Agilent E5100A/B Network Analyzer

Service Manual

SERIAL NUMBERS

This manual applies directly to instruments with serial number prefix "JP1KC" and above, and whose firmware is version 1.0 and above.

Agilent Technologies

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Notice

The information contained in this document is subject to change without notice.

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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.

October 1996 .... Preliminary

July 1998 .... First Edition

March 1999 .... Second Edition (part number: E5100-90120)

June 2000 .... Third Edition (part number: E5100-90120)

October 2002 .... Fourth Edition (part number: E5100-90130)

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 are enclosed in .

Contents

Figures

Tables

1

General Information

Introduction

This manual contains technical information concerning the adjustment and servicing of the E5100A/B Network Analyzer.

Organization of Service Manual

Tabs are used to divide the major chapter of this manual. The names of the tabs following this chapter, and the contents, are described below.

- *Adjustments* provides instructions for adjustment and alignment of the instrument after repair or replacement of an assembly. The adjustments are the correction constants data updating by using the adjustments program.

Note The next seven, blue-tabbed chapters are the core troubleshooting chapters.

- *Troubleshooting*. The troubleshooting strategy is to systematically verify portions of the E5100A/B, and thus narrow down the cause of a problem to the defective assembly. This chapter is the first of a series of troubleshooting procedures. It checks the operation of the analyzer independent of system peripherals, and suggests how to remedy system problems. The *Operator's Check* is located in this chapter.
- *Isolate Faulty Group* is used after a problem has been shown to be in the analyzer. This initial *instrument* troubleshooting section can be used to isolate the fault to one of the five functional groups in the analyzer.
  - □ Power Supply
  - □ Digital Control
  - □ Source
  - □ Receiver
  - □ Accessories

  Each of the first functional group chapters above verifies its constituent assemblies until the faulty assembly is identified. *Accessories* verifies external RF cables and calibration kit devices. *Accessories* is the last of the blue-tabbed troubleshooting chapters.
- *Post-Repair Procedures* contains the *Table of Related Service Procedures* . It is a table of adjustments and verification procedures to be performed after repair or replacement of each assembly.

Note The following chapters are, for the most part, reference material.

- *Service Key Menus* documents the functions of the menus accessed from (System) MORE SERVICE MENU. These menus let the operator test, verify, control, and troubleshoot the E5100A/B. GPIB service mnemonics are included.
- *Theory of Operation* explains the overall operation of the instrument, the division into functional groups, and the operation of each functional group.
- *Replacement Procedures* provides procedures to disassemble portions of the instrument when certain assemblies are to be replaced.
- *Replacement Parts* provides part numbers and illustrations of the replaceable assemblies and miscellaneous chassis parts, together with ordering information.
- *Appendices* contains the manual changes information (required to make this manual compatible with earlier shipment configurations of the instrument), the service related error message, and the motherboard pin assignment list.

Instruments Covered by Manual

Agilent Technologies uses a two-part, nine character serial number which is stamped on the serial number plate (see Figure 1-1) attached to the rear panel. The first four digits and the letter are the serial prefix and the last five digits are the suffix. The letter placed between the two sections identifies the country where the instrument was manufactured. The prefix is the same for all identical instruments; it changes only when a change is made to the test set. 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.

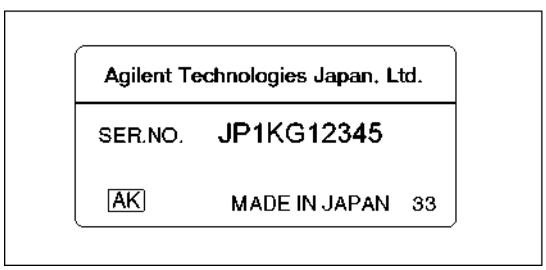

Figure 1-1. Serial Number Plate

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.

For servicing the E5100A with Option 509

The E5100A with Option 509 may not have display and front key control functions. When the E5100A with Option 509 is turned ON, there may be no information on the LCD display except for `***** Welcome *****`. For servicing the E5100A with Option 509, if it does not have the diaplay and key control functions, you must install new firmware with a firmware disk for Option 509 to obtain required display and key control functions . Refer to the *Digital Control Troubleshooting* chapter to choose and obtain the required firmware disk.

If the E5100A with Option 509 has the display and key control functions, you don't need to install the new firmware for servicing the analyzer.

Table of Service Test Equipment

The first part of Table 1-1 lists all of the equipment required to verify, adjust, and troubleshoot the E5100A/B and perform the operator's check. The table also notes the use and critical specifications of each item, and the recommended models.

Note

Adjustments 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$3.51) or Windows 95		1	A
Software	HP VEE ($\geq$4.0)		1	A
GPIB Interface Card	No substitute	82350/82340/82341	1	A
Spectrum Analyzer	Frequency: 100 Hz to 1.5 GHz	8566A/66B/68A/68B	1	P
Multimeter	No substitute	3458A	1	P, A
Frequency Counter	Frequency: 10 Hz to 300 MHz Accuracy: $<$ 0.25 ppm	5334B Opt.010,030/ 5335A Opt.010,030/ 5334B Opt.030 + 5061B/ 5335A Opt.030 + 5061B/ 5385A + 5071A 53181A Opt.010 or Opt.012[2]	1	P, A
Power Meter	No substitute	436A Opt.022[3], 437B, or 438A E4418A[4]	1	P, A
Power Sensor	Frequency: 100 kHz to 300 MHz Power: +5 dBm to -20 dBm	8482A	1	P, A
	Frequency: 10 MHz to 300 MHz Power: -20 to -60 dBm	8481D	1	P, A

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

2 The 53181A can not used for Performance Test.

3 The 436A Opt.022 can not be used for adjustment.

4 The E4418A can not used for Performance test

Table 1-1. Recommended Test Equipment (continued)

Equipment	Critical Specifications	Recommended Model	Qty	Use[1]
80 dB Step Attenuator	no substitute	8496A[1]/G with Opt.001 & H60[2]	1	P, A
Attenuator /Switch Driver	No substitute	11713A	1	P, A
Coaxial Loads	50 Ω Termination N type	909C Opt.012	2	P
	50 Ω Termination BNC type	11593A	4	P, A
	50 Ω Feedthrough, BNC(m)-BNC(f)	11048C or PN 04192-61002	1	P, A
Program	Adjustments Program (3.5 in)	PN E5100-65003	1	A
Attenuator Pad	Impedance 50 Ω, N(m)-N(f)			
	ATT 10 dB, VSWR < 1.015	8491A Opt.010 & H60[3]	2	P
	ATT 10 dB	8491A Opt.010	1	P
	ATT 20 dB	8491A Opt.020	1	P
	ATT 30 dB	8491A Opt.030	1	A
Cables	50 Ω N(m)-N(m), 61 cm	11500B	1	P
	50 Ω BNC(m)-BNC(m), 30 cm	PN 8120-1838	4	P, A
	50 Ω BNC(m)-BNC(m), 61 cm	PN 8120-1839	1	P, A
	50 Ω BNC(m)-BNC(m), 122 cm	PN 8120-1840	2	P
	GPIB Cable	10833A/B/C	3	A, T
Adapters	50 Ω, N(m)-N(m)	PN 1250-0778	1	P
	50 Ω, N(m)-BNC(f)	PN 1250-1476	5	P, A
	50 Ω, N(f)-BNC(m)	PN 1250-1477	1	P, A
	BNC(f)-Dual Banana Plug	PN 1251-2277	1	P, A
Power Splitter	Freq. Range: > 300 MHz, Two-way	11667A	1	P, A

1 The 8496A cannot be used for adjustment.

2 An 8496A/G step attenuator with required low VSWR(1.02) can be purchased by specifying option H60, then contact your nearest Agilent Technologies service center for the required calibration frequency and calibration uncertainty.

3 An 8491A Opt.010 fixed attenuator with required low VSWR (<1.015) can be purchased by specifying Opt.H60.

2

Performance Tests for E5100A/B Option 100/200/300/400/600

1. Frequency Accuracy Test

This test verifies the E5100A/B's internal synthesizer frequency accuracy at its highest frequency with an external frequency counter.

Specification

Frequency Range .... 10 kHz to 300 MHz
50 kHz to 300 MHz (with Opt.510)
Frequency Accuracy .... ±20 ppm at 23±5 °C (without Opt.1D5)
±1 ppm at 0 to 55 °C (20 min warm up,with Opt.1D5)

Test Equipment

Frequency Counter 5334B Opt.010,030
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839
50 Ω Termination BNC type .... 11593A (Opt.002 or Opt.003)

Procedure

1. Connect the BNC(m)-BNC(m) Cable(61cm) from E5100A/B RF OUT -1 to the Frequency Counter INPUT C as shown in Figure 2-1.

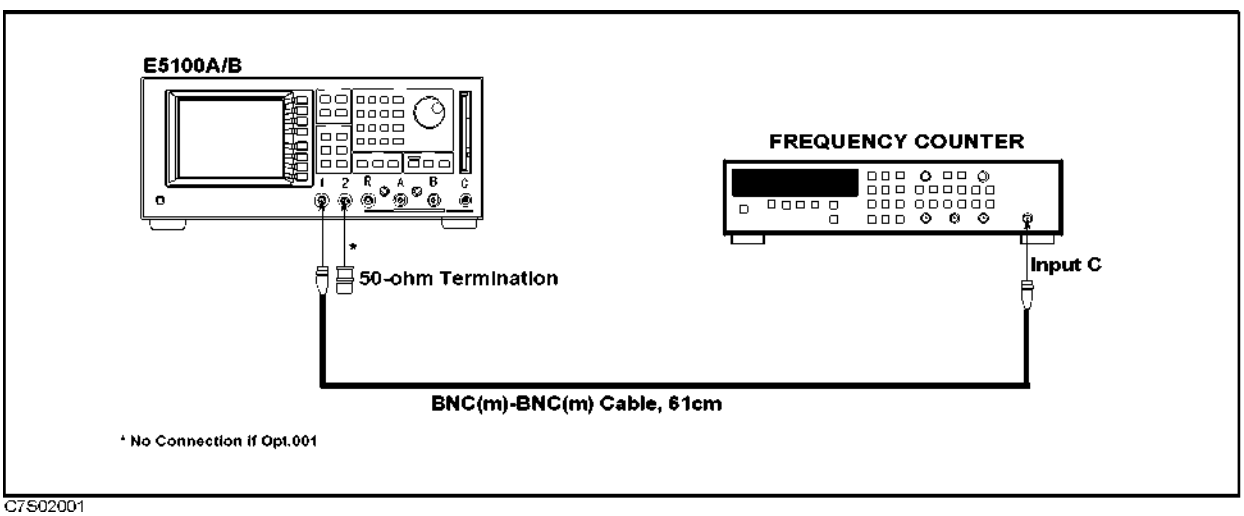

Figure 2-1. Frequency Range and Accuracy Test Setup

Note If the E5100A/B has Option 1D5, confirm that a BNC(m)-BNC(m) adapter is connected between the EXT REF INPUT (10/N MHz) connector and the REF OVEN (OptION 1D5) connector on the rear panel. If Option 1D5 is NOT installed, connect nothing to the EXT REF INPUT (10/N MHz) connector.

2. Set the gate time of the frequency counter to 100 ms
3. Set up the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Span Frequency = 0 Hz	(Span) (0) × 1
Center Frequency = 300 MHz	(Center) (300) × M

4. Record the frequency counter reading on the Performance Test Record.

2. Harmonics Test

This test measures the E5100A signal source's second harmonics and third harmonics with a spectrum analyzer.

Note The E5100B does not require this test.

Specification

Harmonics (for E5100A):

Opt.001 without Opt.010 .... < −35 dBc (at −4dBm output level)
Opt.002 without Opt.010 .... < −35 dBc (at −10dBm output level)
Opt.003 without Opt.010 .... < −35 dBc (at −7dBm output level)
Opt.001 with Opt.010 ....< −20 dBc (at +21 dBm output level)
Opt.002 with Opt.010 ....< −20 dBc (at +15 dBm output level)
Opt.003 with Opt.010 ....< −20 dBc (at +18 dBm output level)
Opt.600 ....< −20 dBc (at +15dBm output level)

Test Equipment

Spectrum Analyzer 8566A/66B/68A/68B
N(m)-BNC(f) Adapter ....Agilent P/N 1250-1476
BNC(m)-BNC(m) Cable, 122 cm ....Agilent P/N 8120-1840, 2 ea.
50 Ω Termination BNC type .... 11593A (Opt.002 or Opt.003)

Procedure

1. Set up the test configuration shown in Figure 2-2.

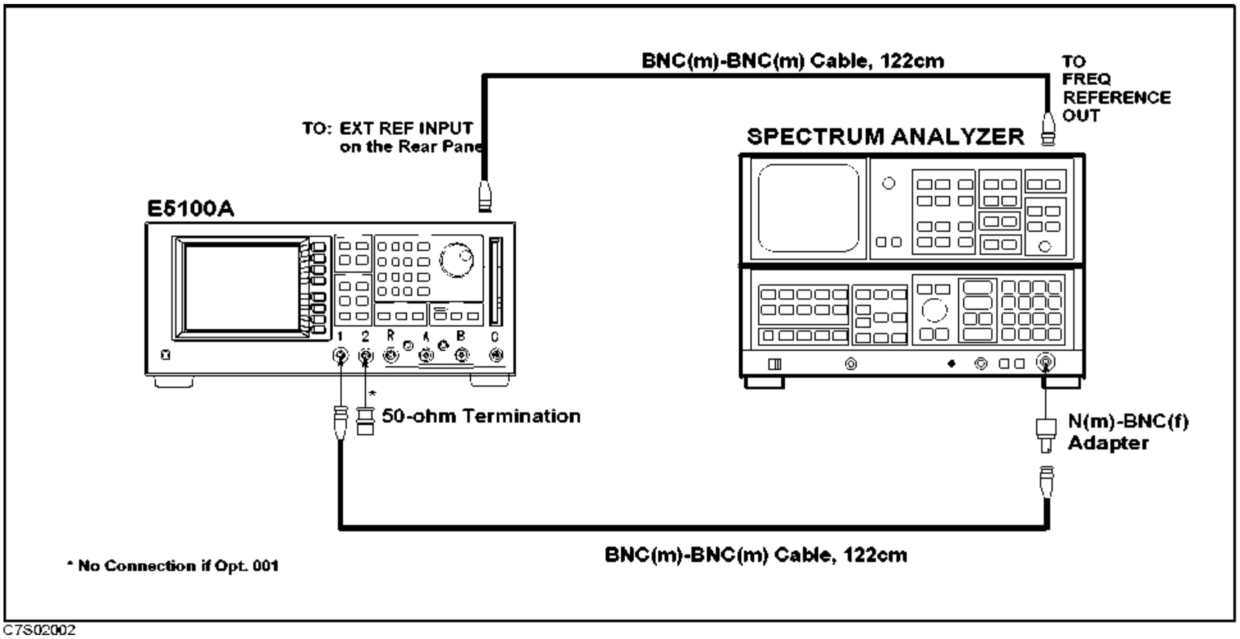

Figure 2-2. Harmonics Test Setup

Note

Harmonics Test, Non-Harmonic Spurious Test, and Phase Noise Test use the same test setup.

2. Set up the E5100A/B as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Source Power	
= –4 dBm (Opt.001 without Opt.010)	(Sweep) POWER (–4) × 1
= –10 dBm (Opt.002 without Opt.010)	(Sweep) POWER (–10) × 1
= –7 dBm (Opt.003 without Opt.010)	(Sweep) POWER (–7) × 1
= +21 dBm (Opt.001 with Opt.010)	(Sweep) POWER (21) × 1
= +15 dBm (Opt.002 with Opt.010)	(Sweep) POWER (15) × 1
= +18 dBm (Opt.003 with Opt.010)	(Sweep) POWER (18) × 1
= +15 dBm (Opt.600)	(Sweep) POWER (15) × 1
Span Frequency = 0 Hz	(Span) (0) × 1

3. Set the spectrum analyzer as follows:

Video Bandwidth	30 Hz
Without Opt.010: Reference Level	20 dB
With Opt.010: Reference Level	30 dB

4. Set the E5100A's center frequency and the spectrum analyzer's center frequency, span frequency, and resolution bandwidth according to the table below. Then record the spectrum analyzer readings (peak value) in the calculation sheet.

Table 2-1. Harmonics Test Setup

E5100A Center Frequency	Spectrum Analyzer		
	Center	Span	RBW
10 kHz[1]	10 kHz	1 kHz	100 Hz
	20 kHz	1 kHz	100 Hz
	30 kHz	1 kHz	100 Hz
100 kHz	100 kHz	10 kHz	1 kHz
	200 kHz	10 kHz	1 kHz
	300 kHz	10 kHz	1 kHz
1 MHz	1 MHz	10 kHz	1 kHz
	2 MHz	10 kHz	1 kHz
	3 MHz	10 kHz	1 kHz
10 MHz	10 MHz	10 kHz	1 kHz
	20 MHz	10 kHz	1 kHz
	30 MHz	10 kHz	1 kHz
100 MHz	100 MHz	10 kHz	1 kHz
	200 MHz	10 kHz	1 kHz
	300 MHz	10 kHz	1 kHz
200 MHz	200 MHz	10 kHz	1 kHz
	400 MHz	10 kHz	1 kHz
	600 MHz	10 kHz	1 kHz
300 MHz	300 MHz	10 kHz	1 kHz
	600 MHz	10 kHz	1 kHz
	900 MHz	10 kHz	1 kHz

1 E5100A with Option 510 does not require the harmomics test at this frequency.

5. Use the equation given on the calculation sheet to calculate the test results, and transcribe the test results to the performance test record.

3. Non-Harmonic Spurious Test

This test measures the E5100A/B's signal source Non-Harmonic Spurious signals which appear near the carrier frequency.

Specification

Non-Harmonic Spurious:

Opt.001 without Opt.010 .... < −45 dBc (at −4 dBm Output Level, ≤ 300 MHz)

Opt.002 without Opt.010 .... < −45 dBc (at −10 dBm Output Level, ≤ 300 MHz)

Opt.003 without Opt.010 .... < −45 dBc (at −7 dBm Output Level, ≤ 300 MHz)

Opt.001 with Opt.010 .... < −45 dBc (at +6 dBm Output Level, ≤ 300 MHz)

Opt.002 with Opt.010 .... < −45 dBc (at 0 dBm Output Level, ≤ 300 MHz)

Opt.003 with Opt.010 .... < −45 dBc (at +3 dBm Output Level, ≤ 300 MHz)

Opt.600 .... < −45 dBc (at 0 dBm Output Level, ≤ 300 MHz)

Test Equipment

Spectrum Analyzer 8566A/66B/68A/68B
N(m)-BNC(f) Adapter .... Agilent P/N 1250-1476
BNC(m)-BNC(m) Cable, 122 cm .... Agilent P/N 8120-1840, 2 ea.
50 Ω Termination BNC type .... 11593A (Opt.002 or Opt.003)

Procedure

1. Set up the test configuration shown in Figure 2-3.

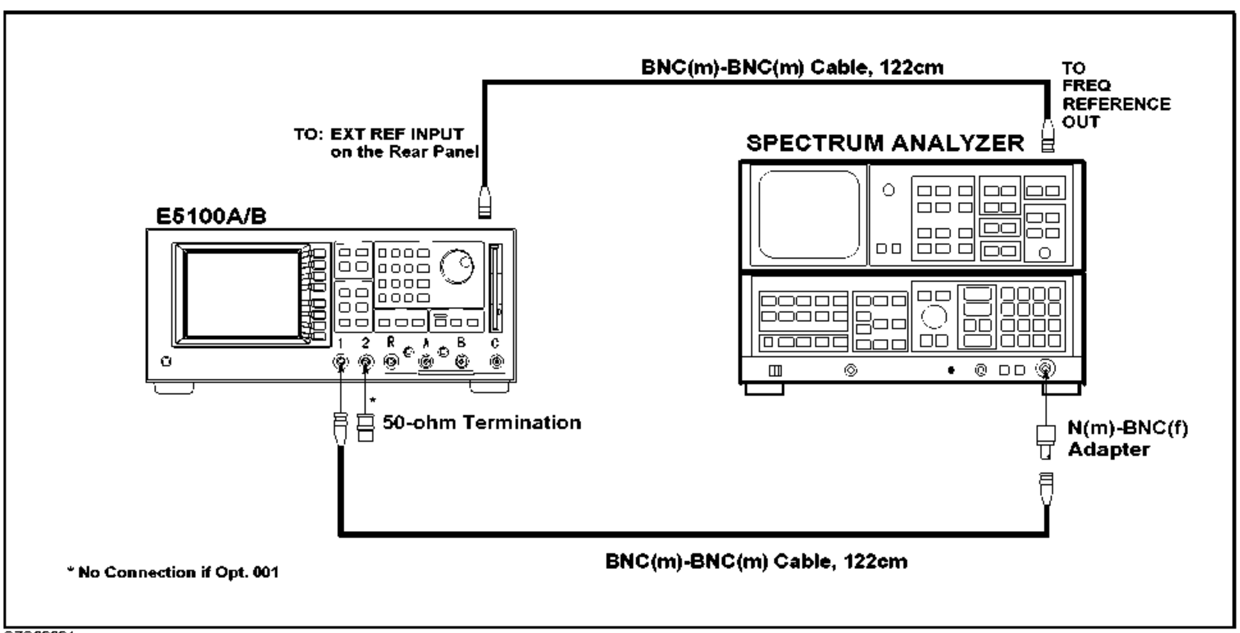

Figure 2-3. Non-Harmonic Spurious Test Setup

Note Harmonics Test, Non-Harmonic Spurious Test, and Phase Noise Test use the same test setup.

2. Set up the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Source Power	
= −4 dBm (Opt.001 without Opt.010)	(Sweep) POWER (−4) × 1
= −10 dBm (Opt.002 without Opt.010)	(Sweep) POWER (−10) × 1
= −7 dBm (Opt.003 without Opt.010)	(Sweep) POWER (−7) × 1
= +6 dBm (Opt.001 with Opt.010)	(Sweep) POWER (6) × 1
= 0 dBm (Opt.002 with Opt.010)	(Sweep) POWER (0) × 1
= +3 dBm (Opt.003 with Opt.010)	(Sweep) POWER (3) × 1
= 0 dBm (Opt.600)	(Sweep) POWER (0) × 1
Span Frequency = 0 Hz	(Span) (0) × 1

3. Set the spectrum analyzer as follows:

Video Bandwidth	300 Hz
Reference Level	0 dB

4. Obtain the required readings of the spectrum analyzer as follows:
   a. Set the E5100A/B's center frequency and the spectrum analyzer's center frequency, span frequency, and resolution bandwidth according to Table 2-2.
   b. Move the spectrum analyzer's marker to the peak value (fundamental) using the peak search function.
   c. Record the fundamental frequency and amplitude on the calculation sheet.
   d. Calculate the spectrum analyzer's center frequency for the sprious measurememt according to the calculation sheet, if necessary.
   e. Set the spectrum analyzer Center, Span, and RBW according to the table.
   f. Move the spectrum analyzer's marker to the peak value (Spurious Max.) using the peak search function.
   g. Record the spectrum analyzer reading on the calculation sheet.
   h. Repeat steps a. through g. until all frequencies in the table are completed.

Table 2-2. Non-Harmonic Spurious Test Setup

E5100A/B Center Frequency	Spectrum Analyzer			
	Center	Span	RBW	Marker
239.95 MHz	239.95 MHz	1 kHz	300 Hz	Fundamental (f_1)
	(f_1) − 10.417 kHz	1 kHz	300 Hz	Sprious Max.
	(f_1) + 10.417 kHz	1 kHz	300 Hz	Sprious Max.
	(f_1) + 100 kHz	1 kHz	300 Hz	Sprious Max.

5. Use the equation given on the calculation sheet to calculate the test results, and transcribe the test results to the performance test record.

4. Phase Noise Test

This test measures the E5100A/B signal source Phase Noise broadering the carrier spectrum.

Specification

Phase Noise .... < −90 dBc/Hz (at 10 kHz offset from 0 dBm fundamental)

Test Equipment

Spectrum Analyzer 8566A/66B/68A/68B
N(m)-BNC(f) Adapter ....Agilent P/N 1250-1476
BNC(m)-BNC(m) Cable, 122 cm ....Agilent P/N 8120-1840, 2 ea.
50 Ω Termination BNC type .... 11593A (Opt.002 or Opt.003)

Procedure

1. Set up the test configuration as shown in Figure 2-4.

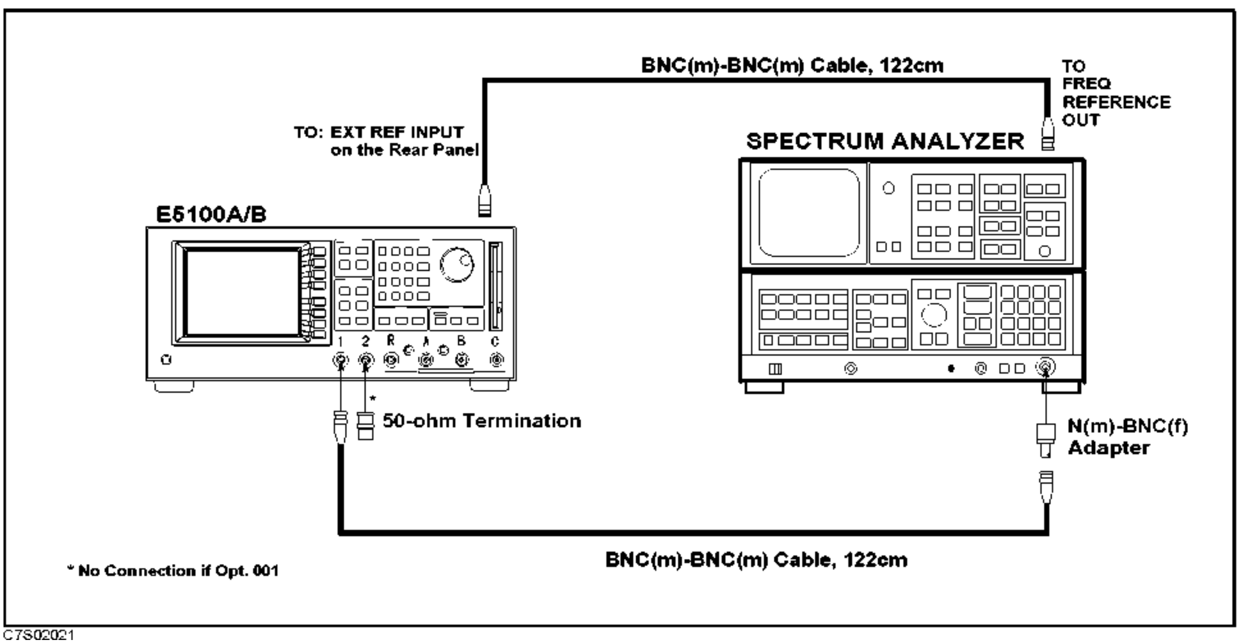

Figure 2-4. Phase Noise Test Setup

Note Harmonics Test, Non-Harmonic Spurious Test, and Phase Noise Test use the same test setup.

2. Set up the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Source Power = 0 dBm	(Sweep) POWER (0) × 1
Span Frequency = 0 Hz	(Span) (0) × 1

3. Set the spectrum analyzer as follows:

   Frequency Span 25 kHz

4. Set the E5100A/B's center frequency, the spectrum analyzer's center frequency, and its resolution bandwidth according to the following table. Then record the spectrum analyzer reading at center frequency into calculation sheet, and record the spectrum analyzer reading at the ± 10 kHz frequency points of the center frequency into calculation sheet.

Table 2-3. Phase Noise Test Setup

E5100A/B Center Frequency	Spectrum analyzer	
	Center Frequency	RBW
455 kHz	455 kHz	300 Hz
150 MHz	150 MHz	300 Hz
300 MHz	300 MHz	300 Hz

Note

When you measure noise level at the ±10 kHz frequency points of each center frequency, you must set the spectrum analyzer to noise level measurement mode. When the noise level function is activated and the marker is placed in the noise, the rms noise level is read out normalized to a 1 Hz noise power bandwidth.

5. Use the equation given on the calculation sheet to calculate the test results, and record the test results in the performance test record.

5. Source Level Accuracy/Flatness Test

This test measures the E5100A/B signal source actual output power Level at 50 MHz and its flatness relative to the level at 50 MHz.

Specification

Level Accuracy .... ± 1 dB (at 23±5°C, 0 dBm output level, 50 MHz)

Level Flatness (at 23 ±5°C, relative to 0 dBm output level at 50 MHz):
- Opt.001/002 without Opt.010 .... +2 dB, −4 dB (at 10 kHz ≤ freq. ≤ 300 MHz)
- Opt.003 without Opt.010 .... +2.5 dB, −4.5 dB (at 10 kHz ≤ freq. ≤ 300 MHz)
- Opt.010 or Opt.600 .... +2.5 dB, −4.5 dB (at 50 kHz ≤ freq. ≤ 100 MHz)
  +3 dB, −5 dB (at 100 MHz < freq. ≤ 300 MHz)

Test Equipment

Power Meter 436A Opt.022/437B/438A
Power Sensor 8482A
Multimeter 3458A
BNC(m)-BNC(m) Cable, 122 cm .... Agilent P/N 8120-1840
N(f)-BNC(m) Adapter .... Agilent P/N 1250-1477
50 Ω Termination BNC type .... 11593A (Opt.002 or Opt.003)
50 Ω Feedthrough 11048C
BNC(f)-Dual Banana Plug .... Agilent P/N 1251-2277

Procedure

1. Connect the Power Sensor to the Power Meter, and calibrate the Power Meter for the Power Sensor.
2. Set up the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Center Frequency = 50 MHz	(Center) (50) × M
Span Frequency = 0 Hz	(Span) (0) × 1
Source Power = 0 dBm	(Sweep) POWER (0) × 1

3. Connect the Power Sensor to the E5100A/B RF OUT 1 as shown in Figure 2-5.

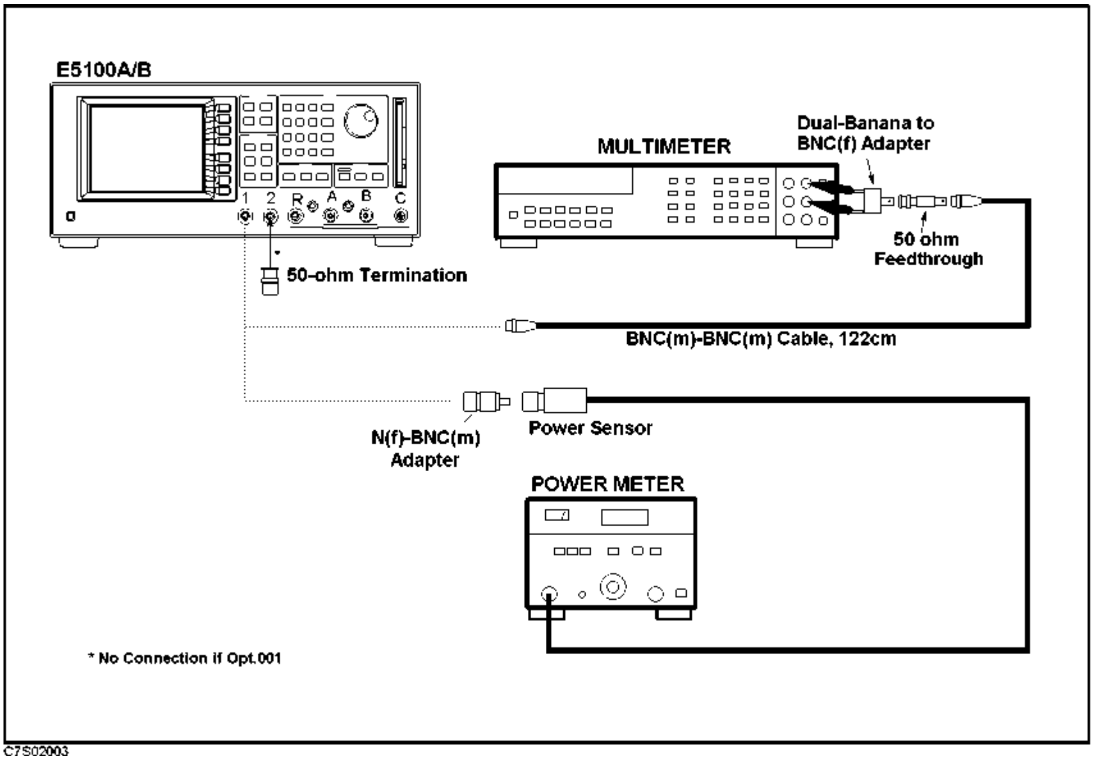

Figure 2-5. Source Level Accuracy/Flatness Test

4. Record the Power Meter reading on the performance test record, and transcribe it into Calculation Sheet.
5. Set the E5100A/B center frequency as follows, and record the power meter reading into calculation sheet.

E5100A/B Center Frequency
1 MHz
10 MHz
100 MHz
150 MHz
200 MHz
250 MHz
300 MHz

6. Disconnect the power sensor, and connect the Digital Voltmeter INPUT to E5100A/B RF OUT 1, as shown in Figure 2-5. Use a 50 Ω Feedthrough on the Digital Voltmeter input.
7. Set the Digital Voltmeter as follows:

Measurement Function:	AC Volts mode
Display Reading Value:	dBm reading value
Measurement Method:	Synchronous Sampling Conversion

8. Set the E5100A/B center frequency as follows, and record the power meter reading in the calculation sheet for each setting.

E5100A/B Center Frequency
10 kHz
50 kHz
100 kHz

9. Use the equation given on the Calculation sheet to calculate the test results (flatness), and transcribe the test results to the FLATNESS column in the performance test record.

6. Source Power Linearity Test

This test measures the E5100A/B signal source power level at several points to verify linearity.

Specification

Power Lineality (at 23±5°C, relative to 0 dBm output level at 50 MHz)

without Opt.010 .... ±1 dB
with Opt.010 or 600
.... ±1.5 dB ([max power level − 70 dB] ≤ [power level] < [max power level − 60 dB])
.... ±1 dB ([max power level − 60 dB] ≤ [power level] ≤ [max power level]

Test Equipment

Power Meter 436A Opt.022/437B/438A
Power Sensor 8481D
80 dB Step Attenuator .... 8496A/G with Opt.001 & H60
Attenuator/Switch Driver .... 11713A (if 8496G is used)
50 Ω Termination BNC type .... 11593A (if without Opt.001)
N(m)-BNC(f) Adapter .... Agilent P/N 1250-1476
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839

Procedure

1. Connect the Power Sensor to the Power Meter, and calibrate the Power Meter for the Power Sensor.
2. Connect the equipment as shown in Figure 2-6.

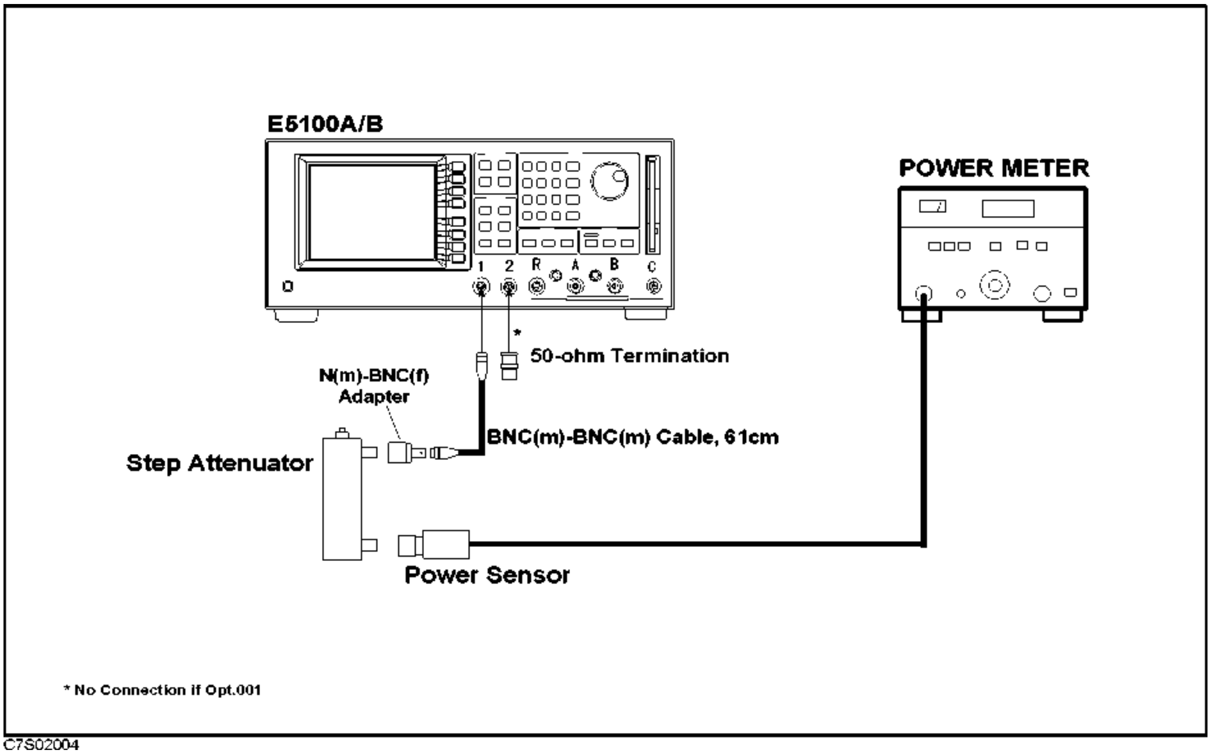

Figure 2-6. Source Power Linearity Test

3. Set the step attenuator to 30 dB.
4. Set up the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Number of Points = 201	(Sweep) NUMBER of POINTs (201) × 1
Center Frequency = 50 MHz	(Center) (50) × M
Span Frequency = 0 Hz	(Span) (0) ×
Source Power = 0 dBm	(Sweep) POWER (0) × 1

5. Set up the power meter as follows:

Calibration Factor	100
Resolution	0.001 dB
Range	AUTO
Display	LOG Display
Mode	Relative Mode

6. Record the power meter's reading value into calculation sheet.
7. Set the source power and step attenuator according to the following table, and record the power meter's reading value into the calculation sheet.

Table 2-4.
Source Power Linearity Test Setup
(Opt.001 without Opt.010)

E5100A/B Source Power	Step Attenuator Setting	Level
+11 dBm	−50 dB	−39 dB
+5 dBm	−40 dB	−35 dB
−5 dBm	−30 dB	−35 dB
−9 dBm	−30 dB	−39 dB

Table 2-5.
Source Power Linearity Test Setup
(Opt.002 without Opt.010)

E5100A/B Source Power	Step Attenuator Setting	Level
+5 dBm	−40 dB	−35 dB
−5 dBm	−30 dB	−35 dB
−10 dBm	−20 dB	−30 dB
−15 dBm	−20 dB	−35 dB

Table 2-6.
Source Power Linearity Test Setup
(Opt.003 without Opt.010)

E5100A/B Source Power	Step Attenuator Setting	Level
+7 dBm	−40 dB	−37 dB
+5 dBm	−40 dB	−35 dB
−5 dBm	−30 dB	−35 dB
−10 dBm	−20 dB	−30 dB
−13 dBm	−20 dB	−33 dB

Table 2-7.
Source Power Linearity Test Setup
(Opt.001 with Opt.010)

E5100A/B Source Power	Step Attenuator Setting	Level
+22 dBm	−60 dB	−38 dB
+10 dBm	−40 dB	−30 dB
−10 dBm	−20 dB	−30 dB
−20 dBm	−10 dB	−30 dB
−30 dBm	−10 dB	−40 dB
−40 dBm	−10 dB	−50 dB
−48 dBm	−10 dB	−58 dB

Table 2-8.
Source Power Linearity Test Setup
(Opt.002 with Opt.010)

E5100A/B Source Power	Step Attenuator Setting	Level
+16 dBm	−50 dB	−34 dB
+10 dBm	−40 dB	−30 dB
−10 dBm	−20 dB	−30 dB
−20 dBm	−10 dB	−30 dB
−30 dBm	−10 dB	−40 dB
−40 dBm	−10 dB	−50 dB
−50 dBm	−10 dB	−60 dB
−54 dBm	0 dB	−54 dB

Table 2-9. Source Power Linearity Test Setup (Opt.003 with Opt.010, or Opt.600)

E5100A/B Source Power	Step Attenuator Setting	Level
+18 dBm	−50 dB	−32 dB
+10 dBm	−40 dB	−30 dB
−10 dBm	−20 dB	−30 dB
−20 dBm	−10 dB	−30 dB
−30 dBm	−10 dB	−40 dB
−40 dBm	−10 dB	−50 dB
−50 dBm	−10 dB	−60 dB
−52 dBm	0 dB	−62 dB

8. Use the equation given on the calculation sheet to calculate the test results, and transcribe the test results to the performance test record.

7. Receiver Noise Level Test

This test measures the E5100A/B's Receiver Noise Level (Noise Floor).

Specification

(at magnitude measurement, 23 ± 5°C, RF attenuator: 0 dB, 50 Ω input)

E5100A:

IF BW 30 kHz .... −100 dBm (1 MHz ≤ Freq. ≤ 300 MHz)
IF BW 10 kHz .... −105 dBm (300 kHz ≤ Freq. ≤ 300 MHz)
IF BW 3 kHz .... −110 dBm (100 kHz ≤ Freq. ≤ 300 MHz)
IF BW 1 kHz .... −115 dBm (100 kHz ≤ Freq. ≤ 300 MHz)
−95 dBm (30 kHz ≤ Freq. < 100 kHz)
IF BW 300 Hz .... −120 dBm (100 kHz ≤ Freq. ≤ 300 MHz)
−100 dBm (10 kHz ≤ Freq. < 100 kHz)
IF BW 100 Hz .... −125 dBm (100 kHz ≤ Freq. ≤ 300 MHz)
−105 dBm (10 kHz ≤ Freq. < 100 kHz)

E5100B:

IF BW 30 kHz .... −100 dBm (1 MHz ≤ Freq. ≤ 300 MHz)
IF BW 10 kHz .... −105 dBm (300 kHz ≤ Freq. ≤ 300 MHz)
IF BW 3 kHz .... −110 dBm (100 kHz ≤ Freq. ≤ 300 MHz)
IF BW 1 kHz .... −115 dBm (100 kHz ≤ Freq. ≤ 300 MHz)
−95 dBm (30 kHz ≤ Freq. < 100 kHz)

Test Equipment

50 Ω Termination N type .... 909C Opt.012, 1 ea (Opt.102), 2 ea (Opt.302)

50 Ω Termination BNC type .... 11593A, 4 ea max.

Procedure

1. Connect each 50 Ω termination to each input as shown in Figure 2-7.

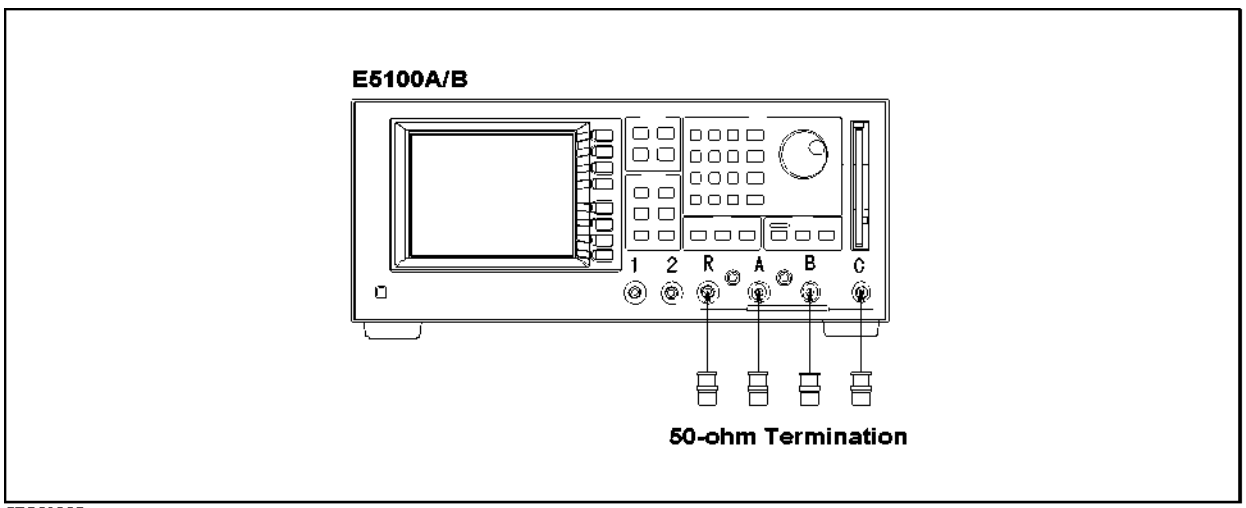

Figure 2-7. Receiver Noise Level Test

2. Set up the E5100A/B as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Span Frequency = 0 Hz	(Span) (0) × 1
IF BW = 100 Hz (for E5100A)	(Sweep) IF BW (100) × 1
IF BW = 1 kHz (for E5100B)	(Sweep) IF BW (1) × k
Input Attenuator = 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
	A 0 dB (Opt.200/300/400/600)
	B 0 dB (Opt.300/400)
	C 0 dB (Opt.400)
Source Power	(Sweep) POWER
= −9 dBm (Opt.001 without Opt.010)	(−9) × 1
= −15 dBm (Opt.002 without Opt.010)	(−15) × 1
= −12 dBm (Opt.003 without Opt.010)	(−12) × 1
= −48 dBm (Opt.001 with Opt.010)	(−48) × 1
= −54 dBm (Opt.002 with Opt.010)	(−54) × 1
= −51 dBm (Opt.003 with Opt.010)	(−51) × 1
= −52 dBm (Opt.600)	(−52) × 1
Meas. Config. : R, LIN MAG	(Meas/Format) MEAS MORE MORE R FORMAT
	MORE LIN MAG
Number of Points : 201	(Sweep) NUMBER of POINTs (201) × 1
Marker Function : STATISTICS ON	(Marker) UTILITY MENU
	STATISTICS on OFF (turn it ON)

3. Set the E5100A/B's center frequency as follows, and record the average value of the trace into calculation sheet.

E5100A/B Center Frequency
10 kHz (only E5100A)
30 kHz (only E5100B)
95 kHz
455 kHz
1.01 MHz
10.7 MHz
101 MHz
110 MHz
201 MHz
299 MHz

4. Use the equation given on the calculation sheet to calculate the test results (receiver noise), and transcribe the test results to the Receiver Noise column in the performance test record.
5. Set the E5100A/B's center frequency to 455 kHz.
6. Set the E5100A/B's IF BW as follows, and record the average value of the trace into calculation sheet.

E5100A/B IF BW
300 Hz (only E5100A)
1 kHz (only E5100A)
3 kHz
10 kHz
30 kHz

7. Set the E5100A/B's center frequency to 101 MHz.
8. Set the E5100A/B's IF BW as follows, and record the average value of the trace into calculation sheet.

E5100A/B IF BW
300 Hz (only E5100A)
1 kHz (only E5100A)
3 kHz
10 kHz
30 kHz

9. Repeat Steps 2 through 8 for Input A, B(Opt.300/400), and C(Opt.400).

8. Trace Noise Test

This test checks the E5100A/B's trace noise on a CW signal in ratio mode. This test is done in CW in order to eliminate any effects of frequency response.

Note An E5100A/B with Option 100 does not require this test.

Specification

(at 1 kHz IF BW, −5 dBm input level @ RF ATT = 25 dB, −30 dBm input level @ RF ATT = 0 dB)

Magnitude .... < 0.01 dB rms
Phase .... < 0.05 ° rms

Test Equipment

Power Splitter 11667A
50 Ω Termination BNC type 11593A
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839, 3ea
N(m)-BNC(f) Adapter .... Agilent P/N 1250-1476, 4ea max.

Procedure

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

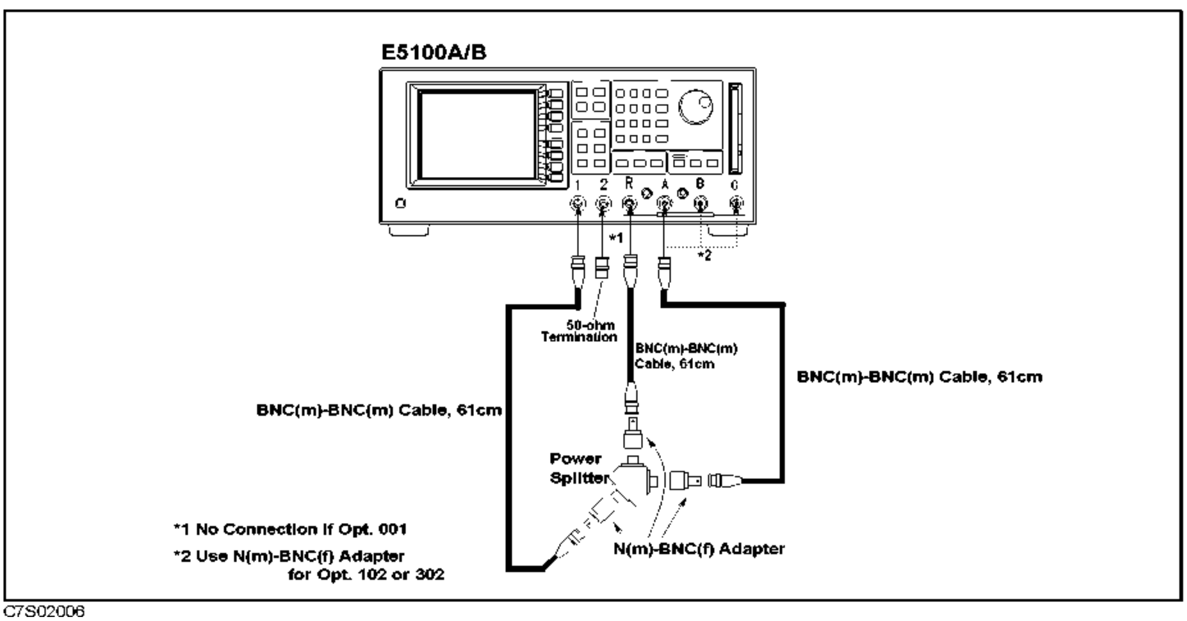

Figure 2-8. Trace Noise Test Setup

2. Set up the E5100A/B as follows:

Control Settings **Key Strokes**

Preset	(Preset)
Source Power = 1 dBm	(Sweep) POWER (1) × 1
Span Frequency = 0 Hz	(Span) (0) × 1
Number of Points = 201	(Sweep) NUMBER of POINTs (201) × 1
Input-R, A Attenuator = 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB PORT : A 25 dB
Channel 1 Setup:	
Measurement = A/R	(Meas/Format) MEAS A/R
Format = LOG MAG	(Meas/Format) FORMAT MORE LOG MAG
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Channel 2 Setup:	
Measurement = A/R	(Meas/Format) ACTIVE CH (set to [CH2]) MEAS A/R
Format = PHASE	(Meas/Format) FORMAT MORE PHASE
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)

3. Set the E5100A/B's center frequency and IF BW in accordance with the following table. The standard deviation trace value is displayed as a marker statistic (s.dev) in the upper right-hand corner of the LCD display of each channel's display. Record each standard deviation value of the magnitude and phase in the performance test record.

Table 2-10. Trace Noise Test Setup

E5100A/B Center Freq.	E5100A/B IF BW
10 kHz	100 Hz
100 kHz	1 kHz
1 MHz	1 kHz
10 MHz	1 kHz
100 MHz	1 kHz
300 MHz	1 kHz

4. Disconnect the cable from Input-A and connect it to Input-B.
5. Change the E5100A/B setups as follows:

Control Settings	**Key Strokes**
Input- B Attenuator = 25 dB	(System) MORE ATTENUATOR PORT : B 25 dB
CH 1: B/R, LOG MAG	(Meas/Format) ACTIVE CH (set to [CH1]) MEAS

B/R

Channel 2 Setup:

Measurement = B/R	(Meas/Format) ACTIVE CH (set to [CH2]) MEAS B/R

6. Repeat step 3.
7. Disconnect the cable from Input-B and connect it to Input-C.
8. Change the E5100A/B setups as follows:

Control Settings	**Key Strokes**
Input- B Attenuator = 25 dB	(System) MORE ATTENUATOR PORT : C 25 dB
CH 1: C/R, LOG MAG	(Meas/Format) ACTIVE CH (set to [CH1]) MEAS C/R

Channel 2 Setup:

Measurement = C/R	(Meas/Format) ACTIVE CH (set to [CH2]) MEAS C/R

9. Repeat step 3.
10. Disconnect the cable from Input-R and connect it to Input-B.
11. Change the E5100A/B setups as follows:

Control Settings	**Key Strokes**
CH 1: C/B, LOG MAG	(Meas/Format) ACTIVE CH (set to [CH1]) MEAS MORE C/B

Channel 2 Setup:

Measurement = C/B	(Meas/Format) ACTIVE CH (set to [CH2]) MEAS MORE C/B

12. Repeat step 3.

9. Residual Response Test

This test measures the E5100A/B's Residual Response. This test measures how effectively the internal oscillator signal's interference is reduced by measuring the amplitude at some known frequencies with its input terminated.

Specification

Residual Response .... < −80 dBm

(except for the following frequency points: 50 kHz, 100 kHz, 95.825 MHz, 95.875 MHz, 159.791667 MHz, 159.825 MHz, 159.841667 MHz, 159.875 MHz, 239.75 MHz, 239.875 MHz)

Test Equipment

50 Ω Termination BNC type .... 11593A, 3 ea max.
50 Ω Termination N type .... 909C Opt.012 (for E5100A/B Opt.102/302)

Procedure

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

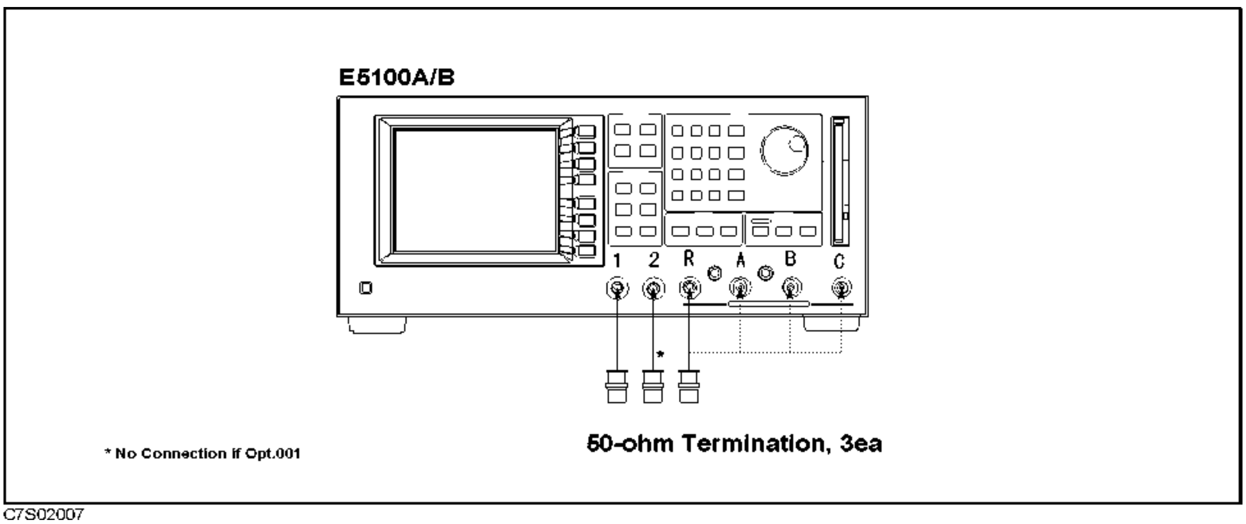

Figure 2-9. Residual Response Test Setup

2. Set up the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Meas. Config. = R	(Meas/Format) MEAS MORE MORE R
Span Frequency = 0 Hz	(Span) (0) × 1
IF BW = 10 Hz	(Sweep) IF BW (10) × 1
Source Power	(Sweep) POWER
= −9 dBm (Opt.001 without Opt.010)	(−9) × 1

= −15 dBm (Opt.002 without Opt.010)	(−15) × 1
= −12 dBm (Opt.003 without Opt.010)	(−12) × 1
= −48 dBm (Opt.001 with Opt.010)	(−48) × 1
= −54 dBm (Opt.002 with Opt.010)	(−54) × 1
= −51 dBm (Opt.003 with Opt.010)	(−51) × 1
= −52 dBm (Opt.600)	(−52) × 1
Number of Points = 2	(Sweep) NUMBER of POINTs (2) × 1
Input-R Attenuator = 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB

3. Set the E5100A/B's center frequency as follows, and record the maximum value of the trace into calculation sheet.

E5100A/B Center Frequency
47.85 MHz
47.875 MHz
59.84375 MHz
59.875 MHz
68.410714 MHz
68.446428 MHz
79.833333 MHz
79.875 MHz
119.8125 MHz
119.875 MHz
159.775 MHz
159.808333 MHz
159.858333 MHz
159.891666 MHz
239.8 MHz
239.825 MHz

4. Remove the 50 Ω termination of the E5100A/B Input-R and connect it to the E5100A/B Input-A.
5. Change the E5100A/B control settings as follows:

Control Settings	**Key Strokes**
Meas. Config. = A	(Meas/Format) MEAS MORE MORE A

6. Repeat step 3.
7. Remove the 50 Ω termination of the E5100A Input-A and connect it to the E5100A/B Input-B.
8. Change the E5100A control settings as follows:

Control Settings	**Key Strokes**
Meas. Config. = B	(Meas/Format) MEAS MORE MORE B

9. Repeat step 3.
10. Remove the 50 Ω termination of the E5100A Input-B and connect it to the E5100A Input-C.
11. Change the E5100A control settings as follows:

Control Settings	**Key Strokes**
Meas. Config. = C	(Meas/Format) MEAS MORE MORE C

12. Repeat step 3.

10. Input Crosstalk Test

The signal leakage interference between the E5100A/B's two inputs, when one input is driven and the other is terminated, is measured by this test.

Note An E5100A/B with Option 100 does not require this test.

Specification

Input Crosstalk:

E5100A .... < -110 dB (10 kHz $\leq$ freq. $<$ 100 kHz)
< -120 dB (100 kHz $\leq$ freq. $\leq$300 MHz)

E5100B .... < -85 dB (10 kHz $\leq$ freq. $<$ 100 kHz)
< -105 dB (100 kHz $\leq$ freq. $\leq$ 250 MHz)
< -95 dB (250 MHz $<$ freq. $\leq$ 300 MHz)

Test Equipment

BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839
50 Ω Termination BNC type .... 11593A, 4 ea max.
50 Ω Termination N type .... 909C Opt.012 (if with Opt.102/302), 2 ea max.
N(m)-BNC(f) Adapter .... Agilent P/N 1250-1476 (if with Opt.102/302)

Procedure

E5100A

Table 2-11 is the summary of the E5100A's test setup.

Table 2-11. E5100A Input Crosstalk Test Setup Summary

Measurement Configuration	Frequency		IF BW	NOP	Output Power	Input Attenuator			
	Start	Stop				R	A	B	C
A/R, B/R, C/R	10 kHz	99.4 kHz	10 Hz	15	0 dBm	25 dB	0 dB	0 dB	0 dB
	100.2 kHz	199.8 kHz		4	0 dBm				
	200.2 kHz	300 MHz		201	5 dBm				
R/A, B/A, C/A	10 kHz	99.4 kHz	10 Hz	15	0 dBm	0 dB	25 dB	0 dB	0 dB
	100.2 kHz	199.8 kHz		4	0 dBm				
	200.2 kHz	300 MHz		201	5 dBm				
R/B, A/B, C/B	10 kHz	99.4 kHz	10 Hz	15	0 dBm	0 dB	0 dB	25 dB	0 dB
	100.2 kHz	199.8 kHz		4	0 dBm				
	200.2 kHz	300 MHz		201	5 dBm				
R/C, A/C, B/C	10 kHz	99.4 kHz	10 Hz	15	0 dBm	0 dB	0 dB	0 dB	25 dB
	100.2 kHz	199.8 kHz		4	0 dBm				
	200.2 kHz	300 MHz		201	5 dBm				

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

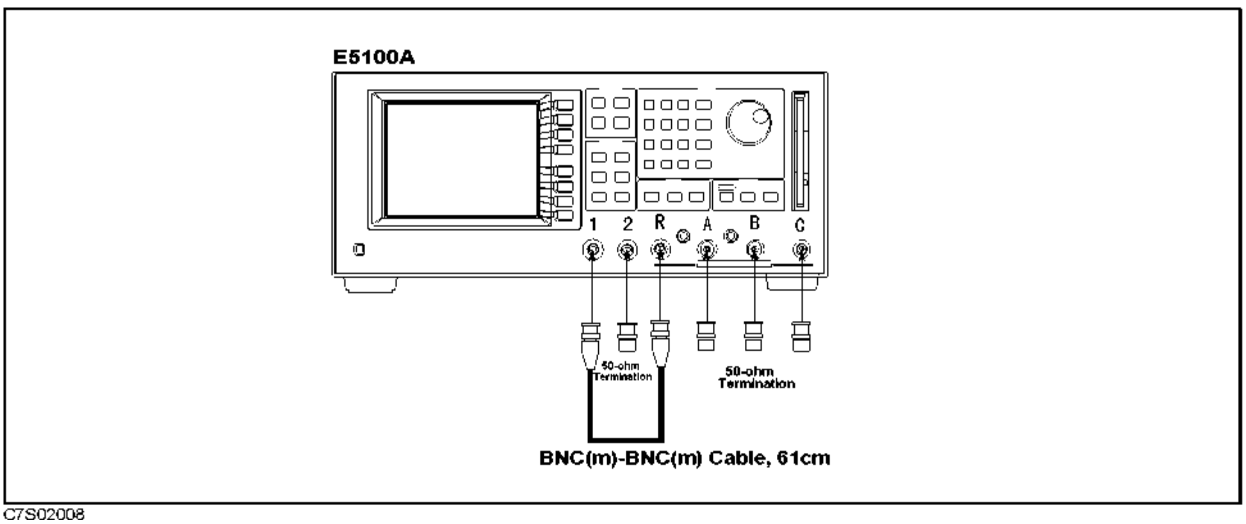

Figure 2-10. R into A, B, C Input Crosstalk Test Setup

2. Set up IF BW of the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
IF BW: 10 Hz	(Sweep) IF BW (10) × 1

Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A,B,C Attenuator: 0 dB	A 0 dB B 0 dB C 0 dB
Number of Channel = 3 (if Opt.400)	(Meas/Format) NUM of CH 3
Multi Channel ON	(Display) MULTI CH on OFF (turn it ON)
Channel-1 Setup:	(Meas/Format) ACTIVE CH (set to [CH1])
Meas. Config.: A/R, LOG MAG	(Meas/Format) MEAS A/R FORMAT LOG MAG
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Channel-2 Setup:(if not Opt.200)	(Meas/Format) ACTIVE CH (set to [CH2])
Meas. Config.: B/R, LOG MAG	(Meas/Format) MEAS B/R FORMAT LOG MAG
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Channel-3 Setup:(if Opt.400)	(Meas/Format) ACTIVE CH (set to [CH3])
Meas. Config.: C/R, LOG MAG	(Meas/Format) MEAS C/R FORMAT LOG MAG
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)

3. Set the E5100A's start frequency, stop frequency, number of points, and source power as follows:

Control Settings	**Key Strokes**
Start Frequency = 10 kHz	(Start) (10) × k
Stop Frequency = 99.4 kHz	(Stop) (99.4) × k
Number of Points = 15	(Sweep) NUMBER of POINTs (15) × 1
Source Power = 0 dBm	(Sweep) POWER (0) × 1

4. Perform the following key strokes for a single sweep measurement.

   (Trigger) SINGLE

5. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

   (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

6. Move the Channel-2 marker to the maximum value (B/R) using the following key storokes. Record the maximum value on the calculation sheet.

ACTIVE CH (set to [CH2]) SEARCH: MAX

7. If Option 400 is installed, move the Channel-3 marker to the maximum value (C/R) using the following key storokes. Record the maximum value on the calculation sheet.

   ACTIVE CH (set to [CH2]) SEARCH: MAX

8. Repeat steps 4 and 7 three more times and record each maximum value on the calculation sheet. Use the equation given on the calculation sheet to calculate avarage value, and record the data in the performance test record.

9. Change the E5100A's start frequency, stop frequency, and number of points as follows:

Control Settings	Key Strokes
Start Frequency = 100.2 kHz	(Start) (100.2) × k
Stop Frequency = 199.8 kHz	(Stop) (199.8) × k
Number of Points = 4	(Sweep) NUMBER of POINTs (4) × 1

10. Perform the following key strokes for a single sweep measurement.

    (Trigger) SINGLE

11. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

    (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

12. Move the Channel-2 marker to the maximum value (B/R) using the following key storokes. Record the maximum value on the calculation sheet.

    ACTIVE CH (set to [CH2]) SEARCH: MAX

13. If Option 400 is installed, move the Channel-3 marker to the maximum value (C/R) using the following key storokes. Record the maximum value on the calculation sheet.

    ACTIVE CH (set to [CH3]) SEARCH: MAX

14. Repeat steps 10 and 13 three more times and record each maximum value on the calculation sheet. Use the equation given on the calculation sheet to calculate avarage value, and record the data in the performance test record.

15. Change the E5100A's start frequency, stop frequency, number of points, and source power as follows:

Control Settings	Key Strokes
Start Frequency = 200.2 kHz	(Start) (200.2) × k
Stop Frequency = 300 MHz	(Stop) (300) × M
Number of Points = 201	(Sweep) NUMBER of POINTs (201) × 1
Source Power = 5 dBm	(Sweep) POWER (5) × 1

16. Perform the following key strokes for a single sweep measurement.

    (Trigger) SINGLE

17. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

    (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

18. Move the Channel-2 marker to the maximum value (B/R) using the following key storokes. Record the maximum value on the calculation sheet.

    ACTIVE CH (set to [CH2]) SEARCH: MAX

19. If Option 400 is installed, move the Channel-3 marker to the maximum value (C/R) using the following key storokes. Record the maximum value on the calculation sheet.

    ACTIVE CH (set to [CH3]) SEARCH: MAX

20. Repeat steps 16 and 19 three more times and record each maximum value on the calculation sheet. Use the equation given on the calculation sheet to calculate avarage value, and record the data in the performance test record.
21. Change the connection as shown in Figure 2-11.

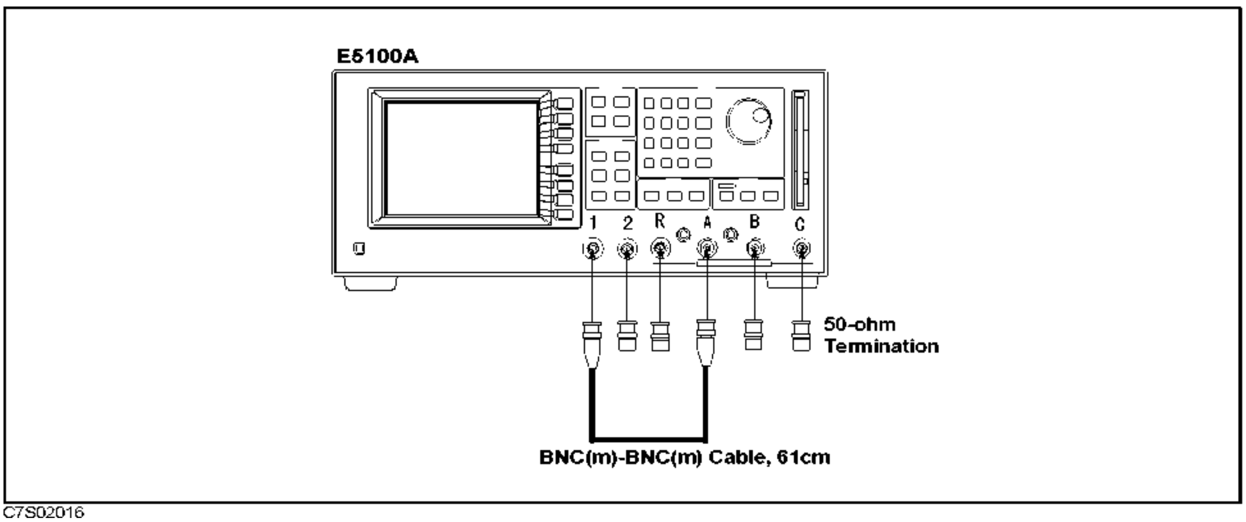

Figure 2-11. A into R, B, C Input Crosstalk Test Setup

22. Repeat steps 2 through 20 for R/A, B/A, and C/A in accordance with the test setup listed in Table 2-11.
23. Change the connection as shown in Figure 2-12.

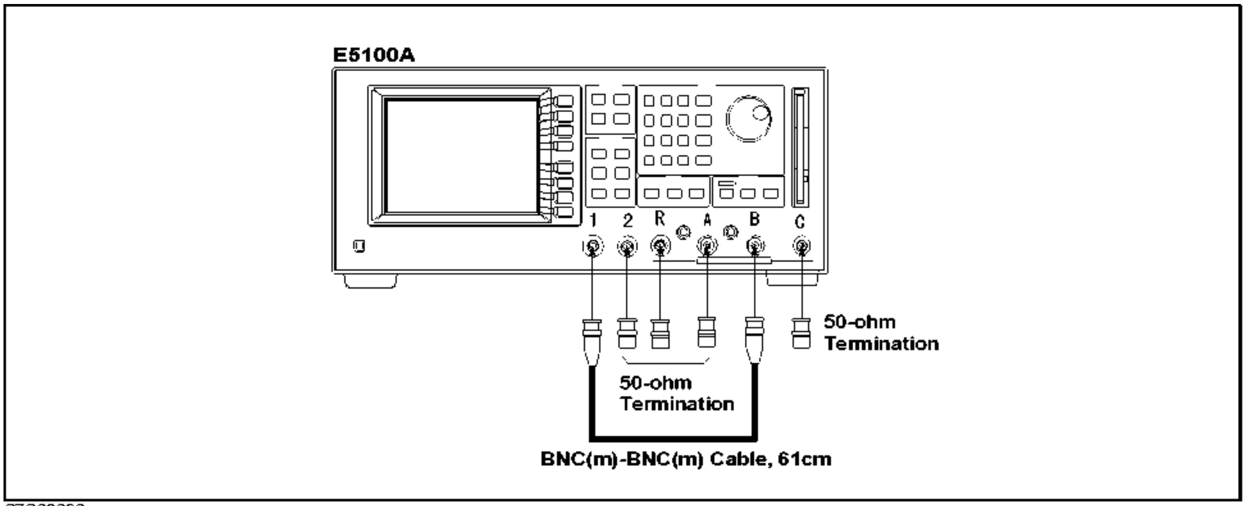

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Figure 2-12. B into R, A, C Input Crosstalk Test Setup

24. Repeat steps 2 through 20 for R/B, A/B, and C/B in accordance with the test setup listed in Table 2-11.
25. Change the connection as shown in Figure 2-13.

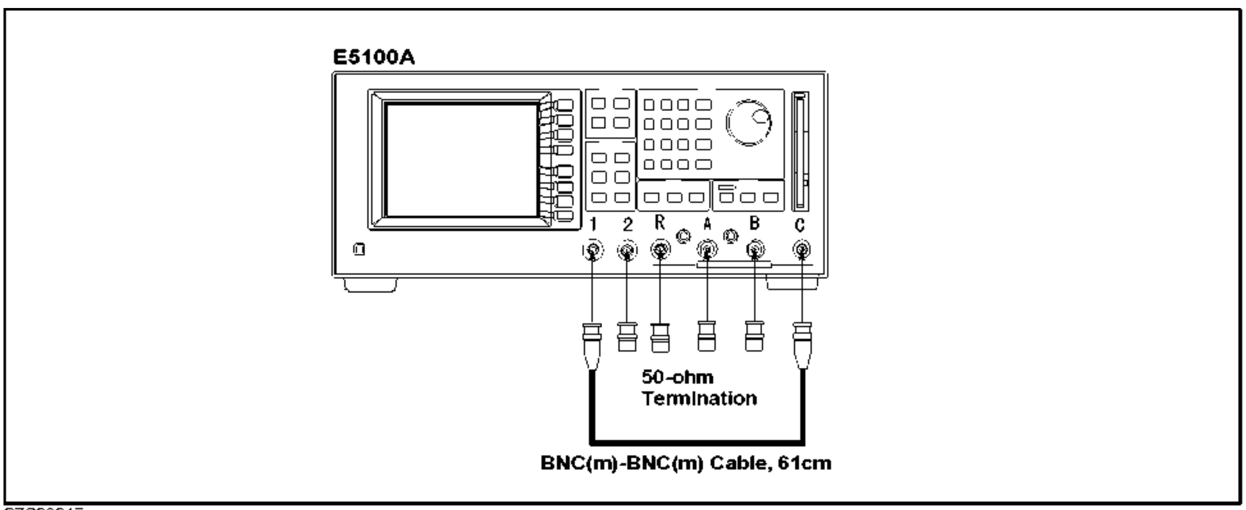

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Figure 2-13. C into R, A, B Input Crosstalk Test Setup

26. Repeat steps 2 through 20 for R/C, A/C, and B/C in accordance with the test setup listed in Table 2-11.

E5100B

Table 2-12 is the summary of the E5100B's test setup.

Table 2-12. E5100B Input Crosstalk Test Setup Summary

Measurement Configuration	Frequency		IF BW	NOP	Output Power	Input Attenuator	
	Start	Stop				R	A
A/R	10 kHz	99.4 kHz	100 Hz	15	0 dBm	25 dB	0 dB
	100.2 kHz	199.8 kHz		4	0 dBm		
	200.2 kHz	250 MHz		201	5 dBm		
	250 MHz	300 MHz		21	5 dBm		
R/A	10 kHz	99.4 kHz	100 Hz	15	0 dBm	0 dB	25 dB
	100.2 kHz	199.8 kHz		4	0 dBm		
	200.2 kHz	250 MHz		201	5 dBm		
	250 MHz	300 MHz		21	5 dBm		

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

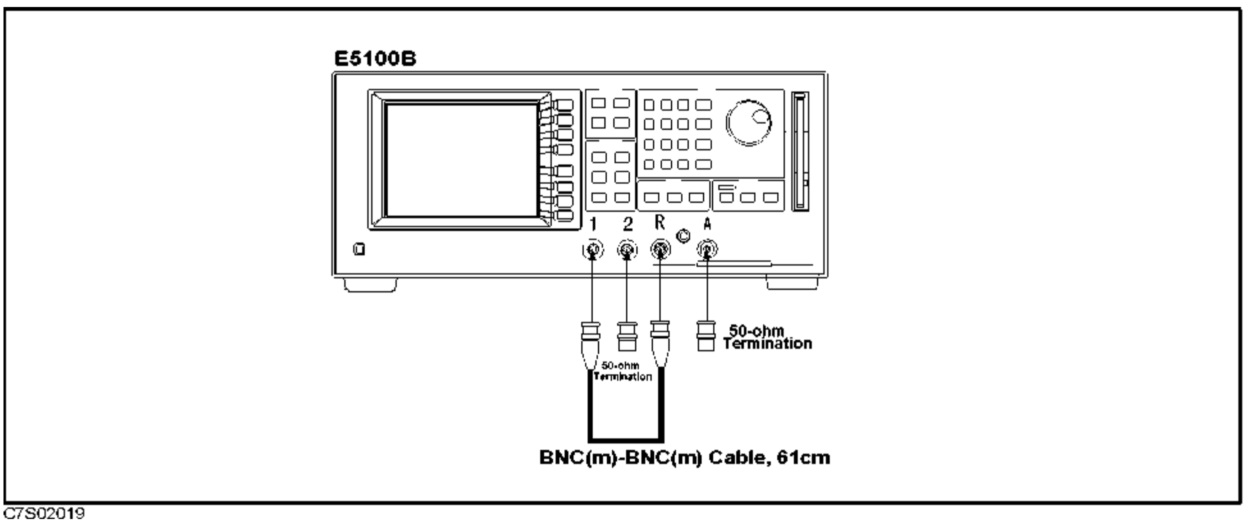

Figure 2-14. R into A Input Crosstalk Test Setup

2. Set up IF BW of the E5100B as follows:

Control Settings	Key Strokes
Preset	(Preset)
IF BW: 100 Hz	(Sweep) IF BW (100) × 1
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 0 dB	A 0 dB

Channel-1 Setup:	(Meas/Format) ACTIVE CH (set to [CH1])
Meas. Config.: A/R, LOG MAG	(Meas/Format) MEAS A/R FORMAT MORE LOG MAG
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)

3. Set the E5100B's start frequency, stop frequency, number of points, and source power as follows:

Control Settings	Key Strokes
Start Frequency = 10 kHz	(Start) (10) × k
Stop Frequency = 99.4 kHz	(Stop) (99.4) × k
Number of Points = 15	(Sweep) NUMBER of POINTs (15) × 1
Source Power = 0 dBm	(Sweep) POWER (0) × 1

4. Perform the following key strokes for a single sweep measurement.

   (Trigger) SINGLE

5. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

   (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

6. Transcribe the test results to the performance test record.
7. Change the E5100B's start frequency, stop frequency, and number of points as follows:

Control Settings	Key Strokes
Start Frequency = 100.2 kHz	(Start) (100.2) × k
Stop Frequency = 199.8 kHz	(Stop) (199.8) × k
Number of Points = 4	(Sweep) NUMBER of POINTs (4) × 1

8. Perform the following key strokes for a single sweep measurement.

   (Trigger) SINGLE

9. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

   (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

10. Transcribe the test results to the performance test record.
11. Change the E5100B's start frequency, stop frequency, number of points, and source power as follows:

Control Settings	Key Strokes
Start Frequency = 200.2 kHz	(Start) (200.2) × k
Stop Frequency = 250 MHz	(Stop) (250) × M

Number of Points = 201	(Sweep) NUMBER of POINTs (201) × 1
Source Power = 5 dBm	(Sweep) POWER (5) × 1

12. Perform the following key strokes for a single sweep measurement.

    (Trigger) SINGLE

13. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

    (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

14. Change the E5100B's start frequency, stop frequency, and number of points as follows:

Control Settings	**Key Strokes**
Start Frequency = 250 MHz	(Start) (250) × M
Stop Frequency = 300 MHz	(Stop) (300) × M
Number of Points = 21	(Sweep) NUMBER of POINTs (21) × 1

15. Perform the following key strokes for a single sweep measurement.

    (Trigger) SINGLE

16. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

    (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

17. Transcribe the test results to the performance test record.
18. Change the connection as shown in Figure 2-15.

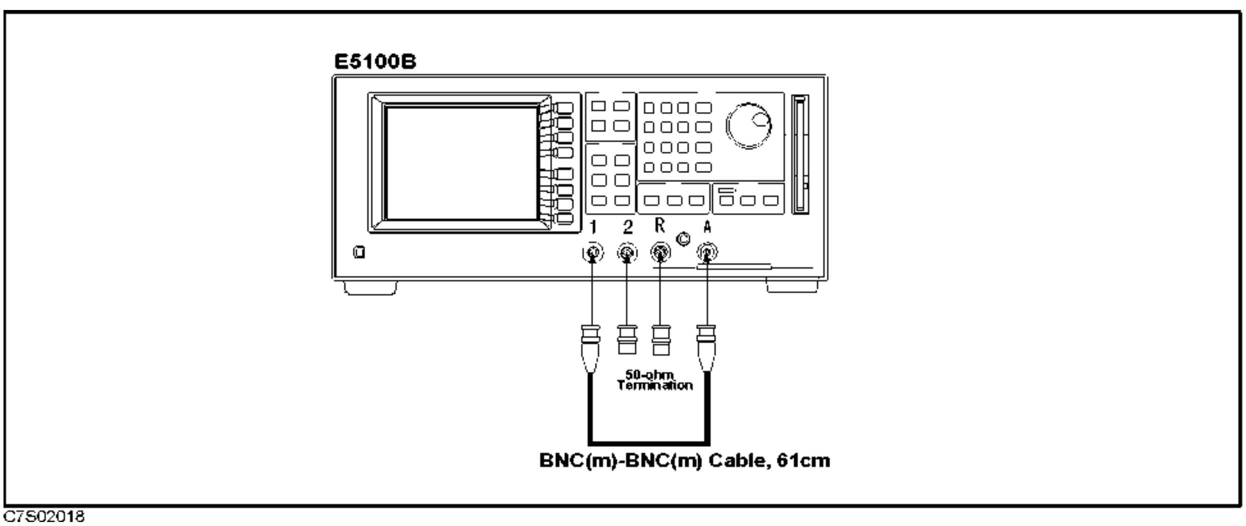

Figure 2-15. A into R Input Crosstalk Test Setup

19. Repeat steps 2 through 17 for R/A in accordance with the test setup listed in Table 2-12.

11. Absolute Amplitude Accuracy Test

This test checks the E5100A's absolute amplitude accuracy. A digital multimeter and a power meter are used to measure the actual output level at each setting.

Note An E5100B does not require this test.

Note An E5100A with Option 510 does not require this test.

Specification

Absolute Amplitude Accuracy .... ±1.0 dB (E5100A at 23 ±5°C, −10 dBm input)

Test Equipment

Power Meter	436A Opt.022/437B/438A
Power Sensor	8481D
Power Sensor	8482A
Multimeter	3458A
Attenuator Pad 20 dB	8491A Opt.020
Power Splitter	11667A
N(m)-BNC(f) Adapter	Agilent P/N 1250-0780, 5ea
N(f)-BNC(f) Adapter	Agilent P/N 1250-1474
50 Ω Termination BNC type	11593A
50 Ω Feedthrough	11048C
BNC(f)-Dual Banana Plug	Agilent P/N 1251-2277
BNC(m)-BNC(m) Cable, 61 cm	Agilent P/N 8120-1839, 4ea

Procedure

1. Connect the E5100A, power splitter, and multimeter as shown in Figure 2-16.

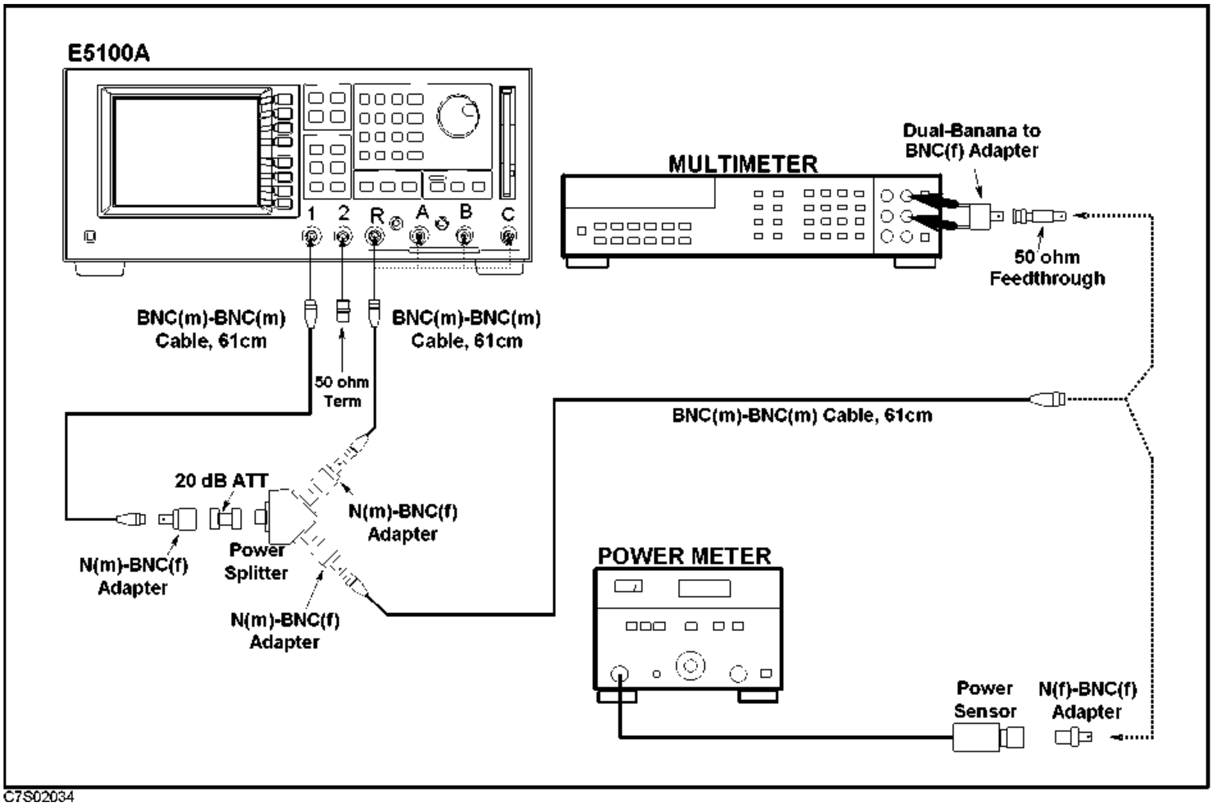

Figure 2-16. Absolute Amplitude Accuracy Test Setup

2. Set the digital voltmeter as follows:

Measurement Function:	AC Volts mode
Display Reading Value:	dBm reading value
Measurement Method:	Synchronous Sampling Conversion
AC Bandwidth	$\leq$ 2 MHz

3. Set up the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Meas. Config.: R (for Input-R test)	(Meas/Format) MEAS MORE MORE R
Meas. Config.: A (for Input-A test)	(Meas/Format) MEAS MORE MORE A
Meas. Config.: B (for Input-B test)	(Meas/Format) MEAS MORE MORE B
Meas. Config.: C (for Input-C test)	(Meas/Format) MEAS MORE MORE C
Format: LOG MAG	FORMAT MORE LOG MAG
Span = 0 Hz	(Span) (0) × 1
IF BW = 30 Hz	(Sweep) IF BW (30) × 1
Number of points = 20	(Sweep) NUMBER of POINTs (20) × 1
Source Power = −4 dBm	(Sweep) POWER (−4) × 1
Input-R Attenuator: 0 dB (for Input-R test)	(System) MORE ATTENUATOR PORT : R 0 dB

Input-A Attenuator: 0 dB (for Input-A test)	(System) MORE ATTENUATOR A 0 dB
Input-B Attenuator: 0 dB (for Input-B test)	(System) MORE ATTENUATOR B 0 dB
Input-C Attenuator: 0 dB (for Input-C test)	(System) MORE ATTENUATOR C 0 dB
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)

4. Set the E5100A's center frequency and Multimeter's AC Bandwidth according to the following table. Then record the readings of the digital multimeter, and the E5100A's readings in the calculation sheet.

Table 2-13. Absolute Amplitude Accuracy Test Setup

E5100A Center Freq.	Multimeter AC Bandwidth
10 kHz	$\leq$ 2 MHz
100 kHz	> 2 MHz
1 MHz	> 2 MHz

5. Set the Digital Multimeter's AC Bandwidth to $\leq$ 2 MHz.
6. Set up the E5100A as follows:

Control Settings	**Key Strokes**
Source Power = 1 dBm	(Sweep) POWER (1) × 1
Input-R Attenuator: 25 dB (for Input-R test)	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB (for Input-A test)	(System) MORE ATTENUATOR A 25 dB
Input-B Attenuator: 25 dB (for Input-B test)	(System) MORE ATTENUATOR B 25 dB
Input-C Attenuator: 25 dB (for Input-C test)	(System) MORE ATTENUATOR C 25 dB

7. Remove the 20 dB attenuator connected to the power splitter's input port and reconnect the N(m)-BNC(f) adapter and BNC(m)-BNC(m) cable without the attenuator.
8. Set the E5100A's center frequency according to the following table. Then record the readings (mean) of the digital multimeter, and the E5100A's readings in the calculation sheet.

Table 2-14. Absolute Amplitude Accuracy Test Setup

E5100A Center Freq.	Multimeter AC Bandwidth
10 kHz	$\leq$ 2 MHz
100 kHz	$\leq$ 2 MHz

9. Connect the Power Sensor 8481D to the Power Meter, and calibrate the Power Meter for the Power Sensor.

10. Remove the digital multimeter from the power splitter, and connect the power sensor 8481D to the power splitter as shown in Figure 2-16.

11. Set the power meter setting as follows:

Calibration Factor:	100
Resolution:	0.001 dB
Set Range:	Auto
Display:	LOG display
Mode:	Relative mode

12. Insert the 20 dB attenuator between the power splitter's input port and N(m)-BNC(f) adapter. (See Figure 2-16)

13. Set up the E5100A as follows:

Control Settings	Key Strokes
Source Power = −4 dBm	(Sweep) POWER (−4) × 1
Input-R Attenuator: 0 dB (for Input-R test)	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB (for Input-A test)	(System) MORE ATTENUATOR A 0 dB
Input-B Attenuator: 0 dB (for Input-B test)	(System) MORE ATTENUATOR B 0 dB
Input-C Attenuator: 0 dB (for Input-C test)	(System) MORE ATTENUATOR C 0 dB

14. Set the E5100A's center frequency according to the following table. Then record the readings (mean) of the power meter, and the E5100A's readings in the calculation sheet.

Table 2-15. Absolute Amplitude Accuracy Test Setup

E5100A Center Freq.
10 MHz
30 MHz
50 MHz
100 MHz
300 MHz

15. Replace the power sensor 8481D with the 8482A, and calibrate the power meter for the power sensor.

16. Set up the E5100A as follows:

Control Settings	Key Strokes
Source Power = 1 dBm	(Sweep) POWER (1) × 1
Input-R Attenuator: 25 dB (for Input-R test)	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB (for Input-A test)	(System) MORE ATTENUATOR A 25 dB
Input-B Attenuator: 25 dB (for Input-B test)	(System) MORE ATTENUATOR B 25 dB
Input-C Attenuator: 25 dB (for Input-C test)	(System) MORE ATTENUATOR C 25 dB

17. Remove the 20 dB attenuator connected to the power splitter's input port and reconnect the N(m)-BNC(f) adapter and BNC(m)-BNC(m) cable without the attenuator.
18. Set the E5100A's center frequency according to the following table. Then record the readings of the power meter, and the E5100A's readings (mean) in the calculation sheet.

Table 2-16. Absolute Amplitude Accuracy Test Setup

E5100A Center Freq.
1 MHz
10 MHz
30 MHz
50 MHz
100 MHz
300 MHz

19. Remove the power sensor from the power splitter, and connect the digital multimeter to the power splitter as shown in Figure 2-16.
20. Remove the BNC(m)-BNC(m) cable from the Input-R, and connect it to the Input-A.
21. Repeat steps 2 through 18 for Input-A.
22. Remove the power sensor from the power splitter, and connect the digital multimeter to the power splitter as shown in Figure 2-16.
23. Remove the BNC(m)-BNC(m) cable from the Input-A, and connect it to the Input-B.
24. Repeat steps 2 through 18 for Input-B.
25. Remove the power sensor from the power splitter, and connect the digital multimeter to the power splitter as shown in Figure 2-16.
26. Remove the BNC(m)-BNC(m) cable from the Input-B, and connect it to the Input-C.
27. Repeat steps 2 through 18 for Input-C.

12. Dynamic Accuracy Test

This test measures the E5100A/B's dynamic accuracy. The dynamic accuracy is a measure of how well the receiver measure the magnitude and phase components of a signal as that signal varies in amplitude over the specified dynamic range.

Specification

(at 23 ±5°C, 10 Hz IF BW, −10 dBm reference input level relative to maximum input level, −20 dBm test input level relative to maximum input level, except for ramp frequency sweep)

Test Channel Input Level RF Attenuator	Dynamic Accuracy Frequency	
25 dB	**0 dB**	**Excluding 10 kHz to 50 kHz**
+5 to −5 dBm[1]	−20 to −30 dBm[2]	±0.4 dB
−5 to −15 dBm	−30 to −40 dBm	±0.09 dB
−15 to −45 dBm	−40 to −70 dBm	±0.05 dB
−45 to −55 dBm	−70 to −80 dBm	±0.06 dB
−55 to −65 dBm	−80 to −90 dBm	±0.1 dB
−65 to −75 dBm	−90 to −100 dBm	±0.3 dB
−75 to −85 dBm	−100 to −110 dBm	±0.9 dB
−85 to −95 dBm	−110 to −120 dBm	±3 dB

1 0 to −5 dBm at 10 kHz to 200 kHz

2 −25 to −30 dBm at 10 kHz to 200 kHz

with Option 100
(at 23 ±5°C, 10 Hz IF BW, −20 dB input-A level relative to maximum input level, except for ramp frequency sweep, right after measuring reference)

Test Channel Input Level RF Attenuator	Dynamic Accuracy Frequency	
25 dB	**0 dB**	**Excluding 10 kHz to 50 kHz**
+5 to −5 dBm[1]	−20 to −30 dBm[2]	±0.4 dB
−5 to −45 dBm	−30 to −70 dBm	±0.1 dB
−45 to −55 dBm	−70 to −80 dBm	±0.1 dB
−55 to −65 dBm	−80 to −90 dBm	±0.2 dB
−65 to −75 dBm	−90 to −100 dBm	±0.6 dB

1 0 to −5 dBm at 10 kHz to 200 kHz

2 −25 to −30 dBm at 10 kHz to 200 kHz

(at 23 ±5°C, 10 Hz IF BW, −10 dBm reference input level relative to maximum input level, −20 dBm test input level relative to maximum input level, except for ramp frequency sweep)

Test Channel Input Level RF Attenuator	Dynamic Accuracy Frequency	
25 dB	0 dB	Excluding 10 kHz to 50 kHz
+5 to − 5 dBm[1]	−20 to −30 dBm[2]	±3°
−5 to −15 dBm	−30 to −40 dBm	±0.6°
−15 to −45 dBm	−40 to −70 dBm	±0.3°
−45 to −55 dBm	−70 to −80 dBm	±0.3°
−55 to −65 dBm	−80 to −90 dBm	±0.6°
−65 to −75 dBm	−90 to −100 dBm	±1.8°
−75 to −85 dBm	−100 to −110 dBm	±6°
−85 to −95 dBm	−110 to −120 dBm	±18°

1 0 to −5 dBm at 10 kHz to 200 kHz

2 −25 to −30 dBm at 10 kHz to 200 kHz

Test Equipment

80 dB Step Attenuator .... 8496A/G Opt.001 & H60
Attenuator/Switch Driver .... 11713A (if 8496G is used)
Attenuator Pad 20 dB .... 8491A with Opt.020 & H60, 2 ea
Attenuator Pad 20 dB .... 8491A with Opt.020
Attenuator Pad 10 dB .... 8491A with Opt.010 & H60, 2 ea
Attenuator Pad 10 dB .... 8491A with Opt.010
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839, 4ea max
N(m)-BNC(f) Adapter .... Agilent P/N 1250-0780, 3ea max
N(m)-BNC(m) Adapter .... Agilent P/N 1250-0082
N(f)-BNC(f) Adapter .... Agilent P/N 1250-1474
50Ω Termination BNC Type 11593A
Power Splitter .... 11667A(Opt.001/003/006)

Procedure

For Option 200/300/400 with Option 002

Low Level Test:

1. Record the step attenuator 50 MHz calibration value on the calculation sheet.
2. Connect the test equipment as shown in Figure 2-17.

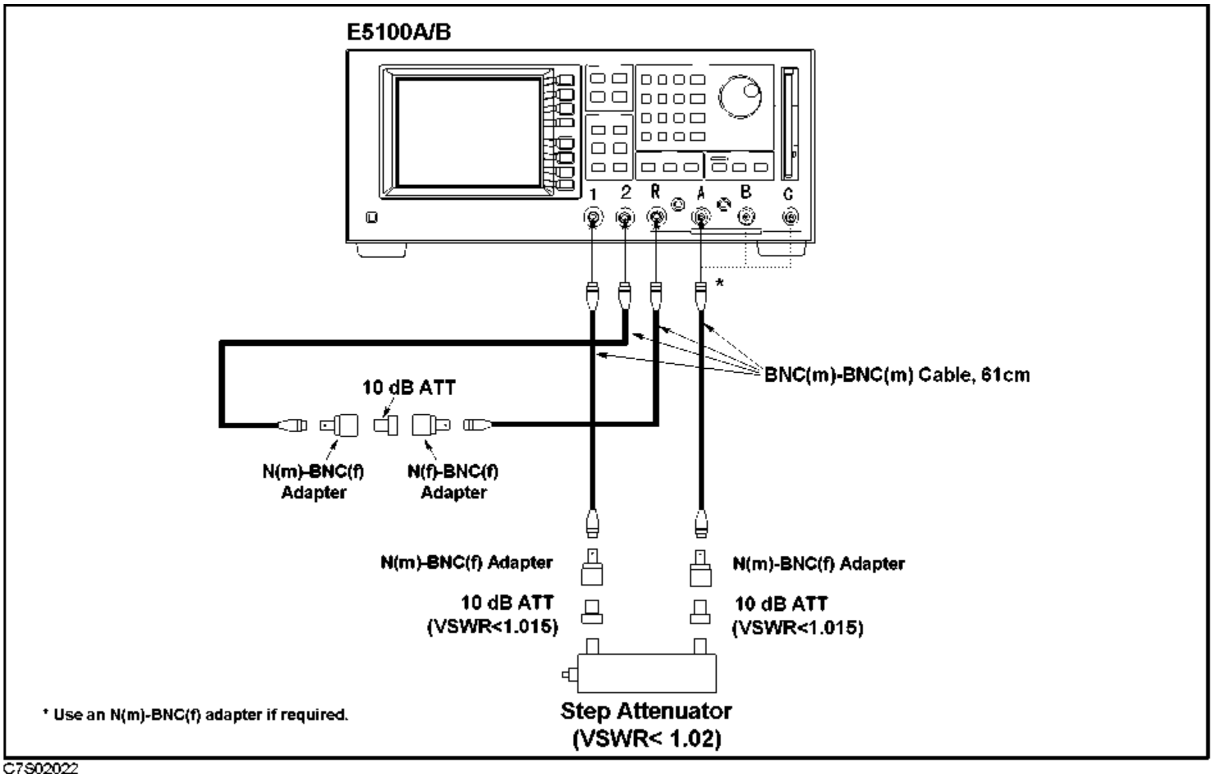

Figure 2-17. Dynamic Accuracy Test Setup 1 for Opt.200/300/400 with Opt.002

3. Set the E5100A/B as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Channel-1	
Measurement: A/R	(Meas/Format) MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Channel-2	
Measurement; A/R	(Meas/Format) ACTIVE CH (set to [CH2])
	MEAS A/R
Format: Phase	FORMAT MORE PHASE
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)
Coupled Channel ON	(Sweep) COUPLED CH on OFF (turn it ON)
Start = 3 MHz	(Start) (3) × M
Stop= 50.001 MHz	(Stop) (50.001) × M
NOP = 2	(Sweep) NUMBER of POINTs (2) × 1
IF BW = 10 Hz	IF BW (10) × 1 RETURN
Power = 5 dBm	POWER (5) × 1

Input-R Attenuator: 25 dB — (System) MORE ATTENUATOR PORT : R 25 dB

Input-A Attenuator: 25 dB — A 25 dB

4. Set the step Attenuator setting to 0 dB.
5. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

6. Perform the following key strokes to set up markers:

   (Marker) ACTIVE CH (set to [CH1]) MKR MODE MENU MARKERS: COUPLED
   MARKERS: DESCRETE
   (Marker) ACTIVE CH (set to [CH2]) MKR MODE MENU MARKERS: DESCRETE

7. Set the step attenuator to 10 dB.
8. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

9. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
10. Transcribe the test results to the performance test record.
11. Repeat the steps 8 and 10 for each step attenuator setting of 20 dB to 80 dB.

High Level Test:

1. Connect the test equipment as shown in Figure 2-18.

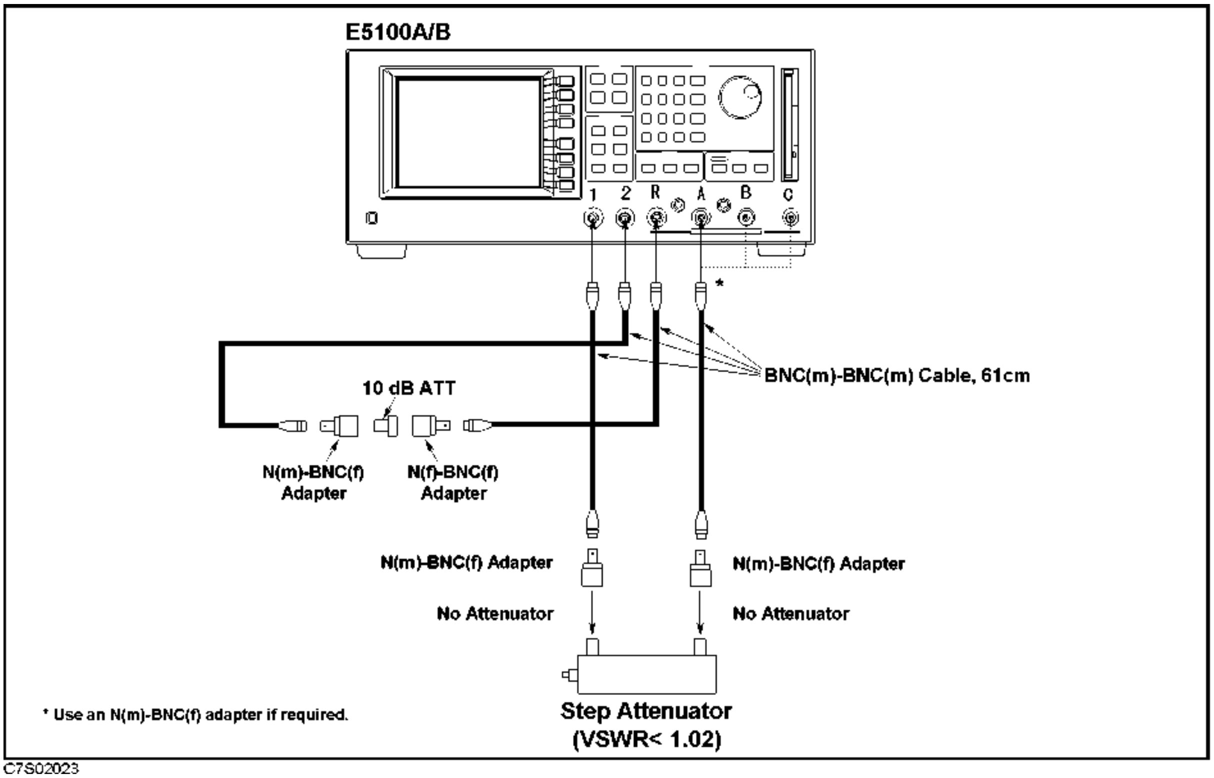

Figure 2-18. Dynamic Accuracy Test Setup 2 for Opt.200/300/400 with Opt.002

2. Set the step attenuator to 0 dB.
3. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

4. Set the step attenuator to 20 dB.
5. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

6. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
7. Transcribe the test results to the performance test record.
8. Connect the test equipment as shown in Figure 2-19.

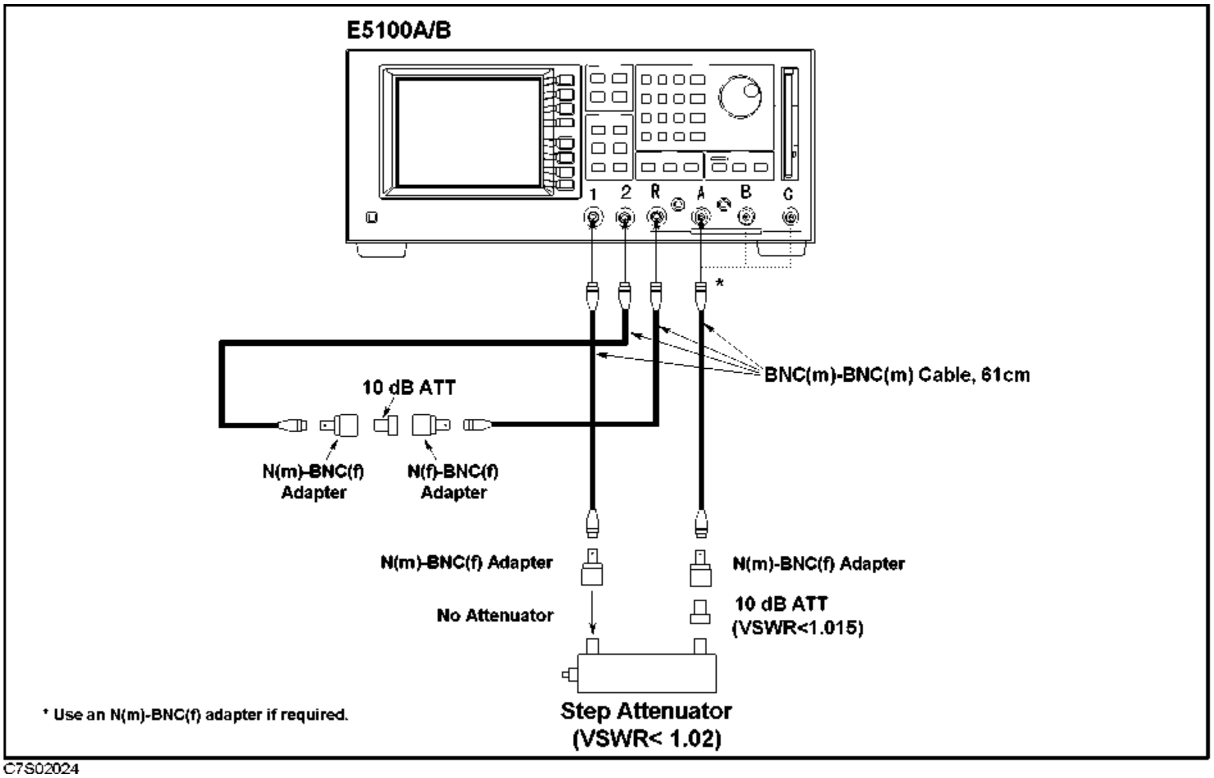

Figure 2-19. Dynamic Accuracy Test Setup 3 for Opt.200/300/400 with Opt.002

9. Set the step attenuator to 0 dB.
10. Perform the following key strokes to do a pass loss calibration:

   (Cal) `ACTIVE CH` (set to [CH1]) `RESPONSE` `THRU` `DONE:`
   `ACTIVE CH` (set to [CH2]) `RESPONSE` `THRU` `DONE:`

11. Set the step attenuator to 10 dB.
12. Perform the following key strokes for a single sweep measurement:

   (Trigger) `SINGLE`

13. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
14. Transcribe the test results to the performance test record.
15. Repeat the low level test and high level test for B/R, C/R, and C/B measurement.

For Opt.200/300/400 with Opt.001, Opt.200/300/400 with Opt.003 and Opt.010, and Opt.600

Low Level Test:

1. Record the step attenuator 50 MHz calibration value on the calculation sheet.
2. Connect the test equipment as shown in Figure 2-20.

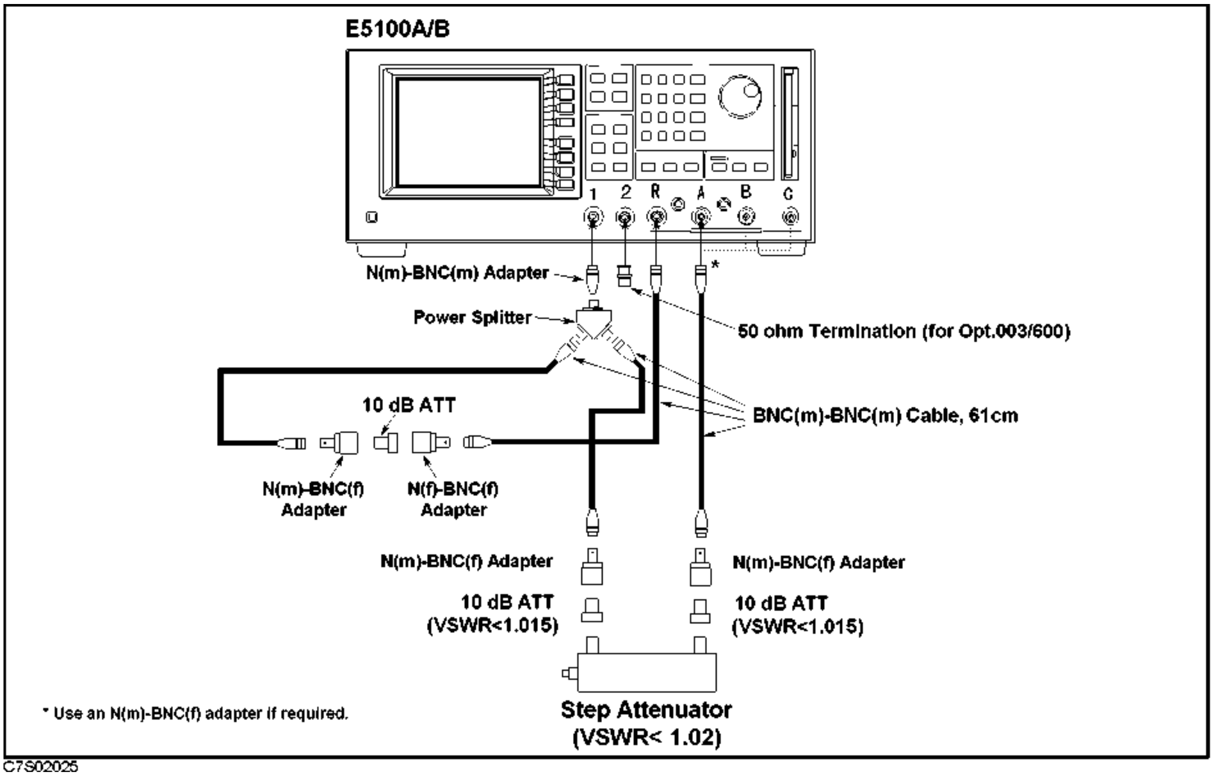

Figure 2-20.
Dynamic Accuracy Test Setup 1 for Opt.200/300/400 with Opt.001, Opt.200/300/400 with Opt.003 and Opt.010, and Opt.600

3. Set the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Channel-1	
Measurement: A/R	(Meas/Format) MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Channel-2	
Measurement; A/R	(Meas/Format) ACTIVE CH (set to [CH2])
	MEAS A/R
Format: Phase	FORMAT MORE PHASE
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)

Coupled Channel ON	(Sweep) COUPLED CH on OFF (turn it ON)
Start = 3 MHz	(Start) (3) × M
Stop = 50.001 MHz	(Stop) (50.001) × M
NOP = 2	(Sweep) NUMBER of POINTs (2) × 1
IF BW = 10 Hz	IF BW (10) × 1 RETURN
Power = 11 dBm	POWER (11) × 1
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB	A 25 dB

4. Set the step Attenuator setting to 0 dB.
5. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:
6. Perform the following key strokes to set up markers:

   (Marker) ACTIVE CH (set to [CH1]) MKR MODE MENU MARKERS: COUPLED
   MARKERS: DESCRETE
   (Marker) ACTIVE CH (set to [CH2]) MKR MODE MENU MARKERS: DESCRETE
7. Set the step attenuator to 10 dB.
8. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE
9. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
10. Transcribe the test results to the performance test record.
11. Repeat the steps 8 and 10 for each step attenuator setting of 20 dB to 80 dB.

High Level Test:

1. Connect the test equipment as shown in Figure 2-21.

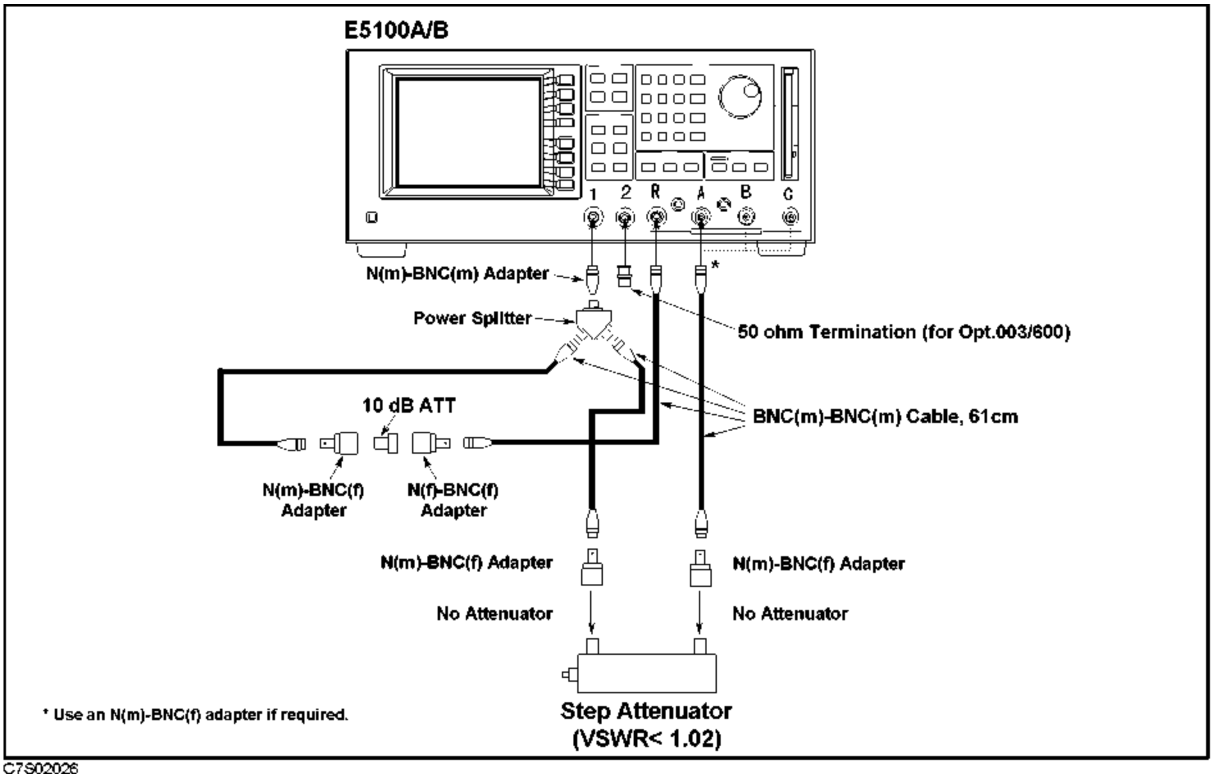

Figure 2-21.
Dynamic Accuracy Test Setup 2 for Opt.200/300/400 with Opt.001, Opt.200/300/400 with Opt.003 and Opt.010, and Opt.600

2. Set the step attenuator to 0 dB.
3. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

4. Set the step attenuator to 20 dB.
5. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

6. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
7. Transcribe the test results to the performance test record.
8. Connect the test equipment as shown in Figure 2-22.

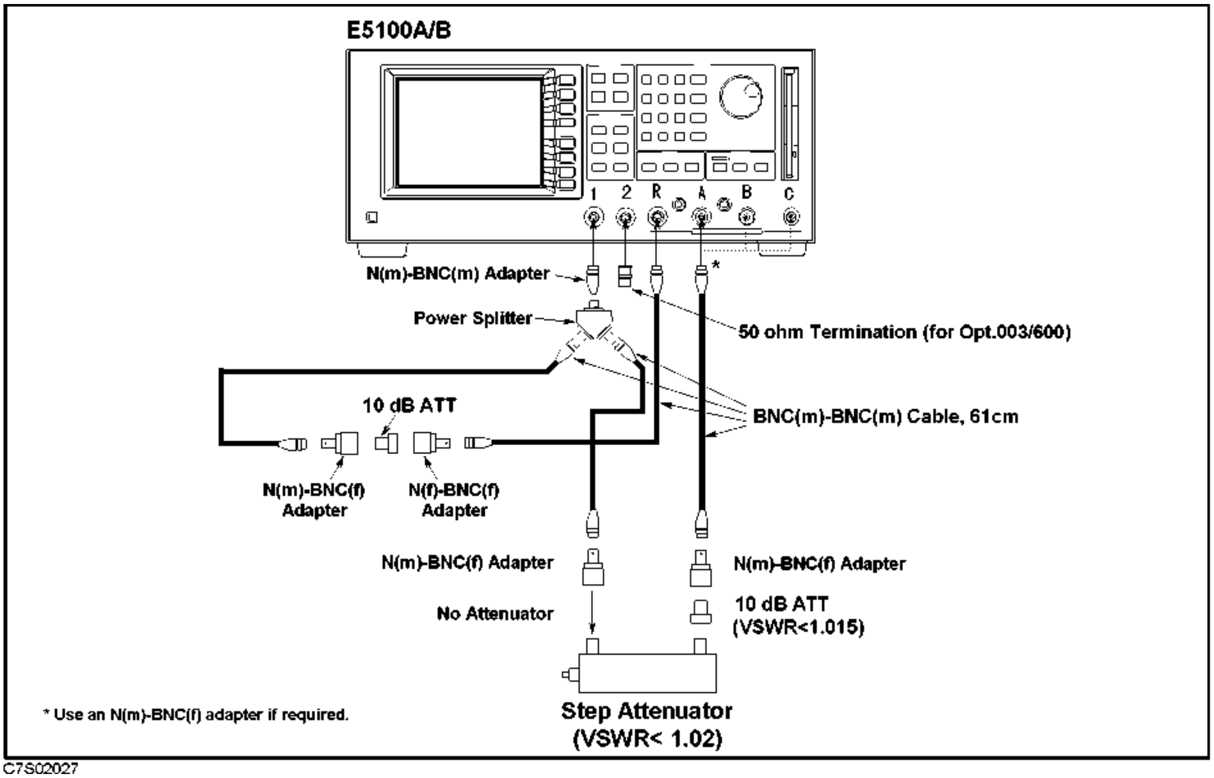

Figure 2-22.
Dynamic Accuracy Test Setup 3 for Opt.200/300/400 with Opt.001, Opt.200/300/400 with Opt.003 and Opt.010, and Opt.600

9. Set the step attenuator to 0 dB.
10. Perform the following key strokes to do a pass loss calibration:

    (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
    ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

11. Set the step attenuator to 10 dB.
12. Perform the following key strokes for a single sweep measurement:

    (Trigger) SINGLE

13. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
14. Transcribe the test results to the performance test record.
15. Repeat the low level test and high level test for B/R, C/R, and C/B measurement.

For Opt.200/300/400 with Opt.003 without Opt.010

Low Level Test:

1. Record the step attenuator 50 MHz calibration value on the calculation sheet.
2. Connect the test equipment as shown in Figure 2-23.

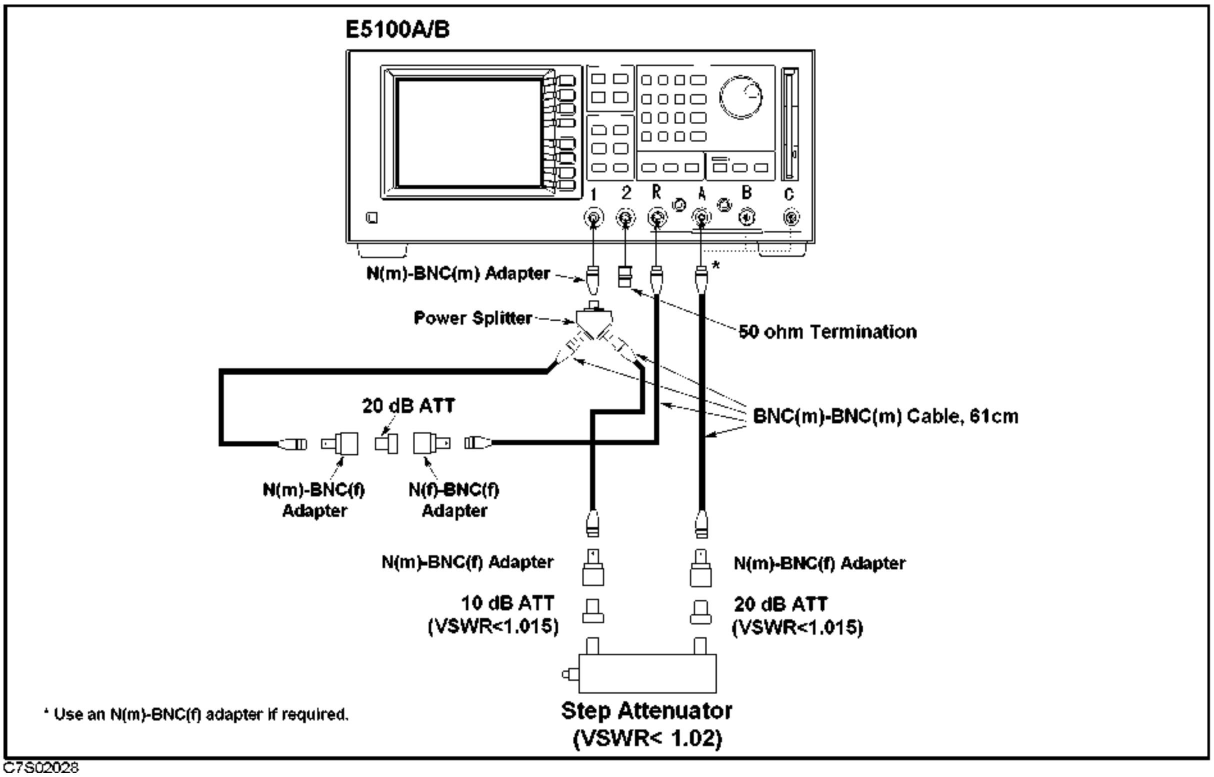

Figure 2-23. Dynamic Accuracy Test Setup 1 for Opt.200/300/400 with Opt.003 without Opt.010

3. Set the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Channel-1	
Measurement: A/R	(Meas/Format) MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Channel-2	
Measurement; A/R	(Meas/Format) ACTIVE CH (set to [CH2])
	MEAS A/R
Format: Phase	FORMAT MORE PHASE
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)
Coupled Channel ON	(Sweep) COUPLED CH on OFF (turn it ON)
Start = 3 MHz	(Start) (3) × M

Stop = 50.001 MHz	(Stop) (50.001) × M
NOP = 2	(Sweep) NUMBER of POINTs (2) × 1
IF BW = 10 Hz	IF BW (10) × 1 RETURN
Power = −4 dBm	POWER (−4) × 1
Input-R Attenuator: 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB	A 0 dB

4. Set the step Attenuator setting to 0 dB.
5. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

6. Perform the following key strokes to set up markers:

   (Marker) ACTIVE CH (set to [CH1]) MKR MODE MENU MARKERS: COUPLED
   MARKERS: DESCRETE
   (Marker) ACTIVE CH (set to [CH2]) MKR MODE MENU MARKERS: DESCRETE

7. Set the step attenuator to 10 dB.
8. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

9. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
10. Transcribe the test results to the performance test record.
11. Repeat the steps 8 and 10 for each step attenuator setting of 20 dB to 80 dB.

High Level Test:

1. Connect the test equipment as shown in Figure 2-24.

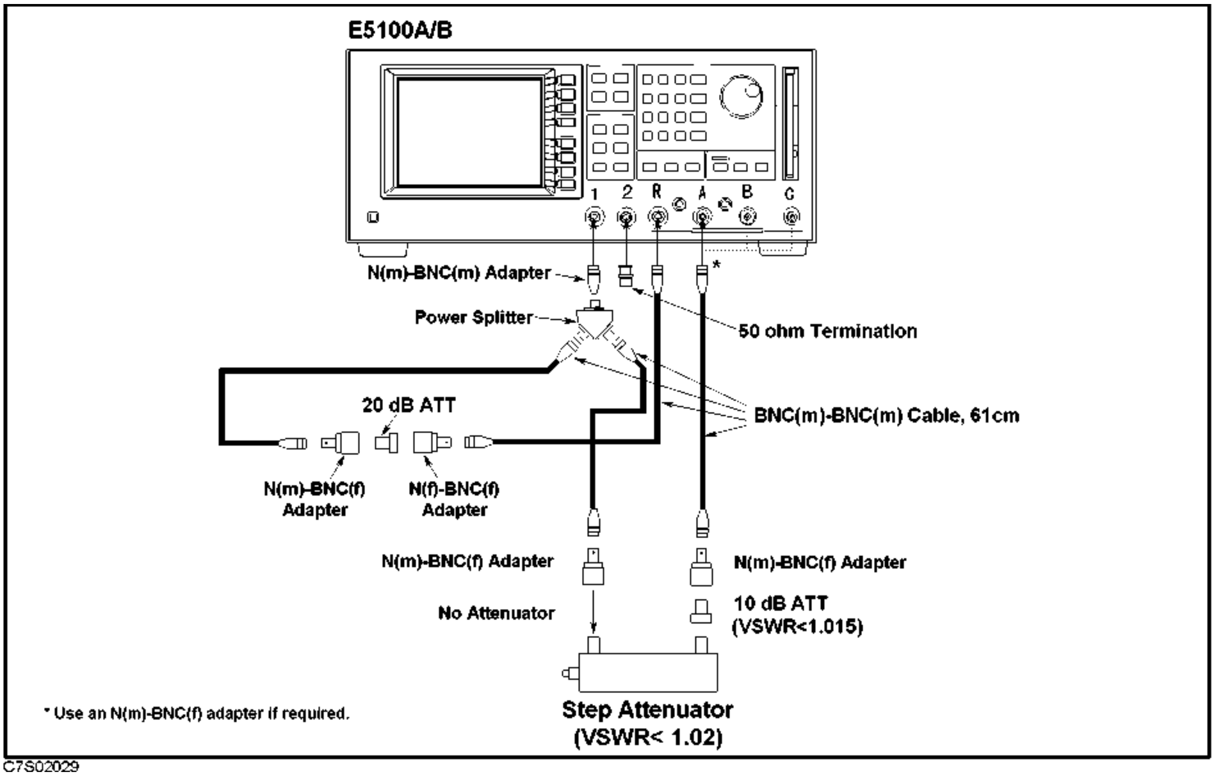

Figure 2-24.
Dynamic Accuracy Test Setup 2 for Opt.200/300/400 with Opt.003 without Opt.010

2. Set the step attenuator to 0 dB.
3. Perform the following key strokes to do a pass loss calibration:

   (Cal) `ACTIVE CH` (set to [CH1]) `RESPONSE` `THRU` `DONE:`
   `ACTIVE CH` (set to [CH2]) `RESPONSE` `THRU` `DONE:`

4. Set the step attenuator to 20 dB.
5. Perform the following key strokes for a single sweep measurement:

   (Trigger) `SINGLE`

6. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
7. Transcribe the test results to the performance test record.
8. Connect the test equipment as shown in Figure 2-25.

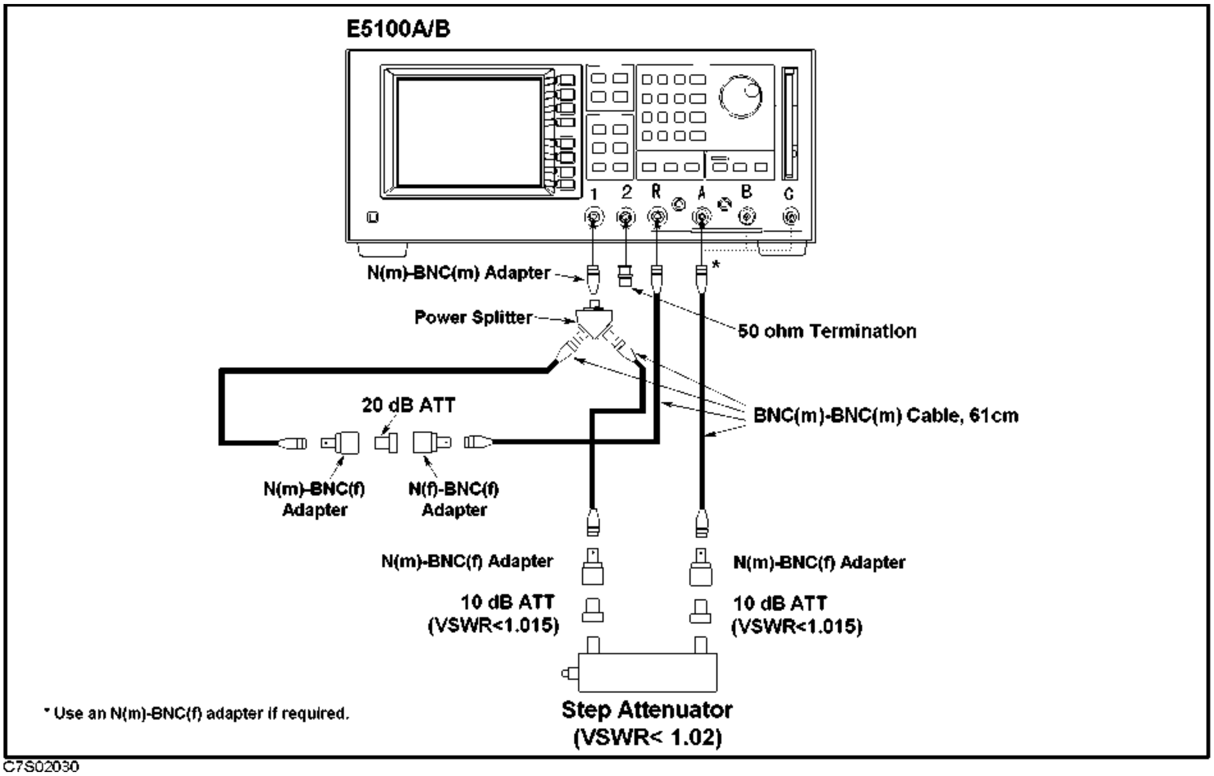

Figure 2-25.
Dynamic Accuracy Test Setup 3 for Opt.200/300/400 with Opt.003 without Opt.010

9. Set the step attenuator to 0 dB.
10. Perform the following key strokes to do a pass loss calibration:

   (Cal) `ACTIVE CH` (set to [CH1]) `RESPONSE` `THRU` `DONE:`
   `ACTIVE CH` (set to [CH2]) `RESPONSE` `THRU` `DONE:`

11. Set the step attenuator to 10 dB.
12. Perform the following key strokes for a single sweep measurement:

   (Trigger) `SINGLE`

13. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
14. Transcribe the test results to the performance test record.
15. Repeat the low level test and high level test for B/R, C/R, and C/B measurement.

For Option 100

Low Level Test:

1. Record the step attenuator 50 MHz calibration value on the calculation sheet.
2. Connect the test equipment as shown in Figure 2-26.

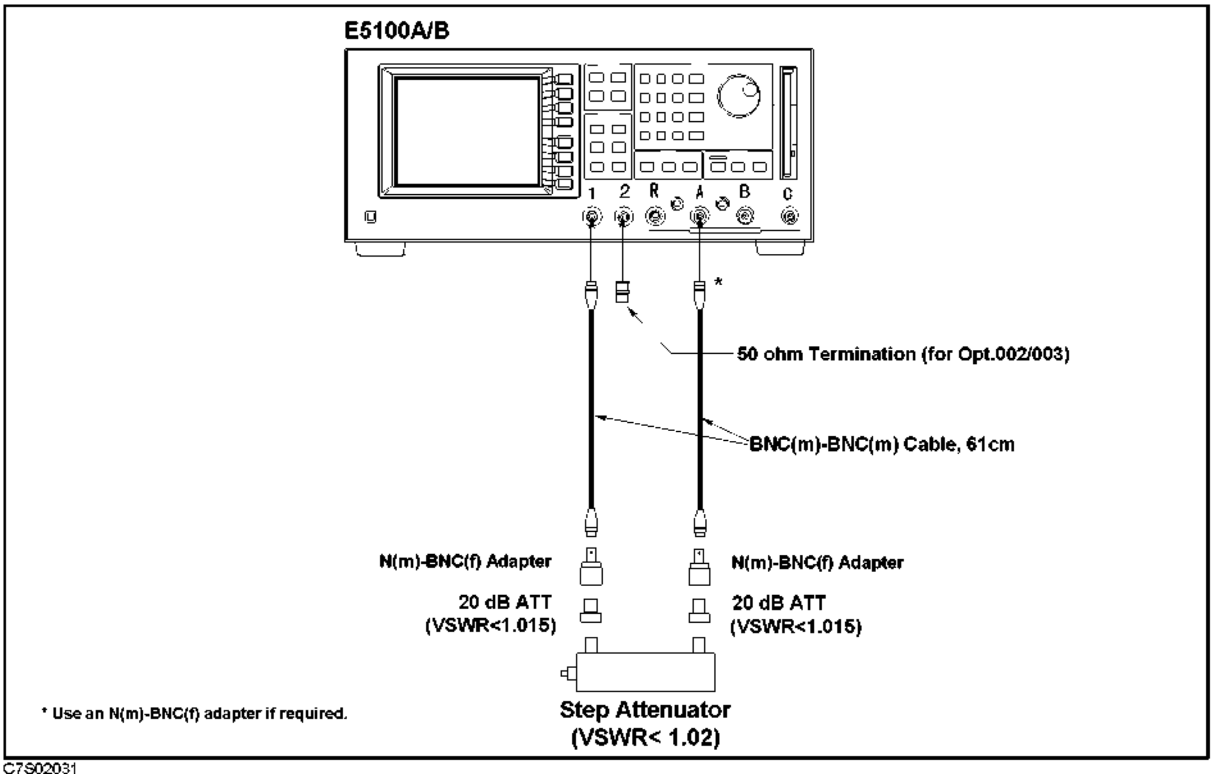

Figure 2-26. Dynamic Accuracy Test Setup 1 for Opt.100

3. Set the E5100A/B as follows:

Control Settings	Key Strokes
Preset	(Preset)
Channel-1	
Measurement: A/R	(Meas/Format) MEAS A
Format: LOG MAG	FORMAT MORE LOG MAG
Channel-2	
Measurement; A/R	(Meas/Format) ACTIVE CH (set to [CH2])
	MEAS A
Format: Phase	FORMAT MORE PHASE
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)
Coupled Channel ON	(Sweep) COUPLED CH on OFF (turn it ON)
Start = 3 MHz	(Start) (3) × M
Stop= 50.001 MHz	(Stop) (50.001) × M

NOP = 2	Sweep NUMBER of POINTs 2 × 1
IF BW = 10 Hz	IF BW 10 × 1 RETURN
Power = 0 dBm	POWER 0 × 1
Input-A Attenuator: 25 dB	System MORE ATTENUATOR PORT : A 25 dB

4. Set the step Attenuator setting to 0 dB.
5. Perform the following key strokes to do a pass loss calibration:

   Cal ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

6. Perform the following key strokes to set up markers:

   Marker ACTIVE CH (set to [CH1]) MKR MODE MENU MARKERS: COUPLED
   MARKERS: DESCRETE
   Marker ACTIVE CH (set to [CH2]) MKR MODE MENU MARKERS: DESCRETE

7. Set the step attenuator to 10 dB.
8. Perform the following key strokes for a single sweep measurement:

   Trigger SINGLE

9. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
10. Transcribe the test results to the performance test record.
11. Repeat the steps 8 and 10 for each step attenuator setting of 20 dB to 80 dB.

High Level Test:

1. Connect the test equipment as shown in Figure 2-27.

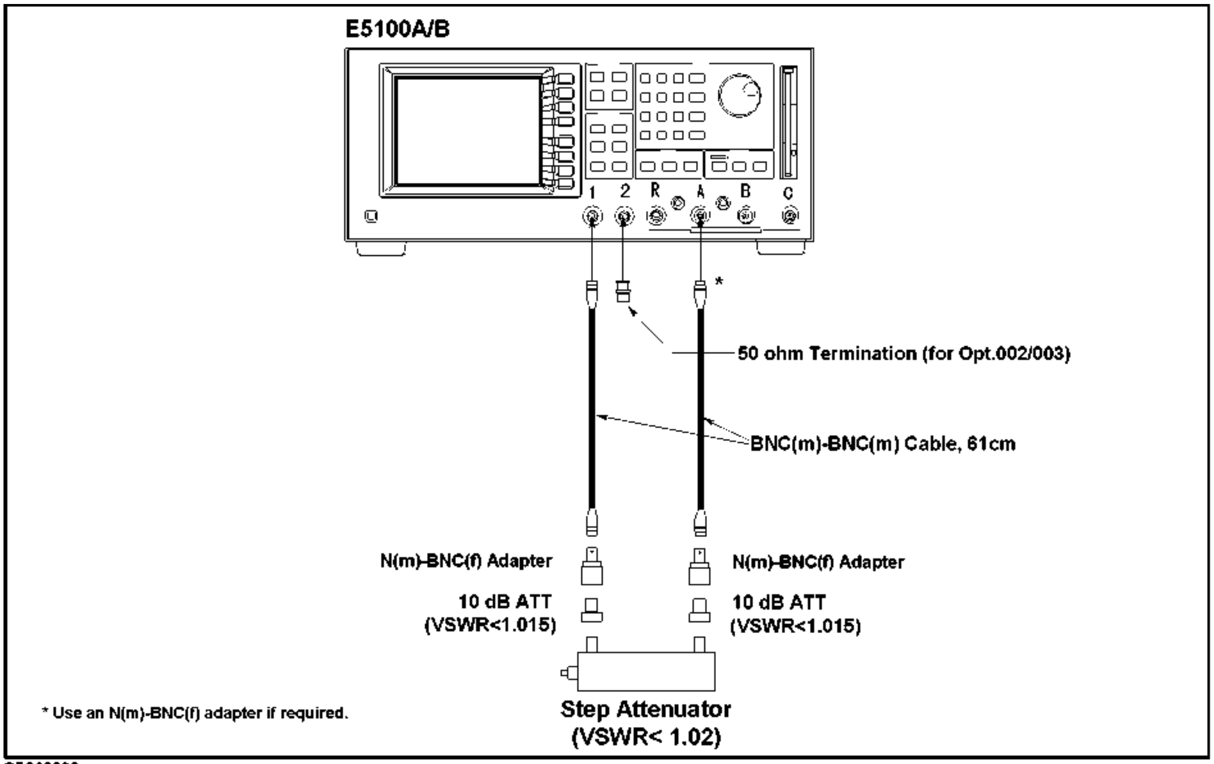

Figure 2-27. Dynamic Accuracy Test Setup 2 for Opt.100

2. Set the step attenuator to 0 dB.
3. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

4. Set the step attenuator to 20 dB.
5. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

6. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
7. Transcribe the test results to the performance test record.
8. Connect the test equipment as shown in Figure 2-28.

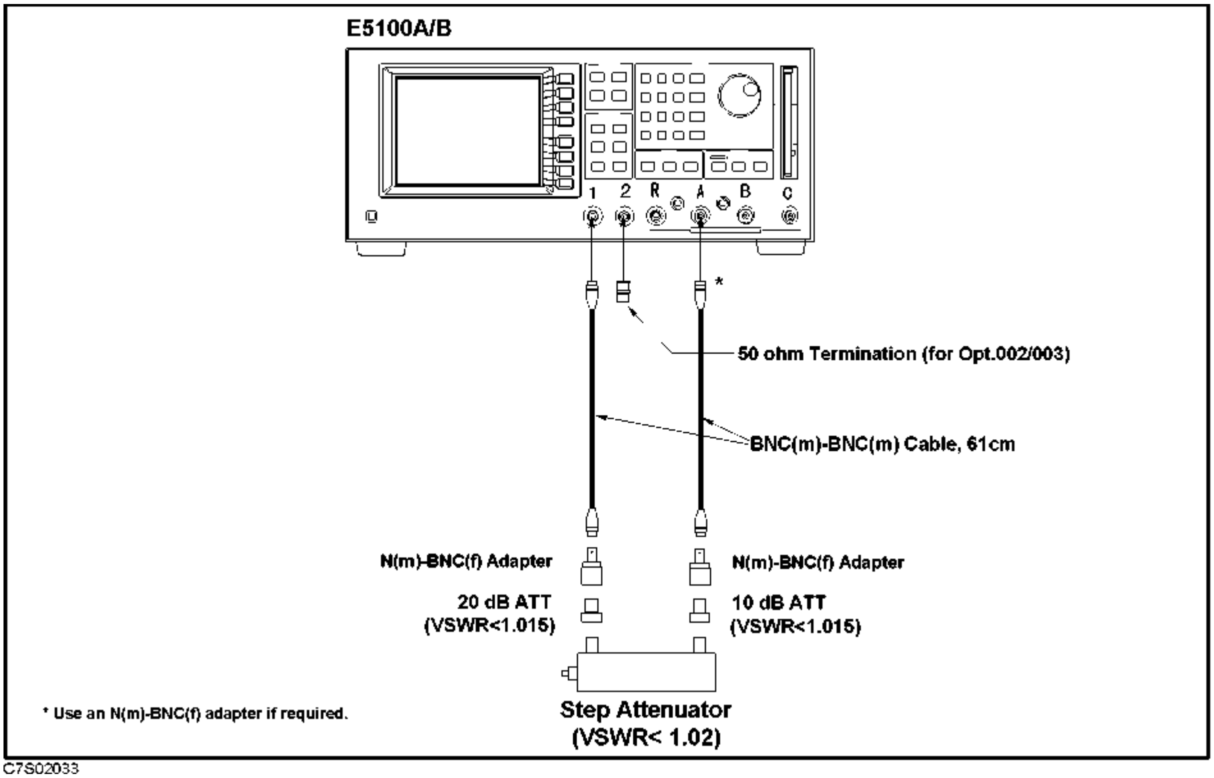

Figure 2-28. Dynamic Accuracy Test Setup 3 for Opt.100

9. Set the step attenuator to 0 dB.
10. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

11. Set the step attenuator to 10 dB.
12. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

13. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
14. Transcribe the test results to the performance test record.
15. Repeat the low level test and high level test for B/R, C/R, and C/B measurement.

13. Magnitude Ratio Frequency Response Test

This test checks the magnitude ratio accuracy for each pair of inputs by measuring the peak-to-peak variation of the ratioed trace.

Note An E5100B does not require this test. An E5100A with Option 100 does not require this test.

Specification

(at 23 ± 5°C, −30 dBm input level for RF attenuator: 0 dB or −5 dBm input level for RF attenuator: 25 dB, the same RF attenuator setting for both inputs)

50 Ω input

- E5100A
  - 10 kHz ≤ freq. < 100 kHz .... ±1 dB
  - 100 kHz ≤ freq. ≤ 100 MHz .... ±0.5 dB
  - 100 MHz < freq. ≤ 300 MHz .... ±1 dB

1 MΩ input for Opt. 101 or 301

(using 50 Ω feedthrough) .... ±3 dB

Test Equipment

Power Splitter 11667A
50 Ω Termination BNC type .... 11593A (if without Opt.001)
Fixed Attenuator 20 dB 8491A Opt.020
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839, 3ea
N(m)-BNC(f) Adapter .... Agilent P/N 1250-0780, 3ea
50Ω Feedthrough 11048C (Opt.101/301)

Procedure

Input Impedance: 50Ω

1. Connect the equipment as shown in Figure 2-29.

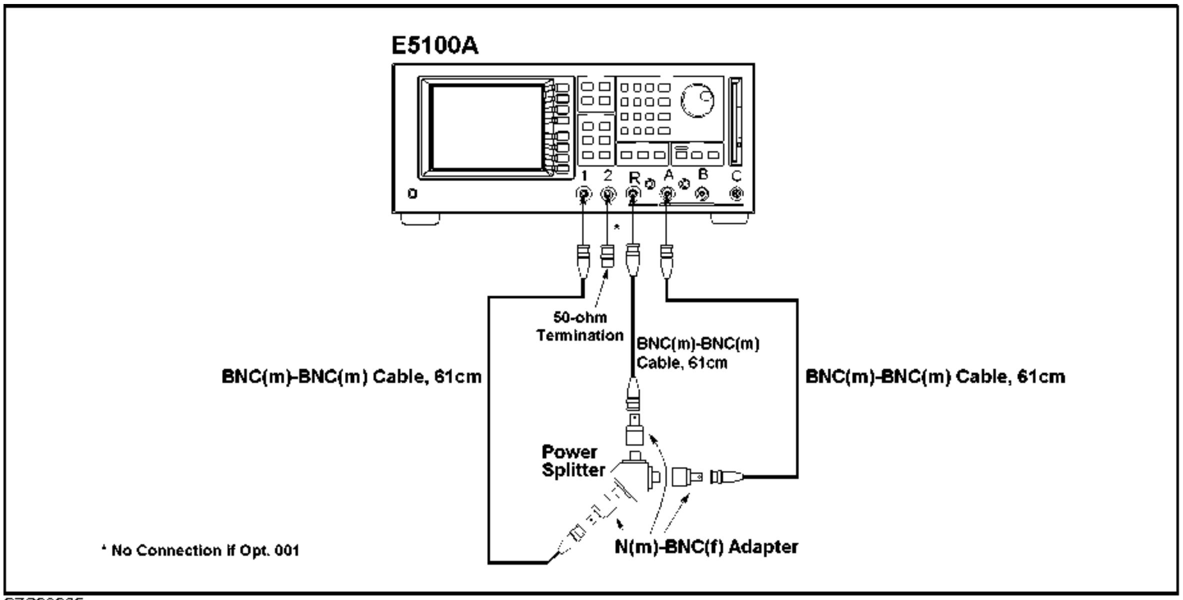

Figure 2-29. Magnitude Ratio Frequency Response Test Setup-1

2. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Power= 1 dBm	(Sweep) POWER (1) × 1
IF BW= 30 Hz	IF BW (30) × 1
Active Channel: CH1	(Meas/Format) ACTIVE CH (set to [CH1])
Measurement: A/R	MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Scale: 0.1 dB/div	(Display) SCALE MENU SCALE/DIV (.1) × 1
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB	A 25 dB

3. Store the measurement data using the following key stroke:

   (Marker) ACTIVE CH (set to [CH1]) (Display) DEFINE TRACE DATA→MEM

4. Reverse R and A cable connections on the E5100A input ports.
5. Press DATA and MEMORY key.
6. Visually average the two traces; imagine a trace directly between the two traces. (If both traces are not completely visible, change the scale as required.)
   a. Press (Marker) rotate the RPG knob, and record the maximum "averaged" power deviation from 10 kHz to 100 kHz on the performance test record.

b. Rotate the RPG knob, and record the maximum “averaged” power deviation from 100 kHz to 100 MHz on the performance test record.

c. Rotate the RPG knob, and record the maximum “averaged” power deviation from 100 MHz to 300 MHz on the performance test record.

7. Press (Display) DEFINE TRACE TRACE: DATA .

8. Change the connection as shown in Figure 2-30.

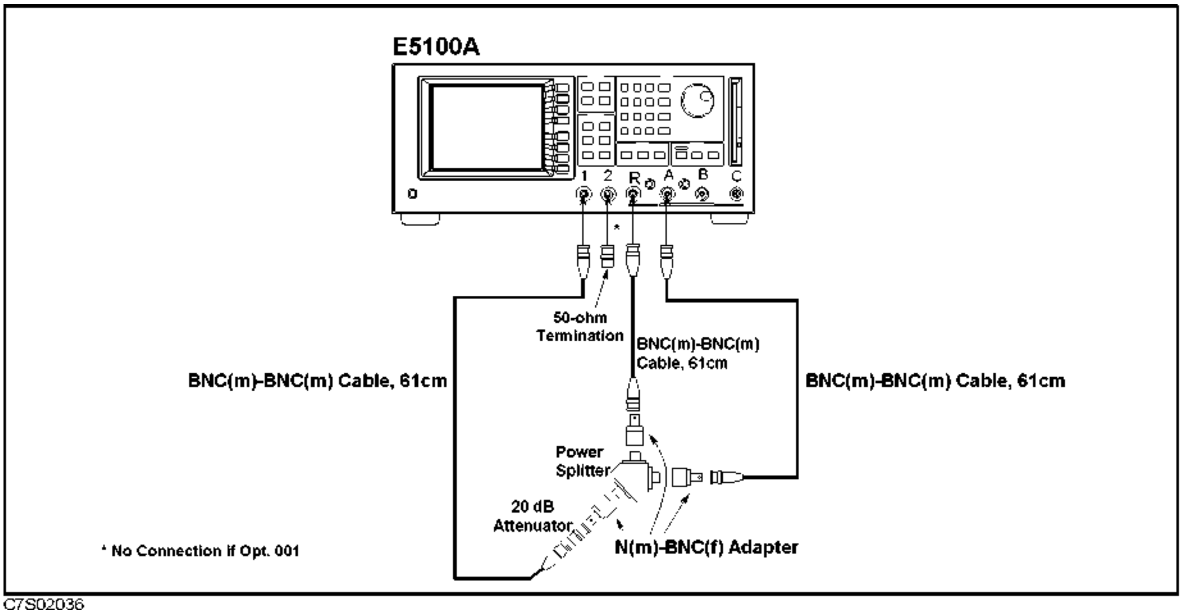

Figure 2-30. Magnitude Ratio Frequency Response Test Setup-2

9. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Power= −4 dBm	(Sweep) POWER (−4) × 1
Input-R Attenuator: 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB	A 0 dB

10. Repeat the steps 3 through 6.

11. Repeat the steps 1 through 10 for B/R (Opt.300/400).

12. Repeat the steps 1 through 10 for C/R (Opt.400).

13. Repeat the steps 1 through 10 for B/C (Opt.400).

Input Impedance: 1MΩ (Opt.101/301)

1. Connect the equipment as shown in Figure 2-31.

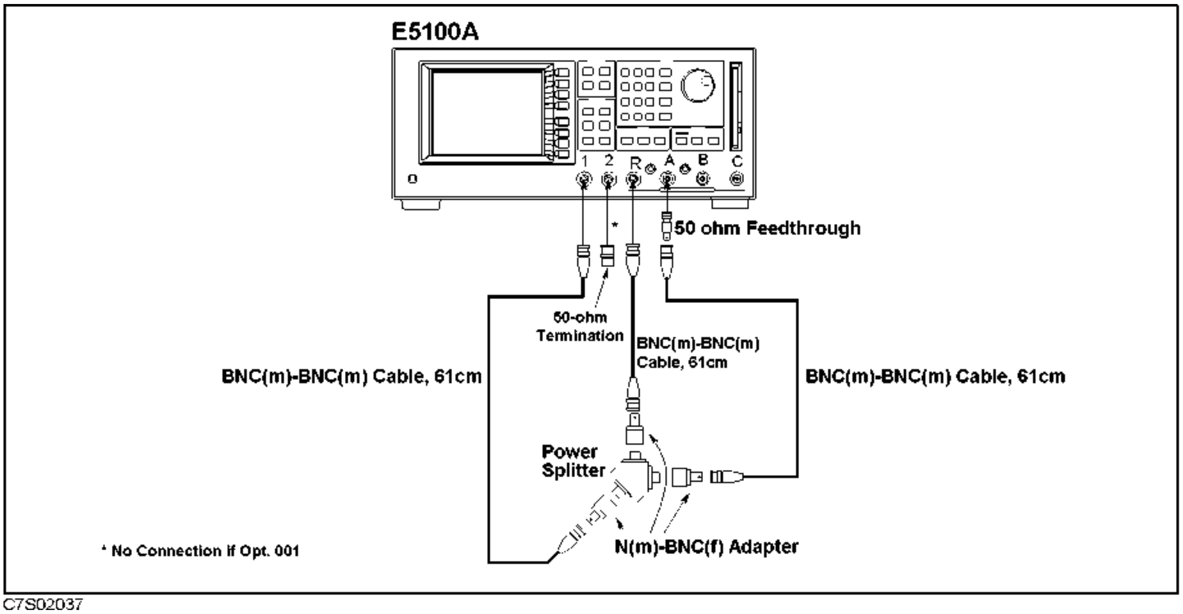

Figure 2-31. Magnitude Ratio Frequency Response Test Setup-3

2. Set the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Stop = 5 MHz	(Stop) (5) M
Power = 1 dBm	(Sweep) POWER (1) × 1
IF BW = 30 Hz	IF BW (30) × 1
Active Channel: CH1	(Meas/Format) ACTIVE CH (set to [CH1])
Measurement: A/R	MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Scale: 0.1 dB/div	(Display) SCALE MENU SCALE/DIV (.1) × 1
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB	A 25 dB

3. Store the measurement data using the following key stroke:

   (Marker) ACTIVE CH (set to [CH1]) (Display) DEFINE TRACE DATA→MEM

4. Reverse R and A cable connections on the E5100A input ports.
5. Press DATA and MEMORY key.

6. Visually average the two traces; imagine a trace directly between the two traces. (If both traces are not completely visible, change the scale as required.)

   Press (Marker) rotate the RPG knob, and record the maximum "averaged" power deviation from 10 kHz to 5 MHz on the performance test record.

7. Press (Display) DEFINE TRACE TRACE: DATA.

8. Change the connection as shown in Figure 2-32.

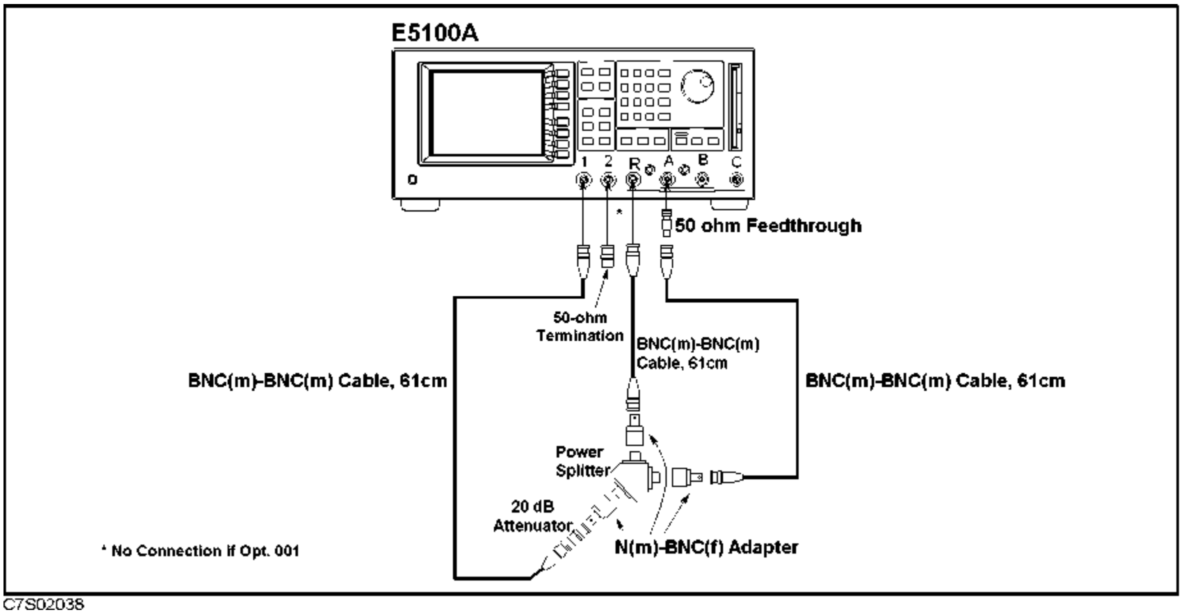

Figure 2-32. Magnitude Ratio Frequency Response Test Setup-4

9. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Power= −4 dBm	(Sweep) POWER (−4) × 1
Input-R Attenuator: 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB	A 0 dB

10. Repeat the steps 3 through 6.

11. Repeat test for B/R (Opt.300/400).

12. Repeat test for B/C (Opt.400).

14. Phase Frequency Response Test

This test checks the phase accuracy for each pair of inputs by measuring the peak-to-peak variation of the ratioed trace.

Note An E5100B does not require this test. An E5100A with Option 100 does not require this test.

Specification

(at 23 ± 5°C, −30 dBm input level for RF attenuator: 0 dB or −5 dBm input level for RF attenuator: 25 dB, the same RF attenuator setting for both inputs, 50 Ω input)

- E5100A
  - 10 kHz ≤ freq. < 100 kHz .... ±5°
  - 100 kHz ≤ freq. ≤ 100 MHz .... ±2.5°
  - 100 MHz < freq. ≤ 300 MHz .... ±5°

Test Equipment

Power Splitter 11667A
50 Ω Termination BNC type .... 11593A (if without Opt.001)
Fixed Attenuator 20 dB 8491A Opt.020
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839, 3ea
N(m)-BNC(f) Adapter .... Agilent P/N 1250-0780, 3ea

Procedure

1. Connect the equipment as shown in Figure 2-33.

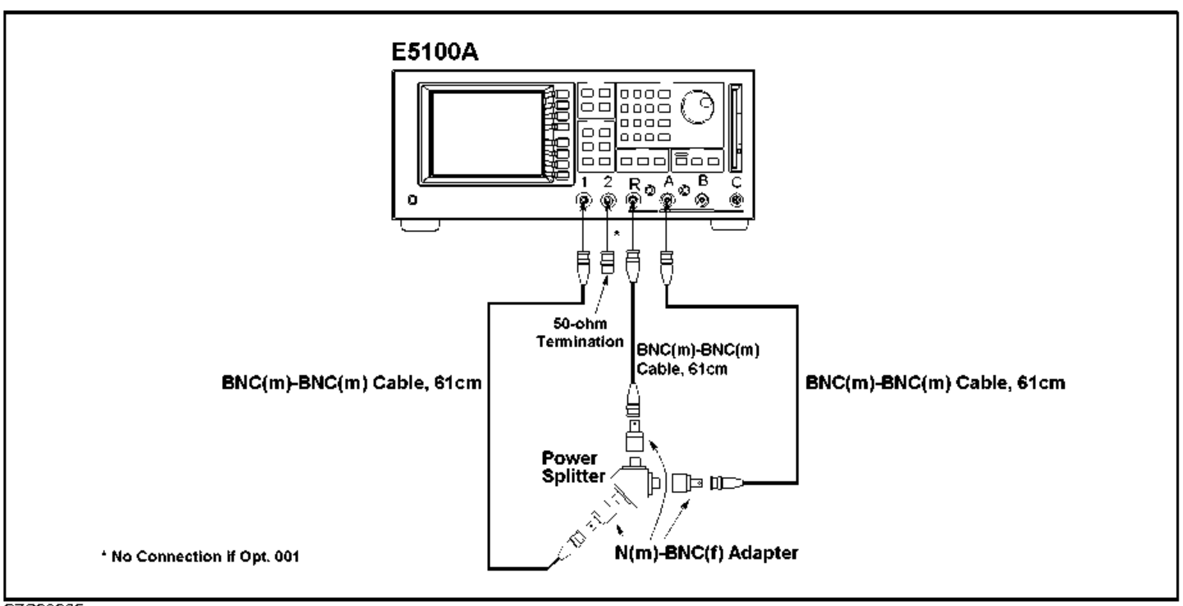

Figure 2-33. Phase Frequency Response Test Setup-1

2. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Power = 1 dBm	(Sweep) POWER (1) × 1
IF BW = 30 Hz	IF BW (30) × 1
Active Channel: CH1	(Meas/Format) ACTIVE CH (set to [CH1])
Measurement: A/R	MEAS A/R
Format: PHASE	FORMAT MORE PHASE
Scale: 0.1 dB/div	(Display) SCALE MENU SCALE/DIV (.1) × 1
MULTI Channel ON	(Display) MULTI CH on OFF (turn it ON)
Statistics: ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB	A 25 dB

3. Press (Display) MORE ELECTRICAL DELAY and turn the RPG knob or press (⇧) (⇩) to vary the electrical delay until the standard deviation value as a marker statistic (s.dev) is minimum as possible.

4. Press PHASE OFFSET and enter the mean value as a marker statistic (mean).

5. Perform the following key strokes for a single sweep measurement.

   (Trigger) SINGLE

6. Perform the following key strokes to set the marker search range from 10 kHz to 100 kHz.

   (Marker) ACTIVE MARKER 1 (10) × k 2 (100) × k RETURN ΔMODE MENU ΔREF MKR ΔREF=1 RETURN RETURN MARKER SEARCH SEARCH RANGE SEARCH RNG STORE PART SRCH on OFF (turn it ON)

7. Move the marker to the maximum value and the minimum value using the following key strokes. Compare the two values, and record the larger one in the performance test record.

   (Marker) ΔMODE MENE ΔMODE OFF RETURN MKR SEARCH SEARCH: MAX MIN

8. Press (Marker) ΔMODE MENU ΔREF MKR ΔREF=1 .

9. Perform the following key strokes to set the marker search range from 100 kHz to 100 MHz.

   (Marker) ACTIVE MARKER 1 (100) × k 2 (100) × M RETURN MKR SEARCH SEARCH RANGE SEARCH RNG STORE

10. Move the marker to the maximum value and the minimum value using the following key strokes. Compare the two values, and record the larger one in the performance test record.

(Marker) ΔMODE MENU ΔMODE OFF RETURN MKR SEARCH MAX MIN

11. Press (Marker) ΔMODE MENU ΔREF MKR ΔREF=1 .

12. Perform the following key strokes to set the marker search range from 100 MHz to 300 MHz.

13. (Marker) ACTIVE MARKER 1 (100) × M 2 (300) × M RETURN MKR SEARCH SEARCH RANGE SEARCH RNG STORE

14. Move the marker to the maximum value and the minimum value using the following key strokes. Compare the two values, and record the larger one in the performance test record.

(Marker) ΔMODE MENU ΔMODE OFF RETURN MKR SEARCH SEARCH: MAX MIN

15. Press (Marker) ΔMODE MENU ΔREF MKR ΔREF=1 .

16. Change the connection as shown in Figure 2-34.

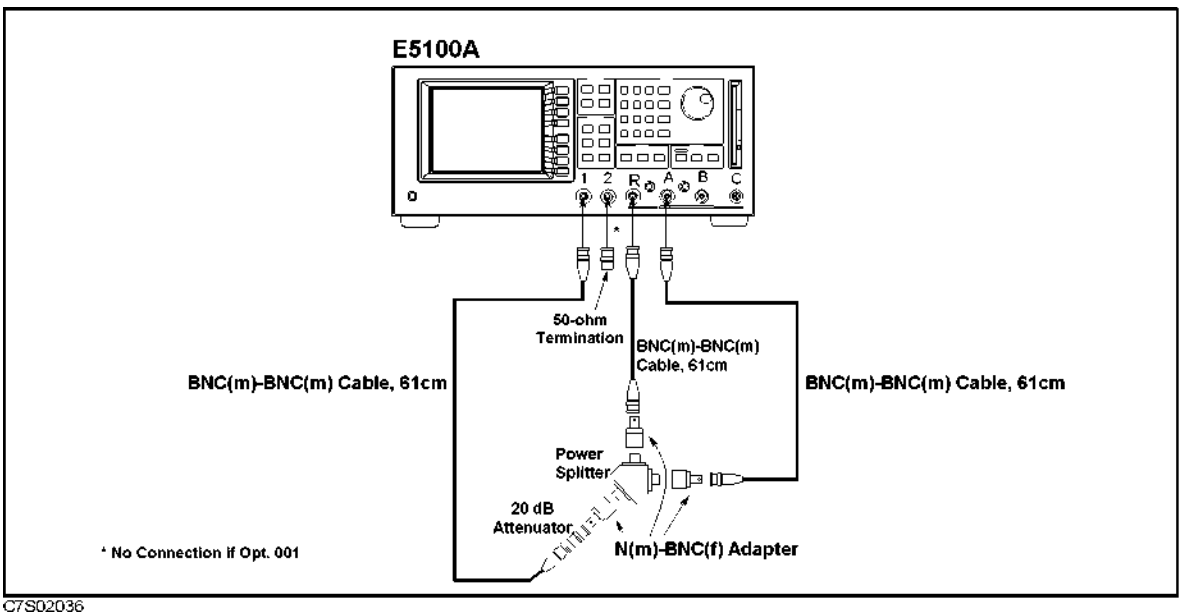

Figure 2-34. Phase Frequency Response Test Setup-2

17. Set the E5100A/B as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Power= −4 dBm	(Sweep) POWER (−1) (4) × 1
Input-R Attenuator: 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB	A 0 dB

18. Repeat the steps 3 through 14.

19. Change the E5100A/B control settings for B/R Phase:

Control Settings	**Key Strokes**

Active Channel: CH2	(Meas/Format) ACTIVE CH (set to [CH2])
Measurement: B/R	MEAS B/R
Format: PHASE	FORMAT MORE PHASE
Trigger Mode: Continuous	(Trigger) CONTINUOUS

20. Repeat steps 3 through 18.
21. Change the E5100A/B control settings for A/B Phase:

Control Settings	**Key Strokes**
Active Channel: CH2	(Meas/Format) ACTIVE CH (set to [CH2])
Measurement: A/B	MEAS A/B
Format: PHASE	FORMAT MORE PHASE
Trigger Mode: Continuous	(Trigger) CONTINUOUS

22. Repeat steps 3 through 18.
23. Repeat steps 1 through 22 for B/R (Opt.300/400).
24. Repeat steps 1 through 22 for C/R (Opt.400).
25. Repeat steps 1 through 22 for B/C (Opt.400).

3

Performance Tests for E5100A Option 118/218/318/618

1. Frequency Accuracy Test

This test verifies the E5100A's internal synthesizer frequency accuracy at its highest frequency with an external frequency counter.

Specification

Frequency Range .... 10 kHz to 180 MHz
50 kHz to 180 MHz (with Opt.510)
Frequency Accuracy .... ±20 ppm at 23±5 °C (without Opt.1D5)
±1 ppm at 0 to 55 °C (20 min warm up,with Opt.1D5)

Test Equipment

Frequency Counter 5334B Opt.010,030
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839
50 Ω Termination BNC type .... Agilent 11593A (Opt.002 or Opt.003)

Procedure

1. Connect the BNC(m)-BNC(m) Cable(61cm) from E5100A RF OUT -1 to the Frequency Counter INPUT C as shown in Figure 3-1.

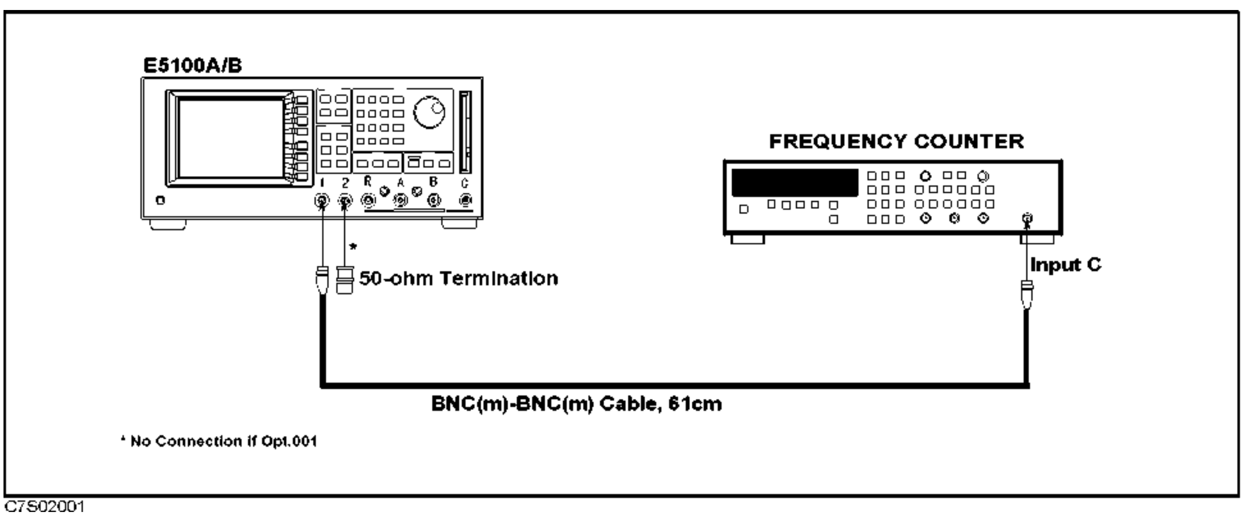

Figure 3-1. Frequency Range and Accuracy Test Setup

Note If the E5100A has Option 1D5, confirm that a BNC(m)-BNC(m) adapter is connected between the EXT REF INPUT (10/N MHz) connector and the REF OVEN (OptION 1D5) connector on the rear panel. If Option 1D5 is NOT installed, connect nothing to the EXT REF INPUT (10/N MHz) connector.

2. Set the gate time of the frequency counter to 100 ms
3. Set up the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Span Frequency = 0 Hz	(Span) (0) × 1
Center Frequency = 180 MHz	(Center) (180) × M

4. Record the frequency counter reading on the Performance Test Record.

2. Harmonics Test

This test measures the E5100A signal source's second harmonics and third harmonics with a spectrum analyzer.

Specification

Harmonics (for E5100A):

Opt.001 without Opt.010 .... < −35 dBc (at −4dBm output level)
Opt.002 without Opt.010 .... < −35 dBc (at −10dBm output level)
Opt.003 without Opt.010 .... < −35 dBc (at −7dBm output level)
Opt.001 with Opt.010 .... < −20 dBc (at +21 dBm output level)
Opt.002 with Opt.010 .... < −20 dBc (at +15 dBm output level)
Opt.003 with Opt.010 .... < −20 dBc (at +18 dBm output level)
Opt.618 .... < −20 dBc (at +15dBm output level)

Test Equipment

Spectrum Analyzer 8566A/66B/68A/68B
N(m)-BNC(f) Adapter .... Agilent P/N 1250-1476
BNC(m)-BNC(m) Cable, 122 cm .... Agilent P/N 8120-1840, 2 ea.
50 Ω Termination BNC type .... Agilent 11593A (Opt.002 or Opt.003)

Procedure

1. Set up the test configuration shown in Figure 3-2.

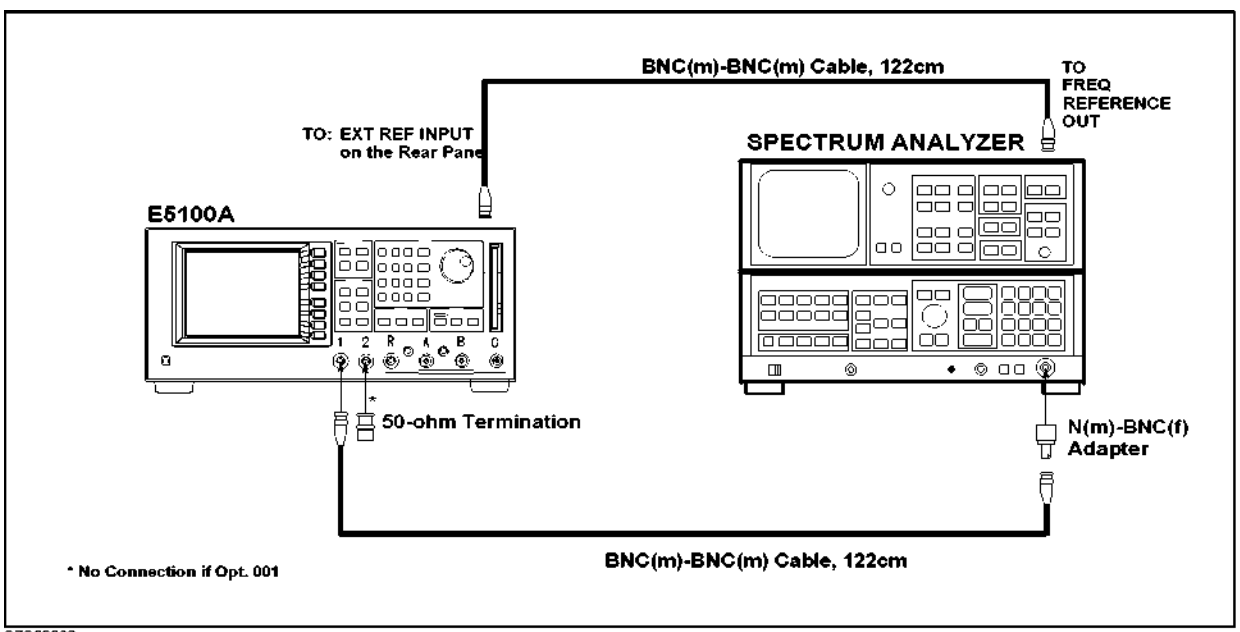

Figure 3-2. Harmonics Test Setup

Note Harmonics Test, Non-Harmonic Spurious Test, and Phase Noise Test use the same test setup.

2. Set up the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Source Power	
= −4 dBm (Opt.001 without Opt.010)	(Sweep) POWER (−4) × 1
= −10 dBm (Opt.002 without Opt.010)	(Sweep) POWER (−10) × 1
= −7 dBm (Opt.003 without Opt.010)	(Sweep) POWER (−7) × 1
= +21 dBm (Opt.001 with Opt.010)	(Sweep) POWER (21) × 1
= +15 dBm (Opt.002 with Opt.010)	(Sweep) POWER (15) × 1
= +18 dBm (Opt.003 with Opt.010)	(Sweep) POWER (18) × 1
= +15 dBm (Opt.618)	(Sweep) POWER (15) × 1
Span Frequency = 0 Hz	(Span) (0) × 1

3. Set the spectrum analyzer as follows:

Video Bandwidth	30 Hz
Without Opt.010: Reference Level	20 dB
With Opt.010: Reference Level	30 dB

4. Set the E5100A's center frequency and the spectrum analyzer's center frequency, span frequency, and resolution bandwidth according to the table below. Then record the spectrum analyzer readings (peak value) in the calculation sheet.

Table 3-1. Harmonics Test Setup

E5100A Center Frequency	Spectrum Analyzer		
	Center	Span	RBW
10 kHz[1]	10 kHz	1 kHz	100 Hz
	20 kHz	1 kHz	100 Hz
	30 kHz	1 kHz	100 Hz
100 kHz	100 kHz	10 kHz	1 kHz
	200 kHz	10 kHz	1 kHz
	300 kHz	10 kHz	1 kHz
1 MHz	1 MHz	10 kHz	1 kHz
	2 MHz	10 kHz	1 kHz
	3 MHz	10 kHz	1 kHz
10 MHz	10 MHz	10 kHz	1 kHz
	20 MHz	10 kHz	1 kHz
	30 MHz	10 kHz	1 kHz
100 MHz	100 MHz	10 kHz	1 kHz
	200 MHz	10 kHz	1 kHz
	300 MHz	10 kHz	1 kHz
180 MHz	180 MHz	10 kHz	1 kHz
	360 MHz	10 kHz	1 kHz
	540 MHz	10 kHz	1 kHz

1 E5100A with Option 510 does not require the harmonics test at this frequency.

5. Use the equation given on the calculation sheet to calculate the test results, and transcribe the test results to the performance test record.

3. Non-Harmonic Spurious Test

Non-Harmonic Spurious Test is only for E5100A/B Option 100/200/300/400/600. An E5100A with Option 118/218/318/618 does not require this test.

4. Phase Noise Test

This test measures the E5100A signal source Phase Noise broadering the carrier spectrum.

Specification

Phase Noise .... < −90 dBc/Hz (at 10 kHz offset from 0 dBm fundamental)

Test Equipment

Spectrum Analyzer 8566A/66B/68A/68B
N(m)-BNC(f) Adapter .... Agilent P/N 1250-1476
BNC(m)-BNC(m) Cable, 122 cm .... Agilent P/N 8120-1840, 2 ea.
50 Ω Termination BNC type .... 11593A (Opt.002 or Opt.003)

Procedure

1. Set up the test configuration as shown in Figure 3-3.

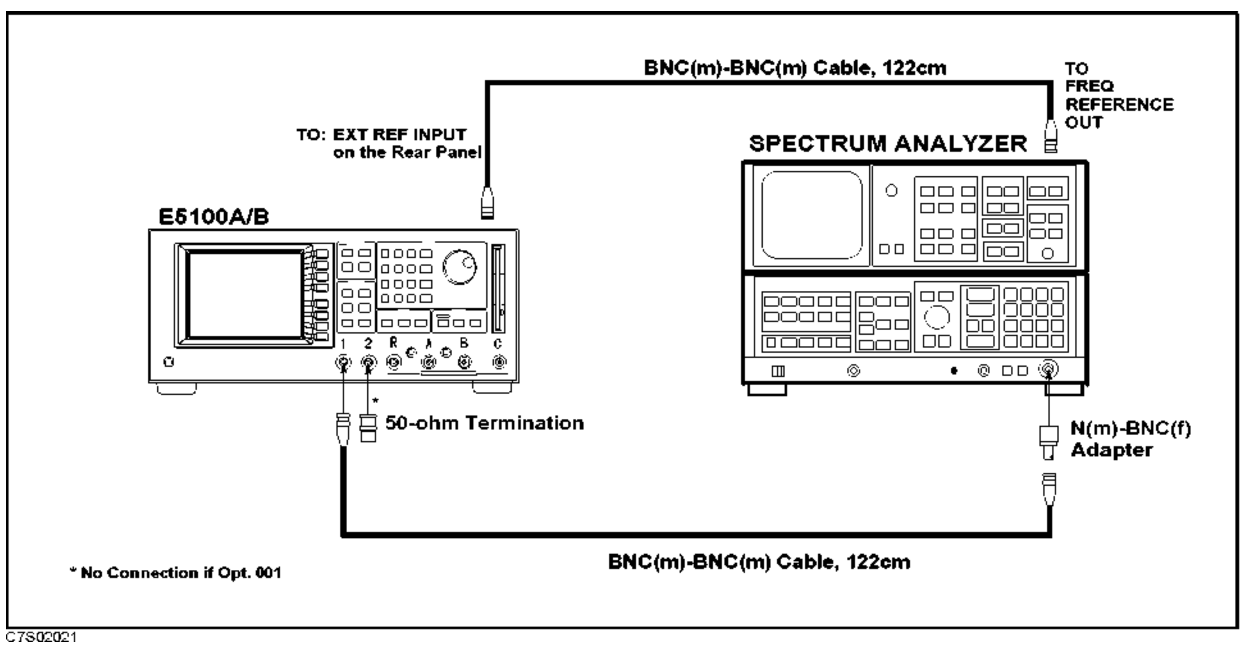

Figure 3-3. Phase Noise Test Setup

Note Harmonics Test, Non-Harmonic Spurious Test, and Phase Noise Test use the same test setup.

2. Set up the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Source Power = 0 dBm	(Sweep) POWER (0) × 1
Span Frequency = 0 Hz	(Span) (0) × 1

3. Set the spectrum analyzer as follows:

Frequency Span	25 kHz

4. Set the E5100A's center frequency, the spectrum analyzer's center frequency, and its resolution bandwidth according to the following table. Then record the spectrum analyzer reading at center frequency into calculation sheet, and record the spectrum analyzer reading at the ± 10 kHz frequency points of the center frequency into calculation sheet.

Table 3-2. Phase Noise Test Setup

E5100A Center Frequency	Spectrum analyzer	
	Center Frequency	RBW
455 kHz	455 kHz	300 Hz
150 MHz	150 MHz	300 Hz
180 MHz	180 MHz	300 Hz

Note

When you measure noise level at the ±10 kHz frequency points of each center frequency, you must set the spectrum analyzer to noise level measurement mode. When the noise level function is activated and the marker is placed in the noise, the rms noise level is read out normalized to a 1 Hz noise power bandwidth.

5. Use the equation given on the calculation sheet to calculate the test results, and record the test results in the performance test record.

5. Source Level Accuracy/Flatness Test

This test measures the E5100A signal source actual output power Level at 50 MHz and its flatness relative to the level at 50 MHz.

Specification

Level Accuracy .... ± 1 dB (at 23±5°C, 0 dBm output level, 50 MHz)

Level Flatness (at 23 ±5°C, relative to 0 dBm output level at 50 MHz):
- Opt.001/002 without Opt.010 .... +2 dB, −4 dB (at 10 kHz ≤ freq. ≤ 180 MHz)
- Opt.003 without Opt.010 .... +2.5 dB, −4.5 dB (at 10 kHz ≤ freq. ≤ 180 MHz)
- Opt.010 or Opt.618 .... +2.5 dB, −4.5 dB (at 50 kHz ≤ freq. ≤ 100 MHz)
  +3 dB, −5 dB (at 100 MHz < freq. ≤ 180 MHz)

Test Equipment

Power Meter 436A Opt.022/437B/438A
Power Sensor 8482A
Multimeter 3458A
BNC(m)-BNC(m) Cable, 122 cm .... Agilent P/N 8120-1840
N(f)-BNC(m) Adapter .... Agilent P/N 1250-1477
50 Ω Termination BNC type .... 11593A (Opt.002 or Opt.003)
50 Ω Feedthrough 11048C
BNC(f)-Dual Banana Plug .... Agilent P/N 1251-2277

Procedure

1. Connect the Power Sensor to the Power Meter, and calibrate the Power Meter for the Power Sensor.
2. Set up the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Center Frequency = 50 MHz	(Center) (50) × M
Span Frequency = 0 Hz	(Span) (0) × 1
Source Power = 0 dBm	(Sweep) POWER (0) × 1

3. Connect the Power Sensor to the E5100A RF OUT 1 as shown in Figure 3-4.

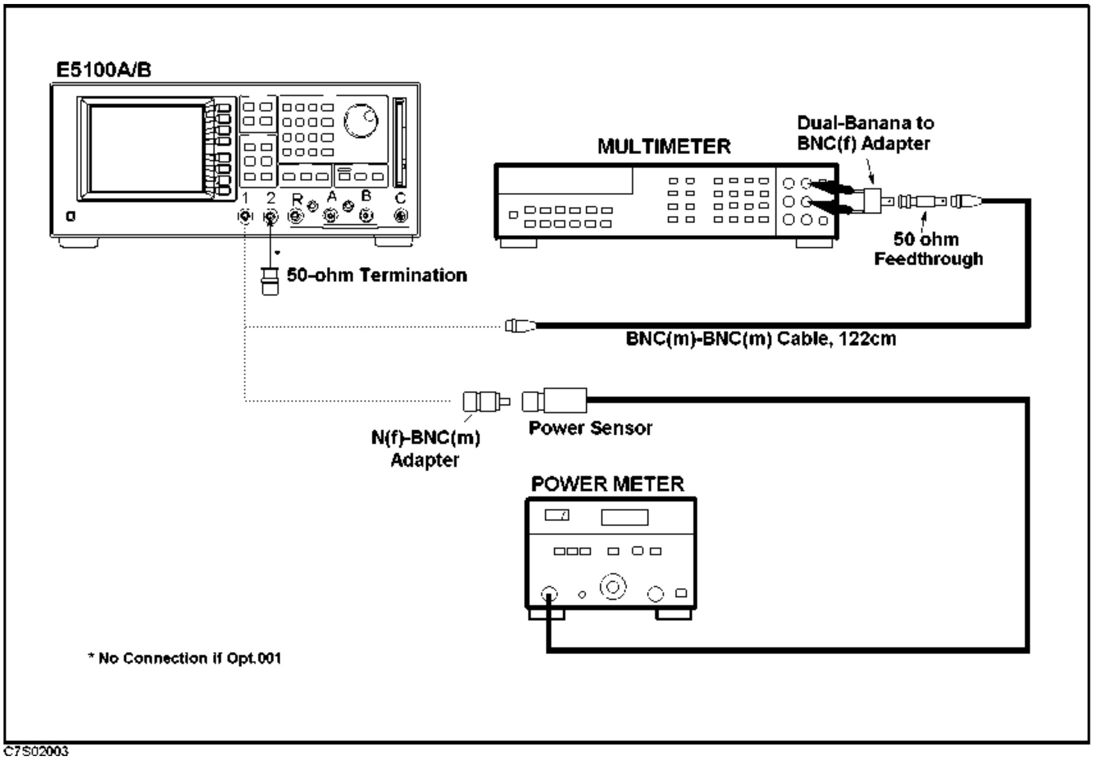

Figure 3-4. Source Level Accuracy/Flatness Test

4. Record the Power Meter reading on the performance test record, and transcribe it into Calculation Sheet.
5. Set the E5100A center frequency as follows, and record the power meter reading into calculation sheet.

E5100A Center Frequency
1 MHz
10 MHz
100 MHz
150 MHz
180 MHz

6. Disconnect the power sensor, and connect the Digital Voltmeter INPUT to E5100A RF OUT 1, as shown in Figure 3-4. Use a 50 Ω Feedthrough on the Digital Voltmeter input.
7. Set the Digital Voltmeter as follows:

Measurement Function:	AC Volts mode
Display Reading Value:	dBm reading value
Measurement Method:	Synchronous Sampling Conversion

8. Set the E5100A center frequency as follows, and record the power meter reading in the calculation sheet for each setting.

E5100A Center Frequency
10 kHz
50 kHz
100 kHz

9. Use the equation given on the Calculation sheet to calculate the test results (flatness), and transcribe the test results to the FLATNESS column in the performance test record.

6. Source Power Linearity Test

This test measures the E5100A signal source power level at several points to verify linearity.

Specification

Power Lineality (at 23±5°C, relative to 0 dBm output level at 50 MHz)

without Opt.010 .... ±1 dB
with Opt.010 or 618
.... ±1.5 dB ([max power level − 70 dB] ≤ [power level] < [max power level − 60 dB])
.... ±1 dB ([max power level − 60 dB] ≤ [power level] ≤ [max power level]

Test Equipment

Power Meter 436A Opt.022/437B/438A
Power Sensor 8481D
80 dB Step Attenuator .... 8496A/G with Opt.001 & H60
Attenuator/Switch Driver .... 11713A (if 8496G is used)
50 Ω Termination BNC type .... 11593A (if without Opt.001)
N(m)-BNC(f) Adapter .... Agilent P/N 1250-1476
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839

Procedure

1. Connect the Power Sensor to the Power Meter, and calibrate the Power Meter for the Power Sensor.
2. Connect the equipment as shown in Figure 3-5.

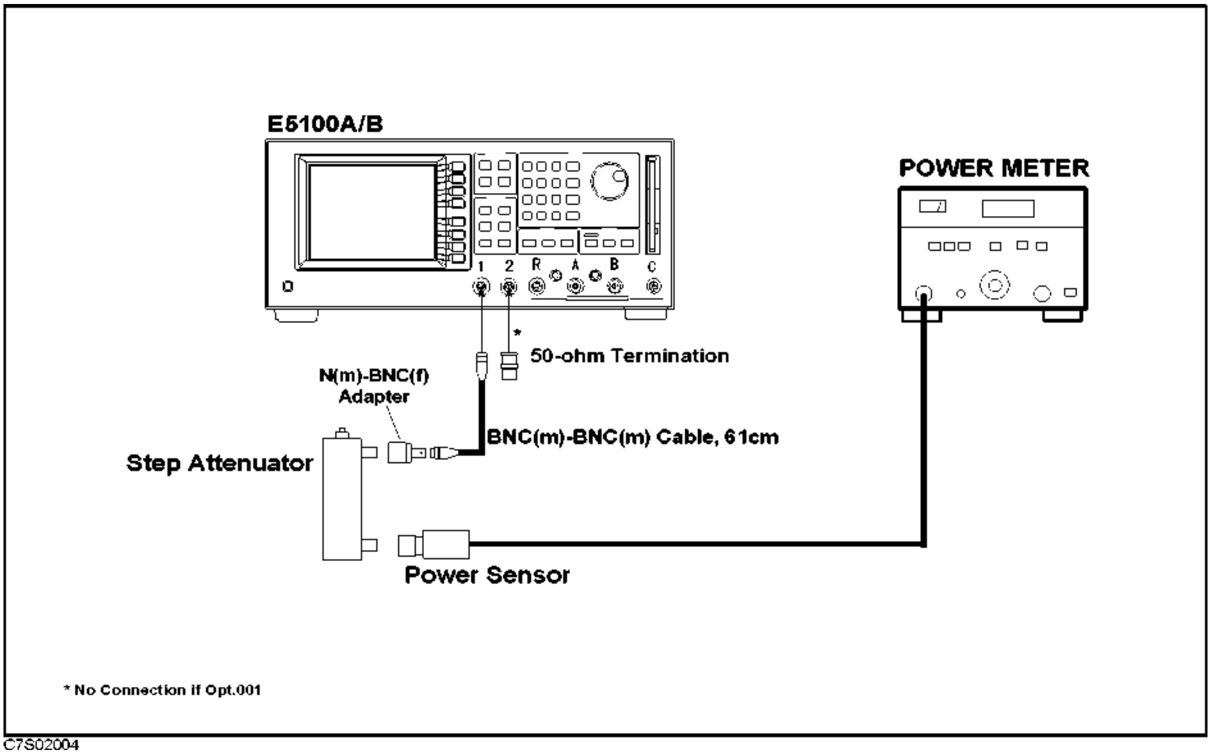

Figure 3-5. Source Power Linearity Test

3. Set the step attenuator to 30 dB.
4. Set up the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Number of Points = 201	(Sweep) NUMBER of POINTs (201) × 1
Center Frequency = 50 MHz	(Center) (50) × M
Span Frequency = 0 Hz	(Span) (0) ×
Source Power = 0 dBm	(Sweep) POWER (0) × 1

5. Set up the power meter as follows:

Calibration Factor	100
Resolution	0.001 dB
Range	AUTO
Display	LOG Display
Mode	Relative Mode

6. Record the power meter's reading value into calculation sheet.
7. Set the source power and step attenuator according to the following table, and record the power meter's reading value into the calculation sheet.

Table 3-3. Source Power Linearity Test Setup (Opt.001 without Opt.010)

E5100A Source Power	Step Attenuator Setting	Level
+11 dBm	−50 dB	−39 dB
+5 dBm	−40 dB	−35 dB
−5 dBm	−30 dB	−35 dB
−9 dBm	−30 dB	−39 dB

Table 3-4. Source Power Linearity Test Setup (Opt.002 without Opt.010)

E5100A Source Power	Step Attenuator Setting	Level
+5 dBm	−40 dB	−35 dB
−5 dBm	−30 dB	−35 dB
−10 dBm	−20 dB	−30 dB
−15 dBm	−20 dB	−35 dB

Table 3-5. Source Power Linearity Test Setup (Opt.003 without Opt.010)

E5100A Source Power	Step Attenuator Setting	Level
+7 dBm	−40 dB	−37 dB
+5 dBm	−40 dB	−35 dB
−5 dBm	−30 dB	−35 dB
−10 dBm	−20 dB	−30 dB
−13 dBm	−20 dB	−33 dB

Table 3-6. Source Power Linearity Test Setup (Opt.001 with Opt.010)

E5100A Source Power	Step Attenuator Setting	Level
+22 dBm	−60 dB	−38 dB
+10 dBm	−40 dB	−30 dB
−10 dBm	−20 dB	−30 dB
−20 dBm	−10 dB	−30 dB
−30 dBm	−10 dB	−40 dB
−40 dBm	−10 dB	−50 dB
−48 dBm	−10 dB	−58 dB

Table 3-7. Source Power Linearity Test Setup (Opt.002 with Opt.010)

E5100A Source Power	Step Attenuator Setting	Level
+16 dBm	−50 dB	−34 dB
+10 dBm	−40 dB	−30 dB
−10 dBm	−20 dB	−30 dB
−20 dBm	−10 dB	−30 dB
−30 dBm	−10 dB	−40 dB
−40 dBm	−10 dB	−50 dB
−50 dBm	−10 dB	−60 dB
−54 dBm	0 dB	−54 dB

Table 3-8.
Source Power Linearity Test Setup
(Opt.003 with Opt.010, or Opt.618)

E5100A Source Power	Step Attenuator Setting	Level
+18 dBm	−50 dB	−32 dB
+10 dBm	−40 dB	−30 dB
−10 dBm	−20 dB	−30 dB
−20 dBm	−10 dB	−30 dB
−30 dBm	−10 dB	−40 dB
−40 dBm	−10 dB	−50 dB
−50 dBm	−10 dB	−60 dB
−52 dBm	0 dB	−62 dB

8. Use the equation given on the calculation sheet to calculate the test results, and transcribe the test results to the performance test record.

7. Receiver Noise Level Test

This test measures the E5100A's Receiver Noise Level (Noise Floor).

Specification

(at magnitude measurement, 23 ± 5°C, RF attenuator: 0 dB, 50 Ω input)

E5100A:

IF BW 30 kHz .... −100 dBm (1 MHz ≤ Freq. ≤ 180 MHz)
IF BW 10 kHz .... −105 dBm (300 kHz ≤ Freq. ≤ 180 MHz)
IF BW 3 kHz .... −110 dBm (100 kHz ≤ Freq. ≤ 180 MHz)
IF BW 1 kHz .... −115 dBm (100 kHz ≤ Freq. ≤ 180 MHz)
−95 dBm (30 kHz ≤ Freq. < 100 kHz)
IF BW 300 Hz .... −120 dBm (100 kHz ≤ Freq. ≤ 180 MHz)
−100 dBm (10 kHz ≤ Freq. < 100 kHz)
IF BW 100 Hz .... −125 dBm (100 kHz ≤ Freq. ≤ 180 MHz)
−105 dBm (10 kHz ≤ Freq. < 100 kHz)

Test Equipment

50 Ω Termination N type .... 909C Opt.012, 1 ea (Opt.102), 2 ea (Opt.302)

50 Ω Termination BNC type .... 11593A, 4 ea max.

Procedure

1. Connect each 50 Ω termination to each input as shown in Figure 3-6.

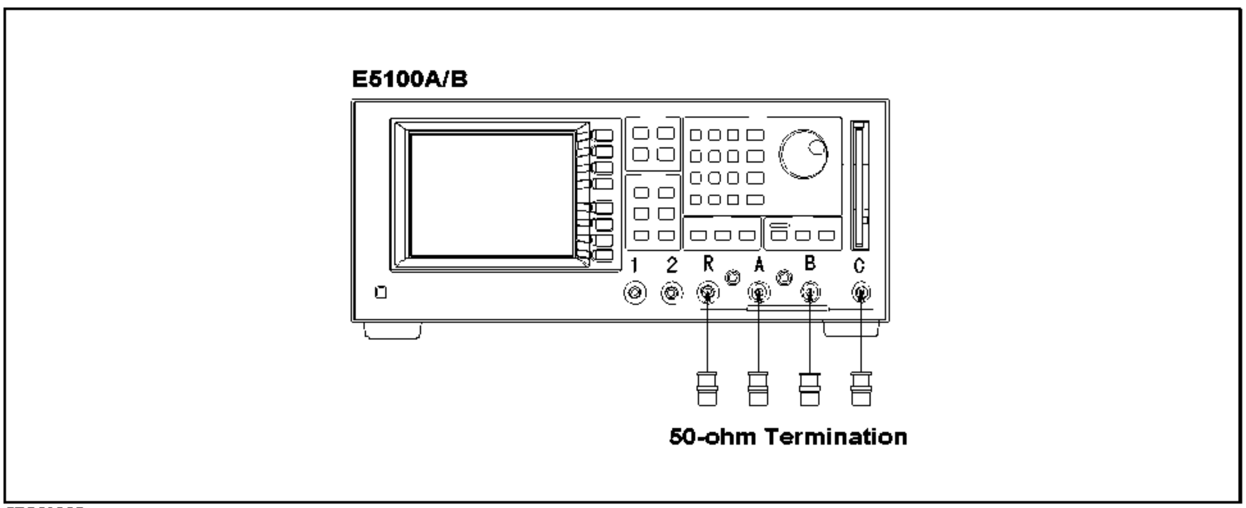

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Figure 3-6. Receiver Noise Level Test

2. Set up the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Span Frequency = 0 Hz	(Span) (0) × 1

IF BW = 100 Hz (for E5100A)	(Sweep) IF BW (100) × 1
Input Attenuator = 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
	A 0 dB (Opt.218/318/618)
	B 0 dB (Opt.318)
Source Power	(Sweep) POWER
= −9 dBm (Opt.001 without Opt.010)	(−9) × 1
= −15 dBm (Opt.002 without Opt.010)	(−15) × 1
= −12 dBm (Opt.003 without Opt.010)	(−12) × 1
= −48 dBm (Opt.001 with Opt.010)	(−48) × 1
= −54 dBm (Opt.002 with Opt.010)	(−54) × 1
= −51 dBm (Opt.003 with Opt.010)	(−51) × 1
= −52 dBm (Opt.618)	(−52) × 1
Meas. Config. : R, LIN MAG	(Meas/Format) MEAS MORE MORE R FORMAT
	MORE LIN MAG
Number of Points : 201	(Sweep) NUMBER of POINTs (201) × 1
Marker Function : STATISTICS ON	(Marker) UTILITY MENU
	STATISTICS on OFF (turn it ON)

3. Set the E5100A's center frequency as follows, and record the average value of the trace into calculation sheet.

E5100A Center Frequency
10 kHz
95 kHz
455 kHz
1.01 MHz
10.7 MHz
101 MHz
110 MHz
179 MHz

4. Use the equation given on the calculation sheet to calculate the test results (receiver noise), and transcribe the test results to the Receiver Noise column in the performance test record.
5. Set the E5100A's center frequency to 455 kHz.
6. Set the E5100A's IF BW as follows, and record the average value of the trace into calculation sheet.

E5100A IF BW
300 Hz
1 kHz
3 kHz
10 kHz
30 kHz

7. Set the E5100A's center frequency to 101 MHz.
8. Set the E5100A's IF BW as follows, and record the average value of the trace into calculation sheet.

E5100A IF BW
300 Hz
1 kHz
3 kHz
10 kHz
30 kHz

9. Repeat Steps 2 through 8 for Input A, B(Opt.318).

8. Trace Noise Test

This test checks the E5100A's trace noise on a CW signal in ratio mode. This test is done in CW in order to eliminate any effects of frequency response.

Note An E5100A with Option 118 does not require this test.

Specification

(at 1 kHz IF BW, −5 dBm input level @ RF ATT = 25 dB, −30 dBm input level @ RF ATT = 0 dB)

Magnitude ....< 0.01 dB rms
Phase ....< 0.05 ° rms

Test Equipment

Power Splitter 11667A
50 Ω Termination BNC type 11593A
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839, 3ea
N(m)-BNC(f) Adapter ....Agilent P/N 1250-1476, 4ea max.

Procedure

1. Connect the equipment as shown in Figure 3-7.

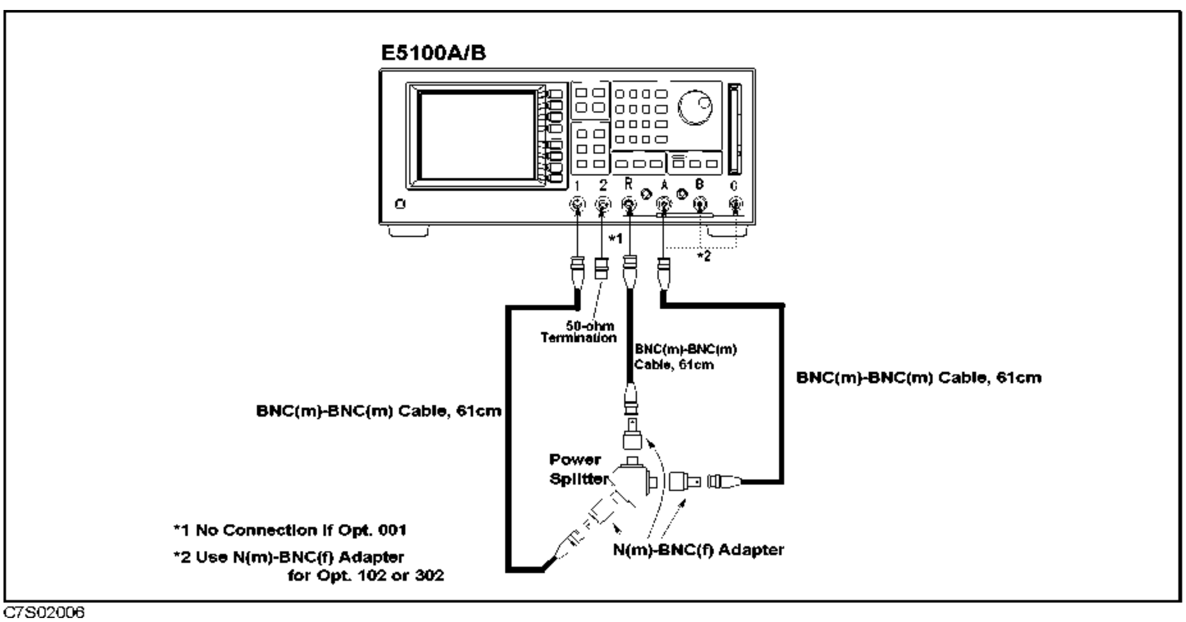

Figure 3-7. Trace Noise Test Setup

2. Set up the E5100A as follows:

Control Settings **Key Strokes**

Control Settings	Key Strokes
Preset	(Preset)
Source Power = 1 dBm	(Sweep) POWER (1) × 1
Span Frequency = 0 Hz	(Span) (0) × 1
Number of Points = 201	(Sweep) NUMBER of POINTs (201) × 1
Input-R, A Attenuator = 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB PORT : A 25 dB
Channel 1 Setup:	
Measurement = A/R	(Meas/Format) MEAS A/R
Format = LOG MAG	(Meas/Format) FORMAT MORE LOG MAG
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Channel 2 Setup:	
Measurement = A/R	(Meas/Format) ACTIVE CH (set to [CH2]) MEAS A/R
Format = PHASE	(Meas/Format) FORMAT MORE PHASE
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)

3. Set the E5100A's center frequency and IF BW in accordance with the following table. The standard deviation trace value is displayed as a marker statistic (s.dev) in the upper right-hand corner of the LCD display of each channel's display. Record each standard deviation value of the magnitude and phase in the performance test record.

Table 3-9. Trace Noise Test Setup

E5100A Center Freq.	E5100A IF BW
10 kHz	100 Hz
100 kHz	1 kHz
1 MHz	1 kHz
10 MHz	1 kHz
100 MHz	1 kHz
180 MHz	1 kHz

4. Disconnect the cable from Input-A and connect it to Input-B.
5. Change the E5100A setups as follows:

Control Settings	Key Strokes
Input- B Attenuator = 25 dB	(System) MORE ATTENUATOR PORT : B 25 dB
CH 1: B/R, LOG MAG	(Meas/Format) ACTIVE CH (set to [CH1]) MEAS B/R

Channel 2 Setup:

Measurement = B/R	(Meas/Format) ACTIVE CH (set to [CH2]) MEAS B/R

6. Repeat step 3.

9. Residual Response Test

This test measures the E5100A's Residual Response. This test measures how effectively the internal oscillator signal's interference is reduced by measuring the amplitude at some known frequencies with its input terminated.

Specification

Residual Response .... < −80 dBm

(except for the following frequency points: 50 kHz, 100 kHz, 95.825 MHz, 95.875 MHz, 159.791667 MHz, 159.825 MHz, 159.841667 MHz, 159.875 MHz)

Test Equipment

50 Ω Termination BNC type .... 11593A, 3 ea max.
50 Ω Termination N type .... 909C Opt.012 (for E5100A Opt.102/302)

Procedure

1. Connect the equipment as shown in Figure 3-8.

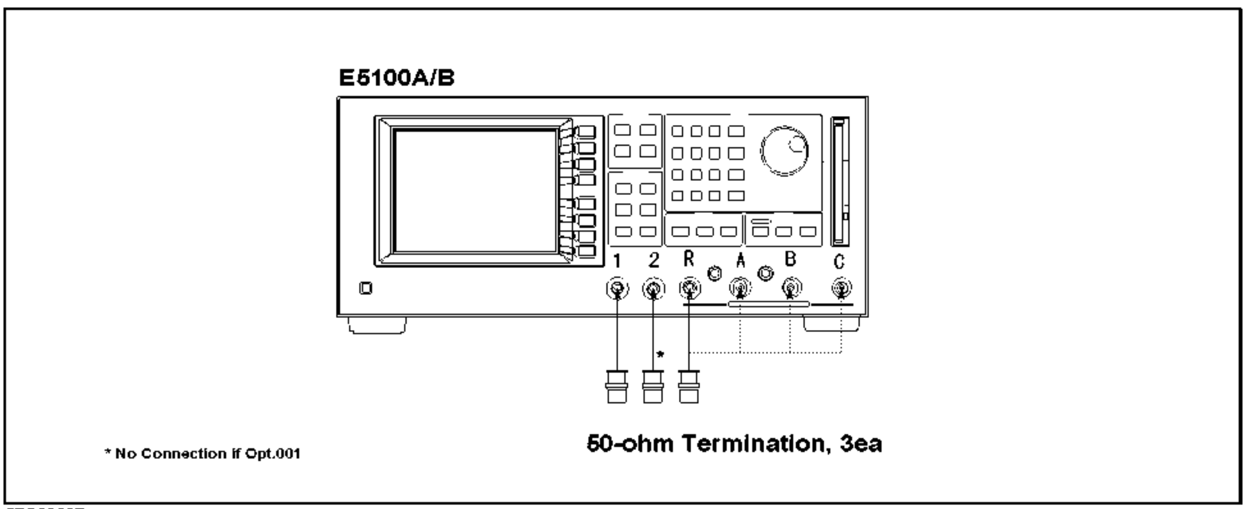

Figure 3-8. Residual Response Test Setup

2. Set up the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Meas. Config. = R	(Meas/Format) MEAS MORE MORE R
Span Frequency = 0 Hz	(Span) (0) × 1
IF BW = 10 Hz	(Sweep) IF BW (10) × 1
Source Power	(Sweep) POWER
= −9 dBm (Opt.001 without Opt.010)	(−9) × 1

Control Settings	Key Strokes
= −15 dBm (Opt.002 without Opt.010)	(−15) × 1
= −12 dBm (Opt.003 without Opt.010)	(−12) × 1
= −48 dBm (Opt.001 with Opt.010)	(−48) × 1
= −54 dBm (Opt.002 with Opt.010)	(−54) × 1
= −51 dBm (Opt.003 with Opt.010)	(−51) × 1
= −52 dBm (Opt.618)	(−52) × 1
Number of Points = 2	(Sweep) NUMBER of POINTs (2) × 1
Input-R Attenuator = 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB

3. Set the E5100A's center frequency as follows, and record the maximum value of the trace into calculation sheet.

E5100A Center Frequency
47.85 MHz
47.875 MHz
59.84375 MHz
59.875 MHz
68.410714 MHz
68.446428 MHz
79.833333 MHz
79.875 MHz
119.8125 MHz
119.875 MHz
159.775 MHz
159.808333 MHz
159.858333 MHz
159.891666 MHz

4. Remove the 50 Ω termination of the E5100A Input-R and connect it to the E5100A Input-A.
5. Change the E5100A control settings as follows:

Control Settings	Key Strokes
Meas. Config. = A	(Meas/Format) MEAS MORE MORE A

6. Repeat step 3.
7. Remove the 50 Ω termination of the E5100A Input-A and connect it to the E5100A Input-B.
8. Change the E5100A control settings as follows:

Control Settings	Key Strokes
Meas. Config. = B	(Meas/Format) MEAS MORE MORE B

9. Repeat step 3.

10. Input Crosstalk Test

The signal leakage interference between the E5100A's two inputs, when one input is driven and the other is terminated, is measured by this test.

Note An E5100A with Option 118 does not require this test.

Specification

Input Crosstalk:

E5100A .... < -110 dB (10 kHz $\leq$ freq. $<$ 100 kHz)
< -120 dB (100 kHz $\leq$ freq. $\leq$180 MHz)

Test Equipment

BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839
50 Ω Termination BNC type .... 11593A, 4 ea max.
50 Ω Termination N type .... 909C Opt.012 (if with Opt.102/302), 2 ea max.
N(m)-BNC(f) Adapter .... Agilent P/N 1250-1476 (if with Opt.102/302)

Procedure

E5100A

Table 3-10 is the summary of the E5100A's test setup.

Table 3-10. E5100A Input Crosstalk Test Setup Summary

Measurement Configuration	Frequency		IF BW	NOP	Output Power	Input Attenuator		
	Start	Stop				R	A	B
A/R, B/R	10 kHz	99.4 kHz	10 Hz	15	0 dBm	25 dB	0 dB	0 dB
	100.2 kHz	199.8 kHz		4	0 dBm			
	200.2 kHz	180 MHz		201	5 dBm			
R/A, B/A	10 kHz	99.4 kHz	10 Hz	15	0 dBm	0 dB	25 dB	0 dB
	100.2 kHz	199.8 kHz		4	0 dBm			
	200.2 kHz	180 MHz		201	5 dBm			
R/B, A/B	10 kHz	99.4 kHz	10 Hz	15	0 dBm	0 dB	0 dB	25 dB
	100.2 kHz	199.8 kHz		4	0 dBm			
	200.2 kHz	180 MHz		201	5 dBm			

1. Connect the equipment as shown in Figure 3-9.

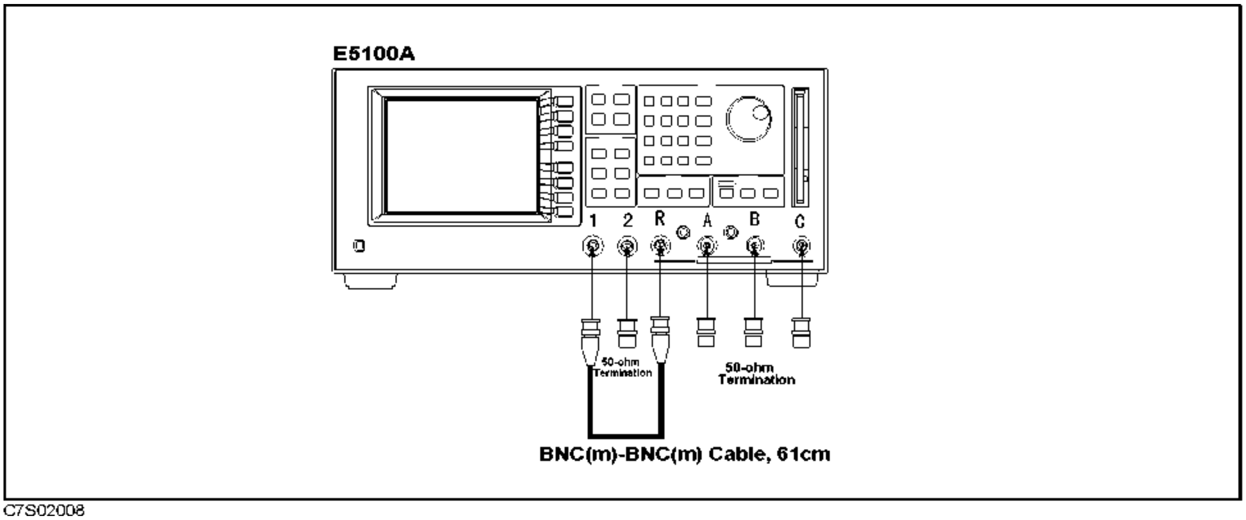

Figure 3-9. R into A, B Input Crosstalk Test Setup

2. Set up IF BW of the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
IF BW: 10 Hz	(Sweep) IF BW (10) × 1
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A,B Attenuator: 0 dB	A 0 dB B 0 dB
Multi Channel ON	(Display) MULTI CH on OFF (turn it ON)
Channel-1 Setup:	(Meas/Format) ACTIVE CH (set to [CH1])
Meas. Config.: A/R, LOG MAG	(Meas/Format) MEAS A/R FORMAT LOG MAG
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Channel-2 Setup:(if not Opt.218)	(Meas/Format) ACTIVE CH (set to [CH2])
Meas. Config.: B/R, LOG MAG	(Meas/Format) MEAS B/R FORMAT LOG MAG
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)

3. Set the E5100A's start frequency, stop frequency, number of points, and source power as follows:

Control Settings	Key Strokes
Start Frequency = 10 kHz	(Start) (10) × k

Stop Frequency = 99.4 kHz	(Stop) (99.4) × k
Number of Points = 15	(Sweep) NUMBER of POINTs (15) × 1
Source Power = 0 dBm	(Sweep) POWER (0) × 1

4. Perform the following key strokes for a single sweep measurement.

   (Trigger) SINGLE

5. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

   (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

6. Move the Channel-2 marker to the maximum value (B/R) using the following key storokes. Record the maximum value on the calculation sheet.

   ACTIVE CH (set to [CH2]) SEARCH: MAX

7. Repeat steps 4 and 7 three more times and record each maximum value on the calculation sheet. Use the equation given on the calculation sheet to calculate avarage value, and record the data in the performance test record.

8. Change the E5100A's start frequency, stop frequency, and number of points as follows:

Control Settings	Key Strokes
Start Frequency = 100.2 kHz	(Start) (100.2) × k
Stop Frequency = 199.8 kHz	(Stop) (199.8) × k
Number of Points = 4	(Sweep) NUMBER of POINTs (4) × 1

9. Perform the following key strokes for a single sweep measurement.

   (Trigger) SINGLE

10. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

    (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

11. Move the Channel-2 marker to the maximum value (B/R) using the following key storokes. Record the maximum value on the calculation sheet.

    ACTIVE CH (set to [CH2]) SEARCH: MAX

12. Repeat steps 10 and 13 three more times and record each maximum value on the calculation sheet. Use the equation given on the calculation sheet to calculate avarage value, and record the data in the performance test record.

13. Change the E5100A's start frequency, stop frequency, number of points, and source power as follows:

Control Settings	Key Strokes
Start Frequency = 200.2 kHz	(Start) (200.2) × k
Stop Frequency = 180 MHz	(Stop) (180) × M
Number of Points = 201	(Sweep) NUMBER of POINTs (201) × 1

Source Power = 5 dBm (Sweep) POWER (5) × 1

14. Perform the following key strokes for a single sweep measurement.

    (Trigger) SINGLE

15. Confirm that the single sweep is completed, and then move the Channel-1 marker to the maximum value (A/R) using the following key strokes. Record the maximum value on the calculation sheet.

    (Marker) ACTIVE CH (set to [CH1]) ACTIVE MARKER 1 (Marker) MKR SEARCH SEARCH: MAX

16. Move the Channel-2 marker to the maximum value (B/R) using the following key storokes. Record the maximum value on the calculation sheet.

    ACTIVE CH (set to [CH2]) SEARCH: MAX

17. Repeat steps 16 and 19 three more times and record each maximum value on the calculation sheet. Use the equation given on the calculation sheet to calculate avarage value, and record the data in the performance test record.

18. Change the connection as shown in Figure 3-10.

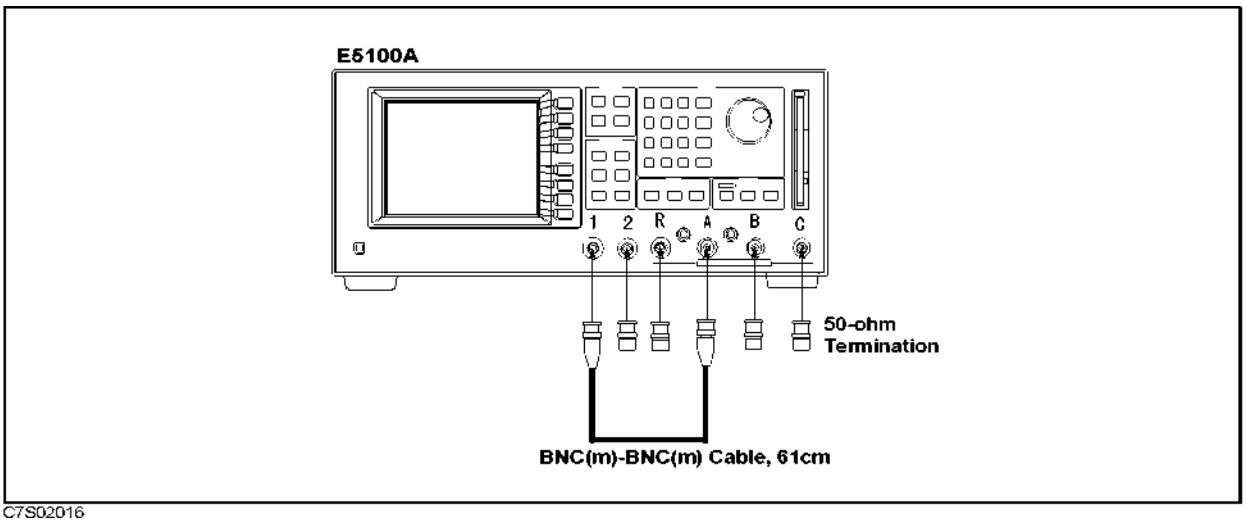

Figure 3-10. A into R, B Input Crosstalk Test Setup

19. Repeat steps 2 through 20 for R/A and B/A in accordance with the test setup listed in Table 3-10.

20. Change the connection as shown in Figure 3-11.

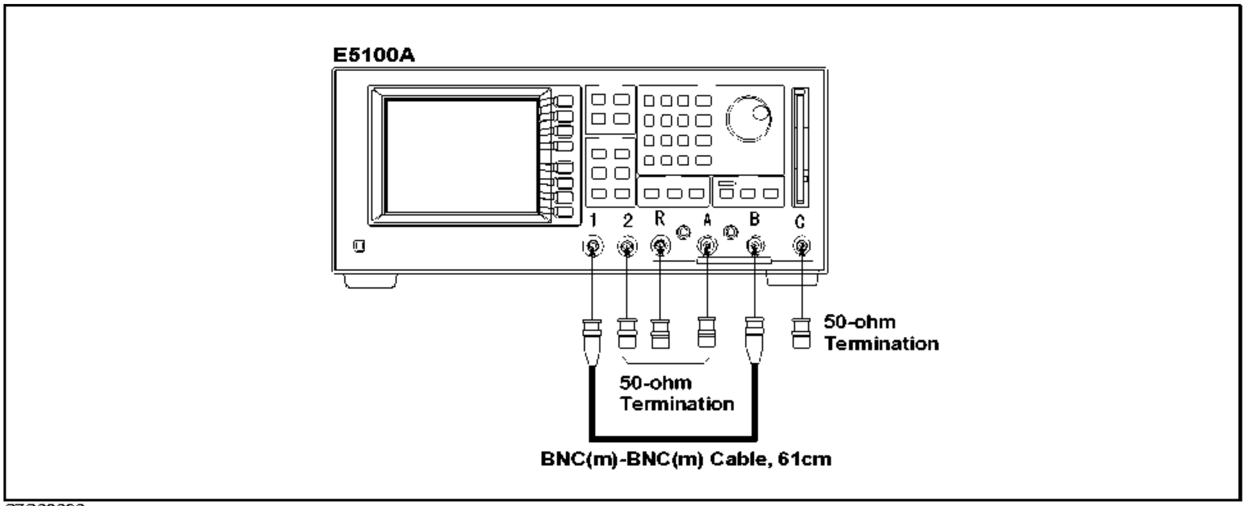

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Figure 3-11. B into R, A Input Crosstalk Test Setup

21. Repeat steps 2 through 20 for R/B and A/B in accordance with the test setup listed in Table 3-10.

11. Absolute Amplitude Accuracy Test

This test checks the E5100A's absolute amplitude accuracy. A digital multimeter and a power meter are used to measure the actual output level at each setting.

Note An E5100A with Option 510 does not require this test.

Specification

Absolute Amplitude Accuracy .... ±1.0 dB (E5100A at 23 ±5°C, −10 dBm input)

Test Equipment

Power Meter	436A Opt.022/437B/438A
Power Sensor	8481D
Power Sensor	8482A
Multimeter	3458A
Attenuator Pad 20 dB	8491A Opt.020
Power Splitter	11667A
N(m)-BNC(f) Adapter	Agilent P/N 1250-0780, 5ea
N(f)-BNC(f) Adapter	Agilent P/N 1250-1474
50 Ω Termination BNC type	11593A
50 Ω Feedthrough	11048C
BNC(f)-Dual Banana Plug	Agilent P/N 1251-2277
BNC(m)-BNC(m) Cable, 61 cm	Agilent P/N 8120-1839, 4ea

Procedure

1. Connect the E5100A, power splitter, and multimeter as shown in Figure 3-12.

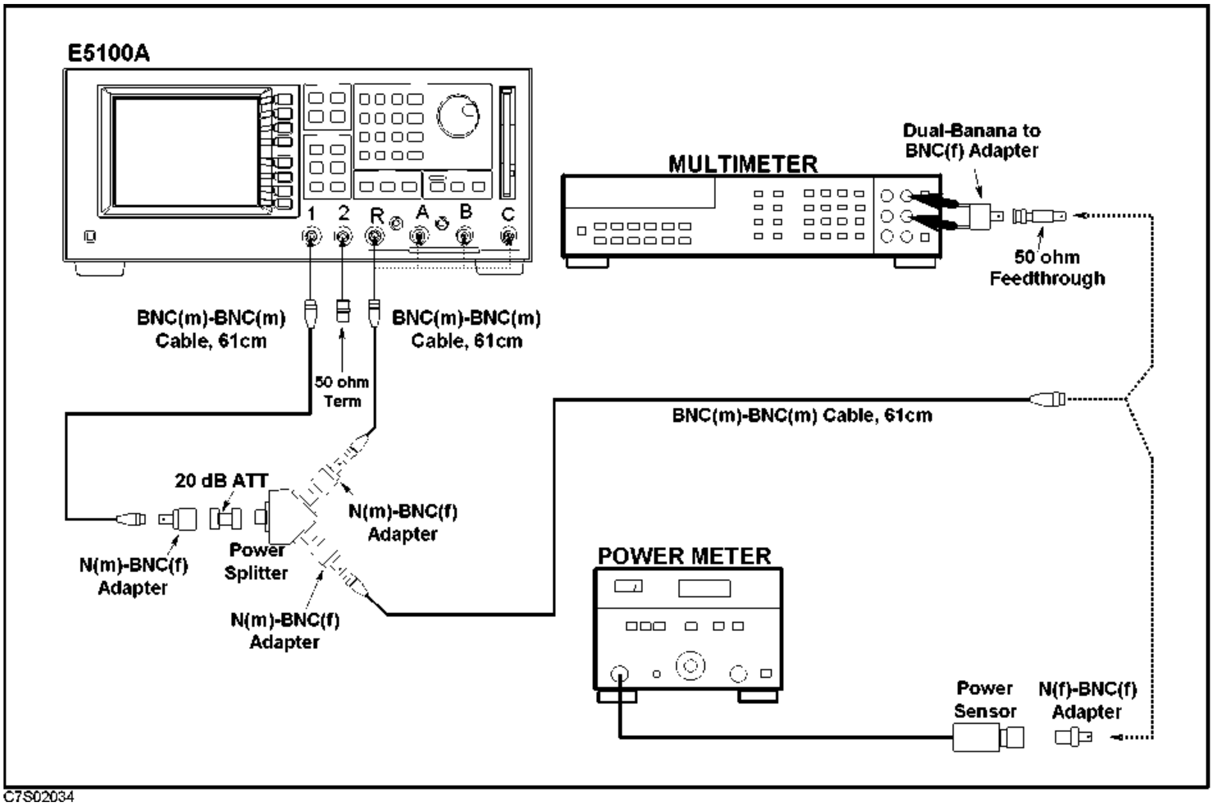


Figure 3-12. Absolute Amplitude Accuracy Test Setup

2. Set the digital voltmeter as follows:

Measurement Function:	AC Volts mode
Display Reading Value:	dBm reading value
Measurement Method:	Synchronous Sampling Conversion
AC Bandwidth	$\leq$ 2 MHz

3. Set up the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Meas. Config.: R (for Input-R test)	(Meas/Format) MEAS MORE MORE R
Meas. Config.: A (for Input-A test)	(Meas/Format) MEAS MORE MORE A
Meas. Config.: B (for Input-B test)	(Meas/Format) MEAS MORE MORE B
Format: LOG MAG	FORMAT MORE LOG MAG
Span = 0 Hz	(Span) (0) × 1
IF BW = 30 Hz	(Sweep) IF BW (30) × 1
Number of points = 20	(Sweep) NUMBER of POINTs (20) × 1
Source Power = −4 dBm	(Sweep) POWER (−4) × 1
Input-R Attenuator: 0 dB (for Input-R test)	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB (for Input-A test)	(System) MORE ATTENUATOR A 0 dB

Input-B Attenuator: 0 dB (for Input-B test)	(System) MORE ATTENUATOR B 0 dB
Statistics ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)

4. Set the E5100A's center frequency and Multimeter's AC Bandwidth according to the following table. Then record the readings of the digital multimeter, and the E5100A's readings in the calculation sheet.

Table 3-11. Absolute Amplitude Accuracy Test Setup

E5100A Center Freq.	Multimeter AC Bandwidth
10 kHz	$\leq$ 2 MHz
100 kHz	$>$ 2 MHz
1 MHz	$>$ 2 MHz

5. Set the Digital Multimeter's AC Bandwidth to $\leq$ 2 MHz.
6. Set up the E5100A as follows:

Control Settings	Key Strokes
Source Power = 1 dBm	(Sweep) POWER (1) × 1
Input-R Attenuator: 25 dB (for Input-R test)	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB (for Input-A test)	(System) MORE ATTENUATOR A 25 dB
Input-B Attenuator: 25 dB (for Input-B test)	(System) MORE ATTENUATOR B 25 dB

7. Remove the 20 dB attenuator connected to the power splitter's input port and reconnect the N(m)-BNC(f) adapter and BNC(m)-BNC(m) cable without the attenuator.
8. Set the E5100A's center frequency according to the following table. Then record the readings (mean) of the digital multimeter, and the E5100A's readings in the calculation sheet.

Table 3-12. Absolute Amplitude Accuracy Test Setup

E5100A Center Freq.	Multimeter AC Bandwidth
10 kHz	$\leq$ 2 MHz
100 kHz	$\leq$ 2 MHz

9. Connect the Power Sensor 8481D to the Power Meter, and calibrate the Power Meter for the Power Sensor.
10. Remove the digital multimeter from the power splitter, and connect the power sensor 8481D to the power splitter as shown in Figure 3-12.
11. Set the power meter setting as follows:

Calibration Factor: 100

Resolution:	0.001 dB
Set Range:	Auto
Display:	LOG display
Mode:	Relative mode

12. Insert the 20 dB attenuator between the power splitter's input port and N(m)-BNC(f) adapter. (See Figure 2-16)
13. Set up the E5100A as follows:

Control Settings	Key Strokes
Source Power = −4 dBm	(Sweep) POWER (−4) × 1
Input-R Attenuator: 0 dB (for Input-R test)	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB (for Input-A test)	(System) MORE ATTENUATOR A 0 dB
Input-B Attenuator: 0 dB (for Input-B test)	(System) MORE ATTENUATOR B 0 dB

14. Set the E5100A's center frequency according to the following table. Then record the readings (mean) of the power meter, and the E5100A's readings in the calculation sheet.

Table 3-13. Absolute Amplitude Accuracy Test Setup

E5100A Center Freq.
10 MHz
30 MHz
50 MHz
100 MHz
180 MHz

15. Replace the power sensor 8481D with the 8482A, and calibrate the power meter for the power sensor.
16. Set up the E5100A as follows:

Control Settings	Key Strokes
Source Power = 1 dBm	(Sweep) POWER (1) × 1
Input-R Attenuator: 25 dB (for Input-R test)	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB (for Input-A test)	(System) MORE ATTENUATOR A 25 dB
Input-B Attenuator: 25 dB (for Input-B test)	(System) MORE ATTENUATOR B 25 dB

17. Remove the 20 dB attenuator connected to the power splitter's input port and reconnect the N(m)-BNC(f) adapter and BNC(m)-BNC(m) cable without the attenuator.
18. Set the E5100A's center frequency according to the following table. Then record the readings of the power meter, and the E5100A's readings (mean) in the calculation sheet.

Table 3-14. Absolute Amplitude Accuracy Test Setup

E5100A Center Freq.
1 MHz
10 MHz
30 MHz
50 MHz
100 MHz
180 MHz

19. Remove the power sensor from the power splitter, and connect the digital multimeter to the power splitter as shown in Figure 3-12.
20. Remove the BNC(m)-BNC(m) cable from the Input-R, and connect it to the Input-A.
21. Repeat steps 2 through 18 for Input-A.
22. Remove the power sensor from the power splitter, and connect the digital multimeter to the power splitter as shown in Figure 3-12.
23. Remove the BNC(m)-BNC(m) cable from the Input-A, and connect it to the Input-B.
24. Repeat steps 2 through 18 for Input-B.

12. Dynamic Accuracy Test

This test measures the E5100A's dynamic accuracy. The dynamic accuracy is a measure of how well the receiver measure the magnitude and phase components of a signal as that signal varies in amplitude over the specified dynamic range.

Specification

(at 23 ±5°C, 10 Hz IF BW, −10 dBm reference input level relative to maximum input level, −20 dBm test input level relative to maximum input level, except for ramp frequency sweep)

Test Channel Input Level **RF Attenuator**	**Dynamic Accuracy** **Frequency**	
25 dB	**0 dB**	**Excluding 10 kHz to 50 kHz**
+5 to −5 dBm[1]	−20 to −30 dBm[2]	±0.4 dB
−5 to −15 dBm	−30 to −40 dBm	±0.09 dB
−15 to −45 dBm	−40 to −70 dBm	±0.05 dB
−45 to −55 dBm	−70 to −80 dBm	±0.06 dB
−55 to −65 dBm	−80 to −90 dBm	±0.1 dB
−65 to −75 dBm	−90 to −100 dBm	±0.3 dB
−75 to −85 dBm	−100 to −110 dBm	±0.9 dB
−85 to −95 dBm	−110 to −120 dBm	±3 dB

1 0 to −5 dBm at 10 kHz to 200 kHz

2 −25 to −30 dBm at 10 kHz to 200 kHz

with Option 118
(at 23 ±5°C, 10 Hz IF BW, −20 dB input-A level relative to maximum input level, except for ramp frequency sweep, right after measuring reference)

Test Channel Input Level **RF Attenuator**	**Dynamic Accuracy** **Frequency**	
25 dB	**0 dB**	**Excluding 10 kHz to 50 kHz**
+5 to −5 dBm[1]	−20 to −30 dBm[2]	±0.4 dB
−5 to −45 dBm	−30 to −70 dBm	±0.1 dB
−45 to −55 dBm	−70 to −80 dBm	±0.1 dB
−55 to −65 dBm	−80 to −90 dBm	±0.2 dB
−65 to −75 dBm	−90 to −100 dBm	±0.6 dB

1 0 to −5 dBm at 10 kHz to 200 kHz

2 −25 to −30 dBm at 10 kHz to 200 kHz

(at 23 ±5°C, 10 Hz IF BW, −10 dBm reference input level relative to maximum input level, −20 dBm test input level relative to maximum input level, except for ramp frequency sweep)

Test Channel Input Level RF Attenuator	Dynamic Accuracy Frequency	
25 dB	0 dB	Excluding 10 kHz to 50 kHz
+5 to − 5 dBm[1]	−20 to −30 dBm[2]	±3°
−5 to −15 dBm	−30 to −40 dBm	±0.6°
−15 to −45 dBm	−40 to −70 dBm	±0.3°
−45 to −55 dBm	−70 to −80 dBm	±0.3°
−55 to −65 dBm	−80 to −90 dBm	±0.6°
−65 to −75 dBm	−90 to −100 dBm	±1.8°
−75 to −85 dBm	−100 to −110 dBm	±6°
−85 to −95 dBm	−110 to −120 dBm	±18°

1 0 to −5 dBm at 10 kHz to 200 kHz

2 −25 to −30 dBm at 10 kHz to 200 kHz

Test Equipment

80 dB Step Attenuator .... 8496A/G Opt.001 & H60
Attenuator/Switch Driver .... 11713A (if 8496G is used)
Attenuator Pad 20 dB .... 8491A with Opt.020 & H60, 2 ea
Attenuator Pad 20 dB .... 8491A with Opt.020
Attenuator Pad 10 dB .... 8491A with Opt.010 & H60, 2 ea
Attenuator Pad 10 dB .... 8491A with Opt.010
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839, 4ea max
N(m)-BNC(f) Adapter .... Agilent P/N 1250-0780, 3ea max
N(m)-BNC(m) Adapter .... Agilent P/N 1250-0082
N(f)-BNC(f) Adapter .... Agilent P/N 1250-1474
50Ω Termination BNC Type 11593A
Power Splitter .... 11667A(Opt.001/003/006)

Procedure

For Option 218/318 with Option 002

Low Level Test:

1. Record the step attenuator 50 MHz calibration value on the calculation sheet.
2. Connect the test equipment as shown in Figure 3-13.

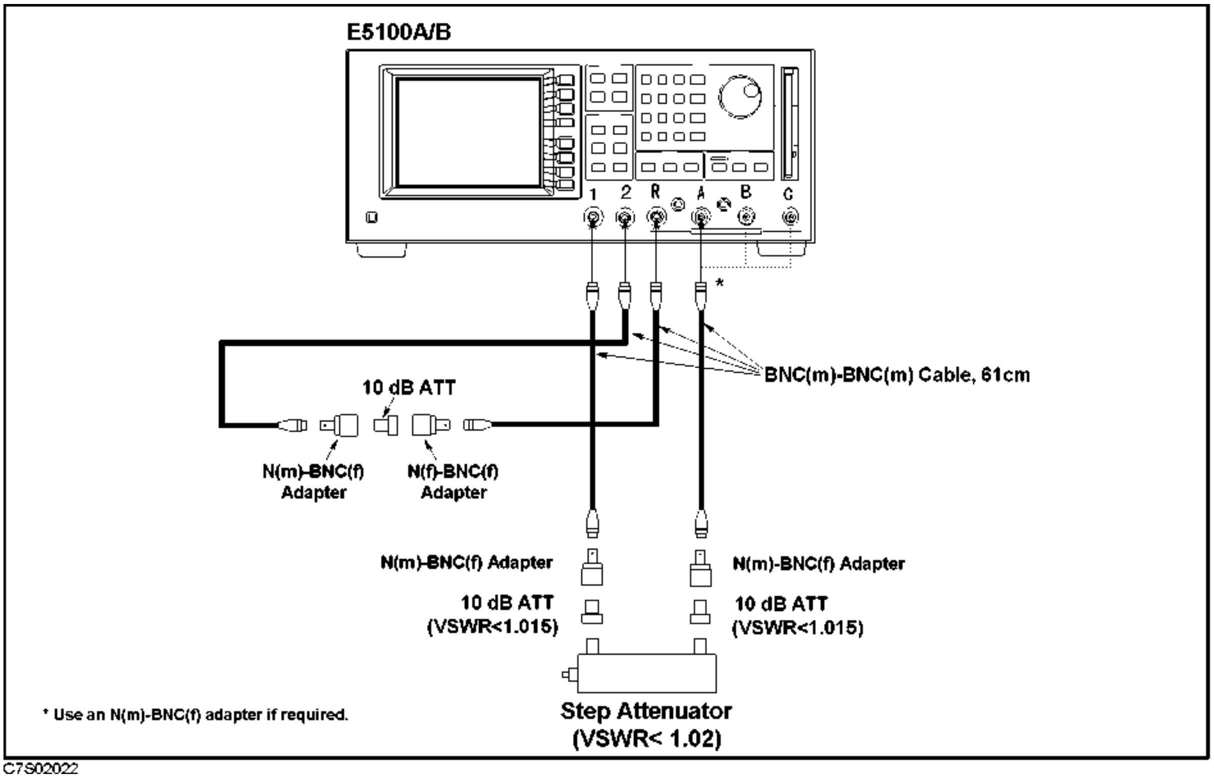


Figure 3-13. Dynamic Accuracy Test Setup 1 for Opt.218/318 with Opt.002

3. Set the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Channel-1	
Measurement: A/R	(Meas/Format) MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Channel-2	
Measurement; A/R	(Meas/Format) ACTIVE CH (set to [CH2])
	MEAS A/R
Format: Phase	FORMAT MORE PHASE
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)
Coupled Channel ON	(Sweep) COUPLED CH on OFF (turn it ON)
Start = 3 MHz	(Start) (3) × M
Stop= 50.001 MHz	(Stop) (50.001) × M
NOP = 2	(Sweep) NUMBER of POINTs (2) × 1
IF BW = 10 Hz	IF BW (10) × 1 RETURN
Power = 5 dBm	POWER (5) × 1

Input-R Attenuator: 25 dB — System MORE ATTENUATOR PORT : R 25 dB

Input-A Attenuator: 25 dB — A 25 dB

4. Set the step Attenuator setting to 0 dB.
5. Perform the following key strokes to do a pass loss calibration:

   Cal ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

6. Perform the following key strokes to set up markers:

   Marker ACTIVE CH (set to [CH1]) MKR MODE MENU MARKERS: COUPLED
   MARKERS: DESCRETE
   Marker ACTIVE CH (set to [CH2]) MKR MODE MENU MARKERS: DESCRETE

7. Set the step attenuator to 10 dB.
8. Perform the following key strokes for a single sweep measurement:

   Trigger SINGLE

9. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
10. Transcribe the test results to the performance test record.
11. Repeat the steps 8 and 10 for each step attenuator setting of 20 dB to 80 dB.

High Level Test:

1. Connect the test equipment as shown in Figure 3-14.

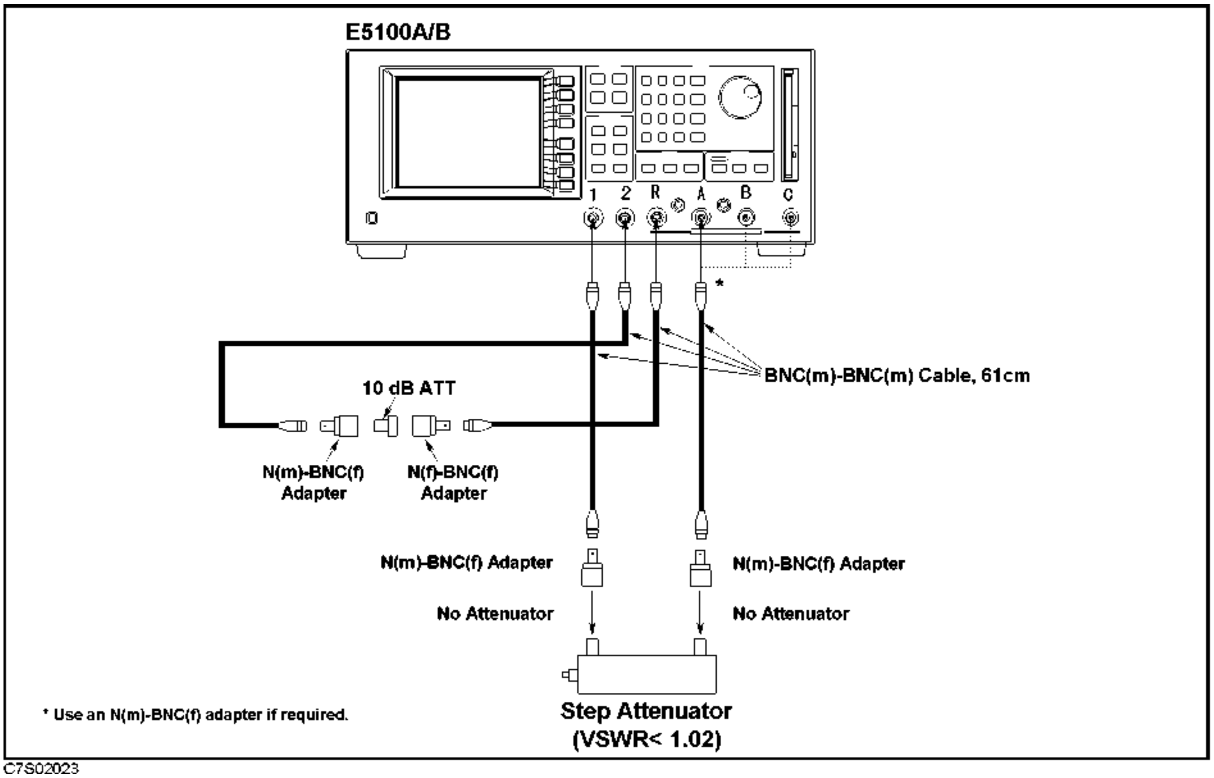


Figure 3-14. Dynamic Accuracy Test Setup 2 for Opt.218/318 with Opt.002

2. Set the step attenuator to 0 dB.
3. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

4. Set the step attenuator to 20 dB.
5. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

6. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
7. Transcribe the test results to the performance test record.
8. Connect the test equipment as shown in Figure 3-15.

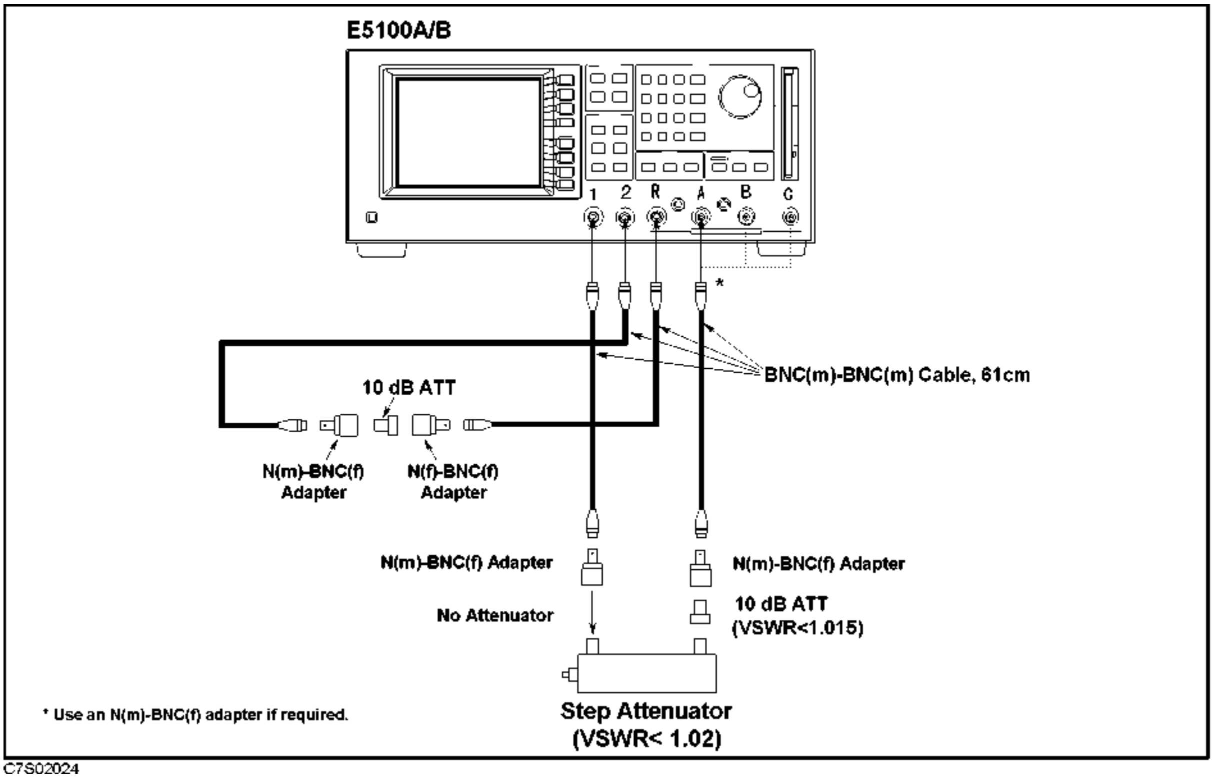


Figure 3-15. Dynamic Accuracy Test Setup 3 for Opt.218/318 with Opt.002

9. Set the step attenuator to 0 dB.
10. Perform the following key strokes to do a pass loss calibration:

    (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
    ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

11. Set the step attenuator to 10 dB.
12. Perform the following key strokes for a single sweep measurement:

    (Trigger) SINGLE

13. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
14. Transcribe the test results to the performance test record.
15. Repeat the low level test and high level test for B/R measurement.

For Opt.218/318 with Opt.001, Opt.218/318 with Opt.003 and Opt.010, and Opt.618

Low Level Test:

1. Record the step attenuator 50 MHz calibration value on the calculation sheet.
2. Connect the test equipment as shown in Figure 3-16.

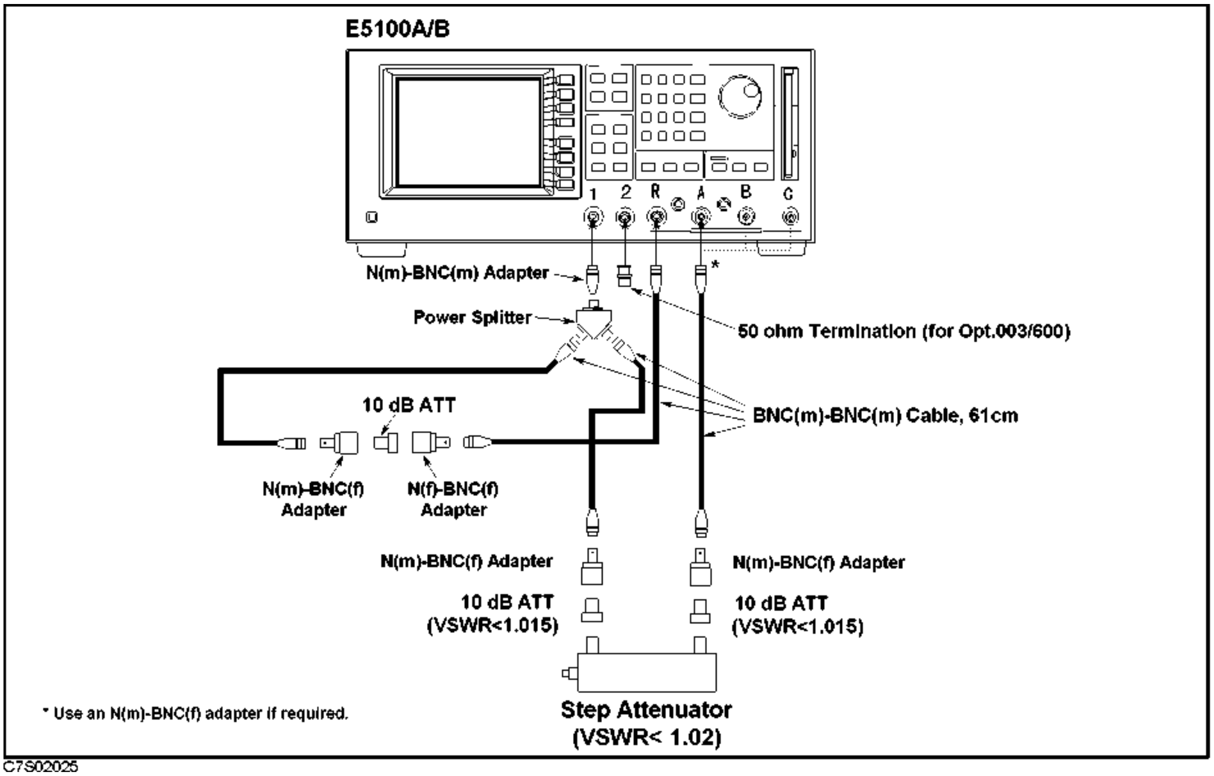


Figure 3-16.
Dynamic Accuracy Test Setup 1 for Opt.218/318 with Opt.001, Opt.218/318 with Opt.003 and Opt.010, and Opt.618

3. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Channel-1	
Measurement: A/R	(Meas/Format) MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Channel-2	
Measurement; A/R	(Meas/Format) ACTIVE CH (set to [CH2])
	MEAS A/R
Format: Phase	FORMAT MORE PHASE
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)

Coupled Channel ON	(Sweep) COUPLED CH on OFF (turn it ON)
Start = 3 MHz	(Start) (3) × M
Stop = 50.001 MHz	(Stop) (50.001) × M
NOP = 2	(Sweep) NUMBER of POINTs (2) × 1
IF BW = 10 Hz	IF BW (10) × 1 RETURN
Power = 11 dBm	POWER (11) × 1
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB	A 25 dB

4. Set the step Attenuator setting to 0 dB.
5. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

6. Perform the following key strokes to set up markers:

   (Marker) ACTIVE CH (set to [CH1]) MKR MODE MENU MARKERS: COUPLED
   MARKERS: DESCRETE
   (Marker) ACTIVE CH (set to [CH2]) MKR MODE MENU MARKERS: DESCRETE

7. Set the step attenuator to 10 dB.
8. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

9. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
10. Transcribe the test results to the performance test record.
11. Repeat the steps 8 and 10 for each step attenuator setting of 20 dB to 80 dB.

High Level Test:

1. Connect the test equipment as shown in Figure 3-17.

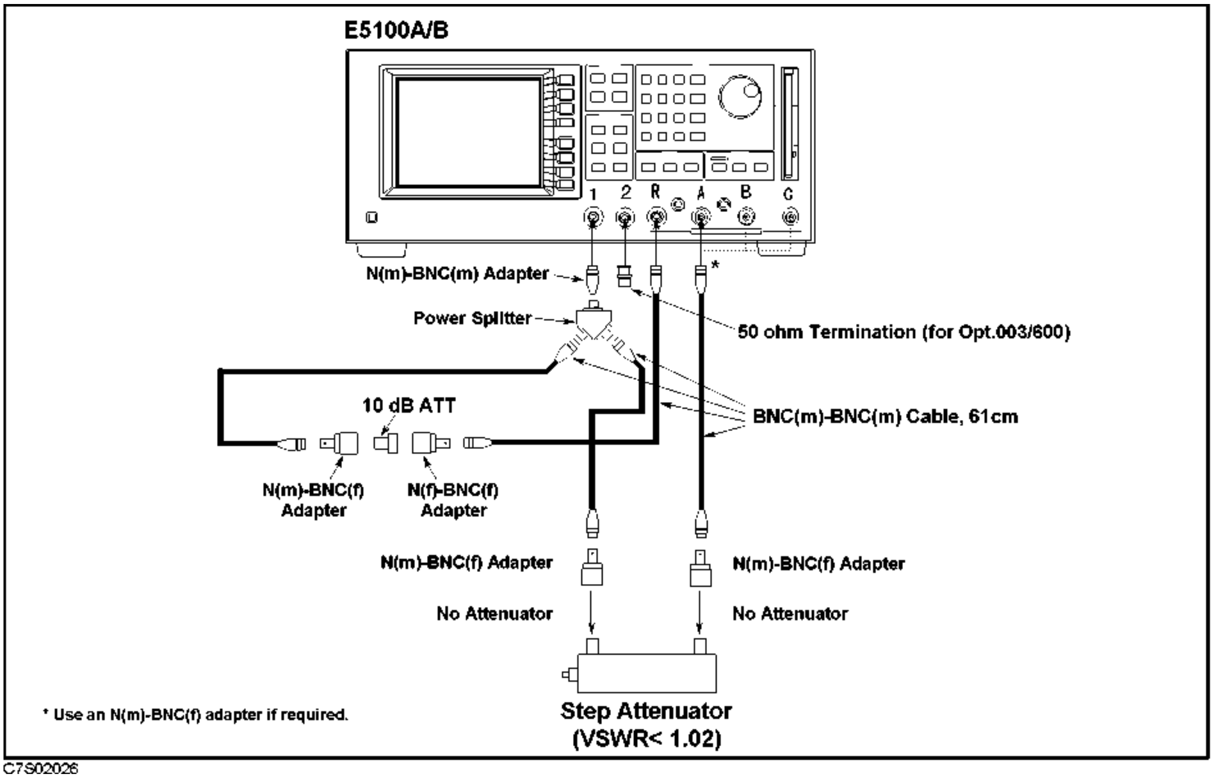


Figure 3-17.
Dynamic Accuracy Test Setup 2 for Opt.218/318 with Opt.001, Opt.218/318 with Opt.003 and Opt.010, and Opt.618

2. Set the step attenuator to 0 dB.
3. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

4. Set the step attenuator to 20 dB.
5. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

6. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
7. Transcribe the test results to the performance test record.
8. Connect the test equipment as shown in Figure 3-18.

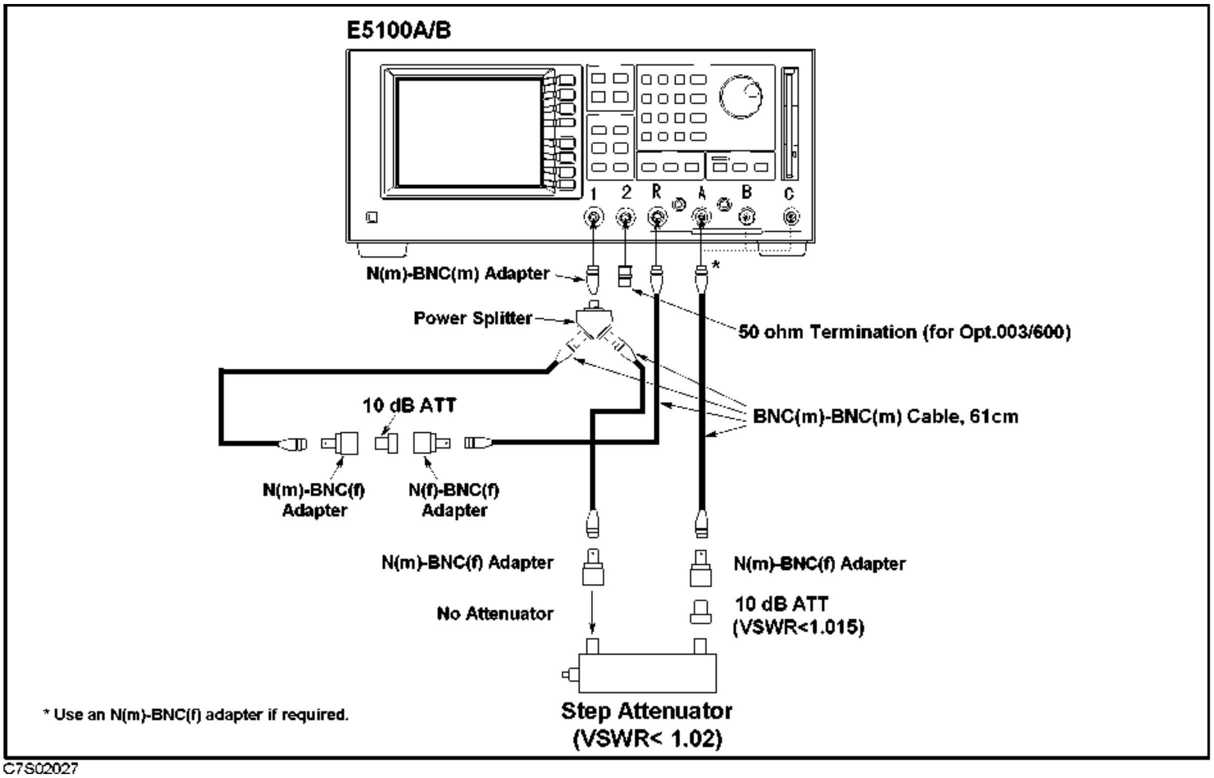


Figure 3-18.
Dynamic Accuracy Test Setup 3 for Opt.218/318 with Opt.001, Opt.218/318 with Opt.003 and Opt.010, and Opt.618

9. Set the step attenuator to 0 dB.
10. Perform the following key strokes to do a pass loss calibration:

    (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
    ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

11. Set the step attenuator to 10 dB.
12. Perform the following key strokes for a single sweep measurement:

    (Trigger) SINGLE

13. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
14. Transcribe the test results to the performance test record.
15. Repeat the low level test and high level test for B/R measurement.

For Opt.218/318 with Opt.003 without Opt.010

Low Level Test:

1. Record the step attenuator 50 MHz calibration value on the calculation sheet.
2. Connect the test equipment as shown in Figure 3-19.

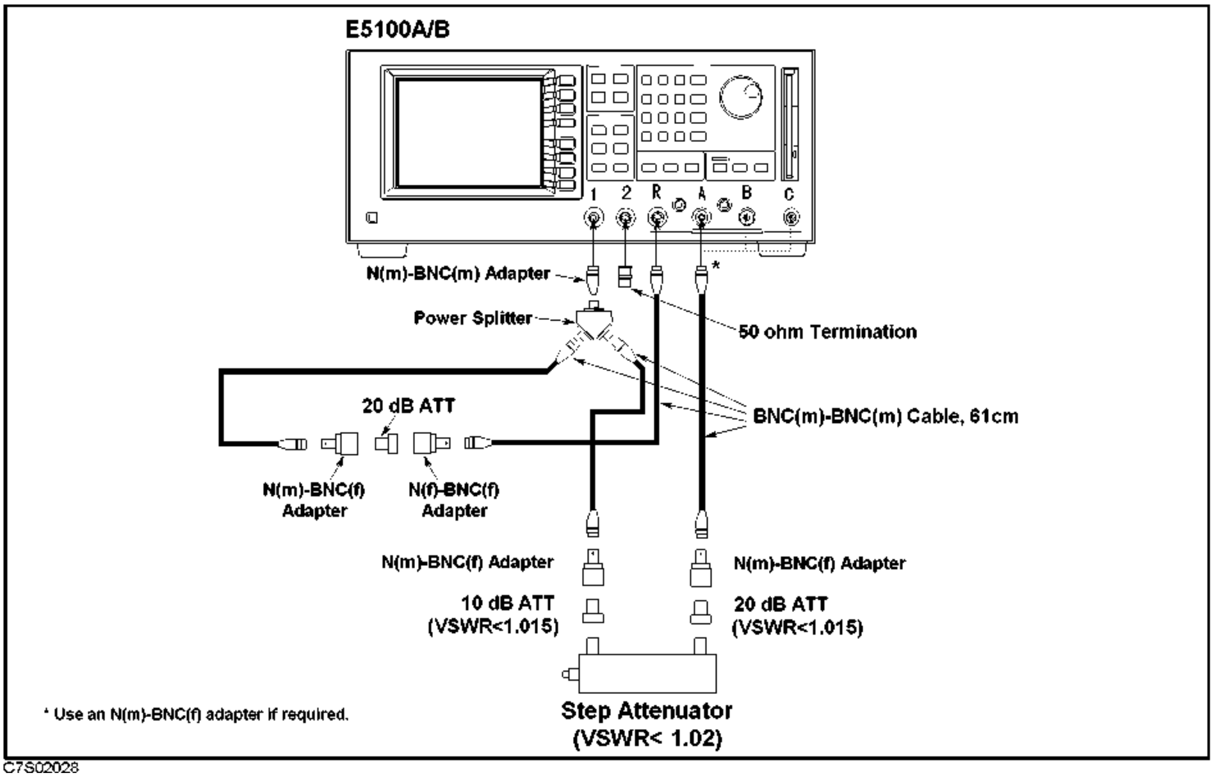


Figure 3-19.
Dynamic Accuracy Test Setup 1 for Opt.218/318 with Opt.003 without Opt.010

3. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Channel-1	
Measurement: A/R	(Meas/Format) MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Channel-2	
Measurement; A/R	(Meas/Format) ACTIVE CH (set to [CH2])
	MEAS A/R
Format: Phase	FORMAT MORE PHASE
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)
Coupled Channel ON	(Sweep) COUPLED CH on OFF (turn it ON)
Start = 3 MHz	(Start) (3) × M

Stop = 50.001 MHz	(Stop) (50.001) × M
NOP = 2	(Sweep) NUMBER of POINTs (2) × 1
IF BW = 10 Hz	IF BW (10) × 1 RETURN
Power = −4 dBm	POWER (−4) × 1
Input-R Attenuator: 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB	A 0 dB

4. Set the step Attenuator setting to 0 dB.
5. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

6. Perform the following key strokes to set up markers:

   (Marker) ACTIVE CH (set to [CH1]) MKR MODE MENU MARKERS: COUPLED
   MARKERS: DESCRETE
   (Marker) ACTIVE CH (set to [CH2]) MKR MODE MENU MARKERS: DESCRETE

7. Set the step attenuator to 10 dB.
8. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

9. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
10. Transcribe the test results to the performance test record.
11. Repeat the steps 8 and 10 for each step attenuator setting of 20 dB to 80 dB.

High Level Test:

1. Connect the test equipment as shown in Figure 3-20.

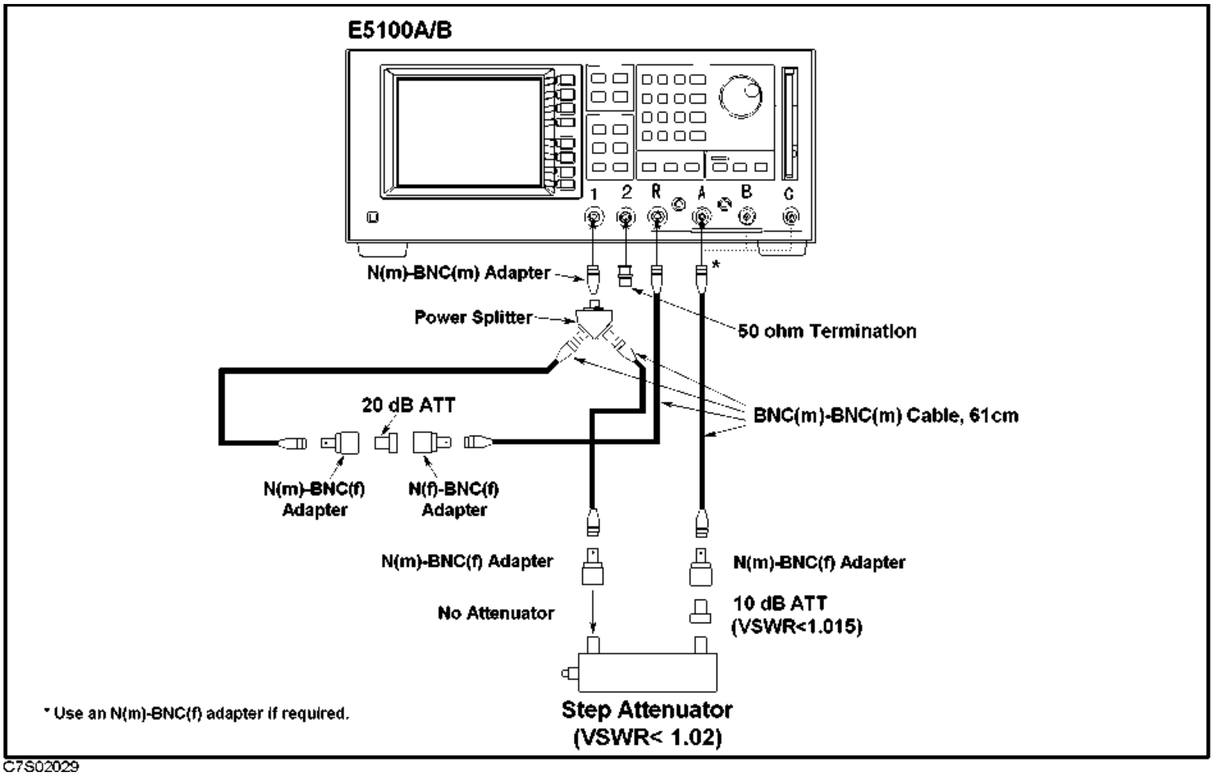


Figure 3-20. Dynamic Accuracy Test Setup 2 for Opt.218/318 with Opt.003 without Opt.010

2. Set the step attenuator to 0 dB.
3. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

4. Set the step attenuator to 20 dB.
5. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

6. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
7. Transcribe the test results to the performance test record.
8. Connect the test equipment as shown in Figure 3-21.

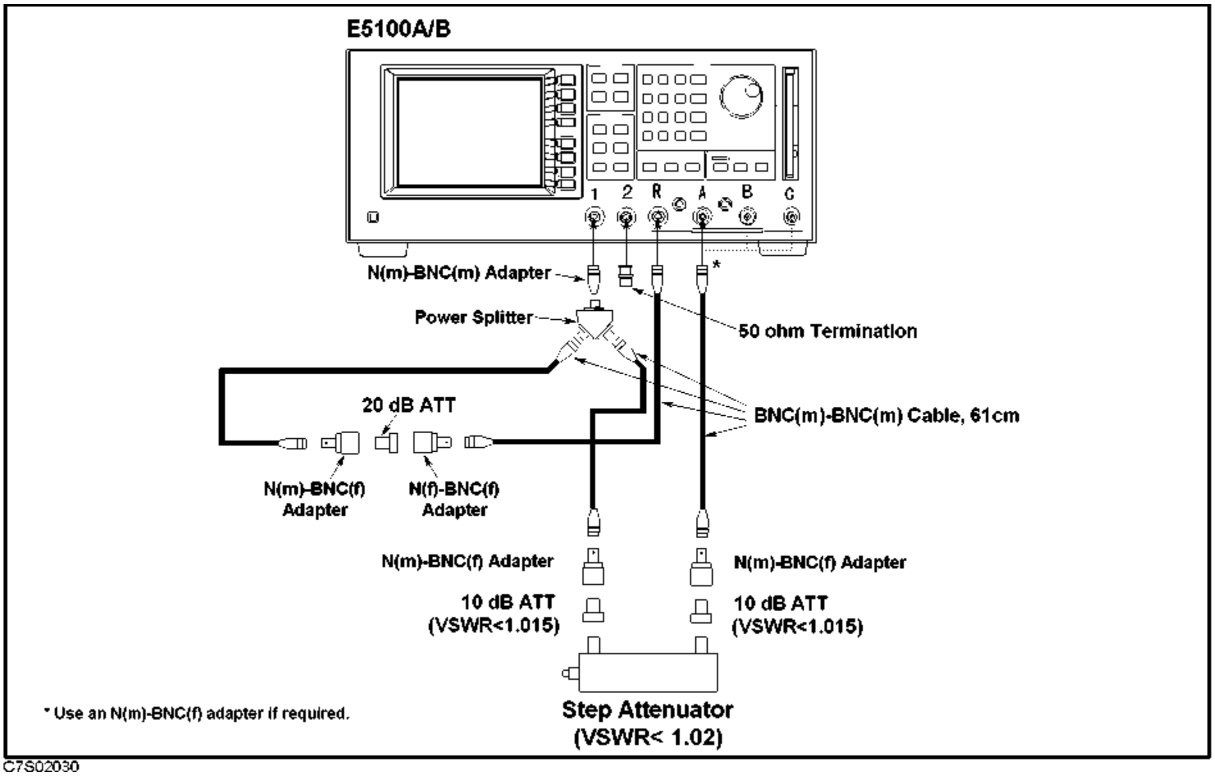


Figure 3-21.
Dynamic Accuracy Test Setup 3 for Opt.218/318 with Opt.003 without Opt.010

9. Set the step attenuator to 0 dB.
10. Perform the following key strokes to do a pass loss calibration:

    (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
    ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

11. Set the step attenuator to 10 dB.
12. Perform the following key strokes for a single sweep measurement:

    (Trigger) SINGLE

13. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
14. Transcribe the test results to the performance test record.
15. Repeat the low level test and high level test for B/R measurement.

For Option 118

Low Level Test:

1. Record the step attenuator 50 MHz calibration value on the calculation sheet.
2. Connect the test equipment as shown in Figure 3-22.

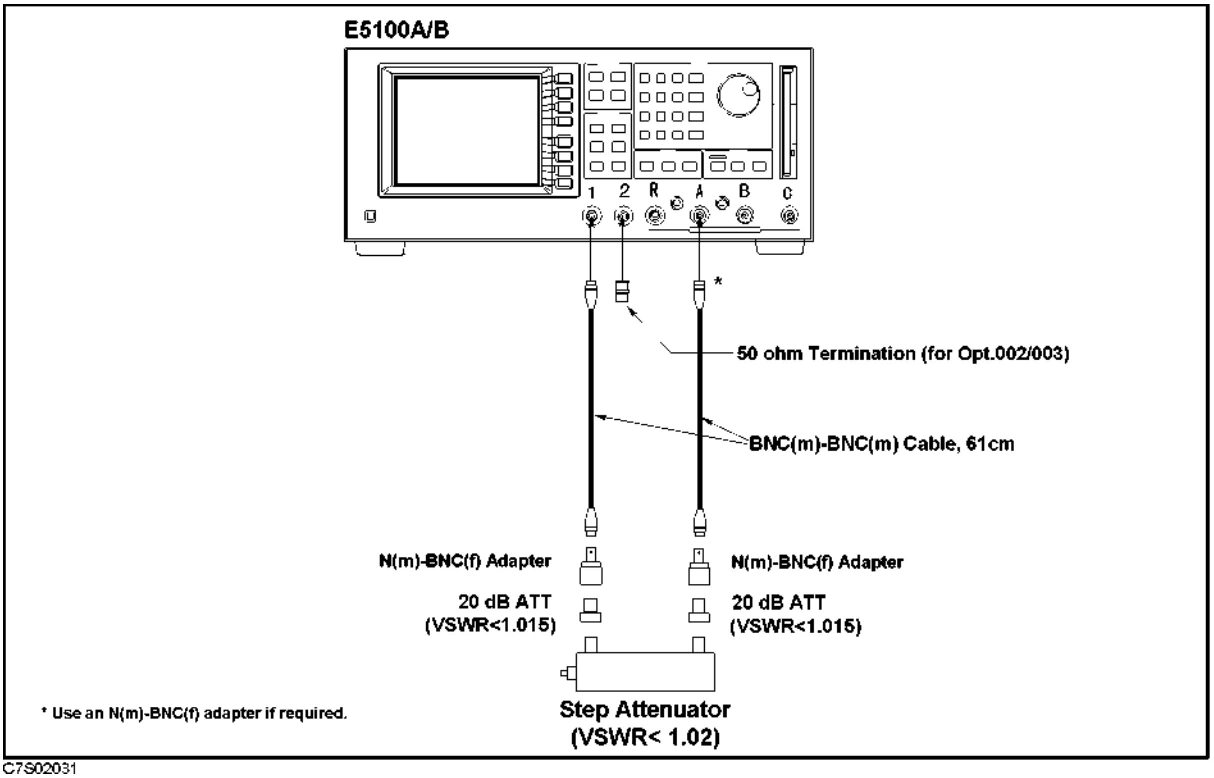


Figure 3-22. Dynamic Accuracy Test Setup 1 for Opt.118

3. Set the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Channel-1	
Measurement: A/R	(Meas/Format) MEAS A
Format: LOG MAG	FORMAT MORE LOG MAG
Channel-2	
Measurement; A/R	(Meas/Format) ACTIVE CH (set to [CH2])
	MEAS A
Format: Phase	FORMAT MORE PHASE
Dual Channel ON	(Display) MULTI CH on OFF (turn it ON)
Coupled Channel ON	(Sweep) COUPLED CH on OFF (turn it ON)
Start = 3 MHz	(Start) (3) × M
Stop= 50.001 MHz	(Stop) (50.001) × M

NOP = 2	Sweep NUMBER of POINTs 2 × 1
IF BW = 10 Hz	IF BW 10 × 1 RETURN
Power = 0 dBm	POWER 0 × 1
Input-A Attenuator: 25 dB	System MORE ATTENUATOR PORT : A 25 dB

4. Set the step Attenuator setting to 0 dB.
5. Perform the following key strokes to do a pass loss calibration:

   Cal ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

6. Perform the following key strokes to set up markers:

   Marker ACTIVE CH (set to [CH1]) MKR MODE MENU MARKERS: COUPLED
   MARKERS: DESCRETE
   Marker ACTIVE CH (set to [CH2]) MKR MODE MENU MARKERS: DESCRETE

7. Set the step attenuator to 10 dB.
8. Perform the following key strokes for a single sweep measurement:

   Trigger SINGLE

9. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
10. Transcribe the test results to the performance test record.
11. Repeat the steps 8 and 10 for each step attenuator setting of 20 dB to 80 dB.

High Level Test:

1. Connect the test equipment as shown in Figure 3-23.

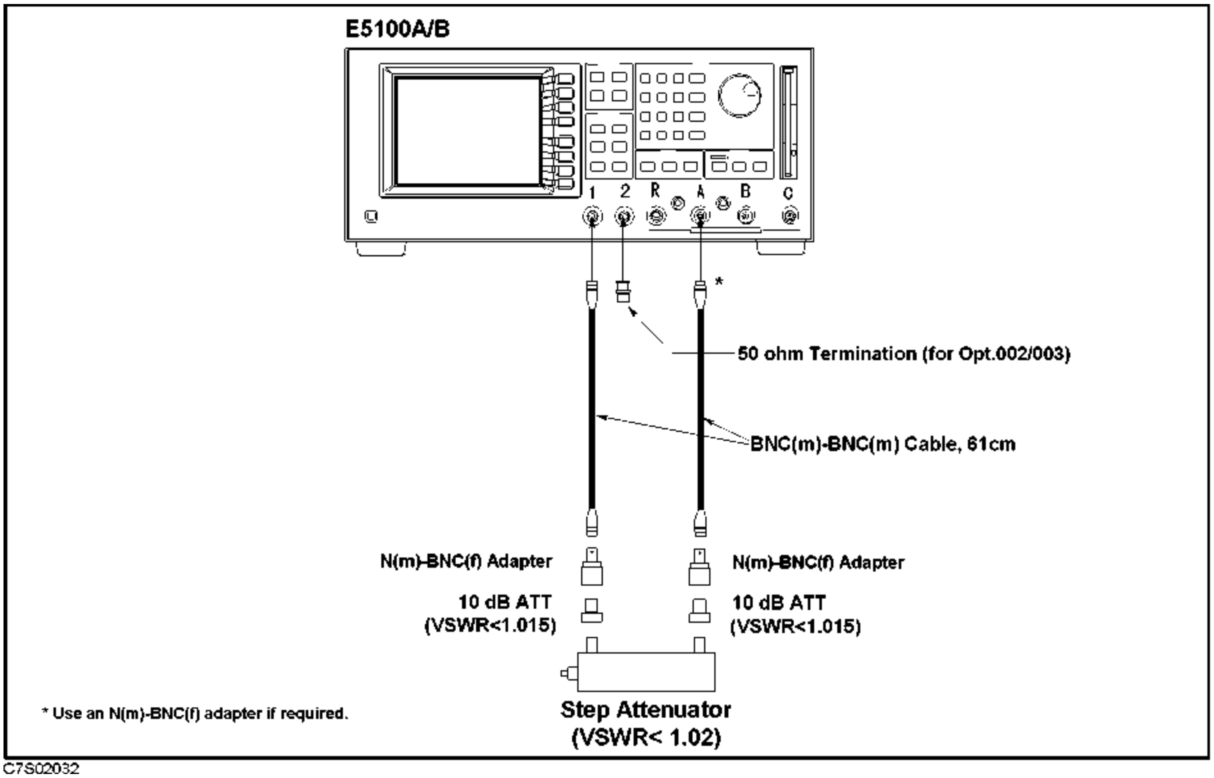


Figure 3-23. Dynamic Accuracy Test Setup 2 for Opt.118

2. Set the step attenuator to 0 dB.
3. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:

   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:
4. Set the step attenuator to 20 dB.
5. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE
6. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
7. Transcribe the test results to the performance test record.
8. Connect the test equipment as shown in Figure 3-24.

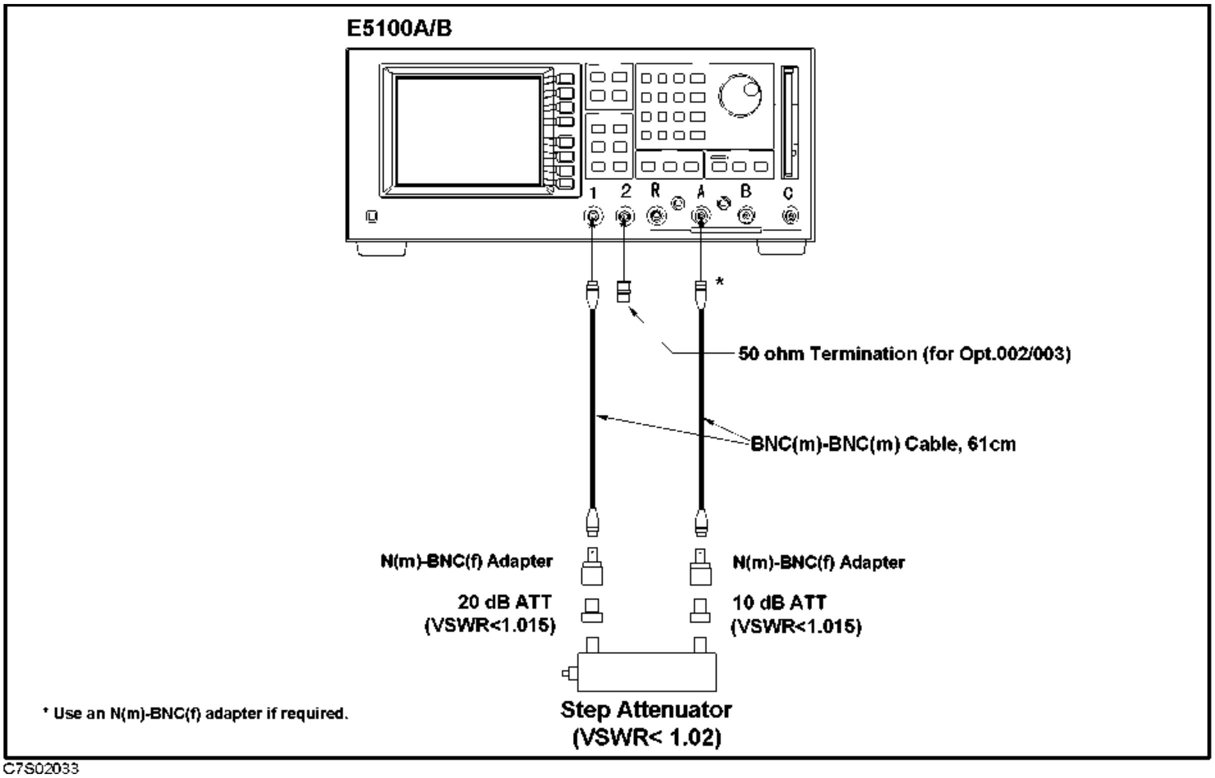


Figure 3-24. Dynamic Accuracy Test Setup 3 for Opt.118

9. Set the step attenuator to 0 dB.
10. Perform the following key strokes to do a pass loss calibration:

   (Cal) ACTIVE CH (set to [CH1]) RESPONSE THRU DONE:
   ACTIVE CH (set to [CH2]) RESPONSE THRU DONE:

11. Set the step attenuator to 10 dB.
12. Perform the following key strokes for a single sweep measurement:

   (Trigger) SINGLE

13. Rotate RPG knob, and record the magnitude measurement reading value at 50.001 MHz and the phase measurement reading value at 3 MHz on the calculation sheet.
14. Transcribe the test results to the performance test record.
15. Repeat the low level test and high level test for B/R measurement.

13. Magnitude Ratio Frequency Response Test

This test checks the magnitude ratio accuracy for each pair of inputs by measuring the peak-to-peak variation of the ratioed trace.

Specification

(at 23 ± 5°C, −30 dBm input level for RF attenuator: 0 dB or −5 dBm input level for RF attenuator: 25 dB, the same RF attenuator setting for both inputs)

50 Ω input

- E5100A
  - 10 kHz ≤ freq. < 100 kHz .... ±1 dB
  - 100 kHz ≤ freq. ≤ 100 MHz .... ±0.5 dB
  - 100 MHz < freq. ≤ 180 MHz .... ±1 dB

1 MΩ input for Opt. 101 or 301

(using 50 Ω feedthrough) .... ±3 dB

Test Equipment

Power Splitter 11667A
50 Ω Termination BNC type .... 11593A (if without Opt.001)
Fixed Attenuator 20 dB 8491A Opt.020
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839, 3ea
N(m)-BNC(f) Adapter .... Agilent P/N 1250-0780, 3ea
50Ω Feedthrough 11048C (Opt.101/301)

Procedure

Input Impedance: 50Ω

1. Connect the equipment as shown in Figure 3-25.

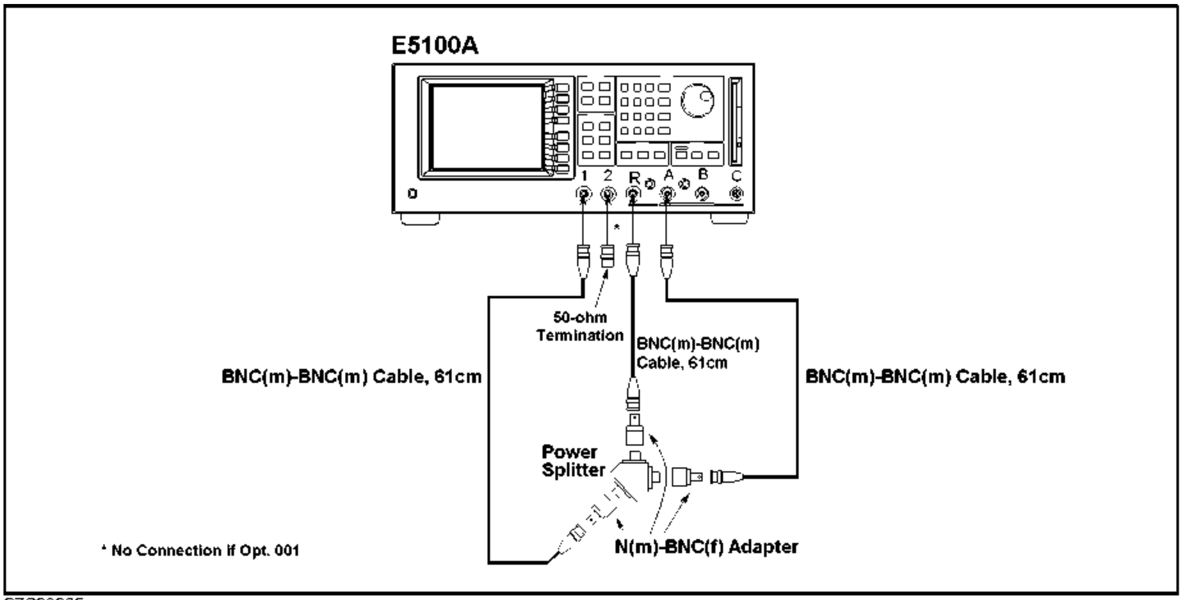


Figure 3-25. Magnitude Ratio Frequency Response Test Setup-1

2. Set the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Power= 1 dBm	(Sweep) POWER (1) × 1
IF BW= 30 Hz	IF BW (30) × 1
Active Channel: CH1	(Meas/Format) ACTIVE CH (set to [CH1])
Measurement: A/R	MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Scale: 0.1 dB/div	(Display) SCALE MENU SCALE/DIV (.1) × 1
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB	A 25 dB

3. Store the measurement data using the following key stroke:

   (Marker) ACTIVE CH (set to [CH1]) (Display) DEFINE TRACE DATA→MEM

4. Reverse R and A cable connections on the E5100A input ports.
5. Press DATA and MEMORY key.
6. Visually average the two traces; imagine a trace directly between the two traces. (If both traces are not completely visible, change the scale as required.)
   a. Press (Marker) rotate the RPG knob, and record the maximum “averaged” power deviation from 10 kHz to 100 kHz on the performance test record.

b. Rotate the RPG knob, and record the maximum “averaged” power deviation from 100 kHz to 100 MHz on the performance test record.

c. Rotate the RPG knob, and record the maximum “averaged” power deviation from 100 MHz to 180 MHz on the performance test record.

7. Press (Display) DEFINE TRACE TRACE: DATA .

8. Change the connection as shown in Figure 3-26.

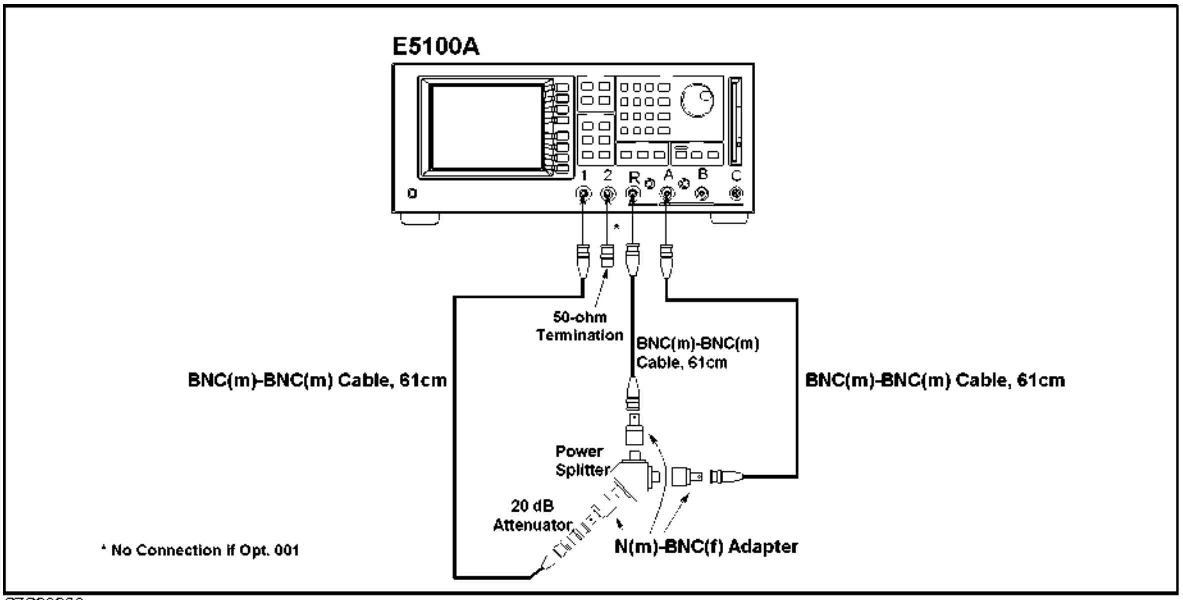


Figure 3-26. Magnitude Ratio Frequency Response Test Setup-2

9. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Power= −4 dBm	(Sweep) POWER (−4) × 1
Input-R Attenuator: 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB	A 0 dB

10. Repeat the steps 3 through 6.

11. Repeat the steps 1 through 10 for B/R (Opt.318).

Input Impedance: 1MΩ (Opt.101/301)

1. Connect the equipment as shown in Figure 3-27.

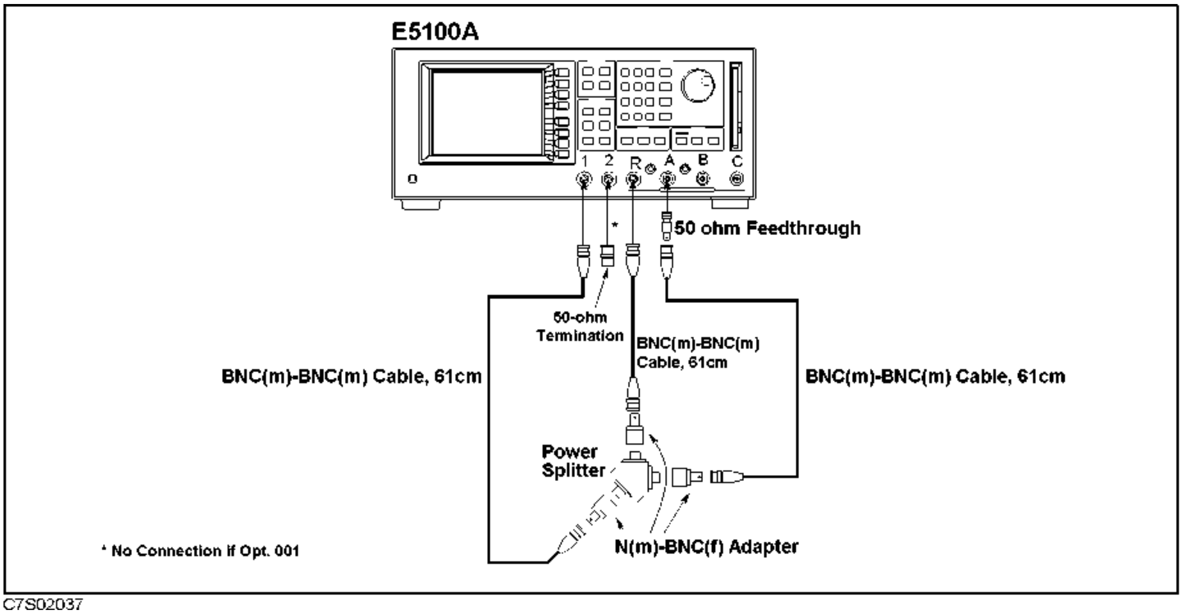


Figure 3-27. Magnitude Ratio Frequency Response Test Setup-3

2. Set the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Stop= 5 MHz	(Stop) (5) M
Power= 1 dBm	(Sweep) POWER (1) × 1
IF BW= 30 Hz	IF BW (30) × 1
Active Channel: CH1	(Meas/Format) ACTIVE CH (set to [CH1])
Measurement: A/R	MEAS A/R
Format: LOG MAG	FORMAT MORE LOG MAG
Scale: 0.1 dB/div	(Display) SCALE MENU SCALE/DIV (.1) × 1
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB	A 25 dB

3. Store the measurement data using the following key stroke:

   (Marker) ACTIVE CH (set to [CH1]) (Display) DEFINE TRACE DATA→MEM

4. Reverse R and A cable connections on the E5100A input ports.
5. Press DATA and MEMORY key.

6. Visually average the two traces; imagine a trace directly between the two traces. (If both traces are not completely visible, change the scale as required.)

   Press (Marker) rotate the RPG knob, and record the maximum "averaged" power deviation from 10 kHz to 5 MHz on the performance test record.

7. Press (Display) DEFINE TRACE TRACE: DATA .

8. Change the connection as shown in Figure 3-28.

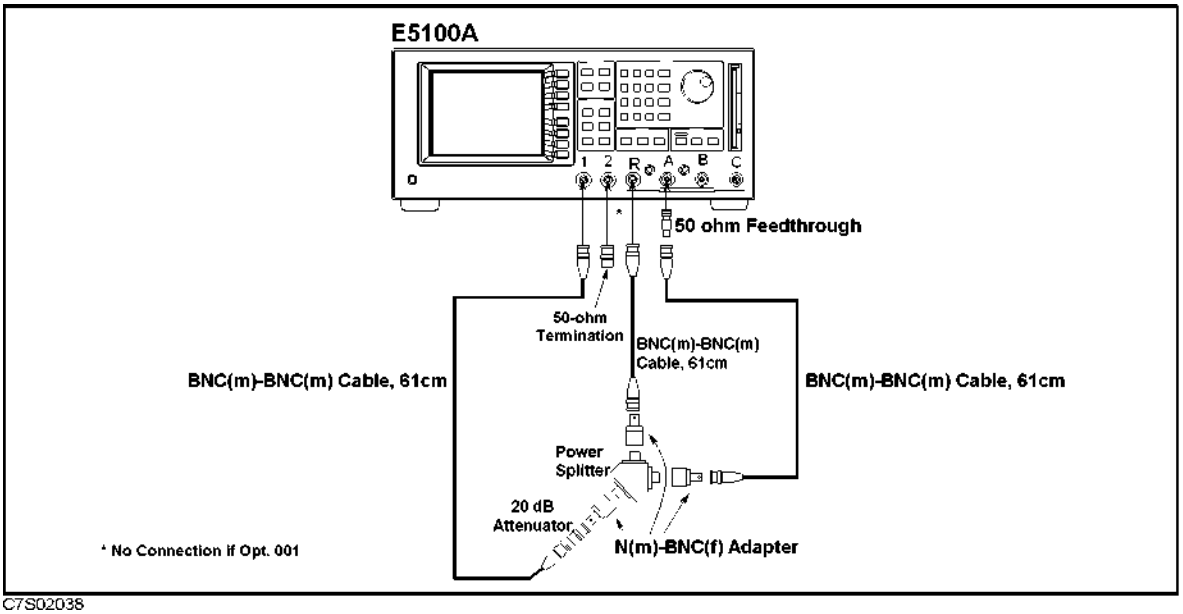


Figure 3-28. Magnitude Ratio Frequency Response Test Setup-4

9. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	(Preset)
Power= −4 dBm	(Sweep) POWER (−4) × 1
Input-R Attenuator: 0 dB	(System) MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB	A 0 dB

10. Repeat the steps 3 through 6.

11. Repeat test for B/R (Opt.318).

14. Phase Frequency Response Test

This test checks the phase accuracy for each pair of inputs by measuring the peak-to-peak variation of the ratioed trace.

Note An E5100B does not require this test. An E5100A with Option 118 does not require this test.

Specification

(at 23 ± 5°C, −30 dBm input level for RF attenuator: 0 dB or −5 dBm input level for RF attenuator: 25 dB, the same RF attenuator setting for both inputs, 50 Ω input)

- E5100A
  - 10 kHz ≤ freq. < 100 kHz .... ±5°
  - 100 kHz ≤ freq. ≤ 100 MHz .... ±2.5°
  - 100 MHz < freq. ≤ 180 MHz .... ±5°

Test Equipment

Power Splitter 11667A
50 Ω Termination BNC type .... 11593A (if without Opt.001)
Fixed Attenuator 20 dB 8491A Opt.020
BNC(m)-BNC(m) Cable, 61 cm .... Agilent P/N 8120-1839, 3ea
N(m)-BNC(f) Adapter .... Agilent P/N 1250-0780, 3ea

Procedure

1. Connect the equipment as shown in Figure 3-29.

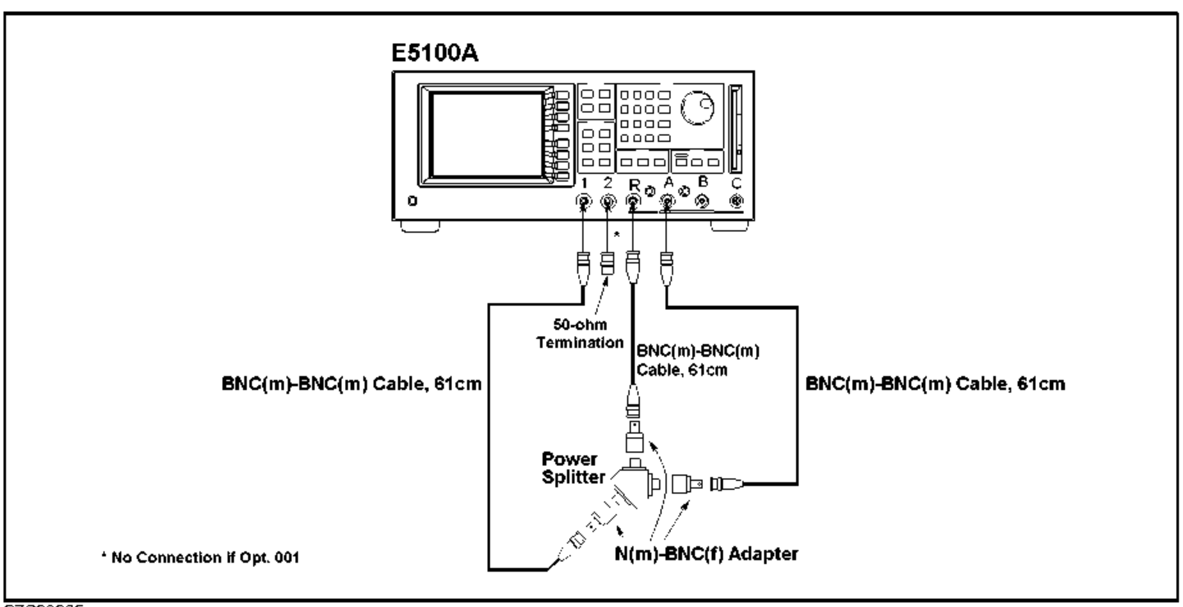


Figure 3-29. Phase Frequency Response Test Setup-1

2. Set the E5100A as follows:

Control Settings	**Key Strokes**
Preset	(Preset)
Power= 1 dBm	(Sweep) POWER (1) × 1
IF BW= 30 Hz	IF BW (30) × 1
Active Channel: CH1	(Meas/Format) ACTIVE CH (set to [CH1])
Measurement: A/R	MEAS A/R
Format: PHASE	FORMAT MORE PHASE
Scale: 0.1 dB/div	(Display) SCALE MENU SCALE/DIV (.1) × 1
MULTI Channel ON	(Display) MULTI CH on OFF (turn it ON)
Statistics: ON	(Marker) UTILITY MENU STATISTICS on OFF (turn it ON)
Input-R Attenuator: 25 dB	(System) MORE ATTENUATOR PORT : R 25 dB
Input-A Attenuator: 25 dB	A 25 dB

3. Press (Display) MORE ELECTRICAL DELAY and turn the RPG knob or press (⇧) (⇩) to vary the electrical delay until the standard deviation value as a marker statistic (s.dev) is minimum as possible.

4. Press PHASE OFFSET and enter the mean value as a marker statistic (mean).

5. Perform the following key strokes for a single sweep measurement.

   (Trigger) SINGLE

6. Perform the following key strokes to set the marker search range from 10 kHz to 100 kHz.

   (Marker) ACTIVE MARKER 1 (10) × k 2 (100) × k RETURN ΔMODE MENU ΔREF MKR ΔREF=1 RETURN RETURN MARKER SEARCH SEARCH RANGE SEARCH RNG STORE PART SRCH on OFF (turn it ON)

7. Move the marker to the maximum value and the minimum value using the following key strokes. Compare the two values, and record the larger one in the performance test record.

   (Marker) ΔMODE MENE ΔMODE OFF RETURN MKR SEARCH SEARCH: MAX MIN

8. Press (Marker) ΔMODE MENU ΔREF MKR ΔREF=1 .

9. Perform the following key strokes to set the marker search range from 100 kHz to 100 MHz.

   (Marker) ACTIVE MARKER 1 (100) × k 2 (100) × M RETURN MKR SEARCH SEARCH RANGE SEARCH RNG STORE

10. Move the marker to the maximum value and the minimum value using the following key strokes. Compare the two values, and record the larger one in the performance test record.

Marker ΔMODE MENU ΔMODE OFF RETURN MKR SEARCH MAX MIN

11. Press Marker ΔMODE MENU ΔREF MKR ΔREF=1 .

12. Perform the following key strokes to set the marker search range from 100 MHz to 180 MHz.

13. Marker ACTIVE MARKER 1 100 × M 2 180 × M RETURN MKR SEARCH SEARCH RANGE SEARCH RNG STORE

14. Move the marker to the maximum value and the minimum value using the following key strokes. Compare the two values, and record the larger one in the performance test record.

Marker ΔMODE MENU ΔMODE OFF RETURN MKR SEARCH SEARCH: MAX MIN

15. Press Marker ΔMODE MENU ΔREF MKR ΔREF=1 .

16. Change the connection as shown in Figure 3-30.

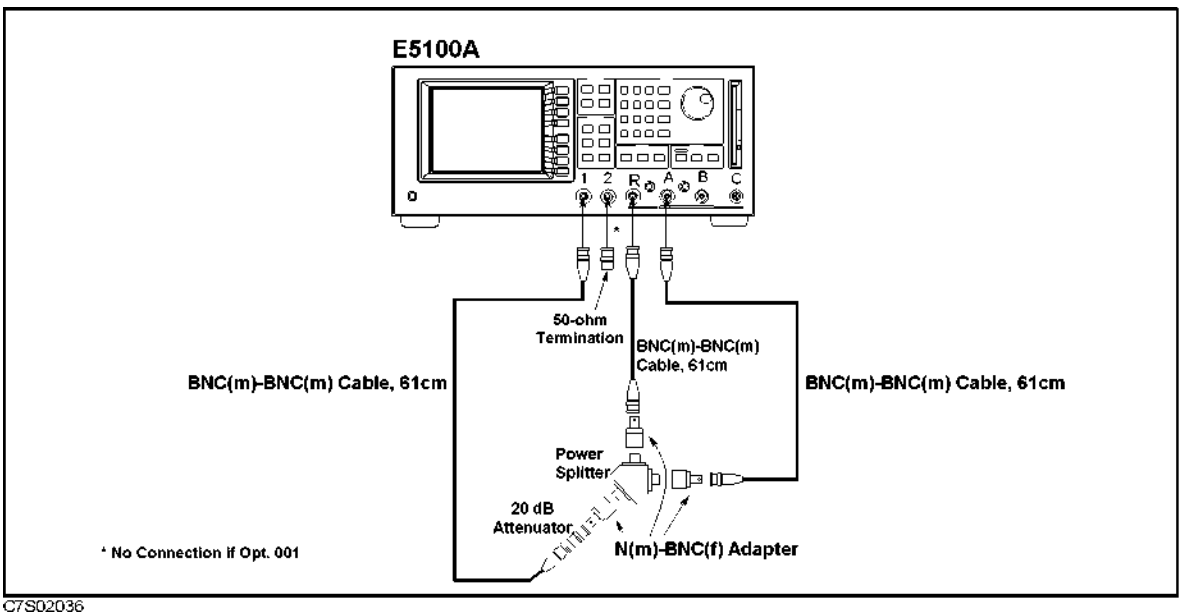


Figure 3-30. Phase Frequency Response Test Setup-2

17. Set the E5100A as follows:

Control Settings	Key Strokes
Preset	Preset
Power= −4 dBm	Sweep POWER −1 4 × 1
Input-R Attenuator: 0 dB	System MORE ATTENUATOR PORT : R 0 dB
Input-A Attenuator: 0 dB	A 0 dB

18. Repeat the steps 3 through 14.

19. Change the E5100A control settings for B/R Phase:

Control Settings **Key Strokes**

Active Channel: CH2	(Meas/Format) ACTIVE CH (set to [CH2])
Measurement: B/R	MEAS B/R
Format: PHASE	FORMAT MORE PHASE
Trigger Mode: Continuous	(Trigger) CONTINUOUS

20. Repeat steps 3 through 18.
21. Change the E5100A control settings for A/B Phase:

Control Settings	**Key Strokes**
Active Channel: CH2	(Meas/Format) ACTIVE CH (set to [CH2])
Measurement: A/B	MEAS A/B
Format: PHASE	FORMAT MORE PHASE
Trigger Mode: Continuous	(Trigger) CONTINUOUS

22. Repeat steps 3 through 18.
23. Repeat steps 1 through 22 for B/R (Opt.318).

4

Adjustments

Introduction

This section describes the adjustments required for the E5100A/B Network Analyzer to operate within its specifications. These adjustments should be performed along with periodic maintenance to keep the E5100A/B in optimum operating condition. The recommended calibration period is 12 months. If proper performance cannot be achieved after the adjustments, see the Troubleshooting chapter.

Note

- *Adjustments 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, a 30 minute warm-up and stabilization period before performing any of the following Adjustments are recommended.

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 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 E5100A/B can remain charged for several minutes even though the E5100A/B is off and unplugged.

Required Controller

Performing adjustments requires the following controller:

Windows PC (Personal Computer)

OS	Microsoft® Windows NT® (≥3.51) or Windows 95®
Software	HP VEE (≥4.0)
GPIB Card	82350, 82340, or 82341

Software Requirements

The adjustments require the E5100A/B Adjustment Program. Contact to Agilent Technologies Kobe Instrument Division to obtain the latest adjustment program.

Required Test Equipment

Required equipment for performing the adjustments is listed in Table 4-1. Use only calibrated test equipment when adjusting the E5100A/B.

Table 4-1. Required Test Equipment for Adjustment

Equipment	Model	Qty
Multimeter	3458A	1
Frequency Counter	5334B Opt. 010/030 or 5386A	1
	53181A Opt.010 or 012	1
Power Meter	437B or 438A or E4418A	1
Power Sensor	8482A	1
80 dB Step Attenuator	8496G with Opt.001 and H60[1]	1
Attenuator/Switch Driver	11713A	1
50Ω Termination, BNC Type	11593A	4
Attenuator Pad 10 dB	8491A Opt.010	1
Attenuator Pad 30 dB	8491A Opt.030	1
Power Splitter	11667A	1
N(m)-BNC(f) Adapter	Agilent P/N 1250-1476	4
N(f)-BNC(m) Adapter	Agilent P/N 1250-1477	1
BNC(m)-BNC(m) Cable, 61cm	Agilent P/N 8120-1839	4
GPIB Cable	10833A/B/C	3

1 An 8496G step attenuator with required low VSWR (1.02) can be purchased by specifying option H60, then contact your nearest Agilent Technologies service center for the required calibratin frequency and calibration uncertainty.

Order of Adjustments

When performing more than one adjustment, perform the operations in order of the page numbers.

Note To perform any adjustment, it is not necessary to remove the outer cover.

Performing Adjustments

The adjustments are empirically derived data that is stored in memory and then recalled to refine the E5100A/B's measurement and to define its operation. The adjustments are as follows:

- VCXO Frequency Calibration
- Source Correction
- IF Attenuator Correction
- Receiver Calibration

Setting Up the System

Performing adjustments requires the system described in this section.

The Hardware Setup is shown in Figure 4-1.

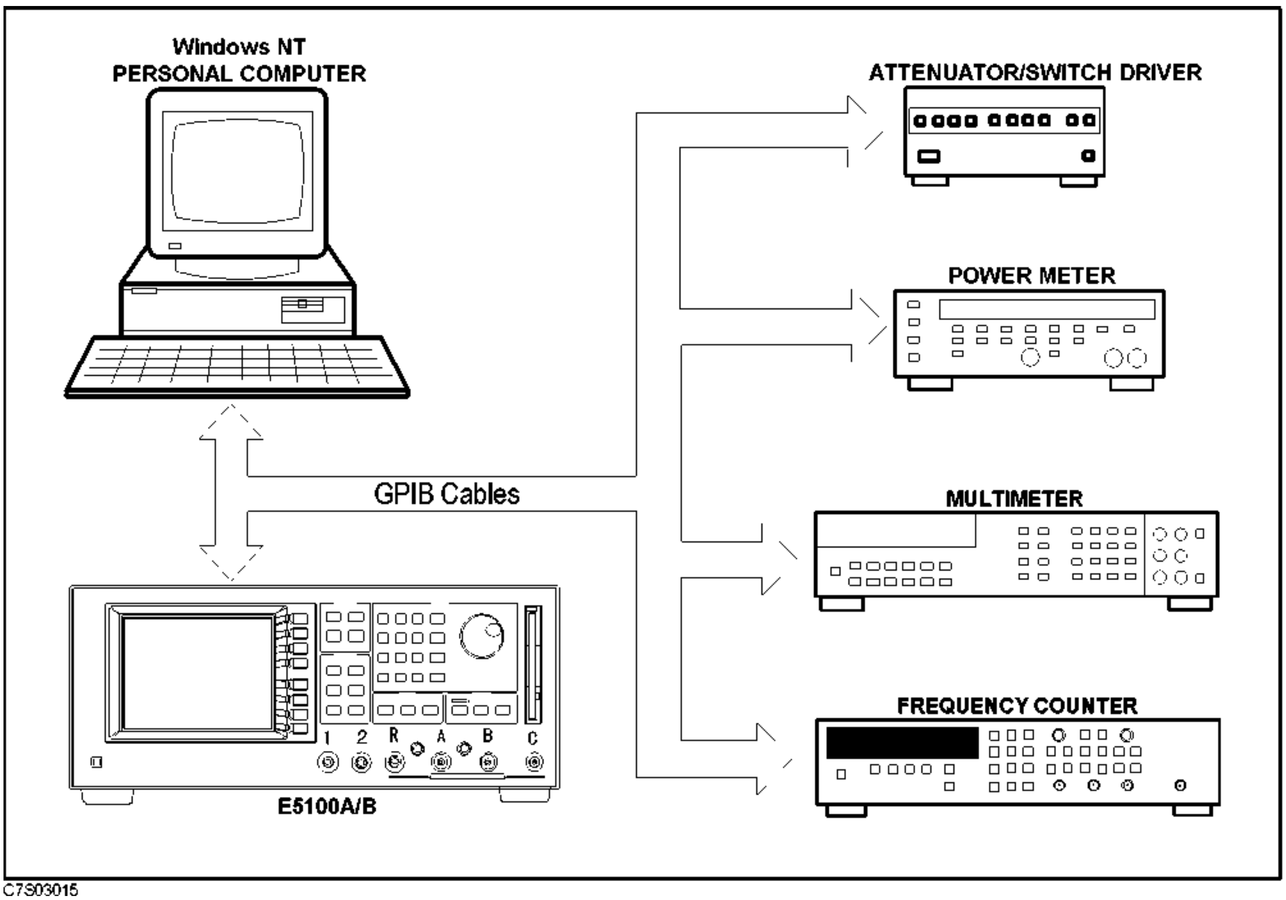


Figure 4-1. Adjustment Hardware Setup

Installing Adjustment Program into Your PC

1. Make a copy of the E5100A/B adjustment program named `E5100ADJ.EXE` in a directory of your harddisk drive.
2. Double-click the filename on the Windows' Explorer to start extracting the self-extracting archive.
3. You will be prompted to enter directory name for installing the program files. Click `Unzip` to use default directory (C:\E5100a_b).
4. Confirm the message that you successfully extract the files and click `OK` and `Close`.

Running the Adjustment Program

1. Start the HP VEE.
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:\E5100A_B\E5100ADJ.VEE` and click `Open`.
3. You may be asked to add drivers for the equipment during the program loading. Click `OK` and enter the address for each equipment. Enter `0` as the address for the equipment which are not used for the adjustment. (Refer to Table 4-2)

Table 4-2. Device Name and GPIB Address Example

Device Name	Equipment	GPIB Address
E 5100A	E5100 A/B	717
rs 232	(not used)	0
FC	Frequency Counter	703
11713A	Attenuator/Switch Driver	728
11713A_2	Attenuator/Switch Driver	728
PMeter	Power Meter	713
438A	Power Meter	713
3458A	Multimeter	722
5386A	Frequency Counter	703
3488A	(not used)	0
3488A_2	(not used)	0
Dummy	(not used)	0

4. Select `START` button on the HP VEE screen.
5. Follow the instructions shown on the display.

1. VCXO Frequency Calibration

The purpose of this procedure is to generate the correction constants which the pretune fractional-N oscillator uses to insure proper phase lock. The correction constants are stored into flash memory.

Required Equipment

Frequency Counter	5334B Opt.010,030 or 5386A
	53181A Opt.010 or 012
BNC(m)-BNC(m) Cable, 61 cm	Agilent P/N 8120-1839

Procedure

1. Run the Adjustments Program
2. Choose the VCXO Frequency Calibration.
3. Following the Adjustments Program instructions, complete this procedure.

Note If 53181A is used, connect BNC(m)-BNC(m) Cable to CHANNEL 1.

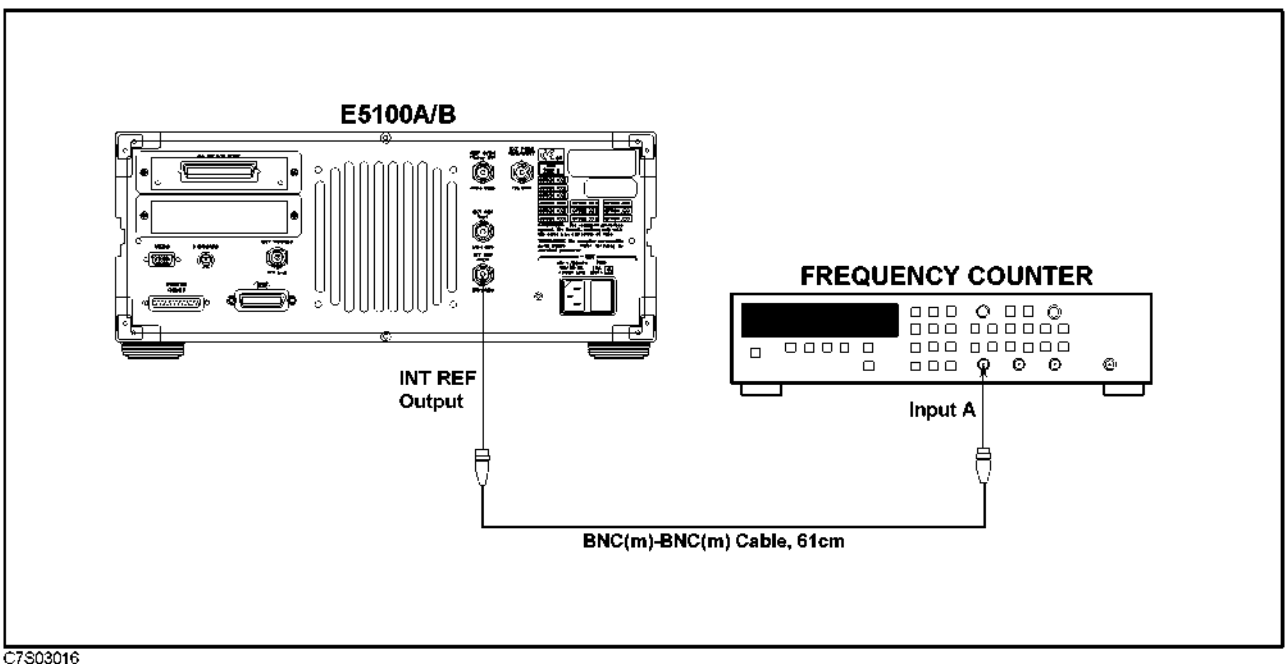


Figure 4-2. VCXO Frequency Calibration Setup

2. Source Correction

The purpose of this procedure is to calibrate the power level linearity. The calibration data in the form of correction constants are then stored in flash memory.

Required Equipment

Power Meter	437B or 438A or E4418A
Power Sensor	8482A
50 Ω Termination BNC type	11593A (if without Opt. 001)
Attenuator Pad 10 dB	8491A Opt.010 (if without Opt.010)
Attenuator Pad 30 dB	8491A Opt.030 (if with Opt.010)
BNC(m)-BNC(m) Cable, 61 cm	Agilent P/N 8120-1839
N(m)-BNC(f) Adapter	Agilent P/N 1250-1476
N(f)-BNC(m) Adapter	Agilent P/N 1250-1477

Procedure

1. Run the Adjustments Program.
2. Choose the Source Correction.
3. Following the Adjustments Program instruction, connect the equipment as shown in Figure 4-3, Figure 4-4, and Figure 4-5.

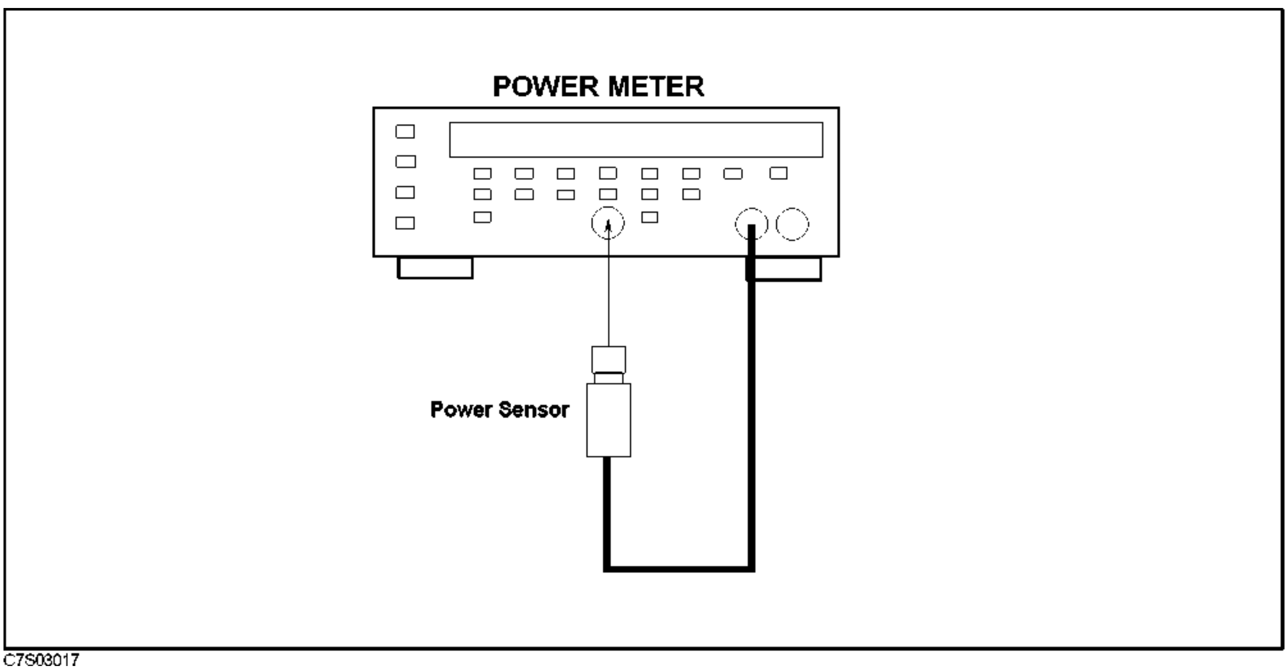
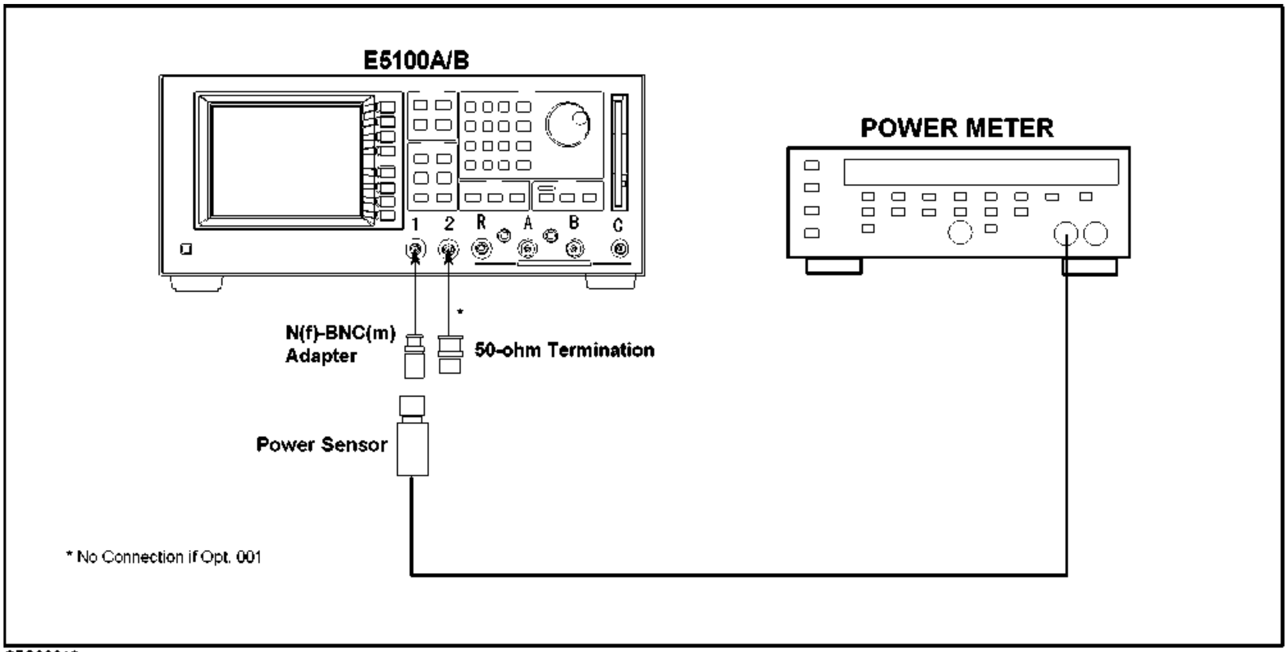
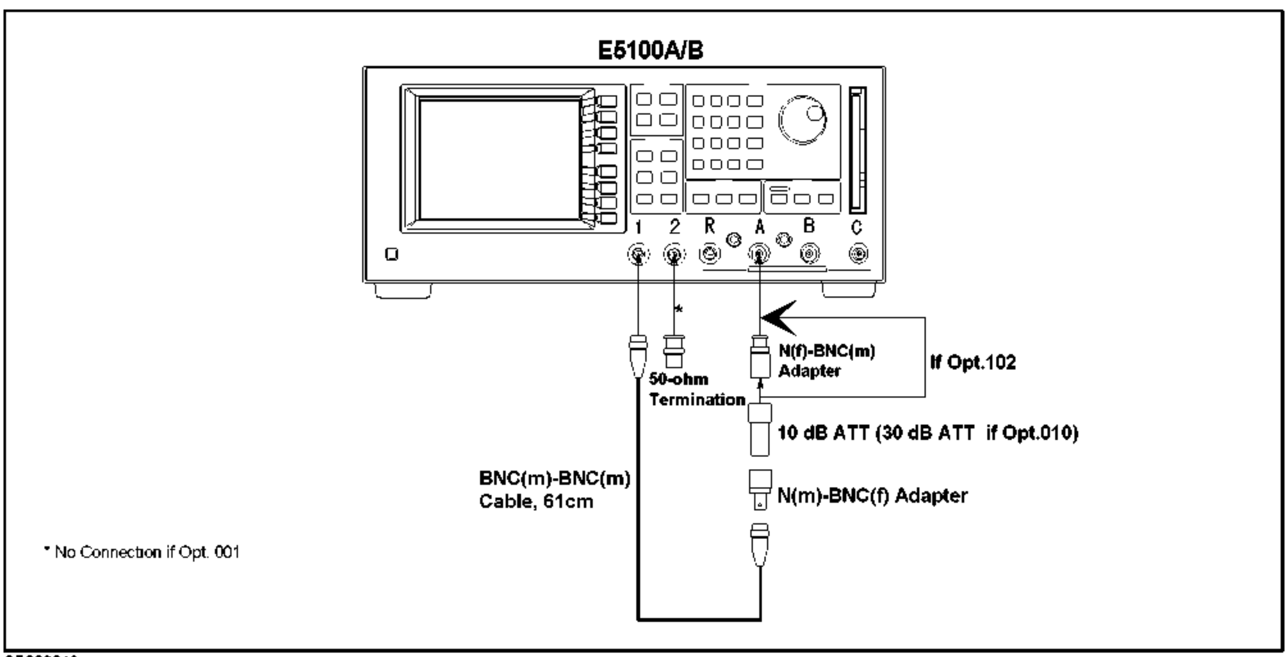


Figure 4-3. Power Sensor Calibration Setup



C7S03018

Figure 4-4. Source Correction Setup 1



C7S03019

Figure 4-5. Source Correction Setup 2

3. IF Attenuator Correction

Note An E5100A/B with Option 100 does not require updating these correction constants.

The purpose of this procedure is to calibrate the Input-R receiver's absolute measurement accuracy. The calibration data in the form of correction constants is then stored in flash memory.

Required Equipment

80 dB Step Attenuator	8496G with Opt.001 & H60
Attenuator/Switch Driver	11713A
Power Splitter	11667A
BNC(m)-BNC(m) Cable, 61 cm	Agilent P/N 8120-1839, 4 ea
N(m)-BNC(f) Adapter	Agilent P/N 1250-1476, 5 or 6 ea

Procedure

1. Run the Adjustments program.
2. Choose the IF Attenuator Correction.
3. Following the Adjustments Program instructions, connect the equipment as shown in Figure 4-6.

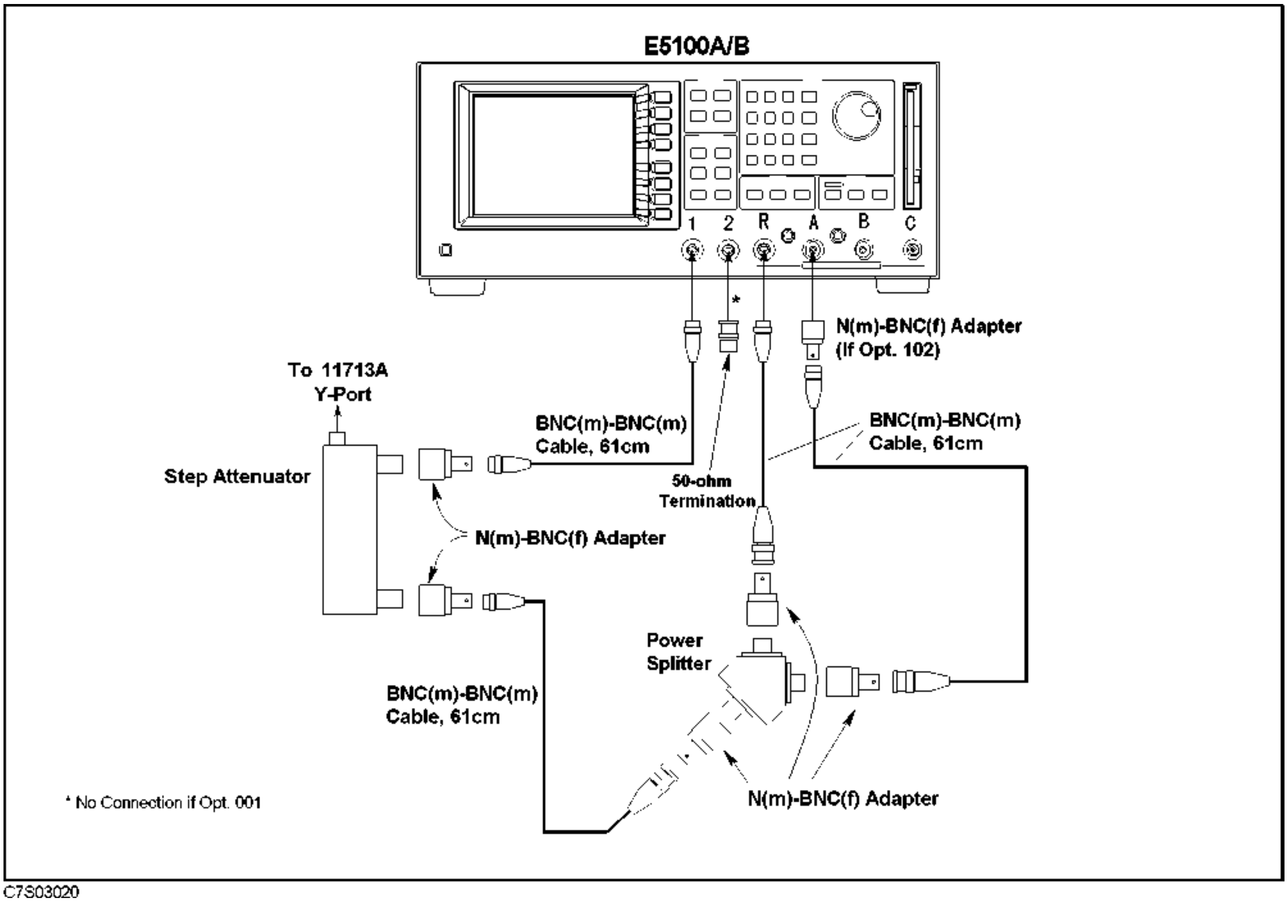


Figure 4-6. IF Attenuator Correction Setup

Note The BNC(m)-BNC(m) cables must have the same length.

4. Following the instructions, complete the procedure.

4. Receiver Calibration

The purpose of this procedure is to calibrate the Input-A receiver absolute measurement accuracy. The calibration data in the form of correction constants is then stored in flash memory.

Required Equipment

Multimeter	3458A
Power Meter	437B or 438A or E4418A
Power Sensor	8482A
80 dB Step Attenuator	8496G with Opt.001 & H60
Attenuator/Switch Driver	11713A
Power Splitter	11667A
50 Ω Feedthrough	11048C
BNC(f)-Dual Banana Plug	Agilent P/N 1251-2277
N(m)-BNC(f) Adapter	Agilent P/N 1250-1476, 5 or 6 ea
N(f)-BNC(f) Adapter	Agilent P/N 1250-1474
BNC(m)-BNC(m) Cable, 61 cm	Agilent P/N 8120-1839, 4 ea

Procedure

1. Run the Adjustments Program.
2. Choose the Receiver Calibration.
3. Following the Adjustments Program instructions, connect the equipment as shown in Figure 4-7, Figure 4-8, and Figure 4-9. The setup will depend on the E5100A/B's options.

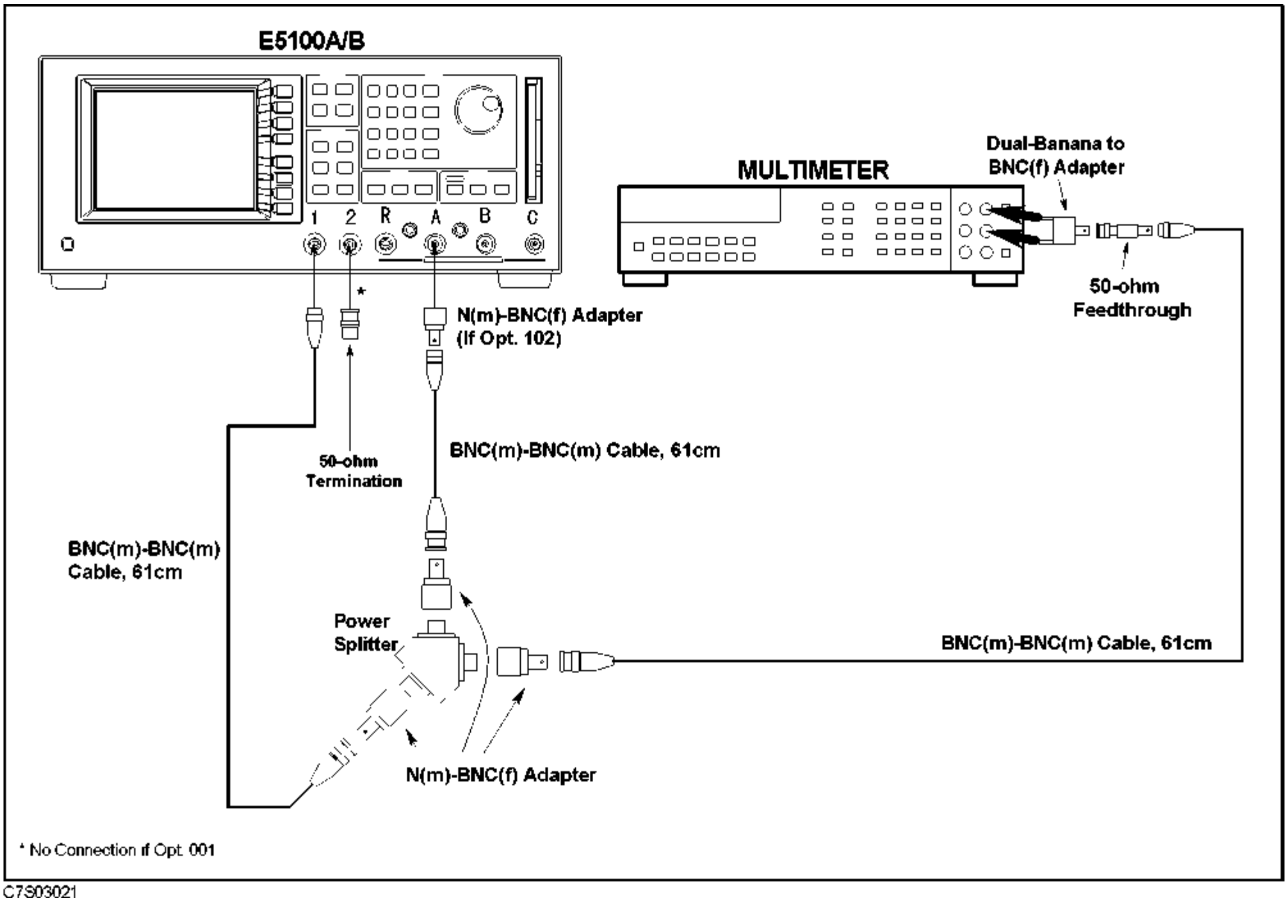


Figure 4-7. Receiver Calibration Setup 1

Note The two BNC(m)-BNC(m) cables from the power splitter to the E5100A/B Input-A and the multimeter must have the same length.

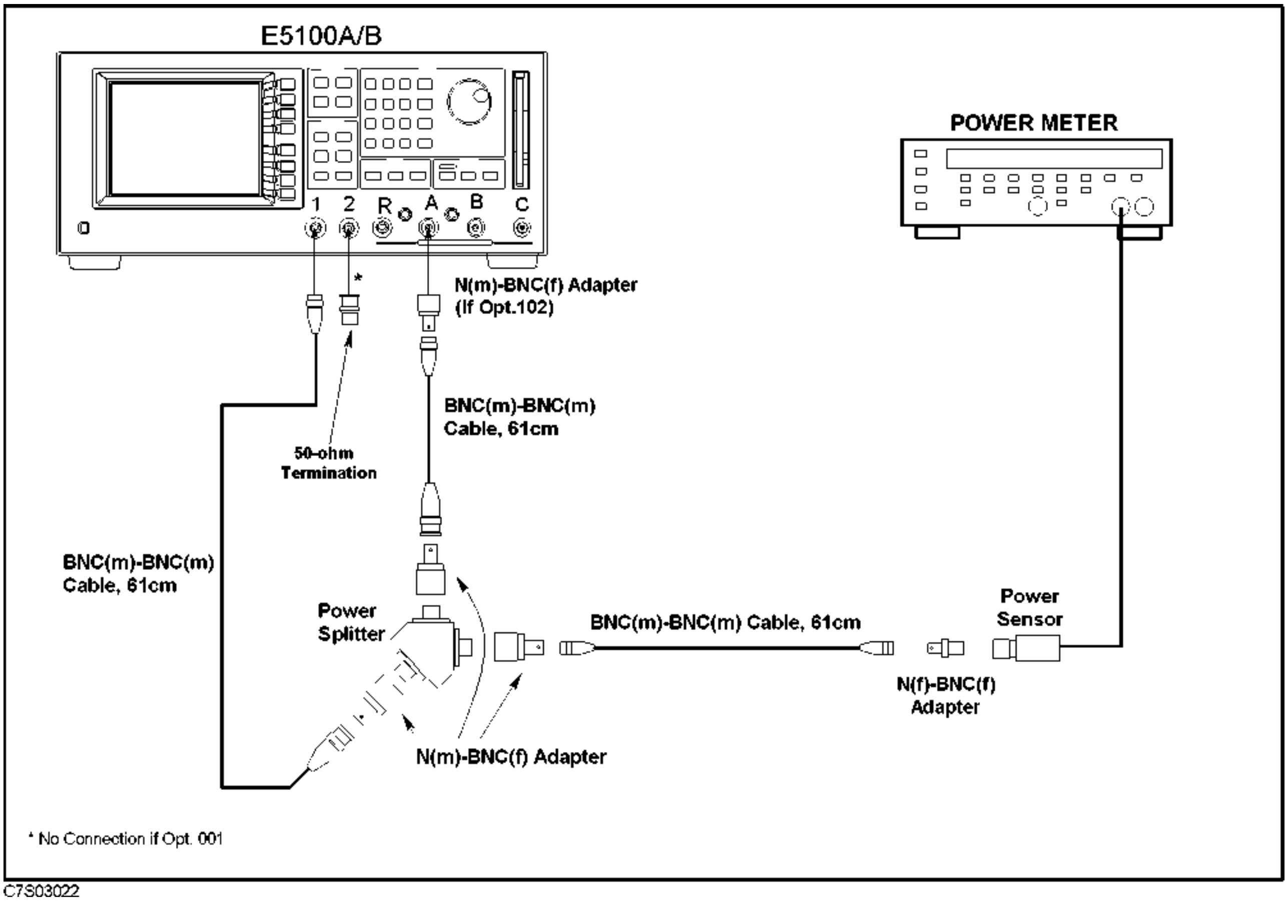


Figure 4-8. Receiver Calibration Setup 2

Note The two BNC(m)-BNC(m) cables from the power splitter to the E5100A/B Input-A and the power sensor must have the same length.

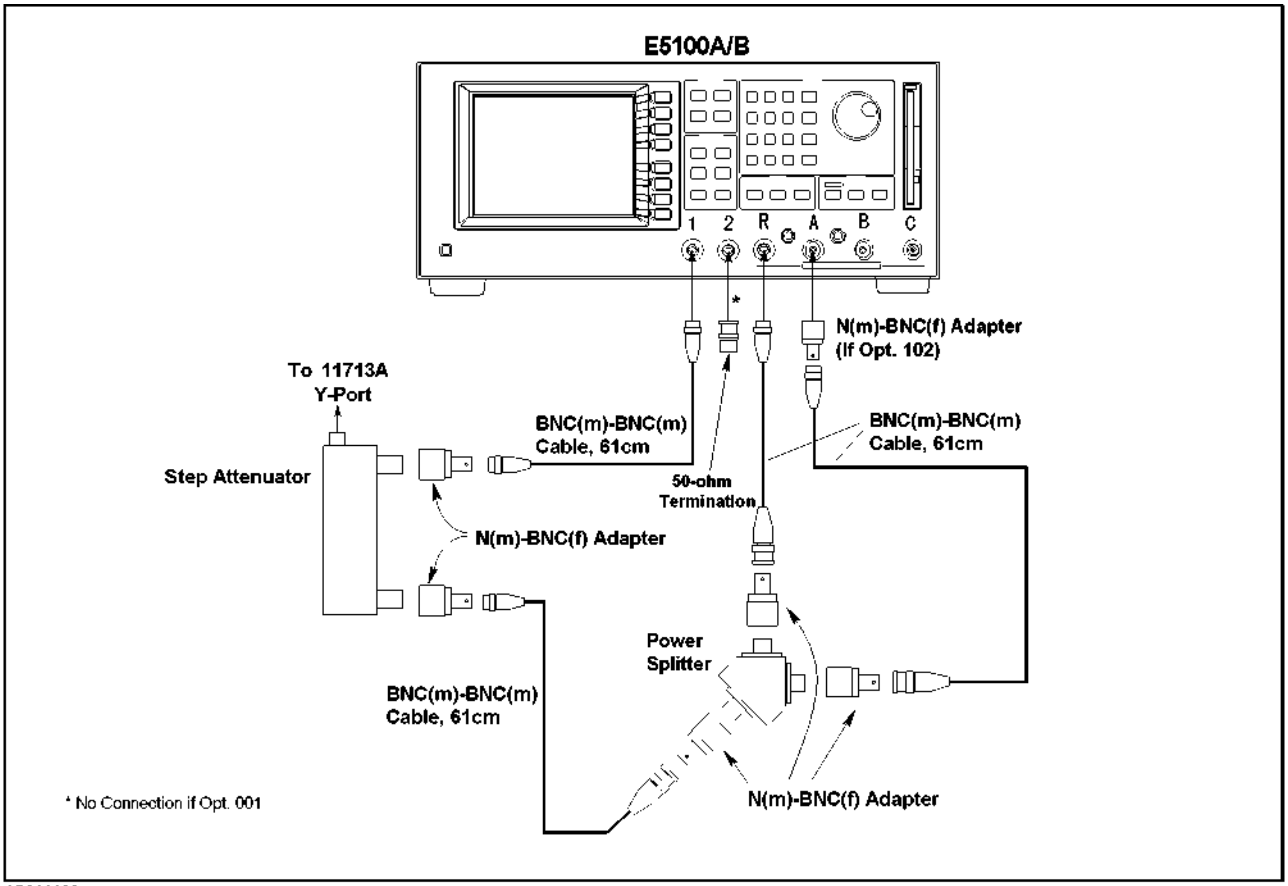


Figure 4-9. Receiver Calibration Setup 3

5

Troubleshooting

Introduction

This chapter describes overall troubleshooting summary and provides the procedure to determine whether the analyzer is faulty, or not. The procedure is performed first in the troubleshooting of this manual.

Troubleshooting Summary

The troubleshooting strategy of this manual is based on a verification (rather than symptomatic) approach. This chapter's first step is to verify the operation of the analyzer alone, independent of accessories or system peripherals. Accessories are devices like test sets, power probes, power splitters, cables, and calibration kits. Peripherals are devices like computers, printers, and keyboards, for instance, and which typically use an GPIB connection and a line connection. This chapter also suggests remedies for system problems external to the analyzer.

This chapter identifies one or some faulty groups in the analyzer's five functional groups. Then refers the technician to the appropriate chapter. The five functional groups are power supply, digital control, source, receiver, and accessories. Descriptions of these groups are provided in the *Theory of Operation* chapter.

Isolate Faulty Group Troubleshooting , the next chapter, assumes that the fault is within one of two functional groups: source, receiver. *Isolate Faulty Group Troubleshooting* identifies the faulty group and refers the technician to the appropriate chapter. These first chapters, *Troubleshooting* and *Isolate Faulty Group Troubleshooting*, stress simple, straight forward procedures.

Figure 5-1 diagrams the troubleshooting organization.

Each of the five chapters following *Isolate Faulty Group Troubleshooting* verifies, one at a time, the assemblies within a group until the faulty assembly is identified. These five chapters employ more lengthy, complicated procedures.

Post-Repair Procedures, is the last chapter of the troubleshooting portion of the manual. *Post-Repair Procedures* is organized by assembly and notes what adjustment to perform and how to verify proper instrument operation following the replacement of an assembly.

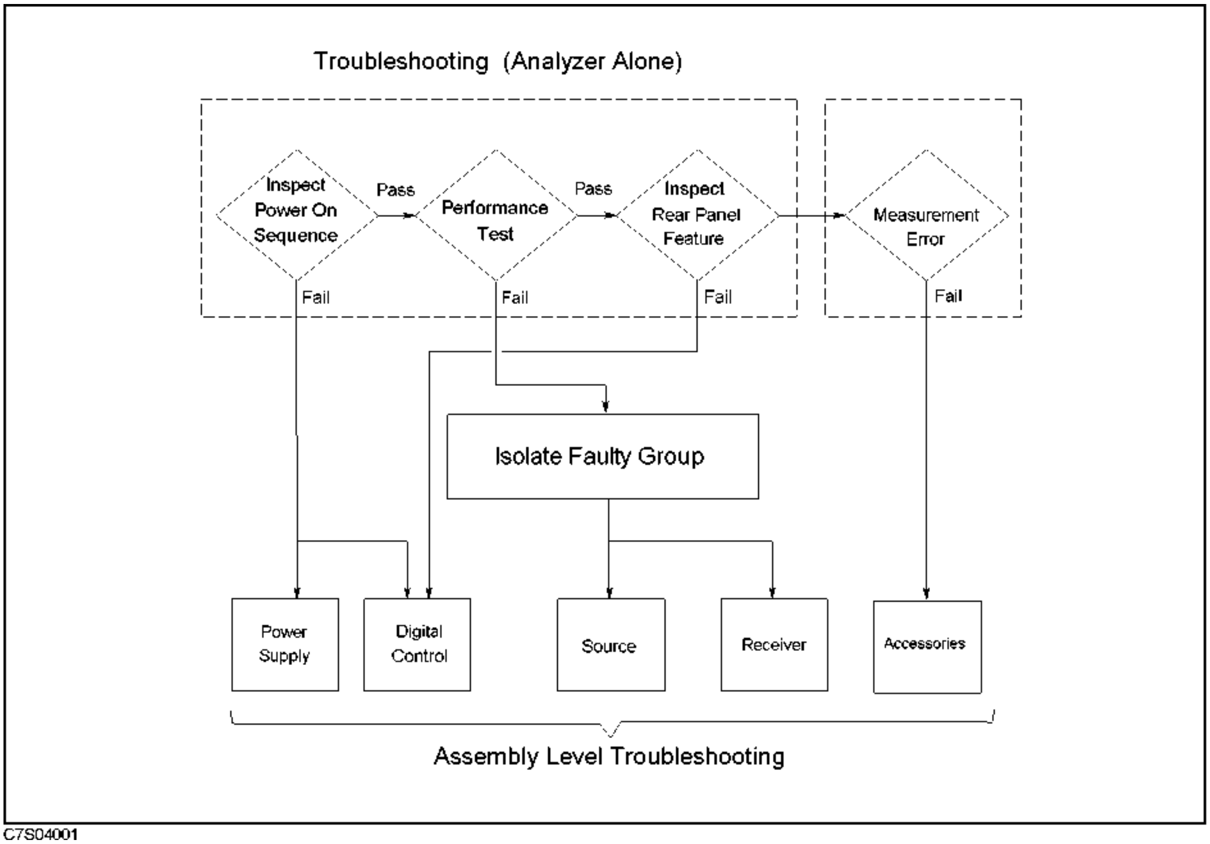


Figure 5-1. Troubleshooting Organization

Start Here

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

1. Disconnect everything from the analyzer: All test set interconnect, GPIB cable, probe power, and RF cables.
2. Perform the *Inspect the Power On Sequence* in this chapter.
3. Perform the *Inspect the Performance Test Result* in this chapter.
4. Perform the *Inspect the Rear Panel Feature* in this chapter.

If the analyzer has passed all of the checks in steps 2 through 4 but it still making incorrect measurements or unexpected operations, suspect the accessories. Accessories such as RF or interconnect cables, calibration and verification kit devices, test set can all induce system problems.

Configure the system as it is normally used and reconfirm the problem. Continue with the *Accessories Troubleshooting* chapter.

Inspect the Power On Sequence

Check the Fan

Turn the analyzer power on. Inspect the fan on the rear panel.

- The fan should be rotating and audible.

If case of unexpected results, check AC line power to the analyzer. Check the fuse (rating listed on the rear panel). If the problem persists, continue with the *Power Supply Troubleshooting* chapter.

Check the Front Displays

Turn on the analyzer and watch for the following events in this order:

1. Beep is sounding.
2. The analyzer displays Internal Test In Progress for several seconds.
3. The analyzer displays the graticule.

If case of unexpected results, continue with *Digital Control Troubleshooting* chapter.

Check Error Message

Turn the analyzer power on. Inspect the LCD. No error message should be displayed.

If one of the error message or a status annotation listed below appears on the LCD, continue with the *Digital Control Troubleshooting* chapter.

- `Self-test failed`
- `!` (Status annotation)

These error messages indicate that one of power-on self tests fails. If an other error message appears, refer to the *Error Messages* in Messages.

If the response of front panel, GPIB commands, or built-in FDD is unexpected, continue with the *Digital Control Troubleshooting* chapter.

Inspect the Performance Test Result

When you want to test the individual analyzer specifications, perform the performance test in accordance with the *Performance Test* . If one or some of the performance tests fail, continue with the *Isolate Faulty Group Troubleshooting* chapter.

Inspect the Rear Panel Feature

If the analyzer is operating unexpectedly after these checks are verified, continue with *Digital Control Troubleshooting* chapter.

Check the GPIB Interface

If the unexpected operations appear when controlling the analyzer 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, 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.

Check the Parallel Interface

Connect an external printer to the analyzer's parallel interface and make a hardcopy of the display.

Check the mini DIN Keyboard Connector

See the Connecting a Keyboard at the Chapter 3, Installation and Setup Guide of E5100A/B User's Guide.

6

Isolate Faulty Group Troubleshooting

Introduction

Use these procedures after you have read the *Troubleshooting* chapter. This chapter provides the *Performance Test Failure Troubleshooting*.

This procedure is to determine which group is faulty in the two functional groups: source, and receiver. Descriptions of these groups are provided in the *Theory of Operation* chapter.

Use the *Performance Test Failure Troubleshooting* when any of the performance tests fail. This procedure isolates the most probable faulty group.

Performance Tests Failure Troubleshooting

Perform the following procedure sequentially when any of performance tests fail.

Perform Adjustments

Table 6-1 gives the recommended adjustments when a performance test fails.

If a performance test fails, you should perform the corresponding adjustments function as shown in Table 6-1. If the tests still fail, see Table 6-2. In a few cases, other adjustments may bring the tests into specification. The following table lists some typical cases.

Table 6-1. Recommended Adjustments

Performance Test	VCXO Freq. Calibration and Source Correction	IF Attenuator Correction and Receiver Calibration
Frequency Accuracy	√	
Harmonics	√	
Non-Harmonic Spurious	√	
Phase Noise	√	
Source Level Accuracy/Flatness.	√	
Source Power Linearity	√	
Receiver Noise Level	√	√
Trace Noise	√	√
Residual Response		√
Input Crosstalk	√	√
Absolute Amplitude Accuracy		√
Dynamic Accuracy		√
Magnitude Ratio Frequency Response		√
Phase Frequency Response		√

Troubleshoot Suspicious Functional Group

Table 6-2 lists the functional groups to suspect first when a performance test fails. If a 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 6-2. Functional Group to Suspect When a Performance Test Fails

Test	Source	Receiver
Frequency Accuracy	√	
Harmonics	√	
Non-Harmonic Spurious	√	
Phase Noise	√	
Source Level Accuracy/Flatness.	√	
Source Power Linearity	√	
Receiver Noise Level	√	√
Trace Noise	√	√
Residual Response		√
Input Crosstalk	√	√
Absolute Amplitude Accuracy		√
Dynamic Accuracy		√
Magnitude Ratio Frequency Response		√
Phase Frequency Response		√

7

Power Supply Troubleshooting

Introduction

Use this procedure only if you have read *Troubleshooting*, and you believe the problem is in the power supply. The procedure is designed to let you identify the bad assembly within the power supply functional group in the shortest possible time.

The power supply functional group consists of:

- Power Supply 130W (Agilent P/N E5100-65002)
- Power Supply 30W (Agilent P/N 0950-2919)

Those assemblies, however, are related to the power supply functional group because power is supplied to each assembly.

If an assembly is replaced, see the *Post Repair Procedures* chapter in this manual. It tells what additional tests or adjustments need to be done after replacing any assembly.

Start Here

Check the Power On Sequence

Turn the analyzer power on. If the LCD display is turned on for a couple of seconds and then turned off, continue with the next *Troubleshoot the Fan*.

Troubleshoot the Fan

Perform the following procedure to troubleshoot the fan.

Troubleshoot the Fan

a. Turn the analyzer power off.

b. Disassemble the rear panel.

c. Remove the fan power cable from the Motherboard A20J20.

d. Connect a DC power supply, a 10 kΩ resistance, and a oscilloscope to the fan power cable using appropriate wires.

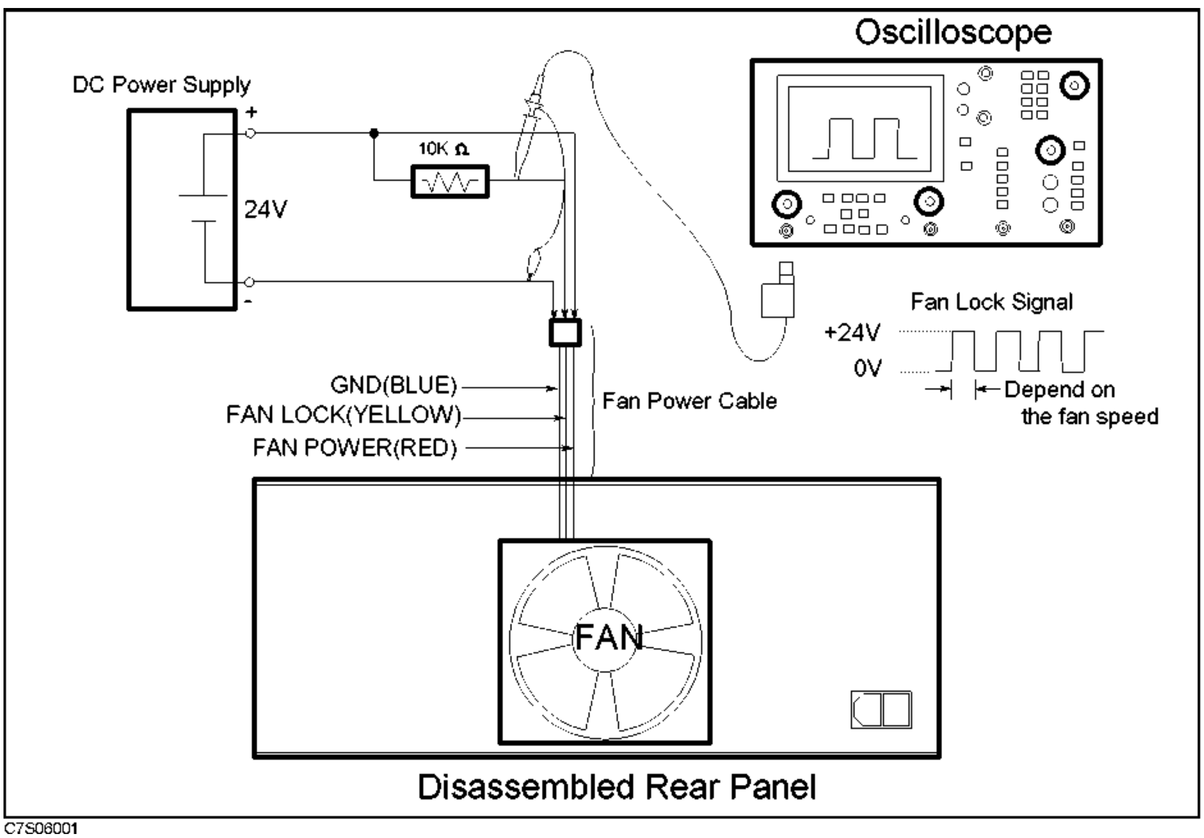


Figure 7-1. Fan Troubleshooting Setup

e. Turn the DC power supply on. Adjust the output voltage to +24 V.

f. Check the fan is rotating. Check the FAN LOCK signal is as shown in Figure 7-1.

- If the fan is not rotating or the FAN LOCK signal is unexpected, replace the fan.
- If these are good, the fan is verified.
- Reconnect the fan power cable to the Motherboard A20J20.

Troubleshoot the Power Supplies

Use this procedure when the fan is not rotating and the LCD display is never turned on in the power on sequence.

Measure the Output Voltages of Power Supplies

a. Turn the analyzer power off.

b. Remove the outer cover of the E5100A/B.

c. Turn the analyzer power on.

d. Measure the output voltages at the A20J16, A20J17, and A20J18 pins using a voltmeter with a small probe.

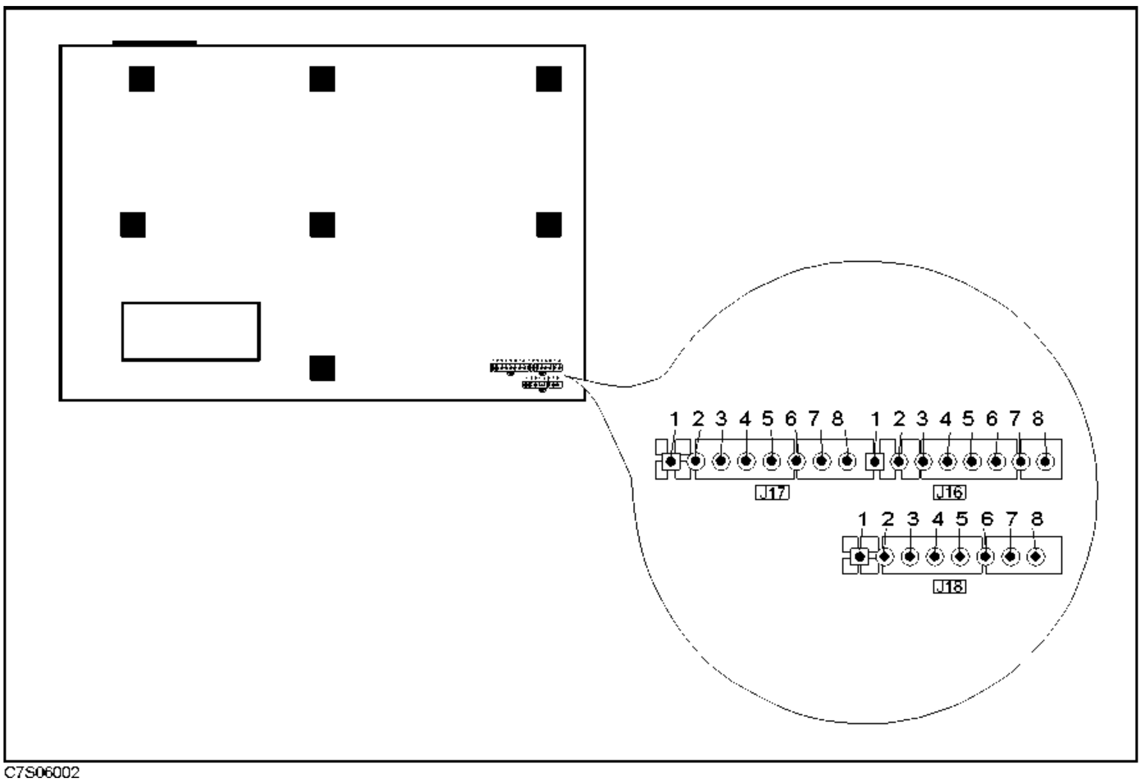


Figure 7-2. Power Supply Output Pins on A20 Mother Board

Table 7-1. Power Supply Output Voltages on A20 Mother Board

Power Supply	Connector Pin[1]	Output Voltage	Range
PS 130W	A20J16 Pin 4,5,6	+5 V	+4.5 V to +5.5 V
	A20J16 Pin 8	+5 V[2]	+4.5 V to +5.5 V
	A20J16 Pin 1,2,3,7	GND	
	A20J17 Pin 3,4	+24 V	+21.6 V to +26.4 V
	A20J17 Pin 5	−15 V	−13.5 V to −16.5 V
	A20J17 Pin 7	+15 V	+13.5 V to +16.5 V
	A20J17 Pin 1,2,6	GND	
PS 30W	A20J18 Pin 3,4	+5 V	+4.5 V to +5.5 V
	A20J18 Pin 5	−12 V	−10.8 V to −13.2 V
	A20J18 Pin 1,2,6	+12 V	+10.8 V to +13.2 V

1 Pin numbers are assigned from upper left on the A20 Motherboard.

2 Remote on/off switching voltage from A41 board. (for auto shut down)

e. Check (and replace) an assembly in accordance with Table 7-2.

Table 7-2. Output Voltage Test Result and Replacement Assembly

PS 130W Output	PS 30W Output	Check (Replace):
PASS	FAIL	PS 30W
FAIL	PASS	A41 Board or PS 130W
FAIL	FAIL	Cables from AC line to power supplies

8

Digital Control Troubleshooting

Introduction

Use this procedure only if you have followed the procedures in the *Troubleshooting* chapter, and believe the problem to be in the digital control group. This procedure is designed to let you identify the bad assembly within the digital control group in the shortest possible time. Whenever an assembly is replaced in this procedure, refer to the *Post-Repair Procedures* chapter in this manual.

The following assemblies make up the digital control group:

- A1 CPU
- A2 Peripheral
- A3 DSP
- A40 Front Keyboard
- A41 Rear Board
- A42 Rear Board
- A43/44/45/46 I/O Port
- LCD Display Assembly
- FDD

A1 CPU Replacement

When you replace a faulty A1 CPU with a new one, remove the flash memories from the faulty A1 and mount the flash memories on the replacement A1. (See the *Board Configuration* chapter)

In the flash memories, the correction constants data is stored after performing the adjustment procedures described in the chapter 3. The data may be valid for the new A1 CPU.

Firmware Installation

No firmware is installed in new A1 CPU assembly. When you replace a faulty A1 CPU with a new one, install a new firmware into the A1 CPU.

Before you start replacing a faulty A1 CPU with a new one, you must know the E5100A/B's hardware configuration because required firmware depends on it.

Note *You must choose a correct firmware disk for the E5100A/B. To install an incorrect firmware may cause a serious damage to the instrument.*

1. Choosing and Ordering a Required Firmware Disk

Table 8-1 is a summary of the E5100A/B's hardware configuration and required firmware disk.

Table 8-1.
E5100A/B Hardware Configuration and Required Firmware Disk

Hardware Configuration				Required Firmware Disk	
Currently Installed Firmware Revision	**Opt.509 Installed?**	**Max. Number of Sweep Points**	**LCD Display Type**	**Agilent Part Number**	**Description**
≤2.xx	Yes	(any)	Monochrome	E5100-180xx[1]	F/W #509 Rev.2.xx
≤2.xx	No	801 or 401	Monochrome	E5100-181xx[1]	F/W 1BW Rev.2.xx
≤2.xx	No	401	Color	E5100-182xx[1]	F/W 1CL Rev.2.xx
≤2.xx	No	1601	Monochrome	E5100-183xx[1]	F/W 2BW Rev.2.xx
≤2.xx	No	1601	Color	E5100-184xx[1]	F/W 2CL Rev.2.xx
3.xx	(any)	(any)	Color	E5100-185xx[1]	F/W Rev.3.xx

1 "xx" should be the latest number to obtain the latest firmware.

Use the following procedures to make sure each hardware configuration.

Checking if Option 509 is installed

- Turn the analyzer power on. If there is no information on the LCD display except for `***** Welcome *****` message, it must have Option 509.
- Check the front and rear panel. If the analyzer has OPTION 509 label, it must have Option 509.

Checking the Currently Installed Firmware Revision

- Diplay the firmware information as follows:
  - Press (System) `MORE` `SERVICE MENU` `FIRMWARE REVISION`. The revision number of currently installed firmware of the analyzer appears on the display.
  - Or, turn the analyzer power off and on. Display message at the end of power on sequence includes the firmware revision information.

  Those are the most credible ways to know the firmware revision of the analyzer.
- The firmware revision can also be checked on the revision label attached on the rear panel as shown in Figure 8-1.

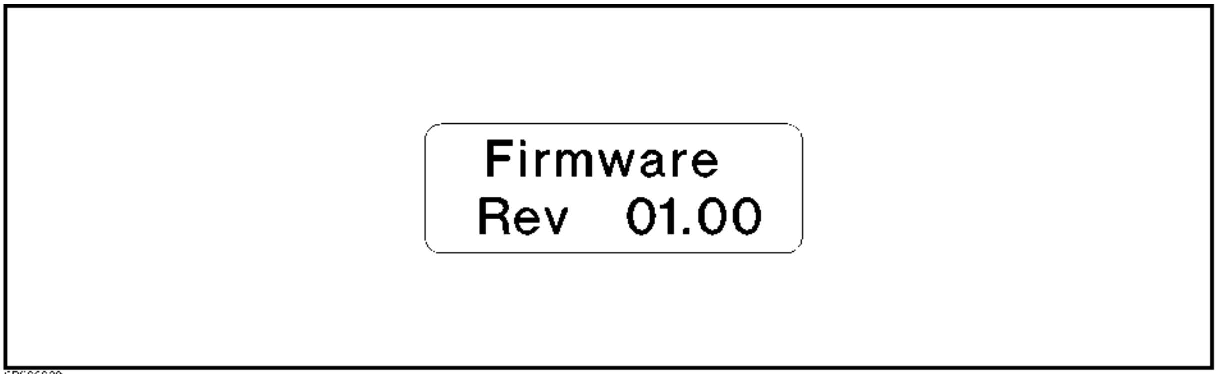


Figure 8-1. Firmware Revision Label

Checking Maximum Number of Sweep Points

1. Turn the E5100A/B ON.
2. Press (Sweep) `Number of POINTs` (1601) `×1`.
   - If the number of points is set to 1601, the maximum number of points of the E5100A/B is 1601.
   - If the number of points is set to 801, the maximum number of points of the E5100A/B is 801.
   - If the number of points is set to 401, the maximum number of points of the E5100A/B is 401.

Note

- If it is difficult to read the maximum number of points on the LCD display due to overlayed traces, try to change the display format using (Meas/Format) `Format` and followed softkeys to change the trace position.
- The E5100A must have 1601 or 801 maximum number of sweep points. The E5100B must have 401 maximum number of sweep points.

  If it is impossible to know that an E5100A has 1601 or 801 maximum number of sweep points due to some trouble, check the Agilent part number of the installed A3 DSP. If A3 part number for an E5100A is E5100-66593, the E5100A must have 1601 maximum number of sweep points as long as the original board (Agilent P/N E5100-66513) has not been replaced with a new board (Agilent P/N E5100-66593) before; if A3 part number for an E5100A is E5100-66513, the E5100A must have 801 maximum number of sweep points.

Checking the LCD Display Type

- Usually, the LCD display type (color or monochrome) can be checked by turning the analyzer power on.
- If it is impossible to know the LCD display type due to some LCD display trouble, check the Agilent part number of installed A2 Peripheral. If the A2 part number is E5100-66502, the LCD type must be monochrome; if the A2 part number is E5000-66502, the LCD type must be color.

2. Installing the Firmware

1. Turn the E5100A/B power off.
2. While pressing both (Preset) and (0) keys at the same time, turn the E5100A/B power on.
3. Wait until the bootloader menu (FIRMWARE UPDATE and other softkeys) appears on the display.
4. Press FIRMWARE UPDATE.
5. Insert the correct firmware disk into the floppy disk drive of the E5100A/B.
6. Press OK.
7. Press EXECUTE UPDATE.
8. Press OK to start the firmware update.
9. Wait until the E5100A/B automatically executes preset operation.
10. Verify that no error message is displayed and that the revision displayed is that of the revision label.
    - In case of unexpected results, inspect the firmware diskette for any damage. Clean the built-in FDD and retry the procedure.

Start Here

1. Check the Power On Sequence

See the *Inspect the Power On Sequence* in the chapter 4 for checking the Power On Sequence.

Check the A1 LEDs (DS1, DS2, and DS3)

There are twelve LEDs (4 × 3) on the A1 CPU. These LEDs should be in the pattern shown in Table 8-2 and Table 8-3 at the end of the power on sequence. Perform the following procedure to check the A1 twelve LEDs.

a. Turn the analyzer off.

b. Remove the outer cover of the analyzer.

c. Turn the analyzer power on.

d. Look at the A1 LEDs DS1, DS2, and DS3. Some of the LEDs light during the power on sequence. At the end of the power on sequence, the LEDs should stay in the pattern shown in Table 8-2 and Table 8-3.

- If the DS1 +5V LED is OFF, check the +5 V power supply from PS 130W assembly. (See the *Power Supply Troubleshooting* chapter.)
- If the DS1 +5V LED is good but the other DS1, DS2, and DS3 LEDs stay in the other pattern, the A1 CPU is probably faulty. Replace the A1 CPU. (DS2 and DS3 LED status shows the results of Boot ROM Checksum Test and DRAM Address Test.)

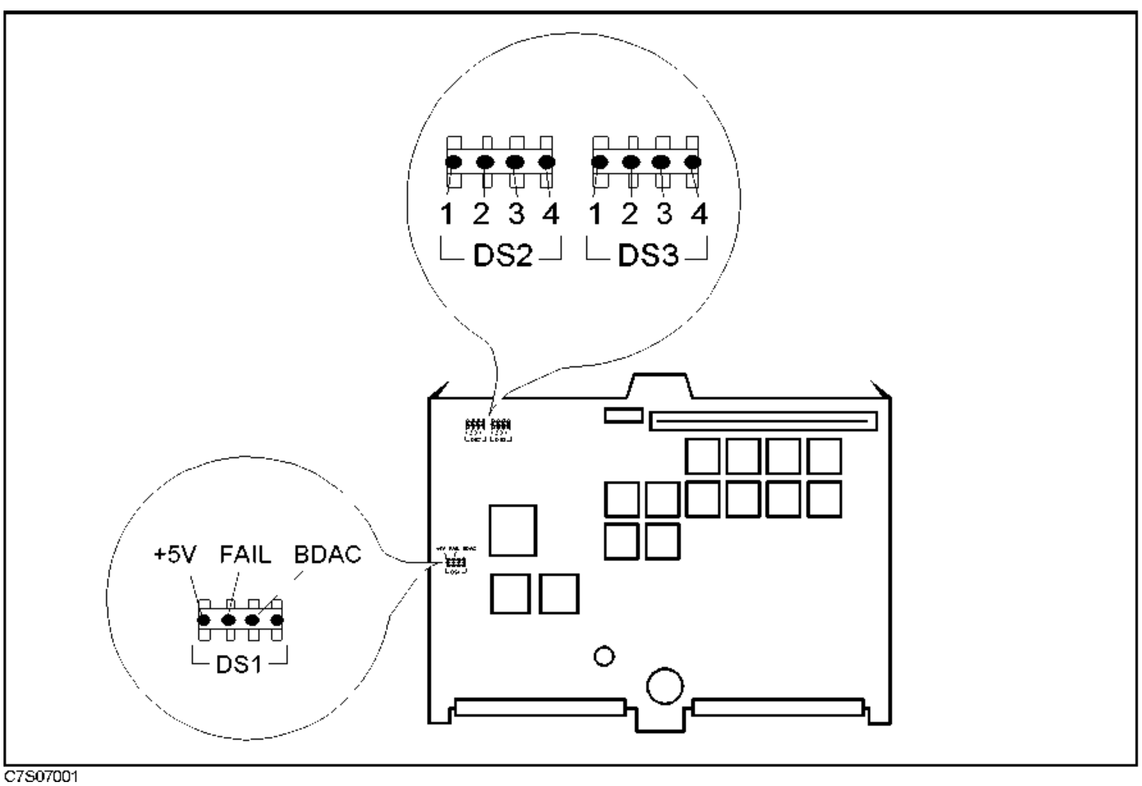


Figure 8-2. A1 CPU LED Location

Table 8-2. A1 LEDs (DS1) Status

A1 LEDs	From Upper Left			
	+5V	**FAIL**	**BDAC**	**-**
DS1	ON	OFF	OFF	-

Table 8-3. A1 LEDs (DS2 and DS3) Status

A1 LEDs	From Upper Left			
	1	**2**	**3**	**4**
DS2	OFF	OFF	OFF	OFF
DS3	OFF	OFF	OFF	OFF

2. Check Error Messages

Turn the analyzer power on. Check no error message appears on the LCD.

- If no error message is displayed, continue with the *Check the A1 ICs* in this *Start Here*.
- If one of error messages listed below is displayed, follow the instruction described below. For the other message, see the *Error Messages* in Messages.

Error Messages	Instruction
(-330) Self-test failed, No.xx	This indicates the power on selftest failed. Continue with the next *Check Power On Selftest*.
(157) BACKUP DATA LOST, xxxxxx	This indicates that the correction constants stored in the flash memories on the A1 CPU are invalid or the flash memories are faulty. Rewrite all correction constants into the flash memories. For the detailed procedure, See the *Adjustments* chapter in this manual. If the rewriting is not successfully performed, replace the flash memories and then rewrite the all correction constants into the new flash memories.
! (Status Annotation)	This indicates that the correction constants stored in the flash memories on the A1 CPU are invalid or the flash memories are faulty.

Check the Internal Tests

The analyzer performs the power on selftest every time when the analyzer is turned on. In the power on selftest, internal diagnostic tests 13 through 23,26, 27, 30 through 83, 85 through87, 89, 96, and 98 are executed sequentially. The failed test indicates the most probable faulty assembly. For more information about the internal tests, see the *Service Menu Keys* chapter in this manual.

If the power on selftest fails and "(-330) Self-test failed, No.xx" message is displayed, execute each single internal test in order of the test numbers to identify the failed test. Then refer to the Table 8-4 for further troubleshooting information.

a. Press (Preset) (System) MORE SERVICE MENU INTERNAL TESTS (13) ×1 to access the internal test 13 (A27 ID).

b. Press EXECUTE TEST to execute the internal test 13.

c. Wait until the test result, "PASS" or "(-330) Self-test failed, No.13" is displayed.

d. If (-330) Self-test failed, No.xx is displayed, note down the self test number.

e. Enter the next internal test number using ten keys, and press ×1 EXECUTE TEST.

f. Repeat steps d and e until you complete the last internal test (No. 98).

Table 8-4.
Troubleshooting Information for Internal Diagnostic Test Failure

Test No.	Failed Test	Troubleshooting Information
13	A27 ID	Check the A27 Synthesizer is correctly installed.
14	A24 ID	Check the A24 Source is correctly installed.
15	A25 ID	Check the A25 RF Amplifier (Opt.010) is correctly installed.
16	A26 ID	Check the A26R/A/B/C Receivers are correctly installed.
17	A28/29/50 Source Port ID	Check the A28 Source Switch (Opt.003), A29 50/1M Ω Switch (Opt.101/301), A50 High Stability Oscillator (Opt.1D5) are correctly installed. (See *Board Configuration*)
21	A24 DCBUS +11.6V	Voltage test fails at +11.6V internal dc bus node of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source.See the *Source Group Troubleshooting* chapter.
22	A24 DCBUS +5VA	Voltage test fails at +5V internal dc bus node of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
23	A24 DCBUS −9V	Voltage test fails at −9V internal dc bus node of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
24	A24 DCBUS VNR VOLT1	Voltage test fails at internal dc bus node (VNR VOLT1) of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
25	A24 DCBUS VNR VOLT2	Voltage test fails at internal dc bus node (VNR VOLT2) of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
26	A24 DCBUS VNR VOLT3	Voltage test fails at internal dc bus node (VNR VOLT3) of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
27	A24 DCBUS CONST VOLT	Voltage test fails at internal dc bus node (CONST VOLT) of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
28	A24 DCBUS DAC VOLT1	Voltage test fails at internal dc bus node (DAC VOLT1) of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.

Table 8-4. Troubleshooting Information for Internal Diagnostic Test Failure (continued)

Test No.	Failed Test	Troubleshooting Information
29	A24 DCBUS DAC VOLT2	Voltage test fails at internal dc bus node (DAC VOLT2) of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
30	A24 DCBUS DAC VOLT3	Voltage test fails at internal dc bus node (DAC VOLT3) of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
31	A24 DCBUS 1ST LOCAL	Voltage test fails at internal dc bus node (1ST LOCAL) of the A24 Source. The A24 Source is a probable faulty board. Replace the A24 Source. See the *Source Group Troubleshooting* chapter.
32	A25 DCBUS +15V	Voltage test fails at +15V internal dc bus node of the A25 RF Amplifier (Opt.010). The A25 RF Amplifier is a probable faulty board. Replace the A25 RF Amplifier. See the *Source Group Troubleshooting* chapter.
41	A26A DCBUS +12VA	Voltage test fails at +12V internal dc bus node (+12VA) of the A26A Receiver. The A26A Receiver is a probable faulty board. Replace the A26A Receiver. See the *Receiver Group Troubleshooting* chapter.
42	A26A DCBUS +12VB	Voltage test fails at +12V internal dc bus node (+12VB) of the A26A Receiver. The A26A Receiver is a probable faulty board. Replace the A26A Receiver. See the *Receiver Group Troubleshooting* chapter.
43	A26A DCBUS +5VA	Voltage test fails at +5V internal dc bus node (+5VA) of the A26A Receiver. The A26A Receiver is a probable faulty board. Replace the A26A Receiver. See the *Receiver Group Troubleshooting* chapter.
44	A26A DCBUS +5VB	Voltage test fails at +5V internal dc bus node (+5VB) of the A26A Receiver. The A26A Receiver is a probable faulty board. Replace the A26A Receiver. See the *Receiver Group Troubleshooting* chapter.
45	A26A DCBUS −5V	Voltage test fails at −5V internal dc bus node of the A26A Receiver. The A26A Receiver is a probable faulty board. Replace the A26A Receiver. See the *Receiver Group Troubleshooting* chapter.

Table 8-4. Troubleshooting Information for Internal Diagnostic Test Failure (continued)

Test No.	Failed Test	Troubleshooting Information
46	A26A DCBUS −12VA	Voltage test fails at −12V internal dc bus node (−12VA) of the A26A Receiver. The A26A Receiver is a probable faulty board. Replace the A26A Receiver. See the *Receiver Group Troubleshooting* chapter.
47	A26A DCBUS −12VB	Voltage test fails at −12V internal dc bus node (−12VB) of the A26A Receiver. The A26A Receiver is a probable faulty board. Replace the A26A Receiver. See the *Receiver Group Troubleshooting* chapter.
48	A26A DCBUS ADC REF VOLT	Voltage test fails at internal dc bus node (ADC REF VOLT) of the A26A Receiver. The A26A Receiver is a probable faulty board. Replace the A26A Receiver. See the *Receiver Group Troubleshooting* chapter.
51	A26R DCBUS +12VA	Voltage test fails at +12V internal dc bus node (+12VA) of the A26R Receiver. The A26R Receiver is a probable faulty board. Replace the A26R Receiver. See the *Receiver Group Troubleshooting* chapter.
52	A26R DCBUS +12VB	Voltage test fails at +12V internal dc bus node (+12VB) of the A26R Receiver. The A26R Receiver is a probable faulty board. Replace the A26R Receiver. See the *Receiver Group Troubleshooting* chapter.
53	A26R DCBUS +5VA	Voltage test fails at +5V internal dc bus node (+5VA) of the A26R Receiver. The A26R Receiver is a probable faulty board. Replace the A26R Receiver. See the *Receiver Group Troubleshooting* chapter.
54	A26R DCBUS +5VB	Voltage test fails at +5V internal dc bus node (+5VB) of the A26R Receiver. The A26R Receiver is a probable faulty board. Replace the A26R Receiver. See the *Receiver Group Troubleshooting* chapter.
55	A26R DCBUS −5V	Voltage test fails at −5V internal dc bus node of the A26R Receiver. The A26R Receiver is a probable faulty board. Replace the A26R Receiver. See the *Receiver Group Troubleshooting* chapter.
56	A26R DCBUS −12VA	Voltage test fails at −12V internal dc bus node (−12VA) of the A26R Receiver. The A26R Receiver is a probable faulty board. Replace the A26R Receiver. See the *Receiver Group Troubleshooting* chapter.

Table 8-4. Troubleshooting Information for Internal Diagnostic Test Failure (continued)

Test No.	Failed Test	Troubleshooting Information
57	A26R DCBUS −12VB	Voltage test fails at the −12V internal dc bus node (−12VB) of the A26R Receiver. The A26R Receiver is a probable faulty board. Replace the A26R Receiver. See the *Receiver Group Troubleshooting* chapter.
58	A26R DCBUS ADC REF VOLT	Voltage test fails at the internal dc bus node (ADC REF VOLT) of the A26R Receiver. The A26R Receiver is a probable faulty board. Replace the A26R Receiver. See the *Receiver Group Troubleshooting* chapter.
61	A26B DCBUS +12VA	Voltage test fails at the +12V internal dc bus node (+12VA) of the A26B Receiver. The A26B Receiver is a probable faulty board. Replace the A26B Receiver. See the *Receiver Group Troubleshooting* chapter.
62	A26B DCBUS +12VB	Voltage test fails at the +12V internal dc bus node (+12VB) of the A26B Receiver. The A26B Receiver is a probable faulty board. Replace the A26B Receiver. See the *Receiver Group Troubleshooting* chapter.
63	A26B DCBUS +5VA	Voltage test fails at the +5V internal dc bus node (+5VA) of the A26B Receiver. The A26B Receiver is a probable faulty board. Replace the A26B Receiver. See the *Receiver Group Troubleshooting* chapter.
64	A26B DCBUS +5VB	Voltage test fails at the +5V internal dc bus node (+5VB) of the A26B Receiver. The A26B Receiver is a probable faulty board. Replace the A26B Receiver. See the *Receiver Group Troubleshooting* chapter.
65	A26B DCBUS −5V	Voltage test fails at the −5V internal dc bus node of the A26B Receiver. The A26B Receiver is a probable faulty board. Replace the A26B Receiver. See the *Receiver Group Troubleshooting* chapter.
66	A26B DCBUS −12VA	Voltage test fails at the −12V internal dc bus node (−12VA) of the A26B Receiver. The A26B Receiver is a probable faulty board. Replace the A26B Receiver. See the *Receiver Group Troubleshooting* chapter.
67	A26B DCBUS −12VB	Voltage test fails at the −12V internal dc bus node (−12VB) of the A26B Receiver. The A26B Receiver is a probable faulty board. Replace the A26B Receiver. See the *Receiver Group Troubleshooting* chapter.

Table 8-4.
Troubleshooting Information for Internal Diagnostic Test Failure (continued)

Test No.	Failed Test	Troubleshooting Information
68	A26B DCBUS ADC REF VOLT	Voltage test fails at the internal dc bus node (ADC REF VOLT) of the A26B Receiver. The A26B Receiver is a probable faulty board. Replace the A26B Receiver. See the *Receiver Group Troubleshooting* chapter.
71	A26C DCBUS +12VA	Voltage test fails at the +12V internal dc bus node (+12VA) of the A26C Receiver. The A26C Receiver is a probable faulty board. Replace the A26C Receiver. See the *Receiver Group Troubleshooting* chapter.
72	A26C DCBUS +12VB	Voltage test fails at the +12V internal dc bus node (+12VB) of the A26C Receiver. The A26C Receiver is a probable faulty board. Replace the A26C Receiver. See the *Receiver Group Troubleshooting* chapter.
73	A26C DCBUS +5VA	Voltage test fails at the +5V internal dc bus node (+5VA) of the A26C Receiver. The A26C Receiver is a probable faulty board. Replace the A26C Receiver. See the *Receiver Group Troubleshooting* chapter.
74	A26C DCBUS +5VB	Voltage test fails at the +5V internal dc bus node (+5VB) of the A26C Receiver. The A26C Receiver is a probable faulty board. Replace the A26C Receiver. See the *Receiver Group Troubleshooting* chapter.
75	A26C DCBUS −5V	Voltage test fails at the −5V internal dc bus node of the A26C Receiver. The A26C Receiver is a probable faulty board. Replace the A26C Receiver. See the *Receiver Group Troubleshooting* chapter.
76	A26C DCBUS −12VA	Voltage test fails at the −12V internal dc bus node (−12VA) of the A26C Receiver. The A26C Receiver is a probable faulty board. Replace the A26C Receiver. See the *Receiver Group Troubleshooting* chapter.
77	A26C DCBUS −12VB	Voltage test fails at the −12V internal dc bus node (−12VB) of the A26C Receiver. The A26C Receiver is a probable faulty board. Replace the A26C Receiver. See the *Receiver Group Troubleshooting* chapter.
78	A26C DCBUS ADC REF VOLT	Voltage test fails at the internal dc bus node (ADC REF VOLT) of the A26C Receiver. The A26C Receiver is a probable faulty board. Replace the A26C Receiver. See the *Receiver Group Troubleshooting* chapter.

Table 8-4.
Troubleshooting Information for Internal Diagnostic Test Failure (continued)

Test No.	Failed Test	Troubleshooting Information
81	A27 DCBUS +13V	Voltage test fails at the +13V internal dc bus node of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
82	A27 DCBUS +5V	Voltage test fails at the +5V internal dc bus node of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
83	A27 DCBUS −12V	Voltage test fails at the −12V internal dc bus node of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
84	A27 DCBUS 40MHZ VCXO ADJ1	Voltage test fails at the internal dc bus node (40MHZ VCXO ADJ1) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
85	A27 DCBUS 40MHZ VCXO ADJ2	Voltage test fails at the internal dc bus node (40MHZ VCXO ADJ2) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
86	A27 FBUS 100KHZ	Frequency test fails at the internal frequency bus node (100KHZ) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
87	A27 FBUS VCO 10KHZ	Frequency test fails at the internal frequency bus node (VCO 10KHZ) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
88	A27 DCBUS VCO 10KHZ INTG	Voltage test fails at the internal dc bus node (VCO 10KHZ INTG) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
89	A27 DCBUS VCO 10KHZ CNTL	Voltage test fails at the internal dc bus node (VCO 10KHZ CNTL) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.

Table 8-4.
Troubleshooting Information for Internal Diagnostic Test Failure (continued)

Test No.	Failed Test	Troubleshooting Information
90	A27 FBUS VCO 100MHZ	Frequency test fails at the internal frequency bus node (VCO 100MHZ) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
91	A27 DCBUS VCO 100MHZ INTG	Voltage test fails at the internal dc bus node (VCO 100MHZ INTG) of the A27 Synthesizer has some problem. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
92	A27 DCBUS VCO 100MHZ CNTL	Voltage test fails at the internal dc bus node (VCO 100MHZ CNTL) of the A27 Synthesizer has some problem. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
93	A27 FBUS VCO 200MHZ	Frequency test fails at the internal frequency bus node (VCO 200MHZ) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
94	A27 DCBUS VCO 200MHZ INTG	Voltage test fails at the internal dc bus node (VCO 200MHZ INTG) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
95	A27 DCBUS VCO 200MHZ CNTL	Voltage test fails at the internal dc bus node (VCO 200MHZ CNTL) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
96	A27 FBUS VCO 300MHZ	Frequency test fails at the internal frequency bus node (VCO 300MHZ) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
97	A27 DCBUS VCO 300MHZ INTG	Voltage test fails at the internal dc bus node (VCO 300MHZ INTG) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.
98	A27 DCBUS VCO 300MHZ CNTL	Voltage test fails at the internal dc bus node (VCO 300MHZ CNTL) of the A27 Synthesizer. The A27 Synthesizer is a probable faulty board. Replace the A27 Synthesizer. See the *Source Group Troubleshooting* chapter.

List of Internal Tests (No. 10 - No. 98)

```
10 ALL INTERNAL TESTS
11 POWER ON INTERNAL TESTS   [POWER_ON_TEST]
13 A27 ID                    [POWER_ON_TEST]
14 A24 ID                    [POWER_ON_TEST]
15 A25 ID                    [POWER_ON_TEST]
16 A26 ID                    [POWER_ON_TEST]
17 A28/29/50/SOURCE PORT ID  [POWER_ON_TEST]
21 A24 DCBUS +11.6V          [POWER_ON_TEST]
22 A24 DCBUS +5VA            [POWER_ON_TEST]
23 A24 DCBUS -9V             [POWER_ON_TEST]
24 A24 DCBUS VNR VOLT1
25 A24 DCBUS VNR VOLT2
26 A24 DCBUS VNR VOLT3       [POWER_ON_TEST]
27 A24 DCBUS CONST VOLT      [POWER_ON_TEST]
28 A24 DCBUS DAC VOLT1
29 A24 DCBUS DAC VOLT2
30 A24 DCBUS DAC VOLT3       [POWER_ON_TEST]
31 A24 DCBUS 1ST LOCAL       [POWER_ON_TEST]
32 A25 DCBUS +15V            [POWER_ON_TEST OPTION ONLY]
41 A26A DCBUS +12VA          [POWER_ON_TEST]
42 A26A DCBUS +12VB          [POWER_ON_TEST]
43 A26A DCBUS +5VA           [POWER_ON_TEST]
44 A26A DCBUS +5VB           [POWER_ON_TEST]
45 A26A DCBUS -5V            [POWER_ON_TEST]
46 A26A DCBUS -12VA          [POWER_ON_TEST]
47 A26A DCBUS -12VB          [POWER_ON_TEST]
48 A26A DCBUS ADC REF VOLT   [POWER_ON_TEST]
51 A26R DCBUS +12VA          [POWER_ON_TEST OPTION ONLY]
52 A26R DCBUS +12VB          [POWER_ON_TEST OPTION ONLY]
53 A26R DCBUS +5VA           [POWER_ON_TEST OPTION ONLY]
54 A26R DCBUS +5VB           [POWER_ON_TEST OPTION ONLY]
55 A26R DCBUS -5V            [POWER_ON_TEST OPTION ONLY]
56 A26R DCBUS -12VA          [POWER_ON_TEST OPTION ONLY]
57 A26R DCBUS -12VB          [POWER_ON_TEST OPTION ONLY]
58 A26R DCBUS ADC REF VOLT   [OPTION ONLY]
61 A26B DCBUS +12VA          [POWER_ON_TEST OPTION ONLY]
62 A26B DCBUS +12VB          [POWER_ON_TEST OPTION ONLY]
63 A26B DCBUS +5VA           [POWER_ON_TEST OPTION ONLY]
64 A26B DCBUS +5VB           [POWER_ON_TEST OPTION ONLY]
65 A26B DCBUS -5V            [POWER_ON_TEST OPTION ONLY]
66 A26B DCBUS -12VA          [POWER_ON_TEST OPTION ONLY]
67 A26B DCBUS -12VB          [POWER_ON_TEST OPTION ONLY]
68 A26B DCBUS ADC REF VOLT   [OPTION ONLY]
71 A26C DCBUS +12VA          [POWER_ON_TEST OPTION ONLY]
72 A26C DCBUS +12VB          [POWER_ON_TEST OPTION ONLY]
73 A26C DCBUS +5VA           [POWER_ON_TEST OPTION ONLY]
74 A26C DCBUS +5VB           [POWER_ON_TEST OPTION ONLY]
75 A26C DCBUS -5V            [POWER_ON_TEST OPTION ONLY]
76 A26C DCBUS -12VA          [POWER_ON_TEST OPTION ONLY]
77 A26C DCBUS -12VB          [POWER_ON_TEST OPTION ONLY]
78 A26C DCBUS ADC REF VOLT   [OPTION ONLY]
81 A27 DCBUS +13V            [POWER_ON_TEST]
82 A27 DCBUS +5V             [POWER_ON_TEST]
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83 A27 DCBUS -12V            [POWER_ON_TEST]
84 A27 DCBUS 40MHZ VCXO ADJ1
85 A27 DCBUS 40MHZ VCXO ADJ2 [POWER_ON_TEST]
86 A27 FBUS 100KHZ           [POWER_ON_TEST]
87 A27 FBUS VCO 10KHZ        [POWER_ON_TEST]
88 A27 DCBUS VCO 10KHZ INTG
89 A27 DCBUS VCO 10KHZ CNTL  [POWER_ON_TEST]
90 A27 FBUS VCO 100MHZ
91 A27 DCBUS VCO 100MHZ INTG
92 A27 DCBUS VCO 100MHZ CNTL
93 A27 FBUS VCO 200MHZ
94 A27 DCBUS VCO 200MHZ INTG
95 A27 DCBUS VCO 200MHZ CNTL
96 A27 FBUS VCO 300MHZ       [POWER_ON_TEST]
97 A27 DCBUS VCO 300MHZ INTG
98 A27 DCBUS VCO 300MHZ CNTL [POWER_ON_TEST]
```

3. Check the A1 ICs

The following A1 ICs are tested using the A1 On Board Test Mode:

- DRAM
- Instruction Flash Memory
- Peripheral IC -1
- SRAM
- Storage Flash Memory
- Peripheral IC -2

Note

- *To test using the A1 On Board Test Mode erases all correction constants and firmware data in the A1 flash memories. You need to install new firmware and to perform all adjustments after the A1 On Board Test.*
- Before you change the A1SW1 switch settings on the A1 CPU in accordance with each test procedure, you must record the switch settings so that you can restore the settings after completing the A1 On Board Test. If you forget the original settings, see the *Board Configuration* chapter.

A1 DRAM Test

The A1 DRAM test performs R/W test and address test. Perform the following procedure to verify the A1 DRAM using the A1 On Board Test Mode.

a. Turn the analyzer power off.

b. Remove the outer cover of the analyzer.

c. Set the A1 switch (A1SW1) as shown in Table 8-5.

Table 8-5. A1 DRAM Test Switch Settings

A1 Switch	From Upper Left							
	1	2	3	4	5	6	7	8
A1SW1	ON	ON	ON	ON	ON	ON	ON	OFF

d. Turn the analyzer power on.

e. Check the A1 LED DS2 and DS3 in accordance with Table 8-6.

Table 8-6. A1 DRAM Test Status

Test Status[1]	A1 LED DS2				A1 LED DS3			
	1	2	3	4	1	2	3	4
Testing	0	0	0	0	0	1	0	0
Pass	0	0	0	0	0	1	0	0
R/W Test Fail	1	0	0	0	0	1	0	0
Adrs Test Fail	0	1	0	0	0	1	0	0

1 0: OFF, 1: ON. When the test completes, LED(s) marked “1” flash at intervals of about 1 second.

f. Restore the A1SW1 to the original settings.

g. If this test fails, replace the A1 CPU.

A1 Instruction Flash Memory Test

The A1 Instruction Flash Memory test performs device check, erase test, and R/W test. Perform the following procedure to verify the A1 Instruction Flash Memories using the A1 On Board Test Mode.

a. Turn the analyzer power off.

b. Remove the outer cover of the analyzer.

c. Set the A1 switch (A1SW1) as shown in Table 8-7.

Table 8-7. A1 Instruction Flash Memory Test Switch Settings

A1 Switch	From Upper Left							
	1	2	3	4	5	6	7	8
A1SW1	ON	OFF	ON	ON	ON	ON	ON	OFF

d. Turn the analyzer power on.

e. Check the A1 LED DS2 and DS3 in accordance with Table 8-8.

Note It takes about 5 minutes to complete the A1 Instruction Flash Memory Test.

Table 8-8. A1 Instruction Flash Memory Test Status

Test Status[1]	A1 LED DS2				A1 LED DS3			
	1	2	3	4	1	2	3	4
Testing	0	0	0	0	0	1	0	0
Pass	0	0	0	0	0	1	0	0
Illegal Device	1	0	0	0	0	1	0	0
Erase Fail	0	1	0	0	0	1	0	0
R/W Fail	0	0	1	0	0	1	0	0

1 0: OFF, 1: ON. When the test completes, LED(s) marked "1" flash at intervals of about 1 second.

f. Restore the A1SW1 to the original settings.

g. If this test fails, replace the A1 CPU.

A1 Peripheral IC -1 Test

The A1 Peripheral IC -1 Test performs 9914 test, 87312 test, and RTC test. Perform the following procedure to verify the A1 Peripheral IC -1 using the A1 On Board Test Mode.

a. Turn the analyzer power off.

b. Remove the outer cover of the analyzer.

c. Set the A1 switch (A1SW1) as shown in Table 8-9.

Table 8-9. A1 Peripheral IC -1 Test Switch Settings

A1 Switch	From Upper Left							
	1	2	3	4	5	6	7	8
A1SW1	OFF	OFF	ON	ON	ON	ON	ON	OFF

d. Turn the analyzer power on.

e. Check the A1 LED DS2 and DS3 in accordance with Table 8-10.

Table 8-10. A1 Peripheral IC -1 Test Status

Test Status[1]	A1 LED DS2				A1 LED DS3			
	1	2	3	4	1	2	3	4
Testing	0	0	0	0	1	1	0	0
Pass	0	0	0	0	1	1	0	0
9914 Fail	1	-	-	0	1	1	0	0
87312 Fail	-	1	-	0	1	1	0	0
RTC Fail	-	-	1	0	1	1	0	0

1 0: OFF, 1: ON, -: Indeterminate. When the test completes, LED(s) marked "1" flash at intervals of about 1 second.

f. Restore the A1SW1 to the original settings.

g. If this test fails, replace the A1 CPU.

A1 SRAM Test

The A1 SRAM Test performs R/W test. Perform the following procedure to verify the A1 SRAM using the A1 On Board Test Mode.

a. Turn the analyzer power off.

b. Remove the outer cover of the analyzer.

c. Set the A1 switch (A1SW1) as shown in Table 8-11.

Table 8-11. A1 SRAM Test Switch Settings

A1 Switch	From Upper Left							
	1	2	3	4	5	6	7	8
A1SW1	ON	ON	OFF	ON	ON	ON	ON	OFF

d. Turn the analyzer power on.

e. Check the A1 LED DS2 and DS3 in accordance with Table 8-12.

Table 8-12. A1 SRAM Test Status

Test Status[1]	A1 LED DS2				A1 LED DS3			
	1	2	3	4	1	2	3	4
Testing	0	0	0	0	0	0	1	0
Pass	0	0	0	0	0	0	1	0
Fail	1	1	1	1	0	0	1	0

1 0: OFF, 1: ON. When the test completes, LED(s) marked "1" flash at intervals of about 1 second.

f. Restore the A1SW1 to the original settings.

g. If this test fails, replace the A1 CPU.

A1 Storage Flash Memory Test

The A1 Storage Flash Memory Test performs device check, erase test, and R/W test. Perform the following procedure to verify the A1 Strage Flash Memory using the A1 On Board Test Mode.

a. Turn the analyzer power off.

b. Remove the outer cover of the analyzer.

c. Set the A1 switch (A1SW1) as shown in Table 8-13.

Table 8-13. A1 Storage Flash Memory Test Switch Settings

A1 Switch	From Upper Left							
	1	2	3	4	5	6	7	8
A1SW1	OFF	ON	OFF	ON	ON	ON	ON	OFF

d. Turn the analyzer power on.

e. Check the A1 LED DS2 and DS3 in accordance with Table 8-14.

Table 8-14. A1 Storage Flash Memory Test Status

Test Status[1]	A1 LED DS2				A1 LED DS3			
	1	2	3	4	1	2	3	4
Testing	0	0	0	0	1	0	1	0
Pass	0	0	0	0	1	0	1	0
Illegal Device	1	0	0	0	1	0	1	0
Erase Fail	0	1	0	0	1	0	1	0
R/W Fail	0	0	1	0	1	0	1	0

1 0: OFF, 1: ON. When the test completes, LED(s) marked "1" flash at intervals of about 1 second.

f. Restore the A1SW1 to the original settings.

g. If this test fails, replace the A1 CPU.

A1 Peripheral IC -2 Test

The A1 Peripheral IC -2 Test performs DIN test. Perform the following procedure to verify the A1 Peripheral IC -2 (DIN) using the A1 On Board Test Mode.

a. Turn the analyzer power off.

b. Remove the outer cover of the analyzer.

c. Set the A1 switch (A1SW1) as shown in Table 8-15.

Table 8-15. A1 Peripheral IC -2 Test Switch Settings

A1 Switch	From Upper Left							
	1	2	3	4	5	6	7	8
A1SW1	ON	OFF	OFF	ON	ON	ON	ON	OFF

d. Turn the analyzer power on.

e. Check the A1 LED DS2 and DS3 in accordance with Table 8-16.

Table 8-16. A1 Peripheral IC -2 Test Status

Test Status[1]	A1 LED DS2				A1 LED DS3			
	1	2	3	4	1	2	3	4
Testing	0	0	0	0	0	1	1	0
Pass	0	0	0	0	0	1	1	0
DIN Fail	1	0	0	0	0	1	1	0

1 0: OFF, 1: ON. When the test completes, LED(s) marked "1" flash at intervals of about 1 second.

f. Restore the A1SW1 to the original settings.

g. If this test fails, replace the A1 CPU.

4. Check the A43/44/45/46 I/O Port

This test checks the I/O Port function. This test requires the I/O Port Test Kit (Agilent Part Number E5100-65001).

Test Procedure:

a. Turn the E5100A/B OFF.

b. Remove the outer cover of the E5100A/B.

c. Remove the 40 pin flat cable (Agilent Part Number 04396-61662) from the 24 bit I/O board (Agilent Part Number E5100-66543, -66544, -66545, or -66546) in the E5100A/B.

d. Connect the 40 pin flat cable which is removed from the 24 bit I/O board to the I/O test board (J1 A20).

e. Connect the I/O test board (J2 A43/44/45/46) and the 24 bit I/O board with 40 pin flat cable included in the test kit.

f. Connect the 24 bit I/O port and I/O test board (J3 A43, J4 A44, J5 A45, or J6 A46) with D-SUB 15 pin cable or 36 pin cable.

g. Turn the E5100A/B ON.

h. Press (System), MORE, SERVICE MENU, 24 BIT I/O TEST

i. Confirm that PASS is appeared on the LCD display.

Table 8-17. I/O Test Connection

E5100A/B Connection	Used Cable	I/O Test Board Connection
A20 Mother Board	40 pin Flat Cable	J1 A20
I/O Board (inside)	40 pin Flat Cable	J1 A43/44/45/46
I/O Board		
Agilent P/N E5100-66543	D-SUB 15 pin Cable	J3 A43
Agilent P/N E5100-66544	D-SUB 15 pin Cable	J4 A44
Agilent P/N E5100-66545	36 pin Cable	J5 A45
Agilent P/N E5100-66546	D-SUB 15 pin Cable	J6 A46

j. If the test fails, replace the A43/44/45/46 Board.

9

Source Group Troubleshooting

Introduction

Use these procedures only if you have read the *Isolate Faulty Group Troubleshooting* chapter and you believe the problem is in the source group.

This procedure is designed to let you identify the bad assembly within the source group in the shortest possible time. Whenever an assembly is replaced in this procedure, refer to *Post Repair Procedures* in the *Post-Repair Procedures* chapter.

The source group consists of the following assemblies:

- A27 Synthesizer
- A24 Source
- A25 RF Amplifier (Opt.010/600)
- A28 Source Switch (Opt.003)
- A50 High Stability Oscillator (Opt.1D5)

Note

Make sure all of the assemblies listed above are firmly seated before performing the procedures in this chapter.

Allow the analyzer to warm up for at least 30 minutes before you perform any procedure in this chapter.

Source Group Troubleshooting Summary

This overview summarizes the sequence of checks included in this chapter. Experienced technicians may save time by following this summary instead of reading the entire procedure. Headings in this summary match the headings in the procedure.

Start Here

1. Run internal self-test 13. If the test fails, check the A27 Synthesizer is correctly installed.
2. Run internal self-test 14. If the test fails, check the A24 Source is correctly installed.
3. If Opt.010/600 is installed, run internal self-test 15. If the test fails, check the A25 RF Amplifier (Opt.010/600) is correctly installed.
4. Run internal self-test 17. If the test fails, check the A28 Source Switch (Opt.003), A29 50/1M Ω Switch (Opt.101/301), A50 High Stability Oscillator (Opt.1D5) are correctly installed. (See *Board Configuration*)
5. Run internal self-tests 21 through 31. If one or more of those tests fail, replace the A24 Source.
6. If Opt.010/600 is installed, run internal self-test 32. If the test fails, replace the A25 RF Amplifier (Opt.010/600).
7. Run internal self-tests 81 through 98. If one or more of those tests fail, replace the A27 Synthesizer.

Check A27 Synthesizer Outputs

1. Check the INT REF signal. If it is bad, replace A27.
2. Check the EXT REF operation. If it is bad, replace A27.

Check A50 High Stability Oscillator (Option 1D5)

Check the REF OVEN signal. If it is bad, replace A50.

Start Here

The following procedure verifies the operation of each assembly in the source group by using the E5100A/B's self-test functions (internal tests). For detailed information about the self-test functions, see the *Service Key Menus*.

Perform the following steps to troubleshoot the source group:

1. Press (Preset) (System) MORE SERVICE MENU INTERNAL TESTS (13) ×1 EXECUTE TEST to run self-test 13: A27 ID.

   If the test fails, there is a possibility that the A27 Synthesizer is incorrectly installed. Check the board installation and cables.

2. Press (14) ×1 EXECUTE TEST to run internal test 14: A24 ID.

   If the test fails, there is a possibility that the A24 Source is incorrectly installed. See the *Board Configuration* chapter.

3. If Opt.010/600 is installed, press (15) ×1 EXECUTE TEST to run internal test 15: A25 ID.

   If the test fails, there is a possibility that the A25 RF Amplifier is incorrectly installed. See the *Board Configuration* chapter.

4. Press (17) ×1 EXECUTE TEST to run internal test 17: A28/29/50 Source Port ID.

   If the test fails, there is a possibility that the A28 Source Switch (Opt.003), A29 50/1M Ω Switch (Opt.101/301), A50 High Stability Oscillator (Opt.1D5) are correctly installed. See the *Board Configuration* chapter.

5. Press (21) ×1 EXECUTE TEST to run internal test 21: A24 DCBUS +11.6V.

   If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

6. Press (22) ×1 EXECUTE TEST to run internal test 22: A24 DCBUS +5VA.

   If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

7. Press (23) ×1 EXECUTE TEST to run internal test 23: A24 DCBUS −9V.

   If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

8. Press (24) ×1 EXECUTE TEST to run internal test 24: A24 DCBUS VNR VOLT1.

   If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

9. Press (25) ×1 EXECUTE TEST to run internal test 25: A24 DCBUS VNR VOLT2.

   If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

10. Press (26) ×1 EXECUTE TEST to run internal test 26: A24 DCBUS VNR VOLT3.

    If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

11. Press (27) ×1 EXECUTE TEST to run internal test 27: A24 DCBUS CONST VOLT.

    If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

12. Press (28) ×1 EXECUTE TEST to run internal test 28: A24 DCBUS DAC VOLT1.

    If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

13. Press (29) ×1 EXECUTE TEST to run internal test 29: A24 DCBUS DAC VOLT2.

    If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

14. Press (30) ×1 EXECUTE TEST to run internal test 30: A24 DCBUS DAC VOLT3.

    If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

15. Press (31) ×1 EXECUTE TEST to run internal test 31: A24 DCBUS 1ST LOCAL.

    If the test fails, there is a possibility that the A24 Source is a faulty board. Replace the A24.

16. If Opt.010/600 is installed, press (32) ×1 EXECUTE TEST to run internal test 32: A25 DCBUS +15V.

    If the test fails, there is a possibility that the A25 RF Amplifier is a faulty board. Replace the A25.

17. Press (81) ×1 EXECUTE TEST to run internal test 81: A27 DCBUS +13V.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

18. Press (82) ×1 EXECUTE TEST to run internal test 82: A27 DCBUS +5V.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

19. Press (83) ×1 EXECUTE TEST to run internal test 83: A27 DCBUS −12V.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

20. Press (84) ×1 EXECUTE TEST to run internal test 84: A27 DCBUS 40MHZ VCXO ADJ1.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

21. Press (85) ×1 EXECUTE TEST to run internal test 85: A27 DCBUS 40MHZ VCXO ADJ2.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

22. Press (86) ×1 EXECUTE TEST to run internal test 86: A27 FBUS 100KHZ.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

23. Press (87) ×1 EXECUTE TEST to run internal test 87: A27 FBUS VCO 10KHZ.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

24. Press (88) ×1 EXECUTE TEST to run internal test 88: A27 FBUS VCO 10KHZ INTG.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

25. Press (89) ×1 EXECUTE TEST to run internal test 89: A27 FBUS VCO 10KHZ CNTL.

If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

26. Press (90) ×1 EXECUTE TEST to run internal test 90: A27 FBUS VCO 100MHZ.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

27. Press (91) ×1 EXECUTE TEST to run internal test 91: A27 FBUS VCO 100MHZ INTG.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

28. Press (92) ×1 EXECUTE TEST to run internal test 92: A27 FBUS VCO 100MHZ CNTL.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

29. Press (93) ×1 EXECUTE TEST to run internal test 93: A27 FBUS VCO 200MHZ.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

30. Press (94) ×1 EXECUTE TEST to run internal test 94: A27 FBUS VCO 200MHZ INTG.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

31. Press (95) ×1 EXECUTE TEST to run internal test 95: A27 FBUS VCO 200MHZ CNTL.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

32. Press (96) ×1 EXECUTE TEST to run internal test 96: A27 FBUS VCO 300MHZ.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

33. Press (97) ×1 EXECUTE TEST to run internal test 97: A27 FBUS VCO 300MHZ INTG.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

34. Press (98) ×1 EXECUTE TEST to run internal test 98: A27 FBUS VCO 300MHZ CNTL.

    If the test fails, there is a possibility that the A27 Synthesizer is a faulty board. Replace the A27.

If all the tests listed above pass and you still believe that the problem is in the source group, verify the outputs of each assembly in the source group. The procedures to do this are provided in the following sections.

Check A27 Synthesizer Output

One of the output signals from the A27 Synthesizer is INT REF signal on the rear panel. The input signal to A27 is the external reference signal from the EXT REF connector. If the output signal and the E5100A/B operation using the EXT REF input signal are good, A27 is probably good.

Perform the following procedures sequentially to verify all the signals listed above and to verify the E5100A/B operation when the EXT REF signal is used.

1. Check the INT REF Signal

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

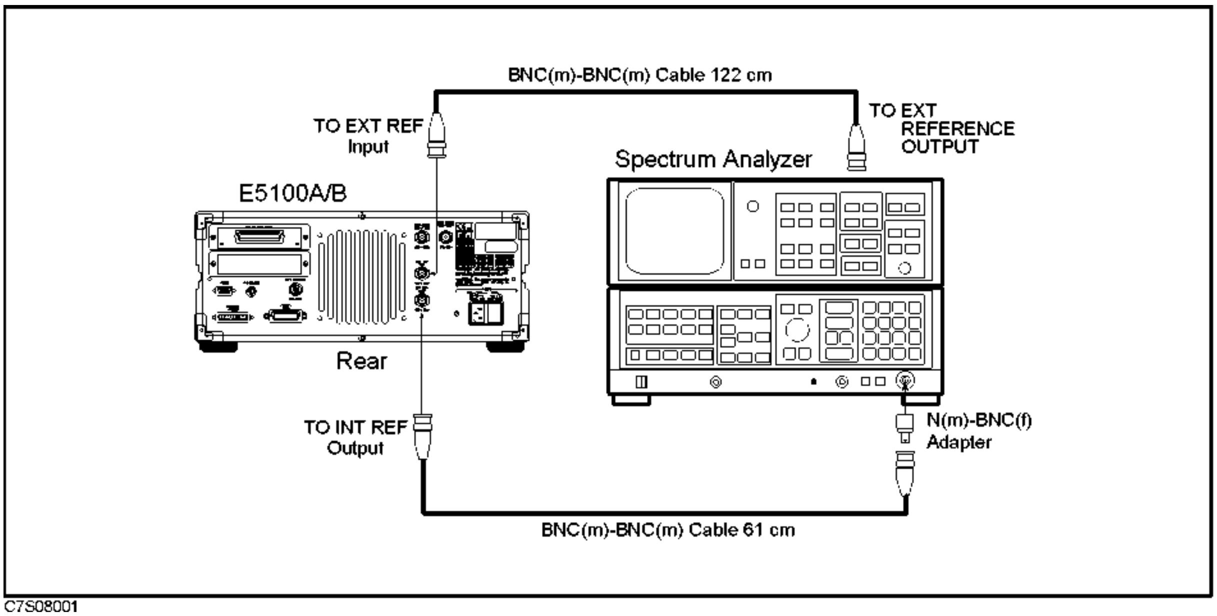


Figure 9-1. INT REF Test Setup

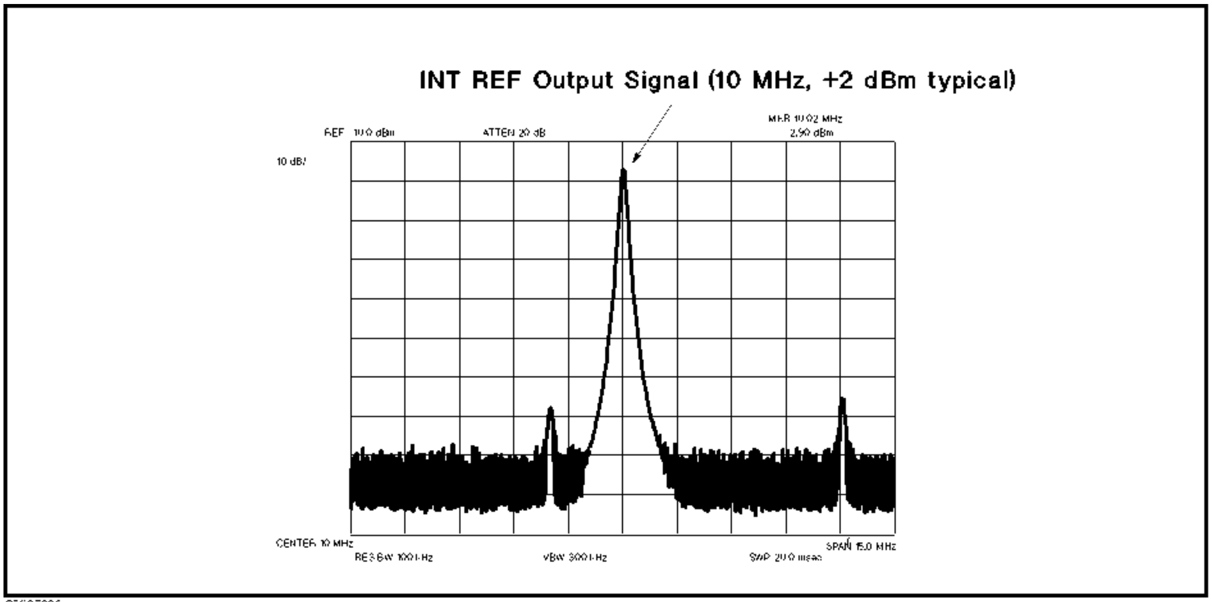
b. Initialize the spectrum analyzer. Then set the controls as follows:

Controls	Settings
Center Frequency	10 MHz
Span	15 MHz
Reference Level	10 dBm

c. On the spectrum analyzer, press (PEAK SEARCH) to move the marker to the peak of the INT REF signal.

d. Check that the frequency is approximately 10 MHz and the level is +2 dBm ± 4 dB. The INT REF signal should be as shown in Figure 9-2.

- If the INT REF signal is good, continue with *3. Check the FRAC N OSC Signal.*
- If the INT REF signal is bad, inspect the cable and connections between the INT REF connector and A27J10. If the cable and connections are good, replace A27.



C5S07006

Figure 9-2. Typical INT REF Signal

2. Check the EXT REF Operation

When an external reference signal (10 MHz, 0 dBm) is applied to the EXT REF input connector on the rear panel, the message "`External Reference`" appears for about 3 seconds on the display. When the external reference signal is removed, nothing happens.

Perform the following steps to verify the operation of the EXT REF input:

a. Connect the equipment as shown in Figure 9-3. Then check that the "`External Reference`" message appears on the display. If Option 1D5 is installed in the E5100A/B, connect the cable between the EXT REF Input connector and REF OVEN (Opt.1D5) connector.

- If the "`External Reference`" message appears correctly, the EXT REF circuit probably working. At this point, the A27 synthesizer is verified.
- If the "`External Reference`" message does not appear, inspect the cable "I" and connections between the EXT REF input connector and A27J2. If the cable and connections are good, the most probable faulty assembly is A27. Replace A27.

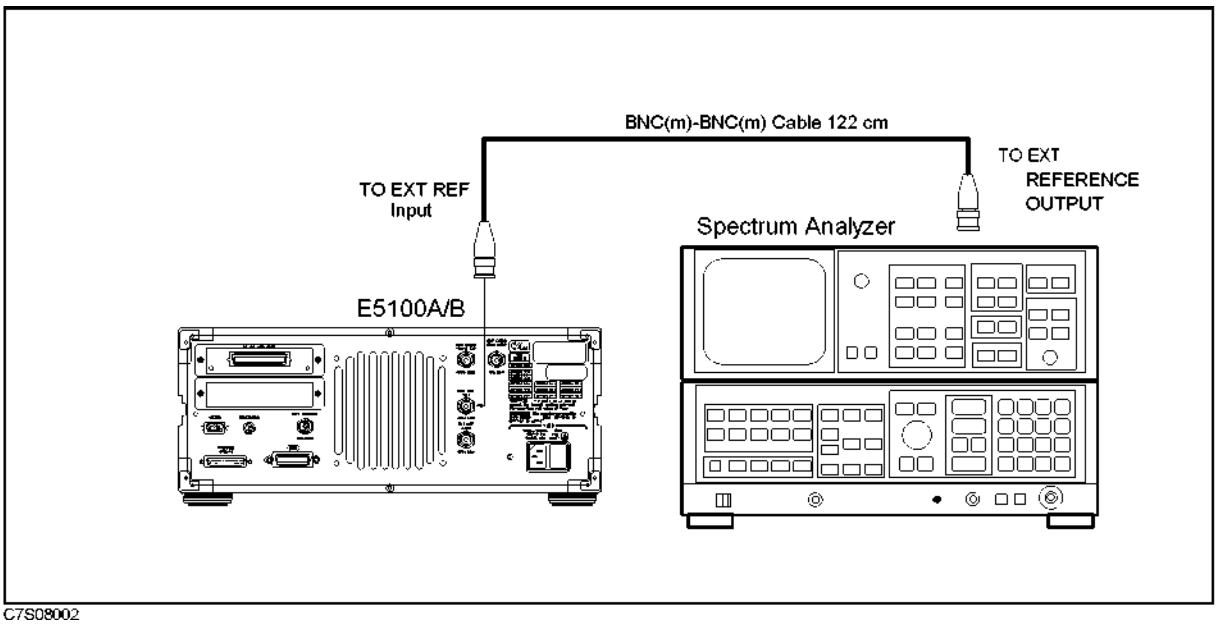


Figure 9-3. EXT REF Test Setup

Check the A50 High Stability Oscillator (Opt.1D5)

Perform the following procedure to verify the A50 High Stability Oscillator:

Observe the REF OVEN signal on the rear panel using a spectrum analyzer. Check that the frequency is 10 MHz and the level is approximately 0 dBm.

- If the signal is good, the A50 High Stability Oscillator is verified.
- If the signal is bad, inspect the cable and connections between A50 and REF OVEN. If the cable and connections are good, replace the A50 High Stability Oscillator.

10

Receiver Group Troubleshooting

Introduction

Use these procedures only if you have read the *Isolate Faulty Group Troubleshooting* chapter, and you believe the problem is in the receiver group.

These procedures are designed to let you identify the bad assembly within the receiver group in the shortest possible time. Whenever an assembly is replaced in this procedure, refer to the *Post Repair Procedures* chapter in this manual.

The procedures isolate the faulty assembly by using the E5100A/B self-test functions (internal tests).

The receiver group consists of the following assemblies:

- A26R Receiver (Opt.200/300/400)
- A26A Receiver (Opt.100/200/300/400)
- A26B Receiver (Opt.300/400)
- A26C Receiver (Opt.400)
- A29 50/1M Ω Switch (Opt.101/301)

Note

Make sure all of the assemblies listed above are firmly seated before performing the procedures in this chapter.

Allow the analyzer to warm up for at least 30 minutes before you perform any procedure in this chapter.

Receiver Group Troubleshooting Summary

This overview summarizes the sequence of checks included in this chapter. Experienced technicians may save time by following the summary instead of reading the entire procedure. Headings in this summary match the headings in the procedure.

Start Here

1. Run internal self-test 16. If the test fails, check if the A26R/A/B/C Receivers are correctly installed.
2. Run internal self-test 17. If the test fails, check the A28 Source Switch (Opt.003), A29 50/1M Ω Switch (Opt.101/301), A50 High Stability Oscillator (Opt.1D5) are correctly installed. (See *Board Configuration*)
3. Run internal self-tests 41 through 48. If one (or more) of those tests fails, replace A26A.
4. Run internal self-tests 51 through 58. If one (or more) of those tests fails, replace A26R.
5. Run internal self-tests 61 through 68. If one (or more) of those tests fails, replace A26B.
6. Run internal self-tests 71 through 78. If one (or more) of those tests fails, replace A26C.

Start Here

The following procedures verify the operation of each assembly in the receiver group by using the E5100A/B self-test functions (internal tests). For detailed information about the self-test functions, see the *Service Key Menus*.

Perform the following procedures sequentially to troubleshoot the receiver.

1. Press (Preset) (System) MORE SERVICE MENU INTERNAL TEST (16) ×1 EXECUTE TEST to run internal test 16: A26 ID.

   If the test fails, there is a possibility that some of the A26R, A26A, A26B, and A26C are incorrectly installed.
2. Press (17) ×1 EXECUTE TEST to run internal test 17: A28/29/50 Source Port ID.

   If the test fails, there is a possibility that the A28 Source Switch (Opt.003), A29 50/1M Ω Switch (Opt.101/301), A50 High Stability Oscillator (Opt.1D5) are correctly installed. See the *Board Configuration* chapter.
3. Press (41) ×1 EXECUTE TEST to run internal test 41: A26A DCBUS +12VA.

   If the test fails, there is a possibility that the A26A Receiver is a faulty board. Replace the A26A.
4. Press (42) ×1 EXECUTE TEST to run internal test 42: A26A DCBUS +12VB.

   If the test fails, there is a possibility that the A26A Receiver is a faulty board. Replace the A26A.
5. Press (43) ×1 EXECUTE TEST to run internal test 43: A26A DCBUS +5VA.

   If the test fails, there is a possibility that the A26A Receiver is a faulty board. Replace the A26A.
6. Press (44) ×1 EXECUTE TEST to run internal test 44: A26A DCBUS +5VB.

   If the test fails, there is a possibility that the A26A Receiver is a faulty board. Replace the A26A.
7. Press (45) ×1 EXECUTE TEST to run internal test 45: A26A DCBUS −5V.

   If the test fails, there is a possibility that the A26A Receiver is a faulty board. Replace the A26A.
8. Press (46) ×1 EXECUTE TEST to run internal test 46: A26A DCBUS −12VA.

   If the test fails, there is a possibility that the A26A Receiver is a faulty board. Replace the A26A.
9. Press (47) ×1 EXECUTE TEST to run internal test 47: A26A DCBUS −12VB.

   If the test fails, there is a possibility that the A26A Receiver is a faulty board. Replace the A26A.
10. Press (48) ×1 EXECUTE TEST to run internal test 48: A26A DCBUS ADC REF VOLT.

    If the test fails, there is a possibility that the A26A Receiver is a faulty board. Replace the A26A.
11. Press (51) ×1 EXECUTE TEST to run internal test 51: A26R DCBUS +12VA.

    If the test fails, there is a possibility that the A26R Receiver is a faulty board. Replace the A26R.
12. Press (52) ×1 EXECUTE TEST to run internal test 52: A26R DCBUS +12VB.

    If the test fails, there is a possibility that the A26R Receiver is a faulty board. Replace the A26R.
13. Press (53) ×1 EXECUTE TEST to run internal test 53: A26R DCBUS +5VA.

If the test fails, there is a possibility that the A26R Receiver is a faulty board. Replace the A26R.

14. Press (54) x1 EXECUTE TEST to run internal test 54: A26R DCBUS +5VB.

    If the test fails, there is a possibility that the A26R Receiver is a faulty board. Replace the A26R.

15. Press (55) x1 EXECUTE TEST to run internal test 55: A26R DCBUS −5V.

    If the test fails, there is a possibility that the A26R Receiver is a faulty board. Replace the A26R.

16. Press (56) x1 EXECUTE TEST to run internal test 56: A26R DCBUS −12VA.

    If the test fails, there is a possibility that the A26R Receiver is a faulty board. Replace the A26R.

17. Press (57) x1 EXECUTE TEST to run internal test 57: A26R DCBUS −12VB.

    If the test fails, there is a possibility that the A26R Receiver is a faulty board. Replace the A26R.

18. Press (58) x1 EXECUTE TEST to run internal test 58: A26R DCBUS ADC REF VOLT.

    If the test fails, there is a possibility that the A26R Receiver is a faulty board. Replace the A26R.

19. Press (61) x1 EXECUTE TEST to run internal test 61: A26B DCBUS +12VA.

    If the test fails, there is a possibility that the A26B Receiver is a faulty board. Replace the A26B.

20. Press (62) x1 EXECUTE TEST to run internal test 62: A26B DCBUS +12VB.

    If the test fails, there is a possibility that the A26B Receiver is a faulty board. Replace the A26B.

21. Press (63) x1 EXECUTE TEST to run internal test 63: A26B DCBUS +5VA.

    If the test fails, there is a possibility that the A26B Receiver is a faulty board. Replace the A26B.

22. Press (64) x1 EXECUTE TEST to run internal test 64: A26B DCBUS +5VB.

    If the test fails, there is a possibility that the A26B Receiver is a faulty board. Replace the A26B.

23. Press (65) x1 EXECUTE TEST to run internal test 65: A26B DCBUS −5V.

    If the test fails, there is a possibility that the A26B Receiver is a faulty board. Replace the A26B.

24. Press (66) x1 EXECUTE TEST to run internal test 66: A26B DCBUS −12VA.

    If the test fails, there is a possibility that the A26B Receiver is a faulty board. Replace the A26B.

25. Press (67) x1 EXECUTE TEST to run internal test 67: A26B DCBUS −12VB.

    If the test fails, there is a possibility that the A26B Receiver is a faulty board. Replace the A26B.

26. Press (68) x1 EXECUTE TEST to run internal test 68: A26B DCBUS ADC REF VOLT.

    If the test fails, there is a possibility that the A26B Receiver is a faulty board. Replace the A26B.

27. Press (71) x1 EXECUTE TEST to run internal test 71: A26C DCBUS +12VA.

    If the test fails, there is a possibility that the A26C Receiver is a faulty board. Replace the A26C.

28. Press (72) x1 EXECUTE TEST to run internal test 72: A26C DCBUS +12VB.

    If the test fails, there is a possibility that the A26C Receiver is a faulty board. Replace the A26C.

29. Press (73) ×1 EXECUTE TEST to run internal test 73: A26C DCBUS +5VA.

    If the test fails, there is a possibility that the A26C Receiver is a faulty board. Replace the A26C.

30. Press (74) ×1 EXECUTE TEST to run internal test 74: A26C DCBUS +5VB.

    If the test fails, there is a possibility that the A26C Receiver is a faulty board. Replace the A26C.

31. Press (75) ×1 EXECUTE TEST to run internal test 75: A26C DCBUS −5V.

    If the test fails, there is a possibility that the A26C Receiver is a faulty board. Replace the A26C.

32. Press (76) ×1 EXECUTE TEST to run internal test 76: A26C DCBUS −12VA.

    If the test fails, there is a possibility that the A26C Receiver is a faulty board. Replace the A26C.

33. Press (77) ×1 EXECUTE TEST to run internal test 77: A26C DCBUS −12VB.

    If the test fails, there is a possibility that the A26C Receiver is a faulty board. Replace the A26C.

34. Press (78) ×1 EXECUTE TEST to run internal test 78: A26C DCBUS ADC REF VOLT.

    If the test fails, there is a possibility that the A26C Receiver is a faulty board. Replace the A26C.

11

Accessories Troubleshooting

Introduction

Use these procedures only if you have followed the troubleshooting procedures and believe the problem is one of the accessories. Reconfigure the system as it is normally used and reconfirm the measurement problem. The measurement problem must be caused by a failure outside of the analyzer (that is, by one of the accessories).

Suspect the following typical problems:

- Operation Errors (for example, improper calibration techniques)
- Faulty Accessories (for example, damaged adapters and RF cables, a faulty power splitter, or T/R test set)

This chapter consists of the following procedures. Perform these procedures sequentially.

Verify Operations
Inspect Connectors
Inspect Accessories

Verify Operations

The measurement problem can be caused by improper operation. Confirm that all operations, connections and control settings, etc., are properly made during the measurement. An example of the typical operation errors are shown in the following paragraph.

Using 75 Ω Connectors with 50 Ω Connectors

Do not use 50 Ω connectors with 75 Ω connectors; their center conductors are different diameters. Using a 50 Ω male connector with a 75 Ω female connector will destroy the female connector.

Inspect the Connectors

Check the physical condition of the analyzer front-panel connectors, and the test set connectors.

Inspect the front panel connectors on the analyzer. Check for bent or broken center pins and loose connector bulkheads.

Inspect the Accessories

Measurement problems can be caused by faulty accessories or faulty devices between the accessories and the analyzer. For example, the RF cables, the probe power connector, and the interconnect cable can cause problems.

Some recommended accessories used with the analyzer are listed below.

- Active Probes (for example, the 41800A Active Probe).
- Power Splitter (for example, the 11850C/D Three-way Power Splitter).

Inspect the cables for any damage. Verify the probe power connector. Then inspect and verify the accessories that are used in the measurement.

Verify the Probe Power

Perform the following procedure to verify the front-panel probe power connector:

1. Turn the analyzer power off.
2. Remove the power cable of the accessory from the probe power connector.
3. Turn the analyzer power on.
4. Measure the power voltages (+15 V and -12.6 V) at the probe power connector using a voltmeter with a small probe. See Figure 11-1 for the voltages and pins on the probe power connector.
   - If the voltages are within the limits, the analyzer's probe power is verified. Suspect a faulty accessory. Verify the accessory used in the measurement problem in accordance with its manual.
   - If the voltages are out of the limits, see the *Power Supply Troubleshooting* chapter in this manual to troubleshoot the power lines (+15 V(AUX) and -12.6 V) of the probe power.

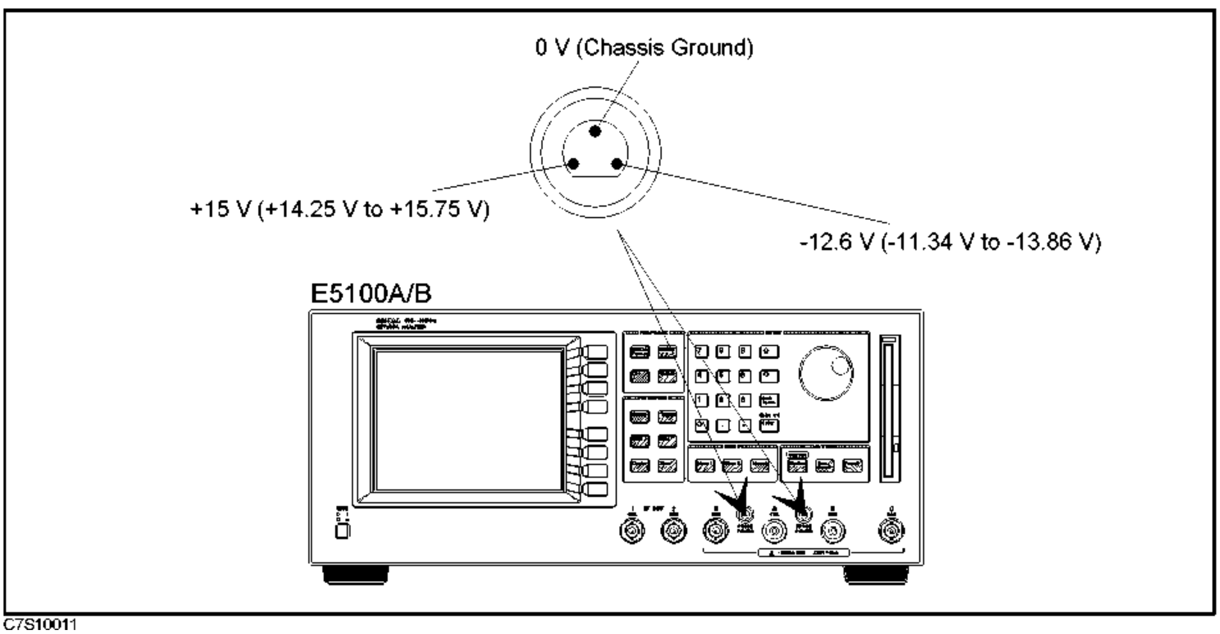


Figure 11-1. Probe Power Connector Voltages

12

Service Key Menus

Introduction

The service key menus are used to test, verify, and troubleshoot the analyzer. They are also used to install and update the firmware in the analyzer.

The service key menus consist of several menus that are accessed through the service menu and the Bootloader menu.

- The service menu is displayed by pressing (System) MORE SERVICE MENU.
- The Bootloader menu is displayed by turning the analyzer power on while pressing (Preset) and (0).

The service key menus allow you to perform the following functions:

- Select and execute a built-in diagnostic test. The analyzer has 69 built-in diagnostic tests. For detailed information, see the *Tests Menu* in this chapter.
- Display the firmware revision. See the *Service Menu* in this chapter.
- Install and update the firmware in the analyzer. For detailed information, see the *Bootloader Menu* in this chapter.

Service Menu

The service menu is used to select and execute internal tests, to test the 24 bit I/O,and to display the firmware revision information. To display the service menu, press (System) MORE SERVICE MENU. Each softkey in the service menu is described below.

INTERNAL TESTS

Selects the first internal test 10: ALL INTERNAL TESTS and allows you to enter the test number. For more information about the internal tests, see the *Internal Tests* later in this chapter.

EXECUTE TEST

Runs the selected test.

24BIT I/O TEST

Executes 24 bit I/O test. For more information about the 24 bit I/O test, see the *24 Bit I/O Test* later in this chapter.

FIRMWARE REVISION

Displays the current firmware revision information. The number and implementation date appear in the active entry area of the display as shown below. Another way to display the firmware information is to cycle the analyzer power (off then on).

```
E5100A REVN.NN: MON DD YEAR
```

where	N.NN:	Revision Number
	MON DD YEAR	Implementation Date (Month Day Year)

Internal Tests

The tests menu is used to select and execute one of the 69 built-in diagnostic tests. More information about the diagnostic tests is provided in the *Diagnostic Tests* later in this section.

To display the tests menu, press (System) MORE SERVICE MENU INTERNAL TESTS.

When entering the tests menu, internal test 10: ALL INTERNAL TESTS is selected as the default test. The test number is displayed in the active entry area of the display.

The diagnostic tests are numbered from 10 to 98. To select a test, enter the desired test number using the numeric keypad.

Note

- After executing a test by pressing EXECUTE TEST, an annotation (!) is displayed to indicate any tests executed and the analyzer settings changed to the test settings. To return the analyzer to normal operation, cycle the analyzer power (off then on).

  To press (Preset) does not return the analyzer to the normal operation.
- While any test is being executed, do not change the analyzer setting using the front-panel keys, the GPIB, or the I-BASIC program . If the setting is changed during test execution, the test result and the analyzer operation are undefined.

Internal Tests

The analyzer has 69 built-in internal self-tests. These tests are completely internal and self-evaluating. They do not require external connections or user interaction.

The analyzer performs the power on self-test every time the power on sequence occurs (when the analyzer is turned on). These tests are used to test, verify, and troubleshoot the analyzer.

The power on self-test consists of internal tests 13 through 23, 26, 27, 30 through 57, 61 through 67, 71 through 77, 81 thorugh 83, 85 through 87, 89, 96, and 98. They are executed in the listed order. If any of the tests fail, that test displays a "`(-330) Self-test failed, No.xx`" message at the end of the power on sequence.

BOOTLOADER MENU

To display the bootloader menu, turning the analyzer on with pressing (Preset) and (0). The Bootloader menu is used to install the firmware into the analyzer using a firmware diskette and the built-in FDD.

FIRMWARE UPDATE - OK

Allows you to install and update the firmware in the analyzer. After pressing FIRMWARE UPDATE softkey, OK softky appear on the display. Before pressing the OK softkey, insert the firmware diskette into the FDD on the front panel. Then press this softkey to install the firmware from the diskette to the analyzer. The detailed procedure is provided in the *Firmware Installation* in the *Post Repair Procedures* chapter.

FIRWARE UPDATE - FIRMWARE VERSION

Displays the revision information of the firmware stored in the firmware diskette as shown below. Before pressing this softkey, insert a firmware diskette into the FDD on the front panel.

```
E5100A/B  REVN.NN : MON DD YEAR
```

where	N.NN:	Revision Number
	MON DD YEAR:	Implementation Date (Month Day Year)

REBOOT

Reboots the analyzer. (If the new firmware is installed, the analyzer automatically boots up.) After pressing the softkey, the analyzer performs the normal power on sequence.

13

Theory of Operation

Theory of Operation begins with a general description of the operation of an analyzer system. This is followed by a more detailed operating theory for the analyzer itself, divided into functional groups.

Each functional group consists of a number of assemblies that combine to perform one of the basic instrument functions. These groups are power supplies, digital control, source, and receiver. The operation of each group is described briefly, to the assembly level only. Detailed component-level circuit theory is not provided here.

Simplified block diagrams illustrate the operation of each functional group.

System Theory

A network analyzer system consists of a source, signal separation devices (a power splitter, T/R test kit, etc.), receivers for measurement, and display of test device characteristics. Figure 13-1 is a simplified block diagram of the network analyzer system.

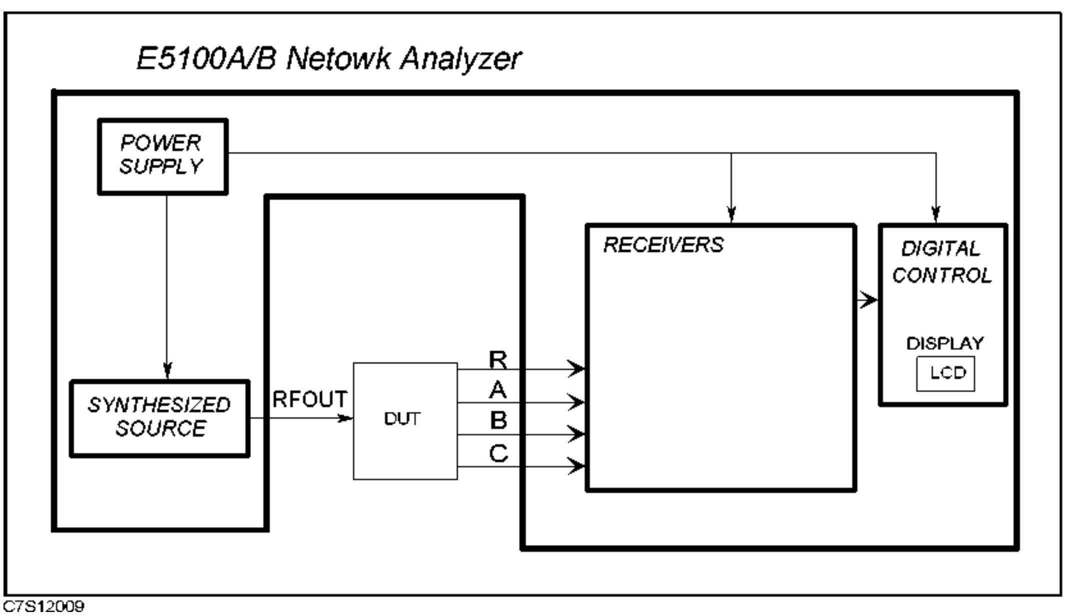


Figure 13-1. Simplified System Block Diagram

The built-in synthesized source generates a CW (continuous wave) or swept RF signal in the range of 10 kHz to 300 MHz (180 MHz for Opt.118/218/318). The RF output power is leveled to a maximum level of +11 dBm.

The signal separation device in a network analyzer system is the built-in power splitter (Opt.002), the 11667A power splitter, or the 87512A/B transmission/reflection test kit.

The source RF signal goes through the signal separation device to the device under test. The signal transmitted through the device (or reflected from its input) is applied to the A and/or B and/or C inputs of the receiver and compared with the incident signal at input R.

The receiver consists of four assemblies for R, A, B, and C inputs (Opt.400). Each receiver assembly converts the RF input frequency to an intermediate frequency for signal processing, and converts to the digital signal using the ADC (Analog-Digital Converter). Then the digitalized raw data is transferred to the digital circuit section.

The raw data are then processed. The processed and formatted data is finally routed to the LCD for display, and to GPIB remote operation.

Analyzer Functional Groups

The operation of the analyzer is most logically described in four functional groups. Each group consists of several major assemblies, and performs a distinct function in the instrument. Some assemblies are related to more than one group, and in fact all the groups are to some extent interrelated and affect each other's performance.

Power Supply: The power supply functional group consists of the 130W power supply and the 30W power supply. It supplies power to the other assemblies in the instrument.

Digital Control: The digital control group consists of the A1 CPU, A2 Peripheral (including Graphics System Processor for display), A3 DSP (Digital Signal Processor), A40 Front Keyboard, A41 Rear Board, A42 Rear Board, A43/44/45/46 I/O Port, LCD Display Assembly, and FDD (Flexible Disk Drive). These assemblies combine to provide digital control for the analyzer.

Source: The source group consists of the A27 Synthesizer, A24 Source, A25 RF Amplifier (Opt.010/600), A28 Source Switch (Opt.003), and A50 High Stability Oscillator (Opt.1D5). The source supplies a phase-locked RF signal to the device under test.

Receiver: The receiver group consists of the A26R/A/B/C receiver assemblies. The receiver measures and processes input signals for display.

The following pages describe the operation of the functional groups.

Power Supply Theory

The power supply functional group consists of the PS 130W Power Supply and the PS 30W Power Supply. These two assemblies provide regulated DC voltages to power all assemblies in the E5100A/B. Figure 13-2 is a simplified block diagram of the power supply group.

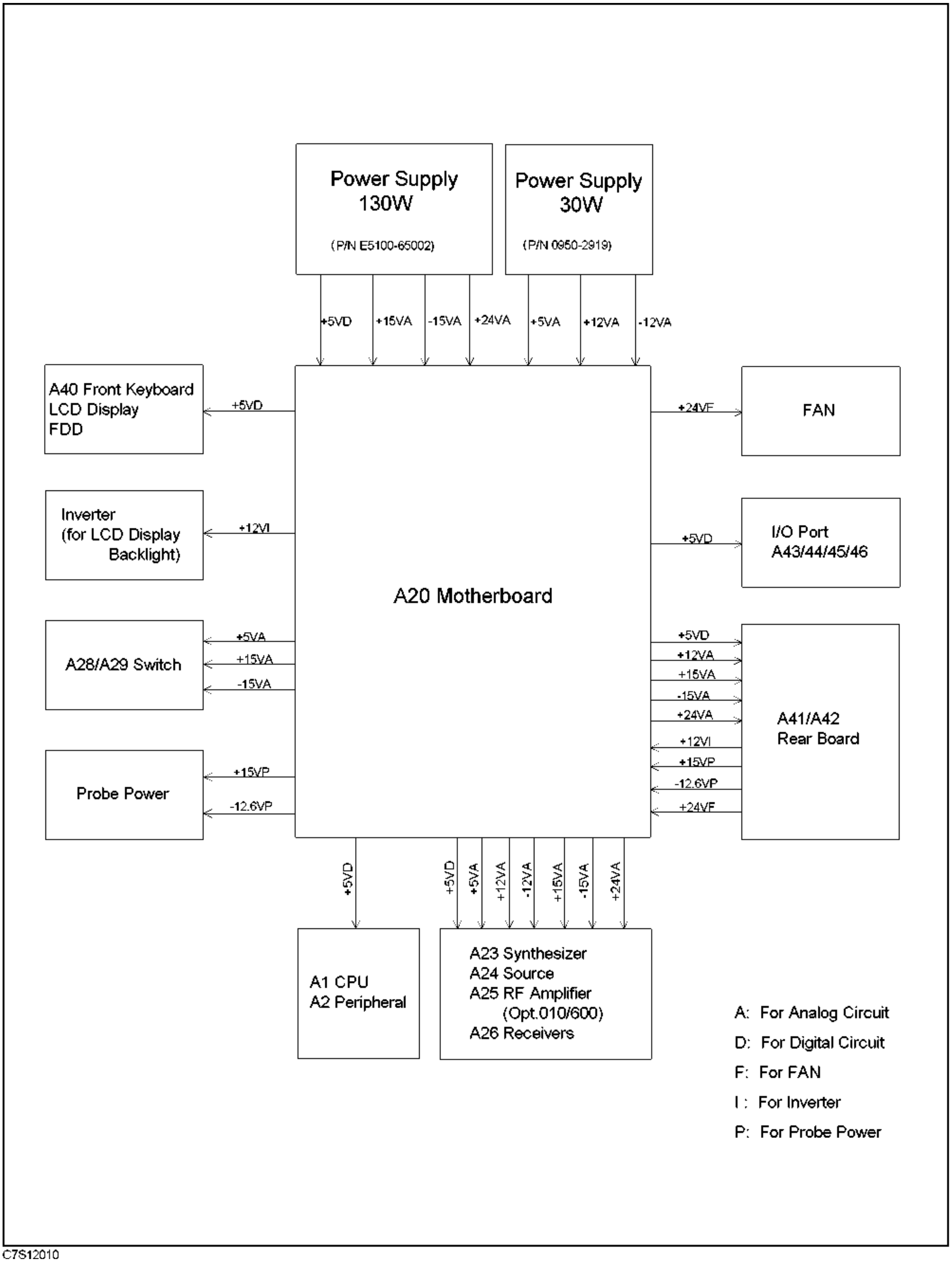


Figure 13-2. Power Supply Simplified Block Diagram

PS 130W Power Supply

The PS 130W Power Supply steps down and rectifies the line voltage. It provides fully regulated +5V digital supply and +15V, −15V, +24V analog supplies.

Regulated +5VD, +15VA, −15VA, +24VA Supplies

The +5VD, +15VA, −15VA, +25VA supplies are regulated by the control loop in the PS 130W Power Supply. They go directly to the motherboard, and from there to all assemblies requiring a digital supply (+5V) and/or analog supplies (+15V, −15V, and +24V).

Shutdown Circuit

The shut down circuit for the PS 130W Power Supply is triggered by overcurrent, overvoltage, or cooling fan stop. When the cooling fan stops due to some failure, A41 Rear Board detects it through Fan Sense signal from the fan and turn off the Shut Down voltage (+5V) which goes to the PS 130W Power Supply.

Shutdown function including the Fan Sense circuit protects the instrument by causing the regulated voltage supplies to be shut down. The output voltages from the PS 30W Power Supply are not shut down when the PS 130W Power Supply is shut down.

PS 30W Power Supply

The PS 30W Power Supply also steps down and rectifies the line voltage. It provides fully regulated +5V, +12V, −12V analog supplies.

Regulated +5VA, +12VA, −12VA Supplies

The +5VA, +12VA, −12VA supplies are regulated by the control loop in the PS 30W Power Supply. They go directly to the motherboard, and from there to all assemblies requiring analog supplies (+5VA, −12VA, and −12VA).

Shutdown Circuit

The shut down circuit is triggered by overcurrent and overvoltage of the PS 30W Power Supply output. It protects the instrument by causing the regulated voltage supplies to be shut down.

The output voltages from the PS 130W Power Supply are also shut down when the PS 30W Power Supply is shut down because the A41 Rear Board does not receive required power supply from the PS 30W and does not supply the Shut Down voltage (+5V) to the PS 130W Power Supply.

DC Fan Power

The fan power (+24 V) is derived from the A41 Rear Board. If the fan is stopped, the shut down circuit is activated.

Display Power

The A41 Rear Board supplies +12 V to the backlight module of the LCD display.

Probe Power

The A41 Rear Board supplies +15 V and -12.6 V to provide a power source at the front panel for an external RF probe.

Line Power Module

The line power module includes the line power switch and the main fuse. The main fuse, which protects the input side of the two power supplies against drawing too much line current, is also accessible at the rear panel.

Digital Control Theory

The digital control functional group consists of the following assemblies:

- A1 CPU
- A2 Peripheral
- A3 DSP
- A40 Front Keyboard
- A41 Rear Board
- A42 Rear Board
- A43/44/45/46 I/O Port
- LCD Display
- FDD

These assemblies combine to provide digital control for the analyzer. They provide math processing functions, as well as communications between the analyzer and an external controller and/or pheriperals. Figure 13-3 is a simplified block diagram of the digital control functional group.

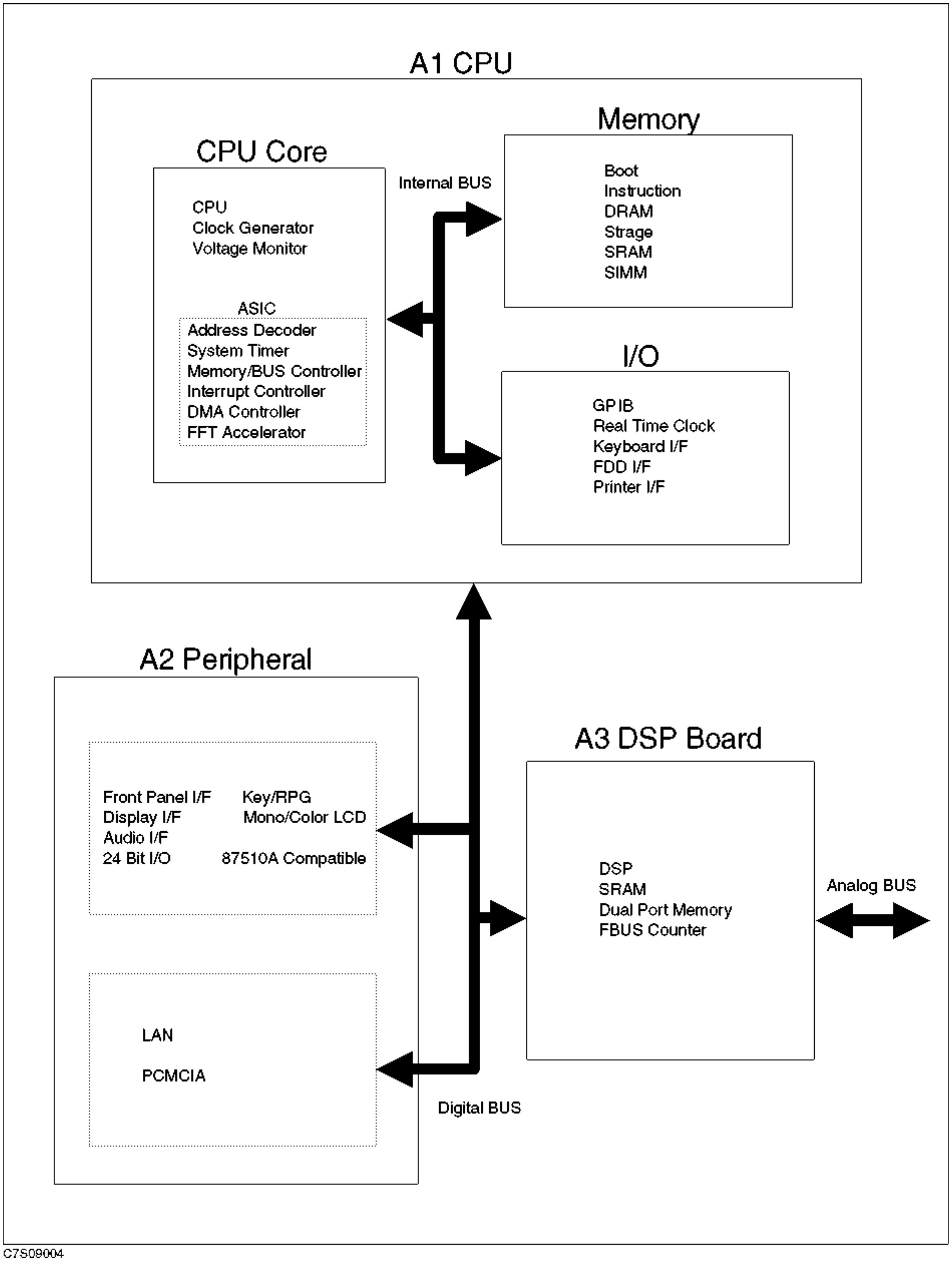


Figure 13-3. Digital Section Block Diagram

A1 CPU

The A1 CPU consists of the CPU (central processing unit) core, memory storages, and I/O control. The CPU core is the master controller for the analyzer, including the other dedicated microprocessors. The memory includes boot ROMs, instruction flash memories, DRAMs, strage flash memories, SRAMs, and SIMM(single inline memory module). I/O control includes the functions of GPIB, real time clock, keybord interface, FDD interface, and printer interface.

The A1 CPU has a backup memory RAM with a large capacitor.

A2 Peripheral

The A2 Peripheral assembly consists of the peripheral I/O controls (front panel interface, audio interface, 24 bit I/O) and the GSP (graphics system processor) which provides an interface between the A1 CPU and the LCD Display.

A40 Front Keyboard

The A40 Front Keyboard assembly detects and decodes user inputs from the front panel and the RPG, and transmits them to the A2 Peripheral I/O control Assembly.

LCD Display

There are two types of LCD display for the E5100A/B, a monochrome LCD and a color LCD (TFT).

FDD

The E5100A/B has a built-in FDD (Flexible Disk Drive) on the front panel. It has a 3-1/2 inch slot, and uses a 2 high density 3-1/2 inch flexible disk. FDD stores/retrieves a data to/from a file on a disk.

Source Theory

The source group generates a stable and accurate RF output signal, which is a CW or swept signal between 10 kHz to 300 MHz (180 MHz for Opt.118/218/318), with a power level from −9 dBm to +11 dBm (Opt.001). Also the source group generates the local (LO) signals for the receivers (A26R/A/B/C).

The source functional group consists of the individual assemblies described below.

A27 Synthesizer

The A27 synthesizer provides a 40 MHz reference frequency, a 40 MHz − IF/12 reference frequency, a FRAC N OSC signal, and an INT REF signal.

The 40 MHz reference signal is supplied to the A24 Source and used to generate RF reference signal (480 MHz). The 40 MHz − IF/12 reference frequency is supplied to the A24 Source and used to generate LO reference frequency (480 MHz − IF). The FRAC N OSC signal is supplied to the A24 Source and used to generate the RF output signal and local oscillator signal.

The A27 Synthesizer consists of the following circuits:

- REF OSC (Reference Oscillator)
- FRAC N OSC (Fractional N Oscillator)
- LO PLL Synthesizer (Local PLL Synthesizer)

REF OSC

The REF OSC generates a stable reference frequency of 40 MHz.

The 40 MHz reference signal is supplied to the FRAC N OSC and LO PLL Synthesizer in the A27 and to the RF Reference in the A24 Source. The 40 MHz reference signal is divided by 4 on the way to the FRAC N OSC. This 10 MHz reference frequency is routed to the INT REF Output connector on the rear panel.

When a 10 MHz external reference signal is applied to the EXT REF Input connector on the rear panel, the REF OSC output signals are phase locked to the external reference signal.

The REF OSC is a phase locked oscillator and contains a 40 MHz VCXO and a phase detector. When the 10 MHz external reference signal is applied to the EXT REF Input connector on the rear panel, it is compared with the VCXO frequency ($\mathbf{F_{vcxo}}$) divided by 4. Phase locking imposes the condition of 10 MHz = $\mathbf{F_{vcxo}}/4$. Therefore, the output frequency ($\mathbf{F_{vcxo}}$) is locked to 40 MHz.

A detector circuit detects the external reference input signal and sends the status to the A1 CPU. Then the A1 CPU displays a message (`External Reference`) on the LCD display.

FRAC N OSC

The FRAC N OSC (Fractional N Oscillator) generates a swept signal of 480 MHz to 780 MHz with a high frequency resolution. The signal is supplied to the RF Reference and Local Reference in the A24 Source. The Local Reference signal is used to generate the swept local oscillator signal.

The FRAC N OSC is a phase locked oscillator. The output signal is phase locked to the 40 MHz reference signal of the REF OSC.

LO PLL Synthesizer

The LO PLL Synthesizer provides the 40 MHz − IF/12 reference frequency to the A24 Source. This output signal is multiplied by 12 ($\times3\times2\times2$) on the A24 Source to generate a local reference signal (480 MHz − IF). The local reference signal is mixed with the Fractional-N PLL output signal for making a local signal.

A24 Source

The source assembly consists of multipliers, an RF Mixer, and a LO Mixer.

Multipliers (×3, ×2, ×2)

The multipliers for RF reference signal receives the 40 MHz reference signal and generate a 480 MHz RF reference signal. This signal is supplied to RF Mixer and is used to generate the RF OUTPUT signal (10 kHz to 300 MHz). The multipliers for LO reference signal receives the 40 MHz − IF/12 reference signal and generates a 480 MHz − IF signal. This signal is supplied to LO Mixer and is used to generate the local oscillator signal.

RF Mixer. The RF Mixer mixes the RF reference signal (480 MHz) with the high resolution wide band signal from A27 Fractional-N PLL, and outputs RF OUTPUT signal (10 kHz to 300 MHz).

LO Mixer. The LO Mixer mixes the LO reference signal (480 MHz − IF) with the high resolution wide band signal from A27 Fractional-N PLL, and outputs the LOCAL signal (RF + IF: 22.5 kHz to 300.0125 MHz).

A25 RF Amplifier (Opt.010/600)

The A25 RF amplifier assembly amplifies the output signal from the A24 Source board (× 11 dB). Before the amplifier, the input signal is attenuated by the level attenuator (0 dB to 48 dB) for a proper output.

Source Group Operation

Figure 13-4 shows the Source Group simplified block diagram. RF reference frequency (F_R : 480 MHz) is mixed with the 1 mHz resolution frequency (F_R + RF : 480.01 MHz to 780 MHz) to output the RF OUTPUT frequency (RF: 10 kHz to 300 MHz). Also the LO reference frequency (F_R - 1st IF: 479.9875 MHz) is mixed by the 1 mHz resolution frequency (F_R + RF: 480.01 MHz to 780 MHz) to output the LO frequency (RF + IF). The LO frequency is applied to the receivers.

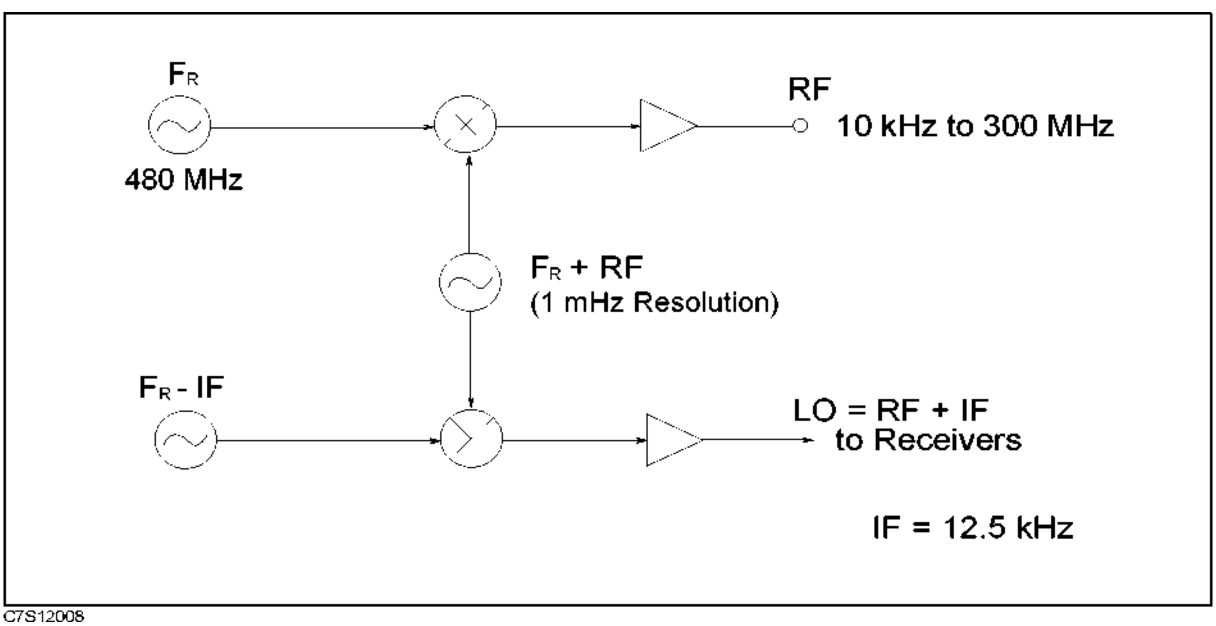


Figure 13-4. Source Group Simplified Block Diagram

Receiver Theory

The receiver functional group consists of the following assemblies.

- A26R Input-R Receiver (Opt.200/300/400)
- A26A Input-A Receiver (Opt.100/200/300/400)
- A26B Input-B Receiver (Opt.300/400)
- A26C Input-C Receiver (Opt.400)

A26R/A/B/C Receiver

The A26R, A26A, A26B, and A26C assemblies are identical assemblies. They down-convert the RF input signal to a 12.5 kHz IF, with amplitude and phase corresponding to the RF input. The IF signal is converted to the digital signal using the Analog-to-Digtal Converter. After that, the digtal signal goes to the A3 DSP Assembly through the analog data bus.

Input Attenuator

Each assembly has the input attenuator (0 dB/25 dB) which can be set using (System) MORE ATTENUATOR.

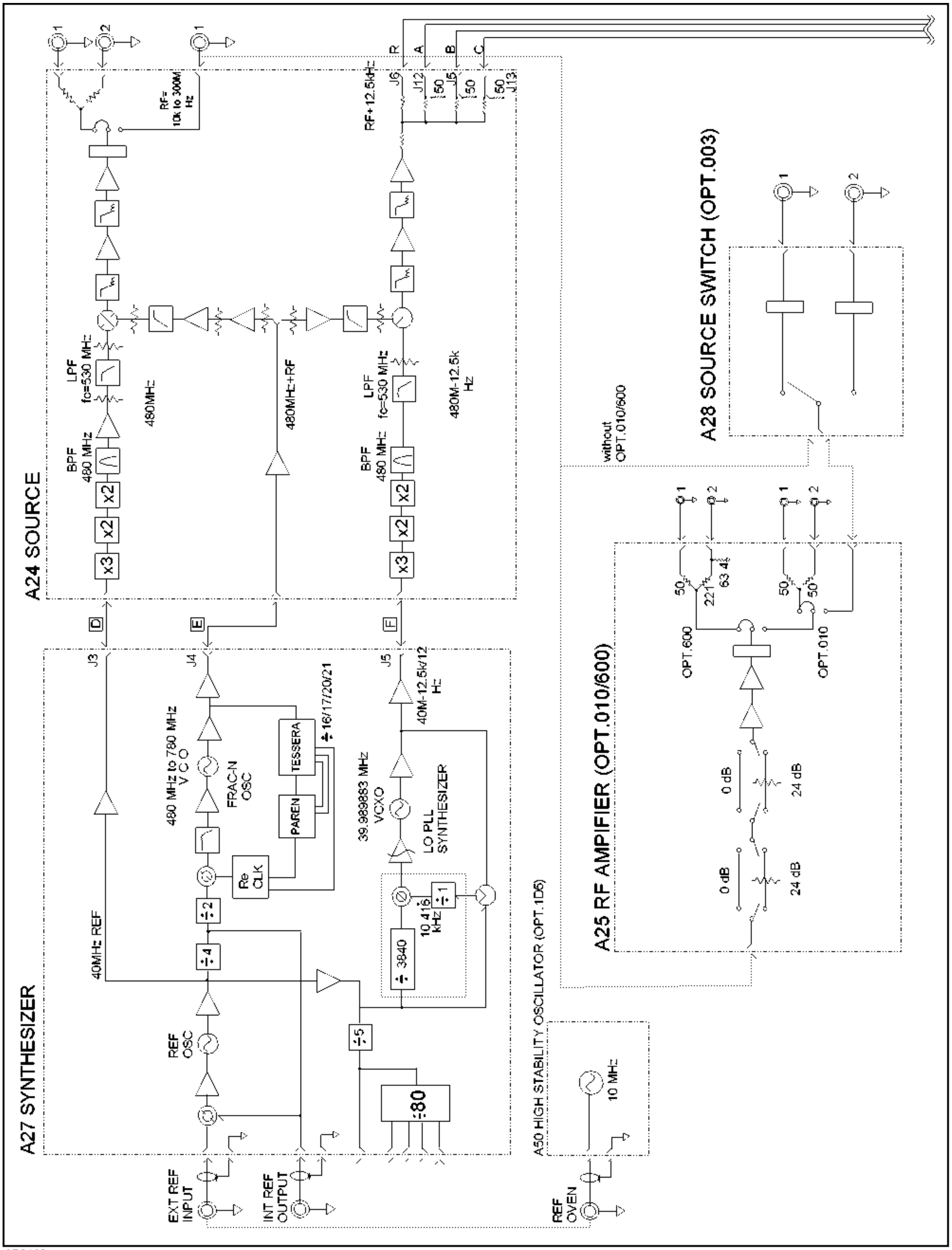


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Figure 13-5. Source Section Block Diagram

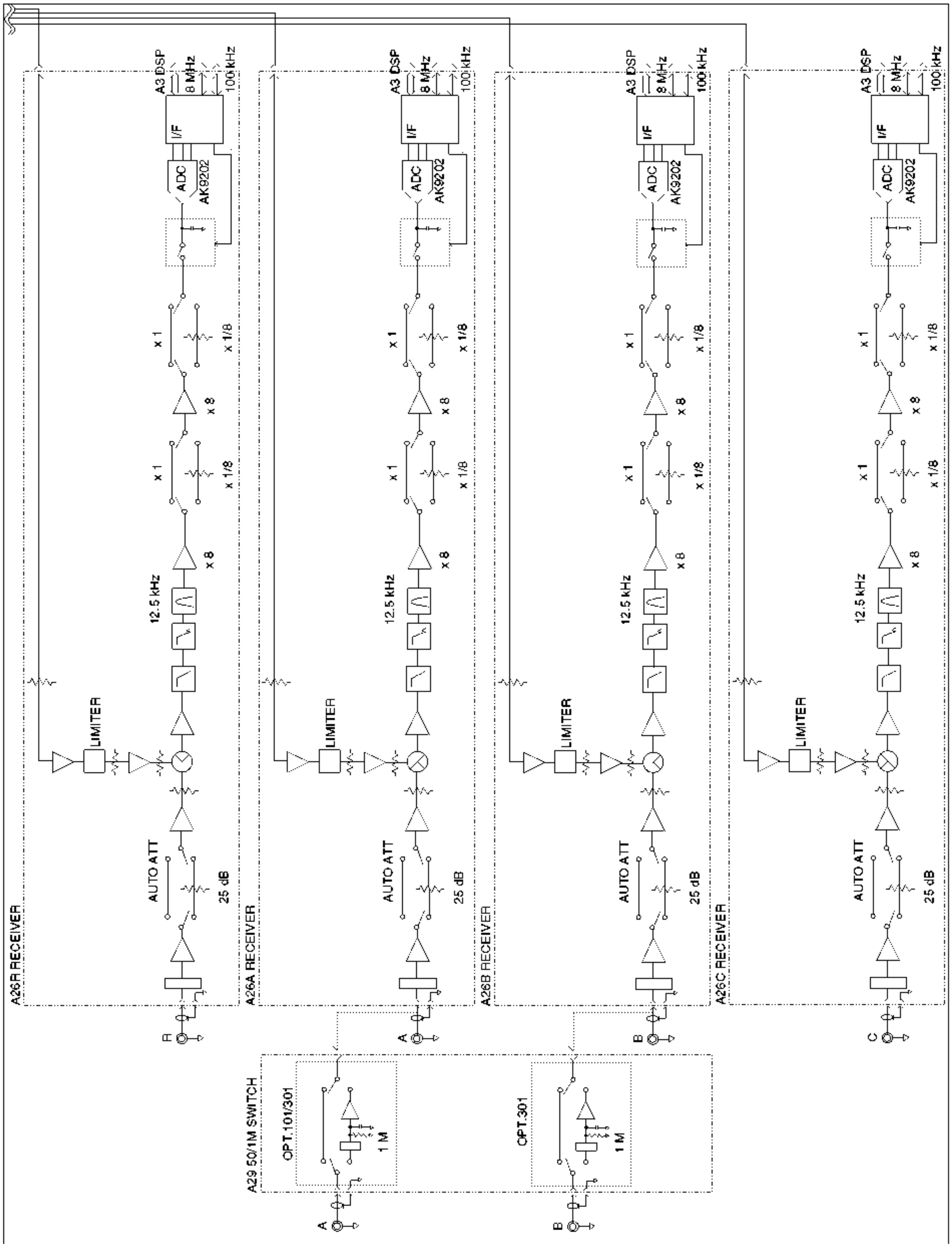

Figure 13-6. Receiver Section Block Diagram

chapter> Replaceable Parts

Introduction

This chapter contains information for ordering replaceable parts. Analyzer 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 13-1. 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 CO CORPORATE 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 13-2. 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 13-3. 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

Assemblies in Main Board Slots

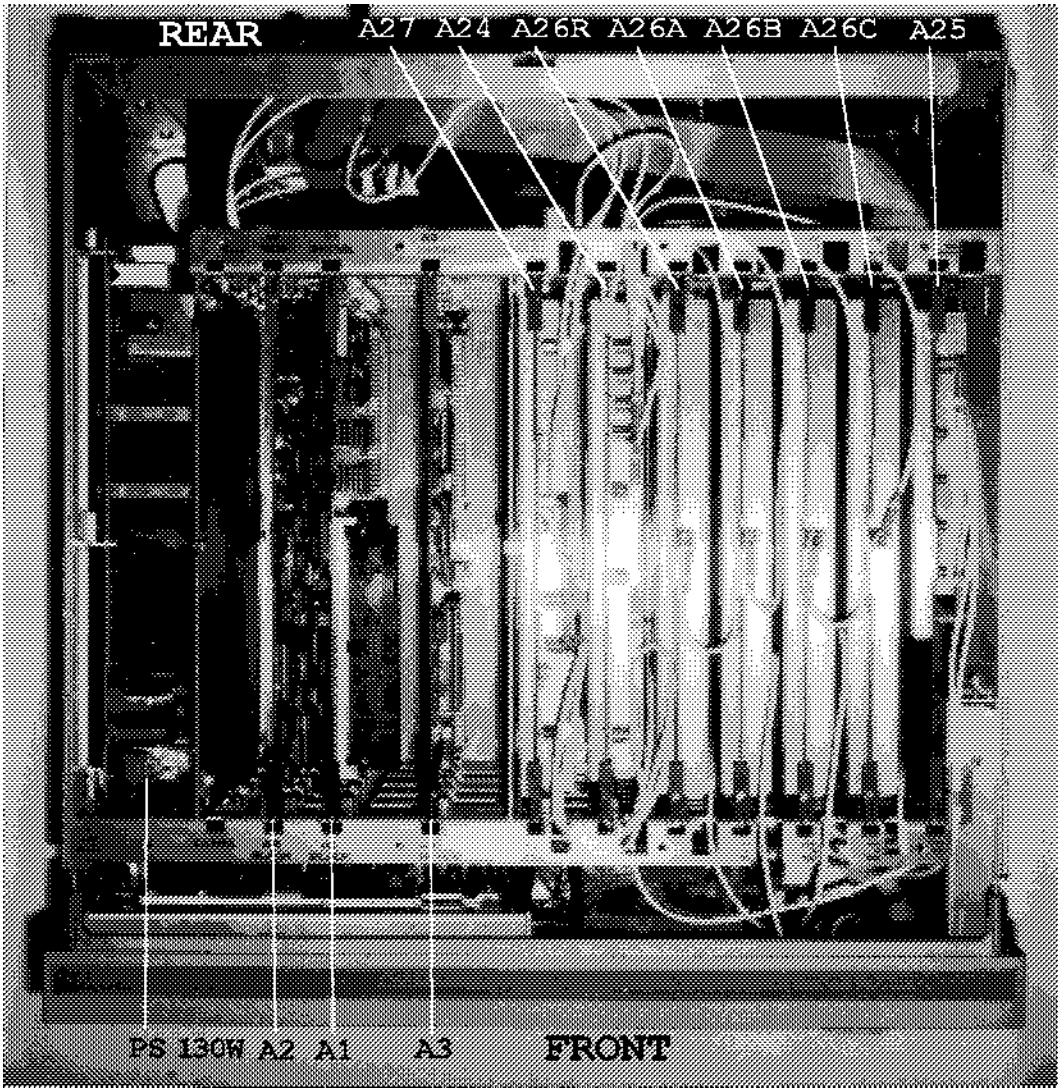

Figure 13-7. Assemblies in Main Board Slots

Assemblies in Main Board Slots

Table 13-4. Assemblies in Main Board Slots

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1	E5100-66511	0	1	CPU WITHOUT SIMM CARD	28480	E5100-66511
	1818-5623	9	1	SIMM CARD	28480	1818-5623
A2	E5100-66502	9	1	PERIPHERAL (FOR MONOCHROME LCD)	28480	E5100-66502
	E5000-66502	9	1	PERIPHERAL (FOR COLOR LCD)	28480	E5000-66502
A3	E5100-66593	8	1	DSP[1]	28480	E5100-66593
A24	E5100-66524	5	1	SOURCE	28480	E5100-66524
A25	E5100-66525	6	1	RF AMPLIFIER (Opt.010/600)	28480	E5100-66525
A26R	E5100-66526	7	1	RECEIVER (Port R)	28480	E5100-66526
A26A	E5100-66526	7	1	RECEIVER (Port A)	28480	E5100-66526
A26B	E5100-66526	7	1	RECEIVER (Port B)	28480	E5100-66526
A26C	E5100-66526	7	1	RECEIVER (Port C)	28480	E5100-66526
A27	E5100-66537	0	1	SYNTHESIZER	28480	E5100-69537
PS 130W	See Table 13-5		1	POWER SUPPLY 130W	28480	

1 The old A3 DSP board (Agilent P/N E5100-66513) was replaced with this new board. This new board can be used for any E5100A/B.

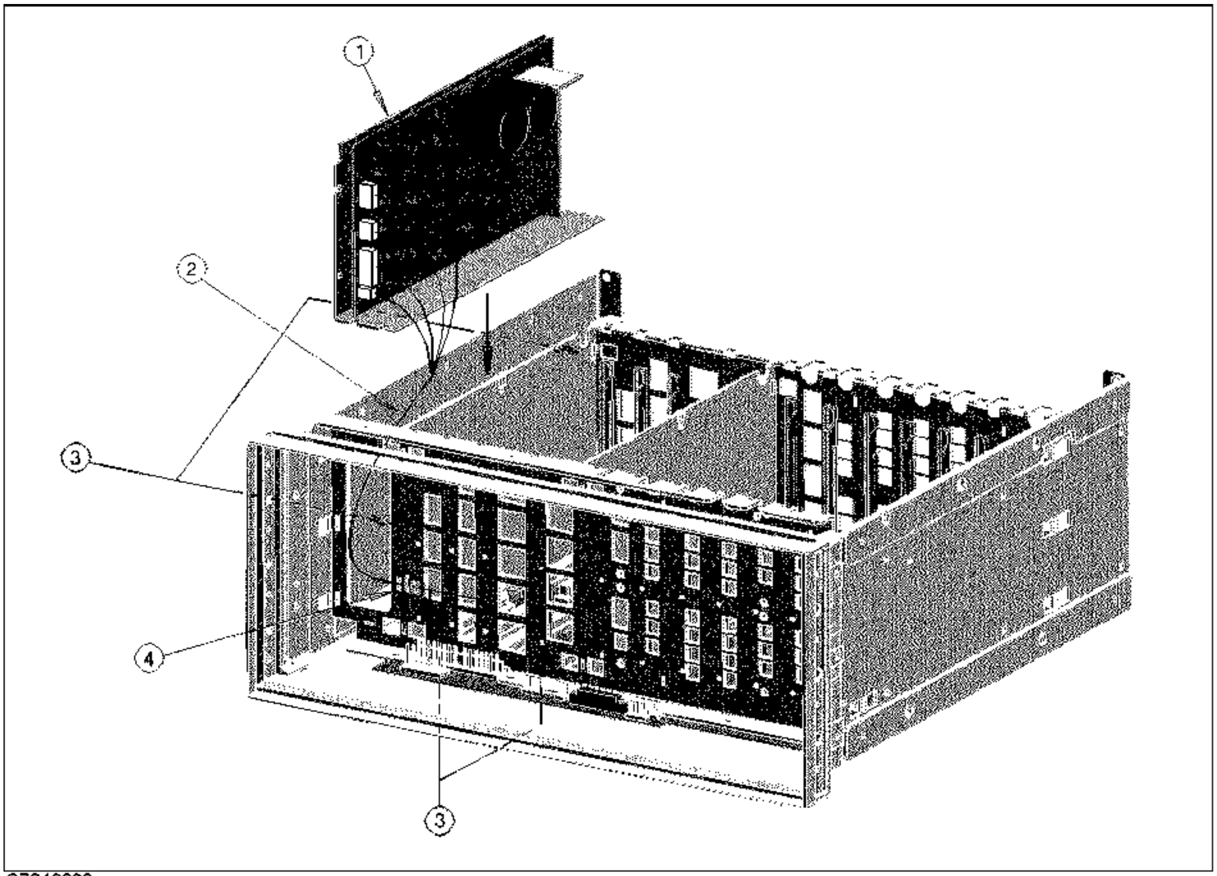

Figure 13-8. PS 130W Power Supply Assembly

Table 13-5. PS 130W Power Supply Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-65002	2	1	PS 130W POWER SUPPLY	28480	E5100-65002
2	E5100-61632	6	1	WIRE ASSY LWQ130	28480	E5100-61632
3	0515-2079	0	4	SCR M4X8	28480	0515-2079
4	1400-1391	5	1	CLAMP CABLE	28480	1400-1391

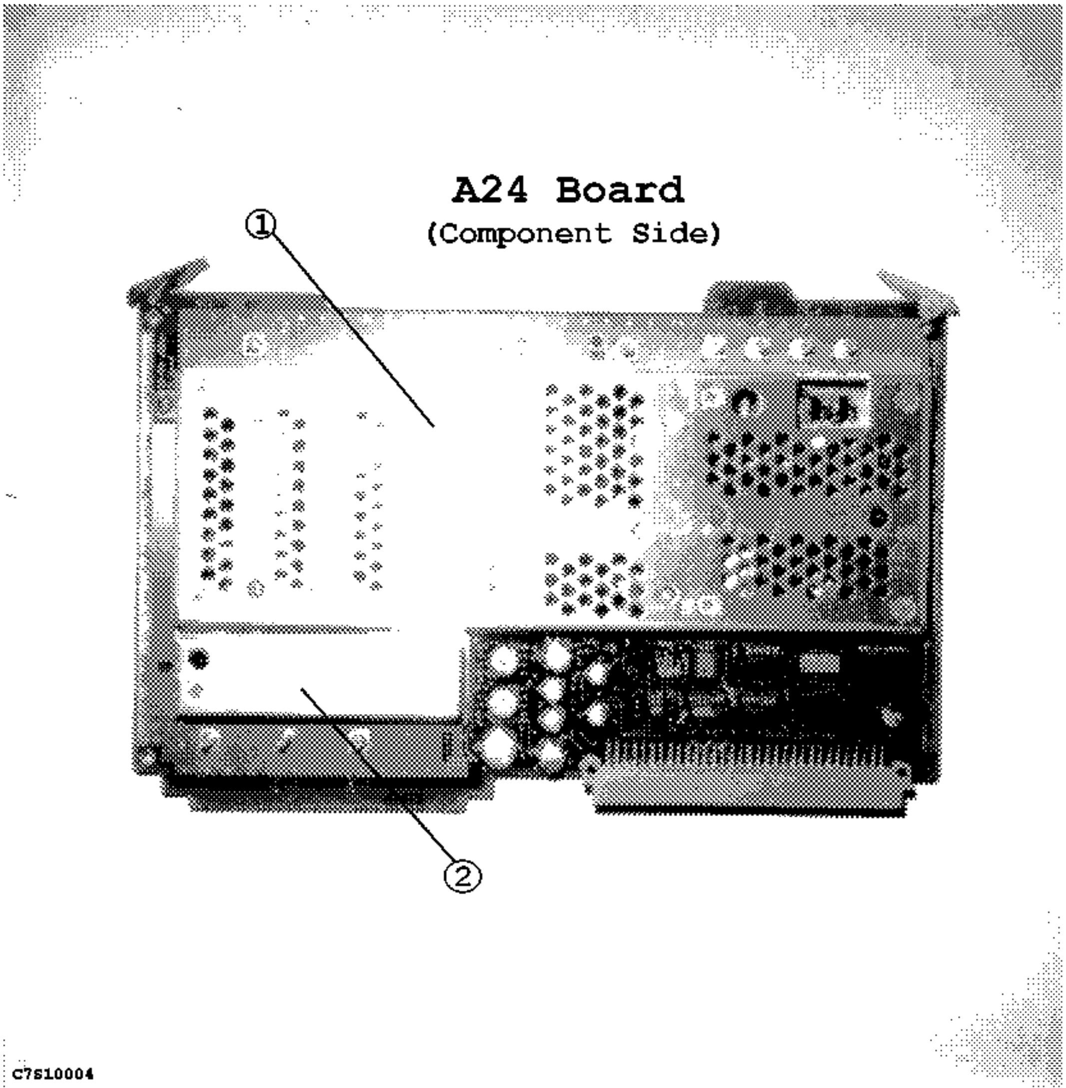

Figure 13-9. A24 Board Shield Case

Table 13-6. A24 Board Shield Case

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-00632	8	1	SHIELD CASE ON COMPONENT SIDE	28480	E5100-00632
	E5100-00633	9	1	SHIELD CASE ON CIRCUIT SIDE	28480	E5100-00633
2	E5100-00652	2	1	SHIELD CASE ON COMPONENT SIDE	28480	E5100-00652
	E5100-00653	3	1	SHIELD CASE ON CIRCUIT SIDE	28480	E5100-00653

Note

The A24 board assembly (Agilent P/N E5100-66524) is furnished with the shield cases shown in Table 13-6. Order these parts when you replace shield cases only.

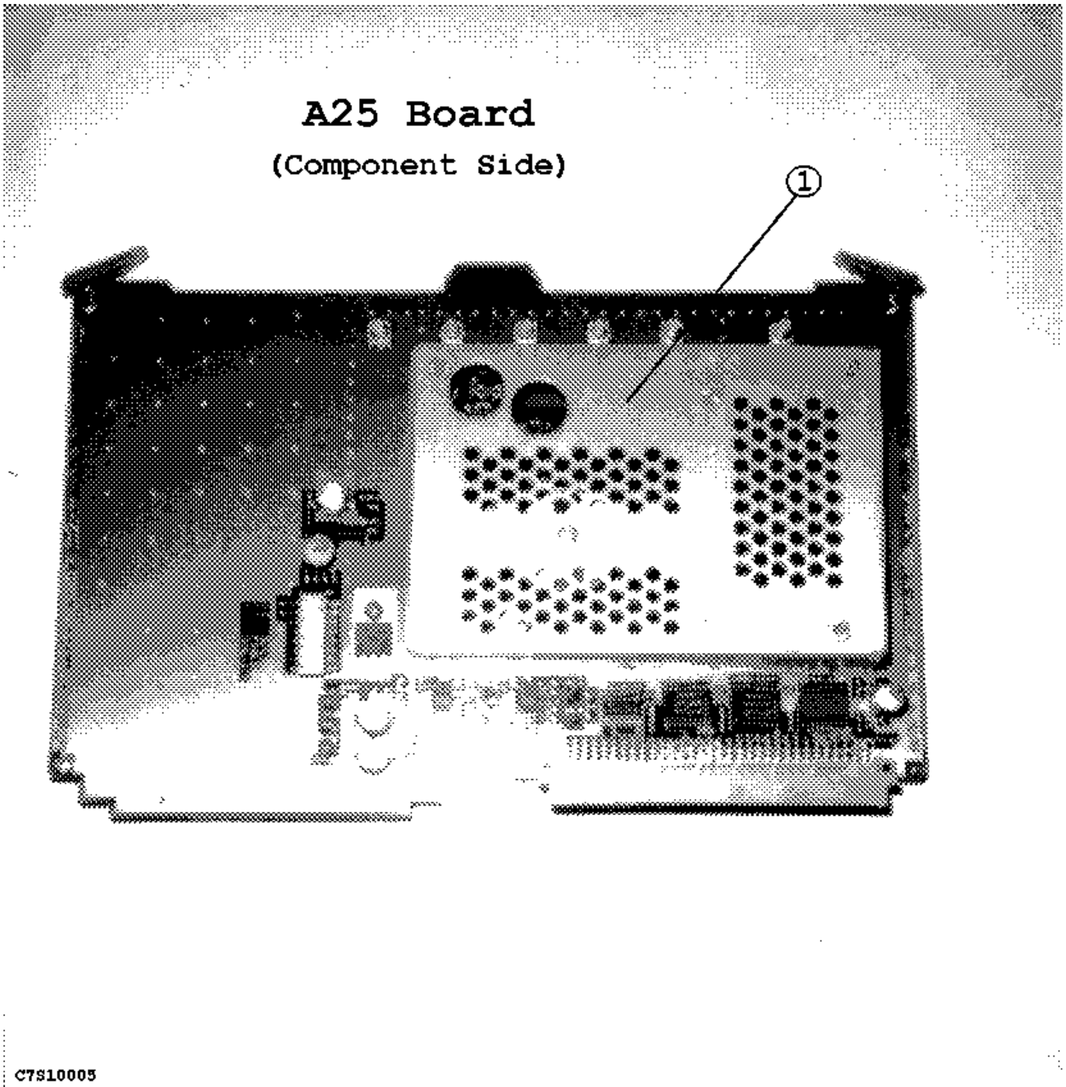

Figure 13-10. A25 Board Shield Case

Table 13-7. A25 Board Shield Case

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-00637	3	1	SHIELD CASE ON COMPONENT SIDE	28480	E5100-00637
	E5100-00657	7	1	SHIELD CASE ON CIRCUIT SIDE	28480	E5100-00657

Note

The A25 board assembly (Agilent P/N E5100-66525) is furnished with the shield cases shown in Table 13-7. Order these parts when you replace shield cases only.

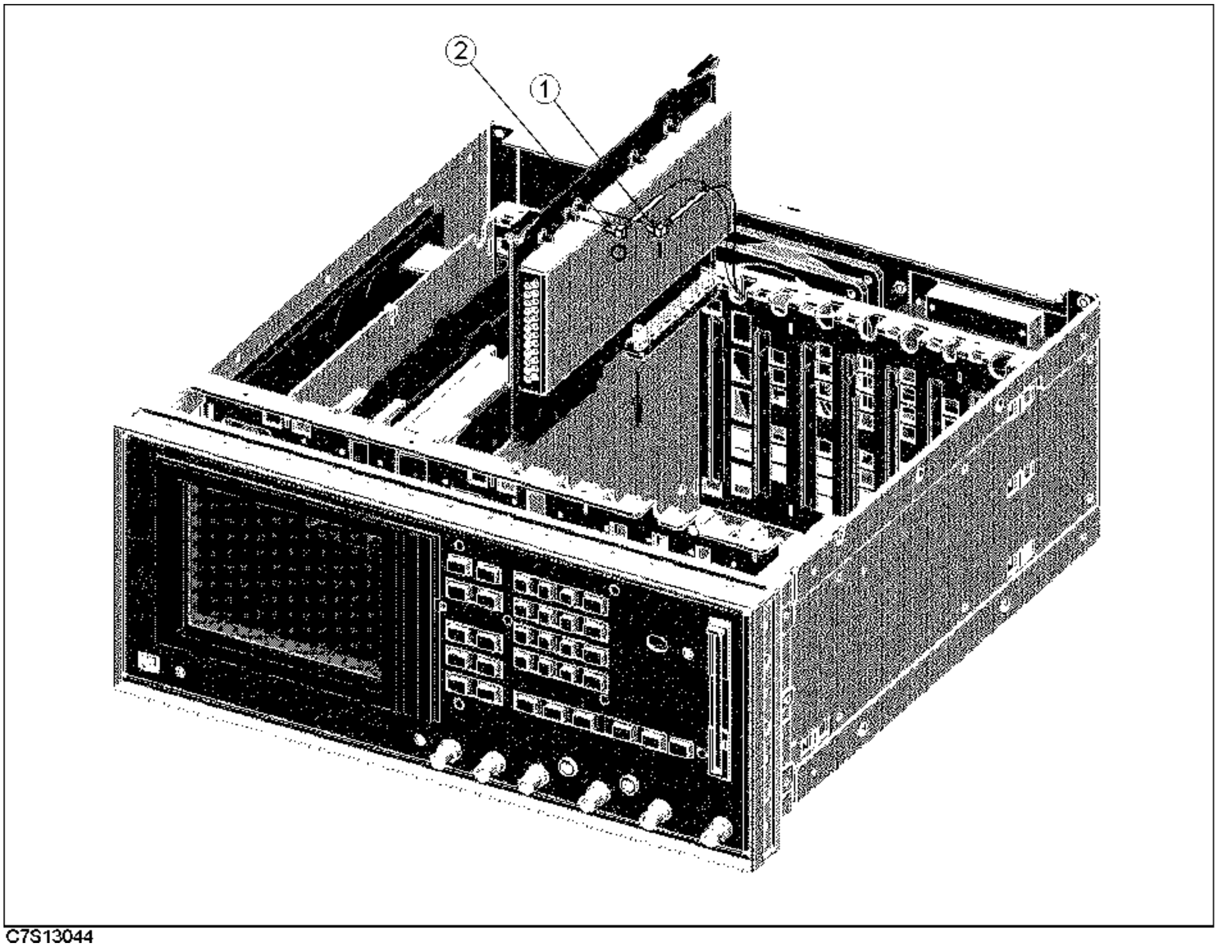

Figure 13-11. RF Cables (A27 to Rear Assembly)

Table 13-8. RF Cables (A27 to Rear Assembly)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61607	5	1	RF CABLE I[1]	28480	E5100-61607
2	E5100-61608	6	1	RF CABLE O[2]	28480	E5100-61608

1 A27J2(I) to EXT REF INPUT (rear assembly). See Figure 13-46

2 A27J1(O) to INT REF OUTPUT (rear assembly). See Figure 13-46

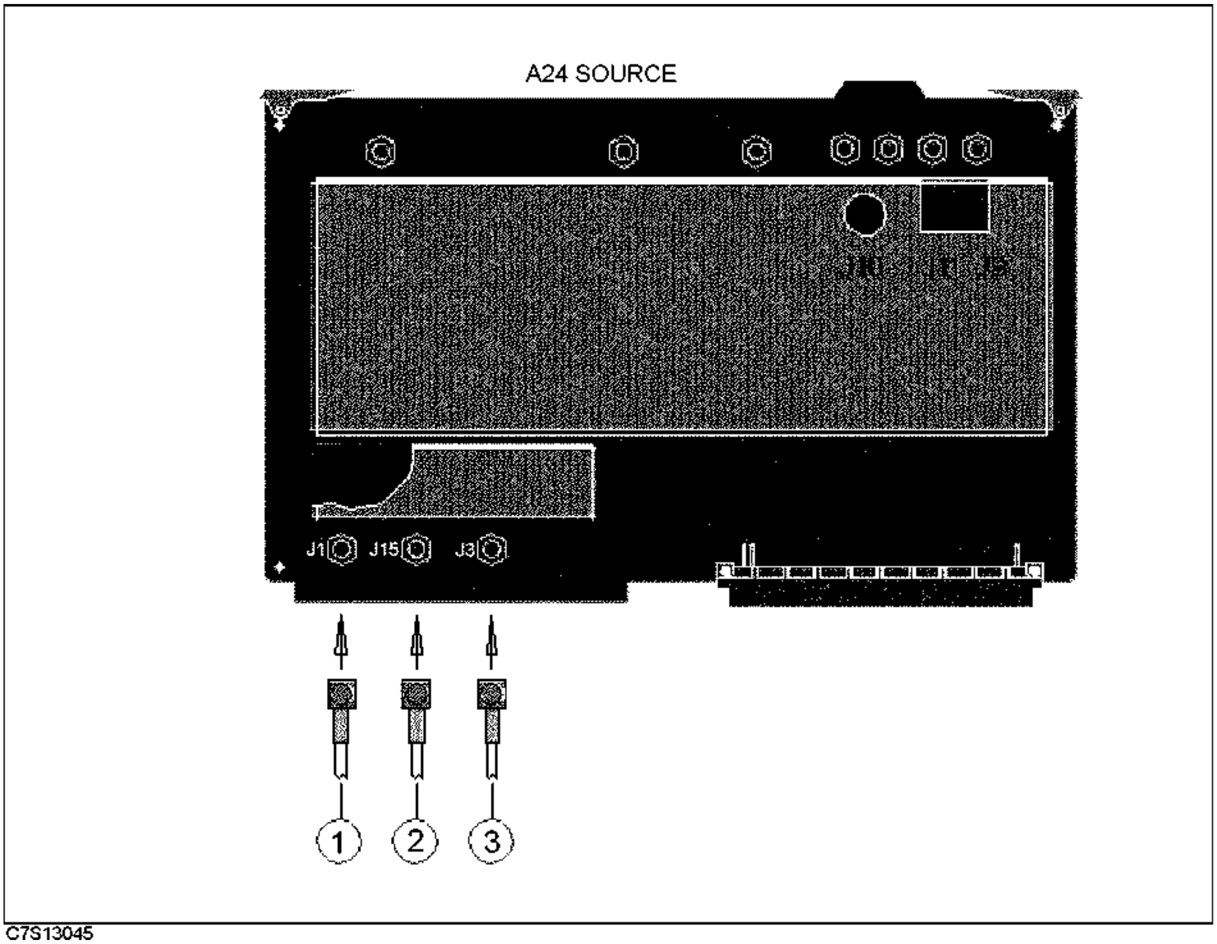

Figure 13-12. RF Cables (A24 to RF OUT 1/RF OUT 2/A25/A28)

Table 13-9. RF Cables (A24 to RF OUT 1/RF OUT 2/A25/A28)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61605	3	1	RF CABLE 1 (Opt.002 without 010)[1]	28480	E5100-61605
2	E5100-61606	4	1	RF CABLE 2 (Opt.002 without 010)[2]	28480	E5100-61606
3	E5100-61610	0	1	RF CABLE 1 (Opt.001 without 010)[3]	28480	E5100-61610
	E5100-61618	8	1	RF CABLE S (Opt.003 without 010)[4]	28480	E5100-61618
	E5100-61621	3	1	RF CABLE S (Opt.010 or 600)[5]	28480	E5100-61621

1 A24J1(1) to RF OUT 1 (front assembly). See Table 13-17.

2 A24J15(2) to RF OUT 2 (front assembly). See Table 13-18.

3 A24J3(S) to RF OUT 1 (front assembly). See Table 13-17

4 A24J3(S) to A28J1. See Figure 13-38.

5 A24J3(S) to A25J1(P). See Figure 13-14.

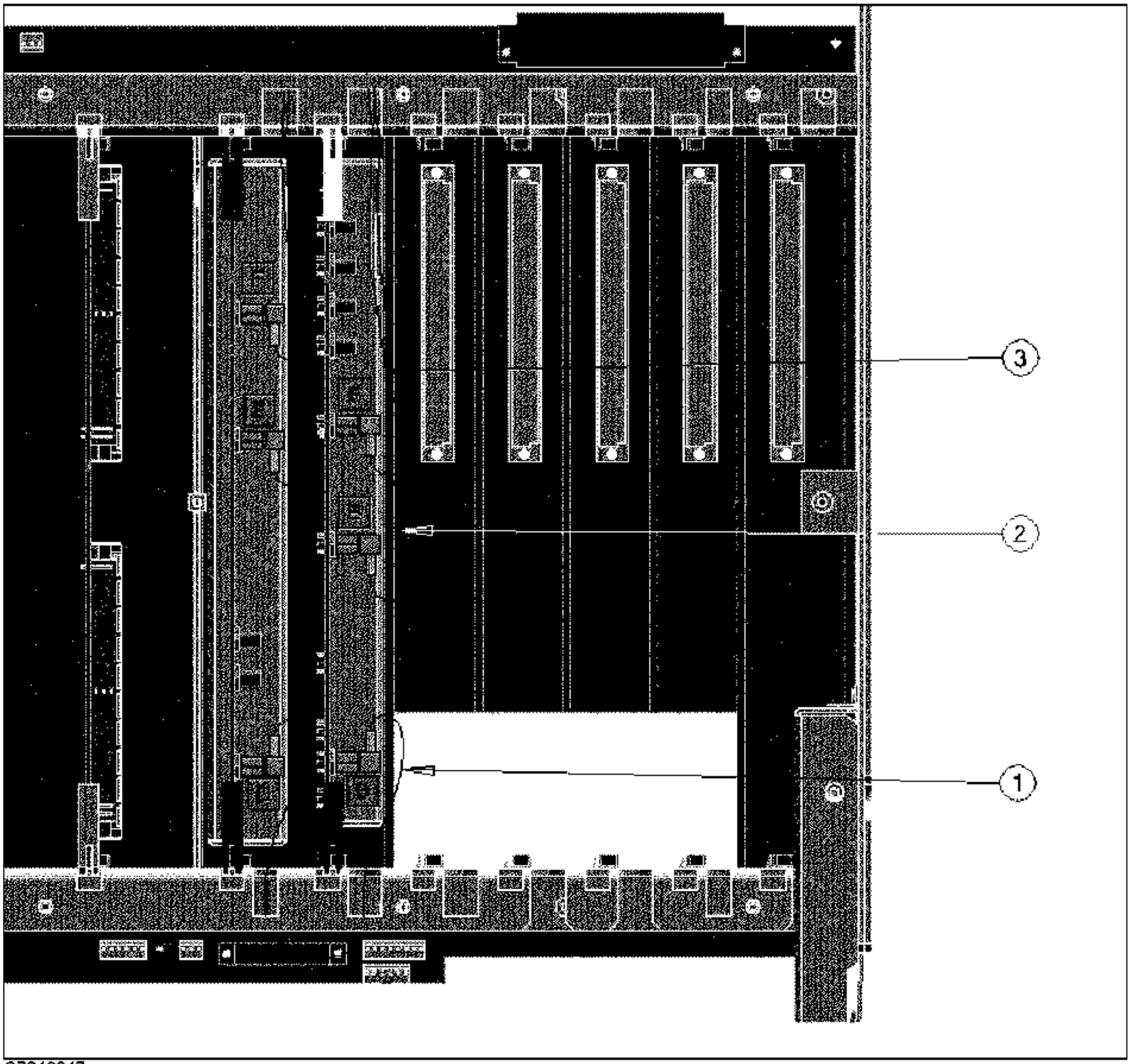

Figure 13-13. RF Cables (A27 to A24)

Table 13-10. RF Cables (A27 to A24)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61615	5	1	RF CBL ASSY D[1]	28480	E5100-61615
2	E5100-61616	6	1	RF CBL ASSY E[2]	28480	E5100-61616
3	E5100-61617	7	1	RF CBL ASSY F[3]	28480	E5100-61617

1 A27J3(D) to A24J16(D).

2 A27J4(E) to A24J7(E).

3 A27J5(F) to A24J8(F).

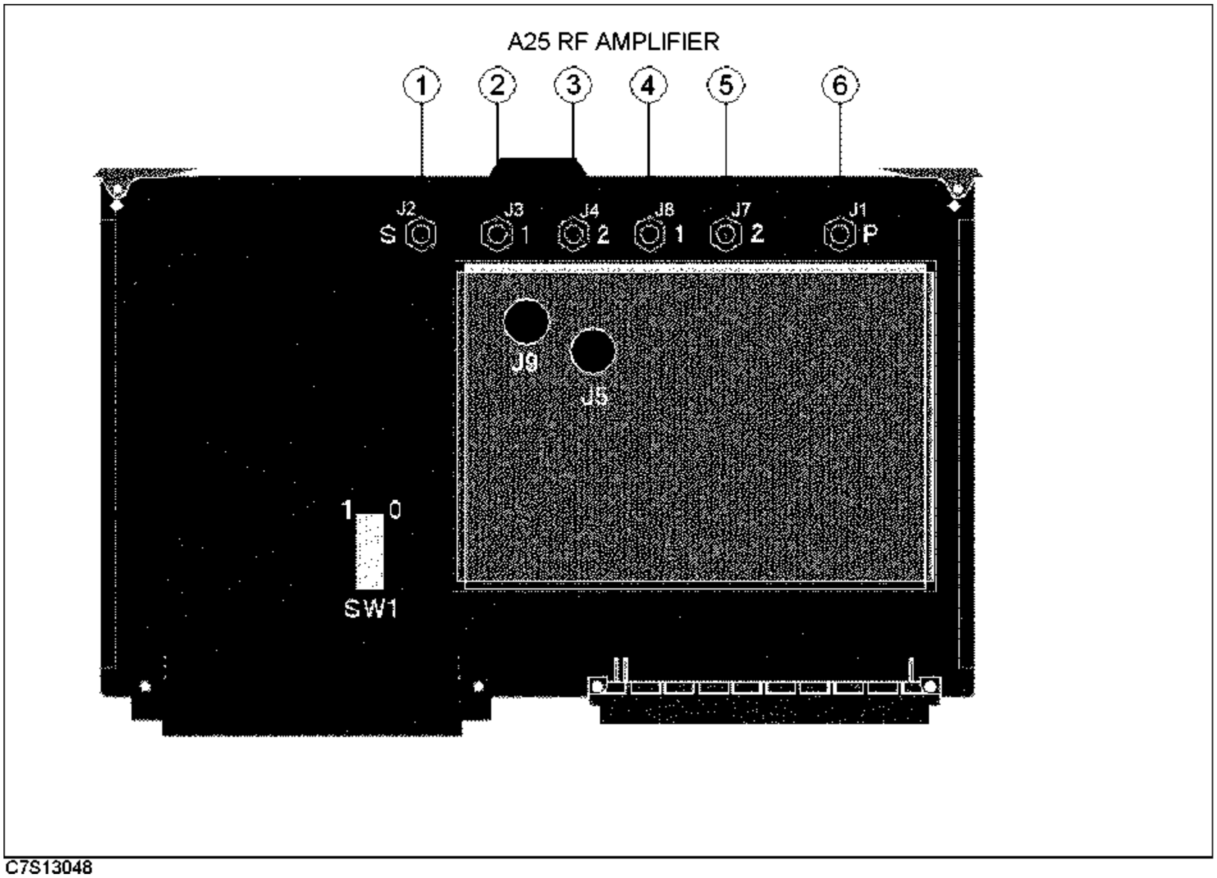

Figure 13-14. RF Cables (A25 to RF OUT 1/RF OUT 2/A24/A28)

Table 13-11. RF Cables (A25 to RF OUT 1/RF OUT 2/A24/A28)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61610	0	1	RF CABLE 1 (Opt.001 with 010)[1]	28480	E5100-61610
	E5100-61618	8	1	RF CABLE S (Opt.003 with 010)[2]	28480	E5100-61618
2	E5100-61619	9	1	RF CABLE 1 (Opt.002 with 010)[3]	28480	E5100-61619
3	E5100-61620	2	1	RF CABLE 2 (Opt.002 with 010)[4]	28480	E5100-61620
4	E5100-61605	3	1	RF CABLE 1 (Opt.600)[5]	28480	E5100-61605
5	E5100-61606	4	1	RF CABLE 2 (Opt.600)[6]	28480	E5100-61606
6	E5100-61621	3	1	RF CABLE S (Opt.010 or 600)[7]	28480	E5100-61621

1 A25J2(S) to RF OUT 1 (front assembly). See Table 13-17.

2 A25J2(S) to A28J1. See Figure 13-38.

3 A25J3(1) to RF OUT 1 (front assembly). See Table 13-17.

4 A25J4(2) to RF OUT 2 (front assembly). See Table 13-18.

5 A25J8(1) to RF OUT 1 (front assembly). See Table 13-17.

6 A25J7(2) to RF OUT 2 (front assembly). See Table 13-18.

7 A25J1(P) to A24J3(S). See Figure 13-12.

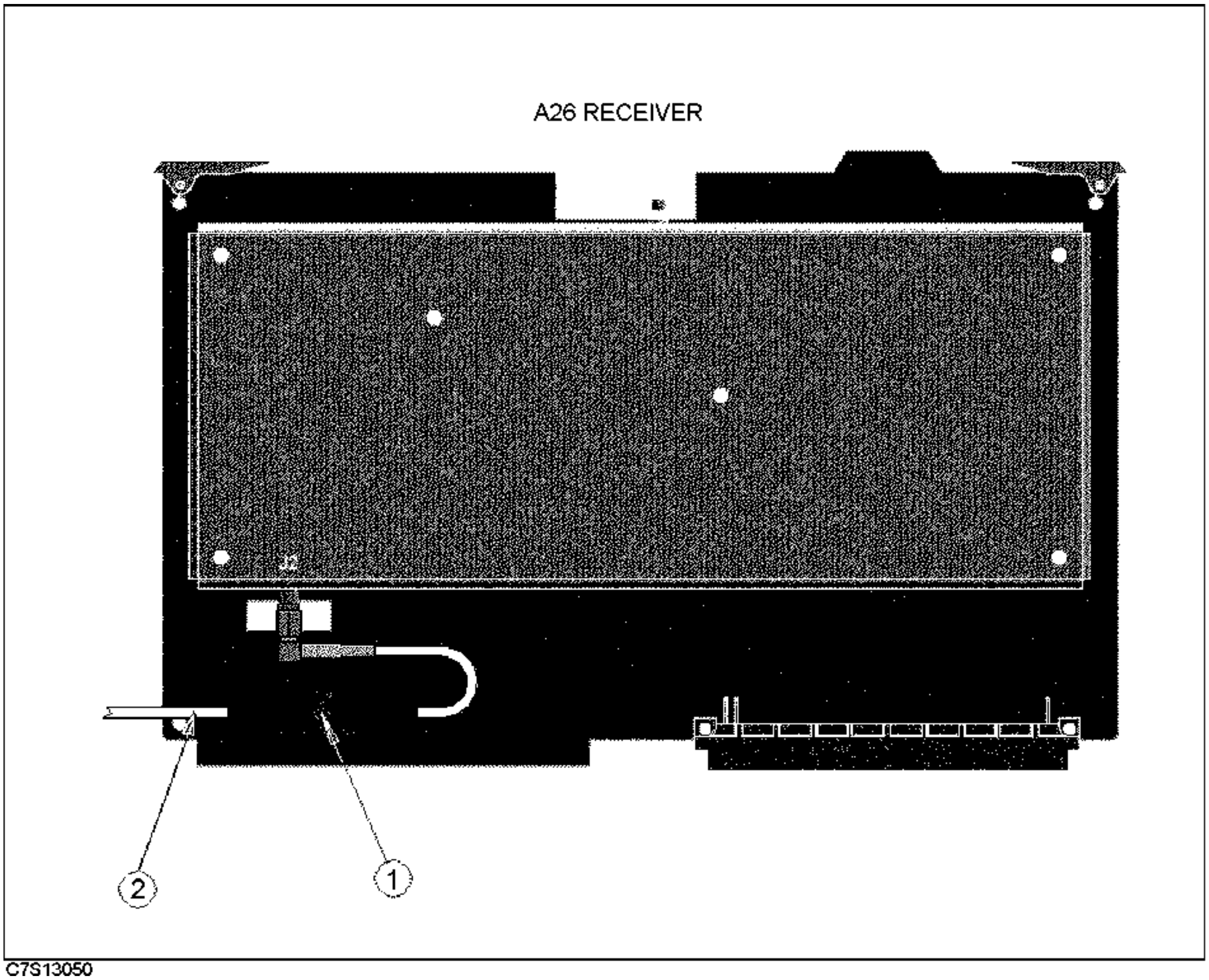

Figure 13-15. RF Cables (A26R/A/B/C to Port R/A/B/C or A29)

Table 13-12. RF Cables (A26R/A/B/C to Port R/A/B/C or A29)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	1400-1334	6	1	CLAMP CABLE	28480	1400-1334
2	See Table 13-21 to Table 13-24		1	RF CABLE R/A/B/C[1]	28480	
	E5100-61628	0	1	RF CABLE A (Opt.101 or 301)[2]	28480	E5100-61628
	E5100-61629	1	1	RF CABLE B (Opt.301)[3]	28480	E5100-61629

1 A26J2 to Port R/A/B/C.

2 A26AJ2 to A29J1.

3 A26BJ2 to A29J4.

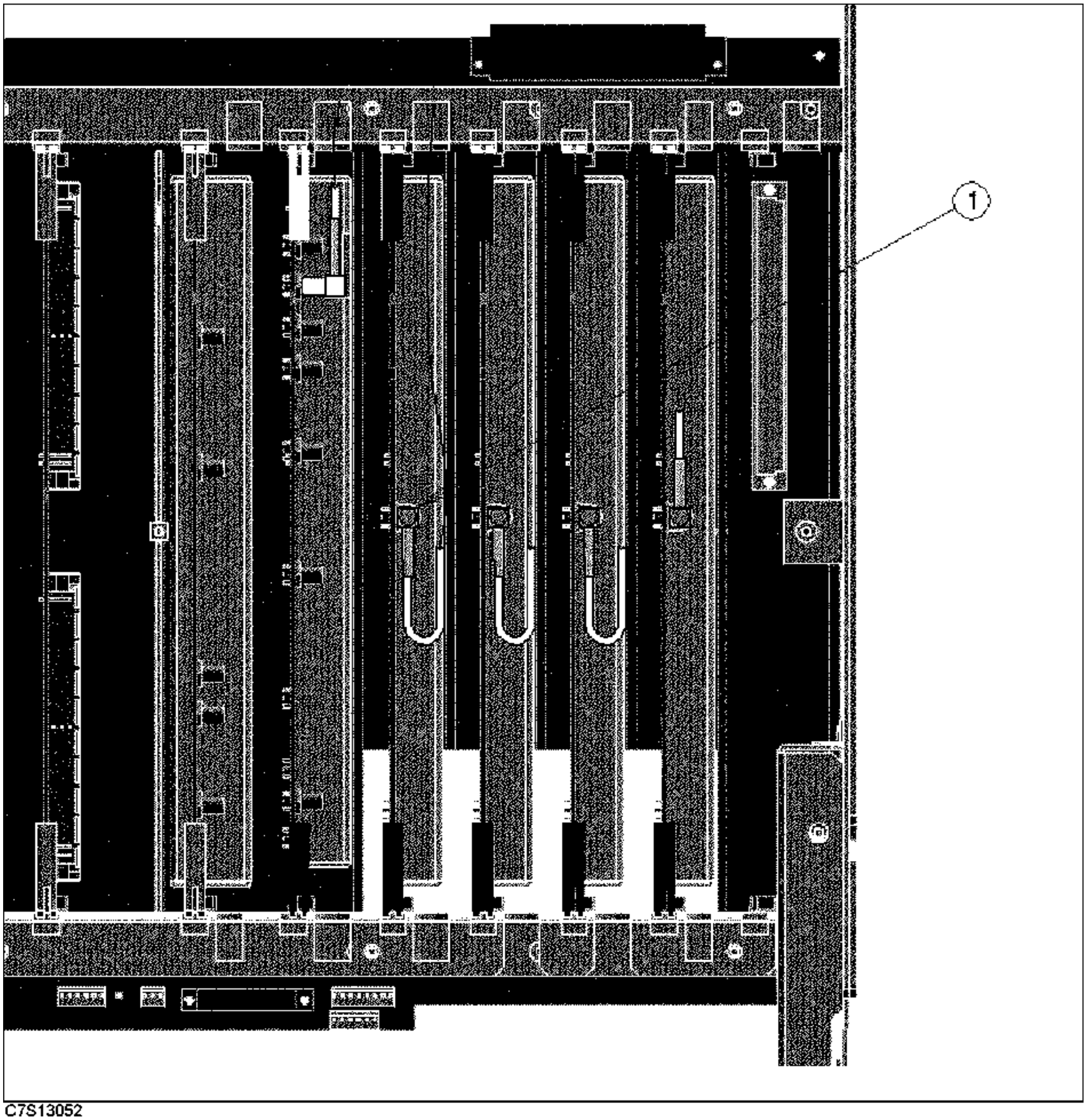

Figure 13-16. RF Cables (A24 to A26)

Table 13-13. RF Cables (A24 to A26)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61611	1	1[1]	RF CABLE ASSY LO[2]	28480	E5100-61611

1 For each receiver.

2 A24J6(R) to A26R, A24J12(A) to A26A, A24J5(B) to A26B, and A24J13(C) to A26C.

Bottom Assemblies

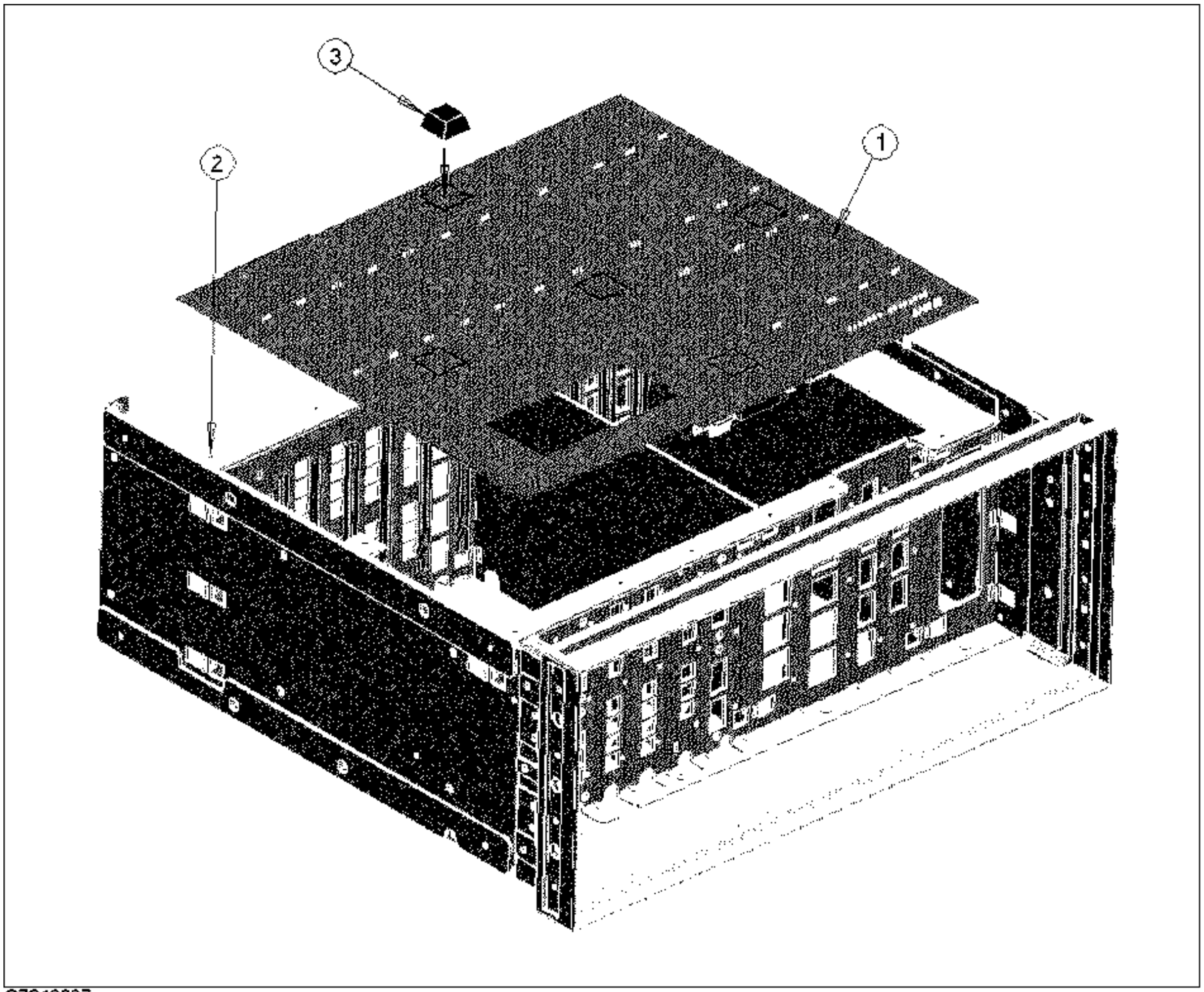

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Figure 13-17. A20 Mother Board

Table 13-14. A20 Mother Board

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-66520	1	1	MOTHERBOARD[1]	28480	E5100-66520
2	0515-1550	0	15	SCR M3-L 8 P-H	28480	0515-1550
3	0403-0424	8	5	CUSHION 20.6X7.6	28480	0403-0424

1 When you replace the A20 Motherbouard, replace the cushions (Agilent P/N 0403-0424) at the same time.

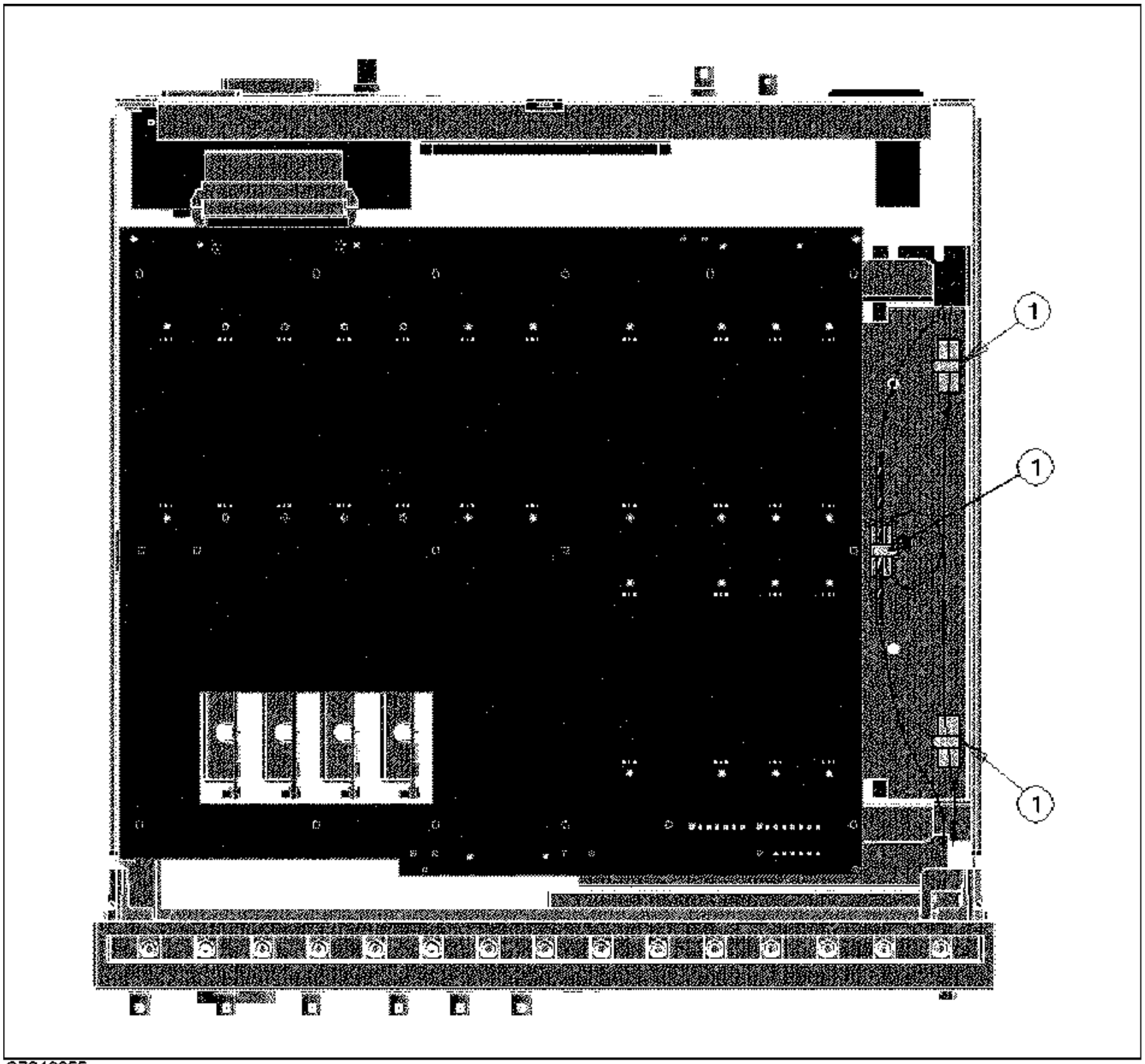

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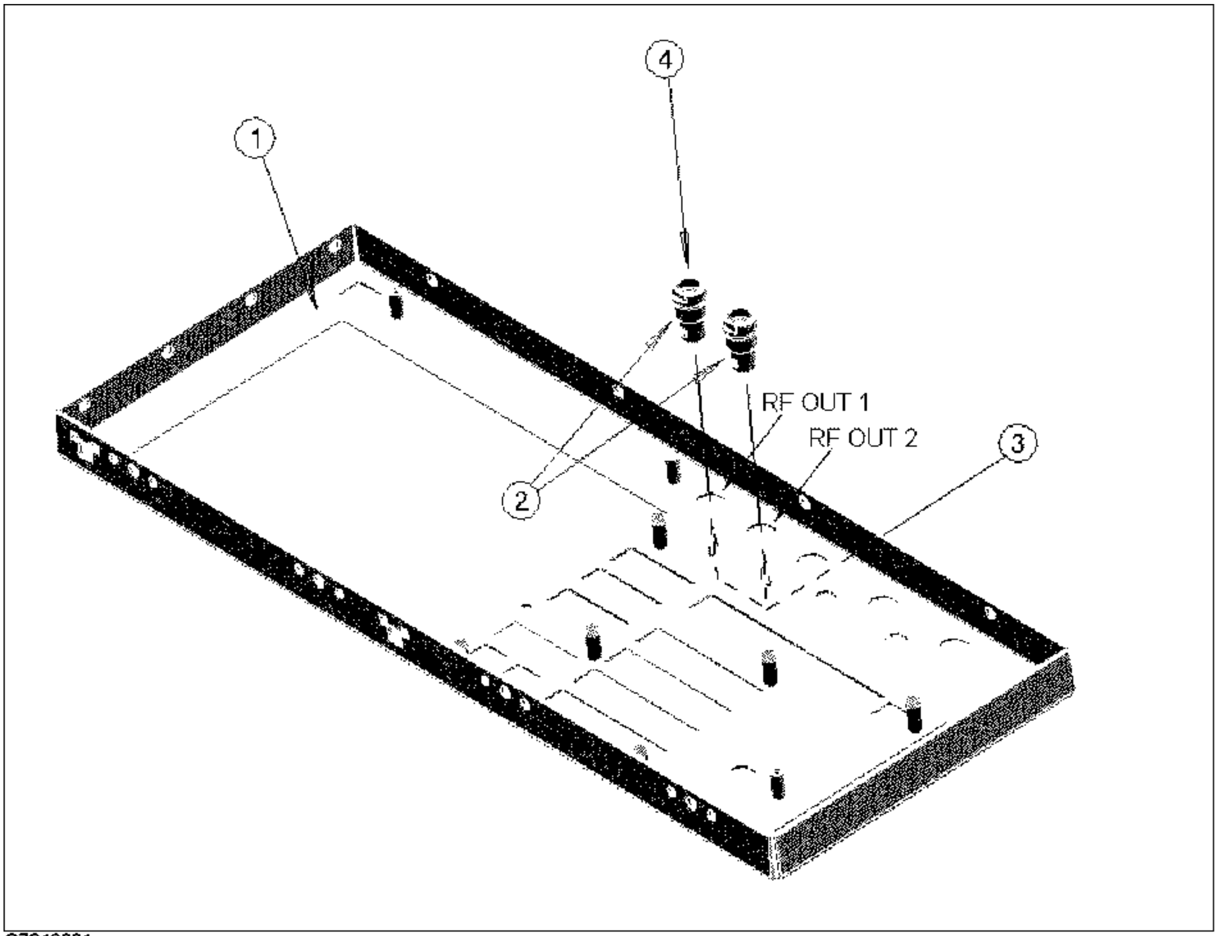
Figure 13-18. Power Supply Cable Clamps

Table 13-15. Power Supply Cable Clamps

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	1400-1334	6	3	CLAMP CABLE	28480	1400-1334

Front Assemblies



C7S13001

Figure 13-19. Front Sub Panel and RF OUT Connector Assemblies

Table 13-16. Front Sub Panel and RF OUT Connector Assemblies

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-00202	8	1	PANEL SUB	28480	E5100-00202
	E5100-00212	0	1	PANEL SUB (Opt.102/302/510)	28480	E5100-00212
2	1250-0252	6	2[1]	CONN-RF BNC	28480	1250-0252
3	2190-0102	8	2[1]	WSHR-LK INTL T	28480	2190-0102
	2950-0035	8	2[1]	NUT-HEX-DBL-CHAM	28480	2950-0035

1 One for Option 001.

Table 13-17. RF Cable for RF OUT 1

Ref. Desig.	Agilent Part Number	C D	Qty.	For Option:		Mfr Code	Mfr Part Number
				Installed	Not Installed		
4	E5100-61610[1]	0	1	001		28480	E5100-61610
	E5100-61605[2]	3	1	002	010	28480	E5100-61605
	E5100-61619[3]	9	1	002, 010		28480	E5100-61619
	E5100-61624[4]	6	1	003		28480	E5100-61624
	E5100-61605[5]	3	1	600		28480	E5100-61605

1 RF OUT 1 to A24J3(S) or A25J2(S) (Opt.010). See Figure 13-12 or Figure 13-14.

2 RF OUT 1 to A24J1(1). See Figure 13-12.

3 RF OUT 1 to A25J3(1). See Figure 13-14.

4 RF OUT 1 to A28J2(1). See Figure 13-38.

5 RF OUT 1 to A25J8(1). See Figure 13-14.

Table 13-18. RF Cable for RF OUT 2

Ref. Desig.	Agilent Part Number	C D	Qty.	For Option:		Mfr Code	Mfr Part Number
				Installed	Not Installed		
4	E5100-61606[1]	4	1	002	010	28480	E5100-61606
	E5100-61620[2]	2	1	002, 010		28480	E5100-61620
	E5100-61625[3]	7	1	003		28480	E5100-61625
	E5100-61606[4]	4	1	600		28480	E5100-61606

1 RF OUT 2 to A24J15(2). See Figure 13-12.

2 RF OUT 2 to A25J4(2). See Figure 13-14.

3 RF OUT 2 to A28J3(2). See Figure 13-38.

4 RF OUT 2 to A25J7(2). See Figure 13-14.

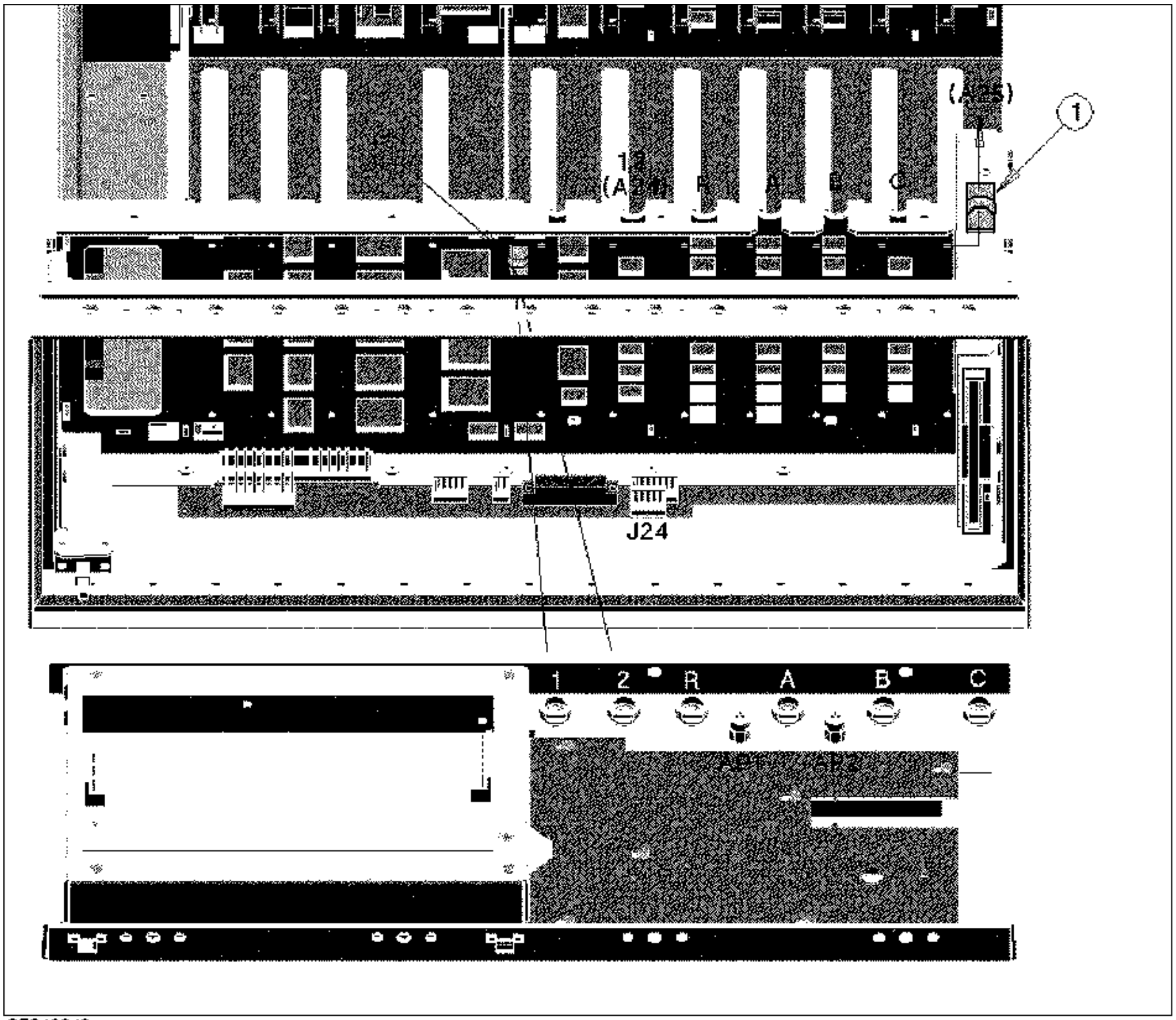


Figure 13-20. RF OUT Cable Clamps (Opt.010 or 600)

Table 13-19. RF OUT Cable Clamps (Opt.010 or 600)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	1400-1334	6	2	CLAMP CABLE[1]	28480	1400-1334

1 If Option 010 or 600 is installed, use those cable clamps.

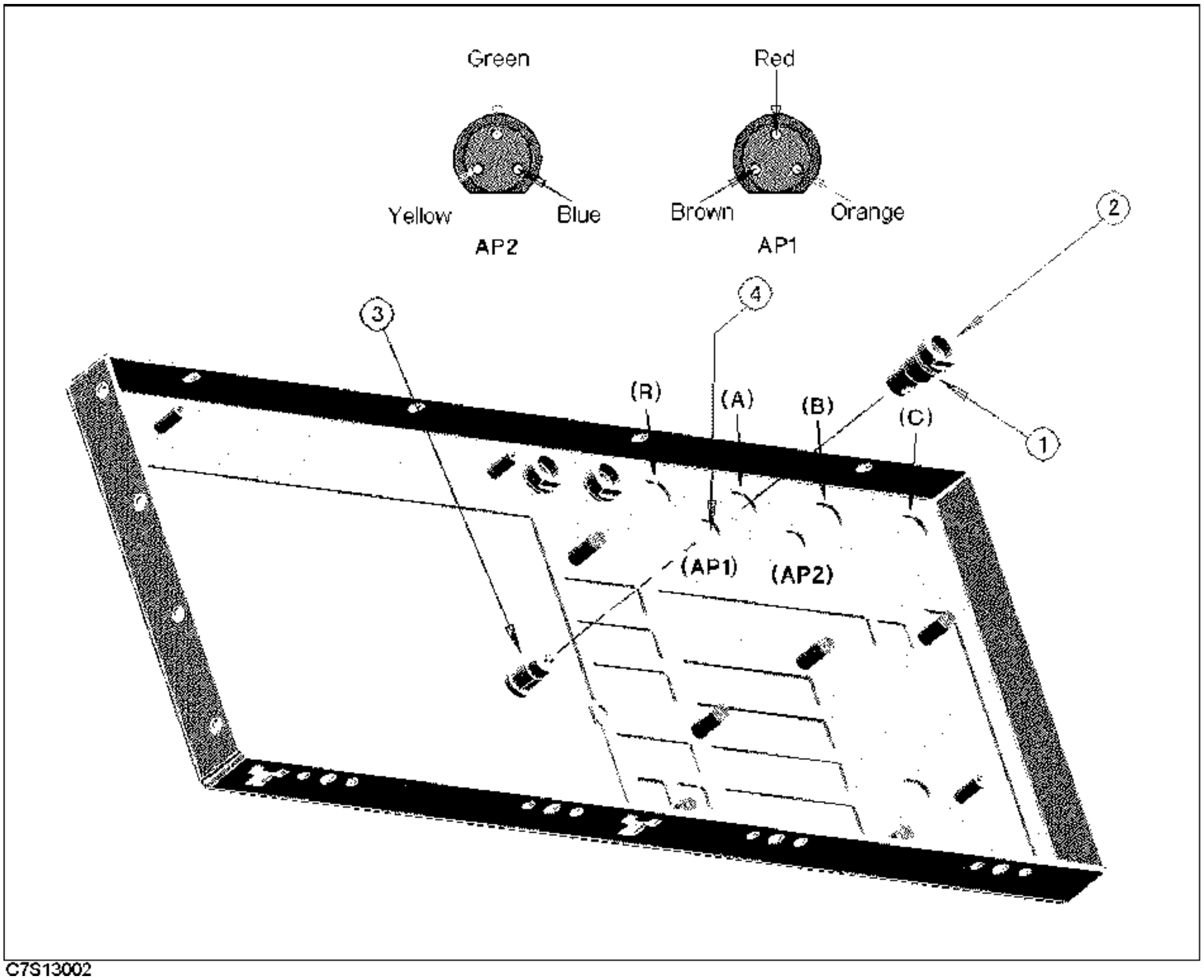


Figure 13-21. Input Port and Probe Power Connector Assemblies

Table 13-20. Input Port Connectors

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	1250-0252	6	1	CONNECTOR-RF (BNC)[1]	28480	1250-0252
	2190-0102	8	1	WSHR-LK INTLT (BNC)[1]	28480	2190-0102
	2950-0035	8	1	NUT-HEX-DBL-CHAM (BNC)[1]	28480	2950-0035
	1250-2312	3	1	ADPT-RF N-SMA (TYPE N)[2]	28480	1250-2312
	2190-0104	0	1	WSHR-LK INTL T (TYPE N)[2]	28480	2190-0104
	2950-0132	6	1	NUT-HEX-DUB-CHAM (TYPE N)[2]	28480	2950-0132

1 For Port R,A,B, and C.

2 For Port A and B (Opt.102 or 302).

Front Assemblies

Table 13-21. RF Cable for Port R

Ref. Desig.	Agilent Part Number	C D	Qty.	For Option: Installed	For Option: Not Installed	Mfr Code	Mfr Part Number
2	E5100-61601[1]	9	1		100	28480	E5100-61601

1 Port R to A26RJ2.

Table 13-22. RF Cable for Port A

Ref. Desig.	Agilent Part Number	C D	Qty.	For Option: Installed	For Option: Not Installed	Mfr Code	Mfr Part Number
2	E5100-61602[1]	0	1	100	101, 102	28480	E5100-61602
				200	101, 102		
				300	301, 302		
				400	301, 302		
				600			
	E5100-61626[2]	8	1	100, 101	102	28480	E5100-61626
				200, 101	102		
				300, 301	302		
				400, 301	302		
	E5100-61654[1]	2	1	100, 102	101	28480	E5100-61654
				200, 102	101		
				300, 302	301		
				400, 302	301		
	E5100-61650[2]	8	1	100, 101, 102		28480	E5100-61650
				200, 101, 102			
				300, 301, 302			
				400, 301, 302			
	E5100-61652[3]	0	1	300, 510		28480	E5100-61652

1 Port A to A26AJ2.

2 Port A to A29J2.

3 Port A to A26AJ2. Semi-rigid cable.

Table 13-23. RF Cable for Port B

Ref. Desig.	Agilent Part Number	C D	Qty.	For Option: Installed	For Option: Not Installed	Mfr Code	Mfr Part Number
2	E5100-61603[1]	1	1	300	301, 302	28480	E5100-61603
				400	301, 302		
	E5100-61627[2]	9	1	300, 301	302	28480	E5100-61627
				400, 301	302		
	E5100-61655[1]	3	1	300, 302	301	28480	E5100-61655
				400, 302	301		
	E5100-61651[2]	9	1	300, 301, 302		28480	E5100-61651
				400, 301, 302			
	E5100-61653[3]	1	1	300, 510		28480	E5100-61653

1 Port B to A26BJ2.

2 Port B to A29J3.

3 Port B to A26BJ2. Semi-rigid cable.

Table 13-24. RF Cable for Port C

Ref. Desig.	Agilent Part Number	C D	Qty.	For Option: Installed	For Option: Not Installed	Mfr Code	Mfr Part Number
2	E5100-61604[1]	2	1	400		28480	E5100-61604

1 Port C to A26CJ2.

Table 13-25. Probe Power Connector and Cable

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
3	1252-4294	8	1	PROBE POWER CONNECTOR	28480	1252-4294
4	E5100-61641	7	1	PROBE POWER CABLE (Opt.102)	28480	E5100-61610
	E5100-61636	0	2	PROBE POWER CABLE (Opt.302)	28480	E5100-61636

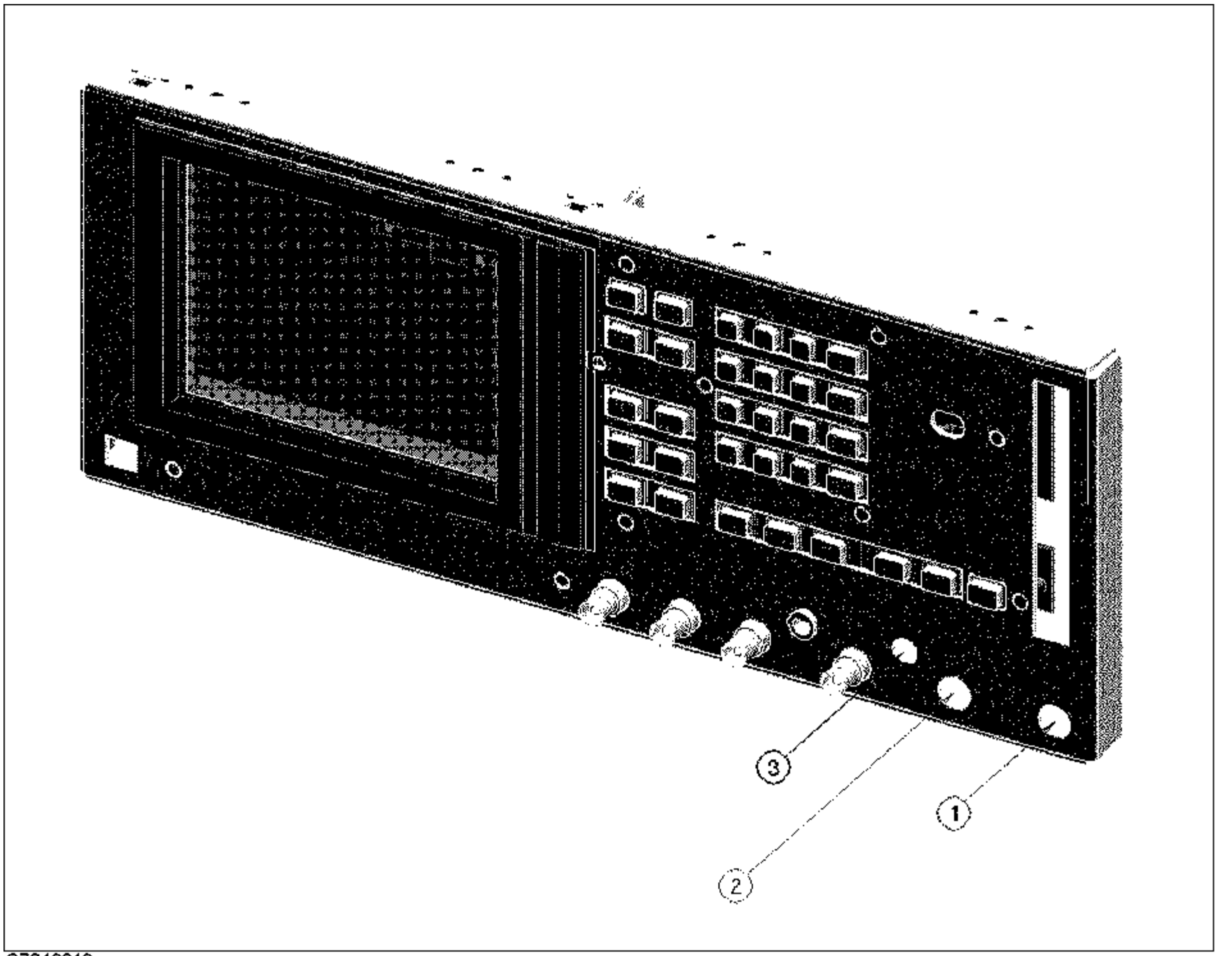


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Figure 13-22. Front Plugs

Table 13-26. Front Plugs

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	6960-0041	1	1[1]	PLUG HOLE BNC[2]	28480	6960-0041
2	6960-0028	4	1[1]	PLUG HOLE TYPE N[3]	28480	6960-0028
3	6960-0081	9	1[1]	PLUG HOLE PROBE POWER[4]	28480	6960-0081

1 For each hole.

2 For Port R, B, C, or RF OUT 2 (Opt.001).

3 For Port B (Opt.102).

4 If not Opt.302.

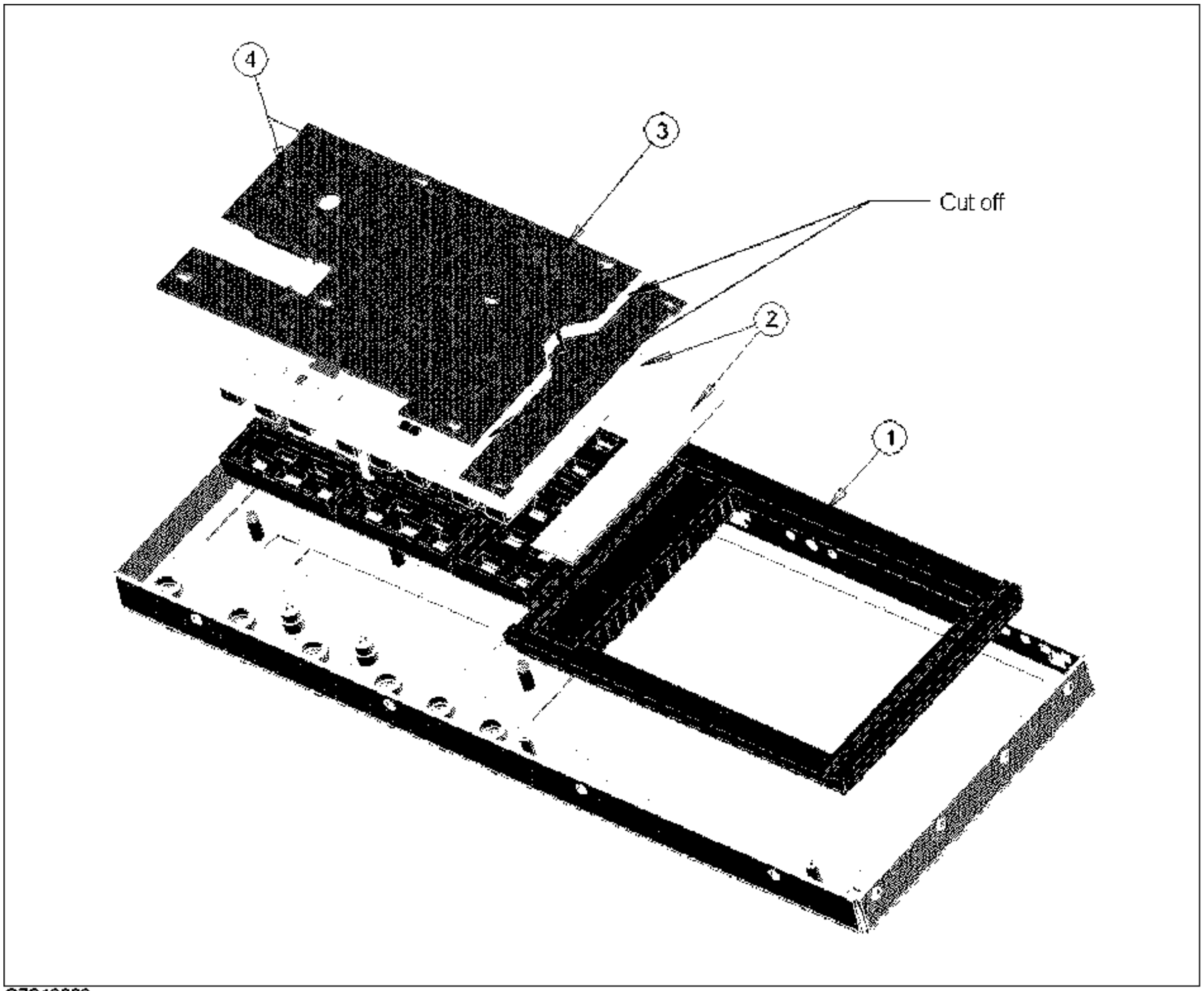

Figure 13-23. Front Keyboard Assembly

Table 13-27. Front Keyboard Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-40001	9	1	BEZEL FRONT	28480	E5100-40001
2	E5100-25001	7	1	RUBBER KEY	28480	E5100-25001
3	E5100-66540	5	1	FRONT KEY BOARD	28480	E5100-66540
4	0515-1550	0	2	SCR M3-L 8 P-H	28480	0515-1550

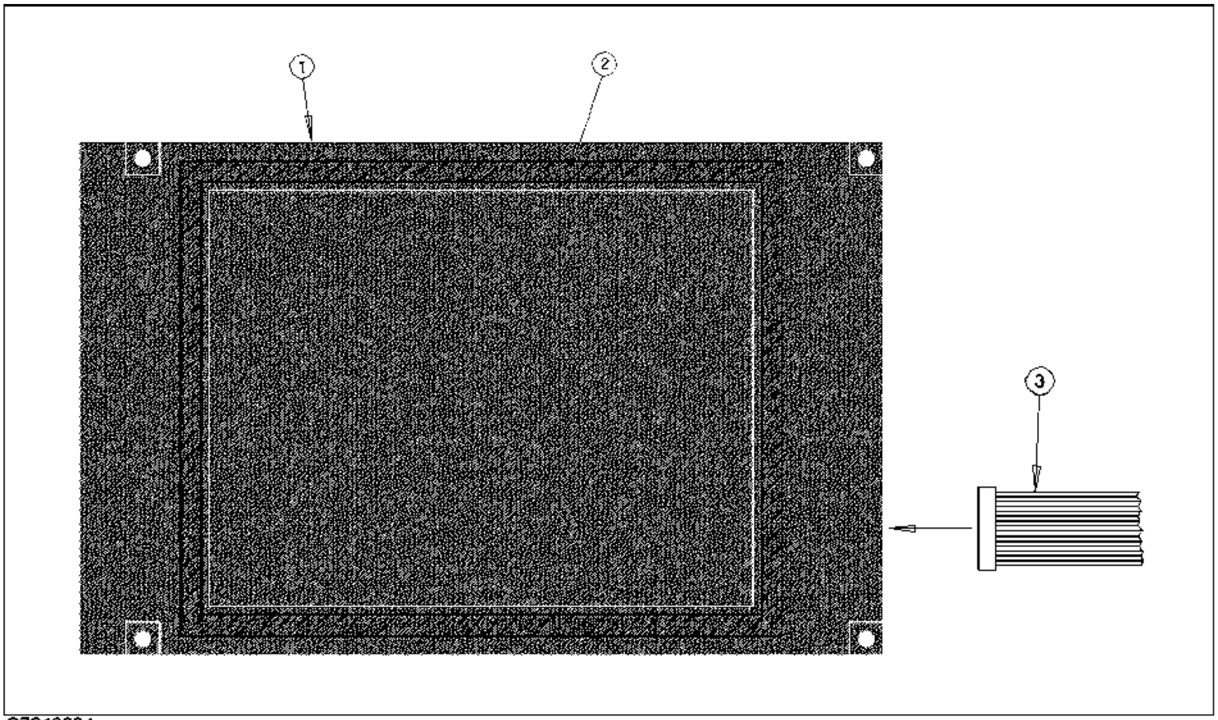

Figure 13-24. Monochrome LCD Assembly 1/4

Table 13-28. Monochrome LCD Assembly 1/4

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	1990-1912	5	1	LCD MONO 6.3"	28480	1990-1912
2	0460-1029	1	100 cm	TAPE-IDL .25IN	28480	0460-1029
3	E5100-61634	8	1	WIRE ASSY LCD	28480	E5100-61634

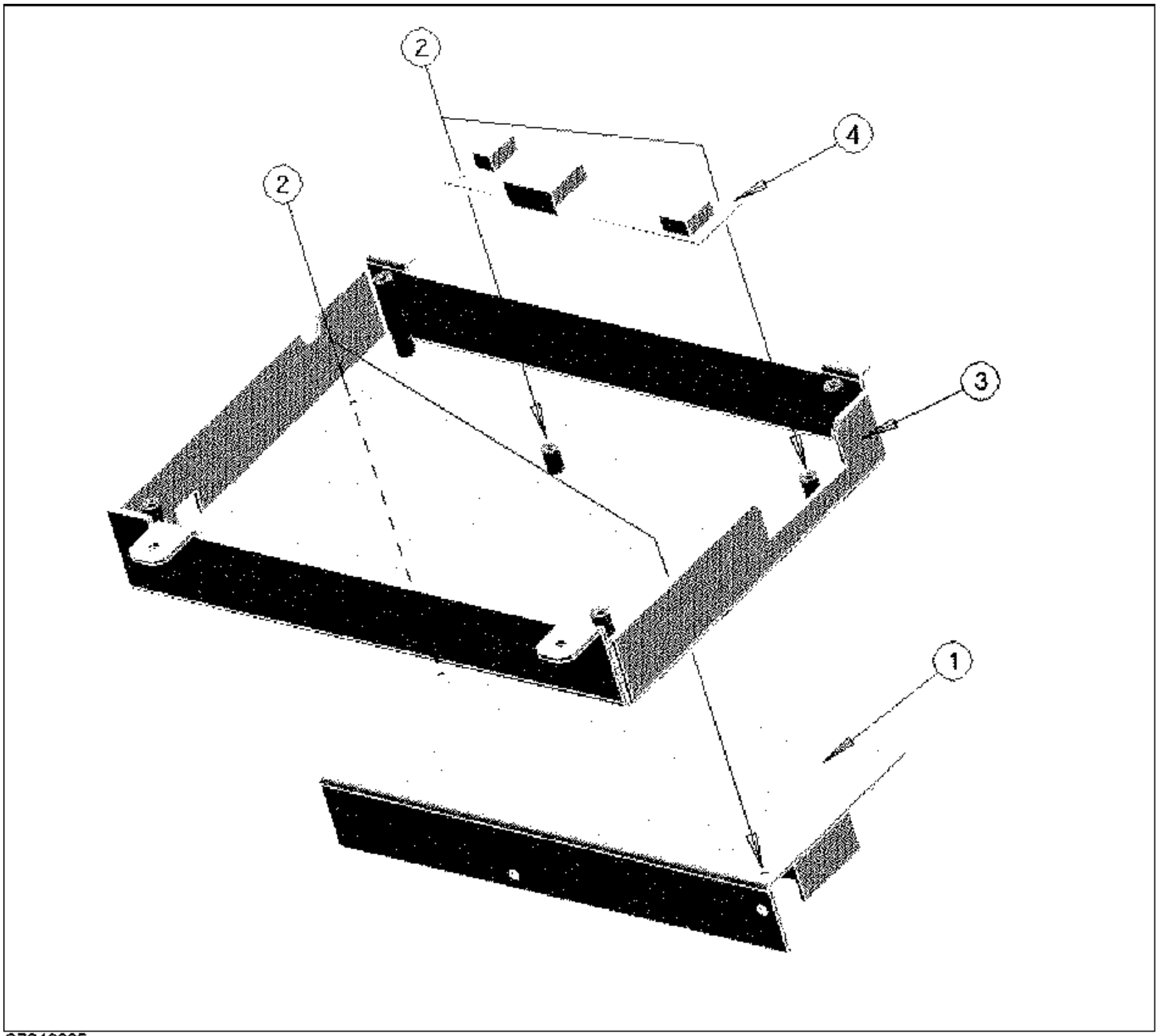

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Figure 13-25. Monochrome LCD Assembly 2/4 (Including Power Supply PS 30W)

Table 13-29.
Monochrome LCD Assembly 2/4 (Including Power Supply PS 30W)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0950-2919	9	1	PS 30W POWER SUPPLY	28480	0950-2919
2	0515-1550	0	4	SCR M3-L 8 P-H	28480	0515-1550
3	E5100-04001	3	1	COVER MONOCHROME LCD	28480	E5100-04001
4	0950-2942	8	1	DC/AC INV	28480	0950-2942

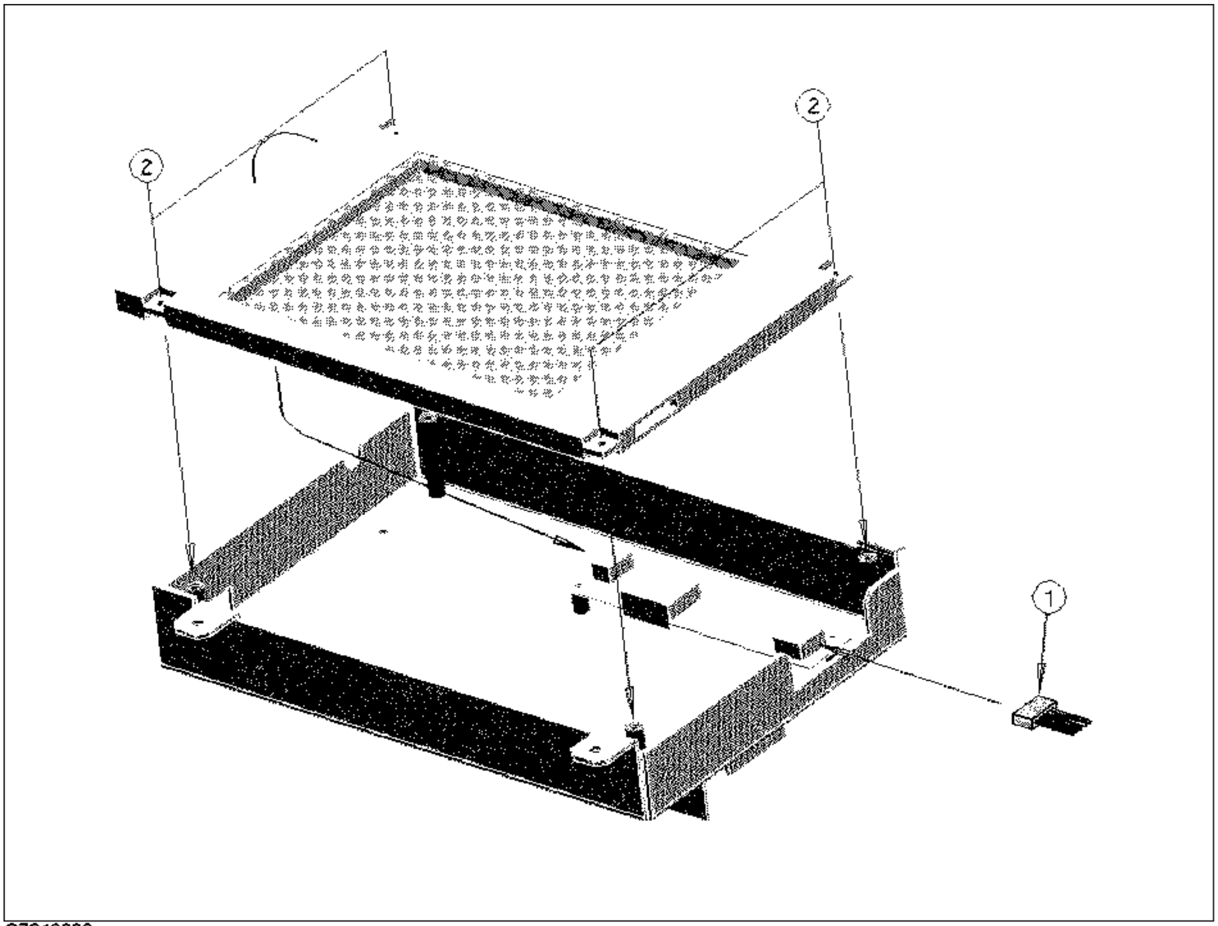

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Figure 13-26. Monochrome LCD Assembly 3/4

Table 13-30. Monochrome LCD Assembly 3/4

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61635	9	1	WIRE ASSY INVTR	28480	E5100-61635
2	0515-1550	0	4	SCR M3-L 8 P-H	28480	0515-1550

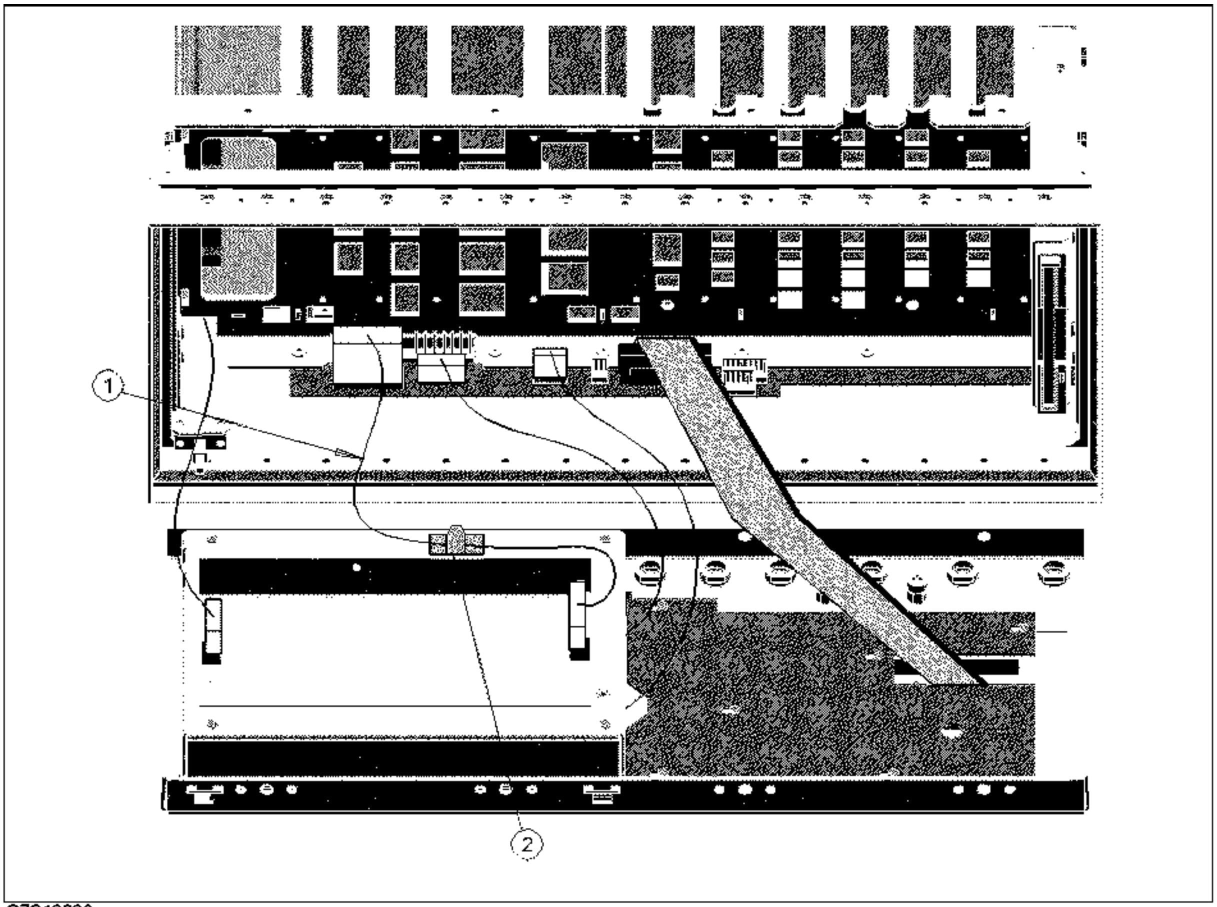

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Figure 13-27. Monochrome LCD Assembly 4/4

Table 13-31. Monochrome LCD Assembly 4/4

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61633	7	1	WIRE ASSY LW30	28480	E5100-61633
2	1400-1334	6	1	CLAMP CABLE	28480	1400-1334

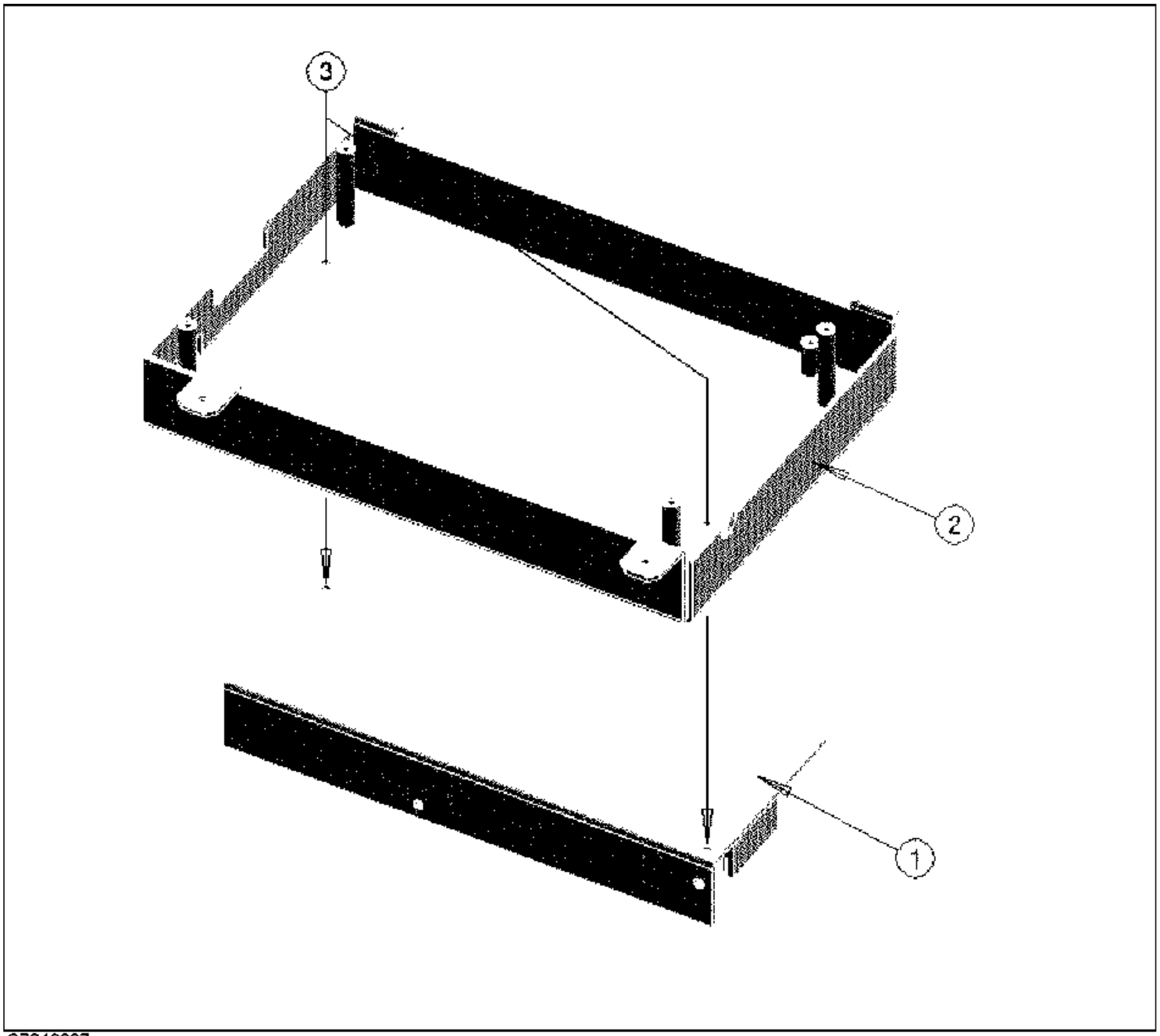

Figure 13-28. Color LCD Assembly 1/6 (Including Power Supply PS 30W)

Table 13-32. Color LCD Assembly 1/6 (Including Power Supply PS 30W)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0950-2919	9	1	PWR-SPLY LW30-01	28480	0950-2919
2	E5000-04001	2	1	COVER LCD	28480	E5000-04001
3	0515-1550	0	2	SCR M3-L 8 P-H	28480	0515-1550

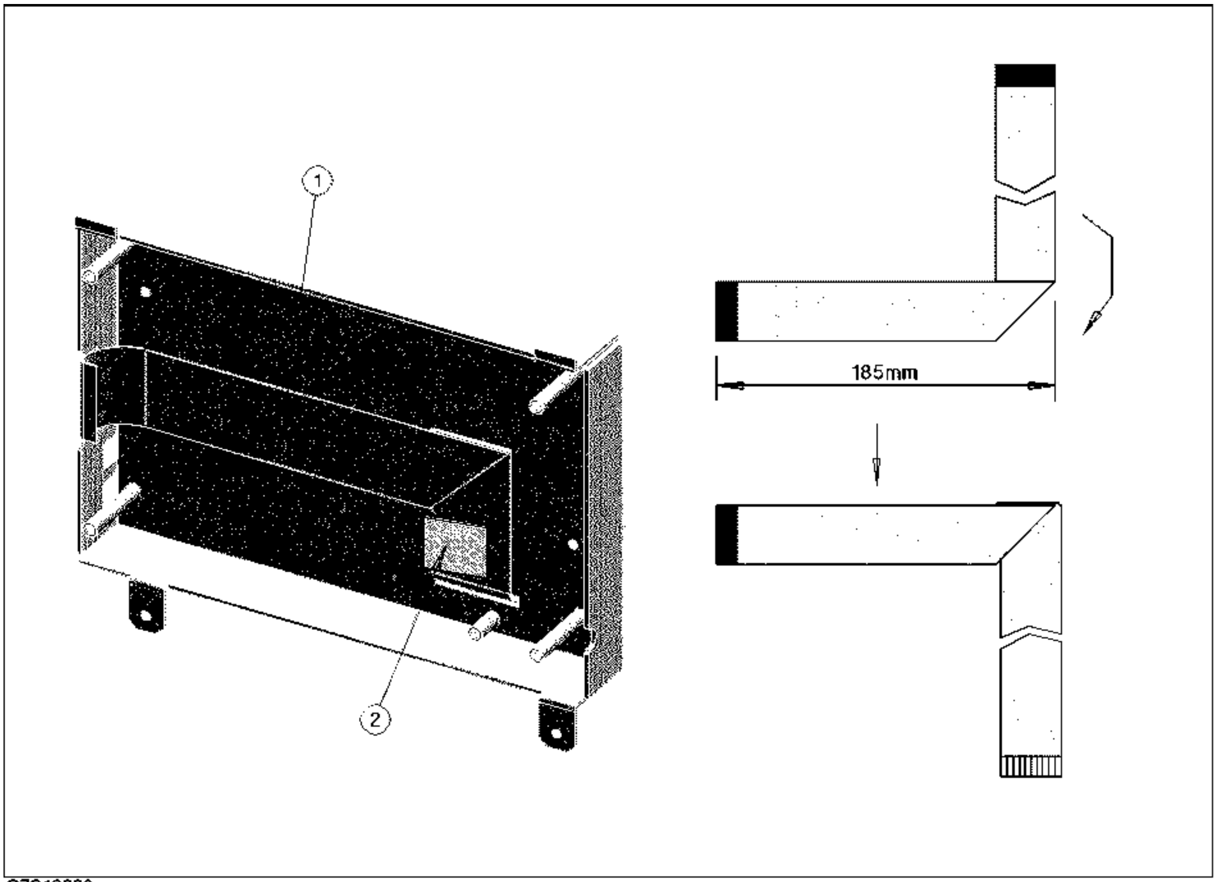

Figure 13-29. Color LCD Assembly 2/6

Table 13-33. Color LCD Assembly 2/6

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5000-61660	9	1	FLEX FLAT CBL	28480	E5000-61660
2	1400-0611	0	1	CLAMP-CABLE	28480	1400-0611

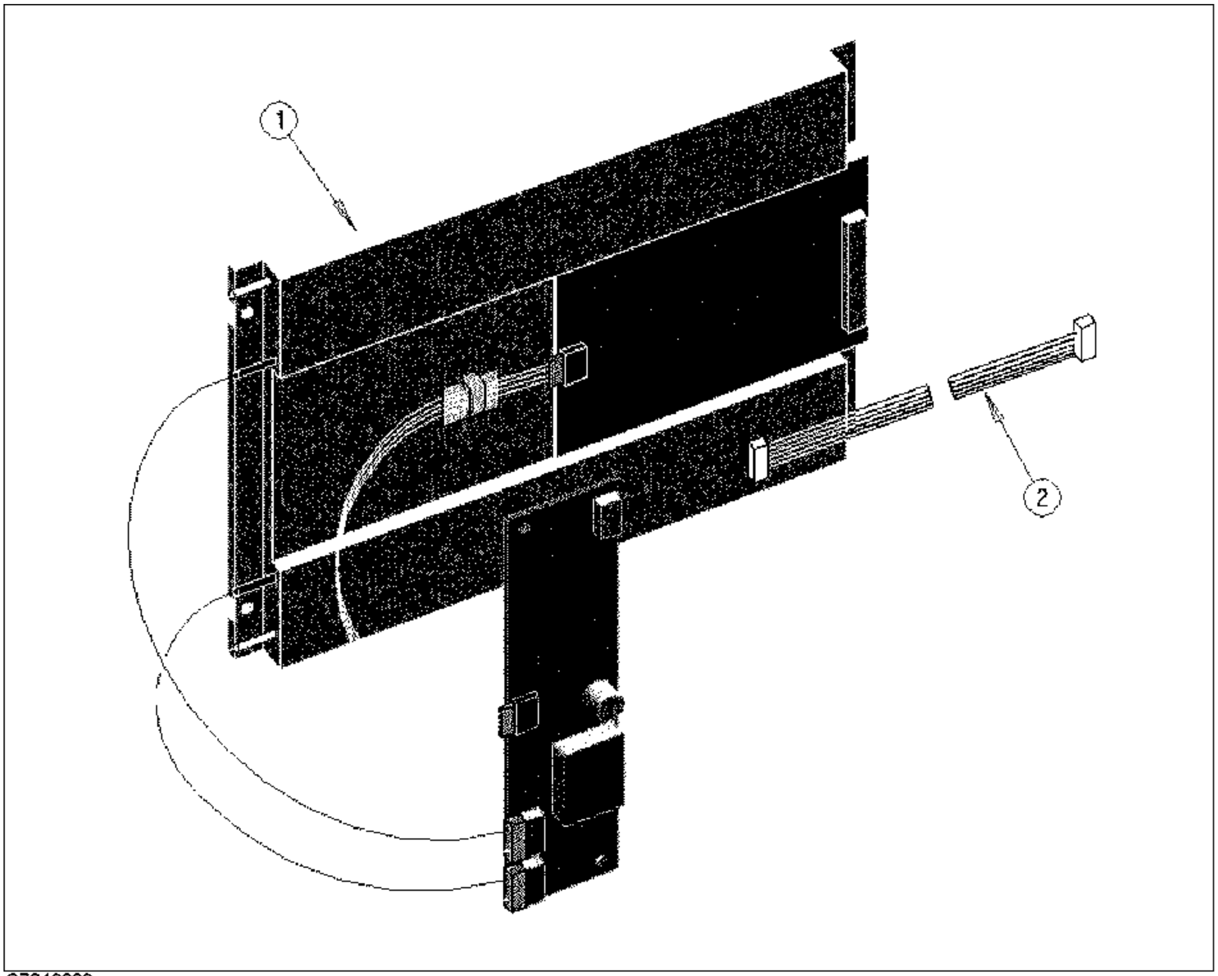

Figure 13-30. Color LCD Assembly 3/6

Table 13-34. Color LCD Assembly 3/6

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5000-61001	2	1	LCD MODULE ASSY	28480	E5000-61001
2	E5000-61630	3	1	CABLE ASSEMBLY	28480	E5000-61630

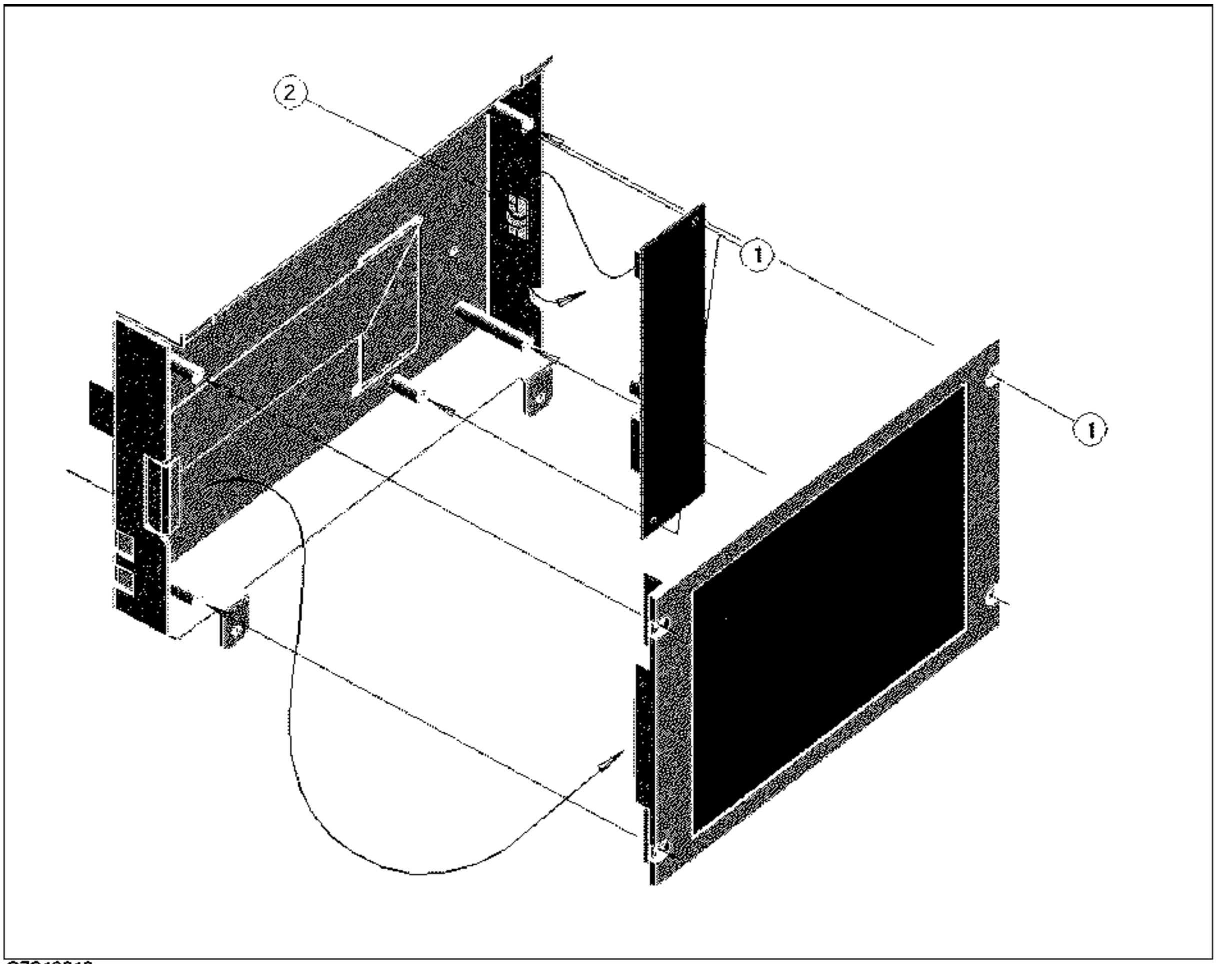

Figure 13-31. Color LCD Assembly 4/6

Table 13-35. Color LCD Assembly 4/6

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0515-0905	7	6	SCR-MACH M2.5	28480	0515-0905
	2190-0583	9	6	M2.5 SPRING WASH	28480	2190-0583
2	1400-1334	6	1	CLAMP CABLE	28480	1400-1334

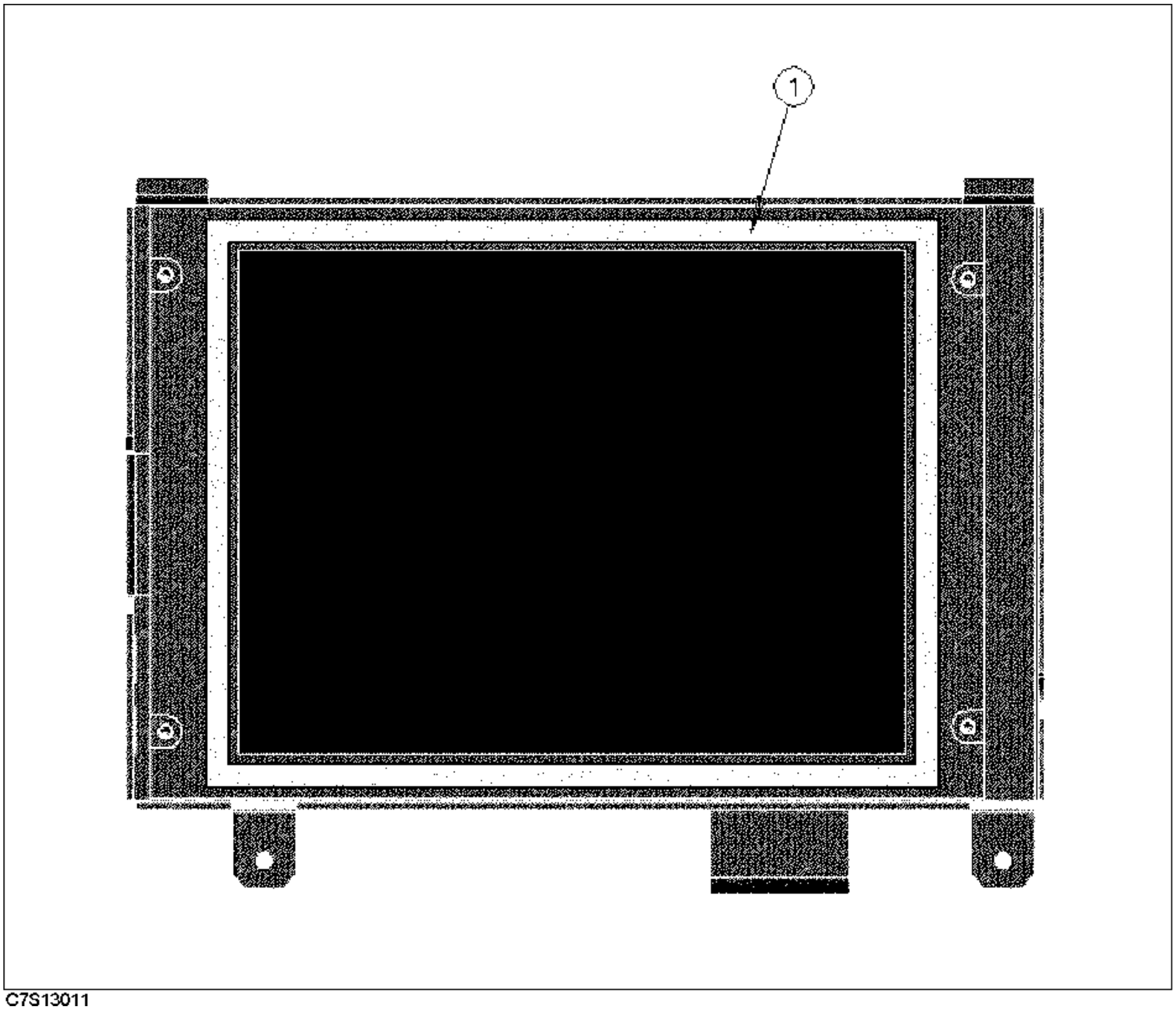

Figure 13-32. Color LCD Assembly 5/6

Table 13-36. Color LCD Assembly 5/6

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0460-1029	1	100 cm	TAPE-IDL .25IN	28480	0460-1029

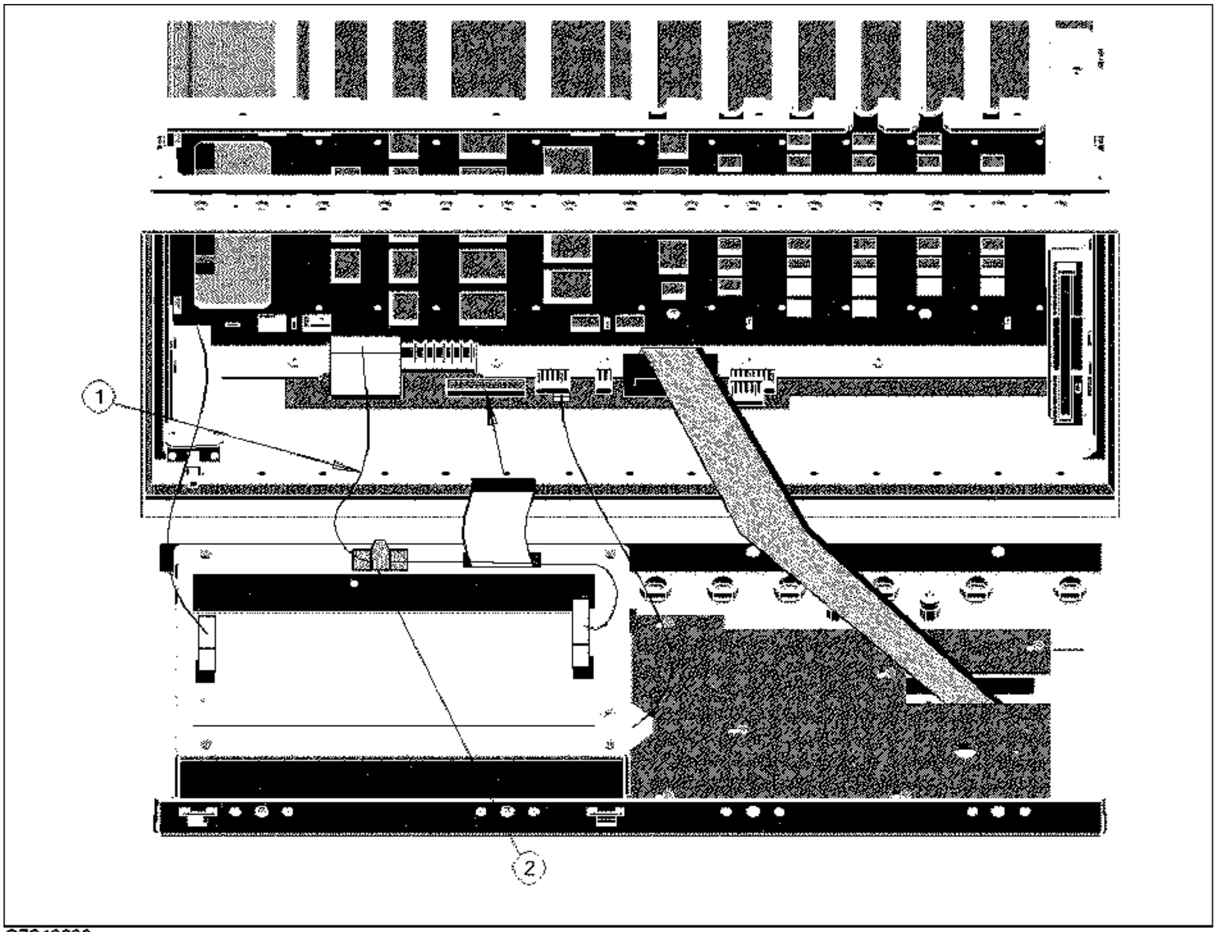

Figure 13-33. Color LCD Assembly 6/6

Table 13-37. Color LCD Assembly 6/6

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61633	7	1	WIRE ASSY LW30	28480	E5100-61633
2	1400-1334	6	1	CLAMP CABLE	28480	1400-1334

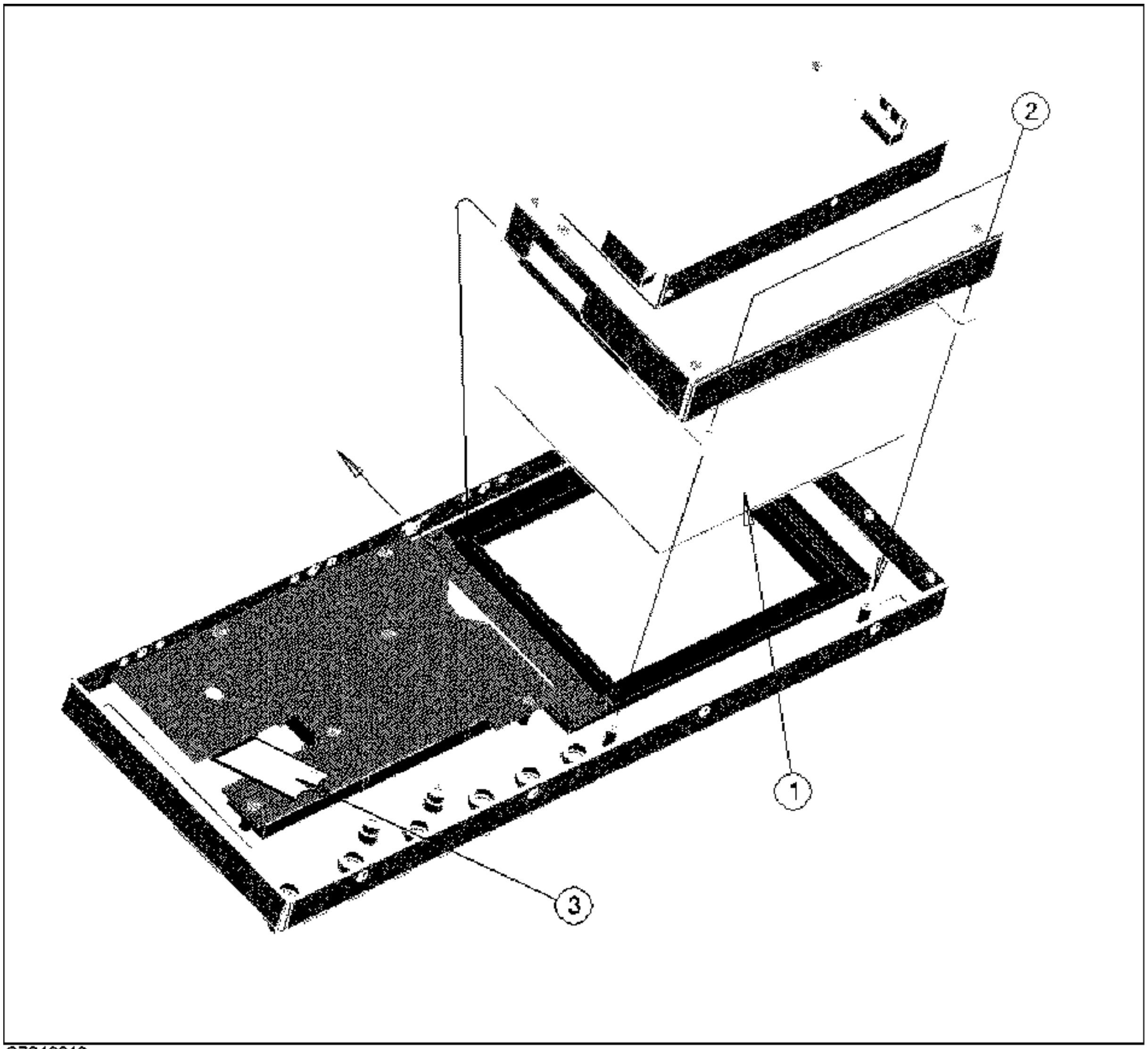

Figure 13-34. Monochrome/Color LCD Assembly

Table 13-38. Monochrome/Color LCD Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-25002	8	1	FILTER (MONOCHROME LCD)	28480	E5100-25002
	E5000-25002	7	1	FILTER (COLOR LCD)	28480	E5000-25002
2	0515-1550	0	2	SCR M3-L 8 P-H	28480	0515-1550
3	08751-61631	1	1	FLAT CABLE ASSY	28480	08751-61631

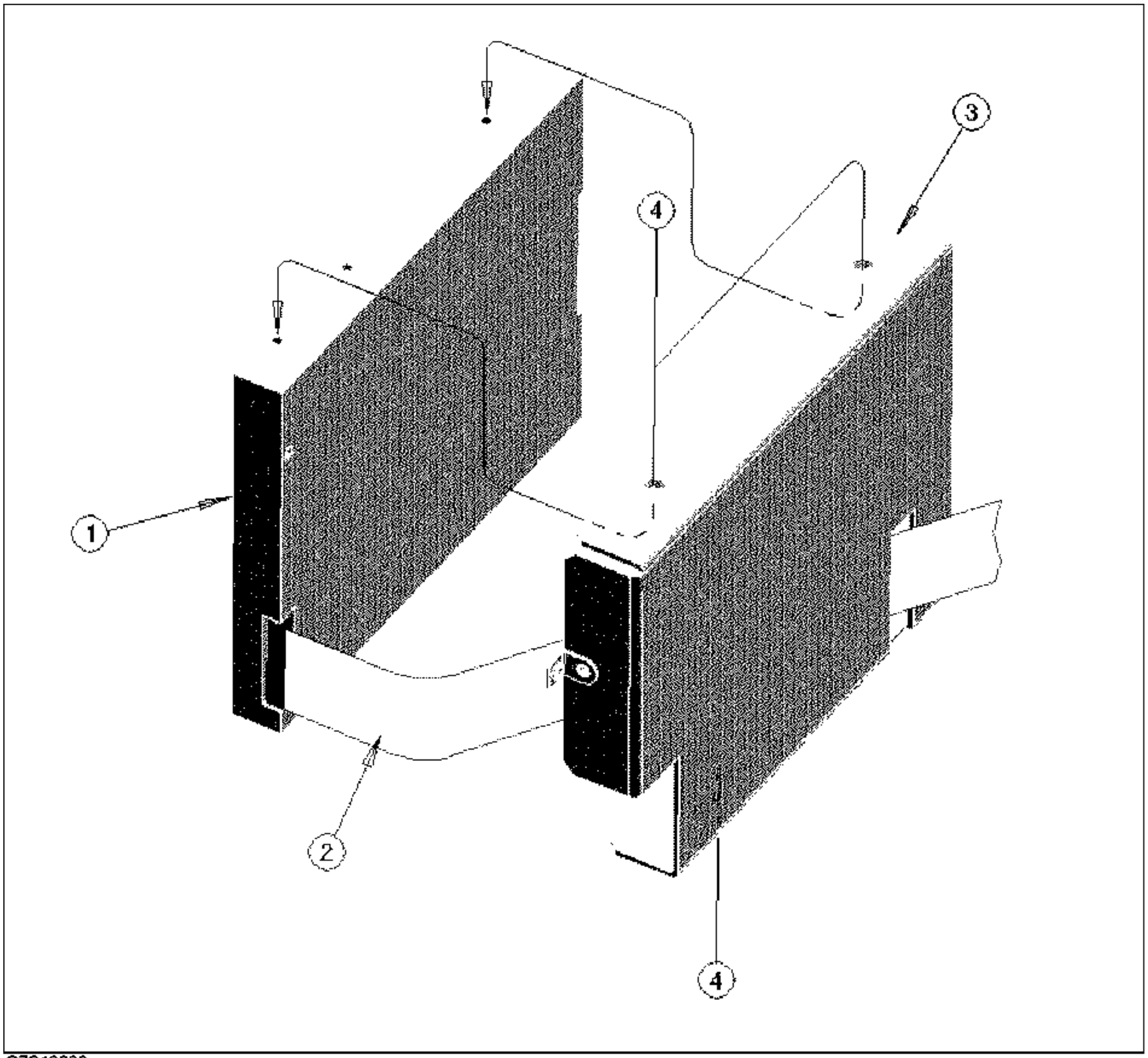

Figure 13-35. Flexible Disk Drive Assembly 1/2

Table 13-39. Flexible Disk Drive Assembly 1/2

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0950-2918	8	1	FDD 3.5"	28480	0950-2918
2	E5100-61661	1	1	CA-FLT-RBN 26PIN	28480	E5100-61661
3	E5100-01203	1	1	BRACKET FDD	28480	E5100-01203
4	0515-0999	9	3	M2.5X0.45 L=6 FL	28480	0515-0999

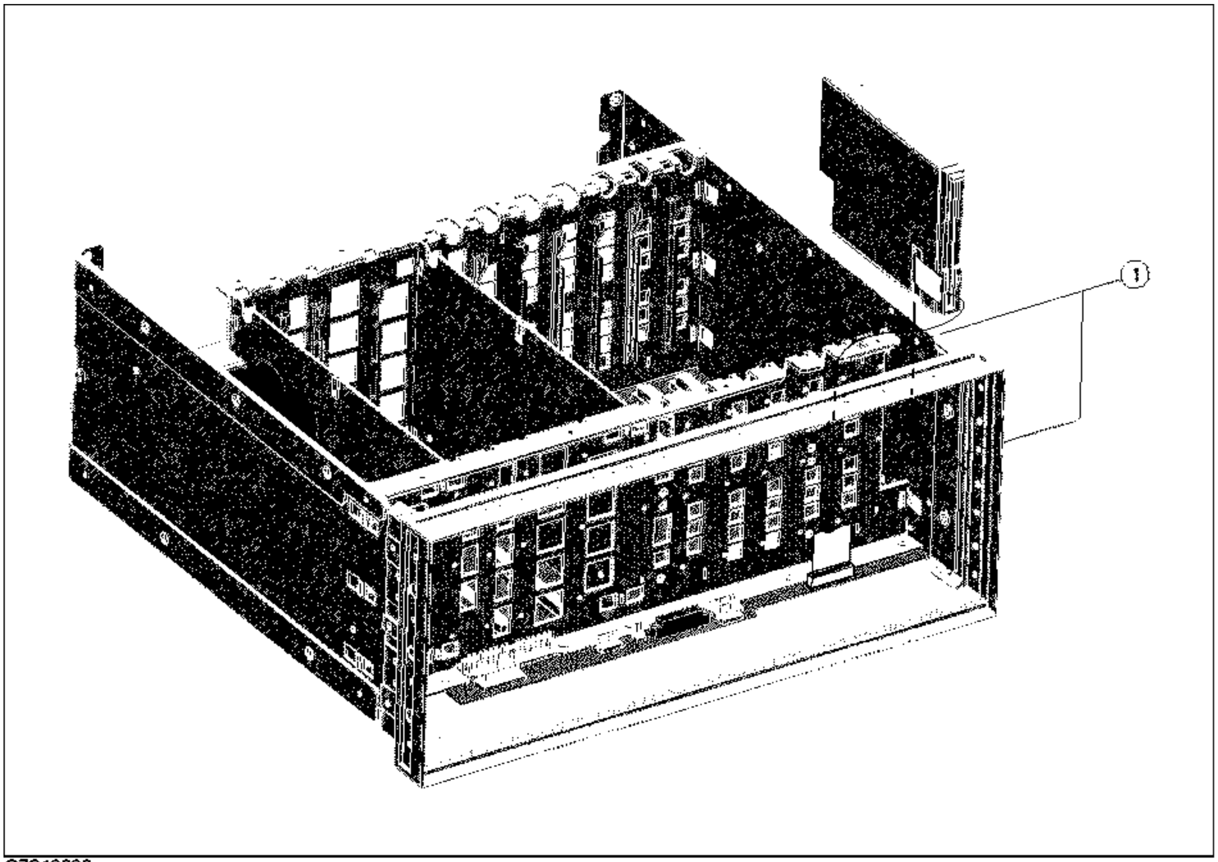

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Figure 13-36. Flexible Disk Drive Assembly 2/2

Table 13-40. Flexible Disk Drive Assembly 2/2

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0515-1550	0	2	SCR M3-L 8 P-H	28480	0515-1550

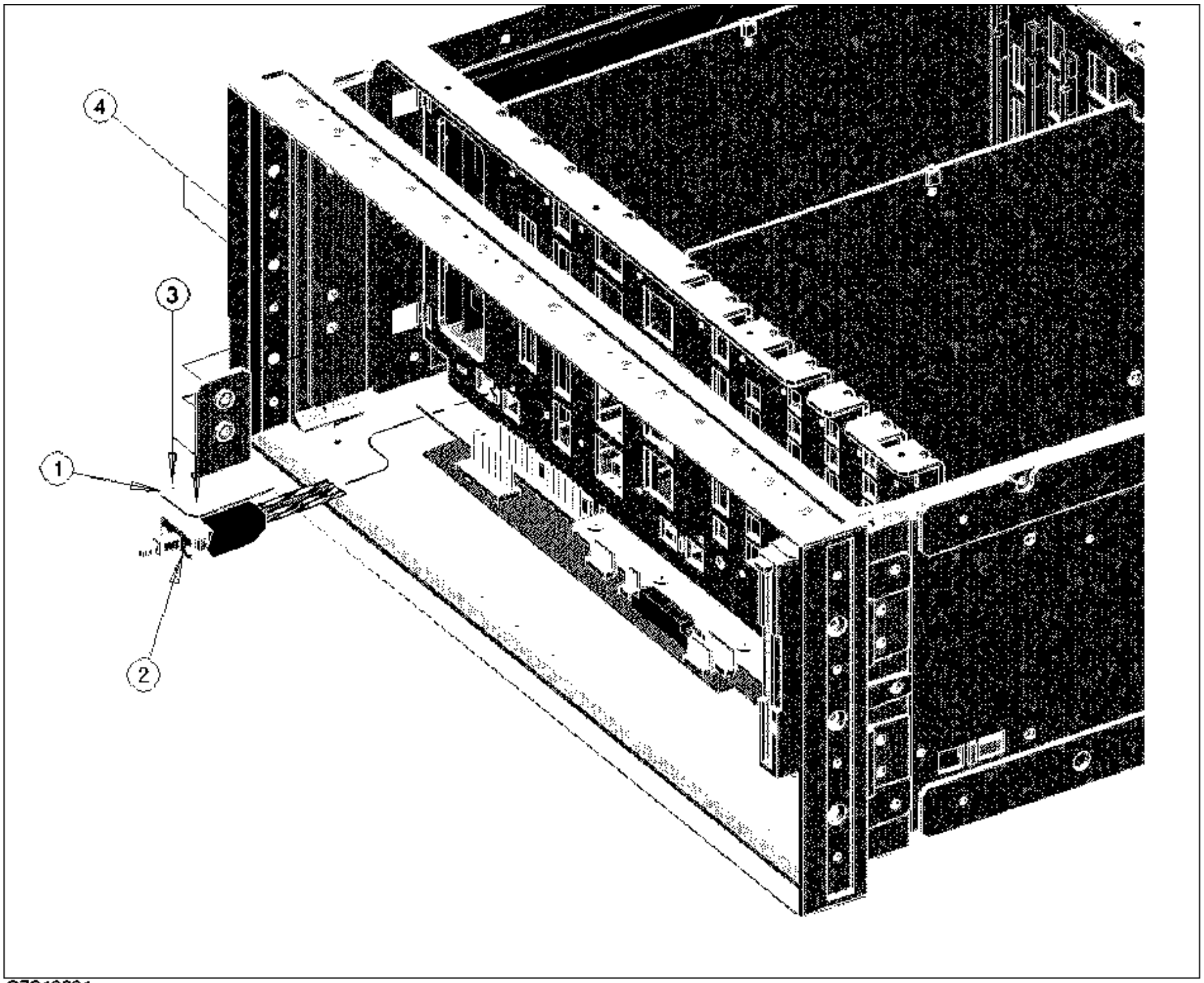


Figure 13-37. Line Switch Assembly

Table 13-41. Line Switch Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-01202	0	1	ANGLE SW	28480	E5100-01202
2	E5100-61631	5	1	WIRE ASSY PRM	28480	E5100-61631
3	0515-0999	9	2	M2.5X0.45 L=6 FL	28480	0515-0999
4	0515-1719	3	2	SCR M4X10	28480	0515-1719

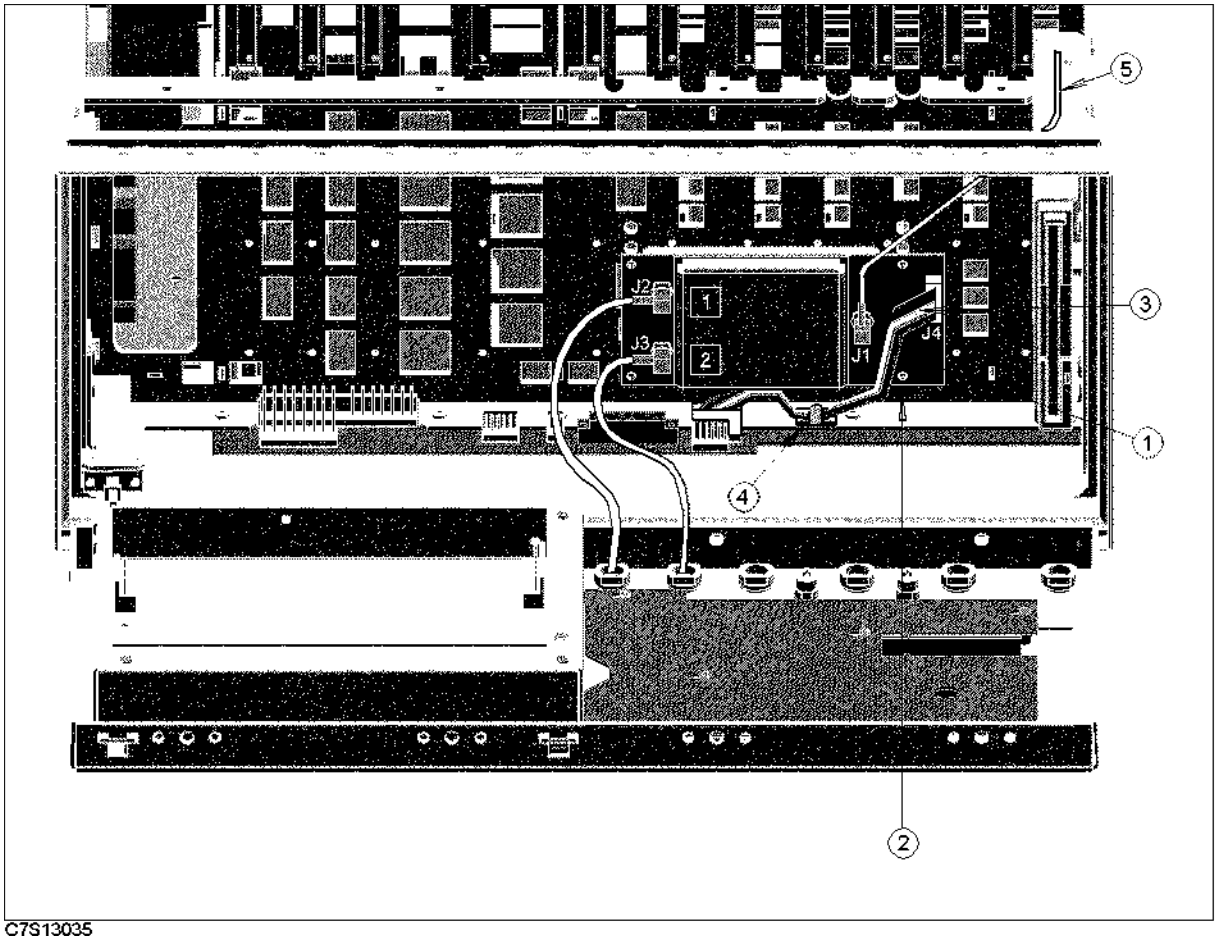


Figure 13-38. A28 Source Switch Board (Opt.003)

Table 13-42. A28 Source Switch Board (Opt.003)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-66528	9	1	A28 SOURCE SW BOARD	28480	E5100-66528
2	0515-1550	0	4	SCR M3-L 8 P-H	28480	05150-1550
3	E5100-61639	3	1	WIRE ASSY 1M/SW	28480	E5100-61639
4	1400-1334	6	1	CLAMP CABLE	28480	1400-1334
5	E5100-61618	8	1	RF CBL ASSY S[1]	28480	E5100-61618

1 A28J1 to A24J3(S) or A25J2(S). If Option 010 is not installed, the cable should be drawn into A24 slot.

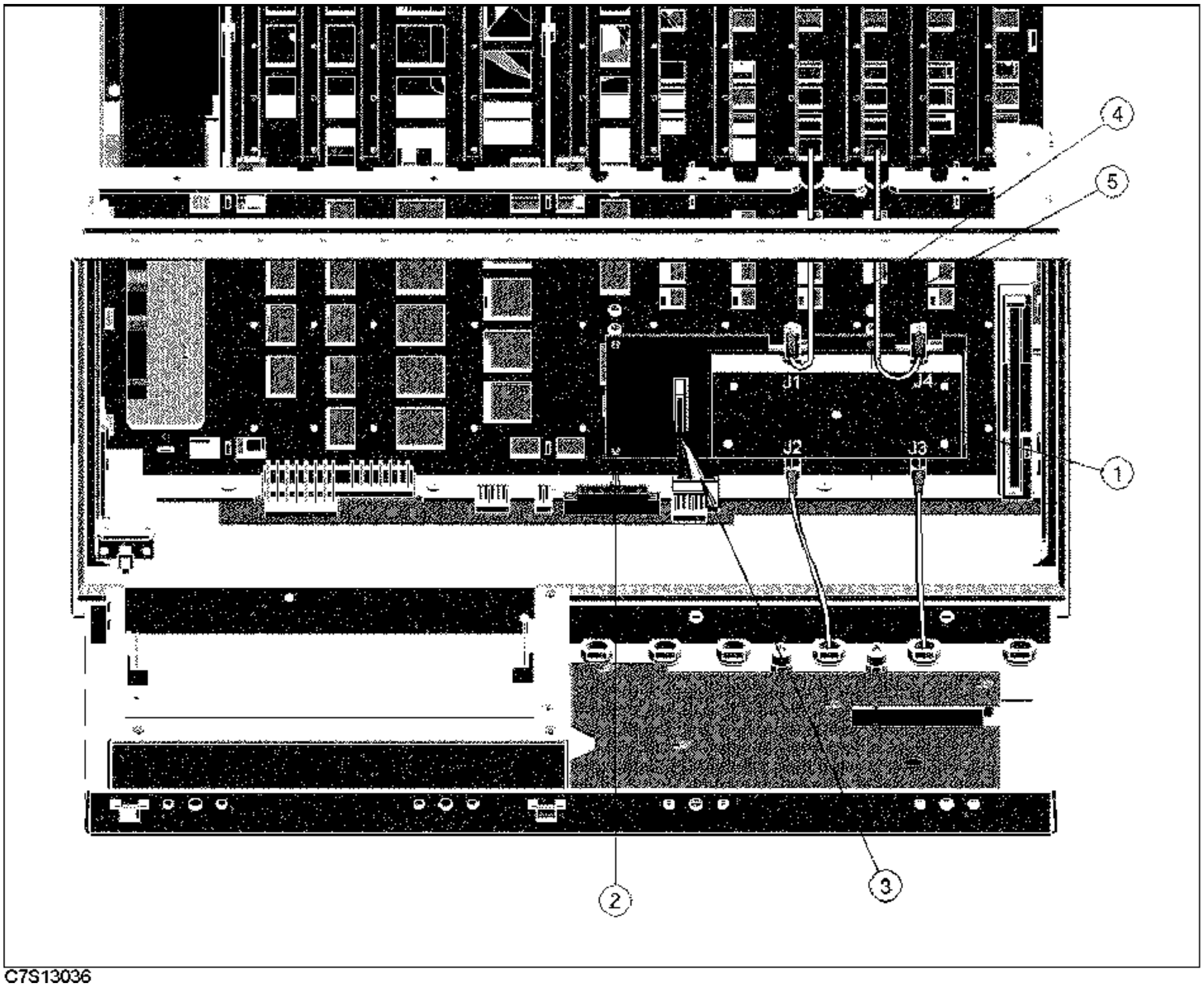


Figure 13-39. A29 50Ω/1MΩ Switch (Opt.101/301)

Table 13-43. A29 50Ω/1MΩ Switch (Opt.101/301)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-66529	0	1	HIGH IMP INPUT	28480	E5100-66529
2	0515-1550	0	4	SCR M3-L 8 P-H	28480	0515-1550
3	E5100-61639	3	1	WIRE ASSY 1M/SW	28480	E5100-61639
4	E5100-61628	0	1	RF CBL ASSY[1]	28480	E5100-61628
5	E5100-61629	1	1	RF CBL ASSY[2]	28480	E5100-61629

1 A29J1 to A26AJ2. See Figure 13-15.

2 A29J4 to A26BJ2. See Figure 13-15.

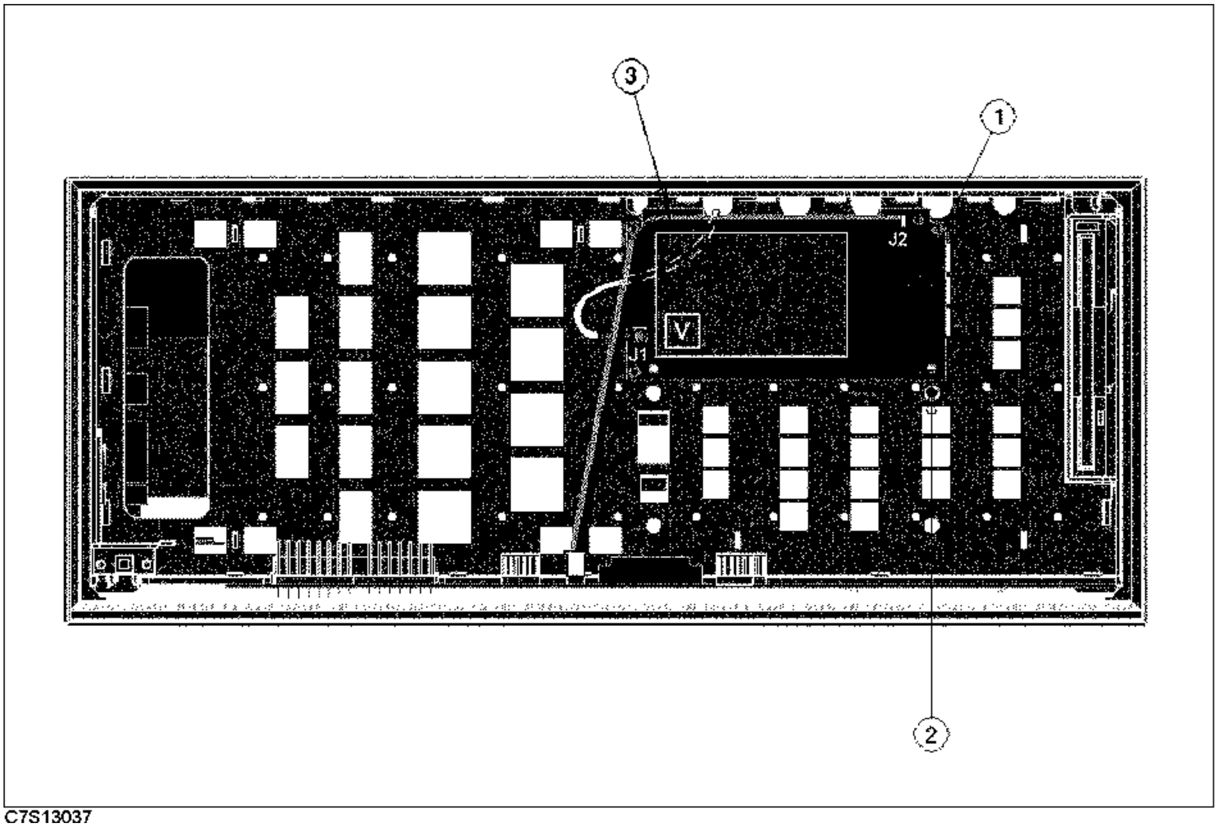


Figure 13-40. A50 High Stability Oscillator (Opt.1D5)

Table 13-44. A50 High Stability Oscillator (Opt.1D5)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-66550	7	1	10MHZ OVEN BD	28480	E5100-66550
2	0515-1550	0	4	SCR M3-L 8 P-H	28480	0515-1550
3	E5100-61638	2	1	WIRE ASSY OVEN[1]	28480	E5100-61638

1 A50J2 to A20J21.

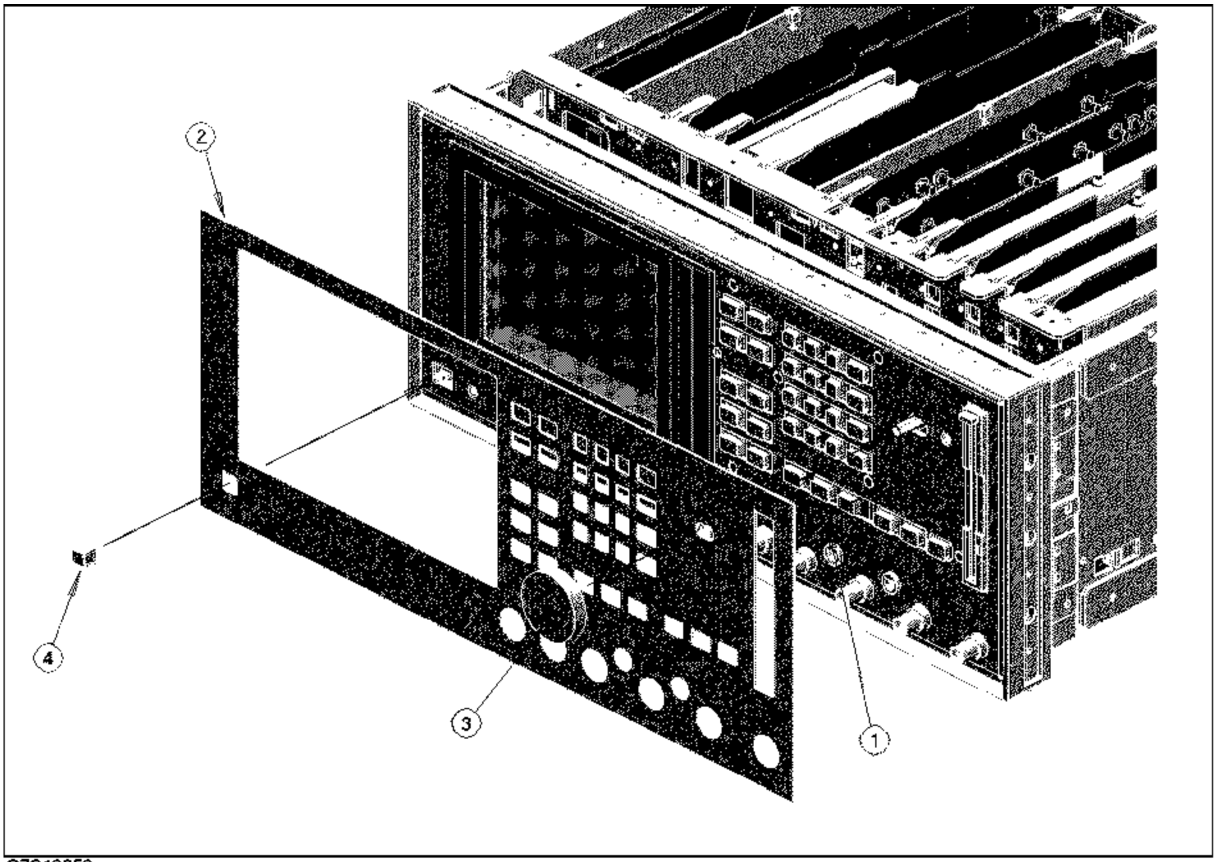


Figure 13-41. Front Panel Assembly

Table 13-45. Front Panel Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	04191-08000	0	1	SPRING	28480	04191-08000
2	E5100-00201	7	1	PANEL FRONT (E5100A)	28480	E5100-00201
	E5100-00211	9	1	PANEL FRONT (E5100B)	28480	E5100-00211
3	01650-47401	7	1	KNOB-RPG	28480	01650-47401
4	5041-0564	4	1	KEY-Q-CORP WHT	28480	5041-0564

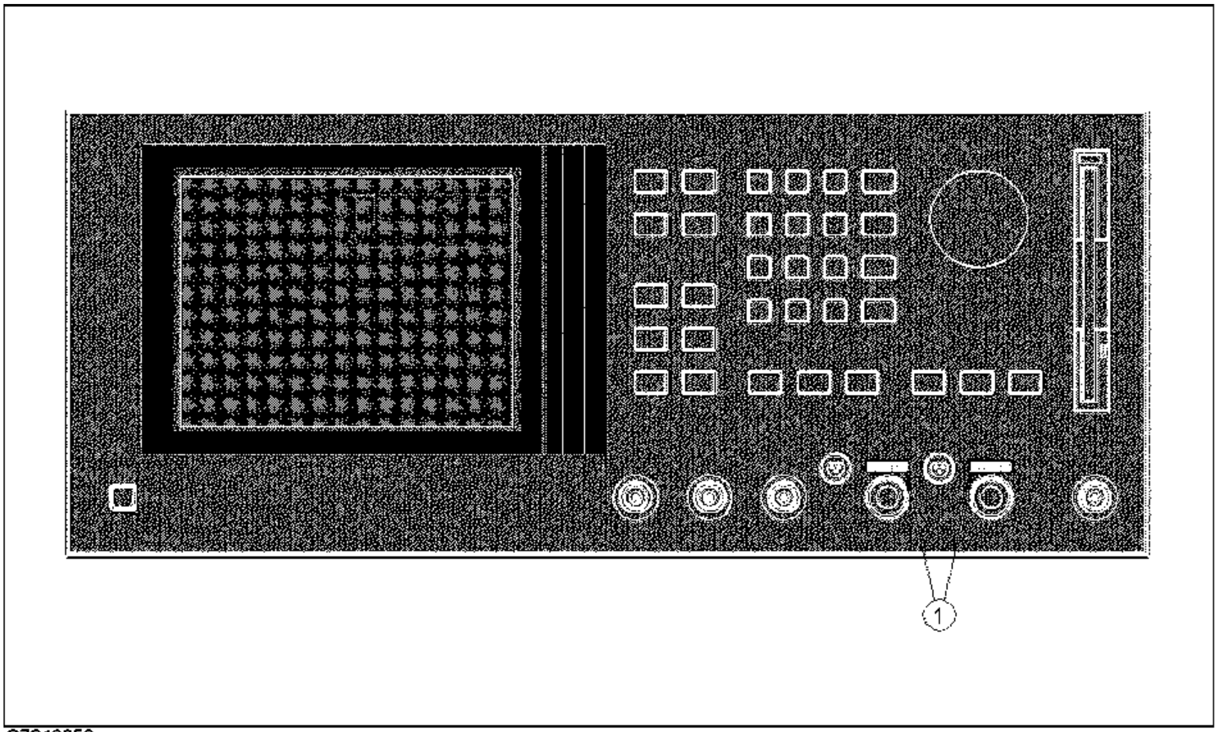


Figure 13-42. 50Ω/1MΩ Label (Opt.101/301)

Table 13-46. 50Ω/1MΩ Label (Opt.101/301)

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-87101	8	1 or 2	LABEL (Opt.101/301)	28480	E5100-87101

Rear Assemblies

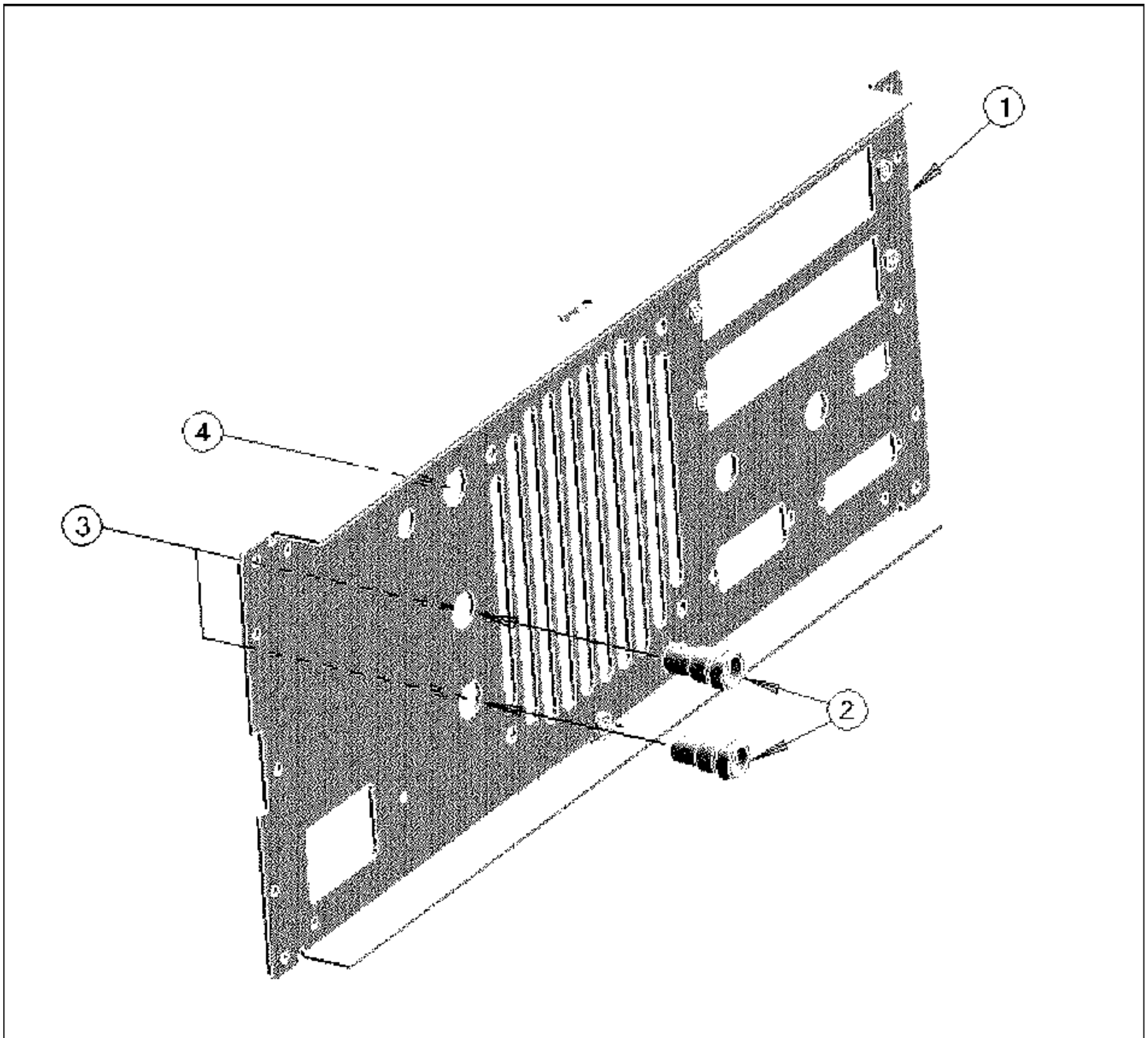


Figure 13-43. EXT REF/INT REF Connectors

Table 13-47. EXT REF/INT REF Connectors

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-00203	9	1	PANEL REAR	28480	E5100-00203
2	1250-0252	6	2	Connector-RF BNC	28480	1250-0252
3	2190-0102	8	2	WSHR-LK INTL T	28480	2190-0102
	2950-0035	8	2	NUT-HEX-DBL-CHAM	28480	2950-0035
4	6960-0041	1	1	PLUG HOLE	28480	6960-0041

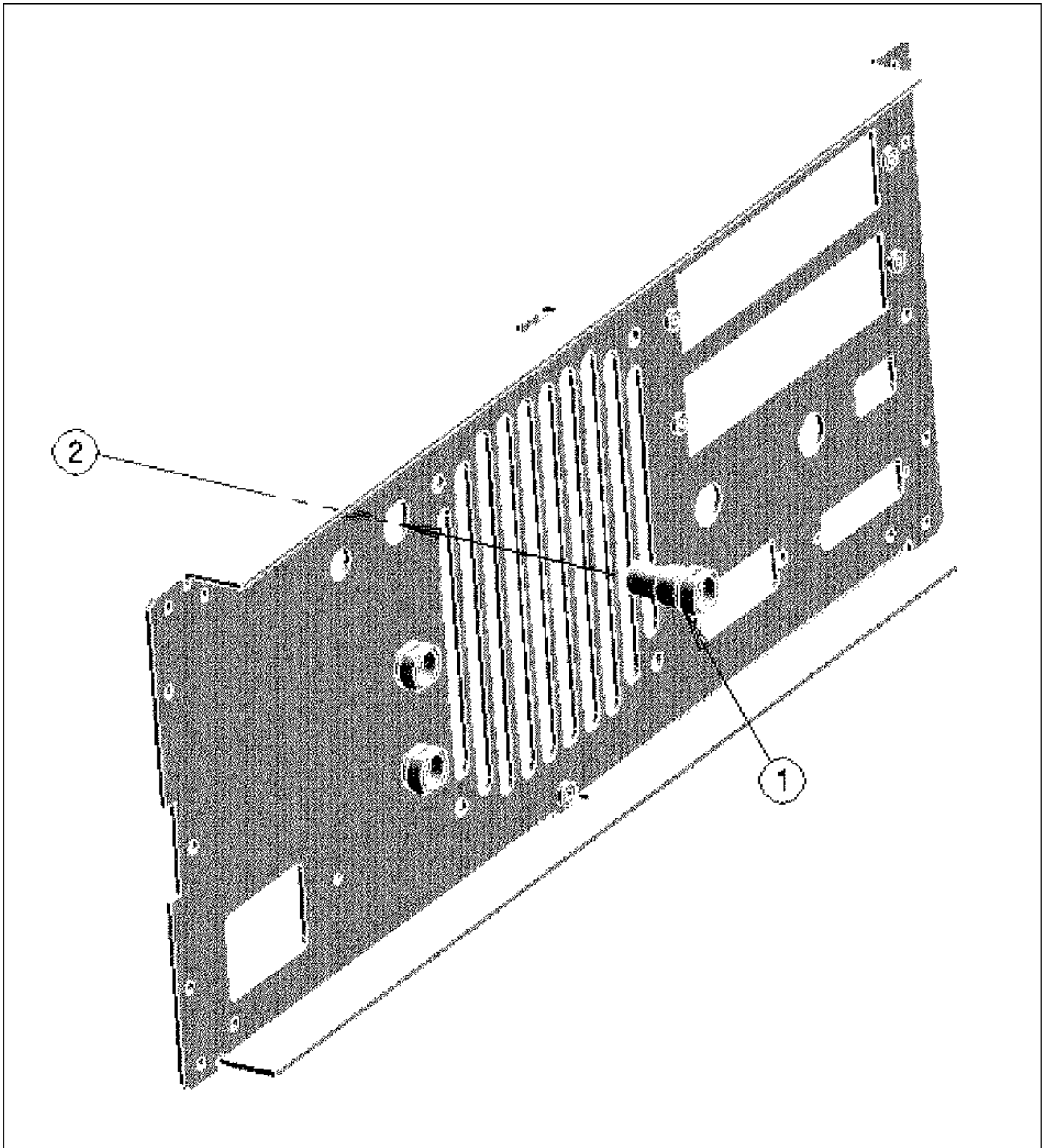


Figure 13-44. REF OVEN Connector

Table 13-48. REF OVEN 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	8	1	WSHR-LK INTL T	28480	2190-0102
	2950-0035	8	1	NUT-HEX-DBL-CHAM	28480	2950-0035

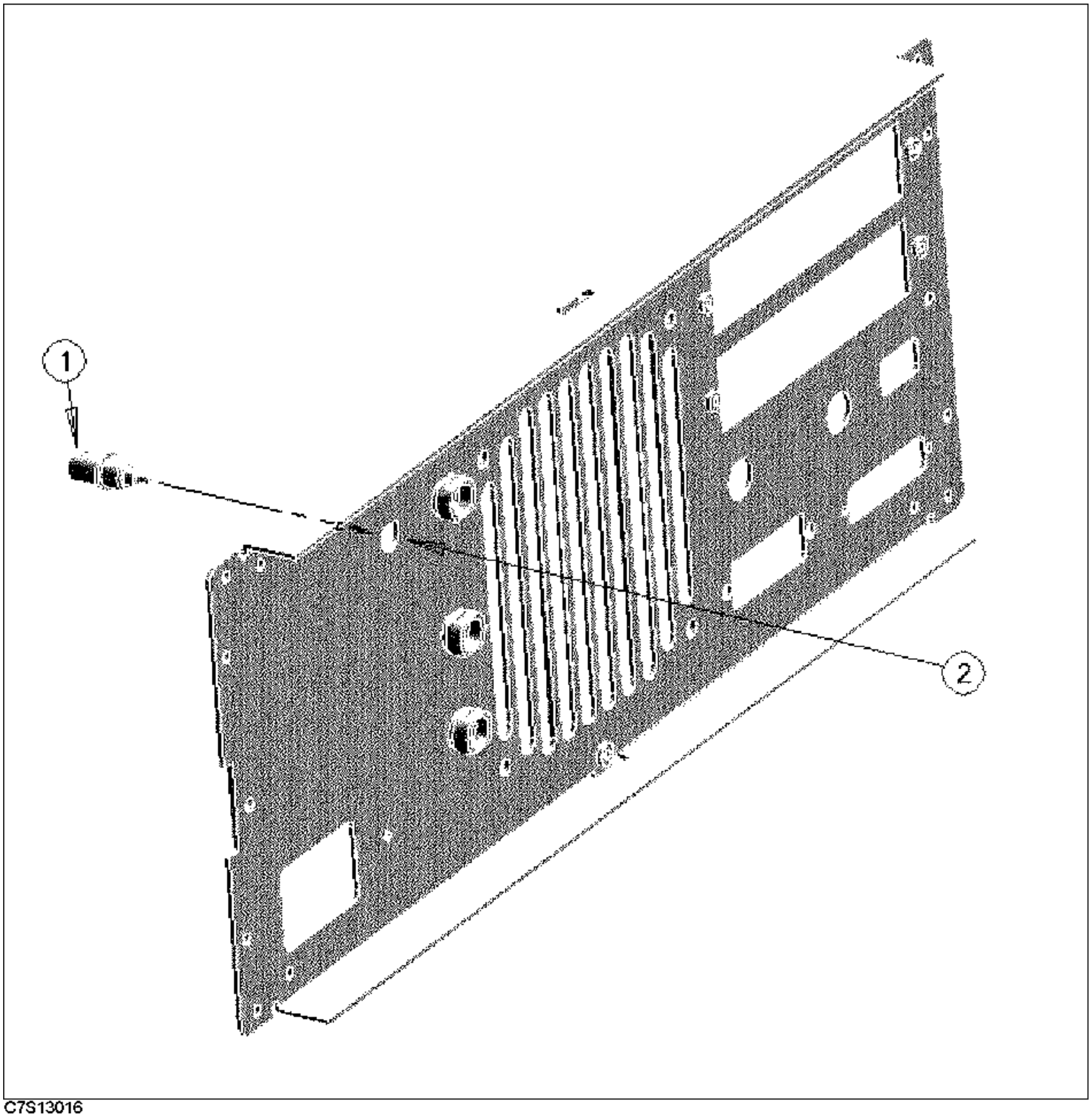


Figure 13-45. EXT PROG RUN/CONT Connector

Table 13-49. EXT PROG RUN/CONT Connector

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	1250-0083	1	1	Connector-RF BNC	28480	1250-0083
2	0360-1190	5	1	TERM-SOLDER LUG	28480	0360-1190
	2190-0016	3	1	WSHR-LK INTL T	28480	2190-0016
	2950-0001	8	1	NUT-HEX-DBL-CHAM	28480	2950-0001

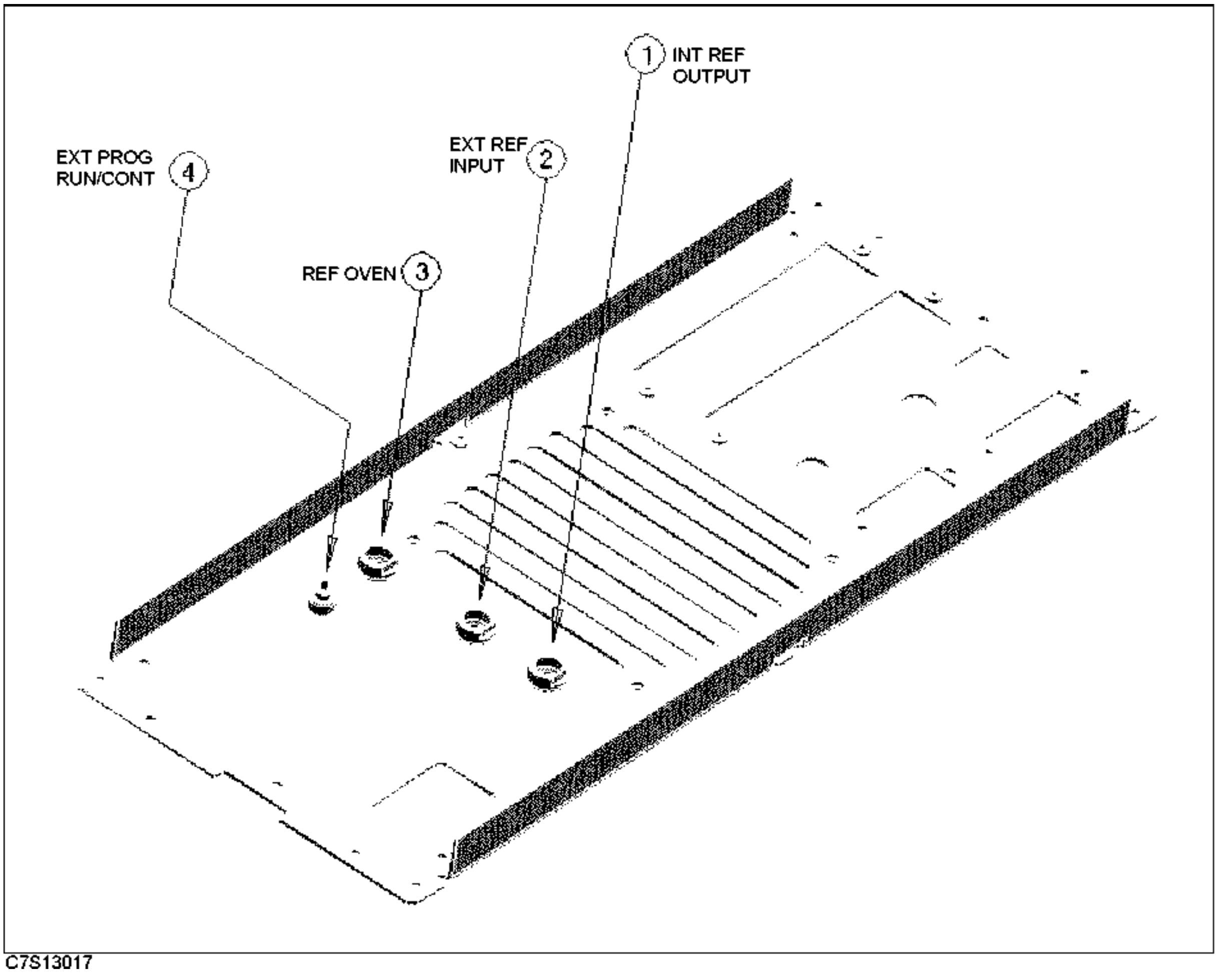


Figure 13-46. Rear RF Cables

Table 13-50. Rear RF Cables

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61608	6	1	RF CABLE O[1]	28480	E5100-61608
2	E5100-61607	5	1	RF CBL ASSY I[2]	28480	E5100-61607
3	E5100-61609	7	1	RF CBL ASSY V[3]	28480	E5100-61609
4	E5100-61637	1	1	WIRE ASSY R/C[4]	28480	E5100-61637

1 INT REF OUTPUT to A27J1(O). See Figure 13-11.

2 EXT REF INPUT to A27J2(I). See Figure 13-11.

3 REF OVEN to A50J1(V). See Figure 13-40.

4 EXT PROG RUN/CONT to A20J27.

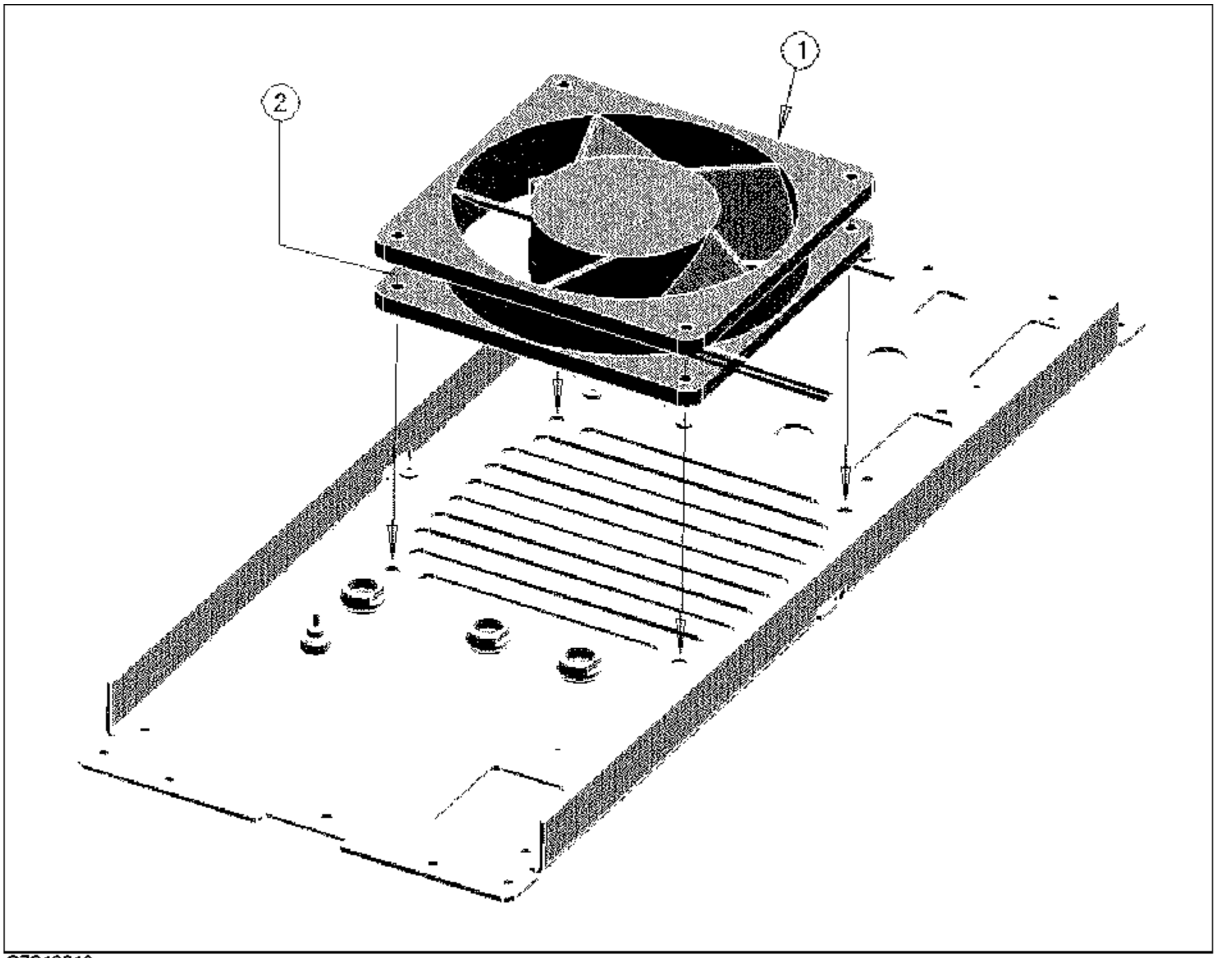


Figure 13-47. Fan Assembly

Table 13-51. Fan Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	04396-61001	0	1	FAN ASSY	28480	04396-61001
2	0515-1598	6	4	SCR SKT-HEAD	28480	0515-1598
	2190-0586	2	4	WSHR-LK HLCL	28480	2190-0586
	3050-0893	9	4	WSHR-FL	28480	3050-0893

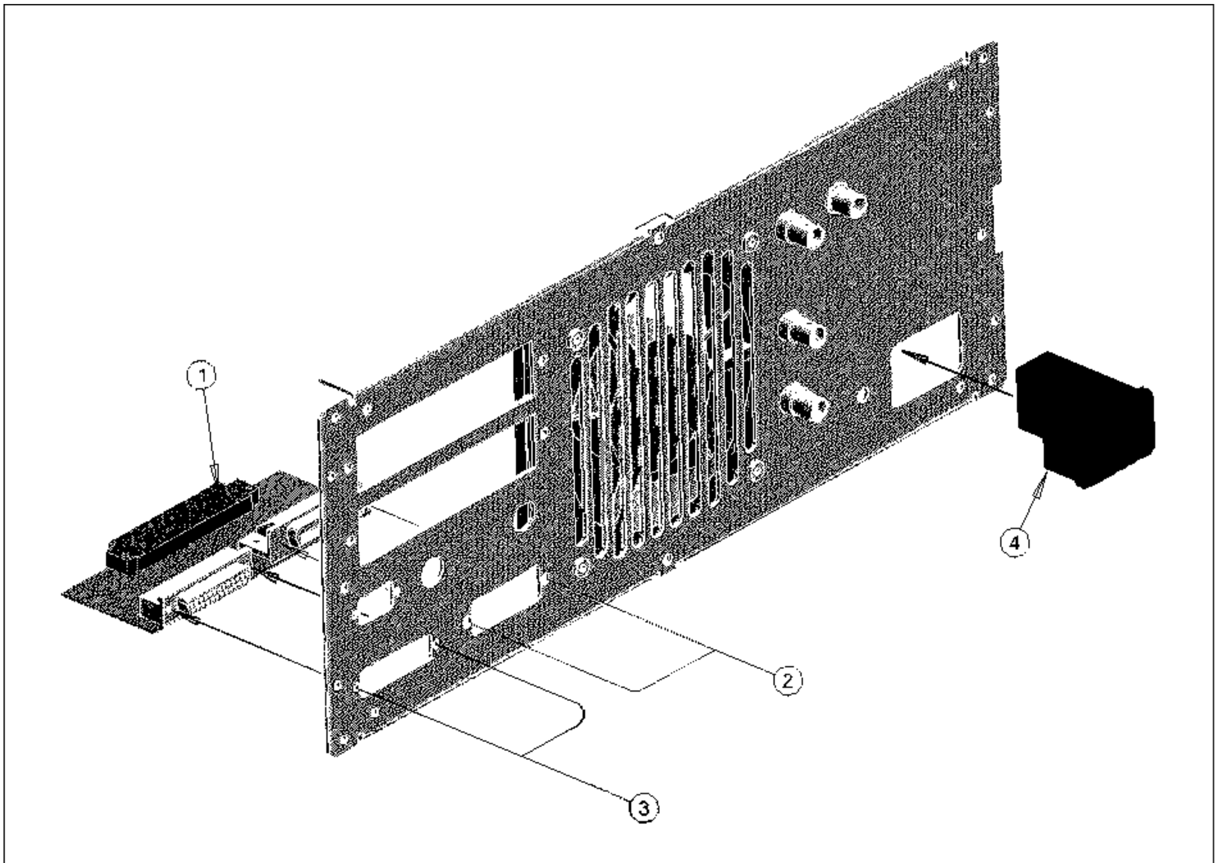


Figure 13-48. GPIB/Printer Port and AC Inlet

Table 13-52. GPIB/Printer Port and AC Inlet

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-66547	2	1	REAR BOARD 1	28480	E5100-66547
2	0380-0644	4	2	STDF-HEX-M/FEX	28480	0380-0644
	2190-0577	1	2	WSHR-LK HLCL	28480	2190-0577
3	1251-5436	0	1	SCRLK F	28480	1251-5436
4	2110-1134	0	1	FUSE DRAWER	28480	2110-1134
	2110-0030	3	1	FUSE 5A 250V	28480	2110-0030
	1252-6951	8	1	AC INLET	28480	1252-6951

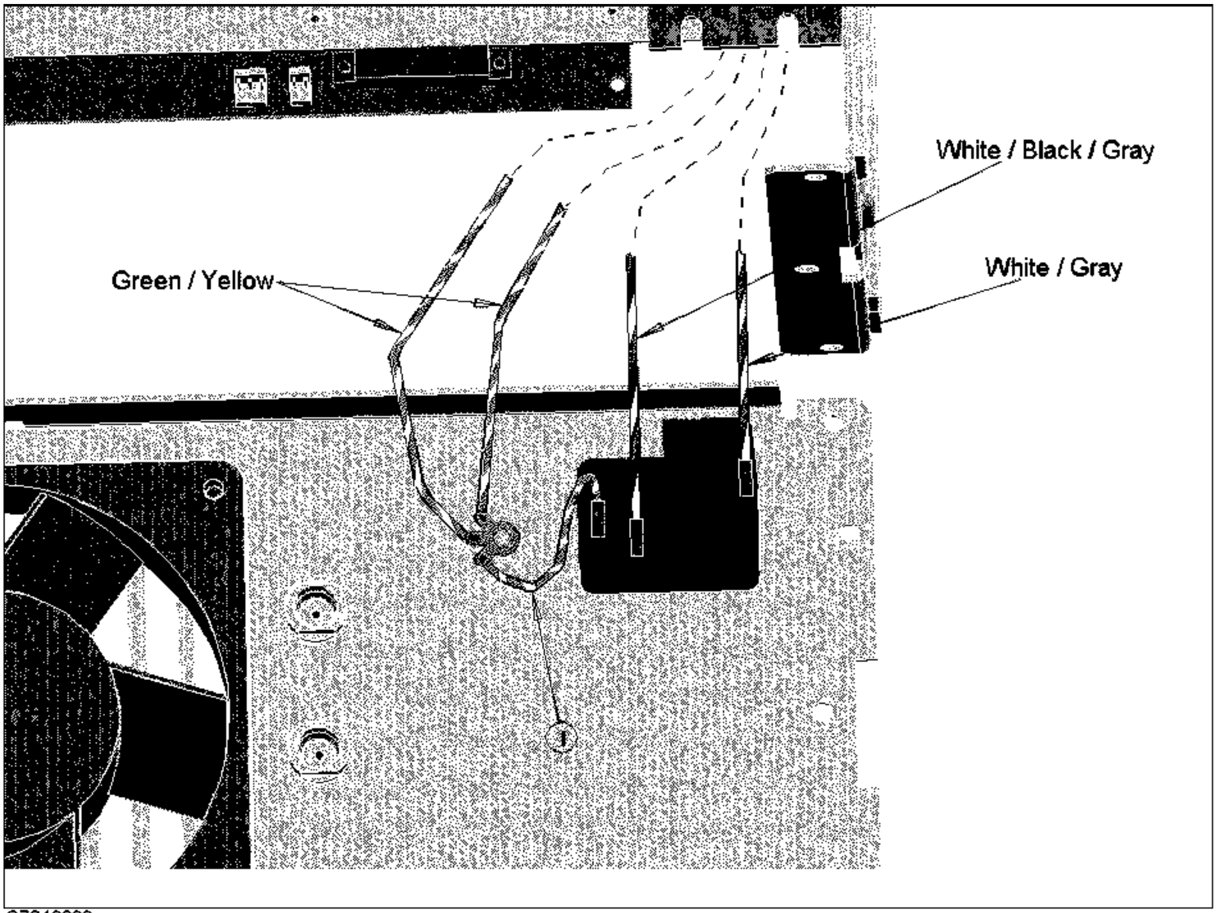


Figure 13-49. Ac Inlet Assembly

Table 13-53. Ac Inlet Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61640	6	1	WIRE ASSY GND	28480	E5100-61640

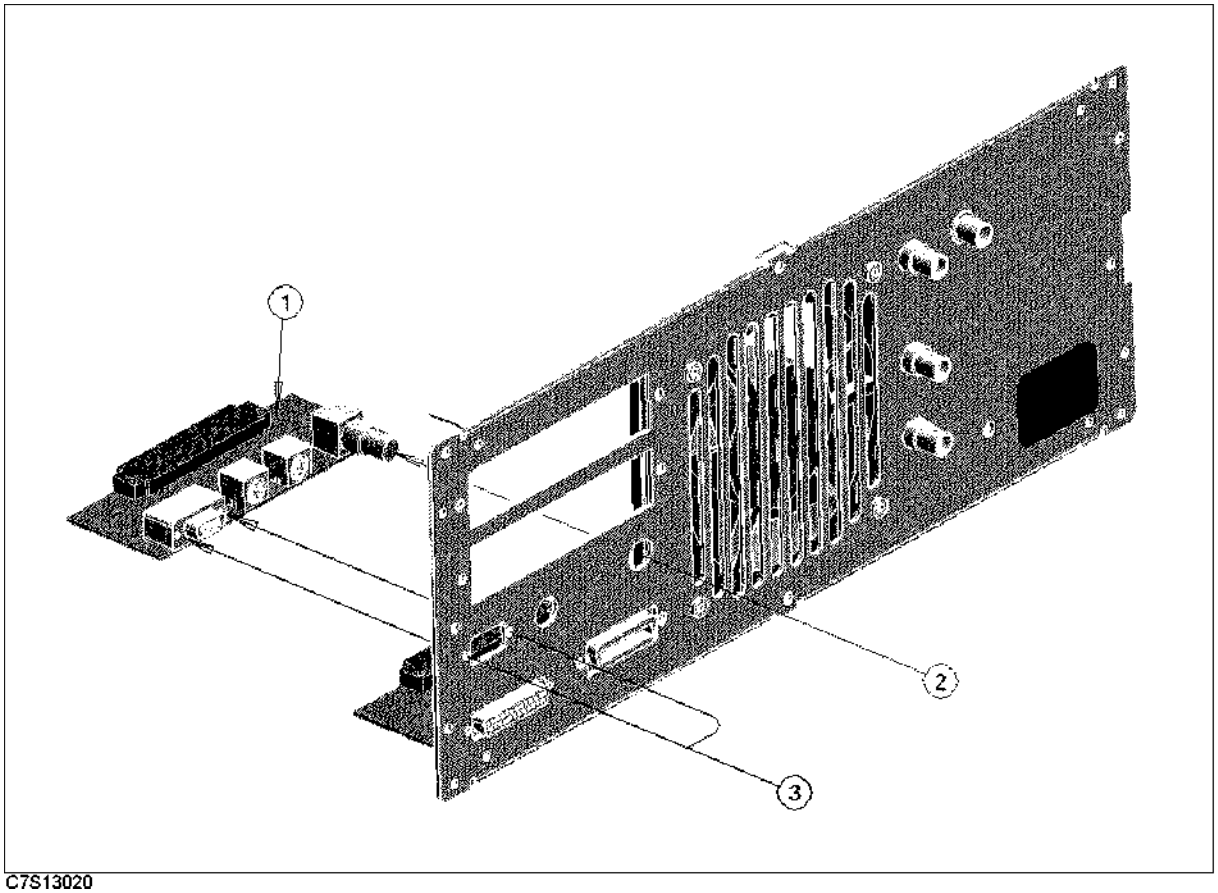


Figure 13-50. External Display/KeyBoard I/F

Table 13-54. External Display/KeyBoard I/F

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-66542	7	1	REAR-2 PANEL B'D	28480	E5100-66542
2	2190-0054	9	1	WSHR-LK INTL T	28480	2190-0054
	2950-0054	1	1	NUT-HEX-DBL-CHAM	28480	2950-0054
3	1251-5436	0	1	SCRLK F	28480	1251-5436

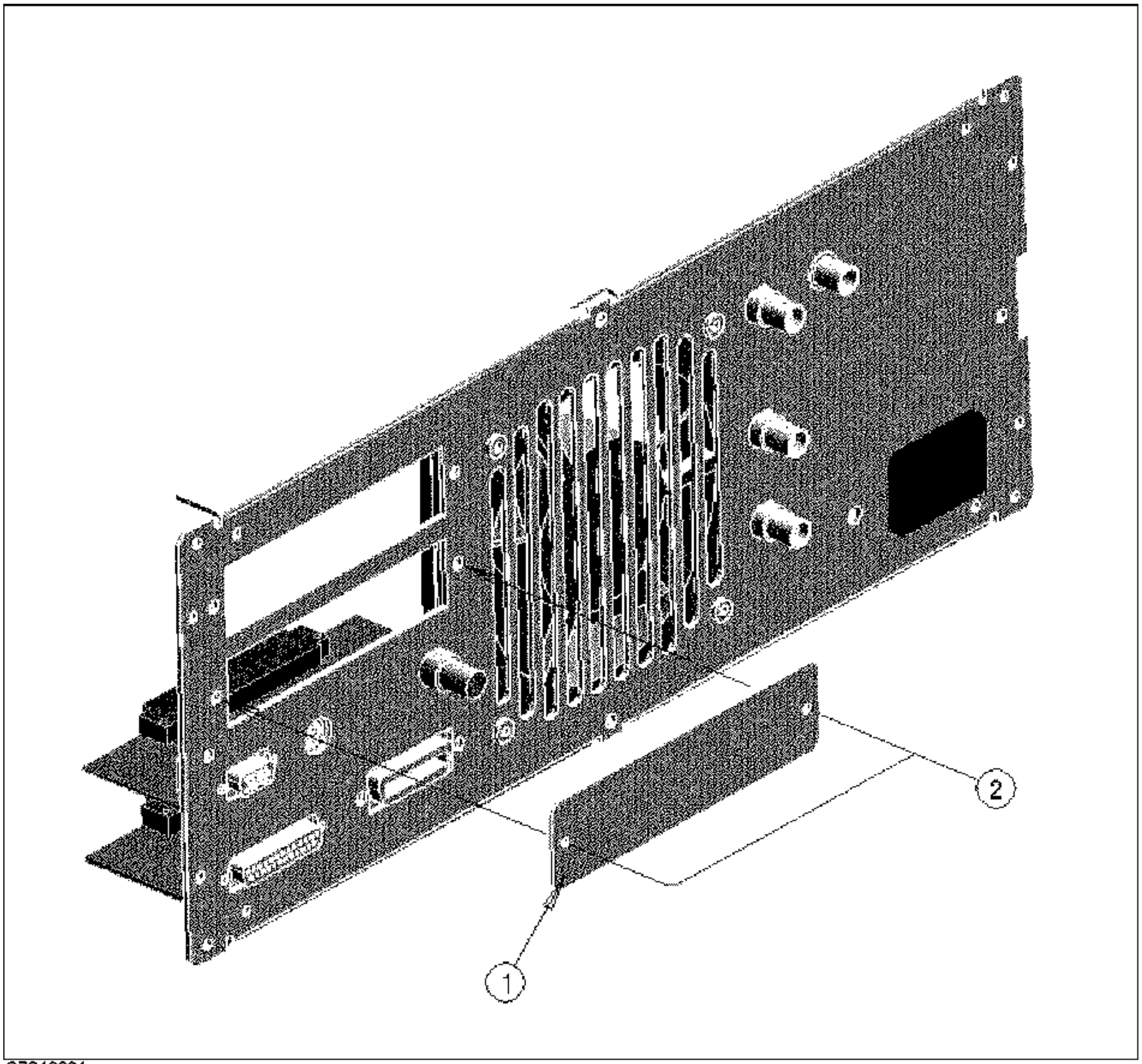


Figure 13-51. I/O Blank Pannel

Table 13-55. I/O Blank Pannel

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-00250	6	1	PANEL I/F	28480	E5100-00250
2	0515-1550	0	2	SCR M3-L 8 P-H	28480	0515-1550

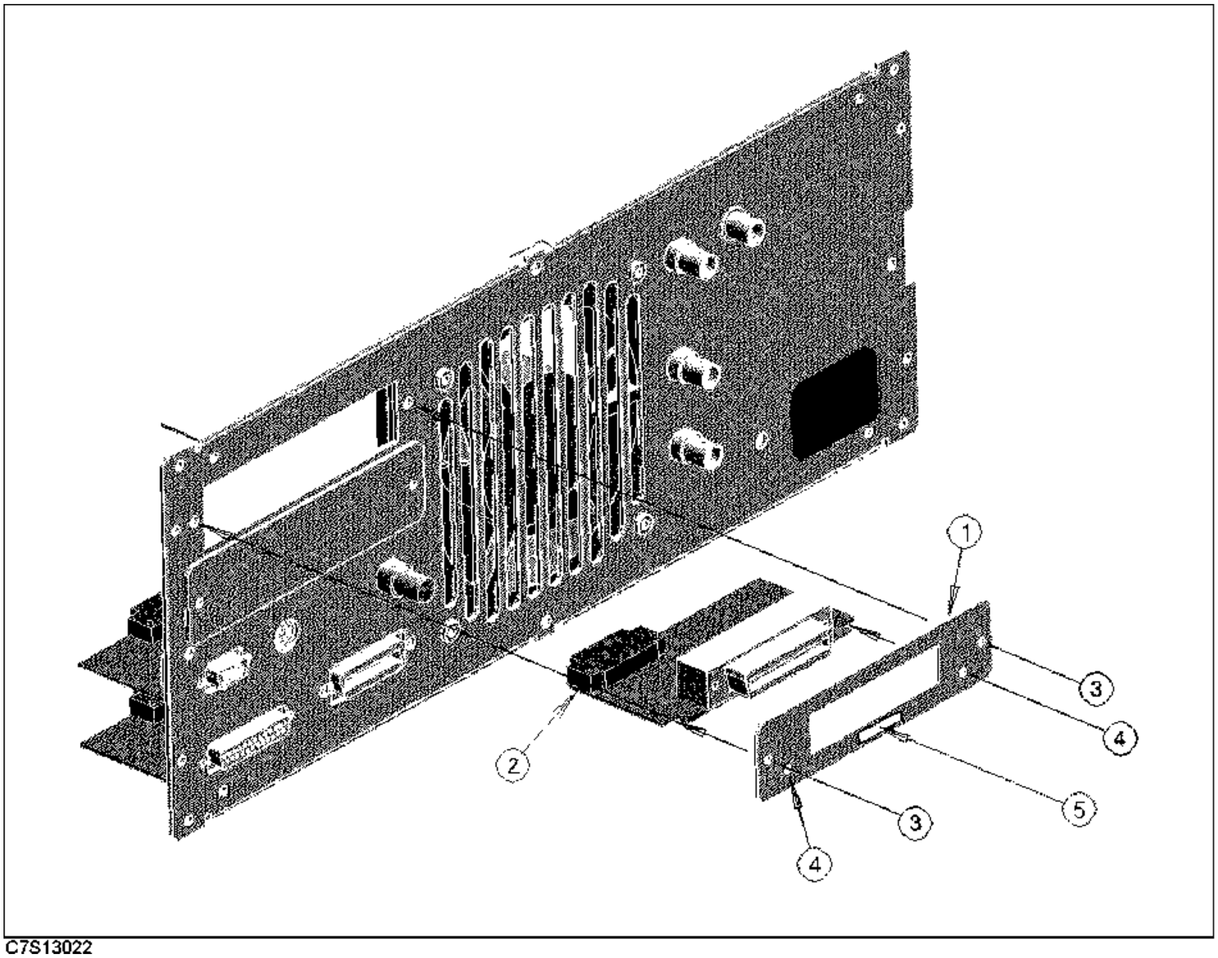


Figure 13-52. Digital I/O Assembly

Table 13-56. Digital I/O Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-00251	7	1	PANEL I/F (STD)	28480	E5100-00251
	E5100-00252	8	1	PANEL I/F (Opt.005)	28480	E5100-00252
	E5100-00251	7	1	PANEL I/F (Opt.006)	28480	E5100-00251
	E5100-00251	7	1	PANEL I/F (Opt.007)	28480	E5100-00251
2	E5100-66543	8	1	24 BIT DIGITAL I/O (STD)	28480	E5100-66543
	E5100-66545	0	1	8 BIT DIGITAL I/O MODE A (Opt.005)	28480	E5100-66545
	E5100-66544	9	1	24 BIT DIGITAL I/O MODE B (Opt.006)	28480	E5100-66544
	E5100-66546	1	1	PHOTO ISOLATE DIGITAL I/O (Opt.007)	28480	E5100-66546
3	0515-1550	0	4	SCR M3-L 8 P-H	28480	0515-1550
4	1251-5436	0	1	SCRLK F	28480	1251-5436
5	7120-0386	8	1	NAME PLATE (Opt.006)	28480	7120-0386
	5182-0431	2	1	LABEL (Opt.007)	28480	5182-0431

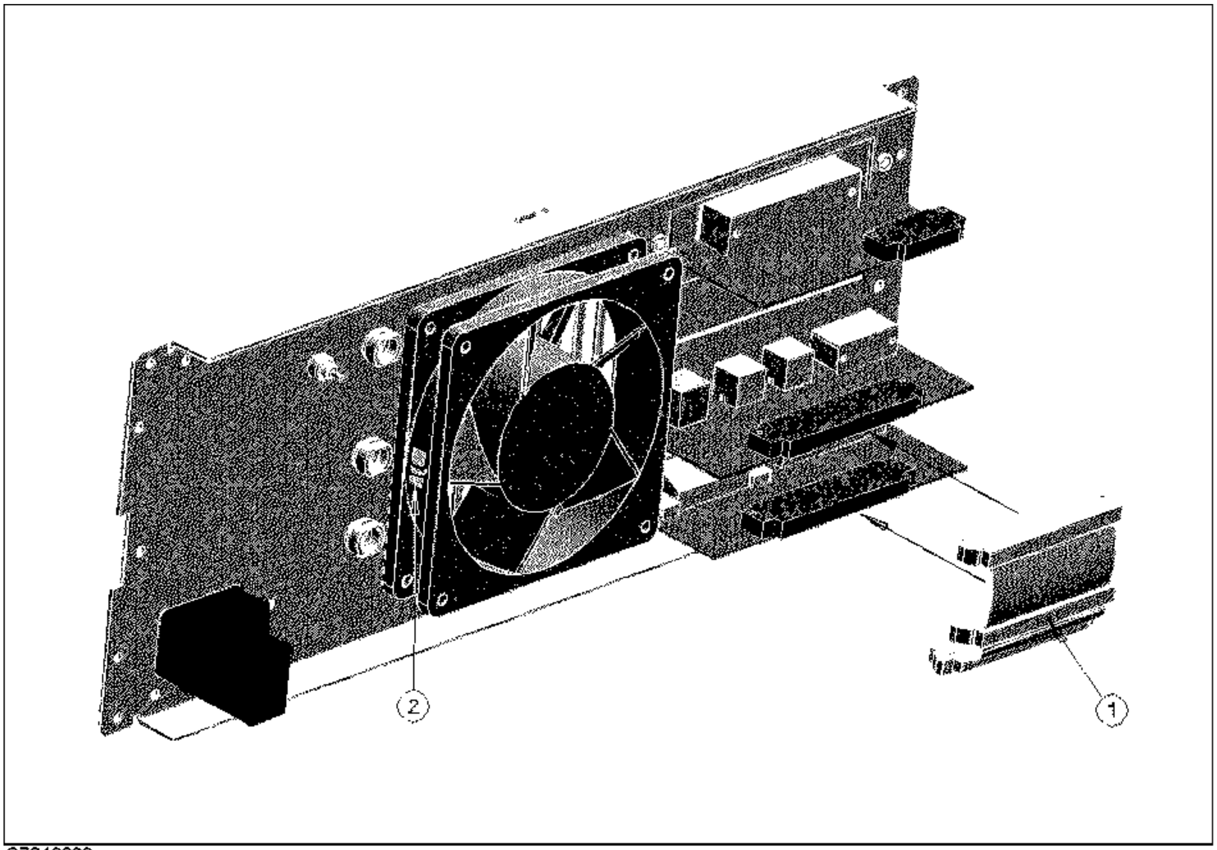


Figure 13-53. Rear Board Flat Cable 1/2

Table 13-57. Rear Board Flat Cable 1/2

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-61660	0	1	FLAT CBL ASSY	28480	E5100-61660
2	1400-1334	6	1	CLAMP CABLE	28480	1400-1334

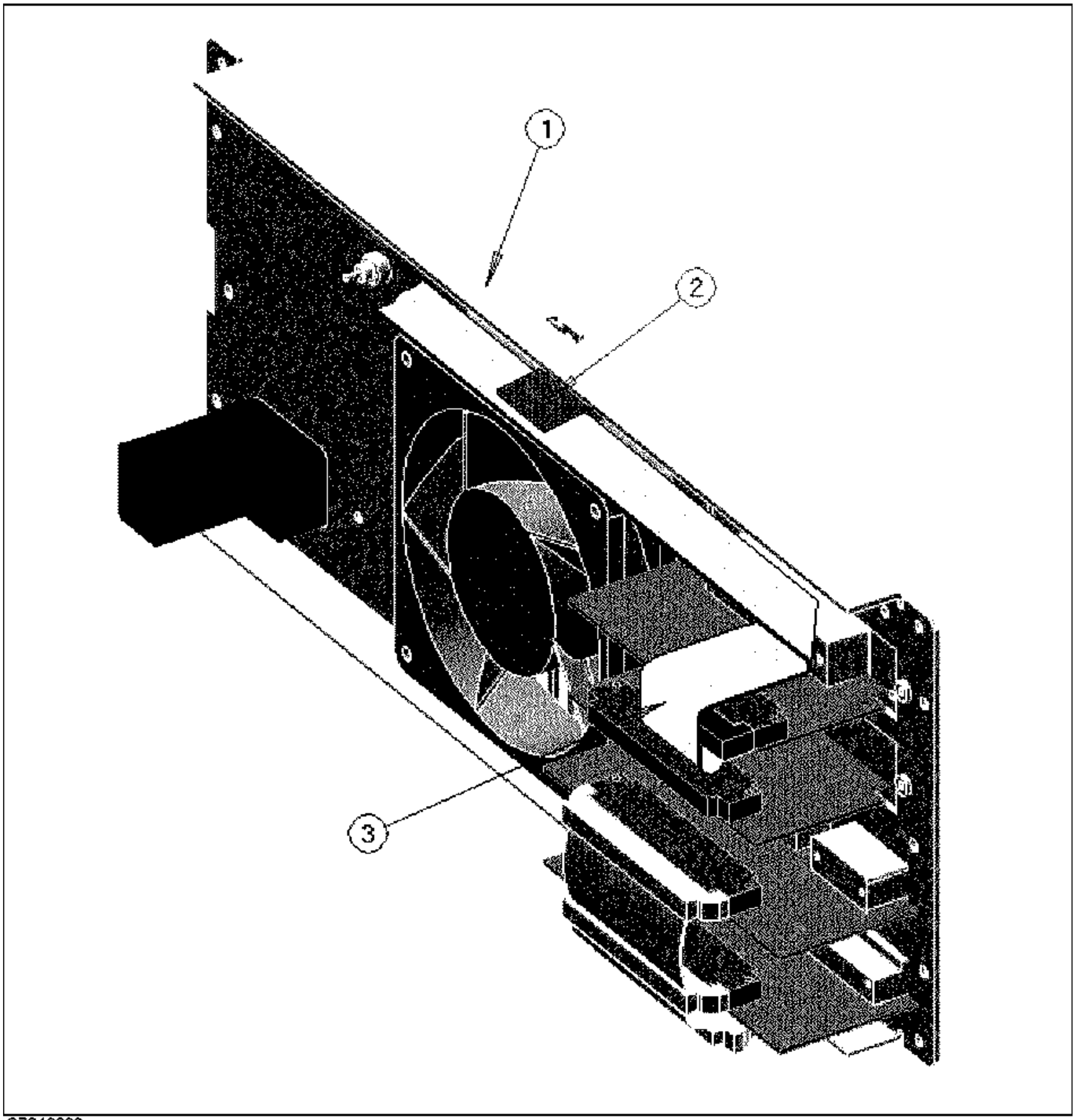


Figure 13-54. Rear Board Flat Cable 2/2

Table 13-58. Rear Board Flat Cable 2/2

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-64902	9	1	REAR ASSY	28480	E5100-64902
2	1400-0611	0	1	CLAMP-CABLE	28480	1400-0611
3	04396-61662	9	1	CA-ASSY FLAT 40	28480	04396-61662

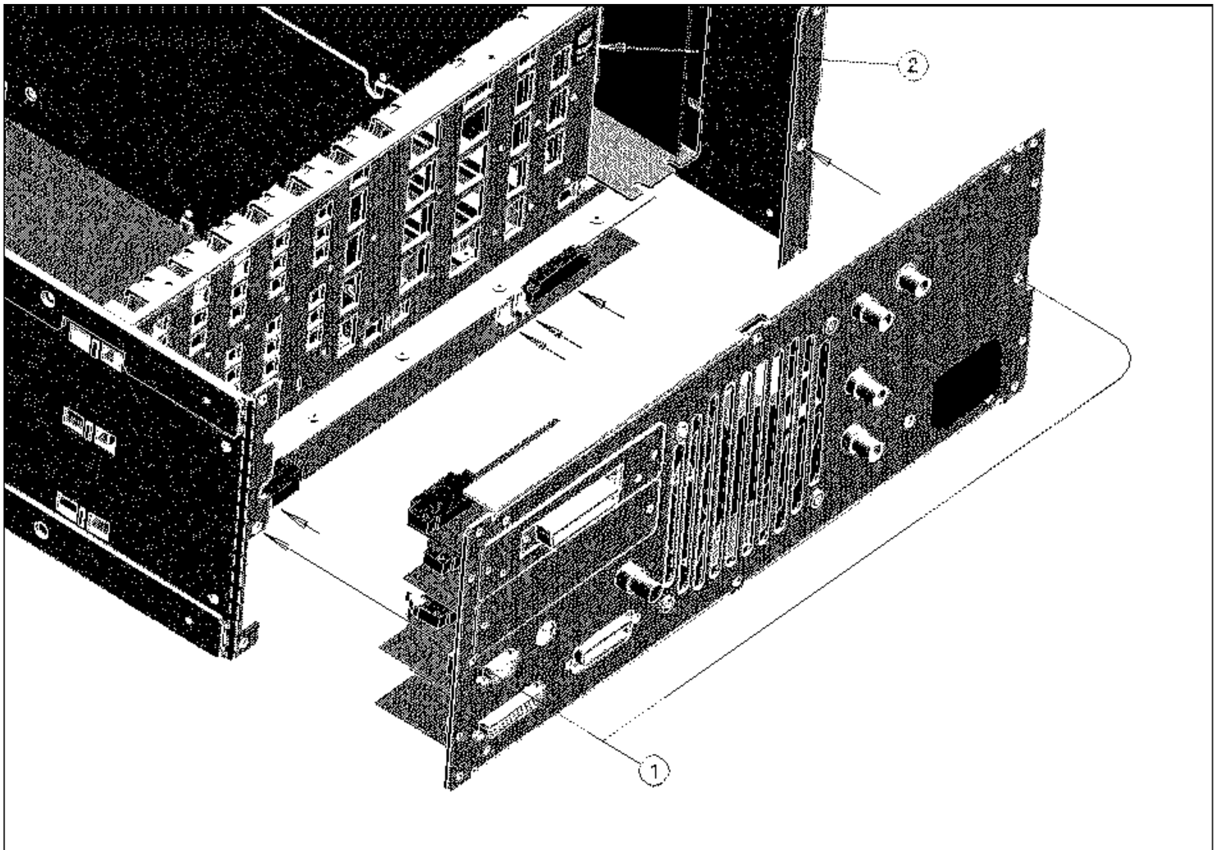


Figure 13-55. Rear Assembly

Table 13-59. Rear Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0515-2079	0	2	SCR M4X8	28480	0515-2079
2	1400-1334	6	1	CLAMP CABLE	28480	1400-1334

Chassis Assemblies

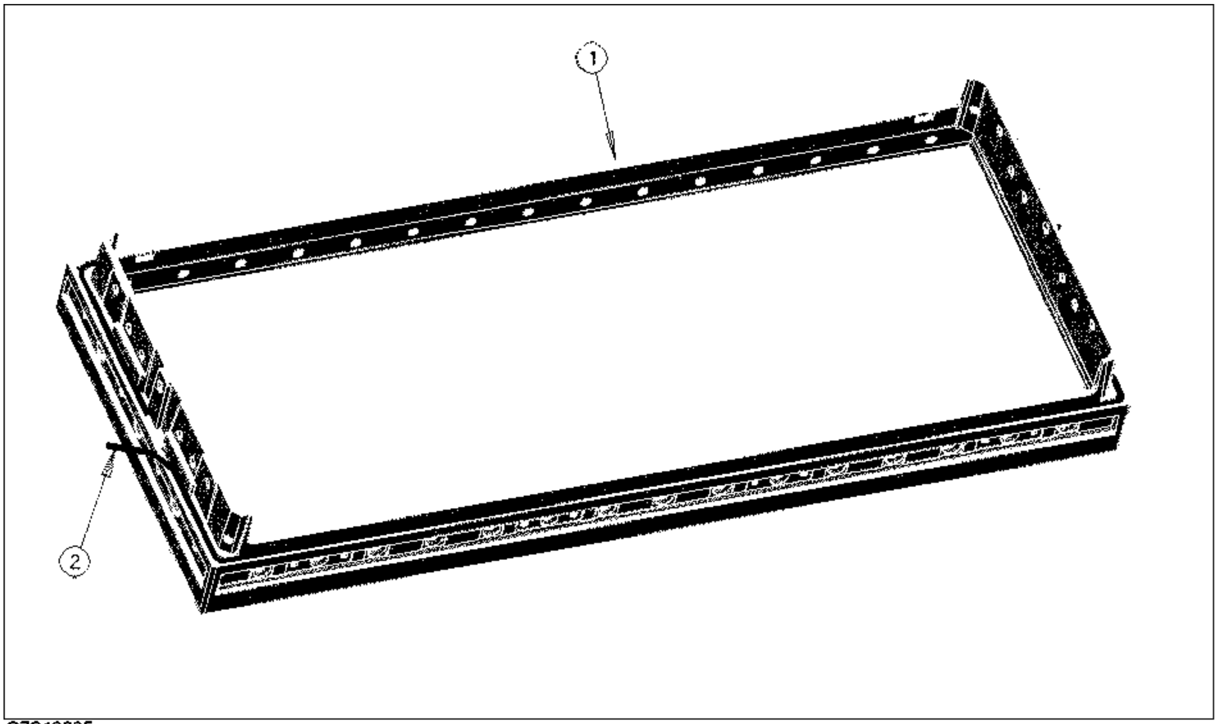


Figure 13-56. Front Frame Assembly

Table 13-60. Front Frame Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	5021-8405	6	1	FRONT FRAME	28480	5021-8405
2	8160-0641	3	1	GASKET BRAID	28480	8160-0641

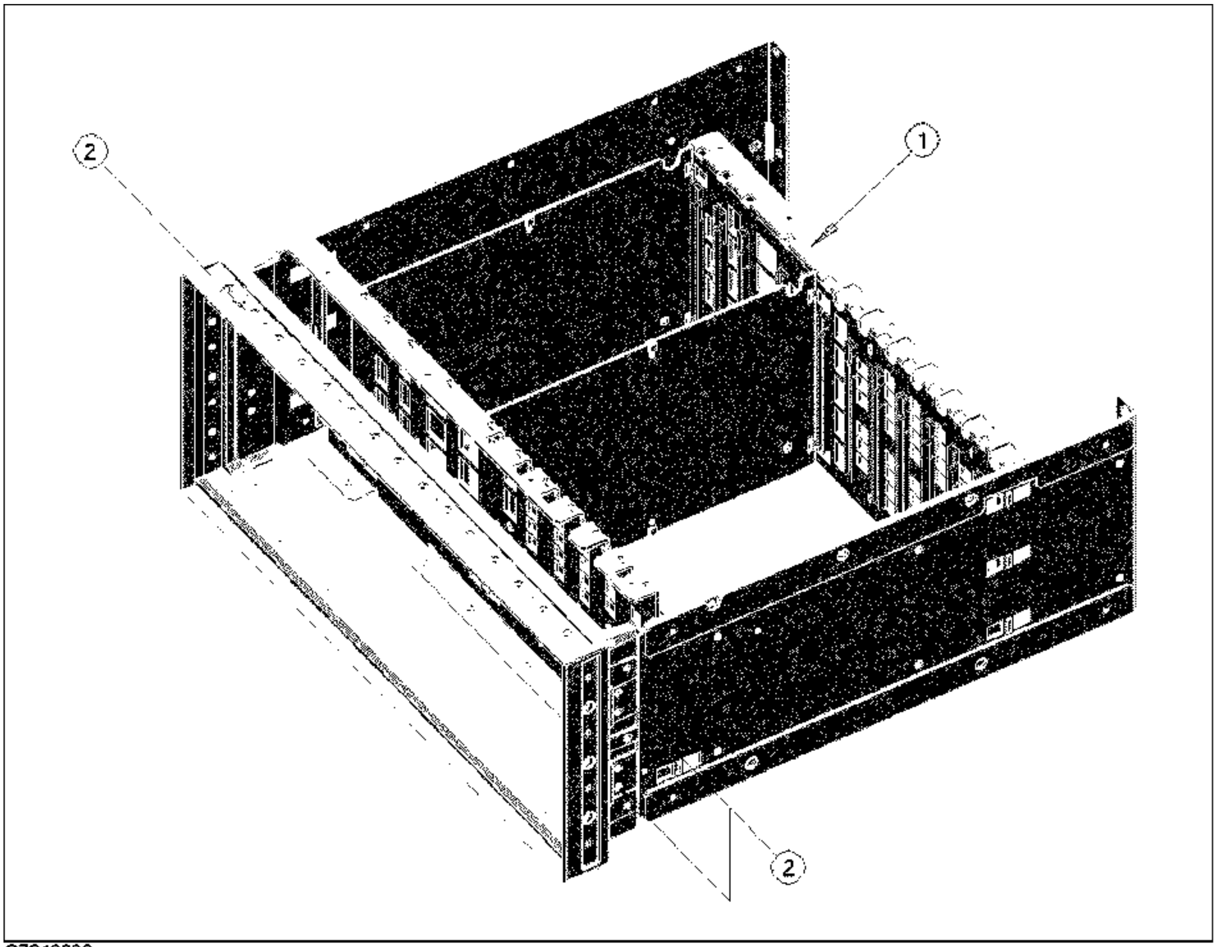
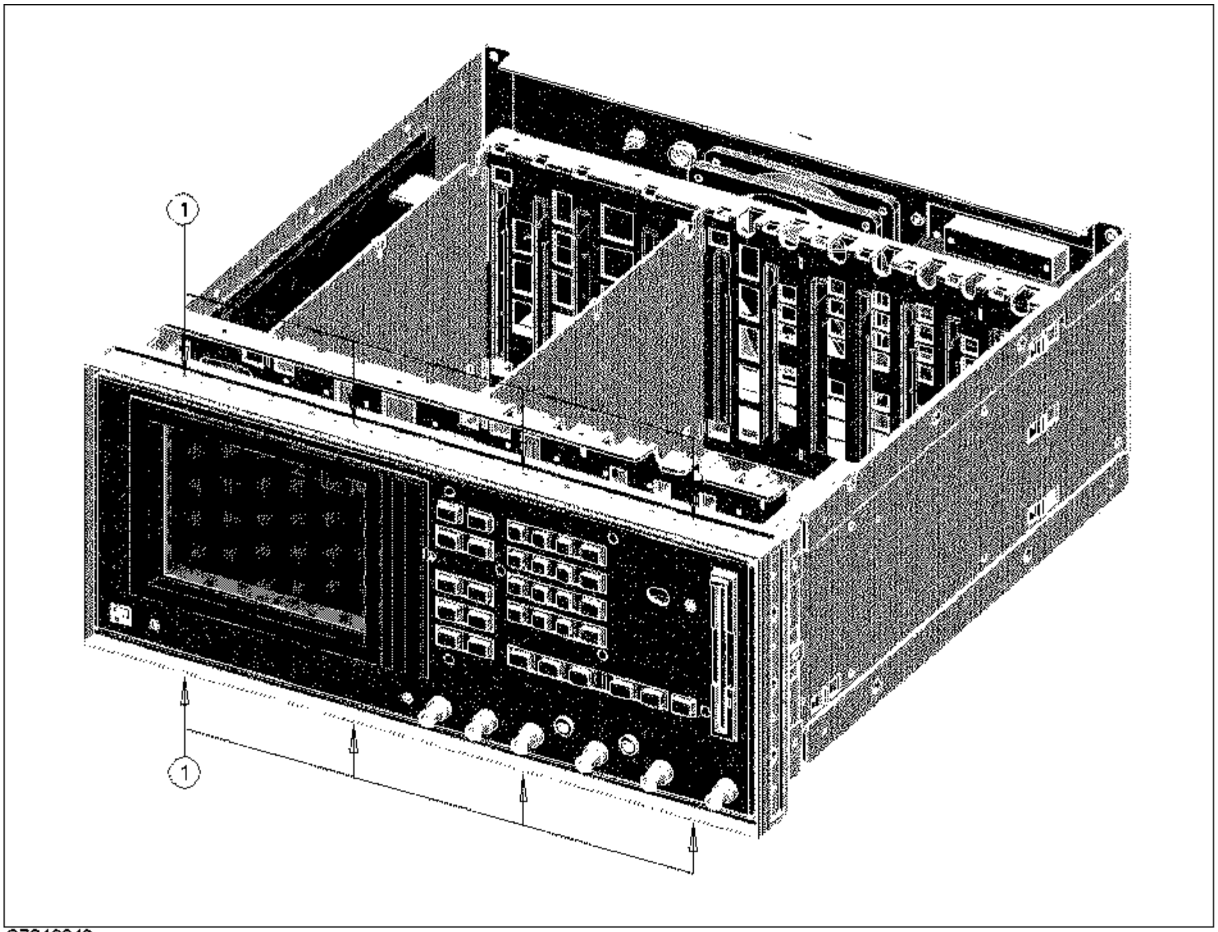


Figure 13-57. Chassis Parts

Table 13-61. Chassis Parts

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-60001	1	1	CHASSIS ASSY	28480	E5100-60001
2	0515-2079	0	3	SCR M4X8	28480	0515-2079



C7S13042

Figure 13-58. Front Screws

Table 13-62. Front Screws

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	0515-0889	6	8	SCR-MACH M3.5X6	28480	0515-0889

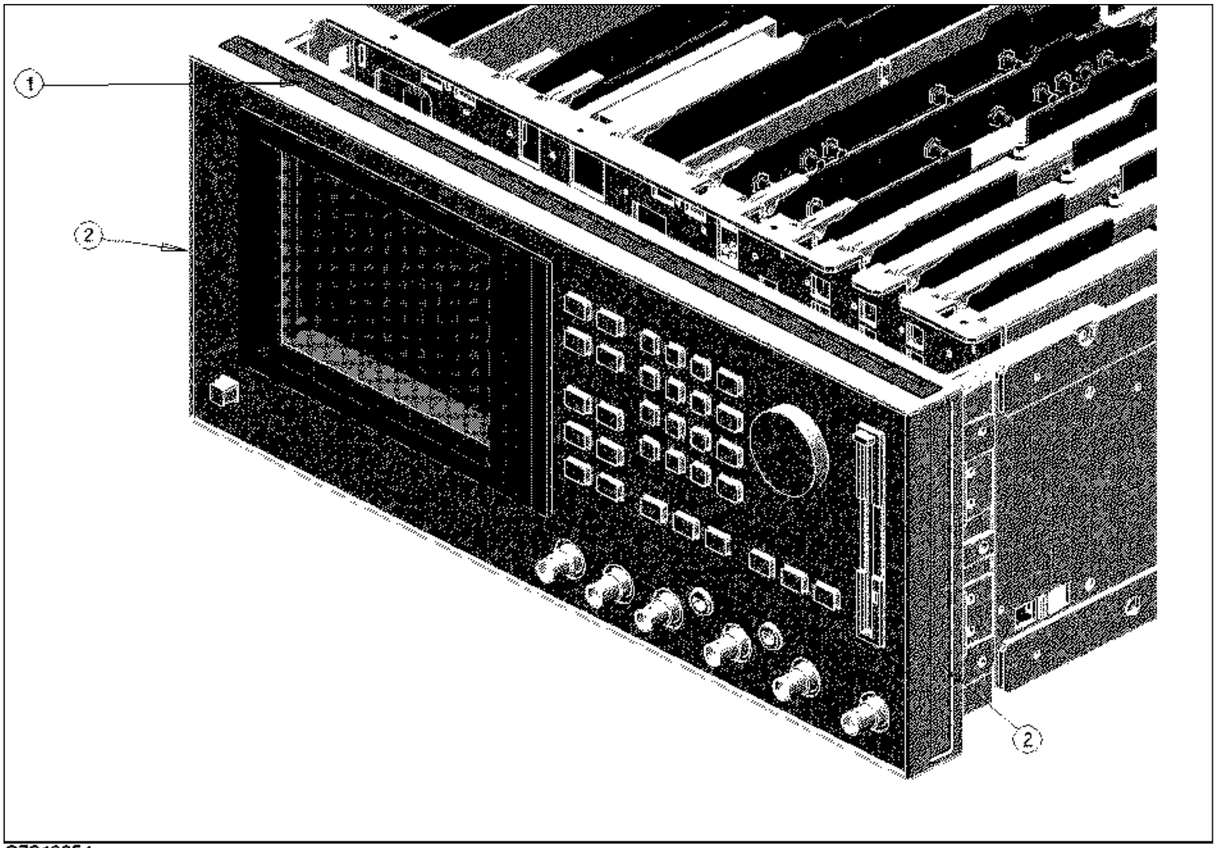


Figure 13-59. Front Trim

Table 13-63. Front Trim

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	5041-8802	9	1	TRIM STRIP	28480	5041-8802
2	5001-0540	2	2	TRIM SIDE	28480	5001-0540

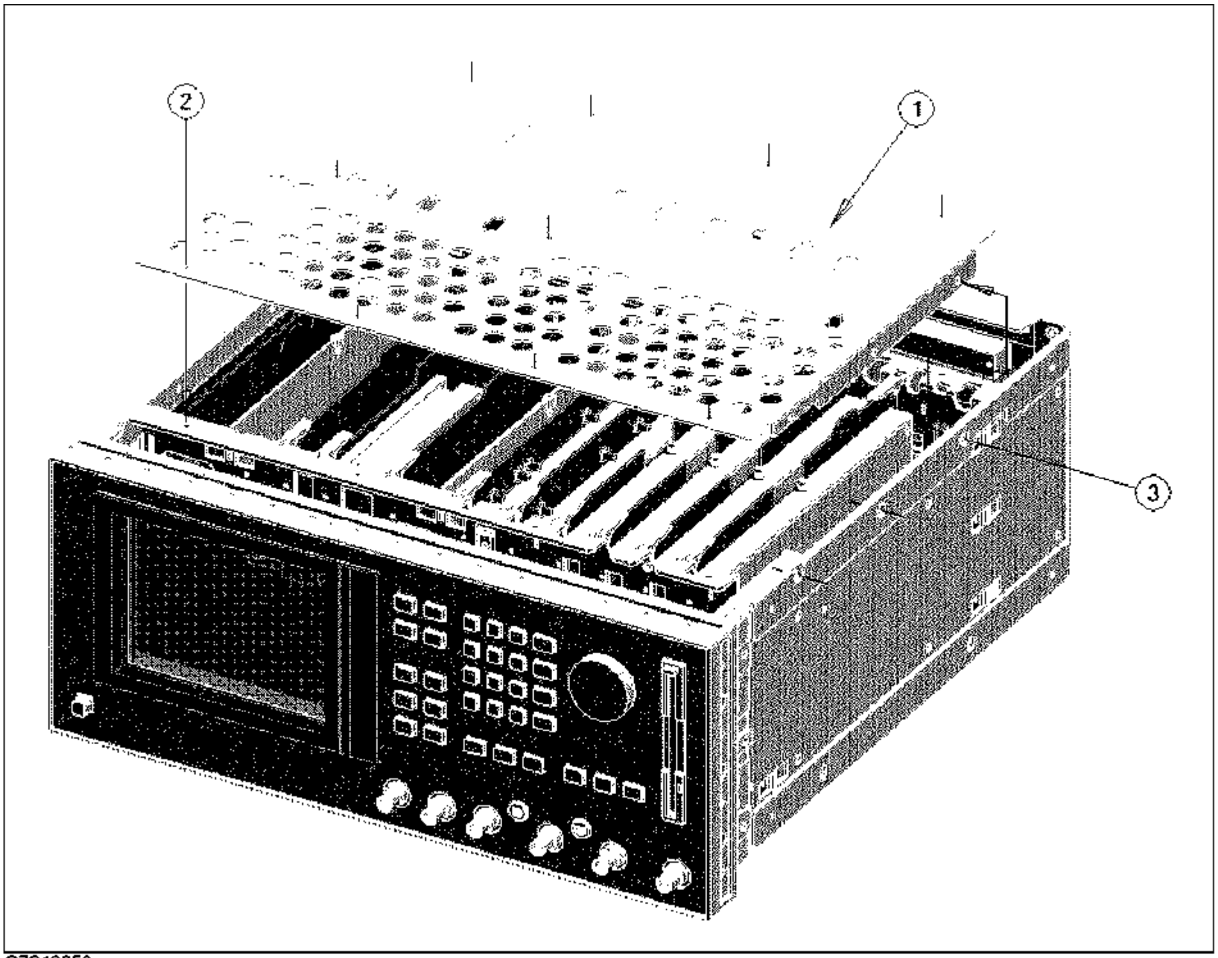


Figure 13-60. Shield Plate

Table 13-64. Shield Plate

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-00611	3	1	PLATE	28480	E5100-00611
2	0515-0914	8	10	SCR-MACH M3X0.5	28480	0515-0914
3	0515-1550	0	6	SCR M3-L 8 P-H	28480	0515-1550

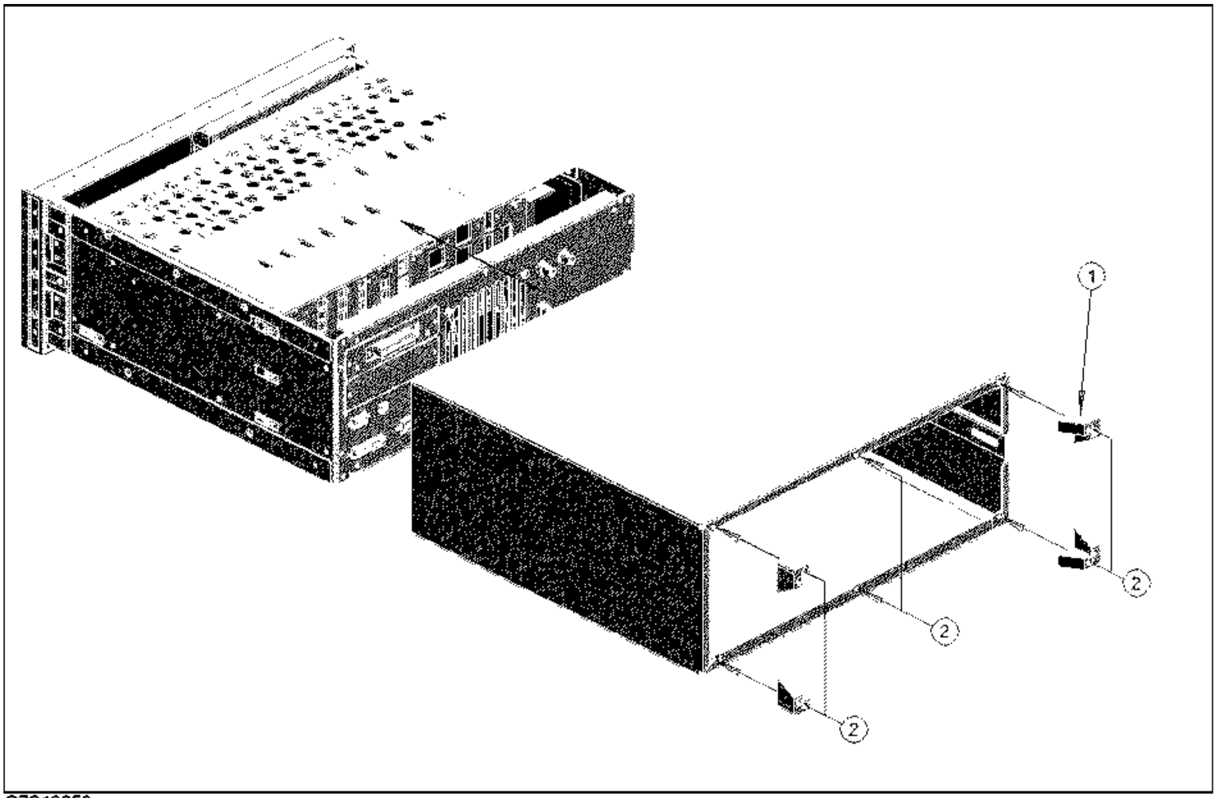


Figure 13-61. Rear Foot

Table 13-65. Rear Foot

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-40002	0	4	STAND OFF	28480	E5100-40002
2	0515-0892	1	6	SCREW M3.5	28480	0515-0892

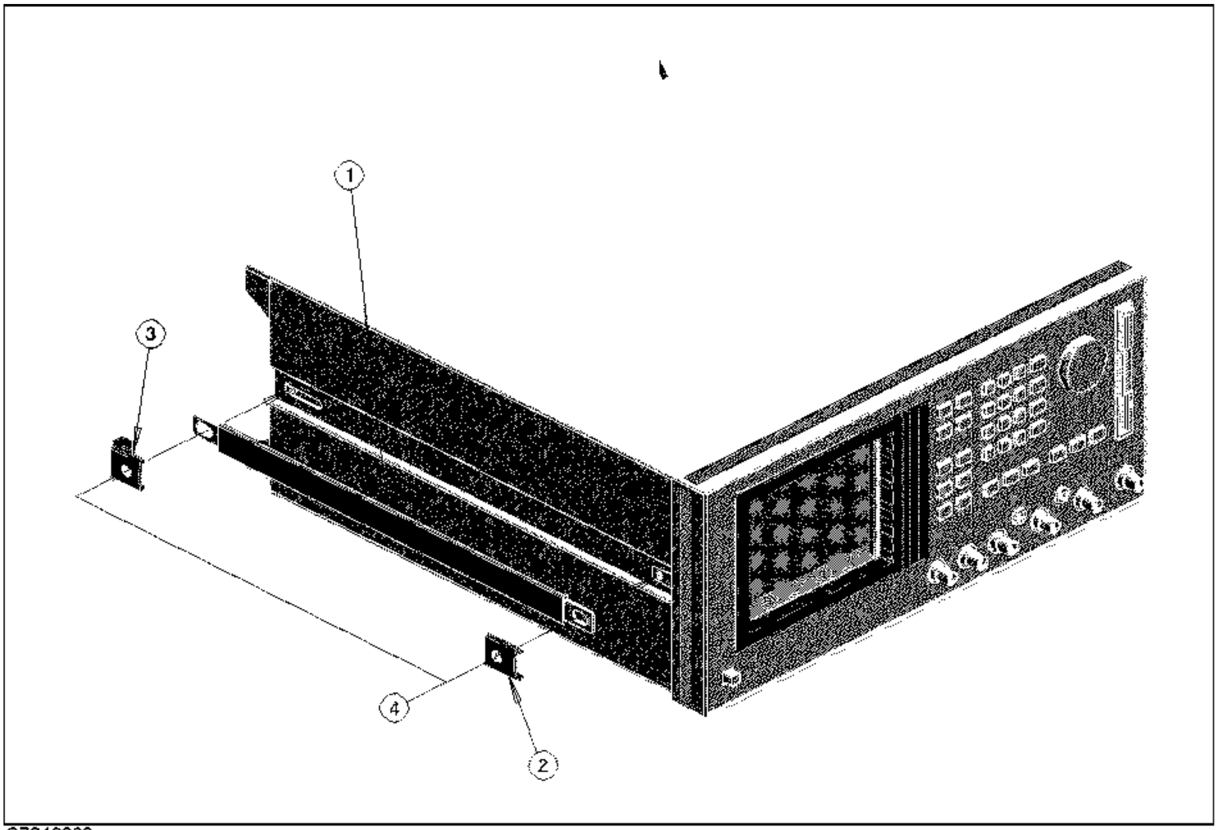


Figure 13-62. Strap Handle

Table 13-66. Strap Handle

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	5062-3703	3	1	STRAP HANDLE	28480	5062-3703
2	5041-8819	8	1	STRAP HANDLE FRT	28480	5041-8819
3	5041-8820	1	1	STRAP HANDL REAR	28480	5041-8820
4	0515-1132	4	2	SCR-MACH M5X0.8	28480	0515-1132

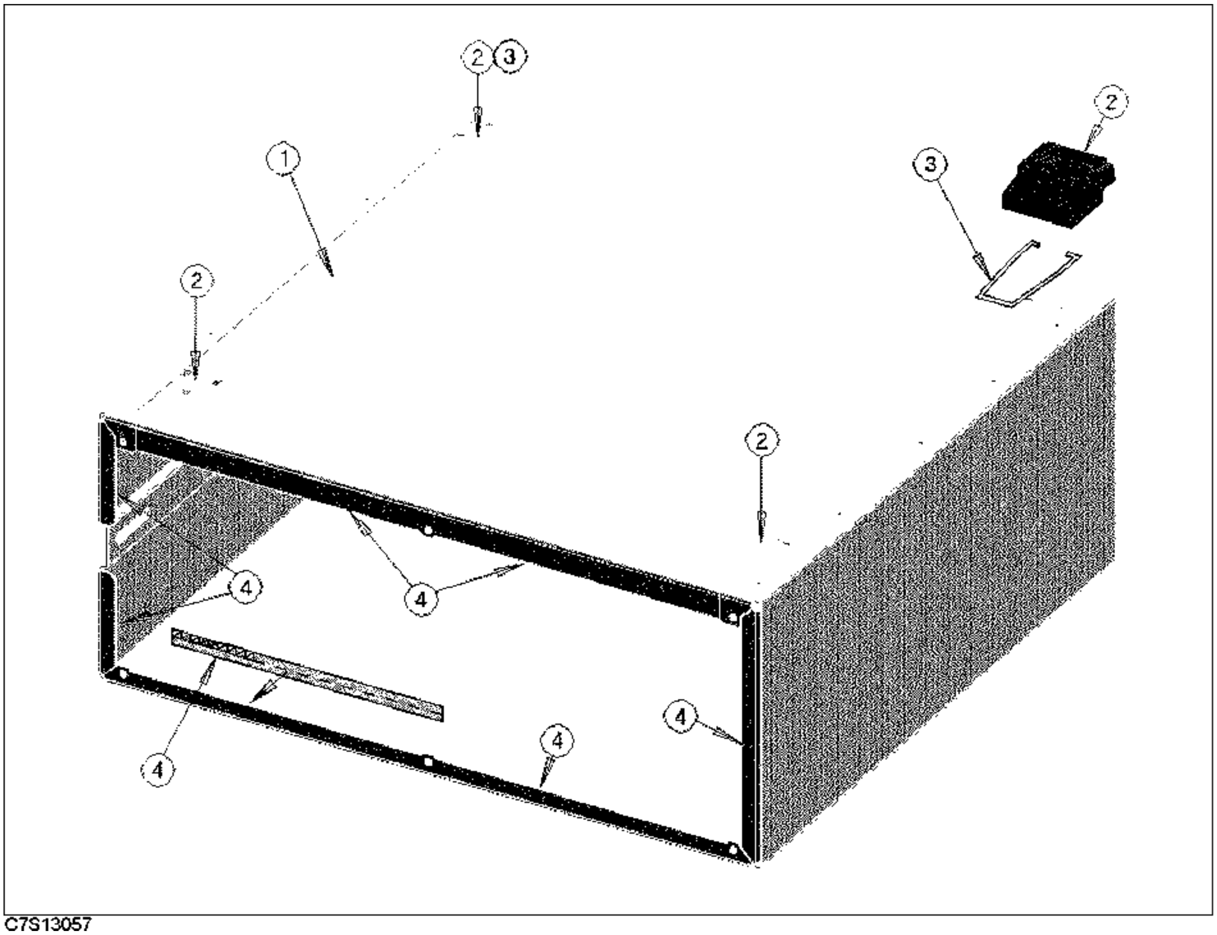


Figure 13-63. Outer Cover Assembly

Table 13-67. Outer Cover Assembly

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
1	E5100-60002	2	1	COVER METAL	28480	E5100-60002
2	5041-8801	8	4	FOOT FL	28480	5041-8801
3	1460-1345	5	2	WIREFORM	28480	1460-1345
4	0363-0125	0	1	SHIELD GASKET	28480	0363-0125

Other Parts

Table 13-68. Fuse

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1F1	2110-0935	7	1	Fuse 5 A	75915	R251005T1
A2F1	2110-0935	7	1	Fuse 5 A	75915	R251005T1
A3F1	2110-0935	7	1	Fuse 5 A	75915	R251005T1
Line Fuse	2110-0030	0	1	Fuse 5 A 250V VF		
	2110-1134		1	Fuse Drawer		

Table 13-69. Miscellaneous Accessories

Ref. Desig.	Agilent Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
				SERVICE TOOLS		
	E5100-65001			I/O Port Test Kit	28480	E5100-65001
	5959-8096			Plastic Cover	28480	5959-8096
				DOCUMENTATION		
	E5100-90015			E5100A/B IBASIC Manual Supplement	28480	E5100-90015
	E5100-90040			E5100A/B Function Reference	28480	E5100-90040
	E5100-90031			E5100A/B User's Guide	28480	E5100-90031
	E5100-90067			E5100A/B Programming Manual	28480	E5100-90067
	E5100-90110			E5100A/B Service Manual	28480	E5100-90110

14

Replacement Procedures

Introduction

This chapter contains the procedures and lists the tools required to remove the major assemblies from the E5100A/B. To install an assembly, after you complete the adjustments or make repairs, reverse the order of steps you performed for the removal of that assembly.

The letters in circles indicate the reference designators in the figures just after the procedure unless otherwise described.

Outer Cover Removal

Tools Required

- Pozidriv screwdriver, pt size #2 (medium)

Procedure

1. Disconnect the power cable from the E5100A/B.
2. Remove the four rear feet.
3. Remove the two outer cover screws from the rear panel.
4. Remove the four bottom feet
5. Remove the side strap.
6. Place the E5100A/B on its side.
7. Slide off the outer cover toward the rear.

If you have a plastic cover (p/n 5959-8096), the following procedure can be used instead of steps 6 and 7:

1. Put a plastic cover (p/n 5959-8096) on the front panel of the E5100A/B and place the E5100A/B on flat table with its front panel down.
2. Slide up the outer cover and remove it carefully.
3. Place the E5100A/B on flat table with its bottom side down.

A1/A2/A3 Board Removal

Tools Required

- Open end wrench, 1/4 inch
- Open end wrench, 15/64 inch (6 mm)
- Pozidriv screwdriver, pt size #1 (small)

Procedure

1. Remove the outer cover as described in “Outer Cover Removal”.
2. Remove the ten screws which fasten the shielding plate over the A1/A2/A3/A24/A25/A26(R through C)/A27 boards.
3. Remove the shielding plate.
4. Lift the extractors at the top corners of the A1/A2/A3 board, lift the A1/A2/A3 board out.

Note When you replace the A1 CPU board, you need to make required configuration for the new board. See *Board Configuration* chapter.

A24/A25/A26(R through C)/A27 Board Removal

Tools Required

- Pozidriv screwdriver, pt size #1 (small)
- Open end wrench, 15/64 inch (6 mm)

Procedure

1. Remove the outer cover as described in “Outer Cover Removal”.
2. Remove the shielding plate covering the boards.
3. Disconnect RF cables.
4. Lift the extractors at the top corners of the board, and lift it out.

Note When you replace the A24 Source or A25 RF Amplifier, you need to make required configuration for the new board. See *Board Configuration* chapter.

Front Panel Removal

Tools Required

- Pozidriv screwdriver, pt size #2 (medium)
- Flat edge screwdriver.

Procedure

1. Remove the outer cover as described in “Outer Cover Removal”.
2. Remove the three screws, which fasten the front panel to the frame, from both sides of the front frame.
3. Gradually press the front panel assembly from the inside towards the front, and remove the front panel.
4. Disconnect the flatcable from the A20 board.

A40 Keyboard Removal

Tools Required

- Pozidriv screwdrivers, pt size #1 (small)
- Hex key, 0.063 inch across flats

Procedure

1. Remove the front panel as described in “Front Panel Removal”.
2. Loosen the two hex set screws in the front panel rotary knob, and pull the knob off.
3. Remove the four screws which fastens the keyboard cover.
4. Remove the keyboard cover
5. Remove the A40 keyboard from the front panel.

LCD Display Assembly Removal

Tools Required

- Pozidriv screwdrivers, pt size #1 (small) and #2 (medium)

Procedure

1. Remove the front panel as described in “Front Panel Removal”.
2. Remove the two screws which hold the LCD display assembly.
3. Disconnect the cable connected to the A20 board.

Flexible Disk Drive Assembly Removal

Tools Required

- Pozidriv screwdriver, pt size #1 (small)
- Hex socket, 7/32 inch (5.5 mm)

Procedure

1. Remove the outer cover as described in “Outer Cover Removal”.
2. Remove the four nuts from the FDD (Flexible Disk Drive) holder.
3. Disconnect the flatcable and the wire assembly from the FDD.

Rear Panel Assembly Removal

Tools Required

- Pozidriv screwdrivers, pt size #1 (small) and #2 (medium)
- Open end wrench, 1/4 inch

Procedure

1. Remove the top outer as described in “Outer Cover Removal”.
2. Disconnect RF cables from the rear panel.
3. Disconnect the flatcable connected with the rear panel.
4. Remove the three screws from the rear panel assembly.
5. Gradually pull the rear panel assembly out from the rear frame.

15

Board Configuration

Introduction

This chapter contains the board configuration information for the following boards:

- A1 CPU
- A24 Source
- A25 RF Amplifier (Opt.010/600)
- PS 130W Power Supply

The bit switch settings and cable connections must be confirmed before these boards are installed.

A1 Board Configuration

Bit Switch Settings

The location and settings of bit switch A1SW1 is shown in Figure 15-1 and Table 15-1.

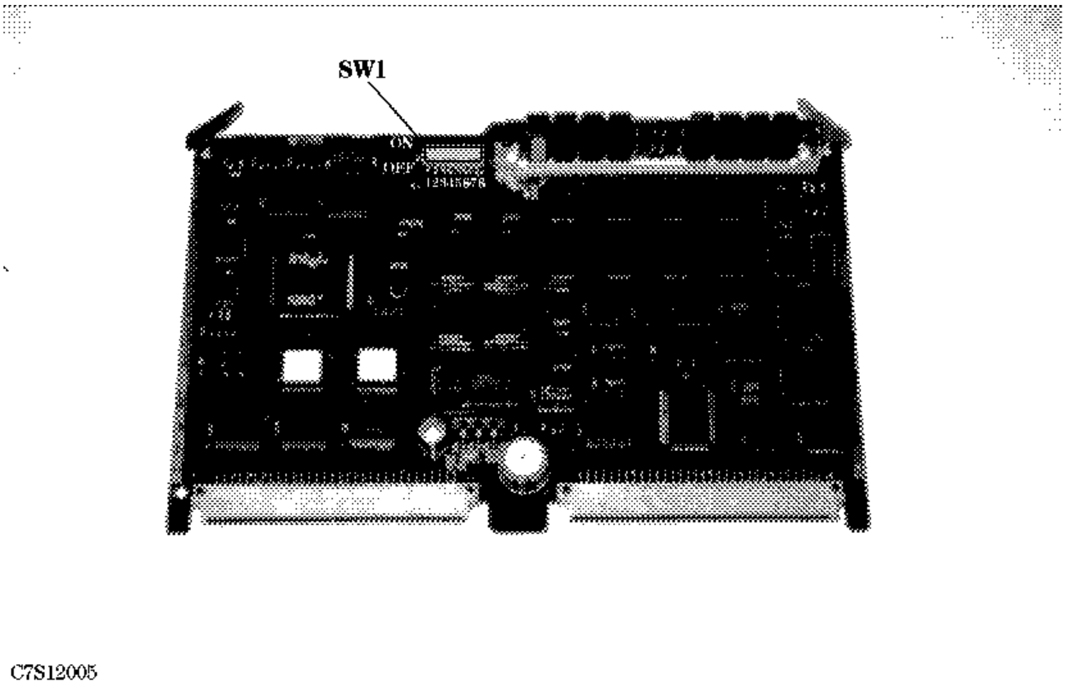


Figure 15-1. A1 Switch Location

Table 15-1. A1 Switch Settings

E5100A/B	Switch A1SW1							
	1	2	3	4	5	6	7	8
Without Opt.509	ON	ON	ON	ON	ON	ON	ON	ON
With Opt.509	OFF	ON	ON	ON	ON	ON	ON	ON

Flash Memories and SIMM

The SIMM (Single Inline Memory Module) is not installed on the A1 board when the replacement board comes from stock. Although flash memories (U5 through U8) are installed on the new replacement board, there is no data in each memory. The four flash memories are for saving correction constants (system calibration data) obtained by adjustments.

1. When you replace the A1 board, you must remove the SIMM and the flash memories (U5, U6, U7, and U8) from the old board and install them on the new board.

Note

- Before you remove the four flash memories from the old board, be sure to mark the location name (U5, U6, U7, U8) on each flash memory. If you lose the original location for each flash memory, you need to perform all adjustments to obtain new system calibration data.
- Other flash memories do not need to move to the new board.

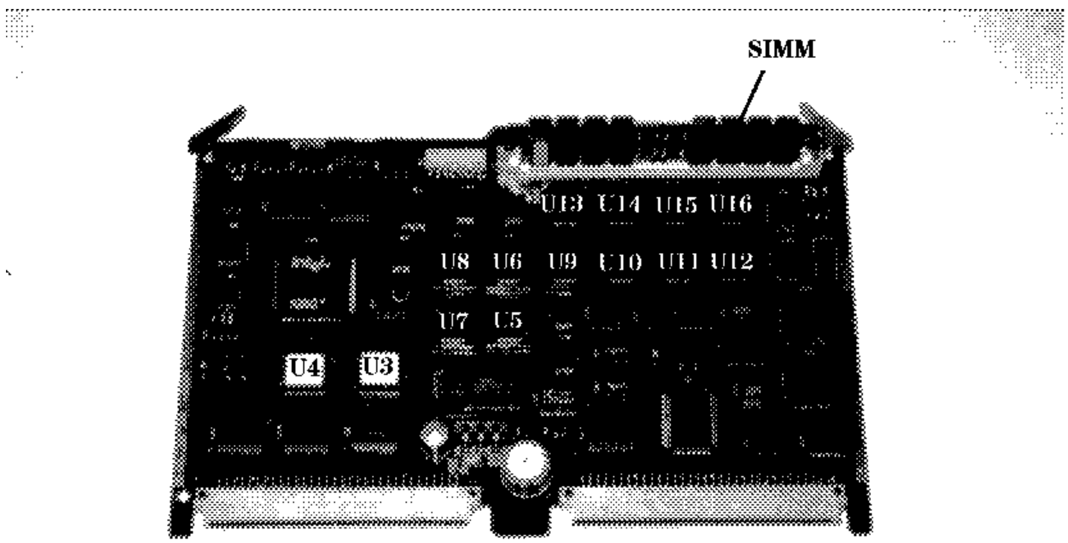


Figure 15-2. A1 Flash Memory and SIMM Location

Table 15-2. A1 Flash Memory and Stored Data

Flash Memory Location	Stored Data	Data Validity of New Board in Stock
U5 through U8	Correction Constants[1]	Invalid
U9 through U16[2]	Firmware	Invalid
U3 and U4	Bootloader	Valid

1 Data obtained and stored by adjustments.

2 Some of the memories may be mounted without sockets.

2. After completing the new board installation, you must reinstall the firmware with a correct firmware disk. Refer to the *Digital Control Troubleshooting* chapter for installing the firmware into the E5100A/B.

A24 Board Configuration

Jumper Setting

The jumper settings of A24J2, A24J9, A24J10, A24J11, and A24J14 are shown in Table 15-3 and Table 15-4. The setting of the A24 jumpers depends on the option which is installed in the unit.

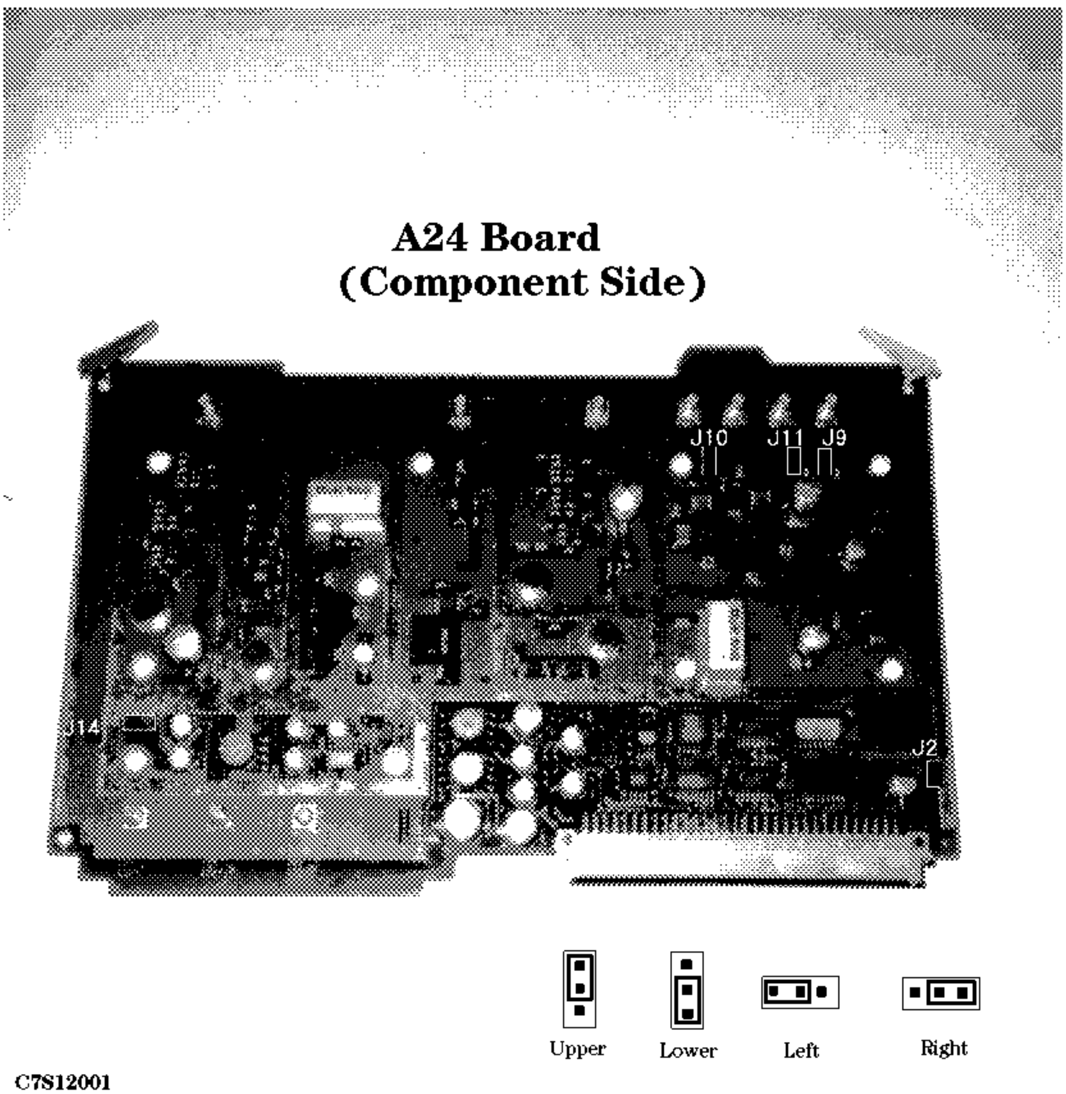


Figure 15-3. A24 Jumper Location and Settings

Table 15-3. A24 Jumper Settings 1

E5100A/B	Jumper		
	J10	J11	J9
Opt.100	Upper	Upper	Upper
Opt.200	Upper	Lower	Upper
Opt.300	Upper	Lower	Lower
Opt.400	Lower	Lower	Lower
Opt.600	Upper	Lower	Upper

Table 15-4. A24 Jumper Settings 2

E5100A/B	Jumper	
	J14	J2
Opt.001	Right	Lower
Opt.002 without Opt.010	Left	Upper
Opt.002 with Opt.010	Right	Lower
Opt.003	Right	Lower
Opt.010	Right	Lower
Opt.600	Right	Lower

Cable Connection

The cable connection to the A24 board depends on the option which is installed in the unit.

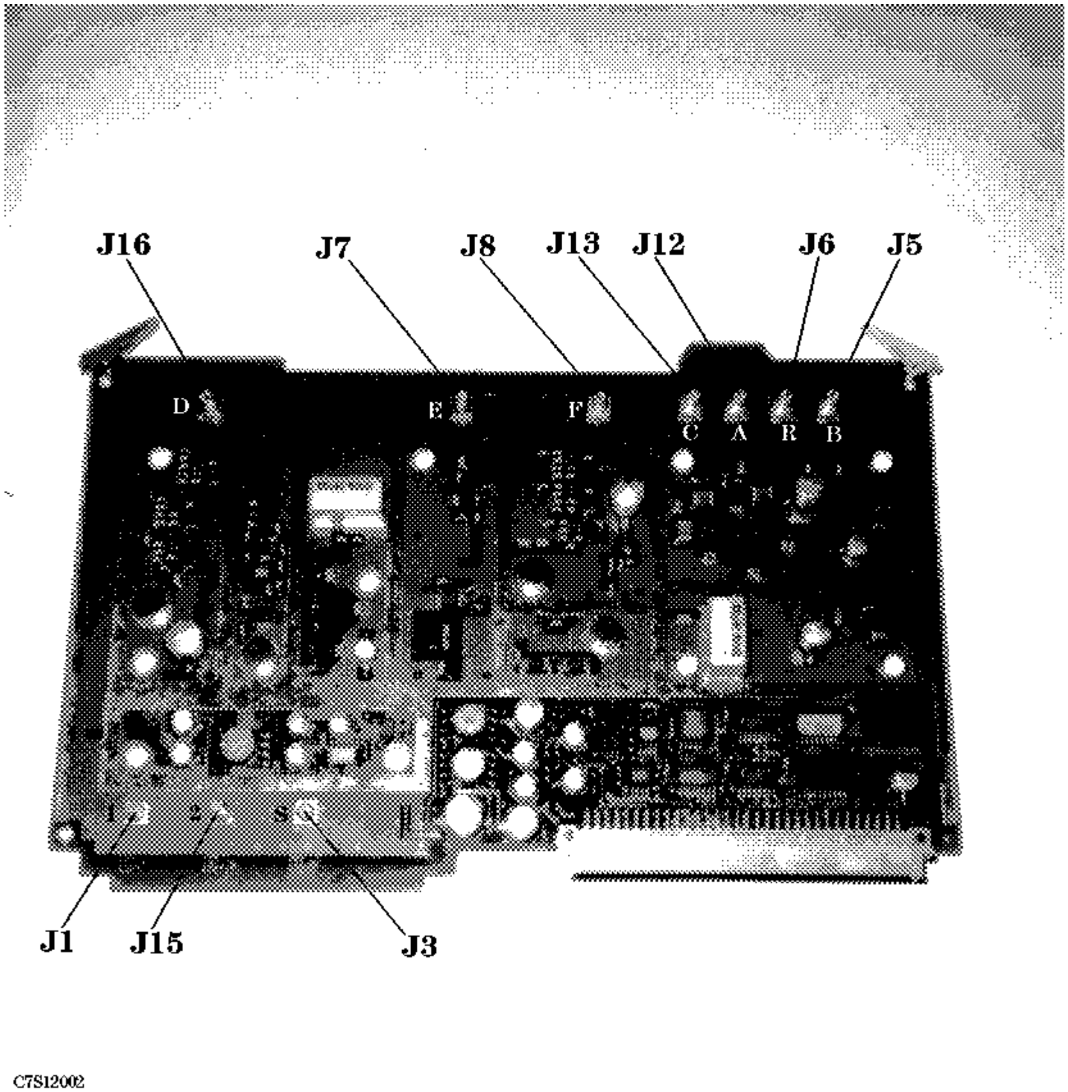


Figure 15-4. A24 Connector Location

Table 15-5. A24 Cable Connection 1

E5100A/B	A24 Connector		
	J1[1]	J15[1]	J3[1]
Opt.001 without Opt.010	Not used	Not used	To: RF OUT 1 (front assembly)
Opt.002 without Opt.010	To: RF OUT 1 (front assembly)	To: RF OUT 2 (front assembly)	Not used
Opt.003 without Opt.010	Not used	Not used	To: A28
Opt.010 or Opt.600	Not used	Not used	To: A25

1 The RF cable for those connection has a ferrite core on one end. The connector which is closed to the ferrite core should be connected to the connector on the A24 Board.

Table 15-6. A24 Cable Connection 2

E5100A/B	A24 Connector						
	J16	J7	J8	J13	J12	J6	J5
Opt.100	To: A27J3	To: A27J4	To: A27J5	Not used	To: A26A	Not used	Not used
Opt.200	To: A27J3	To: A27J4	To: A27J5	Not used	To: A26A	To: A26R	Not used
Opt.300	To: A27J3	To: A27J4	To: A27J5	Not used	To: A26A	To: A26R	To: A26B
Opt.400	To: A27J3	To: A27J4	To: A27J5	To: A26C	To: A26A	To: A26R	To: A26B

A25 Board Configuration (Opt.010/600)

Jumper Settings

The locations and settings of jumpers A25J5, A25J9, and switch A25SW1 are shown in Table 15-7. The settings depends the option which is installed in the unit.

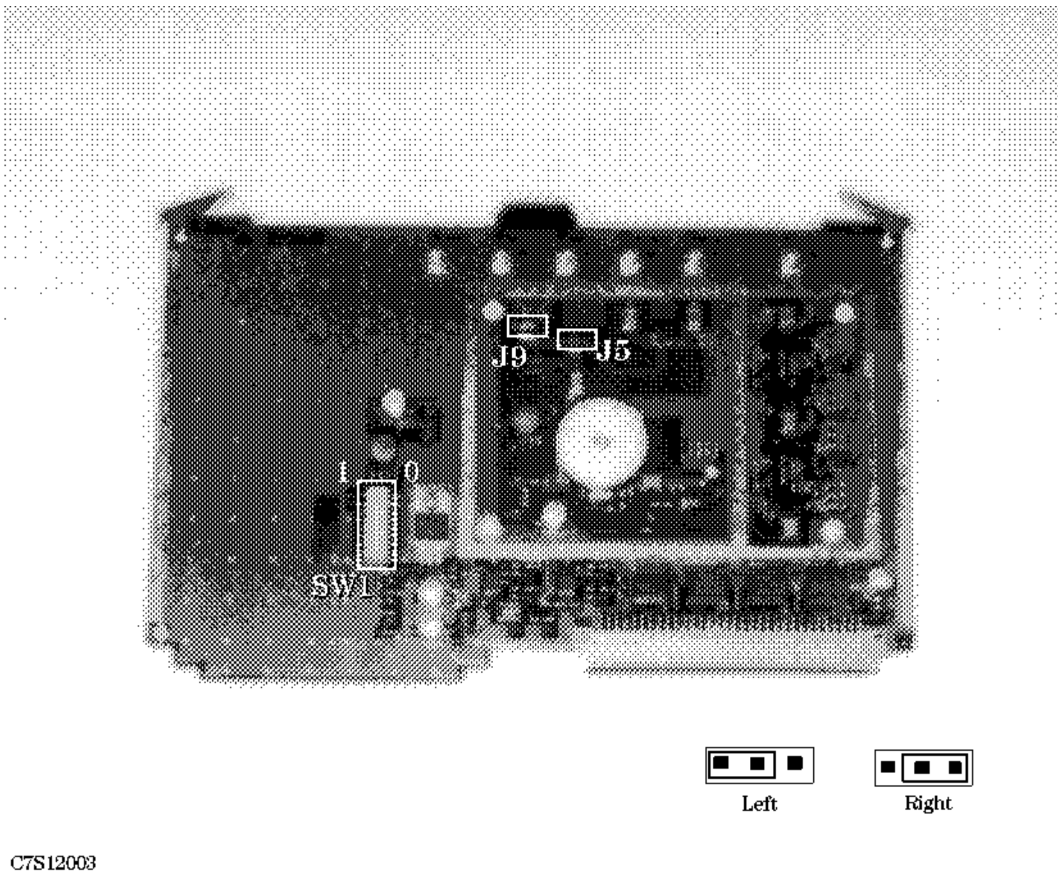


Figure 15-5. A25 Jumper and Switch Locations and Settings

Table 15-7. A25 Jumper and Switch Settings

E5100A/B	Jumper/Switch			
	J9	J5	SW1 No.1	SW1 No.2
Opt.001 with Opt.010	Left	Left	0	1
Opt.002 with Opt.010	Right	Left	0	0
Opt.003 with Opt.010	Left	Left	0	1
Opt.600	Right	Right	1	1

Cable Connection

The cable connection to the A25 board depends on the option which is installed in the unit.

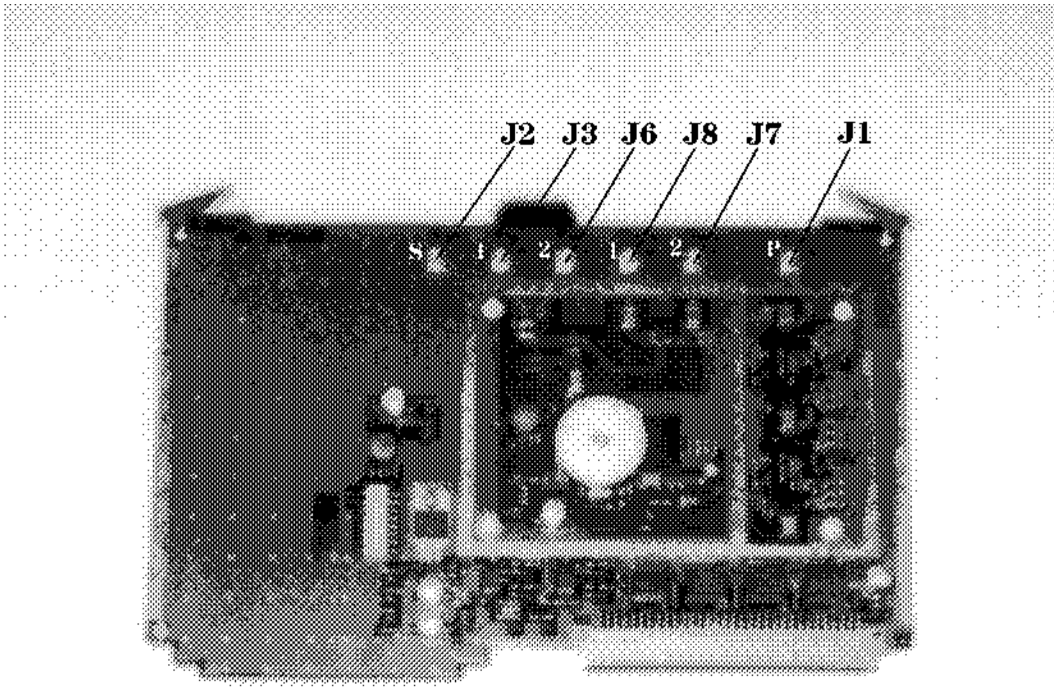


Figure 15-6. A25 Cable Connection

Table 15-8. A25 Cable Connection

E5100A/B	A25 Connector					
	J2	**J3**	**J6**	**J8**	**J7**	**J1**
Opt.001 with Opt.010	To: RF OUT 1[1]	Not used	Not used	Not used	Not used	To: A24[2]
Opt.002 with Opt.010	Not used	To: RF OUT 1[1]	To: RF OUT 2[1]	Not used	Not used	To: A24[2]
Opt.003 with Opt.010	To: A26[2]	Not used	Not used	Not used	Not used	To: A24[2]
Opt.600	Not used	Not used	Not used	To: RF OUT 1[1]	To: RF OUT 2[1]	To: A24[2]

1 On front assembly

2 With cable “S”

PS 130W Power Supply

Make sure the shunt connector is removed from the CN2 terminal on the PS 130W when you install the PS 130W into the E5100A/B.

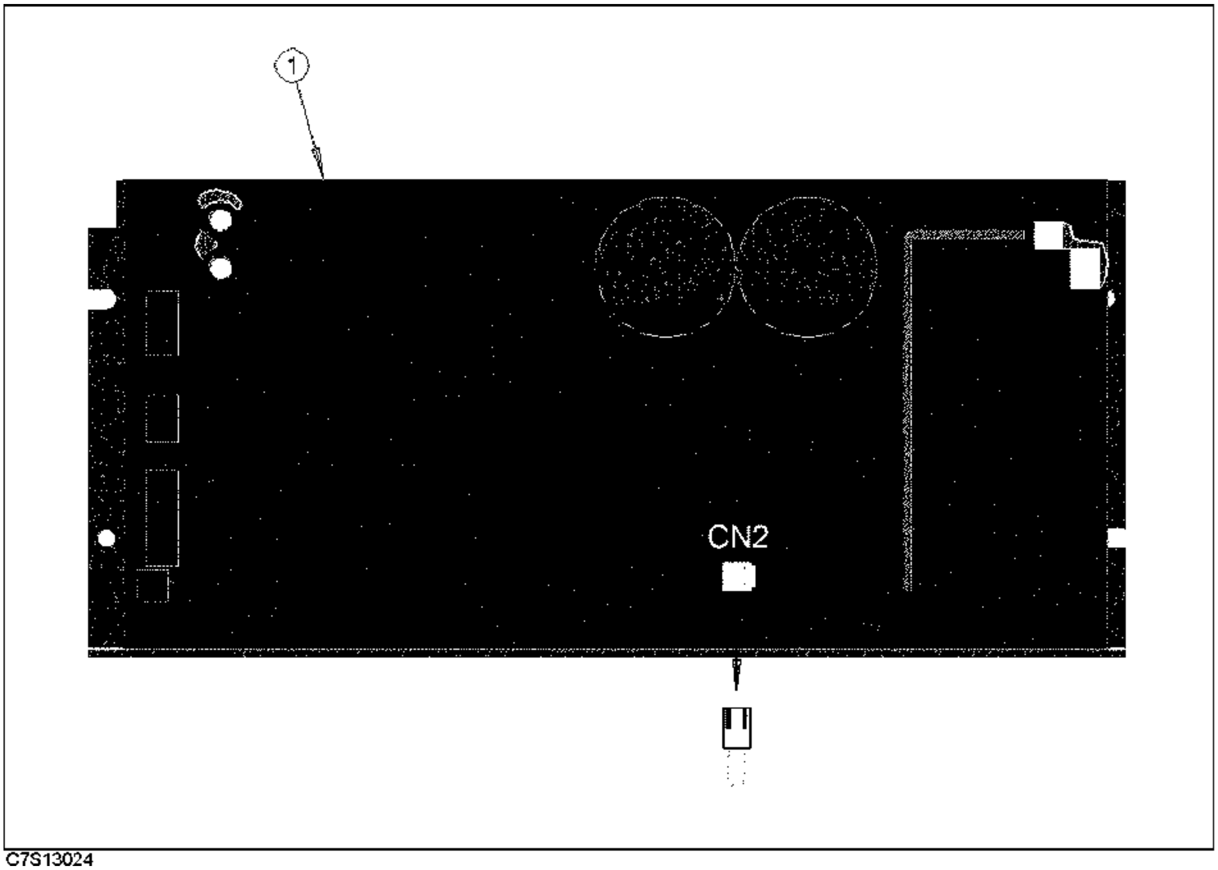


Figure 15-7. Shunt Connector of Power Supply PS 130W

Note The shunt connector is removed from the CN2 ternimal when the PS 130W Power Supply is shipped from the factory.

16

Post Repair Procedures

Introduction

The Table 16-1 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, and Performance Tests following Table 16-1.

Table 16-1. Post Repair Procedures

Replaced Assembly	Board Config.	Required Adjustments	Required Verification
A1 CPU	None	If flash ROMs are replaced, VCXO Frequency Calibration Source Correction IF Attenuator Correction Receiver Calibration	Internal Tests
A2 Peripheral	None	None	Internal Tests 24 bit I/O Test
A3 DSP	None	None	Internal Tests
A24 Source	None	Source Correction	Frequency Range and Accuracy Harmonics Non-Harmonic Sprious Phase Noise Source Level Accuracy/Flatness Source Power Linearity Receiver Noise Level Trace Noise Residual Response Input Crosstalk Absolute Amplitude Accuracy Dynamic Accuracy Magnitude Ratio Frequency Response Phase Frequency Response
A25 RF Amplifier	None	Source Correction	Frequency Range and Accuracy Harmonics Source Level Accuracy/Flatness Source Power Linearity
A26R/A/B/C Receiver	None	IF Attenuator Correction Receiver Calibration	Receiver Noise Level Trace Noise Residual Response Input Crosstalk Absolute Amplitude Accuracy Dynamic Accuracy Magnitude Ratio Frequency Response Phase Frequency Response

Table 16-1. Post Repair Procedures (continued)

Replaced Assembly	Board Config.	Required Adjustments	Required Verification
A27 Synthesizer	None	VCXO Frequency Calibration	Frequency Range and Accuracy
		Source Correction	Harmonics
			Non-Harmonic Sprious
			Phase Noise
			Source Level Accuracy/Flatness
			Source Power Linearity
			Receiver Noise Level
			Trace Noise
			Residual Response
			Input Crosstalk
			Absolute Amplitude Accuracy
			Dynamic Accuracy
			Magnitude Ratio Frequency Response
			Phase Frequency Response
A20 Motherboard	None	None	Frequency Range and Accuracy
			Source Level Accuracy/Flatness
			Magnitude Ratio Frequency Response
A28 Source Switch	None	Source Correction	Frequency Range and Accuracy
			Harmonics
			Non-Harmonic Sprious
			Phase Noise
			Source Level Accuracy/Flatness
			Source Power Linearity
			Receiver Noise Level
			Trace Noise
			Residual Response
			Input Crosstalk
A29 50/1MΩ Switch	None	Receiver Calibration	Receiver Noise Level
			Trace Noise
			Residual Response
			Input Crosstalk
			Absolute Amplitude Accuracy
			Dynamic Accuracy
			Magnitude Ratio Frequency Response
			Phase Frequency Response

Table 16-1. Post Repair Procedures (continued)

Replaced Assembly	Board Config.	Required Adjustments	Required Verification
Power Supply 130W	None	None	Frequency Range and Accuracy Source Level Accuracy/Flatness Magnitude Ratio Frequency Response
Power Supply 31W	None	None	Frequency Range and Accuracy Source Level Accuracy/Flatness Magnitude Ratio Frequency Response
A50 High Stability OSC	None	None	Frequency Range and Accuracy

A

Calculation Sheet

Introduction

This chapter contains calculation sheets for each performance test that requires additional calculations to determine the final test result.

Use the calculation sheet in this chapter as an aid for recording raw measurement data and calculating the performance test results.

Calculation sheet entries are provided only for performance tests in which calculations are required to obtain the test results.

2. Harmonics Test

E5100A/B Center Frequency	Spectrum Analyzer Frequency	Spectrum Analyzer Reading	Test Result [b−a]
10 kHz[1]	10 kHz	**a** = ________ dBm	
	20 kHz	**b** = ________ dBm	________ dBc
	30 kHz	**b** = ________ dBm	________ dBc
100 kHz	100 kHz	**a** = ________ dBm	
	200 kHz	**b** = ________ dBm	________ dBc
	300 kHz	**b** = ________ dBm	________ dBc
1 MHz	1 MHz	**a** = ________ dBm	
	2 MHz	**b** = ________ dBm	________ dBc
	3 MHz	**b** = ________ dBm	________ dBc
10 MHz	10 MHz	**a** = ________ dBm	
	20 MHz	**b** = ________ dBm	________ dBc
	30 MHz	**b** = ________ dBm	________ dBc
100 MHz	100 MHz	**a** = ________ dBm	
	200 MHz	**b** = ________ dBm	________ dBc
	300 MHz	**b** = ________ dBm	________ dBc
180 MHz	180 MHz	**a** = ________ dBm	
	360 MHz	**b** = ________ dBm	________ dBc
	540 MHz	**b** = ________ dBm	________ dBc
200 MHz	200 MHz	**a** = ________ dBm	
	400 MHz	**b** = ________ dBm	________ dBc
	600 MHz	**b** = ________ dBm	________ dBc
300 MHz	300 MHz	**a** = ________ dBm	
	600 MHz	**b** = ________ dBm	________ dBc
	900 MHz	**b** = ________ dBm	________ dBc

1 E5100A with option 510 does not require the harmonics test at this frequency.

3. Non-Harmonic Spurious Test

E5100A/B Center Frequency	Spectrum Analyzer Frequency	Spectrum Analyzer Reading	Test Result [b−a]
239.95 MHz	**f_1** = ________	**a** = ________ dBm	
	f_1 − 10.417 kHz = ________	**b** = ________ dBm	________ dBc
	f_1 + 10.417 kHz = ________	**b** = ________ dBm	________ dBc
	f_1 + 100 kHz = ________	**b** = ________ dBm	________ dBc

4. Phase Noise Test

E5100A/B Center Frequency	Spectrum Analyzer Frequency	Spectrum Analyzer Reading	Test Result [b−a]
455 kHz	455 kHz	**a** = ________ dBm	
	445 kHz	**b** = ________ dBm	________ dBc
	465 kHz	**b** = ________ dBm	________ dBc
150 MHz	150 MHz	**a** = ________ dBm	
	149.99 MHz	**b** = ________ dBm	________ dBc
	150.01 MHz	**b** = ________ dBm	________ dBc
180 MHz	180 MHz	**a** = ________ dBm	
	179.99 MHz	**b** = ________ dBm	________ dBc
	180.01 MHz	**b** = ________ dBm	________ dBc
300 MHz	300 MHz	**a** = ________ dBm	
	299.99 MHz	**b** = ________ dBm	________ dBc
	300.01 MHz	**b** = ________ dBm	________ dBc

5. Source Level Accuracy/Flatness Test

Frequency	Power Meter Reading [ref[1]]
50 MHz	________ dBm

1 : is the power meter reading of the source level accuracy test.

Frequency	Power Meter Reading [a]	Test Result [a−ref]
10 kHz[1]	________ dBm	________ dB
50 kHz	________ dBm	________ dB
100 kHz	________ dBm	________ dB
1 MHz	________ dBm	________ dB
10 MHz	________ dBm	________ dB
100 MHz	________ dBm	________ dB
150 MHz	________ dBm	________ dB
180 MHz	________ dBm	________ dB
200 MHz	________ dBm	________ dB
250 MHz	________ dBm	________ dB
300 MHz	________ dBm	________ dB

1 If an Opt.010 or 600 is installed, test at this frequency is not required.

6. Source Power Linearity Test

Step Attenuator Calibration Value at 50 MHz

Attenuation	Calibration Value[1]
10 dB	**a1** = ________ dB
20 dB	**a2** = ________ dB
30 dB	**a3** = ________ dB
40 dB	**a4** = ________ dB
50 dB	**a5** = ________ dB
60 dB	**a6** = ________ dB

1 : Incremental attenuation referenced to 0 dB setting.

Reference (0 dBm)

E5100A/B Source Power	Power Meter Reading [b]		Reference [ref]
0 dBm	________ dBm	**b + a3 =**	________ dBm

Source Power Linearity

Note Calculate **ref** in the calculation sheet for the reference (0 dBm) first. Then calculate test results using the equation and the value of **ref**.

With option 001 and without option 010

E5100A/B Source Power	Power Meter Reading [b]		Test Result
+11 dBm	________ dBm	**b + a5 − ref − 11 =**	________ dB
+5 dBm	________ dBm	**b + a4 − ref − 5 =**	________ dB
−5 dBm	________ dBm	**b + a3 − ref + 5 =**	________ dB
−9 dBm	________ dBm	**b + a3 − ref + 9 =**	________ dB

With Option 002 and without Option 010

E5100A/B Source Power	Power Meter Reading [b]			Test Result	
+5 dBm	________	dBm	**b + a4 − ref − 5 =**	________	dB
−5 dBm	________	dBm	**b + a3 − ref + 5 =**	________	dB
−10 dBm	________	dBm	**b + a2 − ref + 10 =**	________	dB
−15 dBm	________	dBm	**b + a2 − ref + 15 =**	________	dB

With Option 003 and without Option 010

E5100A/B Source Power	Power Meter Reading [b]			Test Result	
+7 dBm	________	dBm	**b + a4 − ref − 7 =**	________	dB
+5 dBm	________	dBm	**b + a4 − ref − 5 =**	________	dB
−5 dBm	________	dBm	**b + a3 − ref + 5 =**	________	dB
−10 dBm	________	dBm	**b + a2 − ref + 10 =**	________	dB
−13 dBm	________	dBm	**b + a2 − ref + 13 =**	________	dB

With both Option 001 and Option 010

E5100A/B Source Power	Power Meter Reading [b]			Test Result	
+22 dBm	________	dBm	**b + a6 − ref − 22 =**	________	dB
+10 dBm	________	dBm	**b + a4 − ref − 10 =**	________	dB
−10 dBm	________	dBm	**b + a2 − ref + 10 =**	________	dB
−20 dBm	________	dBm	**b + a1 − ref + 20 =**	________	dB
−30 dBm	________	dBm	**b + a1 − ref + 30 =**	________	dB
−40 dBm	________	dBm	**b + a1 − ref + 40 =**	________	dB
−48 dBm	________	dBm	**b + a1 − ref + 48 =**	________	dB

With both Option 002 and Option 010

E5100A/B Source Power	Power Meter Reading [b]		Test Result		
+16 dBm	______	dBm	**b + a5 − ref − 16 =**	______	dB
+10 dBm	______	dBm	**b + a4 − ref − 10 =**	______	dB
−10 dBm	______	dBm	**b + a2 − ref + 10 =**	______	dB
−20 dBm	______	dBm	**b + a1 − ref + 20 =**	______	dB
−30 dBm	______	dBm	**b + a1 − ref + 30 =**	______	dB
−40 dBm	______	dBm	**b + a1 − ref + 40 =**	______	dB
−50 dBm	______	dBm	**b + a1 − ref + 50 =**	______	dB
−54 dBm	______	dBm	**b − ref + 54 =**	______	dB

With both Option 003 and Option 010, or with Option 600

E5100A/B Source Power	Power Meter Reading [b]		Test Result		
+18 dBm	______	dBm	**b + a5 − ref − 18 =**	______	dB
+10 dBm	______	dBm	**b + a4 − ref − 10 =**	______	dB
−10 dBm	______	dBm	**b + a2 − ref + 10 =**	______	dB
−20 dBm	______	dBm	**b + a1 − ref + 20 =**	______	dB
−30 dBm	______	dBm	**b + a1 − ref + 30 =**	______	dB
−40 dBm	______	dBm	**b + a1 − ref + 40 =**	______	dB
−50 dBm	______	dBm	**b + a1 − ref + 50 =**	______	dB
−52 dBm	______	dBm	**b − ref + 52 =**	______	dB

7. Receiver Noise Level Test

E5100A

At IF BW 100 Hz

Frequency	Input	Trace Mean [a]		Test Result [20×log(a)]	
10 kHz	R	____	Unit	____	dBm
	A	____	Unit	____	dBm
	B	____	Unit	____	dBm
	C	____	Unit	____	dBm
95 kHz	R	____	Unit	____	dBm
	A	____	Unit	____	dBm
	B	____	Unit	____	dBm
	C	____	Unit	____	dBm
455 kHz	R	____	Unit	____	dBm
	A	____	Unit	____	dBm
	B	____	Unit	____	dBm
	C	____	Unit	____	dBm
1.01 MHz	R	____	Unit	____	dBm
	A	____	Unit	____	dBm
	B	____	Unit	____	dBm
	C	____	Unit	____	dBm
10.7 MHz	R	____	Unit	____	dBm
	A	____	Unit	____	dBm
	B	____	Unit	____	dBm
	C	____	Unit	____	dBm
101 MHz	R	____	Unit	____	dBm
	A	____	Unit	____	dBm
	B	____	Unit	____	dBm
	C	____	Unit	____	dBm
110 MHz	R	____	Unit	____	dBm
	A	____	Unit	____	dBm
	B	____	Unit	____	dBm
	C	____	Unit	____	dBm

Frequency	Input	Trace Mean [a]	Test Result [20×log(a)]
179 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
	B	________ Unit	________ dBm
	C	________ Unit	________ dBm
201 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
	B	________ Unit	________ dBm
	C	________ Unit	________ dBm
299 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
	B	________ Unit	________ dBm
	C	________ Unit	________ dBm

At IF BW 300 Hz

Frequency	Input	Trace Mean [a]	Test Result [20×log(a)]
455 kHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
	B	________ Unit	________ dBm
	C	________ Unit	________ dBm
101 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
	B	________ Unit	________ dBm
	C	________ Unit	________ dBm

At IF BW 1 kHz

Frequency	Input	Trace Mean [a]	Test Result [20×log(a)]
455 kHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
	B	________ Unit	________ dBm
	C	________ Unit	________ dBm
101 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
	B	________ Unit	________ dBm
	C	________ Unit	________ dBm

At IF BW 3 kHz

Frequency	Input	Trace Mean [a]		Test Result [20×log(a)]	
455 kHz	R	________	Unit	________	dBm
	A	________	Unit	________	dBm
	B	________	Unit	________	dBm
	C	________	Unit	________	dBm
101 MHz	R	________	Unit	________	dBm
	A	________	Unit	________	dBm
	B	________	Unit	________	dBm
	C	________	Unit	________	dBm

At IF BW 10 kHz

Frequency	Input	Trace Mean [a]		Test Result [20×log(a)]	
455 kHz	R	________	Unit	________	dBm
	A	________	Unit	________	dBm
	B	________	Unit	________	dBm
	C	________	Unit	________	dBm
101 MHz	R	________	Unit	________	dBm
	A	________	Unit	________	dBm
	B	________	Unit	________	dBm
	C	________	Unit	________	dBm

At IF BW 30 kHz

Frequency	Input	Trace Mean [a]		Test Result [20×log(a)]	
455 kHz	R	________	Unit	________	dBm
	A	________	Unit	________	dBm
	B	________	Unit	________	dBm
	C	________	Unit	________	dBm
101 MHz	R	________	Unit	________	dBm
	A	________	Unit	________	dBm
	B	________	Unit	________	dBm
	C	________	Unit	________	dBm

E5100B

At IF BW 1 kHz

Frequency	Input	Trace Mean [a]	Test Result [20×log(a)]
30 kHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
95 kHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
455 kHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
1.01 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
10.7 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
101 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
110 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
201 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
299 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm

At IF BW 3 kHz

Frequency	Input	Trace Mean [a]	Test Result [20×log(a)]
455 kHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
101 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm

At IF BW 10 kHz

Frequency	Input	Trace Mean [a]	Test Result [20×log(a)]
455 kHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm
101 MHz	R	________ Unit	________ dBm
	A	________ Unit	________ dBm

At IF BW 30 kHz

Frequency	Input	Trace Mean [a]		Test Result [20×log(a)]	
455 kHz	R	____________	Unit	____________	dBm
	A	____________	Unit	____________	dBm
101 MHz	R	____________	Unit	____________	dBm
	A	____________	Unit	____________	dBm

10. Input Crosstalk Test

E5100A

Measurement	Frequency	Trace Max	Test Result [(a + b + c + d)/4]
R into A	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
R into B	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB

Measurement	Frequency	Trace Max	Test Result [(a + b + c + d)/4]
R into C	10 kHz to 100 kHz	**a** = ______ dB	
		b = ______ dB	
		c = ______ dB	
		d = ______ dB	______ dB
	100 kHz to 200 kHz	**a** = ______ dB	
		b = ______ dB	
		c = ______ dB	
		d = ______ dB	______ dB
	200 kHz to 180 MHz	**a** = ______ dB	
		b = ______ dB	
		c = ______ dB	
		d = ______ dB	______ dB
	200 kHz to 300 MHz	**a** = ______ dB	
		b = ______ dB	
		c = ______ dB	
		d = ______ dB	______ dB
A into R	10 kHz to 100 kHz	**a** = ______ dB	
		b = ______ dB	
		c = ______ dB	
		d = ______ dB	______ dB
	100 kHz to 200 kHz	**a** = ______ dB	
		b = ______ dB	
		c = ______ dB	
		d = ______ dB	______ dB
	200 kHz to 180 MHz	**a** = ______ dB	
		b = ______ dB	
		c = ______ dB	
		d = ______ dB	______ dB
	200 kHz to 300 MHz	**a** = ______ dB	
		b = ______ dB	
		c = ______ dB	
		d = ______ dB	______ dB

Measurement	Frequency	Trace Max	Test Result [(a + b + c + d)/4]
A into B	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
A into C	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB

Measurement	Frequency	Trace Max	Test Result [(a + b + c + d)/4]
B into R	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
B into A	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB

Measurement	Frequency	Trace Max	Test Result [(a + b + c + d)/4]
B into C	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
C into R	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB

Measurement	Frequency	Trace Max	Test Result [(a + b + c + d)/4]
C into A	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
C into B	10 kHz to 100 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	100 kHz to 200 kHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 180 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB
	200 kHz to 300 MHz	**a** = ________ dB	
		b = ________ dB	
		c = ________ dB	
		d = ________ dB	________ dB

11. Absolute Amplitude Accuracy Test

R input (Attenuator: 0 dB)

Frequency	E5100A/B Reading [a]	Multimeter/Power Meter Reading [b]	Test Result [a−b]
10 kHz	______ dBm	______ dBm	______ dB
100 kHz	______ dBm	______ dBm	______ dB
1 MHz	______ dBm	______ dBm	______ dB
10 MHz	______ dBm	______ dBm	______ dB
30 MHz	______ dBm	______ dBm	______ dB
50 MHz	______ dBm	______ dBm	______ dB
100 MHz	______ dBm	______ dBm	______ dB
180 MHz	______ dBm	______ dBm	______ dB
300 MHz	______ dBm	______ dBm	______ dB

R input (Attenuator: 25 dB)

Frequency	E5100A/B Reading [a]	Multimeter/Power Meter Reading [b]	Test Result [a−b]
10 kHz	______ dBm	______ dBm	______ dB
100 kHz	______ dBm	______ dBm	______ dB
1 MHz	______ dBm	______ dBm	______ dB
10 MHz	______ dBm	______ dBm	______ dB
30 MHz	______ dBm	______ dBm	______ dB
50 MHz	______ dBm	______ dBm	______ dB
100 MHz	______ dBm	______ dBm	______ dB
180 MHz	______ dBm	______ dBm	______ dB
300 MHz	______ dBm	______ dBm	______ dB

A input (Attenuator: 0 dB)

Frequency	E5100A/B Reading [a]	Multimeter/Power Meter Reading [b]	Test Result [a−b]
10 kHz	______ dBm	______ dBm	______ dB
100 kHz	______ dBm	______ dBm	______ dB
1 MHz	______ dBm	______ dBm	______ dB
10 MHz	______ dBm	______ dBm	______ dB
30 MHz	______ dBm	______ dBm	______ dB
50 MHz	______ dBm	______ dBm	______ dB
100 MHz	______ dBm	______ dBm	______ dB
180 MHz	______ dBm	______ dBm	______ dB
300 MHz	______ dBm	______ dBm	______ dB

A input (Attenuator: 25 dB)

Frequency	E5100A/B Reading [a]	Multimeter/Power Meter Reading [b]	Test Result [a−b]
10 kHz	______ dBm	______ dBm	______ dB
100 kHz	______ dBm	______ dBm	______ dB
1 MHz	______ dBm	______ dBm	______ dB
10 MHz	______ dBm	______ dBm	______ dB
30 MHz	______ dBm	______ dBm	______ dB
50 MHz	______ dBm	______ dBm	______ dB
100 MHz	______ dBm	______ dBm	______ dB
180 MHz	______ dBm	______ dBm	______ dB
300 MHz	______ dBm	______ dBm	______ dB

B input (Attenuator: 0 dB)

Frequency	E5100A/B Reading [a]	Multimeter/Power Meter Reading [b]	Test Result [a−b]
10 kHz	______ dBm	______ dBm	______ dB
100 kHz	______ dBm	______ dBm	______ dB
1 MHz	______ dBm	______ dBm	______ dB
10 MHz	______ dBm	______ dBm	______ dB
30 MHz	______ dBm	______ dBm	______ dB
50 MHz	______ dBm	______ dBm	______ dB
100 MHz	______ dBm	______ dBm	______ dB
180 MHz	______ dBm	______ dBm	______ dB
300 MHz	______ dBm	______ dBm	______ dB

B input (Attenuator: 25 dB)

Frequency	E5100A/B Reading [a]	Multimeter/Power Meter Reading [b]	Test Result [a−b]
10 kHz	______ dBm	______ dBm	______ dB
100 kHz	______ dBm	______ dBm	______ dB
1 MHz	______ dBm	______ dBm	______ dB
10 MHz	______ dBm	______ dBm	______ dB
30 MHz	______ dBm	______ dBm	______ dB
50 MHz	______ dBm	______ dBm	______ dB
100 MHz	______ dBm	______ dBm	______ dB
180 MHz	______ dBm	______ dBm	______ dB
300 MHz	______ dBm	______ dBm	______ dB

C input (Attenuator: 0 dB)

Frequency	E5100A/B Reading [a]	Multimeter/Power Meter Reading [b]	Test Result [a−b]
10 kHz	______ dBm	______ dBm	______ dB
100 kHz	______ dBm	______ dBm	______ dB
1 MHz	______ dBm	______ dBm	______ dB
10 MHz	______ dBm	______ dBm	______ dB
30 MHz	______ dBm	______ dBm	______ dB
50 MHz	______ dBm	______ dBm	______ dB
100 MHz	______ dBm	______ dBm	______ dB
180 MHz	______ dBm	______ dBm	______ dB
300 MHz	______ dBm	______ dBm	______ dB

C input (Attenuator: 25 dB)

Frequency	E5100A/B Reading [a]	Multimeter/Power Meter Reading [b]	Test Result [a−b]
10 kHz	______ dBm	______ dBm	______ dB
100 kHz	______ dBm	______ dBm	______ dB
1 MHz	______ dBm	______ dBm	______ dB
10 MHz	______ dBm	______ dBm	______ dB
30 MHz	______ dBm	______ dBm	______ dB
50 MHz	______ dBm	______ dBm	______ dB
100 MHz	______ dBm	______ dBm	______ dB
180 MHz	______ dBm	______ dBm	______ dB
300 MHz	______ dBm	______ dBm	______ dB

12. Dynamic Accuracy Test

Step Attenuator Calibration Value at 50 MHz

Attenuation	Calibration Value[1]		
10 dB	**a1** =	___________	dB
20 dB	**a2** =	___________	dB
30 dB	**a3** =	___________	dB
40 dB	**a4** =	___________	dB
50 dB	**a5** =	___________	dB
60 dB	**a6** =	___________	dB
70 dB	**a7** =	___________	dB
80 dB	**a8** =	___________	dB

1 : Incremental attenuation referenced to 0 dB setting.

A/R Measurement

Magnitude Ratio

Step Attenuator Setting	E5100A/B Reading [b]		Test Result			A Input Level
10 dB	___________	dB	**b + a1** =	___________	dB	−25 dBm
20 dB	___________	dB	**b + a2** =	___________	dB	−35 dBm
30 dB	___________	dB	**b + a3** =	___________	dB	−45 dBm
40 dB	___________	dB	**b + a4** =	___________	dB	−55 dBm
50 dB	___________	dB	**b + a5** =	___________	dB	−65 dBm
60 dB	___________	dB	**b + a6** =	___________	dB	−75 dBm
70 dB	___________	dB	**b + a7** =	___________	dB	−85 dBm
80 dB	___________	dB	**b + a8** =	___________	dB	−95 dBm
20 dB	___________	dB	**b + a2** =	___________	dB	+5 dBm
10 dB	___________	dB	**b + a1** =	___________	dB	−5 dBm

Phase

Step Attenuator Setting	Test Result		A Input Level
10 dB	___________	deg	−25 dBm
20 dB	___________	deg	−35 dBm
30 dB	___________	deg	−45 dBm
40 dB	___________	deg	−55 dBm
50 dB	___________	deg	−65 dBm
60 dB	___________	deg	−75 dBm
70 dB	___________	deg	−85 dBm
80 dB	___________	deg	−95 dBm
20 dB	___________	deg	+5 dBm
10 dB	___________	deg	−5 dBm

B/R Measurement

Magnitude Ratio

Step Attenuator Setting	E5100A/B Reading [b]		Test Result	B Input Level
10 dB	________ dB	**b + a1 =**	________ dB	−25 dBm
20 dB	________ dB	**b + a2 =**	________ dB	−35 dBm
30 dB	________ dB	**b + a3 =**	________ dB	−45 dBm
40 dB	________ dB	**b + a4 =**	________ dB	−55 dBm
50 dB	________ dB	**b + a5 =**	________ dB	−65 dBm
60 dB	________ dB	**b + a6 =**	________ dB	−75 dBm
70 dB	________ dB	**b + a7 =**	________ dB	−85 dBm
80 dB	________ dB	**b + a8 =**	________ dB	−95 dBm
20 dB	________ dB	**b + a2 =**	________ dB	+5 dBm
10 dB	________ dB	**b + a1 =**	________ dB	−5 dBm

Phase

Step Attenuator Setting	Test Result	B Input Level
10 dB	________ deg	−25 dBm
20 dB	________ deg	−35 dBm
30 dB	________ deg	−45 dBm
40 dB	________ deg	−55 dBm
50 dB	________ deg	−65 dBm
60 dB	________ deg	−75 dBm
70 dB	________ deg	−85 dBm
80 dB	________ deg	−95 dBm
20 dB	________ deg	+5 dBm
10 dB	________ deg	−5 dBm

C/R Measurement

Magnitude Ratio

Step Attenuator Setting	E5100A/B Reading [b]		Test Result	C Input Level
10 dB	___________ dB	b+a1 =	___________ dB	−25 dBm
20 dB	___________ dB	b+a2 =	___________ dB	−35 dBm
30 dB	___________ dB	b+a3 =	___________ dB	−45 dBm
40 dB	___________ dB	b+a4 =	___________ dB	−55 dBm
50 dB	___________ dB	b+a5 =	___________ dB	−65 dBm
60 dB	___________ dB	b+a6 =	___________ dB	−75 dBm
70 dB	___________ dB	b+a7 =	___________ dB	−85 dBm
80 dB	___________ dB	b+a8 =	___________ dB	−95 dBm
20 dB	___________ dB	b+a2 =	___________ dB	+5 dBm
10 dB	___________ dB	b+a1 =	___________ dB	−5 dBm

Phase

Step Attenuator Setting	Test Result	C Input Level
10 dB	___________ deg	−25 dBm
20 dB	___________ deg	−35 dBm
30 dB	___________ deg	−45 dBm
40 dB	___________ deg	−55 dBm
50 dB	___________ deg	−65 dBm
60 dB	___________ deg	−75 dBm
70 dB	___________ deg	−85 dBm
80 dB	___________ deg	−95 dBm
20 dB	___________ deg	+5 dBm
10 dB	___________ deg	−5 dBm

C/B Measurement

Magnitude Ratio

Step Attenuator Setting	E5100A/B Reading [b]		Test Result		C Input Level
10 dB	____________ dB	**b + a1 =**	____________	dB	−25 dBm
20 dB	____________ dB	**b + a2 =**	____________	dB	−35 dBm
30 dB	____________ dB	**b + a3 =**	____________	dB	−45 dBm
40 dB	____________ dB	**b + a4 =**	____________	dB	−55 dBm
50 dB	____________ dB	**b + a5 =**	____________	dB	−65 dBm
60 dB	____________ dB	**b + a6 =**	____________	dB	−75 dBm
70 dB	____________ dB	**b + a7 =**	____________	dB	−85 dBm
80 dB	____________ dB	**b + a8 =**	____________	dB	−95 dBm
20 dB	____________ dB	**b + a2 =**	____________	dB	+5 dBm
10 dB	____________ dB	**b + a1 =**	____________	dB	−5 dBm

Phase

Step Attenuator Setting	Test Result	C Input Level
10 dB	____________ deg	−25 dBm
20 dB	____________ deg	−35 dBm
30 dB	____________ deg	−45 dBm
40 dB	____________ deg	−55 dBm
50 dB	____________ deg	−65 dBm
60 dB	____________ deg	−75 dBm
70 dB	____________ deg	−85 dBm
80 dB	____________ deg	−95 dBm
20 dB	____________ deg	+5 dBm
10 dB	____________ deg	−5 dBm

B

Performance Test Record for E5100A/B Option 100/200/300/400/600

Agilent Technologies E5100A/B Network Analyzer

Date: ______________________________
Temperature: ______________________________
Humidity: ______________________________
Serial No.: ______________________________
Tested by: ______________________________

1. Frequency Range and Accuracy Test

Without Option 1D5

Frequency	Minimum Limit	Test Result	Maximum Limit
300 MHz	299.994 MHz	____________________	300.006 MHz

With Option 1D5

Frequency	Minimum Limit	Test Result	Maximum Limit
300 MHz	299.9997 MHz	____________________	300.0003 MHz

2. Harmonics Test

Option 001/002/003 without Option 010

Frequency	Harmonics Frequency	Test Result	Test Limit
10 kHz[1]	20 kHz	____________ dBc	< −35 dBc
	30 kHz	____________ dBc	< −35 dBc
100 kHz	200 kHz	____________ dBc	< −35 dBc
	300 kHz	____________ dBc	< −35 dBc
1 MHz	2 MHz	____________ dBc	< −35 dBc
	3 MHz	____________ dBc	< −35 dBc
10 MHz	20 MHz	____________ dBc	< −35 dBc
	30 MHz	____________ dBc	< −35 dBc
100 MHz	200 MHz	____________ dBc	< −35 dBc
	300 MHz	____________ dBc	< −35 dBc
200 MHz	400 MHz	____________ dBc	< −35 dBc
	600 MHz	____________ dBc	< −35 dBc
300 MHz	600 MHz	____________ dBc	< −35 dBc
	900 MHz	____________ dBc	< −35 dBc

1 E5100A with option 510 does not require the harmomics test at this frequency.

Option 010 or Option 600

Frequency	Harmonics Frequency	Test Result	Test Limit
10 kHz	20 kHz	________ dBc	< −20 dBc
	30 kHz	________ dBc	< −20 dBc
100 kHz	200 kHz	________ dBc	< −20 dBc
	300 kHz	________ dBc	< −20 dBc
1 MHz	2 MHz	________ dBc	< −20 dBc
	3 MHz	________ dBc	< −20 dBc
10 MHz	20 MHz	________ dBc	< −20 dBc
	30 MHz	________ dBc	< −20 dBc
100 MHz	200 MHz	________ dBc	< −20 dBc
	300 MHz	________ dBc	< −20 dBc
200 MHz	400 MHz	________ dBc	< −20 dBc
	600 MHz	________ dBc	< −20 dBc
300 MHz	600 MHz	________ dBc	< −20 dBc
	900 MHz	________ dBc	< −20 dBc

3. Non-Harmonic Spurious Test

Non-Harmonic Frequency	Spectrum Analyzer Center Frequency	Test Result	Test Limit
239.95 MHz	Fundamental − 10.417 kHz	______	< −45 dBc
	Fundamental + 10.417 kHz	______	< −45 dBc
	Fundamental + 100 kHz	______	< −45 dBc

4. Phase Noise Test

Reference	Frequency	Test Result	Test Limit
455 kHz	445 kHz	___________	< −90 dBc
	465 kHz	___________	< −90 dBc
150 MHz	149.99 MHz	___________	< −90 dBc
	150.01 MHz	___________	< −90 dBc
300 MHz	299.99 MHz	___________	< −90 dBc
	300.01 MHz	___________	< −90 dBc

5. Source Level Accuracy/Flatness Test

Level Accuracy (at 50 MHz, 0 dBm)

Minimum Limit	Test Result	Maximum Limit
−1 dBm	___________	1 dBm

Level Flatness (relative to 0 dBm at 50 MHz)

Option 001/002 without Option 010

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz	−4 dB	___________	2 dB
50 kHz	−4 dB	___________	2 dB
100 kHz	−4 dB	___________	2 dB
1 MHz	−4 dB	___________	2 dB
10 MHz	−4 dB	___________	2 dB
100 MHz	−4 dB	___________	2 dB
150 MHz	−4 dB	___________	2 dB
200 MHz	−4 dB	___________	2 dB
250 MHz	−4 dB	___________	2 dB
300 MHz	−4 dB	___________	2 dB

Option 003 without Option 010

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz	−4.5 dB	___________	2.5 dB
50 kHz	−4.5 dB	___________	2.5 dB
100 kHz	−4.5 dB	___________	2.5 dB
1 MHz	−4.5 dB	___________	2.5 dB
10 MHz	−4.5 dB	___________	2.5 dB
100 MHz	−4.5 dB	___________	2.5 dB
150 MHz	−4.5 dB	___________	2.5 dB
200 MHz	−4.5 dB	___________	2.5 dB
250 MHz	−4.5 dB	___________	2.5 dB
300 MHz	−4.5 dB	___________	2.5 dB

Option 010 or Option 600

Frequency	Minimum Limit	Test Result	Maximum Limit
50 kHz	−4.5 dB	________	2.5 dB
100 kHz	−4.5 dB	________	2.5 dB
1 MHz	−4.5 dB	________	2.5 dB
10 MHz	−4.5 dB	________	2.5 dB
100 MHz	−4.5 dB	________	2.5 dB
150 MHz	−5 dB	________	3 dB
200 MHz	−5 dB	________	3 dB
250 MHz	−5 dB	________	3 dB
300 MHz	−5 dB	________	3 dB

6. Source Power Linearity Test

Option 001 without Option 010

E5100A/B Power Setting	Minimum Limit	Test Result	Maximum Limit
+11 dBm	−1.0 dB	________	1.0 dB
+5 dBm	−1.0 dB	________	1.0 dB
−5 dBm	−1.0 dB	________	1.0 dB
−9 dBm	−1.0 dB	________	1.0 dB

Option 002 without Option 010

E5100A/B Power Setting	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−1.0 dB	________	1.0 dB
−5 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−15 dBm	−1.0 dB	________	1.0 dB

Option 001 with Option 010

E5100A/B Power Setting	Minimum Limit	Test Result	Maximum Limit
+22 dBm	−1.0 dB	________	1.0 dB
+10 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−20 dBm	−1.0 dB	________	1.0 dB
−30 dBm	−1.0 dB	________	1.0 dB
−40 dBm	−1.5 dB	________	1.5 dB
−48 dBm	−1.5 dB	________	1.5 dB

Option 002 with Option 010

E5100A/B Power Setting	Minimum Limit	Test Result	Maximum Limit
+16 dBm	−1.0 dB	________	1.0 dB
+10 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−20 dBm	−1.0 dB	________	1.0 dB
−30 dBm	−1.0 dB	________	1.0 dB
−40 dBm	−1.0 dB	________	1.0 dB
−50 dBm	−1.5 dB	________	1.5 dB
−54 dBm	−1.5 dB	________	1.5 dB

Option 003 without Option 010

E5100A/B Power Setting	Minimum Limit	Test Result	Maximum Limit
+7 dBm	−1.0 dB	________	1.0 dB
+5 dBm	−1.0 dB	________	1.0 dB
−5 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−13 dBm	−1.0 dB	________	1.0 dB

Option 003 with Option 010, Option 600

E5100A/B Power Setting	Minimum Limit	Test Result	Maximum Limit
+18 dBm	−1.0 dB	________	1.0 dB
+10 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−20 dBm	−1.0 dB	________	1.0 dB
−30 dBm	−1.0 dB	________	1.0 dB
−40 dBm	−1.0 dB	________	1.0 dB
−50 dBm	−1.5 dB	________	1.5 dB
−52 dBm	−1.5 dB	________	1.5 dB

7. Receiver Noise Level Test

E5100A

At IF BW 100 Hz

Frequency	R	A	B	C	Test Limit
10 kHz					< −105 dBm
95 kHz					< −105 dBm
455 kHz					< −125 dBm
1.01 MHz					< −125 dBm
10.7 MHz					< −125 dBm
101 MHz					< −125 dBm
110 MHz					< −125 dBm
201 MHz					< −125 dBm
299 MHz					< −125 dBm

At IF BW 300 Hz

Frequency	R	A	B	C	Test Limit
455 kHz					< −120 dBm
101 MHz					< −120 dBm

At IF BW 1 kHz

Frequency	R	A	B	C	Test Limit
455 kHz					< −115 dBm
101 MHz					< −115 dBm

At IF BW 3 kHz

Frequency	R	A	B	C	Test Limit
455 kHz					< −110 dBm
101 MHz					< −110 dBm

At IF BW 10 kHz

Frequency	R	A	B	C	Test Limit
455 kHz					< −105 dBm
101 MHz					< −105 dBm

At IF BW 30 kHz

Frequency	R	A	B	C	Test Limit
455 kHz	________	________	________	________	< −100dBm
101 MHz	________	________	________	________	< −100 dBm

E5100B

At IF BW 1 kHz

Frequency	R	A	Test Limit
30 kHz	________	________	< −95 dBm
95 kHz	________	________	< −95 dBm
455 kHz	________	________	< −115 dBm
1.01 MHz	________	________	< −115 dBm
10.7 MHz	________	________	< −115 dBm
101 MHz	________	________	< −115 dBm
110 MHz	________	________	< −115 dBm
201 MHz	________	________	< −115 dBm
299 MHz	________	________	< −115 dBm

At IF BW 3 kHz

Frequency	R	A	Test Limit
455 kHz	________	________	< −110 dBm
101 MHz	________	________	< −110 dBm

At IF BW 10 kHz

Frequency	R	A	Test Limit
455 kHz	________	________	< −105 dBm
101 MHz	________	________	< −105 dBm

At IF BW 30 kHz

Frequency	R	A	Test Limit
455 kHz	________	________	< −100 dBm
101 MHz	________	________	< −100 dBm

8. Trace Noise Test

Measurement	Frequency		Test Reslt	Test Limit
A/R	10 kHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	100 kHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	1 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	10 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	100 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	300 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
B/R	10 kHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	100 kHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	1 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	10 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	100 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	300 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °

Measurement	Frequency		Test Reslt	Test Limit
C/R	10 kHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	100 kHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	1 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	10 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	100 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	300 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
C/B	10 kHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	100 kHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	1 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	10 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	100 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	300 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °

9. Residual Response Test

Input-R

Frequency	Test Result	Test Limit
47.85 MHz	___________	< −80 dBm
47.875 MHz	___________	< −80 dBm
59.84375 MHz	___________	< −80 dBm
59.875 MHz	___________	< −80 dBm
68.410714 MHz	___________	< −80 dBm
68.446428 MHz	___________	< −80 dBm
79.833333 MHz	___________	< −80 dBm
79.875 MHz	___________	< −80 dBm
119.8125 MHz	___________	< −80 dBm
119.875 MHz	___________	< −80 dBm
159.775 MHz	___________	< −80 dBm
159.808333 MHz	___________	< −80 dBm
159.858333 MHz	___________	< −80 dBm
159.891666 MHz	___________	< −80 dBm
239.8 MHz	___________	< −80 dBm
239.825 MHz	___________	< −80 dBm

Input-A

Frequency	Test Result	Test Limit
47.85 MHz	________	< −80 dBm
47.875 MHz	________	< −80 dBm
59.84375 MHz	________	< −80 dBm
59.875 MHz	________	< −80 dBm
68.410714 MHz	________	< −80 dBm
68.446428 MHz	________	< −80 dBm
79.833333 MHz	________	< −80 dBm
79.875 MHz	________	< −80 dBm
119.8125 MHz	________	< −80 dBm
119.875 MHz	________	< −80 dBm
159.775 MHz	________	< −80 dBm
159.808333 MHz	________	< −80 dBm
159.858333 MHz	________	< −80 dBm
159.891666 MHz	________	< −80 dBm
239.8 MHz	________	< −80 dBm
239.825 MHz	________	< −80 dBm

Input-B

Frequency	Test Result	Test Limit
47.85 MHz	________	< −80 dBm
47.875 MHz	________	< −80 dBm
59.84375 MHz	________	< −80 dBm
59.875 MHz	________	< −80 dBm
68.410714 MHz	________	< −80 dBm
68.446428 MHz	________	< −80 dBm
79.833333 MHz	________	< −80 dBm
79.875 MHz	________	< −80 dBm
119.8125 MHz	________	< −80 dBm
119.875 MHz	________	< −80 dBm
159.775 MHz	________	< −80 dBm
159.808333 MHz	________	< −80 dBm
159.858333 MHz	________	< −80 dBm
159.891666 MHz	________	< −80 dBm
239.8 MHz	________	< −80 dBm
239.825 MHz	________	< −80 dBm

Input-C

Frequency	Test Result	Test Limit
47.85 MHz	________	< −80 dBm
47.875 MHz	________	< −80 dBm
59.84375 MHz	________	< −80 dBm
59.875 MHz	________	< −80 dBm
68.410714 MHz	________	< −80 dBm
68.446428 MHz	________	< −80 dBm
79.833333 MHz	________	< −80 dBm
79.875 MHz	________	< −80 dBm
119.8125 MHz	________	< −80 dBm
119.875 MHz	________	< −80 dBm
159.775 MHz	________	< −80 dBm
159.808333 MHz	________	< −80 dBm
159.858333 MHz	________	< −80 dBm
159.891666 MHz	________	< −80 dBm
239.8 MHz	________	< −80 dBm
239.825 MHz	________	< −80 dBm

10. Input Crosstalk Test

E5100A

Measurement	Frequency	Test Result	Test Limit
R into A Crosstalk	10 kHz to 100 kHz	______	< −110 dB
	100 kHz to 200 kHz	______	< −120 dB
	200 kHz to 300 MHz	______	< −120 dB
R into B Crosstalk	10 kHz to 100 kHz	______	< −110 dB
	100 kHz to 200 kHz	______	< −120 dB
	200 kHz to 300 MHz	______	< −120 dB
R into C Crosstalk	10 kHz to 100 kHz	______	< −110 dB
	100 kHz to 200 kHz	______	< −120 dB
	200 kHz to 300 MHz	______	< −120 dB
A into R Crosstalk	10 kHz to 100 kHz	______	< −110 dB
	100 kHz to 200 kHz	______	< −120 dB
	200 kHz to 300 MHz	______	< −120 dB
A into B Crosstalk	10 kHz to 100 kHz	______	< −110 dB
	100 kHz to 200 kHz	______	< −120 dB
	200 kHz to 300 MHz	______	< −120 dB
A into C Crosstalk	10 kHz to 100 kHz	______	< −110 dB
	100 kHz to 200 MHz	______	< −120 dB
	200 kHz to 300 MHz	______	< −120 dB

Measurement	Frequency	Test Result	Test Limit
B into R Crosstalk	10 kHz to 100 kHz	________	< −110 dB
	100 kHz to 200 kHz	________	< −120 dB
	200 kHz to 300 MHz	________	< −120 dB
B into A Crosstalk	10 kHz to 100 kHz	________	< −110 dB
	100 kHz to 200 kHz	________	< −120 dB
	200 kHz to 300 MHz	________	< −120 dB
B into C Crosstalk	10 kHz to 100 kHz	________	< −110 dB
	100 kHz to 200 kHz	________	< −120 dB
	200 kHz to 300 MHz	________	< −120 dB
C into R Crosstalk	10 kHz to 100 kHz	________	< −110 dB
	100 kHz to 200 kHz	________	< −120 dB
	200 kHz to 300 MHz	________	< −120 dB
C into A Crosstalk	10 kHz to 100 kHz	________	< −110 dB
	100 kHz to 200 kHz	________	< −120 dB
	200 kHz to 300 MHz	________	< −120 dB
C into B Crosstalk	10 kHz to 100 kHz	________	< −110 dB
	100 kHz to 200 kHz	________	< −120 dB
	200 kHz to 300 MHz	________	< −120 dB

E5100B

Measurement	Frequency	Test Result	Test Limit
R into A Crosstalk	10 kHz to 100 kHz	________	< −85 dB
	100 kHz to 200 kHz	________	< −105 dB
	200 kHz to 250 MHz	________	< −105 dB
	250 MHz to 300 MHz	________	< −105 dB
A into R Crosstalk	10 kHz to 100 kHz	________	< −85 dB
	100 kHz to 200 kHz	________	< −105 dB
	200 kHz to 250 MHz	________	< −105 dB
	250 MHz to 300 MHz	________	< −105 dB

11. Absolute Amplitude Accuracy Test

Input R (Attenuator: 0 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	–1.0 dB	________	1.0 dB
100 kHz	–1.0 dB	________	1.0 dB
1 MHz	–1.0 dB	________	1.0 dB
10 MHz	–1.0 dB	________	1.0 dB
30 MHz	–1.0 dB	________	1.0 dB
50 MHz	–1.0 dB	________	1.0 dB
100 MHz	–1.0 dB	________	1.0 dB
300 MHz	–1.0 dB	________	1.0 dB

Input R (Attenuator: 25 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	–1.0 dB	________	1.0 dB
100 kHz	–1.0 dB	________	1.0 dB
1 MHz	–1.0 dB	________	1.0 dB
10 MHz	–1.0 dB	________	1.0 dB
30 MHz	–1.0 dB	________	1.0 dB
50 MHz	–1.0 dB	________	1.0 dB
100 MHz	–1.0 dB	________	1.0 dB
300 MHz	–1.0 dB	________	1.0 dB

Input A (Attenuator: 0 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	–1.0 dB	________	1.0 dB
100 kHz	–1.0 dB	________	1.0 dB
1 MHz	–1.0 dB	________	1.0 dB
10 MHz	–1.0 dB	________	1.0 dB
30 MHz	–1.0 dB	________	1.0 dB
50 MHz	–1.0 dB	________	1.0 dB
100 MHz	–1.0 dB	________	1.0 dB
300 MHz	–1.0 dB	________	1.0 dB

Input A (Attenuator: 25 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
300 MHz	−1.0 dB	________	1.0 dB

Input B (Attenuator: 0 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
300 MHz	−1.0 dB	________	1.0 dB

Input B (Attenuator: 25 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
300 MHz	−1.0 dB	________	1.0 dB

Input C (Attenuator: 0 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	–1.0 dB	________	1.0 dB
100 kHz	–1.0 dB	________	1.0 dB
1 MHz	–1.0 dB	________	1.0 dB
10 MHz	–1.0 dB	________	1.0 dB
30 MHz	–1.0 dB	________	1.0 dB
50 MHz	–1.0 dB	________	1.0 dB
100 MHz	–1.0 dB	________	1.0 dB
300 MHz	–1.0 dB	________	1.0 dB

Input C (Attenuator: 25 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	–1.0 dB	________	1.0 dB
100 kHz	–1.0 dB	________	1.0 dB
1 MHz	–1.0 dB	________	1.0 dB
10 MHz	–1.0 dB	________	1.0 dB
30 MHz	–1.0 dB	________	1.0 dB
50 MHz	–1.0 dB	________	1.0 dB
100 MHz	–1.0 dB	________	1.0 dB
300 MHz	–1.0 dB	________	1.0 dB

12. Dynamic Accuracy Test

A/R Measurement

Magnitude Ratio

A Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−0.4 dB	________	0.4 dB
−5 dBm	−0.09 dB	________	0.09 dB
−25 dBm	−0.05 dB	________	0.05 dB
−35 dBm	−0.05 dB	________	0.05 dB
−45 dBm	−0.05 dB	________	0.05 dB
−55 dBm	−0.06 dB	________	0.06 dB
−65 dBm	−0.1 dB	________	0.1 dB
−75 dBm	−0.3 dB	________	0.3 dB
−85 dBm	−0.9 dB	________	0.9 dB
−95 dBm	−3. dB	________	3 dB

Phase

A Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−3°	________	3°
−5 dBm	−0.6°	________	0.6°
−25 dBm	−0.3°	________	0.3°
−35 dBm	−0.3°	________	0.3°
−45 dBm	−0.3°	________	0.3°
−55 dBm	−0.3°	________	0.3°
−65 dBm	−0.6°	________	0.6°
−75 dBm	−1.8°	________	1.8°
−85 dBm	−6°	________	6°
−95 dBm	−18°	________	18°

B/R Measurement

Magnitude Ratio

B Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−0.4 dB	___________	0.4 dB
−5 dBm	−0.09 dB	___________	0.09 dB
−25 dBm	−0.05 dB	___________	0.05 dB
−35 dBm	−0.05 dB	___________	0.05 dB
−45 dBm	−0.05 dB	___________	0.05 dB
−55 dBm	−0.06 dB	___________	0.06 dB
−65 dBm	−0.1 dB	___________	0.1 dB
−75 dBm	−0.3 dB	___________	0.3 dB
−85 dBm	−0.9 dB	___________	0.9 dB
−95 dBm	−3. dB	___________	3 dB

Phase

B Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−3°	___________	3°
−5 dBm	−0.6°	___________	0.6°
−25 dBm	−0.3°	___________	0.3°
−35 dBm	−0.3°	___________	0.3°
−45 dBm	−0.3°	___________	0.3°
−55 dBm	−0.3°	___________	0.3°
−65 dBm	−0.6°	___________	0.6°
−75 dBm	−1.8°	___________	1.8°
−85 dBm	−6°	___________	6°
−95 dBm	−18°	___________	18°

C/R Measurement

Magnitude Ratio

C Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−0.4 dB	________	0.4 dB
−5 dBm	−0.09 dB	________	0.09 dB
−25 dBm	−0.05 dB	________	0.05 dB
−35 dBm	−0.05 dB	________	0.05 dB
−45 dBm	−0.05 dB	________	0.05 dB
−55 dBm	−0.06 dB	________	0.06 dB
−65 dBm	−0.1 dB	________	0.1 dB
−75 dBm	−0.3 dB	________	0.3 dB
−85 dBm	−0.9 dB	________	0.9 dB
−95 dBm	−3. dB	________	3 dB

Phase

C Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−3°	________	3°
−5 dBm	−0.6°	________	0.6°
−25 dBm	−0.3°	________	0.3°
−35 dBm	−0.3°	________	0.3°
−45 dBm	−0.3°	________	0.3°
−55 dBm	−0.3°	________	0.3°
−65 dBm	−0.6°	________	0.6°
−75 dBm	−1.8°	________	1.8°
−85 dBm	−6°	________	6°
−95 dBm	−18°	________	18°

C/B Measurement

Magnitude Ratio

C Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−0.4 dB	________	0.4 dB
−5 dBm	−0.09 dB	________	0.09 dB
−25 dBm	−0.05 dB	________	0.05 dB
−35 dBm	−0.05 dB	________	0.05 dB
−45 dBm	−0.05 dB	________	0.05 dB
−55 dBm	−0.06 dB	________	0.06 dB
−65 dBm	−0.1 dB	________	0.1 dB
−75 dBm	−0.3 dB	________	0.3 dB
−85 dBm	−0.9 dB	________	0.9 dB
−95 dBm	−3. dB	________	3 dB

Phase

C Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−3°	________	3°
−5 dBm	−0.6°	________	0.6°
−25 dBm	−0.3°	________	0.3°
−35 dBm	−0.3°	________	0.3°
−45 dBm	−0.3°	________	0.3°
−55 dBm	−0.3°	________	0.3°
−65 dBm	−0.6°	________	0.6°
−75 dBm	−1.8°	________	1.8°
−85 dBm	−6°	________	6°
−95 dBm	−18°	________	18°

A Measurement (Option 100)

Magnitude Ratio

A Input Level	Minimum Limit	Test Result	Maximum Limit
−20 dBm	−0.4 dB	________	0.4 dB
−30 dBm	−0.1 dB	________	0.1 dB
−50 dBm	−0.1 dB	________	0.1 dB
−60 dBm	−0.1 dB	________	0.1 dB
−70 dBm	−0.1 dB	________	0.1 dB
−80 dBm	−0.1 dB	________	0.1 dB
−90 dBm	−0.2 dB	________	0.2 dB
−100 dBm	−0.6 dB	________	0.6 dB

Phase

C Input Level	Minimum Limit	Test Result	Maximum Limit
−20 dBm	−3°	________	3°
−30 dBm	−0.6°	________	0.6°
−50 dBm	−0.3°	________	0.3°
−60 dBm	−0.3°	________	0.3°
−70 dBm	−0.3°	________	0.3°
−80 dBm	−0.3°	________	0.3°
−90 dBm	−0.6°	________	0.6°
−100 dBm	−1.8°	________	1.8°

13. Magnitude Ratio Frequency Response Test

E5100A (Input Impedance: 50 Ω)

A/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 300 MHz	−1 dB	________	1 dB

A/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 300 MHz	−1 dB	________	1 dB

B/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 300 MHz	−1 dB	________	1 dB

B/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 300 MHz	−1 dB	________	1 dB

C/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 300 MHz	−1 dB	________	1 dB

C/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 300 MHz	−1 dB	________	1 dB

B/C Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 300 MHz	−1 dB	________	1 dB

B/C Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 300 MHz	−1 dB	________	1 dB

E5100A (Input Impedance: 1 MΩ)

A/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	−3 dB	__________	3 dB

A/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	−3 dB	__________	3 dB

B/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	−3 dB	__________	3 dB

B/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	−3 dB	__________	3 dB

B/C Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	−3 dB	__________	3 dB

B/C Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	−3 dB	__________	3 dB

14. Phase Frequency Response Test

E5100A (Input Impedance: 50 Ω)

A/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	–5°	________	5°
100 kHz to 100 MHz	–2.5°	________	2.5°
100 MHz to 300 MHz	–5°	________	5°

A/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	–5°	________	5°
100 kHz to 100 MHz	–2.5°	________	2.5°
100 MHz to 300 MHz	–5°	________	5°

B/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	–5°	________	5°
100 kHz to 100 MHz	–2.5°	________	2.5°
100 MHz to 300 MHz	–5°	________	5°

B/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	–5°	________	5°
100 kHz to 100 MHz	–2.5°	________	2.5°
100 MHz to 300 MHz	–5°	________	5°

C/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−5°	________	5°
100 kHz to 100 MHz	−2.5°	________	2.5°
100 MHz to 300 MHz	−5°	________	5°

C/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−5°	________	5°
100 kHz to 100 MHz	−2.5°	________	2.5°
100 MHz to 300 MHz	−5°	________	5°

B/C Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−5°	________	5°
100 kHz to 100 MHz	−2.5°	________	2.5°
100 MHz to 300 MHz	−5°	________	5°

B/C Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−5°	________	5°
100 kHz to 100 MHz	−2.5°	________	2.5°
100 MHz to 300 MHz	−5°	________	5°

C

Performance Test Record for E5100A Option 118/218/318/618

Agilent Technologies E5100A Network Analyzer

Date:	______________
Temperature:	______________
Humidity:	______________
Serial No.:	______________
Tested by:	______________

1. Frequency Range and Accuracy Test

Without Option 1D5

Frequency	Minimum Limit	Test Result	Maximum Limit
180 MHz	179.994 MHz	______________	180.006 MHz

With Option 1D5

Frequency	Minimum Limit	Test Result	Maximum Limit
180 MHz	179.9997 MHz	______________	180.0003 MHz

2. Harmonics Test

Option 001/002/003 without Option 010

Frequency	Harmonics Frequency	Test Result	Test Limit
10 kHz[1]	20 kHz	________ dBc	< −35 dBc
	30 kHz	________ dBc	< −35 dBc
100 kHz	200 kHz	________ dBc	< −35 dBc
	300 kHz	________ dBc	< −35 dBc
1 MHz	2 MHz	________ dBc	< −35 dBc
	3 MHz	________ dBc	< −35 dBc
10 MHz	20 MHz	________ dBc	< −35 dBc
	30 MHz	________ dBc	< −35 dBc
100 MHz	200 MHz	________ dBc	< −35 dBc
	300 MHz	________ dBc	< −35 dBc
180 MHz	360 MHz	________ dBc	< −35 dBc
	540 MHz	________ dBc	< −35 dBc

1 E5100A with option 510 does not require the harmomics test at this frequency.

Option 010 or Option 618

Frequency	Harmonics Frequency	Test Result	Test Limit
10 kHz	20 kHz	________ dBc	< −20 dBc
	30 kHz	________ dBc	< −20 dBc
100 kHz	200 kHz	________ dBc	< −20 dBc
	300 kHz	________ dBc	< −20 dBc
1 MHz	2 MHz	________ dBc	< −20 dBc
	3 MHz	________ dBc	< −20 dBc
10 MHz	20 MHz	________ dBc	< −20 dBc
	30 MHz	________ dBc	< −20 dBc
100 MHz	200 MHz	________ dBc	< −20 dBc
	300 MHz	________ dBc	< −20 dBc
180 MHz	180 MHz	________ dBc	< −20 dBc
	360 MHz	________ dBc	< −20 dBc

4. Phase Noise Test

Reference	Frequency	Test Result	Test Limit
455 kHz	445 kHz	__________	< -90 dBc
	465 kHz	__________	< -90 dBc
150 MHz	149.99 MHz	__________	< -90 dBc
	150.01 MHz	__________	< -90 dBc
180 MHz	179.99 MHz	__________	< -90 dBc
	180.01 MHz	__________	< -90 dBc

5. Source Level Accuracy/Flatness Test

Level Accuracy (at 50 MHz, 0 dBm)

Minimum Limit	Test Result	Maximum Limit
−1 dBm	___________	1 dBm

Level Flatness (relative to 0 dBm at 50 MHz)

Option 001/002 without Option 010

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz	−4 dB	___________	2 dB
50 kHz	−4 dB	___________	2 dB
100 kHz	−4 dB	___________	2 dB
1 MHz	−4 dB	___________	2 dB
10 MHz	−4 dB	___________	2 dB
100 MHz	−4 dB	___________	2 dB
150 MHz	−4 dB	___________	2 dB
180 MHz	−4 dB	___________	2 dB

Option 003 without Option 010

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz	−4.5 dB	___________	2.5 dB
50 kHz	−4.5 dB	___________	2.5 dB
100 kHz	−4.5 dB	___________	2.5 dB
1 MHz	−4.5 dB	___________	2.5 dB
10 MHz	−4.5 dB	___________	2.5 dB
100 MHz	−4.5 dB	___________	2.5 dB
150 MHz	−4.5 dB	___________	2.5 dB
180 MHz	−4.5 dB	___________	2.5 dB

Option 010 or Option 618

Frequency	Minimum Limit	Test Result	Maximum Limit
50 kHz	−4.5 dB	___________	2.5 dB
100 kHz	−4.5 dB	___________	2.5 dB
1 MHz	−4.5 dB	___________	2.5 dB
10 MHz	−4.5 dB	___________	2.5 dB
100 MHz	−4.5 dB	___________	2.5 dB
150 MHz	−5 dB	___________	3 dB
180 MHz	−5 dB	___________	3 dB

6. Source Power Linearity Test

Option 001 without Option 010

E5100A Power Setting	Minimum Limit	Test Result	Maximum Limit
+11 dBm	−1.0 dB	________	1.0 dB
+5 dBm	−1.0 dB	________	1.0 dB
−5 dBm	−1.0 dB	________	1.0 dB
−9 dBm	−1.0 dB	________	1.0 dB

Option 002 without Option 010

E5100A Power Setting	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−1.0 dB	________	1.0 dB
−5 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−15 dBm	−1.0 dB	________	1.0 dB

Option 001 with Option 010

E5100A Power Setting	Minimum Limit	Test Result	Maximum Limit
+22 dBm	−1.0 dB	________	1.0 dB
+10 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−20 dBm	−1.0 dB	________	1.0 dB
−30 dBm	−1.0 dB	________	1.0 dB
−40 dBm	−1.5 dB	________	1.5 dB
−48 dBm	−1.5 dB	________	1.5 dB

Option 002 with Option 010

E5100A Power Setting	Minimum Limit	Test Result	Maximum Limit
+16 dBm	−1.0 dB	________	1.0 dB
+10 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−20 dBm	−1.0 dB	________	1.0 dB
−30 dBm	−1.0 dB	________	1.0 dB
−40 dBm	−1.0 dB	________	1.0 dB
−50 dBm	−1.5 dB	________	1.5 dB
−54 dBm	−1.5 dB	________	1.5 dB

Option 003 without Option 010

E5100A Power Setting	Minimum Limit	Test Result	Maximum Limit
+7 dBm	−1.0 dB	________	1.0 dB
+5 dBm	−1.0 dB	________	1.0 dB
−5 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−13 dBm	−1.0 dB	________	1.0 dB

Option 003 with Option 010, Option 618

E5100A Power Setting	Minimum Limit	Test Result	Maximum Limit
+18 dBm	−1.0 dB	________	1.0 dB
+10 dBm	−1.0 dB	________	1.0 dB
−10 dBm	−1.0 dB	________	1.0 dB
−20 dBm	−1.0 dB	________	1.0 dB
−30 dBm	−1.0 dB	________	1.0 dB
−40 dBm	−1.0 dB	________	1.0 dB
−50 dBm	−1.5 dB	________	1.5 dB
−52 dBm	−1.5 dB	________	1.5 dB

7. Receiver Noise Level Test

E5100A

At IF BW 100 Hz

Frequency	R	A	B	Test Limit
10 kHz	______	______	______	< −105 dBm
95 kHz	______	______	______	< −105 dBm
455 kHz	______	______	______	< −125 dBm
1.01 MHz	______	______	______	< −125 dBm
10.7 MHz	______	______	______	< −125 dBm
101 MHz	______	______	______	< −125 dBm
110 MHz	______	______	______	< −125 dBm
179 MHz	______	______	______	< −125 dBm

At IF BW 300 Hz

Frequency	R	A	B	Test Limit
455 kHz	______	______	______	< −120 dBm
101 MHz	______	______	______	< −120 dBm

At IF BW 1 kHz

Frequency	R	A	B	Test Limit
455 kHz	______	______	______	< −115 dBm
101 MHz	______	______	______	< −115 dBm

At IF BW 3 kHz

Frequency	R	A	B	Test Limit
455 kHz	______	______	______	< −110 dBm
101 MHz	______	______	______	< −110 dBm

At IF BW 10 kHz

Frequency	R	A	B	Test Limit
455 kHz	______	______	______	< −105 dBm
101 MHz	______	______	______	< −105 dBm

At IF BW 30 kHz

Frequency	R	A	B	Test Limit
455 kHz	____________	____________	____________	< −100dBm
101 MHz	____________	____________	____________	< −100 dBm

8. Trace Noise Test

Measurement	Frequency		Test Reslt	Test Limit
A/R	10 kHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	100 kHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	1 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	10 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	100 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	180 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
B/R	10 kHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	100 kHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	1 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	10 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	100 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °
	180 MHz	Magnitude	______	< 0.01 dB
		Phase	______	< 0.05 °

Measurement	Frequency		Test Reslt	Test Limit
C/R	10 kHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	100 kHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	1 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	10 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	100 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	300 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
C/B	10 kHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	100 kHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	1 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	10 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	100 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °
	300 MHz	Magnitude		< 0.01 dB
		Phase		< 0.05 °

9. Residual Response Test

Input-R

Frequency	Test Result	Test Limit
47.85 MHz	______	< −80 dBm
47.875 MHz	______	< −80 dBm
59.84375 MHz	______	< −80 dBm
59.875 MHz	______	< −80 dBm
68.410714 MHz	______	< −80 dBm
68.446428 MHz	______	< −80 dBm
79.833333 MHz	______	< −80 dBm
79.875 MHz	______	< −80 dBm
119.8125 MHz	______	< −80 dBm
119.875 MHz	______	< −80 dBm
159.775 MHz	______	< −80 dBm
159.808333 MHz	______	< −80 dBm
159.858333 MHz	______	< −80 dBm
159.891666 MHz	______	< −80 dBm

Input-A

Frequency	Test Result	Test Limit
47.85 MHz	______	< −80 dBm
47.875 MHz	______	< −80 dBm
59.84375 MHz	______	< −80 dBm
59.875 MHz	______	< −80 dBm
68.410714 MHz	______	< −80 dBm
68.446428 MHz	______	< −80 dBm
79.833333 MHz	______	< −80 dBm
79.875 MHz	______	< −80 dBm
119.8125 MHz	______	< −80 dBm
119.875 MHz	______	< −80 dBm
159.775 MHz	______	< −80 dBm
159.808333 MHz	______	< −80 dBm
159.858333 MHz	______	< −80 dBm
159.891666 MHz	______	< −80 dBm

Input-B

Frequency	Test Result	Test Limit
47.85 MHz		< −80 dBm
47.875 MHz		< −80 dBm
59.84375 MHz		< −80 dBm
59.875 MHz		< −80 dBm
68.410714 MHz		< −80 dBm
68.446428 MHz		< −80 dBm
79.833333 MHz		< −80 dBm
79.875 MHz		< −80 dBm
119.8125 MHz		< −80 dBm
119.875 MHz		< −80 dBm
159.775 MHz		< −80 dBm
159.808333 MHz		< −80 dBm
159.858333 MHz		< −80 dBm
159.891666 MHz		< −80 dBm

10. Input Crosstalk Test

E5100A

Measurement	Frequency	Test Result	Test Limit
R into A Crosstalk	10 kHz to 100 kHz	____________	< −110 dB
	100 kHz to 200 kHz	____________	< −120 dB
	200 kHz to 180 MHz	____________	< −120 dB
R into B Crosstalk	10 kHz to 100 kHz	____________	< −110 dB
	100 kHz to 200 kHz	____________	< −120 dB
	200 kHz to 180 MHz	____________	< −120 dB
A into R Crosstalk	10 kHz to 100 kHz	____________	< −110 dB
	100 kHz to 200 kHz	____________	< −120 dB
	200 kHz to 180 MHz	____________	< −120 dB
A into B Crosstalk	10 kHz to 100 kHz	____________	< −110 dB
	100 kHz to 200 kHz	____________	< −120 dB
	200 kHz to 180 MHz	____________	< −120 dB
B into R Crosstalk	10 kHz to 100 kHz	____________	< −110 dB
	100 kHz to 200 kHz	____________	< −120 dB
	200 kHz to 180 MHz	____________	< −120 dB
B into A Crosstalk	10 kHz to 100 kHz	____________	< −110 dB
	100 kHz to 200 kHz	____________	< −120 dB
	200 kHz to 180 MHz	____________	< −120 dB

11. Absolute Amplitude Accuracy Test

Input R (Attenuator: 0 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
180 MHz	−1.0 dB	________	1.0 dB

Input R (Attenuator: 25 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
180 MHz	−1.0 dB	________	1.0 dB

Input A (Attenuator: 0 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
180 MHz	−1.0 dB	________	1.0 dB

Input A (Attenuator: 25 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
180 MHz	−1.0 dB	________	1.0 dB

Input B (Attenuator: 0 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
180 MHz	−1.0 dB	________	1.0 dB

Input B (Attenuator: 25 dB)

Frequency	Mimimum Limit	Test Result	Maximum Limit
10 kHz	−1.0 dB	________	1.0 dB
100 kHz	−1.0 dB	________	1.0 dB
1 MHz	−1.0 dB	________	1.0 dB
10 MHz	−1.0 dB	________	1.0 dB
30 MHz	−1.0 dB	________	1.0 dB
50 MHz	−1.0 dB	________	1.0 dB
100 MHz	−1.0 dB	________	1.0 dB
180 MHz	−1.0 dB	________	1.0 dB

12. Dynamic Accuracy Test

A/R Measurement

Magnitude Ratio

A Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−0.4 dB	___________	0.4 dB
−5 dBm	−0.09 dB	___________	0.09 dB
−25 dBm	−0.05 dB	___________	0.05 dB
−35 dBm	−0.05 dB	___________	0.05 dB
−45 dBm	−0.05 dB	___________	0.05 dB
−55 dBm	−0.06 dB	___________	0.06 dB
−65 dBm	−0.1 dB	___________	0.1 dB
−75 dBm	−0.3 dB	___________	0.3 dB
−85 dBm	−0.9 dB	___________	0.9 dB
−95 dBm	−3. dB	___________	3 dB

Phase

A Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−3°	___________	3°
−5 dBm	−0.6°	___________	0.6°
−25 dBm	−0.3°	___________	0.3°
−35 dBm	−0.3°	___________	0.3°
−45 dBm	−0.3°	___________	0.3°
−55 dBm	−0.3°	___________	0.3°
−65 dBm	−0.6°	___________	0.6°
−75 dBm	−1.8°	___________	1.8°
−85 dBm	−6°	___________	6°
−95 dBm	−18°	___________	18°

B/R Measurement

Magnitude Ratio

B Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−0.4 dB	________	0.4 dB
−5 dBm	−0.09 dB	________	0.09 dB
−25 dBm	−0.05 dB	________	0.05 dB
−35 dBm	−0.05 dB	________	0.05 dB
−45 dBm	−0.05 dB	________	0.05 dB
−55 dBm	−0.06 dB	________	0.06 dB
−65 dBm	−0.1 dB	________	0.1 dB
−75 dBm	−0.3 dB	________	0.3 dB
−85 dBm	−0.9 dB	________	0.9 dB
−95 dBm	−3. dB	________	3 dB

Phase

B Input Level	Minimum Limit	Test Result	Maximum Limit
+5 dBm	−3°	________	3°
−5 dBm	−0.6°	________	0.6°
−25 dBm	−0.3°	________	0.3°
−35 dBm	−0.3°	________	0.3°
−45 dBm	−0.3°	________	0.3°
−55 dBm	−0.3°	________	0.3°
−65 dBm	−0.6°	________	0.6°
−75 dBm	−1.8°	________	1.8°
−85 dBm	−6°	________	6°
−95 dBm	−18°	________	18°

A Measurement (Option 118)

Magnitude Ratio

A Input Level	Minimum Limit	Test Result	Maximum Limit
−20 dBm	−0.4 dB	________	0.4 dB
−30 dBm	−0.1 dB	________	0.1 dB
−50 dBm	−0.1 dB	________	0.1 dB
−60 dBm	−0.1 dB	________	0.1 dB
−70 dBm	−0.1 dB	________	0.1 dB
−80 dBm	−0.1 dB	________	0.1 dB
−90 dBm	−0.2 dB	________	0.2 dB
−100 dBm	−0.6 dB	________	0.6 dB

Phase

C Input Level	Minimum Limit	Test Result	Maximum Limit
−20 dBm	−3°	________	3°
−30 dBm	−0.6°	________	0.6°
−50 dBm	−0.3°	________	0.3°
−60 dBm	−0.3°	________	0.3°
−70 dBm	−0.3°	________	0.3°
−80 dBm	−0.3°	________	0.3°
−90 dBm	−0.6°	________	0.6°
−100 dBm	−1.8°	________	1.8°

13. Magnitude Ratio Frequency Response Test

E5100A (Input Impedance: 50 Ω)

A/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 180 MHz	−1 dB	________	1 dB

A/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 180 MHz	−1 dB	________	1 dB

B/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 180 MHz	−1 dB	________	1 dB

B/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−1 dB	________	1 dB
100 kHz to 100 MHz	−0.5 dB	________	0.5 dB
100 MHz to 180 MHz	−1 dB	________	1 dB

E5100A (Input Impedance: 1 MΩ)

A/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	–3 dB	___________	3 dB

A/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	–3 dB	___________	3 dB

B/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	–3 dB	___________	3 dB

B/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 5 MHz	–3 dB	___________	3 dB

14. Phase Frequency Response Test

E5100A (Input Impedance: 50 Ω)

A/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−5°	________	5°
100 kHz to 100 MHz	−2.5°	________	2.5°
100 MHz to 180 MHz	−5°	________	5°

A/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−5°	________	5°
100 kHz to 100 MHz	−2.5°	________	2.5°
100 MHz to 180 MHz	−5°	________	5°

B/R Measurement (Input Attenuator: 25 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−5°	________	5°
100 kHz to 100 MHz	−2.5°	________	2.5°
100 MHz to 180 MHz	−5°	________	5°

B/R Measurement (Input Attenuator: 0 dB)

Frequency	Minimum Limit	Test Result	Maximum Limit
10 kHz to 100 kHz	−5°	________	5°
100 kHz to 100 MHz	−2.5°	________	2.5°
100 MHz to 180 MHz	−5°	________	5°

D

Manual Changes

Introduction

This appendix contains the information required to adapt this manual to earlier versions or configurations of the analyzer than the current printing date of this manual. The information in this manual applies directly to the E5100A/B Network Analyzer serial number prefix listed on the title page of this manual.

Manual Changes

To adapt this manual to your E5100A/B, see Table D-1 and Table D-2, and make all the manual changes listed opposite your instrument's serial number and firmware version.

Instruments manufactured after the printing of this manual may be different from those documented in this manual. Later instrument versions will be documented in a manual changes supplement that will accompany the manual shipped with that instrument. If your instrument's serial number is not listed on the title page of this manual or in Table D-1, it may be documented in a *yellow MANUAL CHANGES* supplement.

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.

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

Turn on the line switch or execute the `*IDN?` command by GPIB to confirm the firmware version. See the *GPIB Command Reference* manual for information on the `*IDN?` command.

Table D-1. Manual Changes by Serial Number

Serial Prefix or Number	Make Manual Changes
JP1KC	

Table D-2. Manual Changes by Firmware Version

Version	Make Manual Changes

Serial Number

Agilent Technologies uses a two-part, nine-character serial number that is stamped on the serial number plate (see Figure D-1) attached to the rear panel. The first four digits and the letter are the serial prefix and the last five digits are the suffix.

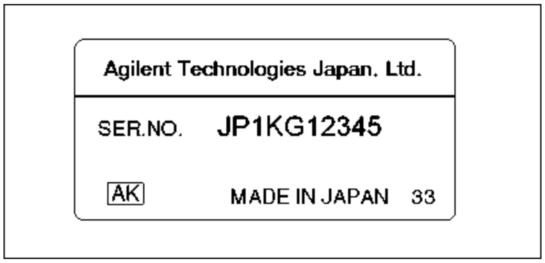


Figure D-1. Serial Number Plate

Error Messages

This section lists the error messages that are displayed on the analyzer display or transmitted by the instrument over GPIB. Each error message is accompanied by an explanation, and suggestions are provided to help in solving the problem. Where applicable, references are given to related sections of the Operation and Maintenance manuals.

When displayed, error messages are usually preceded with the word "CAUTION:". That part of the error message has been omitted here for the sake or brevity. Some messages are for information only, and do not indicate an error condition. Two listings are provided: the first is in alphabetical order, and the second in numerical order.

In addition to error messages, instrument status is indicate by status notations on the display. Examples are "!" and "#". Sometimes these appear in conjunction with error messages. A complete listing of status and notations and their meanings is provided in "Front and Rear Panel".

Error Messages in Alphabetical Order

152 **ADDITIONAL STANDARDS NEEDED**

Error correction for the selected calibration class cannot be computed until all the necessary standards have been measured.

153 **CALIBRATION REQUIRED**

No valid calibration coefficients were found when user attempted to turn calibration ON.

5 **CAN'T CHANGE-ANOTHER CONTROLLER ON BUS**

The analyzer cannot assume the mode of system controller until the active controller is removed from the bus or relinquishes the bus.

55 **CAN'T COPY A DIRECTORY**

A directory name is selected as a source file. Select a file to be copied before pressing COPY FILE.

−281 **CANNOT CREATE PROGRAM**

Indicates that an attempt to create a program was unsuccessful. A reason for the failure might include not enough memory.

−253 **CORRUPT MEDIA**

A legal program command could not be executed because of corrupt media; for example, a bad disk or wrong format.

−104 **DATA TYPE ERROR**

Improper data type used (for example, string data was expected, but numeric data was received).

−255 **DIRECTORY FULL**

A legal program command could not be executed because the media directory was full.

−257 **FILE NAME ERROR**

A legal program command could not be executed because the file name on the device media was in error; for example, an attempt was made to copy to a duplicate file name.

−256 **FILE NAME NOT FOUND**

A legal program command could not be executed because the file name on the device media was not found; for example, an attempt was made to read or copy a nonexistent file.

−282 **ILLEGAL PROGRAM NAME**

The name used to reference a program was invalid; for example, redefining an existing programm deleting a nonexistent program, or in gerenral, referencing a nonexsitent program.

−282 **ILLEGAL VARIABLE NAME**

An attempt was made to reference a nonexistent variable in a program.

154 **LIST TABLE EMPTY OR INSUFFICIENT TABLE**

The frequency list is empty. To implement the list frequency mode, make the list table.

126 **LOCAL MAX NOT FOUND**

The maximum peak whose sharpness is defined by the peak define function cannot be found.

127 **LOCAL MIN NOT FOUND**

The minimum peak whose sharpness is defined by the peak define function cannot be found.

−250 **MASS STORAGE ERROR**

A mass storage error occurred. This error message is used when the device cannot detect the more specific errors described for errors −251 trough −259.

−254 **MEDIA FULL**

A legal program command could not be executed because the media was full.

−258 **MEDIA PROTECTED**

A legal program command could not be executed because the media was protected; for example, the disk was write-protected.

−251 **MISSING MASS STORAGE**

A legal program command could not be executed because of missing mass storage; for example, attempt to access an external disk drive by using Instrument BASIC.

−252 **MISSING MEDIA**

A legal program command could not be executed because of a missing media; for example, no disk.

−109 **MISSING PARAMETER**

A command with an improper number of parameters received.

129 **NO MARKER DELTA - RANGE NOT SET**

The SEARCH RNG STORE softkey requires that delta marker mode be turned ON, with at least two markers displayed.

128 **NO MARKER DELTA - SPAN NOT SET**

The MARKER → SPAN softkey requires that delta marker mode be turned ON, with at least two markers displayed.

156 **NO VALID MEMORY TRACE**

If a memory array is to be displayed or otherwise used, a data must first be stored to memory by GPIB.

56 **NOT A DIRECTORY**

A file name is selected when CHANGE DIRECTORY is pressed. Select a directory name before pressing CHANGE DIRECTORY.

−321 **OUT OF MEMORY**

An internal operation needed more memory than was available.

145 **OVERLOAD ON INPUT**

The power level at one of the receiver inputs exceeds a certain level greater than the maximum input level.

−108 **PARAMETER NOT ALLOWED**

Too many parameters for the command received.

1 **PRINTER NOT POWERED ON OR DISCONNECTED**

The printer does not respond to control. Verify power to the printer and connection between the analyzer and the printer.

−284 **PROGRAM CURRENTLY RUNNING**

Certain operations dealing with programs may be illegal while the program is running; for example, deleting a running program might not be possible.

−280 **PROGRAM ERROR**

Indicates that a downloaded program-ralated execution error occured. This error message should be used when the device cannot detect the more specific errors described for errors −281 through −289. A downloaded program is used to add algorithmic capability to a device. The syntax used in the program and the mechanism for downloading a program is device-specific.

−286 **PROGRAM RUNTIME ERROR**

Runtime error has occured,

−285 **PROGRAM SYNTAX ERROR**

Indicats that a syntax error appears in a downloaded program. The syntax used when parsing the downloaded program is device-specific.

−430 **QUERY DEADLOCKED**

Input buffer and output buffer are full; cannot continue.

−400 **QUERT ERROR**

Query is improper.

−410 **QUERY INTERRUPTED**

Query is followed by DAB or GET before the response was completed.

−420 **QUERY UNTERMINATED**

Addressed to talk, incomplete program message received.

115 **RECALL: CRC ERROR**

A serious error, for example corrupted data, is detected on recalling a file, and this forced the analyzer to be PRESET.

116 **RECALL: INVALID OPTION ERROR**

The recalled file was saved by the other analyzer which is equipped with the diffrerence option.

103 **SAVE: CRC ERROR**

A serious error, for example physically damaged disk surface, is detected on saving a file. Change the disk.

−102 **SYNTAX ERROR**

Unrecognized command or data type was received.

155 **TOO MANY SEGMENTS OR POINTS**

In list table editor, the total of number of points exceeds 801 so that the new segment can not be made.

−113 **UNDEFINED HEADER**

Undefined header or an unrecognized command was received (operation not allowed).

139 **WRONG I/O PORT DIRECTION**

The direction of I/O port C or D is opposite.

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