

Keysight N9000A CXA Signal Analyzer

This manual provides documentation for the following instruments:

N9000A Option 503 (9 kHz – 3.0 GHz)

N9000A Option 507 (9 kHz – 7.5 GHz)

Notice: This document contains references to Agilent. Please note that Agilent's Test and Measurement business has become Keysight Technologies. For more information, go to www.keysight.com.

Manufacturing Part Number: N9000-90018

Printed in USA

August 2014

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WARNING

Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.

CAUTION

Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

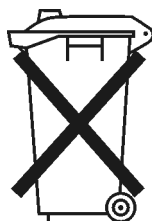
WARNING

This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protected earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

WARNING	The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from it's power supply.
WARNING	The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch (disconnecting device).
WARNING	The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the product from all voltage sources before starting to open.
WARNING	These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

Lithium Battery Disposal

The CXA Signal Analyzer uses an internal 3.0 VDC battery that contains Lithium/Manganese Dioxide (Li/MnO₂). The battery is located on the A4 CPU assembly to power the instrument clock and back up data in SRAM. When the battery is exhausted and ready for disposal, dispose of it according to your country's requirements. The Agilent part number is [1420-0356](#). The manufacturer's part number is CR2032. You can return the battery to your nearest Agilent Technologies Sales and Service office for disposal, if required. Refer to ["Contacting Agilent Technologies" on page 37](#) for a list of Agilent Technologies Sales and Service offices.



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1. Overview

What You Will Find in This Chapter	16
Agilent CXA Signal Analyzer Overview	17
Instrument Option Descriptions	18
Signal Analyzer Accessories	19
Manual Set on CD-ROM	19
50 Ohm Load	20
50 Ohm/75 Ohm Minimum Loss Pad	20
75 Ohm Matching Transformer	20
AC Probe	20
AC Probe (Low Frequency)	20
Broadband Preamplifiers and Power Amplifiers	20
RF and Transient Limiters	21
Power Splitters	21
Static Safe Accessories	21
Before You Start Troubleshooting	22
ESD Information	24
Protection from Electrostatic Discharge	24
Handling of Electronic Components and ESD	25
Test Equipment Usage and ESD	25
For Additional Information about ESD	25
Service Equipment You Will Need	26
Calibration Application Software	26
USB Keyboard and Mouse	27
USB Storage Device	27
Required Test Equipment List	28
After an Instrument Repair	36
Contacting Agilent Technologies	37
Instrument Serial Numbers	39
How to Return Your Instrument for Service	40
Service Order Number	40
Original Packaging	40
Other Packaging	41

2. Boot Up and Initialization Troubleshooting

What You Will Find in This Chapter	44
Check the Basics	45
CXA Instrument Boot Up Process	46
Typical instrument boot-up process flow	47
Potential Problems During Boot Process	49
Yellow Standby LED Does Not Illuminate	49
Green Power On LED Does Not Illuminate	51
Fan(s) Are Not Operating	53
No Agilent Splash Screen Displayed	55
Instrument Hangs at the Agilent Splash Screen	56
PCI Enumeration Error	56
Instrument Cannot Completely Load or Run the Operating System	57
Troubleshooting a Blank Display	57
Verify LCD Backlight Functionality	58

Verify Video Signal Path Integrity	61
Video Controller / LCD Troubleshooting	61
Initializations Did Not Complete	61
Fails an Initial Alignment	62
Signal Level Verification	63
3. Instrument Messages	
Introduction	66
Event and Condition Categories	66
Event Message Format	67
Event Queues	68
Advisory Messages.	70
-800, Operation Complete Event	76
-700, Request Control Event	77
-600, User Request Event	78
-500, Power on Event	79
-400 to -499, Query Errors	80
-300 to -399, Device-Specific Errors	81
-221 Settings Conflict Errors	84
-200 to -299, Execution Errors.	94
-100 to -199, Command Errors.	102
0 Error.	105
Condition Errors 1 to 99, Calibration.	106
Condition Errors 6 to 34, Calibration Skipped	106
Condition Errors 36 to 64, Calibration Needed or Failed.	107
Condition Errors 65 to 92, Calibration Needed (Extended)	108
Condition Errors 67 to 95, Calibration Failure (Extended)	109
Condition Errors 101 to 199, Measurement Integrity	110
Condition Errors 201 to 299, Signal Integrity	112
Condition Errors 301 to 399, Uncalibrated Integrity	116
Condition Errors 401 to 499, Power.	119
Condition Errors 501 to 599, Frequency	120
Condition Errors 601 to 699, Error Summaries	121
Condition Errors 701 to 799, Operation.	122
Condition Errors 801 to 899, Temperature.	123
4. RF Section Troubleshooting	
What You Will Find in This Chapter	126
RF Assembly Description.	127
Purpose	127
RF Section Theory of Operation	128
Input Attenuator	128
Low Pass Filter	128
Preselector Filters	128
Mixer.	128
1st IF Amplifier	128
1st IF Filter	128
2nd LO	128

2nd IF Amplifier	129
2nd IF Filter.	129
Step Attenuator	129
3rd LO	129
3rd IF Amplifier	129
3rd IF Filter	129
Burst Carrier Trigger.	129
Troubleshooting	130
Verifying the 50 MHz Calibrator Signal	131
Verifying the 22.5 MHz IF Signal.	133
Verifying the 300 MHz L.O. Input Power.	134
5. Digital IF Troubleshooting	
What You Will Find in This Chapter	136
Digital I.F. Assembly Description	137
A3 Digital I.F. Assembly Theory of Operation	138
A3 Digital I.F. Troubleshooting	140
Verifying the 22.5 MHz Input Power	140
Verifying the 10 MHz Reference Input	142
6. L.O. Synthesizer/Reference Troubleshooting	
What You Will Find in This Chapter	146
A9 L.O. Assembly Description.	147
Purpose	147
A9 L.O. Assembly Troubleshooting.	148
Verifying the 1st L.O. Output Power.	149
Verifying the Reference Signal	150
7. CPU/Disk Drive Troubleshooting	
What You Will Find in This Chapter	152
A3 CPU Description	153
Disk Drive	153
Front Panel Interface	153
Graphics Controller	153
Power Supply Control	153
Rear Panel Connectivity	153
System Memory	154
System Processor.	154
A4 Hard Disk Drive	155
Overview	156
Troubleshooting software related issues.	157
Reloading the X-Series Software	158
Hard Drive Recovery Process.	159
Agilent Recovery System	159
Using the Instrument Recovery System	160
Replacing the instrument hard disk drive	160
8. Power Supply/Midplane Troubleshooting	

What You Will Find in This Chapter	162
A5 Power Supply Description	163
Purpose	163
Power Supply Theory of Operation	164
A5 Power Supply Basic Troubleshooting (Cover On)	168
A6 Midplane Description	169
Purpose	169
A6 Midplane Assembly Troubleshooting	171
 9. Front Panel/Motherboard Troubleshooting	
What You Will Find in This Chapter	174
A7 Motherboard Description	175
Purpose	175
A7 Motherboard Troubleshooting	176
A1 Front Panel Assembly	177
A1A2 Front Panel Interface Board	177
A1A3 LCD	177
A1A4 LCD Inverter Board	177
A1A5 Front Panel USB Interface Board	177
 10. Block Diagrams	
What You Will Find in This Chapter	180
Block Diagrams	181
RF Block Diagram	182
L.O. Synthesizer & Reference Block Diagram	183
Digital I.F. Block Diagram	184
CXA Computer Block Diagram	185
 11. Service and Diagnostics Menus	
Overview	188
Controlling Access	188
Secure service access	188
Menus	189
Service Key Descriptions	192
Service	192
Timebase	193
Corrections	194
Band Lock	196
LO Band Lock	197
Align	198
 12. Replaceable Parts	
What You Will Find in This Chapter	202
How to Order Parts	203
Replaceable Parts	204
Hardware	209
 13. Assembly Replacement Procedures	

What You Will Find in This Chapter	226
Before Starting	227
Safety	227
Tools you will need	228
Adjustments Tests after an instrument repair	228
Major Assembly Locations	229
Instrument Outer Case	230
Standard Instrument	230
Option PRC	232
Top Brace and Reference Bracket	235
Removal	235
Replacement	235
RF Assembly	236
Removal	236
Replacement	237
Rear Panel	238
Removal	238
Replacement	238
L.O. Assembly	239
Removal	239
Replacement	240
Power Supply Assembly	241
Removal	241
Replacement	242
CPU Assembly	243
Removal	243
Replacement	243
Hard Disk Drive	244
Installation Procedure	244
Powering On the Instrument	249
Accepting the End-User License Agreement (EULA) Screen	249
Setting System Date and Time	251
Utilities, Adjustments, and Performance Verification Tests	251
Additional Tasks	252
DIF Assembly	254
Removal	254
Replacement	254
Midplane Assembly	255
Removal	255
Replacement	256
Motherboard Assembly	257
Removal	257
Replacement	260
Fan Assembly	262
Removal	262
Replacement	264
Input Connector Assembly	265
Removal	265
Replacement	266

Front Frame Assembly	267
Removal	267
Replacement	268
Bail Handle Removal (Option PRC)	269
Front Frame Assembly Components	270
14. Post-Repair Procedures	
What You Will Find in This Chapter	278
Before Starting	278
Post-Repair Procedures	279
Calibration File Backup	282
BIOS Setup Changes	283
15. Functional Tests	
Functional Test Versus Performance Verification	290
Before Performing a Functional Test	291
Test Equipment	292
Displayed Average Noise Level (DANL)	294
Procedure	294
Frequency Readout Accuracy	296
Procedure	297
Second Harmonic Distortion (SHD)	298
Test Limits	298
Procedure	299
Amplitude Accuracy at 50 MHz	300
Procedure	301
Testing Preamp Option (P03, P07)	303
Frequency Response (Flatness)	304
Procedure	305
Frequency Response (Flatness), Preamp On	307
Procedure	308
Scale Fidelity	310
Procedure	311
16. Instrument Software	
What You Will Find in This Chapter	314
Instrument Software Overview	315
Software Licensing	316
Software Updates	317
Instrument Measurement Application Software	317
89601 VSA Software	317

1 Overview

What You Will Find in This Chapter

This chapter provides overview information on your spectrum analyzer.

The following sections are found in this chapter:

- Agilent CXA Overview page 17
- Instrument Option Descriptions page 18
- Before You Start Troubleshooting..... page 22
- ESD Information page 24
- Service Equipment You Will Need page 26
- Required Equipment..... page 28
- Contacting Agilent Technologies page 37
- How to Return Your Instrument for Service page 40

Agilent CXA Signal Analyzer Overview

The Agilent CXA signal analyzer measures and monitors complex RF and microwave signals. The analyzer integrates traditional spectrum measurements with advanced vector signal analysis to optimize speed, accuracy, and dynamic range. The CXA has Windows XP Pro[®] built in as the operating system, which expands the usability of the analyzer. You will be able to manipulate various file types on your analyzer just like your personal computer. Having a Windows based instrument provides many benefits such as easier file management, built-in Windows based programs such as Internet Explorer, and much more.

The Agilent CXA signal analyzer is readily adaptable to meet changing measurement needs. Optional features, whether hardware or measurement application software, will enable the analyzer to be configured as a comprehensive analytical tool to test communications systems and components.

If customer requirements should change or expand, post sale upgrades can be purchased at any time. Many upgrades require a license key, which is obtained using the Agilent licensing process. If the Agilent Delivery Option is ordered, the entitlement certificate will be emailed to the customer the same day and the license key can be generated and installed in the CXA Signal Analyzer within minutes. Once the license key is entered into the analyzer, the new option is enabled and fully functional.

The service strategy for the CXA is assembly level repair, not component level.

Instrument Option Descriptions

The CXA signal analyzer has a variety of options and measurement applications that can be installed depending on your application. These options and measurement applications can be purchased and installed at the time of sale or as a post-sale upgrade. In order to find out all the requirements about installing an upgrade into the analyzer, refer to http://www.agilent.com/find/cxa_upgrades

Signal Analyzer Accessories

A number of accessories are available from Agilent Technologies to help you configure your analyzer for your specific applications. They can be ordered through your local Agilent Sales and Service Office and are listed below.

Manual Set on CD-ROM

The entire documentation set excluding the CXA Service Guide is shipped with the instrument on CD-ROM. The documentation that exists on the CD-ROM can also be accessed anytime via the web at http://www.agilent.com/find/cxa_manuals.

Each manual is described below:

- **Getting Started Guide:** Describes analyzer features in detail. In addition, this manual covers unpacking and setting up the analyzer, analyzer features, and information on options and accessories, and what to do if you have a problem.
- **Specifications Guide:** Documents specifications, safety, and regulatory information.
- **Instrument Messages:** Includes instrument messages (and suggestions for troubleshooting them).
- **Functional Tests:** Includes manual functional tests.
- **User's/Programmer's References:** Multiple manuals which include programming information and SCPI command descriptions for basic spectrum analyzers and for applications such as IQ analyzer, Phase Noise, and Noise Figure.
- **Measurement Guides and Programming Examples:** Multiple manuals which provide details on how to use catalogs and files, and how to measure various signals for basic spectrum analyzers and for applications such as IQ analyzer, Phase Noise, and Noise Figure.

NOTE	Refer to the front of the CD-ROM, for installation information.
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NOTE	Service documentation is <i>not</i> included in the standard documentation set. Refer to http://www.agilent.com/find/cxa_upgrades
-------------	--

50 Ohm Load

The Agilent 909 series loads come in several models and options providing a variety of frequency ranges and VSWRs. Also, they are available in either 50 ohm or 75 Ohm. Some examples include the:

- 909A: DC to 18 GHz
- 909C: DC to 2 GHz
- 909D: DC to 26.5 GHz

50 Ohm/75 Ohm Minimum Loss Pad

The Agilent 11852B is a low VSWR minimum loss pad that allows you to make measurements on 75 Ohm devices using an analyzer with a 50 Ohm input. It is effective over a frequency range of dc to 2 GHz.

75 Ohm Matching Transformer

The Agilent 11694A allows you to make measurements in 75 Ohm systems using an analyzer with a 50 Ohm input. It is effective over a frequency range of 3 to 500 MHz.

AC Probe

The Agilent 85024A high frequency probe performs in-circuit measurements without adversely loading the circuit under test. The probe has an input capacitance of 0.7 pF shunted by 1 M Ω of resistance and operates over a frequency range of 300 kHz to 3 GHz. High probe sensitivity and low distortion levels allow measurements to be made while taking advantage of the full dynamic range of the spectrum analyzer.

AC Probe (Low Frequency)

The Agilent 41800A low frequency probe has a low input capacitance and a frequency range of 5 Hz to 500 MHz.

Broadband Preamplifiers and Power Amplifiers

Preamplifiers and power amplifiers can be used with your spectrum analyzer to enhance measurements of very low-level signals.

- The Agilent 8447D preamplifier provides a minimum of 25 dB gain from 100 kHz to 1.3 GHz.
- The Agilent 87405A preamplifier provides a minimum of 22 dB gain from 10 MHz to 3 GHz. (Power is supplied by the probe power output of the analyzer.)
- The Agilent 83006A preamplifier provides a minimum of 26 dB gain from 10 MHz to 26.5 GHz.

- The Agilent 85905A CATV 75 ohm preamplifier provides a minimum of 18 dB gain from 45 MHz to 1 GHz. (Power is supplied by the probe power output of the analyzer.)
- The 11909A low noise preamplifier provides a minimum of 32 dB gain from 9 kHz to 1 GHz and a typical noise figure of 1.8 dB.

RF and Transient Limiters

The Agilent 11867A and N9355C RF Limiters protect the analyzer input circuits from damage due to high power levels. The 11867A operates over a frequency range of dc to 1800 MHz and begins reflecting signal levels over 1 mW up to 10 W average power and 100 watts peak power. The N9355C microwave limiter (0.01 to 26.5 GHz) guards against input signals over 10 milliwatts up to 1 watt average power.

The Agilent 11947A Transient Limiter protects the analyzer input circuits from damage due to signal transients. It specifically is needed for use with a line impedance stabilization network (LISN). It operates over a frequency range of 9 kHz to 200 MHz, with 10 dB of insertion loss.

Power Splitters

The Agilent 11667A/B power splitters are two-resistor type splitters that provide excellent output SWR, at 50 Ω impedance. The tracking between the two output arms, over a broad frequency range, allows wideband measurements to be made with a minimum of uncertainty.

11667A: DC to 18 GHz

11667B: DC to 26.5 GHz

Static Safe Accessories

9300-1367	Wrist-strap, color black, stainless steel. Four adjustable links and a 7 mm post-type connection.
9300-0980	Wrist-strap cord 1.5 m (5 ft.)

Before You Start Troubleshooting

Before troubleshooting, complete the following tasks:

- ☐ Familiarize yourself with the safety symbols marked on the instrument and read the general safety considerations in the front of this guide.
- ☐ Read the ESD information below.
- ☐ Familiarize yourself with the troubleshooting information in [Chapter 2, “Boot Up and Initialization Troubleshooting”](#), and how it relates to information on troubleshooting the other assemblies.

WARNING	These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.
----------------	---

WARNING	The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the product from all voltage sources while it is being opened.
----------------	--

WARNING	The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch (disconnecting device).
----------------	---

CAUTION	Always position the instrument for easy access to the disconnecting device (detachable power cord).
----------------	--

WARNING	To prevent electrical shock, disconnect the analyzer from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.
----------------	---

WARNING	This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.
----------------	--

CAUTION	Always use the three-prong ac power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage.
----------------	--

CAUTION	This instrument has an autoranging line voltage input; be sure the supply voltage is within the specified range.
----------------	--

ESD Information

Protection from Electrostatic Discharge

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation. [Figure 1-1](#) shows an example of a static-safe workstation using two types of ESD protection:

- ❑ Conductive table-mat and wrist-strap combination.
- ❑ Conductive floor-mat and heel-strap combination.

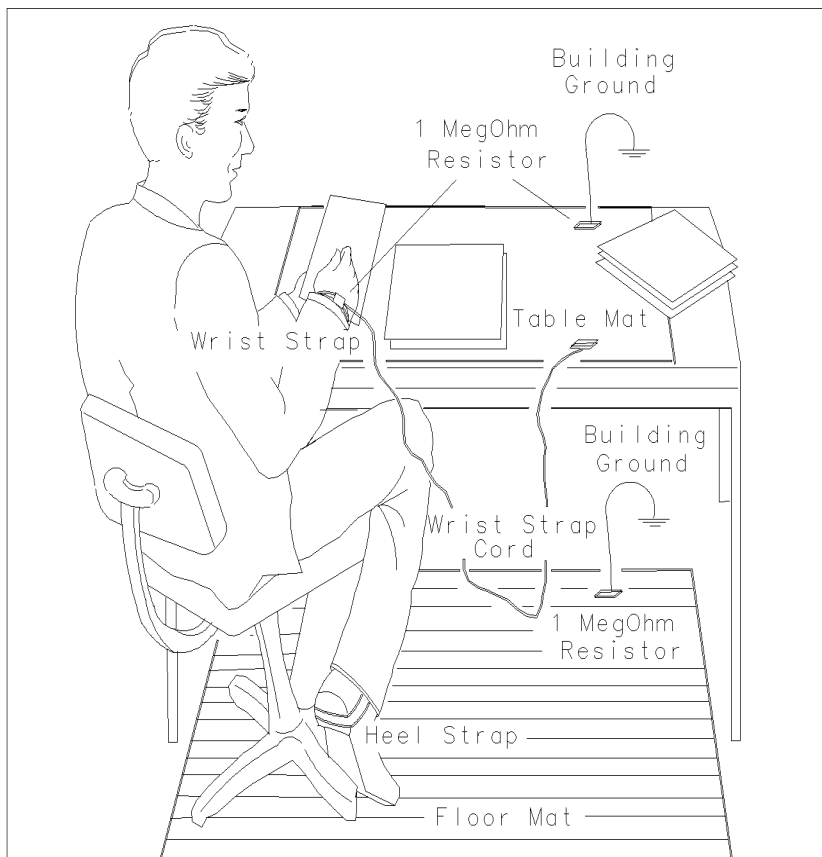
Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. To ensure user safety, the static-safe accessories must provide at least 1 megohm of isolation from ground.

WARNING

These techniques for a static-safe workstation should not be used when working on circuitry with a voltage potential greater than 500 volts.

Figure 1-1

Example of a Static-Safe Workstation



Handling of Electronic Components and ESD

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

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

CAUTION

Always handle printed circuit board assemblies by the edges. This will reduce the possibility of ESD damage to components and prevent contamination of exposed plating.

Test Equipment Usage and ESD

- ☐ Before connecting any coaxial cable to an analyzer connector, momentarily short the center and outer conductors of the cable together.
- ☐ Personnel should be grounded with a 1 megohm resistor-isolated wrist-strap before touching the center pin of any connector and before removing any assembly from the analyzer.
- ☐ Be sure that all analyzers are properly earth-grounded to prevent build-up of static charge.

For Additional Information about ESD

For more information about preventing ESD damage, contact the Electrical Over Stress/Electrostatic Discharge (EOS/ESD) Association, Inc. The ESD standards developed by this agency are sanctioned by the American National Standards Institute (ANSI).

Service Equipment You Will Need

There are certain things that will be required to troubleshoot, adjust, and test the CXA Signal Analyzer. They include the following:

- Calibration Application Software
- USB Keyboard and Mouse
- USB Storage Device
- Test Equipment

Calibration Application Software

Information regarding the Agilent X-Series Signal Analyzer Calibration Application Software can be found at the following web site:

www.agilent.com/find/calibrationsoftware

USB Keyboard and Mouse

A USB keyboard and mouse will be needed to accomplish many of the different troubleshooting tasks, as well as updating the instrument software. Any standard USB keyboard and mouse should work, but you can use the optional keyboard and mouse sold for the instrument. These can be purchased as:

Description	Option Number	Upgrade Option	Part Number
USB Keyboard	N9000A-KYB	N9000AK-KYB	0960-2615
USB Mouse	N9000A-MSE	N9000AK-MSE	0960-2670

USB Storage Device

The main reason why a USB storage device will be needed is to backup calibration data when the hard drive in an instrument needs to be replaced. Most any size of storage device can be used, as the size of the file to be backed up is not much larger than a few megabytes. An optional 4 GB device can be ordered along with an instrument as N9000A-EFM, as an upgrade as N9000AK-EFM, or by using the part number 0950-5165.

NOTE

The memory capacity and part number of the USB storage device supplied with N9000A/AK-EFM is subject to change.

Required Test Equipment List

The following table identifies the equipment recommended for troubleshooting, adjusting, and verifying the performance of the instrument. Only the recommended and alternate equipment is compatible with the performance verification testing. Some tests can use various models of a particular equipment type. The “Recommended Agilent Model” is the preferred equipment. However, the “Alternative Agilent Model” is an acceptable substitute.

Table 1-1 Required Test Equipment

Instrument	Critical Specifications	Recommended Agilent Model Number	Alternative Agilent Model Number	Use ^a
Signal Sources				
Microwave Signal Generator #1	Frequency: 10 MHz to 26.5 GHz Frequency Resolution: 1 Hz Harmonic level: < -30 dBc Amplitude range: -20 dBm to +13 Amplitude resolution: 0.02 VSWR: < 20 GHz: 1.6:1 ≤ 31 GHz: 1.8:1	E8257D (Option 567, 1EA, 1E1) (Option 007, Analog Ramp Sweep, required for Frequency Response Adjustments)	For Adjustments: 83630A/B/L 83630A/B/L (Option 001, 008), 83640A/B/L (Option 001, 008), 83650A/B/L (Option 001, 008), PSG ^b For Performance Tests: 83630B (Option 001, 008), 83640A/B (Option 001, 008), 83650B (Option 001, 008) PSG ^b	A, P, T
Microwave Signal Generator #2 (only required for Third Order Intermodulation)	Frequency: 10 MHz to 26.5 GHz Frequency Resolution: 1 Hz Harmonic level: < -30 dBc Amplitude range: -20 dBm to +13 Amplitude resolution: 0.02 VSWR: < 20 GHz: 1.6:1 ≤ 31 GHz: 1.8:1	PSG ^b (Option 1EA)	83630A/B (Option 008), 83640A/B (Option 008), 83650A/B (Option 008) E8244A, E8254A, E8247C, 57C	A, P
Low Noise Signal Generator (one PSG may be used for multiple sources. See footnote ^b)	Frequency: 50 MHz to 1.0 GHz Harmonics: < -30 dBc ≤ +13 dBm Spectral Purity SSB Phase Noise @ 1 GHz: -112 dBc at 100 Hz offset -121 dBc at 1 kHz offset -131 dBc at 10 kHz offset VSWR: < 1.5:1	E8257D (Options UNR, UNX)	8663A PSG ^b (Options UNR, UNX)	A, P

Table 1-1 Required Test Equipment

Instrument	Critical Specifications	Recommended Agilent Model Number	Alternative Agilent Model Number	Use ^a
RF Signal Generator (one PSG may be used for multiple sources. See footnote ^b)	Frequency: 10 MHz to 26.5 GHz Frequency Resolution: 1 Hz Harmonic level: < -40 dBc Amplitude range: -20 dBm to +13 Amplitude resolution: 0.02 Harmonic level: < 2 GHz, < -30 dBc ≥ 2 GHz & < 26.5 GHz, < -50 dBc VSWR: < 20 GHz: 1.6:1 ≤ 31 GHz: 1.8:1 For Option UNR or UNX: Harmonics: < -30 dBc ≤ +13 dBm Spectral Purity SSB Phase Noise @ 1 GHz: -112 dBc at 100 Hz offset -121 dBc at 1 kHz offset -131 dBc at 10 kHz offset VSWR: < 1.5:1	PSG ^b (Option 1EA)	8665B	A, P
Function Generator	Frequency: 20 Hz to 300 kHz Amplitude Resolution: 0.1 mv Harmonic Distortion: -35 dBc	33250A	33120A (Option 001)	A, P
Counters				
Universal Counter	Frequency: 10 MHz Gate time: 10 to 100 seconds Must be capable of measuring signal at +7 dBm (0.5 Vrms)	53132A	53131A	P
Meters				
Digital Multimeter	AC Accuracy: ± 0.31% of reading	3458A		A, T
Power Meter	Dual Channel Instrumentation Accuracy: ± 0.5% Resolution: 0.01 dB Power Reference Accuracy: 1.2% (± 0.9% rss) Compatible with 8480 series power sensors dB relative mode	E4419B	E4419A N1912A	A, P
RF Power Sensor (2 required)	Frequency Range: 100 kHz to 3 GHz Amplitude Range: -30 to +20 dBm Zero Set: ± 50 mW Zero Drift: < ± 10 nW Measurement Noise: < 110 nW Cal Factor Uncertainty (std): < 1.6% VSWR at 50 MHz: ≤ 1.05 100 kHz to 1 MHz: ≤ 1.20:1 1 MHz to 2 GHz: ≤ 1.10:1 2 GHz to 3 GHz: ≤ 1.30:1 Option H84 Cal Factor: Characterized by standards lab to: ± 0.6% ^c Input Connector: Type-N (m)	8482A (Option H84)	8482A STD (Will increase measurement uncertainty)	A, P

Table 1-1 Required Test Equipment

Instrument	Critical Specifications	Recommended Agilent Model Number	Alternative Agilent Model Number	Use ^a
Microwave Power Sensor (2 required)	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: -30 to +20 dB Zero Set: ± 50 mW Zero Drift: $< \pm 10$ nW Measurement Noise: < 110 nW Cal Factor Uncertainty: $< 2.3\%$ VSWR: 50 MHz to 100 MHz: 1.15:1 100 MHz to 2 GHz: 1.10:1 2 GHz to 12.4 GHz: 1.15:1 12.4 GHz to 18 GHz: 1.20:1 18 GHz to 26.5 GHz: 1.25:1 Input Connector: 3.5 mm (m)	8485A		A, P
Low Power Microwave Power Sensor (2 required) (for Option P08, P13, or P26 only)	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: -70 to +20 dBm Zero Set: ± 50 pW Zero Drift: $< \pm 4$ pW Measurement Noise: < 4 pW Cal Factor Uncertainty: $< 2.6\%$ VSWR: 50 MHz to 100 MHz: 1.15:1 100 MHz to 2 GHz: 1.10:1 2 GHz to 12.4 GHz: 1.15:1 12.4 GHz to 18 GHz: 1.20:1 18 GHz to 26.5 GHz: 1.25:1 Input Connector: 3.5 mm (m)	8485D		A, P
RF Power Sensor (2 required) (CXA only)	Frequency Range: 9 kHz to 18 GHz	E9304A (Option H19)	E9304A (Option H18)	A
Power Sensor Cable (2 required)		11730A		A, P
Standards				
Frequency Standard	Frequency: 10 MHz Accuracy: $< \pm 1 \text{ e}10^{-10}$	Symmetricon 5071A	Agilent 5061B, 5071A	A, P
50 MHz, -25 dBm Calibrator	Frequency Drift: < 2.5 kHz Typical VSWR: 1.06:1 Output Power Variation: ± 0.004 dB Total Harmonic Content: -45 dBc	Z5602A Opt H51		A
Attenuators				
10 dB Step Attenuator	Range: 0 to 110 dB Accuracy: Characterized by standards lab to: $\pm 0.005 + 0.005/10 \text{ dB step}^d$ Calibrated at 50 MHz VSWR: at 50 MHz: $\leq 1.05:1$	8496G	8496H	P
1 dB Step Attenuator	Range: 0 to 11 dB Accuracy: Characterized by standards lab to: $\pm 0.005 \text{ dB}^d$ Calibrated at 50 MHz VSWR: at 50 MHz: $\leq 1.05:1$	8494G	8494H	P

Table 1-1 Required Test Equipment

Instrument	Critical Specifications	Recommended Agilent Model Number	Alternative Agilent Model Number	Use ^a
Attenuator Interconnect Kit	Type N connector kit to connect 8496G to 8494G	11716A		P
Attenuator Driver	Compatible with the 8496G and 8494G step attenuators.	11713A		P
6 dB Fixed Attenuator	6 dB Type-N (m, f) VSWR: at 50 MHz: $\leq 1.05:1$	8491A (Option 006)	8491B/C (Option 006)	P
10 dB Fixed Attenuator	10 dB Type-N (m, f) VSWR: at 50 MHz: $\leq 1.05:1$	8491A (Option 010)	8491B/C (Option 010)	A, P
10 dB Fixed Attenuator	10 dB 3.5 mm (m, f) VSWR: 50 MHz to 19.5 GHz: $\leq 1.25:1$	8493C (Option 010)		A, P
20 dB Fixed Attenuator	20 dB Type-N (m, f) VSWR: 10 MHz: $\leq 1.20:1$	8491A (Option 020)	8491B/C (Option 020)	A
30 dB Fixed Attenuator	30 dB Accuracy: ± 0.5 dB VSWR: 1.05 @ 50 MHz (For use with Low Power Sensors)	11708A		A, P
Terminations				
Type-N (m) (for Option 503, 508, 513)	50 Ω Frequency: 10 kHz to 18 GHz VSWR: $\leq 1.05:1$	909A (Option 012)		P, T
3.5 mm (f)	50 Ω VSWR: ≤ 26.5 GHz: $\leq 1.12:1$	909D		P, T
BNC (m)	50 Ω Frequency: 50 Hz to 300 kHz	1250-0207		P
Miscellaneous Devices				
RF Power Splitter	Frequency: 9 kHz to 3.6 GHz VSWR: $\leq 1.10:1$ Tracking Error: $< \pm 0.15$ dB Connector: Type-N (f)	11667A		P
Microwave Power Splitter	Frequency: 10 MHz to 26.5 GHz VSWR: 10 MHz to 3 GHz: $< 1.06:1$ 3 GHz to 26.5 GHz: $< 1.22:1$ Tracking Error: $< \pm 0.25$ dB Connector: 3.5 mm (f)	11667B (Option H30)	11667B (std.)	P
Microwave Power Divider (for Option BBA)	Frequency: DC to 40 MHz VSWR: $< 1.10:1$ Tracking Error: $< \pm 0.25$ dB Connector: 3.5 mm (f)	11636B		P

Table 1-1 Required Test Equipment

Instrument	Critical Specifications	Recommended Agilent Model Number	Alternative Agilent Model Number	Use ^a
Directional Bridge	Frequency Range: 5 MHz to 3 GHz Directivity: ≤ 5 MHz: 30 dB 5 MHz to 2 GHz: 40 dB 2 GHz to 3 GHz: 30 dB VSWR: ≤ 2 GHz: $\leq 1.15:1$ ≤ 3 GHz: $\leq 1.22:1$ Insertion Loss: ≤ 1.5 , +0.1 dB/GHz Coupling (nominal): 16 dB Connector: Type N (f)	86205A		P
Directional Coupler	2 GHz to 20 GHz Directivity > 16 dB Transmission arm loss: < 1.5 dB (nominal) Coupled Arm Loss: ~ 10 dB (nominal) VSWR: $\leq 1.35:1$ Connector: SMA (f)	87300B		P
Cables				
3.5 mm (m) to 3.5 mm (m) (2 required)	Frequency: DC to 26.5 GHz Length: ≤ 92 cm (36 in.) Insertion Loss: ~ 2 dB VSWR: DC to 18 GHz: $\leq 1.25:1$ 18 GHz to 26.5 GHz: $\leq 1.35:1$	8120-4921		A, P
Type-N (2 required)	Frequency: 10 MHz to 8 GHz Precision Type-N (m), both ends 62 cm (24 in.) VSWR: ≤ 18 GHz: 1.4:1 Insertion Loss: 1.5 dB	11500C		A, P, T
BNC (3 required)	Frequency: DC to 10 MHz 50 Ω Coax BNC (m), both ends 120 cm (48 in.)	10503A		A, P, T
Filters				
50 MHz Low Pass	Cutoff Frequency: 50 MHz Rejection at 65 MHz: > 40 dB Rejection at 75 MHz: > 60 dB Insertion Loss: ~ 1 dB VSWR: $\leq 1.5:1$ BNC (m) to BNC (f)	0955-0306	Telonic Berkeley TLA 50-5AB2	P, T
300 MHz Low Pass (2 Required)	Cutoff Frequency: 300 MHz Rejection at > 435 MHz: > 45 dB VSWR: $\leq 1.5:1$ BNC (m, f)	0955-0455	Telonic Berkeley TLP 300-4AB4	P
1.8 GHz Low Pass (2 Required)	Cutoff frequency: 1.8 GHz Rejection at > 3 GHz: > 45 dB Insertion Loss: ~ 0.25 dB VSWR: $\leq 1.35:1$ SMA (f)	0955-0491	RLC L-1636	P
4.4 GHz Low Pass (2 Required)	Cutoff frequency: 4.4 GHz Rejection at > 5.5 GHz: > 42 dB	9135-0005	K + L ML253-4499/XU-N/ NP	P

Table 1-1 Required Test Equipment

Instrument	Critical Specifications	Recommended Agilent Model Number	Alternative Agilent Model Number	Use ^a
1 GHz Notch	Center frequency: 1.0001 GHz		Trilithic CFN-2-1000.1	P
Adapters				
Type-N (f) to Type-N (f)	Frequency: DC to 18 GHz VSWR: $\leq 1.13:1$	1250-1472		P
Type-N (m) to Type-N (m)	Frequency: DC to 18 GHz VSWR: $\leq 1.13:1$	1250-1475		P
Type-N (f) to BNC (m)	Frequency: DC to 1.3 GHz VSWR: $\leq 1.13:1$	1250-1477		P, T
Type-N (m) to BNC (m)	Frequency: DC to 1.3 GHz VSWR: $\leq 1.13:1$	1250-1473		P, T
Type-N (m) to BNC (f)	Frequency: DC to 1.3 GHz VSWR: $\leq 1.13:1$	1250-1476		P
Type-N (m) to 3.5 mm (m)	Frequency: DC to 18 GHz VSWR: $\leq 1.08:1$	1250-1743		P
Type-N (m) to 3.5 mm (f) (2 Required)	Frequency: DC to 18 GHz VSWR: $\leq 1.08:1$	1250-1744		P
3.5 mm (f) to Type-N (f) (for 3.5 mm source)	Frequency: DC to 18 GHz VSWR: $\leq 1.08:1$	1250-1745		A, P
Type-N (f) to 3.5 mm (m)	Frequency: DC to 18 GHz VSWR: $\leq 1.14:1$	1250-1750		A, P
3.5 mm (f) to 3.5 mm (f) (for 3.5 mm source)	Frequency: DC to 26.5 GHz VSWR: $\leq 1.05:1$	83059B	1250-1749	P
3.5 mm (m) to 3.5 mm (m) (2 Required)	Frequency: DC to 26.5 GHz VSWR: $\leq 1.12:1$	83059A	1250-1748	P
3.5 mm (f) to 2.4 mm (f) (for 2.4 mm source)	Frequency: DC to 26.5 GHz VSWR: $\leq 1.05:1$	11901B		P
Type-N (f) to 2.4 mm (f) (for 2.4 mm source)	Frequency: DC to 18 GHz VSWR: $\leq 1.08:1$	11903B		P
BNC (m) to SMA(f)	Frequency: DC to 1.3 GHz VSWR: $\leq 1.13:1$	1250-1700		P
BNC Tee (BNC f,m,f)		1250-0781		A, P
SMB (f) to BNC (f)	Frequency: DC to 1.3 GHz	1250-1236		A, P
BNC (f) to SMA (m)	Frequency: DC to 1.3 GHz	1250-1200		A, P
BNC (f) to Dual Banana		1251-2277		A, P
3.5 mm (f) to Type-N (m)	Shipped with the 8485 for adapting to the Power Reference. Only to be used for power sensor cal.	08485-60005		A, P
Type-N Tee		1250-0559		P

a. A = Adjustments, P = Performance Testing, T = Troubleshooting

Overview

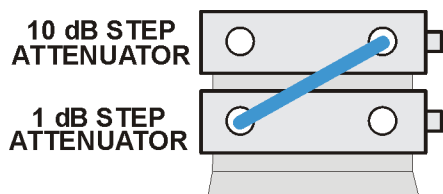
Service Equipment You Will Need

b. Supported PSG models:

E8244A
E8254A
E8257C
E8257D
E8267C
E8267D

Note: One PSG with Option 567, 1EA, 1E1, 007, and UNX or UNR can be used as the Microwave Signal Generator #1, Low Noise Signal Generator, and the RF Signal Generator.

- c. The 8482A power sensor uses cal factors to compensate the power sensor for frequency response errors. Cal factors are stated in percentages. The 8482A factory cal factor uncertainty ranges from 2.2% to 3.1%. The cal factor uncertainty can be reduced to < 2.0% by using metrology grade calibration techniques. The power sensor cal factor uncertainty becomes one component of the Verification Test uncertainty analysis. Lower cal factor uncertainties will translate to wider test margins.
- d. The step attenuators should be permanently joined via the 11716A Interconnect Kit as shown in the diagram.



step_atten_setup

Step Attenuator Loss Characterization

The step attenuator combination should have each attenuator setting characterized by a metrology lab at 50 MHz. The following tables show which sections of the 10 dB and 1 dB step attenuators are utilized for each attenuator setting. The tables also list the Allowable Uncertainty for each attenuator setting. The interconnect cable should NEVER be disconnected once the loss characterization is performed.

Table 1-2 **1 dB Step Attenuator**

Nominal Attenuation (dB)	Attenuator Section				Allowable Uncertainty (dB)
	#1 (1 dB)	#2 (2 dB)	#3 (4 dB)	#4 (4 dB)	
0	Off	Off	Off	Off	0 (Reference)
1	On	Off	Off	Off	< 0.005
2	Off	On	Off	Off	< 0.005
3	On	On	Off	Off	< 0.005
4	Off	Off	On	Off	< 0.005
5	On	Off	On	Off	< 0.005
6	Off	On	On	Off	< 0.005
7	On	On	On	Off	< 0.005
8	Off	Off	On	On	< 0.005

Table 1-2 1 dB Step Attenuator

Nominal Attenuation (dB)	Attenuator Section				Allowable Uncertainty (dB)
	#1 (1 dB)	#2 (2 dB)	#3 (4 dB)	#4 (4 dB)	
9	On	Off	On	On	< 0.005
10	Off	On	On	On	< 0.010
11	On	On	On	On	< 0.010

Table 1-3 10 dB Step Attenuator

Nominal Attenuation (dB)	Attenuator Section				Allowable Uncertainty (dB)
	#1 (10 dB)	#2 (20 dB)	#3 (40 dB)	#4 (40 dB)	
0	Off	Off	Off	Off	0 (Reference)
10	On	Off	Off	Off	< 0.010
20	Off	On	Off	Off	< 0.015
30	On	On	Off	Off	< 0.020
40	Off	Off	On	Off	< 0.025
50	On	Off	On	Off	< 0.030
60	Off	On	On	Off	< 0.035
70	On	On	On	Off	< 0.040
80	Off	Off	On	On	< 0.046
90	On	Off	On	On	< 0.052
100	Off	On	On	On	< 0.058
110	On	On	On	On	< 0.064

After an Instrument Repair

If any instrument assemblies have been repaired or replaced, perform the related adjustments and performance verification tests. These tests are done using the N7814A Agilent X-Series Signal Analyzer Calibration Application Software. Refer to [Chapter 14](#), “Post-Repair Procedures” for a list of post-repair adjustments and performance tests based on which hardware has been changed.

Information regarding the N7814A Agilent X-Series Signal Analyzer Calibration Application Software can be found at

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

Contacting Agilent Technologies

If you have a problem with your instrument, see [Chapter 2, “Boot Up and Initialization Troubleshooting”](#). This section contains a checklist that will help identify some of the most common problems.

There is also support on the world-wide web. The address is:

http://www.agilent.com/find/cxa_support

FAQs, instrument software updates, documentation, and other support information can be accessed from this site.

To obtain servicing information or to order replacement parts, contact the nearest Agilent office listed in [Table 1-4](#). In any correspondence or telephone conversations, refer to the instrument by its model number (N9000A) and full serial number (ex. MY49250887). With this information, the Agilent representative can quickly determine whether your unit is still within its warranty period.

By internet, phone, or fax, get assistance with all your test and measurement needs.

Table 1-4 Contacting Agilent

Online assistance: www.agilent.com/find/assist

United States (tel) 1 800 829-4444	Japan (tel) (+81) 426 56 7832 (fax) (+81) 426 56 7840	New Zealand (tel) 0 800 738 378 (fax) (+64) 4 495 8950	Europe (tel) (+31) 20 547 2323 (fax) (+31) 20 547 2390
Canada (tel) 1 877 894 4414 (fax) (905) 282 6495	Latin America (tel) (305) 269 7500 (fax) (305) 269 7599	Australia (tel) 1 800 629 485 (fax) (+61) 3 9210 5947	

Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

Instrument Serial Numbers

Agilent makes frequent improvements to its products enhancing performance, usability, or reliability. Agilent service personnel have access to complete records of design changes to each type of instrument, based on the instrument's serial number and option designation.

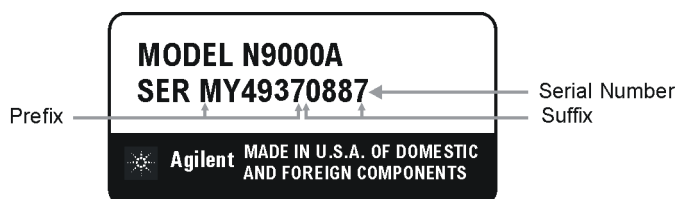
Whenever you contact Agilent about your instrument, have the complete serial number available. This will ensure that you obtain accurate service information.

A serial number label is attached to the rear of the instrument. This label has two instrument identification entries: the first provides the identification number for each option built into the instrument and the second provides the instrument's serial number.

The serial number has two parts: the prefix (two letters and the first four numbers), and the suffix (the last four numbers). Refer to the following figure.

Figure 1-2

Example Serial Number



The first two letters of the prefix identify the country in which the unit was manufactured. The remaining four numbers of the prefix identify the date of the last major design change incorporated in your instrument. The four digit suffix is a sequential number and, coupled with the prefix, provides a unique identification for each unit produced. Whenever you list the serial number or refer to it in obtaining information about your instrument, be sure to use the complete number, including the full prefix and the suffix.

The serial number is located on the rear panel serial sticker or when the analyzer is power up, press **System, Show, System**. The system information can be very useful for updates and post-sale upgrades.

How to Return Your Instrument for Service

Service Order Number

If an instrument is being returned to Agilent for servicing, the phone numbers are mentioned in [Table 1-4, “Contacting Agilent,” on page 38](#). In order for Agilent to expedite the repair please be as specific as possible about the nature of the failure.

Helpful failure descriptions:

- Signal level measures 10 dB too low at 1 GHz
- L.O. Unlock error message appears on screen in spans < 10 MHz
- Analyzer will not complete boot up sequence to signal analyzer mode

Failure descriptions that will most likely increase repair time:

- Analyzer broken
- Analyzer will not make accurate measurements
- Signal drifts

If you have recorded any error messages that appeared on the analyzer display, or have completed a Functional Test or Performance Verification Test, or have any other specific data on the performance of the instrument, please send a copy of this information with the instrument.

Original Packaging

Before shipping, pack the unit in the original factory packaging materials if they are available. If the original materials were not retained, see [“Other Packaging” on page 41](#).

Other Packaging

CAUTION

Instrument damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the equipment or prevent it from shifting in the carton. They cause equipment damage by generating static electricity and by lodging in the instrument louvers, blocking airflow.

You can repack the instrument with commercially available materials, as follows:

1. Protect the control panel with cardboard.
2. Wrap the instrument in antistatic plastic to reduce the possibility of damage caused by electrostatic discharge.
3. Use a strong shipping container. A double-walled, corrugated cardboard carton with 159 kg (350 lb) bursting strength is adequate. The carton must be both large enough and strong enough to accommodate the instrument. Allow at least 3 to 4 inches on all sides of the instrument for packing material.
4. Surround the equipment with three to four inches of packing material and prevent the equipment from moving in the carton. If packing foam is not available, the best alternative is S.D.-240 Air Cap™ from Sealed Air Corporation, Hayward, California, 94545.

Air Cap looks like a plastic sheet filled with 1-1/4 inch air bubbles. Use the pink-colored Air Cap to reduce static electricity. Wrapping the equipment several times in this material should both protect the equipment and prevent it from moving in the carton.
5. Seal the shipping container securely with strong nylon adhesive tape.
6. Mark the shipping container “FRAGILE, HANDLE WITH CARE” to assure careful handling.
7. Retain copies of all shipping papers.

Overview

How to Return Your Instrument for Service

2 Boot Up and Initialization Troubleshooting

Boot Up and Initialization Troubleshooting

What You Will Find in This Chapter

This chapter provides information that is useful when starting to troubleshoot a spectrum analyzer. It includes procedures for troubleshooting common failures and provides information on isolating problems in the analyzer.

The following sections are found in this chapter:

Check the Basics.....	page 45
CXA Instrument Boot Up Process.....	page 46
Potential Problems During Boot Process.....	page 49
Signal Level Verification.....	page 63

Check the Basics

Before calling Agilent Technologies or returning the instrument for service, please make the following checks:

1. Is there power at the power outlet? At the power receptacle on the instrument?
2. Is the instrument turned on? Check to see if the front panel LED is green, which indicates the power supply is on.
3. If other equipment, cables, and connectors are being used with the instrument, make sure they are connected properly.
4. Review the procedure for the measurement being performed when the problem appeared. Are all the settings correct?
5. If the instrument is not functioning as expected, return the unit to a known state by pressing the **Mode Preset** key.
6. Is the measurement being performed, and the results that are expected, within the specifications and capabilities of the instrument? Refer to the specifications book for specifications.
7. In order to meet specifications, the instrument must be aligned. Press **System, Alignments, Align Now, All**. The diagnostic tests should all pass. If the instrument displays a failure during these tests, refer to [“Fails an Initial Alignment” on page 62](#).
8. Check to see if the instrument has the latest firmware before starting the troubleshooting procedure. Press **System, Show System**. The firmware revision is listed under **Firmware Revision**. For more information, refer to [“Instrument Software” on page 313](#).
9. Is the instrument displaying an error message? If so, refer to [Chapter 3 , “Instrument Messages,” on page 65](#) for more information.
10. If the necessary test equipment is available, perform the functional checks in [Chapter 15 , “Functional Tests,” on page 289](#).

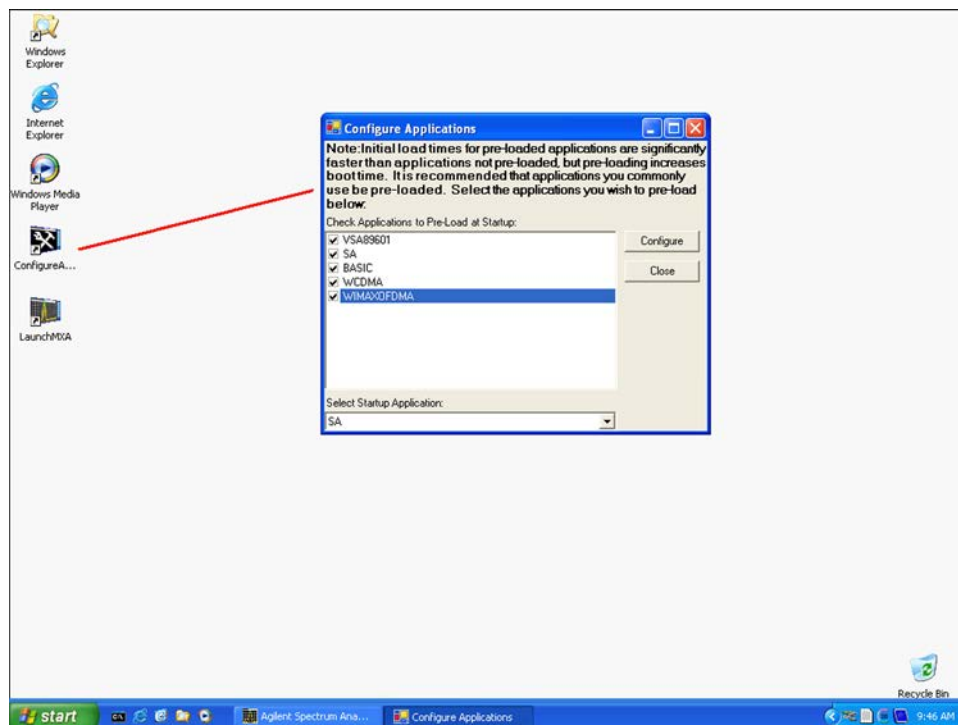
CXA Instrument Boot Up Process

This section describes the N9000A Signal Analyzer boot up process from initial AC power to a normal analyzer sweep. The boot process time from start to finish will take ~3 minutes. This boot time will vary slightly depending on the analyzer hardware configuration, installed options and the number of measurement applications.

By default, the measurement applications will preload before the CXA spectrum analyzer application is fully booted. The analyzer boot time can be shortened if needed by turning off the preload process for applications that are not going to be used. If this is done, the preload process will be bypassed during the application boot up. If a certain measurement mode is selected that did not preload during the original boot, that measurement application will preload at that time. When this occurs the mode switching time will take longer. Once the application is loaded all subsequent mode switches will be much faster.

If the user does not want the measurement applications to preload during the CXA application boot process, select the ConfigureApplications.exe on the desktop as shown in Figure 2-1. This will bring up a window that shows the various applications and what is selected to preload. By default all applications are checked and therefore, will preload when the CXA application is launched. Uncheck any applications to bypass the preloading process, select Configure, and then Close the Configure Applications window when finished.

Figure 2-1 Configure Application



Typical instrument boot-up process flow

1. Plug in the AC power cord from a known good AC power source into the rear panel of the analyzer.
2. The yellow standby LED illuminates on the analyzer front panel to the left-hand side of the On/Off button. If the yellow Standby LED is not illuminating refer to the [“Yellow Standby LED Does Not Illuminate”](#) section in this chapter.
3. To turn the analyzer on, press the On/Off button. The yellow Standby LED should turn off and the green Power On LED should illuminate. A green Power On LED indicates that the power supply has received an “On” command from the A4 CPU assembly. If the green Power On LED is not illuminating refer to the [“Green Power On LED Does Not Illuminate”](#) section in this chapter.

NOTE

If the analyzer AC power source was removed by the operator by pulling the power cord or by turning off the analyzer via a power main switch on a test rack, the analyzer will automatically power on without having to press the On/Off button on the front panel.

4. Both instrument fans should start running. The fans are mounted on the left-hand side of the analyzer and draw air into the instrument to cool the internal circuitry. If either fan is not running refer to the [“Fan\(s\) Are Not Operating”](#) section in this chapter.
5. The Agilent Technologies splash screen is displayed in white font on a dark background for ~5-10 seconds after the analyzer is turned on. If the Agilent Technologies logo is not displayed refer to the [“No Agilent Splash Screen Displayed”](#) section in this chapter. If the instrument hangs at the Agilent Technologies splash screen refer to the [“Instrument Hangs at the Agilent Splash Screen”](#) section in this chapter.
6. Verify text is displayed on screen where the user has the option of booting Windows XP or running the Agilent Recovery System. The default selection is to boot Windows XP. If a recovery is required, press the Down Arrow key on the front panel of the analyzer within 5 seconds to highlight “Agilent Recovery System” and press the Enter key on the analyzer, otherwise Windows XP will begin to boot. If the Windows XP boot screen is not displayed within a few seconds refer to the [“Instrument Cannot Completely Load or Run the Operating System”](#) section in this chapter.
7. If the recovery system is not selected the Windows XP Professional operating system will begin to boot up. This will take ~20-30 seconds.

NOTE

If a recovery was selected follow the on-screen instructions and perform a system recovery. Additional information about performing a system recovery can be found in [Chapter 7 , “CPU/Disk Drive Troubleshooting,” on page 151](#) in this manual.

8. Agilent Technologies logo is displayed in white font on a blue background while Windows finishes loading user preferences. If this does not occur refer to

Boot Up and Initialization Troubleshooting

CXA Instrument Boot Up Process

- the “Instrument Cannot Completely Load or Run the Operating System” section in this chapter.
9. By default, the initialization process of the CXA Spectrum Analyzer application begins loading. If any of the initializing processes do not complete, refer to the “Initializations Did Not Complete” section in this chapter.
10. While the application software is loading the instrument will perform a total of 24 internal alignments before the analyzer begins to sweep. If an alignment fails, refer to the “Fails an Initial Alignment” section in this chapter.
11. If any of the initial alignments fail, check the alignment history for troubleshooting hints.
- Navigate to:

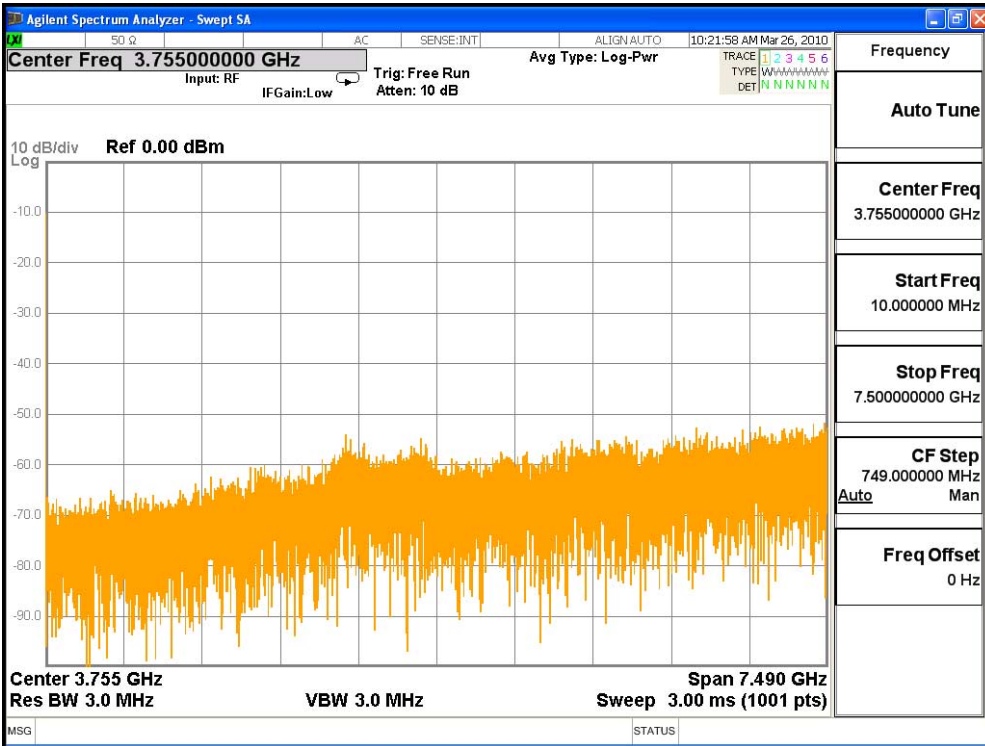
C:\ProgramFiles\Agilent\SignalAnalysis\Physics\AlignmentHistory.txt

and look for any failed status for the various internal hardware items listed in this file.

Once the CXA application is fully initialized and aligned, the sweep should resemble Figure 2-2 when delivered from the factory. This completes the boot process from initial AC power to the spectrum analyzer application.

IMPORTANT If the power up state has been changed from the factory power on state by the user, the analyzer will boot to that state.

Figure 2-2 Typical Instrument Sweep at Power-up
(Display theme changed for printing clarity)



Potential Problems During Boot Process

This section describes potential problems that may occur if there is an internal hardware issue that prohibits the CXA from completing a full boot up to the spectrum analyzer application.

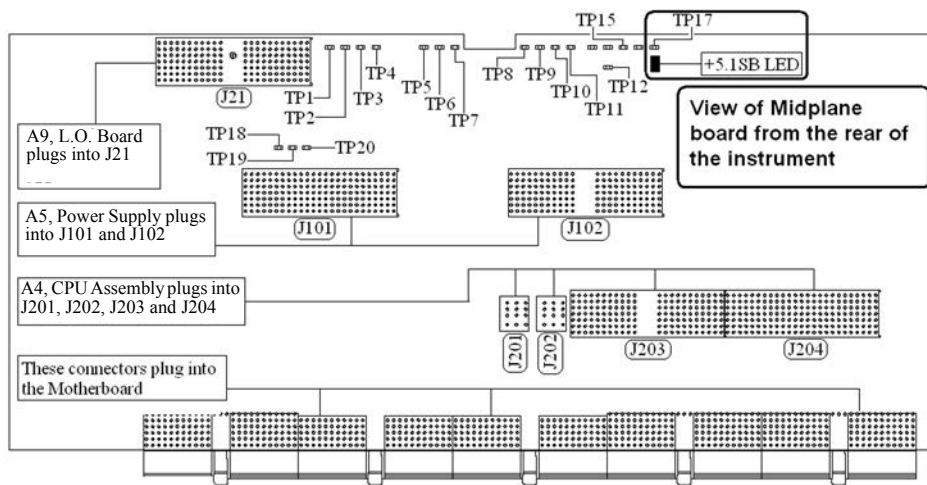
Yellow Standby LED Does Not Illuminate

Control of the yellow front panel Standby LED comes from the A3 CPU board assembly. This signal is routed through the A6 Midplane board and is then buffered on the A7 Motherboard before being sent to the A1A2 Front Panel Interface board. Of course, the power for this all originates with the A5 Power Supply Assembly. When the Standby LED does not come on it could be due to any one of these assemblies. This procedure will help to determine which one is the cause.

If the instrument turns on and operates properly but the yellow Standby LED does not work then all that will need to be done is to trace where the control signal for the LED is being lost using the routing information in the preceding paragraph.

1. The Standby LED will only turn on when the instrument is connected to an AC source that has a voltage level and frequency of that specified for the instrument. Before proceeding verify that these requirements are being met. Refer to the instrument rear panel for these requirements.
2. Remove the AC power cord and then remove the instrument cover. Refer to the [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
3. Referring to [Figure 2-3](#), verify the +5.1V standby LED on the A6 Midplane board is on.

Figure 2-3 A6 Midplane Board +5.1V LED



NOTE

All DC power supplies come from the A5 Power Supply assembly. However, the most convenient measurement location for all the DC supplies is the A6 Midplane. All power supply LED's are accessible once the instrument cover has been removed.

Is the +5.1SB LED on the A6 Midplane board on?

If yes:

After verifying that the connections from the front panel Standby LED back to the A3 CPU board are not at fault, replace the A3 CPU board.

If no:

Replace the A5 Power Supply assembly.

NOTE

Before replacing the power supply, verify the midplane and motherboard interconnects are mechanically secure.

Green Power On LED Does Not Illuminate

Control of the green front panel Power On LED comes from the A3 CPU board assembly. This signal is routed through the A6 Midplane board and is then buffered on the A7 Motherboard before being sent to the A1A2 Front Panel Interface board. Of course, the power for this all originates with the A5 Power Supply Assembly. When the Power On LED does not come on it could be due to any one of these assemblies. This procedure will help to determine which one is the cause.

This procedure assumes that the yellow Standby LED does turn on when the AC power is connected to the rear panel of the instrument. If it doesn't, refer to the [“Yellow Standby LED Does Not Illuminate”](#) section before proceeding.

If the instrument turns on and operates properly but the green Power On LED does not work then all that will need to be done is to trace where the control signal for the LED is being lost using the routing information in the preceding paragraph.

1. The Power On LED will only turn on when the instrument is connected to an AC source that has a voltage level and frequency of that specified for the instrument and the front panel On/Off button has been pressed. Before proceeding verify that these requirements are being met. Refer to the instrument rear panel for these requirements.
2. Remove the AC power cord and then remove the instrument cover. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
3. Remove the MP7 Top Brace. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
4. With AC power connected to the rear of the instrument but without turning it on, leaving it in standby mode, measure the voltage at the top side of R867 of the A7 Midplane board assembly. See [Figure 2-4](#) for R867 location.

Does the voltage at R867 measure 5 VDC?

If yes:

Proceed to [step 5](#).

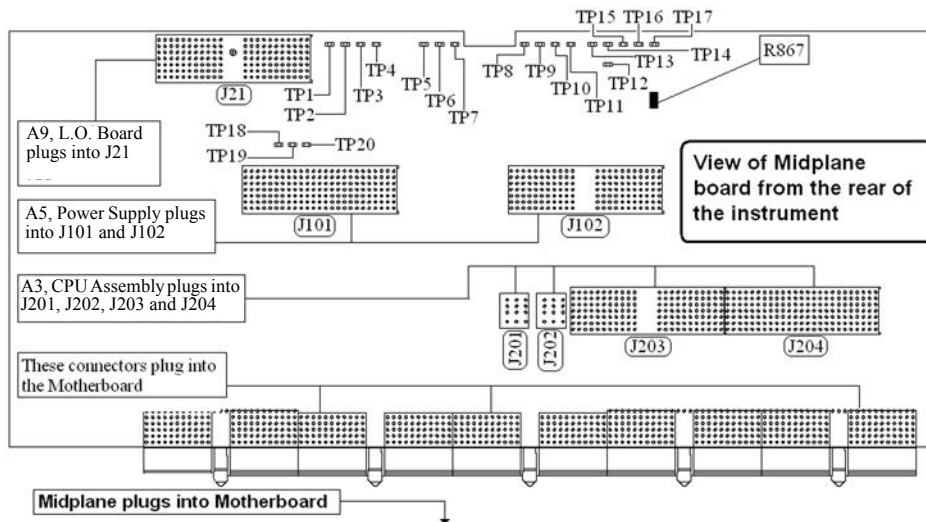
If no:

Replace the A6 Power Supply assembly.

NOTE

Before replacing the power supply, verify the midplane and motherboard interconnects are mechanically secure.

Figure 2-4 **A7 Midplane Board - R867**



5. While monitoring the voltage at R867, turn the instrument power on by pressing the front panel On/Off button.

Does the voltage at R867 measure 0 VDC?

If yes:

Proceed to [step 6](#).

If no:

After verifying that the connections from the front panel On/Off button back to the A4 CPU board are not at fault, replace the A3 CPU board.

6. Do all of the green power supply LEDs along the top of the A6 Midplane board come on?

If yes:

After verifying that the connections from the front panel On/Off button back to the A3 CPU board are not at fault, replace the A3 CPU board.

If no:

Replace the A5 Power Supply assembly.

NOTE

Before replacing the power supply, verify the midplane and motherboard interconnects are mechanically secure.

Fan(s) Are Not Operating

Control of the instrument fans comes from the A5 Power Supply assembly. This signal is routed from the A5 Power Supply through the A6 Midplane board, where there is a test point and LED to monitor the level, and is then routed to the A7 Motherboard where it is filtered before being sent to the Fans. When the Fans do not come on it could be due to any one of these assemblies. This procedure will help to determine which one is the cause.

This procedure assumes that the green Power On LED on the front panel does turn on when the instrument is turned on. If it doesn't, refer to the [“Green Power On LED Does Not Illuminate”](#) section before proceeding.

1. The instrument fans will only turn on when the instrument is connected to an AC source that has a voltage level and frequency of that specified for the instrument and the front panel On/Off button has been pressed. Before proceeding verify that these requirements are being met. Refer to the instrument rear panel for these requirements.
2. Remove the AC power cord and then remove the instrument cover. Refer to the [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
3. Are both fans not spinning?

If yes:

Proceed to [step 4](#).

If no:

Proceed to [step 6](#).

4. Remove the MP7 Top Brace. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
5. Referring to [Figure 2-5](#), verify that the Fan LED on the A6 Midplane board is on. Is the Fan LED on?

If yes:

Measure the voltage level at TP1 on the A6 Midplane board. Is the TP1 voltage between +7 and +15 VDC

If yes:

Proceed to [step 6](#).

If no:

Replace the A5 Power Supply assembly.

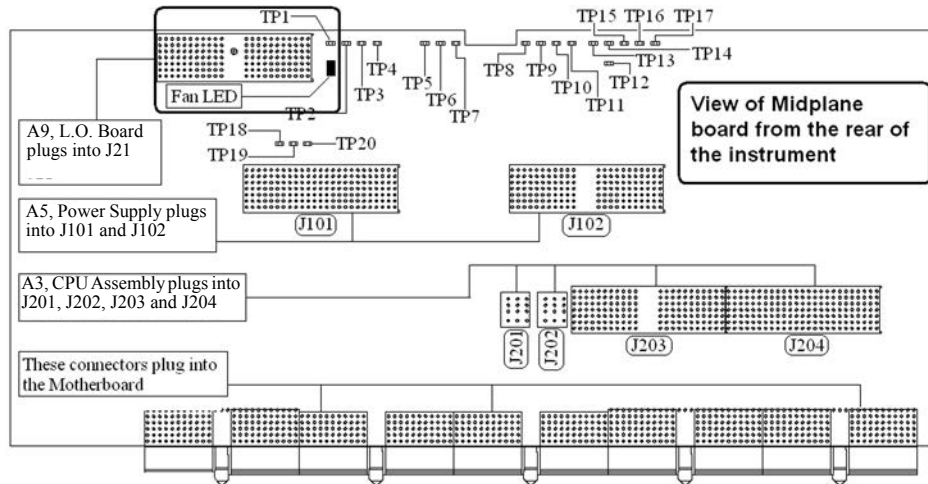
If no:

Replace the A5 Power Supply assembly.

NOTE

Before replacing the power supply, verify the midplane and motherboard interconnects are mechanically secure.

Figure 2-5 A6 Midplane Board - Fan LED



6. With the instrument turned off, and the AC power cord removed, remove the Fan Assembly including unplugging both fans from the A7 Motherboard. Refer to [Chapter 13, "Assembly Replacement Procedures,"](#) on page 225 in this manual.
7. Turn the instrument power back on and measure the fan voltage at both of the fan connectors (J6 & J7) on the A7 Motherboard.

Both connectors have three pins. The outer conductors on both connectors are the FAN_P supply and the center conductors are FAN_N. The voltage between FAN_P and chassis ground should be between +7 and +15 VDC on both connectors.

Does the A7 Motherboard fan connector for the fan(s) that do not work have the required voltage level?

If yes:

Replace the fan(s) that is not working

If no:

After verifying that the connections between the A6 Midplane board and the A7 Motherboard are mechanically and electrically secure replace the A7 Motherboard.

No Agilent Splash Screen Displayed

(Black background with white “Agilent Technologies” text)

A problem of not displaying the Agilent splash screen could be caused by many different things. It could be due to a down power supply, a processor hardware problem, an instrument boot-up process error, a display section failure, etc.

This procedure assumes that the green Power On LED on the front panel does turn on when the instrument is turned on. If it doesn't, refer to the [“Green Power On LED Does Not Illuminate”](#) section before proceeding.

1. Remove the AC power cord and then remove the instrument cover. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
2. Remove the MP7 Top Brace. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
3. With the AC power applied and the On/Off button turned on, verify that all of the power supply voltages are at their proper level. This can easily be done by viewing the power supply LEDs on the back side of the A6 Midplane board. See [“Power Supply/Midplane Troubleshooting” on page 161](#) of this manual.

Are all of the power supply voltages at the proper level?

If yes:

Proceed to [step 4](#).

If no:

After verifying that the connections between the A5 Power Supply, the A6 Midplane board, and the A7 Motherboard are all mechanically and electrically secure, replace the A5 Power Supply assembly.

4. Connect an external VGA monitor to the rear panel display output.

Does the external monitor display the correct information?

If yes:

Proceed to the [“Troubleshooting a Blank Display”](#) section in this chapter.

If no:

Replace the A3 CPU Board assembly.

Instrument Hangs at the Agilent Splash Screen

A problem of the instrument hanging at the Agilent splash screen could be caused by many different things. It could be due to a down power supply, a processor hardware problem, an instrument boot-up process error, etc.

1. Remove the AC power cord and then remove the instrument cover. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
2. Remove the MP7 Top Brace. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
3. With the AC power applied and the On/Off button turned on, verify that all of the power supply voltages are at their proper level. This can easily be done by viewing the power supply LEDs on the back side of the A6 Midplane board. See [“A6 Midplane Assembly Troubleshooting” on page 171](#) of this manual.

Are all of the power supply voltages at the proper level?

If yes:

After verifying that the connections from the A6 Midplane board to the A3 CPU board are not at fault, replace the A3 CPU board.

If no:

After verifying that the connections between the A6 Power Supply, the A6 Midplane board, and the A7 Motherboard are all mechanically and electrically secure, replace the A5 Power Supply assembly.

PCI Enumeration Error

When the instrument is first booting up it runs some BIOS level self tests, one of which is that of the devices on the PCI bus. If there is a problem with a device on the PCI bus a “PCI enumeration” error may be seen on the boot screen. Since the only assembly connected to the PCI bus, other than the A3 CPU board, is the A2 Digital IF assembly, try removing this assembly and rebooting the instrument to see if the error goes away. Of course, you will have other error messages due to this assembly being missing, but this will allow you to isolate this particular error.

Instrument Cannot Completely Load or Run the Operating System

A problem of the instrument not loading the operating system can be caused by a few different things. It could be due to a down power supply, a processor hardware problem, an instrument boot-up process error, corrupt hard drive, etc.

This procedure assumes that the instrument can get past the Agilent splash screen at power on. If it doesn't, refer to the [“Instrument Hangs at the Agilent Splash Screen”](#) section before proceeding.

1. Verify that there are no external USB storage devices connected to the instrument.
2. Does the instrument get far enough along in the boot process to run the “Agilent Recovery System”?

If yes:

Run the “Agilent Recovery System” by referring to the [“Hard Drive Recovery Process”](#) on page 159. If this does not correct the problem replace the A4 Hard Disk Drive.

If no:

Replace the A4 Hard Disk Drive.

Troubleshooting a Blank Display

This section is intended to troubleshoot a display system problem that would cause the internal LCD to be blank. It is assumed that the rest of the instrument is booting up and functioning properly. To determine if the problem is an internal display issue only, connect an external VGA monitor to the rear panel display output. If the rear panel display output is also not working go to the [“No Agilent Splash Screen Displayed”](#) section in this chapter.

Once it has been determined that the rest of the instrument appears to be functioning properly there are a few possible problems that could be causing the display to be blank. They are:

- An LCD Backlight inverter problem
- A video signal path integrity problem
- A video controller / LCD problem

Verify LCD Backlight Functionality

There are two backlights within the LCD assembly, one across the top and one across the bottom. If only one of the backlights has burnt out, the other will still function. Considering this fact, as well as the fact that the expected life span of the backlights is much longer than the LCD itself, it is not very likely that the backlights themselves would cause a completely blank display.

To determine if a blank display problem is backlight related:

1. Remove the AC power cord and then remove the instrument cover. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
2. Remove the MP7 Top Brace. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this manual.
3. Turn the instrument on and allow enough time for it to completely boot-up.
4. Shine a bright light at the display and look closely for the expected information (a large flashlight should work). Since most of the display section of the screen has a black background you will need to look at either the area next to the softkeys or the area across the top of the screen, since these sections will have the largest areas of lighter information in them.
5. Can the expected display information now be seen?

If yes:

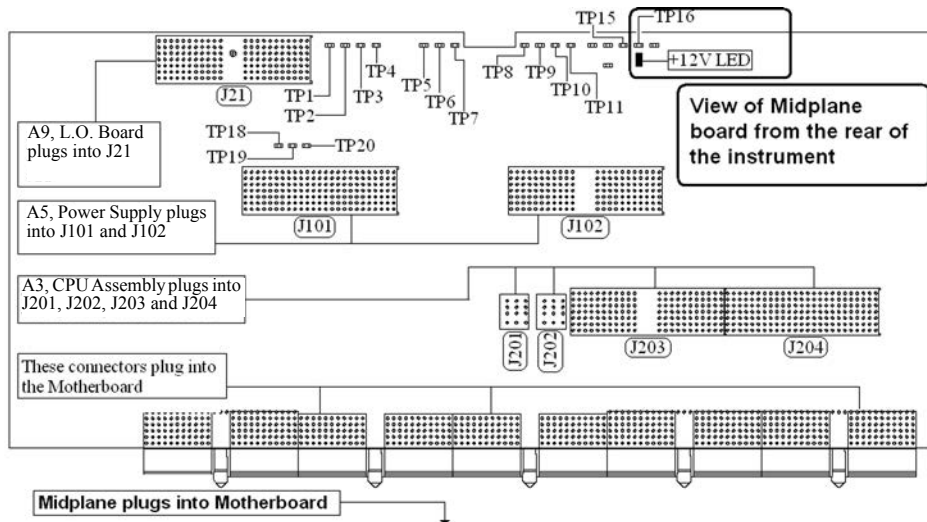
The problem is backlight related. Proceed to [step 6](#).

If no:

The problem is not backlight related. Skip to [“Verify Video Signal Path Integrity”](#).

6. Referring to [Figure 2-6](#), verify that the +12D VDC power supply is on.

Figure 2-6 A6 Midplane Board +12D LED



Is the +12D backlight supply voltage LED on?

If yes:

Proceed to [step 7](#).

If no:

Replace the A5 Power Supply assembly.

7. With the instrument turned off remove the 8 screws that attach the front panel assembly to the instrument chassis.
8. Without disconnecting any of the cables carefully lay the front panel assembly face down on the work surface.
9. Referring to [Figure 2-7](#), verify the 3 voltage levels listed in [Table 2-1](#) are correct.

NOTE

The instrument does have a screen saver which can disable the display backlight after a predefined period of time. If there is any question as to whether or not this has been set by the user prior to the current failure, and the "Inverter Enable" voltage measures too low, press a front panel key and see if the voltage level increases to the expected level.

Figure 2-7 A1A2 Front Panel Interface Board LCD Backlight Inverter Control Voltages

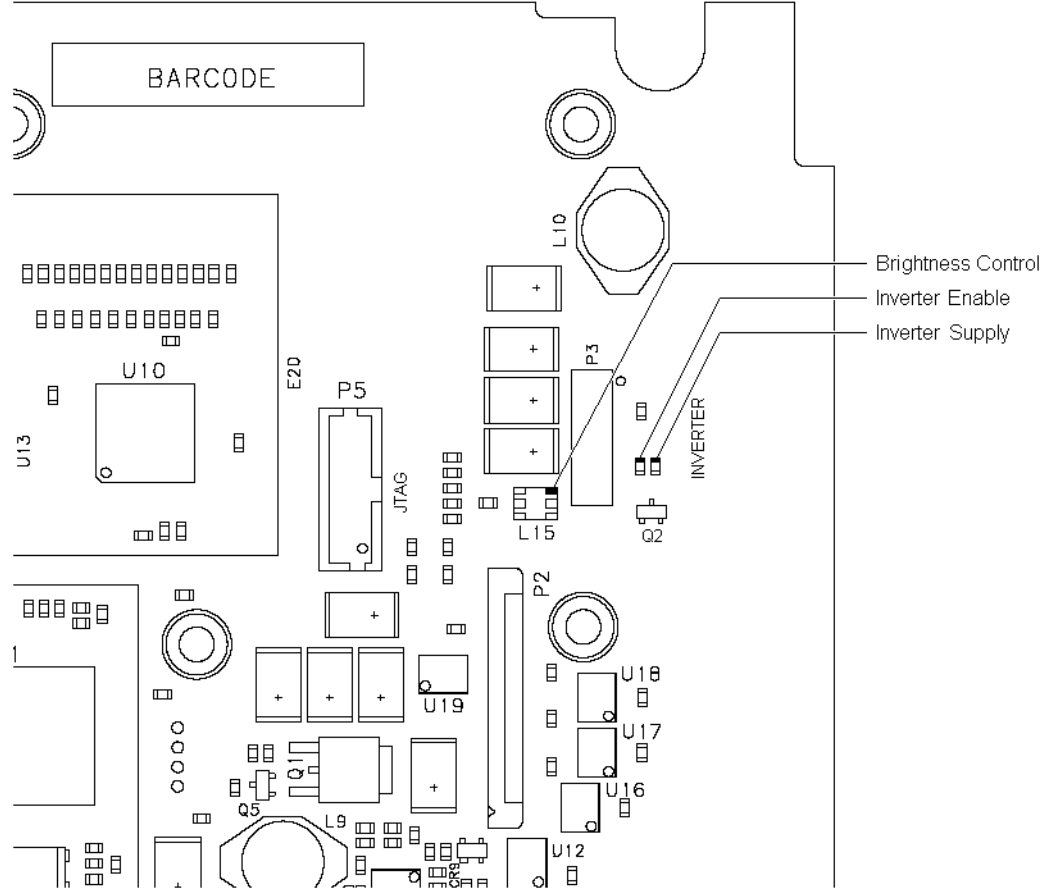


Table 2-1 Expected Backlight Inverter Control Voltage Levels

Signal	Expected Voltage
Brightness Control	0 to 3 VDC
Inverter Enable	>6 VDC
Inverter Supply	+12 VDC

10. Are all of the 3 voltage levels within their expected ranges?

If yes:

Replace the A1A4 LCD Inverter board.

If no:

Replace the A1A2 Front Panel Interface board.

Verify Video Signal Path Integrity

The video controller is located on the A4 Processor assembly and is routed to the front panel LCD through a few interconnections. These interconnections are:

- A3 Processor assembly to A6 Midplane Board
- A6 Midplane Board to A7 Motherboard assembly
- A7 Motherboard assembly to A1A2 Front Panel Interface assembly via W1 ribbon cable
- A1A2 Front Panel Interface to A1A3 LCD via A1W1 flex-circuit

If all of these connections are properly made and none of the cables are damaged proceed to [“Video Controller / LCD Troubleshooting”](#).

Video Controller / LCD Troubleshooting

The video controller is located on the A3 Processor assembly. The video signals that the controller outputs are LVDS. As described above, these signals are routed to the LCD via the A6 Midplane Board, A7 Motherboard, and A1A2 Front Panel Interface board.

On the A1A2 Front Panel Interface board the LVDS signals are buffered and then sent to the LCD via the A1W1 Flex circuit.

The most likely cause for a video problem is the A3 Processor assembly; however it could be the result of a defective LCD.

Initializations Did Not Complete

During the initialization of the CXA Signal Analyzer Application the following messages will be displayed on the application splash screen:

- Checking for required services (1 of 7)
- Initializing License Services (2 of 7)
- Initializing Hardware (3 of 7)
- Initializing Data Services (4 of 7)
- Initializing SCPI Services (5 of 7)
- Initializing Message Services (6 of 7)
- Initializing Front Panel EEPROM Services (7 of 7)

If there is a problem with any of these initializations not completing or causing an error message to be displayed refer to the instrument Event Log. This can be accessed by using an external USB keyboard and mouse and selecting Start, Run, enter Eventvwr.exe, and select OK.

Once the Event Viewer comes up, look under SA for the latest error entries. Double-click on the entries to view further details, which should give you some idea of what the problem is.

Fails an Initial Alignment

While the application software is loading the instrument will perform a total of 10 internal alignments before the analyzer begins to sweep. The alignment numbers, descriptions and related hardware are described in the [Table 2-2](#).

Table 2-2 **Initial Alignments**

Alignment Number	Description	Related Hardware
1	Variable Gain Align	A8 RF
2	Step Gain Adjust	A8 RF
3	Flatness Adjust	A8 RF
4	Variable Attenuator	A8 RF
5	Mechanical Attenuator Verification	A8 RF
6	Filter Margin	A8 RF
7	Low Band Path Gain Verification	A8 RF
8	Low Band Preamplifier Gain Verification	A8 RF
9	Burst Carrier Trigger	A2 Digital IF
10	Trigger Interpolation	A2 Digital IF

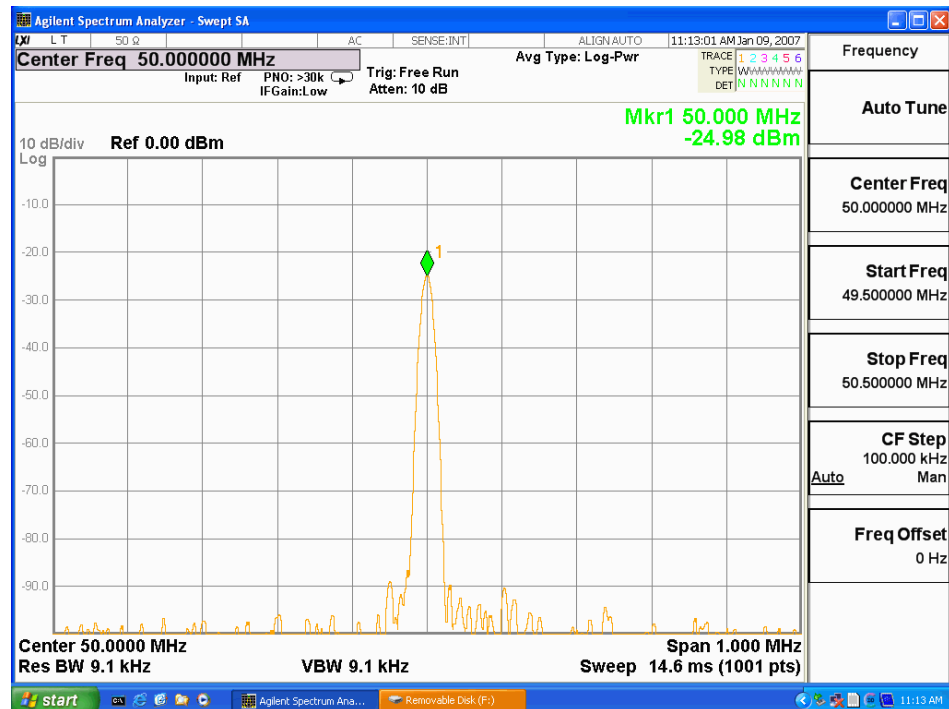
Using an external USB keyboard and mouse you can also access the alignment history, which can be found in a text file at:

C:\ProgramFiles\Agilent\SignalAnalysis\Physics\AlignmentHistory.txt

You will find the most current alignment information at the bottom of this file. Look for the failed alignments and troubleshoot the Related Hardware based on the information provided in [Table 2-2](#).

Signal Level Verification

Measure the 50 MHz RF calibrator signal level by pressing **Input/Output, RF Calibrator, 50 MHz**. Now press **Freq, 50 MHz, SPAN, 1 MHz, Peak Search**. If the analyzer is functioning correctly in low band, the 50 MHz calibrator level should be $-25 \text{ dBm} \pm 2 \text{ dB}$. See the figure below.



Is the signal level correct?

If yes:

The analyzer low band path is functioning properly at least at 50 MHz.

If no:

Refer to [Chapter 4](#), “RF Section Troubleshooting” in this manual.

NOTE

It is possible that other input frequencies could have an amplitude problem even though the 50 MHz calibrator is within tolerance. Using the internal RF calibrator provides a quick check of the low band path.

3 Instrument Messages

Introduction

The Error and Status messaging system of the Agilent Signal Analyzer reports events and conditions in a consistent fashion, as well as logging and reporting event history.

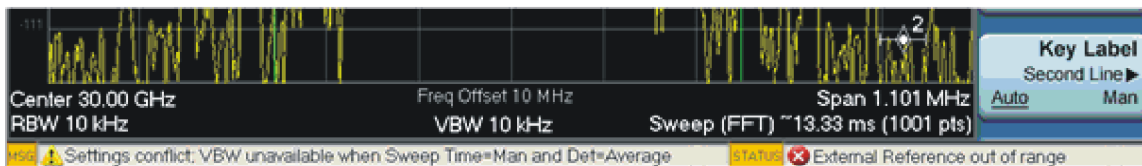
Event vs. Condition Messages

An **Event** is simply a message indicating that something has happened. Events are sub-divided according to their severity, into Error, Warning or Advisory categories. The sub-divisions are described in more detail in the section [Appendix , “Event and Condition Categories,”](#).

Event messages appear in the **Message Line** at the bottom left of the analyzer’s display window.

A **Condition** is a state of the Analyzer, which is characterized by a **Detection** event and a **Clearing** event. Conditions may be Errors or Warnings.

Condition messages appear in the **Status Panel** at the bottom right of the analyzer’s display screen.



Event and Condition Categories

The three categories of severity are described below, for both Events and Conditions.

Errors



Error messages appear when a requested operation has failed. (For example, “Detector not available”, “File not saved”.) Error messages are often generated during remote operation when an invalid programming command has been entered. (For example, “Undefined header”.)

Some errors are conditions rather than single events. They exist for a period of time, so they have associated “Detected” and “Cleared” events. (For example, “LO Unlocked” or “External reference out of range”)

Error messages appear in the Status Panel at the bottom of the display. A message remains until you press a key, or another message is displayed in its place.

Error messages are logged in the error queues. If the error is a condition, both the Detected and Cleared events are logged.

Warnings



Warning messages appear when a requested operation has completed successfully, but there are modifications and/or side effects. (For example, if you requested too high a stop frequency, then “Data out of range” is displayed and the analyzer sets itself to the highest available stop frequency.)

Some warnings are conditions rather than single events. They exist for a period of time, so they have a “Detected” event and a “Cleared” event. (For example, if you set the sweep time too fast for a measurement to meet the instrument specifications then the “Meas Uncal” message is displayed until you slow down the sweep time.)

Warning messages appear in the Status Panel at the bottom of the display. The message remains until you press a key, or another message is displayed in its place.

Warnings are logged in the error queues. If the warning is a condition, both the Detected and Cleared event messages are logged.

Advisories



Advisory messages tell the front panel user some useful information. (For example, “File saved successfully” or “Measuring the fundamental”).

Advisory messages appear in the Status Panel at the bottom of the display. The message remains until you press a key, or another message is displayed in its place.

Advisory messages are not logged in the error queues.

Grayout messages are a special type of Advisory, which appear when you attempt to access a function that is not available. This could be a grayed out front panel key, or an inappropriate SCPI command. There are two types of grayout messages: Benign and Forced.

1. **Benign:** the requested function is not available because it does not make sense with the current instrument settings. Changing it does not affect the current measurement. (For example, setting the number of FFTs/Span when you are not in the FFT mode.)

A benign grayout gives an Advisory type of message only when the front panel key is pressed.

The requested function cannot be changed from the front panel, but it can be changed remotely.

2. **Forced:** the requested function is not available either because changing it would cause an invalid measurement, or because of hardware limitations, or because the selection conflicts with other settings. (For example, selecting the electrical attenuator when the frequency span includes frequencies above 3.6 GHz.)

A forced grayout function cannot be changed either from the front panel or remotely. It generates a special type of Advisory message. It also only appears on the front panel when the key is pressed. Remotely, the message will appear in the event queue as a warning “-221, Settings conflict; <conflict description>”.

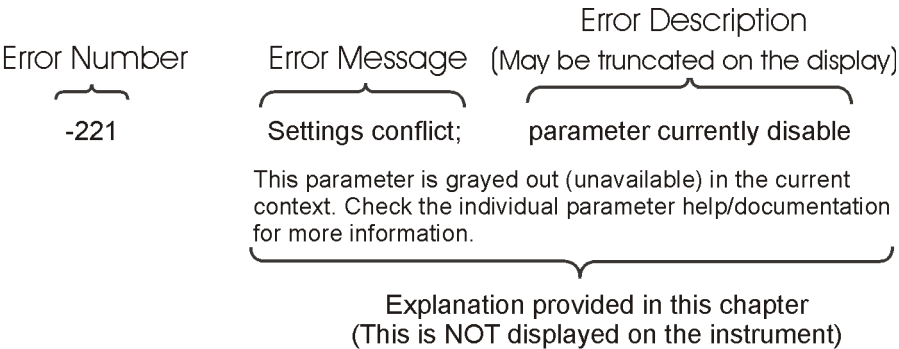
Event Message Format

The event messages are listed in numerical order according to their message number. Advisory messages do not have numbers, and are listed in alphabetical order.

An explanation is included with each error to further clarify its meaning. Some errors are specified in industry standards and there are references to the IEEE

Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols and Common Commands for Use with ANSI/IEEE Std 488.1-1987*. New York, NY, 1992.

Figure 3-1 Error Message Example



pk716b

Event Queues

There are several different event queues that are viewed/queried and managed separately. Note that Conditions are logged in the queues as pairs of events: a “Detected” event and a corresponding “Cleared” event.

Front Panel Status	Error messages can be viewed by pressing, System, Show Errors, Status . The Status screen shows error conditions that currently exist. When an error event is caused by a command sent over a remote interface, the resulting messages are logged in the queue for that interface. For convenience, they are also logged in the front panel queue.
Front Panel History	Error messages can be viewed by pressing, System, Show Errors, History . The History screen shows all the error events that have occurred since the instrument was turned on, with a maximum of 100 messages. When an error situation is caused by a command sent over a remote interface, the resulting messages are logged in the queue for that interface. For convenience, they are also logged in the front panel queue.
Remote interfaces (GPIB/LAN)	When an error event is caused by a command sent over a remote interface, the resulting messages are output to the queue for that interface. To return an error, you must query the queue for that interface. An error event that is caused by a front panel action is not reported to any remote interface queue. However, a status condition is usually caused by an internal event that is not related to a particular interface, so the Detected/Cleared events for status conditions are reported to all the error queues.

Table 3-1 **Characteristics of the Event Queues**

Characteristic	Front-Panel Status	Front-Panel History	Remote Interfaces (GPIB/LAN)
Capacity (maximum number of messages)	100	100	100
Overflow Handling	Circular (rotating). Drops oldest error as new error comes in.	Circular (rotating). Drops oldest error as new error comes in.	Linear, first-in/first-out. Replaces newest error with: -350, Queue overflow
Viewing Entries	Press: System, Show Errors, Status	Press: System, Show Errors, History	Send SCPI query to the desired interface. SYSTem:ERRor?
Clearing the Queue	Press: System, Show Errors, Clear Error Queue Clears the errors in all the queues.	Press: System, Show Errors, Clear Error Queue Clears the errors in all the queues.	Send *CLS command to the desired interface. Clears errors in the queue for this particular interface only.

Table 3-2 **Summary of Event Reporting Modes**

Event Type	SCPI Error Queues	Front Panel History Queue	Status Panel Display
Error Event	Logged	Logged	Displayed in Message Line
Warning Event	Logged	Logged	Displayed in Message Line
Advisory Event	Logged	Logged	Displayed in Message Line
Error Condition Detected	Logged	Logged	Displayed in Status Line
Error Condition Cleared	Logged		
Warning Condition Detected	Logged	Logged	Displayed in Status Line
Warning Condition Cleared	Logged		
Grayout Advisory (Benign)	Not logged	Logged	Displayed in Message Line
Grayout Advisory (Forced)	See note ^a	Logged	Displayed in Message Line

a. Not logged, unless the cause of the Advisory was remotely generated, in which case a Warning message, type -221, is logged.

Advisory Messages

An advisory is simply a message that lets you know something useful - for example “File saved successfully” or “Measuring fundamental.” Operation completion and running status indications are common types of advisories. Advisories have no number and are not logged in the error queue.

Advisories include gray-out “settings conflict” errors. These gray-outs are benign (i.e. changing them has no impact on the current measurement).

Advisories are event-type errors only. They are never conditions.

Message	Description/Correction Information
All Auto/Man functions have been set to Auto	
All Auto/Man functions have been set to Auto.	Message generated by pressing the Auto Couple front-panel key.
Allowable Center Frequency exceeded for the current span	When rotating the knob or step up/down keys to change the Center frequency, the value of the Span is kept constant. Therefore, the center frequency is limited by the frequency range of the instrument.
Allowable Span exceeded for the current center frequency	When rotating the knob or step up/down keys to change the Span, the value of the Center frequency is kept constant. Therefore, the span is limited by the frequency range of the instrument.
Allowable Start Frequency exceeded for the current span	When rotating the knob or step up/down keys to change the Start frequency, the value of the Span is kept constant. Therefore, the start frequency is limited by the frequency range of the instrument.
Allowable Stop frequency exceeded for the current span	When rotating the knob or step up/down keys to change the Stop frequency, the value of the Span is kept constant. Therefore, the stop frequency is limited by the frequency range of the instrument.
Already in Single, press Restart to initiate a new sweep or sequence	The instrument is already in the single state. If you want to start a new sweep or sequence, press the Restart key instead.
Auto sweep time rules do not apply in FFT sweeps	FFT sweeps do not use the auto sweep time rules, so the rules setting cannot be changed from the front panel. The setting can be changed remotely and it will have no effect on the current operation unless the analyzer is switched out of FFT sweeps.
Band Adjust has no effect on a Fixed marker	If a Marker is a Fixed type marker, the marker's value does not change from when it first became fixed. So you cannot change the band of a fixed marker.

Band Adjust has no effect with Mkr Function Off	If Marker Function is off changing the band has no effect
Band-pass filter set to OFF	Turning on any high-pass or low-pass filter will turn off band pass filters.
Cal Cancelled; Calibration data cleared	User has cancelled the cal either directly or indirectly by changing the setup parameters. The current cal data has been erased. Perform a new user cal to obtain calibrated results again.
Cal Invalid: meas freq pt(s) > 3.6GHz are > 50MHz from existing Cal pts	When freq points being measured are above 3.6 GHz and a calibration has been successfully performed, and the number of points are changed, the new points are required to be within 50 MHz of the current cal points or the preselector optimize frequencies become inaccurate and the whole cal needs to be invalidated. Interpolation of the cal can only be performed if the new freq points are within 50 MHz of the cal points. To overcome this problem, change the number of freq points back to match cal points or perform another user cal.
Carrier power is too low for optimum dynamic range.	For better dynamic range, transmit band spur measurements require >10 dBm signal power at the RF input port.
Connecting to source...	External Signal Generator is being sent SCPI commands interrogating it to see if it is suitable for the CXA to control. Please wait until complete before pressing any buttons.
Demod Time is not available in Zero Span	The Demod Time function is not available in zero span because in zero span we are ALWAYS demodulating.
Detector <X> changed due to physical constraints	You have selected more detectors than the instrument hardware can implement. An existing detector selection has been changed to allow the current detector choice to be selected. <X> indicates the trace number for which the detector was changed.
Dynamic range is not optimum. Set AUTO RF input.	
Exp. Averaging not available when AUTO PhNoise is active.	
FFT Width is not settable unless Sweep Type is set to FFT	You must select the FFT sweep type before you can set the FFT Width
File <filename> saved	The file save operation executed successfully.
Filter BW function is only available for Gaussian filter type	Flattop and CISPR/MIL filters have defined shapes that cannot be altered. So only the Gaussian filter type allows filter bandwidth definition changes.

Instrument Messages
Advisory Messages

Fixed LO freq should be greater than RF Stop freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The LO fixed freq should be greater than the RF freq's for an LSB or DSB (for DSB measurements the setup uses LSB values) downconverter setup. Use the graph icon on the DUT setup form to clarify the setup required.
Freq Scale Type=Log is not available in Zero Span	Logarithmic scaling cannot be used for time domain sweeps (0 Hz span).
Frequency Hopping enabled, waiting for valid burst	The demodulated burst type has not been found in the originally demodulated slot location within the frame.
Frequency menu has changed to reflect frequency context switch	The frequency context parameter has been changed either by the user or the system. The frequency menu will now contain the frequencies for the new context. No action required.
Gate required for valid results	
High-pass and Low-pass filters set to OFF	Turning on any band pass filter will turn off high-pass and low-pass filters.
High-pass filter set to OFF	Turning on any band pass filter will turn off high-pass filters.
IF Fixed freq should be greater than LO Stop freq	The setup frequencies break the rules for an upconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The IF fixed freq should be greater than the LO Stop freq for a USB upconverter swept LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
IF Fixed freq should be greater than RF Stop freq	The setup frequencies break the rules for an upconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The IF fixed freq should be greater than the RF Stop freq for an upconverter swept LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
IF Start freq should be greater than LO Fixed freq	The setup frequencies break the rules for an upconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The IF start freq should be greater than the LO fixed freq for an USB upconverter fixed LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
IF Start freq should be greater than RF Start freq	The setup frequencies break the rules for an upconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The IF start freq should be greater than the RF Start freq for an upconverter fixed LO setup. Use the graph icon on the DUT setup form to clarify the setup required.

Input is internal	The instrument's input is set to internal (the internal amplitude reference signal). So any signals connected to the front/rear panel inputs cannot be measured.
LO Fixed freq should be greater than IF Stop freq	The setup frequencies break the rules for an upconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The LO fixed freq should be greater than the IF Stop freq for an LSB upconverter fixed LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
LO Fixed freq should be greater than RF Stop freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The LO fixed freq should be greater than the RF Stop freq's for an LSB or DSB (for DSB measurements the setup uses LSB values) downconverter fixed LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
LO Start freq should be greater than IF Fixed freq	The setup frequencies break the rules for an upconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The LO Start freq should be greater than the IF fixed freq for an LSB upconverter swept LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
LO Start freq should be greater than RF Start freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The LO start freq should be greater than the RF Start freq's for an LSB downconverter swept LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
LO Stop freq should be greater than RF Stop freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The LO Stop freq should be greater than the RF Stop freq's for a DSB (for DSB measurements the setup uses LSB values) downconverter swept LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
Low-pass filter set to OFF	Turning on any band pass filter will turn off low-pass filters.
No spurs have been found	You has started a measurement in examine meas type in single or continual sweep mode, or full meas type in single sweep mode, but no spurs were found.
Preparing Calculation...	
Preselector is centered	The preselector has been successfully centered
Preselector not used in this frequency range.	You cannot center or adjust the preselector because it is not used at all at the current marker frequency or between the current start and stop frequencies

Instrument Messages
Advisory Messages

Probe connected, cal data is being reapplied; <port>; <probe>	A probe has been connected, calibration data is being reapplied
Probe connected, no probe cal; using cable cal data; <port>; <probe>	A probe has been connected and no probe calibration data is available. The latest cable calibration data will be used
Probe disconnected, reverting to cable calibration data; <port>	A probe has been disconnected, calibration data reverting to the last cable calibration data
Reading SNS data...	The Agilent Smart Noise Source has been connected and the application is reading the device EEPROM data. Please wait until complete before continuing.
Recalled File <filename>	A file recall (open/load) was successfully completed.
Refer to online help for assistance with DSB measurements	The Double Side Band measurement requires careful setup to obtain valid results. Please refer to the manuals for help with this setup.
Requested timeslot number is not present.	The selected timeslot is not on. (Timeslot is referenced to the trigger point.)
RF Start freq should be greater than IF Fixed freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The RF Start freq should be greater than the IF Fixed freq for a DSB (for DSB measurements the setup uses LSB values) downconverter swept LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
RF Start freq should be greater than IF start freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The RF start freq should be greater than the IF Start freq's for an LSB downconverter fixed LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
RF Start freq should be greater than LO fixed freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The RF start freq should be greater than the LO fixed freq's for an USB downconverter fixed LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
RF Start freq should be greater than LO Start freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The RF start freq should be greater than the LO Start freq's for an USB downconverter swept LO setup. Use the graph icon on the DUT setup form to clarify the setup required.

RF Stop freq should be greater than IF Stop freq	The setup frequencies break the rules for a downconverter measurement. The measurement will still run, but check setup frequencies are correct before continuing. The RF Stop freq should be greater than the IF Stop freq's for an USB or DSB (for DSB measurements the setup uses LSB values) downconverter fixed LO setup. Use the graph icon on the DUT setup form to clarify the setup required.
Scale/Div only applies in Log Y Scale	Setting the Scale/Division only makes sense when you are using a logarithmic Y scale.
Signal Track is turned off when Zero Span is selected	Signal Track is not available when you have selected Zero Span. So if Zero Span is entered while in Signal Track is On, Signal Track is turned off.
Sweep Points/Span is < minimum. Results may be inaccurate.	The sweep point to span ratio is below the minimum required to ensure the bucket ratio is large enough to test DVB-T masks
Sweep Setup is not available in Zero Span	Zero span is a display at a single frequency, so there is no "sweeping" to set up.
Sync is RF Ampl (not Training Sequence). Bits are not accurate.	
Trace file saved.	The trace saving operation was successful.
Use Gate View Sweep Time in the Gate menu.	When in Gate View you use Gate View Sweep Time, rather than Sweep Time, to control the Gate View window
User Cal valid. Apply Cal from Meas Setup menu	The measurement setup has changed such that the current cal data can be applied to the results. To apply the cal, press Meas Setup/Cal Setup/Apply Calibration. A new cal can be performed if required.

-800, Operation Complete Event

Err#	Message	Verbose/Correction Information
-800	Operation complete	The instrument has completed all selected pending operations in accordance with the IEEE 488.2, 12.5.2 synchronization protocol.

-700, Request Control Event

Err#	Message	Verbose/Correction Information
-700	Request control	The instrument requested to become the active IEEE 4881 controller-in-charge.

-600, User Request Event

Err#	Message	Verbose/Correction Information
-600	User request	The instrument has detected the activation of a user request local control.

-500, Power on Event

Err#	Message	Verbose/Correction Information
-500	Power on	The instrument has detected an off to on transition in its power supply.

-400 to -499, Query Errors

Err#	Message	Verbose/Correction Information
-400	Query Error	There was a problem with a query command. The exact problem cannot be specifically identified.
-410	Query INTERRUPTED	Some condition caused an INTERRUPTED query to occur. For example, a query was followed by DAB or GET before a response was completely sent.
-420	Query UNTERMINATED	Some condition caused an UNTERMINATED query to occur. For example, the device was addressed to talk and an incomplete program message was received.
-430	Query DEADLOCKED	Some condition caused a DEADLOCKED query to occur. For example, both the input buffer and the output buffer are full and the analyzer cannot continue. The analyzer automatically discards output to correct the deadlock.
-440	Query UNTERMINATED after indefinite response	A query was received in the same program message after a query requesting an indefinite response was executed.

-300 to -399, Device-Specific Errors

Err#	Message	Verbose/Correction Information
-300	Device-specific error	An instrument error occurred and the exact problem cannot be specifically identified. Report this error to the nearest Agilent Technologies sales or service office.
-310	System error;	An internal system-type error has occurred. The exact problem cannot be specifically identified. Report this error to the nearest Agilent Technologies sales or service office.
-310	System error; A license will soon expire; <feature code> will expire in <time>	The indicated feature/software will expire in the specified time. Contact Agilent Technologies to purchase continued use of this functionality.
-310	System error; Error transmitting a LAN event to the network.	Communication with the network driver failed.
-310	System Error; Ext Source not responding	Signal source at given IP address is not responding / IP does not belong to a source. Check IP address and network connection.
-310	System error; Failed to initialize the PTP clock to current time.	Failure communicating with the DMC libraries' PTP controller.
-310	System error; Failed to instantiate the PTP ordinary clock.	Failure in the starting up the DMC libraries' PTP controller.
-310	System error; feature <feature code> not licensed	The specified feature, for example "N9073A-TR2" is not licensed. The license may have expired. You cannot use it until you get a license.
-310	System error; Feature expired; <feature code>	The specified feature has expired. The license is no longer valid.
-310	System error; License installation failed; <feature code>	The license installation of the specified feature, for example "N9073A-TR2", has failed. You should refer to the event log in the control panel for more details.
-310	System error; License removal failed; <feature code>	The license removal of the specified feature, for example "N9073A-TR2" has failed. You should refer to the event log in the control panel for more details.
-310	System error; No license; <feature code> will terminate in <time>	The specified feature will stop working in the specified time due to the license expiration. You will be prompted to save results and exit.

Instrument Messages
-300 to -399, Device-Specific Errors

-310	System error; The configured PTP hardware driver could not be instantiated.	The PTP driver failed on initialization.
-310	System error; The PTP hardware driver reported a configuration error.	Failure in the execution of the PTP driver. The most likely cause of this error is a mismatch between versions of the PTP driver and the LXI middleware.
-310	System error; The PTP ordinary clock reported a configuration error.	Failure in execution of the DMC libraries' PTP controller.
-310	System error; The Trigger alarm delayed LAN event was not scheduled due to an existing pending event.	Delayed LAN events cannot occur too close together (within 20 ms).
-310	System error; The Trigger alarm delayed LAN event was not scheduled due to a conflict with an existing scheduled alarm.	Delayed LAN events cannot occur too close to a scheduled Alarm (within 20 ms).
-310	System error; The Trigger alarm was not scheduled due to a conflict with an existing scheduled alarm.	Alarms cannot be scheduled to happen too close together (within 20 ms).
-311	Memory error	There is a physical problem with the instrument memory, such as a parity error.
-312	PUD memory lost	Protected user data saved by the *PUD command has been lost.
-313	Calibration memory lost	The nonvolatile calibration data used by the *CAL? command has been lost.
-314	Save/recall memory lost	The nonvolatile data saved by the *SAV? command has been lost.
-315	Configuration memory lost	The nonvolatile configuration data saved by the instrument has been lost.
-320	Storage fault;	A problem was found while using data storage. The error is not an indication of physical damage or failure of any mass storage element.
-321	Out of memory	An internal operation needed more memory than was available. Report this error to the nearest Agilent Technologies sales or service office.

-330	Self-test failed	A self-test failure occurred. Report this error to the nearest Agilent Technologies sales or service office.
-340	Calibration failed	The instrument requires an Align All Now. Restore the alignment by pressing System, Alignments, Align All Now.
-340	Calibration failed; no signal detected; <port>	The calibration for the <I I-bar Q Q-bar> port did not succeed because the calibration signal was not detected. Check that the <I I-bar Q Q-bar > port is properly connected to the Cal Out port.
-350	Queue overflow	An error occurred that did not get put in the error queue because the queue was full.
-360	Communication error	There was a problem with instrument remote communications. The exact problem cannot be specifically identified.
-360	Communication error; SNS data read failure. Disconnect then reconnect SNS	The Agilent Smart Noise Source connected to the CXA has failed to be read by the application. Please disconnect and reconnect the SNS. If this continues to fail, then the SNS may have had its EEPROM corrupted or another hardware fault exists. Check SNS on another instrument, NFA and ESA are also SNS compatible instruments. Check the device is not an Agilent power sensor which uses the same cable interface.
-361	Parity error in program message	A parity bit was not correct when the data was received. For example, on a parallel port.
-362	Framing error in program message	A stop bit was not detected when data was received. For example, on a remote bus port.
-363	Input buffer overrun	A software or hardware input buffer on a port overflowed with data because of improper or nonexistent pacing.
-365	Time out error	There was a time-out problem in the instrument. The exact problem cannot be specifically identified.

-221 Settings Conflict Errors

This is one of the errors in the standard SCPI error range of -200 to -299. See the table in section -200 to -299, Execution Errors for the rest of those errors.

The <subtext> part of a Settings Conflict error should be worded so that the text is: “function1” is not whatever/with/while/when “function2”. This makes them easier to find - alphabetically, to avoid duplicates.

The entire message displays in the error history as “-221, Settings conflict; <subtext>”

For example, -221.0076 displays as:

-221, Settings conflict; Invalid trace number

Err#	Message	Verbose/Correction Information
-221	Channel BW is not available in Zero Span	The Channel BW function is not available in zero span.
-221	De-emphasis only available in FM	The de-emphasis function is only available if FM demod is selected.
-221	Setting conflict; <trigger source> trigger is not available while input is <input port>	The trigger source (Video, RF Burst, I/Q Mag, etc.) is not available with the current input port (RF, IQ, etc.)
-221	Setting conflict; Differential setting determined by probe type	A probe is connected that has a built in Differential setting. The setting cannot be changed manually.
-221	Setting conflict; Input Z unavailable when probe sensed	A probe is connected and the Input Z is set based on the probe type. It cannot be changed manually.
-221	Settings conflict;	A legal command was received but it could not be executed due to the current device state.
-221	Settings conflict; *.CSV file format is not available in this measurement.	You cannot load or save base instrument traces, as this is not supported by the Log Plot measurement.
-221	Settings conflict; <Q Param> cannot be changed when Q same as I	When the “Q Same as I” parameter is set to Yes, the I parameter value is copied to <Q Param> and the <Q Param> value cannot be changed. Set Q Same as I to No to enable explicit control of the <Q Param> value.
-221	Settings conflict; A Valid User Cal is required. Optimize aborted	Optimize Preselector can only be performed if a valid user cal exists and is applied to current results. Perform a user cal first or apply existing cal.
-221	Settings conflict; Antenna Unit is only available when antenna Correction is on	These special units only apply when you are doing antenna measurements with corrections enabled.

-221	Settings conflict; Band is not available when Mixer Type is Preselected	The K, E, W, F, D, G, Y, J band functionality is not available if the selected Mixer Type is Preselected.
-221	Settings conflict; BTS gain is not available in this Mode	Base Transceiver Station gain correction is not available in some Modes, or in some measurements (for example, the SA measurement).
-221	Settings conflict; Calibration cannot be performed without valid ENR data	The cal ENR table has no values in it, and hence the cal cannot be performed. Correct by either populating the cal ENR table, set ENR mode to Spot, or set the 'Use Meas Table Data for Cal' to 'On'.
-221	Settings conflict; Cancellation is not available while measuring DANL floor.	Phase Noise cancellation does not make sense when measuring the DANL Floor, so for this reason it has been disabled
-221	Settings conflict; Cancellation Ref trace has no data.	When performing phase noise cancellation, you need to supply a reference trace that will be used to cancel out the background noise of the analyzer. The reference trace must be in Reference (View) mode, and selected by the Ref Trace parameter under the Cancellation menu
-221	Settings Conflict; Cancellation trace has different X-Scale	Reference trace for the cancellation has a different range of X-axis against the target trace
-221	Settings conflict; Cannot optimize while user cal in progress	Optimize Preselector cannot be performed while a user cal is in progress. The user cal performs an optimize preselector prior to taking the noise source on/off level results for the cal data.
-221	Settings conflict; Carrier freq not allowed with BMT. (Bottom/Middle/Top only)	The transmit band spur measurement only allows bottom (B), middle (M), and top (T) channel frequencies for each supported frequency band. The carrier frequency must be set to the bottom, middle or top frequency of the current frequency band.
-221	Settings Conflict; Code channel duplication	This error is reported when the given code channel overlaps other code channel
-221	Settings conflict; Command is incompatible with band pair marker	Using remote commands, you have tried to adjust the start or stop frequency of a span pair marker. You can only adjust the center and span.
-221	Settings conflict; Continuous Peak is not available with Fixed marker	The continuous peak feature cannot be used with a marker that is fixed. By definition that marker value cannot change.
-221	Settings conflict; Continuous Peak is not available with Signal Track on	The continuous peak feature cannot be used while you are also using the signal tracking function.

Instrument Messages
-221 Settings Conflict Errors

-221	Settings conflict; Corrections with different antenna units not allowed	When a correction with antenna units is turned on, that is the only unit allowed. You can have two sets of antenna corrections turned on, but only if they have the same units.
-221	Settings conflict; Desired preamp setting is not available	
-221	Settings conflict; Destination trace for Trace Math cannot be a trace operand	The resulting trace data (from doing a trace math function) cannot be put into the any of the traces that are being used by the math operation.
-221	Settings conflict; Downconv only available when DUT is Amplifier	SCPI only message. The System Downconverter can only be set to 'On' when the DUT type is amplifier. Change DUT type to Amplifier if the System Downconverter is required.
-221	Settings conflict; EDGE EVM only supports EDGE TCH burst type.	
-221	Settings conflict; Electronic attenuator is disabled	You are using the mechanical attenuator, and have not enabled the electronic attenuator. You cannot set the value of the electronic attenuator because it automatically sets/changes when enabled.
-221	Settings conflict; Electronic attenuator is not available above 3.6 GHz	The maximum frequency of the electronic attenuator is 3.6 GHz. This is because of switching capacitance.
-221	Settings conflict; Electronic attenuator unavailable in current state	
-221	Settings conflict; Electronic attenuator unavailable with Preamp on	The internal preamp is on. Electronic attenuator cannot be used while you are using the internal preamp.
-221	Settings Conflict; FAST method can only be used while Radio Std is W-CDMA	
-221	Settings conflict; Feature not supported for this measurement.	Some functionality is available in one measurement, but not in another. (See the measurements under the Meas key.) This error occurs if you send a SCPI command or push a gray-out key that is not available in the current selected measurement.
-221	Settings conflict; FFT IF Gain High not available when Swept IF Gain = Manual Low	When Swept IF Gain is manually set to Low, you cannot set the FFT IF Gain to High because that would make the Reference Level couplings wrong in FFT mode.
-221	Settings conflict; FFT method is unavailable for level gating	If you are using level gating, you cannot select the FFT Gate Method.

-221	Settings conflict; FFT sweep type is not available while in Gated LO	The gated LO function turns the LO on and off as it sweeps. So the FFT sweep type is not available if you have selected gated LO.
-221	Settings conflict; FFT sweep type is not available while in Gated Video	The FFT sweep type is not available if you have selected the gated video function.
-221	Settings conflict; Fixed marker adjust not available while Marker Function is on	If a Marker Function is on for a Fixed marker, the marker's reported value is derived from the function. Therefore, you cannot directly set the X or Y value of a Fixed marker that has a marker function turned on.
-221	Settings conflict; Fixed Marker Y value is not adjustable with Normalize On	If Normalize is on the Amplitude scale is in dB units, so adjusting the Y value of a Fixed marker is not possible.
-221	Settings conflict; Freq > 3.6 GHz unavailable while electronic attenuator enabled	The electronic attenuator does not function above 3.6 GHz. So if you have that attenuator enabled, you cannot change the center frequency so that frequencies above 3.6 GHz are displayed/measured.
-221	Settings conflict; Frequency Offset is not available with Segmented Sweep	The frequency offset feature cannot be used when you are using the segmented sweep capability.
-221	Settings conflict; Frequency Offset not available when Frequency Scale is Log	The frequency offset feature cannot be used when you have selected a log scale for the frequency axis.
-221	Settings conflict; Function unavailable with MW Presel off	You cannot center or adjust the preselector because the Microwave Preselector is currently off
-221	Settings conflict; Gate control is Edge for Gated FFT	You cannot use level triggering to control the gate if you are using the FFT gating method.
-221	Settings conflict; Gate control must be Edge for this Gate Source	You cannot use level triggering to control the gate when you are using the currently selected gate source.
-221	Settings conflict; Gate is not available when Marker Count on	The gate function cannot be used while you have marker count turned on.
-221	Settings conflict; Gate Length is not settable in FFT sweeps	The sweep time for FFT sweeps is set by the calculations. So sweep time settings cannot be adjusted.
-221	Settings conflict; Gate Length is not settable in FFT sweeps	The sweep time for FFT sweeps is set by the calculations. So sweep time settings cannot be adjusted.
-221	Settings conflict; Gate Method is not compatible with current Sweep Type setting	If the Gate is On and you have the FFT Sweep Type manually selected, then the Gate Method cannot be selected.
-221	Settings conflict; Gated FFT is not available while Sweep Type is set to Swept	The gated FFT function is not available if you have selected the swept type of sweep. You must be in the FFT sweep type.

Instrument Messages
-221 Settings Conflict Errors

-221	Settings conflict; Gated LO is not available while Sweep Type is set to FFT	The FFT sweep type moves the LO frequency in steps. So the gated LO function is not available if you have selected FFT sweep.
-221	Settings conflict; Gated Video is not available while Sweep Type is set to FFT	The gated video function is not available if you have selected the FFT sweep type.
-221	Settings conflict; Incorrect RBW for demod. Change RBW	
-221	Settings conflict; Ind I/Q is not available for this measurement	The Independent I and Q setting is not available for the current measurement. Only some measurements (initially, only VXA) support this setting.
-221	Settings conflict; Invalid trace number	The subopcode used to specify the trace number is invalid for this measurement or query
-221	Settings conflict; Knob is not available to modify this function	You should select a specific value for this function. So scrolling through values with the knob is not allowed.
-221	Settings conflict; Log Scale Type is not available when Detector Mode is Normal	
-221	Settings conflict; Log Scale Type is not available with Demod View	The logarithmic x-axis scales are not available when you have the demod view turned on.
-221	Settings conflict; Log Scale Type is only available in swept measurement	Logarithmic scaling can be used when making a swept SA measurement. It is not available in the SA measurement when you are using FFT sweeps.
-221	Settings conflict; Log Scale Type not available when Segmented Sweep is on	The logarithmic scales are not available while you are using the segmented sweep capability.
-221	Settings conflict; Log Scale Type only available when Frequency Offset = 0 Hz	If you have any amount of frequency offset, then you cannot use logarithmic scaling for the X axis.
-221	Settings conflict; Marker 1 Trace Update=off turns off Signal Track	Signal Track not available unless the trace containing Marker 1 is updating
-221	Settings conflict; Marker cannot be relative to itself	A marker must be set relative to another marker, not to itself.
-221	Settings conflict; Marker Count is not available when Gate on	The marker count function cannot be used while you have gating turned on.

-221	Settings conflict; Marker Function is not available for a Fixed marker	If a Marker is a Fixed type marker, the marker's value does not change from when it first became fixed. You cannot turn on or change a Marker Function because there is no ongoing measurement data to use for the marker function calculation.
-221	Settings conflict; Marker type must be delta	MkrΔ->Span and MkrΔ->CF require that the selected marker be a delta marker.
-221	Settings conflict; Marker-> command is not available with segmented sweep	Most of the “Marker To” commands are not available with segmented sweep turned on. So you cannot select these functions.
-221	Settings conflict; Marker-> function is not available in zero span	Most of the “Marker To” functions are not available if you are in zero span (span = 0 Hz, or time domain). So you cannot send the commands for these functions.
-221	Settings conflict; Meas Type was changed to Examine for Exp Avg Mode.	Average Mode has been changed to Exponential. Full Meas Type is not available for Exponential Average Mode therefore Meas Type has been changed to Examine.
-221	Settings conflict; Meas Type was changed to Full for Repeat Avg Mode	Average Mode has been changed to Repeat. Examine Meas Type is not available for Repeat Average Mode therefore Meas Type has been changed to Full.
-221	Settings Conflict; MinPts/RBW limit not met	
-221	Settings conflict; Mixer Type is not available when in this band	The Mixer Type selection is not available in the K, E, W, F, D, G, Y, J band because those bands do not allow Preselected Mixing.
-221	Settings conflict; Mkr -> CF is not available when the x-axis is time domain	The marker to center frequency functionality does not work when the x-axis is in the time domain.
-221	Settings conflict; MS gain is not available in this Mode	Mobile Station gain correction is not available in some Modes, or in some measurements (for example, the SA measurement).
-221	Settings conflict; No meas frequencies are above 3.6 GHz	Optimize Preselector can only be performed on frequencies in high band i.e. freqs above 3.6 GHz. The current setup does not have input freqs (IF) in this range so an Optimize Preselector cannot be performed.
-221	Settings conflict; Normal detector is not allowed with X scale is Log	The normal detector cannot be used when the x-axis scale is logarithmic. Why not? Are the results weird? Frequency slewed?
-221	Settings conflict; Normalize is not available when Scale Type = Lin	Normalize does not support Linear amplitude scale, since the results are always presented as a dB ratio.

Instrument Messages
-221 Settings Conflict Errors

-221	Settings conflict; Normalize is not available while Demod View is on	The normalization (correction) function cannot be used if you are using the Demod View.
-221	Settings conflict; Normalize is not available while Trace Math is on	The Normalize function works by doing trace manipulation. So if trace math is on you cannot turn on normalization.
-221	Settings conflict; Option not available	You have attempted to perform an action for which a required option is not installed
-221	Settings conflict; Param only available when DUT is a freq converter	SCPI only message. The sideband and freq context parameters are only available when a freq conversion setup is in use. Change setup to contain a freq conversion to use these parameters.
-221	Settings conflict; Param only available when External LO Mode is Swept	SCPI only message. This parameter is only available when the LO mode is set to Swept. Change the LO Mode to Swept.
-221	Settings conflict; Param only available when External LO Mode is Fixed	SCPI only message. This parameter is only available when the LO mode is set to Fixed. Change the Freq Mode to Fixed.
-221	Settings conflict; Param only available when Frequency Mode is Fixed	SCPI only message. This parameter is only available when the Freq mode is set to Fixed. Change the Freq Mode to Fixed.
-221	Settings conflict; Param only available when Frequency Mode is Swept	SCPI only message. This parameter is only available when the Freq mode is set to Swept. Change the Freq Mode to Swept
-221	Settings conflict; Param only available when valid cal data exists	SCPI only message. The 'Apply Calibration' parameter is only available when the stored cal data matches the current setup. Perform a fresh 'Calibrate Now' or change setup such that current cal data is valid.
-221	Settings conflict; Parameter currently is disabled	This parameter is grayed out (unavailable) in the current context. Check the individual parameter help/documentation for more information.
-221	Settings conflict; Preamp gain is not available in this Mode	Preamp gain correction is not available in some Modes or Measurements
-221	Settings conflict; Preamp unavailable with electronic attenuator on	The electronic attenuator is on. Internal preamp cannot be used while you are using the electronic attenuator.
-221	Settings conflict; Reference marker must be in same window	A delta marker and its reference must be in the same window. This error occurs when you try to turn on a delta marker who's reference is in a different window.
-221	Settings conflict; Res BW cannot be auto-coupled while in Zero Span	The resolution bandwidth cannot be set to auto while you are in zero span (time domain).

-221	Settings conflict; Scale Type = Lin is not available when Normalize is on	Only the Log amplitude scale is available in Normalize, since the results are always presented as a dB ratio.
-221	Settings conflict; Settings conflict; Mask unavailable for current Span. Increase to display mask.	The current span setting is either narrower than the mask width or so wide that there are too few display points to allow the mask to be drawn. Increase or decrease the span to display the mask.
-221	Settings conflict; Settings conflict; Pre-trigger is insufficient for demod. Decrease Trig Delay.	
-221	Settings conflict; Signal Track is not available when Freq Scale=Log	The signal tracking feature cannot be used when you have selected a log scale for the frequency axis.
-221	Settings conflict; Signal Track is not available with Continuous Peak	The signal tracking feature cannot be used while you are also using the continuous peak function.
-221	Settings conflict; Signal Track is not available with Segmented Sweep	The signal tracking feature cannot be used when you are using the segmented sweep capability.
-221	Settings conflict; Signal Track is only available in Swept SA measurement	The signal track functionality can be used when making a swept SA measurement. It is not available in the SA measurement when you are using FFT sweeps.
-221	Settings conflict; Signal Track is turned off when Zero Span is selected	Signal Track is not available when you have selected Zero Span. So if Zero Span is entered while in Signal Track is On, Signal Track is turned off.
-221	Settings conflict; Span is not available when Segmented Sweep is on	Segmented Sweep uses multiple sweeps, each with its own span setting. You cannot set the span when segmented sweep is selected because the function does not know which span to change.
-221	Settings Conflict; Span limited to XXX	
-221	Settings conflict; Span Zoom is not available in Zero Span	Span Zoom does not work with a time domain x-axis. You must select a span greater than 0 Hz.
-221	Settings conflict; Span Zoom not available when Frequency Scale Type = Log	The Span Zoom feature cannot be used when the X-axis scale is logarithmic frequency.
-221	Settings conflict; Span Zoom not available when Segmented Sweep is on	Segmented Sweep uses multiple sweeps so it does not know what sweep to zoom in on. Also, it cannot zoom a span over a sweep boundary.
-221	Settings conflict; Step keys are not available to modify this function	You should select a specific value for this function. So using the Up/Down step keys to scroll through values is not allowed.

Instrument Messages
-221 Settings Conflict Errors

-221	Settings conflict; Sweep Setup only available in swept measurements	The current measurement uses FFT mode and so does not use the Sweep Setup menu
-221	Settings conflict; Sweep Time cannot be auto-coupled in FFT sweeps	The sweep time for FFT sweeps is set by the calculations. So sweep time settings cannot be adjusted.
-221	Settings conflict; Sweep Time cannot be auto-coupled while in Zero Span	You cannot send the remote command to set the sweep time to auto while you are in zero span.
-221	Settings conflict; Sweep Time cannot be set while in FFT sweeps	The sweep time for FFT sweeps is set by the calculations. It cannot be manually controlled.
-221	Settings conflict; Swept IF Gain High not available when FFT IF Gain = Manual Low	When FFT IF Gain is manually set to Low, you cannot set the Swept IF Gain to High because that would make the Reference Level couplings wrong in swept mode.
-221	Settings conflict; Swept LO not available when freq mode is Fixed	SCPI only message. The LO Mode cannot be set to Swept when the freq mode is set to fixed. Change the freq mode away from fixed, or perform the measurement at several fixed frequencies.
-221	Settings conflict; Swept Type=Swept is not available while in Gated FFT	If you have selected gated FFT then you are using the FFT sweep type and you cannot select the swept type of sweeping.
-221	Settings conflict; System Display Settings, Annotation is Off	This is an override that turns off many of the annotations. This is available as a security feature.
-221	Settings conflict; T hot must be greater than T cold	The Tcold value set under Meas Setup/ENR/Tcold, needs to be lower than the Thot value currently being set. Tcold is often taken as the ambient temperature of the noise source. If using an SNS the Tcold value may be read automatically before every sweep.
-221	Settings conflict; TG start freq is less than 1/2 Res BW	Tracking generator uncalibrated at start frequencies below 1/2 the current resolution bandwidth.
-221	Settings Conflict; The parameter cannot be changed in FAST mode	
-221	Settings conflict; Trace Math is not available while Normalize is on	The Normalize function works by doing trace manipulation, so trace math is not available while normalization is running.
-221	Settings conflict; Trace smoothing with VBW not available with Avg Detector	
-221	Settings conflict; Trigger is not available with span > 0 Hz.	

-221	Settings conflict; Tx Band Spur meas does not support this frequency band.	The transmit band spur measurement does not support all of the commercially available frequency bands. You need to change your selection under Mode Setup, Radio, Band to one of the supported bands.
-221	Settings conflict; Tx Band Spur measurement is not defined for mobiles.	Only base station testing is available.
-221	Settings conflict; Zero Span not available when Frequency Scale Type = Log	Logarithmic scales cannot be used for time domain sweeps (0 Hz span).
-221	Settings conflict; Zero Span not available when Segmented Sweep is on	Segmented Sweep uses multiple sweeps. It cannot combine sweeps with 0 Hz frequency (time domain sweeps).
-221	Settings conflict; Zone is not available when Segmented Sweep is on	The Zone functionality cannot be used while using segmented sweep.

-200 to -299, Execution Errors

For -221 error messages, see the previous sections.

Note that Execution Errors are divided into subclasses:

- 21x – Trigger errors
- 22x – Parameter error
- 23x – Data corrupt or stale (invalid data)
- 24x – Hardware error
- 25x – Mass storage error
- 26x – Expression data error
- 27x – Macro error
- 28x – Program error (a downloaded program-related execution error)
- 29x – Memory use error

Err#	Message	Verbose/Correction Information
-200	Execution Error	A program execution error has occurred. The exact problem cannot be specifically identified.
-200	Execution error; Carrier frequency outside device's transmit band	The entered channel/carrier frequency is not within the range of your current mode setup selection of standard and device.
-200	Execution error; Invalid GSM burst timing	A GSM-like burst was acquired, but its timing is not valid. Ensure the correct Burst Type has been selected.
-200	Execution error; Invalid IP address	The IP address supplied is either not valid or does not belong to a compatible Signal Generator. Please check the IP address and instrument connection and try again.
-200	Execution error; Invalid Marker Trace.	Cannot place markers on the reference trace, because the reference trace is currently turned off or has no data.
-200	Execution Error; No peak found.	No signal peak was found within the defined parameters of the search.
-200	Execution error; No ranges are defined. Activate a range.	There are no active ranges in the range table. You will need to activate at least one range.
-200	Execution Error; Preselector centering failed	Algorithm failed to center the preselector. This maybe caused by the signal peak being too low in amplitude. Or it could be from excessive CW input signal, alignment error, or hardware failure.
-200	Execution Error; Signal not stable enough to track	The signal that you have selected to track is changing too much for the function to track it properly.

-200	Execution Error; Store ref trace before turning on Normalize	The Reference trace data must be stored in the Ref trace before you turn on the Normalization function.
-200	Execution error; Sync word was not found.	NADC & PDC: In an EVM measurement, the sync word is not found and the synchronization cannot be established when Sync Word is selected in the Burst Sync menu. Flexible Digital Demodulation: The sync word cannot be detected because of inappropriate parameter settings or incorrect signal.
-200	Execution error; Trace file contains no compatible traces.	The trace file may have been created by another version of the Phase Noise personality, which uses a different trace format that is incompatible with the version you are running. Please check you are running the most up to date version of the personality.
-200	Execution error; Trace file created by incompatible version of Phase Noise App	The trace file may have been created by another version of the Phase Noise personality, which uses a different trace format that is incompatible with the version you are running. Please check you are running the most up to date version of the personality.
-201	Invalid while in local	The command cannot be executed while the instrument in Local control.
-202	Settings lost due to rtl	A “return to local” control was forced and some settings were lost as a result of this.
-203	Command protected	The command could not be executed because it is disabled. It was disabled by licensing or password protection
-203	Command protected; feature not licensed	The specified feature, for example “N9073A-TR2” is not licensed. The license may have expired. You cannot use it until you get a license.
-210	Trigger error	A trigger error has occurred, but the exact problem cannot be specifically identified.
-211	Trigger ignored	A GET, *TRG or other triggering signal was received, but it was ignored because of timing considerations. For example, maybe the instrument was not ready to respond when the command was received.
-212	Arm ignored	An arming signal was received, but it was ignored.
-213	Init ignored	An initiate trigger/sweep request was received and ignored, because another measurement was already in progress.
-214	Trigger deadlock	The trigger source for the initiation of a measurement is set to GET, and the following measurement query was received. The measurement cannot be started until a GET is received, but the GET would cause an INTERRUPTED error.
-215	Arm deadlock	The arm source for the initiation of a measurement is set to GET and the following measurement query is received. The measurement cannot be started until a GET is received and the GET would cause an INTERRUPTED error.

Instrument Messages
-200 to -299, Execution Errors

-220	Parameter error	A problem was found with a program data element. The exact problem cannot be specifically identified.
-221	Settings conflict;	There are many types of settings conflict errors. See section 3.5 for information about these errors.
-222	Data out of range;	A data element was found but the instrument could not be set to that value because it was outside the range defined for the command. A descriptive message may be appended, such as “clipped to upper limit”
-222	Data out of range; Invalid list data	You tried to use a trace that has a number of sweep points that is different from the current setting of sweep points.
-222	Data out of range; Two entries already exist at this x-axis value.	When entering values for limit lines, you cannot have more than two y-axis (amplitude) values entered for a specific x-axis (frequency) value.
-223	Too much data	A data element (of block, expression, array type, or string type) had more data than allowed by the command, or by the available memory.
-223	Too much data; 200 spurs found. Additional spurs ignored.	There are too many spurs for the table (the limit is 200), and any additional spurs that are found will be ignored.
-224	Illegal parameter value	An exact data value (from a list of the allowed values) was required - but not found. See the feature description for information about the expected parameter values.
-224	Illegal parameter value; <Value> invalid. Fractional values are not allowed.	The seconds parameter of an LXI time may not contain a fractional portion. For example 123456789.0 is valid while 123456789.1 is not.
-224	Illegal parameter value; <value> out of range.	The value does not fall in the valid range
-224	Illegal parameter value; Exceeding the max list length	The list parameters have a maximum allowed length. You are trying to set a length longer than the maximum.
-224	Illegal parameter value; Gated FFT is not available while Sweep Type is set to Swept	The gated FFT function is not available if you have selected the swept type of sweep. You must be in the FFT sweep type.
-224	Illegal parameter value; Gated LO is not available while Sweep Type is set to FFT	The FFT sweep type moves the LO frequency in steps. So the gated LO function is not available if you have selected FFT sweep.
-224	Illegal parameter value; Gated Video is not available while Sweep Type is set to FFT	The gated video function is not available if you have selected the FFT sweep type.

-224	Illegal parameter value; Illegal identifier <identifier>. This value may already be in use.	The value for the LXI LAN identifier parameter must be unique (i.e. LAN0 and LAN7 must have different identifier strings).
-224	Illegal parameter value; Index out of range	When querying the LXI Event Log or the Servo Log, an index may be used to look at a specific entry. This error occurs if the index provided does not point to a valid entry.
-224	Illegal parameter value; Invalid list length	You are trying to set some list measurement settings, but the multiple lists that you sent were not all the same length. The number of settings must be consistent from list to list.
-224	Illegal parameter value; LXI Event <event> already exists.	This error occurs when you try to add an LXI Event that has already been added.
-224	Illegal parameter value; LXI Event <event> contains illegal characters.	When a new LXI Event is created, it may not use the comma, semicolon, or newline characters. All other printable ASCII characters are valid.
-224	Illegal parameter value; LXI Event <event> does not exist.	The requested event has not been added yet.
-224	Illegal parameter value; Measurement not available	You tried to turn on a measurement that is not available in the current mode.
-224	Illegal parameter value; trace points not available for tier	You tried to import a trace file that contains trace points that don't match the number of trace points available for your software license tier.
-225	Out of memory	There is not enough memory to perform the requested operation.
-225	Out of memory; Memory limit caused Data Acquisition to be truncated	
-226	List not same length	You are using the LIST structure, but have individual lists that are not the same lengths.
-230	Data corrupt or stale;	A legal data element was found, but it could not be used because the data format or the data structure was not correct. Maybe a new measurement had been started but had not completed.
-230	Data corrupt or stale; Measurement data is not available	Measurement data not available. The measurement that you are trying to get data from must be the current active measurement. Maybe you have not initiated the measurement, or it has not completed all the sweeps/averages needed.
-230	Data corrupt or stale; Trace contains no data.	Trace cannot be displayed because currently there is no data assigned to it. Use the functions under the Trace menu, or load a previously saved trace, to assign data to the trace.

Instrument Messages
-200 to -299, Execution Errors

-230	Data corrupt or stale; Unable to load state from file	There is something wrong with the state data in the desired file. Maybe the file is corrupt, or it is from an instrument/version that is not recognized by the current instrument.
-231	Data questionable	Indicates that the measurement accuracy is suspect
-232	Invalid format	A data element was found but it could not be used because the data format or the data structure was not correct.
-232	Invalid format; Map information not loaded	Instrument failed to load the burst mapping information from the selected file.
-233	Invalid version	A legal data element was found but could not be used because the version of the data is incorrect. For example, state data changes as new instrument features are added, so old state files may not work in an instrument with a newer version of software.
-240	Hardware error	A legal program command or query could not be executed because of a hardware error. The exact problem cannot be specifically identified.
-240	Hardware error; See details in Windows Event Log under SA	The internal data acquisition system detected a problem at startup and logged the details in the Windows Event Log.
-241	Hardware missing	The operation could not be performed because of missing hardware; perhaps the optional hardware is not installed.
-241	Hardware missing; Internal preamp not available at all frequency points	The Internal Preamp is currently turned on, but the measurement is being performed completely or partially outside the range of the preamp. It is recommended that the user turns preamp off to ensure consistent results across the entire measurement.
-241	Hardware missing; not available for this model number	The hardware required is not part of this model
-241	Hardware missing; Option not installed	The optional hardware is not installed.
-250	Mass storage error;	A problem was found with the mass storage device (memory, disk drive, etc.). The exact problem cannot be specifically identified.
-250	Mass storage error; Access denied	Access is denied.
-250	Mass storage error; Bad path name	The specified path is invalid.
-250	Mass storage error; Can only import single trace .csv files	Trace files containing multiple traces can not be imported. However, if you need to recall multiple traces you can use the Save and Recall functions rather than the Import and Export functions.
-250	Mass storage error; Cannot make	The directory or file cannot be created.

-250	Mass storage error; Different Antenna Unit already in use	Attempt to import Corrections file with Antenna Unit that differs from an in-use correction.
-250	Mass storage error; Directory not found	The system cannot find the path specified.
-250	Mass storage error; Failed to Load trace. Bad file format.	The load trace operation could not be completed, as the input file was not in the expected format. You can only load traces that were previously saved using the 'Save Trace' feature.
-250	Mass storage error; File <filename> wrong type	Attempt to import a data file that is not the proper type for this operation.
-250	Mass storage error; File <filename> and instrument version mismatch	While opening a file, there was a mismatch between file version or model number with instrument version or model number. The import still tried to load as much as possible, but you should check it closely.
-250	Mass storage error; File contains incorrect data for this operation	There is a mismatch between the file data type of the file specified and the destination indicated. For example, a correction set cannot be loaded/imported into a limit line.
-250	Mass storage error; File empty	Cannot save trace because it contains no data. Check that the trace is turned on and contains some valid data.
-250	Mass storage error; Invalid register number for *SAV or *RCL	You have used the *SAV command to save a state to a non-existent state register. Or You have used the *RCL command to recall a state register that wasn't previously saved with the *SAV command.
-250	Mass storage error; Lock violation	The process cannot access the file because another process has locked a portion of the file.
-250	Mass storage error; No file names available	Attempt to use the auto file name generation when all 10,000 file names are taken.
-250	Mass storage error; Open failed	The system cannot open the device or file specified. This could be because the storage media is full, or possibly due to a filename error. If using an external storage device, check that the device is properly formatted.
-250	Mass storage error; Read fault	The system cannot read from the specified device.
-250	Mass storage error; Register <number> empty	Attempt to recall a register with nothing in it
-250	Mass storage error; Sharing violation	The process cannot access the file because it is being used by another process.
-250	Mass storage error; Too many open files	The system cannot open the file.

Instrument Messages
-200 to -299, Execution Errors

-250	Mass storage error; Write fault	The system cannot write to the specified device.
-252	Missing media	A legal command or query could not be executed because missing media.
-253	Corrupt media	A removable media was found to be bad or incorrectly formatted. Any existing data on the media may have been lost.
-254	Media full	A legal command/query could not be executed because the media was full
-255	Directory full	A legal command or query could not be executed because media directory was full.
-256	File name not found;	A legal command or query could not be executed because the file name was not found in the specified location.
-257	File name error;	A legal command or query could not be executed because there was an error with the file name on the device media. For example, maybe you tried to copy to a duplicate file name.
-257	File name error; Allowable extension is .csv	You are using the wrong type of file extension for the current data/file type.
-257	File name error; Allowable extension is .png	You are using the wrong type of file extension for the current data/file type.
-257	File name error; Allowable extension is .state	You are using the wrong type of file extension for the current data/file type.
-257	File name error; Invalid file name	The filename, directory name, or volume label syntax is incorrect.
-257	File name error; name too long	
-258	Media protected	A legal command or query could not be executed because the media was protected. For example, the write-protect was set
-260	Expression error	An error was found with an expression type of data element. The exact problem cannot be specifically identified.
-261	Math error in expression	An expression that has legal syntax could not be executed because of a math error. For example, maybe you are dividing by zero.
-270	Macro error	Indicates that a macro-related execution error occurred.
-271	Macro syntax error	Indicates a syntax error within the macro definition
-272	Macro execution error	Indicates that a syntactically legal macro program data sequence could not be executed due to some error in the macro definition
-273	Illegal macro label	Indicates that the macro label defined in the *DMC command was a legal string syntax, but could not be accepted
-274	Macro parameter error	Indicates that the macro definition improperly used a macro parameter placeholder

-275	Macro definition too long	Indicates that a syntactically legal macro program data sequence could not be executed because the string or block contents were too long for the device to handle
-276	Macro recursion error	Indicates that a syntactically legal macro program data sequence could not be executed because the device found it to be recursive
-277	Macro redefinition\ not allowed	Indicates that a syntactically legal macro label in the *DMC command could not be executed because the macro label was already defined
-278	Macro header not found	Indicates that a syntactically legal macro label in the *GMC? query could not be executed because the header was not previously defined.
-280	Program error	There was an execution error in a down-loaded program. The exact problem cannot be specifically identified.
-281	Cannot create program	Indicates that an attempt to create a program was unsuccessful. A reason for the failure might include not enough memory.
-282	Illegal program name	The name used to reference a program was invalid; for example, redefining an existing program, deleting a nonexistent program, or in general, referencing a nonexistent program.
-283	Illegal variable name	An attempt was made to reference a nonexistent variable in a program.
-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.
-285	Program syntax error	Indicates that a syntax error appears in a downloaded program. The syntax used when parsing the downloaded program is device-specific.
-286	Program runtime error	
-290	Memory use errors	
-291	Out of memory	
-292	Referenced name does not exist	
-293	Referenced name already exists	
-294	Incompatible type	Indicates that the type or structure of a memory item is inadequate

-100 to -199, Command Errors

Err#	Message	Verbose/Correction Information
-100	Command error	There is a problem with the command. The exact problem cannot be specifically identified.
-101	Invalid character	An invalid character was found in part of the command.
-102	Syntax error	An unrecognized command or data type was found, for example a string was received for a command that doesn't accept strings.
-103	Invalid separator	The command was supposed to contain a separator but we found an illegal character. For example, the semicolon was omitted after a command string.
-104	Data type error	We found a data type different than what was expected. For example, numeric or string data was expected, but block data was found.
-105	GET not allowed	A Group Execute Trigger was received within a program message.
-108	Parameter not allowed	More parameters were received than were expected for the command. For example, the *ESE common command only accepts one parameter, so sending *ESE 0,1 is not allowed.
-109	Missing parameter	Fewer parameters were received than required for this command.
-110	Command header error	This is a general error that is generated when a problem is found in a command header, but we can't tell more specifically what the problem is
-111	Header separator error	We found an illegal character in a command where we expected to find a separator.
-112	Program mnemonic too long	The command contains a keyword that is more than twelve characters.
-113	Undefined header	The command meets the SCPI syntax requirements, but is not valid in the current measurement environment.
-114	Header suffix out of range	The value of a numeric suffix that is attached to a program mnemonic makes the header invalid. (A suffix is usually units, like Hz or DB.)
-115	Unexpected number of parameters	The number of parameters received does not correspond to the number of parameters expected.
-120	Numeric data error	An error was found in a data element that appears to be numeric. The exact problem cannot be specifically identified.

-121	Invalid character in number	A character was found that is not valid for the data type. For example, an alpha in a decimal numeric or a “9” in octal data.
-123	Exponent too large	The magnitude of an exponent was greater than 32000.
-124	Too many digits	The mantissa of a decimal-numeric contained more than 255 digits, excluding leading zeros.
-128	Numeric data not allowed	A legal numeric data element was found, but that is not a valid element at this position in the command.
-130	Suffix error	A problem was found in a suffix (units). The exact problem cannot be specifically identified.
-131	Invalid suffix	There is a syntax problem with the suffix. You need to use the suffix (units) that are allowed by this command.
-134	Suffix too long	The suffix contained more than twelve characters.
-138	Suffix not allowed	A suffix was found after a numeric element that does not allow suffixes (units).
-140	Character data error	A problem was found with a character data element. The exact problem cannot be specifically identified.
-141	Invalid character data	Either the character data element contains an invalid character or the element itself is not valid for this command.
-144	Character data too long	The character data element contains more than twelve characters.
-148	Character data not allowed	A character data element that you sent is valid, but it is not allowed in this point in the parsing.
-150	String data error	A problem was found with a string data element. The exact problem cannot be specifically identified.
-151	Invalid string data	A string type of data element was expected, but it is invalid for some reason. For example, an END message was received before the terminal quote character.
-158	String data not allowed	A string data element that you sent is valid, but it is not allowed at this point in the parsing.
-160	Block data error	A problem was found with a block data element. The exact problem cannot be specifically identified.
-161	Invalid block data	A block data element was expected, but it was invalid. For example, an END message was received before the end length was satisfied.
-168	Block data not allowed	A legal block data element was found, but it is not allowed at this point in the parsing.
-170	Expression error	A problem was found with an expression data element. The exact problem cannot be specifically identified.
-171	Invalid expression	An expression data element is not valid. For example, there may be unmatched parentheses or an illegal character.

Instrument Messages
-100 to -199, Command Errors

-178	Expression data not allowed	A legal expression data was found, but it is not allowed at this point in the parsing.
-180	Macro error	A problem was found with a macro element. The exact problem cannot be specifically identified.
-181	Invalid outside macro definition	Indicates that a macro parameter placeholder was encountered outside of a macro definition.
-183	Invalid inside macro definition	Indicates that the program message unit sequence, sent with a *DDT or *DMC command, is syntactically invalid
-184	Macro parameter error	Indicates that a command inside the macro definition had the wrong number or type of parameters.

0 Error

Err#	Message	Verbose/Correction Information
0	No error	The queue is empty. Either every error in the queue has been read, or the queue was cleared by power-on or *CLS.

Condition Errors 1 to 99, Calibration

Condition Errors 6 to 34, Calibration Skipped

Errors with instrument internal alignment routines being skipped. (Selected to not be executed.)

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 6 indicates that the RF Alignment not being done during alignments has been detected, error 1006 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
6	Align RF Skipped	W	
8	unused bit4 is set		
10	unused bit4 is set		
12	unused bit4 is set		
14	unused bit4 is set		
16	unused bit5 is set		
18	unused bit6 is set		
20	unused bit7 is set		
22	unused bit8 is set		
24	unused bit9 is set		
26	unused bit10 is set		
28	unused bit11 is set		
30	unused bit12 is set		
32	unused bit13 is set		
34	unused bit14 is set		

Condition Errors 36 to 64, Calibration Needed or Failed

Errors with instrument internal alignment routines.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 42 indicates an RF Alignment Failure has been detected, error 1042 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
36	DCFM Zero Failure	E	
38	IQ Calibration Failure	E	
40	TG Alignment Failure	E	
42	RF Alignment Failure	E	
44	IF Alignment Failure	E	
46	LO Alignment Failure	E	
48	ADC Alignment Failure	E	
50	FM Demod Alignment Failure	E	
52	Extended Align Needed Sum	E	
54	Extended Align Failure Sum	E	
56	Tracking Peak Needed	W	
58	Align Skipped Sum	E	
60	Align RF Now Needed	E	
62	Corrections Off	W	
64	Align All Now Needed	E	

Condition Errors 65 to 92, Calibration Needed (Extended)

Errors with instrument internal alignment routines.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 66 indicates that the requirement for an Alignment of the EMI conducted frequency range has been detected; error 1066 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
65	unused bit0 is set		
66	Align 9kHz-30MHz required	E	An EMI conducted frequency range alignment is needed.
68	Align 30MHz-1GHz required	E	An EMI radiated frequency range alignment is needed.
72	Input Attenuation not calibrated	E	Corrected measurements have been requested and the required RF front-end setting of x dB has not been calibrated.
74	unused bit5 is set		
76	unused bit6 is set		
78	unused bit7 is set		
80	unused bit8 is set		
82	unused bit9 is set		
84	unused bit10 is set		
86	unused bit11 is set		
88	unused bit12 is set		
90	unused bit13 is set		
92	unused bit14 is set		

Condition Errors 67 to 95, Calibration Failure (Extended)

Errors with instrument internal alignment routines failing.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 67 indicates that the RF Alignment not being done during alignments has been detected, error 1067 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
67	Align 9kHz to 30MHz failed	W	
69	Align 30MHz to 1GHz failed	W	
71	Characterize Preselector failure	W	The preselector characterization routine failed.
73	unused bit4 is set		
75	unused bit4 is set		
77	unused bit5 is set		
79	unused bit6 is set		
81	unused bit7 is set		
83	unused bit8 is set		
85	unused bit9 is set		
87	unused bit10 is set		
89	unused bit11 is set		
91	unused bit12 is set		
93	unused bit13 is set		
95	unused bit14 is set		

Condition Errors 101 to 199, Measurement Integrity

Errors with making measurements: triggering, over range, bad acquisition/data, bad settings.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 129 indicates a Meas Uncal condition has been detected, error 1129 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
133	Signal Summary	E	
135	No Result	E	
135	No Result; Meas invalid with I/Q inputs	E	The current measurement does not support I/Q input; switch to the RF or another input or select a different measurement
135	No Result; Turn on MCE	E	To calculate Timing and Phase results in the Code Domain Power view of Mod Accuracy, the "Multi Channel Estimator" must be set to ON. Otherwise these results are invalid.
139	Uncalibrated Summary	E	
141	Input Overload	W	
141	Input Overload; ADC over range	W	The signal at the input to the IF section is too high. You should increase the attenuation or lower the signal level.
141	Input Overload; I/Q ADC over range	W	The I or Q input exceeds the ADC upper limit.
141	Input Overload; I/Q Voltage over range	W	The input voltage on the I or Q channel exceeds the channel limit. In differential mode the over voltage may occur without causing an ADC overload, for example, if I is at +5.01 V and I-bar is at +5.0 the ADC will be in range but both I and I-bar will exceed the voltage limit.
147	Insufficient Data	E	

147	Insufficient Data; ENR table empty	E	A measurement was attempted or a SCPI query of an ENR table was made and there were no entries in the relevant ENR table (Common, Meas or Cal).
147	Insufficient Data; frequency list empty	E	A measurement was attempted with List frequency mode or a SCPI query of the frequency list table was made and the frequency list table is empty.
147	Insufficient Data; Incr. Demod Time	E	There is insufficient acquisition data to provide accurate metrics. You should increase the Demod Time to acquire enough data.
147	Insufficient Data; Loss table empty	E	A measurement is attempted or a SCPI query of a before or after loss table is made and there are no entries in the relevant loss table
151	Memory Error	E	
151	Memory Error; Shorten capture interval	E	A shortage of free memory related to longer capture intervals has occurred. The measurement is aborted and all results return invalid values
153	I/O Error	E	
153	I/O Error; Ext Source needs IP Addr	E	No IP address entered for external source and external LO control is ON.
155	Trig Error	E	
157	Invalid Data		This is the “dirty marker”, no message in the status line and nothing in the history queue, but there IS an on screen indication so in that sense this is a special case.
159	Settings Alert	W	.
159	Settings Alert; Diff probe mismatch; <I Q I,Q>	W	The attenuation values two probes on the I and/or Q channels differ by too much for a valid differential reading.
159	Settings Alert; LO may overload IF	W	If the sweep type is Swept, the start frequency of the instrument is less than 10 MHz, and you put Swept IF Gain in Manual High, then a warning condition is generated and remains in effect as long as this condition exists.
161	Setting Modified	E	
161	Setting Modified; Filter not applied	E	The filter you have selected is larger than the sampling frequency. You should select a different filter.

Condition Errors 201 to 299, Signal Integrity

Errors with the signals being measured: signals not found (timing/frequency/amplitude), signals noisy or degraded.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 207 indicates a Burst Not Found condition has been detected, error 1207 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
203	unused bit0 is set	E	
205	Degraded Performance	E	
207	Burst Not Found	E	<p>The burst signal cannot be detected because of inappropriate parameter settings or incorrect signal.</p> <p>An in appropriate parameter setting could cause the signal to be partially, rather than fully, on the display, Burst Search Threshold and/or Burst Search Length may need to be adjusted.</p> <p>An incorrect signal could have either insufficient power, the rising or falling edges cannot be detected, or the burst is less than 126 microseconds.</p> <p>Carrier signal is not actually bursted.</p> <p>W-CDMA: Either the signal being analyzed has insufficient power, the rising or falling edges cannot be detected, or the burst is less than 126 microseconds.</p> <p>W_CDMA: Cannot synchronize measurement with PRACH channel for Power Control measurement, because the signal cannot be found. Make sure PRACH is present in the W-CDMA uplink signal, and that the preamble signature and scramble code are set correctly.</p>

207 (cont)	Burst Not Found (cont.)	E	<p>GSM: Data was acquired but a GSM burst was not found, with the timeslot mode disabled.</p> <p>NADC, PDC: A valid burst is not found when the Device is MS.</p> <p>1xEV-DO: Data was acquired but a 1xEV burst was not found, with the timeslot mode disabled.</p> <p>Bluetooth: The burst that has been found does not correspond to the currently selected Bluetooth packet type (the burst length may be too short).</p> <p>WLAN: The instrument cannot find a valid WLAN burst. You may need to extend the search length.</p>
209	Timing Error	E	
209	Timing Error:No time ref pilot burst	E	The pilot burst used for time reference is not active.
211	Carrier(s) incorrect or missing	E	
213	Freq Out of Range	E	
213	Freq Out of Range; External LO	E	One or more external LO frequencies are out of range. Check that the LO frequency limits are set correctly and check the entered measurement frequencies and measurement mode.
213	Freq Out of Range; System input (IF)	E	One or more system input frequencies are out of range. If using a frequency list, check that all entries are valid for current measurement mode.
215	Sync Error	E	<p>W-CDMA: Cannot sync DPCCH pilot.</p> <p>Cannot synchronize measurement with DPCCH pilot for Power Control measurement, because the pilot signal cannot be found. Make sure DPCCH is present in the W-CDMA uplink signal, and that the slot format and scramble code are set correctly.</p>
215	Sync Error;Midamble sync fail	E	Failed to find the uplink slot, which caused the synchronization with the midamble to fail.
215	Sync Error;No freq ref pilot burst	E	The pilot burst used for frequency reference is not active.
215	Sync Error;No pilot burst	E	There is no Pilot burst detected.
215	Sync Error;Preamble length zero	E	Burst type is "Data" or "Preamble" and the measurement cannot find a Preamble
215	Sync Error;Sync code not found	E	Synchronization code is not found in the measured time slot.

Instrument Messages
Condition Errors 201 to 299, Signal Integrity

217	Demod Error	E	<p>This error is normally generated because of one of the following reasons:</p> <ol style="list-style-type: none"> 1. There is no carrier signal. 2. Walsh channels other than the pilot are active. 3. There is some other modulation problem that will prevent the measurement from being made. <p>This problem must be corrected before the measurement can continue.</p> <p>cdma 2000 & W-CDMA: Cannot correlate to the input signal and no active channel is found. (from composite EVM measurement) An active channel must meet the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the active set threshold function in the Meas Setup menu.</p> <p>cdmaOne: A correlation failure with the pilot CDMA channel occurred during synchronous demodulation.</p> <p>1xEV-DO: Cannot correlate to the input signal and no active channel is found. (from composite EVM measurement) An active channel must meet the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the active set threshold function in the Meas Setup menu.</p>
217	Demod Error;Can't correlate	E	<p>Cannot correlate to the input signal and no active channel is found. (from composite EVM measurement) An active channel must meet the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the active set threshold function in the Meas Setup menu.</p>
217	Demod Error;Data interval too short	E	<p>There are not enough input I/Q pairs for the measurement calculation. This may be caused by an incorrect data capture.</p>
217	Demod Error;Muxed bits not found	E	<p>Multiplexed Data Demod Bits are not generated even though Data channel is selected, because all 16 data code channels are not active</p>
217	Demod Error;No active channel	E	<p>There is no active channel detected.</p>
217	Demod Error;No full subframe found	E	<p>No sub-frame or only part of one sub-frame is detected.</p>
217	Demod Error;Not an active slot	E	<p>There is no active slot detected.</p>

219	Signal Too Noisy	E	NADC & PDC: The valid EVM measurement cannot be performed, because the input signal is too noisy. GSM & EDGE: In a GSM measurement, indicates that a burst could not be found in a signal that appears noisy.
221	Slot Error	E	
221	Slot Error; No idle slot found	E	No valid idle slot found in captured data, or no idle slot found in captured interval. Synchronization may succeed and pilot found when this message is issued, but no results are included in peak/average calculation.
221	Slot error;No active slot found	E	No valid active slot found in captured data, or no active slot found in captured interval. Synchronization may succeed and pilot found when this message is issued, but no results are included in peak/average calculation.
223	unused bit10 is set	E	
225	unused bit11 is set	E	
227	unused bit12 is set	E	
229	unused bit13 is set	E	
231	unused bit14 is set	E	

Condition Errors 301 to 399, Uncalibrated Integrity

Errors with measurement calibration/alignment routines and signals.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 307 indicates an “AC: unspec’d below 10 MHz” condition has been detected; error 1307 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
301	Meas Uncal	W	
303	Sig ID On	W	
305	No Long Code Phase	W	
307	AC coupled: Accy unspec’d <10 MHz	W	AC input coupling will function at lower frequencies, but the performance is not specified below 10 MHz.
309	User cal	W	
309	User Cal; Adjusted for new RBW	W	The measurement RBW has been changed since the last calibration (~CAL)

309	User Cal; Cal invalidated	E	<p>The existing user cal has been invalidated because of one of the following reasons:</p> <p>Frequency: Setting the frequency outside the current valid user cal set (for example: If the current sweep range is 2 to 3GHz, then setting the start frequency to 1.9 GHz will invalidate the current user cal. Other frequency changes that will invalidate the user cal are:</p> <ul style="list-style-type: none"> • If the cal was performed at a fixed frequency and you change this frequency. • If you are in "Freq List" mode and you change it to extend beyond the current user cal range. In this case you will see an error message. <p>DUT Type: If the DUT Type parameter changes, causing the measurement frequencies to be pushed outside the current cal.</p> <p>Attenuation: If an attenuation setting is selected but has not been calibrated.</p> <p>Preamp: If set to condition different from current cal settings, for example: if calibrated with the preamp on, turning it off will invalidate the cal.</p> <p>Points: Changing the number of measured frequency points can make the stored preselector offsets become inaccurate and hence invalidate the calibration. This occurs when the following conditions exist:</p> <ul style="list-style-type: none"> • A successful calibration has been performed. • Some measured freq points are > 3.6 GHz. • The new points > 3.6 GHz are located more than 50 MHz away from the current calibration points.
309	User Cal; Cal will be interpolated	W	The measurement frequency range has been changed such that it is a subset of the calibrated range. (~CAL)
309	User Cal; Freq outside cal range	E	The existing user cal has been invalidated because the current measurement frequencies lie partially or wholly outside the range of frequencies used for user-cal. (UNCAL)
311	Calibration	W	
311	Calibration; ENR table extrapolated	W	<p>One or more calibration or measurement frequency points exceed the currently loaded Cal or Meas ENR Table frequency ranges. The corresponding ENR table's lowest frequency ENR value will be re-used for frequencies less than the table range, and the highest frequency ENR value will be re-used for frequencies greater than the table range.</p> <p>(~ENR)</p>

311	Calibration; No ENR data present	W	No ENR Data (ENR)
313	unused bit6 is set	W	
315	unused bit7 is set	W	
317	unused bit8 is set	W	
319	unused bit9 is set	W	
321	unused bit10 is set	W	
323	unused bit11 is set	W	
325	unused bit12 is set	W	
327	unused bit13 is set	W	
329	unused bit14 is set	W	

Condition Errors 401 to 499, Power

Errors with signal power unlevelled, overloaded, oscillating.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 409 indicates a 50 MHz Oscillator Unlevelled condition has been detected, error 1409 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
401	RPP Tripped	W	
403	Source Unlevelled	W	
405	Source LO Unlevelled	E	
407	LO Unlevelled	E	
409	50 MHz Oscillator Unlevelled	E	
411	50 MHz Input Power too High for Cal	W	
413	Input Overload	W	ADC Input overload
415	unused bit7 is set		
417	LO Out Unlevelled	W	
419	Preselector Overload		
421	unused bit10 is set		
423	unused bit11 is set		
425	unused bit12 is set		
427	unused bit13 is set		
429	unused bit14 is set		

Condition Errors 501 to 599, Frequency

Errors with signal frequency unlocked, span/bandwidth/freq reference problems.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 503 indicates a Frequency Reference Unlocked condition has been detected, error 1503 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
501	Source Synthesizer Unlocked	E	
503	Frequency Reference Unlocked	E	
505	2nd LO Unlocked	E	
507	BB Data Clock Synth Unlocked	E	
509	LO Unlocked	E	
511	Invalid Span or BW	W	
513	IF Synthesizer Unlocked	E	
515	Calibration Oscillator Unlocked	E	
517	Even Second Clock Synth Unlocked	E	
519	Demodulation		
521	External ref out of range	E	The external frequency reference signal is missing or is not within the proper amplitude range.
523	unused bit11 is set		
525	unused bit12 is set		
527	unused bit13 is set		
529	unused bit14 is set		

Condition Errors 601 to 699, Error Summaries

The instrument hardware status registers keep track of various error conditions. The bits in this register summarize the status of several different status registers.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 601 indicates a bit in the Voltage Summary register has been set, error 1601 indicates that failure has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
601	Voltage		
603	Current		
605	Time		
607	Power		
609	Temperature		
611	Frequency		
613	Phase		
615	Modulation		
617	Calibration		
619	Integrity		
621	unused bit10 is set		
623	CALL		
625	unused bit12 is set		
627	Integrity		
629	Command Warning		

Condition Errors 701 to 799, Operation

Errors showing that the instrument is busy doing something.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 711 indicates that the Waiting for Trigger condition has been detected; error 1711 indicates that condition has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
701	Calibrating		
703	Setting		
705	Ranging		
707	Sweeping		
709	Measuring		
711	Waiting for Trigger		
713	Waiting for ARM		
715	Correcting		
717	Paused		
719	NMR Ready Summary		
721	DC Coupled	W	
723	Printing		
725	Mass Memory Busy		
727	Instrument Summary		
729	Program Running		

Condition Errors 801 to 899, Temperature

Errors with instrument internal temperatures.

An event with the error number shown in the table means the condition has been detected.

When the condition is cleared, an event with the error number plus 1000 is generated.

For example, error 801 indicates that the Ref Osc Oven Cold condition has been detected; error 1801 indicates that condition has been cleared.

An E in the Error or Warning column means that an error is put up on the front panel and sent out to SCPI when this condition is detected. A W in this column means that a Warning is put up on the front panel but nothing goes out to SCPI. Nothing in this column means nothing is put up; status bit only.

Err#	Message	Error or Warning	Verbose/Correction Information
801	Reference Oscillator Oven Cold	W	
803	unused bit1 is set		
805	unused bit2 is set		
807	unused bit3 is set		
809	unused bit4 is set		
811	unused bit5 is set		
813	unused bit6 is set		
815	unused bit7 is set		
817	unused bit8 is set		
819	unused bit9 is set		
821	unused bit10 is set		
823	unused bit11 is set		
825	unused bit12 is set		
827	unused bit13 is set		
829	unused bit14 is set		

4 RF Section Troubleshooting

What You Will Find in This Chapter

The following information is found in this chapter:

1. Theory of operation of the RF section
2. Isolating the cause of an hardware problem by verifying the functionality of assemblies in the RF section signal path.

NOTE

Each section describes how the assembly works and gives information to help you troubleshoot the assembly. Each description covers the purpose of the assembly, describes the main components, and lists external connections to the assembly.

This following descriptions are found in this chapter:

RF Assembly Description	page 127
RF Section Theory of Operation	page 131
Troubleshooting	page 130

RF Assembly Description

Purpose

There are various optional frequency ranges that can be ordered with the N9000A, Signal Analyzer.

- Option 503, 3.0 GHz Frequency Range
- Option 507, 7.5 GHz Frequency Range

The RF input signal can be routed through three different front end signal paths. These various paths are switched in and out based on where the signal analyzer center frequency is tuned.

1. Low band RF path is used when the input frequency is ≤ 3.0 GHz
2. High band RF path is used when the input frequency is > 3.0 GHz to 7.5 GHz

The RF board have both RF section and AIF section. The RF section is designed to convert RF input signals to an intermediate frequency of 322.5 MHz. Then a switch to high-band and low-band merged together. Signal entered AIF section. The AIF section provides gain to compensate for the loss of the second mixer and adjust the IF output level to ADC in DIF. It down converts the second IF frequency 322.5 MHz to the third IF frequency 22.5 MHz with the appropriate gain and filtering. The AIF section also provides RF Triggering.

1. When tuned below 3.0 GHz, the RF section up-converts the signal to low band first IF of 3947.5 MHz and then down converts to second IF of 322.5 MHz with the appropriate filtering and switchable preamplifier. The image and out-of-band responses will be eliminated by the low band pass filter.
2. When tuned in the high band (3 GHz to 7.5 GHz), the RF section down converts the signal to high band first IF of 1228.75 MHz and then down converts to second IF of 322.5 MHz with the appropriate filtering and switchable preamplifier. The image and out-of-band responses will be eliminated by the six groups of preselector filters. HA

Inputs to the RF assembly

- 1st LO Input (from the A9 L.O. Assembly)
- 3rd LO Input (from the A9 L.O. Assembly)
- 100 MHz reference signal (from the A9 L.O. Assembly)
- Signal Input (from the Signal Input Connector)
- 50 MHz Cal signal (from the A9 L.O. Assembly)

Outputs from the RF assembly

- 22.5 MHz signal (to A2 Digital I.F. Assembly)
- AUX IF Output (to Rear Panel)

RF Section Theory of Operation

Input Attenuator

The input attenuator has 50 dB of attenuation adjustable in 1 dB steps. The attenuator is built in two stages: A 20dB power stage and a 31dB x 1dB steps variable attenuator.

Low Pass Filter

While in low band, the low pass filter works as pre-filter to pass the low band frequencies.

Preselector Filters

The preselector filters are used for high band input frequencies. There are six groups of preselector filters, whose main purpose is to filter out unwanted spurious or image response signals.

Mixer

There are three mixers that reside on this assembly.

The first mixer is used to upconvert the low band signal to first IF frequency 3947.5 MHz, while down convert the high band signal to first IF frequency 1228.75 MHz.

The second mixer is used to down convert first IF signal to second IF frequency 322.5 MHz.

The third mixer is used to convert the 322.5 MHz second IF to 22.5 MHz.

1st IF Amplifier

This filter is centered around the first IF frequency and to reject the image frequency.

1st IF Filter

This filter is centered around the first IF frequency and to reject the image frequency.

2nd LO

The 2nd LO signal reside on this assembly for use as LO for the second mixer.

2nd IF Amplifier

Provides IF gain and isolation between the second mixers and the 322.5MHz bandpass filter.

2nd IF Filter

Provides image filtering (~25MHz BW) when in wide-band demod mode, and protects downstream circuits from strong out-of-band signals.

Step Attenuator

A 1 dB step attenuator follows to compensate for band gain differences.

3rd LO

The 300 MHz 3rd LO signal comes from the A9 L.O. Assembly and conditions it for use as an LO in the third mixer that reside on this assembly.

3rd IF Amplifier

First amplifier

Provides fixed gain (about 13dB) to improve noise figure.

Second amplifier (variable amplifier)

Provides variable gain to keep overall gain constant for different paths.

Step Gain amplifier (last amplifier)

Provides an additional switchable 10 dB of gain to overcome the ADC noise floor and provide an additional 2 dB or so of sensitivity.

3rd IF Filter

The third IF filters are anti-alias filters, which attenuate unwanted out-of-band noise and distortion products. The first anti-alias filter is centered at 22.5 MHz with 25 MHz wide. The signal can bypass the second anti-alias filter when the analyzer utilizes Basic Analyzer swept, or wide-band demod. The through path is selected when the image filter is in the 25 MHz mode (for Basic Analyzer swept and wide-band demod). In all other cases the signal will pass through the second 12 MHz anti-alias filter.

Burst Carrier Trigger

The Burst Carrier Trigger detector provides a binary signal to be used as a trigger based on the presence of an RF input signal or not. The variable gain amplifiers drive a detector and its output drives a comparator which generates the trigger signal.

Troubleshooting

The N9000A has an internal 50 MHz amplitude reference signal that is used to verify the low band path. Refer to [Chapter 10](#) , “Block Diagrams” for details.

Equipment needed:

Functioning Spectrum Analyzer

DVM

Cables & Connectors

NOTE

To perform the following checks, it will be necessary to remove the outer cover and the top brace. See [Chapter 13](#) for removal procedures.

Turn the instrument on and allow it to complete its full boot up process to Spectrum Analyzer mode. Use the internal 50 MHz, -25 dBm calibrator signal as a reference for troubleshooting by pressing **Mode Preset, Input/Output, RF Calibrator, 50 MHz** on the analyzer. Now press **FREQ (Channel), 50 MHz, SPAN (X Scale), 1 MHz, Peak Search**. The 50 MHz reference signal should measure 50 MHz @ -25 dBm \pm 2 dB on the analyzer display. If the power level is within tolerance, the low band path is functioning correctly at 50 MHz.

If the power level is not within tolerance, follow the below steps to:

- Verify 50 MHz calibrator signal (from the A9 L.O. Assembly)
- Verify 22.5 MHz IF signal (to A2 DIF Assembly)

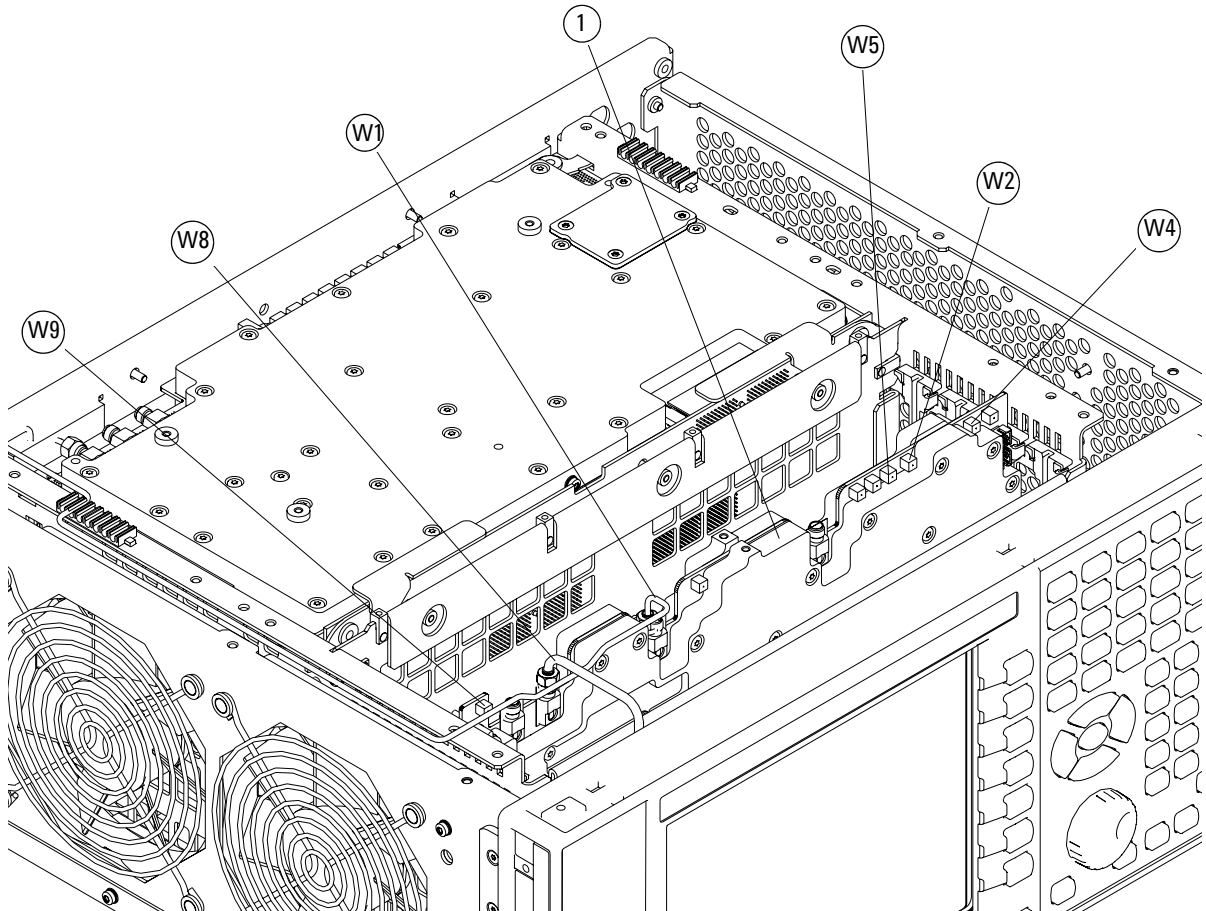
IMPORTANT

Turn off auto align by pressing **System, Alignments, Auto Align, Off**.

Verifying the 50 MHz Calibrator Signal

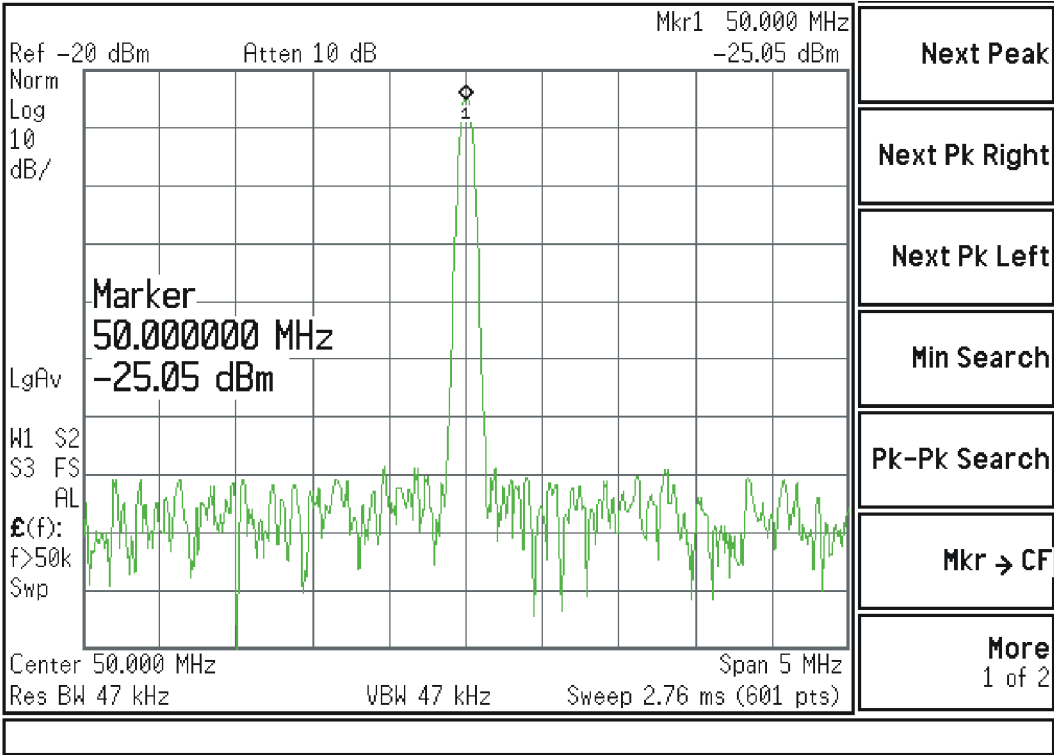
- Remove cable W9 from A8J337 RF Assembly (1) and measure the 50 MHz calibrator signal on the cable end with a functioning Spectrum Analyzer. Refer to [Figure 4-1](#).

Figure 4-1 RF Assembly Cables Location



- If the L.O. assembly calibrator is functioning properly, the 50 MHz calibrator signal will measure 50 MHz at $-25 \text{ dBm} \pm 3 \text{ dB}$. See [Figure 4-2](#). If this level is incorrect, the L.O. assembly is most likely defective. If the level is within tolerance, the RF assembly is most likely defective. Reconnect W9 at A8J337.

Figure 4-2 50 MHz Calibrator Signal

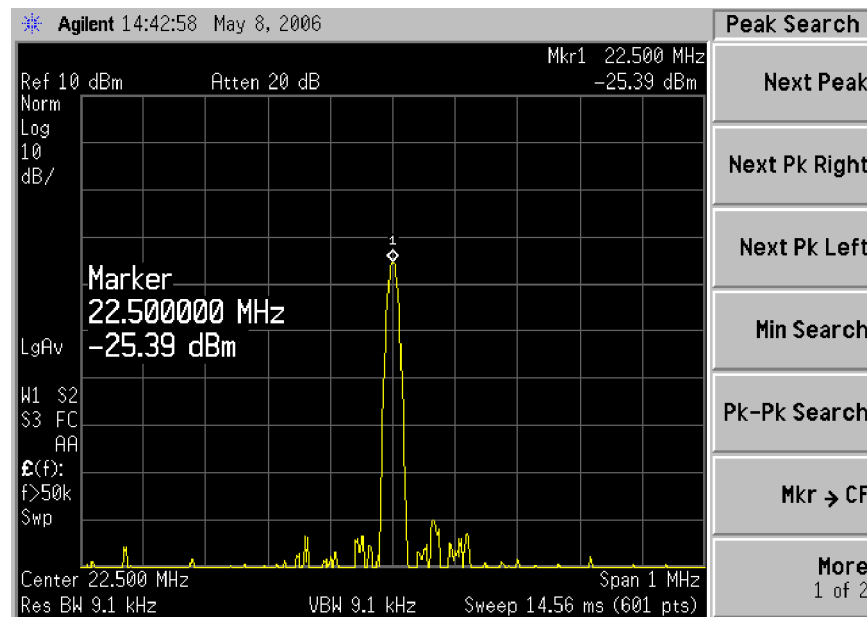


Verifying the 22.5 MHz IF Signal

- Verify the input attenuator on the N9000A is set to 10 dB. Look near the top of the display near the center and verify that **Atten: 10 dB** is visible. If needed change the input attenuator by pressing **AMPTD**, **Attenuation**, **10 dB** on the analyzer.
- Referring to [Figure 4-1](#), carefully disconnect the W4 cable at A8J320.
- Connect the W4 cable to the MMCX female to SMA female connector. Use an appropriate cable to go from the SMA connector to the RF input of a functioning spectrum analyzer to verify the 22.5 MHz I.F. and amplitude is correct.
- Press **Freq**, **22.5 MHz**, **Span**, **1 MHz**, **Peak Search** on the functioning spectrum analyzer.
- The analyzer marker should read 22.5 MHz at $-25 \text{ dBm} \pm 4 \text{ dBm}$ as shown in [Figure 4-3](#).

Figure 4-3

A2 Analog I.F. Output



- If the 22.5 MHz signal is not measuring the correct power level, do not assume the RF Assembly is the most probable cause until the 3rd L.O. frequency and power level have been verified below.

NOTE

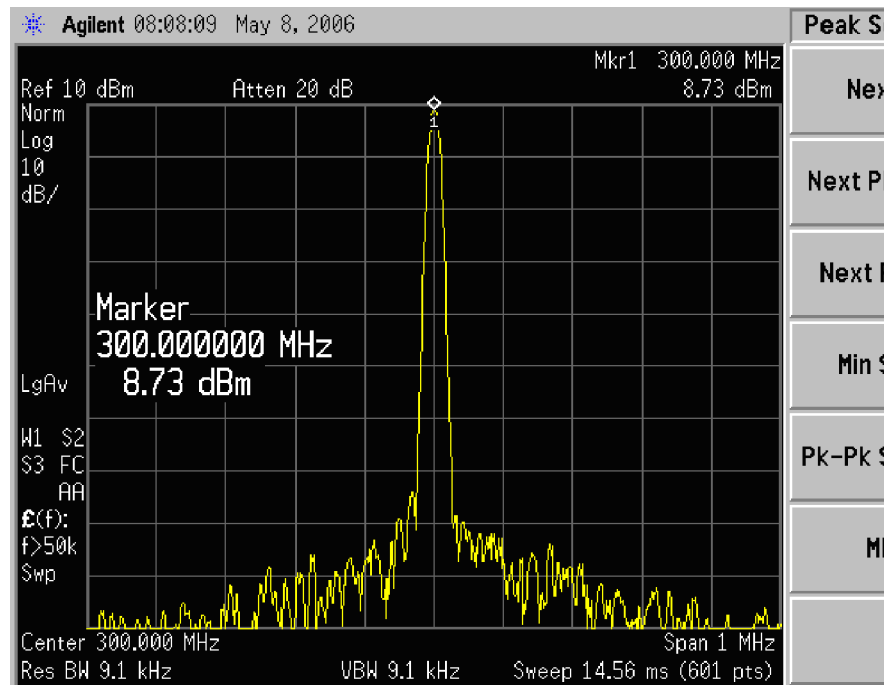
You should hear a distinct snap when reconnecting the W4 cable. If this cable is not installed properly, intermittent signal fluctuations may occur on the analyzer display.

Verifying the 300 MHz L.O. Input Power

- Referring to [Figure 4-1](#), carefully disconnect the W2 at A8J321.
- Connect the W2 cable to the MMCX female to SMA female connector. Use an appropriate cable to go from the SMA connector to the RF input of a functioning spectrum analyzer.
- Press **Freq, 300 MHz, Span, 1 MHz, Amplitude, 10 dBm, Peak Search** on the functioning spectrum analyzer.
- The analyzer marker should read 300 MHz at 10 dBm \pm 3 dBm as shown in [Figure 4-4](#).

Figure 4-4

300 MHz L.O.



- If the 300 MHz signal is not measuring the correct power level, see the A9 L.O. Assembly troubleshooting section in this service guide. If the 300 MHz L.O. is measuring the correct power level and frequency and the 22.5 MHz signal is low, the most probable cause is the A8 RF Assembly.

5 Digital IF Troubleshooting

What You Will Find in This Chapter

The following information is presented in this chapter:

1. Theory of operation of the Digital IF assembly.
2. Isolating the cause of a hardware problem by verifying the functionality of assemblies in the Digital IF assembly signal path.

NOTE

Each of the following sections first describes how the assembly works, then gives information to help you troubleshoot the assembly. Each description explains the purpose of the assembly, describes the main components, and lists external connections to the assembly.

This following sections are found in this chapter:

- [A3 Digital I.F. Assembly Theory of Operation](#)..... page 138
- [A3 Digital I.F. Troubleshooting](#) page 140

Digital I.F. Assembly Description

The A2 Digital I.F. has circuitry that is needed to analyze complex communication signals that can occupy up to 25 MHz of information bandwidth. It digitizes the final 22.5 MHz I.F. from the A8 RF Assembly, by processing the time domain continuous data into I/Q (in-phase and quadrature) signals before sending the data to the A3 CPU assembly for further processing and front panel display.

The Digital I.F. has the following main functions:

- Digitizes the final 22.5 MHz Intermediate Frequency
- 14 bit ADC with a 90 MHz sample rate
- DSP for standard spectrum analysis
- Capture memory for complex signals
- Noise Source Control
- Dither for final I.F.
- Provides the alignment sequence generator for wide band alignments
- Provides wide band Comb Calibration Signal
- Trigger interpolation and associated alignment

A3 Digital I.F. Assembly Theory of Operation

NOTE

Refer to [Chapter 10](#) , “Block Diagrams”.

Data Acquisition

The 22.5 MHz IF comes from the A8 RF assembly. The input level to the A3 Digital IF assembly is -25 dBm. The IF input has a 25 MHz bandwidth centered at 22.5 MHz. The analog circuitry leading to the ADC converts the singled ended signal from the Analog IF to differential required by the ADC. In addition, it is part of a filter, part of which is on the AIF, which improves distortion. Finally, it couples in the dither signal. The ADC is a 14 bit device sampling continuously at 90 Ms/Second.

Rear Panel Triggers

The board has two trigger inputs and two trigger outputs all used via a BNC connector. The trigger inputs are used when an external device has a trigger signal and the user wants to use that external trigger to trigger the signal analyzer. The trigger outputs are used to synchronize other pieces of test equipment to the CXA. These outputs are configurable through the Input/Output menu via the front panel of the instrument.

The trigger inputs each allow trigger levels to be set from -5 to $+5$ volts using the control DAC. The circuits have relatively high input impedance. The trigger outputs have 50Ω source impedance with TTL drive levels into no load.

Control DAC

The control DAC is used to set trigger levels and the gain of the reconstruction system. All three outputs can be adjusted from -2.5 to $+2.5$ volts.

Sample Rate Generator

The 10 MHz reference signal comes from the A16 Reference Assembly. This signal is fairly high power at $+10$ dBm. The signal goes through a 10 MHz to 30 MHz tripler. A 0 to 5V 10 MHz square wave is generated. Capacitors form a single-pole band pass filter to select the 3rd harmonic, 30 MHz.

The signal then passes through a 30 MHz to 90 MHz tripler. A 0 to 5V 30 MHz square wave is generated. Capacitors form a single-pole band pass filter to select the 3rd harmonic, 90 MHz.

Noise Source Voltage Regulator

Various external noise sources can be connected to the rear panel of the N9000A Signal Analyzer. These noise sources require a very accurate 28 volt DC power supply.

The 28 volt BNC output connector is used with the 346 series noise sources.

The Smart Noise Source (SNS) interface includes power switching for the 28 volt and 15 volt power supply. In addition, it has buffers to interface to the SNS I2C bus for control and read back of ENR data automatically. The SNS connector is used with the SNS series noise sources.

DSP

The signal from the ADC is sent to the Digital Signal Processor.

Digital Bus Common Mode Filtering

The Digital Bus is a real time digital interface. It is sometimes referred to as Messenger or LVDS. The implementation on the Digital IF is unidirectional, meaning it can only source data, not receive it. Common mode filtering is required to translate the digital ground referenced signals to analog ground at the rear panel.

A3 Digital I.F. Troubleshooting

Verifying the 22.5 MHz Input Power

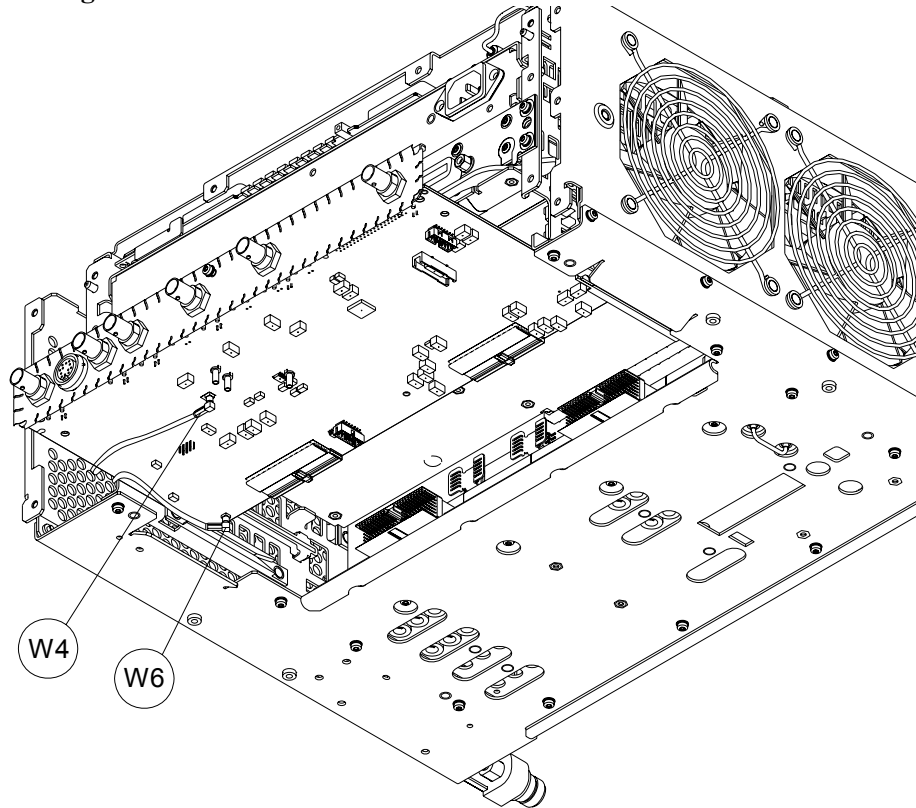
1. Perform an instrument shut down.
2. Remove the cover of the N9000A Signal Analyzer. Refer to [Chapter 13, “Assembly Replacement Procedures,”](#) on page 225 in this service guide.
3. Turn the instrument over so that the bottom is facing up.
4. Turn on the N9000A Signal Analyzer and wait for the instrument to complete the boot up process.
5. Press **System, Alignments, Auto Align, Off**
6. Press **Input, RF Calibrator, 50 MHz**
7. Verify the 50 MHz signal is at -25 dBm by pressing **FREQ, 50 MHz, SPAN, 1 MHz, Peak Search** on the analyzer. The marker readout should be 50 MHz at -25 dBm \pm 3 dBm. If this reference signal is measuring incorrectly, see [Chapter 4, “RF Section Troubleshooting,”](#) on page 125 in this service guide.
8. To continue verifying press **SPAN, Zero Span**. Verify the input attenuator on the N9000A is set to 10 dB. (Look near the top of the display near the center and verify Atten: 10 dB)

NOTE

If the analyzer is not in 10 dB of input attenuation press **AMPTD, Attenuation, 10 dB**.

9. Referring to [Figure 5-1](#), carefully disconnect W4 at A3J15.

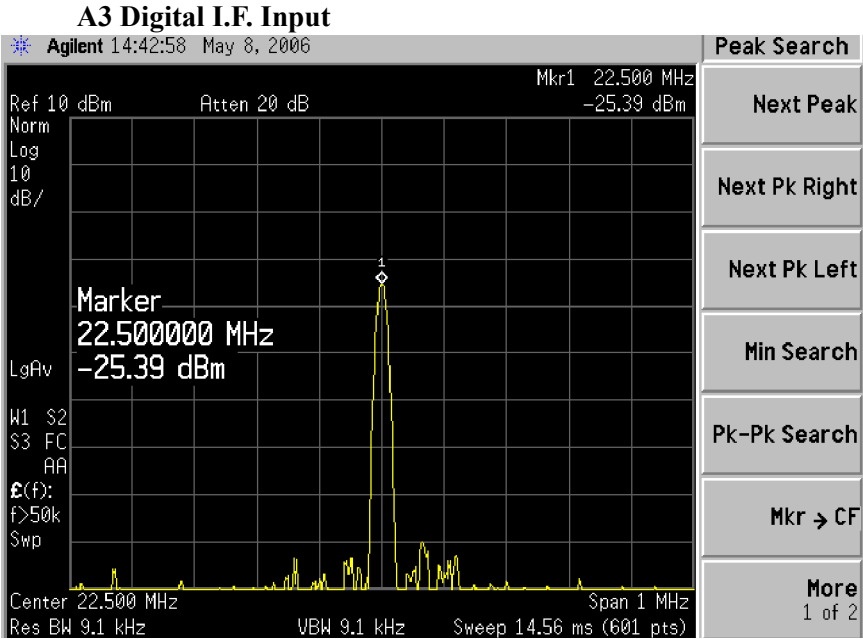
Figure 5-1 **A2 Digital I.F. Cables**



10. Connect the W4 cable to the MMCX female to SMA female connector. Use an appropriate cable to go from the SMA connector to the RF input of a functioning spectrum analyzer.
11. Press **Freq**, **22.5 MHz Span**, **1 MHz**, **Peak Search** on the functioning spectrum analyzer.

12. The analyzer should read 22.5 MHz at $-25 \text{ dBm} \pm 4 \text{ dB}$ as shown in [Figure 5-2](#).

Figure 5-2



If the 22.5 MHz signal is not measuring the correct power level, see [“RF Troubleshooting” on page 127](#) in this service guide.

Verifying the 10 MHz Reference Input

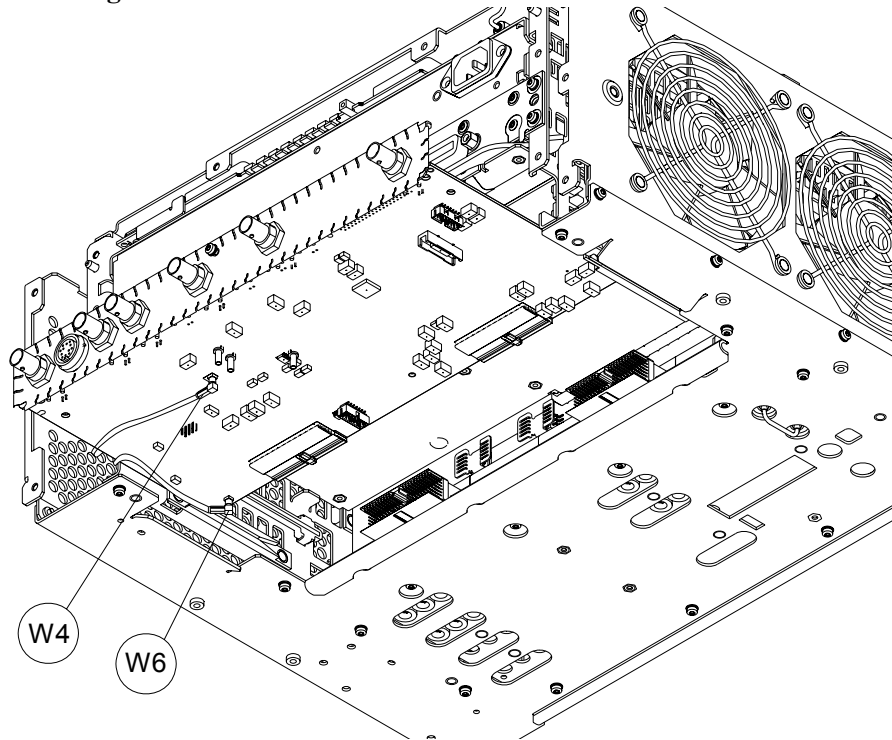
1. Perform an instrument shut down.
2. Remove the cover of the N9000A Signal Analyzer. Refer to [Chapter 13, “Assembly Replacement Procedures,” on page 225](#) in this service guide.
3. Turn the instrument over so that the bottom is facing up.
4. Turn on the N9000A Signal Analyzer and wait for the instrument to complete the boot up process.
5. Press **System, Alignments, Auto Align, Off**.
6. Press **Input/Output, RF calibrator, 50 MHz**.
7. Verify the 50 MHz signal is at -25 dBm by pressing **FREQ, 50 MHz, SPAN, 1 MHz, Peak Search** on the analyzer. The maker readout should be 50 MHz at $-25 \text{ dBm} \pm 3 \text{ dBm}$. If this reference signal is measuring incorrectly, see [Chapter 4, “RF Section Troubleshooting,” on page 125](#) in this service guide.
8. To continue verifying press **SPAN, Zero Span**. Verify the input attenuator on the N9000A is set to 10 dB. (Look near the top of the display near the center and verify Atten: 10 dB)

NOTE If the analyzer is not in 10 dB of input attenuation press **AMPTD, Attenuation, 10 dB**.

- Referring to [Figure 5-3](#), carefully disconnect W6 at A2J14.

Figure 5-3

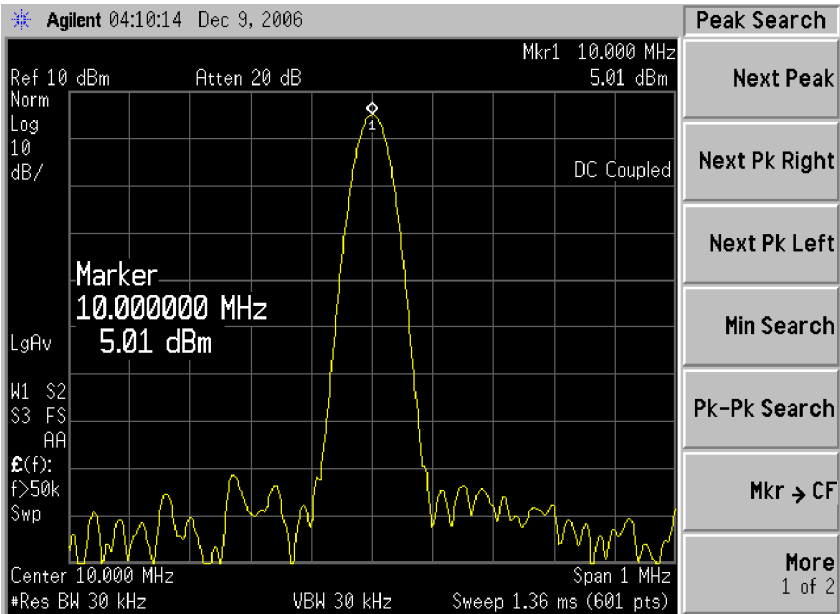
A2 Digital I.F. Cables



- Connect the W6 cable to the MMCX female to SMA female connector. Use an appropriate cable to go from the SMA connector to the RF input of a functioning spectrum analyzer.
- Press **Freq, 10 MHz, Span, 1 MHz, Peak Search** on the functioning spectrum analyzer.

12. The analyzer should read 10 MHz at +5 dBm \pm 3 dBm as shown in Figure 5-4.

Figure 5-4 A2 Digital I.F. Reference Input



If the 22.5 MHz and 10 MHz signals measure the correct frequency and amplitude and yet the display is not processing the signal properly, the most probable causes are the A2 Digital IF or the A3 CPU. It is difficult to separate these two assemblies given the architecture of the analyzer. Each assembly will have to be tried to see which one is causing the failure.

What You Will Find in This Chapter

The following information is found in this chapter:

1. Description of the L.O. assembly.
2. Isolating the cause of a hardware problem by verifying the functionality of assemblies in the L.O. assembly signal path.

A9 L.O. Assembly Description

Purpose

The A9 L.O. Assembly have both L.O. synthesizer circuit and reference circuit.

The L.O. synthesizer circuit provides the 1st Local Oscillator to the A8 RF Assembly for RF conversion.

The reference circuit provides various output signals that are used as both reference signals and local oscillators throughout the analyzer. These signals are phase locked back to the 10 MHz reference oscillator to provide optimum frequency accuracy and stability. The reference signals and local oscillators can be phase locked in one of two ways:

1. The internal 10 MHz reference located on this Assembly.
2. An externally provided reference such as a house standard or the reference from a base transceiver station.

When the analyzer is using the internal 10 MHz reference, the annotation near the top of the display states SENSE: INT or INT REF.

The externally provided reference will accept an input signal of nominally 10 MHz. This externally provided reference signal must have a power level greater than +5 dBm. If the external reference is 10 MHz \pm <200 Hz and **Freq Ref In** is set to **Sense**, the analyzer will automatically switch from SENSE:INT to SENSE:EXT.

The frequency accuracy of the analyzer is directly tied to the accuracy of the frequency reference that is being used.

This assembly has the following inputs and outputs:

- 1st L.O. output signal to A8 RF Assembly
- 3rd L.O. output signal to A8 RF Assembly
- 100 MHz reference signal to A8 RF Assembly for 2nd L.O.
- 10 MHz reference signal to A2 DIF Assembly
- 50 MHz Cal signal to A8 RF Assembly
- 10 MHz external reference signal input

A9 L.O. Assembly Troubleshooting

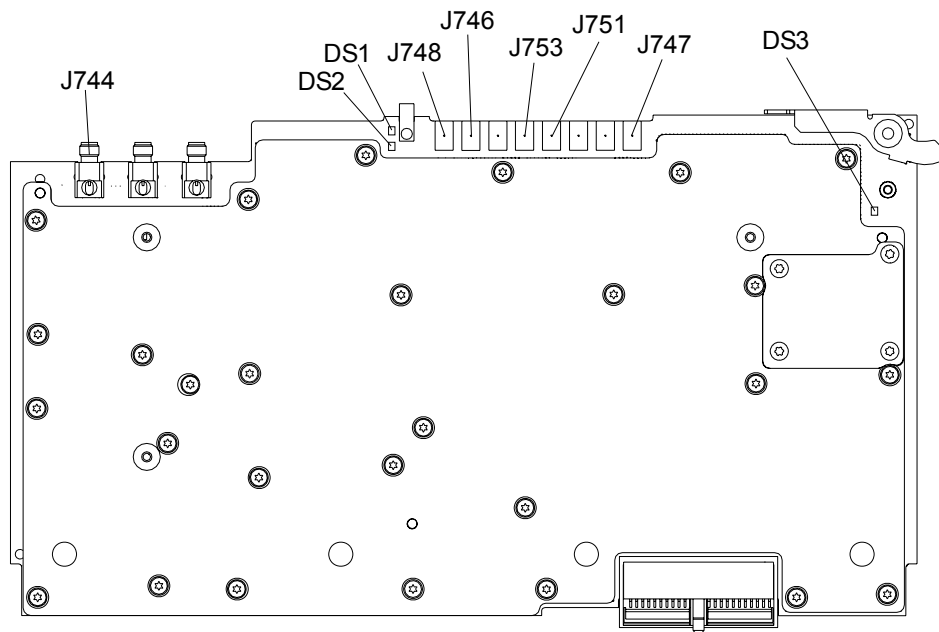
Turn on the N9000A Signal Analyzer and wait for the instrument to complete the boot up process. Follow the below steps to verify the L.O. Assembly is functioning properly:

- Observe the condition of DS1, DS2 and DS3 LEDs. In normal condition, these LEDs should all be off. See LED location in [Figure 6-1](#) below.
- Press **System, Alignments, Align Now, All**. If the alignment functions correctly with no error messages on the analyzer display, most of the board is working properly.
- Measure 1st L.O. output power and frequency
- Measure reference signals output power and frequency.

These items can be checked with a functioning spectrum analyzer using cables and connectors that function well up to 10 GHz.

Figure 6-1

A9 L.O. Synthesizer Assembly



Verifying the 1st L.O. Output Power:

- Turn on the N9000A Signal Analyzer and wait for the instrument to complete the boot up process.
- Press **FREQ, 50 MHz, SPAN, Zero Span**.
- Disconnect W1 cable at J744 (see [Figure 6-1](#)).
- Connect J744 1st LO output to the RF input of the functioning spectrum analyzer using a cable that will function up to 10 GHz.
- Press **Frequency, 3.9975 GHz, Span, 5 MHz, Peak Search** on the functioning spectrum analyzer. If the functioning spectrum analyzer has a preselector peak or preselector centering function, perform that operation to guarantee the preselector is optimized for the measurement.
- The analyzer marker should read 3.9975 GHz at +15 dBm \pm 3 dB.

NOTE

If the 3.9975 GHz signal is not measuring the correct power level, the LO assembly is the most probable cause.

Continue changing the center frequency of the CXA as per [Table 6-1 on page 149](#) and measure the LO output expected frequency and power using the functioning spectrum analyzer.

NOTE

Perform the preselector peak or preselector centering on the functioning spectrum analyzer if any of the expected 1st L.O. power levels are not within tolerance.

Table 6-1 1st L.O.

Center Frequency of CXA Signal Analyzer	Expected 1st L.O. Frequency (GHz) @A14J704	Expected 1st L.O. Power (dBm) @A14J704
50 MHz	3.9975	+15 \pm 3 dB
1.30 GHz	5.2475	+15 \pm 3 dB
2.0 GHz	5.9475	+15 \pm 3 dB

Verifying the Reference Signal

Verify the reference signals, local oscillator output frequencies, and power levels as per Table 6-2 using a functioning spectrum analyzer. In order to measure the signals, remove the rear panel. Refer to “Rear Panel” removal procedure on section on page 249 for details. If these outputs measure incorrectly, the L.O. Assembly is the most probable cause provided the power supply is operating correctly. Refer to “Power Supply/Midplane Troubleshooting” on page 165 if the power supplies are suspect.

Figure 6-2 A16 Reference Assembly Layout

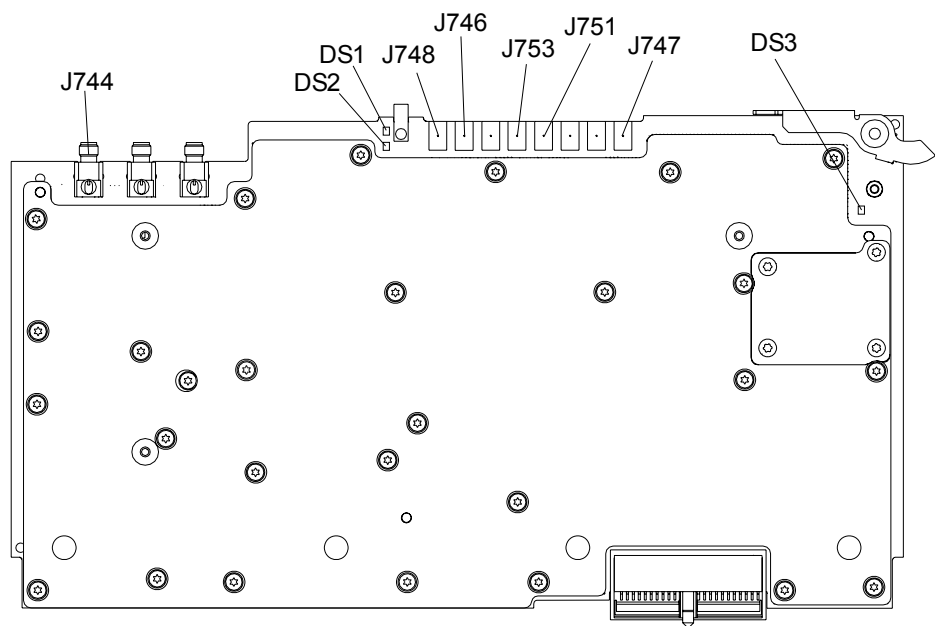


Table 6-2 Connector Details

Signal Description	Signal Location	Expected Frequency (MHz)	Expected Power Level (dBm)	Special Instrument Conditions
50 MHz Cal Out	J748	50 MHz	−25 dBm	Input/Output, RF Calibrator, 50 MHz
300 MHz 3 rd L.O. Out	J746	300 MHz	+10 dBm	
100 MHz Reference Out for 2 nd L.O.	J753	100 MHz	+8 dBm	
10 MHz Reference Out to DIF	J751	10 MHz	+5 dBm	

What You Will Find in This Chapter

NOTE

Each section first describes how the assembly works, then gives information to help you troubleshoot the assembly. Each description explains the purpose of the assembly, describes the main components, and lists external connections to the assembly.

The following sections are found in this chapter:

- [A3 CPU Description](#) on page 153
- [A4 Hard Disk Drive](#) on page 155
- [Troubleshooting software related issues](#) on page 157
- [Reloading the X-Series Software](#) on page 158
- [Hard Drive Recovery Process](#) on page 159
- [Replacing the instrument hard disk drive](#) on page 160

A3 CPU Description

Disk Drive

The A4 Disk Drive assembly is contained within the A3 CPU board assembly and is replaced as an individual assembly. Also, when the A3 CPU board assembly is replaced the existing A4 Disk Drive assembly will be used.

Front Panel Interface

The instrument USB bus is the electrical interface to the instrument front panel. One of the USB ports on the host controller hub located on the A4 CPU board assembly is routed to the A1A2 Front Panel Interface board for this use. The port is a High Speed USB (2.0) compliant port.

Graphics Controller

The entire graphics subsystem is contained within a single chip, along with the interface logic to map memory from main system memory for the video RAM. There are two outputs of the graphics controller that are used by the instrument. One provides the LCD video data to drive the internal instrument LCD display and the other supplies the rear panel VGA output.

Power Supply Control

The power control line from the front panel momentary power switch connects to the A3 CPU board assembly. When the front panel power switch is turned on the A3 CPU board assembly pulls the PS_ON line to the A5 Power Supply assembly to a TTL low level, which tells the power supply to turn on. Once the +12V D, +5.1V D, and +3.35V D supplies are all on and within specification the A6 Power Supply assembly pulls the PWROK_H line to a TTL high state, which then causes the A3 CPU board to come out of reset and boot-up.

Outputs from the A3 CPU board assembly also drive the two front panel power state LEDs.

Provisions have also been made to allow the CPU board to remember which power state it was in when a power failure occurs. The instrument will return to the same power state after a power failure.

Rear Panel Connectivity

The A3 CPU board assembly has direct access to the rear panel of the instrument. The external connections provided on the A3 CPU board assembly include:

- External VGA
- LAN (RJ45) 10/100 based-T Ethernet port

A3 CPU Description

- USB
 - 4 x Type-A ports (USB 2.0 compatible)
 - 1 x Type-B port (USB 2.0 compatible) CXA behaves like a USB device (client)
- GPIB

If the CPU board is suspect in an instrument failure, a full description of the instrument boot process is described in [Chapter 2, “Boot Up and Initialization Troubleshooting”](#).

System Memory

There are two DIMM memory slots on the A3 CPU board assembly. Both slots accept 184-pin DDR SDRAM DIMM memory modules. While the memory controller chip itself does support a wide range of DDR memory types, only memory fully qualified by Agilent Technologies is supported. Full qualification includes mechanical vibration and shock, thermal and power dissipation and the basic electrical characteristics.

System Processor

The A3 CPU board assembly uses an Intel Pentium-M series processor chip.

A4 Hard Disk Drive

The CXA A4 Hard Disk Drive is physically connected to the CPU assembly. Failures of this disk drive can be either hardware or software related. The first step in trouble shooting is to determine if the failure is software related. If software is found not to be the issue, the hard disk drive should be replaced.

IMPORTANT

Calibration File Backup

Backing up the calibration file before changing the A4 Disk Drive is highly recommended. To do this you will need to connect a USB mouse and follow the steps below:

- a. Right click on the Start Menu.
- b. Left click “Explore”.
- c. Navigate to the E:\ drive (Calibration E:).
- d. Click on the E:\ drive.
- e. Double click on the AlignDataStorage folder.
- f. Save the CurrentDataSet.xml file onto a USB storage device.

Once the new A4 Disk Drive is installed, copy the Current DataSet.xml file from the USB storage device to the AlignDataStorage folder on the E:\ drive

If this file cannot be backed up because the instrument will not fully boot, go ahead and change the A4 Disk Drive and perform all adjustments listed in [Chapter 14](#) , “Post-Repair Procedures” for the A4 assembly.

Overview

The A4 Disk Drive assembly has been divided up into four different partitions. They are:

- C. This partition contains the operating system and software installed by Agilent. This is an open system which means you can install additional software, which should be installed on the C: drive. However, only a limited set of software applications are tested for use with the instrument software. The installation and/or use of other software is not warranted, and could interfere with the operation of the instrument software. If the Agilent Recovery process is ever run, the original version of the C: drive, as shipped from the factory, will be restored. The user will need to reload any other software that was previously installed into the instrument.

Do not save any user data to the C: drive partition, as any data saved in this partition will be lost if the Agilent Recovery process is run.

- D. This partition is reserved for data storage. The User Accounts that are preconfigured by Agilent and their My Documents folder are mapped to the D: drive. This is for the convenience of backing-up the user data. You should always back-up the data on the D: drive. This allows you to restore the data if the A4 Disk Drive assembly ever needs to be replaced.

Data saved in this partition will not be lost if the Agilent Recovery process is run.

- E. This partition is reserved for Agilent's use. The primary use of the E: drive is for storing of the instrument Calibration and Alignment data. Do not change or overwrite the files on this drive. This could cause your instrument to not meet specifications, or even to stop functioning correctly. It is also recommended that you back up the contents of this drive. This allows you to restore the data if the A5 Disk Drive assembly ever needs to be replaced, which could otherwise require that all instrument adjustments be performed.

While data saved in this partition will not be lost if the Agilent Recovery process is run, do not use this drive for data storage.

In addition, a hidden recovery partition is located on the drive. This partition contains an image of the C: drive as it was when the instrument was shipped from the factory. To restore the C: drive using the image stored in this recovery partition see the section titled [“Hard Drive Recovery Process” on page 159](#).

Troubleshooting software related issues

The C: drive contains the Windows XP operating software and the X-Series software. Boot problems can be caused by either a failure of the Windows XP operating system or the X-Series software. The failure could have occurred due to a failed installation procedure, X-Series software update failure or a virus.

To correct these issues there are two procedures that can be initiated to resolve a software related issue.

- Reload the X-Series software.
- Use the Recovery Process to reinstall the Windows XP operating System and X-Series software as it was when it left the factory.

Reloading the X-Series Software

The X-Series software contains all the required components for the signal analyzer application as well as all software options. If the X-Series software has become corrupt the Windows XP operating system will boot but the X-Series software application will fail to start. In these cases go to [Chapter 16 , “Instrument Software,”](#) for information on how to update the X-Series software. This procedure will not affect the instrument’s calibration or user files.

If this does not resolve the boot issue, or the instrument never boots the Windows XP operating system proceed to the Hard Drive Recovery Process.

Hard Drive Recovery Process

The Agilent Recovery System can be used to repair software errors on the instrument's hard disk drive, or to restore the original factory configuration of the system software. The Agilent Recovery System is stored in a separate hidden hard disk drive partition. Repairing errors on the hard disk drive may result in loss of data or files. Restoring the original factory system software does not restore any of the following items:

- Windows system configurations that were made after the instrument was shipped from the factory. For example, Windows and Service Pack updates, user accounts, and windows configuration settings. After an Agilent Recovery, these configurations will have to be redone by the end user.
- Additional software that was installed after the instrument was shipped from the factory. After an Agilent Recovery, that software will need to be re-installed by the end user.
- Any data or programs saved on the D: or E: drives. This data will be retained on the hard drive and not altered by the recovery process.
- Any updates that were made to the Agilent measurement application software.

Calibration data is not lost during this process because it resides on the E drive partition.

Agilent Recovery System

The instrument hard disk recovery system is stored in a separate hard drive partition, it can be used to attempt to repair errors on the hard disk or restore the original factory instrument system on the hard drive.

Using the Instrument Recovery System

1. Make sure the instrument is turned off.
2. Turn on the instrument.
3. After the “Agilent Technologies” screen is displayed the following screen contents will be displayed for 3 seconds.

Please select the operating system to start:

Microsoft Windows XP Professional

Agilent Recovery System

Use the up and down arrow keys to move the highlight to your choice.

Press **Enter** to choose.

4. Press the down arrow key to move the highlight to “Agilent Recovery System”, press the **Enter** key.
5. When the Agilent Recovery System has booted, follow the on-screen instructions to recover the image of the C drive.
6. After exiting the Agilent Recovery System, the instrument will reboot a few times.
7. Update the X-Series software to the latest version by downloading it from the following URL:

www.agilent.com/find/xseries_software

Replacing the instrument hard disk drive

If the above two procedures did not resolve the booting issue. The hard disk drive should be replaced. Please refer to the “[Hard Disk Drive](#)” replacement section on [page 244](#).

Power Supply/Midplane Troubleshooting

What You Will Find in This Chapter

The following information is found in this chapter:

1. Theory of operation of the power supply.
2. Isolating the cause of a power supply problem.
3. Theory of operation of the Midplane Assembly.

This following descriptions are found in this chapter:

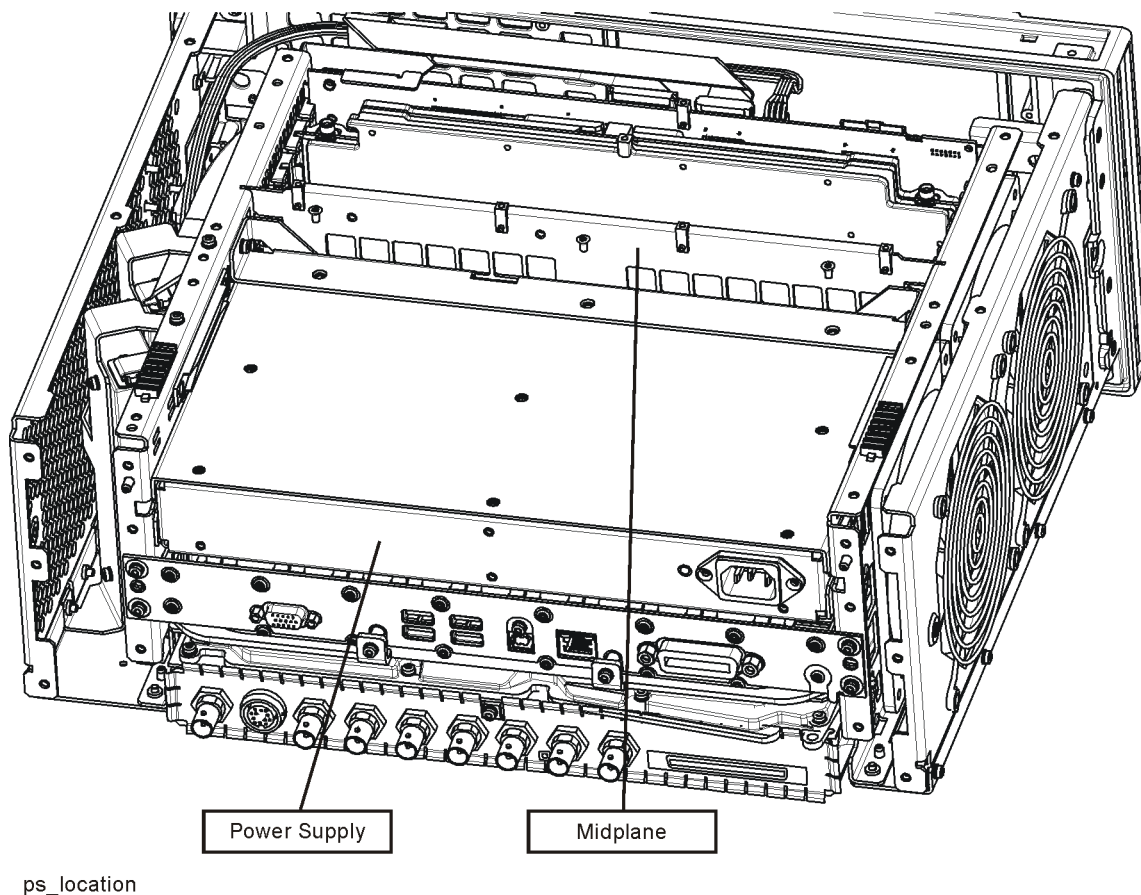
- [A5 Power Supply Description](#) page 163
- [A5 Power Supply Basic Troubleshooting \(Cover On\)](#) page 168
- [A6 Midplane Description](#) page 169

A5 Power Supply Description

Purpose

The A5 Power Supply assembly provides all the necessary DC voltages for the entire CXA signal analyzer to operate correctly. If any of the power supplies are not within their operating voltages, the analyzer will not function. The power supply outputs provide power to all the printed circuit boards, microcircuit assemblies, front panel display and fans, any of which can cause an over current condition if not operating correctly. The power supply will remain on in an over current state for a minimum of 0.1 second. The power supply will turn off no later than 0.4 seconds after the beginning of the over current state. Any one output over current condition will latch the supply off until the line voltage is removed from the rear panel AC power input connector and then reconnected. The power supply assembly plugs into the A6 Midplane Assembly from the rear of the instrument. (see [Figure 8-1](#).)

Figure 8-1 **Power Supply and Midplane**



Power Supply Theory of Operation

The A5 Power Supply assembly is serviced as an assembly only; no component level repair is supported.

The A5 Power Supply assembly provides most all of the necessary DC voltages for the CXA. If any of the power supplies are not within their operating voltages, the instrument will not function properly.

The A5 Power Supply assembly is a switching supply that operates at a frequency of ~120 kHz.

The A5 Power Supply assembly is an auto ranging supply, requiring no user selection of the input voltage. The input AC voltage and frequency requirements for the A5 Power Supply assembly are printed on the rear panel of the instruments as well as on the power supply itself.

While there are no test points or status LEDs accessible for troubleshooting on the A5 Power Supply assembly, there are both test points and status LEDs for all of the different power supply voltages, as well as other power supply status lines, on the A6 Midplane Board assembly. See the [“A6 Midplane Description” on page 169](#) for detailed information on the location of each

Supply Voltages

The following voltage levels are produced by the A5 Power Supply assembly:

Voltage Level	Ground Reference	A6 Midplane Connector	Voltage Level	Ground Reference	A6 Midplane Connector
+15V SB	ACOM	J101	+12V D	DCOM	J111
+5.1V SB	DCOM	J111/J112	+5.1V D	DCOM	J109/J110
+32V A	ACOM	J101	+3.35V D	DCOM	J107/J108
+15V A	ACOM	J103/J104	-15V A	ACOM	J105
+9V A	ACOM	J104	-7V A	ACOM	J105
+5.2V A	ACOM	J102	FAN POS	FAN NEG	J101
			FAN NEG	FAN POS	J101

Control Inputs

There are a number of control inputs for the A5 Power Supply assembly. They are:

PS_ON PS_ON is a signal that when pulled low tells the A5 Power Supply assembly to turn on all of its outputs. This signal comes from the A3 CPU board assembly and is initiated by pressing the front panel power button.

DITHER DITHER is an AC coupled analog signal going to the supply that is used to frequency modulate the power supply switching frequency for the purpose of lowering any power supply related interference.

OFFn OFFn is an input that is to be used only as a “Panic Stop”. This signal can be used for such functions as an emergency over temperature shut down. This type of shut down is a last resort and does not perform the recommended operating system shut down of the instrument.

TEMP_SEN TEMP_SEN is an analog input to the fan speed control circuit. The fan runs at a slow speed at room temperature to reduce noise and then will ramp up to full speed as the temperature increases.

Control/Status Outputs

There are a number of control and status outputs for the A5 Power Supply assembly. They are:

PWROK_H PWROK_H is used to verify that the +12V D, +5.1V D, and +3.35V D are all on and within specification. A TTL high level on this output brings the CPU out of reset and initiates the instrument boot up process.

LINE_TRIG LINE_TRIG is a TTL level signal that is synchronous to the AC line input. This signal is typically used in spectrum analyzers to trigger an instrument sweep synchronous to the AC power line.

PS_TEMP PS_TEMP is a read out of the internal temperature of the power supply.

PS_FAULT PS_FAULT will be a TTL low level signal to indicate that the supply is experiencing an over voltage, over current, or over temperature condition.

Fuse

The A5 Power Supply has no user replaceable fuse. While there is a fuse internal to the supply this is not meant for field replacement. If the internal fuse is blown, the power supply has experienced a major failure and should be replaced.

Standby Supplies

The A5 Power Supply assembly has two standby supplies that should always on if the AC input voltage requirements are met. These are the +15V STBY and the +5.1V STBY supplies. These supplies are used to by the instrument to keep certain circuits alive even when the power is turned off.

Over Current Protection

The A5 Power Supply assembly has built in over current protection that will shut down the supply if current draw from the instrument is too great. The power supply will remain on in over current state for a minimum of 1 second. The power supply shall turn off no later than 5 seconds after the beginning of the over current state. The power supply shall remain off until the line voltage is removed and then reconnected or the front panel power switch is cycled. Over current shut down

does not apply to the standby supplies, the fan voltage, and the +32V A supply.

Thermal Protection

The A5 Power Supply assembly will protect itself by shutting down if it overheats. It will also reset itself with no user interaction after the temperature is reduced by approximately 10 degrees C.

Power Supply Output Signals

Table 8-1 describes the output signals from the Power Supply assembly.

Table 8-1 **Power Supply Output Signals**

Signal Name	Description	Maximum Output Current (Amps)	Test Load (Amps)
+32A	32 Volt Analog power supply.	1.8	0.5
+15A	15 Volt Analog power supply	4.25	1.3
+15SB	15 Volt Standby power supply	--	--
+9A	9 Volt Analog power supply	4.0	1.4
+9A_Sense			
+5.2A	5.2 Volt Analog power supply	11.5	3.7
+5.2_Sense			
-7A	-7 Volt Analog power supply	4.5	1.5
-7A_Sense			
-15A	-15 Volt Analog power supply	1.5	0.5
ACOM	Analog Ground. Connected to common ground inside power supply.	--	--
ACOM_Sense	Remote sense for analog ground.	--	--
PS_Faultn	Power supply fault output, active low.	--	--
PS_Temp	Analog temperature output. Control element for fan speed.	--	--
Line_Trig	Line Trigger Output.	--	--
Dither	Dither input from A7 Midplane for switching frequency modulation.	--	--
Temp_Sense	External temperature input for fan speed control.	--	--
Offn	Off input, active low. Used to turn off all non-standby supplies.	--	--

Table 8-1 Power Supply Output Signals

Signal Name	Description	Maximum Output Current (Amps)	Test Load (Amps)
Fan_P	Positive fan power supply.	1.0	0.5
Fan_N	Negative fan power supply.	1.0	0.5
+12D	12 Volt Digital power supply.	8.0	2.6
+5.1D	5.1 Volt Digital power supply.	8.5	2.7
+5.1D_Sense	Remote sense for +5.1 digital supply.	--	--
+5.1SB	5.1 Volt Standby power supply.	0.5	0.2
+3.35D	3.35 Volt Digital power supply.	6.5	2.0
+3.35D_Sense	Remote sense for +3.35 digital supply.	--	--
DCOM	Digital ground. Connected to the common ground point inside the power supply.	--	--
DCOM_Sense	Remote sense for DCOM.	--	--
PWR_OK	Power OK Output.	--	--
PS_ONn	Power supply turn on input, active low.	--	--
ChassisCOM	Power supply outer case. Connected to common ground point inside the power supply.	--	--

A5 Power Supply Basic Troubleshooting (Cover On)

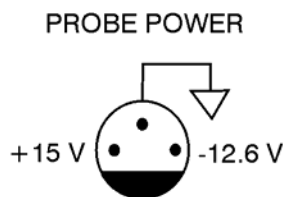
NOTE

There are no user replaceable fuses on the power supply. If the internal fuse is blown, the power supply has experienced a major failure and should be replaced. If you determine that the power supply is the failed assembly, replace the power supply. If the power supply is suspect, perform the following quick checks before removing the instrument cover.

1. Ensure the instrument is plugged into a known good AC power source and the yellow standby LED near the power on switch is illuminated. A lit yellow LED indicates the +5.1 SB VDC power supply voltage is providing enough voltage to light the LED.
2. Power on the instrument and verify that the green LED on the front panel is lit. A lit LED indicates the power supply has received an “ON” command from the A4, CPU assembly and that the +5.2 A VDC supply is on.
3. Verify both fans are operating on the side panel of the instrument. The fans can be heard once the analyzer is powered up. If the fans are operating, the fan power supply is functioning.
4. The front panel probe power connector can be used to check the +15 VDC (+/-7%) and -12.5 VDC (+/-10%) supplies. The -12.5 VDC is produced by post regulating the -15 VDC supply. A voltmeter can be used to verify these supplies. Refer to [Figure 8-2](#) for a diagram of the probe power connector.

Figure 8-2

Probe Power Connector



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If these initial checks are functioning properly and yet the signal analyzer will not boot up properly, or the display is not turning on, refer to [Chapter 2, “Boot Up and Initialization Troubleshooting”](#) in this service manual.

It is possible that some portion of the initial troubleshooting check may fail. [Chapter 2](#) should also be referenced if this is the case. [Chapter 2](#) describes the entire instrument boot process, from initial power on to a successful signal analyzer sweep. If any portion of the boot process fails, [Chapter 2](#) describes a step-by-step troubleshooting procedure to help isolate the root cause of the failure.

A6 Midplane Description

Purpose

The Midplane links the following major assemblies:

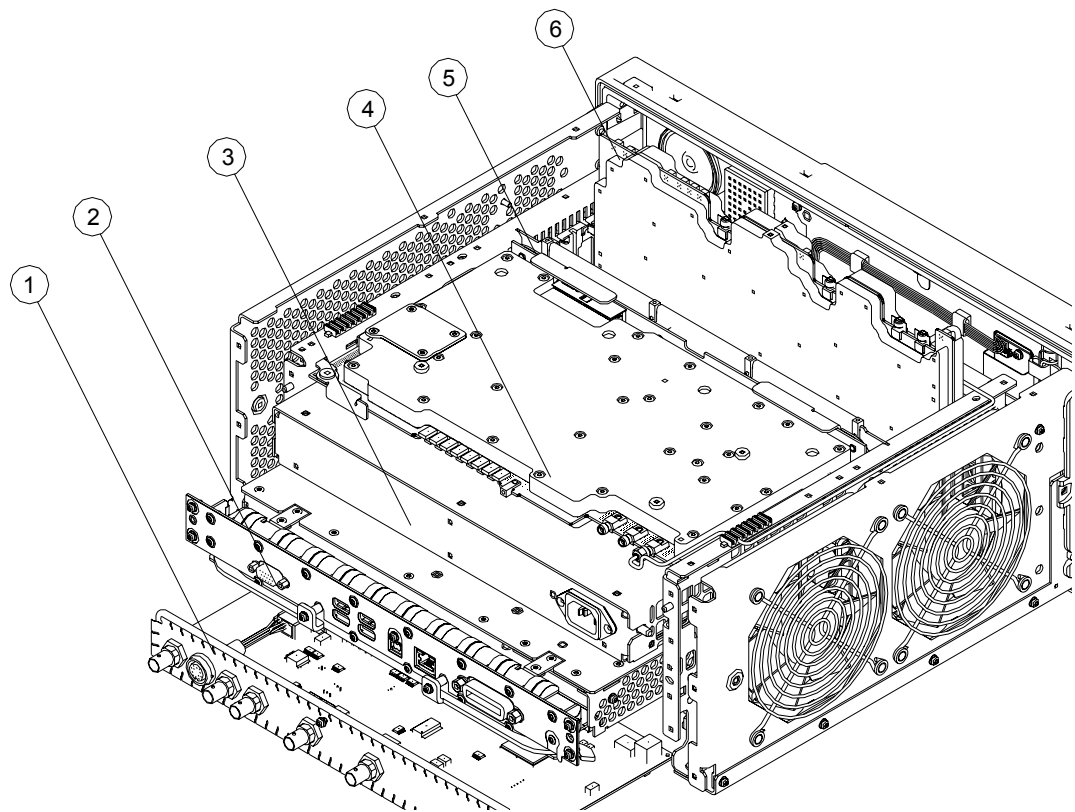
- A3 CPU Assembly
- A5 Power Supply Assembly
- A7 Motherboard
- A9 L.O. Assembly

Refer to [Figure 8-3](#). The Midplane Assembly (**5**) plugs into the Motherboard. The CPU, Power Supply, and L.O. Assemblies plug directly into the Midplane board from the rear of the instrument. The Digital I.F. Assemblies plug into the CXA from the rear of the instrument into the Motherboard itself.

The Midplane Assembly itself has the following circuits:

- Power supply dithering. This triangle wave of approximately 100 Hz goes directly to the A5 Power Supply and is used to frequency modulate the power supply switching frequency for the purpose of lowering any power supply related sidebands.
- +3.3 volt analog linear power supply (+3.3 A)
- -5.2 volt analog linear power supply (-5.2 A)
- Circuit to phase lock the CPU clock to the instrument's 10 MHz reference
- Non-volatile memory for storage of software license keys
- Power Supply test points and status LED's
- Complex Programmable Logic Device (CPLD) used as instrument local bus (ILB) buffer to A9 L.O. Assembly.

Figure 8-3 **Midplane**



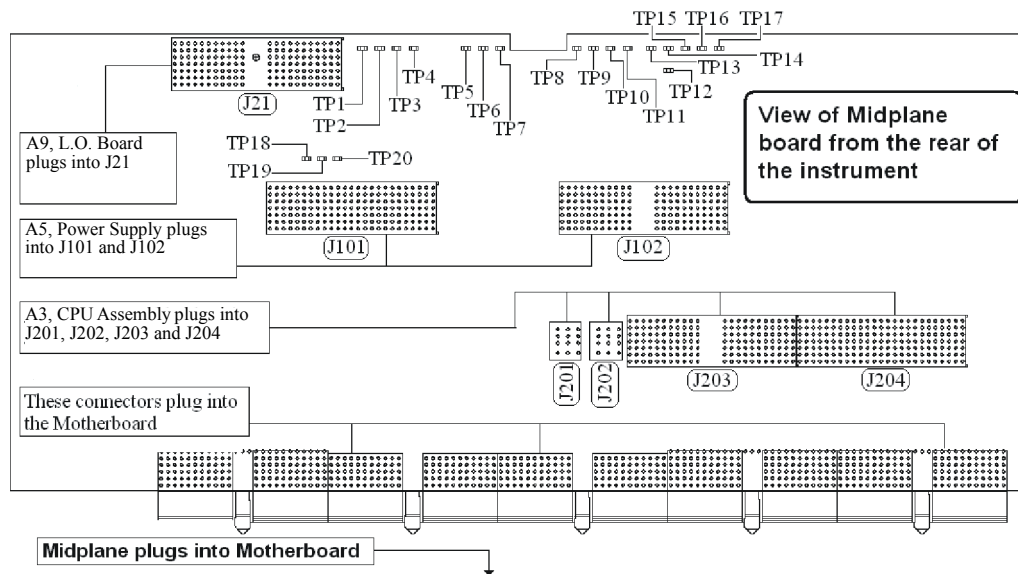
Item	Description
1	A2 Digital I.F. Assembly
2	A3 CPU Kit (less hard drive, includes battery)
3	A5 Power Supply
4	A9 L.O. Assembly
5	A6 Midplane Assembly
6	A8 RF Assembly

NOTE The RF, and Digital IF plug into the Motherboard. All other assemblies mentioned plug into the Midplane from the rear of the instrument.

A6 Midplane Assembly Troubleshooting

If there is an analyzer function such as a boot up issue where the power supplies are suspect, view the power supply LED's on the Midplane Assembly by removing the instrument outer cover. See [Figure 8-4](#).

Figure 8-4 Midplane Assembly



As shown above, the Midplane Assembly has test points for each power supply that can be used as measurement points. These DC voltages can be verified with a voltmeter. Continuity measurements can also be performed on each power supply if a shorted condition is suspect. Refer to the table below for measurement details.

NOTE

Voltage readings are referenced to ACOM (TP4). All ohmmeter measurements were taken from the power supply test point to ACOM. Due to capacitive effects, wait for the ohmmeter readings to stabilize.

Power Supply	Test Point	Description	Expected Voltmeter Reading (VDC) Power ON	Expected Ohmmeter Reading (K Ω) Power OFF
+32A	TP3	32 Volt Analog supply	+32 \pm 2.0	1.3 k Ω
+15A	TP6	15 Volt Analog supply	+15 \pm 1.0	260 Ω
+15SB	TP2	15 Volt Standby supply	+15 \pm 1.0	264 Ω
+12D	TP16	12 Volt Digital supply	+12 \pm 1.0	264 Ω
+9A	TP7	9 Volt Analog supply	+9 \pm 1.0	120 Ω
+5.2A	TP5	5.2 Volt Analog supply	+5.2 \pm 0.75	3.6 k Ω
+5.1D	TP15	5.1 Volt Digital supply	+5.1 \pm 0.75	40 Ω
+5.1SB	TP17	5.1 Volt Standby	+5.1 \pm 0.75	228 Ω
+3.35D	TP13	3.35 Volt Digital supply	+3.35 \pm 0.75	47 Ω
+3.3A	TP10	3.3 Volt Analog supply	+3.3 \pm 0.75	36 Ω
-5.2A	TP11	-5.2 Volt Analog supply	-5.2 \pm 0.75	1.9 Ω
-7A	TP8	-7 Volt Analog supply	-7 \pm 1.0	445 Ω
-15A	TP9	-15 Volt Analog supply	-15 \pm 1.0	390 Ω
n/a	TP1	Fan Positive supply	8.5 to 13.5 VDC ~8.8 VDC @ 25C	490 Ω
n/a	TP4	Analog Common	n/a	n/a
n/a	TP14	Digital Common	n/a	n/a
n/a	TP12	Power OK	+3.9 \pm 0.75	9.2 k Ω

What You Will Find in This Chapter

The following information is found in this chapter:

1. Theory of operation of the Motherboard Assembly.
2. Theory of operation of the Front Panel Assembly.
3. Isolating the cause of an hardware problem by verifying the functionality of assemblies.

This following descriptions are found in this chapter:

- [A7 Motherboard Description](#) page 175
- [A1 Front Panel Assembly](#) page 177

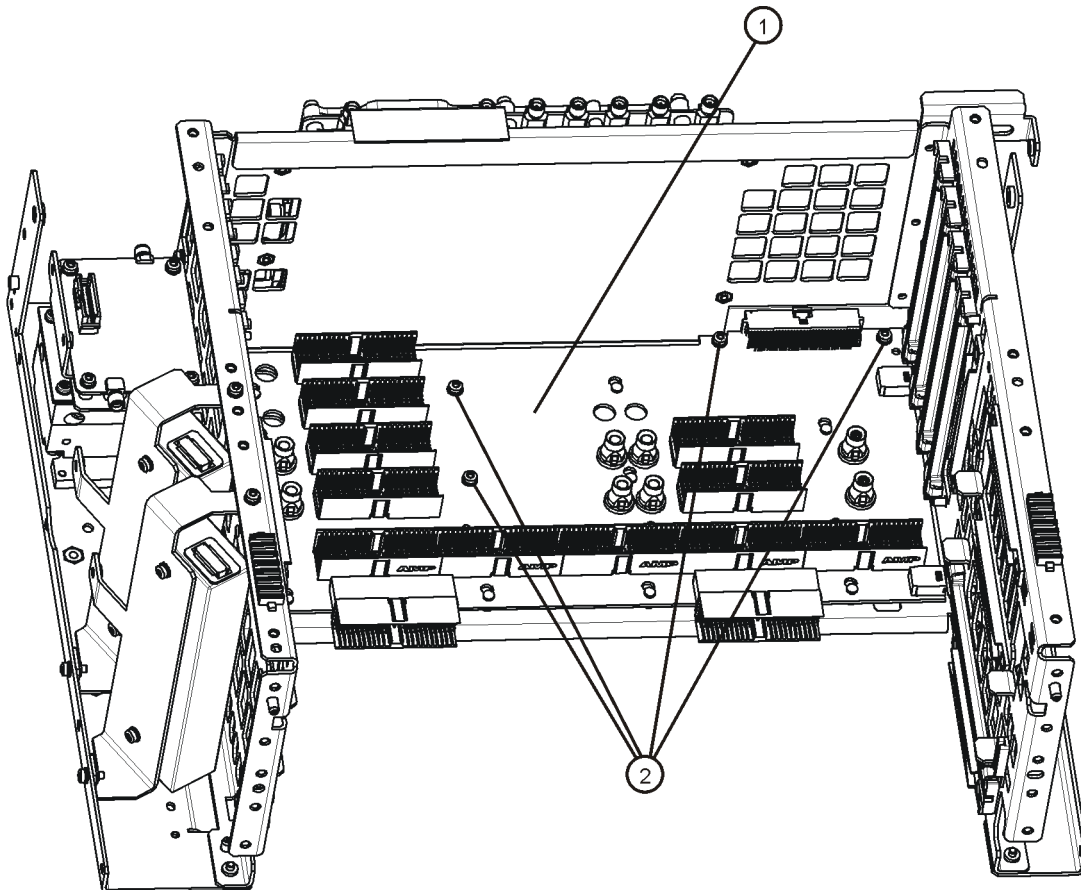
A7 Motherboard Description

Purpose

The Motherboard is an electrical link between many of the electrical assemblies in the instrument. The main functions of this PC board include:

- Distribute power
- Control and common signals between all the measurement PC boards including the A6 Midplane and the Front Panel Assembly
- Circuitry for fan speed control
- 10 MHz Reference distribution

Figure 9-1 **Motherboard**



motherboard_replace

The Motherboard is a horizontally mounted, located near the bottom of the

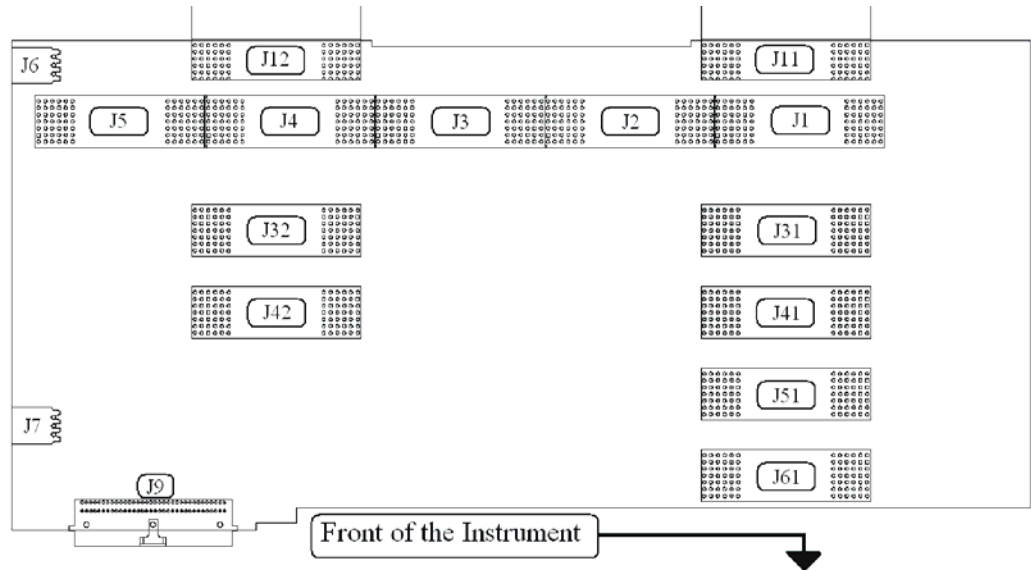
Front Panel/Motherboard Troubleshooting

A7 Motherboard Description

analyzer. The Motherboard has the following connector types:

- (6) Analog Card Cage Connectors (J1, J11, J31, J41, J51, J61)
- (4) Digital Card Cage Signals and voltages using PCI connectors (J4, J12, J32, J42)
- (1) Analog Power (J2)
- (1) Mixed Power (J3)
- (2) Front Panel Connectors (J5 and J9)
- (2) Fan Connector (J6 and J7)

Figure 9-2 **Motherboard Connectors**



Motherboard Connector	What Plugs In?	Motherboard Connector	What Plugs In?
J1	A7, Midplane	J11	A2, Digital I.F, analog signals
J2	A7, Midplane	J12	A2, Digital I.F, analog signals
J3	A7, Midplane	J31	Option Slot
J4	A7, Midplane	J32	Option Slot
J5	A7, Midplane	J41	Option Slot
J6	B2, Fan #2	J42	Option Slot
J7	B1, Fan #1	J51	A8, RF
J9	Front Panel	J61	--

A7 Motherboard Troubleshooting

There are no troubleshooting procedures for this assembly. If the Motherboard is suspect, it must be replaced.

A1 Front Panel Assembly

The major components of the A1 Front Frame Assembly are the A1A2 Front Panel Interface Board, A1A3 LCD, A1A4 LCD Inverter Board, and the A1A5 Front Panel USB Interface Board, all of which are serviceable as individual components.

The A1 assembly is used to display the measurement results, accept user input via the keyboard, and connect USB peripheral devices.

A1A2 Front Panel Interface Board

The A1A2 Front Panel Interface board is serviced as an assembly only; no component level repair is supported.

The Front Panel Interface Board contains LCD control, Inverter drive, audio amplifiers, internal speaker, a 4 port USB hub, and a USB keyboard microcontroller.

The two different front panel rubber keypads attach to the back side of the board, which has the keyboard contacts printed on the reverse side.

The 4 ports from the USB hub contained on this board go to the 2 front panel USB connectors, the keyboard microcontroller, and the fourth port is unused.

A1A3 LCD

The LCD used is an 8.4inch XGA TFT display, which has a resolution of 1024 x 768. It has two backlights that are not individually replaceable.

A1A4 LCD Inverter Board

The Inverter Board provides the high voltage required by the LCD backlights.

A1A5 Front Panel USB Interface Board

The Front Panel USB Interface Board provides the front panel USB connections.

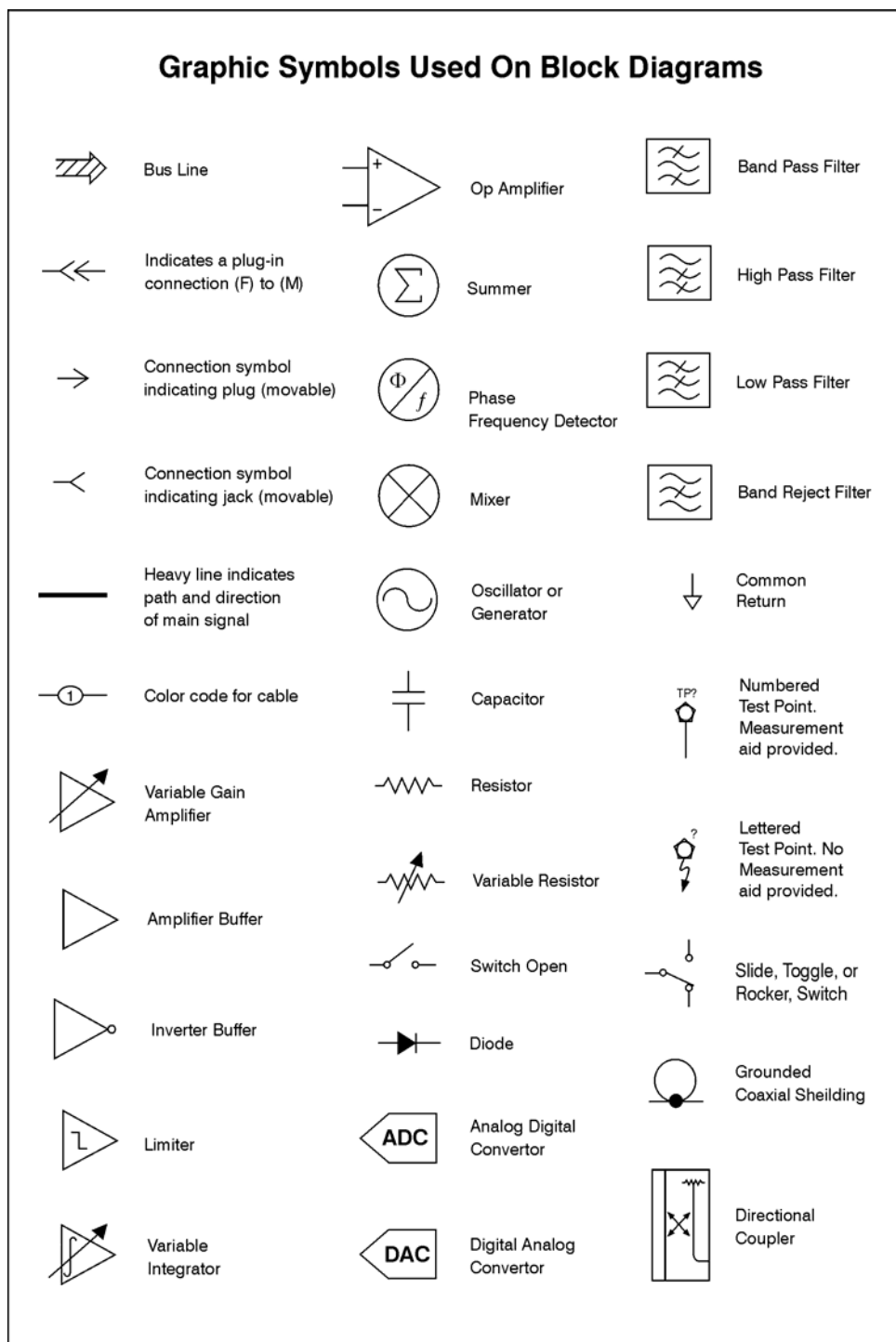
10 Block Diagrams

What You Will Find in This Chapter

The following sections are found in this chapter:

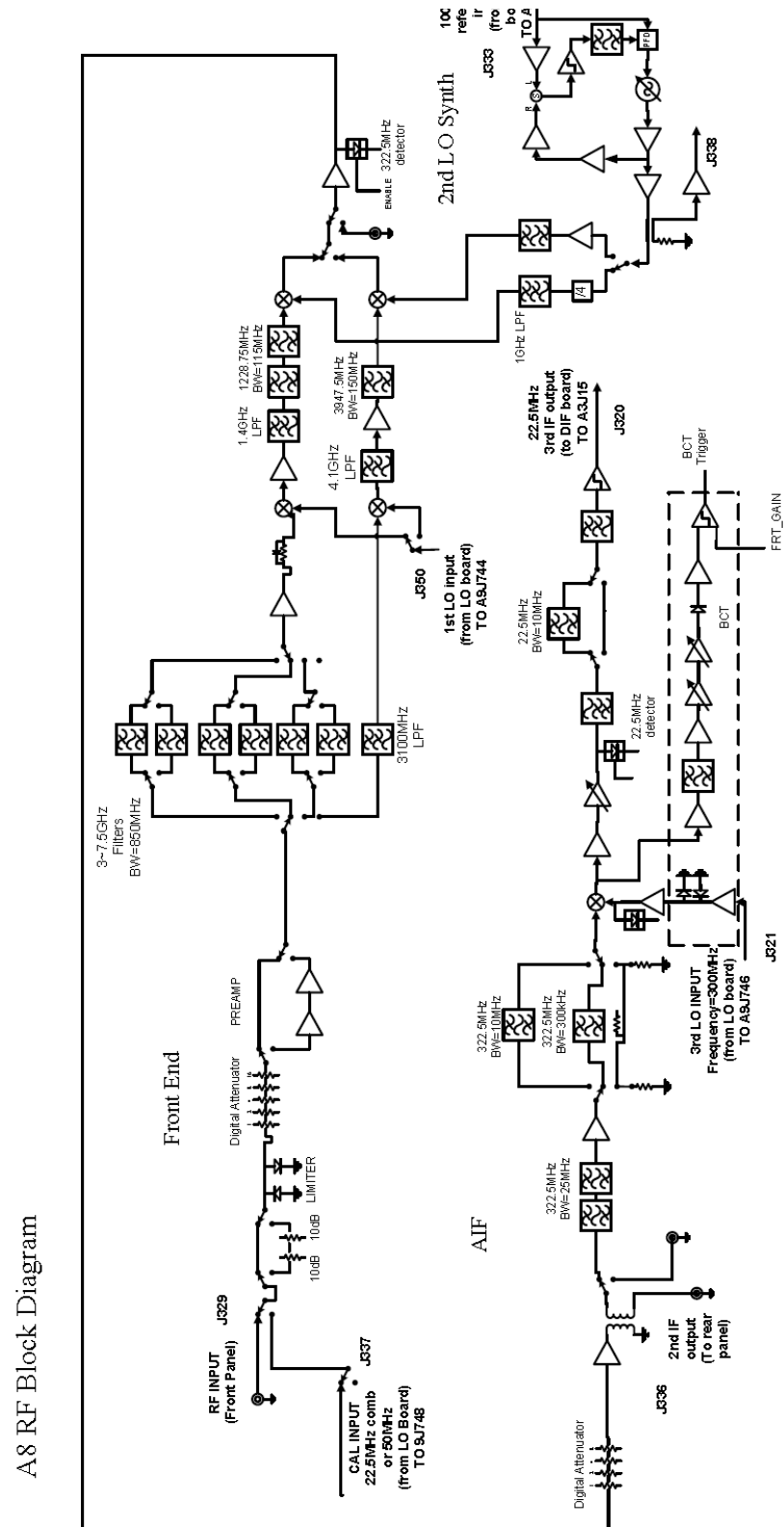
- RF block diagram [page 182](#)
- L.O. Synthesizer & Reference Block Diagram [page 183](#)
- Digital I.F. block diagram..... [page 184](#)
- CXA Computer block diagram [page 185](#)

Block Diagrams



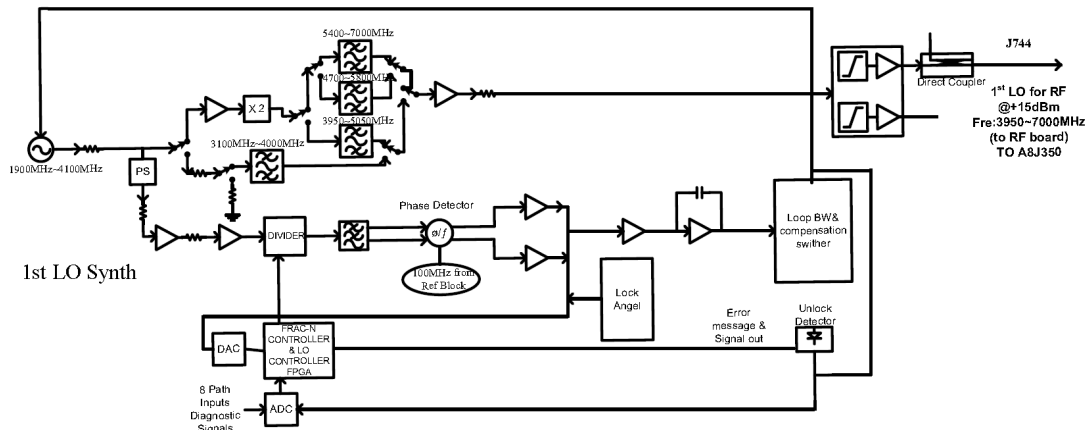
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RF Block Diagram

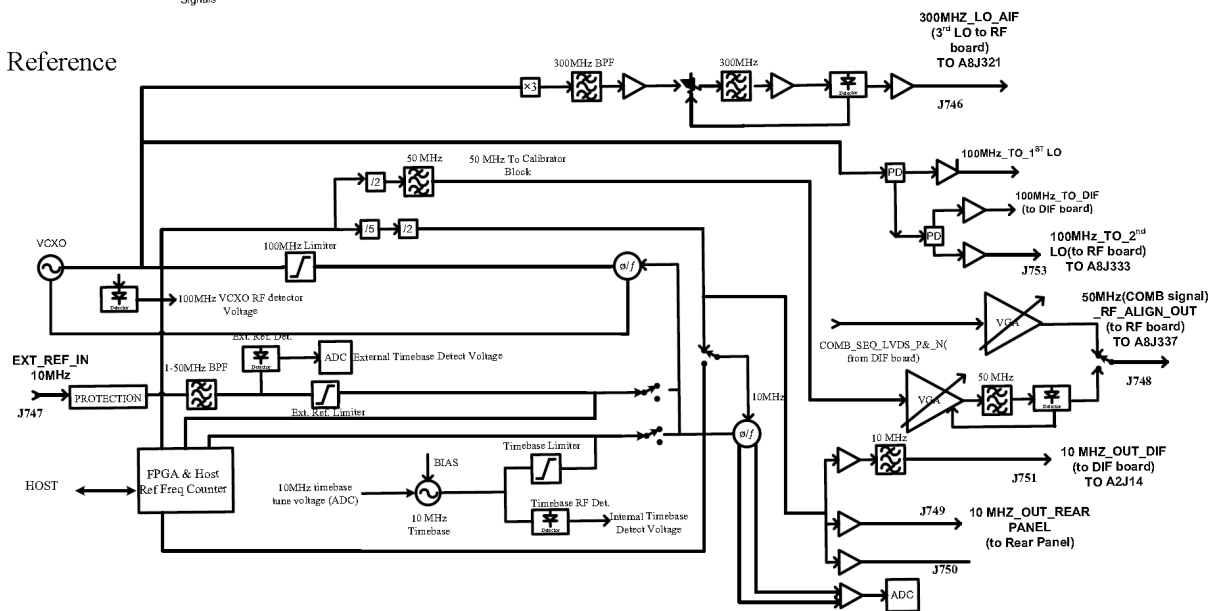


L.O. Synthesizer & Reference Block Diagram

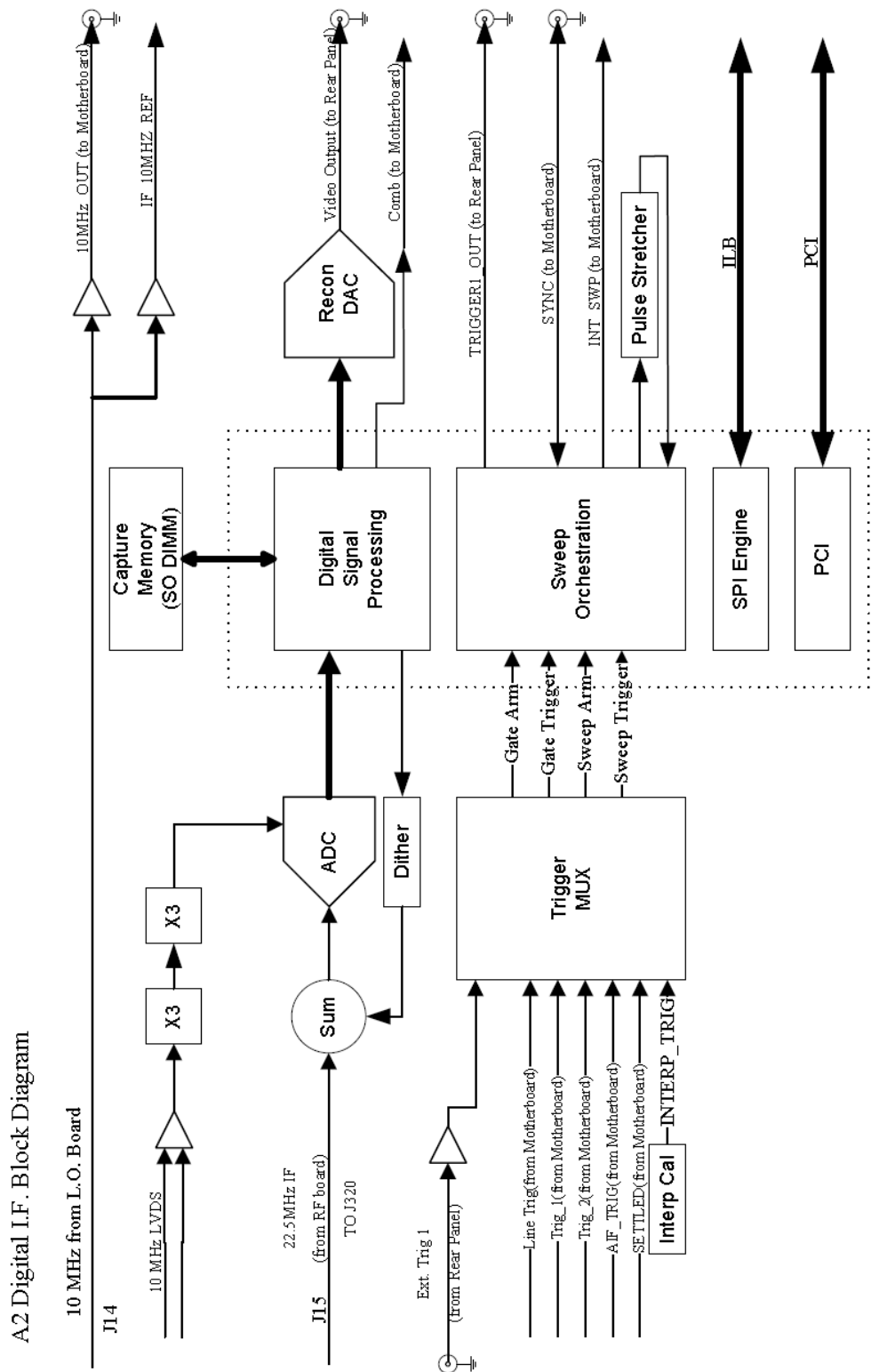
A9 LO Synthesizer & Reference Block Diagram



Reference

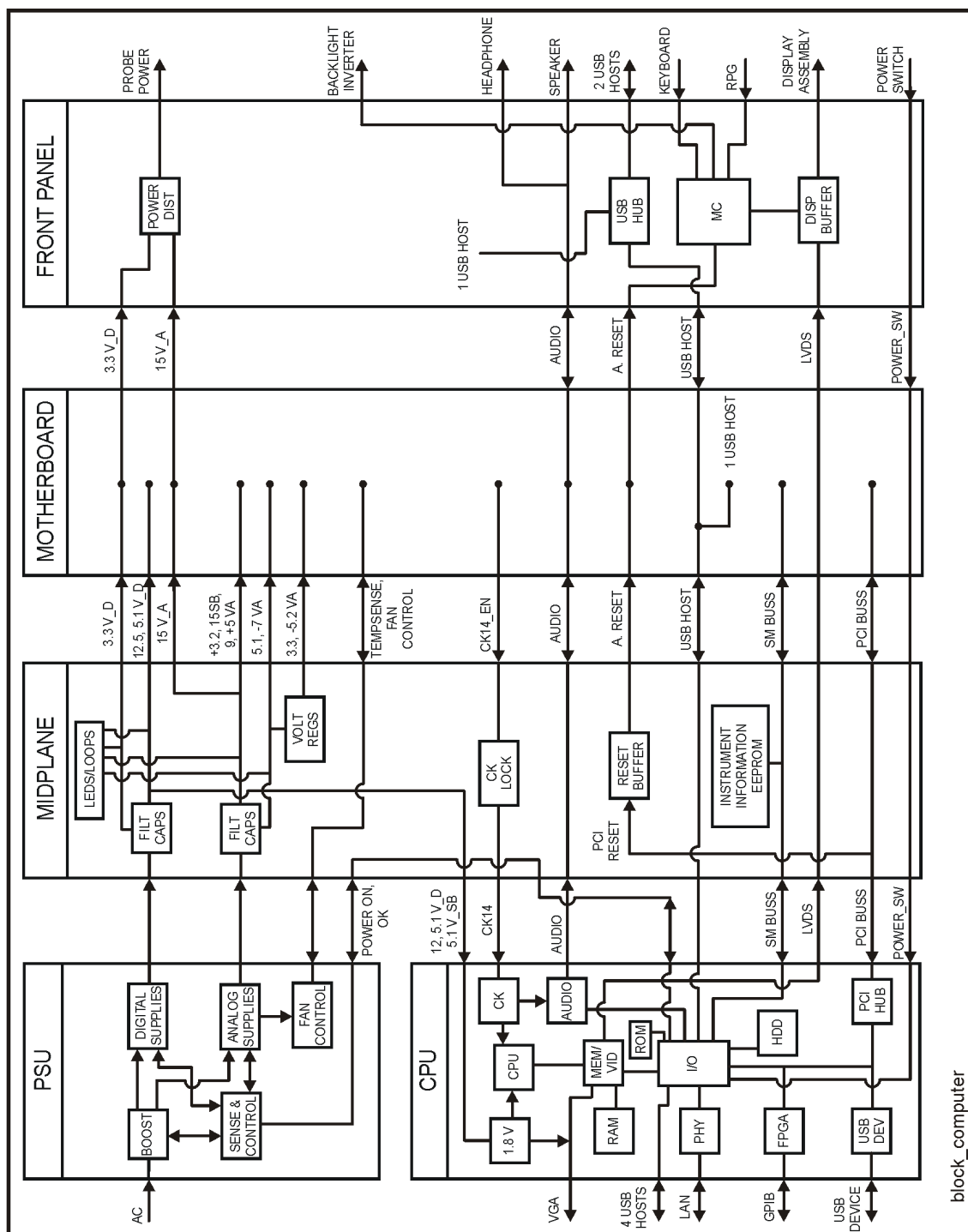


Digital I.F. Block Diagram



CXA Computer Block Diagram

POWER SUPPLY, CPU, MIDPLANE, MOTHERBOARD, FRONT PANEL BLOCK DIAGRAM



11 Service and Diagnostics Menus

Overview

The Service capabilities described below are accessed via the Service and Diagnostic menus in the System menu. The Service capabilities are intended for field service technicians. These technicians may be at an Agilent Service Center or at a self-maintaining customer site.

There are two types of Service capabilities:

1. **Diagnostics** - These are available to any user and will assist in initial troubleshooting of instrument malfunctions. Examples are the ability to read the mechanical relay cycles.
2. **Service Functions** - These are for use by the factory or field repair technicians, access is controlled. Examples are the ability to band lock the analyzer and control the DAC which sets the 10 MHz Reference frequency.

Controlling Access

There are two levels of service and diagnostics capabilities:

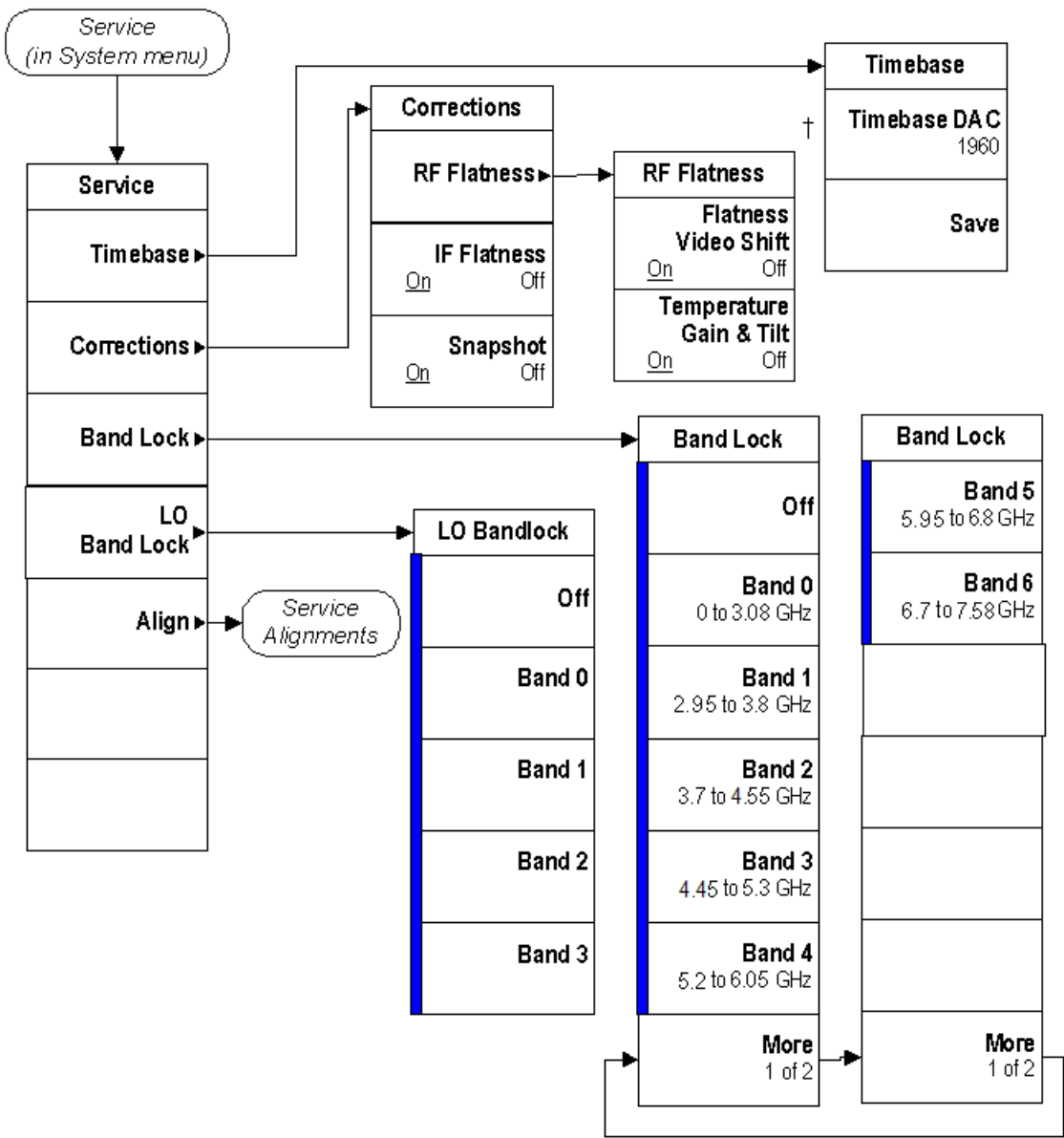
1. “Regular access” to diagnostic capabilities that everyone is allowed access. Care may be required to use a feature appropriately. This is the “Diagnostic” type of Service capability defined above.
2. “Secure service access” to the Service menu. This prevents the casual user from accessing and using these features. It is intended to provide this access to Agilent Service Centers or any customer who purchases the Service Guide. The “Service Functions” type of Service capability is defined above.

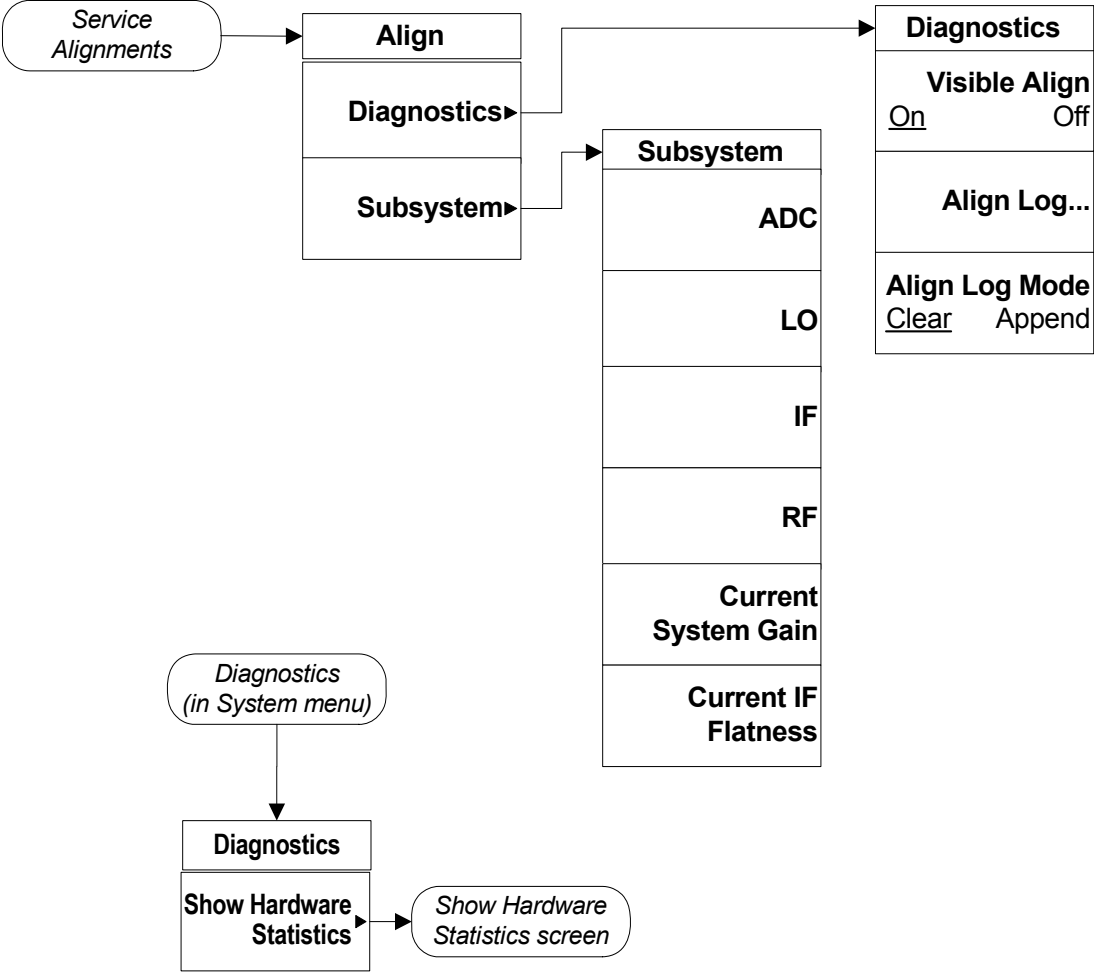
Access to secured service capabilities is gained through the Windows[®] Authentication (login). In addition, the technician is required to enter a specific numeric Service Code that is controlled by the instrument software. The Service Code is defined to be easily entered via the front panel; an external keyboard or mouse will not be required. Once access has been gained, it persists within the execution of the instrument application. If the user exits the instrument application, they must re-enter the Service Code to gain access.

Secure service access

Secure service access is the Windows[®] Login of “advanceduser”. The “advanceduser” must be a member of the Power Users group. This account has not been pre-configured on the instrument. The administrator must create the login and make “advanceduser” a member of the Power Users group (refer to Windows XP Help and Support Center). Agilent recommends using the password “service 4u” to ensure the analyzer can be supported by multiple people. The Service Code is “-2061”.

Menus

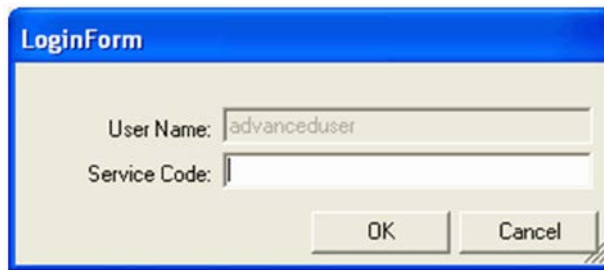




Service Key Descriptions

Service

This menu key is only visible when the logged-in user is “advanceduser”. The first access to the Service Menu after invoking the instrument application will require an authentication, which is to enter the Service Code. Subsequent accesses to the Service Menu are unimpeded. The Authentication dialog looks like:



The LoginForm dialog box has a blue title bar with the text "LoginForm". It contains two text input fields: "User Name:" with the value "advanceduser" and "Service Code:" which is empty. At the bottom right, there are two buttons: "OK" and "Cancel".

“OK” is the default key thus the Enter key is used to complete the entry. If an invalid Service Code is entered authentication is not granted and the user is provided the following dialog:



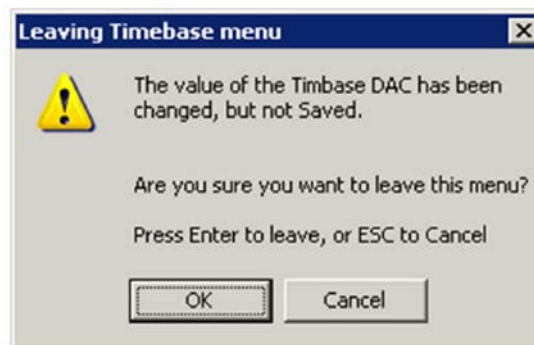
The error dialog box has a blue title bar with a red close button (X) in the top right corner. The main text area contains the message: "Mismatching service code. Please enter the service code and try again." At the bottom center, there is an "OK" button.

Timebase

Allows the technician to adjust the 10 MHz reference (“timebase”) manually.

NOTE

If the Timebase DAC value has been changed, but no Save operation performed before exiting this menu, a warning is provided to the user that they have not saved their setting:

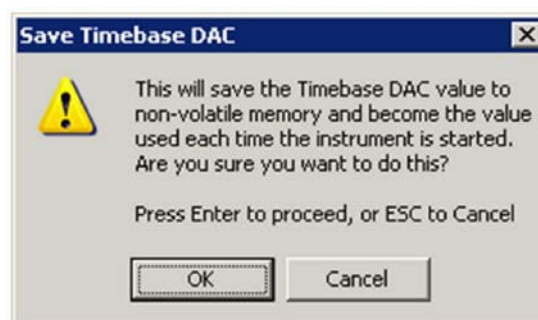


Timebase DAC

Allows the technician the ability to adjust the 10 MHz reference (“timebase”). The adjustment is performed by changing the DAC setting controlling the reference. Once the reference is adjusted to the proper frequency, the DAC value can be saved in non-volatile memory by pressing the Save menu key.

Save

Saves the current Timebase DAC setting in the appropriate cal file. The operator is presented a prompt to confirm the operation:



Corrections

The Corrections menu allows the technician to activate and deactivate specific amplitude correction sets. With this capability, the technician can determine if an anomaly is a result of raw hardware performance or incorrect correction data. It also allows the technician the ability to measure the raw hardware performance when all corrections are set to Off.

RF Flatness

Displays a menu which allows the technician to activate and deactivate the corrections unique to the RF flatness of the analyzer. RF Flatness corrections consist of two major parts: raw flatness corrections and temperature corrections. These corrections are summed together and applied by using RF gain, IF gain, and/or “video shift” (post-digitized mathematical offset). The selections in this menu allow the corrections to be applied or not applied to facilitate troubleshooting the cause of flatness-related problems.

Flatness Video Shift On/Off

The Flatness Video Shift turns off the corrections for gain vs. frequency. It does not turn off the corrections for changes in the analog IF gain that accompany flatness changes. This function turns both the gain and video shift on or off, but does not affect the temperature corrections. When set to off, it is possible to measure the raw flatness of the spectrum analyzer while maintaining the temperature corrections.

When **Flatness Video Shift** is **Off**, the Advisory Event “Flatness Video Shift OFF” will be displayed.

When **Flatness Video Shift** is **ON**, the Advisory Event “Flatness Video Shift OFF” will be cleared.

Temperature Gain & Tilt On/Off

This function controls both temperature adjustment mechanisms: overall gain vs. temperature, and the temperature-proportional tilt of the gain vs. frequency.

When **Temperature Gain & Tilt** is **OFF**, the Advisory Event “Flatness Temperature Gain & Tilt OFF” will be displayed.

When **Temperature Gain & Tilt** is **ON**, the Advisory Event “Flatness Temperature Gain & Tilt OFF” will be cleared.

IF Flatness

This function turns the corrections related to IF flatness On or Off.

When **IF Flatness** is **OFF**, the Advisory Event “IF Flatness corrections OFF” will be displayed.

When **IF Flatness** is **ON**, the Advisory Event “IF Flatness corrections OFF” will be cleared.

Snapshot Alignments On/Off

During normal auto alignment operation, the firmware will perform an RBW and IQ alignment when the analyzer RBW state is changed, and every 10 minutes thereafter. These alignments can hinder troubleshooting the analyzer since they can change correction factors when the state is changed. Turning snapshot alignments off disables the RBW portion of these alignments for more accurate troubleshooting. (Use **IF Flatness ON/OFF** to control the IQ alignment.)

When **Snapshot Alignments** are **OFF**, the Advisory Event “Snapshot OFF” will be displayed.

When **Snapshot Alignments** are **ON**, the Advisory Event “Snapshot OFF” will be cleared.

Band Lock

Provides the ability to tune the analyzer over as large a range as can be accommodated by the specified harmonic number and 1st LO frequency range. As a result, this feature can be used to check performance in the frequency band overlap regions. By definition, multi-band sweeps are not allowed.

When band lock is in effect the Advisory Event “Band Locked: Band <x>” where “x” is a value between 0 and 6.

When band lock is not in affect the Advisory Event “Band Locked: Band <x>” is cleared.

Dependencies/Couplings:

1. Band Lock is only available on CXA with frequency range option 507.
2. The individual bands available for selection also depends upon the particular frequency range option.

Off

Turns Band Lock to Off. Analyzer will tune from band to band normally.

Band 0

Locks the analyzer to Band 0.

Band 1

Locks the analyzer to Band 1.

Band 2

Locks the analyzer to Band 2.

Band 3

Locks the analyzer to Band 3.

Band 4

Locks the analyzer to Band 4.

Band 5

Locks the analyzer to Band 5.

Band 6

Locks the analyzer to Band 6.

LO Band Lock

Provides the ability to tune the analyzer over as large a range as can be accommodated by the specified LO Band. As a result, this feature can be used to check performance in the LO band overlap regions. By definition, multi-band sweeps are not allowed.

When band lock is in effect the Advisory Event “LO Band Locked: Band <x>” where “x” is a value between 1 and 3.

When band lock is not in effect the Advisory Event “LO Band Locked: Band <x>” is cleared.

Dependencies/Couplings:

LO Bandlock will be grayed-out if Bandlock is OFF. If Harmonic Bandlock is any setting other than OFF, LO Bandlock menu key is enabled. If LO Bandlock is other than OFF, and the Harmonic Bandlock is transitioned to OFF, the LO Bandlock is set to OFF.

Off

Turns LO Band Lock to Off. Analyzer will tune from LO band to LO band normally.

Band 1

Locks the analyzer to LO Band 1.

Band 2

Locks the analyzer to LO Band 2.

Band 3

Locks the analyzer to LO Band 3.

Align

The Align Menu allows accessing Diagnostic capabilities of Alignment, and invoking alignments for individual subsystems.

Diagnostic

The Diagnostic menu contains items for controlling the operating behavior of Alignment and the Alignment reporting capabilities.

Visible Align

Controls the state of Visible Align. Visible Align replaces the “Aligning 1 or 10” messages with descriptive messages describing the alignment piece begin executed.

Align Log...

Invokes Notepad with the Alignment Log loaded. The log can be viewed or saved to an external media or drive. Notepad can be closed without a mouse or external keyboard by pressing ALT front-panel key, then arrow down to highlight Exit, then press Enter.

Align Log Mode

The Alignment System places information about the last alignment performed into a log. The log can be configured to operate in clear or append mode. In clear mode the log only contains information on the last alignment performed; the log is cleared with each alignment performed. In append mode each new alignment appends to the log. In append mode, care must be taken by the operator to not allow the log to grow to a size so large as to inhibit system operation.

Subsystem

The Subsystem menu allows invoking individual components of the internal alignments.

ADC

Immediately executes an alignment of the ADC subsystem. The instrument will stop any measurement currently underway, perform the alignment, then restart the measurement from the beginning.

A failure of ADC will set the Error Condition “Align ADC failed”. A failure will not employ new ADC alignment data.

Successful completion of ADC will clear the Error Condition “Align ADC failed”.

The Advisory Event “Alignment complete” is displayed when the alignment is complete.

Align ADC can be interrupted by pressing the Cancel (ESC) front-panel key. When this occurs, no new ADC alignment data will be employed.

LO

Immediately executes an alignment of the LO subsystem. The instrument will stop any measurement currently underway, perform the alignment, then restart the measurement from the beginning.

A failure of LO will set the Error Condition “Align LO failed”. A failure will not employ new LO alignment data.

Successful completion of LO will clear the Error Condition “Align LO failed”.

The Advisory Event “Alignment complete” is displayed when the alignment is complete.

Align LO can be interrupted by pressing the Cancel (ESC) front-panel key. When this occurs, no new LO alignment data will be employed.

IF

Immediately executes an alignment of the IF subsystem. The instrument will stop any measurement currently underway, perform the alignment, then restart the measurement from the beginning.

A failure of IF will set the Error Condition “Align IF failed”. A failure will not employ new IF alignment data.

Successful completion of IF will clear the Error Condition “Align IF failed” and clear bit 6 in the Status.

The Advisory Event “Alignment complete” is displayed when the alignment is complete.

Align IF can be interrupted by pressing the Cancel (ESC) front-panel key. When this occurs, no new IF alignment data will be employed.

RF

This is exactly the same as the customer accessible Align Now, RF with one exception: the alignment can be invoked even if a previous Align Now, All has not been executed (this key is not grayed-out if using default alignment data). See description of Align Now, RF in the User's Guide.

Current Gain System

Immediately executes an alignment of the Current System Gain, for the purpose of improving small amplitude variations that occur as resolution bandwidth is switched. This alignment is done by measuring the response of the current system state configuration to the 50 MHz amplitude reference signal. All subsequent measurements are then compensated appropriately for absolute amplitude accuracy. The instrument will stop any measurement currently underway, perform the alignment, then restart the measurement from the beginning.

The Advisory Event “Alignment complete” is displayed when the alignment is complete.

Align Current System Gain can be interrupted by pressing the Cancel (ESC) front-panel key. When this occurs, no new Current System Gain alignment data will be employed.

Current IF Flatness

Immediately executes an alignment of the Current IF Flatness, for the purpose of improving the absolute amplitude accuracy within FFT Sweeps and improving the group delay in some digital demodulation measurements. The instrument will stop any measurement currently underway, perform the alignment, then restart the measurement from the beginning.

The Advisory Event “Alignment complete” is displayed when the alignment is complete.

Align Current IF Flatness can be interrupted by pressing the **Cancel (ESC)** front-panel key. When this occurs, no new Current IF Flatness alignment data will be employed.

12 **Replaceable Parts**

What You Will Find in This Chapter

The following information is found in this chapter:

1. Part number tables for assemblies, mechanical parts, cables, front panel connectors, and labels.
2. Part location diagrams for the following:

Fig. 12-1 Major Assemblies	page 209
Fig. 12-2 External Hardware (Benchtop Configuration)	page 210
Fig. 12-3 External Hardware and Bail Handle (Option PRC)	page 211
Fig. 12-4 External Hardware (Option PRC)	page 212
Fig. 12-5 CPU Battery and Hard Drive Cable	page 213
Fig. 12-6 Top Brace and Reference Bracket	page 214
Fig. 12-7 RF Cables	page 215
Fig. 12-8 LO cables	page 216
Fig. 12-9 DIF Cables	page 217
Fig. 12-10 Chassis	page 218
Fig. 12-11 Motherboard	page 219
Fig. 12-12 Fan Hardware	page 220
Fig. 12-13 Input Connector	page 221
Fig. 12-14 Front Frame Parts	page 222
Fig. 12-15 Front Frame Exploded View	page 223

How to Order Parts

To order an assembly or mechanical part listed in this chapter, go to:

www.parts.agilent.com

If you do not have web access, or the parts you are interested in cannot be found in the parts list provided, contact your local Agilent Technologies sales and service office with the following information:

- Product model number
- Product serial number
- Description of where the part is located, what it looks like, and its function (if known)
- Quantity required

For a list of Agilent Technologies sales and service office locations, refer to [“Contacting Agilent Technologies” on page 37](#).

Replaceable Parts

Some of the assemblies listed in the following table are related to options that are available with the CXA Signal Analyzer. These options are described below.

Table 12-1 All Replaceable Parts

Reference Designator	Description	Part Number
A1A1	Front Frame Assembly Replacement Kit ^a	N9020-60110
A1A1MP1	Front Frame	W1312-20108
A1A1MP2	Main Keypad Overlay	N9000-80101
A1A1MP3	Connector Overlay	E4410-80109
A1A1MP4	Front Frame Ground Spring	W1312-00021
A1A1MP5	Braided Gasket	-----
A1A1MP6	Chromeric Gasket	-----
A1A1MP7	Front Frame Top Trim Strip (Use with Option PRC, Portable)	W1312-40004
A1A1MP8	Front Frame Top Trim Strip (Use with standard Bench analyzer)	W1312-40019
A1A1MP9-10	Front Frame Side Trim Strip	W1312-40005
A1A1MP11-12	Vinyl Side Trim (Use with standard Bench Analyzer)	5041-9172
A1A2	Front Panel Interface Board	W1312-60042
A1A2MP1	Speaker	9164-0453
A1A2MP2	Speaker Foam	W1312-40016
A1A3	Liquid Crystal Display	2090-0911
A1A4	Inverter Board (Display Backlight Power)	0950-4635
A1A5	Front Panel Daughter Board	W1312-63121
A1MP1	Main Keypad	E4410-40100
A1MP2	Display Keypad	E4410-40101
A1MP3	Frequency Label, 3.0 GHz	N9000-80017
A1MP4	Frequency Label, 7.5 GHz	N9000-80000
A1MP5	LCD Glass Filter	1000-1435
A1MP6	LCD Lens Gasket	W1312-40006
A1MP7	RPG Knob	W1312-40017
A1MP8-11	Cable Clamp (Front Panel Cables)	1400-1439
A1MP12	Display Bracket	W1312-00023

Table 12-1 All Replaceable Parts

Reference Designator	Description	Part Number
A1MP13	Inverter Board Shield	W1312-00024
A1W1	Power Cable, Display to Front Panel Interface Board	W1312-60010
A1W2	Power Cable, Front Panel Interface Board to Inverter Board	W1312-60011
A2	Digital I.F. Assembly	N9000-60400
A3	CPU Kit (less hard drive, includes battery)	N9020-60031
A3BT1	CPU Board Battery	1420-0356
A4	Hard Disk Drive Kit	N9020-60066
A4W1	Hard Disk Drive Ribbon Cable	8121-1611
A5	Power Supply	0950-4894
A6	Midplane Assembly	E4410-60106
A7	Motherboard Assembly	E4410-63100
A8	RF Assembly	N9000-60401
A9	L.O. Assembly	N9000-60403
B1-B2	Fan	3160-4199
J1	Type-N (f) RF Input Connector Assembly	5002-0702
MP1	Chassis Base	E4410-00102
MP2	Chassis Side, Right (inner)	W1312-00046
MP3	Chassis Side, Left (inner)	W1312-00047
MP4	Midplane Bracket	W1312-00048
MP5	Chassis Front Bracket	W1312-00049
MP6	Fan Bracket	W1312-00106
MP7	Top Brace	N9020-60018
MP8	Chassis Side, Right (Outer, attaches to RF bracket)	E4410-00101
MP9	Rear Panel Assembly	N9000-00100
MP11-12	Coax Cable Clips	5041-7250
MP13-15	Tie Wrap (For long semi-rigid cables)	1400-0249
MP16	Dress Cover (includes magnetic gasket)	N9020-60020
MP17-20	Rear Feet (Benchtop Configuration)	5041-9611
MP21-22	Strap Handles (Benchtop Configuration)	N9020-60002
MP25-26	Fan Guard	3160-4198

Table 12-1 All Replaceable Parts

Reference Designator	Description	Part Number
MP27-34	Rivet, Fan Mounting (8 pieces)	0361-1272
MP35	Z-Bracket Power Supply to Chassis	W1312-00016
MP36	O-ring, Type N (f) RF Input Connector	8160-1637
MP37	PC Board Plastic Guides (10 pieces)	W1312-40001
MP38-41	Front Bumpers (Option PRC, Portable)	W1312-40020
MP42-45	Rear Bumpers (Option PRC, Portable)	W1312-40021
MP46	Bail Handle (Option PRC, Portable)	W1312-60036
MP47	Front Panel Protective Cover (Option CVR)	W1312-40025
MP48	CPU & Power Supply Guide Pin Grommets (8 pieces)	0400-0353
MP49	50 Ω Termination (for A13)	1810-0118
MP50	Spiral Wrap	0890-0025
MP51	Rear Frame Lock Washer (External Reference Cable)	2190-0102
MP52	Rear Frame Lock Nut (External Reference Cable)	0590-2332
MP53-56	Bottom Feet Hole Plugs (Option PRC, Portable)	W1312-40032
MP57-60	Strap Handle Plugs (Option PRC, Portable)	W1312-40024
MP61	Top Bracket	N9000-00104
MP62-65	Bottom Feet (Benchtop Configuration)	5041-9167
MP66-67	Tilt Stands (Benchtop Configuration)	1460-1345
MP68-71	Bottom Feet Key Locks (Benchtop Configuration)	5021-2840
W1	Cable Assembly, A9J744 to A8J350	N9000-20117
W2	Cable Assembly, A9J746 to A8J321	N9000-20118
W3	Cable Assembly, A9J753 to A8J333	N9000-20102
W4	Cable Assembly, A2J15 to A8J320	N9000-20103
W5	Cable Assembly, A8J336 to Aux IF Output	N9000-20108
W6	Cable Assembly, A9J751 to A2J14	N9000-20119
W7	Cable Assembly, Ext. Reference (rear frame) to A9J747	N9000-20111
W8	Cable Assembly, J1 (RF Input) to A8J329	N9000-20113
W9	Cable Assembly, A9J748 to A8J337	N9000-20115
W10	Cable, Front Panel Interface Board to Motherboard (Ribbon)	E4410-60171

a. Frequency range label not included in kit. See [A1MP3](#) - [A1MP4](#).

Table 12-2 Attaching Hardware

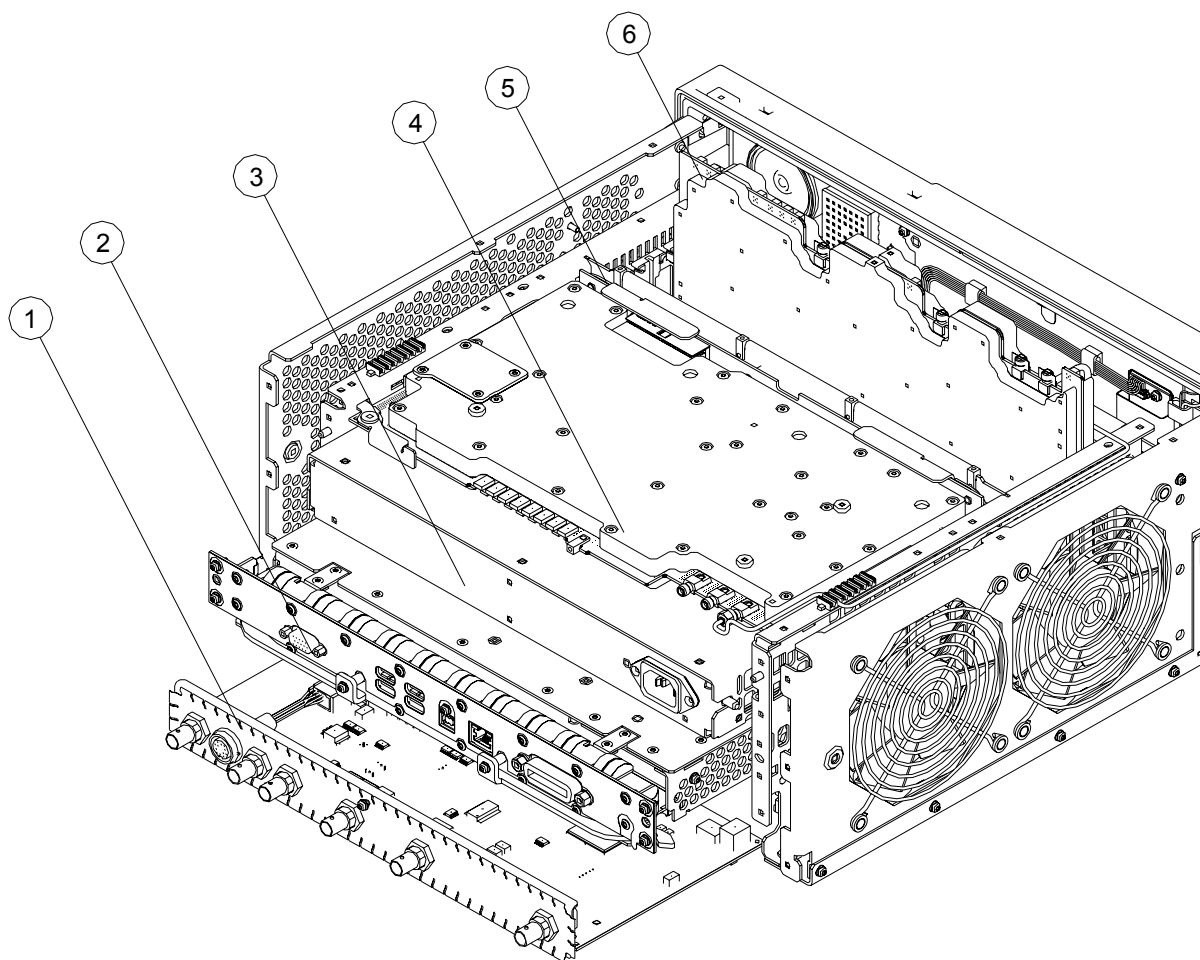
Attach	To	Qty	Part Number	Type	Tool	Torque
Attenuators	Chassis	2 per	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Bail Handle	Front Frame	4	0515-0435	M4 X 0.7 (14 mm long)	Torx T-20	21 inch-lbs
Chassis Bottom	Chassis Sides, Midplane & Front Bracket	15	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Chassis Side (Right Outside)	RF Bracket	8	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
CPU Assembly	Chassis	6	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
CPU Shield	CPU & Hard Disk Drive	19	0515-5074	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Display	Display Bracket	4	0515-1934	M2.5 X 0.45 (6 mm long)	Torx T-8	5 inch-lbs
Display Bracket	Front Frame	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
External Reference BNC	Rear Panel	1	2190-0102	Lock Washer	n/a	n/a
External Reference BNC	Rear Panel	1	0590-2332	Hex Nut	9/16" Nut Driver	21 inch-lbs
Fan Assembly	Chassis	5	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Fan	Fan Bracket	8	0361-1272	Rivets	n/a	n/a
Front Bumpers (Opt. PRC)	Front Frame	8	0515-0435	M4 X 0.7 (14 mm long)	Torx T-20	21 inch-lbs
Front Chassis Bracket & Midplane Bracket	Chassis Sides	10	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Front Frame	Chassis	8	0515-1035	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Front Frame Bottom	Chassis	2 per	0515-1035	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Front Panel Assy.	Chassis	6	0515-1035	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Front Panel Daughter Board	Front Frame	3	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Front Panel Interface	Front Frame	13	0515-1521	M3 X 0.5 (5 mm long)	Torx T-10	9 inch lbs.
Inverter Board	Inverter Bracket	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Midplane Assembly	Midplane Bracket	6	0515-0375	M3 X 0.5 (16 mm long)	Torx T-10	9 inch-lbs
Motherboard	Chassis Base	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Power Supply 'Z' Bracket	Chassis Sides	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs

Table 12-2 Attaching Hardware

Attach	To	Qty	Part Number	Type	Tool	Torque
Power Supply 'Z' Bracket	Power Supply	3	0515-1227	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Rear Bumper Feet (Opt. PRC)	Rear Panel	4	0515-1619	M4 X 0.7 (25 mm long)	Torx T-20	21 inch-lbs.
Rear Bumper Feet (Opt. PRC)	Rear Panel	4	3050-0893	Flat Washer	n/a	n/a
Rear Feet	Rear Panel	4	0515-1619	M4 X 0.7 (25 mm long)	Torx T-20	21 inch-lbs
Rear Feet	Rear Panel	4	3050-0893	Flat Washer	n/a	n/a
Rear Frame	Chassis	18	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Rear Frame	Top Bracket, Reference Assembly	4	0515-1227	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
RF Input Connector	Chassis	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Strap Handle Plugs (Opt. PRC)	Instrument Cover	4	0515-0710	M4 X 0.8 (12 mm long)	Torx T-20	21 inch-lbs
Strap Handles	Chassis Side	2 per	0515-0710	M4 X 0.8 (18 mm long)	Torx T-20	21 inch-lbs
Top Brace	Top Bracket, Reference Assembly	4	0515-1227	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Top Brace	Board Assemblies	6	0515-1227	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Top Brace & Reference Assembly Bracket	Chassis Components	12	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs

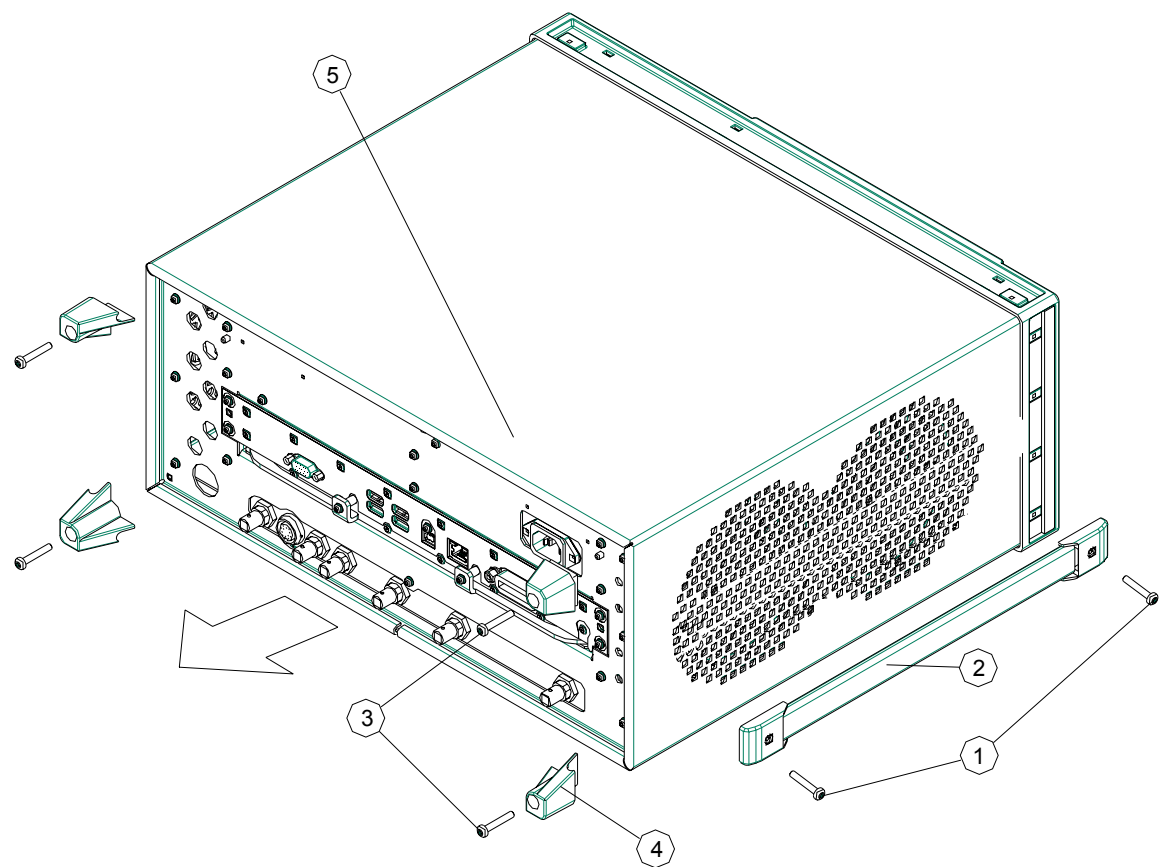
Hardware

Figure 12-1 Major Assemblies



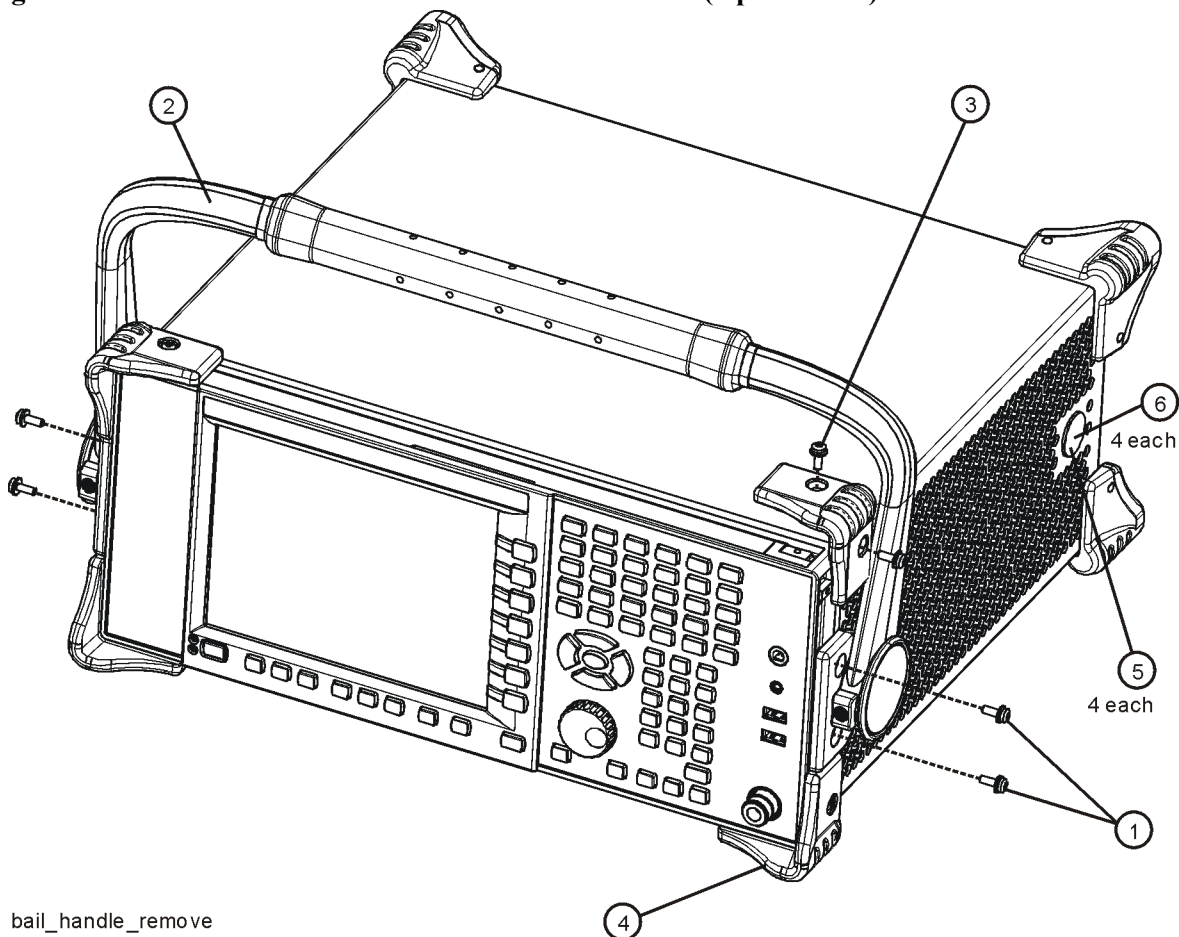
Item	Description	Agilent Part Number
1	A2 Digital I.F. Assembly	N9000-60400
2	A3 CPU Kit (less hard drive, includes battery)	N9020-60031
3	A5 Power Supply	0950-4894
4	A9 L.O. Assembly	N9000-60403
5	A6 Midplane Assembly	E4410-60106
6	A8 RF Assembly	N9000-60401

Figure 12-2 External Hardware (Benchtop Configuration)



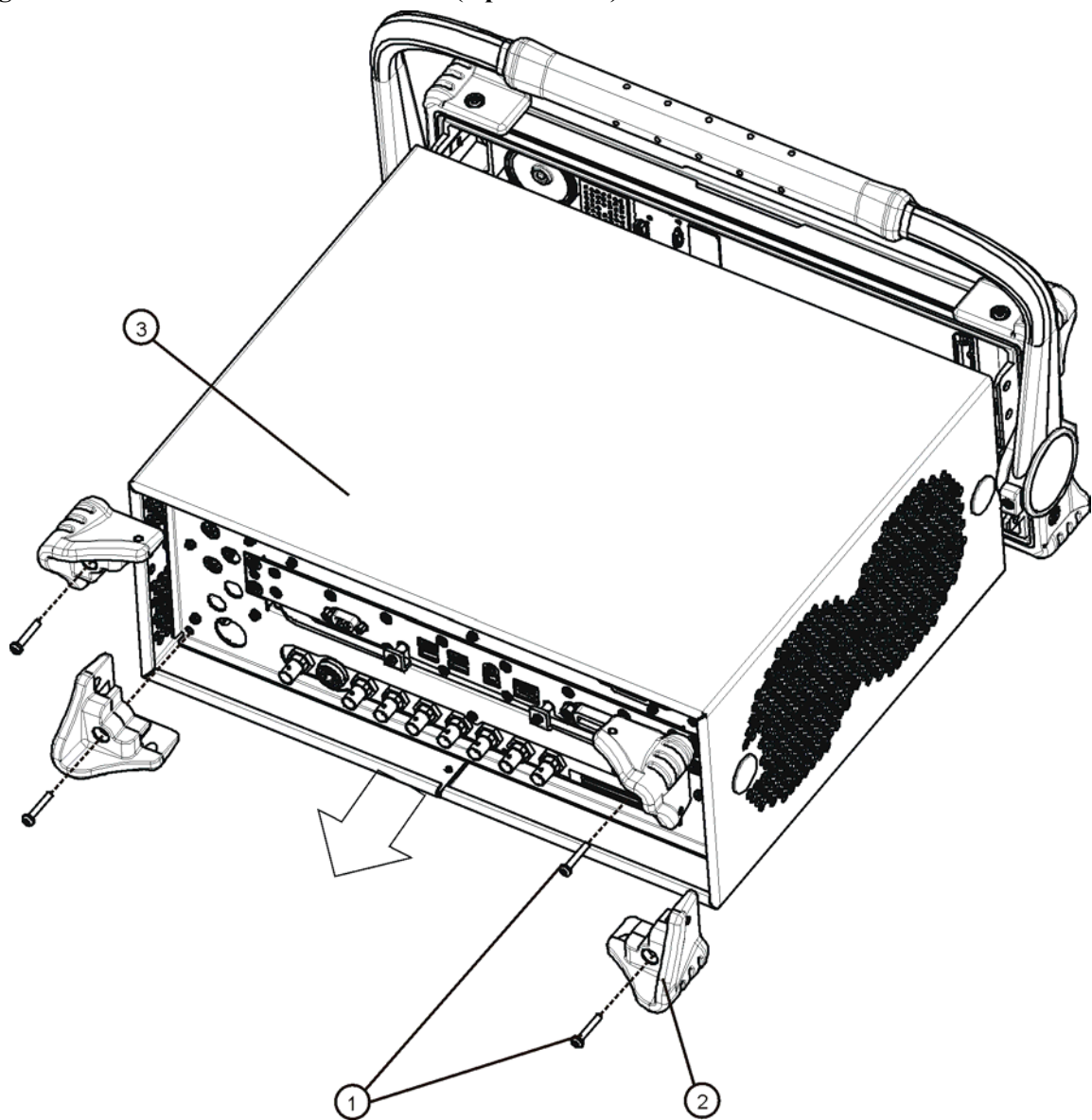
Item	Description	Agilent Part Number
1, 2	MP21-22 Strap Handles (Benchtop Configuration) (includes screws)	N9020-60002
3	Screw M4 X 0.7 (25 mm long)	0515-1619
4	MP17-20 Rear Feet (Benchtop Configuration)	5041-9611
5	MP16 Dress Cover (includes magnetic gasket)	N9020-60020

Figure 12-3 External Hardware and Bail Handle (Option PRC)



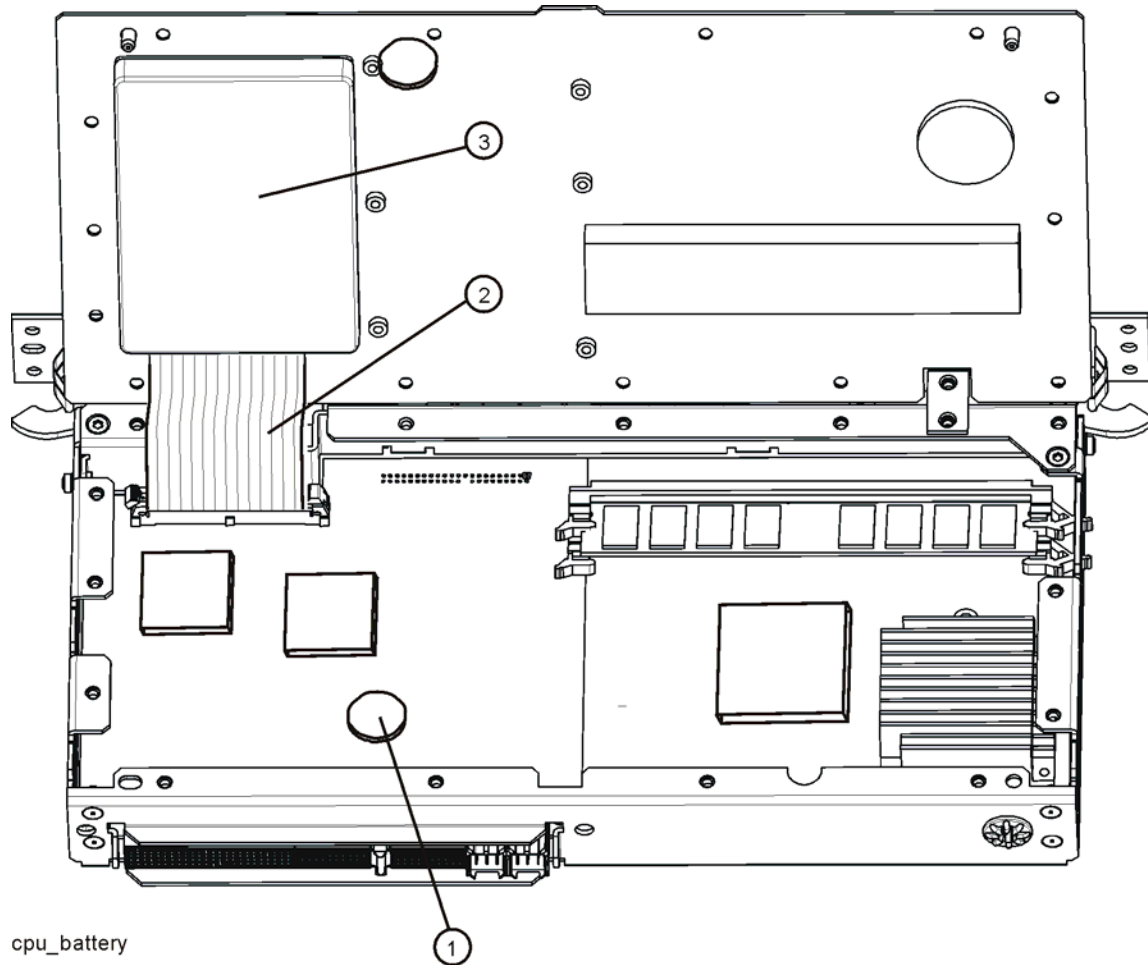
Item	Description	Agilent Part Number
1	Screw M4 X 0.7 (14 mm long)	0515-0435
2	MP46 Bail Handle (Option PRC, Portable)	W1312-60036
3	Screw M4 X 0.7 (14 mm long)	0515-0435
4	MP38-41 Front Bumpers (Option PRC, Portable)	W1312-40020
5	MP57-60 Strap Handle Plugs (Option PRC, Portable)	W1312-40024
6	Screw M4 X 0.8 (12 mm long)	0515-0710

Figure 12-4 External Hardware (Option PRC)



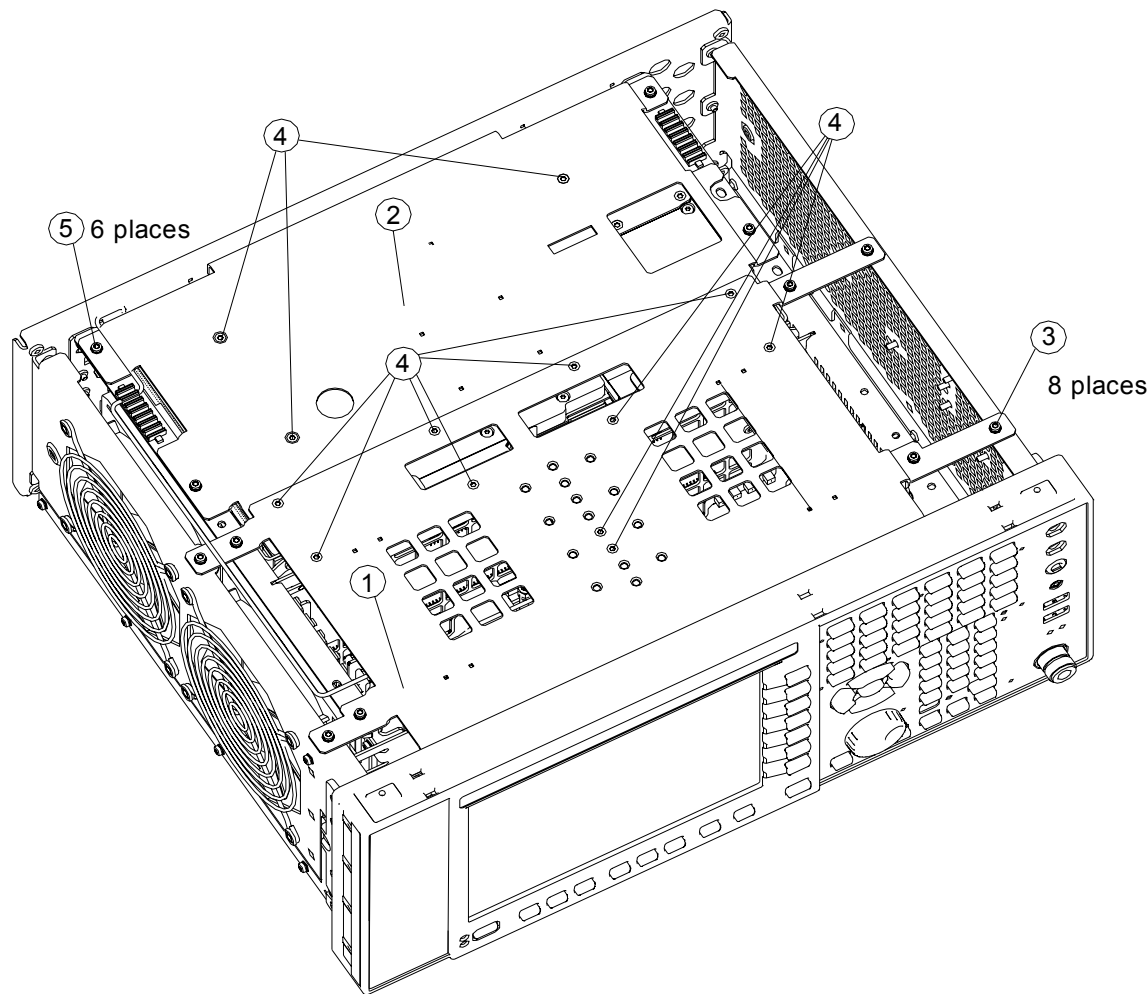
Item	Description	Agilent Part Number
1	Screw M4 X 0.7 (25 mm long)	0515-1619
2	MP42-45 Rear Bumpers (Option PRC, Portable) (includes screws)	W1312-40021
3	MP16 Dress Cover (includes magnetic gasket)	N9020-60020

Figure 12-5 CPU Battery and Hard Drive Cable



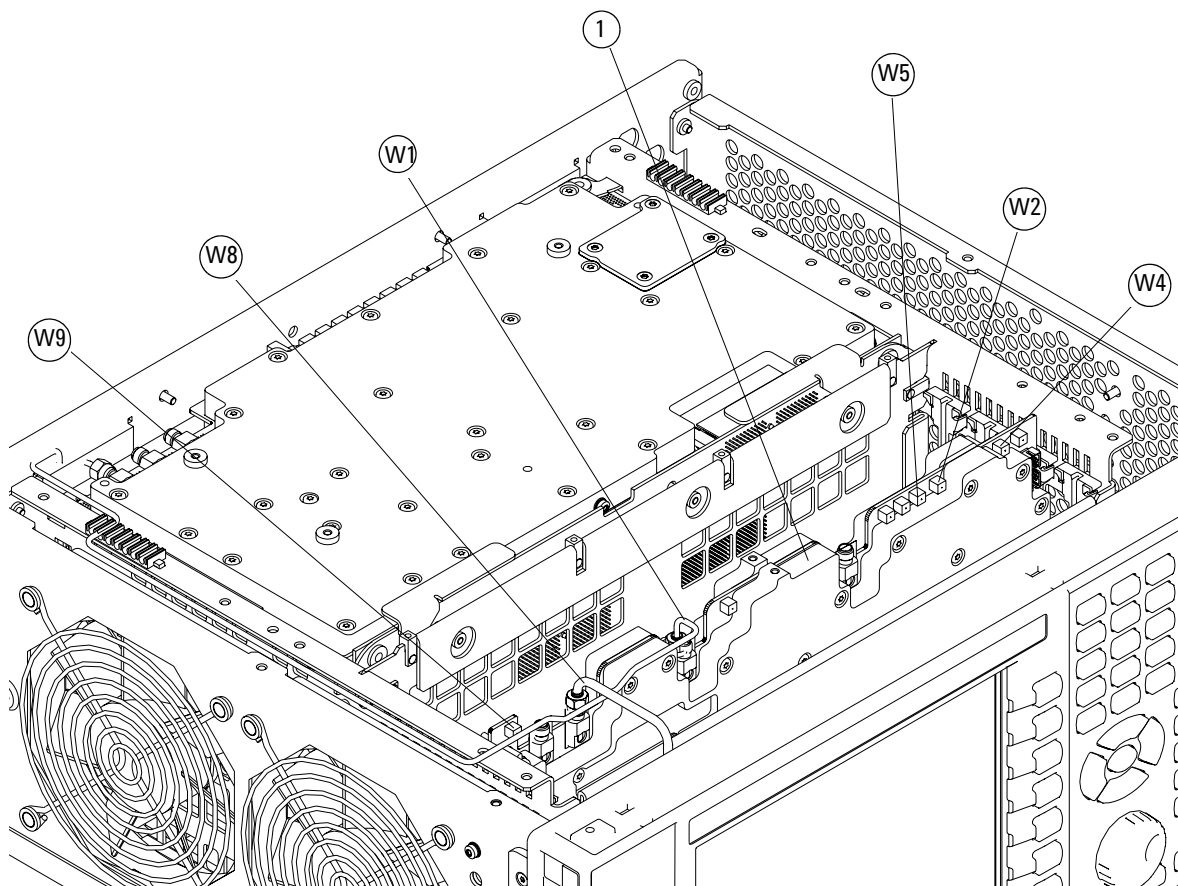
Item	Description	Agilent Part Number
1	A3BT1 CPU Board Battery	1420-0356
2	Hard Disk Drive Ribbon Cable	8121-1611
3	Hard Disk Drive	N9020-60066

Figure 12-6 Top Brace and Reference Bracket



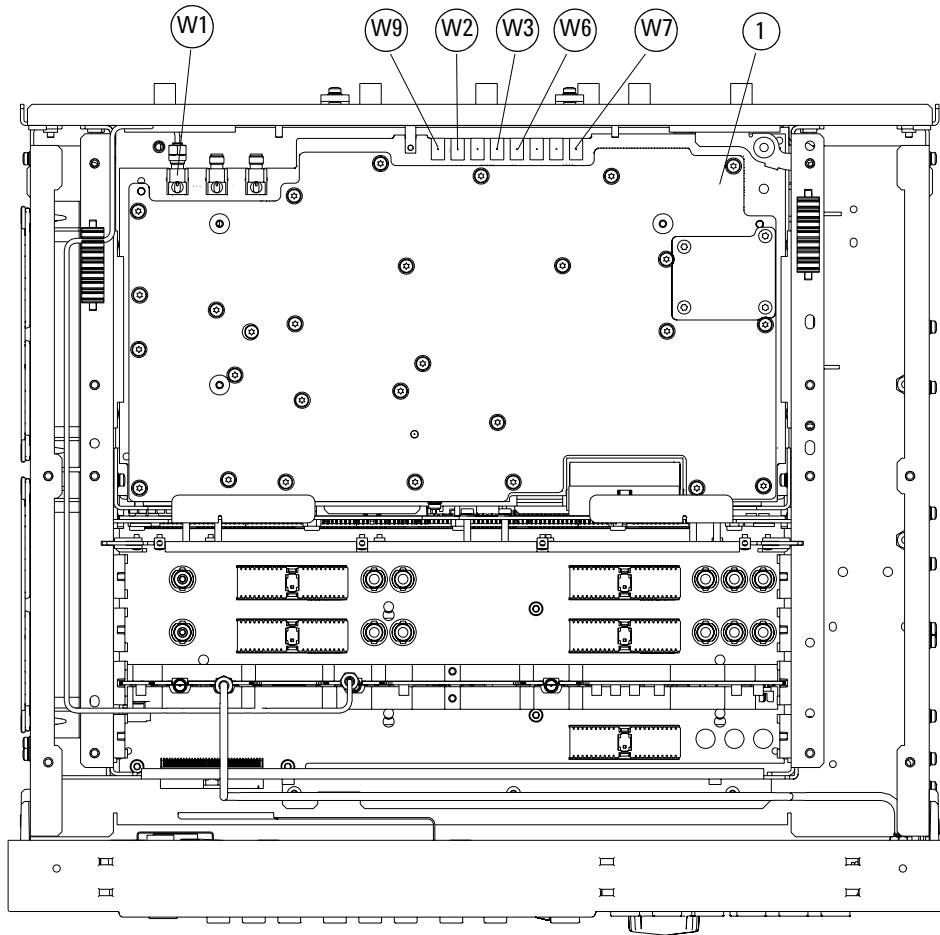
Item	Description	Agilent Part Number
1	MP7 Top Brace	N9020-60018
2	MP61 Top Bracket	N9000-00104
3	Screw M3 X 0.5 (8 mm long)	0515-0372
4	Screw M3 X 0.5 (6 mm long)	0515-1227
5	Screw M3 X 0.5 (8 mm long)	0515-0372

Figure 12-7 RF Cables



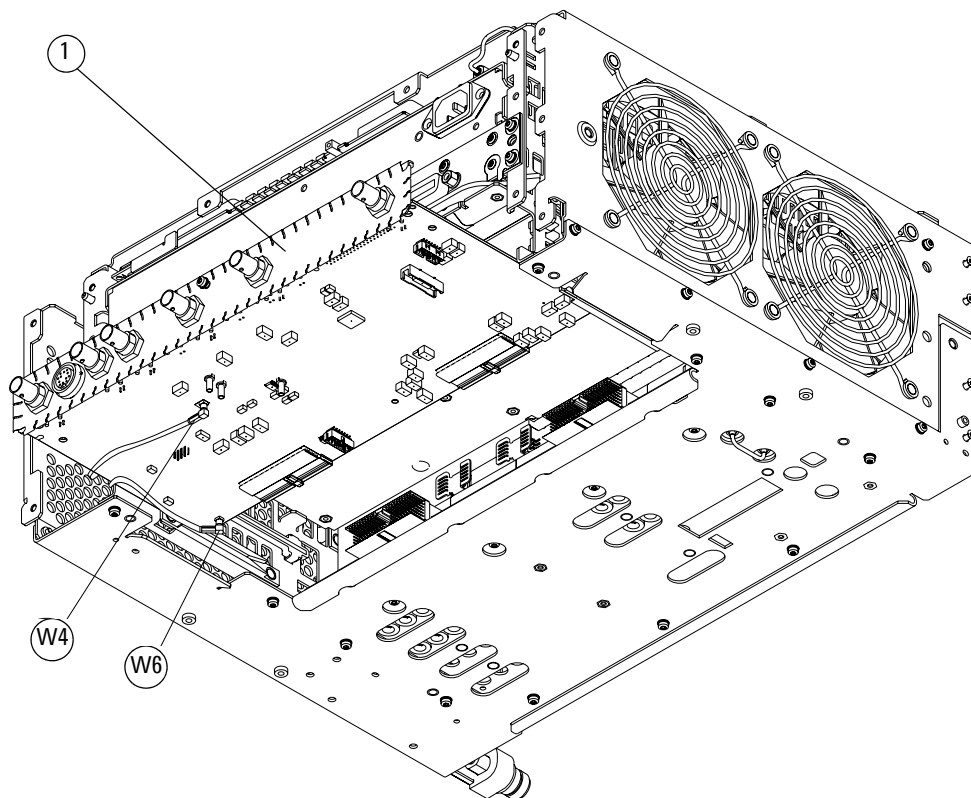
Item	Description	Agilent Part Number
1	A8 RF Assembly	N9000-60401
W1	Cable Assembly, A9J744 to A8J350	N9000-20117
W2	Cable Assembly, A9J746 to A8J321	N9000-20118
W4	Cable Assembly, A2J15 to A8J320	N9000-20103
W5	Cable Assembly, A8J336 to Aux IF Output	N9000-20108
W8	Cable Assembly, J1 (RF Input) to A8J329	N9000-20113
W9	Cable Assembly, A9J748 to A8J337	N9000-20115

Figure 12-8 **LO cables**



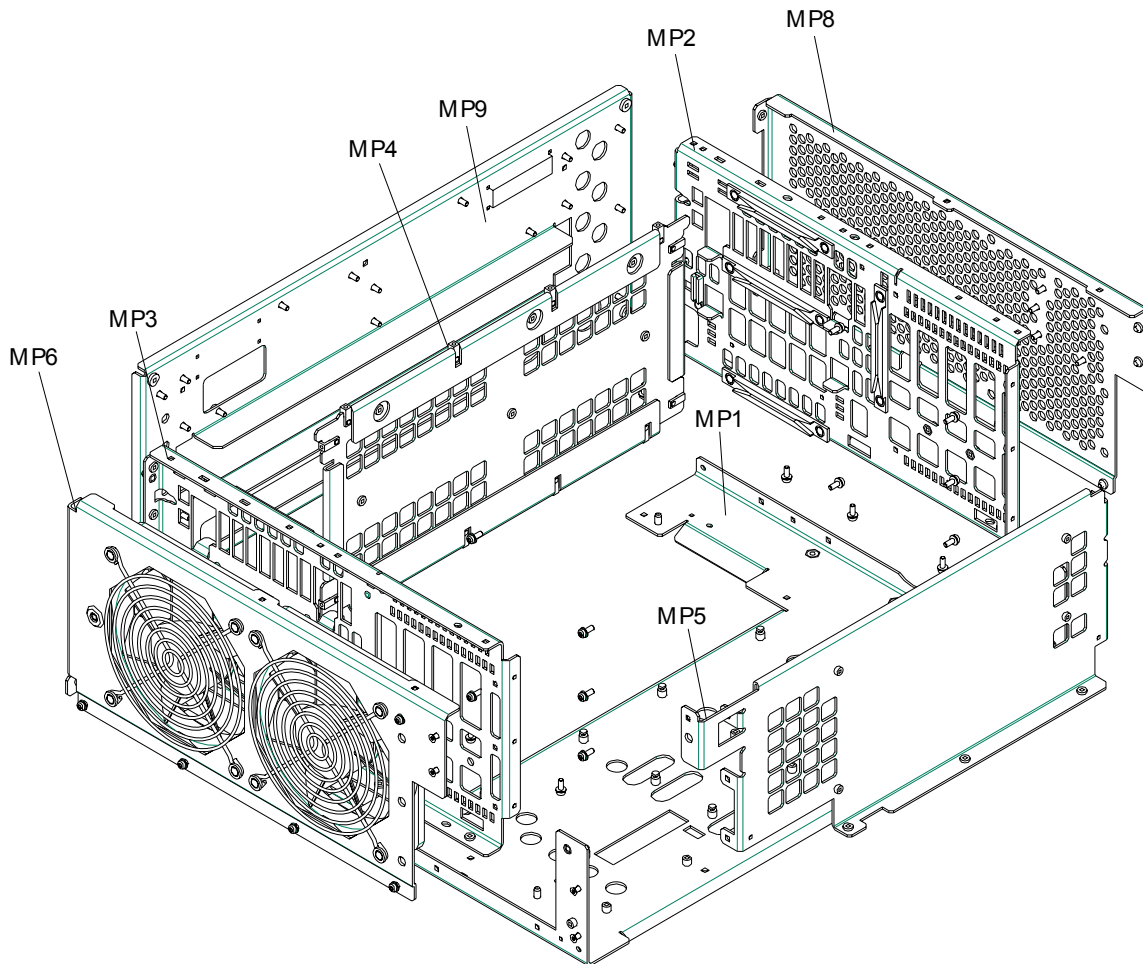
Item	Description	Agilent Part Number
1	A9 L.O. Assembly	N9000-60403
W1	Cable Assembly, A9J744 to A8J350	N9000-20117
W2	Cable Assembly, A9J746 to A8J321	N9000-20118
W3	Cable Assembly, A9J753 to A8J333	N9000-20102
W6	Cable Assembly, A9J751 to A2J14	N9000-20119
W7	Cable Assembly, Ext. Reference (rear frame) to A9J747	N9000-20111
W9	Cable Assembly, A9J748 to A8J337	N9000-20115

Figure 12-9 **DIF Cables**



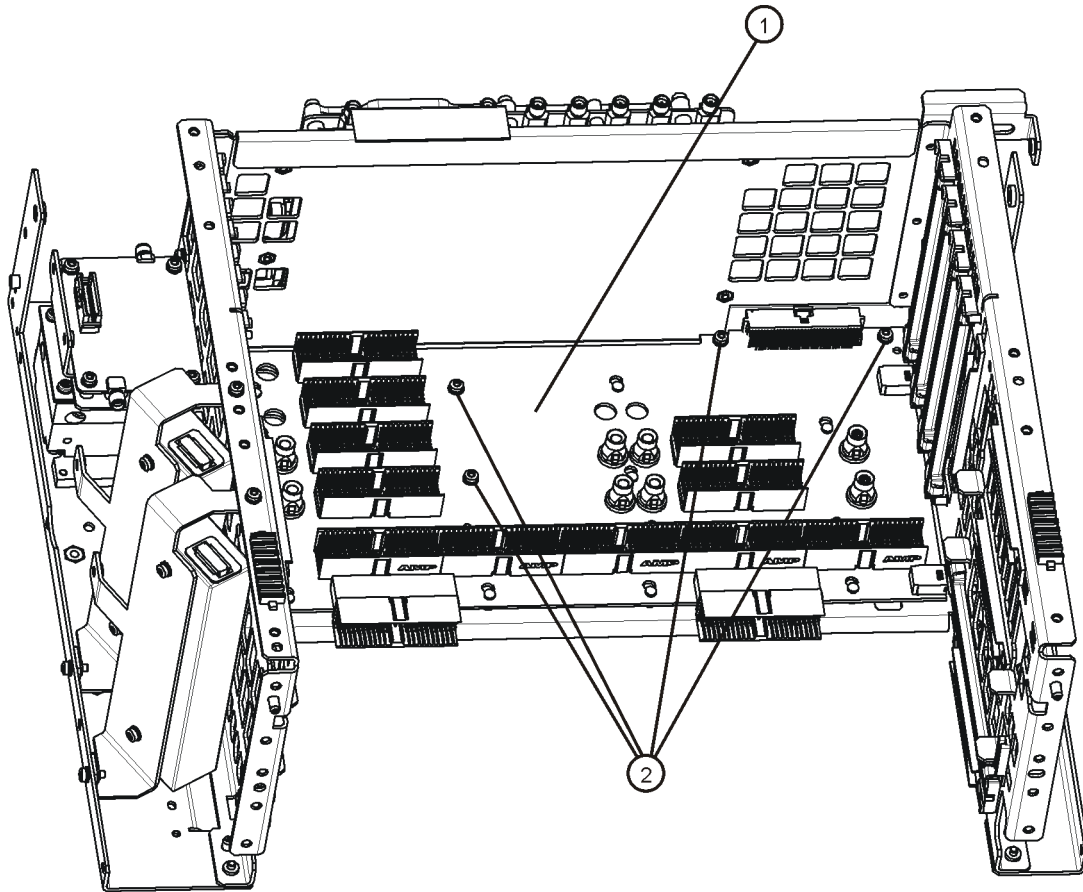
Item	Description	Agilent Part Number
1	A2 Digital I.F. Assembly	N9000-60400
W4	Cable Assembly, A2J15 to A8J320	N9000-20103
W6	Cable Assembly, A9J751 to A2J14	N9000-20119

Figure 12-10 Chassis



Item	Description	Agilent Part Number
MP1	Chassis Base	E4410-00102
MP2	Chassis Side, Right (inner)	W1312-00046
MP3	Chassis Side, Left (inner)	W1312-00047
MP4	Midplane Bracket	W1312-00048
MP5	Chassis Front Bracket	W1312-00049
MP6	Fan Bracket	W1312-00106
MP8	Chassis Side, Right (Outer, attaches to RF bracket)	E4410-00101
MP9	Rear Panel Assembly	N9000-20119

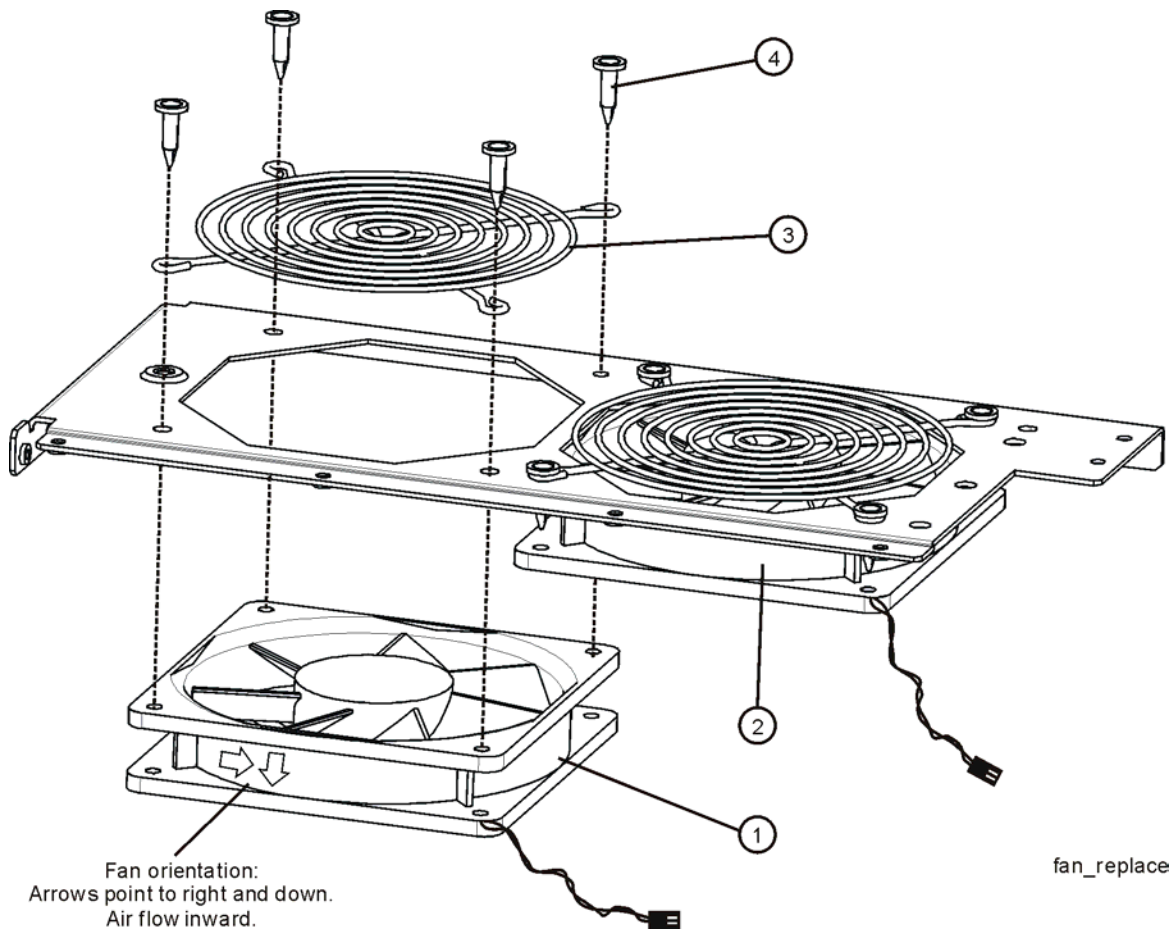
Figure 12-11 **Motherboard**



motherboard_replace

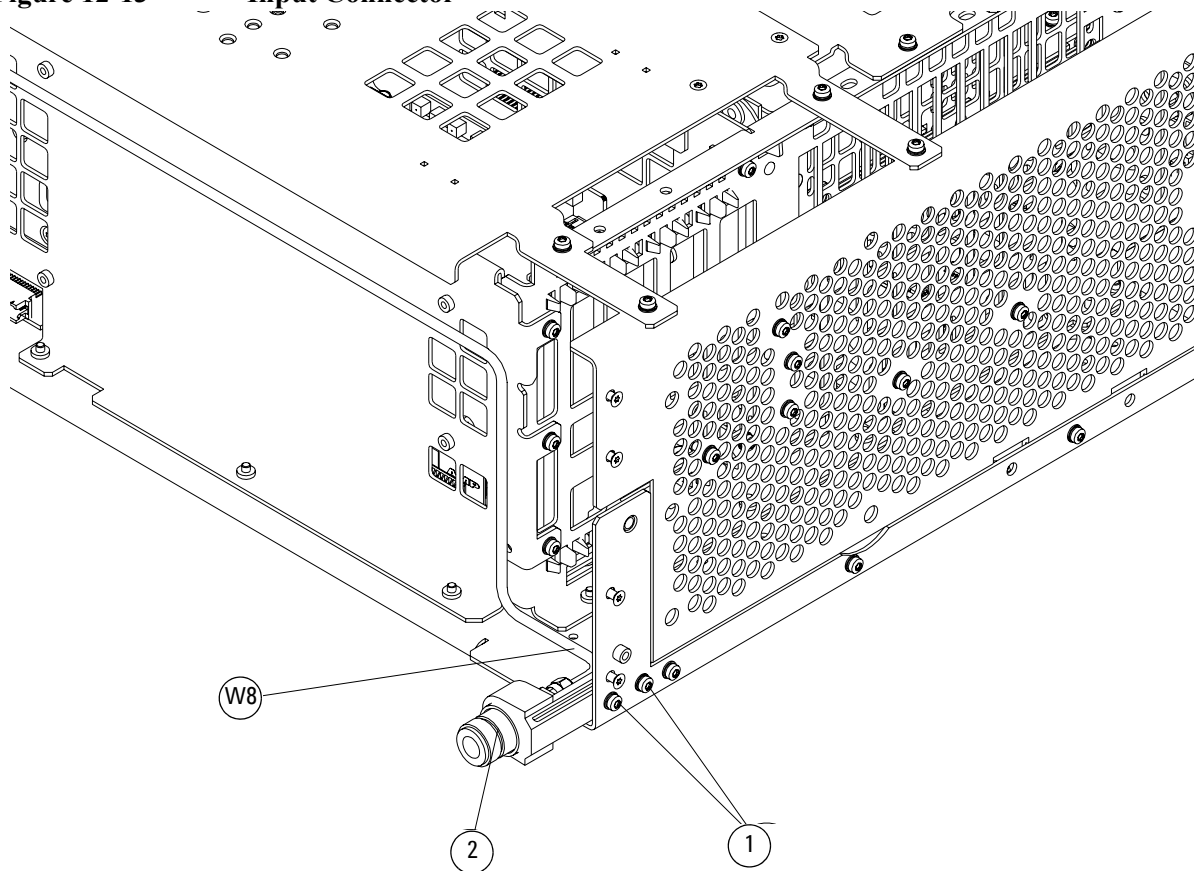
Item	Description	Agilent Part Number
1	A7 Motherboard Assembly	E4410-63100
2	Screw M3 X0.5 (8 mm long)	0515-0372

Figure 12-12 Fan Hardware



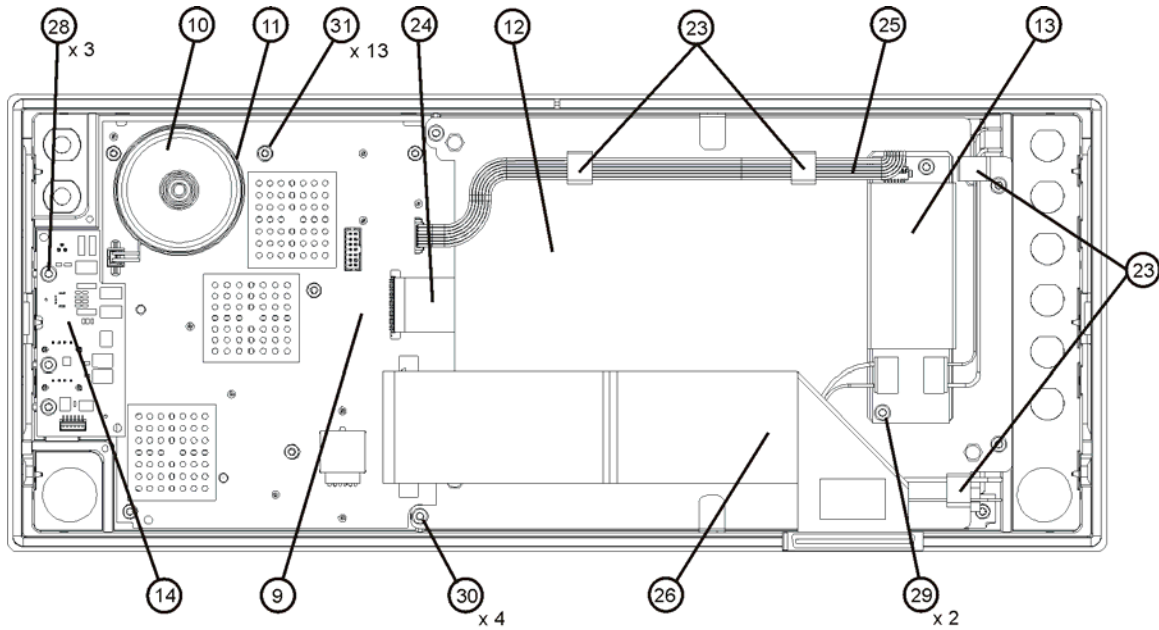
Item	Description	Agilent Part Number
1	B1 Fan	3160-4199
2	B2 Fan	3160-4199
3	MP25-26 Fan Guard	3160-4198
4	MP27-34 Rivet, Fan Mounting (8 pieces)	0361-1272

Figure 12-13 **Input Connector**



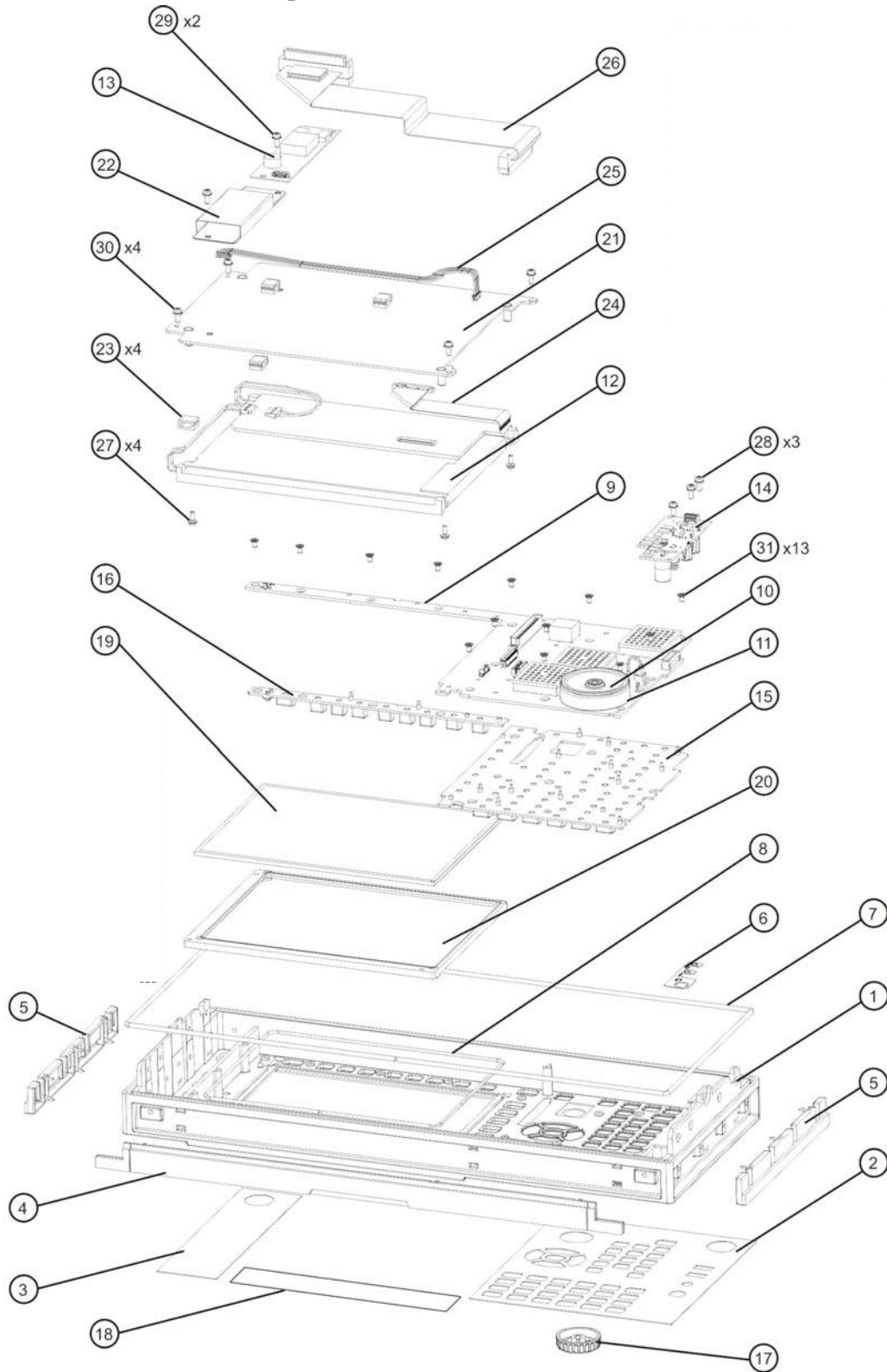
Item	Description	Agilent Part Number
1	Screw M3 X 0.5 (8 mm long)	0515-0372
2	J1 Type-N (f) RF Input Connector Assembly	5002-0702
W8	Cable Assembly, J1 (RF Input) to A8J329	N9000-20113

Figure 12-14 Front Frame Parts



Item	Description	Agilent Part Number
9	A1A2 Front Panel Interface Board	W1312-60042
10	A1A2MP1 Speaker	9164-0453
11	A1A2MP2 Speaker Foam	W1312-40016
12	A1A3 Liquid Crystal Display	2090-0911
13	A1A4 Inverter Board (Display Backlight Power)	0950-4635
14	A1A5 Front Panel Daughter Board	W1312-63121
23	A1MP8-11 Cable Clamp (Front Panel Cables)	1400-1439
24	A1W1 Power Cable, Display to Front Panel Interface Board	W1312-60010
25	A1W2 Power Cable, Front Panel Interface Board to Inverter Board	W1312-60011
26	W10 Cable, Front Panel Interface Board to Motherboard (Ribbon)	E4410-60171
28, 28, 30	Screw M3 X 0.5 (8 mm long)	0515-0372
31	Screw M3 X 0.5 (5 mm long)	0515-1521

Figure 12-15 Front Frame Exploded View



frontframeexplode

Replaceable Parts
Hardware

Item	Description	Agilent Part Number
1	A1A1MP1 Front Frame	W1312-20108
2	A1A1MP2 Main Keypad Overlay	N9000-80101
3	A1A1MP3 Connector Overlay	E4410-80109
4a	A1A1MP7 Front Frame Top Trim Strip (Use with Option PRC, Portable)	W1312-40004 (Illustrated)
4b	A1A1MP8 Front Frame Top Trim Strip (Use with standard Bench analyzer)	W1312-40019 (Not Illustrated)
5	A1A1MP9-10 Front Frame Side Trim Strip	W1312-40005
6	A1A1MP4 Front Frame Ground Spring	W1312-00021
7	A1A1MP5 Braided Gasket	--
8	A1A1MP6 Chromeric Gasket	--
9	A1A2 Front Panel Interface Board	W1312-60042
10	A1A2MP1 Speaker	9164-0453
11	A1A2MP2 Speaker Foam	W1312-40016
12	A1A3 Liquid Crystal Display	2090-0911
13	A1A4 Inverter Board (Display Backlight Power)	0950-4635
14	A1A5 Front Panel Daughter Board	W1312-63121
15	A1MP1 Main Keypad	E4410-40100
16	A1MP2 Display Keypad	E4410-40101
17	A1MP7 RPG Knob	W1312-40017
18	A1MP3 Frequency Label, 3.0 GHz A1MP4 Frequency Label, 7.5 GHz	N9000-80017 N9000-80000
19	A1MP5 LCD Glass Filter	1000-1435
20	A1MP6 LCD Lens Gasket	W1312-40006
21	A1MP12 Display Bracket	W1312-00023
22	A1MP13 Inverter Board Shield	W1312-00024
23	A1MP8-11 Cable Clamp (Front Panel Cables)	1400-1439
24	A1W1 Power Cable, Display to Front Panel Interface Board	W1312-60010
25	A1W2 Power Cable, Front Panel Interface Board to Inverter Board	W1312-60011
26	W10 Cable, Front Panel Interface Board to Motherboard (Ribbon)	E4410-60171
27	Screw M2.5 X 0.45 (6 mm long)	0515-1934
28, 29, 30	Screw M3 X 0.5 (8 mm long)	0515-0372
31	Screw M3 X 0.5 (5 mm long)	0515-1521

13 Assembly Replacement Procedures

What You Will Find in This Chapter

Procedures in this chapter enable you to locate, remove, and replace the following major assemblies in your instrument.

Refer to [Chapter 12 , “Replaceable Parts,”](#) for part numbers, assembly descriptions, and ordering information.

- [Instrument Outer Case](#) [page 230](#)
- [Top Brace and Reference Bracket](#) [page 235](#)
- [RF Assembly](#) [page 236](#)
- [Rear Panel](#) [page 238](#)
- [L.O. Assembly](#) [page 239](#)
- [Power Supply Assembly](#) [page 241](#)
- [CPU Assembly](#) [page 243](#)
- [Hard Disk Drive](#) [page 244](#)
- [DIF Assembly](#) [page 254](#)
- [Midplane Assembly](#) [page 255](#)
- [Motherboard Assembly](#) [page 257](#)
- [Fan Assembly](#) [page 262](#)
- [Input Connector Assembly](#) [page 265](#)
- [Front Frame Assembly](#) [page 267](#)
- [Display Assembly](#) [page 273](#)
- [Daughter Board, Interface Board and Keypad](#) [page 275](#)

Before Starting

Before starting to disassemble the instrument:

- ❑ Check that you are familiar with the safety symbols marked on the instrument. And, read the general safety considerations and the safety note definitions given in the front of this guide.
- ❑ The instrument contains static sensitive components. Read the section entitled [“ESD Information” on page 24](#).

Safety

WARNING

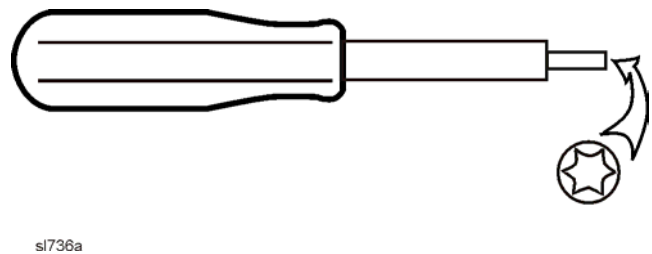
The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the product from all voltage sources while it is being opened.

WARNING

The instrument contains potentially hazardous voltages. Refer to the safety symbols on the instrument and the general safety considerations at the beginning of this service guide before operating the unit with the cover removed. Failure to heed the safety precautions can result in severe or fatal injury.

Tools you will need

Figure 13-1 TORX Tool



sl736a

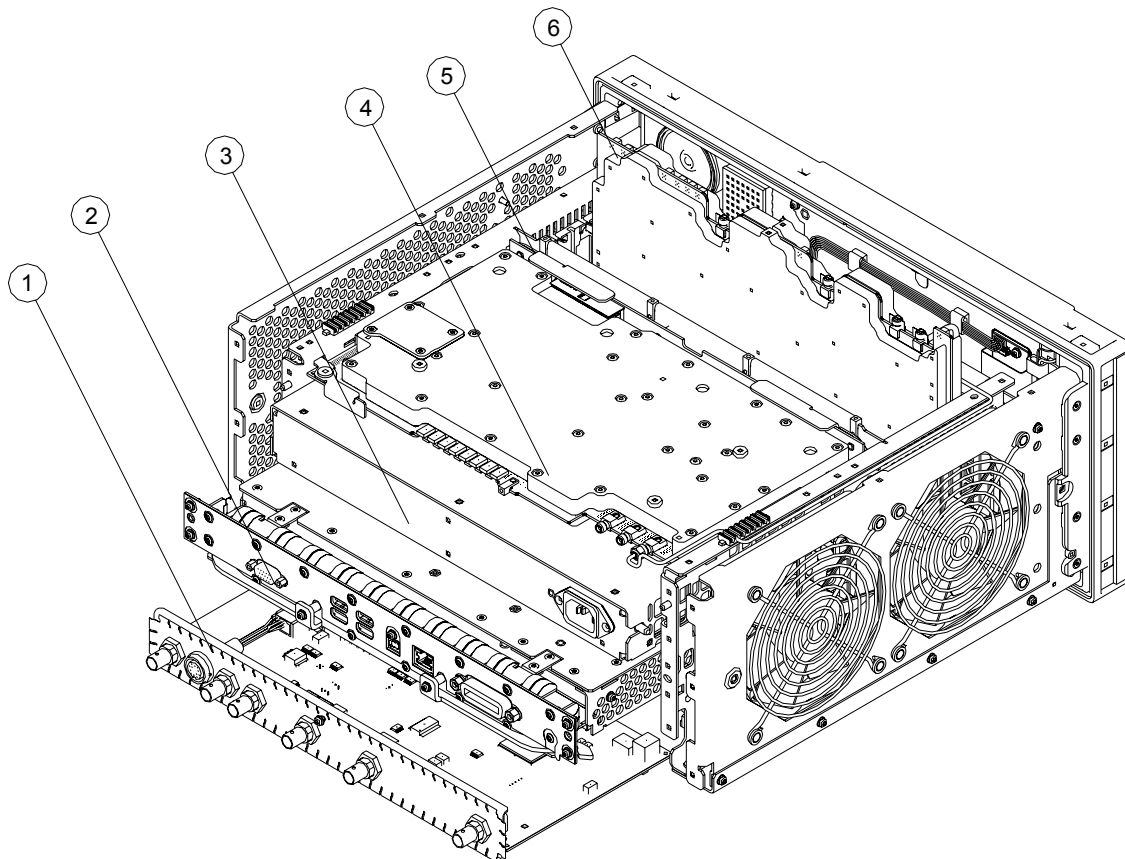
Description	Agilent Part Number
TORX Hand Driver - Size T-10	8710-1623
TORX Hand Driver - Size T-20	8710-1615
9/16 inch nut driver	8720-0008
5/16 inch open-end wrench	source locally
cable puller	5021-6773

Adjustments Tests after an instrument repair

Refer to [Table 14-1 on page 280](#) for information about post-repair procedures. If one or more instrument assemblies have been repaired or replaced, perform the related adjustments and performance verification tests.

Major Assembly Locations

Figure 13-2 Major Assemblies



Item	Description
1	A2 Digital I.F. Assembly
2	A3 CPU Assembly
3	A5 Power Supply
4	A9 L.O. Assembly
5	A6 Midplane Assembly
6	A8 RF Assembly

Instrument Outer Case

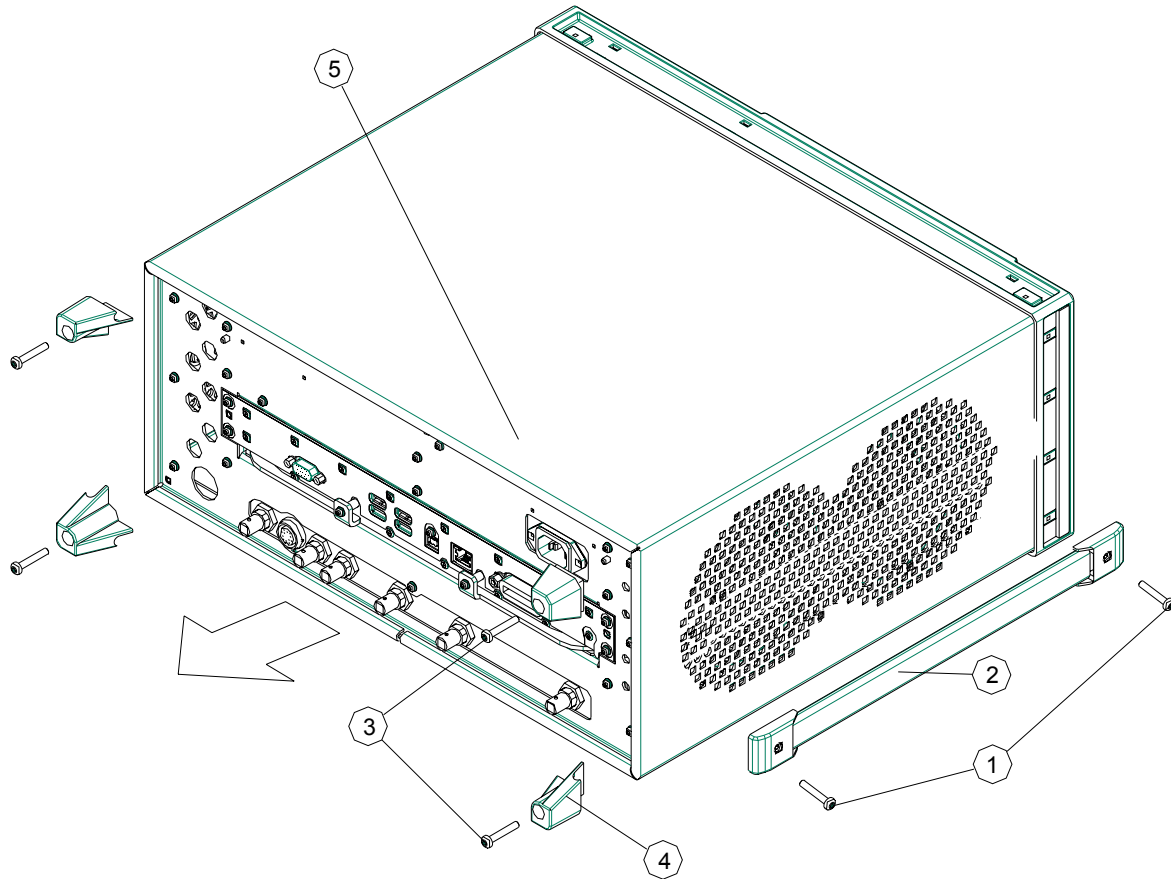
CAUTION	If the instrument is placed on its face during any of the following procedures, be sure to use a soft surface or soft cloth to avoid damage to the front panel, keys, or input connector.
NOTE	If the analyzer has Option PRC, Portable Configuration, refer to the “ Option PRC ” section on page 232 to remove the outer case.

Standard Instrument

Removal

1. Disconnect the instrument from ac power.
2. Refer to [Figure 13-3](#). Using the T-20 driver, remove the four screws (two on each side) **(1)** that attach the handle strap **(2)** on each side of the instrument.
3. Using the T-20 driver, remove the four screws (including washers) **(3)** that hold the rear feet **(4)** in place.
4. Pull the instrument cover **(5)** off towards the rear of the instrument.

Figure 13-3 **Standard Instrument Outer Case Removal**



Replacement

1. Disconnect the instrument from ac power.
2. Slide the instrument cover back onto the deck from the rear. The seam on the cover should be on the bottom. Be sure the cover seats into the gasket groove in the Front Frame Assembly.
3. Replace the four rear feet to the rear of the instrument. Torque the rear feet screws to 21 inch pounds.
4. Replace the handle straps on both sides of the instrument. Torque the handle strap screws to 21 inch pounds.

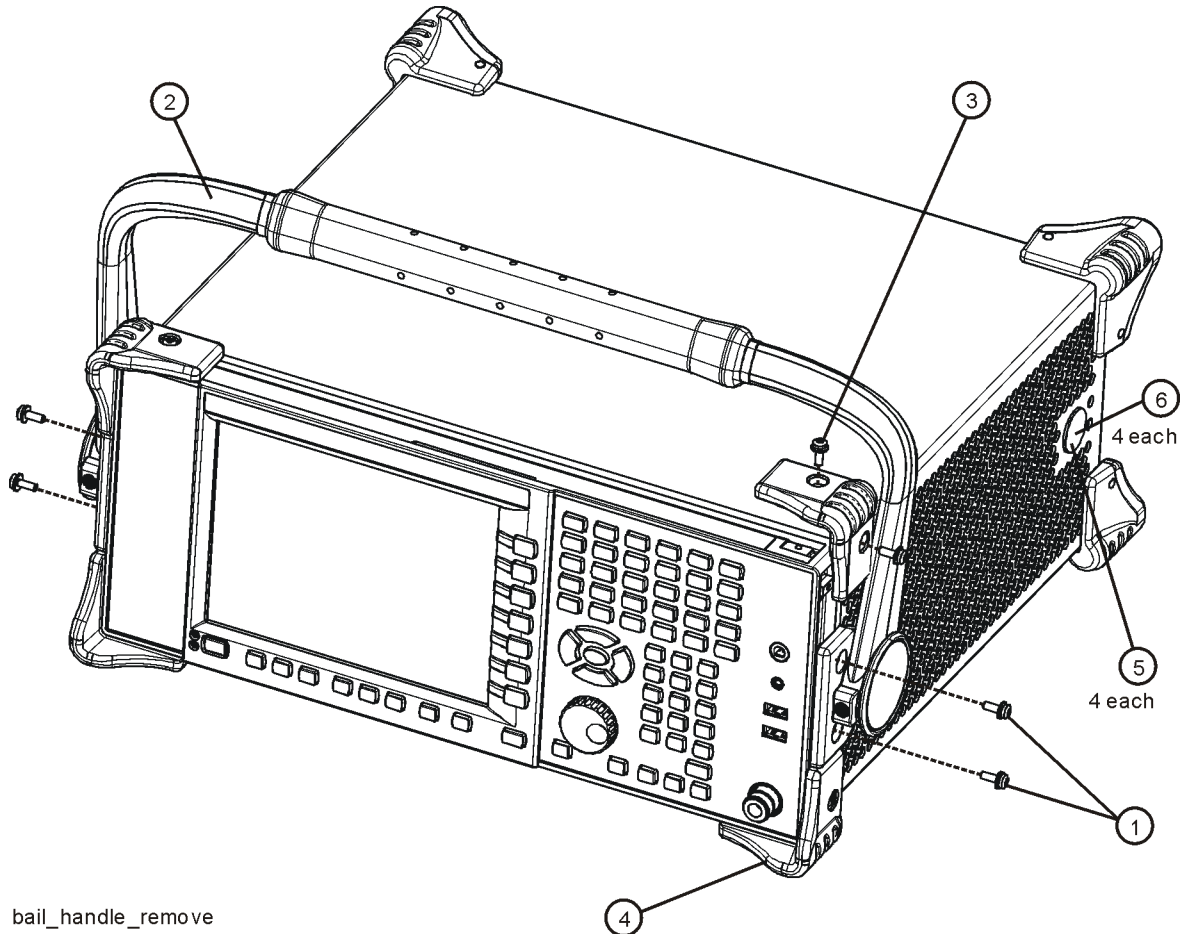
Option PRC

Removal

1. Disconnect the instrument from ac power.

Refer to [Figure 13-4](#). Using the T-20 driver, remove the four screws (two on each side) (1) that hold the bail handle (2) to the front frame.

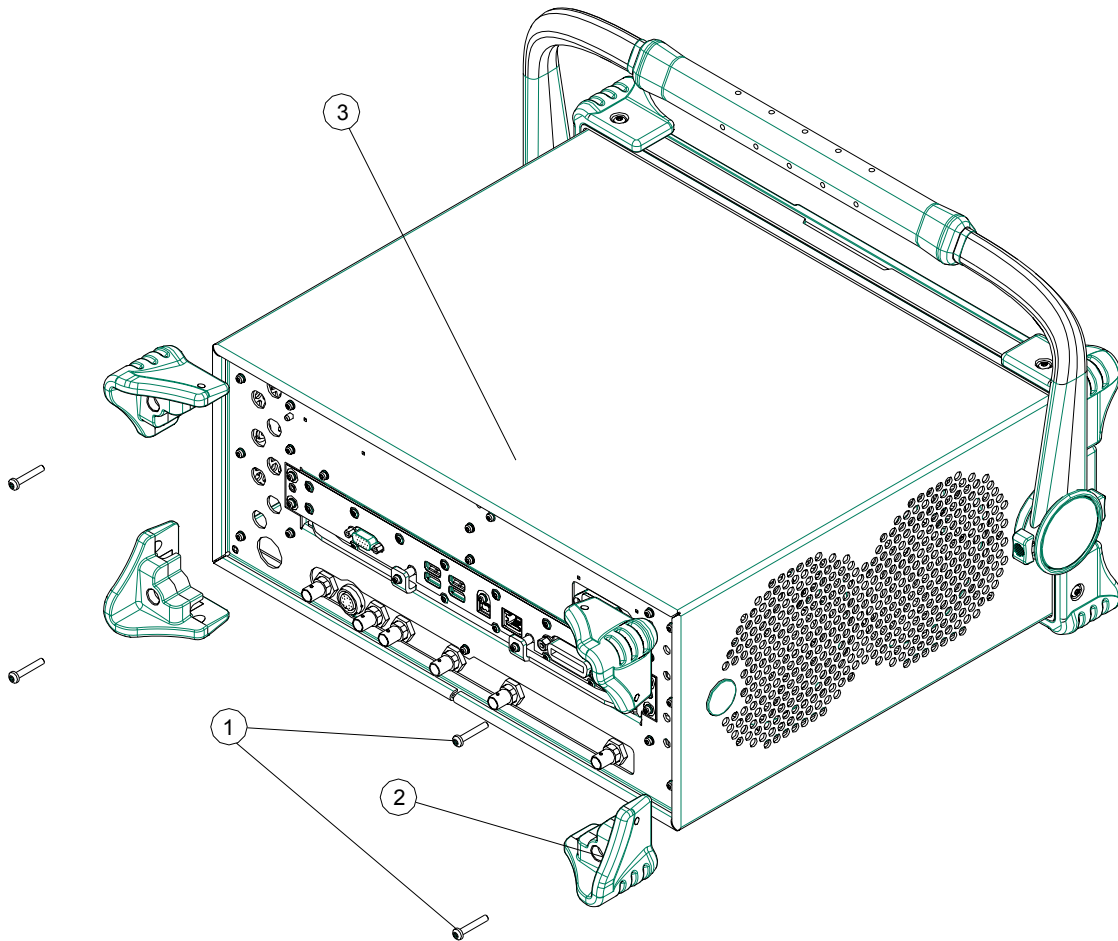
Figure 13-4 Bail Handle Removal



2. Using the T-20 driver, remove the four screws (two on each side) (6) that hold the strap handle plugs (5) in place.

3. Refer to [Figure 13-5](#). Using the T-20 driver, remove the four screws including washers (1) that hold the rear bumpers (2) in place.

Figure 13-5 **Option PRC Instrument Outer Case Removal**



4. Pull the instrument cover (3) off towards the rear of the instrument.

Replacement

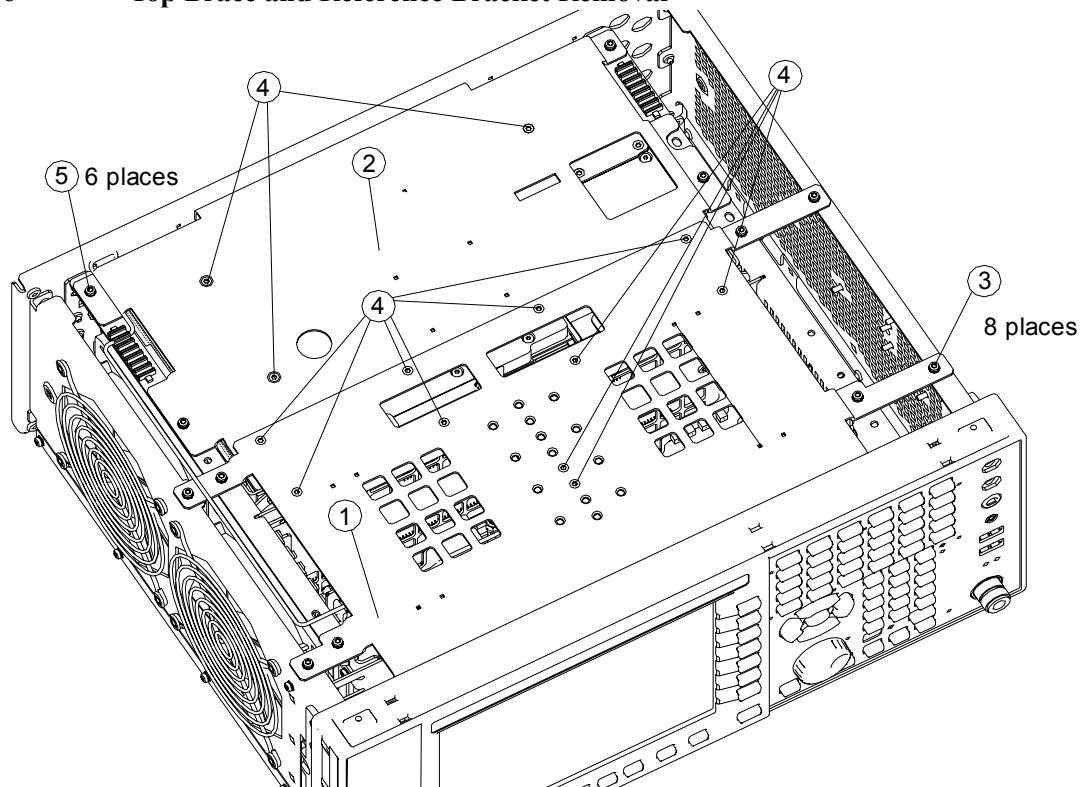
1. Disconnect the instrument from ac power.
2. Slide the instrument cover back onto the deck from the rear. The seam on the cover should be on the bottom. Be sure the cover seats into the gasket groove in the Front Frame Assembly.
3. Refer to [Figure 13-4](#). Replace the strap handle plugs **(5)** in place and attach using the T-20 driver to replace the four screws (two on each side) **(6)**. Torque to 21 inch pounds.
4. Place the bail handle into position on the front frame and using the T-20 driver, replace the four screws (two on each side) **(1)** that hold the bail handle **(2)** to the front frame. Torque to 21 inch pounds.
5. Refer to [Figure 13-5](#). Replace the four rear bumpers to the rear of the instrument. Torque to 21 inch pounds.

Top Brace and Reference Bracket

Removal

1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Refer to [Figure 13-6](#). To remove the top brace (1), use the T-10 driver to remove the eight screws (3) (0515-0372) attaching the top brace to the chassis, the six screws (4) (0515-1227) attaching the top brace to the boards, and the four screws (4) attaching the top brace to the reference bracket.
3. To remove the reference bracket (2), use the T-10 driver to remove the six screws (5) (including two at the rear panel) attaching the reference bracket to the instrument and the four screws (4) attaching the top brace to the reference bracket.

Figure 13-6 **Top Brace and Reference Bracket Removal**



Replacement

1. Refer to [Figure 13-6](#). To replace the top brace or the reference bracket, place them into the correct position and attach the appropriate screws. Torque to 9 inch-pounds.

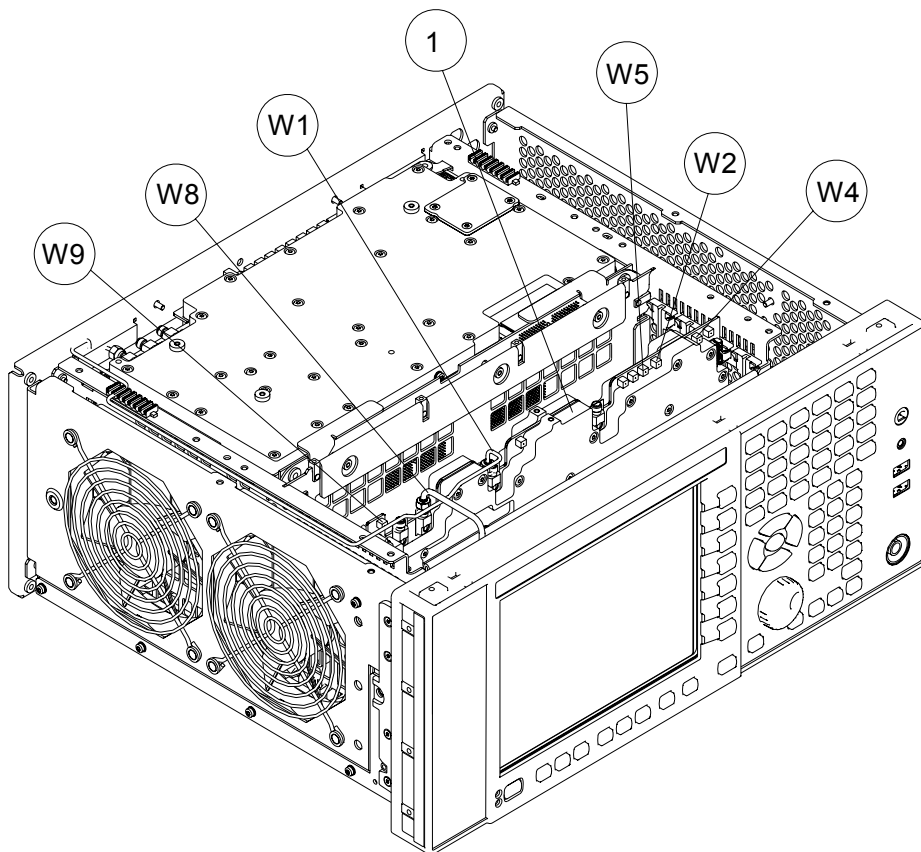
RF Assembly

Removal

1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Remove the instrument top brace. Refer to the [Top Brace and Reference Bracket](#) removal procedure.
3. Refer to [Figure 13-7](#). Remove the cables W1, W2, W4, W5, W8 and W9 from the RF assembly (1).
4. The RF assembly can now be unplugged from the motherboard by pulling up on the board and lifted out of the chassis.

Figure 13-7

RF Area Components and Cables



Replacement

1. Refer to [Figure 13-7](#). Install the RF assembly into slot 5 in the chassis and press down to plug it into the motherboard.
2. Reattach the cables W1, W2, W4, W5, W8 and W9 to the RF assembly (1).
3. Replace the instrument top brace. Refer to the [Top Brace and Reference Bracket](#) replacement procedure.
4. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

Rear Panel

Removal

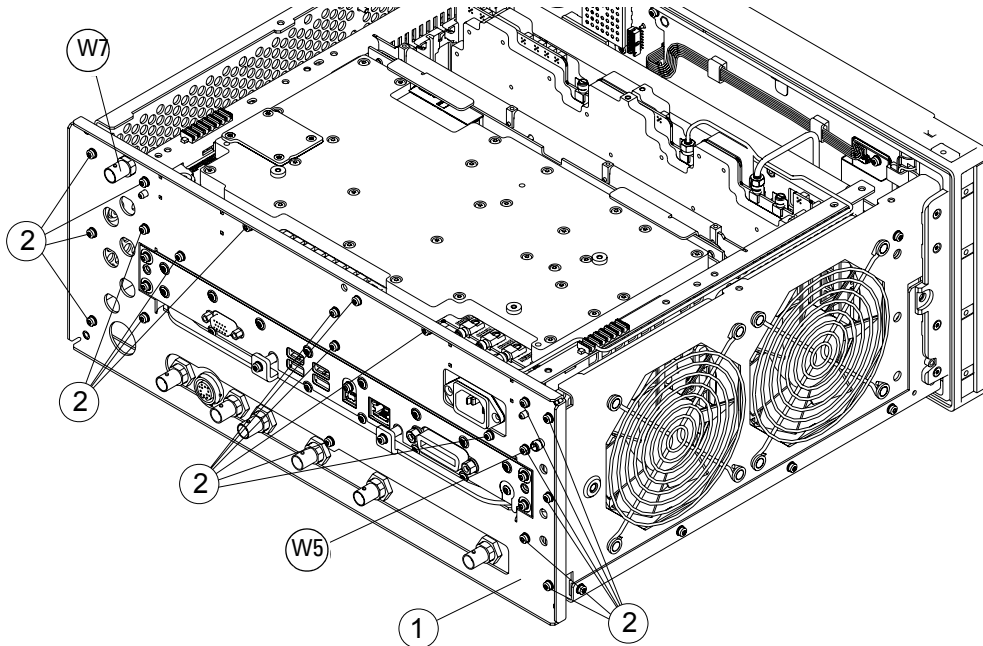
1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Refer to [Figure 13-8](#). Using the T-10 driver, remove the twenty screws (2) attaching the rear panel (1) to the chassis and to the reference bracket. The rear panel can now be removed.
3. Refer to [Figure 13-7](#). Remove W5 cable from the RF assembly. Refer to [Figure 13-9](#). Remove W7 cable from the L.O. assembly.

NOTE

If the rear panel is being replaced with a new rear panel, remove W5 and W7 at the rear panel using a 9/16-inch nut driver.

Figure 13-8

Rear Panel Removal



Replacement

1. Reattach W5 and W7 cable depending on how you removed it.
2. Refer to [Figure 13-8](#). Place the rear panel (1) into position in the chassis. Replace the twenty screws (2) to attach the rear panel to the chassis. Torque to 9 inch-pounds.
3. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

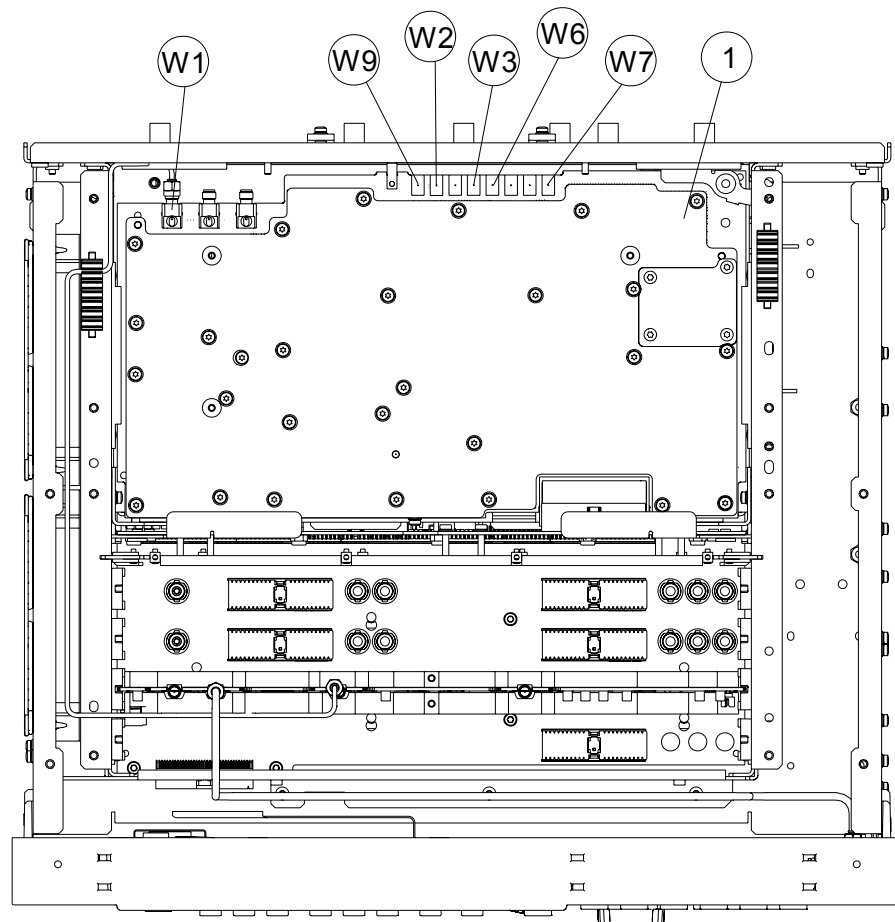
L.O. Assembly

Removal

1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Remove the reference bracket. Refer to the [Top Brace and Reference Bracket](#) removal procedure.
3. Remove the rear panel. Refer to the [Rear Panel](#) removal procedure.
4. Refer to [Figure 13-9](#). Remove cables W1, W2, W3, W6, W7 and W9 from the L.O. assembly (1). Use the 5/16 inch wrench where necessary.

Figure 13-9

L.O. Board Cables



5. The reference assembly can be removed from the chassis by leveraging up on the ejector and pulling the board out on the other side.

Replacement

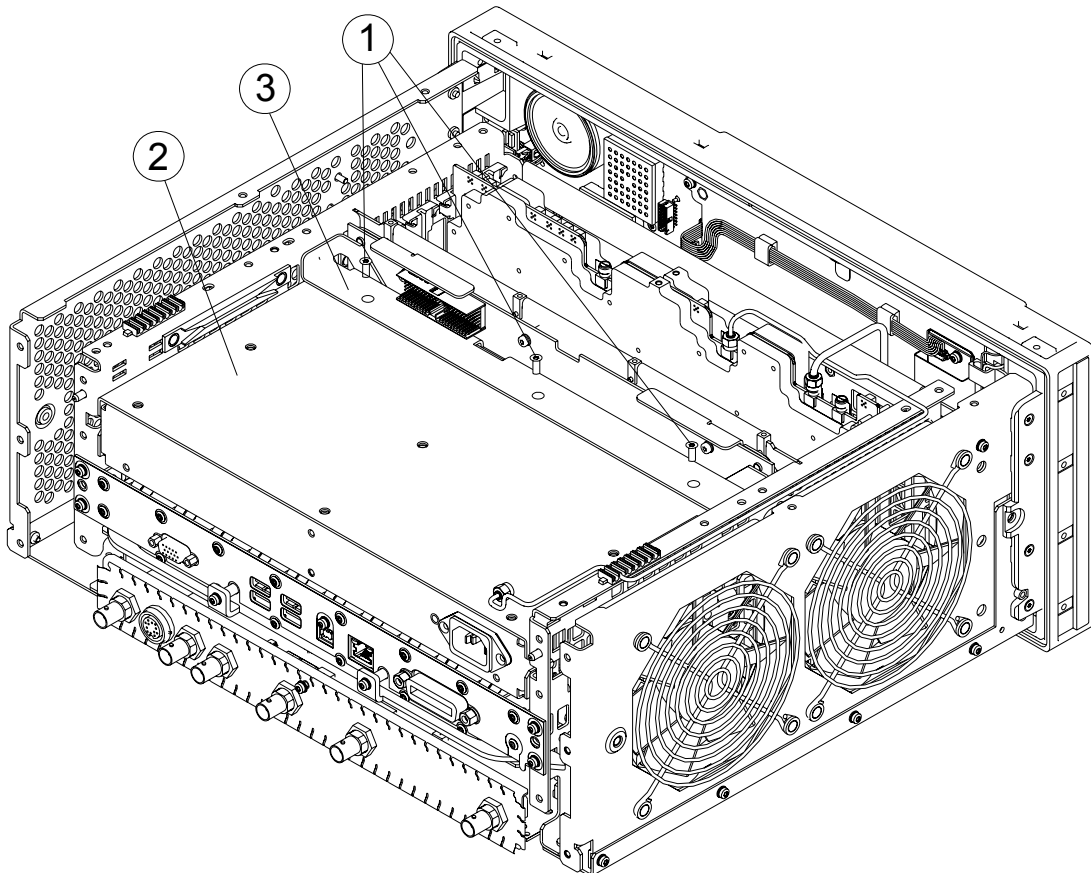
1. Slide the reference assembly into the slot at the rear of the instrument and push on the assembly to mate the connectors to the midplane assembly. Secure with the ejector.
2. Refer to [Figure 13-9](#). Replace cables W1, W2, W3, W6, W7 and W9 to the correct locations. Torque the semi-rigid cables to 10 inch-pounds.
3. Replace the rear panel. Refer to the [Rear Panel](#) replacement procedure.
4. Replace the reference bracket. Refer to the [Top Brace and Reference Bracket](#) replacement procedure.
5. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

Power Supply Assembly

Removal

1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Remove the rear panel. Refer to the [Rear Panel](#) removal procedure.
3. Remove the top brace and reference bracket. Refer to the [Top Brace and Reference Bracket](#) removal procedure.
4. Remove the reference assembly. Refer to the [L.O. Assembly](#) removal procedure.
5. Remove the CPU assembly. Refer to the [CPU Assembly](#) removal procedure.
6. Refer to [Figure 13-10](#). Remove the three screws (1) attaching the power supply (2) to the power supply bracket (3).
7. The power supply assembly can be removed from the chassis by pulling straight out the back.

Figure 13-10 **Power Supply Assembly Removal**



Replacement

1. Slide the power supply assembly into the slot at the rear of the instrument and push on the assembly to mate the connectors to the midplane assembly.
2. Refer to [Figure 13-10](#). Replace the three screws (**1**) through the power supply bracket (**3**) and into the power supply (**2**). Torque to 9 inch-pounds.
3. Replace the CPU assembly. Refer to the [CPU Assembly](#) replacement procedure.
4. Replace the reference assembly. Refer to the [L.O. Assembly](#) replacement procedure.
5. Replace the top brace and reference bracket. Refer to the [Top Brace and Reference Bracket](#) replacement procedure.
6. Replace the rear panel. Refer to the [Rear Panel](#) replacement procedure.
7. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

CPU Assembly

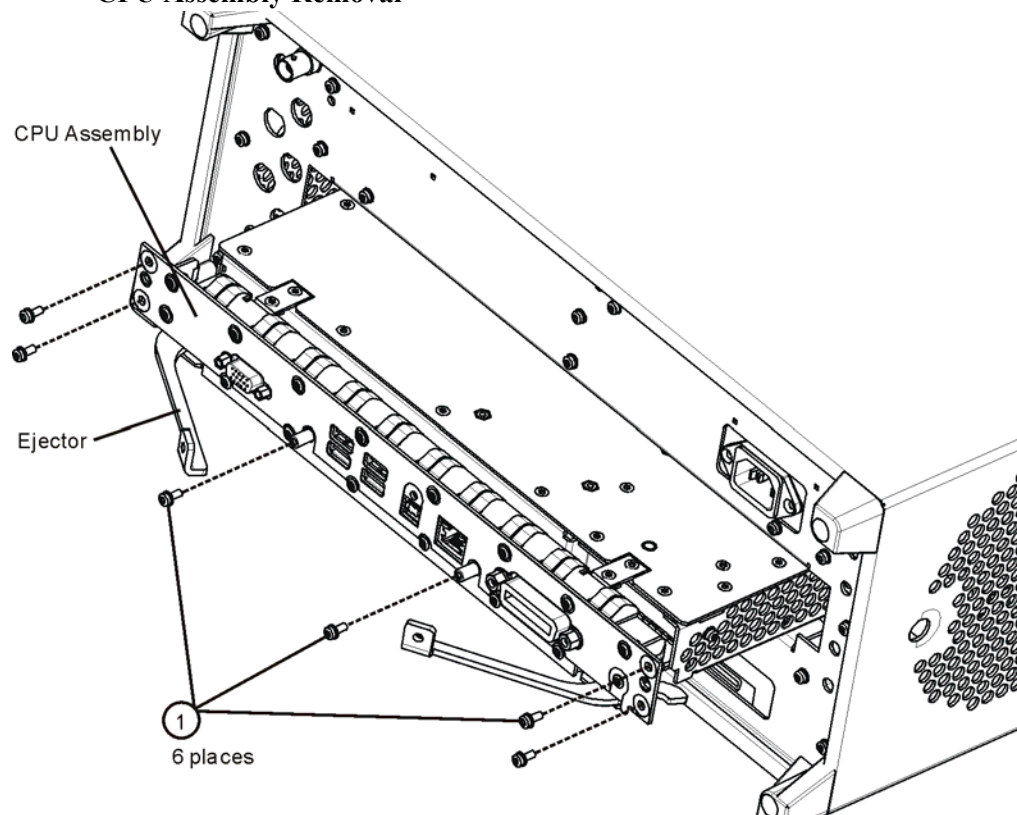
Removal

1. Refer to [Figure 13-11](#). Remove the six screws (1) attaching the CPU assembly to the chassis.
2. The CPU assembly can be removed from the chassis by pulling straight out the back. Use the two ejectors to pull the CPU assembly out from the chassis.

NOTE

If the A3BT1 CPU board battery was changed, refer to [Chapter 14](#), “Post-Repair Procedures,” for setup instructions.

Figure 13-11 CPU Assembly Removal



Replacement

1. Slide the CPU assembly into the slot at the rear of the instrument and push on the assembly to mate the connectors to the midplane assembly. Secure the board with the ejectors.
2. Refer to [Figure 13-11](#). Replace the six screws (1) that attach the CPU assembly to the chassis. Torque to 9 inch-pounds.

Hard Disk Drive

Installation Procedure

CAUTION

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation. Refer to the documentation that pertains to your instrument for information about static-safe workstations and ordering static-safe accessories.

IMPORTANT

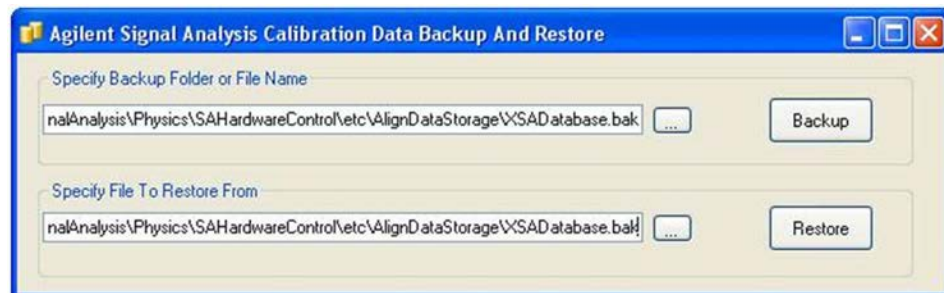
Calibration File Backup

Backing up the calibration file before changing the A4 Disk Drive is highly recommended. To do this you will need to connect a USB mouse and follow the steps below. This is only available for XSA-Series Software version A.01.55 or greater. If the file cannot be backed up or the instrument software version is <A.01.55, all instrument adjustments will need to be run after the drive replacement.

1. Navigate to the following directory using Windows Explorer:

C:\Program Files\Agilent\SignalAnalysis\Physics

2. Double-Click BackupAndRestore.exe
3. The following Dialog box will appear:



4. Set the Backup File to the USB drive and save the file.
5. When the A4 Disk Drive is replaced restore this file using the same utility on the new assembly.

NOTE

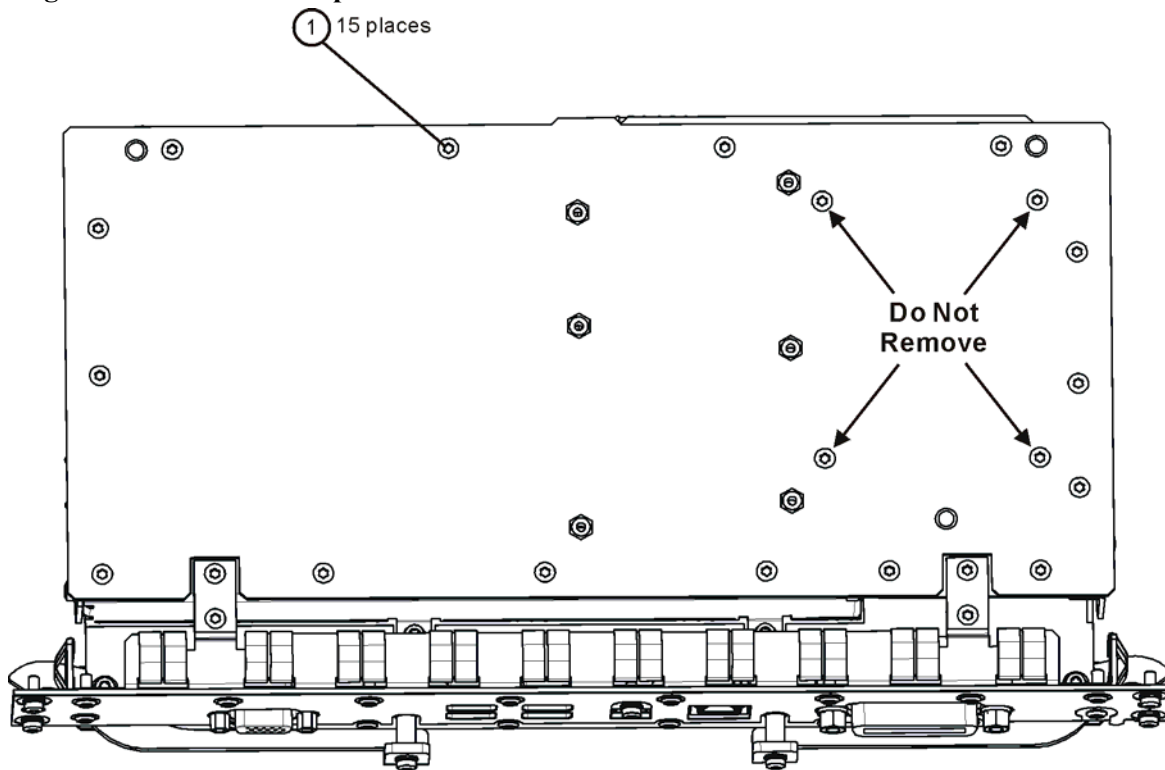
While the replacement disk drive has the Windows XP operating system loaded onto it, the license that accompanies it in this kit is for Windows Vista. This is being done within the scope of our license agreement with Microsoft and is necessary at this time, as the instrument applications software is not supported or qualified with any operating system other than Windows XP.

In an effort to eliminate any further confusion for the end user, an additional label is included in this kit that must be affixed to the rear of the instrument, along with the Windows Vista license, to explain why the instrument has this Windows Vista license while running Windows XP.

1. Refer to [Figure 13-11](#). Locate and remove the existing CPU assembly from the instrument by removing the 6 rear panel screws (1). The CPU assembly can be removed from the chassis by pulling straight out the back. Use the two ejectors to pull the CPU assembly out from the chassis.
2. Refer to [Figure 13-12](#). Remove and discard the 15 machine screws (1) from the CPU assembly. The screws need to be discarded because dried precoated screws can cause cross threading.

NOTE Do not remove the 4 Hard Drive screws.

Figure 13-12 CPU Top Shield Screws



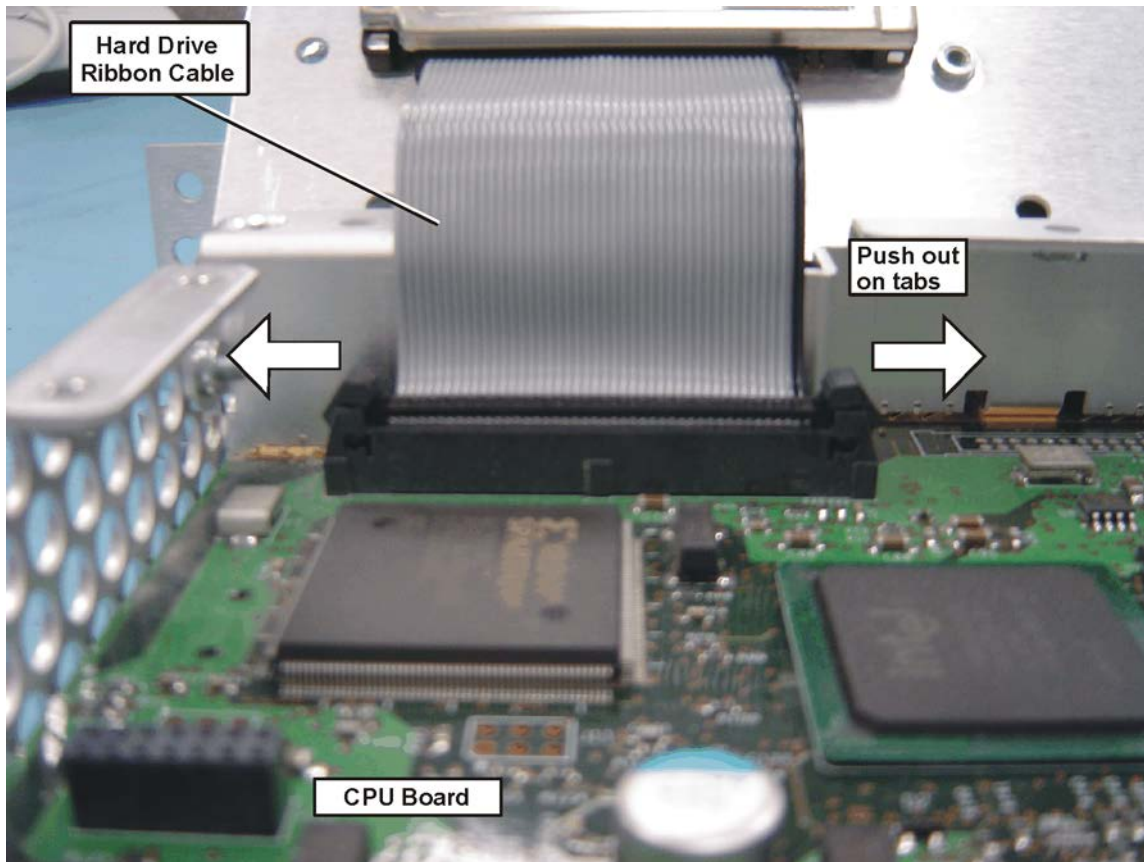
cpu_topscrows

Assembly Replacement Procedures

Hard Disk Drive

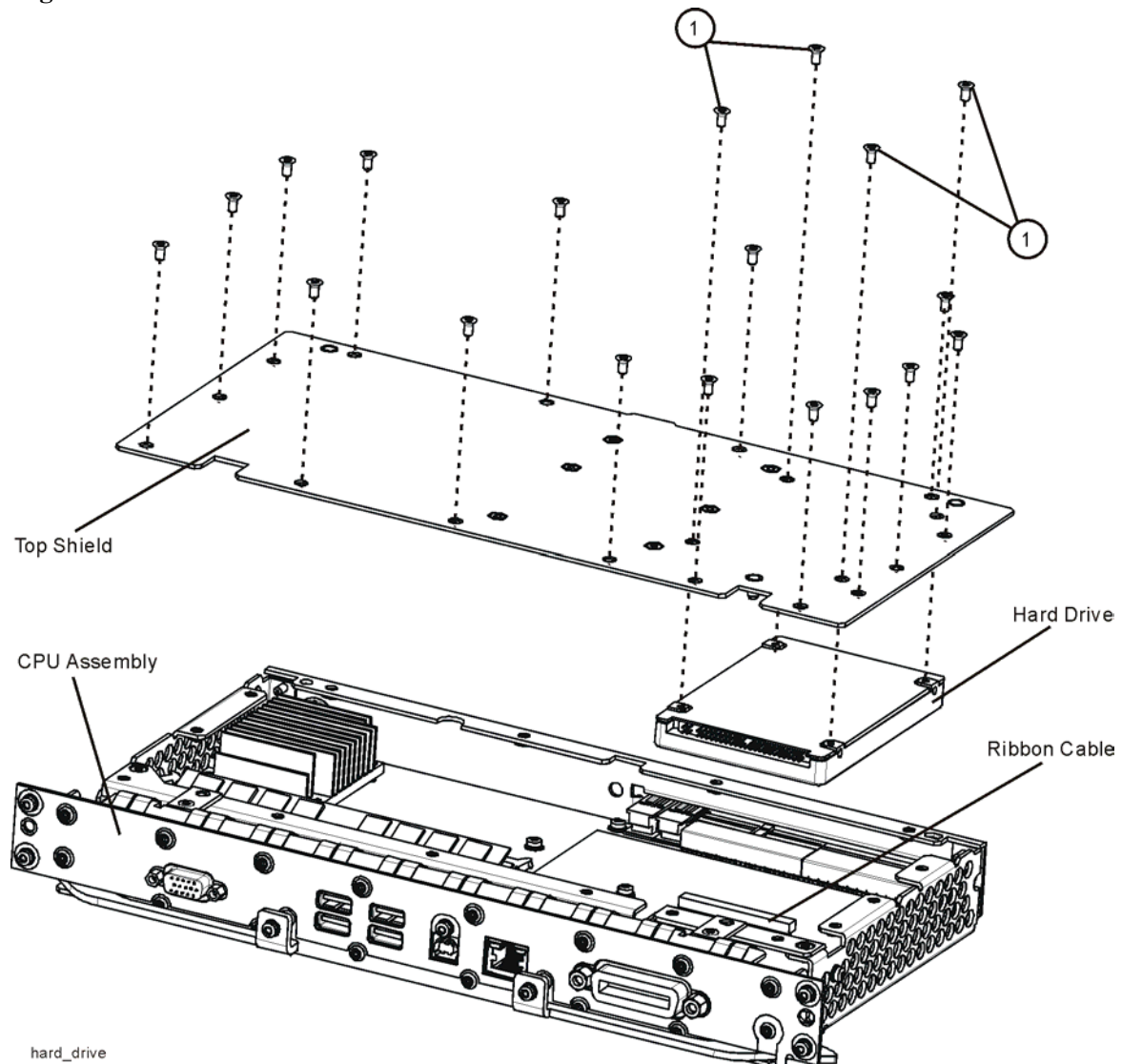
3. Refer to [Figure 13-13](#). Carefully lift up the CPU top shield and unlock the Hard Drive ribbon cable from the CPU Board by pressing down and out on the two locking tabs located on the sides of the connector as shown.

Figure 13-13 **Hard Drive Ribbon Cable**



4. Refer to [Figure 13-14](#). Uninstall the existing Hard Drive from the Top Shield by removing and discarding the 4 Loctited machine screws (1) from the CPU assembly. Screws need to be discarded because dried precoated screws can cause cross threading.

Figure 13-14 CPU/Hard Drive Parts



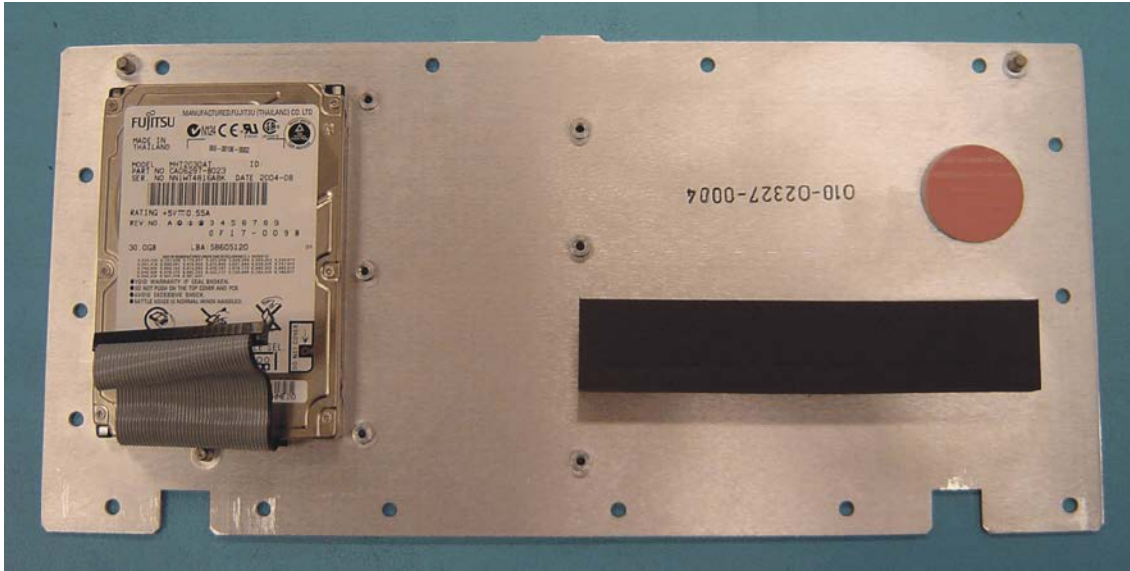
5. Remove the ribbon cable from the Hard Disk Drive and set the ribbon cable aside. Discard the defective Hard Disk Drive.
6. Locate the Programmed Hard Disk Drive.
7. Connect the Hard Drive ribbon cable to the Programmed Hard Disk Drive.

Assembly Replacement Procedures

Hard Disk Drive

8. Install the Programmed Hard Disk Drive to the Top Shield using precoated four Machine Screws (0515-5074) as shown in [Figure 13-15](#). Torque screws to 9 inch-pounds.

Figure 13-15 Top Shield/Hard Drive Assembly



9. Connect the Hard Drive ribbon cable from the Top Shield/Hard Drive/Ribbon Cable assembly to the CPU assembly. When the ribbon cable is fully seated the two locking tabs will grip the sides of the ribbon cable connector.
10. Install the Top Shield/Hard Drive/Ribbon Cable assembly to the CPU assembly using fifteen precoated Machine Screws (0515-5074). Torque screws to 9 inch-pounds.
11. Refer to [Figure 13-11](#). Replace the CPU assembly in the instrument with 6 screws. Torque to 9 inch-pounds.

12. Locate the Windows XP License Sticker that came with the replacement hard drive and apply the sticker to the rear of the instrument as shown in [Figure 13-16](#), covering the existing sticker if present.

Figure 13-16 Windows License Sticker Rear Panel Location



Powering On the Instrument

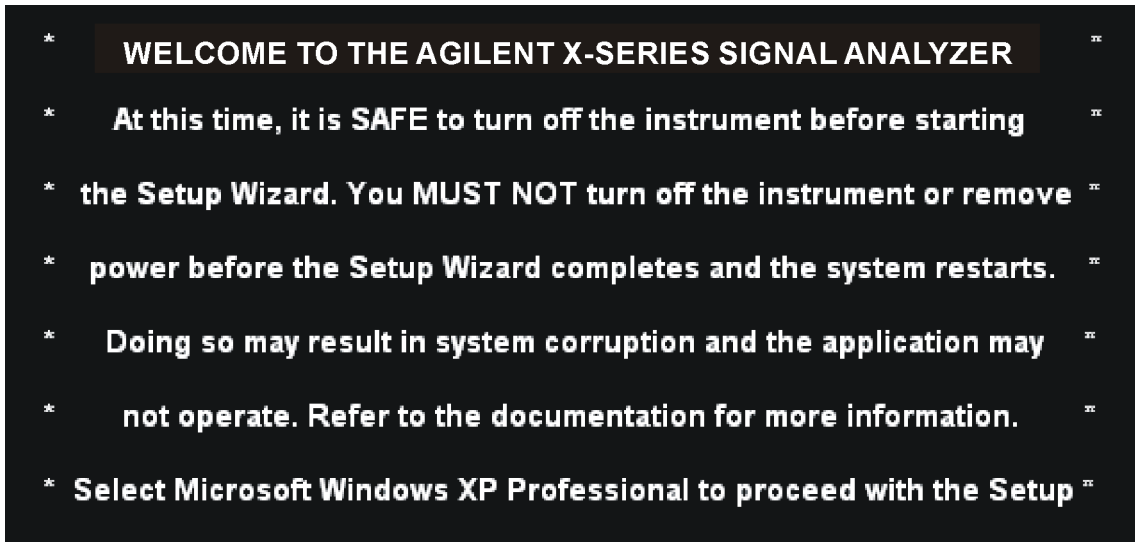
1. Position the instrument so that you have easy access to the power cord and plug it in.
2. Press the power switch (located in the lower left-hand corner of the analyzer's front panel) to turn the analyzer on.

Accepting the End-User License Agreement (EULA) Screen

NOTE

A warning about accepting the Microsoft End-User License agreement will be displayed since the analyzer Hard Disk Drive has been replaced. The Microsoft End-User License agreement must be accepted the first time you see it so that adjustments and verification tests can be performed. At the end of this procedure the instrument recovery will reset the instrument to the factory Out-of-the-Box state.

Figure 13-17 Agilent Welcome Screen



The License Agreement screen asks you to accept the terms of the End-User License Agreement for Windows XP. You must accept this agreement to continue the Windows XP installation and configuration. If you do not accept this agreement, the instrument shuts down and the next time you turn it on the Windows XP Setup Wizard starts from the beginning again.

If you have connected a USB mouse, position the cursor appropriately and use the left mouse button to navigate the License Agreement screen.

If you do not have a mouse available to navigate the screen, then use the instrument front panel keys as follows:

1. Use the **Up** and **Down** arrow keys to select "Microsoft Windows XP Professional". Press **Enter**. It may take up to 10 minutes for Windows to initialize.
2. Press **Enter** to move to the License Agreement screen.
3. Press the **Tab** key to select the License Agreement text box.
4. Press the **Tab** key again. This accesses "I don't accept this agreement." You need to press the **Up** arrow to select "I accept this agreement."
5. Press **Tab, Tab** then **Enter** to finish this screen and move to the Date and Time Settings screen.

Setting System Date and Time

The Date and Time Settings screen is used to set the appropriate date, time and time zone. These settings will be configured later by the end user.

1. Press **Enter** to finish this screen and continue the Windows XP Setup Wizard.
2. Wait for the Windows XP Setup Wizard to complete. The instrument will restart itself twice.
3. Perform a full calibration. After calibrating the instrument, perform the steps in the “[Additional Tasks](#)” section to complete the installation.

Utilities, Adjustments, and Performance Verification Tests

Adjustments and performance verification testing requires the use of the calibration software. The latest software information and downloads are available at:

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

NOTE

The signal analyzer Calibration Files are located on the Hard Disk Drive. Therefore, replacement of the Hard Disk Drive will invalidate the current instrument calibration. A full calibration is required to assure that the instrument meets all specifications. Arrangements regarding the level of calibration must be made between the end user and the calibration provider.

Before beginning the adjustment, update the X-Series instrument software at http://www.agilent.com/find/xseries_software. This will guarantee the current FPGA code is installed in the lower level assemblies.

Adjustments Required

All

Performance Testing Required

Frequency Response (All tests)

Additional Tasks

1. Make sure the instrument is turned off.
2. Turn on the instrument.
3. After the “Agilent Technologies” screen is displayed the following screen contents will be displayed for 3 seconds.

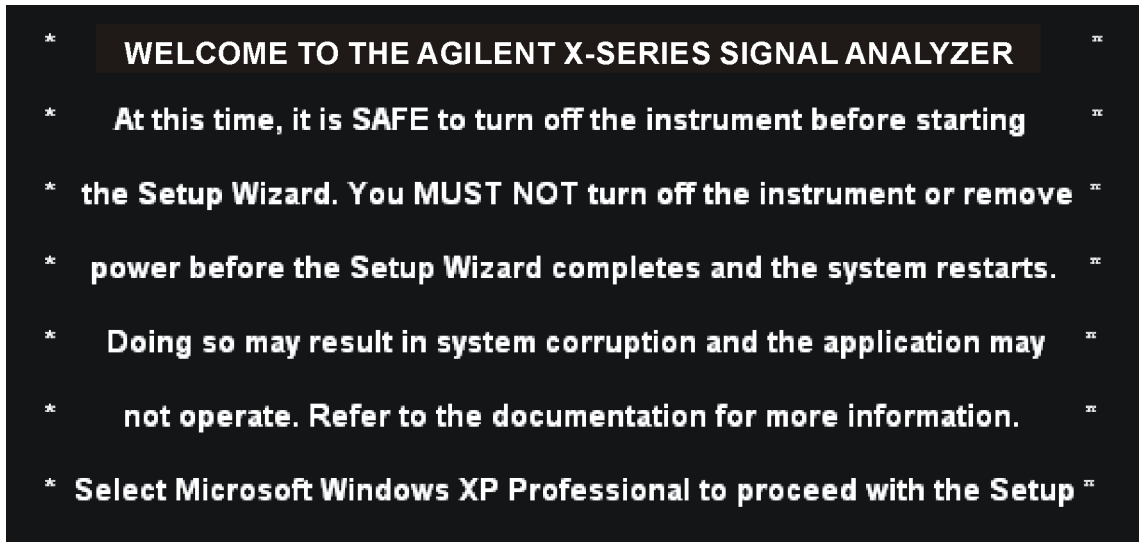
Please select the operating system to start:
Microsoft Windows XP Professional
Agilent Recovery System
Use the up and down arrow keys to move the highlight to your choice.
Press **Enter** to choose.
4. Press the down arrow key to move the highlight to “Agilent Recovery System”, press the **Enter** key.
5. When the Agilent Recovery System has booted, follow the on-screen instructions to recover the image of the C drive.
 - a. Press **2**, then press **Enter** to select the recovery.
 - b. Press **1**, then press **Enter** to continue.
 - c. Press **1**, then **Enter** to confirm. It may take up to 25 minutes for this process to complete.
6. After exiting the Agilent Recovery System, you will be prompted to press any key to continue. The instrument will reboot if the recovery process was successful.

CAUTION

When the instrument reboots it will display a warning about accepting the Microsoft User license agreement (ULA). When this warning screen is displayed, **turn the instrument off without excepting the agreement.**

7. After the instrument reboots, you will see the following screen. Do not accept the Microsoft User License agreement (ULA). Turn off the instrument to complete the installation.

Figure 13-18 ULA Screen



End of installation.

For assistance, contact your nearest Agilent Technologies Sales and Service Office. To find your local Agilent office access the following URL, or if in the United States, call the following telephone number:

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

1-800-829-4444 (8 am - 8 pm ET, Monday - Friday)

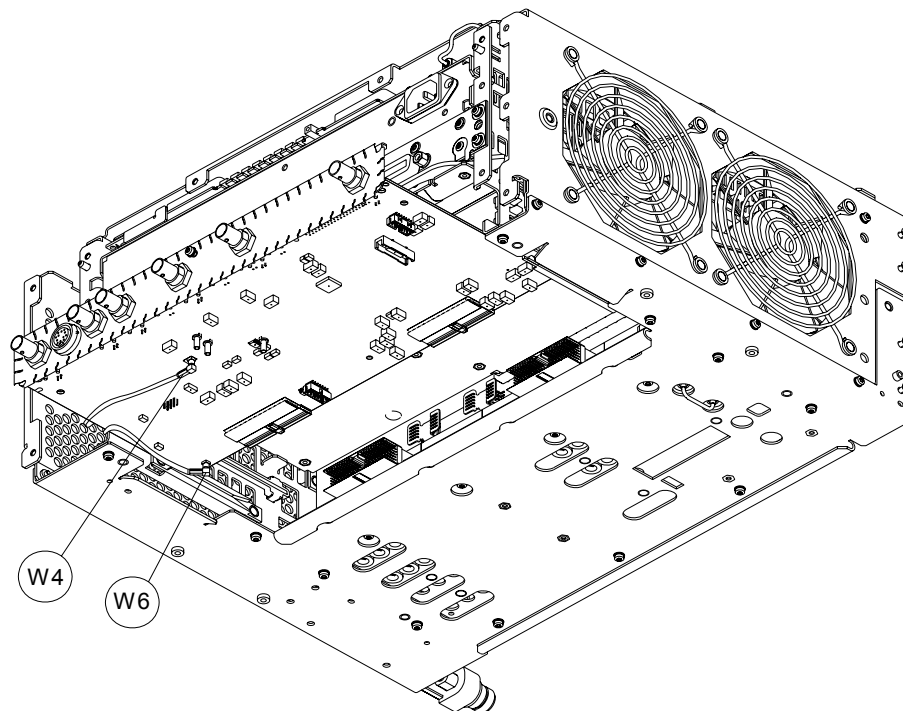
DIF Assembly

Removal

1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Remove the rear panel. Refer to the [Rear Panel](#) removal procedure.
3. Refer to [Figure 13-19](#). Remove cable W4 and W6 from the bottom of the DIF assembly.
4. The DIF assembly can be removed from the chassis by pulling straight out the back.

Figure 13-19

DIF Cables Removal



Replacement

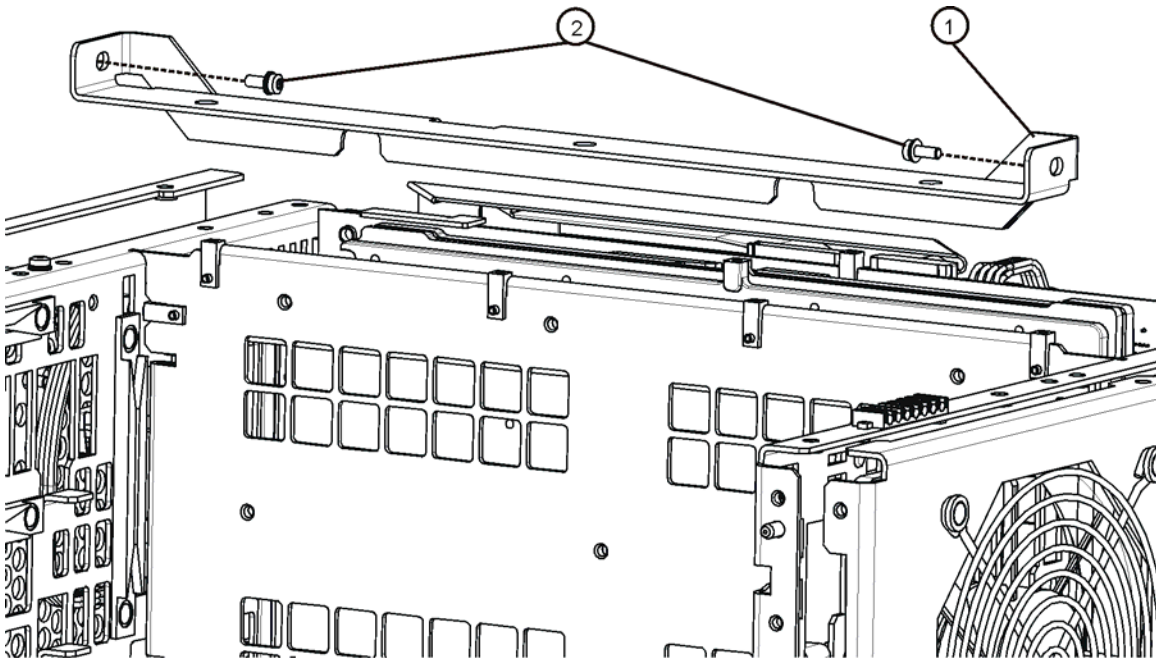
1. Slide the DIF assembly into the slot at the rear of the instrument and push on the assembly to mate the connectors to the midplane assembly.
2. Refer to [Figure 13-19](#). Replace cable W4 and W6 to the bottom of the DIF assembly.
3. Replace the rear panel. Refer to the [Rear Panel](#) replacement procedure.
4. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

Midplane Assembly

Removal

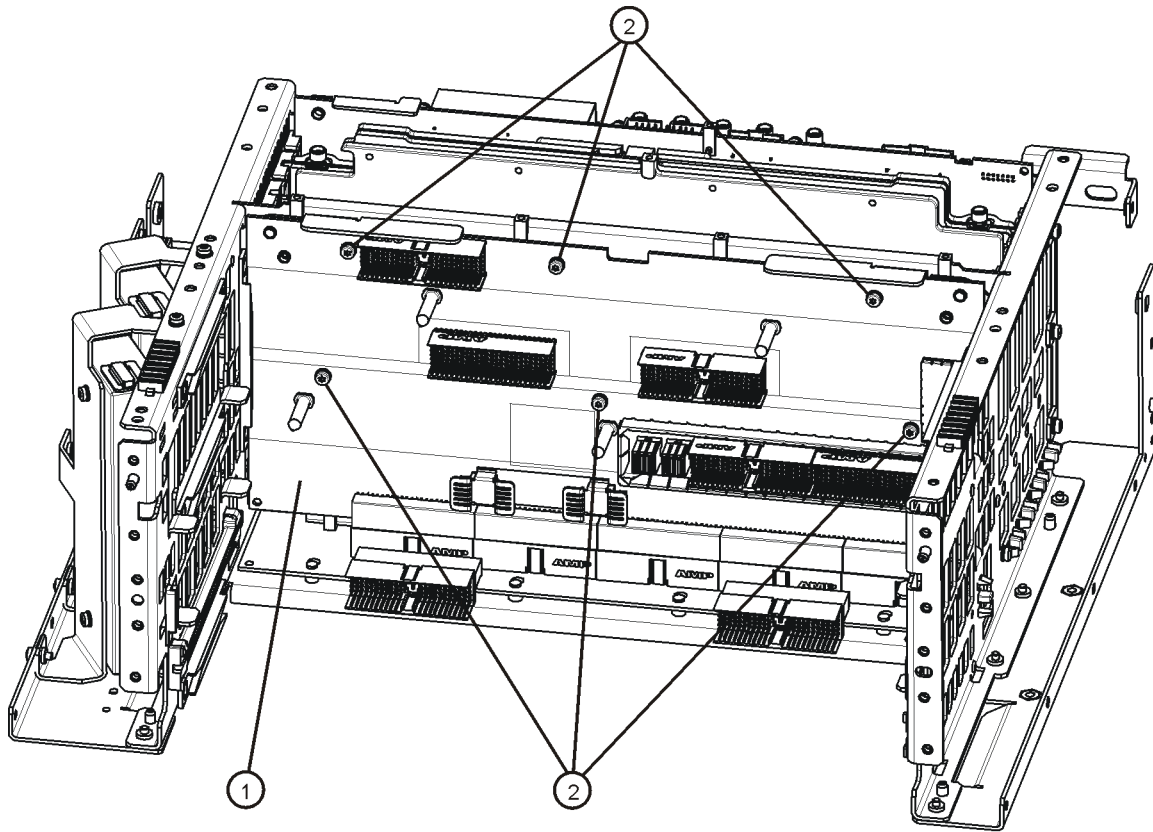
1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Remove the rear panel. Refer to the [Rear Panel](#) removal procedure.
3. Remove the top brace and reference bracket. Refer to the [Top Brace and Reference Bracket](#) removal procedure.
4. Remove the L.O. assembly. Refer to the [L.O. Assembly](#) removal procedure.
5. Remove the CPU assembly. Refer to the [CPU Assembly](#) removal procedure.
6. Remove the power supply assembly. Refer to the [Power Supply Assembly](#) removal procedure.
7. Refer to [Figure 13-20](#). Remove the power supply support bracket (1) by removing the two screws (2).

Figure 13-20 Power Supply Bracket



8. Refer to [Figure 13-21](#). Remove the six screws (2) attaching the midplane assembly (1) to the midplane bracket. The midplane assembly can now be pulled up from the chassis by leveraging up on the ejectors.

Figure 13-21 Midplane Assembly Removal



Replacement

1. Refer to [Figure 13-21](#). Install the midplane assembly into the chassis and attach to the midplane bracket using the six screws (**2**) removed earlier. Torque to 9 inch-pounds.
2. Replace the power supply support bracket with the two screws. Torque to 9 inch-pounds.
3. Replace the power supply assembly. Refer to the [Power Supply Assembly](#) replacement procedure.
4. Replace the CPU assembly. Refer to the [CPU Assembly](#) replacement procedure.
5. Replace the reference assembly. Refer to the [L.O. Assembly](#) replacement procedure.
6. Replace the top brace and reference bracket. Refer to the [Top Brace and Reference Bracket](#) replacement procedure.
7. Replace the rear panel. Refer to the [Rear Panel](#) replacement procedure.
8. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

Motherboard Assembly

Removal

1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Remove the rear panel. Refer to the [Rear Panel](#) removal procedure.
3. Remove the top brace and reference bracket. Refer to the [Top Brace and Reference Bracket](#) removal procedure.
4. Remove the reference assembly. Refer to the [L.O. Assembly](#) removal procedure.
5. Remove the CPU assembly. Refer to the [CPU Assembly](#) removal procedure.
6. Remove the power supply assembly. Refer to the [Power Supply Assembly](#) removal procedure.
7. Remove the DIF assembly. Refer to the [DIF Assembly](#) removal procedure.
8. Remove the RF assembly. Refer to the [RF Assembly](#) removal procedure.
9. Remove the Midplane assembly. Refer to the [Midplane Assembly](#) removal procedure.
10. Remove the Front Frame Assembly. Refer to the [Front Frame Assembly](#) removal procedure.
11. Remove the fan assembly. Refer to the [Fan Assembly](#) removal procedure.
12. Refer to [Figure 13-22](#) and [Figure 13-23](#). Remove the midplane bracket (1) by removing the eight screws (2) (two on each side and four on the bottom).

Figure 13-22 Midplane Bracket Removal

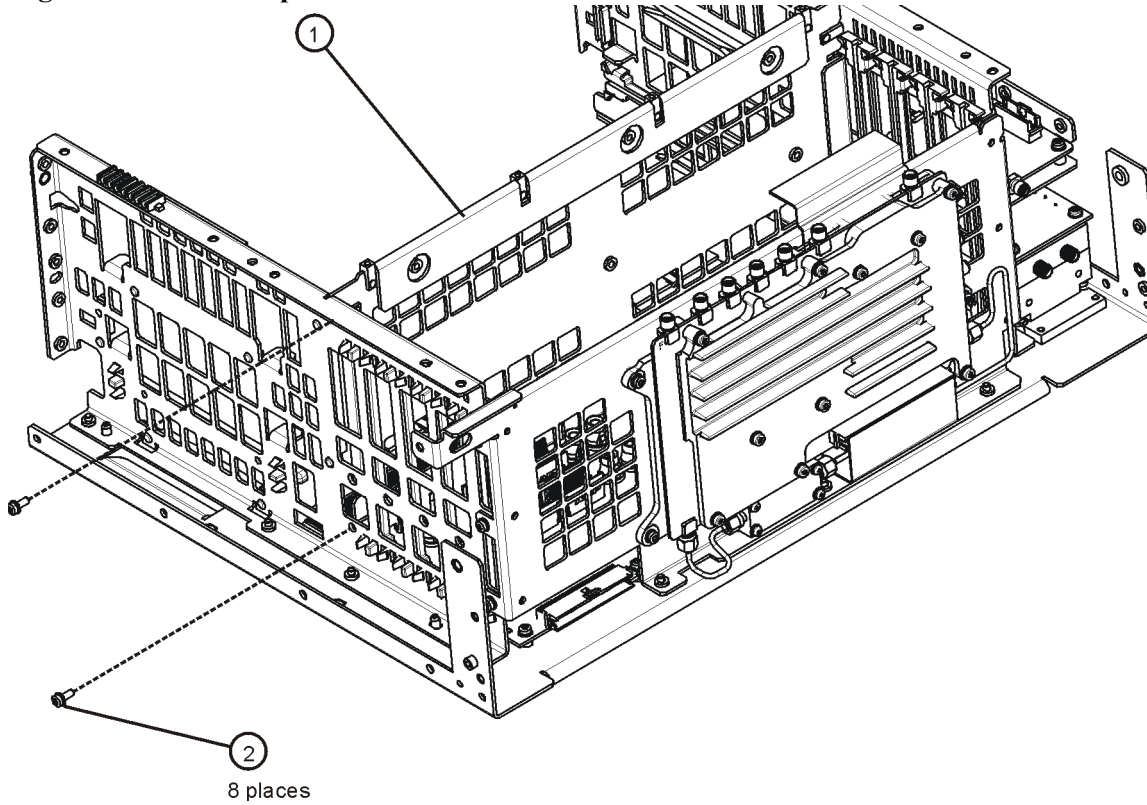
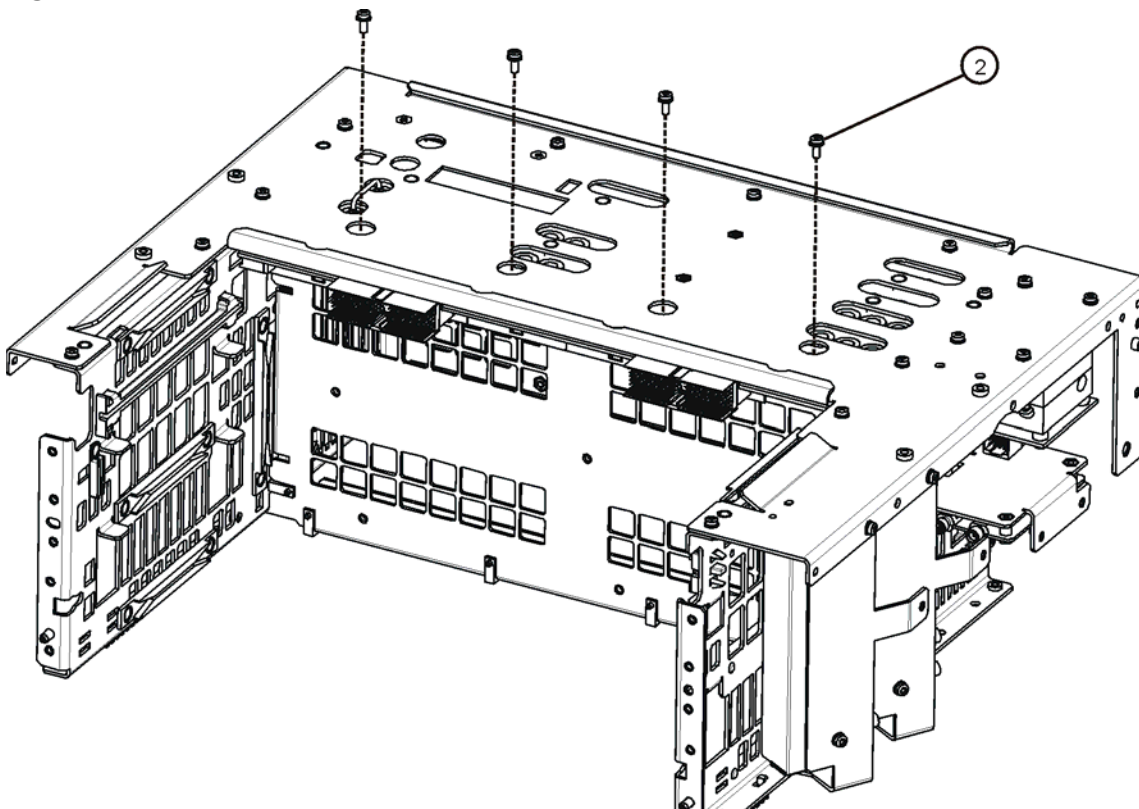
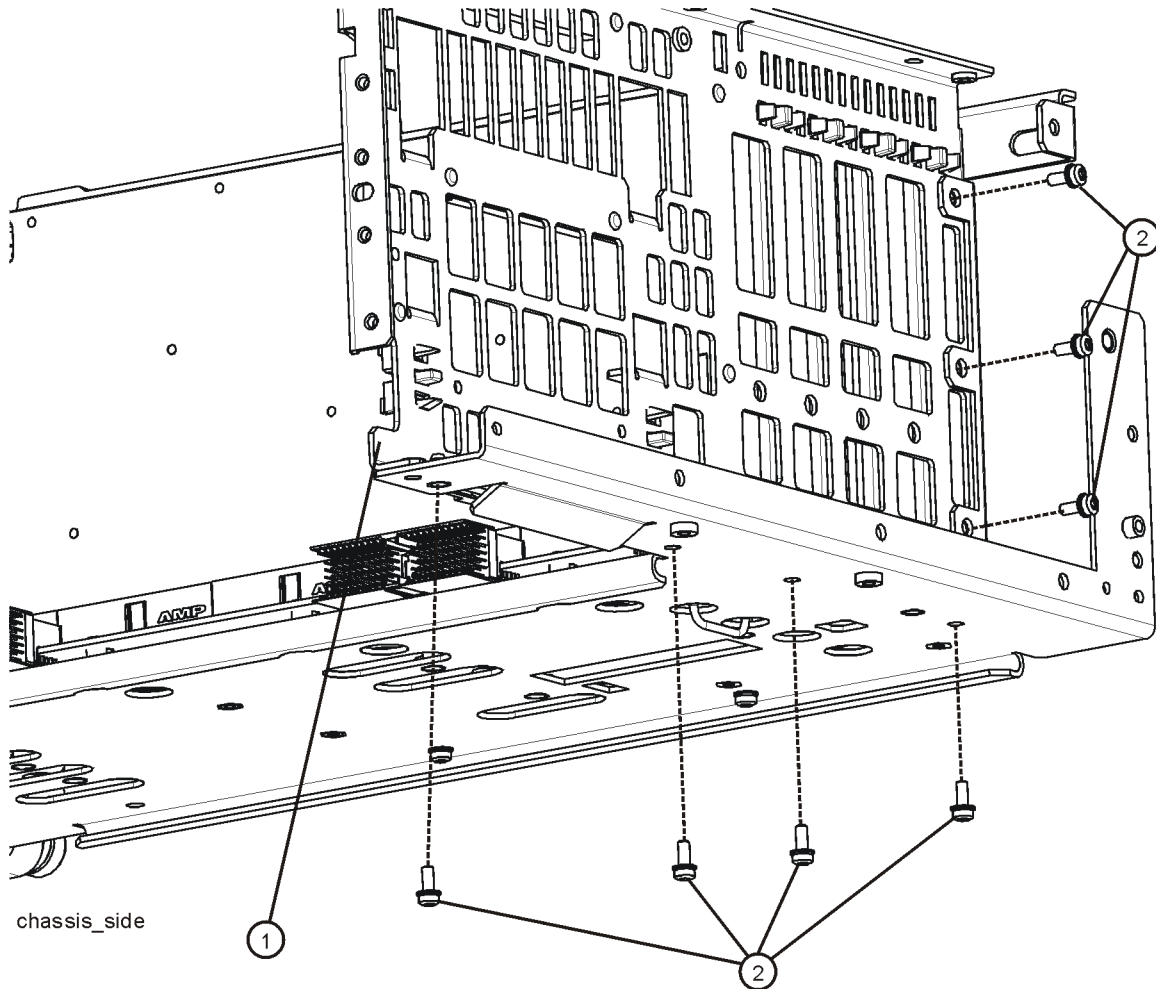


Figure 13-23 Bottom Screws



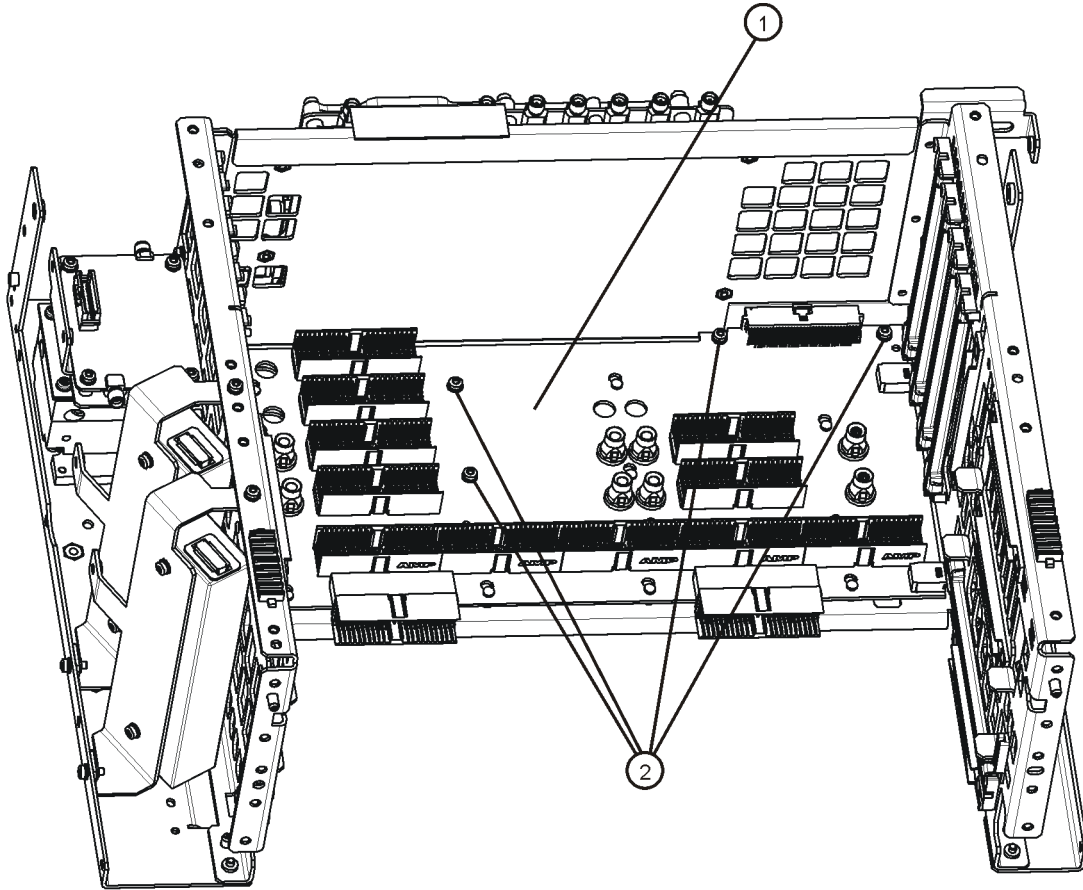
13. Refer to [Figure 13-24](#). Remove the left side chassis (same side as the fan) by removing the seven screws (four on the bottom).

Figure 13-24 Chassis Side Removal



14. Refer to [Figure 13-25](#). Remove the motherboard (1) by removing the four screws (2).

Figure 13-25 Motherboard Assembly Removal



motherboard_replace

Replacement

1. Refer to [Figure 13-25](#). Place the motherboard (1) into position in the chassis and replace the four screws (2). Torque to 9 inch-pounds.
2. Refer to [Figure 13-24](#). Replace the left side chassis by replacing the seven screws. Torque to 9 inch-pounds.
3. Refer to [Figure 13-22](#). Replace the midplane bracket (1) by replacing the eight screws (2). Torque to 9 inch-pounds.
4. Replace the fan assembly. Refer to the [Fan Assembly](#) replacement procedure.
5. Replace the Front Frame Assembly. Refer to the [Front Frame Assembly](#) replacement procedure.
6. Replace the Midplane assembly. Refer to the [Midplane Assembly](#) replacement procedure.

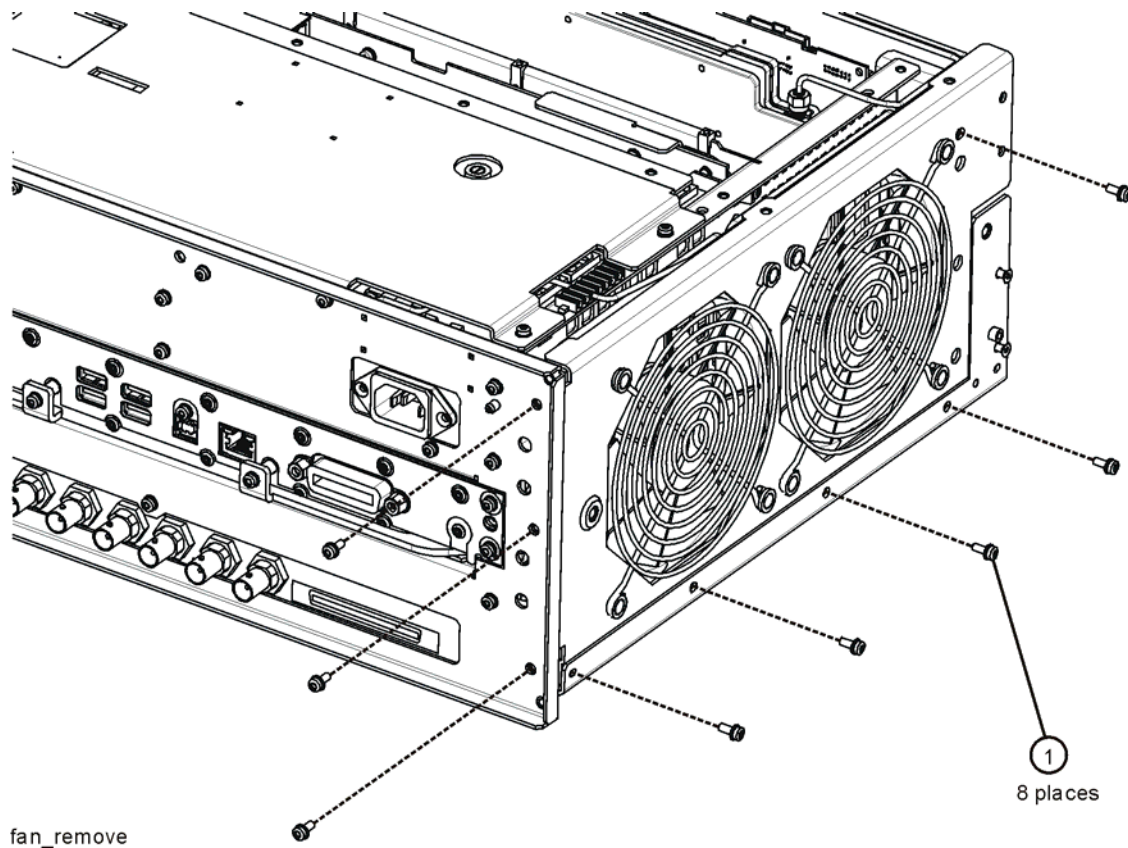
7. Replace the DIF assembly. Refer to the [DIF Assembly](#) replacement procedure.
8. Replace the power supply assembly. Refer to the [Power Supply Assembly](#) replacement procedure.
9. Replace the CPU assembly. Refer to the [CPU Assembly](#) replacement procedure.
10. Replace the L.O. assembly. Refer to the [L.O. Assembly](#) replacement procedure.
11. Replace the top brace and reference bracket. Refer to the [Top Brace and Reference Bracket](#) replacement procedure.
12. Replace the rear panel. Refer to the [Rear Panel](#) replacement procedure.
13. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

Fan Assembly

Removal

1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Remove the top brace. Refer to the [Top Brace and Reference Bracket](#) removal procedure.
3. Remove the Front Frame Assembly. Refer to the [Front Frame Assembly](#) removal procedure.
4. Refer to [Figure 13-26](#). Remove the eight screws (1) that attach the fan assembly to the chassis.

Figure 13-26 Fan Assembly Removal

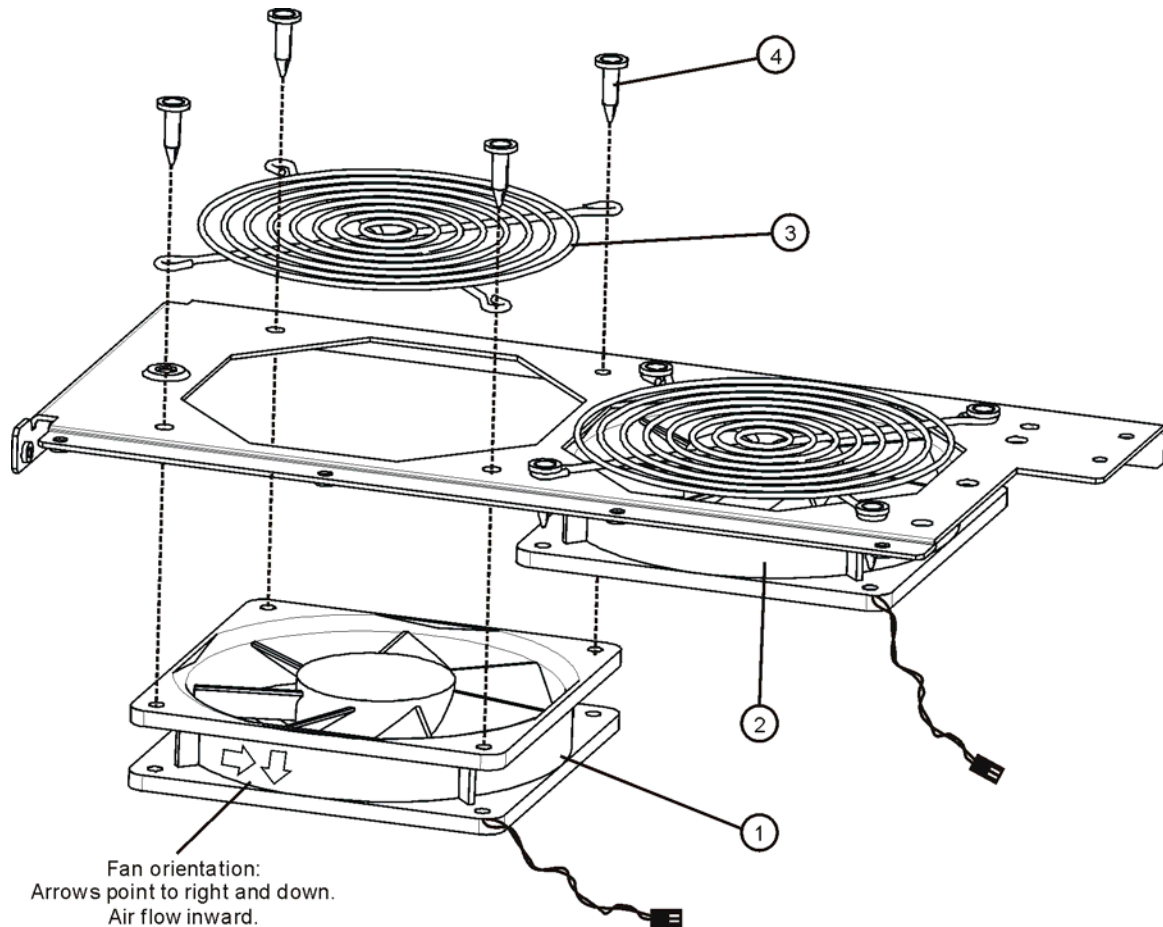


5. Unplug the fan wires from the motherboard. The fan assembly can now be lifted from the chassis.

Replacing a Fan

1. Refer to [Figure 13-27](#). To replace a fan, it is necessary to remove the 4 plastic rivets (4) that attach the fan (1) and guard (3) to the fan bracket. To do this use a small screwdriver to unscrew the rivet and remove it from the bracket.

Figure 13-27 Fan Replacement



2. Position the new fan on the work surface with the arrows pointing to the right and down.
3. Orient the fan guard so that the rings are on the outside, and that the “V” of the support legs are pointing to the neighboring fan.
4. With the rivets center posts raised, snap the rivets into place through the fan grill and fan bracket and into the fan. Screw the center posts into place.

Replacement

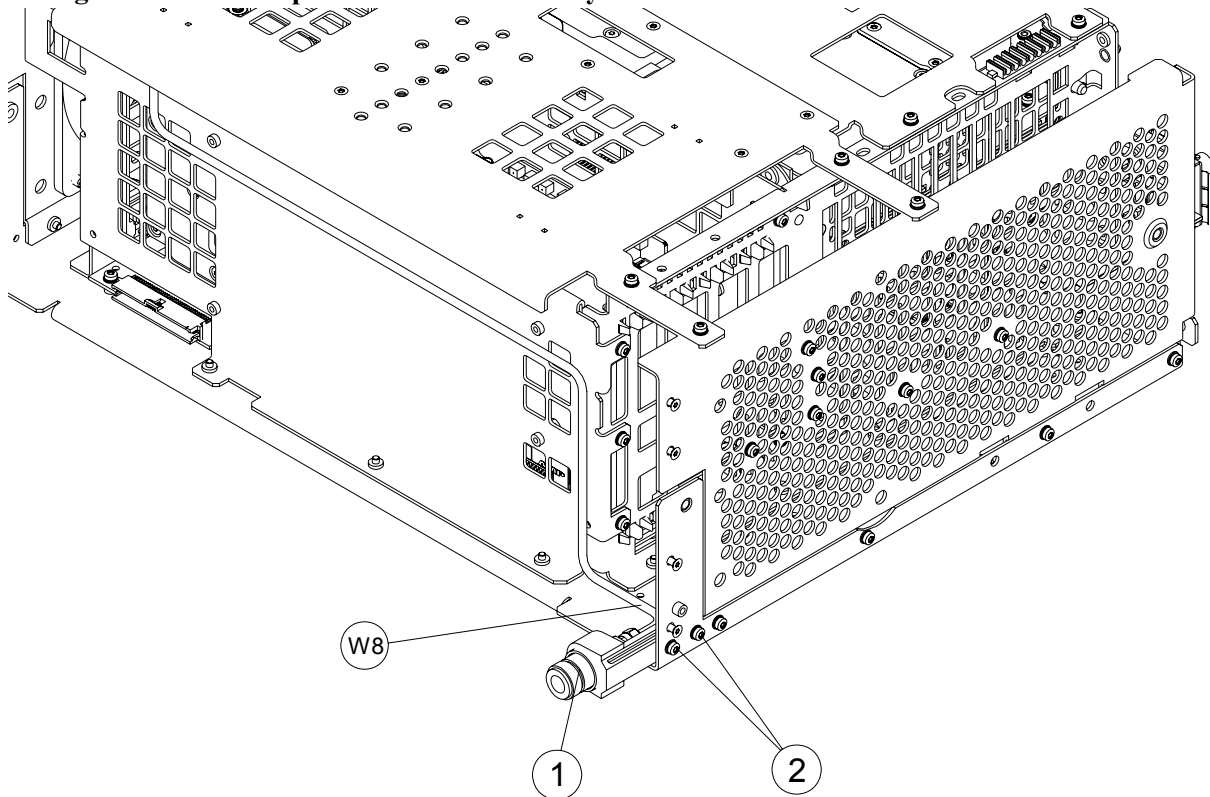
1. Plug the fan wires into the motherboard.
2. Refer to [Figure 13-26](#). Place the fan assembly into position in the chassis. Replace the eight screws (**1**) to attach the fan assembly to the chassis. Torque to 9 inch-pounds.
3. Replace the Front Frame Assembly. Refer to the [Front Frame Assembly](#) replacement procedure.
4. Replace the top brace. Refer to the [Top Brace and Reference Bracket](#) replacement procedure.
5. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

Input Connector Assembly

Removal

1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.
2. Remove the Front Frame Assembly. Refer to the [Front Frame Assembly](#) removal procedure.
3. Refer to [Figure 13-28](#). Disconnect the semi-rigid cable W8 from the Input Connector Assembly.

Figure 13-28 Input Connector Assembly Removal



4. Remove the two screws (1) that attach the Input Connector Assembly to the chassis. The connector assembly can now be lifted from the chassis.

Replacement

1. Refer to [Figure 13-28](#). Place the Input Connector Assembly into position in the chassis. Replace the two screws (1) to attach the Input Connector Assembly to the chassis. Torque to 9 inch-pounds.
2. Reconnect the semi-rigid cable W8 to the Input Connector Assembly. Torque to 10 inch-pounds.
3. Replace the Front Frame Assembly. Refer to the [Front Frame Assembly](#) replacement procedure.
4. Replace the instrument outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

Front Frame Assembly

Removal

NOTE

Make sure any connectors on the front panel are removed.

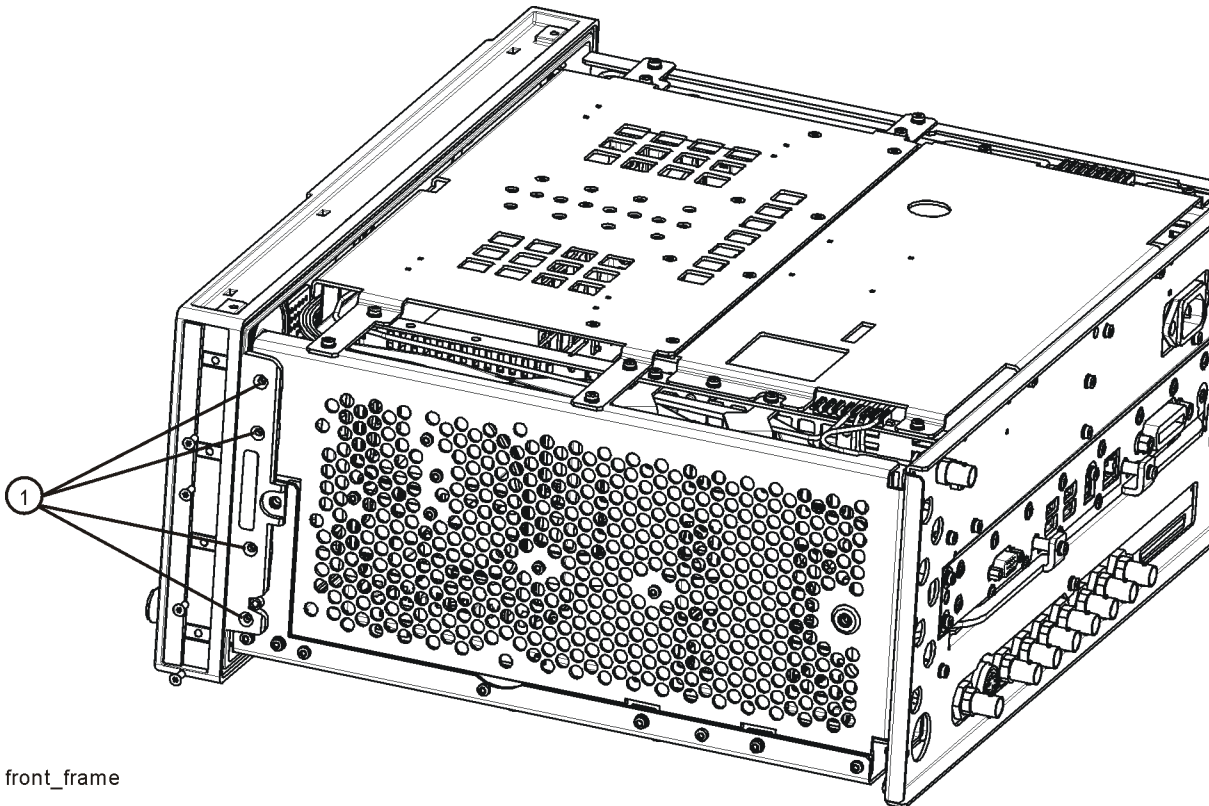
1. Remove the instrument outer case. Refer to the [Instrument Outer Case](#) removal procedure.

NOTE

If the analyzer has Option PRC, Portable Configuration, and you want to remove the bail handle and bumpers from the front frame, refer to the [“Bail Handle Removal \(Option PRC\)”](#) section on [page 269](#).

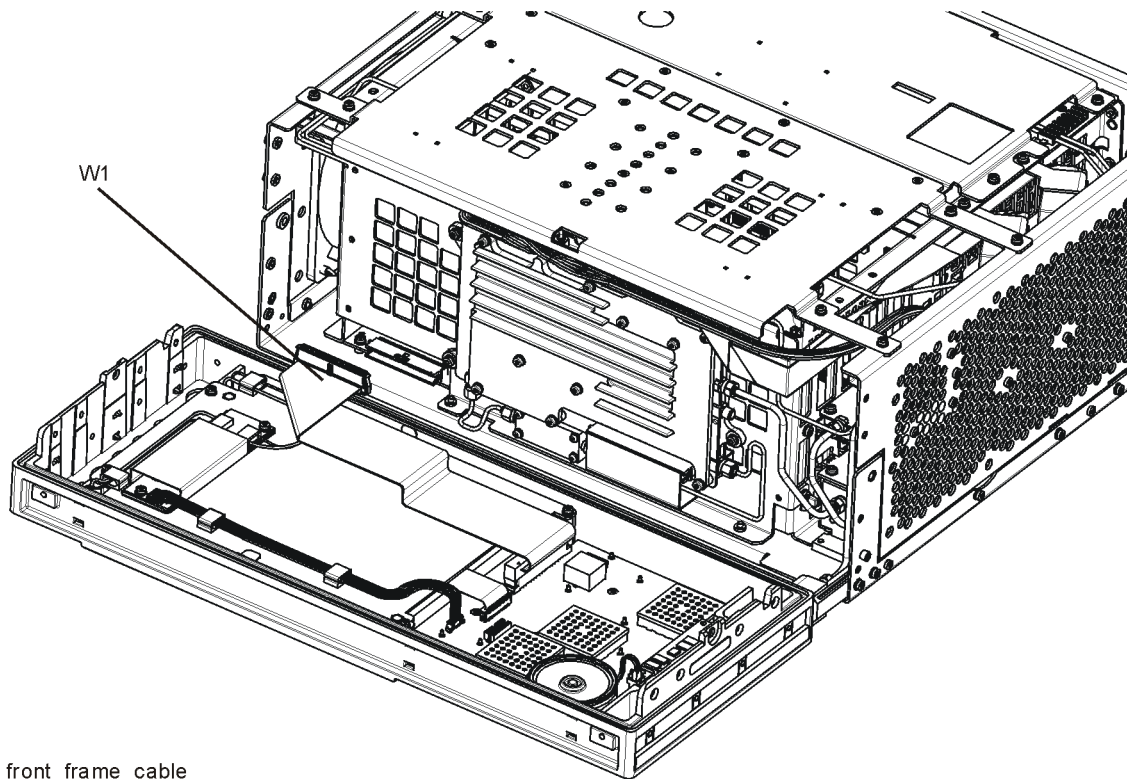
2. Refer to [Figure 13-29](#). Using the T-10 driver, remove the eight screws (1), four on each side, to detach the Front Frame Assembly from the chassis.
3. Refer to [Figure 13-30](#). Pull the Front Frame Assembly carefully away from the chassis. Remove the ribbon cable W1 from the mother board.

Figure 13-29 Front Frame Assembly Removal



front_frame

Figure 13-30 **Front Panel Cable**



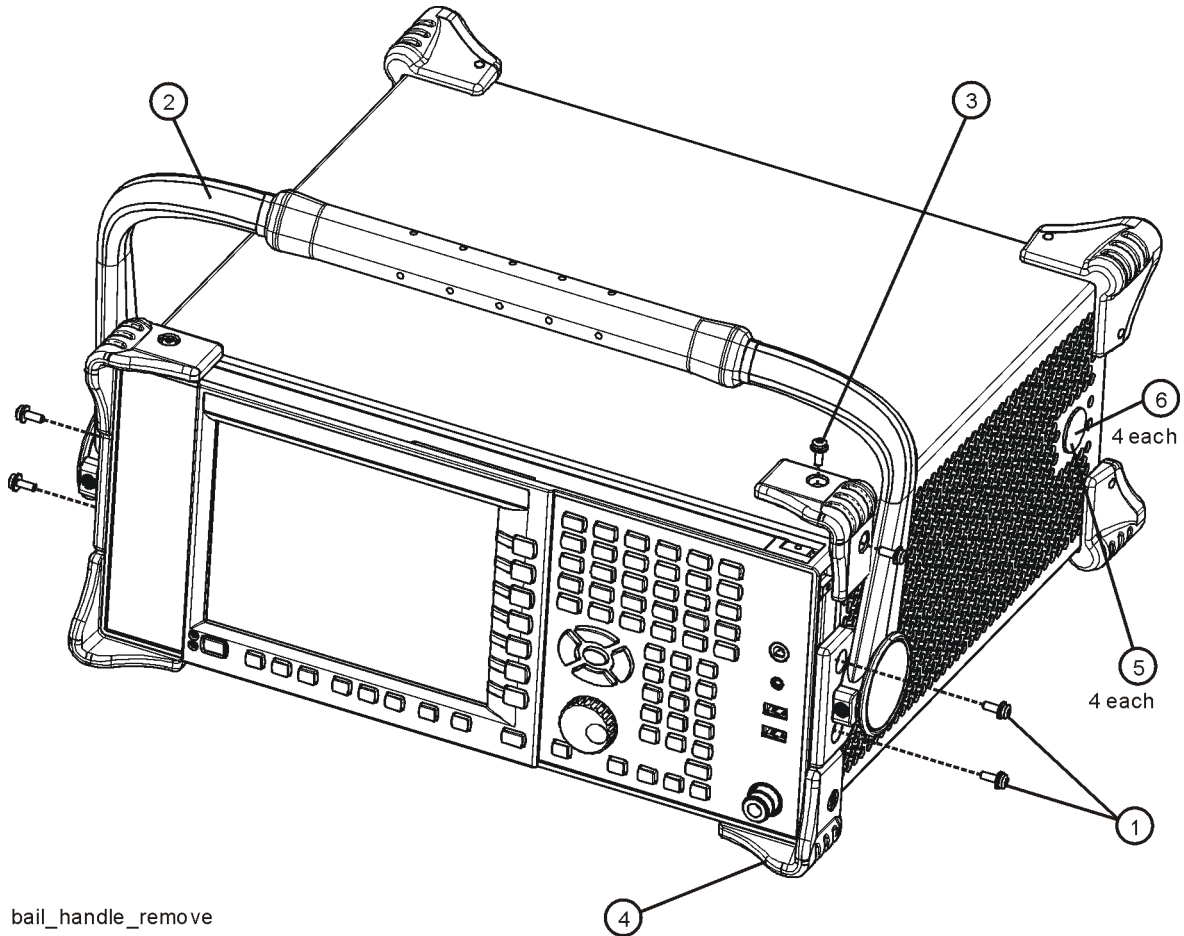
Replacement

1. Reattach the ribbon cable W10.
2. Refer to [Figure 13-29](#). Carefully position the Front Frame Assembly onto the chassis. Ensure no cables are crushed. Replace the eight screws (1), four on each side of the chassis. Torque to 9 inch pounds.
3. Replace the outer case. Refer to the [Instrument Outer Case](#) replacement procedure.

Bail Handle Removal (Option PRC)

1. Refer to [Figure 13-31](#). Using the T-20 driver, remove the four screws (1), two on each side, to detach the Bail Handle Assembly (2) from the front frame.
2. Using the T-20 driver, remove the two screws (3) on each front bumper (4) and remove from the front frame.
3. When replacing these parts, torque to 21 inch-pounds.

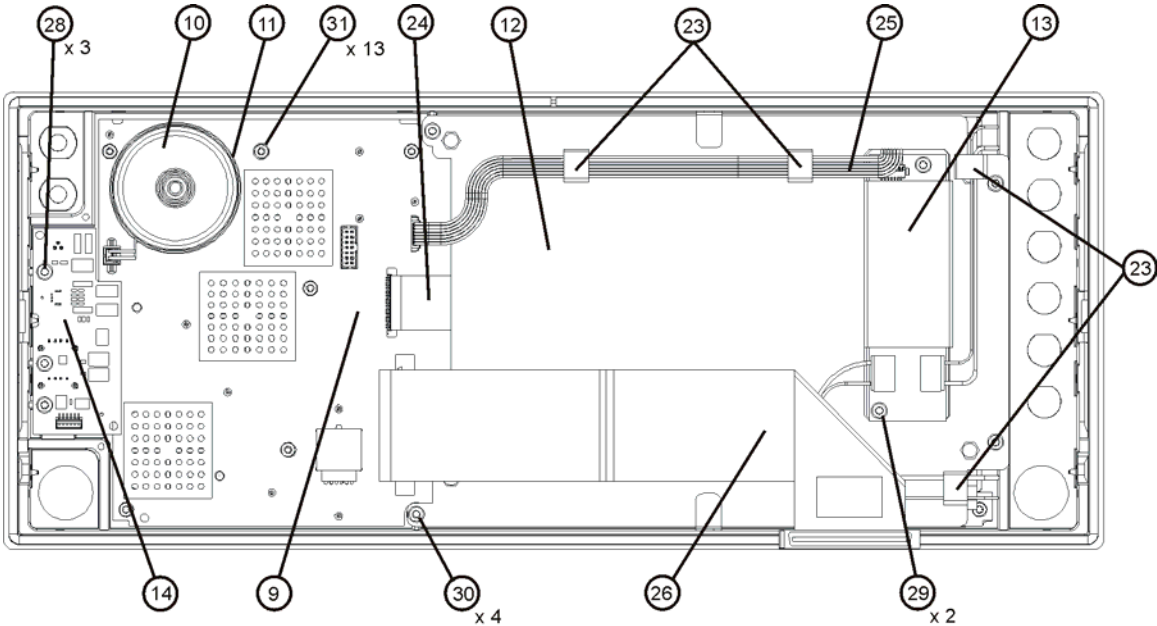
Figure 13-31 Bail Handle and Front Bumpers Removal



Front Frame Assembly Components

NOTE Access to any of the Front Frame assemblies requires removal of the Front Frame Assembly from the chassis.

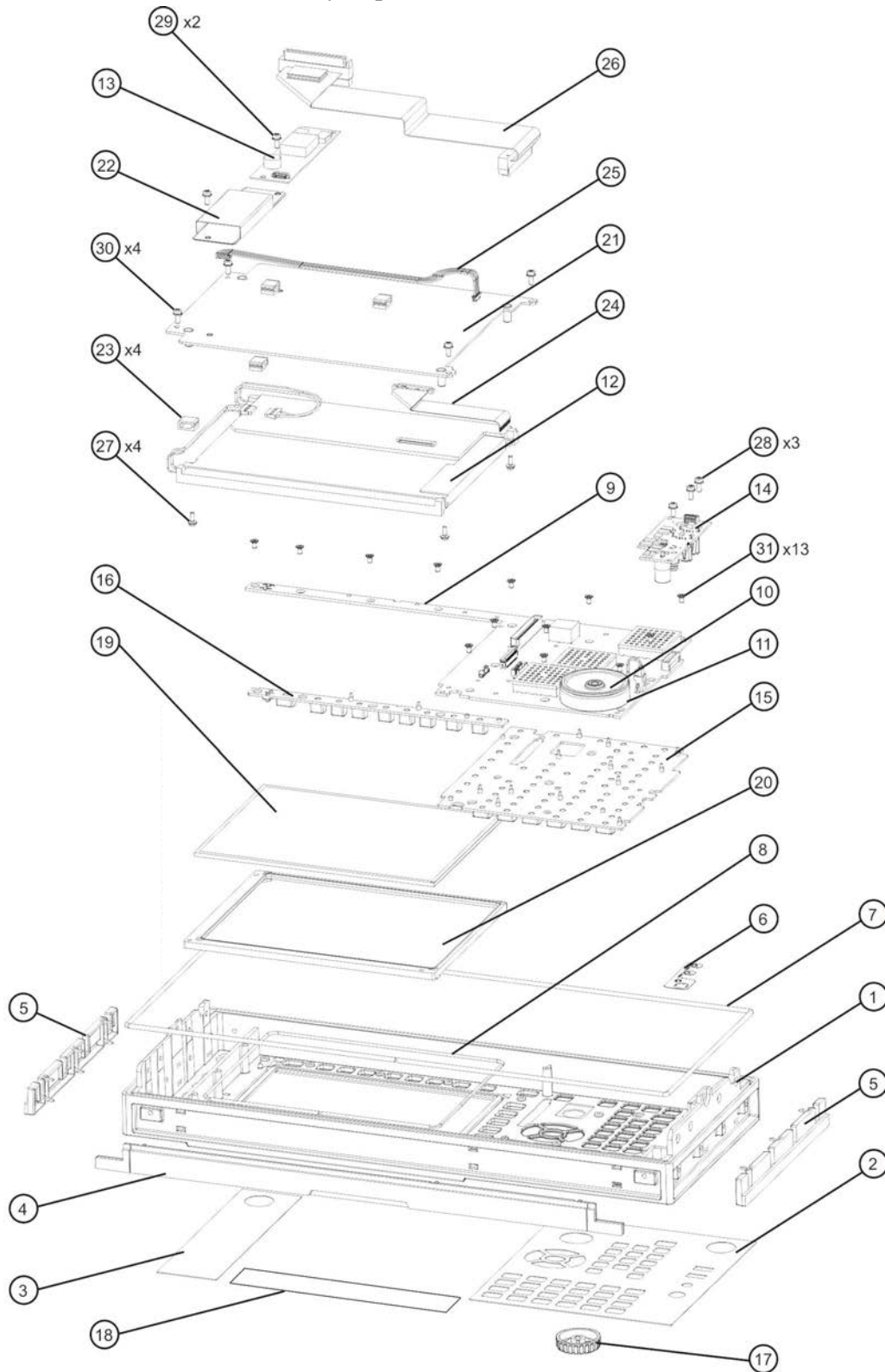
Figure 13-32 Front Frame Assembly Parts Locator



Item	Reference Designator	Description
9	A1A2	Front Panel Interface Board
10	A1A2MP1	Speaker
11	A1A2MP2	Speaker Foam
12	A1A3	Liquid Crystal Display
13	A1A4	Inverter Board (Display Backlight Power)
14	A1A5	Front Panel Daughter Board
23	A1MP8-11	Cable Clamp (Front Panel Cables)
24	A1W1	Power Cable, Display to Front Panel Interface Board
25	A1W2	Power Cable, Front Panel Interface Board to Inverter Board
26	W10	Cable, Front Panel Interface Board to Motherboard (Ribbon)
28, 29, 30	-	Screw - M3 X 8 mm (TORX Pan Head)
31	-	Screw - M3 X 5 mm (TORX Flat Head)

Figure 13-33

Front Frame Assembly Exploded View



ontframeexplode

Assembly Replacement Procedures
Front Frame Assembly

Item	Reference Designator	Description
1	A1A1	Front Frame
2	A1A1MP2	Main Keypad Overlay
3	A1A1MP3	Connector Overlay
4	A1A1MP7	Front Frame Top Trim Strip (Use with standard Bench analyzer)
5	A1A1MP9-10	Front Frame Side Trim Strip
6	A1A1MP4	Front Frame Ground Spring
7	A1A1MP5	Braided Gasket
8	A1A1MP6	Chromeric Gasket
9	A1A2	Front Panel Interface Board
10	A1A2MP1	Speaker
11	A1A2MP2	Speaker Foam
12	A1A3	Liquid Crystal Display
13	A1A4	Inverter Board (Display Backlight Power)
14	A1A5	Front Panel Daughter Board
15	A1MP1	Main Keypad
16	A1MP2	Display Keypad
17	A1MP7	RPG Knob
18	A1MP3	Frequency Label, 3.0 GHz
	A1MP4	Frequency Label, 7.5 GHz
19	A1MP5	LCD Glass Filter
20	A1MP6	LCD Lens Gasket
21	A1MP12	Display Bracket
22	A1MP13	Inverter Board Shield
23	A1MP8-11	Cable Clamp (Front Panel Cables)
24	A1W1	Power Cable, Display to Front Panel Interface Board
25	A1W2	Power Cable, Front Panel Interface Board to Inverter Board
26	W10	Cable, Front Panel Interface Board to Motherboard (Ribbon)
27	-	Screw - M2.5 X 8 mm (TORX Pan Head)
28	-	Screw - M3 X 8 mm (TORX Pan Head)
29	-	Screw - M3 X 8 mm (TORX Pan Head)
30	-	Screw - M3 X 8 mm (TORX Pan Head)
31	-	Screw - M3 X 5 mm (TORX Flat Head)

Display Assembly

Removal

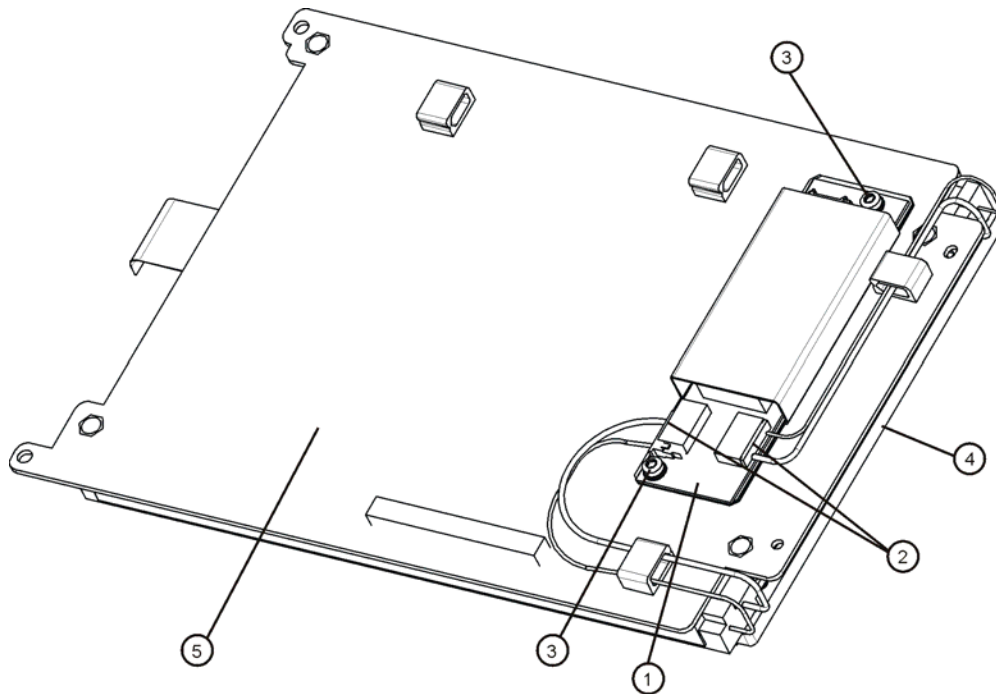
1. Refer to [Figure 13-32](#). Ribbon cable W10 (26) must be separated from the display by pulling up to separate the velcro that is used to adhere the cable to the bracket.
2. Disconnect the cable A1W2 (25) from the LCD Inverter board (13) and unclip the cable from the cable clamps.
3. Disconnect the flex circuit A1W1 (24) from the front panel interface board (9).
4. Remove the four screws (30) securing the display bracket (12) to the Front Frame Assembly. The display can now be removed from the Front Frame Assembly.

CAUTION

Once the display assembly has been removed from the Front Frame Assembly, the glass filter is no longer secured. DO NOT tip the assembly in such a manner that would cause it to fall out of place, as this may cause injury and/or damage to the glass.

5. Refer to [Figure 13-34](#). Disconnect the backlight wires (2) from the inverter board.

Figure 13-34 Inverter Board Removal



Assembly Replacement Procedures

Front Frame Assembly

6. To remove the A1A4 LCD Backlight Inverter board **(1)**, remove the two screws **(3)** securing the inverter board to the display bracket **(5)**.
7. To remove the A1A3 LCD **(4)**, flip the assembly over and remove the four screws securing the LCD to the display bracket **(5)**.

Replacement

1. To replace the A1A3 LCD **(4)**, place it on the display bracket **(5)** and replace the four screws. Torque to 9 inch pounds.
2. To replace the A1A4 Inverter board **(1)**, place it on the display bracket **(5)** and replace the two screws **(3)**. Torque to 9 inch pounds.
3. Reattach the backlight wires **(2)** onto the inverter board.
4. Refer to [Figure 13-32](#). Place the display bracket into position in the Front Frame Assembly. Reconnect the flex circuit A1W1 **(24)** to the front panel interface board **(9)**.
5. Replace the four screws **(30)** that secure the display bracket to the Front Frame Assembly. Torque to 9 inch pounds.
6. Reconnect the cable A1W2 **(25)** to the Inverter board **(13)**. Reclip the cable into the cable clamps.
7. Adhere the velcro on ribbon cable W10 to the display.

Daughter Board, Interface Board and Keypad

Removal

1. Refer to [Figure 13-33](#). Remove the RPG knob **(17)** by carefully pulling it off.
2. Remove the display. Refer to the [Display Assembly](#) removal procedure.
3. Refer to [Figure 13-32](#). Remove the A1A5 Front Panel Daughter board **(14)** by removing the three screws **(28)** and unplugging it from the front panel interface board.
4. Remove the thirteen screws **(31)** securing the A1A2 Front Panel Interface board to the Front Frame Assembly. The Front Panel Interface board with the keypad attached can now be lifted from the Front Frame Assembly.
5. To separate the keypad from the Front Panel Interface board, use a push tool or pliers to carefully separate the pull through tabs.

Replacement

1. Install the keypad onto the Front Panel Interface board using the pull through tabs and alignment holes. Use a push tool or pliers to ensure that all of the pull through tabs are properly captive on the board.
2. Install the A1A2 Front Panel Interface board/keypad assembly into the Front Frame Assembly, and replace the thirteen screws **(31)** to secure. Torque to 9 inch pounds.
3. Replace the A1A5 Front Panel Daughter board **(14)** by plugging it into the Front Panel Interface board using the board to board connectors and secure it with the three screws **(28)**. Torque to 9 inch pounds.
4. Replace the display. Refer to the [Display Assembly](#) replacement procedure.
5. Replace the RPG knob by firmly pressing it on.

14 Post-Repair Procedures

What You Will Find in This Chapter

This chapter provides information that will enable you to return an instrument to full operation following the replacement of any instrument assembly. This information includes a table that shows which adjustments and/or performance tests must be executed after replacing an assembly.

Before Starting

There are three things you should do before starting any of the procedures listed or described in this chapter:

- ☐ Familiarize yourself with the safety symbols, and read the general safety considerations and the safety note definitions in the front of this guide, **before** you begin the procedures in this chapter.
- ☐ Check that the analyzer has been turned on and allowed to warm up.
- ☐ Ensure that the analyzer is operating within a temperature range of 20 °C to 30 °C.

Test equipment you will need

Refer to [Table on page 28](#), for a list of recommended equipment and critical test equipment specifications for the performance verification and adjustments.

Post-Repair Procedures

Table 14-1 lists the adjustments and performance verification tests needed after an assembly replacement.

After an assembly is replaced, find the assembly that has been replaced in the left-hand column, and then perform the recommended adjustment and/or performance verification test. Making the recommended adjustments and/or performance verification tests doesn't guarantee all published specifications are being met. Only a full instrument calibration will do this.

NOTE	Refer to the analyzer user's guide for information on instrument warm-up before performing any of the procedures listed in this chapter.
-------------	--

Table 14-1 Post-Repair Testing Requirements

Assembly Changed or Repaired	Does the Assembly contain FPGA code?	Perform the following adjustments in the order listed ^a	Perform the following performance tests after the adjustments are completed ^a
A1A2 Front Panel Interface	Y		Displayed Average Noise Level Residual Responses
A1A3 Liquid Crystal Display	N	System, Alignments, Align Now, All will run at instrument power up	Displayed Average Noise Level Residual Responses
A2 Digital I.F. Assembly	Y ^b	System, Alignments, Align Now, All will run at instrument power up	Absolute Amplitude Accuracy Resolution Bandwidth Switching Uncertainty Display Scale Fidelity Power Bandwidth Accuracy I.F. Frequency Response
A3 CPU Assembly ^c	N	System, Alignments, Align Now, All will run at instrument power up	Displayed Average Noise Level Residual Responses
A3BT1, Battery ^c	N	System, Alignments, Align Now, All will run at instrument power up	Windows clock via Start Menu, Press Start, Control Panel, Date Time Language and Regional Options, and change the date and time.
A4 Hard Disk Drive ^d	N	Instrument Software Update (http://www.agilent.com/find/xseries_software) All Adjustments	Frequency Response (All Tests)
A5 Power Supply	N		Spurious Responses Displayed Average Noise Level Residual Responses
A6 Midplane board	N	System, Alignments, Align Now, All will run at instrument power up	Displayed Average Noise Level Residual Responses
A7 Motherboard	N	System, Alignments, Align Now, All will run at instrument power up	Displayed Average Noise Level Residual Responses
A8 RF Assembly	Y ^b	System, Alignments, Align Now, All will run at instrument power up Hardware Statistical Reset Utility 50 MHz Calibrator Adjustment Frequency Response (All Adjustments)	Absolute Amplitude Accuracy Frequency Response (All Tests) I.F. Frequency Response Input Attenuation Switching Uncertainty Spurious Responses Displayed Average Noise Level Display Scale Fidelity Resolution Bandwidth Switching Uncertainty Third Order Intermodulation Second Harmonic Distortion Residual Responses

Table 14-1 Post-Repair Testing Requirements (Continued)

Assembly Changed or Repaired	Does the Assembly contain FPGA code?	Perform the following adjustments in the order listed ^a	Perform the following performance tests after the adjustments are completed ^a
A9 L.O. Assembly	Y ^b	System, Alignments, Align Now, All will run at instrument power up 10 MHz Frequency Reference Adjust 50 MHz Calibrator Amplitude Adjust Frequency Response (All Adjustments)	Frequency Readout Accuracy Frequency Reference Accuracy Phase Noise (All Tests) Absolute Amplitude Accuracy Count Accuracy Frequency Response (All Tests) Spurious Responses

- a. Calibration Application Software is required for CXA performance tests and adjustments. For details go to <http://www.agilent.com/find/calibrationsoftware>
b. The instrument software MUST be reinstalled. See the Instrument Software chapter for information on how this is done. Running an update or reinstalling instrument software will synchronize the FPGA with the instrument software.
c. See the BIOS Setup Changes section below for details.
d. See the Calibration File Backup section below for details.

NOTE Some Adjustment tests may be found in the Utility portion of the Test Plan.

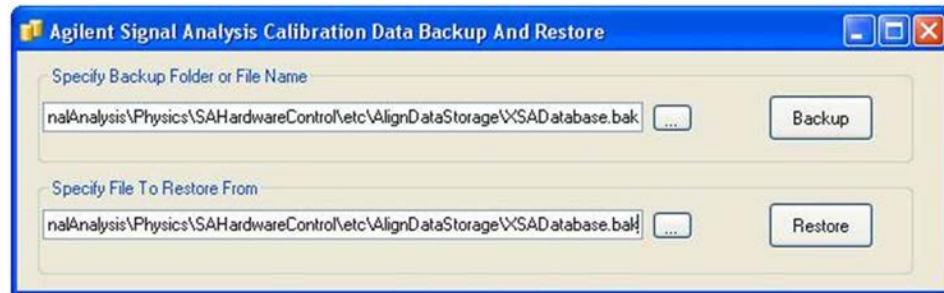
Calibration File Backup

Backing up the calibration file before changing the A5 Disk Drive is highly recommended. To do this you will need to connect a USB mouse and follow the steps below. This is only available for XSA-Series Software version A.01.55 or greater. If the file cannot be backed up or the instrument software version is <A.01.55, all instrument adjustments will need to be run after the drive replacement.

1. Navigate to the following directory using Windows Explorer:

C:\Program Files\Agilent\SignalAnalysis\Physics

2. Double-Click BackupAndRestore.exe
3. The following Dialog box will appear:



4. Set the Backup File to the USB drive and save the file.
5. When the A4 Disk Drive is replaced restore this file using the same utility on the new assembly.

NOTE

While the replacement disk drive has the Windows XP operating system loaded onto it, the license that accompanies it in this kit is for Windows Vista. This is being done within the scope of our license agreement with Microsoft and is necessary at this time, as the instrument applications software is not supported or qualified with any operating system other than Windows XP.

In an effort to eliminate any further confusion for the end user, an additional label is included in this kit that must be affixed to the rear of the instrument, along with the Windows Vista license, to explain why the instrument has this Windows Vista license while running Windows XP.

BIOS Setup Changes

There are two settings in the CPU BIOS that must be verified and may require changing when the A3 CPU assembly or A4BT1 CPU battery is replaced. These settings need to be correct in order for the CXA Signal Analyzer to boot up and operate correctly.

- “IDE 2” must be set to #1 in the “Boot priority order”
- “CK-408 Spread Spectrum” must be set to “Enabled”

Changing and saving these BIOS settings requires a USB external keyboard. Changes to the BIOS are fairly straightforward and should take ~30 seconds.

Verifying Boot Priority

1. Connect an external USB keyboard to one of the front panel USB ports.
2. Turn on instrument power.
3. Confirm Agilent Technologies splash screen comes up within a few seconds as shown in [Figure 14-1](#).

Figure 14-1 **Agilent Technologies Splash Screen**

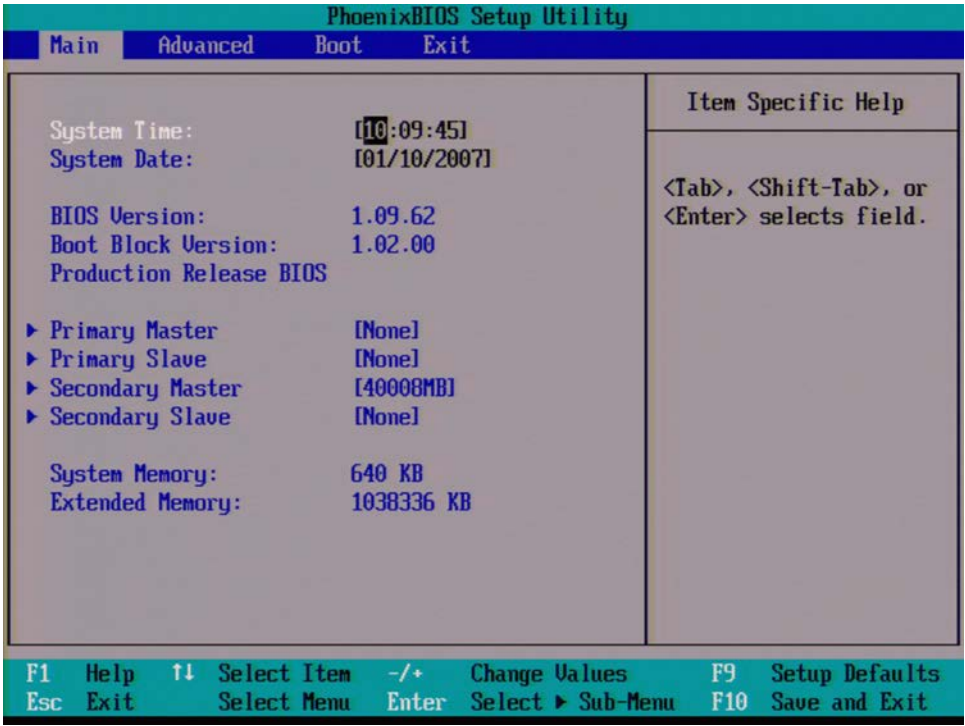


Post-Repair Procedures

Post-Repair Procedures

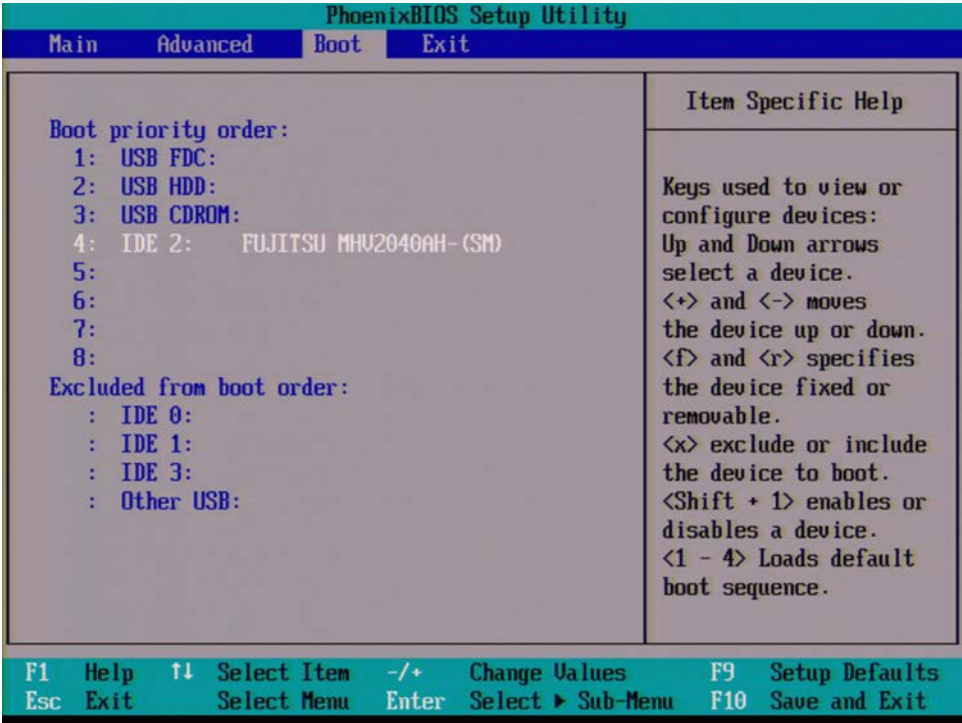
4. Press “F2” on the external keyboard when at the Agilent Technologies splash screen to enter the CPU BIOS Setup Utility as shown in [Figure 14-2](#).

Figure 14-2 CPU BIOS Setup Utility



5. Press the Right Arrow on the external keyboard twice to highlight the Boot tab as shown in [Figure 14-3](#).

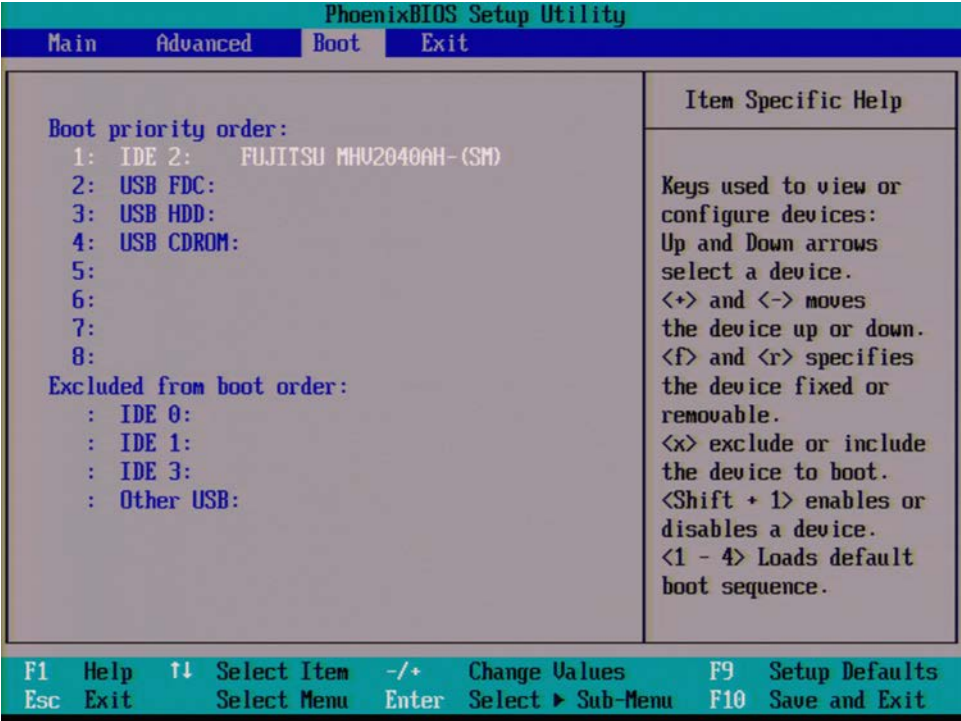
Figure 14-3 Boot Tab Highlighted



6. If IDE 2 is not listed 1st in the boot priority, press the Down Arrow on the external keyboard to highlight IDE 2 as shown in [Figure 14-3](#).

7. Press the “+” key on the external keyboard to bring IDE 2 to the top of the list as shown in Figure 14-4.

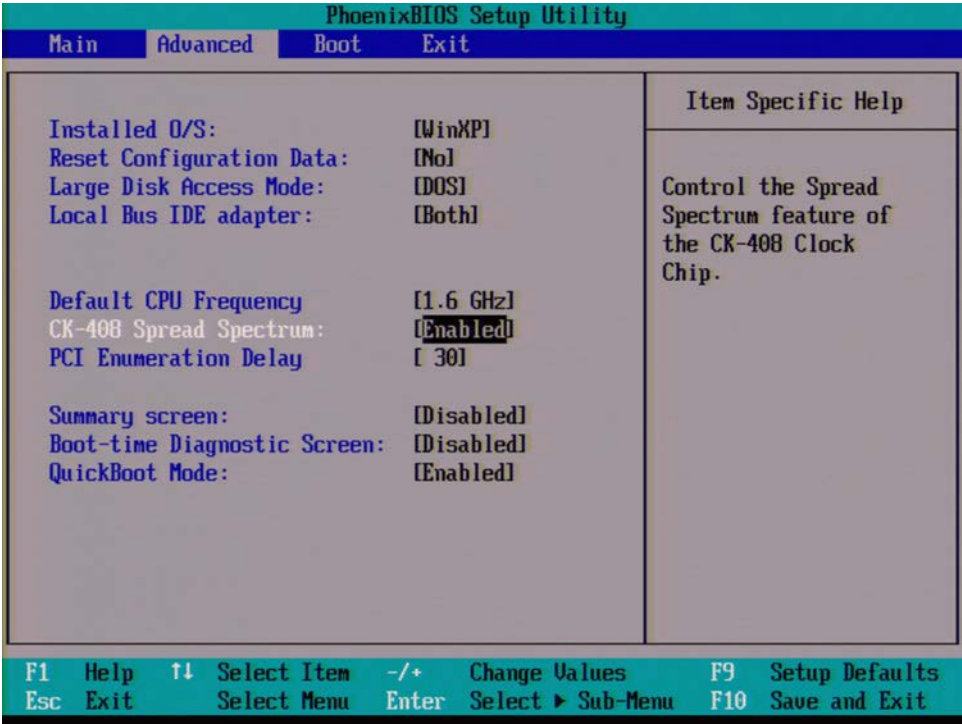
Figure 14-4 IDE 2 at Top of List



Enabling Spread Spectrum

1. Press the Left Arrow on the external keyboard to highlight the Advanced tab as shown in Figure 14-5.

Figure 14-5 Advanced Tab Highlighted



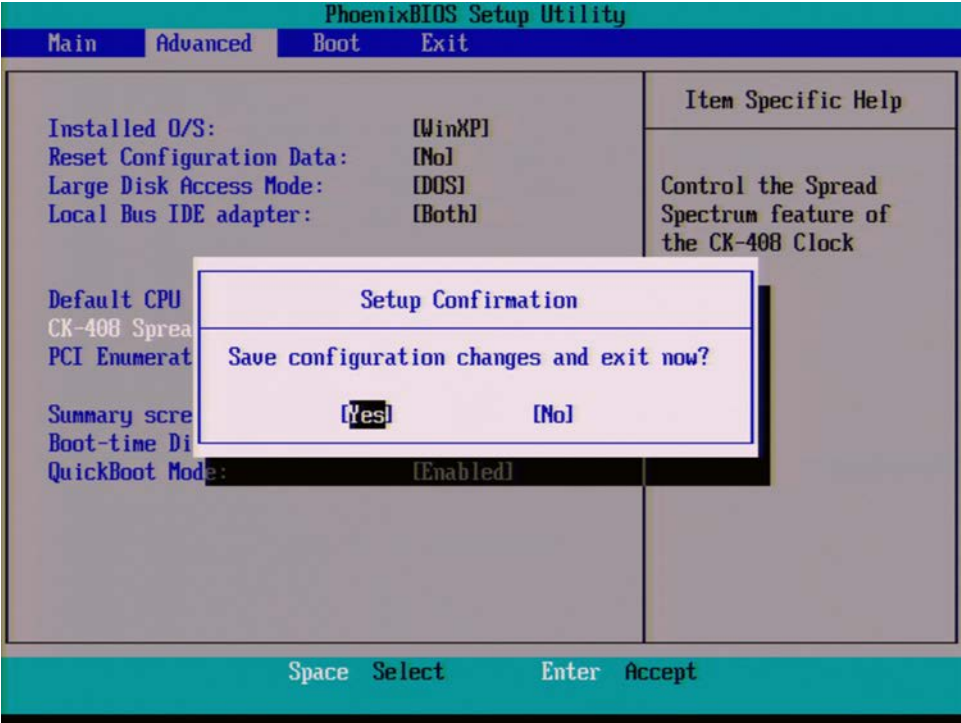
2. Press the Down Arrow on the external keyboard to highlight CK-408 Spread Spectrum
3. Use the “+” key on the external keyboard to change the setting from [Disabled] to [Enabled]
4. Press “F10” on the keyboard to save changes and exit.

Post-Repair Procedures

Post-Repair Procedures

5. Press the Enter key on the external keyboard to confirm the BIOS configuration changes as per [Figure 14-6](#).

Figure 14-6 Confirm BIOS Configuration



6. Perform the remaining adjustments and performance tests as per [Table 14-1](#) for the assembly that was changed.

15 Functional Tests

Functional Test Versus Performance Verification

Functional tests are tests of various instrument parameters that give a high degree of confidence that the analyzer is operating correctly. They are recommended as a check of analyzer operation for incoming inspection or after a repair. Measurement uncertainty analysis is not available for functional tests, and the analyzer is checked against limits that are wider than the published specifications. The functional tests are designed to test an analyzer operating within the temperature range defined by the analyzer specifications using a minimum set of test equipment. If a test does not pass, performance verification tests must be run to determine whether a problem exists.

Functional tests use a minimum set of test equipment to check a much smaller range of parameters (and a limited number of data points for each parameter) than do performance verification tests. Functional tests use limits that are wider than the published specifications; measurement uncertainty analysis is *not* available for functional tests.

NOTE

If a functional test does not pass, you must run performance verification tests to determine whether a problem exists.

Performance verification tests span a wide range of instrument parameters and provide the highest level of confidence that the instrument conforms to published specifications. These tests can be time consuming and require extensive test equipment.

Before Performing a Functional Test

1. Ensure that you have the proper test equipment.
2. Switch on the unit under test (UUT) and let it warm up (in accordance with warm-up requirements in the instrument specifications).
3. Allow sufficient warm-up time for the required test equipment (refer to individual instrument documentation for warm-up specifications).
4. Ensure that the analyzer's frequency reference is set to Internal:
 - a. Press the **Input/Output**, **More**, **Freq Ref In** keys.
 - b. If the **Freq Ref In** softkey does *not* show **Internal**, press the **Freq Ref In** softkey and select **Internal**.
5. Following instrument warm-up, perform the auto align routine:
Press **System**, **Alignments**, **Align Now**, **All**.

NOTE

Functional test accuracy depends on the precision of the test equipment used. Ensure that all of the test equipment is calibrated before running a functional test.

Test Equipment

The table below summarizes the test equipment needed to perform all of the functional tests. Alternate equipment model numbers are given in case the recommended equipment is not available. If neither the recommended nor the alternative test equipment are available, substitute equipment that meets or exceeds the critical specifications listed.

Analyzer Option	Item	Critical Specifications	Recommended Agilent Model	Alternate Agilent Model
	Adapters			
All	3.5 mm (f) to 3.5mm (f) (connector saver for source)	<i>Frequency:</i> 10 MHz to 26.5 GHz <i>VSWR:</i> < 1.1:1	83059B	1250-1749
All	BNC (f) to SMA (m)	<i>Frequency:</i> 40 MHz	1250-1200	
All	Type N (f) to Type N (f)	<i>Frequency:</i> 10 MHz to 18 GHz <i>VSWR:</i> < 1.05:1	1250-1472	1250-0777
All	Type N (m) to 3.5 mm (m)	<i>Frequency:</i> 10 MHz to 18 GHz <i>VSWR:</i> < 1.1:1	1250-1743	
All	Type N (m) to 3.5 mm (f)	<i>Frequency:</i> 10 MHz to 18 GHz <i>VSWR:</i> < 1.1:1	1250-1744	
All	Type N (f) to 3.5 mm (f)	<i>Frequency:</i> 10 MHz to 18 GHz <i>VSWR:</i> < 1.1:1	1250-1745	
All	Type N (m) to BNC (f)	<i>Frequency:</i> 10 MHz to 1 GHz <i>VSWR:</i> < 1.05:1	1250-1476	
	Attenuators			
All	10 dB Step Attenuator	<i>Frequency:</i> 50 MHz <i>Range:</i> 0 to 70 dB	8495A	8496A
All	10 dB Fixed Attenuator (2 required)	<i>Frequency:</i> 50 MHz <i>VSWR:</i> < 1.2:1	8493C Option 010	8493A Option 010 or 8493B Option 010
Pxx	30 dB Fixed Attenuator	<i>Accuracy:</i> < 0.05 dB @ 50 MHz	11708A	
	Cables			
All	3.5 mm (1 meter)	<i>Frequency:</i> 10 MHz to 26.5 GHz <i>VSWR:</i> < 1.4:1 <i>Loss:</i> < 2.0 dB	11500E	8120-4921
All	Cable, BNC (3 required)	120 cm (48 in.) BNC cable	10503A	

Analyzer Option	Item	Critical Specifications	Recommended Agilent Model	Alternate Agilent Model
Signal Source				
All	Synthesized Sweeper	Frequency: 10 MHz to 26.5 GHz Harmonic level: < -40 dBc Amplitude range: 10 to -20 dBm Frequency Accuracy: 0.02%	PSG ^a	83630B, 83640B, 83650B
Power Meter				
All	Power Meter	Power Reference Accuracy: $\pm 1.2\%$ Compatible with power sensor	E4418B	E4419B
All	Power Sensor	Frequency Range: 50 MHz to 3.66 GHz Amplitude Range: -70 to -10 dBm	8481D	8487D 8485D
P03	Low Power Sensor	Frequency Range: 50 MHz to 3.6 GHz Amplitude Range: -70 to -10 dBm	8481D	8485D 8487D
Pxx other than P03	Low Power Sensor	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: -70 to -10 dBm	8485D	8487D
Oscilloscope				
All	Agilent Infiniium Oscilloscope	Cutoff Frequency: 50 MHz Rejection at 65 MHz: > 40 dB Rejection at 75 MHz: > 60 dB Rejection at 80 MHz: > 60 dB Frequency: 10 MHz to 26.5 GHz	54800B	
Miscellaneous Equipment				
All	Filter, 50 MHz Low Pass	Cutoff Frequency: 50 MHz Rejection at 65 MHz: > 40 dB Rejection at 75 MHz: > 60 dB Rejection at 80 MHz: > 60 dB Frequency: 10 MHz to 26.5 GHz	0955-0306	
All	Power Splitter	Nominal Insertion Loss: 6 dB Tracking Between Ports: < 0.25 dB	11667A	11667B
All	Termination, 50 Ω	Type N (m) Connector Frequency: 30 Hz to 26.5 GHz	909A Option 012	

a. PSG model numbers: E8244A, E8254A, E8247C Option 520, E8247C Option H31 or 540, E8257D Option 520, E8257D Option 550, E8257D Option 567, E8267D Option 544.

Displayed Average Noise Level (DANL)

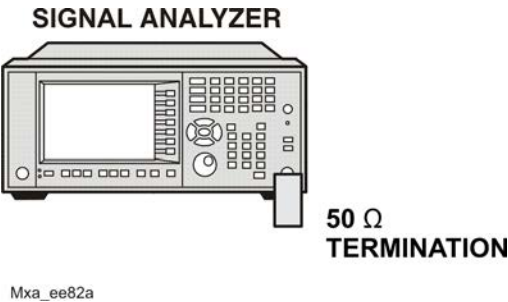
Test Limits (with 0 dB input attenuation)

See [Table 15-1](#) for values.

The Displayed Average Noise Level (DANL) of the signal analyzer is measured across a 10 kHz frequency span at several center frequencies. The analyzer input is terminated into a 50Ω load. A test is performed to assure the measurement is not performed in the presence of a residual response. The measurement is then averaged, and the result is normalized to a 1 Hz bandwidth.

Item	Critical Specifications (for this test)	Recommended Agilent Model
Termination, 50Ω Type-N(m)	Frequency: DC to 18 GHz	909A Option 012

Figure 15-1 **DANL Test Setup**



Procedure

1. Configure the equipment as shown in [Figure 15-1](#)
2. Press **Mode**, **Spectrum Analyzer**, **Mode Preset** on the analyzer.
3. Set up the signal analyzer by pressing:

FREQ Channel, **Center Freq**, 10, **MHz**
Input/Output, **RF Input**, **RF Coupling**, select **DC**
SPAN X Scale, **Span**, 10, **kHz**
AMPTD Y Scale, -70, **dBm**
AMPTD Y Scale, **Attenuation**, **Mech Atten**, 0, **dB**
BW, **Res BW**, 1, **kHz**
BW, **Video BW**, 100, **Hz**
Meas Setup, **Average/Hold**, **Number**, 20, **Enter**
Trace/Detector, **Trace Average**
Single

4. Press **Restart**, then wait for Average/Hold to display 20/20.
5. Press **View/Display, Display**, then press **Display Line, On**.
6. Rotate the knob and set the display line at the average amplitude of the displayed noise floor by visual inspection.
7. Confirm that the measurement is performed on the analyzer noise floor and not on a residual response within the displayed 10 kHz span.

NOTE

Ignore the residual response if one appears when taking the measurement.

8. Enter the value of the display line as the Measured Average Noise Level at 10 MHz column in [Table 15-1](#).
9. Normalize the measured value to a 1 Hz BW by adding –30 dB to the measured value.

NOTE

The –30 dB value is added because the formula used to calculate the value of the noise power in a 1 Hz BW when measured with a 1 kHz BW is:

Normalized Noise = 10 Log (BW 2/BW 1) where BW 2 is the 1 kHz BW we measure and BW 1 is 1 Hz BW to which we want to normalize.

Therefore, 10 Log (1000) = 30 dB, so the noise floor will be 30 dB lower in a 1 Hz BW.

10. Enter the normalized value of the displayed average noise level in [Table 15-1](#).
11. The value of the normalized displayed average noise should be less than the specification value.
12. Change the analyzer center frequency to the next value listed in [Table 15-1](#). Press: **FREQ Channel, Center Freq**, [Table 2-1 Value], **GHz**
13. Repeat [step 7](#) through [step 12](#) to fill in the remainder of [Table 15-1](#) for your analyzer frequency range.

Table 15-1 Displayed Average Noise Level (DANL) Results

Center Frequency	Measured Average Noise Level (dBm)	Normalized Average Noise Level/(1 Hz BW) (dBm)	Test Limits (dBm)
10 MHz			–129
1.999 GHz			–141
5.999 GHz			–130

Frequency Readout Accuracy

Test Limits

Frequency Readout Accuracy is equivalent to the following equation:

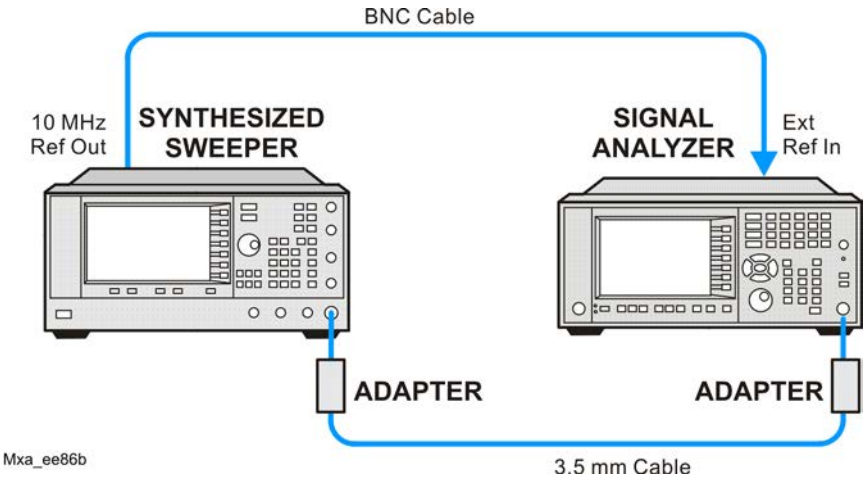
$$\pm(0.25\% \times \text{span} + 5\% \times \text{RBW} + 2 \text{ Hz} + 0.5 \times \text{horizontal resolution})$$

See results table for actual values.

The frequency readout accuracy is measured in several spans and center frequencies that allow both internal analyzer synthesizer modes and prefilter bandwidths to be tested. Frequency reference error is eliminated by using the same frequency standard for the analyzer and signal source.

Item	Critical Specification (for this test)	Recommended Agilent Model
Adapter, Type-N(m), to 3.5 mm(f)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.1:1	1250-1744
Adapter, 3.5 mm(f) to 3.5 mm(f)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.1:1	83059B
Cable, 3.5 mm, 1 meter	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.4:1	11500E
Cable, BNC, 120 cm	Frequency: 10 MHz	10503A
Synthesized Sweeper	Frequency: 10 MHz to 1.51 GHz	PSG

Figure 15-2 Frequency Readout Accuracy Test Setup



Procedure

1. Configure the equipment as shown in [Figure 15-2](#). Confirm the analyzer's built-in auto alignment has been performed within the past 24 hours.
2. On the synthesized sweeper, press **PRESET**, then set the controls as follows:
FREQUENCY, 1505, MHz
POWER LEVEL, -10, dBm
3. Set up the signal analyzer by pressing:
Mode, Spectrum Analyzer
Mode Preset
Input/Output, More, Freq Ref In, External
FREQ Channel, Center Freq, 1505, MHz
SPAN X Scale, Span, 2990, MHz
Trace/Detector, More, Detector, Sample
Single
4. Press **Restart**.

Press **Peak Search** on the analyzer. If the instrument is functioning correctly, the marker reading in the active function block will be between the values listed in [Table 15-2](#). Record the marker value in the Marker Frequency Readout column in [Table 15-2](#).
5. On the signal analyzer, change the span and center frequency as listed in [Table 15-2](#).
6. Change the synthesized sweeper frequency to match the center frequency of the analyzer.
7. Repeat [step 4](#) through [step 6](#) until the Marker Frequency Readout column of [Table 15-2](#) is complete.

Table 15-2 Frequency Readout Accuracy Results

Span (MHz)	Center Frequency (MHz)	Minimum	Marker Frequency Readout	Maximum
2990	1505	1495.9 MHz		1514.1 MHz
127.2	1505	1504.56 MHz		1505.44 MHz
54.1	1505	1504.8122 MHz		1505.1878 MHz
7.95	1505	1504.97240 MHz		1505.0276 MHz
0.106	1505	1504.999630 MHz		1505.000370 MHz
1.98	517.59	517.58316 MHz		517.59684 MHz
1.98	832.50	832.49316 MHz		832.50684 MHz

Second Harmonic Distortion (SHD)

Test Limits

Applied Frequency	Mixer Level	Distortion
40 MHz	–10 dBm	< –55 dBc

This test checks the second harmonic distortion of the signal analyzer by tuning to twice the input frequency and examining the level of the distortion product. A low pass filter is inserted between the source and the signal analyzer to prevent the source second harmonic from artificially raising the second harmonic product displayed on the analyzer.

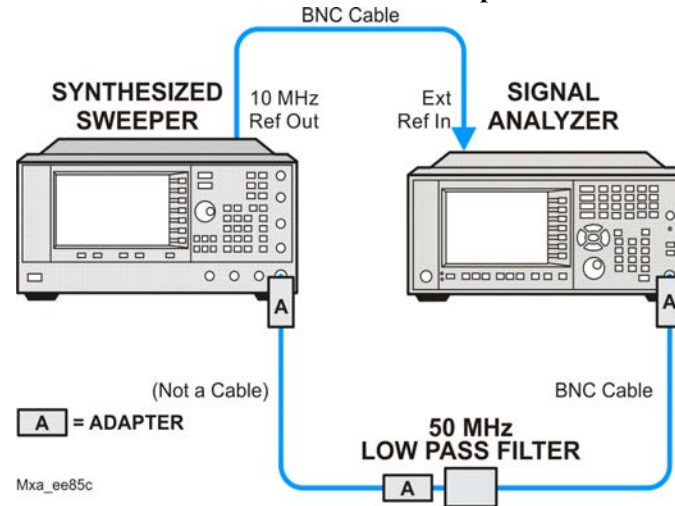
The power level at the input mixer is 20 dB higher than specified to allow the distortion product to be seen. For example, the instrument specification may state that with a –30 dBm signal at the input mixer, the distortion product should be suppressed by > –65 dBc.

The equivalent Second Harmonic Intercept (SHI) is 35 dBm (–30 dBm + 65 dBc). This test is performed with –20 dBm at the mixer and verifies the distortion product is suppressed by –55 dBc. This ensures the SHI is also 35 dBm (–20 dBm + 55 dBc).

Item	Critical Specifications (for this test)	Recommended Agilent Model
Adapter, Type-N(m) to BNC(f)	Frequency: 10 MHz to 80 MHz VSWR: < 1.05:1	1250-1476
Adapter, BNC(f) to SMA(m)	Frequency: 40 to 80 MHz	1250-1200
Adapter, 3.5 mm(f) to 3.5 mm(f)	Frequency: 10 MHz to 80 MHz VSWR: < 1.1:1	83059B
Cable, BNC 120 cm (2 required)	Frequency: 10 to 40 MHz	10503A
Filter, 50 MHz Low Pass	<i>Cutoff Frequency:</i> 50 MHz <i>Rejection at 65 MHz:</i> > 40 dB <i>Rejection at 75 MHz:</i> > 60 dB	0955-0306
Synthesized Sweeper	<i>Frequency:</i> 50 MHz <i>Spectral Purity:</i> Better than –30 dBc	PSG

Figure 15-3

Second Harmonic Distortion Test Setup



Procedure

1. Configure the equipment as shown in [Figure 15-3](#).
2. Press **Mode, Spectrum Analyzer, Mode Preset** on the signal analyzer and Preset the synthesized sweeper.
3. Set up the synthesized sweeper by pressing:
 - Frequency, 40, MHz**
 - Amplitude, -10, dBm**
4. Set up the signal analyzer by pressing:
 - Input/Output, More, Freq Ref In, External**
 - FREQ Channel, Center Freq, 40, MHz**
 - SPAN X Scale, Span, 1, MHz**
5. On the analyzer, press **Peak Search**.
6. Adjust the synthesized sweeper amplitude for a signal analyzer display of $-10 \text{ dBm} \pm 0.1 \text{ dB}$.
7. On the analyzer, activate the marker delta function by pressing the **Marker** and **Delta** keys.
8. On the signal analyzer, press:
 - FREQ Channel, Center Freq, 80, MHz**
 - Meas Setup, Average/Hold Number, 20, Enter**
 - Trace/Detector, Trace Average**
 - Single**
9. Press **Peak Search**. Enter the displayed value under the Measured Second Harmonic Distortion (dBc) heading in [Table 15-3](#).

Table 15-3 Second Harmonic Distortion Results

Applied Frequency (MHz)	Measured Second Harmonic Distortion (dBc)	Mixer Level (dBm)	Specification (dBc)
40		-20	-55

Amplitude Accuracy at 50 MHz

Test Limits

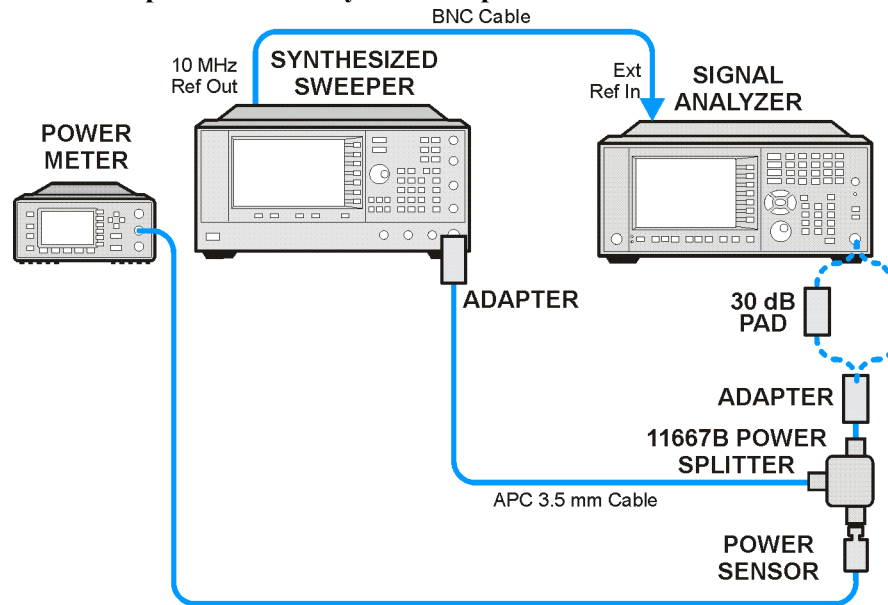
Amplitude Accuracy should remain within 1.13 dB of the measured source value across the range of source levels and changes in resolution bandwidth. The Preamp (option P03, P07) should remain within ± 1.3 dB of measured values.

A synthesized sweeper is used as the signal source for the test. The source amplitude is varied using the signal source amplitude control. The attenuation and resolution bandwidth are varied on the signal analyzer. The source amplitude is measured by the power meter and signal analyzer at each setting, and the values compared. The difference between each pair of measurements indicates the amplitude accuracy.

Item	Critical Specifications	Recommended Agilent Model
Adapter	Type-N(m), to 3.5 mm(m)	1250-1743
Adapter	3.5 mm(f) to 3.5 mm(f)	83059B
Attenuator, 30 dB	<i>Accuracy:</i> < 0.5 dB at 50 MHz	11708A
Cable	3.5 mm, 1 meter	11500E
Cable	BNC, 120 cm	10503A
Power Meter	Compatible with power sensor	E4418B
Power Sensor	<i>Amplitude Range:</i> -25 dBm to 10 dBm	8485A
Power Splitter	3.5 mm (f) connectors 6 dB loss	11667B
Synthesized Sweeper	<i>Typical Temperature Stability:</i> 0.01 dBc/°C	PSG

Figure 15-4

Amplitude Accuracy Test Setup



mxa_ee181a

Procedure

1. Zero and calibrate the power meter.
2. Configure equipment as shown in [Figure 15-4](#), with the power splitter connected directly to the signal analyzer input through the adapter.

CAUTION

To minimize stress on the test equipment connections, support the power sensor.

3. If the auto alignment for the analyzer has not been performed within the past 24 hours, press **System, Alignments, Align Now, All** to perform the auto alignment routine.
4. Press **Mode, Spectrum Analyzer, Mode Preset** on the analyzer.
5. Set up the synthesized sweeper by pressing:

CW, 50, MHz
Power Level, -4, dBm
RF (On)

6. Set up the signal analyzer by pressing:

Input/Output, More, Freq Ref In, External
FREQ Channel, Center Freq, 50, MHz
SPAN X Scale, 2, MHz
AMPTD Y Scale, Attenuation, Mech Atten, 10, dB
Input/Output, RF Input, RF Coupling, select DC
Sweep/Control, Sweep Setup, Swp Time Rules, SA - Accuracy
Meas Setup, Average/Hold Number, 20, Enter
Trace/Detector, Trace Average
Single

Functional Tests
Amplitude Accuracy at 50 MHz

7. Perform the following steps for each row listed in Table 15-4:
 - a. Set the synthesized sweeper amplitude to the value listed in the Nominal Source Amplitude column in Table 15-4
 - b. Set the Mech Atten as indicated in the Attenuation column in Table 15-4
 - c. Set the Span as listed in the Span column of Table 15-4
 - d. Record the source amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 15-4
 - e. On the signal analyzer, press **Restart**.
 - f. Wait for the signal analyzer to finish averaging.
 - g. Press **Peak Search**.
 - h. Record the signal amplitude, as measured by the analyzer in the Measured Amplitude column of Table 15-4
 - i. Calculate the signal amplitude accuracy error using the following equation, and record the results under the Amplitude Accuracy Error column:

$$\text{Amplitude Accuracy Error} = \text{Meas_amp} - \text{Power_meter}$$

Table 15-4 **Amplitude Accuracy Results**

Nominal Source Amplitude (dBm)	Attenuation (dB)	Span (MHz)	Measured Amplitude Meas_amp (dBm)	Power Meter Amplitude Power_meter (dBm)	Amplitude Accuracy Error (dB)	Test Limit (dB)
–4	10	2				±1.13 dB
–9	10	1				±1.13 dB
–14	10	0.5				±1.13 dB
–4	20	0.1				±1.13 dB
–14	20	0.1				±1.13 dB
–4	30	0.1				±1.13 dB
–14	30	0.1				±1.13 dB

Testing Preamp Option (P03, P07)

Instruments containing Options P03, P07 must have the preamp function turned on and tested.

Procedure

1. On the analyzer, press **AMPTD Y Scale, More, Internal Preamp, Low Band**.
2. Connect the equipment as shown in [Figure 15-4 on page 301](#), using a 30 dB Pad between the adaptor and the signal analyzer input.
3. Set the synthesized sweeper amplitude to the value listed in the Nominal Source Amplitude column in [Table 15-5](#)
4. Set the signal analyzer input attenuation to 0 dB.
5. Set the Span as listed in [Table 15-5](#)
6. Record the source amplitude, as measured by the power meter, in the Power Meter Amplitude column of [Table 15-5](#)
7. On the signal analyzer, press **Restart**.
8. Wait for the analyzer to finish averaging.
9. Press **Peak Search**.
10. Record the signal amplitude as measured by the analyzer in the measured amplitude column of [Table 15-5](#)
11. Calculate the signal amplitude accuracy using the following equation:
$$\text{Amplitude Accuracy Error} = \text{Meas_amp} + 30 \text{ dB} - \text{Power_meter}$$
12. Record the results under the Amplitude Accuracy Error column of [Table 15-5](#)

Table 15-5 **Amplitude Accuracy Results (Option P03, P07)**

Nominal Source Amplitude (dBm)	Low-band Preamp	Res BW (kHz)	Span (kHz)	Measured Amplitude Meas_amp (dBm)	Power Meter Amplitude Power_meter (dBm)	Amplitude Accuracy Error (dB)	Test Limit (dB)
-13	ON	1	106				±1.30 dB

Frequency Response (Flatness)

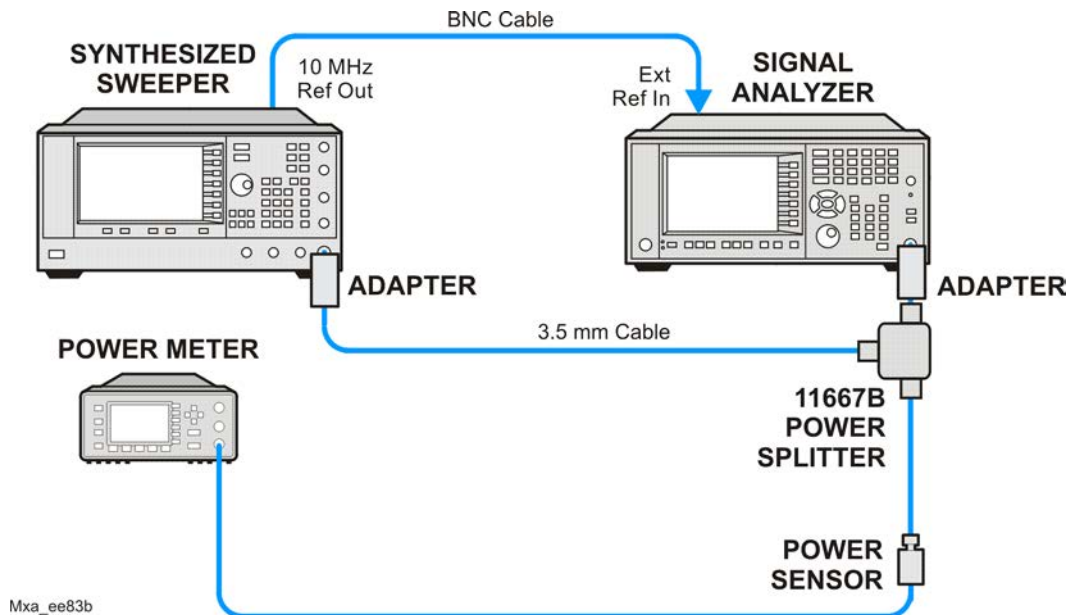
Test Limits

Frequency Range	Limit Relative to 50 MHz
20 Hz to 3.0 GHz	± 1.5 dB
3.0 GHz to 7.5 GHz	± 2.5 dB

The frequency response test measures the signal analyzer's amplitude error as a function of the tuned frequency. Measurements are made ranging from 50 MHz to the maximum frequency range of your analyzer. The signal source amplitude is measured with a power meter to eliminate error due to source flatness. The measured value is normalized to 50 MHz.

Item	Critical Specifications (for this test)	Recommended Agilent Model
Adapter, Type N(m) to 3.5 mm(m)	<i>Frequency:</i> 10 MHz to 18 GHz <i>VSWR:</i> < 1.1:1	1250-1743
Adapter, 3.5 mm(f) to 3.5 mm(f)	<i>Frequency:</i> 10 MHz to 26.5 GHz <i>VSWR:</i> < 1.1:1	83059B
Cable, 3.5 mm, 1 meter	<i>Frequency:</i> 10 MHz to 26.5 GHz <i>VSWR:</i> < 1.4:1	11500E
Cables, BNC 120 cm	<i>Frequency:</i> 10 MHz	10503A
Power Meter	Compatible with power sensor	E4418B
Power Sensor	<i>Frequency Range:</i> 50 MHz to 26.5 GHz	8485A
Power Splitter	<i>Frequency Range:</i> 50 MHz to 26.5 GHz <i>Tracking between ports:</i> < 0.25 dB	11667B
Synthesized Sweeper	<i>Frequency Range:</i> 50 MHz to 26 GHz	PSG

Figure 15-5 Frequency Response Test Setup



Procedure

1. Zero and calibrate the power meter and power sensor as described in the power meter operation manual.
2. Configure the equipment as shown in [Figure 15-5](#).

NOTE

Connect the power splitter to the signal analyzer input using the appropriate adapter. Do not use a cable.

3. Assure the signal analyzer's built-in auto alignment has been performed within the last 24 hours.
4. Press **Mode, Spectrum Analyzer, Mode Preset** on the signal analyzer, and press **Preset** on the synthesized sweeper.
5. Set up the synthesized sweeper by pressing:
CW, 50, MHz
Power level, -4, dBm
6. Set up the signal analyzer by pressing:
Input/Output, More, Freq Ref In, External
FREQ Channel, Center Freq, 50, MHz
SPAN X Scale, Span, 50, kHz
AMPTD Y Scale, Ref Level, 0, dBm
7. Adjust the synthesized sweeper output power for a power meter reading of $-10 \text{ dBm} \pm 0.1 \text{ dB}$.

Functional Tests
Frequency Response (Flatness)

8. On the signal analyzer, press **Single**.
9. Press the **Peak Search** key on the signal analyzer to position the marker on the peak of the signal.
10. Refer to [Table 15-6, “Frequency Response \(Flatness\) Results.”](#) Enter the amplitude of the signal displayed on the signal analyzer into the Meas_{Amp} column of [Table 15-6](#).
11. Enter the power meter reading into the $\text{Power}_{\text{Meter}}$ column of [Table 15-6](#).
12. Tune the synthesized sweeper and signal analyzer to the next frequency listed in [Table 15-6](#).
13. Enter the power sensor calibration factor into the power meter.
14. For frequencies 3.6 GHz and above, press **AMPTD Y Scale**, then **Presel Center** to center the preselector filter for an optimum amplitude measurement.
15. Repeat [step 7](#) through [step 14](#) and complete the remainder of [Table 15-6](#) for the frequency range of your analyzer.
16. Compute the measurement error ($\text{Meas}_{\text{Error}} = \text{Meas}_{\text{Amp}} - \text{Power}_{\text{Meter}}$).
17. Compute the flatness error normalized to 50 MHz:
($\text{Meas}_{\text{Error}} - \text{Meas}_{\text{Error @ 50 MHz}}$)
18. Enter the computed flatness error value into the $\text{Flat}_{\text{Norm}}$ column of [Table 15-6](#).
19. Compare the value of $\text{Flat}_{\text{Norm}}$ to the test limit.

Table 15-6 Frequency Response (Flatness) Results

Center Frequency	Analyzer Amplitude Meas_{amp}	Power Meter Measurement $\text{Power}_{\text{meter}}$	Meas Error $\text{Meas}_{\text{error}}$	Flatness Normalized to 50 MHz $\text{Flat}_{\text{Norm}}$	Flatness Error Test Limits (dB)
50 MHz				0	Ref
1 GHz					±1.5 dB
2 GHz					±1.5 dB
3 GHz					±1.5 dB
3.5 GHz					±1.5 dB
4 GHz					±2.5 dB
6 GHz					±2.5 dB
7 GHz					±2.5 dB

Frequency Response (Flatness), Preamp On

Test Limits

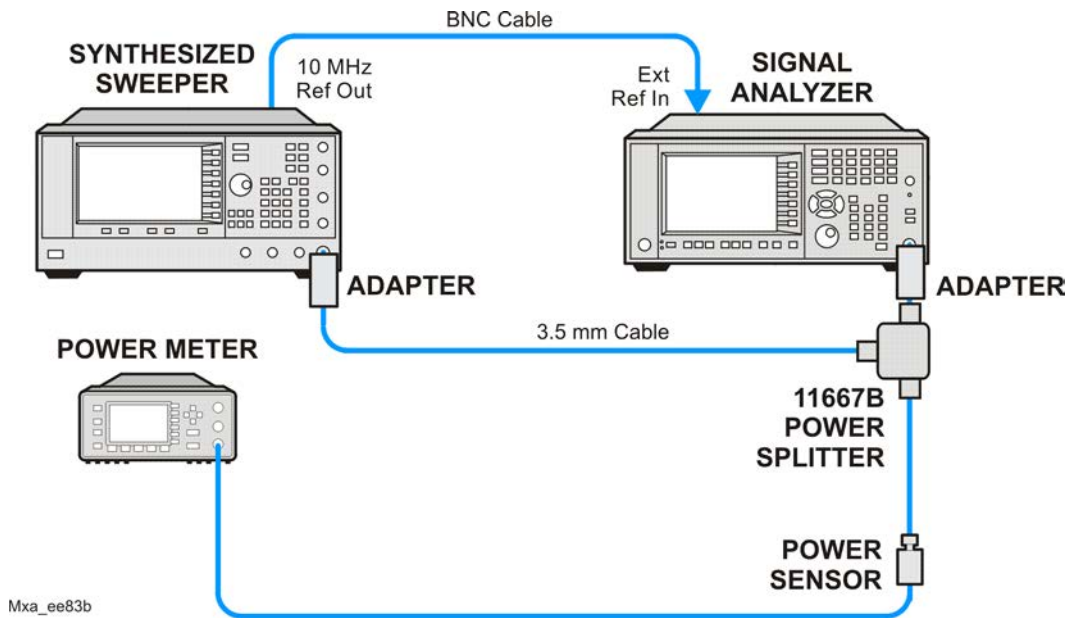
Frequency Range	Limit Relative to 50 MHz
100 kHz to 3.0 GHz	± 2.0 dB
3.0 GHz to 7.5 GHz	± 3.0 dB

The frequency response test, with preamplifier on, measures the signal analyzer's amplitude error as a function of the tuned frequency. Measurements are made ranging from 50 MHz to the maximum frequency range of the preamp. The signal source amplitude is measured with a power meter to eliminate error due to source flatness. The measured value is normalized to 50 MHz.

Item	Critical Specifications (for this test)	Recommended Agilent Model
Adapter, Type N(m) to 3.5 mm(m)	<i>Frequency:</i> 10 MHz to 18 GHz <i>VSWR:</i> < 1.1:1	1250-1743
Adapter, 3.5 mm(f) to 3.5 mm(f)	<i>Frequency:</i> 10 MHz to 26.5 GHz <i>VSWR:</i> < 1.1:1	83059B
Cable, 3.5 mm, 1 meter	<i>Frequency:</i> 10 MHz to 26.5 GHz <i>VSWR:</i> < 1.4:1	11500E
Cables, BNC 120 cm	<i>Frequency:</i> 10 MHz	10503A
Power Meter	Compatible with power sensor	E4418B
Attenuator, 30 dB Fixed	<i>Frequency:</i> 50 MHz <i>Accuracy:</i> ± 0.05 dB	11708A
Power Sensor	<i>Frequency Range:</i> 50 MHz to 26.5 GHz <i>Amplitude Range:</i> -65 dBm to -55 dBm	8485D
Power Splitter	<i>Frequency Range:</i> 50 MHz to 26.5 GHz <i>Tracking between ports:</i> < 0.25 dB	11667B
Synthesized Sweeper	<i>Frequency Range:</i> 50 MHz to 26.5 GHz	PSG

Functional Tests
Frequency Response (Flatness), Preamp On

Figure 15-6 Frequency Response Test Setup



Procedure

1. Zero and calibrate the power meter and power sensor as described in the power meter operation manual.
2. Configure the equipment as shown in [Figure 15-6](#).

NOTE

Connect the power splitter to the signal analyzer input using the appropriate adapter. Do not use a cable.

3. Assure the signal analyzer's built-in auto alignment has been performed within the last 24 hours.
4. Press **Mode, Spectrum Analyzer, Mode Preset** on the signal analyzer, and press **Preset** on the synthesized sweeper.
5. Set up the synthesized sweeper by pressing:

CW, 50, MHz
Power level, -54, dBm

6. Set up the signal analyzer by pressing:

Input/Output, More, Freq Ref In, External
FREQ Channel, Center Freq, 50, MHz
SPAN X Scale, Span, 50, kHz
AMPTD Y Scale, More, Internal Preamp, Full Range
AMPTD Y Scale, Attenuation, Mech Atten, 0, dB
AMPTD Y Scale, Ref Level, -55, dBm

7. Adjust the synthesized sweeper output power for a power meter reading of $-60 \text{ dBm} \pm 0.1 \text{ dB}$.
8. On the signal analyzer, press **Single**.
9. Press the **Peak Search** key on the signal analyzer to position the marker on the peak of the signal.
10. Refer to [Table 15-6](#), “Frequency Response (Flatness) Results.” Enter the amplitude of the signal displayed on the signal analyzer into the Meas_{Amp} column of [Table 15-6](#).
11. Enter the power meter reading into the $\text{Power}_{\text{Meter}}$ column of [Table 15-6](#).
12. Tune the synthesized sweeper and signal analyzer to the next frequency listed in [Table 15-6](#).
13. Enter the power sensor calibration factor into the power meter.
14. For frequencies 3.6 GHz and above, press **AMPTD Y Scale**, then **Presel Center** to center the preselector filter for an optimum amplitude measurement.
15. Repeat [step 7](#) through [step 14](#) and complete the remainder of [Table 15-6](#) for the frequency range of your preamp.
16. Compute the measurement error ($\text{Meas}_{\text{Error}} = \text{Meas}_{\text{Amp}} - \text{Power}_{\text{Meter}}$).
17. Compute the flatness error normalized to 50 MHz:
($\text{Meas}_{\text{Error}} - \text{Meas}_{\text{Error}} @ 50 \text{ MHz}$)
18. Enter the computed flatness error value into the $\text{Flat}_{\text{Norm}}$ column of [Table 15-6](#).
19. Compare the value of $\text{Flat}_{\text{Norm}}$ to the test limit.

Table 15-7 Frequency Response (Flatness) Results

Center Frequency	Analyzer Amplitude Meas_{amp}	Power Meter Measurement $\text{Power}_{\text{meter}}$	Meas Error $\text{Meas}_{\text{error}}$	Flatness Normalized to 50 MHz $\text{Flat}_{\text{Norm}}$	Flatness Error Test Limits (dB)
50 MHz				0	Ref
1 GHz					$\pm 2.0 \text{ dB}$
2 GHz					$\pm 2.0 \text{ dB}$
3 GHz					$\pm 2.0 \text{ dB}$
3.5 GHz					$\pm 2.0 \text{ dB}$
4 GHz					$\pm 3.0 \text{ dB}$
6 GHz					$\pm 3.0 \text{ dB}$
7 GHz					$\pm 3.0 \text{ dB}$

Scale Fidelity

Test Limits

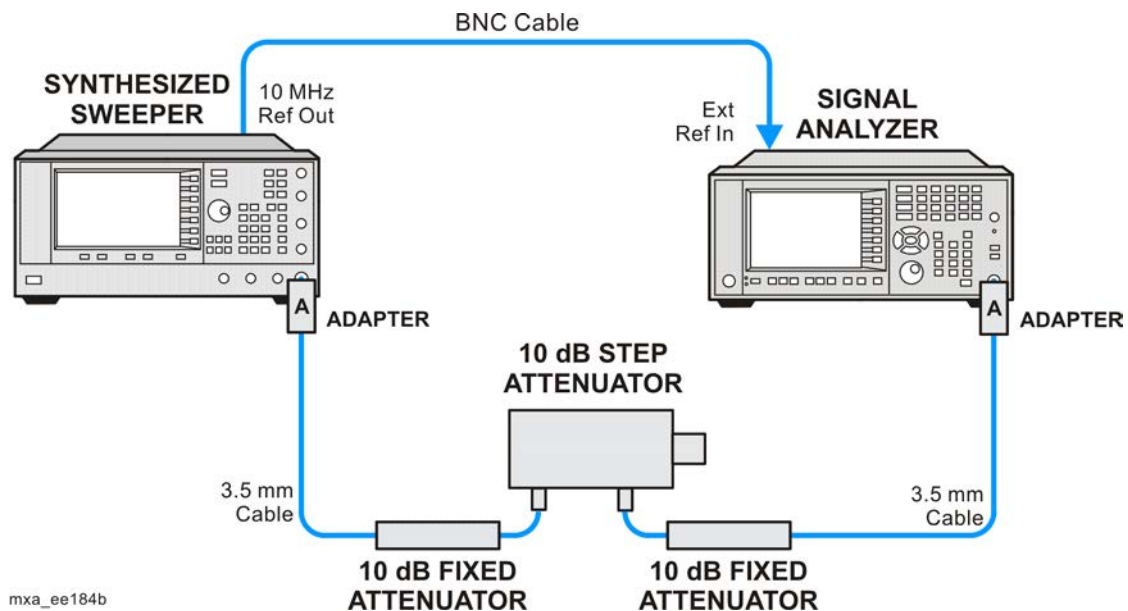
The scale fidelity error will be $\leq \pm 1.0$ dB with ≤ -10 dBm at the mixer.

This test checks the scale fidelity of the instrument by maintaining a constant reference level and measuring signals of different amplitudes over most of the display range. This test sets the input attenuator to 10 dB and the Reference Level to 0 dBm. The external attenuator is set to 0 dB, and the amplitude of the source is adjusted to set the displayed signal at the reference level.

The instrument's internal marker is used to measure the reference amplitude. The Marker Delta function is activated and the RF input is reduced using the external precision step attenuator. Signal input levels from 0 dBm to -50 dBm are measured.

Item	Critical Specifications (for this test)	Recommended Agilent Model
Adapter, Type-N(m), to 3.5 mm(f)	Frequency: 10 MHz to 18 GHz <i>VSWR</i> : $< 1.1:1$	1250-1745
Adapter, 3.5 mm(f) to 3.5 mm(f)	Frequency: 10 MHz to 26.5 GHz <i>VSWR</i> : $< 1.1:1$	83059B
Attenuator, 10 dB Step	<i>Range</i> : 0-50 dB <i>Frequency</i> : 50 MHz <i>Accuracy</i> : ± 0.25 dB	8495A
Attenuator, 10 dB fixed (2 required)	Frequency: 50 MHz <i>VSWR</i> : $< 1.2:1$	8493C, option 010
Cable, 3.5 mm, 1 meter (2 required)	<i>Frequency</i> : 10 MHz to 26.5 GHz <i>VSWR</i> : $< 1.4:1$	11500E
Cable, BNC 120 cm	<i>Frequency</i> : 10 MHz	10503A
Synthesized Sweeper	<i>Output Level Accuracy</i> : 0 to -15 dBm: ± 1.0 dB	PSG

Figure 15-7 Scale Fidelity Setup



NOTE

Averaging is used for all measurements to improve repeatability and reduce measurement uncertainty.

Procedure

1. Configure the equipment as shown in [Figure 15-7](#).
2. Preset the Source and press **Mode, Spectrum Analyzer, Mode Preset** on the analyzer.
3. Set up the synthesized sweeper by pressing:
 - Frequency, 50, MHz**
 - Amplitude, +5, dBm**
 - RF On/Off, On**
4. Set up the signal analyzer by pressing:
 - Input/Output, More, Freq Ref In, External**
 - FREQ Channel, Center Freq, 50, MHz**
 - SPAN X Scale, Span, 1, MHz**
 - AMPTD Y Scale, Ref Level, 0, dBm**
 - Meas Setup, Average/Hold Number, 10, Enter**
 - Trace/Detector, Trace Average**
 - Peak Search**
5. Set the external 10 dB step attenuator to 0 dB.
6. Adjust the amplitude on the signal source until the marker amplitude on the analyzer reads $-15 \text{ dBm} \pm 0.2 \text{ dB}$.

Functional Tests
Scale Fidelity

7. On the analyzer, press the **Single, Restart** to trigger a 10 sweep average.
8. On the analyzer, activate the Marker Delta function by pressing **Peak Search, Marker Delta**.
9. Perform the following steps for each attenuator setting listed in the table below:
 - a. Select the next External attenuator setting.
 - b. Press the **Restart** key to trigger a 10 sweep average.
 - c. Enter the delta marker value into [Table 15-8](#).
 - d. Check delta marker reading against the test limits.

Table 15-8 Scale Fidelity Results

External Attenuator Setting	Minimum (dB)	Marker Delta Value (dB)	Maximum (dB)
0	N/A	Reference	N/A
10	-11.0		-9.0
20	-21.0		-19.0
30	-31.0		-29.0
40	-41.0		-39.0
50	-51.0		-49.0

What You Will Find in This Chapter

Instrument Software Overview	page 315
Software Licensing	page 316
Software Updates	page 317
Instrument Measurement Application Software	page 317
89601 VSA Software	page 317

Instrument Software Overview

The instrument software, installed in every instrument, contains not only the spectrum analyzer measurement application, but also all of the other currently available measurement applications. However, only the licensed applications will be seen and available for use.

To view the currently licensed measurement applications press **System, Show, System**. In addition to listing the application model number and description you will also see the revision of each. However, the complete package itself also has a revision associated with it, which can also be found on this screen as the “Firmware Revision”.

Since the instrument application software is distributed in one complete package, when an update is installed they are all updated at the same time. One of the benefits of this is that you cannot have revisions that are incompatible with each other installed in an instrument. However, there is one exception to this, which would be the 89601A VSA software. While the latest revision of the 89601A VSA software is installed in each instrument as it left the factory, it must be updated, and kept in sync with the rest of the instrument application software independently.

Software Licensing

All application software needs to have a valid license in order to be available for use. This also includes the spectrum analyzer application (N9060A).

License keys are valid for one major revision. The software can be updated to any minor revision within the same major revision without the need of a new license. For example, a license that is valid for revision A.01.00 will be valid for all revisions up to and including revision A.01.99.

If the software is updated to a higher major revision a new license key will need to be installed. For example, a new license would be required if the revision number changes from A.01.xx to A.02.00 or higher.

Software Updates

Instrument Measurement Application Software

Updates are installed much like most other types of commercial software packages. The latest revision of the software, along with complete installation instructions, can be obtained by one of two methods, which are:

Web Download:

The latest revision of the software can be downloaded from:

www.agilent.com/find/xseries_software

Software On Media:

The latest revision of the software can be purchased on a USB storage device as option N9000AK-SWM.

89601 VSA Software

Updates for the 89601 VSA software can be downloaded from:

<http://sa.tm.agilent.com/89600/Software>

The revision of the 89601 VSA software must be compatible with the revision of the instrument measurement application software package that is installed in the instrument. To determine what revisions are compatible, and if a further updates are required, please see the software compatibility information on the instrument measurement application software download web page listed above.

Index

- RF front end
 - see A13 RF front end assembly
- Numerics**
- 50 ohm load, 20
- 50 ohm/75 ohm minimum loss pad, 20
- 75 ohm matching transformer, 20
- A**
- A10 input attenuator
 - description, 128
 - part number, 204
- A11 low band switch
 - description, 128
 - part number, 204
- A12 YTF
 - description, 128
 - part number, 204
- A13 RF front end assembly
 - description, 128, 129
- A14 L.O. synthesizer assembly
 - description, 128, 129
 - part number, 204
 - troubleshooting, 148
- A15 front end control assembly
 - part number, 204
- A16 reference assembly
 - part number, 204
 - removal, 239
- A1A2 front panel interface board
 - description, 177
 - part number, 204
 - removal, 275
- A1A3 LCD
 - description, 177
 - part number, 204
 - removal, 273
 - troubleshooting, 57
- A1A4 inverter board
 - part number, 204
 - removal, 275
- A1A4 LCD Inverter Board
 - description, 177
- A1A5 front panel daughter board
 - part number, 204
 - removal, 275
- A1A5 Front Panel USB Interface Board
 - description, 177
- A2 analog IF assembly
 - description, 137
 - part number, 204
 - removal, 254
- A3 digital IF assembly
 - part number, 204
 - removal, 254
 - troubleshooting, 140
- A4 CPU assembly
 - description, 153
 - part number, 204
 - removal, 243
 - troubleshooting, 153
- A4BT1 CPU board battery
 - description, 3
 - disposal, 3
 - part number, 204
 - post-repair setup, 280
 - replacement, 243
- A5 hard disk drive
 - description, 155
 - part number, 204
 - recovery process, 159
 - removal, 244
 - troubleshooting, 155
- A6 power supply
 - description, 163
 - part number, 204
 - removal, 241
 - troubleshooting, 168
- A7 midplane
 - description, 169
 - part number, 204
 - troubleshooting, 171
- A7 midplane assembly
 - part number, 204
- A8 motherboard
 - description, 175
 - part number, 204
 - removal, 257
 - troubleshooting, 176
- A9 input attenuator
 - description, 128
 - part number, 204
- AC probe, 20
- access to service menus, 188
- accessories, 19
 - 50 ohm load, 20
 - 50 ohm/75 ohm minimum loss pad, 20
 - 75 ohm matching transformer, 20
 - AC probe, 20
 - broadband preamplifiers, 20
 - power splitters, 21
 - RF limiters, 21
 - transient limiters, 21
- adjustments
 - equipment, 28
 - required test equipment, 28
 - test equipment, 28
- advisory messages, 67
- after repairs
 - see post-repair procedures, 279
- Agilent Technologies
 - contacting, 37
- Sales and Service offices, 37
- splash screen, 47
- Align menu description, 198
- alignment failure, 62
- Alignments key, 45
- amplifiers, 20
- amplitude accuracy test, 300
 - option 1DS, 303
- amplitude linearity test, 310
- analog IF
 - see A2 analog IF assembly
- application updating, 315
- B**
- B1, B2 fans
 - part number, 204
 - removal, 262
 - troubleshooting, 53
- backlights, 58
- bail handle
 - part number, 204
 - removal, 232
- Band Lock menu description, 196
- basics, troubleshooting, 45
- battery
 - see A4BT1 CPU board battery
- before troubleshooting, 22
- BIOS setup changes, 283
- blank display, 57
- block diagrams, 181
- boot priority, 283
- boot process
 - problems, 49
- boot up process, 46
- broadband preamplifiers, 20
- C**
- cables
 - part numbers, 204
- calibration application software, 26
- calibration file backup, 282
- call centers, 37
- cautions and warnings, 22
- chassis parts
 - part numbers, 204
- checking firmware revision, 45
- computer block diagram, 181
- connector
 - see RF input connector
- contacting Agilent, 37
- corrections menu description, 194
- CPU assembly
 - see A4 CPU assembly
- D**
- DANL test, 294

Index

date and time set, [251](#)
daughter board
 see A1A5 front panel daughter board
DC probes
 use of, [20](#)
diagnostics menus, [187](#)
digital IF
 see A3 digital IF assembly
disk drive
 see A5 hard disk drive
disk drive recovery process, [159](#)
display
 see A1A3 LCD
display output, rear panel, [57](#)
displayed average noise level. See
 DANL, [294](#)
dress case
 see outer case

E

electrostatic discharge, [24](#)
enabling spread spectrum, [287](#)
entitlement certificate, [17](#)
equipment
 adjustments, [28](#)
 functional tests, [292](#)
 performance verification tests, [28](#)
 warm-up time, [291](#)
error messages, [45](#), [65](#), [66](#)
 example, [68](#)
 format, [67](#)
 viewing messages in queue, [69](#)
error queues
 capacity, [69](#)
 clearing, [69](#)
 front panel, [68](#)
 overflow handling, [69](#)
 remote interface (SCPI), [68](#)
 viewing entries, [69](#)
ESD Information, [24](#)
ESD safety accessories, [21](#)
external hardware, [209](#), [210](#), [211](#),
 [212](#), [214](#), [215](#), [216](#), [217](#), [218](#),
 [219](#), [220](#), [222](#), [223](#)
external VGA monitor, [57](#)

F

fans
 see B1, B2 fans
firmware, [45](#)
firmware revision, checking, [45](#)
firmware updating, [315](#)
frequency ranges, [127](#)
frequency readout accuracy test, [296](#)
frequency response
 (flatness) test, [304](#)
frequency response (flatness) test

 preamp on, [307](#)
front end control board
 see A15 front end control assembly
front frame
 description, [177](#)
 part number, [204](#)
 removal, [267](#)
front panel error queue, [68](#)
front panel interface
 see A1A2 front panel interface board,
 [204](#)
functional testing
 performance verification, [290](#)
functional tests, [45](#)
 before performing, [291](#)
 equipment list, [292](#)
 introduction, [289](#)
 vs performance verification tests,
 [290](#)
 warm-up time, [291](#)
 See also individual functional tests,
 [289](#)
Functional Tests Guide on CD-ROM,
 [19](#)

G

Getting Started Guide on CD-ROM, [19](#)
green LED, [47](#)

H

handle
 see bail handle
hard disk drive
 see A5 hard disk drive
hardware
 external, [209](#), [210](#), [211](#), [212](#), [214](#),
 [215](#), [216](#), [217](#), [218](#), [219](#), [220](#),
 [222](#), [223](#)
high band path, [127](#)

I

IF Flatness menu description, [194](#)
initial alignment failure, [62](#)
initialization problem, [61](#)
input attenuators
 see A9 and A10 input attenuator
input connector
 see RF input connector
instrument
 return for service, [40](#)
instrument frequency ranges, [127](#)
instrument messages, [65](#)
Instrument Messages Guide on
 CD-ROM, [19](#)
instrument options, [18](#)
instrument packaging, [40](#)

instrument serial number, [39](#)
instrument upgrade, [18](#)
internal alignments, [62](#)
inverter board
 see A1A4 inverter board

K

keyboard
 USB, [27](#)
keypad
 part number, [204](#)
 removal, [275](#)

L

LCD
 see A1A3 LCD
LED
 front panel, [45](#)
 green, [47](#)
 power on, [51](#)
 standby, [49](#)
 yellow, [47](#), [49](#)
license agreement, [249](#)
license key, [17](#)
licensing software, [316](#)
limiters
 RF and transient, [21](#)
LO Band Lock menu description, [197](#)
load, 50 ohm, [20](#)
low band path, [127](#)

M

major assembly locations, [229](#)
manual set, [19](#)
measurement application updating,
 [315](#)
Measurement Guides and
 Programming Examples Guides
 on CD-ROM, [19](#)
messages
 advisories, [67](#)
 error, [65](#)
 errors, [66](#)
 warnings, [67](#)
messages, warning, [67](#)
midplane
 see A7 midplane
midplane assembly
 removal, [255](#)
midplane bracket
 part number, [204](#)
motherboard
 see A8 motherboard
mouse
 USB, [27](#)

Index

N

N7814A
see calibration application software

O

operating system, 17
problems, 57
options, 19
original instrument packing, 40
other instrument packing, 41
outer case (Option PRC), removal, 232
outer case, removal, 230

P

packaging, 40
parts
replaceable, 204
PCI enumeration error, 56
performance verification tests
equipment, 28
required test equipment, 28
test equipment, 28
performance verification tests vs
functional tests, 290
post-repair procedures, 279
power amplifiers, 20
power on LED, 51
power splitters, 21
power supply
see A6 power supply, 204
preamplifiers, 20
preload measurement applications, 46
preselector
see A12 YTF
probes
AC and DC, 20

R

rear panel
removal, 238
rear panel display output, 57
recovery process, 159
reference assembly
see A16 reference assembly
reference bracket
part number, 204
removal, 235
remove
see individual assemblies

repairs

see post-repair procedures
replace
see individual assemblies
replaceable parts, 204
required equipment, 28
required test equipment
adjustments, 28
performance verification tests, 28
troubleshooting, 28
return instrument for service, 40
RF area components, 236
RF Flatness menu description, 194
RF input connector
part number, 204
removal, 265
RF limiters, 21
RF path block diagram, 181
RF section
description, 127
RPG knob
part number, 204

S

Safety Information, 3, 227
Sales and Service offices, 37
SCPI interface error queue, 68
second harmonic distortion test, 298
serial number, 39
service
equipment, 26
returning your instrument, 40
tools, 228
service key description, 192
service menus, 187
service strategy, 17
set date and time, 251
signal level verification, 63
Snapshot Alignments menu
description, 194
software licensing, 316
specifications, 45
Specifications Guide on CD-ROM, 19
splash screen, 47, 55, 56
splitters, 21
spread spectrum, 287
standby LED, 49
static safety accessories, 21
static-safe workstation, 24
status messages, 67

storage device

USB, 27
support URL, 37
support web site, 37

T

test equipment
adjustments, 28
performance verification tests, 28
post-repair, 278
troubleshooting, 28
tests. See functional tests
time and date set, 251
timebase key description, 193
top brace
part number, 204
removal, 235
transient limiter, 21
troubleshooting
basics, 45
before you start, 22
equipment needed, 28
see individual assemblies

U

updating firmware, 315
updating measurement applications,
315
upgrades, 18
URL, 37, 45
USB keyboard and mouse, 27
USB storage device, 27
User's/Programmers Reference Guides
on CD-ROM, 19

V

video controller, 61
video signal path integrity, 61

W

warning messages, 67
warnings and cautions, 22
web site URL, 45

Y

yellow LED, 47, 49
YTF
see A12 YTF

Index
