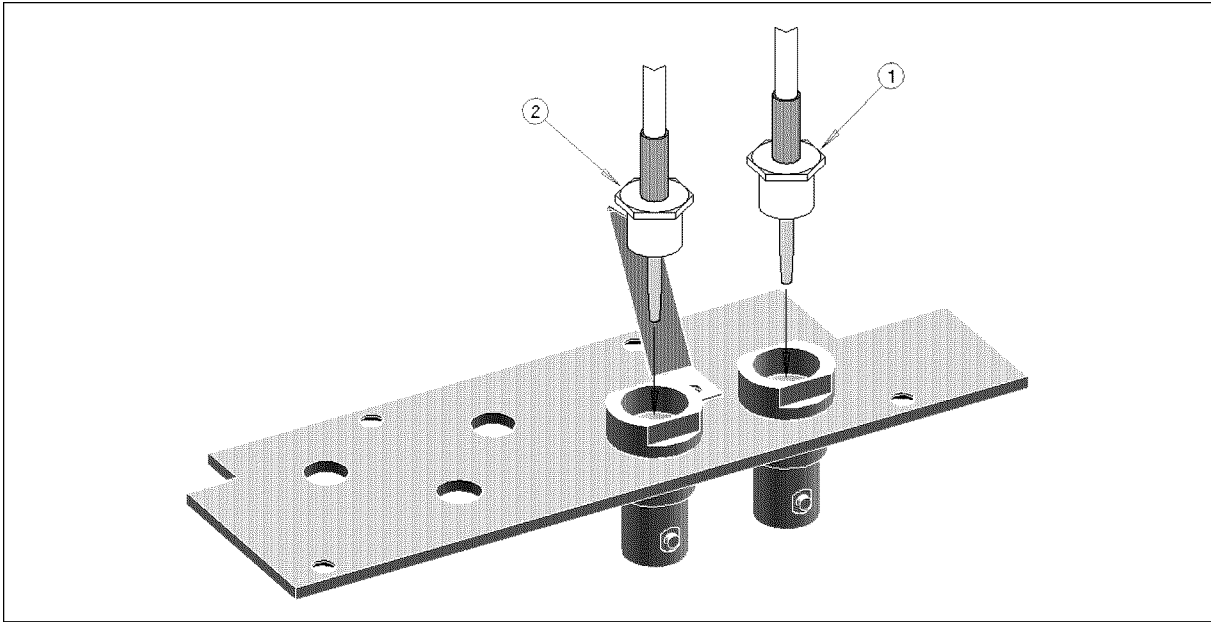
LES07010

Figure 4-10. Front Connector Assembly - RF Cables (E4915A)

Table 4-13. Front Connector Assembly - RF Calbes (E4915A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	See Figure 4-17	6	1	RF Cable "S"	–	–
2	See Figure 4-17	7	1	RF Cable "A"	–	–
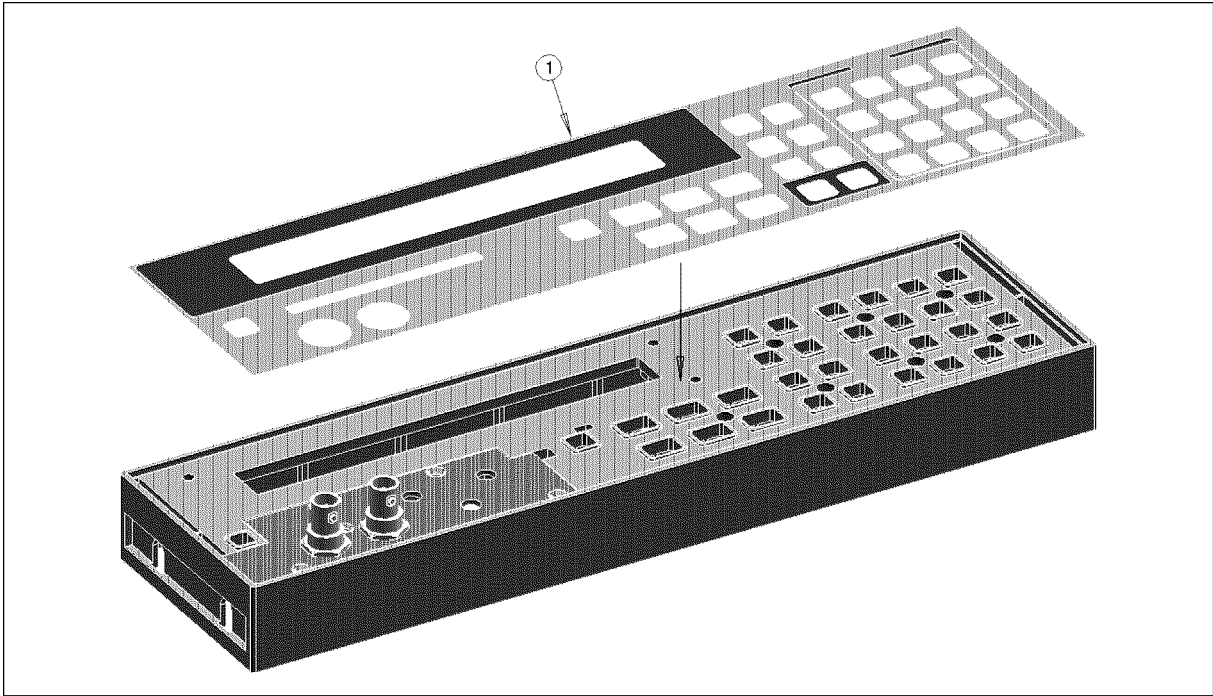
LES07011

Figure 4-11. Front Label

Table 4-14. Front Label

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-87101	6	1	Front Label (E4915A)	28480	E4915-87101
	E4916-87101	7	1	Front Label (E4916A)	28480	E4916-87101
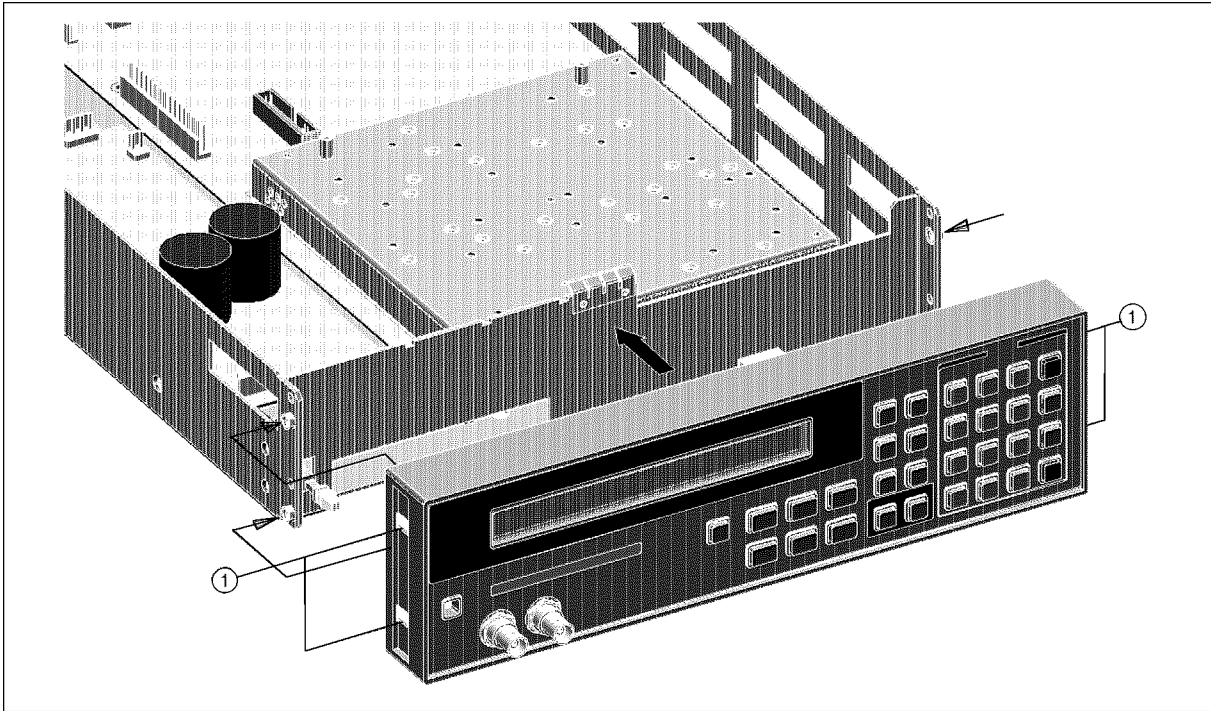
LES03004

Figure 4-12. Front Assembly Screws

Table 4-15. Front Assembly Screws

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0515-0914	6	4	Screw Mach M3X0.5	28480	0515-0914

Rear Assemblies
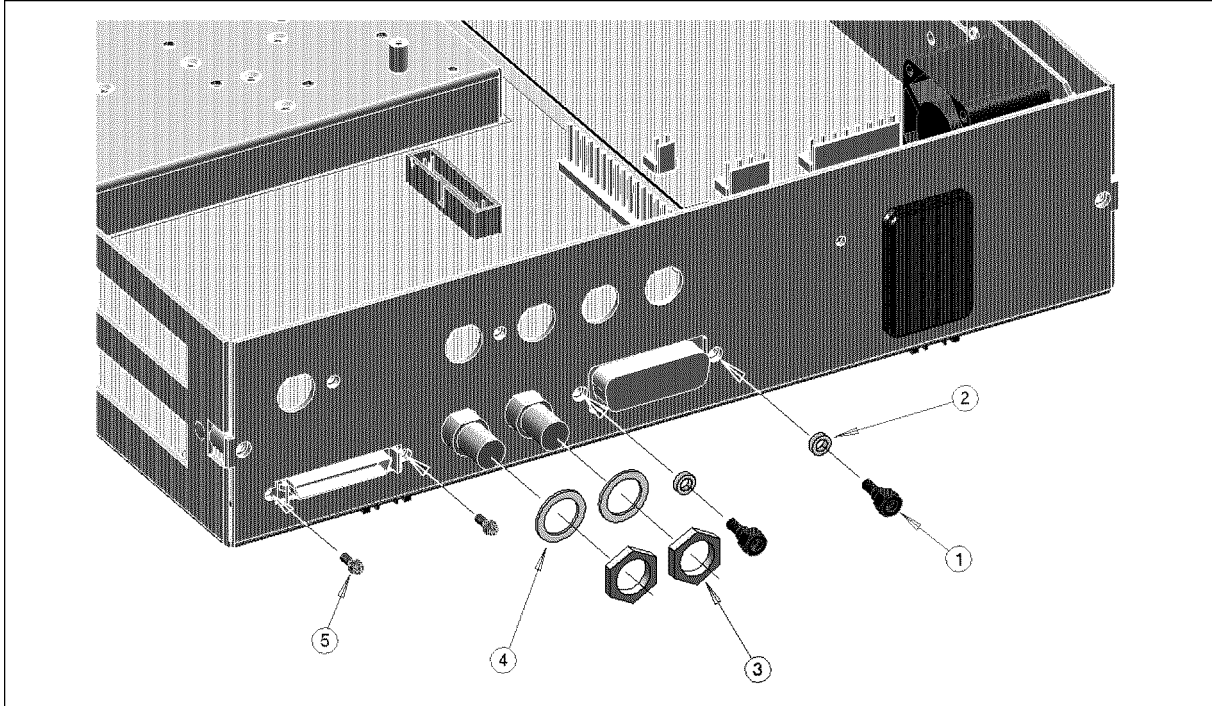
LES07016

Figure 4-13. Rear Assemblies - Interface Connectors

Table 4-16. Rear Assemblies - Interface Connectors

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0380-0644	6	2	Standoff Hex M/FEM	28480	0380-0644
2	2190-0577	9	2	Washer	28480	2190-0577
3	2950-0054	3	2	Nut	28480	2950-0054
4	2190-0054	4	2	Washer	28480	2190-0054
5	1252-5828	8	1	Jack Screw Kit	28480	1252-5828
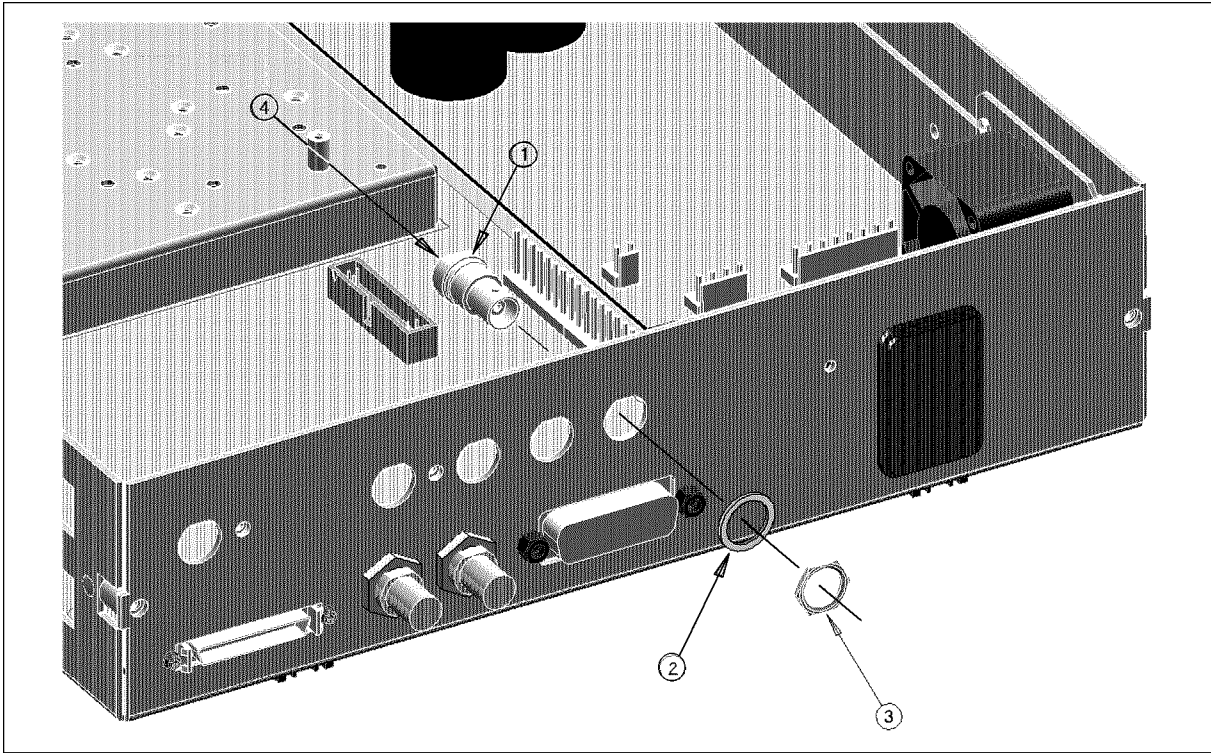
LES07017

Figure 4-14. Rear Assemblies - Analog Output Connector

Table 4-17. Rear Assemblies - Analog Output connector

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	1250-0252	6	1	Connector RF BNC	28480	1250-0252
2	2190-0102	9	1	Washer	28480	2190-0102
3	2950-0035	3	1	Nut	28480	2950-0035
4	See Figure 4-19	4	1	Cable Assembly "O"	–	–
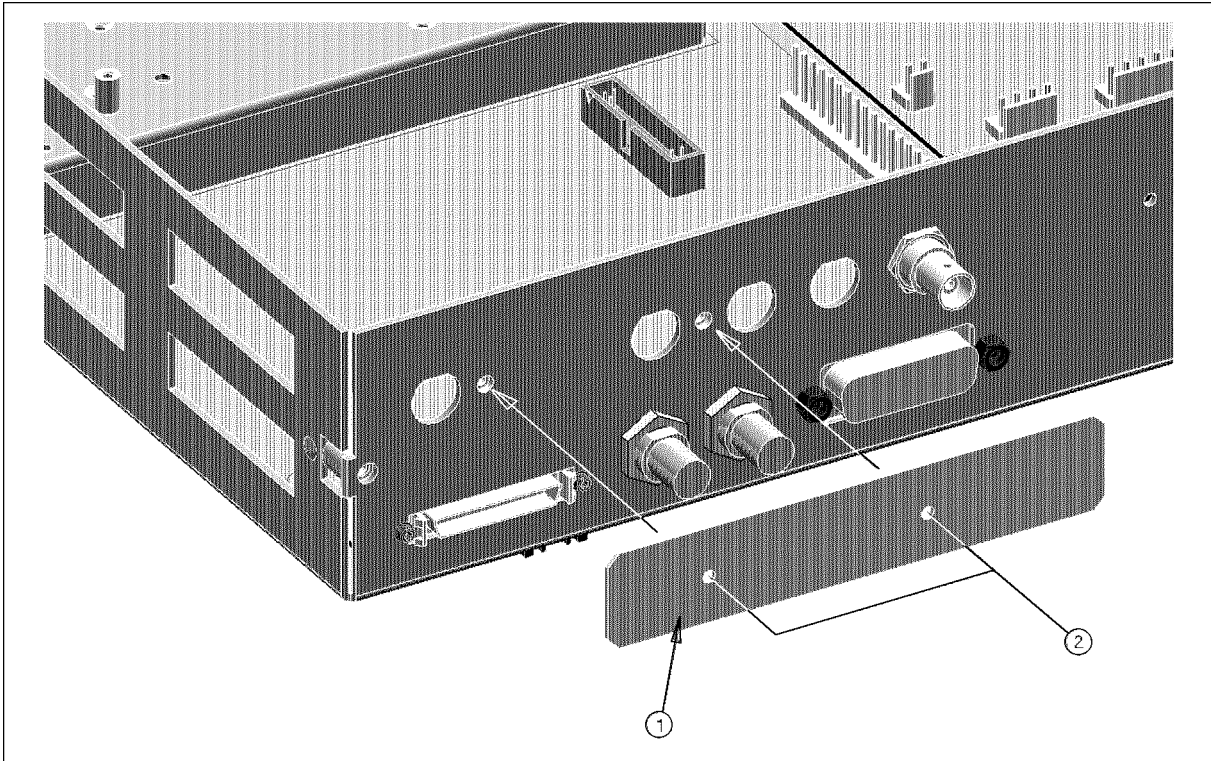
LES07018

Figure 4-15. Rear Assemblies - Rear Plate (E4915A)

Table 4-18. Rear Assemblies - Rear Plate (E4915A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-00211	6	1	Rear Plate	28480	E4915-00211
2	0515-1550	9	2	Screw M3L8 PH	28480	0515-1550
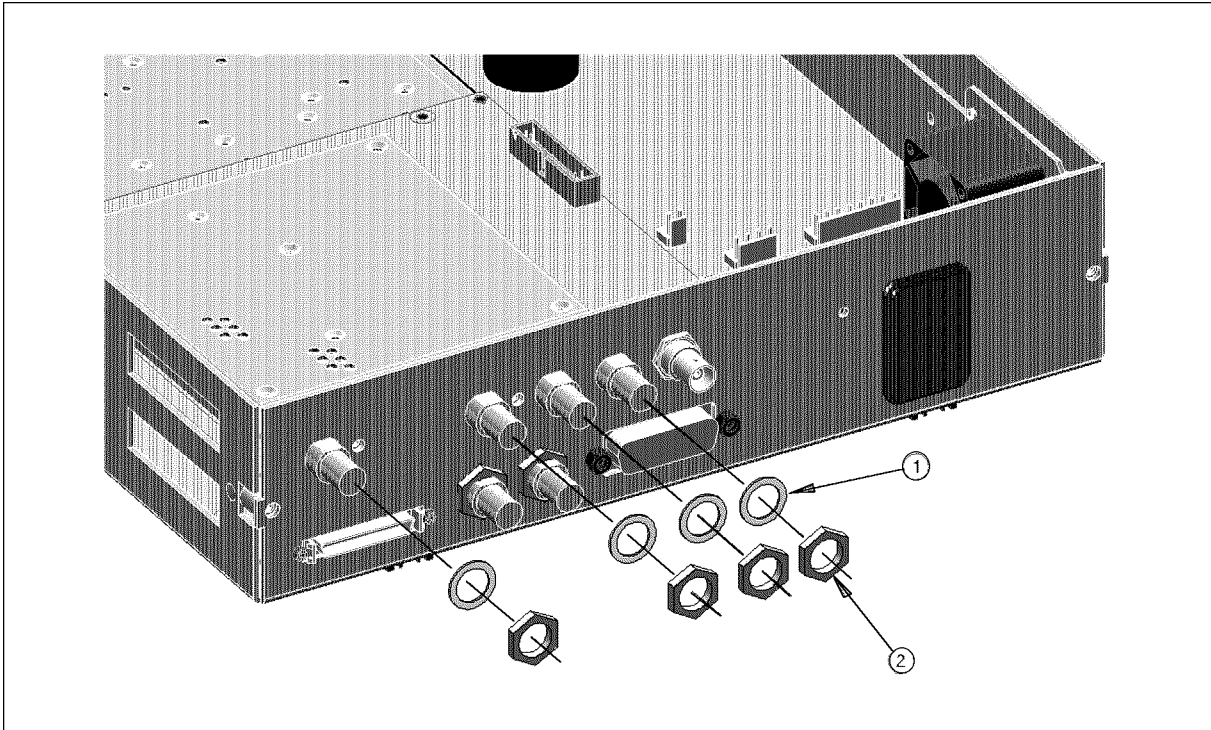
LES07019

Figure 4-16. Rear Assemblies - Test Ports (E4916A)

Table 4-19. Rear Assemblies - Test Ports (E4916A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	2190-0054	6	4	Washer	28480	2190-0054
2	2950-0054	9	4	Nut	28480	2950-0054

Internal Cables
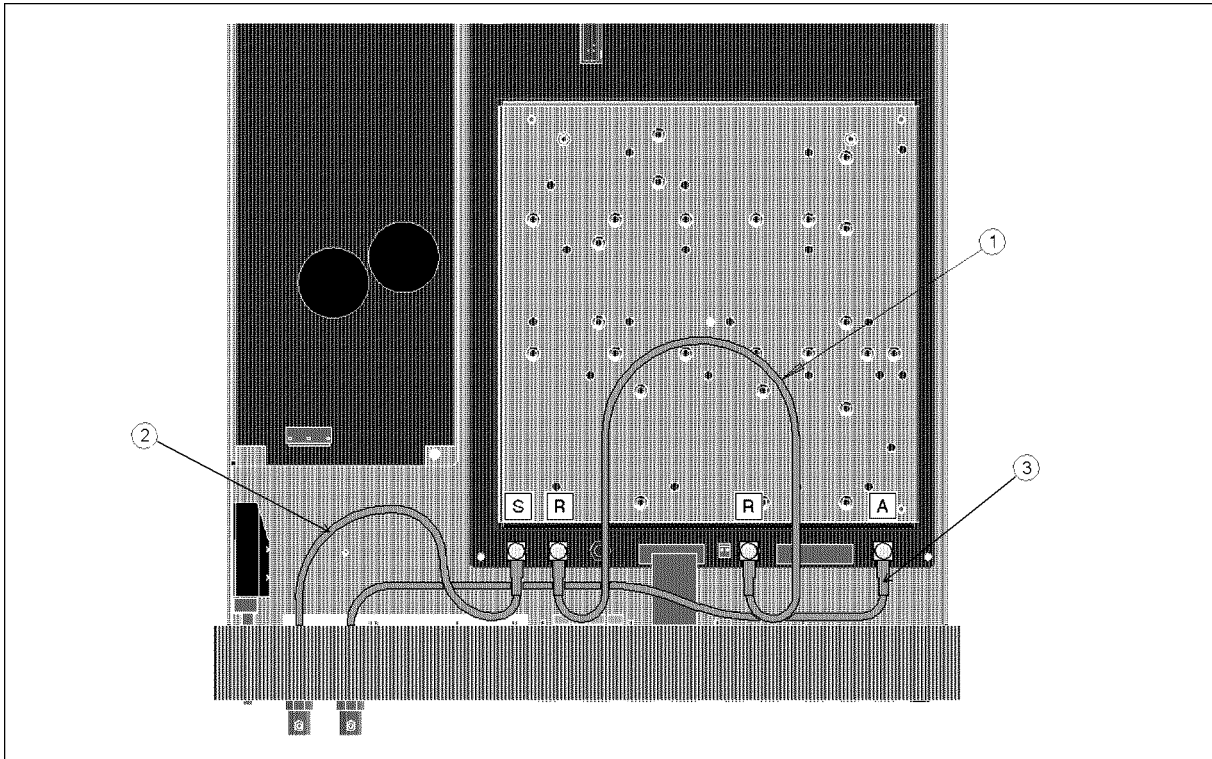
LES03005

Figure 4-17. Cables - A1 to Front Assembly (E4915A)

Table 4-20. Cables - A1 to Front Assembly (E4915A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-61601	6	1	Cable "R" (A1J12-A1J14)	28480	E4915-61601
2	E4915-61604	9	1	Cable "S" (A1J19-SOURCE)	28480	E4915-61604
3	E4915-61605	2	1	Cable "A" (A1J8-TEST)	28480	E4915-61605
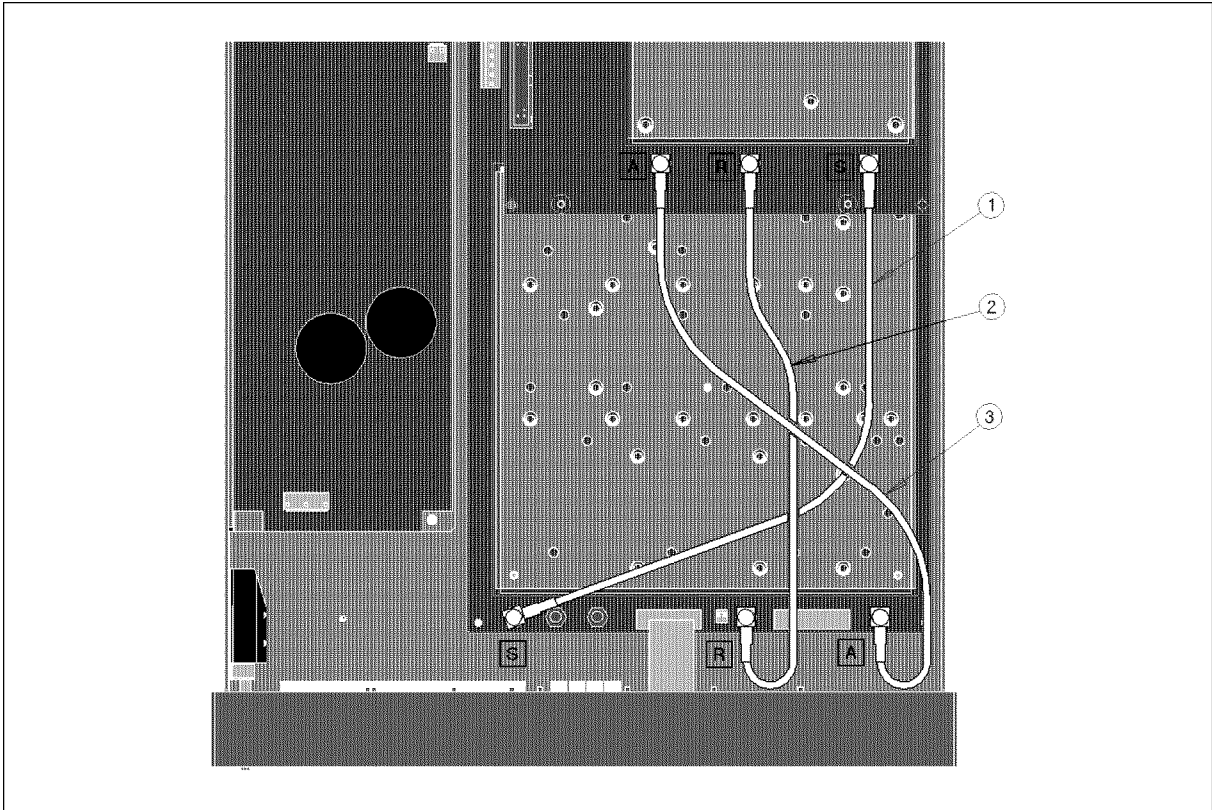
LES07023

Figure 4-18. Cables - A1 to A2 (E4916A)

Table 4-21. Cables - A1 to A2 (E4916A)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4916-61603	6	1	Cable "S" (A1J19-A2J1)	28480	E4916-61603
2	E4915-61601	9	1	Cable "R" (A1J12-A2J6)	28480	E4915-61601
3	E4916-61602	2	1	Cable "A" (A1J8-A2J2)	28480	E4916-61602
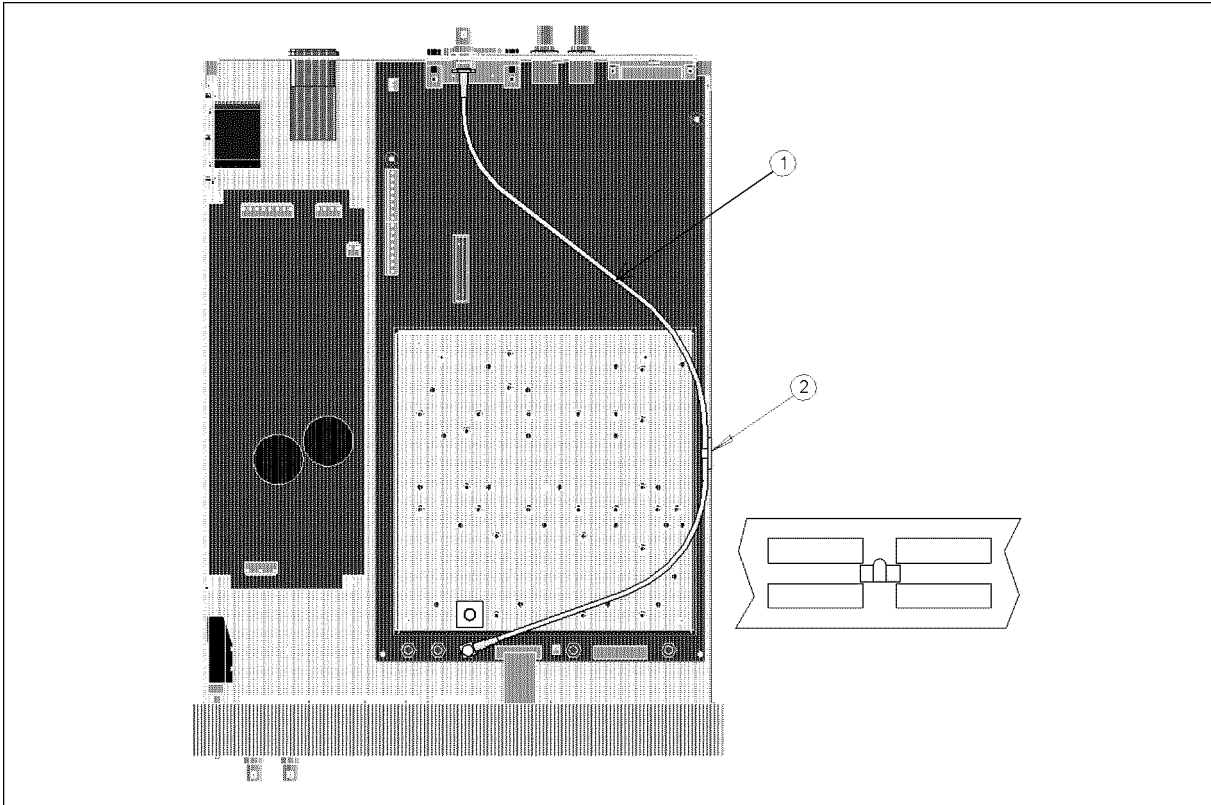
LES03006

Figure 4-19. Cables - A1 to ANALOG Output(Rear Panel)

Table 4-22. Cables - A1 to ANALOG Output(Rear Panel)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-61606	6	1	Cable "O" (A1J29-ANALOG)	28480	E4915-61606
2	1400-1334	9	1	Cable Clamp	28480	1400-1334
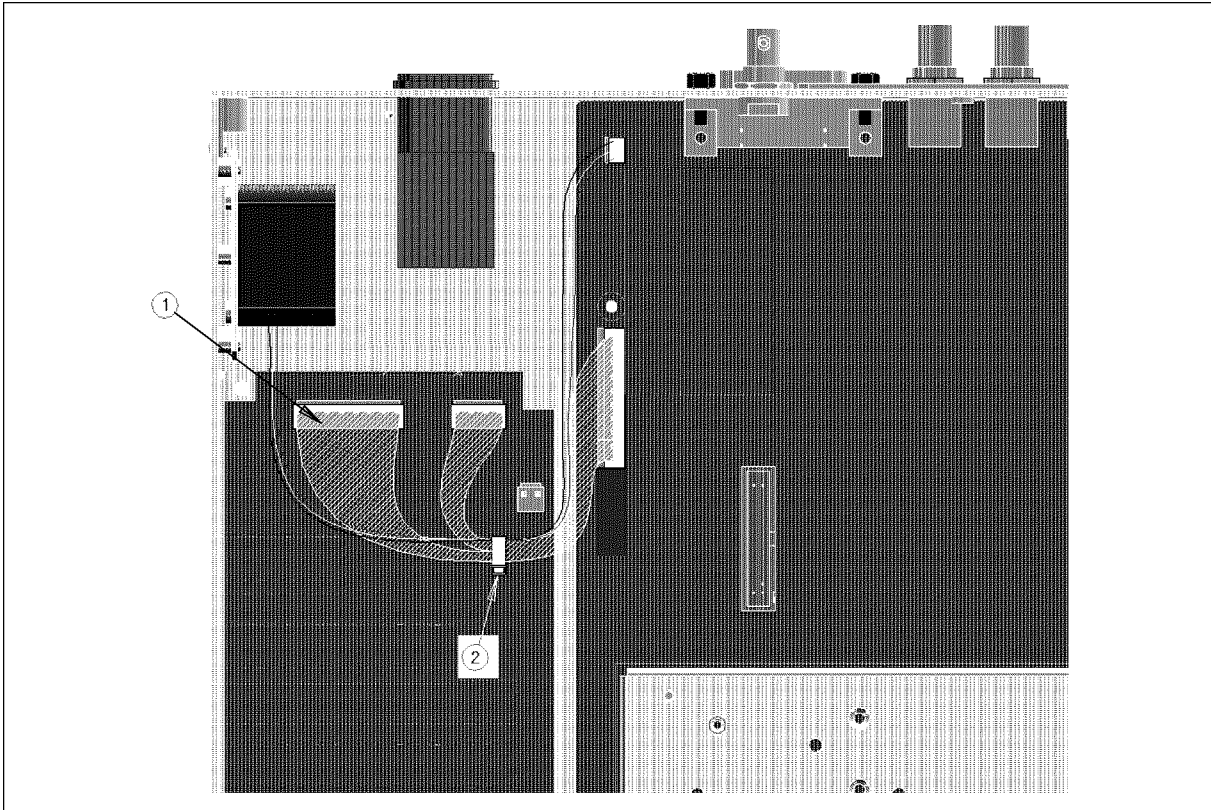
LES07026

Figure 4-20. Cables - A1 to Power Supply Assembly

Table 4-23. Cables - A1 to Power Supply Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-61632	6	1	Cable Assembly (A1J11-CN4/CN5)	28480	E4915-61632
2	1400-0249	9	1	Cable Tie	28480	1400-0249

Power Switch Assemblies
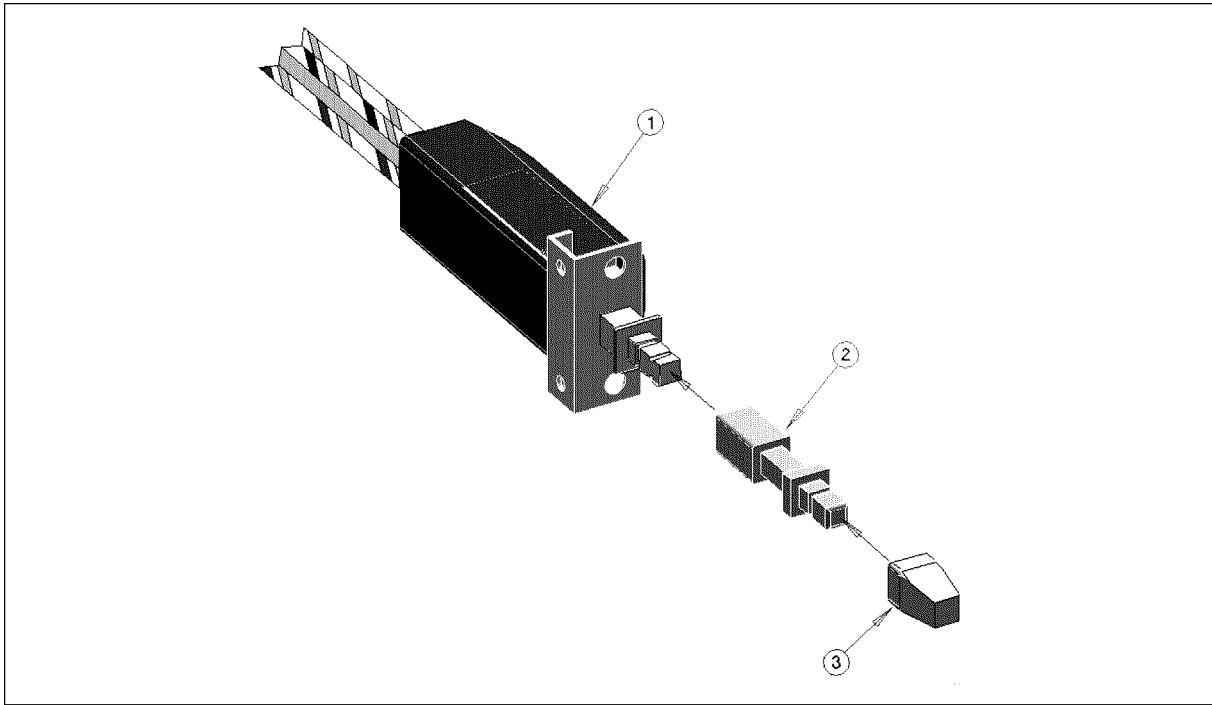
LES07027

Figure 4-21. Power Switch Assembly

Table 4-24. Power Switch Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-61631	6	1	Cable Assembly	28480	E4915-61631
2	5040-3501	9	1	Shaft	28480	5040-3501
3	0370-2862	0	1	Keycap PB White	28480	0370-2862
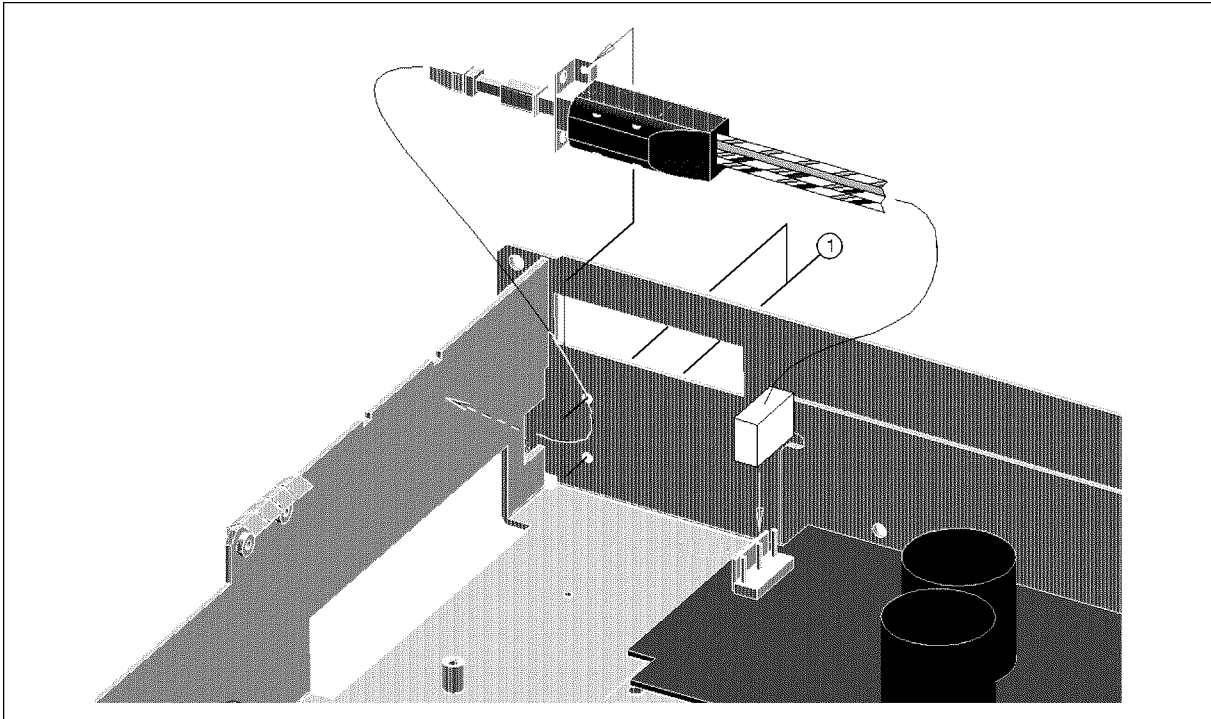
LES07028

Figure 4-22. Power Switch Screws

Table 4-25. Power Switch Screws

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0515-0999	6	2	Screw Mach M3X0.5	28480	0515-0999
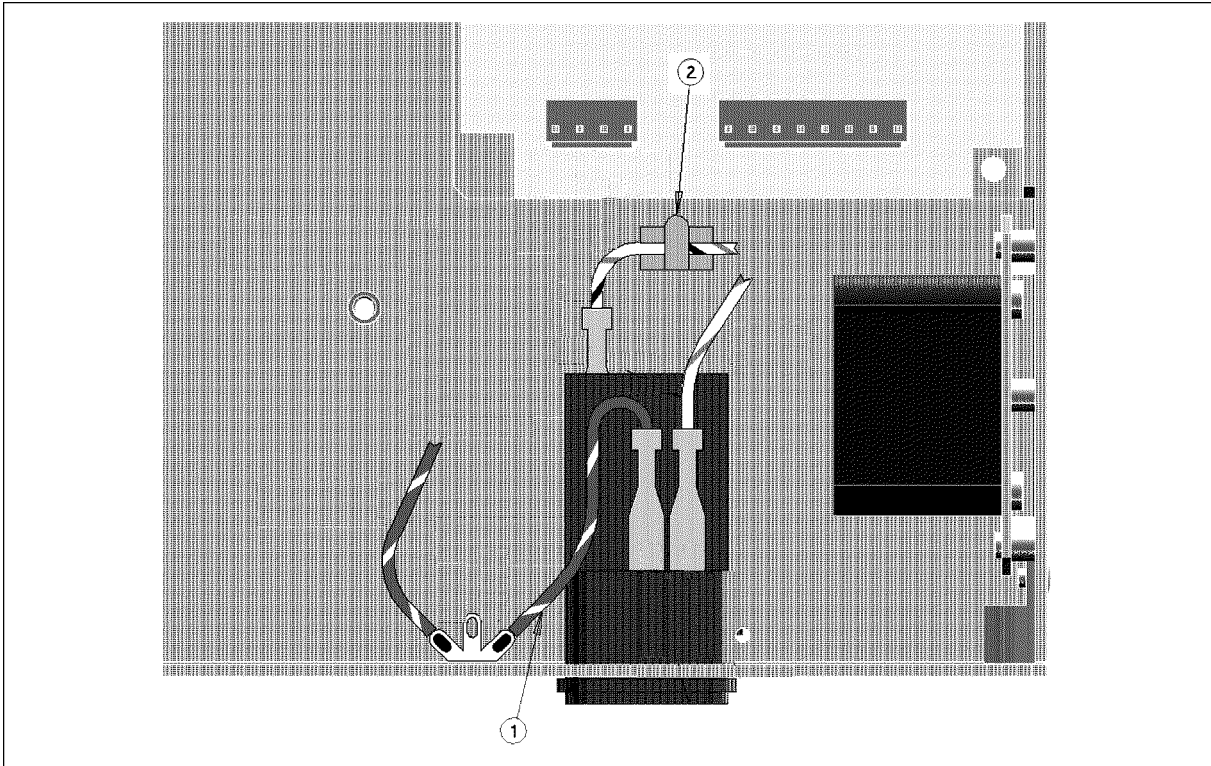
LES07029

Figure 4-23. AC Inlet Connection

Table 4-26. AC Inlet Connection

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61640	6	1	Wire Assembly GND	28480	E5100-61640
2	1400-1334	7	1	Cable Clamp	28480	1400-1334
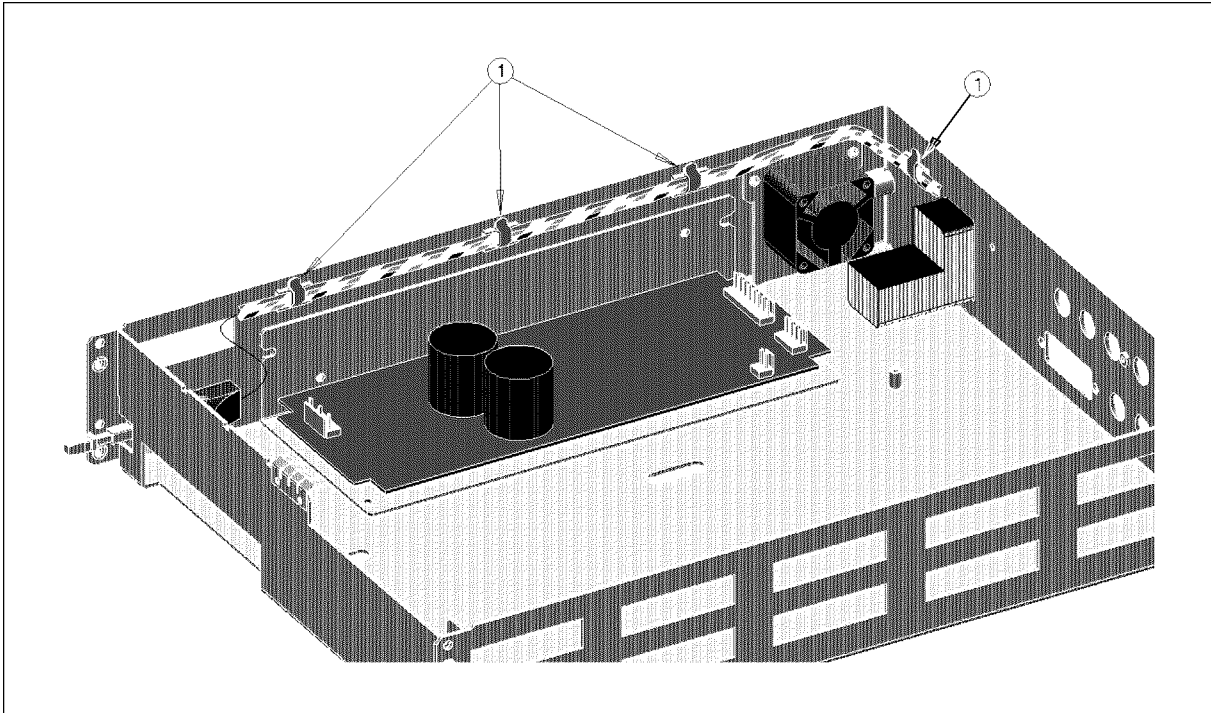
LES03007

Figure 4-24. Power Switch Cable Clamp

Table 4-27. Power Switch Cable Clamp

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	1400-1334	7	4	Cable Clamp	28480	1400-1334

Fan, AC Inlet, and Fuse
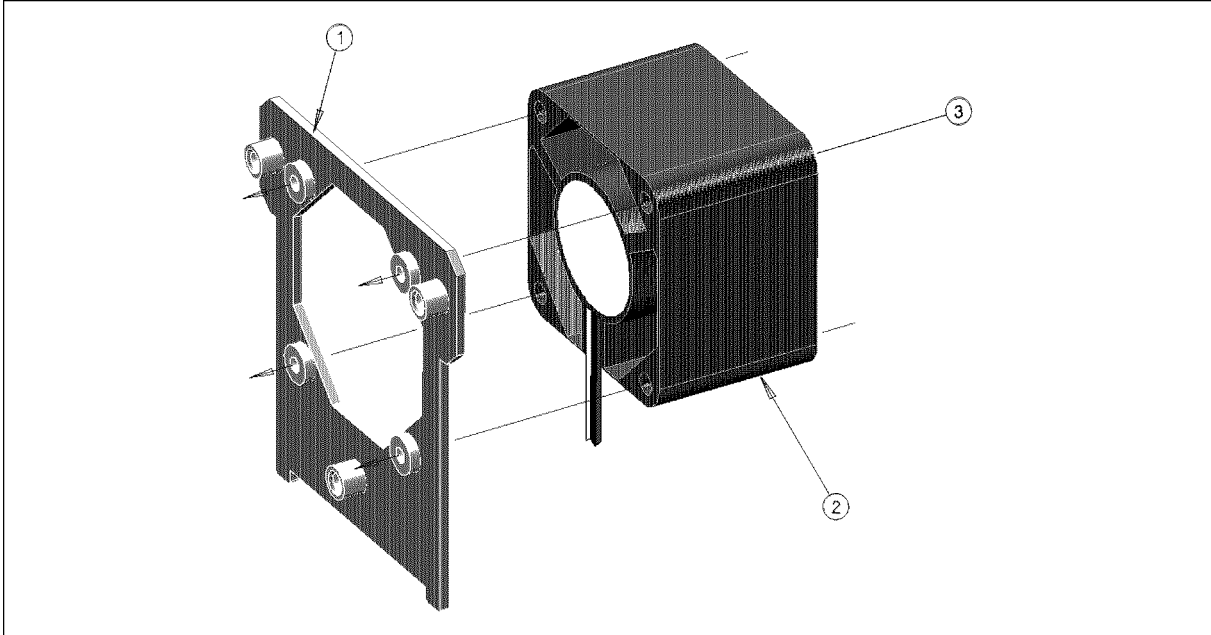
LES07031

Figure 4-25. Fan Assembly

Table 4-28. Fan Assembly

Ref. Desig.	Agilent Part Number	CD	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-01201	7	1	Plate	28480	E4915-01201
2	E4915-61607	3	1	Cable Assembly	28480	E4915-61607
3	0515-0990	1	4	Screw Mach M3x0.5	28480	0515-0990
	2190-0584	2	4	Washer	28480	2190-0584
	3050-0891	1	4	Washer M3	28480	3050-0891
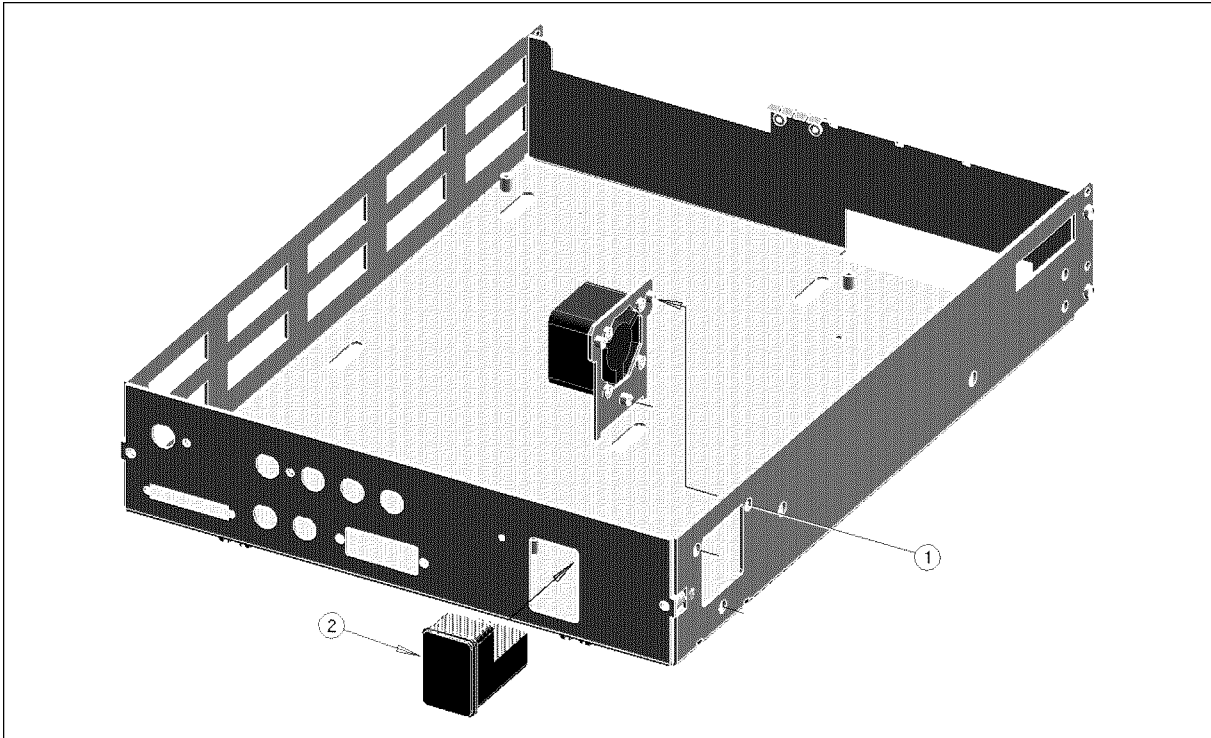
LES07032

Figure 4-26. Fan Assembly Screws, AC Inlet, and Fuse

Table 4-29. Fan Assembly Screws, AC Inlet, and Fuse

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0515-0914	7	3	Screw Mach M3x0.5	28480	0515-0914
2	1252-6951	3	1	AC Inlet	28480	1252-6951
	2110-0381	1	1	Fuse 3A 250V	28480	2110-0381
	2110-1134	3	1	Fuse Drawer	28480	2110-1134

Chassis Parts
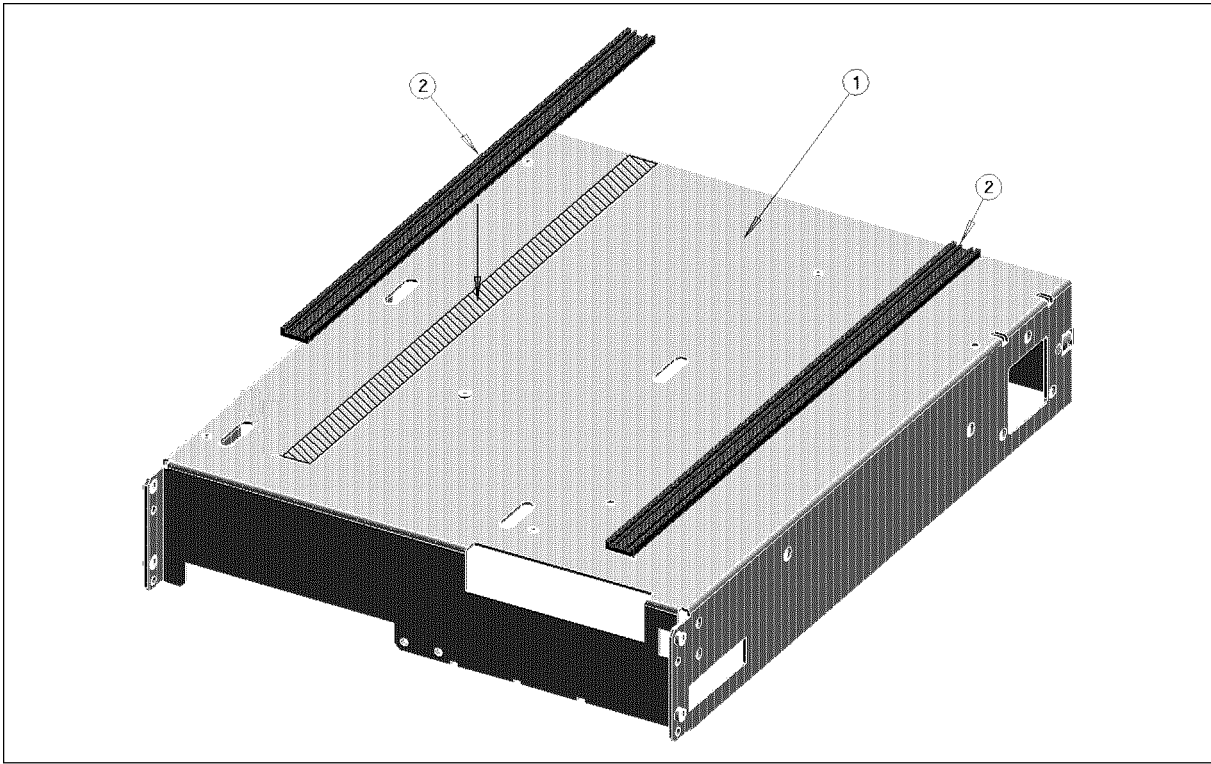
LES07033

Figure 4-27. Chassis

Table 4-30. Chassis

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E4915-00101	7	1	Chassis	28480	E4915-00101
2	5040-3347	3	2	Plate	28480	5040-3347
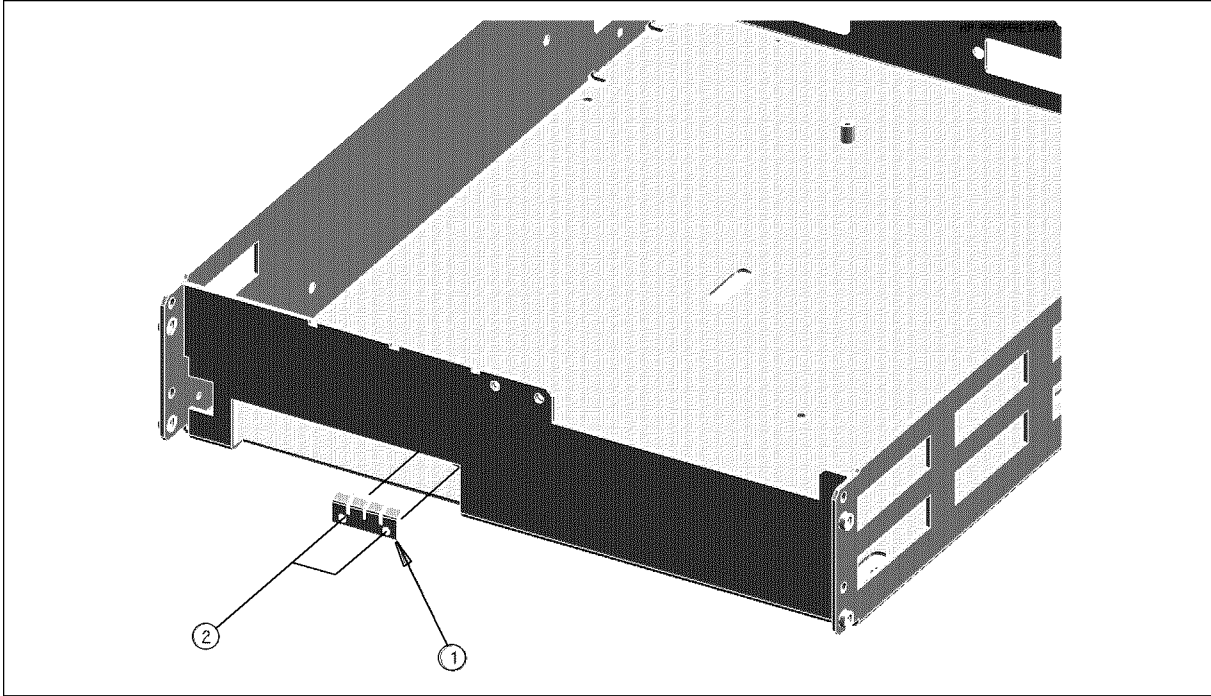
LES07034

Figure 4-28. Gasket

Table 4-31. Gasket

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	04263-07001	7	1	Gasket	28480	04263-07001
2	0515-1550	3	2	Screw M3L8 PH	28480	0515-1550
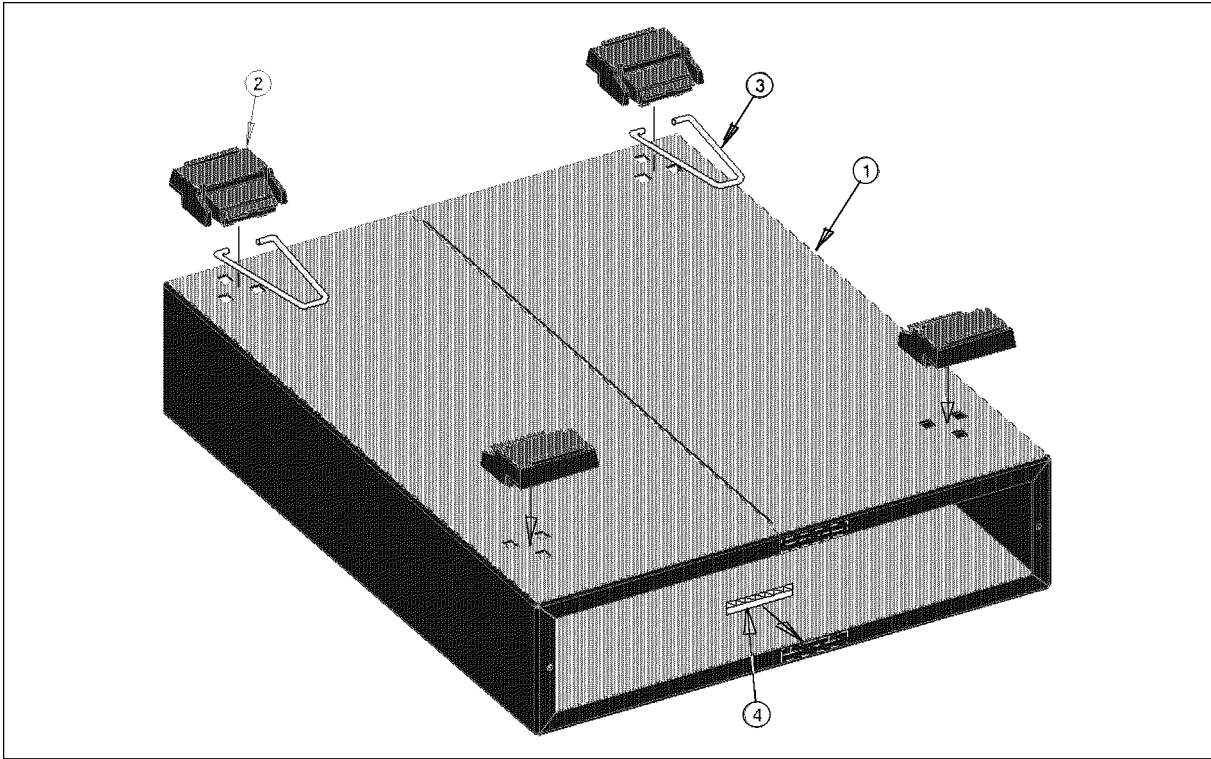
LES07035

Figure 4-29. Foot

Table 4-32. Foot

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	04339-04004	7	1	Outer Cover	28480	04339-04004
2	5041-9167	3	4	Foot	28480	5041-9167
3	1460-1345	0	2	Wireform	28480	1460-1345
4	0363-0125	5	2	Shield Gasket	28480	0363-0125
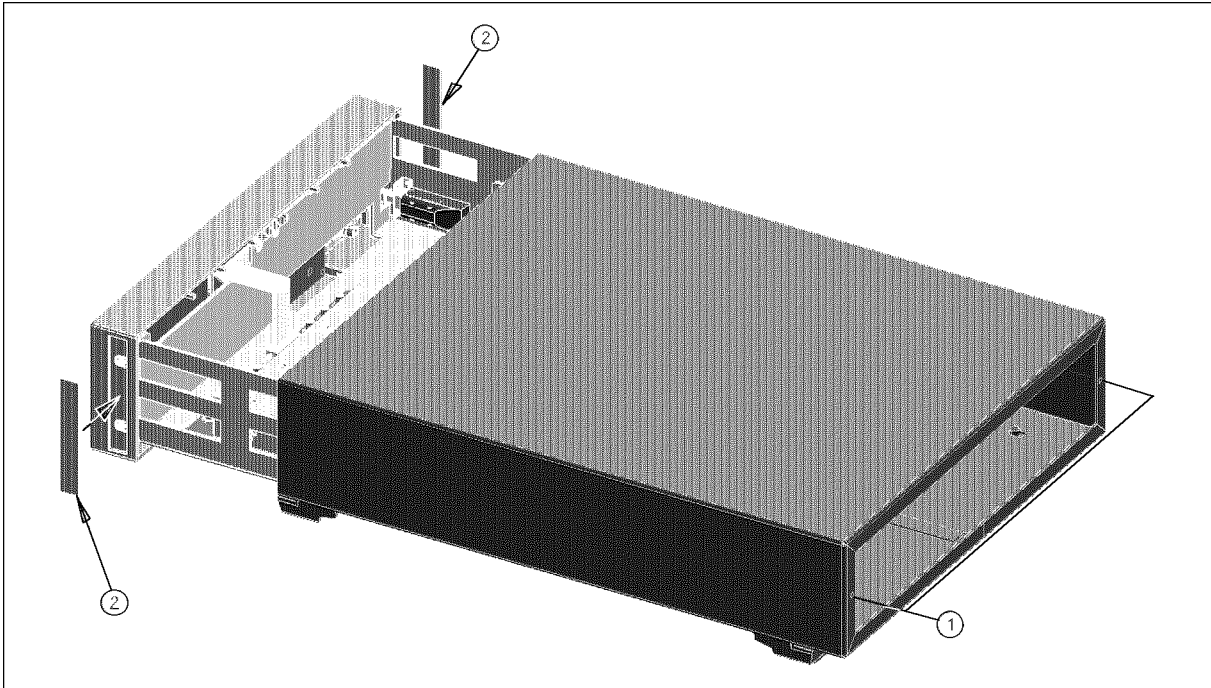
LES07036

Figure 4-30. Outer Cover Screws and Side Trim

Table 4-33. Outer Cover Screws and Side Trim

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0515-1551	7	2	Screw M3L10 PH	28480	0515-1551
2	5041-9170	3	2	Side Trim	28480	5041-9170

Table 4-34. Furnished Accessories

Ref. Desig.	Agilent Part Number	CD	Qty.	Description	Mfr Code	Mfr Part Number
	8120-1838	7	2	BNC Cable 30cm (E4915A)	28480	8120-1838
	8120-1840	3	2	BNC Cable 120cm (E4916A)	28480	8120-1840
	E4915-90040	4	1	Operation Manual -English (Opt.ABA)	28480	E4915-90040
	E4915-90041	5	1	Users Guide -English (Opt.ABA)	28480	E4915-90041
	E4915-97040	8	1	Operation Manual -Japanese (Opt.ABJ)	28480	E4915-97040
	E4915-97041	9	1	Users Guide -Japanese (Opt.ABJ)	28480	E4915-97041

Table 4-35. Firmware Disk

Ref. Desig.	Agilent Part Number	CD	Qty.	Description	Mfr Code	Mfr Part Number
	E4915-18006	0	1	Firmware Disk Rev. 2.10[1]	28480	E4915-18006

1 Lastest as of May 1998.

Table 4-36. Miscellaneous Accessories

Ref. Desig.	Agilent Part Number	CD	Qty.	Description	Mfr Code	Mfr Part Number
				DOCUMENTATION		
	E4915-90110			E4915A/E4916A Service Manual	28480	E4915-90110

5

Replacement Procedures

Introduction

This chapter contains the procedures and lists the tools required to remove the major assemblies from the E4915A/E4916A. To install an assembly, after you make repairs, reverse the order of steps you performed for the removal of that assembly.

Outer Cover Removal

Tools Required

■ Pozidriv screwdriver, pt size #2 (medium)

Procedure

1. Disconnect the power cable from the E4915A/E4916A.
2. Remove the four bottom feet.
3. Remove the two outer cover screws from the rear panel.
4. Slide off the outer cover toward the rear and remove it.

A2 Sub Board Removal (E4916A)

Tools Required

■ Pozidriv screwdriver, pt size #1 (small)

Procedure

1. Remove the outer cover as described in "Outer Cover Removal".

2. Remove the flat cable connected to the A2 sub board.

3. Remove the coaxial cables from the A2 board.

4. Remove the four nuts and screws of SOURCE, GROUND, REFERENCE, and TEST connectors on the rear panel.

5. Remove the two screws and two nuts of the GPIB connector on the rear panel.

6. Remove the two screws of the handler interface connector on the rear panel.

7. Remove the five screws and one washer from the A1 board.

8. Slide the A1 board toward the front pannel and remove it.

A1 Main Board Removal

Tools Required

■ Pozidriv screwdriver, pt size #1 (small)

Procedure

1. Remove the outer cover as described in "Outer Cover Removal".

2. Remove the A2 board as described in "A2 Sub Board Removal (E4916A)" (E4916A).

3. Remove the flat cable from the A1 board.

4. Remove the two nuts and screws of EXT REF Input and EXT TRIGGER connectors on the rear panel.

Front Panel Removal

Tools Required

■ Pozidriv screwdriver, pt size #2 (medium)

Procedure

1. Remove the outer cover as described in "Outer Cover Removal".
2. Remove the cables which is connected to the A1 and A2 boards.
3. Remove the two side strips which cover the four screws.
4. Remove the four side screws.
5. Remove the front pannel assembly.

Power Supply Assembly Removal

Tools Required

■ Pozidriv screwdriver, pt size #1 (small)

Procedure

1. Remove the outer cover as described in "Outer Cover Removal".
2. Remove the A2 board as described in "A2 Sub Board Removal (E4916A)".
3. Remove the A1 board as described in "A1 Main Board Removal" (E4916A).
4. Remove the flat cables from the power supply assembly.
5. Remove the three screws of the power supply assembly.
6. Remove the power supply assembly.

6

Board Configuration

Introduction

This chapter contains the board configuration information for the A1 Main board. The jumper and bit switch settings must be confirmed before the A1 board is installed.

A1 Board Configuration

A1 jumper and bit switch location is shown in Figure 6-1.
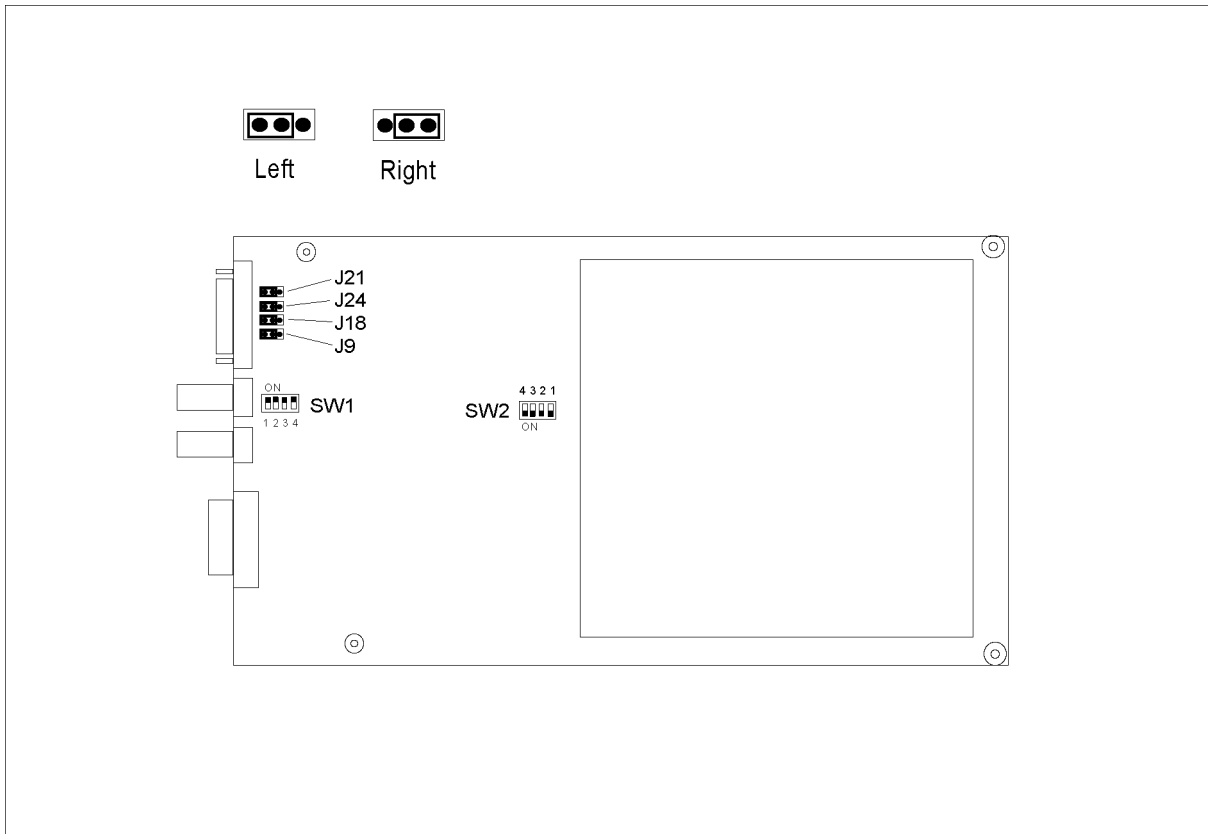
LES09001

Figure 6-1. A1 Jumper and Bit Switch Location

Jumper Settings

The jumper settings of A1J21, A1J24, A1J18, and A1J9 are shown in Table 6-1.

Note   The setting of the A1 jumpers does **not** depend on the options or other configuration.

Table 6-1. A1 Jumper Settings

J21	J24	J18	J9
Left	Left	Left	Left

Bit Switch Settings

The settings of bit switch A1SW1 and A1SW2 are shown in Table 6-2.

Note	The setting of the A1 bit switches does **not** depend on the options or other configuration.

Table 6-2. A1 Switch Settings

	Bit Number			
	1	2	3	4
A1SW1	ON	ON	ON	ON
A1SW2	ON	ON	ON	ON

7

Post Repair Procedures

Introduction

The Table 7-1 lists the procedures which must be performed after the replacement of an assembly. When you replace an assembly, confirm the Board Configuration and perform the Adjustments/Performance Tests following Table 7-1.

Table 7-1. Post Repair Procedures

Replaced Assembly	Board Config.	Required Adjustments/ Performance Tests	Other Verification

A1 Main	Yes[1]	Firmware Installation (INSTALL_FW)
		 ID Writing (WRITE_ID)
		 All adjustments/performance tests:
		  Pre-check and Source Linearity Calibration
		  Oscillator Calibration
		  Source Level Accuracy and Source Power Linearity Test
		  Frequency Accuracy Test
		  Trough Calibration
		  Receiver Test
		  Isolation Test
		  Open Calibration with PI-network Test Fixture
		  Short Calibration with PI-network Test Fixture
		  Load Calibration with PI-network Test Fixture
		  Load Test with PI-network Test Fixture
		  Open Calibration with Impedance Probe[2]
		  Short Calibration with Impedance Probe[2]
		  Load Calibration with Impedance Probe[2]
		  Load Test with Impedance Probe[2]
			Self Test

1 See *Board Configuration*.

2 For the E4916A with Option 001 only.

Table 7-1. Post Repair Procedures (continued)

Replaced Assembly	Board Config.	Required Adjustments/ Performance Tests	Other Verification

A2 Sub	None	All adjustments/performance tests:
		  Pre-check and Source Linearity Calibration
		  Oscillator Calibration
		  Source Level Accuracy and Source Power Linearity Test
		  Frequency Accuracy Test
		  Trough Calibration
		  Receiver Test
		  Isolation Test
		  Open Calibration with PI-network Test Fixture
		  Short Calibration with PI-network Test Fixture
		  Load Calibration with PI-network Test Fixture
		  Load Test with PI-network Test Fixture
		  Open Calibration with Impedance Probe[1]
		  Short Calibration with Impedance Probe[1]
		  Load Calibration with Impedance Probe[1]
		  Load Test with Impedance Probe[1]
			Self Test

Power Supply (0950-3174)	None	All adjustments/performance tests:
		  Pre-check and Source Linearity Calibration
		  Oscillator Calibration
		  Source Level Accuracy and Source Power Linearity Test
		  Frequency Accuracy Test
		  Trough Calibration
		  Receiver Test
		  Isolation Test
		  Open Calibration with PI-network Test Fixture
		  Short Calibration with PI-network Test Fixture
		  Load Calibration with PI-network Test Fixture
		  Load Test with PI-network Test Fixture
		  Open Calibration with Impedance Probe[1]
		  Short Calibration with Impedance Probe[1]
		  Load Calibration with Impedance Probe[1]
		  Load Test with Impedance Probe[1]
			Self Test

Key Board (E4915-66504)	None	None	Self Test
LCD Display (04263-61010)	None	None	Observation

1 For the E4916A with Option 001 only.

Firmware Installation Procedure (INSTALL_FW)

1. Prepare a firmware disk. The Agilent Part Number for the latest firmware disk (REV.2.10) as of May 1998 is E4915-18006.

Table 7-2. Latest Firmware Disk (As of May 1998)

Agilent Part Number	Qty.	Description
E4915-18006	1	Firmware Disk Rev. 2.10

2. Setup the PC environment which is used for adjustments and performance tests of the E4915A/E4916A. (see *Adjustments and Performance Tests*)

3. Connect the E4915A/E4916A to the PC through the GPIB cable.

4. Start the Adjustment/Performance Test Program.

5. Select "INSTALL_FW" in the list box on the program display and click OK .

6. Follow the instructions of the program.

Note New firmware installation is required after A1 Main assembly is replaced.

ID Writing Procedure (WRITE_ID)

1. Setup the PC environment which is used for adjustments and performance tests of the E4915A/E4916A. (see *Adjustments and Performance Tests*)

2. Connect the E4915A/E4916A to the PC through the GPIB cable.

3. Start the Adjustment/Performance Test Program.

4. Select "WRITE_ID" in the list box on the program display and click OK .

5. Follow the instructions of the program.

Note
a. If the Model, Serial No., and Option information in the "Check ID DATA (Write)" field in the "WRITE ID DATA" window is incorrect, you must click EXIT , click Cancel in the "List Box" window, click EXIT in the "Select Model" window to exit the program, and then click Start to restart the program.

b. The installation status of the E4916A Option 001 (Add Impedance Probe) is not saved into the E4916A's internal memory. This means "001" is not appeared on the "ID DATA SET AS FOLLOWS :" field in the "CHECK ID DATA" window.

c. ID writing must be performed after A1 Main assembly is replaced.

Self Test Procedure

1. Press (Blue),(Reset), ▶(select "Yes"),(Enter).

2. Press (Blue),(System), ▼,▼,▼,▼,Self Test, ▶(select "Yes"),(Enter).

3. Confirm that "SELF TEST: PASS" is displayed.

Performance Test Record

Agilent E4915A/E4916A Crystal Impedance / LCR Meter

Model: _____

Date: _____

Temperature: _____

Humidity: _____

Serial No.: _____

Tested by: _____

Source Level Accuracy Test

Output Level = −5 dBm

Frequency	Minimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
2.5 MHz	−3 dB	_____	3 dB	±0.28 dB
10.0 MHz	−3 dB	_____	3 dB	±0.28 dB
50.0 MHz	−3 dB	_____	3 dB	±0.28 dB
120.0 MHz	−3 dB	_____	3 dB	±0.28 dB
175.0 MHz	−3 dB	_____	3 dB	±0.28 dB

Source Power Linearity Test (E4916A only)

Relative to −5 dBm Output Level at 10 MHz

Output Level	Minimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
−20 dBm (−15 dB)	−2 dB	_____	2 dB	±0.39 dB
−10 dBm (−5 dB)	−2 dB	_____	2 dB	±0.39 dB
0 dBm (+5 dB)	−2 dB	_____	2 dB	±0.39 dB
+10 dBm (+15 dB)	−2 dB	_____	2 dB	±0.39 dB

Frequency Accuracy Test

Frequency	Minimum Limit	Test Result	Maximum Limit	Measurement Uncertainty
10 MHz	9.99998 MHz	_____	10.00002 MHz	±2.20 Hz

Function Test Record

Receiver Test

Pass	Fail
[ ]	[ ]

Messages

Error Messages

This appendix lists the messages that are displayed on the E4915A/E4916A's LCD screen or transmitted by the instrument over GPIB in numerical order.

Instrument Errors

12 `ROM TEST FAILED`

A checksum error occurred in the ROM. The ROM must be replaced with new one. Contact your nearest Agilent Technologies office.

13 `RAM TEST FAILED`

A checksum error occurred in the RAM. The RAM must be replaced with new one. Contact your nearest Agilent Technologies office.

14 `FLASH MEM R/W FAILED`

A read/write error occurred in the flush memory. The flash memory must be replaced with new one. Contact your nearest Agilent Technologies office.

15 `User cal data lost`

Calibration/Compensation data or instrument setting data was lost from the Flash memory. The Flash memory must be replaced with new one. Contact your nearest Agilent Technologies office.

16 `Prev. setting lost`

Instrument settings were lost from the backup memory. Note that the E4915A/E4916A retains the instrument settings in the backup memory for a certain period after the power was turned OFF.

17 `Save failed`

The E4915A/E4916A failed to write data into the flush memory. The flash memory must be replaced with new one. Contact your nearest Agilent Technologies office.

18 `Recall failed`

The flash memory contains no instrument settings stored, or does contain illegal data or value the E4915A/E4916A cannot recognize (possibly due to a cheksum error in the stored data). The flash memory must be replaced with new one. Contact your nearest Agilent Technologies office.

19 `Printer no response`

This error occurs when:

■ The printer has no power cord connected

■ The printer is not correctly connected through a valid GPIB cable to your E4915A/E4916A

■ The printer is not set to "`Listen Always`" mode.

Correctly connect or set the printer.

21 `Lockout by handler`

The front panel keys are currently locked via the Handler interface. The key lock function applied via the Handler interface can only be released via the Handler interface, not via the front panel keys or GPIB commands.

22 `Invalid range`

You attempted to enter a value beyond the paremter's valid range. To avoid this error, be sure to enter a value within the valid range.

23 `Search fail`

The E4915A/E4916A failed to find resonance frequency. Change the nominal frequency, search range, or some other parameter to the proper value.

26 `Start point > nop`

The start point is over NOP for EM/DLD measurement mode.

27 `Out of Limit`

LOAD calibration data is over the limit. When this error occurs after OPEN and SHORT calibration,LOAD calibration is not completed correctly. In this case,perform LOAD calibration again. You can ignore this error message when it occures before OPEN and SHORT calibration. In this case this error may occure even no problem.

28 `Code Test Fail`

Program data in the flash memory is corrupt. Contact your nearest Agilent Technologies office to repaire the flash memory.

GPIB Errors

-100 `Command error`

This is a generic syntax error that the E4915A/E4916A cannot detect more specific errors. This code indicates only that a command error, as defined in IEEE 488.2, 115.1.1.4, has occurred.

-101 `Invalid character`

A syntax element contains a character which is invalid for that type; for example, a header containing an ampersand, `SENSE&`

-102 `Syntax error`

An unrecognized command or data type was encountered; for example, a string was received when the E4915A/E4916A was not expecting to receive a string.

-103 `Invalid separator`

The syntax analyzer was expecting a separator and encountered an illegal character; for example, the semicolon was omitted after a program message unit, `*RST:TRIG`.

-104 `Data type error`

The syntax analyzer recognized an unallowed data element; for example, numeric or string data was expected but block data was encountered.

-105 `GET not allowed`

A group Execute Trigger (GET) was received within a program message (see IEEE488.2,7.7).

-108 `Parameter not allowed`

More parameter were received than expected for the header; for example, the `AVER` command only accepts one parameter, so receiving `AVER 2,4` is not allowed.

-109 `Missing parameter`

Fewer parameters were received than required for the header; for example, the `AVER` commands requires one parameter, so receiving `AVER` is not allowed.

-112 `Program mnemonic too long`

The header contains more than twelve characters (see IEEE 488.2,7.6.1.4.1).

-113 `Undefined header`

The header is syntactically correct, but it is undefined for the E4915A/E4916A for example, `*XYZ` is not defined for the E4915A/E4916A.

-121 `Invalid character in number`

An invalid character for the data type being parsed was encountered; for example, an alpha character in a decimal number or a "9" in octal data.

-123 `numeric overflow`

The magnitude of exponent was larger than 32000 (se IEEE488.2,7.7.2.4.1).

-124 `Too many digits`

The mantissa of a decimal numeric data element contains more than 255 digits excluding leading zeros (see IEEE 488.2,7.7.2.4.1)

-128 `Numeric data not allowed`

Legal numeric data element was received, but the E4915A/E4916A does not accept it is this position for a header.

-131 `Invalid suffix`

The suffix does not follow the syntax described in IEEE 788.2,7.7.3.2, or the suffix is inappropriate for the E4915A/E4916A.

-138 `Suffix not allowed`

A suffix was encountered after a numeric element which does not allow suffixes.

-140 `Character data error`

This error, as well as errors -141 through -148, are generated analyzing the syntax of a character data element. This particular error message is used if the E4915A/E4916A cannot detect a more specific error.

-141 `Invalid character data`

Either the character data element contains an invalid character or the particular element received is not valid for the header.

-144 `Character data too long`

The character data element contains more than twelve characters (see IEEE 488.2, 7.7.1.4).

-148 `Character data not allowed`

A legal character data element was encountered that's prohibited by the E4915A/E4916A.

-150 `String data error`

This error as well as errors -151 through -158, are generated when analyzing the syntax of a string data element. This particular error message is used if the E4915A/E4916A cannot detect a more specific error.

-151 `Invalid string data`

A string data element was expected, but was invalid for some reason (see IEEE 488.2, 7.7.5.2); for example, an END message was received before the terminal quote character.

-158 `String data not allowed`

A string data element was encountered but was not allowed by the E4915A/E4916A at this point in the syntax analysis process.

-160 `Block data error`

This error as well as errors -161 through -168, are generated when analyzing the syntax of a block data element. This particular error message is used if the E4915A/E4916A cannot detect a more specific error.

-161 `Invalid block data`

A block data element was expected, but was invalid for some reason (see IEEE 488.2, 7.7.6.2); for example, an END message was received before the length was satisfied.

-168 `Block data not allowed`

A legal block data element was encountered but was not allowed by the E4915A/E4916A at this point in the syntax analysis process.

-170 `Expression error`

This error as well as errors -171 through -178, are generated when analyzing the syntax of an expression data element. This particular error message is used if the E4915A/E4916A cannot detect a more specific error.

-171 `Invalid expression`

The expression data element was invalid (see IEEE 488.2, 7.7.7.2); for example, unmatched parentheses or an illegal character.

-178 `Expression data not allowed`

A legal expression data was encountered but was not allowed by the E4915A/E4916A at this point in the syntax analysis process.

-200 `Execution error`

This is the generic syntax error that the E4915A/E4916A cannot detect more specific errors. This code indicates only that an execution error as defined in IEEE 488.2, 11.5.1.1.5 has occurred.

-211 `Trigger ignored`

A GET, *TRG, or triggering signal was received and recognized by the E4915A/E4916A but was ignored because of E4915A/E4916A timing considerations,\; for example, the E4915A/E4916A was not ready to respond.

-213 `Init ignored`

A request for a measurement initiation was ignored as another measurement was already in progress.

221 `Setting confict`

A legal program data element was parsed but could not be executed due to the current device state (see IEEE 488.2, 6.4.5.3 and 11.5.1.1.5).

-222 `Data out of range`

A legal program data element was parsed but could not be executed because the interpreted value was outside the legal range as defined by the E4915A/E4916A (see IEEE 488.2, 11.5.1.1.5).

-223 `Too much data`

A legal program data element of block, expression, or string type was received that contained more data than the E4915A/E4916A could handle due to memory or related device-specific.

-230 `Data corrupt or stale`

Possibly invalid data; new reading started but not completed since access.

-241 `Hardware missing`

A legal program command or query could not be executed because of missing E4915A/E4916A hardware; for example, an option was no installed.

310 `System error`

Some error, termed "system error" by the E4915A/E4916A, has occurred.

-311 `Memory error`

An error was detected in the E4915A/E4916A's memory.

-313 `Calibration memory lost`

The nonvolatile calibration data has lost.

-350 `Queue overflow`

A specific code entered into the queue in lieu of the code that caused the error. This code indicates that there is no room in the queue and an error occurred but was not recorded.

-400 `Query error`

This is the generic query error that the E4915A/E4916A cannot detect more specific errors. This code indicates only that a error as defined in IEEE 488.2, 11.5.1.1.7 and 6.3 has occurred.

-410 `Query INTERRPUTED`

A condition causing an interrupted error occurred (see IEEE 488.1, 6.3.2.3); for example, a query followed by DAB or GET before a response was completely sent.

-420 `Query UNTERMINATED`

A condition causing an unterminated query error occurred (see IEEE 488.2, 6.3.2); for example, the E4915A/E4916A was addressed to talk and an incomplete program message was received.

-430 `Query DEADLOCKED`

A condition causing an deadlocked query error occurred (see IEEE 488.2, 6.3.1.7); for example, both input buffer and output buffer are full and the E4915A/E4916A cannot continue.

-440 `Query UNTERMINATED after indefinite response`

A query was received in the same program message after an query requesting an indefinite response was executed (see IEEE 488.2, 6.5.7.5.7).