
Keysight Add 4-Port Capability For Version 6, Single- Source Synthesizers Upgrade Kit

To Upgrade PNA-X N5244B or
N5245B Option 217 to Option 417

For Analyzers with Serial Numbers
Prefixed MY/SG/US5201 and
Above

Upgrade Kit Order Number:
N5244BU-617 and N5245BU-617

Keysight Kit Number: N5245-60120

This is an Installation Note for the N5244/45B Option 217 to 417 Microwave Vector Network Analyzers
with serial numbers prefixed MY/SG/US5201 and above.

Notices

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CAUTION

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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.

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**.



Description of the Upgrade

NOTE

IMPORTANT!

This document uses PNA to describe Keysight's PNA/PNA-L/PNA-X network analyzer family. Refer to your instrument to identify your specific model.

NOTE

If you had an A model PNA-X with Option 219/419 with Option H85 that was upgraded to a B model, please refer to Options 217/417. If you had an A model PNA-X with Option 224/423 with Option H85 that was upgraded to a B model then refer to Option 222/422.

This upgrade converts your N5244B or N5245B Option 217 2-port analyzer to a N5244B or N5245B Option 417 4-port analyzer by adding:

- an additional source
- an additional source synthesizer
- two additional doublers
- an additional mixer brick
- two additional reference couplers
- two additional test port couplers
- two additional source attenuators
- two additional receiver attenuators
- a splitter
- a modified front panel
- many 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.**

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.

NOTE

IMPORTANT!

- This document contains references to legacy A27/A28 mixer brick assemblies. Your model instrument may have either legacy assemblies or the new parts installed.
 - Your A27/A28 mixer brick might be a legacy part number 5087-7323 (with (x2) discrete 3dB attenuators 08490-60010) or new part number 5087-7417 (with integrated 3 dB attenuators).
 - See also your instrument's PDF Service Guide ^a.
-

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

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-X 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-X Service Guide” on page 9](#).

License Key Redemption

NOTE

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

If you are unfamiliar with the licensing process, refer to <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 file for the instrument that will receive the option.

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

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

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

- From the certificate
 - Order number
 - Certificate number
- From your instrument

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

- Model number
- Serial number

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

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

You will need to provide an email address, to which Keysight will promptly email your license key file. Refer to **“License Key Redemption” on page 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–X 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-6 TORX driver - set to 4 in-lbs (0.45 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-in (25.4 mm) torque wrench - set to 72 in-lbs (8.15 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	N5244B and N5245B Option 217
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 Kit¹

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 N5245-60120

Ref Desig.	Description	Qty	Part Number
-	Installation note (this document)	1	N5245-90120
-	Software Entitlement Certificate	1	5964-5145
-	China RoHS Addendum	1	9320-6722
A10	26.5 GHz source (2) assembly	1	5087-7780
A12	Doubler assembly, port 3	2	5087-7349
A13	Doubler assembly, port 4		
A17	13.5 GHz source 2 synthesizer board	1	N5240-60074
A26	Splitter	1	5067-4086
A28	Mixer brick (2)	1	5087-7417
A30	Test port 3 reference coupler	2	5087-7760
A31	Test port 4 reference coupler		
A34	Test port 3 coupler	2	5087-7793
A35	Test port 4 coupler		
A39	Test port 3 source attenuator	2	33325-60022
A40	Test port 4 source attenuator		
A47	Test port 3 receiver attenuator	2	33325-60023
A48	Test port 4 receiver attenuator		
A69	3 dB pad, attached to R4 connector on A28 mixer brick	1	08490-60010
-	Test set front plate, 4-port	1	N5224-00005
-	Machine screw, M3.0 x 8, pan head (3 to attach shield to mixer brick; 8 to attach 2 src attn and 2 rcvr attn to brackets; 1 to attach cable bracket to deck)	12	0515-0372
-	Machine screw, M3.0 x 10, pan head (4 to attach 2 reference coupler/bracket assemblies to deck)	4	0515-0374

1. In addition to the upgrade kit, the shipment includes an Software Entitlement Certificate. Refer to **“License Key Redemption” on page 8** for important information about this certificate.

Description of the Upgrade
Items Included in the Upgrade Kit

Table 1 **Contents of Upgrade Kit N5245-60120**

Ref Desig.	Description	Qty	Part Number
-	Machine screw, M4.0 x 10, pan head (2 to attach source 2 to chassis; 2 to attach A12 doubler 3 to chassis; 2 to attach A13 doubler 4 to chassis)	7	0515-0380
-	Machine screw, M3.0 x 6, pan head (4 to attach 2 receiver attenuator/bracket assy. to deck; 4 to attach 2 source attenuator/bracket assy to deck)	8	0515-0430
-	Machine screw, M3.0 x 18, pan head (to attach A10 26.5 GHz source(2) to bracket)	1	0515-0666
-	Machine screw, M3.0 x 25, pan head (to attach mixer brick A28 to mounting block	3	0515-0667
-	Machine screw, M2.0 x 6, flat head (8 to attach 2 reference couplers to brackets)	8	0515-1602
-	Machine screw, 90-DEG-flat-HD, M4.0 x 10, pan head (attach dress panel near ports 3 and 4 to coupler plate)	2	0515-1946
-	Machine screw, M2.5 x 16, pan head (to attach splitter to mixer brick)	2	0515-2007
-	Machine screw, 90-DEG-flat-HD W/PATCH-LK, M3.0 x 20, pan head (attach A10 26.5 GHz source to bracket)	2	0515-2078
-	Dress panel, lower 4-port	1	N5240-00009
-	Front panel overlay, 4-port (Option 417)	1	N5242-80031
-	Gap pad (between each coupler and test set front sub panel)	4	E4403-20033
-	Gap pad (between mixer brick A28 and shield)	4	N5245-20125
-	Bracket, source (Attach bracket to A10 Source 2)	1	N5247-20136
-	Shield, mixer brick	1	N5245-00023
-	50 ohm load, (attach 1 to W58 (N5245-20095); attach 1 to A25 doubler assembly port 4)	1	1250-4261
-	Vibration mount (between couplers 1 & 3, and 2 & 4)	2	0460-2725
-	Mounting nuts (for port 3 & 4 test port couplers)	2	5022-1087
-	Cable guard, center jumper cables	1	N5242-00049
-	Cable tie wrap, 1 to secure W21 (N5245-20008) to side of deck	5	1400-0249
-	Cable clamp, 1 to secure W25 (N5245-20116) to deck	5	1400-1334
-	Bracket for reference coupler	2	N5245-00017
-	Bracket for cables	1	N5245-00022
-	Bracket (For A47 port 3 & A48 port 4 receiver attenuators & A39 & A40 source attenuators.)	4	N5245-00015
-	Dust caps for test ports	4	1401-0214
W2	A10 (source 2) P1 to A17 13.5 GHz source (2) synthesizer J1207	1	N5245-20100

Description of the Upgrade
Items Included in the Upgrade Kit

Table 1 **Contents of Upgrade Kit N5245-60120**

Ref Desig.	Description	Qty	Part Number
W7	A10 (source 2) P5 to A12 port 3 doubler	1	N5245-20034
W8	A10 (source 2) P3 to A13 port 4 doubler	1	N5245-20035
W9	A10 (source 2) P4 to A12 port 3 doubler	1	N5245-20032
W10	A12 port 3 doubler to A13 port 4 doubler	1	N5245-20033
W13	A12 port 3 doubler to W14	1	N5245-20036
W14	A30 port 3 reference coupler to W13	1	N5245-20043
W15	A13 port 4 doubler to W16	1	N5245-20036
W16	A31 port 4 reference coupler to W15	1	N5245-20044
W20	Port 1 CPLR THRU to A33 port 1 coupler	1	N5245-20099
W21	A29 port 1 reference coupler to A37 reference mixer switch	1	N5245-20008
W22	A33 port 1 coupler to front-panel Port 1 CPLR ARM	1	N5245-20014
W24	Port 3 CPLR THRU to A34 port 3 coupler	1	N5245-20098
W25	A30 port 3 ref coupler to front-panel REF 3 SOURCE OUT	1	N5245-20116
W26	A34 port 3 coupler to front-panel Port 3 CPLR ARM	1	N5245-20015
W28	Port 4 CPLR THRU to A35 port 4 coupler	1	N5245-20096
W29	A31 port 4 ref coupler to front-panel REF 4 SOURCE OUT	1	N5245-20117
W30	A35 port 4 coupler to front-panel Port 4 CPLR ARM	1	N5245-20018
W32	Port 2 CPLR THRU to A36 port 2 coupler	1	N5245-20097
W34	A36 port 2 coupler to front-panel Port 2 CPLR ARM	1	N5245-20019
W36	Front panel jumper	6	N5245-20155
W44	REF 3 RCVR R3 IN to A28 mixer brick (R3)	1	N5245-20020
W45	RF cable, REF 4 RCVR R4 IN to A28 mixer brick (R4)	1	N5245-20191
W46	REF 2 RCVR R2 IN to A27 mixer brick (R2)	1	N5245-20115
W52	RF cable, A25 HMA26.5 to A26 splitter	1	N5245-20013
W53	RF cable, A26 splitter to A27 mixer brick	1	N5245-20023
W54	RF cable, A26 splitter to A28 mixer brick	1	N5245-20022
W58	A28 mixer brick to 50 ohm load (1250-4261)	1	N5245-20095
W62	A27 mixer brick (R1) to A24 IF multiplexer (P411)	1	N5242-60021
W63	A27 mixer brick (R2) to A24 IF multiplexer (P412)	1	N5242-60022

Description of the Upgrade
Items Included in the Upgrade Kit

Table 1 **Contents of Upgrade Kit N5245-60120**

Ref Desig.	Description	Qty	Part Number
W65	A28 mixer brick (D) to A24 IF multiplexer (P801)	1	N5242-60024
W66	A28 mixer brick (R4) to A24 IF multiplexer (P414)	1	N5242-60019
W67	A28 mixer brick (R3) to A24 IF multiplexer (P413)	1	N5242-60020
W68'	A28 mixer brick (C) to A24 IF multiplexer (P601)	1	N5242-60023
W70	A24 IF multiplexer board P203 to A16 SPAM board J2 (SPAM 4, 2-port & 4-port or SPAM 5, 4-port)	1	N5242-60013
W72	A24 IF multiplexer board P603 to A16 SPAM board J5 (SPAM 4, 2-port & 4-port or SPAM 5, 4-port)	1	N5242-60015
W77	A14 frequency reference (J7) to A17 13.5 GHz (source 2) synth (J5)	1	N5242-60030
W85	A30 port 3 reference coupler to A39 port 3 source attenuator	1	N5245-20026
W86	A39 port 3 source attenuator to front-panel Port 3 SOURCE OUT	1	N5245-20027
W89	A31 port 4 reference coupler to A40 port 4 source attenuator	1	N5245-20026
W90	A40 port 4 source attenuator to front-panel Port 4 SOURCE OUT	1	N5245-20028
W99	Port 3 RCVR C IN to A47 port 3 receiver attenuator	1	N5245-20073
W100	A47 port 3 receiver attenuator to A28 mixer brick (C)	1	N5245-20066
W101	Port 4 RCVR D IN to A48 port 4 receiver attenuator	1	N5245-20074
W102	A48 port 4 receiver attenuator to A28 mixer brick (D)	1	N5245-20075
-	Ribbon cable, A23 test set motherboard J547 to A39 port 3 source attenuator	2	N5245-60006
-	Ribbon cable, A23 test set motherboard J548 to A40 port 4 source attenuator		
-	Ribbon cable, A23 test set motherboard J206 to A47 port 3 receiver attenuator	2	N5245-60026
-	Ribbon cable, A23 test set motherboard J207 to A48 port 4 receiver attenuator		
-	Ribbon cable, A23 test set motherboard J552 to A28 mixer brick (2) J52	1	N5247-60015
-	Wire assembly, A23 test set motherboard J221 to ports 1/3 LED board J1	2	N5225-60001
-	Wire assembly, A23 test set motherboard J222 to ports 2/4 LED board J1		

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.

NOTE

Some of the following figures provided in this procedure contain bias tees. Bias tees are included in the Option 219/419 upgrade kits and can be ignored for Options 217/417 and 222/422.

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 the A23 Test Set Motherboard.
- Step 6. Remove Some Cables.
- Step 7. Remove the A27 Mixer Brick Assembly.
- Step 8. Assemble the A28 Mixer Brick Assembly.
- Step 9. Install the A27/A28 Mixer Bricks Assembly.
- Step 10. Assemble the A30 and A31 Reference Coupler Assemblies.
- Step 11. Install the A30 and A31 Reference Coupler Assemblies.
- Step 12. Assemble the A47 and A48 Receiver Attenuator Assemblies.
- Step 13. Install the A47 and A48 Receiver Attenuator Assemblies.
- Step 14. Assemble the A39 and A40 Source Attenuator Assemblies.
- Step 15. Install the A39 and A40 Source Attenuator Assemblies.
- Step 18. Assemble the A33 - A36 Test Port Coupler Assemblies.
- Step 19. Install the LED Boards and Test Port Coupler Assemblies to the Test Set Front Plate.
- Step 20. Install the Coupler Plate Assembly to the Deck.
- Step 21. Install Bracket to A10 26.5 GHz Source 2 Assembly.
- Step 22. Assemble the A10 26.5 GHz Source 2 Assembly.

- Step 23. Assemble and Install the A12 and A13 Doubler Assemblies.
- Step 24. Install the A10 26.5 GHz Source 2 Assembly and Cables.
- Step 25. Install the A17 13.5 GHz (Source 2) Synthesizer Board and Cables.
- Step 26. Install the Test Set Cables.
- Step 27. Secure the Front Panel Bulkhead Connectors.
- Step 28. Reinstall the A23 Test Set Motherboard.
- Step 29. Replace the Front Panel's Lower Dress Panel.
- Step 30. Reinstall Front Panel Assembly.
- Step 31. Install the Overlay.
- Step 32. Install the Front Panel Jumper Cables.
- Step 33. Position the Cables and Wires to Prevent Pinching.
- Step 34. Reinstall the Inner Cover.
- Step 35. Reinstall the Outer Cover.
- Step 36. Remove Option 217 License.
- Step 37. Enable Options 417.
- Step 38. Perform Post-Upgrade Adjustments and Calibration.
- Step 39. Prepare the PNA-X 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 file has been received and the information verified, you can proceed with the installation at step 2.

NOTE

If the model number, serial number, or option number do not match those on your license key file, you will not be able to install the option. If this is the case, contact Keysight for assistance before beginning the installation of this upgrade. Refer to **"Contacting Keysight" on page 6**.

Step 2. Remove the Outer Cover

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

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 the A23 Test Set Motherboard

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A23 test set motherboard” in the PDF Service Guide¹.

Step 6. Remove Some 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

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 all bottom-side (test set) semi-rigid cables except for those in the following table. Do not discard the cables that are removed because some will be reused later in the procedure.
To see an image showing the location of cables W11, W17, and W51 click the Chapter 6 bookmark “Top Cables, All Cables - All Options, S/N Prefixes <6021” in the PDF Service Guide¹. To see an image showing the location of cables W55, W56, and W57, click the Chapter 6 bookmark “Bottom RF Cables, 2-Port, Option 217, S/N Prefixes <6021” in the PDF Service Guide¹.

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

Description of the Upgrade
Installation Procedure for the Upgrade

Reference Designator	Type ^a	Part Number	Qty	Description
W11	SR	N5245-20036	1	A7 port 1 doubler to W12
W17	SR	N5245-20036	1	A8 port 2 doubler to W18
W51	SR	N5245-20101	1	A15 13.5 GHz (LO) synthesizer board J1207 to A25 HMA26.5
W55	SR	N5245-20102	1	A7 port 1 doubler to W56
W56	SR	N5245-20103	1	W55 to rear-panel EXT TSET DRIVE RF OUT (J6)
W57	SR	N5245-20012	1	A27 mixer brick to EXT TSET DRIVE LO OUT (J5)

a. SR = semi-rigid coaxial cable.

1. Remove and discard the following gray flexible cables:
 - W147 (N5242-60025) A27 mixer brick (R1) to A24 IF multiplexer (P601)
 - W148 (N5242-60026) A27 mixer brick (R2) to A24 IF multiplexer (P801)
2. Leave the remaining gray flexible cables, the wire harnesses, and the ribbon cables connected where possible. Any that are removed should be labeled for reconnection later.

Step 7. Remove the A27 Mixer Brick Assembly

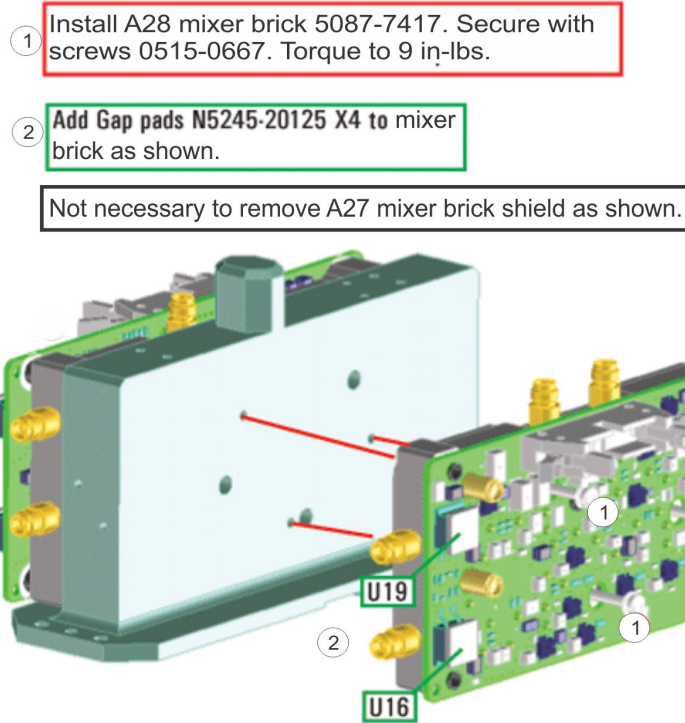
Remove the A27 mixer brick assembly from the PNA. For instructions, click the Chapter 7 bookmark, “Removing and Replacing the A27 and A28 Mixer Bricks” in the PDF Service Guide¹.

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

Step 8. Assemble the A28 Mixer Brick Assembly

1. Follow the two instructions shown in **Figure 1**. New parts are listed in **Table 1 on page 11** of this document.

Figure 1 A28 Mixer Brick Assembly (5087-7417, 0515-0667(x3), N5245-20125 (x4), N5247-20138 (x1))

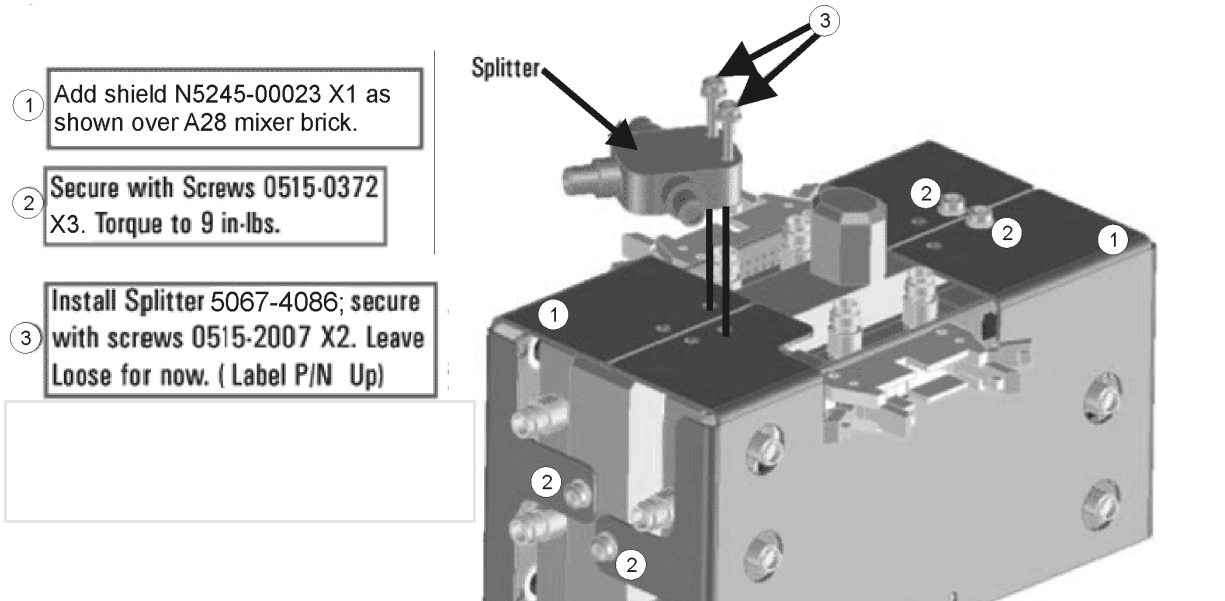


N5245_016_17

2. Follow the four instructions shown in **Figure 2**.

Figure 2

A26 Splitter Assembly (N5245-00023, 5067-4086, 0515-0372 (x3), 0515-2007 (x2))

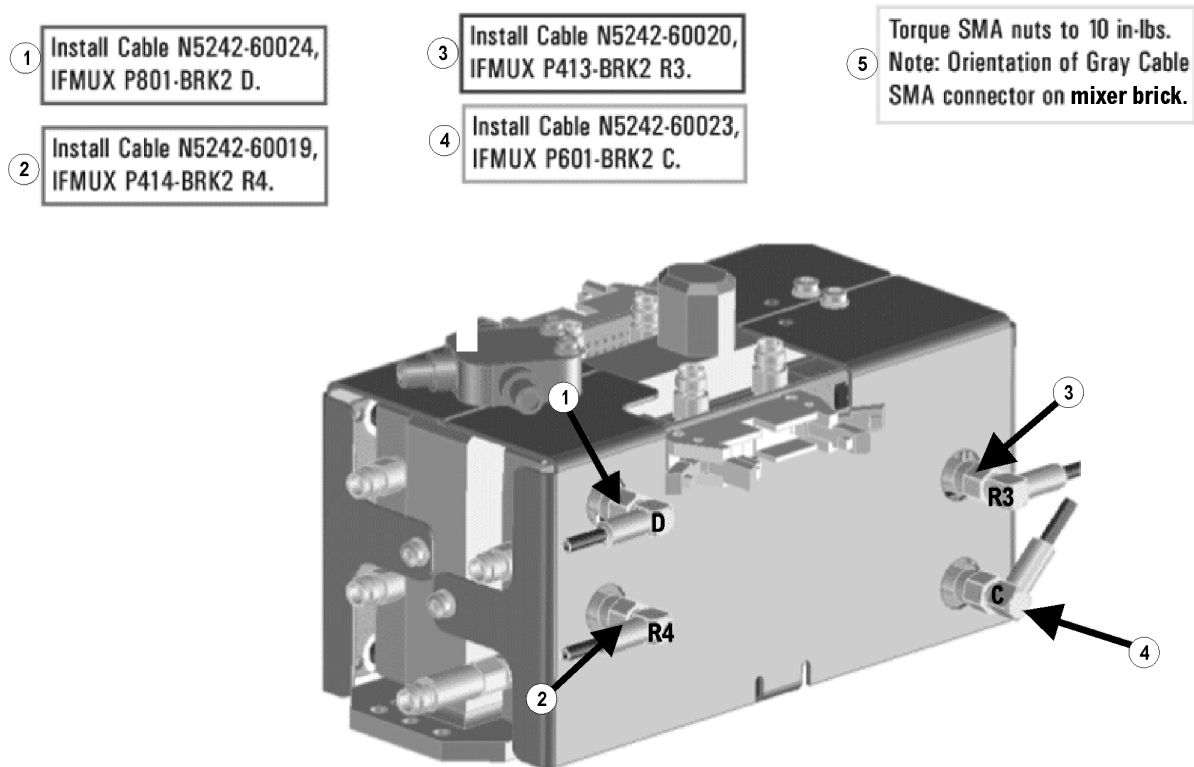


3. Connect the gray flexible cables in the order shown in **Figure 3**.

NOTE

Graphics in this document such as **Figure 3** use very brief text to instruct where to connect a cable. For example, text that reads “N5242-60018 IFMUX P201 - BRK1 B” means to connect the N5242-60018 gray flexible cable at the A24 IF MUX board connector P201 and at A27 Mixer Brick 1 connector B.

Figure 3 A28 Mixer Brick Assembly (N5242-60019, N5242-60020, N5242-60023, and N5242-60024)¹



N5245_016_19

Step 9. Install the A27/A28 Mixer Bricks Assembly

Install the A27/A28 mixer brick assembly, reusing the 4 existing screws. For instructions, click the Chapter 7 bookmark, “Removing and Replacing the A27 and A28 Mixer Bricks” in the PDF Service Guide². New parts are listed in **Table 1 on page 11** of this document

1. Attenuator 08490-60010 is shown in the figure, but is not included in this upgrade and not required with the A28 mixer brick (5087-7417).

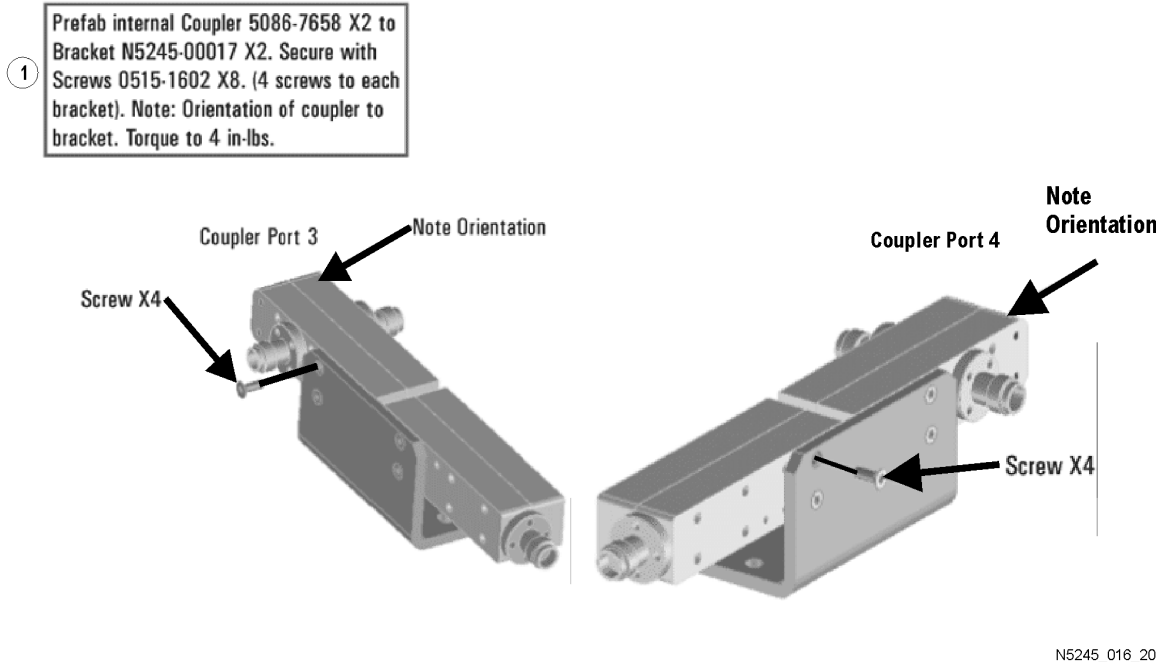
2. See “[Downloading the Online PNA-X Service Guide](#)” on page 9.

Step 10. Assemble the A30 and A31 Reference Coupler Assemblies

Follow the instruction shown in **Figure 4**. New parts are listed in **Table 1 on page 11** of this document.

Figure 4

A30 and A31 Reference Coupler Assembly (5087-7760, N5245-00017, 0515-1602 (x8))



Step 11. Install the A30 and A31 Reference Coupler Assemblies

Install the A30 and A31 reference coupler assemblies. For instructions, click the Chapter 7 bookmark, “Removing and Replacing the A29-A32 Reference Couplers and Reference Coupler Mounting Brackets” in the PDF Service Guide¹. New parts are listed in **Table 1 on page 11** of this document.

Step 12. Assemble the A47 and A48 Receiver Attenuator Assemblies

Assemble the A47 and A48 receiver attenuator assemblies. For instructions, click the Chapter 7 bookmark, “Removing and Replacing the A38-A41 Source Attenuators and the A46-A49 Receiver Attenuators” in the PDF Service Guide¹. New parts are listed in **Table 1 on page 11** of this document.

Step 13. Install the A47 and A48 Receiver Attenuator Assemblies

Install the A47 and A48 receiver attenuator assemblies. For instructions, click the Chapter 7 bookmark, “Removing and Replacing the A38-A41 Source Attenuators and the A46-A49 Receiver Attenuators” in the PDF Service Guide¹. New parts are listed in **Table 1 on page 11** of this document.

Step 14. Assemble the A39 and A40 Source Attenuator Assemblies

Assemble the A39 and A40 source attenuator assemblies. For instructions, click the Chapter 7 bookmark, “Removing and Replacing the A38-A41 Source Attenuators and the A46-A49 Receiver Attenuators” in the PDF Service Guide¹. New parts are listed in **Table 1 on page 11** of this document.

Step 15. Install the A39 and A40 Source Attenuator Assemblies

Install the A39 and A40 source attenuator assemblies. For instructions, click the Chapter 7 bookmark, “Removing and Replacing the A38-A41 Source Attenuators and the A46-A49 Receiver Attenuators” in the PDF Service Guide¹.

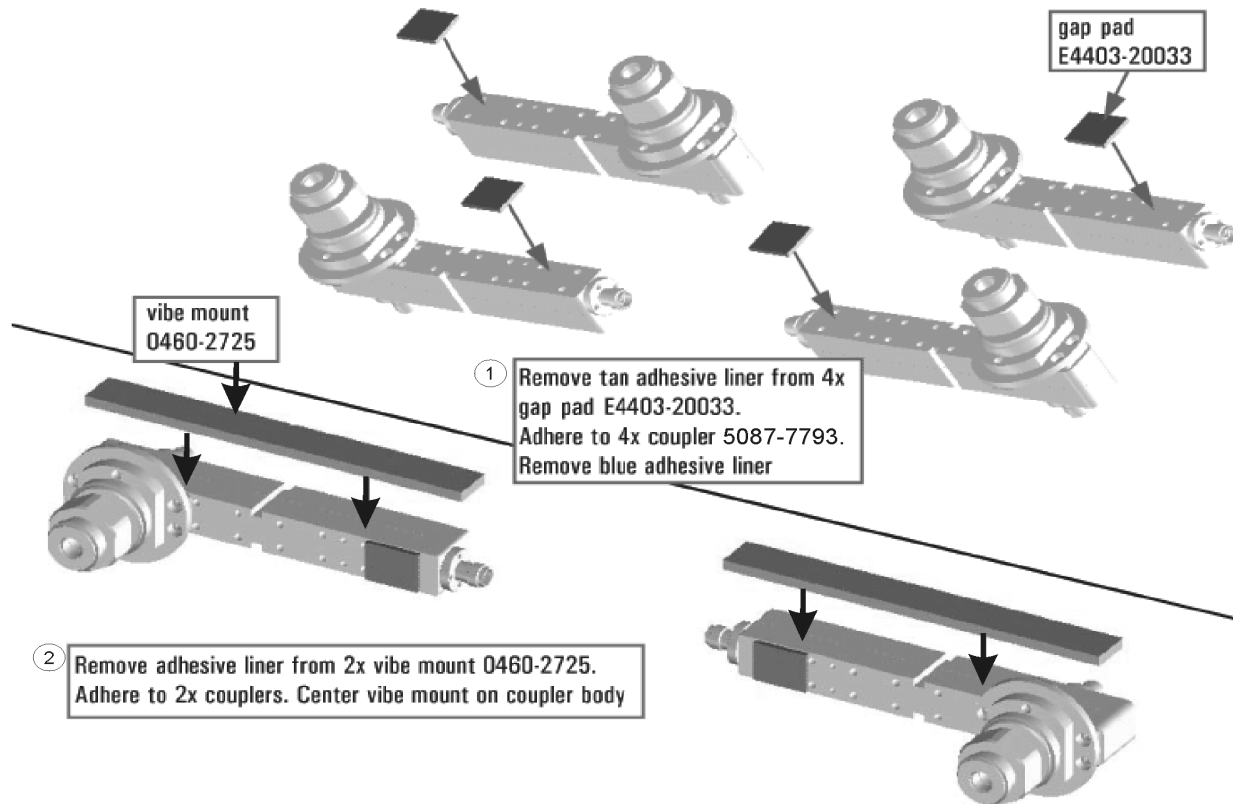
1. See **“Downloading the Online PNA-X Service Guide” on page 9.**

Step 18. Assemble the A33 - A36 Test Port Coupler Assemblies

1. Remove the A33 test port 1 coupler and A36 test port 2 coupler from the PNA. For instructions, click the Chapter 7 bookmark, "Removing and Replacing the A33 - A36 Test Port Couplers" in the PDF Service Guide¹.
2. Using pliers, remove the adhesive bumper on the A33 test port 1 coupler and on the A36 test port 2 coupler.
3. Follow the two instructions shown in **Figure 5**. New parts are listed in **Table 1 on page 11** of this document.

Figure 5

A33 - A36 Test Port Coupler Assembly (0460-2725, E4403-20033 (x4), 5087-7793 (x4), 0460-2725 (x2))

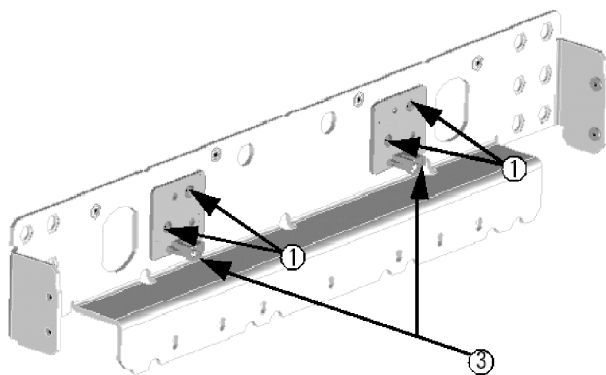


Step 19. Install the LED Boards and Test Port Coupler Assemblies to the Test Set Front Plate

1. Remove two screws from each LED board and remove the boards from the 2-port test set front plate of the PNA.
2. Remove the 2-port test set front plate from the test set deck.
3. Follow the instructions shown in **Figure 6**.

Figure 6

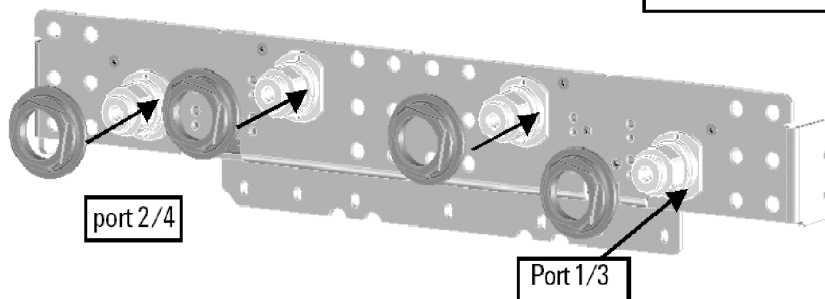
LED Board Assemblies and Test Port Coupler Assemblies
Installation(N5240-60058, N5224-00005, 0515-1521 (x4), 5087-7793,
5022-1087 (x4), N5225-60001 (x2))



- ① Secure 2x LED boards to new test set front plate N5224-00005, reusing 4x screws. NOTE: Look closely at graphic - LED boards may be oriented differently on new test set front plate than on original test set front plate.

- ② Prefab 4x couplers 5087-7793 onto front plate. Note: Port 1/3 and 2/4 couplers must be installed at the same time. **Hand-tighten** 4x mounting nuts 5022-1087 (reuse 2x mounting nuts). **Do not torque.**

- ③ Replace both original LED wire harnesses with new LED wire harnesses N5225-60001.

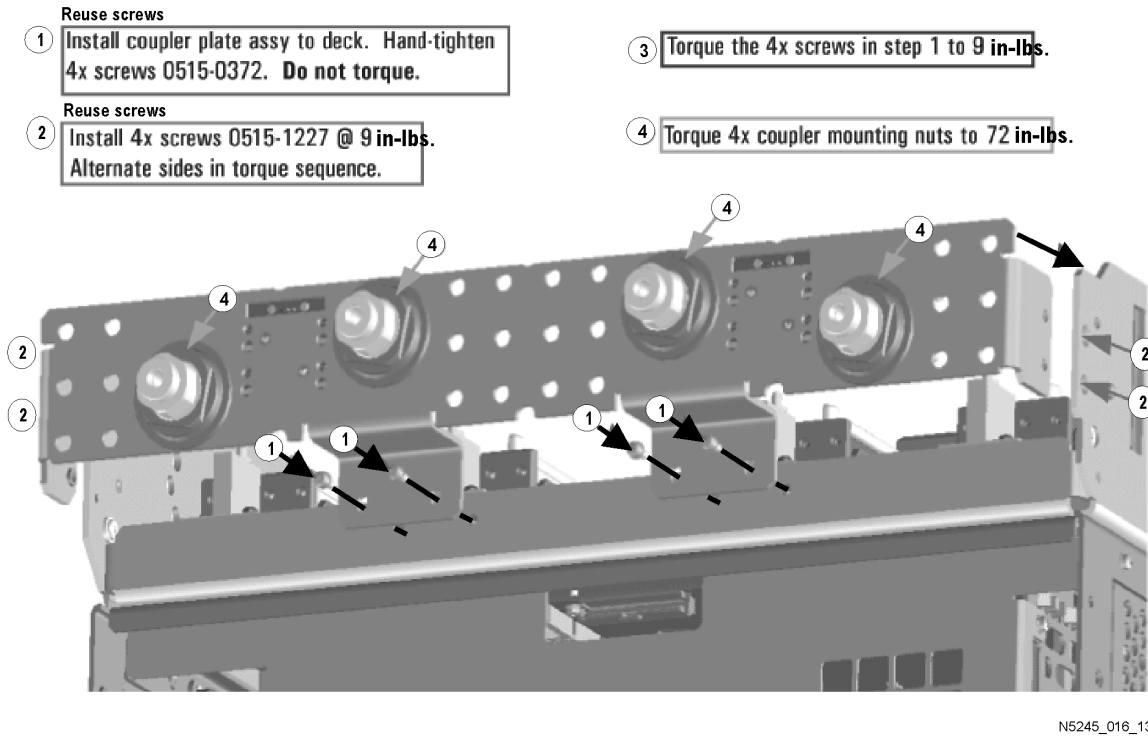


N5245_016_12

Step 20. Install the Coupler Plate Assembly to the Deck

Follow the four instructions shown in **Figure 7**.

Figure 7 Coupler Plate Assembly Installation (0515-0372, 0515-1227)

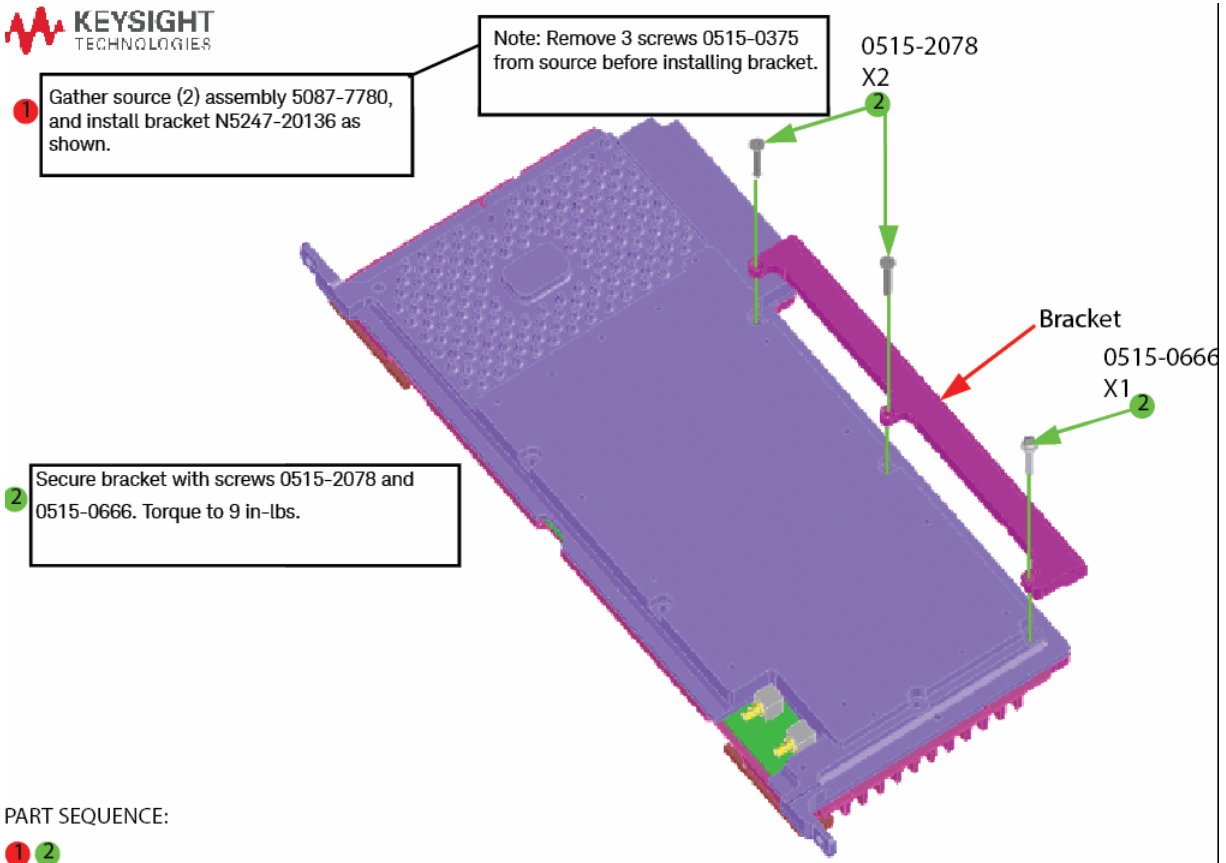


Step 21. Install Bracket to A10 26.5 GHz Source 2 Assembly

Follow the two instructions shown in **Figure 8**.

Figure 8

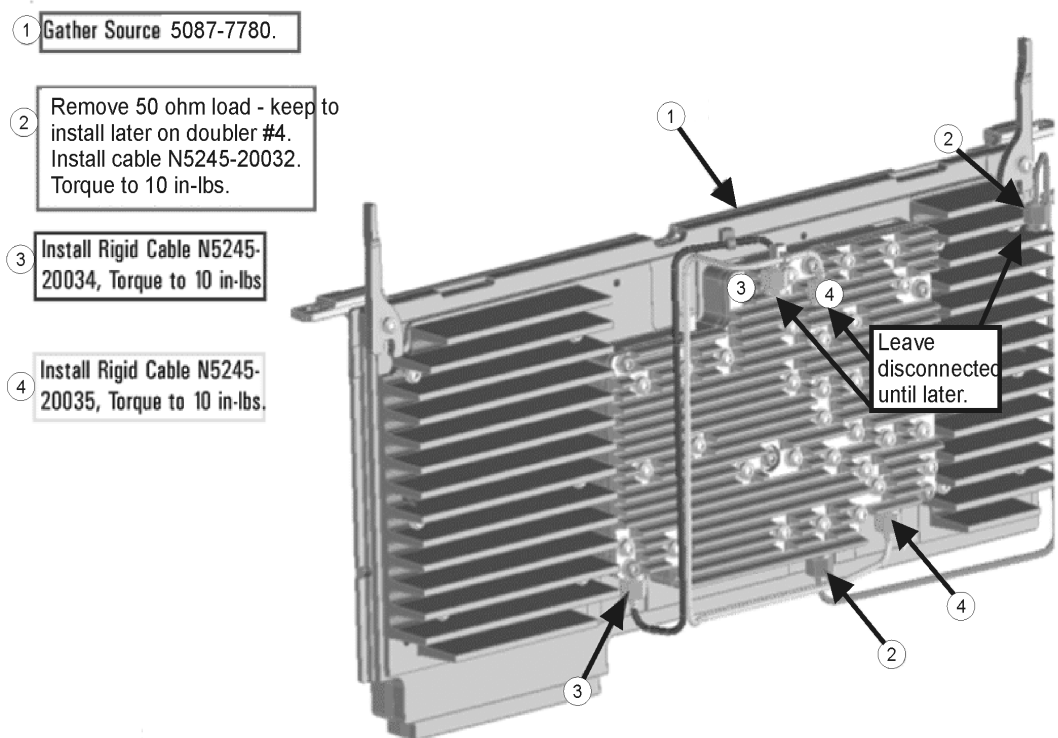
A10 Source 2 Assembly - Attach Bracket N5247-20136 (Using screws: 0515-0666 x1 and 0515-2078 x2)



Step 22. Assemble the A10 26.5 GHz Source 2 Assembly

Follow the four instructions shown in **Figure 9**.

Figure 9 A10 Source 2 Assembly – Attach cables N5245-20032, N5245-20034, & N5245-20035



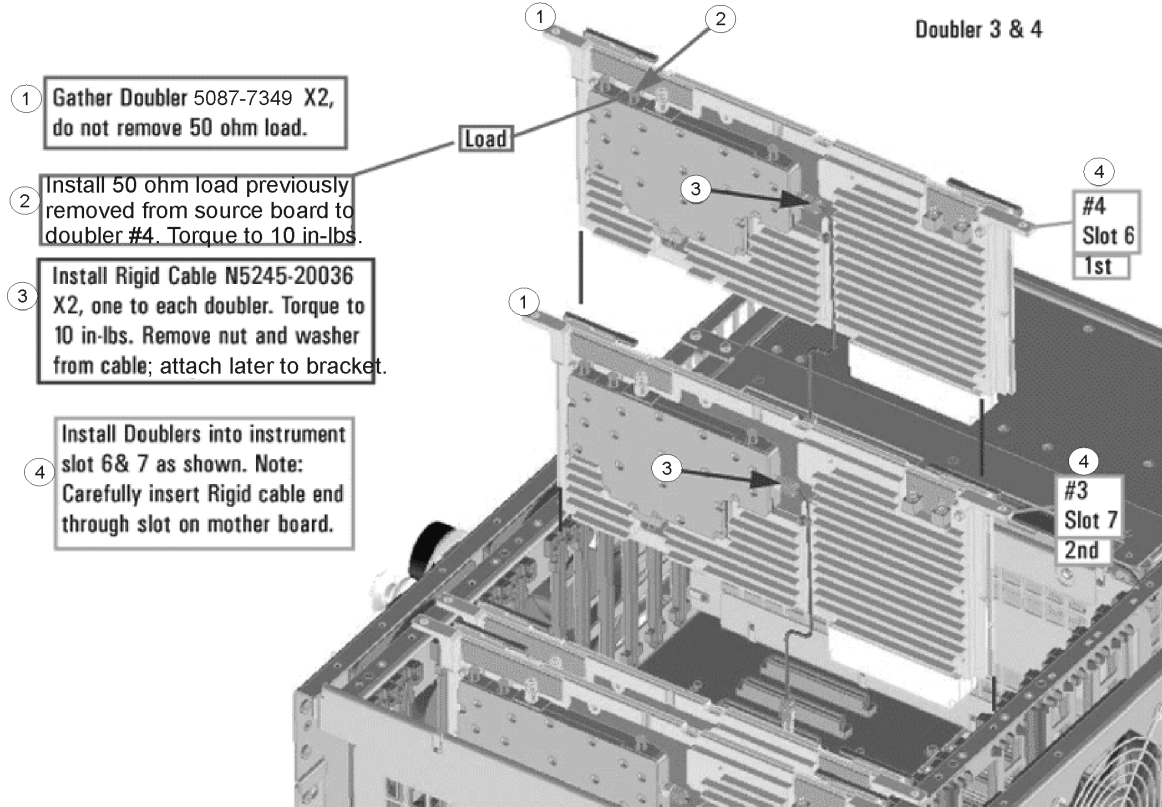
N5245_016_38

Step 23. Assemble and Install the A12 and A13 Doubler Assemblies

Follow the four instructions shown in **Figure 10**.

Figure 10

A12 and A13 Doubler Assemblies Installation (N5245-20036, 5037-7349)

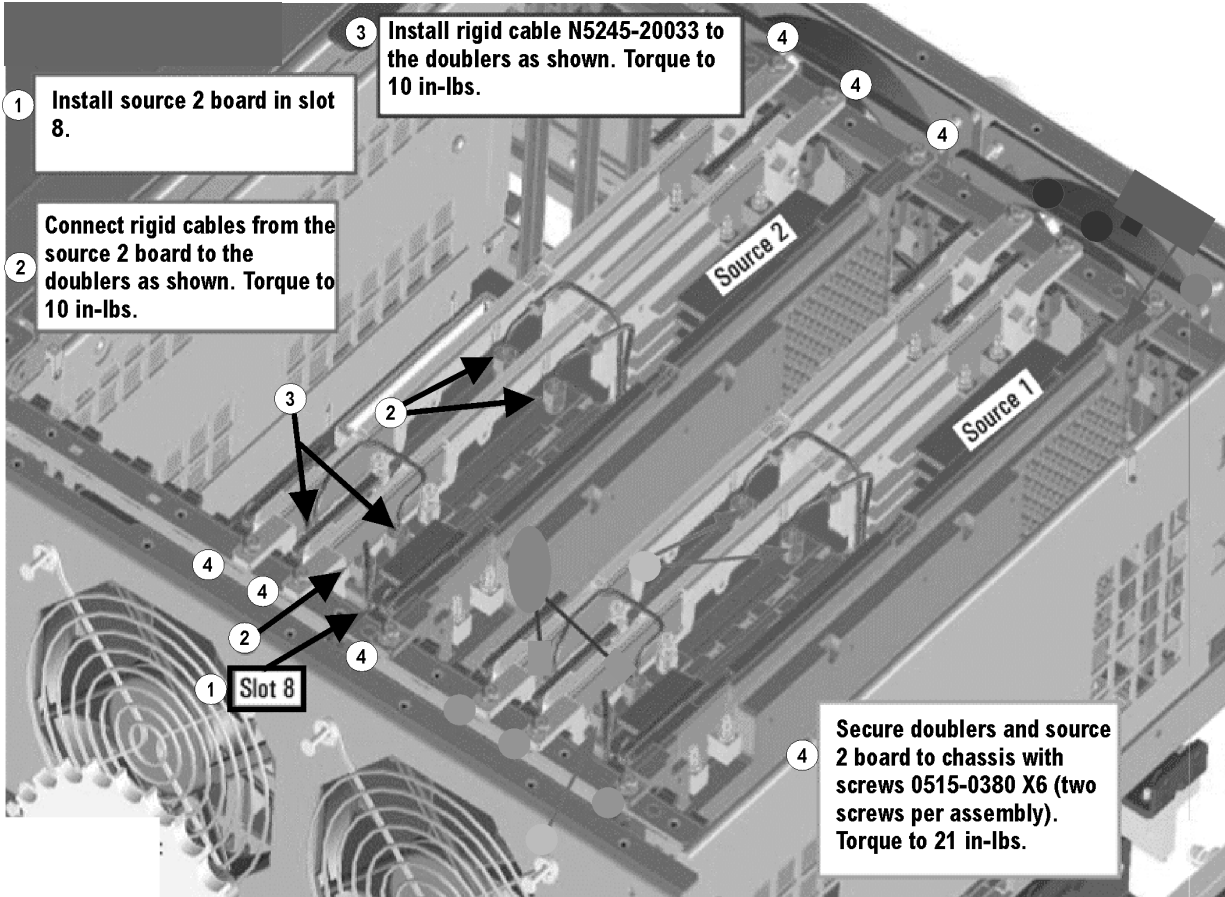


N5245_016_37

Step 24. Install the A10 26.5 GHz Source 2 Assembly and Cables

Follow the four instructions shown in **Figure 11**.

Figure 11 A10 Source 2 Assembly Installation (N5245-20033, 0515-0380)



N5245_016_39

Step 25. Install the A17 13.5 GHz (Source 2) Synthesizer Board and Cables

1. Install gray cable W77 (N5242-60030) to connector J5 of the A17 (source 2) synthesizer board (N5240-60074). The loose end of the cable will be connected on the A14 frequency reference board (J7) after the A17 board has been installed in the analyzer.
2. Install the A17 board into slot 2 in the motherboard. To see an image showing the location of the A17 board in the motherboard, click the Chapter 6 bookmark “Top Assemblies, All Options” in the PDF Service Guide¹.
3. Connect cable W2 (N5245-20100) between the A10 source 2 board and the A17 (source 2) synthesizer board, positioning the cable in the wire looms. Tighten the cable connectors to 10 in-lbs using a 5/16-in torque wrench.
4. Connect the loose end of new gray flex cable W77 (N5242-60030) on the A14 frequency reference board (J7). (The other end of this cable was previously connected to J5 of the source 2 synthesizer board Option 417 image A33 step 1).

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

Step 26. Install the 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.

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. Torque these connections to 21 in-lb.

Flexible Cables Required for Upgrading to an Option 417 PNA

Install the following flexible cables in the order listed. To see images showing the location of these cables, click either of the Chapter 6 bookmarks “Bottom RF Cables, 4-Port, Option 417, S/N Prefixes <6021” in the PDF Service Guide¹. New parts are listed in **Table 1 on page 11**.

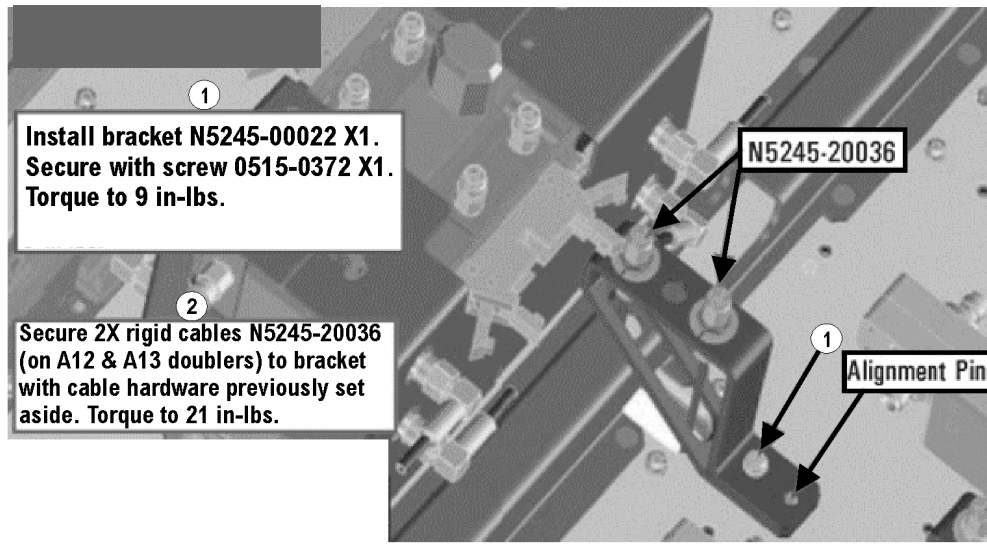
- W62 (N5242-60021) A27 mixer brick (R1) to A24 IF multiplexer (P411)
- W63 (N5242-60022) A27 mixer brick (R2) to A24 IF multiplexer (P412)

Semi-rigid Cables Required for Upgrading to an Option 417 PNA

To see images showing the location of these cables, click the Chapter 6 bookmark “Bottom RF Cables, 4-Port, Option 417, S/N Prefixes <6021” in the PDF Service Guide¹. New parts are listed in **Table 1 on page 11**.

- Follow the two instructions shown in **Figure 11-1** in this document.

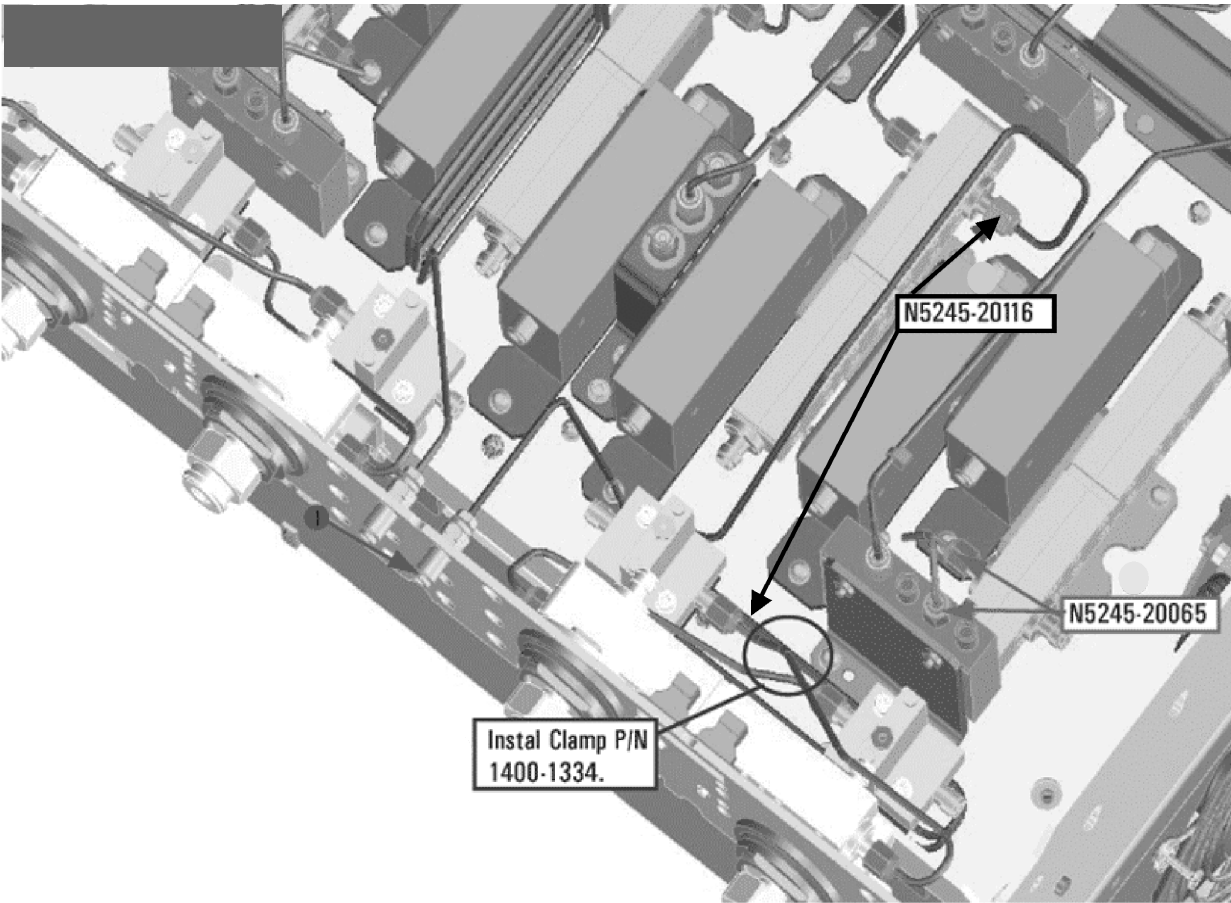
Figure 11-1 Semi-rigid Cables Installation (N5245-00022, N5245-20036, 0515-0372)



N5245_016_32

- W25 (N5245-20116) A30 port 3 ref coupler to front-panel REF 3 SOURCE OUT
- * As shown in **Figure 11-2**, install clamp part number 1400-1334 to secure W25.

Figure 11-2 Location of Cable Clamp to Secure W25 (N5245-20065, N5245-20116, 1400-1334)



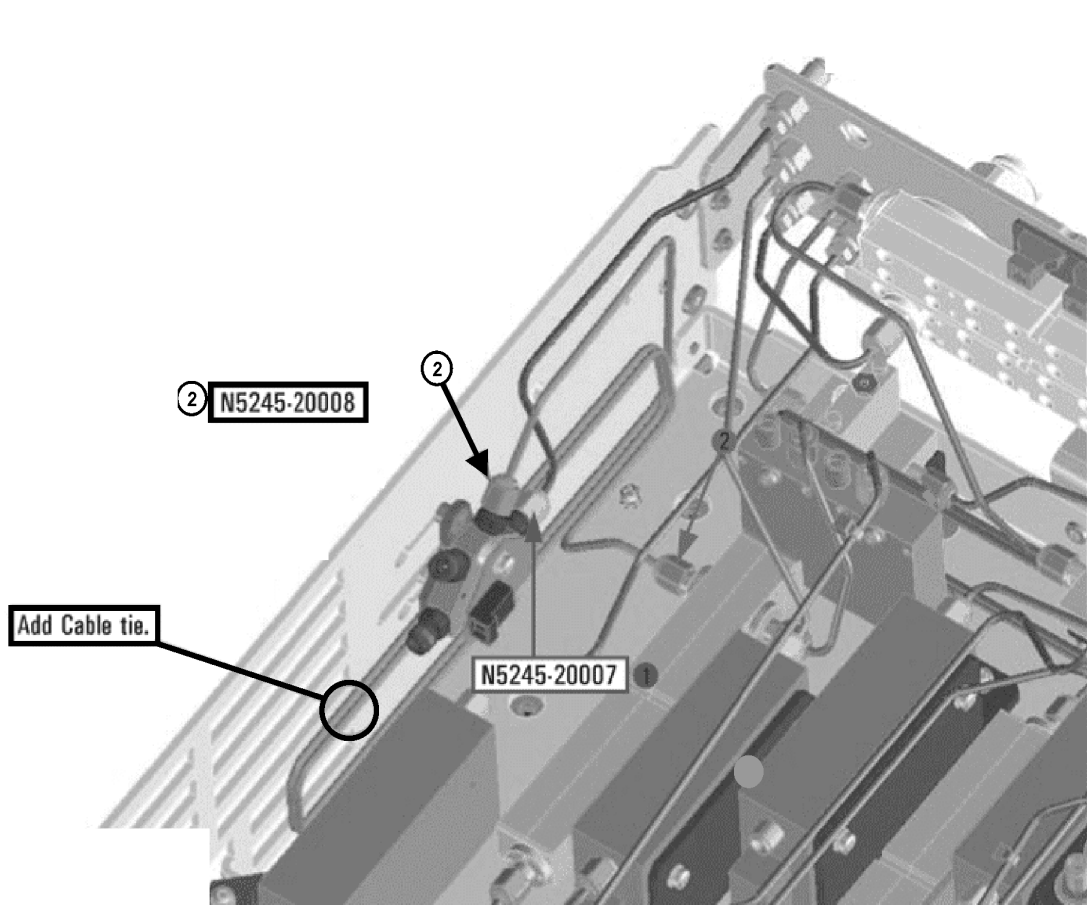
N5245_010_02

- W29 (N5245-20117) A31 port 4 ref coupler to front-panel REF 4 SOURCE OUT
- W89 (N5245-20026) A31 port 4 reference coupler to A40 port 4 source attenuator
- W85 (N5245-20026) A30 port 3 reference coupler to A39 port 3 source attenuator
- W93 (reuse) (N5245-20029) A32 port 2 reference coupler to A41 port 2 source attenuator
- W81 (reuse) (N5245-20029) A29 port 1 reference coupler to A38 port 1 source attenuator
- W103 (reuse) (N5245-20055) Port 2 RCVR B IN to A49 port 2 receiver attenuator
- W34 (N5245-20019) A36 port 2 coupler to front-panel Port 2 CPLR ARM

Description of the Upgrade
Installation Procedure for the Upgrade

- W94 (reuse) (N5245-20031) A41 port 2 source attenuator to front-panel Port 2 SOURCE OUT
- W46 (N5245-20115) REF 2 RCVR R2 IN to A27 mixer brick (R2)
 - * Connect W46 to top R2 connector on the mixer bricks.
- W33 (reuse) (N5245-20010) A32 port 2 ref coupler to front-panel REF 2 SOURCE OUT
- W30 (5245-20018) A35 port 4 coupler to front-panel Port 4 CPLR ARM
- W101 (N5245-20074) Port 4 RCVR D IN to A48 port 4 receiver attenuator
- W90 (N5245-20028) A40 port 4 source attenuator to front-panel Port 4 SOURCE OUT
- W45 (N5245-20191) REF 4 RCVR R4 IN to A69 3 dB pad on A28 mixer brick (R4)
- W99 (N5245-20073) Port 3 RCVR C IN to A47 port 3 receiver attenuator
- W26 (N5245-20015) A34 port 3 coupler to front-panel Port 3 CPLR AR
- W86 (N5245-20027) A39 port 3 source attenuator to front-panel Port 3 SOURCE OUT
- W44 (N5245-20020) REF 3 RCVR R3 IN to A28 mixer brick (R3)
 - * Connect W44 to top R3 connector on the mixer bricks.
- W22 (N5245-20014) A33 port 1 coupler to front-panel Port 1 CPLR ARM
- W97 (reuse) (N5245-20054) Front-panel Port 1 RCVR A IN to A46 port 1 receiver attenuator
- W82 (reuse) (N5245-20077) A38 port 1 source attenuator to front-panel Port 1 SOURCE OUT
- W42 (reuse) (N5245-20007) REF 1 RCVR R1 IN to A37 reference mixer switch
- W21 (N5245-20008) A29 port 1 reference coupler to A37 reference mixer switch
 - * As shown in **Figure 11-3**, install cable tie part number 1400-0249 to secure W21.

Figure 11-3 Location of Cable Tie to Secure W21 (N5245-20007, N5245-20008)



N5245_010_16

- W43 (reuse) (N5245-20009) A37 reference mixer switch to A27 mixer brick (R1)
 - * Connect W43 to bottom R1 connector on the mixer bricks.
- W41 (reuse) (N5245-20006) A37 reference mixer switch to front-panel REF 1 SOURCE OUT
- W102 (N5245-20075) A48 port 4 receiver attenuator to A28 mixer brick (D)
 - * Connect W102 to top D connector on the mixer bricks.
- W100 (N5245-20066) A47 port 3 receiver attenuator to A28 mixer brick (C)
 - * Connect W100 to bottom C connector on the mixer bricks.
- W104 (reuse) (N5245-20057) A49 port 2 receiver attenuator to A27 mixer brick (B)
 - * Connect W104 to bottom B connector on the mixer bricks
- W98 (reuse) (N5245-20056) A46 port 1 receiver attenuator to A27 mixer brick (A)

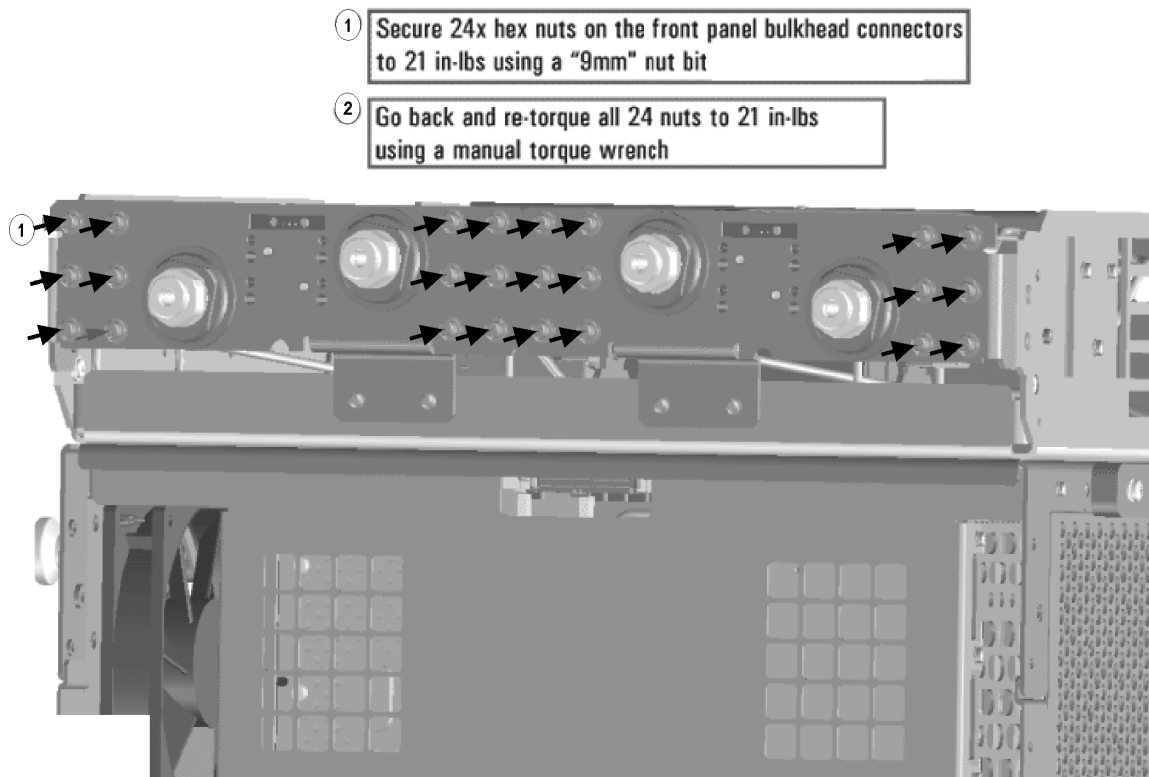
Description of the Upgrade
Installation Procedure for the Upgrade

- * Connect W98 to top A connector on the mixer bricks.
- W18 (reuse) (N5245-20049) A32 port 2 reference coupler to W17
- W12 (reuse) (N5245-20050) A29 port 1 reference coupler to W11
- W16 (N5245-20044) A31 port 4 reference coupler to W15
- W14 (N5245-20043) A30 port 3 reference coupler to W13

Step 27. Secure the Front Panel Bulkhead Connectors

Follow the instruction shown in **Figure 12** in this document.

Figure 12 Bulkhead Connections, Front Panel



N5245_016_31

Step 28. 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 Guide¹.
2. If not already done in a previous step, install the following new ribbon cables in the order listed. To see an image showing the location of these cables, click the Chapter 6 bookmark “Bottom Ribbon Cables and Wire Harnesses, 4-Port, Option 417” in the PDF Service Guide¹. New parts are listed in **Table 1 on page 11**.
 - Ribbon cable, N5247-60015 from A23 test set motherboard J552 to A28 mixer brick (2) J52
 - Ribbon cable (N5245-60026), A23 test set motherboard J206 to A47 port 3 receiver attenuator
 - Ribbon cable (N5245-60026), A23 test set motherboard J207 to A48 port 4 receiver attenuator
 - Ribbon cable (N5245-60006), A23 test set motherboard J547 to A39 port 3 source attenuator
 - Ribbon cable (N5245-60006), A23 test set motherboard J548 to A40 port 4 source attenuator
 - Wire harness (N5225-60001), A23 test set motherboard J221 to ports 1/3 LED board J1
 - Wire harness (N5225-60001), A23 test set motherboard J222 to ports 2/4 LED board J1

Step 29. Replace the Front Panel’s Lower Dress Panel

Before the front panel’s lower dress panel can be replaced, the 2-port lower dress panel and the lower front panel label must be removed from the front panel assembly. Refer to **Figure 13 on page 39**. New parts are listed in **Table 1 on page 11**.

1. Remove the 2-Port lower front panel label (item ①).
2. Remove the 10 screws (save the screws for reuse) from the 2-port dress panel and remove the dress panel (item ② and ③ respectively).

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

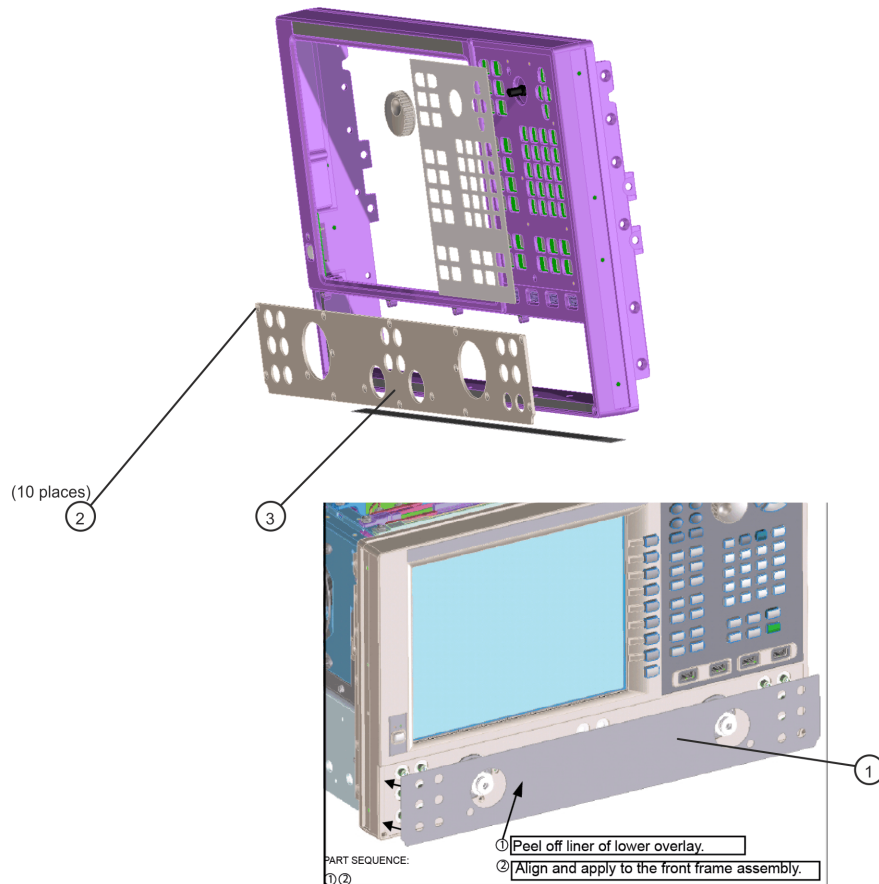
3. Reassemble the front panel's lower dress panel assembly with the new 4-port lower dress panel (N5240-00009) by reversing the order of step 2 in the instructions previously followed.

NOTE

IMPORTANT! To avoid possible damage to the lower front panel overlay (label), do not attempt to attach the lower front panel label until “**Step 22. Assemble the A10 26.5 GHz Source 2 Assembly**” on page 28.

Figure 13

Replacing the Front Panel's Lower Dress Panel and label



Step 30. 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.

- 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.

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

Step 31. Install the Overlay

To see an image of the front panel overlay (N5242-80031), click the Chapter 6 bookmark “Front Panel Assembly, Front Side, All Options” in the PDF Service Guide¹. New parts are listed in **Table 1 on page 11**.

1. **Remove the protective backing from the new front panel overlay (N5242-80031).**
2. **Loosely place the overlay in the recess on the lower front panel.**
3. **Placing two fingers at the middle, press the overlay firmly onto the frame while sliding your fingers in opposite directions towards the ends of the overlay. Repeat on all areas of the overlay.**

Step 32. Install the Front Panel Jumper Cables

Install twelve W36 front panel jumper cables (N5245-20155) – use 6 old jumpers and 6 new jumpers. 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 Guide¹.

Step 33. Position the Cables and Wires to Prevent Pinching

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

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

Step 34. Reinstall the Inner Cover

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

Step 35. Reinstall the Outer Cover

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

Step 36. Remove Option 217 License

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.

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

Option 217 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 37. Enable Options 417

Procedure Requirements

NOTE

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

-
- 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.

Option Enable Procedure

1. Locate the email(s) from Keysight which contain license file attachments. These emails are a result of “**Step 1. Obtain a Keyword and Verify the Information**” on page 16.
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 single license file may contain more than one feature.

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

Option Verification Procedure

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 419 is listed in the PNA-X application.

NOTE

If the options have not been enabled or if the option 217 license has not been removed, contact Keysight Technologies. Refer to "[Getting Assistance from Keysight](#)" on page 6.

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 38. 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.

-
- EE default adjustment
 - synthesizer bandwidth adjustment (only required when the EE default adjustment is not sufficient)
 - IF gain adjustment
 - source adjustment
 - receiver characterization
 - receiver adjustment
 - IF response adjustment (Option 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.

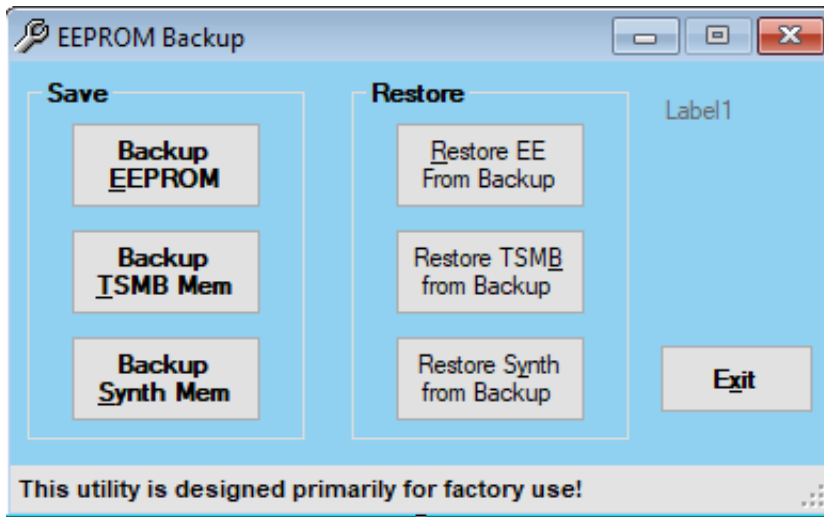
The adjustments listed here generate new correction constants. The analyzer must have a backup of this new data in case any of the data becomes corrupted.

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

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 14 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 39. Prepare the PNA-X for the User

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

Description of the Upgrade
Installation Procedure for the Upgrade

