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

To Upgrade PNA N5221B or N5222B Option 200 to

Option 400

Upgrade Kit Order Numbers: N5221BU- 600 and

N5222BU- 600

Keysight Kit Number: N5222-60116

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.**

KEYSIGHT
TECHNOLOGIES

KEYSIGHT
TECHNOLOGIES

Installation Note

Notices

Trademark Acknowledgments

Manual Part Number

N5222-90116

Edition

Edition 1, October 2021

Printed in USA/Malaysia

Warranty

Technology Licenses

U.S. Government Rights

Safety Notices

CAUTION

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

WARNING

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

Description of the Upgrade

This upgrade converts your N5221B or N5222B Option 200 2-port analyzer to a N5221B or N5222B Option 400 4-port analyzer by adding:

— an additional source

— an additional source synthesizer

— an additional mixer brick

— two additional receiver couplers

— two additional test port couplers

— a splitter

— a modified front panel

— new cables

Refer to "Overview of the Installation Procedure" on page 10.

| CAUTION | This repair must be done at a service center or a self-maintainer service center! Refer to "Getting Assistance from Keysight" on page 2. |

KEYSIGHT
TECHNOLOGIES

Getting Assistance from Keysight

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

Contacting Keysight

Assistance with test and measurements needs and information on finding a local Keysight office are available on the Web at:
http://www.keysight.com/find/assist

If you do not have access to the Internet, please contact your Keysight field engineer.

> **NOTE**
>
> In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine whether your product is still within its warranty period.

If You Have Problems With the Upgrade Kit Contents

Keysight stands behind the quality of the upgrade kit contents. If you have problems with any item in the kit, refer to www.keysight.com and the **Contact Keysight** link.

KEYSIGHT
TECHNOLOGIES

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 5.
	— See also your instrument's PDF Service Guide [a].

a. See "Downloading the Online PNA Service Guide" on page 6.

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 7.

— Enough time - refer to "About Installing the Upgrade" on page 7.

— Test equipment for the post-upgrade adjustments and full instrument calibration. To view the equipment list, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide[1].

1. See "Downloading the Online PNA Service Guide" on page 6.

License Key Redemption

NOTE	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

 — Host ID

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 4.

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 2.

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 5.)

The new N5240-60101 HMA26.5 has the splitter integrated into the assembly. Refer to Figure 1 on page 5.

Figure 1   Comparison of Legacy HMA26.5 (5087-7765) and New HMA26.5 (N5240-60101)
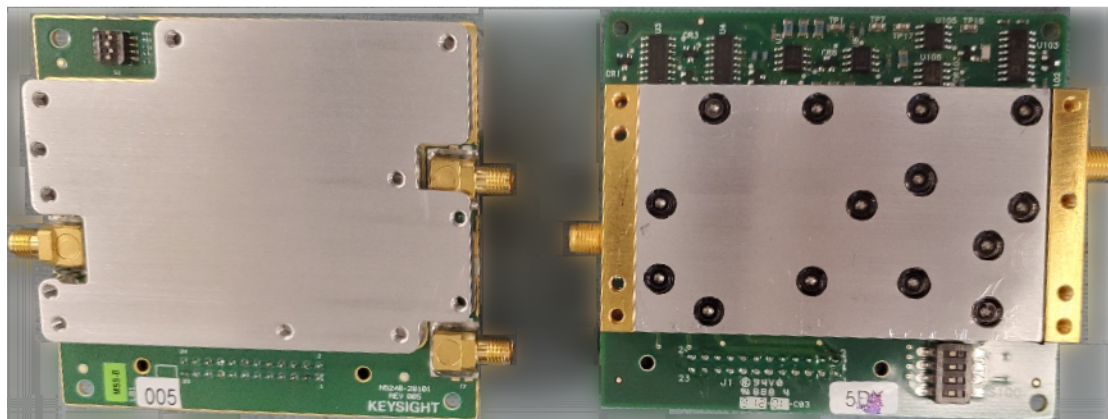
Downloading the Online PNA Service Guide

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 Guide[1].

ESD Equipment Required for the Installation

Description	Keysight Part Number
ESD grounding wrist strap	9300-1367
5-ft grounding cord for wrist strap	9300-0980
2 x 4 ft conductive table mat and 15-ft grounding wire	9300-0797
ESD heel strap (for use with conductive floors)	9300-1308

Tools Required for the Installation

Description	Qty	Part Number
T-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 200
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	5 hours
Estimated adjustment time	0.5 hours
Estimated full instrument calibration time	4.5 hours

Items Included in the Upgrade Kit

Check the contents of your kit against the following list. If any part is missing or damaged, contact Keysight Technologies. Refer to "Getting Assistance from Keysight" on page 2.

Table 1   Contents of Upgrade Kit N5222-60116

Ref Desig.	Description	Qty	Part Number
-	Installation note (this document)	1	N5222-90116
-	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 - with shield tabs	1	N5240-60074
A22	Splitter	1	5087-7139
A24	Mixer brick (2)	1	5087-7829
A26	Test port 3 receiver coupler	2	5087-7757
A27	Test port 4 receiver coupler		
A30	Test port 3 coupler	2	5087-7813
A31	Test port 4 coupler		
-	Machine screw, M2.5 x 12, pan head (to attach A26 and A27 receiver coupler assemblies to test set deck)	4	0515-0374
-	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.)	4	0515-0380
-	Machine screw, M3.0 x 6, flat head (to attach front frame to coupler plate)	2	0515-1946
-	Machine screw, M3 x 14, pan head (to attach splitter to mixer brick)	2	0515-2994
-	Machine screw, M3.0 x 20, pan head (4 to attach brackets to receiver couplers; 3 to attach A24 mixer brick to block)	7	0515-1410
-	Front panel overlay (label), 4-port	1	N5222-80012
-	Test set front plate, 4-port	1	N5221-00007
-	Gap pad (between each test coupler and the test set front plate)	4	E4403-20033
-	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-tie self-locking wide nylon gray	10	1400-0249
-	Cable clamp	5	1400-1334
-	Dust caps for test ports	4	1401-0214
-	Dress panel, overlay – 4-Port	1	N5240-00009
-	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

Table 1 Contents of Upgrade Kit N5222-60116

Ref Desig.	Description	Qty	Part Number
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 A27 port 4 receiver coupler	1	N5222-20042
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
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, A24 IF multiplexer board P203 to A12 SPAM board (J2)	1	N5242-60013
W62	RF cable, A24 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
W98	RF cable, A26 port 3 receiver coupler to A24 mixer brick (R3)	1	N5222-20080
W99	RF cable, A27 port 4 receiver coupler to A24 mixer brick (R4)	1	N5222-20081
W101	RF cable, A25 port 1 receiver coupler to A29 port 1 coupler	1	N5222-20084
W102	RF cable, A26 port 3 receiver coupler to A30 port 3 coupler	1	N5222-20085
W103	RF cable, A27 port 4 receiver coupler to A31 port 4 coupler	1	N5222-20082
W104	RF cable, A28 port 2 receiver coupler to A32 port 2 coupler	1	N5222-20083
W105	RF cable, A29 port 1 coupler to A23 mixer brick (A)	1	N5222-20088
W106	RF cable, A30 port 3 coupler to A24 mixer brick (C)	1	N5222-20089
W107	RF cable, A31 port 4 coupler to A24 mixer brick (D)	1	N5222-20087
W108	RF cable, A32 port 2 coupler to A23 mixer brick (B)	1	N5222-20086
-	Ribbon cable, A19 test set motherboard J221 to ports 1/3 LED board	1	N5242-60009
-	Ribbon cable, A19 test set motherboard J222 to ports 2/4 LED board	1	N5242-60009
-	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 (Test Set) Cables.

Step 7. Remove the A23 Mixer Brick Assembly.

Step 8. Assemble the A24 Mixer Brick Assembly.

Step 9. Assemble the A26 and A27 Receiver Coupler Assemblies.

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

Step 11. Install the A26 and A27 Receiver Coupler Assemblies.

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

Step 13. Install the LED Boards, Bulkhead Connectors, and Test Port Coupler Assemblies to the 4-Port Test Set Front Plate.

Step 14. Install the 4-Port Coupler Plate Assembly to the Deck.

Step 15. Assemble the A8 26.5 GHz Source 2 Assembly.

Step 16. Install the A8 26.5 GHz Source 2 Assembly.

Step 17. Install the A13 13.5 GHz (Source 2) Synthesizer Board and Cables.

Step 18. Install the Test Set Cables.

Step 19. Reinstall the A19 Test Set Motherboard.

Step 20. Install Cables on the A19 Test Set Motherboard.

Step 21. Replace the Front Panel's Lower Dress Panel.

Step 22. Reinstall Front Panel Assembly.

Step 23. Install the Overlay.

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

Step 25. Reinstall the Inner Cover.

Step 26. Reinstall the Outer Cover.

Step 27. Remove Option 200 License.

Step 28. Enable Option 400.

Step 29. Perform Post-Upgrade Adjustments and Calibration.

Step 30. Prepare the PNA for the User.

Step 1. Obtain a Keyword and Verify the Information

Follow the instructions on the Software Entitlement Certificate supplied to obtain a license key for installation of this upgrade. Refer to "License Key Redemption" on page 4.

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 2.

Step 2. Remove the Outer Cover

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

Step 3. Remove the Inner Cover

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

Step 4. Remove the Front Panel Assembly

For instructions, click the Chapter 7 bookmark "Removing and Replacing the Front Panel Assembly" in the PDF Service Guide[1].

Step 5. Remove the A19 Test Set Motherboard

For instructions, click the Chapter 7 bookmark "Removing and Replacing the A19 test set motherboard" in the PDF Service Guide[1].

---

1. See "Downloading the Online PNA Service Guide" on page 6.

Step 6. Remove Some Bottom-Side (Test Set) Cables

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

NOTE	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.
	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 200 (S/N Prefixes <6021)" or "Bottom RF Cables, Standard 2-Port Configuration, Option 200 (S/N Prefixes ≥6021)" in the PDF Service Guide[1].

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

— W60 (N5247-60024) A20 IF multiplexer board P203 to A12 SPAM board J5

— W62 (N5247-60023) A20 IF multiplexer board P603 to A12 SPAM board J2

— W65 (N5242-60026) A23 mixer brick (R2) to A20 IF multiplexer (P801)

— W64 (N5242-60025) A23 mixer brick (R1) to A20 IF multiplexer (P601

— W105 (N5222-20076) A29 port 1 coupler to A23 mixer brick (A)

— W101 (N5222-20075) A25 port 1 receiver coupler to A29 port 1 coupler

— W104 (N5222-20077) A28 port 2 receiver coupler to A32 port 2 coupler

— W70 (N5222-20073) A21 HMA26.5 to A23 mixer brick

— W108 (N5222-20078) A32 port 2 coupler to A23 mixer brick (B)

— Ribbon cable (N5225-60001) A19 test set motherboard J221 to port 1 LED board J1

— Ribbon cable (N5225-60001) A19 test set motherboard J222 to port 2 LED board J1

These cables must be saved - they will be reinstalled.

— W4 (N5222-20040) W3 to A25 port 1 receiver coupler

— W10 (N5222-20043) W9 to A28 port 2 receiver coupler

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 Guide[1].

---

1. See "Downloading the Online PNA Service Guide" on page 6.

Step 8. Assemble the A24 Mixer Brick Assembly

1. Follow the instruction shown in Figure 1 and Figure 2. New parts are listed in Table 1 on page 8 of this document.

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

① Install mixer 5087-7829 to mounting block. Hand start 3x screws 0515-1410. Do not tighten.

② Install 2x screws 0515-0372. Torque to 9 in-lbs.

③ Torque screws installed in step 1 to 9 in-lbs.
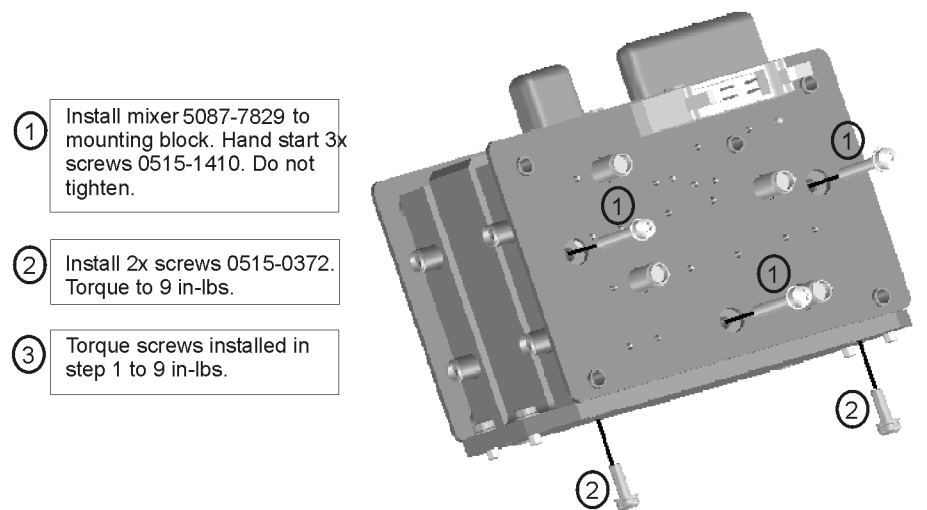
N5222_120_03

Figure 2   A24 Mixer Brick Block Assembly (cont.) – (0515-2994, 0960-0055, 5087-7139, N5242-60019, N5242-60020, N5242-60021, N5242-60022, N5242-60023, N5242-60024)[1]

② Install short 0960-0055. Torque to 10 in-lbs.

N5242-60021 IFMUX P411 to A23 mixer R1

N5242-60022 IFMUX P412 to A23 mixer R2

splitter 5087-7139

① Install splitter 5087-7139 using 2x screws 0515-2994. Leave Loose.

N5242-60024 IFMUX P801 to A24 mixer D

N5242-60020 IFMUX P413 to A24 mixer R3

⑨ Torque SMA nuts to 10 in-lbs. Note orientation of gray cable SMA connectors on mixers.

N5242-60019 IFMUX P414 to A24 mixer R4

N5242-60023 IFMUX P601 to A24 mixer C

N5222_120_04

---

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 5.

Step 9. Assemble the A26 and A27 Receiver Coupler Assemblies

Follow the instructions shown in Figure 3. New parts are listed in Table 1 on page 8 of this document.

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

① Follow steps 2 and 3 EXCEPT mirror the orentation of the bridge to the bracket.

② Prefab receiver coupler 5087-7757 to bracket N5242-00006 using 2x screws 0515-1410. Torque to 9 in-lbs. **Remember:** mirror the orientation of bridge to bracket.

③ Repeat step 2 to create a second assy. Remember: mirror the orientation of bridge to bracket.
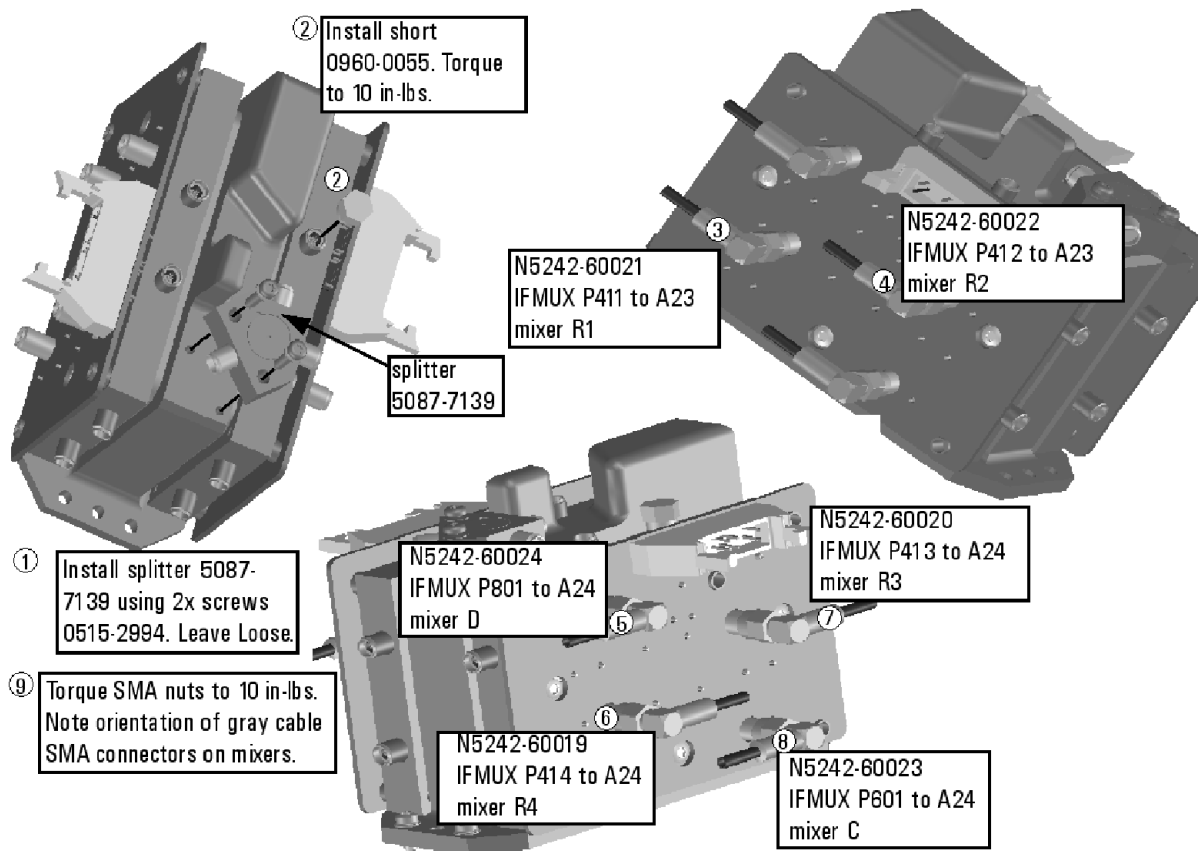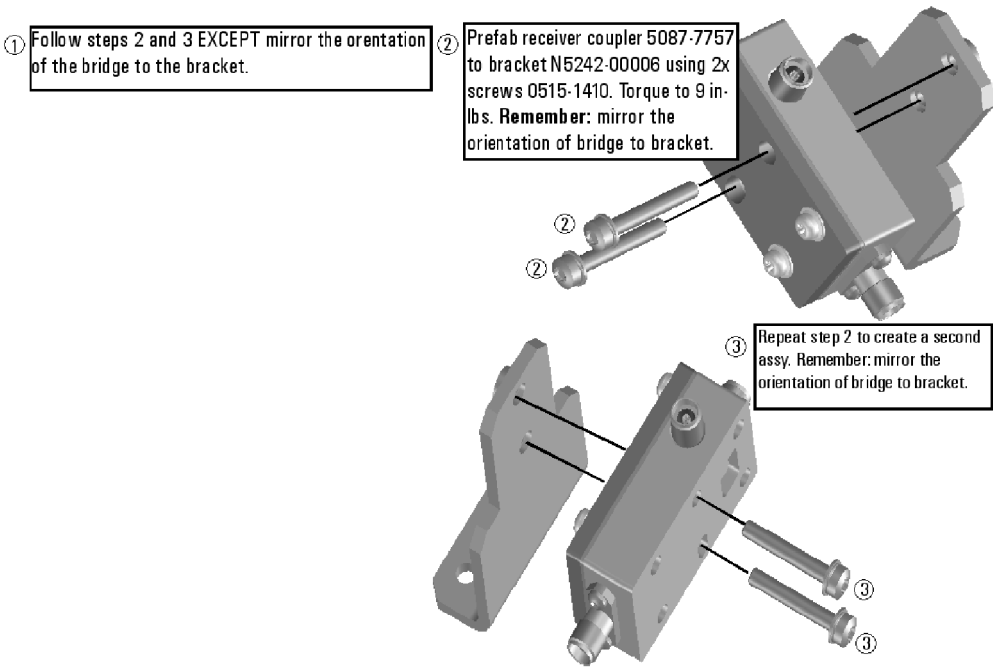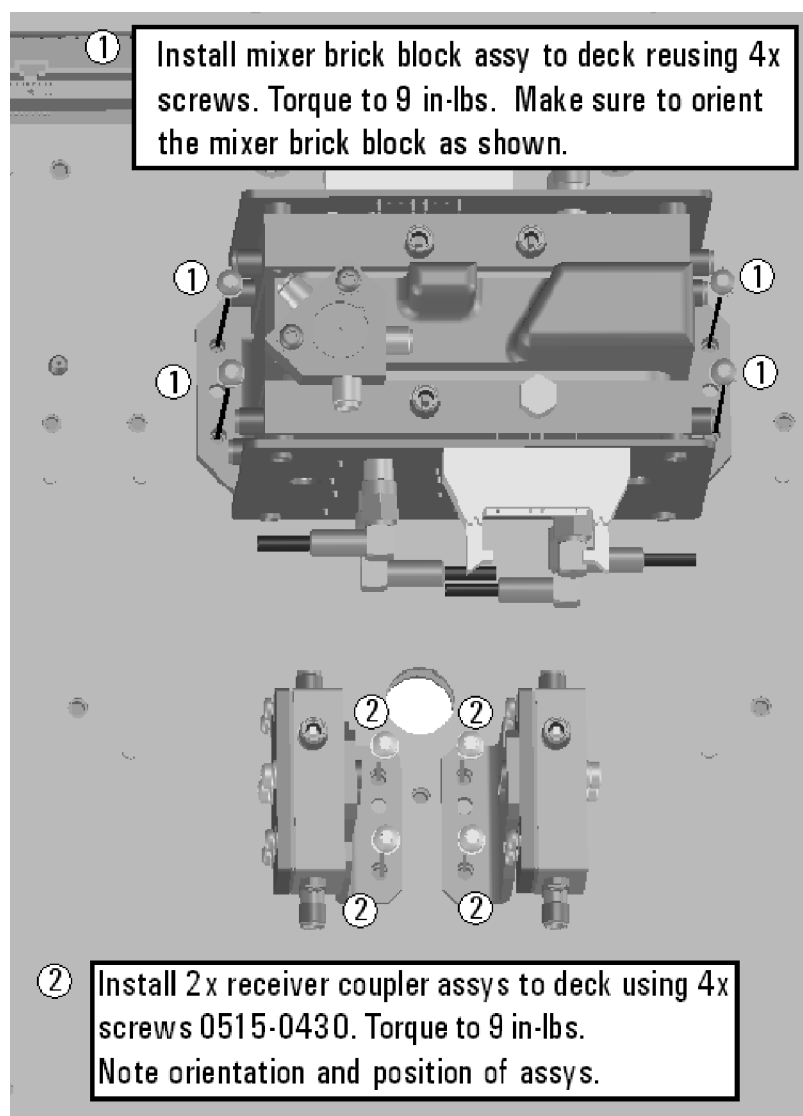
N5222_120_06

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

Follow the instructions shown in Figure 4. New parts are listed in Table 1 on page 8 of this document.

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

① Install mixer brick block assy to deck reusing 4x screws. Torque to 9 in-lbs. Make sure to orient the mixer brick block as shown.

② Install 2x receiver coupler assys to deck using 4x screws 0515-0430. Torque to 9 in-lbs. Note orientation and position of assys.

N5222_120_05

---

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 5.
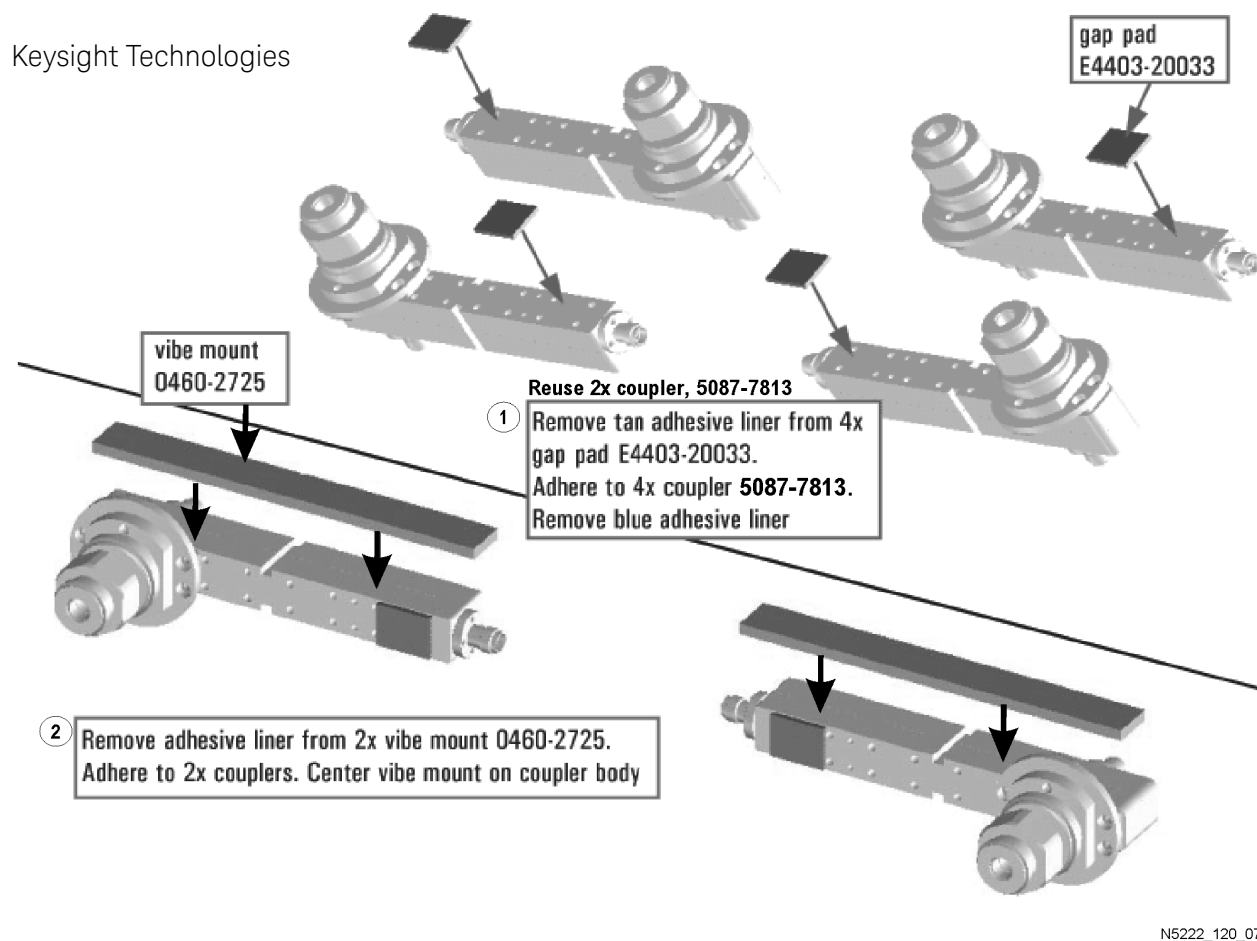
Step 11. Install the A26 and A27 Receiver Coupler Assemblies

Follow the instructions shown in Figure 4. New parts are listed in Table 1 on page 8 of this document.

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

1. 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 Guide[1].

2. Using pliers, remove the adhesive bumper on the A29 test port 1 coupler and on the A32 test port 2 coupler.

3. Follow the two instructions shown in Figure 5. New parts are listed in Table 1 on page 8 of this document.

Figure 5   A29 – A32 Test Port Coupler Assembly (0460-2725, 5087-7813, E4403-20033)

Keysight Technologies

gap pad
E4403-20033

vibe mount
0460-2725

Reuse 2x coupler, 5087-7813

1. Remove tan adhesive liner from 4x gap pad E4403-20033.
Adhere to 4x coupler **5087-7813**.
Remove blue adhesive liner

2. Remove adhesive liner from 2x vibe mount 0460-2725.
Adhere to 2x couplers. Center vibe mount on coupler body

N5222_120_07

Step 13. Install the LED Boards, Bulkhead Connectors, and Test Port Coupler Assemblies to 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 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.

3. 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)

① Reinstall 2x LED boards to 4-port test set front plate N5221-00007. Reuse 4x screws, and torque to 9 in-lbs. Carefully note LED board orientation in image.

② Prefab 2x new couplers 5087-7813 and reuse 2x couplers. Install onto front plate.
Note: Port 1/3 and 2/4 couplers must be installed at the same time. Use 2x new mounting nuts 5022-1087 and reuse 2x. **Hand tighten - do not torque**

port 2/4

Note: Front plate has been made transparent for the purpose of clarity in viewing
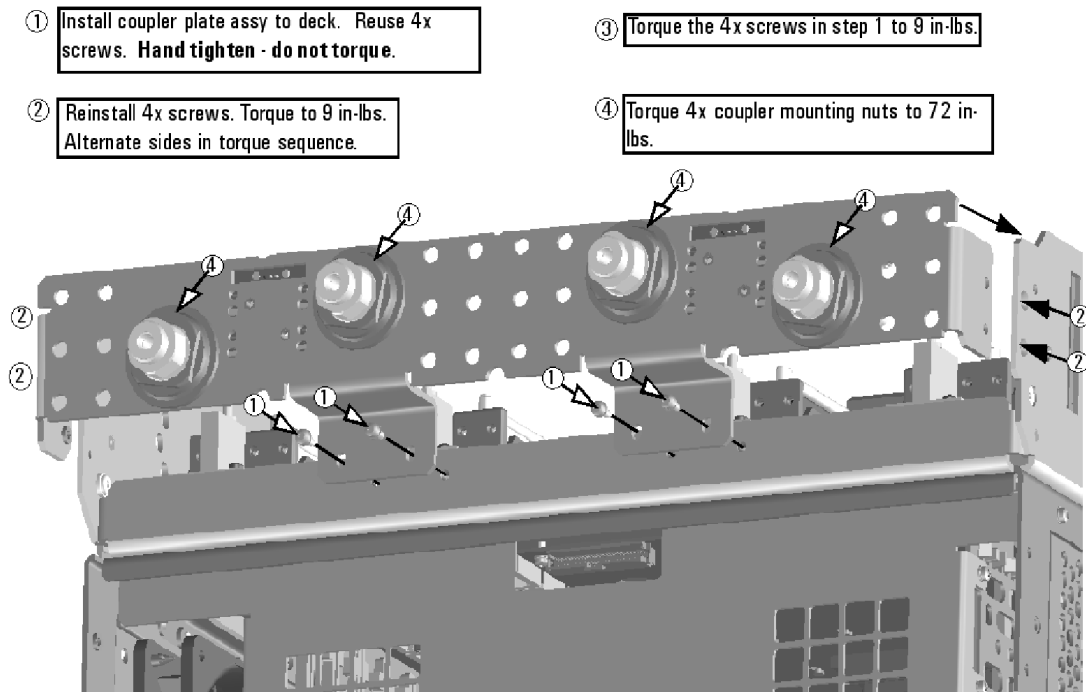
Port 1/3

N5222_120_08

Step 14. Install the 4-Port Coupler Plate Assembly to the Deck

Follow the four instructions shown in Figure 7.

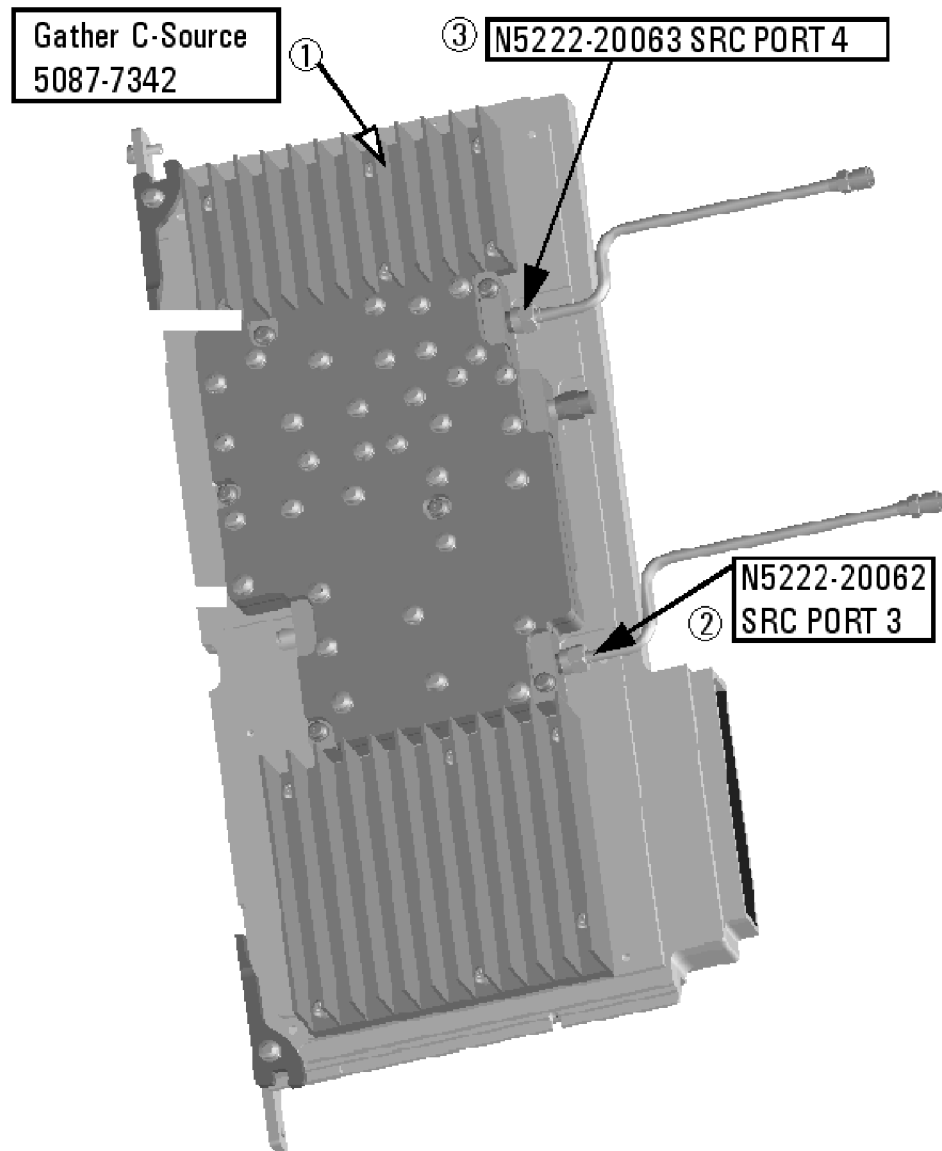Figure 7   Coupler Plate Assembly Installation (0515-0372 (item ①), 0515-1227 (item ②))

N5222_120_09

Step 15. Assemble the A8 26.5 GHz Source 2 Assembly

Follow the three instructions shown in Figure 8.

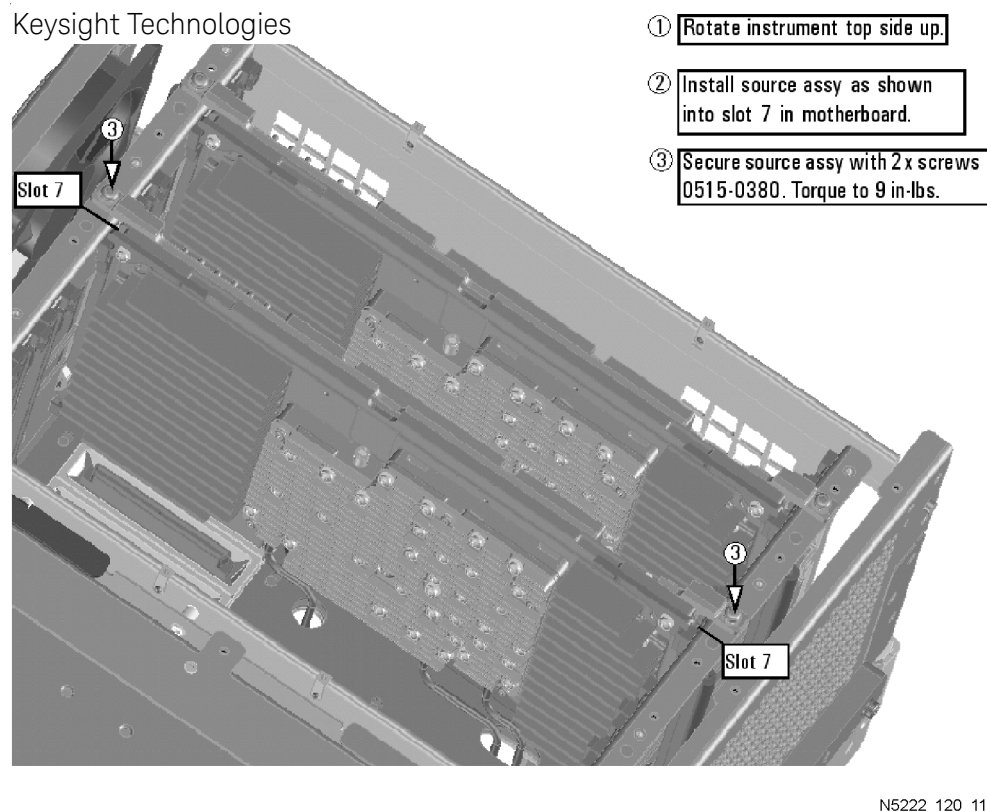Figure 8   A8 Source 2 Assembly (5087-7342, N5222-20062, N5222-20063)

Gather C-Source
5087-7342

①

③ N5222-20063 SRC PORT 4

N5222-20062
② SRC PORT 3

N5222_120_10

Step 16. Install the A8 26.5 GHz Source 2 Assembly

Follow the three instructions shown in Figure 9.

Figure 9   A8 Source 2 Assembly Installation (0515-0380)

N5222_120_11

Step 17. Install the A13 13.5 GHz (Source 2) Synthesizer Board and Cables

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 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 (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 Guide[1].

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 source 2 synthesizer board.)

---

1. See "Downloading the Online PNA Service Guide" on page 6.

Step 18. 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 semirigid cables. Some flexing of the cables may be necessary but do not over-bend them.
CAUTION	Use a 5/16-in torque wrench set to 10 in-lbs on all cable connections except the front and rear panel bulkhead connectors. On these, use a open end torque wrench set 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.

Flexible Cables Required for Upgrading to an Option 400 PNA

Install the following gray flexible cables. To see images showing the location of these cables, click either of the Chapter 6 bookmarks "Bottom RF Cables, 4-Port, Option 400 (S/N Prefixes <6021)" or "Bottom RF Cables, Standard 4-Port Configuration, Option 400 (S/N Prefixes ≥6021)" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 8.

— W60 (N5242-60013) A12 SPAM board (J2) to A20 IF multiplexer (P203)

— W62 (N5242-60015) A12 SPAM board (J5) to A20 IF multiplexer (P603)

   If the following cables were not connected when the new mixer brick assembly was installed earlier, connect them now:

— 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)

---

1. See "Downloading the Online PNA Service Guide" on page 6.

## 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 400(S/N Prefixes <6021)" or "Bottom RF Cables, Standard 4-Port Configuration, Option 400 (S/N Prefixes ≥6021)" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 8.

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

— W108 (N5222-20086) A32 port 2 coupler to A23 mixer brick (B)

— W99 (N5222-20081) A27 port 4 receiver coupler to A24 mixer brick (R4)

   * As shown in Figure 10, install clamps (part number 1400-1334) to secure W99.

Figure 10   Location of Cable Clamps for W99 (N5222-20081)
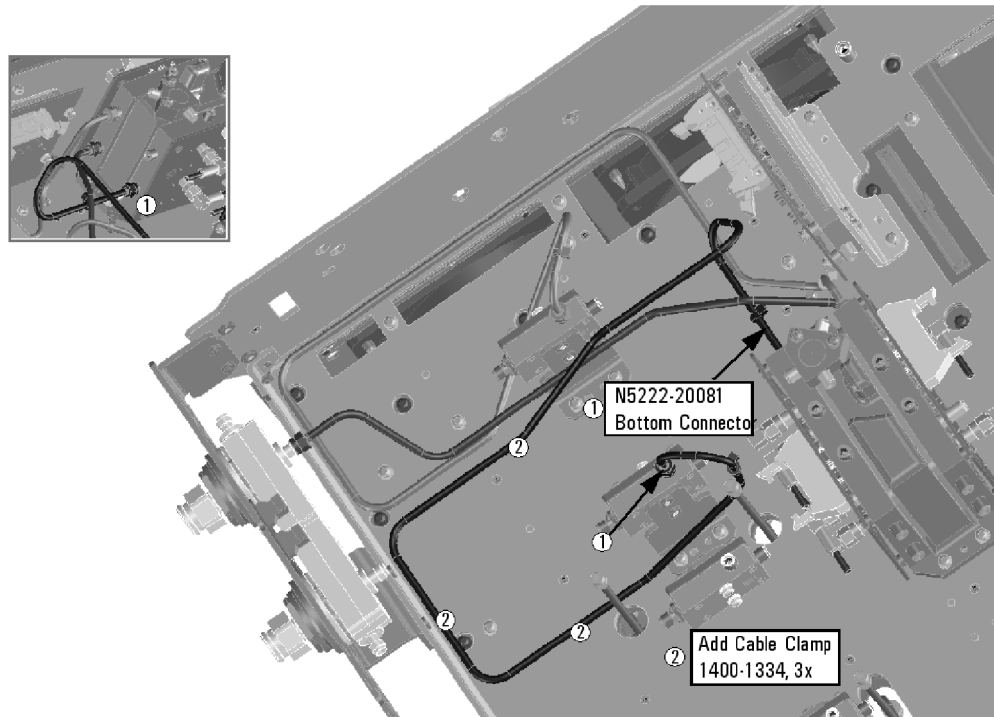
N5222_120_01

— W107 (N5222-20087) A31 port 4 coupler to A24 mixer brick (D)

— W104 (N5222-20083) A28 port 2 receiver coupler to A32 port 2 coupler

— W103 (N5222-20082) A27 port 4 receiver coupler to A31 port 4 coupler

— W105 (N5222-20088) A29 port 1 coupler to A23 mixer brick (A)

1. See "Downloading the Online PNA Service Guide" on page 6.

— W106 (N5222-20089) A30 port 3 coupler to A24 mixer brick (C)

— W98 (N5222-20080) A26 port 3 receiver coupler to A24 mixer brick (R3)

  * As shown in Figure 11, install clamps (part number 1400-1334) to secure W98.

Figure 11   Location of Cable Clamps for W98 (N5222-20080)
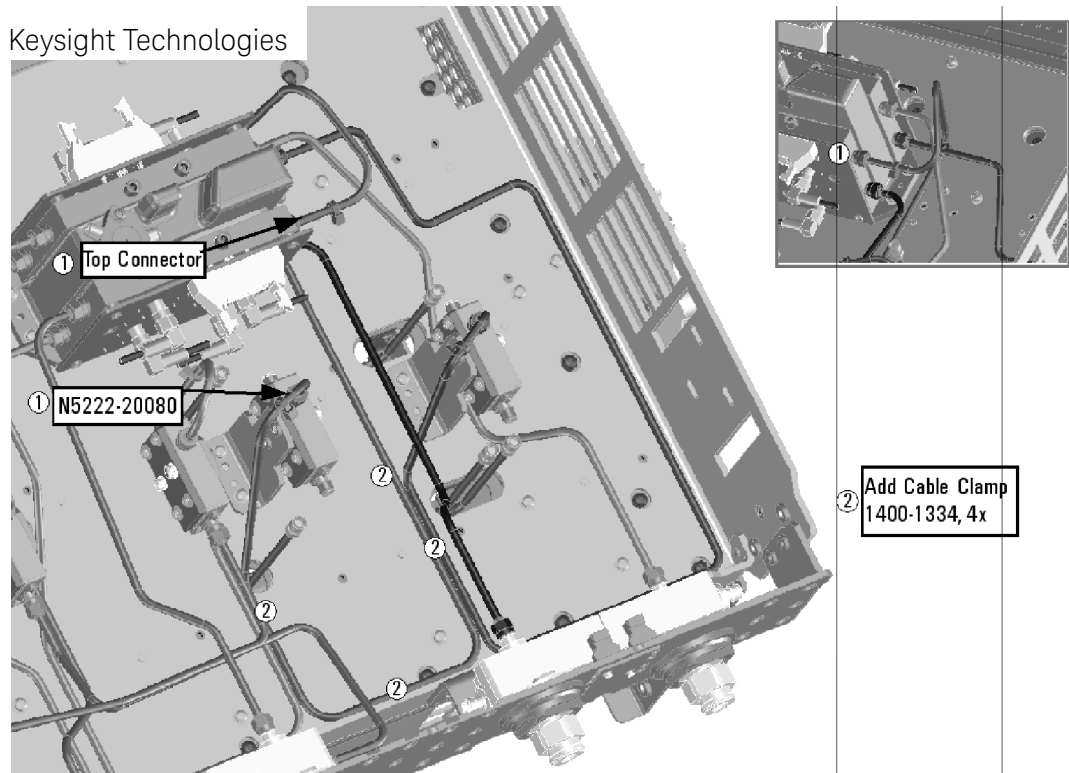
N5222_120_02

— W101 (N5222-20084) A25 port 1 receiver coupler to A29 port 1 coupler

— W102 (N5222-20085) A26 port 3 receiver coupler to A30 port 3 coupler

— 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:

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

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

> **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 5.

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 5.

Step 19. 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 Guide[1].

Step 20. 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 400" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 8.

— (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)

— N5242-60009 A19 test set motherboard J221 to ports 1/3 LED board

— N5242-60009 A19 test set motherboard J222 to ports 2/4 LED board

---

1. See "Downloading the Online PNA Service Guide" on page 6.

## Step 21. 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 12 on page 26. New parts are listed in Table 1 on page 8.

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 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 23. Install the Overlay" on page 27.

Figure 12   Replacing the Front Panel's Lower Dress Panel and label
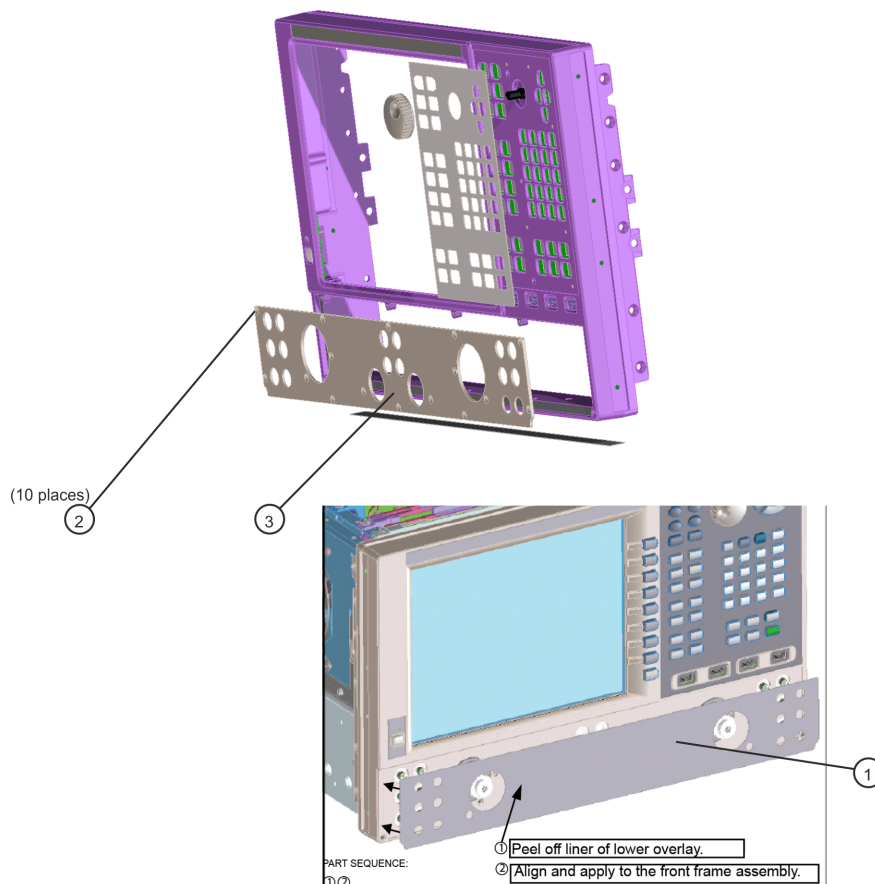
Step 22. Reinstall Front Panel Assembly

For instructions on reinstalling the front panel assembly, click the Chapter 7 bookmark "Removing and Replacing the Front Panel Assembly" in the PDF Service Guide[1].

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

Step 23. Install the Overlay

To see an image of the front panel overlay (N5222-80012), click the Chapter 6 bookmark "Front Panel Assembly, Front Side, All Options" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 8.

1. Remove the protective backing from the new front panel overlay (N5222-80012).

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.

4. Reinstall front panel jumpers.

Step 24. 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 25. Reinstall the Inner Cover

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

Step 26. Reinstall the Outer Cover

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

---

1. See "Downloading the Online PNA Service Guide" on page 6.

Step 27. Remove Option 200 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.

Option 200 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 28. Enable Option 400

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

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.

— 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.

— Obtain your license key file(s) for installation of this upgrade by following the instructions on the supplied Software Entitlement Certificate.

Option Enable Procedure

1. Locate the email(s) from Keysight which contain license file attachments. These emails are a result of .

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. The instrument automatically reads the license file(s) from the USB flash drive, validates the file(s), and installs the option(s). Generally, warnings or error messages may be ignored.

5. Disconnect the USB flash drive from the PNA.

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

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

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(s) have not been enabled or if Option 200 has not has not been removed, contact Keysight Technologies. Refer to "Getting Assistance from Keysight" on page 2.

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 29. 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: Synth LO only (Version 6 synthesizers)

— synthesizer bandwidth adjustment (This test is only required when the EE default adjustment is not sufficient)

— source adjustment

— IF gain adjustment

— receiver adjustment

— receiver characterization

— 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 Guide[1].

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:

---

1. See "Downloading the Online PNA Service Guide" on page 6.

- — 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.

Figure 13   EEPROM Backup Menu
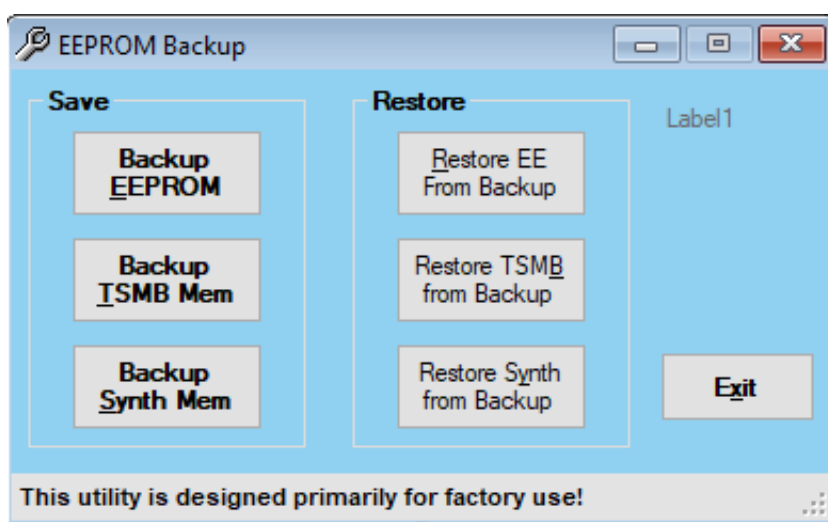
Operator's Check

Perform the Operator's Check to check the basic functionality of the analyzer. For instructions, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide[1].

If you experience difficulty with the basic functioning of the analyzer, contact Keysight. Refer to "Contacting Keysight" on page 2.

Calibration

Although the analyzer functions, its performance relative to its specifications has not been verified. It is recommended that a full instrument calibration be performed using the analyzer's internal performance test software. To view information on the performance test software, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide.

Step 30. 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.

N5222-90116

KEYSIGHT
TECHNOLOGIES