

**Service Guide**  
**N5264A**  
**Agilent Technologies**  
**PNA-X Measurement Receiver**



**Agilent Technologies**

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## Certification

Agilent Technologies, Inc. certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies, Inc. 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.

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## Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies, Inc. products. For information about these agreements and for other assistance, contact Agilent. Refer to [“Contacting Agilent” on page 2-9](#).

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## Safety and Regulatory Information

The safety and regulatory information pertaining to this product is located in [Chapter 1, “Safety and Regulatory Information.”](#)

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## Safety Notes

The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and its meaning before operating this instrument. All pertinent safety notes for using this product are located in [Chapter 1, “Safety and Regulatory Information.”](#)

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<b>WARNING</b>	<b>Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.</b>
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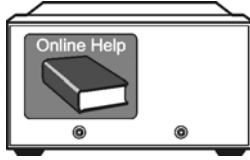
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<b>CAUTION</b>	Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.
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## Documentation Map



The online Help files are embedded in the instrument, offering quick reference to programming and user documentation. From the Help drop-down menu, you can access the Help system in five different languages. Also, you can view a product overview multimedia presentation and access the measurement receiver's Web page.



The *Installation and Quick Start Guide* helps you to quickly familiarize yourself with the measurement receiver. Procedures are provided for installing, configuring, and verifying the operation of the measurement receiver.

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## Printing Copies of Documentation from the Web

To print copies of documentation from the Web, download the PDF file from the Agilent web site:

- Go to <http://www.agilent.com>.
- Enter the document's part number (located on the title page) in the **Quick Search** box.
- Click **GO**.

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# **1 Safety and Regulatory Information**

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## Information in This Chapter

This chapter provides safety information that will help protect you and your measurement receiver. It also contains information that is required by various government regulatory agencies.

### Chapter One at-a-Glance

Section Title	Summary of Content	Start Page
<a href="#">Safety Symbols</a>	Descriptions of <b>CAUTION</b> and <b>WARNING</b> symbols used throughout this manual.	<a href="#">Page 1-3</a>
<a href="#">General Safety Considerations</a>	A list of safety points to consider when servicing your measurement receiver.	<a href="#">Page 1-3</a>
<a href="#">Electrostatic Discharge Protection</a>	A discussion of electrostatic discharge (ESD) and related recommendations and requirements for ESD protection.	<a href="#">Page 1-6</a>
<a href="#">Regulatory Information</a>	Definitions of instrument markings. Instructions for disposing of the measurement receiver's lithium battery.	<a href="#">Page 1-7</a>

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## Safety Symbols

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

---

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

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

---

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## General Safety Considerations

### Safety Earth Ground

---

**WARNING** This is a Safety Class I 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 instrument, will make the instrument dangerous. Intentional interruption is prohibited.

---

---

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

---

### Before Applying Power

---

**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.

---

---

**WARNING** If an instrument handle is damaged, you should replace it immediately. Damaged handles can break while you are moving or lifting the instrument and cause personal injury or damage to the instrument.

---

---

**CAUTION** This instrument has autoranging line voltage input. Be sure the supply voltage is within the specified range.

---

---

**WARNING** **Supply voltages which oscillate between the two normal input ranges of the autoranging line voltage input will damage the power supply. In rare cases, this damage has become a user safety concern. If unstable power levels are expected, the instrument's input power must be buffered by a line conditioner.**

---

---

**CAUTION** This product is designed for use in Installation Category II and Pollution Degree 2.

---

---

**CAUTION** Do not operate the instrument with the outer cover removed for more than 30 minutes, as this could cause the instrument to overheat which could result in costly damage.

---

---

**CAUTION** **Ventilation Requirements:** When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

---

## Servicing

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

---

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

---

---

**WARNING** **Procedures described in this document may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.**

---

---

**CAUTION** Do not operate the instrument with the outer cover removed for more than 30 minutes, as this could cause the instrument to overheat which could result in costly damage.

---

---

**WARNING**      **No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.**

---

---

**WARNING**      **The opening of covers or removal of parts may expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**

---

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

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**NOTE**          There are no replaceable fuses in the mains input or within the power supply assembly.

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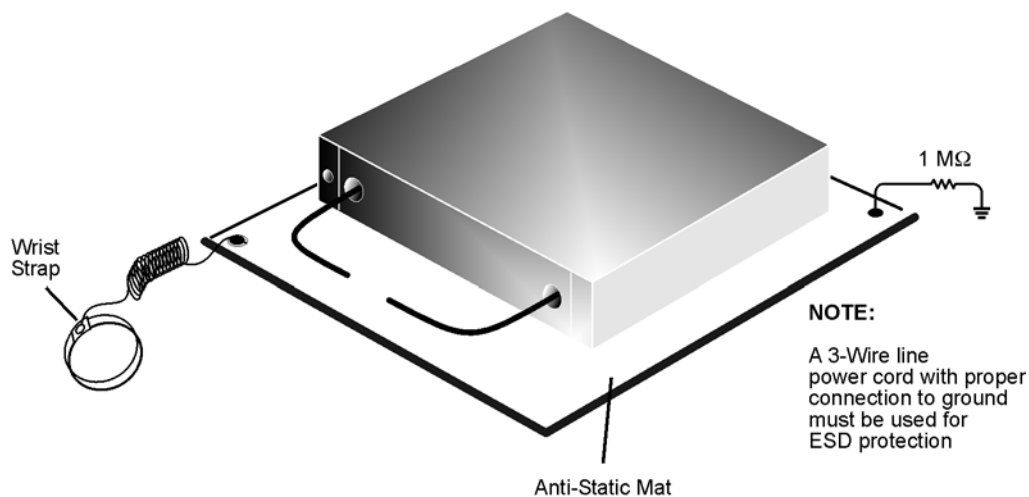
## Electrostatic Discharge Protection

Protection against electrostatic discharge (ESD) is essential while removing assemblies from or connecting cables to the measurement receiver. Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the instrument:

- *always* have a grounded, conductive table mat in front of your test equipment.
- *always* wear a grounded wrist strap, connected to a grounded conductive table mat, having a 1 M $\Omega$  resistor in series with it, when handling components and assemblies or when making connections.
- *always* wear a heel strap when working in an area with a conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
- *always* ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port or cable connector briefly.
- *always* ground the center conductor of a test cable before making a connection to any static-sensitive device. This can be done as follows:
  1. Connect a short (from your calibration kit) to one end of the cable to short the center conductor to the outer conductor.
  2. While wearing a grounded wrist strap, grasp the outer shell of the cable connector.
  3. Connect the other end of the cable to the test port and remove the short from the cable.

Figure 1-1 shows a typical ESD protection setup using a grounded mat and wrist strap. Refer to “ESD Supplies” on page 6-29 for part numbers.

**Figure 1-1 ESD Protection Setup**



esd\_setup

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## Regulatory Information

This section contains information that is required by various government regulatory agencies.

### Instrument Markings

Familiarize yourself with these instrument markings and their meanings before operating the instrument.



The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.



This symbol indicates that the instrument requires alternating current (ac) input.



This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).



This symbol indicates that the power line switch is ON.



This symbol indicates that the power line switch is in the STANDBY position.



This symbol indicates that the power line switch is in the OFF position.



This symbol is used to identify a terminal which is internally connected to the product frame or chassis.



The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)



The CSA mark is a registered trademark of the CSA International. This instrument complies with Canada: CSA 22.2 No. 61010-1-04.



This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.



This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).



Direct Current.



This is a required mark signifying compliance with an EMC requirement. The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.



China RoHS regulations include requirements related to packaging, and require compliance to China standard GB18455-2001.



This symbol indicates compliance with the China RoHS regulations for paper/fiberboard packaging.

## Lithium Battery Disposal

If the battery on the A17 CPU board assembly needs to be disposed of, dispose of it in accordance with your country's requirements. If required, you may return the battery to Agilent Technologies for disposal. Refer to [“Contacting Agilent” on page 2-9](#) for assistance.



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

For instructions on removing and replacing the battery on the A17 CPU board assembly, refer to [“Removing and Replacing the Lithium Battery” on page 7-40](#).



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## **2 General Product Information**

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## Information in This Chapter

### Chapter Two at-a-Glance

Section Title	Summary of Content	Start Page
<a href="#">Maintenance</a>	Cleaning instructions for the external surfaces of your measurement receiver. Information about electrical maintenance of your measurement receiver.	<a href="#">Page 2-2</a>
<a href="#">Options Available</a>	A list of the options available for your measurement receiver.	<a href="#">Page 2-3</a>
<a href="#">Accessories Available</a>	A list of accessories available for your measurement receiver.	<a href="#">Page 2-4</a>
<a href="#">Upgrades Available</a>	A list of the upgrades available for your measurement receiver.	<a href="#">Page 2-5</a>
<a href="#">Required Service Test Equipment</a>	A list of service equipment that is required to perform performance tests, adjustments, and troubleshooting.	<a href="#">Page 2-6</a>
<a href="#">Agilent Support, Services, and Assistance</a>	The Internet address (URL) for on-line assistance. Service and support options available. Calibration options available. Important information about shipping your measurement receiver to Agilent for service or repair.	<a href="#">Page 2-9</a>

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## Maintenance

### Physical Maintenance

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

---

### Electrical Maintenance

Refer to [“Contacting Agilent” on page 2-9](#) and to [Chapter 3, “Tests and Adjustments.”](#)

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## Options Available

### Options as Upgrades

The options described in this section can be ordered as upgrades. Refer to [“Upgrades Available” on page 2-5](#).

Individual upgrade kits are also available and can be ordered by part number. Refer to [“Upgrade Kits” on page 6-63](#) for a complete list of available kits.

### Option 010, Time Domain

With Option 010, the measurement receiver can display the time domain response of a network or test device by calculating the inverse Fourier transform of the frequency domain response. This calculation allows the Option 010 measurement receiver to show the response of a test device as a function of time or distance. In time domain, the magnitude and location of a discontinuity and the characteristics of individual transmission paths of a network or test device can be determined. Time domain operation retains all the accuracy of active error correction.

### Option 108, LO Source

Option 108 adds the internal hardware necessary to provide a synthesized LO source at a rear-panel connector.

### Option 118, Fast CW Mode

With Option 108, the measurement receiver can operate at faster speeds in CW mode.

### Option 1CP, Rack Mount Flange Kit for Instruments with Handles

Option 1CP provides a rack mount kit that contains a pair of flanges (cut to adapt to handles), rack mount rails, and the necessary hardware to mount the instrument in an equipment rack with 482.6 mm (19 inches) horizontal spacing.

Additional kits may be ordered from Agilent. Refer to [“Rack Mount Kits and Handle Kits” on page 6-64](#) for the part numbers.

### Option 1CM, Rack Mount Flange Kit for Instruments without Handles

Option 1CM provides a rack mount kit that contains a pair of flanges, rack mount rails, and the necessary hardware to mount the instrument in an equipment rack with 482.6 mm (19 inches) horizontal spacing.

Additional kits may be ordered from Agilent. Refer to [“Rack Mount Kits and Handle Kits” on page 6-64](#) for the part numbers.

---

## Accessories Available

### CD-RW Drive–N4688A

This accessory is an external read/write CD drive with a USB cable and can be ordered as model number N4688A.

### USB Hub–N4689A

This accessory is a 4-port USB hub for connecting additional USB peripheral devices and can be ordered as model number N4689A.

### Pulse I/O Adapter–N1966A

An adapter for connecting between the measurement receiver's rear-panel PULSE I/O connector and the coaxial inputs and outputs of external pulse generators and external pulse modulators. The adapter contains 11 SMB-male coaxial connectors and a mating connector for the rear-panel PULSE I/O connector.

This adapter can be ordered as model number N1966A.

**Figure 2-1 N1966A Pulse I/O Adapter**



N5242\_001\_201

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## Upgrades Available

The options described in this section can be ordered as upgrades. To order an upgrade for your measurement receiver, order the product's model number, followed by a "U", then indicate the option to be added:

- Your product's current model number followed by a "U". For example, N5264AU.
- The number of the desired option from the available list. For example, Time Domain option would be N5264AU-010.

Individual upgrade kits are also available and can be ordered by part number. Refer to ["Upgrade Kits" on page 6-63](#) for a complete list of available kits.

The following table lists the upgrades that are available for your measurement receiver. Refer to the previous section, ["Options Available" on page 2-3](#), for a complete description of each option upgrade.

**Table 2-1 Upgrades Available**

Upgrade	Order Number
Time Domain (Option 010)	N5264AU-010
LO Source (Option 108)	N5264AU-108
Fast CW Mode (Option 118)	N5264AU-118

## Required Service Test Equipment

Equipment	Critical Specifications	Recommended Model or Part Number	Alternate Model or Part Number	Use <sup>a</sup>
<b>Test Instruments and Software</b>				
Frequency counter	Freq: 10 MHz to 10.5 GHz Accuracy : ±0.5 ppm	53151A Opt 001	None	P, A, T
Spectrum analyzer	Min Freq: 1 MHz Max Freq: > 4 GHz Resolution BW: 300 Hz	8565E	856xE	A, T
Power meter	Accuracy: ±0.0068 dB	E4418B/19B	E4418A/19A <sup>b</sup>	P, A, T
Power sensor	Freq: 300 kHz to 3.0 GHz Range: -30 to +20 dBm	8482A	None	P, A, T
Power sensor	Freq: 3.0 GHz to 26.5 GHz Range: -30 to +20 dBm	E4413A	8485A	P, A, T
Dynamic accuracy test set	None specified	Z5623A Opt H01	None	P
Digital multi-meter	Voltage and resistance measurement capability Voltage resolution: 10 mV	Any	Any	T
Printer	N/A	Any printer with Microsoft® Windows® XP driver		P
Internal test software <sup>c</sup>	N/A	Option 897/898	None	P

- a. P = Performance tests, A = Adjustments, T = Troubleshooting, V = System verification  
 b. If an accurate measurement of the dynamic accuracy specification is not required, the E4418A or E4419A can be used.  
 c. The recommended model or part number for all equipment listed with a “P” in the Use column is required for proper operation of the measurement receiver’s internal test software.

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## Required Service Test Equipment (Cont'd)

Equipment <sup>a</sup>	Critical Specifications	Recommended Model or Part Number	Alternate Model or Part Number	Use <sup>b</sup>
<b>Calibration and Verification Kits</b>				
3.5 mm calibration kit	Freq: 10 MHz to 26.5 GHz	85052B	85052D	P,T,V
3.5 mm verification kit	Freq: 10 MHz to 26.5 GHz	85053B	None	V
<b>Cables</b>				
BNC cable (2 required)	50Ω length ≥ 60 cm	8120-1839	None	A
3.5 mm RF cable (Qty 2)	50Ω length ≥ 60 cm	85131C	85131E	P,A,V
GPIB cable	N/A	10833A/B/C/D	None	P,A
<b>Adapters</b>				
3.5 mm (f) to 3.5 mm (f)	Return Loss: ≥ 32 dB	83059B	85052-60012 <sup>c</sup>	P,A,T
3.5 mm (f) to type-N (m)	Return Loss: ≥ 28 dB	1250-1743	None	P,A,T
<b>Attenuators</b>				
3.5 mm (m,f), 10-dB fixed attenuator	Accuracy: ± 0.5 dB Freq: 10 MHz to 26.5 GHz	8493C Option 010	None	P
3.5 mm (m,f), 20-dB fixed attenuator	Accuracy: ± 0.5 dB Freq: 10 MHz to 26.5 GHz	8493C Option 020	None	P

- a. Unless specified otherwise, equipment listed is required for all measurement receiver options.  
b. P = Performance tests, A = Adjustments, T = Troubleshooting, R = Repair, V = System verification  
c. Included in the 85052B/D calibration kits.

## Required Service Test Equipment (Cont'd)

Equipment <sup>a</sup>	Critical Specifications	Recommended Model or Part Number	Alternate Model Number	Use <sup>b</sup>
<b>Tools</b>				
T-8 TORX driver	0.6 N-m (5 in-lb) setting	N/A	N/A	R
T-10 TORX driver	0.5, 0.8, and 1.0 N-m (4, 7, and 9 in-lb) settings	N/A	N/A	T, R
T-15 TORX driver	1.5 N-m (14 in-lb) setting	N/A	N/A	T, R
T-20 TORX driver	2.4 N-m (21 in-lb) setting	N/A	N/A	T, R
1/4 inch and 5/16 inch open-end wrench	Thin profile	8710-0510	N/A	A, R
5/16 inch, open-end torque wrench (metric equivalent is 8 mm)	1.1 and 2.4 N-m (10 and 21 in-lb) settings (for semi-rigid cables)	N/A	N/A	T, R
1 inch, open-end torque wrench (metric equivalent is 26 mm)	8.1 N-m (72 in-lb) setting (for Port 1 and Port 2 connector nuts)	N/A	N/A	R
20 mm, open-end torque wrench	0.9 N-m (8 in-lb) setting (for measurement port connections)	8710-1764	N/A	P, A, T
<b>Static Safety Parts</b>				
Adjustable antistatic wrist strap	N/A	9300-1367	None	P, A, T
Antistatic wrist strap grounding cord (5 foot)	N/A	9300-0980	None	P, A, T
Static control table mat and earth ground wire	N/A	9300-0797	None	P, A, T
<b>Miscellaneous</b>				
USB flash ROM drive	N/A	Any	None	P, A, R

a. Unless specified otherwise, equipment listed is required for all measurement receiver options.

b. P = Performance tests, A = Adjustments, T = Troubleshooting, R = Repair, V = System verification



---

## Agilent Support, Services, and Assistance

Information on the following topics is included in this section.

- “Service and Support Options”
- “Contacting Agilent”
- “Shipping Your Instrument to Agilent for Service or Repair”

### Service and Support Options

The measurement receiver’s standard warranty is a *one-year return to Agilent Technologies* service warranty.

---

**NOTE** There are many other repair and calibration options available from the Agilent Technologies support organization. These options cover a range of service agreements with varying response times. Contact Agilent for additional information on available service agreements for this product. Refer to “Contacting Agilent” on page 2-9.

---

### Contacting Agilent

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

If you do not have access to the Internet, please contact your Agilent field engineer.

---

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

---

### Shipping Your Instrument to Agilent for Service or Repair

---

**IMPORTANT** Agilent Technologies reserves the right to reformat or replace the internal hard disk drive in your measurement receiver as part of its repair. This will erase all user information stored on the hard disk. It is imperative, therefore, that you make a backup copy of your critical test data located on the hard disk before shipping the measurement receiver to Agilent for repair.

---

If you wish to send your instrument to Agilent Technologies for service or repair:

- Include a complete description of the service requested or of the failure and a description of any failed test and any error message.
- Ship the instrument using the original or comparable antistatic packaging materials.
- Contact Agilent for instructions on where to ship your instrument.



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## **3 Tests and Adjustments**

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## Information in This Chapter

This chapter contains procedures to help you check, verify, and adjust your PNA.

- The checks verify the operation of the assemblies in your analyzer.
- The verification compares the operation of your analyzer to a gold standard.
- The adjustments allow you to tune your analyzer for maximum response.

### Conventions Used for Hardkeys, Softkeys, and Menu Items

The following conventions are used in this document:

**Hardkey**

This represents a “hardkey”, a key that is physically located on the instrument.

**Softkey**

This represents a “softkey”, a key whose label is determined by the instrument firmware.

**Menu Item**

This represents an item in a drop-down or pop-up menu.

### Chapter Three at-a-Glance

Section Title	Summary of Content	Start Page
<a href="#">Before You Begin</a>	Items to consider or procedures to perform before testing is begun: <ul style="list-style-type: none"><li>• <a href="#">Verify the Operating Environment</a></li><li>• <a href="#">Protect Against Electrostatic Discharge (ESD)</a></li><li>• <a href="#">Allow the Analyzer to Warm Up</a></li></ul>	<a href="#">Page 3-3</a>
<a href="#">Performance Tests</a>	A brief summary of each performance test: <ul style="list-style-type: none"><li>• <a href="#">Frequency Accuracy Test</a></li></ul>	<a href="#">Page 3-4</a>
<a href="#">Adjustments</a>	Setups and procedures for adjusting your analyzer: <ul style="list-style-type: none"><li>• <a href="#">10 MHz Frequency Reference Adjustment</a></li></ul>	<a href="#">Page 3-5</a>

---

## Before You Begin

Before checking or adjusting the analyzer, refer to the following paragraphs to:

- make sure the operating environment is within its requirements
- make sure that proper electrostatic discharge (ESD) protection is provided
- make sure the analyzer has warmed up properly to achieve system stability

## Verify the Operating Environment

Due to their operating specifications, the verification and calibration kit devices determine your operating environment conditions. Open the calibration and verification kits and place all the devices on top of the foam inserts so they will reach room temperature. As the device dimensions change with temperature, their electrical characteristics change as well.

It is necessary to keep the environmental levels within the following limits:

- Temperature:  $+23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$  (Error-corrected temperature range)

Once the measurement calibration has been done, the ambient temperature must be maintained to within  $\pm 1\text{ }^{\circ}\text{C}$  of the calibration temperature.

- Humidity: 0% to 95% at  $40\text{ }^{\circ}\text{C}$  maximum, non-condensing
- Altitude: 0 to 4,600 meters ( $\approx 15,000$  feet.)

## Protect Against Electrostatic Discharge (ESD)

This is important. If not properly protected against, electrostatic discharge can seriously damage your analyzer, resulting in costly repair.

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**CAUTION** To reduce the chance of electrostatic discharge, follow all of the recommendations outlined in [“Electrostatic Discharge Protection” on page 1-6](#), for all of the procedures in this chapter.

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## Allow the Analyzer to Warm Up

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**NOTE** To achieve the maximum system stability, allow the analyzer to warm up for at least 90 minutes.

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## Performance Tests

The only performance test applicable to your N5264A microwave PNA-X measurement receiver is:

- [Frequency Accuracy Test](#)

### Frequency Accuracy Test

**Function of the Test:** To verify the frequency accuracy and range of the analyzer's source output.

**Specification Tested:** Test Port Output–CW Accuracy

**Equipment Used:** A frequency counter, a test cable, and adapters.

**Description of the Test:**

1. Connect a frequency counter to the rear-panel 10 MHz REF OUT connector.

**If the Analyzer Fails this Test:**

- If the 10 MHz reference is off by more than 10 Hz, perform the [“10 MHz Frequency Reference Adjustment”](#) on page 3-5 and then repeat this test.

## Adjustments

Adjustments are firmware-driven tests that are used to fine-tune your analyzer. Only one adjustment is applicable to your N5264A PNA-X measurement receiver.

- “10 MHz Frequency Reference Adjustment” on page 3-5

### 10 MHz Frequency Reference Adjustment

The 10 MHz frequency adjustment is used to adjust the frequency accuracy of the network analyzer’s 10 MHz frequency reference on the A10 frequency reference board assembly.

#### Equipment Used for the 10 MHz Frequency Reference Adjustment

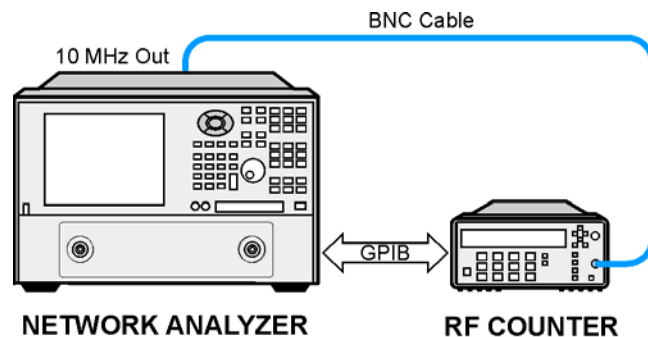
Equipment Type	Model or Part Number	Alternate Model or Part Number
Cable, BNC, 50Ω 24 inch	8120-1839	Any
Frequency counter	53151A, Option 001	Any that will measure a signal at 10 MHz.

#### Procedure

**NOTE** This adjustment typically adjusts to within  $\pm 0.01$  ppm.

1. Connect the equipment as shown in [Figure 3-1](#). Connect a GPIB cable between the network analyzer and the frequency counter.

**Figure 3-1 Equipment Setup for the 10 MHz Frequency Reference Adjustment**



st511a

2. Press UTILITY **System**, then **Service**, then **Adjustments**, then click **10 MHz Freq Adjustment**.
3. Ensure the GPIB settings are correct.
4. Follow the instructions and prompts as they are displayed.





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## 4 Troubleshooting

## Information in This Chapter

The information in this chapter helps you:

- Identify the portion of the analyzer at fault.
- Locate the specific troubleshooting procedure to identify the assembly or peripheral at fault.

The sections in this chapter are arranged in a logical troubleshooting order. The following table lists the sections and a brief summary of what to look for in that section.

### Chapter Four at-a-Glance

Section Title	Summary of Content	Start Page
'Getting Started with Troubleshooting'	A starting point for troubleshooting.	Page 4-4
'Power Up Troubleshooting'	Power-up problems: <ul style="list-style-type: none"> <li>• Power supply problems</li> <li>• LCD problems</li> <li>• Bootup for the network analyzer interface</li> </ul>	Page 4-6
'Front Panel Troubleshooting'	Problems occurring after the network analyzer interface is loaded: <ul style="list-style-type: none"> <li>• Does the display color appear correct?</li> <li>• Do the front panel keys function properly?</li> <li>• Does the front panel USB connector function properly?</li> </ul>	Page 4-13
'Rear Panel Troubleshooting'	Problems associated with the rear panel interconnects. <i>The data found at these rear panel interconnects can be used to troubleshoot the CPU board.</i>	Page 4-17
Instrument Block Diagram	A block diagram for the analyzer including all options.	Page 4-23

## Conventions Used for Hardkeys, Softkeys, and Menu Items

The following conventions are used in this document:

<b>Hardkey</b>	This represents a “hardkey”, a key that is physically located on the instrument.
<b>Softkey</b>	This represents a “softkey”, a key whose label is determined by the instrument firmware.
<b>Menu Item</b>	This represents an item in a drop-down or pop-up menu.

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## Operating the Analyzer With Covers Removed

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**CAUTION** Do not operate the analyzer with the outer cover removed for more than 30 minutes, as this could cause the analyzer to overheat which could result in costly damage.

---

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## Protect Against Electrostatic Discharge (ESD)

This is important. If not properly protected against, electrostatic discharge can seriously damage your analyzer, resulting in costly repair.

---

**CAUTION** To reduce the chance of electrostatic discharge, follow all of the recommendations outlined in [“Electrostatic Discharge Protection” on page 1-6](#), for all of the procedures in this chapter.

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## Assembly Replacement Sequence

After identifying the problem requiring an assembly to be replaced, follow these steps:

- Step 1.** Order a replacement assembly. Refer to [Chapter 6, “Replaceable Parts.”](#)
- Step 2.** Replace the faulty assembly and determine what adjustments are necessary. Refer to [Chapter 7, “Repair and Replacement Procedures.”](#)
- Step 3.** Perform the necessary adjustments. Refer to [Chapter 3, “Tests and Adjustments.”](#)
- Step 4.** Perform the necessary performance tests. Refer to [Chapter 3, “Tests and Adjustments.”](#)

---

## Getting Started with Troubleshooting

Where you begin troubleshooting depends upon the symptoms of the failure. Start by checking the basics as outlined in the following section. Also review the flowchart in [Figure 4-1 on page 4-5](#). You should then be able to determine where in the troubleshooting procedure to begin, to locate the failed assembly.

### Check the Basics

A problem can often be solved by repeating the procedure you were following when the problem occurred. Before calling Agilent Technologies or returning the instrument for service, please perform the following checks:

1. Is there power at the mains receptacle? If not, correct this situation and proceed.
2. Is the instrument turned on? Check to see if the front panel line switch glows. This indicates the power supply is on. If the front panel line switch is on but the power supply does not appear to be on, go to [“Power Up Troubleshooting” on page 4-6](#).
3. Is the Windows® operating system running? If not, refer to [“Operating System Recovery” in Chapter 8](#) for instructions.
4. If other equipment, cables, and connectors are being used with the instrument, make sure they are clean, connected properly and operating correctly.
5. Review the procedure for the measurement being performed when the problem appeared. Are all the settings correct? If not, correct them.

If the instrument is not functioning as expected, return the unit to a known state by pressing the UTILITY Preset key.

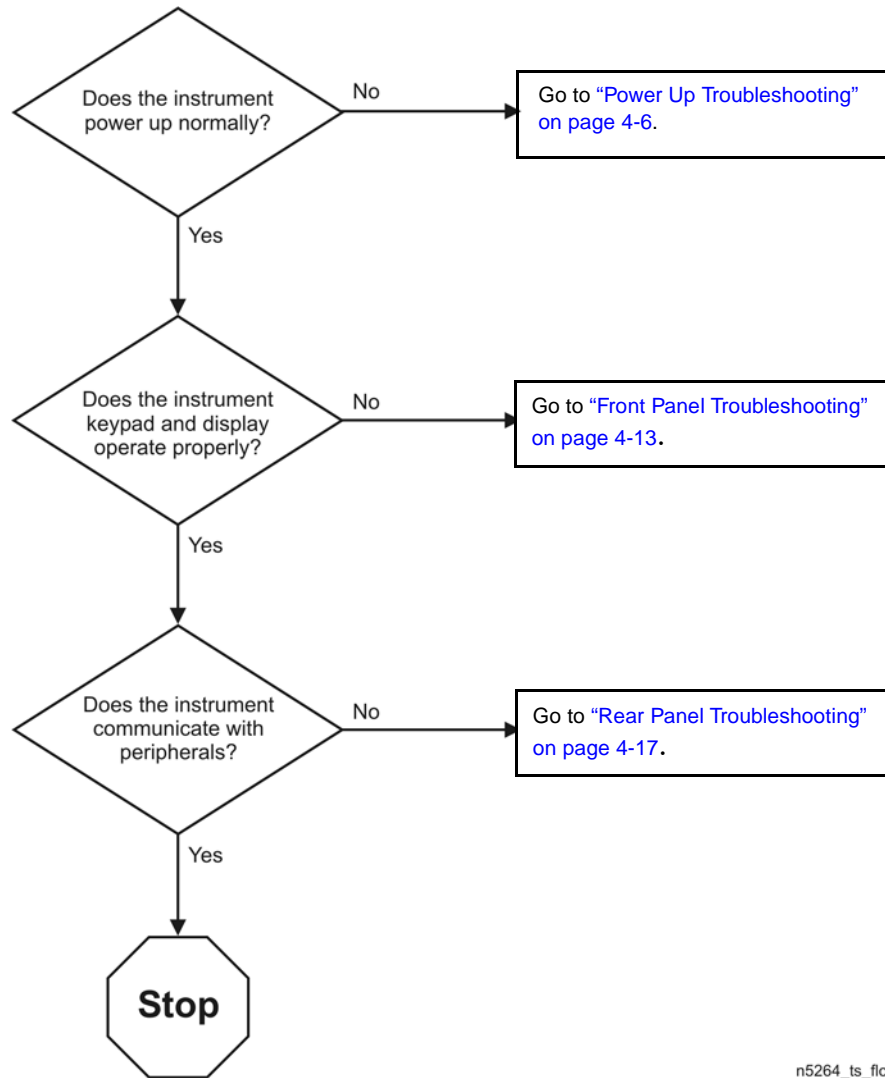
6. Is the measurement being performed, and the results that are expected, within the specifications and capabilities of the instrument? Refer to the embedded help in the analyzer for instrument specifications.
7. If the problem is thought to be due to firmware, check to see if the instrument has the latest firmware before starting the troubleshooting procedure. Refer to [“Firmware Upgrades” in Chapter 8](#) for instructions.
8. If the necessary test equipment is available, perform the operator’s check and system verification in [Chapter 3, “Tests and Adjustments.”](#)

Windows® is a U.S. registered trademark of Microsoft Corporation.

## Troubleshooting Organization

Follow the flowgraph in [Figure 4-1](#) to help direct you to the correct section for troubleshooting the analyzer.

**Figure 4-1 Troubleshooting Organization Flowchart**



n5264\_ts\_flow

---

## Power Up Troubleshooting

---

**WARNING** Immediately unplug the instrument from the ac power line if the unit shows any of the following symptoms:

- **Smoke, arcing, or unusual noise from inside the analyzer.**
  - **A circuit breaker or fuse on the main ac power line opens.**
- 

Check your network analyzer for evidence that it is powering up correctly. Perform the following steps and make sure that the analyzer is displaying correct behavior as noted in the following steps.

**Step 1.** Disconnect all peripherals and plug in the network analyzer. Before the analyzer is powered on, the line switch should glow yellow and no other lights should be on.

**Step 2.** Turn on the network analyzer.

- The line switch should glow green.
- The fans should be audible.
- The display should flash and then show the hardware boot-up sequence. This process checks the RAM and communication with the hard disk drive. These checks return an error message if a problem is detected.
- The Windows operating system should start.
- The network analyzer measurement interface should open with an S<sub>11</sub> measurement displayed.

**Step 3.** If the analyzer powers up correctly, continue troubleshooting with [“Front Panel Troubleshooting”](#) on page 4-13.

**Step 4.** If the analyzer does not power up correctly, follow these troubleshooting steps:

- If the line switch does not glow, go to [“Power Supply Check”](#) on page 4-7.
- If you cannot hear the fans operating, go to [“If the Fans Are Not Operating”](#) on page 4-11.
- If the line switch glows green and the fans are operating (audible), but the display remains dark, go to [“Troubleshooting LCD Display Problems”](#) on page 4-12.
- If the instrument appears to abort the network analyzer measurement interface process, contact Agilent. Refer to [“Contacting Agilent”](#) on page 2-9.

## Power Supply Check

---

**NOTE** There are no fuses to replace within the power supply. If you determine that the power supply is the failed assembly, replace the power supply.

---

A catastrophic failure in the power supply can be determined by observing the line switch and the power supply LED indicators:

1. Ensure that the instrument is plugged in with the power switch in the standby position (power not switched on). Verify that the line switch glows yellow. A line switch that glows yellow indicates that the power supply is providing enough voltage to light the LED. (However, the voltage may not actually be the correct voltage.)
2. Turn on the instrument power and verify that the line switch glows green. When the line switch glows green, it is an indication that the power supply has received an “ON” command and that the power supply can provide enough current to light, at least, this LED.
3. You can determine which power supplies are functioning by viewing the LED indicators on the A15 midplane board. Refer to [Figure 4-2](#).

To view the LED indicators, it is necessary to remove the instrument’s outer and inner covers. Refer to [“Removing the Covers” on page 7-6](#) for removal procedures. To determine the location of the A15 midplane board, refer to [“Top Assemblies, All Options” on page 6-10](#).

---

**CAUTION** Do not operate the analyzer with the outer cover removed for more than 30 minutes, as this could cause the analyzer to overheat which could result in costly damage.

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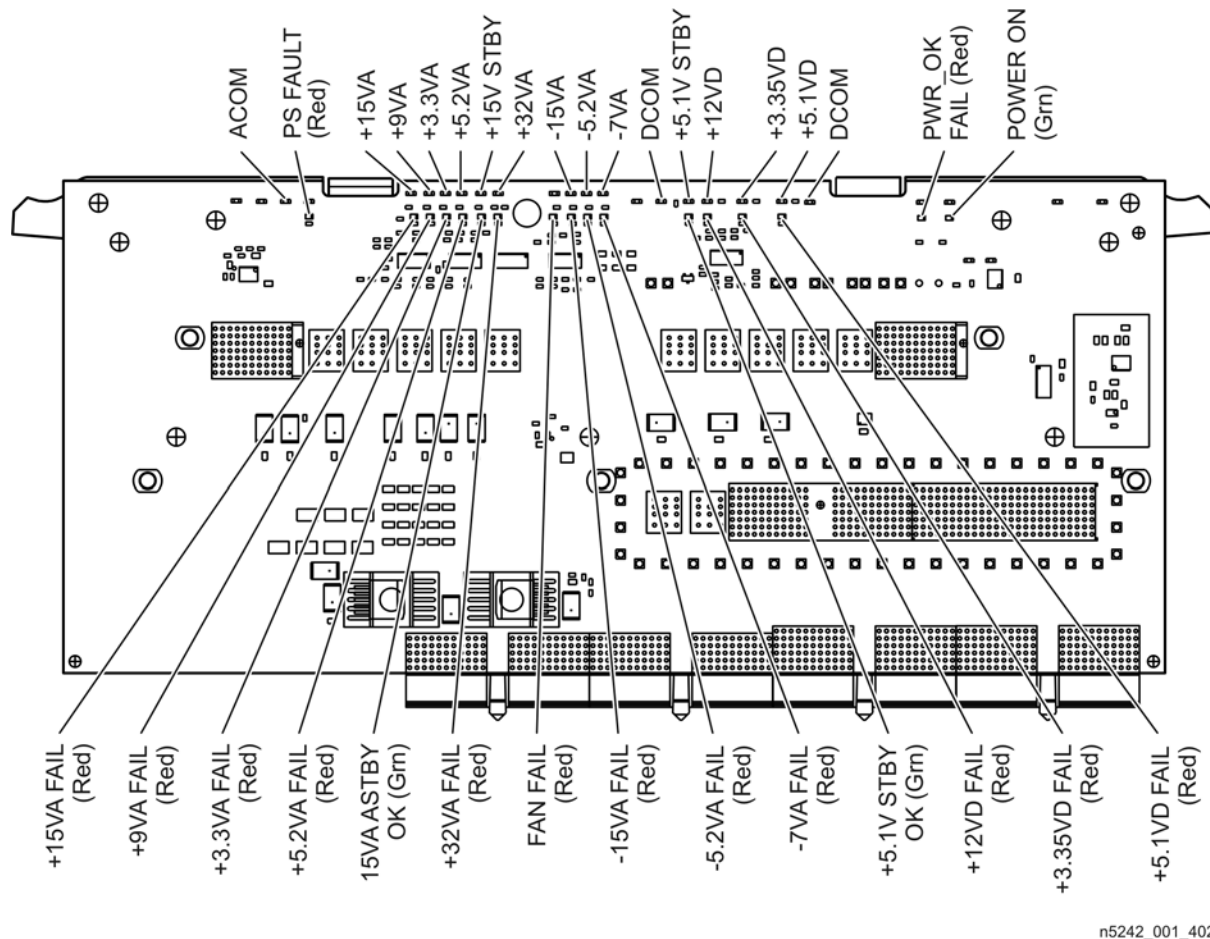
4. If any power supply voltage is missing, it is likely that the problem is a defective A16 power supply, the A15 midplane board, or another assembly that is loading down the A16 power supply. Continue with [“If Any Supply Voltage Is Missing” on page 4-9](#) to determine the cause of the problem.
5. If the line switch is lit correctly, and all the power supply voltages appear to be present, as indicated by the LEDs as shown in [Figure 4-2](#), the power supply has not suffered a catastrophic failure. However, the power supply could still be at fault. Continue at [“Measure the Individual Supply Voltages”](#) to verify that the actual supply voltages are correct.

### Measure the Individual Supply Voltages

Measure the power supply voltages using a digital multi-meter. Use the point labeled ACOM as ground reference for analog supplies and the point marked DCOM as ground reference for digital supplies.

Refer to [Figure 4-2](#) for the power supply measurement points on the A15 midplane board. Refer to [Table 4-1 on page 4-9](#) for the correct voltages.

**Figure 4-2 A15 Midplane Board Power Supply LED Indicators and Measurement Points**



n5242\_001\_402

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**WARNING** The instrument contains potentially hazardous voltages. Refer to the safety symbols provided on the instrument and in **“General Safety Considerations” on page 1-3** before operating the unit with the cover removed. Make sure that the safety instructions are strictly followed. Failure to do so can result in personal injury or loss of life.

---

**CAUTION** Do not operate the analyzer with the outer cover removed for more than 30 minutes, as this could cause the analyzer to overheat which could result in costly damage.

---

**NOTE** If any one individual voltage supply from the A16 power supply develops an over-voltage or over-current problem, all supplies are affected. The cause of the over-voltage or over-current condition can be the A16 power supply itself, or any assembly to which the A16 power supply provides voltage. To isolate the cause, continue to the assembly removal process as described in the section titled **“If Any Supply Voltage Is Missing” on page 4-9**.

---



**Table 4-1 Power Supply Measurement Points**

Test Point	Supply Name	Expected Level (Vdc)	Test Point	Supply Name	Expected Level (Vdc)
TP517	Analog Ground	0 V	TP516	-5.2 V analog	-5.2 ±0.1
TP509	+15 V analog	+15.0 ±0.1	TP514	-7 V analog	-7.0 ±0.1
TP511	+9 V analog	+9.0 ±0.1	TP500	Digital Ground	0 V
TP515	+3.3 V analog	+3.3 ±0.1	TP502	+5.1 V standby	+5.1 ±0.1
TP513	+5.2 V analog	+5.2 ±0.1	TP503	+12 V digital	+12.0 ±0.1
TP501	+15 V standby	+15.0 ±0.1	TP507	+3.35 V digital	+3.35 ±0.1
TP504	+32 V analog	+32.0 ±0.1	TP505	+5.1 V digital	+5.1 ±0.1
TP512	-15 V analog	-15.0 ±0.1	TP519	Digital Ground	0 V

**If All Supply Voltages are Present**

If all of the supplies have measured within tolerances, and the instrument still is not functioning properly, refer to [“Front Panel Troubleshooting” on page 4-13](#).

**If Any Supply Voltage Is Missing**

---

**WARNING**     **Disconnect the line-power cord before removing any assembly. Procedures described in this document may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury or loss of life.**

---

You must sequentially remove all of the assemblies, taking care to disconnect the line power cord before each removal, and then measure the supply voltages after each removal.

If the missing supply voltages return to a “power on” condition after removal of an assembly, suspect that assembly as being defective.

Remove the network analyzer assemblies in the order specified in the following steps (refer to [Chapter 7](#) for removal instructions).

1. Unplug the A19 test set motherboard ribbon cable from the A19 test set motherboard (refer to [“Removing and Replacing the A19 Test Set Motherboard” on page 7-26](#)).
1. Unplug the A19 test set motherboard to A20 IF multiplexer board ribbon cable from the A20 IF multiplexer board (refer to [“Removing and Replacing the A20 IF Multiplexer Board” on page 7-28](#)).
2. Unplug the front panel interface cable from the A1 front panel interface board (refer to [“Removing the A1 Front Panel Interface Board and Keypad Assembly” on page 7-10](#)).
3. Remove the A12 SPAM board (refer to [“Removing and Replacing the A10, A11, and A12 Boards” on page 7-14](#)).
4. Remove the A11 13.5 GHz synthesizer board (refer to [“Removing and Replacing the A10, A11, and A12 Boards” on page 7-14](#)).

5. Remove the A10 frequency reference board (refer to “[Removing and Replacing the A10, A11, and A12 Boards](#)” on page 7-14).
6. Remove the A18 GPIB board (refer to “[Removing and Replacing the A18 GPIB Board](#)” on page 7-24). Reinstall the A16 power supply assembly and the A17 CPU board assembly.
7. Unplug the A51 hard disk drive from the A17 CPU board (refer to “[Removing and Replacing the A51 Hard Disk Drive \(HDD\)](#)” on page 7-32).

The minimum required assemblies to power up the analyzer are:

- A16 power supply
- A15 midplane board
- A14 system motherboard
- A17 CPU board

To further isolate the failure in the three remaining assemblies, measure the resistance (with the power turned off) from the power supply test points to either ACOM or DCOM.

---

**NOTE** Make sure that the only assemblies plugged in are the four minimum required assemblies listed above.

---

Check for shorts (zero  $\Omega$ ) or very low resistance (approximately 1  $\Omega$ ). If a short or low resistance is measured, isolate each of the remaining four boards in the following order, and recheck the shorted test point after each board is removed. You should be able to determine if the shorted condition has changed.

Isolate the remaining three assemblies:

- remove the A17 CPU board
- remove the A16 power supply
- remove the A15 midplane board
- This leaves only the A14 system motherboard installed. If the resistance measurements are still incorrect, this is the suspected faulty assembly.

## If the Fans Are Not Operating

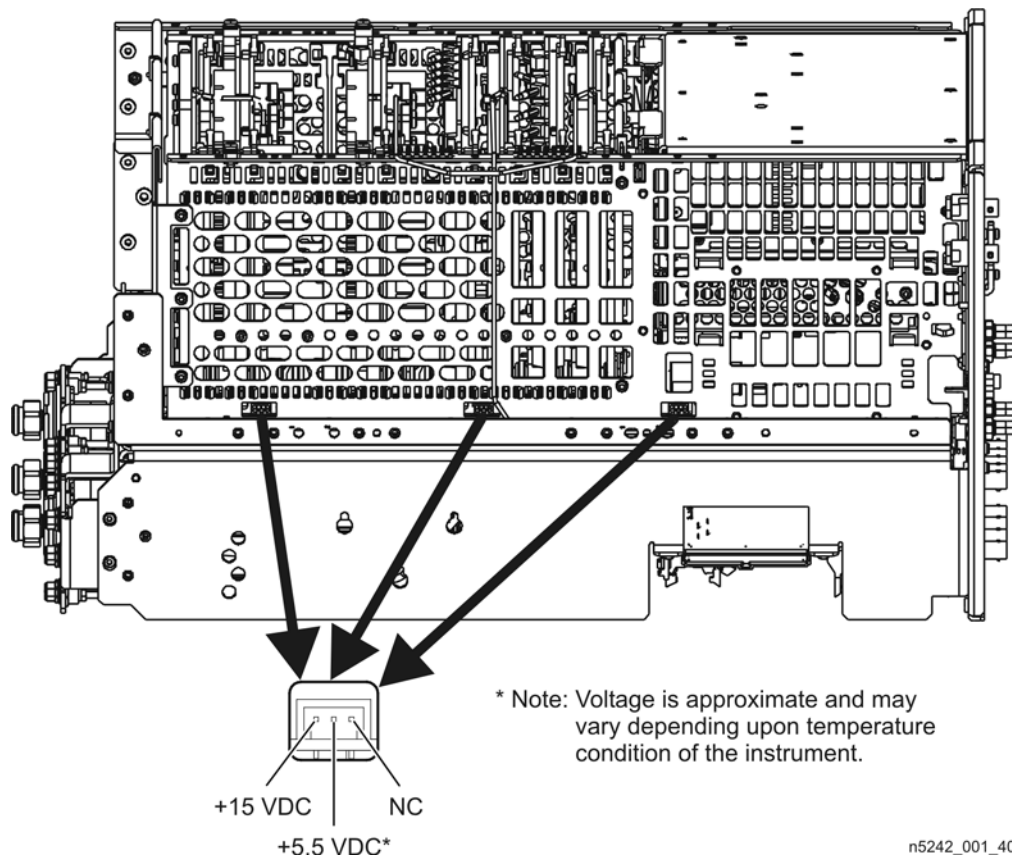
**CAUTION** The power supply may be in thermal shutdown if the instrument has been operating without the fans running. Allow the instrument to cool down before troubleshooting.

If all three fans are not operating, suspect a power supply problem or a defective A14 system motherboard. Refer to [“Power Supply Check” on page 4-7](#) to check the individual supplies. If the supplies are within specifications, the most probable cause is a defective A14 system motherboard. Refer to [“Removing and Replacing the A14 System Motherboard” on page 7-16](#).

If only one or two fans are not functioning, and the power supplies are within specifications, suspect the A14 system motherboard or defective fan(s). Perform the following procedure.

1. Remove the fan bracket, with fans attached, from the analyzer to expose the fan power cable connections on the A14 system motherboard. Refer to [Figure 4-3](#) for location of these connections. Refer to [“Removing and Replacing the Fans” on page 7-38](#).
2. Plug in the power cord and measure the fan voltages at all three connectors on the A14 system motherboard. **THIS MUST BE DONE QUICKLY AS THE ANALYZER WILL RAPIDLY OVERHEAT WITHOUT THE COOLING EFFECT OF THE FANS. DO NOT PLUG IN THE POWER CORD UNTIL READY TO PERFORM MEASUREMENTS.**

**Figure 4-3 Fan Power Cable Connections**



3. If the correct voltage is present at each connection and the fan connectors are in good mechanical condition, suspect a defective fan. Refer to [“Removing and Replacing the Fans”](#) on page 7-38.

If the correct voltage is not present, suspect a defective A14 system motherboard. Refer to [“Removing and Replacing the A14 System Motherboard”](#) on page 7-16.

## Troubleshooting LCD Display Problems

This procedure is intended to isolate the faulty assembly when the display is dark. If the display is lit, but the color mix is faulty, refer to [“A3 Display Test”](#) on page 4-15.

---

**NOTE**            There are no front panel adjustments for intensity and contrast of the LCD.

---

1. If the display is dim, the A3 display assembly is defective. Refer to [“Removing and Replacing the A1–A3 and Other Front Panel Subassemblies”](#) on page 7-10.

If the display is dark (not visible), connect an external VGA monitor to the rear panel Monitor output connector. (Be aware that some multisync monitors might not be able to lock to a 60 Hz sync pulse.) If the video information is not present on the external VGA monitor, the most probable cause is the A17 CPU board. Refer to [“Removing and Replacing the A17 CPU Board Assembly”](#) on page 7-22.

2. If the external VGA monitor displays the correct information, verify that the front panel interface ribbon cable is properly plugged into the motherboard connector. Refer to [“Removing and Replacing the Front Panel Assembly”](#) on page 7-8.
3. If the front panel interface ribbon cable is properly connected, suspect that one or more of the following is defective:
  - inverter board (mounted on the display assembly)
  - A1 front panel interface board
  - A3 display assembly

---

## Front Panel Troubleshooting

The front panel assembly consists of the A1 front panel interface board, the keypad, the A2 USB board, and the A3 display assembly. The following tests verify the operation of the front panel assembly when the analyzer is in the measurement mode. If the instrument fails to power up correctly, or it is difficult to verify due to a faulty display, refer to “[Power Up Troubleshooting](#)” on page 4-6.

Refer to the following sections to verify the operation of the noted assemblies.

- “[Front Panel Keypad and RPG Test](#)” on this page
- “[A3 Display Test](#)” on page 4-15
- “[Checking the A2 USB Board](#)” on page 4-16
- “[A1 Front Panel Interface Board](#)” on page 4-16

If all assemblies are working correctly, continue troubleshooting with “[Rear Panel Troubleshooting](#)” on page 4-17.

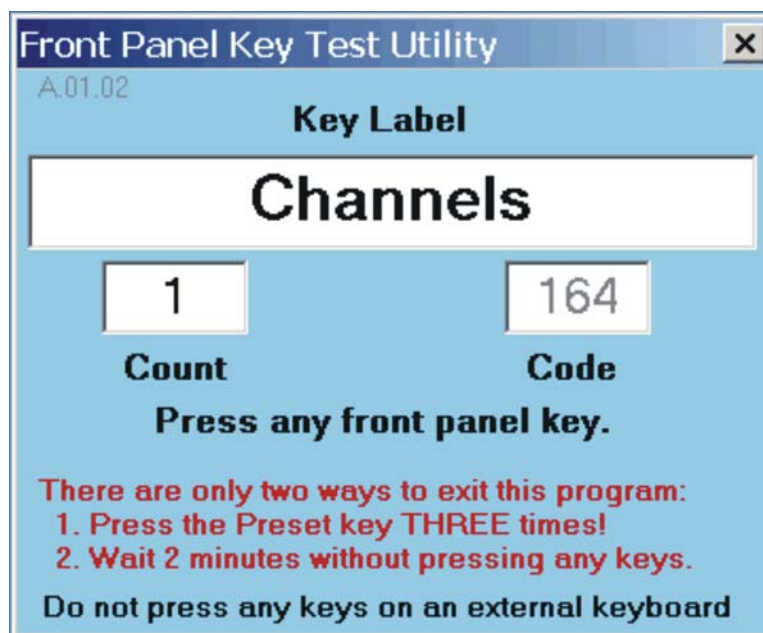
### Front Panel Keypad and RPG Test

Test the front panel keypad by running the front panel test. To run the front panel test, perform the following:

Press UTILITY **System**, then **Service**, then **More**, then **Front Panel Test**.

A **Front Panel Key Test Utility** dialog box will be displayed, as shown in [Figure 4-4](#).

**Figure 4-4 Front Panel Key Test Utility Dialog Box**



n5242\_001\_403

### Checking the Front Panel Keys

To check the front panel keys, push each key and compare the name in the Key Label box to the name physically labeled on the key cap. These names are also in [Table 4-2](#) below.

- If all the key names are correct, then the front panel keypad is working. If some of the keys are not working, suspect a faulty keypad. To replace the keypad, refer to [“Removing the A1 Front Panel Interface Board and Keypad Assembly”](#) on page 7-10.
- If none of the keys are working correctly, suspect a faulty A1 front panel interface board. To replace the A1 front panel interface board, refer to [“Removing the A1 Front Panel Interface Board and Keypad Assembly”](#) on page 7-10.

**Table 4-2 Front Panel Keyboard Key Names**

TRACE/CHAN Keys	RESPONSE Keys	ENTRY Keys	ENTRY Keys (Cont'd)
Trace 1	Meas	OK	k/m
Trace 2	Format	Cancel	Enter Off
Trace 3	Scale	Help	. (decimal point)
Trace 4	Display	Bk Sp	+/-
Traces	Avg	0	<b>STIMULUS Keys</b>
Channel	Cal	1	Freq
<b>Navigation Keys</b>	<b>MARKER/ ANALYSIS Keys</b>	2	Power
←	Marker	3	Sweep
→	Search	4	Trigger
↑	Memory	5	<b>UTILITY Keys</b>
↓	Analysis	6	Save
Click		7	Print
		8	Macro
		9	Recall
		G/n	System
		M/u	Preset

## Checking the RPG (Front Panel Knob)

To check the RPG knob:

1. Press the UTILITY **Preset** key.
2. Rotate the knob and check for a fluid movement of numbers on the analyzer display.
3. If the movement of numbers is not smooth or no numbers appear at all, suspect a faulty A1 front panel interface board. To replace the A1 front panel interface board, refer to [“Removing the A1 Front Panel Interface Board and Keypad Assembly” on page 7-10.](#)

## A3 Display Test

The display should be bright with all annotations and text readable. The display test allows you to check for non-functioning pixels and other problems.

---

**NOTE** If the display is dim or dark, refer to [“Troubleshooting LCD Display Problems” on page 4-12.](#)

---

### What Is a Damaged Pixel?

A pixel is a picture element that combines to create the image on the display. A pixel is about the size of a small pin point.

A damaged pixel is:

- A pixel that has a constant blue, green, or red appearance that will not change, or
- a pixel that has a constant black appearance that will not change.

### How to Run the Display Test

To run the display test, perform the following:

Press UTILITY **System**, then **Service**, then **More**, then **Display Test**.

A multi-color screen is displayed. Be prepared to look for the symptoms described in [“How to Identify a Faulty Display.”](#) Follow the instructions on the screen.

### How to Identify a Faulty Display

A display is considered faulty if:

- More than 0.002% of the total pixels have a constant blue, green, red, or black appearance that will not change.
- Three or more consecutive pixels have a constant blue, green, red, or black appearance that will not change.

If the A3 display assembly is determined to be faulty, replace it. Refer to [“Removing the A3 Display Assembly and the Touchscreen” on page 7-12.](#)

## Checking the A2 USB Board

To verify proper operation of the USB board:

- Connect a known good USB device, such as a USB mouse, to a front panel USB port.
- Wait 15 seconds for the analyzer to verify the device connection, and then check the operation of the USB device.
- If the device performs correctly, the USB board is functioning properly.
- If the device does not perform correctly, the USB board is faulty. Refer to [“Removing the A2 USB Board” on page 7-10](#).

## A1 Front Panel Interface Board

This assembly performs the following functions:

- It routes USB signals between the front-panel USB connector and the A17 CPU board.
- The speaker produces the audio output from signals supplied by the A17 CPU board.
- It routes key pad commands from the keypad to the A17 CPU board.
- It routes display signals from the A17 CPU board to the A3 display assembly.

### Checking the Speaker

If no audio is heard:

- Verify that the volume is set correctly and the proper sound driver is loaded; do the following:
  - Press UTILILITY **System**, then **Configure**, then **Control Panel...** .
  - Click on the **Sounds and Audio Devices** entry. Follow the normal Windows procedure to check the sound drivers and volume. If the audio is still not heard, suspect a faulty speaker. Refer to [“Removing the A1 Front Panel Interface Board and Keypad Assembly” on page 7-10](#).

### Checking the Operation of the Key Pad Commands

To verify the key pad functionality, refer to [“Front Panel Keypad and RPG Test” on page 4-13](#).

### Checking the Display

To verify the display functionality, refer to [“A3 Display Test” on page 4-15](#).



---

## Rear Panel Troubleshooting

Each rear panel connector is associated with a hardware group in the analyzer. You can use the data at these rear panel connectors to help troubleshoot these hardware groups in addition to testing the connectors.

The connectors discussed in this section are:

- USB x 4
- Monitor (VGA)
- GPIB (0) CONTROLLER
- GPIB (1) TALKER/LISTENER
- LAN

### Checking the USB Ports

To verify proper operation of any rear panel USB port:

- Connect a known good USB device, such as a USB mouse.
- Wait 15 seconds for the analyzer to verify the device connection, and then check the operation of the USB device.
- If the device performs correctly, the USB port is functioning properly.
- If the device does not perform correctly, remove the non-working USB device, wait 15 seconds, and then reconnect the device to the rear panel USB port.
- If the USB device still does not work and has been verified to work elsewhere, then the A17 CPU board is faulty. Refer to [“Removing and Replacing the A17 CPU Board Assembly” on page 7-22](#).

### Checking the CONTROLLER Port

The network analyzer uses a National Instruments 488.2 GPIB controller and associated driver software. This software includes a test utility that scans the GPIB bus and returns the status of all the connected peripherals.

To run the test utility software and check the GPIB status:

1. Connect a known good peripheral to the analyzer using a known good GPIB cable.
2. Press UTILITY **System**, then **Configure**, then **SICL/GPIB...**. A **SICL/GPIB/SCPI** dialog box is displayed.
3. In the **GPIB** block, click **System Controller** to establish the analyzer as a controller. Wait for the analyzer to configure, and then click **OK**.
4. If the Window Desktop is not displayed, press UTILITY **System**, then **Configure**, then **Control Panel...** to view the **Windows Taskbar** menu at the bottom of the display.

5. On the **Windows Taskbar** menu, click **Start** then point to **Programs, National Instruments NI-488.2**, and then click **Explore GPIB** to open the **Measurement & Automation** window.
6. On the left side of the **Measurement & Automation** window under folders:
  - a. Click the plus sign to expand the **Measurement & Automation** folder.
  - b. Click the plus sign to expand the **Devices and Interfaces** folder.
  - c. Right click **GPIB0 (AT-GPIB/TNT)** to open a submenu.
7. On the submenu, click **Scan for Instruments** to run the test.
8. The state of all the peripherals found on the bus is returned.
9. If problems are detected, check the connections of all GPIB cables, and check all the GPIB addresses of the instruments on the bus.

---

**NOTE**

**Address Information**

- Each device must have its own unique address.
- The network analyzer's default GPIB address in the controller mode is 21.
- The address set on each device must match the one recognized by the analyzer (and displayed).

Refer to the manual of the peripheral to read or change its address.

---

## Troubleshooting Systems with Controllers

Passing the preceding test indicates that the analyzer's peripheral functions are operating normally. Therefore, if the analyzer has not been operating properly with an external controller, check the following:

- The GPIB interface hardware is incorrectly installed or not operational. (Refer to the embedded help in your analyzer.)
- The programming syntax is incorrect. (Refer to the embedded help in your analyzer.)

## LAN Troubleshooting

Problems with the Local Area Network (LAN) can be difficult to solve. Software and protocol problems can make it difficult to determine whether the analyzer's hardware is working properly, or if there is a problem with the LAN or cabling.

The purpose of this section is to determine if the analyzer's hardware is functioning properly. While the turn-on self-test verifies some LAN hardware functionality, it is limited to internal testing only. Incorrect IP addresses will prevent proper operation. Improper subnet masks may allow only one-way communication, while improper gateway addresses may exclude outside LAN access.

## Ping Command

The analyzer has the built-in capability of performing a “ping” operation. Ping will request the analyzer to send a few bytes of information to a specific LAN device. That device will then signal the analyzer that it has received the information. The analyzer computes the approximate round trip time of the communication cycle and displays it. For a full test of two-way communications, a ping test should be performed in two directions.

- **First:** you should ping from the analyzer to the local area network.
- **Second:** you should ping from the local area network to the analyzer.

---

**NOTE** In the second case, any other network device capable of sending a ping command could be used, assuming it is connected to the same network. This could be a computer or even another analyzer.

---

## How to Ping from the Analyzer to the Local Area Network (LAN)

Follow the steps below to verify proper LAN operation (assuming you have a functioning LAN). If no network LAN is available, see [“Testing Between Two Analyzers” on page 4-20](#).

1. Make sure the IP address on the analyzer is set properly and that it is unique. If unsure how to check the IP address, refer to the embedded help in the analyzer.
2. Make sure the subnet mask is 0.0.0.0. If not, note the current setting (to allow setting it back later) and then set it to 0.0.0.0.
3. Find and note the IP address of another working LAN device on the same network. Make sure this device is turned on, connected, and is functioning properly.
4. To ping the network device:
  - a. If the Windows Desktop is not displayed, press UTILITY **System**, then **Configure**, then **Control Panel...** to view the **Windows Taskbar** menu at the bottom of the display.
  - b. On the **Windows Taskbar** menu, click **Start**, point to **Programs, Accessories**, and then click **Command Prompt**.
  - c. The command prompt window is displayed.
  - d. At the prompt, type `ping xxx.xxx.xxx.xxx1` and press ENTRY **Enter** on the front panel. Refer to Step 5 for the results of a successful ping.
5. The analyzer attempts four cycles of communications with the indicated LAN device.
  - It displays the time it took to complete each cycle.
  - Each cycle times-out after one second if no communication is established and the message, Request timed out, is displayed.
  - It is common for the first of the four cycles to time-out even though subsequent cycles pass.
  - See below for an example output of a successful ping.

---

1. The letters x represent the IP address of the other device on the network.

```
C:>ping 141.121.69.162

Pinging 141.121.69.162 with 32 bytes of data:

Reply from 141.121.69.162: bytes=32 time<10ms TTL=127
Reply from 141.121.69.162: bytes=32 time<10ms TTL=127
Reply from 141.121.69.162: bytes=32 time<10ms TTL=127
Reply from 141.121.69.162: bytes=32 time<10ms TTL=127

Ping statistics for 141.121.69.162:

    Packets: Sent = 4, Received = 4, lost = 0 <0% loss>.
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

6. The above message verifies that one way communication from the analyzer to the network has been established
7. If the subnet mask was changed in step 2, set it back at this time.

### How to Ping from the Local Area Network (LAN) to the Analyzer

Reverse communication should also be verified. Determining this, though, is dependent upon your network setup and software. Generally, you need to issue a ping command using the IP address of the analyzer to be tested. For example, using Windows 95, 98, 2000, or XP and while at a DOS prompt, type in `ping xxx.xxx.xxx.xxx`<sup>1</sup>. Then press **ENTER** on the front panel. If full communication can be established, then the computer display shows the cycle time for each of four cycle attempts (similar to that in step 5). Other software may behave somewhat differently, but basically the same.

If the analyzer can talk to the network, but the network can not talk to the analyzer, then the computer or device used from the network may have a subnet mask that excludes communication with the IP address chosen for the analyzer. Any subnet mask other than 0.0.0.0 will exclude operation from some addresses. Changing the subnet mask of a computer or other device should only be attempted by a qualified network administrator. Failure to communicate due to a subnet mask incompatibility does not indicate any failure of the analyzer.

If the analyzer fails to ping in either direction, and assuming the subnet masks are set properly, then the fault must be isolated to the analyzer or to the network. Contact a qualified network administrator.

### Testing Between Two Analyzers

The ability of the analyzer's LAN to function can be easily tested by connecting two analyzers together using a "crossover cable" (a short length of cable with an RJ-45 connector on each end).

Some network hubs have the capability to make a crossover connection using two normal, or straight-through, cables. If this capability is not available and a crossover cable is not available, a crossover cable can be made by following the directions in "[Constructing a Crossover Cable](#)" on page 4-21.

---

1. The letters x represent the IP address of the analyzer.

Set the IP addresses on two analyzers. The addresses can be set to anything, but they must be different. Make sure the subnet mask and gateway addresses are set to 0.0.0.0 and that the LAN is active on both analyzers. Connect the two analyzers together using either a crossover cable or a crossover hub.

Now follow the steps in [“How to Ping from the Analyzer to the Local Area Network \(LAN\)” on page 4-19](#) to have the first analyzer ping the second analyzer. When done, repeat the procedure having the second analyzer ping the first. If both procedures function properly, the LAN circuitry on both analyzers is verified.

If neither function properly:

- One or both IP addresses could be wrong.
- One or both LAN states could be set to off.
- The crossover cable could be miswired.
- One or both analyzers could be defective.

If possible, eliminate the possibility of a defective analyzer by substitution of a known working unit. Once the analyzer has been proven to be working properly, concentration can be placed on the network itself to determine the cause of the failure.

### **Constructing a Crossover Cable**

A crossover cable can be made from a standard LAN cable by connecting pin 1 from each connector to pin 3 of the other connector, and pin 2 from each connector to pin 6 of the other connector.

1. Strip away a few inches of the outside jacket insulation from the middle of a standard LAN cable that has an RJ-45 connector on each end.

---

<b>NOTE</b>	Pins 1, 2, 3, and 6 of the connectors must be located to determine which wires to cut in the following steps. Most, but not all, LAN cables use the color coding listed in <a href="#">Table 4-3</a> . If your cable does not use this color scheme, you will have to determine the locations of the appropriate wires before proceeding with this procedure.
-------------	---

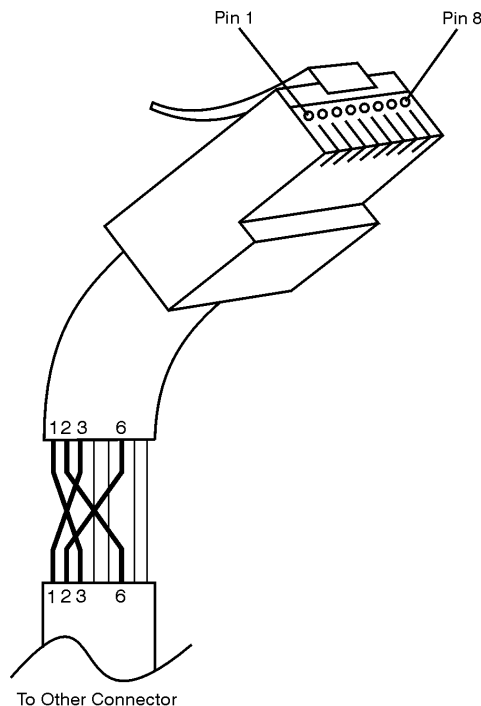
---

**Table 4-3 LAN Pin Definitions and Wire Color Codes**

Pin Number	Color	Pin Number	Color
1 (transmit +)	White/orange	5	White/blue
2 (transmit -)	Orange	6 (receive -)	Green
3 (receive +)	White/green	7	White/brown
4	Blue	8	Brown

2. Cut the wires going to pins 1, 2, 3, and 6. Strip away a small amount of insulation from each of the eight cut ends.
  - a. Connect the wire from pin 1 on one end of the cable to the wire from pin 3 on the other end of the cable.
  - b. Connect the wire from pin 3 on one end of the cable to the wire from pin 1 on the other end of the cable.
  - c. Connect the wire from pin 2 on one end of the cable to the wire from pin 6 on the other end of the cable.
  - d. Connect the wire from pin 6 on one end of the cable to the wire from pin 2 on the other end of the cable.
3. Insulate all exposed wires so that they cannot short together.
4. Label this as a crossover cable so that it cannot be confused with a standard cable.

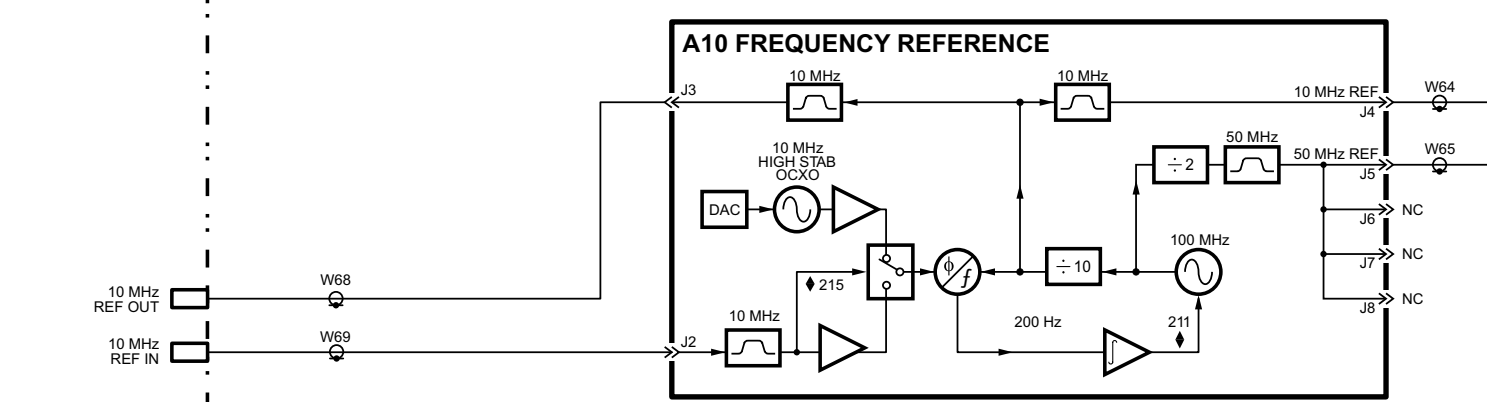
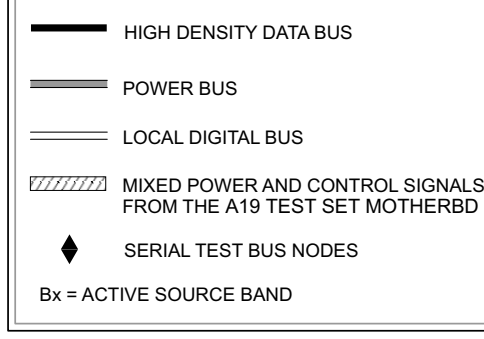
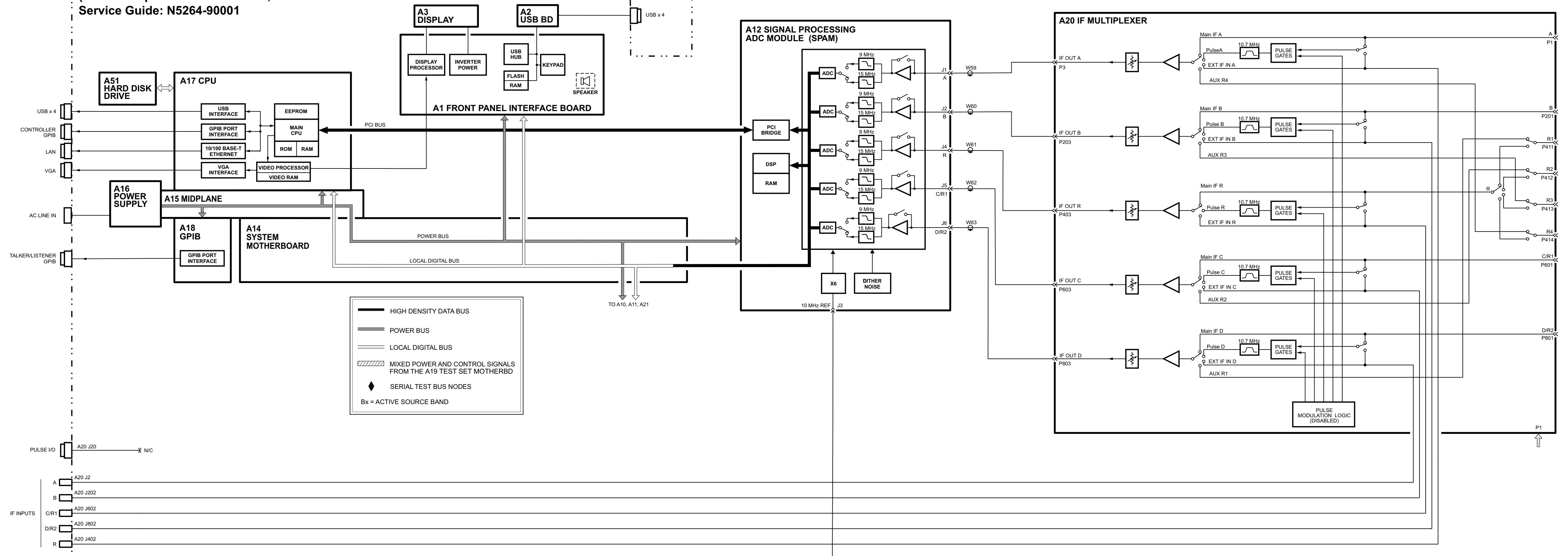
**Figure 4-5 Construction of a Crossover Cable**



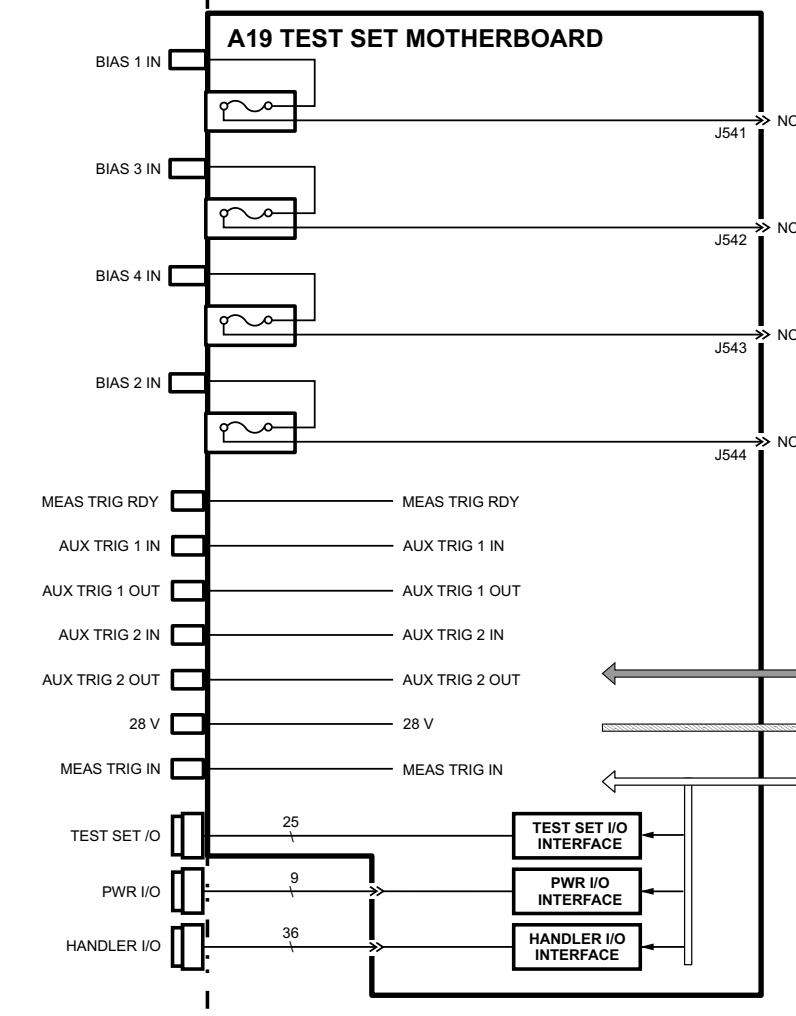
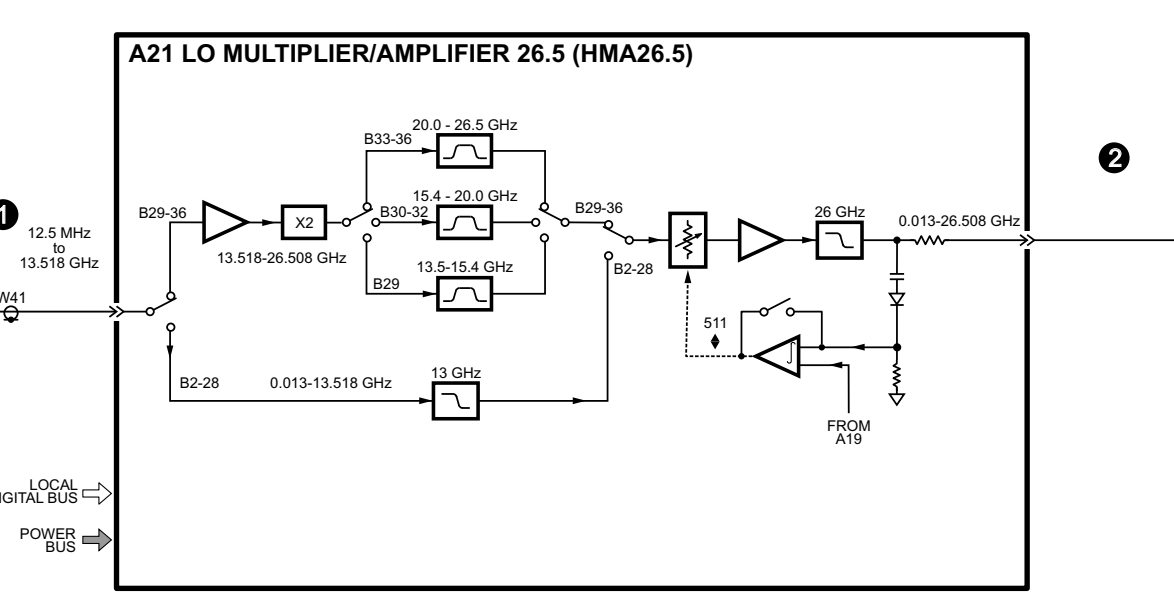
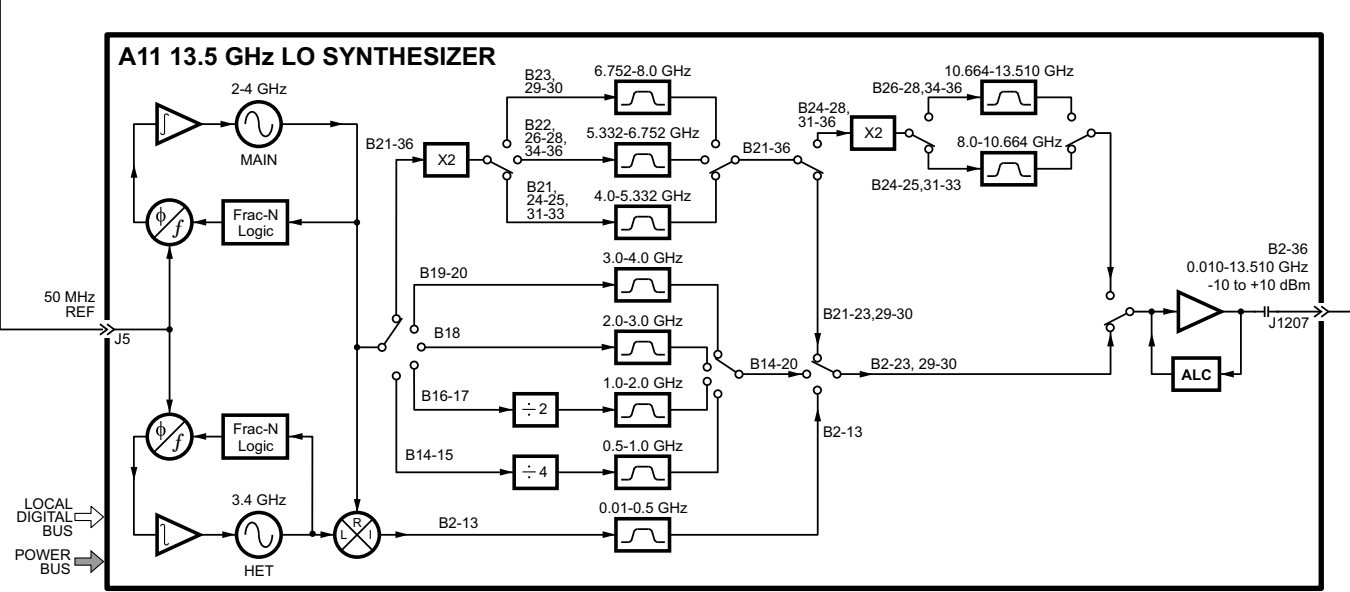
sd623c

REAR PANEL INTERCONNECTS

**N5264A Overall Block Diagram**  
 (Includes Options 700 - Standard; 108 - LO Source  
 Service Guide: N5264-90001



**OPTION 108**



Band	Mixer Brick L.O. Harmonic Number (N)	1 A11 Synthesizer Frequency (GHz)	2 A21 HMA26.5 Frequency (GHz)
0	-	-	-
1	-	-	-
2	1	0.01761 to 0.50761	0.01761 to 0.50761
3	1	0.50761 to 1.00761	0.50761 to 1.00761
4	1	1.00761 to 2.00761	1.00761 to 2.00761
5	1	2.00761 to 3.00761	2.00761 to 3.00761
6	1	3.00761 to 4.00761	3.00761 to 4.00761
7	1	4.00761 to 5.33961	4.00761 to 5.33961
8	1	5.33961 to 6.75961	5.33961 to 6.75961
9	1	6.75961 to 8.00761	6.75961 to 8.00761
10	1	8.00761 to 10.67161	8.00761 to 10.67161
11	1	10.67161 to 13.51761	10.67161 to 13.51761
12	1	6.758803 to 7.703803	13.51761 to 15.40761
13	1	7.703803 to 8.003803	15.40761 to 16.00761
14	1	8.003803 to 10.00381	16.00761 to 20.00761
15	1	10.00381 to 10.66781	20.00761 to 21.33561
16	1	10.66781 to 13.25381	21.33561 to 26.50761





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## **5 Theory of Operation**

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## Information in This Chapter

This chapter provides a general description of the operating theory of the N5264A PNA-X measurement receiver.

- Theory of operation is explained to the assembly level only.
- Component-level circuit theory is not provided.
- A simplified block diagram is included for each functional group.
- A more detailed block diagram is located at the end of [Chapter 4, “Troubleshooting.”](#)

---

**IMPORTANT** Although simplified block diagrams are included within the description of each functional group, it is recommended that the more detailed block diagram, located at the end of [Chapter 4](#), be available for reference as you read the information in this chapter.

---

## Chapter Five at-a-Glance

Section Title	Summary of Content	Start Page
<a href="#">Measurement Receiver System Operation</a>	A summary of the theory of operation for the analyzer.  A summary of the operation of the major functional groups of the analyzer.	<a href="#">Page 5-4</a>
<a href="#">Synthesized LO Group Operation (Option 108)</a>	Operation of the assemblies associated with the source group.	<a href="#">Page 5-6</a>
<a href="#">IF Multiplexer Group Operation</a>	Operation of the assemblies associated with the receiver group.	<a href="#">Page 5-14</a>
<a href="#">Digital Processing and Digital Control Group Operation</a>	Operation of the assemblies associated with digital processing and digital control.	<a href="#">Page 5-16</a>
<a href="#">Power Supply Group Operation</a>	Operation of the power supply assembly group.	<a href="#">Page 5-21</a>

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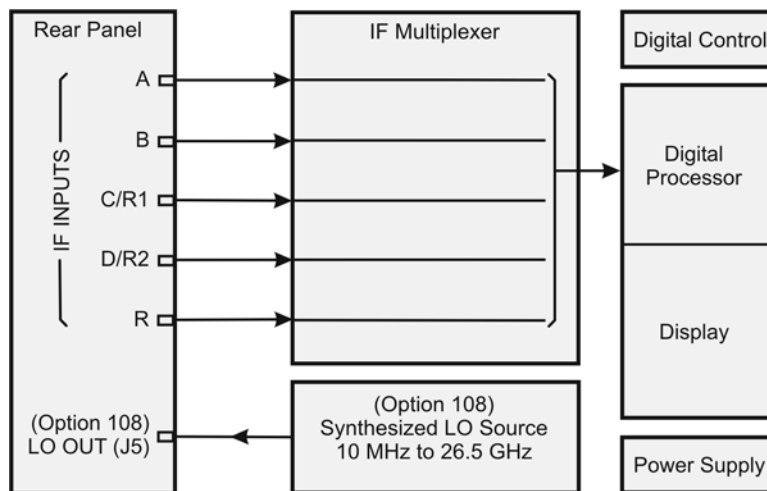
## Measurement Receiver System Operation

External IF INPUT signals are routed through the IF multiplexer to the digital processor where they are processed for display.

The Option 108 PNA-X measurement receiver generates an LO signal from the internal synthesized source that is available at the rear panel LO OUT connector.

Figure 5-1 is a simplified block diagram of the measurement receiver system.

**Figure 5-1 System Simplified Block Diagram**



n5264\_001\_501

## Functional Groups of the Measurement Receiver

The operation of the network analyzer can be separated into major functional groups. Each group consists of assemblies that perform a distinct function in the instrument. Some of the assemblies are related to more than one group, and all of the groups, to some extent, are interrelated and affect each other's performance. The major functional groups are:

- [Synthesized LO Group \(Option 108\)](#)
- [IF Multiplexer Group](#)
- [Digital Processor and Digital Control Group](#)
- [Power Supply Group](#)

### Synthesized LO Group (Option 108)

The built-in synthesized source generates a swept, stepped, or continuous wave (CW) signal in the frequency ranges as listed in [Table 5-1](#).

The LO signal is sent directly to the rear panel LO OUT connector.

Refer to [“Synthesized LO Group Operation \(Option 108\)” on page 5-6](#).

### IF Multiplexer Group

The IF multiplexer group provides five rear panel IF input signals that are sent to the A12 SPAM board for digital processing.

Refer to [“IF Multiplexer Group Operation” on page 5-14](#).

### Digital Processor and Digital Control Group

The digital processor and digital control group are divided into a front panel group and a data acquisition and processing group. The front panel group provides communication to the network analyzer. The data acquisition and processing group provides the output to the display, in addition to signal processing and analyzer control.

Refer to [“Digital Processing and Digital Control Group Operation” on page 5-16](#).

### Power Supply Group

The power supply functional group provides power for the other assemblies in the instrument.

Refer to [“Power Supply Group Operation” on page 5-21](#).

---

## Synthesized LO Group Operation (Option 108)

The LO group produces a stable LO output signal by phase locking a synthesized voltage-controlled oscillator (VCO). Refer to [Table 5-1 on page 5-8](#) for the full frequency range of the source. The outputs at the front panel test ports are swept, stepped or CW signals. Maximum leveled output powers are listed in [Table 5-1 on page 5-8](#). For a simple block diagram of the source group, refer to [Figure 5-2 on page 5-7](#).

In this section the following are described:

- [Basic Operation](#)
- [A10 Frequency Reference Board](#) (including rear-panel interconnects)
- [A11 13.5 GHz LO Synthesizer Board \(Option 108\)](#)
- [A21 Multiplier/Amplifier 26.5 Board \(HMA26.5\) \(Option 108\)](#)
- [A19 Test Set Motherboard](#) (including rear-panel interconnects)

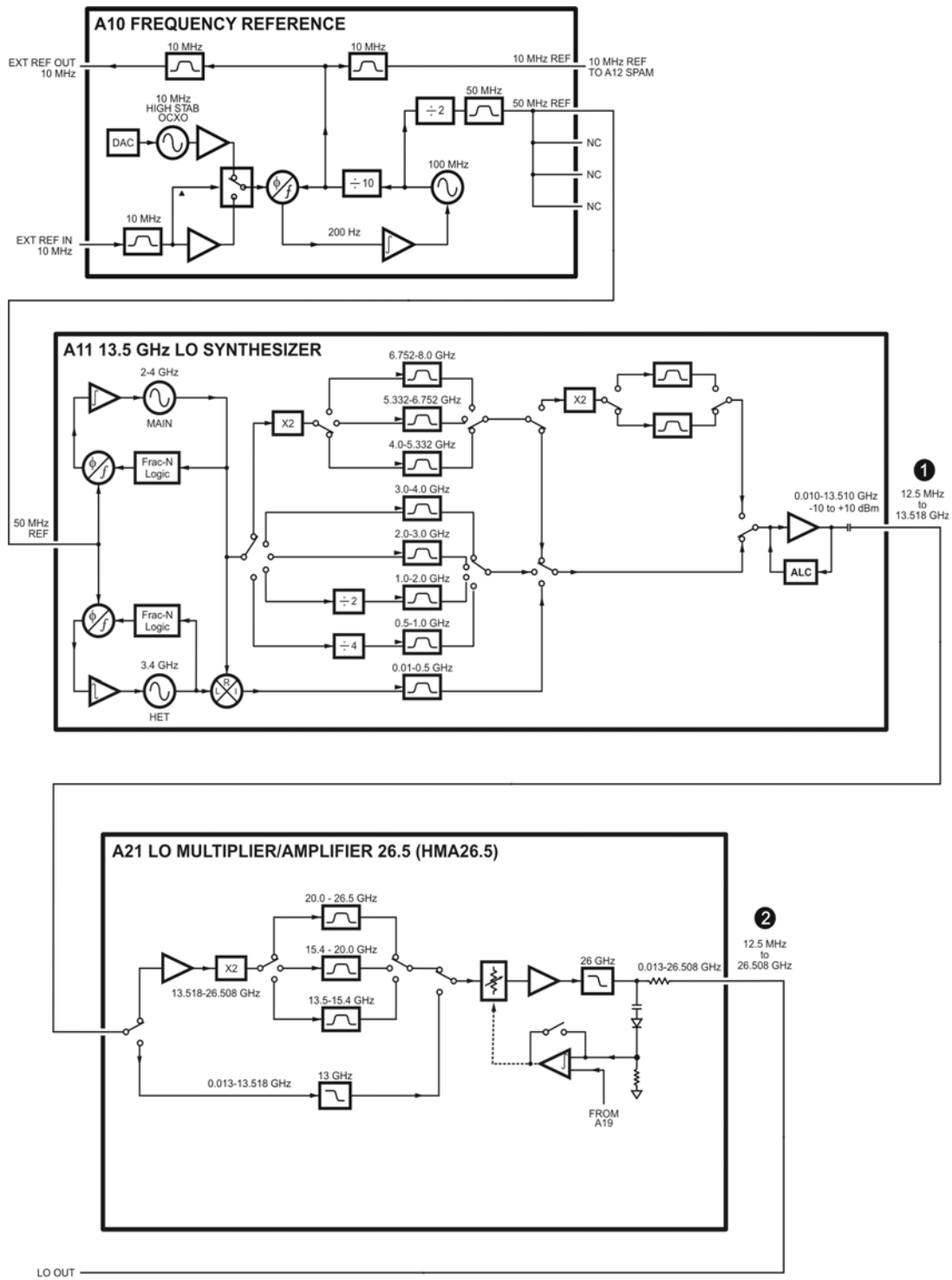
### Basic Operation

[Table 5-1 on page 5-8](#) lists the A11 LO synthesizer frequency and the A21 HMA26.5 output frequency for each band. This table is referred to throughout this chapter and also appears on the overall block diagram at the end of [Chapter 4, “Troubleshooting.”](#)

The A10 frequency reference board produces a constant phase locked reference signal of 50 MHz that is sent to the A11 13.5 GHz LO synthesizer board.

The A11 13.5 GHz synthesizer board produces an LO signal that is sent through the A21 multiplier/amplifier 26.5 (HMA26.5) to the rear panel LO OUT connector.

**Figure 5-2 Synthesized LO Group (Option 108)**



n5264\_001\_502

**Table 5-1 Subsweep Frequencies**

Band	LO Harmonic Number (N)	①	②
		A11 Synthesizer Frequency (GHz)	A21 HMA26.5 Frequency (GHz)
0	-	-	-
1	-	-	-
2	1	0.01761 to 0.50751	0.01761 to 0.50751
3	1	0.50761 to 1.00761	0.50761 to 1.00761
4	1	1.00761 to 2.00761	1.00761 to 2.00761
5	1	2.00761 to 3.00761	2.00761 to 3.00761
6	1	3.00761 to 4.00761	3.00761 to 4.00761
7	1	4.00761 to 5.33961	4.00761 to 5.33961
8	1	5.33961 to 6.75961	5.33961 to 6.75961
9	1	6.75961 to 8.00761	6.75961 to 8.00761
10	1	8.00761 to 10.67161	8.00761 to 10.67161
11	1	10.67161 to 13.51761	10.67161 to 13.51761
12	1	6.758803 to 7.703803	13.51761 to 15.40761
13	1	7.703803 to 8.003803	15.40761 to 16.00761
14	1	8.003803 to 10.00381	16.00761 to 20.00761
15	1	10.00381 to 10.66781	20.00761 to 21.33561
16	1	10.66781 to 13.25381	21.33561 to 26.50761

### A10 Frequency Reference Board

This assembly provides stable reference frequencies to the rest of the instrument. A high stability 10 MHz oven-controlled crystal oscillator (OCXO) normally provides the frequency standard. However, if a 10 MHz external reference signal is detected at the 10 MHz EXT REF IN port on the rear panel, it is used as the frequency reference instead.

The 10 MHz reference signal is used to phase lock a 100 MHz VCO. The output of this VCO is then divided by ten to produce the 10 MHz EXT REF OUT rear panel signal and also a 10 MHz reference signal for the A12 signal processing ADC module (SPAM) board. The VCO output is also divided by two to produce a 50 MHz reference signal for the A11 13.5 GHz LO synthesizer board.



## Rear-Panel Interconnects

<b>10 MHz REF INPUT</b>	<p>A BNC connector that allows an external frequency reference signal to be used to phase lock the analyzer for increased frequency accuracy.</p> <p>The analyzer automatically enables the external frequency reference feature when a signal is connected to this input. When the signal is removed, the analyzer automatically switches back to its internal frequency reference.</p>
<b>10 MHz REF OUTPUT</b>	<p>A BNC connector that allows a 10 MHz reference signal, produced by the A10 frequency reference board, to be output for use in phase locking external test equipment.</p>

## A11 13.5 GHz LO Synthesizer Board (Option 108)

The A11 13.5 GHz LO synthesizer board uses the 50 MHz reference signal from the A10 frequency reference board to tune two VCO circuits: one that sweeps from 2 GHz to 4 GHz and one that is set to a fixed CW frequency of 3.4 GHz.

In bands 2-13, the 3.4 GHz signal is mixed with 3.41 GHz to 3.90 GHz signals from the 2-4 GHz oscillator to produce the output frequencies of 10 MHz to 500 MHz as listed in [Table 5-1](#).

In bands 14 and 15, the output of the swept VCO is passed through a divide-by-4 circuit to produce the output frequencies listed in [Table 5-1](#).

In bands 16 and 17, the swept VCO signal is passed through a divide-by-2 circuit to produce the output frequencies listed in [Table 5-1](#).

In bands 18-20, the swept VCO signal is passed directly to the output of the synthesizer board to produce the output frequencies listed in [Table 5-1](#).

In bands 21-36, the swept VCO signal is passed through a doubler circuit where bands 21-23 and 29-30 are sent directly to the output of the synthesizer board while bands 26-28 and 34-36 are passed through another doubler circuit then to the output of the synthesizer board to produce the output frequencies listed in [Table 5-1](#).

## A21 Multiplier/Amplifier 26.5 Board (HMA26.5) (Option 108)

In bands 2–28, the synthesized LO input is filtered, amplified, and passed through to the rear panel LO OUT connector. In bands 29–36, the input is amplified, doubled, and filtered, then sent to the output.

Together, these signal paths create the full output frequency range of 12.5 MHz to 26.508 GHz that is sent to the rear panel LO OUT connector.

## A19 Test Set Motherboard

The A19 test set motherboard serves these functions:

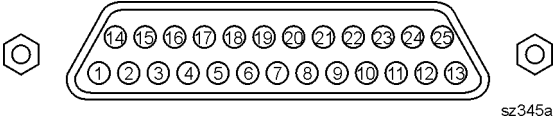
- to act as an interface between the A17 CPU board and the auxiliary rear panel interconnects.
- to provide ALC signals to the A21 HMA26.5.

### Rear Panel Interconnects

The A19 test set motherboard includes the following rear panel interconnects.

<b>TEST SET I/O</b>	<p>A DB-25 female connector that is used to control external test sets. The external test set bus consists of 13 multiplexed address and data lines, three control lines, and an open-collector interrupt line. Pin assignments are listed in <a href="#">Table 5-2 on page 5-11</a>.</p> <p>Up to 16 test sets may be “daisy-chained” on the bus at one time.</p> <p>The Test Set I/O is not compatible with 8753 network analyzer test sets.</p>
<b>HANDLER I/O</b>	<p>A rectangular 36-pin, female connector providing four independent parallel input/output ports, nine control signal lines, one ground, and a power supply line. This connector has Type 2 output pin assignments as listed in <a href="#">Table 5-3 on page 5-12</a>.</p> <p>All signals are TTL-compatible. Data input/output ports consist of two 8-bit output ports (Port A and Port B) and two 4-bit bidirectional ports (Port C and Port D).</p> <p>Connector settings can be changed using SCPI and COM commands. The settings are not accessible from the front panel.</p>
<b>PWR I/O</b>	<p>A DB-9 female connector. Pin assignments are listed in <a href="#">Table 5-4 on page 5-13</a>.</p>

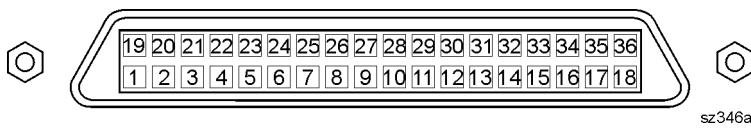
**Table 5-2 TEST SET I/O Connector Pin Assignments**



**DB-25 Female Connector**

Pin Numbers	Name	Function
1	SEL0	TTL out, test set select bit 0, tied to 0 V
2	Sweep Holdoff In	TTL in, low level holds off sweep
3–6	AD12–AD8	TTL I/O, address and latched data
7	GND	0 V, ground reference
8	LAS	TTL out, active low address strobe (1 $\mu$ s min)
9–11	AD4–AD2	TTL I/O, address and latched data
12	GND	0 V, ground reference
13	Interrupt In	TTL in, low level (10 $\mu$ s min) aborts sweep
14	+22 V	+22 Vdc, 100 mA max.
15–16	SEL1–2	TTL out, test set select bits 1-2, tied to 0 V
17	AD11	TTL I/O, address and latched data
18	SEL3	TTL out, test set select bit 3, tied to 0 V
19–21	AD7–5	TTL I/O, address and latched data
22–23	AD0–1	TTL I/O, address and latched data
24	LDS	TTL out, active low data strobe (1 $\mu$ s min)
25	RLW	TTL out, high = read, low = write

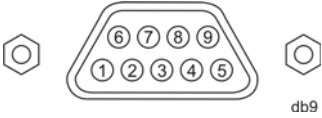
**Table 5-3 HANDLER I/O Connector Pin Assignments**



**Rectangular 36-Pin Female Connector**

Pin Numbers	Name	Function
1	GND	0 V, ground reference
2	INPUT1	TTL in, negative pulse (1 $\mu$ s min) latches OUTPUT1-2
3–4	OUTPUT1–2	TTL out, latched
5–12	Port A0–7 Out	TTL out, latched
13–20	Port B0–7 Out	TTL out, latched
21–24	Port C I/O	TTL I/O, latched
25–28	Port D I/O	TTL I/O, latched
29	Port C Status	TTL out, low = input mode, high = output mode
30	Port D Status	TTL out, low = input mode, high = output mode
31	Output Strobe Write Strobe	TTL out, active low data write strobe (1 $\mu$ s min)
32	No connect	Not used
33	Pass Fail	TTL out, latched, indicates pass fail (programmable polarity)
34	+5 V	+5 Vdc, 100 mA max.
35	Sweep End	TTL out, active low (10 $\mu$ s min) indicates sweep done
36	Pass/Fail Write Strobe	TTL out, active low pass/fail write strobe (1 $\mu$ s min)

**Table 5-4 PWR I/O Connector Pin Assignments**

Pin	Name	Description
 <p><b>DB-9 Female Connector</b></p>		
1	+15V	+15 V @ 400 mA
2	-15V	-15 V @ 400 mA
3	AnalogOut1	Analog Output Voltage Programmable $\pm 10$ V @ 100 mA out Nominally 0 ohms 2.44 mV typical resolution 1 MHz BW
4	AnalogOut2	Analog Output Voltage Programmable $\pm 10$ V @ 100 mA out Nominally 0 ohms 2.44 mV typical resolution 1 MHz BW
5	ACOM	System ground
6	GndSense	Ground sense for Analog In and Analog Out Connected with 51.1 ohms to ACOM
7	AnalogIn1	Analog input: $\pm 10$ V @ 1.22 mV typical resolution $R_{in} > 1$ M-ohm BW $\approx 1$ MHz ADC conversion time < 1 us typical
8	AnalogIn2	Analog input: $\pm 10$ V @ 1.22 mV typical resolution $R_{in} > 1$ M-ohm BW $\approx 1$ MHz ADC conversion time < 1 us typical
9	Power Button	Open collector input Active low replicates power button key press.

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## IF Multiplexer Group Operation

The IF multiplexer group provides five rear panel IF input signals to the [Digital Processor and Digital Control Group](#).

A block diagram of the IF multiplexer group is shown in [Figure 5-4 on page 5-17](#).

The IF multiplexer group consists of:

- [Rear Panel IF Inputs](#)
- [A20 IF Multiplexer Board](#)

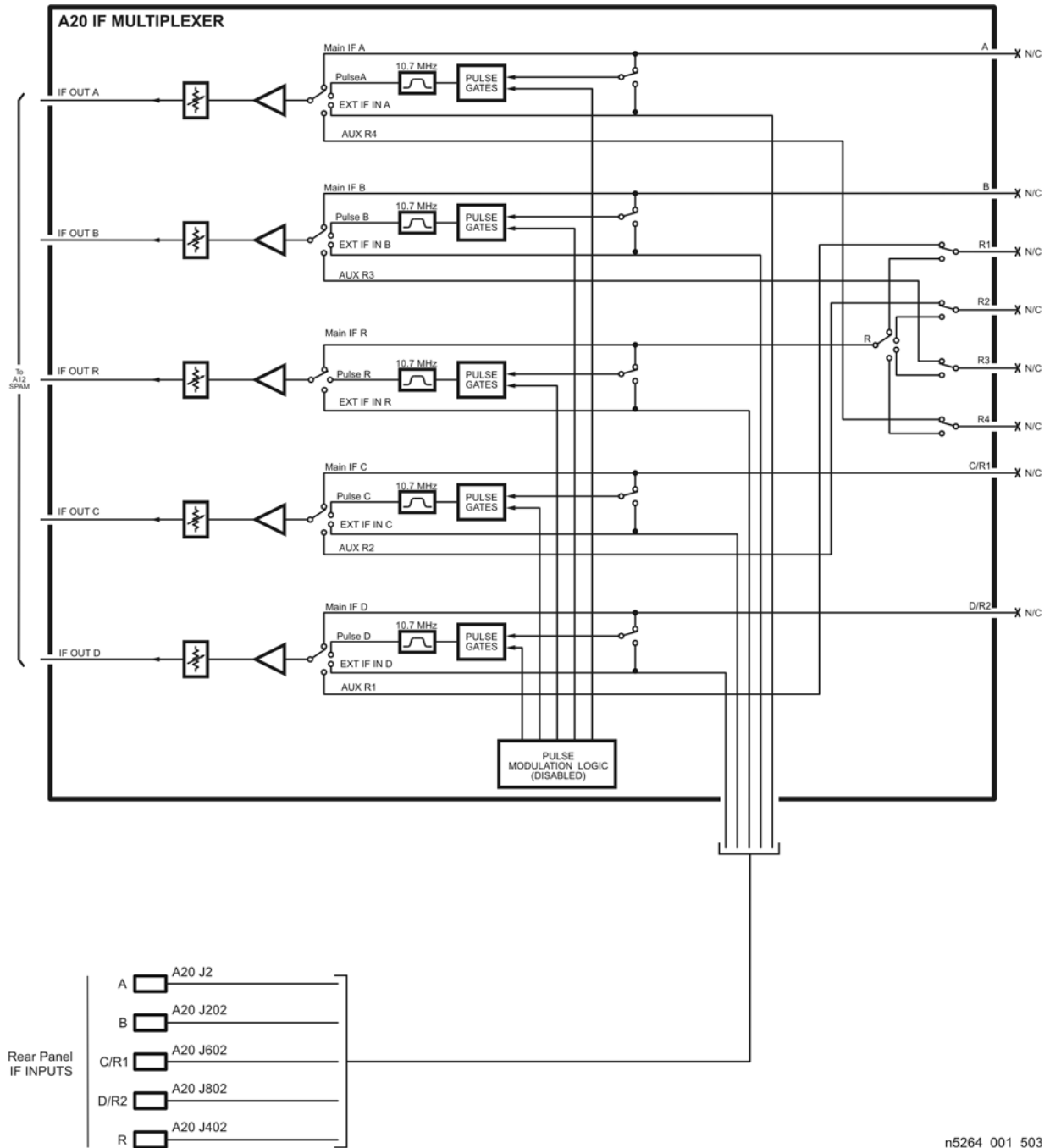
### Rear Panel IF Inputs

These inputs provide the five IF input signals that are sent to the A12 SPAM board for digital processing.

### A20 IF Multiplexer Board

The A20 IF multiplexer board routes the five rear panel IF input signals to the A12 SPAM board.

**Figure 5-3 IF Multiplexer Group**



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## Digital Processing and Digital Control Group Operation

The digital processor and control group provides digital control for the entire analyzer. It provides:

- front panel operation,
- output to the display,
- math processing functions, and
- communications between the analyzer and an external controller or peripherals.

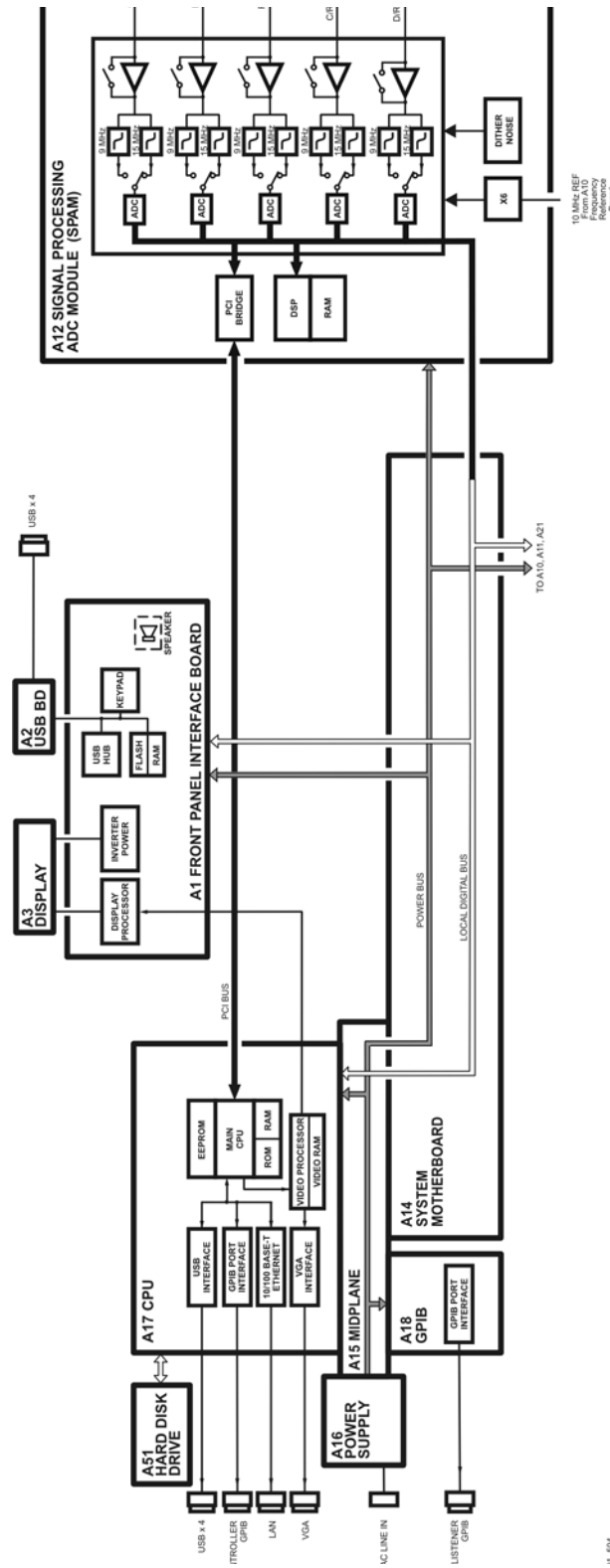
A block diagram of the digital control functional group is shown in [Figure 5-4 on page 5-17](#).

The digital control functional group consists of two subgroups:

- [Front Panel Subgroup](#)
  - [A1 Front Panel Interface Board](#)
  - [A2 USB Board](#)
  - [A3 Display Assembly](#)
  - [Keypad Assembly](#)
  - A14 system motherboard
- [Data Acquisition and Processing Subgroup](#)
  - [A12 SPAM Board](#)
  - [A17 CPU Board](#)
  - [A51 Hard Disk Drive](#)



Figure 5-4 Digital Processing and Digital Control Group



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## Front Panel Subgroup

The front panel subgroup contains the following assemblies:

- [A1 Front Panel Interface Board](#)
- [A2 USB Board](#)
- [A3 Display Assembly](#)
- [Keypad Assembly](#)

### A1 Front Panel Interface Board

The A1 front panel interface board detects and decodes user inputs from the keypad assembly and front panel knob, and transmits them to the A17 CPU board by way of the A14 system motherboard. It also decodes video data from the video processor on the A17 CPU board and supplies this to the A3 display assembly. Power from the power bus on the A14 system motherboard is buffered and routed to the keypad assembly and the A3 display assembly. All data and power signals are routed through a single cable connector to the A14 system motherboard.

The A1 front panel interface board also includes a speaker that emits the audio signals received from the A17 CPU board.

### A2 USB Board

This board provides four universal serial bus (USB) jacks that are industry standard 4-pin connectors allowing multiple USB devices to be connected to the analyzer's front panel.

### A3 Display Assembly

The A3 display assembly contains an 10-inch LCD with associated drive circuitry and backlight inverter. Two cables between the A3 display assembly and the A1 front panel display board provide all necessary power and data for normal operation. The two cables are:

1. A cable to the inverter that supplies buffered power.
2. A cable to the display circuitry that supplies decoded data from the video processor on the A17 CPU board and the necessary drive circuit power. The video data received from the A17 CPU board includes the following:
  - digital TTL horizontal sync
  - digital TTL vertical sync
  - digital TTL red video
  - digital TTL green video
  - digital TTL blue video
  - blanking
  - data clock

### Keypad Assembly

The keypad assembly provides user interface to the analyzer. The front panel rotary pulse generator (RPG) knob is not electrically connected to the keypad, but rather provides user inputs directly to the front panel processor.

## Data Acquisition and Processing Subgroup

The data acquisition and processing subgroup contain the following assemblies. See [Figure 5-4 on page 5-17](#).

- [A12 SPAM Board](#)
- [A17 CPU Board](#) (including rear panel interconnects)
- [A51 Hard Disk Drive](#)

### A12 SPAM Board

The digital signal processor (DSP) receives digitized data from the digital circuitry of the A12 SPAM board. It computes discrete Fourier transforms to extract the complex phase and magnitude data from the analog IF signal. The resulting raw data is written into the main random access memory (RAM). The data taking sequence is triggered either externally from the rear panel or by firmware on the A17 CPU board.

### A17 CPU Board

The A17 CPU board contains the circuitry to control the operation of the analyzer. Some of the components include the central processing unit (CPU), memory (EEPROM, ROM, RAM), bus lines to other board assemblies, and connections to the rear panel. Some of the main components are described next:

- [CPU](#)
- [Main RAM](#)
- [Rear Panel Interconnects](#)

**CPU** The central processing unit (CPU) is a microprocessor that maintains digital control over the entire instrument through the instrument bus. The CPU receives external control information from the keypad, any USB device, LAN or GPIB, and performs processing and formatting operations on the raw data in the main RAM. It controls the DSP, the video processor, and the interconnect port interfaces. In addition, when the analyzer is in the system controller mode, the CPU controls peripheral devices through the peripheral port interfaces.

Front panel settings are stored in SRAM, with a battery providing at least five years of backup storage when external power is off.

**Main RAM** The main random access memory (RAM) is shared memory for the CPU and the DSP. It stores the raw data received from the DSP while additional calculations are performed on it by the CPU. The CPU reads the resulting formatted data from the main RAM, converts it to a user-definable display format, and writes this to the video processor for display.

**Rear Panel Interconnects** The rear panel includes the following interfaces:

<b>USB x4</b>	Four universal serial bus (USB) jacks (industry standard 4-pin connectors).
<b>GPIB (0) Controller</b>	A 24-pin, female, type D-24 connector that meets IEEE-488 standards.
<b>GPIB (1) Talker/Listener</b>	A 24-pin, female, type D-24 connector that meets IEEE-488 standards.
<b>LAN</b>	A standard 8-pin, 10/100BaseT, Ethernet connection. It auto selects between the two data rates.
<b>Display (VGA)</b>	A 15-pin, female, D-sub connector that provides a video output of the analyzer display that can be viewed on an external VGA monitor.

### A51 Hard Disk Drive

The hard disk drive assembly (HDDA) is an integrated development environment (IDE) data storage device which is connected directly to, and physically mounted within the enclosure of, the A17 CPU board. The full operating system and firmware for the network analyzer is stored on the A51 hard disk drive.

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## Power Supply Group Operation

The A16 power supply assembly is a switching power supply operating at 103 kHz switching frequency. The input power ranges for the power supply are 90 to 132 Vac or 195 to 250 Vac. The power supply automatically senses the input voltage and switches between these two ranges.

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**WARNING**      **Supply voltages which oscillate between the two normal input ranges of the autoranging line voltage input will damage the power supply. In rare cases, this damage has become a user safety concern. If unstable power levels are expected, the analyzer input power must be buffered by a line conditioner.**

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The dc output voltages of the A16 power supply assembly are:

- +15 V analog
- +9 V analog
- +3.3 V analog
- +5.2 V analog
- +15 V standby (always on)
- +32 V analog
- -15 V analog
- -5.2 V analog
- -7 V analog
- +5.1 V standby
- +12 V digital
- +3.35 V digital
- +5.1 V digital

The +15 V standby supply remains on continuously whenever the power supply is plugged in. This supply is used to provide power to front panel LEDs and CPU components when the analyzer is turned off.



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## **6 Replaceable Parts**

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## Information in This Chapter

This chapter:

- identifies the replaceable parts for the Agilent PNA-X measurement receiver.
- includes several tables and illustrations to assist you in identifying the correct part for your measurement receiver.
- contains ordering information for new assemblies and rebuilt-exchange assemblies.

### Chapter Six at-a-Glance

Section Title	Summary of Content	Start Page
<a href="#">Ordering Information</a>	How to order a replaceable part from Agilent Technologies.	<a href="#">Page 6-3</a>
<a href="#">Assembly Fault Identification and Replacement Sequence</a>	The correct sequence for determining the failure of, and replacing, a defective assembly.	<a href="#">Page 6-3</a>
<a href="#">Replaceable Parts Listings</a>	Tables that list the assemblies by reference designator with their associated part number and description.  Illustrations that indicate the location of each of the replaceable parts in your measurement receiver: <ul style="list-style-type: none"><li>• Assemblies (front panel, top, and bottom)</li><li>• Cables (top and bottom)</li><li>• Hardware (top, bottom, internal, external, and rear panel)</li><li>• Miscellaneous replaceable parts</li></ul>	<a href="#">Page 6-4</a>



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## Ordering Information

To order a part listed in the replaceable parts lists:

- include the part number
- indicate the quantity required
- Contact Agilent Technologies for instructions on where to send the order. Refer to [“Contacting Agilent” on page 2-9.](#)

To order a part that is not listed in the replaceable parts lists:

- include the instrument model number and complete instrument serial number
- include the description and function of the part
- indicate the quantity required
- Contact Agilent Technologies for instructions on where to send the order. Refer to [“Contacting Agilent” on page 2-9.](#)

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## Assembly Fault Identification and Replacement Sequence

The following steps describe the procedure to identify, and then replace, a faulty assembly.

- Step 1.** Identify the faulty group. Begin with [Chapter 4, “Troubleshooting.”](#) Follow up with the appropriate troubleshooting chapter that identifies the faulty assembly.
- Step 1.** Order a replacement assembly. Refer to [Chapter 6 , “Replaceable Parts”](#) (this chapter).
- Step 2.** Replace the faulty assembly and determine what adjustments are necessary. Refer to [Chapter 7, “Repair and Replacement Procedures.”](#)
- Step 3.** Determine the necessary adjustments and performance tests to be performed. Refer to [Table 7-2, “Related Service Procedures,” on page 7-42.](#)
- Step 4.** Perform the necessary adjustments. Refer to [Chapter 3, “Tests and Adjustments.”](#)
- Step 5.** Perform the necessary performance tests. Refer to [Chapter 3, “Tests and Adjustments.”](#)

## Replaceable Parts Listings

This section contains the replacement part numbers and their descriptions for your Agilent microwave PNA. You can find the locations of replaceable parts in this section:

- listed by reference designator in [Table 6-1](#), or
- listed by the type of part in [Table 6-2](#).

**Table 6-1 Part Number Location by Reference Designator**

Reference Designator	Description	Location
A1	Front panel interface board	"Front Panel Assembly, Back Side, All Options" on page 6-8
A2	USB board	
A3	Display assembly	
A10	Frequency reference board	"Top Assemblies, All Options" on page 6-10
A11	13.5 GHz synthesizer board (Option 108)	
A12	Signal processing ADC module (SPAM) board	
A14	System motherboard	
A15	Midplane board	
A16	Power supply	
A17	CPU board	
A18	GPIB board	
A19	Test set motherboard	"Bottom Assemblies, All Options" on page 6-14
A20	IF multiplexer board	
A21	LO multiplier/amplifier 26.5 (HMA26.5) (Option 108)	
A51	Hard disk drive	"Top Assemblies, All Options" on page 6-10

**Table 6-2 Part Number Location by Type of Part**

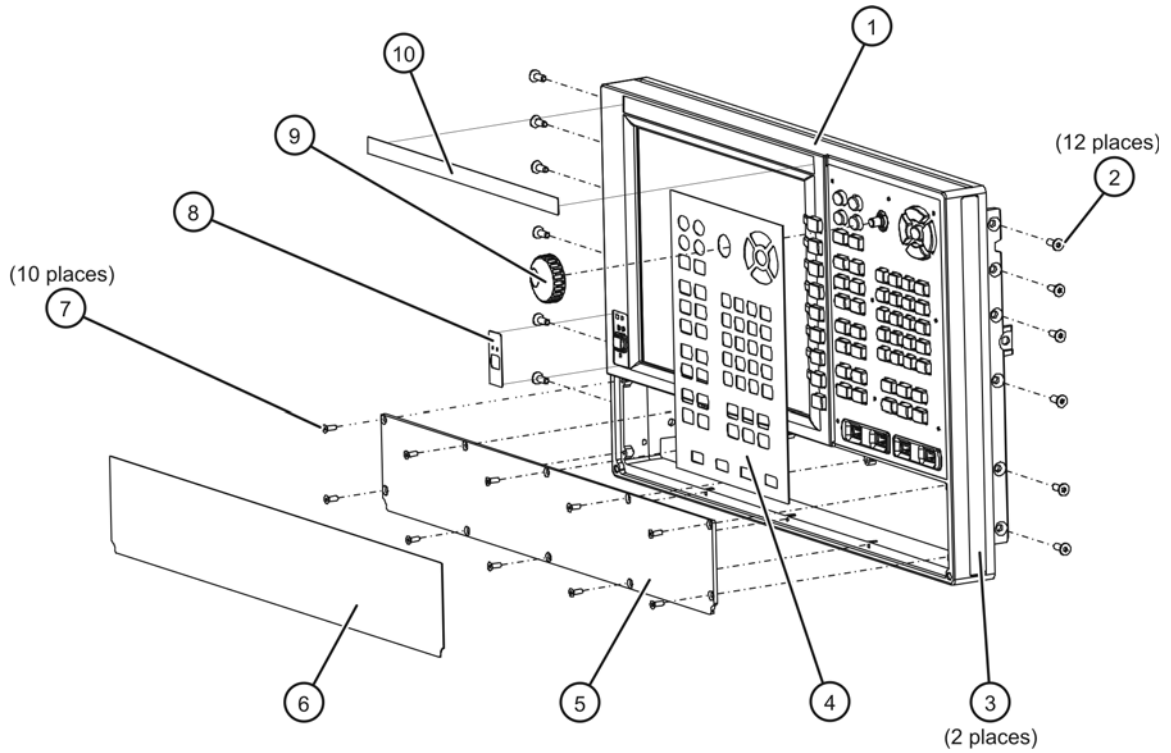
Type of Part	Location
<b>Assemblies</b>	<ul style="list-style-type: none"> <li>• “Front Panel Assembly, Front Side, All Options” on page 6-6</li> <li>• “Front Panel Assembly, Back Side, All Options” on page 6-8</li> <li>• “Top Assemblies, All Options” on page 6-10</li> <li>• “Bottom Assemblies, All Options” on page 6-14</li> <li>• “Rear Panel Assembly, All Options” on page 6-26</li> </ul>
<b>Cables</b>	<ul style="list-style-type: none"> <li>• “Top Cables, All Options” on page 6-12</li> <li>• “Bottom Cables, All Options” on page 6-16</li> </ul>
<b>Hardware</b>	<ul style="list-style-type: none"> <li>• “Top Hardware and Miscellaneous Parts, All Options” on page 6-18</li> <li>• “Bottom Hardware and Miscellaneous Parts, All Options” on page 6-20</li> <li>• “Internal Hardware and Miscellaneous Parts, All Options” on page 6-22</li> <li>• “External Hardware and Miscellaneous Parts, All Options” on page 6-24</li> <li>• “Rear Panel Assembly, All Options” on page 6-26</li> </ul>
<b>Miscellaneous</b>	<ul style="list-style-type: none"> <li>• Service Tools on page 6-28</li> <li>• Documentation on page 6-28</li> <li>• GPIB Cables/GPIB Adapter on page 6-28</li> <li>• Fuses on page 6-28</li> <li>• ESD Supplies on page 6-29</li> <li>• Memory Modules on page 6-28</li> <li>• Upgrades Orderable by Model Number on page 6-28</li> <li>• USB Accessories on page 6-29</li> <li>• Rack Mount Kits and Handle Kits on page 6-29</li> <li>• Touch-up Paint on page 6-29</li> </ul>

## Front Panel Assembly, Front Side, All Options

Reference Designator	Part Number	Qty	Description
①	N5242-20001	1	Front frame assembly
	8160-0660	1.2 m	RFI gasket material, 1.2 meters in length (Must be ordered separately from front frame assembly.)
②	0515-2044	12	Machine screw, M4.0 x 10 flat head (To attach front frame to chassis.)
③ <sup>a</sup>	5041-9183	2	With handles—front handle side trim
	5041-9174	2	Without handles—trim strip, filler
④	N5242-80005	1	Keypad overlay
⑤	N5264-00001	1	Lower front dress panel
⑥	N5264-80001	1	Front panel overlay
⑦	0515-1227	10	Machine screw, M3.0 x 6 flat head (To attach lower dress panel to front frame.)
⑧	N5242-80007	1	Power switch overlay
⑨	W1312-40017	1	Front (RPG) knob
⑩	N5264-80002	1	Nameplate

a. For part numbers of rack mount kits and handle kits, refer to [“Rack Mount Kits and Handle Kits”](#) on page 6-29.

**Figure 6-1 Front Panel Assembly, Front Side, All Options**

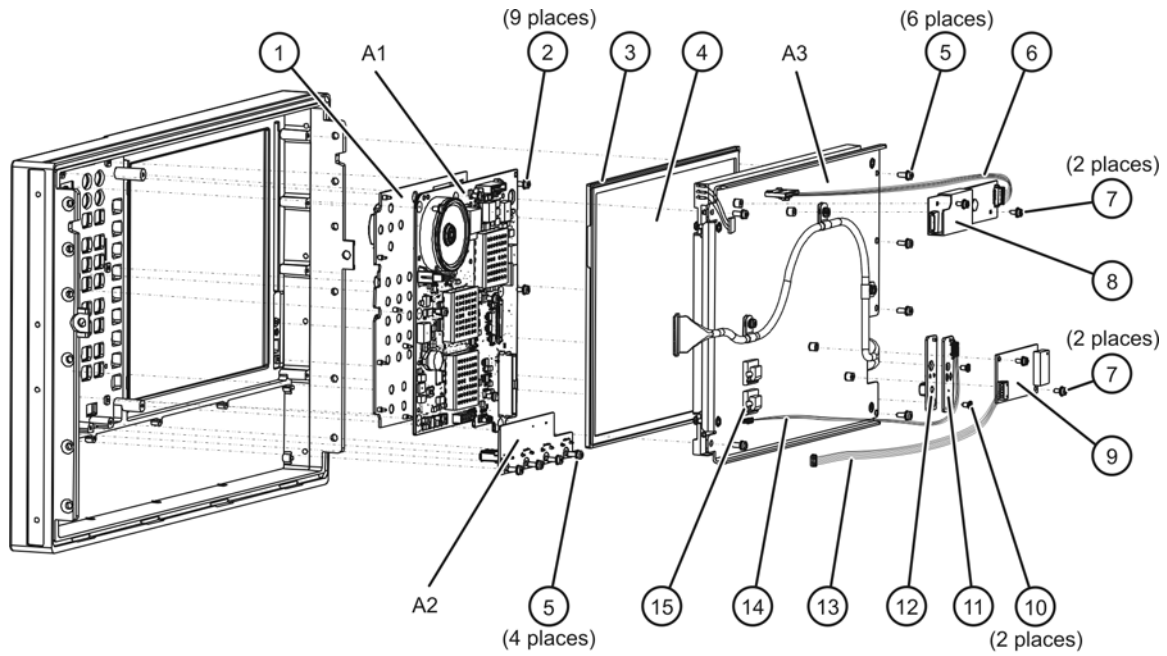


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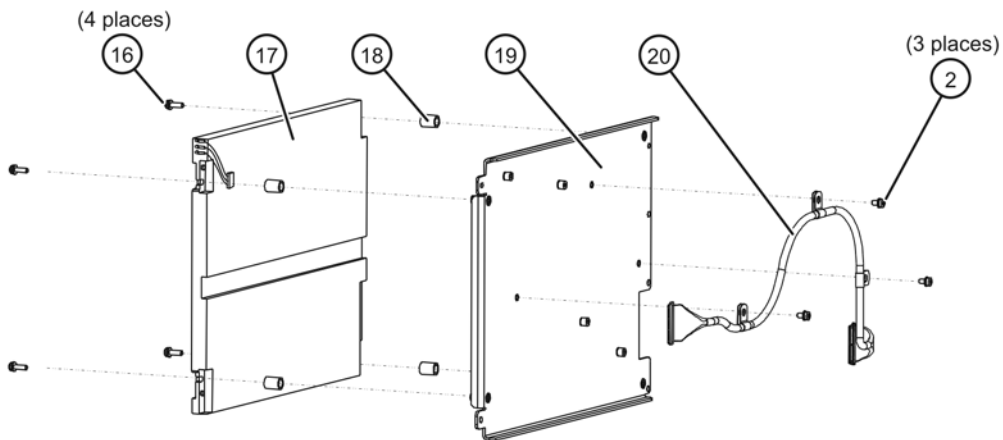
## Front Panel Assembly, Back Side, All Options

Reference Designator	Part Number	Qty	Description
A1	N5240-63053	1	Front panel interface board
A2	N5240-60047	1	USB board
①	N5242-40001	1	Keypad assembly
②	0515-0430	12	Machine screw, M3.0 x 6 pan head (9 to attach front panel interface board to front frame and 3 to attach display cable to display hold down bracket.)
③	N5242-40003	1	Touch screen rubber boot
④	2090-0930	1	Touch screen, 10.4 inch
⑤	0515-0372	10	Machine screw, M3.0 x 8 pan head (6 to attach display to front frame and 4 to attach USB board to front frame.)
⑥	E6601-61028	1	Cable, A3 front panel interface board to inverter board
⑦	0515-1934	4	Machine screw, M2.5 x 6 pan head (To attach inverter board and USB controller board to display hold down bracket.)
⑧	0950-4420	1	Inverter board
⑨	0960-2535	1	USB controller board
⑩	0515-1521	2	Machine screw, M3.0 x 5 flat head (To attach power switch assembly to front frame.)
⑪	N5240-60050	1	Power switch board
⑫	N5240-40001	1	Power button keypad
⑬	W1312-60047	1	USB controller board cable harness
⑭	8121-1451	1	Power switch cable harness
⑮	1410-0510	2	Cable clamp (with adhesive backing)
A3			Display assembly
⑯	0515-0374	4	Machine screw, M3.0 x 10 pan head (To attach LCD display to hold down bracket.)
⑰	2090-0883	1	LCD display
⑱	N5242-20121	4	Spacers (For display hold down bracket standoffs.)
⑲	N5242-00034	1	LCD display hold down bracket
⑳	E6601-61016	1	Display cable

**Figure 6-2 Front Panel Assembly, Back Side, All Options**



**A3 Display Assembly**



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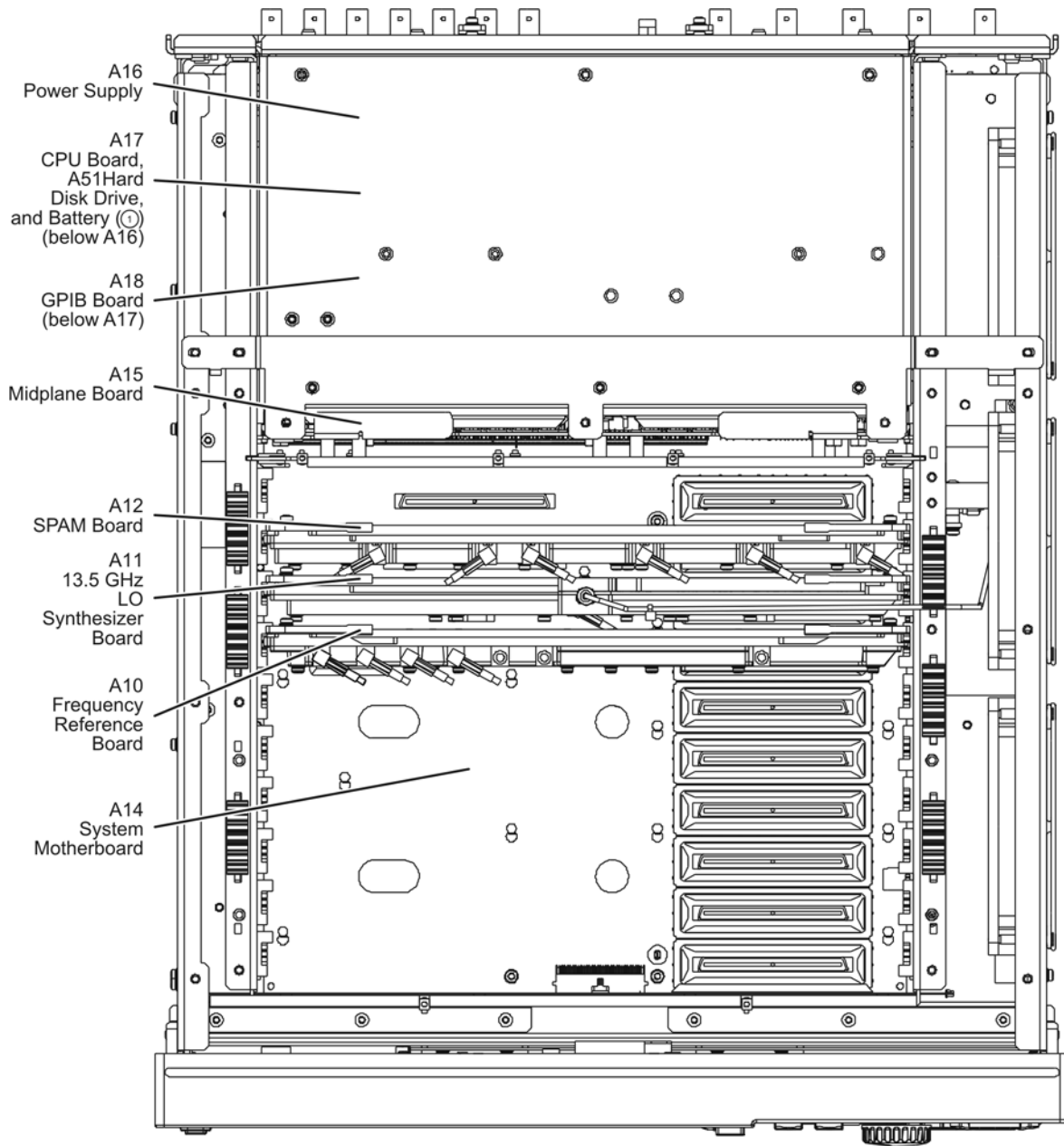
## Top Assemblies, All Options

Reference Designator	Part Number	Qty	Description
A10	N5240-60042	1	Frequency reference board
A11	N5230-60002	1	13.5 GHz LO synthesizer board
A12	N5240-60041	1	Signal Processing ADC Module (SPAM) board
A14	N5240-60044	1	System motherboard
A15	W1312-60002	1	Midplane board
A16	0950-4900 Replaces 0950-4457	1	Power supply
A17	W1312-60068	1	CPU board assembly, 2.0 GHz, 4 GB DDR SDRAM
A18	N5240-60052	1	GPIB board
A51	N5242-60044 <sup>a</sup>	1	Hard disk drive (HDD)
①	1420-0356	1	Battery, lithium manganese dioxide, 3V, 0.22A-hr <sup>b</sup>

- a. The A51 hard disk drive for the 2.0 GHz CPU board plugs into the A17 CPU board assembly from the rear panel and is replaced as an entire assembly. Refer to [“Removing and Replacing the A51 Hard Disk Drive \(HDDA\)” on page 7-48](#) for an illustration.
- b. The lithium battery is located inside the A17 CPU board assembly. Refer to [“Removing and Replacing the Lithium Battery” on page 7-40](#) for an illustration.



**Figure 6-3 Top Assemblies, All Options**



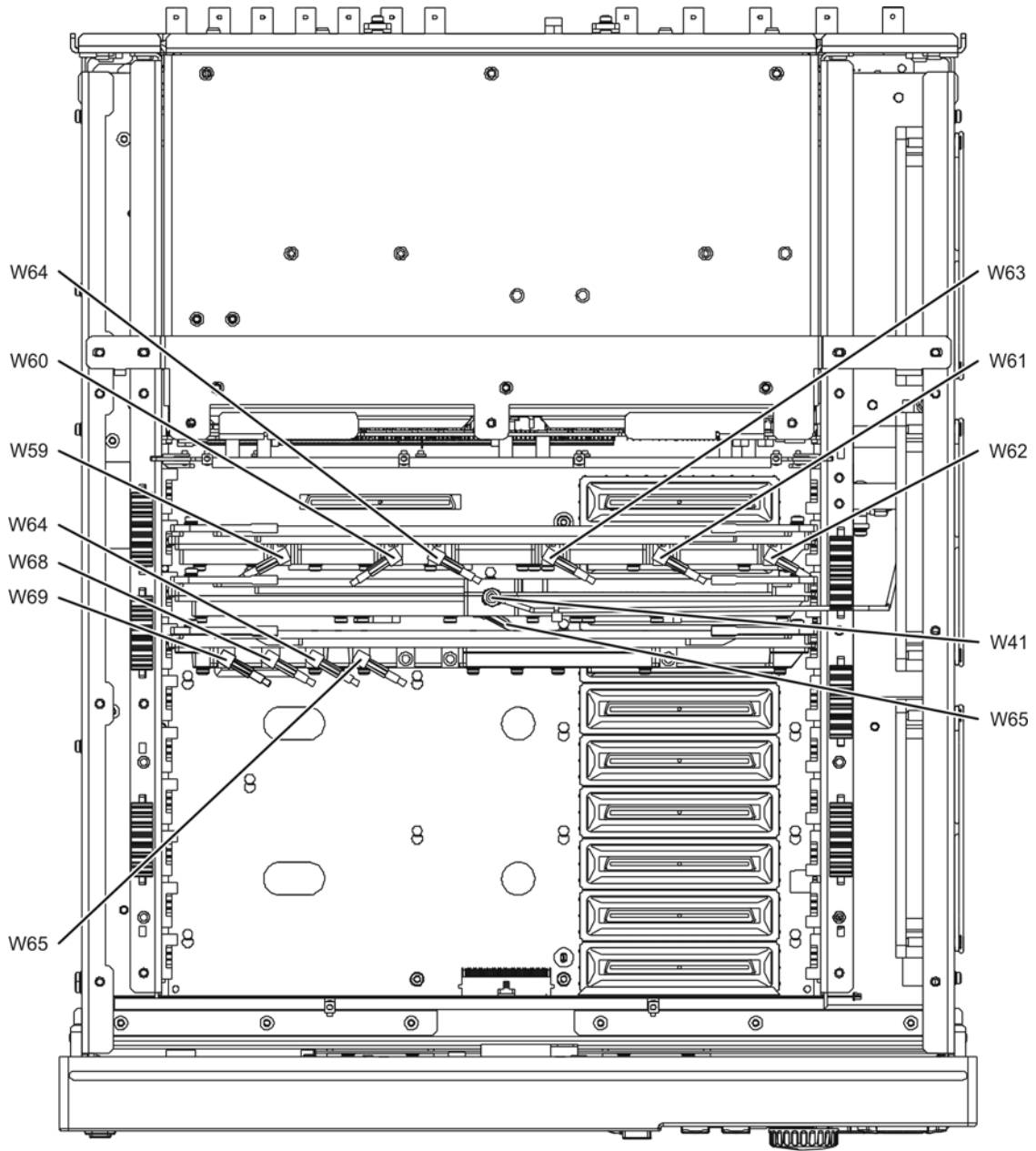
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## Top Cables, All Options

Reference Designator	Type <sup>a</sup>	Part Number	Qty	Description
W41	SR	N5242-20110	1	A11 13.5 GHz (LO) synthesizer board J1207 to A21 HMA26.5
W59	F	N5242-60012	1	A20 IF multiplexer board P3 to A12 SPAM board J1
W60	F	N5242-60013	1	A20 IF multiplexer board P203 to A12 SPAM board J2
W61	F	N5242-60015	1	A20 IF multiplexer board P603 to A12 SPAM board J5
W62	F	N5242-60016	1	A20 IF multiplexer board P803 to A12 SPAM board J6
W63	F	N5242-60014	1	A20 IF multiplexer board P403 to A12 SPAM board J4
W64	F	N5242-60027	1	A10 frequency reference board J4 to A12 SPAM board J3
W65	F	N5242-60028	1	A10 frequency reference board J5 to A11 13.5 GHz (LO) synthesizer board J5
W68	F	8120-5063	2	Rear-panel 10 MHz REF IN to A10 frequency reference board J2
W69				A10 frequency reference board J3 to rear-panel 10 MHz REF OUT

a. SR = semirigid coaxial cable; F = flexible coaxial cable

**Figure 6-4 Top Cables, All Options**

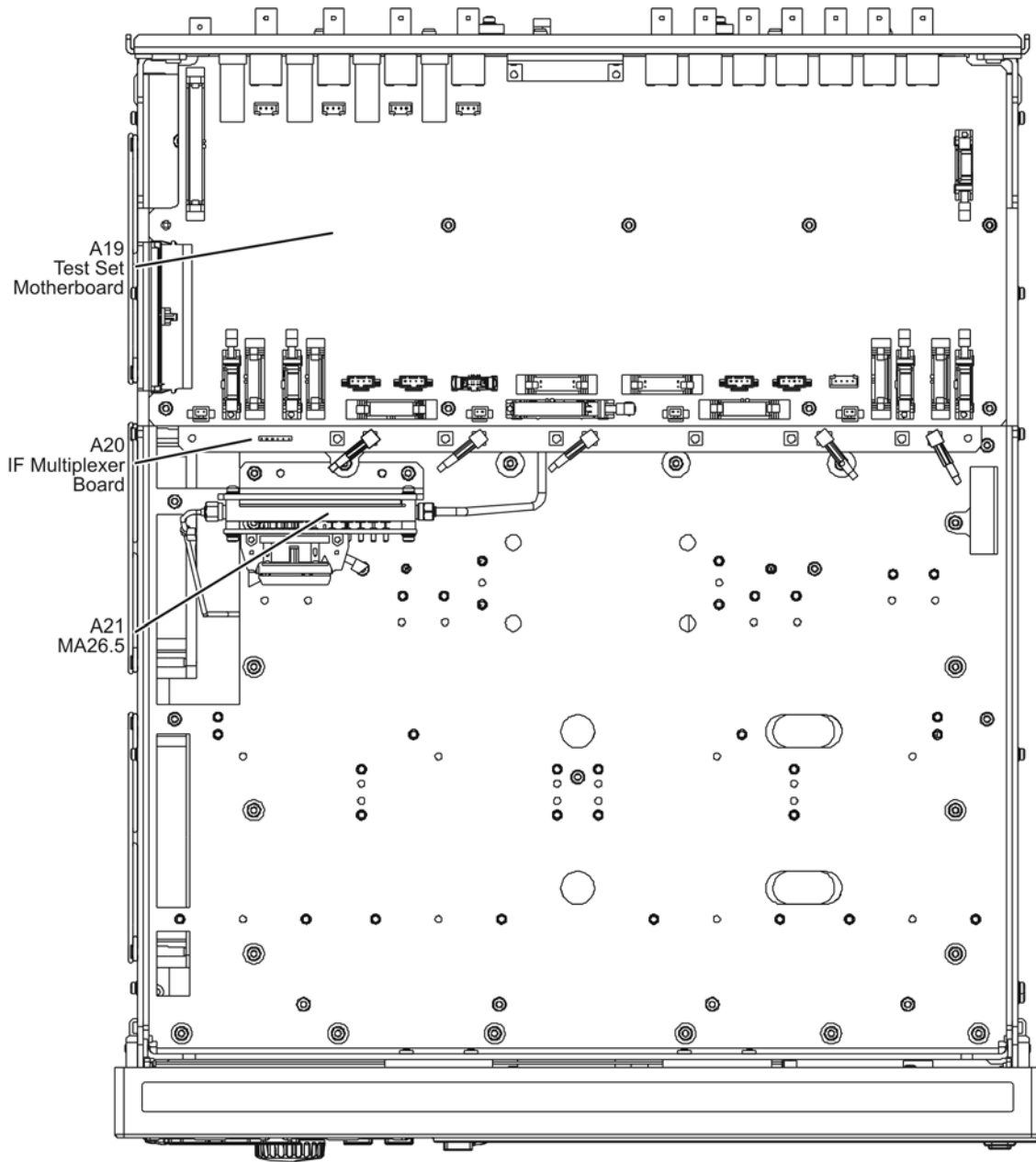


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## Bottom Assemblies, All Options

Reference Designator	Part Number	Qty	Description
A19	N5240-60043	1	Test set motherboard
A20	N5240-60045	1	IF multiplexer board
A21	5087-7711	1	LO Multiplier/amplifier 26.5 (HMA26.5) (Option 108)

**Figure 6-5 Bottom Assemblies, All Options**



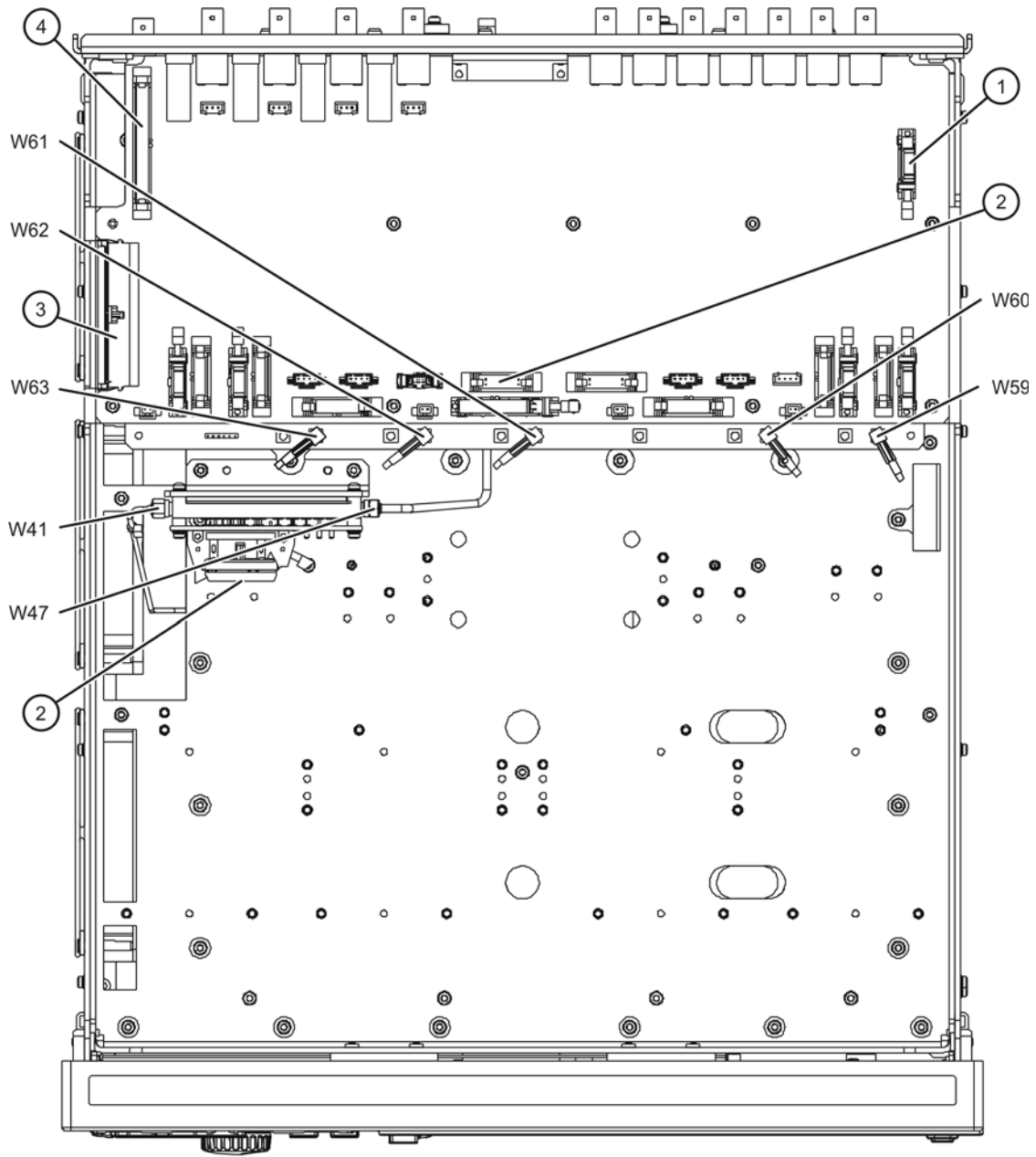
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## Bottom Cables, All Options

Reference Designator	Type <sup>a</sup>	Part Number	Qty	Description
W41	SR	N5242-20110	1	A11 13.5 GHz synthesizer to A21 HMA26.5
W47	SR	N5264-20002	1	A21 HMA26.5 to rear-panel <b>LO OUT</b> (J5)
W59	F	N5242-60012	1	A20 IF multiplexer (P3) to A12 SPAM (J1)
W60	F	N5242-60013	1	A20 IF multiplexer (P203) to A12 SPAM (J2)
W61	F	N5242-60014	1	A20 IF multiplexer (P403) to A12 SPAM (J4)
W62	F	N5242-60015	1	A20 IF multiplexer (P603) to A12 SPAM (J5)
W63	F	N5242-60016	1	A20 IF multiplexer (P803) to A12 SPAM (J6)
①	10R	N5242-60005	1	Rear-panel <b>PWR I/O</b> to A19 test set motherboard J301
②	24R	N5242-60011	1	A19 test set motherboard J209 to A21 HMA26.5
③	100R	N5242-60004	1	A14 system motherboard J1 to A19 test set motherboard J1 to A20 IF multiplexer board J1
④	36R	8121-0834	1	Rear-panel <b>HANDLER I/O</b> to A19 test set motherboard J400

a. SR = semirigid coaxial cable; F = flexible coaxial cable; nR = n wires in a ribbon (flat) cable

**Figure 6-6 Bottom Cables, All Options**

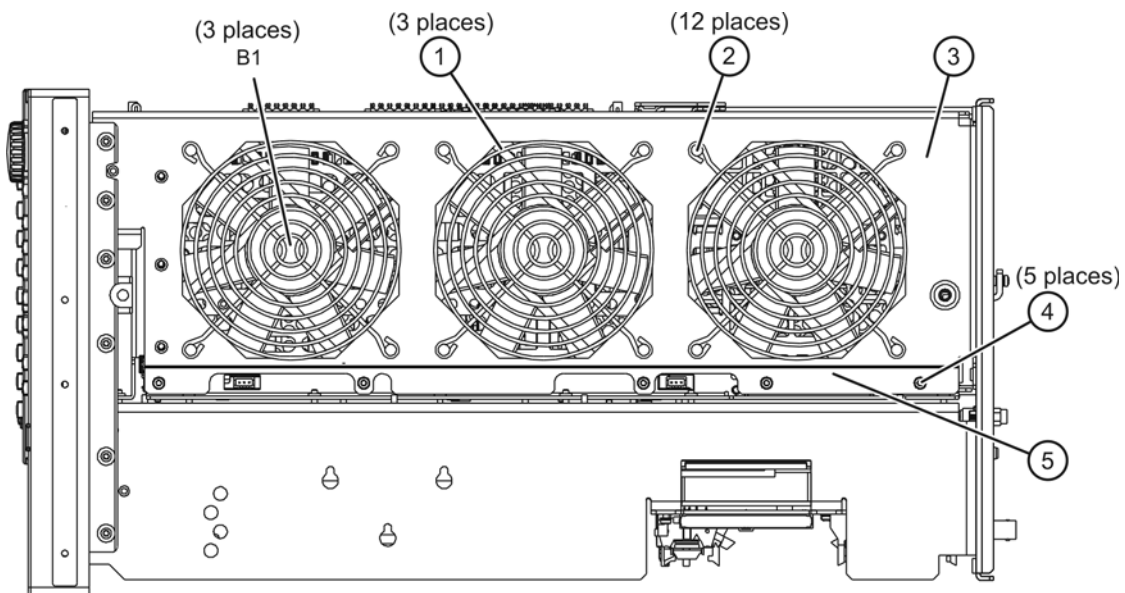


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### Top Hardware and Miscellaneous Parts, All Options

Reference Designator	Part Number	Qty	Description
B1	3160-4199	3	Fan
①	3160-4198	3	Fan guard
②	0361-1272	12	Fan rivet
③	N5242-00015	1	Fan bracket
④	0515-0372	12	Machine screw, M3.0 x 8, pan head (5 to attach fan bracket to chassis, 4 to attach power supply bracket to inner panels, left side bracket, and fan bracket, and 3 to attach A14 system motherboard to the chassis.)
⑤	Chassis (Refer to <a href="#">“Internal Hardware and Miscellaneous Parts, All Options”</a> on page 6-22.)		
⑥	0515-1227	3	Machine screw, M3.0 x 6, flat head (To attach power supply bracket to power supply.)
⑦	W1312-00062	1	Power supply bracket
⑧	0515-0375	6	Machine screw, M3.0 x 16, pan head (To attach midplane board to midplane bracket.)
⑨	0400-0353	5	Midplane board grommets
⑩	5041-7250	3	Wire loom

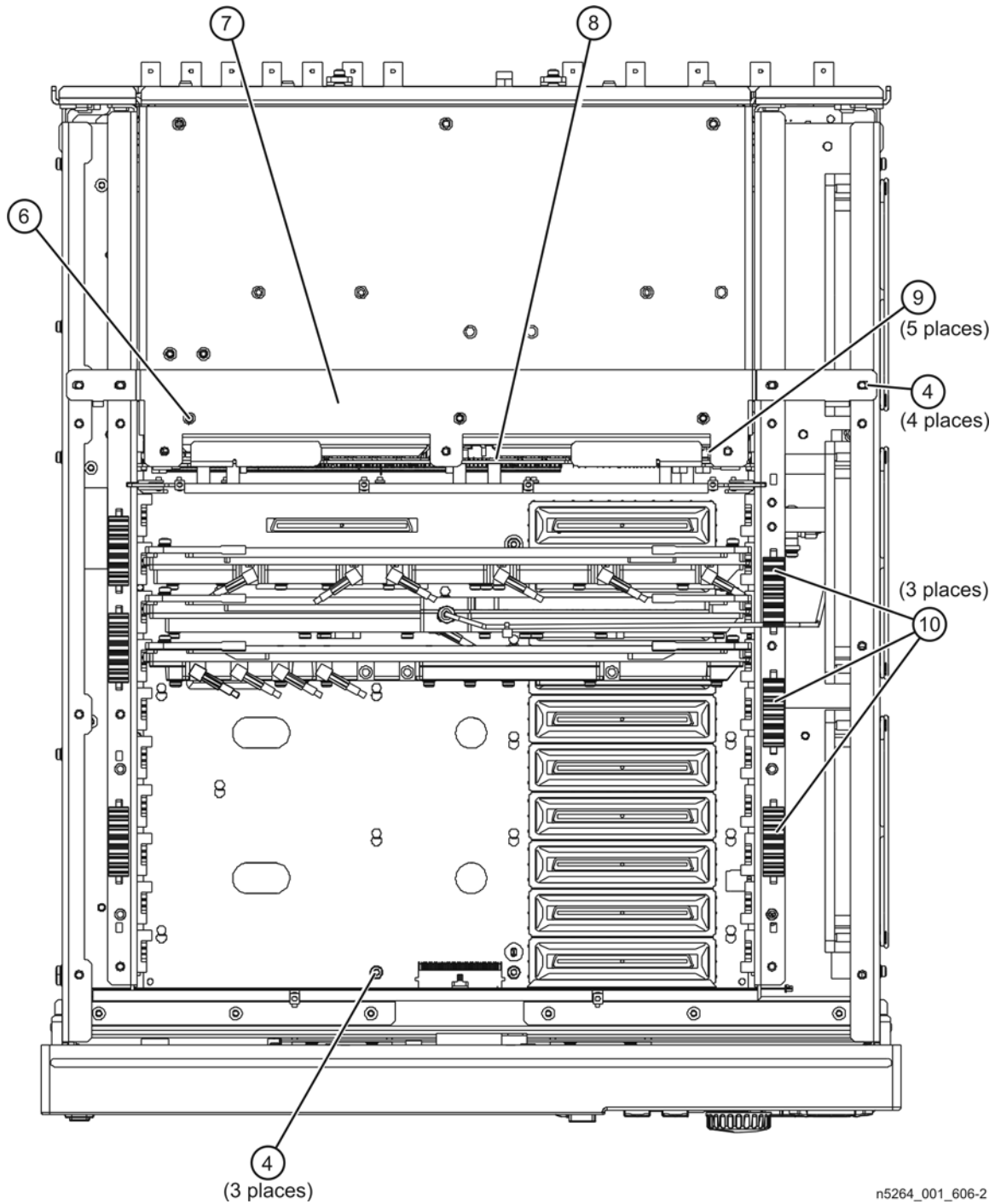
**Figure 6-7 Top Hardware and Miscellaneous Parts, Side View, All Options**



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**Figure 6-8 Top Hardware and Miscellaneous Parts, Top View, All Options**

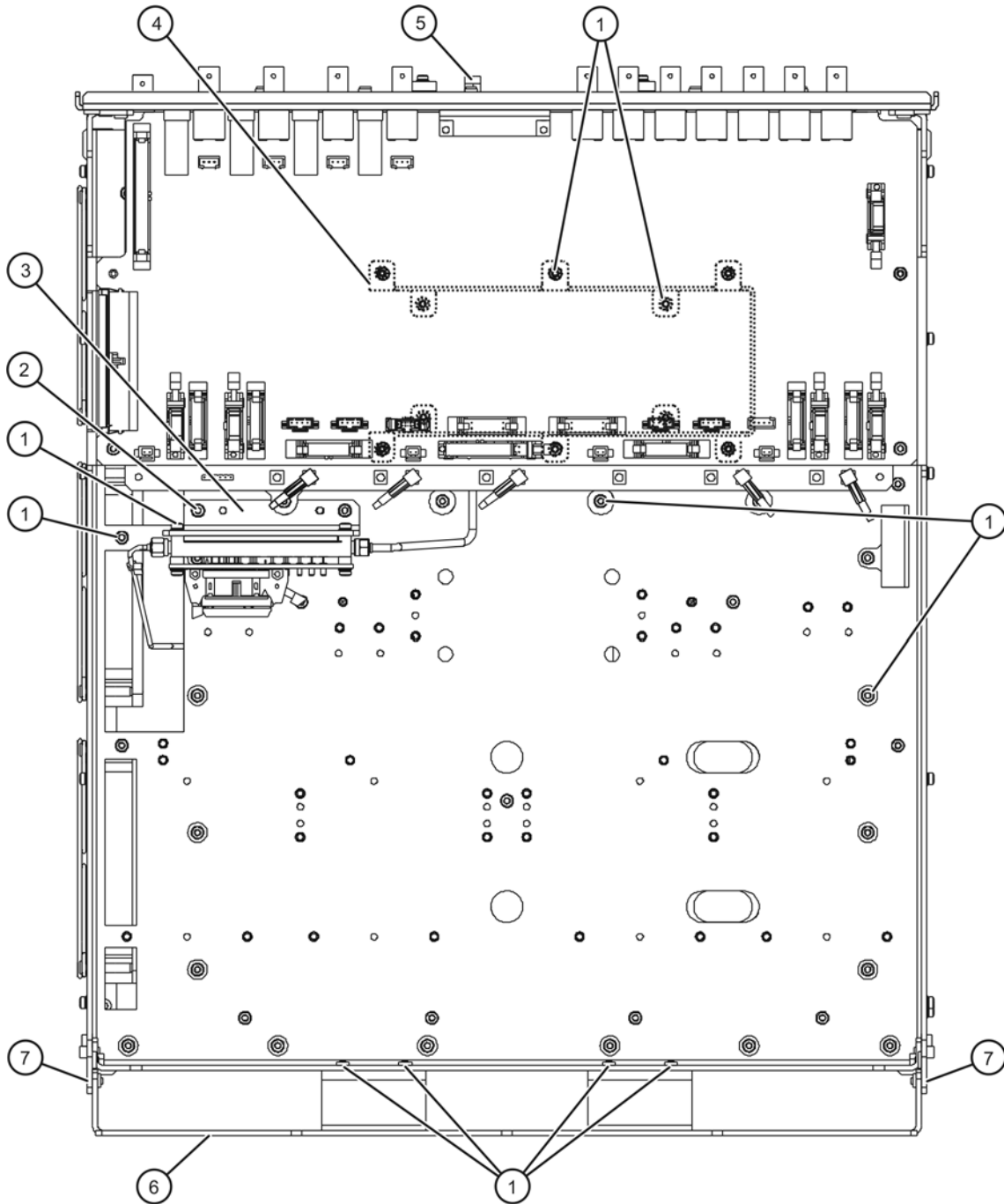


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## Bottom Hardware and Miscellaneous Parts, All Options

Reference Designator	Part Number	Qty	Description
①	0515-0372	39	Machine screw, M3.0 x 8, pan head (4 to attach A19 test set motherboard to test set deck, 6 to attach A19 test set motherboard to stabilizer bracket, 4 to attach stabilizer bracket to A20 IF mux board, 17 to attach test set deck to chassis, 4 to attach A21 HMA26.5 to its mounting bracket, and 4 to attach test set front sub panel to front of test set deck.)
②	0515-0430	2	Machine screw M3.0 x 6 pan head to attach HMA26.5 bracket to test set deck.)
③	N5242-00005	1	Bracket (For A21 HMA26.5.)
④	N5242-00019	1	Stabilizer bracket (Between A19 test set motherboard and A20 IF mux board.)
⑤	1810-0118	2	Termination, 50-ohm load
⑥	N5242-00018	1	Test set front sub panel
⑦	0515-1227	4	Machine screw M3.0 x 6 flat head (to attach test set front sub panel to front of side brackets.)

**Figure 6-9 Bottom Hardware and Miscellaneous Parts, All Options**

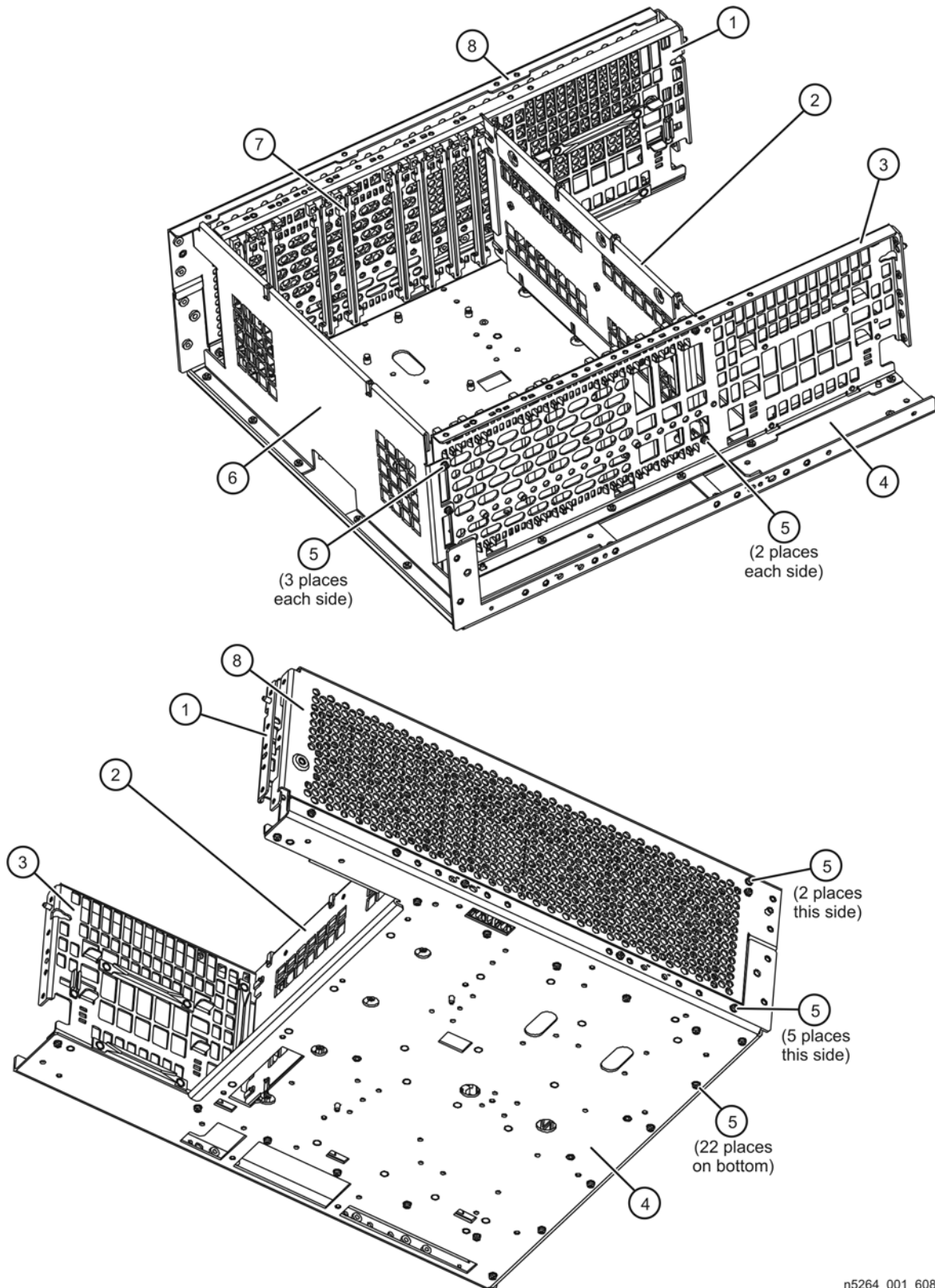


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## Internal Hardware and Miscellaneous Parts, All Options

Reference Designator	Part Number	Qty	Description
①	W1312-00051	1	Left side inner bracket
②	W1312-00048	1	Midplane bracket
③	N5242-00033	1	Right side inner bracket
④	N5242-00001	1	Chassis
⑤	0515-0372	39	Machine screw, M3.0 x 8, pan head (4 to attach midplane bracket to left and right side inner brackets, 6 to attach front bracket to left and right side inner brackets, 2 to attach side bracket to front bracket, 5 to attach side bracket to chassis, 22 to attach chassis to left and right side inner brackets, midplane bracket, and front bracket.)
⑥	N5242-00017	1	Front bracket
⑦	N5242-40002	16	PC board guides
⑧	N5242-00016	1	Side bracket (left)

Figure 6-10 Internal Hardware and Miscellaneous Parts, All Options

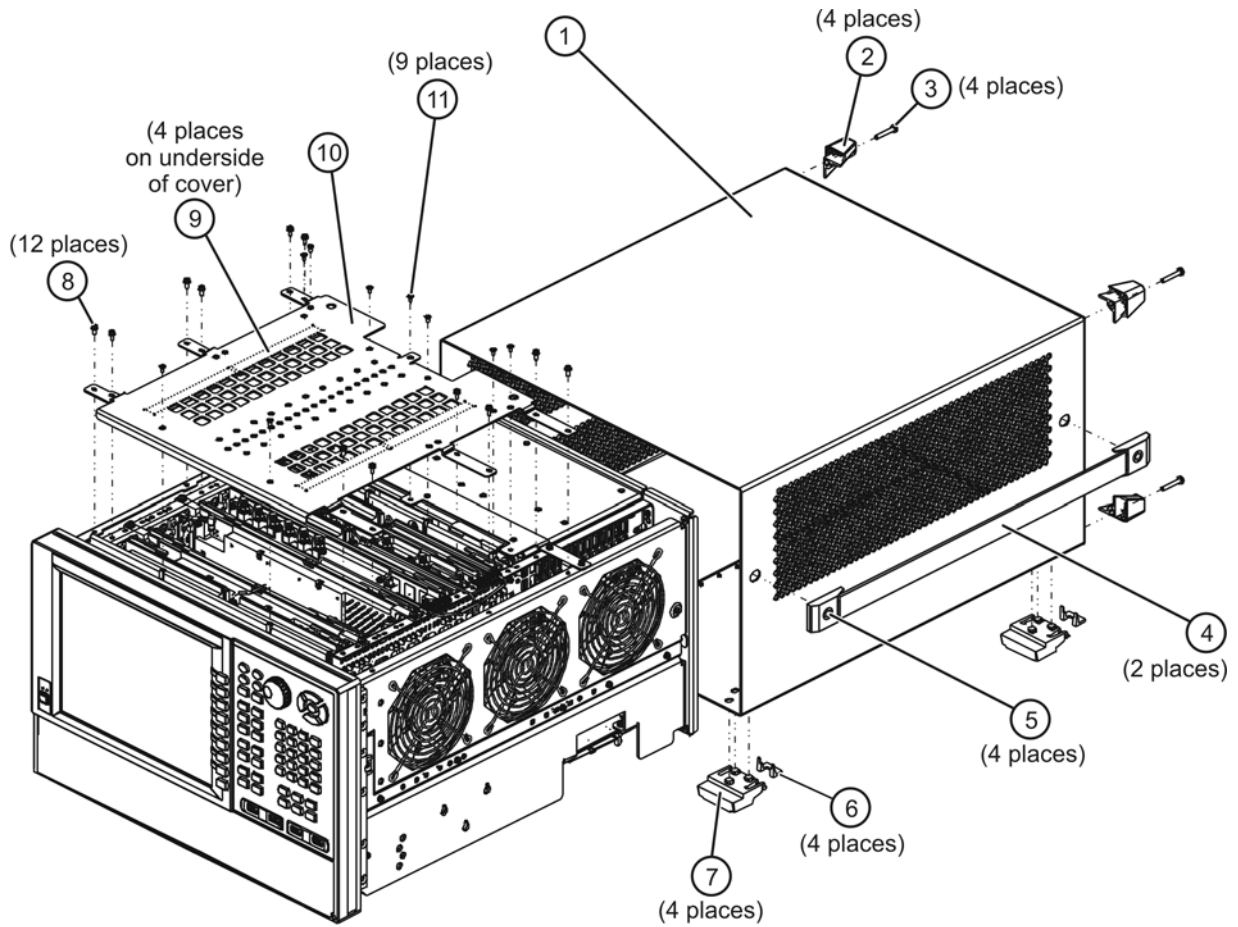


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## External Hardware and Miscellaneous Parts, All Options

Reference Designator	Part Number	Qty	Description
①	N5242-00014	1	Outer cover
②	5041-9611	4	Rear foot
③	0515-1619	4	Machine screw M4.0 x 25, pan head (To attach rear foot.)
④	E4400-60026	2	Strap handle assembly (Includes item ⑤.)
⑤	0515-0710	4	Machine screw M5.0 x 18, flat head (To attach strap handle.)
⑥	5041-9183	4	Key lock (for bottom foot)
⑦	5041-9167	4	Bottom foot
	W1312-40032	4	Hole plug (When instrument is rack mounted.)
⑧	0515-0372	12	Machine screw, M3.0 x 8, pan head (To attach inner cover.)
⑨	N5242-40007	4	Vibration mount (foam pad)
⑩	N5264-00003	1	Inner cover (retaining shield)
⑪	0515-1227	9	Machine screw, M3.0 x 6, flat head (To attach inner cover.)

**Figure 6-11 External Hardware and Miscellaneous Parts, All Options**



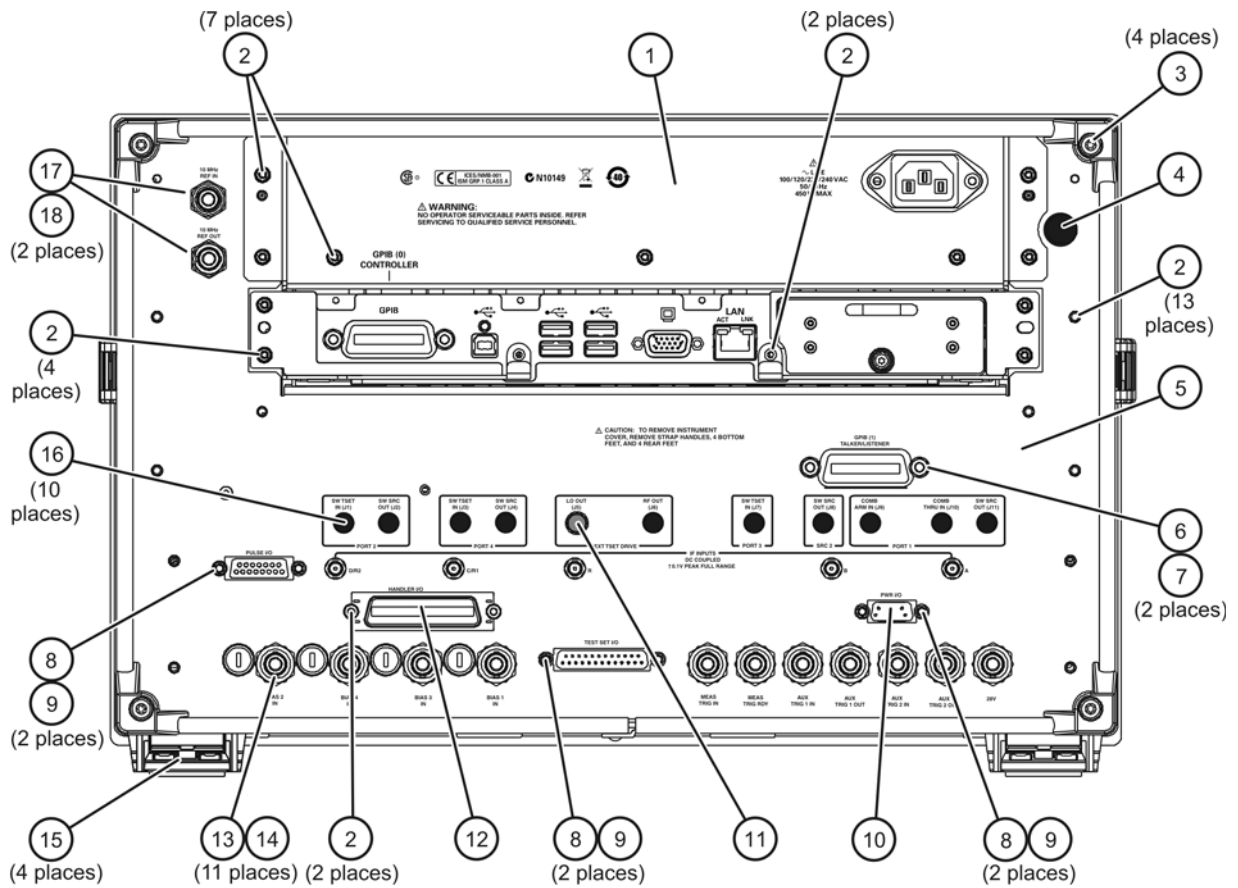
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## Rear Panel Assembly, All Options

Item Number	Part Number	Qty	Description
①	N5245-00028	1	Power supply rear panel
②	0515-0372	28	Machine screw, M3.0 x 8, pan head
③	Rear foot and screw (Refer to <a href="#">“External Hardware and Miscellaneous Parts, All Options”</a> on page 6-24.)		
④	6960-0149	1	Hole plug
⑤	N5242-00010	1	Rear panel
⑥	2190-0034	2	Lock washer
⑦	0380-0644	2	Jack screw
⑧	2190-0584	6	Lock washer
⑨	1251-7812	6	Jack screw
⑩	N5242-60005	1	PWR I/O cable assembly
⑪	1810-0118	1	Termination, 50 ohm load
⑫	8121-0834	1	HANDLER I/O cable assembly
⑬	2190-0068	11	Lock washer
⑭	2950-0054	11	Hex nut
⑮	Bottom foot (Refer to <a href="#">“External Hardware and Miscellaneous Parts, All Options”</a> on page 6-24.)		
⑯	6960-0076	10	Hole plug
⑰	2190-0102	2	Lock washer
⑱	2950-0035	2	Hex nut



Figure 6-12 Rear Panel Assembly, All Options



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## Miscellaneous Part Numbers

**Table 6-3 Part Numbers for Miscellaneous Parts and Accessories**

Description	Model or Part Number
<b>Service Tools</b>	
T-10 TORX driver (set to 9 in-lbs)	N/A
T-20 TORX driver (set to 21 in-lbs)	N/A
Pozidriv screwdriver	N/A
5/16 inch (8 mm), open-end torque wrench; 0.9 N-m (8 in-lb)	8710-1765
<b>Documentation</b>	
Installation and Quick Start Guide (for all PNA series analyzers) (Cannot be ordered. Part number is for reference only. Must be printed from the Agilent Web site. Refer to <a href="#">“Printing Copies of Documentation from the Web” on page iv.</a> )	E8356-90001
Service Guide. (Not available in printed form. Part number is for reference only. Must be printed from the Agilent Web site. Refer to <a href="#">“Printing Copies of Documentation from the Web” on page iv.</a> )	N5264-90001
<b>GPIO Cables/GPIO Adapter</b>	
GPIO cable, 0.5 meter (1.6 feet)	10833D
GPIO cable, 1 meter (3.3 feet)	10833A
GPIO cable, 2 meter (6.6 feet)	10833B
GPIO cable, 4 meter (13.2 feet)	10833C
GPIO cable to GPIO cable adapter	10834A
<b>Fuses</b>	
Rear Panel Bias Input Fuse; Ports 1, 2, 3, and 4 (0.5 A, 125 V)	2110-0046
<b>Memory Modules</b>	
1 GB module, DDR SDRAM, 166 MHz, 184-pin	1819-0329
<b>Battery</b>	
Battery, lithium manganese dioxide, 3V, 0.22A-hr (located on A17 CPU board assembly)	1420-0356
<b>Upgrade Kits orderable by Part Number</b>	
Add Option 010, Time Domain	N5264-60xxx
Add Option 108, LO Source	N5264-60xxx
Add Option 118, Fast CW Mode	N5264-60xxx
<b>Upgrades Orderable by Model Number</b>	
Time Domain (Option 010)	N5264AU-010
LO Source (Option 108)	N5264AU-108
Fast CW Mode (Option 118)	N5264AU-118

**Table 6-3 Part Numbers for Miscellaneous Parts and Accessories (Continued)**

Description	Model or Part Number
<b>USB Accessories</b>	
Mouse	1150-7799
Keyboard (U.S. style)	1150-7896
USB to GPIB adapter	82357B
<b>ESD Supplies</b>	
Adjustable antistatic wrist strap	9300-1367
Antistatic wrist strap grounding cord ( <i>5 foot length</i> )	9300-0980
Static control table mat and earth ground wire	9300-0797
ESD heel strap	9300-1126
<b>Rack Mount Kits and Handle Kits</b>	
Rack mount kit for instruments with handles (Option 1CP)	5063-9237
Rack mount flange for use with handles (two included in 5063-9237)	5022-2809
Rack mount kit for instruments without handles (Option 1CM)	5063-9217
Rack mount flange for use without handles (two included in 5063-9217)	5022-2802
Front handle kit (two handles and hardware)	5063-9230
Front handle (two included in 5063-9230)	5063-9205
<b>Touch-up Paint</b>	
Dove gray ( <i>for use on frame around front panel and painted portion of handles</i> )	6010-1146
French gray ( <i>for use on cover</i> )	6010-1147
Parchment white ( <i>for use on rack mount flanges, rack support flanges, and front panels</i> )	6010-1148



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# **7 Repair and Replacement Procedures**

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## Information in This Chapter

This chapter contains procedures for removing and replacing the major assemblies of your Agilent Technologies PNA-X measurement receiver.

### Chapter Seven at-a-Glance

Section Title	Summary of Content	Start Page
<a href="#">Personal Safety Warnings</a>	Warnings and cautions pertaining to personal safety.	<a href="#">Page 7-3</a>
<a href="#">Electrostatic Discharge (ESD) Protection</a>	Information pertaining to ESD protection.	<a href="#">Page 7-4</a>
<a href="#">Table of Removal and Replacement Procedures</a>	A table of removal and replacement procedures and the corresponding page number where they are located.	<a href="#">Page 7-5</a>
<a href="#">Removal and Replacement Procedures</a>	The actual procedures for removing and replacing the major assemblies in your measurement receiver. <i>The procedures occur in assembly reference designator numerical order.</i>	See <a href="#">Table 7-1 on page 7-5</a> for specific procedures.
<a href="#">Post-Repair Procedures</a>	A table for the proper tests, verifications, and adjustments to perform on your measurement receiver after repair.	<a href="#">Page 7-42</a>

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## Personal Safety Warnings

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

---

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

---

**WARNING**     **Procedures described in this document may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.**

---

**WARNING**     **The power cord is connected to internal capacitors that may remain live for 10 seconds after disconnecting the plug from its power supply assembly. Wait at least 10 seconds, after disconnecting the plug, before removing the covers.**

---

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

---

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

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## Electrostatic Discharge (ESD) Protection

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

This is important. If not properly protected against, electrostatic discharge can seriously damage your measurement receiver, resulting in costly repair.

To reduce the chance of electrostatic discharge, follow all of the recommendations outlined in [“Electrostatic Discharge Protection”](#) on page 1-6, for all of the procedures in this chapter.

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## Removal and Replacement Procedures

**Table 7-1 List of Procedures**

Reference Designator	Assembly Description	Location
N/A	Covers, outer and inner	Page 7-6
N/A	Fan bracket and fans	Page 7-38
N/A	Front panel assembly	Page 7-8
N/A	Front panel LED boards	
A1 A2 A3	Front panel display board USB board Display assembly	Page 7-10
A10 A11 A12	Frequency reference board 13.5 GHz LO synthesizer board (Option 108) Signal processing ADC module (SPAM) board	Page 7-14
A14	System motherboard	Page 7-16
A15	Midplane board	Page 7-18
A16	Power supply	Page 7-20
A17	CPU board	Page 7-22
A18	GPIB board	Page 7-24
A19	Test set motherboard	Page 7-26
A20	IF multiplexer board	Page 7-28
A21	Multiplier/amplifier 26.5 (HMA26.5) (Option 108)	Page 7-30
A51	Hard disk drive	Page 7-32

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## Removing the Covers

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)

### Removing the Outer Cover

---

**CAUTION**     *Do not place the instrument on its front panel.* This will damage the front panel assemblies.

---

Refer to [Figure 7-1](#) for this procedure.

1. Disconnect the power cord.
2. Remove the strap handles (item ①) by loosening the screws (item ②), with a T-20 TORX driver, on both ends until the handle is free of the measurement receiver.
3. Remove the foot locks (item ③) from the four bottom feet (item ④) and then remove the four bottom feet from the outer cover.
4. Remove the four rear panel feet (item ⑤) by removing the center screws (item ⑥) with a T-20 TORX driver,.
5. Slide the outer cover toward the rear of the measurement receiver and remove it.

### Removing the Inner Cover

Refer to [Figure 7-1](#) for this procedure.

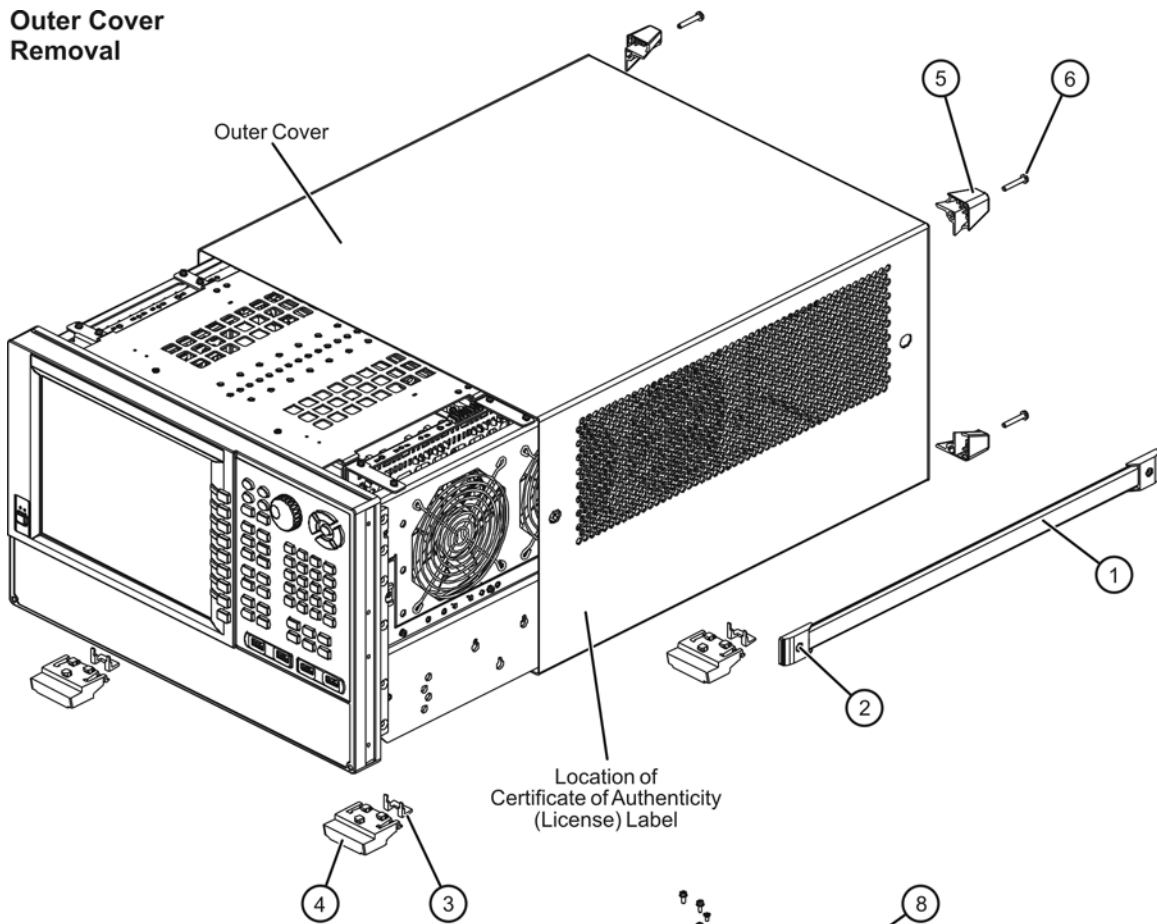
1. With a T-10 TORX driver, remove the 12 pan head screws (item ⑦).
2. With a T-10 TORX driver, remove the 9 flat head screws (item ⑧).
3. Lift off the cover.

### Replacement Procedure

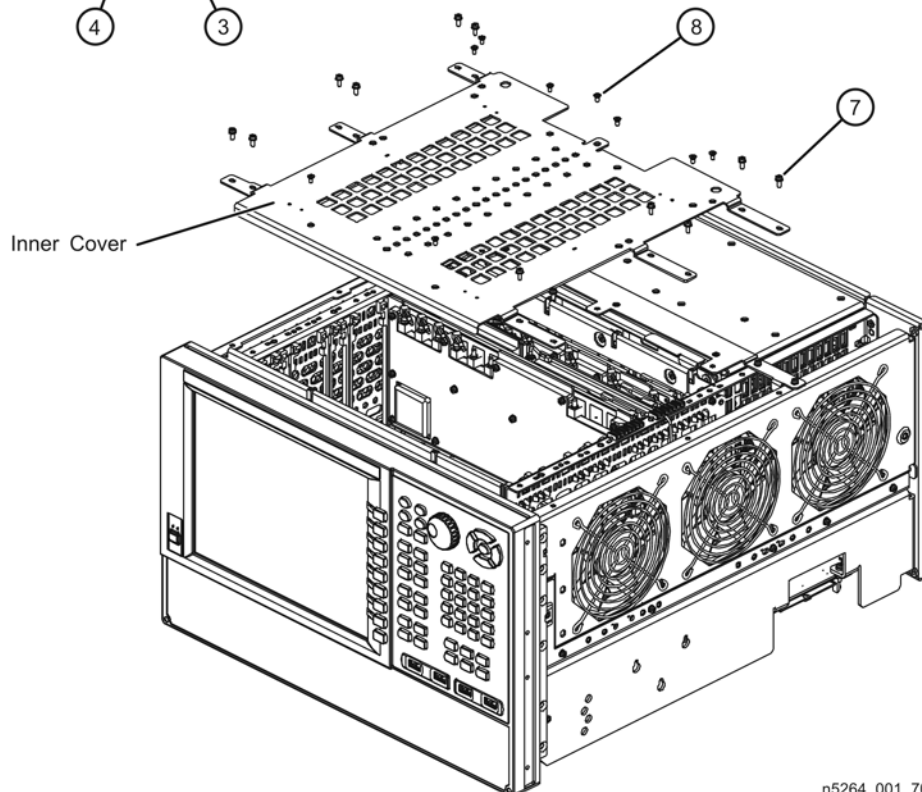
Reverse the order of the removal procedures.

**Figure 7-1 Outer and Inner Cover Removal**

**Outer Cover  
Removal**



**Inner Cover  
Removal**



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---

## Removing and Replacing the Front Panel Assembly

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

Refer to [Figure 7-2](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer cover. Refer to [“Removing the Covers” on page 7-6](#).
3. With a T-10 TORX driver, remove the 12 screws (item ②) from the sides of the frame.

---

**CAUTION** Before removing the front panel from the instrument, lift and support the front of the instrument frame.

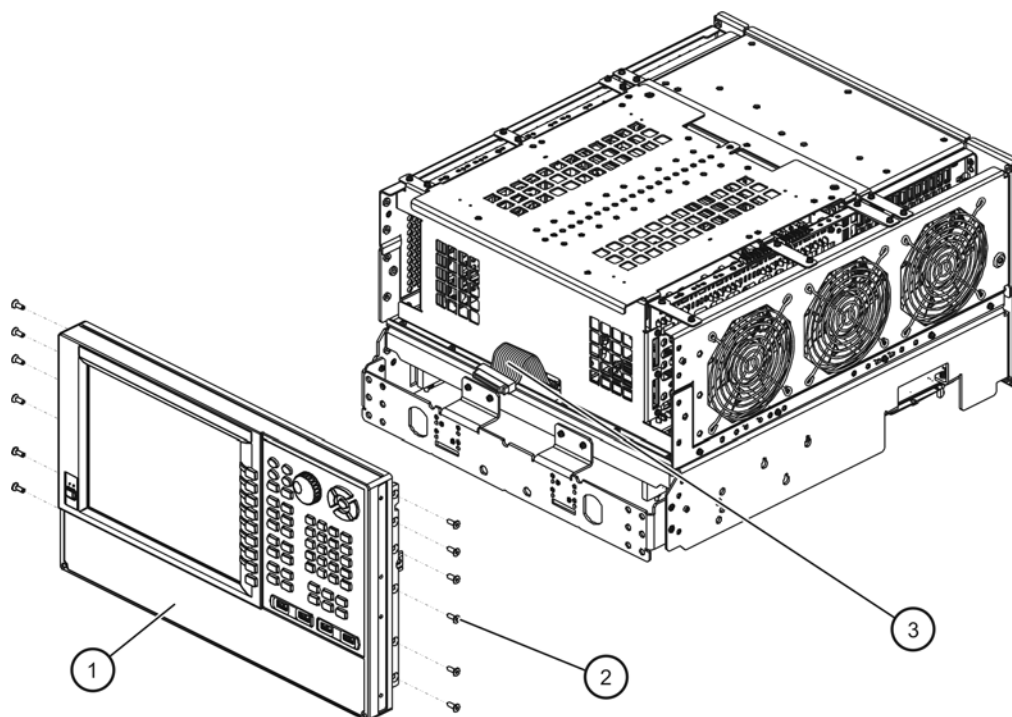
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4. Slide the front panel off of the instrument frame.
5. Disconnect the ribbon cable (item ③) from the A1 front panel interface board.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

**Figure 7-2 Front Panel Assembly Removal**



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## Removing and Replacing the A1–A3 and Other Front Panel Subassemblies

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

Refer to [Figure 7-3](#), [Figure 7-4](#), and [Figure 7-5](#) for the following procedures.

### Pre-removal Procedure

1. Disconnect the power cord.
2. Remove the front panel assembly. Refer to [“Removing and Replacing the Front Panel Assembly” on page 7-8](#).

### Removing the A2 USB Board

1. Remove the four retaining screws (item ①) from the USB board and unplug it from the A1 front panel interface board.

### Removing the A1 Front Panel Interface Board and Keypad Assembly

1. Remove the A2 USB board as outlined above.
2. Remove the round knob (RPG) from the front panel by gently pulling the knob forward.
3. Disconnect the following cables from the A1 front panel interface board: display cable (item ②), inverter board cable (item ③), USB controller board cable (item ④), and power switch cable (item ⑤).
4. Remove the nine screws (item ⑥) from the A1 front panel interface board and remove it from the front panel assembly.
5. The keypad assembly can now be removed from the A1 front panel interface board by gently pulling each of the rubber tabs through the PC board.

### Removing the Inverter Board

1. Disconnect the inverter board cable (item ③) and the LCD cable (item ⑦) from the inverter board.
2. Remove two screws (item ⑧) and remove the inverter board.

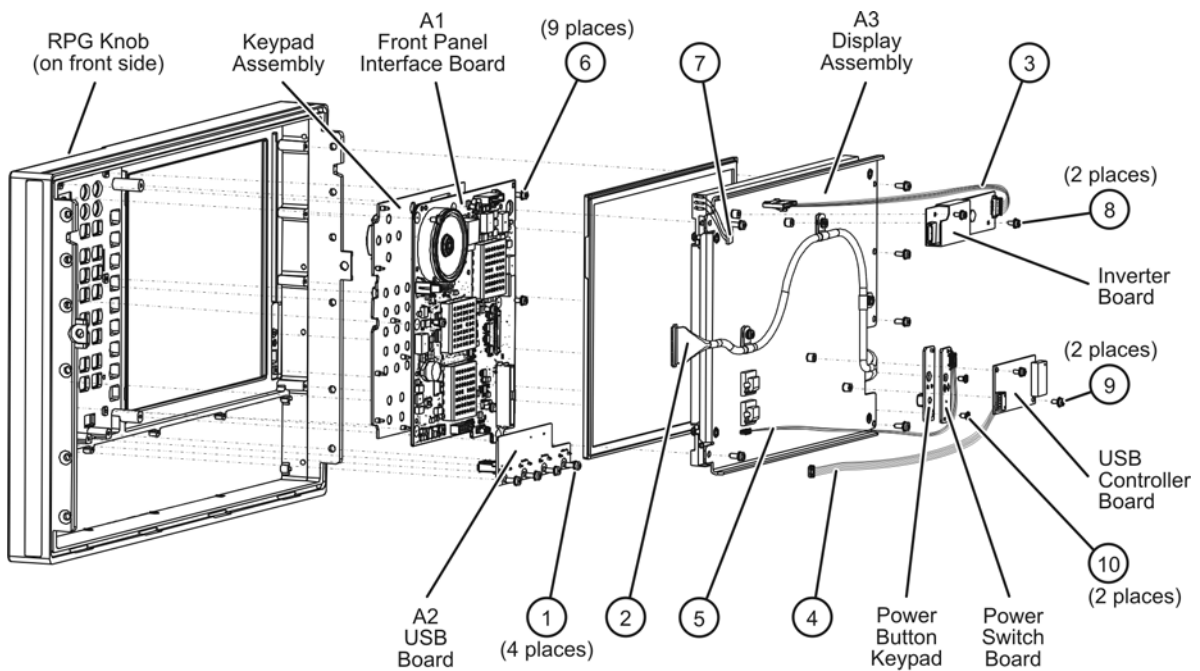
## Removing the USB Controller Board

1. Disconnect the USB controller board cable (item ④) from the USB controller board.
2. Remove two screws (item ⑩) and remove the USB controller board.

## Removing the Power Switch Board and Power Button Keypad

1. Disconnect the power switch cable (item ⑤) from the power switch board.
2. Remove two screws (item ⑩) and remove the power switch board.
3. The power button keypad can now be removed from the power switch board by gently pulling each of the rubber tabs through the PC board.

**Figure 7-3 Front Panel Subassemblies Removal**



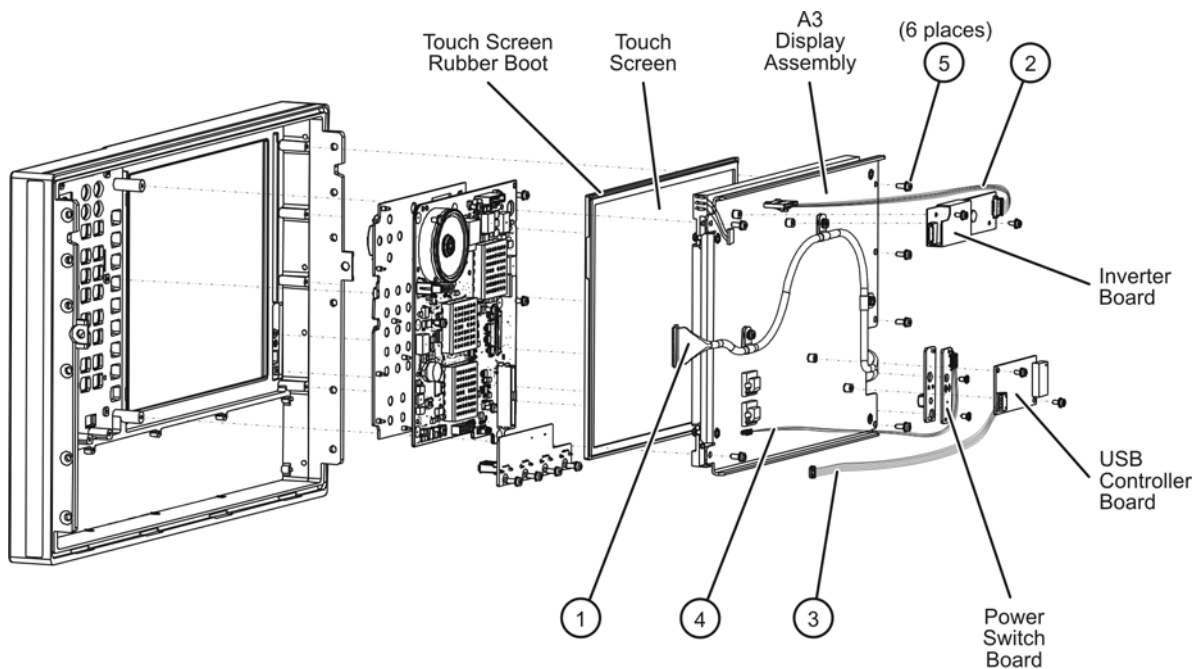
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## Removing the A3 Display Assembly and the Touchscreen

1. Disconnect the following cables from the A1 front panel interface board: display cable (item ①), inverter board cable (item ②), USB controller board cable (item ③), and power switch cable (item ④).
2. Remove six screws (item ⑤) from the A3 display assembly and remove the A3 display assembly from the front panel assembly.
3. The touch screen can now be removed from the front panel assembly. Note the orientation of the touch screen in the front panel assembly for installation of the new touch screen.

To replace the touch screen, note the orientation of the rubber boot on the old touch screen and then remove it and install it on the new one in the same orientation.

**Figure 7-4 A3 Display Assembly and Touch Screen Removal-1**

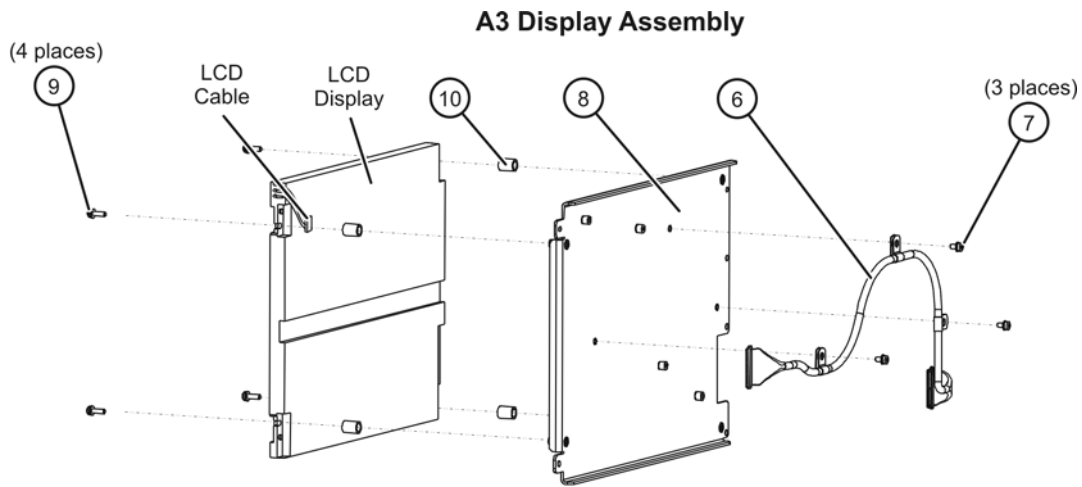


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4. The display cable (item ⑥) can be removed by removing the three screws (item ⑦) that attach it to the LCD display hold down bracket (item ⑧).
5. The LCD display can be removed by disconnecting the LCD cable from the inverter board and then removing the four screws (item ⑨) that attach it to the LCD display hold down bracket (item ⑧). Note the location of the four spacers (item ⑩) before separating the LCD display from the hold down bracket.

**Figure 7-5 A3 Display Assembly and Touch Screen Removal-2**



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### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

---

## Removing and Replacing the A10, A11, and A12 Boards

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- 5/16 inch open-end torque wrench (set to 10 in-lb)
- ESD grounding wrist strap

### Removal Procedure

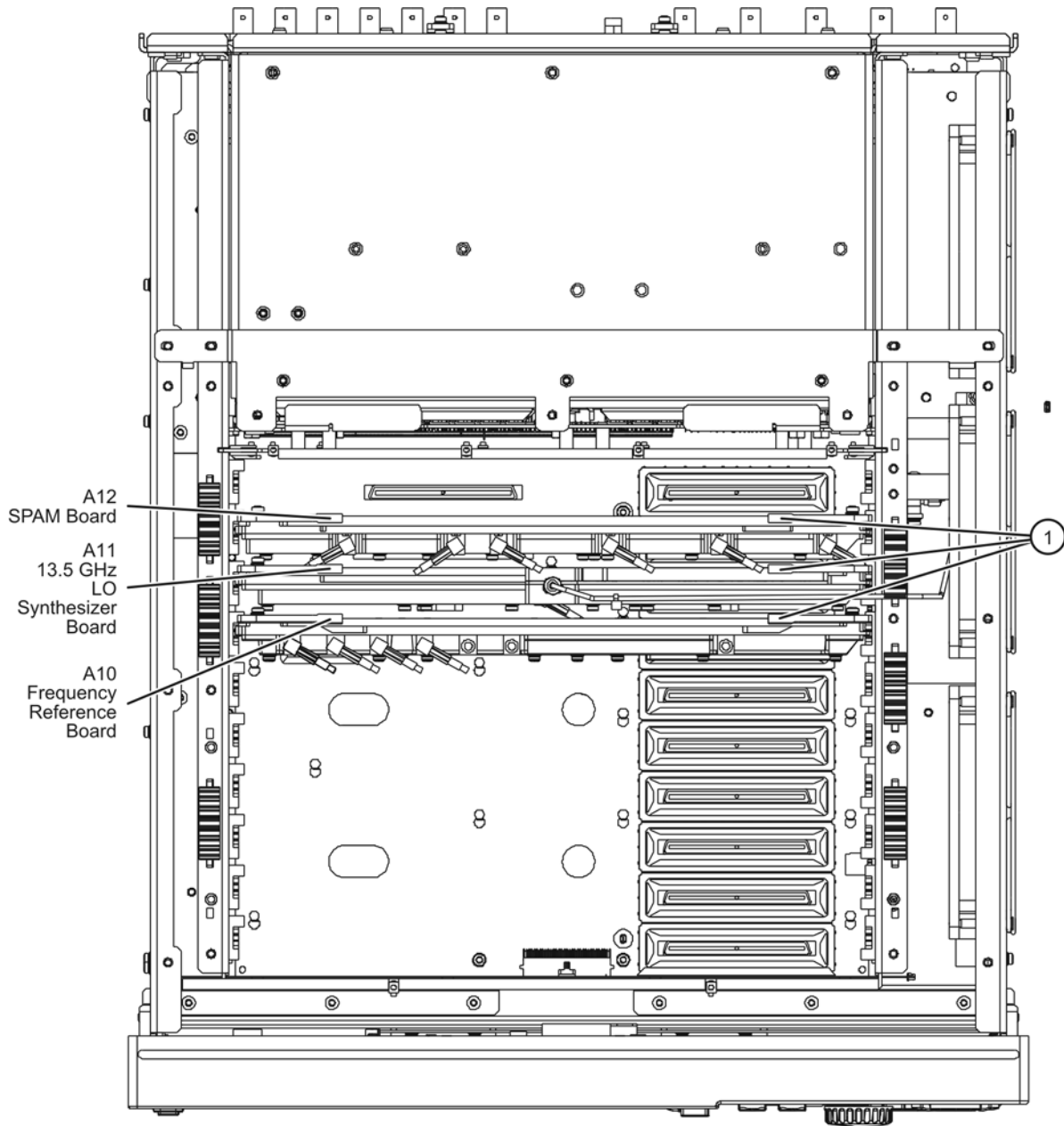
Refer to [Figure 7-6](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer and inner covers. Refer to [“Removing the Covers” on page 7-6](#).
3. Remove all cables connected to the top of the board to be removed. Note the location of each cable for reinstallation.
4. Lift the two extractors (item ①), (one at each end of the board), and lift the board.
5. Before removing the board completely, check the bottom of the board for any attached cables and, if any, disconnect them.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Remember to connect any necessary cables to the bottom of the board before reinstalling it.
3. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

**Figure 7-6 A10, A11, and A12 Boards Removal**



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## Removing and Replacing the A14 System Motherboard

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

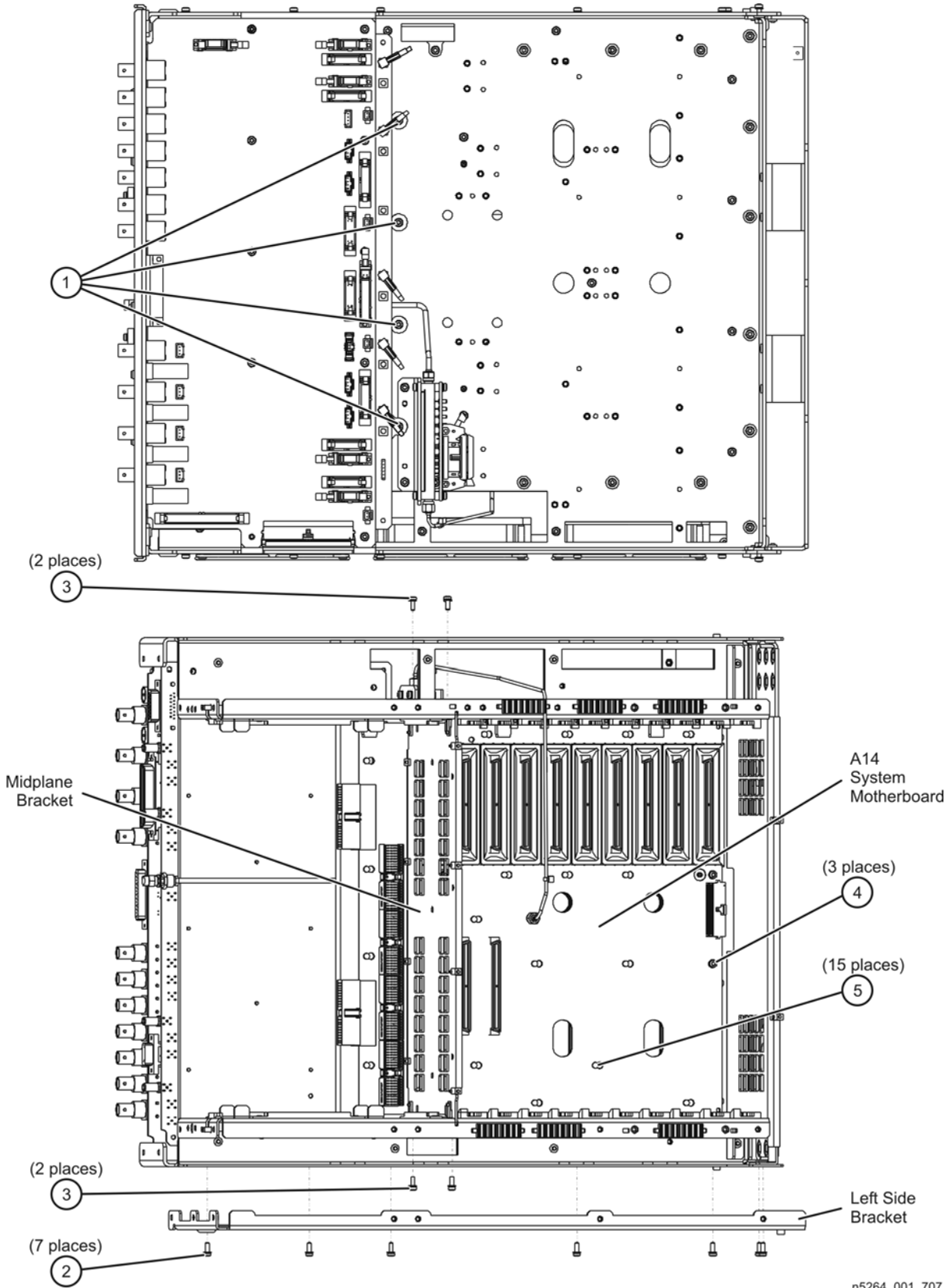
Refer to [Figure 7-7](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer and inner covers. Refer to [“Removing the Covers” on page 7-6](#).
3. Remove the front panel assembly. Refer to [“Removing and Replacing the Front Panel Assembly” on page 7-8](#).
4. Remove the A18 GPIB board. Refer to [“Removing and Replacing the A18 GPIB Board” on page 7-24](#). (This results in the A16 power supply assembly and the A17 CPU board assembly also being removed.)
5. Remove the A15 midplane board. Refer to [“Removing and Replacing the A15 Midplane Board” on page 7-18](#).
6. Remove the A10, A11, and A12 boards. Refer to [“Removing and Replacing the A10, A11, and A12 Boards” on page 7-14](#).
7. Remove the fan bracket and fans. Refer to [“Removing and Replacing the Fans” on page 7-38](#).
8. Turn the measurement receiver over so that the bottom side is up and remove four screws (item ①), that secure the bottom of the midplane bracket to the chassis.
9. Turn the measurement receiver back over so that the top side is up. Remove seven screws (item ②) that secure the left side bracket to the chassis left inner panel.
10. Remove two screws (item ③) from each side that secure the midplane bracket to the chassis left and right inner panels. Lift the midplane bracket out of the measurement receiver.
11. Remove three screws (item ④) that secure the A14 system motherboard to the chassis.
12. Slide the A14 system motherboard toward the rear of the measurement receiver to release it from the 15 keyhole standoffs (item ⑤) on the chassis.
13. Lift the A14 system motherboard just enough to unplug the ribbon cable from the bottom side, then lift it out of the measurement receiver.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

**Figure 7-7 A14 System Motherboard Removal**



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## Removing and Replacing the A15 Midplane Board

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

Refer to [Figure 7-8](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer and inner covers. Refer to [“Removing the Covers”](#) on page 7-6.
3. Remove the A16 power supply assembly. Refer to [“Removing and Replacing the A16 Power Supply Assembly”](#) on page 7-20.
4. Remove the A17 CPU board assembly. Refer to [“Removing and Replacing the A17 CPU Board Assembly”](#) on page 7-22.
5. Remove six screws (item ①) from the A15 midplane board.
6. Lift the board ejectors (item ②) to the upright position to disengage the A15 midplane board from the A14 system motherboard.
7. Note the positions of the five rubber grommets (item ③) on the bottom three A15 midplane board alignment pins. Remove these rubber grommets and retain them for reinstallation on the new A15 midplane board.
8. Lift the A15 midplane board out of the measurement receiver.

### Replacement Procedure

1. Reverse the order of the removal procedure.

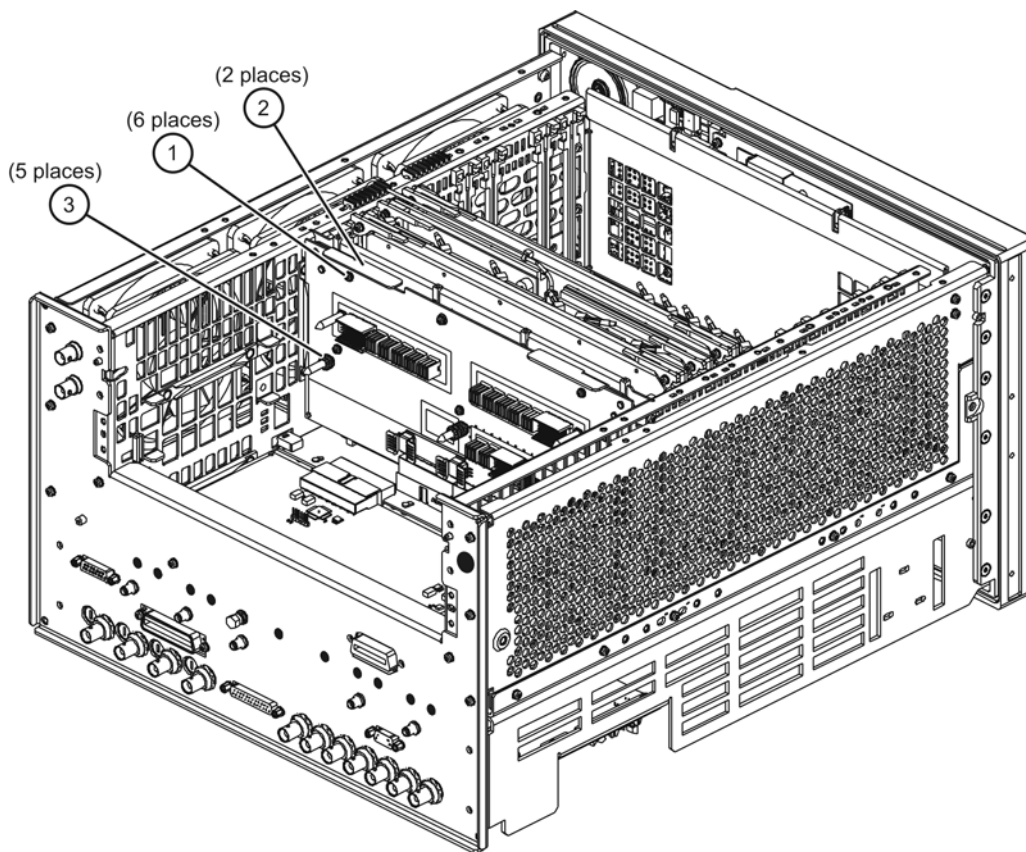
Be careful to align the guide pins on the A15 midplane board connectors with the slots on the A14 system motherboard connectors.

The board ejectors should be in the upright position when installing the A15 midplane board. Align these ejectors with the slots in the chassis inner panels as the board is lowered into position and then push them down flat.

Remember to install the five rubber grommets on the bottom three alignment pins: one on the alignment pin closest to the fans and two each on the other two alignment pins.

2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2](#) on page 7-42.

**Figure 7-8 A15 Midplane Board Removal**



n5264\_001\_708

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## Removing and Replacing the A16 Power Supply Assembly

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

Refer to [Figure 7-9](#) for this procedure.

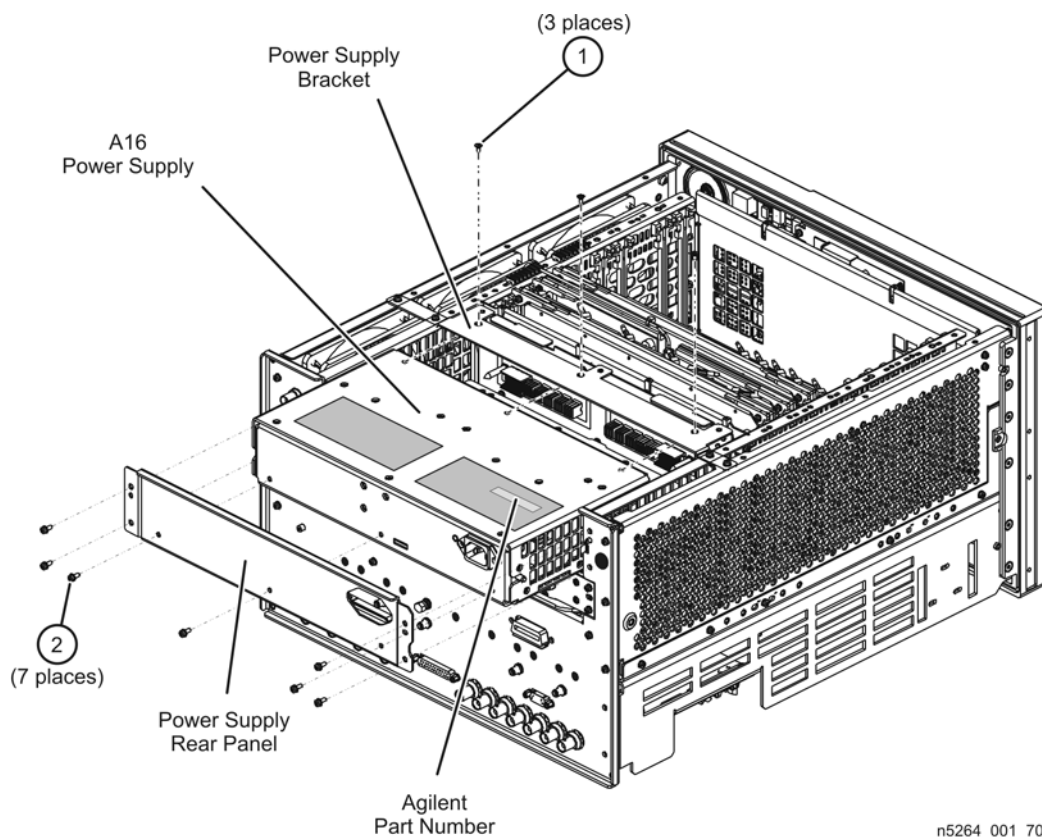
1. Disconnect the power cord.
2. Remove the outer and inner covers. Refer to [“Removing the Covers” on page 7-6](#).
3. Remove the three flat head screws (item ①) from the power supply bracket.
4. Remove the seven pan head screws (item ②) from the power supply rear panel.
5. Slide the A16 power supply assembly out the rear of the measurement receiver.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).



**Figure 7-9 A16 Power Supply Assembly Removal**



n5264\_001\_709

---

## Removing and Replacing the A17 CPU Board Assembly

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

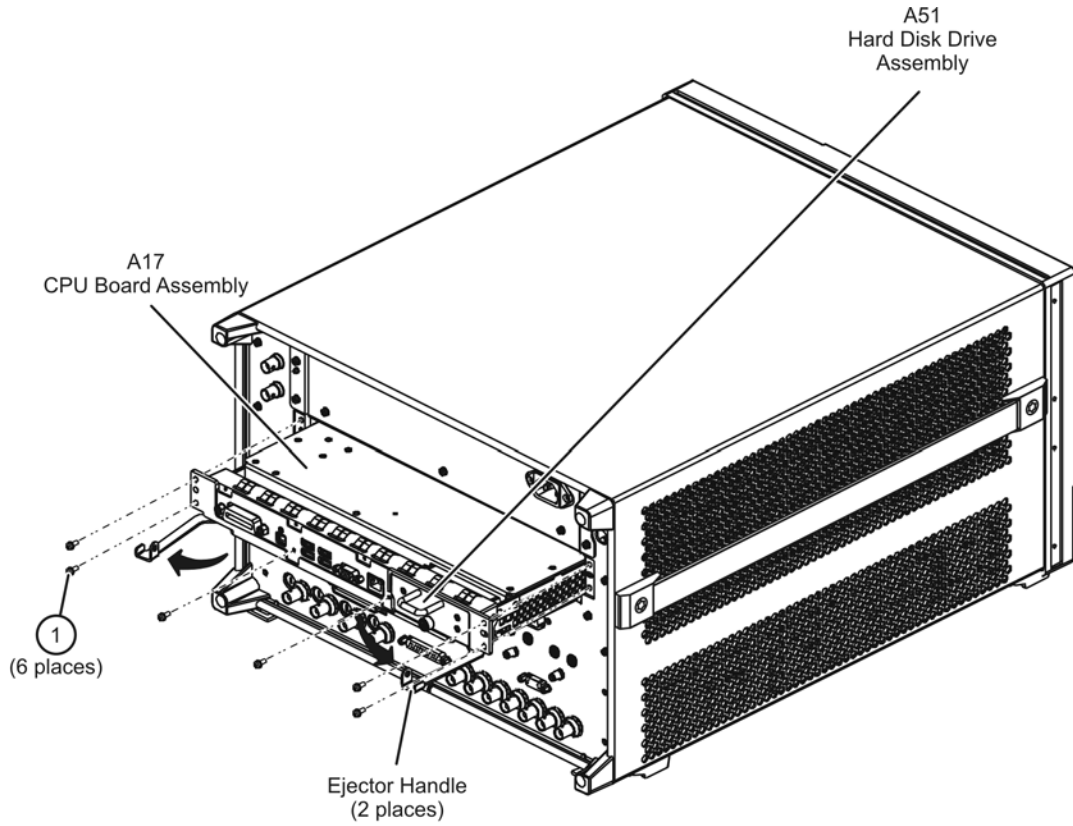
Refer to [Figure 7-10](#) for this procedure.

1. Disconnect the power cord.
2. It is *not* necessary to remove the instrument cover(s) to remove the A17 CPU board assembly.
3. Remove six screws (item ①) from the A17 CPU board assembly; four from the CPU assembly rear panel and two from the ejector handles.
4. Grasp the two ejector handles and rotate them outward toward the sides of the measurement receiver as shown in the illustration. This will disengage the A17 CPU board assembly from the A15 midplane board.
5. Slide the A17 CPU board assembly out the rear of the measurement receiver.
6. If the A17 CPU board assembly is being replaced, you must first remove the A51 hard disk drive for reinstallation in the new A17 CPU board assembly. Refer to “[Removing and Replacing the A51 Hard Disk Drive \(HDD\)](#)” on page 7-32.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. If a new Certificate of Authenticity (license) label is supplied with your new A17 CPU board assembly, adhere it to the outer cover in the location specified in [Figure 7-1 on page 7-7](#).
3. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

**Figure 7-10 A17 CPU Board Assembly Removal**



n5264\_001\_710

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## Removing and Replacing the A18 GPIB Board

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

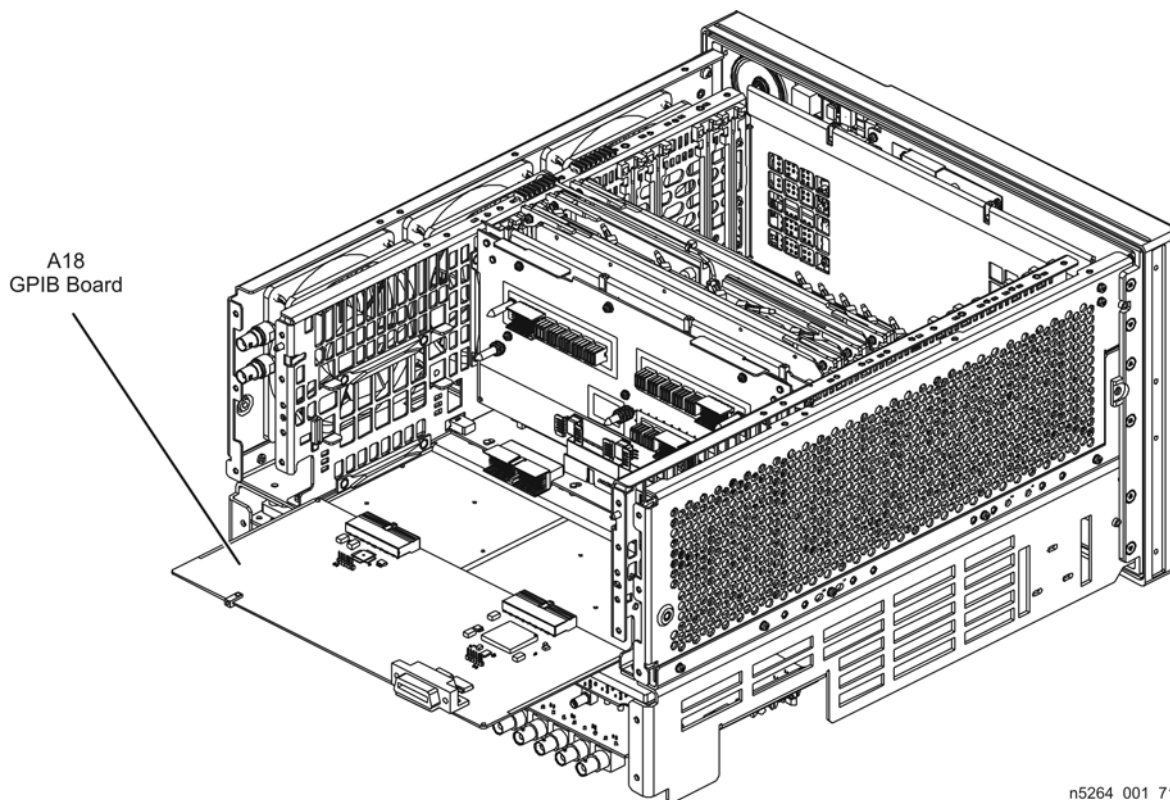
Refer to [Figure 7-11](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer and inner covers. Refer to [“Removing the Covers”](#) on page 7-6.
3. Remove the A16 power supply assembly. Refer to [“Removing and Replacing the A16 Power Supply Assembly”](#) on page 7-20.
4. Remove the A17 CPU board assembly. Refer to [“Removing and Replacing the A17 CPU Board Assembly”](#) on page 7-22.
5. Remove the rear panel. Refer to [“Removing and Replacing the Rear Panel”](#) on page 7-36.
6. Slide the A18 GPIB board out the rear of the measurement receiver.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2](#) on page 7-42.

**Figure 7-11 A18 GPIB Board Removal**



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## Removing and Replacing the A19 Test Set Motherboard

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

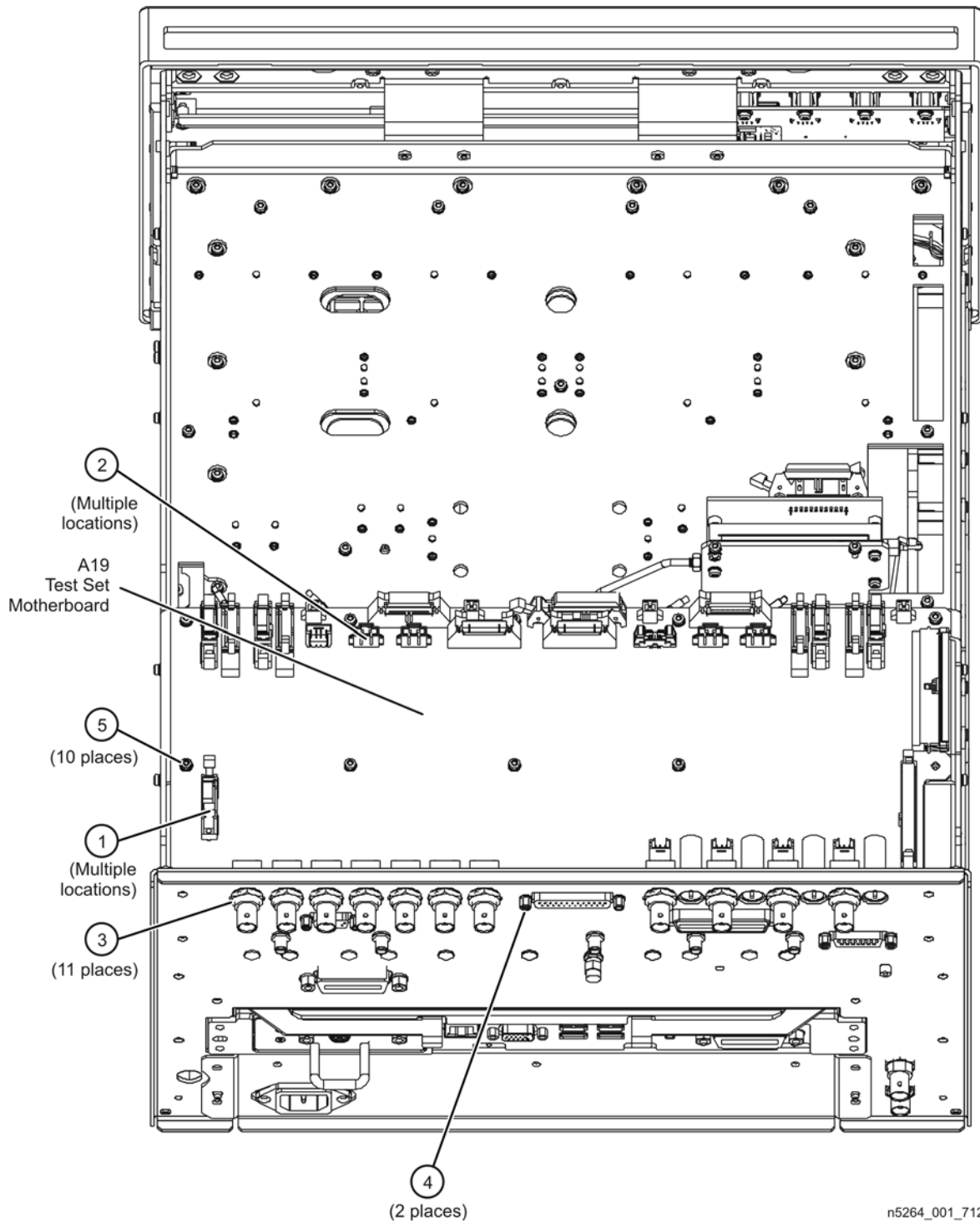
Refer to [Figure 7-12](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer cover. Refer to [“Removing the Covers” on page 7-6](#).
3. Position the measurement receiver bottom side up.
4. Disconnect ALL ribbon cables (item ①) and ALL wire harnesses (item ②) from the A19 test set motherboard.
5. Remove connector hardware (item ③) from 11 rear panel BNC connectors.
6. Remove connector hardware (item ④) from the rear panel TEST SET I/O connector.
7. Remove 10 screws (item ⑤) from the A19 test set motherboard.
8. Slide the A19 test set motherboard toward the front of the instrument until the rear panel BNC connectors are free of the rear panel, then lift the motherboard and remove it from the measurement receiver.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

**Figure 7-12 A19 Test Set Motherboard Removal**



n5264\_001\_712

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## Removing and Replacing the A20 IF Multiplexer Board

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

Refer to [Figure 7-13](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer cover. Refer to [“Removing the Covers”](#) on page 7-6.
3. Position the measurement receiver bottom side up.
4. Remove the A19 test set motherboard. Refer to [“Removing and Replacing the A19 Test Set Motherboard”](#) on page 7-26.
5. Disconnect the ribbon cable (item ①) from the A20 IF multiplexer board.
6. Disconnect ALL gray flexible RF cables (item ②) from the A20 IF multiplexer board.
7. Remove connector hardware (item ③) from five rear panel RF connectors.
8. Remove connector hardware (item ④) from the rear panel PULSE I/O connector.
9. Remove four screws (item ⑤) from the stabilizer bracket and remove the stabilizer bracket.
10. Remove four screws (item ⑥) from the A20 IF multiplexer board.
11. Slide the A20 IF multiplexer board toward the front of the instrument until the rear panel connectors are free of the rear panel, then lift the motherboard and remove it from the measurement receiver.

### Replacement Procedure

1. Reverse the order of the removal procedure.

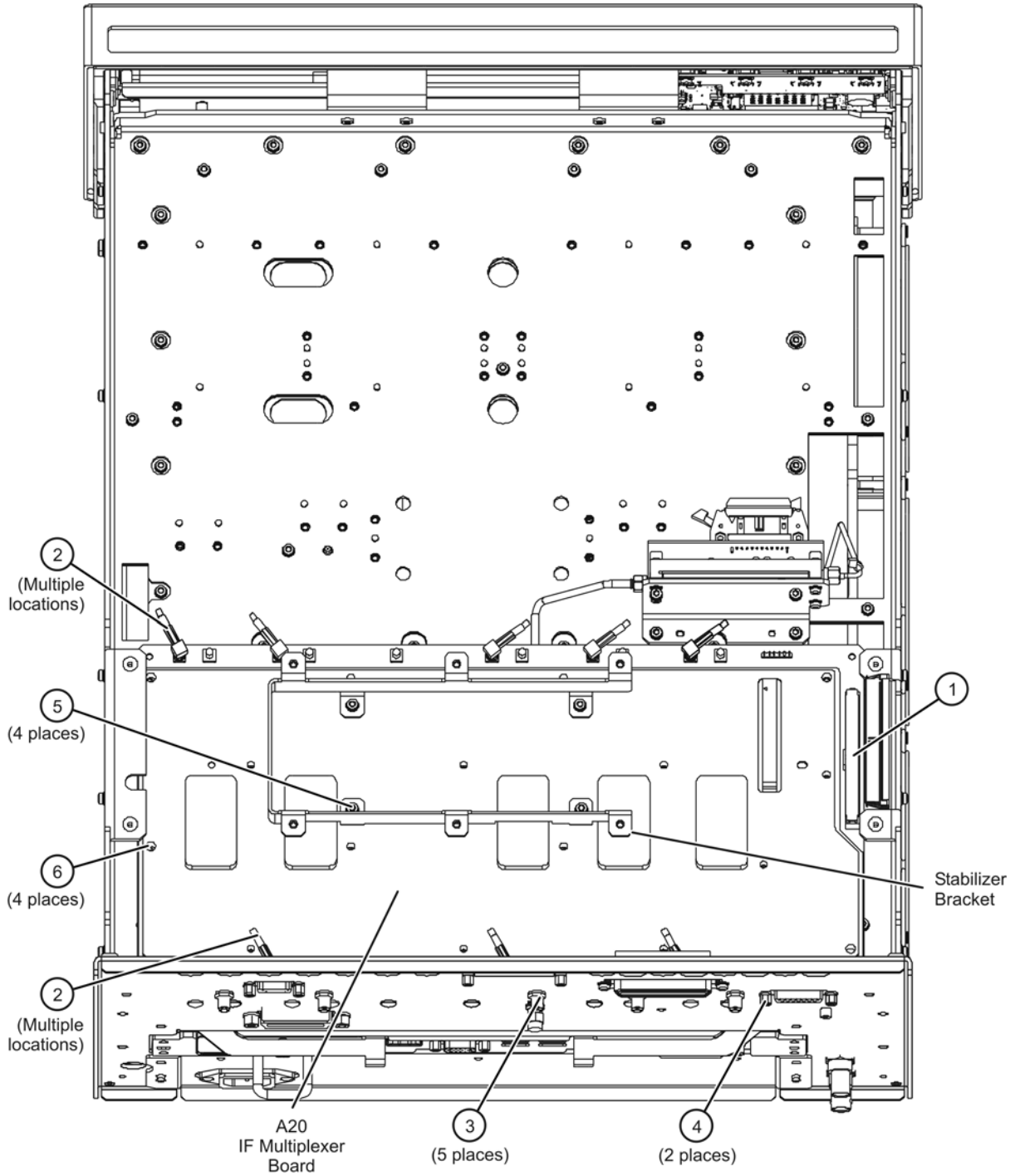
Attach the stabilizer bracket to the new A20 IF multiplexer board using the screws removed from the old one.

Torque rear panel RF connector nuts to 21 in-lbs and PULSE I/O connector screws to 6 in-lbs.

2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2](#) on page 7-42.



**Figure 7-13 A20 IF Multiplexer Board Removal**



n5264\_001\_713

---

## Removing and Replacing the A21 HMA26.5

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- 5/16 inch open-end torque wrench (set to 10 in-lb)
- ESD grounding wrist strap

### Removal Procedure

Refer to [Figure 7-14](#) for this procedure.

---

**CAUTION** Be careful not to damage the center pins of the semirigid cables. Some flexing of the cables is necessary to remove the assembly. However, do not over-bend the semirigid cables.

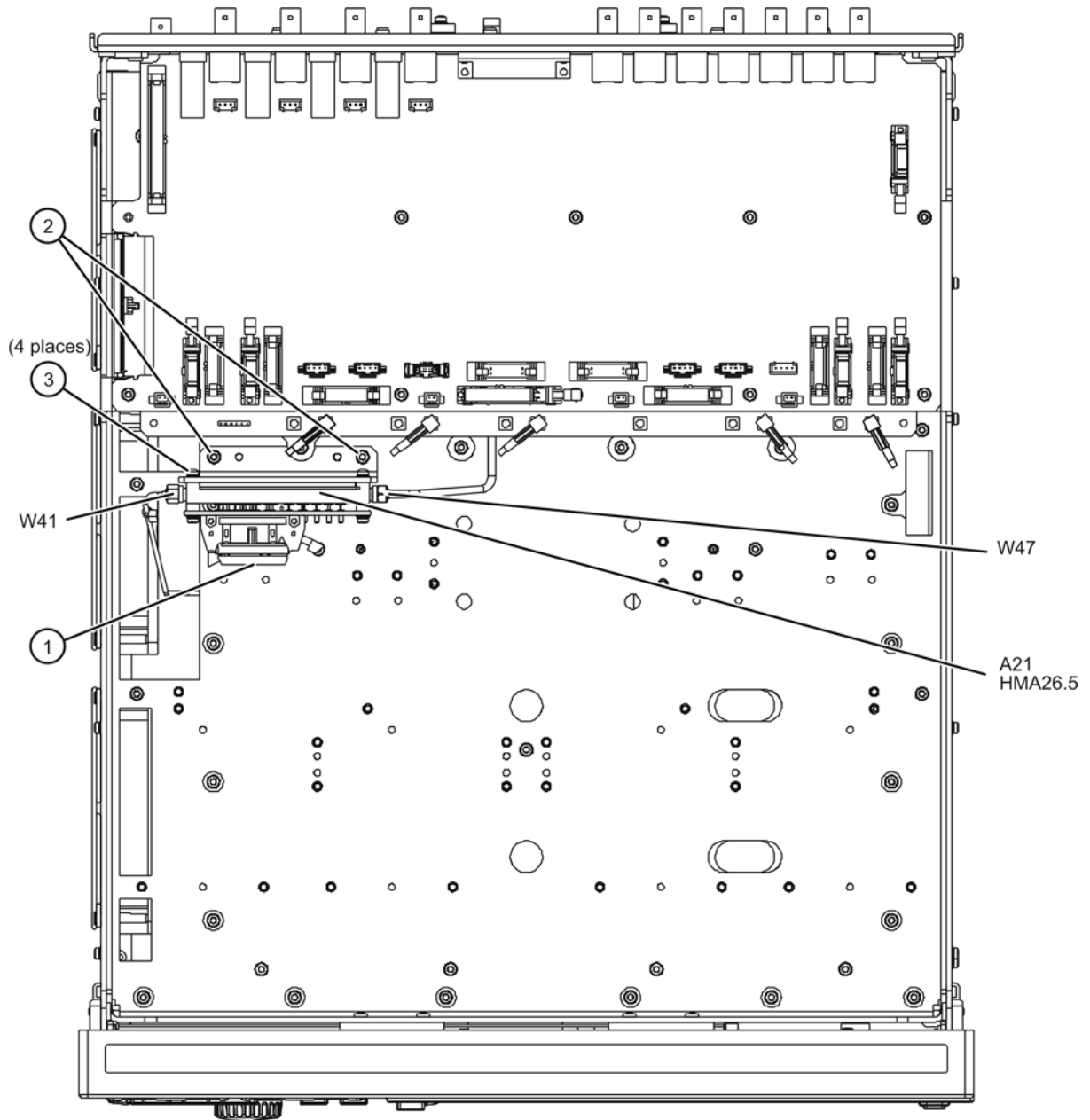
---

1. Disconnect the power cord.
2. Remove the outer cover. Refer to [“Removing the Covers” on page 7-6](#).
3. Position the measurement receiver bottom side up.
4. Disconnect the ribbon cable (item ①) from the A21 HMA26.5 assembly.
5. Disconnect cable W41 from the A21 HMA26.5.
6. Disconnect cable W47 at the A21 HMA26.5.
7. Remove two screws (item ②) from the A21 HMA26.5 mounting bracket.
8. Remove the mounting bracket, with the A21 HMA26.5 attached, from the measurement receiver.
9. Remove four screws (item ③) that attach the A21 HMA26.5 to the mounting bracket.

### Replacement Procedure

1. Reverse the order of the removal procedure.  
Torque all RF cable connectors to 10 in-lbs.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

**Figure 7-14 A21 HMA26.5 Removal**



n5264\_001\_714

---

## Removing and Replacing the A51 Hard Disk Drive (HDD)

Certain unique files exist on the hard disk drive that are necessary for proper operation of your measurement receiver. These files must be copied to another location to allow them to be installed onto the new HDD after it has been installed.

If you are replacing the HDD, the following procedure must be performed first.

### Copy Unique Files from the Hard Disk

1. Insert a USB flash memory drive into a USB port.
2. Open **Windows Explorer**.
3. Navigate to C:\Program Files\Agilent\Network Analyzer.
4. Copy each of the following files from the hard disk drive to the USB flash drive:
  - gen.lic
  - user\_calokitfile
  - All files prefixed with mxcalfile\_.
  - Any personal user files that you wish to preserve.
5. Remove the USB flash drive from the USB port.
6. Exit **Windows Explorer**.

### Tools Required

- ESD grounding wrist strap

### HDDA Removal and Replacement Procedure

Refer to [Figure 7-15](#) for this procedure.

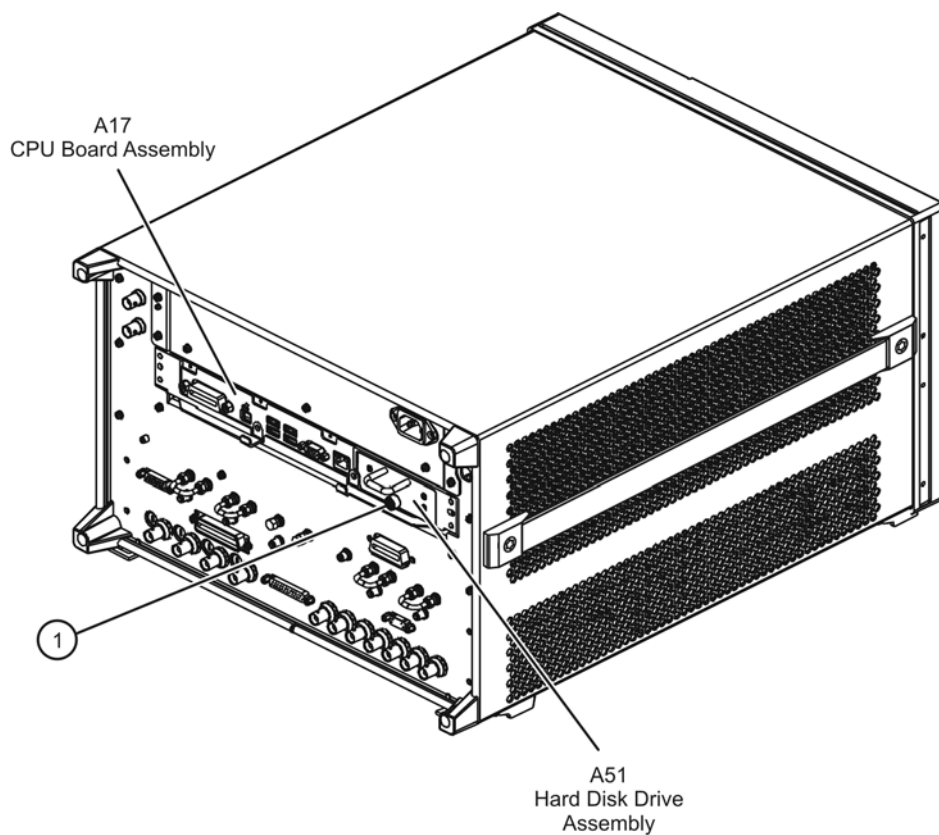
#### Removal

1. Disconnect the measurement receiver power cord.
2. Loosen the knurled nut (item ①) and pull the A51 HDDA out of the A17 CPU board.

#### Replacement

1. Slide the A51 HDDA into the A17 CPU board and tighten the knurled nut (item ①).

**Figure 7-15 Hard Disk Drive Assembly Replacement**



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## Set Up the Agilent Administrator Password

If the hard disk has been replaced, it is necessary to set up the Agilent administrator password for the measurement receiver. This requires obtaining a password from Agilent:

### Obtaining a Password

- If this procedure is being performed by Agilent personnel, go to the following Internet site and follow the instructions under “Agilent Administrator Password”.  
<http://mktwww.soco.agilent.com/field/service/network/pna/support.htm>
- If this procedure is being performed by non-Agilent personnel, contact Agilent for a password before beginning this procedure. Refer to “[Contacting Agilent](#)” on page 2-9.

### Entering Your Agilent Administrator Password

The measurement receiver must be powered up and operating for this procedure.

1. On the **Windows Desktop**, right-click on **My Computer**, and then click **Manage**.
2. In the **Computer Management** window, navigate to **System Tools, Local Users and Groups, Users**.
3. Right-click on **Agilent**, and then click on **Set Password**.
  - a. Type the password obtained from Agilent as the **Password**. Refer to “[Obtaining a Password](#)” in this procedure for information if you have not yet obtained this password.
  - b. Type the password again in the **Confirm password** block.
  - c. Click **OK**.
4. Right-click on **Agilent**, and then click on **Properties**.
  - a. Unselect **User must change password at next logon** (if not already unselected).
  - b. Unselect **User cannot change password** (if not already unselected).
  - c. Select **Password never expires** (if not already selected).
  - d. Click **OK**.
5. Close the **Computer Management** window.

## Install Backup Files onto the New Hard Disk Drive

The files that were previously saved onto a floppy disk or USB memory drive must now be installed onto the new HDD. The measurement receiver must be powered up and operating.

1. Insert the USB flash drive into a USB port.
2. Click on **START**. (It may be necessary to exit the **Network Analyzer** application.)
3. Point to **Programs, Accessories**, and then open **Windows Explorer**.
4. Navigate to C:\Program Files\Agilent\Network Analyzer.
5. Copy each of the backup files from the USB flash drive to the HDD.
6. Navigate to D:\CalFiles\.
7. Copy the backup files prefixed with `mxcalfile_` from the USB flash drive to the HDD.
8. After all files have been copied, remove the USB flash drive from the USB port.
9. Exit **Windows Explorer**.

## Post-Repair Procedures

1. Adhere the new Certificate of Authenticity (license) label to the outer cover in the location specified in [Figure 7-1 on page 7-7](#).
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

---

## Removing and Replacing the Rear Panel

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

Refer to [Figure 7-16](#) for this procedure.

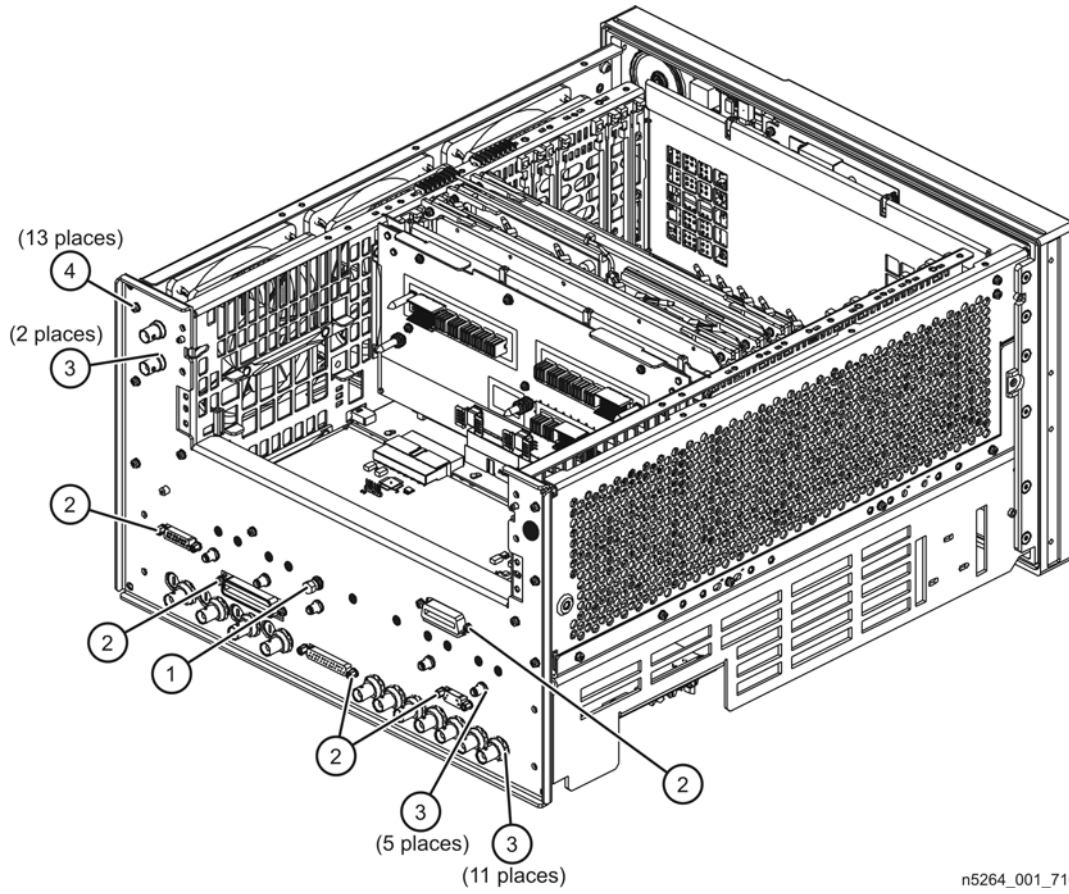
1. Disconnect the power cord.
2. Remove the outer and inner covers. Refer to [“Removing the Covers”](#) on page 7-6.
3. Remove the A16 power supply assembly. Refer to [“Removing and Replacing the A16 Power Supply Assembly”](#) on page 7-20.
4. Remove the A17 CPU board assembly. Refer to [“Removing and Replacing the A17 CPU Board Assembly”](#) on page 7-22.
5. Remove the termination (item ①).
6. Remove the connector hardware (item ②) from each of the five multi-pin connectors. The hardware is not the same on each connector so note which hardware goes with which connector.
7. Remove the connector hardware (item ③) from each of the RF connectors. The hardware is not the same on each connector so note which hardware goes with which connector.
8. Remove the 13 screws (item ④) that attach the rear panel to the chassis.
9. Slide the rear panel over the cable connectors and off of the measurement receiver.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2](#) on page 7-42.



**Figure 7-16 Rear Panel Removal**



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## Removing and Replacing the Fans

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- Pozidriv screw driver
- ESD grounding wrist strap

### Removal Procedure

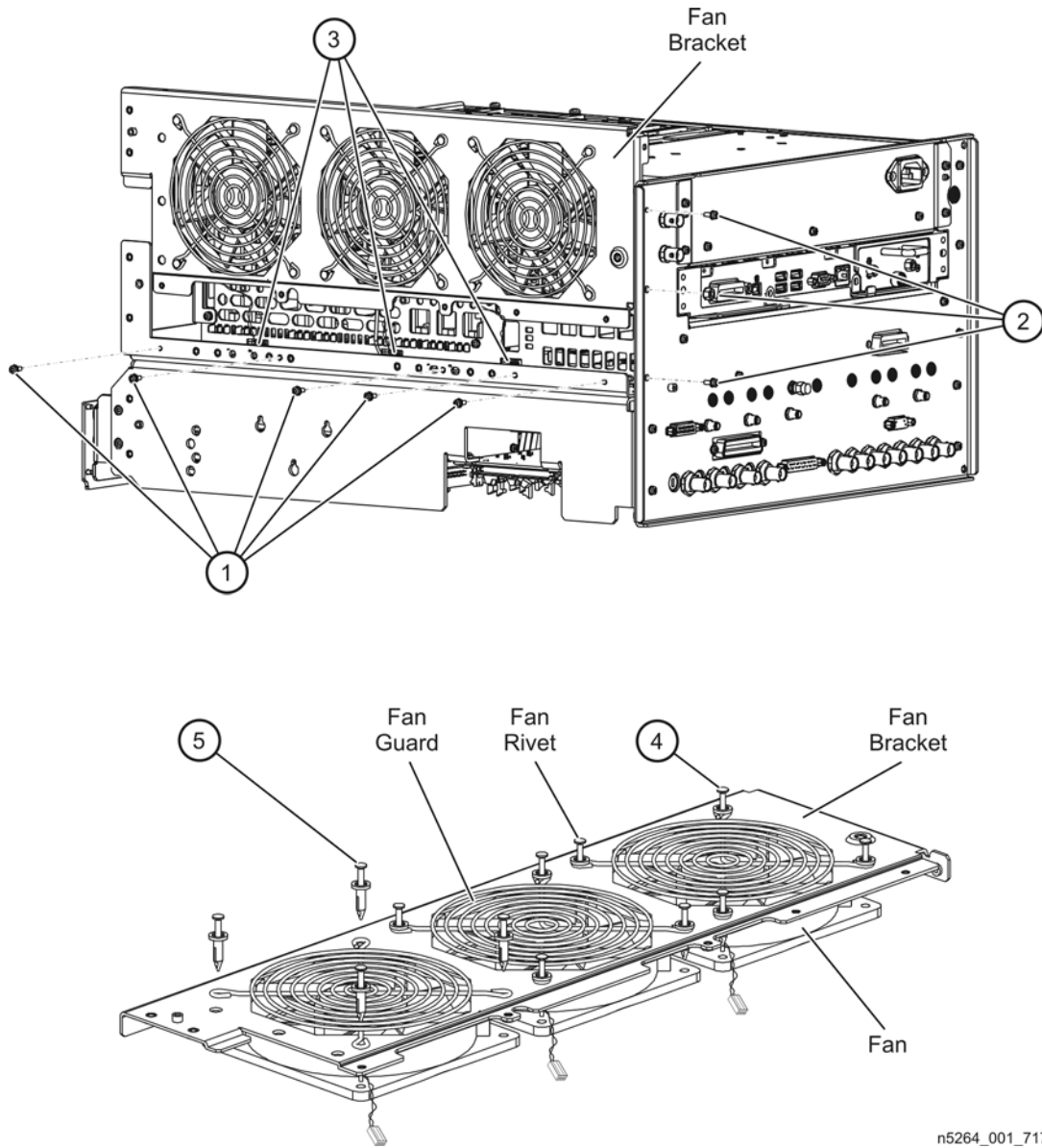
Refer to [Figure 7-17](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer and inner covers. Refer to [“Removing the Covers” on page 7-6](#).
3. Remove the front panel assembly. Refer to [“Removing and Replacing the Front Panel Assembly” on page 7-8](#).
4. Remove the power supply bracket. It is not necessary to remove the entire power supply, just the power supply bracket. Refer to [“Removing and Replacing the A16 Power Supply Assembly” on page 7-20](#).
5. Remove five screws (item ①) that attach the fan bracket to the chassis.
6. Remove three screws (item ②) that attach the rear panel to the fan bracket.
7. Raise the fan bracket out of the measurement receiver just enough to access the fan cables. Disconnect the fan cables from the A14 system motherboard connectors (item ③).
8. Remove the fan bracket and fans from the measurement receiver.
9. To remove a fan or fan guard from the fan bracket:
  - a. Before removing a fan or fan guard, note the orientation of each fan and fan guard for reinstallation.
  - b. Pull up the center pin of each of the fan rivets as shown by (item ④) in the illustration.
  - c. Pull out the rivet completely (as shown by (item ⑤) in the illustration) to release the fan and fan guard.

### Replacement Procedure

1. Reverse the order of the removal procedure.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2 on page 7-42](#).

**Figure 7-17 B1 Fan Removal**



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## Removing and Replacing the Lithium Battery

### Tools Required

- T-10 TORX driver (set to 9 in-lb)
- T-20 TORX driver (set to 21 in-lb)
- ESD grounding wrist strap

### Removal Procedure

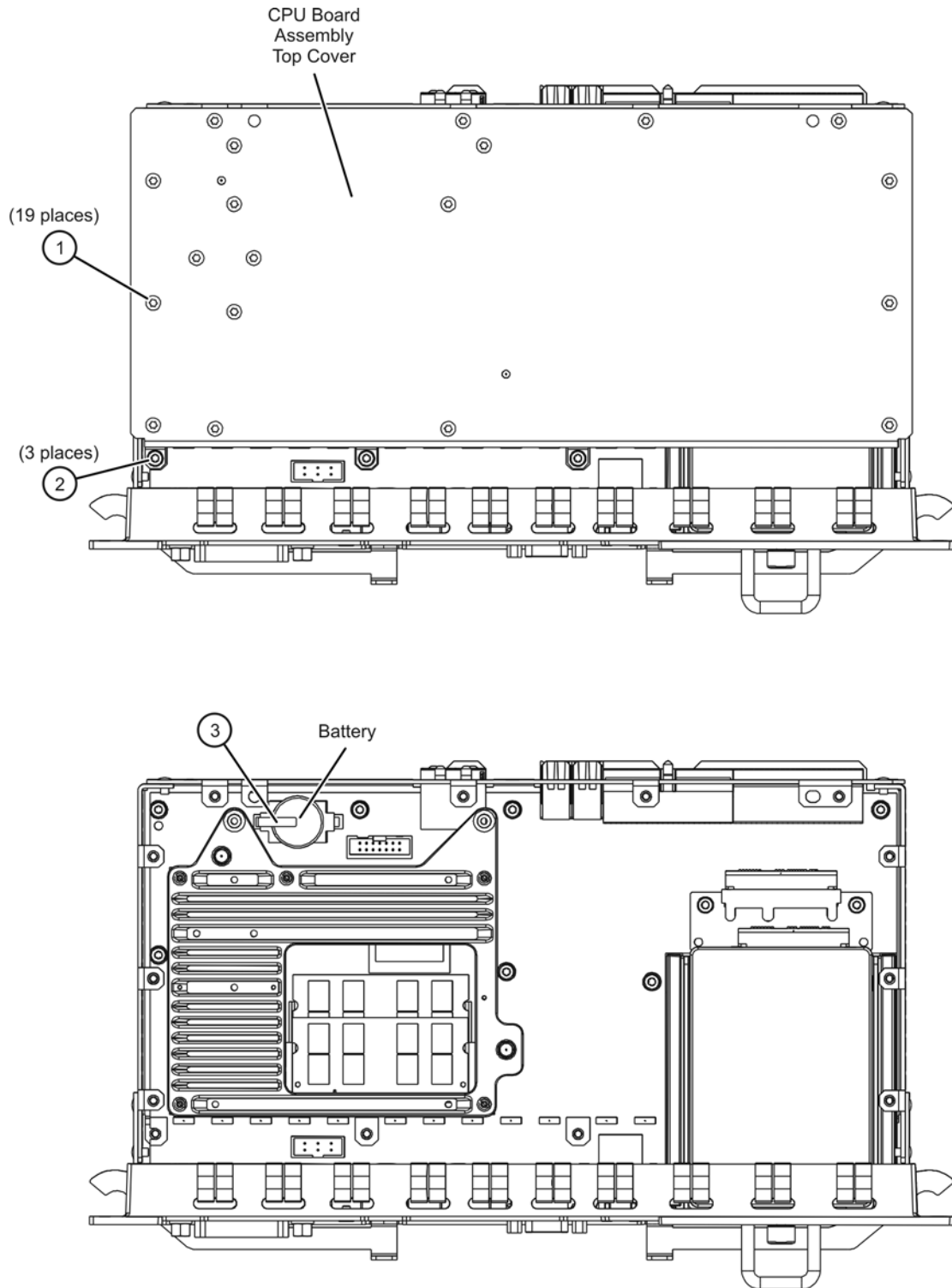
Refer to [Figure 7-18](#) for this procedure.

1. Disconnect the power cord.
2. Remove the outer and inner covers. Refer to [“Removing the Covers”](#) on page 7-6.
3. Remove the A17 CPU board. Refer to [“Removing and Replacing the A17 CPU Board Assembly”](#) on page 7-22.
4. Remove top cover attachment screws (item ①) and (item ②).
5. Lift the top cover off of the CPU board assembly.
6. Remove the battery from the battery holder by lifting it at the open end of the holder and then sliding it from under the clip (item ③).
7. **DO NOT THROW AWAY THE BATTERY. COLLECT IT AS SMALL CHEMICAL WASTE.** Refer to [“Lithium Battery Disposal”](#) on page 1-8 for additional information on battery disposal.

### Replacement Procedure

1. Reverse the order of the removal procedure following all instructions included with the new battery.
2. Perform the post-repair adjustments, verifications, and performance tests that pertain to this removal procedure. Refer to [Table 7-2](#) on page 7-42.

**Figure 7-18. Lithium Battery Removal**



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## Post-Repair Procedures

After the replacement of an assembly, you must perform the service procedures in the order listed in [Table 7-2](#).

**Procedures referenced in this table are located in [Chapter 3, “Tests and Adjustments,”](#) unless specified otherwise.**

**Table 7-2 Related Service Procedures**

Replaced Assembly	Adjustments and Other Procedures	Verification, Performance, and Other Tests and Procedures
A1 front panel display board	No adjustment needed	<a href="#">Front Panel Keypad and RPG Test</a> and <a href="#">A3 Display Test</a> in <a href="#">Chapter 4</a>
A2 USB board	No adjustment needed	Check for proper operation
A3 display assembly	No adjustment needed	<a href="#">A3 Display Test</a> in <a href="#">Chapter 4</a>
A10 frequency reference board	<a href="#">10 MHz Frequency Reference Adjustment</a> Restore option data (Refer to <a href="#">“Repairing and Recovering Option Data”</a> in <a href="#">Chapter 8</a> .)	<a href="#">Frequency Accuracy Test</a>
A11 fractional-N synthesizer board (Option 108)	No adjustment needed	None needed
A12 SPAM board	No adjustment needed	None needed
A14 system motherboard	No adjustment needed	<a href="#">Front Panel Keypad and RPG Test</a> and <a href="#">A3 Display Test</a> in <a href="#">Chapter 4</a>
A15 midplane board	No adjustment needed	None needed
A16 power supply assembly	No adjustment needed	None needed
A17 CPU board	No adjustment needed	None needed
A18 GPIB board	No adjustment needed	None needed
A19 test set motherboard	Reinstall the serial number. (Refer to <a href="#">“Installing or Changing a Serial Number”</a> in <a href="#">Chapter 8</a> .) Re-enable all hardware options. (Refer to <a href="#">“Option Entitlement Certificate”</a> in <a href="#">Chapter 8</a> .)	None needed
A20 IF multiplexer board	None needed	None needed
A21 HMA26.5 (Option 108)	None needed	None needed
A51 hard disk drive	None needed	Read and write to the drive
B1 fan	No adjustment needed	Check for fan operation
Battery	No adjustment needed	None

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## **8 General Purpose Maintenance Procedures**

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## Information in This Chapter

### Chapter Eight at-a-Glance

Section Title	Summary of Content	Start Page
<a href="#">Option Enable Utility</a>	How to use the option enable utility to: <ul style="list-style-type: none"><li>• enable options that have been added to your measurement receiver,</li><li>• repair lost or damaged option data,</li><li>• install or change a serial number.</li></ul>	<a href="#">page 8-3</a>
<a href="#">Firmware Upgrades</a>	How to check your measurement receiver's current firmware revision and where to locate firmware upgrades.	<a href="#">page 8-7</a>
<a href="#">Operating System Recovery</a>	Where to find the information on recovering from a damaged operating system.	<a href="#">page 8-8</a>

### Conventions Used for Hardkeys, Softkeys, and Menu Items

The following conventions are used in this document:

**Hardkey**

This represents a “hardkey”, a key that is physically located on the instrument.

**Softkey**

This represents a “softkey”, a key whose label is determined by the instrument firmware.

**Menu Item**

This represents an item in a drop-down or pop-up menu.



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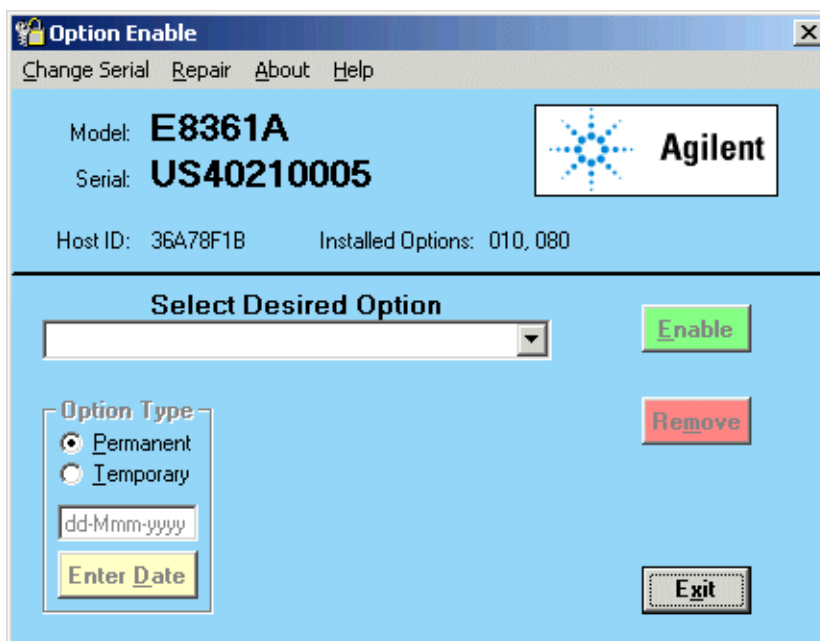
## Option Enable Utility

### Accessing the Option Enable Utility

To start the option enable utility:

- Press UTILITY **System**, then **Service**, then **Option Enable**.
- A dialog box similar to the one illustrated in [Figure 8-1](#) is displayed.

**Figure 8-1 Option Enable Dialog Box**



### Option Entitlement Certificate

If you have received an “Option Entitlement Certificate”, follow the instructions on the certificate, under “HOW TO USE THIS CERTIFICATE:”, to obtain license key(s) for the option(s) listed on the certificate. See the important note below.

---

**NOTE** When upgrading from one model number to another, a new option entitlement certificate will be issued. When this certificate is redeemed for a license key, the automated system will ask for the instrument's Host ID. Be sure to use the new Host ID that is associated with the new model number. Using the current Host ID will cause a license to be generated that will not work with the instrument. To determine the new Host ID, use the utility at the below listed web site with the new model number.

<http://na.tm.agilent.com/pna/upgrades.html>

## Enabling or Removing Options

There are two types of options:

- **Hardware:** Hardware options involve adding additional hardware to the measurement receiver. After the proper hardware has been installed in the measurement receiver, the option can be enabled using the option enable utility.

It is necessary to re-enable all installed hardware options if the test set motherboard is replaced.

- **Software:** Software options add features or functionality to the measurement receiver without the need for additional hardware. These options are enabled using the option enable utility and require a special license key.

---

**NOTE** Some applications require a license key that is provided by Agilent. If you do not have the required license key, contact Agilent for assistance. Refer to [“Contacting Agilent” on page 2-9](#).

---

It is necessary to backup all installed software options if the frequency reference board is replaced.

To enable or remove an option:

1. Start the option enable utility. Refer to [“Accessing the Option Enable Utility” on page 8-3](#).
2. Click the arrow in the **Select Desired Option** box. A list of available options, similar to the list below, will appear.
  - 010 - Time Domain
  - 108 - LO Source
  - 118 - Fast CW Mode
3. Click on the option that you wish to either enable or remove, and then click **Enable** or **Remove**, whichever is appropriate.
4. If the desired option is not available in the list, select **“??? - Enter Unlisted Option”**. A dialog box appears that will allow you to enter the option number. Enter the option number and follow the instructions on the display.

## Repairing and Recovering Option Data

License, option, and model number data are stored in an EEPROM on the frequency reference board and written into the gen.lic file on the hard disk drive. If the data stored in either of these items is lost, it can be recovered from the other item.

If the data on both the hard disk drive and the frequency reference board is lost, it can not be recovered. Contact Agilent for assistance. Refer to [“Contacting Agilent” on page 2-9](#).

### Recovery of Data After Repair

- If the frequency reference board is replaced, use the **Repair** selection to recover data that has been lost as a result of the repair:
  1. Select **Repair** from the **Option Enable** menu bar (see [Figure 8-1 on page 8-3](#)).
  2. Click the **Freq Ref board has been replaced** check box.
  3. Click **Begin Repair**. The data is written from the gen.lic file into the EEPROM.
- If the hard disk drive is replaced, a new gen.lic file is automatically created when the **Network Analyzer** application starts, by retrieving the data from the EEPROM.

### Recovery of Data if Option or Model Numbers are Incorrect

If the measurement receiver option or model numbers are not listed correctly on the measurement receiver display, in either the Option Enable Dialog Box or the About Network Analyzer display, you should regenerate the options license file, gen.lic:

1. Exit the **Network Analyzer** application.
2. Remove (or rename) the existing gen.lic file:
  - a. Open **Windows Explorer** and navigate to C:\Program Files\Agilent\Network Analyzer.
  - b. Delete (or rename) gen.lic.
3. Exit the **Windows Explorer** application.
4. Open the **Network Analyzer** application. The application will generate a new gen.lic file when it starts.
5. Check the option listing:
  - a. Press UTILITY **System**, then **Service**, then **Option Enable** or
  - b. Press UTILITY **System**, then **Help**, then **About NA...**.
6. If the options are still not listed correctly, contact Agilent for assistance. Refer to [“Contacting Agilent” on page 2-9](#).

## Installing or Changing a Serial Number

It is necessary to reinstall the instrument serial number if the test set motherboard is replaced.

---

**IMPORTANT** Use extreme care when entering the serial number, as only one attempt is allowed.

---

1. To change a serial number, select **Change Serial** from the **Option Enable** menu bar (see [Figure 8-1 on page 8-3](#)). The current serial number is displayed. If no serial number has previously been entered, the word “NONE” will be displayed.
2. **VERY CAREFULLY**, type the new serial number into the space provided and then click **Change**.
3. If an error is made in entering the serial number, obtain a clear code from Agilent, enter the clear code in the space provided and click **CLEAR**. The correct serial number can then be entered.

---

**NOTE** To change an incorrect serial number, a clear-code password is required. Contact Agilent to obtain the clear-code. Refer to [“Contacting Agilent” on page 2-9](#).

---

## Firmware Upgrades

### How to Check the Current Firmware Version

1. Press UTILITY **System**, then **Help**, then **About NA...** .

A dialog box showing the current installed Application Code Version is displayed.

2. To determine if a firmware update is available, proceed to [“Downloading from the Internet.”](#)

### Downloading from the Internet

If your measurement receiver is connected to the Internet, there are two methods available for checking the availability of, and downloading, new firmware:

- Download directly from: <http://www.agilent.com/find/pna>. (Select your measurement receiver’s model number in this web site to view available upgrades.)
- Press UTILITY **System**, then **Service**, then **AgileUpdate** .

**AgileUpdate** compares the firmware revision currently installed in your measurement receiver to the latest version available and assists you in downloading and installing the most recent version.

---

## Operating System Recovery

### Recovering from Hard Disk Drive Problems

If you suspect that you have a hard disk drive problem, go to the “Hard Drive Recovery” link on the Agilent PNA Series: Service & Support Home Page on the Internet.

The URL for the Agilent PNA Series: Service & Support Home Page is:

<http://na.tm.agilent.com/pna/>

The URL for the Hard Drive Recovery page is:

<http://na.tm.agilent.com/pna/hdrecovery.html>

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