Keysight Extended Power Range and Bias Tees Upgrade Kit For Version 6 Synthesizers

To Upgrade PNA N5227A/B Option 401 to Option 419

Upgrade Kit Order Number: N5227AU-419 and N5227BU-419

Kit Number: N5227-60106

This is Installation Note is for upgrading the N5227A/B Microwave Network Analyzers from Option 401 to Option 419.

Notices

Trademark Acknowledgments

Manual Part Number

N5227-90106

Edition

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Warranty

Technology Licenses

U.S. Government Rights

Safety Notices

CAUTION

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

WARNING

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

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.

This upgrade converts your standard 4-port configurable test set analyzer (N5227A/B Option 401) to an extended power range analyzer with bias tees by adding:

— a 50-dB source attenuator and a bias tee in each source port channel

— a 50-dB receiver attenuator in each receiver channel

After installation of this upgrade, your analyzer will be an N5227A/B Option 419.

Refer to "Overview of the Installation Procedure" on page 14.

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.

KEYSIGHT
TECHNOLOGIES

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.

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 and the **Contact Keysight** ( ) link.
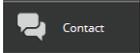
Getting Prepared

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.

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 10.

— 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[1].

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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. |

| NOTE | 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).

| 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. |

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, 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.

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[1].

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-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
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. On these, use a 5/16 inch nutsetter or open end torque wrench set to 21 in-lb.

About Installing the Upgrade

Products affected	N5227A/B Option 401
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	3 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 N5227-60106

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5227-90106
--	Software Entitlement Certificate (provided separately)	1	5964-5145
--	China RoHS Addendum	1	9320-6722
A38–A41	0–50 dB source step attenuator	4	84905-60004
A42–A45	Bias tee	4	5087-7732
A46–A49	0-50 dB receiver step attenuator	4	84905-60004
--	Attenuator bracket	4	N5247-00005
--	Bias tee bracket	2	N5247-20129
--	Machine screw, M3 x 8, pan head (16 to attach attenuators to brackets; 16 to attach attenuator assemblies to deck; 2 to attach port 2 reference coupler assembly to port 2 attenuators assembly; 3 to attach port 3 reference coupler assembly to port 3 attenuators assembly; 3 to attach port 4 reference coupler assembly to port 4 attenuators assembly; 3 to attach port 1 reference coupler assembly to port 1 attenuators assembly; 4 to attach bias tee assemblies to deck; 8 to secure center braces)	60	0515-0372
--	Machine screw, M3 x 6, flat head (to secure bias tees to brackets)	10	0515-1227
--	Machine screw, M3 x 10, pan head (to secure side braces)	5	0515-0374
--	Machine screw, M4 x 10, pan head (to secure center braces)	3	0515-0380
--	Cable clamp (3 to secure W146 (N5247-20058); 1 to secure W145 (N5247-20066); 1 to secure W41 (N5247-20069); 1 to secure W37 (N5247-20070).	11	1400-1334
--	Cable tie wrap, 2 to secure W120 (N5247-20064); 2 to secure W144 (N5247-20071).	8	1400-0249
--	Caps, protective (black)	4	1401-0214
-	Brace (center), bottom side of PNA	2	N5247-20134
-	Brace (center), bottom side of PNA	1	N5247-20133
-	Brace (side), bottom side of PNA	2	N5247-20132
-	2.4 mm dust cap for A28 mixer brick	1	N5247-20138

Items Included in the Upgrade Kit

Table 1   Contents of Upgrade Kit N5227-60106

Ref Desig.	Description	Qty	Part Number
W27	RF cable, A60 port 1 70 GHz doubler to A29 port 1 reference coupler	1	N5247-20044
W28	RF cable, A61 port 3 70 GHz doubler to A30 port 3 reference coupler	1	N5247-20043
W29	RF cable, A62 port 4 70 GHz doubler to A31 port 4 reference coupler	1	N5247-20044
W30	RF cable, A63 port 2 70 GHz doubler to A32 port 2 reference coupler	1	N5247-20043
W37	RF cable, A30 port 3 reference coupler to front-panel REF 3 SOURCE OUT	1	N5247-20070
W41	RF cable, A31 port 4 reference coupler to front-panel REF 4 SOURCE OUT	1	N5247-20069
W101	RF cable, A29 port 1 reference coupler to A38 port 1 source attenuator	1	N5247-20083
W102	RF cable, A38 port 1 source attenuator to front-panel port 1 SOURCE OUT	1	N5247-20014
W103	RF cable, Front-panel port 1 CPLR THRU to A42 port 1 bias tee	1	N5247-20010
W104	RF cable, A33 port 1 coupler to A42 port 1 bias tee	1	N5247-20022
W105	RF cable, A30 port 3 receiver coupler to A39 port 3 source attenuator	1	N5247-20083
W106	RF cable, A39 port 3 source attenuator to front-panel port 3 SOURCE OUT	1	N5247-20009
W107	RF cable, Port 3 CPLR THRU to A43 port 3 bias tee	1	N5247-20081
W108	RF cable, A43 port 3 bias tee to A34 port 3 coupler	1	N5247-20028
W109	RF cable, A31 port 4 reference coupler to A40 port 4 source attenuator	1	N5247-20083
W110	RF cable, A40 port 4 source attenuator to front-panel port 4 SOURCE OUT	1	N5247-20025
W111	RF cable, Port 4 CPLR THRU to A44 port 4 bias tee	1	N5247-20021
W112	RF cable, A44 port 4 bias tee to A35 port 4 coupler	1	N5247-20029
W113	RF cable, A32 port 2 reference coupler to A41 port 2 source attenuator	1	N5247-20083
W114	RF cable, A41 port 2 source attenuator to front-panel port 2 SOURCE OUT	1	N5247-20034
W115	RF cable, Port 2 CPLR THRU to A45 port 2 bias tee	1	N5247-20027
W116	RF cable, A45 port 2 bias tee to A36 port 2 coupler	1	N5247-20080
W117	RF cable, Front-panel port 1 RCVR A IN to A46 port 1 receiver attenuator	1	N5247-20013
W118	RF cable, A46 port 1 receiver attenuator to A27 mixer brick (A)	1	N5247-20047
W119	RF cable, Port 3 RCVR C IN to A47 port 3 receiver attenuator	1	N5247-20008
W120	RF cable, A47 port 3 receiver attenuator to A28 mixer brick (C)	1	N5247-20064
W121	RF cable, Port 4 RCVR D IN to A48 port 4 receiver attenuator	1	N5247-20024
W122	RF cable, A48 port 4 receiver attenuator to A28 mixer brick (D)	1	N5247-20065
W123	RF cable, Port 2 RCVR B IN to A49 port 2 receiver attenuator	1	N5247-20020

Table 1   Contents of Upgrade Kit N5227-60106

Ref Desig.	Description	Qty	Part Number
W124	RF cable, A49 port 2 receiver attenuator to A27 mixer brick (B)	1	N5247-20046
W144	RF cable, A29 port 1 reference coupler to A37 reference mixer switch	1	N5247-20071
W145	RF cable, REF 2 RCVR R2 IN to A27 mixer brick (R2)	1	N5247-20066
W146	RF cable, A32 port 2 ref coupler to front-panel REF 2 SOURCE OUT	1	N5247-20058
--	Ribbon cable, A23 test set motherboard J205 to A46 port 1 receiver attenuator	4	N5247-60020
--	Ribbon cable, A23 test set motherboard J206 to A47 port 3 receiver attenuator		
--	Ribbon cable, A23 test set motherboard J207 to A48 port 4 receiver attenuator		
--	Ribbon cable, A23 test set motherboard J208 to A49 port 2 receiver attenuator		
--	Ribbon cable, A23 test set motherboard J549 to A38 test port 1 source attenuator	4	N5245-60006
--	Ribbon cable, A23 test set motherboard J547 to A39 test port 3 source attenuator		
--	Ribbon cable, A23 test set motherboard J548 to A40 test port 4 source attenuator		
--	Ribbon cable, A23 test set motherboard J546 to A41 test port 2 source attenuator		
--	Ribbon cable, A23 test set motherboard J541 to A42 port 1 bias tee	4	N5247-60021
--	Ribbon cable, A23 test set motherboard J543 to A43 port 3 bias tee		
--	Ribbon cable, A23 test set motherboard J544 to A44 port 4 bias tee		
--	Ribbon cable, A23 test set motherboard J542 to A45 port 2 bias tee		

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.

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 Bottom-Side (Test Set) Cables."

"Step 6. Remove Port 1 and Port 2 Reference Coupler Assemblies from the Test Set Deck."

"Step 7. Swap Brackets on the Port 1 and Port 2 Reference Coupler Assemblies."

"Step 8. Remove Port 3 and Port 4 Reference Coupler Assemblies from the Test Set Deck."

"Step 9. Swap Brackets on the Port 3 and Port 4 Reference Coupler Assemblies."

"Step 10. Assemble the Port 2 and Port 3 Step Attenuators."

"Step 11. Install the Port 2 and Port 3 Step Attenuators."

"Step 12. Assemble the Port 1 and Port 4 Step Attenuators."

"Step 13. Install the Port 1 and Port 4 Step Attenuators."

"Step 14. Reinstall the Port 1, Port 2, Port 3 and Port 4 Reference Coupler Assemblies."

"Step 15. Assemble the Bias Tees."

"Step 16. Install the Bias Tee Assemblies."

"Step 17. Install Some Bottom-Side (Test Set) Cables."

"Step 18. Install the Braces."

"Step 19. Reinstall Front Panel Assembly."

"Step 21. Position the Cables and Wires to Prevent Pinching."

"Step 22. Reinstall the Inner Cover."

"Step 23. Reinstall the Outer Cover."

"Step 24. Remove Option 401 License."

"Step 25. Enable Options 419."

"Step 26. Perform Post-Upgrade Adjustments and Calibration."

"Step 27. 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 15.

> **NOTE**
> If the model number, serial number, or option number do not match those on your license key (A models) or license key file (B models), you will not be able to install the option, 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[1].

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[1].

Step 5. 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 semi-rigid cable, but keep it for re-installation later. To see an image showing the location of the cable, click the Chapter 6 bookmark "Bottom RF Cables, Standard 2-Port Configuration, Option 401 (S/N Prefixes <6021)".[1]
   These cables may be discarded - they will not be reinstalled.
   — W27   (N5247-20074) A60 port 1 70 GHz doubler to A29 port 1

   reference coupler
   — W30   (N5247-20052) A63 port 2 70 GHz doubler to A32 port 2 reference coupler
   — W28   (N5247-20052) A61 port 3 70 GHz doubler to A30 port 3 reference coupler
   — W29   (N5247-20074) A62 port 4 70 GHz doubler to A31 port 4 reference coupler
   — W31   (N5247-20037) A29 port 1 ref coupler to front-panel port 1 SOURCE OUT
   — W47   (N5247-20053) Port 1 RCVR A IN to A27 mixer brick (A)
   — W33   (N5247-20078) A29 port 1 reference coupler to A37 reference mixer switch
   — W36   (N5247-20006) Port 3 CPLR THRU to A34 port 3 coupler
   — W32   (N5247-20016) Port 1 CPLR THRU to A33 port 1 coupler
   — W35   (N5247-20023) A30 port 3 ref coupler to front-panel port 3 SOURCE OUT
   — W48   (N5247-20063) Port 3 RCVR C IN to A28 mixer brick (C)
   — W37   (N5247-20077) A30 port 3 ref coupler to front-panel REF 3 SOURCE OUT
   — W41   (N5247-20075) A31 port 4 ref coupler to front-panel REF 4 SOURCE OUT

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1. Refer to "Downloading the Online PNA Service Guide" on page 9.

— W39 (N5247-20035) A31 port 4 ref coupler to front-panel port 4 SOURCE OUT

— W49 (N5247-20073) Port 4 RCVR D IN to A28 mixer brick (D)

— W56 (N5247-20055) REF 2 RCVR R2 IN to A27 mixer brick (R2)

— W45 (N5247-20076) A32 port 2 ref coupler to front-panel REF 2 SOURCE OUT

— W40 (N5247-20017) Port 4 CPLR THRU to A35 port 4 coupler

— W43 (N5247-20036) A32 port 2 ref coupler to front-panel port 2 SOURCE OUT

— W44 (N5247-20018) Port 2 CPLR THRU to A36 port 2 coupler

— W50 (N5247-20054) Port 2 RCVR B IN to A27 mixer brick (B)

These cables must be saved - they will be reinstalled.

— W24 (N5247-20061) A63 port 2 70 GHz doubler to W23

— W20 (N5247-20015) A62 port 4 70 GHZ doubler to W19

— W12 (N5247-20059) A60 port 1 70 GHz doubler to W11

— W16 (N5247-20060) A61 port 3 70 GHZ doubler to W15

— W52 (N5247-20012) REF 1 RCVR R1 IN to A37 reference mixer switch

— W51 (N5247-20011) A37 reference mixer switch to front-panel REF 1 SOURCE OUT

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 6. Remove Port 1 and Port 2 Reference Coupler Assemblies from the Test Set Deck

For instructions on removing the reference coupler assemblies, click the Chapter 7 bookmark "Removing and Replacing the A29-A32 Reference Couplers and Reference Coupler Mounting Brackets" in the PDF Service Guide[1]. Save the parts for re-installation later.

Step 7. Swap Brackets on the Port 1 and Port 2 Reference Coupler Assemblies

Remove the brackets from the reference coupler assemblies being careful to remember which bracket was removed from each reference coupler. Reinstall the bracket that had been installed on the Port 1 Reference Coupler Assembly

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

onto the Port 2 Reference Coupler Assembly. Next, reinstall the bracket that had been installed on the Port 2 Coupler Assembly onto the Port 1 Reference Coupler Assembly.

Step 8. Remove Port 3 and Port 4 Reference Coupler Assemblies from the Test Set Deck

For instructions on removing the reference coupler assemblies, click the Chapter 7 bookmark "Removing and Replacing the A29-A32 Reference Couplers and Reference Coupler Mounting Brackets" in the PDF Service Guide[1]. Save the parts for re-installation later.

Step 9. Swap Brackets on the Port 3 and Port 4 Reference Coupler Assemblies

Remove the brackets from the reference coupler assemblies being careful to remember which bracket was removed from each reference coupler. Reinstall the bracket that had been installed on the Port 1 Reference Coupler Assembly onto the Port 2 Reference Coupler Assembly. Next, reinstall the bracket that had been installed on the Port 2 Coupler Assembly onto the Port 1 Reference Coupler Assembly.

Step 10. Assemble the Port 2 and Port 3 Step Attenuators

Refer to Figure 1 for this step of the procedure. New parts are listed in Table 1 on page 11. Use a T-10 TORX driver to tighten all screws.

Figure 1   Port 2 and Port 3 Step Attenuators Assembly (0515-0372, 84905-60002, N5247-00005, N5247-60006, N5247-60020)

① Gather Attenuator 84905-60002 X4.

Note orientation of attenuators Port 2 and Port 3

Note: There are 2 Attenuator assemblies to build.

② Install Attenuators into Brackets N5247-00005 X2.

③ Secure with screws 0515-0372 X8. Torque to 9 in-lbs.

④ Install Ribbon Cables N5247-60020 X2 on RCVR attenuators.

⑤ Install Ribbon Cables N5245-60006 X2 on SCR attenuators.
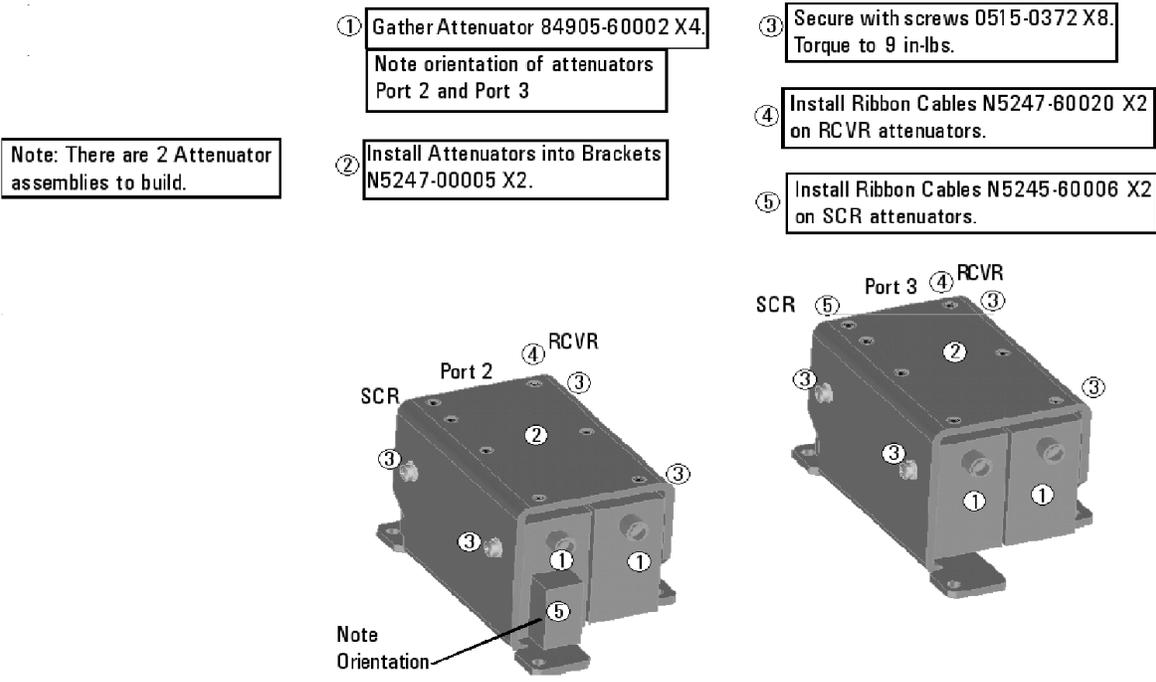
N5247_193_01a

Step 11. Install the Port 2 and Port 3 Step Attenuators

Refer to Figure 2 for this step of the procedure. New parts are listed in Table 1 on page 11. Use a T-10 TORX driver to tighten all screws.

Figure 2   Port 2 and Port 3 Step Attenuators Installation (0515-0372)

Install Attenuator assemblies Port 2&3 as shown. Secure with screws 0515-0372 X8. Torque to 9 in-lbs.
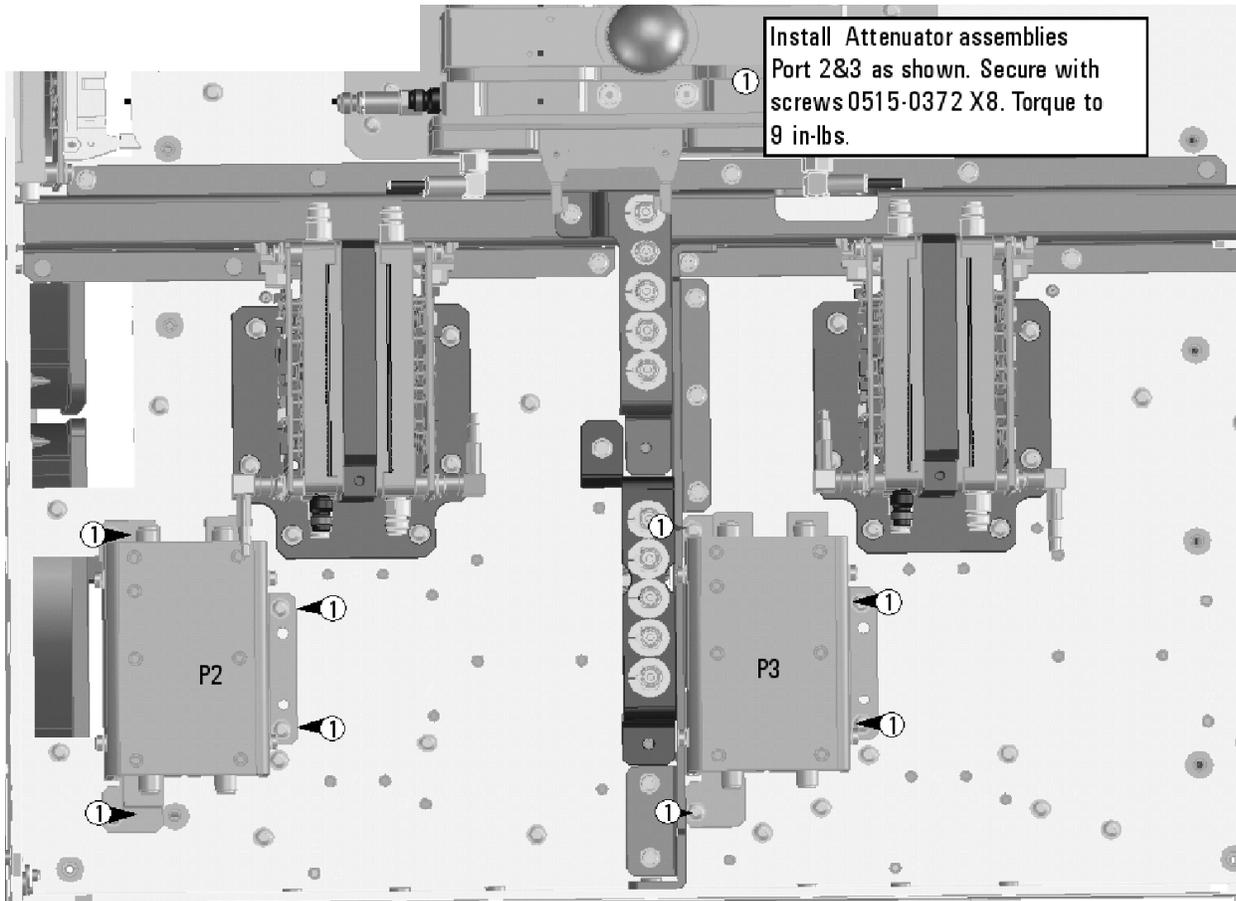
Step 12. Assemble the Port 1 and Port 4 Step Attenuators

Refer to Figure 3 for this step of the procedure. New parts are listed in Table 1 on page 11. Use a T–10 TORX driver to tighten all screws.

Figure 3   Port 1 and Port 4 Step Attenuators Assembly(0515-0372, 84005-60002, N5247-60005, N5247-60006, N5247-60020)

① Gather Attenuator 84905-60002 X4.

Note orientation of attenuators Port 2 and Port 3

Note: There are 2 Attenuator assemblies to build.

② Install Attenuators into Brackets N5247-00005 X2.

③ Secure with screws 0515-0372 X8. Torque to 9 in-lbs.

④ Install Ribbon Cables N5245-60006 X2 on SCR attenuators.

⑤ Install Ribbon Cables N5247-60020 X2 on RCVR attenuators.
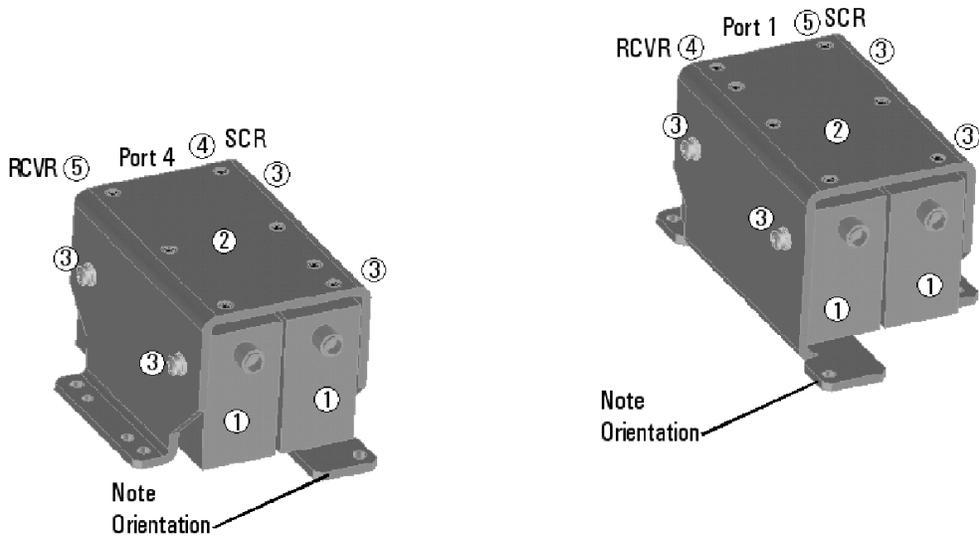
Step 13. Install the Port 1 and Port 4 Step Attenuators

Refer to Figure 4 for this step of the procedure, but ignore the images of the Ports 2 and 3 reference coupler assemblies because they have not yet been installed. New parts are listed in Table 1 on page 11. Use a T–10 TORX driver to tighten all screws.

Figure 4   Port 1 and Port 4 Step Attenuators Installation (0515-0372)

Install Attenuator assemblies Port 1&4 as shown. Secure with screws 0515-0372 X8. Torque to 9 in-lbs. Note orientation of brackets
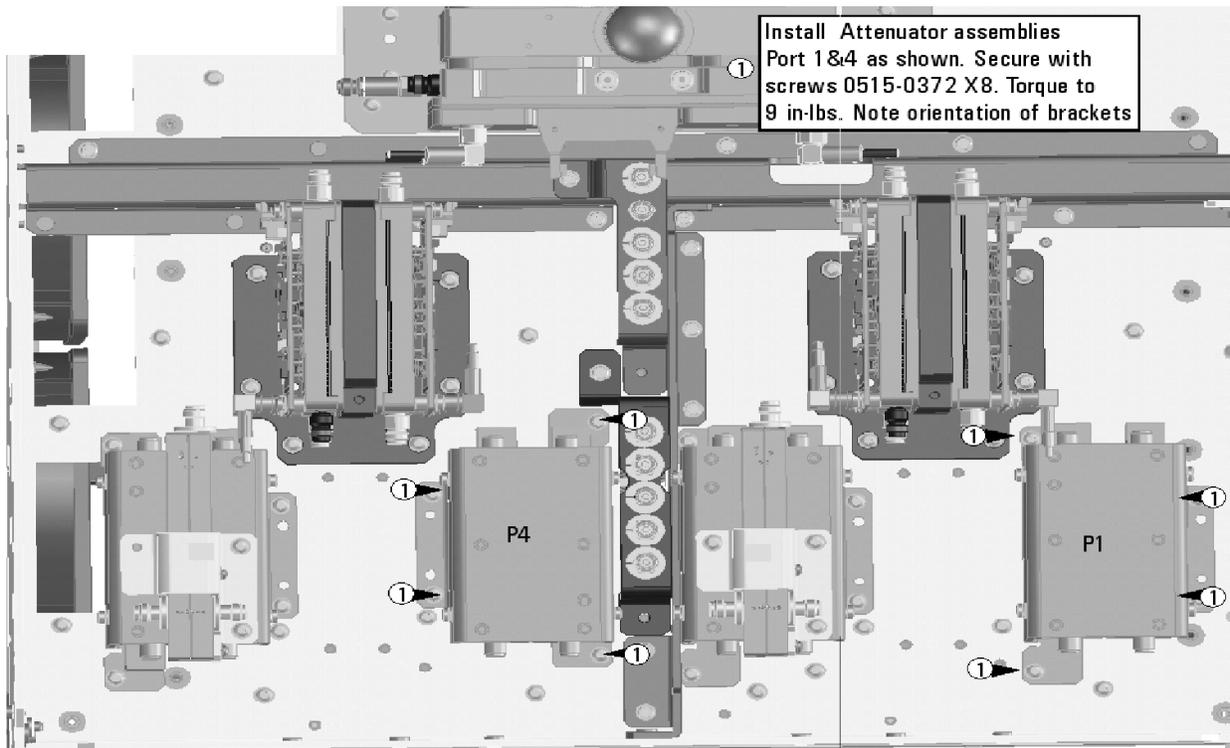
Step 14. Reinstall the Port 1, Port 2, Port 3 and Port 4 Reference Coupler Assemblies

Refer to Figure 5 for this step of the procedure. Use a T–10 TORX driver to tighten all screws.

Figure 5   Port 1, Port 2, Port 3, and Port 4 Reference Coupler Assemblies Re-installation (0515-0372)

Install Coupler 1 & 4 assemblies to attenuators 1 & 4 as shown. Install Coupler 2 & 3 assemblies to attenuators 2 & 3 as shown. Secure with screws 0515-0372 X11. Torque to 9 in-lbs. Note orientation.
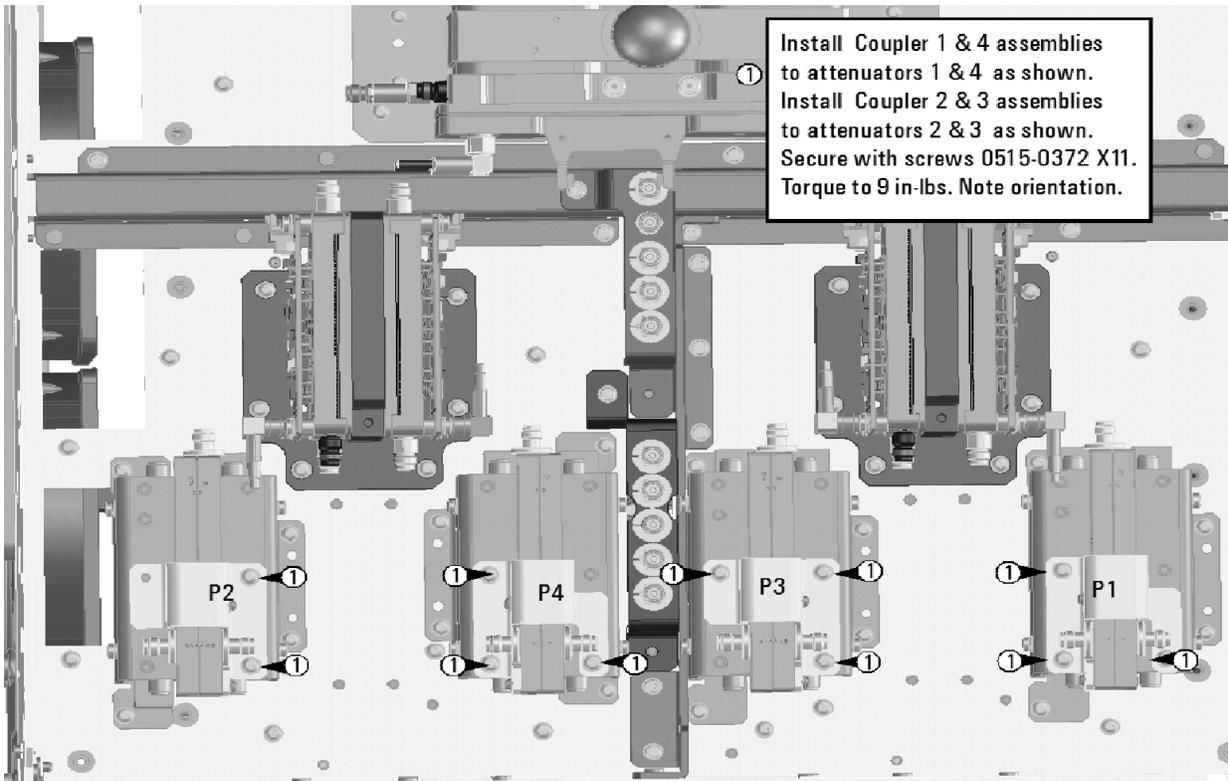
Step 15. Assemble the Bias Tees

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

Figure 6   Bias Tee Assembly (0515-1227, 5087-7732, N5247-20128)

NOTE: there are two bias tee assemblies to be built.

① Gather Bias Tee 5087-7732, and install Bracket N5247-20129 X2. Secure with screws 0515-1227 X8. Torque to 9 in-lbs.

Note: Orientation of Bracket and Bias Tee.
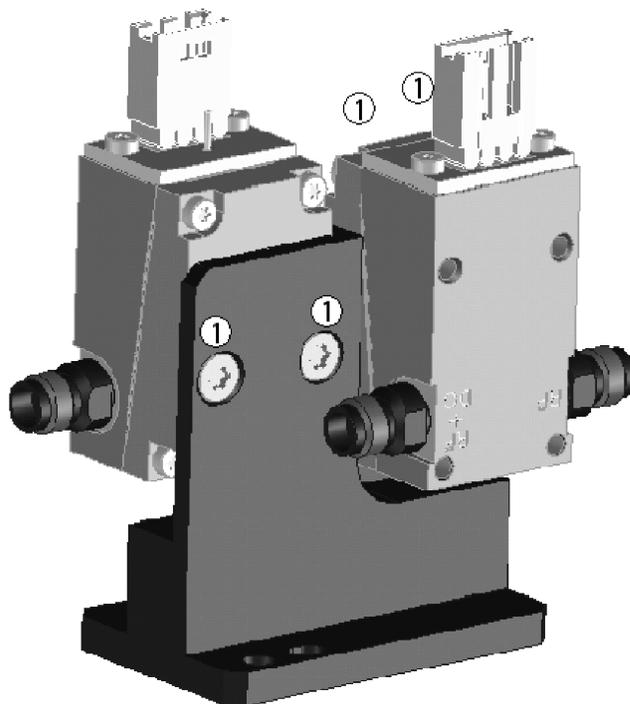
Step 16. Install the Bias Tee Assemblies

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

Figure 7   Bias Tee Installation (0515-0372, N5247-60021)

Install Bias Tee assemblies X2, securing with screws 0515-0372 X4. Install cable harness N5247-60021 to each bias tee as shown. Torque screws to 9 in-lbs.

Cable Harness

Cable Harness

Note:
Slot on bias tee bracket should be towards back of inst.

Port 2

Port 4

Screw X2

Cable Harness

Cable Harness

Port 3

Port 1

Screw X2
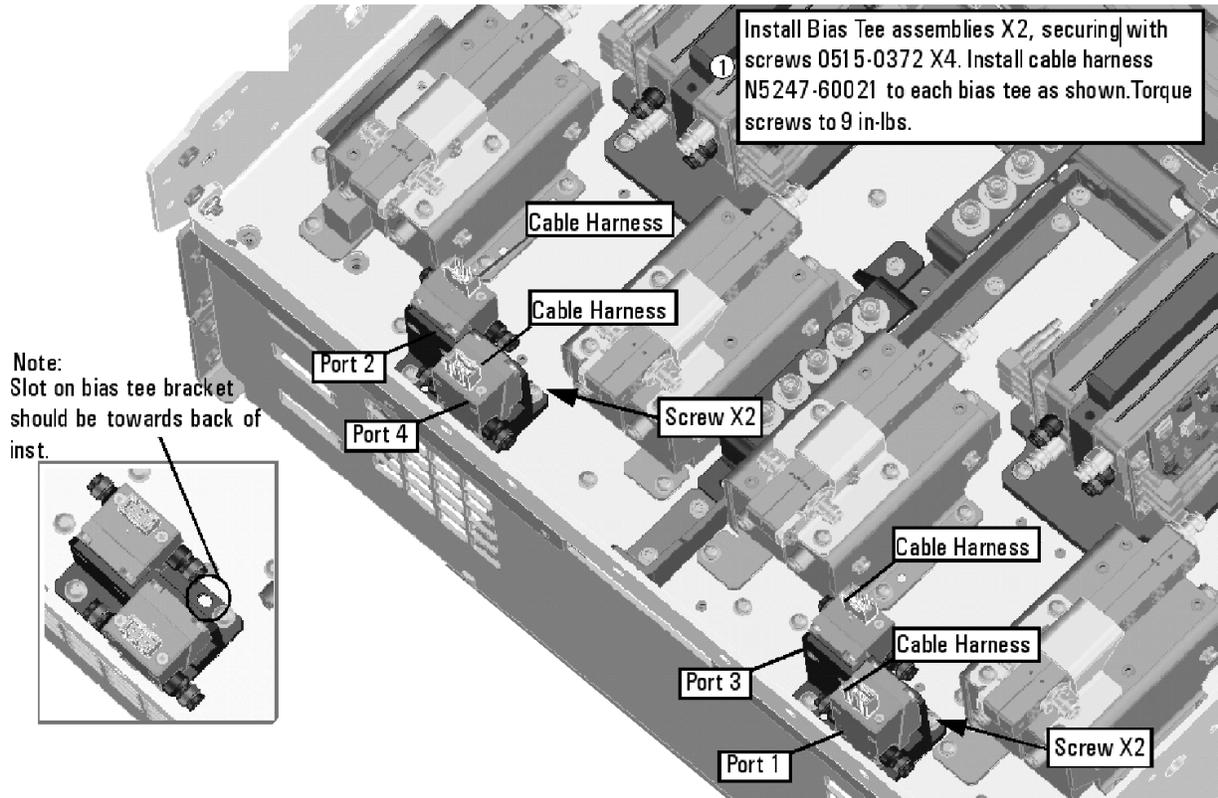
N5247_103_08

Step 17. 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 419 (S/N Prefixes <6021)" in the PDF Service Guide1. New parts are listed in Table 1 on page 11.

Install the following new cables in the order listed.

— W123 (N5247-20020) Port 2 RCVR B IN to A49 port 2 receiver attenuator

— W115 (N5247-20027) Port 2 CPLR THRU to A45 port 2 bias tee

— W114 (N5247-20034) A41 port 2 source attenuator to front-panel port 2 SOURCE OUT

— W112 (N5247-20029) A44 port 4 bias tee to A35 port 4 coupler

— W146 (N5247-20058) A32 port 2 ref coupler to front-panel REF 2 SOURCE OUT

* As shown in Figure 7-1, install three clamps, part number 1400-1334, to secure W146.

Figure 7-1   Location of Cable Clamps (1400-1334) to Secure W146 (N5247-20058)
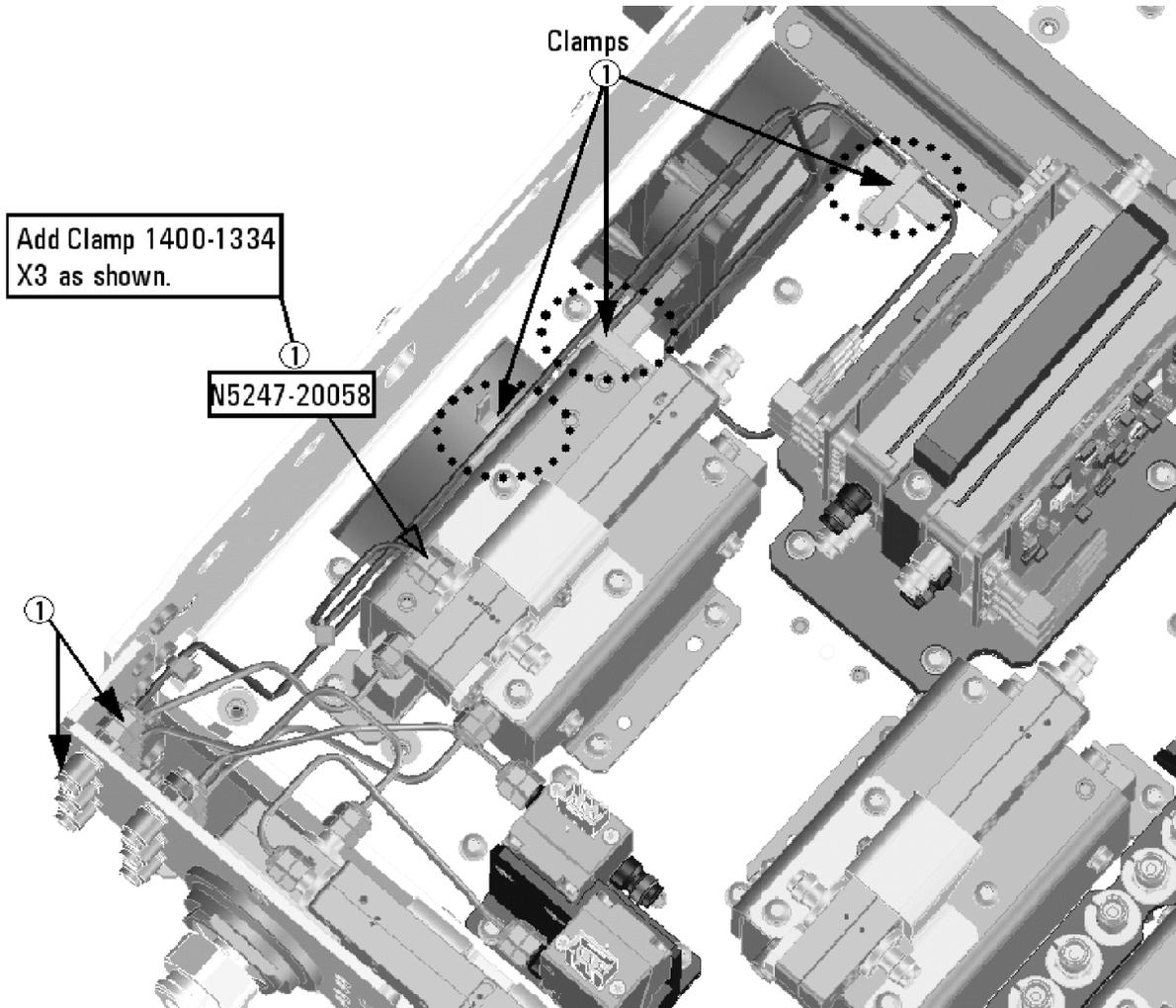

N5247_103_09

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

— W124 (N5247-20046) A49 port 2 receiver attenuator to A27 mixer brick (B)

— W145 (N5245-20066) REF 2 RCVR R2 IN to A27 mixer brick (R2)

* As shown in Figure 7-2, install one clamp, part number 1400-1334, to secure W145 (N5245-20066).

Figure 7-2   Location of Cable Clamp (1400-1334) to Secure W145 (N5247-20066)
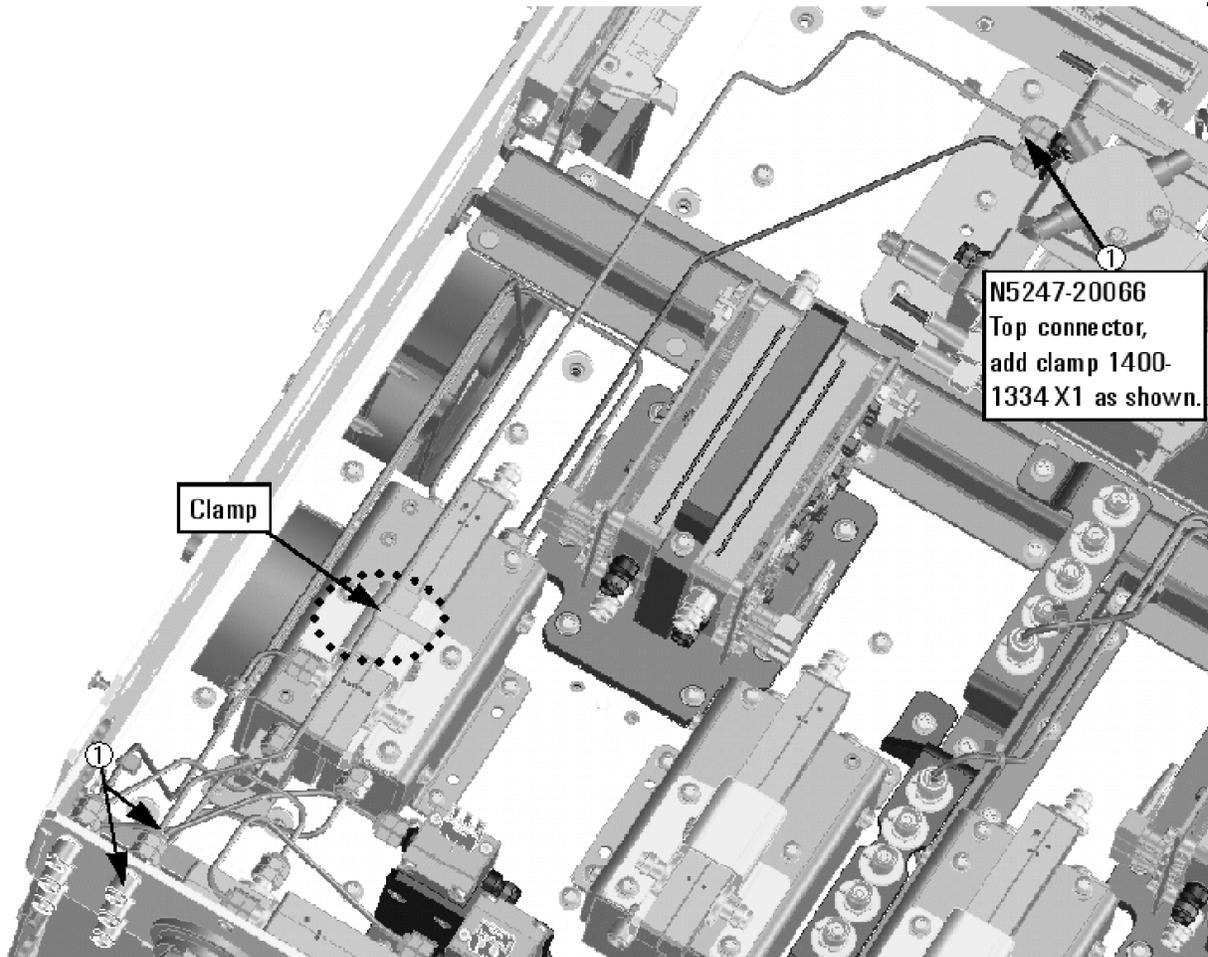
N5247_103_10

— W116 (N5247-20080) A45 port 2 bias tee to A36 port 2 coupler

— W121 (N5247-20024) Port 4 RCVR D IN to A48 port 4 receiver attenuator

— W111 (N5247-20021) Port 4 CPLR THRU to A44 port 4 bias tee

— W110 (N5247-20025) A40 port 4 source attenuator to front-panel port 4 SOURCE OUT

— W41 (N5247-20069) A31 port 4 reference coupler to front-panel REF 4 SOURCE OUT

* As shown in Figure 7-3, install one clamp, part number 1400-1334, to secure W41 (N5247-20069).

Figure 7-3   Location of Cable Clamp (1400-1334) to Secure W41 (N5247-20069)
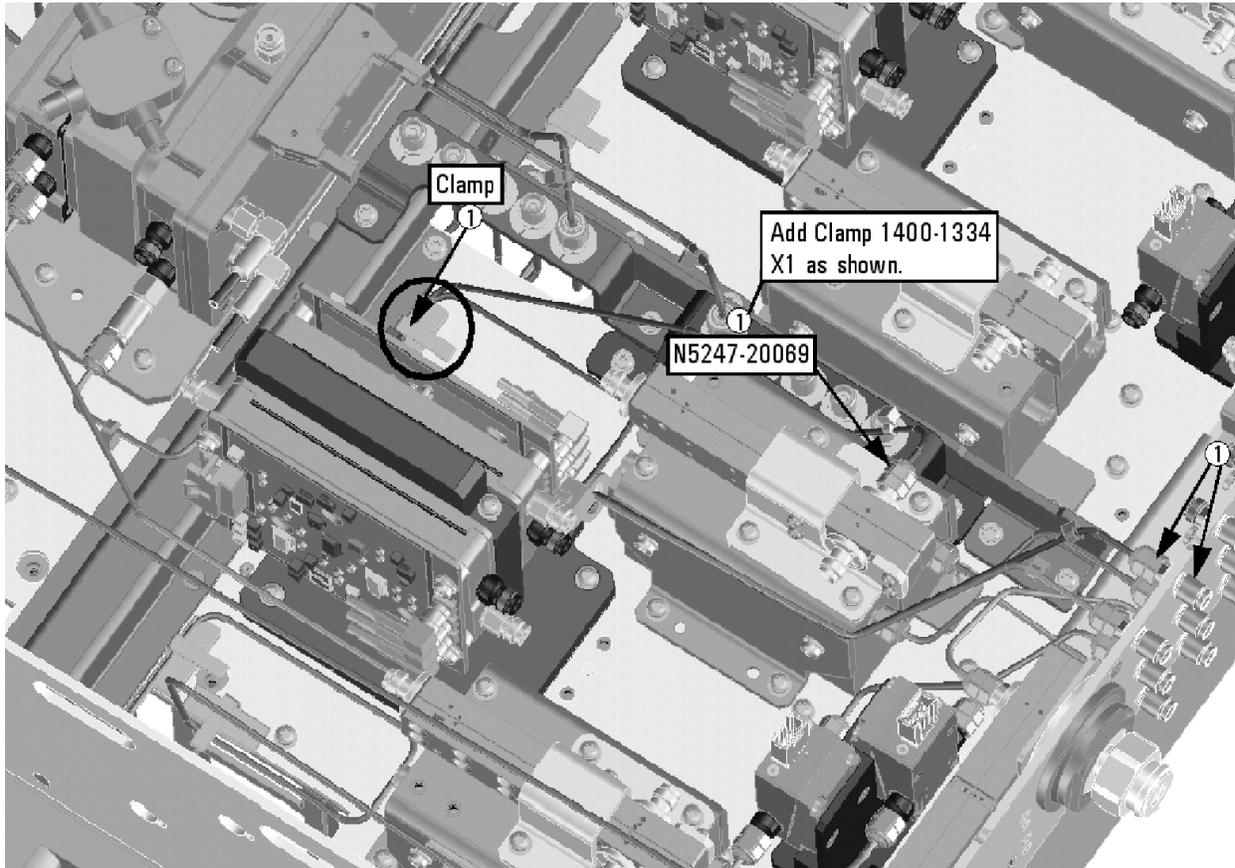
N5227_106_02

— W104 (N5247-20022) A33 port 1 coupler to A42 port 1 bias tee

— W119 (N5247-20008) Port 3 RCVR C IN to A47 port 3 receiver attenuator

— W106 (N5247-20009) A39 port 3 source attenuator to front-panel port 3 SOURCE OUT

— W103 (N5247-20010) Front-panel port 1 CPLR THRU to A42 port 1 bias tee

— W37 (N5247-20070) A30 port 3 reference coupler to front-panel REF 3 SOURCE OUT

* As shown in Figure 7-4, install one clamp, part number 1400-1334, to secure W37 (N5247-20070).

Figure 7-4 Location of Cable Clamp (1400-1334) to Secure W37 (N5247-20070)
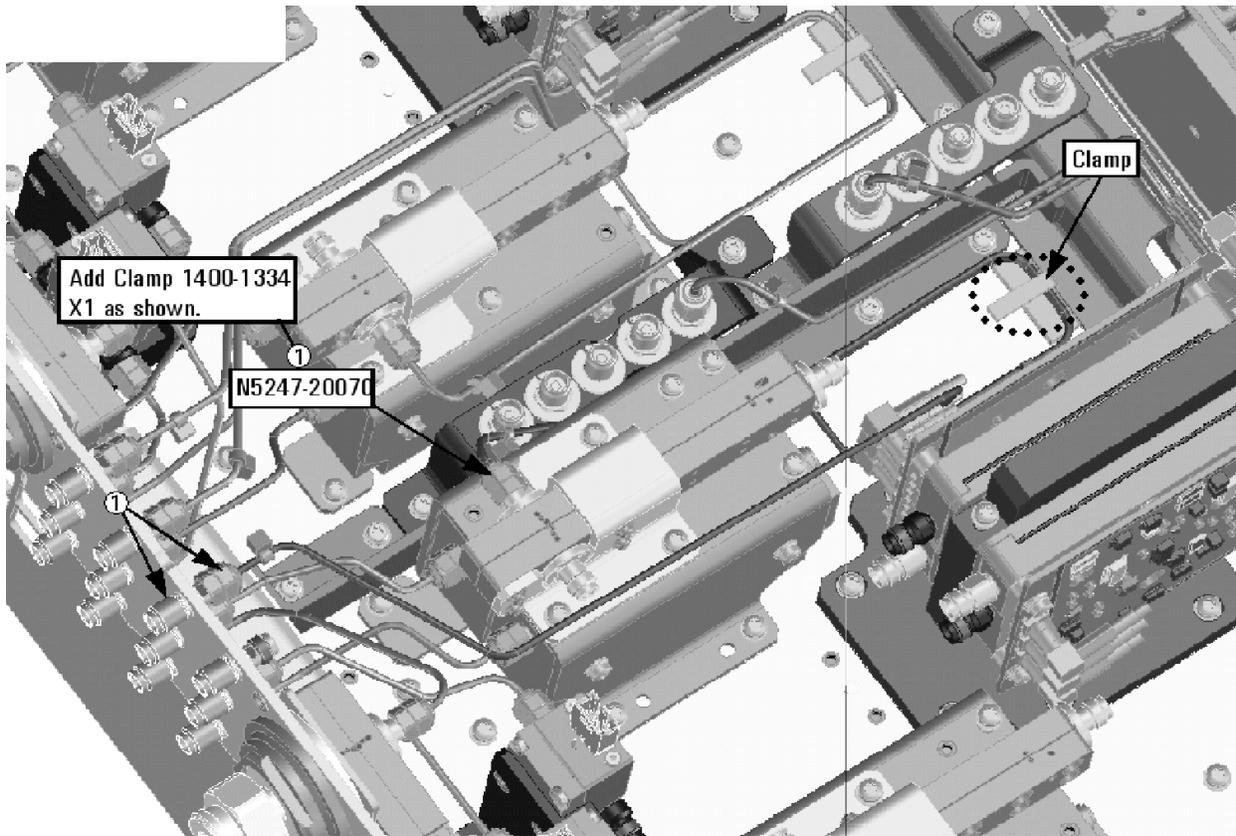
- W120 (N5247-20064) A47 port 3 receiver attenuator to A28 mixer brick (C)

  * As shown in Figure 7-5, install two cable ties, part number 1400-0249, to secure W120 (N5247-20064).

Figure 7-5   Location of Cable Ties (1400-0249) to Secure W120 (N5247-20064)
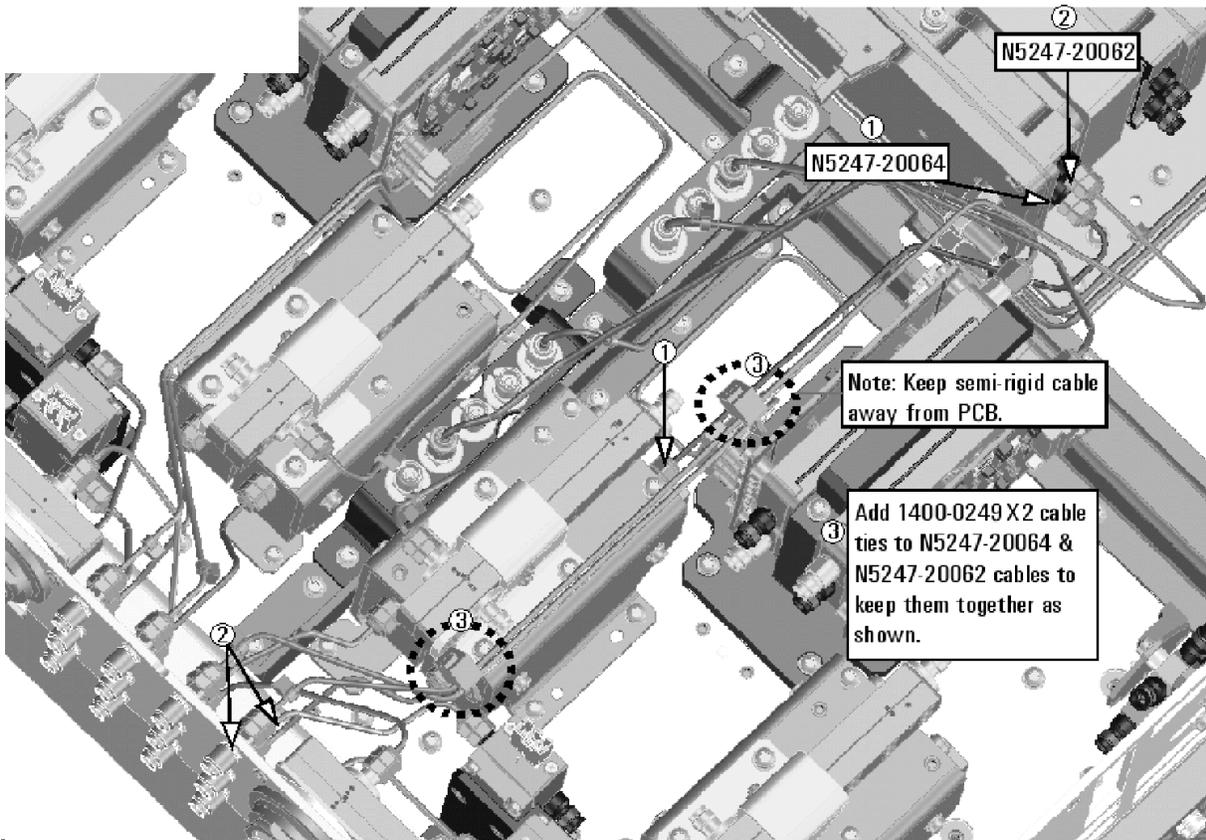
— W107 (N5247-20081) Port 3 CPLR THRU to A43 port 3 bias tee

— W117 (N5247-20013) Front-panel port 1 RCVR A IN to A46 port 1 receiver attenuator

— W102 (N5247-20014) A38 port 1 source attenuator to front–panel port 1 SOURCE OUT

— W108 (N5247-20028) A43 port 3 bias tee to A34 port 3 coupler

— W144 (N5247-20071) A29 port 1 reference coupler to A37 reference mixer switch

* As shown in Figure 7-6, install 2 cable ties, part number 1400–0249, to secure W144 (N5247-20071).

Figure 7-6   Location of Cable Ties to Secure W144 (N5247-20071), Dust Cap (N5247-20138), and Cable Clamp (1400-1334) to Secure W52 (N5247-20012)
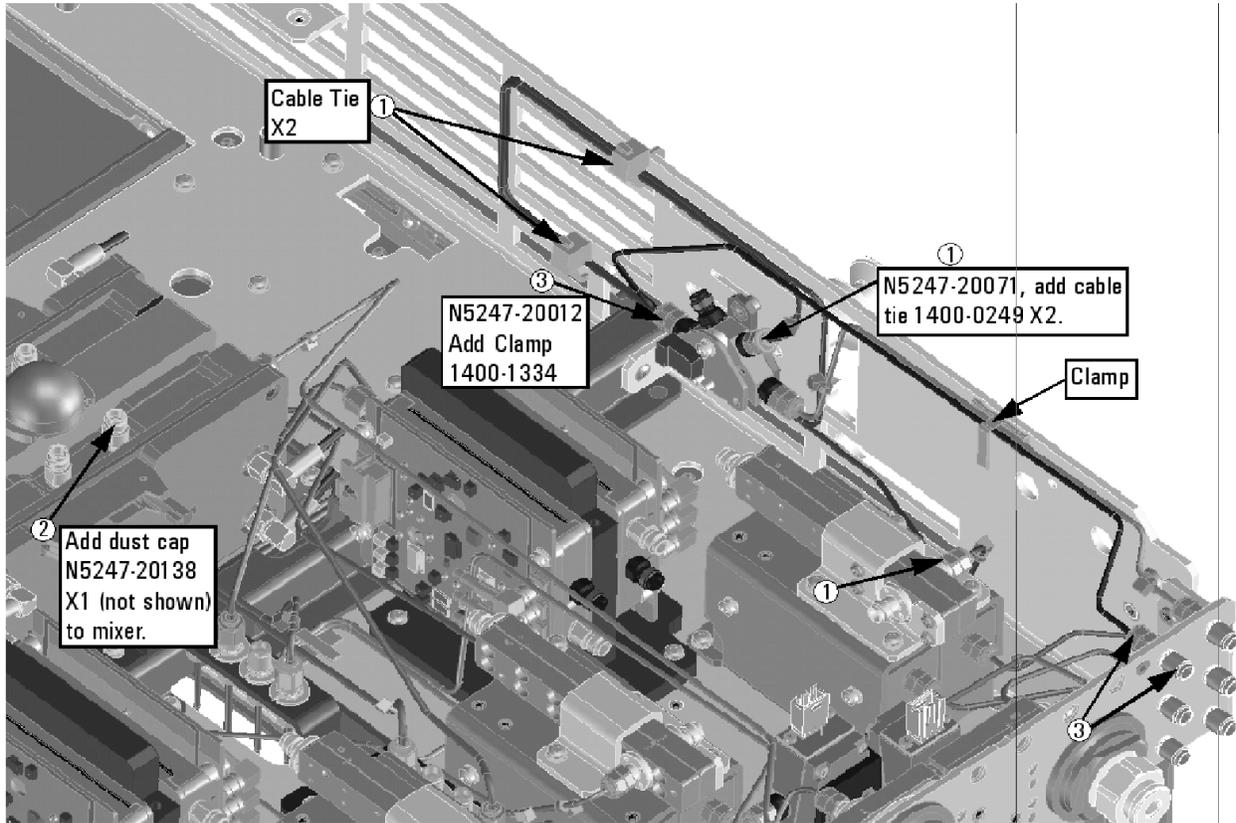
— (N5247-20138) Dust cap

* As shown in Figure 7-6, install dust cap, part number N5247-20138, to mixer.

— W51 (reuse) (N5247-20011) A37 reference mixer switch to front–panel REF 1 SOURCE OUT

— W52 (reuse) (N5247-20012) REF 1 RCVR R1 IN to A37 reference mixer switch

* As shown in Figure 7-6, install 1 cable clamp, part number 1400-1334, to secure W52 (N5247-20012). When done connecting cables to the reference mixer switch, torque the screws on the switch to 9 in-lbs.

— W118 (N5247-20047) A46 port 1 receiver attenuator to A27 mixer brick (A)

— W122 (N5247-20065) A48 port 4 receiver attenuator to A28 mixer brick (D)

— W101 (N5247-20083) A29 port 1 reference coupler to A38 port 1 source attenuator

— W113 (N5247-20083) A32 port 2 reference coupler to A41 port 2 source attenuator

— W109 (N5247-20083) A31 port 4 reference coupler to A40 port 4 source attenuator

— W105 (N5247-20083) A30 port 3 receiver coupler to A39 port 3 source attenuator

— W27 (N5247-20044) A60 port 1 70 GHz doubler to A29 port 1 reference coupler

— W16 (reuse) (N5247-20060) A61 port 3 70 GHZ doubler to W15

— W28 (N5247-20043) A61 port 3 70 GHz doubler to A30 port 3 reference coupler

— W12 (reuse) (N5247-20059) A60 port 1 70 GHz doubler to W11

— W29 (N5247-20044) A62 port 4 70 GHz doubler to A31 port 4 reference coupler

— W20 (reuse) (N5247-20015) A62 port 4 70 GHZ doubler to W19

— W24 (reuse) (N5247-20061) A63 port 2 70 GHz doubler to W23

— W30 (N5247-20043) A63 port 2 70 GHz doubler to A32 port 2 reference coupler

Install the Ribbon Cables and Wire Harnesses

To see an image showing the location of these cables, click the Chapter 6 bookmarks "Bottom Ribbon Cables and Wire Harnesses, 4-Port, Option 419" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 11.

1. If not already done, connect step attenuator ribbon cables as follows:

   — N5245-60006 A38 port 1 source step attenuator to A23 test set motherboard J549

   — N5245-60006 A39 port 3 source step attenuator to A23 test set motherboard J547

   — N5245-60006 A40 port 4 source step attenuator to A23 test set motherboard J548

   — N5245-60006 A41 port 2 source step attenuator to A23 test set motherboard J546

   — N5247-60020 A46 port 1 receiver step attenuator to A23 test set motherboard J205

   — N5247-60020 A47 port 3 receiver step attenuator to A23 test set motherboard J206

   — N5247-60020 A48 port 4 receiver step attenuator to A23 test set motherboard J207

   — N5247-60020 A49 port 2 receiver step attenuator to A23 test set

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

motherboard J208.

2. If not already done, connect bias tee cable harnesses as follows:

    — N5247-60021 A42 port 1 bias tee to A23 test set motherboard J541

    — N5247-60021 A43 port 3 bias tee to A23 test set motherboard J543

    — N5247-60021 A44 port 4 bias tee to A23 test set motherboard J544

    — N5247-60021 A45 port 2 bias tee to A23 test set motherboard J542

Step 18. Install the Braces

Refer to Figure 8 for this step of the procedure. New parts are listed in Table 1 on page 11.

Figure 8   Brace Installation (0515-0372, 0515-0372, 0515-0380, N5247-20132, N5247-20133, N5247-20134)
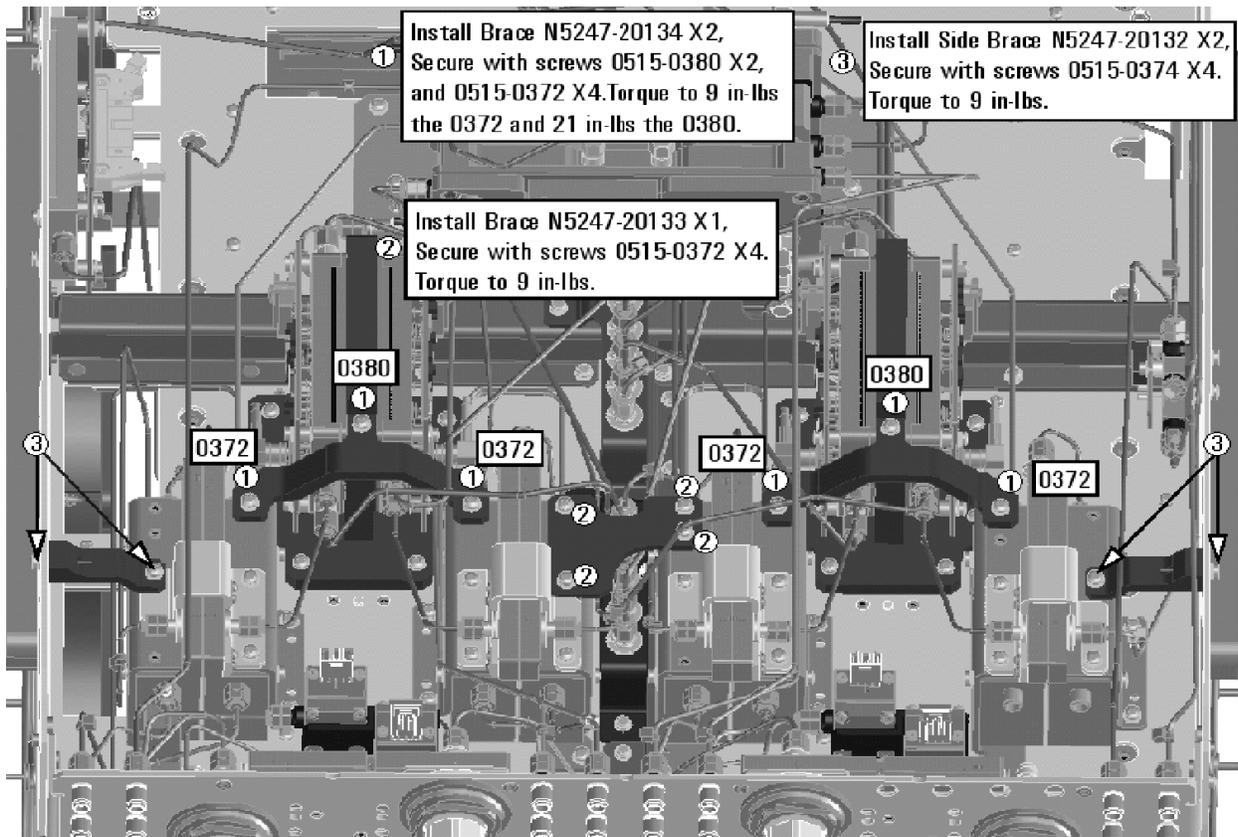
N5247_103_15

Step 19. 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[1].

Step 20. Install the New Lower Front Panel Overlay

Refer to Figure 6 on page 24 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 11.

1. Remove the protective backing from the new front panel overlay, N5227-80015 for "A" models and N5227-80028 for "B" models (item ①).

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. Be sure to install the two new screws (0515-1946) in the front panel, next to test ports 3 and 4. Torque these screws to 9 in-lbs.

Step 21. 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 22. Reinstall the Inner Cover

For instructions, click the Chapter 7 bookmark "Removing the Covers" in the PDF Service Guide[1].

Step 23. Reinstall the Outer Cover

For instructions, click the Chapter 7 bookmark "Removing the Covers" in the PDF Service Guide[1].

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

Step 24. Remove Option 401 License

NOTE	**IMPORTANT!** For A model instruments, skip to "Step 25. Enable Options 419".

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.

A Model Option 401 License Removal Procedure

For B models, refer to "B Model Option 401 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. In the **Select Desired Option** list, click **401**.
4. Click **Remove**.

B Model Option 401 License Removal Procedure

For B models, refer to "A Model Option 401 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 Keysight License Manager dialog box that appears, press or click **Yes** to confirm delete.
4. A message displays stating that the option removal was successful.

Step 25. Enable Options 419

Procedure Requirements

— 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 and mouse must be connected to the network analyzer.

For "A" models, refer to .

For "B" models refer to .

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 **419 - Src/Rcvr Atten & Bias Ts 4-Port**.

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 "419" 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 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.

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(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 6.

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 419 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 26. 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 References Adjustment should be repeated after the PNA has been able to warm up for three hours.

— 10 MHz frequency reference adjustment

— EE default adjustment: Synth LO only (Version 6 synthesizers)

— source adjustment

— IF gain adjustment

— receiver characterization

— receiver adjustment

— IF Response adjustment (For A model: Options 090, 093, or 094 Only. For B models: Options S93090xA/B, S93093A/B, or S93094A/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[1].

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

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

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.

Figure 9   EEPROM Backup Menu
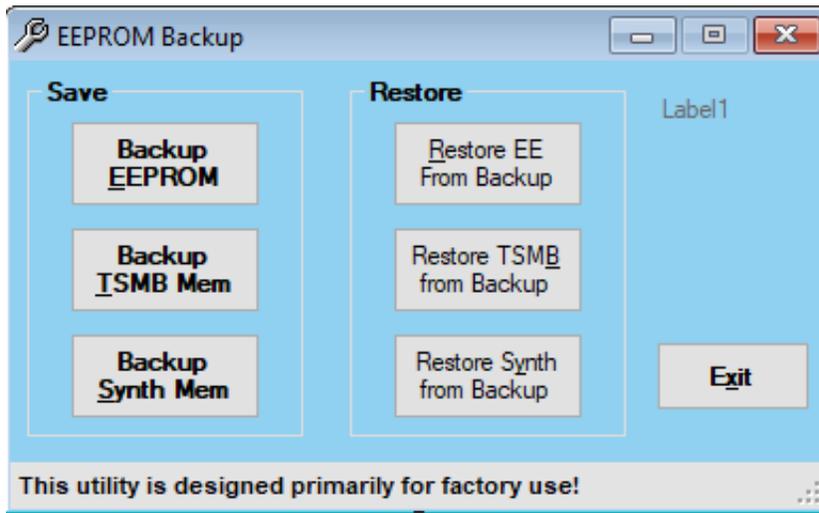
Operator's Check

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[1].

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[1].

Step 27. 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.