Installation Note

Add Source and Receiver Attenuators Upgrade Kit

To Upgrade PNA N5221A or N5222A Option 201 to Option 217

Upgrade Kit Order Numbers: N5221AU-217 or N5222AU-217

Agilent Technologies

Agilent Kit Number: N5222-60103
Agilent Document Number: N5222-90103
Printed in USA June 14, 2013
Supersedes: June 1, 2013
© Agilent Technologies, Inc. 2011-2013

N5222-90103

WARRANTY STATEMENT

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED "AS IS," AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, AGILENT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. AGILENT SHALL NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR ANY INFORMATION CONTAINED HEREIN. SHOULD AGILENT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CONFLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT WILL CONTROL.

DFARS/Restricted Rights Notice

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as "Commercial computer software" as defined in DFAR 252.227-7014 (June 1995), or as a "commercial item" as defined in FAR 2.101(a) or as "Restricted computer software" as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Agilent Technologies' standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

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 201 or N5222A Option 201 network analyzer:

- a 65-dB source attenuator in each source port channel
- a 35-dB receiver attenuator in each receiver channel
- new cables

After installation of this upgrade, your analyzer will be an N5221A Option 217 or N5222A Option 217.

Getting Assistance from Agilent

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

Contacting Agilent

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

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

NOTE In any correspondence or telephone conversation, refer to the Agilent product by its model number and full serial number. With this information, the Agilent 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 an Agilent 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.agilent.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, Agilent will promptly email your license key. Otherwise, you will your receive your license key via postal mail.

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.agilent.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	Agilent 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

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 201
Installation to be performed by	Agilent service center or personnel qualified by Agilent
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 Agilent Technologies. Refer to "Getting Assistance from Agilent" on page 3.

Table 1 Contents of Upgrade Kit N5222-60103

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5222-90103
A34, A37	0–65 dB source step attenuator	2	33321-60077
A42, A45	0-35 dB receiver step attenuator	2	33321-60078
--	Attenuator bracket (For source and receiver attenuators)	2	N5242-00007
--	Cable clamp	7	1400-1334
--	Cable tie	6	1400-0249
--	Front panel overlay	1	N5222-80004
--	Machine screw, M3 x 8, pan head (to attach brackets to attenuators)	10	0515-0372
--	Machine screw, M3 x 6, pan head (to attach attenuator assemblies to deck)	8	0515-0430
W25	RF cable, A28 port 2 receiver coupler to front-panel REF 2 SOURCE OUT	1	N5222-20038
W48	RF cable, A33 reference mixer switch to A23 mixer brick (R1)	1	N5222-20003
W71	RF cable, A25 port 1 receiver coupler to A34 port 1 source attenuator	1	N5222-20002
W72	RF cable, A34 port 1 source attenuator to front-panel Port 1 SOURCE OUT	1	N5222-20028
W83	A28 port 2 receiver coupler to A37 port 2 source attenuator	1	N5222-20001
W84	RF cable, A37 port 2 source attenuator to front-panel Port 2 SOURCE OUT	1	N5222-20036
W87	RF cable, Front-panel Port 1 RCVR A IN to A42 port 1 receiver attenuator	1	N5222-20031
W88	RF cable, A42 port 1 receiver attenuator to A23 mixer brick (A)	1	N5222-20004
W93	RF cable, Front-panel Port 2 RCVR B IN to A45 port 2 receiver attenuator	1	N5222-20037
W94	RF cable, A45 port 2 receiver attenuator to A23 mixer brick (B)	1	N5222-20010
--	Ribbon cable, A19 test set motherboard J205 to A42 port 1 receiver attenuator	2	8121-0982
--	Ribbon cable, A19 test set motherboard J208 to A45 port 2 receiver attenuator		
--	Ribbon cable, A19 test set motherboard J201 to A34 port 1 source attenuator	2	N5242-60008
--	Ribbon cable, A19 test set motherboard J204 to A37 port 2 source attenuator		

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.

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 the Front Panel Assembly.

Step 4. Remove Some Bottom-Side (Test Set) Cables.

Step 5. Assemble the Source and Receiver Attenuator Assemblies.

Step 6. Install the Source and Receiver Attenuator Assemblies.

Step 7. Install Some Bottom-Side (Test Set) 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. Reinstall Front Panel Jumpers.

Step 12. Reinstall the Outer Cover.

Step 13. Enable Option 217.

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 Agilent for assistance before beginning the installation of this upgrade. Refer to "Contacting Agilent" 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. 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.

1. Place the analyzer bottom-side up on a flat surface.
2. Remove the following cables. To see an image showing the location of these cables, click the Chapter 6 bookmark “Bottom RF Cables, Standard 2-Port Configuration, Option 201” in the PDF Service Guide[1].

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

- W11 (N5222-20044) A25 port 1 receiver coupler to front-panel Port 1 SOURCE OUT
- W23 (N5222-20051) A28 port 2 receiver coupler to front-panel Port 2 SOURCE OUT
- W25 (N5222-20059) A28 port 2 receiver coupler to front-panel REF 2 SOURCE OUT
- W31 (N5222-20046) Port 1 RCVR A IN to A23 mixer brick (A)
- W34 (N5222-20052) Port 2 RCVR B IN to A23 mixer brick (B)
- W48 (N5222-20056) A33 reference mixer switch to A23 mixer brick (R1)

These cables must be saved - they will be reinstalled.

- W13 (N5222-20005) A25 port 1 receiver coupler to A33 reference mixer switch
- W30 (N5222-20091) Front panel jumper
- W35 (N5222-20033) 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)

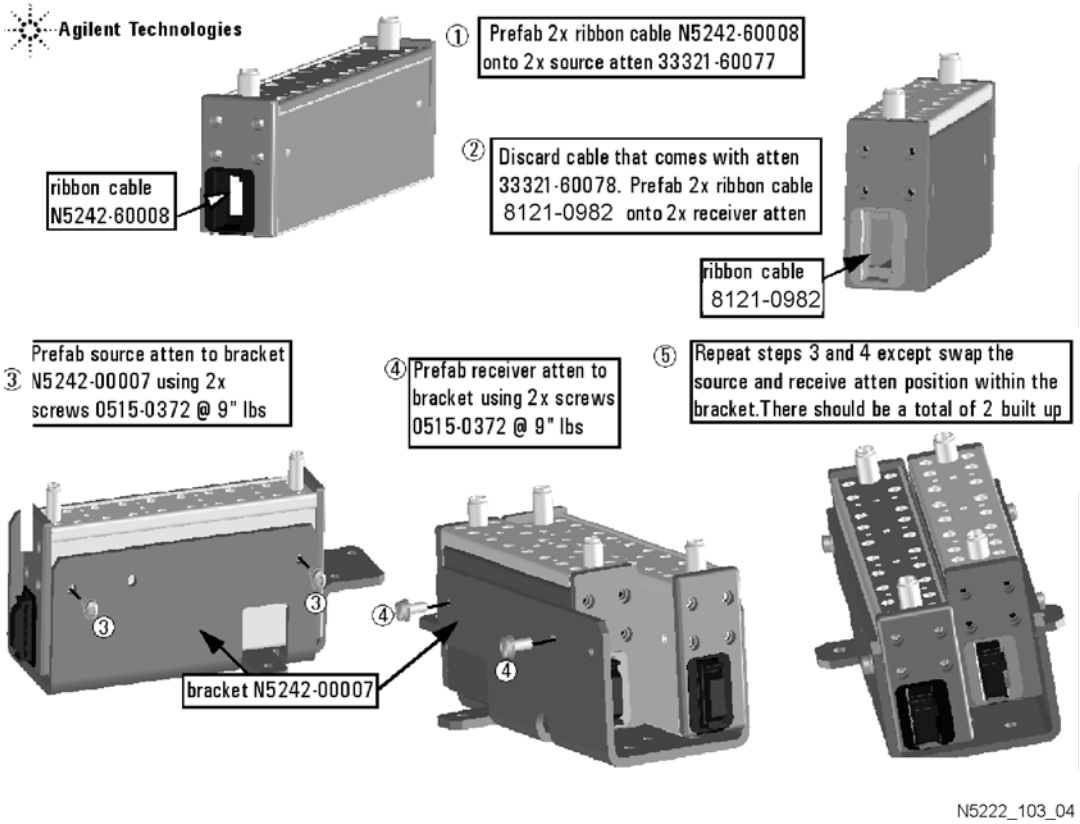
NOTE: Remove and save the cable guards for the front panel jumpers.

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

Step 5. Assemble the Source and Receiver Attenuator Assemblies

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.

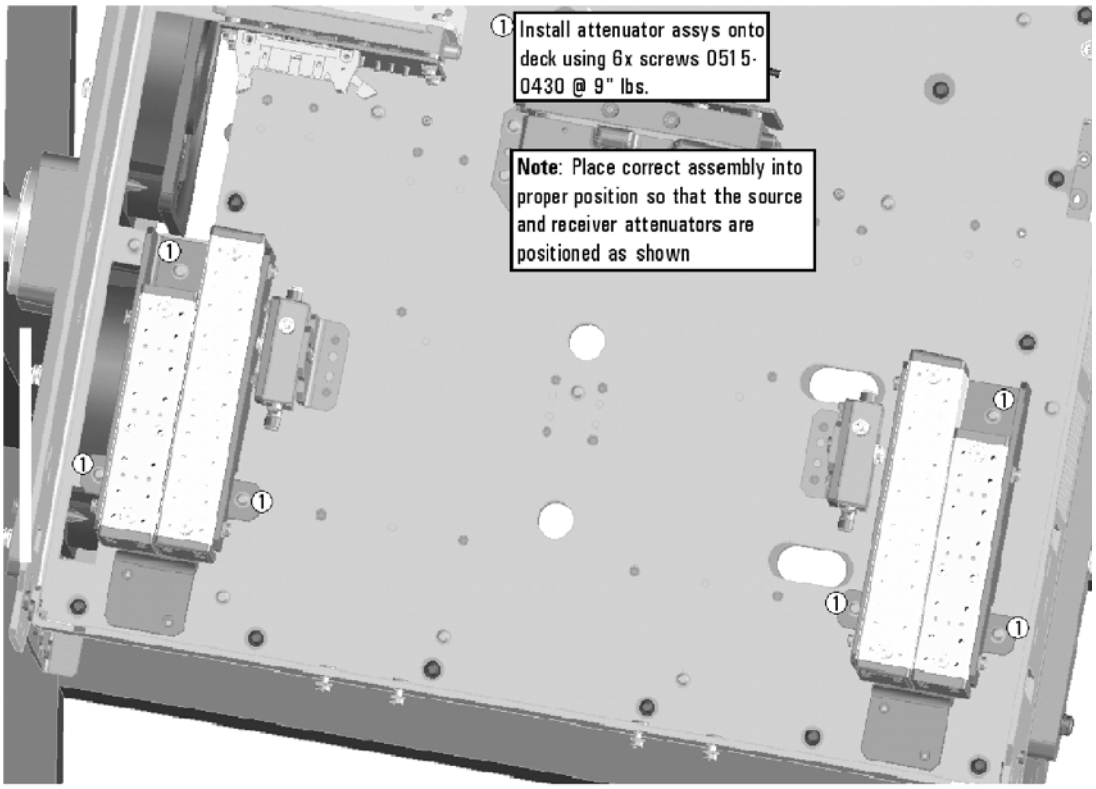
Figure 1 Source and Receiver Attenuator and Bracket Assembly



Step 6. Install the Source and Receiver Attenuator Assemblies

Refer to Figure 2 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 2 Source and Receiver Attenuator Assemblies Installation



Step 7. 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.

Install the Semirigid Cables

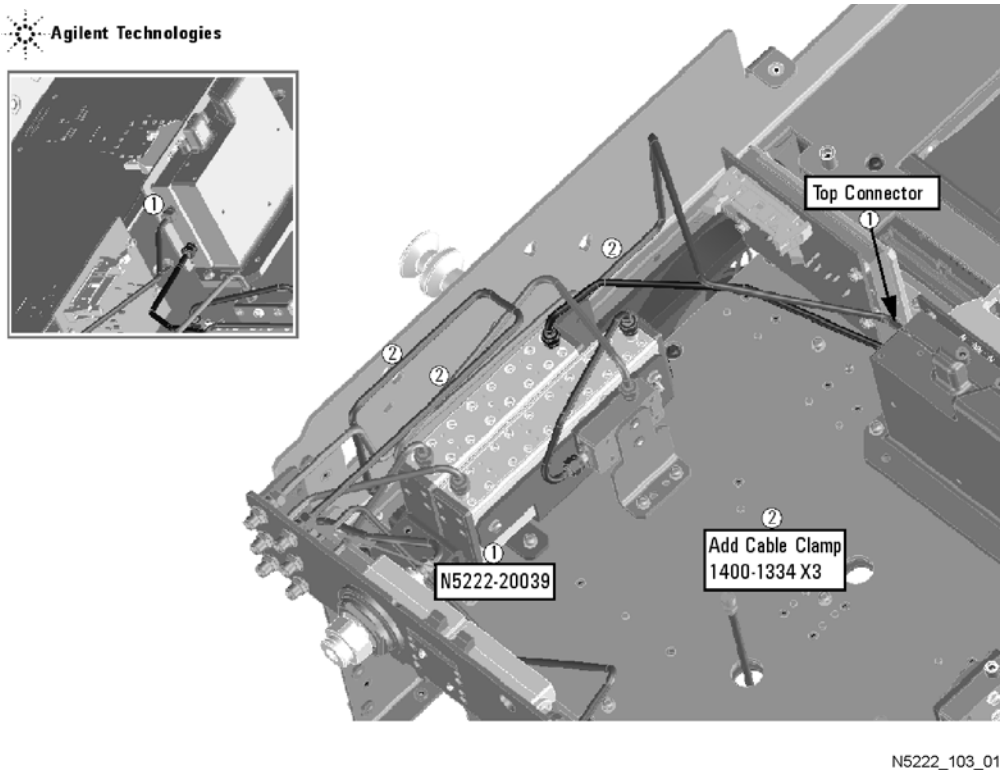
To see an image showing the location of these cables, click the Chapter 6 bookmarks "Bottom RF Cables, 2-port Configuration, Option 217" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 7.

Install the following new cables in the order listed.

- W93 (N5222-20037) Front-panel Port 2 RCVR B IN to A45 port 2 receiver attenuator
- W84 (N5222-20036) A37 port 2 source attenuator to front-panel Port 2 SOURCE OUT
- W83 (N5222-20001) A28 port 2 receiver coupler to A37 port 2 source attenuator
- W25 (N5222-20038) A28 port 2 receiver coupler to front-panel REF 2 SOURCE OUT
- W94 (N5222-20010) A45 port 2 receiver attenuator to A23 mixer brick (B)
- W40 (reuse) (N5222-20039) Front-panel REF 2 RCVR R2 IN to A23 mixer brick (R2)

* As shown in Figure 3 on page 12, install three cable clamps (part number 1400-1334) to secure W40 (part number N5222-20039).

Figure 3 Location of Cable Clamps to Secure W40

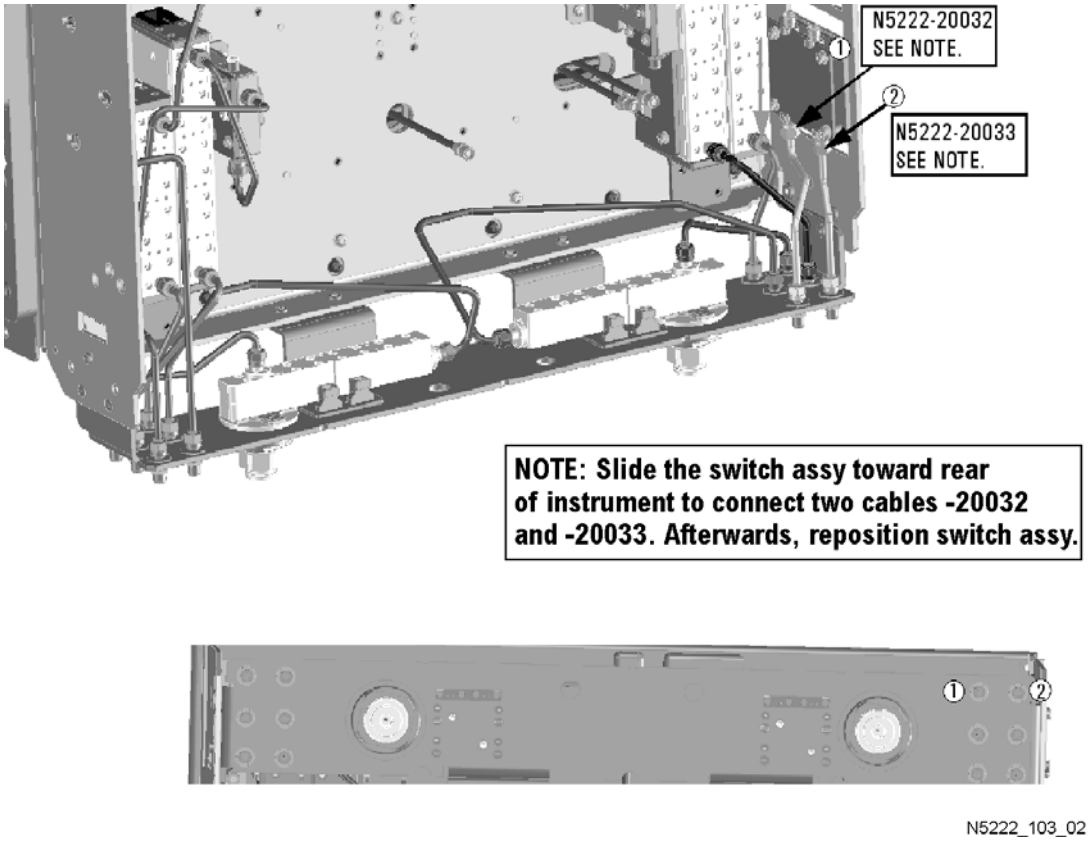


1. See "Downloading the Online PNA Service Guide" on page 5.

- W87 (N5222-20031) Front-panel Port 1 RCVR A IN to A42 port 1 receiver attenuator
- W72 (N5222-20028) A34 port 1 source attenuator to front-panel Port 1 SOURCE OUT
- W36 (reuse) (N5222-20032) Front-panel REF 1 RCVR R1 IN to A33 reference mixer switch

* As shown in the note in Figure 4, follow the instructions to install W36 (part number N5222-20032).

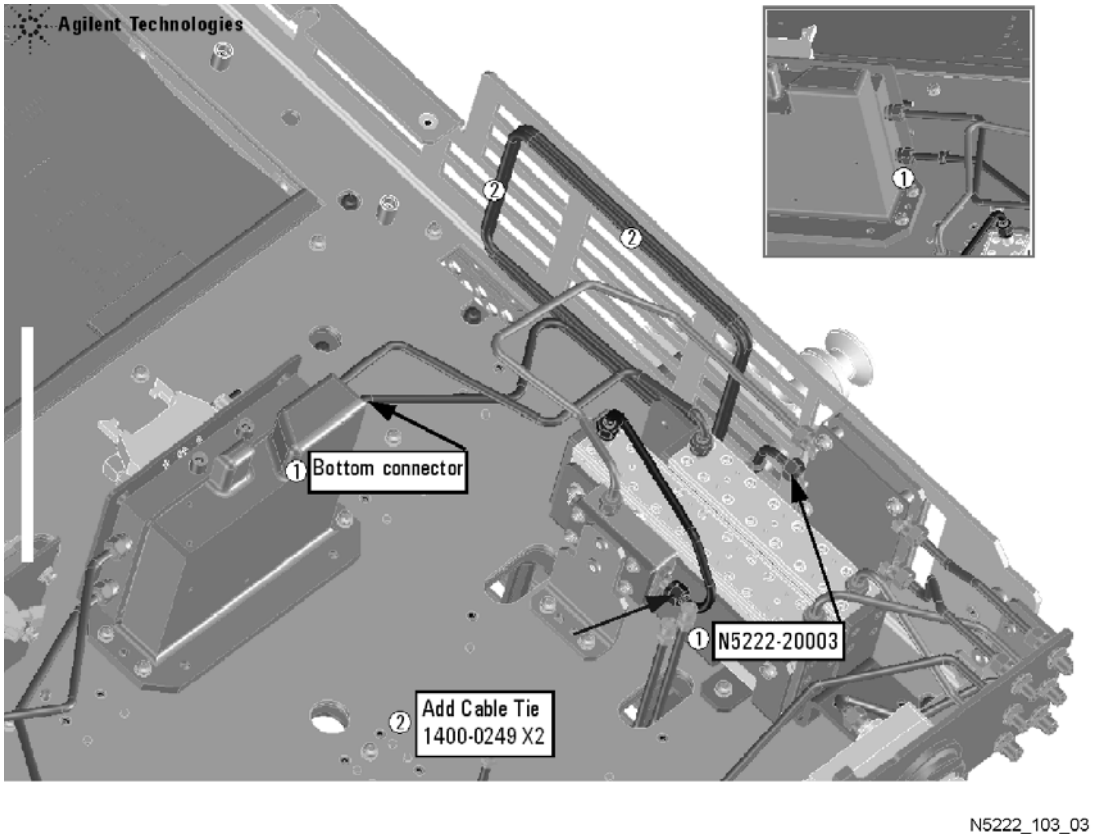
Figure 4 Instructions to Install W36



- W48 (N5222-20003) A33 reference mixer switch to A23 mixer brick (R1)

* As shown in Figure 5, install two cable ties (part number 1400-0249) to secure W48 (part number N5222-20003).

Figure 5 Location of Cable Ties to Secure W48



- 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.

- W71 (N5222-20002) A25 port 1 receiver coupler to A34 port 1 source attenuator
- W88 (N5222-20004) A42 port 1 receiver attenuator to A23 mixer brick (A)
- W30 (reuse) (N5222-20091)Front panel jumpers (quantity = 6)

Install the Ribbon Cables

To see an image showing the location of these cables, click the Chapter 6 bookmarks "Bottom Ribbon Cables and Wire Harnesses, 2-port, Option 217" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 7.

Connect step attenuator ribbon cables as follows:

- (N5242-60008) A19 test set motherboard J201 to A34 port 1 source attenuator
- (N5242-60008) A19 test set motherboard J204 to A37 port 2 source attenuator
- (8121-0982) A19 test set motherboard J205 to A42 port 1 receiver attenuator
- (8121-0982) A19 test set motherboard J208 to A45 port 2 receiver attenuator

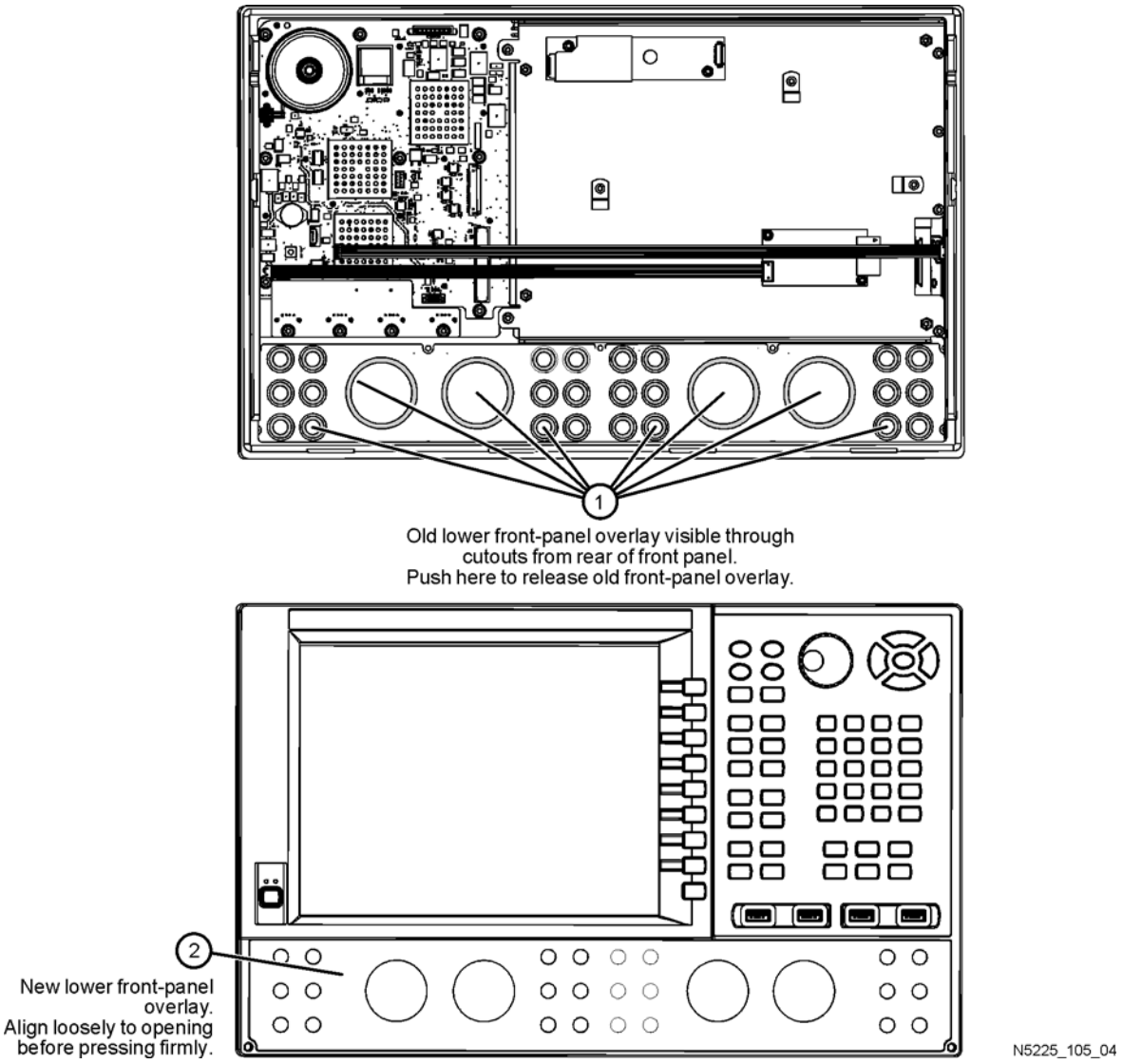
1. See "Downloading the Online PNA Service Guide" on page 5.

Step 8. Remove the Old Lower Front Panel Overlay

Refer to Figure 6 for this step of the procedure. 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 6 Lower Front Panel Overlay Replacement



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 15 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, N5222-80004 (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 11. Reinstall Front Panel Jumpers

Reinstall the 6 front panel jumper cables (reference designator W30; part number N5222-20091).

Step 12. 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 5.

Step 13. Enable Option 217

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 **217 - Configurable TS + Attens**.
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 Agilent. 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 "217" is listed after "Options:" in the display. Click **OK**.

NOTE If Option 217 has not been enabled, perform the "Option Enable Procedure" again. If the option is still not enabled, contact Agilent Technologies. Refer to "Getting Assistance from Agilent" 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 Agilent. Refer to "Contacting Agilent" 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 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.

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