Keysight Add Configurable Test Set Upgrade Kit

To Upgrade PNA N5221A or N5222A Option 400 to Option 401

Upgrade Kit Order Numbers: N5221AU-401 or N5222AU-401

Keysight Kit Number: N5222-60105

KEYSIGHT TECHNOLOGIES

Installation Note

WARRANTY STATEMENT

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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 note until the indicated conditions are fully understood and met.

Description of the Upgrade

This upgrade adds the following items to your N5221A Option 400 or N5222A Option 400 network analyzer:

*   reference mixer switch

*   bulkhead connectors for test set front plate

*   front panel jumpers

*   front panel jumpers cable guards

*   front panel overlay replacement

*   new cables

After installation of this upgrade, your analyzer will be an N5221A Option 401 or N5222A Option 401.

Getting Assistance from Keysight

By internet, phone, or fax, get assistance with all your test and measurement needs.

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: N5242A) 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

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

Tools Required for the Installation

Description	Qty	Part Number
T-10 TORX driver - set to 9 in-lbs (1.02 N.m)	1	N/A
T-20 TORX driver - set to 21 in-lbs (2.38 N.m)	1	N/A
5/16-in (8 mm) nutsetter or open end torque wrench - set to 10 in-lbs (1.13 N.m)	1	N/A

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

About Installing the Upgrade

Products affected	N5221A and N5222A Option 400
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	2 hours
Estimated adjustment time	0.5 hour
Estimated full instrument calibration time	4.5 hours

Items Included in the Upgrade Kit[1]

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 3.

Table 1   Contents of Upgrade Kit N5222-60105

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5222-90105
A33	Reference mixer switch	1	5087-7758
--	Bracket (for A33 reference mixer switch)	1	N5242-00011
--	Machine screw, M3 x 8, pan head (4 to attach bracket to reference mixer switch; 3 to attach reference mixer switch assembly to deck)	9	0515-0372
--	Cable clamp	9	1400-1334
--	Cable tie	5	1400-0249
--	Cable guard- middle	1	N5242-00030
--	Cable guard - side	2	N5242-00029
--	Bulkhead connector for test set front plate (hardware supplied with connector)	24	1250-3805
--	Front panel overlay	1	N5222-80006
W11	RF cable, A25 port 1 receiver coupler to front-panel Port 1 SOURCE OUT	1	N5222-20044
W12	RF cable, Port 1 CPLR THRU to A29 port 1 coupler	1	N5222-20045
W13	RF cable, A25 port 1 receiver coupler to A33 reference mixer switch	1	N5222-20005
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, A27 port 4 receiver coupler to front-panel Port 4 SOURCE OUT	1	N5222-20050
W20	RF cable, Port 4 CPLR THRU to A31 port 4 coupler	1	N5222-20054
W21	RF cable, A27 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
W23	RF cable, A28 port 2 receiver coupler to front-panel Port 2 SOURCE OUT	1	N5222-20051
W24	RF cable, Port 2 CPLR THRU to A32 port 2 coupler	1	N5222-20053
W25	RF cable, A28 port 2 receiver coupler to front-panel REF 2 SOURCE OUT	1	N5222-20059
W26	RF cable, A32 port 2 coupler to front-panel Port 2 CPLR ARM	1	N5222-20034

1. In addition to the upgrade kit, the shipment includes an Option Entitlement Certificate. Refer to "License Key Redemption" on page 4 for important information about this certificate.

Table 1   Contents of Upgrade Kit N5222-60105

Ref Desig.	Description	Qty	Part Number
W30	RF cable, Front panel jumper	12	N5222-20091
W31	RF cable, Port 1 RCVR A IN to A23 mixer brick (A)	1	N5222-20046
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
W34	RF cable, Port 2 RCVR B IN to A23 mixer brick (B)	1	N5222-20052
W35	RF cable, A33 reference mixer switch to front-panel REF 1 SOURCE OUT	1	N5222-20033
W36	RF cable, REF 1 RCVR R1 IN to A33 reference mixer switch	1	N5222-20032
W40	RF cable, REF 2 RCVR R2 IN to A23 mixer brick (R2)	1	N5222-20039
W48	RF cable, A33 reference mixer switch to A23 mixer brick (R1)	1	N5222-20056
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
--	Ribbon cable, A19 test set motherboard J3 to A33 reference mixer switch	1	N5242-60002

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 Front Panel Assembly.

Step 4. Install Bulkhead Connectors on the Test Set Front Plate Assembly.

Step 5. Remove Some Existing Cables.

Step 6. Assemble and Install the A37 Reference Mixer Switch Assembly.

Step 7. Install the Cables.

Step 8. Remove the Old Lower Front Panel Overlay.

Step 9. Reinstall Front Panel Assembly.

Step 10. Install the New Lower Front Panel Overlay.

Step 11. Install Front Panel Jumpers.

Step 12. Position the Cables and Wires to Prevent Pinching.

Step 13. Reinstall the Outer Cover.

Step 14. Enable Option 401.

Step 15. Perform Post-Upgrade Adjustments and Calibration.

Step 16. Prepare the PNA for the User.

Step 1. Obtain a Keyword and Verify the Information

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

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

Step 4. Install Bulkhead Connectors on the Test Set Front Plate Assembly

Install 24 bulkhead connectors to the test set front plate along with washers and nuts (hardware equipped with connector). Torque all nuts to 21 in-lbs. Refer to Figure 7 on page 20 to see the location of the bulkhead connectors.

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

Step 5. Remove Some Existing 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.

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 4-Port Configuration, Option 400" in the PDF Service Guide[1].

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

- W97 (N5222-20074) A25 port 1 receiver coupler to A23 mixer brick (R1)
- W98 (N5222-20080) A26 port 3 receiver coupler to A24 mixer brick (R3)
- W99 (N5222-20081) A27 port 4 receiver coupler to A24 mixer brick (R4)
- W100 (N5222-20079) A28 port 2 receiver coupler A23 mixer brick (R2)
- 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
- W103 (N5222-20082) A27 port 4 receiver coupler to A31 port 4 coupler
- W104 (N5222-20083) A28 port 2 receiver coupler to A32 port 2 coupler
- W105 (N5222-20088) A29 port 1 coupler to A23 mixer brick (A)
- W106 (N5222-20089) A30 port 3 coupler to A24 mixer brick (C)
- W107 (N5222-20087) A31 port 4 coupler to A24 mixer brick (D)
- W108 (N5222-20086) A32 port 2 coupler to A23 mixer brick (B)

These cables must be saved - they will be reinstalled.

- W8 (N5222-20042) W7 to A27 port 4 receiver coupler
- W4 (N5222-20040) W3 to A25 port 1 receiver coupler
- W10 (N5222-20043) W9 to A28 port 2 receiver coupler

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

Step 6. Assemble and Install the A37 Reference Mixer Switch Assembly

Refer to Figure 1 for this step of the procedure. New parts are listed in Table 1 on page 7. Use a T-10 TORX driver to tighten all screws.

Figure 1   Reference Mixer Switch Assembly
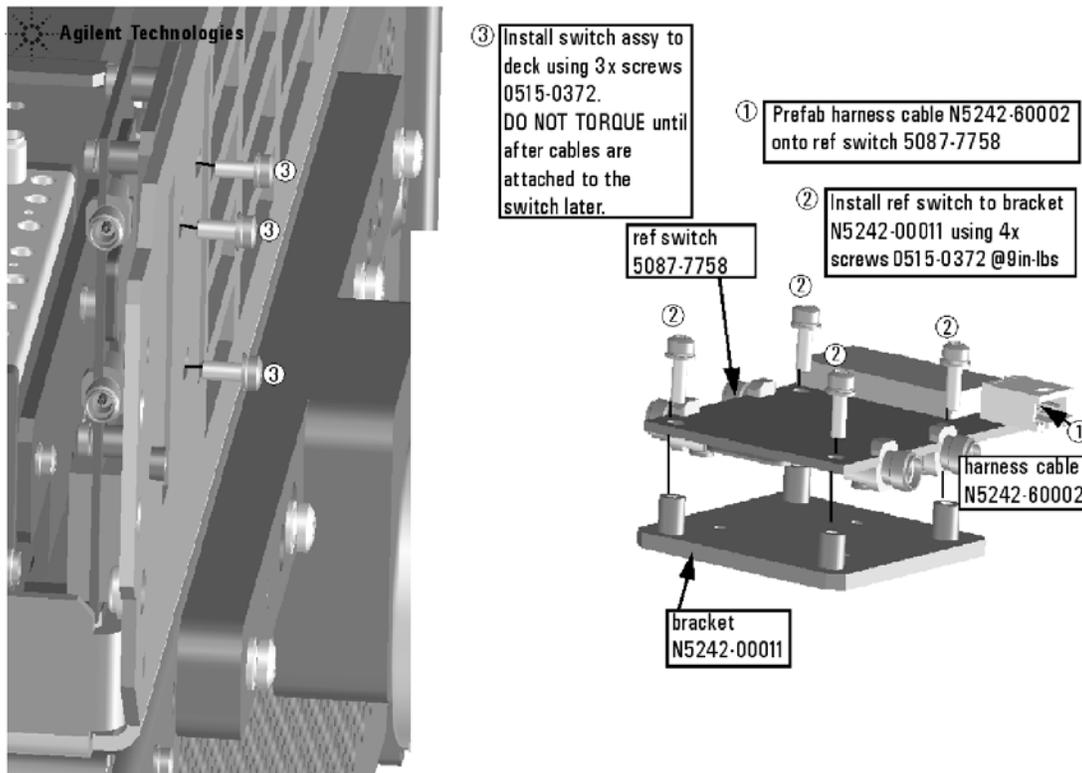
N5222_105_06

Step 7. Install the Cables

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

Install the Semirigid Cables

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

Install the following cables in the order listed.

- W26 (N5222-20034) A32 port 2 coupler to front-panel Port 2 CPLR ARM
- W34 (N5222-20052) Port 2 RCVR B IN to A23 mixer brick (B)
- W23 (N5222-20051) A28 port 2 receiver coupler to front-panel Port 2 SOURCE OUT
- 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)
- W40 (N5222-20039) REF 2 RCVR R2 IN to A23 mixer brick (R2)
- W25 (N5222-20059) A28 port 2 receiver coupler to front-panel REF 2 SOURCE OUT

* As shown in Figure 2 on page 14, install three cable clamps (part number 1400-1334) to secure W25 (part number N5222-20059).

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

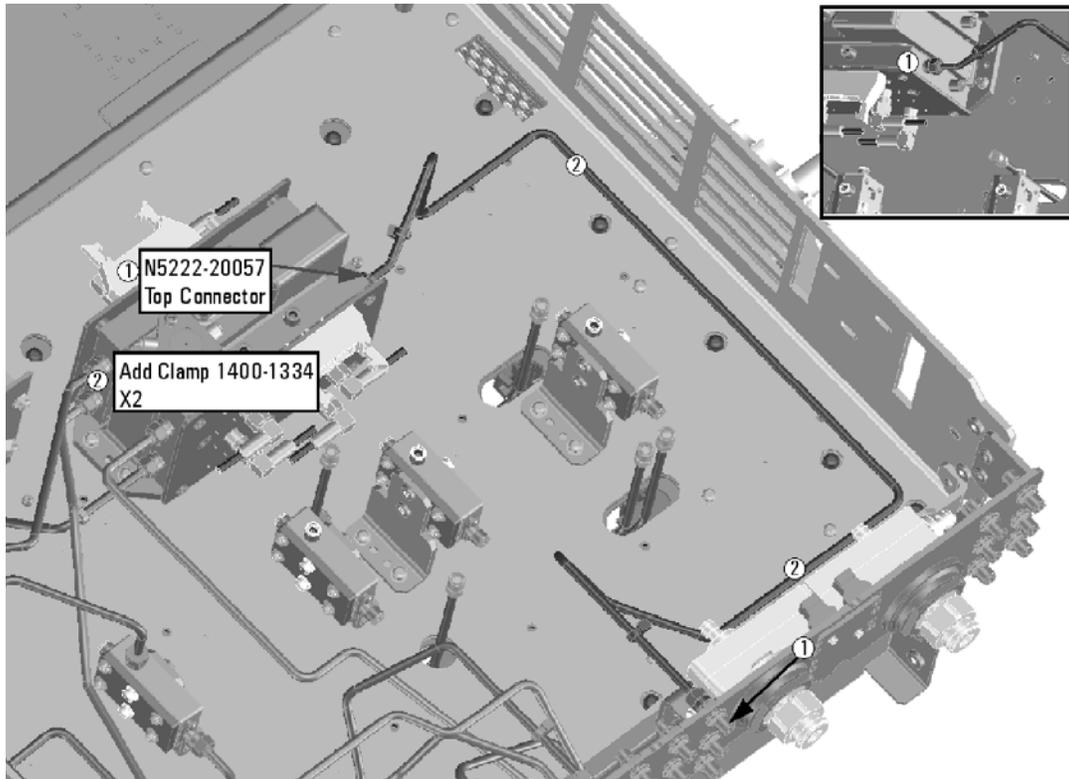**Figure 2**   **Location of Cable Clamp to Secure W25**
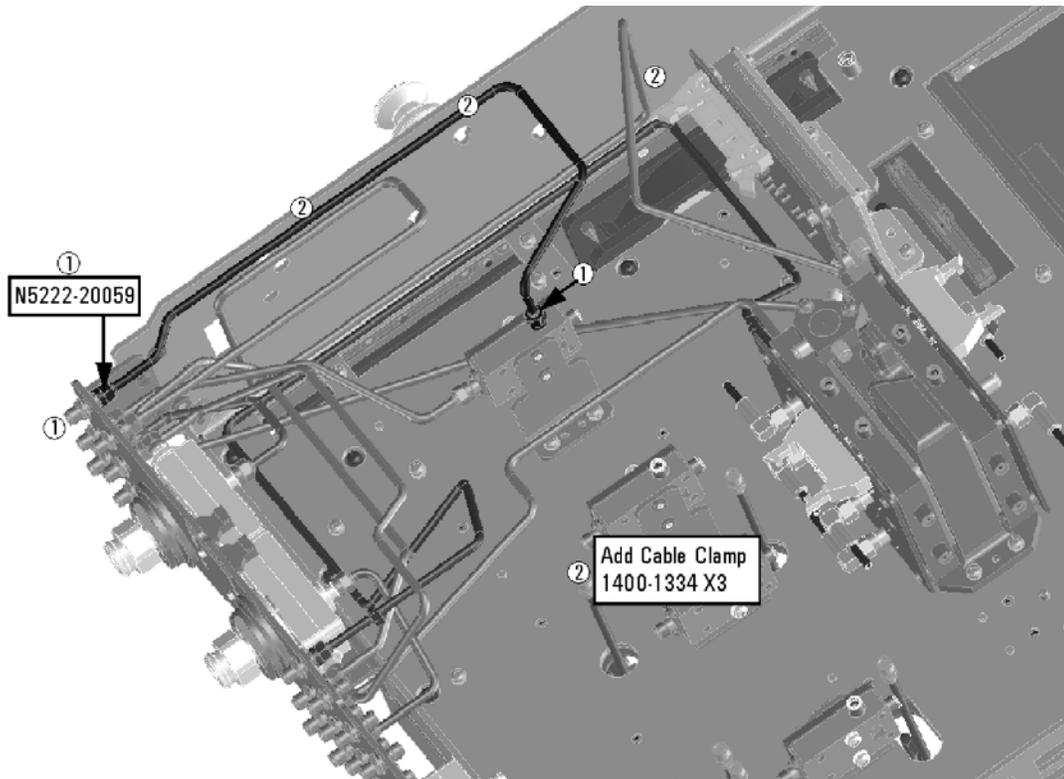
N5222_105_01

- W49   (N5222-20057) REF 3 RCVR R3 IN to A24 mixer brick (R3)

* As shown in Figure 2 on page 14, install two cable clamps (part number 1400-1334) to secure W49 (part number N5222-20057).

**Figure 3   Location of Cable Clamps to Secure W49**

N5222_105_02

- 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

- W31 (N5222-20046) Port 1 RCVR A IN to A23 mixer brick (A)

- 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

- W11 (N5222-20044) A25 port 1 receiver coupler to front-panel Port 1 SOURCE OUT

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

* As shown in Figure 4 on page 16, follow the instructions in the "Note" to secure W35.

- W36 (N5222-20032) REF 1 RCVR R1 IN to A33 reference mixer switch

* As shown in Figure 4 on page 16, follow the instructions in the "Note" to secure W36.
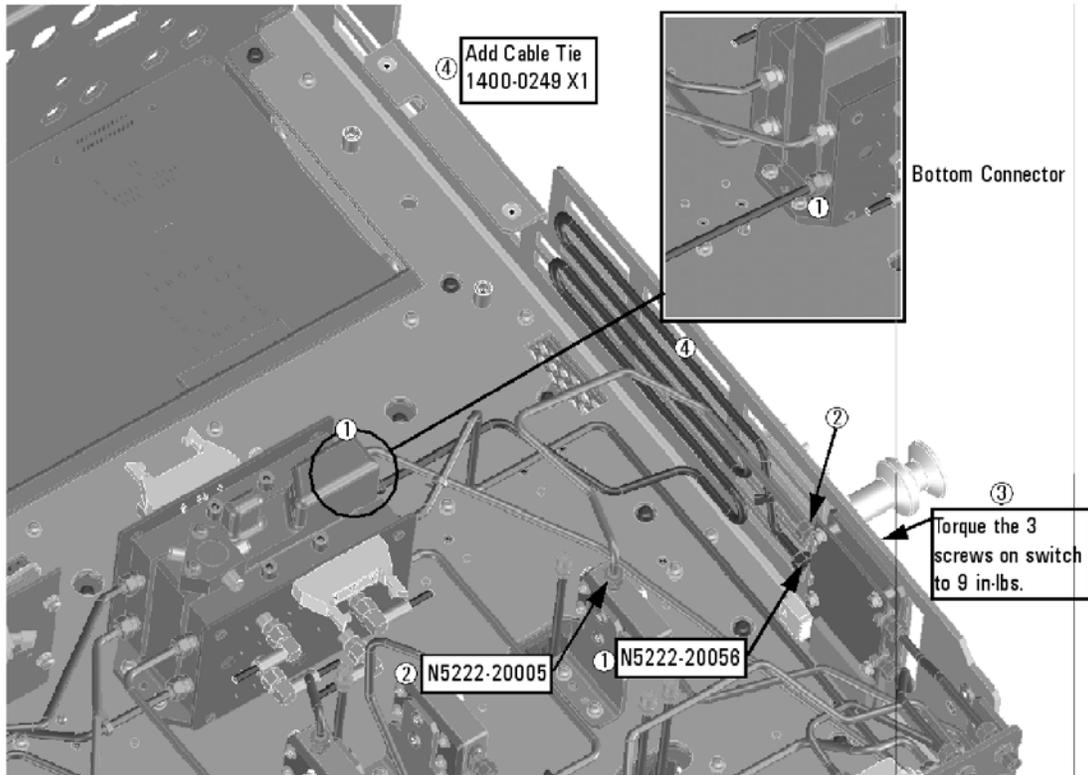
Figure 4   Information for Installing W35 and W36
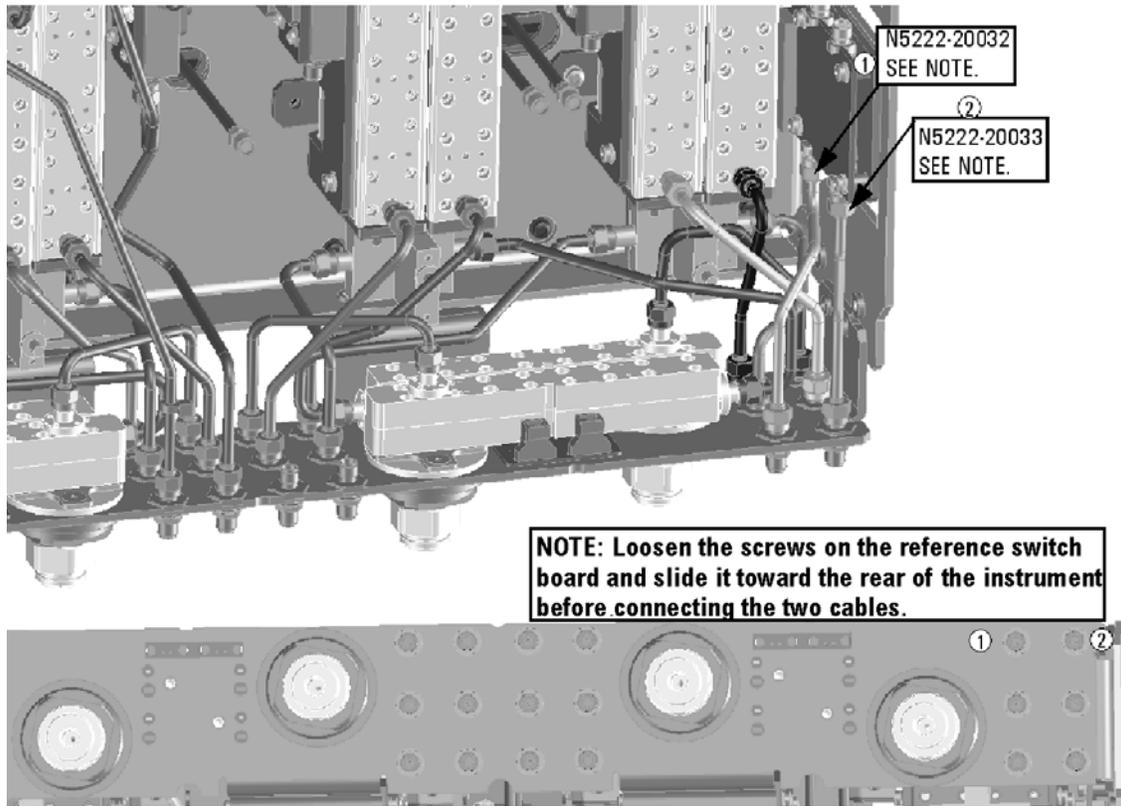
N5222_105_03

- W48 (N5222-20056) A33 reference mixer switch to A23 mixer brick (R1)

install a cable tie (part number 1400-0249) to secure W48 (part number N5222-20056). Also, note the instructions about torquing screws.

Figure 5   Location of Cable Tie to Secure W48

N5222_105_04

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

* As shown in Figure 5, note the instructions about torquing screws.

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

- W8 (reuse) (N5222-20042)W7 to A27 port 4 receiver coupler

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

Install the Ribbon Cable

To see an image showing the location of this cable, click the Chapter 6 bookmarks "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.

If not already done, connect the reference mixer switch ribbon cable (N5242-60002) as follows:

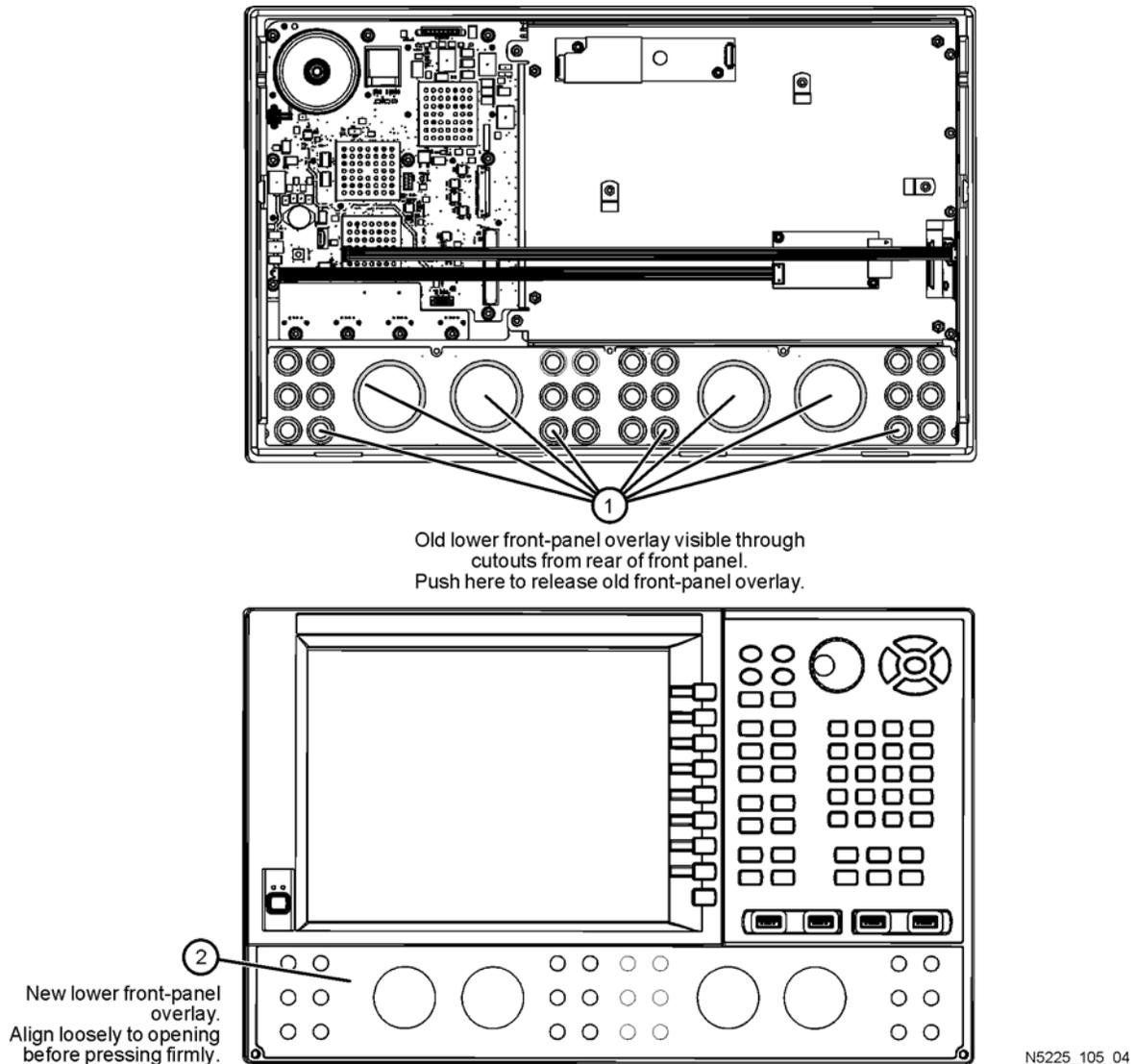- A19 test set motherboard J3 to A33 reference mixer switch

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

Step 8. Remove the Old Lower Front Panel Overlay

Refer to Figure 6 for this step of the procedure. New parts are listed in Table 1 on page 7.

1. From the back side of the front panel, use a blunt object in the cutouts in the lower front dress panel to push on the old overlay (item ①) and separate it from the front dress panel.

2. From the front side of the front panel, pull off the overlay completely and discard it.

3. Remove any adhesive remaining on the front panel.

Figure 6   **Lower Front Panel Overlay Replacement**

Old lower front-panel overlay visible through cutouts from rear of front panel.
Push here to release old front-panel overlay.

New lower front-panel overlay.
Align loosely to opening before pressing firmly.

N5225_105_04

Step 9. 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].

Step 10. Install the New Lower Front Panel Overlay

Refer to Figure 6 on page 18 for this step of the procedure. New parts are listed in Table 1 on page 7.

1. Remove the protective backing from the new front panel overlay, N5222-80003 (item ②).

2. Starting from either side, *loosely* place the overlay in the recess on the lower front panel, ensuring that it fits tightly against the edges of the recess.

3. Once the overlay is in place, press it firmly onto the frame to secure it.

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

Step 11. Install Front Panel Jumpers

As shown in Figure 7, install 12 front panel jumper cables (reference designator W30; part number N5222-20091).

Figure 7   Front Panel Jumper Cables Installation

① Reinstall 12x jumper cables N5222-20091 and torque to 10 in-lbs.

N5225_105_05

Step 12. 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 13. Reinstall the Outer Cover

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

Step 14. 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 System , then Service , then Option Enable . An option enable dialog box will appear.
2. Click the arrow in the **Select Desired Option** box. A list of available options will appear.
3. In the **Select Desired Option** list, click **401 - Configurable Test Set**.
4. Using the keyboard, enter the license key in the box provided. The license key is printed on the 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 15. Perform Post-Upgrade Adjustments and Calibration

Adjustments

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

- source adjustment
- receiver adjustment

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.

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 16. 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.

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