

Installation Note

Keysight – Add 4-Port Capability Upgrade Kit for (For Version 6 Synthesizers)

To Upgrade PNA N5221B and N5222B Option 201 to Option 401

Upgrade Kit Order Number: N5221BU- 601 and N5222BU- 601

Keysight Kit Number: N5222-60117

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**.



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CAUTION

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WARNING

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

Keysight Add 4-Port Capability Upgrade Kit
Upgrade Kit Number: N5222-60117
Installation Note

Description of the Upgrade

This upgrade converts your N5221B or N5222B Option 201 2-port analyzer to a N5221B or N5222B Option 401 4-port analyzer by adding:

- an additional source
- an additional source synthesizer
- an additional mixer brick
- two additional test port couplers
- a splitter
- a modified front panel
- an additional cable guard
- new cables

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

CAUTION

This repair must be done at a service center or a self-maintainer service center! Refer to **“Getting Assistance from Keysight” on page 4.**

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 and new A21 HMA26.5 Multiplier/Amplifier assemblies. Your model instrument may have either legacy assemblies or the new parts installed.
- To verify your instrument's A21 HMA26.5 Multiplier/Amplifier, refer to [“Verify the Model/Version of HMA26.5 Installed” on page 7](#).
- See also your instrument's PDF Service Guide ^a.

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

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

- A license key - refer to [“License Key Redemption”](#) below.
- A PDF copy or a paper copy of the PNA Service Guide - refer to [“Downloading the Online PNA Service Guide”](#) below.
- An ESD-safe work area - refer to [“Protecting Your Workspace from Electrostatic Discharge”](#) below.
- Correct tools - refer to [“Tools Required for the Installation” on page 9](#).
- Enough time - refer to [“About Installing the Upgrade” on page 9](#).
- 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 8](#).

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

NOTE

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

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 4.**

Verify the Model/Version of HMA26.5 Installed

NOTE

Depending on the type of Option upgrade that was purchased, your parts kit may or may not include the following cable part numbers.

This upgrade kit contains components for use with PNA models using the legacy HMA26.5 part number 5086-7765. If your PNA has the newer HMA26.5 part number N5240-60101 installed you may discard these parts:

- A22 splitter 5067-4086
- W42 N5222-20009
- W43 N5222-20007
- W44 N5222-20008

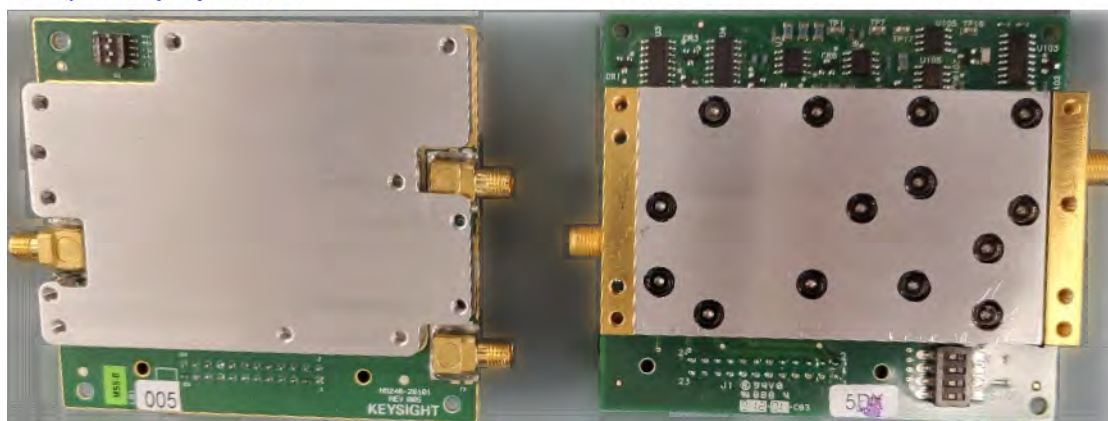
(If you have the legacy 5087-7765 HMA26.5, please discard the N5222-20126 semi-rigid cables. Refer to [Figure 1 on page 7](#).)

The new N5240-60101 HMA26.5 has the splitter integrated into the assembly. Refer to [Figure 1 on page 7](#).

Figure 1 Comparison of Legacy HMA26.5 (5087-7765) and New HMA26.5 (N5240-60101)

New HMA26.5 -- N5240-60101
Requires (x1) Cable.

Legacy HMA26.5 -- 5087-7765
Requires A22 Splitter and (x3) Cables.



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., N5232B) and click **Search**.
3. Click **Support** > **Keysight Product Support**.
4. In the **Search Support** area type your instrument's model number (e.g., N2222B).
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
1-in (25.4 mm) torque wrench - set to 72 in-lbs (8.15 N.m)	1	N/A

CAUTION

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

About Installing the Upgrade

Products affected	N5221B and N5222B Option 201
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	4 hours
Estimated adjustment time	0.5 hours
Estimated full instrument calibration time	5.5 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 4.**

Table 2 Contents of Upgrade Kit N5222-60117

Ref Desig.	Description	Qty	Part Number
-	Installation note (this document)	1	N5222-90117
-	Software Entitlement Certificate	1	5964-5145
-	China RoHS Addendum	1	9320-6722
A8	26.5 GHz source (2) board	1	5087-7342
A13	13.5 GHz (source 2) synthesizer board	1	N5240-60074
A22	Splitter	1	5087-7139
A24	Mixer brick (2)	1	5087-7829
A26	Test port 3 receiver bridge	2	5087-7757
A27	Test port 4 receiver bridge		
A30	Test port 3 coupler	2	5087-7813
A31	Test port 4 coupler		
-	Dress panel, overlay – 4-Port	1	N5240-00009
-	Machine screw, M3 x 8, pan head (to attach A24 to mounting plate)	4	0515-0372
-	Machine screw, M4.0 x 10, pan head (2 each to attach the following boards to the analyzer chassis: A13 13.5 GHz synthesizer board and A8 26.5 GHz source board.)	8	0515-0380
-	Machine screw, M2.5 x 20, pan head (to attach A26 and A27 receiver coupler assemblies to test set deck)	4	0515-0430
-	Machine screw, M3.0 x 12, pan head (to attach N5222-20036 cable bracket)	2	0515-0664
-	Machine screw, M3.0 x 12, pan head	3	0515-0667
-	Machine screw, M3 x 14, pan head (to attach splitter to mixer brick)	2	0515-2994
-	Machine screw, M3.0 x 6, flat head (to attach dress panel to coupler plate)	2	0515-1946
-	Machine screw, M3.0 x 20, pan head (to attach brackets to receiver couplers; to attach A24 mixer brick to block)	7	0515-1410
-	Bulkhead connector for test set front plate (hardware supplied with connector)	12	1250-3805
-	Front panel overlay (label), 4-port	1	N5222-80013
-	Test set front plate, 4-port	1	N5221-00007
-	Gap pad (between each test coupler and the test set front plate)	4	E4403-20033

Items Included in the Upgrade Kit

Table 2 **Contents of Upgrade Kit N5222-60117**

Ref Desig.	Description	Qty	Part Number
-	Short, installed on A24 mixer brick	1	0960-0055
-	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 self-locking wide nylon gray	6	1400-0249
-	Cable clamp, to secure W49 (N5222-20057)	12	1400-1334
-	Dust caps for test ports	4	1401-0214
-	Bracket for receiver coupler	2	N5242-00006
W2	RF cable, 13.5 GHz (source 2) synthesizer board J1207 to A8 26.5 GHz source (2) board P1	1	N5222-20090
W5	RF cable, A8 source (2) board P5 to W6 on bottom of analyzer	1	N5222-20062
W6	RF cable, W5 to A26 port 3 receiver coupler	1	N5222-20041
W7	RF cable, A8 source (2) board P3 to W8 on bottom of analyzer	1	N5222-20063
W8	RF cable, W7 to A23 port 4 receiver coupler	1	N5222-20042
W12	RF cable, Port 1 CPLR THRU to A29 port 1 coupler	1	N5222-20045
W14	RF cable, A29 port 1 coupler to front-panel Port 1 CPLR ARM	1	N5222-20030
W15	RF cable, A26 port 3 receiver coupler to front-panel Port 3 SOURCE OUT	1	N5222-20047
W16	RF cable, Port 3 CPLR THRU to A30 port 3 coupler	1	N5222-20049
W17	RF cable, A26 port 3 receiver coupler to front-panel REF 3 SOURCE OUT	1	N5222-20023
W18	RF cable, A30 port 3 coupler to front-panel Port 3 CPLR ARM	1	N5222-20015
W19	RF cable, A23 port 4 receiver coupler to front-panel Port 4 SOURCE OUT	1	N5222-20050
W20	RF cable, APort 4 CPLR THRU to A31 port 4 coupler	1	N5222-20054
W21	RF cable, A23 port 4 receiver coupler to front-panel REF 4 SOURCE OUT	1	N5222-20025
W22	RF cable, A31 port 4 coupler to front-panel Port 4 CPLR ARM	1	N5222-20018
W24	RF cable, Port 2 CPLR THRU to A32 port 2 coupler	1	N5222-20053
W26	RF cable, A32 port 2 coupler to front-panel Port 2 CPLR ARM	1	N5222-20034
W30	RF cable, Front panel jumper	6	N5222-20091
W32	RF cable, Port 3 RCVR C IN to A24 mixer brick (C)	1	N5222-20048
W33	RF cable, Port 4 RCVR D IN to A24 mixer brick (D)	1	N5222-20055

Table 2 **Contents of Upgrade Kit N5222-60117**

Ref Desig.	Description	Qty	Part Number
W42	RF cable, A21 HMA26.5 to A22 splitter	1	N5222-20009
W43	RF cable, A22 splitter to A23 mixer brick	1	N5222-20007
W44	RF cable, A22 splitter to A24 mixer brick	1	N5222-20008
W49	RF cable, REF 3 RCVR R3 IN to A24 mixer brick (R3)	1	N5222-20057
W50	RF cable, REF 4 RCVR R4 IN to A24 mixer brick (R4)	1	N5222-20058
W52	RF cable, A23 mixer brick (R1) to A20 IF multiplexer (P411)	1	N5242-60021
W53	RF cable, A23 mixer brick (R2) to A20 IF multiplexer (P412)	1	N5242-60022
W55	RF cable, A24 mixer brick (D) to A20 IF multiplexer (P801)	1	N5242-60024
W56	RF cable, A24 mixer brick (R4) to A20 IF multiplexer (P414)	1	N5242-60019
W57	RF cable, A24 mixer brick (R3) to A20 IF multiplexer (P413)	1	N5242-60020
W58	RF cable, A24 mixer brick (C) to A20 IF multiplexer (P601)	1	N5242-60023
W60	RF cable, A20 IF multiplexer board P203 to A12 SPAM board (J2)	1	N5242-60013
W62	RF cable, A20 IF multiplexer board P603 to A12 SPAM board (J5)	1	N5242-60015
W67	RF cable, A10 frequency reference board J7 to bottom of A13 13.5 GHz (source 2) synthesizer board J5 (4-port only)	1	N5242-60030
-	Ribbon cable, A19 test set motherboard J213 to A24 mixer brick (2)	1	N5242-60006

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 the A19 Test Set Motherboard.”
- “Step 6. Remove Some Bottom-Side Semi-Rigid Test Set Cables” on page 15
- “Step 7. Remove the A23 Mixer Brick Assembly.”
- “Step 8. Assemble the A24 Mixer Brick and A22 Splitter Assemblies.”
- “Step 9. Assemble the A26 and A27 Receiver Bridge Assemblies.”
- “Step 10. Install the A23/A24 Mixer Brick Block Assembly.”
- “Step 11. Install the A26 and A27 Receiver Bridge Assemblies.”
- “Step 12. Assemble the A29 - A32 Test Port Coupler Assemblies.”
- “Step 13. Install the LED Boards and Test Port Coupler Assemblies On the 4-Port Test Set Front Plate.”
- “Step 14. Install the Bulkhead Connectors in the Test Set Front Plate.”
- “Step 15. Install the 4-Port Coupler Plate Assembly to the Deck.”
- “Step 16. Assemble the A8 26.5 GHz Source 2 Assembly.”
- “Step 17. Install the A8 26.5 GHz Source 2 Assembly.”
- “Step 18. Install the A13 13.5 GHz (Source 2) Synthesizer Board and Cables.”

“Step 19. Install the Test Set Cables”

“Step 20. Reinstall the A19 Test Set Motherboard.”

“Step 21. Install Cables on the A19 Test Set Motherboard.”

“Step 22. Replace the Front Panel’s Lower Dress Panel.”

“Step 23. Reinstall Front Panel Assembly.”

“Step 24. Install the Overlay.”

“Step 25. Install the Front Panel Jumper Cables.”

“Step 26. Position the Cables and Wires to Prevent Pinching.”

“Step 27. Reinstall the Inner Cover.”

“Step 28. Reinstall the Outer Cover.”

“Step 28. Reinstall the Outer Cover.”

“Step 30. Enable Option 401.”

“Step 31. Perform Post-Upgrade Adjustments and Calibration.”

“Step 32. Prepare the PNA for the User.”

Step 1. Obtain a Keyword and Verify the Information

Follow the instructions on the Software Entitlement Certificate supplied to obtain a license key file for installation of this upgrade. Refer to **“License Key Redemption” on page 6**.

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 4**.

Step 2. Remove the Outer Cover

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

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

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 A19 Test Set Motherboard

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A19 test set motherboard” in the PDF Service Guide¹.

Step 6. Remove Some Bottom-Side Semi-Rigid Test Set Cables

CAUTION

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

NOTE

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

1. Place the analyzer bottom-side up on a flat surface.
2. Remove the following cables. To see an image showing the location of these cables, click the Chapter 6 bookmark “Bottom RF Cables, Standard 2-Port Configuration, Option 201 (S/N Prefixes <6021)” or “Bottom RF Cables, Standard 2-Port Configuration, Option 201 (S/N Prefixes ≥6021)” in the PDF Service Guide¹.

These cables may be discarded - they will not be reinstalled.

- W62 (N5247-60023) A20 IF multiplexer board P603 to A12 SPAM board J2 (2-port)
- W60 (N5247-60024) A20 IF multiplexer board P203 to A12 SPAM board J5 (2-port)
- W64 (N5242-60025) A23 mixer brick (R1) to A20 IF multiplexer (P601)
- W65 (N5242-60026) A23 mixer brick (R2) to A20 IF multiplexer (P801)
- W70 (N5222-20073) A21 HMA26.5 to A23 mixer brick
- W12 (N5222-20068) Port 1 CPLR THRU to A29 port 1 coupler
- W14 (N5222-20070) A29 port 1 coupler to front-panel Port 1 CPLR ARM
- W24 (N5222-20069) Port 2 CPLR THRU to A32 port 2 coupler

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

- W26 (N5222-20071) A32 port 2 coupler to front-panel Port 2 CPLR ARM

These cables must be saved - they will be reinstalled.

- W4 (N5222-20040) W3 to A25 port 1 receiver coupler
- W10 (N5222-20043) W9 to A24 port 2 receiver coupler
- W13 (N5222-20005) A25 port 1 receiver coupler to A33 reference mixer switch
- W36 (N5222-20032) REF 1 RCVR R1 IN to A33 reference mixer switch
- W35 (N5222-20033) A33 reference mixer switch to front-panel REF 1 SOURCE OUT
- W30 (N5222-20091) (qty = 6) Front panel jumper

NOTE: Remove and save the cable guards for the front panel jumpers.

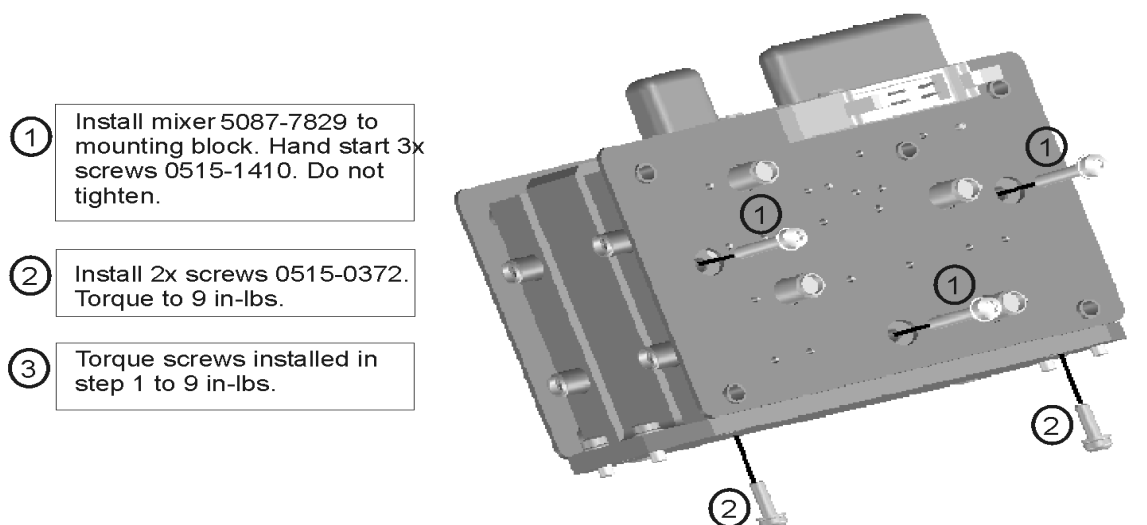
Step 7. Remove the A23 Mixer Brick Assembly

Remove the A23 mixer brick assembly from the PNA. For instructions, click the Chapter 7 bookmark, "Removing and Replacing the A23 and A24 Mixer Bricks" in the PDF Service Guide1.

Step 8. Assemble the A24 Mixer Brick and A22 Splitter Assemblies

1. Follow the instruction shown in **Figure 1** and **Figure 2**. New parts are listed in **Table 2 on page 10** of this document.

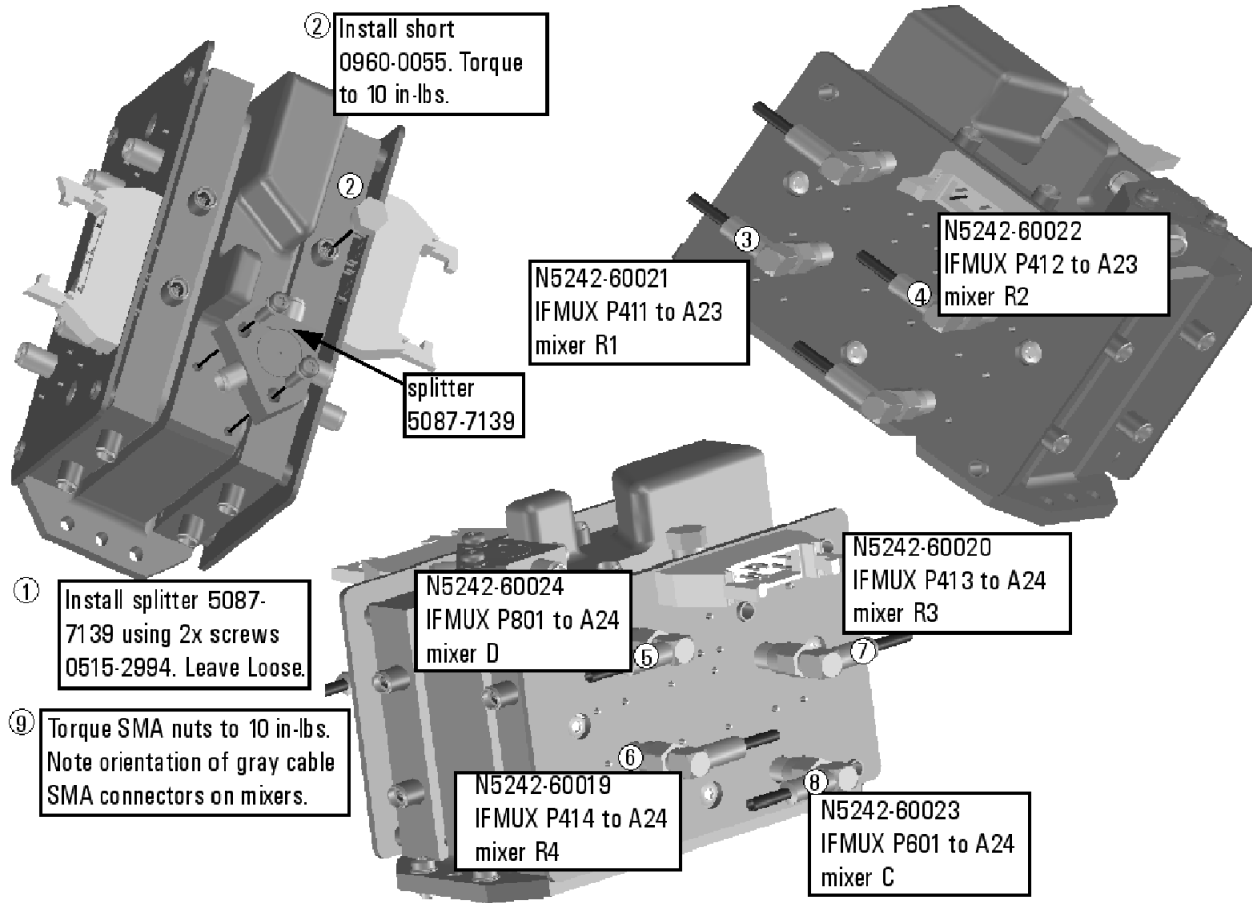
Figure 1 A24 Mixer Brick Assembly (0515-0372, 5087-7829)



N5222_120_03

Figure 2

A24 Mixer Brick Block Assembly (cont.) – (0960-0055, 5087-7139, N5242-60019, N5242-60020, N5242-60021, N5242-60022, N5242-60023, N5242-60024)¹

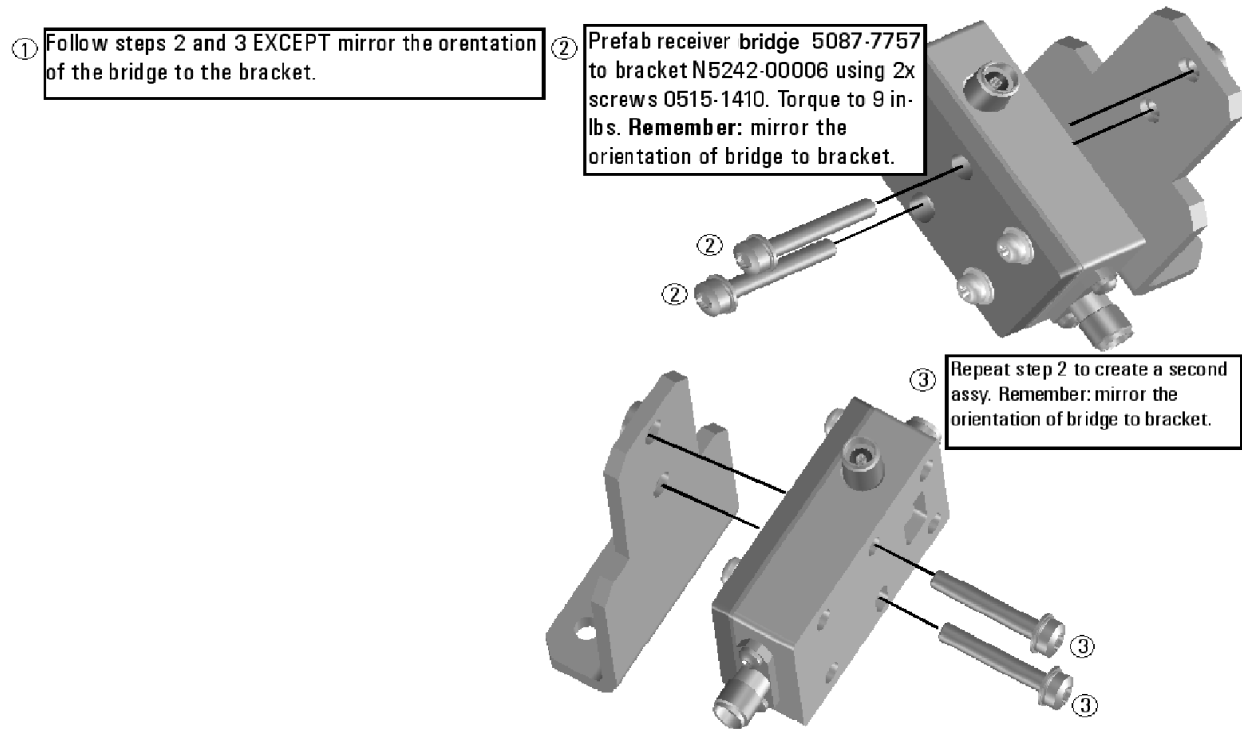


1. The A22 splitter (5087-7139) and N5222-20007, N5222-20008, and N5222-20009 cables are only used with a legacy HMA26.5 p/n: 5087-7765. If your PNA has a new N5240-60101 assembly installed, then set aside these parts as spares for use in other PNAs with the older HMA26.5 or discard. If you are unclear which HMA26.5 assembly your PNA has installed, refer to [Figure 1 on page 7](#).

Step 9. Assemble the A26 and A27 Receiver Bridge Assemblies

Follow the instructions shown in **Figure 3**. New parts are listed in **Table 2** on **page 10** of this document.

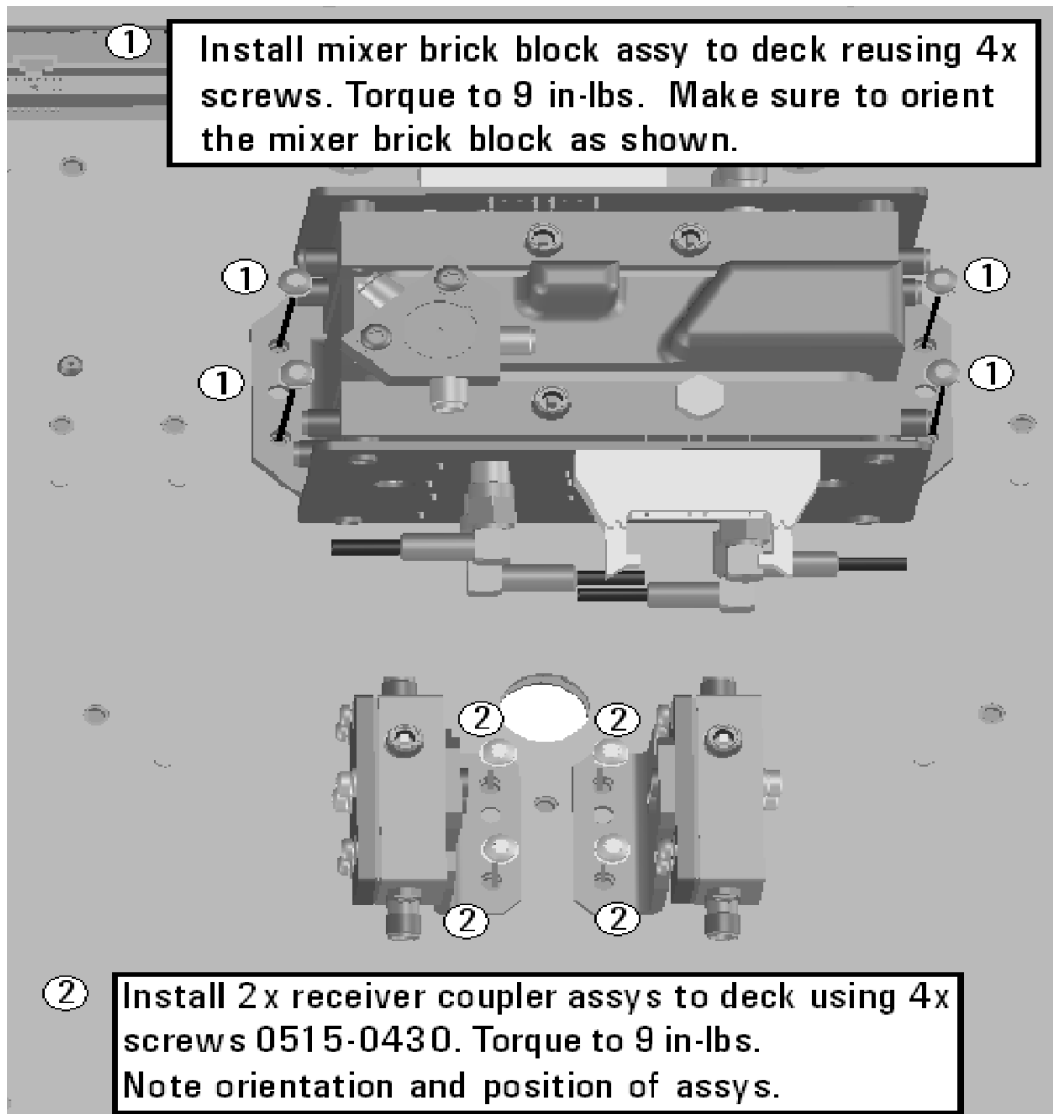
Figure 3 A26 and A27 Receiver Bridge Assemblies (0515-1410, 5087-7757, N5242-00008)



Step 10. Install the A23/A24 Mixer Brick Block Assembly

Follow instruction 1 shown in **Figure 4**. New parts are listed in **Table 2** on **page 10** of this document.

Figure 4 Mixer Brick Block and Receiver Coupler Assemblies Installation (0515-1430)¹



Step 11. Install the A26 and A27 Receiver Bridge Assemblies

Follow instruction 2 shown in **Figure 4**. New parts are listed in **Table 2** on **page 10** of this document.

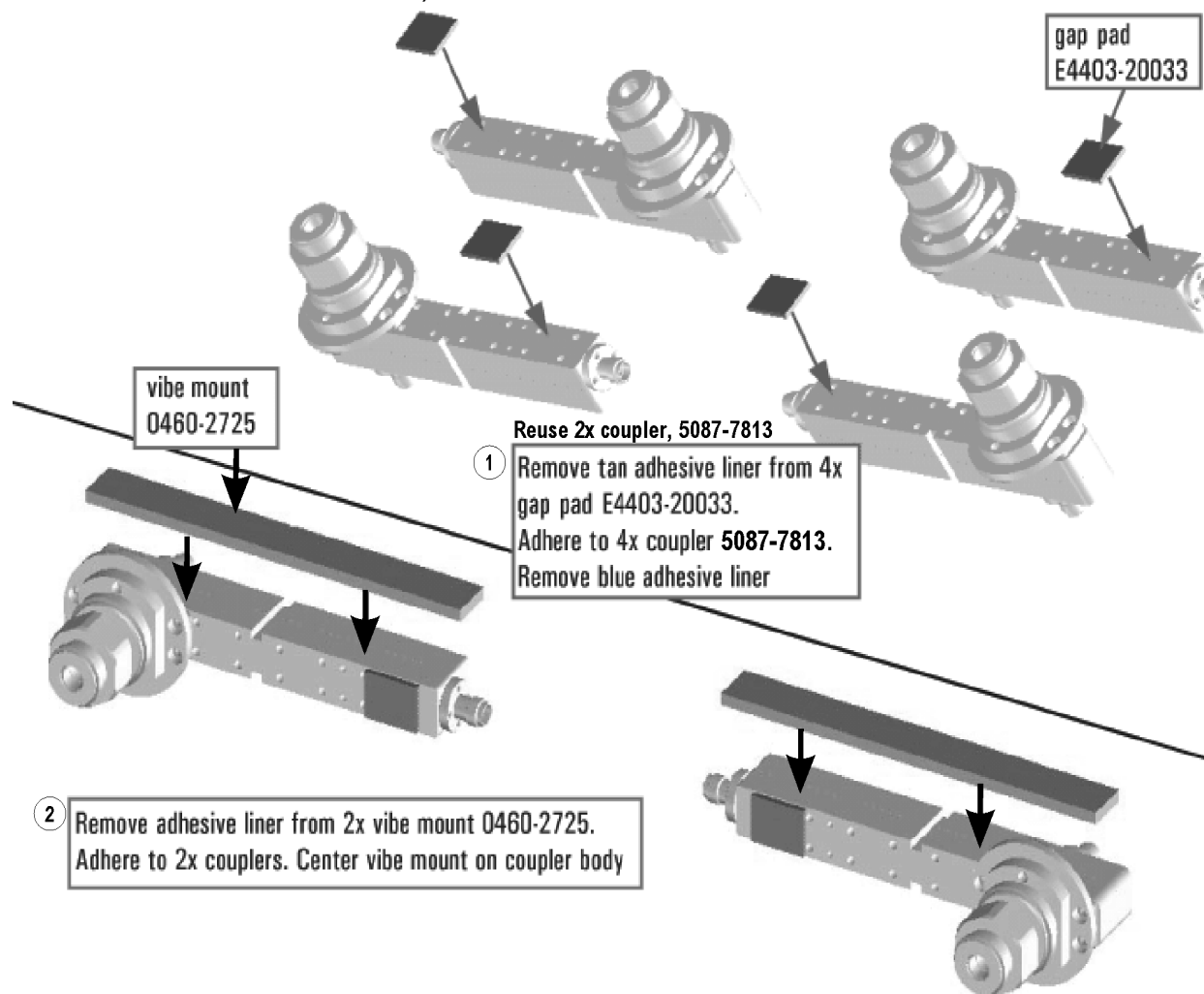
1. The A22 splitter (5087-7139) and N5222-20007, N5222-20008, and N5222-20009 cables are only used with a legacy HMA26.5 p/n: 5087-7765. If your PNA has a new N5240-60101 assembly installed, then set aside these parts as spares for use in other PNAs with the older HMA26.5 or discard. If you are unclear which HMA26.5 assembly your PNA has installed, refer to **Figure 1** on **page 7**.

Step 12. Assemble the A29 - A32 Test Port Coupler Assemblies

2. Remove the A29 test port 1 coupler and A32 test port 2 coupler from the PNA. For instructions, click the Chapter 7 bookmark, "Removing and Replacing the A29 - A32 Test Port Couplers" in the PDF Service Guide¹.
3. Using pliers, remove the adhesive bumper on the A29 test port 1 coupler and on the A32 test port 2 coupler.
4. Follow the two instructions shown in **Figure 5**. New parts are listed in **Table 2 on page 10** of this document.

Figure 5

A29 - A32 Test Port Coupler Assembly (0460-2725, 5087-7813, E4403-20033)



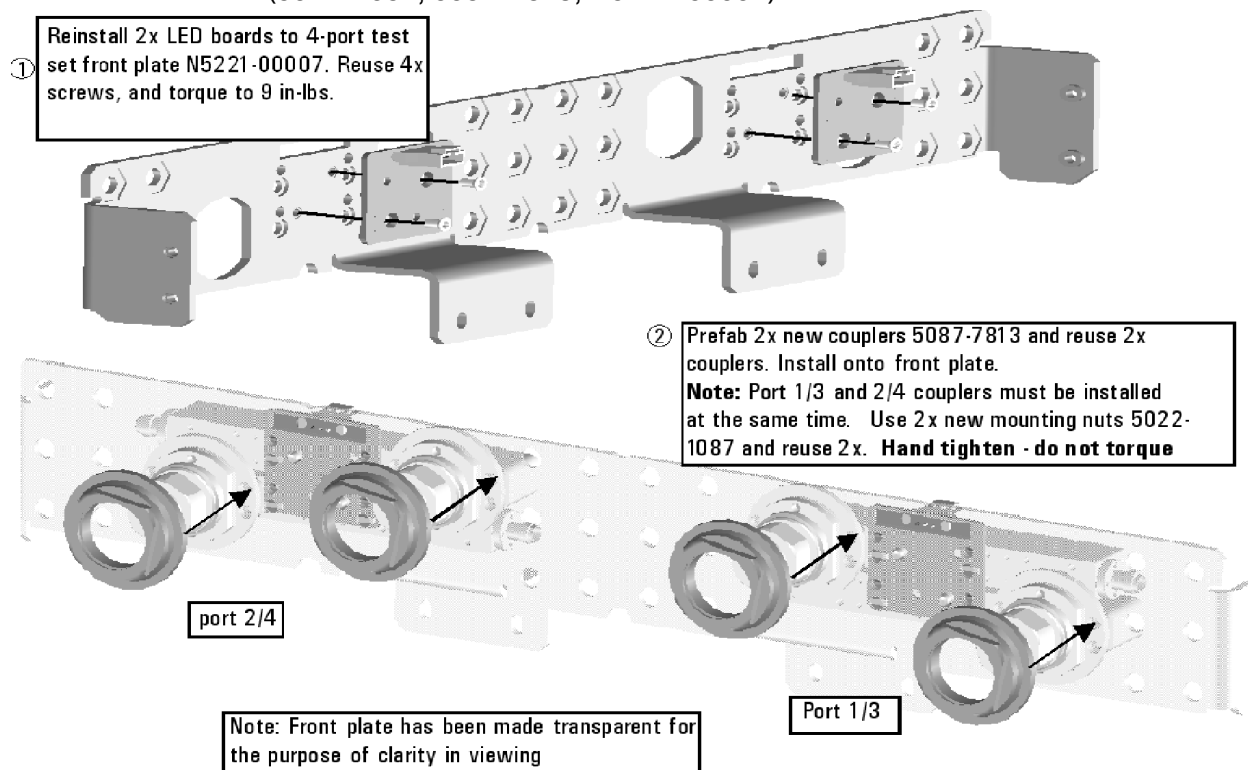
1. See ["Downloading the Online PNA Service Guide" on page 8](#).

Step 13. Install the LED Boards and Test Port Coupler Assemblies On the 4-Port 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. Keep the screws and LED boards for reuse later.
2. Remove the bulkhead connectors, nuts and washers from the 2-port front plate to reuse later.
3. Remove the 2-port test set front plate from the test set deck. Keep the screws for reuse later, but dispose of the test set front plate.
4. Follow the two instructions shown in **Figure 6**.

Figure 6

LED Board Assemblies and Test Port Coupler Assemblies Installation
(5022-1087, 5087-7813, N5221-00007)

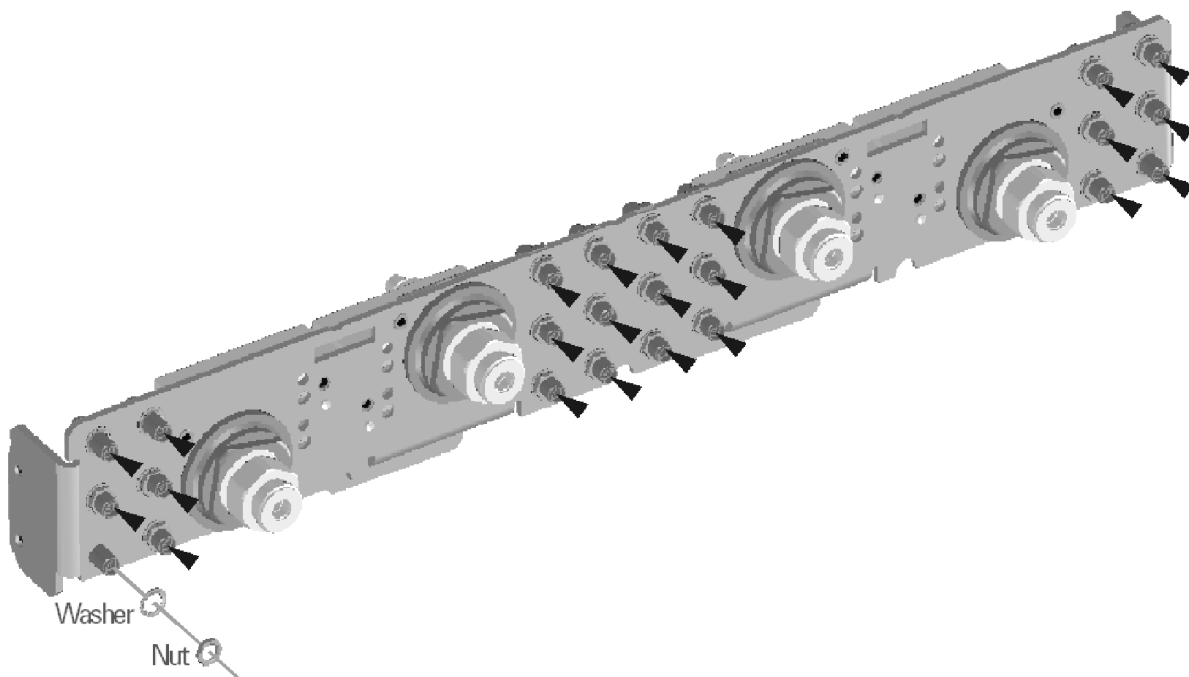


Step 14. Install the Bulkhead Connectors in the Test Set Front Plate

Refer to **Figure 7** for this procedure. New parts are listed in **Table 2 on page 10**.

1. Locate the bulkhead connectors you removed earlier from the 2-port test set front plate of the PNA. Use these and the new bulkhead connectors included in the kit for the remainder of this step.
2. From the back side of the test set front plate, insert a bulkhead connector into a hole in the plate.
3. Install 1x washer and 1x nut. Hand tighten nut and ensure bulkhead connector hexagon nut, on the back side of test set front plate, is aligned to the test set subpanel hexagon indent.
4. Repeat previous two steps for the remaining bulkhead connectors.
5. Torque nuts, on the front side of test set front plate, to 21 in-lbs.

Figure 7 Bulkhead Connectors Installation



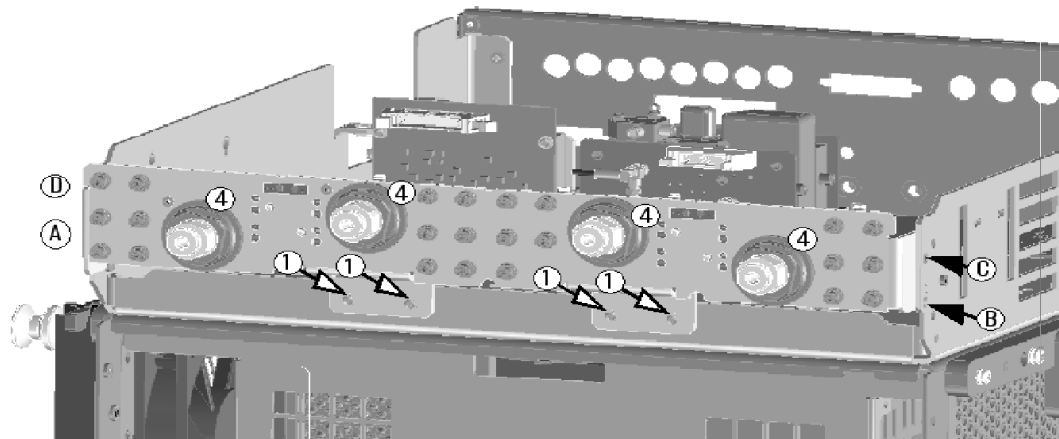
N5242_004_09

Step 15. Install the 4-Port Coupler Plate Assembly to the Deck

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

Figure 8 Coupler Plate Assembly Installation (0515-0372 (item ①), 0515-1227 (item ②))

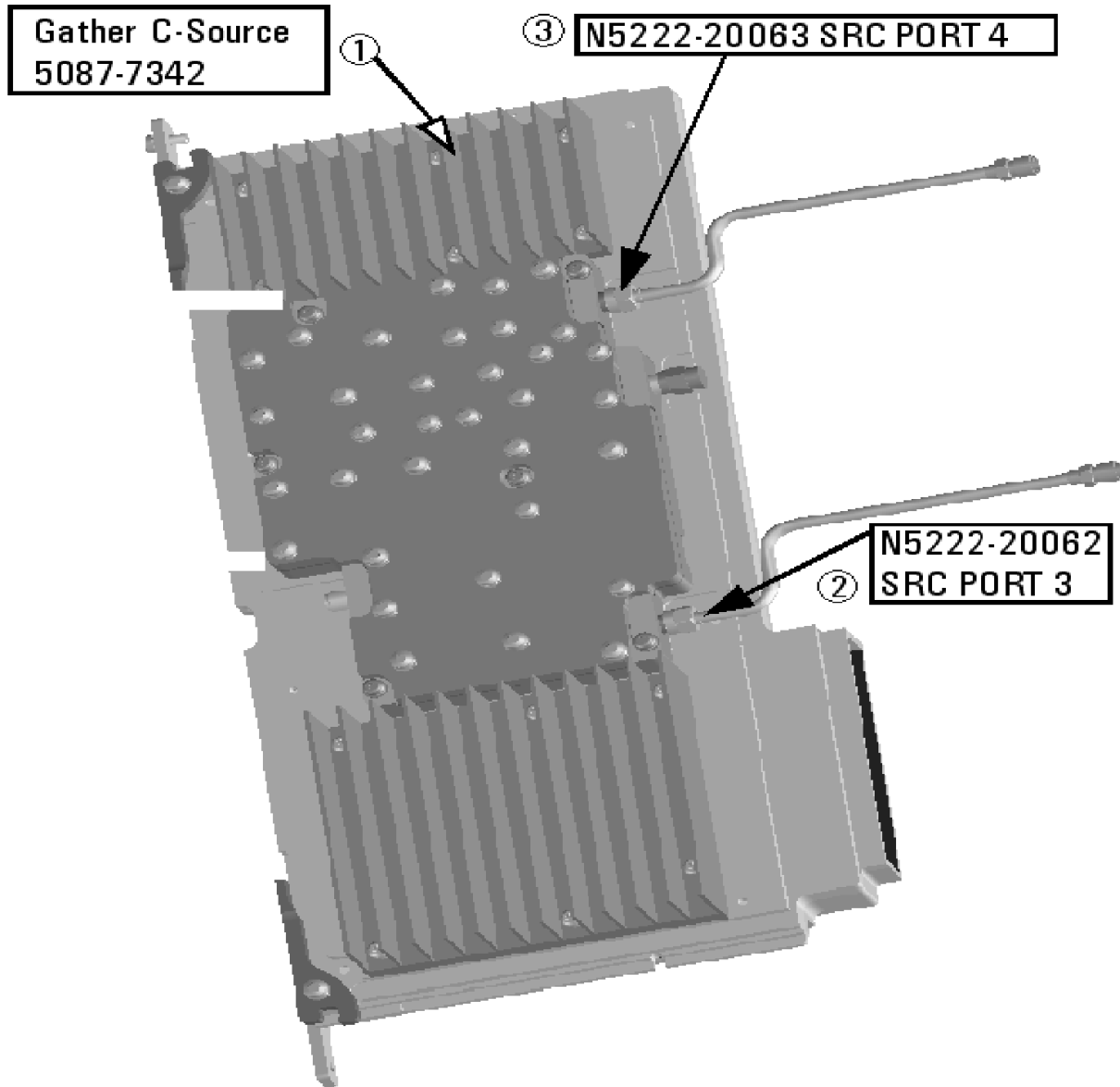
- | | |
|--|---|
| <p>① Install coupler plate assy to deck. Reuse 4x screws. Hand tighten - do not torque.</p> <p>② Reinstall 4x screws. Torque to 9 in-lbs. Alternate sides in torque sequence, as per the circled letters.</p> | <p>③ Torque the 4x screws in step 1 to 9 in-lbs</p> <p>④ Torque the 4x coupler nuts to 72 in-lbs.</p> |
|--|---|



Step 16. Assemble the A8 26.5 GHz Source 2 Assembly

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

Figure 9 A8 Source 2 Assembly (5087-7342, N5222-20062, N5222-20063)

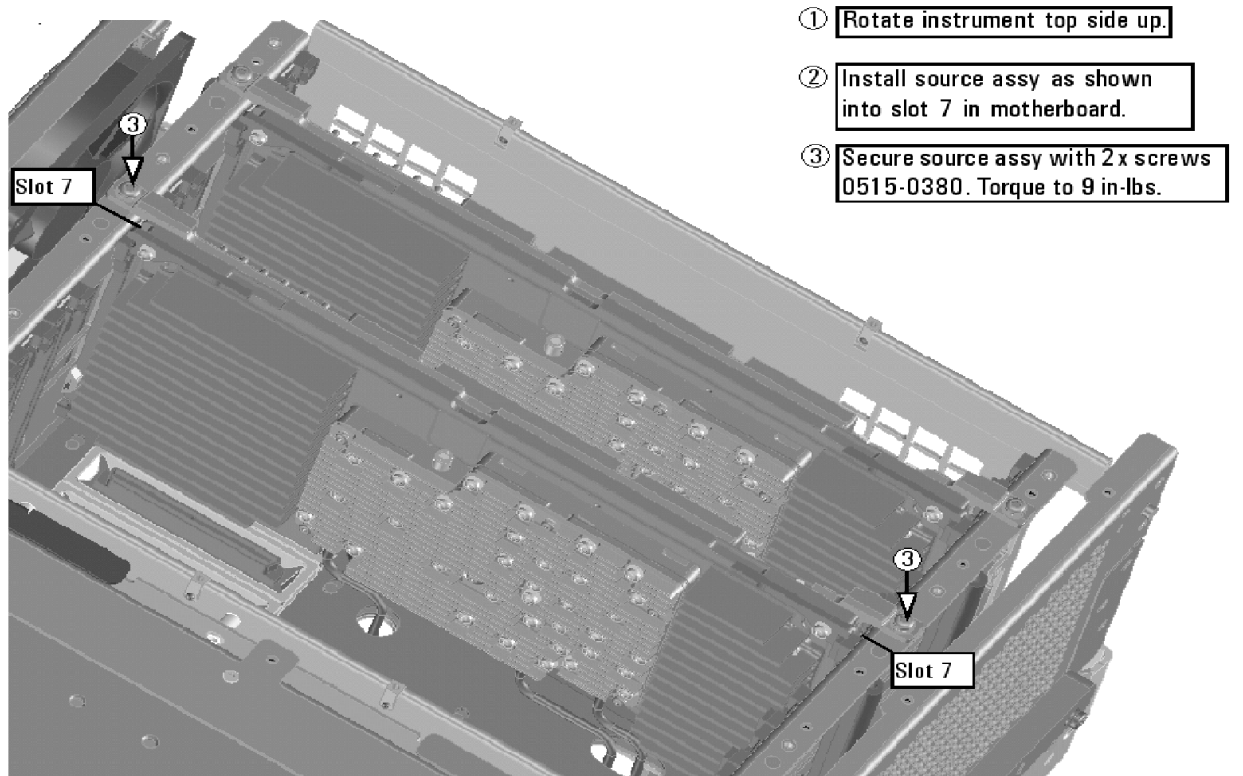


N5222_120_10

Step 17. Install the A8 26.5 GHz Source 2 Assembly

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

Figure 10 A8 Source 2 Assembly Installation (0515-0380)



N5222_120_11

Step 18. Install the A13 13.5 GHz (Source 2) Synthesizer Board and Cables

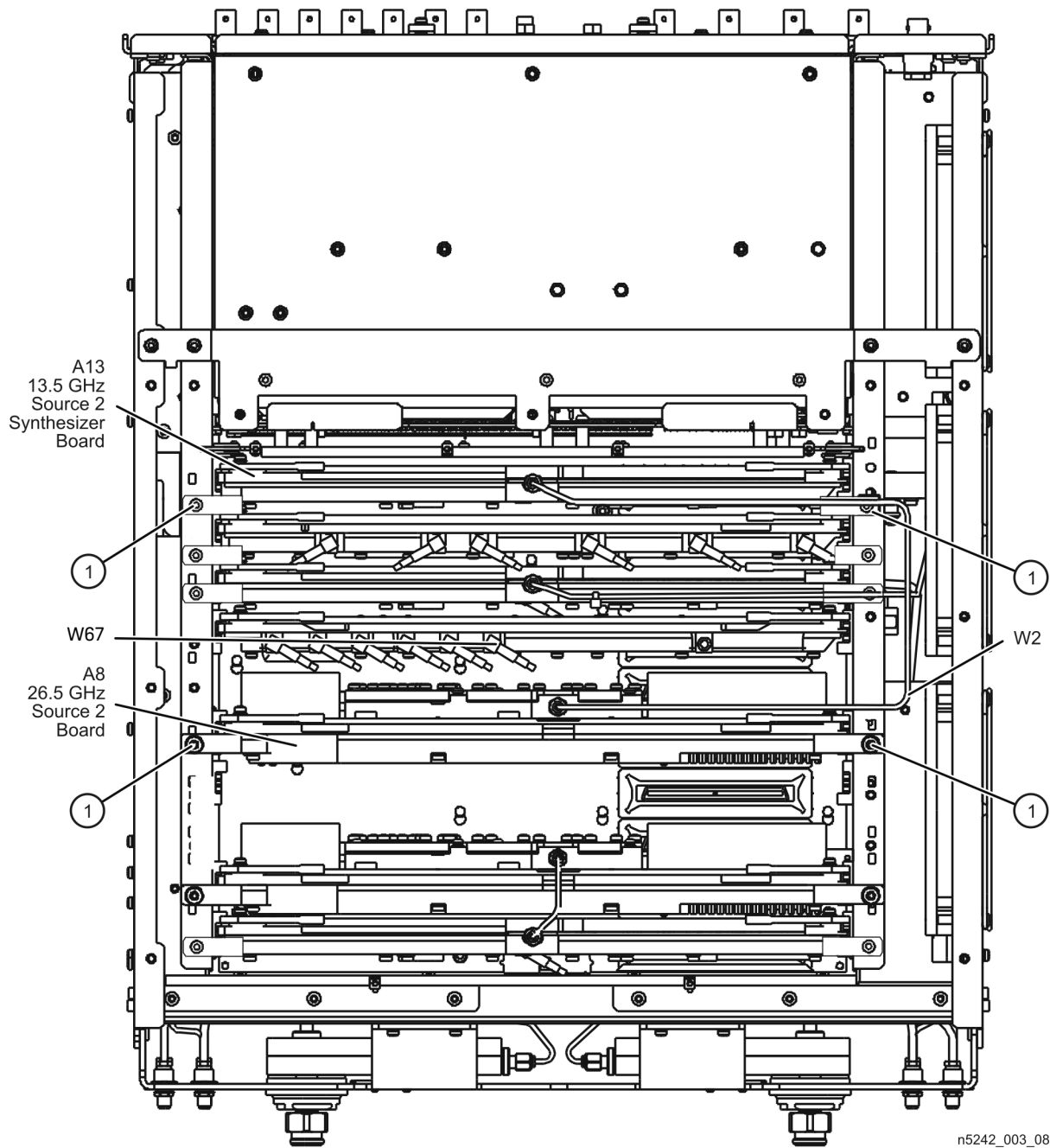
Refer to **Figure 11 on page 27** for this part of this step of the procedure. New parts are listed in **Table 2 on page 10**.

1. Install new gray cable W67 (N5242-60030) to connector J5 of the new A13 (source 2) synthesizer board (N5240-60074). The loose end of the cable will be connected on the A10 frequency reference board (J7) after the A13 source 2 synthesizer board has been installed in the analyzer.
2. Install the A13 board into slot 2 in the motherboard. Secure the board into the chassis using two screws (item ①; 0515-0380). To see an image showing the location of the A13 board in the motherboard, click the Chapter 6 bookmark “Top Assemblies, All Options” in the PDF Service Guide¹.
3. Connect cable W2 (N5222-20090) between the A8 source 2 board and the A13 (source 2) synthesizer board. 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 W67 (N5242-60030) on the A10 frequency reference board (J7). (The other end of this cable was previously connected to J5 of the A13 (source 2) synthesizer board.)

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

Figure 11 Top View of Second Source Boards Installation

Figure 11 Second Source Boards Installation



n5242_003_08

Step 19. Install the Test Set Cables

CAUTION

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

CAUTION

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

NOTE

Cables that are to be reinstalled are designated with “reuse.”

Flexible Cables Required for Upgrading to an Option 401 PNA

Install the following gray flexible cables in the order listed. Mixer brick cables were connected to the mixer bricks earlier in this procedure, but the other ends of these cables still require a connection. To see images showing the location of these cables, click either of the Chapter 6 bookmarks “Bottom RF Cables, 4-Port, Option 401(S/N Prefixes <6021)” or “Bottom RF Cables, Standard 2-Port Configuration, Option 401 (S/N Prefixes ≥6021)” in the PDF Service Guide¹. New parts are listed in **Table 2 on page 10**.

- W60 (N5242-60013) A20 IF multiplexer board P203 to A12 SPAM board J2
- W62 (N5242-60015) A20 IF multiplexer board P603 to A12 SPAM board J5
- W52 (N5242-60021) A23 mixer brick (R1) to A20 IF multiplexer (P411)
- W53 (N5242-60022) A23 mixer brick (R2) to A20 IF multiplexer (P412)
- W55 (N5242-60024) A24 mixer brick (D) to A20 IF multiplexer (P801)
- W56 (N5242-60019) A24 mixer brick (R4) to A20 IF multiplexer (P414)
- W57 (N5242-60020) A24 mixer brick (R3) to A20 IF multiplexer (P413)
- W58 (N5242-60023) A24 mixer brick (C) to A20 IF multiplexer (P601)

Semirigid Cables Required for Upgrading to an Option 400 PNA

To see images showing the location of these cables, click the Chapter 6 bookmark “Bottom RF Cables, 4-Port, Option 401 (S/N Prefixes <6021)” or “Bottom RF Cables, Standard 2-Port Configuration, Option 401 (S/N Prefixes ≥6021)” in the PDF Service Guide¹. New parts are listed in **Table 2 on page 10**.

NOTE

Use a 5/16” wrench to hold cable connectors when tightening a mating semi-rigid cable.

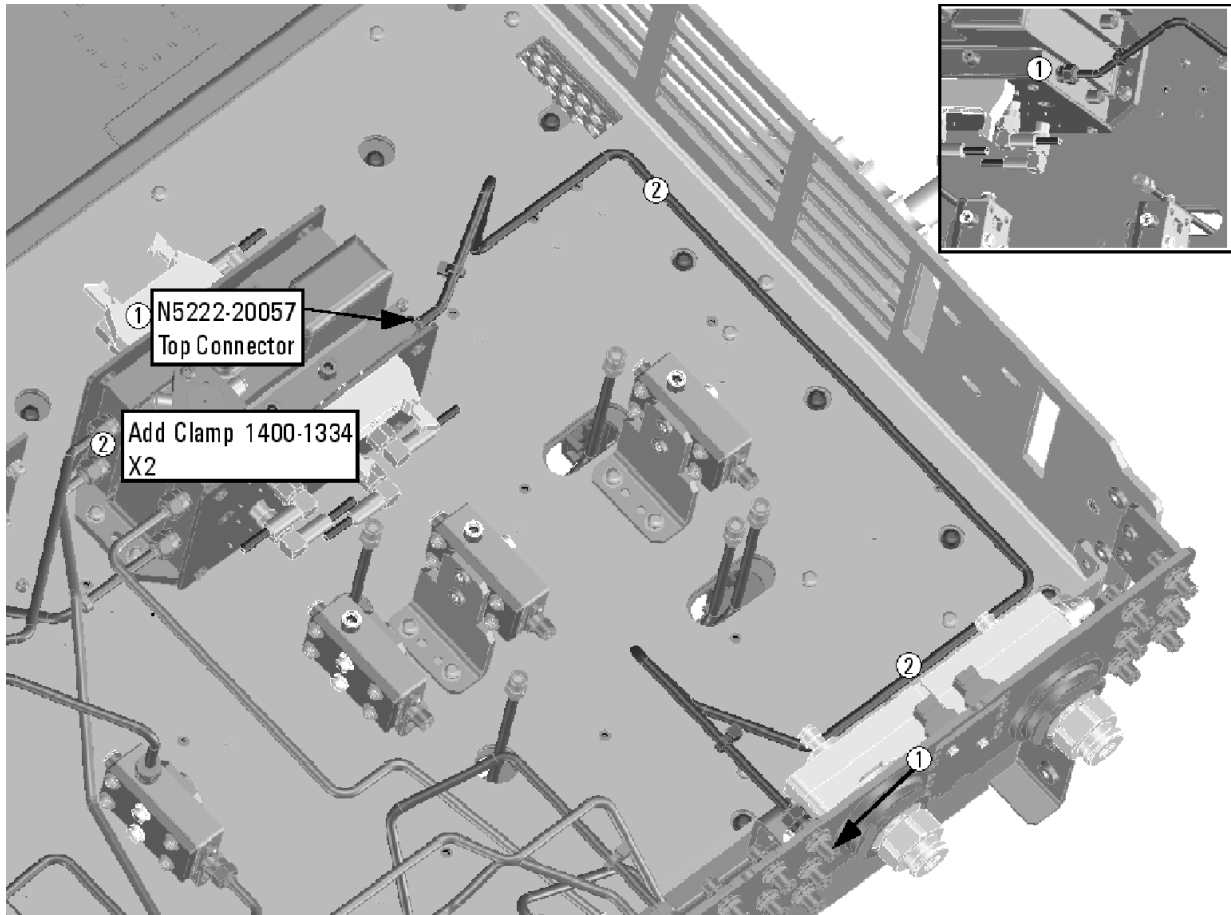
- W26 (N5222-20034) A32 port 2 coupler to front-panel Port 2 CPLR ARM
- W24 (N5222-20053) Port 2 CPLR THRU to A32 port 2 coupler

Installation Procedure for the Upgrade

- W33 (N5222-20055) Port 4 RCVR D IN to A24 mixer brick (D)
- W22 (N5222-20018) A31 port 4 coupler to front-panel Port 4 CPLR ARM
- W20 (N5222-20054) Port 4 CPLR THRU to A31 port 4 coupler
- W50 (N5222-20058) REF 4 RCVR R4 IN to A24 mixer brick (R4)
- W49 (N5222-20057) REF 3 RCVR R3 IN to A24 mixer brick (R3)

* As shown in **Figure 12**, install clamps (part number 1400-1334) to secure W49 (N5222-20057).

Figure 12 Location of Cable Clamps for W49 (1400-1334, N5222-20057)



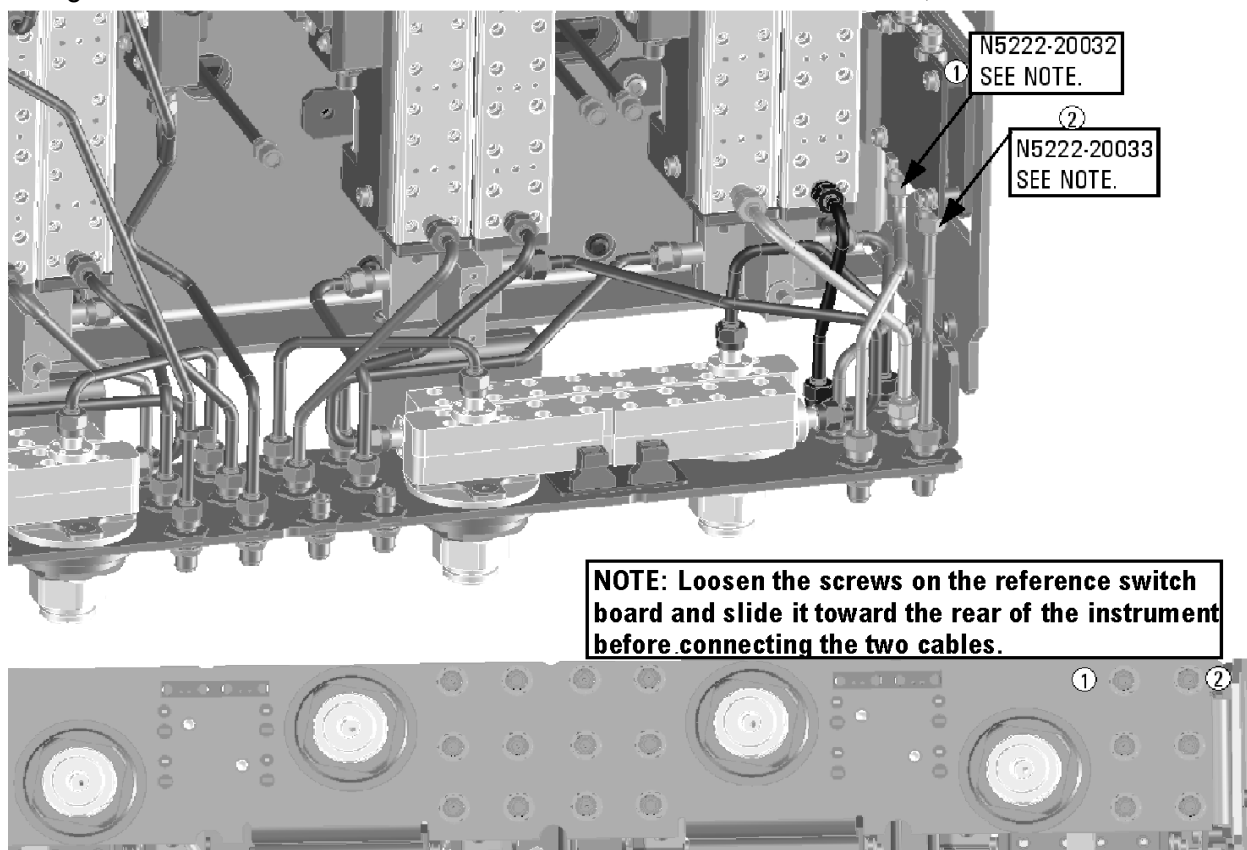
- W32 (N5222-20048) Port 3 RCVR C IN to A24 mixer brick (C)
- W18 (N5222-20015) A30 port 3 coupler to front-panel Port 3 CPLR ARM
- W19 (N5222-20050) A27 port 4 receiver coupler to front-panel Port 4 SOURCE OUT
- W21 (N5222-20025) A27 port 4 receiver coupler to front-panel REF 4 SOURCE OUT
- W15 (N5222-20047) A26 port 3 receiver coupler to front-panel Port 3 SOURCE OUT

Installation Procedure for the Upgrade

- W17 (N5222-20023) A26 port 3 receiver coupler to front-panel REF 3 SOURCE OUT
- W14 (N5222-20030) A29 port 1 coupler to front-panel Port 1 CPLR ARM
- W12 (N5222-20045) Port 1 CPLR THRU to A29 port 1 coupler
- W16 (N5222-20049) Port 3 CPLR THRU to A30 port 3 coupler
- W36 (reuse) (N5222-20032) REF 1 RCVR R1 IN to A33 reference mixer switch

* Refer to the note shown in **Figure 13** for information on installing W36 (part number N5222-20032).

Figure 13 Information to Secure W35 and W36 (N5222-20032, N5222-20033)



- W35 (reuse) (N5222-20033) A33 reference mixer switch to front-panel REF 1 SOURCE OUT

* Refer to the note shown in **Figure 13** for information on installing W36 (part number N5222-20032).

- W13 (reuse) (N5222-20005) A25 port 1 receiver coupler to A33 reference mixer switch

* If the screws that attach the reference mixer switch to the test set deck were loosened, torque these screws now to 9 in-lbs.

- W10 (reuse) (N5222-20043) W9 to A28 port 2 receiver coupler
- W8 (N5222-20042) W7 to A27 port 4 receiver coupler
- W6 (N5222-20041) W5 to A26 port 3 receiver coupler
- W4 (reuse) (N5222-20040) W3 to A25 port 1 receiver coupler

Install New Cable(s) – A21 HMA26.5 to A23/A24 Mixer Brick

If your instrument has a new HMA26.5 (N5240-60101) installed:

- W202 (N5222-20126) RF cable, A24 mixer brick (top connector) to A21 HMA26.5 A24 mixer brick (top connector)

If you have a legacy HMA26.5 (5087-7765) installed, you can discard this cable.

NOTE

- You will need to remove the cap that is installed on the HMA26.5 top connector, before connecting the other end of the W202 cable. You can discard the cap.
- When a A22 splitter is not mounted on the A23/A24 mixer bricks, W202 replaces W42 and W44.

See also, [“Verify the Model/Version of HMA26.5 Installed” on page 7.](#)

If your instrument has a legacy HMA26.5 (5087-7765) installed:

If you have a new HMA26.5 (N5240-60101) installed, you can discard these cables.

- W42 (N5222-20009) A21 HMA26.5 to A22 splitter
NOTE: Tighten both screws on the splitter to 9 in-lbs.
- W44 (N5222-20008) A22 splitter to A24 mixer brick
- W43 (N5222-20007) A22 splitter to A23 mixer brick

See also, [“Verify the Model/Version of HMA26.5 Installed” on page 7.](#)

Step 20. Reinstall the A19 Test Set Motherboard

For instructions on reinstalling the board, click the Chapter 7 bookmark “Removing and Replacing the A19 test set motherboard” in the PDF Service Guide¹.

Step 21. Install Cables on the A19 Test Set Motherboard

CAUTION

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

Install the following ribbon cables. To see an image showing its locations, click the Chapter 6 bookmark “Bottom Ribbon Cables and Wire Harnesses, 4-Port, Option 401 (S/N Prefixes <6021)” or “Bottom Ribbon Cables and Wire Harnesses, Standard 4-Port Configuration, Option 401 (S/N Prefixes ≥6021)” in the PDF Service Guide¹. New parts are listed in **Table 2 on page 10**.

- (reuse) N5242-60006 A19 test set motherboard J212 to A23 mixer brick (1)
- N5242-60006 A19 test set motherboard J213 to A24 mixer brick (2)

Step 22. 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 13-1 on page 33**. New parts are listed in **Table 2 on page 10**.

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

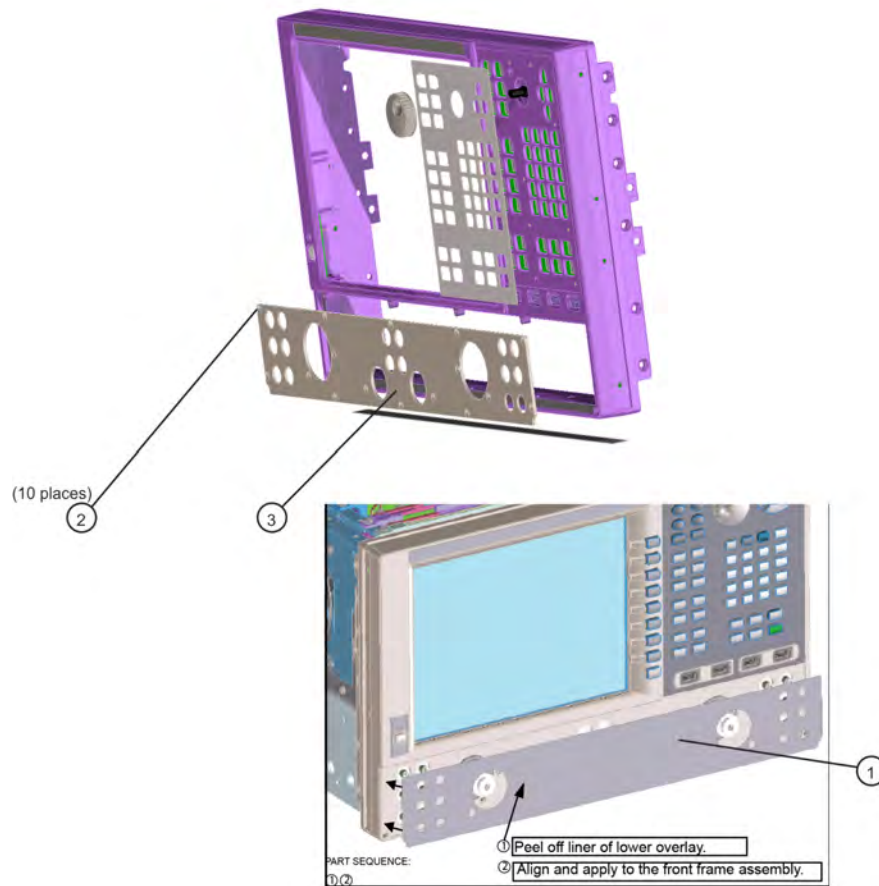
NOTE

IMPORTANT! To avoid possible damage to the lower front panel overlay (label), do not attempt to attach to lower front panel label until “**Step 24. Install the Overlay**” on page 34.

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

Figure 13-1

Replacing the Front Panel's Lower Dress Panel and label



Step 23. 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 Service Guide” on page 8.](#)

Step 24. Install the Overlay

To see an image of the front panel overlay (N5222-80013), refer to [Figure 13-1 on page 33](#). New parts are listed in [Table 2 on page 10](#).

1. Remove the protective backing from the new front panel overlay (N5222-80013).
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 25. Install the Front Panel Jumper Cables

Install twelve W30 front panel jumper cables (N5222-20091) – use 6 new jumpers and reuse 6 old 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 26. 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 27. Reinstall the Inner Cover

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

Step 28. Reinstall the Outer Cover

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

Step 29. Remove Option 201 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 Service Guide” on page 8](#).

Option 201 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 30. Enable Option 401

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 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 14.
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.

4. Connect the USB flash drive to the PNA. 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.

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

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 is running:
 - Press **Help > About NA** and verify that Option **401** is listed in the PNA application.

NOTE

If the option is still not enabled or if the old option has not been removed, contact Keysight Technologies. Refer to “[Getting Assistance from Keysight](#)” on page 4.

3. After successful installation of all upgrades, some features require some adjustments to ensure the instrument meets its specified performance. Refer to the following Web site:
<http://mktwww.srs.is.keysight.com/field/service/network/pna/>.

Step 31. Perform Post-Upgrade Adjustments and Calibration

Adjustments

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.

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

- 10 MHz frequency reference adjustment
- EE default Adjustment
- synthesizer bandwidth Adjustment (only run if the EE default adjustment is insufficient)
- Source Adjustment
- IF Gain Adjustment
- Receiver Characterization
- Receiver Adjustment

- IF Response Adjustment (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.

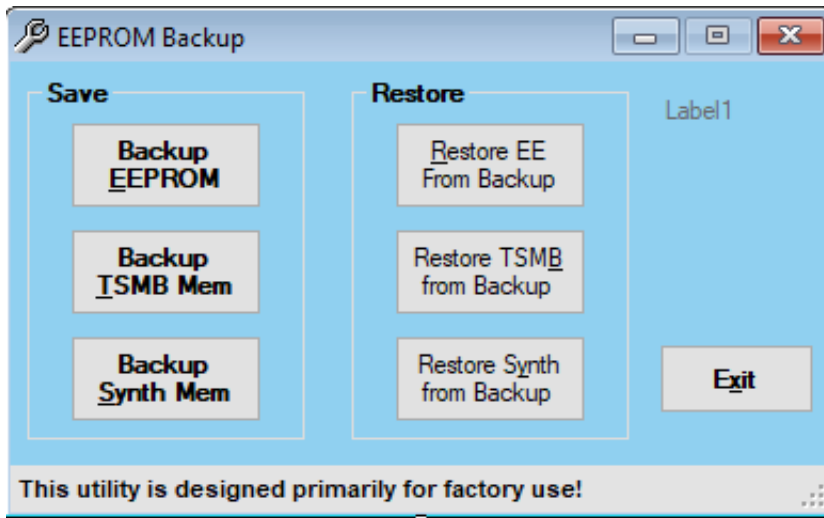
The adjustments listed here generate new correction constants. The analyzer must have a backup of this new data in case any of the data becomes corrupted.

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 Mme.
- Click Backup Synth Mem. (Applies to Version 7 Synthesizers Only)
- Click Exit when the program has finished.

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

Figure 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 4**.

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 32. Prepare the PNA for the User

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

Installation Procedure for the Upgrade



This information is subject to change
without notice.

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