Keysight Technologies
N9040B UXA Signal Analyzer

This manual provides documentation for the following models:

N9040B Option 508 (3 Hz – 8.4 GHz)
N9040B Option 513 (3 Hz – 13.6 GHz)
N9040B Option 526 (3 Hz – 26.5 GHz)
N9040B Option 544 (3 Hz – 44 GHz)
N9040B Option 550 (3 Hz – 50 GHz)

KEYSIGHT TECHNOLOGIES

Service Guide

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Warranty

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Safety Notices

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

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

Where to Find the Latest Information

Documentation is updated periodically. For the latest information about this instrument, including firmware upgrades, application information, and product information, click the website link below.

http://www.keysight.com/find/uxa

To receive the latest updates by email, subscribe to Keysight Email Updates at the following URL:

http://www.keysight.com/find/MyKeysight

Information on preventing instrument damage can be found at:

www.keysight.com/find/PreventingInstrumentRepair

Is your product software up-to-date?

Periodically, Keysight releases software updates to fix known defects and incorporate product enhancements. To search for software updates for your product, go to the Keysight Technical Support website at:

http://www.keysight.com/find/techsupport

Table of Contents

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:

Keysight UXA Signal Analyzer Overview

The Keysight UXA 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 UXA has a Windows 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 Keysight UXA 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. Most measurement application upgrades require a license key, which is obtained using the Keysight Software Licensing service. If the email 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 signal analyzer within minutes (the instrument software may require updating). Once the license key is entered into the analyzer, the new option is enabled and fully functional.

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

Hardware upgrades may require installation of optional hardware, and often require readjustment and verification of the hardware option.

Virus Information

Keysight Technologies does not load anti-virus software into the signal analyzer. It is the customer’s responsibility to install anti-virus software.

Instrument Option Descriptions

The UXA has a variety of hardware and measurement application options. Several of these options are “standard” so they are automatically installed on all UXA analyzers. All options require license files to be present in instrument memory before the option can be used, or viewed on the Show, System screen.

From the front panel, press **System**, **Show**, **System** to view a list of all installed options.

A current list of all instrument options and retrofit requirements is available on the Keysight web site for the UXA signal analyzer.

Option	Description	Notes
508	3 Hz to 8.4 GHz frequency range	
513	3 Hz to 13.6 GHz frequency range	
526	3 Hz to 26.5 GHz frequency range	
544	3 Hz to 44 GHz frequency range	
550	3 Hz to 50 GHz frequency range	
ALV	Auxiliary Log Video (at rear panel Aux IF connector)	
B25	25 MHz information bandwidth	
B40	40 MHz information bandwidth in addition to 25 MHz BW	
B2X	255 MHz information bandwidth	
B5X	510 MHz information bandwidth	
H1G	1 GHz information bandwidth	Requires Option 550
CRP	Arbitrary IF Output (10 MHz to 75 MHz programmable, Aux IF connector on rear panel)	
CR3	2nd IF Out (Aux IF connector on rear panel)	Included on all units
C35	APC 3.5 mm Connector	With Option 526 only
DP2	Deep Capture Memory for IQ data capture	Included on all units
DP4	4 GB Capture Memory	Requires Option B2X or B5X
EA3	Electronic Attenuator	
EDP	Enhanced Display Package	Included on all units
EMC	Software only. Provides EMI detectors and BWs.	
EXM	External Mixing	Included on all units
FBP	Full Bypass Path	Requires Options 550 and H1G

Option	Description	Notes
FP2	Fast Power	Included on all units
FSA	Fine Step Attenuator	Included on all units
FS1	Fast Sweep	Included on all units
LFE	Low Frequency Enabled (allows frequency range to 3 Hz)	Included on all units
LNP	Low Noise Path (provides enhanced DANL and SHI performance above 3.6 GHz)	Included on all units
MPB	Preselector Bypass (bypasses the Preselector filter used above 3.6 GHz)	Included on all units
NF2	Noise Floor Extension	Included on all units
NUL	IM Nulling	Included on all units
PFR	Precision Frequency Reference	Included on all units
P08	Preamp, 100 kHz to 8.4 GHz	
P13	Preamp, 100 kHz to 13.6 GHz	
P26	Preamp, 100 kHz to 26.5 GHz	
P44	Preamp, 100 kHz to 44 GHz	
P50	Preamp, 100 kHz to 50 GHz	
RT1	Real Time Basic Detection	
RT2	Real Time Optimum Detection	
RTL	Real Time Data Link	Included on all units
SF1	Security Features, exclude launch programs	
SF2	Security Features, prohibit saving results	
SSD	Solid State Drive, additional removable, fully imaged	
YAV	Screen Video (rear panel Analog Out connector)	

Signal Analyzer Accessories

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

Specific accessories for the UXA can be found in the UXA Configuration Guide at

http://www.keysight.com/find/UXA

in the Data Sheet and Key Documents section.

Manual Set on CD-ROM

The documentation set provides extensive information for the signal analyzer. Documentation is updated periodically.The latest updates can be accessed via the web at:

http://www.keysight.com/find/UXA_manuals

Each manual is described below:

– Getting Started and Troubleshooting 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).

– 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, WCDMA, and 802.16 OFDMA.

– Measurement Guides and Programming Examples: Multiple manuals which provide details on how to how to use catalogs and files, and how to measure various signals for basic spectrum analyzers and for applications such as IQ analyzer, WCDMA, and LTE.

The documentation set is available for purchase on CD/DVD by ordering option N9060EM1E-ABA.

50 Ohm Load

The Keysight 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 Keysight 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.

AC Probe

The Keysight 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 MΩ 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 Keysight 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.

– U7227A USB preamplifier, 10 MHz to 4 GHz
– U7227C USB preamplifier, 100 MHz to 26.5 GHz
– U7227F USB preamplifier, 2 GHz to 50 GHz
– The Keysight 87405B preamplifier provides a minimum of 22 dB gain from 10 MHz to 4 GHz. (Power is supplied by the probe power output of the analyzer.)
– The Keysight 83006A preamplifier provides a minimum of 26 dB gain from 10 MHz to 26.5 GHz.

RF Limiters

The Keysight 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.

Power Splitters

The Keysight 11667A/B/C 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
11667C: DC to 50 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.)
9300-0797	2 ft by 4 ft conductive mat with 15 ft grounding wire

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

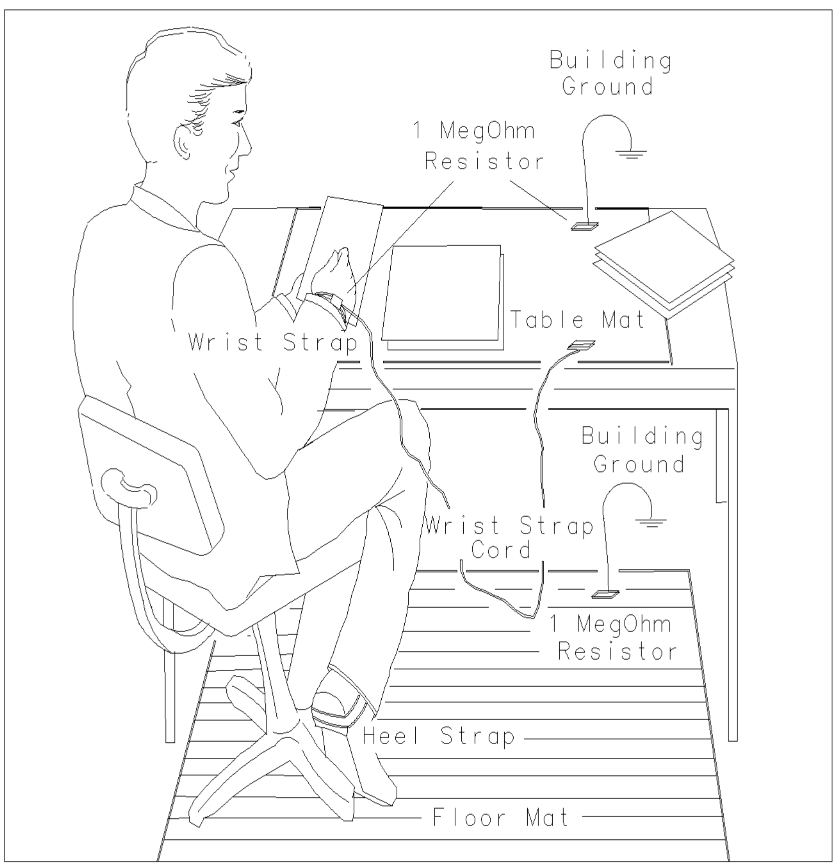
Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation. Figure 1-1 shows an example of a static-safe workstation using two types of ESD protection:

- o Conductive table-mat and wrist-strap combination.
- o 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).

Instrument Maintenance

Cleaning the Instrument

WARNING

To prevent electrical shock, disconnect the signal 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.

Cleaning Connectors

Cleaning connectors with alcohol shall only be done with the instrument power cord removed, and in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

WARNING

Keep isopropyl alcohol away from heat, sparks, and flame. Store in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemical, or carbon dioxide; water may be ineffective.

Use isopropyl alcohol with adequate ventilation and avoid contact with eyes, skin, and clothing. It causes skin irritation, may cause eye damage, and is harmful if swallowed or inhaled. It may be harmful if absorbed through the skin. Wash thoroughly after handling.

In case of spill, soak up with sand or earth. Flush spill area with water.

Dispose of isopropyl alcohol in accordance with all applicable federal, state, and local environmental regulations.

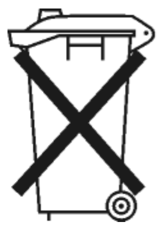
Battery Information

The analyzer uses a lithium battery located on the CPU board. This is not an operator replaceable part. See "How to Return Your Instrument for Service" on page 50. Replaceable parts must be approved or supplied by Keysight Technologies.

WARNING

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended. Discard used batteries according to the manufacturer's instructions.

Do not throw batteries away but collect as small chemical waste.



DO NOT THROW BATTERIES AWAY BUT COLLECT AS SMALL CHEMICAL WASTE.

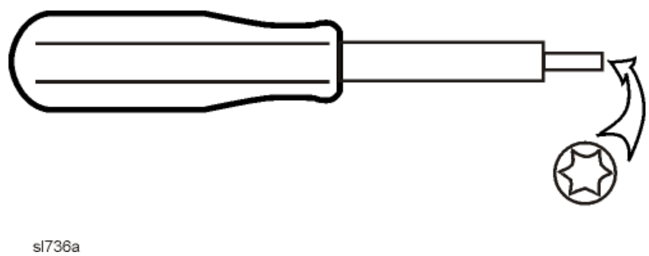
Service Equipment You Will Need

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

– Calibration Application Software
– Front End Controller Troubleshooting Kit
– USB Keyboard and Mouse
– USB Storage Device
– Test Equipment

Tools you will need

Figure 1-2 TORX Tool



Description	Keysight Part Number
TORX Hand Driver - Size T-8	source locally
TORX Hand Driver - Size T-10	source locally
TORX Hand Driver - Size T-20	source locally
9/16 inch nut driver	source locally
1/4 inch nut driver	source locally
5/16 inch open-end wrench	source locally
1/4 inch open-end wrench	source locally
1/4 inch socket on 4 lb torque wrench	source locally
cable puller	5021-6773

Calibration Application Software

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

www.keysight.com/find/calibrationsoftware

Front End Controller Troubleshooting Kit

The Front End Troubleshooting kit contains a PC board, required cables, and installation instructions to verify the switch control logic from the A15 Front End Control board to the lower level front end components is correct. Oftentimes when troubleshooting an RF front end problem, the logic needs to be verified before one of the front end components is changed. This troubleshooting kit will help identify the defective area in a timely manner. In order to effectively isolate A15 Front End Control board problems from front end component problems, it is highly recommended that the N9020-60005 Front End Troubleshooting kit is purchased.

The Front End Troubleshooting kit lower level items can be purchased individually or as a complete kit with instructions. The complete listing of kit components, descriptions, and part numbers can be found below.

Keysight Part	**Keysight Part Number**	**Notes**
Front End Troubleshooting kit	N9020-60005	
Front End Troubleshooting board	E4410-60115	Part of N9020-60005 Troubleshooting kit
Cable, Low Band switch	E4410-60160	Part of N9020-60005 Troubleshooting kit
Cable, RF Downconverter	E4410-60156	Part of N9020-60005 Troubleshooting kit
Cable, YTF Preselector	E4410-60158	Part of N9020-60005 Troubleshooting kit
Cable, Input Attenuators	E4410-60157	Part of N9020-60005 Troubleshooting kit
Cable, Troubleshooting	8121-1400	Right-angle sma (m) to right-angle mmcx (m) (must be ordered separately)
Connector, MMCX (f) to SMA (f)	n/a	www.hubersuhner.com item number: 31_MMCX-SMZ-50-1/111_OE (must be ordered separately)

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.

USB Storage Device

The main reason why a USB storage device will be needed is to download instrument software and backup calibration data when the hard drive in an instrument needs to be replaced. The instrument software is about 3 GB. The calibration files are around 30 megabytes.

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 Keysight Model” is the preferred equipment. However, the “Alternative Keysight Model” is an acceptable substitute.

Table 1-1 Required Test Equipment

Instrument	Recommended Model[a]	Alternative Model[a]	Use[b]
Signal Sources			
Microwave Signal Generator #1	E8257D (Options 567, 1EA/1EU, 1E1)	PSG[c]	P, T
Microwave Signal Generator #2 (only required for Third Order Intermodulation and Gain Compression)	E8257D (Option 1EA/1EU)	PSG[c] 83630A/B/L (Option 001, 008), 83640A/B/L (Option 001, 008), 83650A/B/L (Option 001, 008)	P
Low Noise Signal Generator (one PSG may be used for multiple sources. See footnote [c])	E8257D (Options UNR, UNX, or UNY)	PSG[c] (Options UNR, UNX, or UNY)	P, T
RF Signal Generator (one PSG may be used for multiple sources. See footnote [c])	E8257D (Options UNR, UNX, or UNY)	PSG[c] (Options UNR, UNX, or UNY)	P
Ultra Low Noise Reference Frequency Source (required for testing UXA Phase Noise)	Wenzel Associates Inc[d] Ultra Low Noise Reference Frequency Source Model 500-13438 Rev D		P
Function Generator	33250A	33120A (Option 001)	P
Counters			
Universal Counter	53230A	53132A 53131A	P, T
Meters and Power Sensors (see below for .)			
Digital Multimeter	3458A		P, T
Power Meter	N1914A[e]	E4419A/B N1912A	P

Table 1-1 Required Test Equipment

Instrument	Recommended Model[a]	Alternative Model[a]	Use[b]
RF Power Sensor, Type-N (m) connector (2 required)	8482A	N8482A CFT N8482A Option H84 8482A[f] (Non H84 sensors will increase measurement uncertainty)	P
Microwave Power Sensor 3.5 mm (m) connector (2 required)	N8485A	N8485A CFT 8485A	P
Low Power Microwave Power Sensor 3.5 mm (m) connector (2 required) (for Options P08, P13, or P26 only)	8485D		P
Power Sensor Cable (2 required)	11730A		P, T
Standards			
Frequency Standard	Symmetricom 5071A	HP 5061B 5071A Option 001 10 MHz external reference[g]	P
Attenuators (see below for .)			
10 dB Step Attenuator[h]	8496G (Option 001, H50)	8496H (Option 001, H50)	P
1 dB Step Attenuator[h]	8494G (Option 001, H50)	8494H (Option 001, H50)	P
Attenuator Interconnect Kit (Type-N connector kit to connect the 8496G to the 8494G attenuator)	11716A		P
Attenuator Driver	11713B	11713A	P
3 dB Fixed Attenuator	8491A (Option 003)	8491B (Option 003)	P
6 dB Fixed Attenuator	8491A (Option 006, H33[i])	8491B (Option 006, H33)	P
10 dB Fixed Attenuator	8491A (Option 010, H33[i])	8491B (Option 010, H33)	P
10 dB Fixed Attenuator	8493C (Option 010)		P
20 dB Fixed Attenuator	8491A (Option 020)	8491B (Option 020)	P

Table 1-1 Required Test Equipment

Instrument	Recommended Model[a]	Alternative Model[a]	Use[b]
20 dB Fixed Attenuator (for Option EXM only)	8493C (Option 020)		P
30 dB Fixed Attenuator (for use with low-power power sensors)	11708A		P
Terminations			
Type-N (m) (for Option 508, 513)	909A (Option 012)		P, T
3.5 mm (f) (for Option 526)	909D (Option 526)		P, T
BNC (m)	1250-0207	11593A	P, T
Miscellaneous Devices			
RF Power Splitter, Type-N (f) connector	11667A		P
Microwave Power Splitter, 3.5 mm (f) connector	11667B		P
Directional Bridge, Type-N (f) connector	86205A		P
Directional Coupler, SMA (f) connector	87300C		P
Microwave Power Divider, 3.5 mm (f) connector	11636B		P
Cables			
Coaxial Cable, 3.5 mm (m) to 3.5 mm (m) (2 required)	11500E	8120-4921	P
Type-N precision Type-N (m) both ends (2 required)	11500C		P, T
BNC 50 Ω Coaxial, BNC (m) both ends (3 required)	10503A		P, T
Filters			
50 MHz Low Pass, BNC (m) to BNC (f)	Telonic Berkeley TLA 50-5AB2	0955-0306	P, T

Table 1-1 Required Test Equipment

Instrument	Recommended Model[a]	Alternative Model[a]	Use[b]
300 MHz Low Pass, BNC (m) to BNC (f) (2 Required)	Telonic Berkeley TLP 300-4AB4	0955-0455	P
1.8 GHz Low Pass, SMA (f) to SMA (f) (2 Required)	RLC L-1636	0955-0491	P
5.0 GHz Low Pass, SMA (f) to SMA (f)	RLC F-30-5000-RF		P
8.0 GHz Low Pass, SMA (f) to SMA (f)	RLC F-30-8000-RF		P
12.4 GHz Low Pass, SMA (f) to SMA (f)	RLC F-30-12.4-RF		P
Adapters			
Type-N (f) to Type-N (f)	1250-1472		P
Type-N (m) to Type-N (m)	1250-1475		P
Type-N (f) to BNC (m)	1250-1477		P, T
Type-N (m) to BNC (m)	1250-1473		P, T
Type-N (m) to BNC (f)	1250-1476		P
Type-N (m) to 3.5 mm (m)	1250-1743		
Type-N (m) to 3.5 mm (f) (2 Required)	1250-1744		
Type-N (f) to 3.5 mm (f) (for 3.5 mm source)	1250-1745		
Type-N (f) to 3.5 mm (m)	1250-1750		
3.5 mm (f) to 3.5 mm (f) (for 3.5 mm source)	83059B	1250-1749	P
3.5 mm (m) to 3.5 mm (m) (2 Required)	83059A	1250-1748	P
3.5 mm (f) to 2.4 mm (f) (for 2.4 mm source)	11901B		
2.4 mm (f) to 3.5 mm (m)	11901D		P
Type-N (f) to 2.4 mm (f) (for 2.4 mm source)	11903B		P

Table 1-1 Required Test Equipment

Instrument	Recommended Model[a]	Alternative Model[a]	Use[b]
Type-N (f) to 2.4 mm (f) (for 2.4 mm source)	11903D		P
BNC (m) to SMA (f)	1250-1700		P
BNC Tee (BNC f,m,f)	1250-0781		P
BNC (f) to SMA (m)	1250-1200		P
BNC (f) to Dual Banana	1251-2277		P
3.5 mm (f) to Type-N (m) (for power sensor calibration)	08485-60005		P
2.4 mm (f) to Type-N (m) (for power sensor calibration)	08487-60001		P
Type-N Tee	1250-0559		P

a. Keysight, Agilent, or Hewlett-Packard model numbers unless otherwise noted.
b. P = Performance Testing, T = Troubleshooting
c. Supported PSG models:

E8247C
E8257C
E8257C
E8267C
E8267D

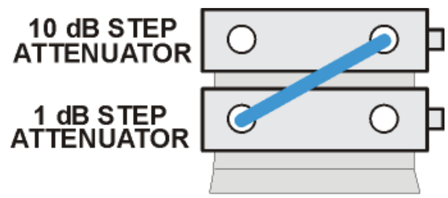
One PSG with Option 567, 1EA/1EU, 1E1, 007, and UNX, UNR, or UNY can be used as the Microwave Signal Generator #1, Low Noise Signal Generator, and the RF Signal Generator
PSG Option 521 is not supported as an alternative model for the X-Series performance verification tests due to its upper and lower frequency limits.

d. Wenzel Associates Inc
2215 Kramer Ln
Austin, Texas 78758
(512) 835-2038
FAX (512) 719-4086

e. N1914A power meters with serial number prefix prior to MY53040007 require Service Note N1914A-07 which fixes a power supply ground loop. The ground loop injects noise into the measurement circuits which can cause unstable measurements at low (-30 dBm) power levels
f. 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 < 1.0% 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.

g. When using the 10 MHz External Reference, be sure to update the Additional Properties in TME to the correct Frequency Accuracy in parts per million (ppm). For example, if overall accuracy is 9e-12, the equivalent is 9e-6 ppm. Refer to the Additional Properties section in the N7800A TME Help for instructions.

h. The step attenuators should be permanently joined via the 11716A Interconnect Kit as shown in the diagram.



step_atten_setup

i. 8491A Option H33 is a fixed attenuator which has been characterized to have a VSWR ≤ 1.05:1 at 50 MHz. A VSWR of 1.05:1 is critical to test Input Attenuator Switching Uncertainty, Display Scale Fidelity, and Absolute Amplitude Accuracy performance tests. Any 8491A/B attenuator can be mapped into this device if the VSWR at 50 MHz has been characterized to be ≤ 1.05:1. When mapping the attenuator, to indicate that is meets the required specification, the Option H33 checkbox will need to be checked in the configure test station Administration screen.

Step Attenuator Loss Characterization

The step attenuator combination should have each attenuator setting characterized by a metrology lab at 50 MHz. This characterization can be ordered through Keysight Technologies as an Option H50 Calibration.

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 Recommended Uncertainty for each attenuator setting. A larger number will result in larger overall test uncertainties which could affect the test pass/fail rate.

The interconnect cable should NEVER be disconnected once the loss characterization is performed.

Guidelines for Ordering Power-Sensor Calibration Service

Use the following guidelines to ensure power sensors used by the N7842A application receive the correct calibration service:

1. **Order Option 1A7 when ordering new power sensors that will be used as working standards in N7800A TME calibrations.**
2. **In the Americas region, order the Keysight Cal + Measurement Uncertainty for power sensor recalibration.**
3. **Outside the Americas region, order ISO 17025/ILAC-G8 calibration service for power sensor recalibration.**

4. When ordering periodic calibration for instruments used as lab standards in the N7800A software, we recommend using “Keysight calibration + uncertainties” for power sensors, and “Keysight calibration + uncertainties + guardbanding” for all other items (please visit Selecting the Right Calibration Services). The N7800A software incorporates the ISO GUM Uncertainty in point-to-point uncertainty calculations. The special “H-series” calibration options in this table provide lower measurement uncertainties through use of direct comparison to devices directly characterized by NPL or NIST (or another NMI). Please order Option H99 to get data on a CD for easy import into the N7800A (avoids manual entry). The overall resulting N7800A measurement uncertainties then reflects these lower device uncertainties. The equipment requirements of each N7800A calibration application are summarized in the specials calibration matrix which can be found at the Recommended Lab Standards and Special Cal Options website.

5. The Keysight Option H99 is a special option for the Roseville Service Center [only] which provides a CD with calibration data included as a .csv file in TME N7800A format for all power sensors used with the N7800A TME application. N7800A TME is SSU calibration software used across Keysight SSU and by many self-maintainers. H99 must be requested from the Roseville SSU upon re-calibration only of any previously purchased power sensor and not for new purchases of BID Power Sensors. This option provides for adding the calibration data to a CD and may be ordered in addition to any other required or requested Std Lab Calibration option (must also be ordered in addition to H99).

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 N7800A Keysight Calibration Application Software. Refer to Chapter 16, "Post-Repair Procedures" for a list of post-repair adjustments and performance tests based on which hardware has been changed.

Information regarding the N7800A Keysight Calibration Application Software can be found at

http://www.keysight.com/find/calibrationsoftware
and
http://cal.software.keysight.com

Contacting Keysight 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.keysight.com/find/uxa_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 Keysight office listed in Table 1-2. In any correspondence or telephone conversations, refer to the instrument by its model number (N9040B) and full serial number (ex. MY49250887). With this information, the Keysight 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 1-2 **Contacting Keysight**

Online assistance: www.keysight.com/find/contactus

Americas	
Country	**Phone Number**
Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	1 800 829-4444

Asia Pacific	
Country	**Phone Number**
Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe and Middle	
Country	**Phone Number**
Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100

Europe and Middle	
Country	**Phone Number**
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	0800 000154
Sweden	0200 882255
Switzerland	0800 805353 Opt. 1 (DE) Opt. 2 (FR) Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus

Instrument Serial Numbers

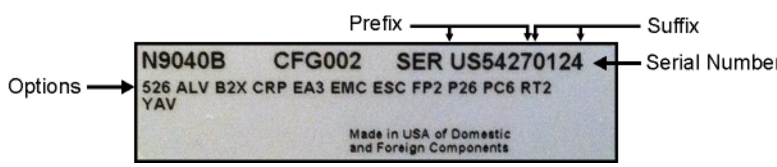
Keysight makes frequent improvements to its products enhancing performance, usability, or reliability. Keysight service personnel have access to complete records of design changes to each type of instrument, based on the instrument's serial number and option designation.

Whenever you contact Keysight 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 1-3 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 Keysight for servicing, the phone numbers are mentioned in Table 1-2, “Contacting Keysight,” on page 47. In order for Keysight 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

– LO 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 51.

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 repackage 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.

2 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:

KEYSIGHT TECHNOLOGIES

Check the Basics

Before calling Keysight 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 Guide 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 73.
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 Chapter 18, “Instrument Software”, on page 551.
9. Is the instrument displaying an error message? If so, refer to Chapter 3, “Instrument Messages”, on page 81 for more information.
10. If the necessary test equipment is available, perform the functional checks in Chapter 17, “Functional Tests”, on page 521.

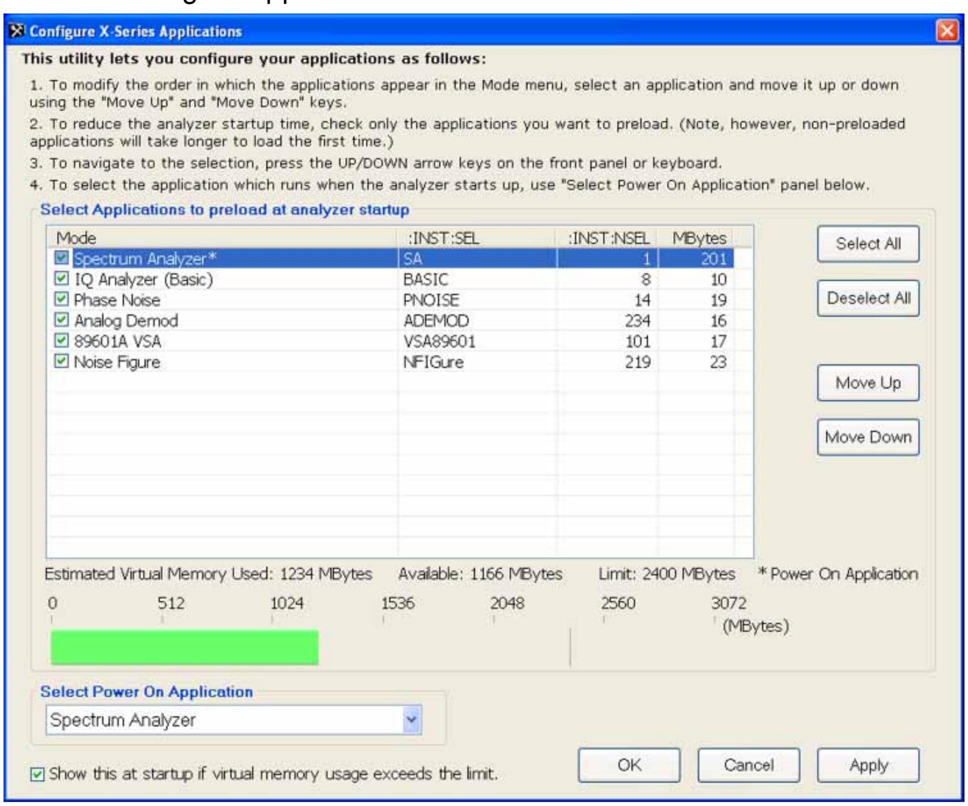
UXA Instrument Boot Up Process

This section describes the N9040B Signal Analyzer boot up process from initial AC power to a normal analyzer sweep. The boot process time from start to finish will take 6 to 8 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 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 application boot process, select the Configure Applications icon on the desktop. This will bring up a window as shown in Figure 2-1 that shows the various applications and what is selected to preload. By default all applications are checked and therefore, will preload when the UXA application is launched. Uncheck any applications to bypass the preloading process, select Apply, and then OK to 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. The 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 a fan is not running refer to the “Fan(s) Are Not Operating” section in this chapter.
5. The Keysight Technologies splash screen is displayed in white font on a dark background for ~5-10 seconds after the analyzer is turned on. If the Keysight Technologies logo is not displayed refer to the “No Keysight Splash Screen Displayed” section in this chapter. If the instrument hangs at the Keysight Technologies splash screen refer to the “Instrument Hangs at the Keysight Splash Screen” section in this chapter.
6. Verify text is displayed on screen where the user has the option of booting Windows 7 FES or running the Instrument Recovery System. The default selection is to boot Windows 7 FES. If a recovery is required, press the Down Arrow key on the front panel of the analyzer within 5 seconds to highlight “Keysight Recovery System” and press the Enter key on the analyzer, otherwise Windows 7 FES will begin to boot. If the Windows 7 FES 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 7 FES 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 8, "CPU/Disk Drive Troubleshooting", on page 229 in this manual.

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8. The Keysight Technologies logo is displayed in white font on a blue background while Windows finishes loading user preferences. This can take up to 4 minutes. If this does not occur refer to the "Instrument Cannot Completely Load or Run the Operating System" section in this chapter.
9. By default, the initialization process of the UXA Spectrum Analyzer application begins loading. The N9040B UXA Signal Analyzer screen appears. This screen remains for slightly over 1 minute. 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 number of internal alignments before the analyzer begins to sweep. A screen with a black background appears and the alignment progress is shown in a yellow box. The number of alignments is dependent on which hardware options are present. 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.

    The instrument alignment history can be found at:

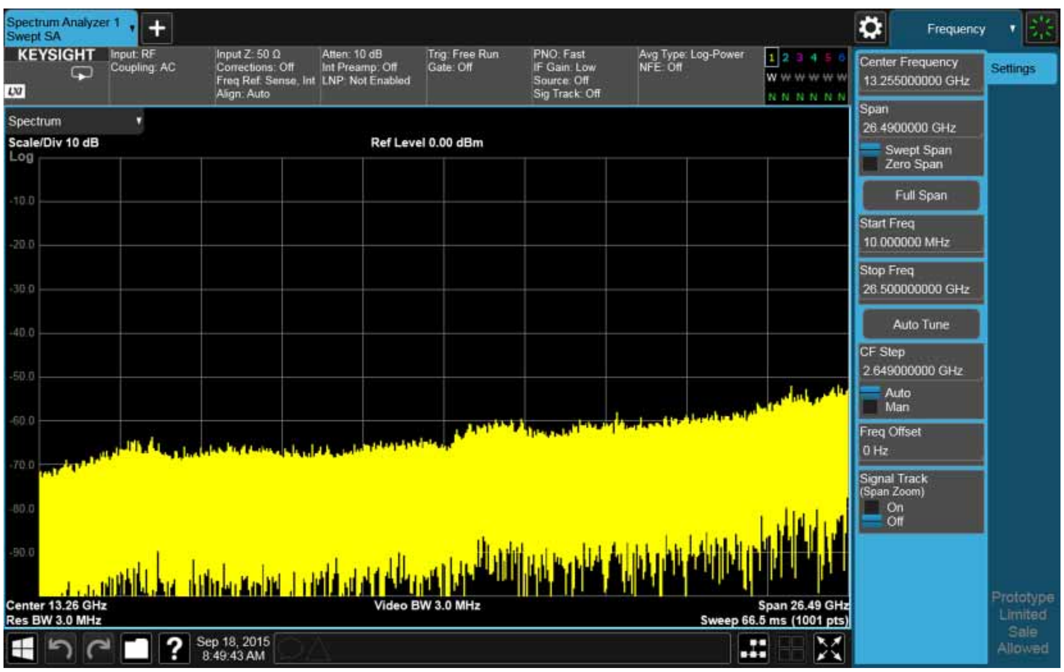
    E:\AlignDataStorage\AlignmentHistory.txt

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

Once the UXA 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



Potential Problems During Boot Process

This section describes potential problems that may occur if there is an internal hardware issue that prohibits the instrument 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 A4 Processor board assembly. This signal is routed through the A7 Midplane board before being sent to the A1A2 Front Panel Interface board through W1. Of course, the power for this all originates with the A6 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.

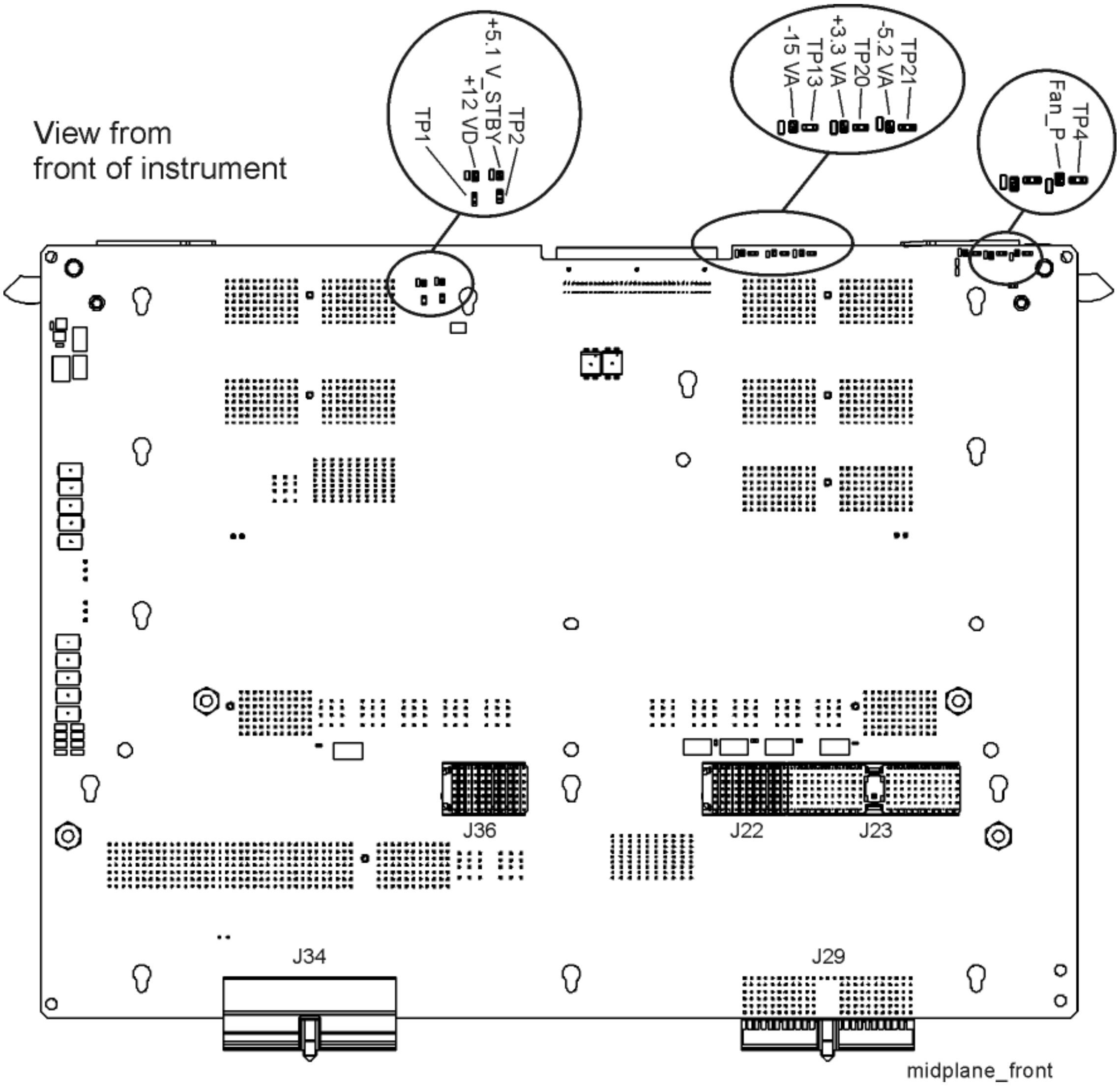
If the instrument turns on and operates properly but the yellow Standby LED does not work then all that will need to be done is to trace where the control signal for the LED is being lost using the routing information in the preceding paragraph.

1. **The Standby LED will only turn on when the instrument is connected to an AC power 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 Chapter 15, “Assembly Replacement Procedures”, on page 365 in this manual.**

3. **Referring to Figure 2-3, verify the +5.1V_STBY LED on the A7 Midplane board is on (green).**

Figure 2-3 A7 Midplane Board +5.1V_STBY LED



NOTE Most DC power supplies come from the A6 Power Supply assembly. However, the most convenient measurement location for most of the DC supplies is the A7 Midplane. Many power supply LED's are accessible once the instrument cover has been removed.

Is the +5.1V_STBY LED on the A7 Midplane board on?

If yes:

After verifying that the connections from the yellow front panel Standby LED back to the A4 Processor board are not at fault, replace the A4 Processor board.

If not:

Replace the A6 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 A4 Processor board assembly. This signal is routed through the A7 Midplane board before being sent to the A1A2 Front Panel Interface board through W1. Of course, the power for this all originates with the A6 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 power 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 15, "Assembly Replacement Procedures", on page 365 in this manual.
3. Remove the Top Brace. Refer to Chapter 15, "Assembly Replacement Procedures", on page 365 in this manual.
4. Power on the UXA while visually monitoring the green LED's by referring to the two figures below.

Figure 2-4 A7 Midplane Board LED's - Rear View

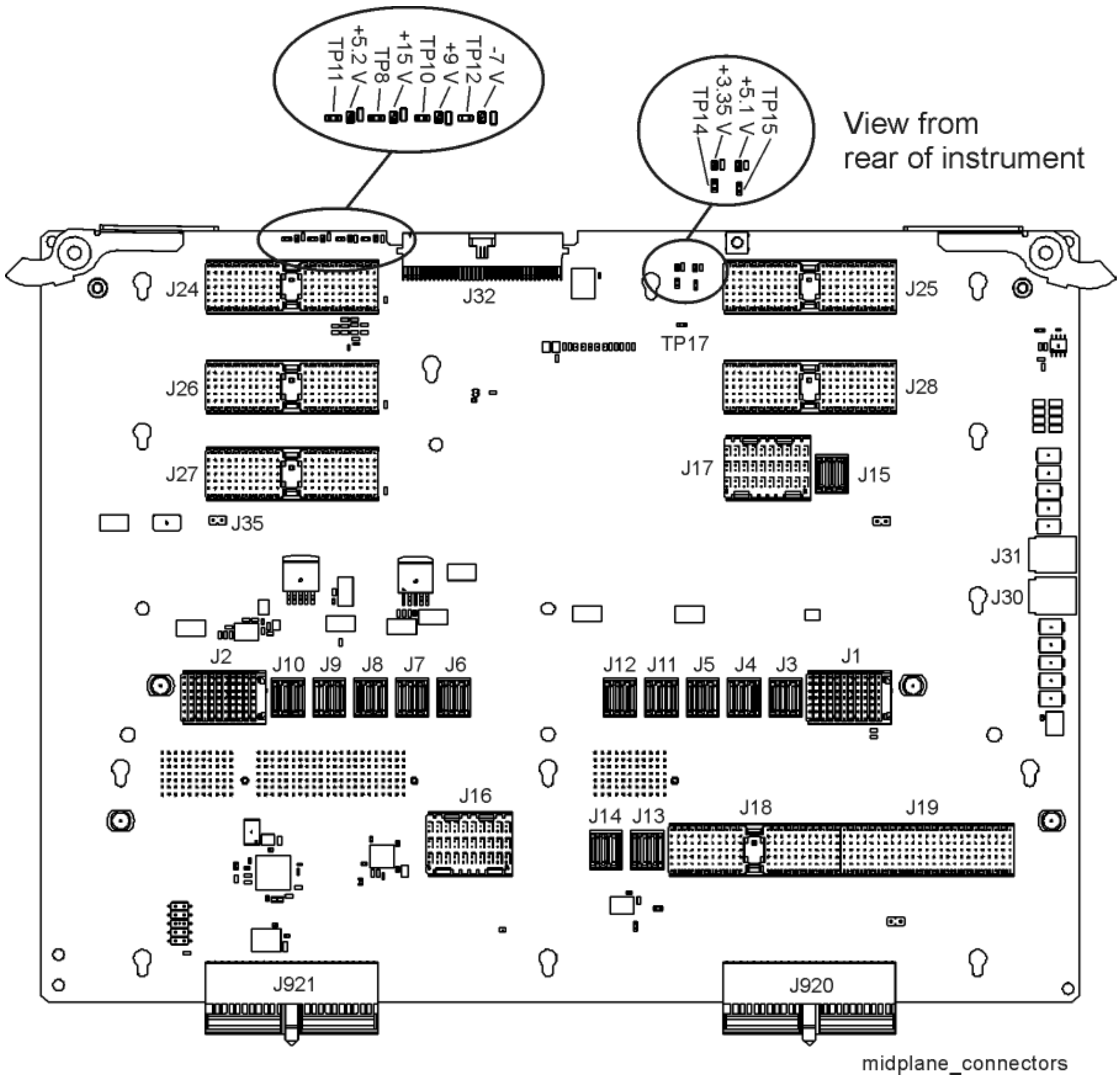
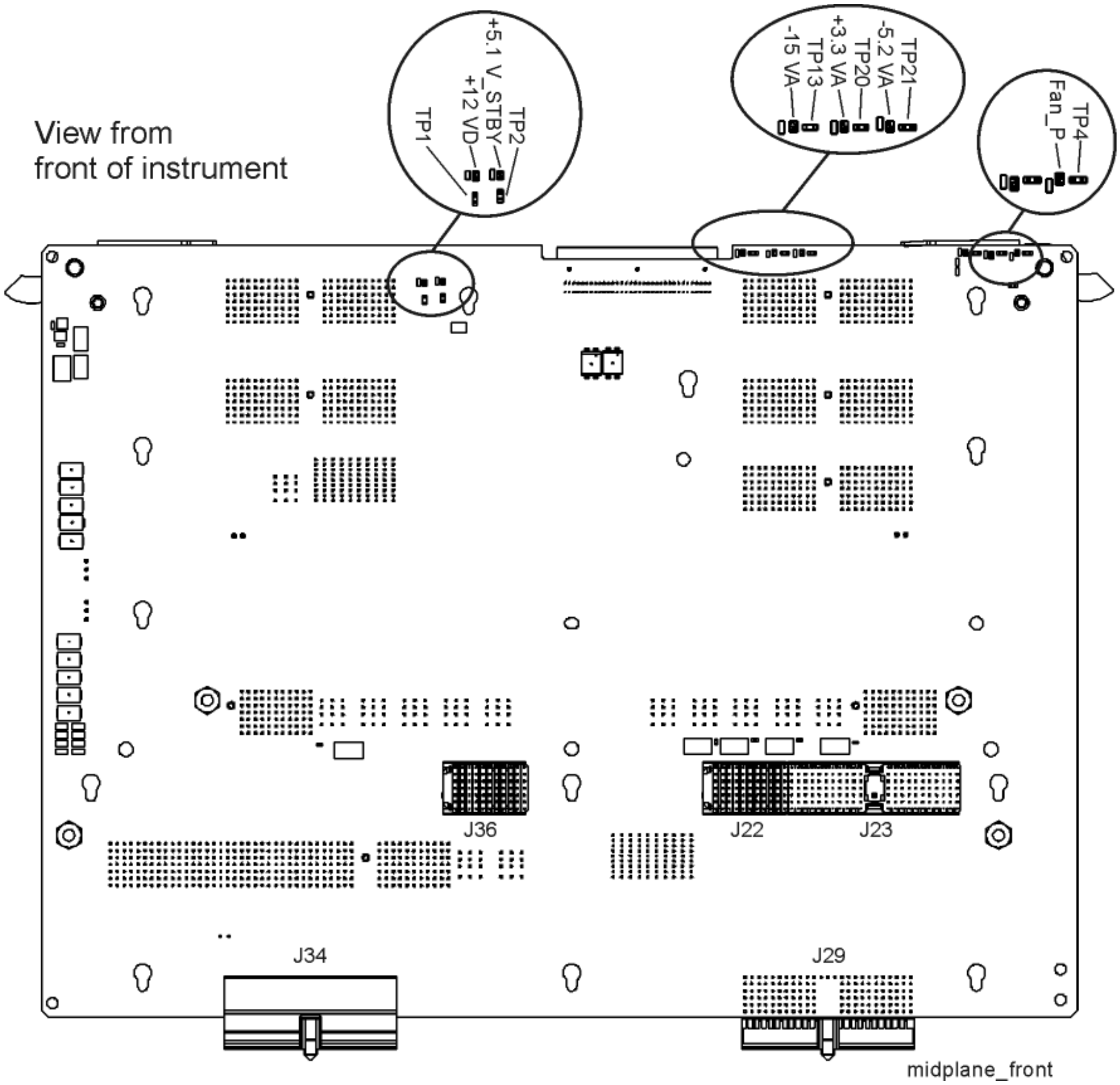


Figure 2-5 A7 Midplane Board LED’s - Front View



5. If any of the LED’s illustrated above are dim or not turned on, an over-current condition is the most probably cause.

6. Power cycle the analyzer off and lift the A14 L.O, Synthesizer, A21 Wideband Analog I.F. (Opt B2X and B5X), A16 Reference, and A15 Front End Controller.

7. Turn the analyzer power on and view the LED’s.

8. If the LED’s are all turned on, one of the lifted assemblies is the cause.

9. Continue troubleshooting until the assembly casing the over-current condition is determined.

10. If one or more LED’s is still dim or not turned on, continue removing measurement assemblies to isolate the over-current condition.

NOTE

At a minimum the A6 Power Supply, A4 CPU, A1A2/A1A1 Front Frame Interface and assembly, and Midplane board must be plugged in to test the power supply LED's.

Table 2-1 Power Supply Voltage Verification

Test Point	Description	Expected Voltages (VDC)
TP11	+5.2 V_A	+5.2 ± 0.75
TP8	+15 V_A	+15 ± 1.0
TP10	+9 V_A	+9 ± 1.0
TP12	-7 V_A	-7 ± 0.75
TP14	+3.35 V_D	+3.35 ± 0.75
TP15	+5.1 V_D	+5.1 ± 0.75
TP13	-15 V_A	-15 ± 1.0
TP20	+3.3 V_A	+3.3 ± 0.75
TP21	-5.2 V_A	-5.2 ± 0.75
TP4	Fan_P	+7 to +15
TP17	DCOM	n/a
TP2	+5.1 V_STBY	+5.1 ± 0.75
TP1	+12 V_D	+12 ± 1.0

Fan(s) Are Not Operating

Control of the instrument fans comes from the A6 Power Supply assembly. This signal is routed from the A6 Power Supply through the A7 Midplane board, where there is a test point and LED to monitor the level, and is then routed to the A8 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 power 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 15, "Assembly Replacement Procedures", on page 365 in this manual.
3. Are both fans not spinning?

If yes:

Proceed to step 4.

If not:

Proceed to step 5.

4. Remove the Top Brace. Refer to Chapter 15, "Assembly Replacement Procedures", on page 365 in this manual.

5. Referring to Figure 2-6, verify that the Fan_P Failure LED on the A7 Midplane board is off.

   Is the Fan_P LED off?

If yes:

Measure the voltage level at Test Point 4 on the A7 Midplane board.

Is the Test Point 4 voltage between +7 and +15 VDC?

If yes:

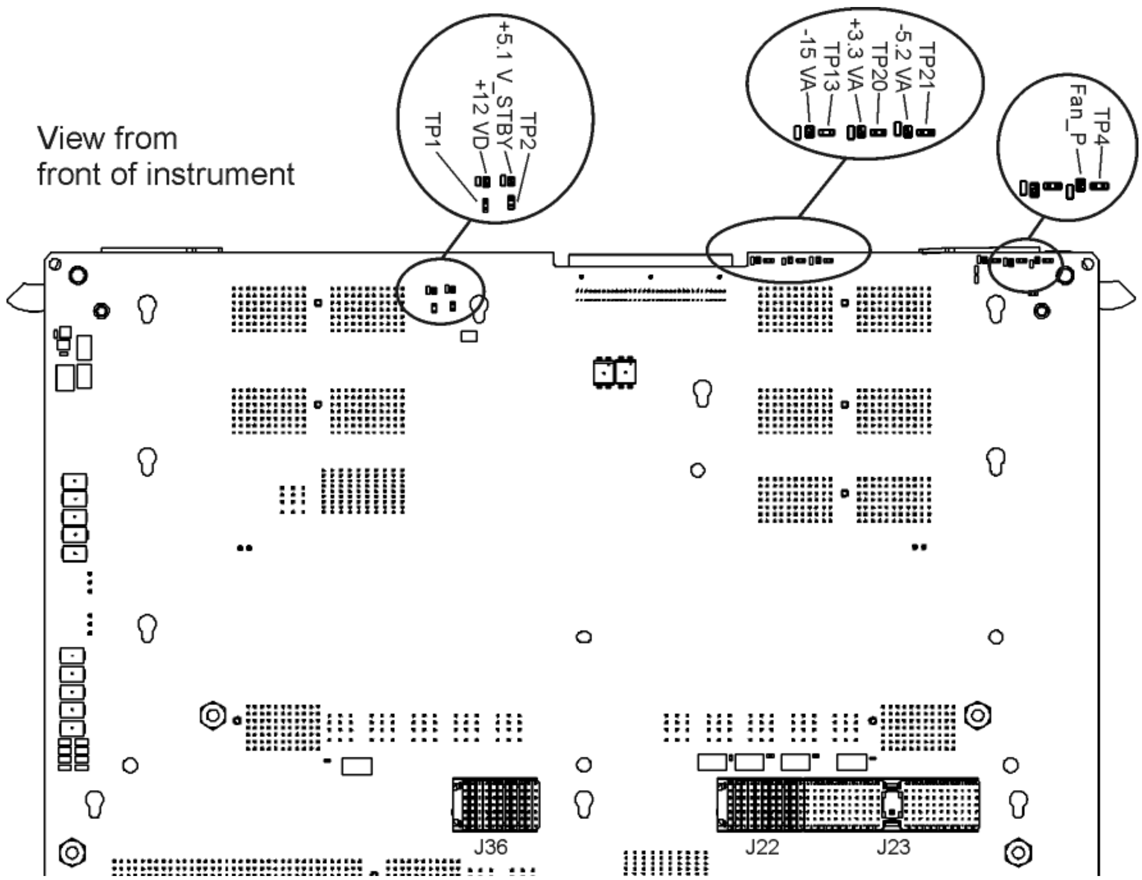
Replace the fan that is not working.

If not:

Replace the A6 Power Supply assembly.

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

Figure 2-6 A7 Midplane Board - Fan_P Failure LED / Test Point 4



No Keysight Splash Screen Displayed

(Black background with white “Keysight Technologies” text)

A problem of not displaying the Keysight 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 15, “Assembly Replacement Procedures”, on page 365 in this manual.
2. Remove the Top Brace. Refer to Chapter 15, “Assembly Replacement Procedures”, on page 365 in this manual.
3. With the AC power applied and the On/Off button turned on, verify that all of the power supply voltages that can be measured are at their proper level. This can easily be done by viewing the power supply LEDs on the back side of the A7 Midplane board. Refer to the "A7 Midplane Board Assembly Troubleshooting" on page 251.

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

If yes:

Proceed to step 4.

If not:

After verifying that the connections between the A6 Power Supply, the A7 Midplane board, and the A8 Motherboard are all mechanically and electrically secure, replace the A6 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 not:

Replace the A4 Processor Board assembly.

Instrument Hangs at the Keysight Splash Screen

A problem of the instrument hanging at the Keysight 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 15, "Assembly Replacement Procedures", on page 365 in this manual.
2. Remove the Top Brace. Refer to Chapter 15, "Assembly Replacement Procedures", on page 365 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 A7 Midplane board. See the "A7 Midplane Board Assembly Troubleshooting" on page 251.

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

If yes:

After verifying that the connections from the A7 Midplane board to the A4 Processor board are not at fault, replace the A4 Processor board.

If not:

After verifying that the connections between the A6 Power Supply, the A7 Midplane board, and the A8 Motherboard are all mechanically and electrically secure, replace the A6 Power Supply assembly.

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 disk drive, etc.

This procedure assumes that the instrument can get past the Keysight splash screen at power on. If it doesn't, refer to the "Instrument Hangs at the Keysight 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 "Keysight Recovery System"?**

If yes:

Run the Instrument Recovery System by referring to the "Disk Drive Recovery Process" on page 238. If this does not correct the problem replace the A5 Disk Drive.

If not:

Replace the A5 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 Keysight 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 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:

– A4 Processor assembly to A7 Midplane Board

– A7 Midplane Board to A8 Motherboard assembly

– A7 Midplane Board to A1A2 Front Panel Interface assembly via W1 ribbon cable

– A1A2 Front Panel Interface to A1A3 Touch Screen Display via A1W1 flex-circuit

If all of these connections are properly made and none of the cables are damaged proceed to “Video Controller / Touch Screen Display Troubleshooting”.

Video Controller / Touch Screen Display Troubleshooting

The video controller is located on the A4 Processor assembly. The video signals that the controller outputs are LVDS. As described above, these signals are routed to the Touch Screen Display via the A7 Midplane Board, A8 Motherboard, and A1A2 Front Panel Interface board.

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

The most likely cause for a video problem is the A4 Processor assembly; however it could be the result of a defective Touch Screen Display.

Initializations Did Not Complete

During the initialization of the UXA 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

Troubleshooting Alignment Failures Using the Alignment History Screen

At instrument power on, an initial alignment is automatically performed. It is also possible to manually trigger an alignment by pressing **System**, **Alignments**, **Align Now**, **All**. The power on alignment performs a few more alignments than the manual Align Now All routine.

The number of alignments depends on the hardware options present in the signal analyzer.

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

E:AlignDataStorage\AlignmentHistory.txt

You will find the most current alignment information at the bottom of this file. Look for the failed alignments. From the windows task bar you can click Edit, Find and type in FAILED and search for a failure.

Note that the information in the history file usually shows that multiple measurements are made for a given alignment routine, and measured values with upper and lower limits are given. For example, the Mechanical Attenuator Algorithm measures and displays all of the attenuator step values. In this case, you can view which steps fail, and by how much. Then based on the input attenuator drawing on the UXA RF Block Diagram, you can determine which attenuator steps are available on each of the two input attenuators. Then you can view the troubleshooting information for the Front End Controller or deduce from the attenuator steps that fail, which attenuator is faulty.

WARNING

Assure there is no 50 MHz signal above 0 dBm applied to the signal analyzer input when the alignment routine is performed. This can cause errors.

The description of the alignment and the alignment hardware dependencies are listed in Table 2-2.

Table 2-2 Initial Alignments

Alignment Description	Most Probable Hardware Failure	Related Hardware
DDS Synth Fast Port Skew Training	A14 Synthesizer	
DDS Synthesizer YTO Pretune DAC	A14 Synthesizer	A16 Reference board is not providing correct 100 MHz or 4.8 GHz signals. A20 YTO output power low.
VCXO Loop Bandwidth Adjusts gain of the PLL loop amplifier. Uses the 10 MHz internal reference	A16 Reference	
Second LO Loop Bandwidth	A2 Analog IF	
Second LO Saw Peak	A16 Reference	
Ext Mix LO Alignment Algorithm		
AIF 255 ADC Setup Alignment Algorithm	Wide Band Analog IF or Wideband Digital IF.	
AIF 255 ADC Clock Alignment Algorithm		
AIF 255 Flex Circuit Cable Test Algorithm	W56 or W57 Flex circuit cable	
Dither Level Algorithm	A3 Digital IF	
LO Nulling Simplex MB Alignment Algorithm	A13 Front End, Uses narrow BW switched filter.	
LO Nulling Simplex WB Alignment Algorithm	A13 Front End, Uses wide BW switched filter.	
AIF LC Wide Prefilter Passband Tuning Algorithm	A2 Analog IF	
AIF LC Wide Prefilter Passband Fine Tuning Algorithm	A2 Analog IF	
AIF LC Narrow Prefilter Passband Tuning Algorithm	A2 Analog IF	
AIF LC Narrow Prefilter Passband Fine Tuning Algorithm	A2 Analog IF	
AIF Xtal Wide Prefilter Passband Tuning Algorithm	A2 Analog IF	A3 Digital IF or A16 Reference
AIF Xtal Narrow Prefilter Passband Tuning Algorithm	A2 Analog IF	

Table 2-2 Initial Alignments

Alignment Description	Most Probable Hardware Failure	Related Hardware
AIF Variable Gain Algorithm	A2 Analog IF	
AIF Step Gain Algorithm	A2 Analog IF	
LO Power Alignment Algorithm	A13 Front End Assembly or A15 Front End Controller	
AIF Variable Attenuator Algorithm	A2 Analog IF	
Mechanical Attenuator Algorithm	A9 and A10 RF Input Attenuators	50 MHz calibrator on A16 Reference
Electrical Attenuator Algorithm	A13 Front End	50 MHz calibrator on A16 Reference. Control signals from A15 Front End Controller
LO Nulling Full Alignment Algorithm	A13 Front End	
LO Nulling Min Alignment Algorithm	A13 Front End	
LO Nulling Full MB Alignment Algorithm	A13 Front End	
LO Nulling Min MB Alignment Algorithm	A13 Front End	
LO Nulling Full WB Alignment Algorithm	A13 Front End	
LO Nulling Min WB Alignment Algorithm	A13 Front End	
Narrow Band Step Cal Adjustment Alignment Algorithm	Alignment signal originates on A3 D-IF, then goes through A16 Reference, through A13 Front End, through A2 Analog IF, and back to A3 Digital IF. If Option B1X present, A25 WB A-IF switches calibrator signal to A16 Reference.	
Narrow Band Step Cal Alignment Algorithm		
DIF 40 Step Cal Adjustment Alignment Algorithm	Since this is wide band alignment done for 40 MHz BW signal path, A2 Analog IF is not included in the signal path.	
DIF 40 Variable Attenuator Algorithm	A3 Digital IF	
AIF 255 Variable Attenuator Alignment Algorithm	A21 Wide band A-IF	

Table 2-2 Initial Alignments

Alignment Description	Most Probable Hardware Failure	Related Hardware
AIF 510 Variable Attenuator Alignment Algorithm		
DIF 40 Step Cal Alignment Algorithm	see above	
DIF 40 Highband Phase Removal Algorithm	see above	
DIF 25 Highband Phase Removal Algorithm	A3 Digital IF	
AIF 255 RF Band 0 Chirp Cal Adjustment Algorithm	A21 Wideband Analog IF Uses 1.2 GHz internal cal signal (not viewable on screen), and it is possible an external signal at the RF input will interfere. Assure no external signals connected. Band 0 is < 3.6 GHz.	
AIF 255 RF Band 0 Chirp Cal Alignment Algorithm	A21 Wideband Analog IF	
AIF 500 RF Band 0 Chirp Cal Adjustment Algorithm	A21 Wideband Analog IF Could be either WB AIF assemblies. See if AIF 255 Chirp Cal fails also. Uses 1.2 GHz internal cal signal (not viewable on screen), and it is possible an external signal at the RF input will interfere. Assure no external signals connected. Band 0 is < 3.6 GHz	
AIF 500 RF Band 0 Chirp Cal Alignment Algorithm		
AIF 500 Phase Alignment Algorithm		
AIF 255 UW Band 1 Chirp Cal Adjustment Algorithm	A21 Wideband Analog IF Uses 4.8 GHz internal cal signal. Assure 4.8 GHz calibrator is present by viewing the calibrator on screen. Band 1 is > 3.6 GHz, high band path.	

Table 2-2 Initial Alignments

Alignment Description	Most Probable Hardware Failure	Related Hardware
AIF 255 UW Band 1 Chirp Cal Alignment Algorithm	A21 Wideband Analog IF	
AIF 500 UW Band 1 Chirp Cal Adjustment Algorithm	A21 Wideband Analog IF Could be either WB AIF assemblies. See if AIF 510 Chirp Cal fails also. Uses 1.2 GHz internal cal signal (not viewable on screen) and it is possible an external signal at the RF input will interfere. Assure no external signals connected. Band 1 is > 3.6 GHz, high band path.	
AIF 500 UW Band 1 Chirp Cal Alignment Algorithm		
E Cal Path System Gain Algorithm	Signal path from A13 Front End to A3 Digital IF	A16 Reference may not be providing 50 MHz E-Cal
Low Band Nominal Path System Gain Algorithm	A13 Front End	50 MHz calibrator on A16 Reference. A9 and A10 Input attenuators
Low Band Preamp Path System Gain Algorithm	A13 Front End	50 MHz calibrator on A16 Reference. A9 and A10 Input attenuators
Low Band Elec Atten Path System Gain Algorithm	A13 Front End	50 MHz calibrator on A16 Reference. A9 and A10 Input attenuators
Preselector Two Point Tuning Algorithm	A12 YTF Preselector or A15 Front End Controller or All Low Band	A13 Front End
High Band Nominal Path System Gain Algorithm	All Front End components	4800 MHz calibrator on A16 Reference

Table 2-2 Initial Alignments

Alignment Description	Most Probable Hardware Failure	Related Hardware
Low Noise Path System Gain Algorithm)	SW3	4800 MHz calibrator on A16 Reference A15 Front End Controller
High Band Preamp Path System Gain Algorithm	A11 Low Band Switch	4800 MHz calibrator on A16 Reference A9 and A10 Input attenuators A15 Front End Controller
High Band Preselector Bypass Path System Gain Algorithm	SW 1 and SW 2, coax switches and cabling	A15 Front End Controller 4800 MHz calibrator on A16 Reference A9 and A10 Input attenuators
High Band Preselector Bypass Preamp Path System Gain Algorithm	A11 Low Band Switch Preselector Bypass Switch(s)	
Burst Carrier Trigger Curve Fit Alignment Algorithm	A2 Analog IF	
DIF 25 Pulse Stretcher Alignment Algorithm	A3 Digital IF	
DIF 40 Pulse Stretcher Alignment Algorithm	A3 Digital IF	
WBDIF Pulse Stretcher Alignment Algorithm	A22 or A23 Wideband Digital IF	

Notes:
NarrowBandIF is the standard 10 MHz IF or the 25 MHz path (B25)

MediumBandIF is the 40 MHz IF path (B40)

WideBandIF is the 255 MHz IF path (B2X)

DualWideBandIF is the 510 MHz IF path (B5X)

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

E:\AlignDataStorage\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

Signal Level Problem with Input Frequencies < 3.6 GHz

Measure the 50 MHz RF calibrator signal level by pressing **Input/Output**, **RF Calibrator**, **50 MHz**. Now press **Freq** and input **50 MHz**. Press **SPAN**, **1 MHz**, and **Peak Search**. If the analyzer is functioning correctly in low band, the 50 MHz calibrator level should be –25 dBm ± 2 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.

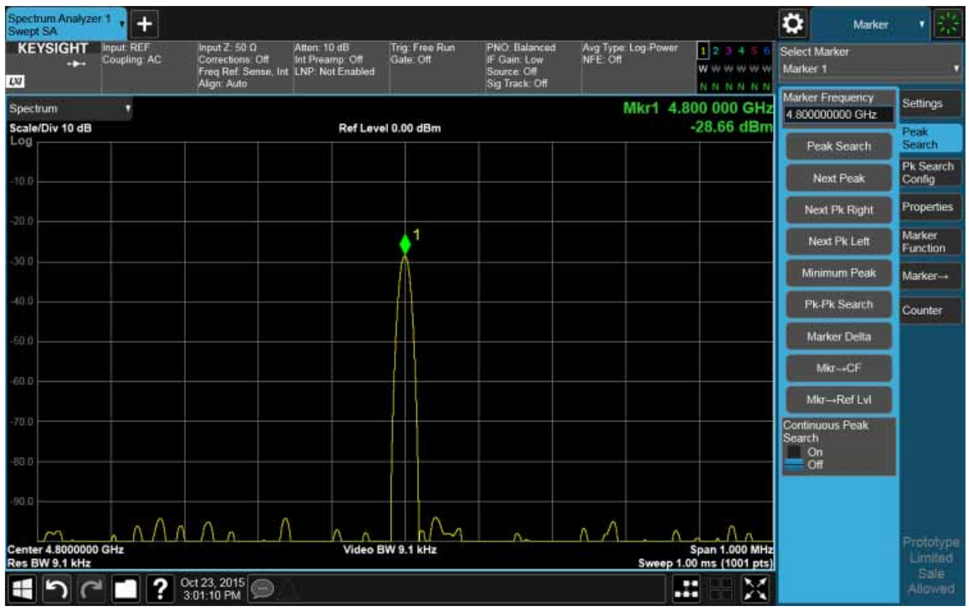
If no:

Refer to Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)” in this manual.

NOTE It is possible that other input frequencies < 3.6 GHz 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.

Signal Level Problem with Input Frequencies > 3.6 GHz

Measure the 4.8 GHz RF calibrator signal level by pressing **Input/Output**, **RF Calibrator**, **4.8 GHz**. Now press **Freq** and input **4.8 GHz**. Press **SPAN**, **1 MHz**, and **Peak Search**. If the analyzer is functioning correctly in high band, the 4.8 GHz calibrator level should be –28 dBm ± 2 dB. See the figure below.



Is the signal level correct?

If yes:

The analyzer high band path is functioning properly at least at 4.8 GHz.

If no:

Press **Amplitude**, **Y-Scale**, **Preselector Center** to manually center the preselector. Refer to Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)” in this manual.

NOTE

It is possible that other input frequencies > 3.6 GHz could have an amplitude problem even though the 4.8 GHz calibrator is within tolerance. Using the internal RF calibrator provides a quick check of the high band path.

3 Instrument Messages

Introduction

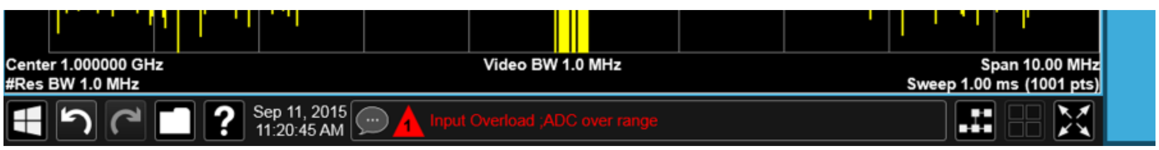
The Error and Status messaging system of the Keysight Signal Analyzer reports events and conditions in a consistent fashion, as well as logging and reporting event history.

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 “Event and Condition Categories”.

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.

Event and Condition messages appear in the Status Bar at the bottom 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 Bar 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 Bar 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.)

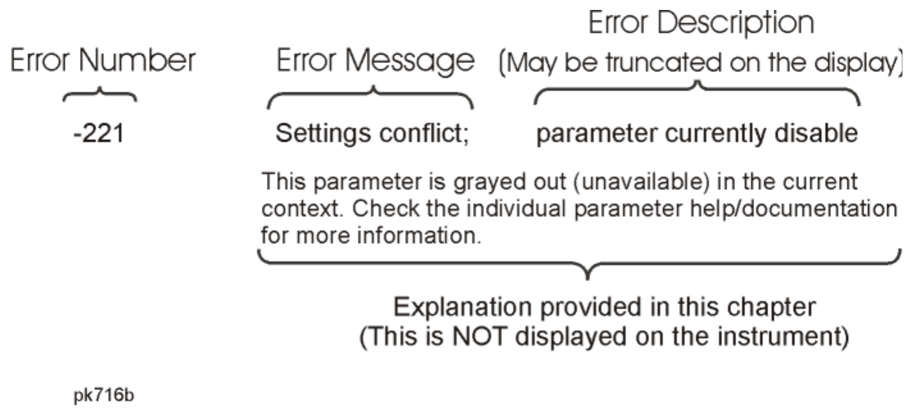
   A forced grayout function cannot be changed either from the front panel or remotely. It generates a special type of Advisory message. It also only appears on the front panel when the key is pressed. Remotely, the message will appear in the event queue as a warning "-221, Settings conflict; <conflict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



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`

Table 3-1 Characteristics of the Event Queues

Characteristic	Front-Panel Status	Front-Panel History	Remote Interfaces (GPIB/LAN)
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.
`Attenuation changes have no impact with external mixing`	
`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.

Message	Description/Correction Information
`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 UXA 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.
`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).

Message	Description/Correction Information
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.

Message	Description/Correction Information
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
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

Message	Description/Correction Information
Reading SNS data…	The Keysight 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.
Signals deleted	The signals in the signal list were successfully deleted.

Message	Description/Correction Information
`Span is not coupled to RBW when EMI detector is selected`	
`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.

Event Messages

Event messages read out in the MSG area in the bottom left of the display. Event messages and message numbers are defined by the SCPI standard.

In the X-Series, sub-messages are often attached to add additional information, to help the user better understand the event being reported. For example, error –221 is defined as “Settings Conflict”, but in the X-Series you will often see a longer message with error –221, such as “Settings Conflict; Function not available in Zero Span”. This helps you understand exactly why you are getting a Settings Conflict error.

–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.

Err#	Message	Verbose/Correction Information
–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 Keysight 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 Keysight 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 Keysight Technologies to purchase continued use of this functionality.
–310	System Error; enable GPIB controller mode	Press System, I/O Config, GPIB and set GPIB Controller to Enabled so that the analyzer can control the source over GPIB
–310	System error; Error transmitting a LAN event to the network.	Communication with the network driver failed.
–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.

Err#	Message	Verbose/Correction Information
–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.
–310	`System Error; No supported source found`	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; source connection lost, check interface connection`	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; 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.

Err#	Message	Verbose/Correction Information
–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 Keysight Technologies sales or service office.
–330	Self-test failed	A self-test failure occurred. Report this error to the nearest Keysight 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; <failure msg> <port>	The calibration for one of the I-Q ports did not succeed. The information in the “failure msg” field can be used to troubleshoot this problem. Contact Keysight technical support if necessary.
–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 Keysight Smart Noise Source connected to the UXA 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 Keysight 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 "–200 to –299, Execution Errors" on page 108.

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	`De-emphasis only available in FM`	The de-emphasis function is only available if FM demod is selected.
–221	`Function not available in Zero Span`	The function you are trying to access is not available in zero span.
–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; Auto Tune not available in Tracking Source mode`	The Auto Tune feature cannot be used when you are using a Tracking Source.

Err#	Message	Verbose/Correction Information
–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; Cal only available when Source Mode is Tracking`	You must be in Tracking Source mode to use the Cal functions under Normalize. Press Source, Source Mode and set it to Tracking.
–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; Can't Auto-Couple Res BW in Zero Span`	The resolution bandwidth cannot be set to auto while you are in zero span (time domain).
–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; 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.

Err#	Message	Verbose/Correction Information
–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 available in this View`	Some functionality is available in one View, but not in another. (See the Views under the View/Display key.) This error occurs if you send a SCPI command or push a gray-out key that is not available in the current selected View.
–221	`Settings conflict; Feature not supported for selected source`	You have asked for a feature that the selected source is not capable of.
–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; Feature not supported for this model number`	This functionality is not a part of the instrument you are using but may be found in other models in the X-Series.

Err#	Message	Verbose/Correction Information
–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; FFT Sweeps unavailable in Tracking Source mode	Since FFT's do not sweep, you cannot use a Tracking Source while doing FFT's
–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 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 not available in Tracking Source mode	The feature cannot be used when you are using a Tracking Source.
–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.

Err#	Message	Verbose/Correction Information
–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; Gate not available with external Tracking Source`	The Gate functions are unavailable when Source Mode is Tracking with an external source. This is because the Gate circuitry is used to sync the external source.
–221	`Settings conflict; Gate not available with Tracking Generator`	If the Source Type is Tracking Generator, the Gate circuitry is used for TG sync and is not available for gating
–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.
–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; LO Phase Noise Adj not available`	For instruments without the Dual-Loop LO, this feature is not available

Err#	Message	Verbose/Correction Information
–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; 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-> 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; 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; 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; 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).

Err#	Message	Verbose/Correction Information
–221	Settings conflict; Must apply Amplitude Correction to make this unit available	These special units only apply when you are doing antenna measurements so you have to have a correction which includes Antenna Units enabled
–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; no source selected	You must select a source using Select Source before you can do this
–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.
–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; Only active Antenna Unit available; no other Y axis units	When a correction with antenna units is turned on, the only Y-Axis units you can have are those that match the Antenna Unit. Turn off the Correction or the Antenna Unit under Input/Output, Corrections
–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.

Err#	Message	Verbose/Correction Information
–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; 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; Relative Trigger needs hardware support for this meas`	To do Relative Triggering in this measurement requires optional hardware that is not present in this analyzer.
–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; 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 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 limited to XXX`	

Err#	Message	Verbose/Correction Information
–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 then 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; 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.
–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; The parameter cannot be changed in FAST mode	

Err#	Message	Verbose/Correction Information
–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; Tracking Source unavailable in FFT Sweeps	Since FFT's do not sweep, you cannot use a Tracking Source while doing FFT's
–221	Settings conflict; Trigger input in use for source synchronization	If Point Trigger is being used with an external trigger input to synchronize an external source to the analyzer, that trigger input is unavailable for triggering.
–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;Administrator privileges required	You must be logged in with administrator privileges to do this. Log out and log back in as the administrator, then restart the SA application.
–221	Settings conflict;Auto Scan Time/Meas Time do not apply in Stepped Scan Type.	The Auto Scan Time/Meas Time are not available when Scan Type =Stepped Scan.
–221	Settings conflict;Auto Scan Time/Meas Time do not apply in Stepped Scan Type.	The Auto Scan Time/Meas Time are not available when Scan Type =Stepped Scan.
–221	Settings conflict;ClearList & Start not available when ScanSeq = (Re)measure	Cannot perform Clear List & Start during (Re)measure because we needs the frequency information of the peaks in signal list to perform (Re)measure.
–221	Settings conflict;EMI Detectors and Average detector can't be used together	User is not allowed to turn on any EMI Detector and Average detector together. They are always mutually exclusive.
–221	Settings conflict;Freq > 1 GHz is not available while RF Input 2 enabled	Frequency is limited to 1GHz while RF Input 2 is enabled.

Err#	Message	Verbose/Correction Information
–221	Settings conflict;Function not available while measurement is running	Settings change is not allowed while measurement is running. You must stop the current measurement if you wish to change the settings.
–221	Settings conflict;function unavailable with this EMC Standard	
–221	Settings conflict;Log Percent Auto Step Rule does not apply in Swept Scan Type.	The Log Percent rule is not available when Scan Type=Swept Scan because we are always doing linear sweep.
–221	Settings conflict;QPD + EMI Average + RMS Average is not allowed	User is not allowed to turn on all 3 EMI detectors together. You must turn off one of the EMI Detectors before you turn this on.
–221	Settings conflict;Range <0> is turned off as total range points > 40001	Max of Total range points is 400000. Reduce Scan Points or increase Step Size in order to turn on that range.
–221	Settings conflict;RF Input 2 is not available above 1GHz	If the frequency range is set above 1GHz, user is not allowed to change to RF Input 2.
–221	Settings conflict;Scan Time & Points do not apply in current Step/Time Control.	The Scan Time & Points are not available when Step/Time Control is set to Step & Dwell.
–221	Settings conflict;Step Size & Meas Time do not apply in current Step/Time Control.	The Step Size & Meas Time are not available when Step/Time Control is set to Scan Time&Pts.

–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	`All ranges are off. Turn on at least a range`	There are no range turn on in scan table. You need to turn on at least a range to initiate a scan.
–200	`At Full Zoom`	Marker Zoom is not available as it has reached full zoom.
–200	`At Full Zoom`	Marker Zoom is not available as it has reached full zoom.
–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.

Err#	Message	Verbose/Correction Information
–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.
–200	Function not available before Marker Zoom is performed	Function not available before perform Marker Zoom
–200	Must perform Scan before do Search	Cannot perform Search as the trace data is found empty
–200	No marked signal	Cannot perform the selected function because no signal was marked. You must mark the peak of interest before selecting the function.
–200	No Measure At Marker Added to Signal List	No signal peak was added into Signal List as there is no valid measure to Marker result. You must perform Measure at maker before selecting Measure At Marker --> List.
–200	No Peak Added to Signal List	No signal peak was added from the Search to Signal List as there is no signal peaks found within the defined parameters of the search criteria.
–200	Signal List is Empty	Cannot perform the selected function because the signal list contains no data.
–200	Signal List is Full	Cannot perform the selected function because the signal list is full. Please clear the list.
–200	Signal Selected is not in the Signal List	The signal selected is not the list. You only can perform the operation on signal that is already available in the list.

Err#	Message	Verbose/Correction Information
–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.
–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; clipped to source max/min`	A source parameter has been entered that exceeds the range of the selected source. The parameter has been clipped to match the range of the source
–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.

Err#	Message	Verbose/Correction Information
–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 then 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.

Err#	Message	Verbose/Correction Information
–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;This instrument is always DC coupled	You can't set AC coupling in this instrument
–224	Illegal parameter value;This model is always AC coupled	You can't set DC coupling in this analyzer
–225	Out of memory	There is not enough memory to perform the requested operation.
–225	Out of memory; Insufficient resources to load Mode <mode name>	If you attempt to load a mode via SCPI that will exceed memory capacity, the Mode does not load and this message is returned. "mode name" is the SCPI parameter for the Mode in question, for example, SA for Spectrum Analyzer Mode. You can free up resources in the System, Power On, Configure Applications menu
–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.

Err#	Message	Verbose/Correction Information
–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.

Err#	Message	Verbose/Correction Information
–250	Mass storage error; Can only load an Antenna Unit into Correction 1	The only Correction register that supports Antenna Units is number 1. You have attempted to load an Ampcor file which contains antenna units into another register
–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 Mass Storage error	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; Mkr Table must be on to save Mkr Table as Meas Results	You have to have a Marker Table on the screen before you can save it. Turn on the Marker Table and try again.
–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 devise, check that the devise is properly formatted.

Err#	Message	Verbose/Correction Information
–250	Mass storage error; Pk Table must be on to save Pk Table as Meas Results	You have to have a Peak Table on the screen before you can save it. Turn on the Peak Table and try again.
–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; Spectrogram must be on to save as Meas Results	You have to have a Spectrogram on the screen before you can save it. Turn on the Spectrogram and try again.
–250	Mass storage error; Too many open files	The system cannot open the file.
–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	

Err#	Message	Verbose/Correction Information
–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.

Err#	Message	Verbose/Correction Information
–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 then 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.

Err#	Message	Verbose/Correction Information
–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.

Err#	Message	Verbose/Correction Information
–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 Messages

Condition messages read out in the STATUS message area in the bottom right of the display. Condition messages are classified as either “Errors” or “Warnings.” In the tables in this section, 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.

For each Condition Messages, there is a corresponding bit in one of the SCPI status registers. These bits are listed in the tables. Some messages exist ONLY as status bits; for these messages the Error or Warning column will contain “status bit only”.

Condition errors 1 to 99, Calibration

These errors correspond to the STATus:QUEStionable:CALibration register. Since this register is fanned out to three sub-registers, with summary bits in the main STATus:QUEStionable:CALibration register, each sub-register has its own range of error numbers.

Condition Errors 6 to 34, Calibration Skipped

This series of errors corresponds to the bits in the STATus:QUEStionable:CALibration:SKIPped sub-register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

For example, error 6 indicates that the “RF Alignment being skipped” condition has been detected, and error 1006 indicates that failure has been cleared.

This register is summarized as bit 11 of the STATus:QUEStionable:CALibration register. See section “Condition Errors 36 to 64, Calibration Needed or Failed” on page 122.

Err#	Bit in status register	Message	Error or Warning	More Information
6	0	`Align RF Skipped`	W	
8	1	unused		
10	2	unused		
12	3	unused		
14	4	unused		
16	5	unused		

Err#	Bit in status register	Message	Error or Warning	More Information
18	6	unused		
20	7	unused		
22	8	unused		
24	9	unused		
26	10	unused		
28	11	unused		
30	12	unused		
32	13	unused		
34	14	unused		

Condition Errors 36 to 64, Calibration Needed or Failed

This series of errors corresponds to the bits in the STATus:QUEStionable:CALibration register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

For example, error 42 indicates that the “RF Alignment Failure” condition has been detected, and error 1042 indicates that failure has been cleared.

Several bits in this register are “summary bits” for registers at a lower level. There are no error messages associated with these bits; they exist only as status bits, read with a STATus:QUEStionable:CALibration? event query or a STATus:QUEStionable:CALibration:CONDition? query.

Note that these summary bits summarize the state and history of the event registers at the lower level. This is true even for bits in the STATus:QUEStionable:CALibration condition register. This means that:

The summary bits read by the STATus:QUEStionable:CALibration:CONDition? query are true if any event bits are set in any of the :CALibration sub-registers :SKIPped, :EXTended:NEEDed or :EXTended:FAILure.

The summary bits read by the STATus:QUEStionable:CALibration? event query are true if any event bit has undergone a false-to-true transition with the PTRansition filter set, or a true-to-false transition with the NTRansition filter set, in any of the :CALibration sub-registers :SKIPped, :EXTended:NEEDed or :EXTended:FAILure.

Thus, the summary bits cannot be used to determine the current state of a lower level condition bit; only the state and history of the lower level event bits.

This register is itself summarized as bit 8 of the STATus:QUEStionable register. See section "Condition Errors 601 to 699, Error Summaries" on page 142.

Err#	Bit in status register	Message	Error or Warning	More Information
36	0	unused		
38	1	unused		
40	2	`TG Alignment Failure`	E	
42	3	`RF Alignment Failure`	E	
44	4	`IF Alignment Failure`	E	
46	5	`LO Alignment Failure`	E	
48	6	`ADC Alignment Failure`	E	
50	7	`FM Demod Alignment Failure`	E	
52	8	`Extended Align Needed Summary`	status bit only	This bit is the summary bit for the STATus:QUEStionable:CALibration:EXTended:NEEDed sub-register.
54	9	`Extended Align Failure Summary`	status bit only	This bit is the summary bit for the STATus:QUEStionable:CALibration:EXTended:FAILure sub-register.
56	10	unused		
58	11	`Align Skipped Sum Summary`	status bit only	This bit is the summary bit for the STATus:QUEStionable:CALibration:SKIPped sub-register.
60	12	`Align Now, RF required`	E	
62	13	unused		
64	14	`Align Now, All required`	E	On PSA, this was error 64

Condition Errors 65 to 92, Calibration Needed (Extended)

This series of errors corresponds to the bits in the STATus:QUEStionable:CALibration:EXTended:NEEDed sub-register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

For example, error 72 indicates that the “Input Attenuation not calibrated” condition has been detected, and error 1072 indicates that failure has been cleared.

This register is summarized as bit 8 of the STATus:QUEStionable:CALibration register. See section “Condition Errors 36 to 64, Calibration Needed or Failed” on page 122.

Err#	Bit in status register	Message	Error or Warning	More Information
	3	`System alignment required`		
65	0	unused		
66	1	`Align 9kHz-30MHz required`	E	An EMI conducted frequency range alignment is needed.
68	2	`Align 30MHz-1GHz required`	E	An EMI radiated frequency range alignment is needed.
72	4	`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	5	unused		
76	6	unused		
78	7	unused		
80	8	unused		
82	9	unused		
84	10	unused		
86	11	unused		
88	12	unused		
90	13	unused		
92	14	unused		

Condition Errors 67 to 95, Calibration Failure (Extended)

This series of errors corresponds to the bits in the STATus:QUEStionable:CALibration:EXTended:FAILure sub-register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

For example, error 71 indicates that the Characterize Preselector Failure has been detected, error 1071 indicates that failure has been cleared.

This register is summarized as bit 9 of the STATus:QUEStionable:CALibration register. See section "Condition Errors 36 to 64, Calibration Needed or Failed" on page 122.

Err#	Bit in status register	Message	Error or Warning	More Information
67	0	`Align 9kHz to 30MHz failed`	W	On PSA, this was error 13749
69	1	`Align 30MHz to 1GHz failed`	W	On PSA, this was error 13751
71	2	`Characterize Preselector failure`	W	The preselector characterization routine failed.
73	3	unused		
75	4	unused		
77	5	unused		
79	6	unused		
81	7	unused		
83	8	unused		
85	9	unused		
87	10	unused		
89	11	unused		
91	12	unused		
93	13	unused		
95	14	unused		

Condition Errors 101 to 199, Measurement Integrity

This series of errors corresponds to the bits in the STATus:QUEStionable:INTegrity register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

For example, error 141 indicates an Input Overload condition has been detected, error 1129 indicates that failure has been cleared.

Two bits in this register are “summary bits” for registers at a lower level. There are no error messages associated with these bits; they exist only as status bits, read with a STATus:QUEStionable:INTegrity? event query or a STATus:QUEStionable:INTegrity:CONDition? query.

Note that these summary bits summarize the state and history of the event registers at the lower level. This is true even for bits in the STATus:QUEStionable:INTegrity condition register. This means that:

The summary bits read by the STATus:QUEStionable:INTegrity:CONDition? query are true if any event bits are set in any of the :INTegrity sub-registers :SIGNal or :UNCalibrated.

The summary bits read by the STATus:QUEStionable:INTegrity? event query are true if any event bit has undergone a false-to-true transition with the PTRansition filter set, or a true-to-false transition with the NTRansition filter set, in any of the :INTegrity sub-registers :SIGNal or :UNCalibrated

Thus, the summary bits cannot be used to determine the current state of a lower level condition bit; only the state and history of the lower level event bits.

This register is itself summarized as bit 9 of the STATus:QUEStionable register. See section “Condition Errors 601 to 699, Error Summaries” on page 142.

Err#	Bit in status register	Message	Error or Warning	More Information
133	0	`Signal Summary`	status bit only	This bit is the summary bit for the STATus:QUEStionable:INTegrity:SIGNal sub-register.
135	1	`No Result`	E	
135	1	`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.

Err#	Bit in status register	Message	Error or Warning	More Information
135	1	`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
137	2	unused		
139	3	`Uncalibrated Summary`	status bit only	This bit is the summary bit for the STATus:QUEStionable:INTegrity:UNCalibrated sub-register.
141	4	`Input Overload`	W	
141	4	`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	4	`Input Overload;I/Q ADC over range`	W	The I or Q input exceeds the ADC upper limit.
141	4	`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.
143	5	unused		
145	6	unused		
147	7	`Insufficient Data`	E	
147	7	`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	7	`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	7	`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	7	`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

Err#	Bit in status register	Message	Error or Warning	More Information
149	8	`Meas Error`		
151	9	`Memory Error`	E	
151	9	`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	10	`I/O Error`	E	
153	10	`I/O Error; Ext Source needs IP Addr`	E	No IP address entered for external source and external LO control is ON.
155	11	`Trig Error`	E	
157	12	`Invalid Data`	Status bit only	This is the “invalid data indicator”, same as the “*” in the upper right corner of the screen. It means that the on-screen annotation does not match the on-screen data, usually because a measurement is pending after a settings change. There is no message in the status line and nothing in the history queue, but there IS an on-screen indication and a status bit.
159	13	`Settings Alert`	W	.
159	13	`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. In some older analyzers this was error 1109.
159	13	`Settings Alert; Diff probe mismatch; <I|Q|I,Q>`	W	The attenuation values of the two probes on the I and/or Q channels differ by too much for a valid differential reading.
159	13	`Settings Alert; Acquisition truncated`	W	In the Analog Demod mode, certain extreme settings combinations will result in a required acquisition length in excess of the capacity of the analyzer. Increase the AF Spectrum RBW or the RF Spectrum RBW, decrease the Channel BW, and/or decrease the Demod Waveform Sweep Time.

Err#	Bit in status register	Message	Error or Warning	More Information
159	13	`Settings Alert; Analog Out settings conflict`	W	The user has manually set the Analog Output under the Input/Output menu to a setting that conflicts with the current measurement. There will be no output on the Analog Out port until this conflict is resolved. In most cases, simply set Analog Out to Auto for the optimal setting.
159	13	Settings Alert;I/Q mismatch:<Differential|Input Z|Attenuation>	W	The impedance, differential, or attenuation settings for the I and Q channels do not match. For valid I+jQ measurements the impedance and differential settings should be the same on both channels and the attenuation should match within 1 dB
159	13	`Settings Alert;Parm/data mismatch`	W	For *Bluetooth*, the detected parameters did not match the data
161	14	`Setting Modified`	E	
161	14	`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

This series of errors corresponds to the bits in the STATus:QUEStionable:INTegrity:SIGNal sub-register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

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

This register is summarized as bit 0 of the STATus:QUEStionable:INTegrity register. See section "Condition Errors 101 to 199, Measurement Integrity" on page 126.

Err#	Bit in Status Register	Message	Error or Warning	More Information
203	0	unused	E	
205	1	unused	E	

Err#	Bit in Status Register	Message	Error or Warning	More Information
207	2	`Burst Not Found`	E	The burst signal cannot be detected because of inappropriate parameter settings or incorrect signal. 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. An incorrect signal could have either insufficient power, the rising or falling edges cannot be detected, or the burst is less than 126 microseconds. Carrier signal is not actually bursted. 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. 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. GSM: Data was acquired but a GSM burst was not found, with the timeslot mode disabled. NADC, PDC: A valid burst is not found when the Device is MS. 1xEV-DO: Data was acquired but a 1xEV burst was not found, with the timeslot mode disabled. *Bluetooth*: The burst that has been found does not correspond to the currently selected *Bluetooth* packet type (the burst length may be too short). WLAN: The instrument cannot find a valid WLAN burst. You may need to extend the search length. In the PSA, this error was reported as one of the following error numbers: 10772, 13104, 10160, 10286, 10420, 10454, 10614, 10904, 10928, 13074, 10287

Err#	Bit in Status Register	Message	Error or Warning	More Information
207	2	`Burst not found;with selected Time Slot`	E	The selected timeslot does not contain the expected burst.
209	3	`Timing Error`	E	
209	3	`Timing Error:No time ref pilot burst`	E	The pilot burst used for time reference is not active.
211	4	`Carrier(s) incorrect or missing`	E	In the PSA, this error was reported as one of the following error numbers: 10165, 10173, 10178, 10419, 10421, 10535, 10560, 10642, 10648, 10650, 10960
213	5	`Freq Out of Range`	E	
213	5	`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.
213	5	`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.
215	6	`Sync Error`	E	W-CDMA: Cannot sync DPCCH pilot. 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.
215	6	`Sync Error;No pilot burst`	E	There is no Pilot burst detected.
215	6	`Sync Error;Sync code not found`	E	Synchronization code is not found in the measured time slot.
215	6	`Sync Error;No freq ref pilot burst`	E	The pilot burst used for frequency reference is not active.
215	6	`Sync Error;Midamble sync fail`	E	Failed to find the uplink slot, which caused the synchronization with the midamble to fail.
215	6	`Sync Error;Preamble length zero`	E	Burst type is “Data” or “Preamble” and the measurement cannot find a Preamble

Err#	Bit in Status Register	Message	Error or Warning	More Information
217	7	`Demod Error`	E	This error is normally generated because of one of the following reasons: 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. This problem must be corrected before the measurement can continue. 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. cdmaOne: A correlation failure with the pilot CDMA channel occurred during synchronous demodulation. 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. In the PSA, this error was reported as one of the following error numbers: 10872, 10962, 13070, 10228, 10768
217	7	`Demod Error;Can't correlate`	E	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.
217	7	`Demod Error;Data interval too short`	E	There are not enough input I/Q pairs for the measurement calculation. This may be caused by an incorrect data capture.

Err#	Bit in Status Register	Message	Error or Warning	More Information
217	7	`Demod Error;No active channel`	E	There is no active channel detected.
217	7	`Demod Error;Not an active slot`	E	There is no active slot detected.
217	7	`Demod Error;No full subframe found`	E	No sub-frame or only part of one sub-frame is detected.
217	7	`Demod Error;Muxed bits not found`	E	Multiplexed Data Demod Bits are not generated even though Data channel is selected, because all 16 data code channels are not active
217	7	`Demod Error;Acq Time too short`	E	For *Bluetooth*, the detected packet type doesn't match the captured packet type because the payload start, end or data could not be found.
219	8	`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. In the PSA, this error was reported as one of the following error numbers: 10702, 10824, 10906, 10930, 13024, 10626, 111
221	9	`Slot Error`	E	
221	9	`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.
221	9	`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.
223	10	unused	E	
225	11	unused	E	
227	12	unused	E	

Err#	Bit in Status Register	Message	Error or Warning	More Information
229	13	unused	E	
231	14	unused	E	

Condition Errors 301 to 399, Uncalibrated Integrity

This series of errors corresponds to the bits in the STATus:QUEStionable:INTegrity:UNCalibrated sub-register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

For example, error 301 indicates a Meas Uncal condition has been detected, error 1301 indicates that failure has been cleared.

This register is summarized as bit 3 of the STATus:QUEStionable:INTegrity register. See section "Condition Errors 101 to 199, Measurement Integrity" on page 126.

Err#	Status Register Bit	Message	Error or Warning	Verbose/Correction Information
301	0	`Meas Uncal`	W	
303	1	`Signal ID on`	W	
305	2	`No Long Code Phase`	W	
307	3	`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	4	`User cal`	W	

Err#	Status Register Bit	Message	Error or Warning	Verbose/Correction Information
309	4	`User Cal; Cal invalidated`	E,W	The existing user cal has been invalidated because of one of the following reasons: 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: • 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. DUT Type: If the DUT Type parameter changes, causing the measurement frequencies to be pushed outside the current cal. Attenuation: If an attenuation setting is selected but has not been calibrated. 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. 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: • 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.

Err#	Status Register Bit	Message	Error or Warning	Verbose/Correction Information
309	4	`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)
309	4	`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	4	`User Cal; Adjusted for new RBW`	W	The measurement RBW has been changed since the last calibration (~CAL)
311	5	`Calibration`	W	
311	5	`Calibration; ENR table extrapolated`	W	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. (~ENR)
311	5	`Calibration; No ENR data present`	W	No ENR Data (ENR)
313	6	`Source Uncal`	W	
313	6	`Source Uncal;adj Start Freq or RBW`	W	While using a Tracking Source, you must make sure the Start Frequency is high enough to avoid capturing LO feedthrough in the trace. This depends on both Start Freq and RBW. If you get this message, increase your Start Freq or narrow your RBW.
315	7	unused	W	
317	8	unused	W	
319	9	unused	W	
321	10	unused	W	
323	11	unused	W	
325	12	unused	W	
327	13	unused	W	

Err#	Status Register Bit	Message	Error or Warning	Verbose/Correction Information
329	14	unused	W	

Condition Errors 401 to 499, Power

This series of errors corresponds to the bits in the STATus:QUEStionable:POWer register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

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

This register is summarized as bit 3 of the STATus:QUEStionable register. See section “Condition Errors 601 to 699, Error Summaries” on page 142.

Err#	Bit in status register	Message	Error or Warning	More Information
401	0	`RPP Tripped`	W	(not currently in use)
403	1	`Source Unleveled`	W	
405	2	`Source LO Unleveled`	E	(not currently in use)
407	3	`LO Unleveled`	E	(not currently in use)
409	4	unused		
411	5	unused		
413	6	unused		
415	7	unused		
417	8	unused		
419	9	`Preselector Overload`	E	
421	10	unused		
423	11	unused		
425	12	unused		
427	13	unused		
429	14	unused		

Condition Errors 501 to 599, Frequency

This series of errors corresponds to the bits in the STATus:QUEStionable:FREQuencyr register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

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

This register is summarized as bit 5 of the STATus:QUEStionable register. See section "Condition Errors 601 to 699, Error Summaries" on page 142.

Err#	Bit in status register	Message	Error or Warning	More Information
501	0	`Source Synth Unlocked`	E	
503	1	`Frequency Reference Unlocked`	E	
505	2	`2nd LO Unlocked`	E	
507	3	unused		
509	4	`LO Unlocked`	E	
511	5	unused		
513	6	`IF Synthesizer Unlocked`	E	
515	7	`Calibration Oscillator Unlocked`	E	
517	8	unused		
519	9	`Demodulation`	E	
521	10	`External ref missing or out of range`	E	The external frequency reference signal is missing or is not within the proper amplitude range. In the PSA, this error was reported as error 622
523	11	unused		
525	12	unused		
527	13	unused		
529	14	unused		

Condition Errors 601 to 699, Error Summaries

This series of errors corresponds to the bits in the STATus:QUEStionable register, read with a STATus:QUEStionable? event query or a STATus:QUEStionable:CONDition? query.

The second column in the table shows the corresponding bit in the status register. These bits do not have any corresponding error messages, although error numbers have been reserved for them as seen in the Err# column; they are status bits only.

The bits in the STATus:QUEStionable register are “summary bits” for registers at a lower level. Note that these summary bits summarize the state and history of the event registers at the lower level. This is true even for bits in the STATus:QUEStionable condition register. This means that:

The summary bits read by the STATus:QUEStionable: CONDition? query are true if any event bits are set in any of the :QUEStionable sub-registers :POWer, :TEMPerature, FREQuency, CALibration or :INTegrity.

The summary bits read by the STATus:QUEStionable? event query are true if any event bit has undergone a false-to-true transition with the PTRansition filter set, or a true-to-false transition with the NTRansition filter set, in any of the :QUEStionable sub-registers :POWer, :TEMPerature, FREQuency, CALibration or :INTegrity.

Thus, the summary bits cannot be used to determine the current state of a lower level condition bit; only the state and history of the lower level event bits.

Err#	Bit in status register	Message	Error or Warning	More Information
601	0	`Voltage unused`		
603	1	`Current unused`		
605	2	`Time unused`		
607	3	`Power`	status bit only	This bit is the summary bit for the STATus:QUEStionable:POWer sub-register.
609	4	`Temperature`	status bit only	This bit is the summary bit for the STATus:QUEStionable:TEMPerature sub-register.
611	5	`Frequency`	status bit only	This bit is the summary bit for the STATus:QUEStionable:FREQuency sub-register.
613	6	`Phase unused`		
615	7	`Modulation unused`		

Err#	Bit in status register	Message	Error or Warning	More Information
617	8	`Calibration`	status bit only	This bit is the summary bit for the STATus:QUEStionable:CALibration sub-register.
619	9	`Integrity`	status bit only	This bit is the summary bit for the STATus:QUEStionable:INTegrity sub-register.
621	10	unused		
623	11	`CALL unused`		
625	12	unused		
627	13	unused		
629	14	`Command Warning unused`		

Condition Errors 701 to 799, Operation

This series of errors corresponds to the bits in the STATus:OPERation register, read with a STATus:OPERation? event query or a STATus:OPERation:CONDition? query.

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 721 indicates that the DC Coupled condition has been detected; error 1721 indicates that condition has been cleared.

Unless otherwise noted in the Error or Warning column, these are status bits only, with no corresponding error message or number

Err#	Bit in status register	Message	Error or Warning	More Information
701	0	`Calibrating`	status bit only	
703	1	`Settling`	status bit only	
705	2	`Ranging unused`		
707	3	`Sweeping`	status bit only	
709	4	`Measuring`	status bit only	
711	5	`Waiting for Trigger`	status bit only	
713	6	`Waiting for Arm`	status bit only	
715	7	unused		
717	8	`Paused`	status bit only	
719	9	`Source Sweeping`	status bit only	
721	10	`DC Coupled`	W	
723	11	unused		
725	12	`Source Waiting for Trigger`	status bit only	
727	13	unused		
729	14	unused		

Condition Errors 801 to 899, Temperature

This series of errors corresponds to the bits in the STATus:QUEStionable:TEMPerature register. The second column in the table shows the corresponding bit.

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. These error numbers can be seen in the Show Errors screen, along with the DETECTED and CLEARED indicators.

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

This register is summarized as bit 4 of the STATus:QUEStionable register. See section "Condition Errors 601 to 699, Error Summaries" on page 142.

Err#	Bit in status register	Message	Error or Warning	More Information
801	0	`Reference Oscillator Oven Cold`	W	(not currently in use)
803	1	unused		
805	2	unused		
807	3	unused		
809	4	unused		
811	5	unused		
813	6	unused		
815	7	unused		
817	8	unused		
819	9	unused		
821	10	unused		
823	11	unused		
825	12	unused		
827	13	unused		
829	14	unused		

4 RF Section Troubleshooting (RF/Microwave Analyzers)

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.

The following sections are found in this chapter:

RF Section Description

This section covers only those optional frequency ranges listed below for the N9040B Signal Analyzer.

– Option 508, 8.4 GHz Frequency Range

– Option 513, 13.6 GHz Frequency Range

– Option 526, 26.5 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 ≤ 3600 MHz
2. High band RF path #1 is used when the input frequency is > 3.6 GHz to 13.6 GHz
3. High band RF path #2 is used when the input frequency is > 13.6 GHz to 26.5 GHz

The RF section is designed to convert RF input signals to an intermediate frequency that is present at the RF output of the A13 Front End assembly. This intermediate frequency (IF) depends on installed options and the IF path selected. This chapter will assume the default operation in Spectrum Analyzer mode. Therefore the IF frequency will be 322.5 MHz.

IF Path	IF	Mode
10 MHz (standard)	322.5 MHz	Spectrum Analyzer or IQ Analyzer
25 MHz (Option B25)	322.5 MHz	IQ Analyzer
40 MHz (Option B40)	250 MHz	IQ Analyzer
255 MHz (Option B2X)	750 MHz	IQ Analyzer
510 MHz (Option B5X)	877 MHz	IQ Analyzer

The RF section is comprised of the following major assemblies:

- A9 Input Attenuator A
- A10 Input Attenuator B
- A11 Low Band Switch Assembly
- A12 YTF Preselector
- A20 Yig Tuned Oscillator
- A13 RF Front End Assembly - shown on the block diagram as A13A1 and A13A2. A13A1 and A13A2 cannot be replaced individually, the entire A13 assembly must be replaced.
- A15 Front End Control Assembly
- Option LNP - Low Noise Path (standard on UXA)
- Option MPB - Microwave Preselector Bypass (standard on UXA)

1. **RF input frequencies < 3600 MHz** route through the low band path. Refer to the RF Lowband Path Block Diagram in Chapter 12 for details.

   The RF input signal level can be optimized by Input Attenuator A and/or Input Attenuator B. The low band switch assembly contains a limiter that offers added protection for the mixer, and routes the input signal to the low band input of the A13 RF Front End assembly. There are (3) different signal paths on the input of the RF Front End assembly that the signal can be routed through depending on installed options and front panel settings.

   - Electronic Attenuator path, 0-24 dB (Option EA3)
   - Low Band Preamplifier path, 20 dB nominal gain
   - Direct to Mixer #1

NOTE The RF input signal can route through the Electronic Attenuator section or the Preamplifier, but not both. All RF input frequencies < 3600 MHz go to Mixer #1.

   The RF input signal is then mixed with the 1st LO from the A20 YTO assembly to a 1st intermediate frequency of 5122.5 MHz. Since the RF input signal is < 3600 MHz for low band, this RF input signal is upconverted in Mixer #1 to the 1st IF. This 1st IF signal is then downconverted in Mixer #2 using the 4800 MHz 2nd LO generated on the A16 Reference assembly to a 2nd intermediate frequency of 322.5 MHz (5122.5 MHz (1st IF) – 4800 MHz (2nd LO)). The 2nd IF output is at A13A1J7. This signal path is used for all frequency range options when the RF input frequencies are < 3600 MHz. The control voltages and biasing for these assemblies come from the A15 Front End Control assembly.

2. **RF input frequencies from 3.6 GHz to 13.6 GHz** go through the high band path. Refer to the RF Highband Path #1 Block Diagram in Chapter 12 for details.

   The input signal level can be optimized by Input Attenuator A and/or Input Attenuator B. The Low Band Switch assembly routes the signal through the A12 YTF Preselector. If one of the optional high band preamps is licensed, the signal can be routed through the preamp. The A15 Front End Controller provides switching signals.

   The Low Band Switch assembly performs the following tasks:

   – Provides a limiter that offers added protection for the mixer and optional preamp.
   – Contains the high band preamp.
   – Routes the input signal to the A12 YTF Preselector. If Options LNP or MPB are installed, the signal is routed through switches.

   The high band input switch in the Front End Assembly routes the RF input signal to Mixer #2, where it mixes with the LO and provides a 1st intermediate frequency of 322.5 MHz. The 322.5 MHz IF output is at A13A1J7. This is the signal path for Option 508, 8.4 GHz Frequency Range, Option 513, 13.6 GHz Frequency Range, and Option 526, 26.5 GHz Frequency Range (up to 13.6 GHz). The control voltages and biasing are provided by the A15 Front End Control Assembly.

3. **RF input frequencies from 13.6 GHz to 26.5 GHz** go through the high band path. Refer to the RF Highband Path #2 Block Diagram in Chapter 12 for details.

   The signal path for 13.6 GHz to 26.5 GHz operation is almost the same as the 3.6 GHz to 13.6 GHz path. The only difference is that Mixer #3 is used in this path. The LO is doubled at tuned frequencies above 17 GHz.

A9 Input Attenuator A

This assembly has two 2 dB attenuator sections, a DC block and a cal signal input port. With the DC block switched in (AC coupled mode), the low end minimum frequency range increases from 3 Hz to 10 MHz due to capacitive effects.

A10 Input Attenuator B

This assembly has a total of 66 dB of attenuation to control the signal level into the Low Band Switch assembly. There is a 6 dB, 10 dB, 20 dB, and 30 dB section in the A10 assembly. Total input attenuation with the A9 and the A10 combined is 70 dB in 2 dB steps.

A11 Low Band Switch

This assembly operates across the entire frequency range of the analyzer. The switch has 3 main functions:

– Switch RF input frequencies from 3 Hz to 3.59 GHz RF Output to A13 RF Front End Assembly.

– Switch input frequencies from 3.6 GHz to 26.5 GHz Microwave RF Output to A12, YTF Preselector.

– Contains optional high band preamplifier, which has a typical gain of 30 dB and a noise figure from 9 to 12 dB up to 18 GHz.

– Contains protective limiter circuitry.

A12 YTF Preselector

The YTF Preselector is used for input frequencies greater than 3.6 GHz. Signals less than 3.6 GHz bypass the YTF assembly and are routed to the low band input of the A13 RF Front End Assembly. The YTF Preselector is a YIG tunable bandpass filter whose main purpose is to track the input signal and to filter out unwanted spurious or image response signals. The YTF Preselector has a 3 dB bandwidth greater than 40 MHz and an insertion loss of ~ 6.5 dB.

The preselector requires centering for optimum amplitude accuracy. The Auto Align routine will perform a rough centering during the preselector two point tuning algorithm. However, when troubleshooting, press **Amplitude**, **Preselector Center** to manually center the preselector.

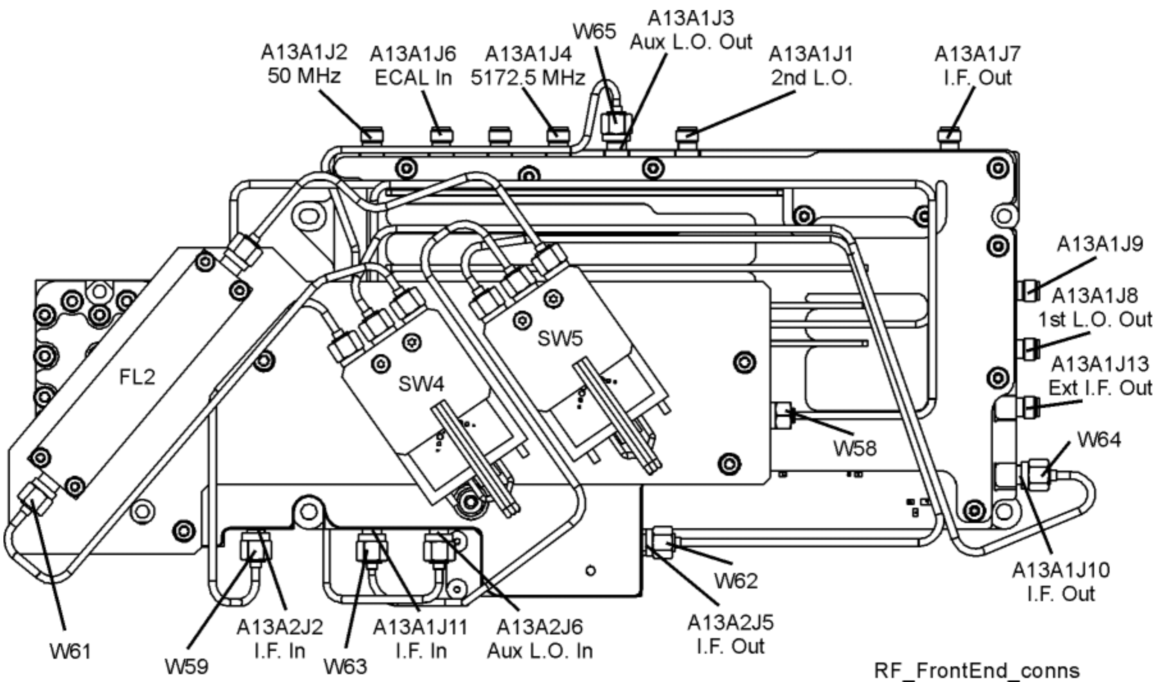
A20 YTO Assembly

Provides the 1st LO signal that is required for the A13 RF Front End Assembly. The 1st LO has a frequency range from 3.50 to 9 GHz. The output power is +13 to +18 dBm. In order to maximize the conversion efficiency and avoid LO unlock, sufficient LO power must be supplied.

A13 RF Front End Assembly

This assembly consists of two circuit boards. A13A1 contains the major front end conversion components. A13A2 contains the switched filters and LO and IM nulling circuits. A13A1 and A13A2 are not separately replaceable. The entire A13 assembly must be replaced. See Figure 4-1.

Figure 4-1 A13 RF Front End Assembly



This assembly contains the following circuits:

- Input Low-pass filter (RF input signals < 3.6 GHz)
- Optional Low Band Electronic Attenuator (0-24 dB attenuation control)
- Optional Low Band Preamplifier and Limiter
- RF Mixer #1 (RF input signals < 3.6 GHz)
- 1st LO Sub-system (3.8 GHz to 8.7 GHz)
- 1st IF Amplifier (5122.5 MHz)
- Switched Filters (A13A2) provides wide BW band pass filter (low band)
- LO and IM nulling (A13A2)
- Mixer #2 (RF input signals 3.6 GHz to 13.599 GHz)
- Microwave Input Amplifier
- Mixer #3 (RF input signals 13.6 GHz to 26.5 GHz)
- LO Doubler
- External Mixing Diplexer

A15 Front End Control Assembly

Provides the correct biasing and switch control logic to the following RF assemblies:

- Input Attenuator A
- Input Attenuator B
- Low Band Switch
- (Option LNP) Low Noise Path (standard on UXA)
- YTF Preselector (Input signals > 3.6 GHz)
- (Option MPB) Microwave Preselector Bypass (standard on UXA)
- Front End Assembly including switched filter
- (Optional) High Band Preamplifier
- (Optional) Low Band Preamplifier
- (Option EA3) Electronic Attenuator (0-24 dB)

NOTE

Refer to Chapter 5, “Front End Control Troubleshooting.” for detailed descriptions & troubleshooting procedures

Troubleshooting

Quick Check to Verify the Low Band Signal Path

The analyzer has an internal 50 MHz amplitude reference signal that is used to verify the low band path. This 50 MHz calibrator is used when the analyzer performs many of the internal alignment routines. Therefore, the functionality of the 50 MHz calibrator and low band path are critical to passing Align All Now. Refer to the RF Lowband Path Block Diagram (Options 508, 513, and 526) in Chapter 12 for details. Reference the instrument settings box on the block diagram.

Equipment needed:

Spectrum Analyzer with frequency range to 8 GHz

Signal source with output power 0 dBm and frequency range to at least 3.6 GHz

Power splitter, 11667B

2 each, quality SMA or 3.5 mm cables

90° SMA (m) to SMA (f) adapter

MMCX (f) to SMA (f) cable or adapter

SMA (f) to SMA (f) adapter

SMA (m) to SMA (m) adapter

NOTE To perform the following checks, it will be necessary to remove the outer cover, top brace, and possibly more brackets. See Chapter 15, “Assembly Replacement Procedures.” 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)**, **Center Frequency**, **50 MHz**, **Span**, **1 MHz**, **Peak Search**. The 50 MHz reference signal should measure 50 MHz @ –25 dBm ± 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 incorrect, select the 4.8 GHz RF Calibrator and set the analyzer center frequency to 4.8 GHz. Since several of the same signal path components are shared between low band and high band, determining if the problem appears in both paths is helpful.

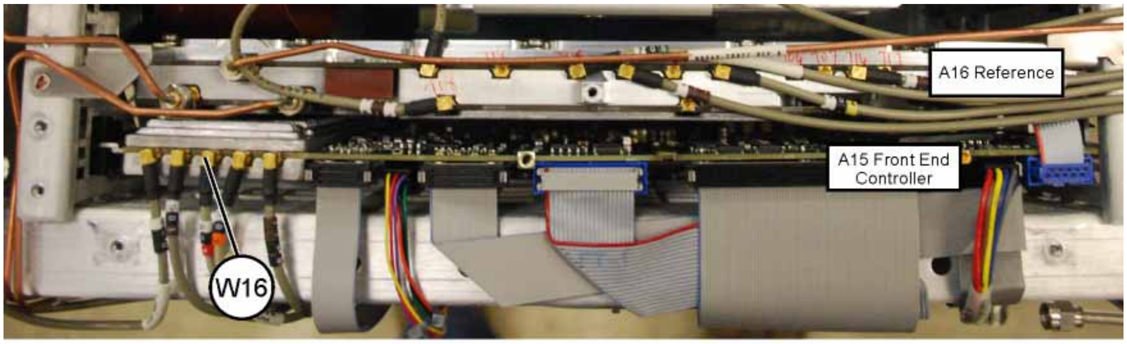
To verify the high band path go to “Quick Check to Verify High Band RF Path” on page 165.

If the power level is not within tolerance, press **FREQ (Channel)**, **Toggle Swept Span to Zero Span**, **AMPTD (Y Scale)**, **Attenuation**, **10 dB**.

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

Disconnect the W16 cable from A15J902 on the Front End Controller IF IN. The end of W16 cable is easily accessed from the top of the instrument (See Figure 4-2.

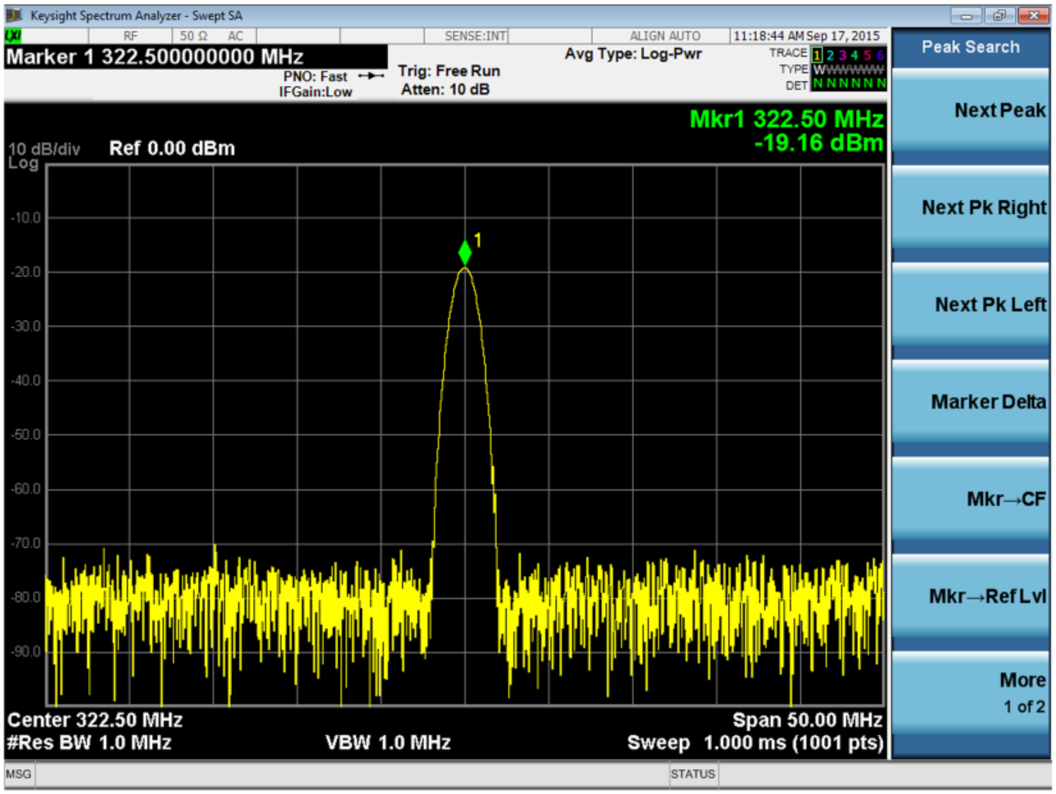
Figure 4-2 W16 at Front End Controller



W16

Connect W16 cable output to a functioning spectrum analyzer and verify the 322.5 MHz intermediate frequency is measuring –20 dBm ± 3 dB using the same analyzer settings as in Figure 4-3.

Figure 4-3 322.5 MHz Intermediate Frequency



If this power level is correct the signal path from the A9 50 MHz Reference signal input port to W16, IF Output is operating correctly using a 50 MHz input calibrator signal. Reconnect the W16 cable to A15J902.

NOTE Flatness issues or power level problems at other input frequencies below 3600 MHz may exist. This type of problem can be diagnosed using an external source to verify performance

If this power level is incorrect, the following assemblies need to be verified using the 50 MHz internal calibrator signal. Be sure the 50 MHz calibrator is turned on. Press **Input/Output**, **RF Calibrator**, **50 MHz** when verifying the performance.

1. A11 Low Band Switch
2. A10 Input Attenuator B
3. A9 Input Attenuator A
4. A16 Reference Assembly (50 MHz calibrator, 2nd LO)
5. A20 YTO
6. A13 RF Front End Assembly

NOTE

In order to gain access to the front end components, remove the front frame assembly, but leave the ribbon cable connected so you can still control the instrument. Remove the right side chassis. Refer to the removal procedures in Chapter 15, “Assembly Replacement Procedures.”.

Troubleshooting a Low Band Problem

Refer to the RF Lowband Path Block Diagram in Chapter 12 and follow the instructions in the settings box. To enable the internal 50 MHz, –25 dBm calibrator signal press **Input/Output**, **RF Calibrator**, **50 MHz**.

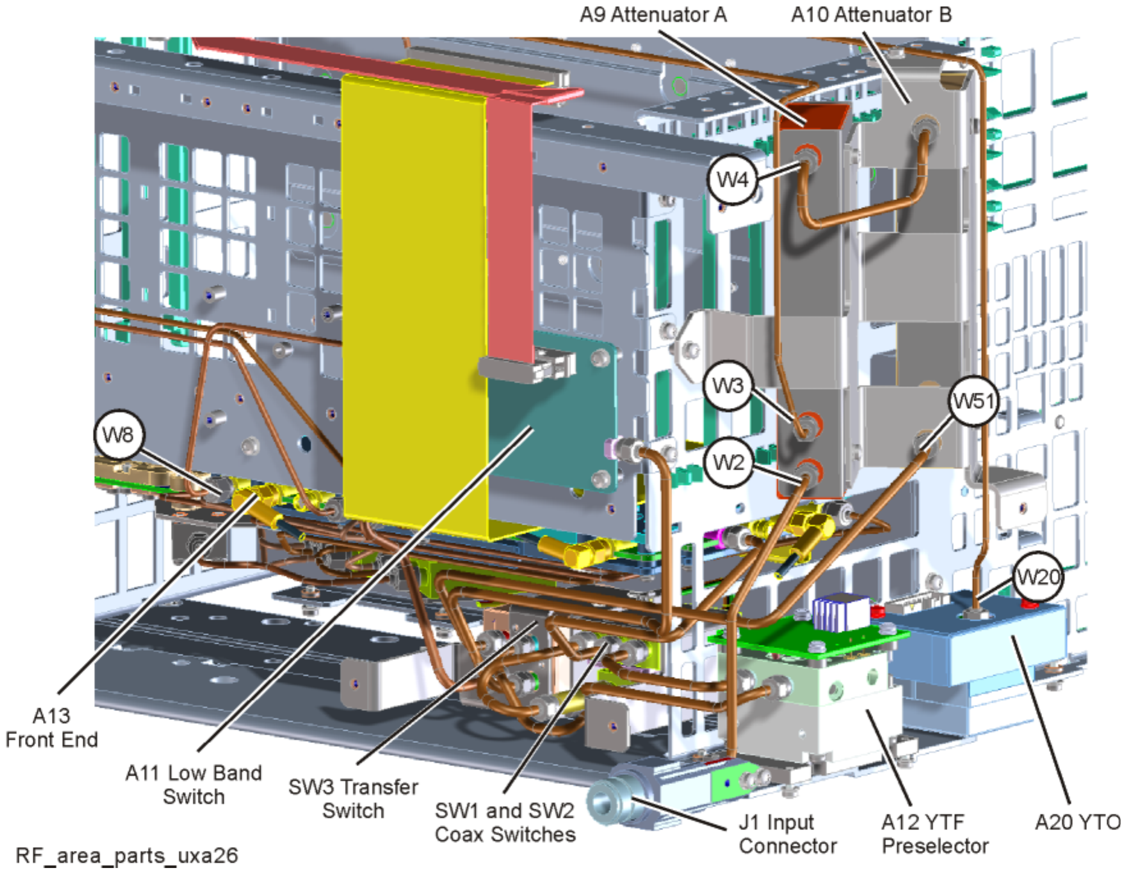
The Low Band signal path (sometimes referred to as Band 0) is used for all signals less than 3.6 GHz when the analyzer is used in normal operation. If the stop frequency is set to 3.6 GHz, the analyzer displays only the Low Band signal path. If the analyzer stop frequency is set above 3.6 GHz and the start frequency is set below 3.6 GHz, the analyzer will sweep up to 3.6 GHz in low band and then automatically switch to the high band path above 3.6 GHz.

A11 Low Band Switch Verification

Disconnect W8 from A13A1J2. See Figure 4-4 for location of connector. Attach a right angle sma adapter to W8 and measure the output of the Low Band Switch with a spectrum analyzer. Expected signal is 50 MHz at –35.3 dBm since the Low Band Switch and Option LNP SW3 have a few tenths of a dB loss.

If the signal level is incorrect, remove A10 Input Attenuator B output cable W51 and measure the output power. Expected signal is 50 MHz at –35 dBm. See Figure 4-4 for location of attenuator. If the attenuator output signal is correct but the Low Band output at W8 is incorrect, suspect the A11 Low Band Switch, the interconnect cables, Switch 3 if Option LNP is present, or the control signals. The control signals are explained in Chapter 5, “Front End Control Troubleshooting”, on page 175.

Figure 4-4 RF Section



A9 Input Attenuator and A10 Input Attenuator Verification

Calibrator Switch Test

On the A16 Reference assembly, disconnect semi rigid cable W3 from A16J701 and measure A16J701 with a spectrum analyzer. Expected signal is 50 MHz at –25 dBm ± 0.5 dB. If signal level is incorrect, suspect A16 Reference assembly is faulty, or the 50 MHz calibrator amplitude requires adjustment using the field calibration software.

To verify calibrator switch operation, connect external signal source set to 50 MHz and –25 dBm to the RF input connector of analyzer under test. Press **Input/Output**, **RF Calibrator**, **Off**. If the signal level at the attenuator output is now correct, suspect the A9 Attenuator cal switch or a faulty control signal from the A15 Front End Controller assembly.

Attenuator Check

Set the signal source connected to the analyzer input port to 0 dBm. On the analyzer, press **Amplitude**, **Attenuation**, and change input attenuation to 0 dB. The measuring spectrum analyzer connected to A10 Attenuator output port should indicate a 0 dBm level.

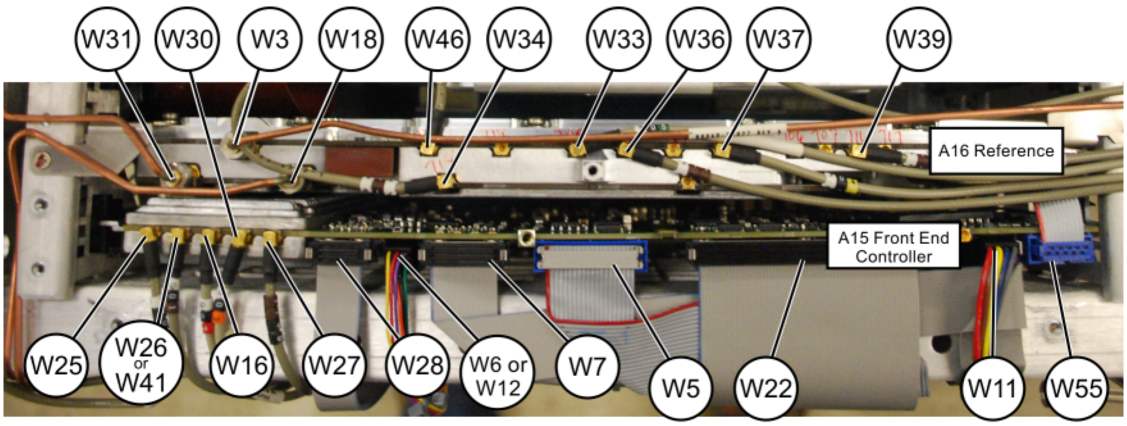
Change the input attenuation on the analyzer under test to 2 dB. See the chart below for expected measurement values at the A10 Attenuator output port.

Analyzer Under Test Attenuator Setting (dB)	Power at A10 Output Port	Input Attenuator Being Tested
0	0 dBm (reference)	Both set to through path
2	–2	A9
4	–4	A9
6	–6	A10
8	–8	A9 set to 2 dB, A10 set to 6 dB
10	–10	A10
20	–20	A10
30	–30	A10
40	–40	A10
50	–50	A10
60	–60	A10
70	–70	A9 set to 4 dB, A10 set to 66 dB

Second LO Level Verification

The second LO signal comes from the A16 Reference Assembly and is only used in Low Band. The second LO signal can be measured by removing the W18 semi-rigid cable from A16J702. Connect the functioning spectrum analyzer to A16J702 connector. This signal goes to A13A1J1 via the W18 cable. Expected signal is 4800 MHz at +10 dBm when a low loss test cable is used and with the measuring spectrum analyzer input attenuator set to at least 20 dB to prevent overload.

Figure 4-5 A16



front_cables_uxa

First LO Level Verification

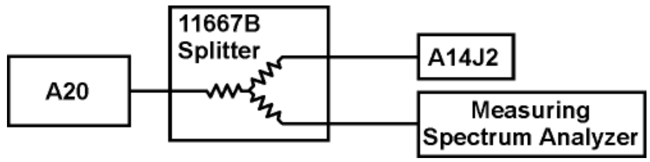
The first LO is the A20 YTO assembly. The first LO is phased locked by the A14 Synthesizer assembly.

To assure the first LO is tuned to the correct frequency and power, measure the A13 Front End assembly at A13A1J3 when the analyzer center frequency is 50 MHz. This test port is chosen because removing cable W19 will not cause the analyzer LO phase lock loop to unlock, which would affect the LO frequency measurement. Analyzer settings should be **FREQ (Channel)**, **Center Frequency**, **50 MHz**, **Span**, **Zero Span**, **System**, **Alignments**, **Auto Align Off**.

The LO signal should measure 5172.5 MHz at 0 dBm ± 3 dB.

If the signal level is incorrect, measure the signal coming from the A20 YTO. In order to measure this signal and avoid an LO Unlock, you will need to install a power splitter. Remove the W20 cable that attaches to A14J2. Connect the input of the splitter to W20 cable using a sma (m) to sma (f) elbow. Connect one arm of the splitter to where the W20 cable was connected. You might want to use a short flexible semi-rigid cable. Connect the measuring spectrum analyzer to the other arm of the splitter. Add the loss through the splitter arm which is 6 dB for the Keysight 11667B splitter.

Figure 4-6 Measuring Setup



The signal should be 5172.5 MHz at +7 dBm ± 3 dB because of the 6 dB loss through the 11667B splitter.

NOTE The output power from A20 is 5172.5 MHz at +13 dBm.

A13 Front End Assembly Verification

NOTE The A13 Front End assembly is shown as A13A1 and A13A2 for troubleshooting clarification. However, A13A1 and A13A2 are not separately replaceable. The entire A13 assembly must be replaced.

Many portions of the Front End Assembly have been verified earlier in the Low Band troubleshooting process outlined above.

The input signal level was measured on W8 as part of the A11 Low Band Switch verification.

The output signal level was measured at W16 during the quick check to verify the Low Band Signal Path.

The Second LO input was tested during the Second LO Verification.

The LO input at W21, and the LO outputs were tested when performing the First LO Verification.

Electronic Attenuator Test (Option EA3)

The electronic attenuator is aligned as part of the System Gain internal alignment process. See the description of the initial alignments and the location of the alignment history file in the Boot Up and Initialization Troubleshooting chapter. Viewing the Alignment History file will tell you if other alignment tests failed, and reveal which electronic attenuator steps failed.

To verify the electronic attenuator operation on instruments with Option EA3, set up the analyzer to view the 50 MHz calibrator signal on screen. Press **Input/Output**, **RF Calibrator**, **50 MHz**, **FREQ (Channel)**, **Center Frequency**, **50 MHz**, **Span**, **500 kHz**

Press **Peak Search** to place a marker on the calibrator signal, then press **Marker Delta**

Activate the electronic attenuator. Press **AMPTD**, **Attenuation**, **Elec Atten**, **Enabled**.

Press the up arrow key to step through all attenuator steps while monitoring the marker delta readout. The signal level should not change more than 0.4 dB as indicated by the marker delta readout.

If the attenuator switches slowly, or the signal is not present when the electronic attenuator is switched into the signal path or the signal appears only when the attenuator is switched on, suspect the control signals from the A15 Front End Controller are faulty or the A13 Front End assembly is faulty. If the attenuator switches, but the switching error between attenuator settings is greater than ± 0.4 dB, assure that any other internal alignment failures are resolved since the System Gain alignment must run before optimum performance is possible. Assure you have evaluated all causes before you replace the Front End assembly.

If you determine the problem is at a frequency other than 50 MHz, perform the low band flatness adjustment before replacing the Front End assembly.

Low Band Preamp (Option P08, P13, P26)

The Preamp is aligned as part of the System Gain internal alignment process. See the description of the initial alignments and the location of the alignment history file in Chapter 2, “Boot Up and Initialization Troubleshooting”, on page 53. Viewing the Alignment History file will tell you if other alignment tests failed, and reveal pass or fail information for the preamp.

If any of the preamp options are installed, the Low Band preamp can be verified as follows:

Set up the analyzer to view the 50 MHz calibrator signal on screen

Press **AMPTD**, **Attenuation**, and verify that the Elec Atten is set to Disabled. It is not possible to turn on both the electronic attenuator and preamp at the same time.

To activate the internal preamplifier press **AMPTD**, **Signal Path**, **On**.

The expected operation is the signal level will not change more than ± 0.5 dB and the noise floor will increase due to the fact the input attenuator is automatically increased. If the amplitude error when switching the preamp on and off is greater than 0.5 dB, assure that any other internal alignment failures are resolved since the System Gain alignment must run before optimum performance is possible. Assure you have evaluated all causes including A15 Front End Controller switching problems, before you replace the Front End assembly.

If you determine the problem is at a frequency other than 50 MHz, perform the low band flatness adjustment before replacing the Front End assembly.

Low Band Mixing Equations

Low Band first mixer:

RF = LO – IF
IF = LO – RF
LO = IF + RF
where RF is the input signal at the signal analyzer

Low Band second mixer:

RF = LO + IF
IF = RF – LO
LO = RF – IF
where RF in this case is the first IF signal (signal at A13A1J11)

Quick Check to Verify High Band RF Path

Refer to the RF Highband Path #1 Block Diagram in Chapter 12.

The High Band signal path (sometimes referred to as Band 1-Band 4) is used for all signals 3.6 GHz and above. If the start frequency is set to 3.6 GHz and above, the analyzer displays only the High Band signal path. If the analyzer start frequency is below 3.6 GHz and the Stop frequency is set above 3.6 GHz, the analyzer will start sweeping in Low Band up to 3.6 GHz, and then automatically switch to the high band path above 3.6 GHz.

Equipment needed:

Spectrum Analyzer with frequency range to 14 GHz

Signal source with output power 0 dBm and frequency range to at least 26 GHz

Power splitter, 11667B

2 each, quality SMA or 3.5 mm cables

90° SMA (m) to SMA (f) adapter

MMCX (f) to SMA (f) cable or adapter

SMA (f) to SMA (f) adapter

SMA (m) to SMA (m) adapter

NOTE To perform the following checks, it will be necessary to remove the outer cover, top brace, and possibly other brackets. See Chapter 15, "Assembly Replacement Procedures." for removal procedures.

Turn the instrument on and allow it to complete its full boot up process to Signal Analyzer mode. Use the internal 4.8 GHz, –28 dBm calibrator signal as a reference for troubleshooting by pressing **Mode Preset**, **Input/Output**, **RF Calibrator**, **4.8 GHz** on the analyzer. Now press **FREQ (Channel)**, **4.8 GHz**, **Span**, **1 MHz**, **Peak Search**.

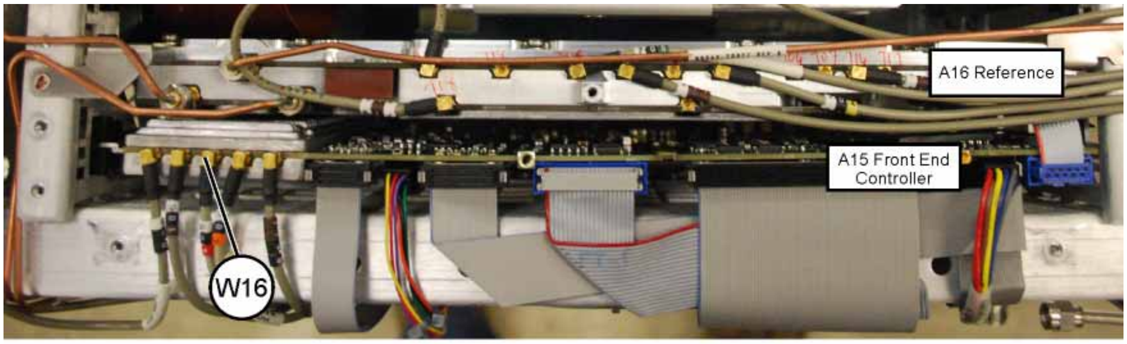
The 4.8 GHz reference signal should measure –28 dBm ± 2 dB on the analyzer display. If the power level is within tolerance, the 3.6 GHz to 13.6 GHz path is functioning correctly at 4.8 GHz.

If the power level is incorrect, select the 50 MHz RF calibrator and set the analyzer center frequency to 50 MHz. Since several of the same signal path components are shared between high band and low band, determining if the problem appears in both paths is helpful

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

Disconnect cable W16 at A15J902, 322.5 MHz output on the A15 Front End Controller. See Figure 4-7. Select Span, 0 Hz.

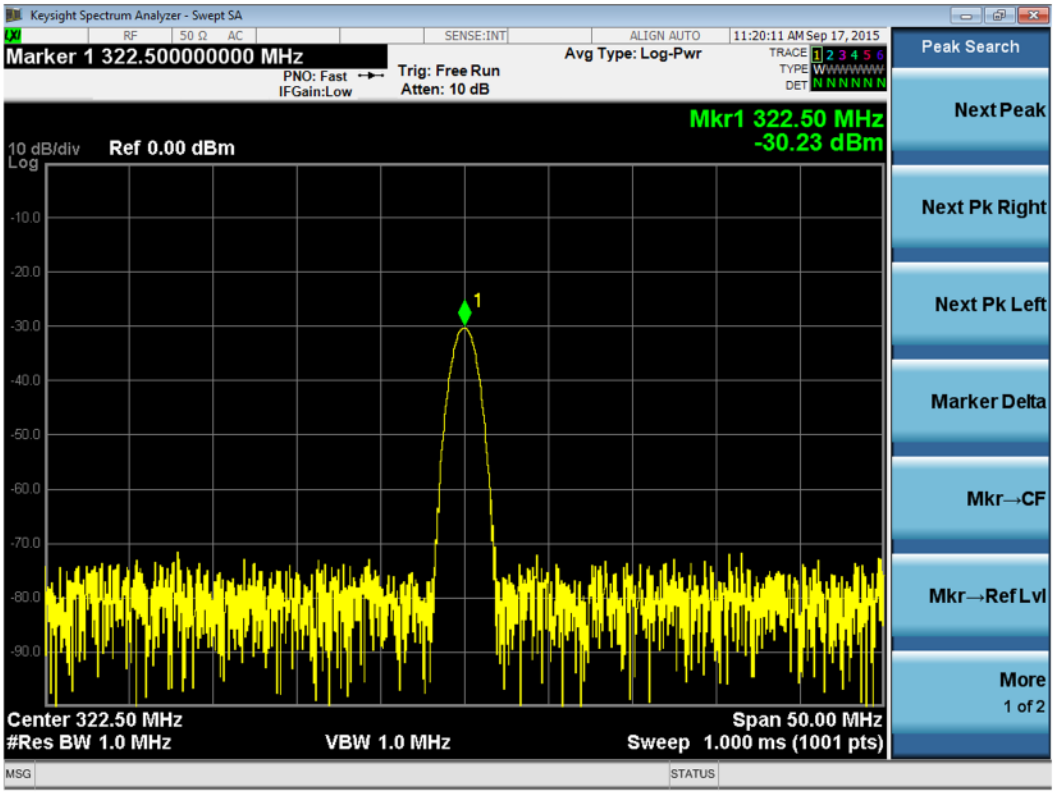
Figure 4-7 A15J902 Location (Options 508, 513, and 526)



W16

Connect W16 output to a functioning spectrum analyzer and verify the 322.5 MHz intermediate frequency is measuring –31 ± 4 dB as shown in Figure 4-8.

Figure 4-8 322.5 MHz Intermediate Frequency



If this power level is correct the Front End assembly is operating correctly in high band. If this power level is incorrect verify the following assemblies using the 4.8 GHz internal calibrator signal.

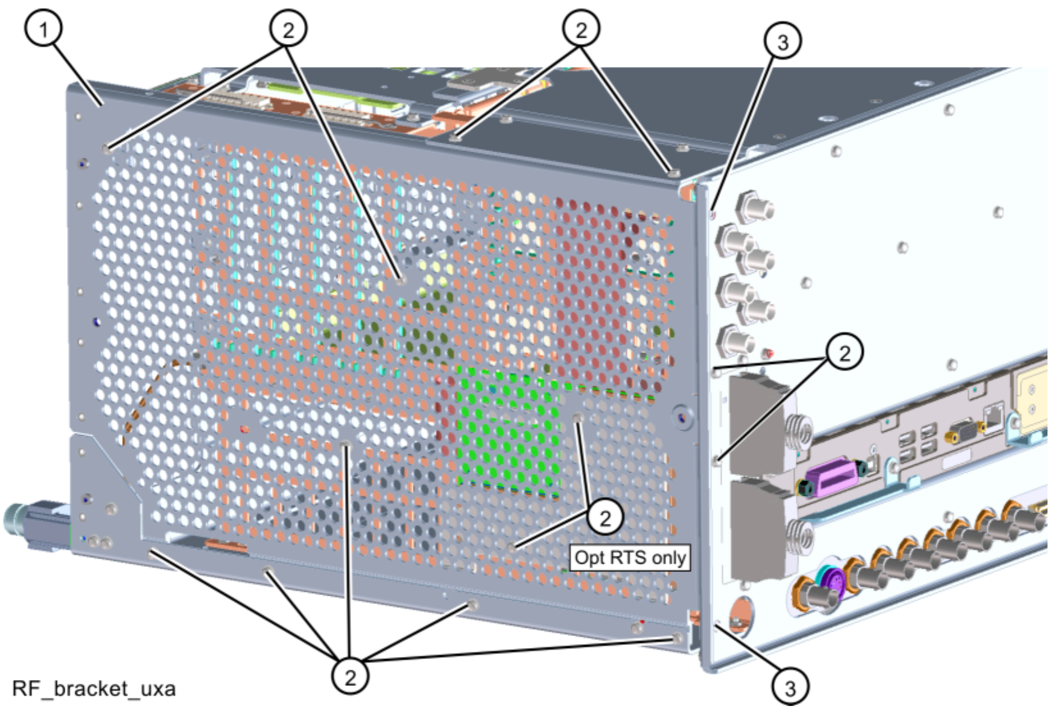
1. A11 Low Band Switch
2. A10 Input Attenuator B
3. A9 Input Attenuator A
4. A16 Reference Assembly (4.8 GHz calibrator)
5. A20 YTO
6. A12 YTF Preselector
7. A13 Front End Assembly

NOTE

High Band #2 signal path utilizes a high band mixer internal to the A13 Front End Assembly for input frequencies from 13.6 GHz to 26.5 GHz. Failures from 13.6 GHz – 26.5 GHz will most likely be caused by the A13 RF Front End Assembly. If the failure is amplitude related, proper adjustments such as frequency response and the YTF Preselector adjust should be performed first before changing the A13 RF Front End Assembly.

In order to gain access to the front end components, remove the side chassis **(1)** by removing the eleven screws **(2)** (0515-0372) and the two screws **(3)** (0515-1946). See Figure 4-9.

Figure 4-9 Remove the Side Chassis



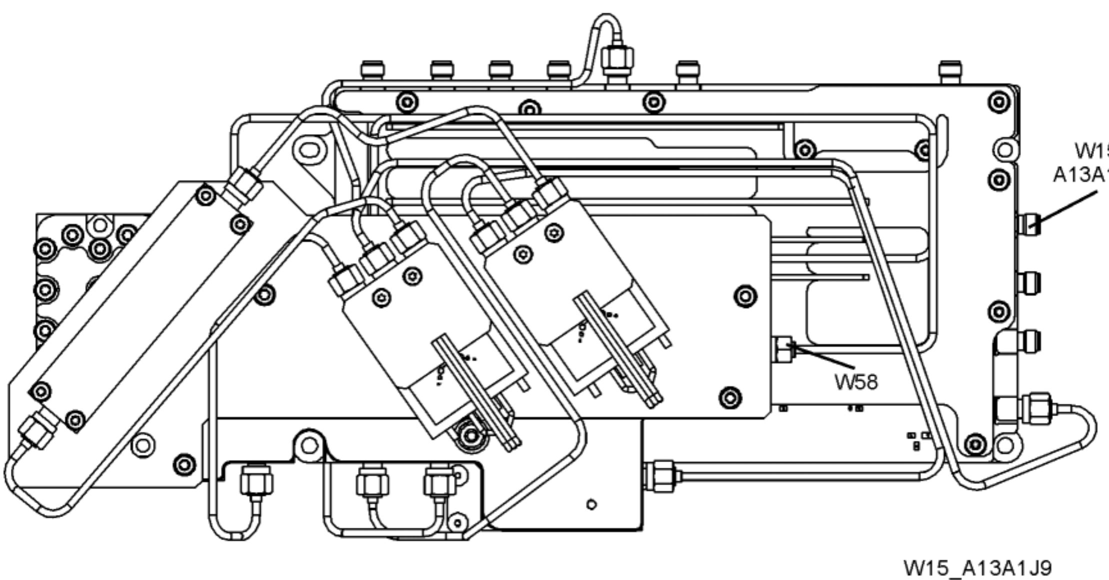
Troubleshooting a High Band Problem

Refer to the RF Highband Path #1 Block Diagram in Chapter 12 and follow the instructions in the settings box. To enable the internal 4.8 GHz, –28 dBm calibrator signal press **Input/Output**, **RF Calibrator**, **4.8 GHz**.

A13 Front End Input Verification

Disconnect W15 from A13A1J9 See Figure 4-10 for location of connector. Loosen the other end of W15 which attaches to SW1to avoid damaging the cable. Attach a right angle sma adapter to W15 and measure the input to the A13 Front End with a spectrum analyzer.

Figure 4-10 A13A1J9 Location

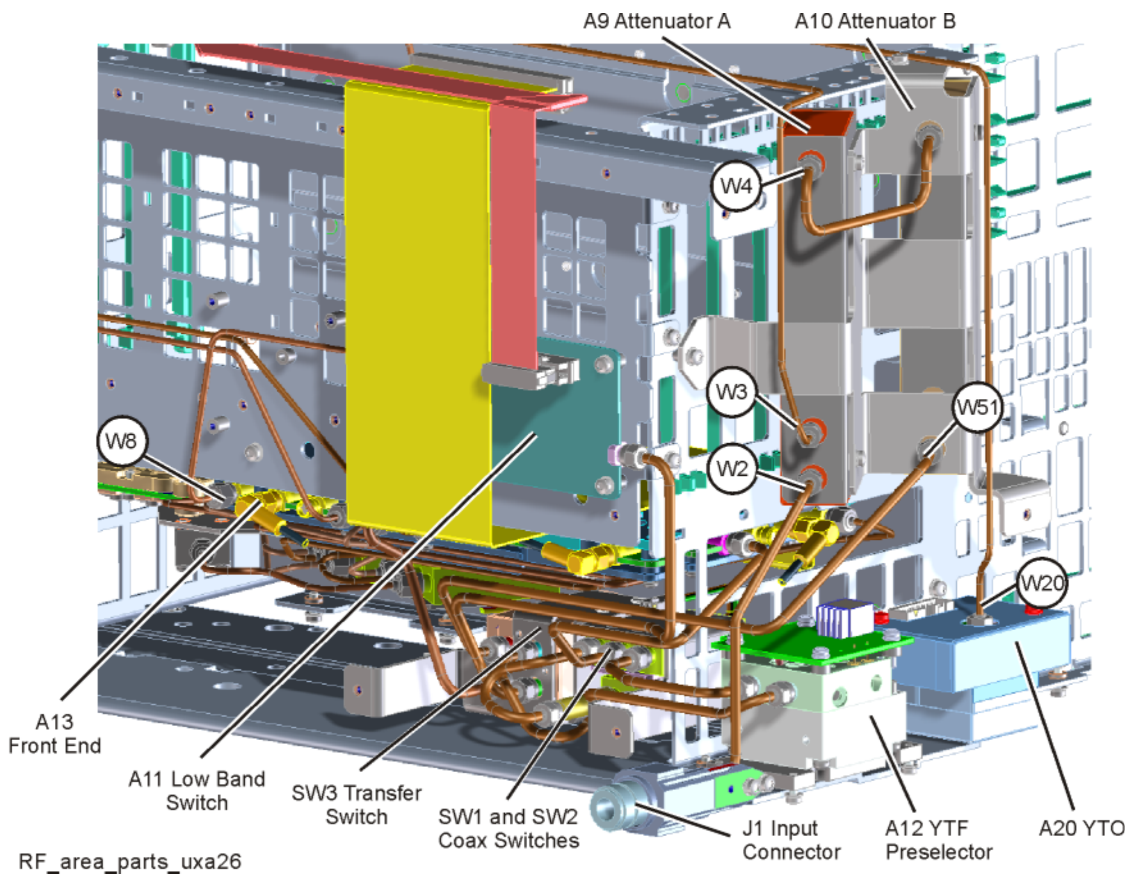


Expected signal is 4.8 GHz at –51 dBm ± 4 dB. The tolerance is large because the A12 YTF (microwave preselector) loss varies between devices, and the YTF may not be perfectly aligned, or the frequency response adjustment may be required.

If the signal level is incorrect, press **AMPTD (Y Scale)**, **Signal Path**, **uWPath Control**, **uW Preselector Bypass**. If the signal level is now –52 dBm, suspect the A12 YTF is out of adjustment or faulty.

To perform the YTF alignment, reconnect W15 cable, and press **System**, **Alignments**, **Advanced**, **Characterize Preselector**. The routine may take several minutes to align the YTF. Display the 4.8 GHz calibrator signal on screen as explained in the quick check section. If the signal level is still incorrect, suspect all assemblies, cables, switches and the A16 Reference calibrator signal between the W15 cable and the input to the A9 Attenuator.

Figure 4-11 RF Section



A9 Input Attenuator A and A10 Input Attenuator B Verification

Calibrator Switch Test

On the A16 Reference assembly, disconnect semi rigid cable W3 from A16J701 and measure A16J701 with a spectrum analyzer. Expected signal is 4.8 GHz at –28 dBm ± 0.5 dB. If signal level is incorrect, suspect A16 Reference Assembly.

To verify calibrator switch operation, connect external signal source set to 4.8 GHz and –25 dBm to the RF input connector of analyzer under test. Press **Input/Output**, **RF Calibrator**, **Off**. If the signal level at the attenuator output is now correct, suspect the A9 Attenuator cal switch or a faulty control signal from the A15 Front End Controller assembly.

Attenuation Check

Set the signal source connected to the analyzer input port to 0 dBm. On the analyzer, press **Amplitude**, **Attenuation**, and change input attenuation to 0 dB. The measuring spectrum analyzer connected to A10 Attenuator output port should indicate a 0 dBm level. Change the input attenuation on the analyzer under test to 2 dB.

See the chart below for expected measurement values at the A10 Attenuator output port.

Analyzer Under Test Attenuator Setting (dB)	Power at A10 Output Port	Input Attenuator Being Tested
0	0 dBm (reference)	Both set to through path
2	–2	A9
4	–4	A9
6	–6	A10
8	–8	A9 set to 2 dB, A10 set to 6 dB
10	–10	A10
20	–20	A10
30	–30	A10
40	–40	A10
50	–50	A10
60	–60	A10
70	–70	A9 set to 4 dB, A10 set to 66 dB

First LO Level Verification

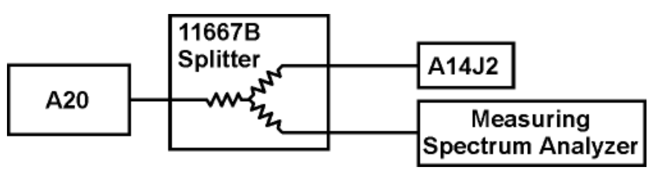
The first LO is the A20 YTO assembly. The first LO is phased locked by the A14 L.O. Synthesizer assembly. Control signals to the A20 YTO come from the A14 L.O. Synthesizer.

To assure the first LO is tuned to the correct frequency and power, measure the A13 Front End assembly at A13A1J3 when the analyzer center frequency is 50 MHz. This test port is chosen because removing cable W19 will not cause the analyzer LO phase lock loop to unlock, which would affect the LO frequency measurement. Analyzer settings should be **FREQ (Channel)**, **Center Frequency**, **4.8 GHz**, **Span**, **Zero Span**, **System**, **Alignments**, **Auto Align Off**.

The LO signal should measure 5122.5 MHz at 0 dBm ± 3 dB.

If the signal level is incorrect, measure the signal coming from the A20 YTO. In order to measure this signal and avoid an LO Unlock, you will need to install a power splitter. Remove the W20 cable that attaches to A14J2. Connect the input of the splitter to W20 cable using a sma (m) to sma (f) elbow. Connect one arm of the splitter to where the W20 cable was connected. You might want to use a short flexible semi-rigid cable. Connect the measuring spectrum analyzer to the other arm of the splitter. Add the loss through the splitter arm which is 6 dB for the Keysight 11667B splitter.

Figure 4-12 Measuring Setup



The signal should be 5122.5 MHz at +7 dBm ± 3 dB because of the 6 dB loss through the 11667B splitter.

NOTE The output power from A20 is 5122.5 MHz at +13 dBm.

A13 Front End Assembly Verification

NOTE

The A13 Front End assembly is shown as A13A1 and A13A2 for troubleshooting clarification. However, A13A1 and A13A2 are not separately replaceable. The entire A13 assembly must be replaced.

Many portions of the Front End Assembly have been verified earlier in the High Band troubleshooting process outlined above.

The input signal level was measured on W15 as part of the A13 Front End Input Verification.

The output signal level was measured at the output of W16 cable during the quick check to verify the High Band signal path.

The LO input at W20, and the LO outputs were tested when performing the First LO Verification.

High Band Preamp (Option P08, P13, P26)

If a preamp option listed above is installed, the High Band preamp can be verified as follows:

View the 4.8 GHz calibrator signal on screen. Press **AMPTD Y Scale**. Tap **Signal Path**, **Internal Preamp Low Band**, **Full Range**, **On** to activate the preamp.The expected operation is the signal level will not change more than +/- 0.5 dB and the noise floor will increase due to the fact the input attenuation was automatically increased.

If the amplitude error when switching the preamp on and off is greater than 0.5 dB, assure that any other internal alignment failures are resolved since the System Gain alignment must run before optimum performance is possible. The amplitude error could be caused by poor frequency response, and performing the high band frequency response adjustment (using the calibration software) will adjust the preamp on, high band path. Assure you have evaluated all causes including A15 Front End Controller switching problems, before you replace the Front End assembly.

High Band Mixing Equations

For input signal frequencies from 3.6 GHz to 8.4 GHz
and 13.6 GHz to 17 GHz:

RF = LO x N – IF
IF = LO x N – RF
LO x N = IF + RF
where RF is the input signal at the signal analyzer
where N is the harmonic mixing mode:
N = 1 for 3.5 GHz to 8.4 GHz
N = 2 for 13.5 GHz to 17 GHz

For input signal frequencies above 8.4 GHz to 13.6 GHz
and 17 GHz to 26.5 GHz:

RF = LO x 2 x N – IF
IF = LO x 2 x N – RF
LO x 2 x N = RF + IF
where RF is the input signal at the signal analyzer
where N is the harmonic mixing mode:
N = 1 for 8.4 GHz to 13.6 GHz
N = 2 for 17 GHz to 26.5 GHz

Low Noise Path (Option LNP)

Allows the Lowband Switch assembly to be bypassed, improving sensitivity in high band path.

Press **AMPTD Y Scale**. Tap **Signal Path**, **uW Path Control**, **Low Noise Path Enable** key. The Low Noise Path will be enabled only after the following conditions are met:

1. The start frequency must be 3.6 GHz or greater.
2. The high band preamp (Option P08, P18, P26) must be Off.

When Switch 3 changes state, you will hear a click. The amplitude of the displayed signal should not change.

Microwave Preselector Bypass (Option MPB)

Allows the YTF to be bypassed improving amplitude accuracy.

Assure start frequency is 3.6 GHz or greater. Press **AMPTD Y Scale**. Tap **Signal Path**, **uW Path Control**, **uW Preselector Bypass**.

When the bypass switches Switch 1 and Switch 2 change state you will hear a click. Depending on the signal source connected, you may see many “signals” appear on screen because without preselection, the analyzer will display images and multiples. The real input signal should not change amplitude when you switch the uW Preselector Bypass on and off.

Keysight Technologies
N9040B UXA Signal Analyzer

Service Guide

5 Front End Control Troubleshooting

What You Will Find in This Chapter

The following information is presented in this chapter:

1. Theory of operation of the Front End Control section.
2. Isolating the cause of a hardware problem by verifying the functionality of assemblies of the Front End Control.

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.

The following information is found in this chapter:

KEYSIGHT TECHNOLOGIES

A15 Front End Control Description

Purpose

The A15 Front End Controller board functionality can be broken down into (3) main categories

1. **Provides switch control logic and bias voltages to the major RF front end assemblies in the N9040B Signal Analyzer.**
2. **Contains on board circuitry providing various signal outputs to other locations within the analyzer.**
3. **Provides control logic for various instrument options within the analyzer.**

These signals are routed to and from the A15 via ribbon cables, wiring harnesses and coaxial cables. The RF front end assemblies require the correct control logic and bias in order to function properly. If the voltages from the A15 are not correct, the RF input signals will most likely be displayed at an incorrect power level if they even get displayed at all.

Standard RF Assemblies Controlled by the A15:

– A9 Input Attenuator A (4 dB total for Opt 508, 513, 526)
– A10 Input Attenuator B (66 dB total for Opt 508, 513, 526)
– A11 Low Band Switch
– A12 YIG Tuned Filter
– A13 RF Front End Assembly

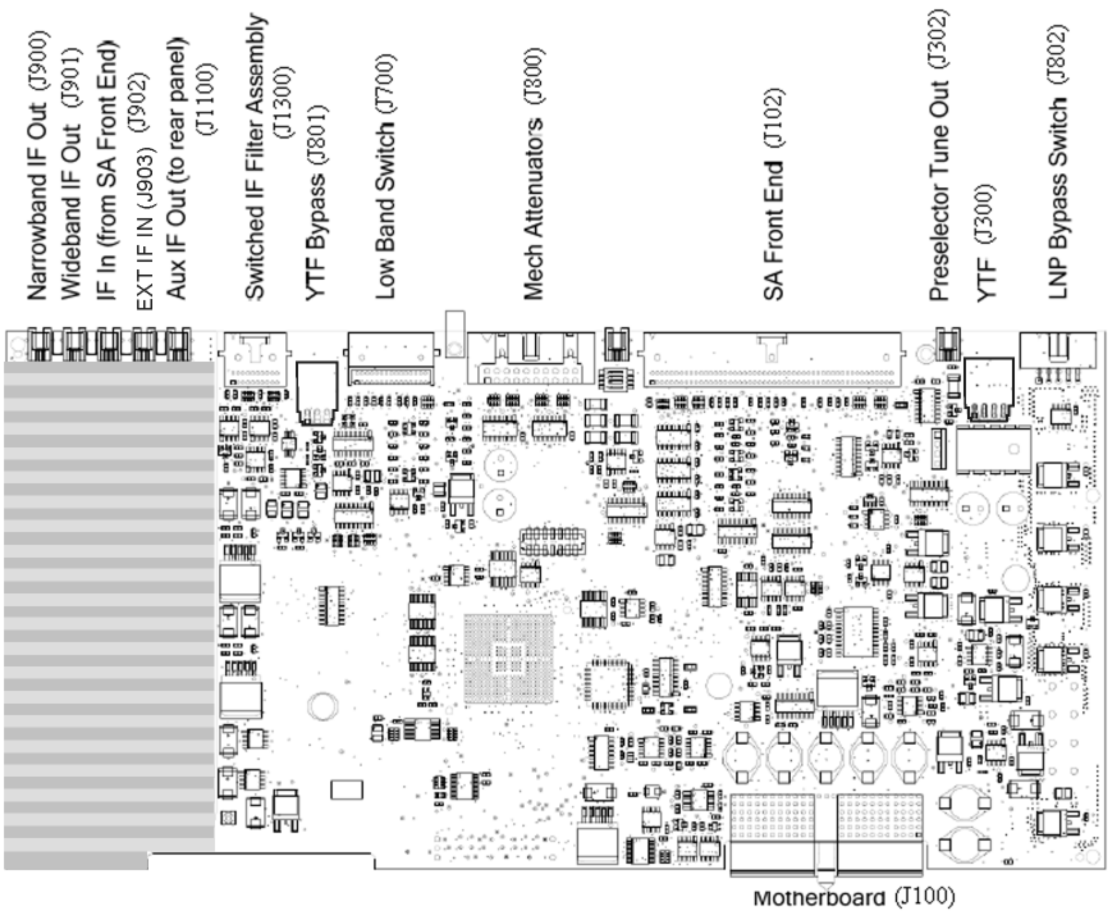
A15 On Board Circuits:

– RF Burst Trigger (When set to Relative Trigger or when start frequency is > 300 MHz.)
– Switched IF Filter Control
– 1st L.O. Optimization
– YTF Tune Ramp
– Preselector Tune Out (Provides output voltage, not specified, reserved for future use)
– Mixer Bias
– Amplifier Bias
– Switch Control
– Sweep Ramp (reserved for future use)

Table 5-1 A15 Option Related Control

Option	Description	Physical Location in the Analyzer
P08	100 kHz to 8.4 GHz Internal Preamplifier	A15 to A11 and A13
P13	100 kHz to 13.6 GHz Internal Preamplifier	A15 to A11 and A13
P26	100 kHz to 26.5 GHz Internal Preamplifier	A15 to A11 and A13
ALV	Log Video Out	A15 to Aux IF Output (rear panel)
CRP	Arbitrary I.F. Out	A15 to Aux IF Output (rear panel)
CR3	2nd I.F. Out	A15 to Aux IF Output (rear panel)
LNP	Low Noise Path	A15 to SW3
MPB	Microwave Preselector Bypass	A15 to SW1 and SW2 (Opt 508, 513, or 526)
EA3	Electronic Attenuator	A15 to A13

Figure 5-1 A15 Front View, Physical Connectors



pxafec2

The table below describes the connector location and the final destinations of the RF signal, switch control logic or bias voltage.

Table 5-2 A15 Connectors and Destinations

A15 Connector Designation	Description	Destination
J900	Narrowband I.F. Out	To A2
J901	Wideband I.F. Out	To A2 or A3 (Wide bandwidths)
J902	322.5 MHz I.F. In	From A13 to A15
J903	Ext IF In	From A13 to A15 (Option EXM)
J1100	Aux I.F. Out	To Rear Panel
J1300	Switched I.F. Filter Out	To A13A2
J801	YTF Bypass Out	To SW1 & SW2 (Option MPB with Option 508, 513, or 526)
J700	Low Band Switch Logic Out	To A11
J800	Mechanical Attenuator Logic Out	To A9 & A10
J102	R.F. Front End Logic Out	To A13
J302	Preselector Tune Out	N/A (test point only)
J300	YTF Bias Control Out	To A12
J802	Low Noise Bypass Switch Logic Out	To SW3 (Option LNP)
J100	Motherboard Connector	From A8

A15 Front End Control Assembly Troubleshooting

The N9020A, MXA Signal Analyzer utilizes an RF front end troubleshooting board that can be used to verify some, but not all of the control circuitry on the N9040B, UXA Signal Analyzer due to the additions of front end assemblies. The troubleshooting board kit part number is N9020-60005 and includes the troubleshooting board and required interconnect cables. If you have the interconnect cables, you can order the board by itself using part number E4410-60115. When using the troubleshooting board and cables on a UXA the control logic for Input Attenuator A, Input Attenuator B, Low Band Switch and some of the power supplies can be verified. The remaining control voltages and RF signals can be measured directly with a voltmeter, oscilloscope or functioning spectrum analyzer.

In order to verify the wide bandwidth I.F.'s and Aux I.F. output frequencies and power levels the following specialty cables and connector will be needed:

MMCX (m) to SMB (f) cable, p/n 8121-0655

MMCX (f) to MMCX (f) barrel. Huber & Suhner 31_mmcx-50-0-1/111_0E

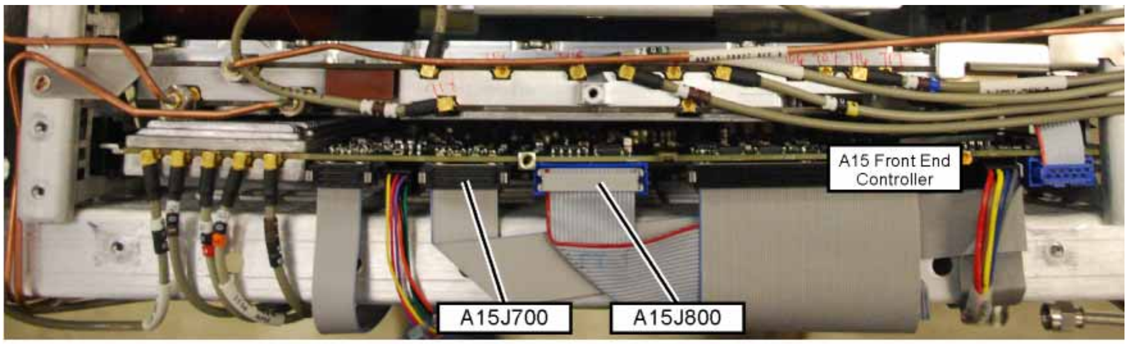
Visit: http://www.hubersuhner.com/de/ie70/hs-index

Other standard cables and connectors need to be used to adapt to the voltmeter or the RF input of the functioning spectrum analyzer.

Verifying Input Attenuator A, Input Attenuator B, Low Band Switch Logic and Power Supplies

1. Turn off the instrument.
2. Disconnect ribbon cables from A15J700 and A15J800 as shown Figure 5-2.

Figure 5-2 Ribbon Cables at A15J700 and A15J800



fec_cables_ts_uxa

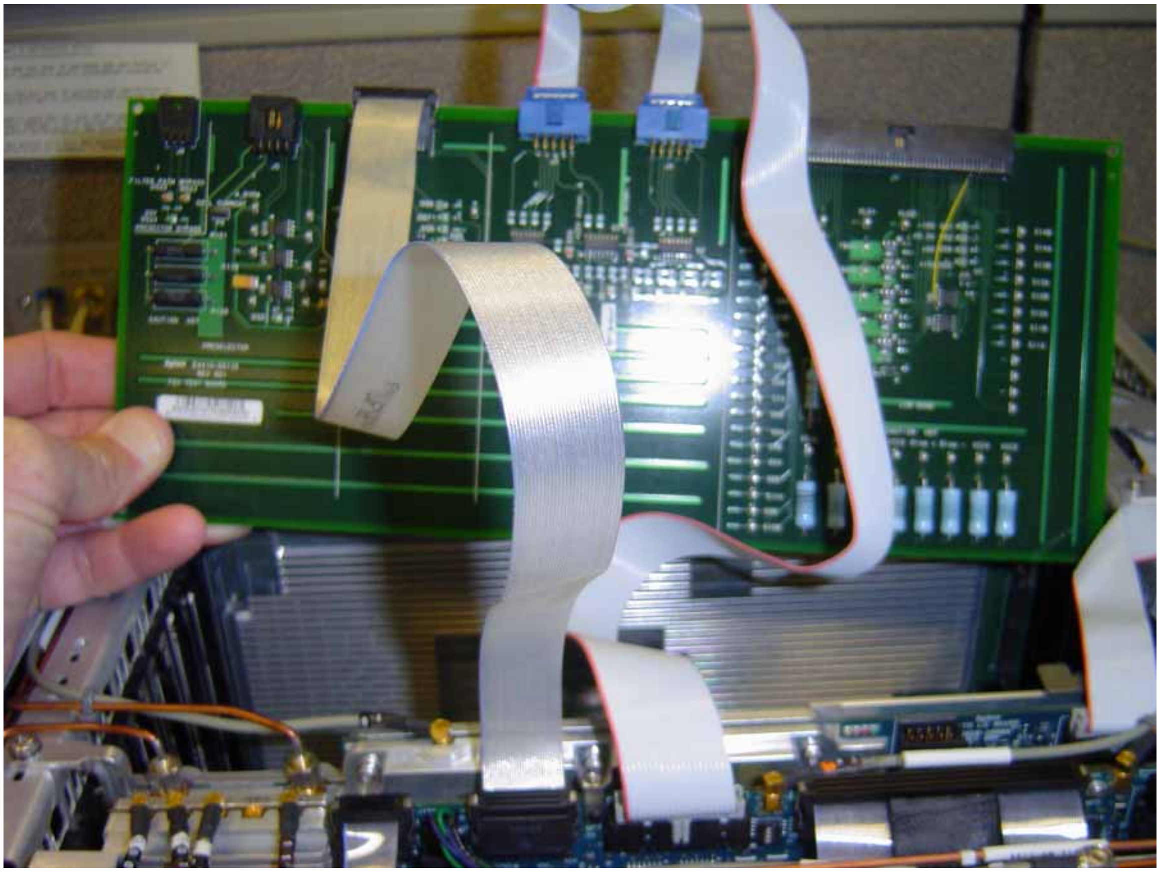
3. Connect the E4410-60115 RF Front End Troubleshooting board to the A15 Front End Control board using the E4410-60157 attenuator control cable. When connecting the attenuator control cable, E4410-60157, note that one end has two 10-pin connectors with one connector extending beyond the other. The shorter connector is marked with a red stripe. Connect the end with the 20-pin connector to A15J800. Connect the two 10-pin connectors to either J3 or J4 of the RF Front End Troubleshooting board based upon the UXA's frequency range as described below:

Table 5-3 UXA Frequency Range

Frequency Range Option	Shorter 10-pin connector (marked with red stripe)	Longer 10-pin connector
508, 513, or 526	J3	J4

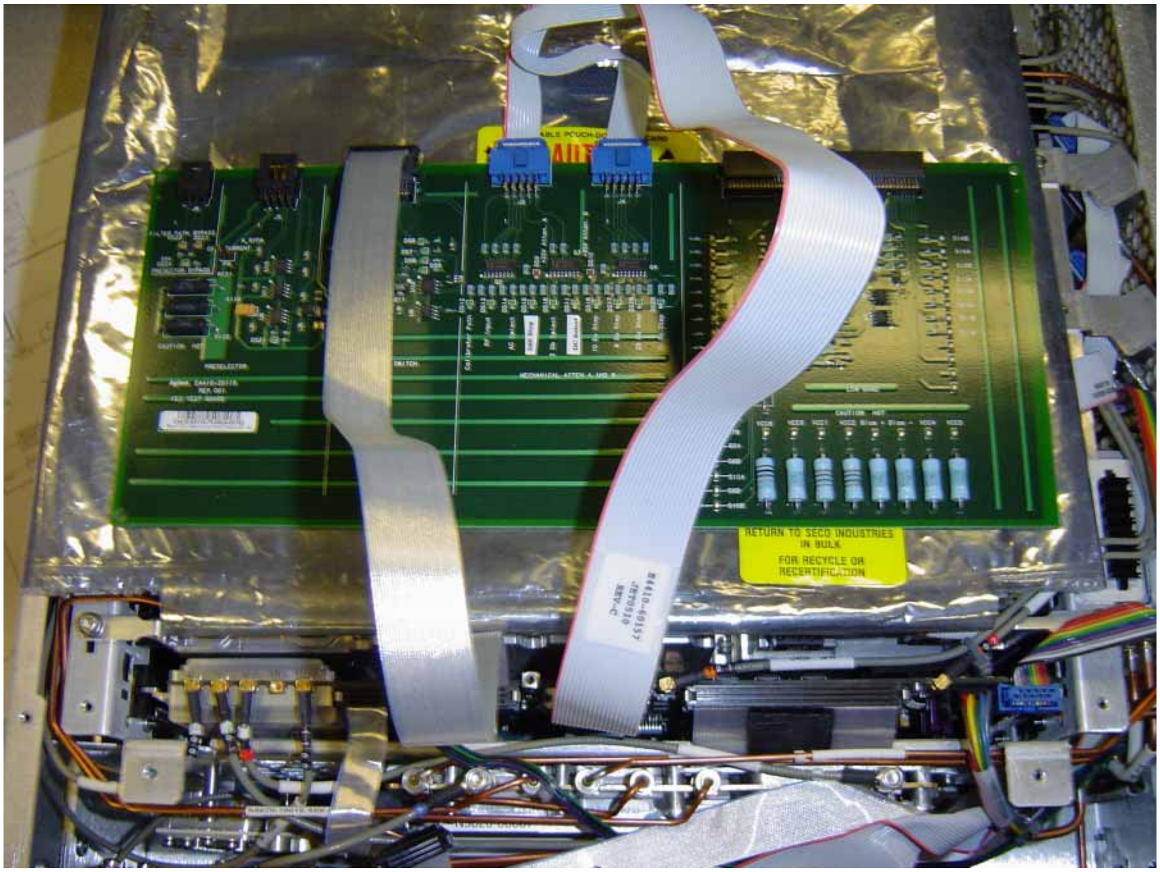
4. If the UXA has frequency range option 508, 513, or 526, also connect the Low Band Switch Control Cable, E4410-60160 between A15J700 and J2 of the RF Front End Troubleshooting board.

Figure 5-3 RF Front End Troubleshooting Board



5. Place the RF front end troubleshooting board on an ESD safe bag or foam to ensure nothing shorts out. See Figure 5-4.

Figure 5-4 RF Front End Troubleshooting Board Placement



6. Turn the instrument on and allow it to complete its full boot up process to the Spectrum Analyzer application.

NOTE You may notice an RF Alignment failure message on the analyzer display. This will occur when the test board is connected.

7. Turn Auto Align off by pressing **System**, **Alignments**, **Auto Align**, choose **Off** from the drop-down menu.

CAUTION Resistors on the test board can get very hot. Handle with care.

Power Supply Verification

Looking at the test board, verify power supply green LED's DS5, DS6, DS7 and DS8 located under the J2 connector are turned on. Additionally red LED's DS9 and DS10 should also be on (located under the J3 and J4 connector). The power supply voltages are listed in the table below.

Table 5-4 Power Supply Voltages

LED	Power Supply
DS5	+15 VDC
DS6	+9.0 VDC
DS7	+5.2 VDC
DS8	-15 VDC
DS9	+25 VDC
DS10	+25 VDC

If any of the power supply LED's are not turned on, see Chapter 2, “Boot Up and Initialization Troubleshooting”.

Input Attenuator A Control Logic Verification (Option 508, 513, 526)

Press **AMPTD**, **Attenuation 0 dB** on the analyzer.

Attenuation LED's DS15-20 on the test board should be off.

When the input attenuation is changed from 0 dB to 2 dB, the 2 dB Step LED DS15 should illuminate. When the input attenuation is changed from 2 dB to 4 dB, DS15 and DS16 should be illuminated as per Table 5-5.

Table 5-5 Input Attenuator A LED’s

Attenuator Setting (dB)	DS15	DS16
0	OFF	OFF
2	ON	OFF
4	ON	ON

If this is incorrect, the most probable cause is the A15, Front End Control assembly.

The analyzer default setting for RF Coupling is AC mode. Verify the AC Select LED DS14 is illuminated at this time. Press **Input/Output**, **RF Coupling**. Toggle the RF Coupling switch to DC (Direct Coupled) and verify DS14 turns off and DS11 turns on. Set the RF Coupling back to AC. If the LED’s are not toggling correctly, the most probably cause is the A15 Front End Controller.

Input Attenuator B Control Logic Verification (Option 508, 513, 526)

Press **AMPTD**, **Attenuation 6 dB** on the analyzer and verify the 6 dB Step LED DS17 is illuminated. Change to the input attenuation settings found in Table 5-6 and verify the proper LED's illuminate on the Front End Troubleshooting board according to Table 5-6.

Table 5-6 Input Attenuator B LED's

Attenuator Setting (dB)	DS20 30 dB Step LED	DS19 20 dB Step LED	DS18 10 dB Step LED	DS17 6 dB Step LED
10	OFF	OFF	ON	OFF
16	OFF	OFF	ON	ON
20	OFF	ON	OFF	OFF
30	ON	OFF	OFF	OFF
40	ON	OFF	ON	OFF
50	ON	ON	OFF	OFF
60	ON	ON	ON	OFF
66	ON	ON	ON	ON

If the LED's illuminate correctly, the switch control logic for the input attenuators from the A15 Front End Control Assembly is correct. If the LED's are not illuminating as expected, the most probable cause is the A15 Front End Control Assembly.

Set the input attenuator back to 10 dB by pressing **AMPTD**, **Attenuation**, **10 dB** on the analyzer.

Low Band Switch Control Logic Verification (Option 508, 513, 526 only)

Press **Mode Preset** on the analyzer. Press **FREQ**, **50 MHz**, **SPAN**, **2 MHz** on the analyzer. Make sure the auto alignments are turned off by pressing **System**, **Alignments**, **Auto Align**, **Off**. Connect the voltmeter positive lead to test point listed in the table below and the negative lead to the instrument chassis. These test points are located under the J2 connector. Verify the voltages in Table 5-7.

Table 5-7

Test Board Test Point	Voltage (VDC)
In1A	–10
In2A	–10
In1B	+10.0
In2B	+10.0

Press **FREQ**, **5 GHz** on the analyzer. Verify the voltages in Table 5-8.

Table 5-8

Test Board Test Point	Voltage (VDC)
In1A	+10.0
In2A	–10
In1B	–10.0
In2B	+10.0

If the voltages are not correct, the most probable cause is the A15 Front End Control board.

Disconnect RF Front End Troubleshooting Board

You do not need the RF front end troubleshooting board to test out the remaining front end hardware components. At this point it is advisable to shutdown the analyzer and disconnect the test board and cables. Be sure to reconnect the UXA Low Band switch ribbon cable and the input attenuator ribbon that were originally plugged into the Front End Control board before testing the input attenuator and low band switch logic.

Preselector Tune Output

The J302 connector is a test point used to verify the internal A12, YIG Tuned Filter drive voltage variations with center frequency. The YTF is used in the high band path (3.6 GHz to 26.5 GHz). Connect A15J302, Presel Tune to a voltmeter. Use the MMCX (m) to SMB (f) to connect to J302 on the A15 board and appropriate adaptors to connect to the voltmeter. Refer to Figure 5-1 for J302 location. You may also need a Banana plug to BNC (f) adapter, part number E9637A for the voltmeter. The preselector tune output voltage can be measured to verify this portion of the A15 is functioning.

Press **System**, **Alignments**, **Auto Align**, and choose **Off** from the drop-down menu once it has fully booted to the spectrum analyzer application. Press **Freq**, **Span** and toggle to Zero Span on the analyzer. The preselector tune output voltage in high band should change when the center frequency of the analyzer is changed.

Table 5-9 Preselector Tune Output Voltages (Option 508, 513, 526)

Center Frequency (GHz)	~ Tune Voltage (VDC)	Valid Frequency Range Option
5.0	1.55	508, 513, 526
10.0	3.12	513, 526
15.0	4.7	526
20.0	6.27	526
26.0	8.17	526

Verifying SW3 (Option LNP only)

Since there is a ribbon cable from the A15J802 to SW3, it is not feasible to use a voltmeter or oscilloscope to measure the control voltages. For testing SW3, the “click” test can be used.

Press **Mode Preset** on the analyzer. Press **FREQ**, **5 GHz**, **SPAN**, **1 MHz**. Verify the optional preamplifier is off by pressing **AMPTD**, **Signal Path** and verify the Internal Preamp Low Band toggle is in the Off position. The Internal Preamp toggle must be Off in order to test SW3. Press **AMPTD**, **Signal Path**, **uW Path Control**, **Low Noise Path Enable** on the analyzer. You should hear a distinct “click” noise from SW3 when the low noise path is selected. Now press **uW Path Control** and select **Standard Path**. SW3 will “click” again and return to the standard RF path.

Another way of testing this switch is using an RF signal. This is described in the RF Section Troubleshooting chapter, under the high band troubleshooting section.

Verifying SW1 and SW2 (Option MPB)

SW1 and SW2 can be verified three different ways:

– “Click” Test

– R.F. Signal Tracing

“Click” Test

This test changes between two different path modes. When this is done a distinct “click” noise from SW1 and SW2 can be heard. Since both switches switch at the same time, it is difficult to decipher if one is switching and the other is not.

Press **Mode**, **Preset** on the analyzer. Press **FREQ**, **5 GHz**, **SPAN**, **1 MHz**, **AMPTD**, **Signal Path**, **uW Path Control**. Standard Path is the default. Select uW Preselector Bypass and you should hear a distinct “click” noise if the control logic from the A15 Front End Control board is getting to SW1 and SW2.

RF Signal Tracing

Refer to Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)” for this method of troubleshooting if you are unable to use an Oscilloscope

Verifying Narrowband IF Out (A15J900)

The outer cover and top shield need to be removed to verify A15J900 I.F. output to the A2 Analog IF assembly. Refer to Chapter 15, “Assembly Replacement Procedures” for the removal procedure. Press **MODE/MEAS**, **Spectrum Analyzer**, **OK**, **Mode Preset** on the analyzer. Press **Input/Output**, **RF Calibrator**, **50 MHz**, **FREQ**, **50 MHz**, **Span** and toggle from Swept Span to Zero Span. Press **Amptd**, **Attenuation**, **10 dB**, **Amptd**, **Signal Path** and verify Internal Preamp Low Band toggle is set to Off. Press **System**, **Alignments**, **Auto Align** and choose **Off** from the drop-down menu. Disconnect the cable marked J900 that plugs into the top of the A15, Front End Controller board and connect a functioning spectrum analyzer where the cable was plugged in. J900's output should be 322.5 MHz at ~-20 dBm on the functioning spectrum analyzer if the Front End Controller board is switching this level correctly. If -20 dBm is not being measured correctly, remove the cable labeled J902 from the Front End Controller board and measure the output of that cable. This should also measure 322.5 MHz at ~-20 dBm. If the output of the J902 cable measures correctly and yet the output of J900 is incorrect, the most probable cause is the A15, Front End Controller board.

Reconnect all cables to their correct location when finished with the measurements.

IMPORTANT When plugging in an mmcx connector, a distinct “snap” should be heard when the cable is seated correctly.

Verifying Aux IF Out, Rear Panel (Option CR3, CRP, ALV only)

The Aux I.F. output connector on the rear panel of the UXA is installed on each instrument; however the actual Aux I.F. output frequency will vary depending on the options installed. These options are all enabled with a license key. The first step in verifying the Aux I.F. output is the make sure the option is licensed by pressing **System**, **Show**, **System** on the analyzer and make sure the option identifies itself in the table.

The I.F. switch path and frequency generation occurs on the A15, Front End Controller board. This troubleshooting procedure provides the instrument setups to verify options CR3, CRP and ALV. Test the Aux I.F. output based on the options installed in the analyzer.

Standard UXA

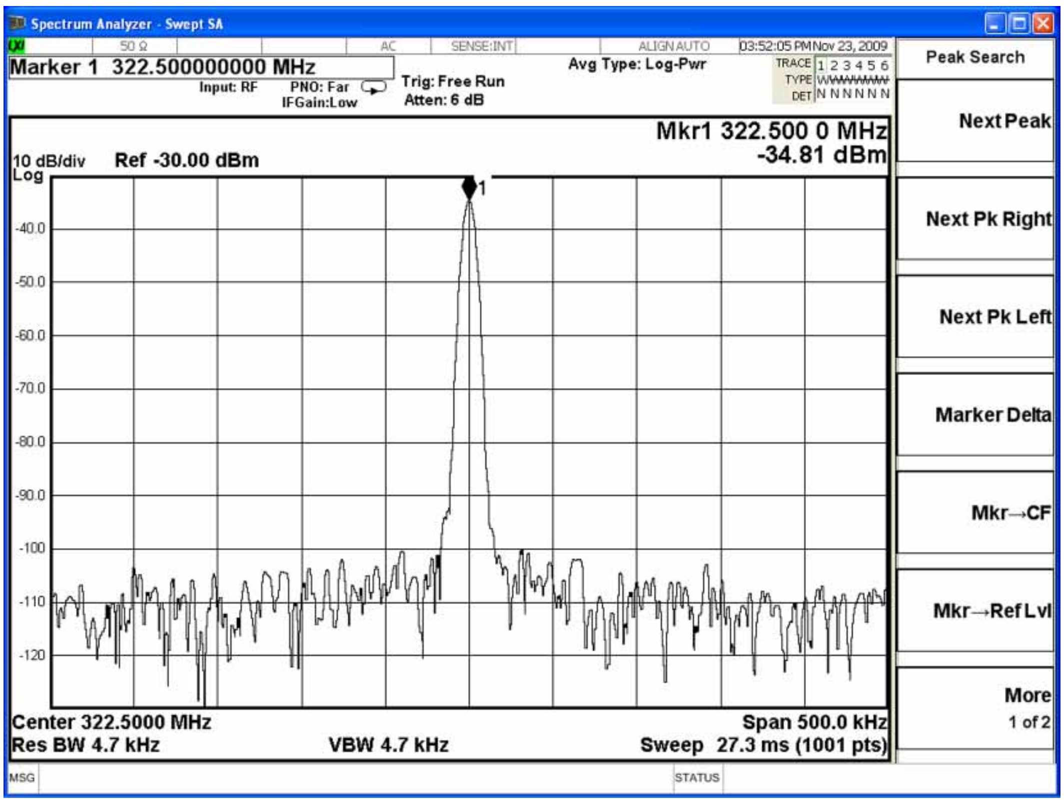
No test to perform.

Verifying Option CR3

Press the following keys on the analyzer:
MODE/MEAS, **Spectrum Analyzer**, **OK**, **Mode Preset**, **Input/Output**, **RF Calibrator**, **50 MHz**, **FREQ**, **50 MHz**, **Span** and toggle switch to Zero Span. Press **System**, **Alignments**, **Auto Align**, **Off**, **Input/Output**, **Output**, **Aux IF Out** and select **Second IF** from the drop-down menu.

Connect the Aux I.F. Output on the rear panel to the RF Input of a functioning spectrum analyzer. If the A15 Front End Controller is switching the I.F. correctly, you should measure 322.5 MHz at –35 dBm ±3 dB as per Figure 5-5.

Figure 5-5 322.5 MHz

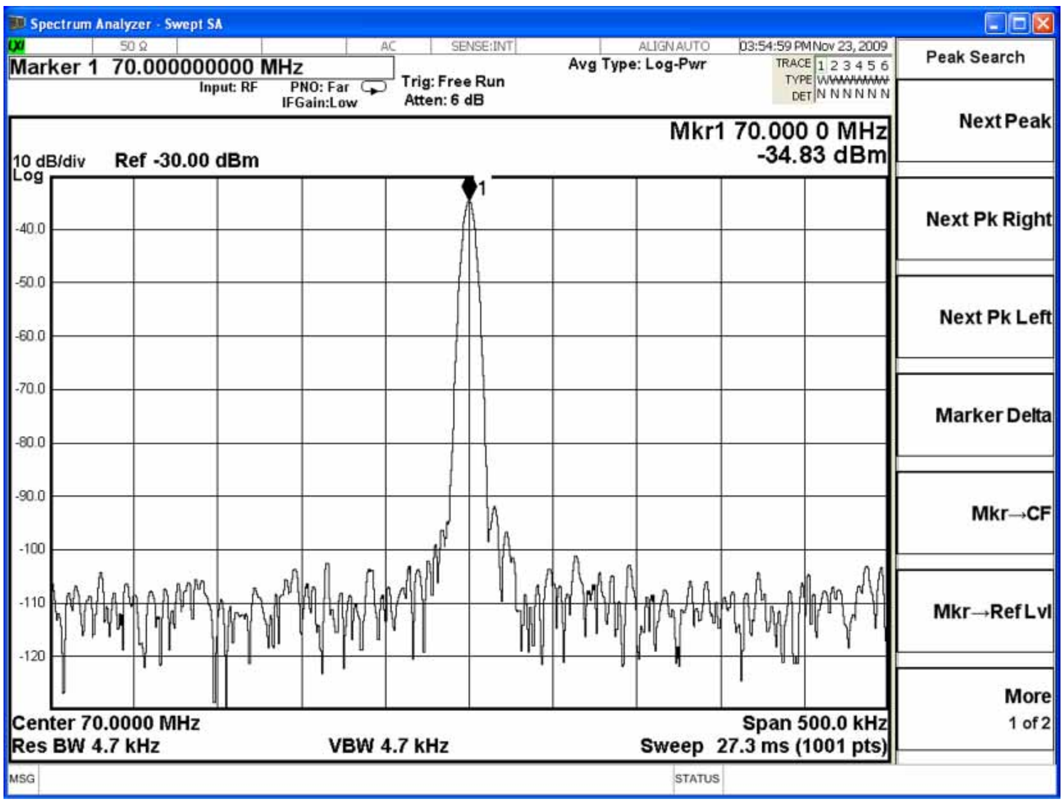


Verifying Option CRP

Press the following keys on the analyzer:
MODE/MEAS, **Spectrum Analyzer**, **OK**, **Mode Preset**, **Input/Output**, **RF Calibrator, 50 MHz**, **FREQ**, **50 MHz**, **Span** and toggle switch to Zero Span. Press **System**, **Alignments**, **Auto Align**, **Off**, **Input/Output**, **More 1 of 2**, **Output Config**, **Aux IF Out**, **Arbitrary IF**.

The default is 70 MHz, which can be measured on a functioning spectrum analyzer. The amplitude level should be –35 dBm ±3 dB as per Figure 5-6. You can select Arbitrary IF Freq and vary the I.F. from 10 MHz to 70 MHz in 500 kHz steps and measure the Aux IF output. The amplitude level should remain fairly flat across the entire arbitrary IF output range.

Figure 5-6 70 MHz



Verifying Option ALV

Equipment needed:

Volt meter

Adapters and cables to connect the volt meter to the Aux IF Out SMA connector on the spectrum analyzer rear panel.

Signal source

Signal source settings:

Frequency: 1 GHz (CW)

Amplitude: –10 dBm

Press the following keys on the analyzer:
MODE/MEAS, Spectrum Analyzer, Mode Preset, OK, FREQ Channel, and set the center frequency to 1 GHz. Press **Span** and toggle the switch to Zero Span. Press **Input/Output**, **Output**, **Aux IF Out** and choose **Fast Log Video** from the drop-down menu.

Connect the rear panel Aux IF Out of the signal analyzer to a voltmeter set to measure DC volts.

Verify that signal level appears on the analyzer screen positioned 1 division below top graticule line.

Voltmeter should measure approximately 1.5 Vdc.

Reduce source output power to –20 dBm. Signal should now appear one division lower, and voltmeter should measure approximately 1.3 VDC.

Reduce source output power to –30 dBm. Signal should now appear one division lower, and voltmeter should measure approximately 1.0 VDC.

6 Analog/Digital IF Troubleshooting

What You Will Find in This Chapter

The following information is presented in this chapter:

1. **Theory of operation of the IF section.**
2. **Isolating the cause of a hardware problem by verifying the functionality of assemblies in the IF section 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.

The following sections are found in this chapter:

A2 Analog IF Assembly Description

When the 10 MHz or 25 MHz IF Path is selected, or when any swept measurement is made, the analyzer's RF input signal is down converted to a 322.5 MHz intermediate frequency in the A13 RF Front End Assembly. This 322.5 MHz signal is routed through the IF MUX on the A15 Front End Control Assembly and then input to the A2 Analog I.F. Assembly.

The Analog I.F. down converts the 322.5 MHz signal to a final 22.5 MHz intermediate frequency. In order to obtain optimal dynamic range and minimize unwanted spurious signals, this signal is filtered, amplified and attenuated throughout this assembly. The final 22.5 MHz signal goes through a series of variable band pass filters each having a specific bandwidth. Three things determine the signal path and which filters are chosen:

– Instrument resolution bandwidth (RBW) setting
– Application used
– Mode applied

This assembly contains one of the two burst carrier trigger (BCT) circuits for performing mobile communication measurements. The BCT on the A2 assembly is relatively narrowband. The other BCT circuit is part of the IF MUX on the A15 Front End Control Assembly and has a much wider bandwidth.

The output of the A2 assembly is a filtered 22.5 MHz signal that goes to one of the two ADCs on the A3 Digital I.F. Assembly.

Inputs to the A2

322.5 MHz signal (from A15 Front End Control Assembly)

LO Input (300 MHz signal from A16 Reference Assembly)

22.5 MHz Cal Comb Signal (from the A3 Digital IF Assembly)

Outputs from the A2

22.5 MHz signal (to A3 Digital IF Assembly)

RF Trigger Detector (to A3 Digital IF Assembly)

A2 Analog IF Assembly Theory of Operation

NOTE

Refer to Chapter 12, “Block Diagrams.”.

Input Switch and Filter

A 322.5 MHz input signal is received from the A15 Front End Control Assembly. The signal then goes through a band pass filter centered at 322.5 MHz with a 25 MHz bandwidth. A comb cal signal can be automatically switched in at the input of the assembly to calibrate the prefilters.

Step Attenuator and Amplifier

A 1 dB step attenuator follows to compensate for band gain differences. The signal then goes through a high-dynamic range amplifier.

Image Filters

One of three different filter paths will be selected automatically, depending on the analyzer mode.

– The through path is selected in IQ Analyzer Mode and wide-band demod.

– The 12 MHz ceramic bandpass filter is used for normal Signal Analyzer swept and FFT operation.

– The 300 kHz Surface Acoustic Wave (SAW) is used for ACP modes.

Mixer

There are two mixers that reside on this assembly. The first mixer is used to down convert the 322.5 MHz input to the final 22.5 MHz IF. The other mixer is described in the IF Comb Cal section.

3rd LO

The 300 MHz 3rd LO signal comes from the A16 Reference Assembly and conditions it for use as an LO in the two mixers that reside on this assembly. The third LO power is ~ +10 dBm to optimize the conversion efficiency of the first mixer.

IF Comb Cal

The 2nd mixer is used to mix the 300 MHz LO from the Reference Assembly with the 22.5 MHz cal comb signal from the A3 Digital IF to allow calibration of the prefilters and overall passband phase and amplitude. The signal is attenuated by 20 dB if necessary.

Post Down Conversion Amplification and Prefiltering

The 22.5 MHz IF goes through a fixed gain amplifier. Then prefilters are switched in and out. The signal then goes through a variable gain amplifier.

The prefilters provide four single-pole filters to limit the bandwidth of the signal reaching the ADC on the A3 Digital IF assembly. There are five different signal paths for the 22.5 MHz IF when using Signal Analyzer swept mode:

1. LC wide
2. LC narrow
3. Crystal wide
4. Crystal narrow
5. Through path

The LC wide signal path is used when the analyzer Res BW setting is 180 kHz to 390 kHz.

The LC narrow signal path is used when the analyzer Res BW setting is 30 kHz to 160 kHz.

The Crystal wide signal path is used when the analyzer Res BW setting is 4.3 kHz to 27 kHz.

The Crystal narrow signal path is used when the analyzer Res BW setting is < 3.9 kHz.

The through path is used when the analyzer Res BW setting is 430 kHz and greater in analyzer swept mode.

NOTE In IQ Analyzer mode or in Spectrum Analyzer mode with Sweep Type of FFT, the analyzer span setting determines the pre-filter settings.

Anti-Alias Filter and Final Amplifier

The anti-alias filters attenuate unwanted out-of-band noise and distortion products. The first anti-alias filter is centered at 22.5 MHz and is 25 MHz wide.

The signal can bypass the second anti-alias filter when the analyzer utilizes either the IQ Analyzer swept, or wide-band demod.

The through path is selected when the image filter is in the 25 MHz mode (for IQ Analyzer swept and wide-band demod)

In all other cases the signal will pass through the second 12 MHz anti-alias filter.

The step gain block provides an additional switchable 10 dB gain to overcome the ADC noise floor and provide an additional 2 dB of analyzer sensitivity.

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.

A2 Analog IF Troubleshooting

There are three steps to verify the A2 Analog IF Assembly.

– Measure the input power and frequency accuracy of the 322.5 MHz signal (from the A13 RF Front End assembly)

– Measure the output power and frequency accuracy of the 22.5 MHz signal (to the A3 Digital IF Assembly)

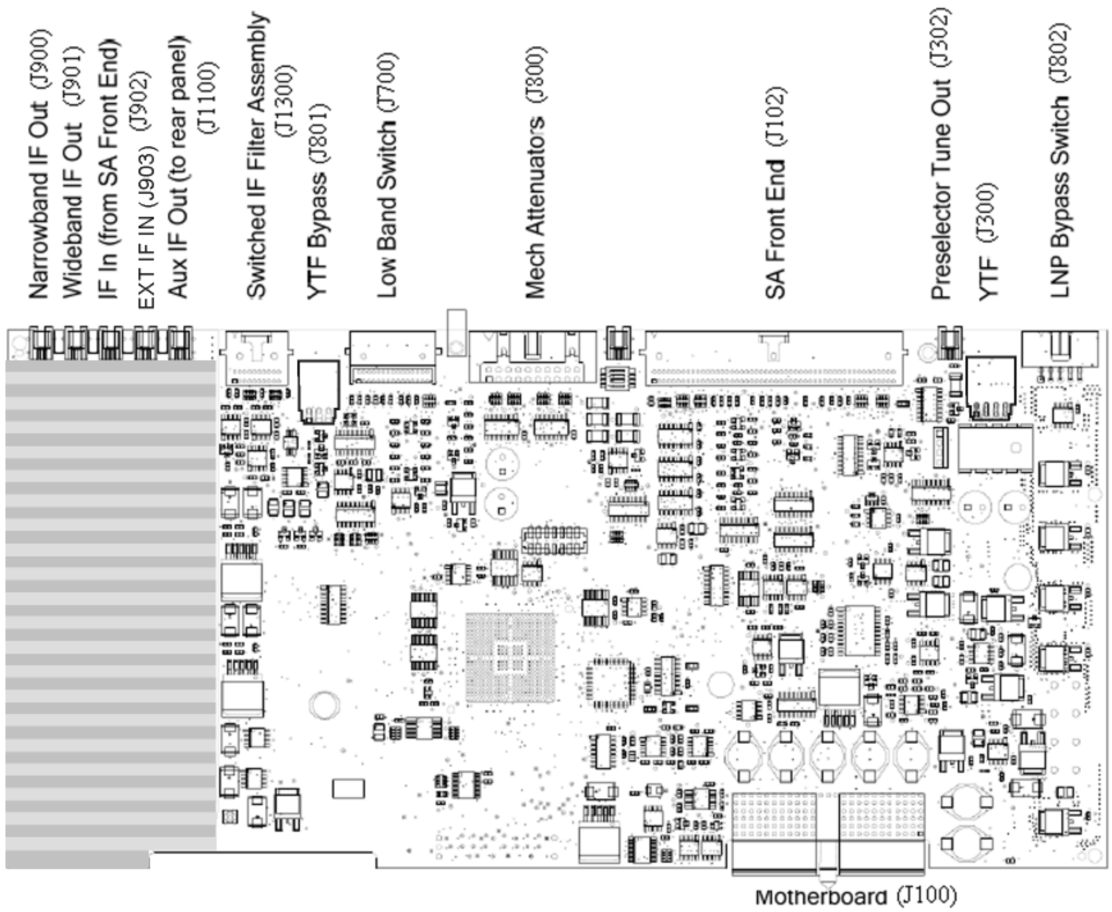
– Measure the 300 MHz input LO signal (from the A16 Reference Assembly)

Verifying the 322.5 MHz Input Power

1. Turn the instrument off.
2. Remove instrument cover. Refer to Chapter 15, “Assembly Replacement Procedures” in this service guide.
3. Turn on the UXA Signal Analyzer and wait for the instrument to complete the boot up process.
4. Press **System**, **Alignments**, **Auto Align**, **Off**.
5. Press **X**.
6. Press **Input/Output**, **RF calibrator**, **50 MHz**.
7. Press the pull down menu.
8. Verify the 50 MHz signal is at –25 dBm on the analyzer display by pressing **FREQ**, **50 MHz**, **SPAN**, **1 MHz**, **Peak Search** on the UXA. The marker readout should be 50 MHz at –25 dBm ± 3 dB. If this reference signal is measuring incorrectly, see Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)” in this service guide.
9. To continue verifying press **SPAN**, **Zero Span**. Verify the input attenuator on the UXA 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.
10. Press **Input/Output**, **RF Calibrator**, **10 MHz**.

11. Carefully disconnect W25 cable at A15J900 as shown in Figure 6-1.

Figure 6-1 A15 RF Front End Control Assembly



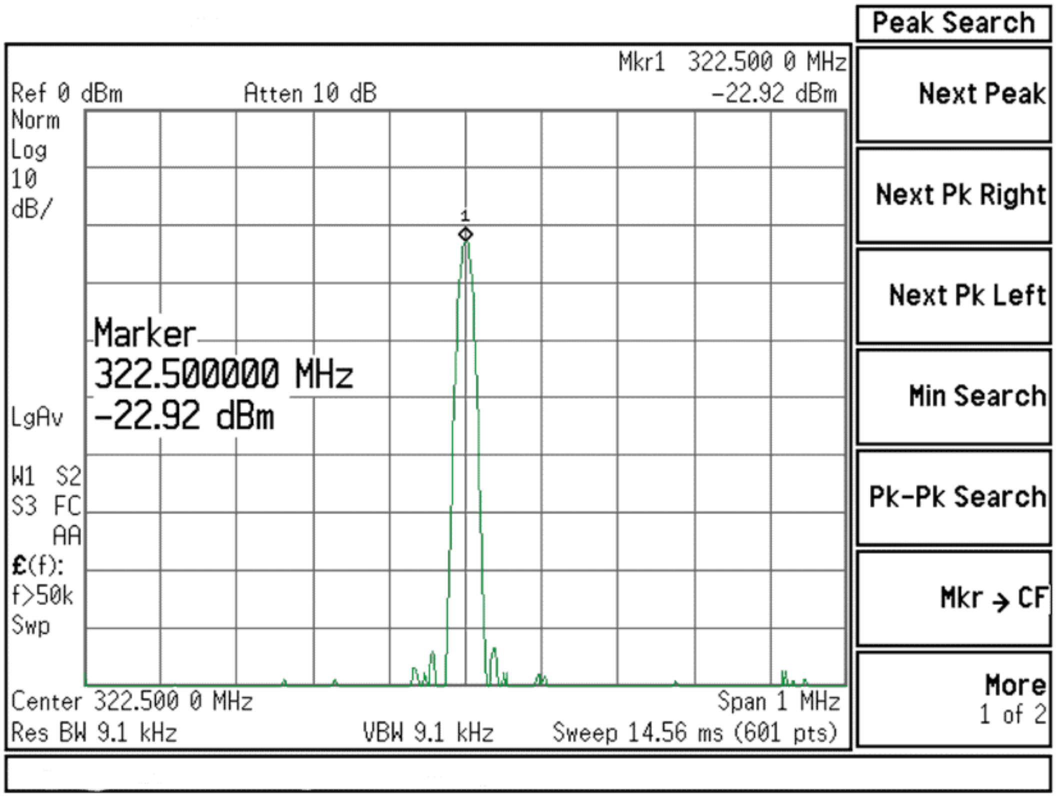
pxafec2

12. Connect A15J900 to a functioning spectrum analyzer using the appropriate MMCX connectors and cables.

13. Press **Freq**, **322.5 MHz**, **Span, 1 MHz**, **Peak Search** on the functioning spectrum analyzer.

14. The analyzer should read 322.5 MHz at –23 dBm ± 3 dB as shown in Figure 6-2.

Figure 6-2 A15 322.5 MHz Output



NOTE

If the 322.5 MHz signal is not measuring the correct power level, refer to Chapter 4, "RF Section Troubleshooting (RF/Microwave Analyzers)." in this service guide.

Reconnect W25 to A15J900.

IMPORTANT

Measuring at this location is for convenience. The 322.5 MHz signal is an output at A15J900. Since the W25 cable connects from this output to the input of the Analog I.F. assembly at A2J100, the small coaxial cable has not been tested at the A2J100 end.

Verifying the 22.5 MHz Output Power

1. Perform an instrument shutdown.
2. Turn the instrument over so the bottom side of the analyzer is facing up.
3. Turn on the UXA Signal Analyzer and wait for the instrument to complete the boot up process.
4. Press **System**, **Alignments**, **Auto Align**, **Off**.
5. Press **X**, pull down menu.
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 marker readout should be 50 MHz at –25 dBm ± 3 dB. If this reference signal is measuring incorrectly, see Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)” in this service guide.
8. To continue verifying press **SPAN**, **Zero Span**. Verify the input attenuator on the UXA 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.
9. Referring to Figure 6-3, carefully disconnect the W42 cable at A3J19.

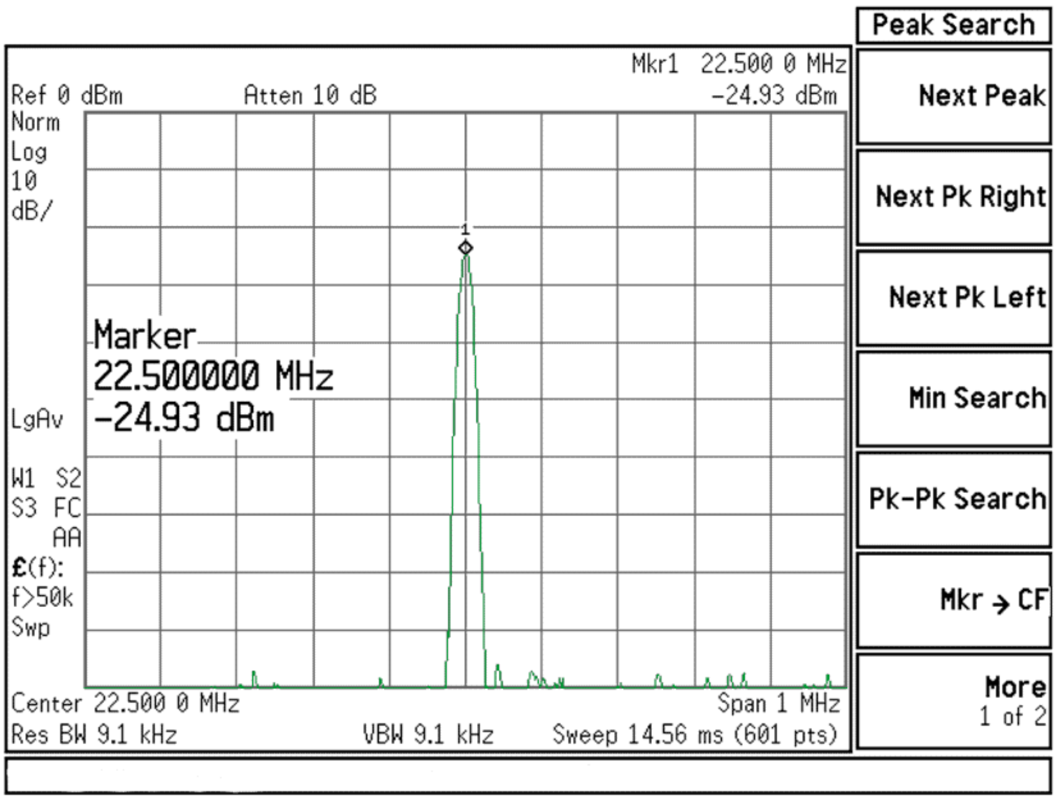
Figure 6-3 A3 Digital IF Cables

10. Connect the W42 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.

11. Press **Freq**, **22.5 MHz**, **Span**, **1 MHz**, **Peak Search** on the functioning spectrum analyzer.

12. The analyzer marker should read 22.5 MHz at –25 dBm ± 4 dB as shown in Figure 6-4.

Figure 6-4 A2 Analog IF Output



13. If the 22.5 MHz signal is not measuring the correct power level, do not assume the Analog IF is the most probable cause until the 3rd LO frequency and power level have been verified below.

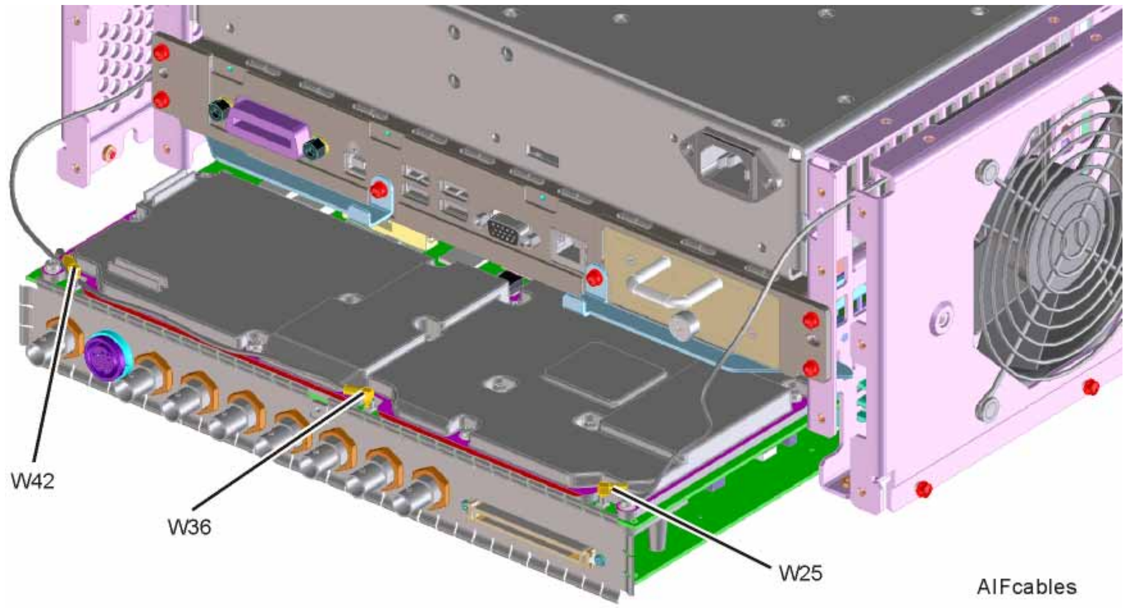
14. If the 22.5 MHz signal is within tolerance, carefully reconnect the W42 cable to A3J19.

NOTE You should hear a distinct snap when reconnecting the W42 cable. If this cable is not installed properly, intermittent signal fluctuations may occur on the analyzer display.

Verifying the 300 MHz LO Input Power from the A16 Reference Assembly

1. Referring to Figure 6-5, carefully disconnect the W36 at A2J300.

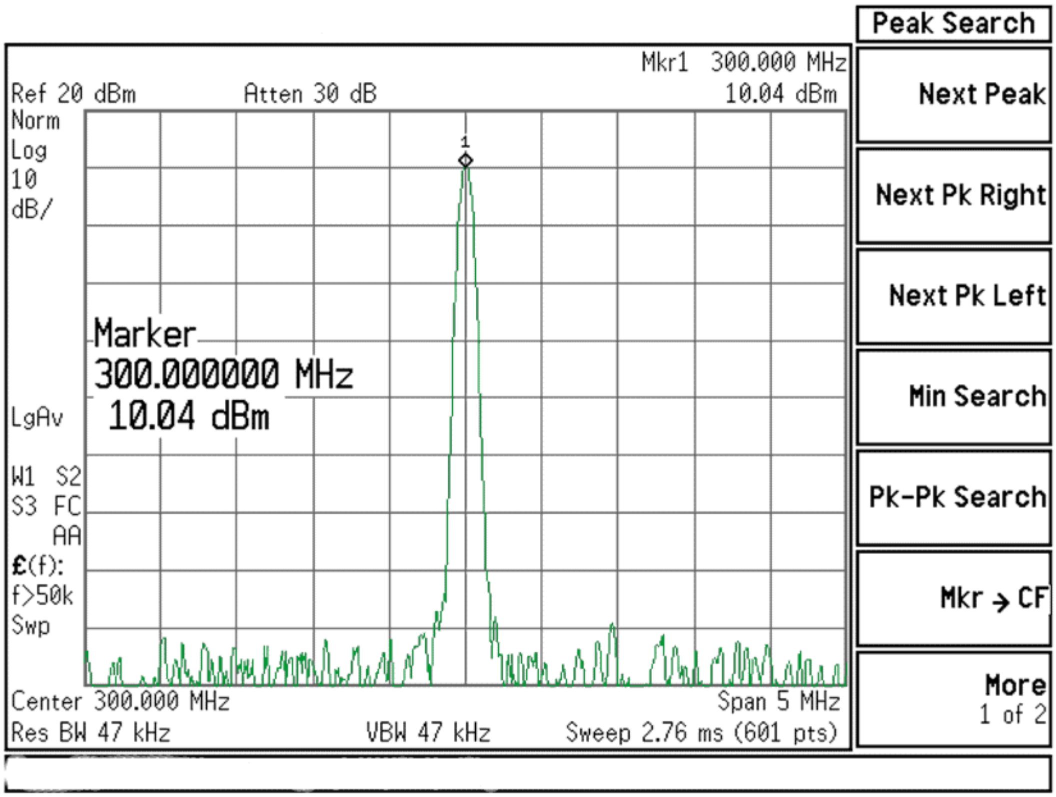
Figure 6-5 A2 Analog IF Cables



2. Connect the W36 cable to the MMCX female to SMA female adapter. Use an appropriate cable to go from the SMA adapter to the RF input of a functioning spectrum analyzer.
3. Press **Freq**, **300 MHz**, **Span**, **1 MHz**, **Amplitude**, **10 dBm**, **Peak Search** on the functioning spectrum analyzer.

4. The analyzer marker should read 300 MHz at 10 dBm ± 3 dB as shown in Figure 6-6.

Figure 6-6 300 MHz LO



5. If the 300 MHz signal is not measuring the correct power level, see the A16 Reference Assembly troubleshooting section in this service guide.

6. If the 300 MHz LO is measuring the correct power level and frequency and the 22.5 MHz signal is low, the most probable cause is the A2 Analog IF assembly.

A3 Digital IF Assembly Description

The A3 Digital I.F. has circuitry that is needed to analyze complex communication signals that can occupy up to 40 MHz of information bandwidth. This assembly has two inputs:

1. **The final 22.5 MHz I.F. from the A2 Analog I.F. for IF bandwidth paths up to 25 MHz wide. This input is used for swept and FFT spectrum analysis.**
2. **The 250 MHz IF from the A15 Front End Control Assembly for IF bandwidth of 40 MHz.**

Each input has a separate ADC that processes the time domain continuous data into I/Q (in-phase and quadrature) signals before sending the data to the A4 CPU assembly for further processing and front panel display.

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

- Digitizes the 22.5 MHz and the 250 MHz IF signals
    - 16 bit ADC with a 100 MHz sample rate to digitize the 22.5 MHz IF
    - 12 bit ADC with a 200 MHz sample rate to digitize the 250 MHz IF
- 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 IF Assembly Theory of Operation

NOTE Refer to Chapter 12, “Block Diagrams.”.

Data Acquisition

The 22.5 MHz IF comes from the A2 Analog IF assembly. The input level to the A3 Digital IF assembly is –25 dBm when observing the 50 MHz calibrator signal. 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 16 bit device sampling continuously at 100 Ms/second.

The 250 MHz IF comes from the A15 Front End Control assembly. The input level is approximately -25 dBm when observing the 50 MHz calibrator signal. The IF input has a 40 MHz bandwidth centered at 250 MHz. The analog circuitry leading to the ADC converts the single-ended signal from the Front End Control to differential required by the ADC. Finally, it couples in the dither signal. The ADC is a 12-bit device sampling continuously at 200 Ms/second.

Rear Panel Triggers

The board has two trigger inputs and two trigger outputs all used via BNC connectors on the rear panel. 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 UXA. 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 50 Ω 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 UXA 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 IF Troubleshooting

Verifying the 22.5 MHz Input Power

1. Perform an instrument shutdown.
2. Remove the cover of the UXA Signal Analyzer. Refer to Chapter 15, “Assembly Replacement Procedures”, on page 365 in this service guide.
3. Turn the instrument over so that the bottom side of the analyzer is facing up.
4. Turn on the UXA Signal Analyzer and wait for the instrument to complete the boot up process.
5. Press **System**, **Alignments**, **Auto Align**, **Off**. Press **X**
6. Press the pull down menu.
7. Press **Input/Output**, **RF Calibrator**, **50 MHz**
8. 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 ± 3 dB. If this reference signal is measuring incorrectly, see Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)”, on page 147 in this service guide.
9. To continue verifying press **SPAN**, **Zero Span**. Verify the input attenuator on the UXA is set to 10 dB. Look near the top of the display near the center and verify **Atten: 10 dB** is visible. If needed change the input attenuator by pressing **AMPTD**, **Attenuation**, **10 dB** on the analyzer.

10. Referring to Figure 6-7, carefully disconnect W42 cable at A3J19.

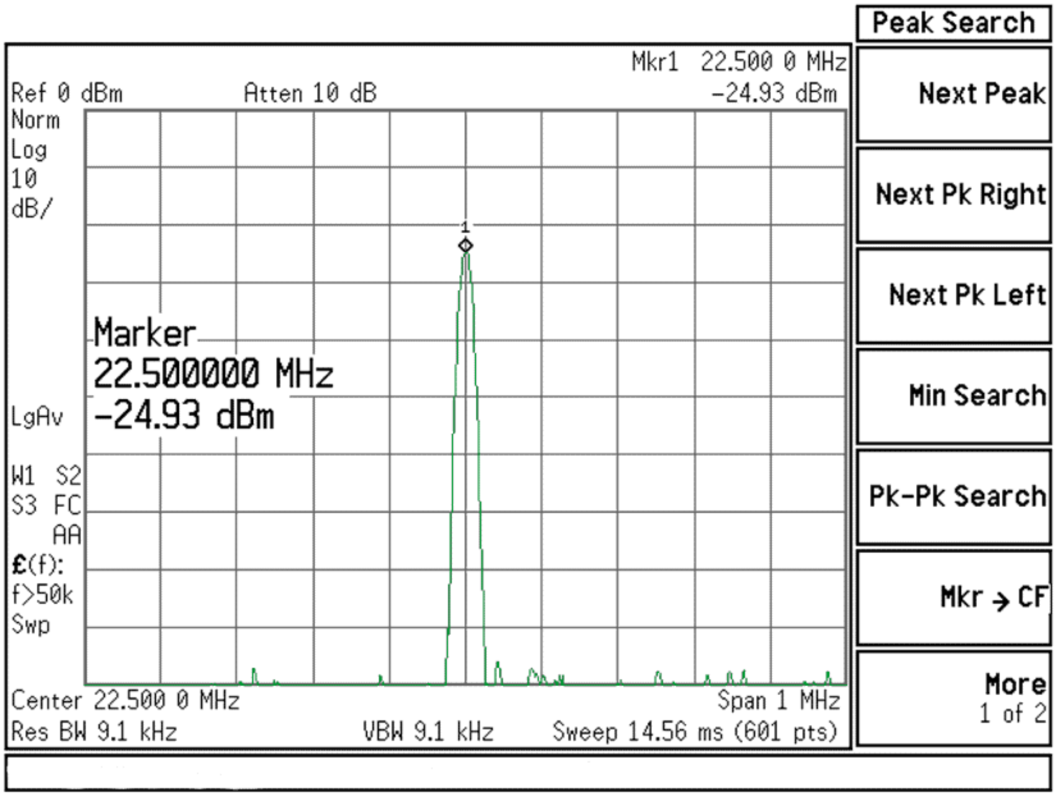
Figure 6-7 A3 Digital IF Cables

11. Connect the W42 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. signal frequency and amplitude is correct.

12. Press **Freq**, **22.5 MHz Span**, **1 MHz**, **Peak Search** on the functioning spectrum analyzer.

13. The analyzer should read 22.5 MHz at –25 dBm ± 4 dB as shown in Figure 6-8.

Figure 6-8 22.5 MHz IF Input



14. If the 22.5 MHz signal is not measuring the correct power level, see "A2 Analog IF Troubleshooting" on page 198 in this service guide.

15. If the 22.5 MHz signal is within tolerance, carefully reconnect the W42 cable to A3J19.

Verifying the 250 MHz IF Input Power (Option B40 only)

NOTE Perform this procedure only if the analyzer is equipped with Option B40, Analysis Bandwidth, 40 MHz

1. Perform an instrument shutdown.
2. Remove the cover of the UXA Signal Analyzer. Refer to Chapter 15, “Assembly Replacement Procedures”, on page 365 in this service guide.
3. Turn the instrument over so that the bottom side of the analyzer is facing up.
4. Turn on the UXA Signal Analyzer and wait for the instrument to complete the boot up process.
5. Press **Mode**, **IQ Analyzer (Basic)**, **Mode Setup**, **IF Path**, **40 MHz**.
6. Press **System**, **Alignments**, **Auto Align**, **Off**.
7. Press **Input/Output**, **RF calibrator**, **50 MHz**.
8. 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 dBm ± 3 dB. If this reference signal is measuring incorrectly, see Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)”, on page 147 in this service guide.
9. To continue verifying press **Meas**, **IQ Waveform.** Verify the input attenuator on the UXA is set to 10 dB. Look near the top of the display near the center and verify **Atten: 10 dB** is visible. If needed change the input attenuator by pressing **AMPTD**, **Attenuation**, **10 dB** on the analyzer
10. Referring to Figure 6-11, carefully disconnect W26 from A3J15.

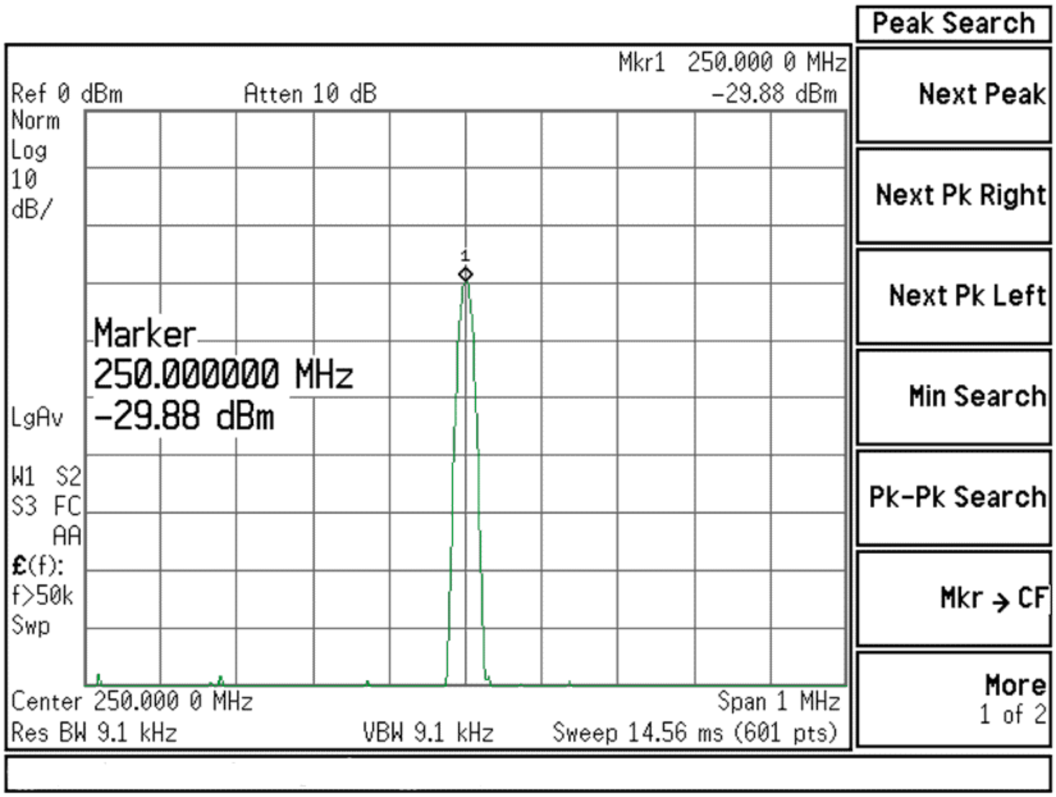
Figure 6-9 A3 Digital IF Cables

11. Connect the W26 or W40 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 250 MHz I.F. signal frequency and amplitude is correct.

12. Press **Freq**, **250 MHz**, **Span**, **1 MHz**, **Peak Search** on the functioning spectrum analyzer.

13. The analyzer marker should read 250 MHz at –30 dBm ± 4 dB as shown in Figure 6-12.

Figure 6-10 250 MHz IF Input



14. If the 250 MHz signal is not measuring the correct power level, see "A15 Front End Control Assembly Troubleshooting" on page 179 in this service guide.

15. If the 250 MHz signal is within tolerance, carefully reconnect the W26 or W40 cable to A3J15.

NOTE

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

Verifying the 100 MHz Reference Input

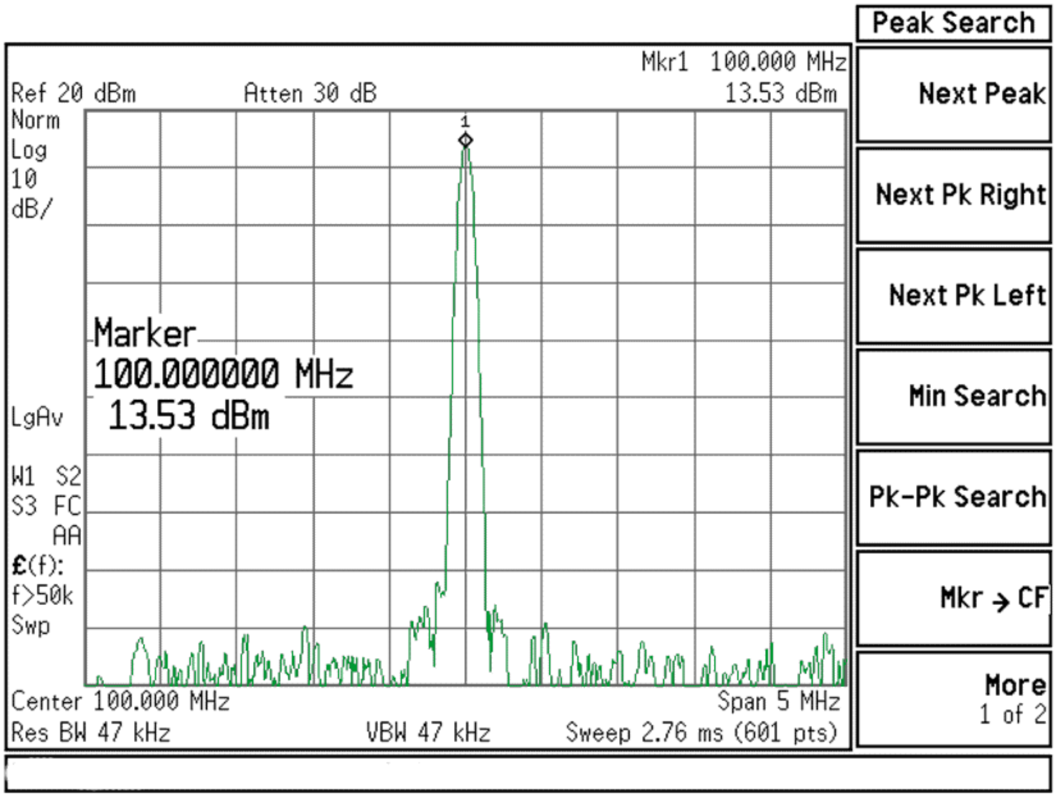
1. Perform an instrument shutdown.
2. Remove the cover of the UXA Signal Analyzer. Refer to Chapter 15, "Assembly Replacement Procedures", on page 365 in this service guide.
3. Turn the instrument over so that the bottom side of the analyzer is facing up.
4. Turn on the UXA Signal Analyzer and wait for the instrument to complete the boot up process.
5. Press **System**, **Alignments**, **Auto Align**, **Off**.
6. Press **Input/Output**, **RF calibrator**, **50 MHz**.
7. Referring to Figure 6-11, carefully disconnect W39 cable at A3J14.

Figure 6-11 A3 Digital IF Cables

8. Connect the W39 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 100 MHz reference frequency and amplitude is correct.
9. Press **AMPTD**, **Ref Level**, **20 dBm**, **Freq**, **100 MHz**, **Span**, **1 MHz**, **Peak Search** on the functioning spectrum analyzer.

10. The analyzer marker should read 100 MHz at +10 dBm ± 4 dB as shown in Figure 6-12.

Figure 6-12 100 MHz Reference Input



11. If the 100 MHz signal is measuring incorrectly this could indicate a problem with the A16 Reference Assembly.

12. If the 22.5 MHz IF, 250 MHz IF (if appropriate) and 100 MHz reference signals measure the correct frequency and amplitude and yet the display is not processing the signal properly, the most probable causes are the A3 Digital IF or the A4 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.

7 LO Synthesizer/Reference Troubleshooting

What You Will Find in This Chapter

The following information is presented in this chapter:

1. **Theory of operation of the LO Synthesizer section.**
2. **Isolating the cause of a hardware problem by verifying the functionality of assemblies in the LO Synthesizer section.**

NOTE Content on the theory and troubleshooting of the A16 Reference assembly will be available in the future.

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 descriptions are found in this chapter:

A14 DDS Synthesizer Description

The Synthesizer uses Direct Digital Synthesis to phase lock the instrument's first LO.

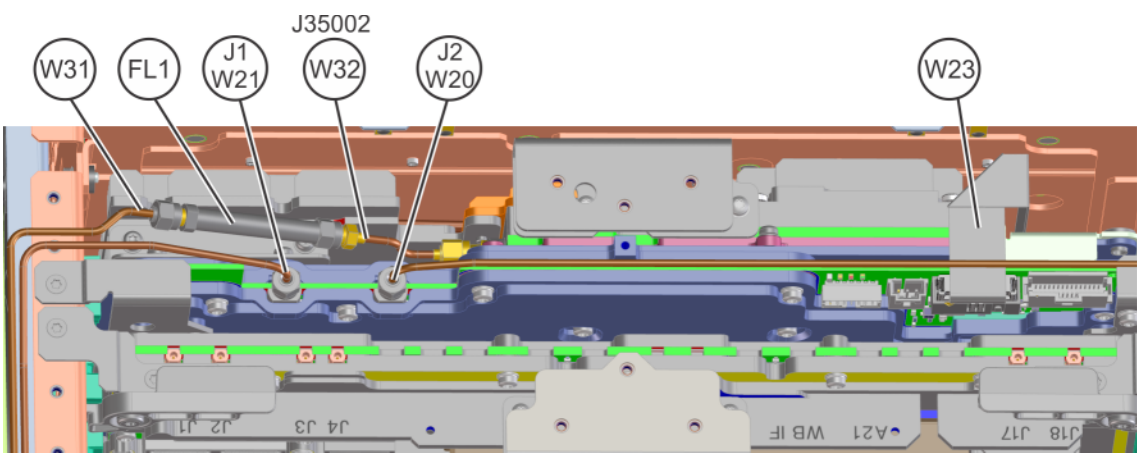
The A20 YTO output of 3.5 to 9.0 GHz is applied to J2.

A 7.2 GHz clock signal is applied from the A16 Reference assembly to J35002.

The LO output from the synthesizer is at J1, and is connected to the A13 Front End assembly at A13J4, providing the first LO signal for the analyzer.

W23 ribbon cable provides YTO control, power supplies, tune current, and Main coil filter control to the A20, YTO assembly.

Figure 7-1 Synthesizer Assembly Cables



Multiple Phase Lock Loop modes for optimized:

- Phase Noise
- Spurious-free output
- Sweep rate

The instrument settings to enable the PLL modes are set up automatically as a function of instrument span, or can be manually selected by pressing **Meas Setup**, **Advanced**, **Phase Noise Optimization**.

The choices are:

Best Close-In Phase Noise [offset < 600 kHz]

Must be in a narrow span <100 MHz

Uses the LO Multiplier path shown in the block diagram

Slightly higher spurs in this setting

Balance Noise and Spurs [offset < 600 kHz]

Auto coupled in spans ≤ 4.2 MHz

Spurs are minimized

Best Spurs [offset < 600 kHz]

Phase noise performance is not as good.

Best Wide-Offset Phase Noise [offset > 800 kHz]

Auto coupled in spans 4.3 to 83.1 MHz

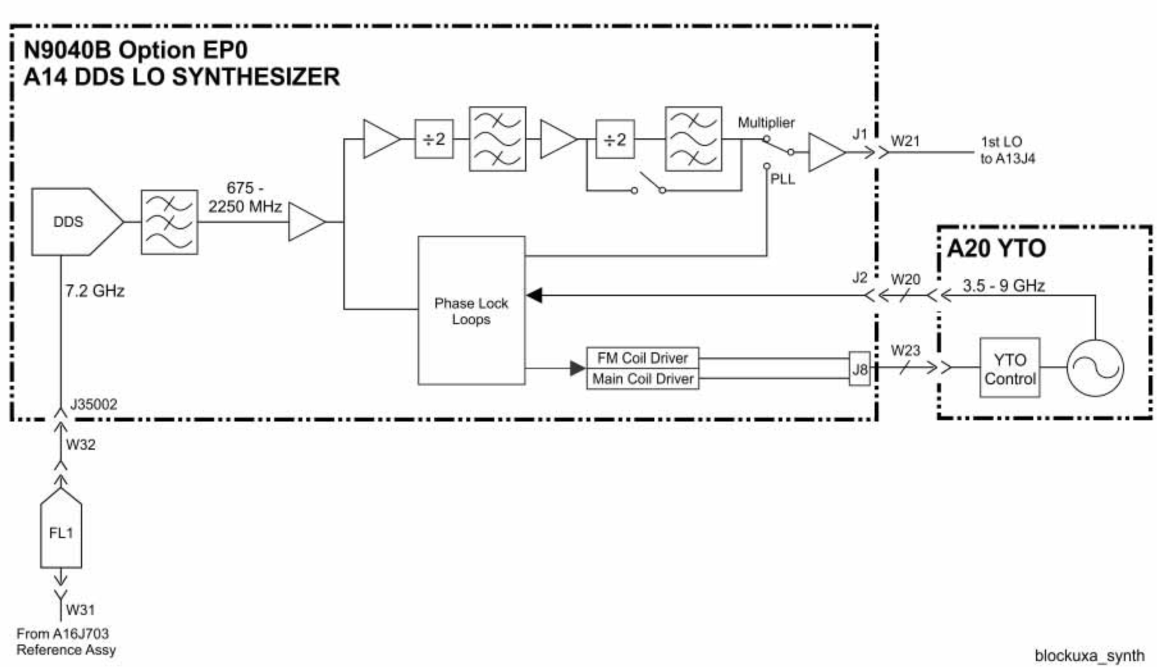
A16 Reference assembly will switch it's 2400 MHz PLL Loop BW to "Narrow" to optimize wide offset noise on the 7200 MHz Reference clock that is sent to J35002.

Fast Tuning

PLL mode with wide loop BW for wide capture range. Spur suppression as good as "Best Spurs" setting. Used in Swept mode. Auto Coupled at spans ≥ 83.2 MHz

Block Diagram

Figure 7-2 N9040B EP0 DDS Synthesizer Block Diagram



Self Alignments

Table 7-1 Self Alignments (Power-up and Periodic)

Alignment Name	
LO Serial Link Test (not displayed on AlignmentHistory screen)	– Performed one time at Power-up. – Checks intra-board communication between the A14 Synthesizer and the A16 DDS Reference. – Prevents normal operation of DDS Reference if thermometers cannot be read. – Upon link test failure, power supplies on DDS Reference disabled and details written to Windows Event log. Event log at: **Control Panel**, **System and Security**, **Administrative Tools**, **View Event Logs**, **Windows Logs**, **System**.
DDSSynthFastPortSkew Training alignment	– Performed one time at Power-up. – This alignment compensates for propagation lead/lag (skew) of the high speed parallel data bus inputs to the DDS DAC from the FPGA of the DDS Reference board. – Compensates for delays in FPGA I/O ports, DAC data inputs, and board layout. – Timing is relative to the data bus clock.
DDSSynthYTO Pretune DAC alignment	– Aligned at Power-up and periodically during instrument operation. – This alignment computes linear-slope, offset and sensitivity constants required to tune the YIG Tuned Oscillator (YTO) over the usable range of 3500-9400 MHz.

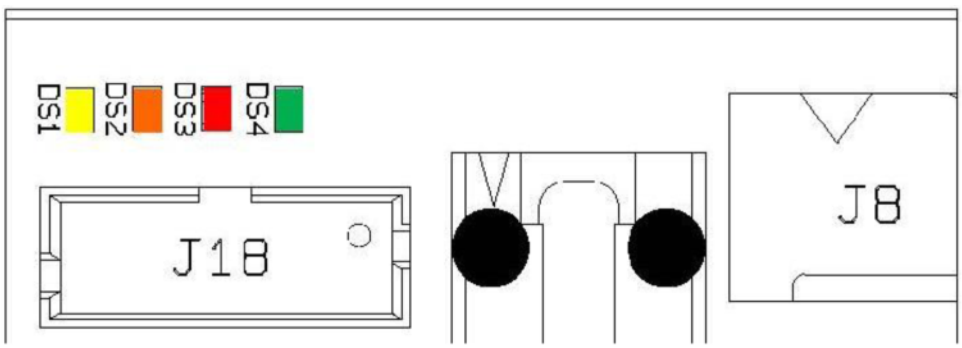
Diagnostic LEDs

- Quick visual assessment of functionality

  If Red LED is on loop is unlocked

  If green is off, instrument thinks FPGA not configured
- 'Blink-codes' warn of error condition

Figure 7-3 Diagnostic LEDs



Debug LED Setting	Yellow	Orange	Red	Green
	Sweep Status	LO READY	Loop Unlocked	FPGA Config'd
X	**1 Blink** • DDS Ref 10 MHz clock error **2 Blinks** • DDS Ref 100 MHz clock error **3 Blinks** • DDS Ref FPGA clock error	**1 Blink** • DDS Synth 10 MHz clock error **2 Blinks** • DDS Ref Thermal Alert	**1 Blink** • DDS Synth 50 MHz clock error **2 Blinks** • DDS Ref Thermal shut-down	FPGA Config'd

Span	LED Behavior	Notes
2.7 GHz to 10.01 MHz	DS1 yellow, DS2 orange, DS3 red flashing. DS4 green steady on	As span is reduced to 245 MHz, you can easily detect DS1-DS3 flashing, but from 240 MHz to 10.1 MHz span, it is difficult to see the flashing, PNO = Fast span > 83.2 MHz PNO= Best Wide at 83.1 MHz
10 MHz	All LEDs are on, and steady	PNO = Best Wide
4.2 MHz	DS1 yellow, DS2 orange and DS4 green on and steady. DS3 red is off	PNO = Balanced. About span 70 kHz, the yellow and orange LEDs just start to blink. At 60 kHz blinking is apparent.
22.2 kHz	DS4 green is on. Other LEDs are off	Instrument has just gone into Sweep (FFT) mode. PNO = Balanced
0 Hz	DS4 green is on. Other LEDs are off	

LO Frequency and Power Level Verification

This procedure measures the LO output power and frequency on J1 port of the Synthesizer assembly.

UXA settings:

Instrument **Preset**

Center Frequency: 3.61 GHz

Span: Zero Hz

Measuring spectrum analyzer settings:

Attenuation: 36 dB

Reference Level: 26 dBm

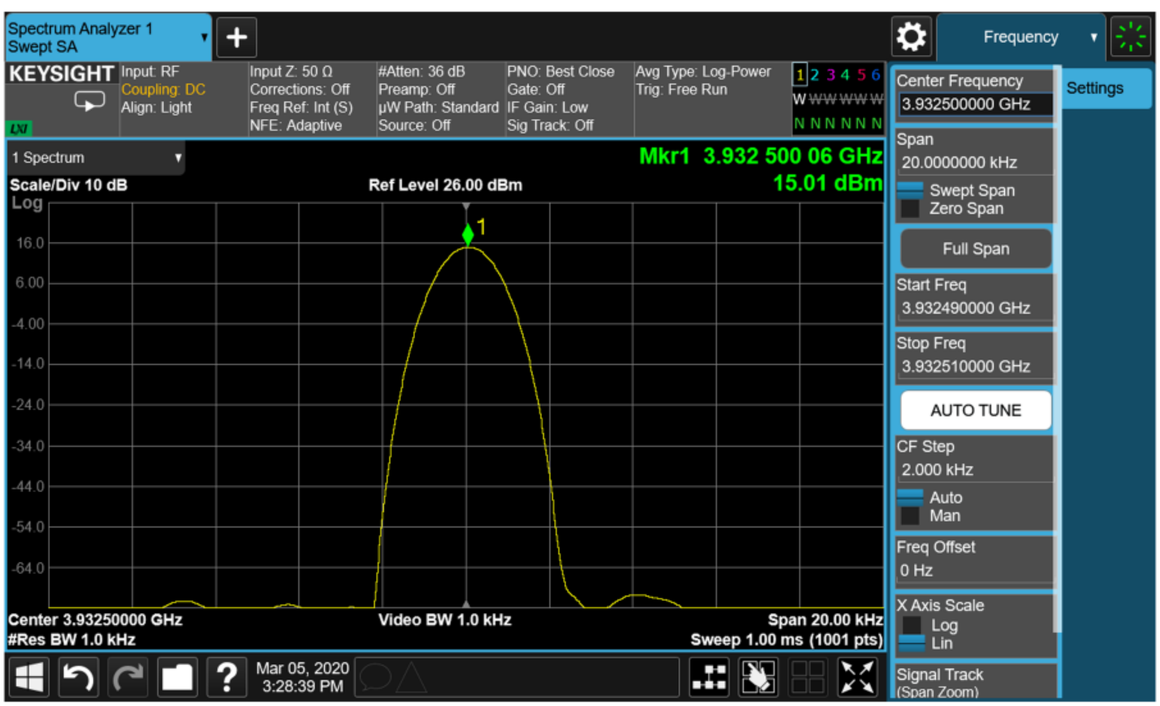
Center Frequency: 3.932500 GHz

Span: 20 kHz

RBW: 1 kHz

1. Connect a spectrum analyzer with a frequency range above 10 GHz to A14 Synthesizer J1. Use a good quality low loss SMA cable since the frequencies being measured are in the 4-9 GHz range.
2. Refer to Figure 7-4.

Figure 7-4 Measuring Spectrum Analyzer, 3.9325 GHz



3. The table below shows power level and LO frequency values at each UXA center frequency. Change the UXA center frequency, and the measuring spectrum analyzer center frequency to verify the LO frequency and power at J1.

UXA Center Frequency, GHz	LO Frequency at J1, GHz	Power Level at J1
3.61 GHz	3.932500	15.0 dBm
3.7 GHz	4.022 500	15.0 dBm
4.0	4.322 500	15.0 dBm
5.0	5.322 500	14.0 dBm
6.0	6.322 500	13.5 dBm
7.0	7.322 500	13.5 dBm
8.4	8.722500	13.8 dBm
9.0	9.322500	-5.4 dBm

Verify 7.2 GHz Signal from A16 Reference Assembly

This procedure measures the 7.2 GHz reference signal at J703 of the A16 Reference assembly. There is a very slight chance the 7.2 GHz filter or semi-rigid cables connecting the filter to the A14 Synthesizer J35002 port are faulty, however the A16J703 output port is an easy location to monitor the signal.

UXA settings:

Instrument **Preset**

Center Frequency: 3.7 GHz

Span: Zero Hz

Measuring spectrum analyzer settings:

Attenuation: 20 dB

Reference Level: 10 dBm

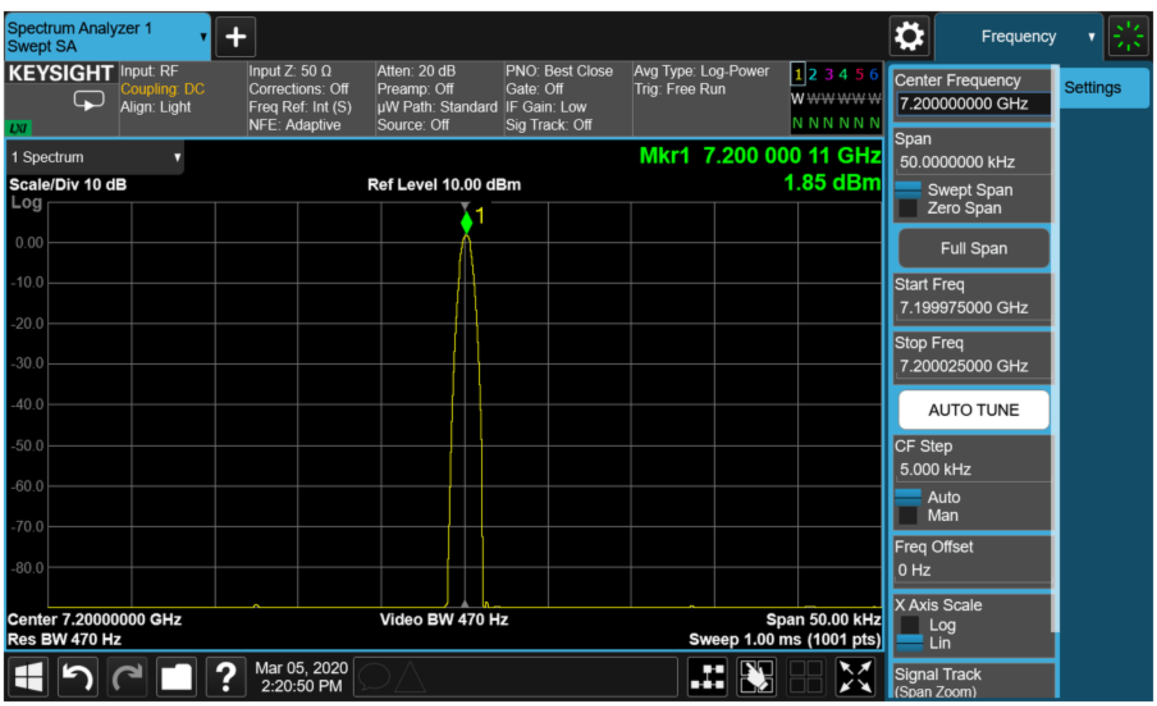
Center Frequency: 7.2 GHz

Span: 50 kHz

RBW: 470 Hz

1. Connect a spectrum analyzer to A16 Reference assembly J703.
2. Refer to Figure 7-5.

Figure 7-5 Measuring Spectrum Analyzer, 7.2 GHz



3. The measured power at 7.2 GHz should be around 1.8 dBm. The instrument under test will show an LO Unlock which is expected since the A14 Synthesizer is not receiving the 7.2 GHz reference signal.
4. To clear the LO Unlock, cycle instrument power.

8 CPU/Disk Drive Troubleshooting

What You Will Find in This Chapter

The following information is presented in this chapter:

1. Theory of operation of the Processor section.
2. Isolating the cause of a hardware problem by verifying the functionality of assemblies in the Processor section.

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.

This following sections are found in this chapter:

A4 Processor Description

If the A4 Processor assembly is suspect in an instrument failure, a full description of the instrument boot process is described in Chapter 2, "Boot Up and Initialization Troubleshooting".

Disk Drive

The A5 Disk Drive can easily be removed from the A4 Processor assembly without removing any of the instrument covers. The disk drive is attached to a tray that is accessed on the rear panel by loosening one screw and pulling the drive out of the processor assembly.

If the A4 Processor assembly is replaced, the existing A5 Disk Drive must be transferred to the replacement Processor assembly.

The A5 Disk Drive is field replaceable. See Chapter 14, "Replaceable Parts" for the correct replacement part number.

A4A1 Disk Drive Interface Board

There may be situations where the A5 disk drive must be removed and inserted many times, such as in a security sensitive environment. Therefore, the A4A1 disk drive interface board can be replaced if connector wear is an issue. See Chapter 14, "Replaceable Parts" for the correct replacement part number.

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 located on the A4 Processor assembly is routed to the A1A2 Front Panel Interface board for this use. This port is a High Speed USB 2.0 compliant port.

Graphics Controller

The entire graphics subsystem is contained within the instrument system processor chipset. There are multiple outputs of the graphics controller that are used by the instrument. One provides the LVDS video control to drive the internal instrument LCD display, one supplies the analog signals to the rear panel VGA output, and one provide the display data to the rear panel DisplayPort connector, which can be used to drive multiple external display types.

Power Supply Control

The power control line from the front panel momentary power switch connects to the A4 Processor assembly. When the front panel power switch is pressed the A4 Processor assembly tells the A6 Power Supply assembly 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 notifies the A4 Processor assembly, which then comes out of reset and boots-up. Outputs from the A4 Processor assembly also drive the two front panel power state LEDs.

Provisions have also been made to allow the processor 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.

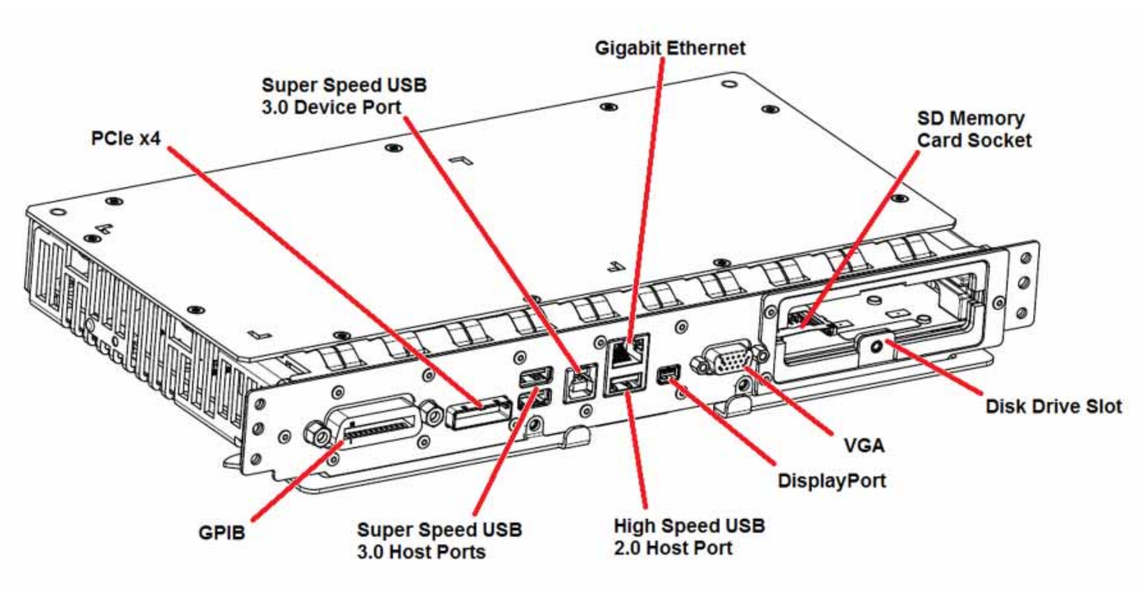
Rear Panel Connectivity

The A4 Processor assembly has direct access to the rear panel of the instrument.

The rear panel connections provided on the A4 Processor assembly are:

- GPIB Interface
- Cabled PCIe x4 Interface
- LAN (RJ45) 10/100/1000 based-T Ethernet port
- USB Ports
    - 2 x Super Speed USB 3.0 Host Ports
    - 1 x Super Speed USB 3.0 Device Port
    - 1 x High Speed USB 2.0 Host Port
- DisplayPort Video Output
- VGA Output
- SD Memory Card Slot (Accessible only when A5 disk drive is removed)

Figure 8-1 A4 Processor Assembly Rear Panel Connectivity



System Memory

The type and amount of system SDRAM in the instrument may vary depending on the age and options installed in an instrument. Current instruments have 16 GB of DDR3 SDRAM in two 204-pin SODIMM memory modules.

The system SDRAM memory is not field replaceable.

System Processor

The processor used in the instrument may vary depending on the age and options installed in an instrument. Current instruments have a Quad Core Intel i7 processor chipset.

The system processor chipset is not field replaceable.

Processor Battery

The A4BT1 Processor battery used is a lithium manganese dioxide coin battery. It powers the instrument clock and maintains the settings for the CMOS BIOS configuration.

The A4BT1 Processor battery is field replaceable. See Chapter 14, “Replaceable Parts” for the correct replacement part number.

SD Memory Card Slot

The main purpose for the SD memory card is for instrument calibration database backup.

The SD memory card that is shipped with each new instrument is currently a 16 GB SDHC card. It is shipped with a backup of the instrument's factory calibration database. The field adjustment software will also automatically create a backup of the instrument calibration database on the SD memory card each time an adjustment is performed.

The SD memory card can be removed if need for security or other reasons and the instrument will function as normal. The SD card can also be manually switched to the Lock (read only) position and the instrument will function normally as well.

While the instrument working calibration database is contained on the E: drive, if when the instrument first boots up and finds a newer database on the SD memory card it will prompt the user to select which database to use. This is intended for use when the A5 disk drive assembly has been changed and the calibration database needs to be transferred to it.

The SD memory card is field replaceable. See Chapter 14, “Replaceable Parts” for the correct replacement part number.

A4 Processor Assembly Troubleshooting

The A4 Processor assembly is serviced as an assembly only; no component level repair is supported.

Boot-Up or Initialization Problems

Typical failures of the A4 Processor assembly will cause the instrument to not boot-up or initialize properly. Of course, these types of failures can also be caused by a variety of other assemblies as well. In order to determine whether a problem such as this is being caused by a defective A4 Processor assembly, first see "UXA Instrument Boot Up Process" on page 55 to eliminate other possibilities.

BIOS Settings

As with other types of PC processor assemblies the A4 Processor assembly has a number of settings particular to the hardware on the board assembly. These settings are saved in a separate memory location on the board and accessed by the BIOS (Basic Input Output System) Setup Utility. If these settings are changed from those that the instrument was initially shipped with this could cause a problem with the booting and/or functionality of the instrument.

If the instrument is having a problem booting up, but is functional enough to enter the BIOS Setup Utility you will want to verify that the BIOS settings have not been changed.

Accessing BIOS Setup Utility

To easily navigate the BIOS Setup Utility you will want to have an external USB keyboard connected to the instrument. Then, when the initial Keysight Technologies splash screen is displayed at power-up, press the key on the keyboard specified on the initial boot screen (typically the DEL key). Once this is pressed you will see the main BIOS Setup Utility screen.

Load Defaults

The instrument was originally shipped from the factory with all of the BIOS settings in their default position. If these have been changed for some reason they can all be returned to their default position by navigating to the **Save & Exit** screen and select **Restore Defaults**. Once the defaults have been loaded select **Save Changes** and **Exit**.

A5 Disk Drive Description

The A5 Disk Drive is a solid state (FLASH) drive. There may be different drive capacities being used, and due to continual changes being made by the drive manufacturers these will continue to change from time to time.

Failures of this disk drive can be either hardware or software related. The first step in troubleshooting is to determine if the failure is software related. If software is found not to be the issue, the disk drive should be replaced.

NOTE

Before replacing the A5 disk drive it is highly recommended that the factory calibration data be backed up to an external drive if at all possible. If this data is not backed up prior to replacing the disk drive all instrument adjustments and performance verification tests will need to be run after the drive is replaced.

For information on how to backup this data see the "Calibration Data Backup and Restore" section in Chapter 16, "Post-Repair Procedures.".

Drive Partitioning

The A5 Disk Drive assembly has been divided up into four different partitions. They are:

C. This partition contains the operating system and software installed at the factory. This is an open system which means you can install additional software, which should be installed on the C: partition. 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 Instrument Image Recovery process is ever run, the original version of the C: partition, as shipped from the factory, will be restored. The user will need to reload any other software that was previously installed in the instrument.

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

D. This partition is reserved for user data storage. The My Documents folders for the user accounts that are preconfigured from the factory are mapped to the D: partition. This is for the convenience of backing-up the user data. You should always back-up the data on the D: partition. This allows you to restore the data if the A5 Disk Drive assembly ever needs to be replaced.

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

E. E.This partition is reserved for Keysight's use. The primary use of the E: partition is for storing of the instrument calibration and alignment data. Do not change or overwrite the files on this partition. This could cause your instrument to not meet specifications, or even to stop functioning properly. It is recommended that you back up the calibration database saved on this partition. For information on how to backup this data see “Calibration Data Backup and Restore” in Chapter 16, “Post-Repair Procedures.”. 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 Instrument Image Recovery process is run, do not use this drive for user 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.

Instrument Image Recovery System

The Instrument Image Recovery System can be used to repair software errors on the instrument's disk drive, or to restore the original factory configuration of the system software. The Instrument Image Recovery System is stored in a separate hidden disk drive partition. Repairing errors on the disk drive may result in loss of data or files.

Restoring the original factory system software does not restore any of the following items:

– Operating system configurations that were changed or updated after the instrument was shipped from the factory. After a recovery, these configurations will have to be redone by the end user.

– Additional software that was installed be the end user. After a recovery, that software will need to be re-installed by the end user.

– Any updates that were made to the instrument measurement application software.

Any user data saved to the D: partition will be retained and not altered by the recovery process. The same is true for the instrument calibration database since it resides on the E: partition.

To restore the C: drive using the image stored in this recovery partition see the section titled “Disk Drive Recovery Process” on page 238.

A5 Disk Drive Troubleshooting

Troubleshooting Software Related Issues

The C: partition contains the operating system and the instrument application software, so boot problems can be caused by either a failure of the operating system or the instrument application software. The failure could have occurred due to a failed installation procedure, instrument application software update failure, a virus, etc...

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

– Reload the instrument application software.

– Use the Disk Drive Recovery Process to reinstall the operating system and instrument application software to the state it was in when the instrument left the factory.

Reloading the Instrument Application Software

The instrument application software contains all the required components for the instrument application as well as all software options. If the instrument application software has become corrupt the operating system will boot but the instrument application software will fail to start. In these cases go to Chapter 18, “Instrument Software.” for information on how to update the instrument application 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 operating system proceed to the “Disk Drive Recovery Process”.

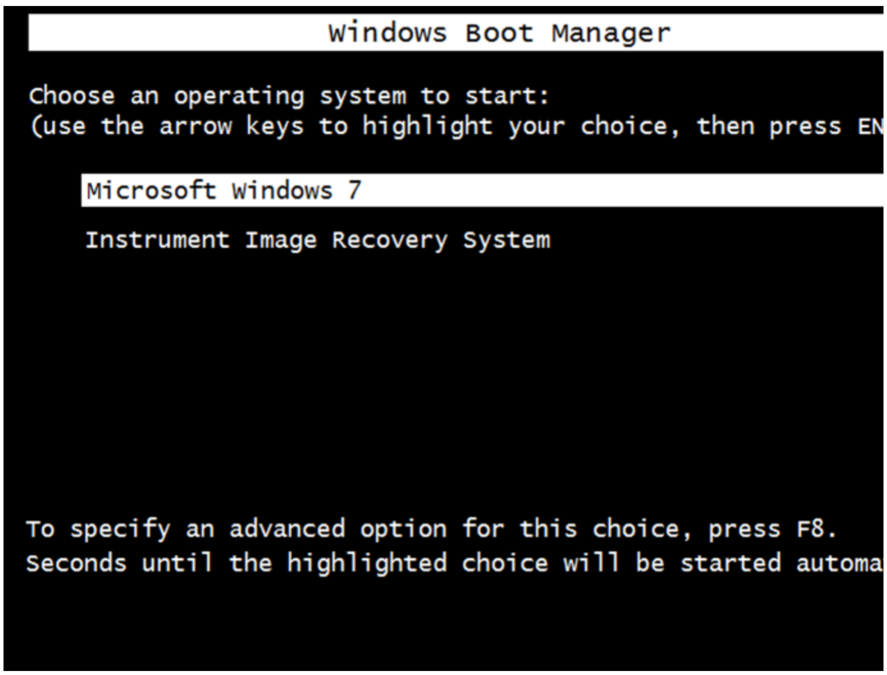
Disk Drive Recovery Process

The Instrument Image Recovery System is stored in a separate hidden disk drive partition. It can be used to attempt to repair errors or restore the original factory instrument system on the C: partition of the instrument disk drive.

Using the Instrument Image Recovery System

1. Make sure the instrument is turned off
2. Turn on the instrument
3. After the "Keysight Technologies" screen is displayed the Windows Boot Manager screen as shown in Figure 8-2 will be displayed for 5 seconds

Figure 8-2 Windows Boot Manager



4. Press the down arrow key to move the highlight to "Instrument Image Recovery System", and press the **Enter** key.
5. When the Instrument Image Recovery System has booted, follow the on-screen instructions to recover the image of the C: partition.
6. After exiting the Instrument Image Recovery System, the instrument may reboot a few times.
7. Update the instrument application software to the latest version by downloading it from the following URL: http://www.keysight.com/find/uxa_software

Replacing the instrument disk drive

If the above two procedures did not resolve the booting issue, the disk drive should be replaced. Please refer to the “A4 CPU/A5 Solid State Drive” replacement section in Chapter 15, “Assembly Replacement Procedures.”.

9 Power Supply/Midplane Troubleshooting

What You Will Find in This Chapter

The following information is presented in this chapter:

1. Theory of operation of the Power Supply/Midplane section.
2. Isolating the cause of a hardware problem by verifying the functionality of assemblies in the Power Supply and Midplane sections.

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.

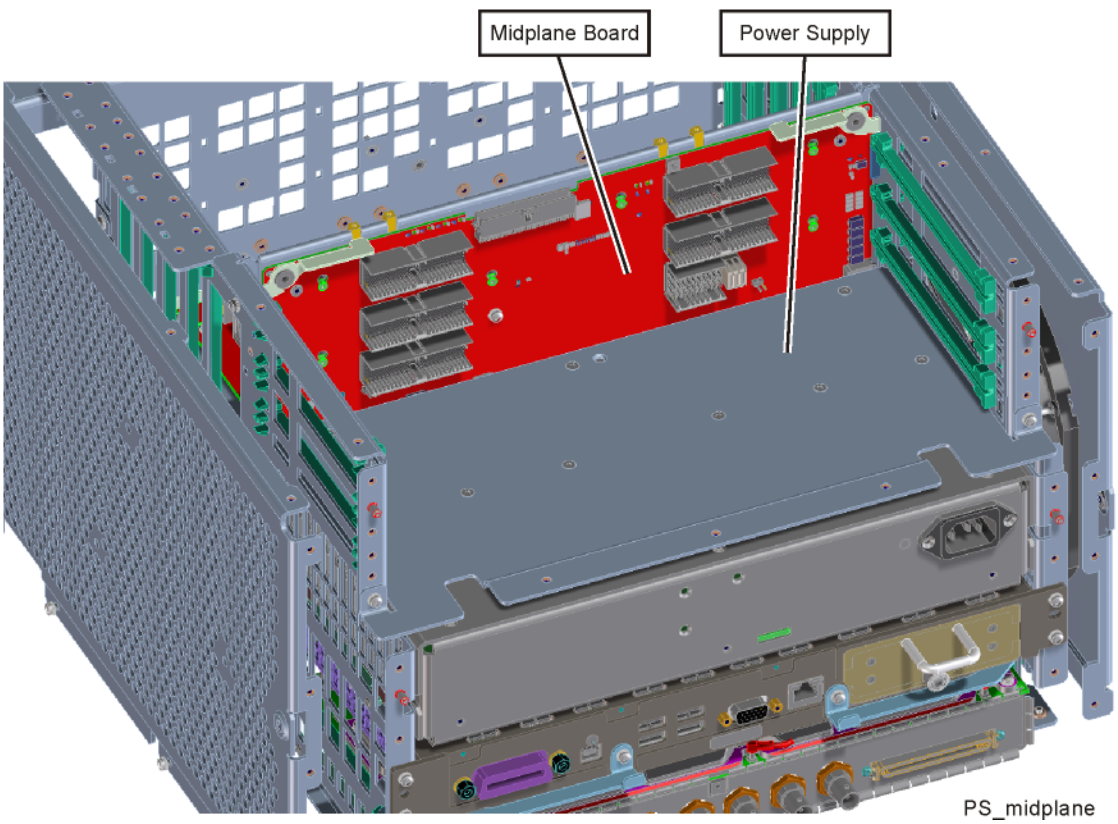
This following descriptions are found in this chapter:

A6 Power Supply Description

Purpose

The A6 Power Supply assembly provides most all the necessary DC voltages for the entire UXA signal analyzer to operate correctly. If any of the power supplies are not within their operating voltages, the analyzer will not function properly. 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 1 second. The power supply will turn off no later than 5 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 A7 Midplane Assembly from the rear of the instrument. (see Figure 9-1.)

Figure 9-1 Power Supply



Power Supply Theory of Operation

The A6 Power Supply assembly is serviced as an assembly only; no component level repair is supported.

The A6 Power Supply assembly provides most all of the necessary DC voltages for the UXA. If any of the power supplies are not within their operating voltages, the instrument will not function properly.

The A6 Power Supply assembly is a switching supply that operates at a frequency of ~130 kHz.

The A6 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 A6 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 A6 Power Supply assembly, there are both test points and status LEDs for some of the different power supply voltages on the A7 Midplane Board assembly. See the "A7 Midplane Board Assembly Description" on page 248 for detailed information on the location of each

Supply Voltages

The following voltage levels are produced by the A6 Power Supply assembly:

Supply Name	Description	Referenced To
+32VA	+32 Volt Analog Supply	ACOM
+15VA	+15 Volt Analog Supply	ACOM
+15VSB	+15 Volt Standby Supply	ACOM
+9VA	+9 Volt Analog Supply	ACOM
+5.2VA	+5.1 Volt Analog Supply	ACOM
-7VA	-7 Volt Analog Supply	ACOM
-15VA	-15 Volt Analog Supply	ACOM
+12VD	+12 Volt Digital Supply	DCOM
+5.1VD	+5.1 Volt Digital Supply	DCOM
+5.1VSB	+5.1 Volt Standby Supply	DCOM
+3.35VD	+3.35 Volt Digital Supply	DCOM
FAN_P	Fan Positive Supply	FAN_N
FAN_N	Fan Negative Supply	FAN_P

Control Inputs

There are a number of control inputs for the A6 Power Supply assembly. The ones that you will want to be familiar with are:

PS_ONn

is a signal that when pulled low tells the A6 Power Supply assembly to turn on all of its outputs. This signal comes from the A4 CPU board assembly and is initiated by pressing the front panel power button.

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. The DITHER signal is generated on the A7 Midplane board assembly.

Control/Status Outputs

There are a number of control and status outputs for the A6 Power Supply assembly. The ones that you will want to be familiar with are:

PWR_OK

is used to verify that the +12VD, +5.1VD, and +3.35VD 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_TRIGGER

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.

PSFAULT_L or PS_FAULTn

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

TEMP_SEN or TEMP_SENSE

is an analog input to the fan speed control circuit. It will cause the fan voltage output from the power supply to increase from the low end to the high end. The fan output voltage has a range from 9.5 V to 14.5 V.

Fuse

The A6 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 A6 Power Supply assembly has two standby supplies that should always be on if the AC input voltage requirements are met. These are the +15VSB and the +5.1VSB supplies. These supplies are used by the instrument to keep certain circuits alive even when the power is turned off.

Over Current Protection

The A6 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 +32VA supply.

Thermal Protection

The A6 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.

A6 Power Supply Assembly Troubleshooting

The A6 Power Supply assembly is serviced as an assembly only; no component level repair is supported.

NOTE The A6 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.

If the instrument will not boot up properly, or the display is not turning on, refer to the UXA Instrument Boot Up Process on page 55 before further A6 Power Supply troubleshooting to rule out any other assembly as the cause of the failure.

Supply Voltages

While there are no test points or status LEDs accessible for troubleshooting on the A6 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 A7 Midplane Board assembly. See the A7 Midplane Board Assembly section in this chapter for detailed information on the location of each.

Control Inputs

PS_ONn

PS_ONn is a signal that when pulled low tells the A6 Power Supply assembly to turn on all of its outputs. This signal comes from the A4 Processor board assembly and is initiated by pressing the front panel power button.

Status Outputs

PWR_OK

The POWER_OK status output is an indication of whether or not all of the digital power supply voltages are up to their specified voltage levels or not. If all of these supplies are working properly this output line will be at a TTL high level. If this output is not at a TTL High level the instrument CPU will not come out of its reset state and will not boot-up. Once this output goes to a TTL high level the instrument CPU will start its boot-up process and the POWER_ON_L line coming from the A4 Processor assembly will go to a TTL low level which will tell the A6 Power Supply assembly to turn on the rest of it output voltages.

PSFAULT_L or **PSFAULTn**

The FAULT_L status output is an indication of whether or not there is a fault detected by the A6 Power Supply that is keeping it from powering on properly. If all of the required conditions to turn the A6 Power Supply assembly on properly are being met this status output line will be at a TTL high level. The conditions that could cause this status output line to be at a TTL low level include that of an over current condition, an over voltage condition, and an over temperature condition. However, there is no way to know at the A6 Power Supply assembly level which one of these conditions may be the cause of a TTL low level to be on the PSFAULT_L or PSFAULTn status output.

While any over voltage or over temperature conditions will most likely be caused by an A6 Power Supply assembly failure, an over current condition will most likely be caused by another assembly in the instrument demanding too much current.

If this output is not at a TTL high level the A6 Power Supply assembly will not turn its non-standby power supplies on, no matter what the A4 Processor assembly tells it to do.

A7 Midplane Board Assembly Description

The A7 Midplane board is used to connect the A4 Processor board assembly and the A6 Power Supply assembly to the A24 Motherboard Interconnect and the A8 Motherboard, and thus the rest of the instrument electrical assemblies.

In addition, the A7 Midplane board also provides the following functions:

– Instrument power supply voltage test points and status LEDs
– +3.3V analog linear power supply regulation (+3.3VA)
– -5.2V analog linear power supply regulation (-5.2VA)
– Non-volatile memory for storage of the instrument model number, serial number, and software license keys (Secure Storage).
– Power supply dithering. A triangle wave of approximately 100 Hz is generated and goes directly to the A6 Power Supply assembly. This is used to frequency modulate the power supply switching frequency for the purpose of lowering any power supply related interference.
– Circuitry to phase lock the A4 Processor assembly CPU clock to the instrument reference frequency.

Midplane Board Connections

Connector	Connects To	Connector	Connects To
J2	A6 Power Supply Assembly	J16	A4 Processor Assembly
J10	A6 Power Supply Assembly	J14	A4 Processor Assembly
J9	A6 Power Supply Assembly	J13	A4 Processor Assembly
J8	A6 Power Supply Assembly	J18	A4 Processor Assembly
J7	A6 Power Supply Assembly	J19	A4 Processor Assembly
J6	A6 Power Supply Assembly	J24	A22 Wideband Digital I.F. (Opt B2X)
J12	A6 Power Supply Assembly	J25	A22 Wideband Digital I.F. (Opt B2X)
J11	A6 Power Supply Assembly	J26	A23 Wideband Digital I.F. (Opt B5X)
J5	A6 Power Supply Assembly	J28	A23 Wideband Digital I.F. (Opt B5X)
J4	A6 Power Supply Assembly	J32	A1A2 Front Panel Interface
J3	A6 Power Supply Assembly	J921	A24 Motherboard Interconnect
J1	A6 Power Supply Assembly	J920	A24 Motherboard Interconnect

Figure 9-2 A7 Midplane Board Assembly Connections, LED’s, and Test Points - Rear View

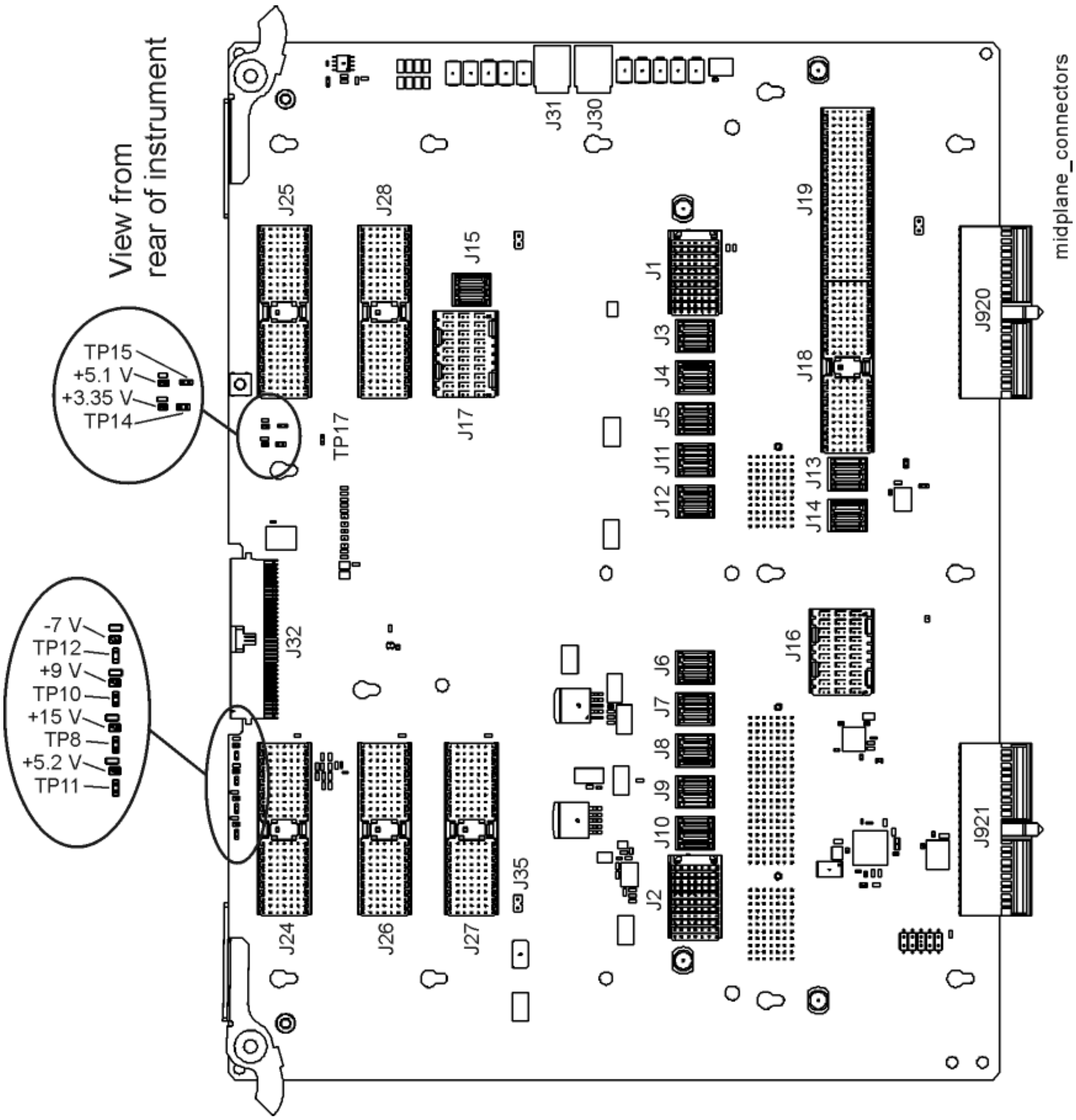
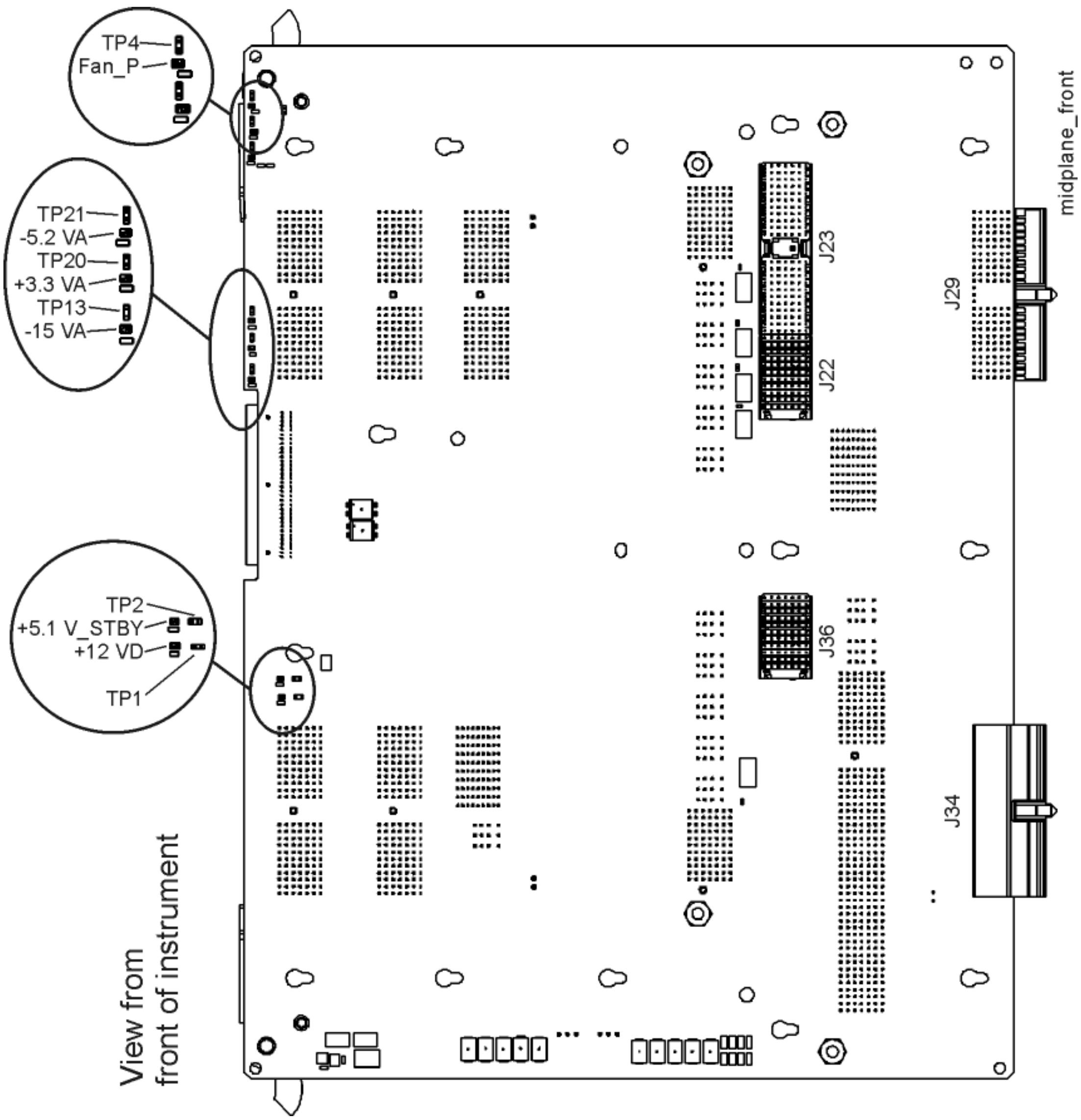


Figure 9-3 A7 Midplane Board Assembly Connections, LED's, and Test Points - Front View



A7 Midplane Board Assembly Troubleshooting

The A7 Midplane board assembly is serviced as an assembly only; no component level repair is supported.

Instrument Power Supply LEDs and Test Points

While the A6 Power Supply assembly has no user accessible LEDs or test points the A7 Midplane board assembly does provide these for some of the different instrument power supplies. A complete list of these can be found in Table 9-1 and the location of each can be seen in Figure 9-2 and Figure 9-3.

Instrument Secure Storage

This is Non-volatile storage of instrument model number, serial number, and software license keys. While the license keys are also contained on the C: drive of the instrument, the model and serial numbers are only saved in this secure memory. There is no way for the user to access this memory in any way. This is reserved for the factory and field software when needed for instrument initialization, as well as the instrument software when installing an option license key. If for some reason any of these cannot be remembered by the instrument there could be a problem with this memory and the A7 Midplane board assembly would need to be replaced.

Power Supply Dithering

A triangle wave of approximately 100 Hz is generated and goes directly to the A6 Power Supply assembly. This is used to frequency modulate the power supply switching frequency for the purpose of lowering any power supply related interference.

If for some reason the level of the power supply related interference is higher than normal this circuitry, or the A6 Power Supply assembly, could be suspect.

Table 9-1 A7 Midplane Board LEDs and Test Points

Supply/ Signal	Description	Referenced To	Generated On	Expected Status	
				Power On	
				LED	Test Point (VDC)
+32VA	+32 Volt Analog Supply	ACOM	A6	Off	not measurable
+15VA	+15 Volt Analog Supply	ACOM	A6	Green	TP8 +15 ± 1.0
+15VSB	+15 Volt Standby Supply	ACOM	A6	n/a	not measurable
+9VA	+9 Volt Analog Supply	ACOM	A6	Green	TP10 +9 ± 1.0
+5.1VA	+5.1 Volt Analog Supply	ACOM	A6	Green	TP11 +5.1 ± 0.75
-7VA	-7 Volt Analog Supply	ACOM	A6	Green	TP12 -7 ± 1.0
-15VA	-15 Volt Analog Supply	ACOM	A6	Green	TP13 -15 ± 1.0
+12VD	+12 Volt Digital Supply	DCOM	A6	Green	TP1 +12 ± 1.0
+5.1VD	+5.1 Volt Digital Supply	DCOM	A6	Green	TP15 +5.1 ± 0.75
+5.1VSB	+5.1 Volt Standby Supply	DCOM	A6	Green	TP2 +5.1 ± 0.75
+3.35VD	+3.35 Volt Digital Supply	DCOM	A6	Green	TP14 +3.35 ± 0.75
FAN_P	Fan Positive Voltage	ACOM	A6	Green	TP4 +9.2 to +14.5
+3.3VA	+3.3 Volt Analog Supply	ACOM	A7	Green	TP20 +3.35 ± 0.75
-5.2VA	-5.2 Volt Analog Supply	ACOM	A7	Green	TP21 -5.2 ± 0.75
PSFAULT_L or PSFAULTn	Power Supply Fault	ACOM	A6	n/a	not measurable
DCOM	Digital Common	n/a		n/a	
PWR_OK	Digital Supplies OK	DCOM	A6	Off	not measurable
PS_ONn	Power Supply Enable	DCOM	A4	Green	not measurable

10 Front Panel/Motherboard Troubleshooting

What You Will Find in This Chapter

Content coming soon.

11 Hardware Options

What You Will Find in This Chapter

The following information is found in this chapter.

The UXA signal analyzer has a variety of hardware options that can be purchased and installed at the time of new instrument sale, or as a post-sale upgrade. Some of these hardware options require the installation of additional hardware, and others require licensing hardware already present in the standard instrument hardware configuration.

A current list of all instrument options and retrofit requirements is available on the Keysight web site for the UXA signal analyzer at:

http://www.keysight.com/find/UXA_upgrades

Table 11-1 Hardware Options

Option	Description	Additional Hardware or License Only	Service Guide Section
ALV	Auxiliary Log Video (at rear panel Aux IF connector)	License Only	Chapter 5, “Front End Control Troubleshooting.”
B25	25 MHz Analysis Bandwidth path	License Only	Chapter 6, “Analog/Digital IF Troubleshooting.”
B40	40 MHz Analysis Bandwidth path in addition to 25 MHz BW	License Only	Chapter 6, “Analog/Digital IF Troubleshooting.”
B2X	255 MHz Analysis Bandwidth path	Additional hardware	This chapter

KEYSIGHT TECHNOLOGIES

Table 11-1 Hardware Options

Option	Description	Additional Hardware or License Only	Service Guide Section
B5X	510 MHz Analysis Bandwidth path	Additional hardware	This chapter
CRP	Arbitrary IF Output (10 MHz to 75 MHz programmable, Aux IF connector on rear panel).	License Only	Chapter 5, “Front End Control Troubleshooting.”
EA3	Electronic Attenuator	License Only	Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers).”
H1G	1 GHz Analysis Bandwidth	Additional hardware	This chapter
P08 **P13** **P26** **P44** **P50**	Preamp, 100 kHz to 8.4 GHz Preamp, 100 kHz to 13.6 GHz Preamp, 100 kHz to 26.5 GHz Preamp, 100 kHz to 44 GHz Preamp, 100 kHz to 50 GHz	License Only	Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers).”
RTS	Real-Time I/Q Data Streaming	License and additional hardware	This chapter
YAV	Y-Axis Output	License Only	Chapter 6, “Analog/Digital IF Troubleshooting.”

NOTE

See Chapter 12, “Block Diagrams.” for information on how these hardware options are installed in the signal path.

A21 Wideband Analog IF Troubleshooting

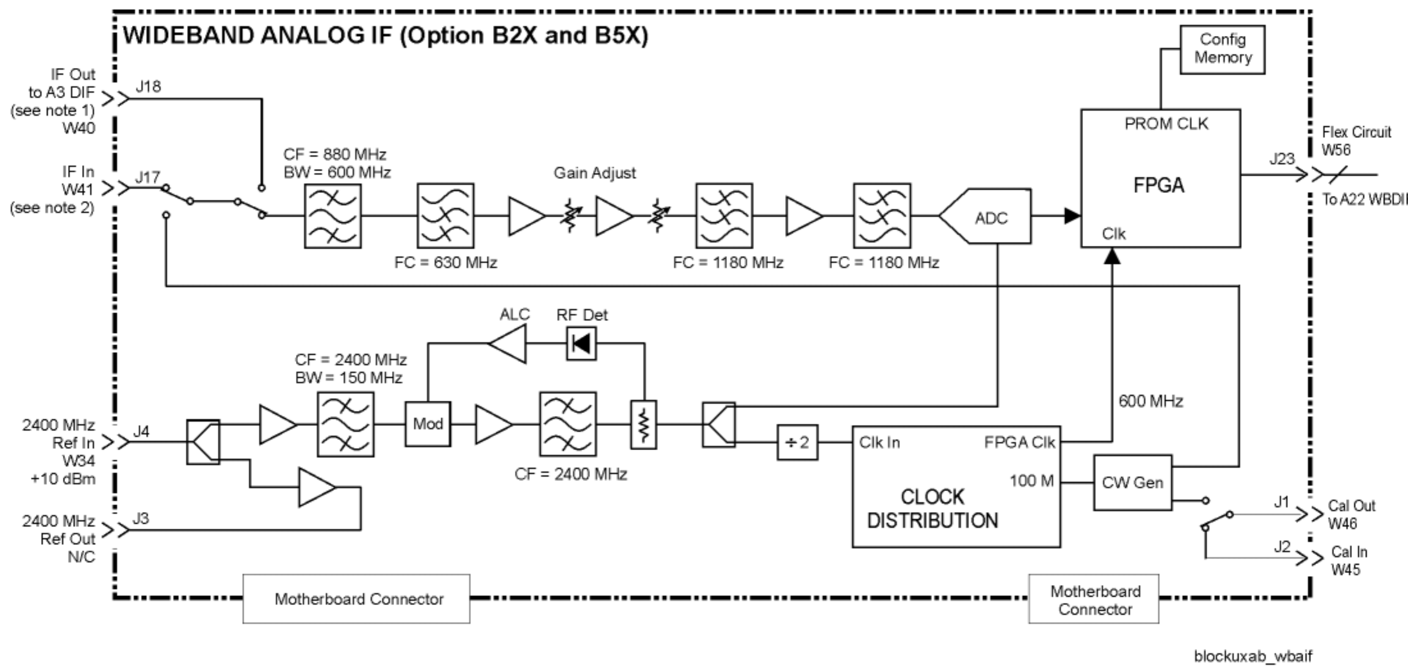
A21 Wideband Analog IF Assembly Description

The analyzer's RF input signal is down converted to a 250 MHz, 750 MHz, or 877.148 MHz intermediate frequency by the A13 Front End assembly and routed through the A15 Front End controller to A15J901. Cable W41 connects to A21J17 Wideband Analog IF Input. The signal is filtered, attenuation and gain applied based upon the instrument settings. This signal is then sampled by the ADC and the resultant data is the sent to the A22 Wideband Digital IF (Option B2X) for processing via the flex circuit cable. If the instrument has Option B5X, 510 MHz Analysis BW, the resultant data is sent to the A22 and A23 Wideband Digital IF boards.The A22 and A23 Wideband Digital IF have no service accessible locations and should be troubleshot from the front panel controls.

If the analyzer is using the Option B40, 40 MHz IF Path, the signal at 250 MHz IF frequency is switched to J18 and this 250 MHz IF is routed through W40 to the A3 Digital IF assembly.

If the analyzer is using the Option B2X, 255 MHz IF Path, the signal at J17 will be at 750 MHz. If the analyzer is using the Option B5X, 510 MHz Path, the signal at J17 will be 877.148 MHz. Both of these IF signal frequencies are processed through the A21 Wideband Analog IF assembly.

Figure 11-1 Analog IF Block Diagram



Note 1

IF Path	J18 Frequency
255, 510 MHz	n. c.
40 MHz	250 MHz

Note 2

IF Path	J17 Frequency
40 MHz	250 MHz
255 MHz	750 MHz
510 MHz	877.148 MHz

Inputs to the A21 Assembly

A21J17 250 MHz or 750 MHz or 877.148 MHz IF signal (from A15J901 Front End Controller)

A21J4 2400 MHz reference from A16 Reference Assembly via W34 cable

A21J2 Calibrator signal from A3J17 40 MHz Digital IF via W45 cable

Outputs from the A21 Assembly

A21J3 2400 MHz Reference Out

A21J18 300 MHz IF Out to A3J16 of the 40 MHz Digital IF

A21J1 Calibrator Out to A16 Reference assembly A16J726 via W46 cable

A21 Wideband Analog IF Assembly Theory of Operation

The A21 Wideband Analog IF assembly primary role is to properly filter and apply attenuation or gain to optimize the level going to the ADC and provide sufficient pre-filtering to reject images that would otherwise interfere with the signal of interest. Precision alignments are used to calibrate the filters, attenuators and gain of this assembly. It is not uncommon that the reported failure will come from failures reported when an alignment fails for this assembly. The alignment history file is a good indicator of a failure for this assembly. This file is a text file that can be viewed using a text editor. The file is located in the following location:

E:\AlignDataStore\AlignmentHistory.txt

This file will list all alignments that have passed or failed. Alignments reporting a failure of the WBAIF assembly can in many cases be attributed to failure of this assembly. If however these errors follow errors in the RF section of the instrument, it is possible that additional WBAIF error will appear due to missing RF Calibration signals and not related to the A21 Wideband IF assembly.

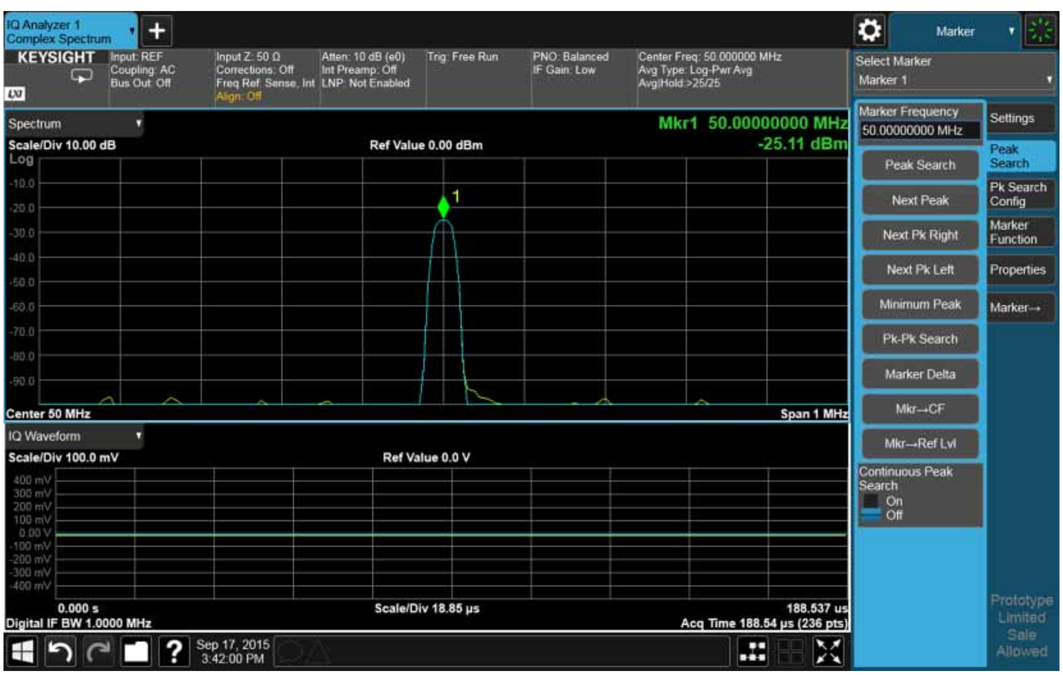
Manually troubleshoot the assembly is basically verifying the proper IF signal at J17 is present and at the proper level. In addition you will want to verify input and output levels of the various calibration and reference signals.

A21 Wideband Troubleshooting

Verify the J17 IF Input level

1. Turn the instrument off.
2. Remove the instrument enclosure and top brace covers. Refer to Chapter 15, “Assembly Replacement Procedures” in this service guide.
3. Turn on the signal analyzer and wait for the instrument to complete the boot up process.
4. Press **System**, **Alignments**, **Auto Align**, **Off**.
5. Press **Mode/Meas**, **IQ Analyzer (Basic)**, **Complex Spectrum**, **OK**
6. Press **Input/Output**, **RF Calibrator**, **50 MHz**
7. Press **Frequency** hard key and set the center frequency to 50 MHz.
8. Press **Meas Setup**, **IF Path**. Tap **IF Path** and choose **255 MHz** or **510 MHz** from the drop down menu. If Option B5X, 510 MHz, is installed, there is no 255 IF Path selection. Choose **510 MHz** in this case.
9. Verify the 50 MHz signal is at –25 dBm on the analyzer display by pressing **Peak Search** on the analyzer. The marker readout should be 50 MHz at –25 dBm ±3 dB. See Figure 11-2. If this reference signal is measuring incorrectly, see Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)” in this service guide.

Figure 11-2 50 MHz Signal



Verify the J18 Output

The J18 output is active only when the 40 MHz IF path is selected.

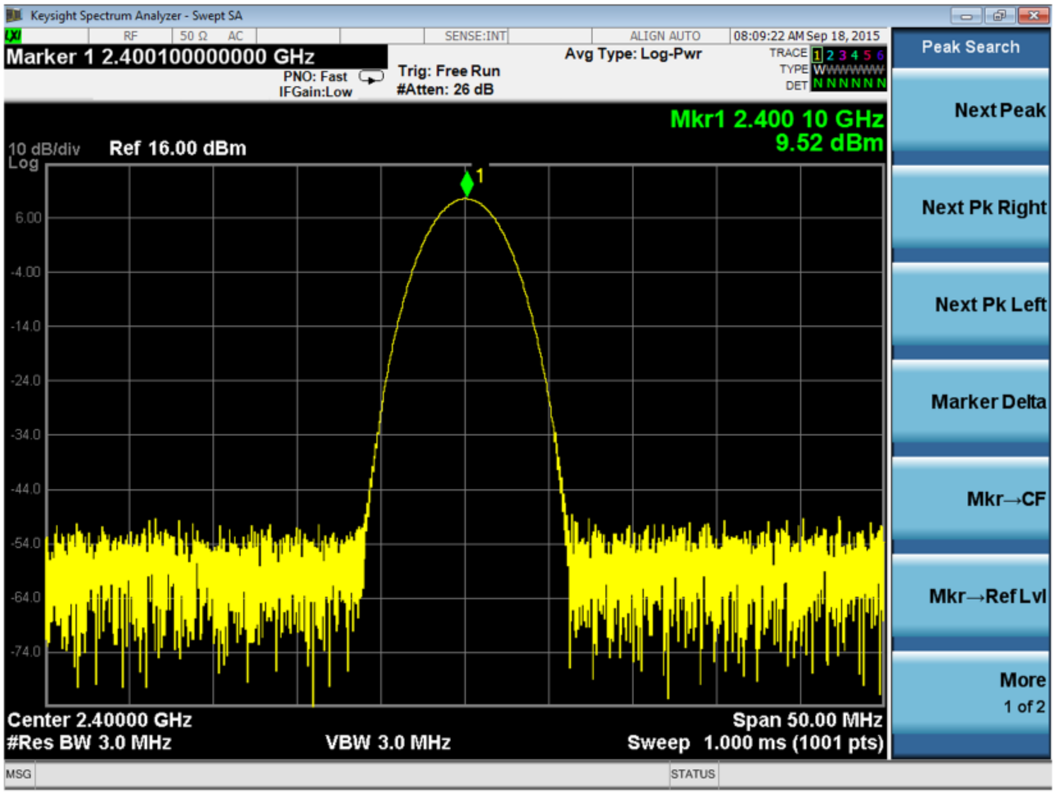
The following test can be used to assure the W41 cable and the switch on the A21 Wideband AIF are good.

1. To select the 40 MHz IF path, press **Meas Setup**, **IF Path**. Tap **IF Path** and choose **40 MHz** from the drop down menu.
2. Turn on the 50 MHz calibrator as explained in the last section. Set the center frequency to 50 MHz. Set the span to 0 Hz.
3. Connect A21J18 to a known good spectrum analyzer. Tune the spectrum analyzer to 250 MHz. This port switches the 250 MHz IF that is input to the A21 Wideband Analog IF to be routed to the A3J15 40 MHz Digital IF. If this –23 dBm ±3 dB signal is present, you have verified the 250 MHz IF from the A15J901 Front End Controller. If this signal is not present, verify the signal is present on A15J901 of the A15 Front End Controller.

Verify the 2400 MHz Frequency Reference

1. Turn the instrument off.
2. Remove the instrument cover. Refer to Chapter 15, “Assembly Replacement Procedures” in this service guide.
3. Turn on the signal analyzer and wait for the instrument to complete the boot up process.
4. Press **System**, **Alignments**, **Auto Align**, **Off**.
5. Press **Mode/Meas**, **IQ Analyzer**, **Complex Spectrum**, **OK**.
6. Press **Input/Output**, **RF Calibrator**, **50 MHz**
7. Press **Meas Setup**, **IF Path**. Tap **IF Path** and choose **255 MHz** or **510 MHz** from the drop down menu.
8. Verify the 50 MHz signal is at –25 dBm on the analyzer display by pressing **FREQ**, **50 MHz**, **SPAN**, **1 MHz**, **Peak Search** on the analyzer. The marker readout should be 50 MHz at –25 dBm ±3 dB. If this reference signal is measuring incorrectly, see Chapter 4, “RF Section Troubleshooting (RF/Microwave Analyzers)” in this service guide.
9. Connect a known good spectrum analyzer to A21J3. Verify reference signal at 2400 MHz at a level of + 9 dBm.

Figure 11-3 2400 MHz Signal



A22 Wideband Digital IF Troubleshooting

Normally failure of this assembly will occur during extensive alignments. Verify if there are alignment error related to the WBDIF located in the E:\AlignDataStore\AlignmentHistrory.txt files.

If errors are found related to WBDIF replace the A22 Wideband Digital IF assembly. To troubleshoot this module set the instrument up as below:

1. Turn on the analyzer and wait for the instrument to complete the boot up process.
2. Press **System**, **Alignments**, **Auto Align**, **Off**.
3. Press **Mode/Meas**, **IQ Analyzer (Basic)**, **Complex Spectrum OK**.
4. Press **Input/Output**, **RF Calibrator**, **50 MHz**
5. Press **Span**, **10 MHz**
6. Press **Meas Setup**, **IF Path**. Tap **IF Path** and choose **255 MHz** or **510 MHz** from the drop down menu.
7. Verify the 50 MHz signal is at –25 dBm on the analyzer display by pressing **Peak Search** on the analyzer. The marker readout should be 50 MHz at –25 dBm ±3 dB.
8. If this signal is not present, determine if the issue is only present with the Wideband 255 MHz or 510 MHz path. Press **Mode Setup**, **IF Path**, **40 MHz**. If the signal is now present, there is a likely failure of the A22 Wideband Digital IF or the A21 Wideband Analog IF

Option RTS, Real-Time I/Q Data Streaming

Description

Option RTS provides real time I and Q data to the instrument rear panel Wideband Digital Bus I and Q connectors.

External record and playback hardware is available from X-Com Systems to connect to the Option RTS rear panel ports.

Signal Analyzer Hardware Requirements

The signal analyzer must contain the Wideband Digital IF and Wideband Analog IF assemblies that are present when the analyzer has Option B2X or B5X.

To verify the option is licensed, and the Wideband Digital hardware is present, press **System**, **Show System** and verify the presence of one or more options listed above (when Option B5X is present, you will also see Option B2X).

Then press **System**, **Show Hardware** and confirm the instrument can identify the hardware. You will see both WB Analog IF and WB Digital IF listed. If Option B5X is installed, you will see two WB Digital IF assemblies listed.

The signal analyzer must contain the Wideband Digital IF Extension board. This board is also listed in the Show Hardware screen as WB DIF Extension.

The Wideband Digital IF Extension board is only present when Option RTS is installed in the instrument, and is located at the right rear of the instrument. The board has I and Q connectors that protrude out of slots in the rear panel, and are labeled Wideband Digital Bus.

The Wideband Digital IF Extension board provides buffering and level shifting to the I and Q signals that come from the Wideband Digital IF assembly via a flex circuit cable. If the instrument contains Option B5X (two Wideband Digital IF assemblies), there will be two flex cables.

Software Requirements

The instrument must have the following options installed:

- N9040B-RT1 or N9040B-RT2, Real Time Analysis
- N9040B-RTS Real Time Data Streaming

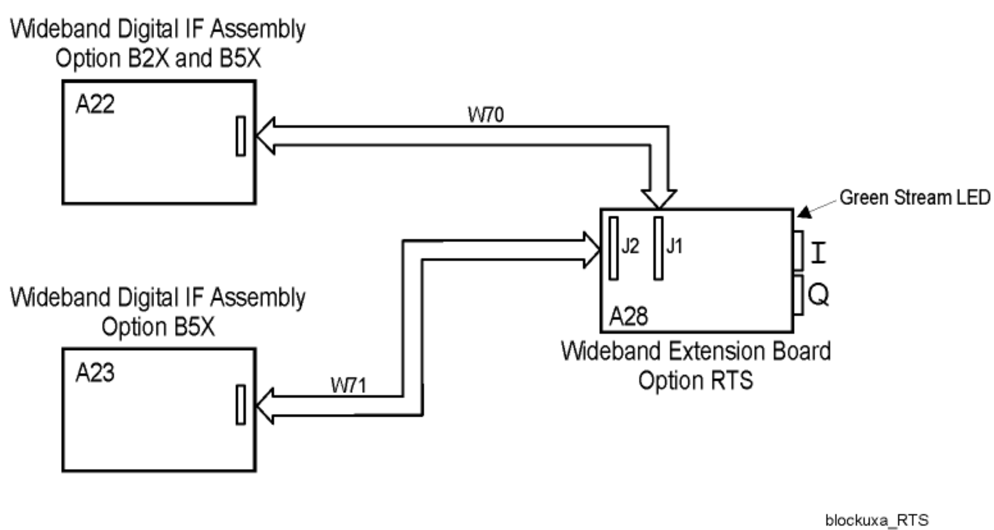
Press **System**, **Show System** and verify the options listed above are present.

Functionality Check

1. Enter Real Time Analysis mode by pressing **MODE/MEAS**. Select **Real-Time Spectrum Analyzer**, **OK**.
2. Press **Input/Output** and select **Output**.
3. Press **Wideband Digital Bus On** to activate the rear panel Wideband Digital Bus connectors, and then verify that the green Stream LED next to the I output connector on the rear panel is illuminated.

There is no easy way to determine if the I and Q data at the rear panel is correct. However if the instrument can complete the power on tests and alignments without an error, and you perform the functionality test above, Option RTS should be working correctly.

Figure 11-4 Option RTS



Option H1G, 1 GHz Analysis Bandwidth Assembly

Description

Option H1G provides 1 GHz Analysis Bandwidth in I Q Analyzer mode.

Signal Analyzer Hardware Requirements

– Analyzer frequency range 50 GHz or above

– Option H1G licensed

– H1G hardware Installed.

NOTE Option B2X, 255 MHz BW hardware is present on instruments that contain Option H1G. The "B2X" A21 Wideband Analog IF assembly provides signal routing.

---

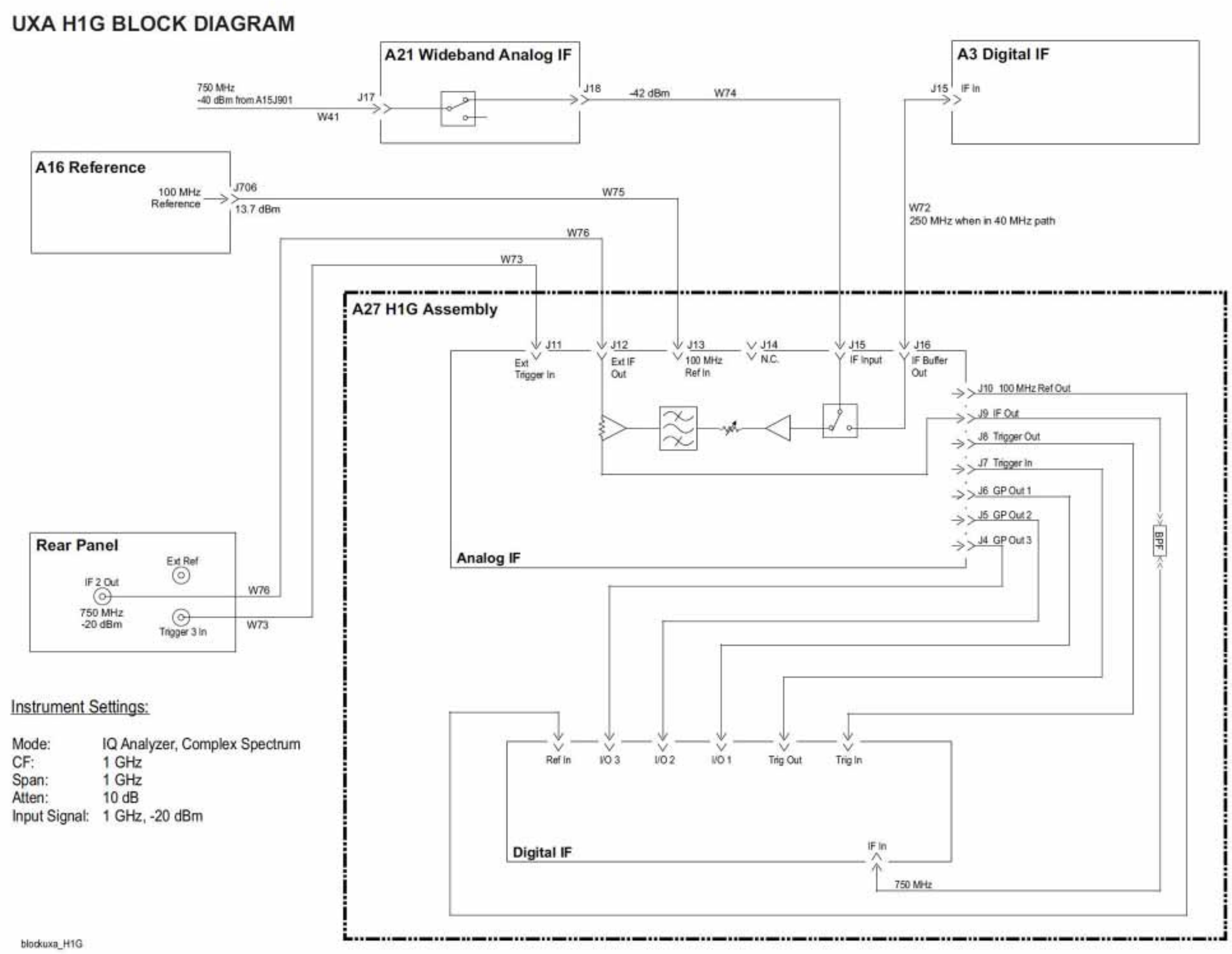
1 GHz Analysis Bandwidth Assembly Theory of Operation

The input signal is down converted to a 750 MHz IF in the A13 Front End assembly. The Front End assembly has a 1 GHz bandpass filter that is switched into the Lowband (<3.6 GHz input signal) signal path using coax switches mounted on the front end assembly. In the high band signal path, the preselector is bypassed to allow ample bandwidth.

Refer to Figure 11-5, "Option H1G Block Diagram,". The 750 MHz IF signal is routed from the A15 Front End Control assembly J901 to A21J17 on the A21 Wideband Analog IF assembly that is used in the 255 MHz IF Path. The 750 MHz IF signal leaves the A21 Wideband Analog IF through J18 and goes to the A27 1 GHz BW assembly.

The A27 1 GHz bandwidth assembly consists of a 1 GHz Analog IF and a Digital IF assembly and interface boards that allows insertion into the rear motherboard. The entire assembly must be replaced because the interconnections are difficult to remove/attach and troubleshooting the individual board assemblies is very difficult due to packaging constraints and lack of test points. Therefore the entire assembly must be replaced.

Figure 11-5 Option H1G Block Diagram



Operation and Verification

Enabling the 1 GHz IF path and verifying performance using the internal calibrator signal.

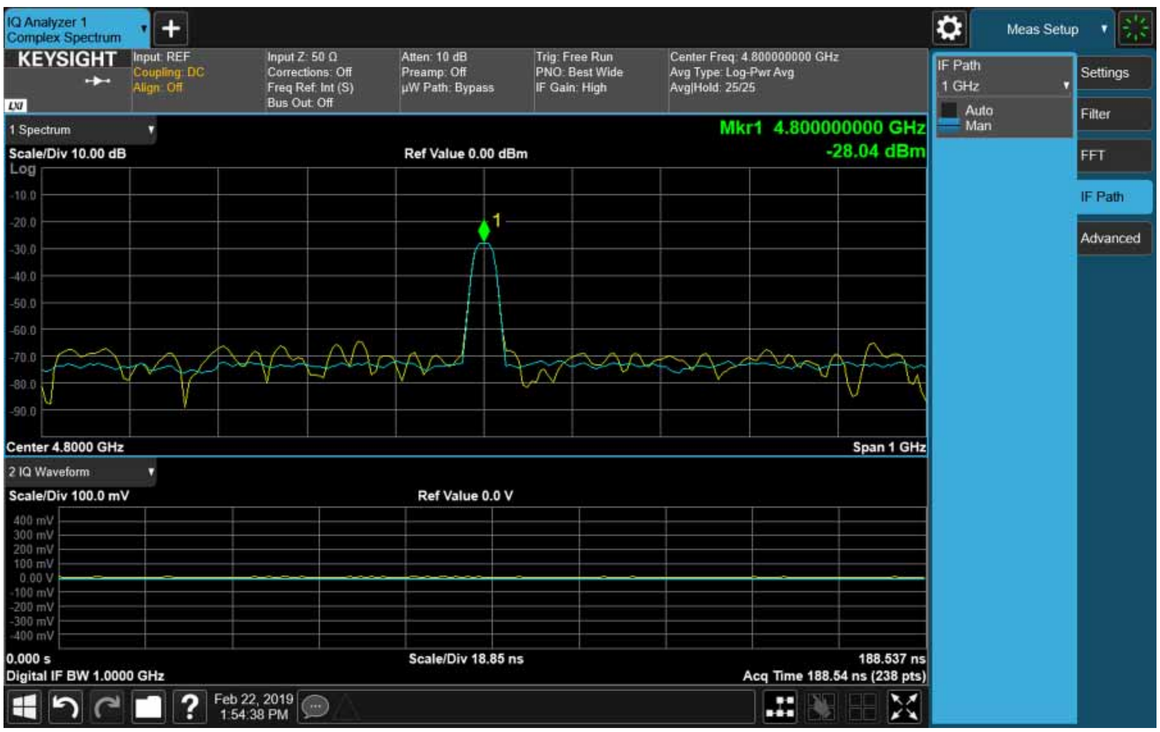
To enable the 1 GHz IF path, press the green **Mode Preset** key, then press **Mode/Meas** and select **IQ Analyzer (Basic)** mode. Assure **Complex Spectrum** is highlighted and tap **OK**.

Press the **Meas Setup** hardkey and tap **IF Path** then **IF Path** pull down and select **1 GHz**.

Turn on the 4.8 GHz calibrator signal by pressing **Input/Output**, **RF Calibrator** and select **4.8 GHz**. Press **FREQ**, and set **Span** to **1 GHz**.

Set the analyzer center frequency to 4.8 GHz and the calibrator signal should appear on screen at about -28 dBm if the 1 GHz path is working correctly. See Figure 11-6.

Figure 11-6 4.8 GHz Calibrator Signal



If the 4.8 GHz calibrator signal is not at the correct level in the 1 GHz IF path, check the calibrator signal level when using the 255 MHz IF path. Press **Meas Setup**, **IF Path** and chose **255 MHz** or **40 MHz**.

Verify the 4.8 GHz calibrator signal amplitude is about -28 dBm. If the signal level is now correct you have verified the problem is in the 1 GHz IF path.

If the signal level is not correct, the problem could be a faulty calibrator signal or some problem in the Front End or IF distribution chain. Go back to **Spectrum Analyzer** mode and troubleshoot using the 50 MHz and 4.8 GHz calibrator signals.

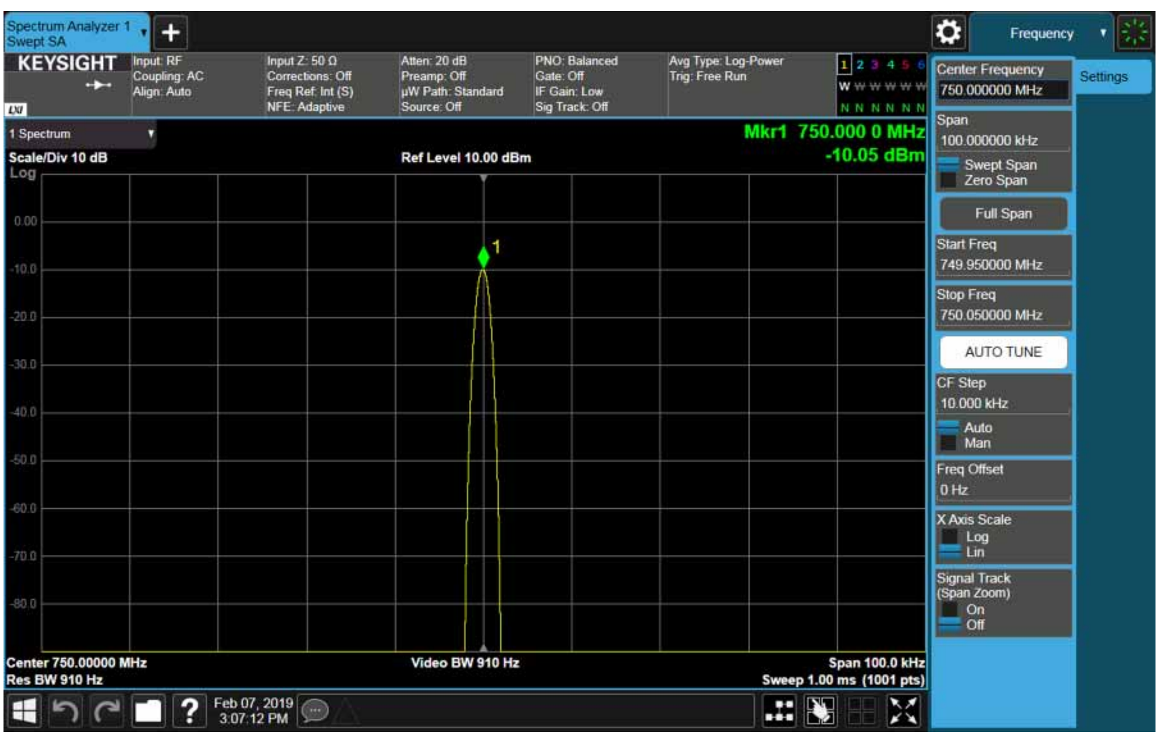
If the problem is only seen in the 1 GHz IF path, connect a spectrum analyzer to the sma rear panel IF 2 Out, that will allow you to measure the signal level out of the 1 GHz Analog IF assembly.

Assure the 1 GHz path is being used. Select **IQ Analyzer** mode. Press **Meas Setup**, **IF Path**, **1 GHz**. Assure the 4.8 GHz calibrator is on.

Enable the rear panel IF 2 Output by pressing **Input/Output**, **Output**, **IF 2 Out** and select **On**. You will see a message on the UXA screen that says 'No Result, measure invalid with IF 2 out set to on" This is because a switch on the 1 GHz IF assembly routed the 750 MHz IF signal to the rear panel and NOT through the rest of the internal signal path.

Set up the measuring spectrum analyzer as shown in Figure 11-7. Notice the 750 MHz signal measures -10 dBm.

Figure 11-7 Spectrum Analyzer Connected to Rear Panel IF 2 Out



Advanced Troubleshooting

This procedure will verify signal levels at the output of the A15 Front End Control assembly, the IF Output of the A21 Wideband Analog IF (B2X assy), the 100 MHz reference from the A16 Reference assembly, and the rear panel IF 2 output from the H1G Analog IF assembly. Refer to Figure 11-5, “Option H1G Block Diagram,”.

1. This procedure uses an external signal source connected to the analyzer's RF Input port.

   External source settings:

   Frequency: 1 GHz

   Amplitude: -20 dBm

   Connect the source 10 MHz Out to the signal analyzer Ext Ref, so both instruments share a single frequency reference.

2. UXA analyzer settings:

   Mode: IQ Analyzer, Complex Spectrum

   Meas Setup, IF Path, 1 GHz

   Center Frequency: 1 GHz

   Span: 1 GHz

   Atten: 10 dB

3. Locate the A15, Front End Control assembly in the instrument and remove the cable from A15J901 (IF Out). Connect a signal analyzer to this J901 MMCX female connector. One way to make this connection is to order a cable, 8121-2608 or 8121-2027 (this is the W16, SMA to MMCX cable used in the UXA).

   Set the measuring signal analyzer to the setting shown in Figure 11-7. The signal amplitude at 750 MHz should be about -40 dBm as shown in Figure 11-8.

Figure 11-8 IF Output of A15 Front End Controller at J901

4. Reconnect A15 J901 cable. Locate A21 Analog IF Assembly and disconnect cable from J718. Measure this 750 MHz signal level with the spectrum analyzer. The signal amplitude should be about 2 dB lower than the previous measurement since the signal is only going through some cabling and the switch on the A21 assembly.

   Reconnect the cable to A21J718.

5. Assure the 100 MHz reference signal at about 13 dBm is present at the A16 Reference Assembly J706.

6. Measure IF2 Out on rear panel. Press Input/Output, Output, IF 2 Out and select On.

   The 750 MHz signal level should be about -20 dBm.

7. If you do not change the -20 dBm amplitude of the signal source, but you change the frequency of the source, and the center frequency of the UXA; the rear panel IF 2 Out amplitude will change erratically due to the fact this is not a calibrated output.

   Here is the performance of one instrument:

Input Frequency	Rear Panel IF2 Output Amplitude	If you turn off IF2 Out, expect this signal level on the UXA screen:
1 GHz	–20.2 dBm	–20.5 dBm
5 GHz	–2.9 dBm	–20.9 dBm
10 GHz	–5.00 dBm	–21.3 dBm
20 GHz	–7.0 dBm	–22.0 dBm
30 GHz	–8.4 dBm	–22.6 dBm
40 GHz	–8.7 dBm	–23.0 dBm
50 GHz	–15.0 dBm	–24.0 dBm

NOTE

At stop frequencies less than 3.6 GHz, the analyzer is in Low Band path, and the there is a 1 GHz bandpass filter and switches connected to a metal plate on the Front End Assembly. See the block diagram for 50 GHz UXA with Option B5X, and notice SW4, the BPF, and SW5.

If the measurement at input frequency 1 GHz is incorrect, but the 5 GHz (or greater) input frequency measurement is correct, suspect a fault with the switches or band pass filter.

Keysight Technologies
N9040B UXA Signal Analyzer

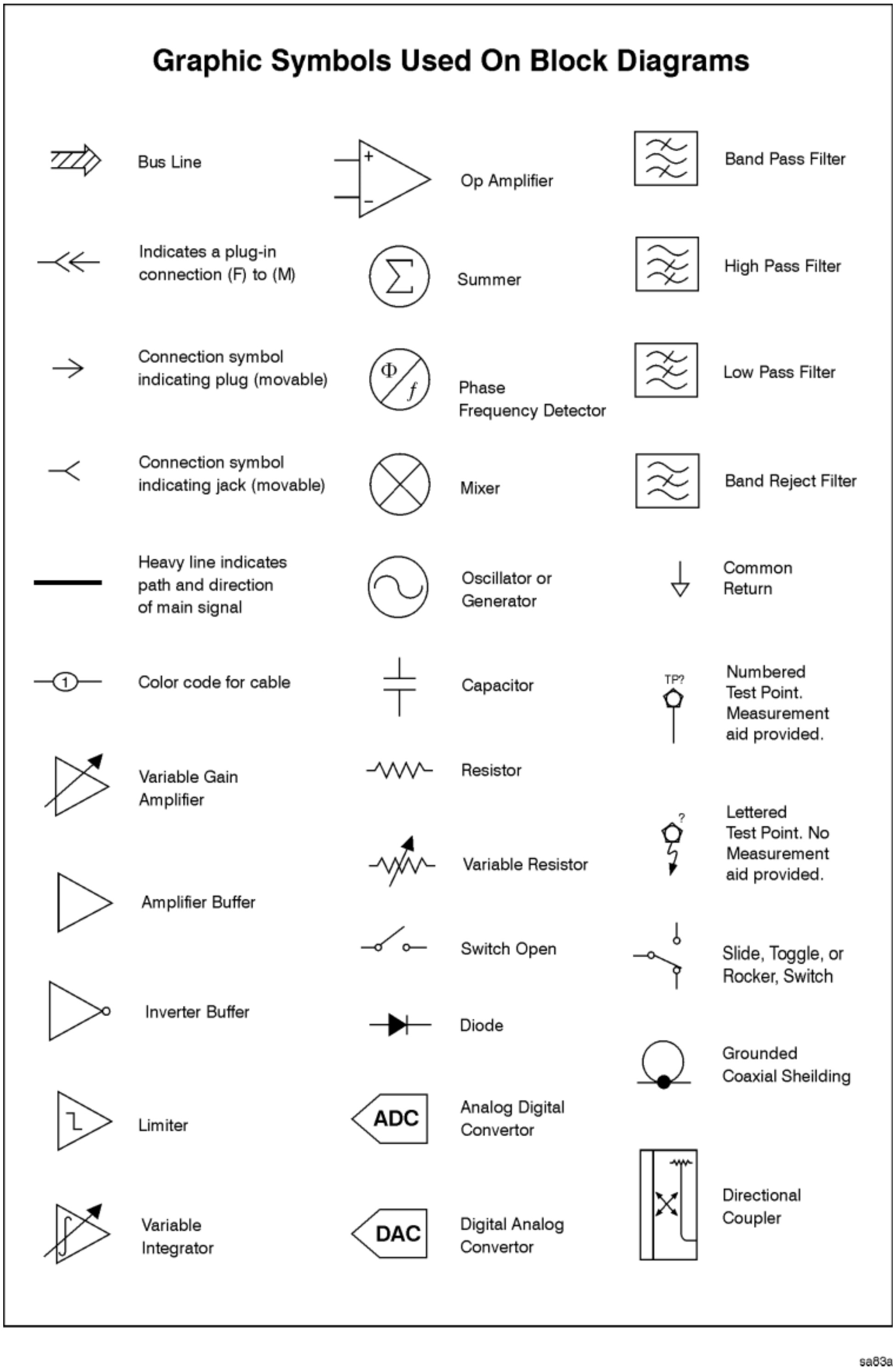
Service Guide

12 Block Diagrams

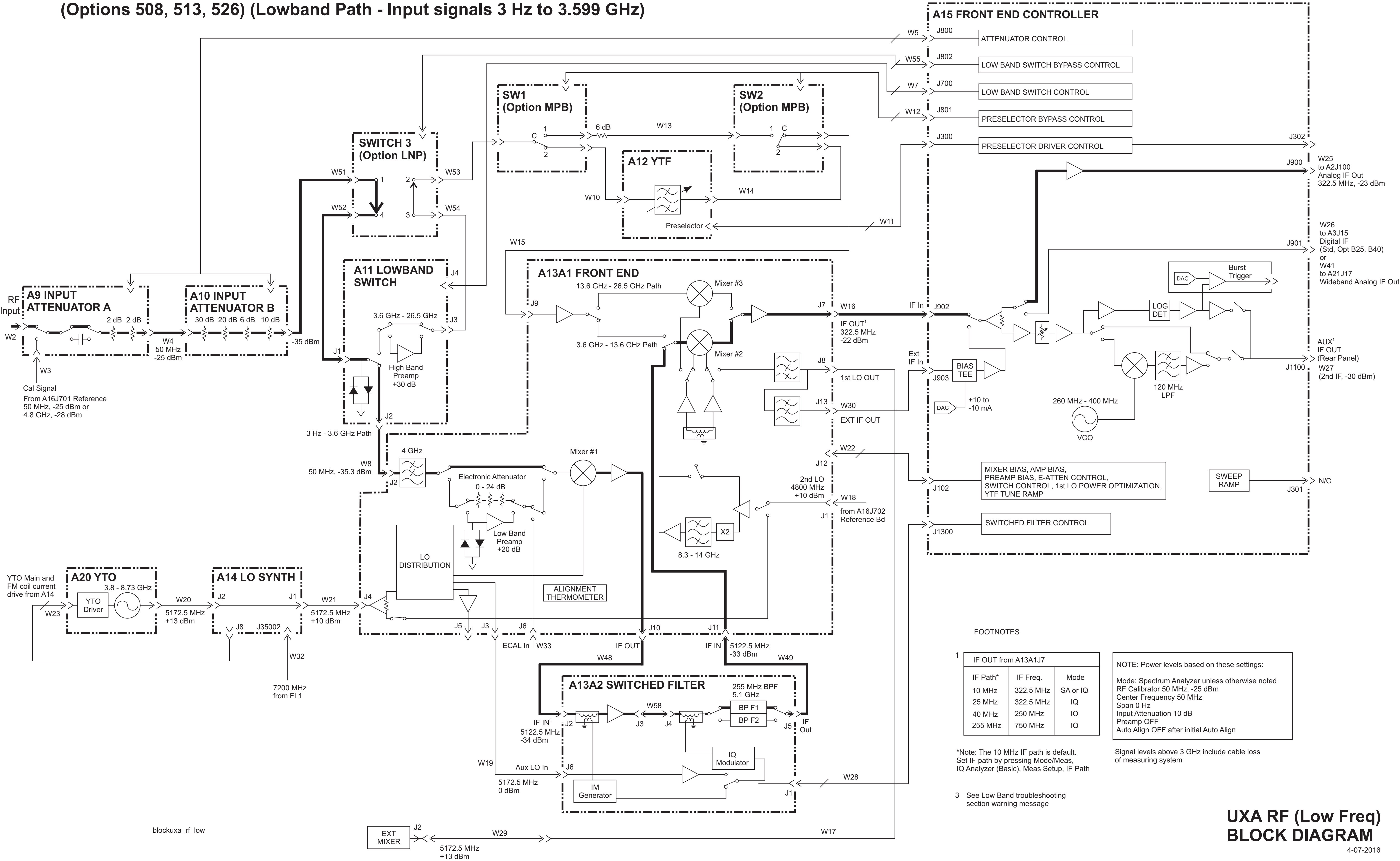
What You Will Find in This Chapter

The following block diagrams are found in this chapter:

Block Diagrams



UXA RF BLOCK DIAGRAM
(Options 508, 513, 526) (Lowband Path - Input signals 3 Hz to 3.599 GHz)



FOOTNOTES

1

IF OUT from A13A1J7		
IF Path*	IF Freq.	Mode
10 MHz	322.5 MHz	SA or IQ
25 MHz	322.5 MHz	IQ
40 MHz	250 MHz	IQ
255 MHz	750 MHz	IQ

*Note: The 10 MHz IF path is default.
Set IF path by pressing Mode/Meas,
IQ Analyzer (Basic), Meas Setup, IF Path

3 See Low Band troubleshooting section warning message

NOTE: Power levels based on these settings:

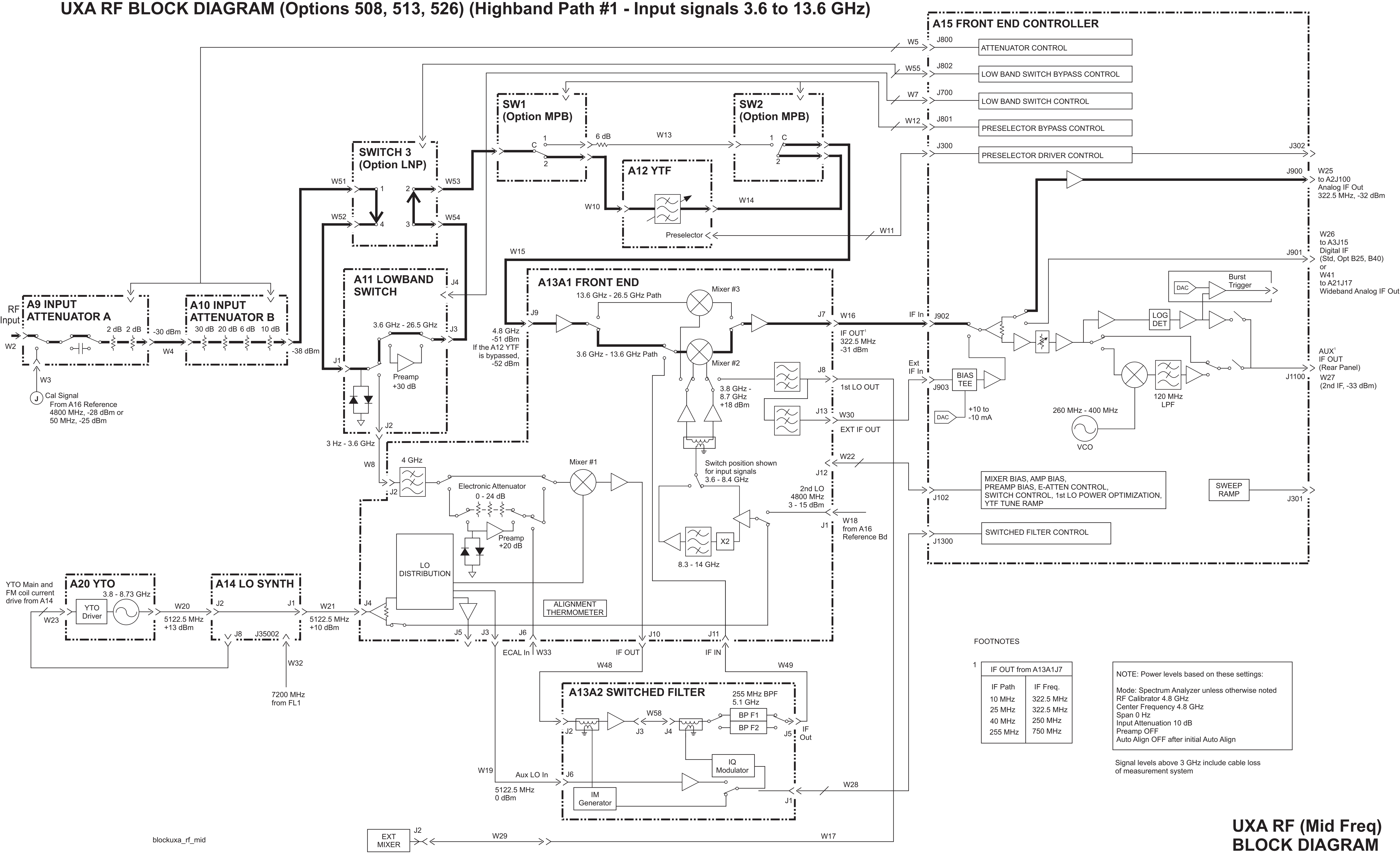
Mode: Spectrum Analyzer unless otherwise noted
RF Calibrator 50 MHz, -25 dBm
Center Frequency 50 MHz
Span 0 Hz
Input Attenuation 10 dB
Preamp OFF
Auto Align OFF after initial Auto Align

Signal levels above 3 GHz include cable loss of measuring system

UXA RF (Low Freq) BLOCK DIAGRAM

4-07-2016

UXA RF BLOCK DIAGRAM (Options 508, 513, 526) (Highband Path #1 - Input signals 3.6 to 13.6 GHz)



FOOTNOTES

1

IF OUT from A13A1J7	
IF Path	IF Freq.
10 MHz	322.5 MHz
25 MHz	322.5 MHz
40 MHz	250 MHz
255 MHz	750 MHz

NOTE: Power levels based on these settings:

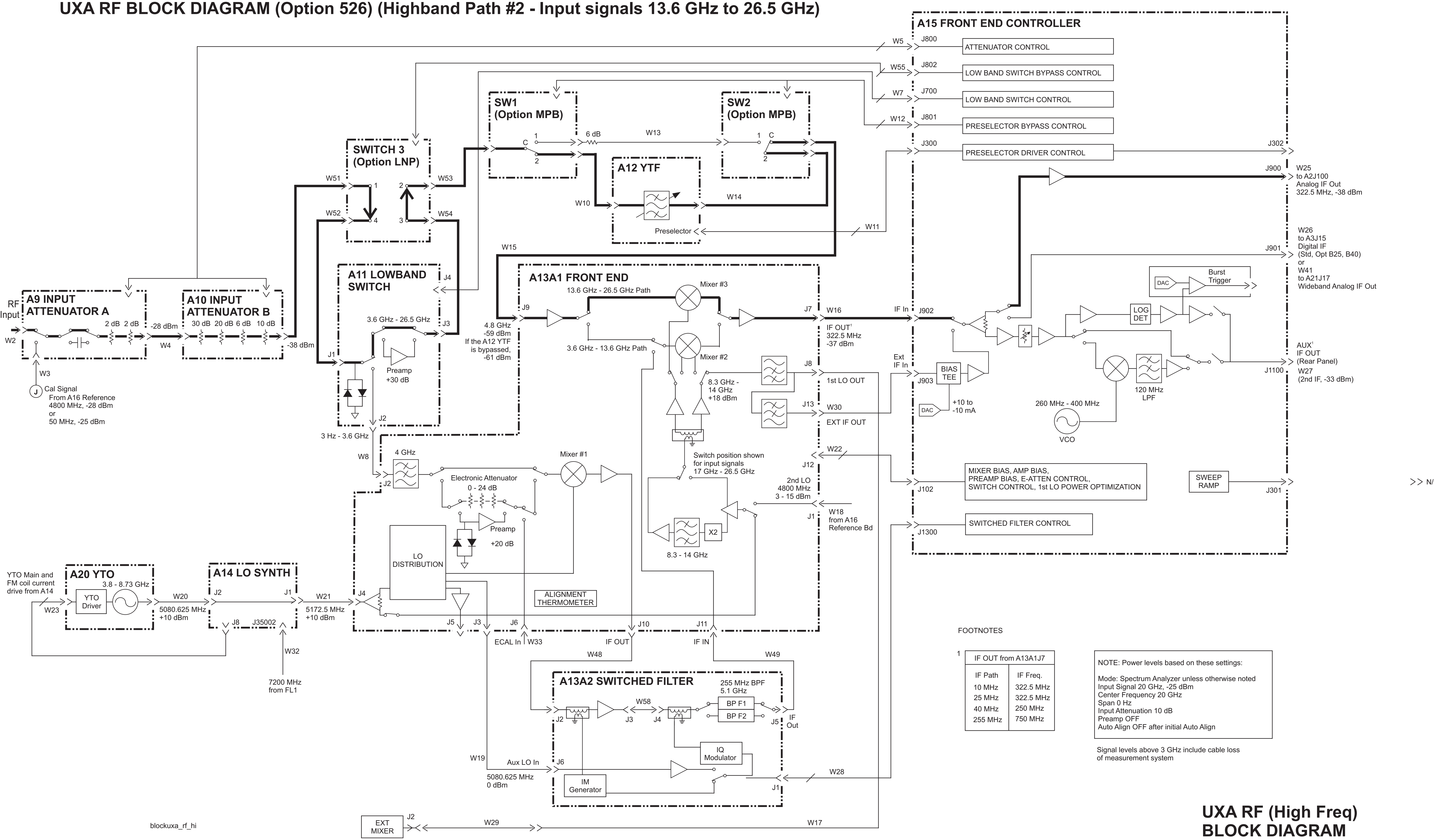
Mode: Spectrum Analyzer unless otherwise noted
RF Calibrator 4.8 GHz
Center Frequency 4.8 GHz
Span 0 Hz
Input Attenuation 10 dB
Preamp OFF
Auto Align OFF after initial Auto Align

Signal levels above 3 GHz include cable loss of measurement system

UXA RF (Mid Freq) BLOCK DIAGRAM

4-07-2016

UXA RF BLOCK DIAGRAM (Option 526) (Highband Path #2 - Input signals 13.6 GHz to 26.5 GHz)



FOOTNOTES

1

IF OUT from A13A1J7	
IF Path	IF Freq.
10 MHz	322.5 MHz
25 MHz	322.5 MHz
40 MHz	250 MHz
255 MHz	750 MHz

NOTE: Power levels based on these settings:

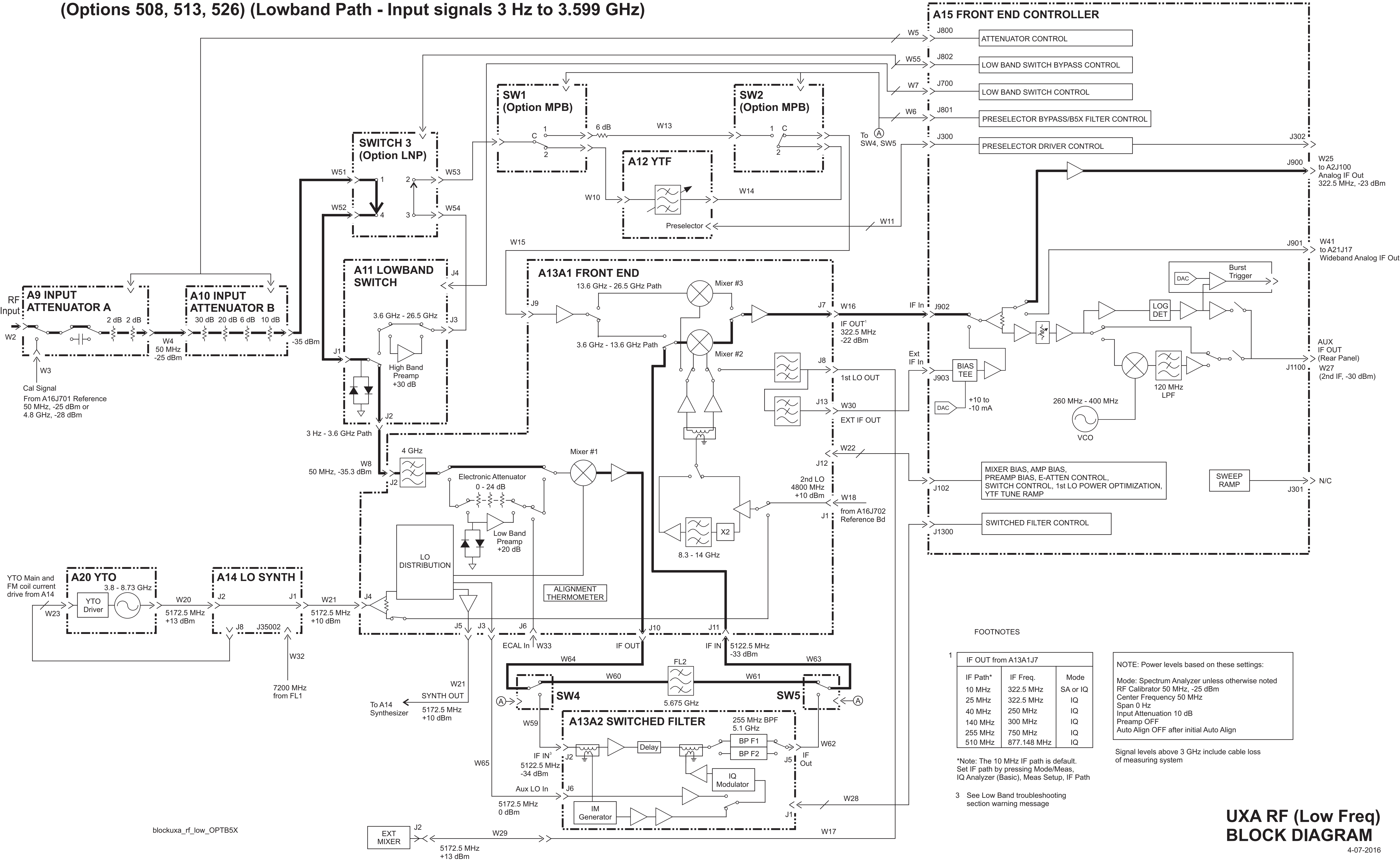
Mode: Spectrum Analyzer unless otherwise noted
Input Signal 20 GHz, -25 dBm
Center Frequency 20 GHz
Span 0 Hz
Input Attenuation 10 dB
Preamp OFF
Auto Align OFF after initial Auto Align

Signal levels above 3 GHz include cable loss
of measurement system

UXA RF (High Freq) BLOCK DIAGRAM

4-07-2016

UXA RF BLOCK DIAGRAM - Option B5X
(Options 508, 513, 526) (Lowband Path - Input signals 3 Hz to 3.599 GHz)



FOOTNOTES

1

IF OUT from A13A1J7		
IF Path*	IF Freq.	Mode
10 MHz	322.5 MHz	SA or IQ
25 MHz	322.5 MHz	IQ
40 MHz	250 MHz	IQ
140 MHz	300 MHz	IQ
255 MHz	750 MHz	IQ
510 MHz	877.148 MHz	IQ

*Note: The 10 MHz IF path is default.
Set IF path by pressing Mode/Meas, IQ Analyzer (Basic), Meas Setup, IF Path

3 See Low Band troubleshooting section warning message

NOTE: Power levels based on these settings:

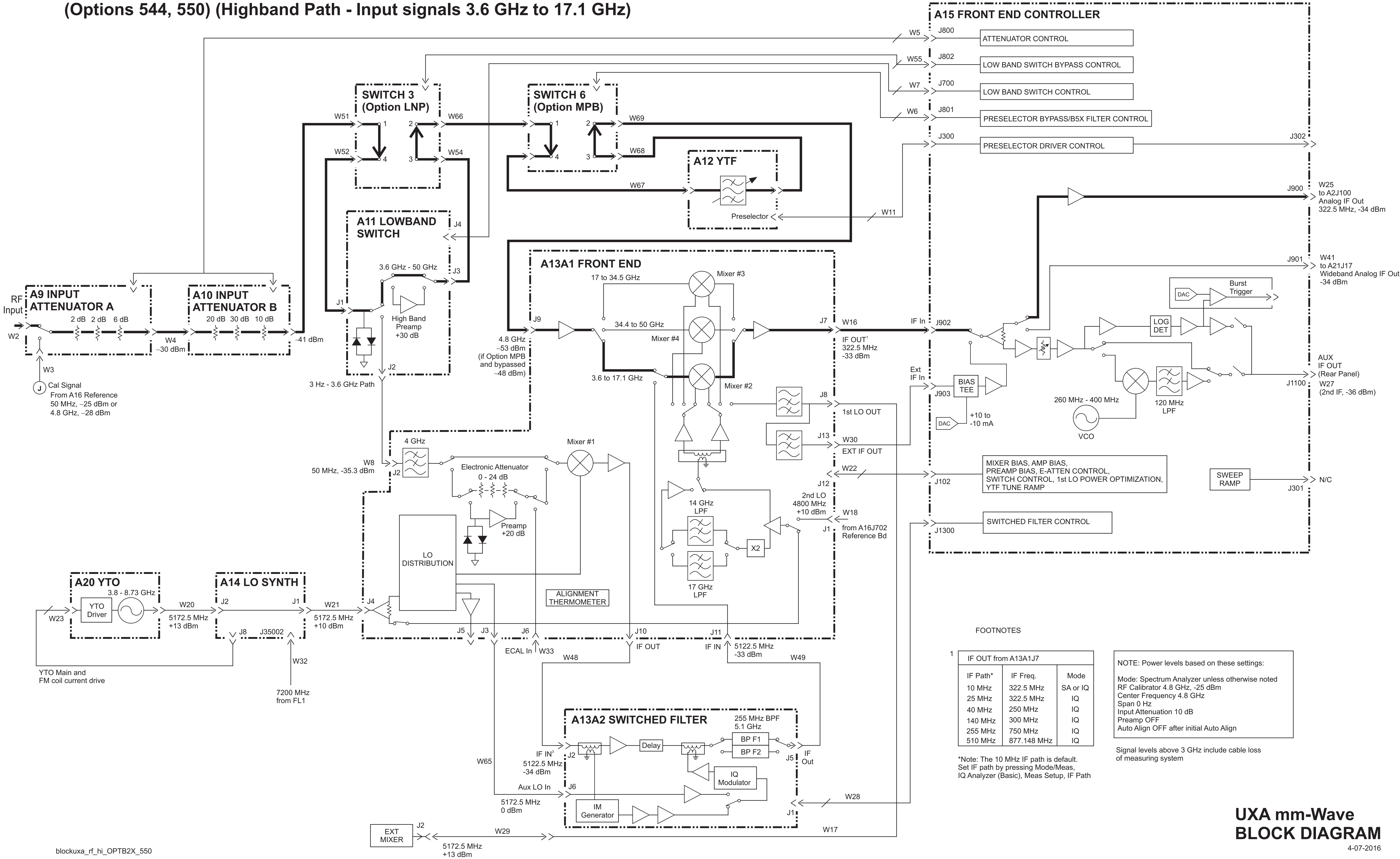
Mode: Spectrum Analyzer unless otherwise noted
RF Calibrator 50 MHz, -25 dBm
Center Frequency 50 MHz
Span 0 Hz
Input Attenuation 10 dB
Preamp OFF
Auto Align OFF after initial Auto Align

Signal levels above 3 GHz include cable loss of measuring system

UXA RF (Low Freq) BLOCK DIAGRAM

4-07-2016

UXA RF BLOCK DIAGRAM - Option B2X
(Options 544, 550) (Highband Path - Input signals 3.6 GHz to 17.1 GHz)



FOOTNOTES

1 IF OUT from A13A1J7

IF Path*	IF Freq.	Mode
10 MHz	322.5 MHz	SA or IQ
25 MHz	322.5 MHz	IQ
40 MHz	250 MHz	IQ
140 MHz	300 MHz	IQ
255 MHz	750 MHz	IQ
510 MHz	877.148 MHz	IQ

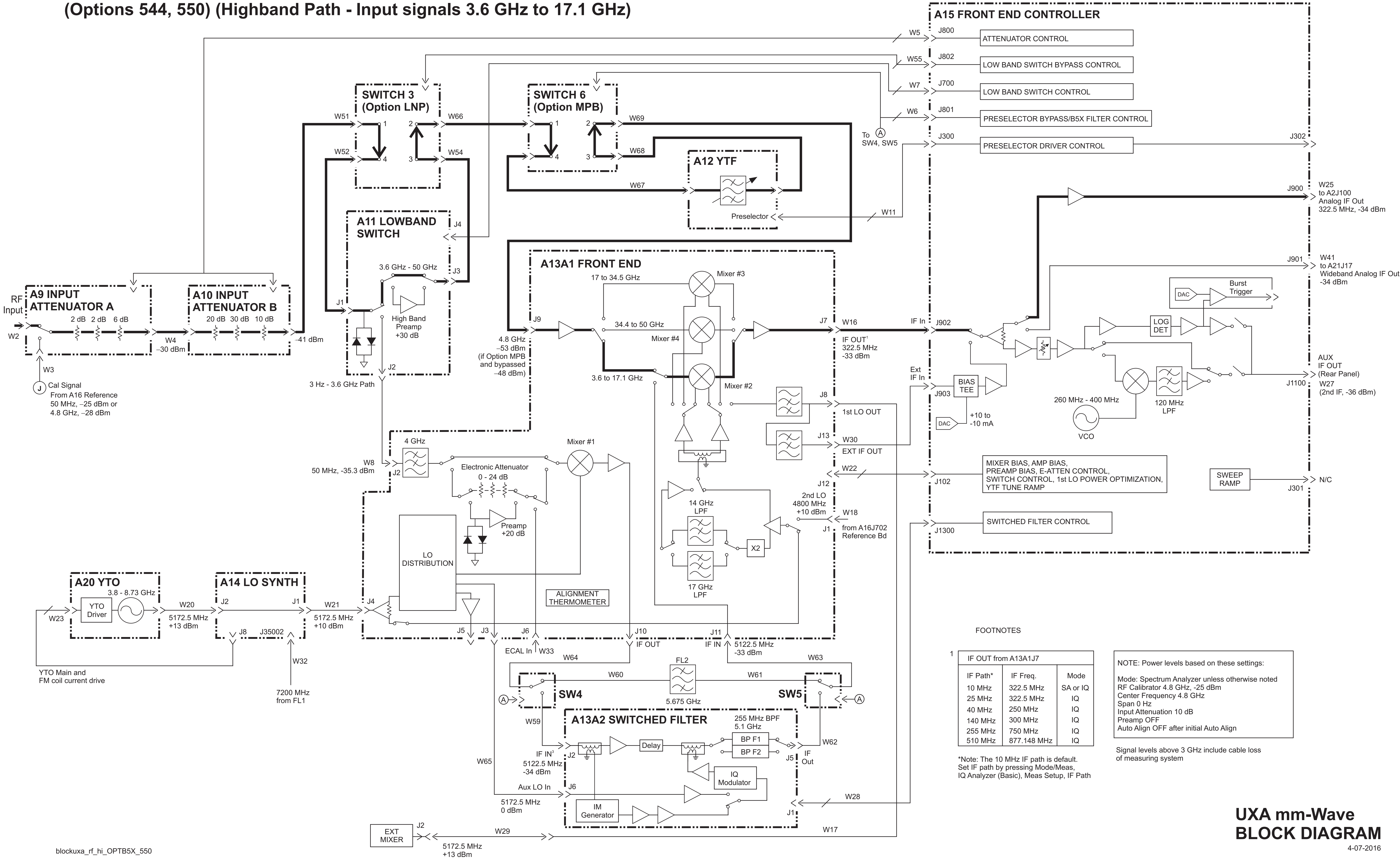
*Note: The 10 MHz IF path is default.
Set IF path by pressing Mode/Meas,
IQ Analyzer (Basic), Meas Setup, IF Path

NOTE: Power levels based on these settings:

Mode: Spectrum Analyzer unless otherwise noted
RF Calibrator 4.8 GHz, -25 dBm
Center Frequency 4.8 GHz
Span 0 Hz
Input Attenuation 10 dB
Preamp OFF
Auto Align OFF after initial Auto Align

Signal levels above 3 GHz include cable loss of measuring system

UXA RF BLOCK DIAGRAM - Option B5X
(Options 544, 550) (Highband Path - Input signals 3.6 GHz to 17.1 GHz)



FOOTNOTES

1

IF OUT from A13A1J7		
IF Path*	IF Freq.	Mode
10 MHz	322.5 MHz	SA or IQ
25 MHz	322.5 MHz	IQ
40 MHz	250 MHz	IQ
140 MHz	300 MHz	IQ
255 MHz	750 MHz	IQ
510 MHz	877.148 MHz	IQ

*Note: The 10 MHz IF path is default.
Set IF path by pressing Mode/Meas,
IQ Analyzer (Basic), Meas Setup, IF Path

NOTE: Power levels based on these settings:

Mode: Spectrum Analyzer unless otherwise noted
RF Calibrator 4.8 GHz, -25 dBm
Center Frequency 4.8 GHz
Span 0 Hz
Input Attenuation 10 dB
Preamp OFF
Auto Align OFF after initial Auto Align

Signal levels above 3 GHz include cable loss of measuring system

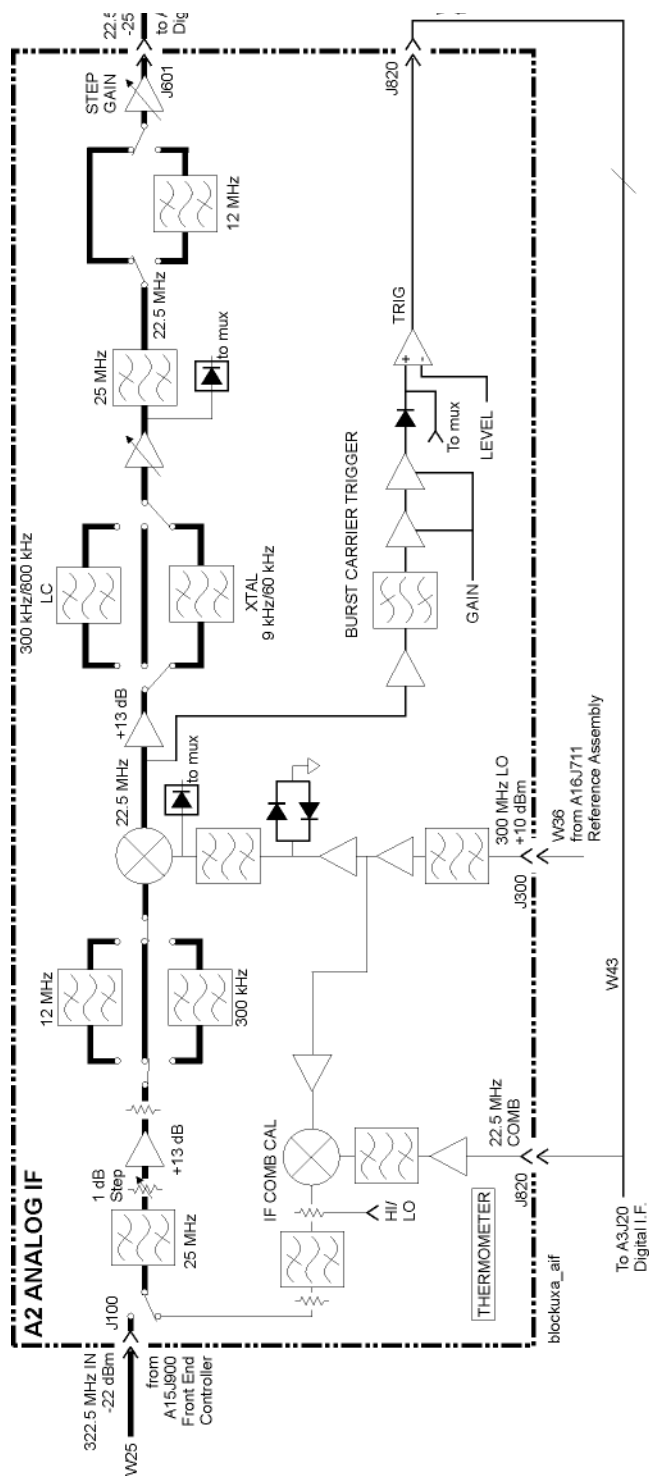
UXA mm-Wave BLOCK DIAGRAM

4-07-2016

blockuxa_rf_hi_OPTB5X_550

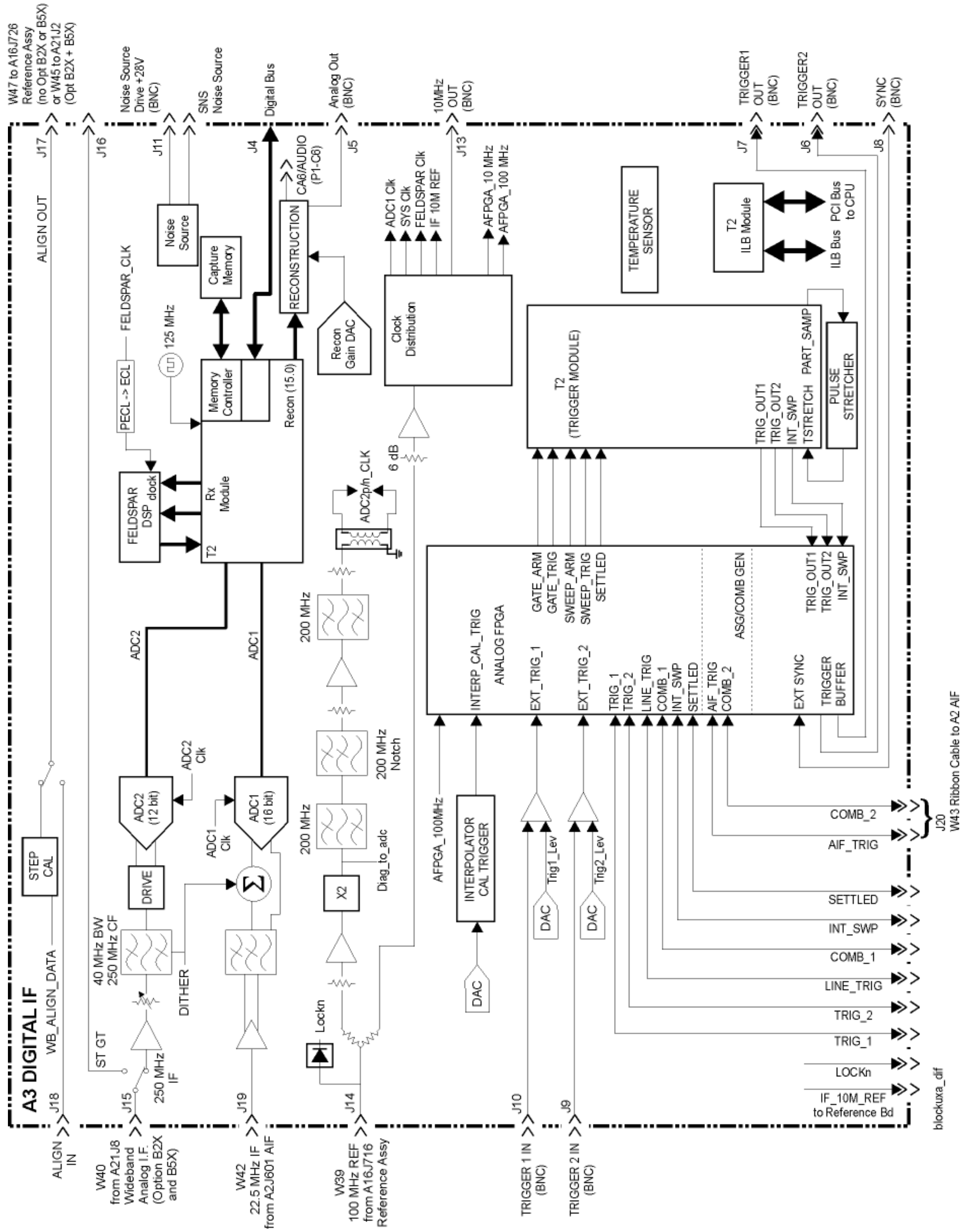
Block Diagrams

Analog IF Block Diagram



Block Diagrams

Digital IF Block Diagram



13 Service and Diagnostics Menus

Overview

The Service capabilities described below are accessed via the Service menus in the System Settings Diagnostic menu and Spectrum Analyzer mode Measure Setup menu. The Service capabilities are intended for field service technicians. These technicians may be at a Keysight 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 Keysight Service Centers or any customer who purchases the Service Guide. The “Service Functions” type of Service capability is defined above.

To access secured service capabilities 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.

NOTE

The Service Diagnostic menus are split into two separate locations for the Multi-touch user interface. They are available through the System -> Service menu and under the SA mode Measure Setup menu. Both menus require that you first login via the System -> Service menu.

Secure service access

To access the secure service capabilities press **System, Service** with the instrument application running. At this point you will see the window shown in Figure 13-1. Enter the Service Code and press **Login**.

The Service Code is: -2061

Figure 13-1 Service Code Entry

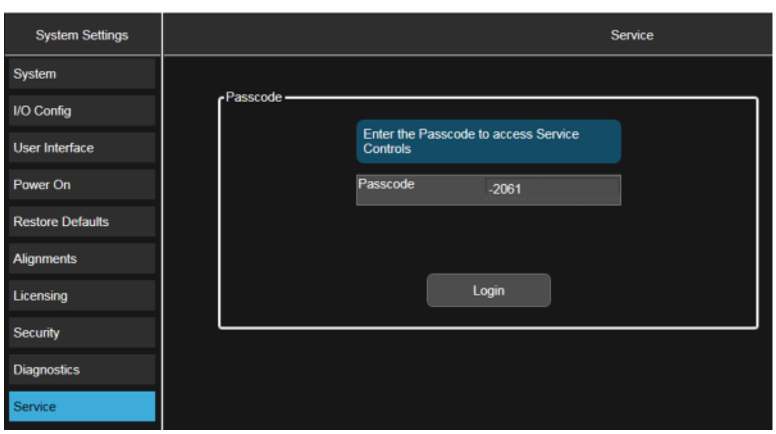


Figure 13-2 Secure Service Menus
(Accessed via System->Service)

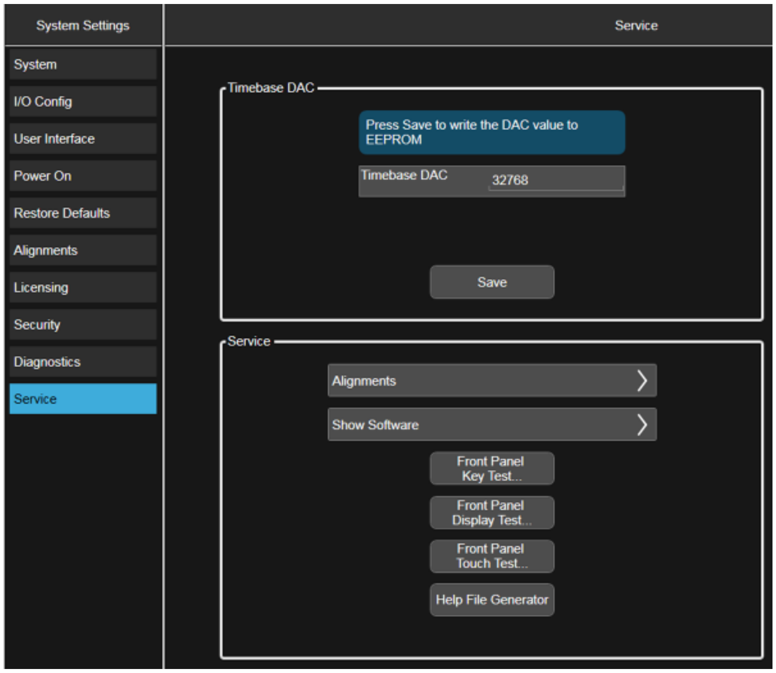


Figure 13-3 Lock and LO
(Accessed via Spectrum Analyzer Mode -> Meas Setup -> Lock and LO)

Figure 13-4 Diagnostics (Hardware Statistics)
(Accessed via System -> Diagnostics)

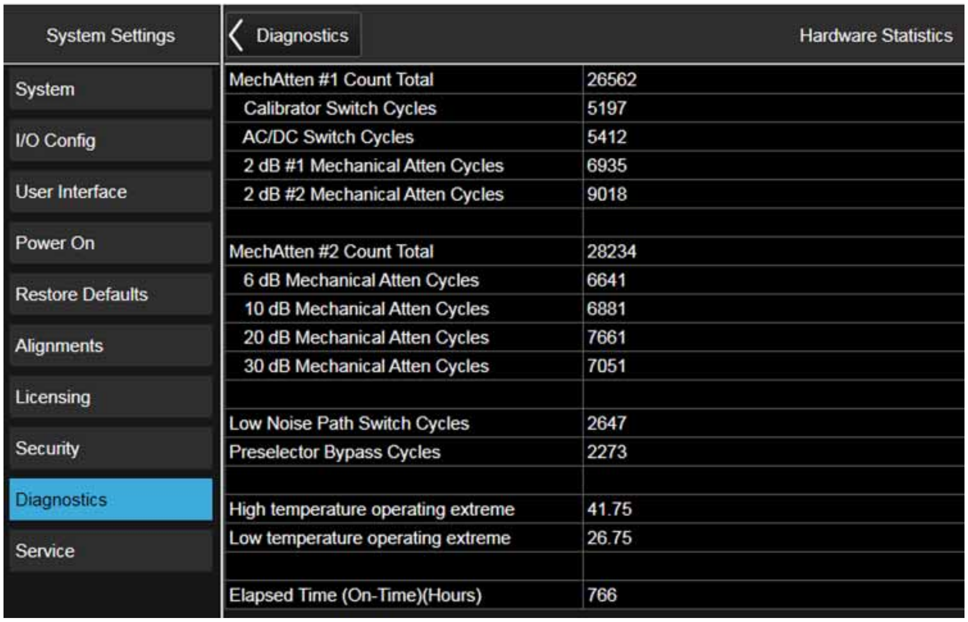
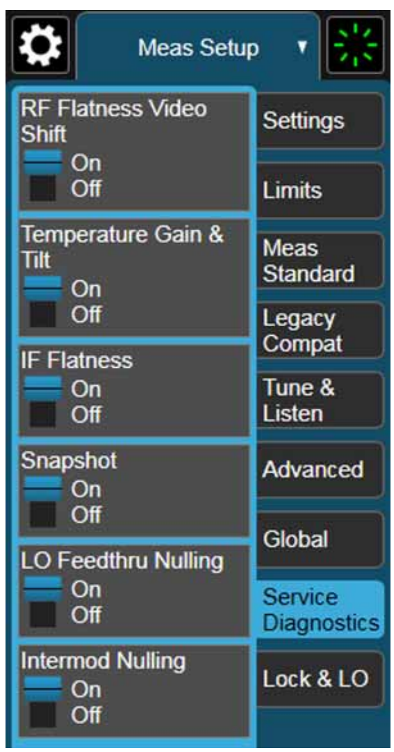


Figure 13-5 Service Diagnostics (Corrections Menu)
(Accessed via Spectrum Analyzer Mode -> Meas Setup -> Service Diagnostics)



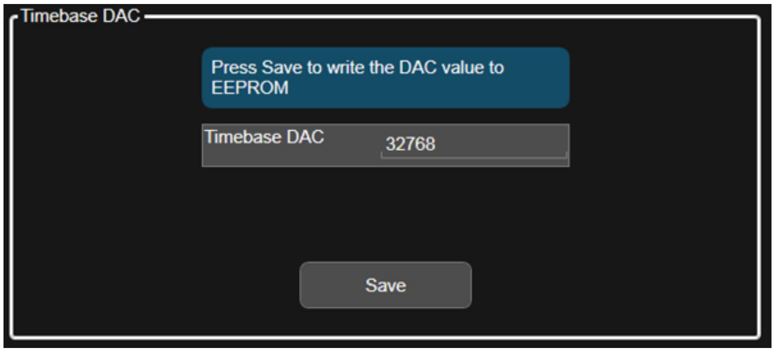
Service Key Descriptions

Timebase

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

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.



Alignments

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

Diagnostics

The Diagnostics 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 X" messages with descriptive messages describing the alignment piece begin executed.

Align Log...
(This is **not** implemented in A.15.xx software)

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.

This file can also be accessed directly on the instrument hard drive as:
E:\AlignDataStorage\AlignmentHistory.txt

Align Log Mode
(This is **not** implemented in A.15.xx software)

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.

Immediate Actions

The Immediate Actions 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.

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.

Current System Gain

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.

LO Phase Noise

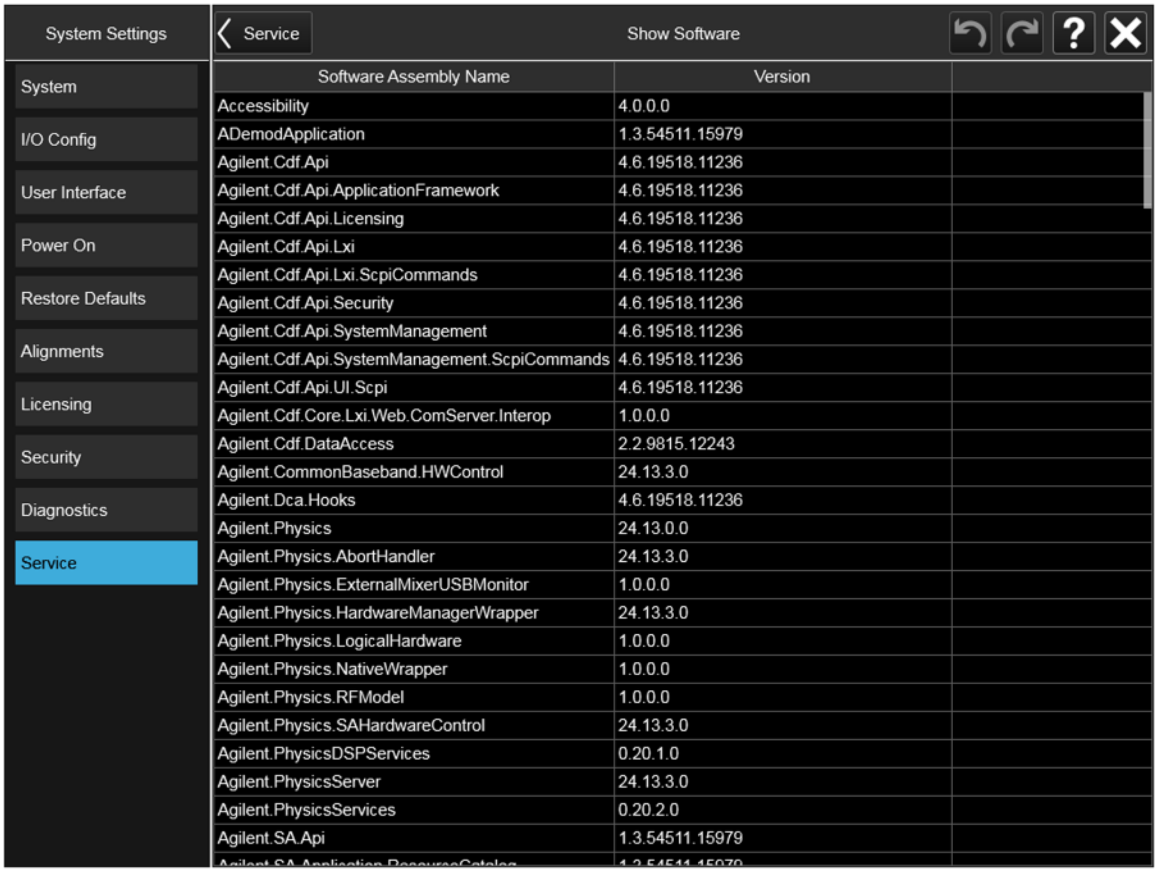
Immediately executes an optimization for LO Phase Noise. When the optimization is finished the value is stored in non-volatile memory. The instrument will stop any measurement currently underway, perform the alignment, and then restart the measurement from the beginning (similar to pressing the **Restart** key).

Show Software

The Show Software screen displays revision information for Keysight internal software that comprises the embedded application and programmable hardware devices (FPGAs and PLDs).

(The Show Software screen is **not** implemented in A.15.xx software)

Figure 13-6 Show Software Screen



Corrections

The Corrections menu for the multi-touch display in UXA is labeled the Service Diagnostics menu under the Spectrum Analyzer Mode, Measure Setup menu. It 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.

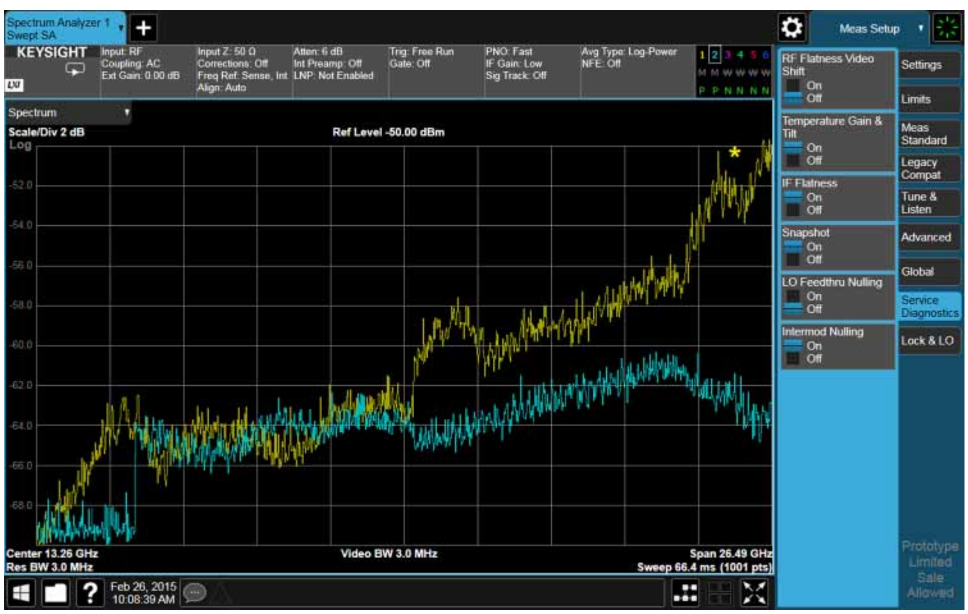
RF Flatness Video Shift On/Off

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.

The example spectrum below shows the effect of turning off RF Flatness Video. The yellow trace shows RF Flatness Video shift on, and the Blue trace shows RF Flatness Video shift off.



Temperature Gain & Tilt

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.)

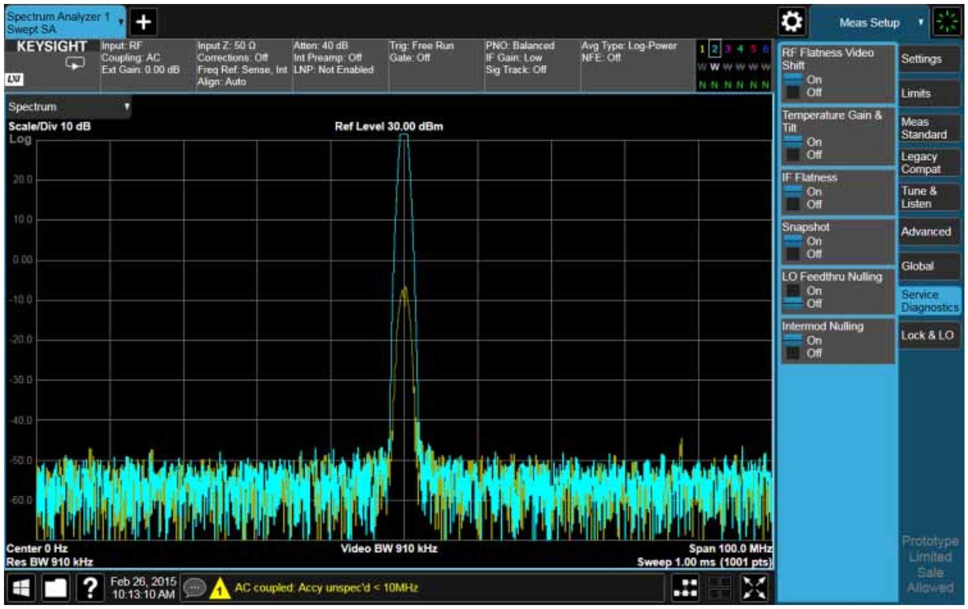
When **Snapshot Alignments** are **OFF**, the Advisory Event “Snapshot OFF” will be displayed.

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

LO Feedthru Nulling

Control is available to set the state of LO Feedthru nulling ON or OFF. In the ON state, the software will determine when it is appropriate to null the LO Feedthru. LO nulling is only available in low band.

An example spectrum demonstrating the difference between LO Feed through nulling turned on/off is shown below. The yellow trace is with feed through nulling turned on, and the blue trace is with feed through nulling turned off.



Intermod Nulling

Control is available to set the state of Intermod Nulling On or OFF. In the ON state, the software will determine when it is appropriate to null the intermodulation products. IM nulling is only available in low band.

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 analyzers with frequency range options beyond 3.6 GHz
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. The Band 6 key label can be different depending on which option is installed.

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 0 and 6.

When band lock is not in affect 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 0

Locks the analyzer to LO Band 0.

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.

Low Noise Path

Provides the ability to lock the Option (LNP) Low Noise Path switch that is used in the μWave Path Control menu into the ON position, regardless of the state of the μWave Path Control menu or functions. The low noise path flatness corrections are applied.

NOTE In normal operation the Low Noise Path and the Microwave Preselector Bypass (Option MPB) cannot be turned on at the same time. This is done to protect the highband mixer from excessive power.

WARNING Assure the mixer power is < –10 dBm
(mixer power = input power - input attenuation)

LO Control

Provides keys that allow you to control the LO. This is only present on analyzers equipped with Opt EXM, External Mixing.

2nd LO Gain DAC

This parameter provides the ability to adjust the output gain of the 2nd LO DAC. The range is from 0 to 4095 where 0 is the minimum gain and 4095 is the maximum gain. Setting a value of 4096 or greater returns control to the instrument. In External Mixing, this DAC controls the level of the 1st LO signal at the front panel EXT MIXER connector.

External LO Turnoff

Disconnects the 1st LO path which will minimize the effect of the 1st LO signal at the front panel EXT MIXER connector.

Front Panel Key Test

Allows you to test the front panel keys of the instrument.
(Note: This is **not** available in A.15.xx software)

Front Panel Display Test

The display test will show 5 screens with colors: white, black, red, green, and blue. This allows you to test for bad pixels in the display. After the last color, the test will exit and results will be stored to the following log file: C:\Temp\DisplayTestResults.txt

Multitouch Test

This test includes a series of simple tests to test the basic functionality of the multi-touch screen. The test results will be stored to the following file: C:\Temp\MultitouchTestResults.txt

Rotate Test

A Picture will appear in the center of the screen. Use two fingers to rotate the image 45 degrees clockwise. Once this is completed, rotate the image 45 degrees counter-clockwise.

Zoom Test

A small picture will appear in the center of the screen. Use two fingers and spread them apart to scale the box until it fills the dotted rectangle around it. The dotted rectangle will resize. Pinch your fingers together to contract the box until it fits inside the now smaller dotted rectangle.

Drag Test

A blue circle will appear in the center of the screen. Drag the circle into each square of the gray grid on the screen to pass the test. Each square will be colored green when it has been dragged over.

Accuracy Test

The screen will display a series of lines. For each blue line, trace along the line with your finger to draw a matching line. Lines that deviate significantly from the blue trace line (i.e beyond the gray lines) will be marked in red.

14 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:

How to Order Parts

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

http://www.keysight.com/find/parts

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 Keysight 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 Keysight Technologies sales and service office locations, refer to "Contacting Keysight Technologies" on page 46.

Replaceable Parts

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

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
A1A1	Front Frame Assembly Replacement Kit[a] (light color) Includes:	N9040-60068
	Front Frame (with the following pre-installed)	
	Cover Plate	N9040-00023
	Main Keyboard overlay	N9040-80001
	Braided gasket	8160-0660
	Display protection boot	N9040-40002
	USB EMI gasket	N9040-00020
	Front Frame Side Trim (2 included)	5041-9691
	Front Frame Top Trim (2 included)	5041-7901
	Connector Overlay	N9040-80002
	Front Frame Assembly Replacement Kit[a] (dark color) Includes:	N9040-60069
	Front Frame (with the following pre-installed)	
	Cover Plate	N9040-00023
	Main Keyboard overlay	N9040-80018
	Braided gasket	8160-0660
	Display protection boot	N9040-40002
	USB EMI gasket	N9040-00020
	Front Frame Side Trim (2 included)	5041-7908
	Front Frame Top Trim (2 included)	5041-7907
	Connector Overlay	N9040-80019
A1A2	Front Panel Keyboard	N9040-63006
A1A3	Touch Screen Display	2090-1098
A1A4	DC to DC Converter Board	0950-5670
A1A5	Front Panel Controller Board with speaker	N9040-63012
A1A6	Front Panel On-Button Keyboard	N9040-63016
A1MP1	Main Keypad	
	light color	N9040-40003
	dark color	N9040-40009
A1MP2	Front Panel On-Button Keypad	
	light color	N9040-40004
	dark color	N9040-40010

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
A1MP4	Frequency Label, 8.4 GHz	
	light color	N9040-80005
	dark color	N9040-80038
A1MP5	Frequency Label, 13.6 GHz	
	light color	N9040-80006
	dark color	N9040-80039
A1MP6	Frequency Label, 26.5 GHz	
	light color	N9040-80007
	dark color	N9040-80040
A1MP7	Label, Frequency, 44 GHz	N9040-80041
A1MP8	Label, Frequency, 50 GHz	N9040-80042
A1MP9	RPG Knob	
	light color	W1312-40017
	dark color	W1312-40179
A1MP10-15	Cable Clamps (miscellaneous front panel cables, to hold down DC-DC converter, display, and controller board cables)	1400-2225
A1MP14	Front Panel Controller Board Bracket	N9040-00052
A1MP21	Display Bracket	N9040-00018
A1MP22	Display Compression Pad	N9040-40001
A1MP23	Display Cable Hold Down (3M double-coated foam tape 4016)	source locally
A1MP24	Ext Mixer Front Panel Connector	1250-1666
A1MP25	Front Panel Interface Board Shield	N9040-00032
A1MP26 & MP27	Front Panel Interface Cable Loop Fasteners	0510-1303
A1W1	Cable Assembly, (Flex Circuit), Display to Front Panel Interface Board	N9040-60024
A1W2	Cable Assembly, DC-DC Converter to Display	N9040-60027
A1W3	Cable Assembly, DC-DC Converter to Display and Controller Board	N9040-60029
A1W4	Cable Assembly, On/Off Keyboard to Front Panel Controller Board	N9040-60026
A2	Analog IF Assembly	N9020-60290
A3	Digital IF Assembly	N9020-60016
A3W1	Cable Assembly, Smart Noise Source (Wire Harness)	N9020-60090

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
A4	CPU Assembly	N9020-60247
A4A1	Disk Drive Interconnect Board	W1312-63079
A4A2	CPU SDHC Memory Card	1819-1250
A4BT1	CPU Battery	1420-0356 (CR2032)
A5	Solid State Drive, Windows 7 (Does not include A5MP1-MP3)	N9020-60352
	Solid State Drive, Windows 10 (Does not include A5MP1-MP3)	N9020-60356
A5MP1	Disk Drive Tray	W1312-40078
A5MP2	Disk Drive Rear Panel	W1312-00103
A5MP3	Disk Drive Handle	1440-0421
A6	Power Supply	0950-5748
A7	Rear Motherboard Assembly	N9040-63003
A7MP1	Bracket, Rear Motherboard	
	s/n prefix < 5616	N9040-00002
	s/n prefix ≥ 5616	N9040-00058
A8	Motherboard (Front/Horizontal mount)	N9040-63002
A9	RF Attenuator A (0-4 dB) (Options 508, 513, 526)	33360-60008
	RF Attenuator A (0-10 dB) (Options 544, 550)	33326-60013
A10	RF Attenuator B (0-66 dB) (Options 508, 513, 526)	33321-60083
	RF Attenuator B (0-60 dB) (Options 544, 550)	33325-60020
A11	Low Band Switch Assembly	
	Options 508, 513, 526	E4410-60121
	Options 544, 550	N9020-60051
A12	YTF Preselector	
	Options 508, 513, 526	5087-7382
	Options 544, 550	5087-7383
A12MP1	Gap Pad for A12 mounting	5022-7179

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
A13[b]	R.F.Front End Assembly	
	Std & Option B2X, Options 508, 513, 526	N9020-60129
	Option B5X, Options 508, 513, 526	N9020-60208
	Option B2X, Options 544, 550	N9020-60210
	Option B5X, Options 544, 550	N9020-60218
	Option H1G, Option 550	N9020-60259
A14	L.O. Synthesizer Assembly	N9020-60227
A15	Front End Controller	N9020-60295
A16	Reference Assembly	N9020-60187
A17	Reserved	
A18	Reserved	
A19	Reserved	
A20	YTO Assembly	N9020-60009
A21	Wideband Analog I.F. (Option B2X & B5X)	N9020-60043
A22	Wideband Digital I.F. (Option B2X)	N9020-60311
A23	Wideband Digital I.F. (Option B5X)	N9020-60311
A24	Motherboard Interconnect Board (A7 & A8)	N9040-63004
A25	Reserved	
A26	Reserved	
A27	H1G Assembly (Option H1G) (not compatible with Option B5X)	N9040-60102
A28	Wideband Extension Board (Option RTS) (also order EMI gasket below)	N9020-60272
A28A1	Gasket, EMI for Wideband Extension Board (Option RTS)	N9020-20178
AT1	Attenuator, 6 dB Coax (connects to SW1 & W13)	08493-60026
B1, B2	Fan	W1312-60063
FL1	7.2 GHz Bandpass Filter (connects to A14)	9135-6218
FL2	5.675 GHz Bandpass Filter (Option B5X)	9135-6217
J1	Type-N Input Connector Assembly	N9039-60030
	2.4 mm Input Connector Assembly	N9030-60011
	3.5 mm Input Connector Assembly (Option C35)	N9020-60196

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
J2	Ext Mixer Connector	1250-1666
SW1	Switch, Coax (lower; Preselector Bypass)	N1810-60069
SW2	Switch, Coax (upper; Preselector Bypass)	N1810-60069
SW3	Switch, Transfer (used for Low Noise Path)	
	Options 508, 513, 526	87222-60026
	Options 544, 550	87222-60029
SW4	Switch, Coax, 510 MHz Bandpass Filter Bypass (Option B5X)	N1810-60102
SW5	Switch, Coax, 510 MHz Bandpass Filter Bypass (Option B5X)	N1810-60102
SW6	Switch, Transfer (used for Preselector Bypass) (Options 544, 550)	87222-60031
	Chassis Base	N9040-00001
	Chassis Side, Left (inner)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00003
	s/n prefix ≥ 5605 and < 5616, Options 508, 513, 526 s/n prefix < 5616 Options 544 and 550	N9040-00037
	s/n prefix ≥ 5616 all frequency ranges	N9040-00059
	Chassis Side, Right (inner)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00004
	s/n prefix ≥ 5605 and < 5616, Options 508, 513, 526 s/n prefix < 5616 Options 544 and 550	N9040-00038
	s/n prefix ≥ 5616 all frequency ranges	N9040-00060
	Card cage Guide (for chassis left and right)	W1312-40001
	Rear Panel	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00014
	s/n prefix ≥ 5605 and < 5616, Options 508, 5113, 526 s/n prefix < 5616 Options 544 and 550	N9040-00050
	s/n prefix ≥ 5616 all frequency ranges	N9040-00057
	Label, blank, silver. Covers rear panel Wideband Digital Bus connector holes when Option RTS is not installed.	N9040-80011
	Bracket, Motherboard (Front/Horizontal mount)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00024
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00051
	Bracket, Chassis Front	N9040-00005

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
	Bracket, RF Side (right side outer)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00013
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00047
	Bracket, Attenuator (used for both attenuators)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00016
	s/n prefix ≥ 5605 Options 508, 513, 526	N9040-00061
	Options 544, 550	N9040-00027
	Bracket, Power Supply	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00021
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00040
	Bracket, Fan (right side inner)	N9040-00007
	Bracket, Fan (Left side/outer)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00006
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00053
	Bracket, "S" shape Chassis Side	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00012
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00041
	Bracket, Rear Brace	
	s/n prefix < 5616	N9040-00009
	s/n prefix ≥ 5616	N9040-00039
	s/n prefix ≥ 5616 Option H1G	N9040-00056
	Bracket, Chassis Front (inner/bottom)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00008
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00036
	Bracket, SW1	E4410-00104
	Bracket, SW2	N9040-00019
	Bracket, SW1 & SW2 Main	N9040-00017
	Bracket, Transfer Switches (Option 544, 550)	N9040-00028
	Bracket, FL2 Bandpass Filter (Option B5X)	N9020-00054
	Bracket, SW4 & SW5 switch covers (Option B5X)	N9020-00055
	Bracket, Base (Option B5X)	N9020-20236

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
	Bracket, Heat Sink (Option B5X)	N9020-20237
	Plate, A3, Digital I.F. Board	N9020-00016
	Chassis Base Stiffener	N9040-00029
	Gasket, EMI, A3,Digital I.F. Board	N9020-00017
	Bracket, A14, L.O.Synthesizer (top)	N9020-00058
	Bracket, A14, L.O.Synthesizer (right)	N9020-00048
	Bracket, A14, L.O.Synthesizer (left)	N9020-00049
	Bracket, A21, Wideband Analog I.F.Assembly (top)	N9020-00035
	Bracket, A21, Wideband Analog I.F.Assembly (right support)	N9020-00056
	Bracket, A21, Wideband Analog I.F.Assembly (left support)	N9020-00057
	Ejector, A21, Wideband Analog I.F.Assembly (right)	W1312-40084
	Ejector, A21, Wideband Analog I.F.Assembly (left)	W1312-40083
	Bracket, Flex Circuit Support	N9040-00025
	Bracket, Wideband Extension Board (Option RTS)	N9040-00033
	Ejector, A16, Reference Assembly (left)	5002-2401
	Spring Clip (qty. 2 Option B5X)	N9040-00035
	Shield, Magnetic, Attenuator A (Options 544, 550)	N9020-00043
	Shield, Magnetic, Attenuator B (Options 544, 550)	N9020-00044
	Shield, YTO, Top	N9020-00005
	Shield, YTO, Bottom	N9020-00006
	Top Brace Front card cage (with holes) s/n prefix < 5605 Options 508, 513, 526 s/n prefix ≥ 5605 and all Options 544 and 550	 N9040-00010 N9040-00055
	Top Brace Rear (solid) s/n prefix < 5605 Options 508, 513, 526 s/n prefix ≥ 5605 and all Options 544 and 550	 N9040-00011 N9040-00049
	Bracket, "T" shape to Top Brace Front	N9040-00034
	Spiral Wrap; 0.250 IN OD; 0.160 IN ID; for Digital IF cables	0890-0025
	Plug hole, Nylon, for 0.5 D hole	6960-0149

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
	Plug hole, Nylon for 0.875 hole	6960-0177
	Plug hole, Nylon for 0.312 hole	6960-0076
	Cable tie	1400-0507
	Clamp,.cable hold down (on Front Brace)	5023-2095
	Grommet, Fan Bracket	0400-0011
	Ext Mixer 50 Ω Load	1810-0118
	Cable Clamp, Fan	1400-0053
	Fan Grill	3160-4253
	Dress Cover light color dark color	 N9040-00015 N9040-00046
	Rear Feet light color dark color	 5041-9611 5041-7903
	Bottom Feet light color dark color	 5041-9167 5041-7906
	Bottom Feet Key Locks	5021-2840
	Strap Handle light color dark color	 E4400-60026 N9040-60059
	Impact Cover, Front light color dark color	 N5245-40001 N9040-40007
	Impact Cover, Rear light color dark color	 N5245-40002 N9040-40008
	Front Frame Handles light color dark color	 5023-1399 5023-3074
	ESD Cap, RF Input Connector (Std & Option C35)	1401-0247

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
	ESD Cap, GPIB Connector	1252-5007
	ESD Cap, VGA Connector	1252-0220
	Type-N Connector O-ring	8160-1637
	Front Frame Removal Warning Label	N9030-80018
W1	Cable, Ribbon, A1A2, Front Panel Interface to A7J32, Rear Motherboard	N9040-60030
W2	Cable, Semi-rigid, RF Input Connector to Attenuator A	
	Option CNF	N9040-20025
	Option C24	N9040-20114
	Option C35	N9040-20043
W3	Cable, Semi-rigid, Cal In to Attenuator, A16J701, Reference Assembly to Attenuator A	
	Options 508, 513, 526	N9040-20027
	Options 544, 550	N9040-20103
W4	Cable, Semi-rigid, Attenuator B to Attenuator A	
	Options 508, 513, 526	N9040-20026
	Options 544, 550	N9040-20102
W5	Cable, Ribbon, Attenuator A/B to A15J800, Front End Controller	
	Options 508, 513, 526	N9040-60032
	Options 544, 550	N9040-60065
W6	Cable, Wire Harness, Switch 1/2 and B5X Switches to A15J801, Front End Controller (Option B5X)	N9040-60031
W7	Cable, Ribbon, A11J4, Low Band Switch to A15J700, Front End Controller	
	Options 508, 513, 526	N9040-60036
	Options 544, 550	N9040-60066
W8	Cable, Semi-rigid, A13J2, R.F. Front End Assembly to A11J2, Low Band Switch	
	Options 508, 513, 526	N9040-20032
	Options 544, 550	N9040-20108
W9	Reserved	
W10	Cable, Semi-rigid, Switch 1 port 2 to YTF In	N9040-20033
W11	Cable, Wire harness, A12J1, YTF to A15J300, Front End Controller	N9040-60033
W12	Wire harness, Switch 1/2 to A15J801, Front End Controller	N9040-60039
	Wire harness, 4 Switch Control (Option B5X)	N9040-60031

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
W13	Cable, Semi-rigid, Switch 2 port 1 to AT1, 6 dB Pad	N9040-20036
W14	Cable, Semi-rigid, A12, YTF Out to Switch 2 port 2	N9040-20034
W15	Cable, Semi-rigid, Switch 2 port C to A13J9, R.F. Front End Assembly (Options 508, 513, 526)	N9040-20035
W16	Cable, Coax, A13J7, R.F. Front End Assembly to A15J902, Front End Controller	
	Options 508, 513, 526	8121-2608
	Options 544, 550	8121-2027
W17	Cable, Semi-rigid, A13J8, R.F. Front End Assembly to W29 Cable	N9040-60046
W18	Cable, Semi-rigid, A16J702, Reference Assembly to A13J1, R.F. Front End Assembly	
	Options 508, 513, 526	N9040-20039
	Options 544, 550	N9040-20113
W19	Cable, Semi-rigid, A13J3, R.F. Front End Assembly to A13A2J6, Switched Filter Assembly	N9020-20077
W20	Cable, Semi-rigid, A20, YTO Output to A14J2, L.O. Synthesizer Assembly	N9040-20037
W21	Cable, Semi-rigid, A14J1, L.O. Synthesizer to A13J4, R.F. Front End Assembly	
	Options 508, 513, 526	N9040-20038
	Options 544, 550	N9040-20112
W22	Cable, Ribbon, A13J12, R.F. Front End Control to A15J102, Front End Controller	N9040-60037
W23	Cable, Ribbon, A14J8, L.O. Synthesizer to A20, YTO Control	N9040-60035
W24	Reserved	
W25	Cable, Coax, A15J900, Front End Controller to A2J100, Analog I.F. Assembly	8121-1865
W26	Cable, Coax, A15J901, Front End Controller to A3J15, Narrowband Digital I.F. Assembly (Std, Option B25, B40)	8121-1919
W27	Cable, Coax, A15J1100, Front End Controller to Aux IF Out Rear Panel	8121-1859
W28	Cable, Ribbon, A15J1300, Front End Controller to A13A2J1, Switched Filter Assembly	N9040-60034
W29	Cable, Semi-rigid, Front Panel Ext Mixer Connector to W17	N9040-20044
W30	Cable, Coax, A13J13 R.F. Front End Assembly to A15J903, Front End Controller	
	Options 508, 513, 526	8121-1940
	Options 544, 550	8121-2608
W31	Cable, Semi-rigid, A16J703, Reference Assembly to FL1, 7.2 GHz Bandpass Filter	N9040-20040
W32	Cable, Semi-rigid, A14J35002, L.O. Synthesizer Assembly to FL1, 7.2 GHz Bandpass Filter	N9020-20226

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
W33	Cable, Coax, A13J6, R.F. Front End Assembly to A16J705, Reference Assembly	8121-1940
W34	Cable, Coax, A16J718, Reference Assembly to A21J4, Wideband Analog I.F. Assembly (Option B2X and B5X)	8121-0152
W35	Reserved	
W36	Cable, Coax, A16J711, Reference Assembly to A2J300, Analog I.F. Assembly	8121-1919
W37	Cable, Coax, Ext Ref In Rear Panel to A16J704, Reference Assembly	8121-1863
W38	Reserved	
W39	Cable, Coax, A16J716, Reference Assembly to A3J14, Digital I.F. Assembly	8121-1861
W40	Cable, Coax, A21J18, Wideband Analog I.F. Assembly to A3J15, Digital I.F. Assembly (Options B2X and B5X)	8121-1401
W41	Cable, Coax, A15J901, Front End Controller to A21J17, Wideband Analog I.F. Assembly (Options B2X and B5X)	8121-1401
W42	Cable, Coax, A2J601, Analog I.F. Assembly to A3J19, Digital I.F. Assembly	8121-2607
W43	Cable, Ribbon, A2J820, Analog I.F. Assembly to A3J20 Digital I.F. Assembly	N9020-60046
W44	Reserved	
W45	Cable, Coax, A3J17, Digital I.F. Assembly to A21J2, Wideband Analog I.F. Assembly (Options B2X and B5X)	8121-1919
W46	Cable, Coax, A21J1, Wideband Analog I.F. Assembly to A16J726, Reference Assembly (Options B2X and B5X)	8121-0152
W47	Cable, Coax, A3J17, Digital I.F. Assembly to A16J726, Reference Assembly (No Options B2X or B5X)	8121-1401
W48	Cable, Semi-rigid, A13A1J10 R.F. Front End Assembly to A13A2J2, Switched Filter Assembly	N9020-20079
W49	Cable, Semi-rigid, A13A2J5, Switched Filter Assembly to A13A1J11, R.F. Front End Assembly	N9020-20078
W50	Reserved	
W51	Cable, Semi-rigid, A10, Input Attenuator B to SW3 port 1, Transfer Switch	
	Options 508, 513, 526	N9040-20028
	Options 544, 550	N9040-20104
W52	Cable, Semi-rigid, SW3 port 4, Transfer Switch to A11J1, Low Band Switch	
	Options 508, 513, 526	N9040-20031
	Options 544, 550	N9040-20106

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
W53	Cable, Semi-rigid, SW3 port 2, Transfer Switch to SW1 port C, Coaxial Switch (Options 508, 513, 526)	N9040-20029
W54	Cable, Semi-rigid, SW3 port 3, Transfer Switch to A11J3, Low Band Switch	
	Options 508, 513, 526	N9040-20030
	Options 544, 550	N9040-20107
W55	Cable, Ribbon, SW3, Transfer Switch to A15J802, Front End Controller	N9040-60038
W56	Cable, Ribbon, A21J23, Wideband Analog I.F. Assembly to Interconnect Bracket WBDIF (Options B2X and B5X)	N9040-60042
W57	Cable, Ribbon, WBDIF Interconnect Bracket to A22J778, Wideband Digital I.F. (Option B2X)	N9040-60045
	Cable, Ribbon, WBDIF A22J778 to WBDIF A21J778 to WBDIF Interconnect Bracket (Option B5X)	N9040-60041
W58	Cable, Semi-rigid, A13A2J3, Switched Filter Assembly to A13A2J4, Switched Filter Assembly	N9020-20080
W59	Cable, Semi-rigid, SW4 Port 2, Coaxial Switch to A13A2J2, R.F. Front End Assembly (Option B5X)	N9020-20267
W60	Cable, Semi-rigid, SW4 Port 1, Coaxial Switch to FL2 Bandpass Filter In (Option B5X)	N9020-20268
W61	Cable, Semi-rigid, FL2, Bandpass Filter Out to SW5 Port 1, Coaxial Switch (Option B5X)	N9020-20269
W62	Cable, Semi-rigid, SW5 Port 2, Coaxial Switch to A13A2J5 R.F. Front End Assembly (Option B5X)	N9020-20264
W63	Cable, Semi-rigid, SW5 Port C, Coaxial Switch to A13A1J11, R.F. Front End Assembly	
	Option B5X, with freq Options 508, 513 or 526	N9020-20265
	Option B5X, with freq Options 544 or 550	N9020-20276
W64	Cable, Semi-rigid, A13A1J10, R.F. Front End Assembly to SW4 Port C, Coaxial Switch (Option B5X)	N9020-20266
W65	Cable, Semi-rigid, A13A1J3, R.F. Front End Assembly to A13A2J6	part of A13 Assembly
W66	Cable, Semi-rigid, Switch 3, port 2 to Switch 6 port 1(Options 544, 550)	N9040-20105
W67	Cable, Semi-rigid, Switch 6, port 4 to A12 YTF input (Options 544, 550)	N9040-20109
W68	Cable, Semi-rigid, Switch 6, port 3 to A12 YTF output (Options 544, 550)	N9040-20110
W69	Cable, Semi-rigid, Switch 6, port 2 to A13A1J9 (Options 544, 550)	N9040-20111
W70	Cable Assembly (flex circuit), A22 WBDIF J9000 to A28 WBDIF Extension Board J1 (Option RTS with Option B2X)	N9040-60047

Table 14-1 All Replaceable Parts

Reference Designator	Description	Part Number
W71	Cable Assembly (flex circuit), A23 WBDIF J9000 to A28 WBDIF Extension Board J21 (Option RTS with Option B5X)	N9040-60048
W72	Cable, Coax, A27J16 H1G Assembly to A3J15 Digital I.F. (Option H1G) See W40.	8121-1401
W73	Cable, Coax, A27J11 to Rear Panel Ext Trig 3 (Option H1G)	8121-0958
W74	Cable, Coax, A21J18 to A27J15 I.F. In (Option H1G)	8121-1401
W75	Cable, Coax, A16J706 to A27J13 100 MHz In (Option H1G)	8121-1861
W76	Cable, Coax, A27J12 to Rear Panel IF 2 Out (Option H1G)	8121-2867
W77	Cable, Semi-rigid, Rear Panel jumper between IF 2 OUT and IF 2 IN s/n < US57212008 (Option H1G)	N9040-20065

a. Does not include nameplate, See A1MP3 through A1 MP8 and A1MP20 through A1MP22.
b. A13 contains A13A1 & A13A2. They are not sold separately.

Table 14-2 Attaching Hardware

Attach	To	Qty	Part Number	Type	Tool	Torque
Analog IF	Digital IF	3	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Attenuators	Attenuator Bracket	2 per	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Attenuator Bracket	Chassis	2 per	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Chassis Base Stiffener (Covers A3, Digital I.F. Assembly)	Chassis Base	6	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
		2	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Chassis Bottom	Chassis Side Brackets (Left & Right)	13	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Chassis Front Brace	Chassis Side Brackets (Left & Right) & Chassis Bottom	9	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Chassis Front Bracket (Inner/Bottom)	Chassis Front Bracket	6	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Chassis Side (Right)	Chassis Side (Inside Right)	1	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Coax Switch	Coax Switch Bracket	2	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	6 inch-lbs
CPU Assembly	Chassis	6	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
DC-DC Converter	Display Bracket	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs

Replaceable Parts

Replaceable Parts

Table 14-2 Attaching Hardware

Attach	To	Qty	Part Number	Type	Tool	Torque
Digital I.F. Board Plate	Digital I.F. Board	8	2190-0068	Washers	n/a	n/a
		8	2950-0054	Nuts	5/8-inch socket	21 inch-lbs
Digital I.F. Board Plate	Digital I.F. Board Plate LVDS Connector	2	0515-1940	M3 X 0.45 (6 mm long)	Torx T-8	6 inch-lbs
Display	Display Bracket	4	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	6 inch-lbs
Display Bracket	Front Frame	6	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	6 inch-lbs
Disk Drive	Disk Drive Tray	4	0515-1035	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
"Ext Mixer" Connector	Front Frame	1	2950-0223	Hex Nut	n/a	21 inch-lbs
External Reference BNC	Rear Panel	1	2190-0102	Lock Washer	n/a	n/a
		1	0590-2332	Hex Nut	9/16” Nut Driver	21 inch-lbs
Fan Grill	Fan Bracket (Right)	3 per	0515-1038	M3 X 0.5 (35 mm long)	Torx T-10	9 inch-lbs
Fan/Bracket Assembly	Chassis (Left)	5	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Front Frame Assembly	Chassis	14	0515-2044	M4 X 0.7 (10 mm long)	Torx T-20	21 inch-lbs
		1	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Front Frame Cover Plate	Front Frame	2	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs

Table 14-2 Attaching Hardware

Attach	To	Qty	Part Number	Type	Tool	Torque
Front Frame Handles	Front Frame	8	0515-2044	M4 X 0.7 (10 mm long)	Torx T-20	21 inch-lbs
Front Panel Controller Board	Front Frame	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch lbs.
Front Panel Controller Board Bracket	Front Frame	4	0515-0664	M3 X 0.5 (12 mm long)	Torx T-10	9 inch lbs
		2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch lbs.
Front Panel Interface Board & Main Keypad	Front Frame	10	0515-0430	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Front Panel Interface Board Shield	Front Frame	41	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
L.O. Synthesizer Assembly Bracket	L.O. Synthesizer Assembly	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
L.O. Synthesizer Assembly Ejectors	L.O. Synthesizer Assembly	2 per side	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
L.O. Synthesizer Assembly Top Bracket (Left & Right)	Chassis Sides	2	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Low Band Switch	Chassis	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Low Band Switch (Option 544, 550)	Chassis	5	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Motherboard (Front)	Motherboard Bracket	9	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Motherboard Interconnect	Chassis Base	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs

Replaceable Parts

Replaceable Parts

Table 14-2 Attaching Hardware

Attach	To	Qty	Part Number	Type	Tool	Torque
Chassis Sides (Left & Right)	Rear Motherboard Bracket	6	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
	New Chassis	8	0515-0433	M4 X 0.7 (8 mm long)	Torx T-20	21 inch-lbs
Cable Clamp (Fan)	Fan Bracket	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Motherboard Bracket (Front)	Chassis	7	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Rear Motherboard	Rear Motherboard Bracket	3	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
On/Off Keyboard & Keypad	Front Frame	2	0515-0430	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Power Supply Bracket	Chassis	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
	New Chassis	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
	Power Supply	9	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Preselector Bypass Switch	Preselector Bypass Switch Bracket	2 per	0515-1992	M2.5 X 0.45 (20 mm long)	Torx T-8	6 inch-lbs
Rear Feet	Rear Panel	4	0515-1619	M4 X 0.7 (25 mm long)	Torx T-20	21 inch-lbs
		4	3050-0893	Flat Washer	n/a	n/a

Table 14-2 Attaching Hardware

Attach	To	Qty	Part Number	Type	Tool	Torque
Rear Brace	Chassis Side (Left & Right)	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
	Wideband Digital I.F. Assembly	1	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
	H1G Assembly (Option H1G)	6	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Rear Frame	Chassis	21	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Rear Frame	Chassis Corners	4	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Reference Assembly Ejector (Left & Right)	Reference Assembly	2 per side	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Reference Assembly Top Bracket (Left & Right)	Chassis Sides	2	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
RF Front End Assembly	Motherboard Bracket	6	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
RF Side Bracket (Right Side Outer)	Chassis Base & Bracket "S" Shape Chassis Side	7	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Small "T" Support Bracket	Top Brace (Front)	6	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Stiffener Brace	Chassis	6	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
		2	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs

Replaceable Parts

Replaceable Parts

Table 14-2 Attaching Hardware

Attach	To	Qty	Part Number	Type	Tool	Torque
Top Brace (Front/Holes)	Chassis	6	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
	Chassis & PCB Assemblies	9	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
	Chassis (Left & Right Sides)	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Top Brace (Rear/Solid)	Chassis Side	5	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
	Chassis Rear	1	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
	Chassis (Left & Right Sides)	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Strap Handles	Chassis Side	2 per	0515-0710	M4 X 0.8 (18 mm long)	Torx T-20	21 inch-lbs
Transfer Switch	Transfer Switch Bracket	4	0515-1934	M2.5 X 0.45 (6 mm long)	Torx T-8	6 inch-lbs
Transfer Switch Bracket	Chassis	3	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Wideband Analog I.F. Assembly Cable Bracket	Chassis Side	1	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Wideband Analog I.F. Cable	Plastic Cable Guard	2	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
Wideband Analog I.F. Assembly Top Bracket	Wideband Analog I.F. Assembly	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
Wideband Analog I.F. Assembly Bracket (Left & Right)	Wideband Analog I.F. Assembly	2 per	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs

Table 14-2 Attaching Hardware

Attach	To	Qty	Part Number	Type	Tool	Torque
Wideband Analog I.F. Assembly Ejector (Left & Right)	Wideband Analog I.F. Assembly	2	0515-0433	M4 X 0.7 (8 mm long)	Torx T-20	21 inch-lbs
Wideband Analog I.F. Assembly Ejector (Left & Right)	Wideband Analog I.F. Assembly	2	3050-0893	Washer	n/a	n/a
Wideband Analog I.F. Assembly Ejector (Left & Right)	Chassis Sides	2	0515-1946	M3 X 0.5 (6 mm long)	Torx T-10	9 inch-lbs
YTF Preselector	Chassis	4	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
YTO Assembly	Chassis	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs
YTO Top Board	YTO Assembly	1	0515-0659	M2 X 0.4 (8 mm long)	Torx T-6	2 inch-lbs
YTO Top Shield	YTO Assembly	2	0515-0372	M3 X 0.5 (8 mm long)	Torx T-10	9 inch-lbs

Replaceable Parts

Hardware

Figure 14-1 Major Assemblies

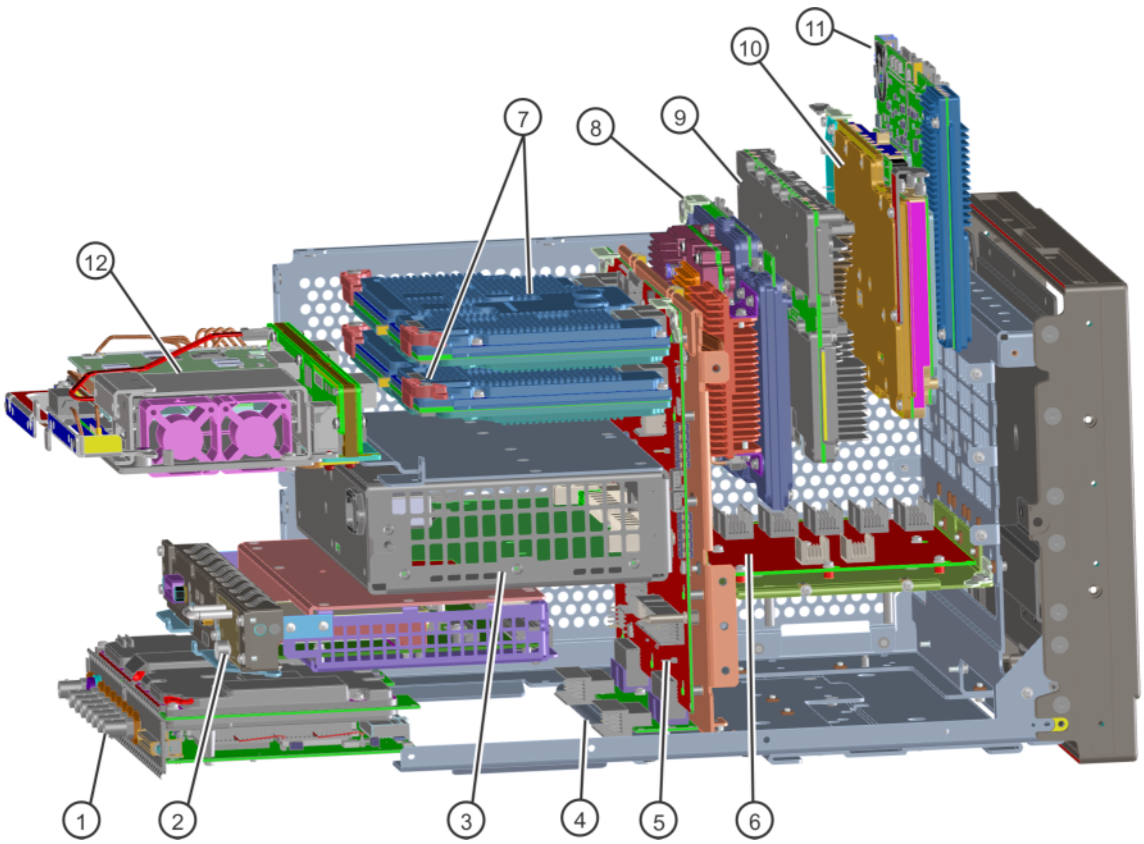


Table 14-3 Major Assemblies

Item	Description	Keysight Part Number
1	A2 Narrowband Analog I.F. & A3 Narrowband Digital I.F. Assembly	N9020-60290 N9020-60016
2	A4 CPU Assembly	N9020-60247
3	A6 Power Supply	0950-5748
4	A24 Motherboard Interconnect Board/ Bottom Motherboard	N9040-63004
5	A7 Rear Motherboard Assembly	N9040-63003
6	A8 Front Motherboard	N9040-63002
7	A22 & A23 Wideband Digital I.F. Assemblies (Options B2X and B5X)	N9020-60311
8	A14 L.O. Synthesizer Assembly	N9020-60227
9	A21 Wideband Analog I.F. Assembly	N9020-60043
10	A16 Reference Assembly	N9020-60187
11	A15 Front End Controller	N9020-60295
12	A27 H1G Assembly (Option H1G) (not compatible with Option B5X)	N9040-60102

Figure 14-2 External Hardware

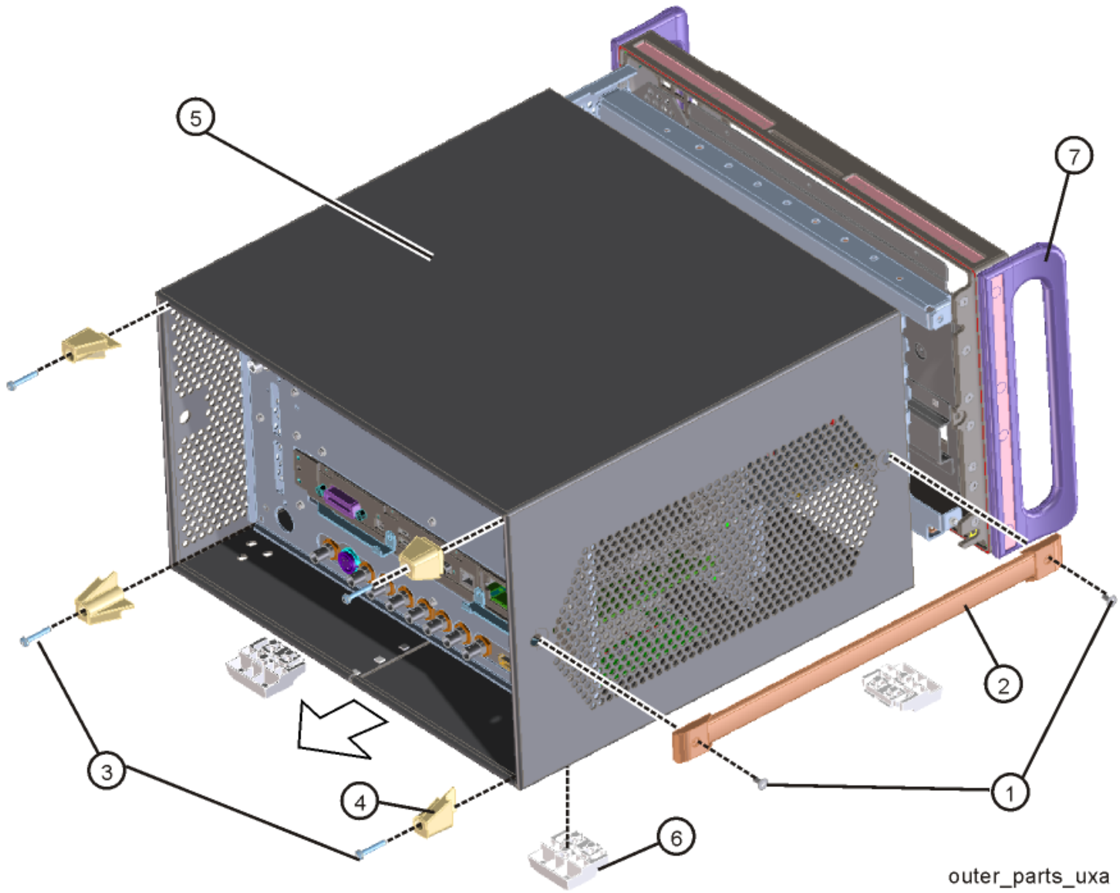


Table 14-4 External Hardware

Item	Description	Keysight Part Number
1, 2	Strap Handle (includes screws)	
	light color	E4400-60026
	dark color	N9040-60059
3	Screw	0515-1619
	Washer	3050-0893
4	Rear Feet	
	light color	5041-9611
	dark color	5041-7903
5	Dress Cover	
	light color	N9040-00015
	dark color	N9040-00046
6	Bottom feet	
	light color	5041-9167
	dark color	5041-7906
7	Front Frame Handles	
	light color	5023-1399
	dark color	5023-3074

Figure 14-3 Top Brace and Card Cage Brace

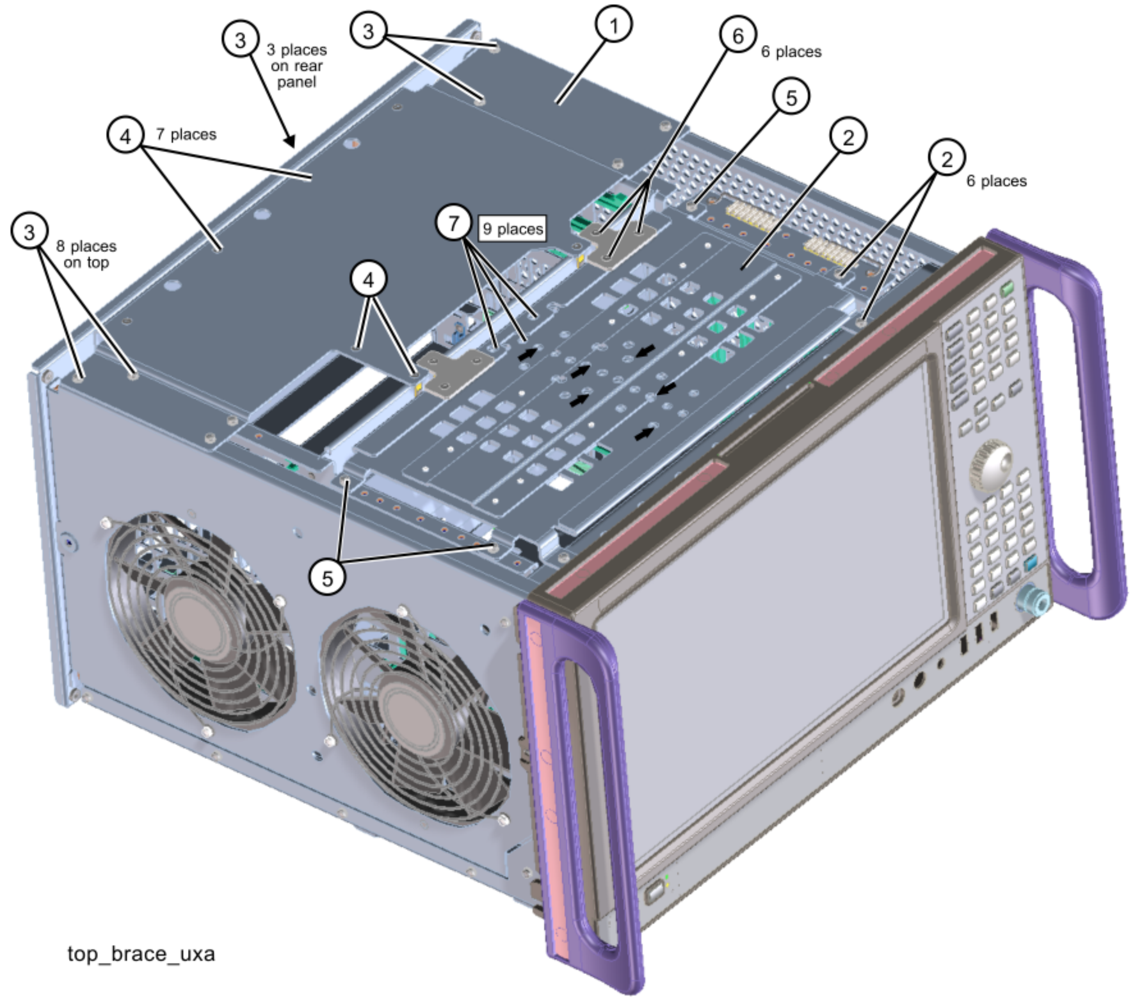


Table 14-5 Top Brace and Card Cage Brace

Item	Description	Keysight Part Number
1	Top Brace Rear (solid)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00011
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00049
2	Top Brace Front card cage (with holes)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00010
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00055
5	Screw	0515-0372
3, 4, 6, 7	Screw	0515-1946

Figure 14-4 RF Area (Options 508, 513, 526)

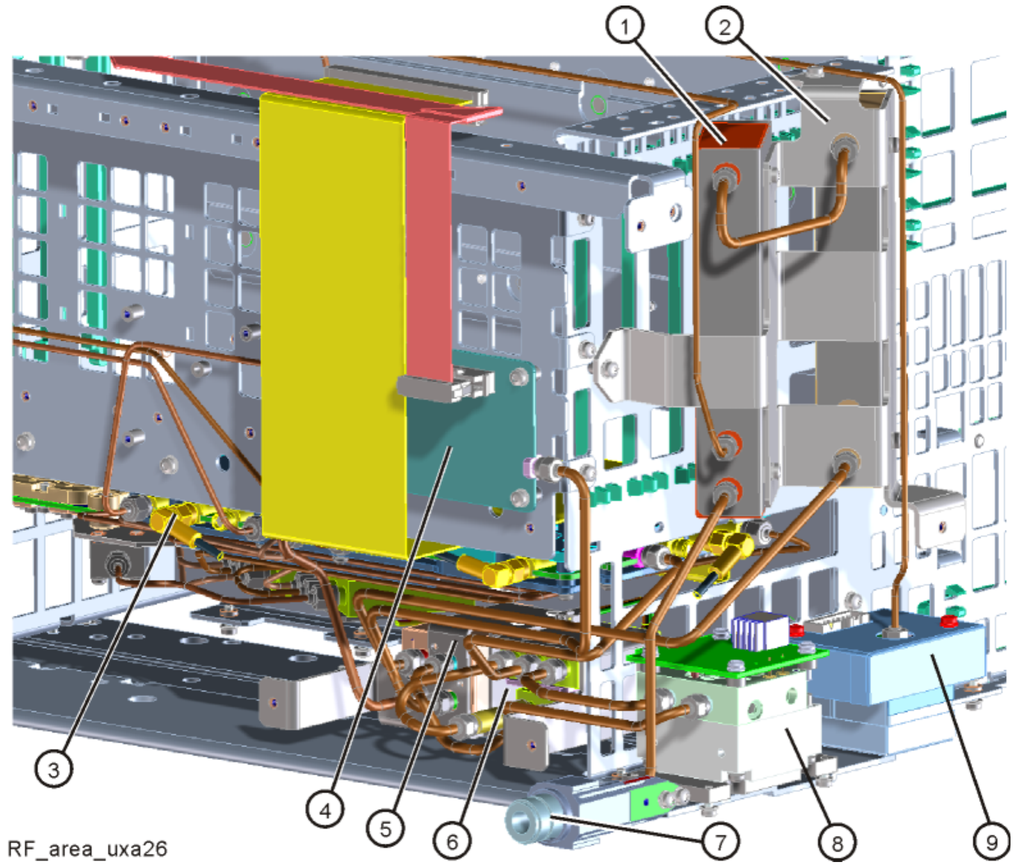


Table 14-6 RF Area (Options 508, 513, 526)

Item	Description	Keysight Part Number
1	A9 RF Attenuator A	33360-60008
2	A10 RF Attenuator B	33321-60083
3	A13 RF Front End Assembly	
	Std & Option B2X (Options 508, 513, 526)	N9020-60129
	Option B5X (Options 508, 513, 526)	N9020-60208
4	A11 Low Band Switch Assembly	E4410-60121
5	SW3 Transfer Switch Assembly	87222-60026
6	SW1 and SW2 Coax Switches	N1810-60069
7	J1 RF Input Connector	
	Type-N	N9039-60030
	3.5 mm (Option C35)	N9020-60196
8	A12 YTF Preselector	5087-7382
9	A20 YTO	N9020-60009

RF Area Cables (Options 508, 513, 526)

Refer to Figure 14-5 through Figure 14-9 for locations of RF area cables for Options 508, 513, and 526.

Figure 14-5 RF Area Cables (Options 508, 513, 526)

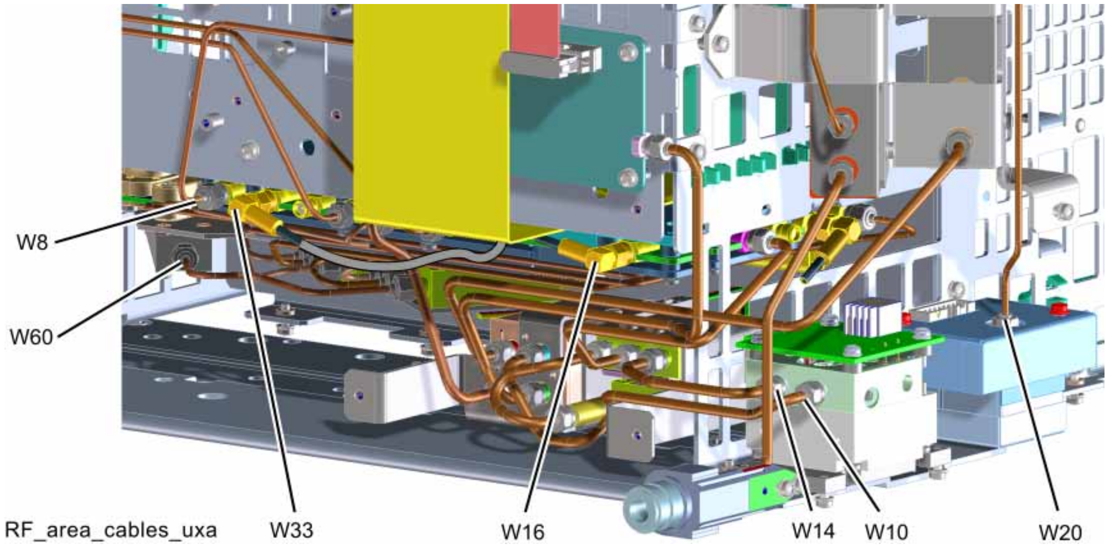


Figure 14-6 Low Band Switch Cables (Options 508, 513, 526)

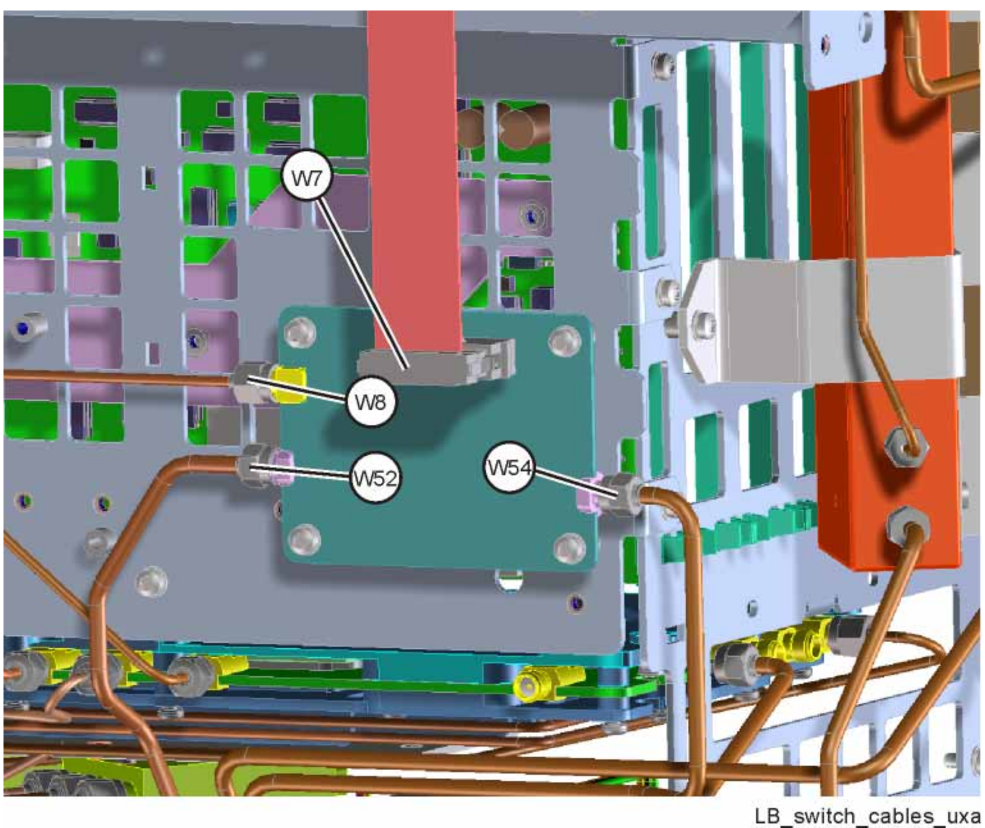


Figure 14-7 MPB/LNP Cables (Options 508, 513, 526)

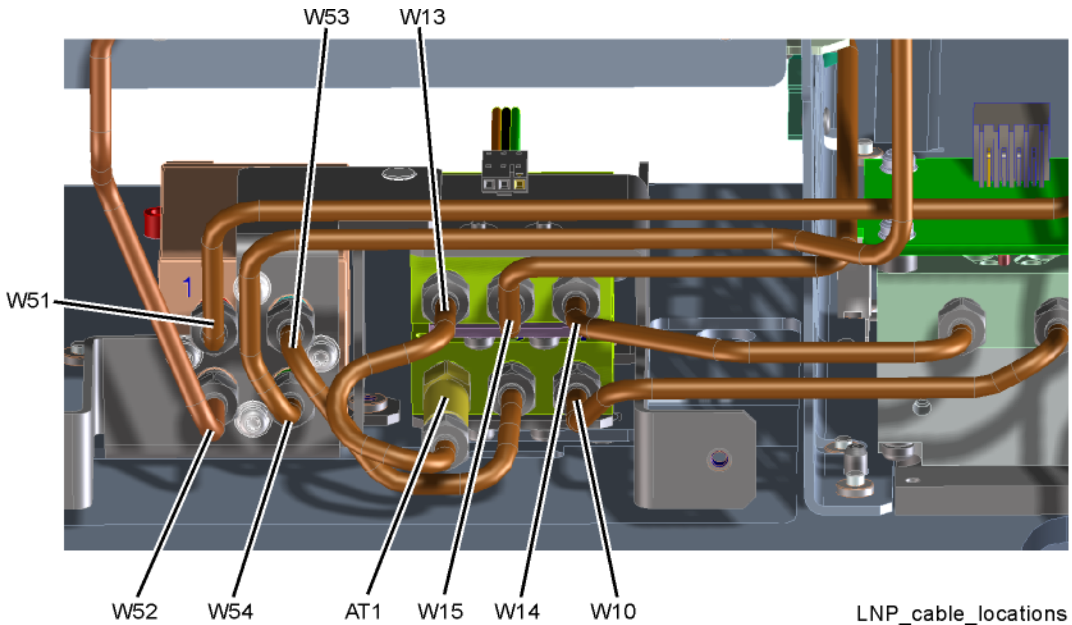


Figure 14-8 RF Front End Cables (Options 508, 513, 526)

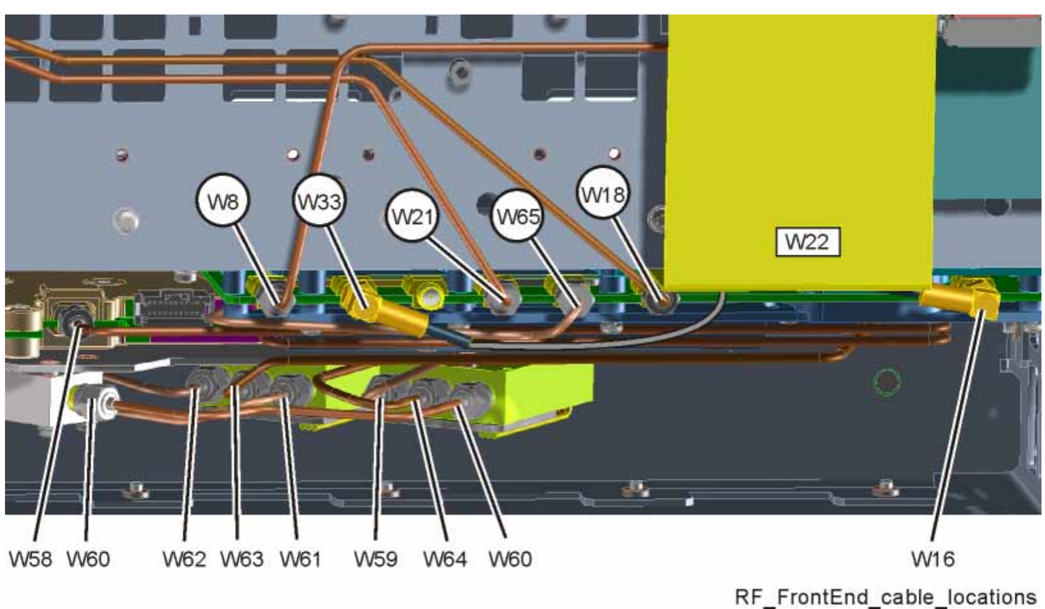


Figure 14-9 RF Front End Side Cables (Options 508, 513, 526)

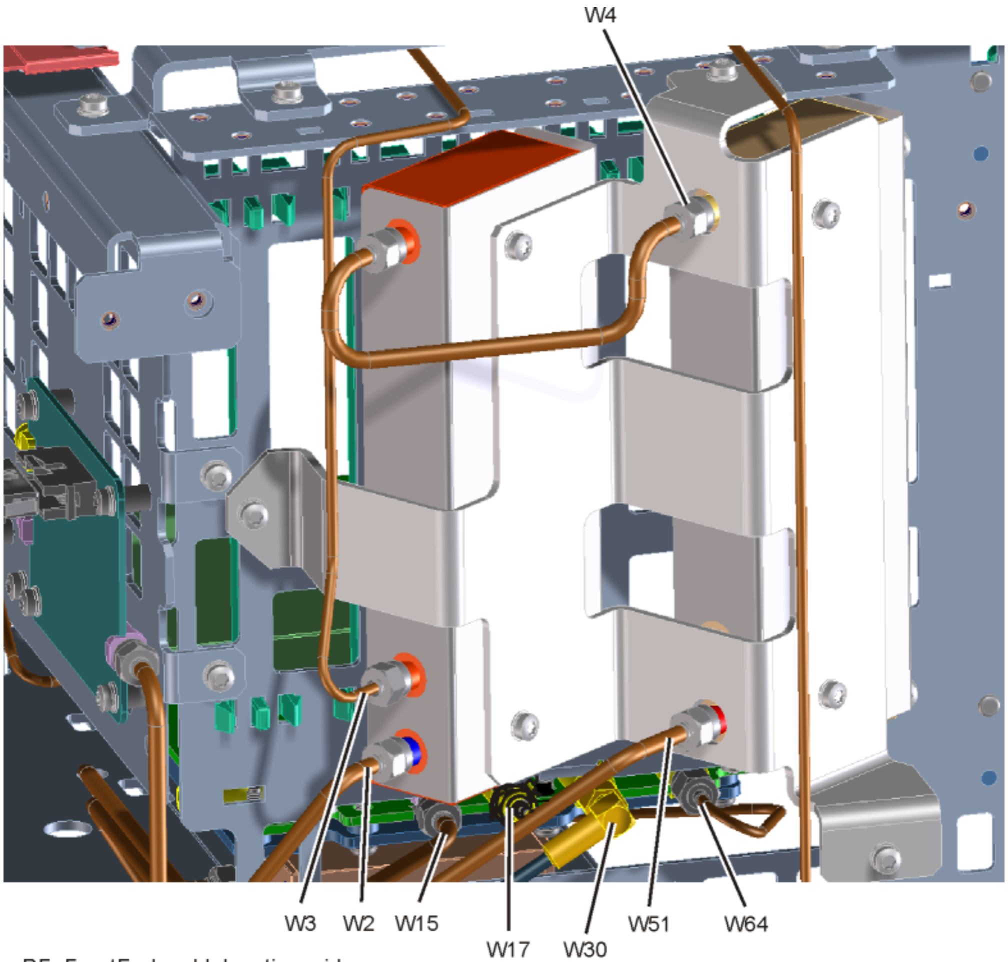


Table 14-7 RF Area Cables (Options 508, 513, 526)

Item	Description	Keysight Part Number
AT1	Attenuator, 6 dB Coax (connects to SW1 & W13)	08493-60026
W2	Cable, Semi-rigid, RF Input Connector to Attenuator A	
	Option CNF	N9040-20025
	Option C35	N9040-20043
W3	Cable, Semi-rigid, Cal In to Attenuator, A16J701, Reference Assembly to Attenuator A	N9040-20027
W4	Cable, Semi-rigid, Attenuator B to Attenuator A	N9040-20026
W7	Cable, Ribbon, A11J4, Low Band Switch to A15J700, Front End Controller	N9040-60036
W8	Cable, Semi-rigid, A13J2, R.F. Front End Assembly to A11J2, Low Band Switch	N9040-20032
W10	Cable, Semi-rigid, Switch 1 port 2 to YTF In	N9040-20033
W13	Cable, Semi-rigid, Switch 2 port 1 to AT1, 6 dB Pad	N9040-20036
W14	Cable, Semi-rigid, A12, YTF Out to Switch 2 port 2	N9040-20034
W15	Cable, Semi-rigid, Switch 2 port C to A13J9, R.F. Front End Assembly (Options 508, 513, 526)	N9040-20035
W16	Cable, Coax, A13J7, R.F. Front End Assembly to A15J902, Front End Controller	8121-2608
W17	Cable, Semi-rigid, A13J8, R.F. Front End Assembly to W29 Cable	N9040-60046
W18	Cable, Semi-rigid, A16J702, Reference Assembly to A13J1, R.F. Front End Assembly	N9040-20039
W20	Cable, Semi-rigid, A20, YTO Output to A14J2, L.O. Synthesizer Assembly	N9040-20037
W21	Cable, Semi-rigid, A14J1, L.O. Synthesizer to A13J4, R.F. Front End Assembly	N9040-20038
W22	Cable, Ribbon, A13J12, R.F. Front End Control to A15J102, Front End Controller	N9040-60037
W30	Cable, Coax, A13J13 R.F. Front End Assembly to A15J903, Front End Controller	8121-1940
W33	Cable, Coax, A13J6, R.F. Front End Assembly to A16J705, Reference Assembly	8121-1940
W51	Cable, Semi-rigid, A10, Input Attenuator B to SW3 port 1, Transfer Switch	N9040-20028
W52	Cable, Semi-rigid, SW3 port 4, Transfer Switch to A11J1, Low Band Switch	N9040-20031
W53	Cable, Semi-rigid, SW3 port 2, Transfer Switch to SW1 port C, Coaxial Switch (Options 508, 513, 526)	N9040-20029
W54	Cable, Semi-rigid, SW3 port 3, Transfer Switch to A11J3, Low Band Switch	N9040-20030
W58	Cable, Semi-rigid, A13A2J3, Switched Filter Assembly to A13A2J4, Switched Filter Assembly	N9020-20080

Table 14-7 RF Area Cables (Options 508, 513, 526)

Item	Description	Keysight Part Number
W59	Cable, Semi-rigid, SW4 Port 2, Coaxial Switch to A13A2J2, R.F. Front End Assembly (Option B5X)	N9020-20267
W60	Cable, Semi-rigid, SW4 Port 1, Coaxial Switch to FL2 Bandpass Filter In (Option B5X)	N9020-20268
W61	Cable, Semi-rigid, FL2, Bandpass Filter Out to SW5 Port 1, Coaxial Switch (Option B5X)	N9020-20269
W62	Cable, Semi-rigid, SW5 Port 2, Coaxial Switch to A13A2J5 R.F. Front End Assembly (Option B5X)	N9020-20264
W63	Cable, Semi-rigid, SW5 Port C, Coaxial Switch to A13A1J11, R.F. Front End Assembly	N9020-20265
W64	Cable, Semi-rigid, A13A1J10, R.F. Front End Assembly to SW4 Port C, Coaxial Switch (Option B5X)	N9020-20266
W65	Cable, Semi-rigid, A13A1J3, R.F. Front End Assembly to A13A2J6	part of A13 Assembly

Figure 14-10 RF Area (Options 544, 550)

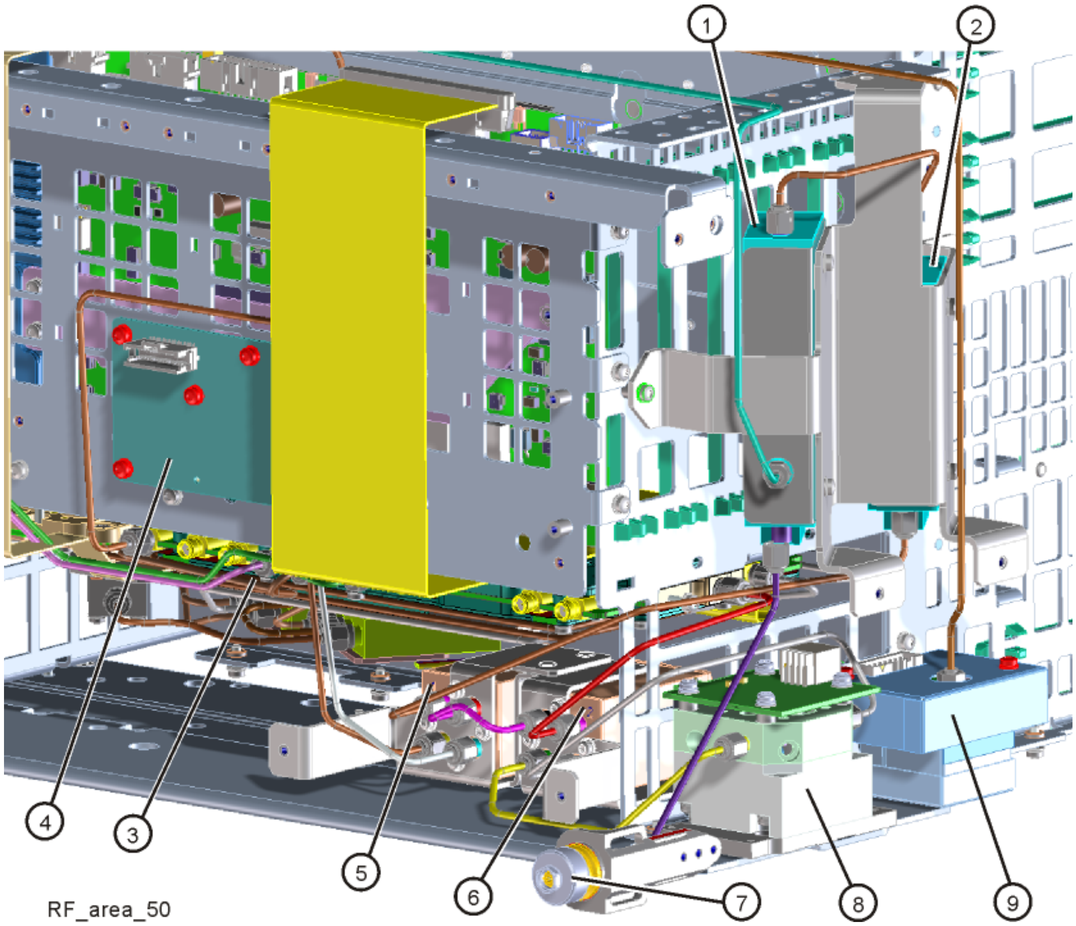


Table 14-8 RF Area (Options 544, 550)

Item	Description	Keysight Part Number
1	A9 RF Attenuator A	33326-60013
2	A10 RF Attenuator B	33325-60020
3	A13 RF Front End Assembly	
	Std & Option B2X (Options 544, 550)	N9020-60210
	Option B5X (Options 544, 550)	N9020-60218
4	A11 Low Band Switch Assembly	N9020-60051
5	SW3 Transfer Switch Assembly	87222-60029
6	SW6 Transfer Switch Assembly	87222-60031
7	J1 RF Input Connector	
	2.4 mm	N9030-60011
8	A12 YTF Preselector	5087-7383
9	A20 YTO	N9020-60009

RF Area Cables (Options 544, 550)

Refer to Figure 14-11 through Figure 14-13 for locations of RF area cables for Options 544 and 550.

Figure 14-11 RF Area Cables (Options 544, 550)

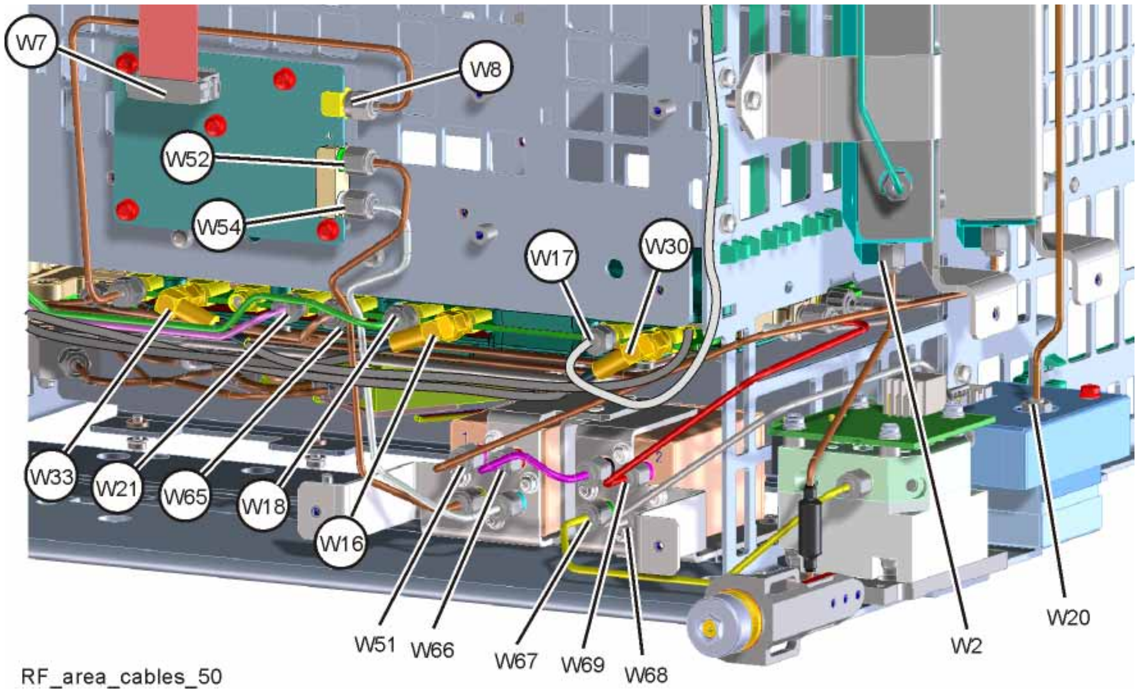


Figure 14-12 RF Front End Cables (Options 544, 550) (Option B5X shown)

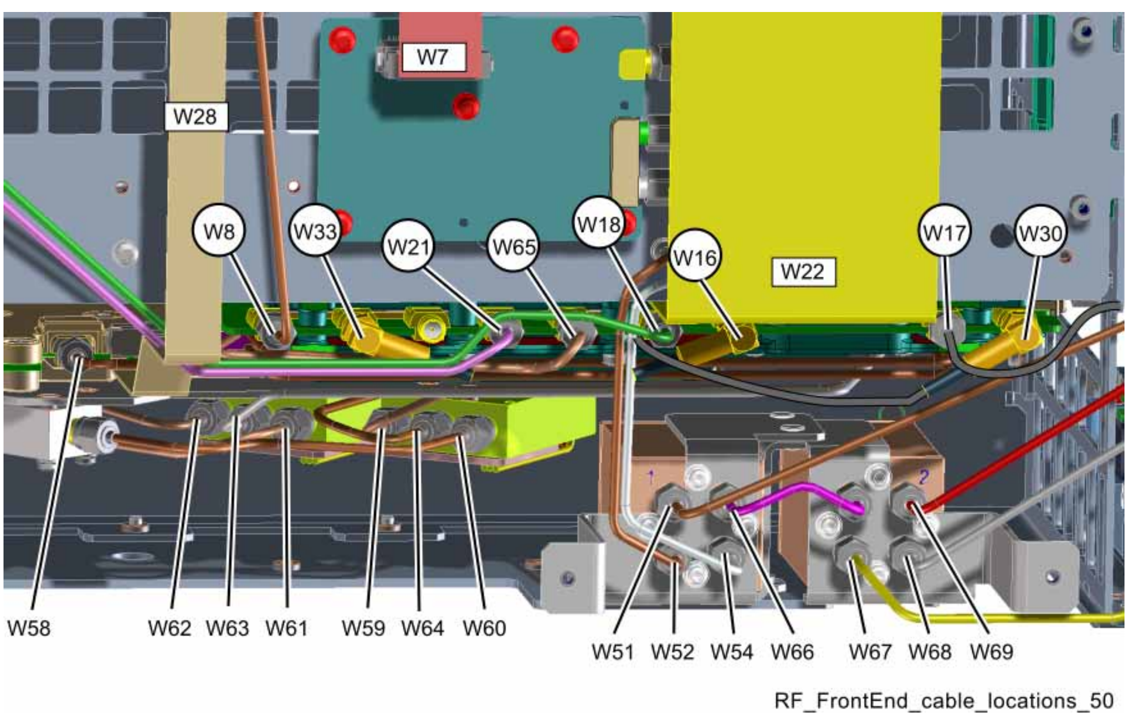


Figure 14-13 RF Front End Side Cables (Options 544, 550)

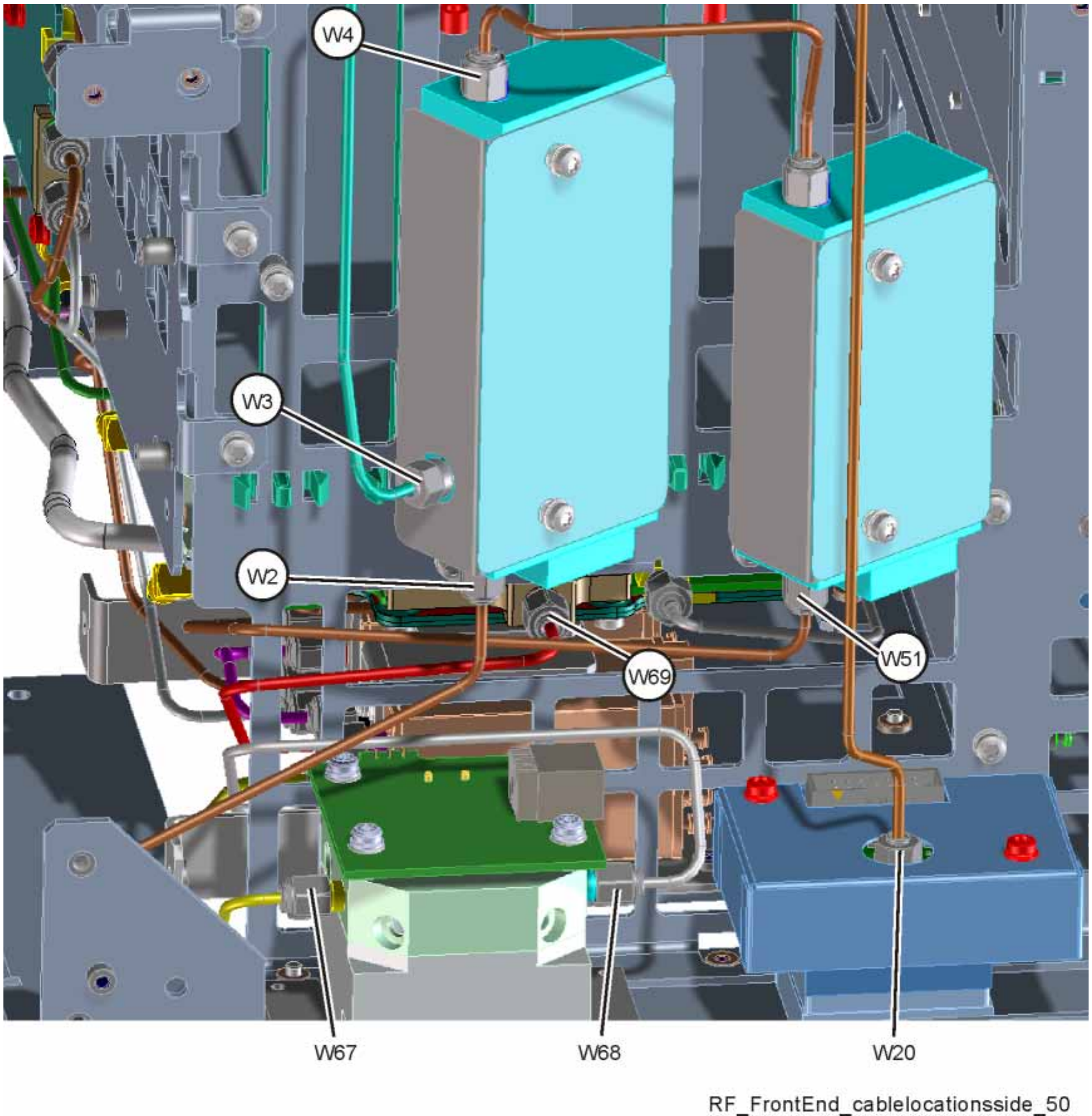


Table 14-9 RF Area Cables (Options 544, 550)

Item	Description	Keysight Part Number
W2	Cable, Semi-rigid, RF Input Connector to Attenuator A	N9040-20114
W3	Cable, Semi-rigid, Cal In to Attenuator, A16J701, Reference Assembly to Attenuator A	N9040-20103
W4	Cable, Semi-rigid, Attenuator B to Attenuator A	N9040-20102
W7	Cable, Ribbon, A11J4, Low Band Switch to A15J700, Front End Controller	N9040-60066
W8	Cable, Semi-rigid, A13J2, R.F. Front End Assembly to A11J2, Low Band Switch	N9040-20108
W16	Cable, Coax, A13J7, R.F. Front End Assembly to A15J902, Front End Controller	8121-2027
W17	Cable, Semi-rigid, A13J8, R.F. Front End Assembly to W29 Cable	N9040-60046
W18	Cable, Semi-rigid, A16J702, Reference Assembly to A13J1, R.F. Front End Assembly	N9040-20113
W20	Cable, Semi-rigid, A20, YTO Output to A14J2, L.O. Synthesizer Assembly	N9040-20037
W21	Cable, Semi-rigid, A14J1, L.O. Synthesizer to A13J4, R.F. Front End Assembly	N9040-20112
W22	Cable, Ribbon, A13J12, R.F. Front End Control to A15J102, Front End Controller	N9040-60037
W28	Cable, Ribbon, A15J1300, Front End Controller to A13A2J1, Switched Filter Assembly	N9040-60034
W30	Cable, Coax, A13J13 R.F. Front End Assembly to A15J903, Front End Controller	8121-2608
W33	Cable, Coax, A13J6, R.F. Front End Assembly to A16J705, Reference Assembly	8121-1940
W51	Cable, Semi-rigid, A10, Input Attenuator B to SW3 port 1, Transfer Switch	N9040-20104
W52	Cable, Semi-rigid, SW3 port 4, Transfer Switch to A11J1, Low Band Switch	N9040-20106
W54	Cable, Semi-rigid, SW3 port 3, Transfer Switch to A11J3, Low Band Switch	N9040-20107
W58	Cable, Semi-rigid, A13A2J3, Switched Filter Assembly to A13A2J4, Switched Filter Assembly	N9020-20080
W59	Cable, Semi-rigid, SW4 Port 2, Coaxial Switch to A13A2J2, R.F. Front End Assembly (Option B5X)	N9020-20267
W60	Cable, Semi-rigid, SW4 Port 1, Coaxial Switch to FL2 Bandpass Filter In (Option B5X)	N9020-20268
W61	Cable, Semi-rigid, FL2, Bandpass Filter Out to SW5 Port 1, Coaxial Switch (Option B5X)	N9020-20269
W62	Cable, Semi-rigid, SW5 Port 2, Coaxial Switch to A13A2J5 R.F. Front End Assembly (Option B5X)	N9020-20264

Table 14-9 RF Area Cables (Options 544, 550)

Item	Description	Keysight Part Number
W63	Cable, Semi-rigid, SW5 Port C, Coaxial Switch to A13A1J11, R.F. Front End Assembly	N9020-20276
W64	Cable, Semi-rigid, A13A1J10, R.F. Front End Assembly to SW4 Port C, Coaxial Switch (Option B5X)	N9020-20266
W65	Cable, Semi-rigid, A13A1J3, R.F. Front End Assembly to A13A2J6	part of A13 Assembly
W66	Cable, Semi-rigid, Switch 3, port 2 to Switch 6 port 1(Options 544, 550)	N9040-20105
W67	Cable, Semi-rigid, Switch 6, port 4 to A12 YTF input (Options 544, 550)	N9040-20109
W68	Cable, Semi-rigid, Switch 6, port 3 to A12 YTF output (Options 544, 550)	N9040-20110
W69	Cable, Semi-rigid, Switch 6, port 2 to A13A1J9 (Options 544, 550)	N9040-20111

Figure 14-14 Card Cage Boards

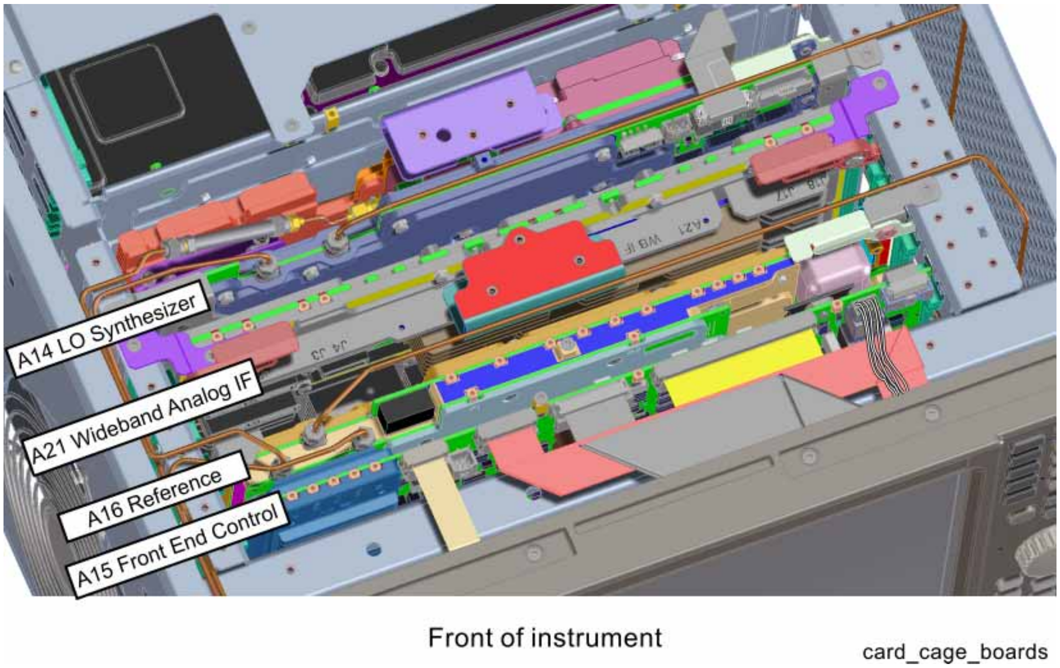
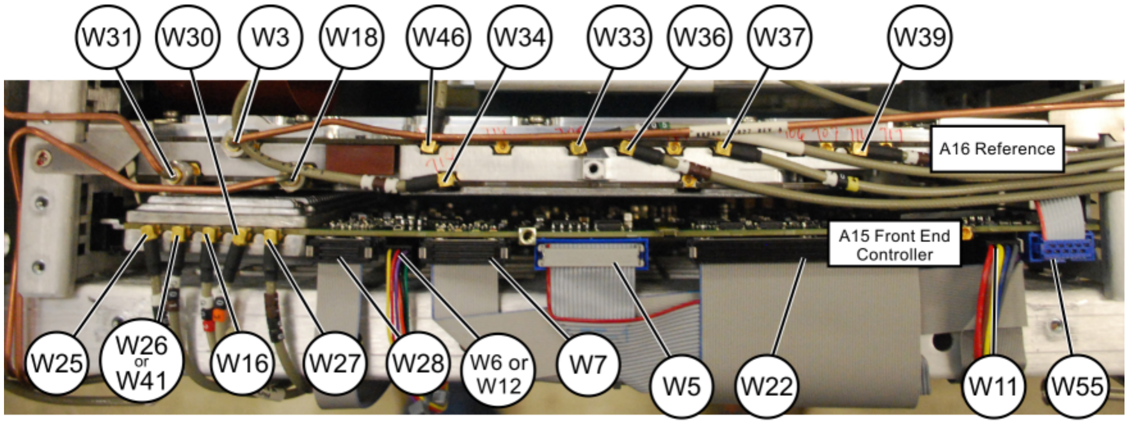


Table 14-10 Card Cage Boards

Item	Description	Keysight Part Number
1	A15 Front End Controller	N9020-60295
2	A16 Reference Assembly	N9020-60187
3	A21 Wideband Analog I.F. Assembly	N9020-60043
4	A14 L.O. Synthesizer Assembly	N9020-60227

Figure 14-15 Reference Assembly and Front End Controller Cables



front_cables_uxa

Table 14-11 Reference Assembly and Front End Controller Cables

Item	Description	Keysight Part Number
	A15 Front End Controller	N9020-60295
	A16 Reference	N9020-60187
W3	Cable, Semi-rigid, Cal In to Attenuator, A16J701, Reference Assembly to Attenuator A	
	Options 508, 513, 526	N9040-20027
	Options 544, 550	N9040-20103
W5	Cable, Ribbon, Attenuator A/B to A15J800, Front End Controller	
	Options 508, 513, 526	N9040-60032
	Options 544, 550	N9040-60065
W6	Cable, Wire Harness, Switch 1/2 and B5X Switches to A15J801, Front End Controller (Option B5X)	N9040-60031
W7	Cable, Ribbon, A11J4, Low Band Switch to A15J700, Front End Controller	
	Options 508, 513, 526	N9040-60036
	Options 544, 550	N9040-60066
W11	Cable, Wire harness, A12J1, YTF to A15J300, Front End Controller	N9040-60033
W12	Wire harness, Switch 1/2 to A15J801, Front End Controller	N9040-60039

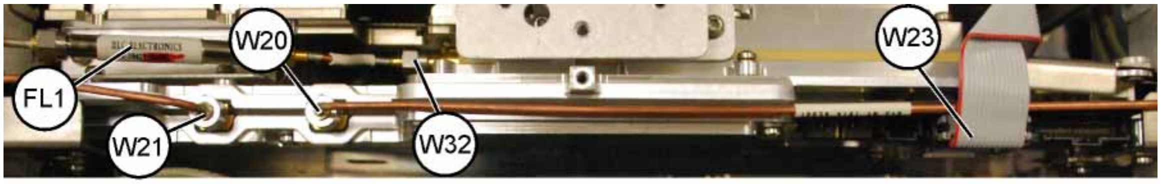
Table 14-11 Reference Assembly and Front End Controller Cables

Item	Description	Keysight Part Number
W16	Cable, Coax, A13J7, R.F. Front End Assembly to A15J902, Front End Controller	
	Options 508, 513, 526	8121-2608
	Options 544, 550	8121-2027
W18	Cable, Semi-rigid, A16J702, Reference Assembly to A13J1, R.F. Front End Assembly	
	Options 508, 513, 526	N9040-20039
	Options 544, 550	N9040-20113
W22	Cable, Ribbon, A13J12, R.F. Front End Control to A15J102, Front End Controller	N9040-60037
W25	Cable, Coax, A15J900, Front End Controller to A2J100, Analog I.F. Assembly	8121-1865
W26	Cable, Coax, A15J901, Front End Controller to A3J15, Narrowband Digital I.F. Assembly (Std, Option B25, B40)	8121-1919
W27	Cable, Coax, A15J1100, Front End Controller to Aux IF Out Rear Panel	8121-1859
W28	Cable, Ribbon, A15J1300, Front End Controller to A13A2J1, Switched Filter Assembly	N9040-60034
W30	Cable, Coax, A13J13 R.F. Front End Assembly to A15J903, Front End Controller	
	Options 508, 513, 526	8121-1940
	Options 544, 550	8121-2608
W31	Cable, Semi-rigid, A16J703, Reference Assembly to FL1, 7.2 GHz Bandpass Filter	N9040-20040
W33	Cable, Coax, A13J6, R.F. Front End Assembly to A16J705, Reference Assembly	8121-1940
W34	Cable, Coax, A16J718, Reference Assembly to A21J4, Wideband Analog I.F. Assembly (Option B2X and B5X)	8121-0152
W36	Cable, Coax, A16J711, Reference Assembly to A2J300, Analog I.F. Assembly	8121-1919
W37	Cable, Coax, Ext Ref In Rear Panel to A16J704, Reference Assembly	8121-1863
W39	Cable, Coax, A16J716, Reference Assembly to A3J14, Digital I.F. Assembly	8121-1861
W41	Cable, Coax, A15J901, Front End Controller to A21J17, Wideband Analog I.F. Assembly (Options B2X and B5X)	8121-1401

Table 14-11 Reference Assembly and Front End Controller Cables

Item	Description	Keysight Part Number
W46	Cable, Coax, A21J1, Wideband Analog I.F. Assembly to A16J726, Reference Assembly (Options B2X and B5X)	8121-0152
W55	Cable, Ribbon, SW3, Transfer Switch to A15J802, Front End Controller	N9040-60038

Figure 14-16 LO Synthesizer Cables



LO_synth_cables_uxa

Table 14-12 LO Synthesizer Cables

Item	Description	Keysight Part Number
FL1	7.2 GHz Bandpass Filter (connects to A14)	9135-6218
W20	Cable, Semi-rigid, A20, YTO Output to A14J2, L.O. Synthesizer Assembly	N9040-20037
W21	Cable, Semi-rigid, A14J1, L.O. Synthesizer to A13J4, R.F. Front End Assembly	
	Options 508, 513, 526	N9040-20038
	Options 544, 550	N9040-20112
W23	Cable, Ribbon, A14J8, L.O. Synthesizer to A20, YTO Control	N9040-60035
W32	Cable, Semi-rigid, A14J35002, L.O. Synthesizer Assembly to FL1, 7.2 GHz Bandpass Filter	N9020-20226

Figure 14-17 AIF/DIF Assemblies

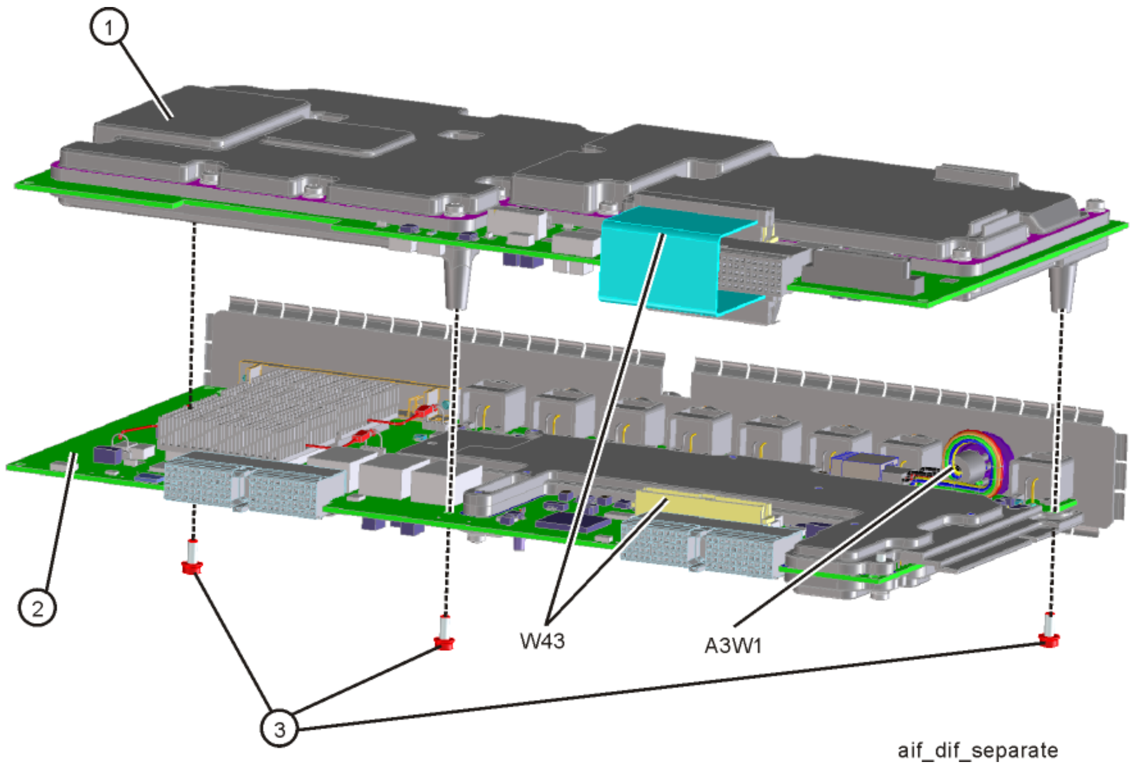


Table 14-13 AIF/DIF Assemblies

Item	Description	Keysight Part Number
1	A2 Analog I.F. Assembly	N9020-60290
2	A3 Digital I.F. Assembly	N9020-60016
3	Screw, M3 X 0.5 (8 mm long)	0515-0372
W43	Cable, Ribbon, A2J820, Analog I.F. Assembly to A3J20 Digital I.F. Assembly	N9020-60046
A3W1	Cable Assembly, Smart Noise Source (Wire Harness)	N9020-60090

Figure 14-18 AIF Cables

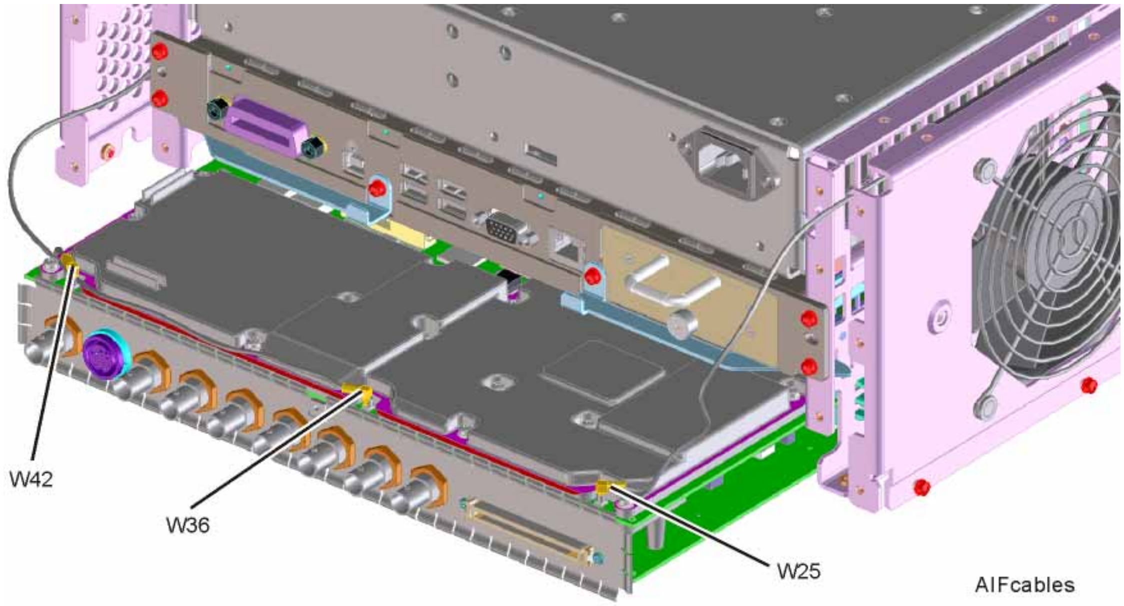


Figure 14-19 DIF Cables

Table 14-14 AIF and DIF Cables

Item	Description	Keysight Part Number
W25	Cable, Coax, A15J900, Front End Controller to A2J100, Analog I.F. Assembly	8121-1865
W26	Cable, Coax, A15J901, Front End Controller to A3J15, Narrowband Digital I.F. Assembly (Std, Option B25, B40)	8121-1919
W36	Cable, Coax, A16J711, Reference Assembly to A2J300, Analog I.F. Assembly	8121-1919
W39	Cable, Coax, A16J716, Reference Assembly to A3J14, Digital I.F. Assembly	8121-1861
W40	Cable, Coax, A21J18, Wideband Analog I.F. Assembly to A3J15, Digital I.F. Assembly (Options B2X and B5X)	8121-1401
W42	Cable, Coax, A2J601, Analog I.F. Assembly to A3J19, Digital I.F. Assembly	8121-2607
W47	Cable, Coax, A3J17, Digital I.F. Assembly to A16J726, Reference Assembly (No Options B2X or B5X)	8121-1401

Figure 14-20 CPU Assembly

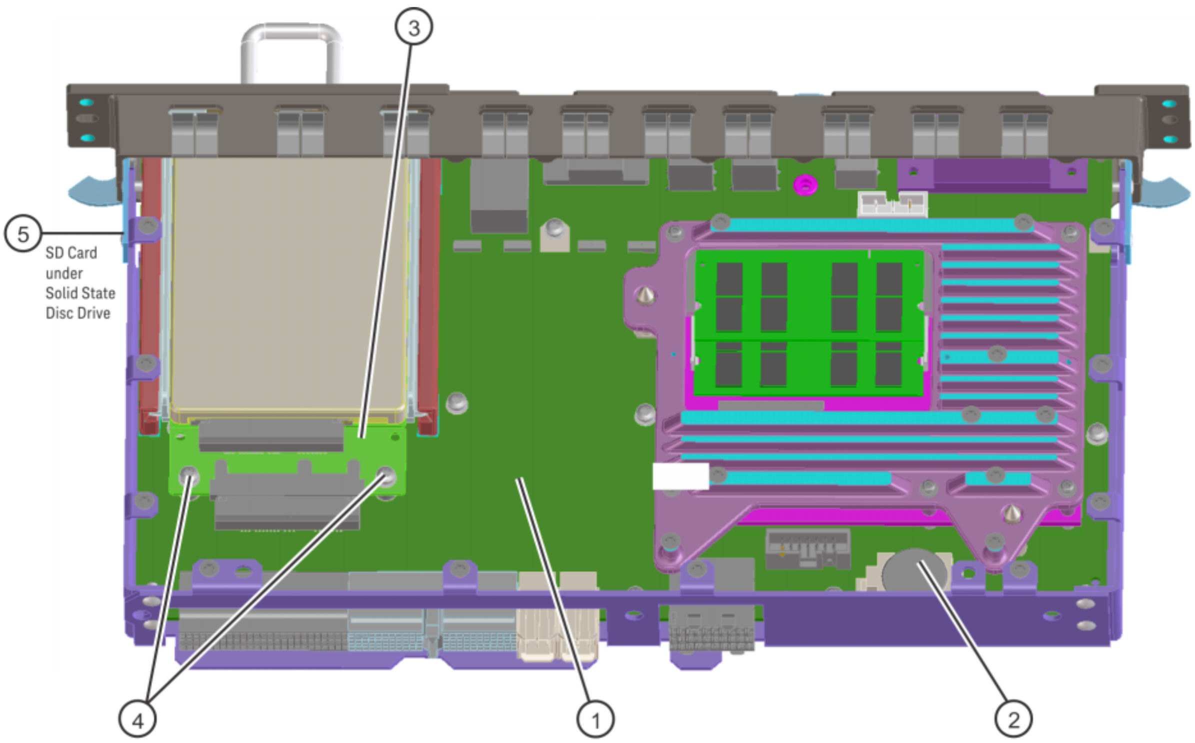


Table 14-15 CPU Assembly

Item	Description	Keysight Part Number
1	A4 CPU Assembly	N9020-60247
2	A4BT1 CPU Battery	1420-0356 (CR2032)
3	A4A1 Disk Drive Interconnect Board	W1312-63079
4	Screw M3 x 0.5 (8 mm long)	0515-0372
5	A4A2 SD Memory Card	1819-1250

Figure 14-21 Disk Drive Tray Assembly

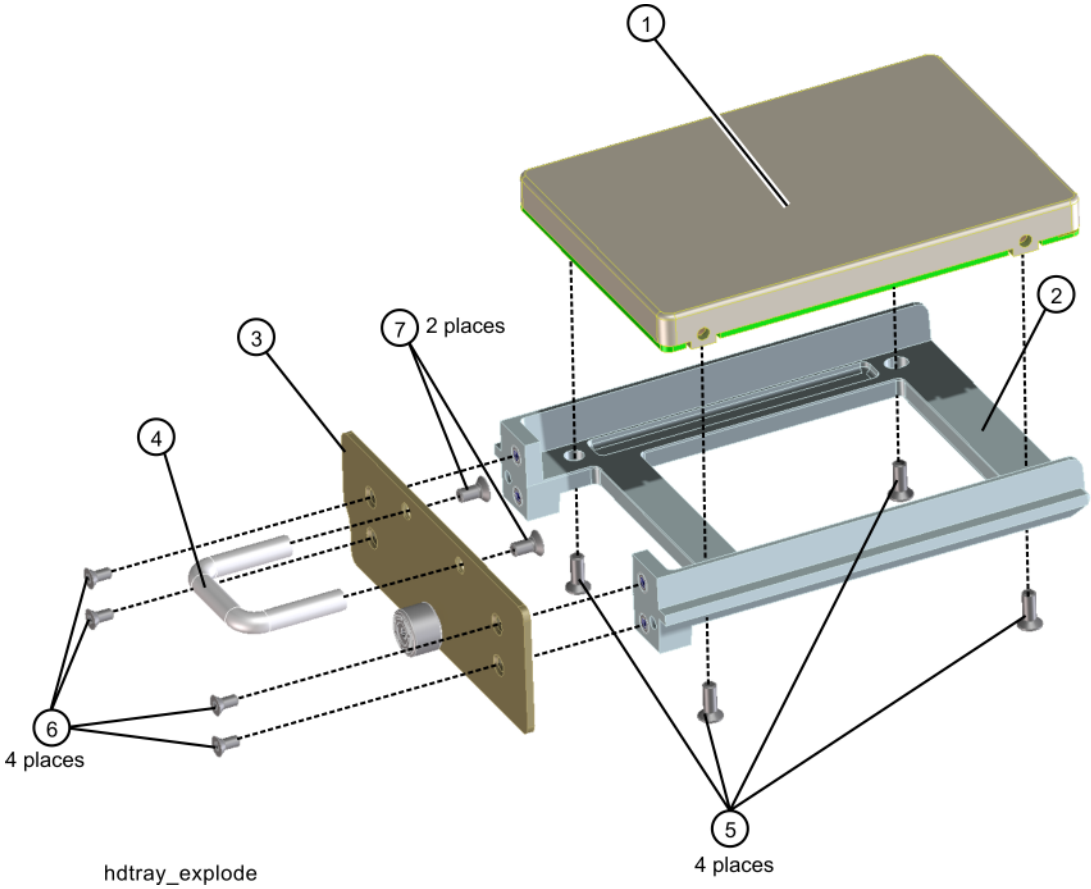


Table 14-16 Disk Drive Tray Assembly

Item	Description	Keysight Part Number
1	A5 Solid State Module	N9020-60352
2	A5MP1 Disk Drive Tray	W1312-40078
3	A5MP2 Disk Drive Rear Panel	W1312-00103
4	A5MP3 Disk Drive Assembly Handle	1440-0421
5	Screw M3 x 0.5 (8 mm long)	0515-1035
6	Screw M2.5 x 0.45 (5 mm long)	0515-2219
7	Screw M3 x 0.5 (6 mm long)	0515-1227

Figure 14-22 Rear Boards

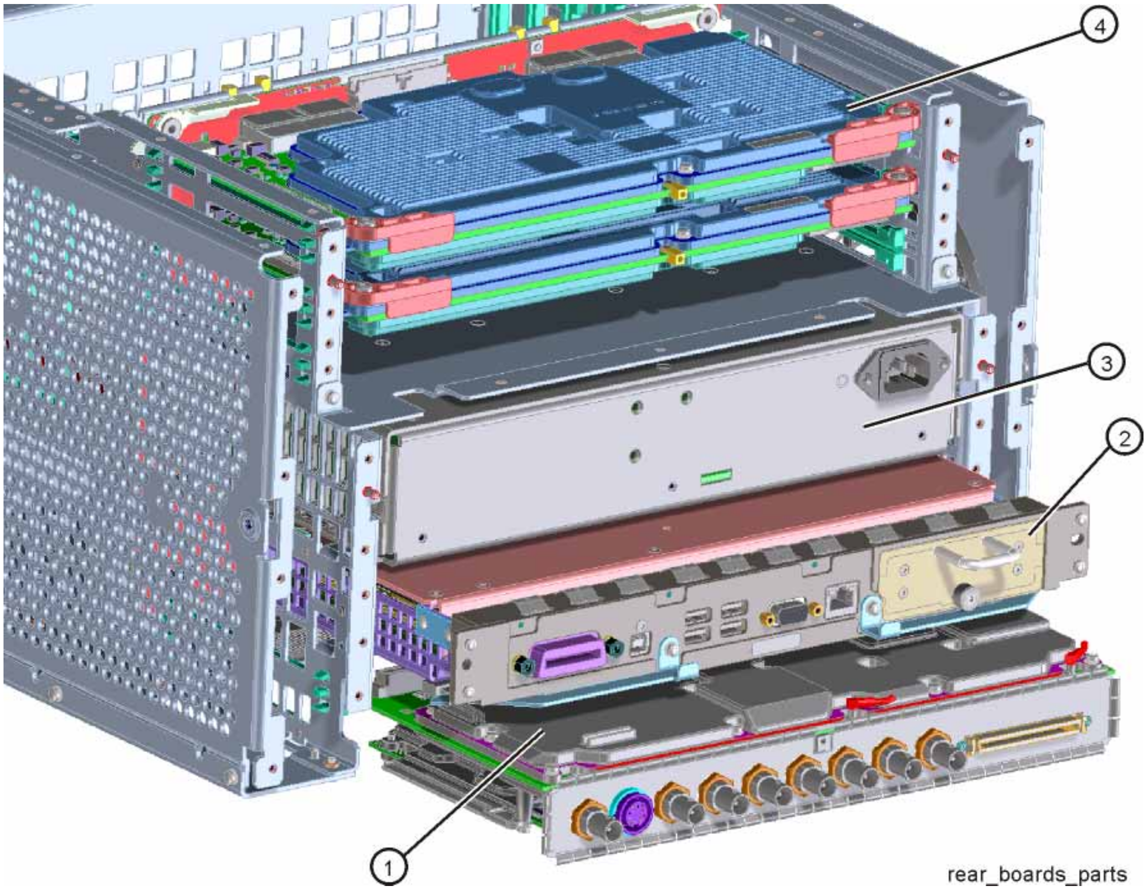


Table 14-17 Rear Boards

Item	Description	Keysight Part Number
1	A2 Narrowband Analog I.F. & A3 Narrowband Digital I.F. Assembly	N9020-60290 N9020-60016
2	A4 CPU Assembly	N9020-60247
3	A6 Power Supply	0950-5748
4	A22 & A23 Wideband Digital I.F. Assemblies (Options B2X and B5X)	N9020-60311

Figure 14-23 Wideband I.F. Ribbon Cables

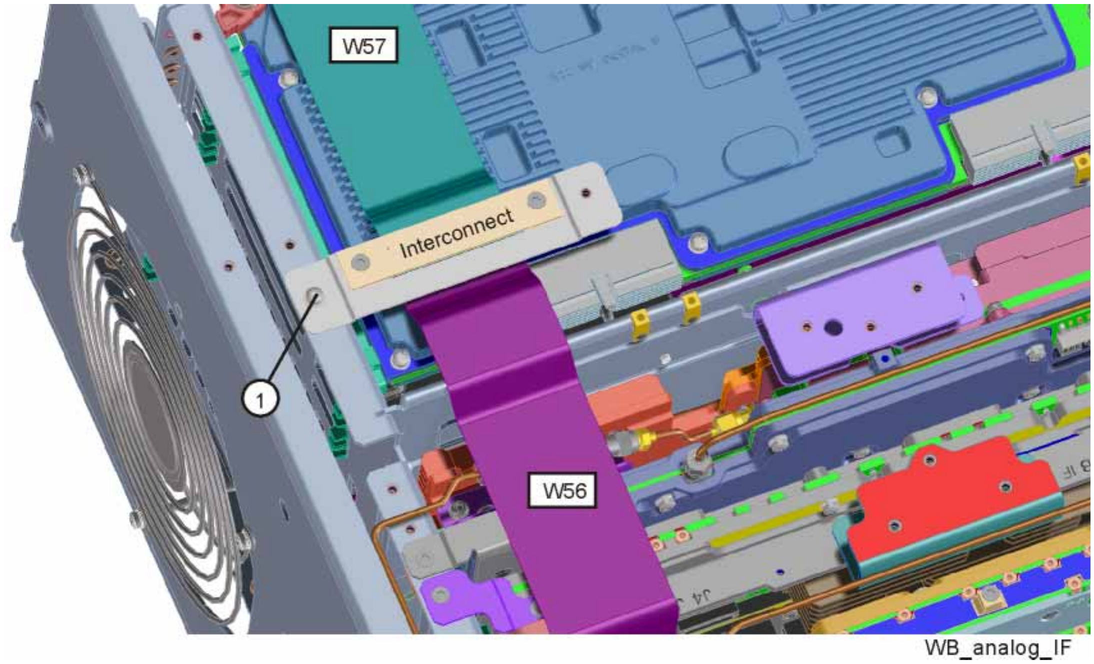


Figure 14-24 Wideband I.F. Cables

Table 14-18 Wideband I.F. Cables

Item	Description	Keysight Part Number
W34	Cable, Coax, A16J718, Reference Assembly to A21J4, Wideband Analog I.F. Assembly (Option B2X and B5X)	8121-0152
W40	Cable, Coax, A21J18, Wideband Analog I.F. Assembly to A3J15, Digital I.F. Assembly (Options B2X and B5X)	8121-1401
W41	Cable, Coax, A15J901, Front End Controller to A21J17, Wideband Analog I.F. Assembly (Options B2X and B5X)	8121-1401
W45	Cable, Coax, A3J17, Digital I.F. Assembly to A21J2, Wideband Analog I.F. Assembly (Options B2X and B5X)	8121-1919
W46	Cable, Coax, A21J1, Wideband Analog I.F. Assembly to A16J726, Reference Assembly (Options B2X and B5X)	8121-0152
W56	Cable, Ribbon, A21J23, Wideband Analog I.F. Assembly to Interconnect Bracket WBDIF (Options B2X and B5X)	N9040-60042
W57	Cable, Ribbon, WBDIF Interconnect Bracket to A22J778, Wideband Digital I.F. (Option B2X)	N9040-60045
	Cable, Ribbon, WBDIF A22J778 to WBDIF A21J778 to WBDIF Interconnect Bracket (Option B5X)	N9040-60041

Figure 14-25 Wideband Extension Board, Option RTS

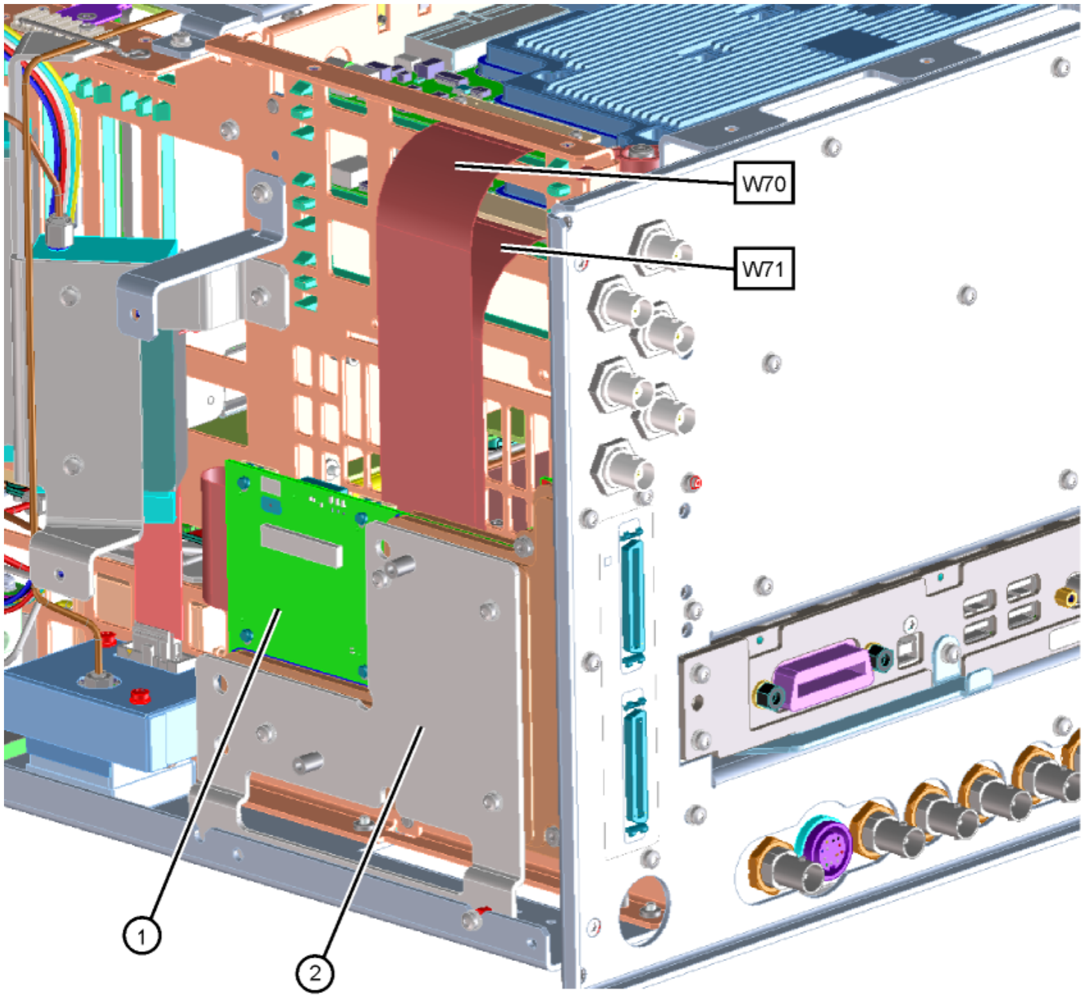


Table 14-19 Wideband Extension Board - Option RTS

Item	Description	Keysight Part Number
1	A28 Wideband Extension Board (Option RTS)	N9020-60272
2	Bracket, Wideband Extension Board (Option RTS)	N9040-00033
W70	Cable Assembly (flex circuit), A22 WBDIF J9000 to A28 WBDIF Extension Board J1 (Option RTS with Option B2X)	N9040-60047
W71	Cable Assembly (flex circuit), A23 WBDIF J9000 to A28 WBDIF Extension Board J21 (Option RTS with Option B5X)	N9040-60048

Figure 14-26 H1G Assembly

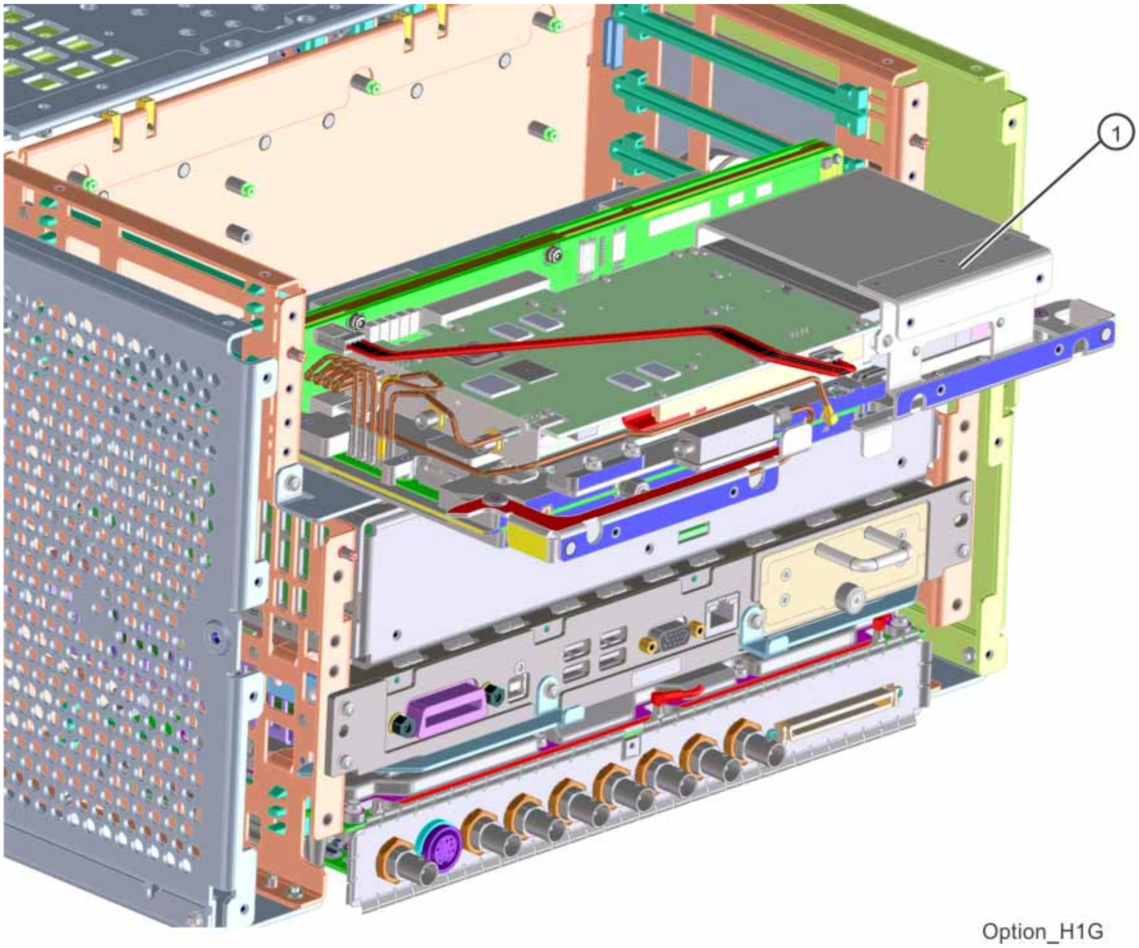


Table 14-20 H1G Assembly

Item	Description	Keysight Part Number
1	A27 H1G Assembly (Option H1G)	N9040-60102

Figure 14-27 Motherboards

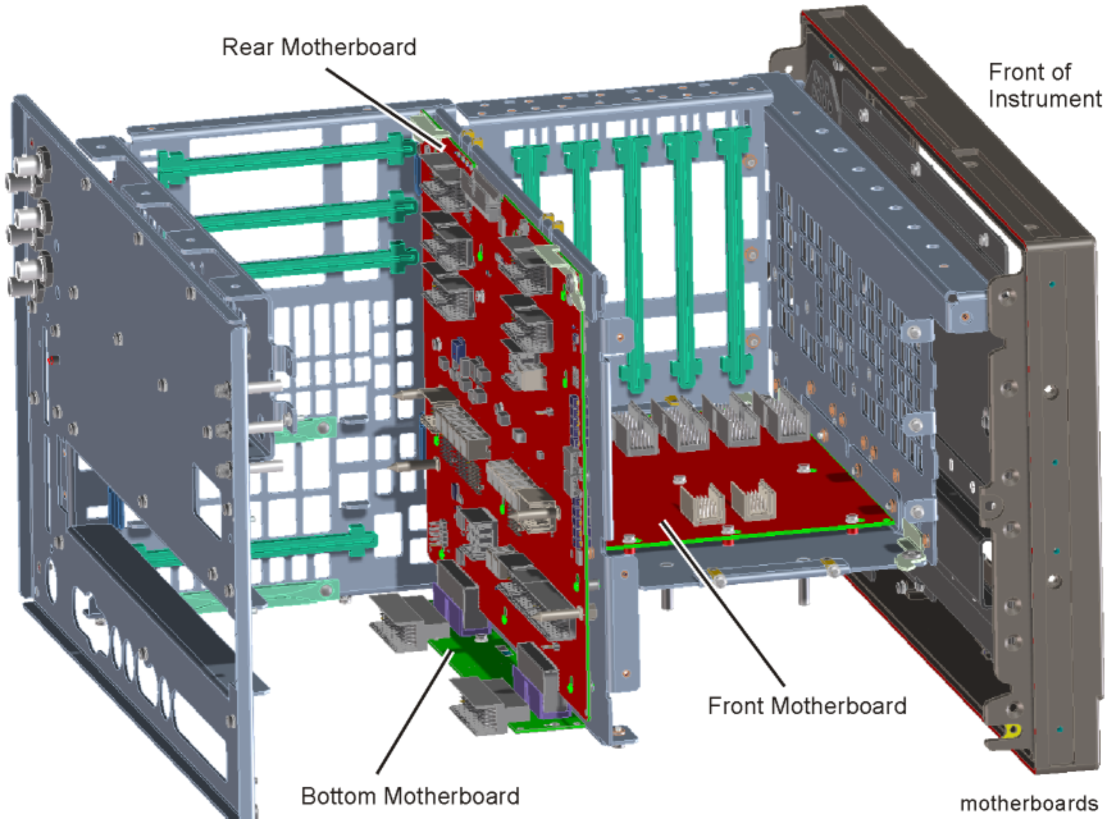


Table 14-21 Motherboards

Item	Description	Keysight Part Number
Rear Motherboard	A7 Rear Motherboard Assembly	N9040-63003
Front Motherboard	A8 Motherboard (Front/Horizontal mount)	N9040-63002
Bottom Motherboard	A24 Motherboard Interconnect Board (A7 & A8)	N9040-63004

Figure 14-28 Chassis

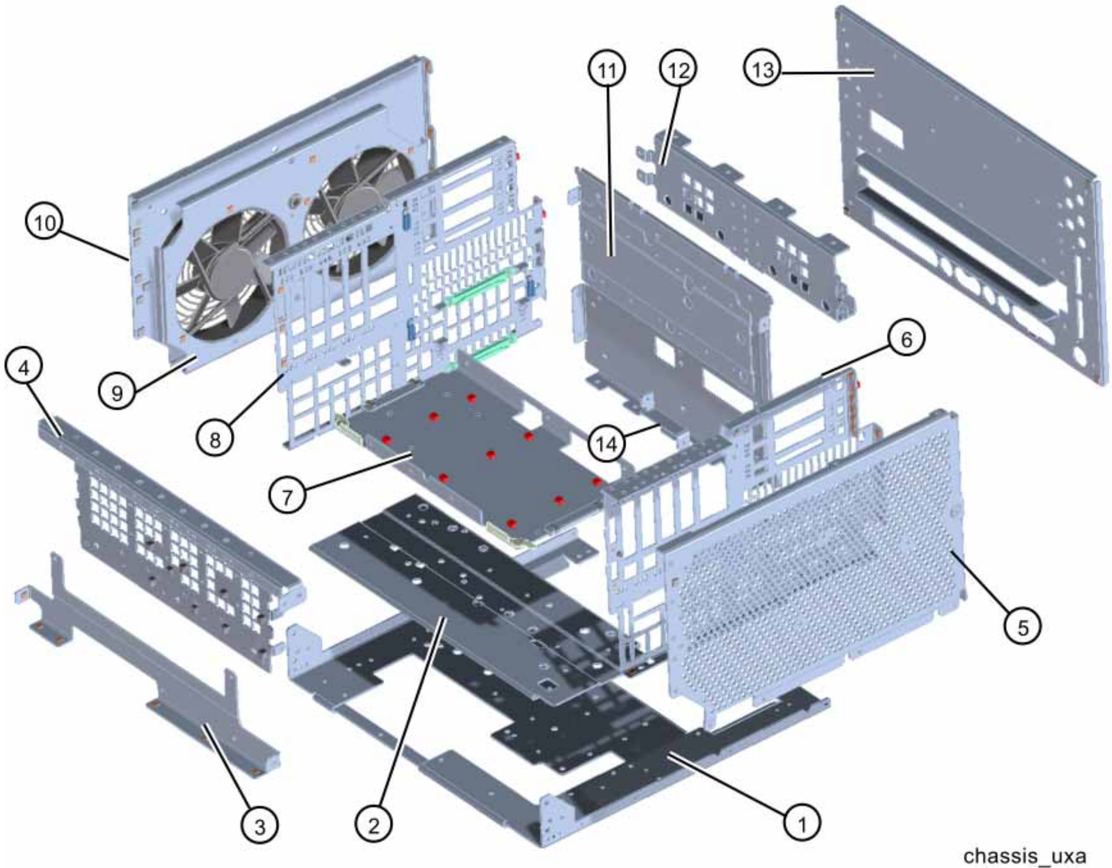


Table 14-22 Chassis

Item	Description	Keysight Part Number
1	Chassis Base	N9040-00001
2	Chassis Base Stiffener	N9040-00029
3	Bracket, Chassis Front (inner/bottom)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00008
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00036
4	Bracket, Chassis Front	N9040-00005
5	Bracket, RF Side (right side outer)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00013
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00047
6	Chassis Side, Right (inner)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00004
	s/n prefix ≥ 5605 and < 5616, Options 508, 513, 526 s/n prefix < 5616 Options 544 and 550	N9040-00038
	s/n prefix ≥ 5616 all frequency ranges	N9040-00060
7	Bracket, Motherboard (Front/Horizontal mount)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00024
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00051
8	Chassis Side, Left (inner)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00003
	s/n prefix ≥ 5605 and < 5616, Options 508, 513, 526 s/n prefix < 5616 Options 544 and 550	N9040-00037
	s/n prefix ≥ 5616 all frequency ranges	N9040-00059
9	Bracket, Fan (right side inner)	N9040-00007
10	Bracket, Fan (Left side/outer)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00006
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00053
11	Bracket, Rear Motherboard	
	s/n prefix < 5616	N9040-00002
	s/n prefix ≥ 5616	N9040-00058

Table 14-22 Chassis

Item	Description	Keysight Part Number
12	Bracket, Rear Brace	
	s/n prefix < 5616	N9040-00009
	s/n prefix ≥ 5616	N9040-00039
	s/n prefix ≥ 5616 Option H1G	N9040-00056
13	Rear Panel	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00014
	s/n prefix ≥ 5605 and < 5616, Options 508, 5113, 526 s/n prefix < 5616 Options 544 and 550	N9040-00050
	s/n prefix ≥ 5616 all frequency ranges	N9040-00057

Figure 14-29 Fan Hardware

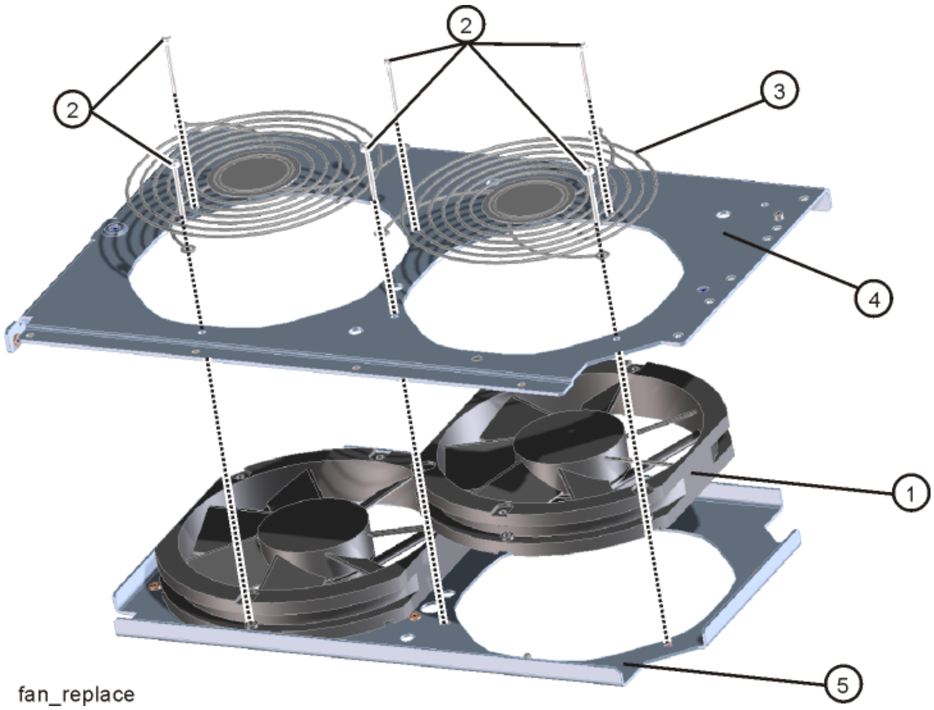


Table 14-23 Fan Hardware

Item	Description	Keysight Part Number
1	B1, B2 Fan	W1312-60063
2	Screw	0515-1038
3	Fan Grill (qty 2)	3160-4253
4	Bracket, Fan (Left side/outer)	
	s/n prefix < 5605 Options 508, 513, 526	N9040-00006
	s/n prefix ≥ 5605 and all Options 544 and 550	N9040-00053
5	Bracket, Fan (right side inner)	N9040-00007

Figure 14-30 Input Connector

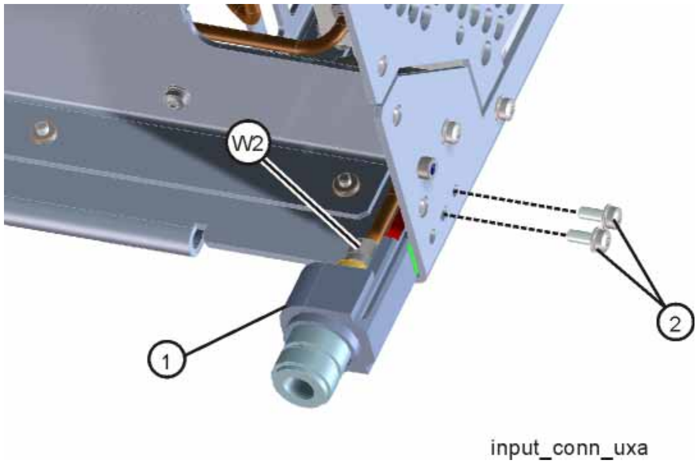


Table 14-24 Input Connector

Item	Description	Keysight Part Number
1	J1 Input Connector Assembly	
	Type-N	N9039-60030
	2.4 mm	N9030-60011
	3.5 mm (Option C35)	N9020-60196
2	Screw	0515-0372
W2	Cable, Semi-rigid, RF Input Connector to Attenuator A	
	Option CNF	N9040-20025
	Option C24	N9040-20114
	Option C35	N9040-20043

Figure 14-31 Front Frame Parts - Shield Removed

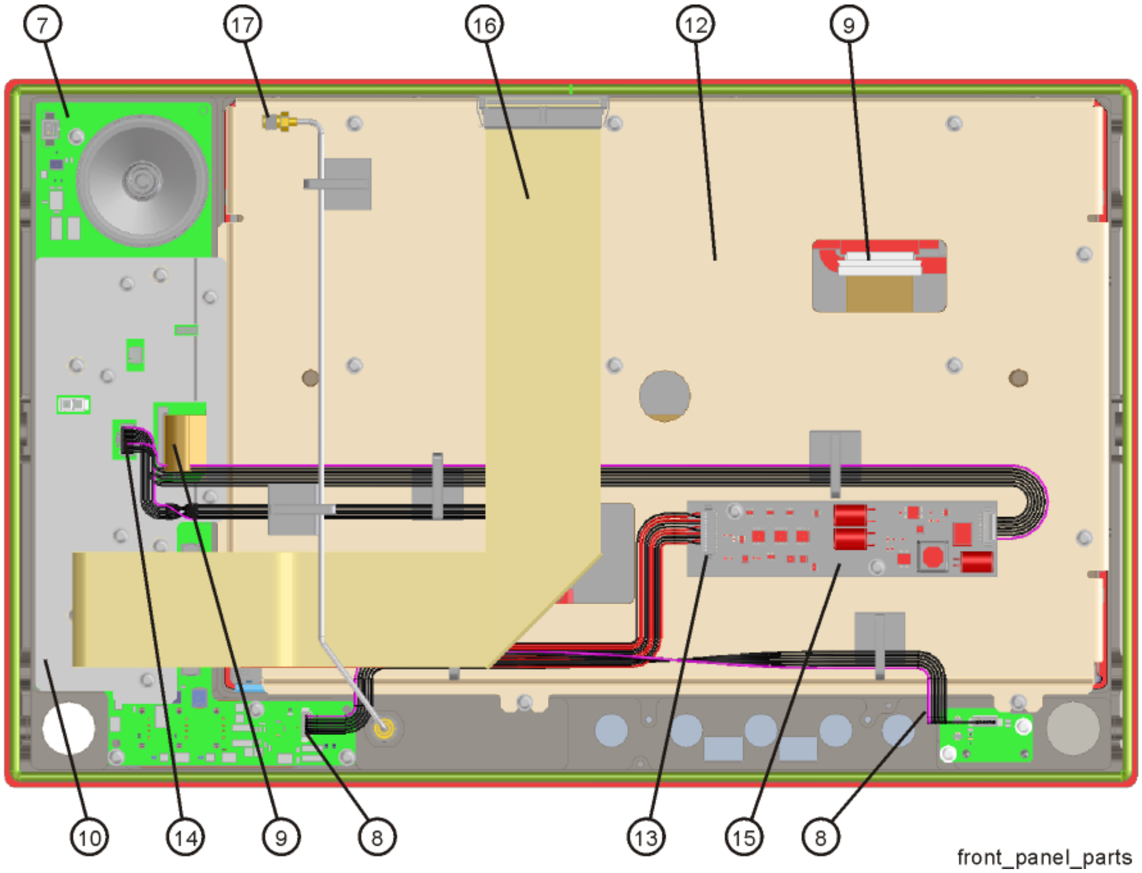


Table 14-25 Front Frame Parts

Item	Description	Keysight Part Number
7	A1A5 Controller Board	N9040-63012
8	A1W4 Cable	N9040-60026
9	A1W1 Cable	N9040-60024
10	A1MP14 Front Panel Interface Bracket	N9040-00052
12	A1MP21 Display Bracket	N9040-00018
13	A1W2 Cable	N9040-60027
14	A1W3 Cable	N9040-60029
15	A1A4 Converter DC-DC	0950-5670
16	W1 Cable	N9040-60030
17	W29 Semi-Rigid Cable	N9040-20044

Figure 14-32 Front Frame Exploded View

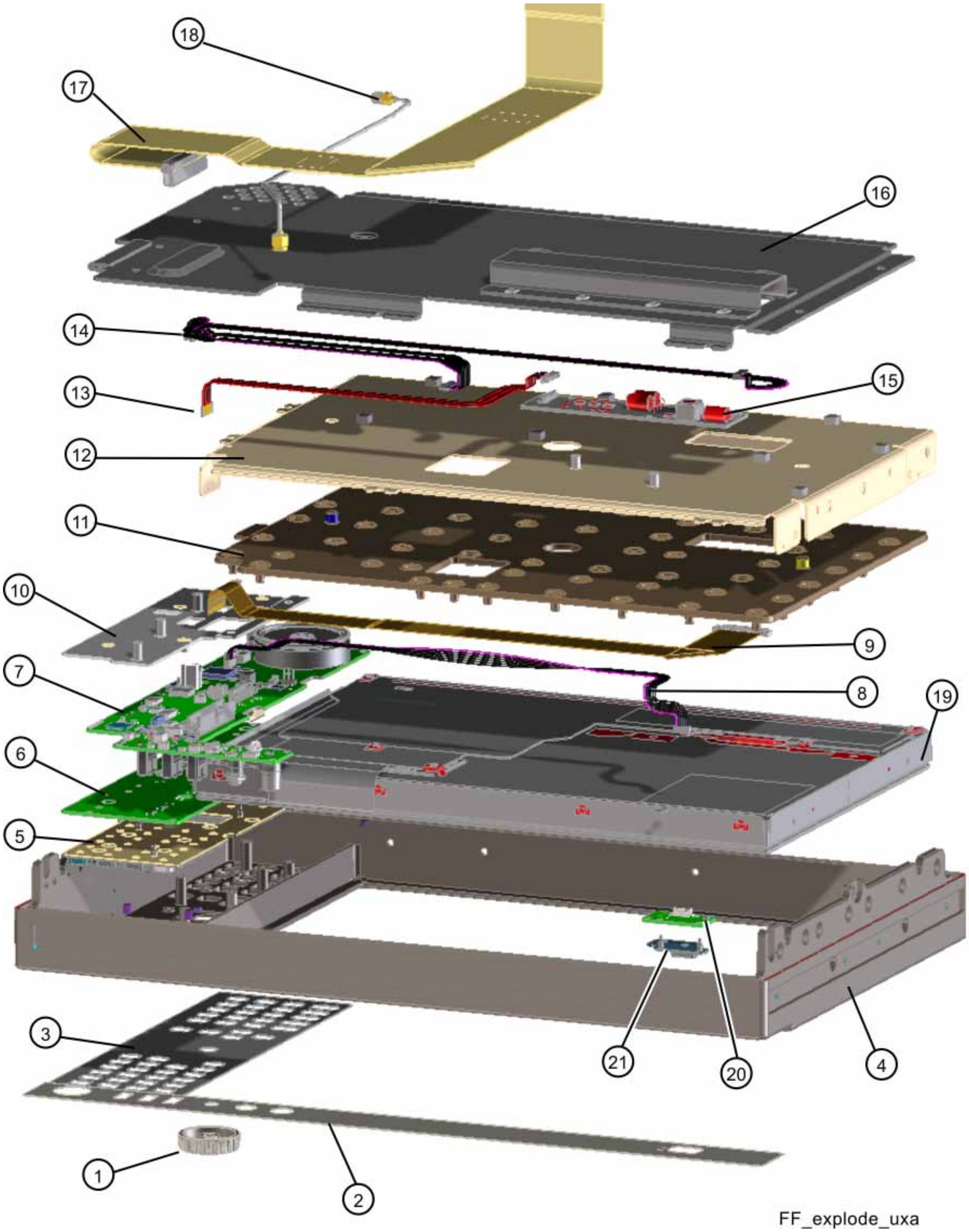


Table 14-26 Front Frame Parts

Item	Description	Keysight Part Number
1	A1MP9 RPG Knob	
	light color	W1312-40017
	dark color	W1312-40179
2	Connector Overlay (included in A1A1 Front Frame)	see Table 14-1
3	Main Keyboard Overlay (included in A1A1 Front Frame)	see Table 14-1
4	A1A1 Front Frame	see Table 14-1
5	A1MP1 Main Keypad	
	light color	N9040-40003
	dark color	N9040-40009
6	A1A2 Front Panel Keyboard	N9040-63006
7	A1A5 Front Panel Controller Board	N9040-63012
8	A1W4 Cable Assembly	N9040-60026
9	A1W1 Cable Assembly (Flex Circuit)	N9040-60024
10	A1MP14 Front Panel Controller Board Bracket	N9040-00052
11	A1MP22 Display Compression Pad	N9040-40001
12	A1MP21 Display Bracket	N9040-00018
13	A1W2 Cable Assembly	N9040-60027
14	A1W3 Cable Assembly	N9040-60029
15	A1A4 DC-DC Converter Board	0950-5670
16	A1MP25 Front Panel Interface Board Shield	N9040-00032
17	W1 Ribbon Cable	N9040-60030
18	W29 Semi-Rigid Cable	N9040-20044
19	A1A3 Touch Screen Display	2090-1098
20	A1A6 Front Panel On Button Keyboard	N9040-63016
21	A1MP2 Front Panel On Button Keypad	
	light color	N9040-40004
	dark color	N9040-40010

15 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 14, "Replaceable Parts." for part numbers, assembly descriptions, and ordering information.

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 31.

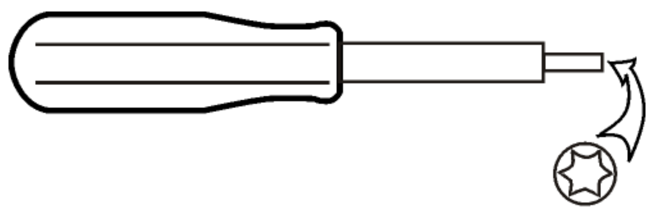
Safety

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 15-1 TORX Tool



sl736a

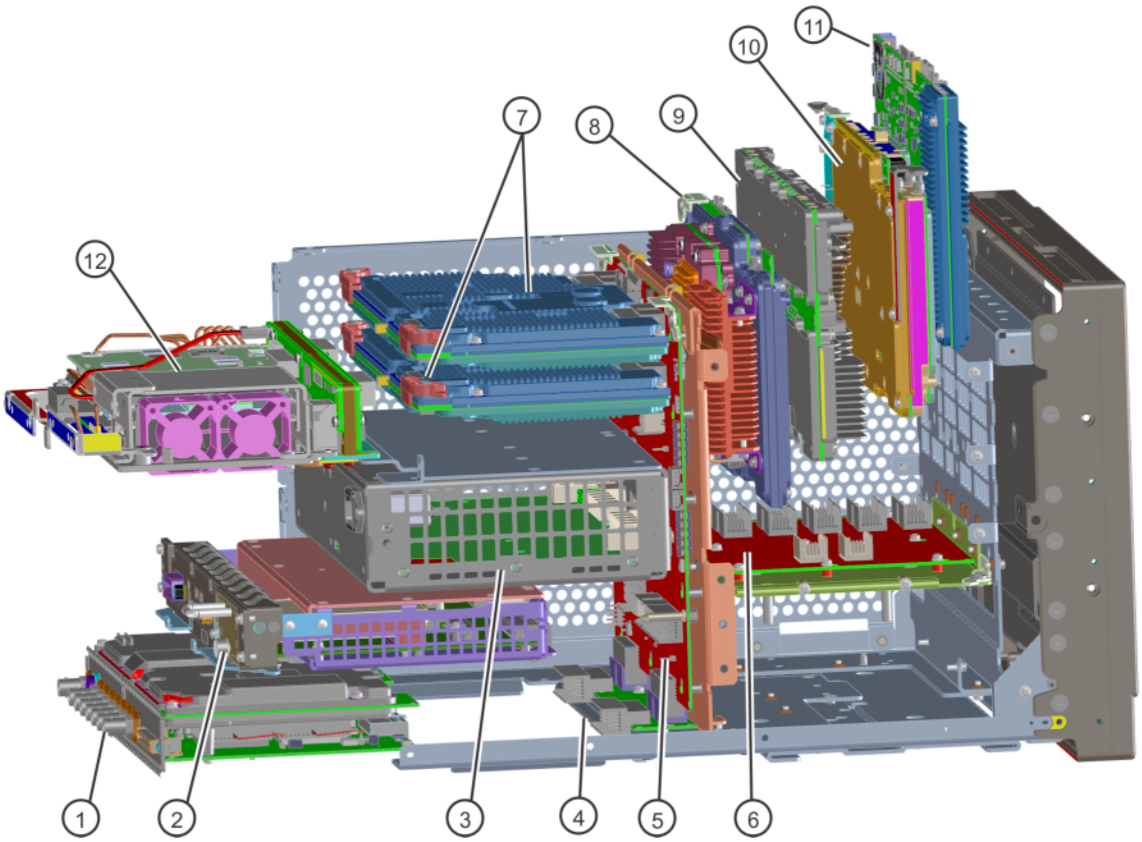
Description	Keysight Part Number
TORX Hand Driver - Size T-8	source locally
TORX Hand Driver - Size T-10	source locally
TORX Hand Driver - Size T-20	source locally
9/16 inch nut driver	source locally
1/4 inch nut driver	source locally
5/16 inch open-end wrench	source locally
1/4 inch open-end wrench	source locally
1/4 inch socket on 4 lb torque wrench	source locally
cable puller	5021-6773

Adjustments Tests after an instrument repair

Refer to Table 16-1 on page 505 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 15-2 Major Assemblies



Item	Description
1	A2 Narrowband Analog I.F. & A3 Narrowband Digital I.F. Assembly
2	A4 CPU Assembly
3	A6 Power Supply
4	A24 Motherboard Interconnect Board
5	A7 Rear Motherboard
6	A8 Front Motherboard
7	A22 Wideband Digital IF (Option B2X) & A23 Wideband Digital IF Assemblies (Option B5X)
8	A14 L.O. Synthesizer Assembly
9	A21 Wideband Analog I.F. Assembly (Options B2X and B5X)
10	A16 Reference Assembly
11	A15 Front End Controller
12	A27 H1G Assembly (Option H1G)

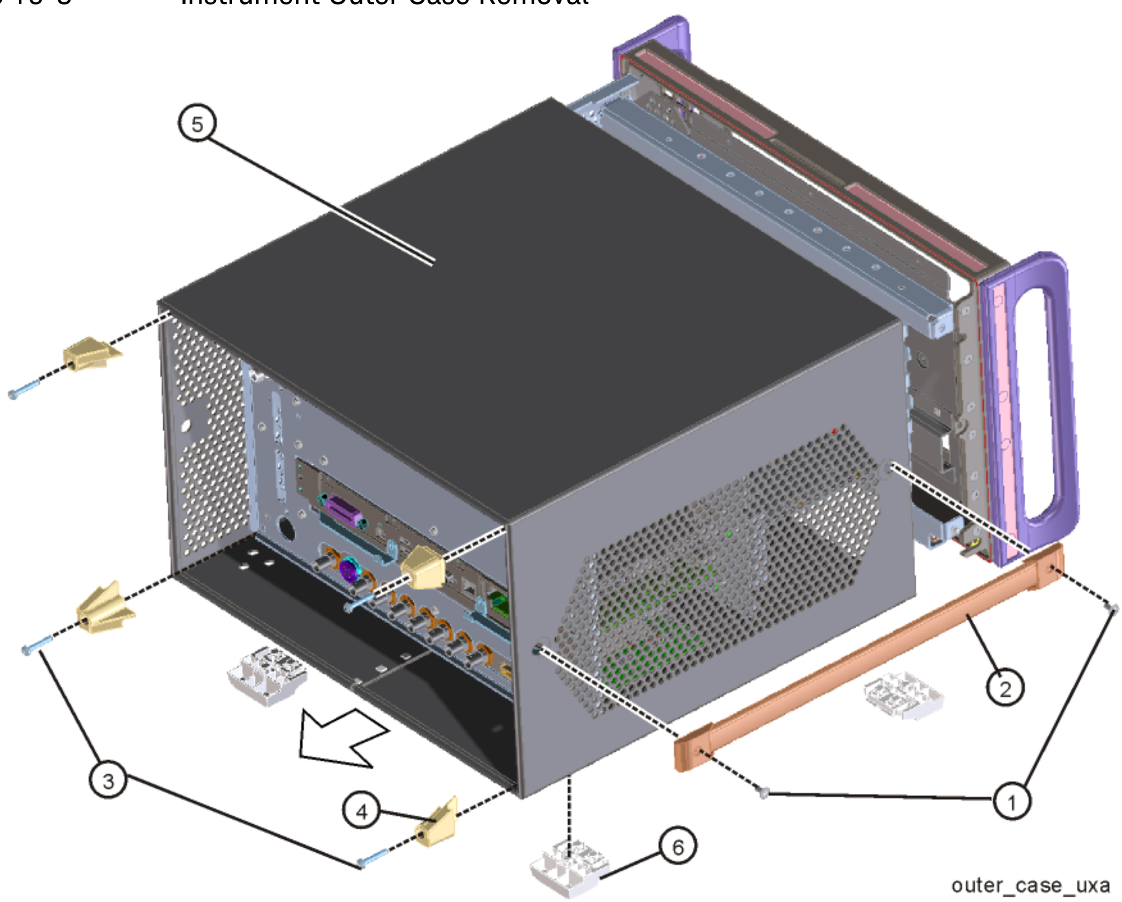
Instrument Outer Case

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.

Removal

1. Disconnect the instrument from ac power.
2. Refer to Figure 15-3. 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. Remove the bottom feet and locks **(6)**. Pull the locks out before lifting the tabs on the feet and sliding to disengage from the outer case.
4. Using the T-20 driver, remove the four screws (including washers) **(3)** that hold the rear feet **(4)** in place.
5. Pull the instrument cover **(5)** off towards the rear of the instrument.

Figure 15-3 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 (0515-1619 and 3050-0893 washers) to 21 inch-pounds.
4. Replace the bottom feet by sliding into place until they snap in. Install the locks by pressing in flat.
5. Replace the handle straps on both sides of the instrument. Torque the handle strap screws to 21 inch-pounds.

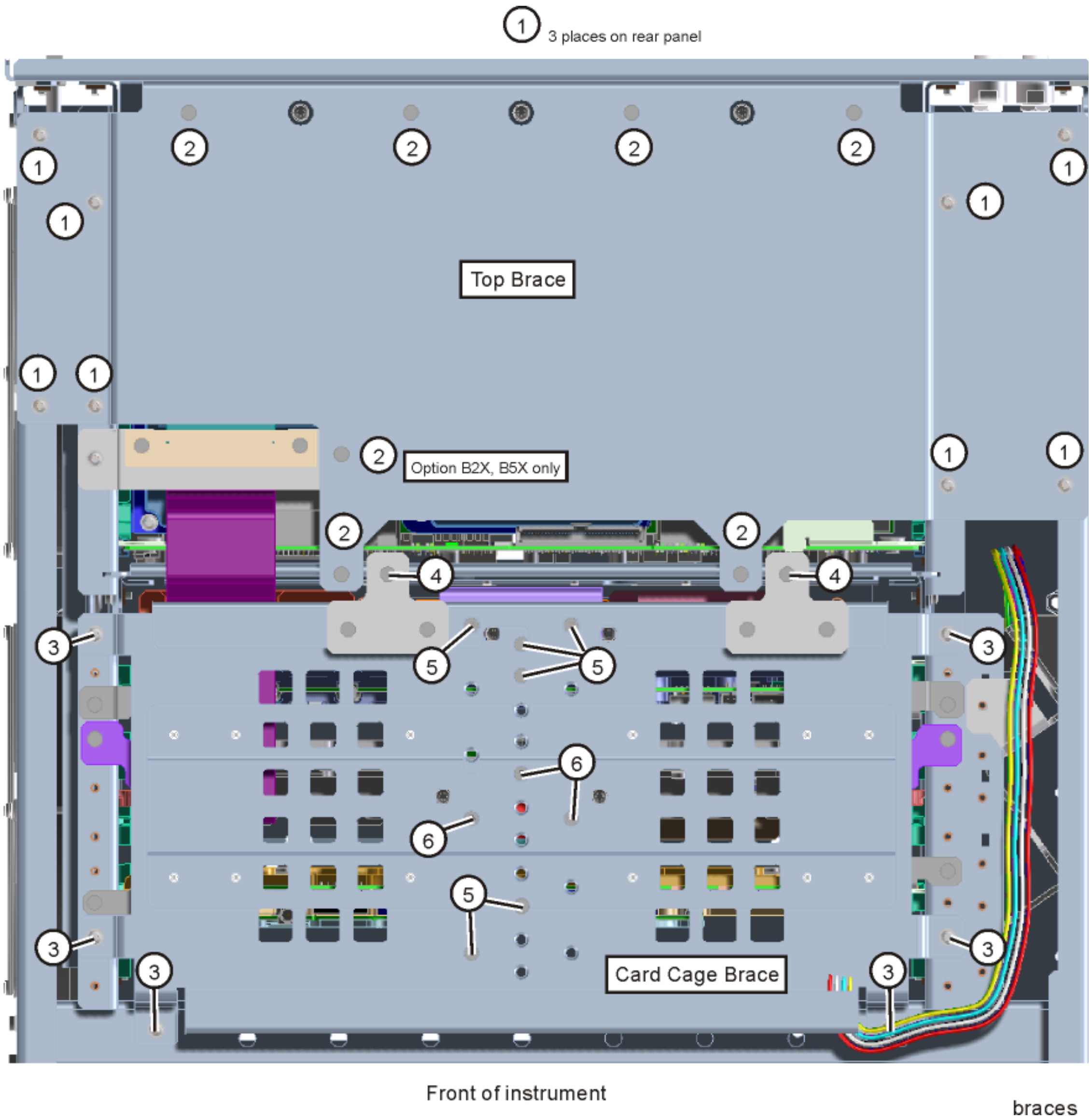
Top Brace and Card Cage Brace

Serial Number Prefix < 5605 Options 508, 513, 526

Removal

1. Disconnect the instrument from ac power.
2. Remove the instrument outer case. Refer to the “Instrument Outer Case” removal procedure.
3. Refer to Figure 15-4. To remove the Top Brace use the T-10 driver to remove the eleven screws **(1)** (0515-0372) and the seven screws **(2)** (0515-1946) attaching the top brace to the chassis.
4. To remove the Card Cage Brace use the T-10 driver to remove the six screws **(3)** (0515-0372), the two screws **(4)** (0515-1946), the six screws **(5)** (0515-1946), and the three screws **(6)** (0515-1946) (only on Option B2X and B5X) attaching the card cage brace to the chassis and the boards.

Figure 15-4 Top Brace and Card Cage Brace Removal - Serial Prefix < 5605 Options 508, 513, 526



Replacement

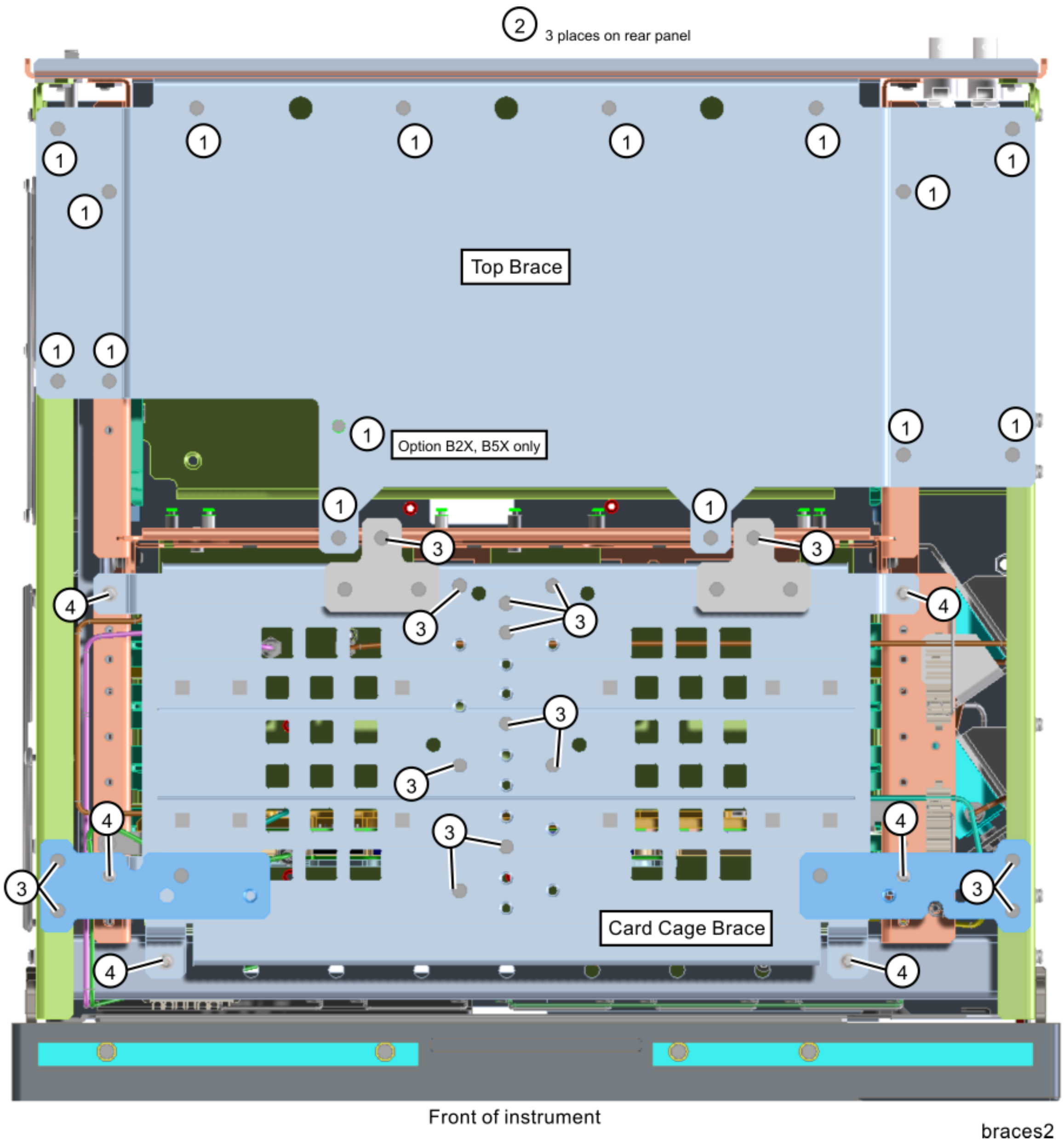
1. To replace the top brace or the card cage bracket, place them into the correct position and attach the screws referred to in the removal process. Torque to 9 inch-pounds.
2. Replace the instrument outer case. Refer to the "Instrument Outer Case" replacement procedure.

Serial Number Prefix ≥ 5605 and All Options 544 and 550

Removal

1. Disconnect the instrument from ac power.
2. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
3. Refer to Figure 15-5. To remove the Top Brace use the T-10 driver to remove the fifteen screws **(1)** (0515-1946) and the three screws on the rear panel **(2)** (0515-0372) attaching the top brace to the chassis.
4. To remove the Card Cage Brace use the T-10 driver to remove the screws **(3)** (0515-1946), and the six screws **(4)** (0515-0372) attaching the card cage brace to the chassis and the boards. The number of 0515-1946 screws will vary depending on the options installed (fifteen with Options B2X and B5X, twelve with Option B40 only).

Figure 15-5 Top Brace and Card Cage Brace Removal - Serial Prefix ≥ 5605 and All Options 544 and 550



Replacement

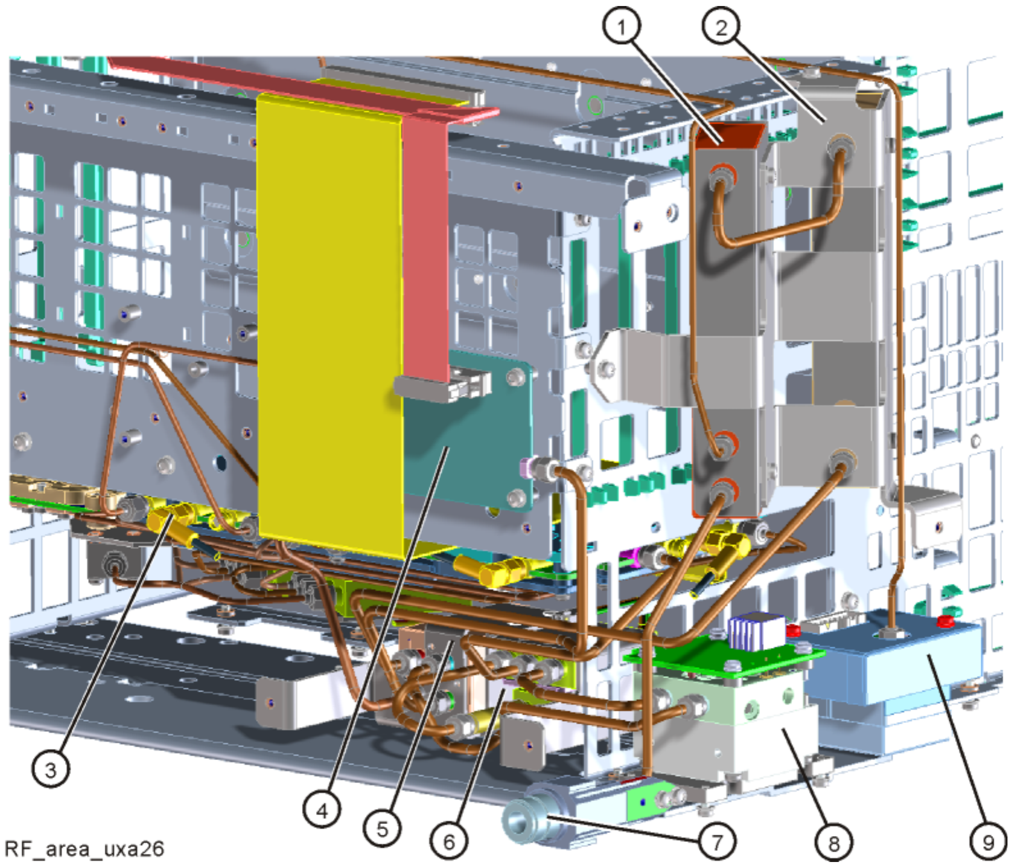
1. To replace the top brace or the card cage bracket, place them into the correct position and attach the screws referred to in the removal process. Torque to 9 inch-pounds.

2. Replace the instrument outer case. Refer to the “Instrument Outer Case” replacement procedure.

RF Area - Options 508, 513, 526

Refer to Figure 15-6. The RF area consists of A9 RF attenuator A **(1)**, A10 RF attenuator B **(2)**, A13 front end assembly **(3)**, A11 low band switch assembly **(4)**, transfer switch SW3 **(5)**, coax switches SW1 and SW2 **(6)**, RF input connector **(7)**, A12 YTF Preselector **(8)**, and A20 YTO **(9)**.

Figure 15-6 RF Area Components - Options 508, 513, 526



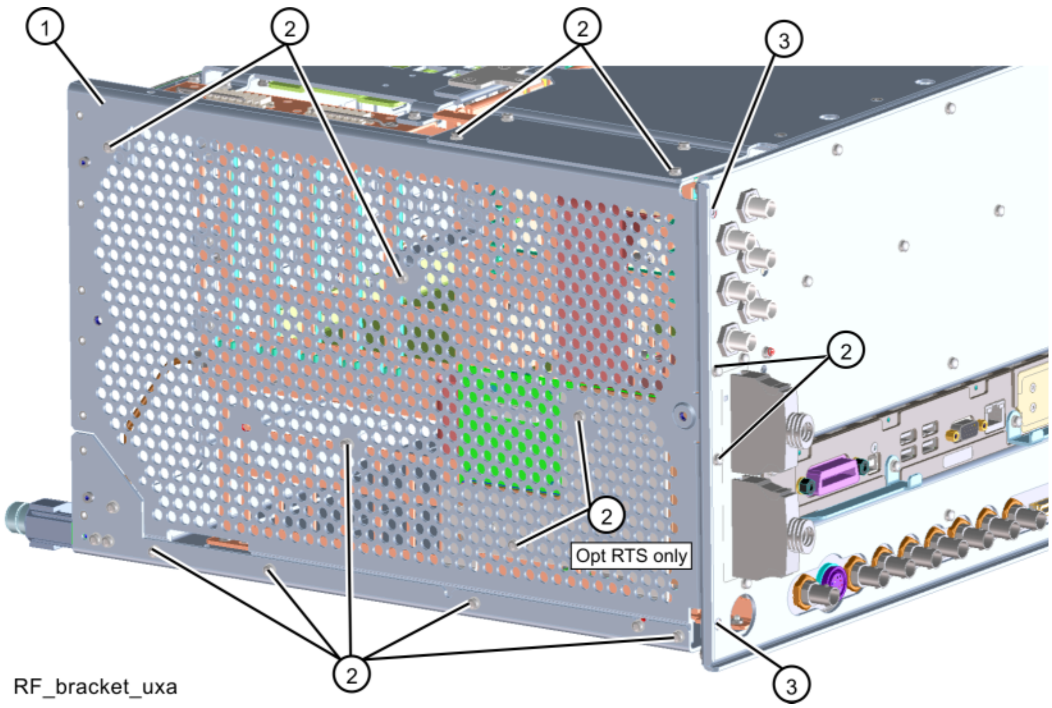
To gain access to any of the RF section parts for removal, follow these steps:

1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Remove the front panel. Refer to the Front Frame Assembly removal procedure.

3. For Serial Number Prefix < 5605:

– To access the attenuators, the YTF Preselector, or the YTO, it is necessary to also remove the RF bracket. Refer to Figure 15-7. Remove the RF bracket **(1)** by removing the eleven (or thirteen with Option RTS) screws **(2)** (0515-0372), and the two screws **(3)** (0515-1946), using the T-10 driver.

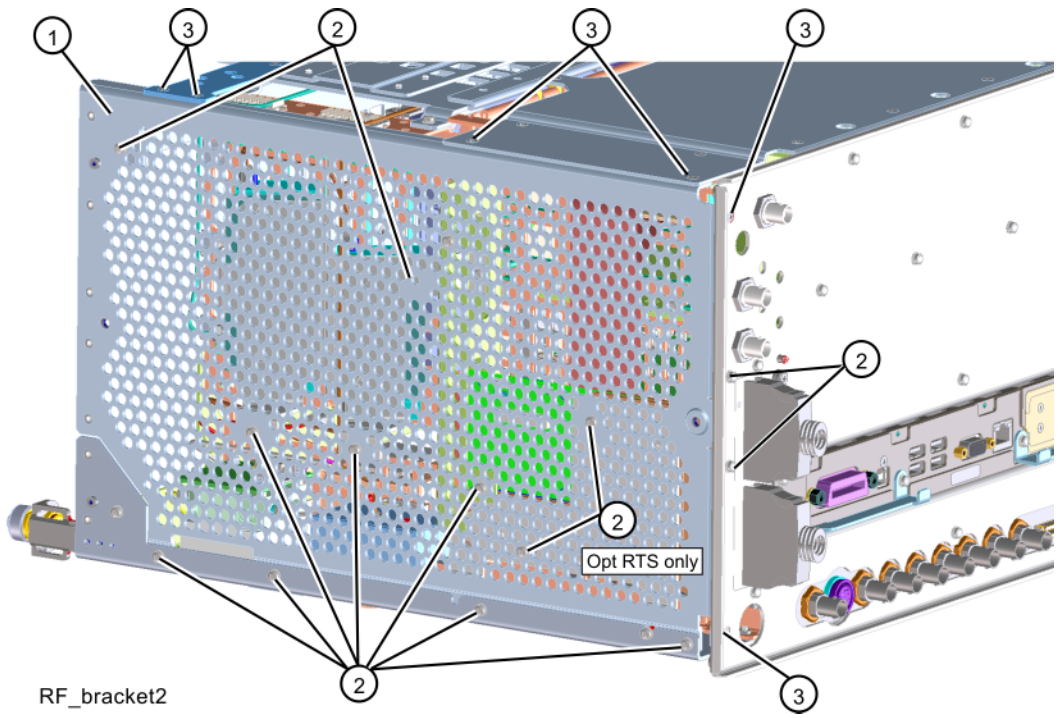
Figure 15-7 RF Bracket Removal, Serial Number Prefix < 5605 Options 508, 513, 526



4. **Serial Number Prefix ≥ 5605:**

   – To access the attenuators, the YTF Preselector, or the YTO, it is necessary to also remove the RF bracket. Refer to Figure 15-8. Remove the RF bracket **(1)** by removing the eleven (or thirteen with Option RTS) screws **(2)** (0515-0372), and the six screws **(3)** (0515-1946), using the T-10 driver.

Figure 15-8 RF Bracket Removal,
Serial Number ≥ Prefix 5605 Options 508, 513, 526



After the part has been replaced, follow these steps:

1. Refer to Figure 15-7 or Figure 15-8. Position the RF bracket onto the chassis and replace the screws **(2)** (0515-0372), and the screws **(3)** (0515-1946), using the T-10 driver. Torque to 9 inch-pounds.
2. Replace the front panel. Refer to the Front Frame Assembly replacement procedure.
3. Replace the instrument outer case. Refer to the “Instrument Outer Case” replacement procedure.

A9 & A10 RF Attenuators

Removal

1. Refer to Figure 15-9 or Figure 15-10, depending on the serial number prefix of your instrument. To remove A9 RF attenuator A **(1)** or A10 RF attenuator B **(2)**, remove the semi-rigid cables W2, W3, W4, and W51 using the 5/16 inch wrench.
2. Remove the ribbon cables attached to each attenuator.
3. Remove the two or three screws **(3)** (0515-0372), depending on the bracket in your instrument, that attach the attenuator bracket to the chassis using the T-10 driver.
4. Remove the attenuator from the bracket by removing the two screws **(4)** (0515-0372).

Figure 15-9 Attenuators Removal - Serial Number < 5605 Options 508, 513, 526

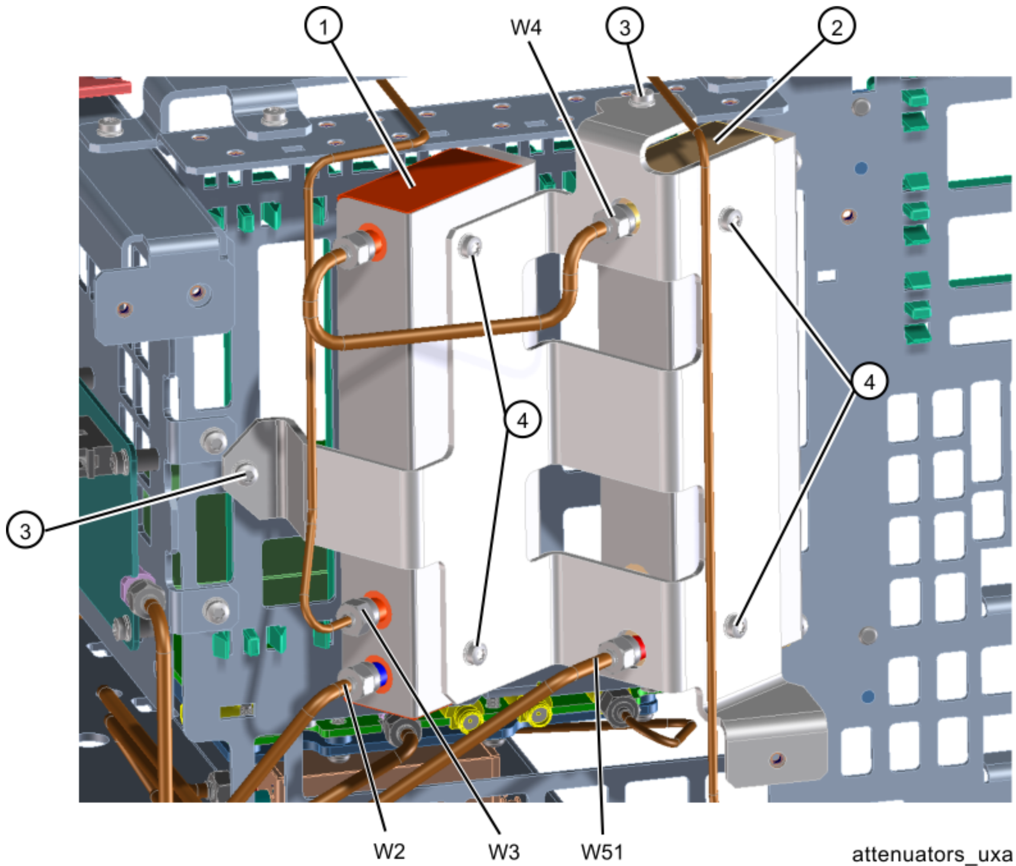
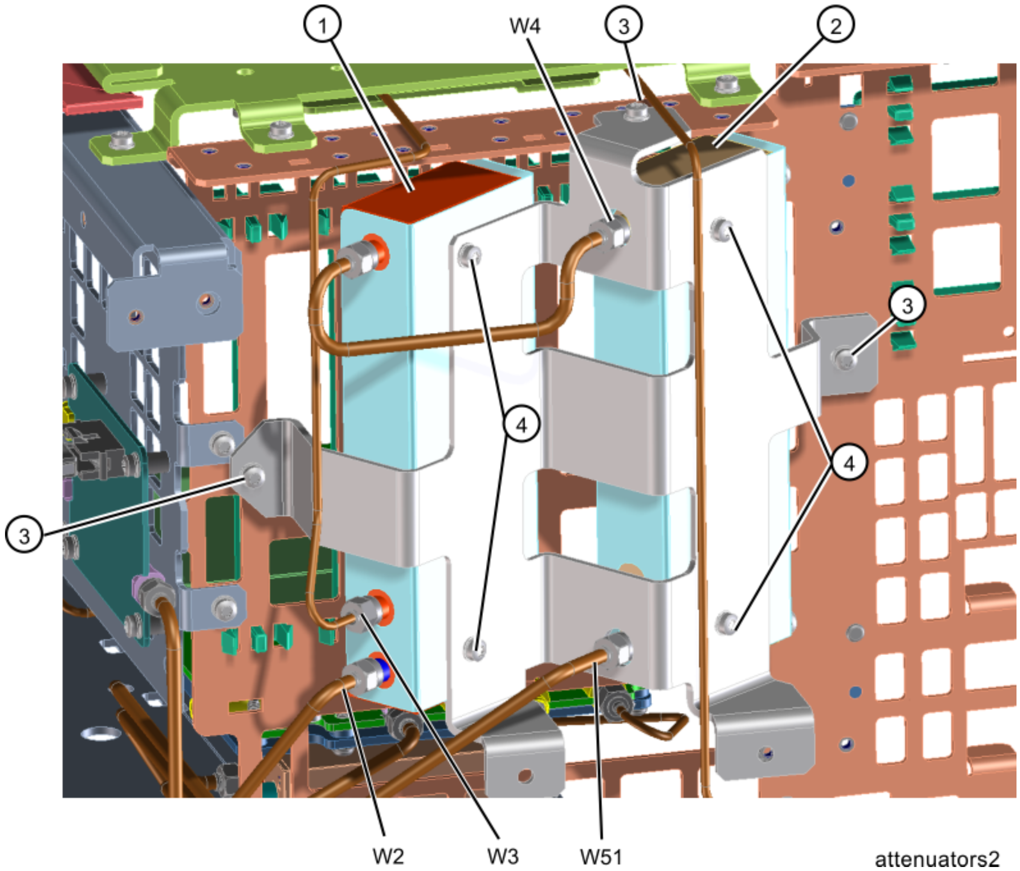


Figure 15-10 Attenuators Removal - Serial Number ≥ Options 508, 513, 526



Item	Keysight Part Number
W2	N9040-20025
W3	N9040-20027
W4	N9040-20026
W51	N9040-20028

Replacement

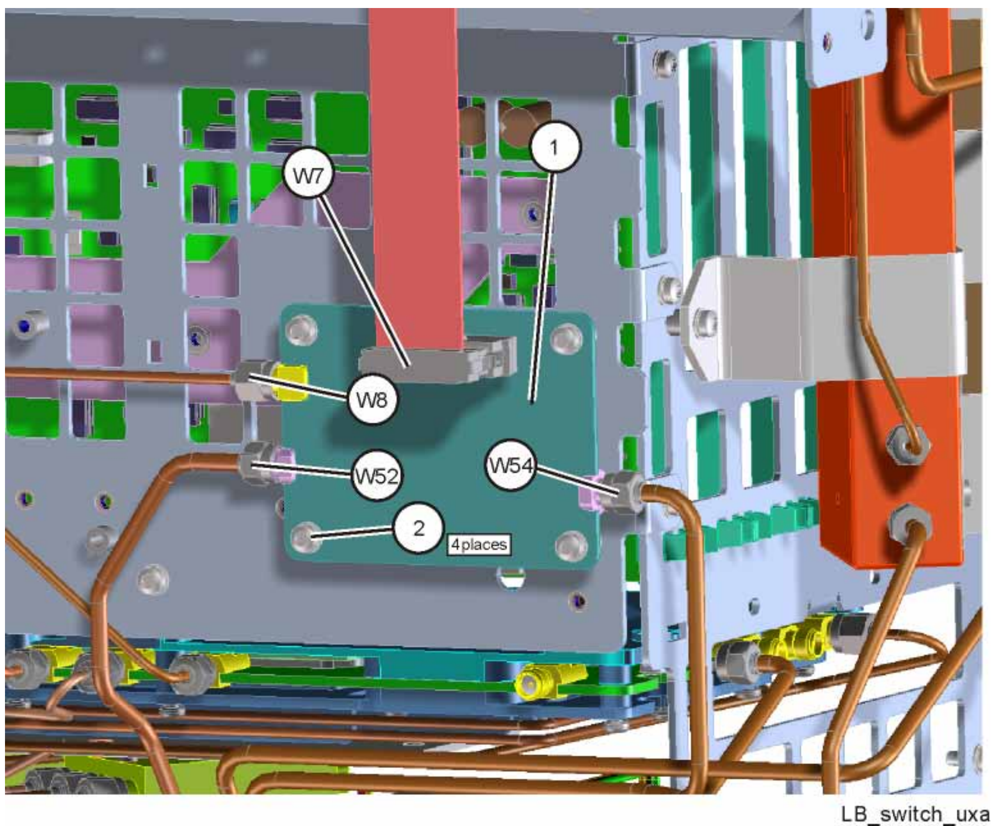
1. Refer to Figure 15-9 or Figure 15-10. Position the attenuator in the bracket so that the ribbon connector end is “down”.
2. Replace the two screws (0515-0372) that attach the attenuator to the bracket. Torque to 9 inch-pounds.
3. Position the attenuators and bracket into the chassis and attach with the screws **(3)** (0515-0372). Torque to 9 inch-pounds.
4. Replace the ribbon cable and semi-rigid cables W2, W3, W4, and W51 to the attenuators. Torque the semi-rigid cables to 10 inch-pounds.
5. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

A11 Low Band Switch

Removal

1. Refer to Figure 15-11. Remove the ribbon cable W7.
2. Remove the semi-rigid cables W8, W52, and W54 using the 5/16 inch wrench.
3. Remove the four screws **(2)** (0515-0372) using the T-10 driver. The A11 low band switch **(1)** can now be removed from the chassis.

Figure 15-11 Low Band Switch Cable Removal - Options 508, 513, 526



Item	Keysight Part Number
W8	N9040-20032
W52	N9040-20031
W54	N9040-20030

Replacement

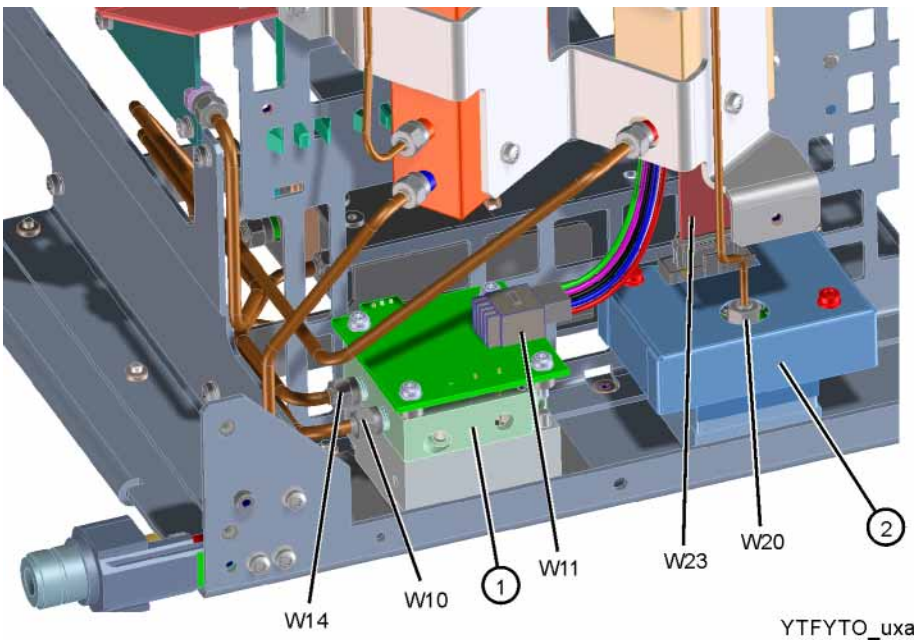
1. Refer to Figure 15-11. Place the switch into place into the chassis and replace the four screws (0515-0372). Torque to 9 inch-pounds.
2. Replace the semi-rigid cables W8, W52, and W54. Torque to 10 inch-pounds.
3. Replace the ribbon cable W7. Ensure locking tabs on the sides of the connector are engaged.
4. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

A12 YTF Preselector

Removal

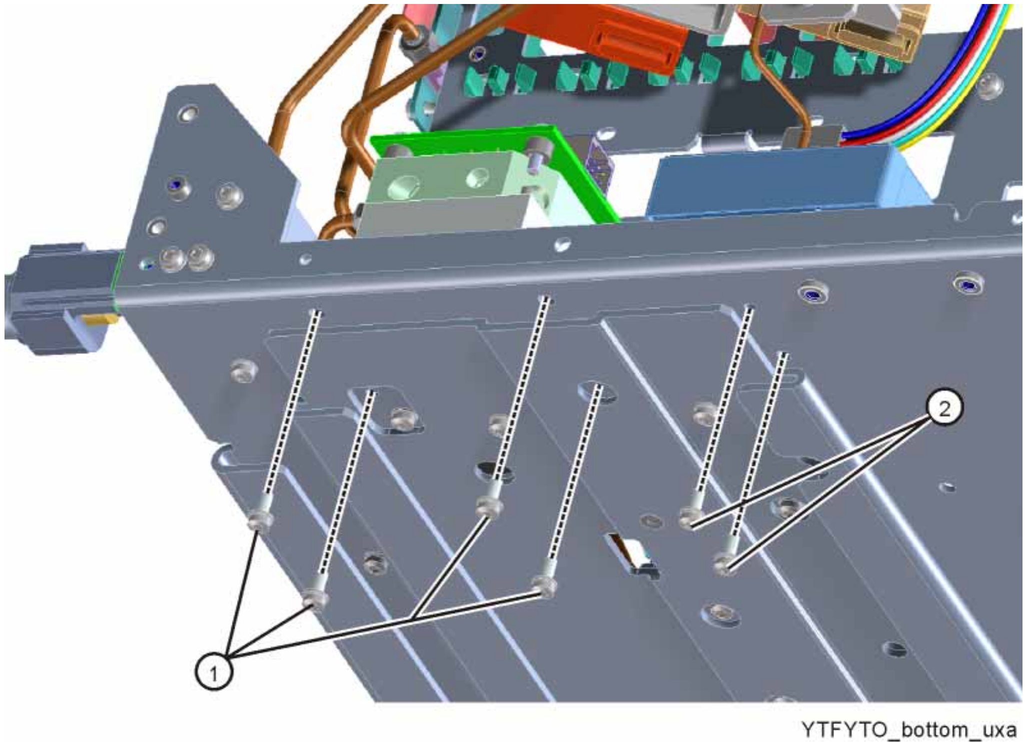
1. Refer to Figure 15-12. Remove cables W10 and W14 from the YTF Preselector **(1)**.
2. Remove the wire harness W11.
3. Refer to Figure 15-13. From the bottom of the instrument, remove the four screws **(1)** (0515-0372). The A12 YTF Preselector can now be removed from the chassis.

Figure 15-12 YTF Preselector Removal - Options 508, 513, 526



Item	Keysight Part Number
W10	N9040-20033
W14	N9040-20034

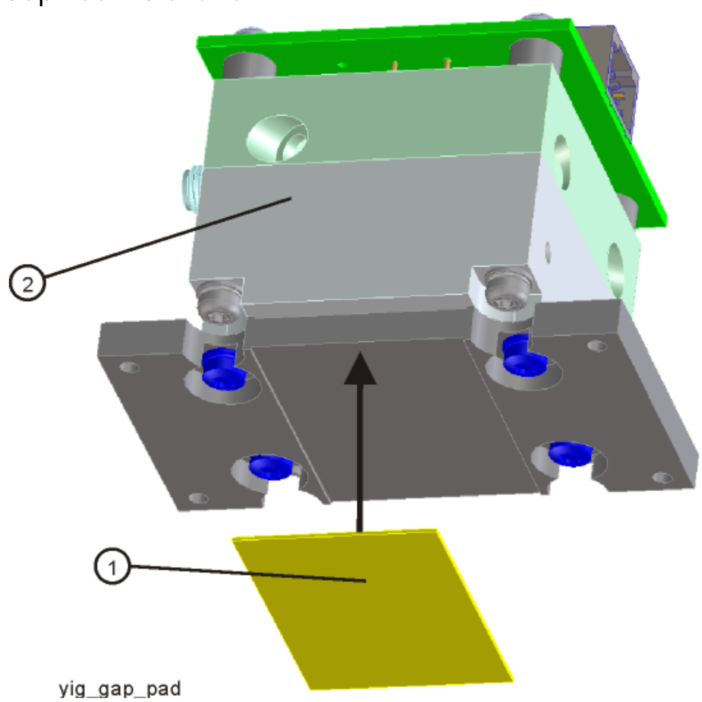
Figure 15-13 YTF Preselector and YTO Bottom Screws



Replacement

1. Inspect the chassis where the YTF Preselector mounts and remove the gap pad if present (see Figure 15-14, item **(1)**. The gap pad may remain attached to the faulty YTF Preselector.
2. Refer to Figure 15-14. Install the replacement gap pad **(1)** (5022-7179) into the recess in the base of the replacement YTF Preselector **(2)** Peel back one corner of the clear plastic backing on the pink side of the gap pad. Remove the blue backing from the other side of the gap pad. Install the gap pad as shown with the pink side exposed. Carefully peel off the clear plastic backing and smooth the gap pad into the recess.

Figure 15-14 Gap Pad Installation



3. Refer to Figure 15-13. Place the YTF Preselector into the chassis with the ports toward the front of the instrument. Replace the four screws **(1)** (0515-0372). Torque to 9 inch-pounds.
4. Figure 15-12. Replace the cables W10 and W14. Torque to 10 inch-pounds.
5. Replace the wire harness W11.
6. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

A20 YTO

Removal

1. Refer to Figure 15-12. Remove cable W20 from the YTO **(2)**.
2. Remove the ribbon cable W23 by pulling forward on the locking latch.
3. Refer to Figure 15-13. From the bottom of the instrument, remove the two screws **(2)** (0515-0372). The A20 YTO can now be removed from the chassis.

Item	Keysight Part Number
W20	N9040-20037

Replacement

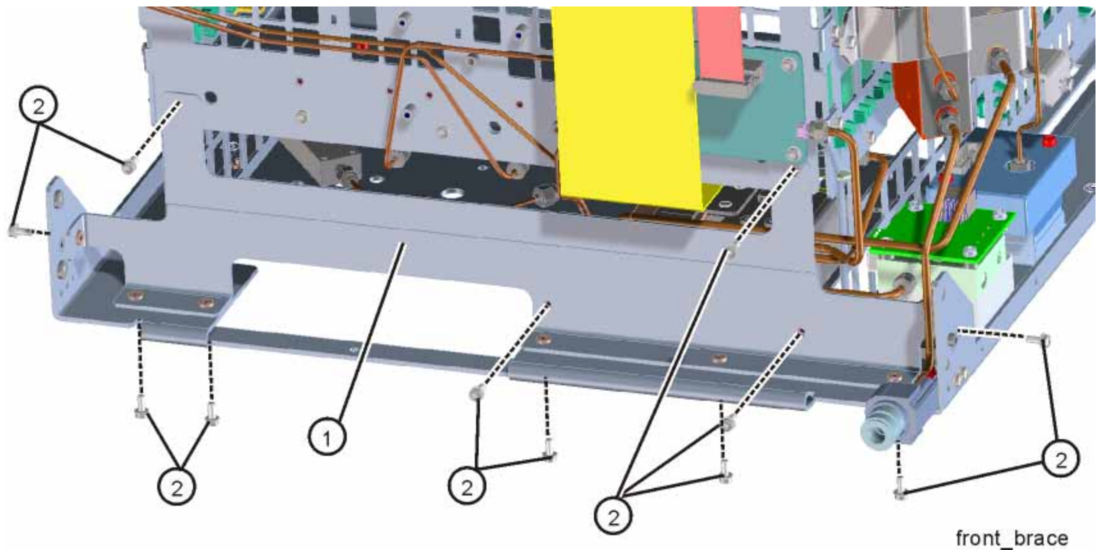
1. Refer to Figure 15-13. Place the YTO into the chassis. Replace the two screws **(2)** (0515-0372). Torque to 9 inch-pounds.
2. Figure 15-12. Replace the cable W20. Torque to 10 inch-pounds.
3. Replace the ribbon cable W23. Ensure the locking latch is engaged.
4. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

Low Noise Path and Microwave Preselector Bypass Switches

Removal

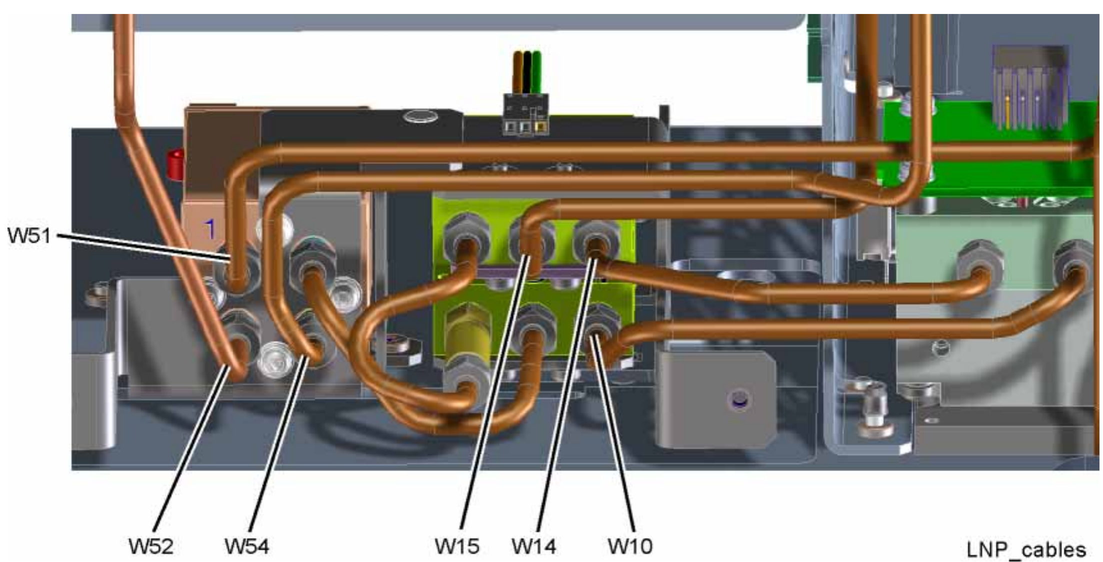
1. Refer to Figure 15-15. Remove the front brace **(1)** by removing the eleven screws **(2)** (0515-0372).

Figure 15-15 Front Brace Removal



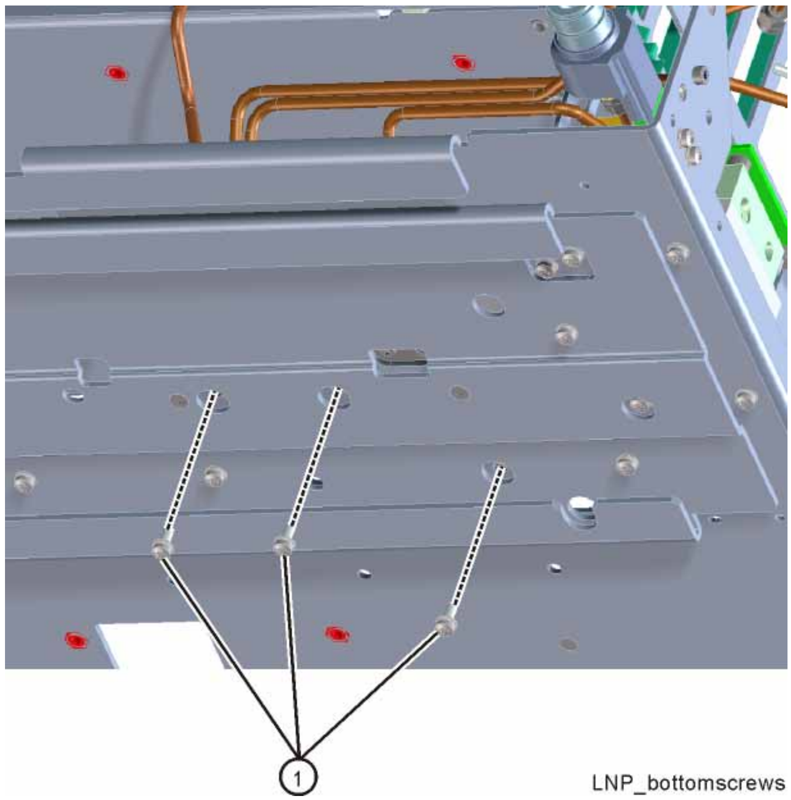
2. Refer to Figure 15-16. Remove cables W10, W14, W15, W51, W52, and W54.

Figure 15-16 W10, W14, W15, W51, W52, and W54 Cables Removal - Options 508, 513, 526



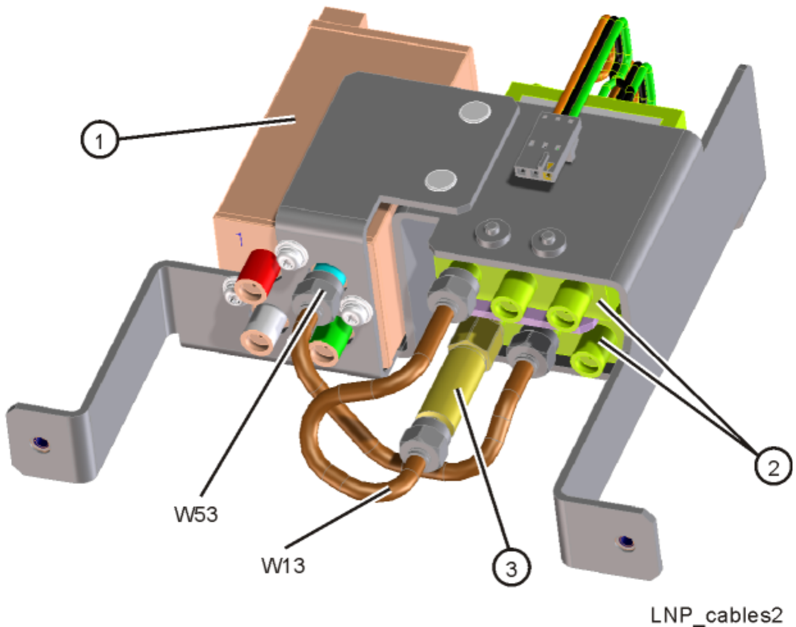
3. Refer to Figure 15-17. Remove the three screws **(1)** (0515-0372) that attach the switch bracket to the chassis. Unplug the ribbon cable and the wire harnesses from each switch. The switches and bracket can now be removed from the chassis.

Figure 15-17 Switch Bracket Bottom Screws



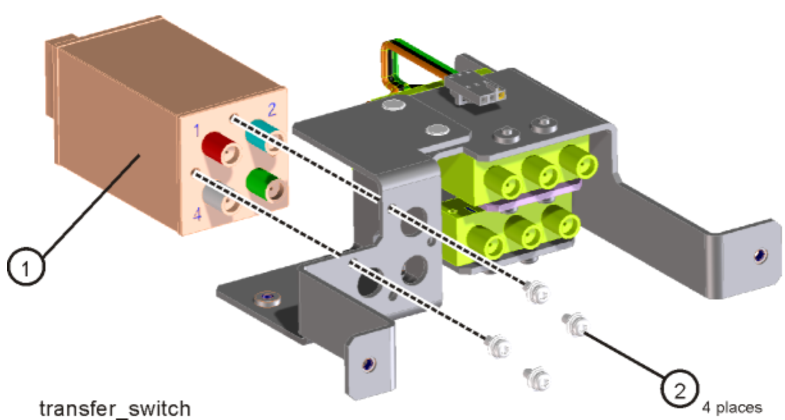
4. Refer to Figure 15-18. To remove the SW3 transfer switch **(1)** or the SW1 and SW2 coax switches **(2)** remove cables W13 and W53 as necessary to access the switch being removed. Remove AT1 attenuator **(3)** if necessary.

Figure 15-18 Transfer Switch, Coax Switches, and Cables - Options 508, 513, 526



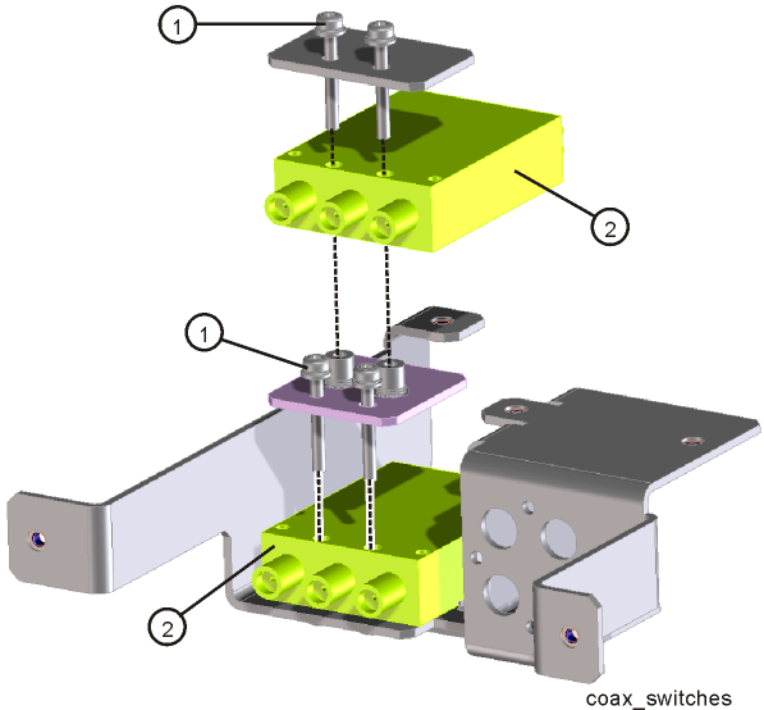
5. Refer to Figure 15-19. To remove the SW3 transfer switch **(1)** remove the four screws **(2)** (0515-1934) attaching the switch to the bracket.

Figure 15-19 Removing Transfer Switch from Bracket - Options 508, 513, 526



6. Refer to Figure 15-20. To remove the SW1 and SW2 coax switches **(2)** remove the two screws **(1)** (0515-1992) attaching each switch to the bracket.

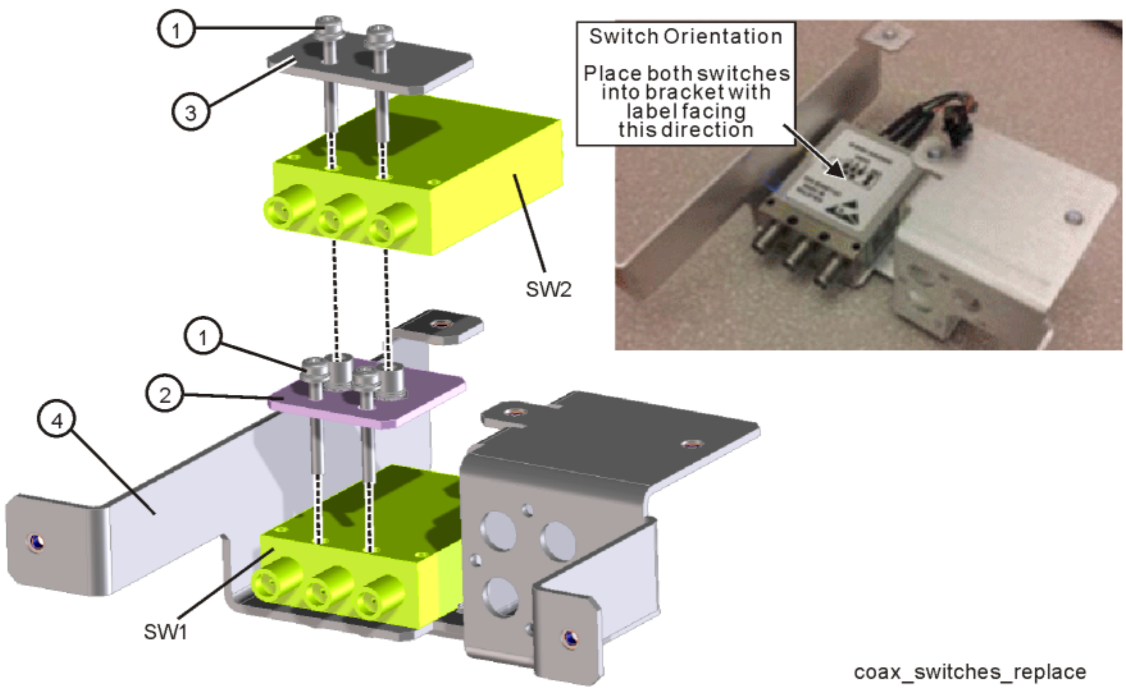
Figure 15-20 Removing Coax Switches from Bracket - Options 508, 513, 526



Replacement

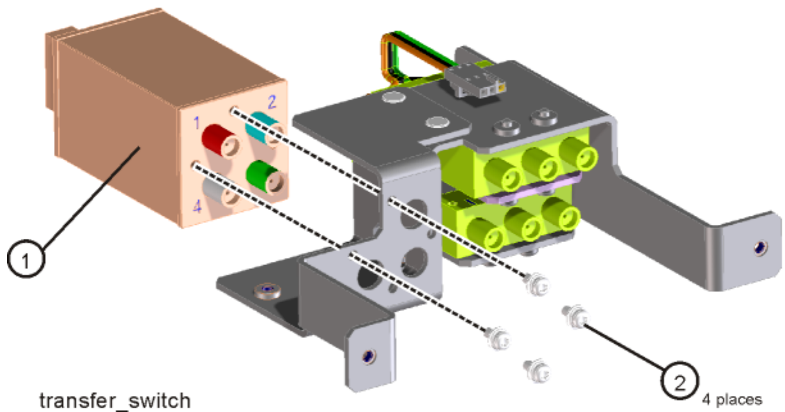
1. Refer to Figure 15-21. When replacing the coax switches, install them into the bracket with the label facing as shown. Install SW1 (bottom switch) and secure with the two screws **(1)** (0515-1992) and SW1 bracket **(2)** (E4410-00104) to the main switch bracket **(4)**. Torque to 6 inch-lbs. Install SW2 (top switch) with the two screws **(1)** (0515-1992) and SW2 bracket **(3)** (N9040-00019). Torque to 6 inch-lbs.

Figure 15-21 Coax Switches Replacement - Options 508, 513, 526



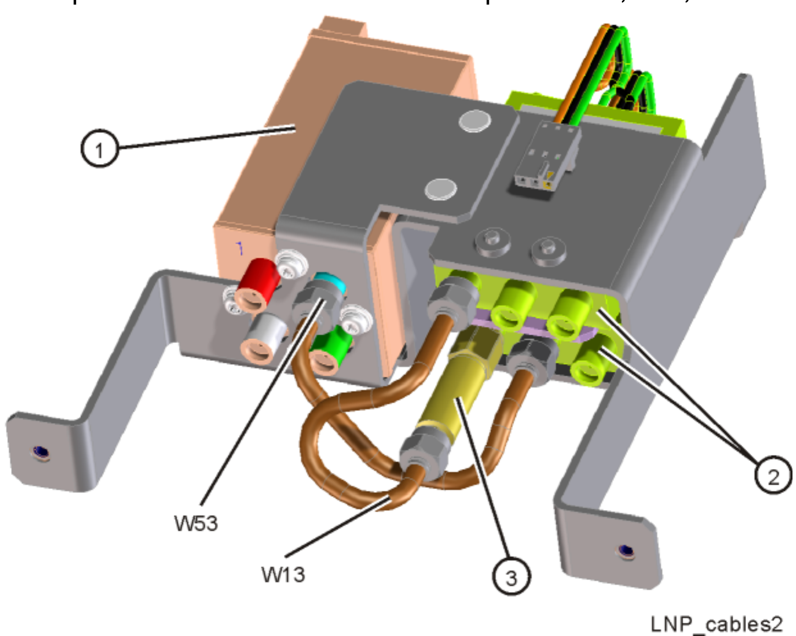
2. Refer to Figure 15-22. Place the SW3 transfer switch **(1)** into the bracket in the orientation shown, with port 1 in the upper left corner. Secure with the four screws **(2)** (0515-1934). Torque to 6 inch-lbs.

Figure 15-22 Replacing Transfer Switch - Options 508, 513, 526



3. Refer to Figure 15-23. Replace AT1 attenuator **(3)**. Torque to 10 inch-lbs. Replace cables W13 and W53. Torque to 10 inch-lbs.

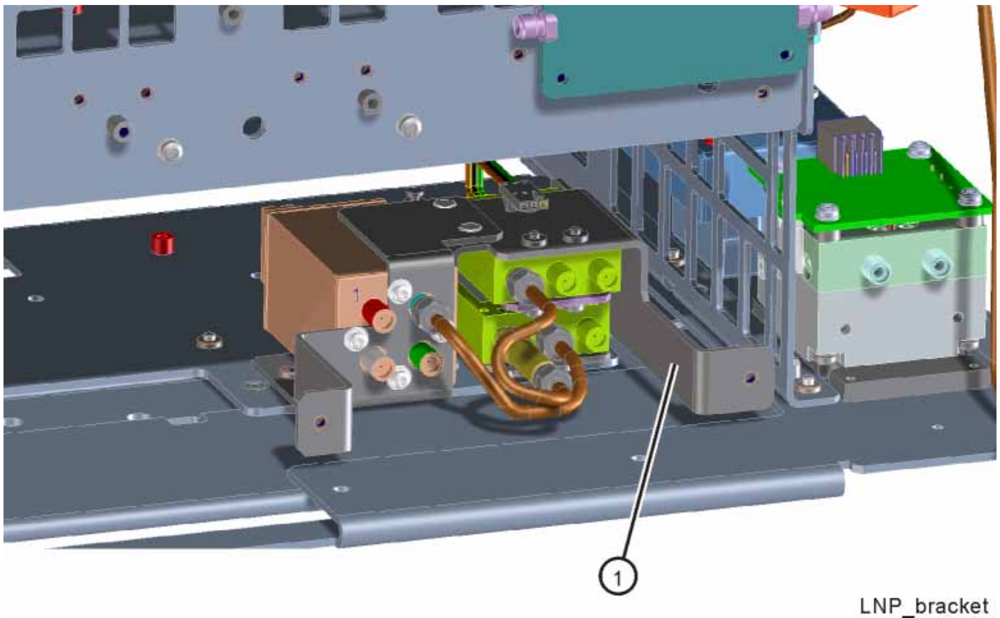
Figure 15-23 Replace Attenuator and Cables - Options 508, 513, 526



Item	Keysight Part Number
W13	N9040-20036
W53	N9040-20029

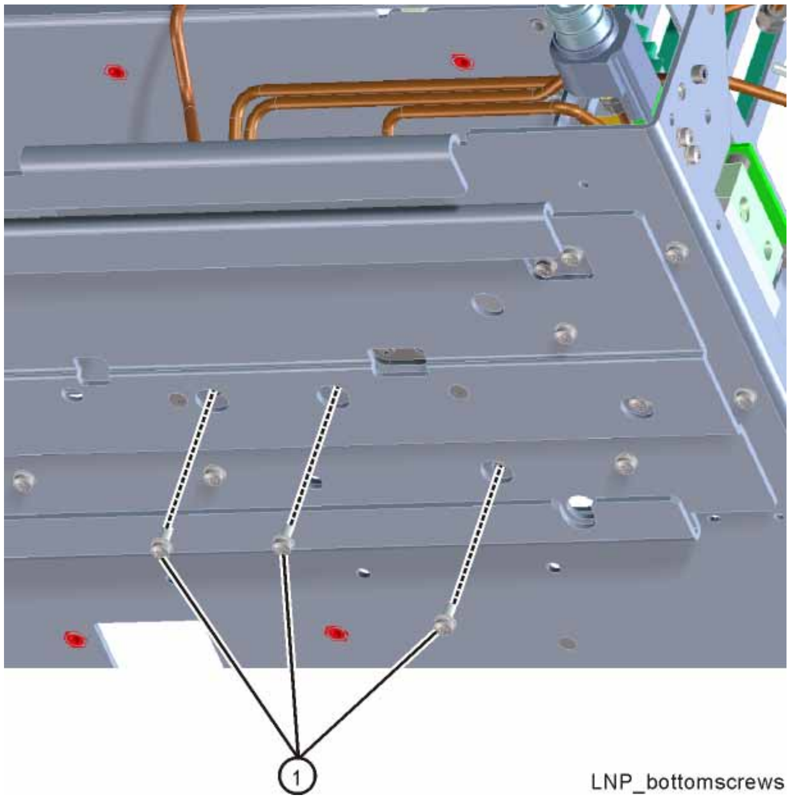
4. Place the switches and switch bracket **(1)** into the chassis as shown in Figure 15-24. Plug the ribbon cable and the wire harnesses into each switch.

Figure 15-24 Switch Bracket - Options 508, 513, 526



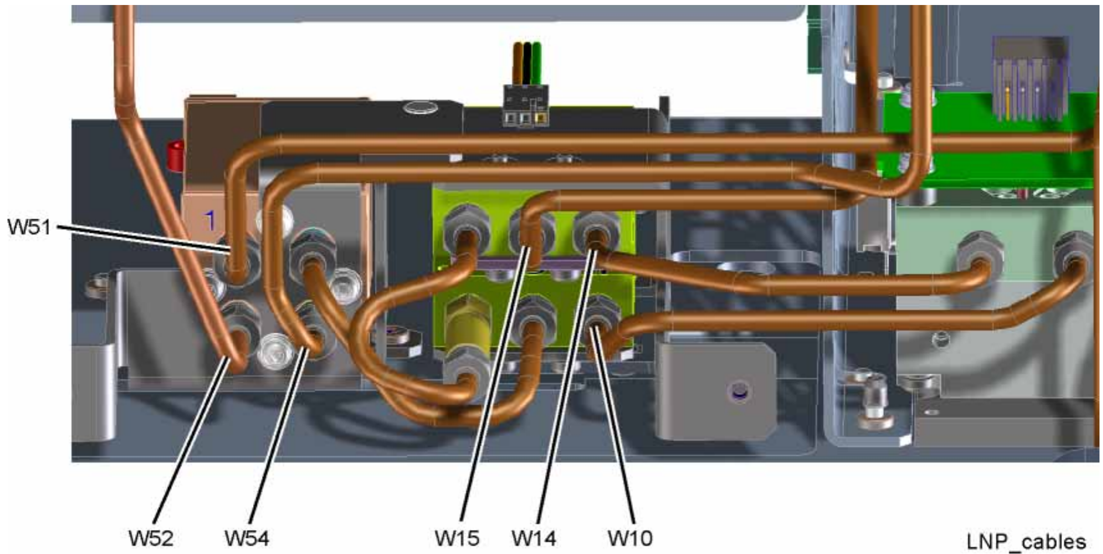
5. Replace the three screws **(1)** (0515-0372) that attach the switch bracket to the chassis as shown in Figure 15-25. Torque to 9 inch-lbs.

Figure 15-25 Switch Bracket Bottom Screws



6. Refer to Figure 15-26. Replace cables W10, W14, W15, W51, W52, and W54. Torque to 10 inch-lbs.

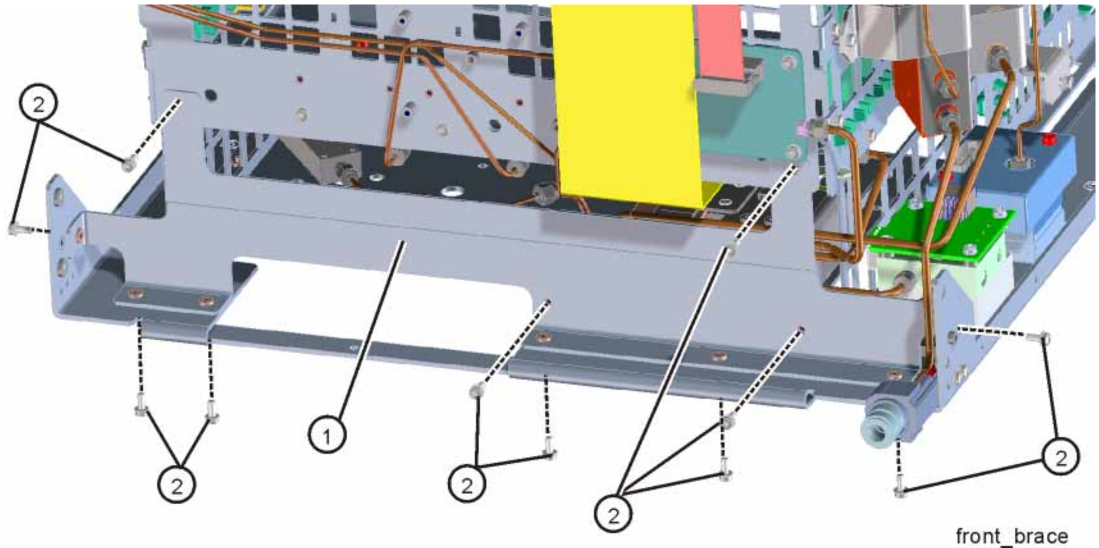
Figure 15-26 W10, W14, W15, W51, W52, and W54 Cables Replacement - Options 508, 513, 526



Item	Keysight Part Number
W10	N9040-20033
W14	N9040-20034
W15	N9040-20035
W51	N9040-20028
W52	N9040-20031
W54	N9040-20030

7. Refer to Figure 15-27. Place the front brace **(1)** into the chassis and secure with the eleven screws **(2)** (0515-0372). Torque to 9 inch-lbs.

Figure 15-27 Front Brace Replacement



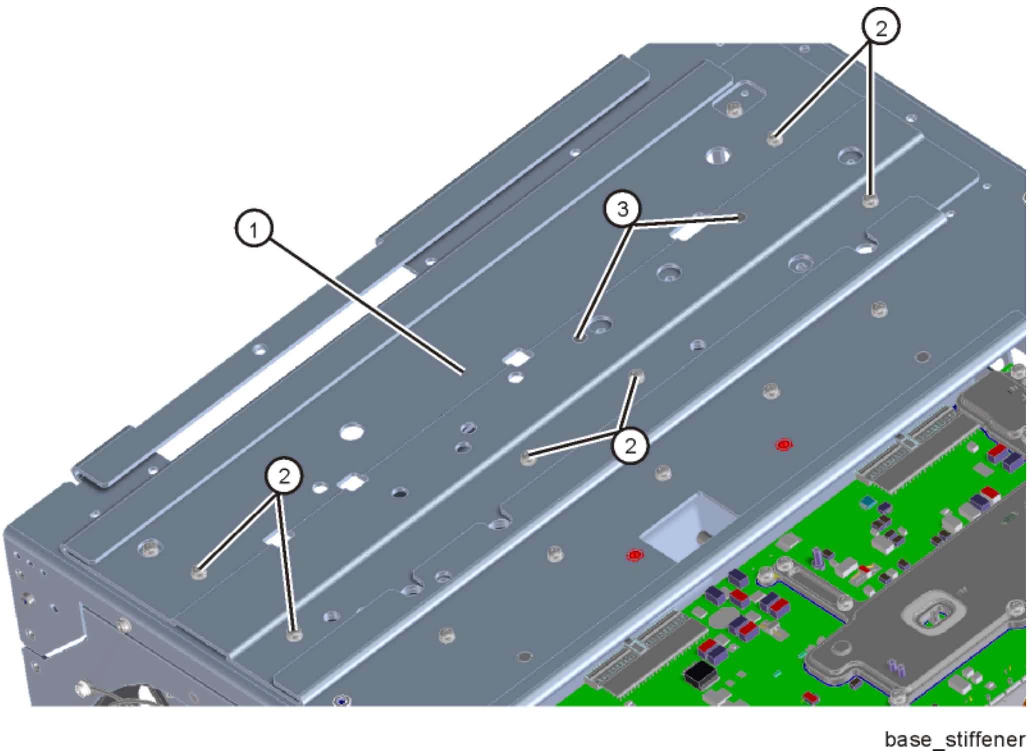
8. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

A13 RF Front End Assembly

Removal

1. Perform step 1 through step 3 in the "Low Noise Path and Microwave Preselector Bypass Switches" removal procedure on page 389 to remove the bracket and switch assembly.
2. Refer to Figure 15-28. Remove the chassis base stiffener **(1)** by removing the six screws **(2)** (0515-0372) and the two screws **(3)** (0515-1946).

Figure 15-28 Chassis Base Stiffener Removal



3. Refer to Figure 15-29 and Figure 15-30. Remove cables W8, W16, W17, W18, W21 W30, and W33 from the A13 Front End assembly.

Figure 15-29 Front End Assembly Cables Removal - Options 508, 513, 526

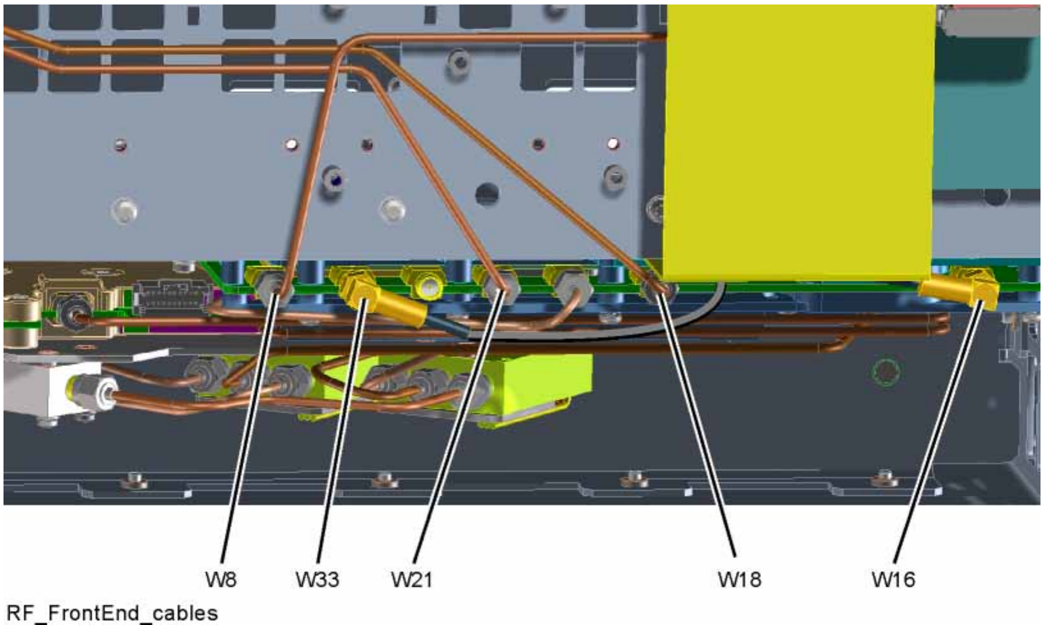
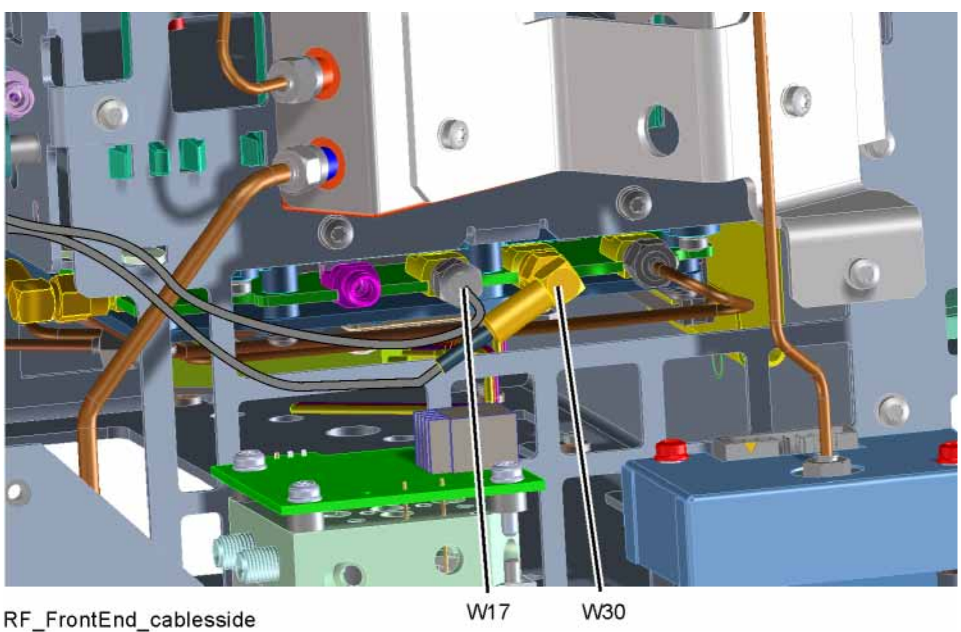
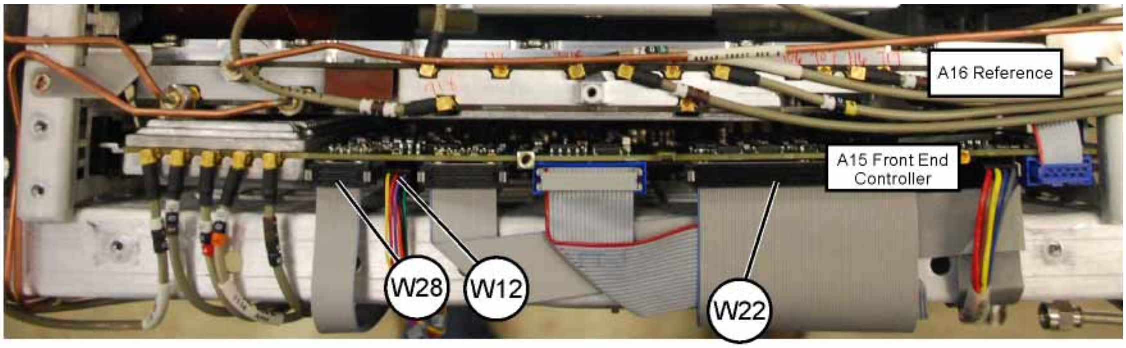


Figure 15-30 Front End Assembly Side Cables Removal - Options 508, 513, 526



4. Refer to Figure 15-31. Unplug ribbon cables W22 and W28, and wire harness W12 from the Front End Controller board.

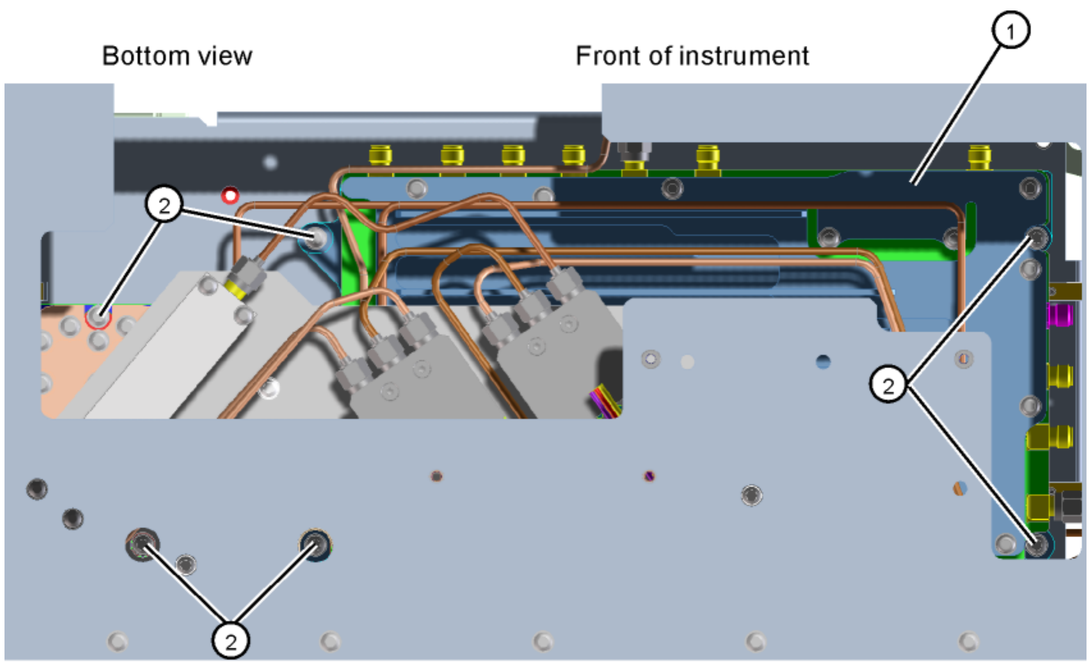
Figure 15-31 Front End Controller Board Cables



frontend_cables_uxa

5. Refer to Figure 15-32. From the bottom of the instrument, remove the six screws **(2)** (0515-0372) that attach the Front End assembly **(1)** to the chassis. The Front End assembly can now be removed.

Figure 15-32 Front End Assembly Bottom Screws - Removal



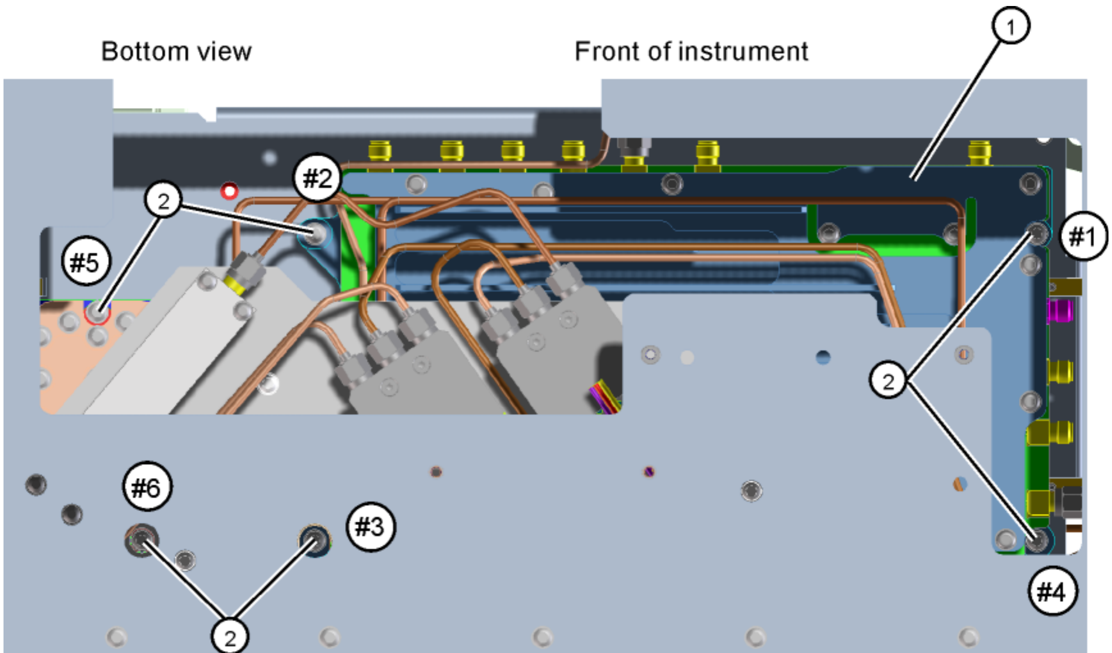
RF_FrontEnd_screws

Replacement

1. Refer to Figure 15-33. Place the Front End assembly into the chassis. From the bottom of the instrument, replace the six screws **(2)** (0515-0372) that attach the Front End assembly **(1)** to the chassis. Torque to 9 inch-pounds in the order shown (#1 to #6).

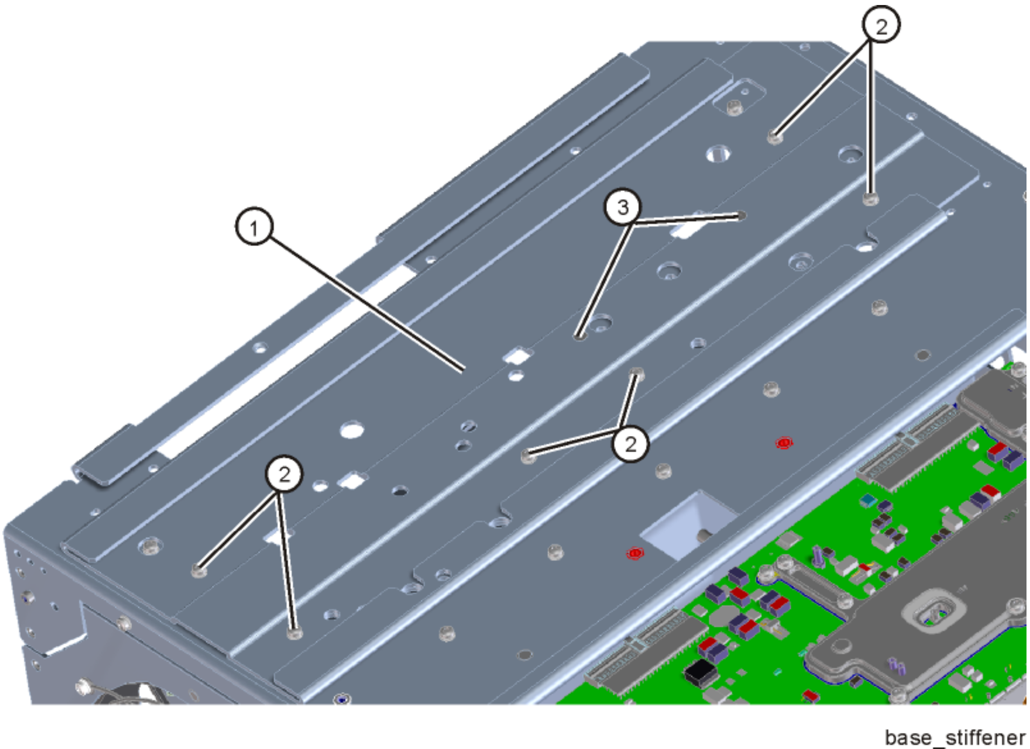
CAUTION Make sure ribbon cable W22 is under the 4 guide tabs on the back of the Front End assembly.

Figure 15-33 Front End Assembly Bottom Screws - Replacement



2. Refer to Figure 15-34. Place the chassis base stiffener **(1)** in position on the chassis base. Secure with the six screws **(2)** (0515-0372) and the two screws **(3)** (0515-1946). Torque all screws to 9 inch-pounds.

Figure 15-34 Chassis Base Stiffener Replacement



3. Refer to Figure 15-35 and Figure 15-36. Replace cables W8, W16, W17, W18, W21 W30, and W33. Torque to 10 inch-pounds.

Figure 15-35 Front End Assembly Cables Replacement - Options 508, 513, 526

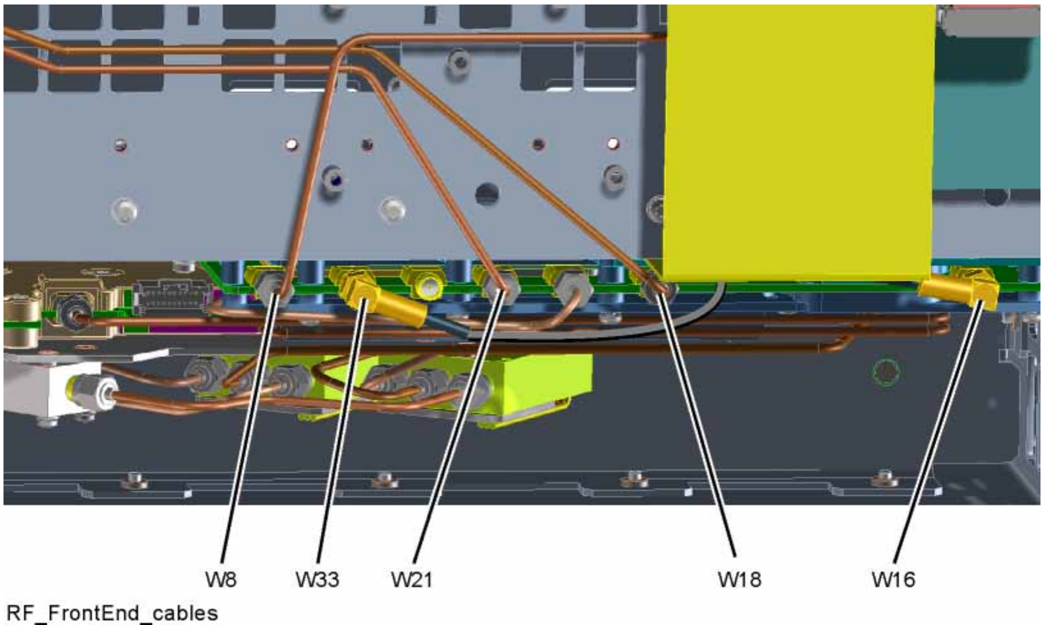
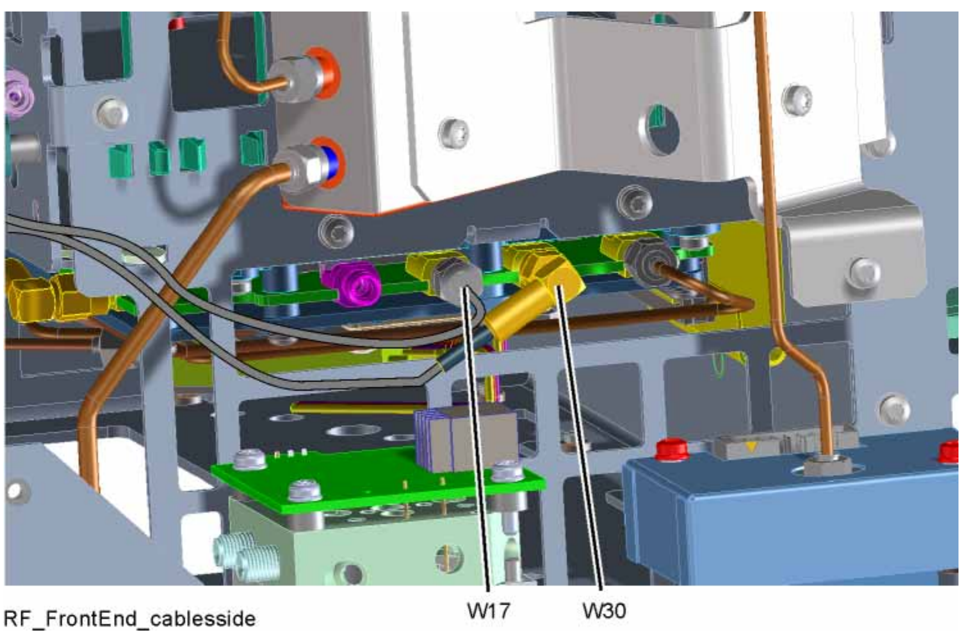


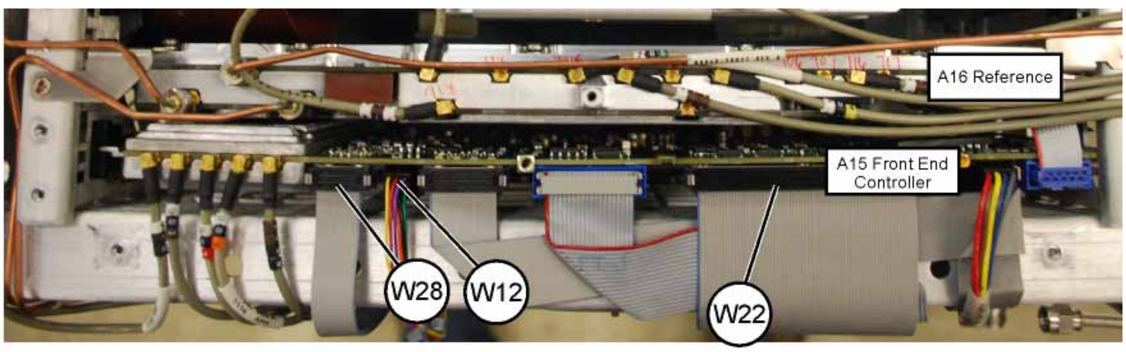
Figure 15-36 Front End Assembly Side Cables Replacement - Options 508, 513, 526



Item	Keysight Part Number
W8	N9040-20032
W16	8121-2608
W17	N9040-60046
W18	N9040-20039
W21	N9040-20038
W30	8121-1940
W33	8121-1940

4. Refer to Figure 15-37. Plug ribbon cables W22 and W28, and wire harness W12 back into the Front End Controller board.

Figure 15-37 Front End Controller Board Cables



frontend_cables_uxa

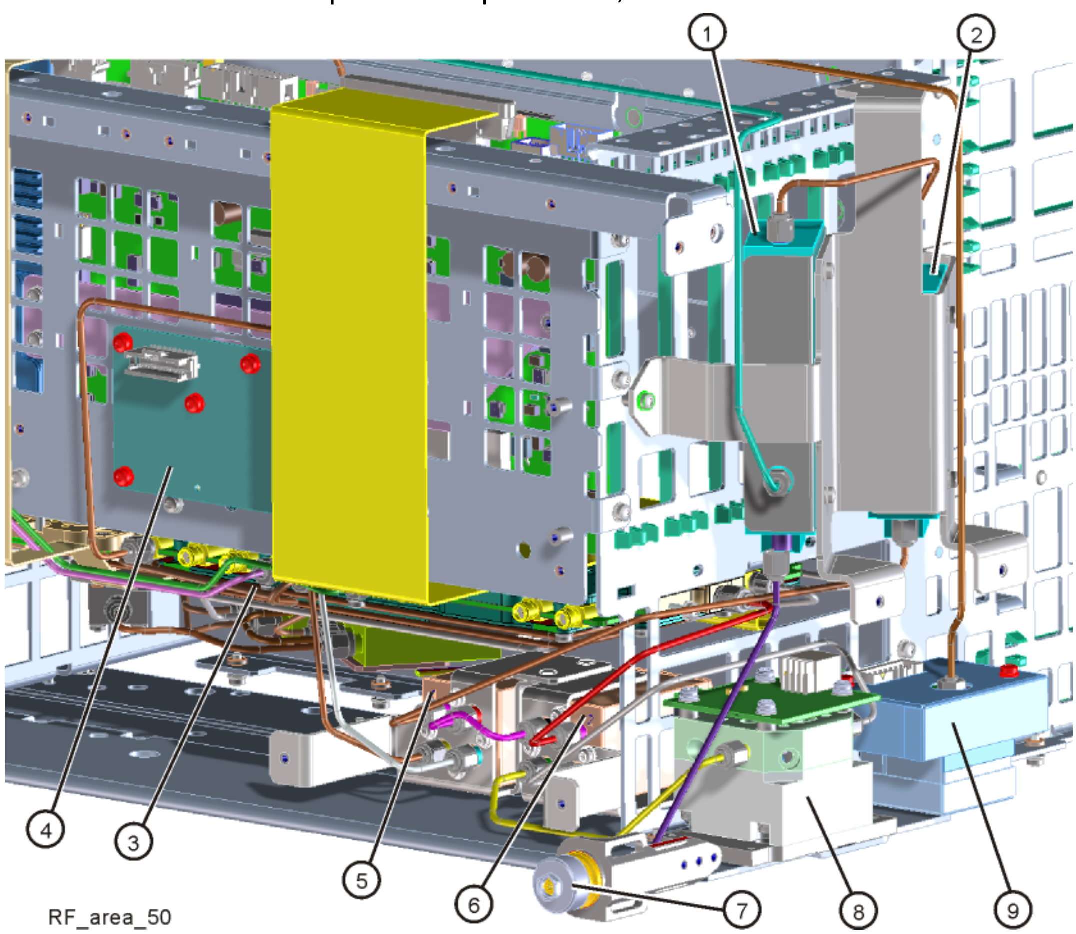
5. Perform step 4 through step 7 in the "Low Noise Path and Microwave Preselector Bypass Switches" replacement procedure on page 395 to replace the bracket and switch assembly and front brace.

6. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

RF Area - Options 544, 550

Refer to Figure 15-38. The RF area consists of A9 RF attenuator A **(1)**, A10 RF attenuator B **(2)**, A13 front end assembly **(3)**, A11 low band switch assembly **(4)**, transfer switch SW3 **(5)**, transfer switch SW6 **(6)**, RF input connector **(7)**, A12 YTF Preselector **(8)**, and A20 YTO **(9)**.

Figure 15-38 RF Area Components - Options 544, 550

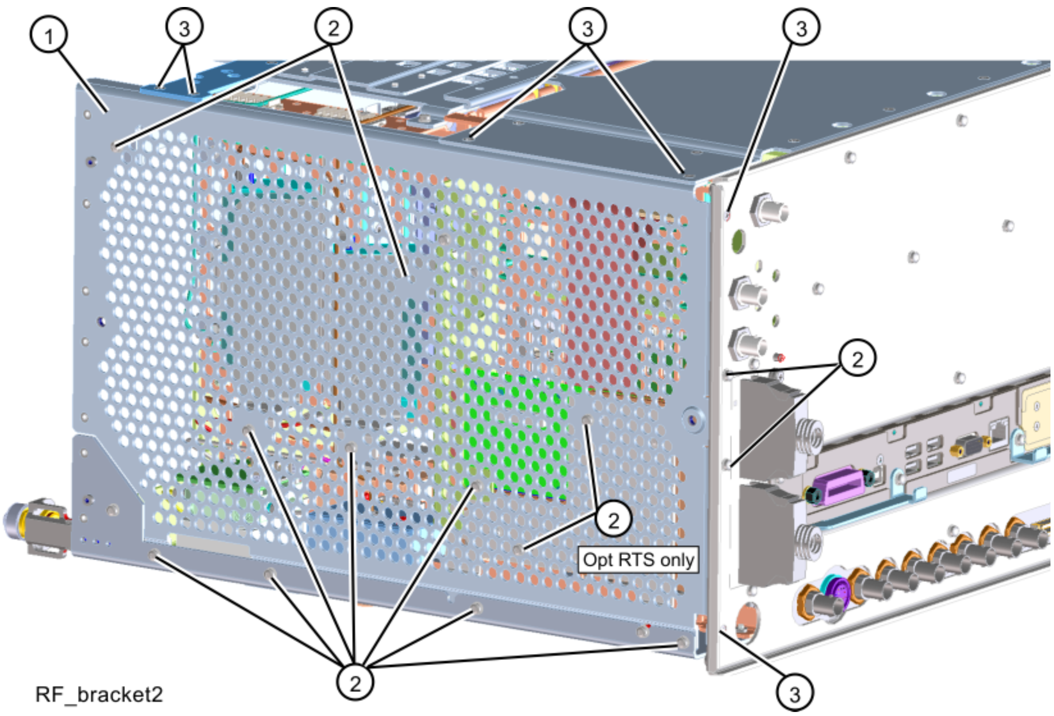


To gain access to any of the RF section parts for removal, follow these steps:

1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Remove the front panel. Refer to the Front Frame Assembly removal procedure.

3. To access the attenuators, the YTF Preselector, or the YTO, it is necessary to also remove the RF bracket. Refer to Figure 15-39. Remove the RF bracket **(1)** by removing the eleven (or thirteen with Option RTS) screws **(2)** (0515-0372), and the six screws **(3)** (0515-1946), using the T-10 driver.

Figure 15-39 RF Bracket Removal - Options 544, 550



After the part has been replaced, follow these steps:

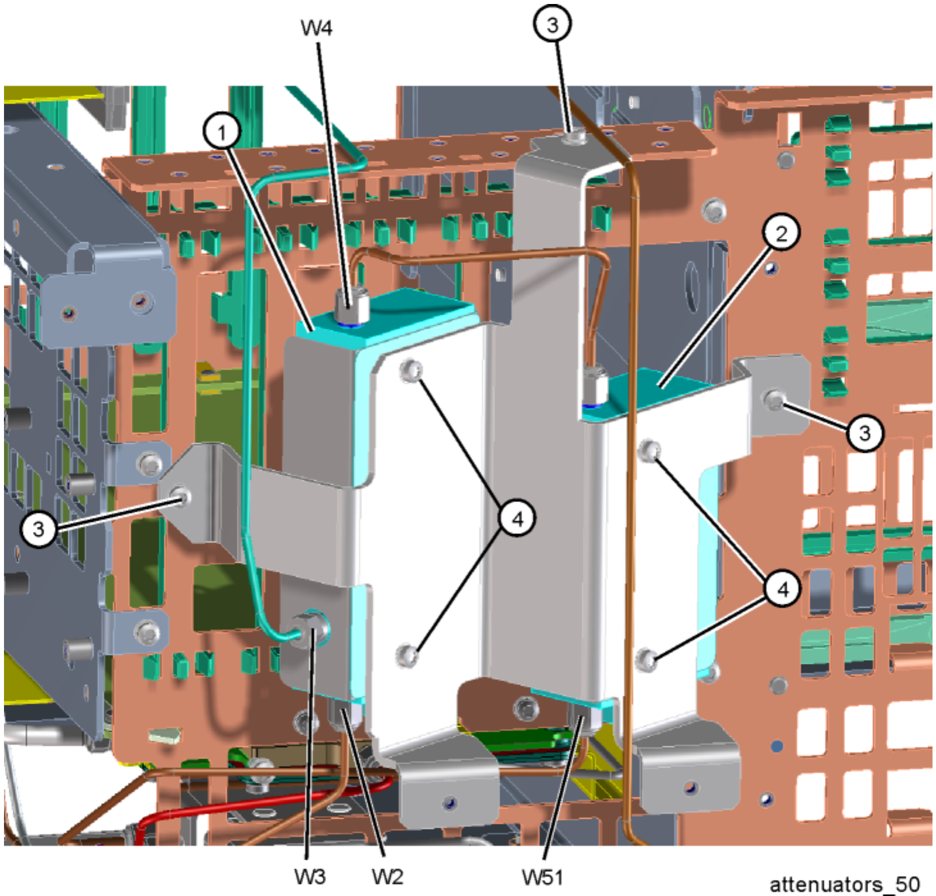
1. Refer to Figure 15-39. Position the RF bracket onto the chassis and replace the eleven screws **(2)** (0515-0372), and the six screws **(3)** (0515-1946), using the T-10 driver. Torque to 9 inch-pounds.
2. Replace the front panel. Refer to the Front Frame Assembly replacement procedure.
3. Replace the instrument outer case. Refer to the "Instrument Outer Case" replacement procedure.

A9 & A10 RF Attenuators

Removal

1. Refer to Figure 15-40. To remove A9 RF attenuator A **(1)** or A10 RF attenuator B **(2)**, remove the semi-rigid cables W2, W3, W4, and W51 using the 5/16 inch wrench.
2. Remove the ribbon cables attached to each attenuator.
3. Remove the three screws **(3)** (0515-0372) that attach the attenuator bracket to the chassis using the T-10 driver.
4. Remove the attenuator from the bracket by removing the two screws **(4)** (0515-0372).

Figure 15-40 Attenuators Removal - Options 544, 550



Item	Keysight Part Number
W2	N9040-20114
W3	N9040-20103
W4	N9040-20102
W51	N9040-20104

Replacement

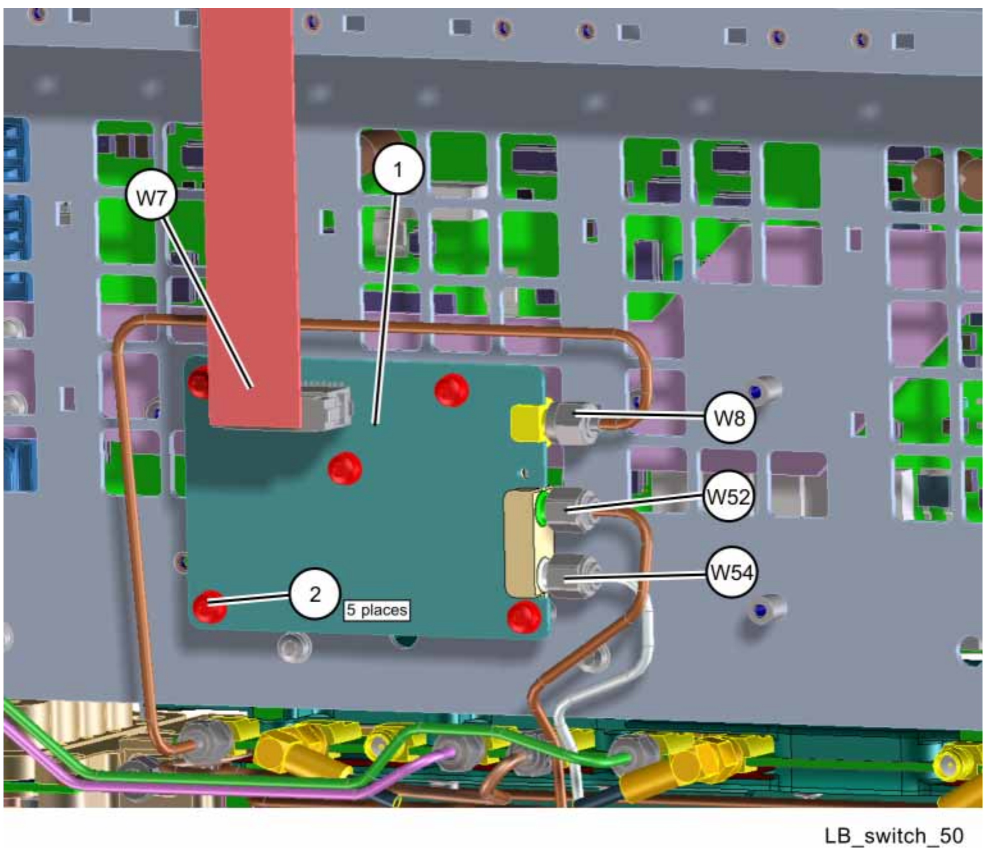
1. Assure the shield are installed on both attenuators.
2. Refer to Figure 15-40. Position the attenuator in the bracket so that the ribbon connector end is “down”.
3. Replace the two screws (0515-0372) that attach the attenuator to the bracket. Torque to 9 inch-pounds.
4. Position the attenuators and bracket into the chassis and attach with the three screws **(3)** (0515-0372). Torque to 9 inch-pounds.
5. Replace the ribbon cable and semi-rigid cables W2, W3, W4, and W51 to the attenuators. Torque the semi-rigid cables to 10 inch-pounds.
6. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

A11 Low Band Switch

Removal

1. Refer to Figure 15-41. Remove the ribbon cable W7.
2. Remove the semi-rigid cables W8, W52, and W54 using the 5/16 inch wrench.
3. Remove the five screws **(2)** (0515-0372) using the T-10 driver. The A11 low band switch **(1)** can now be removed from the chassis.

Figure 15-41 Low Band Switch Cable Removal - Options 544, 550



Item	Keysight Part Number
W8	N9040-20108
W52	N9040-20106
W54	N9040-20107

Replacement

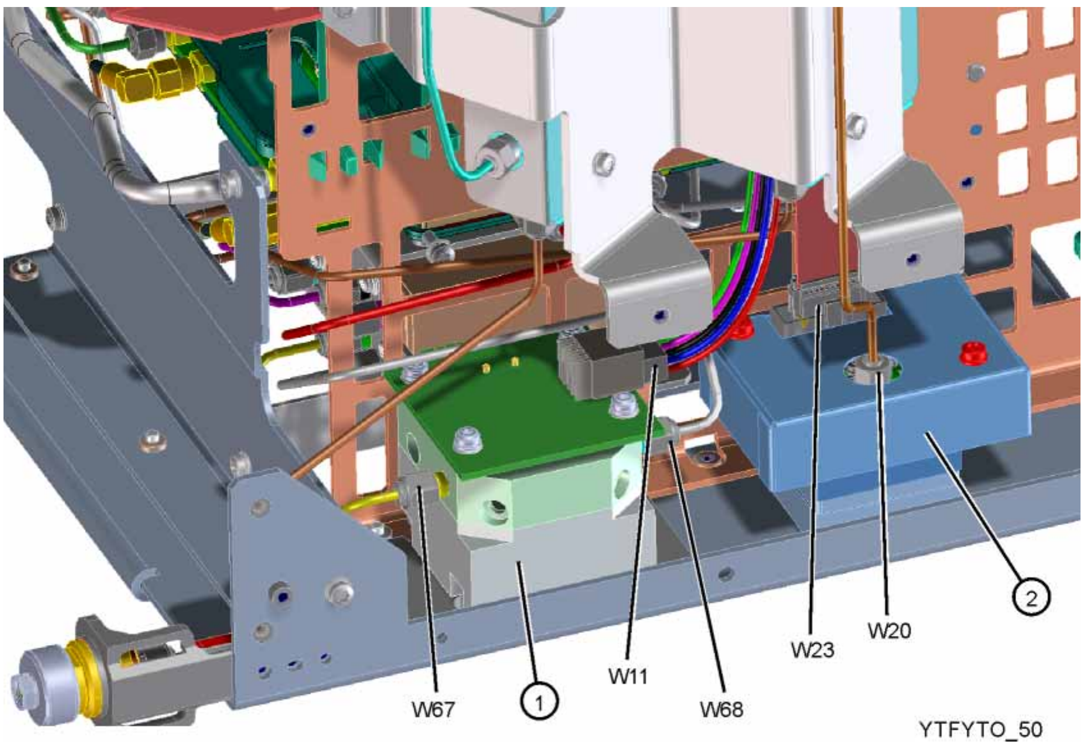
1. Refer to Figure 15-41. Place the switch into place into the chassis and replace the five screws (0515-0372). Torque to 9 inch-pounds.
2. Replace the semi-rigid cables W8, W52, and W54. Torque to 10 inch-pounds.
3. Replace the ribbon cable W7. Ensure locking tabs on the sides of the connector are engaged.
4. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

A12 YTF Preselector

Removal

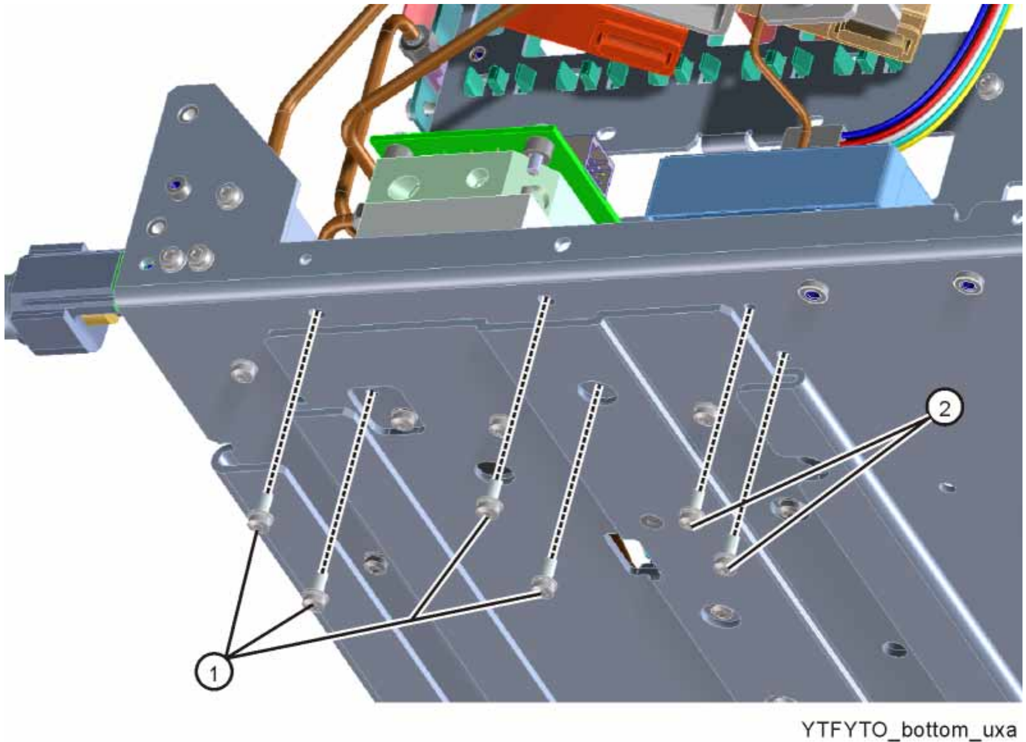
1. Refer to Figure 15-42. Remove cables W67 and W68 from the YTF Preselector **(1)**.
2. Remove the wire harness W11.
3. Refer to Figure 15-43. From the bottom of the instrument, remove the four screws **(1)** (0515-0372). The A12 YTF Preselector can now be removed from the chassis.

Figure 15-42 YTF Preselector Removal - Options 544, 550



Item	Keysight Part Number
W67	N9040-20109
W68	N9040-20110

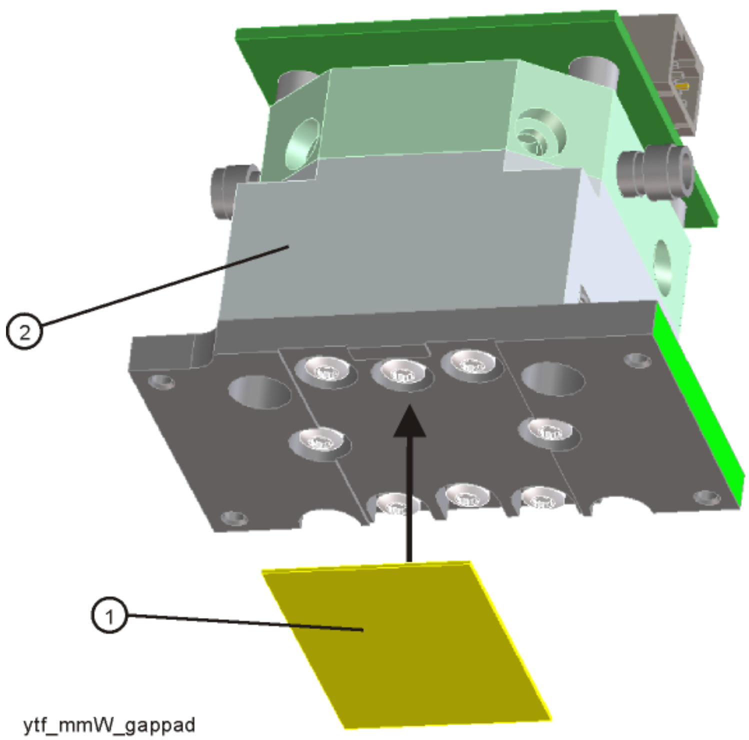
Figure 15-43 YTF Preselector and YTO Bottom Screws



Replacement

1. Inspect the chassis where the YTF Preselector mounts and remove the gap pad if present (see Figure 15-44, item **(1)**. The gap pad may remain attached to the faulty YTF Preselector.
2. Refer to Figure 15-44. Install the replacement gap pad **(1)** (5022-7179) into the recess in the base of the replacement YTF Preselector **(2)**. Peel back one corner of the clear plastic backing on the pink side of the gap pad. Remove the blue backing from the other side of the gap pad. Install the gap pad as shown with the pink side exposed. Carefully peel off the clear plastic backing and smooth the gap pad into the recess.

Figure 15-44 Gap Pad Installation



3. Refer to Figure 15-43. Place the YTF Preselector into the chassis with the ribbon cable connector toward the rear of the instrument. Replace the four screws **(1)** (0515-0372). Torque to 9 inch-pounds.
4. Figure 15-42. Replace the cables W67 and W68. Torque to 10 inch-pounds.
5. Replace the wire harness W11.
6. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

A20 YTO

Removal

1. Refer to Figure 15-42. Remove cable W20 from the YTO **(2)**.
2. Remove the ribbon cable W23 by pulling forward on the locking latch.
3. Refer to Figure 15-43. From the bottom of the instrument, remove the two screws **(2)** (0515-0372). The A20 YTO can now be removed from the chassis.

Item	Keysight Part Number
W20	N9040-20037

Replacement

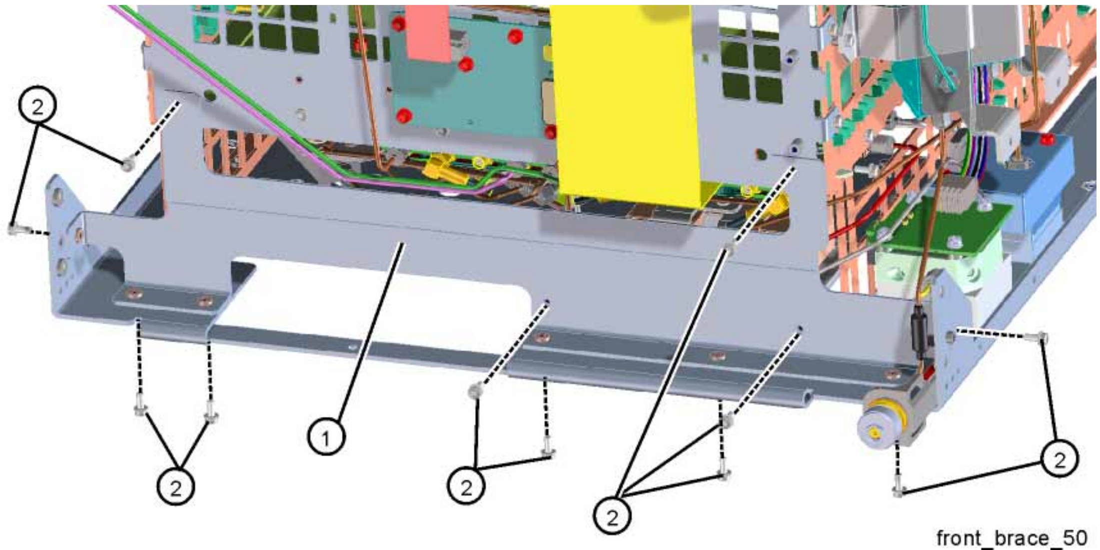
1. Refer to Figure 15-43. Place the YTO into the chassis. Replace the two screws **(2)** (0515-0372). Torque to 9 inch-pounds.
2. Figure 15-42. Replace the cable W20. Torque to 10 inch-pounds.
3. Replace the ribbon cable W23. Ensure the locking latch is engaged.
4. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

Transfer Switches

Removal

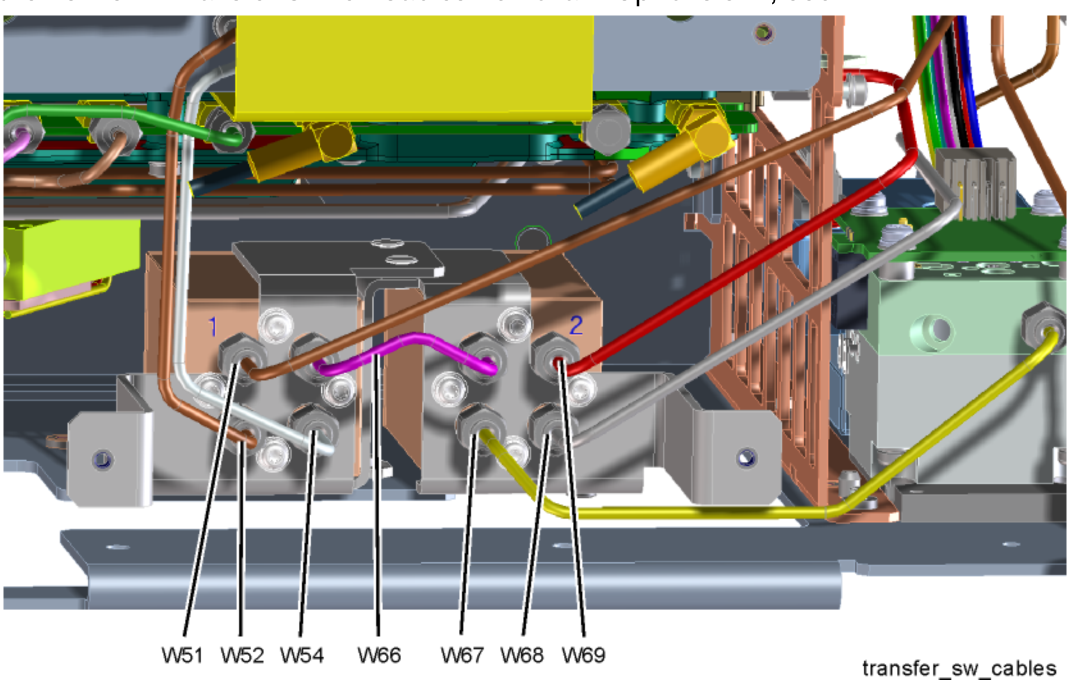
1. Refer to Figure 15-45. Remove the front brace **(1)** by removing the eleven screws **(2)** (0515-0372).

Figure 15-45 Front Brace Removal



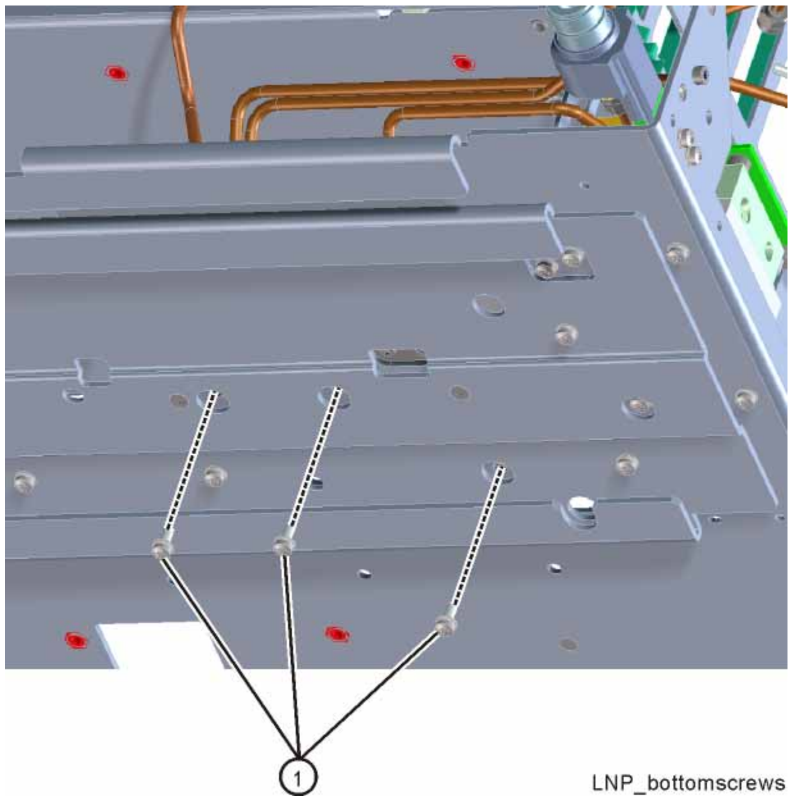
2. Refer to Figure 15-46. Remove cables W51, W52, W54, W66, W67, W68, and W69.

Figure 15-46 Transfer Switch Cables Removal - Options 544, 550



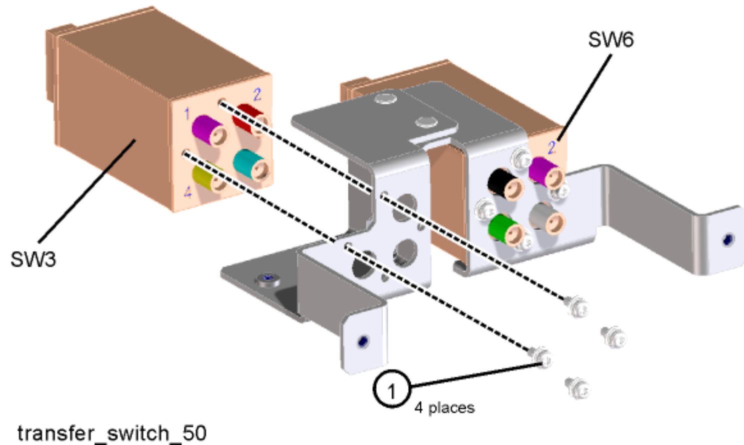
3. Refer to Figure 15-47. Remove the three screws **(1)** (0515-0372) that attach the switch bracket to the chassis. Unplug the ribbon cable and the wire harnesses from each switch. The switches and bracket can now be removed from the chassis.

Figure 15-47 Switch Bracket Bottom Screws



4. Refer to Figure 15-48. To remove either SW3 or SW6 transfer switch remove the four screws **(1)** (0515-1934) attaching the switch to the bracket.

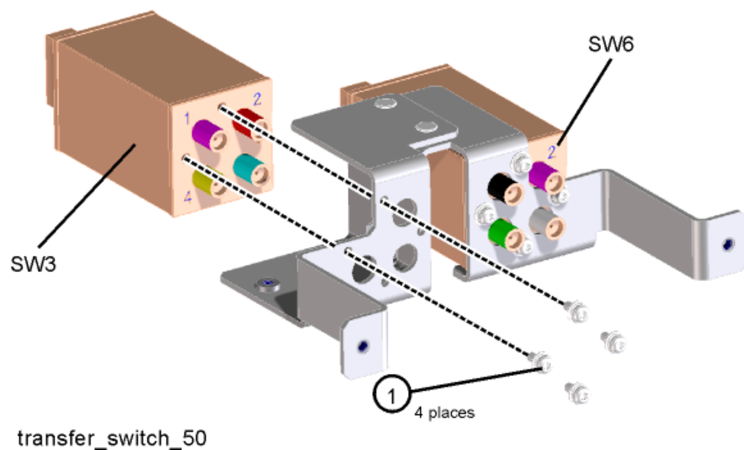
Figure 15-48 Removing Transfer Switch from Bracket - Options 544, 550



Replacement

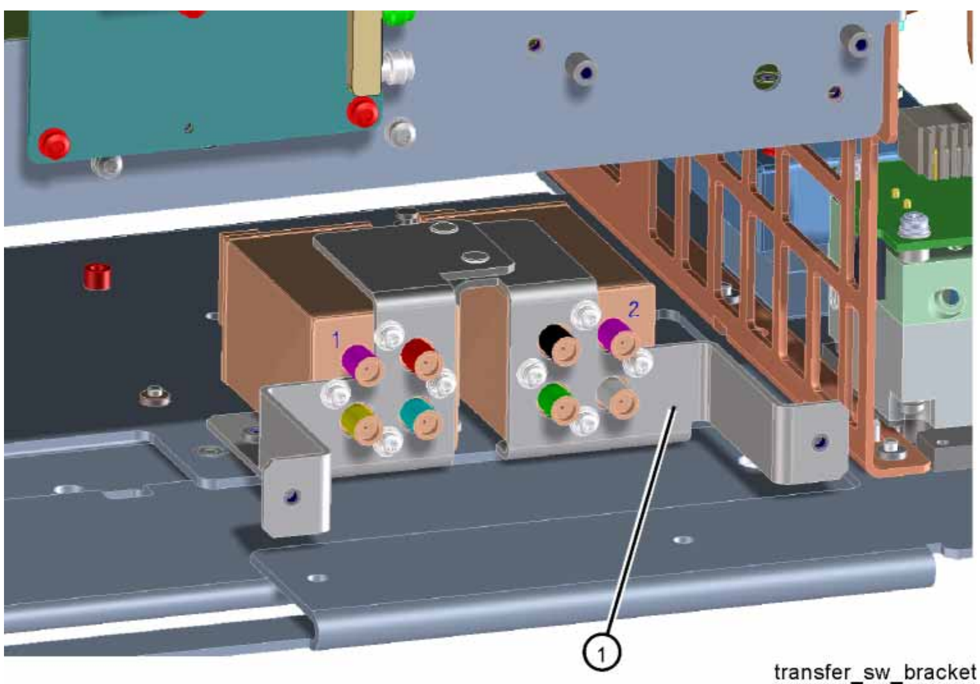
1. Refer to Figure 15-49. Place the SW3 or SW6 transfer switch into the bracket in the orientation shown, with port 1 in the upper left corner. Secure with the four screws **(1)** (0515-1934). Torque to 6 inch-lbs.

Figure 15-49 Replacing Transfer Switch - Options 544, 550



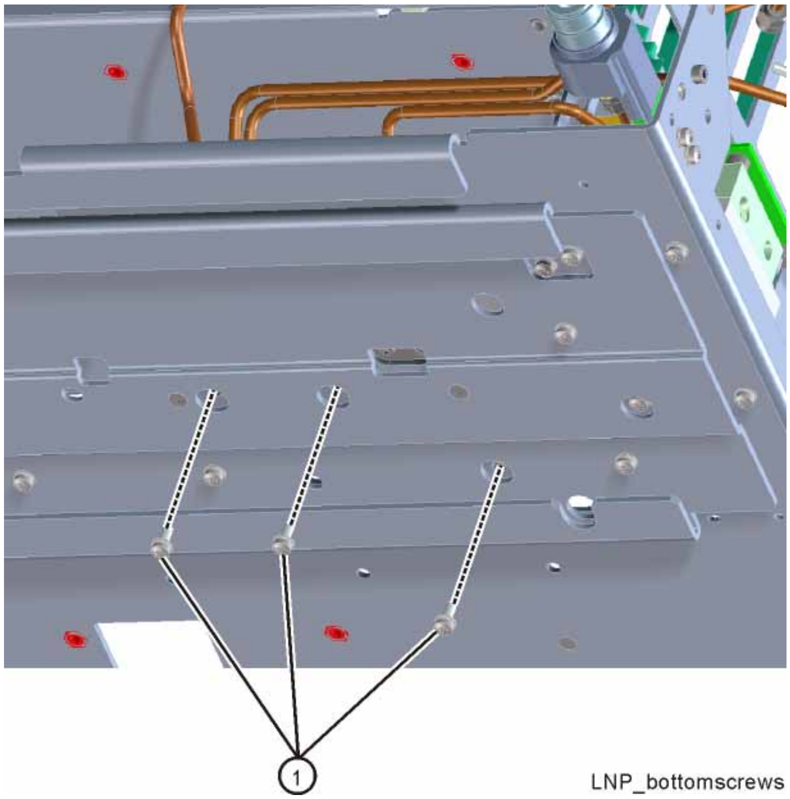
2. Place the switches and switch bracket **(1)** into the chassis as shown in Figure 15-50. Plug the ribbon cable and the wire harnesses into each switch.

Figure 15-50 Switch Bracket - Options 544, 550



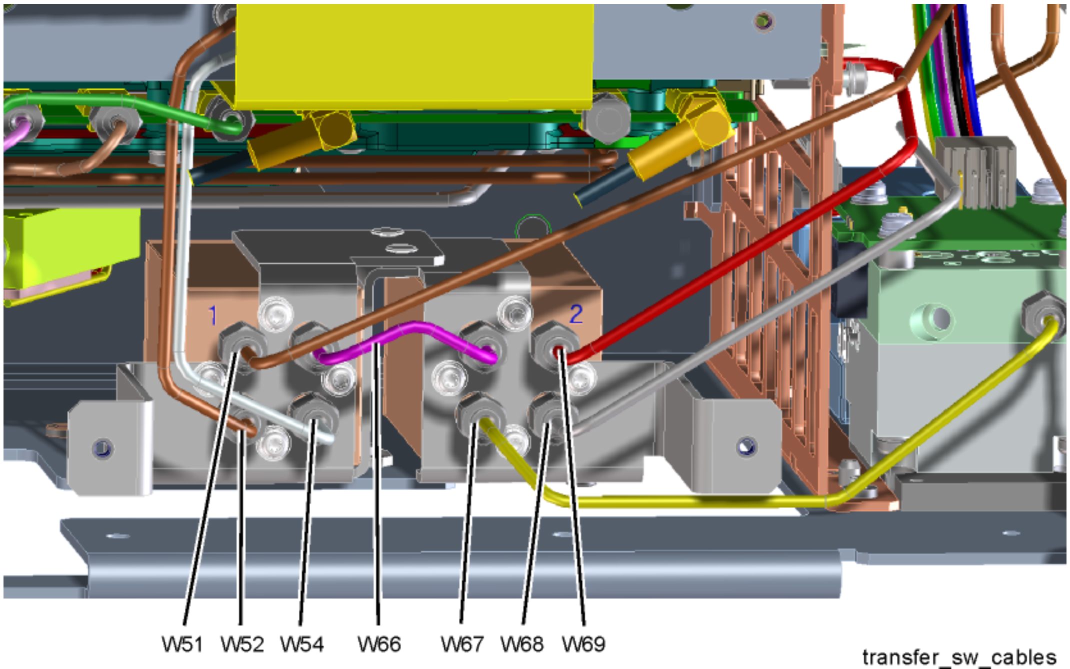
3. Replace the three screws **(1)** (0515-0372) that attach the switch bracket to the chassis as shown in Figure 15-51. Torque to 9 inch-lbs.

Figure 15-51 Switch Bracket Bottom Screws



4. Refer to Figure 15-52. Replace cables W51, W52, W54, W66, W67, W68, and W69. Torque to 10 inch-lbs.

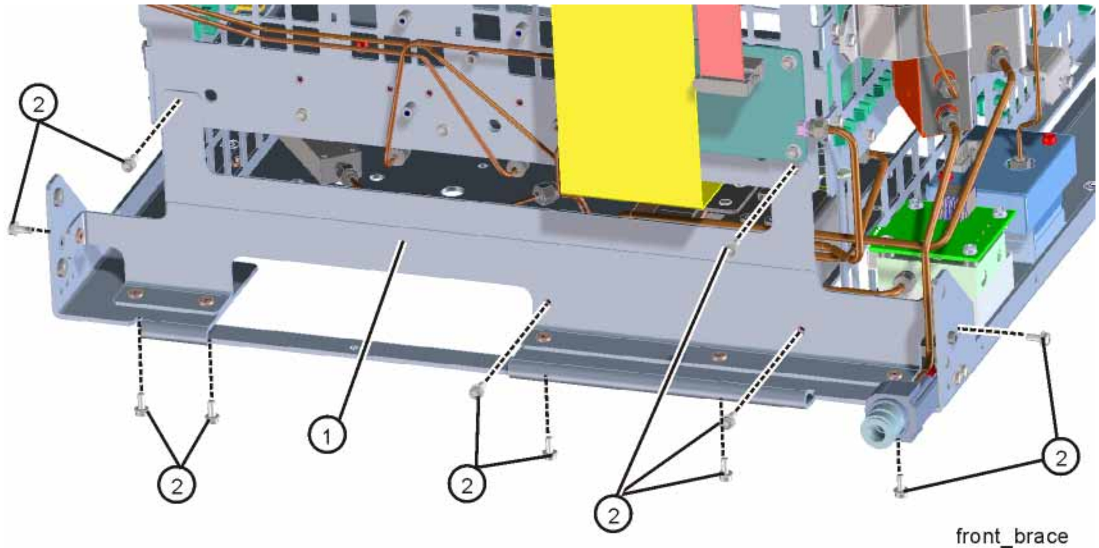
Figure 15-52 Transfer Switch Cables Replacement - Options 544, 550



Item	Keysight Part Number
W51	N9040-20104
W52	N9040-20106
W54	N9040-20107
W66	N9040-20105
W67	N9040-20109
W68	N9040-20110
W69	N9040-20111

5. Refer to Figure 15-53. Place the front brace **(1)** into the chassis and secure with the eleven screws **(2)** (0515-0372). Torque to 9 inch-lbs.

Figure 15-53 Front Brace Replacement



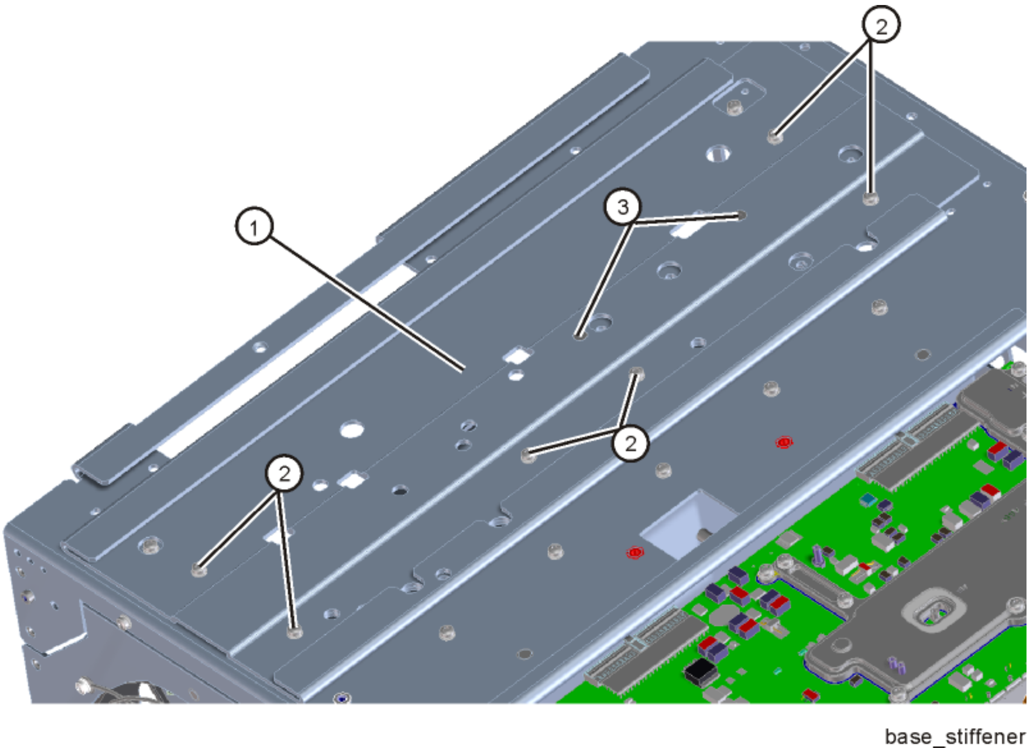
6. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

A13 RF Front End Assembly

Removal

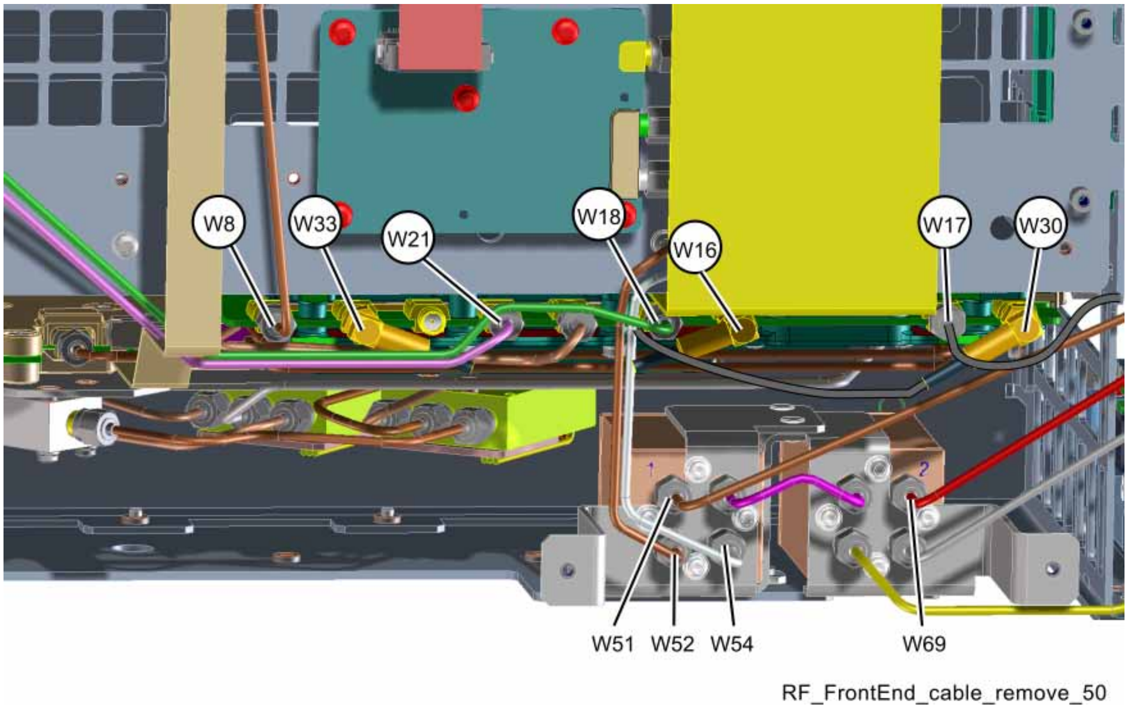
1. Perform step 1 through step 3 in the "Transfer Switches" removal procedure on page 417 to remove the bracket and switch assembly.
2. Refer to Figure 15-54. Remove the chassis base stiffener **(1)** by removing the six screws **(2)** (0515-0372) and the two screws **(3)** (0515-1946).

Figure 15-54 Chassis Base Stiffener Removal



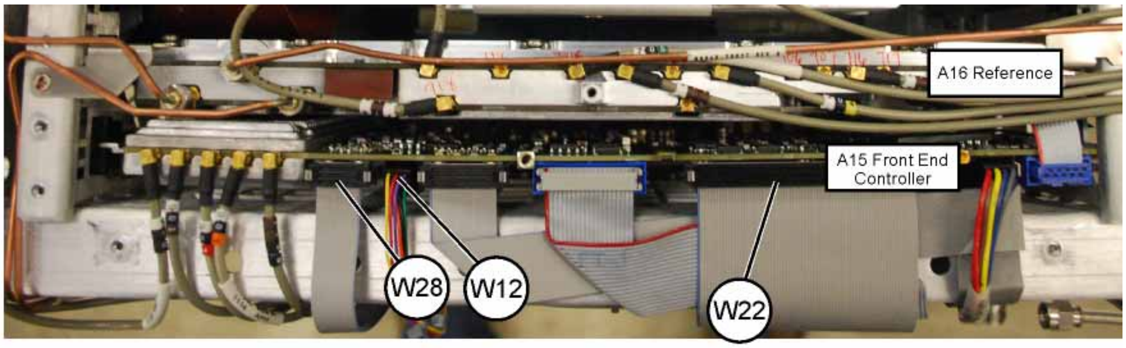
3. Refer to Figure 15-55. Remove the cables W8, W33, W21, W18, W16, W17, and W30 from the A13 Front End assembly. Some cables will not be present if the instrument is not Option B5X.

Figure 15-55 Front End Assembly Cables Removal - Options 544, 550 (Option B5X shown)



4. Refer to Figure 15-56. Unplug ribbon cables W22 and W28, and wire harness W12 from the Front End Controller board.

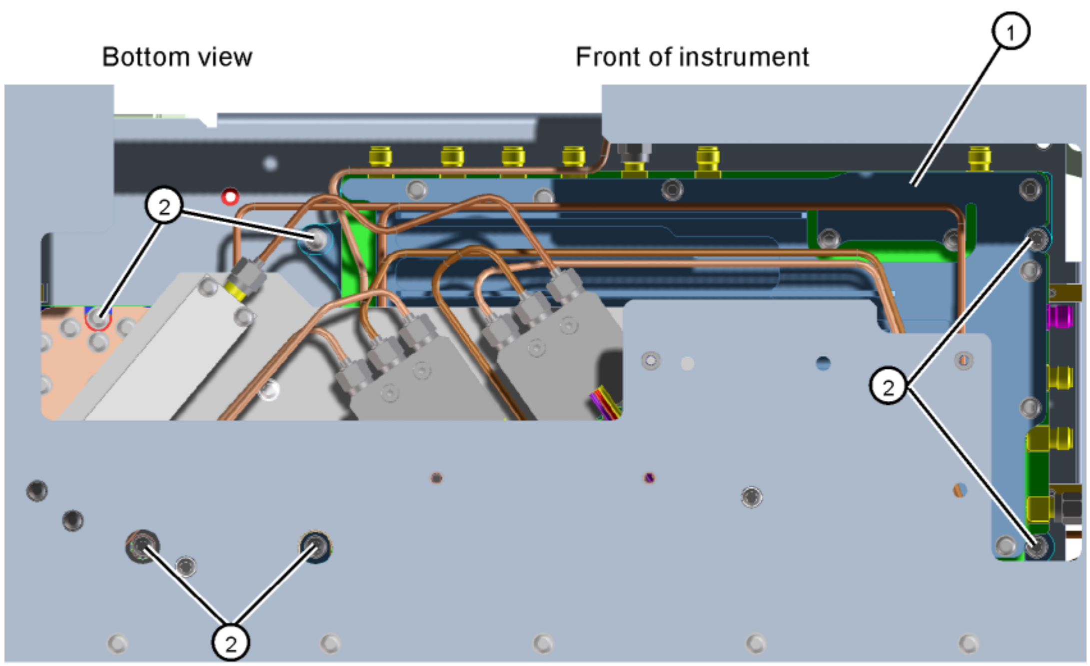
Figure 15-56 Front End Controller Board Cables



frontend_cables_uxa

5. Refer to Figure 15-57. From the bottom of the instrument, remove the six screws **(2)** (0515-0372) that attach the Front End assembly **(1)** to the chassis. The Front End assembly can now be removed.

Figure 15-57 Front End Assembly Bottom Screws - Removal



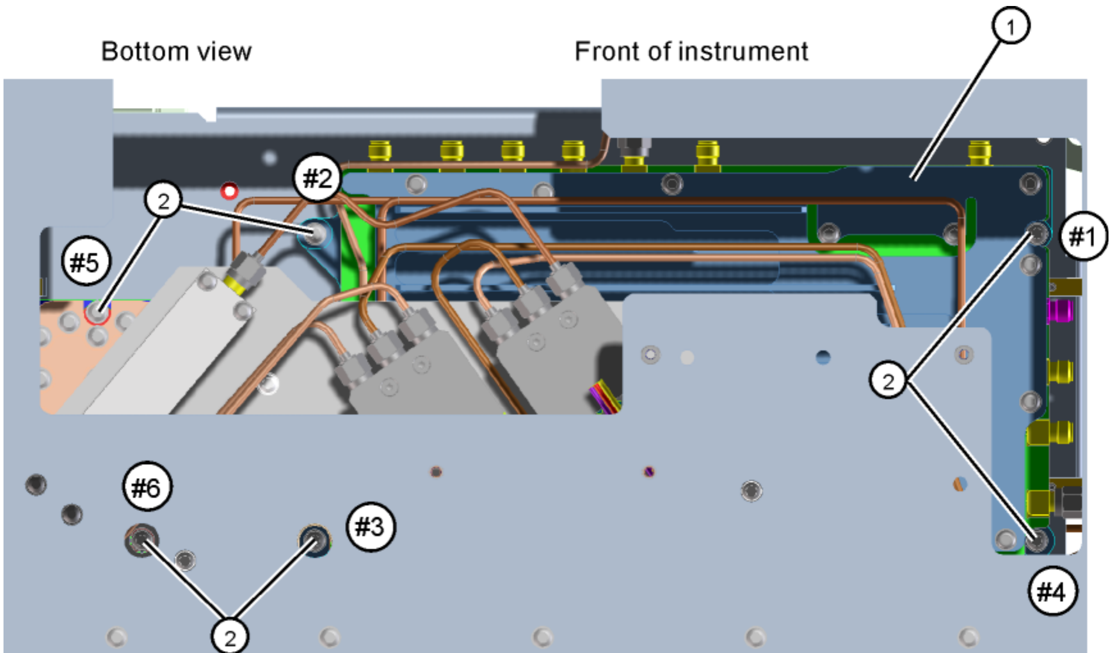
RF_FrontEnd_screws

Replacement

1. Refer to Figure 15-58. Place the Front End assembly into the chassis. From the bottom of the instrument, replace the six screws **(2)** (0515-0372) that attach the Front End assembly **(1)** to the chassis. Torque to 9 inch-pounds in the order shown (#1 to #6).

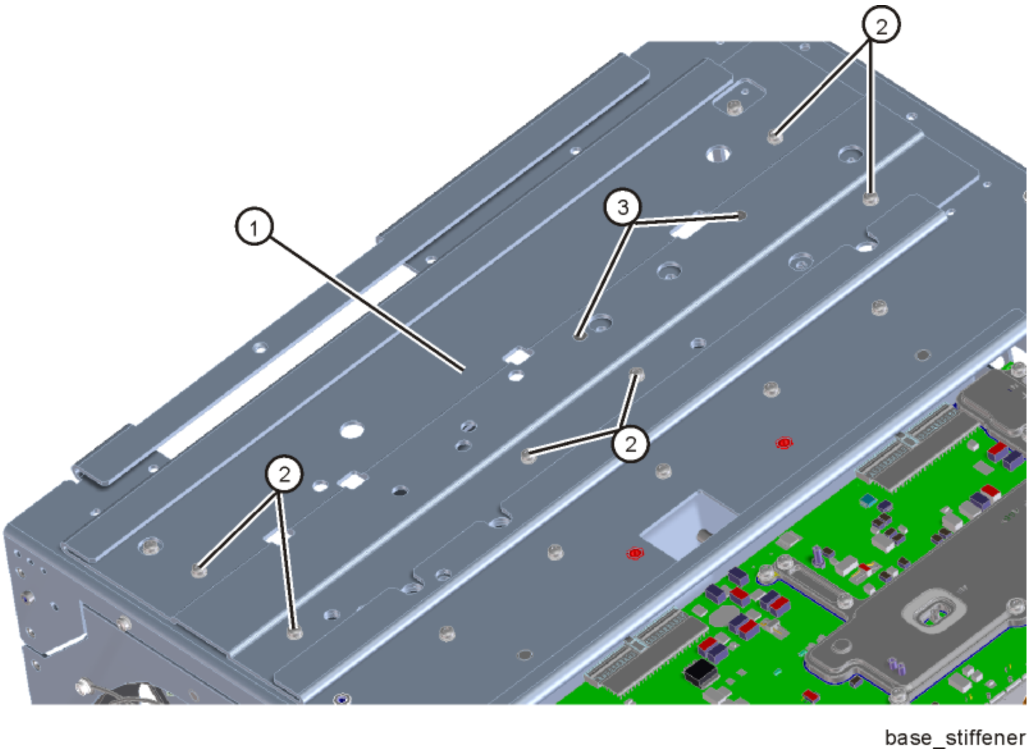
CAUTION Make sure ribbon cable W22 is under the 4 guide tabs on the back of the Front End assembly.

Figure 15-58 Front End Assembly Bottom Screws - Replacement



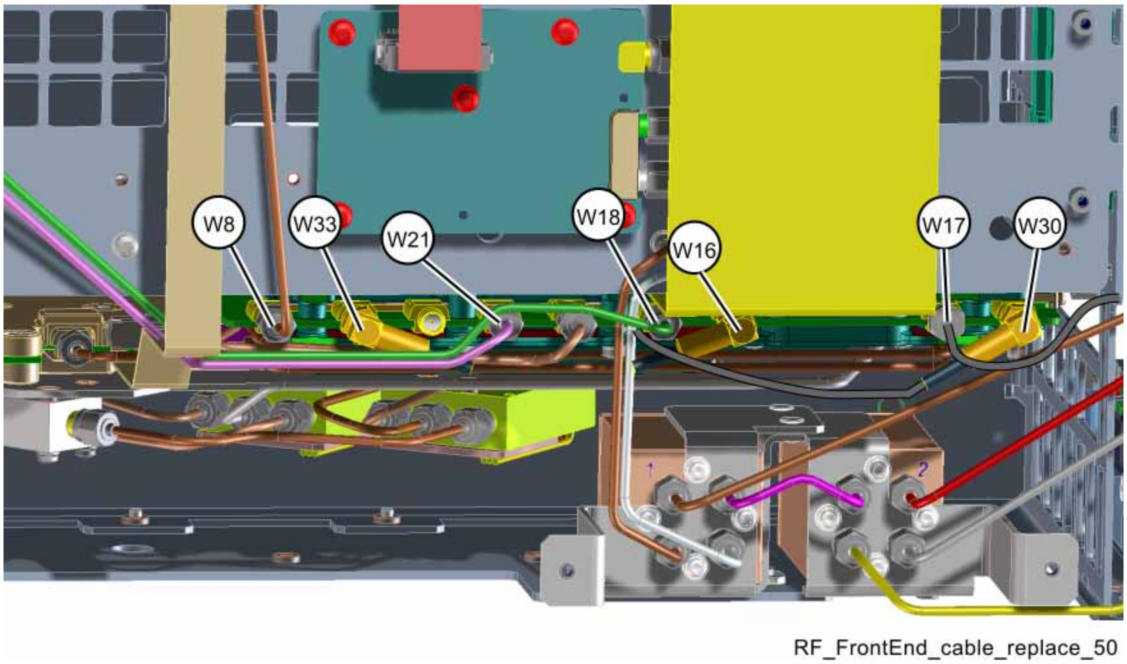
2. Refer to Figure 15-59. Place the chassis base stiffener **(1)** in position on the chassis base. Secure with the six screws **(2)** (0515-0372) and the two screws **(3)** (0515-1946). Torque all screws to 9 inch-pounds.

Figure 15-59 Chassis Base Stiffener Replacement



3. Refer to Figure 15-60. Replace cables W8, W16, W17, W18, W21, W30, and W33. Torque to 10 inch-pounds.

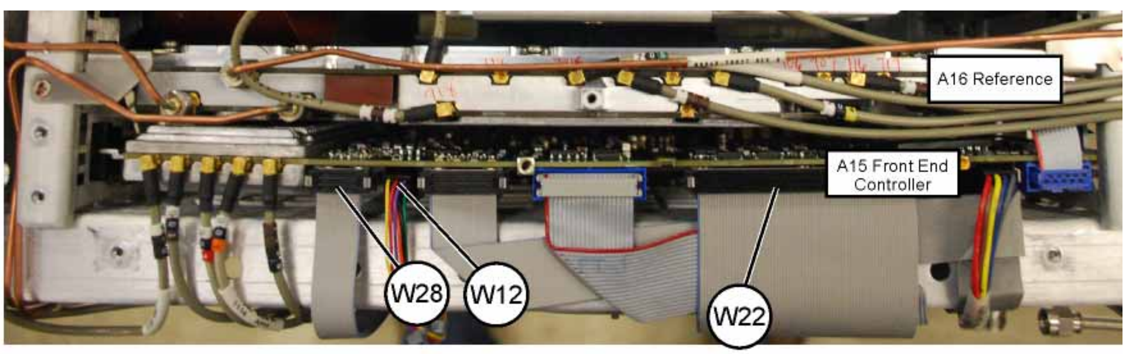
Figure 15-60 Front End Assembly Cables Replacement - Options 544, 550



Item	Keysight Part Number
W8	N9040-20108
W16	8121-2027
W17	N9040-60046
W18	N9040-20113
W21	N9040-20112
W30	8121-2608
W33	8121-1940
W51	N9040-20104
W52	N9040-20106
W54	N9040-20107
W69	N9040-20111

4. Refer to Figure 15-61. Plug ribbon cables W22 and W28, and wire harness W12 back into the Front End Controller board.

Figure 15-61 Front End Controller Board Cables



frontend_cables_uxa

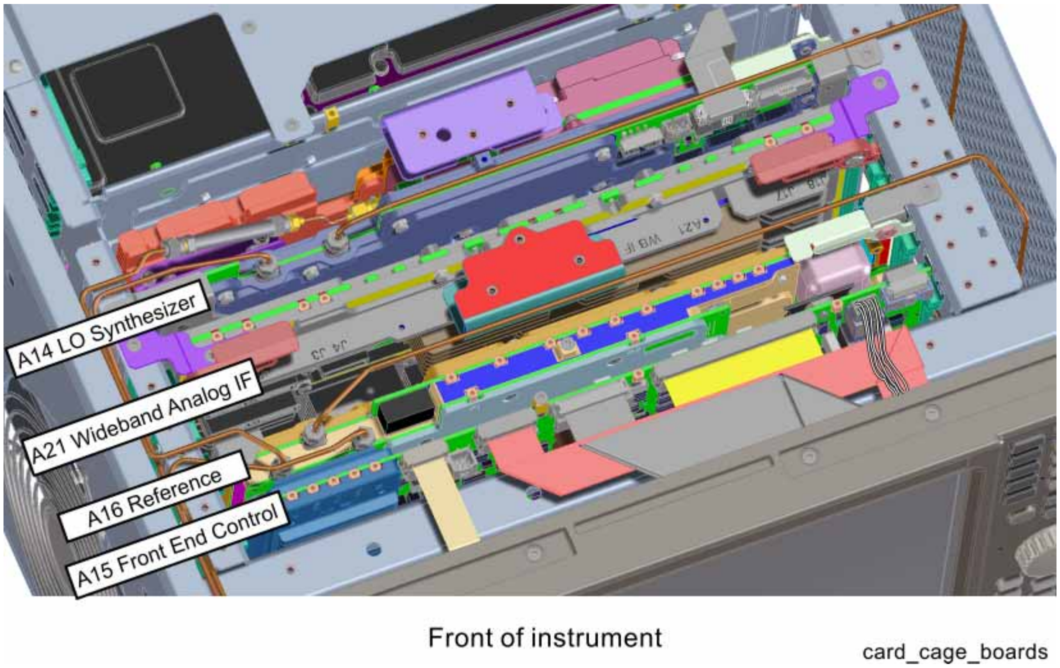
5. Perform step 4 through step 6 in the "Transfer Switches" replacement procedure on page 422 to replace the bracket and switch assembly and front brace.

6. Replace the RF bracket, front panel, and instrument outer case as described on page 378.

Card Cage Boards

The card cage boards are located in the front half of the chassis and consist of the A15 Front End Control, A16 Reference, A21 Wideband Analog I.F. (Option B2X and B5X only), and the A14 L.O. Synthesizer.

Figure 15-62 Card Cage Boards



To gain access to any of the card cage boards for removal, follow these steps:

1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Remove the card cage brace. Perform step 4 in the "Top Brace and Card Cage Brace" removal procedure.

After the part has been replaced, follow these steps:

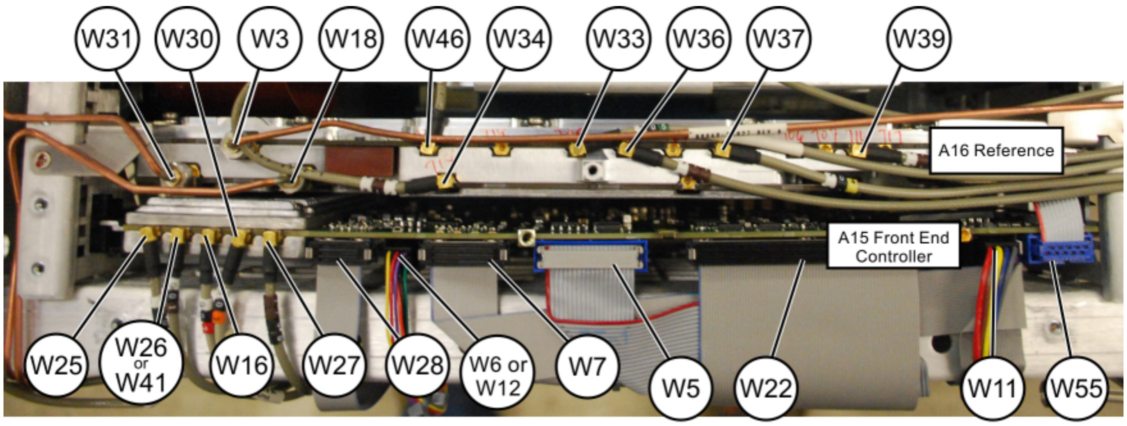
1. Replace the card cage brace as described in the "Top Brace and Card Cage Brace" replacement procedure.
2. Replace the instrument outer case. Refer to the "Instrument Outer Case" replacement procedure.

A15 Front End Control

Removal

1. Refer to Figure 15-62. Locate the A15 Front End Control assembly.
2. Refer to Figure 15-63. Remove cables W5, W7, W11, W12, W16, W22, W25, W26, W27, W28, W30, and W55. The Front End Control assembly can now be removed from the chassis by pulling up to disengage from the front motherboard.

Figure 15-63 Front End Control Cables



front_cables_uxa

Replacement

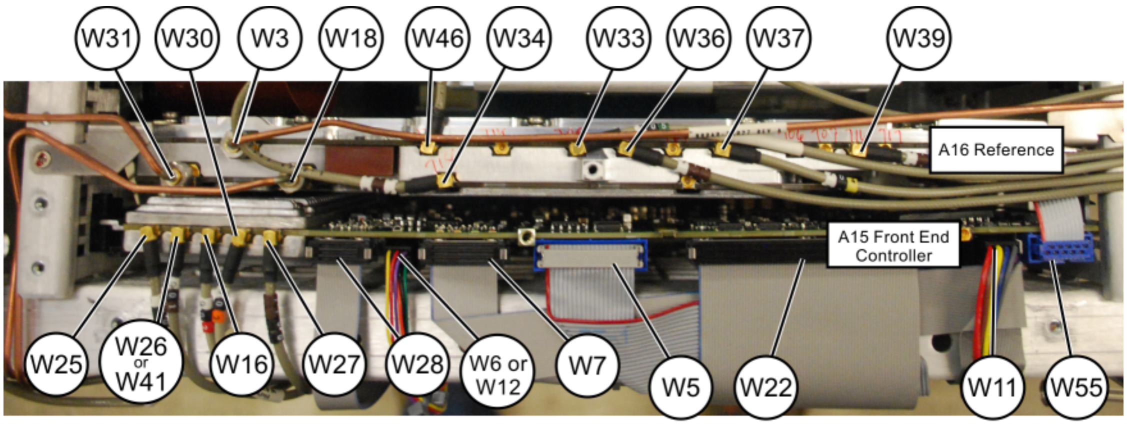
1. Reinstall the Front End Control assembly into the correct slot and push down to mate with the front motherboard.
2. Refer to Figure 15-63. Reinstall cables W5, W7, W11, W12, W16, W22, W25, W26, W27, W28, W30, and W55. You should hear a distinct "snap" when reinstalling the small mmcx cables.

A16 Reference Assembly

Removal

1. Refer to Figure 15-62. Locate the A16 Reference assembly.
2. Refer to Figure 15-64 or Figure 15-65. Remove cables W3, W18, W31, W33, W34 (if present), W36, W37, W39, and W46 or W47.

Figure 15-64 Reference Cables

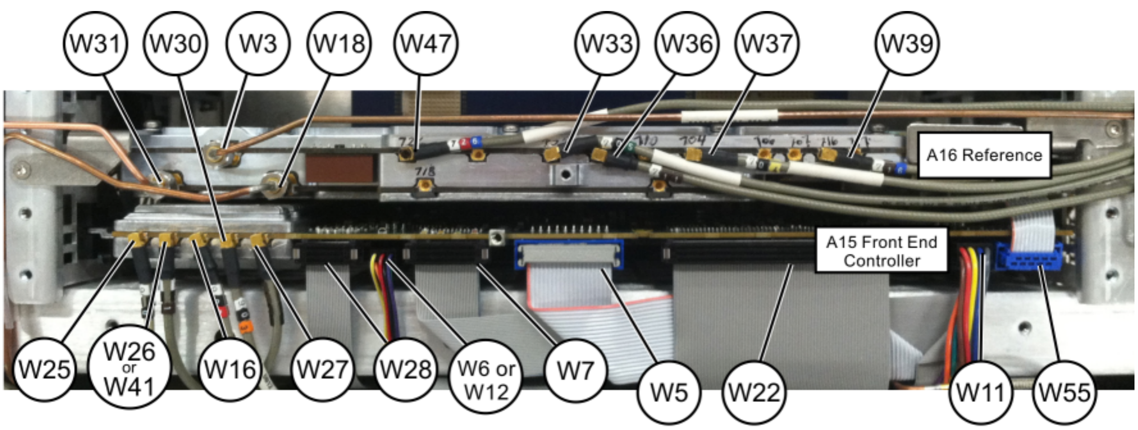


front_cables_uxa

NOTE

The cables will look different for an Option B40 instrument.

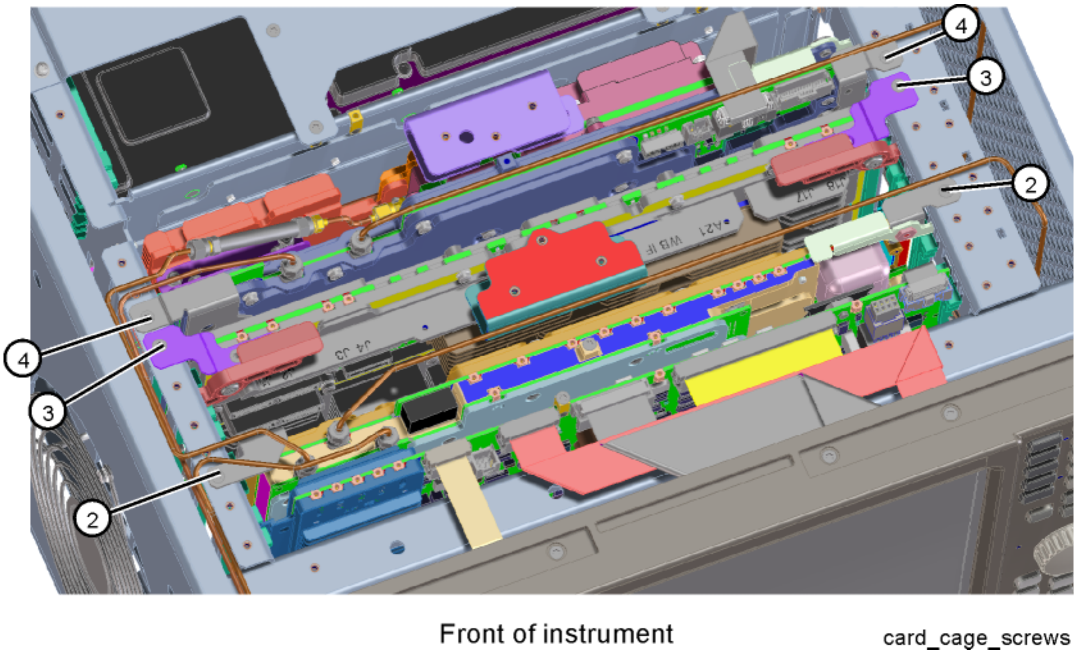
Figure 15-65 Reference Cables - Option B40



front_cables_B40_uxa

3. Refer to Figure 15-66. Remove the two screws **(2)** (0515-1946) that attach the Reference assembly to the chassis. Use the ejector on the Reference assembly to unplug from the motherboard and lift out of the chassis.

Figure 15-66 Card Cage Screws



Replacement

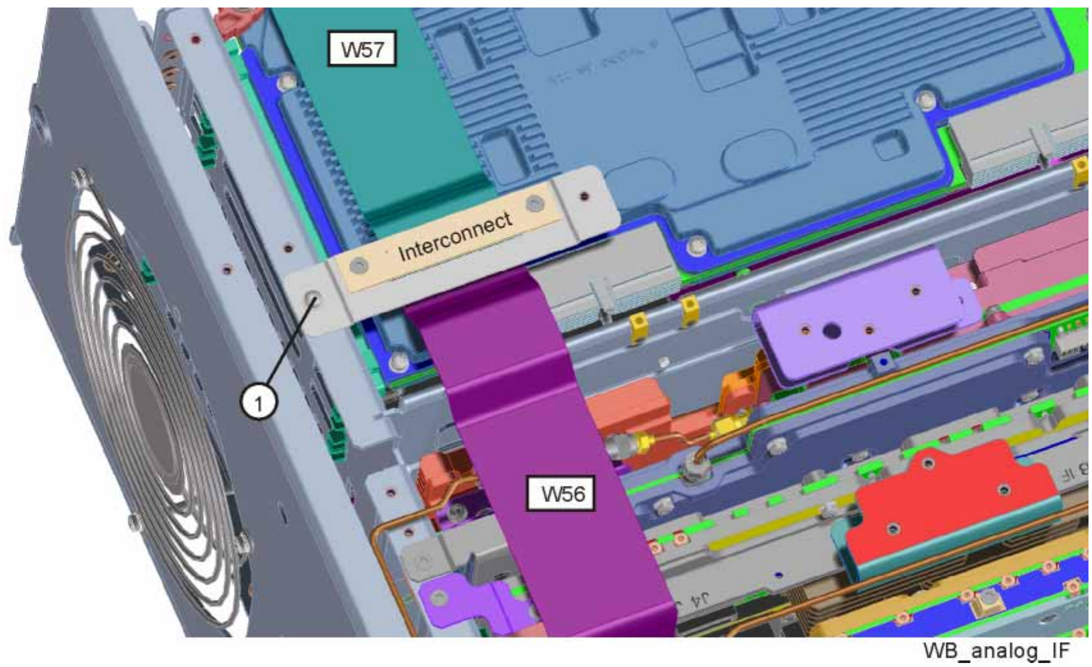
1. Reinstall the Reference assembly into the correct slot and use the ejector to secure and to mate with the motherboard.
2. Refer to Figure 15-66. Replace the two screws **(2)** (0515-1946). Torque to 9 inch-pounds.
3. Refer to Figure 15-64. Reinstall cables W3, W18, W31, W33, W34, W36, W37, W39, and W46. You should hear a distinct "snap" when reinstalling the small mmcx cables. Torque the semi-rigid cables to 10 inch-pounds.

A21 Wideband Analog I.F. Assembly (Option B2X and B5X only)

Removal

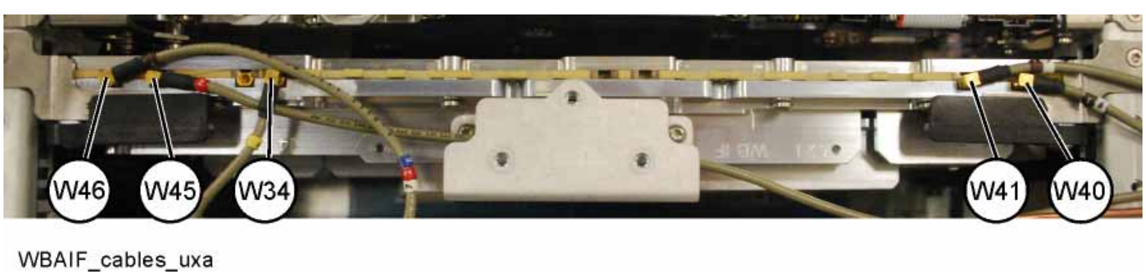
1. To remove the A21 Wideband Analog I.F. assembly it is also necessary to remove the top brace. Perform step 3 in the "Top Brace and Card Cage Brace" removal procedure.
2. Refer to Figure 15-62. Locate the Wideband Analog I.F. assembly **(3)**.
3. Refer to Figure 15-67. Remove ribbon cable W56 by first removing the single screw **(1)** (0515-0372). Then unplug W56 from the interconnection with W57.

Figure 15-67 Wideband I.F. Ribbon Cable



4. Refer to Figure 15-68. Remove cables W34, W40, W41, W45, and W46.

Figure 15-68 Wideband I.F. Cables



5. Refer to Figure 15-66. Remove the two screws **(3)** (0515-1946) that attach the Wideband I.F. assembly to the chassis. Use the ejectors on the Wideband Analog I.F. assembly to unplug from the motherboard and lift out of the chassis.

Replacement

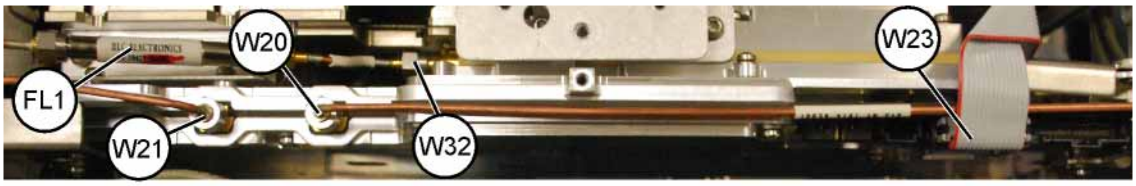
1. Reinstall the Wideband Analog I.F. assembly into the correct slot and use the ejectors to secure and to mate with the motherboard.
2. Refer to Figure 15-66. Replace the two screws **(3)** (0515-1946). Torque to 9 inch-pounds.
3. Refer to Figure 15-68. Reinstall cables W34, W40, W41, W45, and W46. You should hear a distinct "snap" when reinstalling the small mmcx cables.
4. Refer to Figure 15-67. Plug ribbon cable W56 into W57 at the interconnect. Replace the single screw **(1)** (0515-0372). Torque to 9 inch-pounds.
5. Replace the top brace as described in the "Top Brace and Card Cage Brace" replacement procedure.

A14 L.O. Synthesizer

Removal

1. Refer to Figure 15-62. Locate the A14 L.O. Synthesizer assembly **(4)**.
2. Refer to Figure 15-69. Remove cables W20, W21, W23, and W32.

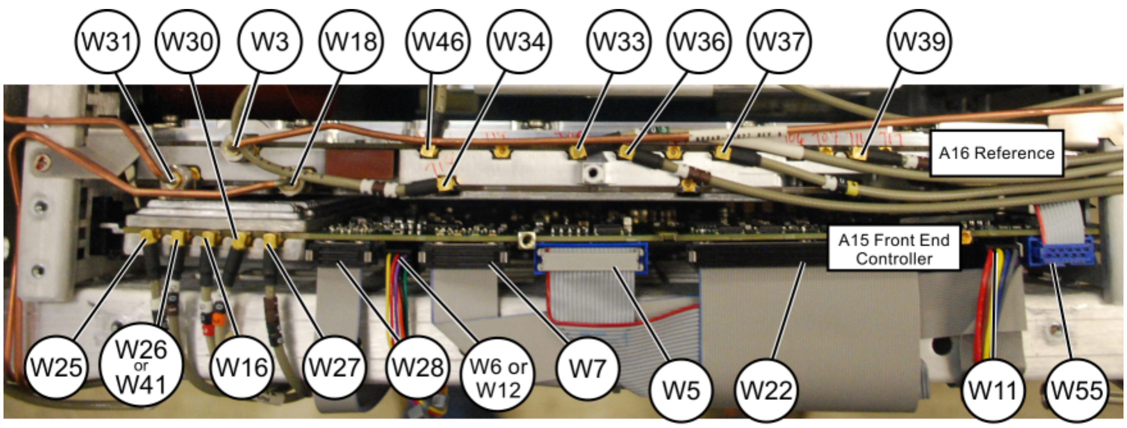
Figure 15-69 L.O. Synthesizer Cables



LO_synth_cables_uxa

3. Refer to Figure 15-70. Remove cable W31 from the Reference board.

Figure 15-70 Reference Board W31 Cable



front_cables_uxa

4. Refer to Figure 15-66. Remove the two screws **(4)** (0515-1946) that attach the L.O. Synthesizer assembly to the chassis. Use the ejector on the L.O. Synthesizer assembly to unplug from the motherboard and lift out of the chassis.

Replacement

1. Reinstall the L.O. Synthesizer assembly into the correct slot and use the ejector to secure and to mate with the motherboard.
2. Refer to Figure 15-66. Replace the two screws **(4)** (0515-1946). Torque to 9 inch-pounds.
3. Refer to Figure 15-69. Reinstall cables W20, W21, W23, and W32. Torque the semi-rigid cables to 10 inch-pounds.
4. Refer to Figure 15-70. Reinstall cable W31. Torque to 10 inch-pounds.

Rear Panel

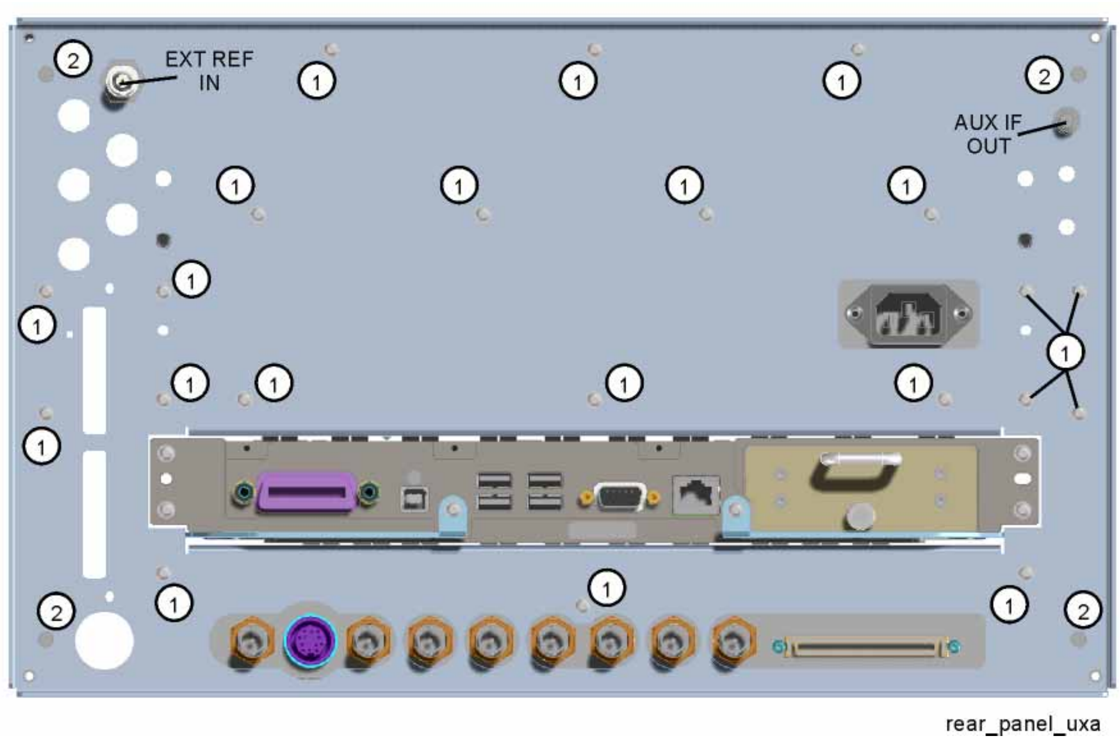
Removal

1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Refer to Figure 15-71. Use a 9/16 inch nut driver to remove the EXT REF IN connector from the rear panel. Use a 5/16 inch nut driver to remove the AUX IF OUT connector from the rear panel.

Serial Number Prefix < 5616

3. Refer to Figure 15-71. Remove the twenty-one screws **(1)** (0515-0372) and the four screws **(2)** (0515-1946). The rear panel can now be removed from the chassis.

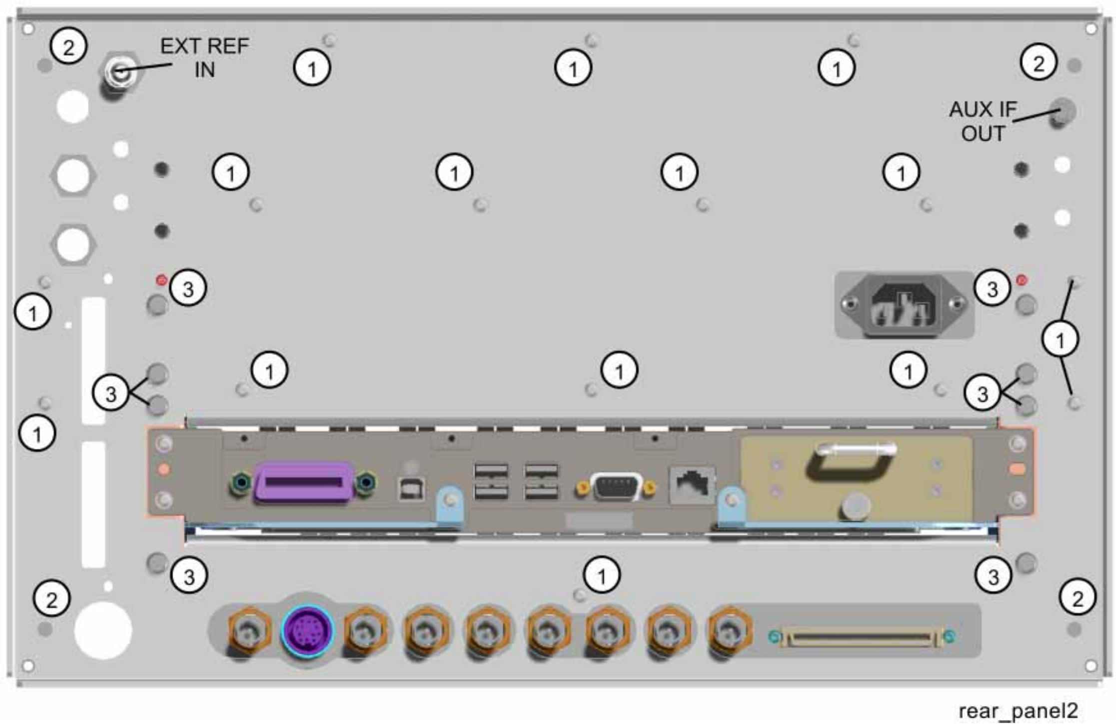
Figure 15-71 Rear Panel Screw Locations
Serial Number Prefix < 5616



Serial Number Prefix ≥ 5616

4. Refer to Figure 15-72. Remove the fifteen screws **(1)** (0515-0372), the four screws **(2)** (0515-1946), and the eight screws **(3)** (0515-0433). The rear panel can now be removed from the chassis.

Figure 15-72 Rear Panel Screw Locations
Serial Number Prefix ≥ 5616



Replacement

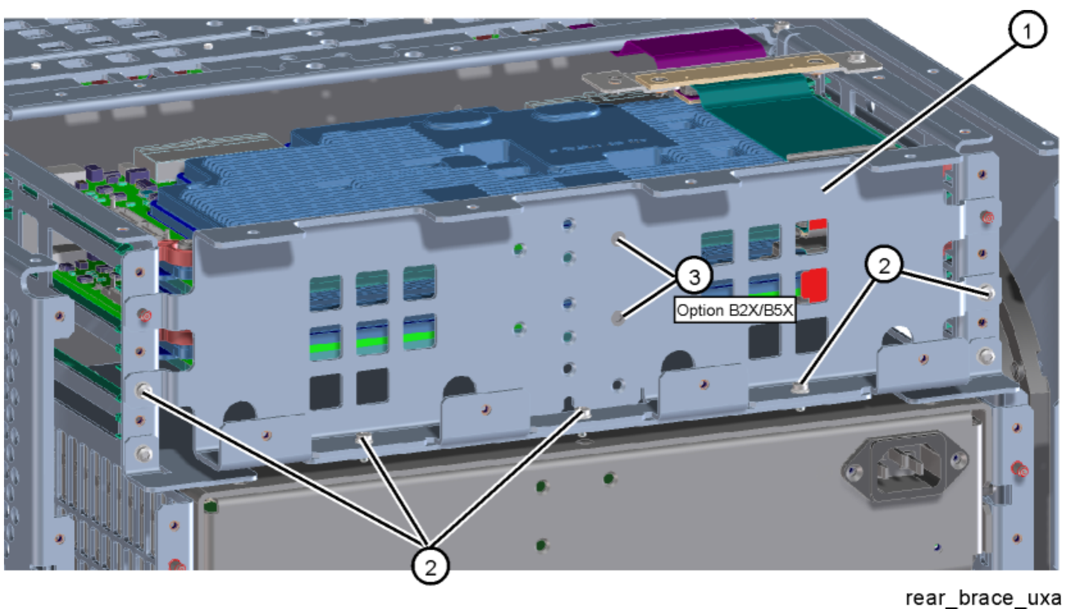
1. Refer to Figure 15-71. Install the EXT REF IN connector and the AUX IF OUT connector through the rear panel ports. Use the lock washers and nuts to secure. Use a 9/16 inch nut driver on the EXT REF IN connector and torque to 21 inch-pounds. Use a 5/16 inch nut driver on the AUX IF OUT connector and torque to 10 inch-pounds. Reinstall the rear panel into position in the chassis.
2. **For Serial Number Prefix < 5616**:
   - Refer to Figure 15-71. Replace the twenty-one screws **(1)** (0515-0372) and the four screws **(2)** (0515-1946). Torque all screws to 9 inch-pounds.
3. **For Serial Number Prefix ≥ 5616:**
   - Refer to Figure 15-72. Replace the fifteen screws **(1)** (0515-0372) and the four screws **(2)** (0515-1946). Torque to 9 inch-pounds.
   - Replace the eight screws **(3)** (0515-0433). Torque to 21 inch-pounds.
4. Replace the instrument outer case. Refer to the “Instrument Outer Case” replacement procedure.

A22 & A23 Wideband Digital I.F. Boards

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. Perform step 3 in the "Top Brace and Card Cage Brace" removal procedure.
4. **For Serial Number Prefix < 5605 Options 508, 513, 526**:
   – Refer to Figure 15-73. Remove the rear brace **(1)** by removing the five screws **(2)** (0515-0372) and the one or two screws **(3)** (0515-1946). Option B2X instruments will only have the top screw, while Option B5X instruments will have both.

Figure 15-73 Rear Brace Removal
Serial Number Prefix < 5605 Options 508, 513, 526



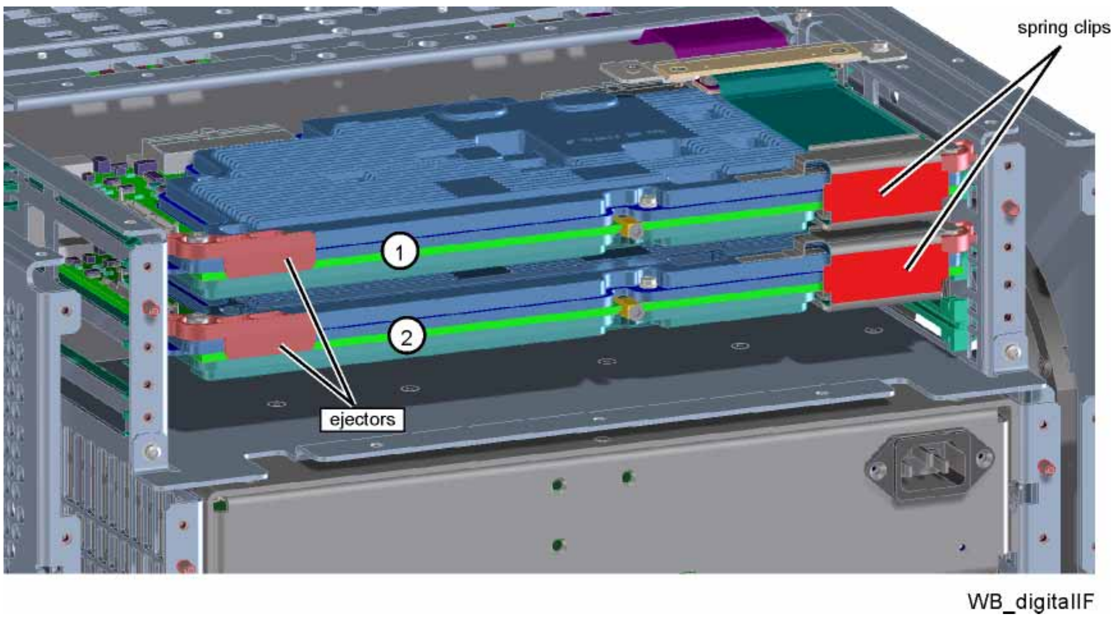
5. For Serial Number Prefix ≥ 5605 and All Options 544 and 550:

– Refer to Figure 15-74. Remove the rear brace **(1)** by removing the four screws **(2)** (0515-0372) and the one or two screws **(3)** (0515-1946). Option B2X instruments will only have the top screw, while Option B5X instruments will have both.

Figure 15-74 Rear Brace Removal
Serial Number Prefix ≥ 5605 and All Options 544 and 550

6. Refer to Figure 15-75. Option B2X instruments will only have the top Wideband Digital I.F. board **(1)**. Option B5X instruments will have both boards **(1)** and **(2)**. Remove the spring clips securing the ribbon cables. Unplug the ribbon cables from each Wideband Digital I.F. board. Use the ejectors to remove the boards from the chassis by sliding them towards the rear of the instrument.

Figure 15-75 Wideband Digital I.F. Boards Removal



Replacement

1. Refer to Figure 15-75. Reinstall the Wideband I.F. boards into the slots as shown. Use the ejectors to mate the boards to the rear motherboard and lock into place.

2. Reconnect the ribbon cables to the boards. Place the spring clips into place to hold the ribbon cable.

3. **For Serial Number Prefix < 5605 Options 508, 513, 526**:

   – Refer to Figure 15-73. Reinstall the rear brace **(1)** into position. Secure with the five screws **(2)** (0515-0372) and the one or two screws **(3)** (0515-1946). Torque all screws to 9 inch-pounds.

4. **For Serial Number Prefix** ≥ **5605 and All Options 544 and 550**:

   – Refer to Figure 15-74. Reinstall the rear brace **(1)** into position. Secure with the four screws **(2)** (0515-0372) and the one or two screws **(3)** (0515-1946). Torque all screws to 9 inch-pounds.

5. Replace the top brace as described in the “Top Brace and Card Cage Brace” replacement procedure.

6. Replace the instrument outer case. Refer to the “Instrument Outer Case” replacement procedure.

A27 H1G Assembly (Option H1G)

There are two versions of Option H1G hardware that have been installed in the instrument. The early version is no longer available. Only the latest version is available for repair purposes.

The early version is identified by the presence of the rear panel connector IF 2 IN, and a semi-rigid jumper cable that connects IF 2 IN to IF 2 OUT.

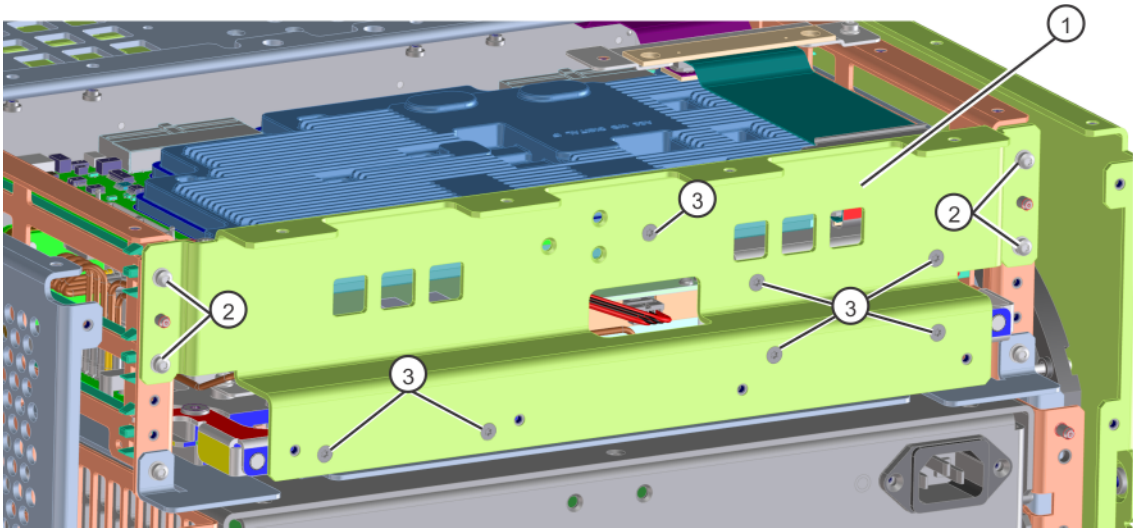
The latest version of Option H1G hardware only has the rear panel IF 2 OUT connector. The jumper cable is not present. Also the coaxial cable input /output connections on the H1G assembly have been re-color coded, which means you will need to remove and replace color bands on some flex coax cables when replacing the early H1G hardware with the latest version. The latest H1G assembly is provided as a replacement kit that includes a hole plug and the cable color bands. These color bands and hole plug are only required if you are replacing the early version H1G assembly.

Replacement process when the H1G assembly is the early version

Removal

1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Remove the top brace. Perform step 3 in the "Top Brace and Card Cage Brace" removal procedure. Save the screws for reuse.
3. On the rear panel remove the semi-rigid jumper cable between IF 2 IN and IF 2 OUT connectors. Discard this cable.
4. Remove the IF 2 IN and IF 2 OUT connector nuts and washers. Use a 5/16-inch wrench. One of these nuts and washers will be reused.
5. Remove the screws from the rear panel and carefully pull away from the instrument. Avoid damaging the cables still attached. Remove the IF 2 IN and IF 2 OUT cables from the rear panel.
6. Refer to Figure 15-76. Remove the rear brace **(1)** by removing the four screws **(2)** (0515-0372) and the seven screws **(3)** (0515-1946).

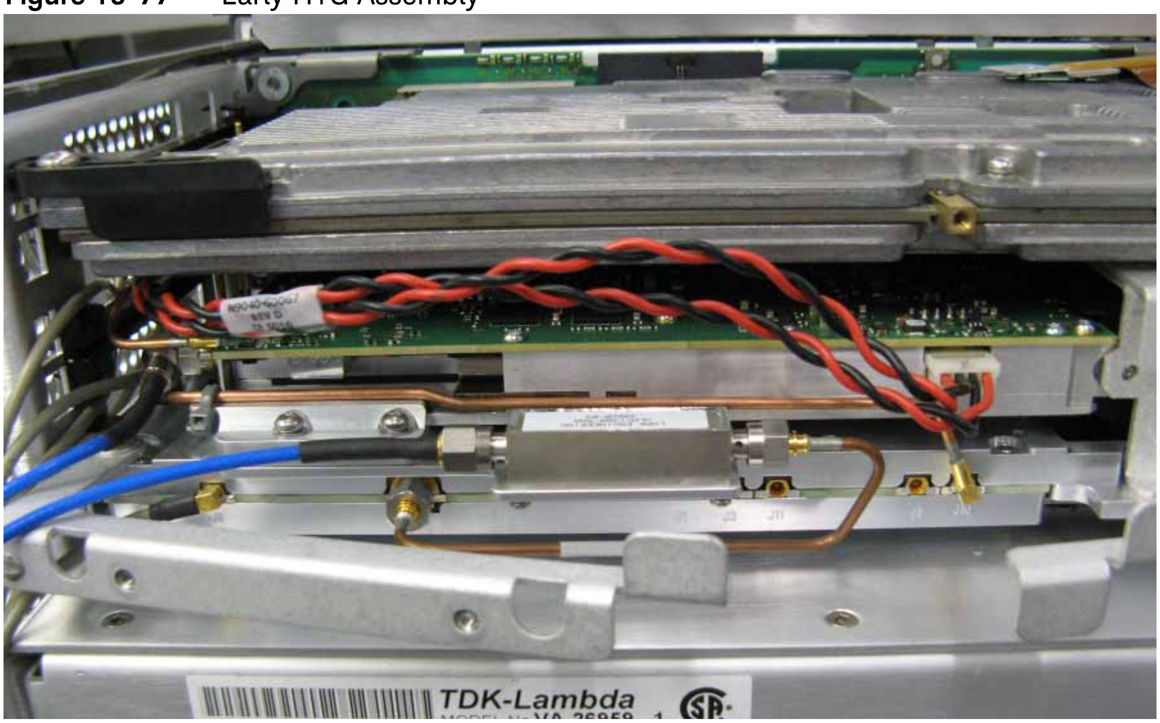
Figure 15-76 Rear Brace Removal



7. Locate the H1G assembly and use the board extractor handles to loosen the board slightly and allow access to the coax cables attached to the board.

8. Refer to Figure 15-77.Remove the snap-in cables from the board assembly. Leave the blue cables attached for removal later.

Figure 15-77 Early H1G Assembly



9. Remove the H1G assembly from the chassis, being careful to not pinch the gray coax cables on the left side of the instrument.

10. Remove the blue cable, 8121-2866, from the H1G assembly filter using a 5/16-inch wrench. Discard this cable

11. Remove the other blue cable, 8121-2867, from the H1G assembly. Save this cable for reuse.

Replacement

1. Locate the cable marker color bands in the kit. Change the color code bands on the coax cables disconnected earlier.

   On the cable currently marked with the '9" color code band, remove the '9" band and install "1" and a "3" color bands to label this cable 13.

   When installing the color bands, first spread the color band to relax the plastic, then quickly push the color band onto the cable.

2. On the cable currently marked with the "3" color band, remove the "3' and install "1" and "5" color bands to label this cable 15.

3. On the cable currently marked with the "1" color band, install "6" color band to make this a "16" cable. There is an extra '1" color band in the kit if you need to replace the existing color band.

4. On the rear panel BNC cable Trigger 3 IN, attach two "1" color bands next to the mmcx connector to label this cable "11".

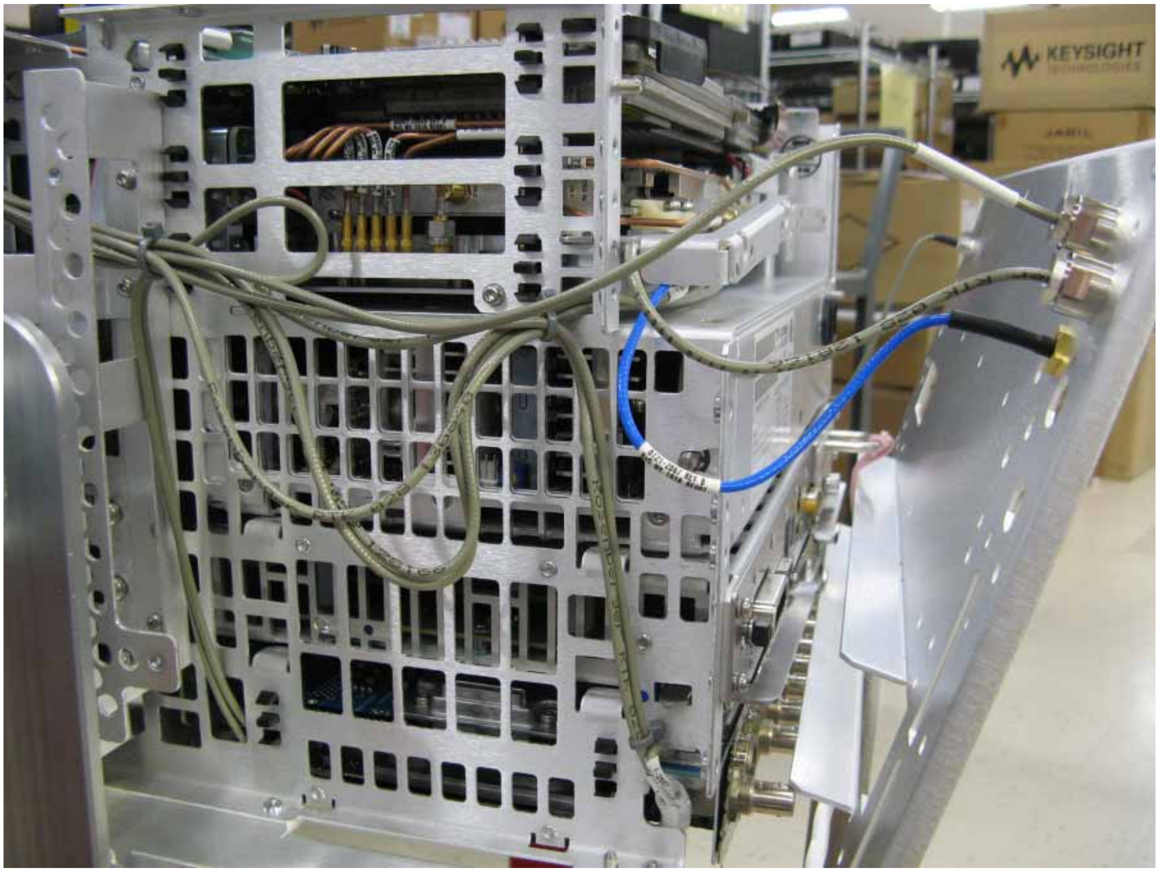
5. Locate the replacement H1G assembly in the kit, remove it from the shipping container and carefully insert it into the instrument. Leave the board extractor handles open which makes cable reattachment easier.

6. Locate the blue 8121-2867 cable removed earlier and attach the sma end to J12 of the H1G assembly. Use 5/16-inch wrench and torque to 10 inch-pounds. The cable will route under the left board extractor arm. The other end will be attached to the IF 2 OUT hole in the rear panel later.

7. Connect the "11" cable, from the rear panel to J11 on the H1G assembly. This cable routes over the left board extractor arm.

8. Refer to Figure 15-78. Connect the 13, 15 and 16 color cables to the H1G assembly J13, J15 and J16. Assure the cables snap in securely. You may need to remove the instrument right side RF cover and cut the cable ties if you need to adjust the cable length, so the cables connect easily and the cable are routed so any excess length is at the instrument side panel and not at the rear panel. Replace the cable ties after cable re-routing.

Figure 15-78 Cable Routing



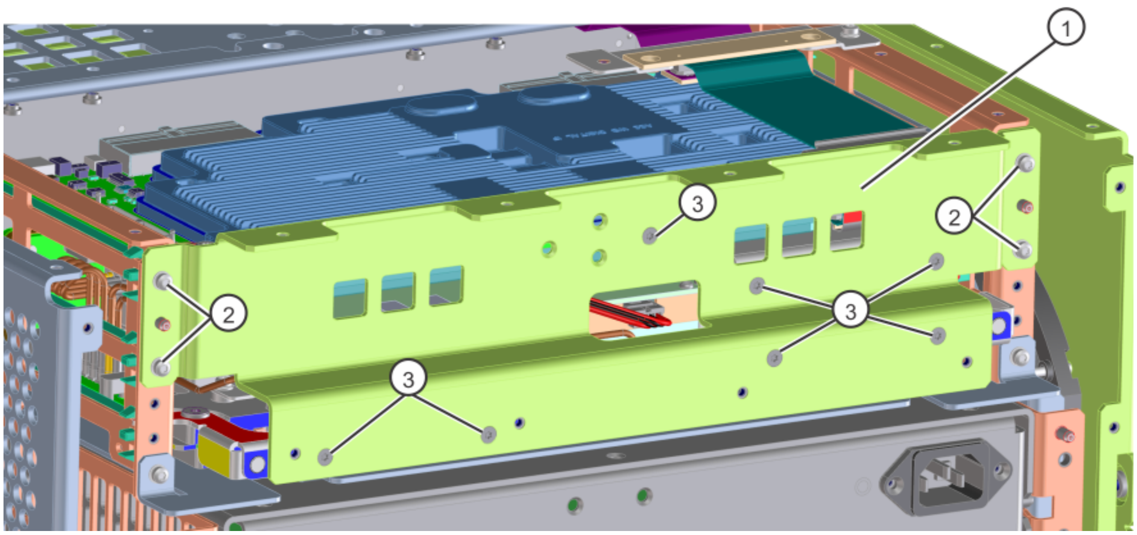
9. Locate the blue cable connected to J12 on the H1G assembly and install the sma end through the rear panel hole marked IF 2 OUT. Secure with the nut and washer removed earlier. Torque to 10 inch-pounds using a 5/16-inch wrench.
10. Re install the rear brace and rear panel using the screws removed earlier.
11. Locate the black plastic hole plug in the kit and install in the IF 2 IN hole on the rear panel.
12. Re install the top brace and instrument enclosure.

Replacement process when the H1G assembly is the later version

Removal

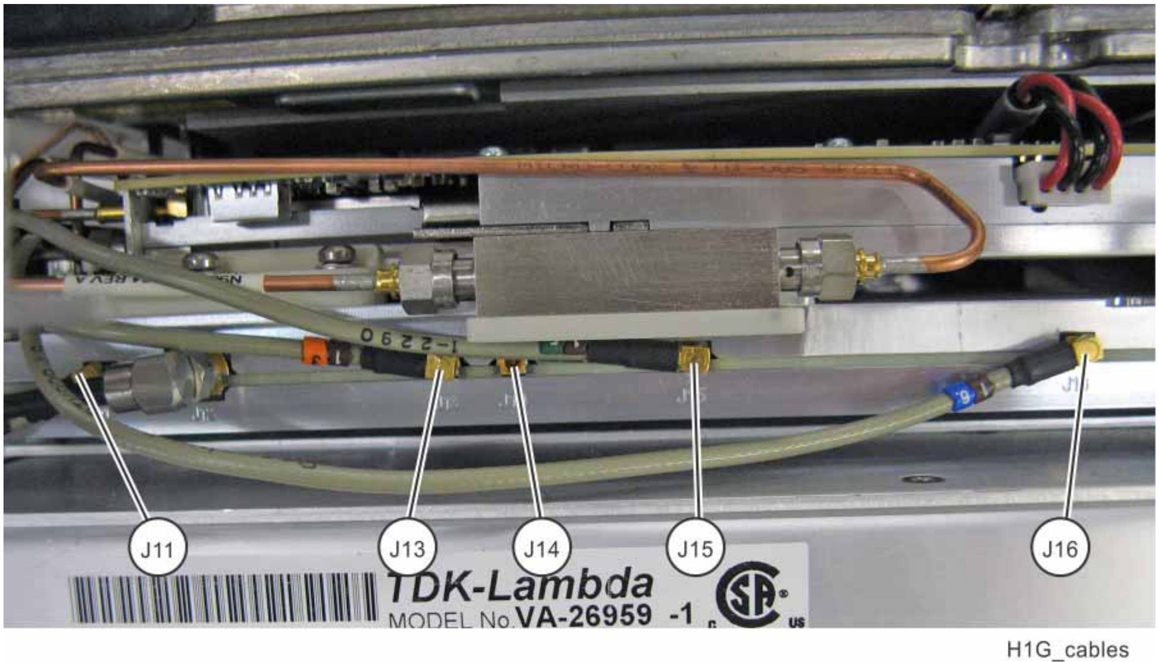
1. Remove the instrument outer case. Refer to the “Instrument Outer Case” removal procedure.
2. Remove the top brace. Perform step 3 in the “Top Brace and Card Cage Brace” removal procedure. Save the screws for reuse.
3. Remove the screws from the rear panel and carefully pull away from the instrument. Avoid damaging the cables attached.
4. Refer to Figure 15-79. Remove the rear brace **(1)** by removing the four screws **(2)** (0515-0372) and the seven screws **(3)** (0515-1946). Save the screws for reuse.

Figure 15-79 Rear Brace Removal



5. Locate the H1G assembly and use the board extractor handles to loosen the board slightly and allow access to the coax cables attached to the board.
6. Remove the snap-in cables from the board assembly. Remove the blue cable from the H1G assembly J12 using a 5/16-inch wrench. See Figure 15-80.

Figure 15-80 H1G Cable Connections



7. Remove the H1G assembly from the chassis, being careful to not pinch the gray coax cables on the left side of the instrument.

Replacement

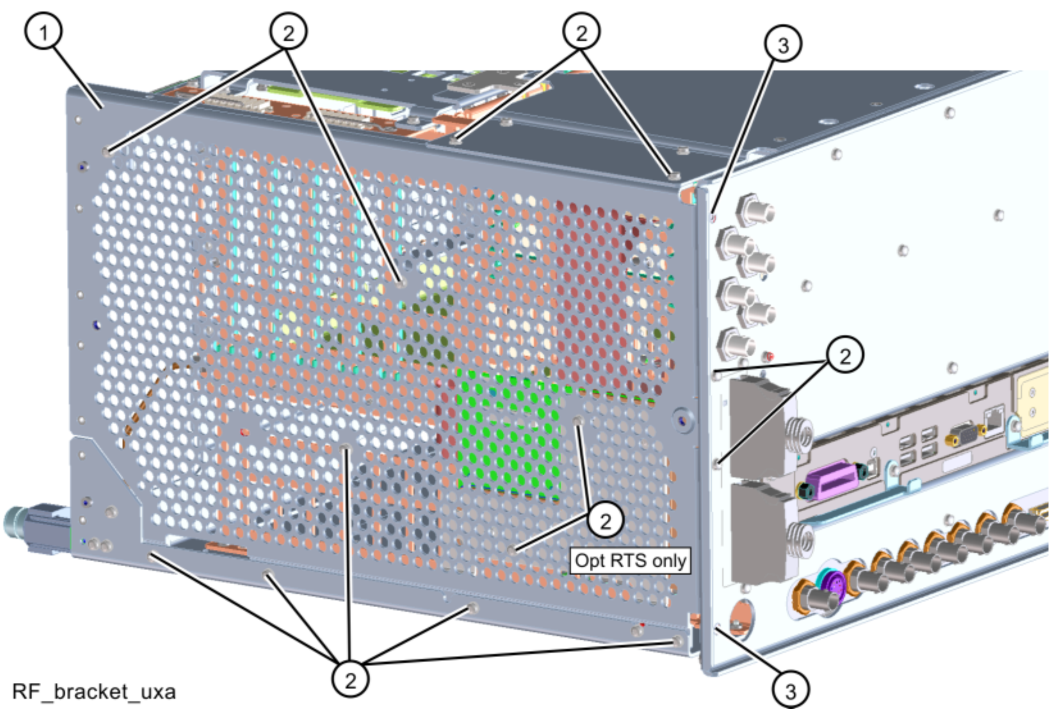
1. Locate the replacement H1G assembly in the kit, remove it from the shipping container and carefully insert it into the instrument. Leave the board extractor handles open which makes cable reattachment easier.
2. Locate the blue cable connected to the rear panel and route under the left board extractor arm. Use a 5/16-inch wrench and torque to 10 inch-pounds.
3. Connect the "11" cable, from the rear panel Trigger 3 IN to J11 on the H1G assembly. This cable routes over the left board extractor arm.
4. Connect the 13, 15 and 16 color cables to the H1G assembly J13, J15 and J16. Assure the cables snap in securely.
5. Re install the rear brace and rear panel using the screws removed earlier.
6. Re install the top brace and instrument enclosure.

A28 Wideband Extension Board (Option RTS)

Removal

1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Remove the top brace. Perform step 3 in the "Top Brace and Card Cage Brace" removal procedure.
3. **For Serial Number Prefix < 5605:**
   - Refer to Figure 15-81. Remove the RF bracket **(1)** by removing the thirteen screws **(2)** (0515-0372), and the two screws **(3)** (0515-1946), using the T-10 driver.

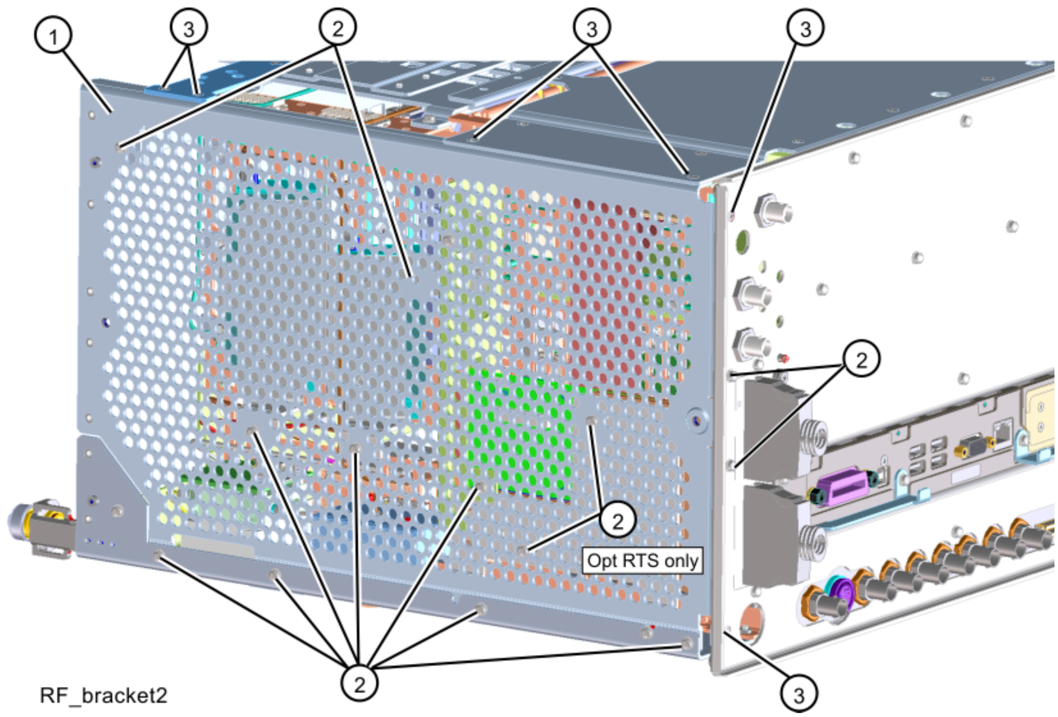
Figure 15-81 RF Bracket Removal, Serial Number Prefix < 5605



4. **Serial Number Prefix ≥ 5605:**

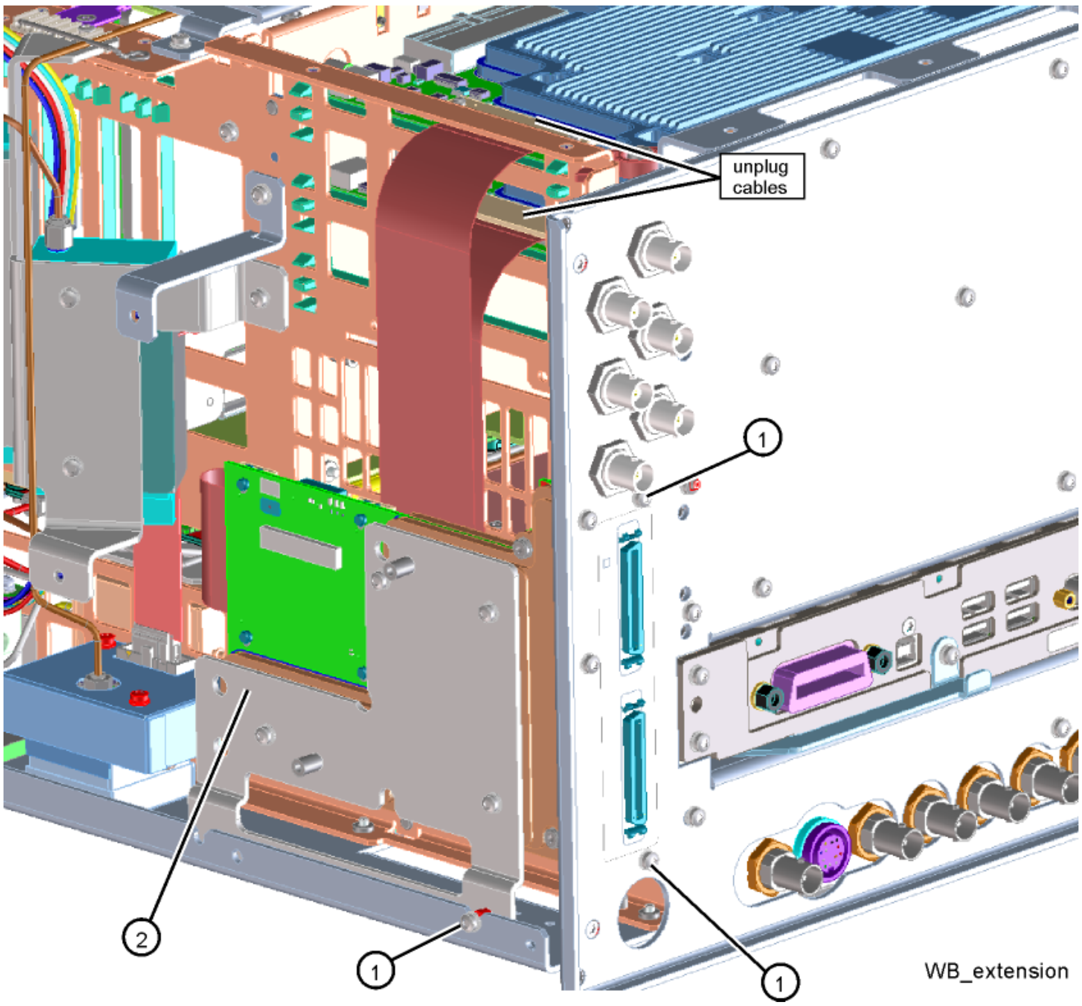
   – Refer to Figure 15-82. Remove the RF bracket **(1)** by removing the thirteen screws **(2)** (0515-0372), and the six screws **(3)** (0515-1946), using the T-10 driver.

Figure 15-82 RF Bracket Removal, Serial Number ≥ Prefix 5605



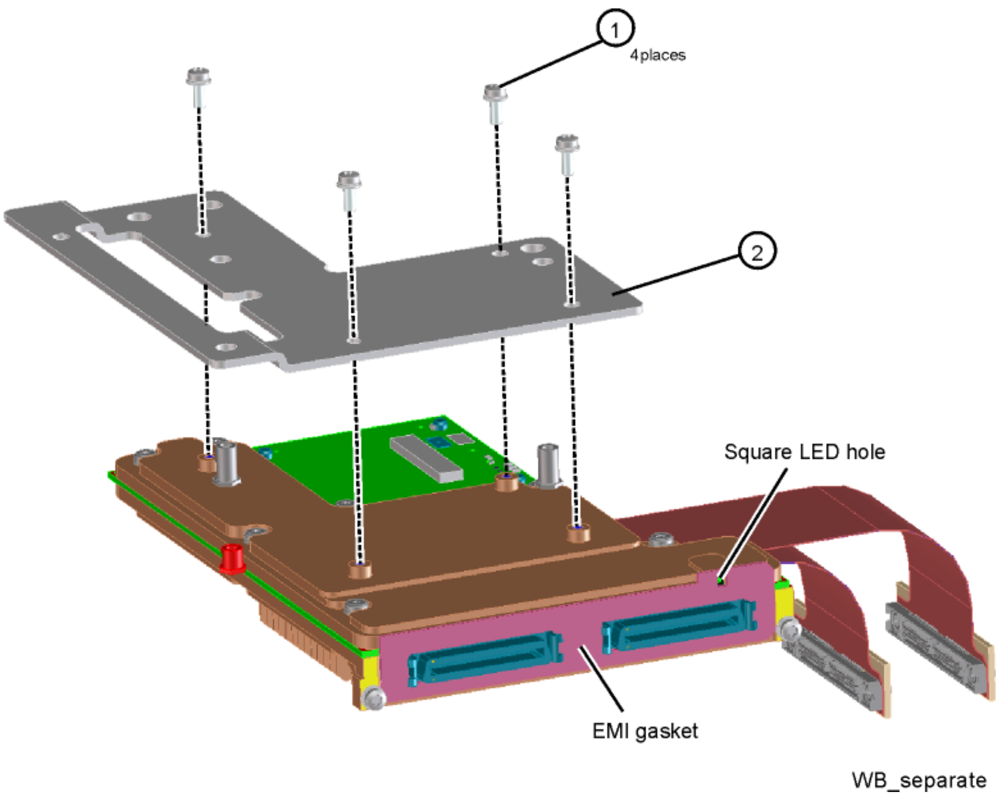
5. Refer to Figure 15-83. Option B2X instruments will only have the top Wideband Digital I.F. board. Option B5X instruments will have both boards. Unplug the flex circuit cables from each Wideband Digital I.F. board at the location shown. Remove the three screws **(1)** attaching the Wideband Extension board **(2)** to the chassis. The A28 Wideband Extension board can now be removed from the chassis.

Figure 15-83 Wideband Extension Board Removal



6. Refer to Figure 15-84. To separate the bracket **(2)** from the Wideband Extension board, remove the four screws **(1)** (0515-0372).

Figure 15-84 Wideband Extension Board and Bracket Separation



7. Attach the bracket to the new Wideband Extension board with the four screws. Torque to 9 inch-pounds.

8. Remove the flex circuit cable(s) from the old board and attach to the new Wideband Extension board, taking care to connect them to the same connectors as the old board. Refer to Figure 15-87. Option B2X instruments will have one flex cable. Option B5X instruments will have two flex cables.

9. When replacing the EMI gasket, notice the gasket has a small square hole and needs to be aligned with the square hole on the Wideband Extension Board casting. There is an LED in the casting, and the small square hole allows the LED to be visible from the rear panel.

   The gasket is fragile. Carefully peel off the backing from the gasket and apply the sticky side of the gasket over the two Wideband Extension board connectors.

Replacement

1. Refer to Figure 15-85 and Figure 15-86. The flex circuit cables will need to be routed as shown.

Figure 15-85 Flex Circuit Routing - 1

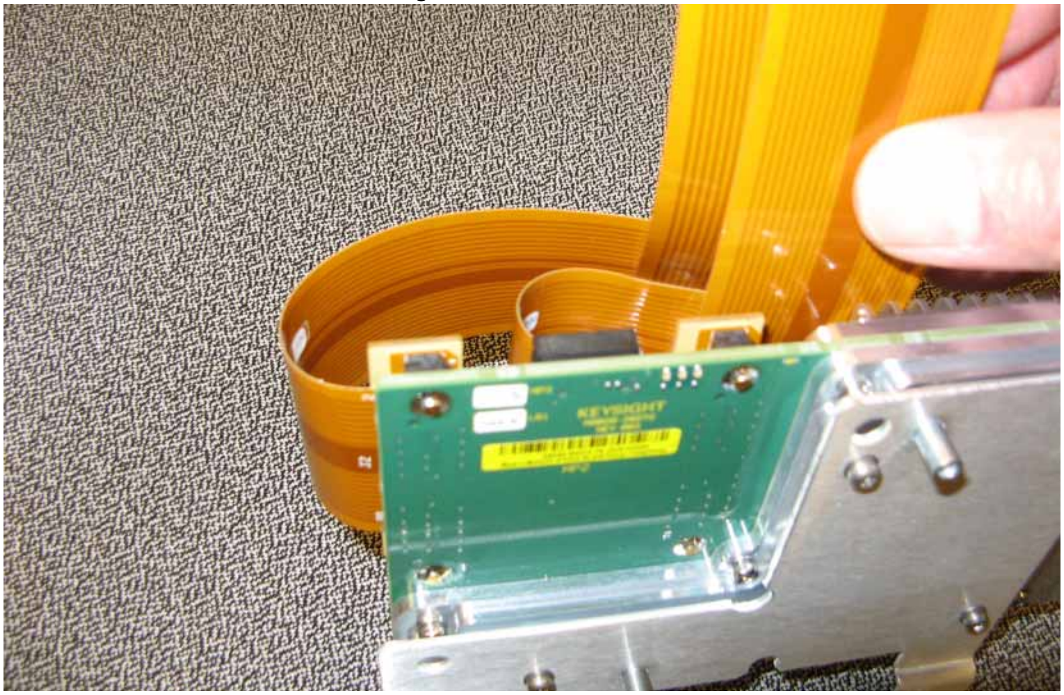
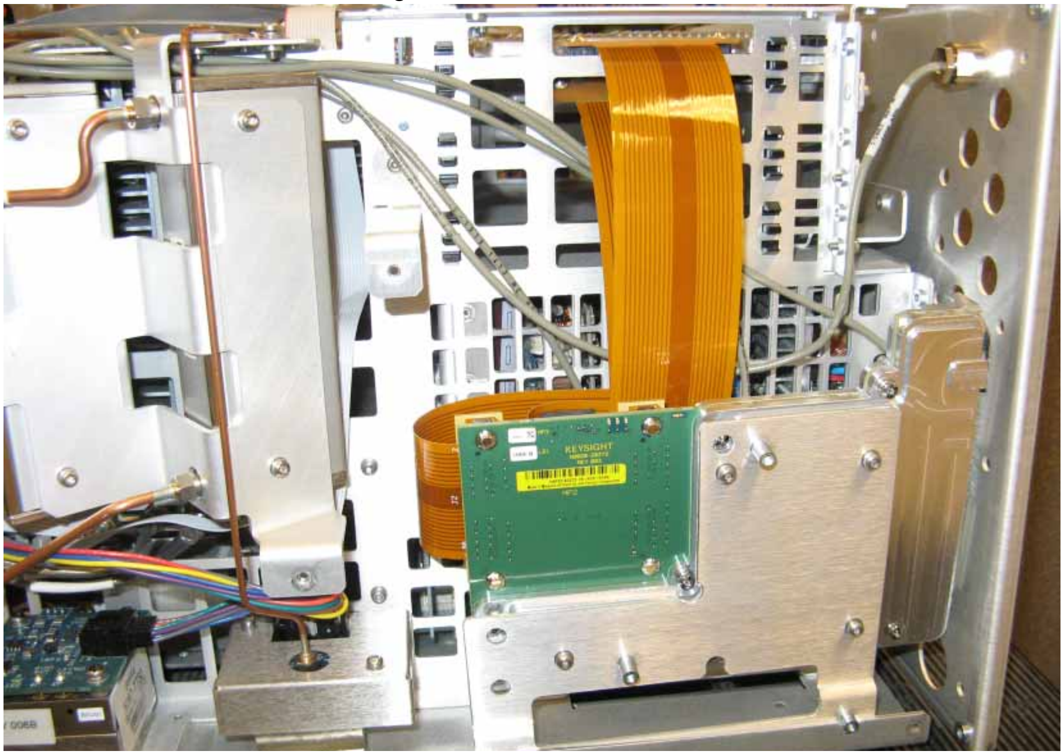


Figure 15-86 Flex Circuit Routing - 2

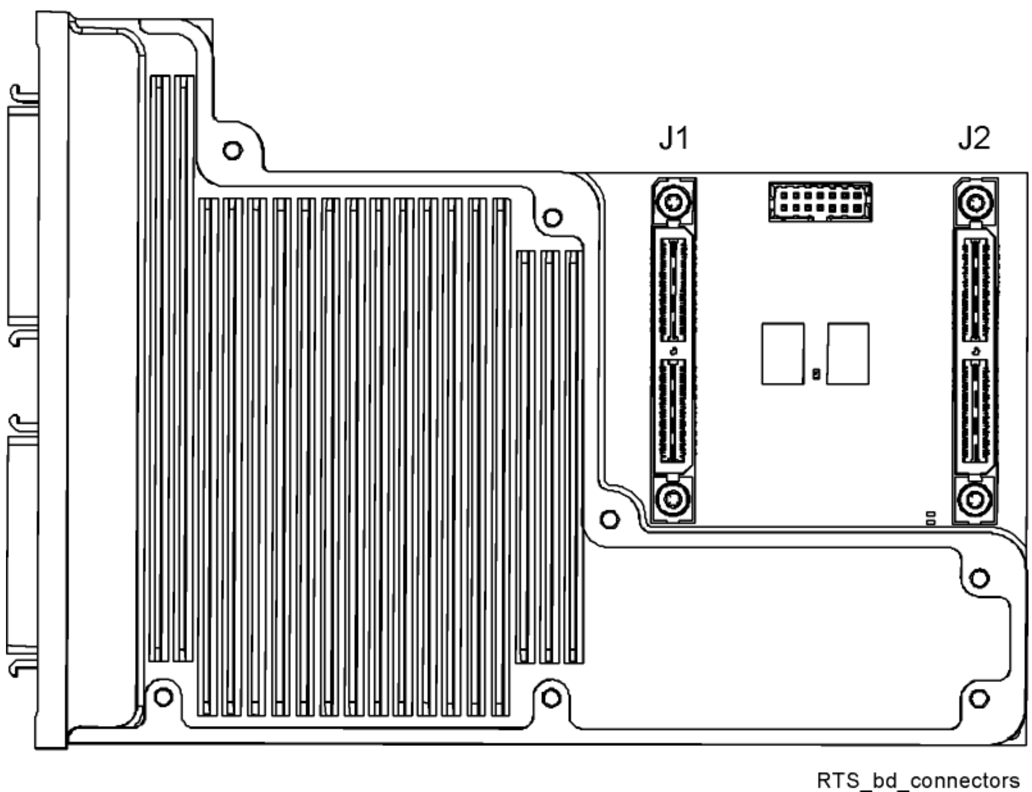


2. Refer to Figure 15-83. Place the W28 Wideband Extension board into the chassis in the position shown. Attach to the chassis with the three screws **(1)**. Torque to 9 inch-pounds.

3. Refer to Figure 15-87. Connect the flex circuit cables to the Wideband Digital boards in the card cage. If the UXA has only the top WB DIF board, connect the flex circuit cable from the Wideband Extension J1 to the connector on the WB Digital IF assembly.

   If the UXA has two WB Digital IF boards, connect the flex circuit attached to the Wideband Extension J2 (J2 is connector is on the edge of the Wideband Extension) to the bottom WB Digital IF board in the card cage. Connect the other flex circuit from the WB Digital IF Extension J1 to the top WB Digital IF board in the card cage.

Figure 15-87 Wideband Extension Board Connectors



4. Replace the RF panel as described on pages page 451 and page 452.

5. Replace the top brace. Refer to the "Top Brace and Card Cage Brace" replacement procedure.

6. Replace the instrument outer case. Refer to the "Instrument Outer Case" replace procedure.

A6 Power Supply

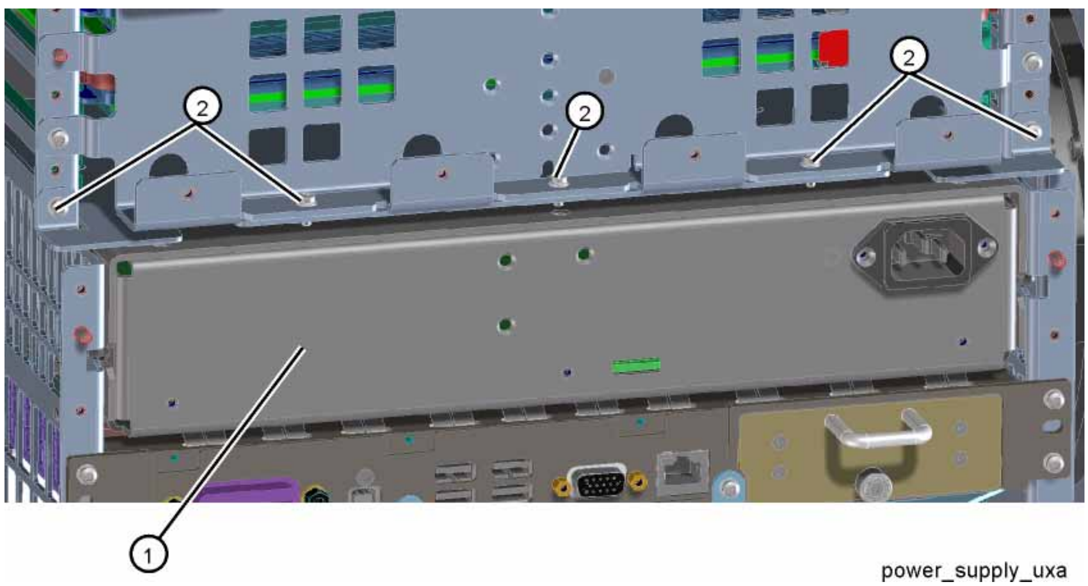
Removal

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. Perform step 3 in the "Top Brace and Card Cage Brace" removal procedure.

Serial Number Prefix < 5605 Options 508, 513, 526

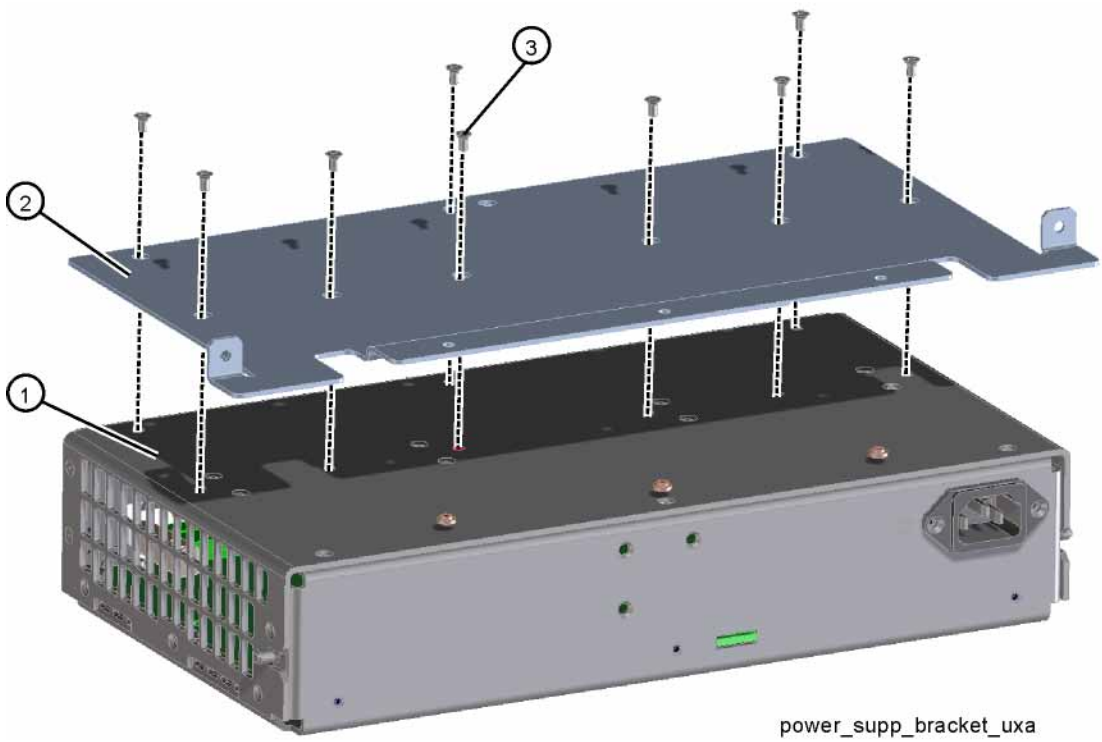
1. Refer to Figure 15-88. Remove the five screws **(2)** (0515-0372) that attach the A6 power supply **(1)** to the chassis. The power supply can now be removed by sliding it out of the rear of the chassis.

Figure 15-88 Power Supply Removal
Serial Number Prefix < 5605 Options 508, 513, 526



2. If replacing the power supply, the supply bracket will need to be removed from the old power supply and installed on the new one. Refer to Figure 15-89. Remove the nine screws **(3)** (0515-1946) that attach the power supply bracket **(2)** to the A6 power supply **(1)**. When reinstalling the bracket torque the screws to 9 inch-pounds.

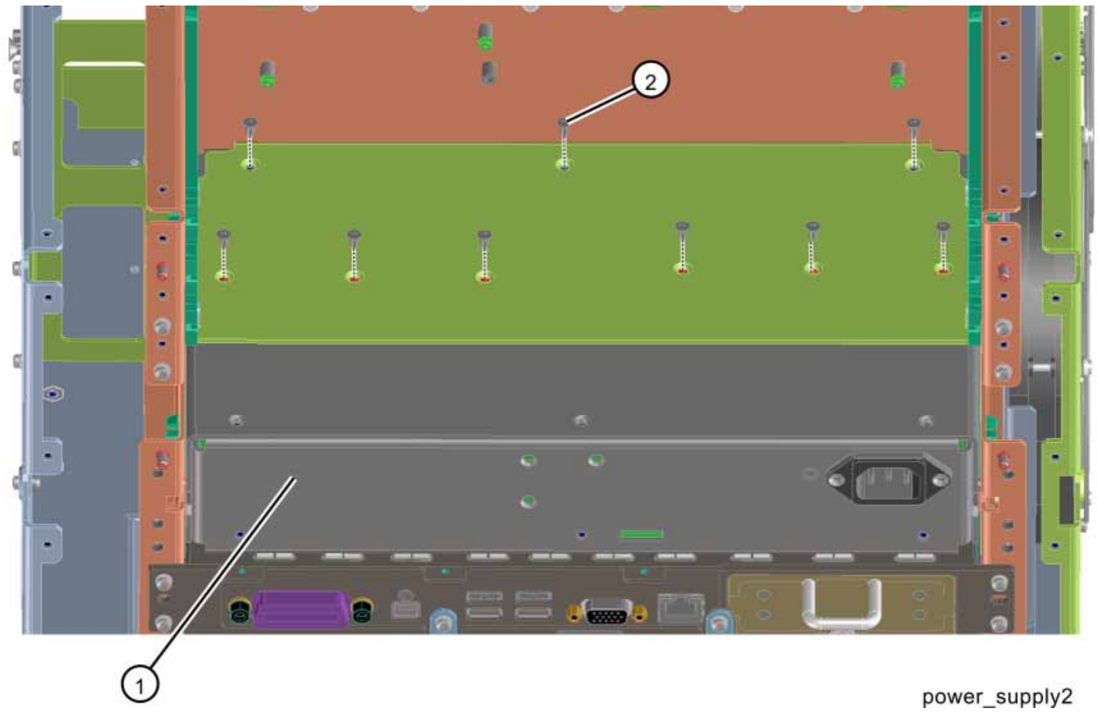
Figure 15-89 Power Supply Bracket Separation
Serial Number Prefix < 5605 Options 508, 513, 526



Serial Number Prefix ≥ 5605 and All Options 544 and 550

1. If the instrument has Option B2X or B5X, the A22 and A23 Wideband Digital I.F. boards must be removed. Refer to the "A22 & A23 Wideband Digital I.F. Boards" removal procedure.
2. Refer to Figure 15-90. Remove the nine screws **(2)** (0515-1946) that attach the A6 power supply **(1)** to the bracket. The power supply can now be removed by sliding it out of the rear of the chassis.

Figure 15-90 Power Supply Removal
Serial Number Prefix ≥ 5605 and All Options 544 and 550



Replacement

Serial Number Prefix < 5605 Options 508, 513, 526

1. Reinstall the power supply into position in the chassis and slide forward to mate with the rear motherboard.
2. Refer to Figure 15-88. Replace the five screws **(2)** (0515-0372) that attach the power supply **(1)** to the chassis. Torque to 9 inch-pounds.
3. Replace the top brace as described in the "Top Brace and Card Cage Brace" replacement procedure.
4. Replace the instrument outer case. Refer to the "Instrument Outer Case" replacement procedure.

Serial Number Prefix ≥ 5605 and All Options 544 and 550

1. Reinstall the power supply into position in the chassis and slide forward to mate with the rear motherboard.
2. Refer to Figure 15-90. Replace the nine screws **(2)** (0515-1946) that attach the A6 power supply **(1)** to the bracket. Torque to 9 inch-pounds.
3. If the instrument has Option B2X or B5X, the A22 and A23 Wideband Digital I.F. boards must be replaced. Refer to the "A22 & A23 Wideband Digital I.F. Boards" replacement procedure.
4. Replace the top brace as described in the "Top Brace and Card Cage Brace" replacement procedure.
5. Replace the instrument outer case. Refer to the "Instrument Outer Case" replacement procedure.

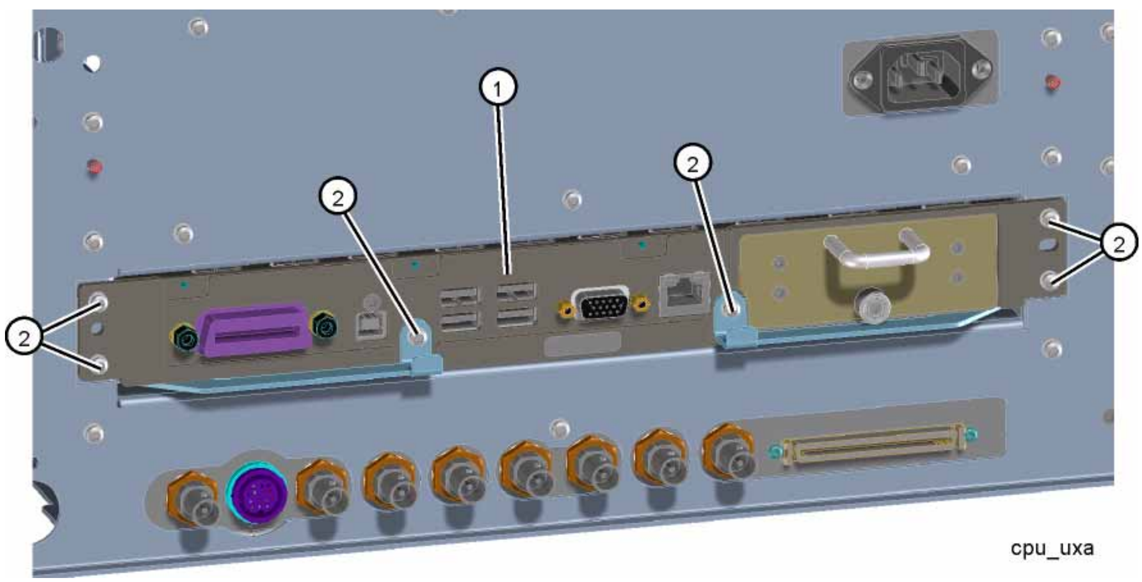
A4 CPU/A5 Solid State Drive

NOTE To remove the SSD or the memory card, it is not necessary to remove the CPU assembly from the chassis. See the "Replacement of A5 SSD or A4A1CPU Memory Card" procedure on page 462.

Removal

1. Refer to Figure 15-91. Remove the six screws **(2)** (0515-0372) that secure the A4 CPU assembly **(1)** to the chassis. Use the ejectors to disconnect the CPU from the rear motherboard and remove it from the chassis.

Figure 15-91 CPU Removal



Replacement

1. Refer to Figure 15-91. Slide the CPU assembly into the slot and use the ejectors to mate the CPU with the rear motherboard. Replace the six screws **(2)** (0515-0372). Torque to 9 inch-pounds.

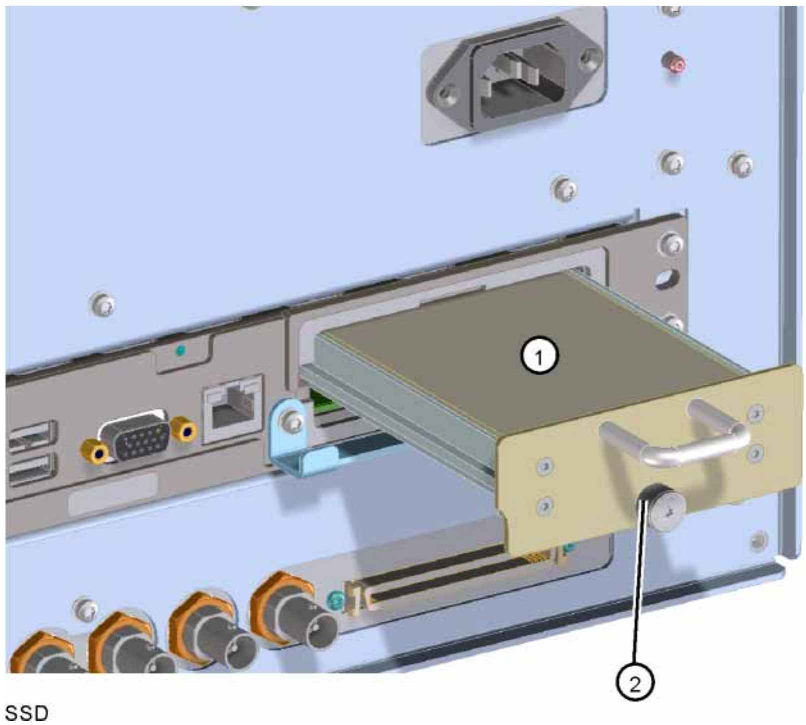
Replacement of A5 SSD or A4A1CPU Memory Card

Disk Drive

Removal

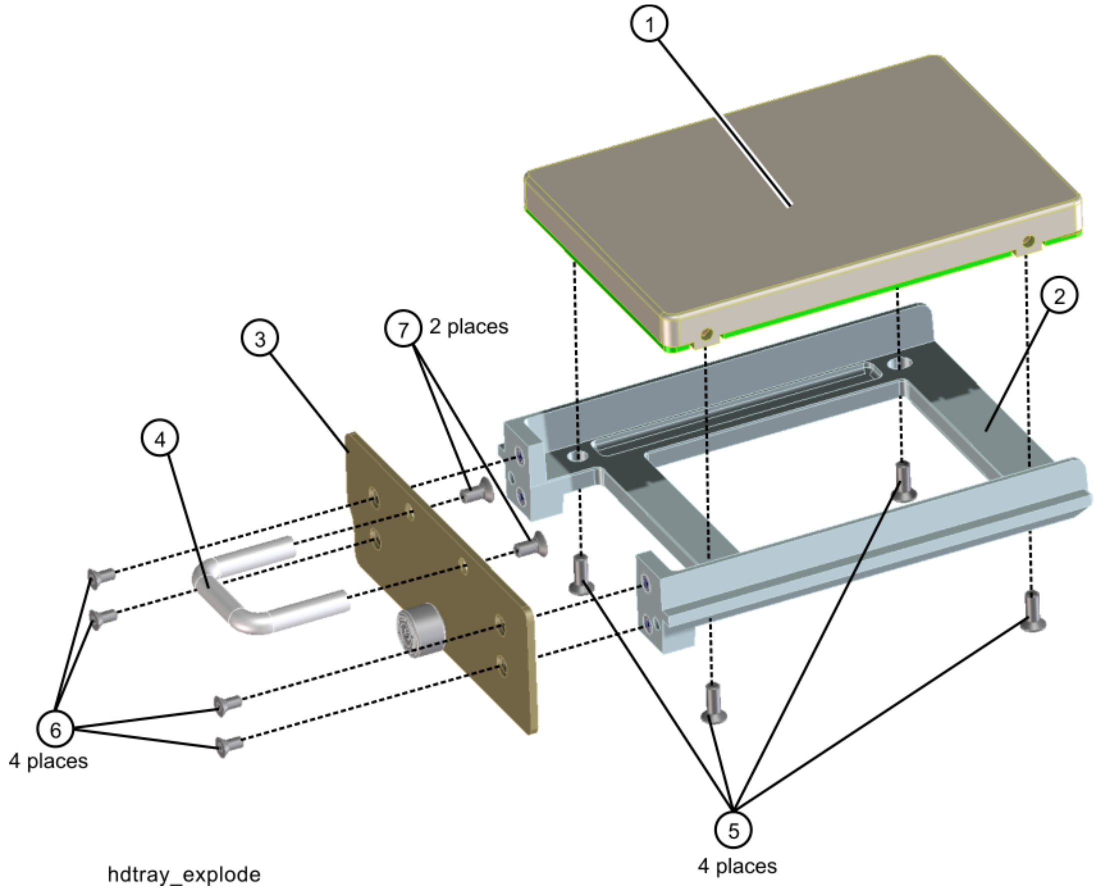
1. Refer to Figure 15-92. Loosen the thumb screw **(2)** and pull the SSD **(1)** out of the CPU assembly.

Figure 15-92 SSD Removal



2. Refer to Figure 15-93. Remove the four screws **(5)** (0515-1035) from the disk drive tray that secure the SSD **(1)**.

Figure 15-93 Disk Drive Tray Screws



Replacement

1. Refer to Figure 15-93. Place the new SSD into the tray assembly and attach with the four screws **(5)** (0515-1035). Torque to 9 inch-pounds.

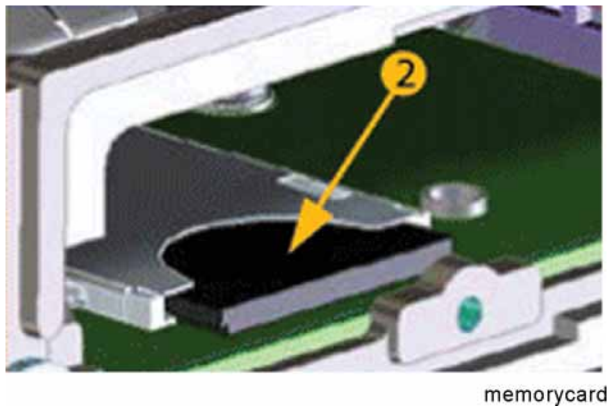
NOTE Make sure not to use the 0515-0372 screw because for the PC6 processor it will cause the SSD to interfere with the CPU memory card.

2. Refer to Figure 15-92. Slide the SSD into the CPU assembly and push to mate the connector. Secure the thumb screw to 9 inch-pounds.

A4A1 CPU Memory Card

1. Refer to Figure 15-94. Remove the SSD as described on page 462. The memory card **(2)** can be removed by pushing on the memory card and it will spring out. To install the memory card push it into the slot until you feel the spring catch. Then replace the SSD as described on page 463.

Figure 15-94 CPU Memory Card Removal



A2 AIF/A3 DIF

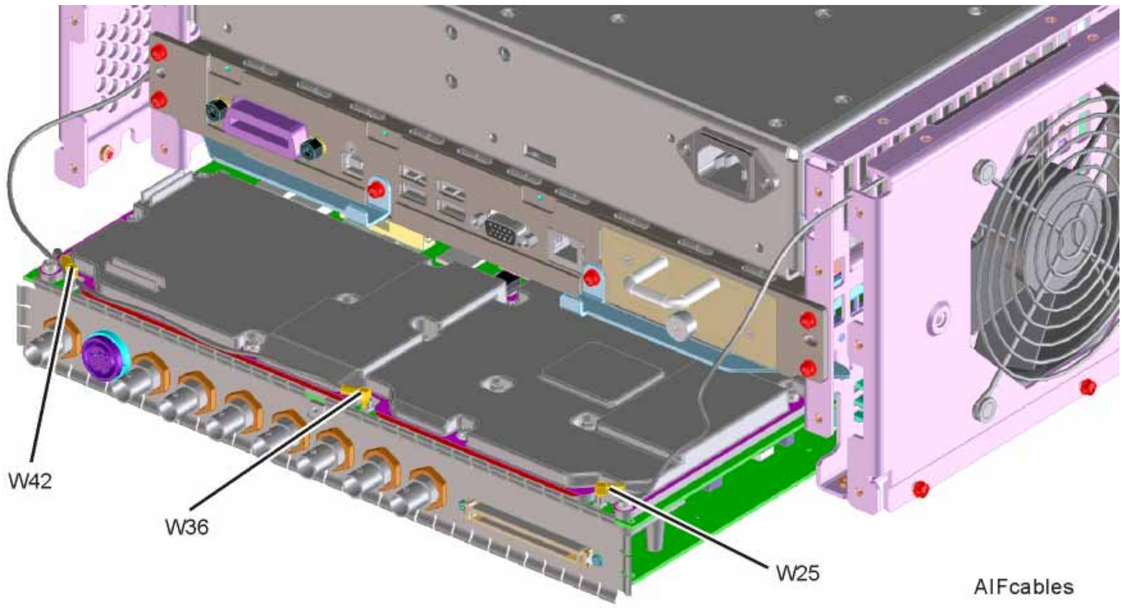
Removal

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 15-95. Remove cables W39, W40, W42, and W47 from the bottom of the DIF assembly.

Figure 15-95 DIF Cables

4. Refer to Figure 15-96. Pull the AIF/DIF assembly part way out of the chassis. Remove cables W25, W36, and W42 from the AIF assembly.

Figure 15-96 AIF Cables

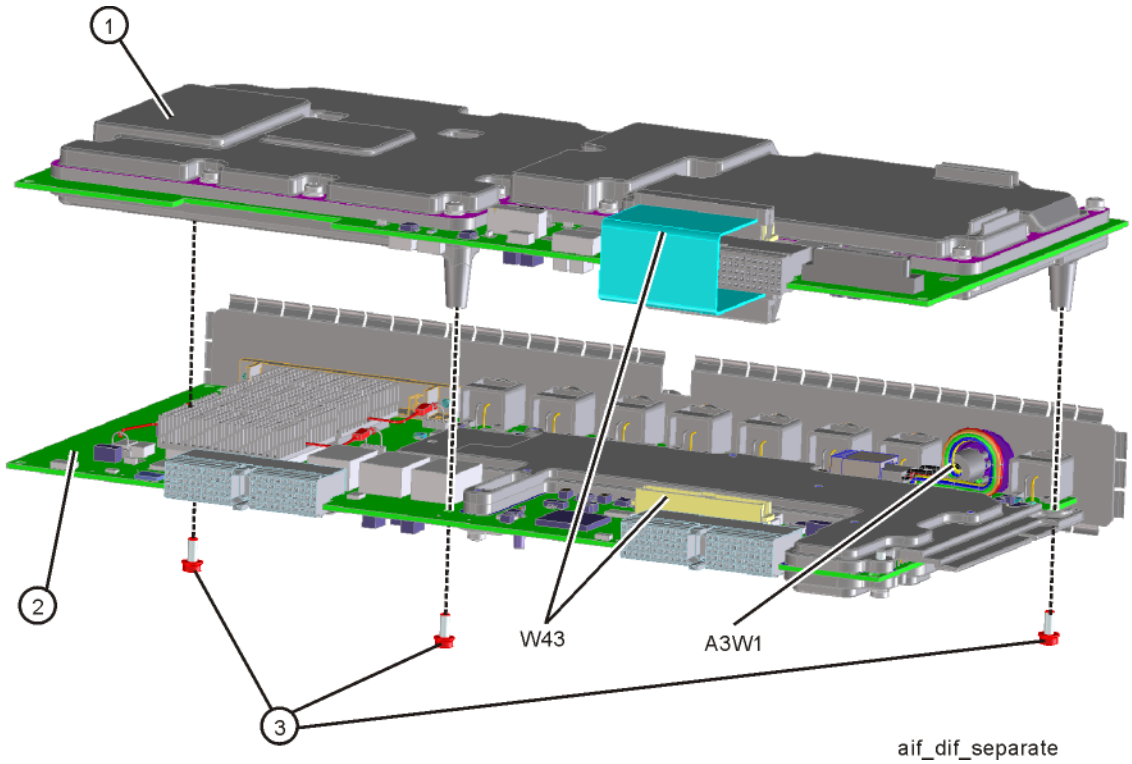


5. The AIF/DIF assembly can be removed from the chassis by pulling straight out the back.

Separate AIF/DIF Assembly

1. Refer to Figure 15-97. To separate the AIF **(1)** from the DIF **(2)**, unplug ribbon cable W43 from the AIF assembly.
2. From underneath the assembly, remove the three screws **(3)** (0515-0372).

Figure 15-97 AIF/DIF Separation



1. To pair the AIF and DIF together again, set the DIF in position over the AIF. Reinstall the three screws (0515-0372) removed before. Torque to 9 inch-pounds, starting with the middle screw.
2. Reconnect the ribbon cable W43.

Replacement

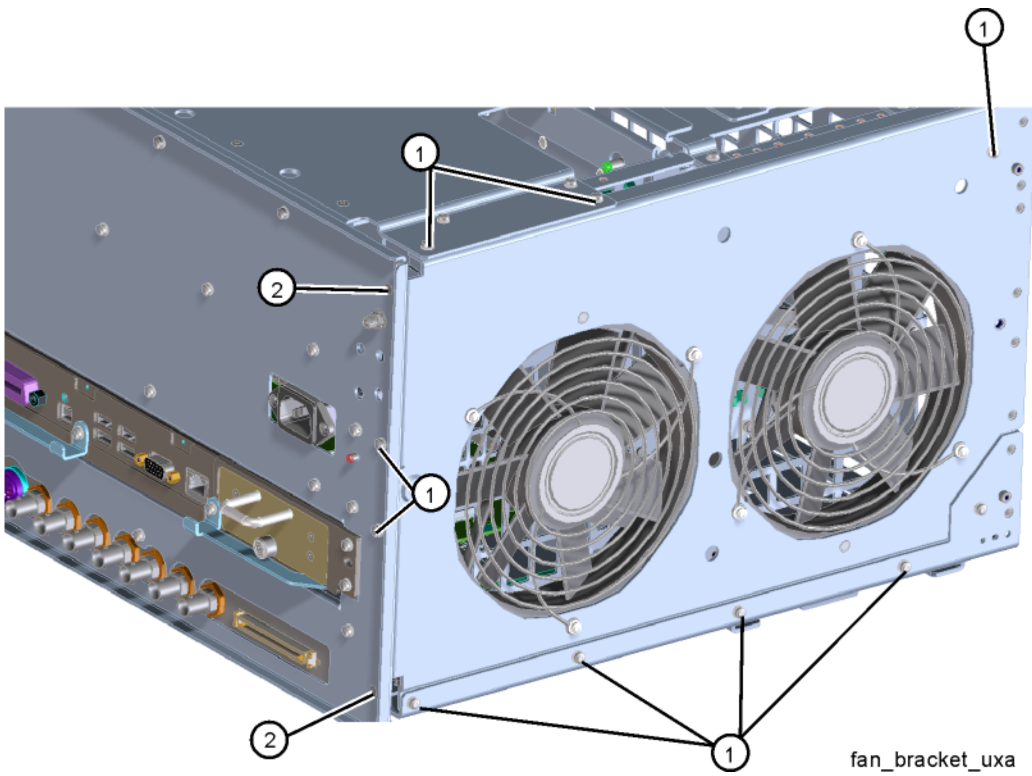
1. Slide the AIF/DIF assembly partially into the slot at the rear of the instrument.
2. Refer to Figure 15-96. Replace cables W25, W36, and W42 to the AIF assembly.
3. Push on the AIF/DIF assembly to mate the connectors to the motherboard assembly.
4. Refer to Figure 15-95. Replace cables W39, W40, W42, and W47 to the bottom of the DIF assembly.
5. Replace the rear panel. Refer to the “Rear Panel” replacement procedure.
6. Replace the instrument outer case. Refer to the “Instrument Outer Case” replace procedure.

Fan Assembly

Removal

1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Remove the front frame. Refer to the "Front Frame Assembly" removal procedure.
3. **For Serial Number Prefix < 5605 Options 508, 513, 526**:
   - Refer to Figure 15-98. Remove the nine screws **(1)** (0515-0372) and the two screws **(2)** (0515-1946) that attach the fan bracket to the chassis.

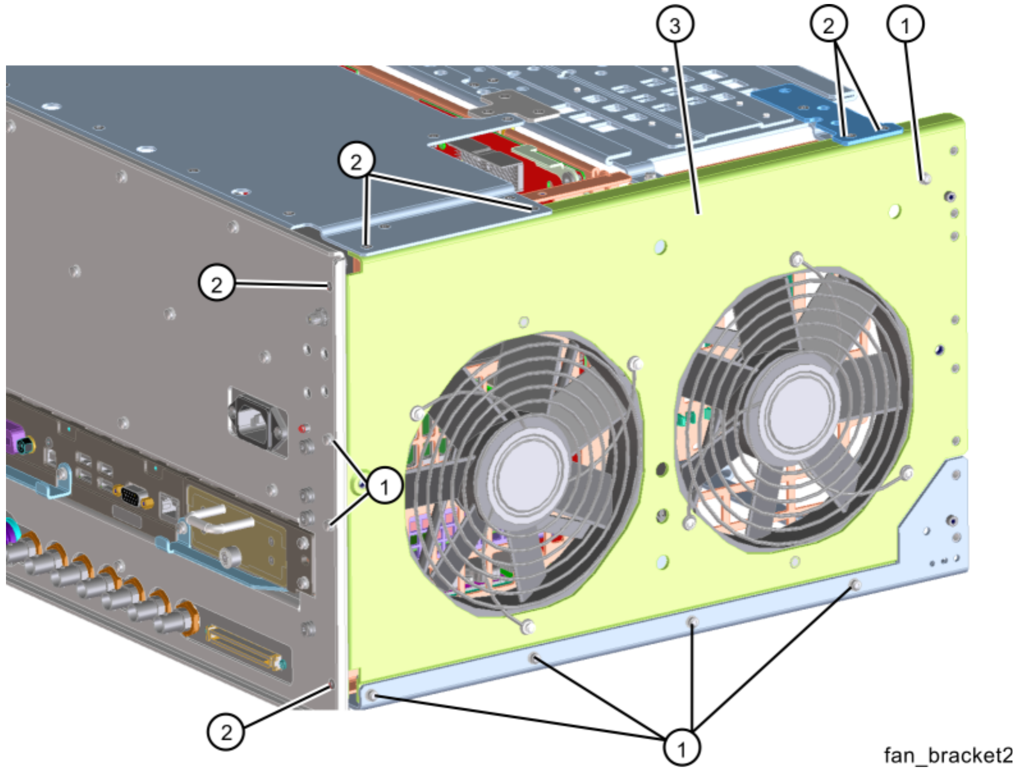
Figure 15-98 Fan Bracket Removal
Serial Number Prefix < 5605 Options 508, 513, 526



4. **For Serial Number Prefix ≥ 5605 and All Options 544 and 550**:

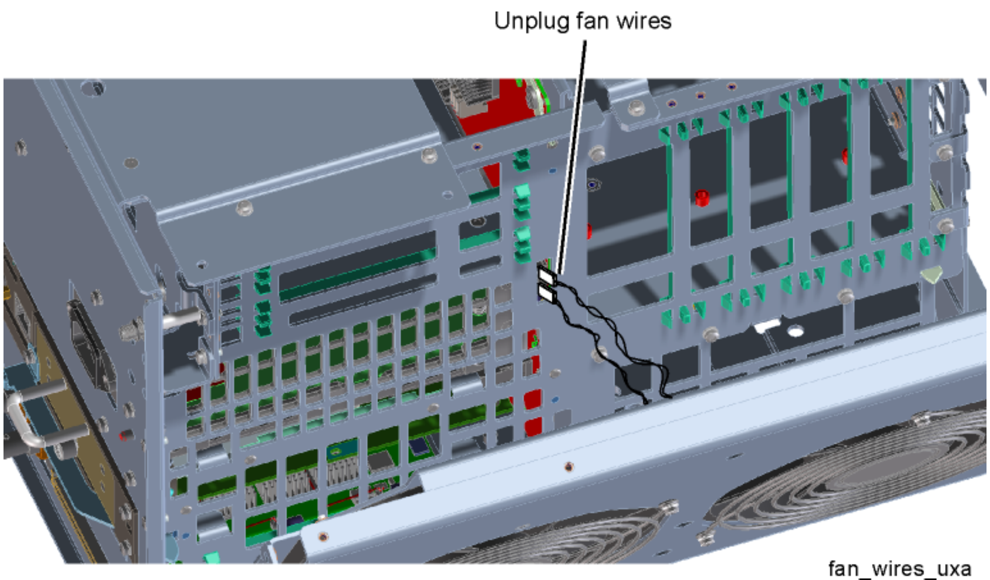
– Refer to Figure 15-99. Remove the seven screws **(1)** (0515-0372) and the six screws **(2)** (0515-1946) that attach the fan bracket **(3)** to the chassis.

Figure 15-99 Fan Bracket Removal
Serial Number Prefix ≥ 5605 and All Options 544 and 550



5. Refer to Figure 15-100. Fold the fan bracket down and unplug both fan wires from the rear motherboard.

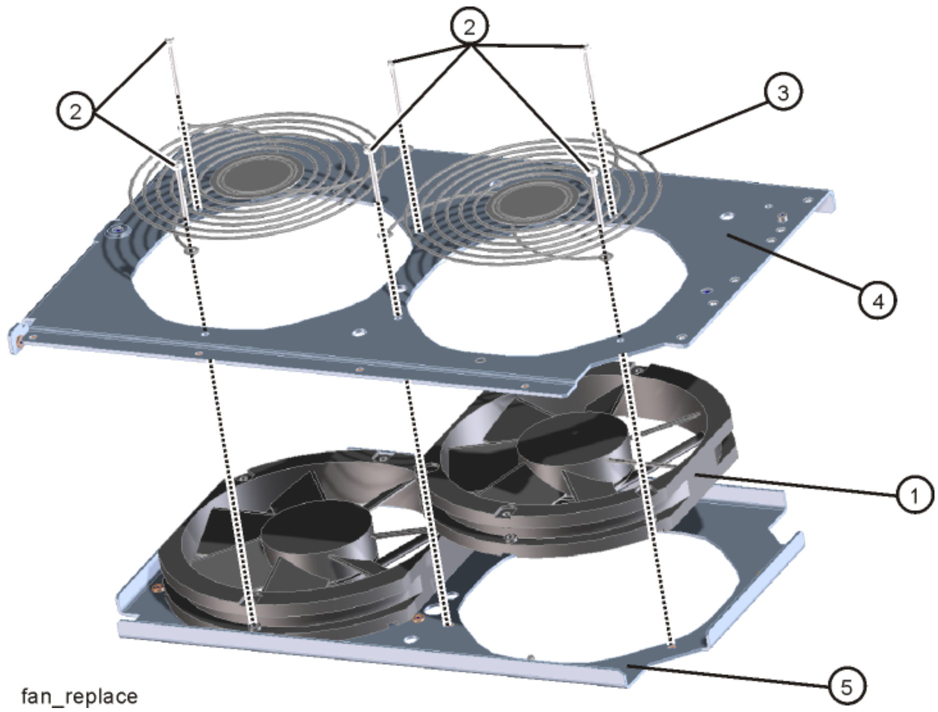
Figure 15-100 Unplug Fan Wires



Fan Replacement

1. Refer to Figure 15-101. To replace a fan **(1)**, remove the six screws **(2)** (0515-1038). Lift off the fan grills **(3)** and the side bracket **(4)**. Remove the screw (0515-0372) from the clip retaining the fan wires. The fan can now be lifted out and replaced.

Figure 15-101 Fan Replacement



2. When replacing a fan, place it on the inner side bracket **(5)** using the guide pins. Note the orientation of the fan air flow, the air flow marks on the fan point toward the bracket. Feed the fan wires through the grommet. Reattach the wire retaining clip with the screw (0515-0372).

3. Place the side bracket **(4)** into position and replace the six screws **(2)** (0515-1038). Torque to 9 inch-pounds.

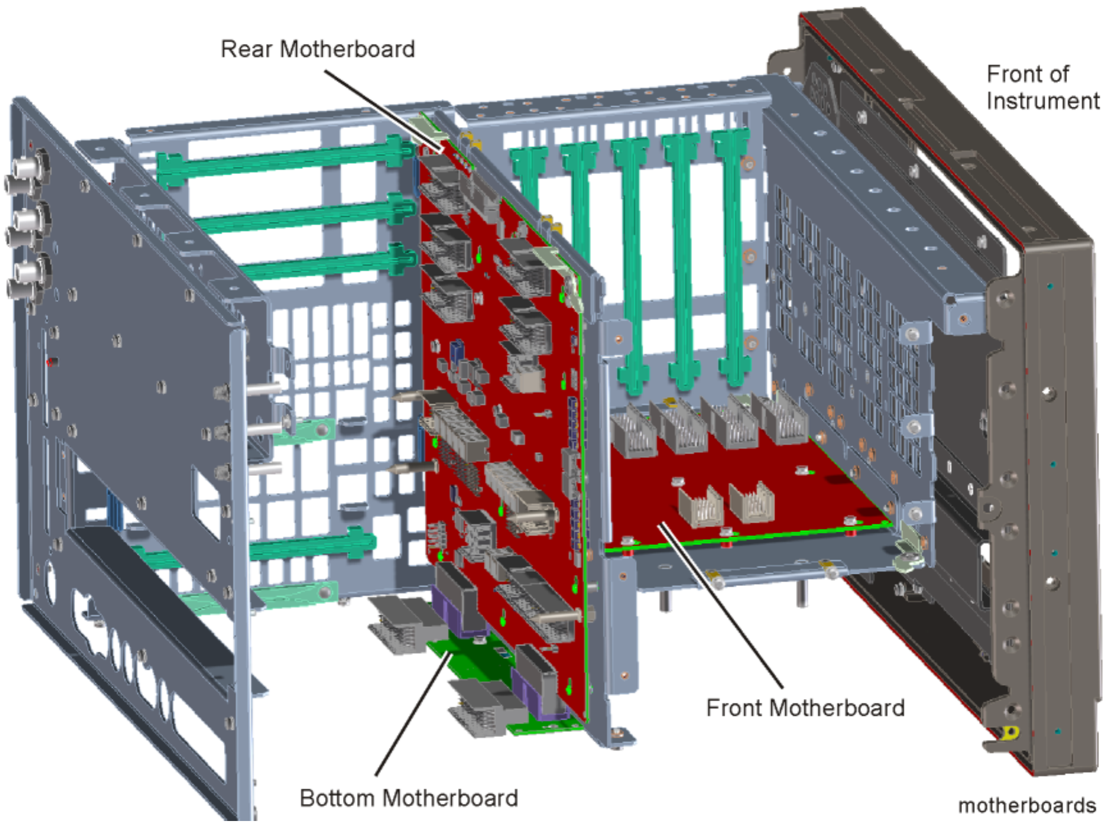
Replacement

1. Refer to Figure 15-100. Place the fan bracket next to the chassis and plug in the fan wires into the rear mother board.
2. **For Serial Number Prefix < 5605 Options 508, 513, 526**:
   – Refer to Figure 15-98. Place the fan bracket into position taking care to avoid pinching the fan wires between the fan bracket and the chassis. Replace the nine screws **(1)** (0515-0372) and the two screws **(2)** (0515-1946). Torque all screws to 9 inch-pounds.
3. **For Serial Number Prefix ≥ 5605 and All Options 544 and 550**:
   – Refer to Figure 15-99. Place the fan bracket into position taking care to avoid pinching the fan wires between the fan bracket and the chassis. Replace the seven screws **(1)** (0515-0372) and the six screws **(2)** (0515-1946) that attach the fan bracket **(3)** to the chassis. Torque all screws to 9 inch-pounds.
4. Replace the front frame. Refer to the “Front Frame Assembly” replacement procedure.
5. Replace the instrument outer case. Refer to the “Instrument Outer Case” replacement procedure.

Motherboards

There are three motherboards in the UXA. The front motherboard (A8 Front Motherboard), rear motherboard (A7 Rear Motherboard), and bottom motherboard (A24 Motherboard Interconnect board). Figure 15-102 shows the locations of the motherboards with most of the other assemblies removed.

Figure 15-102 Motherboard Locations



Front Motherboard (A8 Front Motherboard)

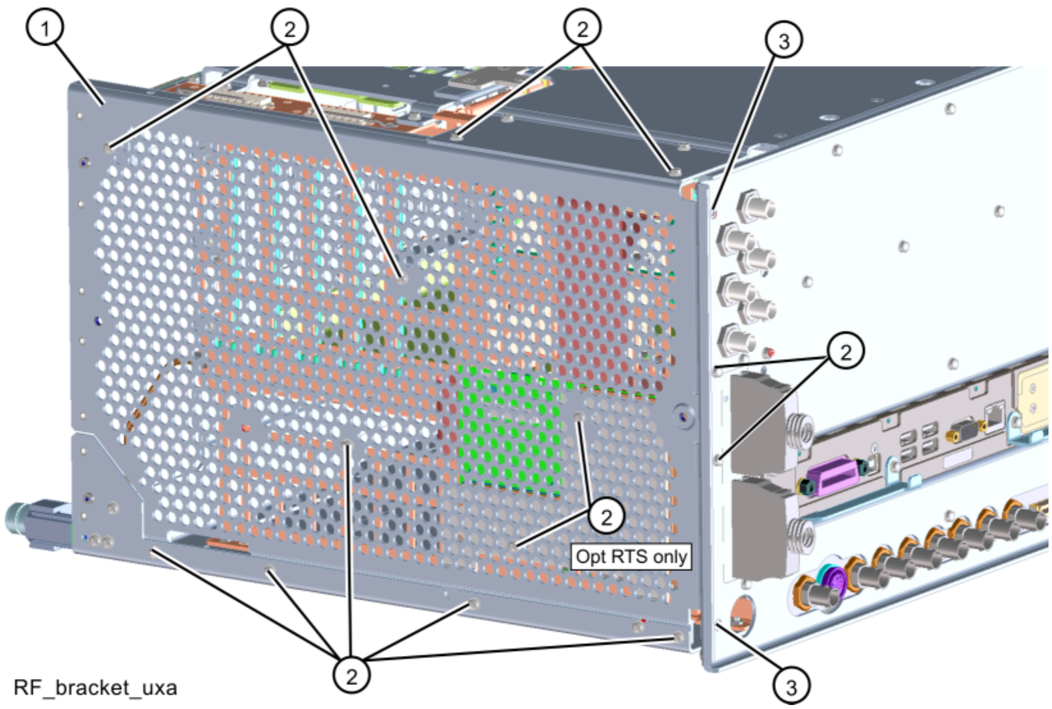
Removal

1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Remove the top brace and card cage brace. Refer to the "Top Brace and Card Cage Brace" removal procedure.
3. Remove the front frame. Refer to the "Front Frame Assembly" removal procedure.
4. Remove all of the card cage assemblies. Refer to the "Card Cage Boards" procedures.

5. For Serial Number Prefix < 5605:

– Refer to Figure 15-103. Remove the RF bracket **(1)** by removing the eleven (or thirteen with Option RTS) screws **(2)** (0515-0372), and the two screws **(3)** (0515-1946), using the T-10 driver.

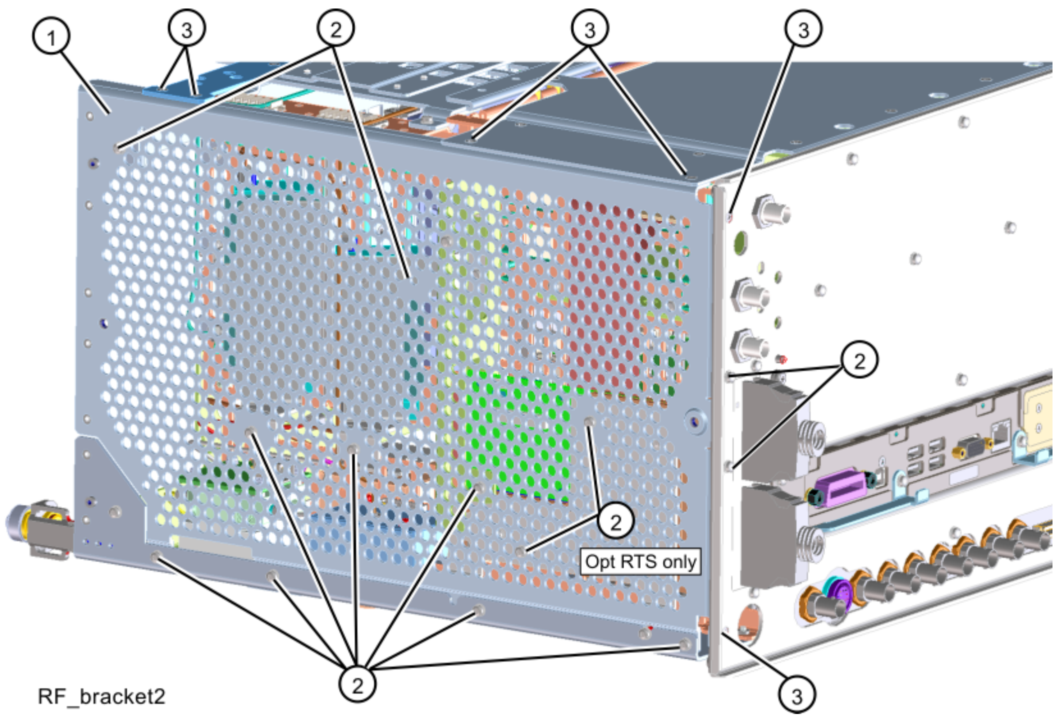
Figure 15-103 RF Bracket Removal, Serial Number Prefix < 5605



6. Serial Number Prefix ≥ 5605:

– Refer to Figure 15-104. Remove the RF bracket **(1)** by removing the eleven (or thirteen with Option RTS) screws **(2)** (0515-0372), and the six screws **(3)** (0515-1946), using the T-10 driver.

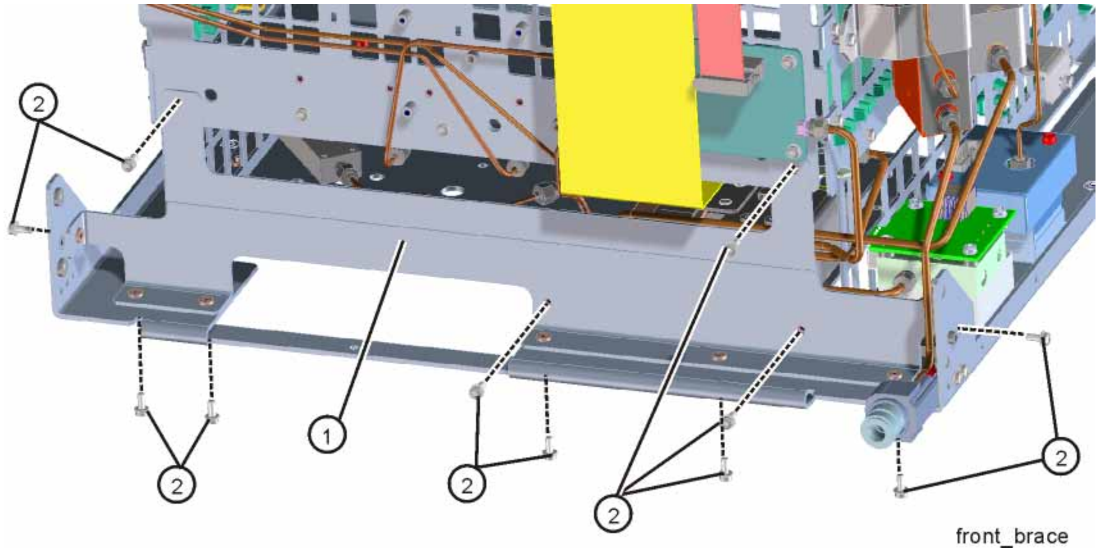
Figure 15-104 RF Bracket Removal, Serial Number ≥ Prefix 5605



7. Remove the fan bracket. Refer to the "Fan Assembly" removal procedure.

8. Refer to Figure 15-105. Remove the front brace **(1)** by removing the eleven screws **(2)** (0515-0372).

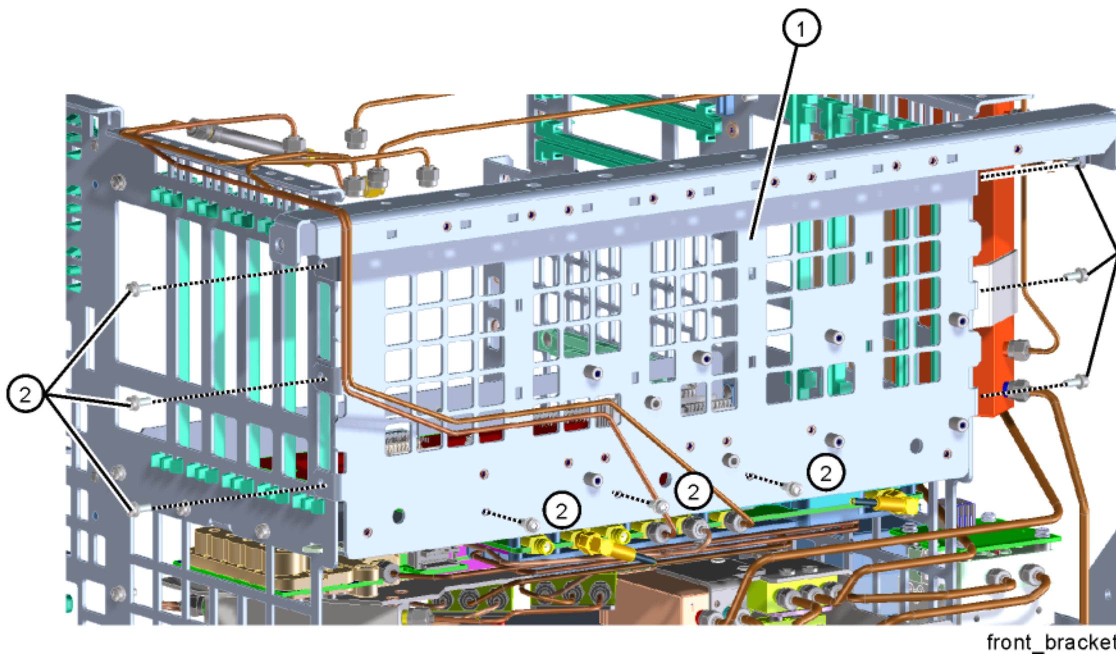
Figure 15-105 Front Brace Removal



9. Remove the Low Band switch assembly. Refer to the "A11 Low Band Switch" removal procedure.

10.Refer to Figure 15-106. Remove the front bracket **(1)** by removing the nine screws **(2)** (0515-0372).

Figure 15-106 Front Bracket Removal

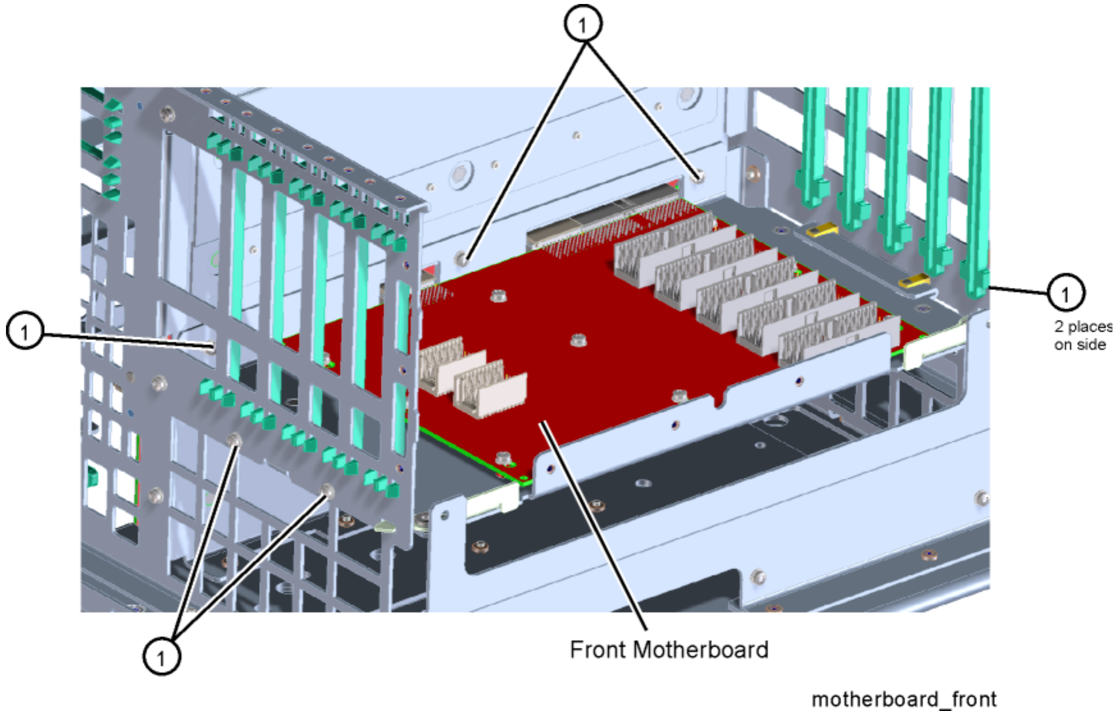


11.Remove the Low Noise Path and Microwave Preselector Bypass Switches. Refer to the "Low Noise Path and Microwave Preselector Bypass Switches" removal procedure.

12.Remove the Front End Assembly. Refer to the "A13 RF Front End Assembly" removal procedure.

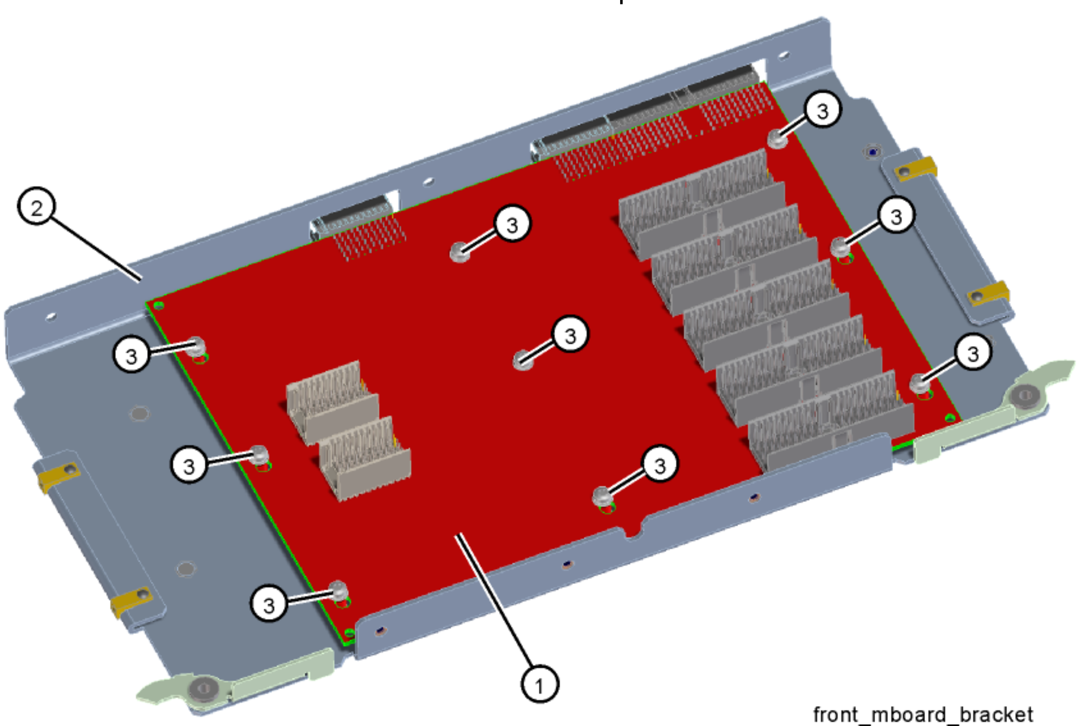
13.Refer to Figure 15-107. Remove the seven screws **(1)** (0515-0372) that attach the front motherboard bracket to the chassis. Use the ejectors to disconnect from the rear motherboard and pull out towards the front of the instrument to remove from the chassis.

Figure 15-107 Front Motherboard Removal



14. Refer to Figure 15-108. To separate the front motherboard **(1)** from the bracket **(2)**, remove the nine screws **(3)** (0515-0372). When replacing the screws, torque to 9 inch-pounds.

Figure 15-108 Front Motherboard and Bracket Separation



Replacement

1. Refer to Figure 15-107. Slide the front motherboard into the slot and use the ejectors to mate with the rear motherboard connectors. Replace the seven screws **(1)** (0515-0372) that attach the front motherboard bracket to the chassis. Torque to 9 inch-pounds.

2. Refer to Figure 15-106. Place the front bracket **(1)** into position in the chassis and replace the nine screws **(2)** (0515-0372). Torque to 9 inch-pounds.

3. Replace the Low Band switch assembly. Refer to the “A11 Low Band Switch” replacement procedure.

4. Replace the Front End Assembly. Refer to the “A13 RF Front End Assembly” replacement procedure.

5. Replace the Low Noise Path and Microwave Preselector Bypass Switches. Refer to the “Low Noise Path and Microwave Preselector Bypass Switches” replacement procedure.

6. Refer to Figure 15-105. Place the front brace **(1)** into position in the chassis and replace the eleven screws **(2)** (0515-0372). Torque to 9 inch-pounds.

7. Replace the RF bracket. Refer to the RF Bracket removal steps on page 474 or page 475. Torque screws to 9 inch-pounds.

8. Replace the fan bracket. Refer to the “Fan Assembly” replacement procedure.

9. Replace all of the card cage assemblies. Refer to the “Card Cage Boards” procedures.

10. Replace the front frame. Refer to the “Front Frame Assembly” replacement procedure.

11. Replace the top brace and card cage brace. Refer to the “Top Brace and Card Cage Brace” replacement procedure.

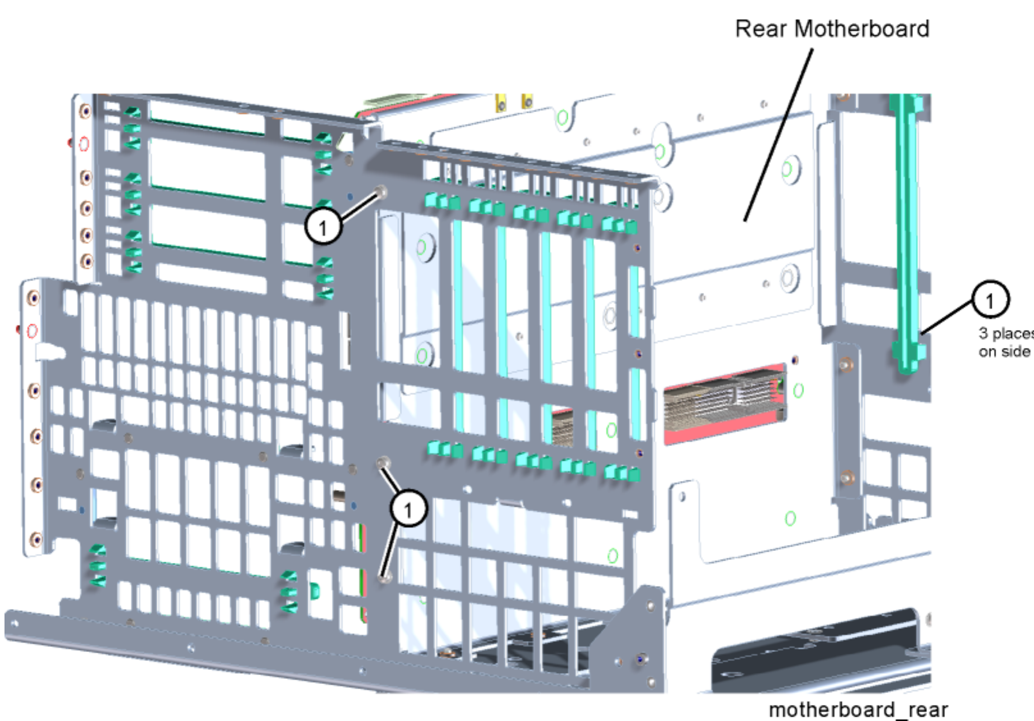
12. Replace the instrument outer case. Refer to the “Instrument Outer Case” replacement procedure.

Rear Motherboard (A7 Rear Motherboard)

Removal

1. Remove the front motherboard. Refer to the "Front Motherboard (A8 Front Motherboard)" removal procedure.
2. Remove the wideband digital I.F. assemblies if present. Refer to the "A22 & A23 Wideband Digital I.F. Boards" removal procedure.
3. Remove the CPU assembly. Refer to the "A4 CPU/A5 Solid State Drive" removal procedure.
4. Remove the power supply. Refer to the "A6 Power Supply" removal procedure.
5. Remove AIF/DIF assembly. Refer to the "A2 AIF/A3 DIF" removal procedure.
6. **For Serial Number Prefix < 5616**:
   - Refer to Figure 15-109. Remove the six screws **(1)** (three on each side) (0515-0372) that attach the rear motherboard bracket to the chassis.

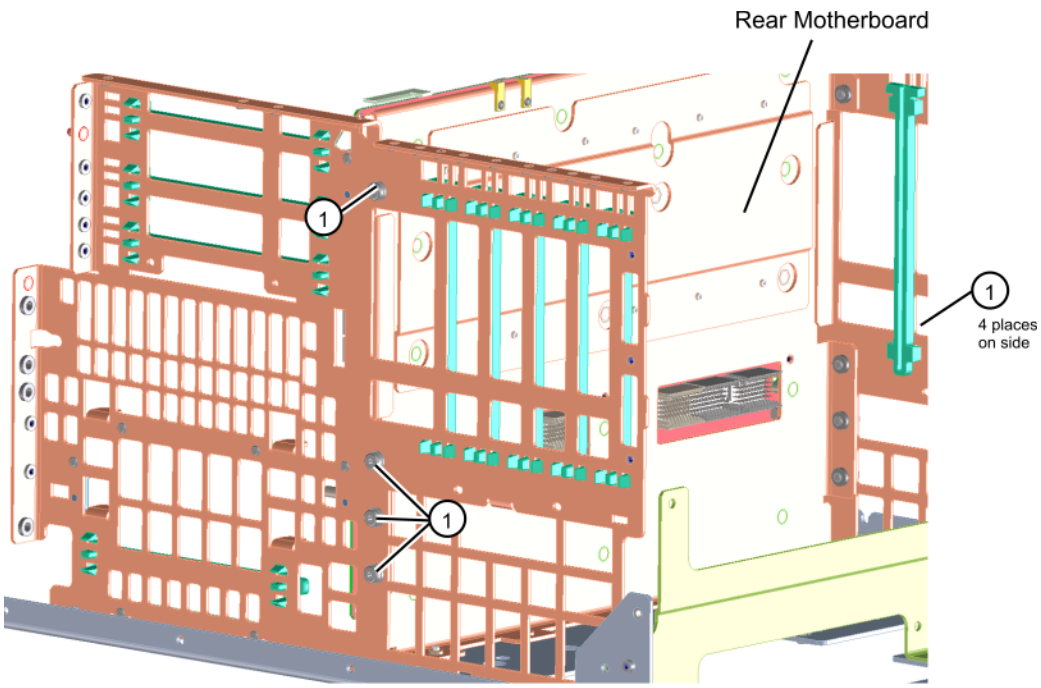
Figure 15-109 Rear Motherboard Removal
Serial Number Prefix < 5616



7. **For Serial Number Prefix ≥ 5616**:

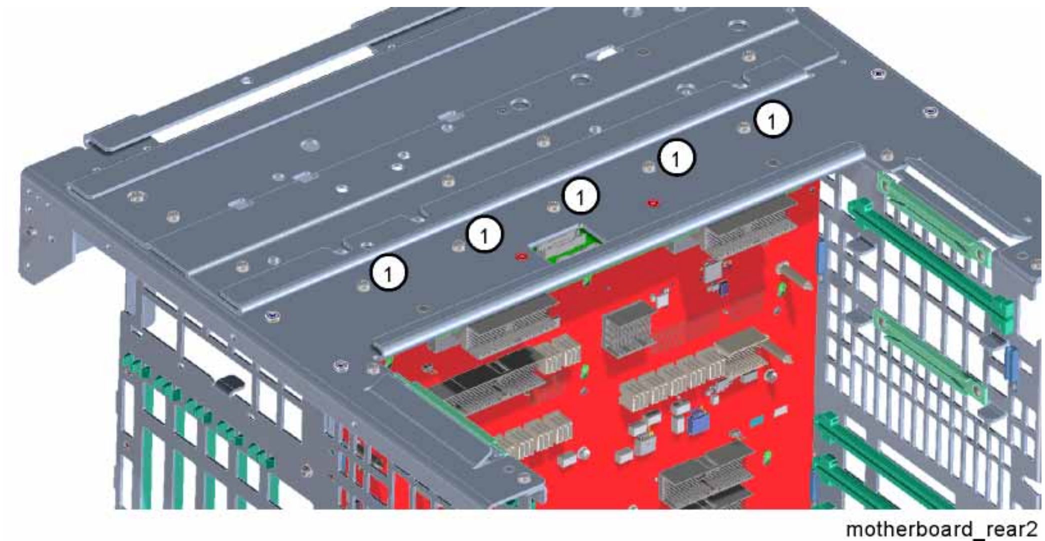
   – Refer to Figure 15-110. Remove the eight screws **(1)** (four on each side) (0515-0433) that attach the rear motherboard bracket to the chassis.

Figure 15-110 Rear Motherboard Removal
Serial Number Prefix ≥ 5616



8. Refer to Figure 15-111. Remove the five screws **(1)** (0515-0372) that attach the rear motherboard bracket to the base of the chassis. Pull the rear motherboard up to disconnect from the bottom motherboard and pull out of the chassis.

Figure 15-111 Rear Motherboard Removal - Bottom Screws



Replacement

1. **For Serial Number Prefix < 5616**:
   – Refer to Figure 15-109. Place the rear motherboard and bracket into the chassis and push down to mate with the bottom motherboard. Replace the six screws **(1)** (three on each side) (0515-0372) to attach the rear motherboard bracket to the chassis. Torque to 9 inch-pounds.
2. **For Serial Number Prefix ≥ 5616**:
   – Refer to Figure 15-110. Place the rear motherboard and bracket into the chassis and push down to mate with the bottom motherboard. Replace the eight screws **(1)** (four on each side) (0515-0433) that attach the rear motherboard bracket to the chassis. Torque to 21 inch-pounds.
3. Refer to Figure 15-111. Replace the five screws **(1)** (0515-0372) to attach the rear motherboard bracket to the bottom of the chassis. Torque to 9 inch-pounds.

4. Replace AIF/DIF assembly. Refer to the "A2 AIF/A3 DIF" replacement procedure.

5. Replace the power supply. Refer to the "A6 Power Supply" replacement procedure.

6. Replace the CPU assembly. Refer to the "A4 CPU/A5 Solid State Drive" replacement procedure.

7. Replace the wideband digital I.F. assemblies if present. Refer to the "A22 & A23 Wideband Digital I.F. Boards" replacement procedure.

8. Replace the front motherboard. Refer to the "Front Motherboard (A8 Front Motherboard)" replacement procedure.

Bottom Motherboard (A24 Motherboard Interconnect)

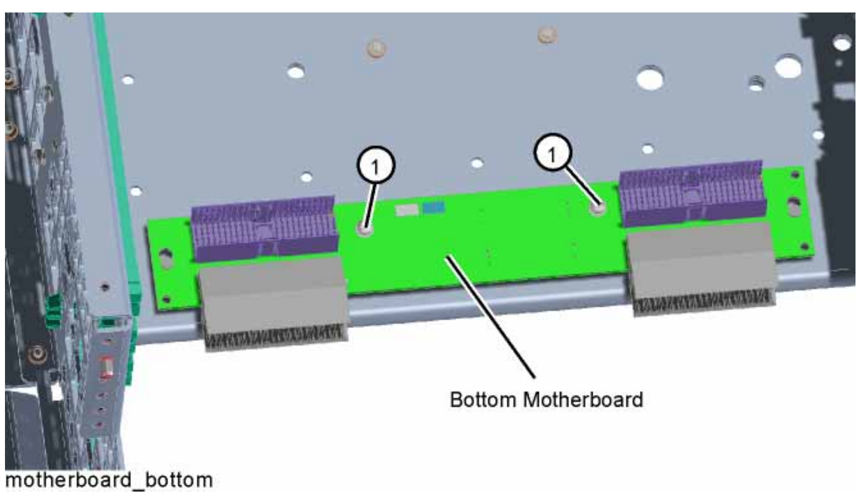
Removal

1. Remove the front motherboard. Refer to the "Front Motherboard (A8 Front Motherboard)" removal procedure.

2. Remove the rear motherboard. Refer to the "Rear Motherboard (A7 Rear Motherboard)" removal procedure.

3. Refer to Figure 15-112. Remove the two screws **(1)** (0515-0372) that attach the bottom motherboard to the chassis. Push the bottom motherboard forward to disengage from the locking pins on the chassis.

Figure 15-112 Bottom Motherboard Removal



Replacement

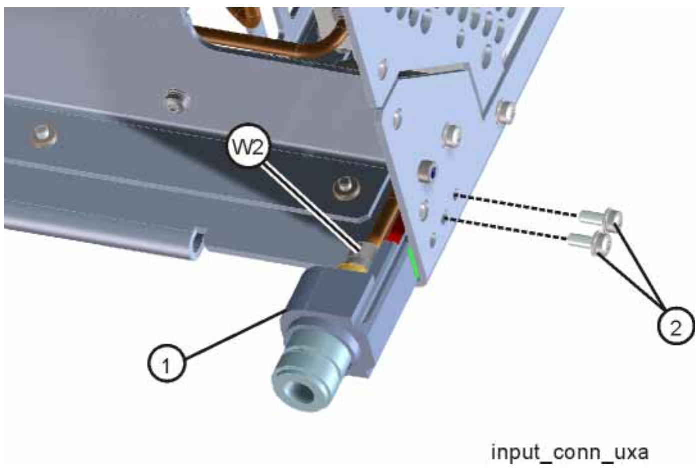
1. Refer to Figure 15-112. Place the bottom motherboard into position and line up the holes in the board to the pins on the chassis. Lower and push the board towards the rear of the chassis to lock into place. Replace the two screws **(1)** (0515-0372) to attach the bottom motherboard to the chassis. Torque to 9 inch-pounds.
2. Replace the rear motherboard. Refer to the "Rear Motherboard (A7 Rear Motherboard)" replacement procedure.
3. Replace the front motherboard. Refer to the "Front Motherboard (A8 Front Motherboard)" replacement procedure.

Input Connector

Removal

1. Remove the instrument outer case. Refer to the “Instrument Outer Case” removal procedure.
2. Remove the front frame. Refer to the “Front Frame Assembly” removal procedure.
3. Refer to Figure 15-113. Disconnect the W2 semi-rigid cable from the input connector **(1)**.

Figure 15-113 Input Connector Removal



4. Remove the two screws **(2)** (0515-0372) that attach the input connector to the chassis.

Replacement

1. Refer to Figure 15-113. Reinstall the input connector **(1)** into position in the chassis. Replace the two screws **(2)** (0515-0372). Torque to 9 inch-pounds.
2. Reconnect the semi-rigid cable W2 to the input connector. Torque to 10 inch-pounds.
3. Replace the front frame. Refer to the “Front Frame Assembly” replacement procedure.
4. Replace the instrument outer case. Refer to the “Instrument Outer Case” replacement procedure.

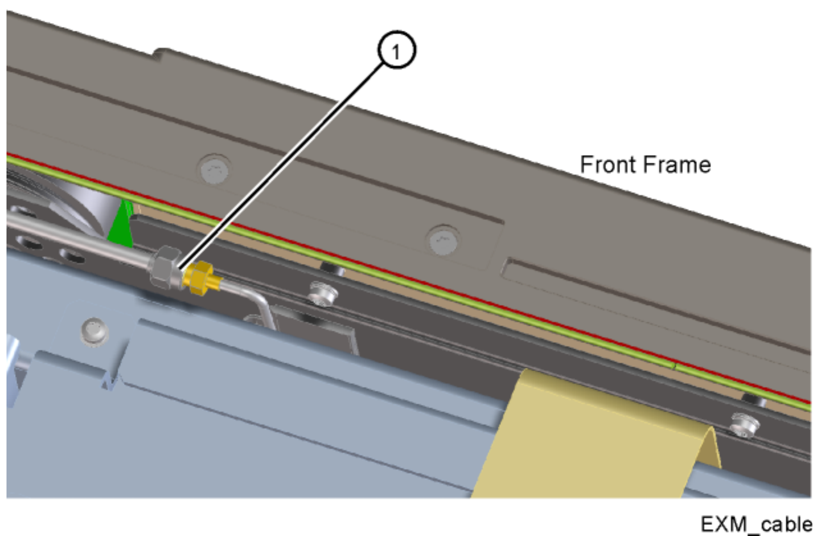
Front Frame Assembly

Removal

NOTE Make sure any connectors on the front panel are removed.

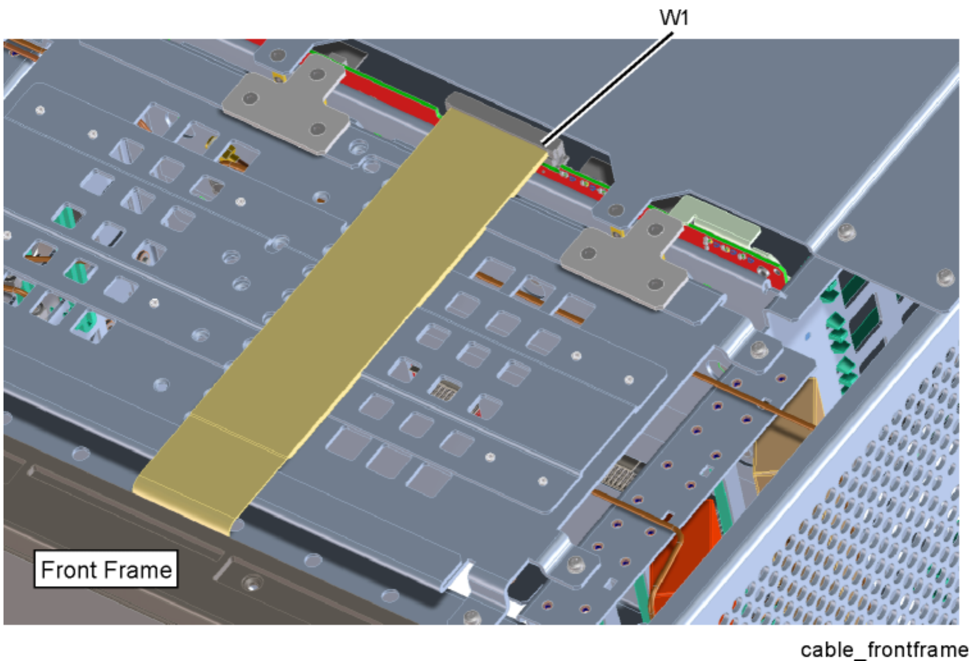
1. Remove the instrument outer case. Refer to the "Instrument Outer Case" removal procedure.
2. Refer to Figure 15-114. Disconnect the two cables **(1)** (just behind the front frame) with a 5/16-inch wrench and a 1/4-inch wrench.

Figure 15-114 EXM Cable



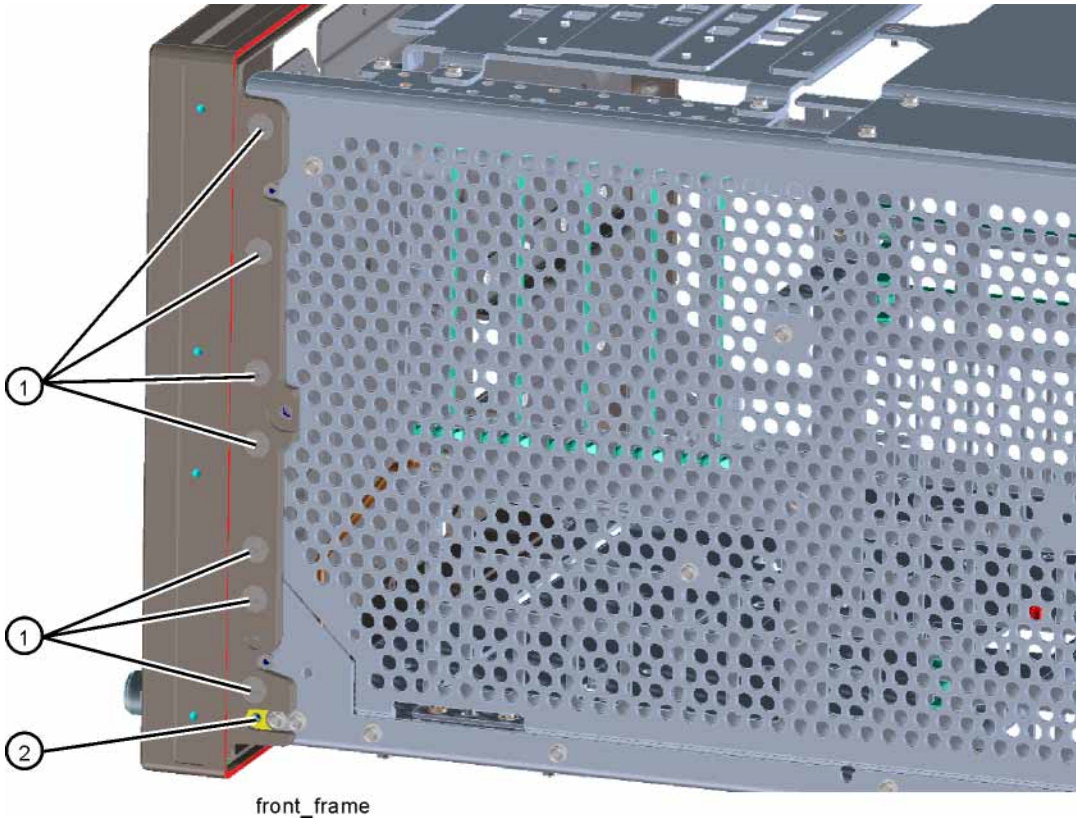
3. Refer to Figure 15-115. Disconnect W1 ribbon cable from the rear motherboard at the location indicated. The cable has locking tabs on each side, pinch and pull to release.

Figure 15-115 Front Panel Cable



4. Refer to Figure 15-116. Using the T-20 driver, remove the fourteen screws **(1)** (seven on each side) (0515-2044). Using the T-10 driver, remove the one screw **(2)** (0515-0372). The front frame can now be detached from the chassis.

Figure 15-116 Front Frame Assembly Removal



Replacement

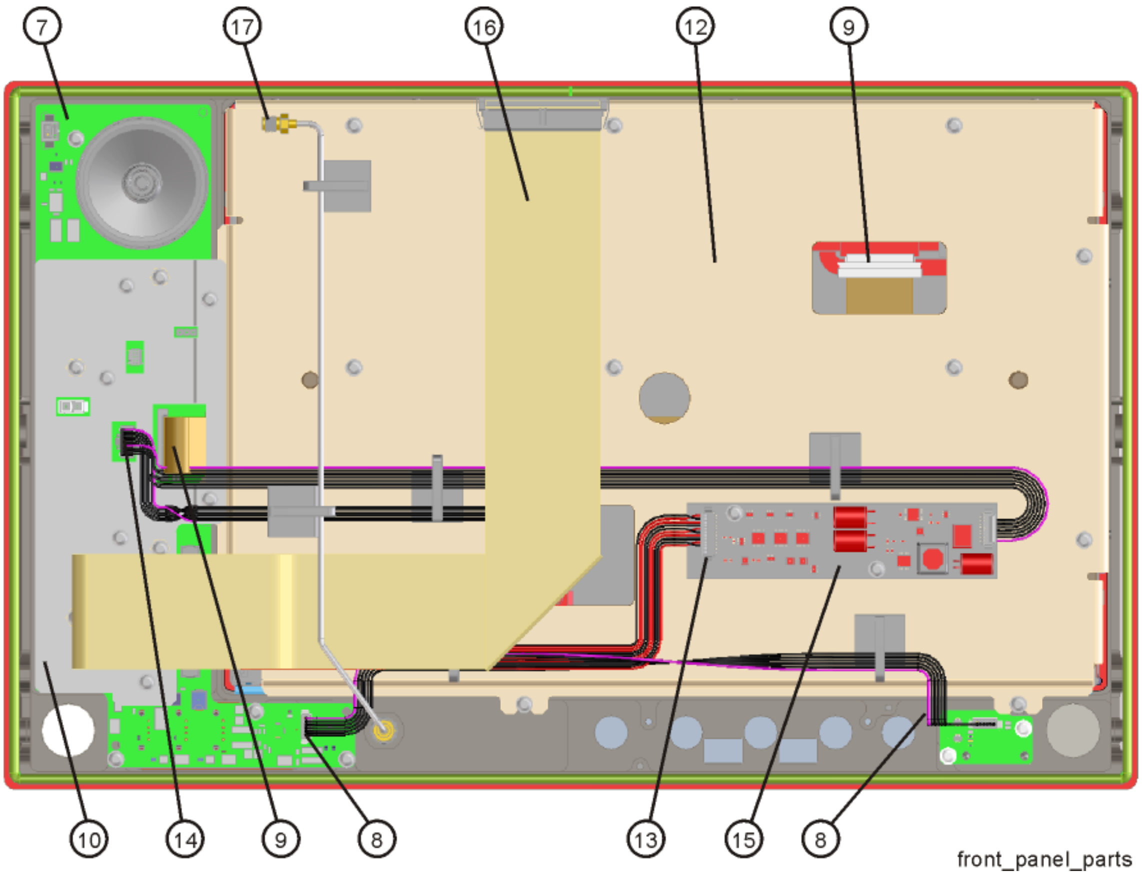
1. Refer to Figure 15-116. Carefully position the front frame assembly onto the chassis. Ensure no cables are pinched. Ensure the O-ring is secured over the RF connector. Using the T-20 driver, replace the fourteen screws **(1)** (seven on each side) (0515-2044). Torque to 21 inch-pounds.
2. Using the T-10 driver, replace the one screw **(2)** (0515-0372). Torque to 9 inch-pounds.
3. Refer to Figure 15-115. Reattach the ribbon cable W1. Ensure the locking tabs are engaged.
4. Refer to Figure 15-114. Reconnect the two cables **(1)** just behind the front frame. Torque to 10 inch-pounds.
5. Replace the outer case. Refer to the "Instrument Outer Case" replacement procedure.

Front Frame Assembly Components

NOTE

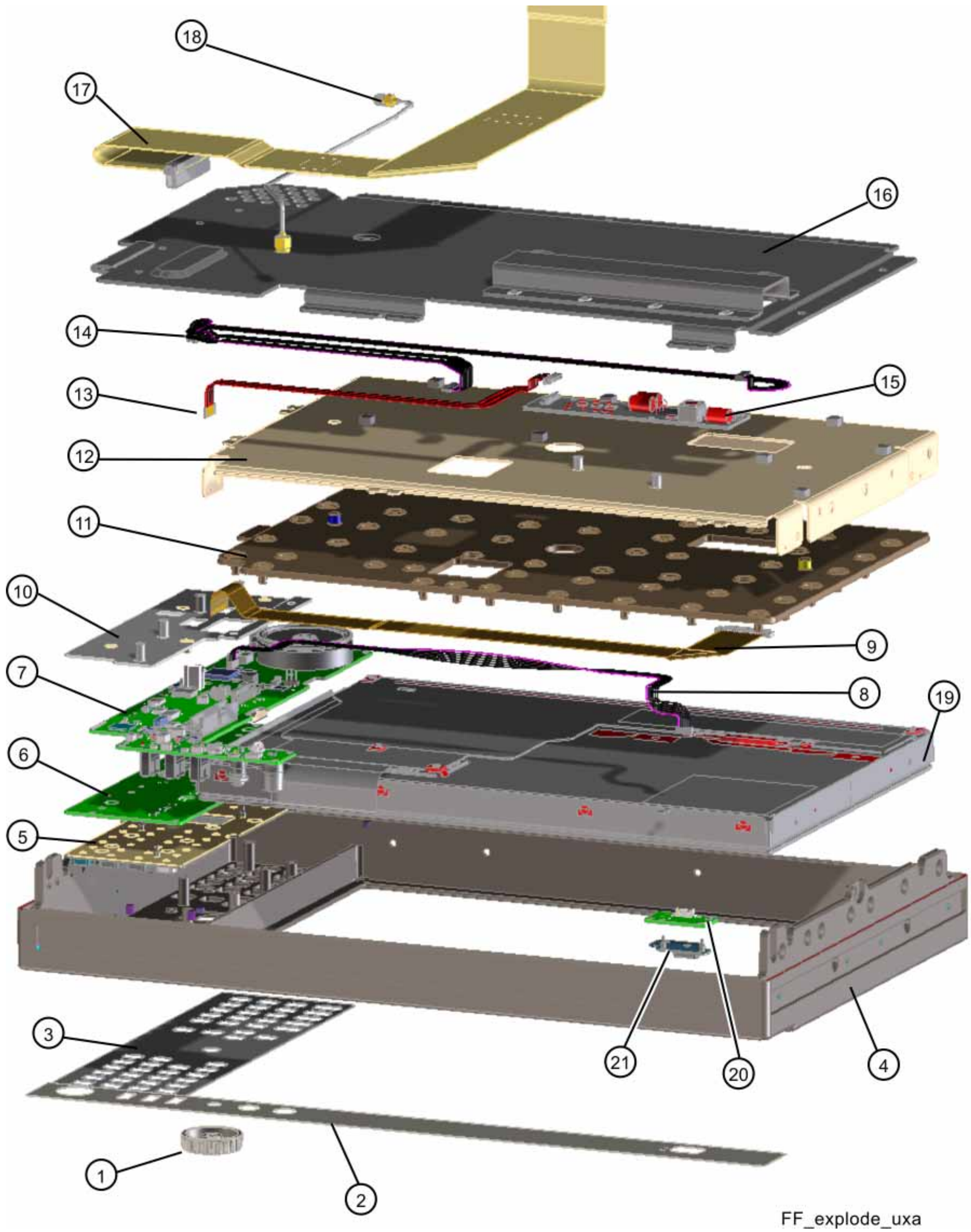
Access to any of the Front Frame assemblies requires removal of the Front Frame Assembly from the chassis.

Figure 15-117 Front Frame Parts



Item	Description	Item	Description
7	A1A5 Controller Board	13	A1W2 Cable
8	A1W4 Cable	14	A1W3 Cable
9	A1W1 Cable	15	A1A4 Converter DC-DC
10	A1MP14 Front Panel Interface Bracket	16	W1 Cable
12	A1MP21 Display Bracket	17	W29 Semi-rigid Cable

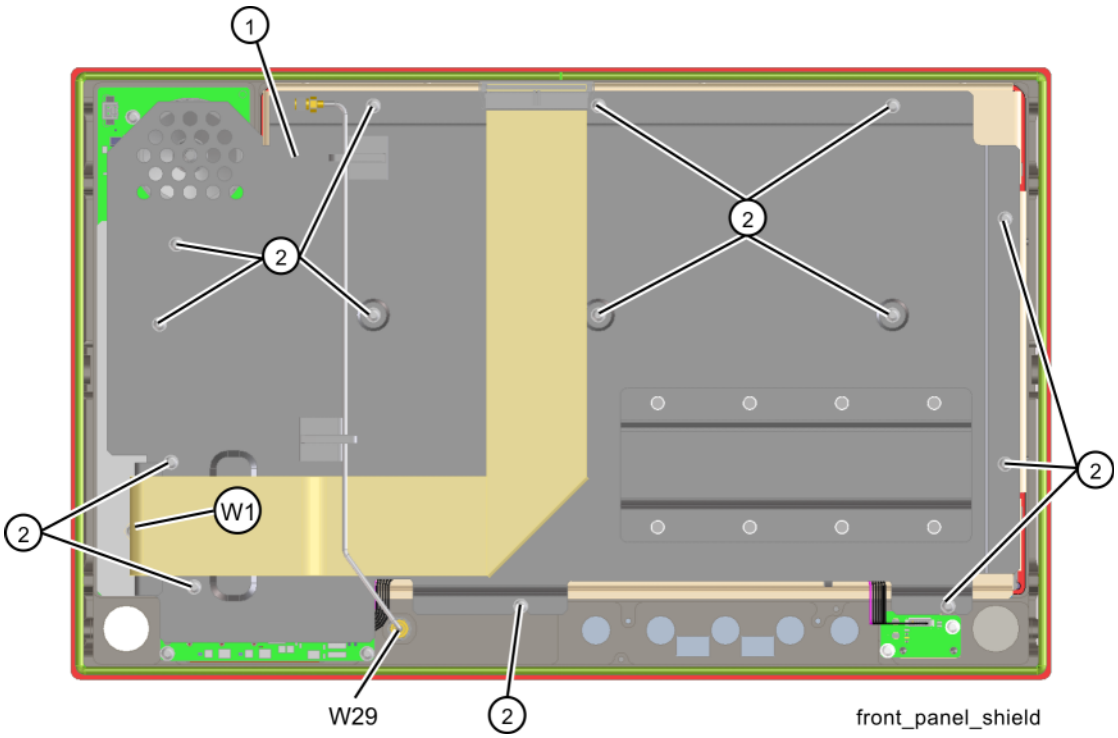
Figure 15-118 Front Frame Exploded View



Item	Description
1	A1MP9 RPG Knob
2	Connector Overlay
3	Main Keyboard Overlay
4	Front Frame
5	A1MP1 Main Keypad
6	Front Panel Interface Board
7	Front Panel Controller Board
8	A1W4 Cable Assembly
9	A1W1 Cable Assembly (Flex Circuit)
10	Front Panel Controller Board Bracket
11	Display Compression Pad
12	Display Bracket
13	A1W2 Cable Assembly
14	A1W3 Cable Assembly
15	DC-DC Converter Board
16	Front Panel Interface Board Shield
17	W1 Ribbon Cable
18	W29 Semi-Rigid Cable
19	A1A3 Touch Screen Display
20	A1A6 Front Panel On Button Keyboard
21	A1MP2 Front Panel On Button Keypad

Front Panel Shield

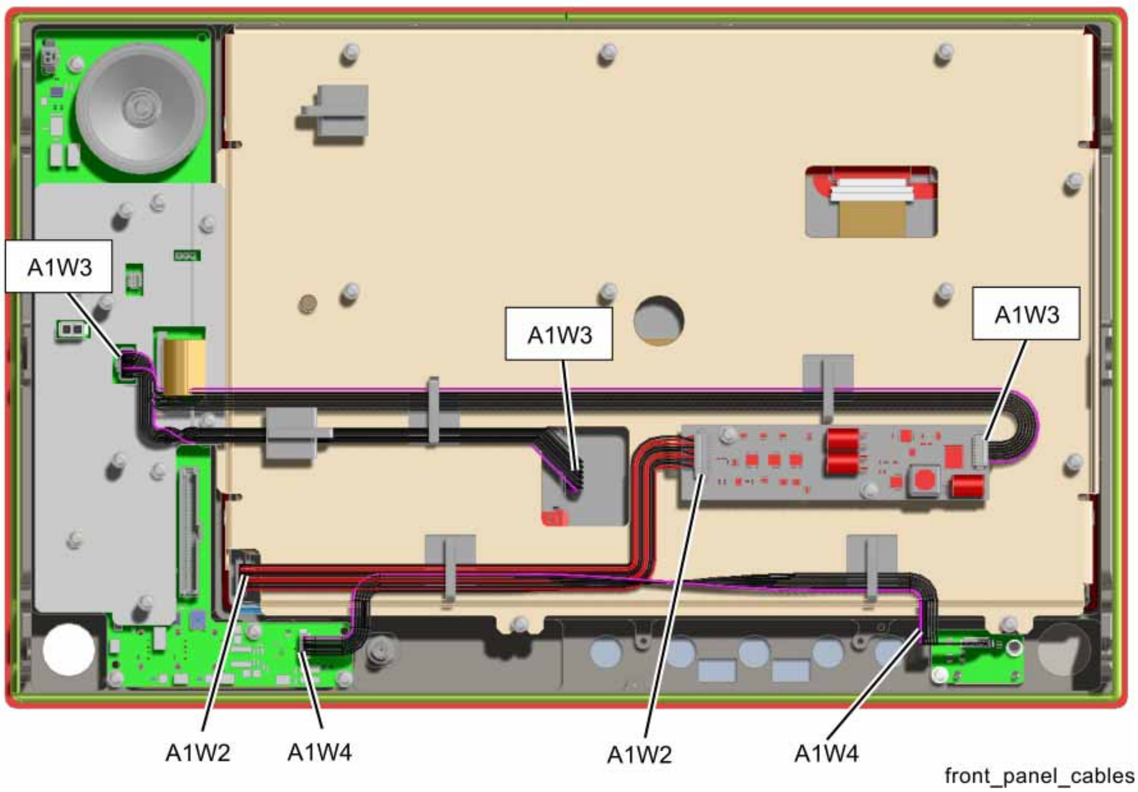
Figure 15-119 Front Panel Shield



1. Refer to Figure 15-119. Remove cable W29.
2. To remove the front panel shield **(1)**, remove the fourteen screws **(2)** (0515-0372).
3. When replacing the front panel shield, torque all screws to 9 inch-pounds, When replacing ribbon cable W1 press firmly on each side to ensure the hooks catch on the boards mating connector.
4. When replacing the cable W29 torque to 10 inch-pounds.

Front Panel Cables

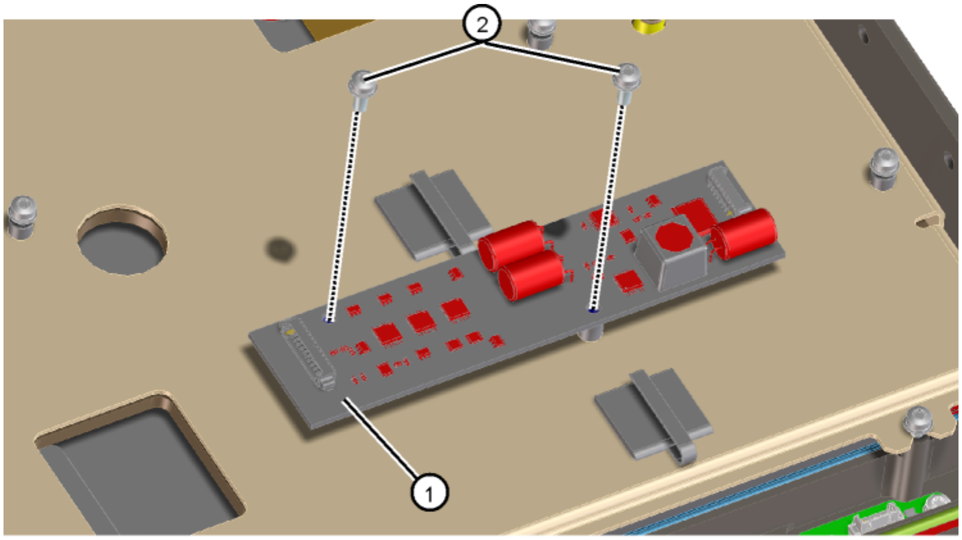
Figure 15-120 Front Panel Cables



1. Refer to Figure 15-120. Remove cables A1W2, A1W3, and A1W4.
2. When replacing the cables, dress in the appropriate cable clamps.

DC DC Converter Board

Figure 15-121 DC DC Converter Board

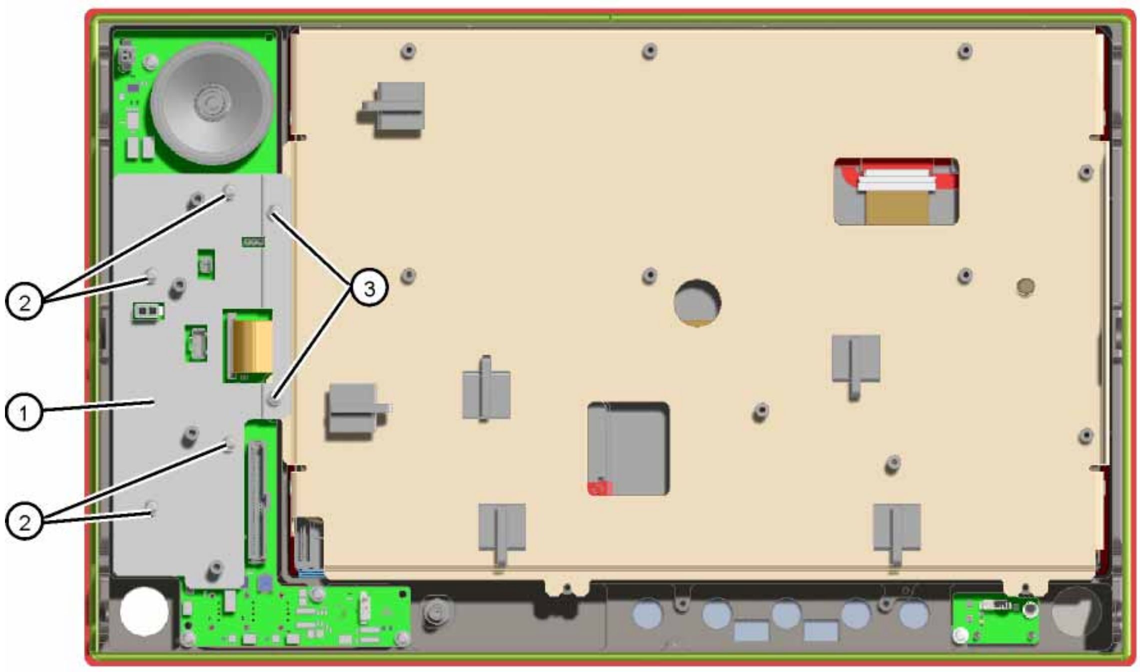


1. Refer to Figure 15-121. To remove the DC DC converter board **(1)**, remove the two screws **(2)** (0515-0372).
2. When replacing the board, torque the screws to 9 inch-pounds.

Controller Bracket and Controller Board

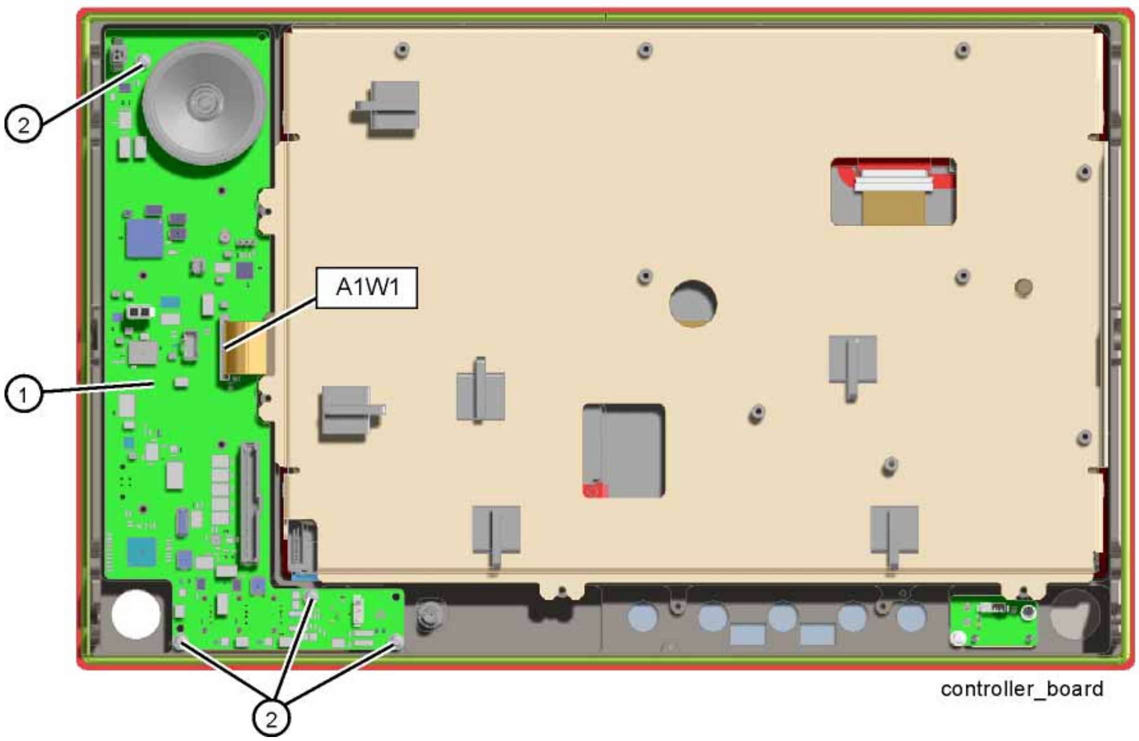
1. Refer to Figure 15-122. To remove the controller bracket **(1)**, remove the four screws **(2)** (0515-0664) and the two screws **(3)** (0515-0372).

Figure 15-122 Controller Bracket



2. Refer to Figure 15-123. Unplug cable A1W1 from the controller board at the location shown. Pull up on the locking tab to remove the cable. To remove the controller board **(1)**, remove the four screws **(2)** (0515-0372).

Figure 15-123 Controller Board



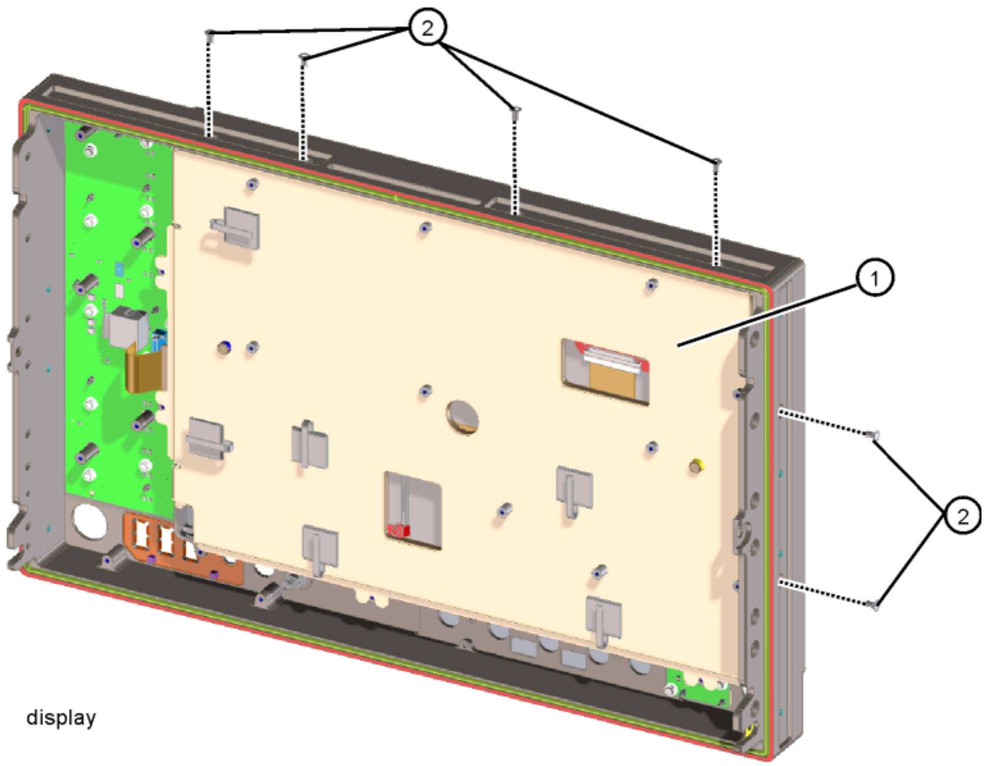
3. When replacing the board, position on top of the keyboard and press down to mate connectors. Torque the screws to 9 inch-pounds. When replacing the cable A1W1 press down on the locking tab with the cable fully seated to secure.

Display Assembly

Removal

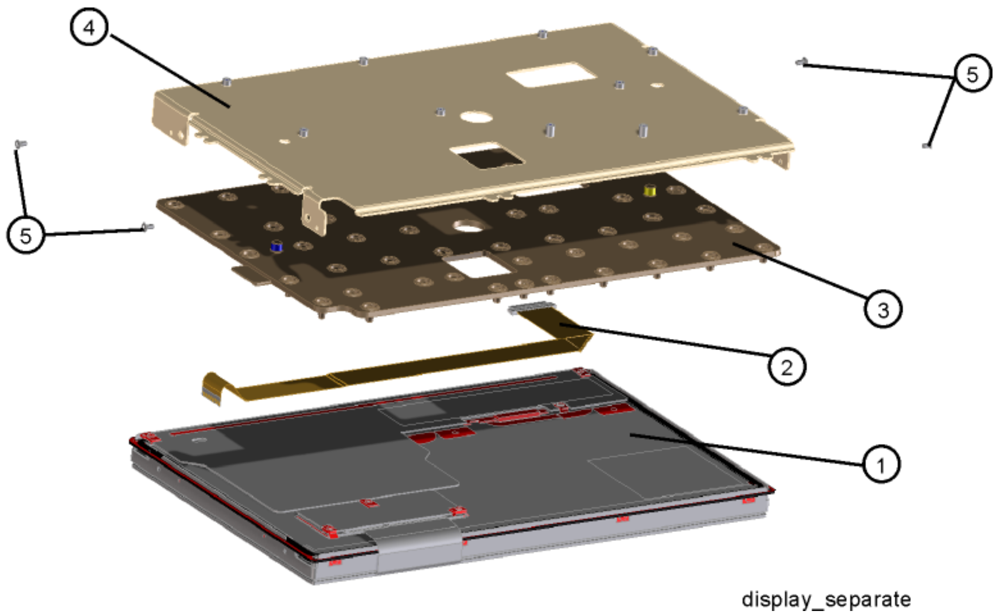
1. Refer to Figure 15-124. Remove the six screws **(2)** (0515-1946). The display assembly **(1)** can now be lifted out of the front frame.

Figure 15-124 Display Removal



2. Refer to Figure 15-125. To separate the display **(1)** from the display bracket **(4)**, remove the four screws **(5)** (0515-1946). The display bracket can now be separated from the display. Separate the display compression pad **(3)** and disconnect cable A1W1 **(2)**

Figure 15-125 Display and Bracket Separation

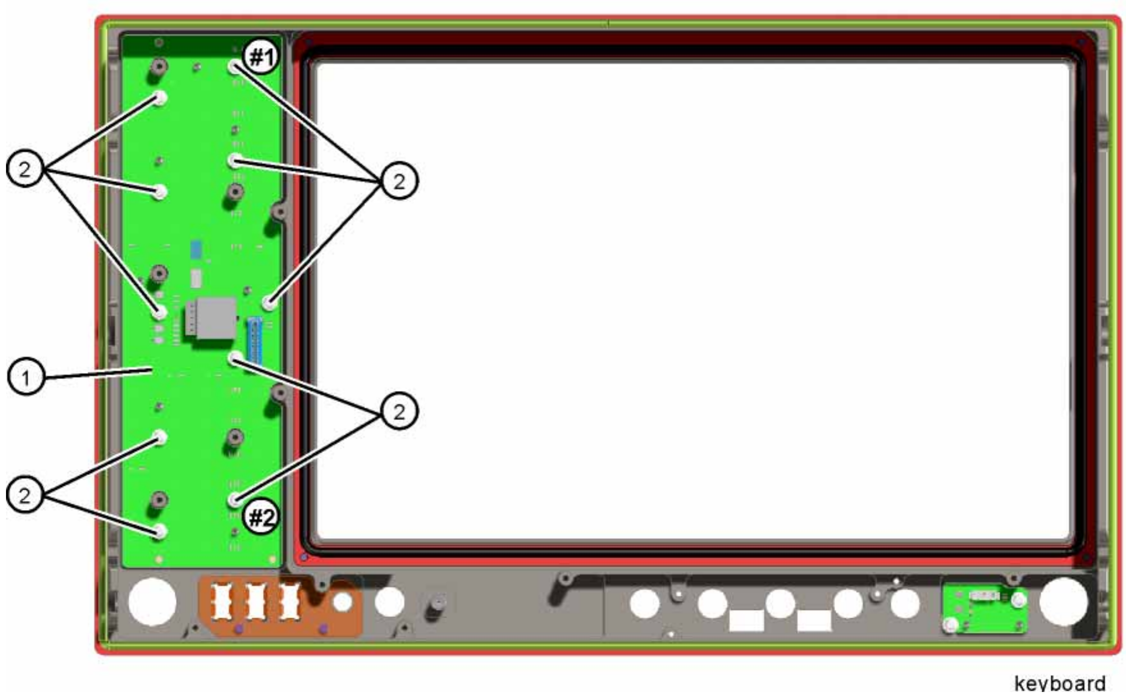


3. To reassemble the display assembly, first connect cable A1W1 **(2)** to the display **(1)**.
4. Place the display compression pad **(3)** on the display as shown in Figure 15-125. Make sure the pad is seated properly.
5. Place the display bracket **(4)** onto the display and replace the four screws **(5)** (0515-1946). Torque to 6 inch-pounds.

Keyboard/Keypad

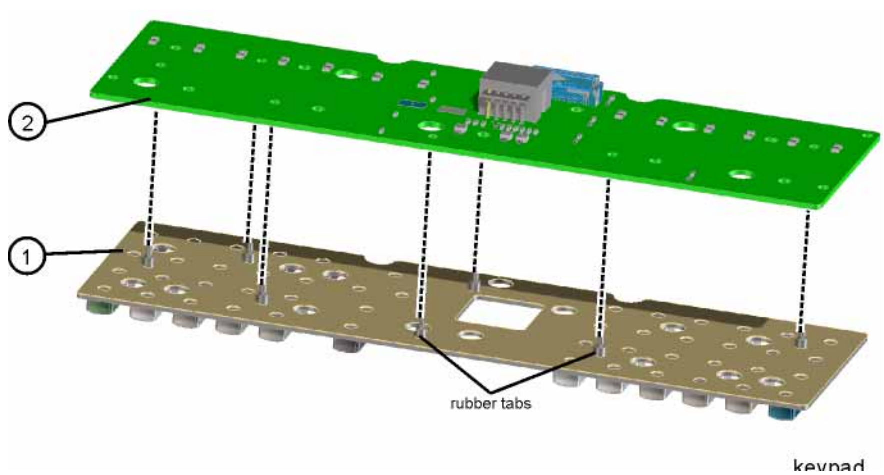
1. Refer to Figure 15-126. Remove the RPG knob by carefully pulling it off. To remove the keyboard **(1)**, remove the ten screws **(2)** (0515-0430).

Figure 15-126 Keyboard



2. Refer to Figure 15-127. To separate the keypad **(1)** from the keyboard **(2)**, pull the keypad away from the keyboard to release the multiple rubber tabs.

Figure 15-127 Keyboard Keypad Separation



3. Remove the protective film from the new keypad (if replacing). Lay the keypad on the keyboard and pull up on the tabs from the back of the board to seat them in place.
4. When replacing the board, position in the front frame and replace the ten screws. Torque the screws to 9 inch-pounds, starting with the screw #1 first and then #2 as shown in Figure 15-126. Replace the RPG knob by firmly pushing it onto the shaft.

16 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 1-1 on page 38, for a list of recommended equipment and critical test equipment specifications for the performance verification and adjustments.

Post-Repair Procedures

Table 16-1 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.

The following procedures are also included in the "Additional Tasks" on page 509.

– "Calibration Data Backup and Restore"

– "BIOS Settings Verification"

– "FPGA Synchronization"

– "Programming Model and Serial Numbers"

Table 16-1 Post-Repair Testing Requirements

Assembly	Adjustments to Perform (in the order listed)[a]	Performance Verifications to Perform After Adjustments[a]
A1A2 Front Panel Interface	None	Residual Responses Displayed Average Noise Level
A1A3 Liquid Crystal Display	None	Residual Responses Displayed Average Noise Level
A2 Analog IF Assembly	IF Flatness Adjust (Option B25 or B40)	Power Bandwidth Accuracy Resolution Bandwidth Switching Uncertainty Residual Responses Displayed Average Noise Level IF Frequency Response (Option B25, B40) Absolute Amplitude Accuracy Display Scale Fidelity
A3 Digital IF Assembly	FPGA Synchronization[b]	Power Bandwidth Accuracy Resolution Bandwidth Switching Uncertainty Residual Responses Displayed Average Noise Level IF Frequency Response (Option B25, B40) Absolute Amplitude Accuracy Display Scale Fidelity
A4 CPU Assembly	BIOS Settings Verification[b] Set Instrument Time and Date[c]	Residual Responses Displayed Average Noise Level
A4BT1 Battery	BIOS Settings Verification[b] Set Instrument Time and Date[c]	Residual Responses Displayed Average Noise Level
A5 Disk Drive[d]	Accept End User License Agreement (EULA)[b] Instrument Software Update[e] All Adjustments[df]	Residual Responses Displayed Average Noise Level Frequency Response (All Tests)
A6 Power Supply	None	Residual Responses Displayed Average Noise Level Spurious Responses
A7 Midplane board	Program Instrument Model and Serial Number[b]	Residual Responses Displayed Average Noise Level
A8 Motherboard	None	Run all tests since instrument was disassembled.

Table 16-1 Post-Repair Testing Requirements (Continued)

Assembly	Adjustments to Perform (in the order listed)[a]	Performance Verifications to Perform After Adjustments[a]
A9 & A10 RF Attenuators	Hardware Statistical Reset Utility 50 MHz Calibrator Adjustment Frequency Response (All Adjustments) Attenuator Slope	Residual Responses Displayed Average Noise Level Spurious Responses Third Order Intermodulation Absolute Amplitude Accuracy Input Attenuation Switching Uncertainty Frequency Response (All Tests)
A11 Low Band Switch	Frequency Response (All Tests) Attenuator Slope	Residual Responses Displayed Average Noise Level Spurious Responses Third Order Intermodulation Second Harmonic Distortion Absolute Amplitude Accuracy Frequency Response (All Tests)
A12 YTF Preselector	YTF Alignment (Press **System**, **Alignments**, **Advanced**, **Characterize Preselector**) Frequency Response (All Adjustments) Attenuator Slope	Residual Responses Displayed Average Noise Level Spurious Responses Third Order Intermodulation Second Harmonic Distortion Absolute Amplitude Accuracy Frequency Response (All Tests)
A13 Front End Assembly	YTF Alignment (Press **System**, **Alignments**, **Advanced**, **Characterize Preselector**) RF Frequency Response (All Tests) IF Frequency Response UWBIF (Option B2X, or B5X, or H1G only) IF Frequency Response UWBIF Full Bypass Path (Option B2X, or B5X, or H1G, and FBP only) Attenuator Slope IF Phase Linearity (Option B2X, or B5X, or H1G only) TOI Adjustment Front End Controller Attenuator Adjustment Attenuator Slope Preamp On Characterize Noise Floor (Press **System**, **Alignments**, **Advanced**)	Residual Responses Displayed Average Noise Level Spurious Responses Third Order Intermodulation Second Harmonic Distortion Absolute Amplitude Accuracy RF Frequency Response (All Tests) IF Frequency Response UWBIF (Option B2X, or B5X, or H1G only) Effective DANL If the instrument has Option B2X, or B5X, or H1G, go to the Utilities menu and perform: IF Frequency Response UWBIF Check IF Phase Linearity Utility
A13 SW4/SW5 or FL2 (Option 510)	Characterize Noise Floor (Press **System**, **Alignments**, **Advanced**)	Residual Responses Displayed Average Noise Level Spurious Responses Third Order Intermodulation Second Harmonic Distortion Absolute Amplitude Accuracy Frequency Response (below 3.6 GHz) Effective DANL

Table 16-1 Post-Repair Testing Requirements (Continued)

Assembly	Adjustments to Perform (in the order listed)[a]	Performance Verifications to Perform After Adjustments[a]
A14 Synthesizer Assembly	FPGA Synchronization[b]	Residual Responses Displayed Average Noise Level Spurious Responses Phase Noise (All Tests) Frequency Response (All Tests)
A15 Front End Control Assembly	FPGA Synchronization[b] YTF Alignment (Press **System**, **Alignments**, **Advanced**, **Characterize Preselector**) Front End Controller Attenuator Adjustment Frequency Response (All Tests) Attenuator Slope TOI Adjustment Characterize Noise Floor (Press **System**, **Alignments**, **Advanced**)	Residual Responses Displayed Average Noise Level Absolute Amplitude Accuracy Frequency Response (All Tests) Effective DANL
A16 Reference Assembly	FPGA Synchronization[b] 10 MHz Frequency Reference Adjust 50 MHz Calibrator Amplitude Adjust 4800 MHz Calibrator Amplitude Adjust	Frequency Reference Accuracy Residual Responses Displayed Average Noise Level Frequency Readout Accuracy Count Accuracy Absolute Amplitude Accuracy Phase Noise (All Tests)
A20 YTO	Assure 1st LO unlocked or unleveled messages do not appear.	Residual Responses Phase Noise Frequency Response (all tests)
A21 Wideband Analog IF (Option B2X/B5X)	FPGA Synchronization[b] IF Frequency Response UWBIF IF Phase Linearity	Noise Density Spurious Responses IF Frequency Response UWBIF *Also, go to Utilities and perform:* IF Frequency Response UWBIF Check (utility) IF Phase Linearity Utility
A22 Wideband Digital IF (Option B2X/B5X)	FPGA Synchronization[b] IF Frequency Response UWBIF IF Phase Linearity	Noise Density Spurious Responses IF Frequency Response UWBIF *Also, go to Utilities and perform:* IF Frequency Response UWBIF Check (utility) IF Phase Linearity Utility
A27 H1G Assembly (Option H1G)	FPGA Synchronization[b] IF Frequency Response UWBIF IF Frequency Response UWBIF Full Bypass Path (if Option FBP is present) IF Phase Linearity	IF Frequency Response UWBIF *Also, go to Utilities and perform:* IF Frequency Response UWBIF Check (utility) IF Phase Linearity Utility

Table 16-1 Post-Repair Testing Requirements (Continued)

Assembly	Adjustments to Perform (in the order listed)[a]	Performance Verifications to Perform After Adjustments[a]
SW1 or SW2 Preselector bypass switch (Option MPB)	Frequency Response (all tests) Reset Preselector Bypass cycles using software utility Characterize Noise Floor (Press **System**, **Alignments**, **Advanced**)	Frequency Response (all tests) Effective DANL
SW3 Low Noise Path Switch (Option LNP)	Frequency Response (all tests) Reset Low Noise Path switch using software utility Characterize Noise Floor (Press **System**, **Alignments**, **Advanced**)	Frequency Response (all tests) Effective DANL

a. Calibration Application Software is required for all performance tests and most adjustments. For details go to http://www.keysight.com/find/calibrationsoftware
b. See the Additional Tasks section in this chapter for detailed instructions on this task.
c. To set the instrument time and date press **Start**, **Control Panel**, **Date Time Language and Regional Options**, **Date and Time**
d. Before replacing the A5 Disk Drive, see the “Calibration Data Backup and Restore” section in this chapter for details.
e. See Chapter 17, “Instrument Software” for instructions on updating the instrument software to the latest version.
f. The 50 MHz and 4800 MHz Calibrator Amplitude Adjustments must be done prior to Frequency Response Adjustments.

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

Additional Tasks

Calibration Data Backup and Restore

In order for the instrument being repaired to not need all of the instrument adjustments and performance verification tests to be run after the A5 Disk Drive is replaced the calibration data will need to be backed up onto an external drive prior to removing the existing disk drive.

NOTE While the backing up and restoring of the calibration data to the new disk drive will return the instrument performance to the state that it was prior to a repair this does not guarantee that all instrument performance parameters meet their specified values. A full instrument calibration would be required to verify this.

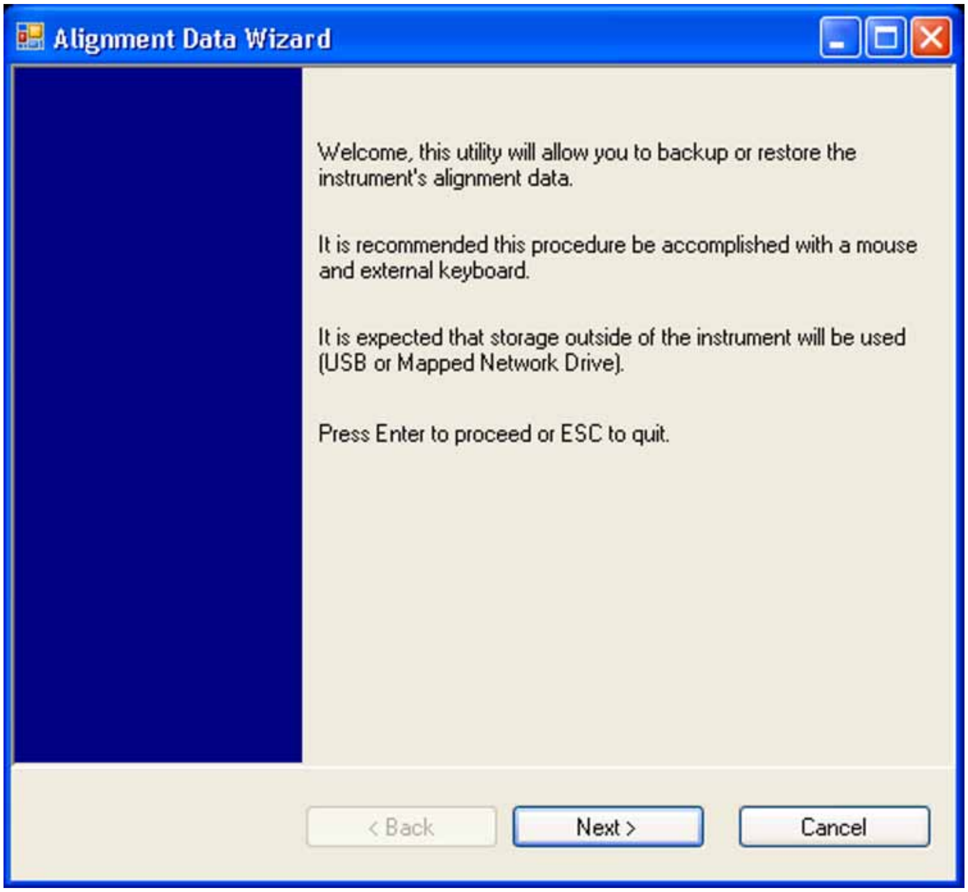
Data Backup

There are two different backup procedures that might need to be followed. Which backup procedure to be run will depend on whether the software will run or not.

If the Instrument Software Application Will Run

1. Connect a USB keyboard and mouse to two of the instrument rear panel USB ports
2. Connect a USB FLASH drive to one of the front panel USB port.
3. Press **System**, **Alignments**, **Backup or Restore Align Data**.
4. The Alignment Data Wizard window as shown in Figure 16-1 will appear.

Figure 16-1 Alignment Data Wizard



5. Follow the on-screen instruction to backup the calibration data to the USB FLASH drive.

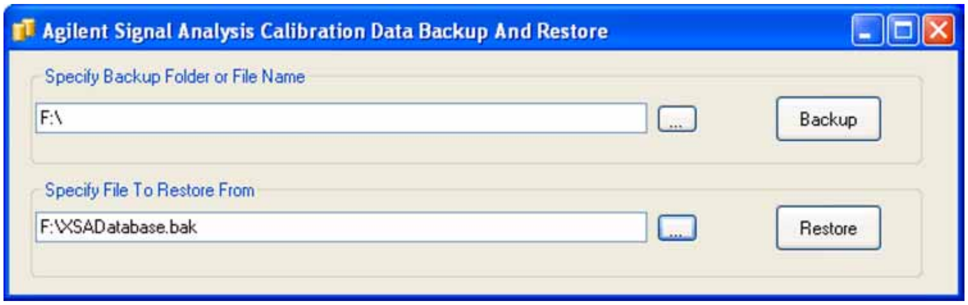
If the Instrument Software Application Will Not Run

1. Connect a USB mouse to one of the instrument front panel USB ports.
2. Connect a USB FLASH drive to the other front panel USB port.
3. Using the mouse double-click on the Windows Explorer link on the desktop and navigate to the following folder:

   C:\Program Files\Agilent\SignalAnalysis\Physics

4. Double-click on BackupAndRestore.exe and the window shown in Figure 16-2 will appear.

Figure 16-2 Calibration Data Backup



5. Under the “Specify Backup Folder or File Name” use the mouse to select the “...” button to open the “Browse For Folder” dialog box.
6. Select the USB FLASH drive and press **OK**.

NOTE While you can use the “Make New Folder” button in the “Browse For Folder” dialog box to create a sub-folder on the USB FLASH drive, and you can specify a filename in the “Specify Backup Folder or File Name” window, you can also just use the root directory on the drive and let the instrument select a default filename for you.

7. Select “Backup” and wait for the calibration database to be backed up.
8. When the backup has completed close the Calibration Data Backup And Restore window.

Data Restore

1. Connect a USB mouse to one of the instrument front panel USB ports.
2. Locate the USB FLASH drive that was earlier used to backup the instrument calibration file and insert it into one of the instrument front panel USB ports.
3. Restore the instrument calibration data by pressing: **System**, **Alignments**, **Backup or Restore Align Data...**. The Alignment Data Wizard window as shown in Figure 16-1 will appear.
4. Follow the on-screen instruction to restore the previously saved calibration data from the USB FLASH drive.
5. Cycle instrument power.

BIOS Settings Verification

Whenever either the A4 CPU assembly or the A4BT1 CPU Battery is changed there are certain BIOS settings that need to be verified. If these are not set correctly the instrument may not boot up or operate correctly.

Default BIOS Settings

1. Connect an external USB keyboard to one of the front panel USB ports.
2. Turn on instrument power.
3. Confirm Keysight Technologies splash screen comes up within a few seconds.
4. Press the key on the keyboard specified on the initial boot screen to enter the setup utility.
5. Navigate to the Exit screen and select “Restore Defaults” or “Load Setup Defaults”, whichever is present.
6. Once the defaults have been loaded select “Save Changed” and “Exit”.

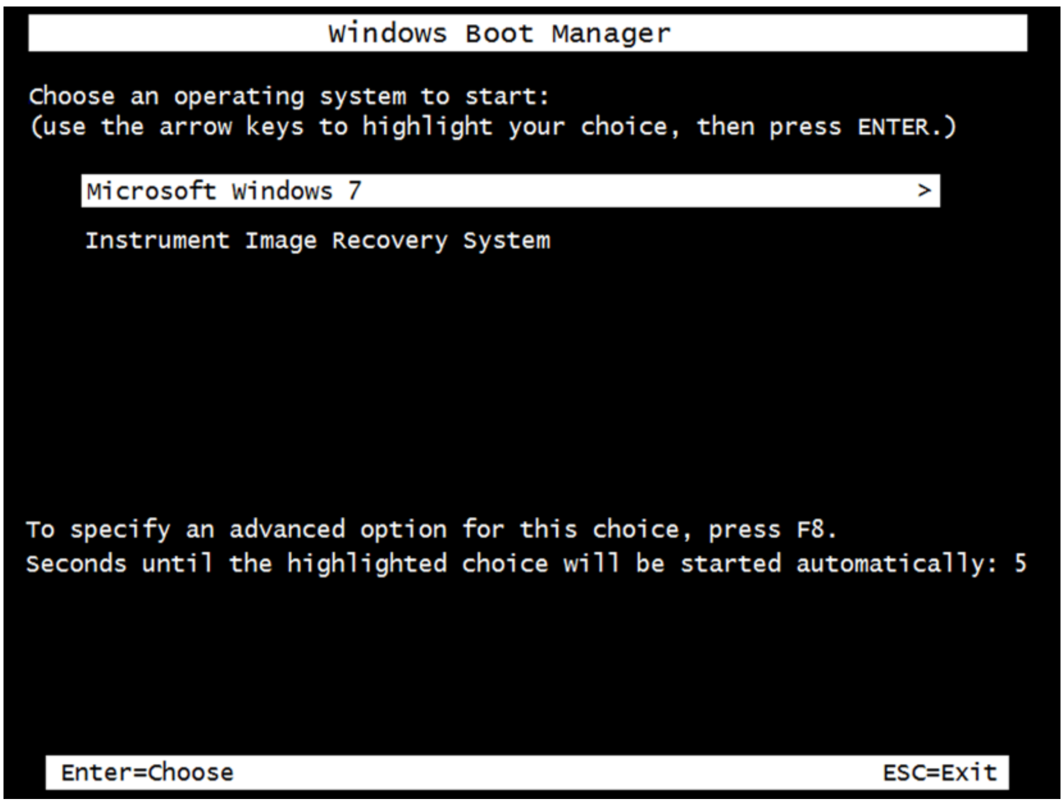
Operating System Initialization

When a new disk drive is powered on for the first time the operating system will need to initialize itself before the instrument can be used. This will take just a few minutes to complete and will require very little user interaction.

Initialization

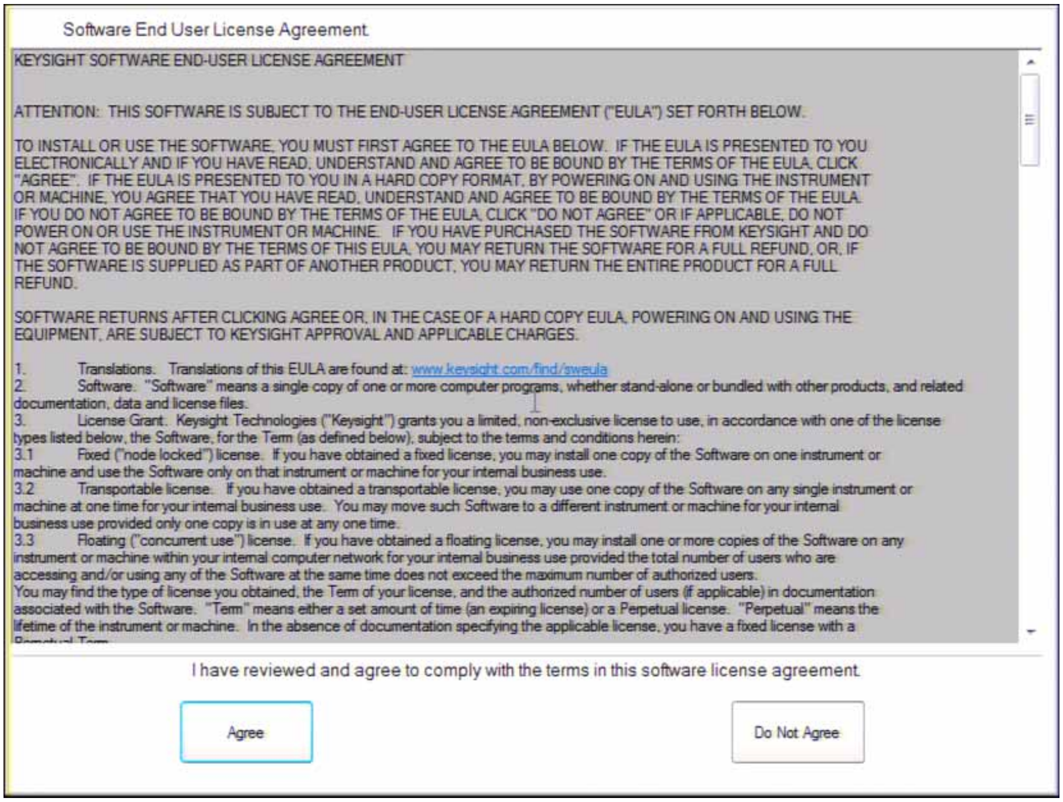
1. With the new disk drive installed power the instrument on.
2. Within a few seconds you will see the initial Keysight Technologies splash screen, and then the boot selection menu as seen in Figure 16-3.
3. Allow the instrument to boot the Windows operating system. (This will happen automatically after 5 seconds if the instrument is left alone).

Figure 16-3 Boot Selection Screen



4. After a few moments the License Agreement message window will appear, as shown in Figure 16-4.

Figure 16-4 License Agreement Window



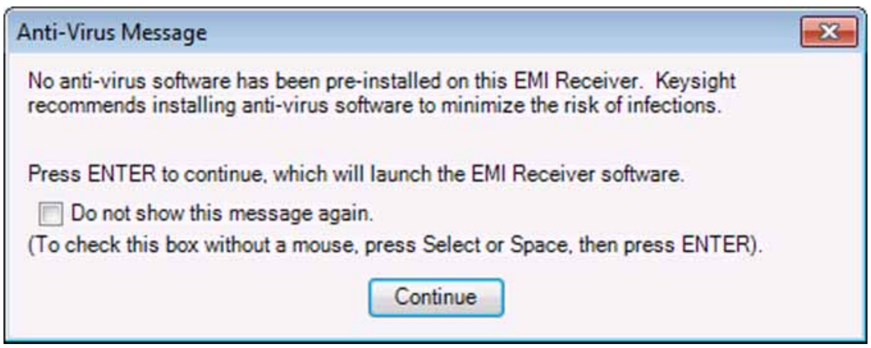
5. Select "Agree" to continue with the operating system initialization.

NOTE

If the initialization process would like to be postponed select "Do Not Agree" at this time to safely shut the instrument off. The next time this disk drive is powered on this process will be restarted.

6. The instrument will now reboot and complete the initialization process. Once this process has completed the Anti-Virus Message will appear, as shown in Figure 16-5. At this point the operating system initialization process will be completed and either selection can be made, or the instrument can be powered off.

Figure 16-5 Anti-Virus Message



7. The disk drive in use is now ready for further configuration.

FPGA Synchronization

There is FPGA (Field-Programmable Gate Array) program code on many different assemblies inside of the instrument, and all of these must be of a compatible version with the instrument software revision. In order to ensure that this requirement is met when either an assembly is replaced that contains FPGA code on it, or if the A5 Disk Drive is replaced with a drive that has a different version of software than the previous drive, you will need to take certain steps to ensure that the instrument operates properly.

NOTE Even if an instrument appears to work properly when an assembly with FPGA code is replaced, that does not mean that the FPGA code is completely compatible with the software version installed in the instrument. There could be incompatibilities that will only be seen under certain measurement conditions.

Updating the Instrument FPGA Code

All instruments have a utility included in them that will update the FPGA code on all of the different assemblies in the instrument that have it. When this utility is run it will detect the assemblies that need to be updated and will update them to the correct revision.

NOTE Once you start the FPGA programming process you MUST NOT interrupt the process for any reason. This would include turning the instrument off or unplugging the power cord to the instrument. Doing so will result in an inoperative instrument, requiring the affected assembly to be replaced.

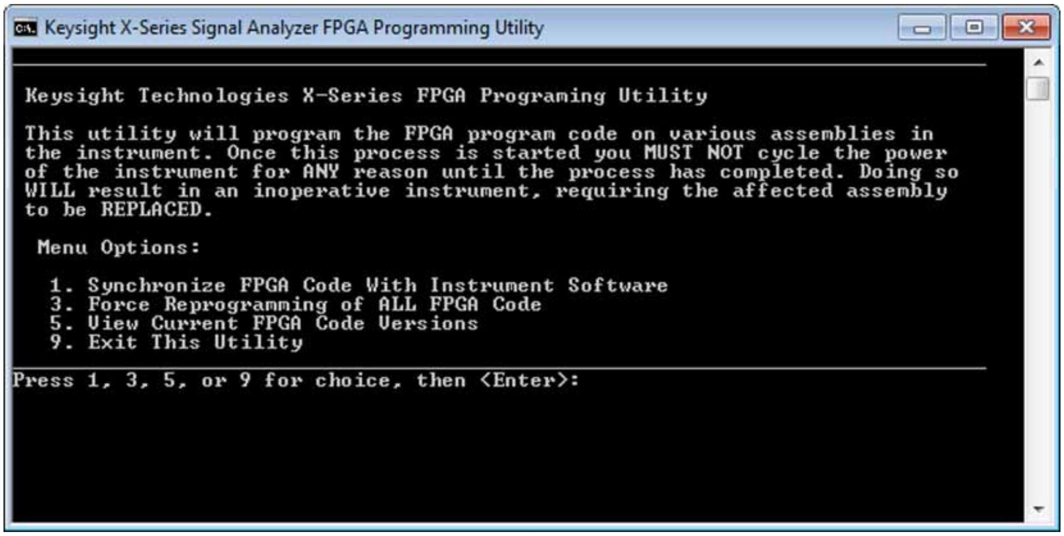
1. Close the instrument application software by pressing **File**, **Exit**, **Enter** using the front panel keys.
2. Connect a USB mouse to one of the instrument front panel USB ports.
3. Using the mouse double-click on the Windows Explorer link on the desktop and navigate to the following folder:

   C:\Program Files\Agilent\SignalAnalysis\Physics
4. In this folder find and execute the file named:

   FPGA_Prog.bat

5. The FPGA Programming Utility will start and a window as shown in Figure 16-6 will appear.

Figure 16-6 FPGA Programming Utility



6. To program the FPGA code enter **1** and press **Enter**. You will need to confirm this selection by pressing **1** and **Enter** one more time.

7. The programming of the FPGA code could take a few minutes to complete. Once it has finished the instrument will reboot itself to use the new code and this process will then be completed.

Programming Model and Serial Numbers

Since the instrument model and serial numbers are stored only on the A7 Midplane board assembly, this information will be lost when this board assembly is replaced. Until the instrument model and serial numbers are restored the instrument application software will not allow any user measurements to be made, due to the fact that all previously installed license keys will not be accepted. However, the license files will not be automatically deleted. Once the model and serial numbers are restore the license files will then be recognized and accepted, returning the instrument to the capability that was available prior to the A7 Midplane board assembly replacement.

To program the model and serial numbers into a replacement A7 Midplane board assembly the N7800A Keysight Calibration Application Software will be required.

Information regarding N7800A Keysight Calibration Application Software can be found at:

http://www.keysight.com/find/calibrationsoftware

When the calibration software first detects the instrument it will recognize that it does not have a valid model and serial number and will prompt the user to enter the correct values.

NOTE Be very careful when entering the instrument serial number into the software, because once it has been written it can no longer be changed.

Since the instrument model and serial numbers are stored on the A7 Midplane board assembly, this should only be required when this assembly has been replaced with a new one.

17 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**, **Freq Ref In**.
    b. If the **Freq Ref In** softkey does **not** show Internal, press the **Freq Ref Input** 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 Keysight Model	Alternate Keysight Model
	Adapters			
All	3.5 mm (f) to 3.5mm (f) (connector saver for source)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B	1250-1749
All	BNC (f) to SMA (m)	Frequency: 40 MHz	1250-1200	
All	Type N (f) to Type N (f)	Frequency: 10 MHz to 18 GHz VSWR: < 1.05:1	1250-1472	1250-0777
All	Type N (m) to 3.5 mm (m)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1743	
All	Type N (m) to 3.5 mm (f)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1744	
All	Type N (f) to 3.5 mm (f)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1745	
All	Type N (m) to BNC (f)	Frequency: 10 MHz to 1 GHz VSWR: < 1.05:1	1250-1476	
	Attenuators			
All	10 dB Step Attenuator	Frequency: 50 MHz Range: 0 to 70 dB	8495A	8496A
All	10 dB Fixed Attenuator (2 required)	Frequency: 50 MHz VSWR: < 1.2:1	8493C Option 010	8493A Option 010 or 8493B Option 010
Preamp Options (Pxx)	30 dB Fixed Attenuator	Accuracy: < 0.05 dB @ 50 MHz	11708A	

Analyzer Option	Item	Critical Specifications	Recommended Keysight Model	Alternate Keysight Model
	Cables			
All	3.5 mm (1 meter)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.4:1 Loss: < 2.0 dB	11500E	8120-4921
All	Cable, BNC (3 required)	120 cm (48 in.) BNC cable	10503A	
	Signal Source			
All	Synthesized Sweeper	Frequency: 10 MHz to 50 GHz[a] Harmonic level: < - 40 dBc Amplitude range: 10 to - 20 dBm Frequency Accuracy: 0.02%	PSG[b]	83630B, 83640B, 83650B
	Power Meter			
All	Power Meter	Power Reference Accuracy: ±1.2% Compatible with power sensor	E4418B	E4419B
All	Power Sensor	Frequency Range: 50 MHz to 3.66 GHz Amplitude Range: -70 to –20 dBm	8481D	8487D 8485D
508, 513	Power Sensor	Frequency Range: 50 MHz to 13.66 GHz Amplitude Range: -30 to +20 dBm	8481A	
526	Power Sensor	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: -30 to +20 dBm	8485A	
Preamp	Low Power Sensor	Frequency Range: 50 MHz to 50 GHz[c] Amplitude Range: –70 to –20 dBm	8487D	8485D[c]
	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	
526	Power Splitter, 3.5 mm	Nominal Insertion Loss: 6 dB Tracking Between Ports: < 0.25 dB	11667B	
508, 513	Power Splitter	Nominal Insertion Loss: 6 dB Tracking Between Ports: < 0.25 dB	11667A	11667B

Analyzer Option	Item	Critical Specifications	Recommended Keysight Model	Alternate Keysight Model
All	Termination, 50 W	Type N (m) Connector Frequency: 30 Hz to 26.5 GHz	909A Option 012	

a. Maximum frequency equal to or greater than the maximum frequency of the UXA.
b. 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.
c. Maximum frequency equal to or greater than the maximum frequency of the preamplifier option.

Displayed Average Noise Level (DANL)

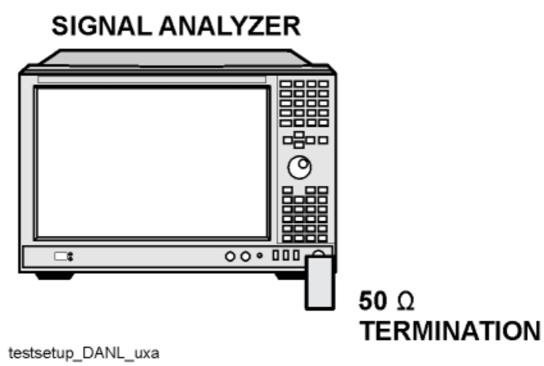
Test Limits (with 0 dB input attenuation)

See Table 17-1 on page 528 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 50W 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 Keysight Model
Termination, 50W Type-N(m)	Frequency: DC to 18 GHz	909A Option 012

Figure 17-1 DANL Test Setup



Procedure

1. Configure the equipment as shown in Figure 17-1.
2. Press **Mode/Meas**, **Spectrum Analyzer**, **OK**, **Mode Preset** on the analyzer.
3. Set up the signal analyzer by pressing:

    FREQ Channel, **Center Frequency**, 10, **MHz**
    Input/Output, select **INPUT FREQ (Channel)**, **RF**, **RF Coupling**, select **DC**
    Span, 10, **kHz**
    AMPTD Y Scale, –70, **dBm**
    AMPTD Y Scale, Attenuation, **MechAtten**, 0, **dB**
    BW, **Res BW**, 1, **kHz**
    BW, **Video BW**, 100, **Hz**
    Meas Setup, Average/Hold, Number, 20, **Enter**
    Trace, **Trace Average**
    Single

4. Press **Restart**, then wait for Average/Hold to display 20/20.
5. Press **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 17-1.
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 17-1
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 17-1. Press: **FREQ Channel**, **Center Freq**, [Table 2-1 Value], **GHz**

13. Repeat step 4 through step 12 to fill in the remainder of Table 17-1 for your analyzer frequency range.

Table 17-1 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			–153
2 GHz			–152
6 GHz			–148
13 GHz			–147
20 GHz			–140
26.5 GHz			–133

Frequency Readout Accuracy

Test Limits

Frequency Readout Accuracy is equivalent to the following equation:

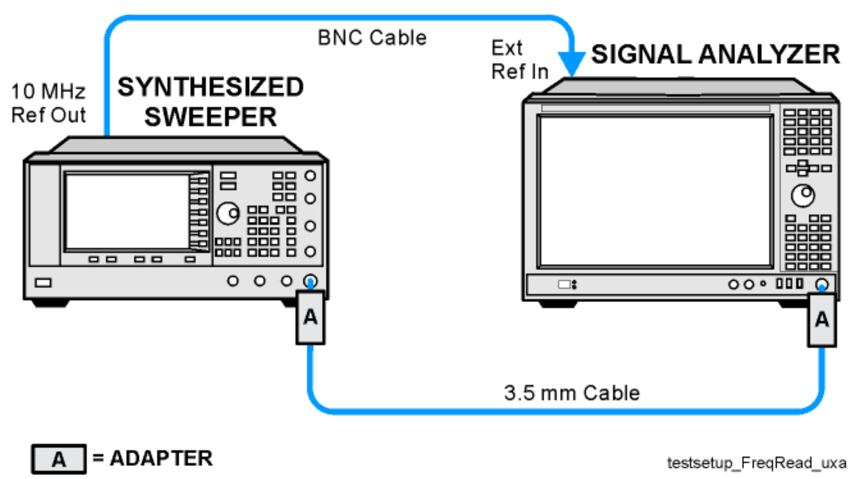
$$\pm(\mathbf{0.25}\% \times span + \mathbf{5}\% \times RBW + \mathbf{2}\ Hz + \mathbf{0.5} \times horizontal\ resolution)$$

See Table 17-2 on page 530 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 Keysight 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 17-2 Frequency Readout Accuracy Test Setup



Procedure

1. Configure the equipment as shown in Figure 17-2. 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**
   RF, On

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 17-2. Record the marker value in the Marker Frequency Readout column in Table 17-2.

5. On the signal analyzer, change the span and center frequency as listed in Table 17-2.

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 17-2 is complete.

Table 17-2 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

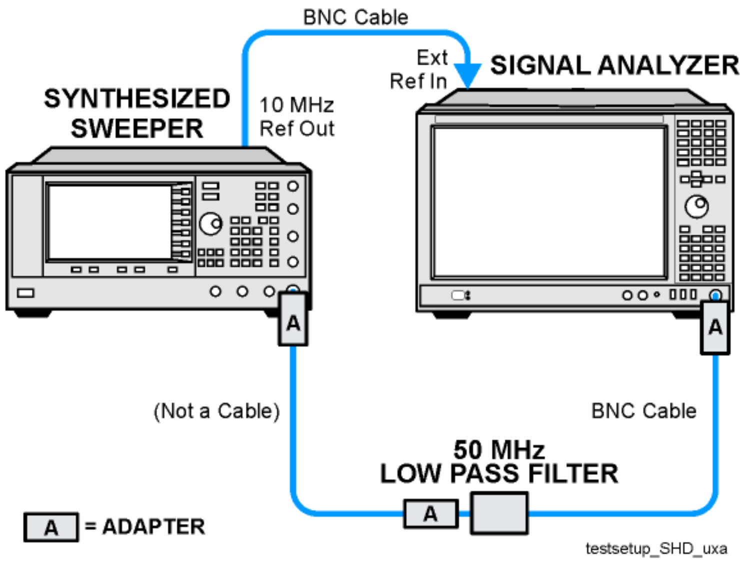
Applied Frequency	Mixer Level[a]	Distortion
40 MHz	–15 dBm	< –60 dBc

a. **Mixer Level = Input Level - RF Attenuation**

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.

Item	Critical Specifications (for this test)	Recommended Keysight 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	Cutoff Frequency: 50 MHz Rejection at 65 MHz: > 40 dB Rejection at 75 MHz: > 60 dB	0955-0306
Synthesized Sweeper	Frequency: 50 MHz Spectral Purity: Better than –30 dBc	PSG

Figure 17-3 Second Harmonic Distortion Test Setup



Procedure

1. Configure the equipment as shown in Figure 17-3.
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, –5, **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**
   AMPTD Y Scale, Attenuation, Mech Atten, 10, **dB**

5. On the analyzer, press **Peak Search**.
6. Adjust the synthesized sweeper amplitude for a signal analyzer display of –5 dBm ±0.1 dB.
7. On the signal 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 17-3.

Table 17-3 Second Harmonic Distortion Results

Applied Frequency (MHz)	Measured Second Harmonic Distortion (dBc)	Mixer Level (dBm)	Specification (dBc)
40		–15	–60

Amplitude Accuracy at 50 MHz

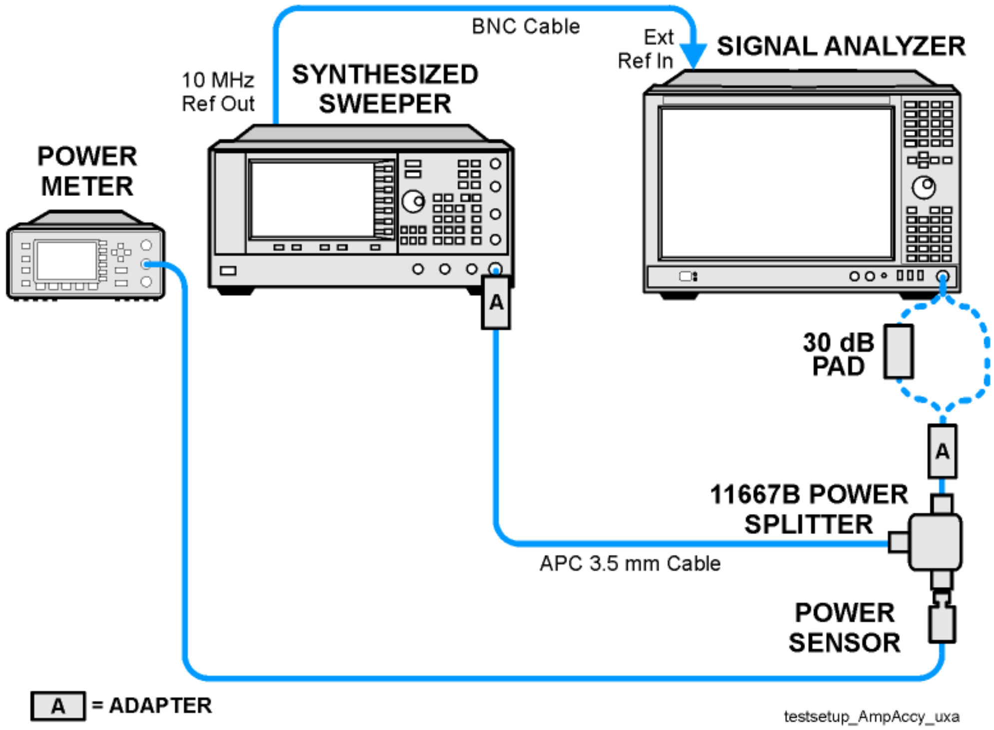
Test Limits

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 P08, P13, P26) 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 Keysight 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	Accuracy: < 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	Amplitude Range: -25 dBm to 10 dBm	8485A
Power Splitter	3.5 mm (f) connectors 6 dB loss	11667B
Synthesized Sweeper	Typical Temperature Stability: 0.01 dBc/°C	PSG

Figure 17-4 Amplitude Accuracy Test Setup



Procedure

1. Zero and calibrate the power meter.
2. Configure equipment as shown in Figure 17-4, 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

7. Perform the following steps for each row listed in Table 17-4:

   a. Set the synthesized sweeper amplitude to the value listed in the Nominal Source Amplitude column in Table 17-4.

   b. Set the Mech Atten as indicated in the Attenuation column in Table 17-4.

   c. Set the Span as listed in the Span column of Table 17-4.

   d. Record the synthesized sweeper amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 17-4.

   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 17-4.

   i. Calculate the signal amplitude accuracy error using the following equation, and record the results under the Amplitude Accuracy Error column:

   Amplitude Accuracy Error = Meas_amp - Power_meter

Table 17-4 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 (P08, P13, P26)

Instruments containing Option P08, P13, P26 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 17-4 on page 535, 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 17-5.
4. Set the signal analyzer input attenuation to 0 dB.
5. Set the Span as listed in Table 17-5.
6. Record the synthesized sweeper amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 17-5.
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 17-5.
11. Calculate the signal amplitude accuracy using the following equation:

    Amplitude Accuracy Error = Meas_amp + 30 dB - Power_meter

12. Record the results under the Amplitude Accuracy Error column of Table 17-5.

Table 17-5 Amplitude Accuracy Results (Option P08, P13, P26)

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

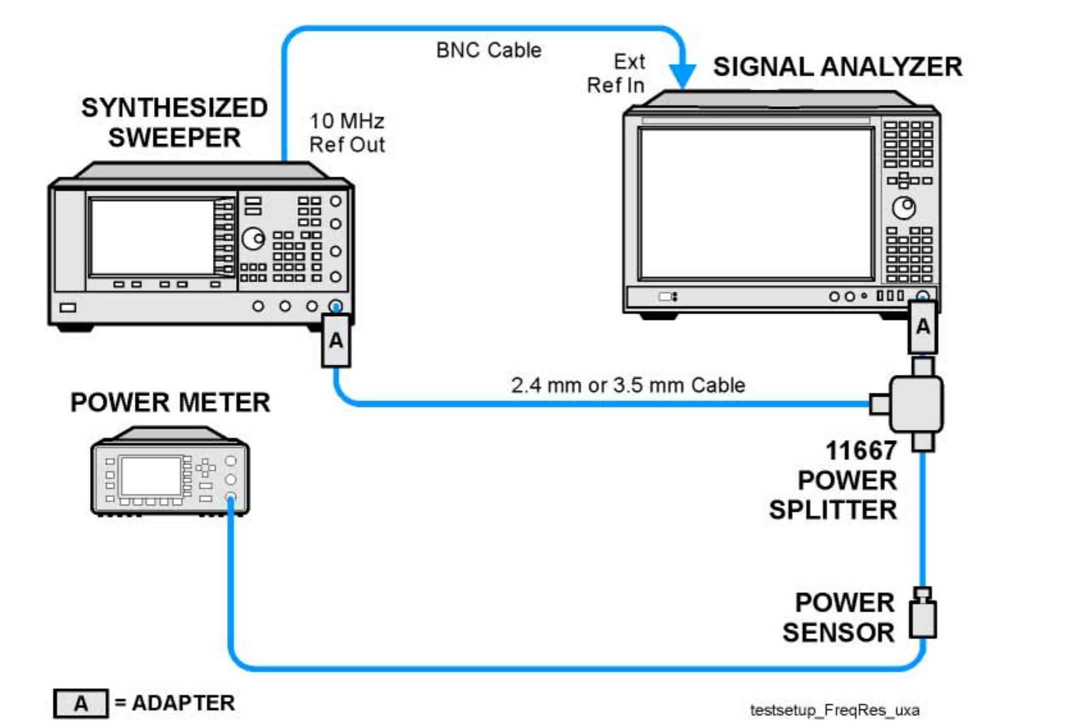
Frequency Range	Limit Relative to 50 MHz
20 Hz to 3.6 GHz	±1.5 dB
> 3.6 GHz to 8.4 GHz	±2.5 dB
> 8.4 GHz to 13.6 GHz	±3.0 dB
> 13.6 GHz to 26.5 GHz	±3.5 dB

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 Keysight Model
Adapter Type N (m) to 3.5 mm (m)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1743
Adapter, 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B
Cable, 3.5 mm, 1 meter (Opt 508, 513, 526)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.4:1	11500E
Cables, BNC 120 cm	Frequency: 10 MHz	10503A
Power Meter	Compatible with power sensor	E4418B
Power Sensor (Opt 508, 513, 526)	Frequency Range: 50 MHz to 26.5 GHz	8485A
Power Splitter (Opt 508, 513, 526)	Frequency Range: 50 MHz to 26.5 GHz Tracking between ports: < 0.25 dB	11667B
Synthesized Sweeper	Frequency Range: 50 MHz to 50 GHz[a]	PSG

a. Maximum frequency of the sweeper must be greater than or equal to maximum specified frequency of the UXA.

Figure 17-5 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 17-5.

NOTE Connect the power splitter to the signal analyzer input using the appropriate adapter. Do not use a cable. An adapter will only be necessary if the UXA input connector is Type-N.

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 dBm ±0.1 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 17-6, “Frequency Response (Flatness) Results.” Enter the amplitude of the signal displayed on the signal analyzer into the $Meas_{Amp}$ column of Table 17-6.

11. Enter the power meter reading into the $Power_{Meter}$ column of Table 17-6.

12. Tune the synthesized sweeper and signal analyzer to the next frequency listed in Table 17-6.

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 17-6 for the frequency range of your analyzer.

16. Compute the measurement error ($Meas_{Error}$ = $Meas_{Amp}$ - $Power_{Meter}$).

17. Compute the flatness error normalized to 50 MHz:
    ($Meas_{Error}$ - $Meas_{Error}$ @ 50 MHz)

18. Enter the computed flatness error value into the $Flat_{Norm}$ column of Table 17-6.

19. Compare the value of $Flat_{Norm}$ to the test limit.

Table 17-6 Frequency Response (Flatness) Results

Center Frequency	Analyzer Amplitude $Meas_{amp}$	Power Meter Measurement $Power_{meter}$	Meas Error $Meas_{error}$	Flatness Normalized to 50 MHz $Flat_{Norm}$	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
8 GHz					±2.5 dB
9 GHz					±3.0 dB
11 GHz					±3.0 dB
13 GHz					±3.0 dB
14 GHz					±3.5 dB
17 GHz					±3.5 dB
20 GHz					±3.5 dB
23 GHz					±3.5 dB
26 GHz					±3.5 dB

Frequency Response (Flatness), Preamp On

Test Limits

Frequency Range	Limit Relative to 50 MHz
100 kHz to 3.6 GHz	±2.0 dB
> 3.6 GHz to 8.4 GHz	±3.0 dB
> 8.4 GHz to 13.6 GHz	±3.5 dB
> 13.6 GHz to 26.5 GHz	±4.0 dB

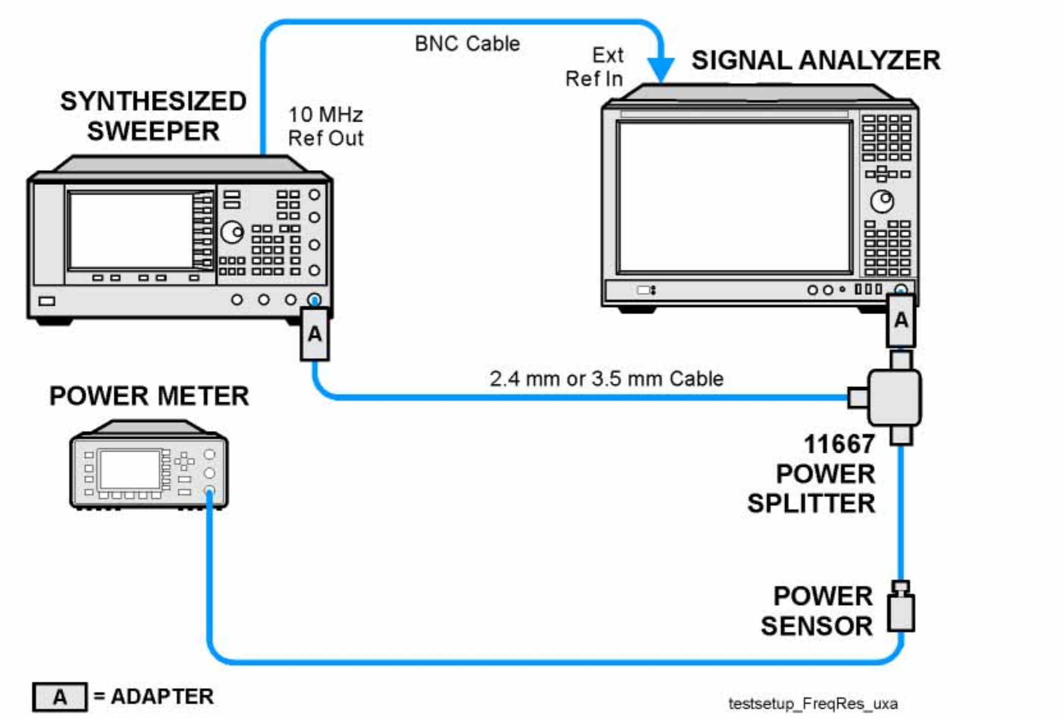
The frequency response test, with preamplifier on, measures the signal analyzer's amplitude error as a function of the tuned frequency. Measurements are made ranging from 50 MHz to the maximum frequency range of the preamp. The signal source amplitude is measured with a power meter to eliminate error due to source flatness. The measured value is normalized to 50 MHz.

Item	Critical Specifications (for this test)	Recommended Keysight Model
Adapter Type N (m) to 3.5 mm (m)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1743
Adapter 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B
Cable, 3.5 mm, 1 meter (Opt P08, P13, P26)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.4:1	11500E
Cable, 2.4 mm, 1 meter (Opt P43, P44, P50)	Frequency: 10 MHz to 50 GHz VSWR: < 1.55:1	8120-6164
Cables, BNC 120 cm	Frequency: 10 MHz	10503A
Power Meter	Compatible with power sensor	E4418B
Attenuator, 30 dB Fixed	Frequency: 50 MHz Accuracy: ±0.05 dB	11708A
Power Sensor (Opt P08, P13, P13)	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: –65 dBm to –55 dBm	8485D

Item	Critical Specifications (for this test)	Recommended Keysight Model
Power Sensor (Opt P43, P44, P50)	Frequency Range: 50 MHz to 50 GHz Amplitude Range: –65 dBm to –55 dBm	8487D
Power Splitter (Opt P08, P13, P13)	Frequency Range: 50 MHz to 26.5 GHz Tracking between ports: < 0.25 dB	11667B
Power Splitter (Opt P43, P44, P50)	Frequency Range: 50 MHz to 50 GHz Tracking between ports: < 0.40 dB	11667C
Synthesized Sweeper	Frequency Range: 50 MHz to 50 GHz[a]	PSG

a. Maximum frequency of the sweeper must be equal to or greater than the maximum frequency of the preamplifier option.

Figure 17-6 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 17-5.

NOTE Connect the power splitter to the signal analyzer input using the appropriate adapter. Do not use a cable. An adapter will only be necessary if the UXA input connector is Type-N.

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 dBm ±0.1 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 17-6, “Frequency Response (Flatness) Results.” Enter the amplitude of the signal displayed on the signal analyzer into the $Meas_{Amp}$ column of Table 17-6.
11. Enter the power meter reading into the $Power_{Meter}$ column of Table 17-6.
12. Tune the synthesized sweeper and signal analyzer to the next frequency listed in Table 17-6.
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 17-6 for the frequency range of your preamp.

16. Compute the measurement error ($Meas_{Error}$ = $Meas_{Amp}$ - $Power_{Meter}$).

17. Compute the flatness error normalized to 50 MHz:
($Meas_{Error}$ - $Meas_{Error}$ @ 50 MHz)

18. Enter the computed flatness error value into the $Flat_{Norm}$ column of Table 17-6.

19. Compare the value of $Flat_{Norm}$ to the test limit.

Table 17-7 Frequency Response (Flatness) Results

Center Frequency	Analyzer Amplitude $Meas_{amp}$	Power Meter Measurement $Power_{meter}$	Meas Error $Meas_{error}$	Flatness Normalized to 50 MHz $Flat_{Norm}$	Flatness Error Test Limits (dB)
50 MHz				0	Ref
1 GHz					±2.0 dB
2 GHz					±2.0 dB
3 GHz					±2.0 dB
3.5 GHz					±2.0 dB
4 GHz					±3.0 dB
6 GHz					±3.0 dB
8 GHz					±3.0 dB
9 GHz					±3.5 dB
11 GHz					±3.5 dB
13 GHz					±3.5 dB
14 GHz					±4.0 dB
17 GHz					±4.0 dB
20 GHz					±4.0 dB
23 GHz					±4.0 dB
26 GHz					±4.0 dB

Scale Fidelity

Test Limits

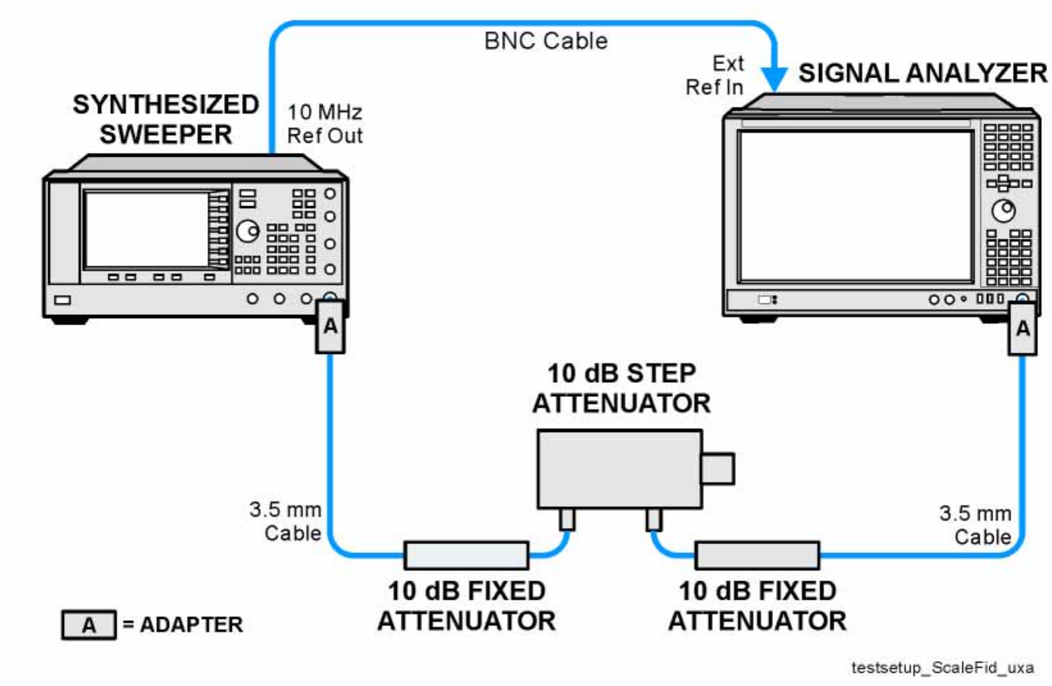
The scale fidelity error will be £ ±1.0 dB with £ -10 dBm at the mixer.

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 Keysight Model
Adapter Type-N (m) to 3.5 mm (f)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1745
Adapter 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B
Attenuator, 10 dB Step	Range: 0-50 dB Frequency: 50 MHz Accuracy: ±0.25 dB	8495A
Attenuator, 10 dB fixed (2 required)	Frequency: 50 MHz VSWR: < 1.2:1	8493C, Option 010
Cable, 3.5 mm, 1 meter (2 required)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.4:1	11500E
Cable, BNC 120 cm	Frequency: 10 MHz	10503A
Synthesized Sweeper	Output Level Accuracy: 0 to –15 dBm: ±1.0 dB	PSG

Figure 17-7 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 17-7.
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 dBm ± 0.2 dB.
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 17-8.
   d. Check delta marker reading against the test limits.

Table 17-8 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

18 Instrument Software

What You Will Find in This Chapter

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 “Instrument S/W 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 are exceptions to this, the first being the 89601B VSA software. While the latest revision of the 89601B 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. The other exception is N9051B.

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 (N9060B).

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:

http://www.keysight.com/find/uxa_software

89601 VSA Software

Updates for the 89601 VSA software can be downloaded from:

http://www.keysight.com/find/sa_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.

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