
Keysight Extended Power Range and Bias Tees Upgrade Kit

This manual provides documentation for the following models:

PNA-X N5247A/B Option 400/401 to 419

Upgrade Kit Order Number:
N5247AU-926 and N5247BU-419

Keysight Kit Number: N5247-60103

This is Installation Note is for upgrading the N5247A/B Microwave Network Analyzers from Option 400/401 to Option 419.

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CAUTION

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Keysight Extended Power Range and Bias Tees Upgrade Kit
Upgrade Kit Order Number: N5247AU-926 and N5247BU-419
Installation Note

Description of the Upgrade

This upgrade converts your standard 4-port configurable test set analyzer (N5247A/B Option 400/401) 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 N5247A/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.**

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 Guide¹.

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 Option 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 a license key from: <http://www.keysight.com/find/softwarelicense>. To complete the request, you will need to gather the following information:

- From the certificate
 - Order number
 - Certificate number
- From your instrument
 - 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) file from the Keysight Software Manager:

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

Getting Prepared

If you provide an email address, Keysight will promptly email your license key. Otherwise, you will receive your license key via postal mail.

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 Guide¹.

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
5/16-in (8 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 bulkhead 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 400/401
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 N5247-60103

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5247-90103
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	8	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 coupler assembly to port 2 attenuators assembly; 3 to attach port 3 coupler assembly to port 3 attenuators assembly; 3 to attach port 4 coupler assembly to port 4 attenuators assembly; 3 to attach port 1 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); 1 to secure W144 (N5247-20071).	8	1400-0249
-	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
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

Items Included in the Upgrade Kit

Table 1 **Contents of Upgrade Kit N5247-60103**

Ref Desig.	Description	Qty	Part Number
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	N5247-20081
W104	RF cable, A33 port 1 coupler to A42 port 1 bias tee	1	N5247-20022
W105	RF cable, A30 port 3 reference 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	N5247-20010
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
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

Table 1 Contents of Upgrade Kit N5247-60103

Ref Desig.	Description	Qty	Part Number
--	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 Coupler Assemblies from the Test Set Deck."
- "Step 7. Swap Brackets on the Port 1 and Port 2 Coupler Assemblies."
- "Step 8. Assemble the Port 2 and Port 3 Step Attenuators."
- "Step 9. Install the Step Attenuators."
- "Step 10. Reinstall the Port 2 and Port 3 Coupler Assemblies."
- "Step 11. Remove Port 3 and Port 4 Coupler Assemblies from the Test Set Deck."
- "Step 12. Swap Brackets on the Port 3 and Port 4 Coupler Assemblies."
- "Step 13. Assemble the Port 1 and Port 4 Step Attenuators."
- "Step 14. Install the Step Attenuators."
- "Step 15. Reinstall the Port 3 and Port 4 Coupler Assemblies."
- "Step 16. Assemble the Bias Tees."
- "Step 17. Install the Bias Tee Assemblies."
- "Step 18. Install Some Bottom-Side (Test Set) Cables."
- "Step 19. Install the Braces."
- "Step 20. 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. Enable Options 419.”

“Step 25. Perform Post-Upgrade Adjustments and Calibration.”

“Step 26. Prepare the PNA for the User.”

Step 1. Obtain a Keyword and Verify the Information

Follow the instructions on the Option 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 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 (A models) or license key file (B models), 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 Guide¹.

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 Guide¹.

Step 5. Remove Some Bottom-Side (Test Set) Cables

NOTE

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.**

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 cables in the following two lists in the order shown. To see an image showing the location of these cables, click the Chapter 6 bookmark "Bottom RF Cables, Standard 4-Port Configuration, Option 400/401 (S/N Prefixes <6021)" or "Bottom RF Cables, Standard 4-Port Configuration, Option 400/401 (S/N Prefixes ≥6021)" in the PDF Service Guide¹. 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
 - 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
 - W30 (N5247-20052) A63 port 2 70 GHz doubler to A32 port 2 reference coupler
 - W31 (N5247-20037) A29 port 1 ref coupler to front-panel port 1 SOURCE OUT
 - W32 (N5247-20016) Port 1 CPLR THRU to A33 port 1 coupler
 - W33 (N5247-20078) A29 port 1 reference coupler to A37 reference mixer switch
 - W35 (N5247-20023) A30 port 3 ref coupler to front-panel port 3 SOURCE OUT
 - W36 (N5247-20006) Port 3 CPLR THRU to A34 port 3 coupler
 - W37 (N5247-20077) A30 port 3 ref coupler to front-panel REF 3 SOURCE OUT

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

- W39 (N5247-20035) A31 port 4 ref coupler to front-panel port 4 SOURCE OUT
- W40 (N5247-20017) Port 4 CPLR THRU to A35 port 4 coupler
- W41 (N5247-20075) A31 port 4 ref coupler to front-panel REF 4 SOURCE OUT
- 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
- W45 (N5247-20076) A32 port 2 ref coupler to front-panel REF 2 SOURCE OUT
- W47 (N5247-20053) Port 1 RCVR A IN to A27 mixer brick (A)
- W48 (N5247-20063) Port 3 RCVR C IN to A28 mixer brick (C)
- W49 (N5247-20073) Port 4 RCVR D IN to A28 mixer brick (D)
- W50 (N5247-20054) Port 2 RCVR B IN to A27 mixer brick (B)
- W56 (N5247-20055) REF 2 RCVR R2 IN to A27 mixer brick (R2)

These cables must be saved - they will be reinstalled.

- 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
- W22 (N5247-20068) A62 port 4 70 GHZ doubler to W21
- W34 (N5247-20082) A33 port 1 coupler to front-panel port 1 CPLR ARM
- W38 (N5247-20007) A34 port 3 coupler to front-panel port 3 CPLR ARM
- W42 (N5247-20026) A35 port 4 coupler to front-panel port 4 CPLR ARM
- W46 (N5247-20019) A36 port 2 coupler to front-panel port 2 CPLR ARM
- W54 (N5247-20062) REF 3 RCVR R3 IN to A28 mixer brick (R3)
- W55 (N5247-20067) REF 4 RCVR R4 IN to 3 dB pad on A28 mixer brick (R4)
- W62 (N5247-20111) Port 4 CPLR THRU to A44 port 4 bias tee
- W66 (N5247-20109) W65 to rear-panel EXT TSET DRIVE RF OUT (J6)
- W68 (N5247-20088) rear-panel port RF2 OUT (J12) to W67
- W69 (N5247-20112) A27 mixer brick to EXT TSET DRIVE LO OUT (J5)

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 Coupler Assemblies from the Test Set Deck

For instructions on removing the coupler assemblies, click the Chapter 7 bookmark “Removing and Replacing the A29-A32 Reference Couplers and Reference Coupler Mounting Brackets” in the PDF Service Guide¹. Save the parts for reinstallation later.

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

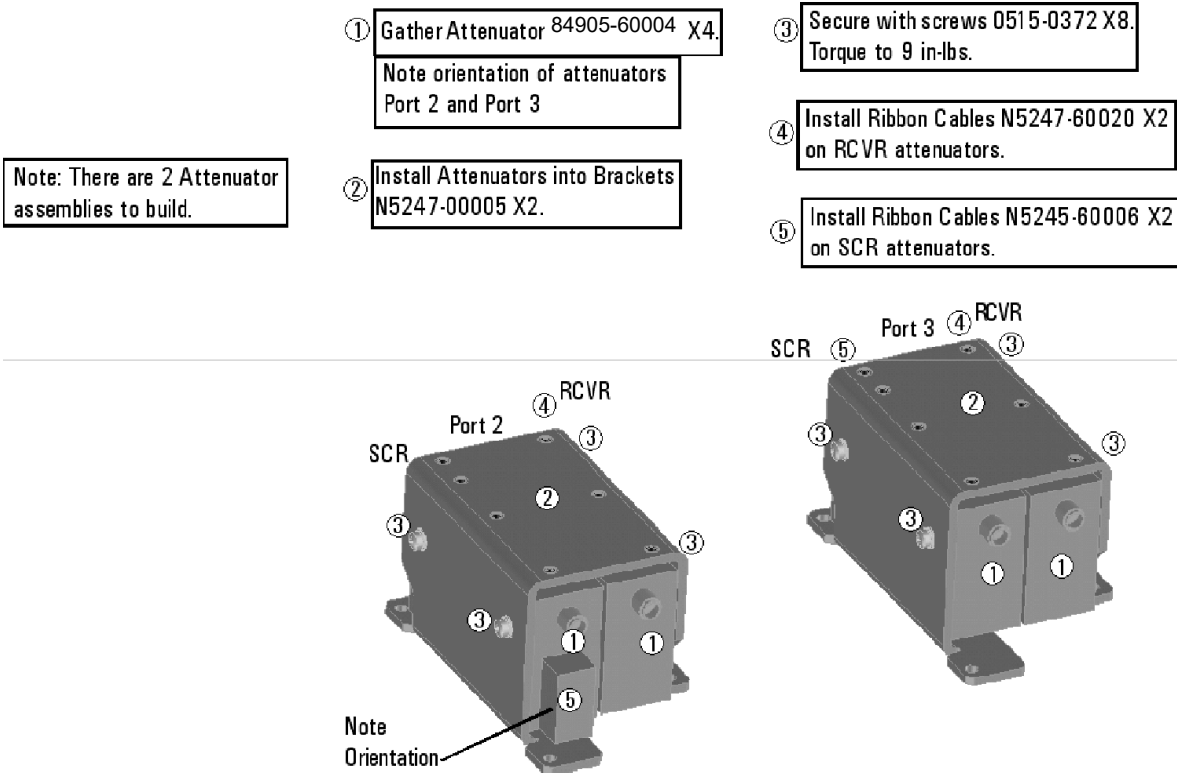
Remove the brackets from the coupler assemblies being careful to remember which bracket was removed from each coupler. Reinstall the bracket that had been installed on the Port 1 Coupler Assembly onto the Port 2 Coupler Assembly. Next, reinstall the bracket that had been installed on the Port 2 Coupler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

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

Step 8. 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.

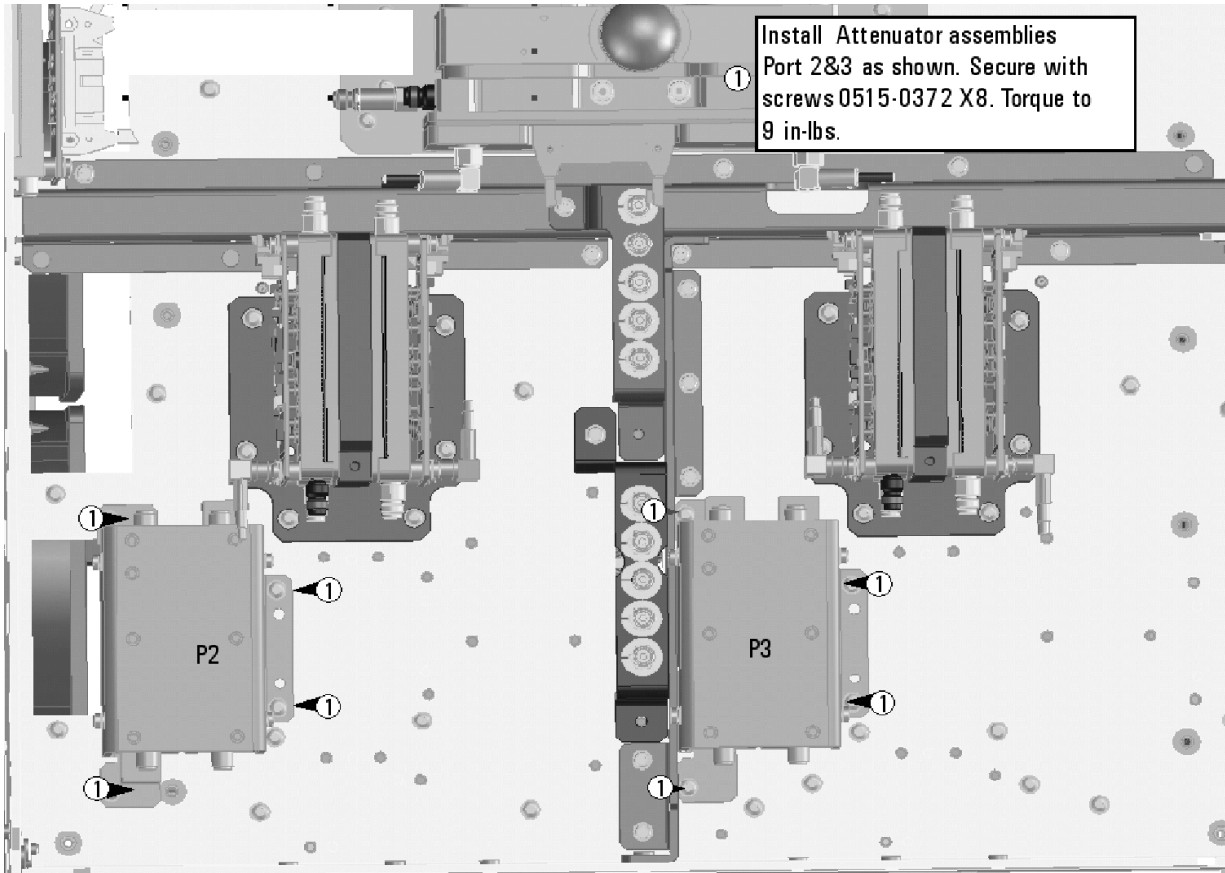
Figure 1 Port 2 and Port 3 Step Attenuators Assembly (0515-0372, 84905-60004, N5247-00005, N5247-60006, N5247-60020)



Step 9. Install the 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)

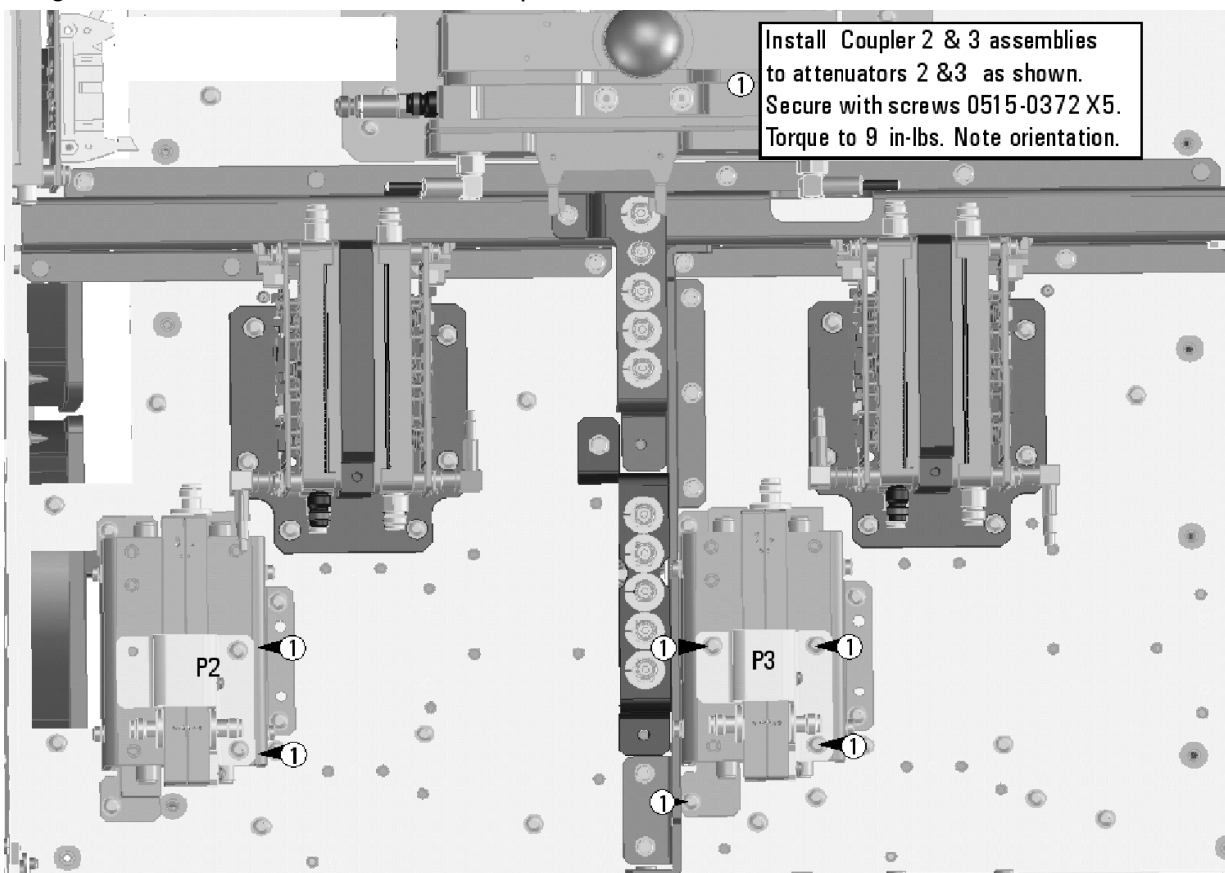


N5247_103_02

Step 10. Reinstall the Port 2 and Port 3 Coupler Assemblies

Refer to **Figure 3** for this step of the procedure. Use a T-10 TORX driver to tighten all screws.

Figure 3 Port 2 and Port 3 Coupler Assemblies Reinstallation (0515-0372)



N5247_103_03

Step 11. Remove Port 3 and Port 4 Coupler Assemblies from the Test Set Deck

For instructions on removing the coupler assemblies, click the Chapter 7 bookmark “Removing and Replacing the A29–A32 Reference Couplers and Reference Coupler Mounting Brackets” in the PDF Service Guide¹. Save the parts for reinstallation later.

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

Step 12. Swap Brackets on the Port 3 and Port 4 Coupler Assemblies

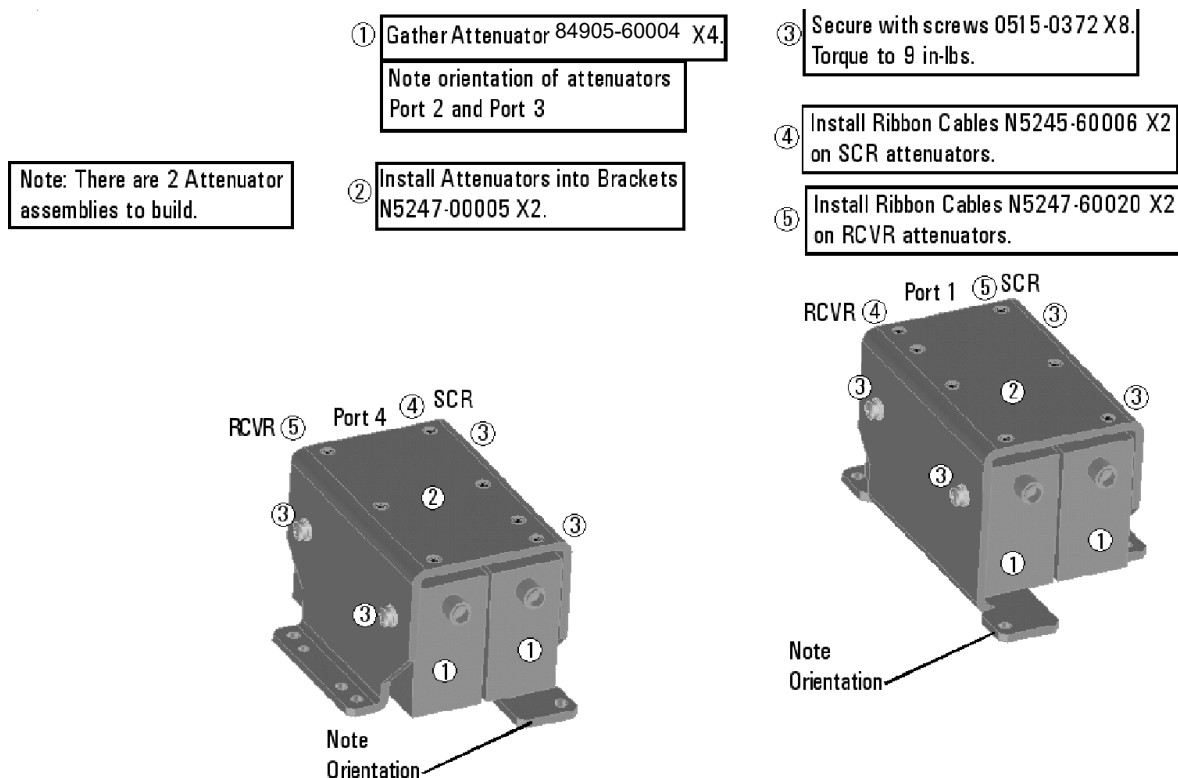
Remove the brackets from the coupler assemblies being careful to remember which bracket was removed from each coupler. Reinstall the bracket that had been installed on the Port 1 Coupler Assembly onto the Port 2 Coupler Assembly. Next, reinstall the bracket that had been installed on the Port 2 Coupler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

Step 13. Assemble the Port 1 and Port 4 Step Attenuators

Refer to **Figure 4** 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 4

Port 1 and Port 4 Step Attenuators Assembly (0515-0372, 84905-60004, N5247-00005, N5247-60006, N5247-60020)

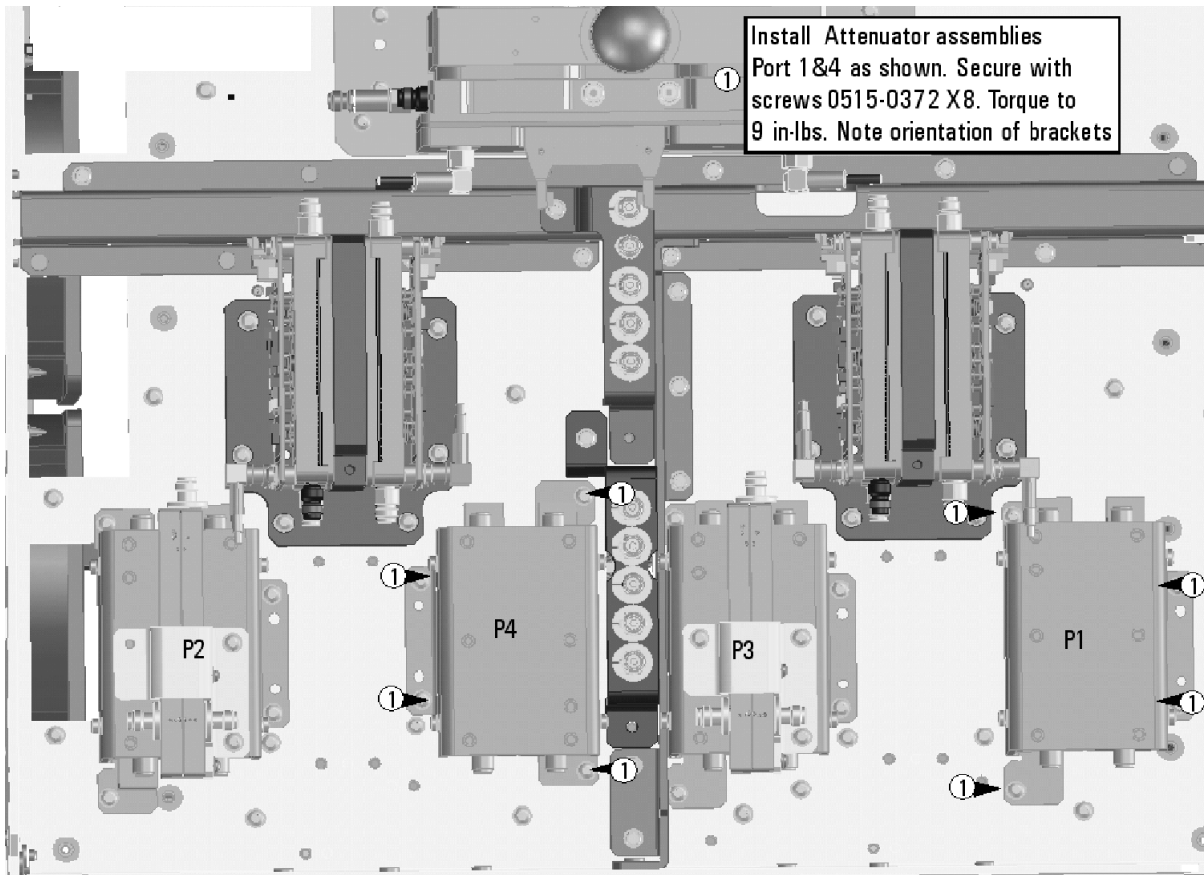


N5247_103_04

Step 14. Install the Step Attenuators

Refer to **Figure 5** 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 5 Port 1 and Port 4 Step Attenuators Installation (0515-0372)



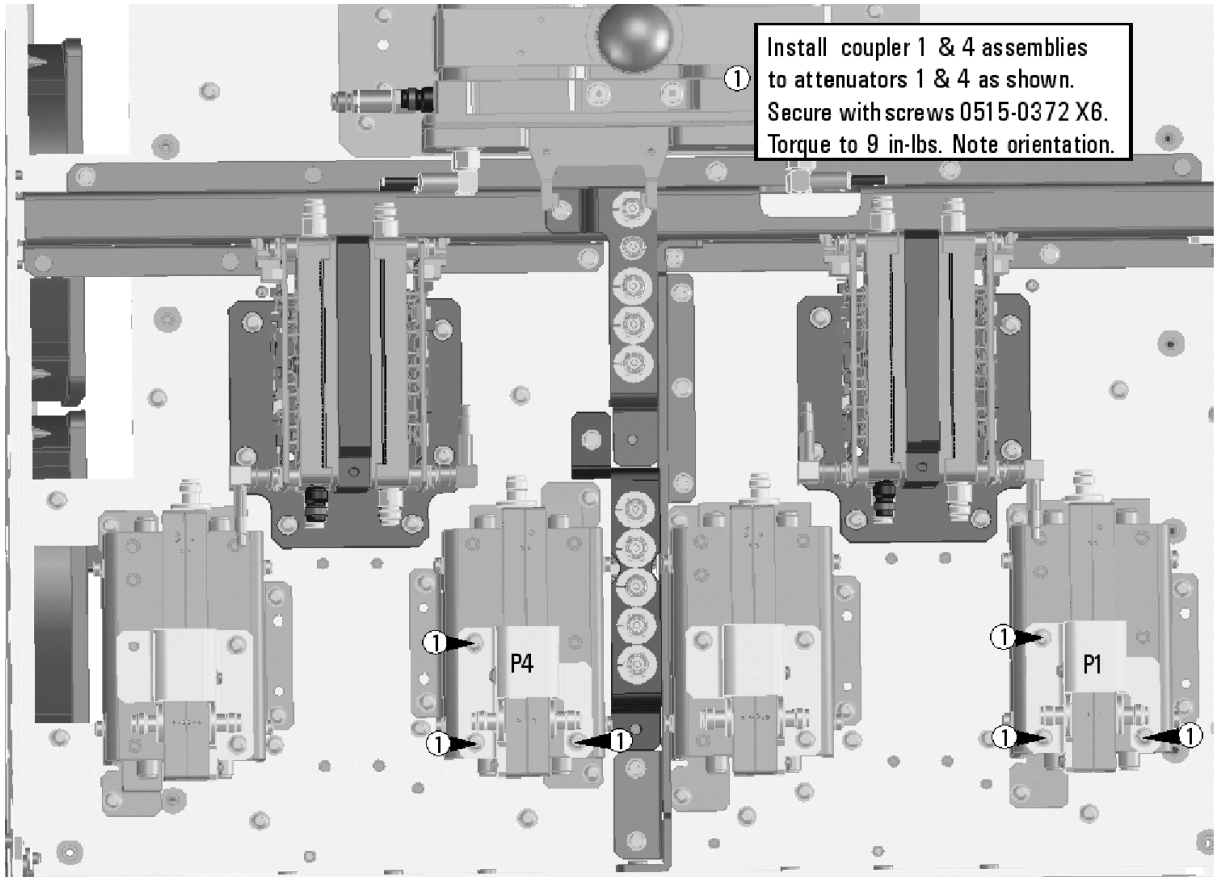
N5247_103_05

Step 15. Reinstall the Port 3 and Port 4 Coupler Assemblies

Refer to **Figure 6** for this step of the procedure. Use a T-10 TORX driver to tighten all screws.

Figure 6

Port 3 and Port 4 Coupler Assemblies Reinstallation (0515-0372)



N5247_103_06

Step 16. Assemble the Bias Tees

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

Figure 7

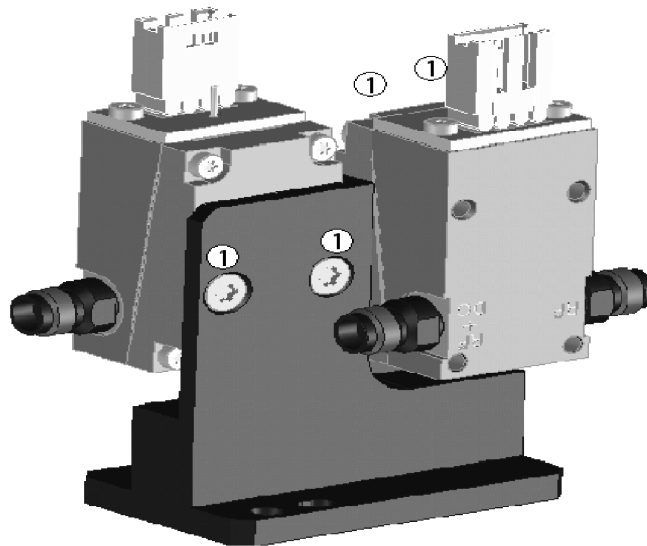
Bias Tees Assembly (0515-1227, 5087-7732, N5247-20129)

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.

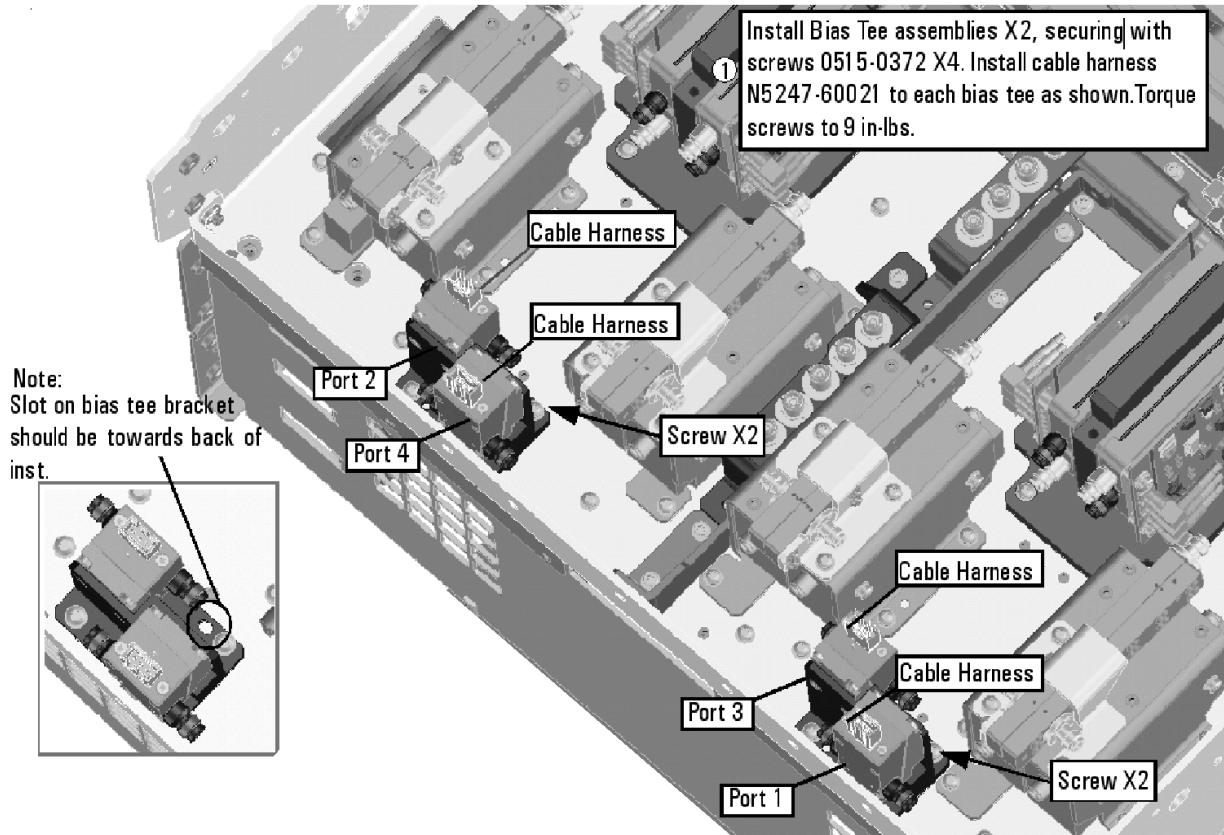
Note: Orientation of Bracket and Bias Tee.



Step 17. Install the Bias Tee Assemblies

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

Figure 8 Bias Tee Installation (0515-0372, N5247-60021)



Step 18. 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 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.

Install the Semirigid 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)” or “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**.

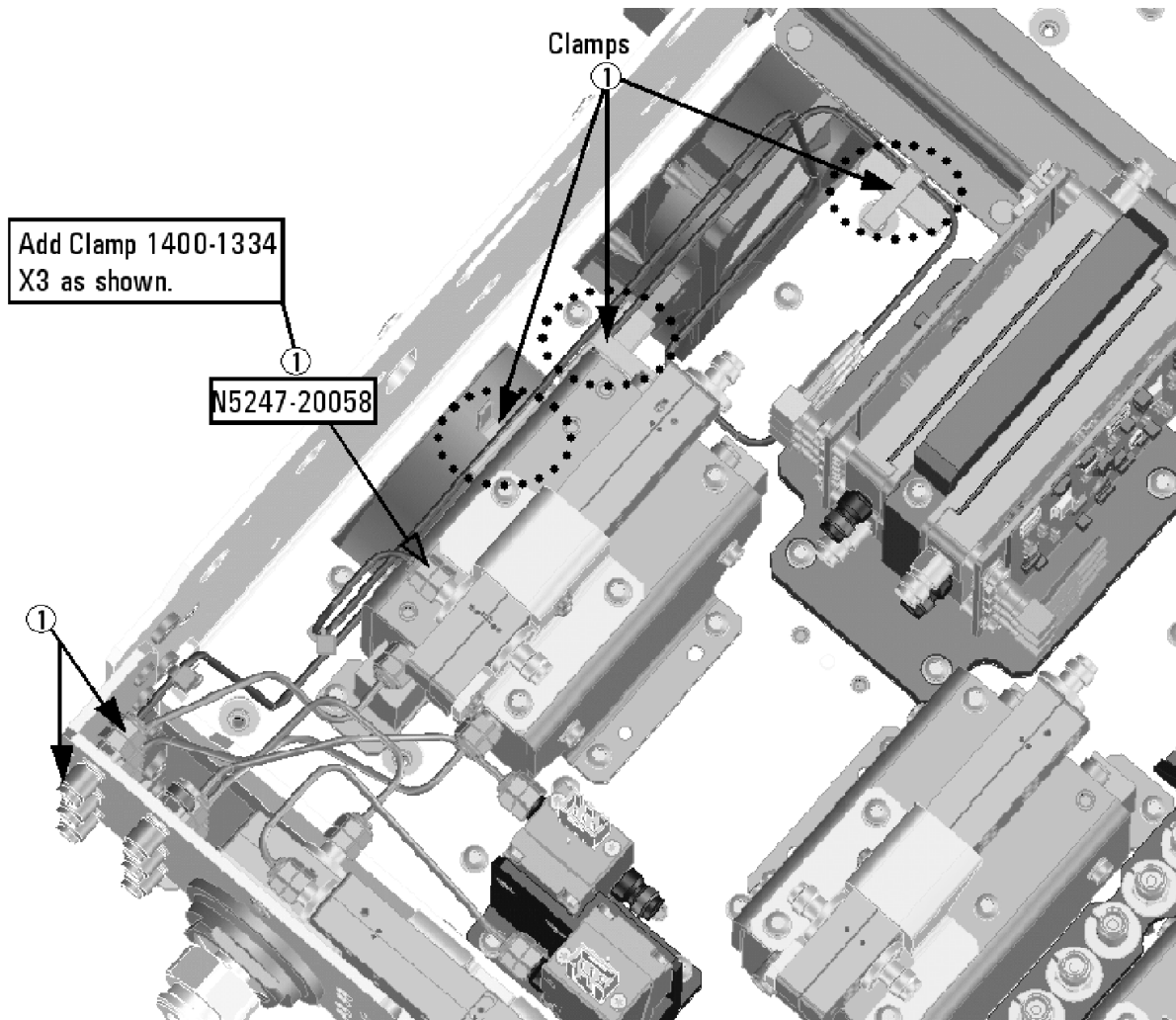
Install the following new cables in the order listed.

- W69 (reuse) (N5247-20112) A27 mixer brick to EXT TSET DRIVE LO OUT (J5)
- W66 (reuse) (N5247-20109) W65 to rear-panel EXT TSET DRIVE RF OUT (J6)
- W68 (reuse) (N5247-20088) Rear-panel port RF2 OUT (J12) to W67
- W123(N5247-20020) Port 2 RCVR B IN to A49 port 2 receiver attenuator
- W46 (reuse) (N5247-20019) A36 port 2 coupler to front-panel port 2 CPLR ARM
- 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 9**, install three clamps, part number 1400-1334, to secure W146.

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

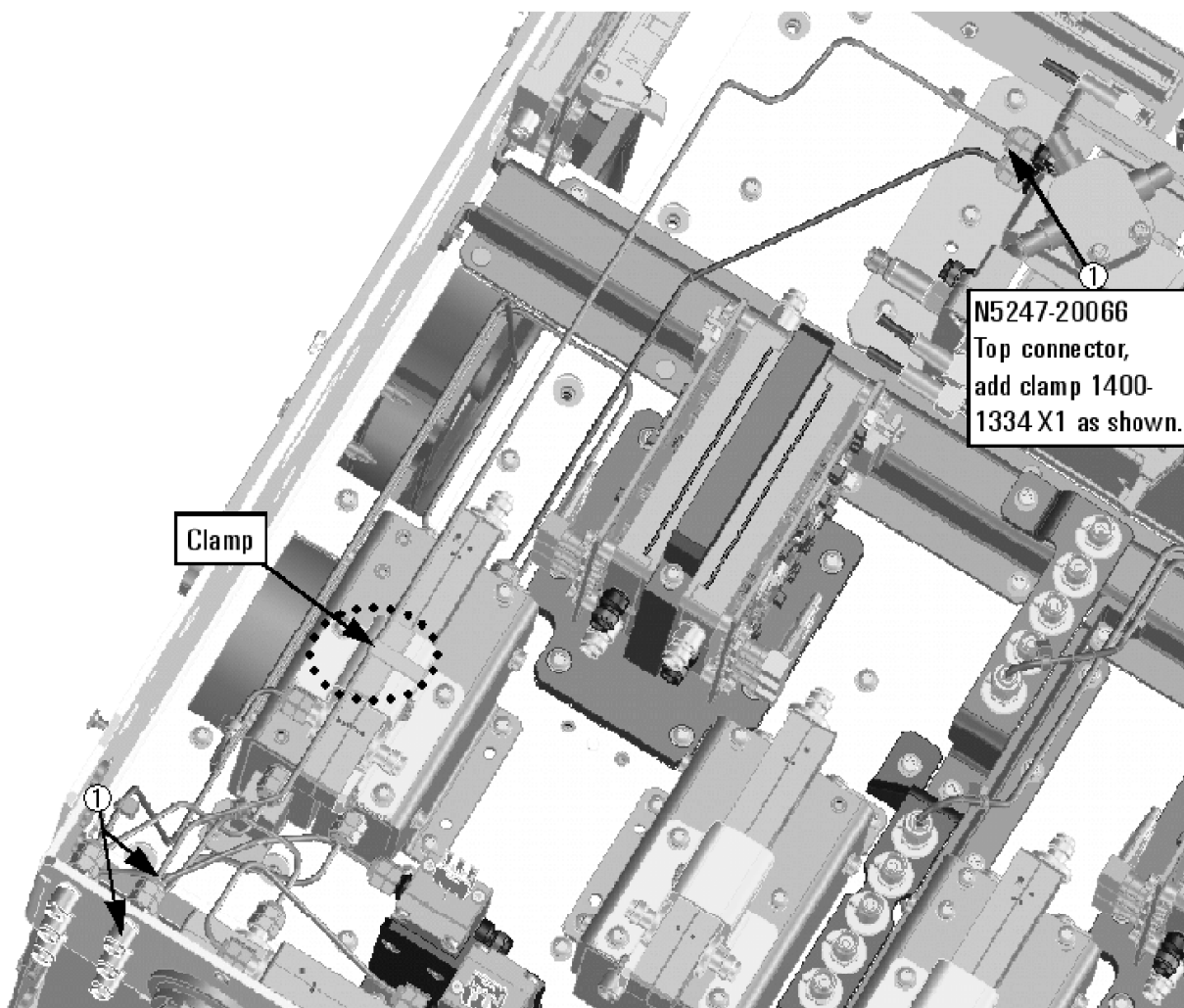
Figure 9 Location of Cable Clamps to Secure W146 (1400-1334, N5247-20058)



- 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 10**, install one clamp, part number 1400-1334, to secure W145 (N5245-20066).

Figure 10 Location of Cable Clamp to Secure W145 (N5247-20066)

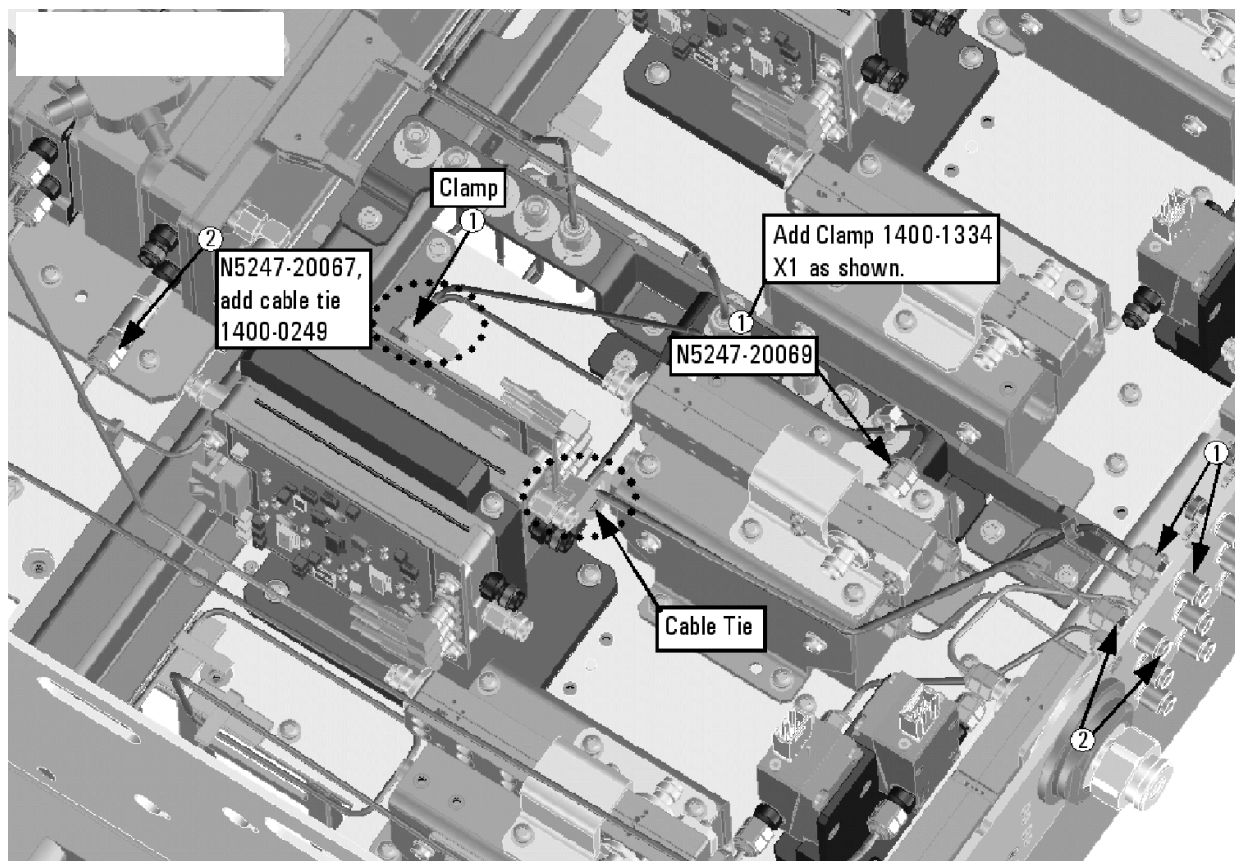


N5247_103_10

- 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
- W42 (reuse) (N5247-20026) A35 port 4 coupler to front-panel port 4 CPLR ARM
- 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
- W55 (reuse) (N5247-20067) REF 4 RCVR R4 IN to 3 dB pad on A28 mixer brick (R4)

* As shown in **Figure 11**, install one clamp, part number 1400-1334, to secure W41 (N5247-20069), and install one cable tie, part number 1400-0249, to secure W55 (N5247-20067).

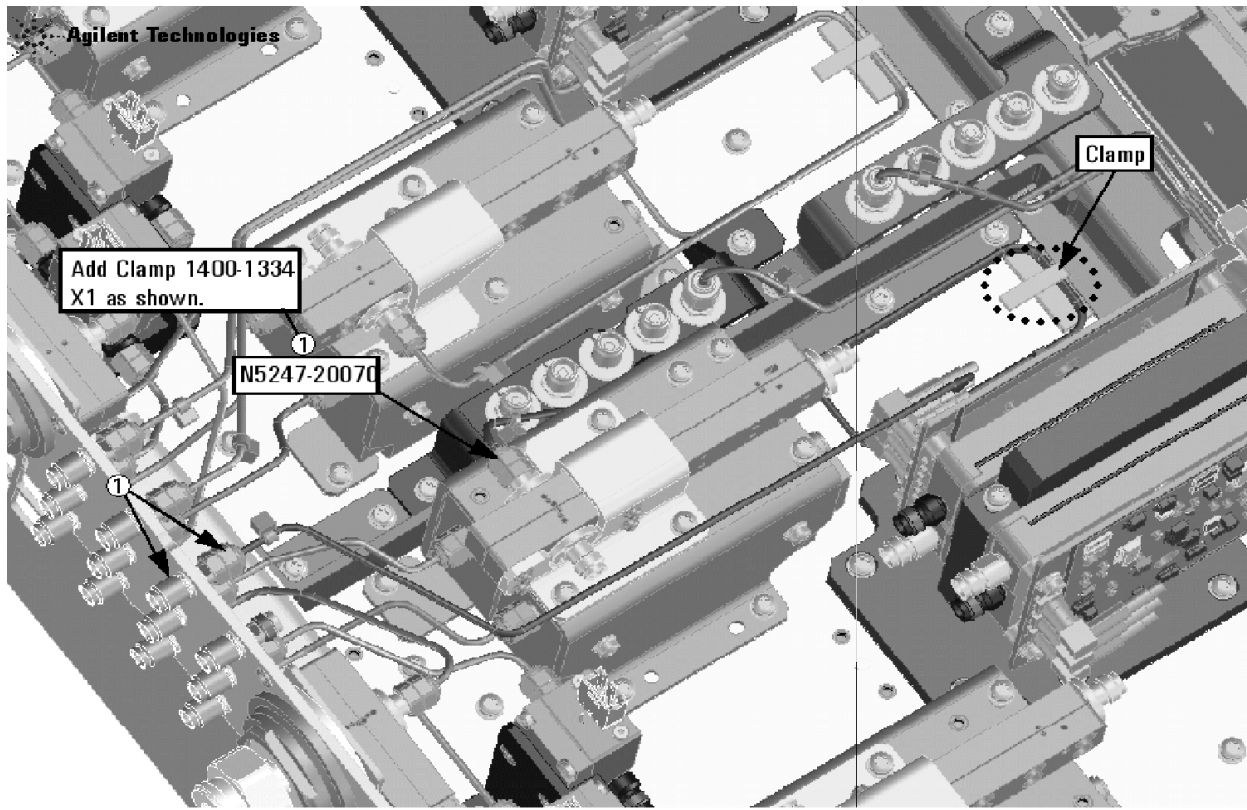
Figure 11 Location of Cable Clamp to Secure W41 (N5247-20069) and Cable Tie to Secure W55 (N5247-20067)



- 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
- W38 (reuse) (N5247-20007) A34 port 3 coupler to front-panel port 3 CPLR ARM
- W106 (N5247-20009) A39 port 3 source attenuator to front-panel port 3 SOURCE OUT
- W103(N5247-20081) 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 12**, install one clamp, part number 1400-1334, to secure W37 (N5247-20070).

Figure 12 Location of Cable Clamp to Secure W37 (N5247-20070)

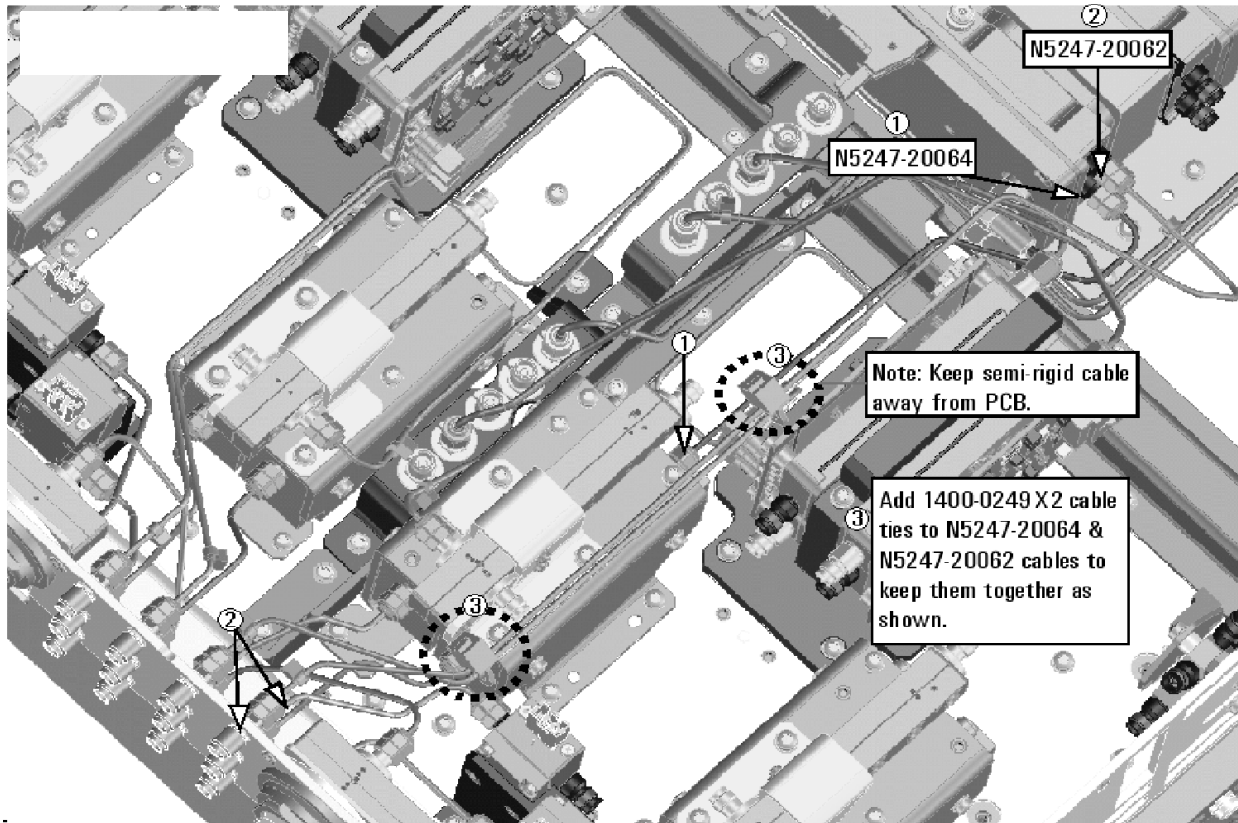


N5247_103_12

- W18 (reuse) (N5247-20084) A61 port 3 70 GHZ doubler to W17
- W120 (N5247-20064) A47 port 3 receiver attenuator to A28 mixer brick (C)
- W54 (reuse) (N5247-20062) REF 3 RCVR R3 IN to A28 mixer brick (R3)

* As shown in **Figure 13**, install 2 cable ties, part number 1400-0249, to secure W120 (N5247-20064) and W54 (N5247-20062).

Figure 13 Location of Cable Ties to Secure W120 (N5247-20064) and W54 (N5247-20062)

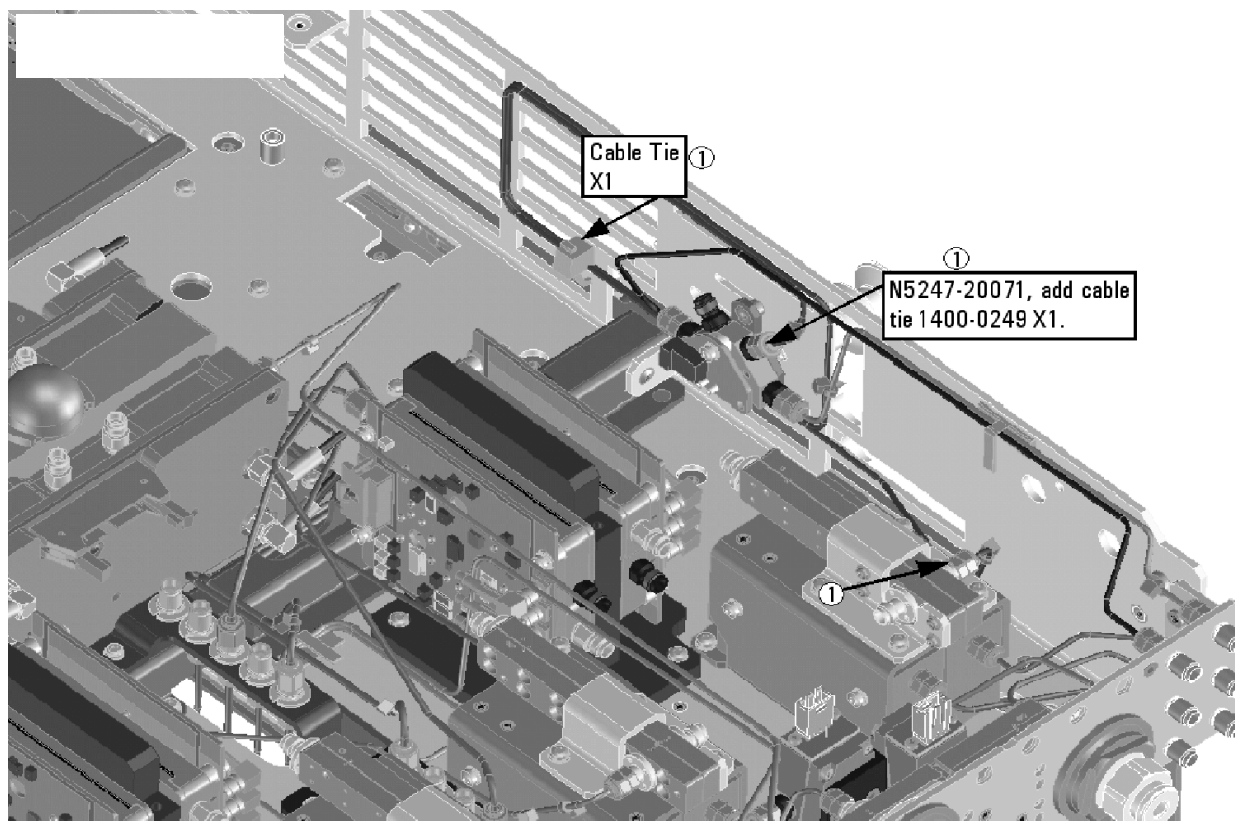


N5247 103 13

- W107 (N5247-20010) Port 3 CPLR THRU to A43 port 3 bias tee
- W34 (reuse) (N5247-20082) A33 port 1 coupler to front-panel port 1 CPLR ARM
- 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 14**, install 2 cable ties, part number 1400-0249, to secure W144 (N5247-20071).

Figure 14 Location of Cable Ties to Secure W144 (N5247-20071)



N5247-103-14

- 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
- W105 (N5247-20083)A30 port 3 reference coupler to A39 port 3 source attenuator
- W109(N5247-20083)A31 port 4 reference coupler to A40 port 4 source attenuator
- W27 (N5247-20044)A60 port 1 70 GHz doubler to A29 port 1 reference couple
- 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

- 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
- W30 (N5247-20043) A63 port 2 70 GHz doubler to A32 port 2 reference coupler
- W22 (reuse) (N5247-20068) A62 port 4 70 GHz doubler to W21
- W62 (reuse) (N5247-20111) Port 4 CPLR THRU to A44 port 4 bias tee

Install the Ribbon Cables and Wire Harnesses

CAUTION

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

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 Guide¹. New parts are listed in **Table 1 on page 11**.

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

- A38 port 1 source step attenuator to A23 test set motherboard J549
- A39 port 3 source step attenuator to A23 test set motherboard J547
- A40 port 4 source step attenuator to A23 test set motherboard J548
- A41 port 2 source step attenuator to A23 test set motherboard J546
- A46 port 1 receiver step attenuator to A23 test set motherboard J205
- A47 port 3 receiver step attenuator to A23 test set motherboard J206
- A48 port 4 receiver step attenuator to A23 test set motherboard J207
- A49 port 2 receiver step attenuator to A23 test set motherboard J208.

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

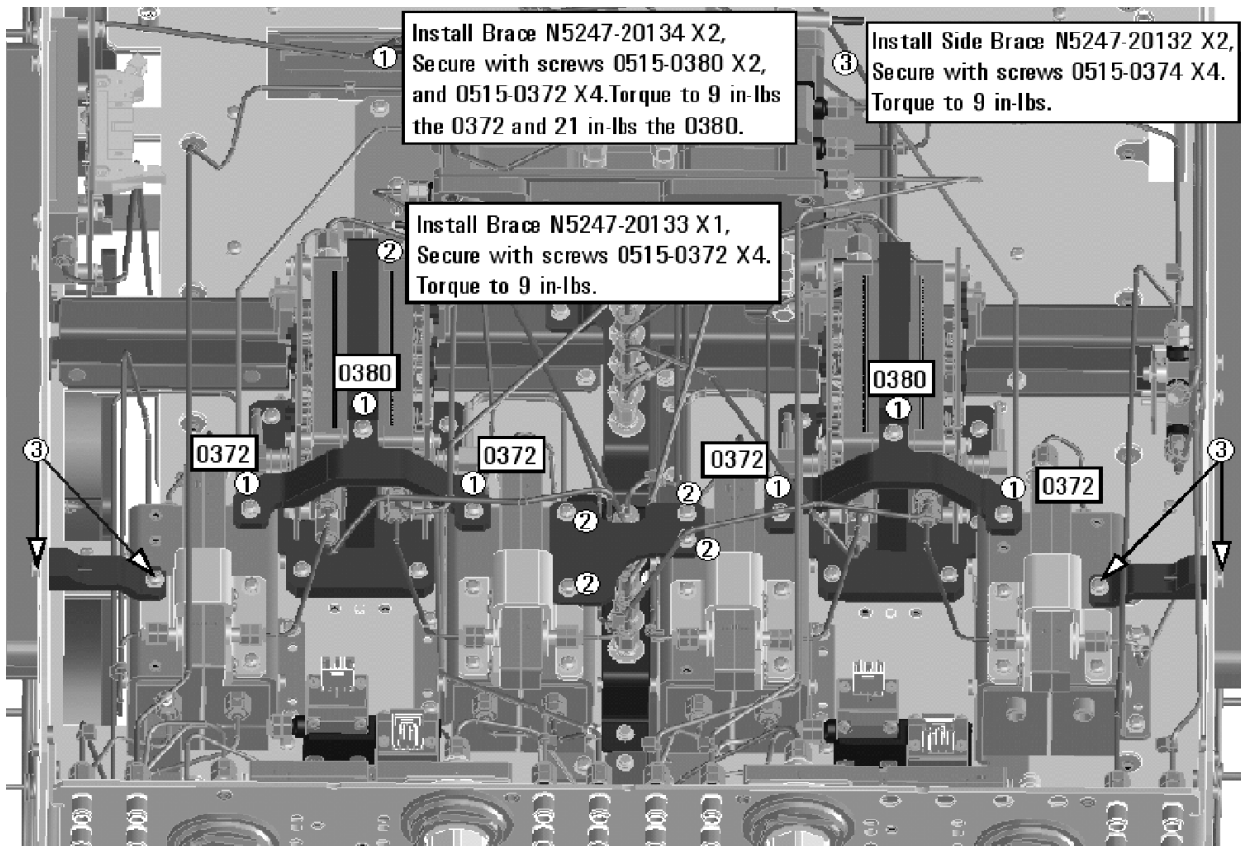
- A42 port 1 bias tee to A23 test set motherboard J541
- A43 port 3 bias tee to A23 test set motherboard J543
- A44 port 4 bias tee to A23 test set motherboard J544
- A45 port 2 bias tee to A23 test set motherboard J542

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

Step 19. Install the Braces

Refer to **Figure 15** for this step of the procedure. New parts are listed in **Table 1** on page 11.

Figure 15 **Brace Installation (0515-0372, 0515-0374, 0515-0380, N5247-20132, N5247-20133, N5247-20134)**



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 Guide¹.

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 Guide¹.

Step 23. Reinstall the Outer Cover

For instructions, click the Chapter 7 bookmark “Removing the Covers” in the PDF Service Guide¹.

Step 24. 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 **“Option Enable Procedure for “A” Model Instruments” on page 36.**

For “B” models refer to **“Option Enable Procedure for “B” Model Instruments” on page 37.**

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 has not been enabled, 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 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 25. 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.

- 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
- 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 Guide¹.

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.

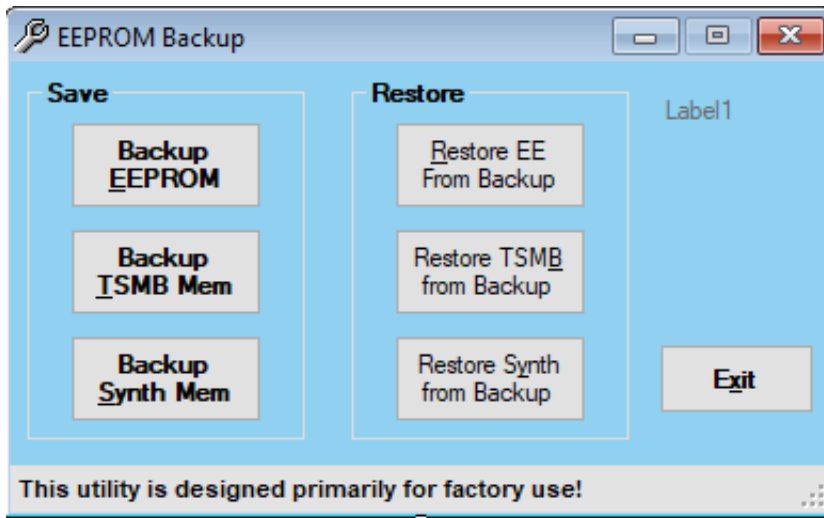
The adjustments listed here generate new correction constants. The analyzer must have a backup of this new data in case any of the data becomes corrupted.

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.

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

Figure 16 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 Guide¹.

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 Guide¹.

Step 26. 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.

