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# Keysight Noise Figure Measurement Capability Upgrade Kit

To Upgrade PNA-X  
N5247A/B Option 423 and  
N5247B Option 425  
to include Option 029 or  
E29

Upgrade Kit Order  
Numbers:

N5247AU-929 and  
N5247BU-429 and  
N5247BU-4E9

Keysight Kit Number:  
N5247-60116 or  
N5247-60121

This is Installation Note is for upgrading the N5247A/B Microwave Network Analyzers with Option 029 or E29  
Noise Figure Measurement Capability.

# Notices

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2009-2023

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## Manual Part Number

N5247-90116

## Edition

Edition 1, August 2023

Printed in USA/Malaysia

Published by:  
Keysight Technologies  
1400 Fountaingrove Parkway  
Santa Rosa, CA 95403

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### CAUTION

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

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NOTICE: This document contains references to Agilent Technologies. Agilent's former Test and Measurement business has become Keysight Technologies. For more information, go to **[www.keysight.com](http://www.keysight.com)**.





## Description of the Upgrade

### NOTE

**IMPORTANT!** Option 029 or E29 requires Noise Figure Measurements Option S93029A/B. Option S93029A/B is not included with this kit. If you need to order Option S93029B, contact Keysight. Refer to “**Contacting Keysight**” on page 5.

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This upgrade adds noise figure measurement capability to your N5247A/B Option 423 or N5247B Option 425 4-port analyzer by adding Option 029 or E29 which includes:

- a noise down converter and noise receiver
- a bypass switch in ports 1 and 2

Refer to “**Overview of the Installation Procedure**” on page 13.

### CAUTION

This repair must be done at a service center or a self-maintainer service center! Refer to “**Getting Assistance from Keysight**” on page 5.

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## Getting Assistance from Keysight

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

### Contacting Keysight

Assistance with test and measurements needs and information on finding a local Keysight office are available on the Web at:

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

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

### NOTE

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

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## If You Have Problems With the Upgrade Kit Contents

Keysight stands behind the quality of the upgrade kit contents. If you have problems with any item in the kit, refer to [www.keysight.com](http://www.keysight.com) and the **Contact**

Keysight (  ) link.

## Getting Prepared

### CAUTION

The PNA contains extremely sensitive components that can be ruined if mishandled. Follow instructions carefully when making cable connections, especially wire harness connections.

The person performing the work accepts responsibility for the full cost of the repair or replacement of damaged components.

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To successfully install this upgrade kit, you will need the following:

- A license key - refer to **“License Key Redemption”** below.
- A PDF copy or a paper copy of the PNA Service Guide - refer to **“Downloading the Online PNA Service Guide”** below.
- An ESD-safe work area - refer to **“Protecting Your Workspace from Electrostatic Discharge”** below.
- Correct tools - refer to **“Tools Required for the Installation” on page 9.**
- Enough time - refer to **“About Installing the Upgrade” on page 10.**
- Test equipment for the post-upgrade adjustments. To view the equipment list, click the Chapter 3 bookmark “Tests and Adjustments” in the PDF Service Guide<sup>1</sup>.

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1. See **“Downloading the Online PNA Service Guide” on page 8.**

## License Key Redemption

### NOTE

The only difference between an A model license key redemption and a B model is that the A model uses a 12-character license key and the B model uses a license key file.

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### NOTE

Ensure that you are connected to an external server, before attempting to download your email and license key file.

If you are unfamiliar with the licensing process:

– For A models: Refer to

<https://www.keysight.com/us/en/assets/9018-03565/installation-guides/9018-03565.pdf> (N5225-90110).

– For B models: Refer to the

<https://www.keysight.com/us/en/assets/9018-04534/installation-guides/9018-04534.pdf> (N5242-90024).

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### NOTE

The enclosed Software Entitlement Certificate is a receipt, verifying that you have purchased a licensed option for the PNA of your choice. You must now use a Keysight Web page to request a license key file for the instrument that will receive the option.

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To enable the option product(s), you must request license key(s) file from the Keysight Software Manager:

<http://www.keysight.com/find/softwaremanager>:

To complete the request, you will need to gather the following information:

– From the certificate

– Order number

– Certificate number

– From your instrument

(Instrument information is available in the network analyzer - on the toolbar, click Help, then click About Network Analyzer.)

– Model number

– Serial number

**A models ONLY:** From the online Keysight HostID utility:

– Part of the OEC procedure to obtain the 12-digit license key online requires you to provide the HostID number of the PNA. This HostID number is NOT the one currently shown on the PNA. To determine your new HostID, Keysight personnel should use the new model number with the utility at <http://mktwww.srs.is.keysight.com/field/service/network/pna/upgrades.html>. Non-Keysight personnel should contact Keysight at <http://www.keysight.com/key/contactus>.

– Host ID

Using the information just gathered, you must request license key file(s) from the Keysight Software Manager:

<http://www.keysight.com/find/softwaremanager>.

You will need to provide an email address, to which Keysight will promptly email your license key file. Refer to **“License Key Redemption” on page 7**.

## Verify the License Contents

Refer to the license message you received from Keysight:

If the model number, serial number, or option number do not match those on the license message you received from Keysight, you will not be able to install the license key file. If this is the case you received from Keysight, you will not be able to install the license key file. If this is the case, contact Keysight for assistance. Refer to **“Getting Assistance from Keysight” on page 5**.

## Downloading the Online PNA Service Guide

To view the online Service Guide for your PNA model number, use the following steps:

1. Go to [www.keysight.com](http://www.keysight.com).
2. In the **Search** box, enter the model number of the analyzer (e.g., N5225B) and click **Search**.
3. Click **Support** > **Keysight Product Support**.
4. In the **Search Support** area type your instrument's model number (e.g., N2225B).
5. Press **Enter**.
6. Scroll down to the **PRINT DOCUMENTATION** section and click to select **Service Manual**.

The **Service Manual** for your instrument will be displayed near the top of the right column.

7. Click the hyperlink of the Service Guide title to download the PDF file.
8. When the PDF of the Service Guide is displayed, scroll through the Contents section bookmarks to locate the information needed.



## Protecting Your Workspace from Electrostatic Discharge

For information, click on the Chapter 1 bookmark, “Electrostatic Discharge Protection” in the PDF Service Guide<sup>1</sup>.

### ESD Equipment Required for the Installation

Description	Keysight Part Number
ESD grounding wrist strap	9300-1367
5-ft grounding cord for wrist strap	9300-0980
2 x 4 ft conductive table mat and 15-ft grounding wire	9300-0797
ESD heel strap (for use with conductive floors)	9300-1308

## Tools Required for the Installation

Description	Qty	Part Number
T-6 TORX driver – set to 4 in-lbs (0.45 N.m)	1	N/A
T-8 TORX driver – set to 6 in-lbs (0.68 N.m)	1	N/A
T-10 TORX driver - set to 9 in-lbs (1.02 N.m)	1	N/A
T-20 TORX driver - set to 21 in-lbs (2.38 N.m)	1	N/A
5/16-in (8 mm) nutsetter or open end torque wrench- set to 10 in-lbs (1.13 N.m)	1	N/A
5/8-in (16 mm) nutsetter or open end torque wrench - set to 21 in-lbs (2.38 N.m)	1	N/A
9 mm nutsetter or open end torque wrench - set to 21 in-lbs (2.38 N.m)	1	N/A

#### CAUTION

Use a 5/16-in torque wrench set to 10 in-lbs on all cable connections except the front and rear panel bulkhead connectors. Torque these connections to 21 in-lb.

1. See “[Downloading the Online PNA Service Guide](#)” on page 8.

Description of the Upgrade  
Getting Prepared

## About Installing the Upgrade

Products affected	N5247A/B Option 423 and N5247B Option 425
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	5.0 hours
Estimated adjustment time	1.5 hours (with LFE 2.5 hours) <sup>a</sup>
Estimated full instrument calibration time	7.0 hours (with LFE 8.0 hours) <sup>a</sup>

a. Low Frequency Extension (LFE) source adjustment requires an additional 1.0 hour of test time.

## Items Included in the Upgrade Kit

Check the contents of your kit against the following list. If any part is missing or damaged, contact Keysight Technologies. Refer to **“Getting Assistance from Keysight” on page 5**.

**Table 1** Contents of Upgrade Kit N5247-60116 or N5247-60121

Ref Desig.	Description	Qty	Part Number
	Installation note (this document)	1	N5247-90116
	Software Entitlement Certificate	1	9300-0000
	China RoHS Addendum	1	9320-6722
Assemblies			
A9	Noise receiver board	1	N5245-60124
A23	Test set, motherboard PCA	1	N5245-60157
A56 & A57	Bypass switch, port 1 and port 2	2	N1811-60010
A59	Noise downconverter (receiver – 50 GHz Option 029 – N5247-60116)	1	5087-7344
	Noise downconverter (receiver – 67 GHz Option E29 – N5247-60121)		5087-7464
A64	Tuner	1	5087-7345
Hardware/Miscellaneous			
	Termination (2.44 mm SMA), 50 ohm – 50 GHz	1	0955-2394
	Bracket, A56 and A57 noise bypass switches	2	N5245-00033
	Machine screw, M3.0 x 8, pan head (to attach A56 and A57 to side frame)	4	0515-0372
	Machine screw, M3.0 x 12, pan head (to attach A64 to side frame)	2	0515-0664
	Machine screw, M2.5 x 20, pan head (to attach switch brackets to side frame)	4	0515-1992
	Machine screw, M3.0 x 14, pan head (to attach A59 to side frame)	3	0515-2994
	Lower front panel overlay, N5247A Option 423 with Option 029	1	N5247-80013
	Lower front panel overlay, N5247B Option 423 with Option 029 or E29	1	N5247-80023
	Lower front panel overlay, N5247B Option 425 with Option 029 or E29	1	N5247-80028
Cables			
W162	RF cable, A42 port 1 bias tee to A56 port 1 noise bypass switch	1	N5247-20120
W163	RF cable, A64 tuner to A56 port 1 noise bypass switch	1	N5247-20117
W164	RF cable, A64 tuner to A56 port 1 noise bypass switch	1	N5247-20118

Description of the Upgrade  
Items Included in the Upgrade Kit

Table 1 Contents of Upgrade Kit N5247-60116 or N5247-60121

Ref Desig.	Description	Qty	Part Number
W165	RF cable, front-panel port 1 CPLR THRU to A56 port 1 noise bypass switch	1	N5247-20119
W166	RF cable, port 2 CPLR THRU to A57 port 2 noise bypass switch	1	N5247-20124
W167	RF cable, A57 port 2 noise bypass switch to A45 port 2 bias tee	1	N5247-20123
W168	RF cable, A59 noise downconverter to A57 port 2 noise bypass switch	1	N5247-20121
W169	RF cable, A59 noise downconverter to A57 port 2 noise bypass switch	1	N5247-20122
W171	RF cable, A59 noise downconverter to A9 noise board	1	N5247-20144
W172	Coaxial cable, A59 noise downconverter assembly J3 to A9 noise board J1	1	N5245-60020
W173	RF cable, A59 noise downconverter to A9 noise board	1	N5247-20145
W174	RF cable, A28 mixer brick to A59 noise downconverter	1	N5247-20143
W175	Coaxial cable, A59 noise downconverter assembly J2 to A9 noise board J5	1	N5245-60019
W189	RF cable, A42 port 1 bias tee to A56 port 1 noise bypass switch	1	N5247-20172
W190	RF cable, A74 Bias Tee combiner, Port 2 to A57 noise switch, port 2	1	N5247-20173
	Ribbon cable, A59 noise downconverter J1 port 1 to A23 test set motherboard J548	1	N5245-60018
	Ribbon cable, A64 tuner J9 to A23 test set motherboard J7	1	N5245-60021

**NOTE**

Extra quantities of items such as protective plastic caps, screws, cable ties, and cable clamps may be included in this upgrade kit. It is normal for some of these items to remain unused after the upgrade is completed.

## Installation Procedure for the Upgrade

The network analyzer must be in proper working condition prior to installing this option. Any necessary repairs must be made before proceeding with this installation.

### **WARNING**

This installation requires the removal of the analyzer's protective outer covers. The analyzer must be powered down and disconnected from the mains supply before performing this procedure.

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### Overview of the Installation Procedure

- "Step 1. Obtain a Keyword and Verify the Information."
- "Step 2. Remove the Outer Cover."
- "Step 3. Remove the Inner Cover."
- "Step 4. Remove the Front Panel Assembly."
- "Step 5. Remove Some of the Existing Test Set Cables."
- "Step 6. Assemble the A23 Test Set Motherboard."
- "Step 7. Install the A59 Noise Downconverter (Receiver) to the Chassis."
- "Step 8. Install the A57 Noise Switch (Port 2) to Bracket and Attach Cables to A59 Noise Downconverter (Receiver) Assembly."
- "Step 9. Install Semirigid Cables to the Noise Assembly."
- "Step 10. Install Switch Bracket and Switch."
- "Step 11. Install the A56 Switch to Bracket and Bracket to the Chassis."
- "Step 12. Install the A64 Tuner to Chassis and Attach Cable to the Tuner."
- "Step 13. Install the A9 Noise Receiver Board."
- "Step 14. Install the New Test Set Cables."
- "Step 15. Replace the lower front panel overlay."
- "Step 16. Reinstall the Front Panel Assembly."
- "Step 17. Install the New Lower Front Panel Overlay."
- "Step 18. Position the Cables and Wires to Prevent Pinching."
- "Step 19. Reinstall the Inner Cover."
- "Step 20. Reinstall the Outer Cover."
- "Step 21. Remove Option 028 License ("A" Model Instruments Only)."
- "Step 22. Enable Option 029 or E29."

**“Step 23. Verify the PNA Analyzer Program is Running with the Correct Options.”**

**“Step 24. Perform Post-Upgrade Adjustments and Calibration.”**

**“Step 25. Prepare the PNA for the User.”**

## Step 1. Obtain a Keyword and Verify the Information

Follow the instructions on the Software Entitlement Certificate supplied to obtain a license key for installation of this upgrade. Refer to **“License Key Redemption” on page 7**.

Verify that the model number, serial number, and option number information on the license key match those of the instrument on which this upgrade will be installed.

If the model number, serial number, or option number do not match those on your license key, you will not be able to install the option. If this is the case, contact Keysight for assistance before beginning the installation of this upgrade. Refer to **“Contacting Keysight” on page 5**.

Once the license key file has been received and the information verified, you can proceed with the installation at step 2.

### NOTE

If the model number, serial number, or option number do not match those on your license key file, you will not be able to install the option. If this is the case, contact Keysight for assistance before beginning the installation of this upgrade. Refer to **“Contacting Keysight” on page 5**.

## Step 2. Remove the Outer Cover

### CAUTION

This procedure is best performed with the analyzer resting on its front handles in the vertical position. Do not place the analyzer on its front panel without the handles. This will damage the front panel assemblies.

For instructions, click the Chapter 7 bookmark “Removing the Covers” in the PDF Service Guide.

## Step 3. Remove the Inner Cover

For instructions, click the Chapter 7 bookmark “Removing the Covers” in the PDF Service Guide.

## Step 4. Remove the Front Panel Assembly

For instructions, click the Chapter 7 bookmark “Removing and Replacing the Front Panel Assembly” in the PDF Service Guide<sup>1</sup>.

## Step 5. Remove Some of the Existing Test Set Cables

### CAUTION

Be careful not to damage the center pins of the semirigid cables. Some flexing of the cables may be necessary but do not over-bend them.

### NOTE

Leave the gray flexible cables, the wire harnesses, and the ribbon cables connected where possible. Any that are removed should be labeled for reconnection later.

To see an image showing the location of some of the cables click the Chapter 6 bookmark “Top Cables, All Cables – All Options (S/N Prefixes <6021)” or “Top Cables, All Cables – All Options (S/N Prefixes ≥6021)” in the PDF Service Guide<sup>1</sup>. And, to see an image showing the location of the other cables, click the Chapter 6 bookmark “Bottom RF Cables, 2-Port, Option 423 (S/N Prefixes <6021)” or “Bottom RF Cables, 2-Port, Option 423 (S/N Prefixes ≥6021)”<sup>1</sup>.

1. Place the analyzer bottom-side up on a flat surface.
2. Remove the following cables in the order listed. Unless otherwise marked, discard these cables; they will not be reused.

### For Option 423 Only:

- N5247-20027 Port 2 CPLR THRU to A45 port 2 bias tee
- N5247-20080 A45 port 2 bias tee to A36 port 2 coupler
- N5247-20029 A44 port 4 bias tee to A35 port 4 coupler
- N5247-20021 Port 4 CPLR THRU to A44 port 4 bias tee
- N5247-20022 A33 port 1 coupler to A42 port 1 bias tee
- N5247-20010 Port 3 CPLR THRU to A43 port 3 bias tee
- N5247-20081 Front-panel port 1 CPLR THRU to A42 port 1 bias tee
- N5247-20028 A43 port 3 bias tee to A34 port 3 coupler
- N5247-20058 A32 port 2 ref coupler to front-panel REF 2 SOURCE OUT

1. See “[Downloading the Online PNA Service Guide](#)” on page 8.

**For Option 425 Only:**

- N5247-20163 Port 2 CPLR THRU to A74 port 2 bias tee
- N5247-20167 Front-panel port 1 CPLR THRU to A71 port 1 bias tee

Step 6. Assemble the A23 Test Set Motherboard

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A23 Test Set Motherboard” in the PDF Service Guide<sup>1</sup>.

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1. See [“Downloading the Online PNA Service Guide” on page 8.](#)



## Step 7. Install the A59 Noise Downconverter (Receiver) to the Chassis

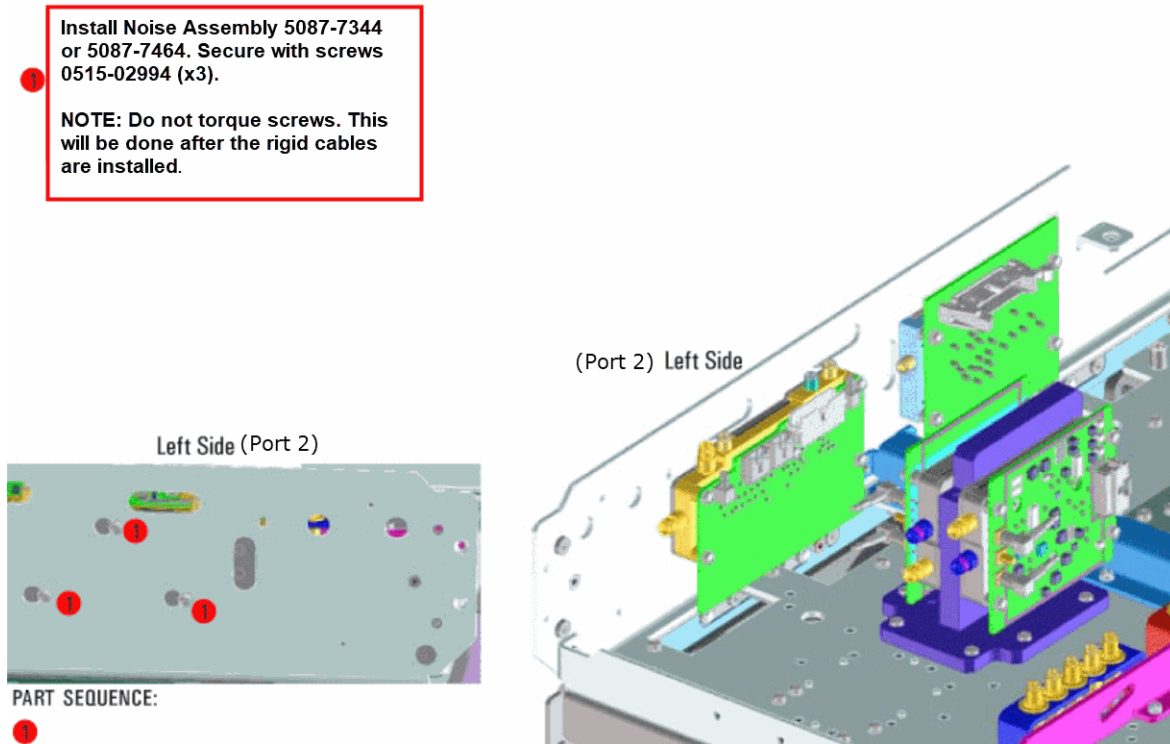
Refer to **Figure 2** for this step of the procedure. New parts are listed in **Table 1 on page 11**.

1. Attach the new noise downconverter receiver (item ①) to the chassis as shown.

Secure the noise downconverter receiver to its bracket using three screws, but do not torque. The screws will be torqued after the simirigid cables are installed.

Figure 2

Noise Receiver (5087-7344, 5087-7464 and 0515-2994)

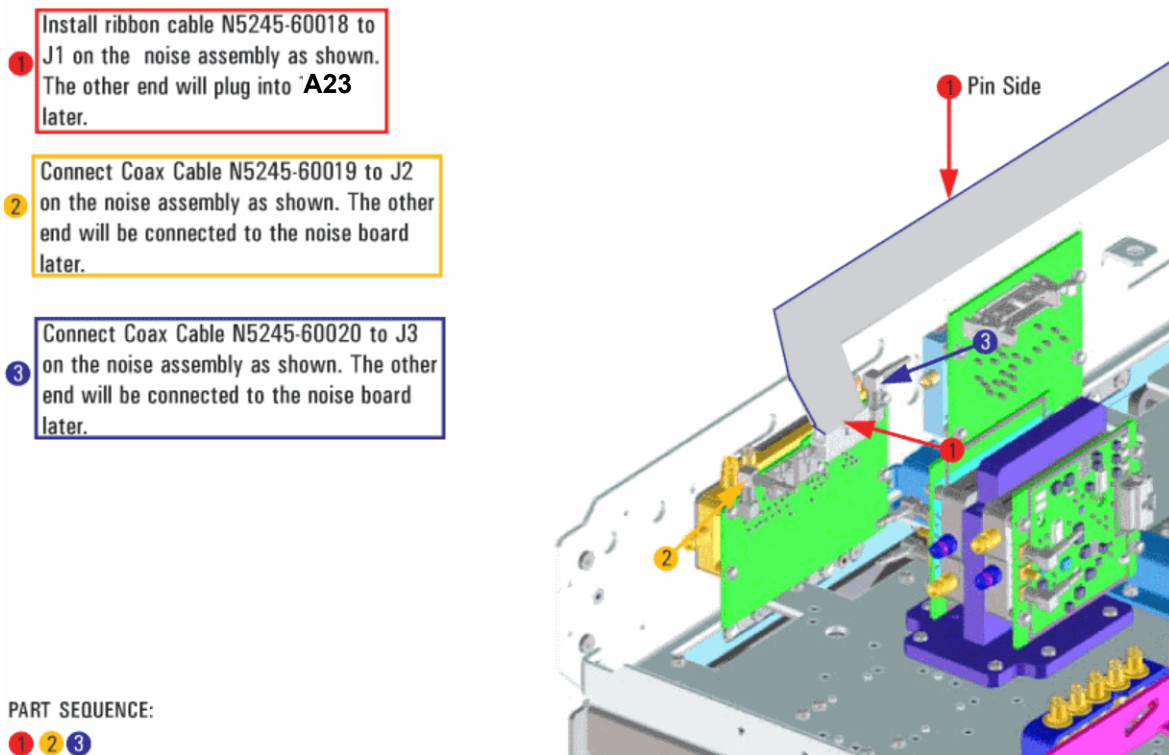


## Step 8. Install the A57 Noise Switch (Port 2) to Bracket and Attach Cables to A59 Noise Downconverter (Receiver) Assembly

Refer to **Figure 3** for this step of the procedure. New parts are listed in Table 1 on page 7.

1. Install ribbon cable (Item ① - N5245-60018) to J1 on the noise assembly as shown in **Figure 3**. Later the other end plugs into the A23 test set motherboard.
2. Connect coax cable (Item ② - N5245-60019) to J2 on the noise assembly as shown in **Figure 3**. Later the other end connects to the noise board.
3. Connect coax cable (Item ③ - N5245-60020) to 'J3 IF out' on the noise assembly as shown in **Figure 3**. Later the other end connects to the noise board.

Figure 3 Attach Cables to Noise Receiver Assembly (N5245-60018, N5245-60019, & N5245-60020)



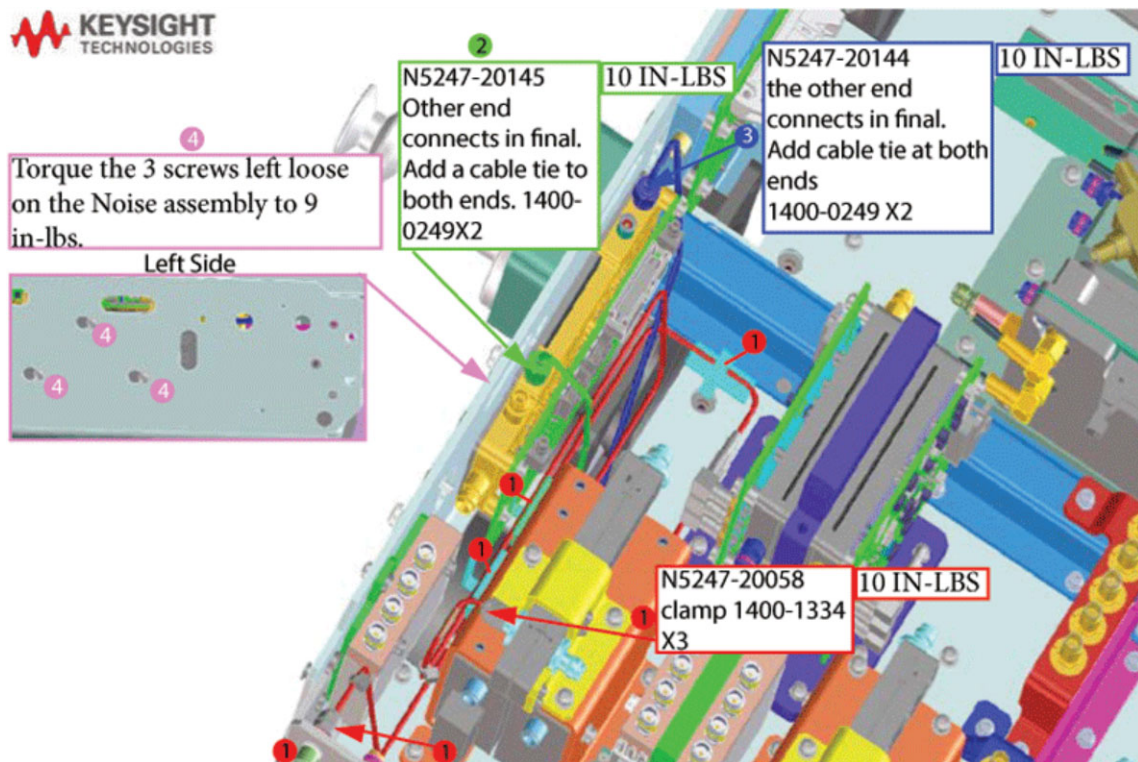
## Step 9. Install Semirigid Cables to the Noise Assembly

Refer to **Figure 4** for the following:

1. Torque N5247-20058 to 10 in-lbs and add clamps 1400-1334 (x3, item ①).
2. Torque N5247-20145 to 10 in-lbs. The other end to be connected at “**Step 14. Install the New Test Set Cables**” on page 24. Add cable ties 1400-0249 (x2, item ②).
3. Torque N5247-20144 to 10 in-lbs. The other end to be connected at “**Step 14. Install the New Test Set Cables**” on page 24.
4. Torque the 0515-2994 (x3, Item ③) screws to the noise assembly and chassis to 9 in-lbs.

Figure 4

Install the Semirigid Cables to the Noise Assembly (N5247-20058, N5247-20144, N5247-20145, 0515-2994, 1400-0249, 1400-1334)



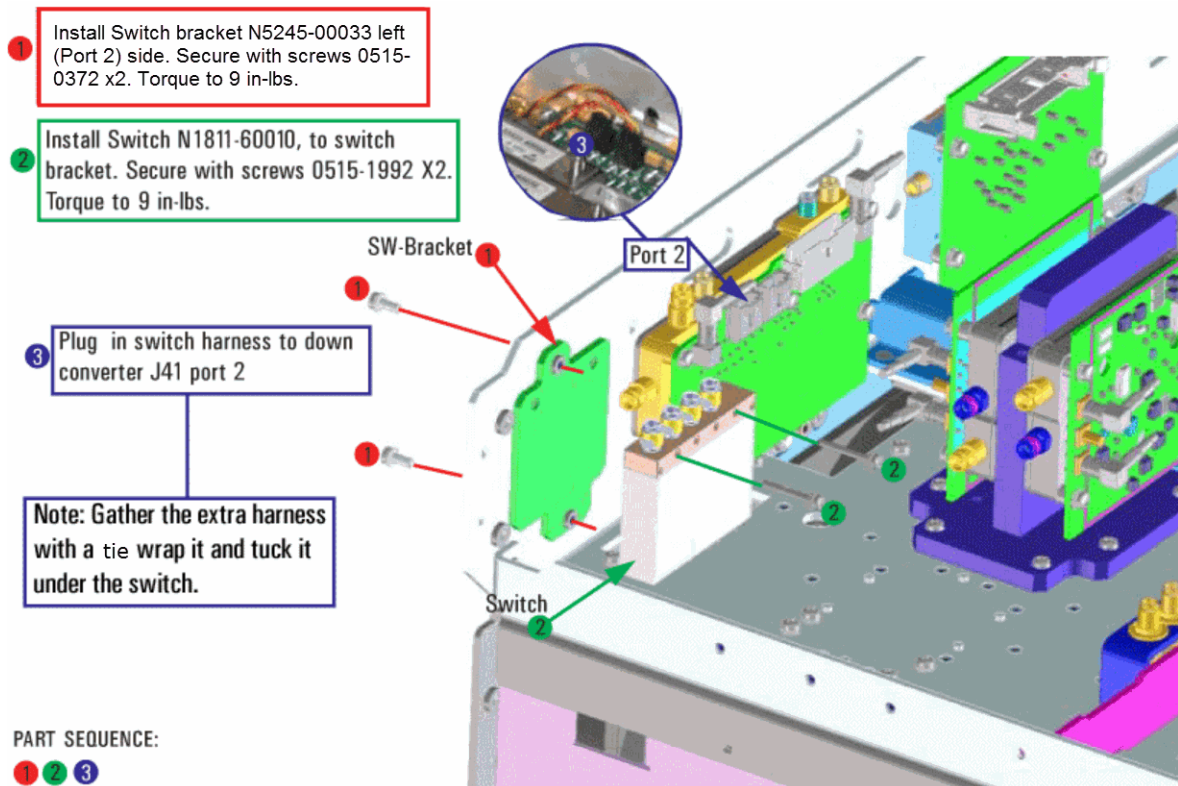
## Step 10. Install Switch Bracket and Switch

Refer to **Figure 5** for this step of the procedure. New parts are listed in Table 1 on page 7.

1. Install the Switch bracket (item ①) to the left side chassis. Secure with 2 screws and torque to 9 in-lbs.
2. Install the A57 Switch to the switch bracket using two screws (Item ②). Torque to 9 in-lbs.
3. Plug in switch harness (Item ③) to downconverter J41 port 2.

Figure 5

Attach Switch Bracket and Switch (N5245-00033, N1810-60010, 0515-0372, & 0515-1992)





### Step 11. Install the A56 Switch to Bracket and Bracket to the Chassis

Refer to **Figure 6** for this step of the procedure. New parts are listed in **Table 1 on page 11**.

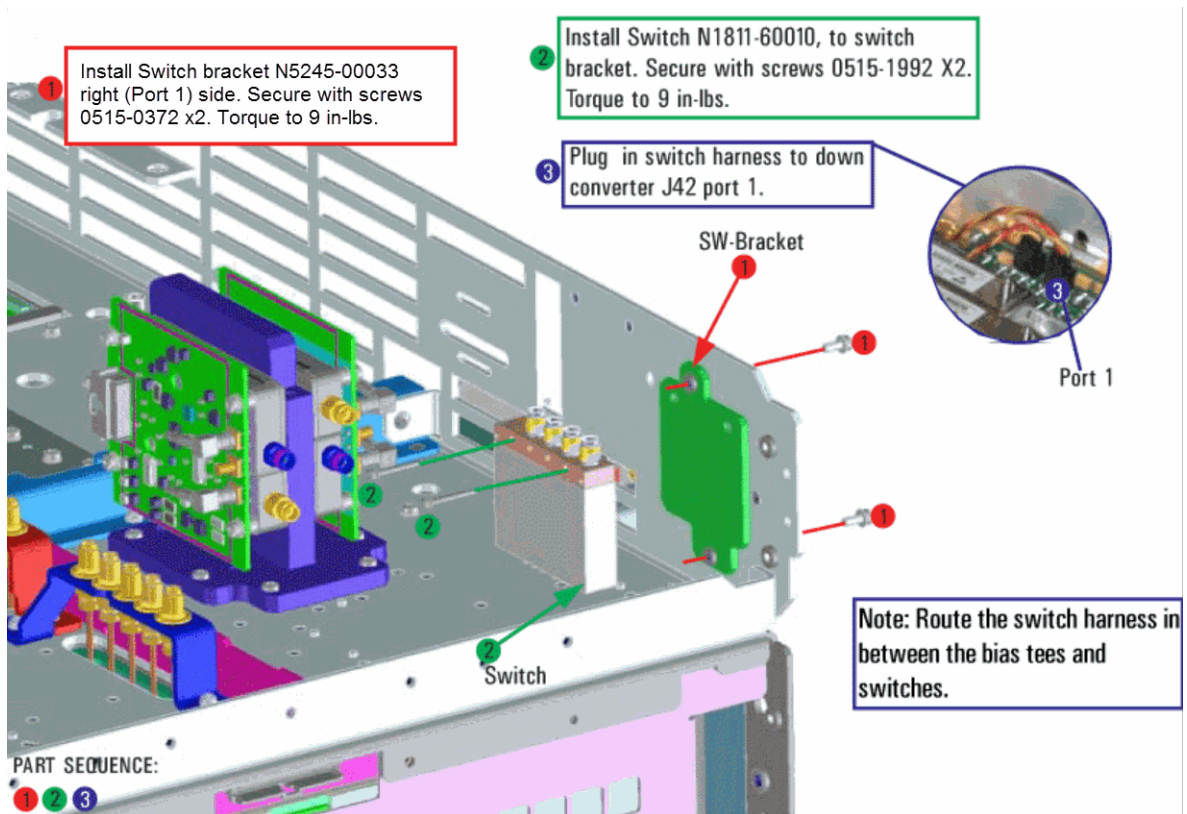
1. Install the bracket (item ① – N5245-00033) to the switch bracket using two screws.
2. Install switch (Item ② – N1811-60010) and to bracket. Secure with two 1515-0372 screws. Torque to 9 in-lbs.
3. Plug in switch harness (Item ③) to downconverter J42 port 1.

#### NOTE

Route the switch harness in between the bias tees.

Figure 6

Install the A56 Noise Switch (Port 1) to Bracket and Attach Cables to A64 Tuner Assembly (N1811-60010, N5245-00033, 0515-0372 and 0515-1992)



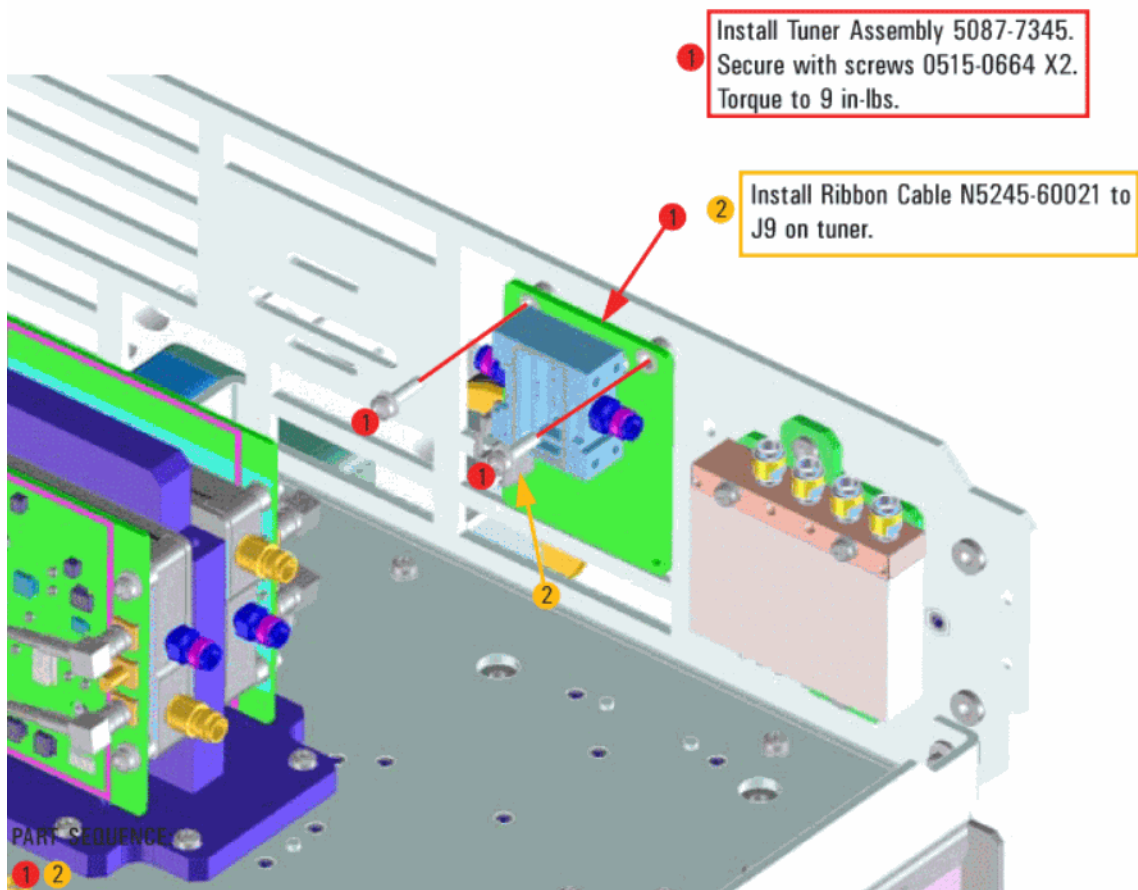
## Step 12. Install the A64 Tuner to Chassis and Attach Cable to the Tuner

Refer to **Figure 7** for this step of the procedure. New parts are listed in **Table 1** on page 11.

1. Install the tuner (item ① – 5087-7345) to the chassis using two screws. Torque to 9 in-lbs.
2. Plug in ribbon cable (Item ② - N5245-60021) to J9 on the A64 tuner. The other end is connected at final to the test set mother board.

Figure 7

Install the Tuner to the Chassis and Attach Cable to the A64 Tuner Assembly (5087-7345, N5245-60021, & 0515-0664)

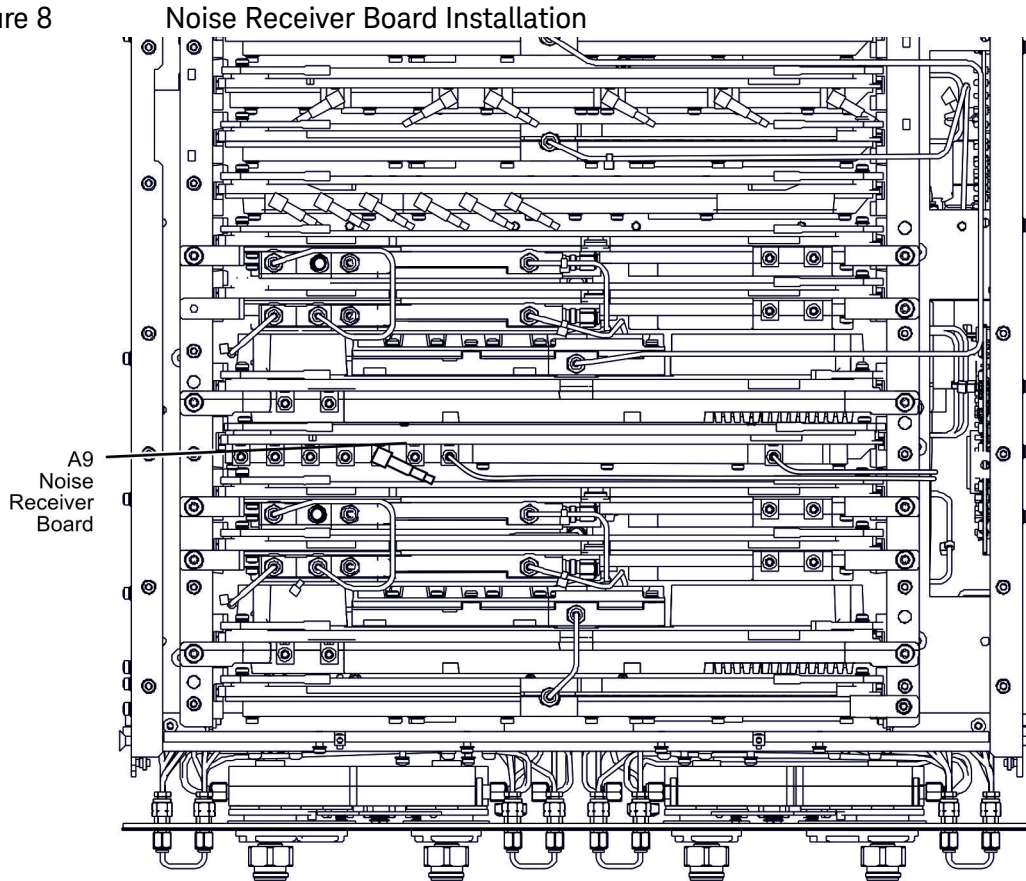


### Step 13. Install the A9 Noise Receiver Board

Refer to **Figure 8** for this part of this step of the procedure. Although only Option 422 is shown in the illustration, Option 423 and Option 425 with 029 or E29 are similar in appearance. New parts are listed in **Table 1 on page 11**.

1. Place the analyzer top-side up on a flat surface.
2. Insert the A9 noise receiver board in the analyzer as shown. Make sure it is fully seated in the motherboard connector.

Figure 8



## Step 14. Install the New Test Set Cables

### CAUTION

Follow instructions carefully when making cable connections, especially wire harness connections. Incorrect connections can destroy components, resulting in additional customer costs.

---

### CAUTION

Be careful not to damage the center pins of the semirigid cables. Some flexing of the cables may be necessary but do not over-bend them.

---

### CAUTION

Use a 5/16-in torque wrench set to 10 in-lbs on all cable connections except the front and rear panel bulkhead connectors. On these, use a 9 mm nutsetter or open end torque wrench set to 21 in-lb.

---

Refer to [Figure 9 on page 27](#) through [Figure 12 on page 30](#) for this step of the procedure. Although only Option 423 is shown in the illustrations, Option 425 is similar in appearance. To see an image showing the location of these cables, click the appropriate Chapter 6 bookmark (e.g., “4-Port Configuration, Options 423/029/E29 (S/N Prefixes <6021)” or “4-Port Configuration, Options 423/029/E29 (S/N Prefixes ≥6021)”) in the PDF Service Guide<sup>1</sup>. New parts are listed in [Table 1 on page 11](#).

#### 1. Connect the following wire harness and ribbon cables:

### NOTE

The reference designators in this step correspond to the figures [Figure 9 on page 27](#) through [Figure 12 on page 30](#). But, some of the previous steps are provided for your reference.

---

Connect the following, by referring to [Figure 10 on page 28](#):

- ①–(N5247-20145) A59 noise downconverter to A9 noise board.
- ②–(N5247-20144) A59 noise downconverter to A9 noise board.

Connect the following by referring to [Figure 11 on page 29](#) (See also [Figure 7 on page 22](#)):

- ①–(N5245-60020) Verify A59 noise downconverter assembly J3 to A9 noise board J1 “IF IN”.
- ②–(N5245-60019) Verify A59 noise downconverter assembly J2 to A9 noise board J5 “DET IN”.

Connect the following by referring to [Figure 12 on page 30](#) (See also [Figure 3 on page 18](#) and [Figure 7 on page 22](#)):

- ①–(N5245-60018) A59 noise receiver to the A23 test set motherboard J550.

---

1. See [“Downloading the Online PNA Service Guide” on page 8](#).



- ②–(N5245-60021) Verify A64 tuner to A23 test set motherboard J7
2. Install the following semirigid cables in the order listed. Unless otherwise indicated, use a 5/16-in torque wrench set to 10 in-lbs to tighten all cable connectors.

**NOTE**

If necessary loosen the noise microcircuit to install cables. Re-torque connectors to 10 in-lbs. after the cables have been installed.

**All model analyzers, unless otherwise indicated:**

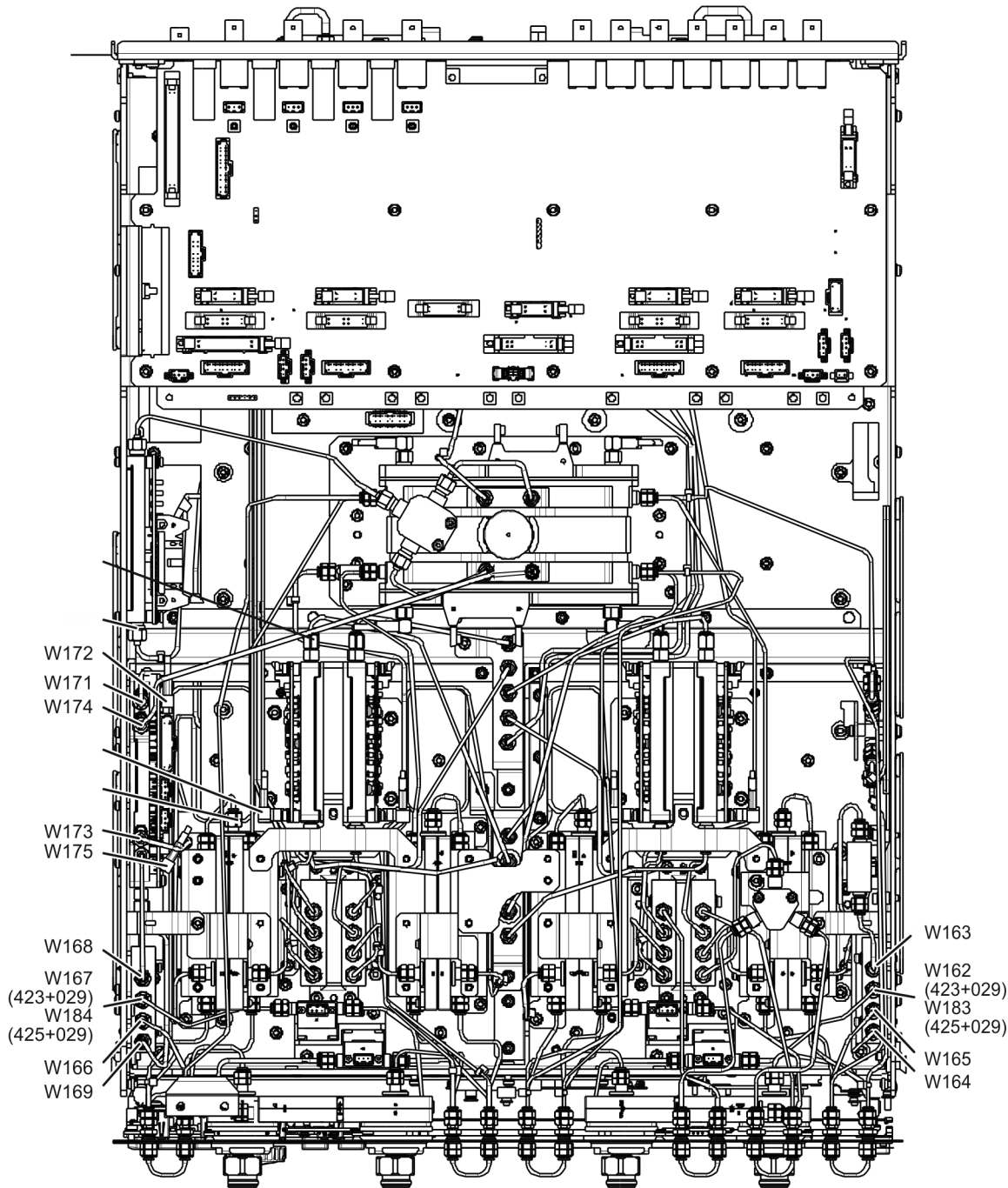
- W166 (N5247-20124) Port 2 CPLR THRU to A57 port 2 noise bypass switch
  - **425+029 or 425+E29 Only!** W190 (N5247-20173) A74 Port 2 bias tee combiner to A57 port 2 noise bypass switch
  - W165 (N5247-20119) A42 port 1 bias tee to A56 port 1 noise bypass switch
  - **425+029 or 425+E29 Only!** W189 (N5247-20172) A71 port 1 bias tee to A56 port 1 noise bypass switch
  - **423+029 or 423+E29 Only!** W167 (N5247-20123) A57 port 2 noise bypass switch to A45 port 2 bias tee
  - W169 (N5247-20122) A59 noise downconverter to A57 port 2 noise bypass switch
  - W168 (N5247-20121) A59 noise downconverter to A57 port 2 noise bypass switch
  - **423+029 or 423+E29 Only!** W162 (N5247-20120) A42 port 1 bias tee to A56 port 1 noise bypass switch
  - W164 (N5247-20118) A64 tuner to A56 port 1 noise bypass switch
  - W163 (N5247-20117) RF cable, A26 splitter to A27 mixer brick
  - W174 (N5247-20143) A59 noise downconverter to A28 mixer brick
3. Position the analyzer as shown in **Figure 9 on page 27** through **Figure 12 on page 30** (fans facing upwards) and loosely install the following cables. Route each of the cables through the opening in the test set deck to the top side of the analyzer. The other ends will be connected in the next step.
- W173 (N5247-20145) A59 noise downconverter to A9 noise board
  - W171 (N5247-20144) A59 noise downconverter to A9 noise board
  - N5245-60018 Flexible cable, A59 noise receiver to the A23 test set motherboard J550
  - W175 (N5245-60019) Flexible cable, A59 noise downconverter assembly J2 to A9 noise board J5

- W172 N5245-60020 Flexible cable, A59 noise downconverter assembly J3 to A9 noise board J1
- N5245-60021 Flexible cable, A64 tuner to A23 test set motherboard J7

Refer to [Figure 9 on page 27](#) through [Figure 12 on page 30](#) for this part of this step of the procedure. Although only Option 423 with 029 or E29 is shown in the illustration, Option 425 with 029 or E29 is similar in appearance. New parts are listed in [Table 1 on page 11](#).

4. The analyzer should be positioned on its left side (fans facing upwards) as shown.
5. Connect semirigid cables W171 (item ②) and W173 (item ①) as indicated in [Figure 10 on page 28](#). Torque connectors to 10 in-lbs.
6. Connect flexible cable W172 (item ②) and W175 (item ①) as indicated in [Figure 11 on page 29](#).
7. Connect flexible cable N5245-60018 (item ①) and N5245-60021 (item ②) as indicated in [Figure 12 on page 30](#).
8. Go back and torque the connectors on the other ends of W171 and W173 to 10 in-lbs.

Figure 9 New Test Set Cable Installation, Part 1 (Option 423 with 029 or E29 Shown)



(Some parts removed for clarity.)

N5247\_116\_4-Pt\_029\_BTM

Figure 10 New Test Set Cables Installation, Part 2 (N5245-20144, N5245-20145)

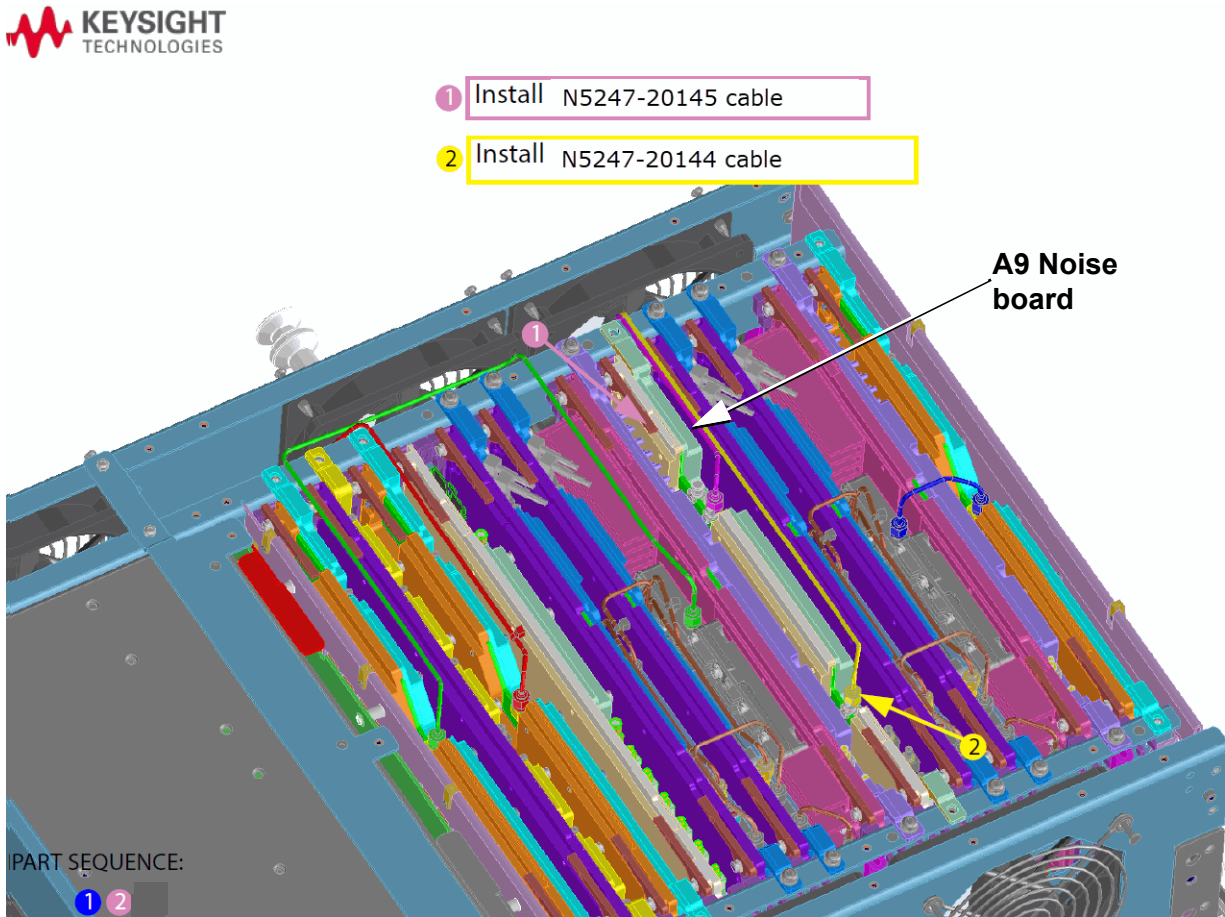


Figure 11



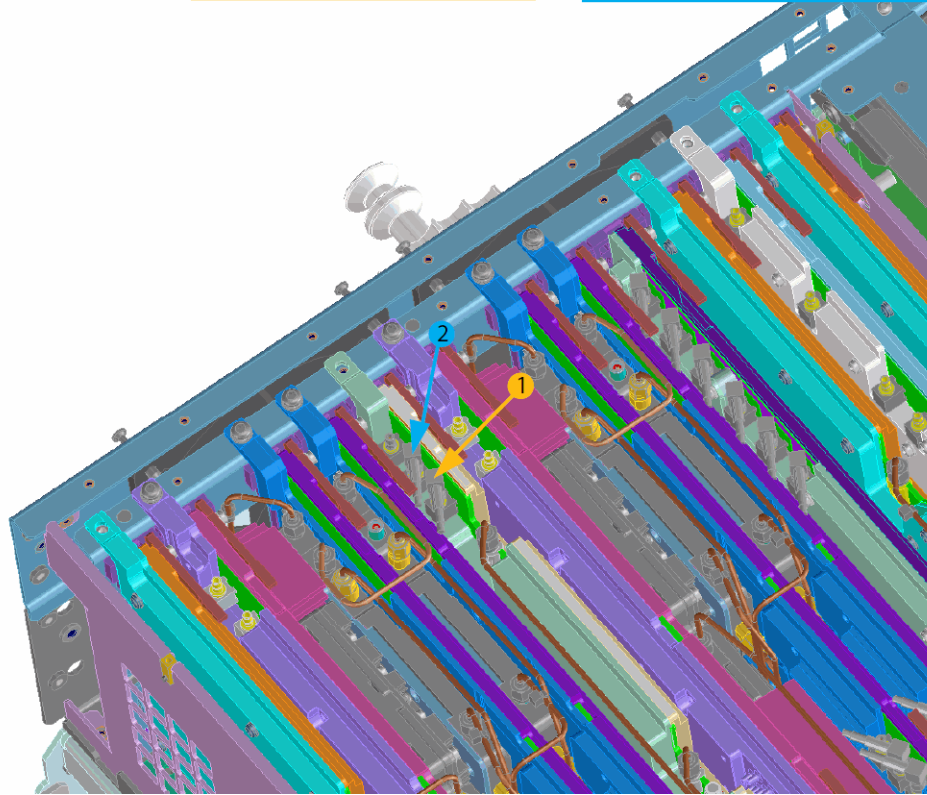
New Test Set Cables Installation, Part 3 (N5245-60019, N5245-60020)

1

Connect the other end of the  
down converter N5245-60020  
gray cable to the J1 "IF IN"

2

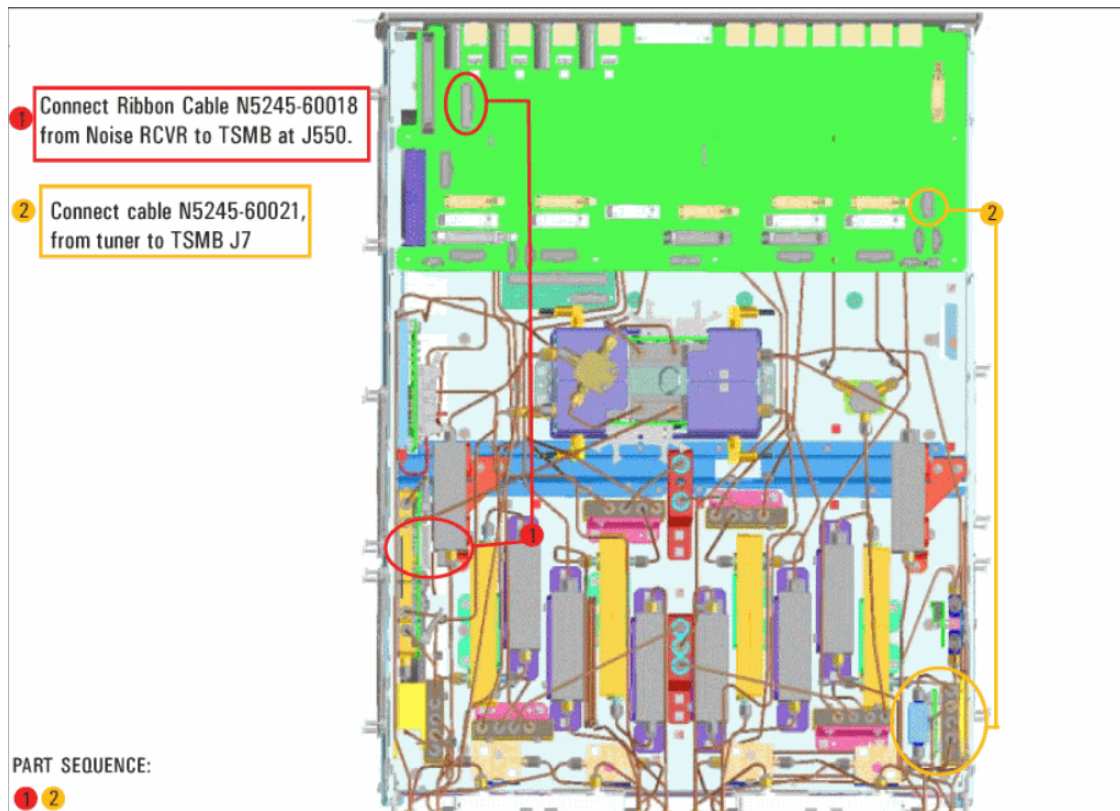
Connect the other end of the  
downconverter N5245-60019  
gray cable to the J5 "DET IN"



PART SEQUENCE:

1 2

Figure 12 New Test Set Cable Installation, Connect to A23 (TSMB), Part 4  
(N5245-60018, N5245-60021)



## Step 15. Replace the lower front panel overlay

Refer to **Figure 13** for this step of the procedure. New parts are listed in **Table 1 on page 11**.

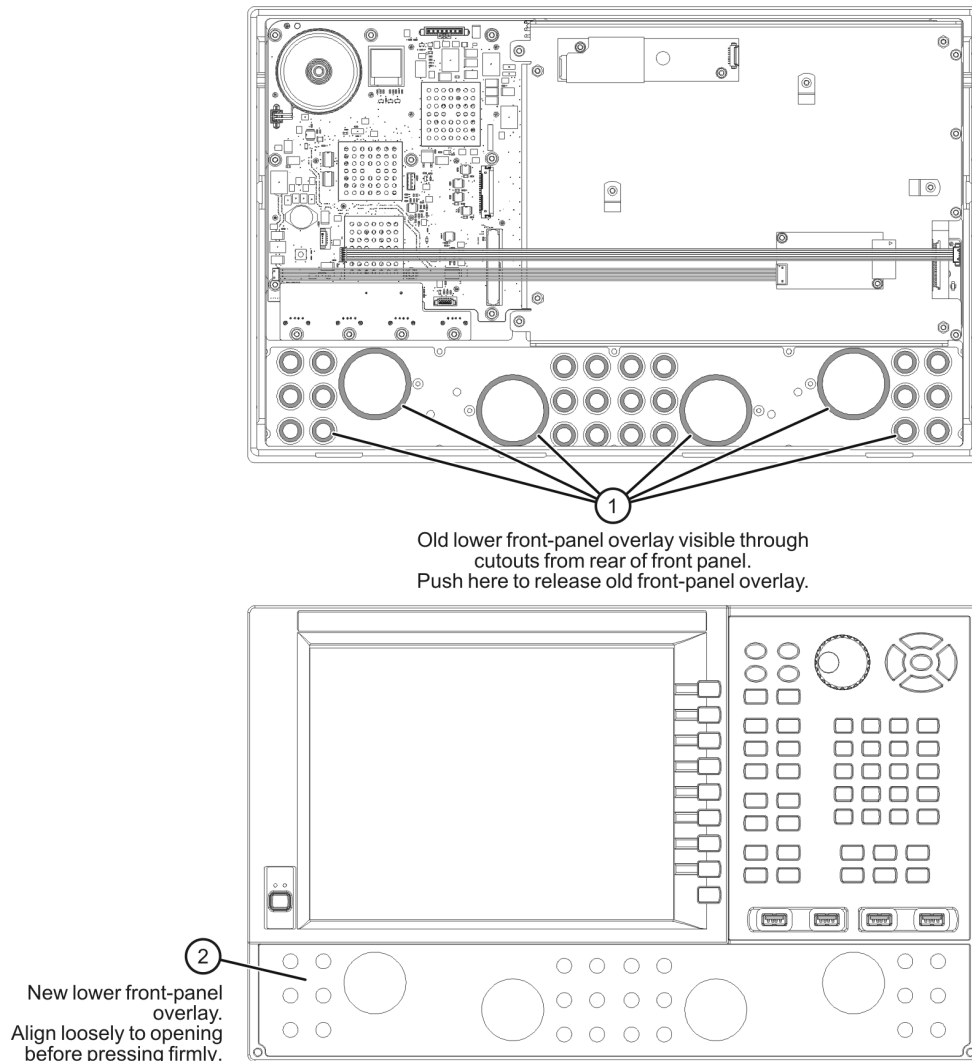
1. From the back side of the front panel, use a blunt object in the cutouts in the lower front dress panel to push on the old overlay (item ①) and separate it from the front dress panel.
2. From the front side of the front panel, pull off the overlay completely and discard it.
3. Remove any adhesive remaining on the front panel.

### NOTE

**IMPORTANT!** To avoid possible damage to the lower front panel overlay, do not attempt to attach the lower front panel label until **“Step 17. Install the New Lower Front Panel Overlay” on page 33**.

Figure 13

### Lower Front Panel Overlay Replacement



n5242\_010\_10



## Step 16. Reinstall the Front Panel Assembly

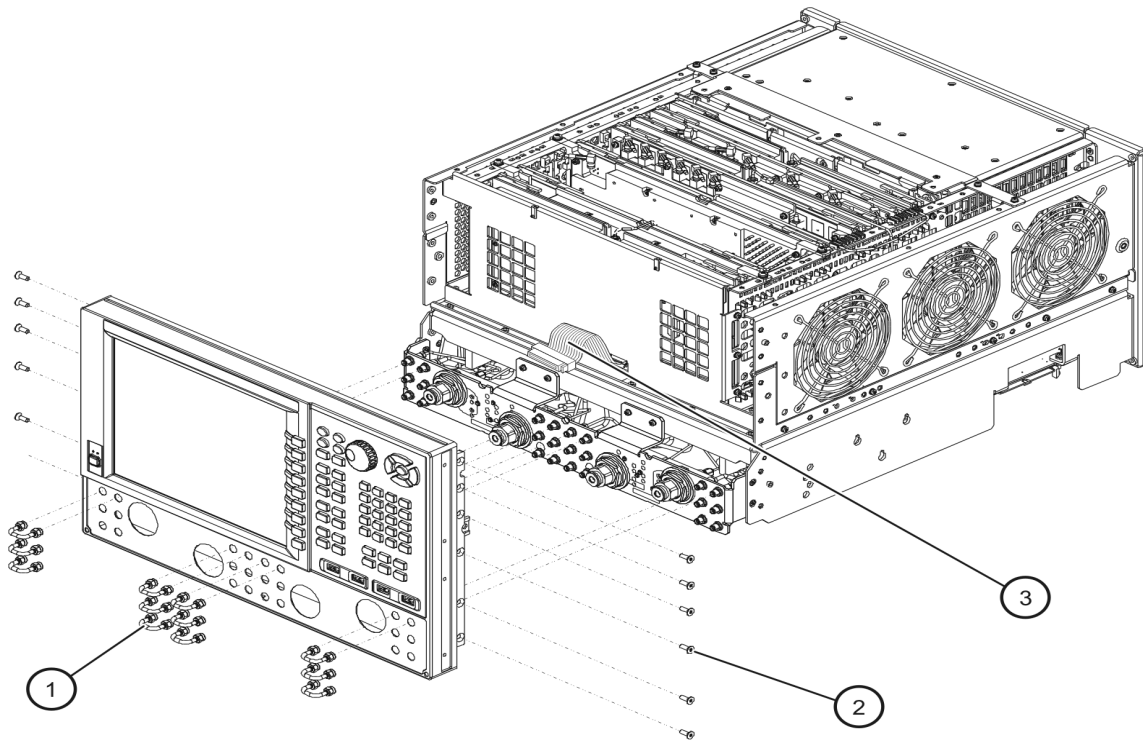
### CAUTION

Before installing the front panel assembly onto the analyzer, lift and support the front of the analyzer chassis.

Refer to **Figure 14** for this step of the procedure. New parts are listed in **Table 1** on page 11.

1. Reconnect the ribbon cable (item ③) to the A1 front panel interface board.
2. Slide the front panel over the front-panel connectors.
3. With a T-10 TORX driver, reinstall the 12 screws (item ②) in the sides of the frame.

Figure 14 Front Panel Assembly Re-installation



n5242\_010\_02



## Step 17. Install the New Lower Front Panel Overlay

Refer to **Figure 13 on page 31** for the lower overlay and to **Figure 14 on page 32** for the hex nuts installation for this step of the procedure. New parts are listed in **Table 1 on page 11**.

1. Remove the protective backing from the new front panel overlay, N5247-80013 (N5247A Option 423 with 029 or E29), N5247-80023 (N5247B Option 423 with 029 or E29), or N5247-80028 (N5247B Option 425 with 029 or E29) – (item ②).
2. Starting from either side, **loosely** place the overlay in the recess on the lower front panel, ensuring that it fits tightly against the edges of the recess.
3. Once the overlay is in place, press it firmly onto the frame to secure it.
4. Reinstall all of the semirigid jumpers (item ①) on the front-panel, and tighten each of the connectors using a 5/16-in torque wrench set to 10 in-lbs. Refer to **Figure 14 on page 32**.

## Step 18. Position the Cables and Wires to Prevent Pinching

On the top side of the PNA, carefully position the grey flex cables so they can't be pinched between the covers and the rails.

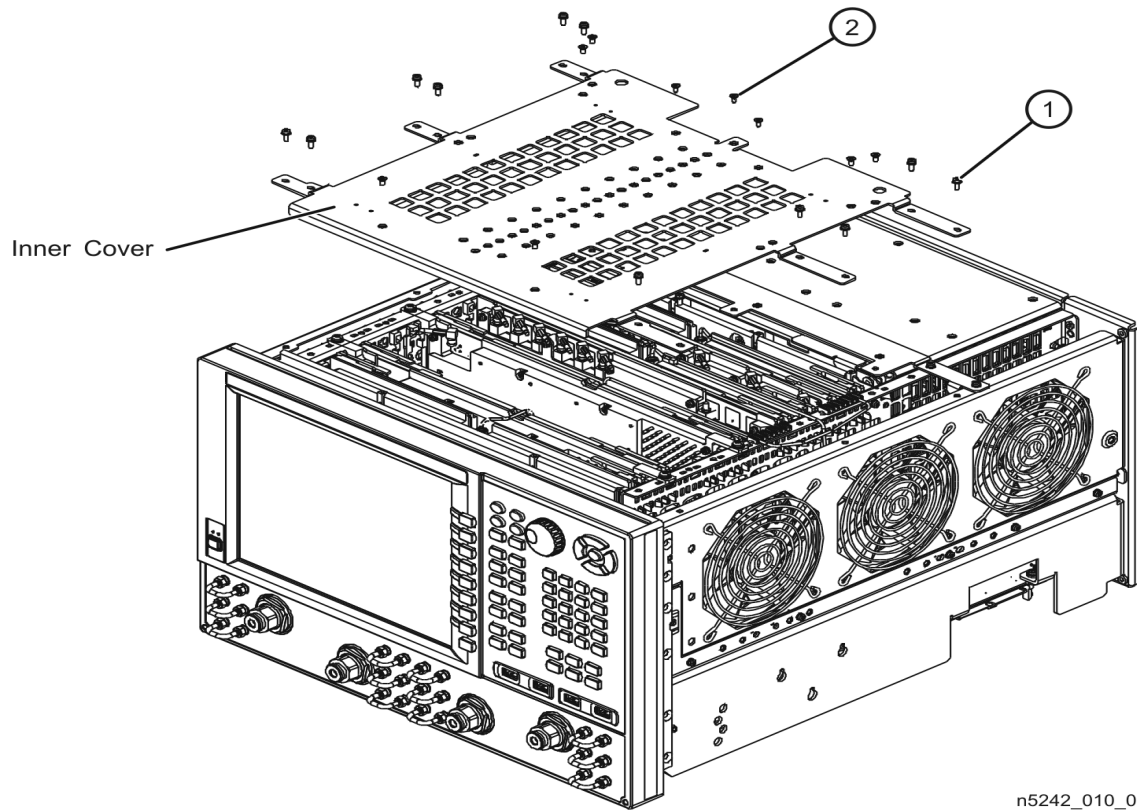
On the bottom side of the PNA, carefully fold or push down the ribbon cables and wires so they can't be pinched between the hardware and the outer cover. Ribbon cables and wires must never be positioned on top of hardware.

## Step 19. Reinstall the Inner Cover

Refer to **Figure 15** for this step of the procedure.

1. Position the inner cover on the analyzer.
2. With a T-10 TORX driver, install the 12 pan head screws (item ①).
3. With a T-10 TORX driver, install the 9 flat head screws (item ②).

Figure 15 Inner Cover Re-installation



n5242\_010\_0

## Step 20. Reinstall the Outer Cover

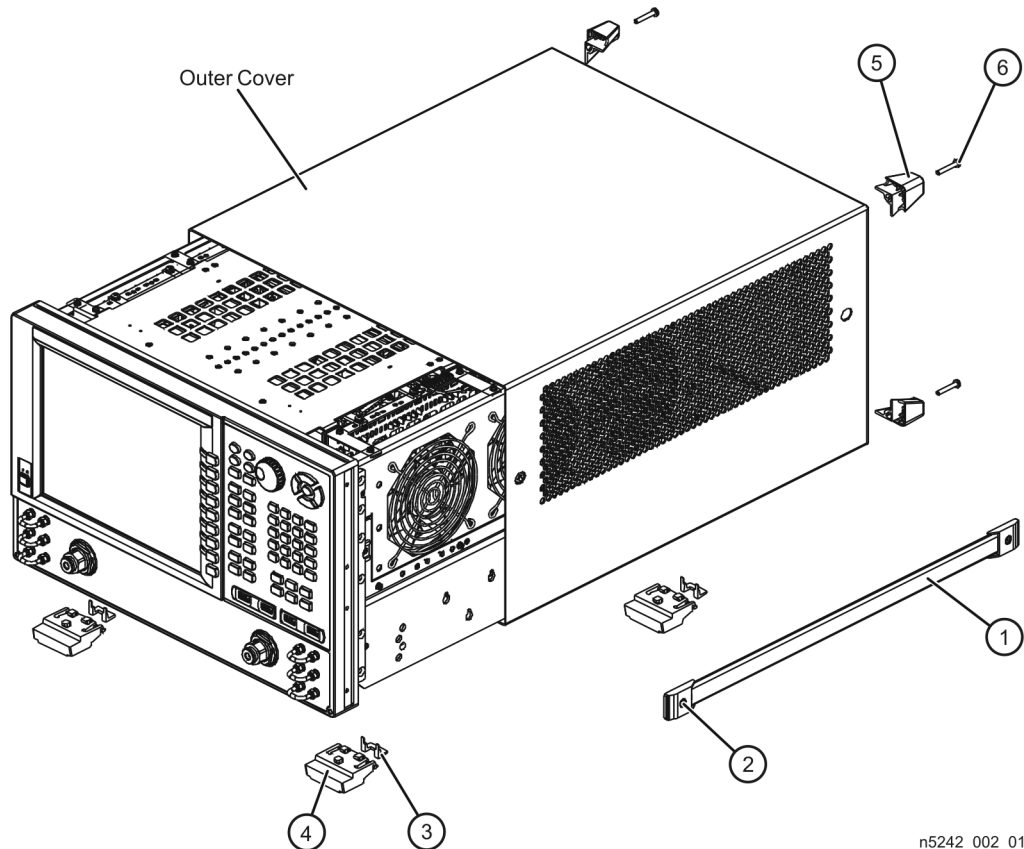
### CAUTION

This procedure is best performed with the analyzer resting on its front handles in the vertical position. Do not place the analyzer on its front panel without the handles. This will damage the front panel assemblies.

Refer to **Figure 16** for this step of the procedure.

1. Slide the outer cover over the analyzer frame.
2. Install the four rear panel feet (item ⑤) by installing the center screws (item ⑥) with a T-20 TORX driver.
3. Install the four bottom feet (item ④) onto the bottom of the outer cover then install the foot locks (item ③).
4. Install the strap handles (item ①) by tightening the screws (item ②) on both ends of each strap handle with a T-20 TORX driver.

Figure 16 Outer Cover Re-installation



n5242\_002\_01

## Step 21. Remove Option 028 License (“A” Model Instruments Only)

### NOTE

If Option 028 is not loaded on your PNA, proceed to “**Step 22. Enable Option 029 or E29**” on page 37.

---

### Procedure Requirements

- The analyzer must be powered up and operating to perform this procedure.
- The Network Analyzer program must **not** be running.
- A keyboard and mouse must be connected to the network analyzer.

### Option 028 License Removal Procedure

1. To start the option enable utility, press UTILITY **System**, then **Service**, then **Option Enable**. An option enable dialog box will appear.
2. Click the arrow in the **Select Desired Option** box. A list of available options will appear.
3. Click the on the desired option **028** and click red **Remove button**.
4. A message displays stating that the option removal was successful.
5. Exit the Option Enable window.
6. Restart the PNA Analyzer application: Press **File > Exit**.
7. In the Exit NA Application dialog box that opens, press **OK**.

## Step 22. Enable Option 029 or E29

### Procedure Requirements

#### NOTE

For this step, you will need a USB flash drive.

A single license file may contain more than one feature.

---

- The analyzer must be powered up and operating to perform this procedure.
- The Network Analyzer program must **not** be running.
- Refer to the license message you received from Keysight: Verify that the analyzer's model and serial numbers match those on the license message you received from Keysight.
- A keyboard must be connected to the network analyzer.

For "A" models, refer to:

- ["Option Enable Procedure for "A" Model Instruments" on page 38.](#)
- [""A" Model Option Verification Procedure" on page 38.](#)

For "B" models refer to:

- ["Option Enable Procedure for "B" Model Instruments" on page 38.](#)
- [""B" Model Option Verification Procedure" on page 39.](#)

### Option Enable Procedure for “A” Model Instruments

1. To start the option enable utility, press UTILITY **System**, then **Service**, then **Option Enable**. An option enable dialog box will appear.
2. Click the arrow in the **Select Desired Option** box. A list of available options will appear.
3. In the **Select Desired Option** list, click **029 - Noise Figure Measurements**.
4. Using the keyboard, enter the license key in the box provided. The license key is printed on the license message you received from Keysight. Enter this key *exactly* as it is printed on the message.
5. Click **Enable**.
6. Click Yes in answer to the displayed question in the Restart Analyzer? box.
7. When the installation is complete, click **Exit**.

### “A” Model Option Verification Procedure

Once the analyzer has restarted and the Network Analyzer program is again running:

1. On the analyzer’s **Help** menu, click **About Network Analyzer**.
2. Verify that “029” is listed after “Options:” in the display. Click **OK**.

### Option Enable Procedure for “B” Model Instruments

#### NOTE

For this step, you will need a USB flash drive.

A single license file may contain more than one feature.

1. Locate the email(s) from Keysight which contain license file attachments. These emails are a result of Step 3 on “**License Key Redemption**” on **page 7**.
2. Copy the license file(s) from the email(s) to the root directory of the USB flash drive.  
More than one license file may be copied to the USB flash drive.

#### NOTE

A license file may contain more than one feature.

3. Insert the USB flash drive to the PNA’s USB drive slot. Within 5 seconds, the PNA should display a small “New licenses installed” message.

Else, load the license key file(s), manually move your license file(s) to C:\Program Files\Agilent\licensing. It may take Keysight License Manager an extra ~5 seconds to enable the licenses.

**NOTE**

Attempting to re-install a license file that is already installed may generate a “Corrupt Media” error message. Ignore this message.

---

4. Disconnect the USB flash drive from the PNA.
5. On the analyzer, click or press to open the KLM software from your PNA's Windows taskbar by pressing **Start > More Programs > Keysight License Manager folder > Keysight License Manager** and verify the options are correct.

### “B” Model Option Verification Procedure

**NOTE**

If the option has not been enabled, contact Keysight Technologies. Refer to [“Getting Assistance from Keysight” on page 5](#).

---

Once the Network Analyzer program is again running:

1. Start the Network Analyzer program.
2. Once the Network Analyzer program is running:
  - Press **Help > About NA** and verify that Option 029 or E29 is listed in the PNA application.
3. After successful installation of all upgrades, some features require some adjustments to ensure the instrument meets its specified performance. Refer to the Adjustments (i.e., Diagnostic Tools, Utilities, and Adjustments) topic in the PNA Online Help:  
<https://rfmw.em.keysight.com/wireless/helpfiles/N52xxB/help.htm>.

## Step 23. Verify the PNA Analyzer Program is Running with the Correct Options

Once the Network Analyzer program is again running:

1. Start the Network Analyzer program.
2. Once the Network Analyzer program is running:
  - Press **Help** > **About NA** and verify that Option 029 or E29 is listed in the PNA application.
3. After successful installation of all upgrades, some features require some adjustments to ensure the instrument meets its specified performance. Refer to the Adjustments (i.e., Diagnostic Tools, Utilities, and Adjustments) topic in the PNA Online Help:  
<https://rfmw.em.keysight.com/wireless/helpfiles/N52xxB/help.htm>.

### NOTE

If if the option(s) have not been enabled or if your older options have not been removed, contact Keysight Technologies. Refer to “[Getting Assistance from Keysight](#)” on page 5.

## Step 24. Perform Post-Upgrade Adjustments and Calibration

### Adjustments

The following adjustments must be made due to the hardware changes of the analyzer.

- Default EE adjustment - select the LO Drive-NF adjustment and either adjust or initialize the values.
- Source Adjustment
- IF Gain Adjustment
- Receiver Characterization
- Receiver Adjustment
- IF Response Adjustment (N5247A with Option 090, 093, 094, or N5247B with Option S93090xA/B, S93093A/B, or S93094A/B Only)
- Noise Figure Adjustment (Option N5247A 029 or N5247B 029 or E29 with S93029A/B Only)

These adjustments are described in the PNA Service Guide and in the PNA on-line HELP. A list of equipment required to perform these adjustments is also found in the service guide.

To view this service guide information, click the Chapter 3 bookmark “Tests and Adjustments” in the PDF Service Guide<sup>1</sup>.

1. See “[Downloading the Online PNA Service Guide](#)” on page 8.



After the specified adjustments have been performed, the analyzer should operate and phase lock over its entire frequency range.

## Operator's Check

Perform the Operator's Check to check the basic functionality of the analyzer. For instructions, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide<sup>1</sup>.

If you experience difficulty with the basic functioning of the analyzer, contact Keysight. Refer to **"Contacting Keysight" on page 5**.

## Calibration

Although the analyzer functions, its performance relative to its specifications has not been verified. It is recommended that a full instrument calibration be performed using the analyzer's internal performance test software. To view information on the performance test software, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide<sup>1</sup>.

## EEPROM Backup

The analyzer uses arrays of correction constants to enable the analyzer to produce accurate, leveled source signals and receive clean test signals. These constants are stored in non-volatile EEPROM memory and in flash memory files.

The adjustments listed here generate new correction constants. The analyzer must have a backup of this new data in case any of the data becomes corrupted.

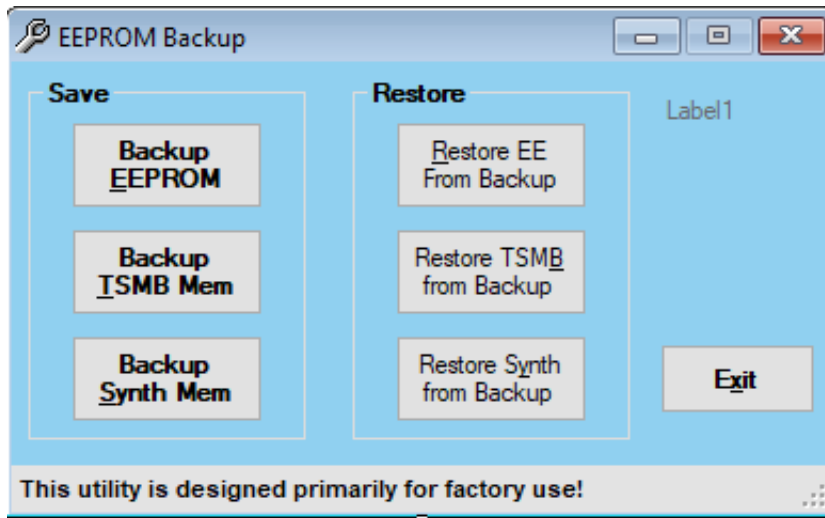
To store the backup data, perform these steps:

- Navigate to the EEPROM Backup Utility, located at:
  - Windows 7 -- C:\Program Files (x86)\Keysight\Network Analyzer\Service\eebackup.exe
  - Windows 10 -- C:\Program Files\Keysight\Network Analyzer\Service\eebackup.exe
- Run the program.
- Click Backup EEPROM.
- Click Backup TSMB Mem.
- Click Backup Synth Mem. (Applies to Version 7 Synthesizers Only)
- Click Exit when the program has finished.

---

1. See **"Downloading the Online PNA Service Guide" on page 8**.

Figure 17      EEPROM Backup Menu



Step 25. Prepare the PNA for the User

1. If necessary, reinstall front jumper cables.
2. Install the cable guards, pushing them over the front jumper cables until the cushioning material touches the front panel of the PNA.
3. Install the dust caps on the test ports.
4. Clean the analyzer, as needed, using a damp cloth.





This information is subject to change  
without notice.

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Edition 1, August 2023

N5247-90116



N5247-90116

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