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# **Keysight Combiner and Mechanical Switches Upgrade Kit For Version 6, Single-Source Synthesizers**

To Upgrade PNA-X  
N5247A/B Option 419 to  
Option 423

Upgrade Kit Order Number:  
N5247AU-927 and  
N5247BU-423

Keysight Kit Number:  
N5247-60104

This is Installation Note is for upgrading the N5247A/B Microwave Network Analyzers from Option 419 to Option 423.

# Notices

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### CAUTION

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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

Some of the assembly drawings in this document may be different from your instrument, but the process is similar for both an “A” model and “B” model instruments.

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This upgrade converts your standard 4-port configurable test set analyzer (N5247A/B Option 419 to an N5247A/B Option 423):

- a mechanical switch to each source port channel
- a source combiner to the port 1 channel
- rear-panel test set inputs
- source outputs routed to the rear panel
- a new cable guard for Port 1 front panel jumpers
- a modified front panel
- many additional new cables

Refer to **“Overview of the Installation Procedure” on page 15.**

### CAUTION

This repair must be done at a service center or a self-maintainer service center! Refer to **“Getting Assistance from Keysight” on page 6.**

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## Getting Assistance from Keysight

Installing this upgrade kit requires special skills and experience. If you think you may not be qualified to do the work, or need advice, contact Keysight.

### 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 10.
- Enough time - refer to [“About Installing the Upgrade”](#) on page 11.
- Test equipment for the post-upgrade adjustments and full instrument calibration. 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 9.

## 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.

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

– For A models: Refer

<https://www.keysight.com/us/en/assets/9018-01616/installation-guides/9018-01616.pdf> (N5242-90006).

– 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 for the instrument that will receive the option.

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To enable the option product, you must request license key(s) (A models) or license key files(s) (B models) 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 go to

<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(s) for your A model or for your B models, a license key file(s) from the Keysight Software Manager: <http://www.keysight.com/find/softwaremanager>.

You will need to provide an email address, Keysight will promptly email your A model license key(s) or a for a B model, license key file(s) attachment message. Refer to **“License Key Redemption” on page 8**.

## 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 6**.

## 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
5/16-in (8 mm) nutsetter or open end torque wrench - set to 21 in-lbs (2.38 N.m)	1	N/A
3/16-in (5 mm) nutsetter or open end torque wrench - set to 6 in-lbs (0.68 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
1/4-in (6 mm) open end wrench	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 cable connectors. On these, use a 9 mm nutsetter or open end torque wrench set to 21 in-lb.

## About Installing the Upgrade

Products affected	N5247A/B Option 419
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	5 hours
Estimated adjustment time	0.5 hours
Estimated full instrument calibration time	4.5 hours

## 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 6**.

**Table 1**                      **Contents of Upgrade Kit N5247-60104**

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5247-90104
--	Software Entitlement Certificate	1	9300-0000
--	China RoHS Addendum	1	9320-6722
A50	Port 1 mechanical switch	4	N1811-60010
A51	Port 3 mechanical switch		
A52	Port 4 mechanical switch		
A53	Port 2 mechanical switch		
A54	Combiner	1	11667-60016
--	Bracket for combiner	1	N5247-00007
--	Bracket for mechanical switches	2	N5247-20130
--	Lower overlay for front panel - “A” Models - Opt. 423	1	N5247-80002
--	Lower overlay for front panel - “A” Models - Opt. 423 with 029	1	N5247-80013
--	Lower overlay for front panel - “B” Models - Opt. 423	1	N5247-80019
--	Lower overlay for front panel - “B” Models - Opt. 423 with 029	1	N5247-80023
--	Cable guard, port 1 jumper cables - “A” Models	1	N5247-00018
--	Cable guard, port 1 jumper cables - “B” Models	1	N5247-00024
--	Machine screw, M3.0 x 16, pan head (to attach mechanical switches to brackets)	10	0515-0375
--	Machine screw, M2 x 14, pan head (to attach combiner to bracket)	3	0515-0661
--	Machine screw, M3 x 8, pan head (8 to attach switch assemblies to deck)	10	0515-0372
--	Machine screw, M3 x 6, pan head (2 to attach combiner bracket to attenuator bracket)	3	0515-0430
--	Termination, 2.4 mm 50 GHz load	1	0955-2394
--	Cable clamp [2 to secure W142 (N5247-20089), W141 (N5247-20099), W138 (N5247-20098) and W137 (N5245-20097); 1 to secure W134 (N5247-20095); 1 to secure W145 (N5247-20066); 1 to secure W137 (N5247-20070)]	10	1400-1334
--	Machine screw, M3.0 x 6, flat head (2 to attach front panel)	3	0515-1946

## Items Included in the Upgrade Kit

**Table 1**                      **Contents of Upgrade Kit N5247-60104**

Ref Desig.	Description	Qty	Part Number
--	Cable tie [2 to secure W137 (N5247-20070) and W54 (N5247-20062)]	6	1400-0249
--	Rear panel 1.85 mm female bulkhead connectors	5	1250-4747 <sup>a</sup>
--	Front panel 1.85 mm female bulkhead connectors	4	
--	Nut for rear panel 1.85 mm female bulkhead connectors	5	1250-3516
--	Nut for front panel 1.85 mm male bulkhead connectors	4	
--	Washer for rear panel 1.85 mm female bulkhead connectors	5	1250-3310
--	Washers for front panel 1.85 mm female bulkhead connectors	4	
W60	RF cable, front panel jumper	2	N5247-20107
W125	RF cable, A50 port 1 mechanical switch to A60 port 1 70 GHz doubler	1	N5247-20030
W126	RF cable, A50 port 1 mechanical switch to A29 port 1 reference coupler	1	N5247-20031
W127	RF cable, A50 port 1 mechanical switch to PORT 1 SW SRC OUT	1	N5247-20091
W128	RF cable, Front-panel PORT 1 COMB THRU IN to A54 combiner	1	N5247-20092
W129	RF cable, Front-panel PORT 3 COMB ARM IN to A54 combiner	1	N5247-20093
W130	RF cable, A50 port 1 mechanical switch to A54 combiner	1	N5247-20094
W131	RF cable, A51 port 3 mechanical switch to A61 port 3 70 GHz doubler	1	N5247-20032
W132	RF cable, A51 port 3 mechanical switch to A30 port 3 reference coupler	1	N5247-20033
W133	RF cable, A51 port 3 mechanical switch to PORT 3 SW SRC OUT	1	N5247-20090
W134	RF cable, rear-panel PORT 3 SW TSET IN (J7) to A51 port 3 mechanical switch	1	N5247-20095
W135	RF cable, A52 port 4 mechanical switch to A62 port 4 70 GHz doubler	1	N5247-20030
W136	RF cable, A52 port 4 mechanical switch to A31 port 4 reference coupler	1	N5247-20031
W137	RF cable, A52 port 4 mechanical switch to PORT 4 SW SRC OUT (J4)	1	N5247-20097
W138	RF cable, A52 port 4 mechanical switch to PORT 4 SW TSET (J3)	1	N5247-20098
W139	RF cable, A53 port 2 mechanical switch to A63 port 2 70 GHz doubler	1	N5247-20032
W140	RF cable, A53 port 2 mechanical switch to A32 port 2 reference coupler	1	N5247-20033
W141	RF cable, A53 port 2 mechanical switch to PORT 2 SW SRC OUT (J2)	1	N5247-20099
W142	RF cable, A53 port 2 mechanical switch to PORT 2 TSET IN (J1)	1	N5247-20089
W143	RF cable, rear panel jumper	2	N5247-20107

a. This upgrade kit may contain either a bulkhead adapter part number 5065-4673 or 1250-4747.

## Items Included in the Upgrade Kit

### 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.

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## 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 Cable Guard for the Port 1 Front Panel Jumper Cables."
- "Step 5. Remove the Front Panel Assembly."
- "Step 6. Remove the Braces on the Bottom Side of the PNA."
- "Step 7. Remove the A23 Test Set Motherboard."
- "Step 8. Remove the A24 IF Multiplexer Board."
- "Step 9. Remove Some Bottom-Side (Test Set) Cables."
- "Step 10. Assemble the A50, A51, A52, and A53 Mechanical Switch Assemblies."
- "Step 11. Install the Mechanical Switch Assemblies."
- "Step 12. Assemble and Install the A54 Combiner Assembly."
- "Step 13. Install the New Bulkhead Connectors in the Test Set Front Plate."
- "Step 14. Install Some Bottom-Side (Test Set) Cables."
- "Step 15. Install Rear Panel Hardware."
- "Step 16. Reinstall the A24 IF Multiplexer Board."
- "Step 17. Reinstall the A23 Test Set Motherboard."
- "Step 18. Reinstall the Braces on the Bottom Side of the PNA."
- "Step 19. Remove the Old Lower Front Panel Overlay."
- "Step 20. Reinstall Front Panel Assembly."
- "Step 21. Install the New Lower Front Panel Overlay."
- "Step 22. Install New Front Panel Jumper Cables."
- "Step 23. Install Rear Panel Jumpers and Load."

“Step 24. Position the Cables and Wires to Prevent Pinching.”

“Step 25. Reinstall the Inner Cover.”

“Step 26. Reinstall the Outer Cover.”

“Step 27. Remove Option 419 License (B Models Only).”

“Step 28. Enable Options 423.”

“Step 29. Perform Post-Upgrade Adjustments and Calibration.”

“Step 30. 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 8**.

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.

Once the license key (A models) or license key file (B models) has been received and the information verified, you can proceed with the installation at **“Step 2. Remove the Outer Cover” on page 16**.

### 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 6**.

## Step 2. Remove the Outer Cover

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<sup>1</sup>.

## Step 4. Remove the Cable Guard for the Port 1 Front Panel Jumper Cables

Gently pull the cable guard off of the Port 1 front panel jumper cables, and discard it. A new cable guard will be reinstalled later in the procedure.

## Step 5. 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 6. Remove the Braces on the Bottom Side of the PNA

Remove the braces from the bottom side of the PNA. Keep all parts for re-installation later.

## Step 7. Remove 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>.

## Step 8. Remove the A24 IF Multiplexer Board

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A24 IF Multiplexer Board” in the PDF Service Guide<sup>1</sup>.

## Step 9. Remove Some Bottom-Side (Test Set) Cables

### CAUTION

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

### NOTE

When removing a cable, also remove the plastic cable clamp, if present. It is normal for some of the cable clamp’s adhesive to remain.

1. Place the analyzer bottom-side up on a flat surface.
2. Remove the following cables. To see an image showing the location of these cables, click the Chapter 6 bookmark “Bottom RF Cables, Standard 4-Port Configuration, Option 419 (S/N Prefixes <6021)” or “Bottom RF Cables, Standard 4-Port Configuration, Option 419 (S/N Prefixes ≥6021)”<sup>1</sup>.

These four cables may be discarded – they will not be reinstalled.

- W27 (N5247-20044) A60 port 1 70 GHz doubler to A29 port 1 reference coupler
- W28 (N5247-20043) A61 port 3 70 GHz doubler to A30 port 3 reference coupler
- W29 (N5247-20044) A62 port 4 70 GHz doubler to A31 port 4 reference coupler
- W30 (N5247-20043) A63 port 2 70 GHz doubler to A32 port 2 reference

1. See “[Downloading the Online PNA Service Guide](#)” on page 9.

coupler

These cables must be saved – they will be reinstalled.

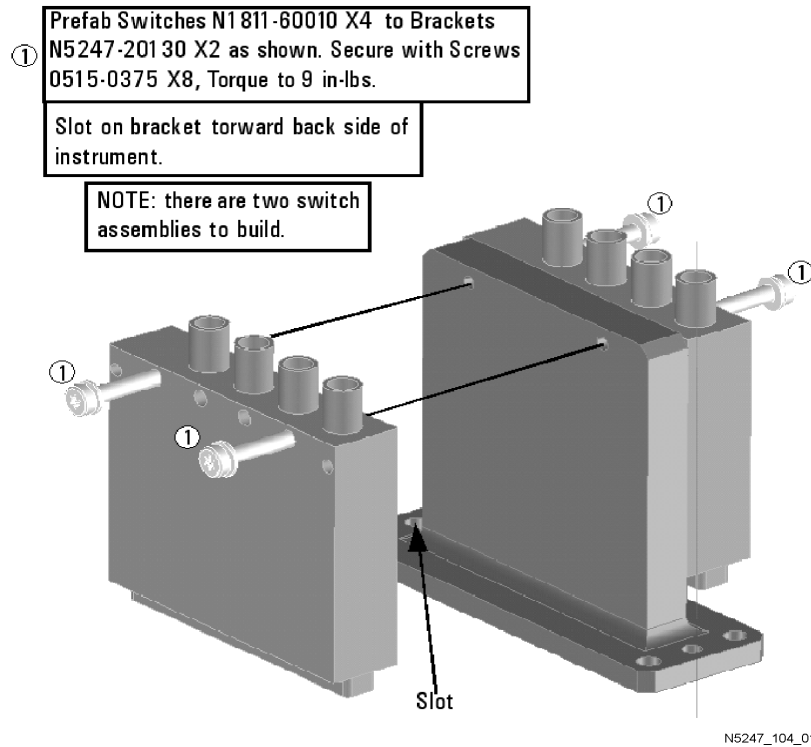
- W12 (N5247-20059) A60 port 1 70 GHz doubler to W11
- W14 (N5247-20072) A60 port 1 70 GHz doubler to W13
- W16 (N5247-20060) A61 port 3 70 GHz doubler to W15
- W18 (N5247-20084) A61 port 3 70 GHz doubler to W17
- W20 (N5247-20015) A62 port 4 70 GHz doubler to W19
- W24 (N5247-20061) A63 port 2 70 GHz doubler to W23
- W26 (N5247-20051) A63 port 2 70 GHz doubler to W25
- W37 (N5247-20070) A30 port 3 ref coupler to front-panel REF 3 SOURCE OUT
- W53 (N5247-20048) A37 reference mixer switch to A27 mixer brick (R1)
- W54 (N5247-20062) REF 3 RCVR R3 IN to A28 mixer brick (R3)
- W62 (N5247-20111) A25 HMA26.5 to A26 splitter
- W118 (N5247-20047) A46 port 1 receiver attenuator to A27 mixer brick (A)
- W120 (N5247-20064) A47 port 3 receiver attenuator to A28 mixer brick (C)
- W124 (N5247-20046) A49 port 2 receiver attenuator to A27 mixer brick (B)
- W145 (N5247-20066) REF 2 RCVR R2 IN to A27 mixer brick (R2)

3. **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.**

## Step 10. Assemble the A50, A51, A52, and A53 Mechanical Switch Assemblies

Refer to **Figure 1** for this step of the procedure. New parts are listed in **Table 1** on page 12.

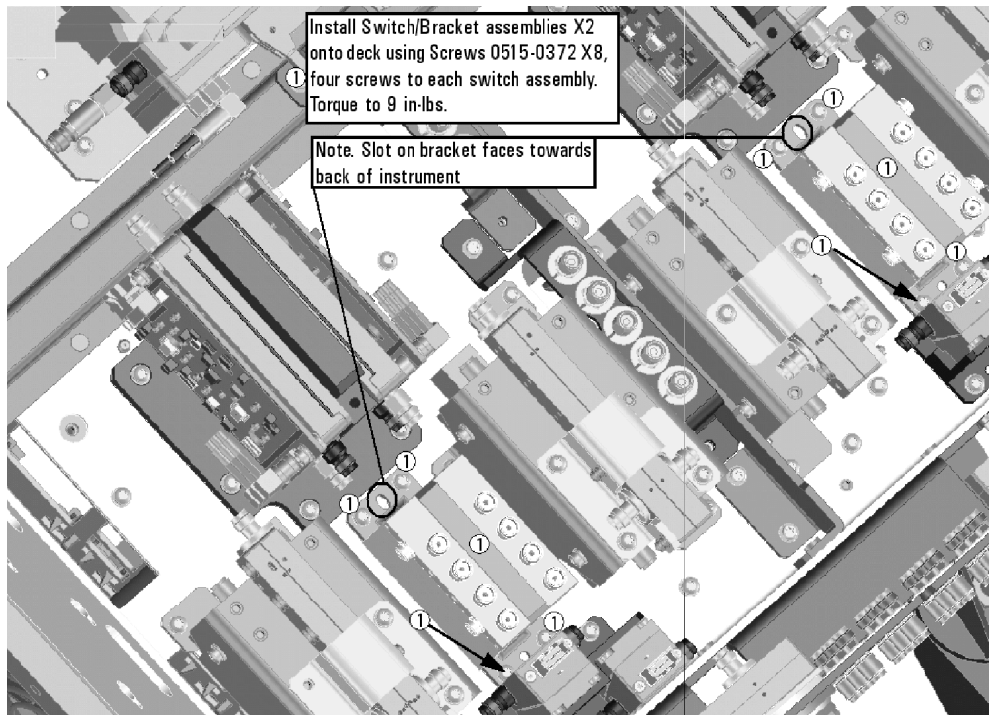
**Figure 1** Mechanical Switch Assembly (0515-0375, N1811-80010, N5247-20130)



## Step 11. Install the Mechanical Switch Assemblies

Refer to **Figure 2** for this step of the procedure. New parts are listed in **Table 1** on page 12.

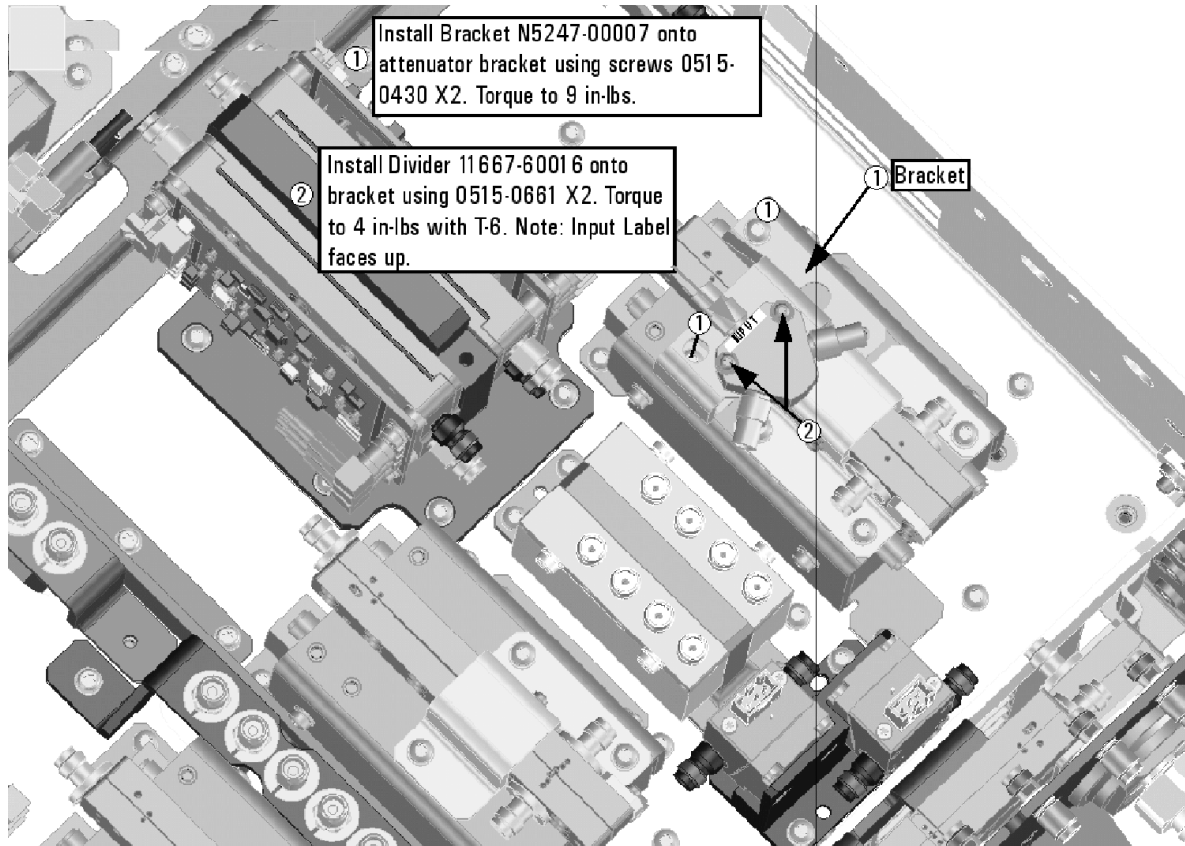
**Figure 2** Mechanical Switch Installation (0315-0372)



## Step 12. Assemble and Install the A54 Combiner Assembly

Refer to **Figure 3** for this step of the procedure. New parts are listed in **Table 1** on page 12.

**Figure 3** A54 Combiner Assembly and Installation (0515-0430, 0515-0661, 11667-60016, N5247-00007)

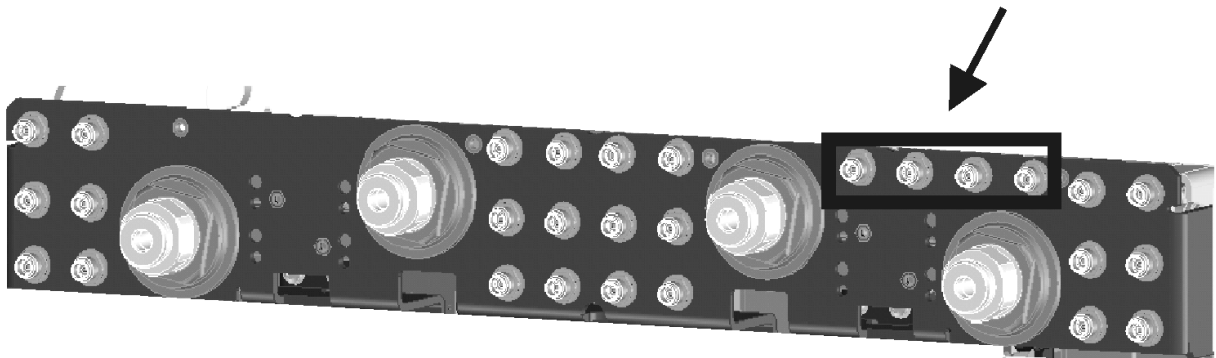


### Step 13. Install the New Bulkhead Connectors in the Test Set Front Plate

Refer to **Figure 3-1** for this step of the procedure. New parts are listed in **Table 1 on page 12**.

Install four bulkhead connectors (1250-4747), washers (1250-3310), and nuts (1250-3616). Hand tighten at first, then, after all have been installed, torque to 21 in-lbs.

Figure 3-1 Front Panel Bulkhead Connectors Installation



N5247\_104\_09

### Step 14. Install Some Bottom-Side (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 semi-rigid cables. Some flexing of the cables may be necessary but do not over-bend them.

#### Install the Semi-rigid Cables

To see an image showing the location of these cables, click the Chapter 6 bookmarks “Bottom RF Cables, 4-Port Configuration, Option 423” in the PDF Service Guide<sup>1</sup>. New parts are listed in **Table 1 on page 12**.

Install the following new cables in the order listed.

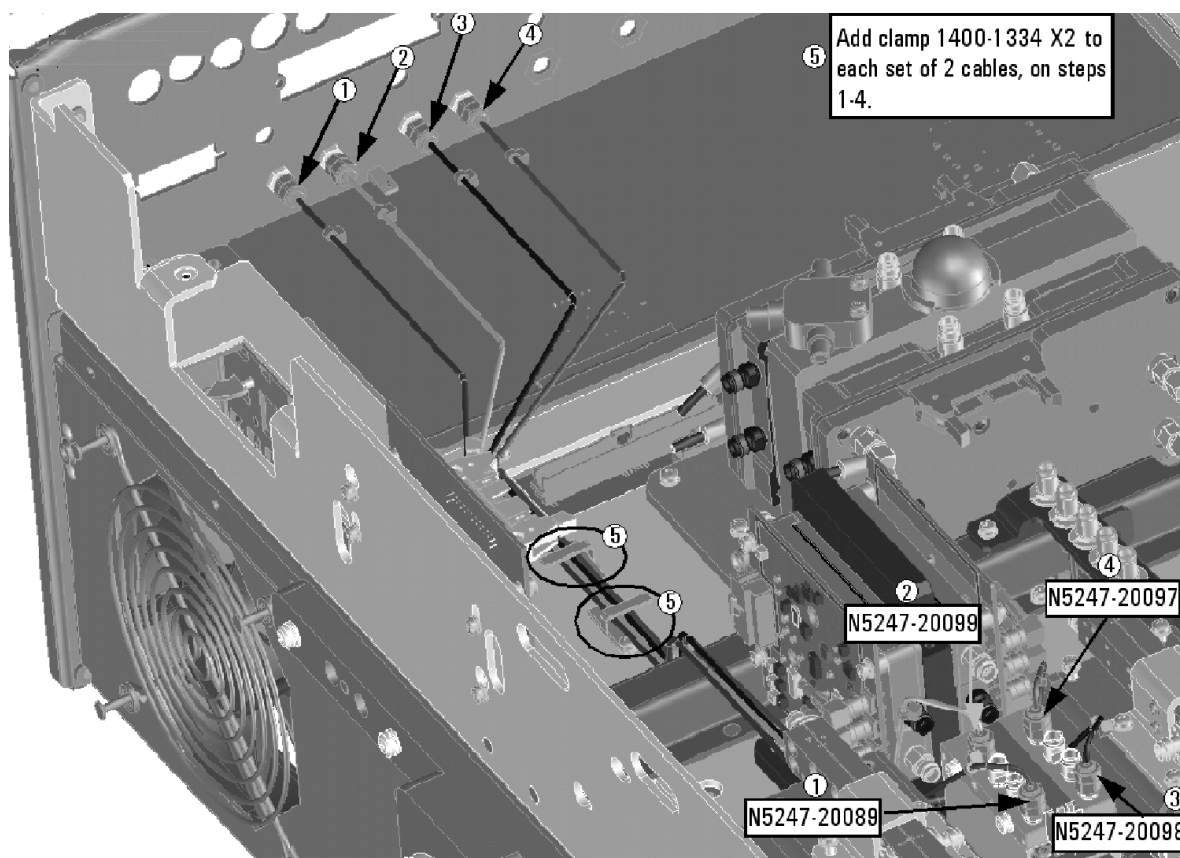
- W142 (N5247-20089) A53 port 2 mechanical switch to PORT 2 TSET IN (J1)

1. See “[Downloading the Online PNA Service Guide](#)” on page 9.

- W141 (N5247-20099)A53 port 2 mechanical switch to PORT 2 SW SRC OUT (J2)
- W138 (N5247-20098)A52 port 4 mechanical switch to PORT 4 SW TSET (J3)
- W137 (N5247-20097)A52 port 4 mechanical switch to PORT 4 SW SRC OUT (J4)

\* As shown in **Figure 4**, install two cable clamps (part number 1400-1334) to secure W142 (N5247-20089), W141 (N5247-20099), W138 (N5247-20098) and W137 (N5245-20097).

**Figure 4** Location of Cable Clamps to Secure W142 (N5247-20089), W141 (N5247-20099), W138 (N5247-20098) and W137 (N5245-20097)

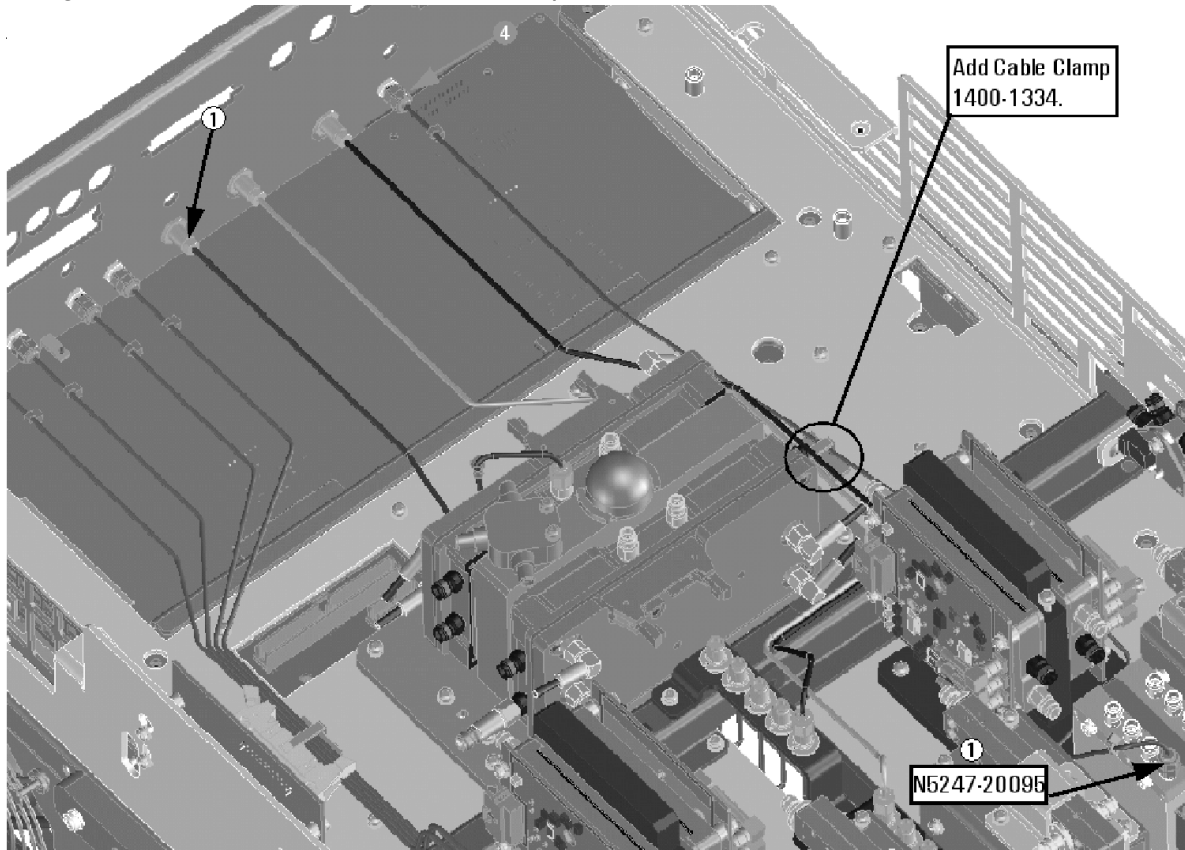


N5247\_104\_04

- W134 (N5247-20095) Rear-panel PORT 3 SW TSET IN (J7) to A51 port 3 mechanical switch

\* As shown in **Figure 5**, install a cable clamp (part number 1400-1334) to secure W134 (N5247-20095).

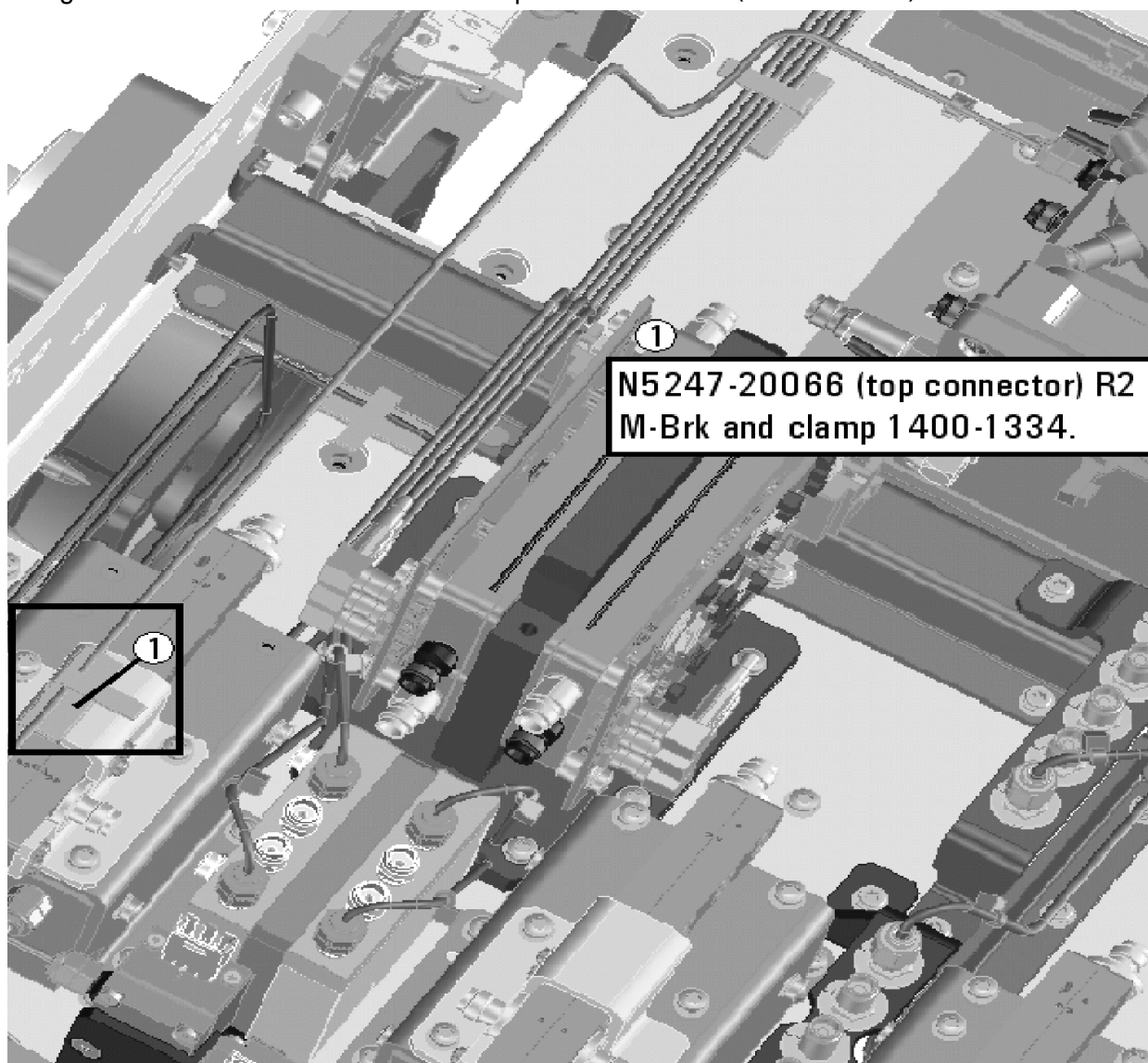
Figure 5 Location of Cable Clamp to Secure W134 (N5247-20095)



N5247\_104\_05

- W145 (reuse) (N5247-20066) REF 2 RCVR R2 IN to A27 mixer brick (R2)  
\* As shown in **Figure 6**, install a cable clamp (part number 1400-1334) to secure W145 (N5247-20066).

Figure 6 Location of Cable Clamp to Secure W145 (N5247-20066)

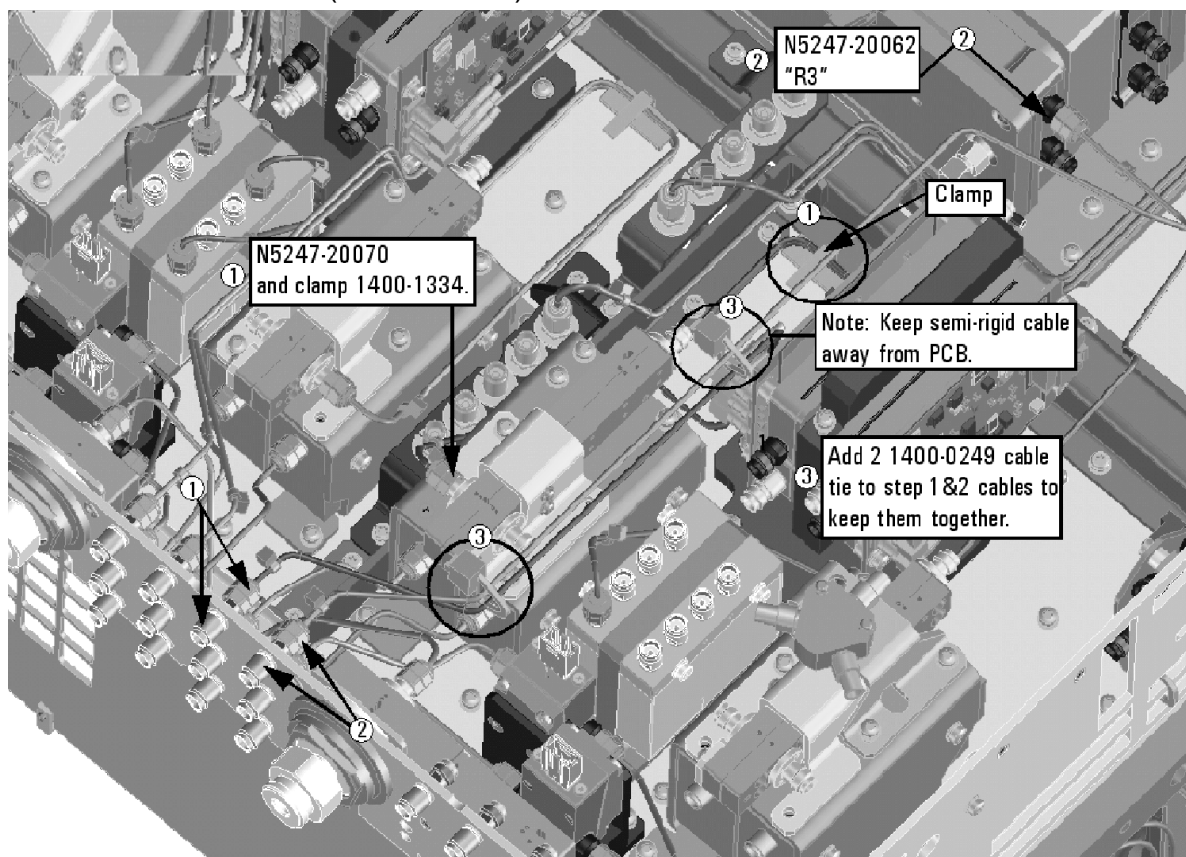


N5247\_104\_07

- W37 (reuse) (N5247-20070) A30 port 3 ref coupler to front-panel REF 3 SOURCE OUT
- W54 (reuse) (N5247-20062) REF 3 RCVR R3 IN to A28 mixer brick (R3)

\* As shown in **Figure 7**, install a cable clamp (part number 1400-1334) to secure W137 (N5247-20070) and two cable ties (1400-0249) to secure W137 (N5247-20070) and W54 (N5247-20062).

**Figure 7** Location of Cable Clamp and Cable Ties to Secure W137 (N5247-20070) and W54 (N5247-20062)



N5247\_104\_08

- W53 (reuse) (N5247-20048) A37 reference mixer switch to A27 mixer brick (R1)
- W120 (reuse) (N5247-20064) A47 port 3 receiver attenuator to A28 mixer brick (C)
- W118 (reuse) (N5247-20047) A46 port 1 receiver attenuator to A27 mixer brick (A)
- W132 (N5247-20033) A51 port 3 mechanical switch to A30 port 3 reference coupler
- W140 (N5247-20033) A53 port 2 mechanical switch to A32 port 2 reference coupler
- W126 (N5247-20031) A50 port 1 mechanical switch to A29 port 1 reference coupler
- W136 (N5245-20031) A52 port 4 mechanical switch to A31 port 4 reference coupler
- W26 (reuse) (N5247-20051) A63 port 2 70 GHz doubler to W25
- W24 (reuse) (N5247-20061) A63 port 2 70 GHz doubler to W23

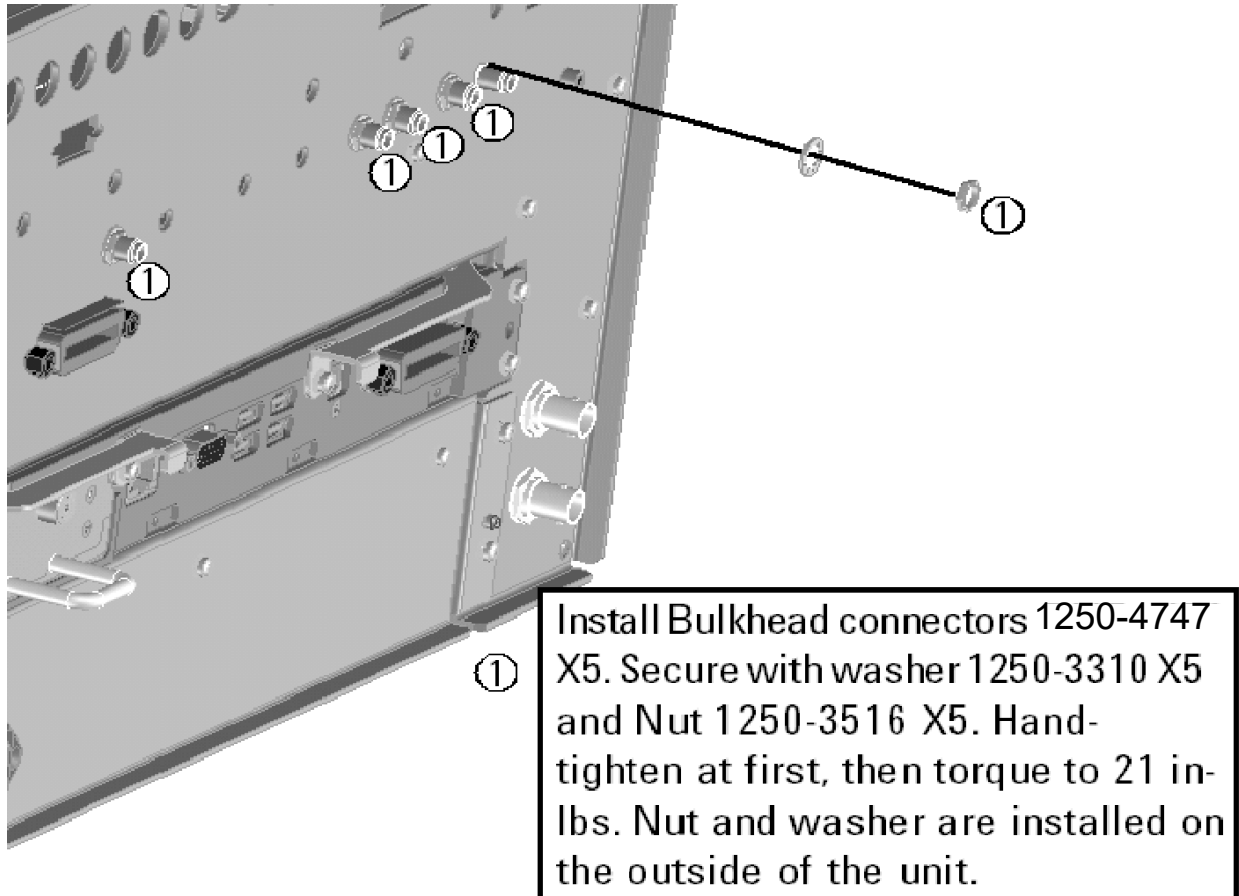
## Installation Procedure for the Upgrade

- W124 (reuse) (N5247-20046) A49 port 2 receiver attenuator to A27 mixer brick (B)
- W18 (reuse) (N5247-20084) A61 port 3 70 GHz doubler to W17
- W14 (reuse) (N5247-20072) A60 port 1 70 GHz doubler to W13
- W16 (reuse) (N5247-20060) A61 port 3 70 GHz doubler to W15
- W125 (N5247-20030) A50 port 1 mechanical switch to A60 port 1 70 GHz doubler
- W135 (N5247-20030) A52 port 4 mechanical switch to A62 port 4 70 GHz doubler
- W12 (reuse) (N5247-20059) A60 port 1 70 GHz doubler to W11
- W131 (N5247-20032) A51 port 3 mechanical switch to A61 port 3 70 GHz doubler
- W139 (N5247-20032) A53 port 2 mechanical switch to A63 port 2 70 GHz doubler
- W20 (reuse) (N5247-20015) A62 port 4 70 GHz doubler to W19
- W133 (N5247-20090) A51 port 3 mechanical switch to PORT 3 SW SRC OUT
- W130 (N5247-20094) A50 port 1 mechanical switch to A54 combiner
- W127 (N5245-20091) A50 port 1 mechanical switch to PORT 1 SW SRC OUT
- W129 (N5247-20093) Front-panel PORT 3 COMB ARM IN to A54 combiner
- W128 (N5247-20092) Front-panel PORT 1 COMB THRU IN to A54 combiner
- W62 (reuse)(N5247-20111) A25 HMA26.5 to A26 splitter

## Step 15. Install Rear Panel Hardware

Follow the instructions shown in **Figure 8**. New parts are listed in **Table 1** on **page 12**.

**Figure 8** Rear Panel Hardware (1250-3310, 1250-3516, 1250-4747)



N5247 104 10

## Step 16. Reinstall the A24 IF Multiplexer Board

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A24 IF Multiplexer Board” in the PDF Service Guide<sup>1</sup>.

## Step 17. Reinstall the A23 Test Set Motherboard

1. For instructions on reinstalling the board, click the Chapter 7 bookmark “Removing and Replacing the A23 test set motherboard” in the PDF Service Guide<sup>1</sup>.
2. If not already done in a previous step, install the following new wire harnesses in the order listed. To see an image showing their location, click the Chapter 6 bookmark “Bottom Ribbon Cables and Wire Harnesses, 4-Port, Option 423” in the PDF Service Guide<sup>1</sup>. New parts are listed in **Table 1 on page 12.**
  - Wire harness (part of mechanical switch assembly), A23 test set motherboard J101 to A50 port 1 mechanical switch
  - Wire harness (part of mechanical switch assembly), A23 test set motherboard J102 to A51 port 3 mechanical switch
  - Wire harness (part of mechanical switch assembly), A23 test set motherboard J103 to A52 port 4 mechanical switch
  - Wire harness (part of mechanical switch assembly), A23 test set motherboard J104 to A53 port 2 mechanical switch

## Step 18. Reinstall the Braces on the Bottom Side of the PNA

Reinstall the braces on the bottom side of the PNA, reusing all of the parts you saved earlier. To see an image showing the location of these braces, click the Chapter 6 bookmarks “Bottom RF Cables, 4-Port Configuration, Option 423” in the PDF Service Guide<sup>1</sup>.

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1. See “[Downloading the Online PNA Service Guide](#)” on page 9.

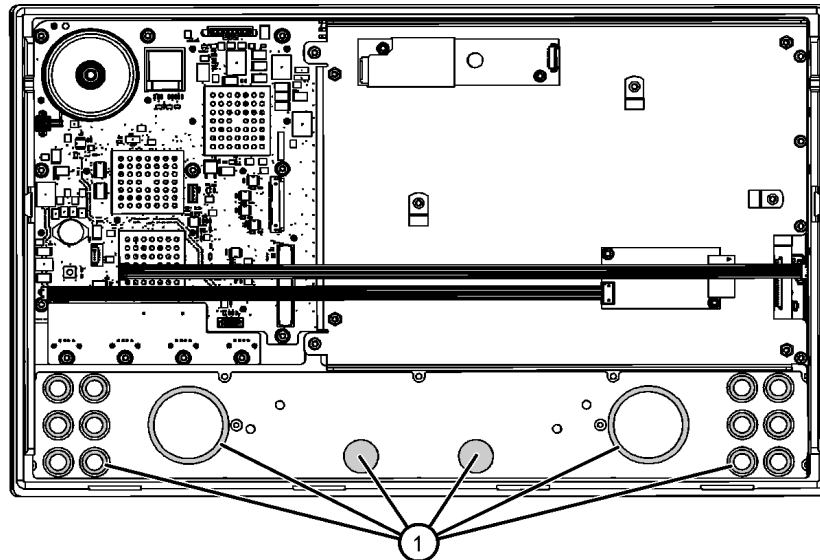
## Step 19. Remove the Old Lower Front Panel Overlay

Refer to **Figure 9** for this step of the procedure. Although a 4-port PNA is shown in the graphic, the concept is the same for the 2-port PNA. New parts are listed in **Table 1 on page 12**.

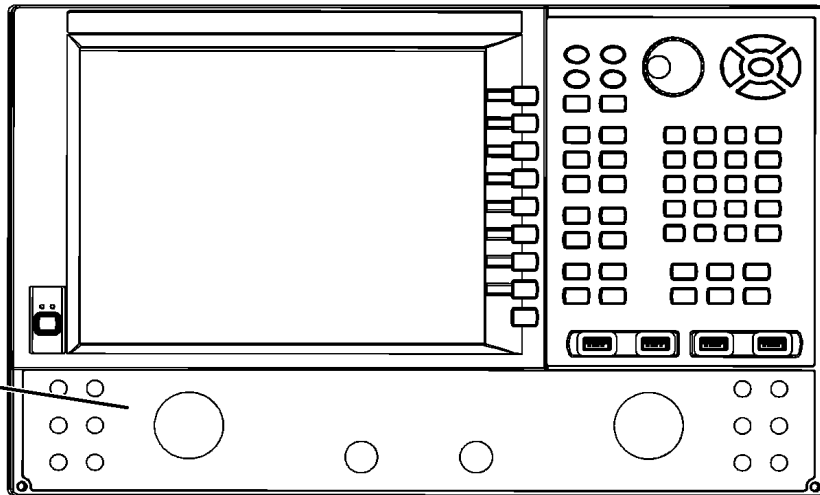
1. From the back side of the front panel, use a blunt object in the cutouts in the lower front dress panel to push on the old overlay (item ①) and separate it from the front dress panel.
2. From the front side of the front panel, pull off the overlay completely and discard it.
3. Remove any adhesive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

Figure 9

### Lower Front Panel Overlay Replacement



Old lower front-panel overlay visible through cutouts from rear of front panel.  
Push here to release old front-panel overlay.



New lower front-panel overlay.  
Align loosely to opening before pressing firmly.

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## Step 20. Reinstall Front Panel Assembly

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

## Step 21. Install the New Lower Front Panel Overlay

Refer to **Figure 9 on page 30** for this step of the procedure. Although a 4-port PNA is shown in the graphic, the concept is the same for the 2-port PNA. New parts are listed in **Table 1 on page 12**.

1. **Remove the protective backing from the new front panel overlay, N5222-80003 (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.**

## Step 22. Install New Front Panel Jumper Cables

Install twelve W60 front panel jumper cables (N5247-20107) – 6 that were removed previously and 2 new jumpers provided. To see an image of the front panel jumper cables, click the Chapter 7 bookmark “Removing and Replacing the Front Panel Assembly” in the PDF Service Guide<sup>1</sup>.

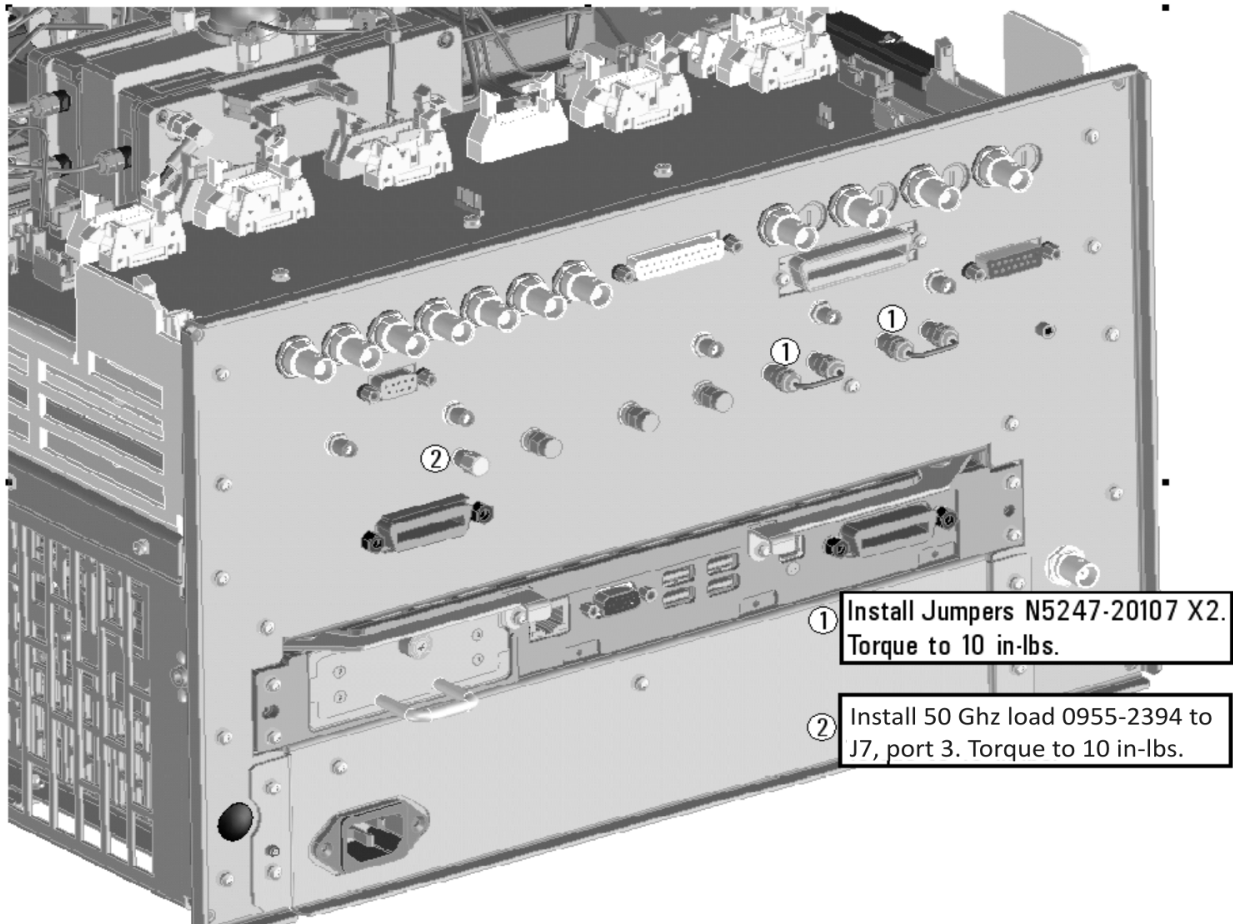
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1. See **“Downloading the Online PNA Service Guide” on page 9**.

## Step 23. Install Rear Panel Jumpers and Load

Install two new W143 jumper cables, N5247-20107, on the rear panel. Refer to **Figure 10** for instructions. New parts are listed in **Table 1 on page 12**.

**Figure 10**      **Rear Panel Jumper Installation**



## Step 24. Position the Cables and Wires to Prevent Pinching

On the top side of the PNA, carefully position the gray 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 25. Reinstall the Inner Cover

For instructions, click the Chapter 7 bookmark "Removing the Covers" in the PDF Service Guide<sup>1</sup>.

1. See **"Downloading the Online PNA Service Guide" on page 9**.

## Step 26. Reinstall the Outer Cover

For instructions, click the Chapter 7 bookmark “Removing the Covers” in the PDF Service Guide<sup>1</sup>.

## Step 27. Remove Option 419 License (B Models Only)

### NOTE

**IMPORTANT!** For A model instruments, skip to “**Step 28. Enable Options 423**”.

### 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 419 License Removal Procedure

1. To start the Keysight License Manager, press **Start > Keysight License Manager > Keysight License Manager**. A Keysight License Manager dialog box will appear.
2. Right click the on the desired option and click **Delete**.
3. In the Select Desired Option list, click **419**.
4. In the Keysight License Manager dialog box that appears, press or click **Yes** to confirm delete.
5. A message displays stating that the option removal was successful.
6. Restart the PNA Analyzer application: Press **File > Exit**.
7. In the Exit NA Application dialog box that opens, press **OK**.

---

1. See “**Downloading the Online PNA Service Guide**” on page 9.

## Step 28. Enable Options 423

### Procedure Requirements

- The analyzer must be powered up and operating to perform this procedure.
- The Network Analyzer program **not** must 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 34](#).

For "B" models refer to ["Option Enable Procedure for "B" Model Instruments " on page 35](#).

### 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 **423 - Combiner & Switches**.
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 "423" is listed after "Options:" in the display. Click OK.

#### NOTE

If option 423 has not been enabled, contact Keysight Technologies. Refer to ["Getting Assistance from Keysight" on page 6](#).

## Option Enable Procedure for “B” Model Instruments

### NOTE

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

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 8](#).
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.

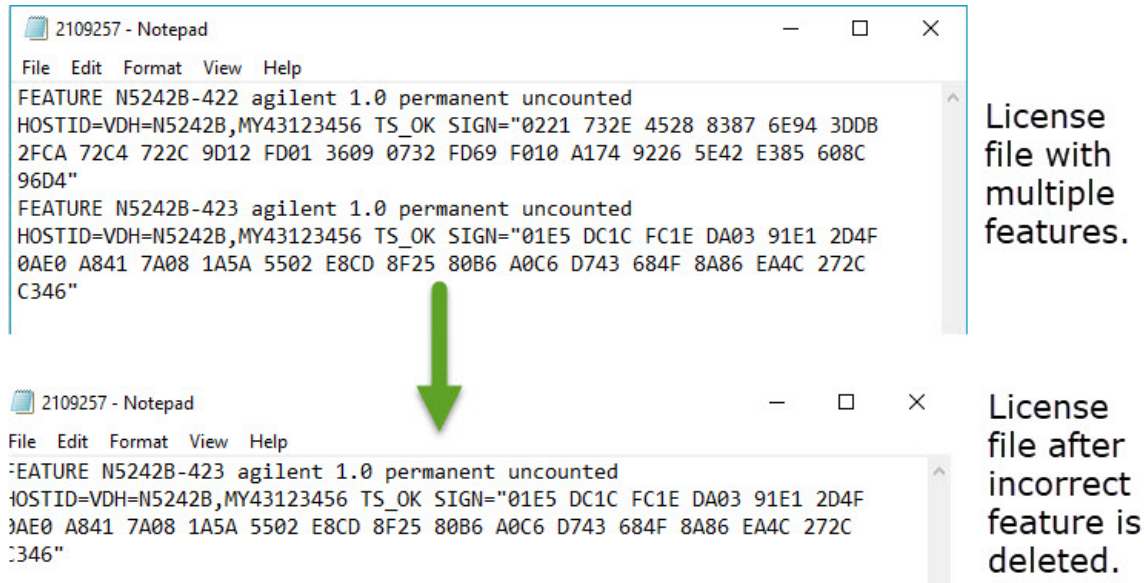
### NOTE

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.
4. Verifying and editing the license file:  
For these steps, refer to the example in [Figure 11 on page 36](#).
  - a. Verify your USB flash drive is connected to a PC.
  - b. Open your license file using a text read/write program similar to Notepad.
  - c. If you have more than one licensed feature, delete the feature that is **not** required for this upgrade. (e.g., in this case N5242B-423 is the correct upgrade. So, N5242B-422 is to be deleted from the text file.)

**Figure 11** Editing a Keysight License File Using a Text Editor.

**Note:** This figure may not contain your specific features and is an example only. In this example N5242B-422 is the incorrect feature. N5242B-423 is the correct feature.



- d. Re-save the text license file to the root directory of your USB flash drive.
- e. Verify that only the single correctly edited text license file is in the root directory of your USB drive.
- f. Eject your USB flash drive and remove the USB flash drive from your PC.

##### 5. Disconnect the USB flash drive from the PNA.

#### NOTE

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

6. 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 6](#).

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Once the analyzer has restarted and 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 401 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 29. Perform Post-Upgrade Adjustments and Calibration

### Adjustments

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

### NOTE

#### IMPORTANT!

The 10 MHz reference crystal oscillator is the most accurate after running for three hours. The 10 MHz Frequency Reference Adjustment can be run after the PNA has warmed up for 90 minutes, and the other adjustments can be completed in the order presented, but then the 10 MHz Frequency Reference Adjustment should be repeated after the PNA has been able to warm up for three hours.

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- 10 MHz frequency reference adjustment
- EE default adjustment: Synth LO only (Version 6 synthesizers)
- synthesizer bandwidth adjustment (only if EE default adjustment is insufficient)
- source adjustment
- IF gain adjustment
- receiver characterization
- receiver adjustment

- IF Response adjustment (For A models: Options 090, 092, 093, or 094 Only. For B models: Options S93090xA/B, S93092A/B, S93093A/B, or S93094A/B Only.)
- noise adjustment (For A models: Option 029. For B models: Option 029 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>.

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

### 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.

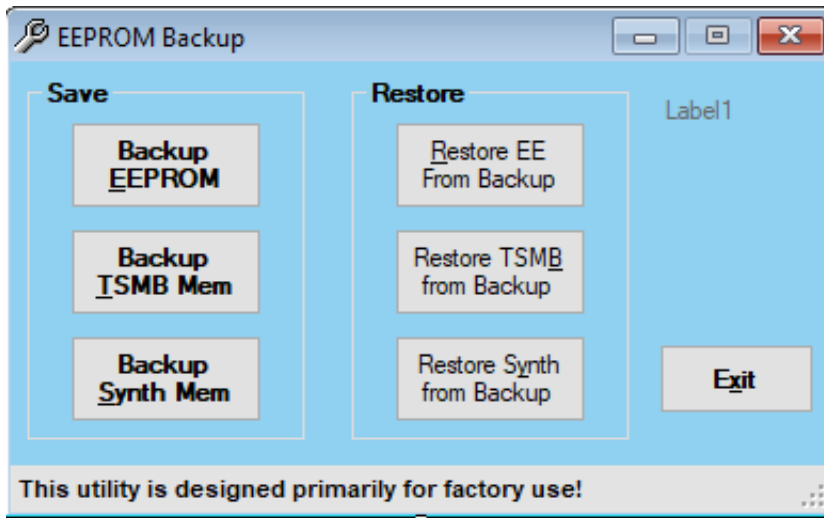
To store the backup data, perform these steps:

- 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.

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1. See [“Downloading the Online PNA Service Guide” on page 9](#).

Figure 12 EEPROM Backup Menu



### 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 6**.

### 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>.

## Step 30. Prepare the PNA for the User

1. If necessary, reinstall front jumper cables.
2. If necessary, reinstall 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.

## Installation Procedure for the Upgrade



