

Keysight X-Series Signal Generators

This manual provides documentation for the following generators:

N5171B/72B EXG

N5181B/82B MXG

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CAUTION

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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.

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| User's Guide | <ul style="list-style-type: none">• Signal Generator Overview• Setting Preferences & Enabling Options• Basic Operation• Optimizing Performance• Using Analog Modulation (Option UNT Only)• Using Pulse Modulation (Option UNU Only)• Basic Digital Operation - No BBG Option Installed• Basic Digital Operation (Option 651/652/654)• Adding Real-Time Noise to a Signal (Option 403)• Real-Time Phase Noise Impairments (Option 432)• Custom Digital Modulation (Option 431)• Multitone and Two-Tone Waveform Generator (Option 430)• Working in a Secure Environment• Troubleshooting |
| Programming Guide | <ul style="list-style-type: none">• Getting Started with Remote Operation• Using IO Interfaces• Programming Examples• Programming the Status Register System• Creating and Downloading Files• Creating and Downloading User-Data Files |
| SCPI Reference | <ul style="list-style-type: none">• SCPI Basics• Basic Function Commands• LXI System Commands• System Commands• Analog Modulation Commands• Arb Commands• Real-Time Commands• N5171B/72B/81B/82B SCPI Command Compatibility |
| Service Guide | <ul style="list-style-type: none">• Troubleshooting• Replaceable Parts• Assembly Replacement• Post-Repair Procedures• Safety and Regulatory Information• Instrument History |
| Key Help^a | <ul style="list-style-type: none">• Key function description• Related SCPI commands |

^aPress the **Help** hardkey, and then the key for which you wish help.

1 Troubleshooting

Before Troubleshooting

WARNING These troubleshooting instructions are for use by qualified personnel. To avoid electrical shock, do not perform any troubleshooting unless qualified.

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

The following techniques related to ESD and static-safe workstations should not be used when working on circuitry with a voltage potential greater than 500 volts.

WARNING Keep fingers and all other objects away from the fans when the signal generator is plugged in.

CAUTION *Before permanently removing any instrument assembly*, the instrument's static and dynamic arrays must be configured for the exchange of assemblies. The process to do the appropriate configuration is performed automatically by the instrument with the [Assembly Installation and Removal Overview](#) front panel softkeys. Refer to the [Assembly Removal and Installation Procedure](#) and to the "Hardware Assembly Installation and Removal Softkeys" on page 3-2.

For the instrument to meet performance specifications and for accurate self-test results, allow a warm up period of 45 minutes within an operational temperature range of 0 to 55 °C. For more information, refer to the X-Series signal generator *Data Sheets*.

NOTE When a procedure instructs you to preset the signal generator, press the **Preset** hardkey, not the **User Preset** hardkey.

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 using two types of static-safe workstation protection:

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

Both types, when used together, provide a significant level of ESD protection. Of 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 M Ω of isolation from ground.

Handling of Electronic Components and ESD

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.

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 close attention to how all components are handled.

- Keep static-generating materials at least one meter away from all components.
- Store or transport components in static-shielding containers.

Contacting Agilent Technologies

Before contacting Agilent, read the warranty information that is shipped with your signal generator. If your signal generator is covered under a maintenance agreement, be familiar with its terms.

Assistance with test and measurements needs, and information on finding a local Agilent office is available on the Web at: <http://www.agilent.com/find/assist>.

If you do not have access to the internet, contact your local field engineer.

NOTE In any correspondence or telephone conversation, refer to the signal generator by its model number and full serial number. With this information the Agilent representative can determine whether your signal generator is still within its warranty period.

Be prepared to provide the following information:

- a complete description of the failure
- if the signal generator was dead on arrival (DOA) or if it functioned prior to failure
- the model number, all options, and the serial number of the signal generator
- the firmware revision date
- if the self tests have been run

Returning a Signal Generator for Service

Use the information in this section if you need to return the signal generator to Agilent Technologies.

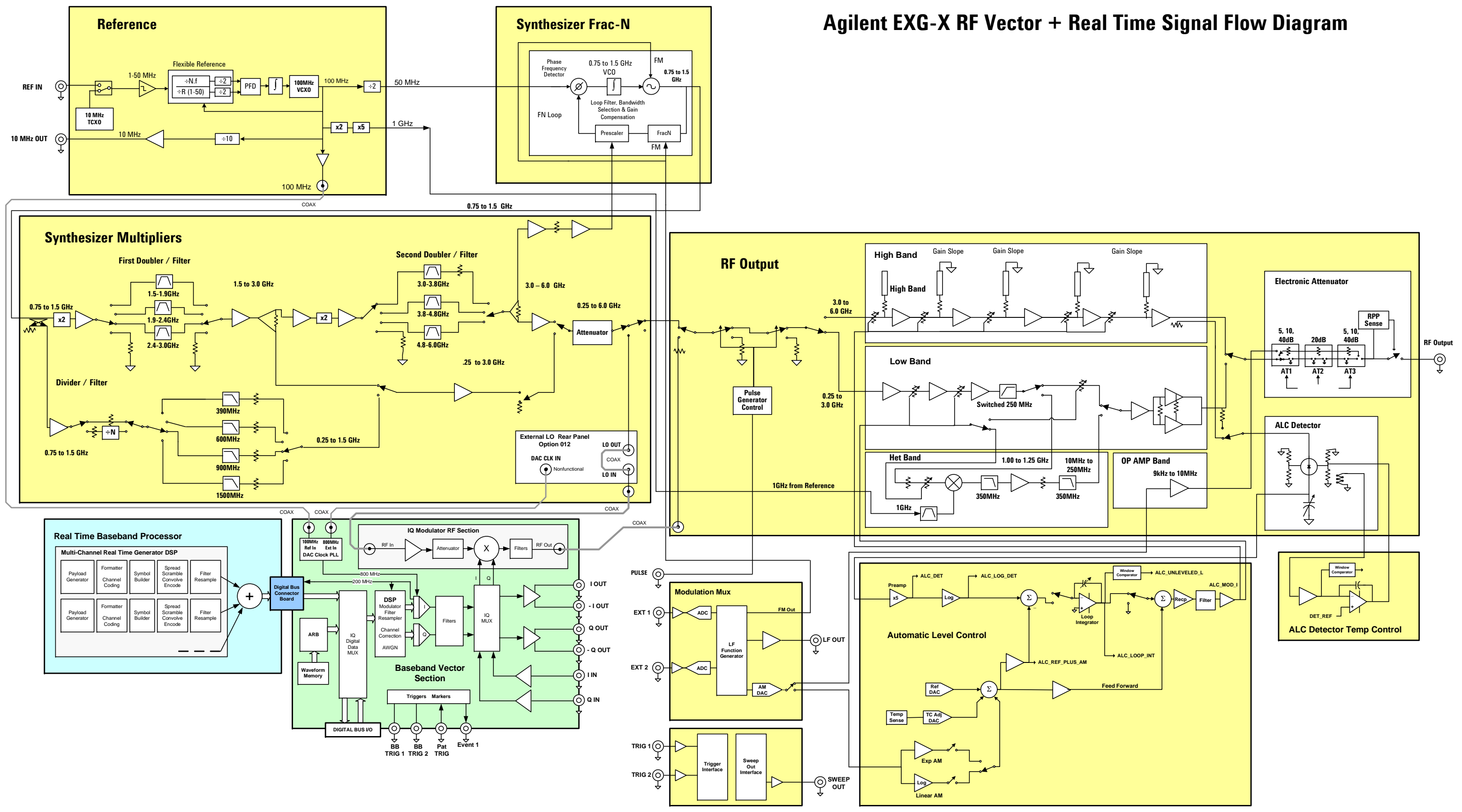
Packaging the Signal Generator

1. Use the original packaging materials or a strong shipping container that is made of double-walled, corrugated cardboard with 159 kg (350 lb.) bursting strength. The carton must be both large enough and strong enough to accommodate the signal generator and allow at least 3 to 4 inches on all sides of the signal generator for packing material.

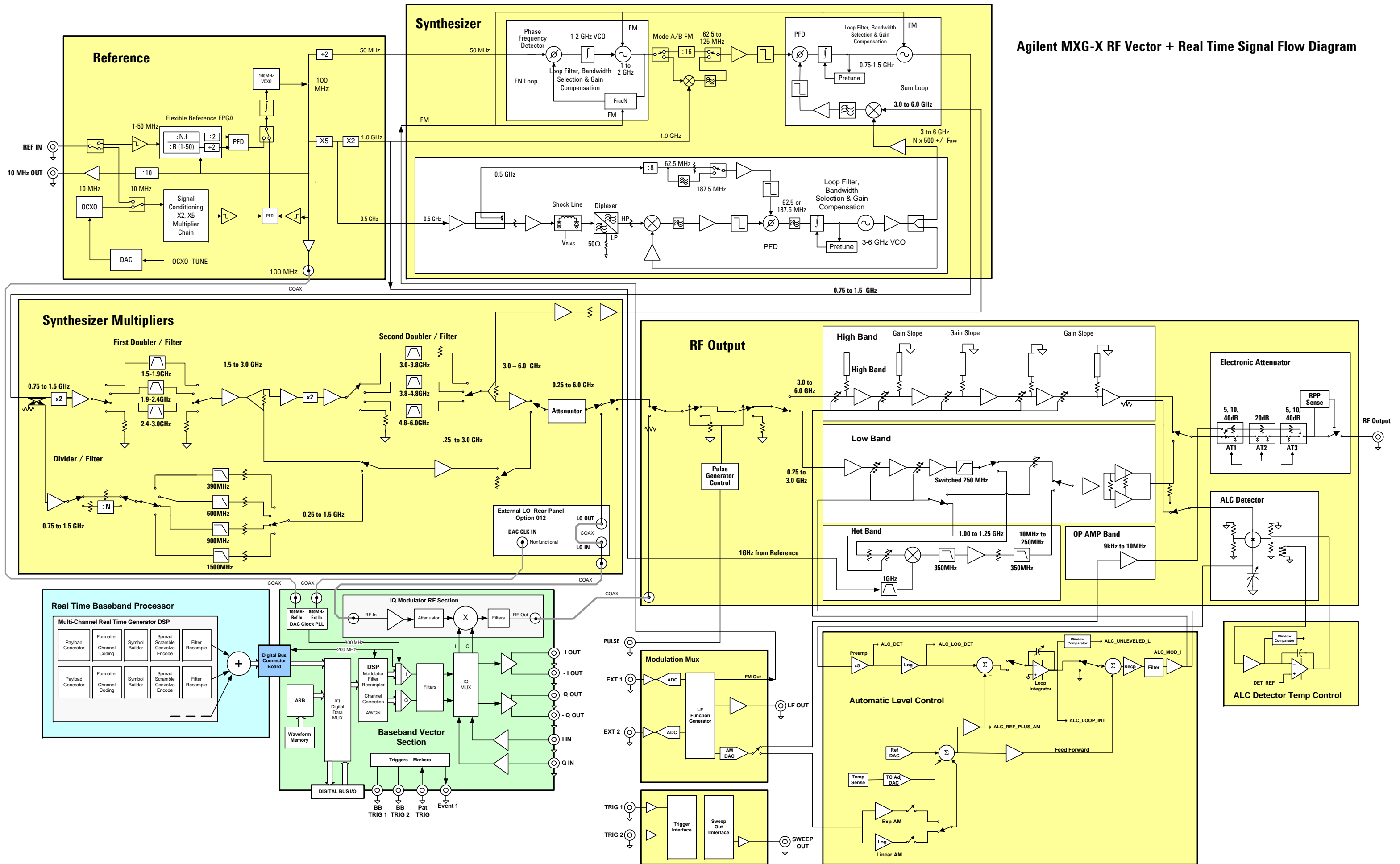
CAUTION Signal generator damage can result from using packaging materials other than those specified. Never use styrene pellets, of any shape, as packaging material. They do not adequately cushion the signal generator or prevent it from shifting in the carton. Styrene pellets can cause equipment damage by generating static electricity and lodging in the signal generator fan.

2. Surround the signal generator with at least 3 to 4 inches of packing material, or enough to prevent the instrument from moving in the carton. If packing foam is not available, the best alternative is SD-240 Air Cap™ from Sealed Air Corporation (Hayward, CA 94545). Air Cap looks like a pink plastic sheet covered with 1-1/4 inch air-filled bubbles. Use the Air Cap to reduce static electricity. Wrap the signal generator several times in the material to protect the signal generator and to prevent it from moving in the carton.
3. Seal the shipping container securely with strong, nylon adhesive tape.
4. Mark the shipping container “FRAGILE, HANDLE WITH CARE” to ensure careful handling.
5. Retain copies of all shipping papers.

Agilent EXG-X RF Vector + Real Time Signal Flow Diagram



Agilent MXG-X RF Vector + Real Time Signal Flow Diagram



Overall Block Description

The objective of the overall block diagram is to provide a functional overview of the Agilent N5171B/72B EXG and N5181B/82B MXG X-Series signal generators. The major functional circuitry shown in the block diagram is described in this section. Familiarize yourself with this information before you start troubleshooting.

The overall block diagrams for the N5171B/81B and N5172B/82B are similar, though individual hardware circuitry is very different. The N5171B/72B EXG-B hardware circuitry is based on a single-loop frequency synthesis design similar to the design of the prior MXG-A signal generator. The N5181B/82B MXG-B hardware circuitry improves the overall phase noise of the product through the use of a triple-loop frequency synthesis hardware design.

The overall capabilities are similar when comparing the N5171B/81B and the N5172B/82B, except for the A2 Vector module. The A2 Vector Module controls digital arbitrary circuitry operations in the N5172B/82B. Additionally, the N5172B/82B with Option 660 contains the A7 Real Time Baseband Generator (BBG) Assembly along with supporting/connecting hardware.

The following components are not shown in the overall block diagram, but are described in this section.

- A1 power Supply
- A5 CPU
- A6 Front Panel Interface Scan Assembly
- A7A1 Real Time Assembly Power Supply
- Front Panel

A1 Power Supply

The main power supply is a switching supply designed with an automatic line-voltage and frequency selection. The supply has a maximum total output power draw of 210 watts. The supply converts line voltage (120 Vac or 240 Vac) to regulated dc voltages. There is an internal power line fuse that is not replaceable. If the fuse opens, the power supply must be replaced. All A1 Power Supply outputs, except for the 5.1SB (standby-supply), are over-current protected and will not be damaged if a continuous short circuit occurs.

A2 Vector Module (N5172B/82B Only)

The A2 Vector Module, a self contained, fully enclosed, Arbitrary (ARB) Baseband Generator (BBG) assembly, that supports digital modulation in the N5172B/82B. It receives a 100 MHz clock signal and the main RF signals from the A3 RF assembly when digital modulation is turned on. The RF signals are I/Q modulated, band-pass filtered, amplified, and returned to the amplification output stages of the A3 RF assembly. External I/Q input signals are also applied via this assembly. The A2 Vector Module only has influence on the RF carrier signal when the ARB BBG is turned on.

A3 RF Assembly

The A3 RF assembly combines circuitry traditionally found on individual, interconnected assemblies such as Reference, Synthesizer, Fractional-N and Output assemblies onto one PC assembly. In analog mode, this assembly is completely autonomous in creating a RF carrier signal. Functioning with the support hardware; i.e. A1 Power Supply, A5 CPU and the user interface via the Front Panel, this one assembly is the warranted functionality and specifications of the product. Analog mode bypasses other hardware, if installed; i.e. A2 Vector or A7 Real Time assemblies.

Reference Circuitry

The reference circuitry uses either a high performance internal 10 MHz OCXO (Oven) oscillator (MXG-B) or a 10 MHz VCTCXO oscillator (EXG-B). The circuitry is designed to lock to an external reference frequency between 1 MHz and 50 MHz, with a resolution less than 0.1 Hz when option 1ER is installed. Without the flexible reference option (Option 1ER) the reference will only lock to an external reference of 10 MHz.

The reference output signals are multiplied/divided to provide the following signals:

- A 50 MHz reference signal to the synthesizer Frac-N and FM circuitry.
- A 100 MHz clock signal to the A2 Vector Module.
- A 1 GHz LO signal to the heterodyne (HET) band mixer.

Synthesizer Circuitry

The frequency synthesis circuitry used in the X-Series are based on either a single (EXG-B) or a multi (MXG-B) loop phase-locked loop (PLL) design. X-Series uses a Frac-N synthesis FPGA to control the multiplier and divider modules. Frequency multipliers and dividers are used to extend the basic synthesis loop frequency range to cover 250 MHz to 6 GHz. Frequency and phase modulations are built into the synthesizer circuitry using the Frac-N FPGA.

- The VCO tunes over a range of 750 MHz to 1.5 GHz
 - From 250 MHz to 375 MHz, the VCO is divided by 4.
 - From 375 MHz to 750 MHz, the VCO is divided by 2.
 - From 750 MHz to 1500 MHz, the VCO is multiplied by 1.
 - From 1500 MHz to 3000.001 MHz, the VCO is multiplied by 2.
 - From 3000.001 MHz to 6000 MHz, the VCO is multiplied by 4.
- The PLL operates over a range of 3.0 to 6 GHz.
- The heterodyne band provides frequencies from 10 MHz to 250 MHz and operates over a VCO range of 1.0001-1.25 GHz. The 10 MHz to 250 MHz signal is obtained by mixing the heterodyne band with the 1 GHz LO signal provided by the reference circuitry. The resultant IF signal is then amplified to provide the 10 MHz to 250 MHz RF signals.
- The Op-AMP Band provides frequencies down to 9 kHz and up to 10 MHz. The Op-amp band is generated using direct digital synthesis (DDS). The DDS module is implemented in the FPGA using the same 50 MHz clock used as a reference in the PLL. The reason it is called op-amp band is because there is no ALC loop involved in this path. The frequencies are low enough that op-amps are used as the amplifiers. These amplifiers have their own feedback loop and therefore do not need an external control to keep them level over temperature and time. There is no digital modulation in the Op-AMP Band.

Output Power Leveling Circuitry (Automatic Leveling Control Circuitry)

The Automatic Leveling Control (ALC) loop on the A3 RF assembly provides leveled output power. The ALC loop is a feedback control system that monitors RF power and maintains power at a user-selected level. The RF path must provide a minimum power level to the ALC loop for the ALC loop to work correctly. The minimum required power is slightly higher than the maximum-leveled power.

- In closed loop mode, ALC on, a leveled output power is obtained by comparing a detected voltage with a reference voltage. The detected voltage is generated by coupling off a portion of the RF output signal and converting it to a dc voltage using detector diodes. The reference voltage is generated using calibrated DACs. When the reference and detected levels are not the same, the ALC integrator output ramps up or down to increase or decrease the detected level. If the integrator cannot achieve a match between the detected and reference voltages, an unlevelled annunciator is displayed.
- In open loop mode, ALC off, a leveled output power is obtained with a reference voltage. The reference voltage is used to control the modulation drive current. The reference voltage is determined by setting the desired power. It includes the stored calibration data used to compensate for any losses that occur after the detector.

All analog Amplitude Modulation (AM) is performed using a dedicated diode modulator in the ALC subsystem. For Pulse Modulation, ALC is only on for a short period within the pulse duration. Outside this short period of time, ALC is in a holding state waiting for the next pulse.

A4 40GB Solid State Drive (SSD) (N5172B/82B Only)

The 40 GB non-volatile memory is a Solid-State Drive (SSD) and offers a substantial performance boost over conventional mechanical hard disk drives. The SSD has built-in data protection features, a larger capacity and provides a substantial performance improvement over conventional mechanical hard disk drives. Random read/write performance up to 30,000 / 3,700 IOPS and a bandwidth sequential read/write performance up to 200 /45 MB/s.

A5 CPU

The A5 CPU is a hybrid Type-1/Type-10 COM (Computer-on-Module) nanoETX Express assembly. It incorporates the Win CE Compact Framework processor solution and is compatible with the PICMG® defined COM Express™ standard and follows the Pin-out Type 1 along with providing common instrument I/O interfaces. The A5 CPU controls all activities in the signal generator. It translates information entered from the front panel keys, LAN, GPIB, USB 2.0, or Auxiliary Interface (25 Pin SCSI II) into machine level instructions and communicates these instructions on the internal buses. The A5 CPU also monitors critical circuits for unlevelled and unlocked conditions, and reports these problems on the LCD Display.

A6 Front Panel Interface Scan Assembly

The A6 Interface assembly is a Liquid Crystal Display (LCD) drive assembly that provides the necessary interface, control and drive circuits for the front panel. Front panel USB connectors, the LCD back-light control, Keypad, Power On/Off switch, and the LCD support circuitry are all interrelated within this assembly. Unlike other similar display drive assemblies this assembly is low voltage; 5 VDC or less.

A7 Real-Time Baseband Generator Assembly

The Real Time Baseband assembly has, as an integral part of its design, a general purpose digital signal processor featuring a single I/Q channel. The processor is capable of supporting many of today's multiple phone standards; GSM, LTE, CDMA 2K, WCDMA. Additionally, this assembly supports Digital TV, Satellite Positioning and Real Time modification of ARB waveform streaming.

A7A1 Real-Time Assembly Power Supply

The auxiliary power supply provides the A7 Real Time BBG with 12 volts DC. This Power Supply is a AC/DC Switching 60-W 1-Output 12V 5A supply that operates directly off the instrument power line voltage. It is designed to operate over the frequency range of 47-440 Hz and includes overload short-circuit protection on all outputs.

Common Circuitry

Front Panel Hardkeys and Softkeys

Some front panel keys are referred to as hardkeys and are dedicated to specific functions. Hardkeys and the Rotary Pulse Generator (RPG) knob are used to select the most commonly used features and to control the display's contrast and intensity.

The front panel keys along the side of the LCD display are referred to as softkeys and are used to select functions; these functions are displayed to the left of each softkey. When a softkey is pressed, its displayed functionality is executed. Some softkeys have multiple lower-level menus that are displayed when the softkey is pressed.

The front panel hardkeys and softkeys use a row and column configuration. Pressing a key makes a connection between a row and a column; the keypad controller (located on the A6 Front Panel Interface assembly) interprets the pressing of each of the front panel keys and performs the appropriate action.

Liquid Crystal Display (LCD)

The LCD provides a visual real-time updated interface between the signal generator's settings, condition and the user. The LCD consists of a 262k color Thin Film Transistor (TFT) RGB liquid crystal display panel. The display is a high resolution wide viewing angle XGA panel that incorporates a white Light Emitting Diode (LED) back-light system, polarized glare compensation, Thin-Film Transistor (TFT) timing controller, source and gate drivers. Internal DC-to-DC boost circuits generate gate and source driver voltages. The display is operated with a 3.3 VDC source.

Getting Started with Troubleshooting

WARNING Immediately unplug the signal generator from the ac power line if the signal generator shows any of the following symptoms:

- smoke, arcing, or unusual noise from inside the signal generator
- a circuit breaker or fuse on the main ac power line opens

If this rare and unlikely symptom occurs it's a potentially hazardous condition. Do not try to repair, instead, return the signal generator to Agilent Technologies for service.

CAUTION For the instrument to meet performance specifications and for accurate self-test results, allow a warm up period of 45 minutes within an operational temperature range of 0 to 55 °C. For more information, refer to the X-Series signal generator *Data Sheet*.

This section describes the basic procedural flow of troubleshooting when servicing the N5171B, N5172B, N5181B, and N5182B. The following table provides a troubleshooting path from a failure symptom to the isolation of the possible fault. Prior individually related conditions are assumed to have occurred when troubleshooting assembly level problems. It is therefore recommended that unless restricted by a instrument specific fault and/or limited functionality. Perform the troubleshooting procedure in the order presented in this table.

If able to run self test...	
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LCD Display Appears to be Inoperative (Dark)	page 1-33
If other conditions occur...	
The Instrument Does Not Power-On	page 1-35
Front Panel LEDs are not Functioning	page 1-35
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Self Test Overview

The philosophy behind the self test is, “*It is better to pass a defective signal generator than to fail a good signal generator.*” The self test is designed as a diagnostic tool used to check instrument hardware. The self test does not require the signal generator to be adjusted before self-tests will pass. This philosophy implies that some failures will not be detected or reported as faulty, and therefore will pass. If the signal generator powers up, troubleshooting should always start with running the self test and resolving reported problems.

Embedded in the signal generator’s firmware is a group of self tests that should be used to evaluate the condition of the circuitry on the assemblies. Self tests check hardware performance under controlled conditions and compare test results to predetermined limits. If the results fall within the limits, the signal generator passes. If one or more test results fall outside the limits, the self test routine evaluates the failure(s) and reports the most independent failure.

1. When the signal generator is tested at the factory, the self test limits are loaded into the A5 CPU memory.
2. When the self test runs, latches and DACs are set to known states.
3. Multiplexers and ADCs route the dc signals from the selected test nodes to the A5 CPU assembly.
4. The A5 CPU compares the detected dc level to the test limit. If the detected value is within limits, the A5 CPU reports a pass.
5. If one or more detected values fall outside the limits, the most independent failure is determined and reported.

Independent failures can best be understood by using an example where there are three assemblies in a series: A1 is the first assembly, A2 the second assembly, and A3 the third assembly. A1 output is the input for A2, and A2 output is the input for A3. If A1 output is defective, A2 and A3 outputs are also defective. If A2 output is defective, A3 output is defective.

A file in the instrument contains this dependency knowledge for the signal generator to use when identifying the most independent failure. Therefore, if A1, A2, and A3 self tests all fail, the signal generator reports A1 as the most independent failure. If A1 passes, but A2 and A3 fail, self-test reports A2 as the most independent failure. If A2 passes and A3 fails, self-test reports A3 as the most independent failure. If two independent failures occur, self-test reports only one failure at a time and reports the second failure after the first reported failure is repaired. The troubleshooting procedure is based on the most independent failure and no lower level information is needed. Although not needed for troubleshooting the signal generator, the self-test overhead provides features that enable you to view lower level detailed information about the subroutines and to select specific routines to run.

These features include:

- Select/Deselect Test
- Select/Deselect All
- Run Highlighted Tests
- Run Selected Tests
- Loop Selected
- View Details - When View Details is selected, the measured value, lower, and upper limits are displayed for the highlighted test.

Running Self Test

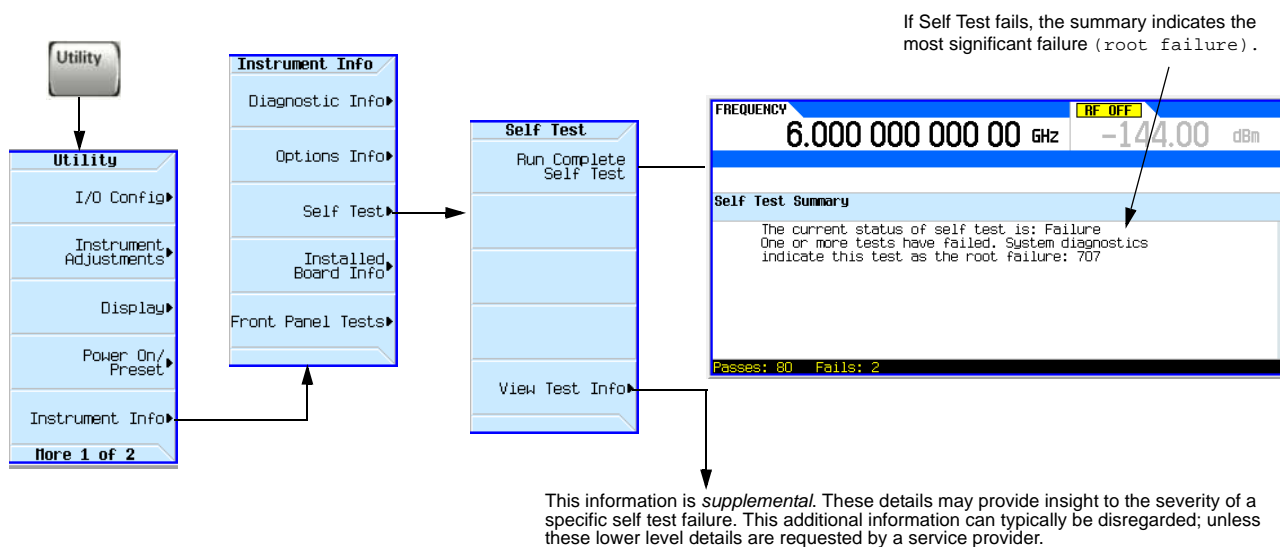
Self tests are a series of internal complex tests that test the interconnects between individual circuit components and assemblies. Captured data is externally compared to expected results, thereby providing a current valuation of the signal generators functions. Run a complete self test when initially setting up the signal generator, after an assembly has been replaced; to verify signal generator functionality, and prior to performing manual or automated performance verification tests. Self tests are designed to confirm that the signal generator is operating properly or isolate problems to a specific faulty assembly.

Not all self tests are conducted on all models of the X-Series. Depending on the installed standard and optioned hardware specific self tests are activated and made available as necessary.

Run self test on an X-Series signal generator using one of the following ways:

- front panel, see [“Run Self Test Using the Front Panel”](#) on page 1-13
- enter SCPI command: *TST?

Run Self Test Using the Front Panel



1. Disconnect all unnecessary external cables, including GPIB, LAN, and USB cables.
2. Set the signal generator to **Preset**. Press **Utility > Power On/Preset**. If **Power On** is not set to (Preset) then press **Power On** and select **Preset**.
3. Press **Utility > Instrument Info > Self Test > Run Complete Self Test**.

An activity bar displays on the screen indicating the test progress.

When self test completes, one of the following messages displays:

- The current status of the self-test is: Success. All self tests have passed
- The current status of the self-test is: Failure. One or more tests have failed. System diagnostics indicate this test as the root failure: xxx

If the signal generator fails only one test, the title of the failed test displays. If the signal generator fails more than one test, the test number of the most significant failure displays.

NOTE If self tests take longer than 10 minutes to complete, go to [“A1 Power Supply Troubleshooting”](#) on page 1-24 to troubleshoot a possible power supply failure.

4. Locate the number and name of the failed test for your signal generator model in [Table 1-1](#). The **Resolution** column in the table lists the assembly in which the failure is likely to have occurred or other troubleshooting information for that test.
5. Prior to permanently replacing any of the following assemblies refer to [“Assembly Installation and Removal Overview”](#) on [page 3-2](#), and complete the [“Assembly Removal and Installation Procedure”](#) on [page 3-3](#).
 - A2 Vector Module Assembly (N5172B/82B only)
 - A3 RF Assembly (All models)
 - A5 CPU (All models)

CAUTION The following process should *only* be completed if the suspect assembly has been confirmed to be bad/faulty. Completing the assembly replacement process *accidentally* on a good/working assembly could cause problems with the subsequent replacement of the *actual* bad/faulty assembly.

NOTE Ensure that the power supply is functioning correctly prior to running the self tests.

6. After *permanently* replacing one of the assemblies listed, the [“Assembly Removal and Installation Procedure”](#) on [page 3-3](#) must be performed.

CAUTION If the [“Assembly Removal and Installation Procedure”](#) is not performed the instrument hardware may not function properly (e.g. instrument errors and possibly self-test failures).

Table 1-1 Self Tests

Self Test Failure Number	Resolution
100 Digital Self Tests	
101	Replace the A3 RF Assembly
102	Go to “Troubleshooting Self Test 102” on page 1-16
103	Go to “A1 Power Supply Troubleshooting” on page 1-24
104	Replace the A3 RF Assembly
105	Replace the A3 RF Assembly
200 Reference Self Tests	
201	Go to “A1 Power Supply Troubleshooting” on page 1-24
202 - 208	Replace the A3 RF Assembly
300 Synthesizer Self Tests	
301	Go to “A1 Power Supply Troubleshooting” on page 1-24
302 - 320	Replace the A3 RF Assembly
400 Output Self Tests	
401	Go to “A1 Power Supply Troubleshooting” on page 1-24
402 - 413	Replace the A3 RF Assembly
500 Modulation Self Tests	
501 - 507	Replace the A3 RF Assembly
600 Attenuator Self Tests	
601	Go to “A1 Power Supply Troubleshooting” on page 1-24

Table 1-1 Self Tests (Continued)

Self Test Failure Number	Resolution
602 - 603	Replace the A3 RF Assembly
700 BB Digital Self Tests	
701	Go to “A1 Power Supply Troubleshooting” on page 1-24
702 to 708 (except 704)	Replace the A2 Vector Module
704	Go to “Troubleshooting Self Test 704” on page 1-16
800 BB Analog Baseband Self Tests	
801 - 804	Replace the A2 Vector Module
900 BB RF Self Tests	
901 - 905	Go to “Troubleshooting Self Test 901 to 905” on page 1-17
1500 RT Board Self Tests	
1501 - 1512	Replace the A7 Real-Time BBG

Troubleshooting Self Test 102

A self test 102 failure can be caused by either the A1 Power Supply, A2 Vector or the A3 RF Assembly. Instrument Error messages and/or other self test failures, listed under View Details, should be considered prior to replacing any specific hardware. Validate all power supply DC and AC ripple voltages first by going to “A1 Power Supply”. Evaluating the specific self test failures and the power supply values may identify the probable faulty assembly.

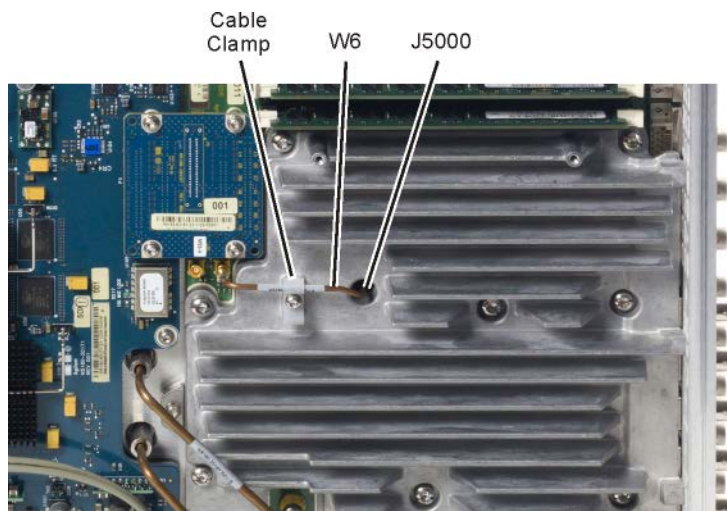
Troubleshooting Self Test 704

Self-test 704 validates the 100 MHz Reference clock signal that originates on the A3 RF Assembly and is the clock pulse for the ARB FPGA on the A2 Vector Assembly. If the 100 MHz clock is inadequate in amplitude or frequency the cause likely originates from the A3 RF Assembly.

If self-test 704 fails, perform the following:

1. Refer to [Figure 1-1](#). Remove plastic clamp holding cable W6.
2. Carefully remove W6 by pulling straight up at both ends of W6.
3. Inspect and verify the cable is acceptable.
 - a. If the cable is considered faulty, REPLACE the cable.
4. Connect the output from the blind female MCX connector J5000 through a 10 dB attenuator (PAD) to a spectrum analyzer.

Figure 1-1W6 - J5000



W6_J5000

5. Setup the spectrum analyzer:
 - a. Set the reference level to +30 dBm.
 - b. Set the CW frequency to 100 MHz.
 - c. Set the Span to 100 MHz.
6. The output signal frequency from J5000 should be 100 MHz at > 0 dBm.
7. If the measurement is within range, the A3 RF Assembly is likely good. REPLACE the A2 Vector Assembly.

Troubleshooting Self Test 901 to 905

These self-tests validate the LO signal from the output of the synthesizer section of the A3 RF Assembly. There is circuitry on the A3 RF Assembly that cannot be isolated specifically to the A3 RF Assembly by self-tests, including the associated vertical SMA connector (J2004) that is on the A3 RF assembly. If this connector opens up or if there is a short, then a self-test failure 901 can occur. A similar issue can occur and cause self-test failures 903 and 904 if connector J2003 opens up or shorts. These same self-test failures can also be caused by the corresponding vertical SMA connectors on the A2 Vector Assembly should connectors P1 or P2 open or short. The connecting semi-rigid cables W7 or W8 should also be eliminated as possible causes for these self-test failures.

If these self-test(s) fail, perform the following:

1. Carefully remove W7 and W8 from both of their connectors.
2. Inspect and verify the cables are acceptable.
 - a. If a cable is considered faulty, REPLACE the cable.
3. Verify connectors J2004 and J2003 are properly attached to the PCB by gently attempting to move both connectors.
 - a. If either connector is loose, REPLACE the A3 RF Assembly.
4. Similarly verify that both connectors P1 and P2 on the A2 Vector Assembly are properly attached.
 - a. If either connector is loose, REPLACE the A2 Vector Assembly
5. If the connectors are properly attached, go to step 6.
6. Connect the output from connector J2004 through a 10 dB attenuator (PAD) to a spectrum analyzer.
7. Setup the spectrum analyzer:
 - a. Set the reference level to -30 dBm.
 - b. Set the CW frequency to 1GHz.
 - c. Set the Span to 100 MHz.
8. Set up the generator:
 - a. Press Preset
 - b. Press Frequency to 1 GHz
 - c. Press RF On/Off to On.
 - d. Press AMPTD and verify ALC is On
9. The output signal frequency from J2004 should be 1 GHz > -60 dBm.
10. Repeat steps 7b and 8b for frequencies 2, 3, 4, 5 and 6 GHz.
11. If the measurements are within range, the A3 RF Assembly is likely good. REPLACE the A2 Vector Assembly.

Self Tests Do Not Run or Self Tests Run Slowly

If self tests will not run or run slowly, the most likely cause is a faulty A1 Power Supply or A5 CPU assembly. The A5 CPU assembly relies on correct power supply voltages. If the A1 Power Supply is faulty, it could cause a false A5 CPU assembly error.

1. Troubleshoot the A1 Power Supply. Refer to [“A1 Power Supply Troubleshooting” on page 1-24](#).
2. If troubleshooting the A1 Power Supply does not correct the problem, troubleshoot the A5 CPU assembly. Refer to [“A5 CPU Assembly Troubleshooting” on page 1-29](#).
3. If self tests still will not run or run slowly, the fault may be identified within the boot-up routine. Use the following [“Boot-up Routine”](#) procedure to identify and isolate the problem.

Boot-up Routine

NOTE The Boot-up routine is only necessary if (at this time) *IF* Self Tests cannot be performed or completed for some unknown reason.

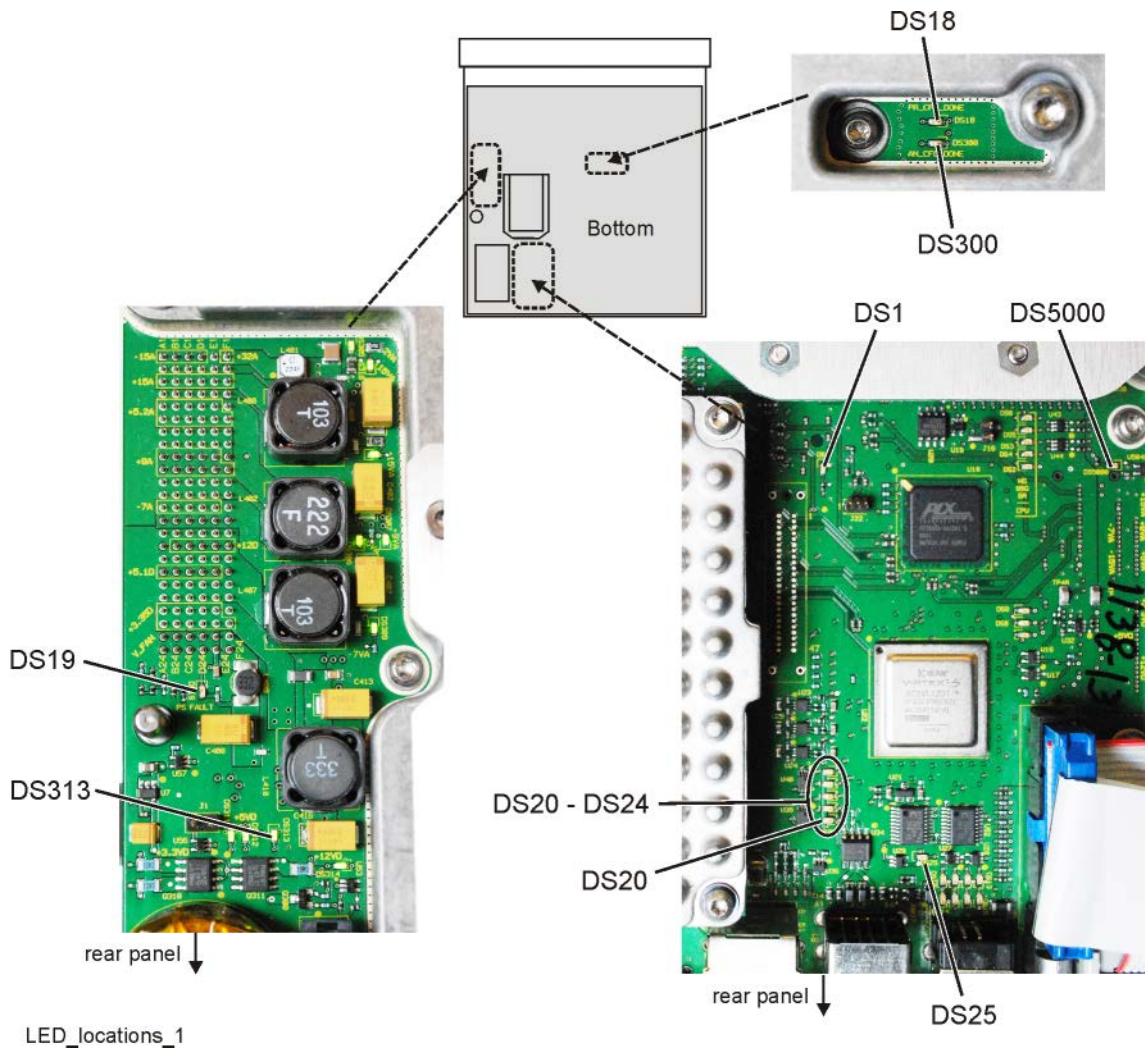
If you are unable to run a complete self test, monitor the boot-up routine to perhaps isolate a faulty assembly. The entire procedure should be completed, if possible, prior to troubleshooting an identified faulty assembly. Complete each step, taking note of any item that does not respond as expected, then troubleshoot as described in [step 21](#).

1. Check the yellow standby LED.
 - a. Connect the signal generator to a power source.
 - b. If the generator immediately powers up, turn the generator off.
 - c. Confirm that the yellow standby LED adjacent to the power button is lit.
2. Check the green LED.
 - a. Turn the signal generator on.
 - b. Confirm that the yellow standby LED is off.
 - c. Confirm that the green LED adjacent to the power button is lit.
3. Verify that the front panel LCD display turns on and is displaying the expected information.
4. Turn the signal generator off.
5. Remove the outer and inner instrument covers. Refer to [Chapter 3, "Assembly Replacement"](#) for instructions on removing the instrument covers.
6. Turn the signal generator on.
7. Visually inspect the fans individually to verify that the fans are turning.
8. Turn power off.
9. Position the signal generator with the bottom facing up.

10. With the unit still off, refer to [Figure 1-2](#) to visually inspect and verify the following status LEDs are lit:

- DS19 (red)
- DS20 through DS24 (red)
- DS313 (green)

Figure 1-2 Status LEDs



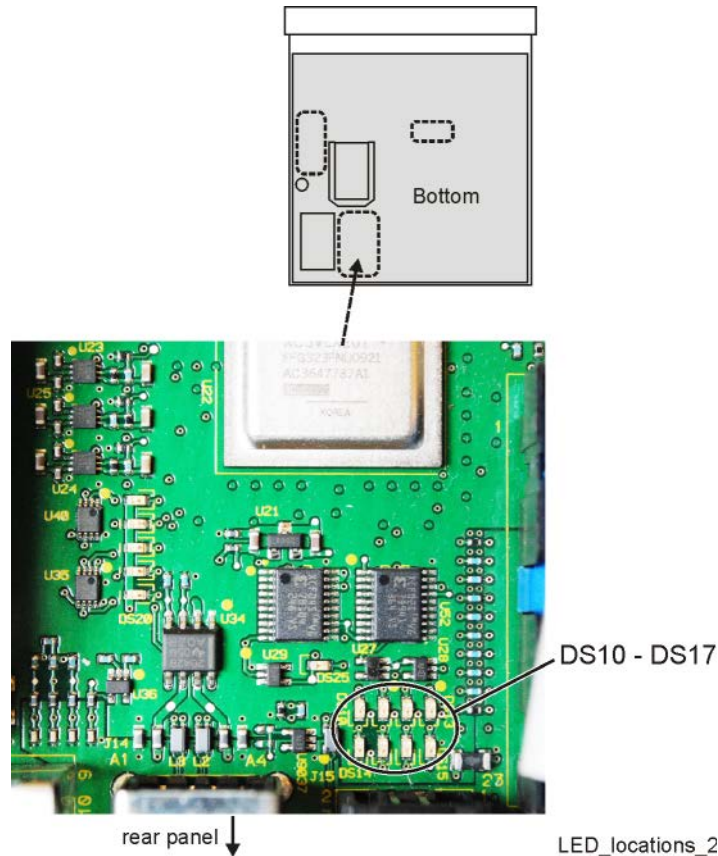
11. Using [Figure 1-2](#) locate the following FPGA LEDs (off):

- DS1 PCIe Ref Clock
- DS18 FRAC-N FPGA
- DS25 Bridge FPGA
- DS300 Analog FPGA
- DS5000 REF FPGA

These 'red' LEDs should only come on momentarily then immediately go off when power is applied. If one or more LED remains lit this would be an indication that the FPGA(s) failed to program.

12. Turn the signal generator on and ensure the FPGA LEDs momentarily turn-on and then off. A number of power-up attempts may be needed to ensure all the FPGA LEDs did appropriately come on momentarily.
13. Turn the signal generator off.
14. Using [Figure 1-3](#) locate the Debug LEDs (off):
 - DS10 through DS17

Figure 1-3 Debug LEDs



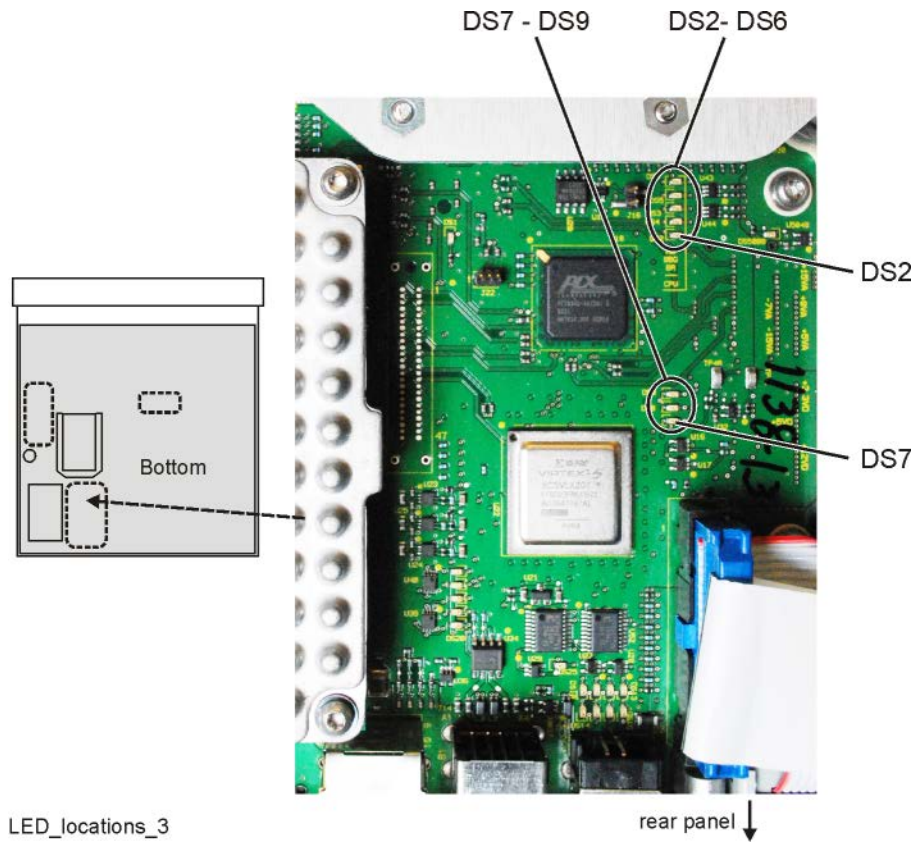
When the signal generator is turned-on these 'yellow' Debug LEDs will complete a startup routine. During the startup routine, depending on the installed instrument hardware, different LEDs will sequentially turn-on and off. At the end of the signal generator's boot-up and the completion of the Debug LEDs' routine ALL the LEDs will remain lit. The complete boot-up routine can vary but typically completes in less than 60 seconds.

15. Turn the signal generator on.
16. Verify that the yellow Debug LEDs complete the startup routine.
17. Re-check that all the FPGA LEDs are off.
18. Check the front panel display for startup errors. Make note of any errors that might be displayed.

19. Using [Figure 1-4](#) to locate and verify the following 'green' LEDs are on. These LEDs indicate the overall condition of the lower level communication between hardware components.

- DS2, DS4, DS5, DS6 (DS3 remains off)
- DS7 - yellow pulsing (*Heartbeat)
- DS7, DS8, DS9

Figure 1-4 Lower Level Communication LEDs



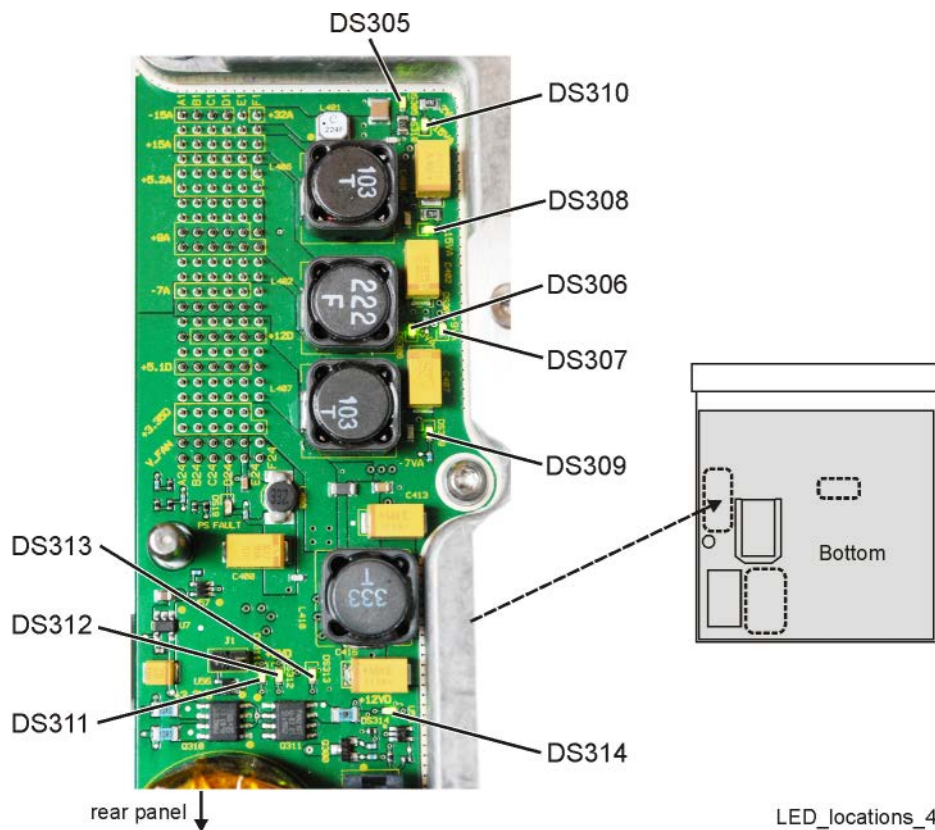
*LED DS7 functionality resembles the continuous pulsing or a heartbeat. This LED is a visual indication of the ongoing communication between the A5 CPU and the A3 RF assembly.

20. Using [Figure 1-5](#) locate and verify the following 'green' LEDs are on. These LEDs are indicators of the different analog (A) and digital (D) power supply voltages. The LEDs can provide a quick visual check that the individual power supplies are on and meeting a minimum voltage. The LEDs are not necessarily an indicator of the overall quality of the indicated voltage.

- DS305 +32VAF
- DS306 +5VAF
- DS307 +9VAF
- DS308 +15VAF
- DS309 -7VAF
- DS310 -15VAF
- DS311 +3.3VDF
- DS312 +5VDF
- DS313 +5.1VDF *Standby Power LED
- DS314 +12VDF

*LED DS313 is always on when the signal generator is plugged in.

Figure 1-5 Analog and Digital Power Supply Voltage LEDs



21. Troubleshoot all items that did not function as expected.

- May require firmware to be downloaded into instrument so FPGA code is correct.

CAUTION Not upgrading the firmware to the current version could cause errors during instrument boot-up.

- Only perform option Backup if CPU has been verified as the fault, else ignore error 617 Config error at this time.
- If the front panel yellow standby LED is not functioning, go to [“The Green Front Panel Power Switch LED or Yellow Standby LED is Not Working” on page 1-36](#) to troubleshoot the error.
- If the front panel green power switch LED is not functioning, go to [“The Green Front Panel Power Switch LED or Yellow Standby LED is Not Working” on page 1-36](#) to troubleshoot the error.
- If the front panel LCD display does not turn on, go to [“LCD Display Appears to be Inoperative \(Dark\)” on page 1-33](#) to troubleshoot the error.
- If the fans do not power on, go to [“The Fans are Not Working” on page 1-45](#) to troubleshoot the error.
- If any of the yellow Debug LEDs, DS10 through DS17, remain on, replace the A5 CPU assembly.
- If any of the power supply voltage LEDs are off, go to [“A1 Power Supply” on page 1-7](#).
- If any of the FPGA LEDs are on, the FPGA(s) loading process has malfunctioned. Due to the design and assembly interaction. If any one of either the A1 Power Supply, A3 RF and A5 CPU assemblies becomes faulty it can interfere with the functionality of the others.
 - Go to [“A1 Power Supply” on page 1-7](#) to verify the supplied voltages
 - If FPGA LEDs remain on, the A3 RF assembly is likely the faulty assembly.
- If Power Supply measurements are satisfactory and any of the FPGAs Unlock LEDs are on, replace the A3 RF assembly.
- If all FPGA LEDs turn off, then the A5 CPU is likely the faulty assembly. Go to [“A5 CPU Assembly Troubleshooting” on page 1-29](#) to confirm that the A5 CPU is at fault.
- If the yellow DS7 'Heartbeat' LED is not “blinking”, the most likely assembly at fault is the A3 RF assembly. Go to [“A5 CPU Assembly Troubleshooting” on page 1-29](#) to confirm that the A3 RF assembly is at fault.

22. After all boot- up routine errors have been successfully fixed, run a complete self-test again.

Press: **Utility > Instrument Info > Self-Test > Run Complete Self-Test.**

Troubleshooting Assembly Level Problems

WARNING To allow the power supplies to discharge, wait 30 seconds after unplugging the instrument before removing or installing any assemblies.

CAUTION Before permanently removing any instrument assembly, the instrument's static and dynamic arrays must be configured for the exchange of assemblies. The process to do the appropriate configuration is performed automatically by the instrument with the [Assembly Installation and Removal Overview](#) front panel softkeys. Refer to the [Assembly Removal and Installation Procedure](#) and to the "Hardware Assembly Installation and Removal Softkeys" on page 3-2.

A1 Power Supply Troubleshooting

The main power supply is a switching supply designed with an automatic line-voltage and frequency selection. The supply has a maximum total output power draw of 210 watts. The supply converts line voltage (120 Vac or 240 Vac) to regulated dc voltages. There is an internal power line fuse that is not replaceable. If the fuse opens, the power supply must be replaced. All A1 Power Supply outputs, except for the 5.1SB (standby-supply), are over-current protected and will not be damaged if a continuous short circuit occurs.

1. Remove the outer and inner instrument covers. Refer to [Chapter 3, "Assembly Replacement"](#) for instructions on removing the instrument covers.
2. Reconnect the power cord.
3. Position the signal generator so the A3 RF assembly faces up and the A3J10 Power Supply connector is accessible.
4. Measure the voltage levels at A3J10.

Refer to [Table 1-2](#) to determine the correct supply voltages for the signal generator's power supplies. Because the power supply voltages are filtered or regulated on the A3 RF assembly, the faulty assembly could be either the A1 Power Supply or the A3 RF assembly.

5. If any DC or measured AC ripple voltage is incorrect, replace the A1 Power Supply.

NOTE If all A3J10 voltages are 0 volts, the most likely cause is the internal power line fuse in the A1 Power Supply. The internal power line fuse is NOT replaceable. The complete A1 Power Supply must be replaced.

6. After the replacement of the A1 Power Supply, re-measure the DC and ripple levels at A3J10.
7. If the voltages are still incorrect, the faulty assembly is the A3 RF assembly and not the A1 Power Supply. Replace the A3 RF assembly. If you replaced the A1 Power Supply, but the A3 RF assembly was the faulty assembly, the new A1 Power Supply can be returned to Agilent.

Figure 1-6 A3J10

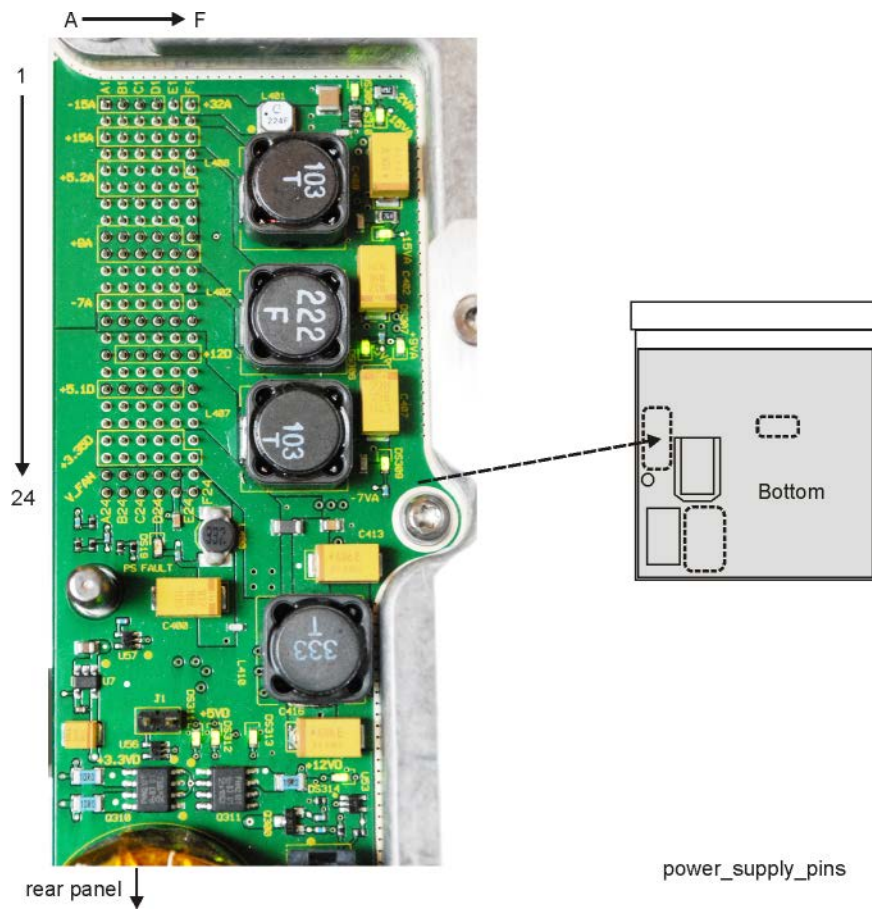


Table 1-2 A3J10 Output Connector Pin Assignment

	A	B	C	D	E	F
1	-15V (A ^a)	-15V (A)	-15V (A)	-15V (A)	ACOM	+32V (A)
2	ACOM	ACOM	ACOM	ACOM	ACOM	ACOM
3	+15V (A)	+15V (A)	+15V (A)	+15V (A)	+15V (A)	+15V (A)
4	ACOM	ACOM	ACOM	ACOM	ACOM	ACOM
5	+5.2V (A)	+5.2V (A)	+5.2V (A)	+5.2V (A)	+5.2V (A)	+5.2V_SENSE
6	+5.2V (A)	+5.2V (A)	+5.2V (A)	+5.2V (A)	+5.2V (A)	+5.2V (A)
7	ACOM	ACOM	ACOM	ACOM	ACOM	ACOM
8	ACOM	ACOM	ACOM	ACOM	ACOM	ACOM
9	+9V (A)	+9V (A)	+9V (A)	+9V (A)	+9V (A)	+9V_SENSE
10	+9V (A)	+9V (A)	+9V (A)	+9V (A)	+9V (A)	+9V (A)
11	ACOM	ACOM	ACOM	ACOM	ACOM	ACOM
12	ACOM	ACOM	ACOM	ACOM	ACOM	ACOM
13	-7V (A)	-7V (A)	-7V (A)	-7V (A)	-7V (A)	-7V_SENSE
14	ACOM	ACOM	ACOM	ACOM	ACOM	ACOM_SENSE
15	D ^b COM	DCOM	DCOM	DCOM	DCOM	DCOM_SENSE
16	N.C	+12V (D)	+12V (D)	+12V (D)	+12V (D)	+12V (D)
17	DCOM	DCOM	DCOM	DCOM	DCOM	DCOM_SENSE
18	+5.1V (D)	+5.1V (D)	+5.1V (D)	+5.1V (D)	+5.1V (D)	+5.1v_SENSE
19	DCOM	DCOM	DCOM	DCOM	DCOM	DCOM
20	DCOM	DCOM	DCOM	DCOM	DCOM	DCOM
21	+3.35V (D)	+3.35V (D)	+3.35V (D)	+3.35V (D)	+3.35V (D)	+3.35V (D)
22	+3.35V (D)	+3.35V (D)	+3.35V (D)	+3.35V (D)	+3.35V (D)	+3.35V (D)
23	FAN_P	FAN_P	FAN_N	FAN_N	PS_TEMP	+5.1SB
24	N.C	OFFn	TEMP_SENSE	PS_FAULTn	PWR_OK	PS_ONn

^aA= voltages or common ground to analog circuitry.

^bD= voltages or common ground to digital circuitry.

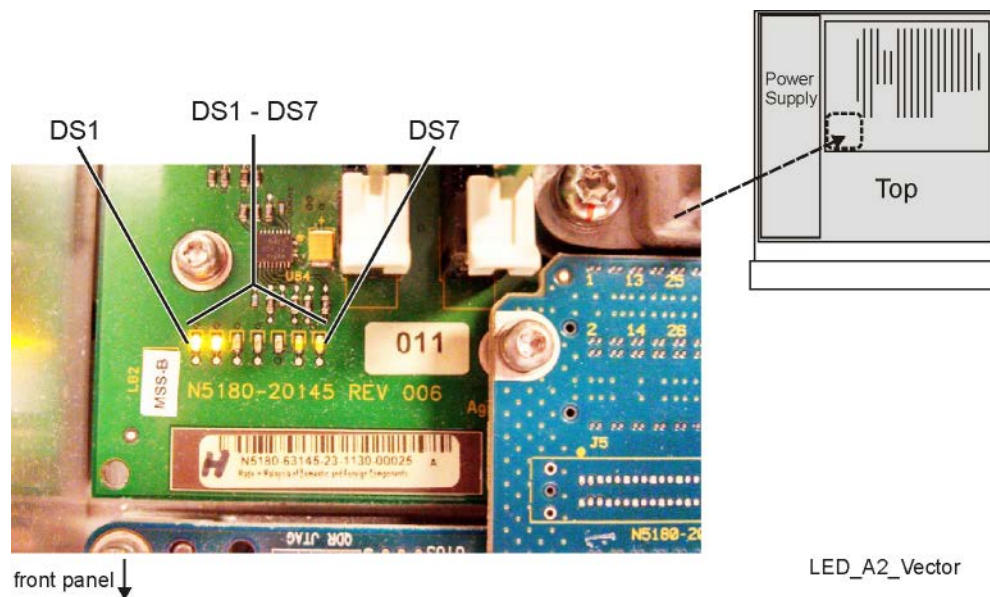
A2 Vector Module Troubleshooting (N5172B/82B Only)

During the startup routine different LEDs will sequentially turn-on and off. At the end of the signal generator's boot-up and the completion of the Debug LEDs' routine, the LEDs will remain in a set pattern. The complete boot-up routine can vary but typically completes in less than 60 seconds.

Power up routine.

Refer to [Figure 1-7](#). Locate the Debug LEDs DS1 - DS7 (off).

Figure 1-7 A2 Vector Module Debug LEDs



LED_A2_Vector

- With the signal generator plugged-in there are no LEDs on.
- At power up 'red' DS5 is the only LED that initially comes on momentarily and then off.
- When DS5 goes off DS1 begins to pulse on (heartbeat).
- DS2 comes on as does DS6.
- DS6 is dimly lit compared to DS2.
- After ~15 seconds DS7 turns on dimly and DS6 begins to dimly continuously blink.
This LED pattern remains for a total of ~45 seconds at which time 'red' DS5 comes on again for ~3 seconds.
- DS6 and DS7 turn off for the same length of time.
- DS5 once again turns off and DS6 and DS7 turn back on with DS6 once again dimly blinking.
- This final pattern of 'yellow' LEDs remains constant while the signal generator is on.

LED	Meaning	Troubleshooting Indication
DS1	Heartbeat LED - A heartbeat pattern indicates the Interface FPGA is out of its reset state and that there is an on-going communication of the PCIe connection.	Failure = Not beating. If the LED is not flashing (beating) the Interface FPGA is mis-configured. The A2 Vector Module may be faulty. Go to “A5 CPU Assembly Troubleshooting” on page 1-29 to confirm the A2 Vector Module is faulty.
DS2	Indicates a valid image has been loaded in the Interface FPGA	Failure = Off. If the LED is not ‘On’ the FPGA image has not been loaded correctly and/or the image is corrupted.
DS3	Controlled by FW and is used as necessary.	Failure = On. The LED is normally ‘Off’. Unless the FW manipulates this LED, it should not be ‘On’.
DS4	Controlled by FW and is used as necessary.	Failure = On. The LED is normally ‘Off’. Unless the FW manipulates this LED, it should not be ‘On’.
DS5	Indicates the FPGA images have fully loaded successfully from the Configuration PROM.	Failure = On If the LED is On, one or more of the FPGA images have failed. Go to “A5 CPU Assembly Troubleshooting” on page 1-29 to confirm the A2 Vector Module is faulty.
DS6	Indicates the ARB FPGA is no longer in reset state and is correctly receiving the 200 MHz DAC clock signal.	Failure = Not blinking. The ARB FPGA is not imaged correctly or the 200 MHz clock signal has been lost.
DS7	Indicates the ARB FPGA has been loaded and it is communicating with the Interface FPGA.	Failure = Off. If the LED is not ‘On’ the FPGA image has not been loaded correctly and/or the image is corrupted.

A3 RF Assembly Troubleshooting

The self test routine is specifically designed to troubleshoot the A3 RF assembly. Troubleshooting the A3 RF assembly relies on the ability of the signal generator to complete the associated self test.

1. Run a complete self test or A3 RF assembly specific self tests.

Press: **Utility > Instrument Info > Self Test > Run Complete Self Test**

- If any self test fails, refer to step 4 of [“Running Self Test” on page 1-13](#).
2. If a complete self test cannot be run, monitoring the [“Boot-up Routine” on page 1-18](#) may provide insight to a specific faulty assembly.

A4 Internal 40GB Solid State Drive - SSD Troubleshooting (N5172B/82B Only)

Solid-State Drive failures cover a broad spectrum of failure symptoms. If there is a Solid-State Drive failure it is likely that no two drives will fail exactly the same. Application and the use model may contribute to the perceived failure symptom. Symptoms could be but not limited to the following:

- Instrument does not recognize SSD and displays memory errors.
- Error(s) occurred during Operating System booting.
- Unable to complete the storing or retrieving a waveform file(s).
- Time required for retrieving or storing data has become exceedingly long.
- Instrument indicates randomly or consistently incorrect drive capacity.

There is only limited troubleshooting that can be easily accomplished on the SSD. Given the ease of replacement of the SSD. If the failure symptoms point to the SSD, it is suggested to:

- If another unit is available, check the SSD in that unit to see if the results are the same.
- Directly replace the SSD in the unit and validate that the failure symptoms have been eliminated.

A5 CPU Assembly Troubleshooting

At power-on, the A5 CPU and the installed firmware run a series of initializing boot-up procedures and instrument operational checks. The operational checks are completed if all power supply voltages are present, the A5 CPU is working correctly and the main FPGA's initialization has finished. If any part of the boot-up procedure fails, an error message will be displayed.

An A5 CPU failure symptom will change according to the type of failure that has occurred. A complete A5 CPU failure may still allow the signal generator to power up and all power supplies to be verified. Complete the following procedure to isolate the faulty assembly.

1. Monitor the [“Boot-up Routine” on page 1-18](#).
 - If any failures occur troubleshoot them.
2. If all power supplies are functional, attempt to communicate with the signal generator by:
 - front panel
 - LAN or USB. Refer to the Agilent Signal Generators Programming Guide for instructions on connecting through LAN and USB.
3. If minimal or no communication/functionality occurs, replace the A5 CPU.
4. If you can communicate, re-install the signal generator's firmware. Go to www.agilent.com/find/upgradeassistant for information on re-installing the EXG or MXG X-Series firmware.

NOTE Agilent recommends always loading the most recent version of firmware before replacing any assembly.

5. If any of the following occurs:
 - No command response is received.
 - “Request Timed Out” response is received.
 - Firmware cannot be re-loaded and/or does not correct the symptom.
 - a. Put the instrument into diagnostics mode:

Power up the instrument while still holding the Preset hardkey for approximately 15 seconds.

The diagnostic service menu is displayed.

b. Turn the signal generator off.

- Press and hold **Preset**, turn the signal generator on, continue to hold **Preset** for ~20 seconds.
- Scroll down to **Start Main FW Service** menu.
- Press **Select**.
- Press **Continue** > **Next Page** > **Next Page** > **Bootup in no hardware mode** (*Verify an “x” is displayed in the “ (example: [x])*)

The instrument is now in the “Bootup in no hardware mode”.

c. Verify the instrument is connected to the LAN.

d. Re-load the most recent version of firmware.

If the instrument boots up without errors, run a complete self-test again.

Press: **Utility** > **Instrument Info** > **Self-Test** > **Run Complete Self-Test**.

If the firmware still cannot be loaded, proceed to [step 6](#).

6. If reloading the firmware does *not* correct the symptom, replace the A3 RF assembly.

A6 Front Panel Interface Scan Assembly Troubleshooting

The A6 Front Panel Interface Scan assembly is a Liquid Crystal Display drive assembly that provides the necessary interface, control and circuits for the complete front panel. Front panel USB connectors, the LCD back-light control, Keypad, Power On/Off switch, and the LCD support circuitry are all interrelated within this assembly. Unlike other similar display drive assemblies this assembly is low voltage; 5 VCD or less.

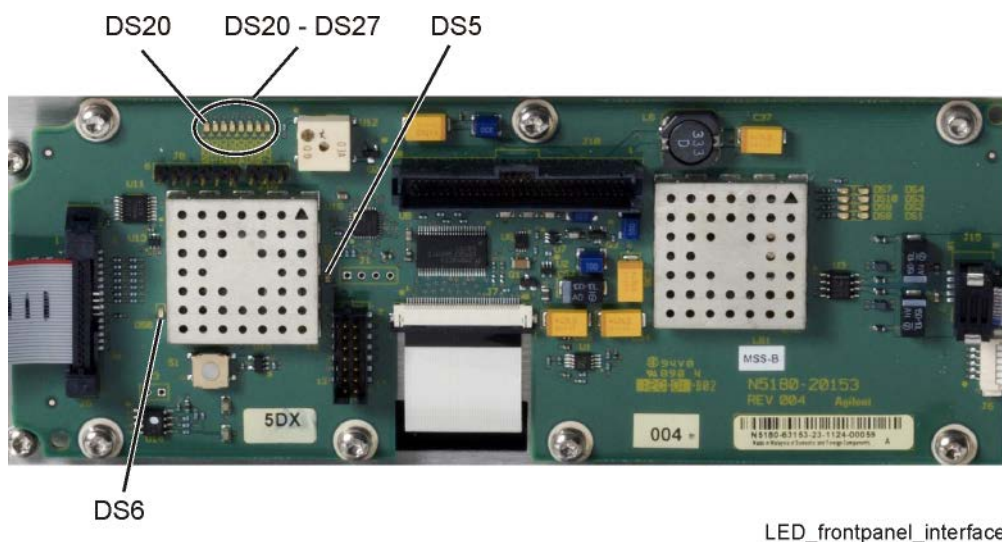
There are no specific automated self-tests associated directly on or for the front panel, except for the related different supply voltages coming from the power supply and the A3 RF assembly via ribbon cable W1.

The A6 Front Panel Interface Scan assembly has a boot-up routine it goes through when the instrument is initially powered up. During this routine, different lower level functions are initiated and verified. If the Interface Scan assembly completes its boot-up sequence the assembly functionality is potentially not at fault. Depending on the observed instrument failure, the faulty component may be an independent failing mechanism that is connected to the Interface Scan assembly; i.e. Keypad assembly or connecting ribbon cable, Front Panel LCD Display or Backlight, etc....

To determine if the A6 Front Panel Interface Scan assembly is faulty, verify the completion of the following boot-up sequence.

1. Turn the signal generator off.
2. Using [Figure 1-8](#) locate the DS5, DS6, and the Debug LEDs (off) DS20 - DS27.

Figure 1-8 LED DS1 and A6J5-1



LED_frontpanel_interface

3. Monitor the rear of the front panel while applying power.

Power boot-up routine

- With the signal generator plugged-in there are no LEDs located on the rear of the Front Panel that are powered on. The yellow Power Switch standby-LED located on the front of the Front Panel should be on.
- At power up 'red' Reset LED DS6 comes on momentarily and then off.
- Yellow VSYNC Program delay LEDs DS24 - DS27 all come on and remain on at the same time that DS6 had initially came on then off.
- DS20 - DS23 remain off

- When DS6 goes off the green Debug LED DS5 immediately begins to blink at a rapid rate.

LED	Meaning	Troubleshooting Indication
DS5	Heartbeat LED - A rapid beating pattern indicates the interface PIC Controller is out of its reset state and the there is an on-going communication of the instrument PCIe connection.	Failure = Not beating. If the LED is not rapidly flashing (beating) the Interface Controller is potentially miss-configured and/or inoperative. The A6 Front Panel Interface Scan board is possibly faulty.
DS6	Indicates a valid image has been loaded in the interface FPGA.	Failure = On. If the LED remains 'On' the FPGA image has not been loaded correctly and/or the image is corrupted. The A6 Front Panel Interface Scan board is possibly faulty.
DS20-DS22	Controlled by FW and are used as necessary. (Not currently used)	Failure = On. The LEDs are normally 'OFF'. Unless future FW specifically manipulates these LED, they remain 'Off'.
DS23-DS27	Controlled by FW indicating that the necessary Display sync boot-up delay has occurred.	Failure = OFF. The LEDs are normally 'ON'. The A6 Front Panel Interface Scan board is possibly faulty.

4. Depending on the instrument original failure symptoms, if the boot-up routine performs as expected, the A6 Front Panel Interface Scan board is potentially not at fault.

NOTE Unlike some earlier products, the lower level circuit assemblies of the complete Front Panel operate at voltages below 5 VDC. If necessary, additional troubleshooting can be performed on individual component/circuit related assemblies. To do so, the complete Front Panel needs to be removed to acquire access.

5. If the Front Panel requires additional troubleshooting of lower level components. Refer to [Chapter 3](#) for the Front Panel removal procedure.

CAUTION Ensure to adequately protect the Front Panel from marring, actual mechanical and/or electrical damage.

6. Follow the Troubleshooting process below for lower level component/circuitry that may require further fault determination.

LCD Display Appears to be Inoperative (Dark)

1. Verify that the display is 'Dark' due to the instrument "Screen Saver" function being activated.
 - Pressing any front panel key will deactivate the screen saver function temporarily and return the display to normal.

The screen saver function can significantly extend the life of the display. The screen saver function can set for different time intervals or be permanently turned Off if having it On is not acceptable. Refer to the instrument User's guide for instructions.
2. With the signal generator connected to the appropriate power line voltage and turned Off, verify the yellow front panel Power Switch standby LED is On.
 - If the yellow standby LED is not On, go to ["The Green Front Panel Power Switch LED or Yellow Standby LED is Not Working" on page 1-36](#) to troubleshoot it.
3. With the signal generator turned On, verify the green front panel LED is On.
 - If the green LED is not On, go to ["The Green Front Panel Power Switch LED or Yellow Standby LED is Not Working" on page 1-36](#) to troubleshoot it.
4. Verify, by listening, that the fans are on.
 - If the fans are not on, go to ["The Fans are Not Working" on page 1-45](#), to troubleshoot them.
5. Verify that the LEDs for the Mod On/Off and RF On/Off keys turn on and off when pressed.
 - If the LEDs do not function, go to ["All Front Panel LEDs are Not Functioning" on page 1-35](#) to troubleshoot them.
6. Connect via LAN or USB cable to the rear of the unit and connect via the Virtual Control Panel (VCP). Go to "Virtual Control Panel Operation" located in the User's/Service Guide. Then return and continue testing via the use of the VCP.
7. After connecting to the unit via VCP, the virtual front panel display should appear to be similar to what is normally viewed on the Front Panel display, as shown below.



- If the display appears to be normal, the most likely cause is a faulty LCD Display. First replace the LCD display.
- If replacing the LCD display does not correct the fault then replace the Interface Scan assembly.
- If the VCP Front Panel is not visible, go to ["A5 CPU Assembly Troubleshooting" on page 1-29](#) to troubleshoot it.
- If the VCP Front Panel is not a normal representation but appears to be corrupted with vertical lines (see below), visually inspect W1 Front Panel Ribbon Cable for damage and check cable for continuity.

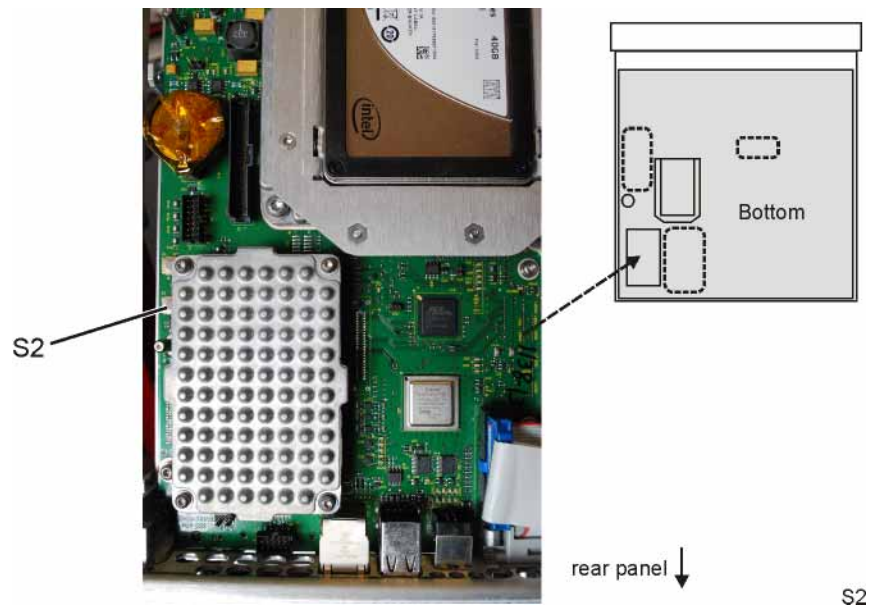


8. If steps 1 through 5 does not provide a likely Front Panel fault.
9. Connect via LAN or USB cable to the rear of the unit and connect via the Virtual Control Panel (VCP). Go to “Virtual Control Panel Operation” located in the User’s/Service Guide. Then return and continue testing via the use of the VCP.
10. Using VCP, proceed to and activate by clicking “Run Complete Self-Test”.
11. Self-Test results will take 4 to 5 minutes. Results will not be completely seen till the VCP display is refreshed on the computer.
12. If there is a failed Self-Test:
 - Follow the steps earlier for “Running Self Test” on page 1-13.
 - If the resolution of the Self-Test failure does not fix the LCD’s condition OR, the LCD is required for troubleshooting failure, then return and/or proceed to the next test.
13. Proceed to and click on the “Front Panel Tests”.
 - The entire suite of tests should function as expected. Only the “LED Blink Test”, “Key Test”, and “RPG Test” will provide visible results.
14. Click on “LED Blink Test”.
 - The ‘More’, ‘Mod On/Off’ and ‘RF On/Off’ LEDs should blink continuously till the test is stopped by clicking on “End LED Blink Test”.
15. Click on “Key Test”.
 - Each depicted key can only be activated by pressing each key on the Front Panel. Doing so will highlight each key pressed but ONLY after the VCP is refreshed on the computer.
 - After all the keys are verified as being good. Pressing or clicking the bottom softkey “Press here to Exit Key Test” will end the test. Refreshing the VCP on the computer will be required if the Front Panel key is pressed vs. clicking it.
16. Click on “RPG Test”.
 - Rotating the RPG knob a minimum of 5 detentes both clockwise and counter clockwise from its starting point will validate the RPG’s functionality. The results of this test will only be visible after the VCP is refreshed on the computer.
17. If any of the steps 10 through 13 fail replace the Front Panel Keyboard assembly.
18. If the replacement of a suspected Keyboard assembly does not correct the detected fault, replace the Interface Scan assembly.
19. If replacing the Interface Scan assembly does not provide a fix for the LCD Display issue, the most likely cause is a faulty LCD Display. Replace the LCD Display.

The Signal Generator Does Not Power On

1. Position the signal generator with the A3 RF assembly facing up.
2. Re-connect the W1 ribbon cable to the A3 RF assembly.
3. Turn the generator 'On'
 - If the unit cannot be turned on by the main Front Panel On-Off switch.
 - Refer to [Figure 1-9](#) to locate the internal power switch S2.
 - Press line switch S2 (PWR) to turn the signal generator on.

Figure 1-9 S2 Location



4. If the unit won't power up using the main Front Panel On-Off switch but powers up as expected using S2 (PWR) switch, the fault may be associated with W1 or the Front Panel.
5. Once the unit is powered on, verify that the Front Panel is functioning as before.

All Front Panel LEDs are Not Functioning

Verify front panel LED functionality by performing the LED Blink test. The RF, MOD, and More LEDs on the front panel should blink.

Softkey Location: **Utility > Instrument Info > Front Panel Tests**

- If none of the LEDs blink, replace the A6 Front Panel Interface Scan board.
- If some of the LEDs blink, replace the Key Pad assembly.

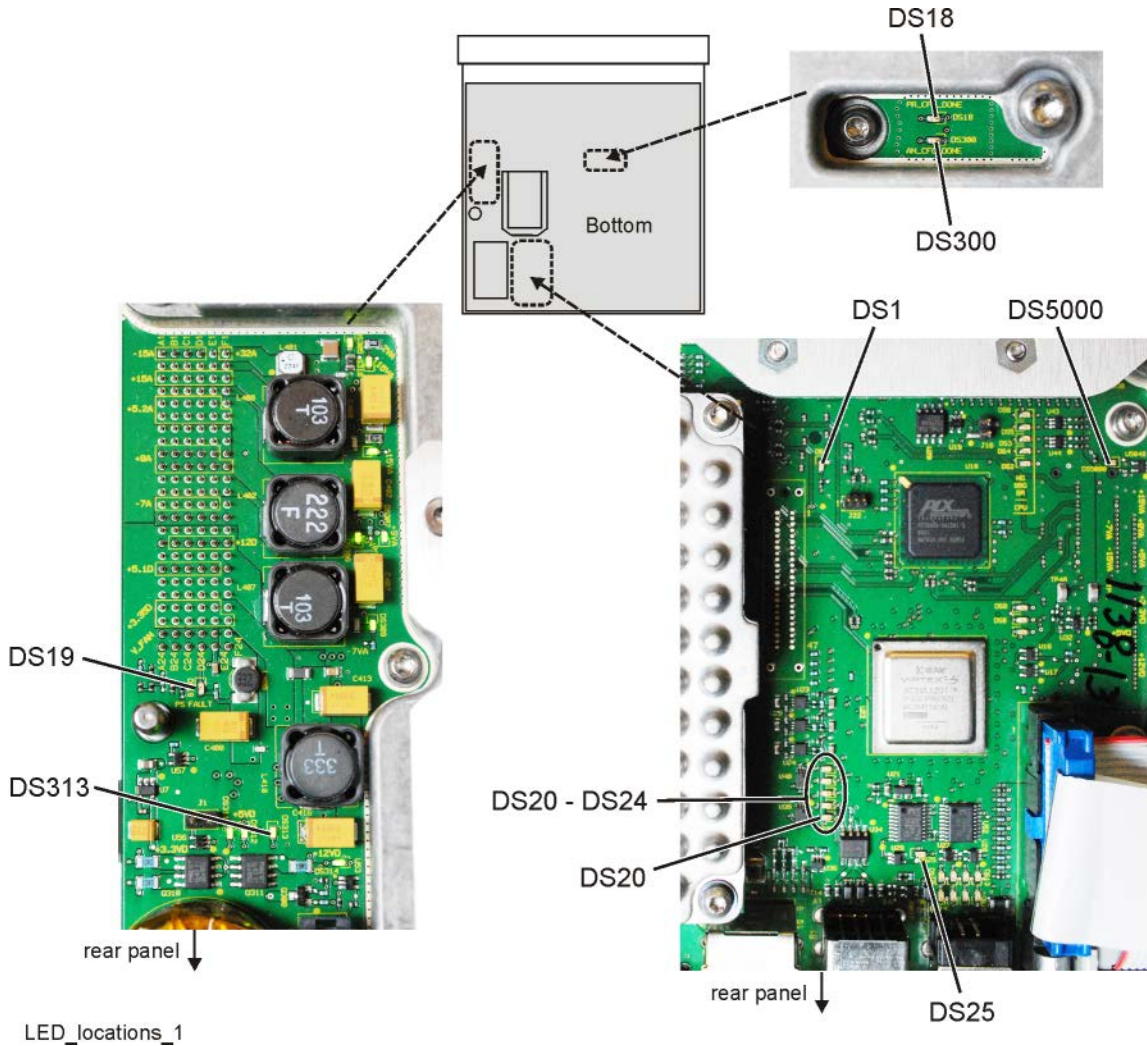
The Green Front Panel Power Switch LED or Yellow Standby LED is Not Working

The power switch and standby LEDs are controlled by the +5.1 Vdc standby line. The +5.1 Vdc standby line is supplied by the A1 Power Supply and is routed through the A3 RF assembly to the front panel.

With the signal generator plugged in and the power turned off, the yellow standby LED should be on. When the signal generator is turned on, the yellow standby LED should turn off and the green front panel power switch LED should turn on. If either of these LEDs are not functioning as expected, complete the following procedure to correct the problem.

1. Remove the outer and inner instrument covers. Refer to [Chapter 3, "Assembly Replacement"](#) for instructions on removing the instrument covers.
2. Using [Figure 1-10](#), check the green DS3 LED on the A3 RF assembly.
 - If DS3 is on, continue to [step 3](#).
 - If DS3 is off, go to [step 4](#).
3. Using [Figure 1-10](#), press line switch S1 on the A3 RF assembly.

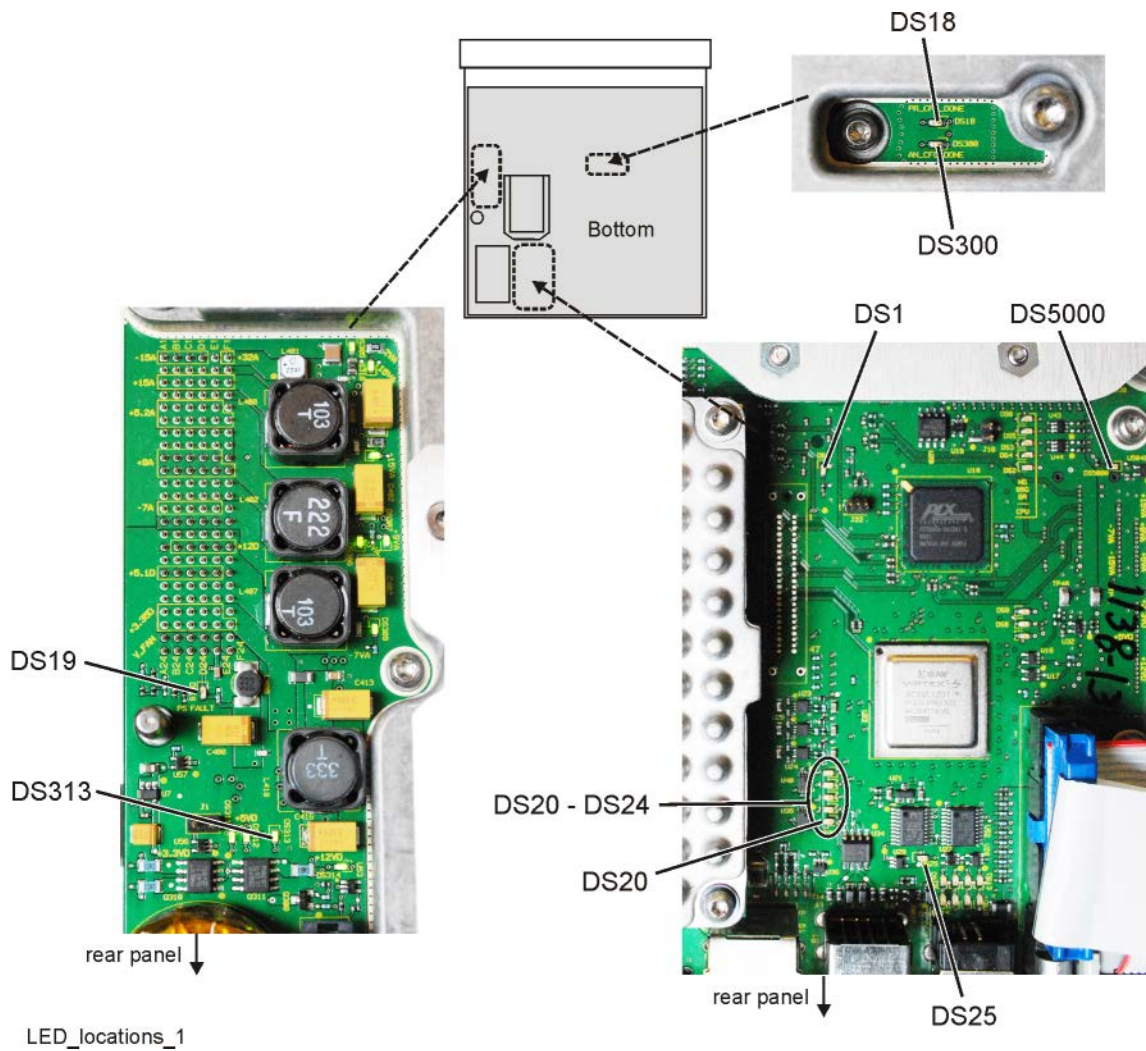
Figure 1-10 Line Switch



a. Using [Figure 1-11](#), verify that the following power supply voltage LEDs are on.

- +3.3VDF, DS1
- +5VDF, DS2
- +5.1VSBF, DS3
- +12VDF, DS4
- +32VAF, DS5
- +5VAF, DS6
- +9VAF, DS7
- +15VAF, DS8
- -7VAF, DS9
- -15VAF, DS10

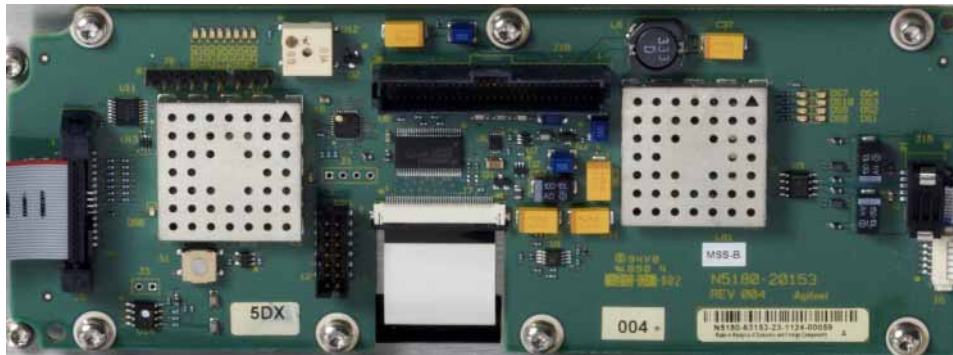
Figure 1-11 Power Supply LEDs



- b. If any other power supply LEDs are off, go to [“A1 Power Supply Troubleshooting”](#) on page 1-24 to troubleshoot the A1 Power Supply.
- c. Verify that the W1 ribbon cable connections are tight.
- d. Remove the front panel. Refer to [Chapter 3, "Assembly Replacement"](#).
- e. Re-connect the W1 ribbon cable to the A3 RF assembly.

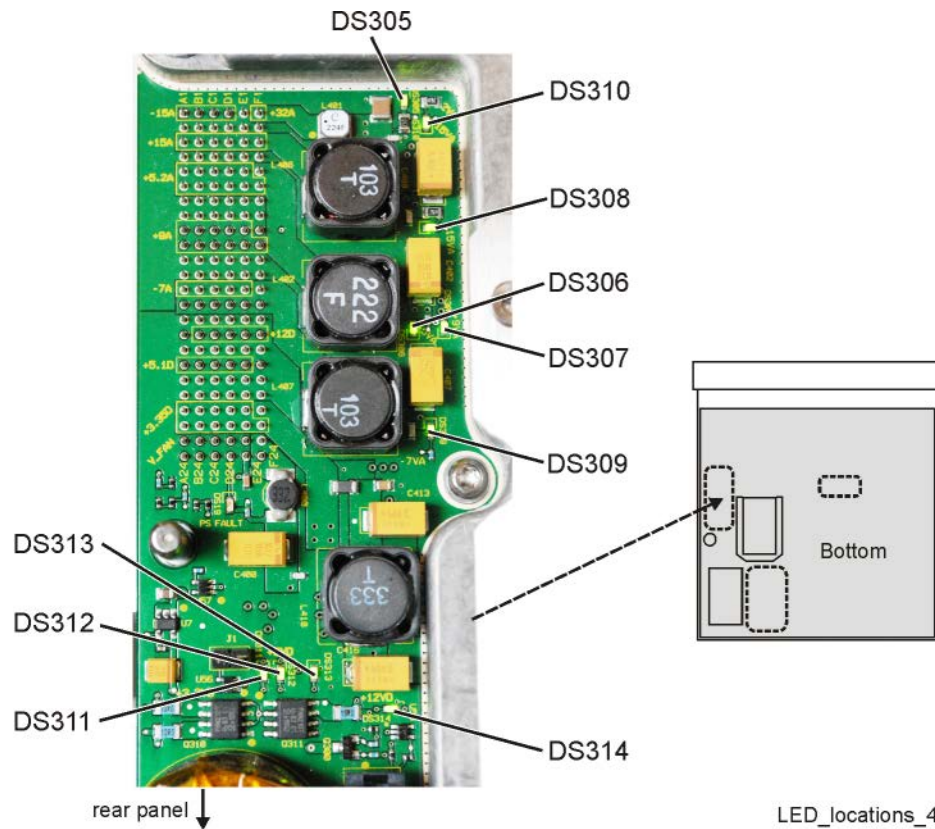
- f. See [Figure 1-12](#). Use a voltmeter with a small probe to measure the output voltage +5.1V on the A6 Front Panel Interface Scan board at J1-34.
- If the voltage is within limits, the fault is likely with the A6 Front Panel Interface Scan board. Refer to [“A6 Front Panel Interface Scan Assembly Troubleshooting”](#) on [page 1-31](#) to troubleshoot.
 - If the voltage is not within limits, measure J6-34 on the A3 RF assembly. Refer to [Figure 1-11](#).
 - If the voltage is within limits, replace W1.
 - If the voltage is not within limits, go to [step 4](#).

Figure 1-12 +5.1V on A6 at J1-34



- See [Figure 1-13](#). Use a voltmeter with a small probe to measure the output voltage +5.1SB on the A3 RF assembly at J10-F23.

Figure 1-13 +5.1SB at J10-F23



- If the voltage is not within limits, the fault is likely with the A1 Power Supply. Replace the A1 Power Supply.
- If the voltage is within limits:
 - a. Replace the A3 RF assembly.
 - b. See [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).

Front Panel Hardkeys or Softkeys are Not Functioning

Verify individual key functionality by performing the Front Panel Key Test. Pressing each key should darken the location on the front panel associated with that key.

Press: **Utility > Instrument Info > Front Panel Tests > Key Test**

- If intermittent operation occurs, replace the Key Pad assembly.
- If more than 50% of the keys do not cause the corresponding test area to change color, replace the A6 Front Panel Interface Scan board.

The RPG Knob is Not Functioning

Verify the RPG functionality by performing the front panel RPG test.

Press: **Utility > Instrument Info > Front Panel Tests > RPG Test**

- Turning the RPG knob to the right should cause positive incremental changes; expected range +10.
- Turning the RPG knob to the left should cause negative incremental changes; expected range -10.

Figure 1-14 A6 Front Panel Interface Scan Board

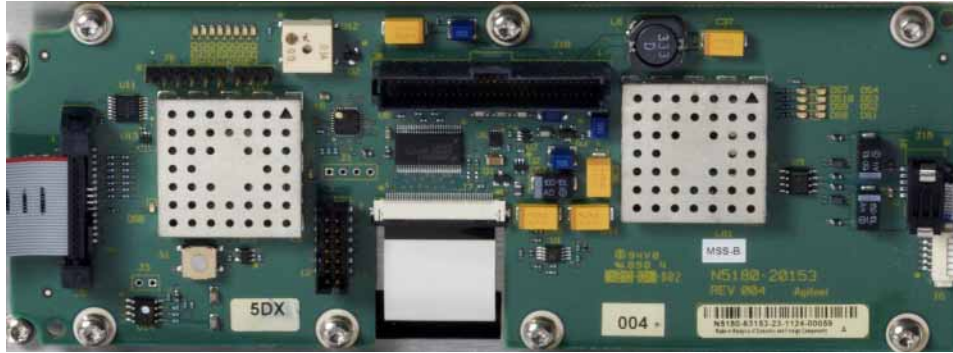
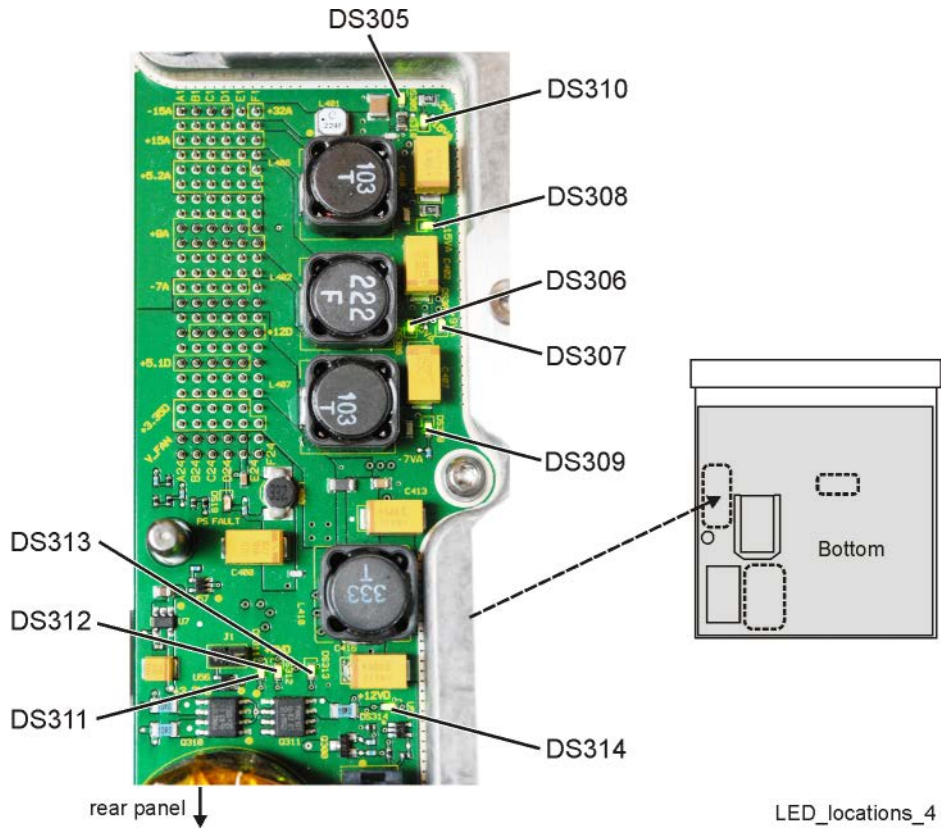


Figure 1-15 A3J6 and A3J10



If the RPG test fails, complete the following procedure to determine the faulty assembly/part:

1. Remove the front panel. Refer to [Chapter 3, "Assembly Replacement"](#).
2. Refer to [Figure 1-14](#). Verify that A6J2-25 has a voltage of +3 Vdc:
 - If A6J2-25 has a voltage of +3 Vdc, go to [step 10](#).
 - If A6J2-25 does not have a voltage of +3 Vdc, go to [step 3](#).
3. Refer to [Figure 1-14](#). Measure A6J1-11 and A6J1-12; they should have a voltage of +3 Vdc.
 - If A6J1-11 and A6J1-12 have a voltage of +3 Vdc, replace the A6 Front Panel Interface Scan board.
 - If A6J1-11 and A6J1-12 do not have a voltage of +3 Vdc, go to [step 4](#).
4. Refer to [Figure 1-15](#). Measure A3J6-11 and A3J6-12; they should have a voltage of +3 Vdc.
 - If A3J6-11 and A3J6-12 have a voltage of +3 Vdc, replace the W1 ribbon cable.
 - If A3J6-11 and A3J6-12 do not have a voltage of +3 Vdc, go to [step 5](#).
5. Refer to [Figure 1-15](#). Measure A3J10-A21 and A3J10-A22; they should have a voltage of +3 Vdc.
 - If A3J10-A21 and A3J10-A22 have a voltage of +3 Vdc:
 - a. Replace the A3 RF assembly.
 - b. After replacing the A3 RF assembly, go to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).
 - If A3J10-A21 and A3J10-A22 do not have a voltage of +3 Vdc, go to ["A1 Power Supply Troubleshooting"](#) on [page 1-24](#) to troubleshoot the A1 Power Supply.
6. Refer to [Figure 1-14](#). Measure A6J2-28; it should have a voltage of +5 Vdc.
 - If A6J2-28 has a voltage of +5 Vdc, go to [step 10](#).
 - If A6J2-28 does not have a voltage of +5 Vdc, go to [step 7](#).
7. Refer to [Figure 1-14](#). Measure A6J1-3 and A6J1-4; they should have a voltage of +12 Vdc.
 - If A6J1-3 and A6J1-4 have a voltage of +12 Vdc, replace the A6 Front Panel Interface Scan board.
 - If A6J1-3 and A6J1-4 do not have a voltage of +12 Vdc, go to [step 8](#).
8. Refer to [Figure 1-15](#). Measure A3J6-3 and A3J6-4; they should have a voltage of +12 Vdc.
 - If A3J6-3 and A3J6-4 have a voltage of +12 Vdc, replace the W1 ribbon cable.
 - If A3J6-3 and A3J6-4 do not have a voltage of +12 Vdc, go to [step 9](#).
9. Refer to [Figure 1-15](#). Measure A3J10-B16; it should have a voltage of +12 Vdc.
 - If A3J10-B16 has a voltage of +12 Vdc:
 - a. Replace the A3 RF assembly.
 - b. Go to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).
 - If A3J10-B16 does not have a voltage of +3 Vdc, go to ["A1 Power Supply Troubleshooting"](#) on [page 1-24](#) to troubleshoot the A1 Power Supply.
10. Refer to [Figure 1-14](#). Using an oscilloscope, turn the RPG knob and measure A6J2-26 and A6J2-30. There should be a 4V square pulse. If there is no 4V square pulse, replace the Keypad assembly.

Blank or Missing Pixels

Verify functionality by performing the front panel LCD Pixel tests.

Press: **Utility > Instrument Info > Front Panel Tests > Pixel Screen Tests**

- If the same area of the display is blank during each pixel test, replace the LCD Display.
- If an area of the display is only blank during some of the tests, replace the A6 Front Panel Interface Scan board.

The Screen Saver is Not Functioning

The screen saver delay can be set from 1 to 12 hours. The PIC Controller controls the screen saver by turning the LCD backlight on or off.

1. Verify the signal generator is turned on.
2. Set the delay time to 1 hour. Press: **Utility > Display > Screen Saver Delay**, then turn the RPG knob.
3. Allow the screen saver delay time to elapse.
4. Check to see if the display has gone dark.
5. If the display has not gone dark, replace the A6 Front Panel Interface Scan board.
6. Set the delay time to 1 hour.
7. Allow the screen saver delay time to elapse.
8. Check to see if the display has gone dark.
9. If the display still has not gone dark, replace the A5 CPU assembly.

A7 Real Time BBG Assembly Troubleshooting

Troubleshooting the A7 Real Time BBG assembly relies on the ability of the signal generator to complete the associated self-tests beginning at 1500.

1. If a single BBG self-test fails and is considered the most probable cause. Replace the A7 assembly.
2. If multiple or all associated BBG self-tests fails (View Test Info)
 - Verify that the associated power supply LEDs are On when the unit is connected to the appropriate power line voltage with the unit Off.
 - A7A1 Real Time assembly power supply green LED is On.
 - A7 DS11 12 V green LED is On.
3. If A7A1 LED is Off, go to [“A1 Power Supply Troubleshooting” on page 1-24.](#)
4. If A7 DS11 is Off, continue to step 6.
5. If both LED's are On, go to step 6
6. Power On the unit and verify all the listed LEDs below on On.

LED	Voltage	Color	Function
DS4			
DS5	1.2V		
DS6	1.2V		
DS8			
DS9	1.8V		
DS10	2.5V		
DS11	12V		
DS12	3.3V		
DS16		Red	
DS17			100 MHz Clock
DS18	0.9VTT		

7. The entire procedure must be completed prior to troubleshooting an identified faulty assembly. Complete each step, taking note of any item that does not respond as expected, then troubleshoot as described. Turn the instrument on and verify.

Run a complete self- test or A7 Real Time BBG assembly specific self tests.

Press: **Utility > Instrument Info > Self Test > Run Complete Self Test.**

If any self test fails, refer to step 4 of [Run Self Test Using the Front Panel.](#)

The Fans are Not Working

The four fans are connected directly to the A1 Power Supply. The fan motors are AC motors, with a DC to AC inverter built into the motor hub. The control, voltage, and filtering for the fans are integrated into the A1 Power Supply. The fan control voltage is a nominal 12 Vdc. The control range can vary from a minimum of 8 volts up to a maximum of 13.8 volts. Using internal sensors, the control circuit sets the fan voltage to adjust the fan speed to protect the A1 Power Supply and the signal generator. The A1 Power Supply will function at full output load, up to 25° C, without raising the minimum fan voltage. The A1 Power Supply may begin to raise the fan voltage at 25° C and will reach maximum voltage at no lower than 45° C ambient.

- If a single fan is inoperative, the most likely cause is a faulty fan.
 1. Unplug the inoperative fan and one working fan.
 2. Plug the inoperative fan into the working fan's connector on the A1 Power Supply.
 - If the inoperative fan works, the connector on the A1 Power Supply is faulty. Replace the A1 Power Supply.
 - If the inoperative fan does not work, plug the good fan into the inoperative fan's connector on the A1 Power Supply. If the good fan works, the inoperative fan is faulty. Replace the fan.
- If two or more fans are inoperative, the most likely assembly at fault is the A1 Power Supply. The four fans are connected in parallel, so if the A1 Power Supply voltage is faulty for one fan, then by design, the voltage will be faulty for all four fans. Replace the A1 Power Supply.

No LAN Activity

The signal generator supports 100-Base T-LAN. When the signal generator is connected to an active LAN, one of the green DS1 LEDs, viewable through the rear panel, will be on and the other green DS1 LED will blink.

- If either of the DS1 LEDs do not respond to an active LAN connection, replace the A5 CPU assembly.

No Front Panel USB Activity

The front panel Type-A USB connectors support data transfers.

NOTE Not all USB memory sticks are compatible with the Type-A USB connector on this signal generator. Go to www.agilent.com/find/x-series for a list of USB storage devices that work with this signal generator.

1. Connect a compatible USB memory stick to the signal generator. The signal generator should detect the USB memory stick immediately.
2. If a compatible memory stick does not work, but the rear panel USB and all other instrument functions operate correctly, replace the USB Board.
3. If replacing the USB Board does not correct the problem, replace the A5 CPU assembly.

No Rear-Panel USB Activity

The rear-panel type Mini-B 5 pin USB connector is used for remotely controlling the signal generator using SCPI commands.

1. Connect a USB cable between a controller PC that has been configured to communicate through a USB cable and the signal generator. The PC should detect the signal generator almost immediately.
2. If the signal generator is not detected:
 - a. Verify the rear-panel Mini-B USB cable is inserted deeply enough to make proper contact.
 - b. If the rear-panel Mini-B USB cable is inserted deeply enough to make proper contact, replace the A5 CPU assembly.

No GPIB Activity

The signal generator supports a general purpose interface bus (GPIB). The GPIB enables communication with compatible devices such as external controllers.

1. Replace the GPIB cable with a known working cable.
2. Send a SCPI command to the signal generator.
3. Verify the signal generator responds to the SCPI command.
4. If the signal generator does not respond to the SCPI command, replace the A5 CPU assembly.

Error Messages

For more information on Error Messages go to the error messages list on the documentation CD, N5180-90007, or online at <http://cp.literature.agilent.com/litweb/pdf/N5180-90020.pdf>.

Troubleshooting Unlocks

The phase lock loop refers to the frequency generating circuit used to maintain the phase relationship between the frequency generation loop and a reference frequency. By maintaining the phase relationship, the frequency accuracy of the signal generator is guaranteed.

To maintain accuracy, the phase lock loop compares the phase of a signal from the reference assembly to the phase of the frequency loop signal. If the two signals are out of phase, the phase comparator circuit adjusts the frequency loop signal until the signals are in phase. If the phase comparator circuit cannot adjust the phase of the frequency loop signal, the phase comparator rails and generates an unlocked message. The unlock message will be displayed on the front panel.

Troubleshoot multiple loop unlock messages in the following order:

1. ["508 Frac-N Loop Unlock" on page 1-46](#)
2. ["512 Reference Unlocked" on page 1-47](#)
3. ["515 Reference Missing" on page 1-47](#)
4. ["532 PCI Bridge FPGA DCM Unlocked" on page 1-47](#)
5. ["533 RF Analog FPGA DCM Unlocked" on page 1-47](#)

508 Frac- N Loop Unlock

A 508 Frac-N Loop Unlock message indicates a problem with the Voltage Control Oscillator's (VCO) phase-locked loop on the A3 RF assembly.

- If the signal generator is connected to an external reference:
 1. Check the reference's frequency, power, and physical connection.
 2. Make sure the external reference frequency, specified in the instrument setup, is correct.
 3. If the external reference signal and connection is good, replace the A3 RF Assembly.
- If the signal generator is not connected to an external reference:
 1. Replace the A3 RF assembly.
 2. Go to [Chapter 4, "Post Repair Procedures and Operational Performance Verification"](#).

512 Reference Unlocked

A 512 Reference Unlocked message indicates a problem with the external reference settings or connections.

- If the signal generator is connected to an external reference:
 1. Check the reference's frequency, power, and physical connection.
 2. Make sure the external reference frequency, specified in the instrument setup, is correct.
 3. If the external reference signal and connection is good, replace the A3 RF Assembly.
- If the signal generator is not connected to an external reference:
 1. Replace the A3 RF assembly.
 2. Go to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).

515 Reference Missing

A 515 Reference Missing message indicates the Reference circuit's 10 MHz reference signal is bad or missing. The signal generator's reference is unlocked.

- If the signal generator is connected to an external reference:
 1. Check the reference's frequency, power, and physical connection.
 2. Make sure the external reference frequency, specified in the instrument setup, is correct.
 3. If the external reference signal and connection is good, replace the A3 RF Assembly.
- If the signal generator is not connected to an external reference:
 1. Replace the A3 RF assembly.
 2. Go to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).

532 PCI Bridge FPGA DCM Unlocked

A 532 PCI Bridge FPGA DCM Unlocked message indicates that the PCI Bridge FPGA clocks are not working correctly.

- If this message appears:
 1. Replace the A3 RF assembly.
 2. Go to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).

533 RF Analog FPGA DCM Unlocked

A 533 RF Analog FPGA DCM Unlocked message indicates the FPGA clocks are not working correctly.

- If this message appears:
 1. Replace the A3 RF assembly.
 2. Go to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).

Troubleshooting Unlevels

An Automatic Leveling Control (ALC) loop on the A3 RF assembly provides leveled output power. The ALC loop is a feedback control system that monitors RF power and maintains power at the user-selected level. The RF path must provide a minimum power level to the ALC loop for the ALC loop to work correctly. The minimum required power is slightly higher than the instrument maximum power level.

A leveled output power is obtained by comparing a detected voltage with a reference voltage. The detected voltage is generated by coupling off a portion of the RF output signal and converting it to a dc voltage using detector diodes. The reference voltage is generated using calibrated DAC's. When the reference and detected levels are not the same, the ALC integrator output ramps up or down, to increase or decrease the detected level. If the integrator cannot achieve a match between the detected and reference voltages an unlevelled annunciator is displayed.

1. Run a complete self test.

Press: **Utility > Instrument Info > Self Test > Run Complete Self Test.**

2. Troubleshoot any unlocks.

Refer to [“Troubleshooting Unlocks” on page 1-46.](#)

3. Measure the output power at the RF connector.

4. Check the measured output power level against the values in [Table 1-4.](#)

NOTE The output power values shown in these tables might not apply to your specific signal generator configuration. Refer to the current data sheet for the latest power level data.

Table 1-4 Maximum Output Power

Frequency	Standard	Option 1EA
N5171B/72B		
9 kHz to 10 MHz	+13 dBm	+17 dBm
10 MHz to 3 GHz	+18 dBm	+21 dBm
3 GHz to 6 GHz	+16 dBm	+18 dBm
N5081B/82B		
9 kHz to 10 MHz	+13 dBm	+17 dBm
10 MHz to 3 GHz	+18 dBm	+24 dBm
3 GHz to 5 GHz	+16 dBm	+19 dBm
5 GHz to 6 GHz	+16 dBm	+18 dBm

- If the signal generator is an N5171B/81B and it does not meet the listed power level in [Table 1-4](#), proceed to [“Troubleshooting the RF Path” on page 1-49.](#)
- If the signal generator is an N5172B/82B and does not achieve the maximum power levels listed in [Table 1-4](#), perform the following procedure:

Press

1. **Mode > Dual Arb > Arb Off/On** - until Off is highlighted
2. Press **Mode > More > Real Time I/Q Baseband AWGN > Real-time AWGN Off/On** - until Off is highlighted
3. Using [Table 1-4](#), re-check the maximum power levels.
 - If the signal generator meets its maximum power levels, proceed to [“Troubleshooting the RF Path” on page 1-49.](#)
 - If the signal generator does not achieve the maximum power levels:
 - a. Replace the A2 Vector Module assembly.
 - b. Proceed to [“Troubleshooting the RF Path” on page 1-49.](#)

Troubleshooting the RF Path

The ALC loop circuitry is part of the A3 RF assembly. It is likely an unlevelled or under power condition is the result of a problem with the A3 RF assembly.

- For an N5171B/81B signal generator, replace the A3 RF assembly.
- For an N5172B/82B signal generator,
 - a. Attempt to verify that the A2 Vector Module is *not* contributing to the unlevelled or under power condition. Refer to “[A2 Vector Module Troubleshooting \(N5172B/82B Only\)](#)” on page 1-27.
 - b. If the A2 Vector Module is likely not contributing to the condition, replace the A3 RF assembly.

Troubleshooting the 6 GHz Electronic Attenuator

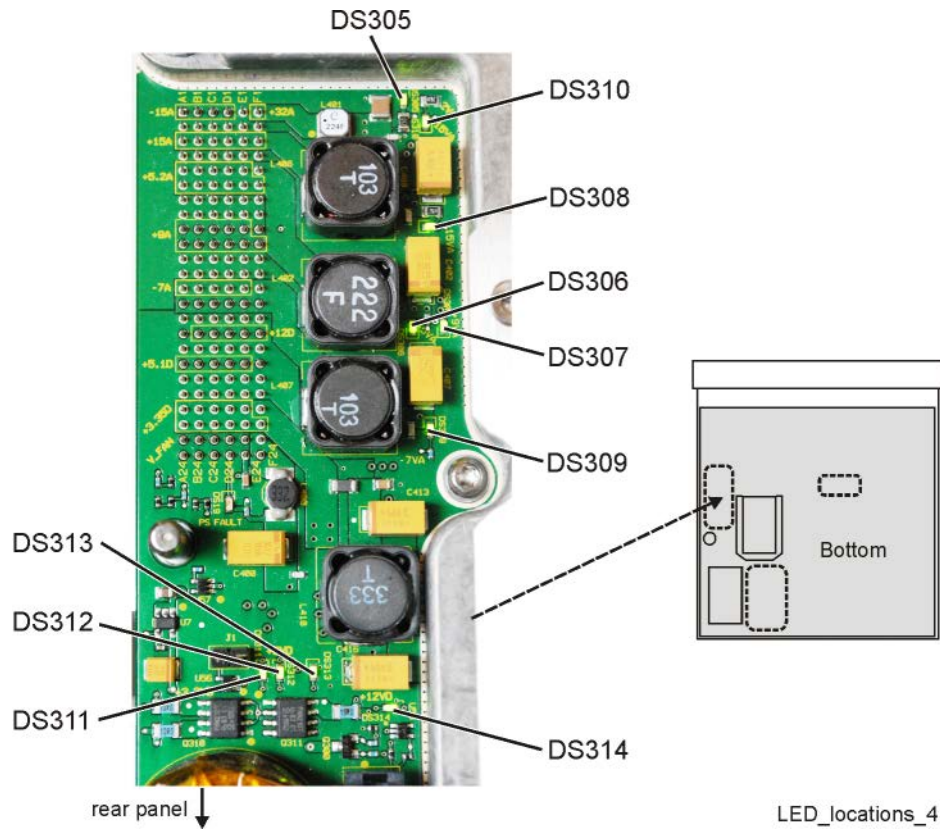
The 6 GHz electronic attenuator is built into the A3 RF assembly. It has an attenuation range of 130 dB, in 5 dB steps. The attenuator is used to rough tune the power level, while the ALC loop is used to fine-tune the power level. (The ALC fine tunes the power level within each 5 dB step.) Due to the interactive design of the attenuator and the ALC loop, there is no precise setting that will predict when the attenuator will be switched in. The firmware, along with the selected frequency, the current ALC setting, modulation, and the requested attenuation all work together to determine the optimum instrument performance and when an attenuation step is switched in.

Aside from an A1 Power Supply failure, any suspected improper functionality of the attenuator requires the replacement of the A3 RF assembly.

The best way to troubleshoot the 6 GHz Electronic Attenuator is to run self test “601 Attenuator Voltages”. If this self-test cannot be run, perform the following steps:

1. Refer to [Figure 1-16](#). Use a voltmeter with a small probe to measure the output voltage +5.1V at J10-F23 and +/- 15V at J10-A1 and J10-A3 on the A3 RF assembly.

Figure 1-16 +5.1V and +/-15V



- If the voltages are within limits, the A1 Power Supply is not at fault. Replace the A3 RF assembly.
- If any voltages are incorrect, the faulty assembly could be either the A1 Power Supply or the A3 RF assembly.
 - a. Replace the A1 Power Supply¹.
 - b. Repeat [step 1](#).
 - c. If the voltages are still incorrect replace the A3 RF assembly.

¹If you replaced the A1 Power Supply, but the A3 RF assembly was the faulty assembly, you can return the new A1 Power Supply to Agilent.

Troubleshooting Harmonic Spurious

Harmonics are multiples of the fundamental output frequency produced by a signal generator. Specifically, the second harmonic is two times the output frequency and its amplitude is measured relative to the fundamental (carrier) output frequency amplitude; the power level of a harmonic is expressed as -xx dBc.

- If the frequency of a harmonic falls beyond the frequency range of the signal generator, that particular harmonic is not specified or measured.
- If the frequency of a harmonic falls within the frequency range of the signal generator, the harmonic's power level is obtained with the following procedure:
 1. Set the signal generator and spectrum analyzer to the same harmonic frequency.
 2. Set the signal generator to a specific power level. Its output peak power level is measured on the spectrum analyzer; this peak power level is the reference level used for the harmonic measurement.
 3. Set the signal generator to the fundamental frequency. The power level of the fundamental frequency is measured by using **Peak Search** and **Marker Delta**.

This measurement obtains the power level of the harmonic and is expressed as a dBc value; it is the difference between the fundamental peak power level and the harmonic frequency power level.

Troubleshooting Harmonic Spurious by Fundamental Frequency

All mixing products and by-products are generated on the A3 RF assembly. Harmonic spurious problems will most likely be associated with the A3 RF assembly.

- Spurious harmonic levels beyond the published specifications of the N5181B/82B require the replacement of the A3 RF assembly.

To Verify Harmonic Performance at the RF Output

1. Signal Generator Settings
 - a. Set the frequency of the signal generator to the harmonic frequency being measured. For example, when planning to measure the second harmonic of a 1 GHz signal, set the frequency of the signal generator to 2 GHz.
 - b. Set the power level of the signal generator to +4 dBm.
2. Spectrum Analyzer Settings
 - a. Connect a spectrum analyzer to the RF Output connector of the signal generator.
 - b. Set the frequency of the spectrum analyzer to the harmonic frequency being measured. To continue with our example, set the frequency of the spectrum analyzer to 2 GHz.
 - c. On the spectrum analyzer, press the **Peak Search** and **Marker Delta** keys. The marker should indicate approximately 0 dBm.
3. Signal Generator Settings
 - a. Set the signal generator to the fundamental frequency of the harmonic being measured. In this example, because the measured harmonic was at 2 GHz, the signal generator should be set to 1 GHz.
4. Spectrum Analyzer Settings
 - a. On the spectrum analyzer, read the power level (and record it for future reference, in case further troubleshooting is necessary). The marker should indicate a power level in dBc; this is the power level of the harmonic being measured.
 - b. Compare the power level of the marker against the specified harmonic performance level for your signal generator.

Troubleshooting Non-Harmonic Spurious

Non-harmonic spurious responses are unwanted signals that are not related to the fundamental output frequency but are produced by the internal frequency synthesis section of the signal generator. There are many different groupings a spur can fall into. The grouping determines what assembly is most likely generating the spur.

Spur types for this signal generator are noted in [Table 1-5](#). To troubleshoot spurs:

1. Identify the grouping based on failing a specified performance test.
2. Check for loose or broken cables and castings.
3. Replace the assembly.

Table 1-5

Type of Spur	Options	Description	Replace
Reference Spurs	All	These spurs are generated by the 10 MHz frequency reference on the A3 RF assembly.	A3 RF assembly ^a
Mixing Spurs	All	These spurs are generated by the mixing products of the RF and IF signals on the A3 RF assembly. The signal generator is tuned to a frequency in the Heterodyne band (≤ 250 MHz) to measure these spurs.	A3 RF assembly ^a
Power Supply Spurs	All	These spurs are generated by the power supply switching at a 120 kHz rate.	A1 Power Supply
LO Feedthru Spurs	All	These spurs are generated by the LO signal passing through the mixer in the Heterodyne band.	A3 RF assembly ^a
RF Feedthru Spurs	All	These spurs are generated by the RF signal passing through the mixer in the Heterodyne band.	A3 RF assembly ^a

^aAfter replacing the A3 RF assembly, go to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).

Troubleshooting Performance Test Problems

This section describes the available Agilent X-Series signal generator performance tests. These performance tests verify that the signal generator meets specifications.

IMPORTANT All test equipment configurations, cables and adapters must be properly torqued. Exceeding recommended torque values can cause damage to a cable or adapter, and may cause inaccurate test results.

Manual Performance Test Problems

When a manual performance test fails or self tests, performed as part of the manual performance test, fails, use this table to locate the most likely faulty assembly or action to perform. The tests are listed in the order they should be performed.

Performance test that is failing...	Action to perform...
I/Q Calibration (N5172B/82B only)	<ul style="list-style-type: none"> Replace the A2 Vector Module assembly.
Self-Tests	<ul style="list-style-type: none"> Go to "Running Self Test" on page 1-13.
Relative Frequency Range and Accuracy Verification	<ul style="list-style-type: none"> Replace the A3 RF assembly^a.
Leveled Output Power Verification	<ul style="list-style-type: none"> For the N5171B/81B signal generator, replace the A3 RF assembly^b. For the N5172B/82B signal generator, ensure that digital modulation is turned off by pressing the following keys: <ol style="list-style-type: none"> Mode > Dual Arb > Arb Off/On - until Off is highlighted Mode > More > Real-Time Custom Modulation > Real-Time Custom Off/On - until Off is highlighted Re-run the Leveled Output Power Verification test. <ul style="list-style-type: none"> If the signal generator passes the Leveled Output Power Verification test, replace the A2 Vector Module. If the signal generator does not pass the Leveled Output Power Verification test, replace the A3 RF assembly^b.

^aAfter replacing the A3 RF assembly, go to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification"](#).

^b If the Leveled Output Power Verification fails only a few test points or fails by a small margin, attempt performing adjustments via N7800A Service Software. If after adjustments the instrument does not meet its warranted specifications, replace the A3 RF assembly.

Automated Performance Test Problems

If the self-tests pass, but an automated performance test fails, use this table to locate the assembly that is most likely to have failed. To avoid unnecessary reconfiguration of test equipment, run the performance tests in the order in which they are listed in the table. Always use the latest revision of the N7800A Service Software.

NOTE When Performance Tests fail by a minimal margin or only a few test points fail, performing the appropriate related adjustment may improve the instrument performance.

When such performance conditions exist, always perform adjustments via N7800A Service Software. If after adjustments the instrument does not meet its warranted specifications, then proceed with the action called out in the table below.

Performance Test that is Failing...	Action to Perform...
Digital Modulation Power Level Accuracy Relative to (N5172B/82B only)	Replace the A3 RF assembly
Power Level Accuracy	Replace the A3 RF assembly
Harmonic Spurious	Replace the A3 RF assembly
Sub-Harmonic Spurious	Replace the A3 RF assembly
Non-Harmonic Spurious	Replace the A3 RF assembly
WCDMA Adjacent Channel Power (N5172B/82B only)	<ol style="list-style-type: none"> 1. Rerun the test at a power level of -7 dBm. 2. Reduce the power level by 1 dB and repeat test. 3. Repeat the test three more times, reducing the power level by 1 dB each time. <ul style="list-style-type: none"> • If the ACP performance improves, replace the A3 RF assembly. • If the ACP performance remains consistent or degrades, replace the A2 Vector Module.
FM Deviation Accuracy	Replace the A3 RF assembly
FM Distortion	Replace the A3 RF assembly
Digital Modulation Quality (N5172B/82B only)	Replace the A2 Vector module
DCFM Carrier Offset	Replace the A3 RF assembly
Amplitude Switching Speed	Replace the A3 RF assembly
Frequency Switching Speed	Replace the A3 RF assembly
Timebase Aging Rate (Optional - Manual Performance Test)	Replace the A3 RF assembly

2 Replaceable Parts

Ordering Information

To order a part, do the following:

1. Determine the part number.
2. Determine the quantity required.
3. Mail this information to the nearest Agilent Technologies office or, in the U.S., call the hot-line number listed in the following section.

To order a part not listed in the replaceable parts lists, mail the following information to the nearest Agilent Technologies office.

1. the instrument model number
2. the serial number and options, if any (see rear panel)
3. a description of the part
4. a description of the part's function
5. the quantity required

Order Parts Fast

When you have gathered the information required to place an order, go to the Agilent Technologies Technical Support website:

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

Shipping a Defective Assembly Back to Agilent Technologies

1. When you receive the rebuilt/exchange assembly, be careful not to damage the box and shipping hardware in which it was shipped. You will use that box and shipping hardware to return the defective assembly. The box you receive should contain the following:
 - the rebuilt assembly
 - an exchange assembly failure report
 - a return address label
2. Complete the failure report.
3. Place the failure report and the defective assembly in the box. Be sure to remove the enclosed return address label.
4. Seal the box with tape.

If you are inside the United States, stick the pre-printed return address label over the label that is already on the box and return the box to Agilent Technologies. (Agilent Technologies pays postage on boxes mailed within the United States.)

If you are outside the United States, do not use the return address label; instead, address the box to the nearest Agilent Technologies sales and service office.

Frequency and Hardware Options

The following options are available with the Agilent N5171B/72B EXG and N5181B/82B MXG X-Series signal generators.

Frequency Options	
501	9 kHz to 1 GHz frequency range (N5171B only)
503	9 kHz to 3 GHz frequency range
506	9 kHz to 6 GHz frequency range

Hardware Options	
006	Instrument security and removable flash memory
012	LO in/out for phase coherency
099	RF assembly upgrade for expanded license key upgradeability
1EA	High Output Power
1EM	Moves all connectors to the rear panel
1EQ	Low Power
1ER	Flexible Reference Input
660	Baseband Generator with Real-Time Capability
UNM	Standard front and rear panel connector configuration
UNT	AM, FM, Phase Modulation
UNV	Enhanced Dynamic Range
UNW	Narrow Pulse Modulation
UNX	Low Phase Noise
UNY	Enhanced Low Phase Noise
UNZ	Fast Switching

Assemblies, Cables, and Hardware

Refer to [Table 2-1](#) through [Table 2-5](#) for N5171B/72B EXG and N5181B/82B MXG X-Series signal generators.

Table 2-1 N5171B/72B, N5181B/82B Assemblies and Hardware

Description	Part Number	Figure Number
Complete Front Panel Replacement Kit - N5171B	N5180-60439	2-7 , 2-26
Complete Front Panel Replacement Kit - N5172B	N5180-60440	2-7 , 2-26
Complete Front Panel Replacement Kit - N5181B	N5180-60441	2-7 , 2-26
Complete Front Panel Replacement Kit - N5182B	N5180-60442	2-7 , 2-26
Overlay, Front panel left	N5180-80033	2-27
Nameplate	N/A	2-27
Trim - FR FR Side - 1 each (not a full sheet)	5041-9170	2-30
RPG Knob	W1312-40017	2-27
Key Pad Assembly	N5180-60409	2-8 , 2-9
Large Keypad Overlay	N/A	2-27
Key Pad Flubber	N5180-40011	2-8 , 2-9
Washer-Wavy .490ID (N5172B, N5182B) (Qty 2 required)	2190-0102	2-27
Nut-Hex 15/32-32 (N5172B, N5182B) (Qty 2 required)	2950-0035	2-27
RF Connector/Spacer/Bracket w/ W9 Rigid Cable Assembly	N5180-60434	2-27 & 2-29
Wire-mesh EMI Gasket	8160-0660	2-28
Hole Plug CVX Head 0.750 in. diameter hole (Front Panel, for Option 1EM instruments)	6960-0517	2-30
Power Switch Assembly	N5180-60410	2-7 , 2-10
Rear Panel - N5171B/81B Rear Panel - N5172B/82B	N5180-00020 N5180-00019	2-31
Screw-Machine M3.0 8 -PN-TX N5171B/81B - (Qty 4 required) N5172B/82B - (Qty 10 required)	0515-0372	2-31
Screw-Machine Pan Torx T8 M2.5 x 0.45 6mm (N5172B/82B only) - Qty 4	0515-0366	2-31
Washer Lock .505ID (BNC connectors on rear-panel) N5171B/81B - (QTY 8 required) N5172B/82B - (Qty 15 required)	2190-0068	2-31
Nut-Hex 1/2-28 (BNC connectors on rear-panel board) N5171B/81B - (Qty 8 required) N5172B/82B - (Qty 15 required)	2950-0054	2-31
Rear-Panel Hole Plug	6960-0517	2-31
LO IN Rear Panel Connector Assembly	1250-1666	2-31 & 2-32
W16 LO OUT to LO IN Semi-Rigid Jumper Cable	N5180-20178	2-31 & 2-32

Table 2-1 N5171B/72B, N5181B/82B Assemblies and Hardware

Description	Part Number	Figure Number
LO OUT Rear Panel Connector Assembly	1250-1666	2-31 & 2-32
DAC CLK IN Rear Panel Connector Assembly	1250-1666	2-31 & 2-32
USB Board	N5180-60411	2-7, 2-11
LCD Assembly	N5180-60412	2-12
EMI LCD Glass Filter	N5180-60413	2-13
A1 Power Supply	N5180-60414	2-1
A2 Vector BBG Assembly (N5172B, N5182B only)	N5180-60415	2-1, 2-14
A2 Bracket, Connector Preload	N5180-00035	2-14
A3 RF Assembly	See Table 2-2 through Table 2-5 for option-specific assemblies.	2-2, 2-15
A3BT1 Battery 3V 620 ma-HR Li Manganese Dioxide	1420-0533	2-2
A4 40 GB SSD (N5172B, 82B only)	N5180-60426	2-2, 2-16
A5 CPU Assembly	N5180-60427	2-2, 2-17
CPU Heatsink	N5180-60443	2-2, 2-18
A6 Front Panel Interface Scan Assembly	N5180-60428	2-7, 2-19
A7 Real Time BBG Assembly (N5172B, 82B, Option 660 only)	N5180-60429	2-1, 2-20
A7A1 Real Time Aux Power Supply w/o cover (N5172B, 82B, Option 660 only)	N5180-60430	2-1, 2-21
Aux A7A1 Power Supply Cover (only) - with top insulator installed (N5172B, 82B, Option 660 only)	N5180-60431	2-1, 2-22
A8 Real Time BBG Jumper Board (N5172B, 82B, Option 660 only)	N5180-60432	2-1, 2-23
B1 thru B4 Fan Assembly (each)	N5180-60433	2-1, 2-24
IC 8 GB Flash Memory SMT (Option 006 only)	1819-1026	2-25
Main Chassis Inside Top Cover	W1312-00126	2-33
Main Chassis Inside Bottom Cover	W1312-00127	2-33
Screw-Machine M3.0 x 08 FL-TX (inside top and bottom covers to main chassis, 1 ea)	0515-1227	2-33
Screw-Machine M3.0 x 08 -PN-TX (inside top and bottom covers to rear panel, 1 ea)	0515-0372	2-33
Chassis Corner Nuts (1 ea, requires 0361-1894 PoP Rivet)	W1312-20038	2-34
SST PoP-Rivet, (1 ea)	0361-1894	2-34
Assy-Strap Handle - includes the following parts:	W1312-60097	2-35
Strap Assembly		

Table 2-1 N5171B/72B, N5181B/82B Assemblies and Hardware

Description	Part Number	Figure Number
Ground Spring		
Handle Retainer - Qty 2		
End Cap - Qty 2		
Screw-Machine M5 x 18 FL-TX - Qty 2		
Hole Plug (not shown) - 1 ea	W1312-40024	
Screw-Machine M5 x 0.8 12mm-lg (not shown) - 1 ea	0515-0708	
Rear Feet Screws (not shown) - 1 ea	0515-1619	
Rear-Panel Feet - 1 ea	5041-9611	2-35
Feet-Bottom	5041-9167	2-35
Tilt Stand	1460-1345	2-35
Set of 4 Bottom Feet with Tilt Stands	5000-0913	2-35
Outside Instrument Cover	W1312-00128	2-35
Hole Plug, Bottom Feet - 1 ea	W1312-40032	2-35
Front Panel Cover	N5180-40012	2-36
Hard Transit Case w/foam (not shown)	N5180-80053	

Table 2-2 RF Assemblies for N5171B

Frequency Option	Description	New Assembly Part Number	Exchange Assembly Part Number
501, 503, or 506	A3 RF Assembly Front Panel Output (UNM) All option configurations	N5180-60416	N5180-69416
501, 503, or 506 (rear panel RF output)	A3 RF Assembly Rear Panel Output (1EM) All option configurations	N5180-60420	N5180-69420

Table 2-3 RF Assemblies for N5172B

Frequency Option	Description	New Assembly Part Number	Exchange Assembly Part Number
503	A3 RF Assembly Front Panel Output (UNM) All option configurations	N5180-60417	N5180-69417
506	A3 RF Assembly Front Panel Output (UNM) All option configurations except any of the following: 1EA, UNV, UNZ, or 099	N5180-60418	N5180-69418
	A3 RF Assembly Front Panel Output (UNM) All option configurations	N5180-60419	N5180-69419
503 or 506 (rear panel RF output)	A3 RF Assembly Rear Panel Output (1EM) All option configurations	N5180-60420	N5180-69420

Table 2-4 RF Assemblies for N5181B

Frequency Option	Description	New Assembly Part Number	Exchange Assembly Part Number
503	A3 RF Assembly Front Panel Output (UNM) All option configurations	N5180-60456	N5180-69456
506	A3 RF Assembly Front Panel Output (UNM) All option configurations	N5180-60457	N5180-69457
503 or 506 (rear panel RF output)	A3 RF Assembly Rear Panel Output (1EM) All option configurations	N5180-60425	N5180-69425

Table 2-5 RF Assemblies for N5182B

Frequency Option	Description	New Assembly Part Number	Exchange Assembly Part Number
503	A3 RF Assembly Front Panel Output (UNM) All option configurations except any of the following: 1EA, 1EQ, UNV, UNX, UNY, UNZ, or 099	N5180-60421	N5180-69421
	A3 RF Assembly Front Panel Output (UNM) All option configurations	N5180-60422	N5180-69422
506	A3 RF Assembly Front Panel Output (UNM) All option configurations except any of the following: 1EA, 1EQ, UNV, UNX, UNY, UNZ, or 099	N5180-60423	N5180-69423
	A3 RF Assembly Front Panel Output All option configurations	N5180-60424	N5180-69424
503 or 506 (rear panel RF output)	A3 RF Assembly Rear Panel Output (1EM) All option configurations	N5180-60425	N5180-69425

Table 2-6 Cables

Reference Designator	Description	Part Number	Figure Number
W1	Ribbon Cable, Front Panel	N5180-60183	2-1 & 2-2
W2	Front Panel USB Ribbon Cable	N5180-60186	2-7 & 2-11
W3	Keyboard to Interface Ribbon Cable	8121-1382	2-7 & 2-19
W4 (N5172B, 82B only)	Front Panel (I Input) Cable Assembly	N5180-60435	2-1, 2-6, & 2-7
W5 (N5172B, 82B only)	Front Panel (Q Input) Cable Assembly	N5180-60435	2-1, 2-6, & 2-7
W6 (N5172B, 82B only)	Semi-Rigid Cable	N5180-60436	2-1
W7 (N5172B, 82B only)	Semi-Rigid Cable	N5180-20187	2-1
W8 (N5172B, 82B only)	Semi-Rigid Cable	N5180-20188	2-1
W9 (N5172B, 82B only)	Semi-Rigid Cable	N5180-20175	2-1 & 2-29
W10 (N5172B, 82B only)	AUX Power Supply Cable Assembly (Option 660)	N5180-60437	2-1
W11	GPIO Ribbon Cable	N5180-60185	2-2
W12 (N5172B, 82B only)	6-pin Aux to A7 Power Cable (Option 660)	N5180-60181	2-1 & 2-21
W13 (N5172B, 82B only)	A2P4 to DAC CLK IN Connector - Semi-rigid Cable	N5180-20176	2-3
W14 (N5172B, 82B, Option 012 only)	A3 Assembly to LO OUT Connector - Semi-Rigid Cable	N5180-20186	2-3
W15 (N5172B, 82B, Option 012 only)	A2P1 to LO IN Connector - Semi-Rigid Cable	N5180-20144	2-3
W16 (N5172B, 82B, Option 012 only)	LO OUT to LO IN - Semi-Rigid Jumper Cable	N5180-20178	2-3 & 2-31
W17 (Option 1EM only)	Rear Panel (I Input) Cable	N5180-60458	2-4
W18 (Option 1EM only)	Rear Panel (Q Input) Cable	N5180-60458	2-4
W19 (Option 1EM only)	Semi-Rigid Cable	N5180-60459	2-5
Cable Clips	Fan Cable Clip (4 ea) Aux Power Supply Cable Clip (4 ea) W6 Clamp (2 ea)	N5180-60438	2-1 & 2-4

Figure 2-1 Assemblies Top View

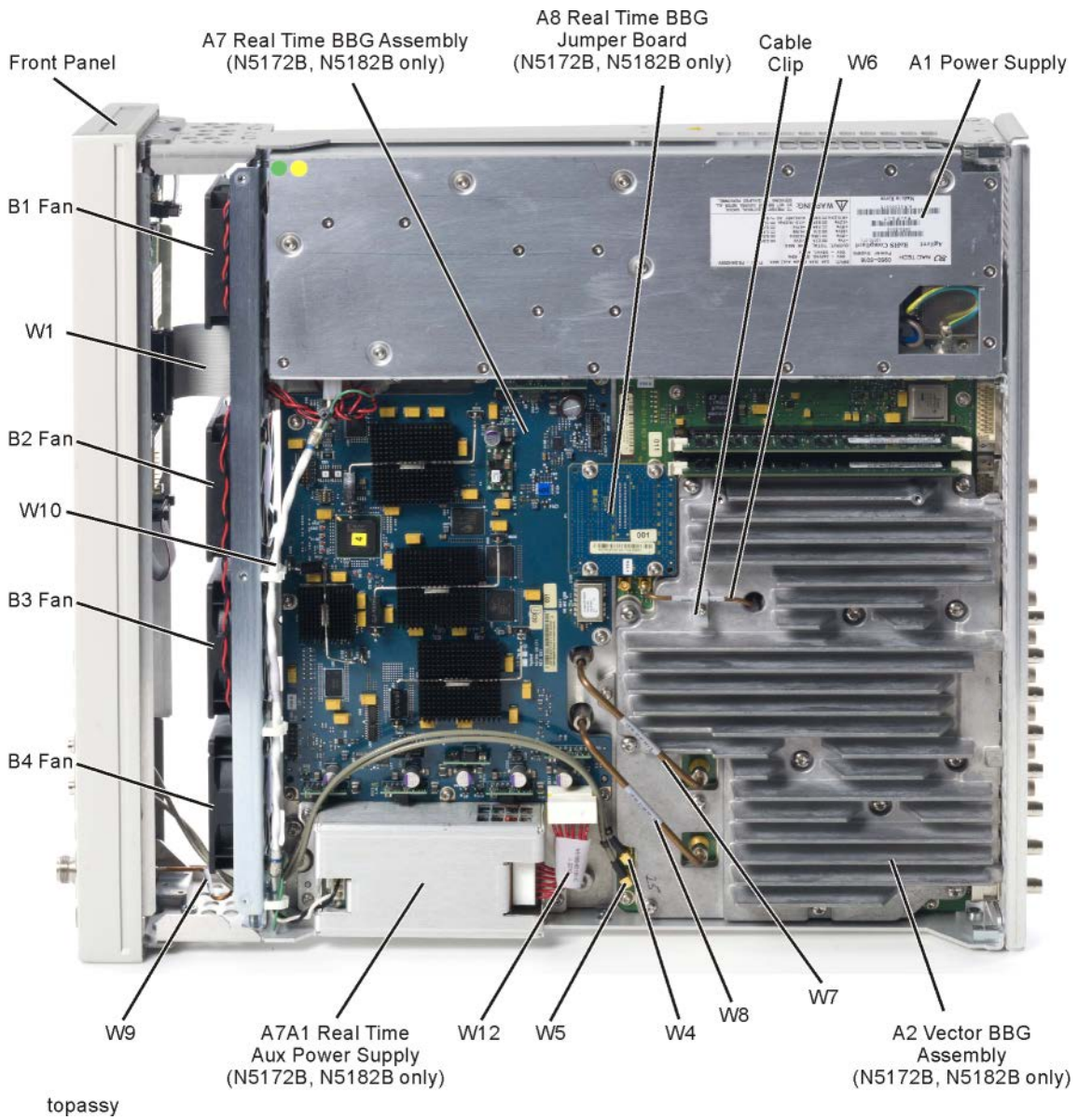


Figure 2-2 Assemblies Bottom View

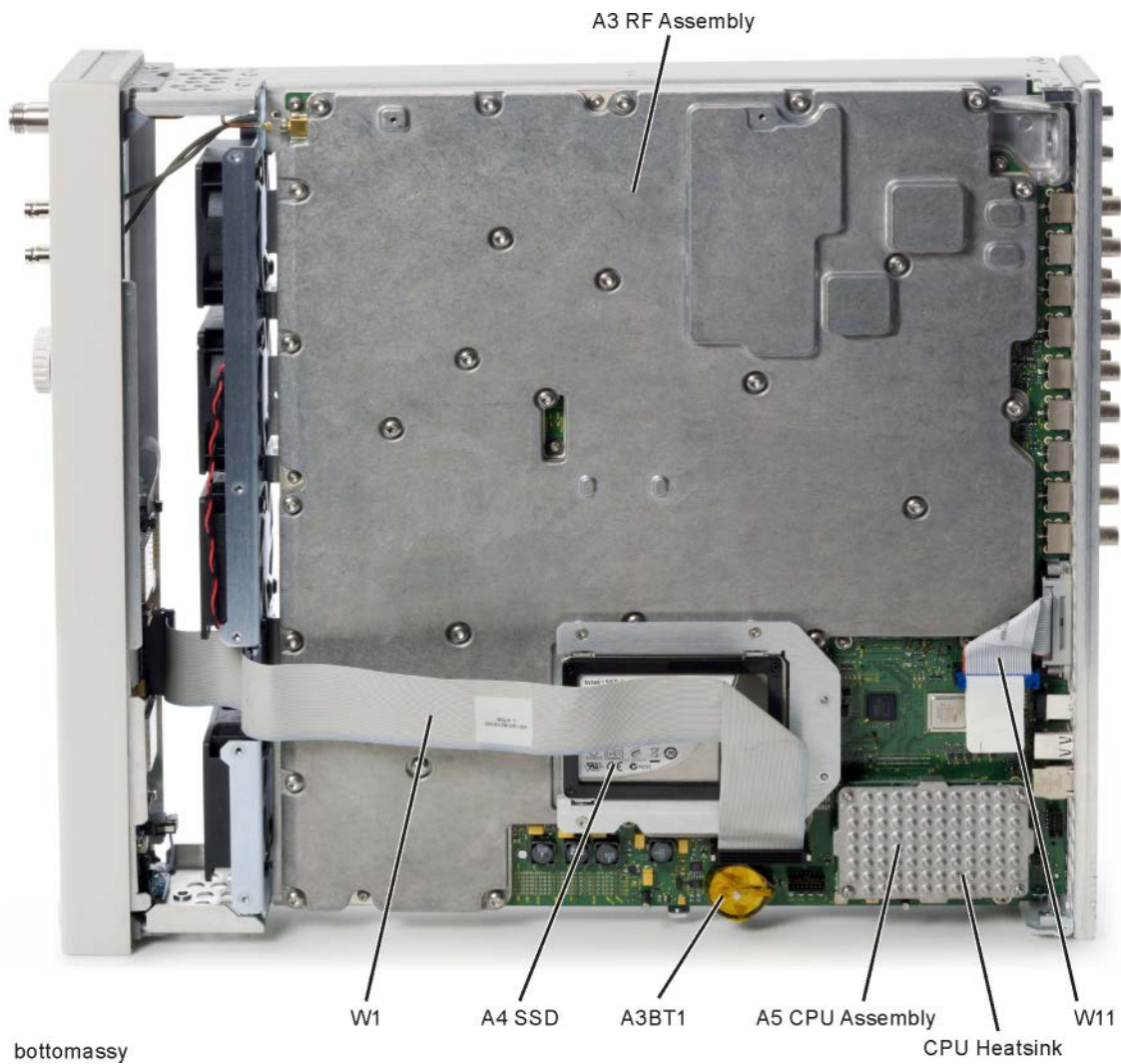


Figure 2-3 Rear Panel Cables - Option 012

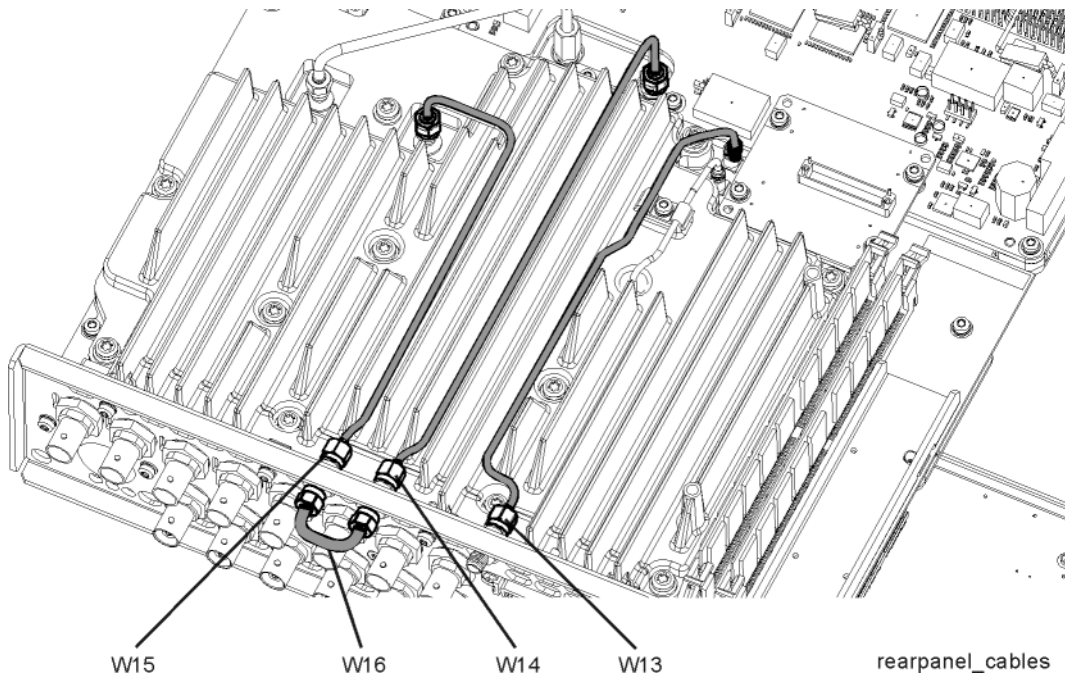


Figure 2-4 Option 1EM Cables

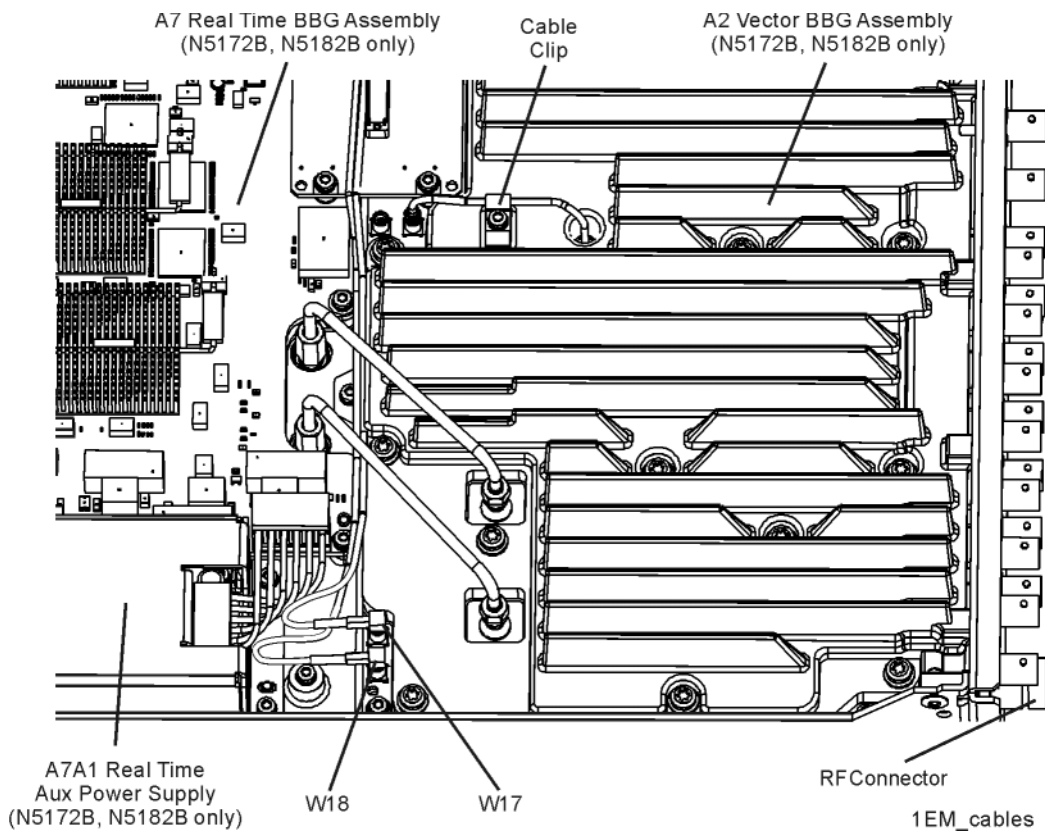
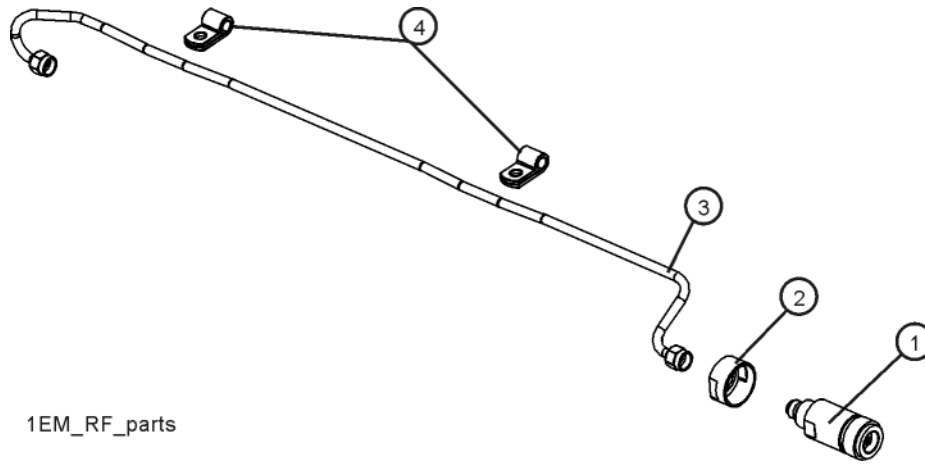


Figure 2-5 W19 1EM Rear Panel Semi-Rigid RF Cable Assembly Parts - N5180-60459



Item	Description
1	RF Connector
2	Spacer
3	W19 Semi-Rigid RF Cable
4	Clamp (2)
not shown	Screws (2 ea)

Figure 2-6 W4 - W5 Cable Assembly

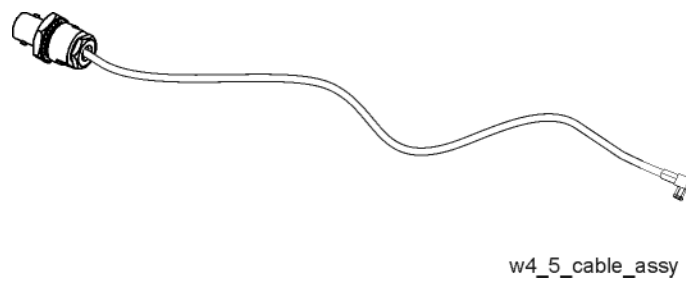
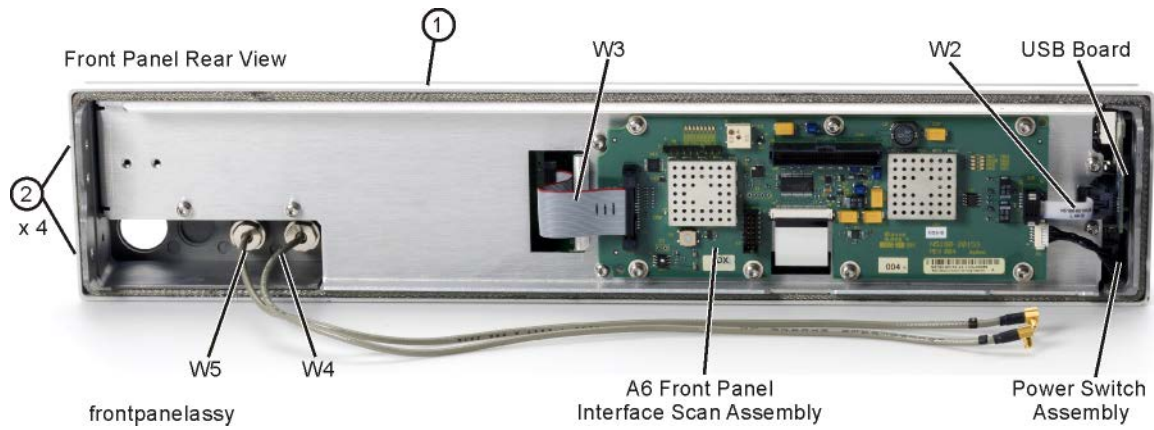


Figure 2-7 Front Panel Assemblies

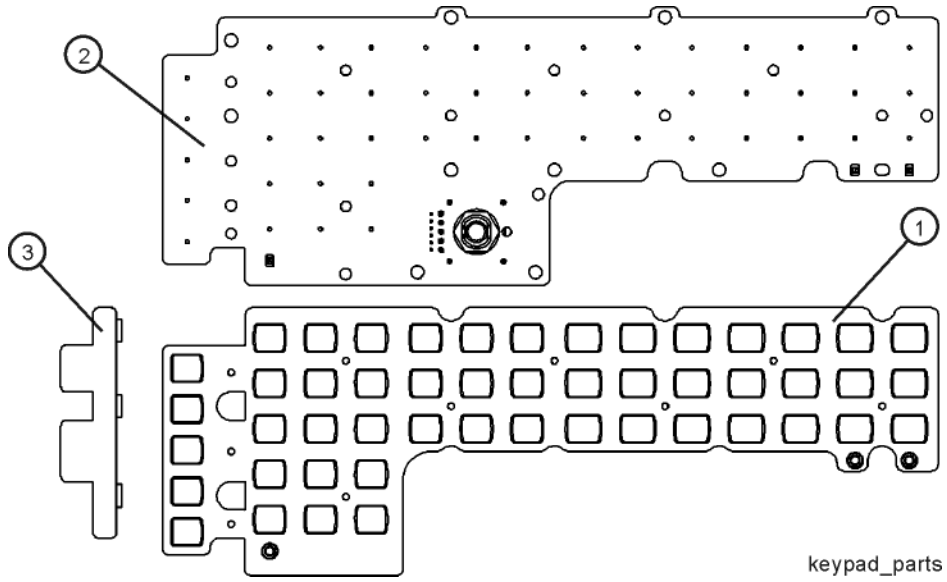


Item	Description
1	Front Panel Assembly
2	Screws (4 ea) 0515-5844

Figure 2-8 Key Pad Flubber - N5180-40011

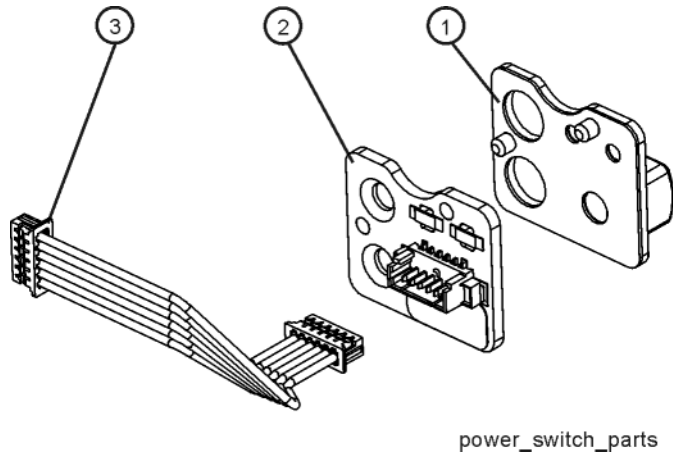


Figure 2-9 Key Pad Assembly Parts - N5180-60409



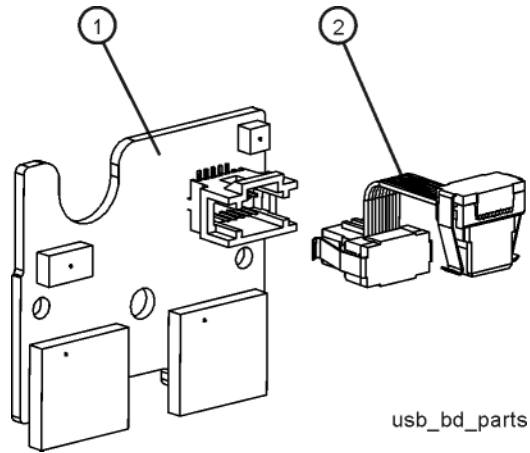
Item	Description
1	Key Pad Flubber
2	Keypad PC Board
3	Side Support
not shown	Screws (3 ea)

Figure 2-10 Power Switch Assembly Parts - N5180-60410



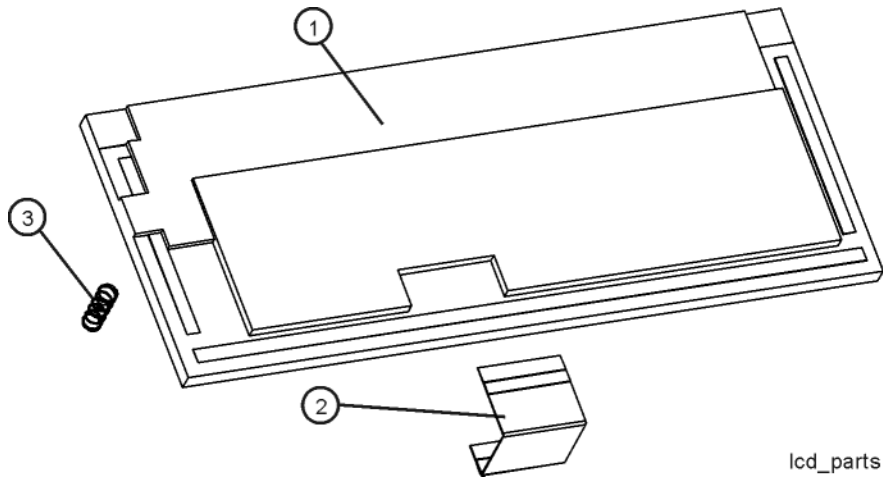
Item	Description
1	Switch Flubber
2	Power Switch PC Board
3	6 pin wire cable
not shown	Screws (2 ea)

Figure 2-11 USB Board Parts - N5180-60411



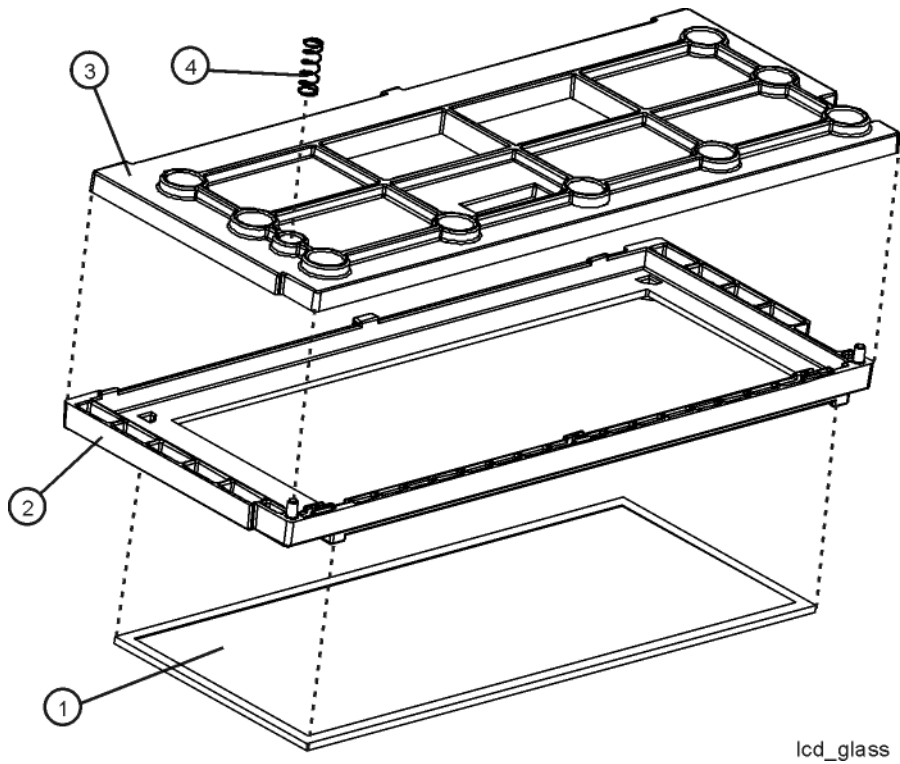
Item	Description
1	USB Board
2	W2 USB Ribbon Cable
not shown	Screw (1 ea)

Figure 2-12 LCD Assembly Parts - N5180-60412



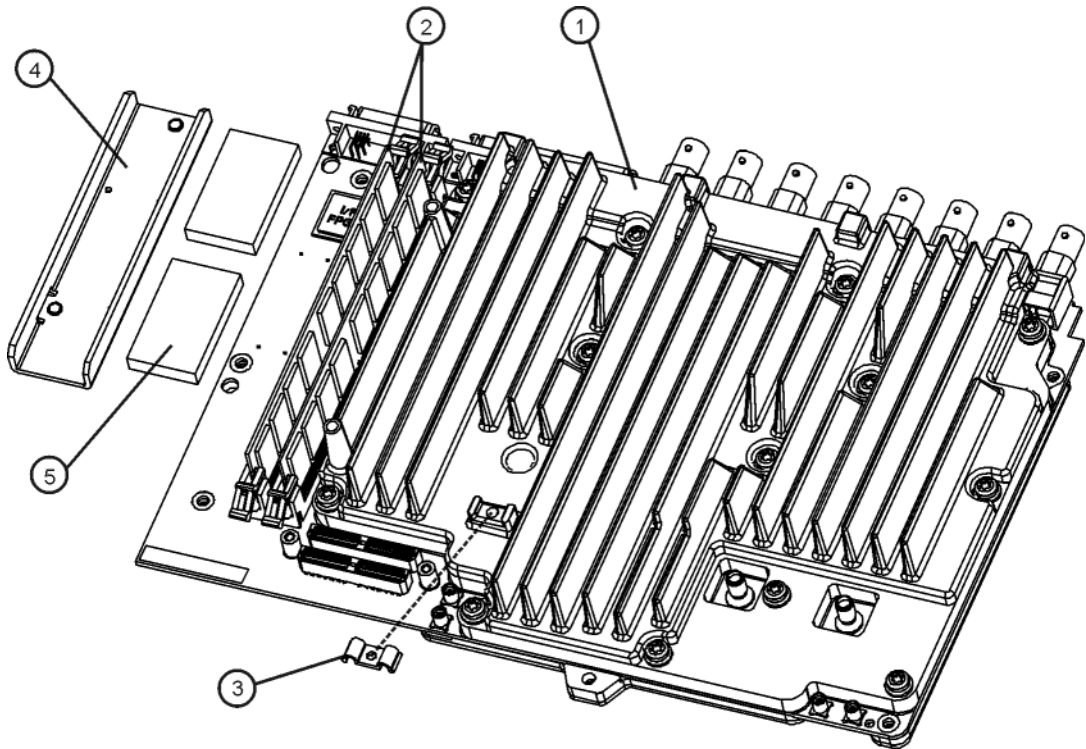
Item	Description
1	LCD Display
2	Display Flex Cable
3	Compression Spring

Figure 2-13 EMI LCD Glass Filter Parts - N5180-60413



Item	Description
1	Filter - LCD Glass
2	Display Boot
3	Display Hold-Down Boot
4	Compression Spring

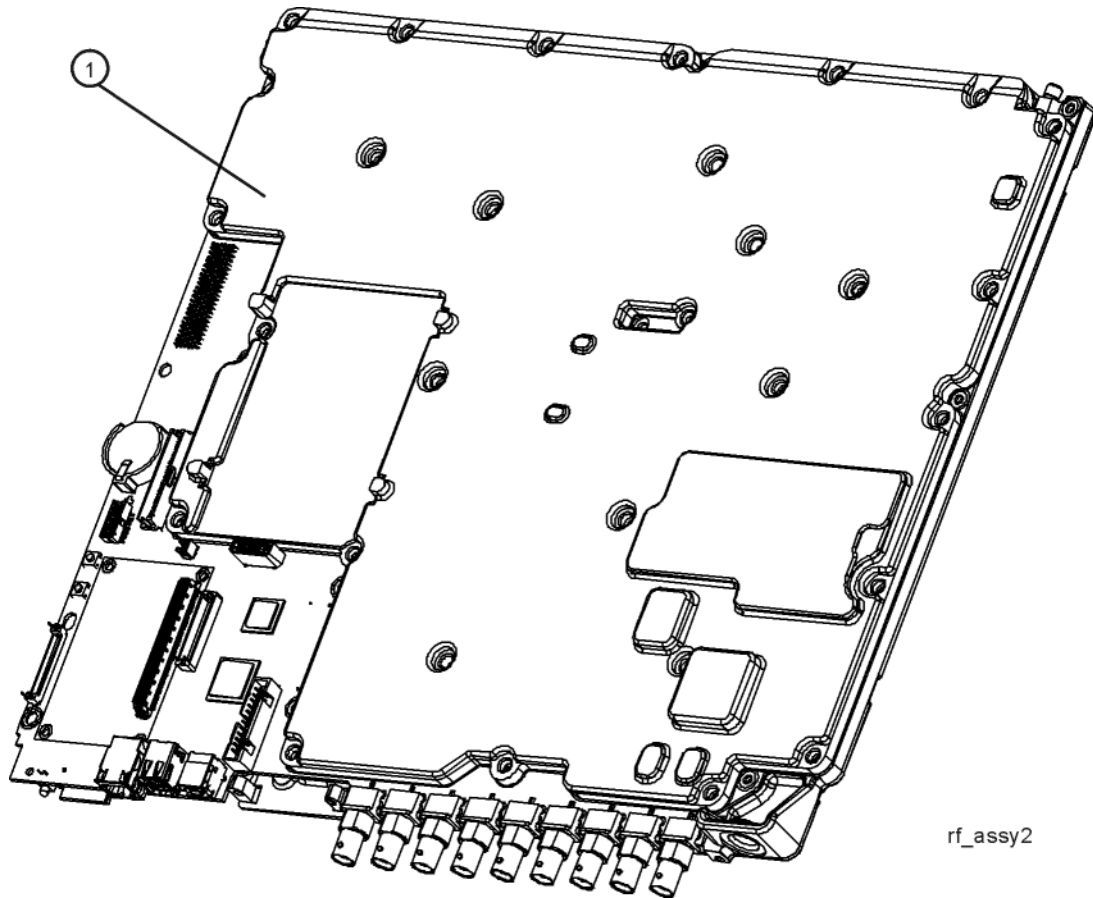
Figure 2-14 A2 Vector BBG Assembly Parts - N5180-60415



vector_BBG_parts

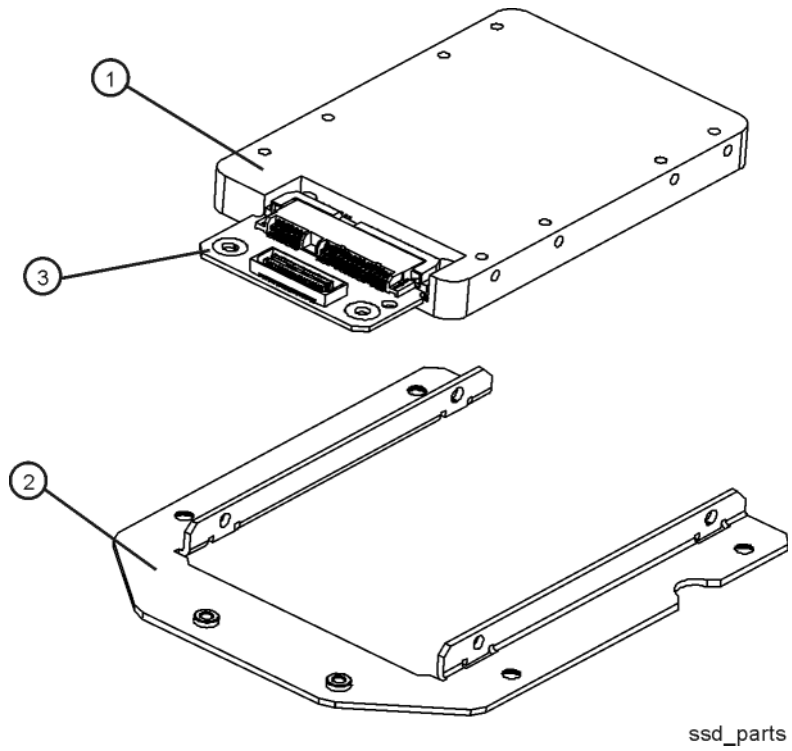
Item	Description
1	A2 Vector BBG
2	SDRAM
3	Clamp
4	Bracket, Connector Preload
5	Foam (2 ea)
not shown	Screw (1 ea)
not shown	Screws (4 ea)

Figure 2-15 A3 RF Assembly - See Table 2-2 through Table 2-5 for option-specific assemblies.



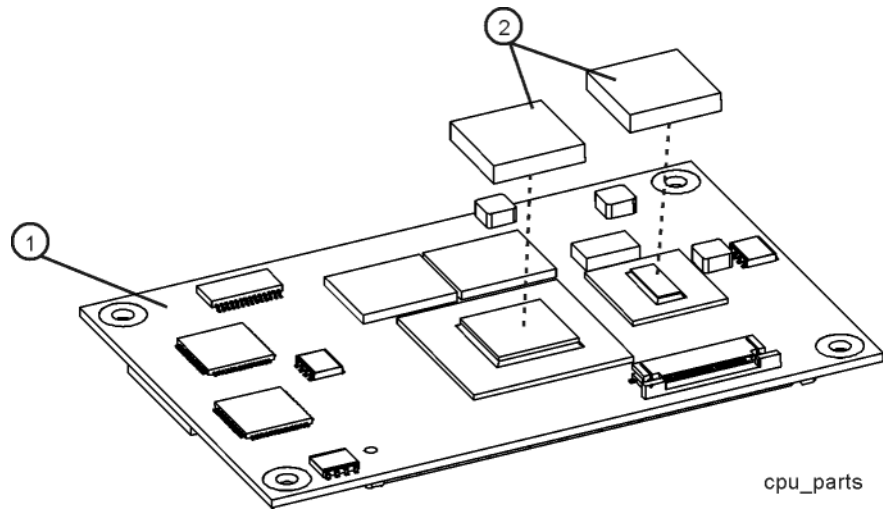
Item	Description
1	A3 RF Assembly

Figure 2-16 A4 SSD Parts - N5180-60426



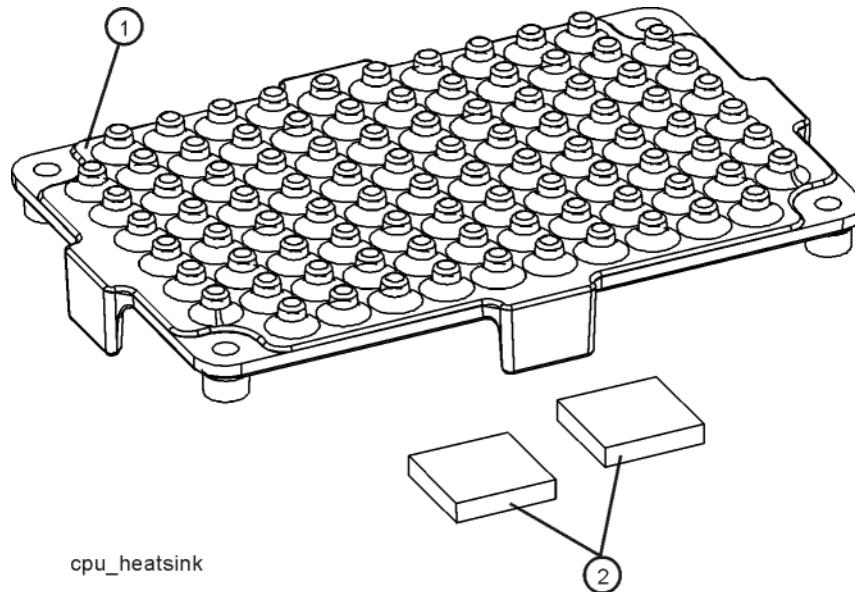
Item	Description
1	40 GB SSD
not shown	Screws (6 ea)
2	SSD Bracket
not shown	Screws (4 ea)
3	PCA, Non Volatile Memory

Figure 2-17 A5 CPU Assembly Parts - N5180-60427



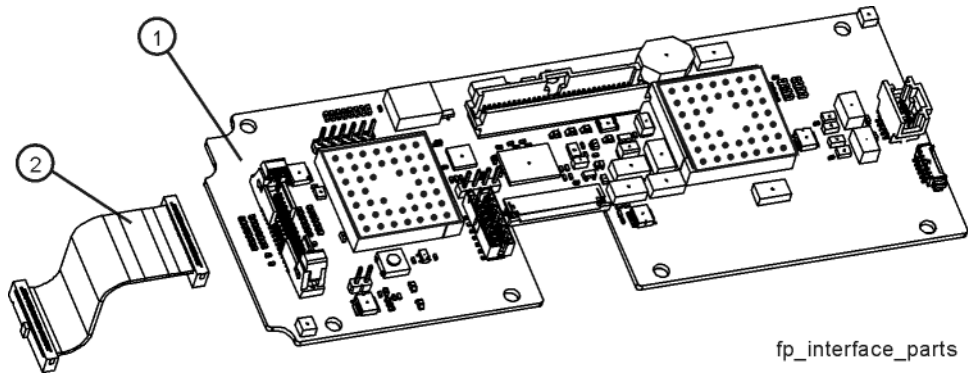
Item	Description
1	CPU Assembly
2	Thermal Pads (2 ea)
not shown	Screws (4 ea)

Figure 2-18 CPU Heatsink Parts - N5180-60443



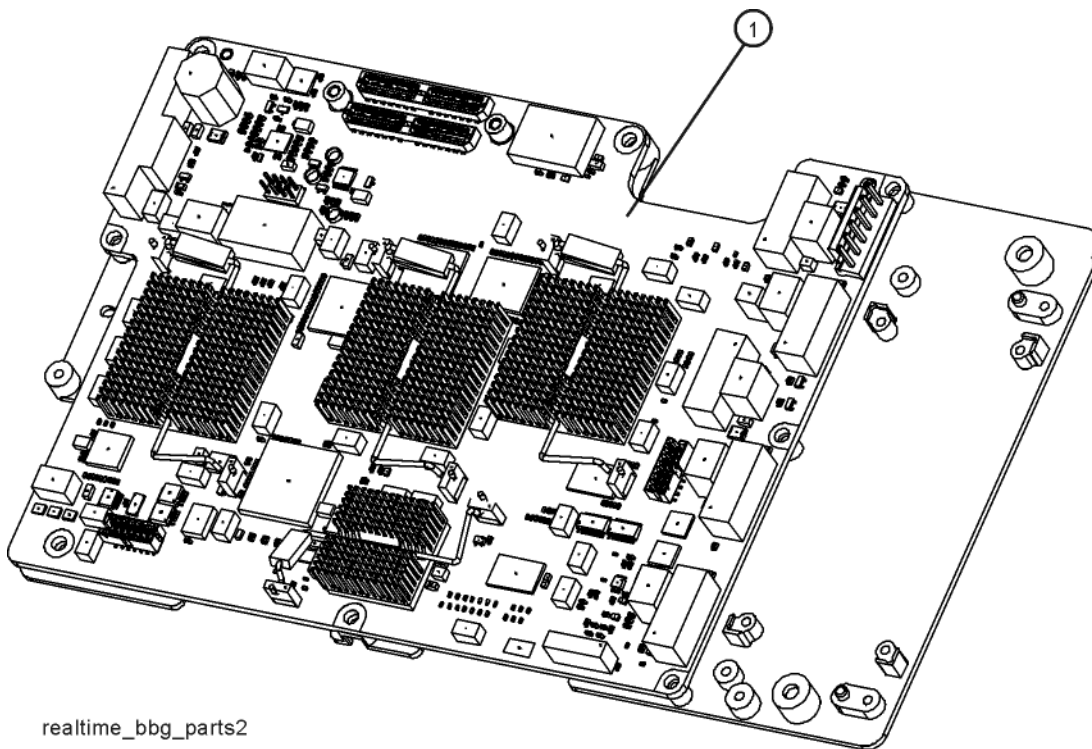
Item	Description
1	CPU Heatsink
2	Thermal Pads (2 ea)
not shown	Screws (4 ea)

Figure 2-19 A6 Front Panel Interface Scan Assembly Parts - N5180-60428



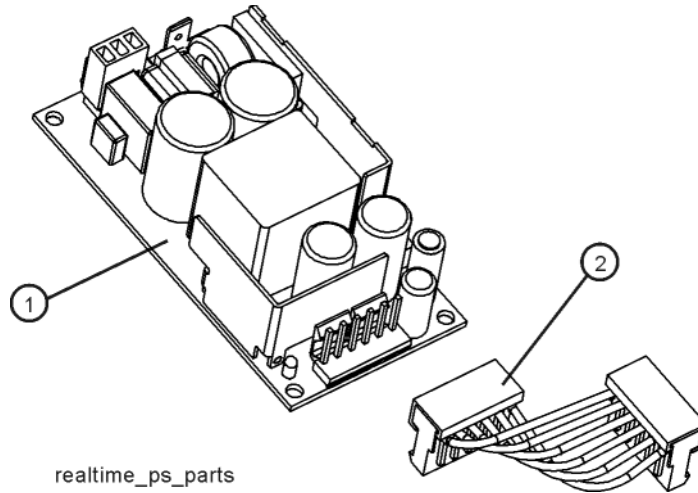
Item	Description
1	Interface Board
2	W3 Interface Ribbon Cable
not shown	Screws (7 ea)

Figure 2-20 A7 Real Time BBG Assembly - N5180-60429



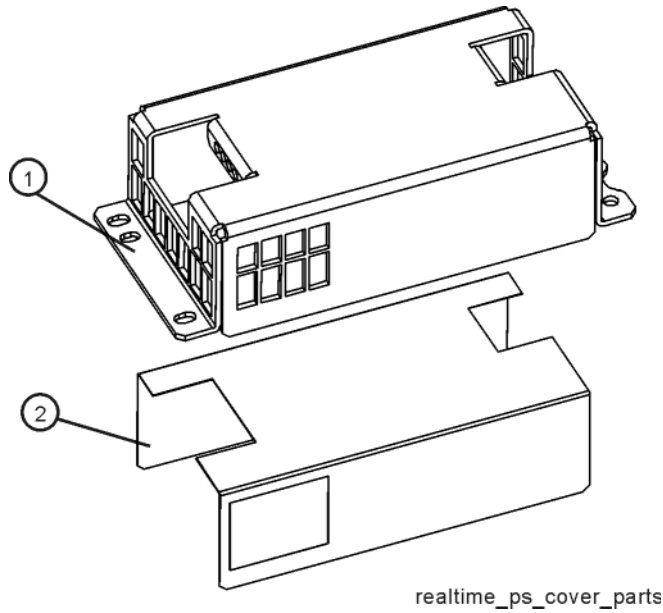
Item	Description
1	A7 Real Time BBG Assembly

Figure 2-21 A7A1 Real Time Aux Power Supply w/o Cover - N5180-60430



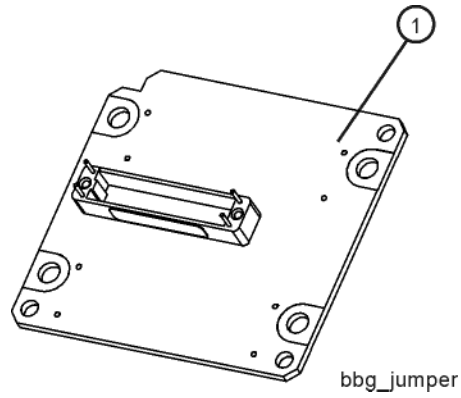
Item	Description
1	A1A1 Real Time Aux Power Supply
2	W12 Power Supply Cable
not shown	Screws (4 ea)

Figure 2-22 Aux A7A1 Power Supply Cover (only) - N5180-60431



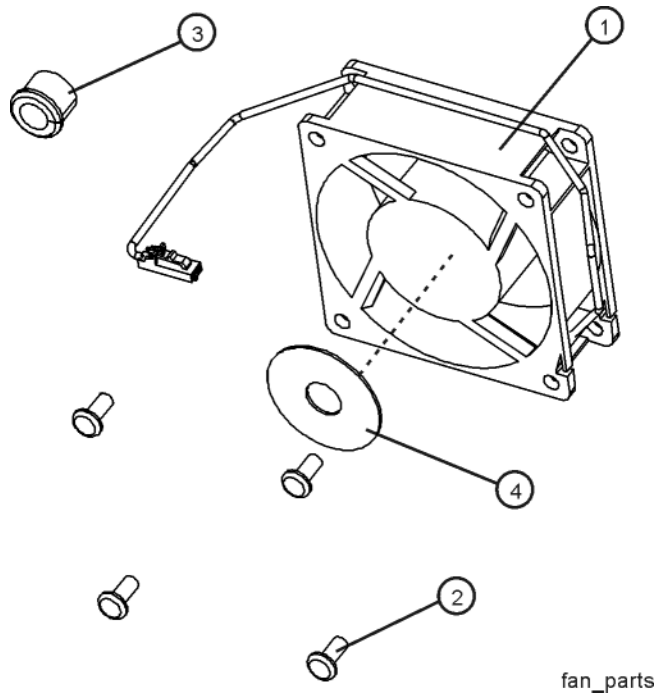
Item	Description
1	Power Supply Cover
2	Insulator (installed)
3	Screws (4 ea)

Figure 2-23 A8 Real Time BBG Jumper Board - N5180-60432



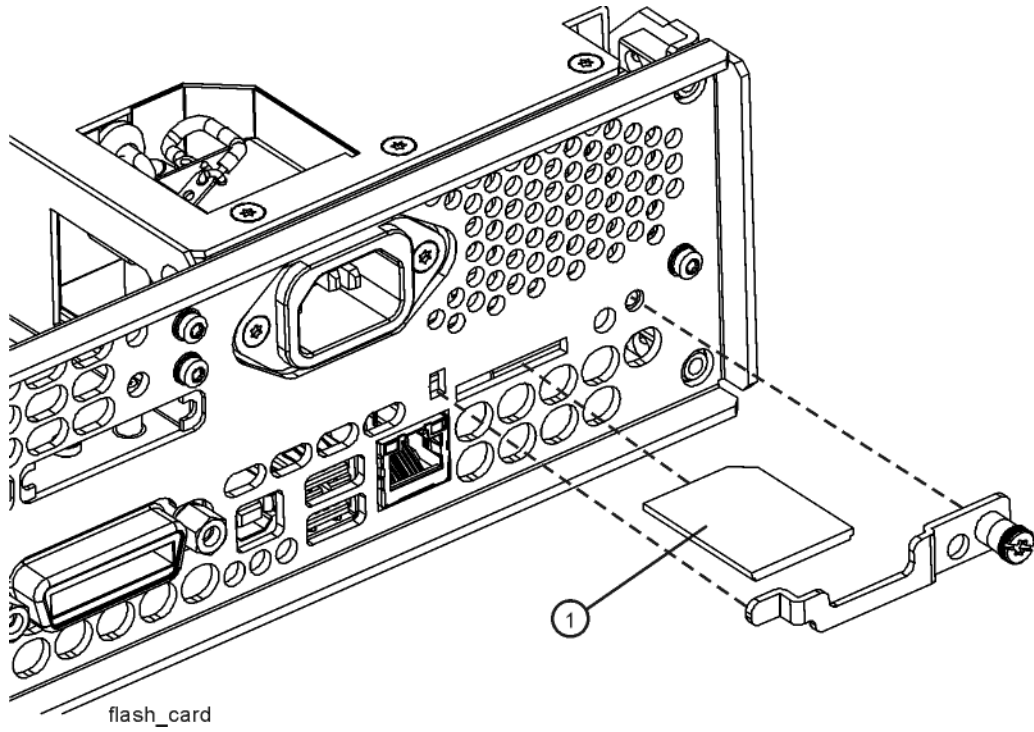
Item	Description
1	A8 Real Time BBG Jumper Board

Figure 2-24 B1 Through B4 Fan Assembly Parts - N5180-60433



Item	Description
1	Fan Assembly
2	Fan Rivet (4)
3	Grommet Snap
4	Support Fan Motor

Figure 2-25 Flash Memory Card- 1819-1026



Item	Description
1	Flash Memory

Hardware

This section lists part numbers for hardware and other instrument parts in your signal generator.

- [Front Panel View](#) on 2-25
- [Rear Panel View](#) on 2-28
- [“Main Chassis with Inside Covers”](#) on page 2-30
- [“Outer Instrument Cover and Associated Parts”](#) on page 2-32

Front Panel View

Figure 2-26 Front Panels

N5171B



N5172B



N5181B



N5182B



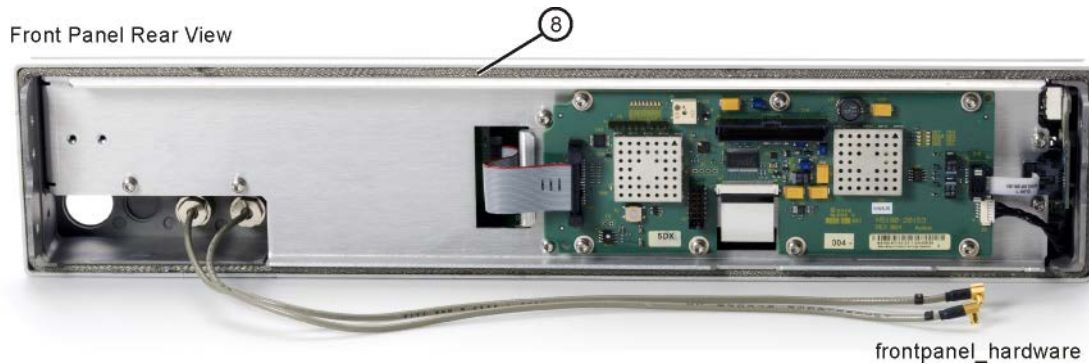
frontpanels_4

Figure 2-27 Front Panel View



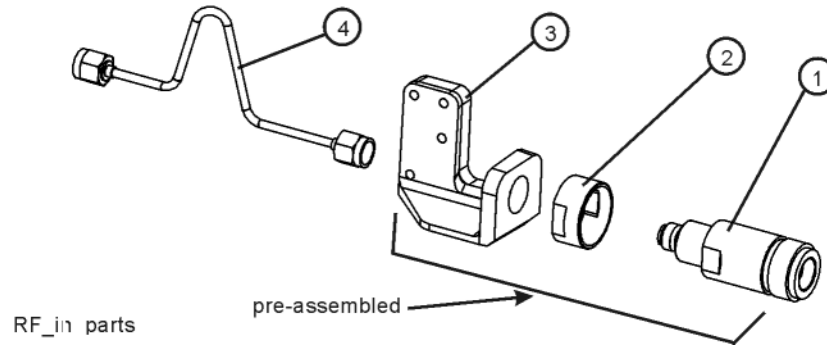
Item	Description
1	Overlay, Front Panel left
2	Nameplate
3	RPG Knob
4	Large Keypad Overlay
5	Washer-Wavy
6	Nut-Hex
7	RF Connector

Figure 2-28 Front Panel Hardware



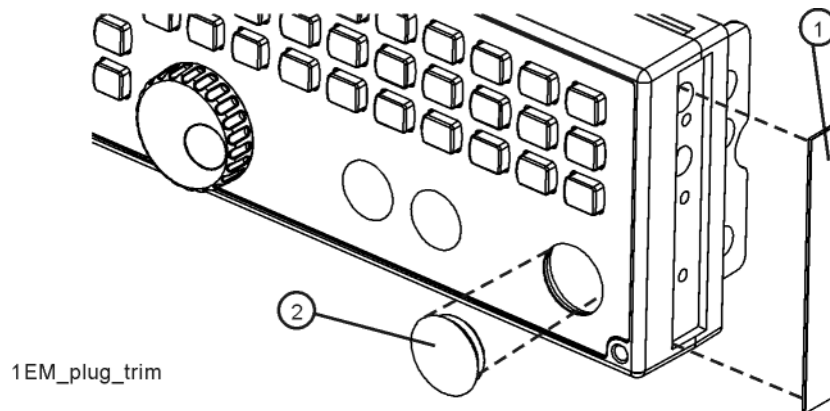
Item	Description
8	Wire-mesh EMI Gasket

Figure 2-29 RF Connector/Spacer/Bracket w/ W9 Rigid Cable Assembly Parts - N5180-60434



Item	Description
1	RF Connector
2	Spacer
3	Bracket
4	W9 Semi-Rigid RF Cable
not shown	Screws (3 ea)

Figure 2-30 Front Panel Trim and Option 1EM Hole Plug



Item	Description
1	Side Trim
2	Hole Plug

Rear Panel View

Figure 2-31 Rear Panel View

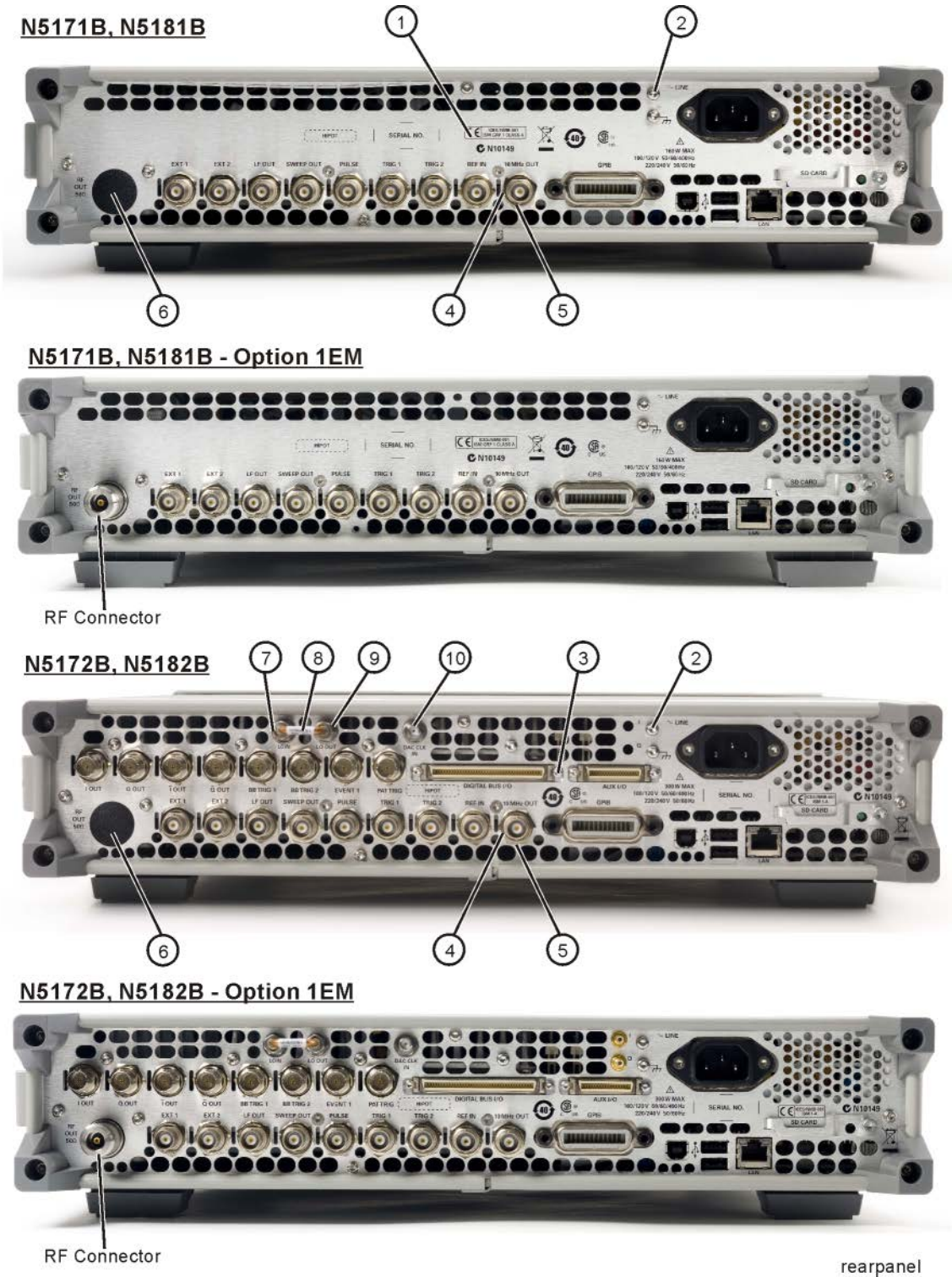
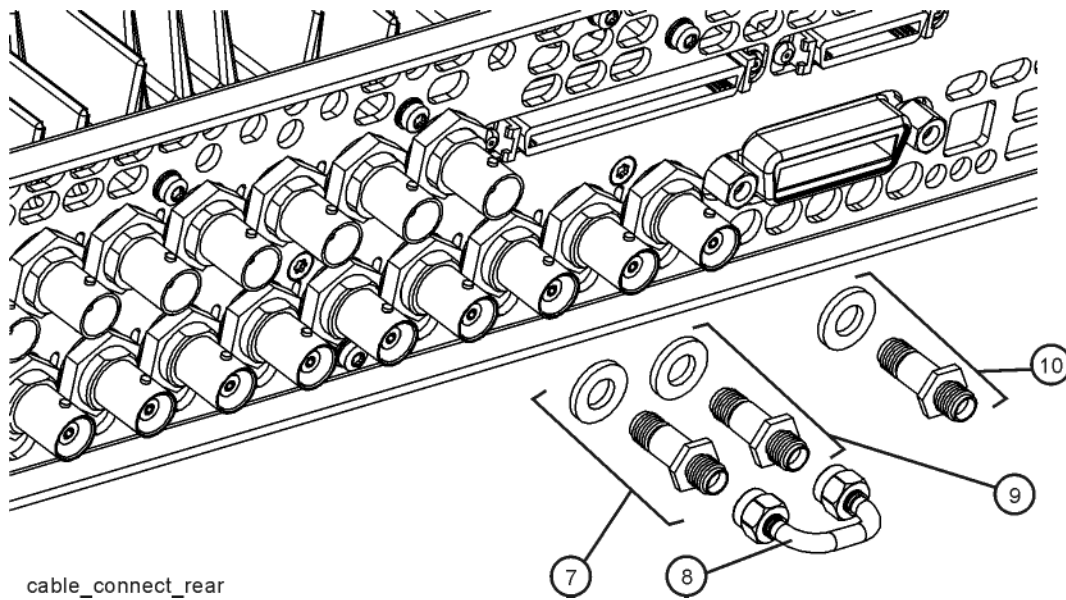


Table 2-7 Rear Panel Hardware

Item	Description
1	Rear Panel
2	Screw, machine M3.0 x 8
3	Screw, machine 4-40 (N5172B/82B only)
4	Lock washer
5	Hex nut
6	Rear Panel Hole Plug
7	LO IN Rear Panel Connector assembly
8	W16 LO OUT to LO IN Semi-Rigid Jumper Cable
9	LO OUT Rear Panel Connector assembly
10	DAC CLK IN Rear Panel Connector assembly

Figure 2-32 Rear Panel Cable Connectors - Option 012



Item	Description
7	LO IN Rear Panel Connector assembly
8	W16 LO OUT to LO IN Semi-Rigid Jumper Cable
9	LO OUT Rear Panel Connector assembly

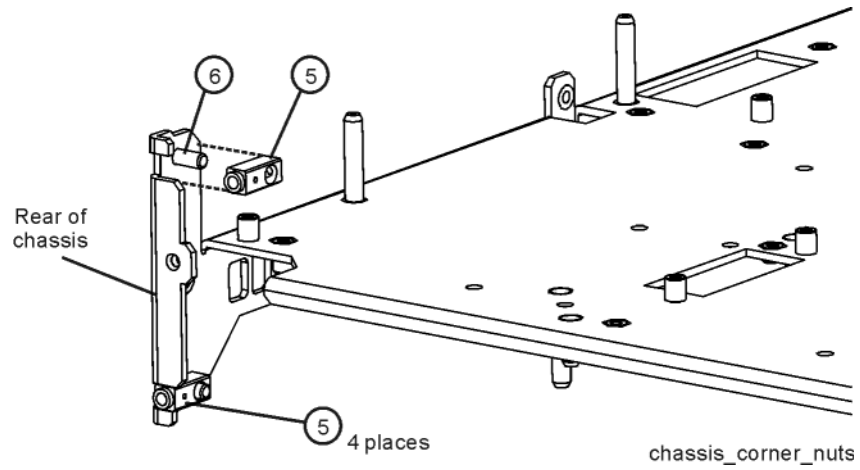
Main Chassis with Inside Covers

Figure 2-33 Main Chassis with Inside Covers



Item	Description
1	Main Chassis Inside Top Cover
2	Main Chassis Inside Bottom Cover
3	Screw - machine M3.0 x 08 FL-TX
4	Screw - machine M3.0 x 08 PN-TX

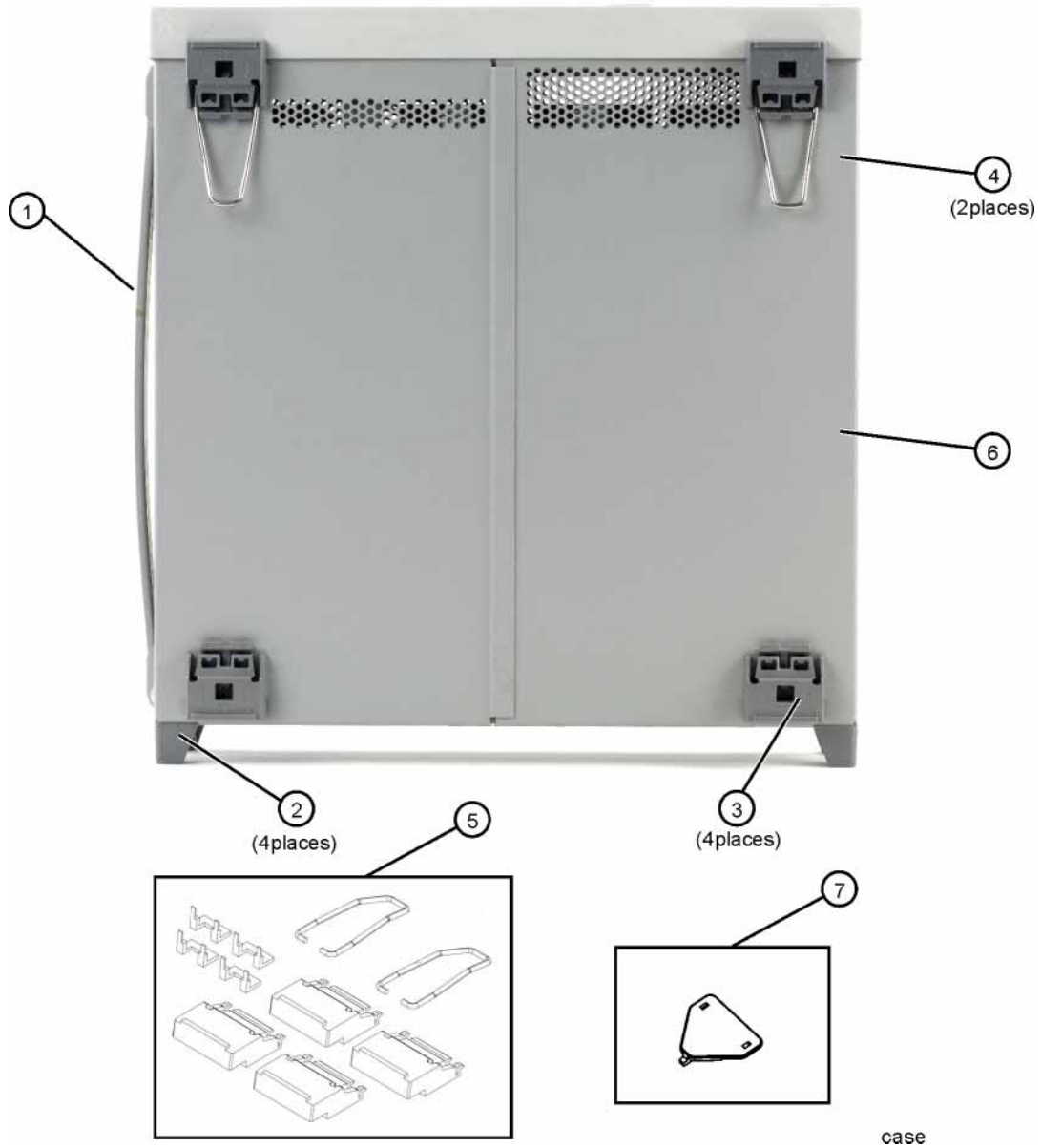
Figure 2-34 Chassis Corner Nuts



Item	Description
5	Chassis Corner Nut
6	SST PoP-Rivet

Outer Instrument Cover and Associated Parts

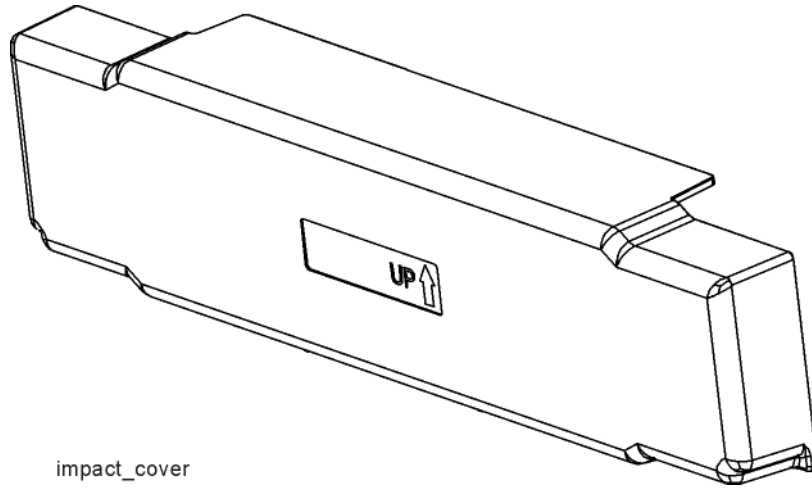
Figure 2-35 Outer Instrument Cover and Associated Parts



case

Item	Description
1	Strap Handle assembly
2	Rear Panel Feet
3	Bottom Feet
4	Tilt Stand
5	Set of 4 Bottom Feet with Tilt Stands
6	Outside Instrument Cover
7	Hole Plug, Bottom Feet

Figure 2-36 Front Panel Cover



impact_cover

Miscellaneous

This section lists part numbers for miscellaneous items that can be used with your signal generator.

Documentation

Description	Part Number
CD-ROM Documentation	N5180-90058
Installation Guide	N5180-90054
User's Guide	N5180-90056
SCPI Command Reference	N5180-90057
Programming Guide	N5180-90074
Programming Compatibility Guide	N5180-90069
Service Guide	N5180-90059
Firmware Upgrade Guide	N5180-90071
Specifications/Data Sheet (N5171B/81B)	5989-5311EN
Specifications/Data Sheet (N5172B/82B)	5989-5261EN

NOTE The X-Series documentation can also be found on the web at http://www.agilent.com/find/X-Series_SG

Electrostatic Discharge (ESD) Protective Supplies

Description	Part Number
ESD connector end cap front-panel RF output	1401-0247
ESD connector end cap-GPIB	1252-5007
2 X 4 Ft. Antistatic Table Mat with 15 FT. Ground Wire	9300-0797
5 Ft. Grounding Cord (for wrist strap)	9300-0980
Adjustable Antistatic Wrist Strap	9300-1367

Abbreviations Used in Part Descriptions

This section defines the reference designators, abbreviations, and option numbers that are used in the part descriptions throughout this chapter.

Reference Designator	Definition
A	assembly
AT	attenuator
B	fan
DS	lamp
J	electrical connector; jack
W	cable; transmission path; wire

Abbreviation	Definition
BN	buttonhead (screws)
CPU	central processing unit
	conical washer (screws)
EXT	external
FL	flathead (screws)
Ft	feet
Hex	hexagonal
GPIB	general purpose interface bus
HX	hexagonal recess (screws)
I	in-phase
LF	low frequency
M	meters or metric hardware
PC	patch lock (screws) or printed circuit
PN	panhead (screws)
Q	quadrature
Qty	quantity
RF	radio frequency
RPP	reverse power protection
SMA	subminiature type-A
TX	TORX recess (screws)

3 Assembly Replacement

Before You Replace an Assembly

CAUTION Many of the assemblies in this instrument are very susceptible to damage from electrostatic discharge (ESD). Perform service procedures only at a static-safe workstation and wear a grounding strap.

You must upgrade your firmware, to at least B.01.40, before replacing any assembly. Go to www.agilent.com/find/upgradeassistant for information on upgrading instrument firmware.

To avoid internal calibration failures and potential post-repair errors, before removing any instrument assembly, the instrument's static and dynamic arrays must be configured for the exchange of assemblies. The process to do the appropriate configuration is performed automatically by the MXG with the [Assembly Installation and Removal Overview](#) front panel softkeys. Refer to the [Assembly Removal and Installation Procedure](#) and to the "Hardware Assembly Installation and Removal Softkeys" on page 3-2.

Be sure to review the warning and caution statements described in [Chapter 5, "Safety and Regulatory," on page 5-1](#), prior to replacing an assembly in your signal generator.

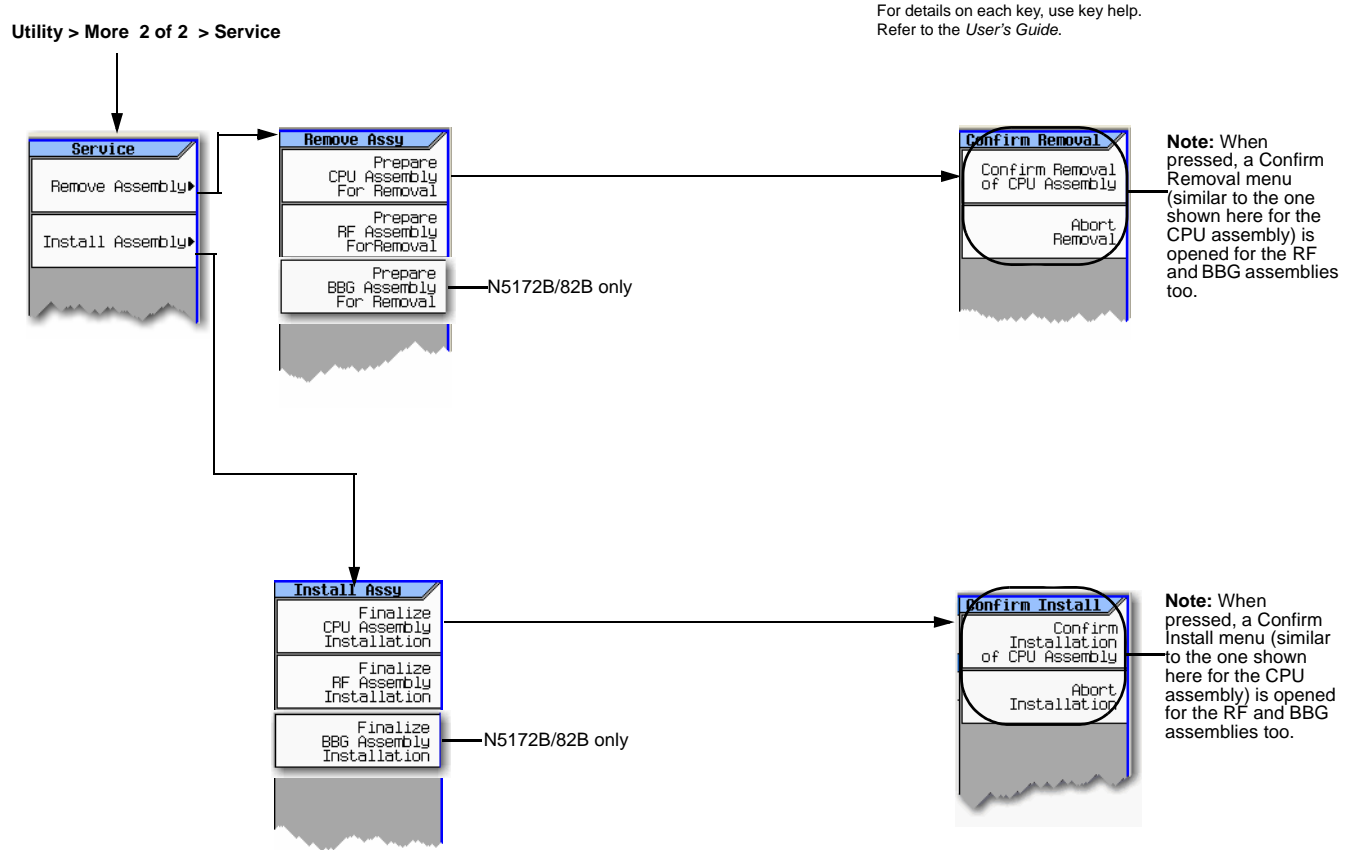
The ability to ensure proper hardware compatibility when an assembly is replaced in the MXG, is based on the capability of the product to save and reconfigure its arrays. To ensure that existing and new hardware is appropriately configured correctly, the static and dynamic arrays associated with the different assemblies *must* be modified as needed.

The process to do the appropriate configuration is performed automatically by the MXG with the [Assembly Installation and Removal Overview](#) front panel softkeys.

The corresponding assembly removal softkey is pressed once prior to a specific assembly being permanently removed for replacement from the instrument. Once the removed assembly has been permanently replaced the corresponding installation softkey is pressed, completing the hardware and installation.

Assembly Installation and Removal Overview

Figure 3-1 Hardware Assembly Installation and Removal Softkeys



Note:

Each **Remove Assembly** softkey (CPU/RF/BBG) when enabled will display a message in the lower left quadrant of display indicating assembly prepared for removal or removal has been aborted.

Each **Install Assembly** softkey, when enabled will display a message in the lower left quadrant of display indicating assembly prepared for installation or installation has been aborted.

Assembly Removal and Installation Procedure

NOTE This section is meant to be a high level overview of the process for replacing an assembly.

1. Faulty/bad board assembly is identified by using the troubleshooting information in [Chapter 1](#).
2. Before removing the bad assembly, use the Remove Assembly service menu to transfer the assembly's array information, by pressing the corresponding softkey: Prepare <CPU/RF/BBG> Assembly For Removal. (Refer to [Assembly Installation and Removal Overview](#).)

CAUTION Do *not* proceed with assembly replacement until step [step 2](#) has been completed. Failure to perform this step can result in the hardware not functioning optimally, resulting in instrument errors and possibly self-test failures.

3. Replace the faulty/bad assembly.
4. Press the corresponding Install Assembly menu softkey: Finalize <CPU/RF/BBG> Assembly Installation. (Refer to [Assembly Installation and Removal Overview](#).)

CAUTION Do not proceed with Assembly replacement until step [step 4](#) has been completed. Failure to perform this step can result in the hardware not functioning optimally, resulting in instrument errors and possibly self-test failures.

After Replacing or Repairing an Assembly

After you have replaced or repaired an assembly, certain performance tests may have to be performed. Refer to [Chapter 4, "Post-Repair Procedures and Operational Performance Verification," on page 4-1](#), for the list of performance tests required for each assembly.

Assemblies You Can Replace

- "Outer Cover" on page 3-5
- "Inner Top Cover" on page 3-7
- "Inner Bottom Cover" on page 3-8
- "Front-Panel" on page 3-9
- "A1 Power Supply" on page 3-11
- "A2 Vector BBG Assembly (N5172B and N5182B)" on page 3-13
- "A3 RF Assembly" on page 3-16
- "A3BT1 Battery" on page 3-21
- "A4 SSD (N5172B/82B only)" on page 3-22
- "A5 CPU" on page 3-24
- "A6 Front Panel Interface Scan Assembly" on page 3-25
- "USB Board" on page 3-27
- "LCD Display" on page 3-29
- "Key Pad" on page 3-31
- "Power Switch" on page 3-33
- "A7 Real Time BBG Assembly (N5172B and N5182B Option 660)" on page 3-35
- "A7A1 Real Time Aux Power Supply" on page 3-37
- "RF Connector" on page 3-41
- "B1 thru B4 Fans" on page 3-42
- "Rear Panel (N5171B/81B)" on page 3-45
- "Rear Panel (N5172B/82B)" on page 3-46

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Outer Cover

Tools Required

- T-20 driver

Removal Procedure

Refer to [Figure 3-2](#) for this procedure.

1. Disconnect the power cord.
2. Using the T-20 driver, loosen the two screws (1) and remove the strap handle (2).
3. Using the T-20 driver, remove the two hole plugs (not shown in photo) from the opposite side of the instrument.
4. Using the T-20 driver, remove the center screws from the four rear-panel feet (3).
5. Remove the four bottom feet (4) from the cover by first removing the locking keys and then lifting the tab and sliding the foot toward the tab.
6. Place the signal generator on its side.
7. Place one hand on the front panel, use the other hand to lift the rear of the signal generator and slide the outer cover (5) off to remove it from the frame.

CAUTION The RF connector can be easily damaged. Use extreme caution to not damage the RF connector when lifting the rear of the signal generator.

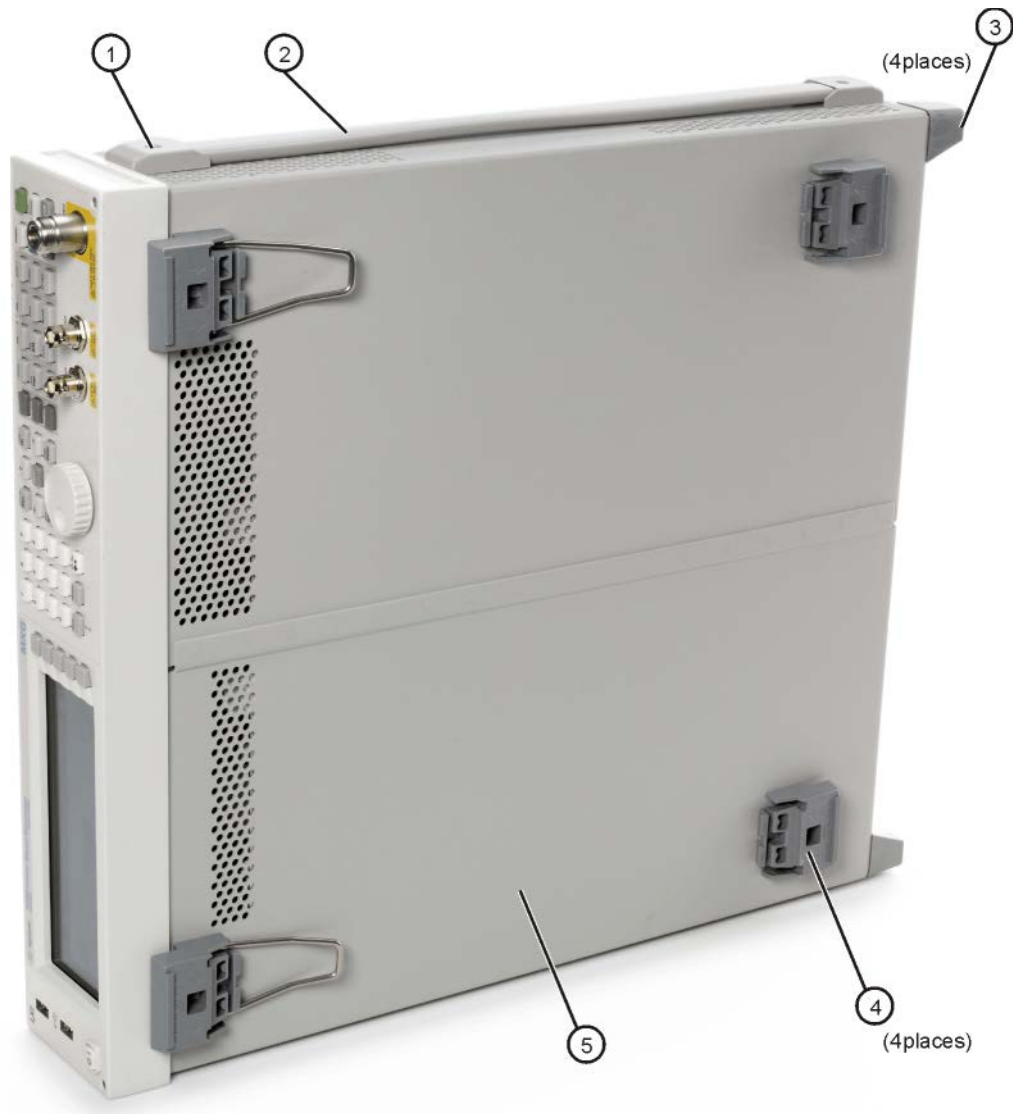
Replacement Procedure

1. Reverse the order of the removal procedures.

CAUTION When sliding the outer cover back on the signal generator keep fingers away from the back of the front panel. They can get severely pinched.

2. Recommended torque for all screws is 21 in-lbs.

Figure 3-2 Outer Cover Removal



external

Inner Top Cover

Tools Required

- T-10 driver

Removal Procedure

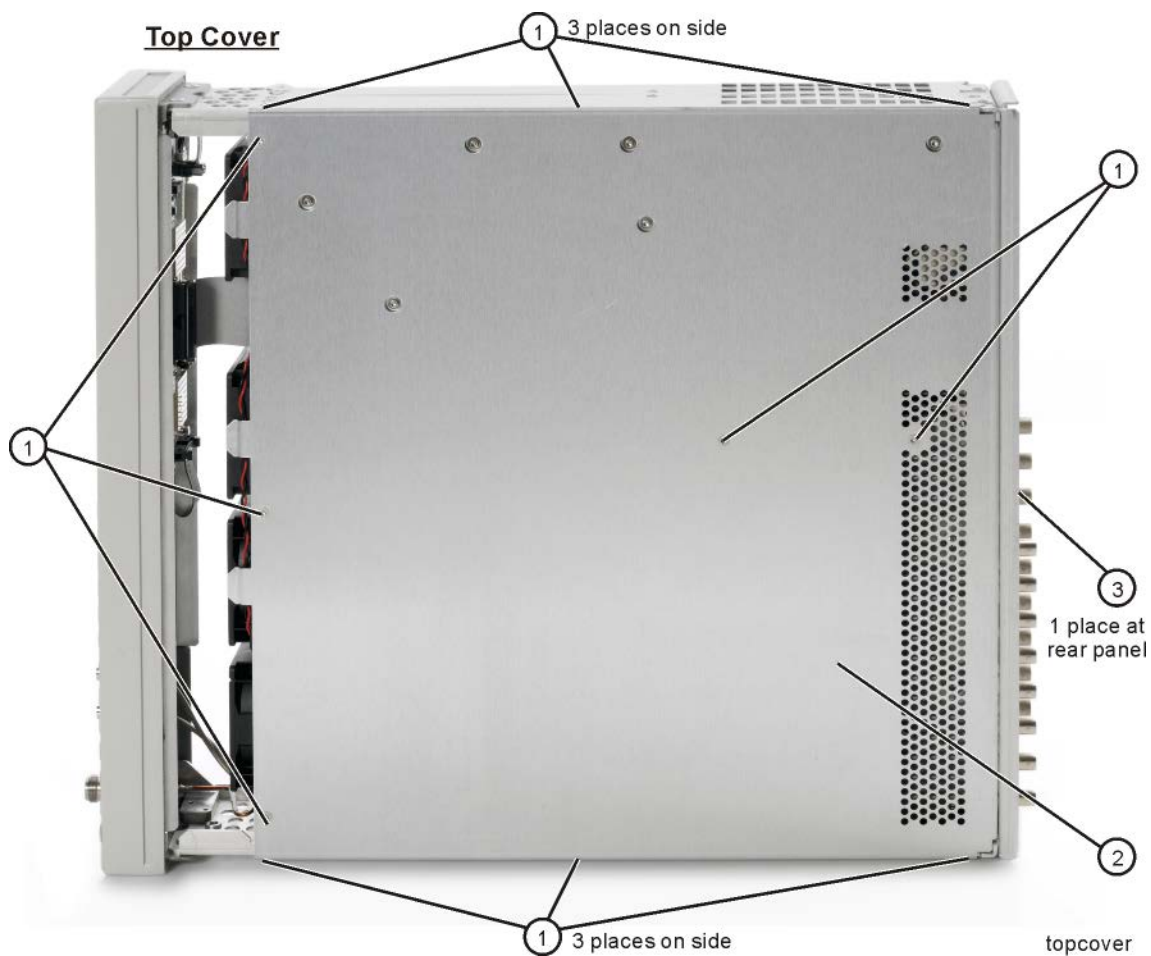
Refer to [Figure 3-3](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer-cover from the signal generator. Refer to ["Outer Cover" on page 3-5](#).
3. Place the signal generator flat with the front-panel facing you.
4. Using the T-10 driver, remove the eleven flat-top screws (1) from the inner top cover (2).
5. Using the T-10 driver, remove the screw (3) from the rear panel.
6. Remove the inner top cover.

Replacement Procedure

1. Reverse the order of the removal procedures.
2. Recommended torque for all screws is 9 in-lbs.

Figure 3-3 Inner Top Cover Removal



Inner Bottom Cover

Tools Required

- T-10 driver

Removal Procedure

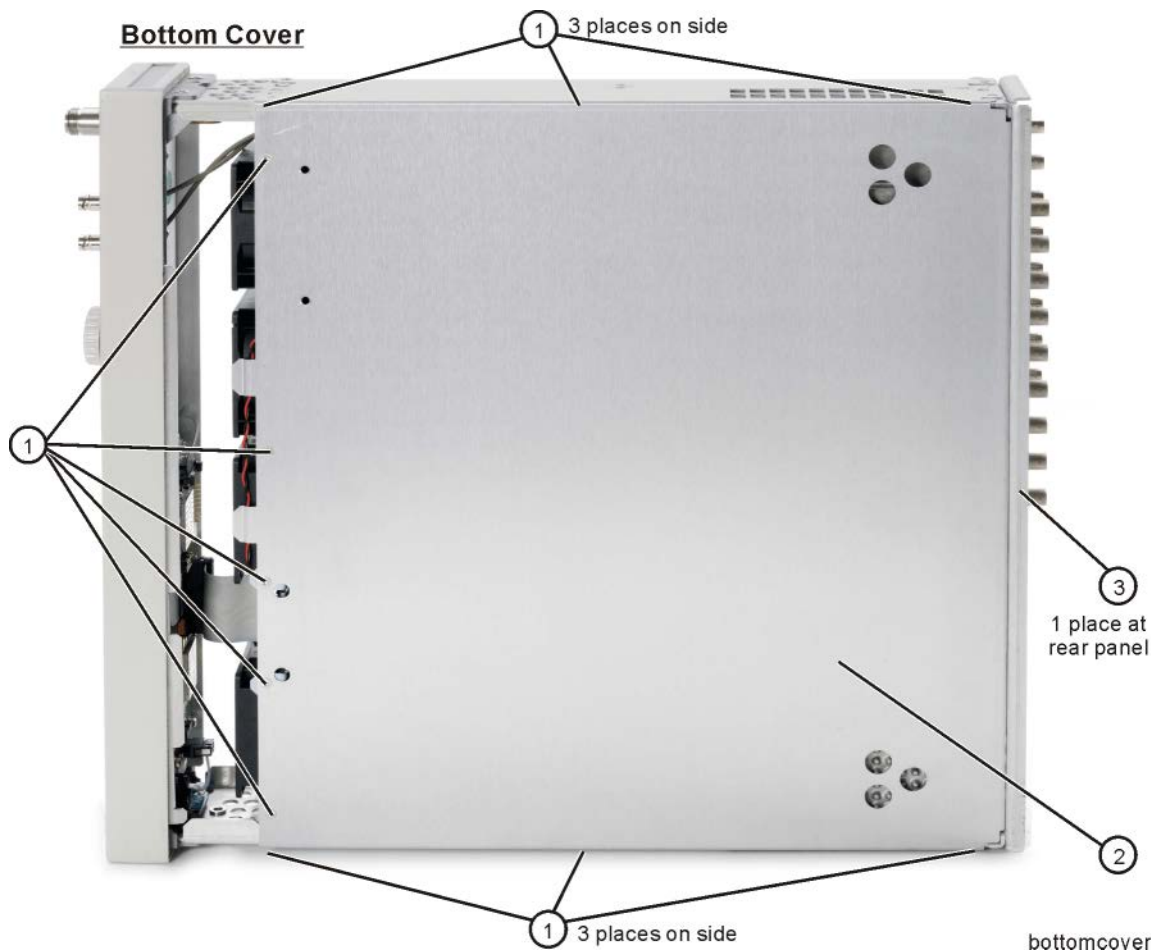
Refer to [Figure 3-4](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer-cover from the signal generator. Refer to ["Outer Cover" on page 3-5](#).
3. Place the signal generator flat with the front-panel facing you.
4. Using the T-10 driver, remove the eleven flat-top screws (1) from the inner bottom cover (2).
5. Using the T-10 driver, remove the screw (3) from the rear panel.
6. Remove the inner bottom cover.

Replacement Procedure

1. Reverse the order of the removal procedures.
2. Recommended torque for all screws is 9 in-lbs.

Figure 3-4 Inner Bottom Cover



Front-Panel

Tools Required

- T-20 driver
- needle-nose pliers

Removal Procedure

Refer to [Figure 3-5](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to "[Outer Cover](#)" on page 3-5, "[Inner Top Cover](#)" on page 3-7, and "[Inner Bottom Cover](#)" on page 3-8.
3. With the signal generator on its side, disconnect W1 from the A3 RF assembly by squeezing the cable connector and pulling the cable away from the signal generator.
4. For N5172B and 82B instruments, place the signal generator flat with the A2 Vector BBG assembly facing you and use the needle-nose pliers to disconnect the following cables,
 - W3 (I Input) from A2J15
 - W4 (Q Input) from A2J16
5. Remove the chassis grommet before pulling W3 and W4 thru the chassis (N5172B and 82B only).
6. With the signal generator upside down and flat, use the T-20 driver to remove the four screws (1) from the sides of the chassis

NOTE The four screws that attach the front panel to the chassis are recommended to be one-time use only hardware. These should be replaced with the new screws (0515-5844) if available. These screws are provided in the front panel replacement kit.

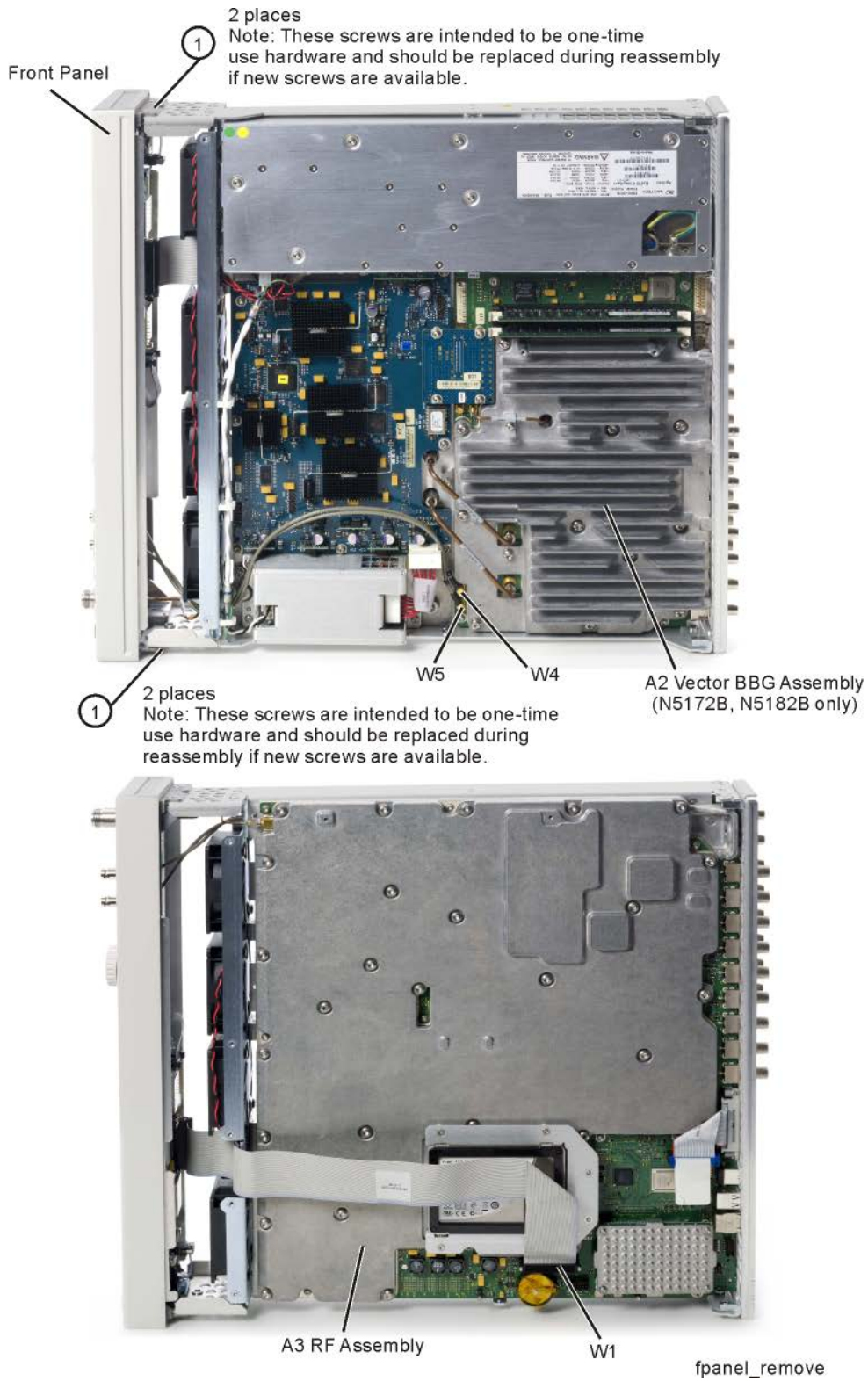
CAUTION Before removing the front-panel from the signal generator, lift and support the front frame of the signal generator.

7. Slide the front-panel over the RF output connector.
8. Remove the front-panel.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for all screws is 21 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-5 Front-Panel



A1 Power Supply

Tools Required

- T-10 driver

Removal Procedure

Refer to [Figure 3-6](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to ["Outer Cover" on page 3-5](#), and ["Inner Top Cover" on page 3-7](#).
3. Remove the rear panel from the signal generator. Refer to ["Rear Panel \(N5171B/81B\)" on page 3-45](#), or ["Rear Panel \(N5172B/82B\)" on page 3-46](#).

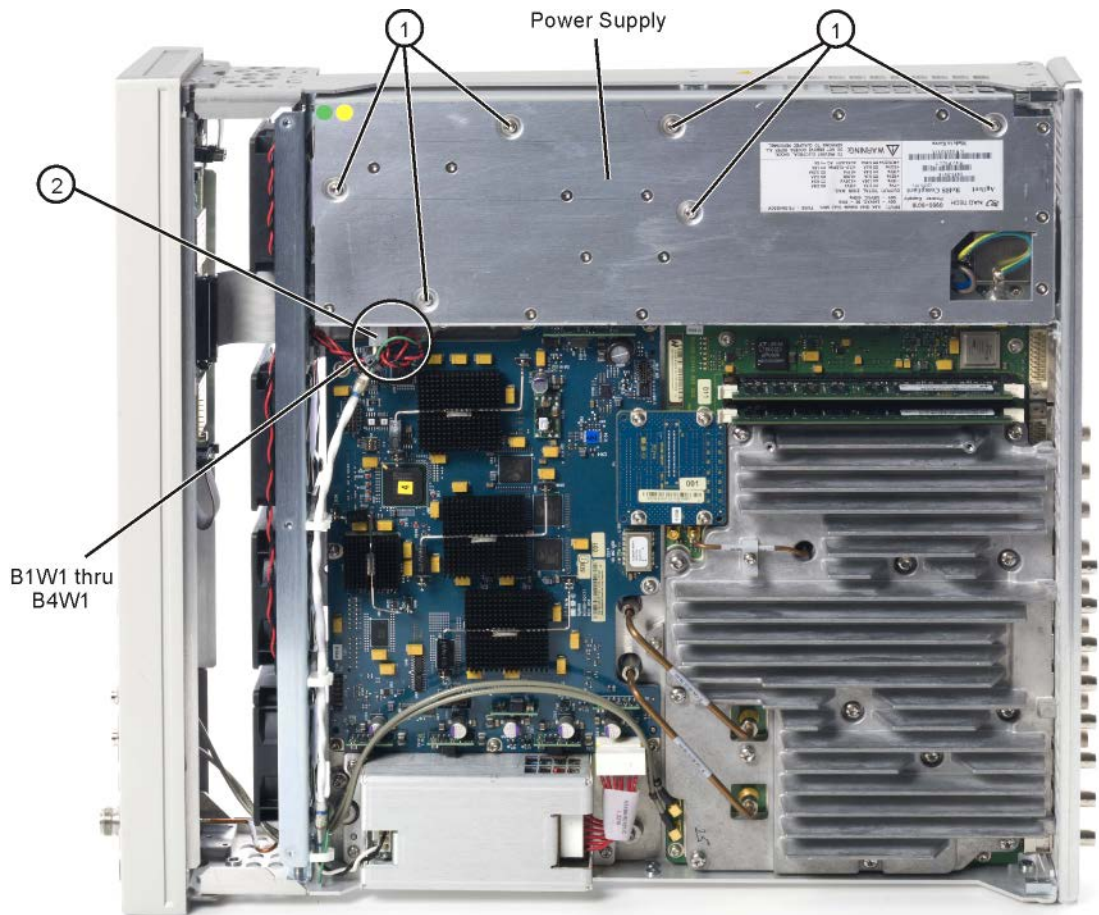
NOTE The rear panel must be removed so the power connector on the A1 Power Supply can be disconnected from the A3 RF assembly without damaging the connector pins.

4. Place the signal generator flat and upright with the front-panel facing you.
5. Using the T-10 driver, press the connector latch to disconnect B1W1 thru B4W1 from the A1 Power Supply.
6. If Option 660 is installed, disconnect the Aux Power Supply cable (2) from the A1 Power Supply.
7. Using the T-10 driver, remove the six screws (1) that secure the A1 Power Supply to the chassis.
8. Remove the A1 Power Supply.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for all screws is 9 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-6 A1 Power Supply



power_supply_remove

A2 Vector BBG Assembly (N5172B and N5182B)

Tools Required

- T-10 driver
- 5/16" open-ended wrench
- needle-nose pliers

Removal Procedure

Refer to [Figure 3-7](#) for this procedure.

1. When permanently replacing the A2 Vector BBG assembly go to "[Assembly Installation and Removal Overview](#)" on [page 3-2](#), and complete the "[Assembly Removal and Installation Procedure](#)" on [page 3-3](#).
2. Disconnect the power cord.
3. Remove the covers from the signal generator. Refer to "[Outer Cover](#)" on [page 3-5](#), "[Inner Top Cover](#)" on [page 3-7](#), and "[Inner Bottom Cover](#)" on [page 3-8](#).
4. Remove the rear panel from the signal generator. Refer to "[Rear Panel \(N5172B/82B\)](#)" on [page 3-46](#).

NOTE The rear panel must be removed to allow the pin connector on the A2 Vector BBG assembly to be disconnected from the A3 RF assembly without damaging the connector pins.

5. Place the signal generator flat with the A2 Vector BBG assembly facing up and the rear panel facing you.
6. Refer to [Figure 3-7](#). Use the needle-nose pliers to disconnect the cables from the following locations:
 - A2J15, I Input, W4 (W17 for Option 1EM instruments).
 - A2J16, Q Input, W5 (W18 for Option 1EM instruments).
7. Remove the cable clamp and cable W6.
8. Using the 5/16" open-ended wrench, disconnect the following cables according to the instrument you have:
 - Instruments *without* Option 012: Remove cables W7 and W8.
 - Instruments *with* Option 012: refer to [Figure 3-8](#). Remove cables W13, W14, and W15.
9. Refer to [Figure 3-7](#). If Option 660 is installed, use the T-10 driver to remove the four screws (1) that secure the A8 Real Time Jumper Board to the A2 Vector BBG assembly and the A7 Real Time BBG assembly. Pull up on the Real Time Jumper Board to disengage from the assemblies.
10. Using the T-10 driver, remove the two screws (2) and four screws (3) that connect the A2 Vector BBG assembly to the chassis.
11. Place your thumbs under the BNC connectors and push up on the A2 Vector BBG assembly to release it from the pin connector.
12. Remove the A2 Vector BBG assembly.

Replacement Procedure

1. Reverse the order of the removal procedure.

NOTE If Option 660 is installed, follow these steps:

- a. When plugging in the A8 Real Time Jumper Board into the A2 and A7 boards, it is important to have all boards loose in order to ensure proper connector mating.
 - b. it will be necessary to loosen the eight screws (1) (refer to [Figure 3-28](#)) attaching the A7 Real Time BBG assembly to the chassis before plugging in the A8 Real Time Jumper Board.
 - c. After the A8 Jumper board is plugged into both the A2 and A7 boards, tighten the four A8 board screws (1) first. Refer to [Figure 3-7](#).
 - d. Then you can tighten the eight screws for the A7 board and the five screws for the A2 board.
-

2. Recommended torque for all T-10 screws is 9 in-lbs.

WARNING

The vertical SMA board connectors (on the A2 and A3 assemblies) for cables W7 and W8 can be broken loose easily.

DO NOT OVER-TORQUE THESE CONNECTORS. The recommended torque is 9 in-lbs.

NOTE Place the cable with the long nut into place first, then connect to the A2 Vector BBG assembly.

3. Recommended torque for all BNC connectors is 21 in-lbs.

4. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-7 A2 Vector BBG Assembly (N5182B Option 1EM with Option 012)

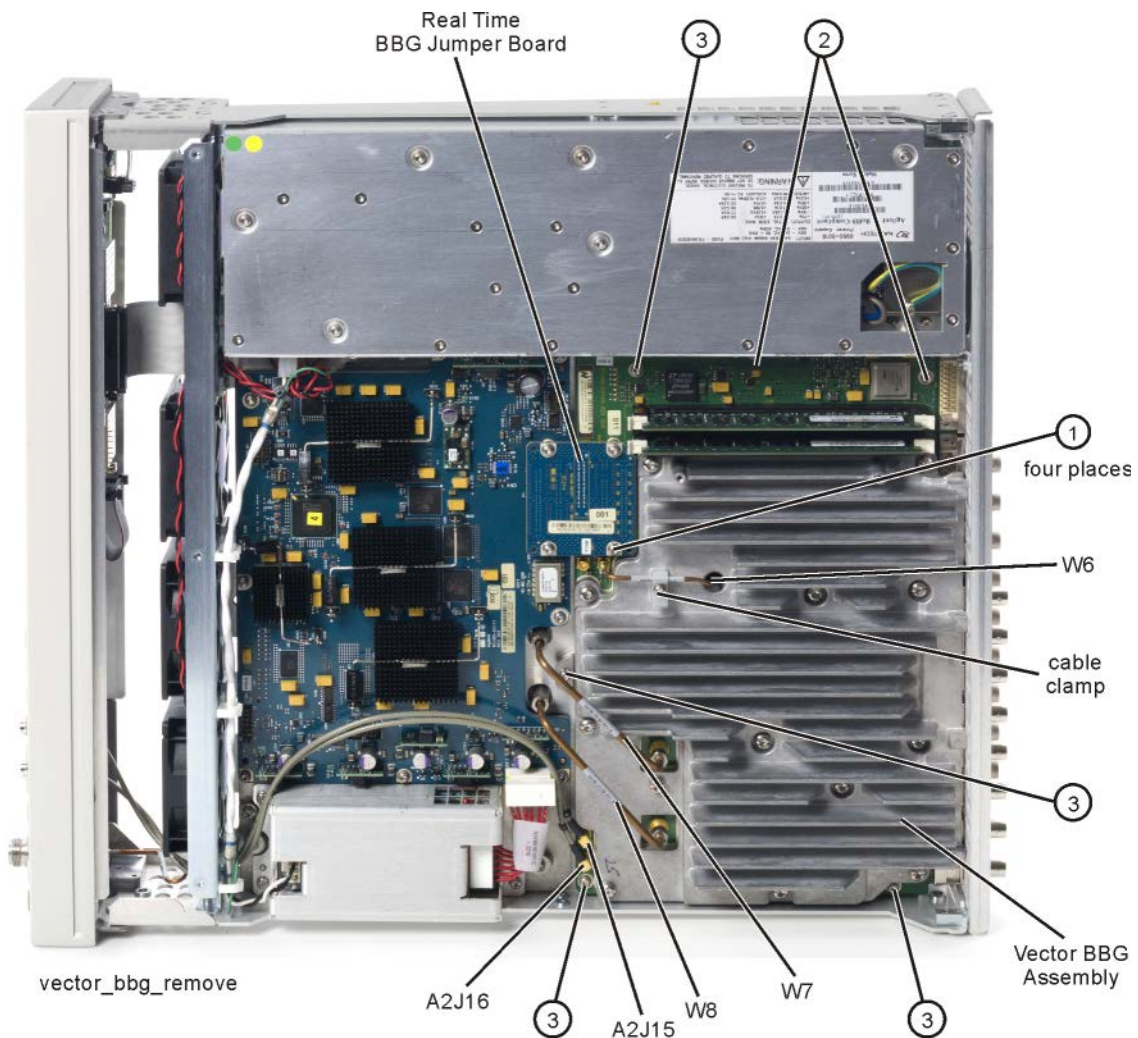
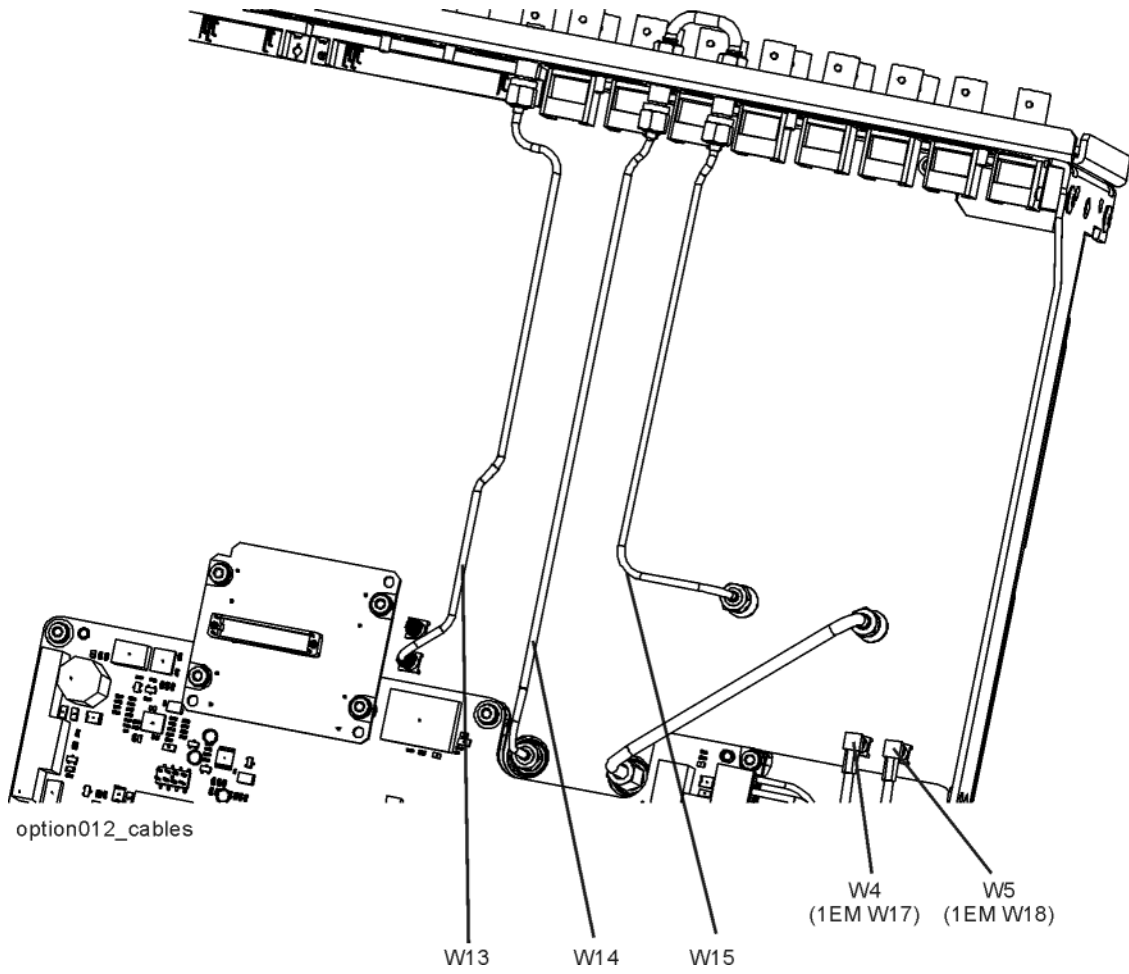


Figure 3-8 Option 012 Cables



A3 RF Assembly

WARNING Do not disconnect the RF connector cable from the A3 RF assembly or the RF connector itself. Removing the cable will result in instrument failure.

Tools Required

- T-10 driver
- 5/16" open-ended wrench
- common screwdriver

Removal Procedure

NOTE Pry slots have been provided on both sides of the A3 RF assembly to aid in removing the board.

1. Go to "Assembly Installation and Removal Overview" on page 3-2, and complete the "Assembly Removal and Installation Procedure" on page 3-3.
2. Disconnect the power cord.
3. Remove the covers from the signal generator. Refer to "Outer Cover" on page 3-5, "Inner Top Cover" on page 3-7, and "Inner Bottom Cover" on page 3-8.
4. For N5171B and N5181B instruments, skip to [step 6](#). For N5172B and N5182B instruments, place the signal generator flat with the A2 Vector BBG assembly facing up and the rear panel facing you.
5. Using the 5/16" open-ended wrench, disconnect the following cables according to the instrument you have.
Instruments *without* Option 012 refer to [Figure 3-9](#): W7 and W8.
Instruments *with* Option 012 refer to [Figure 3-10](#): W8 and W14.
6. Place the signal generator flat with the A3 RF assembly facing up.
7. Remove the following assemblies, in the order listed
 - a. "A4 SSD (N5172B/82B only)" (see [page 3-22](#))
 - b. "A5 CPU" (see [page 3-24](#))
 - c. Rear Panel (N5171B/81B see [page 3-45](#). N5172B/82B see [page 3-46](#).)
 - d. "Front-Panel" (see [page 3-9](#))
8. For Option 1EM instruments, skip to [step 9](#). For all other instruments, refer to [Figure 3-11](#). Using the T-10 driver, remove the 3 screws (1) that connect the RF In connector to the chassis.

CAUTION The RF Connector can be easily damaged. Use extreme caution when disconnecting and reconnecting the RF connector bracket from and to the instrument chassis.

9. Refer to [Figure 3-12](#). Using the T-10 driver, remove the 10 screws (1) that connect the A3 RF assembly to the chassis.
10. Refer to [Figure 3-13](#) and [Figure 3-14](#). Place the tip of a medium common screwdriver into one of the three pry slots on the A3 RF assembly and twist the screwdriver to release the board from the connector pins.
11. Repeat [step 10](#) with the other two pry slots.
12. Remove the A3 RF assembly as shown in [Figure 3-14](#).

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for Front Panel screws is 21 in-lbs. Recommended torque for all other screws is 9 in-lbs.
3. Recommended torque for all BNC connectors is 21 in-lbs.
4. Perform the post-repair service procedure and performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-9 Cable Removal for RF Assembly (std) - N5172B and N5182B

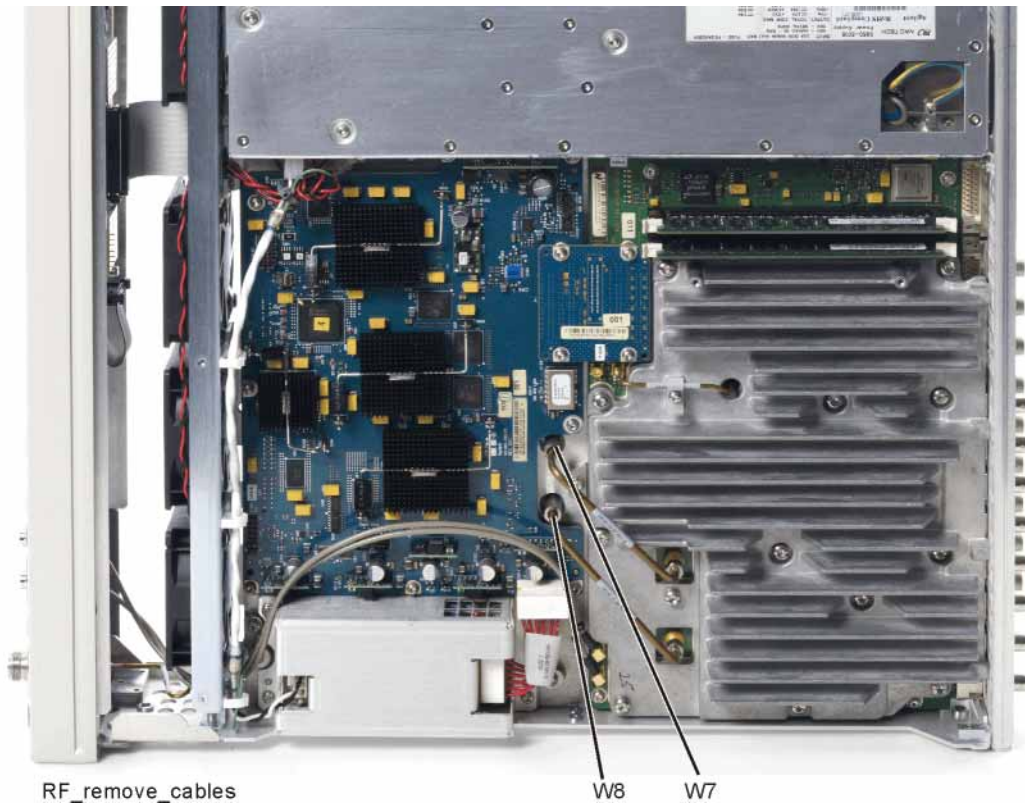


Figure 3-10 Cable Removal for A3 RF Assembly, Option 012 - N5172B and N5182B

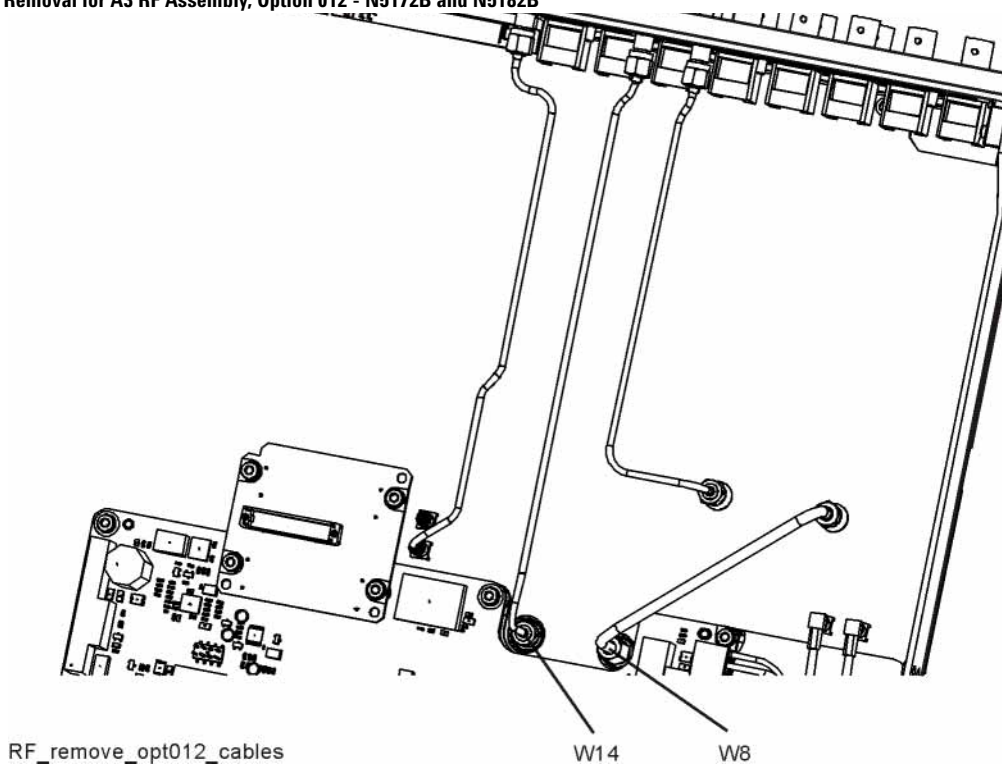


Figure 3-11 RF In Connector - Screw locations

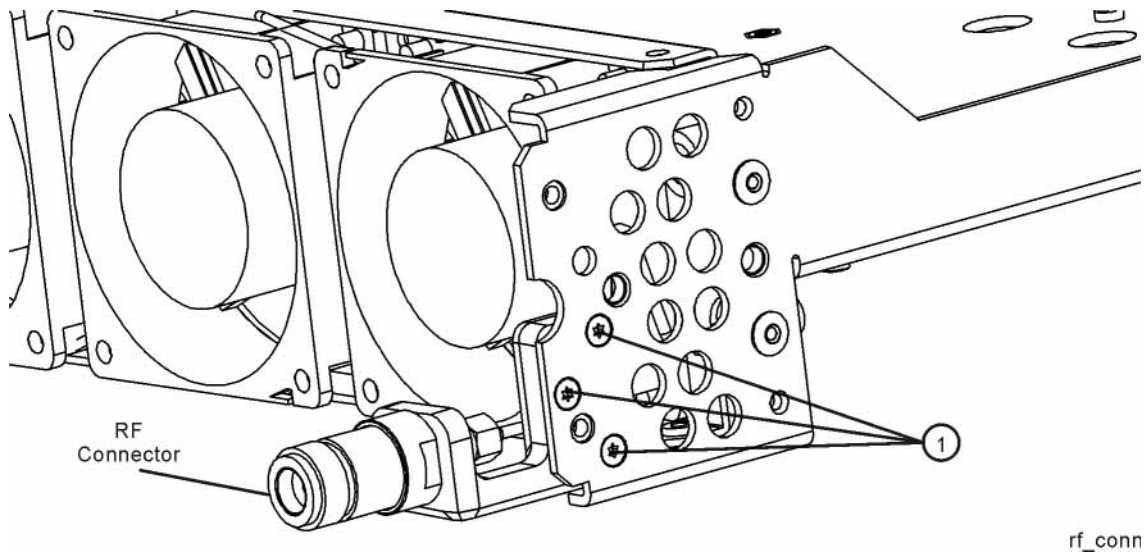


Figure 3-12 A3 RF Assembly - Screw locations

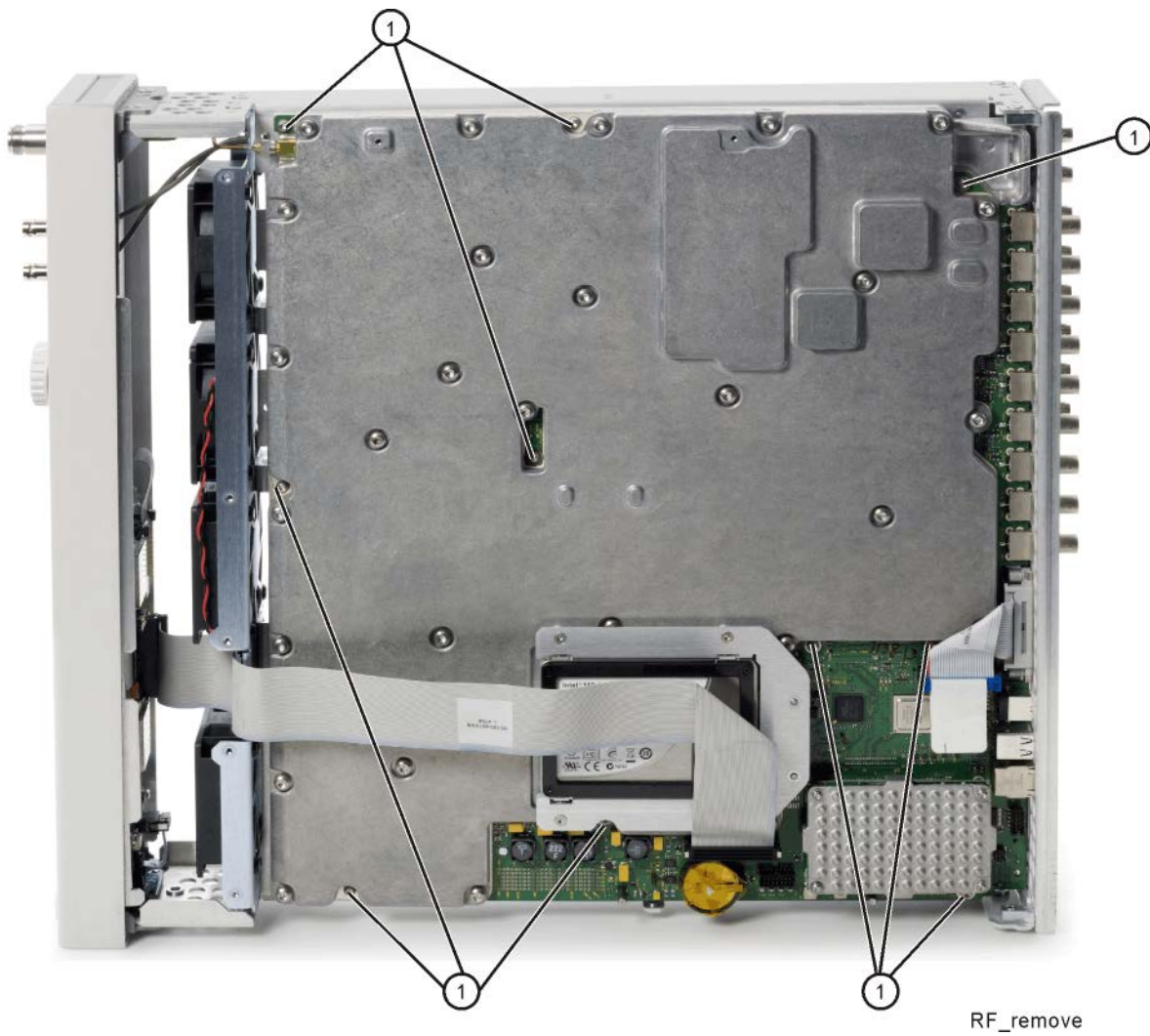


Figure 3-13 A3 RF Assembly - Removal

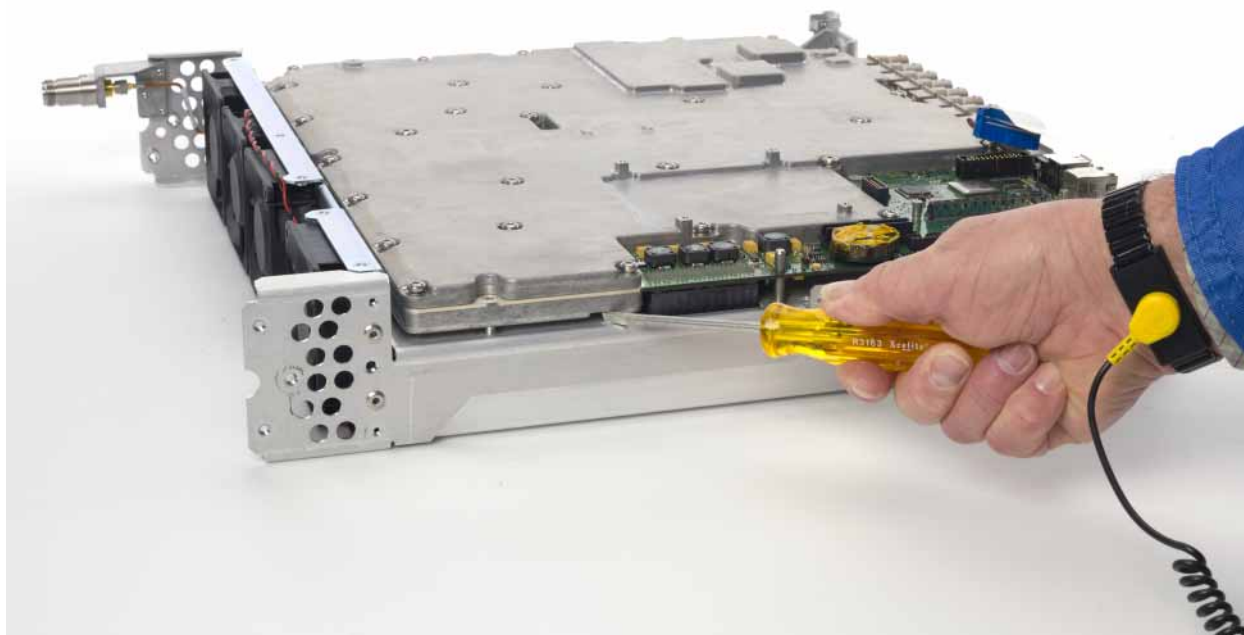
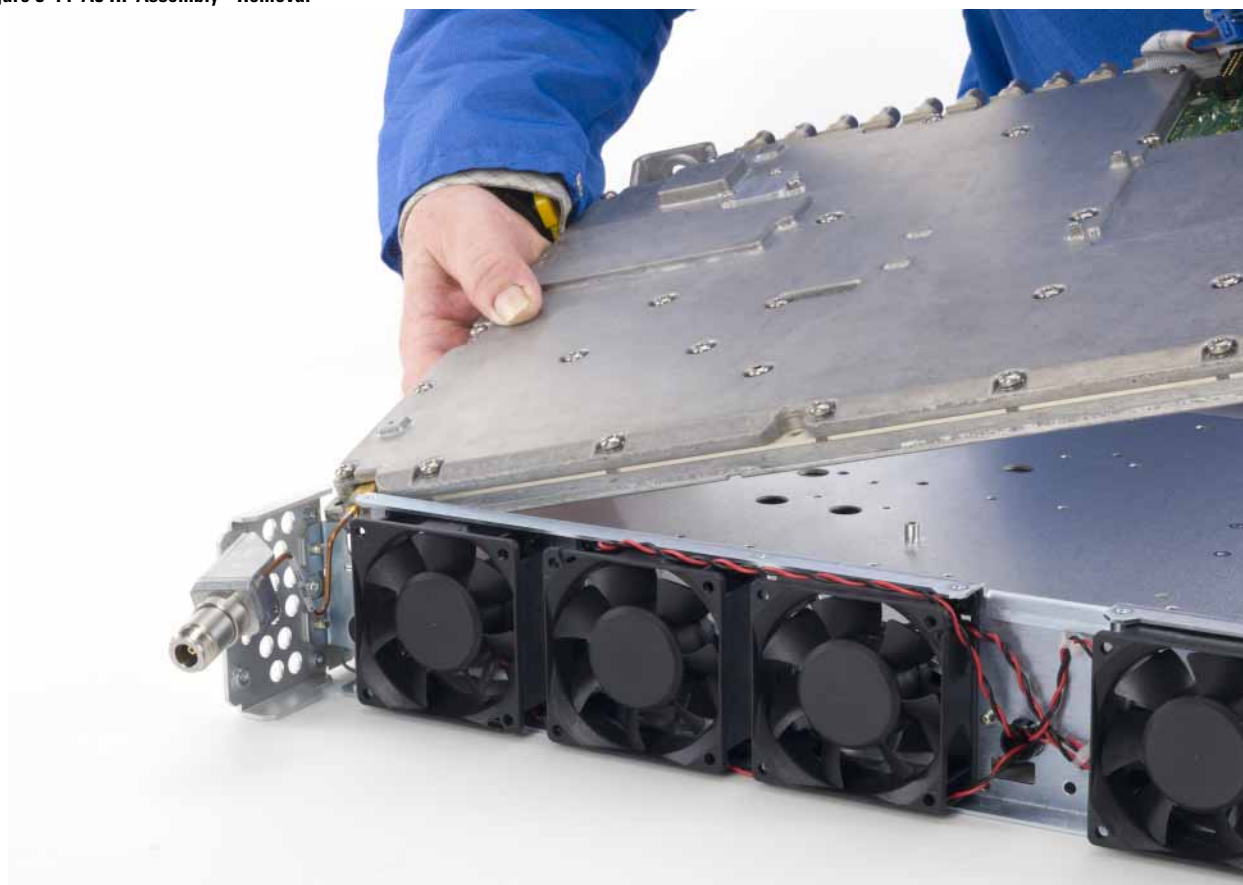


Figure 3-14 A3 RF Assembly - Removal



A3BT1 Battery

WARNING This battery contains lithium. Do not incinerate or puncture this battery. Do not install this battery backwards. To dispose of the battery in a safe manner. Refer to ["Lithium Battery Disposal" on page 5-2](#).

NOTE The battery is part of the power off circuitry. Removing the battery will not cause any stored data to be lost.

Tools Required

- T-10 driver
- small common screw driver

Removal Procedure

Refer to [Figure 3-15](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to ["Outer Cover" on page 3-5](#) and ["Inner Bottom Cover" on page 3-8](#).
3. Place the signal generator flat with the A3 RF assembly facing up and the front-panel towards you.
4. Using the flat-head screw driver, remove the A3BT1 by leveraging the battery out of its socket.

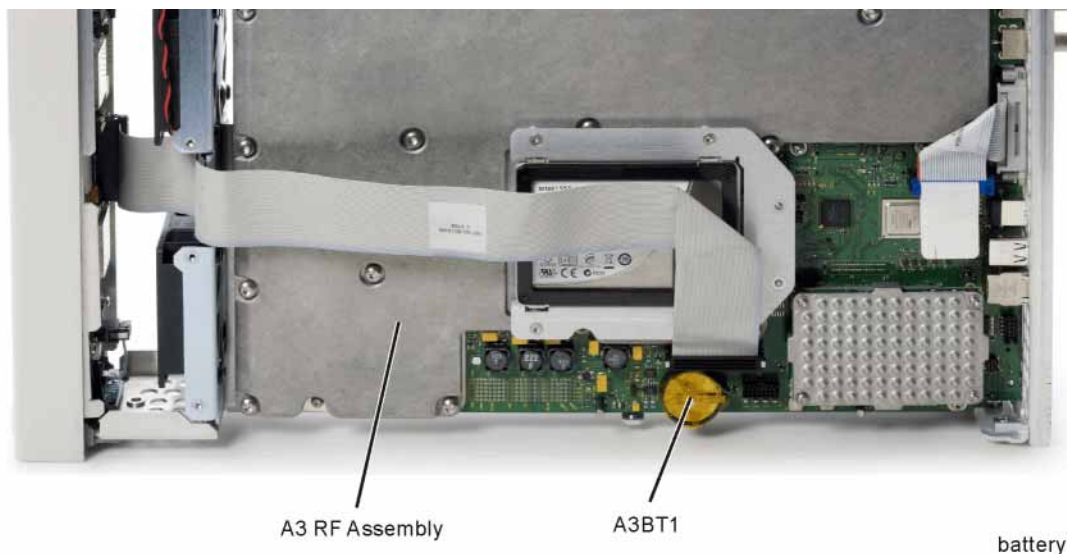
Replacement Procedure

1. Reverse the remaining steps of the removal procedure.

NOTE To install the battery, the positive side is aligned with the positive sign on the A3 RF assembly's battery clip.

2. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-15 A3BT1 Battery



A4 SSD (N5172B/82B only)

Tools Required

- T-10 driver

Removal Procedure

Refer to [Figure 3-16](#) and [Figure 3-17](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to ["Outer Cover" on page 3-5](#) and ["Inner Bottom Cover" on page 3-8](#).
3. Place the signal generator flat and upside down with the rear panel facing you.
4. Using the T-10 driver, remove the four screws (6) that attach the A4 SSD assembly to the A3 RF assembly.
5. Remove the A4 SSD assembly by gently rocking it side to side to release the pins.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for all screws is 9 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-16 A4 SSD

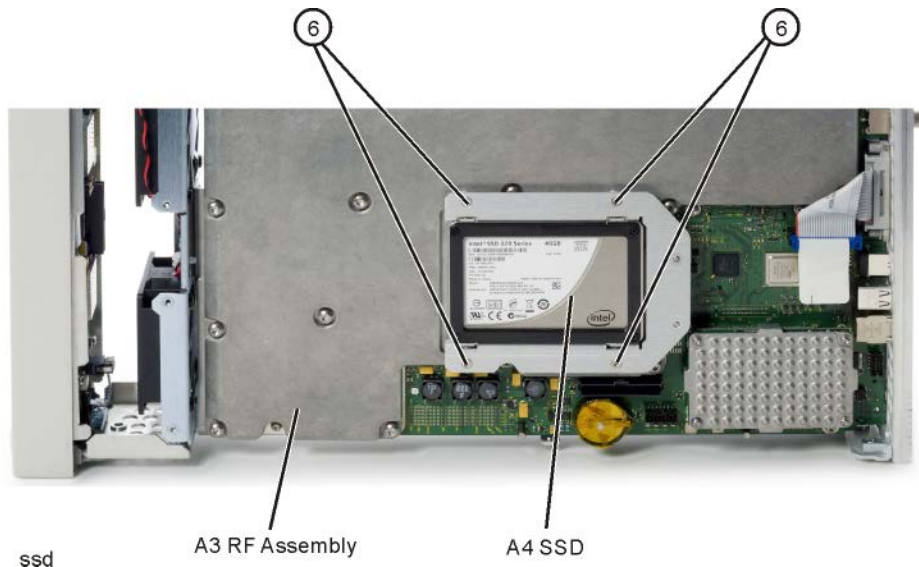
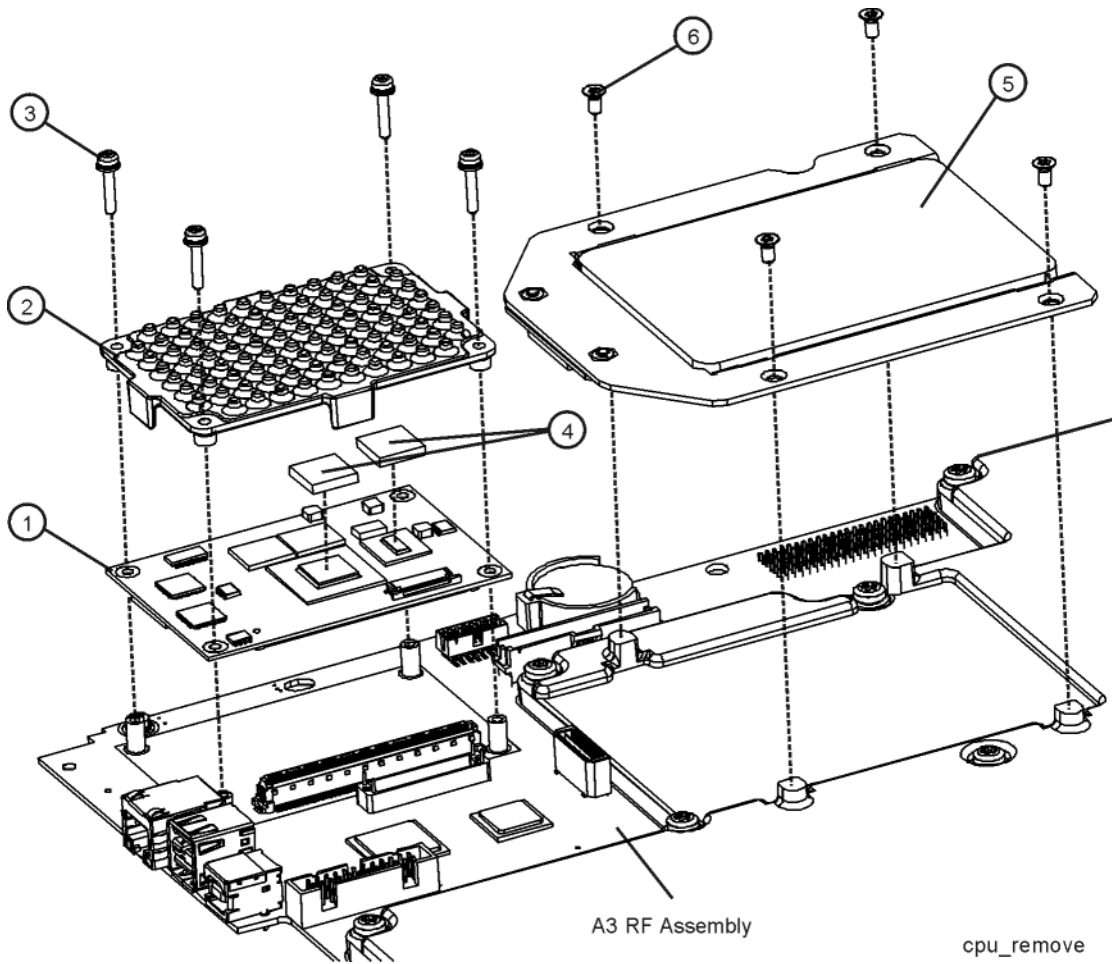


Figure 3-17 A4 SSD and A5 CPU Removal



A5 CPU

Tools Required

- T-8 driver

Removal Procedure

Refer to [Figure 3-17](#) and [Figure 3-18](#) for this procedure.

CAUTION There are three pin connectors attaching the A5 CPU to the A3 RF assembly. They are located on the short end of the A5 CPU board, closest to the front-panel. Use caution when removing the A5 CPU board.

1. Go to ["Assembly Installation and Removal Overview"](#) on [page 3-2](#), and complete the ["Assembly Removal and Installation Procedure"](#) on [page 3-3](#).
2. Disconnect the power cord.
3. Remove the covers from the signal generator. Refer to ["Outer Cover"](#) on [page 3-5](#) and ["Inner Bottom Cover"](#) on [page 3-8](#).
4. Place the signal generator flat and upside down with the front-panel facing you.
5. Using the T-8 driver, remove the four screws (3) that attach the A5 CPU (1) and heatsink (2) to the A3 RF assembly.
6. Remove the A5 CPU.
7. The thermal pads (4) should also be replaced.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for the four CPU screws is 6 in-lbs.
3. Perform the post-repair service procedure and performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-18 A5 CPU



A6 Front Panel Interface Scan Assembly

Tools Required

- T-10 driver

Removal Procedure

Refer to [Figure 3-19](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to ["Outer Cover" on page 3-5](#), ["Inner Top Cover" on page 3-7](#), and ["Inner Bottom Cover" on page 3-8](#).
3. Remove the front-panel from the signal generator. Refer to ["Front-Panel" on page 3-9](#).
4. Disconnect the LCD cable from the A6 Front Panel Interface Scan assembly. Refer to [Figure 3-20](#). Disengage the locking tabs by sliding them in the direction shown. When reassembling, ensure the locking tabs are pushed in and engaged on both sides of the connector.
5. Disconnect the Power Switch cable from the A6 Front Panel Interface Scan assembly.
6. Disconnect the W2 ribbon cable from the A6 Front Panel Interface Scan assembly.
7. Disconnect the W3 ribbon cable from the A6 Front Panel Interface Scan assembly.
8. Using the T-10 driver, remove the seven screws (1) that secure the A6 Front Panel Interface Scan assembly to the front-panel sub-panel.
9. Remove the A6 Front Panel Interface Scan assembly.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for all screws is 9 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-19 Front Panel Interface Scan Assembly

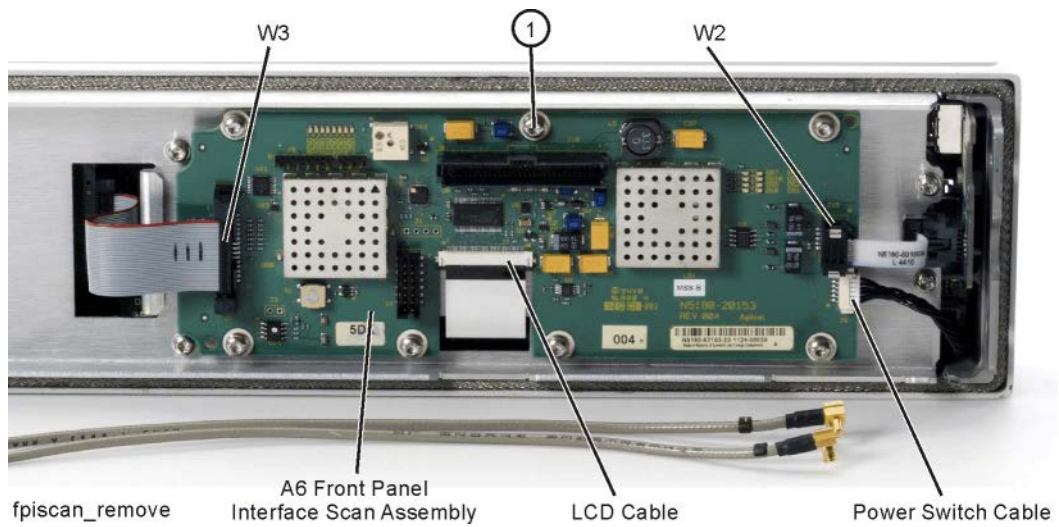
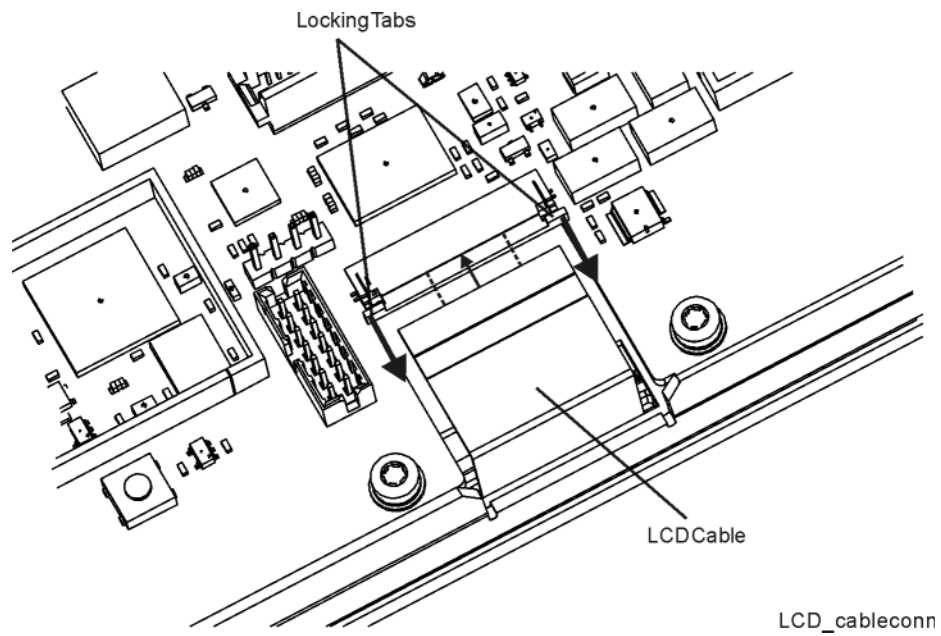


Figure 3-20 LCD Cable Locking Tabs



USB Board

Tools Required

- T-10 driver

Removal Procedure

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to "Outer Cover" on page 3-5, "Inner Top Cover" on page 3-7, and "Inner Bottom Cover" on page 3-8.
3. Remove the front-panel from the signal generator. Refer to "Front-Panel" on page 3-9.
4. Refer to [Figure 3-21](#). Disconnect W2 from the Front Panel Interface Scan assembly.
5. Carefully remove the foam trim from the side of the Front Panel.
6. Refer to [Figure 3-22](#). Using the T-10 driver, remove the screw (1) securing the USB board to the front-panel.
7. Remove USB board

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for screw is 9 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-21 USB Board Location

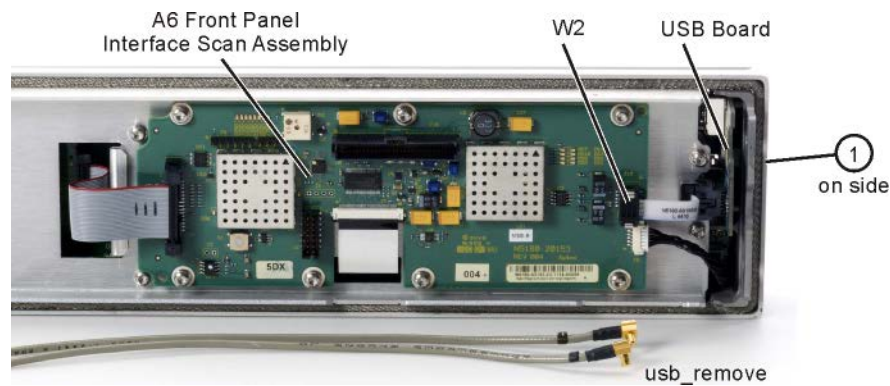
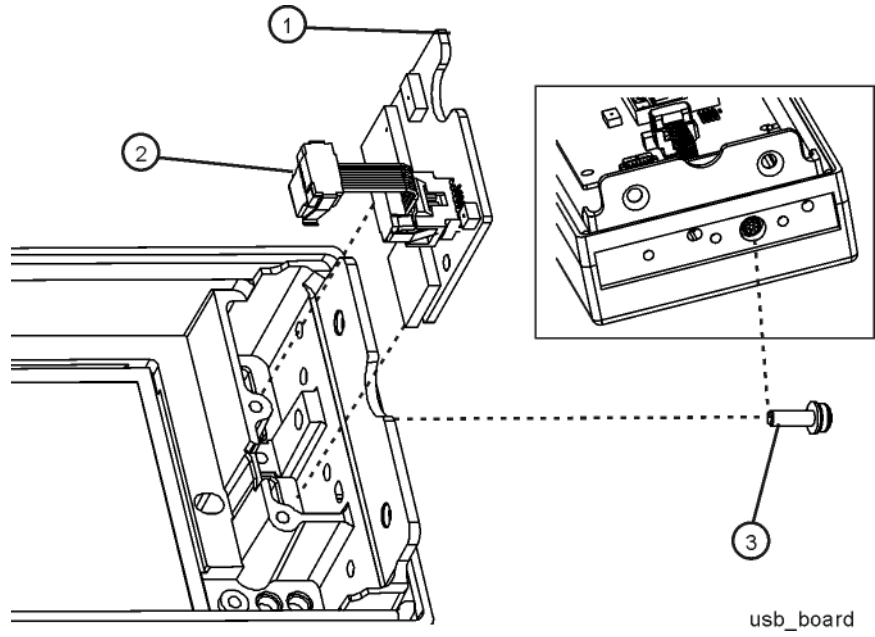


Figure 3-22 USB Board Removal



LCD Display

Tools Required

- T-10 driver

Removal Procedure

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to ["Outer Cover" on page 3-5](#), ["Inner Top Cover" on page 3-7](#), and ["Inner Bottom Cover" on page 3-8](#).
3. Remove the front-panel from the signal generator. Refer to ["Front-Panel" on page 3-9](#).
4. Remove the A6 Front Panel Interface Scan assembly from the front panel. Refer to ["A6 Front Panel Interface Scan Assembly" on page 3-25](#).
5. Refer to [Figure 3-23](#). Using the T-10 driver, remove the eight screws (1) that secure the sub-panel to the front-panel.
6. Remove the sub-panel.
7. Refer to [Figure 3-24](#). Remove the display hold-down. Take care to avoid losing the grounding spring that sits in the display hold-down.
8. Remove the LCD Display.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for all screws is 9 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-23 Sub Panel

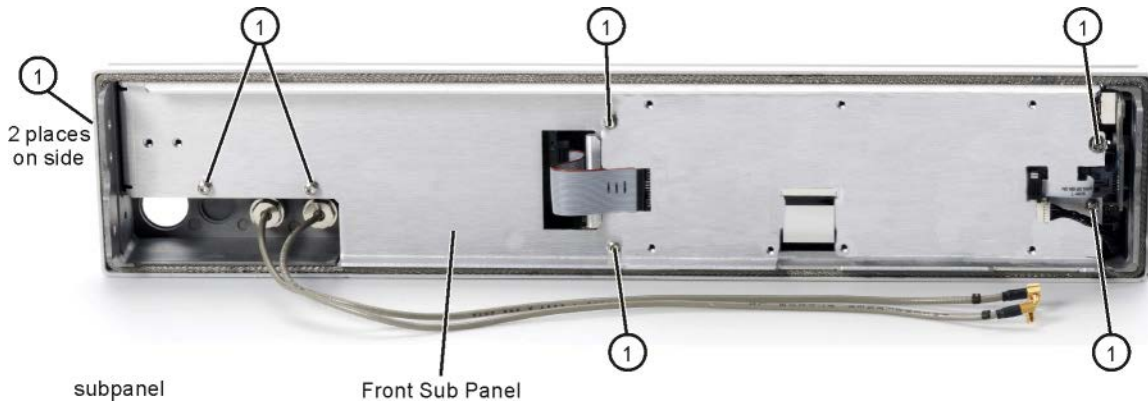
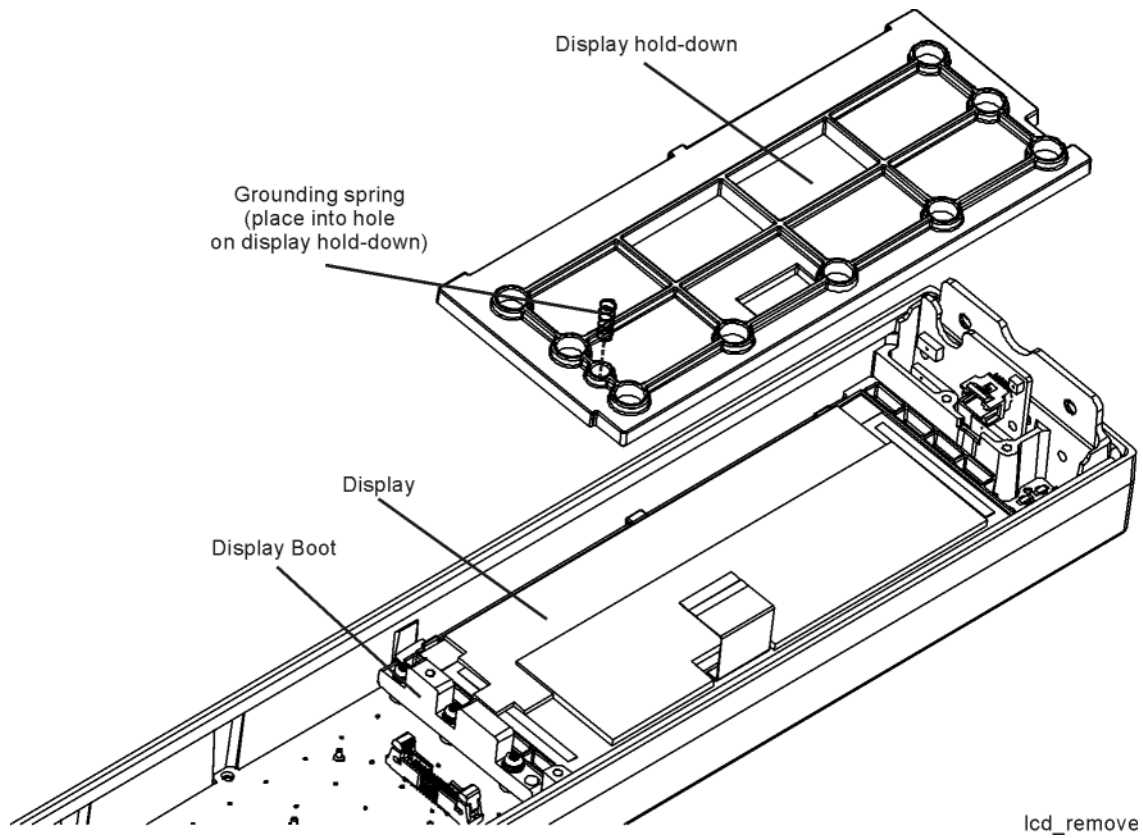


Figure 3-24 LCD Display



Key Pad

Tools Required

- T-10 driver

Removal Procedure

Refer to [Figure 3-25](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to ["Outer Cover" on page 3-5](#), ["Inner Top Cover" on page 3-7](#), and ["Inner Bottom Cover" on page 3-8](#).
3. Remove the Rotary Pulse Generator (RPG) knob by carefully pulling it off the shaft of the RPG.
4. Remove the front-panel from the signal generator. Refer to ["Front-Panel" on page 3-9](#).
5. Remove the A6 Front Panel Interface Scan assembly from the front panel. Refer to ["A6 Front Panel Interface Scan Assembly" on page 3-25](#).
6. Remove the LCD Display from the signal generator. Refer to ["LCD Display" on page 3-29](#).
7. Using the T-10 driver, remove the three screws (1) that secure the Side Support to the front-panel frame.
8. Using the T-10 driver, remove the nine screws (3) that secure the Key Pad and Key Pad Board to the front-panel frame.
9. Remove the Key Pad and Key Pad Board.

Replacement Procedure

1. Reverse the order of the removal procedure.

NOTE Refer to [Figure 3-26](#). Hand start the two screws labeled "A" and "B" until they are snug, then install the remaining ten screws.

2. Recommended torque for all screws is 9 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-25 Key Pad

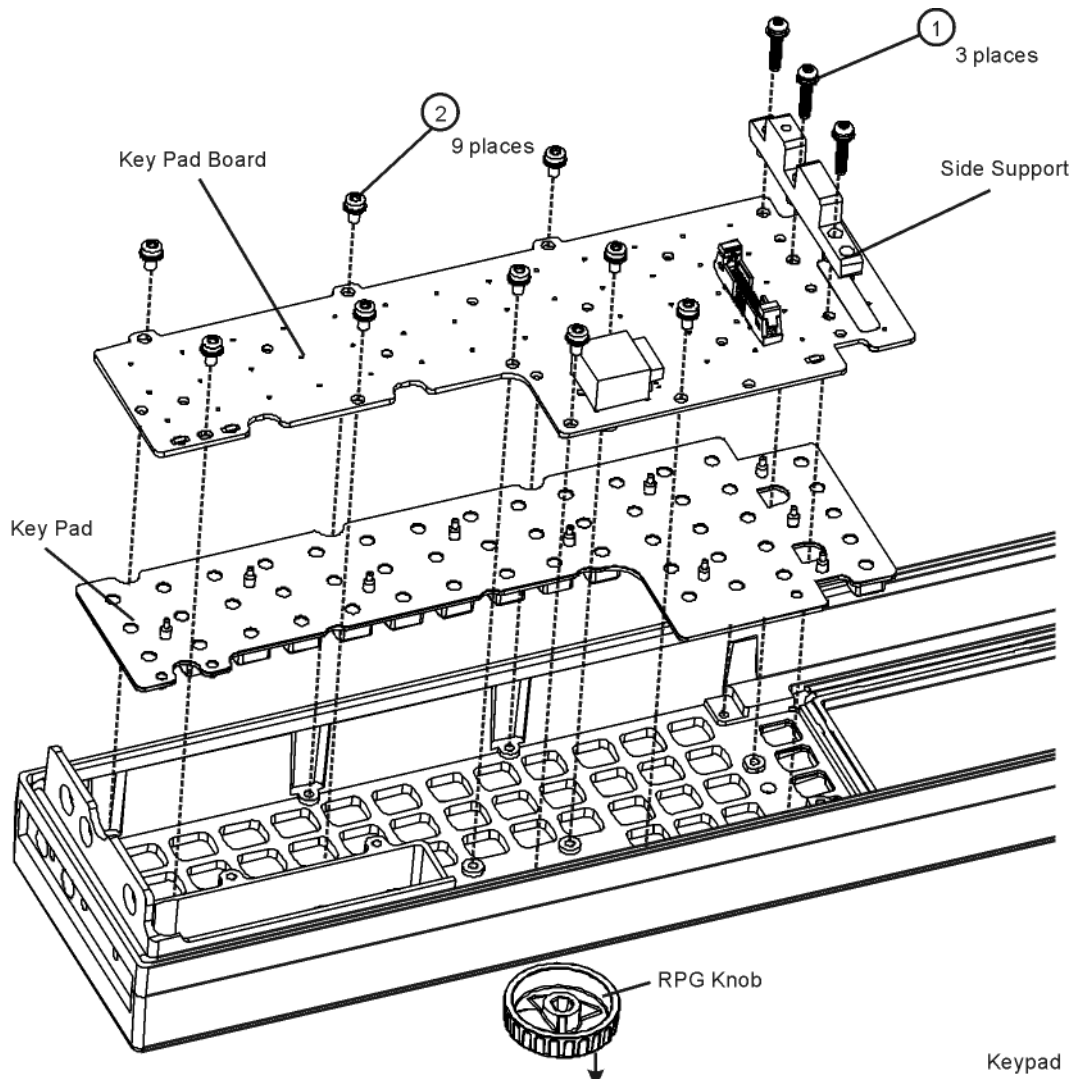
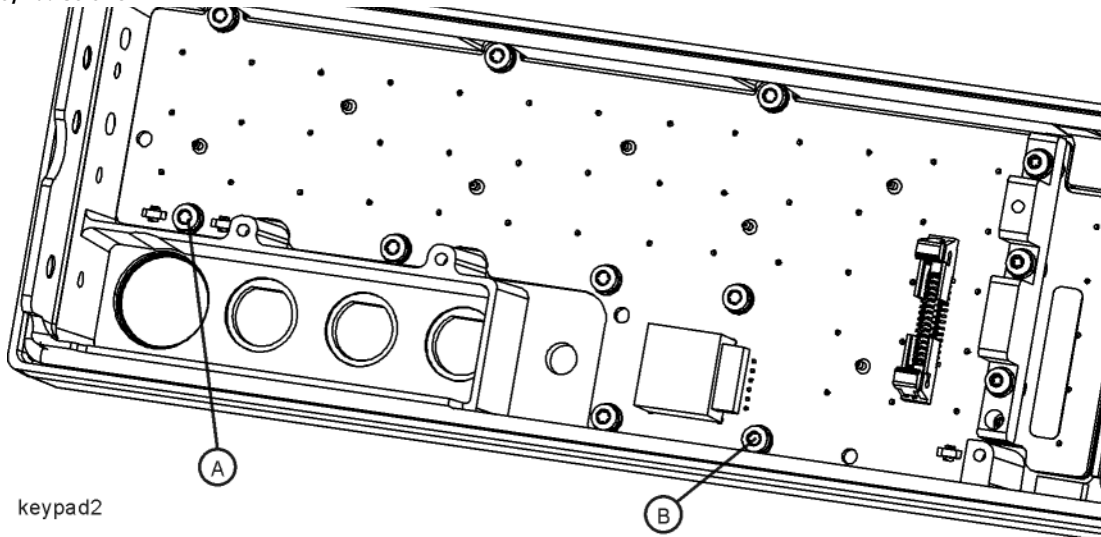


Figure 3-26 Key Pad Screws



Power Switch

Tools Required

- T-10 driver

Removal Procedure

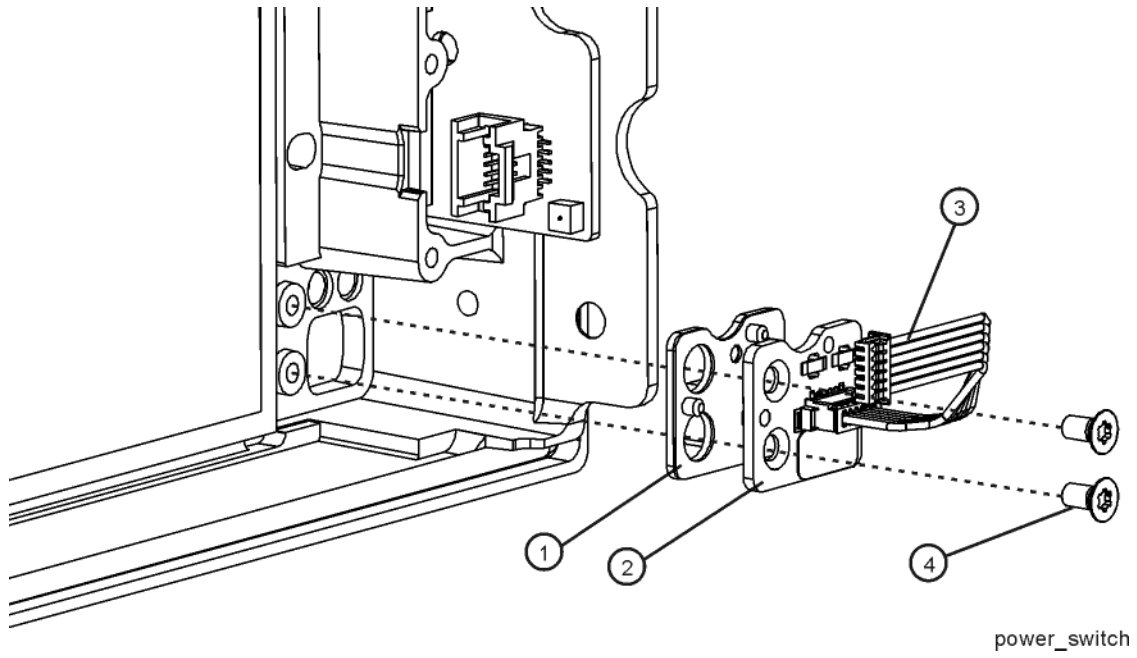
Refer to [Figure 3-27](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to ["Outer Cover" on page 3-5](#), ["Inner Top Cover" on page 3-7](#), and ["Inner Bottom Cover" on page 3-8](#).
3. Remove the front-panel from the signal generator. Refer to ["Front-Panel" on page 3-9](#).
4. Remove the A6 Front Panel Interface Scan assembly from the signal generator. Refer to ["A6 Front Panel Interface Scan Assembly" on page 3-25](#).
5. Remove the LCD Display from the signal generator. Refer to ["LCD Display" on page 3-29](#).
6. Using the T-10 driver, remove the two screws (1) that secure the Power Switch (2) to the front-panel frame.
7. Remove the Power Switch.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for all screws is 9 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-27 Power Switch



A7 Real Time BBG Assembly (N5172B and N5182B Option 660)

Tools Required

- T-10 driver
- 5/16" open-ended wrench
- needle-nose pliers

Removal Procedure

Refer to [Figure 3-28](#) for this procedure.

1. Go to "[Assembly Installation and Removal Overview](#)" on page 3-2, and complete the "[Assembly Removal and Installation Procedure](#)" on page 3-3.
2. Disconnect the power cord.
3. Remove the covers from the signal generator. Refer to "[Outer Cover](#)" on page 3-5 and "[Inner Top Cover](#)" on page 3-7.
4. Place the signal generator flat with the A7 Real Time BBG assembly facing up and the rear panel facing you.
5. Refer to [Figure 3-28](#). Remove power cable W12 from the A7 Real Time BBG assembly.
6. Remove power cable W10 from the A1 Power Supply.
7. Remove the four screws (2) attaching the A8 Real Time BBG Jumper board. Unplug and remove the jumper board.
8. Refer to [Figure 3-28](#). Using the T-10 driver, remove the eight screws (1) attaching the A7 Real Time BBG assembly to the chassis deck.
9. Remove the A7 Real Time BBG assembly.

Replacement Procedure

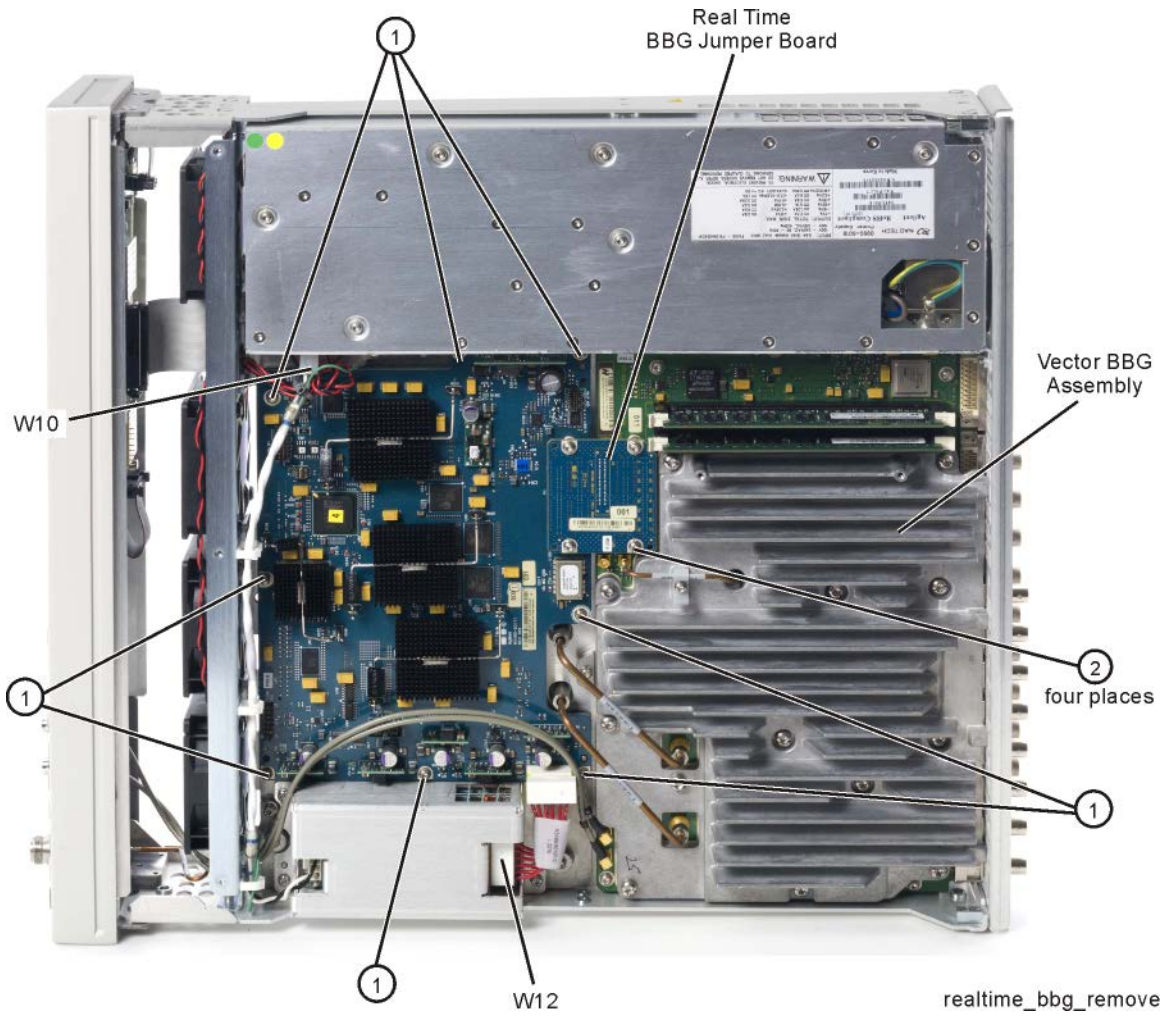
1. Reverse the order of the removal procedure.

NOTE When plugging in the A8 Real Time Jumper Board into the A2 and A7 boards, it is important to have all boards loose in order to ensure proper connector mating. Follow these steps:

- a. It will be necessary to loosen the five screws (2) and (3) (refer to [Figure 3-7](#)) attaching the A2 Vector BBG assembly to the chassis before plugging in the A8 Real Time Jumper Board.
- b. After the A8 Jumper board is plugged into both the A2 and A7 boards, tighten the four A8 board screws (2) first. Refer to [Figure 3-28](#).
- c. Then you can tighten the eight screws for the A7 board and the five screws for the A2 board.

-
2. Recommended torque for all T-10 screws is 9 in-lbs.
 3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-28 A7 Real Time BBG Assembly (N5172B, N5182B Option 660)



A7A1 Real Time Aux Power Supply

Tools Required

- T-10 driver
- needle-nose pliers

Removal Procedure

Refer to [Figure 3-29](#) for this procedure.

1. Go to ["Assembly Installation and Removal Overview"](#) on page 3-2, and complete the ["Assembly Removal and Installation Procedure"](#) on page 3-3.
2. Disconnect the power cord.
3. Remove the covers from the signal generator. Refer to ["Outer Cover"](#) on page 3-5 and ["Inner Top Cover"](#) on page 3-7.
4. Place the signal generator flat with the A7 Real Time BBG assembly facing up and the rear panel facing you.
5. Refer to [Figure 3-29](#). Remove power cable W12 from the A7A1 Real Time Aux Power Supply (1).
6. Remove power cable W10 from A7A1 Real Time Aux Power Supply assembly.
7. Refer to [Figure 3-30](#). Remove the four screws (1) attaching the A7A1 Real Time Aux Power Supply cover. Remove cover.
8. Refer to [Figure 3-31](#). Remove the four screws (2) attaching the A7A1 Real Time Aux Power Supply to the chassis.
9. Remove the A7A1 Real Time Aux Power Supply.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for all T-10 screws is 9 in-lbs.
3. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-29 A7 Real Time Aux Power Supply Cable Removal)

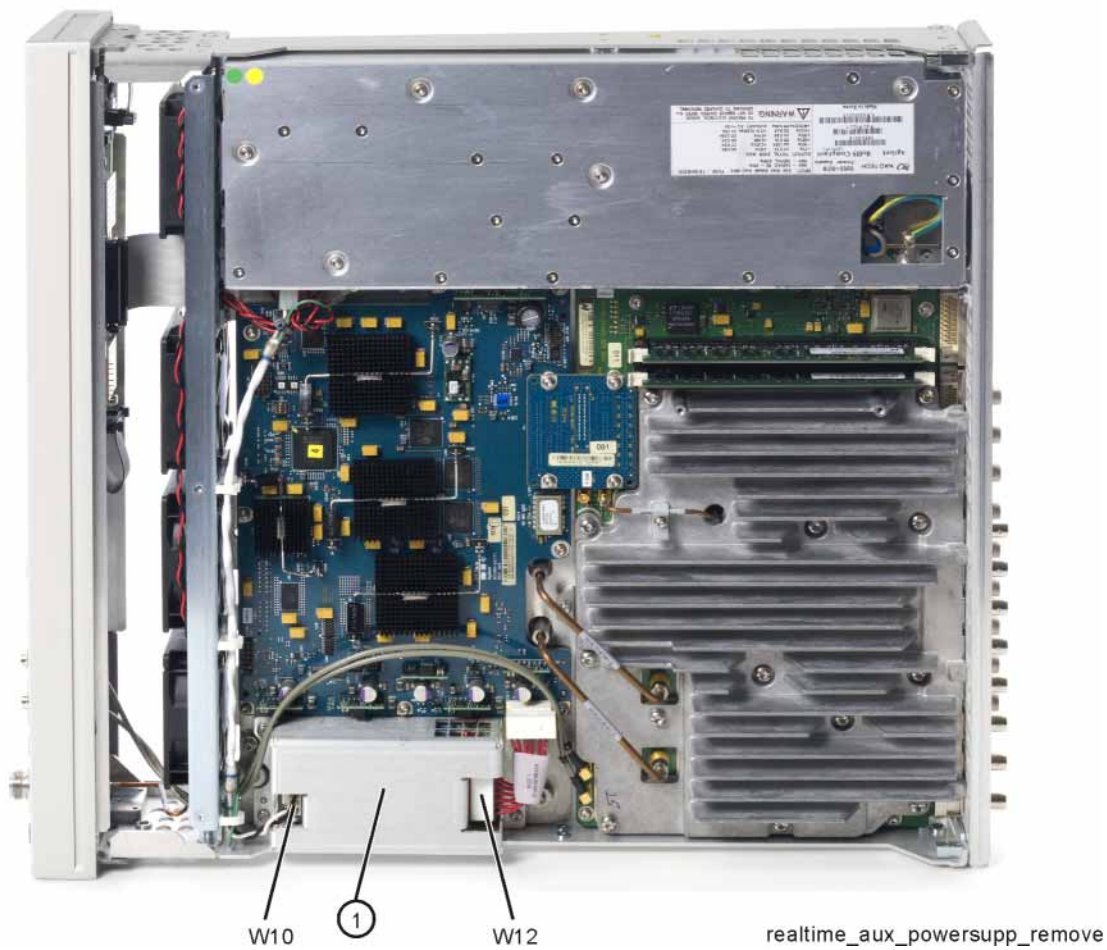


Figure 3-30 A7 Real Time Aux Power Supply Cover)

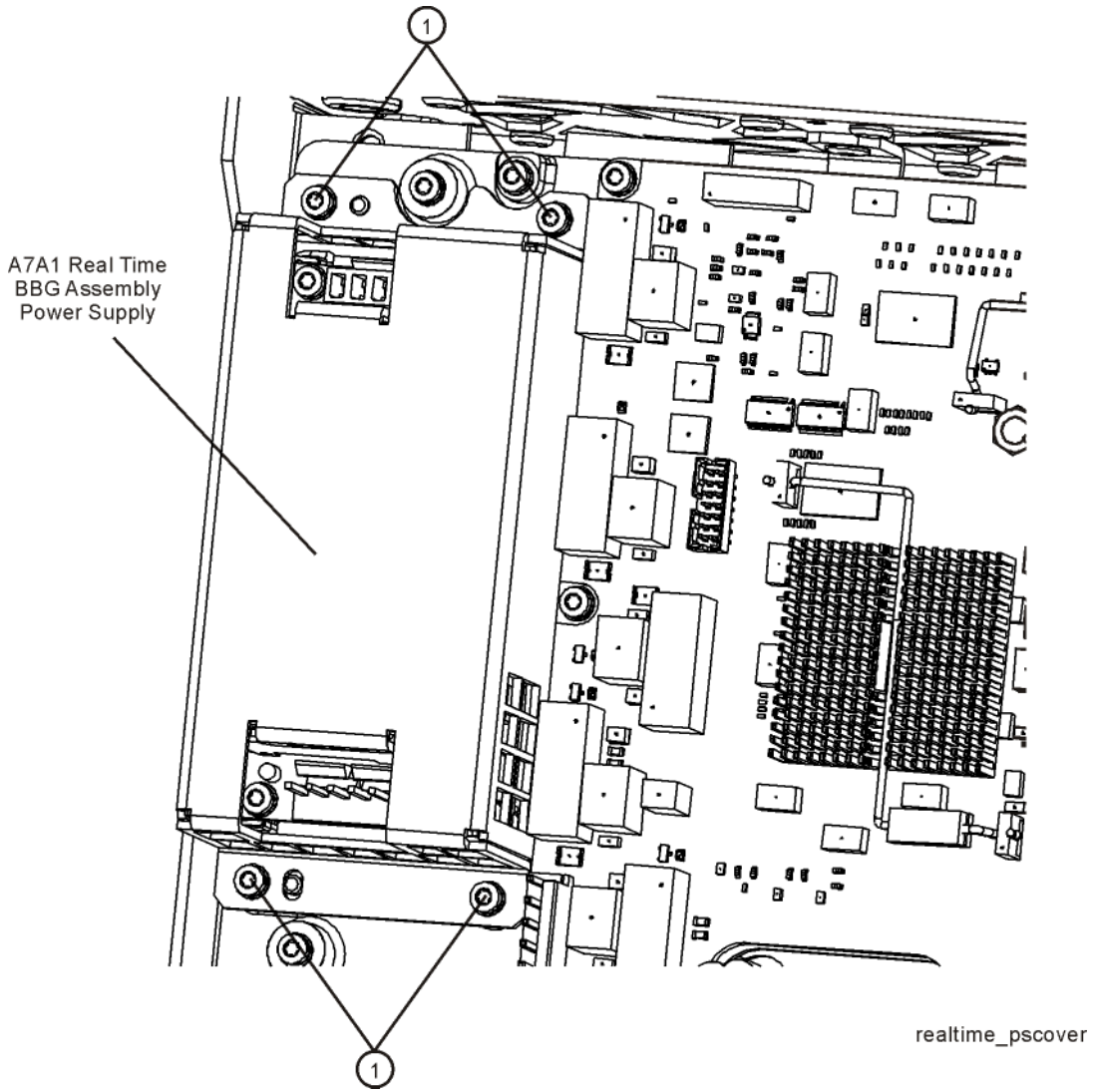
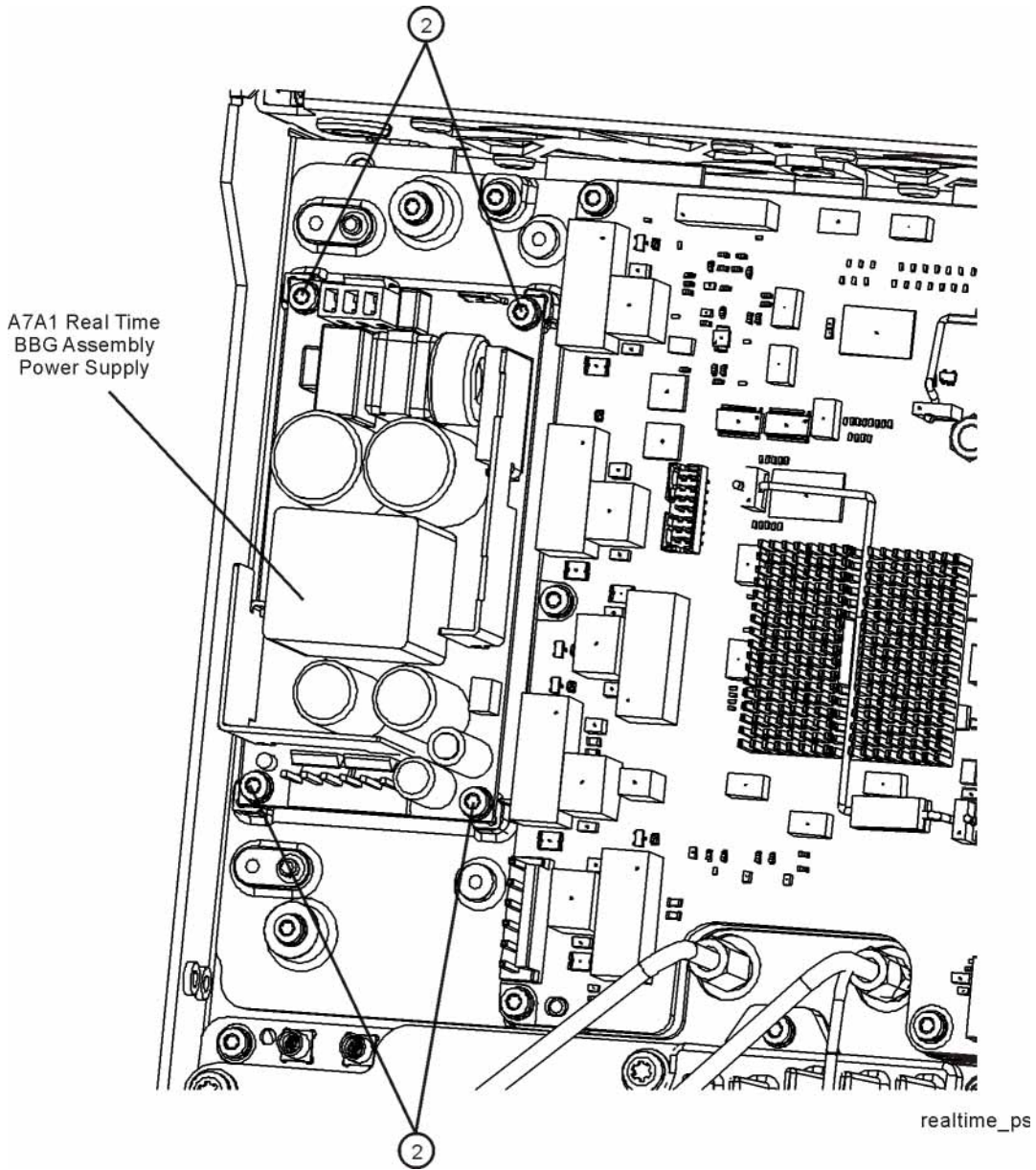


Figure 3-31 A7 Real Time Aux Power Supply



RF Connector

Tools Required

- T-10 driver
- 5/16" open-ended wrench

Removal Procedure

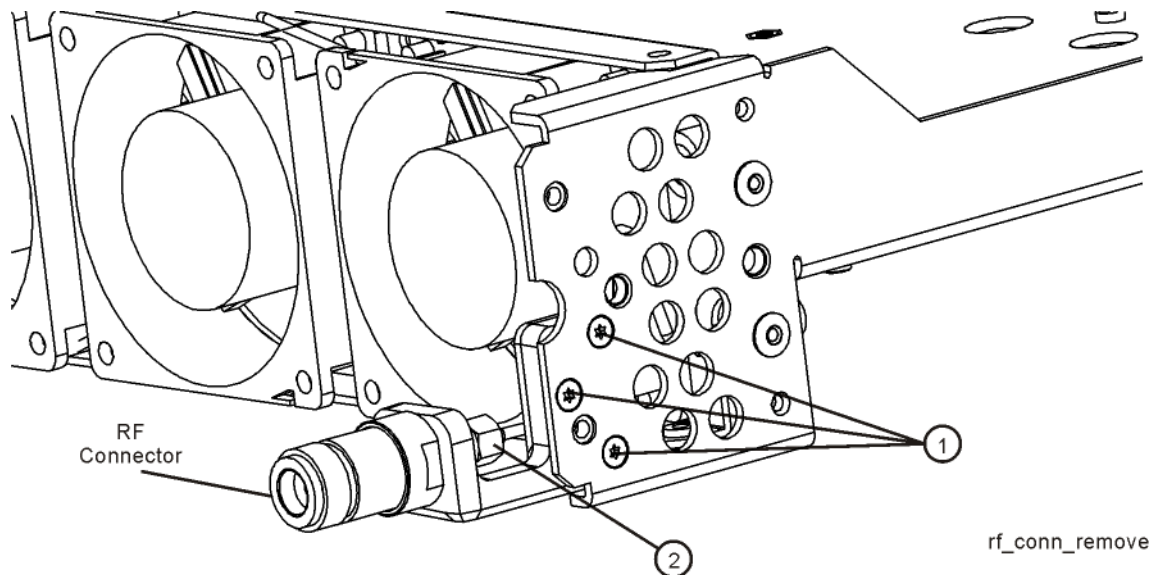
Refer to [Figure 3-32](#) for this procedure.

1. Go to ["Assembly Installation and Removal Overview"](#) on page 3-2, and complete the ["Assembly Removal and Installation Procedure"](#) on page 3-3.
2. Disconnect the power cord.
3. Remove the outer cover from the signal generator. Refer to ["Outer Cover"](#) on page 3-5.
4. Remove the front panel from the signal generator. Refer to ["Front-Panel"](#) on page 3-9.
5. Using the 5/16" open-ended wrench, disconnect W9 (2) from the RF connector.
6. Using the T-10 driver, remove the three screws (1) that attach the RF connector to the chassis.
7. Remove the RF connector.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for the three screws is 9 in-lbs.
3. Recommended torque for W9 cable is 9 in-lbs.
4. Perform the post-repair service procedure and performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-32 RF In Connector Removal



B1 thru B4 Fans

Tools Required

- T-10 driver
- T-20 driver
- needle-nose pliers

Removal Procedure

Refer to [Figure 3-33](#) and [Figure 3-34](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to "[Outer Cover](#)" on page 3-5, "[Inner Top Cover](#)" on page 3-7, and "[Inner Bottom Cover](#)" on page 3-8.

NOTE If you are replacing the B1 Fan, remove the A1 Power Supply. Refer to "[A1 Power Supply](#)" on page 3-11.

3. Place the signal generator flat with the A2 Vector BBG assembly facing up and the front-panel facing you.
4. Remove W10 at the A1 Power Supply to gain access to the fan cables.
5. Using the T-10 driver, press the connector latch to disconnect the fan cable (1) from the A1 Power Supply.
6. Use the T-20 driver to push the rivet (2) out until you can remove it with your fingers.
7. Remove the fan, releasing the fan cable from the cable clips.

Replacement Procedure

1. Reverse the order of the removal procedure.

NOTE To re-install the rivets, use the needle-nose pliers to depress the rivet tip before inserting it into the chassis hole.

2. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-33 B1 thru B4 Fans (1 of 2)

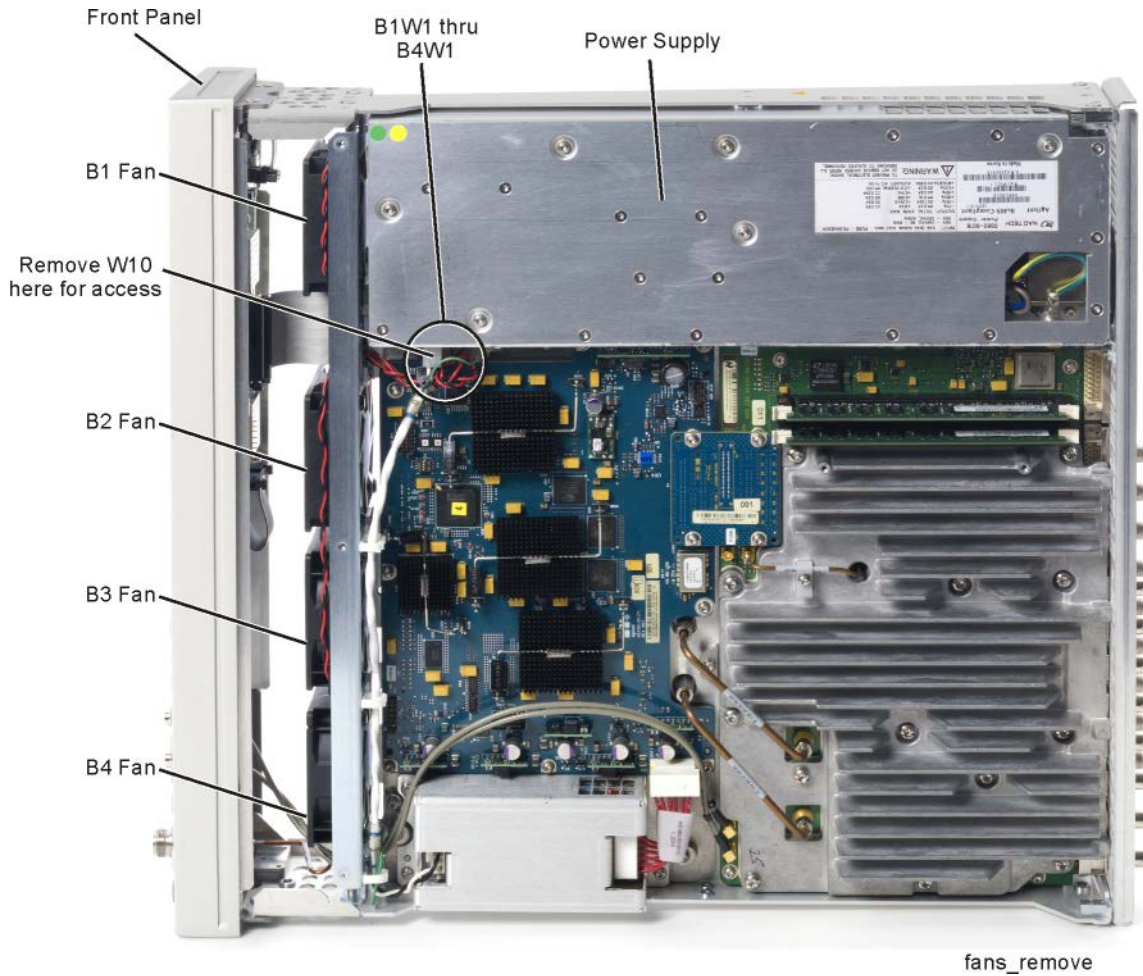


Figure 3-34 B1 thru B4 Fans (2 of 2)



fan_cable_rivet

Rear Panel (N5171B/81B)

Tools Required

- T-10 driver
- 5/8" hex-nut driver (p/n: 8710-2546)

Removal Procedure

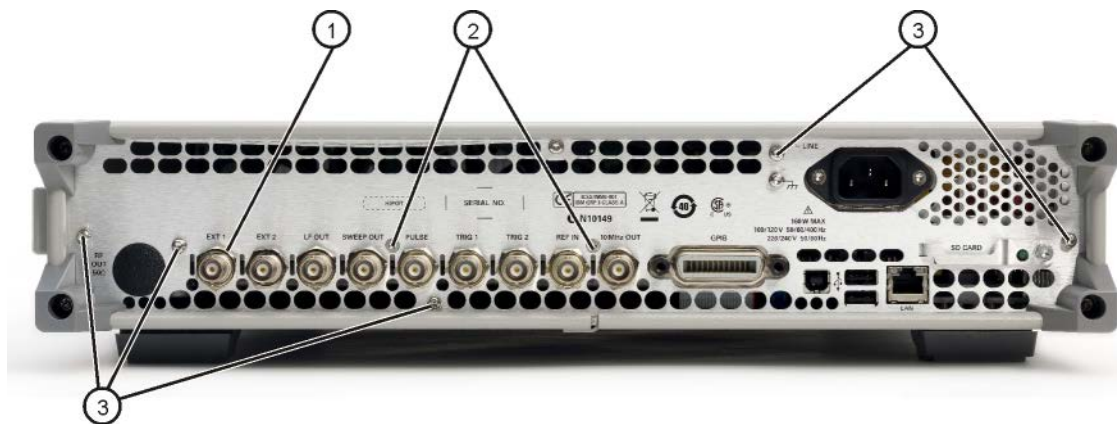
Refer to [Figure 3-35](#) for this procedure.

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to "Outer Cover" on page 3-5, "Inner Top Cover" on page 3-7, and "Inner Bottom Cover" on page 3-8.
3. Place the signal generator flat with the rear panel facing you.
4. Using the 5/8" hex-nut driver, remove the nuts and washers (1) securing the A3 RF assembly BNC's to the rear panel.
5. Using the T-10 driver, remove the two screws (2) and the five screws (3) securing the rear panel to the signal generator's chassis.
6. Pull the rear panel away from the signal generator's chassis.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Recommended torque for all screws is 9 in-lbs.
3. Recommended torque for all BNC connectors is 21 in-lbs.
4. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-35 N5171B/81B Rear Panel Removal



rearpanel_remove_71_81

Rear Panel (N5172B/82B)

Tools Required

- T-8 driver
- T-10 driver
- 5/8" hex-nut driver (p/n: 8710-2546)
- 5/16" open-ended wrench
- 1/4" hex-nut driver

Removal Procedure

1. Disconnect the power cord.
2. Remove the covers from the signal generator. Refer to "Outer Cover" on page 3-5, "Inner Top Cover" on page 3-7, and "Inner Bottom Cover" on page 3-8.
3. Place the signal generator flat with the rear panel facing you.
4. Refer to [Figure 3-36](#). Remove the Flash Memory card and cover.
5. If Option 012 is installed, use the 5/16" open-ended wrench to disconnect W14, W15, and W16 from the rear panel.
6. Refer to [Figure 3-37](#). use the 5/16" open-ended wrench to disconnect W13 from the rear panel.
7. Refer to [Figure 3-38](#) and [Figure 3-39](#). If Option 1EM is installed, use the 1/4" hex-nut driver to remove the two nuts and washers (2) securing the I and Q cables to the rear panel.
8. Refer to [Figure 3-39](#). Using the 5/8" hex-nut driver, remove the seventeen nuts and washers (1) securing the A2 Vector BBG assembly and A3 RF assembly BNC's to the rear panel.
9. Using the T-8 driver, remove the four screws (3) securing the A2 Vector BBG assembly connectors to the rear panel.
10. Using the T-10 driver, remove the two screws (4) and the eight screws (5) securing the rear panel to the signal generators chassis.
11. Pull the rear panel away from the signal generator's chassis.

Replacement Procedure

1. Reverse the order of the removal procedure.
2. Refer to [Figure 3-39](#). Recommended torque for the four screws (3) securing the A2 Vector BBG assembly connectors is 6 in-lbs.
3. Recommended torque for all other screws is 9 in-lbs.
4. Recommended torque for all BNC connectors is 21 in-lbs.
5. Perform the post-repair performance tests that pertain to this replacement procedure, see [Chapter 4, Post-Repair Procedures and Operational Performance Verification](#).

Figure 3-36 Flash Memory Card and Cover Removal

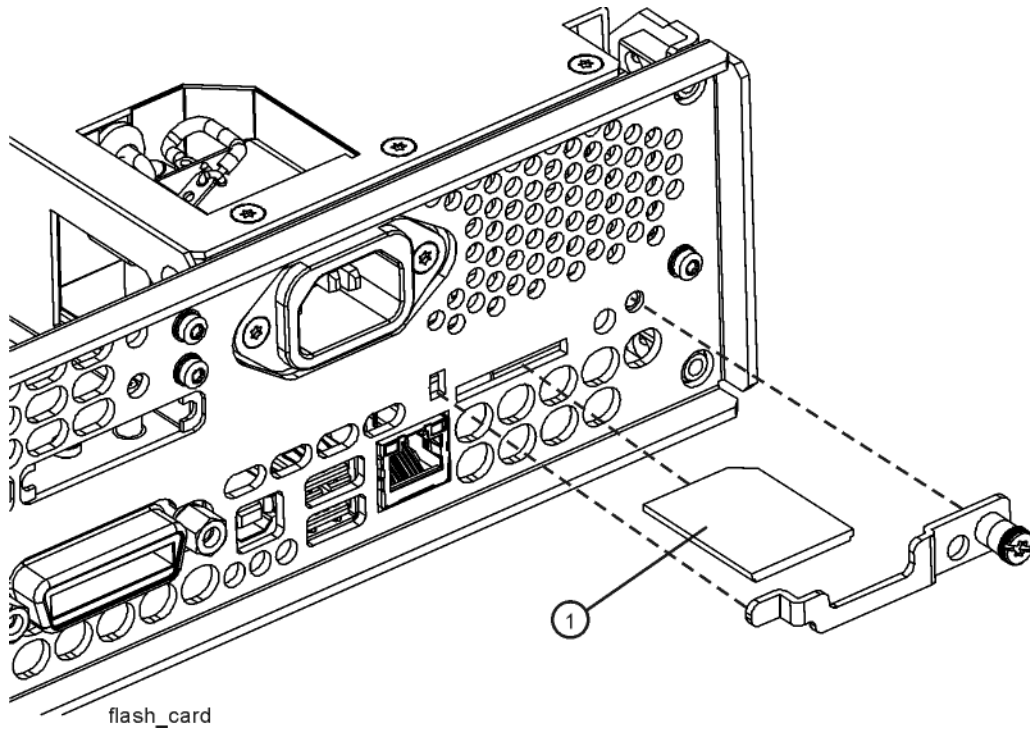


Figure 3-37 N5172B/82B Rear Panel Cables

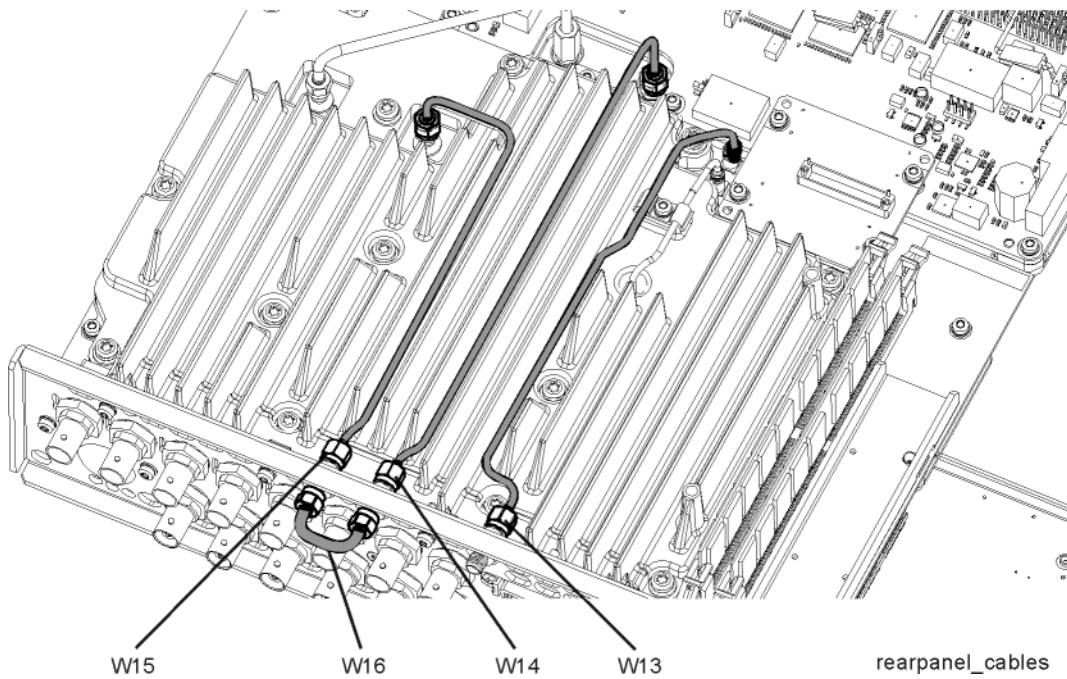


Figure 3-38 N5172B/82B Rear Panel I/Q Connector Removal

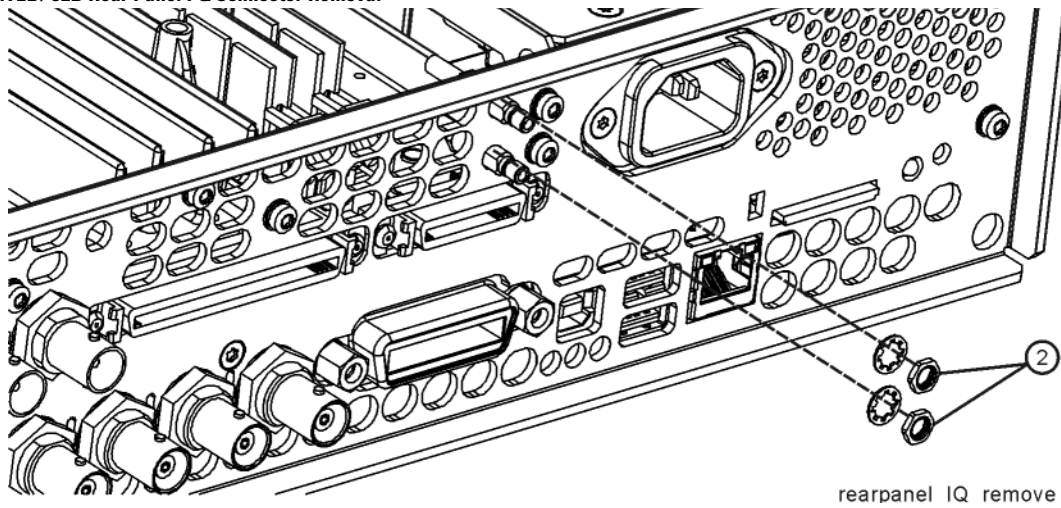
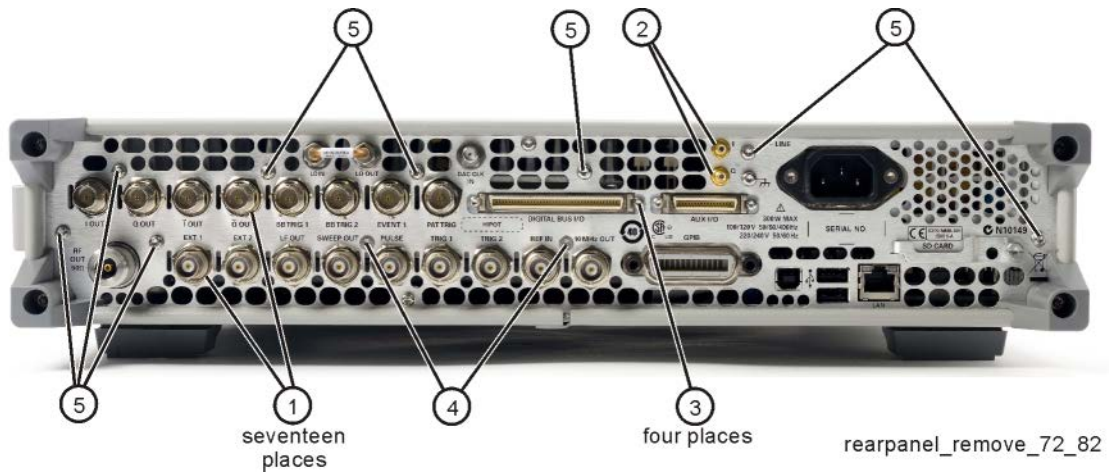


Figure 3-39 N5172B/82B Rear Panel Removal



4 Post-Repair Procedures and Operational Performance Verification

Post Repair Procedures

CAUTION After changing an assembly, but before performance verification, Agilent recommends that the most recent firmware is loaded into the instrument.

To avoid internal calibration failures and potential post-repair errors, before removing any instrument assembly, the instrument's static and dynamic arrays must be configured for the exchange of assemblies. The process to do the appropriate configuration is performed automatically by the MXG with the [Assembly Installation and Removal Overview](#) front panel softkeys. Refer to the [Assembly Installation and Removal Overview](#) and to the [Figure 3-1, Hardware Assembly Installation and Removal Softkeys](#), on page 3-2.

For the instrument to meet performance specifications and for accurate self-test results, allow a warm up period of 45 minutes within an operational temperature range of 0 to 55 °C. For more information, refer to the MXG signal generator *Data Sheet*.

Service Procedure

CAUTION After replacing an assembly, it is critical to do a backup or restore in the instrument—as indicated in the tables below—to return the instrument to full configuration capability. Refer to [Table 4-1](#).

After replacing an assembly, check the following table to determine which front panel service procedure should be run.

- If you upgraded your firmware to B.01.10 or later, refer to [Table 4-1](#).

Table 4-1 Assembly Replaced with the latest firmware installed – Restore/Backup

Condition	Procedure
Installed new A5 CPU assembly. With Error: “617 Configuration Error: The instrument has no frequency range option installed. Use the service procedure to recover instrument licenses from the backup.”	Turn the signal generator off. Press and hold Preset , turn the signal generator on, continue to hold Preset for ~20 seconds. Scroll down to Start Main FW Service menu. Press Select . Press: Continue > Next Page > Restore License Data from Backup > Done Cycle the power on the signal generator. If this procedure fails, the signal generator may be limited to 1 GHz and all options could be missing. Contact an Agilent Technologies service support person for assistance.

Table 4-1 Assembly Replaced with the latest firmware installed – Restore/Backup (Continued)

Condition	Procedure
<p>Installed new A3 RF assembly.</p> <p>With Error:</p> <p>“617 Configuration Error: Instrument licenses have not been copied to the backup storage. Use the service procedure to copy license keys to backup storage.”</p>	<p>Turn the signal generator off.</p> <p>Press and hold Preset, turn the signal generator on, continue to hold Preset for ~20 seconds.</p> <p>Scroll down to Start Main FW Service menu.</p> <p>Press Select.</p> <p>Press: Continue > Next Page > Backup License Data > Done</p> <p>Cycle the power on the signal generator.</p> <p>If this procedure fails, the signal generator may be limited to 1 GHz and all options could be missing. Contact an Agilent Technologies service support person for assistance.</p>
<p>Installed an A3 RF assembly that was previously used in another instrument.</p> <p>With Error:</p> <p>“617 Configuration Error: The backup memory contains license keys for serial number <serial number>. Use the service procedure to overwrite the backup memory.”</p>	<p>If this is a temporary change, ignore the message.</p> <p>If this is meant to be a permanent change, Agilent does not support it. A new A3 RF assembly must be installed.</p>
<p>Installed an A5 CPU assembly that was previously used in another instrument.</p> <p>With Error:</p> <p>“617 Configuration Error: The backup memory contains license keys for serial number <serial number>. Use the service procedure to overwrite the backup memory.”</p>	<p>If this is a temporary change, ignore the message.</p> <p>If this is meant to be a permanent change, Agilent does not support it. A new A5 CPU must be installed.</p>

Post-Repair Overview

N5171B/72B/81B/82B

Replacement assemblies are fully calibrated and do not require any adjustments. The factory completes a performance test on each replacement assembly, so a comprehensive performance test is *not* required by the customer upon receipt and installation of an assembly. A manual operational performance verification is *recommended* to check basic operation.

Manual Performance Tests

To ensure the signal generator is meeting all published specifications, [Table 4-2](#) lists the recommended manual operational performance verification tests to be performed after a specific assembly has been repaired or replaced.

Table 4-2 Manual Operational Performance Verification Tests

Manual Operational Performance Verification Tests	Replaced Assembly									
	Key Pad	LCD Display	A1 Power Supply	A2 Vector Module (N5172B/82B only)	A3 RF Assembly	A3 RF Assembly (N5181B/82B)	A4 Memory Chip (N5172B/82B only)	A5 CPU	A6 Front Panel Interface Scan Assembly	A7 Real Time BBG Assembly
The following performance verification tests are listed in the order that they should be performed.										
I/Q Calibration (N5172B/82B only) on page 4-6				✓	✓					
Enhanced Factory Calibration on page 4-6				✓	✓					
Running Self Test on page 4-6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Relative Frequency Range and Accuracy Check on page 4-8				✓	✓	✓				
Leveled Output Power on page 4-10				✓	✓	✓				
Phase Noise ^a (N5181B/82B only)						✓				

^a The Phase Noise test procedure is available as part of the N5181B and N5182B calibration software.

If a manual performance verification test fails:

1. Verify that the test setup is correct.
 - For I/Q Calibration and Self Tests
 - Confirm that all external cables, including GPIB, LAN, and USB cables, are disconnected from the signal generator.
 - For Relative Frequency Range and Accuracy Verification
 - Verify that the cables are connected correctly.
 - Verify that the spectrum analyzer is set to external reference.
 - For Leveled Output Accuracy Verification
 - Verify you are using the appropriate power sensor.
 - Normally, power sensor calibration factors are automatically downloaded to the power meter when the power meter turns on. If this does not occur, manually enter the correct calibration factors for the power sensor you are using.
 - Verify the power sensor is properly calibrated to the power meter.
2. If the tests setups are correct, go to [“Troubleshooting Performance Test Problems” on page 1-53](#).

Automated Performance Verification Tests

For the N5171B/72B/81B/82B: [Table 4-3](#) lists the automated service software performance verification tests that should be performed to confirm the instrument still meets its warranted specifications. Run these tests at least every 36 months or more often as necessary.

Download the service software from <http://www.agilent.com/find/calibrationsoftware> or you can purchase the software on a CDROM (a license is required to run the calibration software).

If an automated performance verification test fails, go to [“Troubleshooting Performance Test Problems”](#) on page 1-53 to troubleshoot the instrument failure.

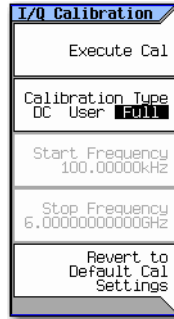
Table 4-3 Automated Performance Verification Tests

N5171B N5181B	N5172B N5182B	Automated performance verification tests are listed in the order they should be performed to prevent invalid results and to minimize changes in test equipment configurations.
	✓	Digital Modulation Power Level Accuracy Relative to
✓	✓	Maximum Leveled Power
✓	✓	Power Level Accuracy
✓	✓	Harmonic Spurious
✓	✓	Sub-Harmonic Spurious
✓	✓	Non-Harmonic Spurious
	✓	WCDMA Adjacent Channel Power
✓	✓	FM Deviation Accuracy
✓	✓	FM Distortion
	✓	Digital Modulation Quality
✓	✓	DCFM Carrier Offset
✓	✓	Amplitude Switching Speed
✓	✓	Frequency Switching Speed
✓	✓	Internal Rise Fall Time (Option UNW)

I/Q Calibration (N5172B/82B only)

When you perform an I/Q calibration, that calibration data takes precedence over the factory-supplied calibration data. The calibration routines improves performance that may degrade over time or due to temperature changes.

Press **I/Q > I/Q Calibration > Calibration Type Full**



Enhanced Factory Calibration

Firmware must be updated to the latest firmware release and the Enhanced Factory Calibration must be run once before you can turn on the I/Q Internal Channel Corrections (Factory Correction Type). Optionally, this calibration procedure can be run anytime for new calibration data.

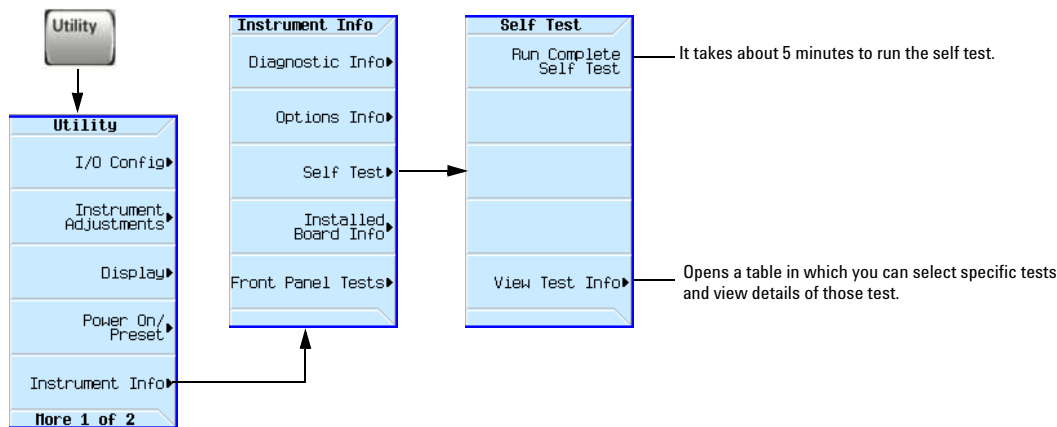
NOTE Depending on the equipment you use, the Enhanced Factory Calibration may take up to four hours to complete.

On the signal generator:

1. Press **Utility > More > Service > I/Q Int Channel Correction Calibrations > Enhanced Factory Calibration**.
2. Follow the instructions on the signal generator display to complete the calibration.

Running Self Test

Self Test is a series of internal tests of signal generator functions. If this test fails, refer to [“Self Test Failure” on page 7](#) for further instructions.



Use the following procedure to run self test:

1. Disconnect all external cables, including GPIB, LAN, and USB cables.
2. Preset the signal generator: Press **Preset > Utility > Instrument Info > Self Test**.

The following message appears:

- The current status of the self-test is: Incomplete. Not all tests have been run.

3. Press **Run Complete Self Test**.

An activity bar displays on the screen indicating the test progress.

If you press **Abort** while self-test is running, the following message displays:

- The current status of the self-test is: Incomplete. Not all tests have been run.

When self-test completes, one of the following messages displays:

- The current status of the self-test is: Passed
- The current status of the self-test is: Failure. One or more tests have failed. System diagnostics indicate this test as the root failure: xxx

If the signal generator fails only one test, the title of the failed test displays. If the signal generator fails more than one test, the test number of the most significant failure (root failure) displays.

NOTE The root failure is the error to report to Agilent Support. Refer to [“Contacting Agilent Technologies” on page 1-2](#).

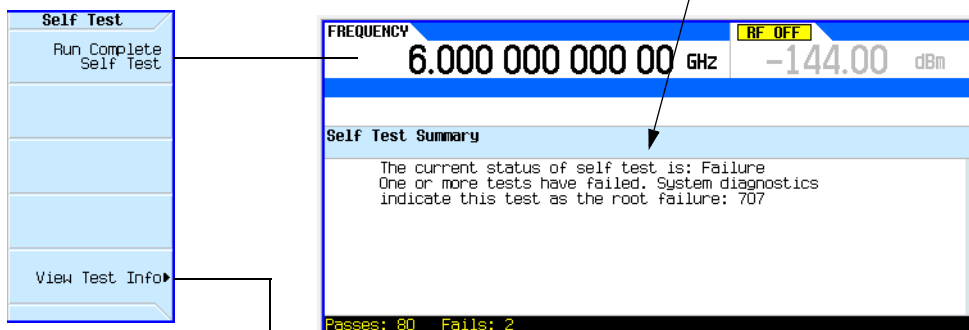
Self Test Failure

1. Confirm that all external cables, including GPIB, LAN, and USB cables, are disconnected from the signal generator and repeat the self-test.
2. If the self-test continues to fail, the signal generator requires service. If you are unable to service the signal generator, send it to an Agilent service center for repair. Include a detailed description of the most significant failure (root failure) and any displayed error messages. Also include the model, serial number, installed options, and firmware version.

See [“Returning a Signal Generator for Service” on page 1-2](#) for return instructions.

Viewing Test Results

Utility > Instrument Info >
Self Test



This information is *supplemental*. Please disregard unless Agilent specifically requests this information.

Relative Frequency Range and Accuracy Check

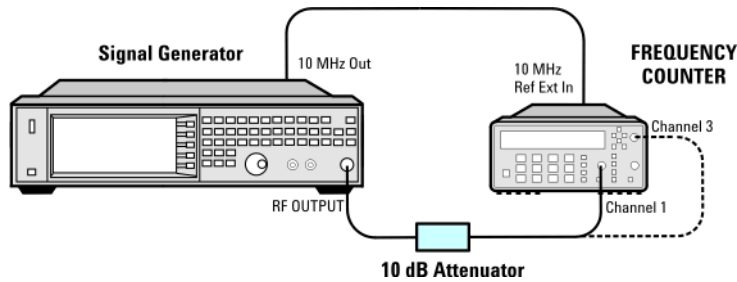
The frequency range is tested by determining the frequency accuracy relative to the timebase at the frequency limits of the signal generator. This test can be performed with a frequency counter that meets the frequency accuracy limits in [Table 4-4](#).

Test Equipment	Recommended Model
Frequency Counter	Agilent 53131A/32A Universal Counter

Frequency Counter Procedure

Test Setup

1. Connect the equipment as shown.



2. Preset the signal generator: Press **Preset**.
3. Turn modulation off: Press the **Mod On/Off** so that the MOD On/Off LED turns off.
4. Set the amplitude:
Press **Amplitude** and enter 0 dBm.
5. Turn RF on: Press **RF On/Off** so that the RF On/Off LED lights.
6. Verify that the frequency counter is locked to the 10 MHz external reference frequency (± 1 Hz).
7. For maximum accuracy, set the gate time on the frequency counter to >5 seconds.
(For example, press **Gate & ExtArm** twice and use the arrow keys to set the value.)
8. Set the frequency: Press **Frequency** and set the signal generator to the first frequency listed in [Table 4-4](#).
9. Confirm that the measured frequency is within the limits listed.
10. Repeat step 8 and step 8 for all of the frequencies in the table that are within the frequency range of your signal generator.

NOTE For frequencies <200 MHz, use Channel 3 on the frequency counter (press **Freq Ratio** until CH3: displays).

Table 4-4 Frequency Accuracy Limits

Frequency (MHz)	Limit (Hz)
0.01 MHz	±1
0.1 MHz	±1
200 MHz	±1
300 MHz	±1
500 MHz	±1
1000 MHz	±1
2000 MHz	±1
3100 MHz	±1
6000 MHz	±1

Troubleshooting Problems with the Frequency Accuracy Check

- Verify the cables are connected correctly.
- If you are using a frequency counter, verify that you are using the correct channel for the frequencies you are measuring.

Leveled Output Power

This test verifies that the CW output power from the signal generator is within defined limits. The following table lists the preferred equipment for this test.

Test Equipment	Recommended Model
Power Meter	Agilent E4418B or E4419A/B E-Series or equivalent
Power Sensor, Input: Type-N (m)	Agilent E9304A

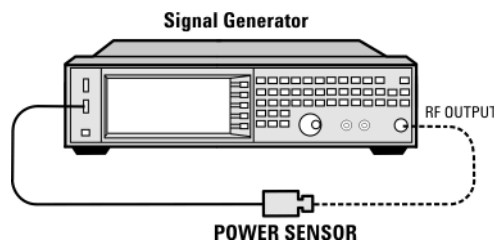
- [N5171B/81B Test Procedure on page 4-10](#)
- [N5171B/81B Alternative Test Procedure on page 4-11](#)
- [N5172B/82B Test Procedure on page 4-13](#)
- [N5172B/82B Alternative Test Procedure on page 4-16](#)

If this test fails, refer to “Troubleshooting Problems with the Output Power Check” on page 17 for further instructions.

N5171B/81B Test Procedure

Test Setup

1. Connect the equipment as shown:



2. Zero and calibrate the power sensor.

NOTE USB U2000A Series Power Sensors do not require the sensor to be zeroed or calibrated.

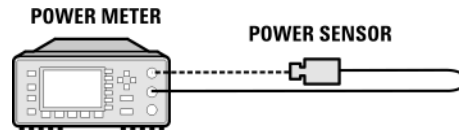
3. Connect the power sensor to the RF output of the signal generator. Once the LED on the power sensor turns off, the sensor is ready to measure.
4. Preset the signal generator: Press **Preset**
5. Turn the internal power meter channel on: Press **Aux Fctn** > **Power Meter Measurements** > **Channel A On** (or **Channel B On**).
6. Turn RF on: Press **RF On/Off** so that the RF On/Off LED lights.
7. Turn modulation off: Press **Mod On/Off** so that the **Mod On/Off** LED turns off.
8. Set the frequency: Press **Frequency** and enter the first frequency value listed in [Table 4-5](#).
9. Set the amplitude: Press **Amplitude** and enter the amplitude value for that frequency.
10. Measure the output power level.
11. Repeat steps 8 through 10 to measure power at each of the frequencies listed in [Table 4-5](#).
12. Confirm that the measured power levels are within the limits listed in the table.

N5171B/81B Alternative Test Procedure

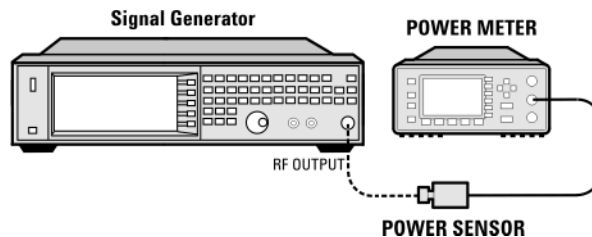
If a USB power sensor is not available, use a power meter to measure the output power of the signal generator.

Test Setup

1. Zero and calibrate the power sensor to the power meter:



2. Connect the equipment as shown:



3. Preset the signal generator: Press **Preset**.
4. Turn RF on: Press **RF On/Off** so that the RF On/Off LED lights.
5. Turn modulation off: Press **Mod On/Off** so that the Mod On/Off LED turns off.
6. Set the frequency: Press **Frequency** and enter the first frequency value listed in [Table 4-5](#).
7. Set the amplitude: Press **Amplitude** and enter the amplitude value for that frequency.
8. Configure the power meter for the measurement.
 - a. Press the **Frequency Cal Fac** button on the power meter.
 - b. Select a power meter channel (if applicable).
 - c. Use the arrow keys to enter the frequency at which to measure the power.
9. Measure the output power level.
10. Repeat steps 6 through 9 to measure power at each of the 15 frequencies listed in [Table 4-5](#).
11. Confirm that the measured power levels are within the limits listed in the table.

NOTE Limit values are due to power meter uncertainty.

Table 4-5 Leveled Output Power Limits

N5171B/81B Output Power		
Frequency	Amplitude (dBm)	Limits (dB)
100 kHz	7	±0.6
1 MHz	7	±0.8
50 MHz	7	±0.8
125 MHz	7	±0.8
275 MHz	7	±0.8
338 MHz	7	±0.8

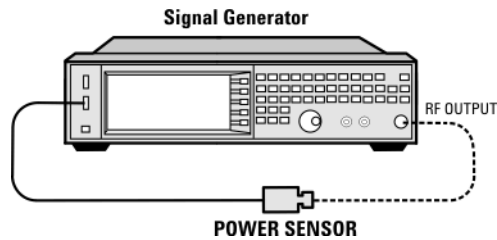
Table 4-5 Leveled Output Power Limits

N5171B/81B Output Power		
Frequency	Amplitude (dBm)	Limits (dB)
425 MHz	7	±0.8
538 MHz	7	±0.6
675 MHz	7	±0.6
850 MHz	7	±0.6
1075 MHz	7	±0.6
1350 MHz	7	±0.6
1700 MHz	7	±0.6
2150 MHz	7	±0.6
2700 MHz	7	±0.6
3400 MHz	7	±0.6
4300 MHz	7	±0.6
5400 MHz	7	±0.6

N5172B/82B Test Procedure

Test Setup

1. Connect the equipment as shown:



2. Zero and calibrate the power sensor.

NOTE USB U2000A Series Power Sensors do not require the sensor to be zeroed or calibrated.

3. Connect the power sensor to the RF output of the signal generator. Once the LED on the power sensor turns off, the sensor is ready to measure.
4. Preset the signal generator: Press **Preset**
5. Turn the internal power meter channel on: Press **Aux Fctn** > **Power Meter Measurements** > **Channel A On** (or **Channel B On**).
6. Turn RF on: Press **RF On/Off** so that the RF On/Off LED lights.
7. Turn modulation off: Press **Mod On/Off** so that the **Mod On/Off** LED turns off.
8. Set the frequency: Press **Frequency** and enter the first frequency value listed in [Table 4-6](#).
9. Set the amplitude: Press **Amplitude** and enter the amplitude value for that frequency.
10. Measure the output power level.
11. Repeat steps 8 through 10 to measure power at each of the frequencies listed in [Table 4-6](#).
12. Confirm that the measured power levels are within the limits listed in the table.

Without Modulation

1. Set the signal generator frequency to the first value listed in [Table 4-6](#):
 Press **Frequency > 50 > MHz**.
2. Set the amplitude to 7 dBm:
 Press **Amplitude > 7 > dBm**.
3. If using a power meter, configure the power meter as follows:
 - a. On the power meter, press the **Frequency Cal Fac** button.
 - b. If applicable, select a power meter channel.
 - c. Use the arrow keys to enter the frequency at which to measure the power.
4. Measure the output power level.
5. Repeat steps 1 through 4 for the remaining frequencies in the table, and confirm that the power level at each point is within limits.

Table 4-6 Output Power without Modulation

N5172B/82B Output Power without Modulation		
Frequency (MHz)	Amplitude (dBm)	Limits (dB)
50	7	±0.6
100	7	±0.6
250	7	±0.6
338	7	±0.6
425	7	±0.6
538	7	±0.6
675	7	±0.6
850	7	±0.6
1075	7	±0.6
1350	7	±0.6
1700	7	±0.6
2150	7	±0.6
2700	7	±0.6
3400	7	±0.6
4300	7	±0.6
5400	7	±0.6

With Modulation

1. Preset the signal generator: Press **Preset**.
2. Select the factory-supplied waveform SINE_TEST_WFM:
 - a. Press **Mode > Dual ARB > Select Waveform**.
 - b. Highlight the SINE_TEST_WFM waveform.
 - c. Press **Select Waveform**.

3. Turn the arbitrary waveform player on: Press the **ARB** softkey to highlight **On**.
4. Set the frequency to the first value listed in [Table 4-7](#):
Press **Frequency > 50 > MHz**.
5. Set the amplitude to 7 dBm:
Press **Amplitude > 7 > dBm**.
6. If using a power meter, configure the power meter as follows:
 - a. On the power meter, press the **Frequency Cal Fac** button.
 - b. Select a power meter channel (if applicable).
 - c. Use the arrow keys to enter the frequency at which to measure the power.
7. Measure the output power.
8. Repeat steps 4 through 7 for the remaining frequencies listed in [Table 4-7](#), and confirm that the power level at each point is within limits.

Table 4-7 Output Power with Modulation

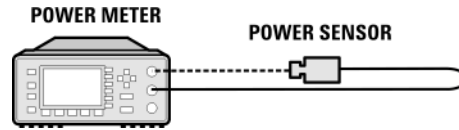
N5172B/82B Output Power with Modulation		
Frequency (MHz)	Amplitude (dBm)	Limits (dB)
50	7	±1.05
100	7	±1.05
250	7	±1.05
323	7	±1.05
512	7	±1.05
814	7	±1.05
1275	7	±1.05
2025	7	±1.05
2750	7	±1.05
3750	7	±1.05
5250	7	±1.05

N5172B/82B Alternative Test Procedure

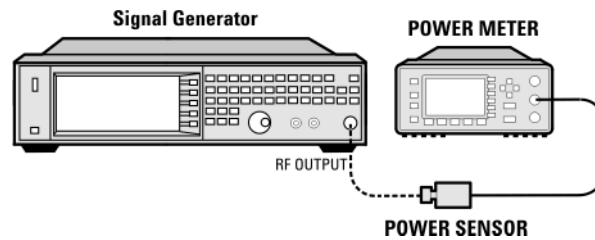
If a USB power sensor is not available, use a power meter to measure the output power of the signal generator.

Test Setup

1. Zero and calibrate the power sensor to the power meter:



2. Connect the equipment as shown below:



3. Preset the signal generator: Press **Preset**.
4. Turn RF on: Press **RF On/Off** so that the RF On/Off LED lights.
5. Turn modulation off:
Press **Mod On/Off** so that the Mod On/Off LED turns off.
6. Continue the procedure from [“Without Modulation” on page 4-14](#).
7. Continue the procedure from [“With Modulation” on page 4-14](#) to complete the output power measurements of the N5172B/82B.

Troubleshooting Problems with the Output Power Check

- Verify that you are using the appropriate power sensor.
- Normally, power sensor calibration factors are automatically downloaded to the power meter when the power meter turns on. If this does not occur, manually enter the correct calibration factors for the power sensor you are using.
- Verify that the power sensor is properly calibrated to the power meter.

5 Safety and Regulatory

This chapter provides information on the following:

- “General Safety Considerations” on page 5-1
- “Lithium Battery Disposal” on page 5-2
- “Assistance” on page 5-2
- “Certification” on page 5-2

The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and its meaning before operating this instrument.

WARNING Warning denotes a hazard. It calls attention to a condition or situation that could result in personal injury or loss of life. Do not proceed beyond a warning until you fully understand the indicated conditions or situations.

CAUTION Caution calls attention to a condition or situation that could result in damage to or destruction of the signal generator, or in the loss of a user’s settings or data. Do not proceed beyond a caution until you fully understand the indicated conditions..

General Safety Considerations

The following safety notes apply specifically to signal generators. These notes also appear in other chapters of this service guide as required.

WARNING These servicing instructions are for use by qualified personal 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 before starting to open.

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

WARNING The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from its power supply.

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.

WARNING Replace battery only with the same or equivalent type recommended. Discard used batteries according to manufacturer’s instructions.

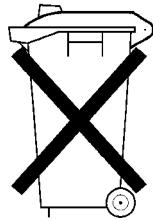
WARNING If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

CAUTION Many of the assemblies in this instrument are very susceptible to damage from electrostatic discharge (ESD). Perform service procedures only at a static-safe workstation and wear a grounding strap.

Lithium Battery Disposal

When the battery on the A14 CPU is exhausted and/or ready for disposal, dispose of it according to your country's requirements. You can return the battery to your nearest Agilent Technologies Sales and Service office for disposal, if required.

Figure 5-1



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

sk780a

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products. For any assistance, contact your nearest Agilent Technologies sales and service office.

Certification

Agilent Technologies Company certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

6 Instrument History

How to Use this Chapter

This chapter documents changes that have been made to the N518xB signal generators. If your signal generator is an early version these changes may affect it.

May 1, 2012

Initial release of the N5171B/72B, N5181B/82B MXG Signal Generators.

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