Keysight Add Bias Tees Upgrade Kit

To Upgrade PNA N5221A or N5222A Option 217 to Option 219
Upgrade Kit Order Numbers: N5221AU-219 or N5222AU-219
Keysight Kit Number: N5222-60104

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Installation Note

NOTICE: This document contains references to Agilent Technologies. Agilent's former Test and Measurement business has become Keysight Technologies. For more information, go to **www.keysight.com.**

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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 or N5222A Option 217 analyzer:

- a bias tee in each source port channel

- a replacement overlay for the lower front panel

- new RF cables

After installation of this upgrade, your analyzer will be an N5221A or N5222A Option 219.

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 217

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 N5222-60104

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5222-90104
A38–A41	Bias tee	2	5067-4865
--	Machine screw, M3 x 6, pan head (to attach bias tee brackets to deck)	8	0515-0430
--	Machine screw, M3 x 14, pan head (to secure bias tees to brackets)	5	0515-2994
--	Cable clamp	7	1400-1334
--	Front panel overlay	1	N5222-80003
W73	RF cable, Front-panel Port 1 CPLR THRU to A38 port 1 bias tee	1	N5222-20029
W85	RF cable, Front-panel Port 2 CPLR THRU to A41 port 2 bias tee	1	N5222-20035
W119	RF cable, A38 port 1 bias tee to A29 port 1 coupler	1	N5222-20072
W120	RF cable, A41 port 2 bias tee to A32 port 2 coupler	1	N5222-20065

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.

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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.

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 Some Bottom-Side (Test Set) Cables.

Step 4. Remove the Front Panel Assembly.

Step 5. Install the Bias Tees.

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

Step 7. Remove the Old Lower Front Panel Overlay.

Step 8. Reinstall Front Panel Assembly.

Step 9. Install the New Lower Front Panel Overlay.

Step 10. Reinstall Front Panel Jumpers.

Step 12. Reinstall the Outer Cover.

Step 13. Enable Option 219.

Step 14. Perform Post-Upgrade Adjustments and Calibration.

Step 15. 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 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 cables in the following list. To see an image showing the location of these cables, click the Chapter 6 bookmark "Bottom RF Cables, Standard 2-port Configuration, Option 217" in the PDF Service Guide[1].

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

   • W114 (N5222-20068) A29 port 1 coupler to front-panel Port 1 CPLR THRU

   • W116 (N5222-20069) A32 port 2 coupler to front-panel Port 2 CPLR THRU

   These cables must be saved - they will be reinstalled.

   • W25 (N5222-20038) A28 port 2 receiver coupler to front-panel REF 2 SOURCE OUT

   • W30 (qty 6) (N5222-20033) Front panel jumper

   • W35 (N5222-20091) A33 reference mixer switch to front-panel REF 1 SOURCE OUT

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

   • W40 (N5222-20039) Front-panel REF 2 RCVR R2 IN to A23 mixer brick (R2)

   • W30 (N5222-20091) Front panel jumpers (quantity = 6)

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

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

3. 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.
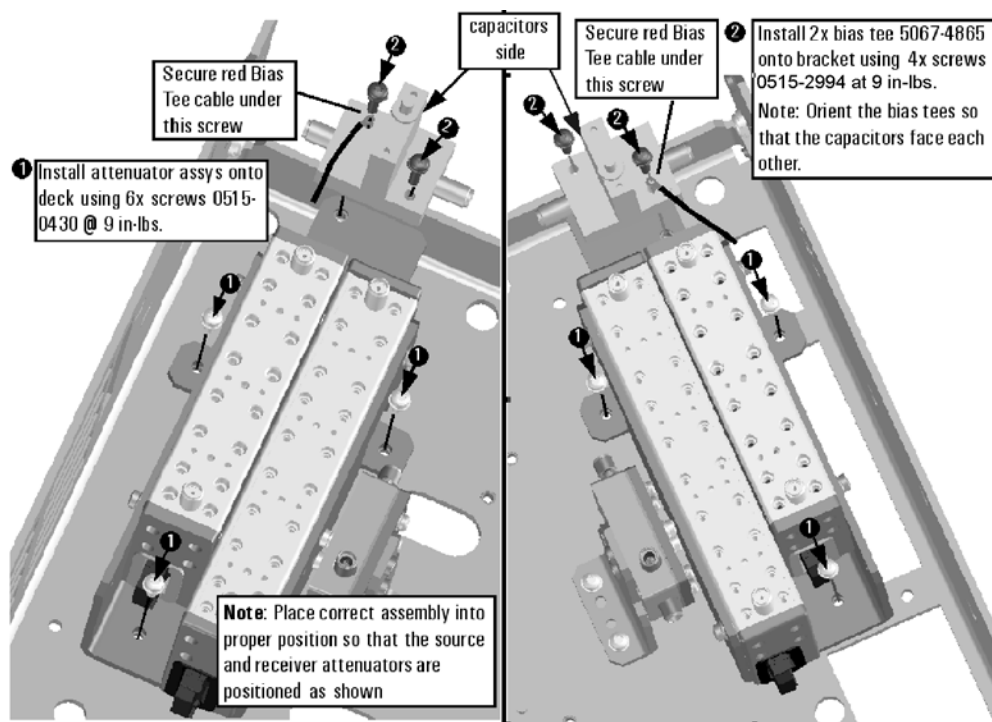
Step 4. Remove the Front Panel Assembly

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

Step 5. Install the Bias Tees

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

Figure 1   Bias Tees Installation

capacitors side

Secure red Bias Tee cable under this screw

❷ Install 2x bias tee 5067-4865 onto bracket using 4x screws 0515-2994 at 9 in-lbs.

Note: Orient the bias tees so that the capacitors face each other.

Secure red Bias Tee cable under this screw

❶ Install attenuator assys onto deck using 6x screws 0515-0430 @ 9 in-lbs.

Note: Place correct assembly into proper position so that the source and receiver attenuators are positioned as shown

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Step 6. Install Some Bottom-Side (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.

Install the Semirigid Cables

To see an image showing the location of these cables, click the Chapter 6 bookmarks "Bottom RF Cables, 2-port Configuration, Option 219" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 7.

Install the following new cables in the order listed.

- W85 (N5222-20035) Front-panel Port 2 CPLR THRU to A41 port 2 bias tee

- W120 (N5222-20065) A41 port 2 bias tee to A32 port 2 coupler

- W25 (reuse) (N5222-20038) A28 port 2 receiver coupler to front-panel REF 2 SOURCE OUT

- W40 (reuse) (N5222-20039) Front-panel REF 2 RCVR R2 IN to A23 mixer brick (R2)

* As shown in Figure 2 on page 12, install three cable clamps (part number 1400-1334) to secure W40 (part number N5222-20039).

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

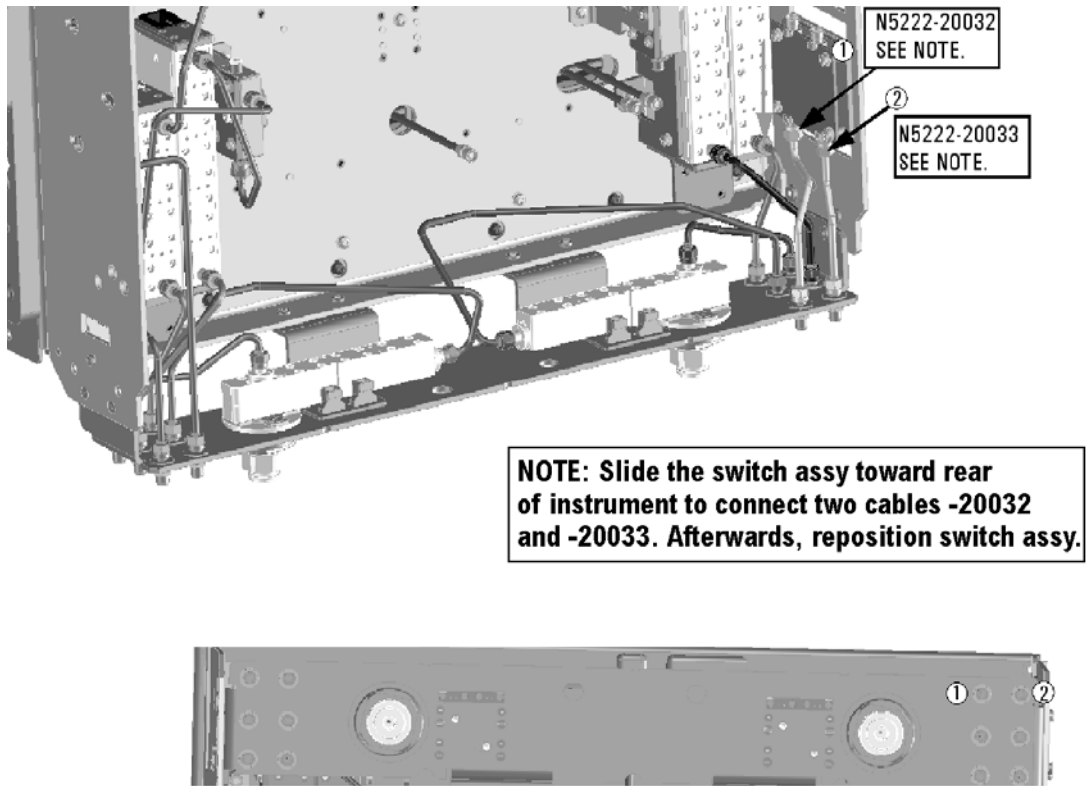**Figure 2   Location of Cable Clamps to Secure W40**
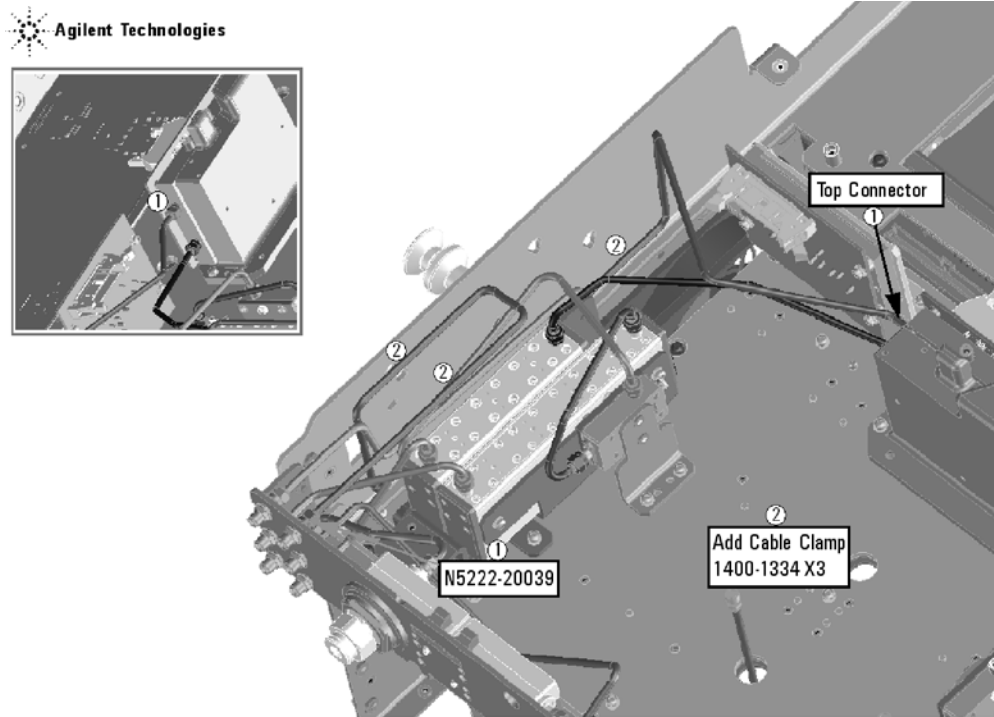
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- W73 (N5222-20029) Port 1 CPLR THRU to A38 port 1 bias tee

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

* As shown in the note in Figure 3, follow the instructions to install W36 (part number N5222-20032).

Figure 3   **Instructions to Install W36**

N5222_103_02

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

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

- • W119 (N5222-20072) A38 port 1 bias tee to A29 port 1 coupler

Install the Ribbon Cables and Wire Harnesses

To see an image showing the location of these cables, click the Chapter 6 bookmarks "Bottom Ribbon Cables and Wire Harnesses, 2-port, Option 219" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 7.

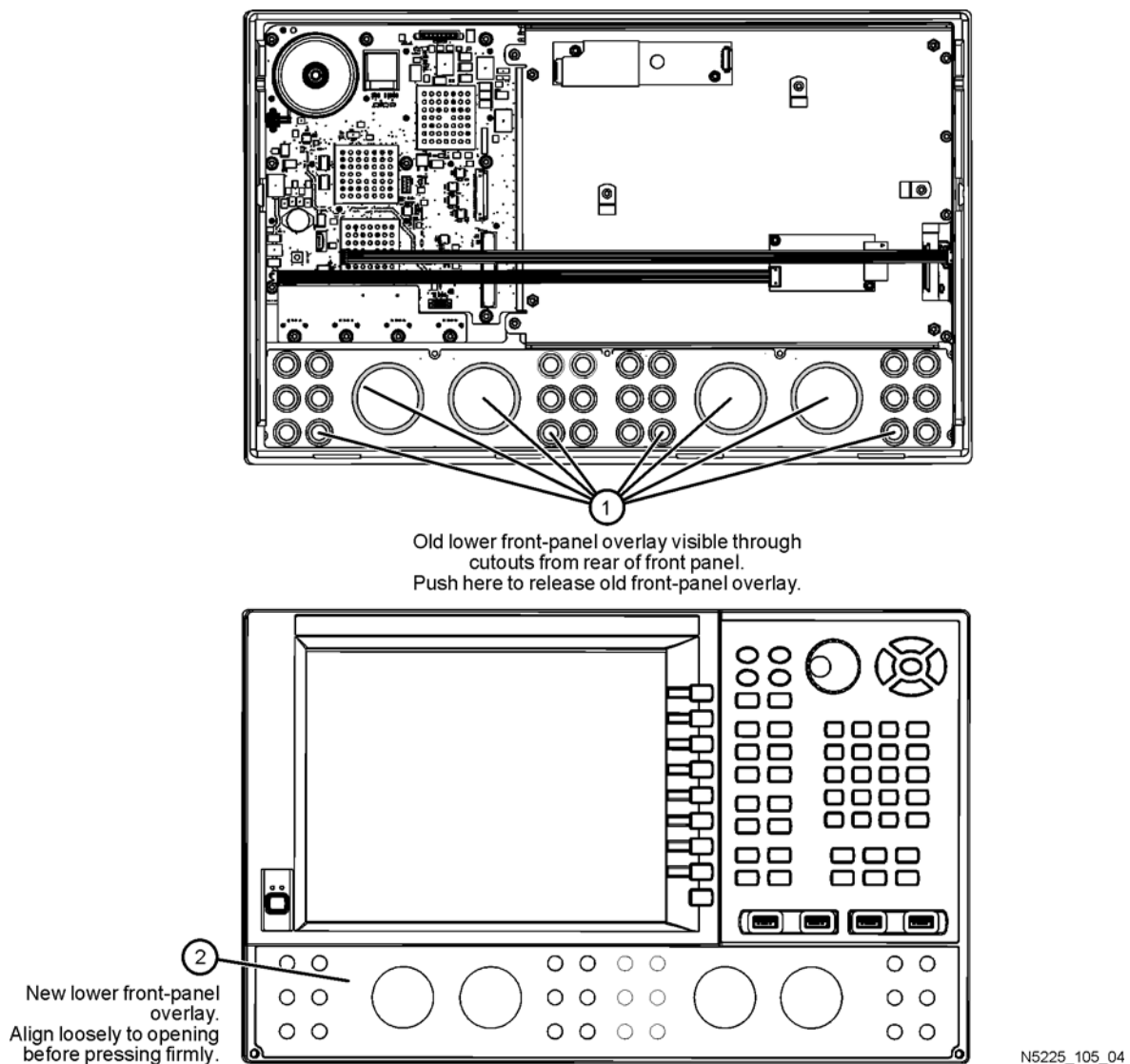If not already done, connect bias tee cable harnesses as follows:

- • A38 port 1 bias tee to A23 test set motherboard J541
- • A41 port 2 bias tee to A23 test set motherboard J542

Step 7. Remove the Old Lower Front Panel Overlay

Refer to Figure 4 for this step of the procedure. Although this figure shows a 4-port PNA, the concept is the same for a 2-port PNA. 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 4   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.

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Step 8. 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 9. Install the New Lower Front Panel Overlay

Refer to Figure 4 on page 14 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.

Step 10. Reinstall Front Panel Jumpers

Reinstall all six of the front panel jumper cables (W30), part number N5222-20091. Torque to 10 in-lbs.

Step 11. 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 12. Reinstall the Outer Cover

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

Step 13. Enable Option 219

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 **219 - Config TS + Attens + Bias Tees**.

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 "219" is listed after "Options:" in the display. Click **OK**.

NOTE	If Option 219 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 14. 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].

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

Step 15. 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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