Keysight - N5241/2/9B Noise Figure Capabilities - 4-Port Upgrade Kit (For Version 6 and Version 7 Synthesizers) - Installation Guide

To Upgrade PNA-X N5241/2/9B Option 417/419/423/425
to include Option 029

Upgrade Kit Order Numbers:
N5241BU-429, N5242BU-429, and N5249BU-429

Keysight Kit Number: N5242-60121

This is the Installation Guide for the N5241/2/9B Series Microwave Network Analyzers.

Notices

Trademark Acknowledgments

Manual Part Number

N5242-90121

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Warranty

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Safety Notices

CAUTION

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

WARNING

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

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.**

Description of the Upgrade

NOTE

If you had an A model PNA-X with Option 219/419 with Option H85 that was upgraded to a B model, please refer to Options 217/417. If you had an A model PNA-X with Option 224/423 with Option H85 that was upgraded to a B model then refer to Option 222/422.

NOTE

IMPORTANT! Option 029 requires Noise Figure Measurements Option S93029A. Option S93029A is not included with this kit. If you need to order Option S93029A, contact Keysight. Refer to "Contacting Keysight" on page 6.

NOTE

IMPORTANT! This kit contains the newer N5245-60124 noise receiver board (with tabs). If your instrument serial prefix is less than 5200, you need to order the N5245-60125 noise receiver board kit. Contact Keysight to swap out the N5245-60124 board for a N5245-60125 kit. Refer to "Contacting Keysight" on page 6 operating system.

NOTE

The following may apply to your B model PNA-X: In June 2013, the N5241A/AS and N5242A/AS analyzers underwent significant hardware changes. Some components that have 2.4 mm connectors (bias tees, couplers, and some semi-rigid cables) were replaced with components that have 3.5 mm connectors.

Be very careful to use the appropriate hardware in your analyzer. Using the wrong hardware can ruin analyzer components, resulting in additional customer costs.

This upgrade adds noise figure measurement capability to your Option 417, 419, 422, 423, or 425 4-port analyzer by adding Option 029 which includes:

- a noise down converter and noise receiver
- a bypass switch in ports 1 and 2

Refer to "Overview of the Installation Procedure" on page 14.

CAUTION

This repair must be done at a service center or a self-maintainer service center! Refer to "Getting Assistance from Keysight" on page 6.

Getting Assistance from Keysight

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

Contacting Keysight

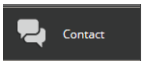
Assistance with test and measurements needs and information on finding a local Keysight office are available on the Web at:
http://www.keysight.com/find/assist

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.

If You Have Problems With the Upgrade Kit Contents

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

) link.

Getting Prepared

CAUTION

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

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

NOTE

IMPORTANT!

- This document contains references to legacy and new A21 HMA26.5 Multiplier/Amplifier assemblies. Your model instrument may have either legacy assemblies or the new parts installed.
- To verify your instrument's A21 HMA26.5 Multiplier/Amplifier, refer to "Verify the Model/Version of HMA26.5 Installed" on page 9.
- See also your instrument's PDF Service Guide [a].

a. See "Downloading the Online PNA Service Guide" on page 10.

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 11.
- Enough time - refer to "About Installing the Upgrade" on page 11.
- Test equipment for the post-upgrade adjustments. To view the equipment list, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide[1].

1. See "Downloading the Online PNA Service Guide" on page 10.

License Key Redemption

NOTE

Ensure that you are connected to an external server, before attempting to download your email and license key file.

If you are unfamiliar with the licensing process, refer to the https://www.keysight.com/us/en/assets/9018-04534/installation-guides/9018-04534.pdf (N5242-90024).

NOTE

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

To enable the option product(s), you must request license key(s) file from the Keysight Software Manager:
http://www.keysight.com/find/softwaremanager:

To complete the request, you will need to gather the following information:

- From the certificate
  - Order number
  - Certificate number
- From your instrument

  (Instrument information is available in the network analyzer - on the toolbar, click Help, then click About Network Analyzer.)
  - Model number
  - Serial number

Using the information just gathered, you must request license key(s) from the Keysight Software Manager:
http://www.keysight.com/find/softwaremanager.

You will need to provide an email address, to which Keysight will promptly email your license key file. Refer to “License Key Redemption” on page 8.

Verify the License Contents

Refer to the license message you received from Keysight:

If the model number, serial number, or option number do not match those on the license message you received from Keysight, you will not be able to install the license key file. If this is the case you received from Keysight, you will not be able to install the license key file. If this is the case, contact Keysight for assistance. Refer to “Getting Assistance from Keysight” on page 6.

Verify the Model/Version of HMA26.5 Installed

NOTE **Depending on the type of Option upgrade that was purchased, your parts kit may or may not include the following cable part numbers.**

This upgrade kit contains components for use with PNA-X models using the legacy HMA26.5 part number 5086-7765. If your PNA-X has the newer HMA26.5 part number N5240-60101 installed you may discard these parts:

- A22 splitter 5087-7139
- W42 N5222-20009
- W43 N5222-20007
- W44 N5222-20008 (4-port only)

(If you have the legacy 5087-7765 HMA26.5, please discard the W202 N5222-20126 semi-rigid cables. Refer to Figure 1 on page 9.)

The new N5240-60101 HMA26.5 has the splitter integrated into the assembly. Refer to Figure 1 on page 9.

Figure 1 **Comparison of Legacy HMA26.5 (5087-7765) and New HMA26.5 (N5240-60101)**

Downloading the Online PNA Service Guide

To view the online Service Guide for your PNA model number, use the following steps:

1. Go to www.keysight.com.
2. In the Search box, enter the model number of the analyzer (e.g., N5232B) and click **Search**.
3. Click **Support** > **Keysight Product Support**.
4. In the **Search Support** area type your instrument's model number (e.g., N2222B).
5. Press **Enter**.
6. Scroll down to the **PRINT DOCUMENTATION** section and click to select **Service Manual**.

   The **Service Manual** for your instrument will be displayed near the top of the right column.
7. Click the hyperlink of the Service Guide title to download the PDF file.
8. When the PDF of the Service Guide is displayed, scroll through the Contents section bookmarks to locate the information needed.

Protecting Your Workspace from Electrostatic Discharge

For information, click on the Chapter 1 bookmark, "Electrostatic Discharge Protection" in the PDF Service Guide[1].

ESD Equipment Required for the Installation

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

1. See "Downloading the Online PNA Service Guide" on page 10.

Tools Required for the Installation

Description	Qty	Part Number
T-10 TORX driver (set to 9 in-lbs)	1	N/A
T-20 TORX driver (set to 21 in-lbs)	1	N/A
5/16-in torque wrench (set to 10 in-lbs)	1	N/A
5/16-in torque wrench (set to 21 in-lbs)	1	N/A
1-in torque wrench (set to 72 in-lbs)	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 and the bias tees and bias tee combiners. The bias tees and bias tee combiners should be torqued to 9 in-lbs. And, on the front and rear bulkhead connectors, use a 5/16 inch nutsetter or open end torque wrench set to 21 in-lb.

About Installing the Upgrade

Products affected[a]	N5241B, N5242B, and N5249B Option 417, 419, 422, 423, or 425
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	5.0 hours
Estimated adjustment time	1.5 hours (2.5 hours[b])
Estimated full instrument calibration time	7.0 hours (8 hours[b])

a. This upgrade is for models with Version 6 or Version 7 synthesizers. Version 7 dual-digital synthesizers (DDS) instruments have a s/n prefix 6201 and greater or instruments upgraded with N52xxBU-xS7.
b. Add 1.0 hours for N5242B equipped with Option 425 low frequency extension (LFE).

Items Included in the Upgrade Kit

Check the contents of your kit against the following list. If any part is missing or damaged, contact Keysight Technologies. Refer to "Getting Assistance from Keysight" on page 6.

Table 1 Contents of Upgrade Kit N5242-60121

Ref Desig.	Description		Qty	Part Number
	Installation note (this document)		1	N5242-90121
	Software Entitlement Certificate		1	9300-0000
	China RoHS Addendum		1	9320-6722
Accessory Items				
Note to Installer The following two items are used when performing vector-corrected noise figure measurements and are not used in the upgrade. They are packaged separately in the kit and must remain with the analyzer.				
	Female-to-female adapter used to connect an ECal module		1	85052-60013
	RF cable used to connect an ECal module		1	N5242-20169
Assemblies				
A7	Noise receiver board	5201 and above:	1	N5245-60124
		5200 and below:		Call Keysight[a]
A52	Bypass switch, port 1		1	N1811-60030
A53	Bypass switch, port 2		1	N1811-60028
A54	Bridge		1	5087-7794
A55	Noise downconverter		1	5087-7767
Hardware/Miscellaneous				
	Switch/attenuator bracket		2	N5242-00031
	Bias tee/combiner bracket		2	N5242-00032
	Machine screw, M3.0 x 18, pan head (to attach A52 and A53 to switch brackets)		4	0515-0666
	Machine screw, M3.0 x 6, pan head (to attach bias tee brackets)		4	0515-0430
	Machine screw, M3.0 x 20, pan head (to attach A54 to side frame)		1	0515-1410
	Hex nut with lock washer (for screw 0515-1410; to attach A54 to side frame)		1	0535-0031
	Machine screw, M3.0 x 10, pan head (to attach A55 to side frame)		3	0515-0374
	Dust cap for test port		4	1410-0214
	Lower front panel overlay, N5241/2/9B Option 419/423 with Option 029		1	N5242-80028

Table 1 Contents of Upgrade Kit N5242-60121

Ref Desig.	Description	Qty	Part Number
	Lower front panel overlay, N5241/2/9B Option 417/422 with Option 029	1	N5242-80034
	Lower front panel overlay, N5241/2/9B Option 425 with Option 029	1	N5242-80037
Cables			
W121	RF cable, A25 port 1 bridge to A34 port 1 source attenuator	1	N5242-20273
W122	RF cable, A34 port 1 source attenuator to A52 port 1 bypass switch	1	N5242-20298
W123	RF cable, A52 port 1 bypass switch to front-panel Port 1 SOURCE OUT	1	N5242-20297
W124	RF cable, front-panel Port 1 CPLR THRU to A52 port 1 bypass switch	1	N5242-20295
W125	RF cable, A52 port 1 bypass switch to A71 port 1 bias tee combiner (Option 423 with 029 Only)	1	N5242-20296
W126	RF cable, A28 port 2 bridge to A37 port 2 source attenuator	1	N5242-20272
W127	RF cable, A37 port 2 source attenuator to A53 port 2 bypass switch	1	N5242-20292
W128	RF cable, A53 port 2 bypass switch to front-panel Port 2 SOURCE OUT	1	N5242-20303
W129	RF cable, A53 port 2 bypass switch to A54 port 2 bridge	1	N5242-20293
W130	RF cable, A52 port 2 bypass switch to A54 port 2 bridge	1	N5242-20302
W131	RF cable (male-to-male adapter), A54 port 2 bridge to A55 noise down converter	1	1250-3576
W132	RF cable, front-panel Port 1 RCVR A IN to A42 port 1 receiver attenuator	1	N5242-20277
W133	RF cable, A42 port 1 receiver attenuator to A23 mixer brick (A)	1	N5242-20275
W134	RF cable, A45 port 2 receiver attenuator to A23 mixer brick (B)	1	N5242-20276
W135	RF cable, front-panel Port 2 RCVR B IN to A45 port 2 receiver attenuator	1	N5242-20278
W136	RF cable, A33 reference mixer switch to A23 mixer brick (R1)	1	N5242-20274
W137	RF cable, A28 port 2 bridge to front-panel REF 2 SOURCE OUT	1	N5242-20279
W138	RF cable, front-panel REF 2 RCVR R2 IN to A23 mixer brick (R2)	1	N5242-20280
W140	RF cable, A24 mixer brick to A55 noise down converter	1	N5242-20294
W141	RF cable, A55 noise downconverter to A7 noise receiver board LO	1	N5242-20322
W142	RF cable, A55 noise downconverter J4 to A7 noise receiver board P2	1	N5242-60041
W143	RF cable, A55 noise downconverter to A7 noise receiver board RF	1	N5242-20323
W153	RF cable, front-panel port 2 CPLR THRU to A32 port 2 coupler (Option 422 with 029 Only)	1	N5242-20310
W169	RF cable, A52 port 1 bypass switch to A71 port 1 bias tee combiner (Option 425 with 029 Only)	1	N5242-20325

Table 1 Contents of Upgrade Kit N5242-60121

Ref Desig.	Description	Qty	Part Number
	Ribbon cable, A19 test set motherboard J550 to A55 noise downconverter J1	1	N5242-60033
Not Included (For Reference Only)			
A16	Power Supply	1	0950-4934

a. If your instrument serial prefix is less than 5200, you need to order the N5245-60125 noise receiver board kit. Contact Keysight to swap out the N5245-60124 board for a N5245-60125 kit.

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

All Instruments

"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 Existing Test Set Cables."

"Step 6. Remove the Existing Attenuators, Brackets, and Bias Tee/combiners (If Present)."

"Step 7. Assemble the Old Attenuators and the New A52 and A53 Bypass Switches onto the New Brackets."

"Step 8. Install the New Brackets, with the Old Attenuators and the New A52 and A53 Bypass Switches, into the Analyzer."

Instruments with Serial prefixes <5200 Only

All Instruments

All Instruments

Step 1. Obtain a Keyword and Verify the Information

Follow the instructions on the Software Entitlement Certificate supplied to obtain a license key for installation of this upgrade. Refer to "License Key Redemption" on page 8.

Verify that the model number, serial number, and option number information on the license key match those of the instrument on which this upgrade will be installed.

Once the license key file has been received and the information verified, you can proceed with the installation at step 2.

NOTE

If the model number, serial number, or option number do not match those on your license key file, you will not be able to install the option. If this is the case, contact Keysight for assistance before beginning the installation of this upgrade. Refer to "Contacting Keysight" on page 6.

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].

1. See "Downloading the Online PNA Service Guide" on page 10.

Step 4. Remove the Front Panel Assembly

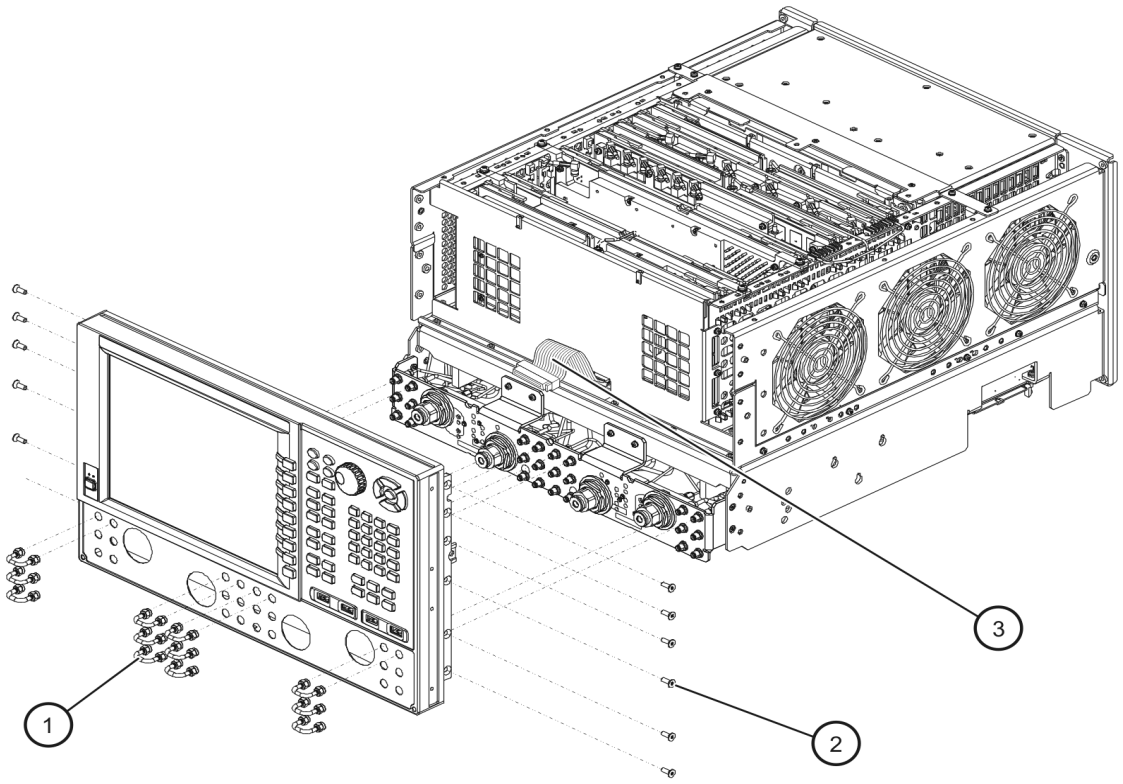
Refer to Figure 2 for this step of the procedure.

1. With a 5/16-in wrench, remove all front panel jumpers (item ①).
2. With a T-10 TORX driver, remove the screws (item ②) from the sides of the frame.

CAUTION Before removing the front panel from the analyzer, lift and support the front of the analyzer chassis.

3. Slide the front panel over the test port connectors.
4. Disconnect the front panel interface ribbon cable (item l). The front panel is now free from the analyzer.

Figure 2 Front Panel Assembly Removal



n5242_010_02

Step 5. Remove the Existing 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 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.

Refer to Figure 3 on page 21 for this step of the procedure. Although only Option 419 is shown in the illustration, Option 417, 422, 423, and 425 are similar in appearance.

1. Place the analyzer bottom-side up on a flat surface.
2. Remove the following cables in the order listed. Unless otherwise marked, discard these cables; they will not be reused.

   For analyzers with serial numbers prefixed MY/SG/US5310 and below:

   For all analyzer serial numbers and Options (**IMPORTANT**: save these cables for reuse):

   – W26 A32 port 2 coupler to front-panel Port 2 CPLR ARM
   – W14 A29 port 1 coupler to front-panel Port 1 CPLR ARM

   For analyzers serial numbers prefixed MY/SG/US5310 and above and with Option 417and 422 Only:

   – W40 REF 2 RCVR R2 IN to A23 mixer brick (R2)
   – W24 Port 2 CPLR THRU to A32 port 2 coupler (Option 422 Only)

   For analyzers serial numbers prefixed MY/SG/US5310 and above and with Option 417, 419, 422, or 423, but NOT Option 425):

   – W94 A45 port 2 receiver attenuator to A23 mixer brick (B)
   – W88 A42 port 1 receiver attenuator to A23 mixer brick (A)
   – W37 A33 reference mixer switch to A23 mixer brick (R1)
   – W71 A25 port 1 bridge to A34 port 1 source attenuator
   – W25 A28 port 2 bridge to front-panel REF 2 SOURCE OUT

For analyzer options with serial numbers prefixed MY/SG/US5310 and above:

- W83 A28 port 2 bridge to A37 port 2 source attenuator
- W72 A34 port 1 source attenuator to front-panel Port 1 SOURCE OUT
- W87 Front-panel Port 1 RCVR A IN to A42 port 2 receiver attenuator
- W84 A37 port 2 source attenuator to front-panel Port 2 SOURCE OUT
- W93 Front-panel Port 2 RCVR B IN to A45 port 2 receiver attenuator

If bias tee option is installed (Option 419 or 423 Only, but NOT 425):

NOTE

IMPORTANT! Option 419/423 Bias tees are different from the Option 425 Bias tee combiner. This section applies only to the Option 419/423 Bias tees.

For analyzers with serial numbers prefixed MY/SG/US5310 and below (**IMPORTANT**: save these cables for reuse):

- W86 A41 port 2 bias tee to A32 port 2 coupler
- W74 A38 port 1 bias tee to A29 port 1 coupler
- W85 A41 port 2 bias tee to front panel port 2 CPLR THRU
- W78 A39 port 3 bias t to A30 port 3 coupler

For all analyzer serial numbers with Option 419 or 423:

- W73 Front-panel Port 1 CPLR THRU to A38 port 1 bias tee

If bias tee option is not installed (Option 417 or Option 422) – (**IMPORTANT**: save these cables for reuse)**:**

For analyzers with serial numbers prefixed MY/SG/US5310 and below:

- W12 Front panel port 1 CPLR THRU to A29 port 1 coupler
- W24 Front panel port 2 CPLR THRU to A32 port 2 coupler (Discard for Option 422)

If bias tee combiner option is installed (Option 425 Only):

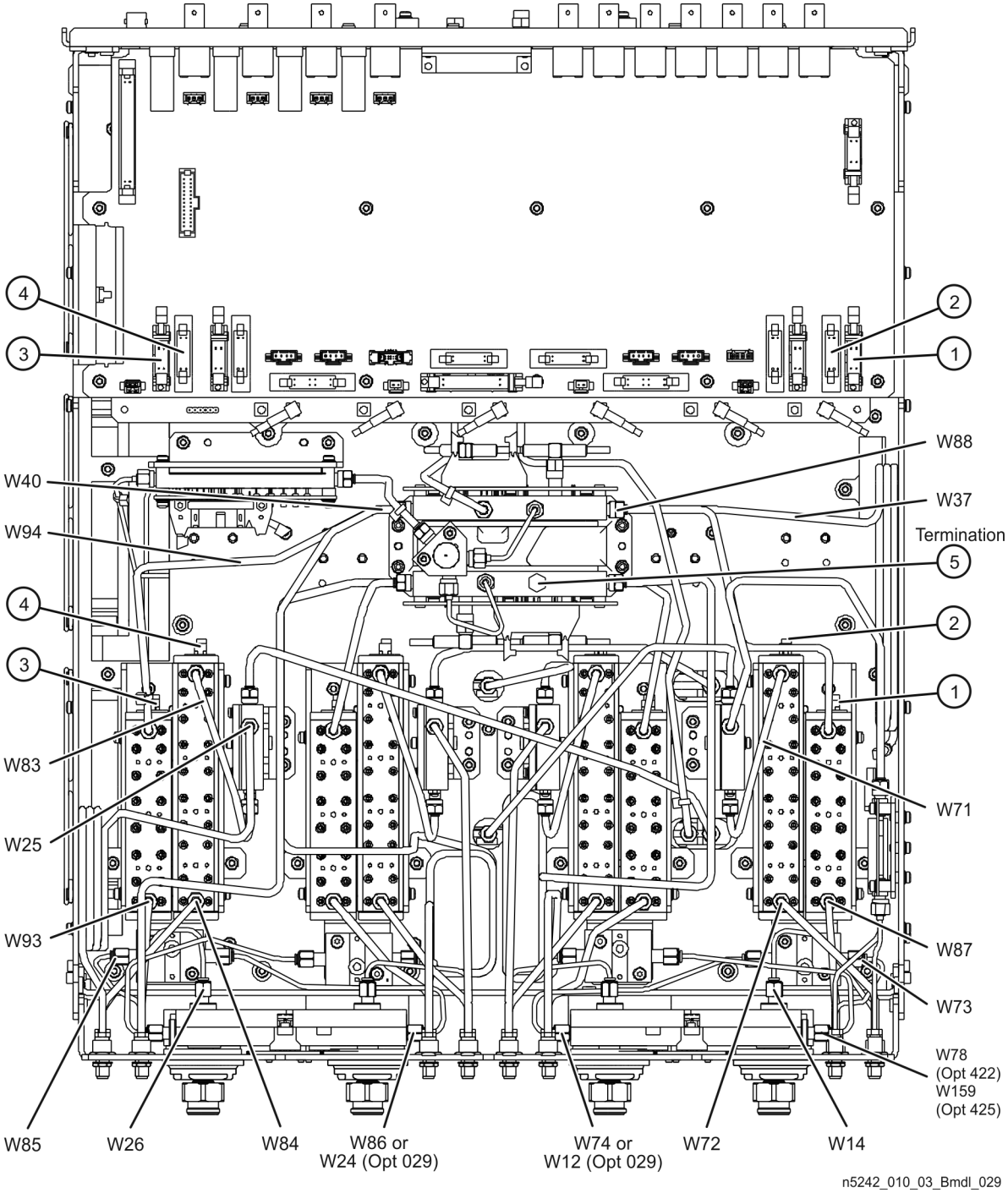
NOTE

IMPORTANT! Option 419/423 Bias tees are different from the Option 425 Bias tee combiners. This section applies only to the Option 425 Bias tee combiners.

- W159 A71 Bias tee combiner, Port 1 to front panel CPLR THRU

3. Disconnect the ribbon cable from the port 1 and port 2 step attenuator connectors. It is not necessary to disconnect these ribbon cables from the A19 test set motherboard; connector designations are given here for reference only.
   a. Item ① connects between the A42 port 1 receiver attenuator and A19 test set motherboard connector J205.
   b. Item ② connects between the A34 port 1 source attenuator and A19 test set motherboard connector J201.
   c. Item ③ connects between the A45 port 2 receiver attenuator and A19 test set motherboard connector J208.
   d. Item ④ connects between the A37 port 2 source attenuator and A19 test set motherboard connector J204.
4. Remove the termination (item ⑤) from the A24 mixer brick. This termination will not be reinstalled.

Figure 3 Existing Test Set Cables Removal[1]



1. The A22 splitter (5087-7139) and N5222-20007, N5222-20008, and N5222-20009 cables are only used with a legacy HMA26.5 p/n: 5087-7765. If your PNA has a new N5240-60101 assembly installed, then set aside these parts as spares for use in other PNAs with the older HMA26.5 or discard. If you are unclear which HMA26.5 assembly your PNA has installed, refer to Figure 1 on page 9.

Step 6. Remove the Existing Attenuators, Brackets, and Bias Tee/combiners (If Present)

Refer to Figure 5 for this step of the procedure. Although only Option 419 is shown in the illustration, Option 417, 422, 423, and 425 are similar in appearance.

5. Place the analyzer bottom-side up on a flat surface.

If bias tee option (Option 419 and 423 only) is installed (**NOT** Option 417 or 422):

For analyzers with serial numbers prefixed MY/SG/US5321 and above:

6. Remove two screws (item ①) from the A38 port 1 bias tee and the A41 port 2 bias tee and lift them out of the PNA, and set them aside for re-installation later.

   Else skip to next step.

For analyzers with serial numbers prefixed MY/SG/US5310 and below:

7. Remove two screws (item ①) from the A38 port 1 bias tee and lift it out of the PNA. The original A38 port 1 bias tees has 2.4 mm connectors and will be replaced later with bias tee having 3.5 mm connectors. The coupler and bias tee must be replaced as a set so they have the same connector type. Since this component has 3.5 mm connectors, you must replace old 2.4 mm connecting cables with new 3.5 mm cables. Also, you must purchase one bulkhead connector 1250-3805 for each replacement cable that connects to the front panel. Refer to service guide Table 6-2 for the part number needed.

   See also, "Contacting Keysight" on page 6.

   Else, skip to next step.

If bias tee combiner (Option 425 only) is installed (NOT Option 417 or 422):

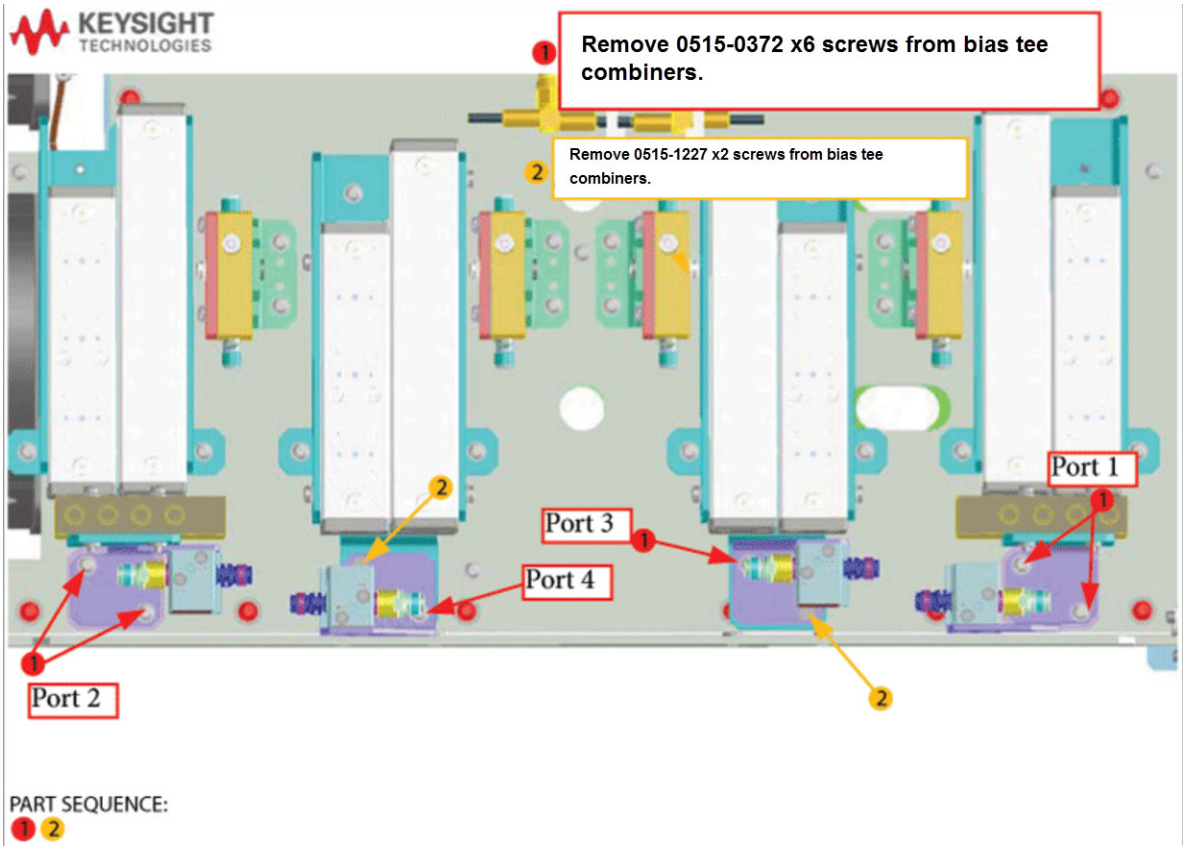
8. Remove all gray cables, cable clamps, and screws from the bias tee combiners, be sure to note their locations and set them aside for re-installation later.
9. Remove the x8 screws mounting the bias tee combiners to the brackets.

   Else, skip to next step.

NOTE

IMPORTANT! The port 3 and 4 mounting screws use x2 different screws than ports 1 and 2. For removing bias tee combiners, refer to Figure 4.

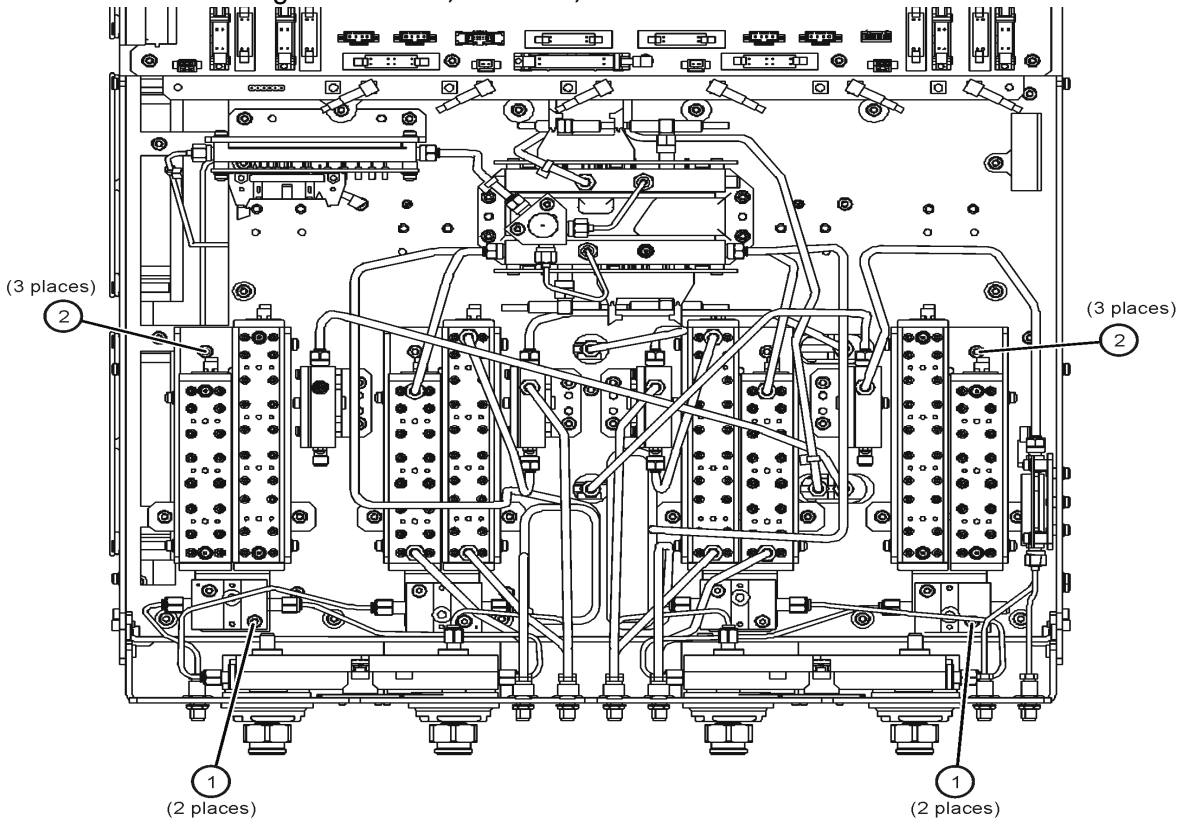
Figure 4 Bias Tee Combiner and Brackets Removal—Option 425 Only



For all analyzers:

10. Remove three screws (item ②) from each attenuator bracket.
11. Remove the attenuator brackets, with the attenuators still attached, from the analyzer.
12. If it is necessary to remove any other cables from the analyzer to facilitate removal of the attenuators and bias tees brackets, be sure to note their locations and set them aside for re-installation later.

Figure 5 Existing Attenuators, Brackets, and Bias Tees Removal[1]



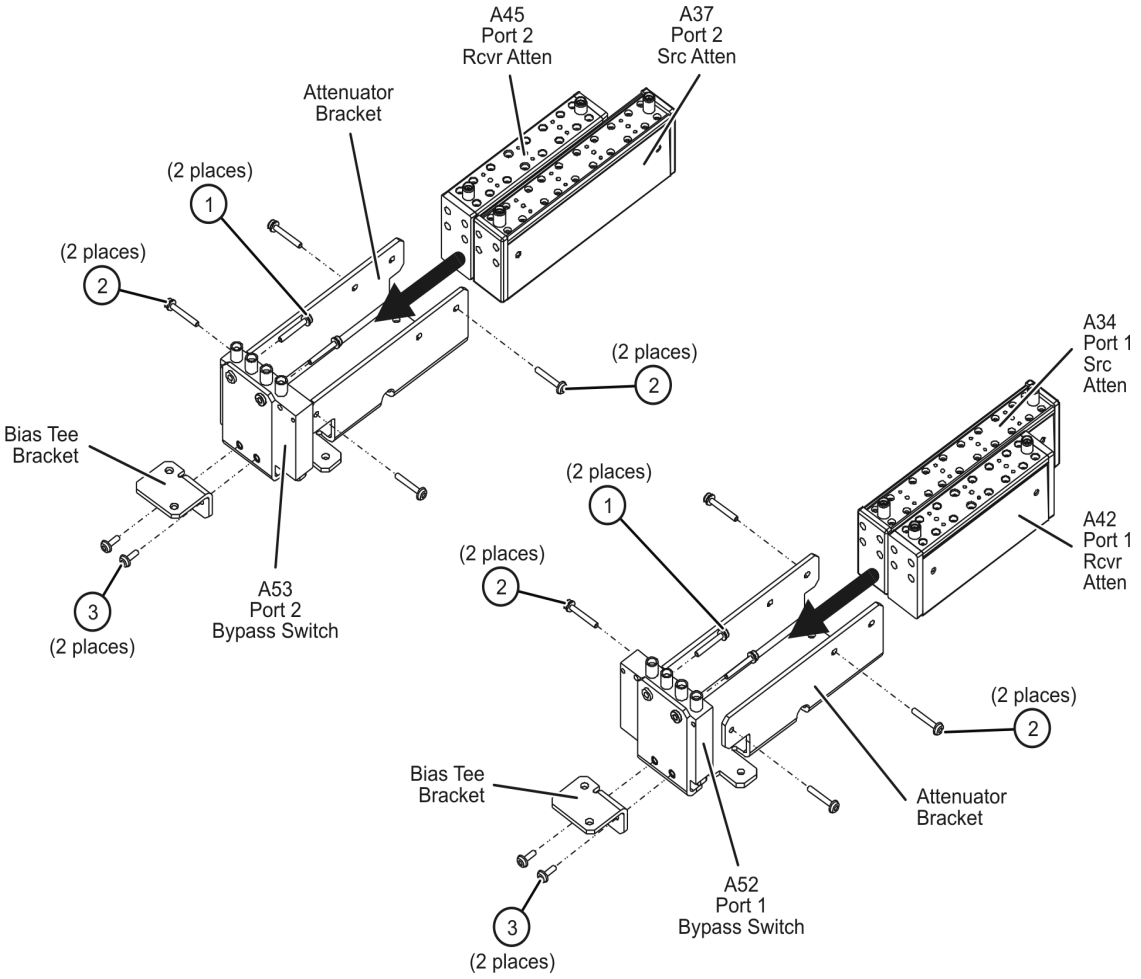
1. The A22 splitter (5087-7139) and N5222-20007, N5222-20008, and N5222-20009 cables are only used with a legacy HMA26.5 p/n: 5087-7765. If your PNA has a new N5240-60101 assembly installed, then set aside these parts as spares for use in other PNAs with the older HMA26.5 or discard. If you are unclear which HMA26.5 assembly your PNA has installed, refer to Figure 1 on page 9.

Step 7. Assemble the Old Attenuators and the New A52 and A53 Bypass Switches onto the New Brackets

Refer to Figure 6 for this step of the procedure. New parts are listed in Table 2 on page 12.

1. Position each new bypass switch on a new switch bracket as shown. Make sure that the switches are oriented as shown; they are not oriented the same for both ports. The A52 switch, with the longest cable, is for port 1.
2. Secure each switch to its bracket using two screws (item ②) for each.
3. Remove the source and receiver attenuators from the old bracket and, using the same screws (item ②), attach them to the new brackets. Make sure that they are oriented as shown; they are not oriented the same for both ports.
4. Secure the bias tee brackets to the attenuator brackets using two screws (item ③) for each.

Figure 6 Attenuators and Bypass Switches Assembly



Step 8. Install the New Brackets, with the Old Attenuators and the New A52 and A53 Bypass Switches, into the Analyzer

Refer to Figure 7 on page 27 and Figure 8 on page 28, and Figure 9 on page 29 for this step of the procedure. Although only Option 419 is shown in Figure 7, Option 417, 422, 423, and 425 are similar in appearance. New parts are listed in Table 2 on page 12.

1. Position the attenuator brackets, with the attenuators and bypass switches attached, in the analyzer as shown. Make sure that the brackets are placed as shown; the attenuators and bypass switches are not oriented the same for both ports.
2. Secure the attenuator brackets to the analyzer test set deck using three screws (item ①) for each.

If bias tee option is installed (NOT Option 417 or Option 422):

CAUTION Installing these bias tees backwards will cause damage to the analyzer source modules.

For analyzers with serial numbers prefixed MY/SG/US5321 and above:

3. Position the existing bias tees (Options 419/423) or bias tee combiners (Option 425), configured as shown in Figure 8 on page 28 (Options 419/423) and Figure 9 on page 29 (Option 425), on the new bias tee/combiner brackets and secure each of them with the original two mounting screws (item ②).
4. Reconnect existing cables W74, W85, W86, and if applicable, do one of the following:
   - new cable W125 to the A38 port 1 bias tee (Option 423 with 029 Only)
   - new cable W168 to the A71 port1 bias tee combiner (Option 425 with 029 Only)

For analyzers with serial numbers prefixed MY/SG/US5310 and below:

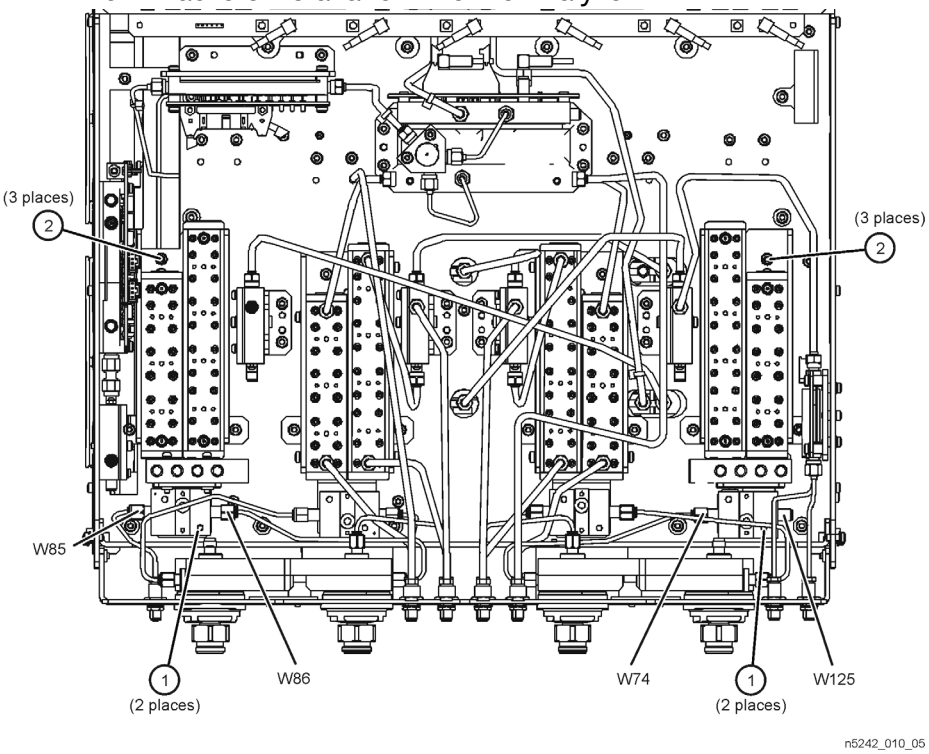
5. Position the new bias tees, configured as shown in Figure 8 on page 28, on the new bias tee brackets and secure each of them with the original two mounting screws (item ②).
6. Connect new cables W85 and if applicable, do one of the following:
   - new cable W125 to the A38 port 1 bias tee (Option 423 with 029 Only)
   - new cable W168 to the A71 port 1 bias tee combiner (Option 425 with 029 Only)

   New cables W74 and W86 will be installed later.

For all analyzers:

7. Reinstall other cables that were removed to facilitate removal of the old attenuator brackets.

Figure 7 New Brackets Installation into the Analyzer[1]



1. The A22 splitter (5087-7139) and N5222-20007, N5222-20008, and N5222-20009 cables are only used with a legacy HMA26.5 p/n: 5087-7765. If your PNA has a new N5240-60101 assembly installed, then set aside these parts as spares for use in other PNAs with the older HMA26.5 or discard. If you are unclear which HMA26.5 assembly your PNA has installed, refer to Figure 1 on page 9.

Figure 8 A23 and A24 Mixer Brick Assembly (Option 419/423) – (0515-0430, 0515-0665, 5057-4865)

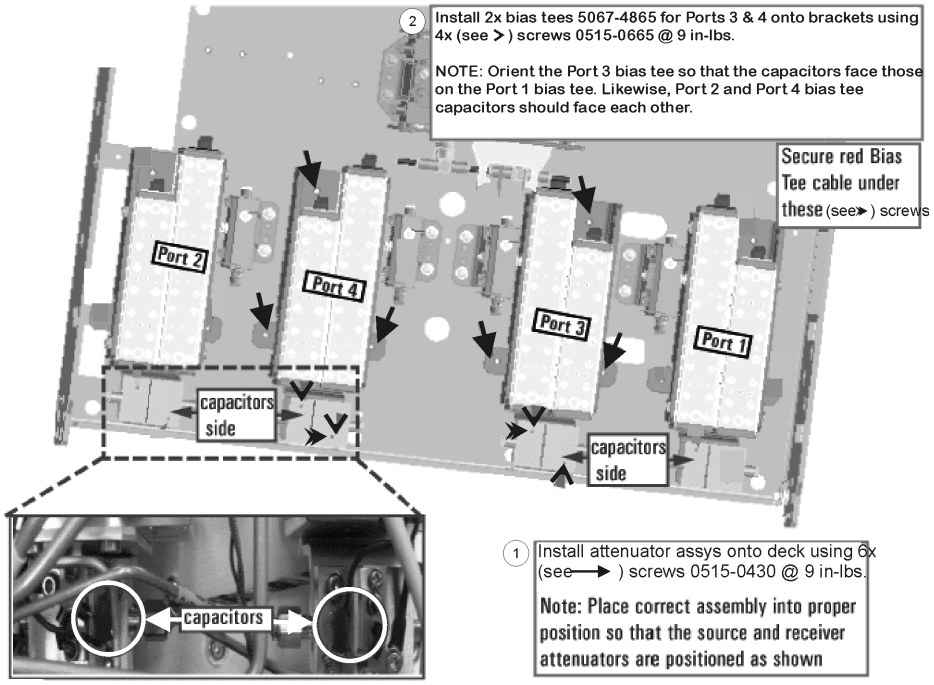
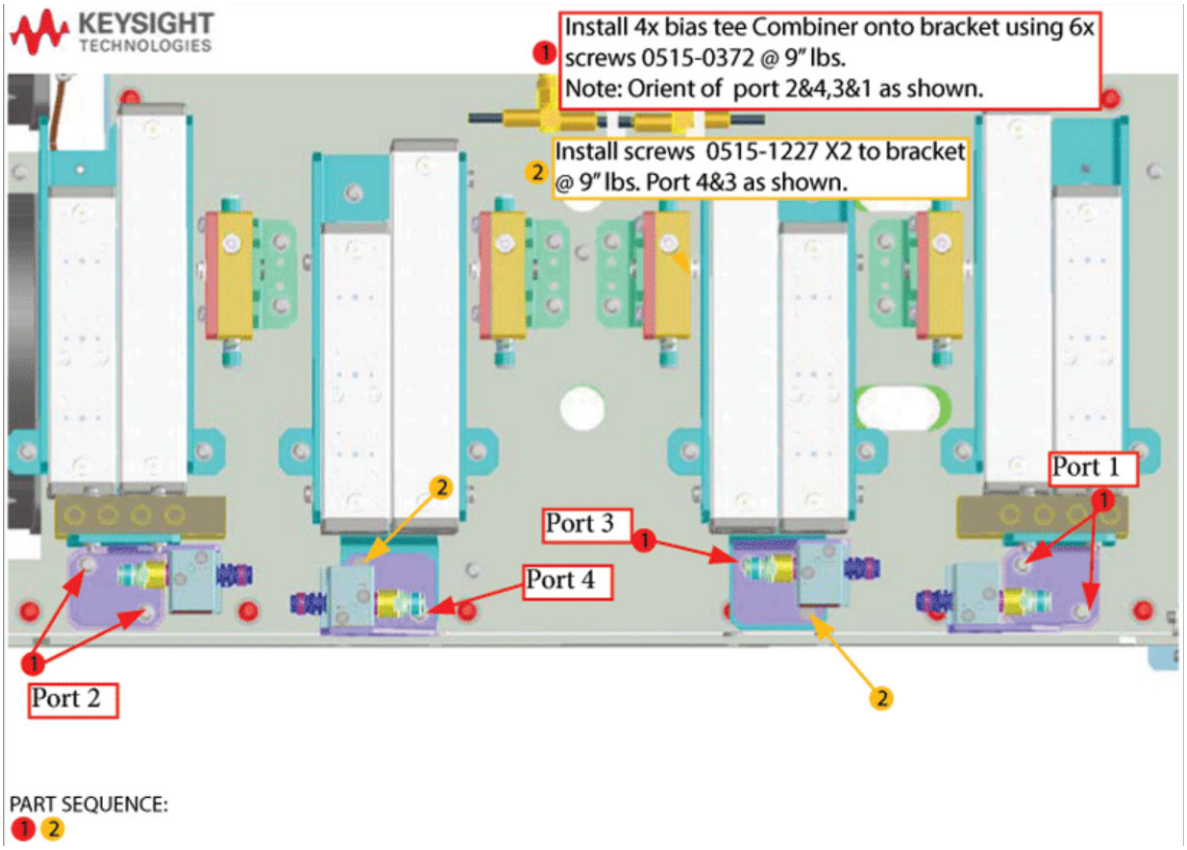


Figure 9 A23 and A24 Mixer Brick Assembly (Option 425 Only) – (0515-0372, 0515-1227fS)

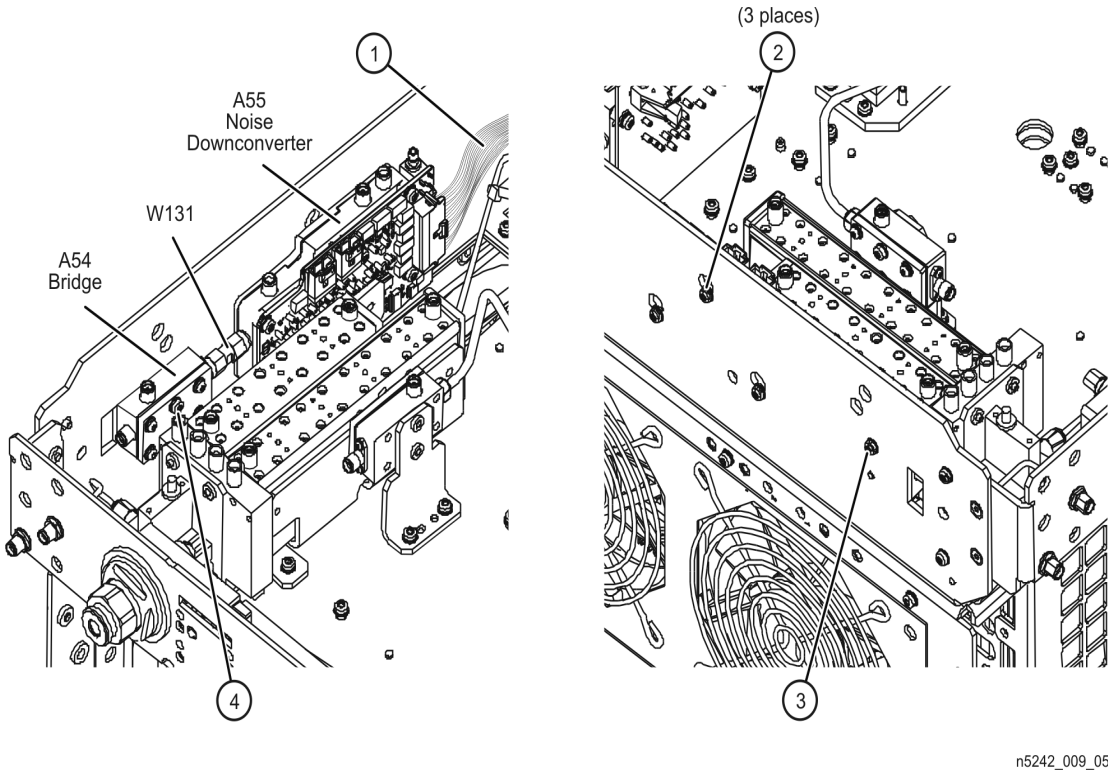


Step 9. Assemble and Install the A54 Bridge and A55 Noise Down converter

Refer to Figure 10 for this step of the procedure. New parts are listed in Table 2 on page 12.

1. Connect the A54 bridge to the A55 noise downconverter, using cable adapter W131, as shown. Place these assemblies on a flat surface and torque each W131 connector to 10 in-lbs while holding the A54 and A55 assemblies flat.
2. Connect the ribbon cable (item ①) to the A55 noise downconverter connector as shown.
3. Place the combined A54/W131/A55 assembly into the analyzer as shown.
4. Secure the A55 noise downconverter to the side frame using three screws (item ②), as shown.
5. Secure the A54 bridge to the side frame using one screw (item ③) and one hex nut with lock washer (item ④), as shown. Install the screw from the outside of the side frame, through the top hole in the A54 bridge, and place the nut/washer on the inside. Hold the hex nut with a wrench while tightening the screw.

Figure 10 A54 Bridge and A55 Noise Down Converter Installation



Instruments with Serial prefixes <5200 Only

NOTE

This section assumes you have an instrument with a serial prefix <5200 and have contacted Keysight to swap your N5245-60124 noise figure board for a N5245-60125 kit. Refer to "Contacting Keysight" on page 6.

If your instrument serial is >5200 skip to next step.

Step 10. Modify the N5245-60124 Noise Figure Board (With Tabs) Per Instructions in the Upgrade Kit N5245-60125 (Serial prefixes <5200 Only)

NOTE

If your PNA serial prefix is >5200, skip to the next step.

Follow the instructions in your N5245-60125 kit to modify your N5245-60124 to a no tabs noise board. Refer to https://www.keysight.com/us/en/assets/9922-03843/installation-guides/Revision-Note-N5241-2-4-5-7-9-A-B-Noise-Figure-Board-Revision-Kit.pdf (N5245-90125).

All Instruments

Step 11. Reinstall the Cables

Reinstall the cables that were removed to facilitate removal of the old attenuator brackets by referring to "Step 5. Remove the Existing Test Set Cables" on page 18. Reverse the order of the removal of the cables to reinstall them.

Step 12. Install the New Test Set Cables

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

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

CAUTION Use a 5/16-in torque wrench set to 10 in-lbs on all cable connections except the front and rear panel bulkhead connectors. On these, use a 9 mm nutsetter or open end torque wrench set to 21 in-lb.

Refer to Figure 11 and Figure 12 for this step of the procedure. Although only Option 419 is shown in the illustrations, Option 417, 422, 423, and 425 are similar in appearance. New parts are listed in Table 2 on page 12.

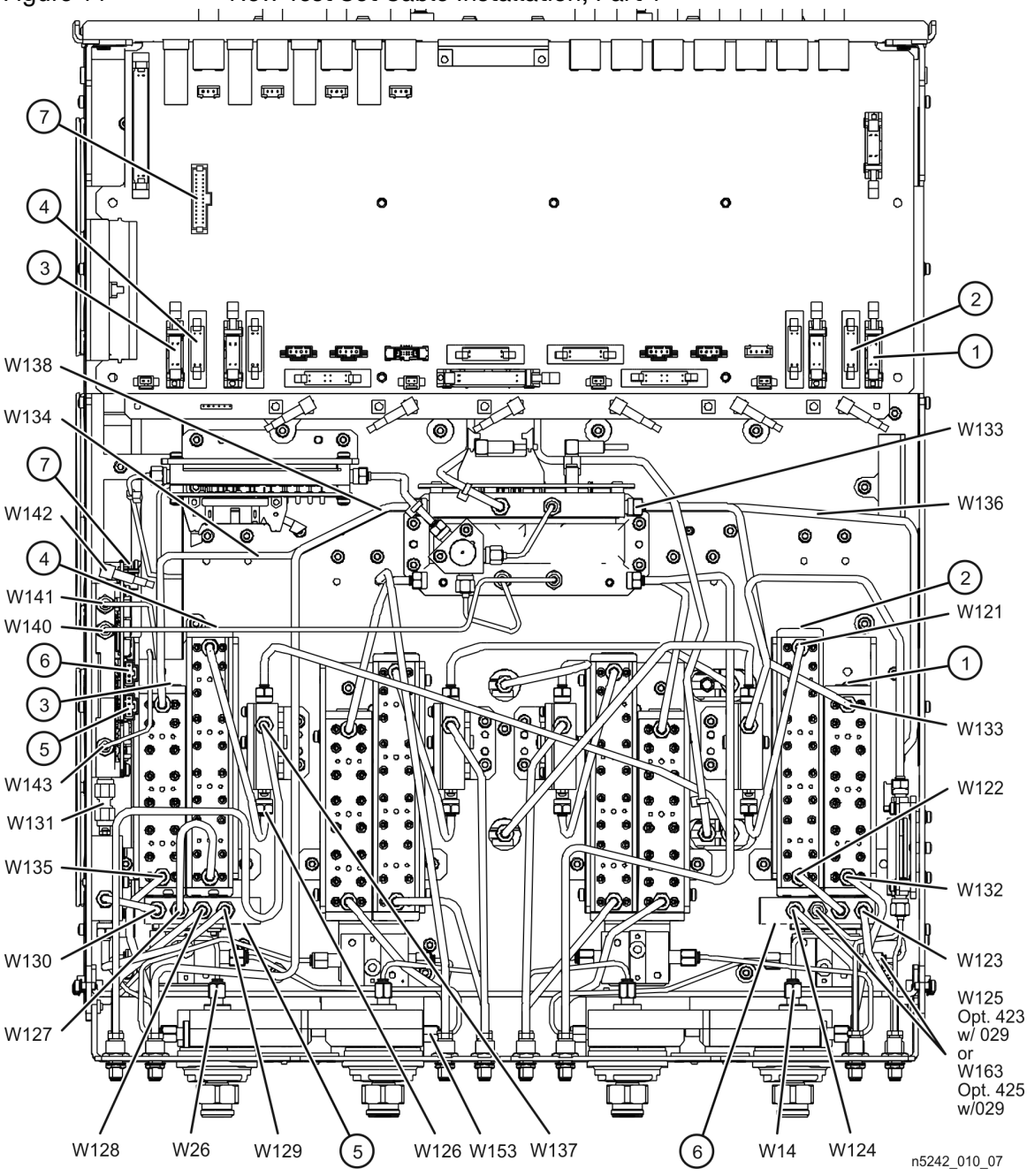
1. Connect the following wire harness and ribbon cables:
   - ①–A42 port 1 receiver attenuator to A19 test set motherboard J205
   - ②–A34 port 1 source attenuator to A19 test set motherboard J201
   - ③–A45 port 2 receiver attenuator to A19 test set motherboard J208
   - ④–A37 port 2 source attenuator to A19 test set motherboard J204
   - ⑤–A53 port 2 bridge to A55 noise downconverter J11
   - ⑥–A52 port 1 bridge to A55 noise downconverter J10
   - ⑦–A55 noise down converter J1 to A19 test set motherboard J550
2. Install the following semirigid cables in the order listed. Use a 5/16-in torque wrench set to 10 in-lbs to tighten all cable connectors.
   - W135 (N5242-20278) Front-panel Port 2 RCVR B IN to A45 port 2 receiver attenuator
   - W128 (N5242-20303) A53 port 2 bypass switch to front-panel Port 2 SOURCE OUT

- W127 (N5242-20292) A37 port 2 source attenuator to A53 port 2 bypass switch
- W130 (N5242-20302) A53 port 2 bypass switch to A54 port 2 bridge
- W129 (N5242-20293) A53 port 2 bypass switch to A54 port 2 bridge
- W132 (N5242-20277) Front-panel Port 1 RCVR A IN to A42 port 1 receiver attenuator
- W153 (N5242-20310) Front-panel front-panel port 2 CPLR THRU to A32 port 2 coupler (Option 422 with 029 Only)
- W124 (N5242-20295) Front-panel Port 1 CPLR THRU to A52 port 1 bypass switch
- W123 (N5242-20297) A52 port 1 bypass switch to front-panel Port 1 SOURCE OUT
- W122 (N5242-20298) A34 port 1 source attenuator to A52 port 1 bypass switch
- W126 (N5242-20272) A28 port 2 bridge to A37 port 2 source attenuator
- W137 (N5242-20279) A28 port 2 bridge to front-panel REF 2 SOURCE OUT
- W121 (N5242-20273) A25 port 1 bridge to A34 port 1 source attenuator
- W136 (N5242-20274) A33 reference mixer switch to A23 mixer brick (R1)
- W133 (N5242-20275) A42 port 1 receiver attenuator to A23 mixer brick (A)
- W134 (N5242-20276) A45 port 2 receiver attenuator to A23 mixer brick (B)
- W138 (N5242-20280) Front-panel REF 2 RCVR R2 IN to A23 mixer brick (R2)
- W140 (N5242-20294) A24 mixer brick to A55 noise down converter

3. Position the analyzer as shown in Figure 12 on page 35 (fans facing upwards) and loosely install the following cables. Route each of the cables through the opening in the test set deck to the top side of the analyzer. The other ends will be connected in the next step.
   - W143 (N5242-20323) Semirigid cable, A55 noise down converter to A7 noise receiver board RF
   - W141 (N5242-20322) Semirigid cable, A55 noise down converter to A7 noise receiver board LO

– W142 (N5242-60041) Flexible cable, A55 noise down converter J4 to A7 noise receiver board P2

Figure 11 New Test Set Cable Installation, Part 1[1]

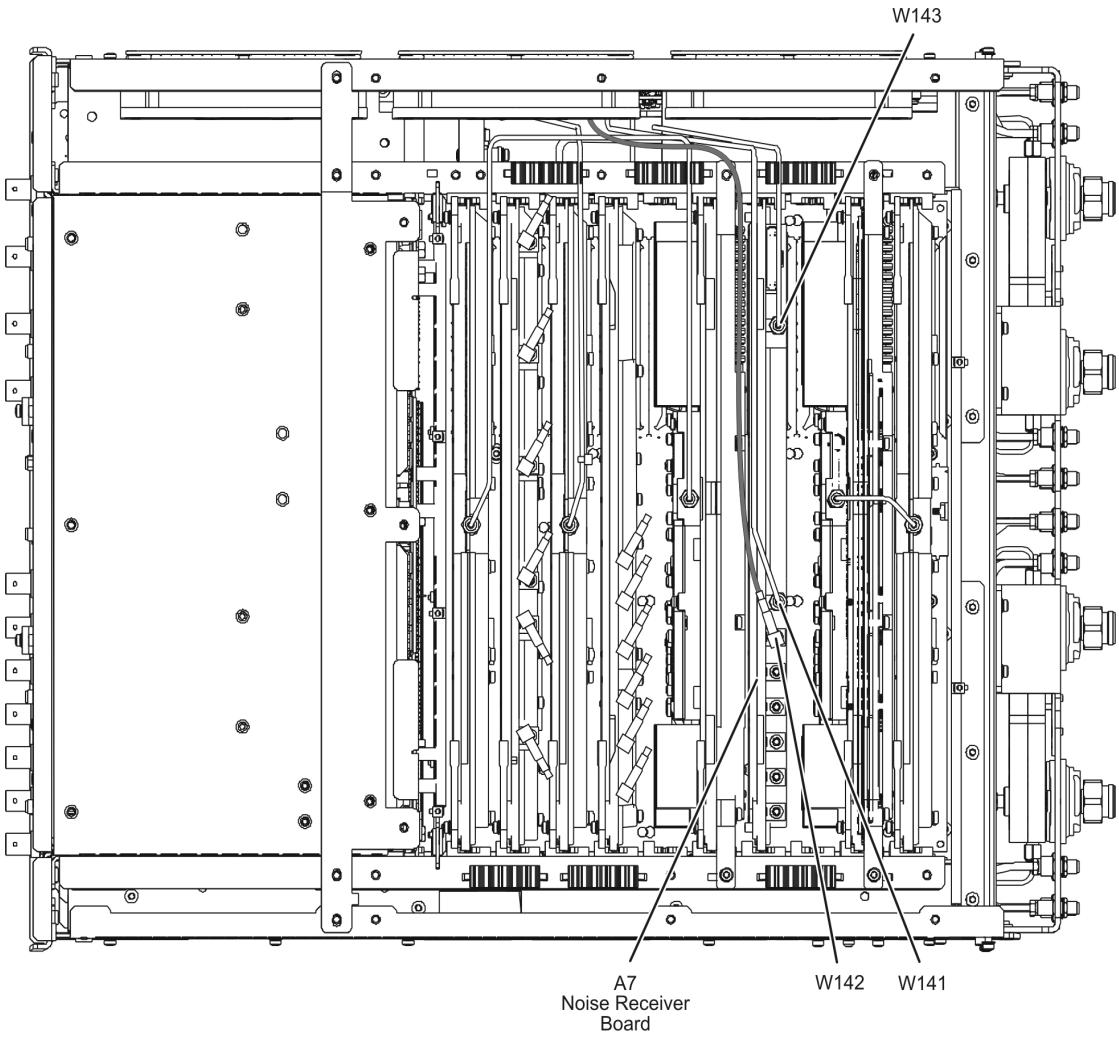


1. The A22 splitter (5087-7139) and N5222-20007, N5222-20008, and N5222-20009 cables are only used with a legacy HMA26.5 p/n: 5087-7765. If your PNA has a new N5240-60101 assembly installed, then set aside these parts as spares for use in other PNAs with the older HMA26.5 or discard. If you are unclear which HMA26.5 assembly your PNA has installed, refer to Figure 1 on page 9.

Refer to Figure 12 for this part of this step of the procedure. Although only Option 419 is shown in the illustration, Option 417, 422, 423, and 425 are similar in appearance. New parts are listed in Table 2 on page 12.

4. The analyzer should be positioned on its left side (fans facing upwards) as shown.
5. Connect semirigid cables W141 and W143 as indicated. Torque connectors to 10 in-lbs.
6. Connect flexible cable W142 as indicated.
7. Go back and torque the connectors on the other ends of W141 and W143 to 10 in-lbs.

Figure 12 New Test Set Cable Installation, Part 2

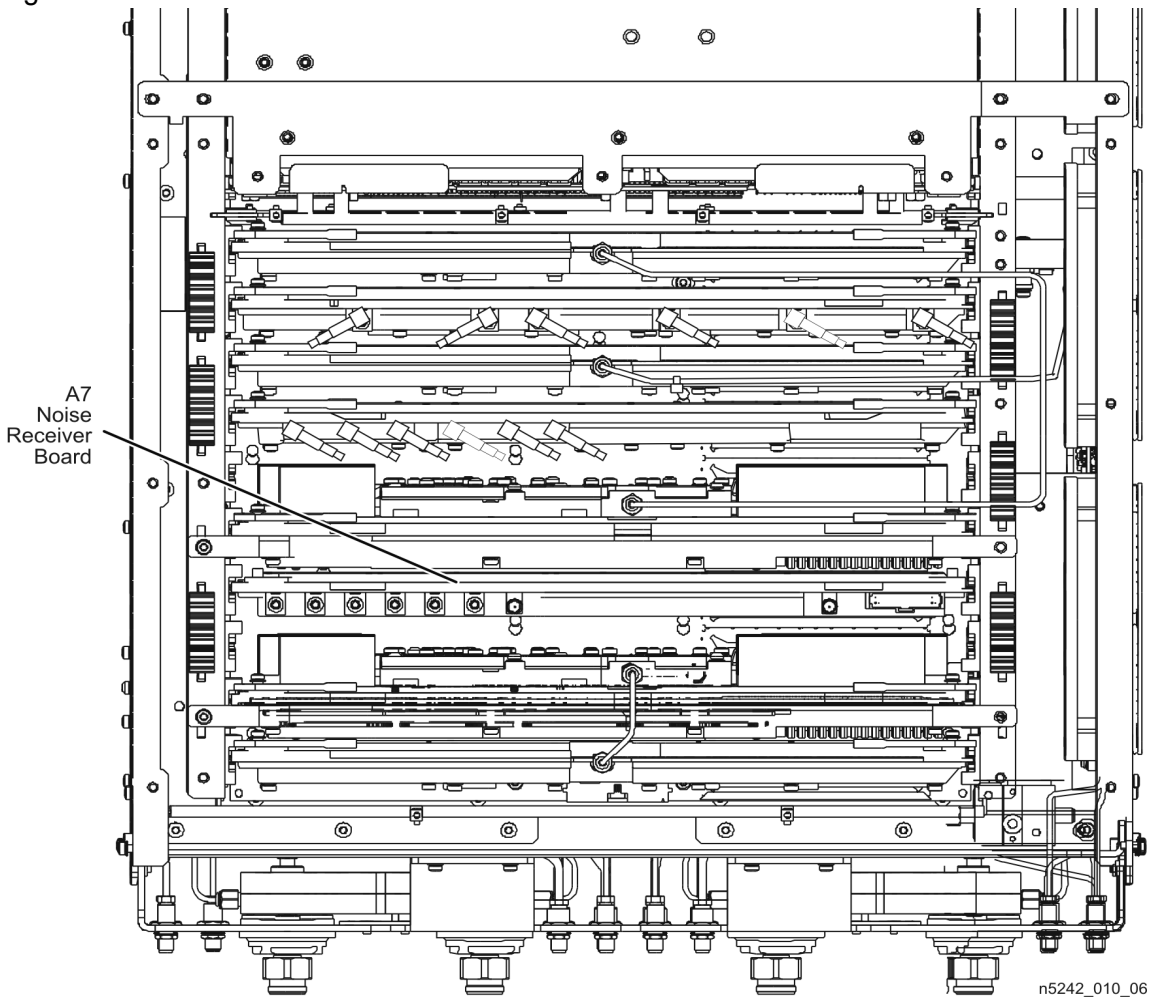


Step 13. Install the A7 Noise Receiver Board

Refer to Figure 13 for this part of this step of the procedure. Although only Option 419 is shown in the illustration, Option 417, 422, 423, and 425 are similar in appearance. New parts are listed in Table 2 on page 12.

1. Place the analyzer top-side up on a flat surface.
2. Insert the A7 noise receiver board in the analyzer as shown. Make sure it is fully seated in the motherboard connector.

Figure 13 Noise Receiver Board Installation

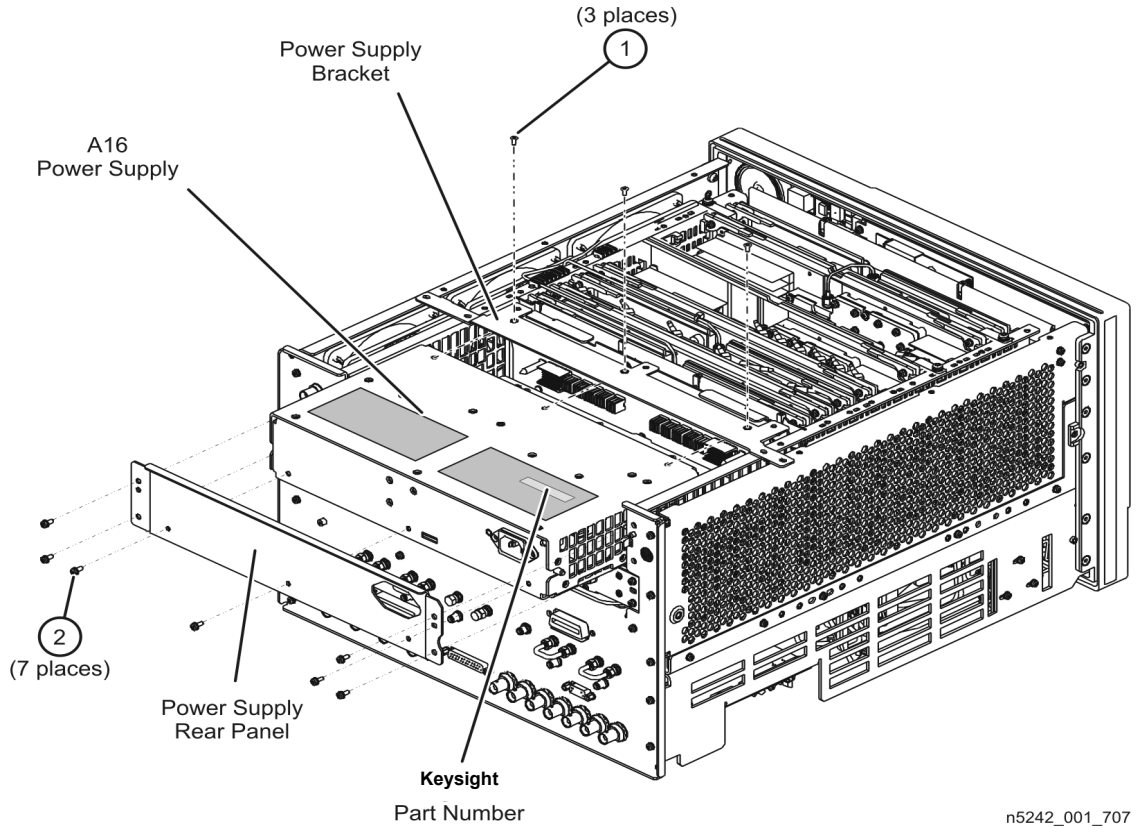


Step 14. Replace the A16 Power Supply (If Necessary)

Refer to Figure 14 for this step of the procedure. The analyzer model shown in the illustration is for reference only and may not be the same as your analyzer. New parts are listed in Table 2 on page 12.

1. Check the part number of the power supply currently installed in your analyzer. If the correct power supply is installed, you need not replace it.
   a. The part number should be as shown in Table 2 on page 12.
   b. If the part number IS as shown, proceed to "Step 15. Replace the lower front panel overlay".
   c. If the part number IS NOT as show, continue with this step.
2. Remove the three flat head screws (item ①) from the power supply bracket.
3. Remove the seven pan head screws (item ②) from the power supply rear panel.
4. Slide the A16 power supply assembly out the rear of the analyzer.
5. Slide the new A16 power supply assembly into position in the analyzer.
6. Reinstall the seven pan head screws (item ②) in the power supply rear panel.
7. Reinstall the three flat head screws (item ①) in the power supply bracket.

Figure 14 Power Supply Replacement



Step 15. Replace the lower front panel overlay

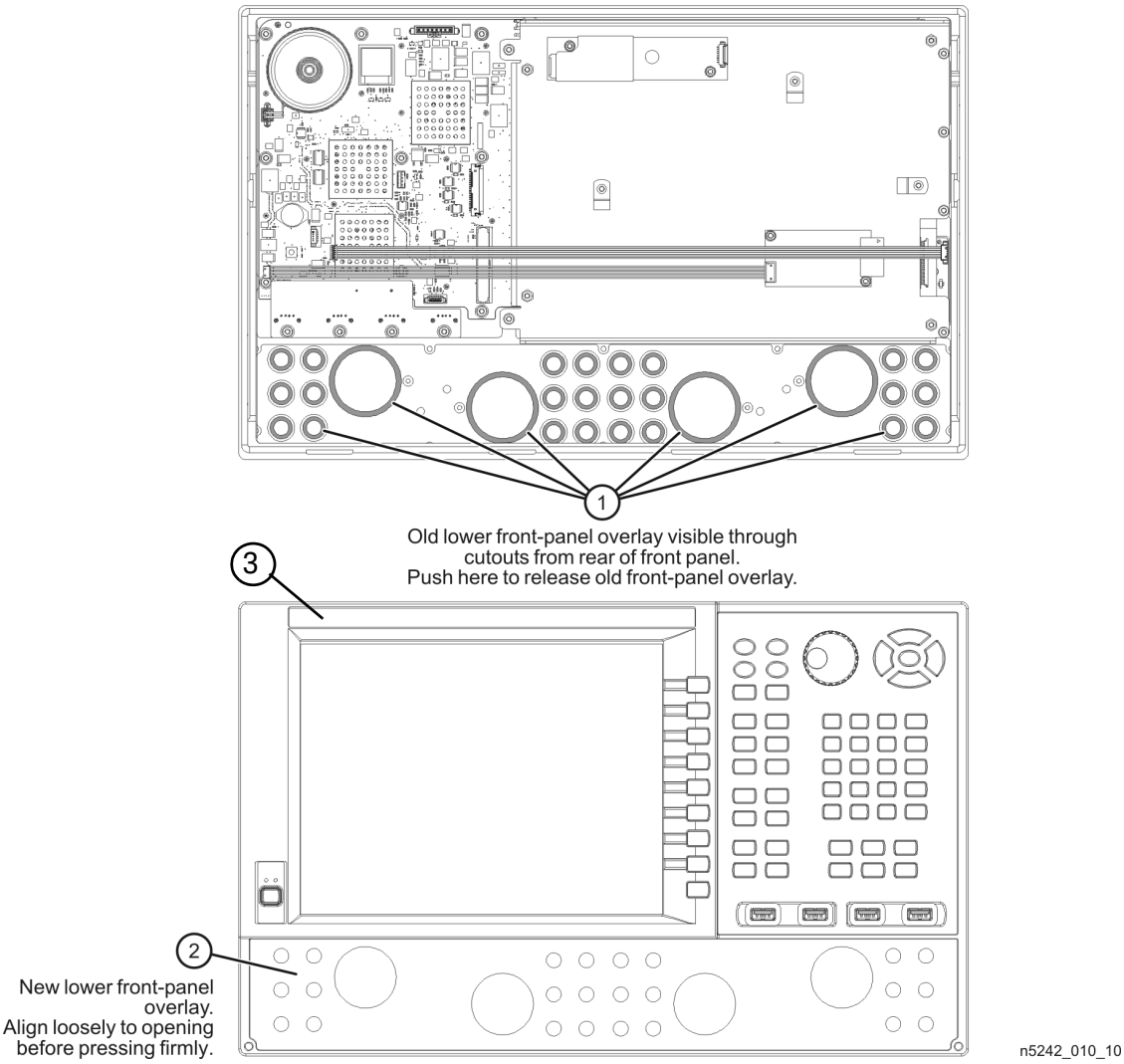
Refer to Figure 14 for this step of the procedure. New parts are listed in Table 2 on page 12.

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 the nameplate from the front panel (item ③).
4. Remove any adhesive remaining on the front panel.

NOTE

IMPORTANT! To avoid possible damage to the lower front panel overlay, do not attempt to attach the lower front panel label until "Step 17. Install the New Lower Front Panel Overlay" on page 41.

Figure 15 Lower Front Panel Overlay Replacement



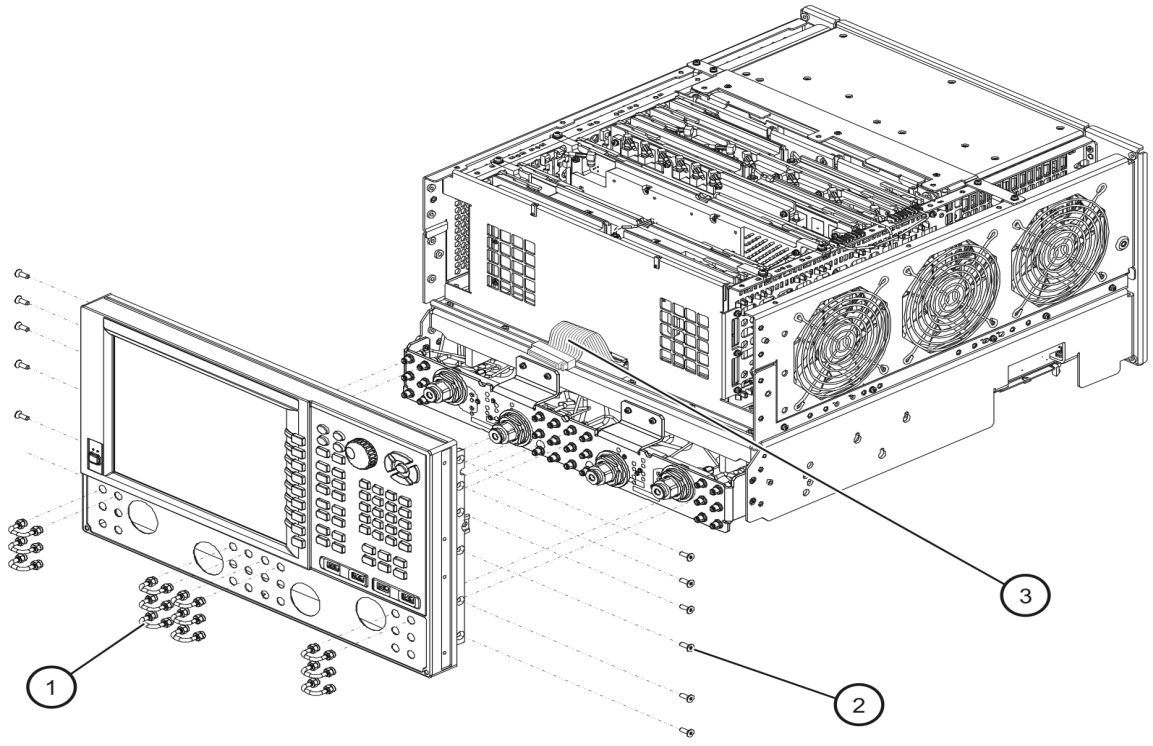
Step 16. Reinstall the Front Panel Assembly

CAUTION Before installing the front panel assembly onto the analyzer, lift and support the front of the analyzer chassis.

Refer to Figure 16 for this step of the procedure. New parts are listed in Table 2 on page 12.

1. Make sure all of the hex nuts on the front-panel cable connectors have been tightened using a 5/16-in torque wrench set to 21-in lbs.
2. Reconnect the ribbon cable (item ③) to the A1 front panel interface board.
3. Slide the front panel over the front-panel connectors.
4. With a T-10 TORX driver, reinstall the 12 screws (item ②) in the sides of the frame.

Figure 16 Front Panel Assembly Re-installation



Step 17. Install the New Lower Front Panel Overlay

Refer to Figure 15 on page 39 for this step of the procedure. Although a 4-port PNA is shown in the graphic, the concept is the same for the 2-port PNA. New parts are listed in Table 2 on page 12.

1. Remove the protective backing from the new front panel overlay, — (item ②). Refer to new parts are listed in Table 2 on page 12

NOTE

There is more than one front panel overlay included in the upgrade kit; make sure you choose the correct one for your analyzer's model/option combination. Refer to Table 2 on page 12.

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 18. 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.

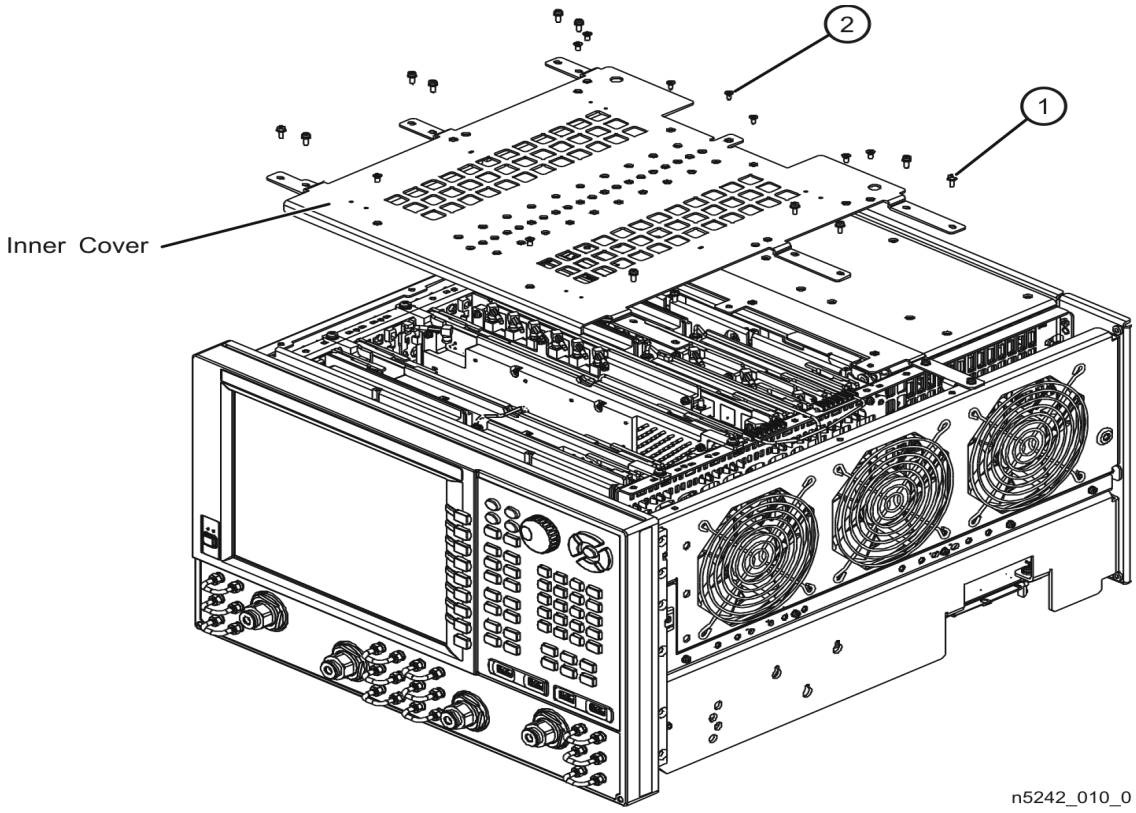
On the bottom side of the PNA, carefully fold or push down the ribbon cables and wires so they can't be pinched between the hardware and the outer cover. Ribbon cables and wires must never be positioned on top of hardware.

Step 19. Reinstall the Inner Cover

Refer to Figure 17 for this step of the procedure.

1. Position the inner cover on the analyzer.
2. With a T-10 TORX driver, install the 12 pan head screws (item ①).
3. With a T-10 TORX driver, install the 9 flat head screws (item ②).

Figure 17 Inner Cover Re-installation



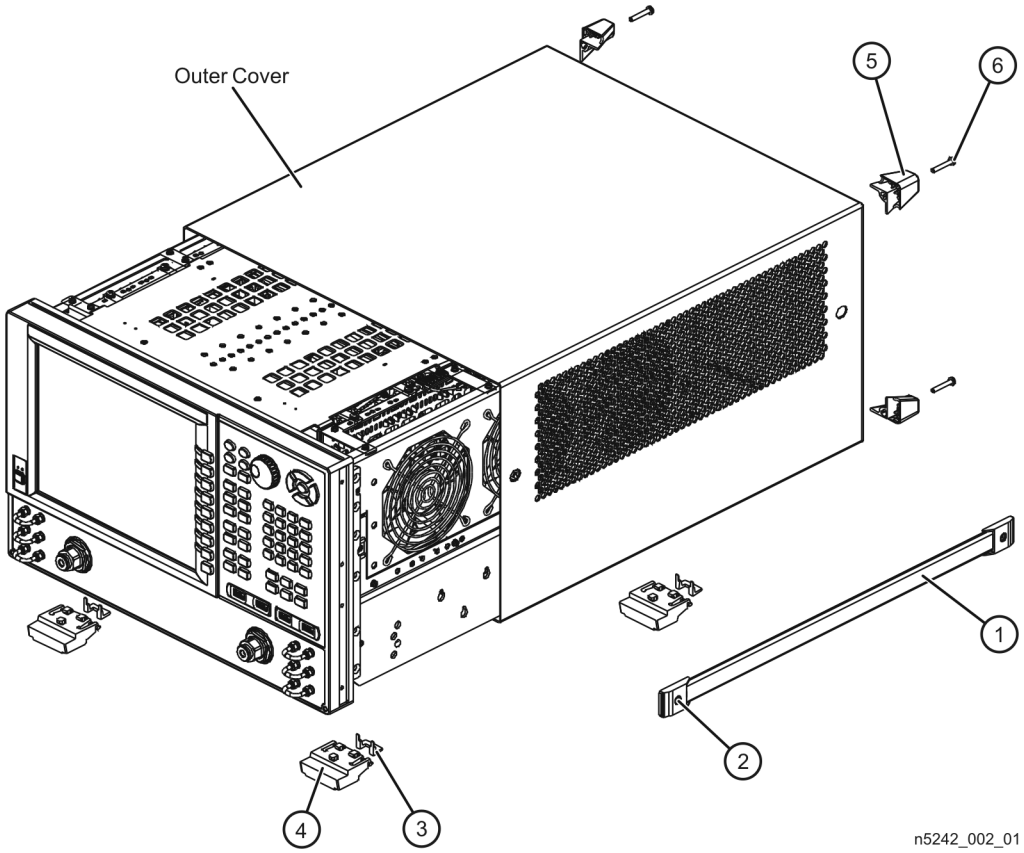
Step 20. Reinstall the Outer Cover

CAUTION This procedure is best performed with the analyzer resting on its front handles in the vertical position. Do not place the analyzer on its front panel without the handles. This will damage the front panel assemblies.

Refer to Figure 18 for this step of the procedure.

1. Slide the outer cover over the analyzer frame.
2. Install the four rear panel feet (item ⑤) by installing the center screws (item ⑥) with a T-20 TORX driver.
3. Install the four bottom feet (item ④) onto the bottom of the outer cover then install the foot locks (item ③).
4. Install the strap handles (item ①) by tightening the screws (item ②) on both ends of each strap handle with a T-20 TORX driver.
5. Install the front panel jumpers (item ①). Refer to Figure 16 on page 40.

Figure 18 Outer Cover Re-installation



Step 21. Remove Option 028 License

NOTE If Option 28 is not loaded on your PNA, proceed to "Step 22. Enable Option 029" on page 44.

Procedure Requirements

- The analyzer must be powered up and operating to perform this procedure.
- The Network Analyzer program must **not** be running.
- A keyboard and mouse must be connected to the network analyzer.

Option 028 License Removal Procedure

1. To start the Keysight License Manager, press **Start** > **Keysight License Manager** > **Keysight License Manager**. A Keysight License Manager dialog box will appear.
2. Right click the on the desired option and click **Delete**.
3. In the Keysight License Manager dialog box that appears, press or click **Yes** to confirm delete.
4. A message displays stating that the option removal was successful.

Step 22. Enable Option 029

Procedure Requirements

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

- The analyzer must be powered up and operating to perform this procedure.
- The Network Analyzer program must **not** be running.
- Refer to the license message you received from Keysight: Verify that the analyzer's model and serial numbers match those on the license message you received from Keysight.
- A keyboard must be connected to the network analyzer.

Option Enable Procedure

NOTE

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

A single license file may contain more than one feature.

1. Locate the email(s) from Keysight which contain license file attachments. These emails are the result of "Step 1. Obtain a Keyword and Verify the Information" on page 16.
2. Copy the license file(s) from the email(s) to a USB flash drive. More than one license file may be copied to the USB flash drive.

NOTE

A single license file may contain more than one feature.

3. Insert the USB flash drive into the PNA's USB drive slot. Within 5 seconds, the PNA should display a small "New license installed" message.

   Else, load the license key file(s), manually mover your license file(s) to `C:\Program Files\Agilent\licensing`. It may take Keysight Manager an extra ~5 seconds to enable the licenses.

NOTE

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

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

Step 23. Verify the PNA Analyzer Program is Running with the Correct Options

Once the Network Analyzer program is running:

1. Start the Network Analyzer program.
2. Once the Network Analyzer is running:
   - Press **Help** > **About NA** and verify that Option **029** is listed in the PNA application.

NOTE

If if the option(s) have not been enabled or if your older options have not been removed, contact Keysight Technologies. Refer to "Getting Assistance from Keysight" on page 6.

3. After successful installation of all upgrades, some features require some adjustments to ensure the instrument meets its specified performance. Refer to the Adjustments (i.e., Diagnostic Tools, Utilities, and Adjustments) topic in the PNA Online Help: https://rfmw.em.keysight.com/wireless/helpfiles/N52xxB/help.htm.

Step 24. Perform Post-Upgrade Adjustments and Calibration

Adjustments

NOTE

IMPORTANT!

The 10 MHz reference crystal oscillator is the most accurate after running for three hours. The 10 MHz Frequency Reference Adjustment can be run after the PNA has warmed up for 90 minutes, and the other adjustments can be completed in the order presented, but then the 10 MHz Frequency Reference Adjustment should be repeated after the PNA has been able to warm up for three hours.

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

- 10 MHz frequency reference adjustment
- Default EE adjustment - select the Synth LO (Version 6 synthesizers), LO Drive-NF adjustment and either adjust or initialize the values or All Synthesizers (Version 7 synthesizers)
- Source Adjustment
- IF Gain Adjustment
- Receiver Characterization
- Receiver Adjustment

- LFE Receiver Adj
- IF Response Adjustment (Option S93090xA/B, S93093A/B, or S93094A/B Only)
- Noise Figure Adjustment (Option 029 with S93029A/B Only)

These adjustments are described in the PNA Service Guide and in the PNA on-line HELP. A list of equipment required to perform these adjustments is also found in the service guide.

To view this service guide information, click the Chapter 3 bookmark “Tests and Adjustments” in the PDF Service Guide[1].

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

EEPROM Backup

The analyzer uses arrays of correction constants to enable the analyzer to produce accurate, leveled source signals and receive clean test signals. These constants are stored in non-volatile EEPROM memory and in flash memory files.

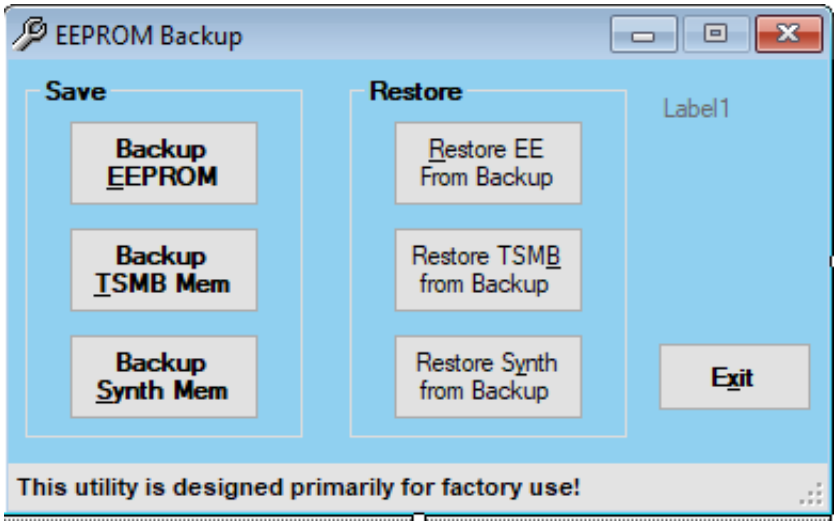
The adjustments listed here generate new correction constants. The analyzer must have a backup of this new data in case any of the data becomes corrupted.

To store the backup data, perform these steps:

- Navigate to the EEPROM Backup Utility, located at:
  - Windows 7 -- `C:\Program Files (x86)\Keysight\Network Analyzer\Service\eebackup.exe`
  - Windows 10 -- `C:\Program Files\Keysight\Network Analyzer\Service\eebackup.exe`
- Run the program.
- Click Backup EEPROM.
- Click Backup TSMB Mme.
- Click Backup Synth Mem. (Applies to Version 7 Synthesizers Only)
- Click Exit when the program has finished.

1. See “Downloading the Online PNA Service Guide” on page 10.

Figure 19 EEPROM Backup Menu



Operator's Check

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

If you experience difficulty with the basic functioning of the analyzer, contact Keysight. Refer to "Contacting Keysight" on page 6.

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 25. 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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