Keysight Add 4-Port Capability Upgrade Kit

To Upgrade PNA N5221A or N5222A Option 201 to Option 401

Upgrade Kit Order Numbers: N5221AU- 601 and N5222AU- 601

Keysight Kit Number: N5222-60112

KEYSIGHT
TECHNOLOGIES

Installation Note

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Safety Notes

The following safety notes are used throughout this document. Familiarize yourself with each of these notes and its meaning before performing any of the procedures in this document.

WARNING	**Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**
CAUTION	Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

Description of the Upgrade

This upgrade converts your N5221A or N5222A Option 201 2-port analyzer to a N5221A or N5222A Option 401 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

- an additional cable guard

- new cables

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.

Getting Prepared

CAUTION   The PNA contains extremely sensitive components that can be ruined if mishandled. Follow instructions carefully when making cable connections, especially wire harness connections.

                      The person performing the work accepts responsibility for the full cost of the repair or replacement of damaged components.

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

- A license key - refer to "License Key Redemption" below.

- A PDF copy or a paper copy of the PNA Service Guide - refer to "Downloading the Online PNA Service Guide" below.

- An ESD-safe work area - refer to "Protecting Your Workspace from Electrostatic Discharge" below.

- Correct tools - refer to "Tools Required for the Installation" on page 6.

- Enough time - refer to "About Installing the Upgrade" on page 6.

- 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].

License Key Redemption

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

To enable the option product, you must request a license key from: http://www.keysight.com/find/softwarelicense. To complete the request, you will need to gather the following information:

- From the certificate

  ❏ Order number

  ❏ Certificate number

- From your instrument

  ❏ Model number

  ❏ Serial number

  ❏ Host ID

The instrument information is available on the network analyzer – on the analyzer's **Help** menu, click **About Network Analyzer**.

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

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1. See "Downloading the Online PNA Service Guide" on page 5.

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 (Ex: N5222A) and click **Search**.

3. Click Technical Support > Manuals.

4. Click Service Manual.

5. Click the service guide title to download the PDF file.

6. 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	N5221A and N5222A Option 201
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 .

Table 1   Contents of Upgrade Kit N5222-60112

Ref Desig.	Description	Qty	Part Number
-	Installation note (this document)	1	N5222-90121
A8	26.5 GHz source (2) board	1	5087-7342
A13	13.5 GHz (source 2) synthesizer board	1	N5240-60074 Was N5242-60150
A22	Splitter	1	5087-7139
A24	Mixer brick (2)	1	5087-7829 Was 5087-7766
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		
-	Front frame, 4-port	1	N5247-20141
-	Machine screw, M2.5 x 20, pan head (to attach A26 and A27 receiver coupler assemblies to test set deck)	5	0515-0430
-	Machine screw, M4.0 x 10, pan head (to attach the following boards to the analyzer chassis: A13 13.5 GHz synthesizer board and A8 26.5 GHz source board.)	5	0515-0380
-	Machine screw, M3.0 x 6, flat head (to attach front frame to coupler plate)	3	0515-1946
-	Machine screw, M3 x 14, pan head (to attach splitter to mixer brick)	3	0515-2994
-	Machine screw, M3.0 x 20, pan head (to attach brackets to receiver couplers; to attach A24 mixer brick to block)	9	0515-1410
--	Bulkhead connector for test set front plate (hardware supplied with connector)	12	1250-3805
-	Front panel overlay (label), 4-port	1	N5222-80006
-	Keypad overlay (label)	1	N5242-80005
-	Power button overlay (label)	1	N5242-80007
-	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 guard, center jumper cables	1	N5242-00030
-	Cable clamp, to secure W49 (N5222-20057)	6	1400-1334
-	Dust caps for test ports	4	1401-0214
-	Bracket for receiver coupler	2	N5242-00006
-	Nameplate, N5221A	1	N5221-80005

Table 1   Contents of Upgrade Kit N5222-60112

Ref Desig.	Description	Qty	Part Number
-	Nameplate, N5222A	1	N5222-80001
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
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

Table 1 **Contents of Upgrade Kit N5222-60112**

Ref Desig.	Description	Qty	Part Number
-	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 A23 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 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 Frame in the Front Panel Assembly.

Step 23. Reinstall Front Panel Assembly.

Step 24. Install the Overlays and Nameplate.

Step 25. Install the Front Panel Jumper Cables.

Step 1. Obtain a Keyword and Verify the Information

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

If the model number, serial number, or option number do not match those on your license key, 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 3.

Once the license key has been received and the information verified, you can proceed with the installation at step 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 A23 Test Set Motherboard

For instructions, click the Chapter 7 bookmark "Removing and Replacing the A23 test set motherboard" in the PDF Service Guide[1].

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1. See "Downloading the Online PNA Service Guide" on page 5.

Step 6. Remove Some Bottom-Side (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 in the order listed. To see an image showing the location of these cables, click the Chapter 6 bookmark "Bottom RF Cables, Standard 4-Port Configuration, Option 201" in the PDF Service Guide[1].

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)
- W42 (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
- 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.
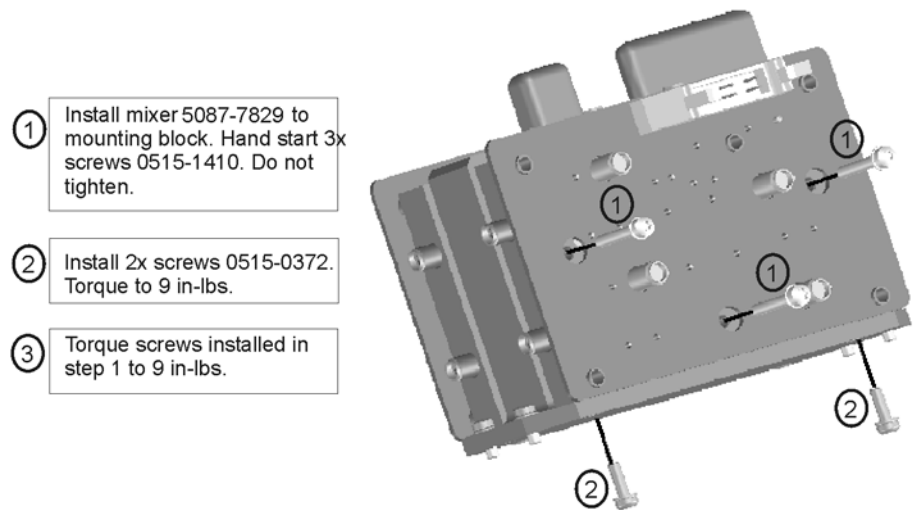
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1. See .

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].
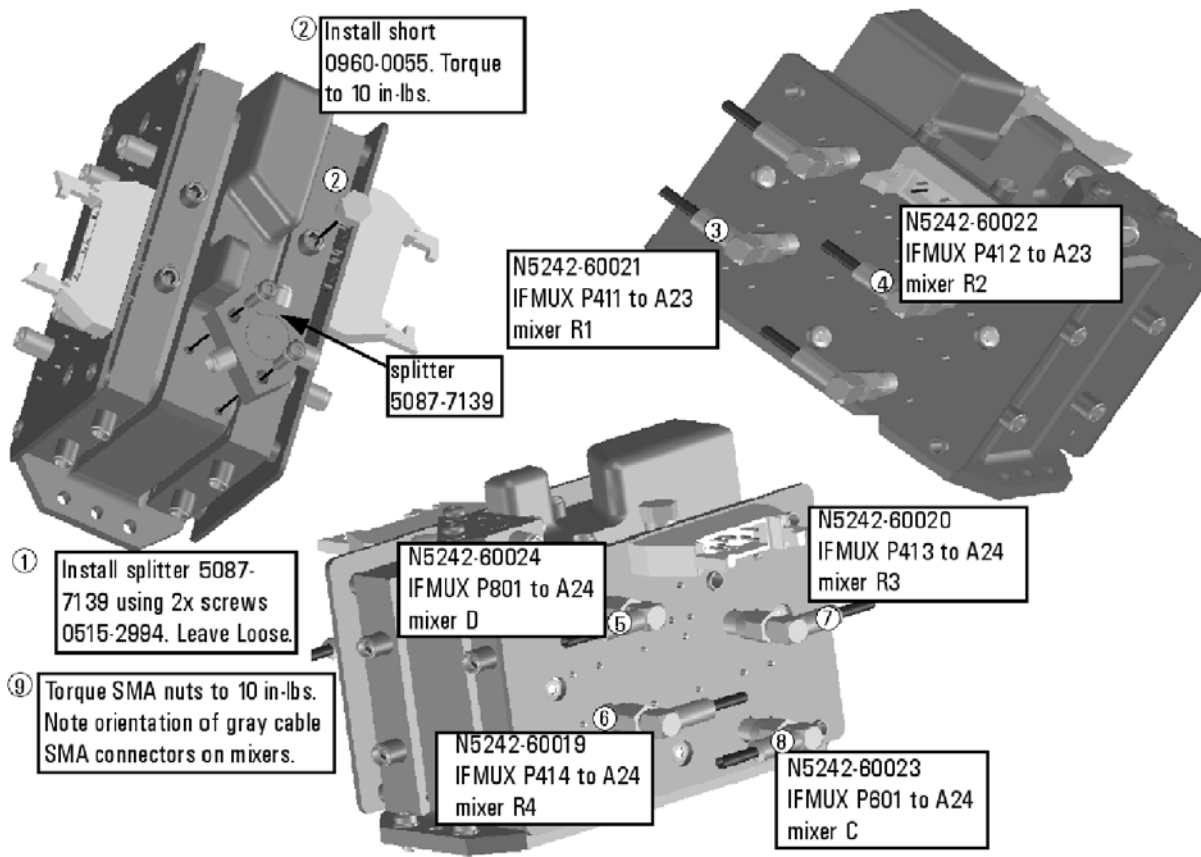
Step 8. Assemble the A24 Mixer Brick Assembly

1. Follow the instruction shown in Figure 1 and Figure 2. New parts are listed in Table 1 on page 7 of this document.

Figure 1   A24 Mixer Brick Assembly

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.)

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

N5242-60022 IFMUX P412 to A23 mixer R2

N5242-60021 IFMUX P411 to A23 mixer R1

splitter 5087-7139

N5242-60020 IFMUX P413 to A24 mixer R3

N5242-60024 IFMUX P801 to A24 mixer D

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

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

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 7 of this document.

Figure 3   **A26 and A27 Receiver Coupler Assemblies**
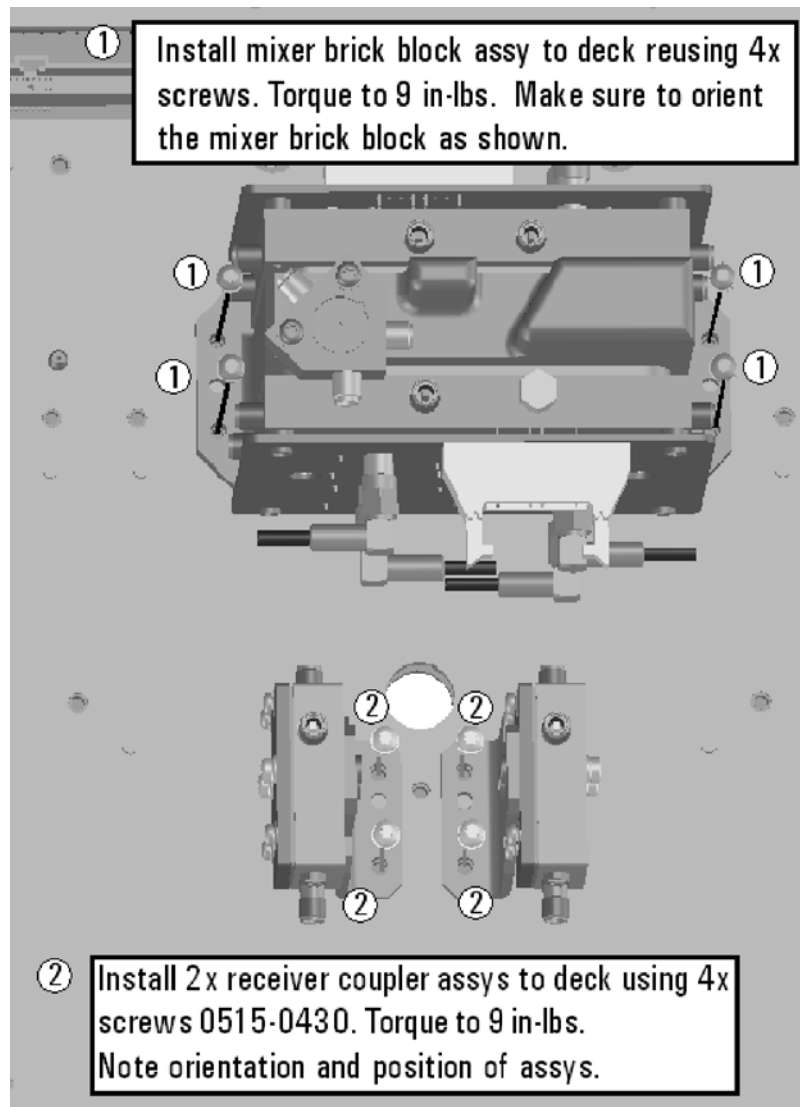
① Follow steps 2 and 3 EXCEPT mirror the orentation of the bridge to the bracket.

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.
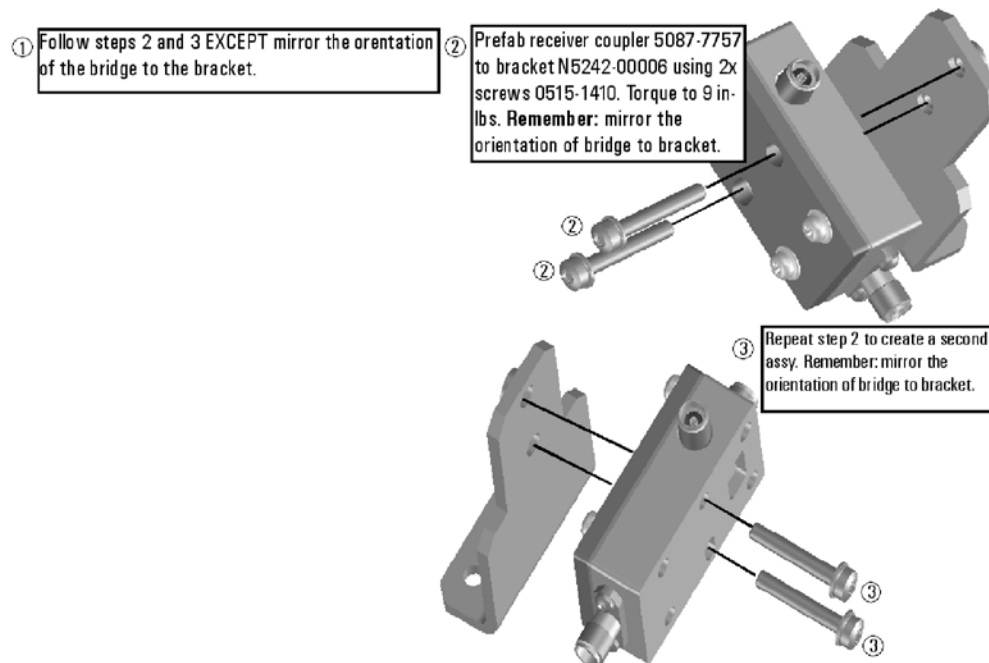
N5222_120_06

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

Follow instruction 1 shown in Figure 4. New parts are listed in Table 1 on page 7 of this document.

Figure 4   **Mixer Brick Block and Receiver Coupler Assemblies Installation**

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

Step 11. Install the A26 and A27 Receiver Coupler Assemblies

Follow instruction 2 shown in Figure 4. New parts are listed in Table 1 on page 7 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 7 of this document.

Figure 5   A29 - A32 Test Port Coupler Assembly
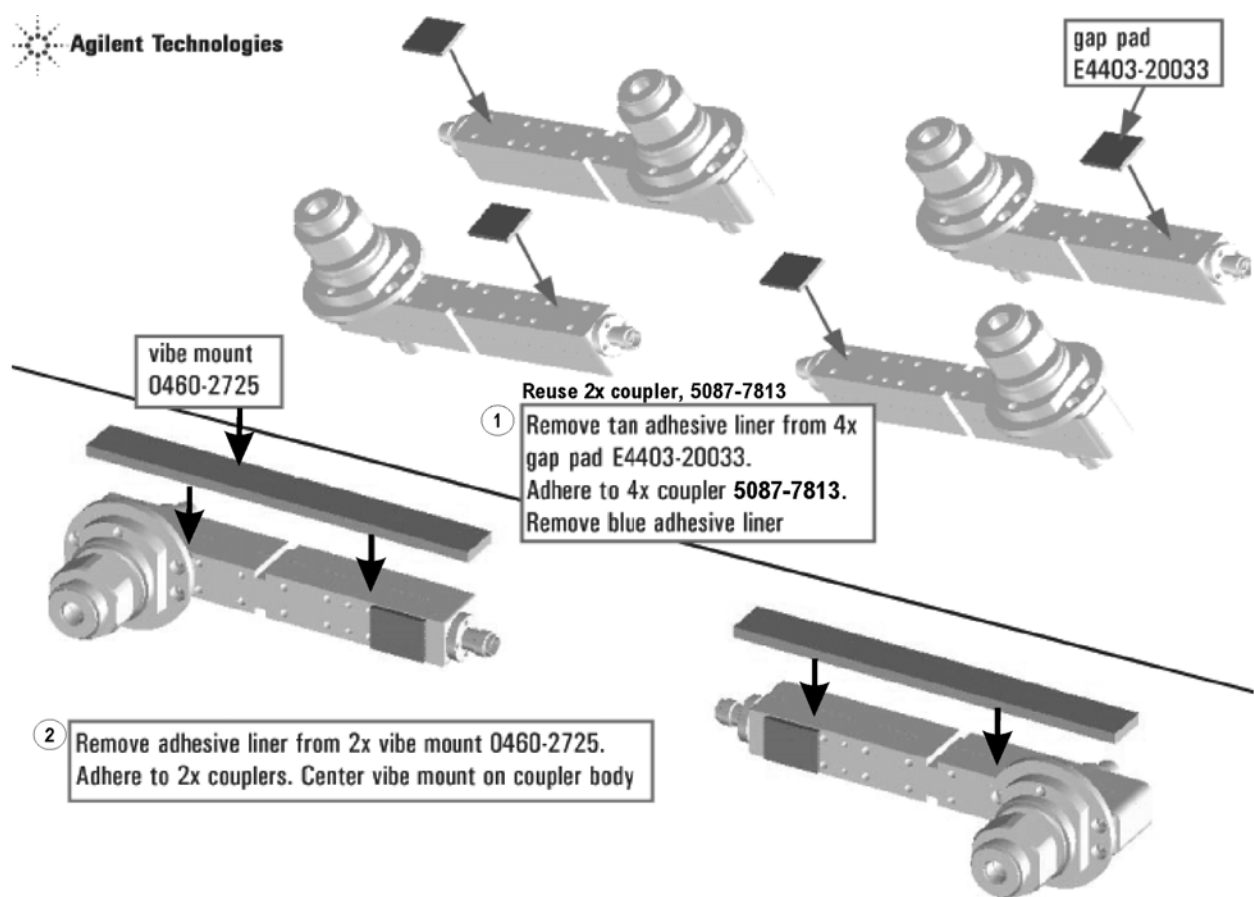
Step 13. Install the LED Boards and Test Port Coupler Assemblies On the 4-Port Test Set Front Plate

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

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

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

Port 1/3

Note: Front plate has been made transparent for the purpose of clarity in viewing

N5222_121_04

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 1 on page 7.

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

Washer
Nut
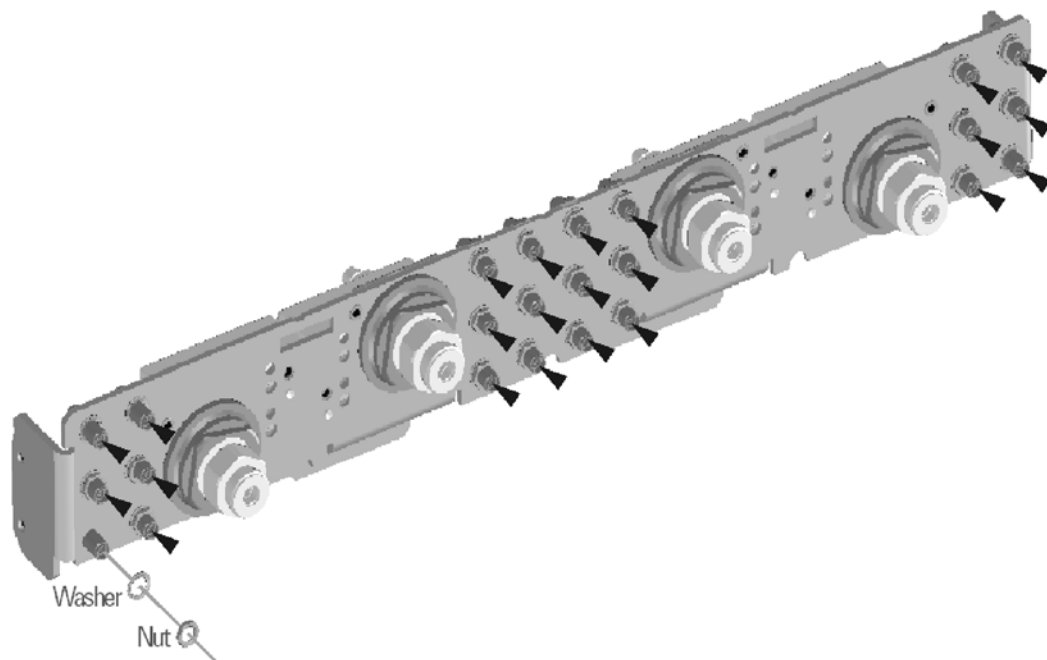
N5242_004_09

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

Follow the four instructions shown in Figure 8.

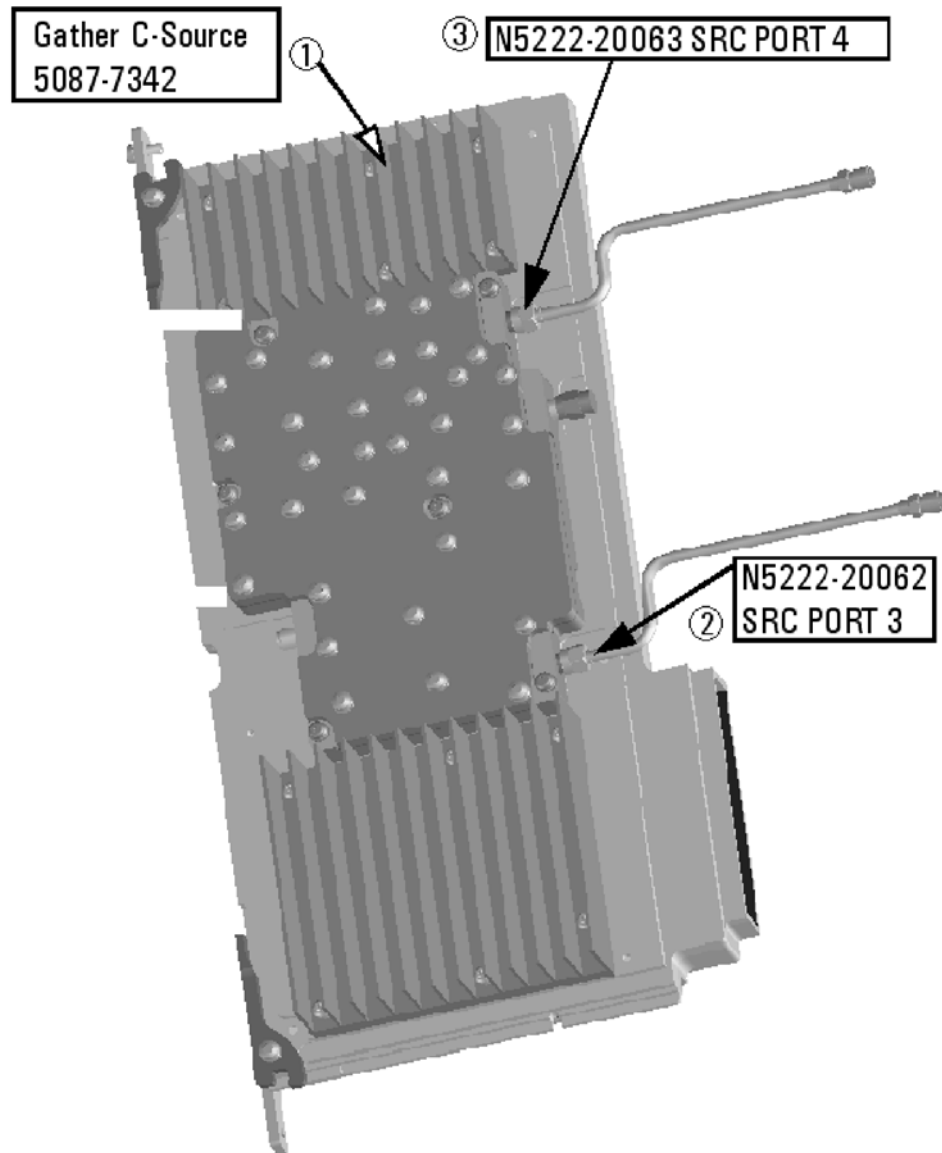**Figure 8   Coupler Plate Assembly Installation**

N5222_112_05

Step 16. Assemble the A8 26.5 GHz Source 2 Assembly

Follow the three instructions shown in Figure 9.
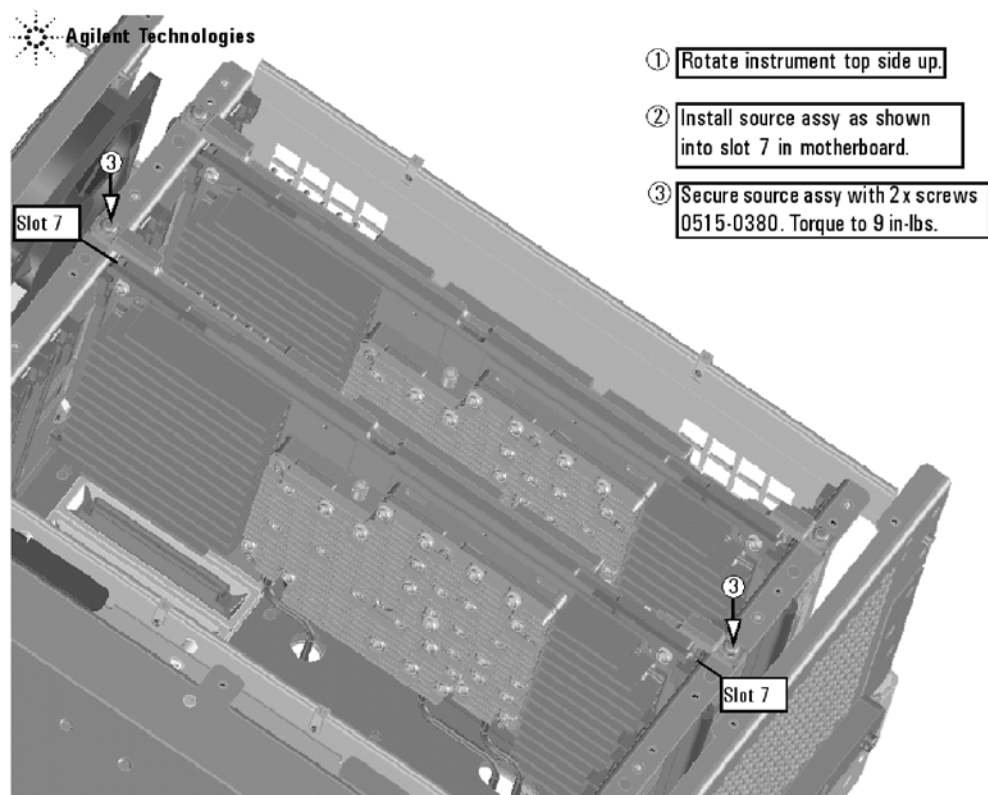
Figure 9   A8 Source 2 Assembly

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

N5222_120_11

Step 18. 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 A13 (source 2) synthesizer board.)

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1. See "Downloading the Online PNA Service Guide" on page 5.

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. |

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" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 7.

- 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 401 PNA**

To see images showing the location of these cables, click the Chapter 6 bookmark "Bottom RF Cables, 4-Port, Option 401" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 7.

| 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
- 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 11, install clamps (part number 1400-1334) to secure W49 (N5222-20057).

**Figure 11   Location of Cable Clamps for W49 (N5222-20057)**
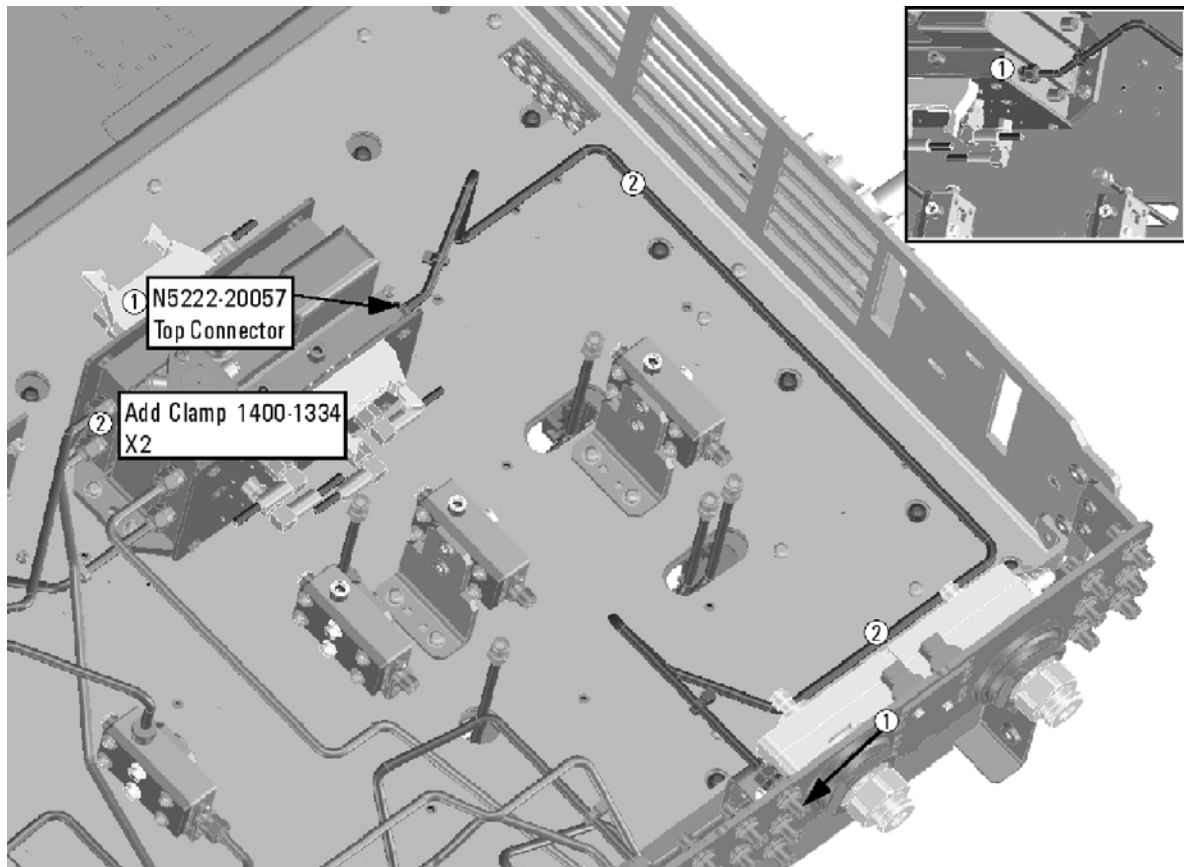
N5222_121_01

- 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
- 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 12 for information on installing W36 (part number N5222-20032).

Figure 12   Information to Secure W35 and W36
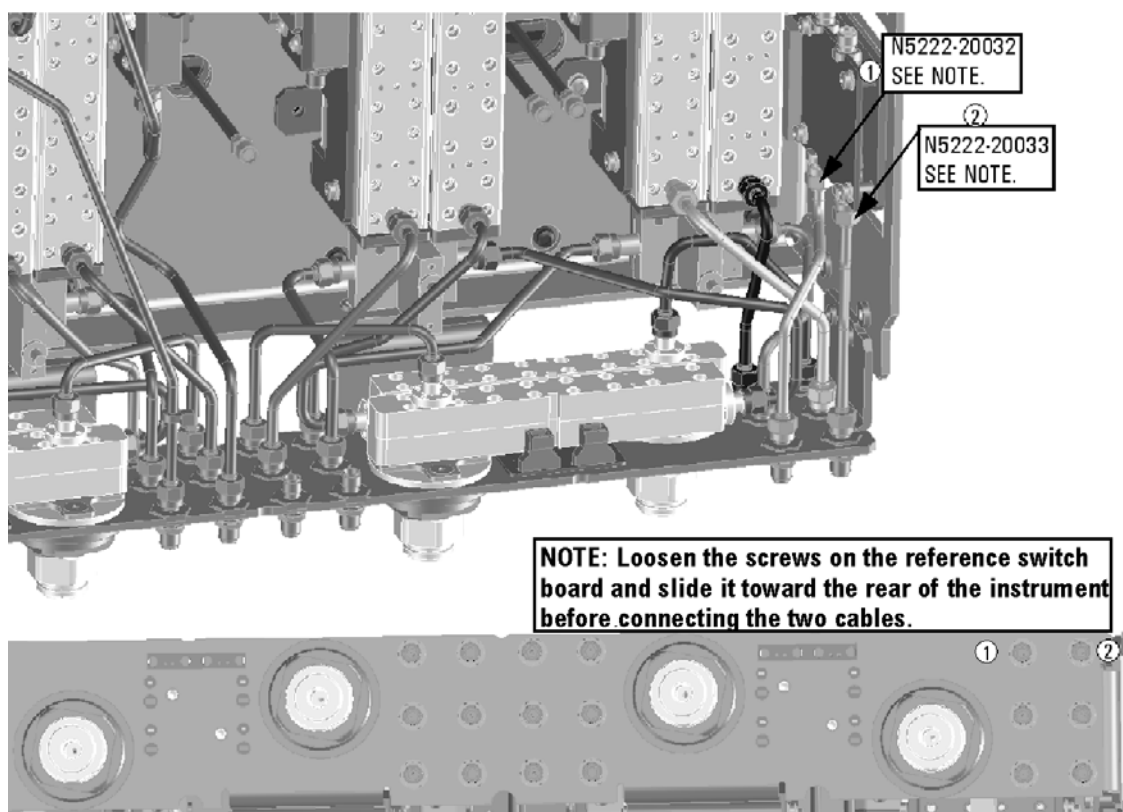
N5222_121_03

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

  * Refer to the note shown in Figure 12 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

- 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

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 Guide[1].

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" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 7.

- (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 Frame in the Front Panel Assembly

Before the front frame can be replaced, the items making up the back side of the front panel assembly must be removed. For instructions on removing these items, click the Chapter 7 bookmark "Removing and Replacing the A1-A3 and Other Front Panel Subassemblies" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 7.

1. In the section "Removing the A2 USB Board," perform the only step.

2. In the section "Removing the A1 Front Panel Interface Board and Keypad Assembly," perform steps 1 - 5.

3. In the section "Removing the Power Switch Board and Power Button Keypad," perform only step 1.

4. Remove the braided gasket from the backside edges of the 2-port front frame and install it in the 4-port front frame.

5. Reassemble the front panel assembly with the new 4-port front frame (N5247-20141) by reversing the order of the instructions previously followed.

Step 23. Reinstall Front Panel Assembly

1. 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].

2. 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.

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1. See "Downloading the Online PNA Service Guide" on page 5.

Step 24. Install the Overlays and Nameplate

To see an image of the front panel overlay (N5222-80006), keypad overlay (N5242-80005), power button overlay (N5242-80007), click the Chapter 6 bookmark "Front Panel Assembly, Front Side, All Options" in the PDF Service Guide[1]. New parts are listed in .

1. Remove the protective backing from the new front panel overlay (N5222-80006).

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. Repeat steps 1-3 to install the keypad overlay (N5242-80005).

5. Repeat steps 1-3 to install the power button overlay (N5242-80007).

6. Repeat steps 1-3 to install the nameplate (N5221-80005 for model N5221A or N5222-80001 for model N5222A).

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 Guide[1].

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 Guide[1].

Step 28. Reinstall the Outer Cover

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

Step 29. Enable Option 401

Procedure Requirements

- The analyzer must be powered up and operating to perform this procedure.
- The Network Analyzer program must be running.
- A keyboard must be connected to the network analyzer.

Option Enable Procedure

1. To start the option enable utility, press UTILITY $\boxed{\text{System}}$, then $\boxed{\text{Service}}$, then $\boxed{\text{Option Enable}}$. An option enable dialog box will appear.

2. Click the arrow in the **Select Desired Option** box. A list of available options will appear.

3. In the **Select Desired Option** list, click **401 - Configurable Test Set**.

4. Using the keyboard, enter the license key in the box provided. The license key is printed on the license message you received from Keysight. Enter this key *exactly* as it is printed on the message.

5. Click **Enable**.

6. Click **Yes** in answer to the displayed question in the **Restart Analyzer?** box.

7. When the installation is complete, click **Exit**.

Option Verification Procedure

Once the analyzer has restarted and the Network Analyzer program is again running:

1. On the analyzer's **Help** menu, click **About Network Analyzer**.

2. Verify that "401" is listed after "Options:" in the display. Click **OK**.

| NOTE | If Option 401 has not been enabled, perform the "Option Enable Procedure" again. If the option is still not enabled, contact Keysight Technologies. Refer to "Getting Assistance from Keysight" on page 3. |

Step 30. Perform Post-Upgrade Adjustments and Calibration

Adjustments

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

- default EE

- source adjustment

- receiver adjustment

- receiver characterization

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.

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

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 3.

Calibration

Although the analyzer functions, its performance relative to its specifications has not been verified. It is recommended that a full instrument calibration be performed using the analyzer's internal performance test software. To view information on the performance test software, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide[1].

Step 31. 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.

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1. See "Downloading the Online PNA Service Guide" on page 5.

Installation Note N5222-90121

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