
Keysight - N5244/5A&B Noise Figure Measurement Capability Upgrade Kit For Version 6 and Version 7 Synthesizers - Installation Guide

To Upgrade PNA-X N5244/5A Option 224
or
N5244/5B Option 222/224
to include Option 029

Upgrade Kit Order Numbers:
N5244AU-924, N5245AU-924,
N5244BU-229, and N5245BU-229

Keysight Kit Number: N5245-60118

This is the Installation Guide for the N5244/5A&B Series Microwave Network Analyzers.

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CAUTION

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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

CAUTION

N5244/45A and N5244/5B PNAs with serial number prefixes <5201 cannot upgrade to Option 029. N5244/5A and N5244/5B PNAs with serial number prefixes >5200, have hardware that supports Option 029.

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! For N5244/5B models, Option 029 requires Noise Figure Measurements Option S93029A/B. Option S93029A/B is not included with this kit. If you need to order Option S93029A/B, contact Keysight. Refer to [“Contacting Keysight” on page 6](#).

NOTE

This kit may contain either a N5245-60124 noise figure boards (with tabs, for models with s/n prefix of 5201 or greater) or for models with a s/n prefix 5200 or lower a N5245-60124 board (without tabs). Refer to [Table 2 on page 12](#).

NOTE

This kit may contains references to bias tees. Bias tees only apply to Option 224.

This upgrade adds noise figure measurement capability to your Option 222 or Option 224 2-port analyzer by adding Option 029 which includes:

- a noise down converter and noise receiver
- a splitter to provide a signal to the noise down converter/receiver
- a bypass switch to each source port channel

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

Installing this upgrade kit requires special skills and experience. If you think you may not be qualified to do the work, or need advice, contact Keysight.

Contacting Keysight

Assistance with test and measurements needs and information on finding a local Keysight office are available on the Web at:

<http://www.keysight.com/find/assist>

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

NOTE

In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine whether your product is still within its warranty period.

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 A25 HMA26.5 Multiplier/Amplifier and A27/A28 mixer brick assemblies. Your model instrument may have either legacy assemblies or the new parts installed.
 - Version 7 synthesizers only: To verify your instrument's A25 HMA26.5 Multiplier/Amplifier, refer to [“Verify the Model/Version of HMA26.5 Installed” on page 9](#).
 - The A27/A28 mixer bricks might be a legacy part number 5087-7323 (with (x2) discrete 3dB attenuators, 08490-60010) or new part number 5087-7417 (with integrated 3 dB attenuators).
 - See also your instrument's PDF Service Guide ^a.
-

a. See [“Downloading the Online PNA-X Service Guide” on page 9](#).

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-X 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 and full instrument calibration. To view the equipment list, click the Chapter 3 bookmark “Tests and Adjustments” in the PDF Service Guide¹.

1. See [“Downloading the Online PNA-X Service Guide” on page 9](#).

License Key Redemption

NOTE

The only difference between an A model license key redemption and a B model is that the A model uses a 12-character license key and the B model uses a license key file.

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:

– For A models: Refer to

<https://www.keysight.com/us/en/assets/9018-03565/installation-guides/9018-03565.pdf> (N5225-90110).

– For B models: 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

– **A models ONLY:** From the online Keysight HostID utility

Part of the OEC procedure to obtain the 12-digit license key online requires you to provide the HostID number of the PNA. This HostID number is NOT the one currently shown on the PNA. To determine your new HostID, Keysight personnel should use the new model number with the utility at go to

<http://mktwww.srs.is.keysight.com/field/service/network/pna/upgrades.html>. Non-Keysight personnel should contact Keysight at <http://www.keysight.com/key/contactus>.

– Host ID

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**.

Downloading the Online PNA–X 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., N5225B) and click **Search**.
3. Click **Support > Keysight Product Support**.
4. In the **Search Support** area type your instrument’s model number (e.g., N2225B).
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.

Verify the Model/Version of HMA26.5 Installed

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:

- A26 splitter 5067-4086
- W52 N5245-20013
- W53 N5245-20023
- W54 N5245-20022

Getting Prepared

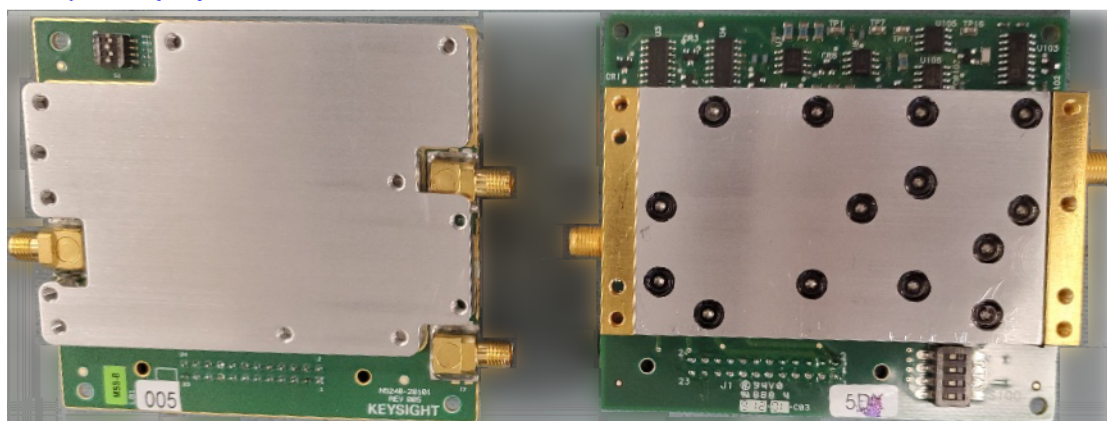
(If you have the legacy 5086-7765 HMA26.5, please discard the N5245-20195 semi-rigid cables. Refer to [Figure 1 on page 10.](#))

The new N5240-60101 HMA26.5 has the splitter integrated into the assembly. Refer to [Figure 1 on page 10.](#)

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

New HMA26.5 -- N5240-60101
Requires (x1) Cable.

Legacy HMA26.5 -- 5087-7765
Requires A26 Splitter and (x3) Cables.



Protecting Your Workspace from Electrostatic Discharge

For information, click on the Chapter 1 bookmark, “Electrostatic Discharge Protection” in the PDF Service Guide¹.

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-X Service Guide” on page 9.](#)

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
5/8-in (16 mm) nutsetter or open end torque wrench - set to 21 in-lbs (2.38 N.m)	1	N/A
9 mm nutsetter or open end torque wrench - set to 21 in-lbs (2.38 N.m)	1	N/A

CAUTION

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

About Installing the Upgrade

Products affected	N5244A/B and N5245A/B Options 222 or 224
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	5 hours
Estimated adjustment time	0.5 hours
Estimated full instrument calibration time	6.0 hours

Items Included in the Upgrade Kit

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

Table 2 Contents of Upgrade Kit N5245-60118

Ref Desig.	Description	Qty	Part Number
	Installation note (this document)	1	N5245-90118
	Software Entitlement Certificate	1	5964-5145
Assemblies			
A9	Noise receiver board	1	N5245-60124
	5201 and above:		
	5200 and below:		N/A
A23	Test set, motherboard PCA	1	N5245-60157
A26	Splitter	1	5067-4086
A56 & A57	Bypass switch, port 1 and port 2	2	N1811-60033
A59	Noise downconverter (receiver)	1	5087-7344
A64	Tuner	1	5087-7345
Hardware/Miscellaneous			
	Bracket, for A59 bridge and down converter, port 2 side	1	N5245-00032
	Bracket, for A56 port 1 noise bypass switch, port 1 side	2	N5245-00034
	Machine screw, M3.0 x 8, pan head (to attach noise converter assembly to chassis left side, x1, install bracket to chassis right side, x2)	3	0515-0372
	Machine screw, M4.0 x 10, pan head	2	0515-0380
	Machine screw, M3.0 x 25, pan head (to attach switch & tuner to bracket, x2)	5	0515-0667
	Machine screw, M2.5 x 20, pan head (to attach switch bracket to chassis x2)	5	0515-1992
	Machine screw, M3.0 x 14, pan head (to attach bracket to noise converter x3)	3	0515-2994
	Cable-Tie	1	1400-0249
	Dust cap for test port	2	1401-0214
	Lower front panel overlay, Option 224 with Option 029 – N5244/5A with Option 224	1	N5245-80022
	Lower front panel overlay, Option 224 with Option 029 – N5244/5B with Option 224	1	N5245-80029

Items Included in the Upgrade Kit

Table 2 **Contents of Upgrade Kit N5245-60118**

Ref Desig.	Description	Qty	Part Number
	Lower front panel overlay, Option 224 with Option 029 – N5244/5B with Option 222	1	N5245-80033
Cables			
W52	RF cable, A25 HMA26.5 to A26 splitter	1	N5245-20013
W53	RF cable, A26 splitter to A27 mixer brick	1	N5245-20023
W157	A33 port 1 coupler to A56 Port 1 noise bypass switch (Opt. 222 with 029 only)	1	N5245-20160
W158	A36 port 2 coupler to A57 Port 2 noise bypass switch (Opt. 222 with 029 only)	1	N5245-20161
W161	RF cable, A38 port 1 source attenuator to front panel port 1 SOURCE OUT	1	N5245-20151
W162	RF cable, Front panel port 1 CPLR THRU to A56 port 1 noise bypass switch	1	N5245-20153
W163	RF cable, A64 tuner to A56 port 1 noise bypass switch	1	N5245-20149
W164	RF cable, A64 tuner to A56 port 1 noise bypass switch	1	N5245-20148
W165	RF cable, A42 port 1 bias tee to A56 port 1 noise bypass switch (Opt. 224 with 029 only)	1	N5245-20152
W166	RF cable, A57 port 2 noise bypass switch to port 2 CPLR THRU	1	N5245-20080
W167	RF cable, A57 port 2 noise bypass switch to A45 port 2 bias tee (Opt. 224 with 029 only)	1	N5245-20105
W168	RF cable, A59 noise downconverter to A57 port 2 noise bypass switch	1	N5245-20146
W169	RF cable, A59 noise downconverter to A57 port 2 noise bypass switch	1	N5245-20147
W170	RF cable, A26 splitter to A59 noise downconverter	1	N5245-20150
W171	RF cable, A59 noise downconverter to A9 noise board	1	N5245-20144
W173	Ribbon cable, A59 noise downconverter to A9 noise board	1	N5245-20145
W172	Coaxial cable, A59 noise downconverter assembly J3 to A9 noise board J1	1	N5245-60020
W175	Coaxial cable, A9 noise board J5 to A59 noise downconverter assembly J2	1	N5245-60019
	Ribbon cable, A59 noise downconverter J1 port 1 to A23 test set motherboard J550	1	N5245-60018
	Ribbon cable, A64 tuner J9 to A23 test set motherboard J7	1	N5245-60021

NOTE

Extra quantities of items such as protective plastic caps, screws, cable ties, and cable clamps may be included in this upgrade kit. It is normal for some of these items to remain unused after the upgrade is completed.

Installation Procedure for the Upgrade

The network analyzer must be in proper working condition prior to installing this option. Any necessary repairs must be made before proceeding with this installation.

WARNING

This installation requires the removal of the analyzer's protective outer covers. The analyzer must be powered down and disconnected from the mains supply before performing this procedure.

Overview of the Installation Procedure

- "Step 1. Obtain a Keyword and Verify the Information."
- "Step 2. Remove the Outer Cover."
- "Step 3. Remove the Inner Cover."
- "Step 4. Remove the Front Panel Assembly."
- "Step 5. Replace the A23 Test Set Motherboard."
- "Step 6. Remove Some Existing Test Set Cables."
- "Install the A23 Test Set Motherboard (N5245-60157)."
- "Step 7. Install the A26 Splitter."
- "Step 8. Assemble the A59 Noise Downconverter (Receiver) and Bracket and Install to the Chassis."
- "Step 9. Install the A59 Noise Downconverter (Receiver) and Bracket Onto the Chassis."
- "Step 10. Install the A57 Noise Switch (Port 2) to Bracket and Attach Cables to A59 Noise Downconverter (Receiver) Assembly."
- "Step 11. Install the A56 Noise Switch (Port 1), A64 Tuner to Bracket, and Bracket to the Chassis."
- "Step 12. Install the A9 Noise Receiver Board."
- "Step 13. Install the Test Set Cables."
- "Step 14. Remove the Old Lower Front Panel Overlay."
- "Step 15. Reinstall the Front Panel Assembly."
- "Step 16. Install the New Lower Front Panel Overlay and Front Panel Jumpers."
- "Step 17. Position the Cables and Wires to Prevent Pinching."
- "Step 18. Reinstall the Inner Cover."
- "Step 19. Reinstall the Outer Cover."
- "Step 20. Remove Option 028 License."

Step 1. Obtain a Keyword and Verify the Information

“Step 21. Enable Option 029.”

“Step 22. Perform Post-Upgrade Adjustments and Calibration.”

“Step 23. Prepare the PNA-X for the User.”

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.

Step 3. Remove the Inner Cover

For instructions, click the Chapter 7 bookmark “Removing the Covers” in the PDF Service Guide.

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 Guide¹.

Step 5. Replace the A23 Test Set Motherboard

NOTE

IMPORTANT! If you already have a N5245-60157 test set motherboard installed, skip this step.

NOTE

IMPORTANT! 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.

Remove the A23 Test Set Motherboard (N5245-60003)

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A23 Test Set Motherboard” in the PDF Service Guide¹.

Install the A23 Test Set Motherboard (N5245-60157)

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A23 Test Set Motherboard” in the PDF Service Guide¹.

1. See “[Downloading the Online PNA-X Service Guide](#)” on page 9.

Step 6. Remove Some 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.

CAUTION

There two separate major serial number prefix groups referred to in the Service Guide (i.e., "S/N Prefixes <6021" or "S/N Prefixes ≥6021"). Refer to the serial number prefix section that is applicable to your instrument.

NOTE

Optional: If it is necessary to remove any of the DC cables (N5290-60091) ferrite bead clamps. Re-install using new clamps as space allows.

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.**

To see an image showing the location of these cables, click the appropriate Chapter 6 bookmark for your serial number prefix (S/N Prefixes <6021) or (S/N Prefixes ≥6021): (Ex: "2-Port Configuration, Option 222/029") in the PDF Service Guide.

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 all analyzer serial numbers

- N5245-20077 A38 port 1 source attenuator to front-panel Port 1 SOURCE OUT
- N5245-20048 A25 HMA26.5 to A27 mixer brick

For Option 222 (no bias tee option) – all analyzer serial numbers

- N5245-20045 Front panel port 1 CPLR THRU to A33 port 1 coupler
- N5245-20106 A32 test port 2 reference coupler to W17

For Option 224 (with bias tee option) – all analyzer serial numbers

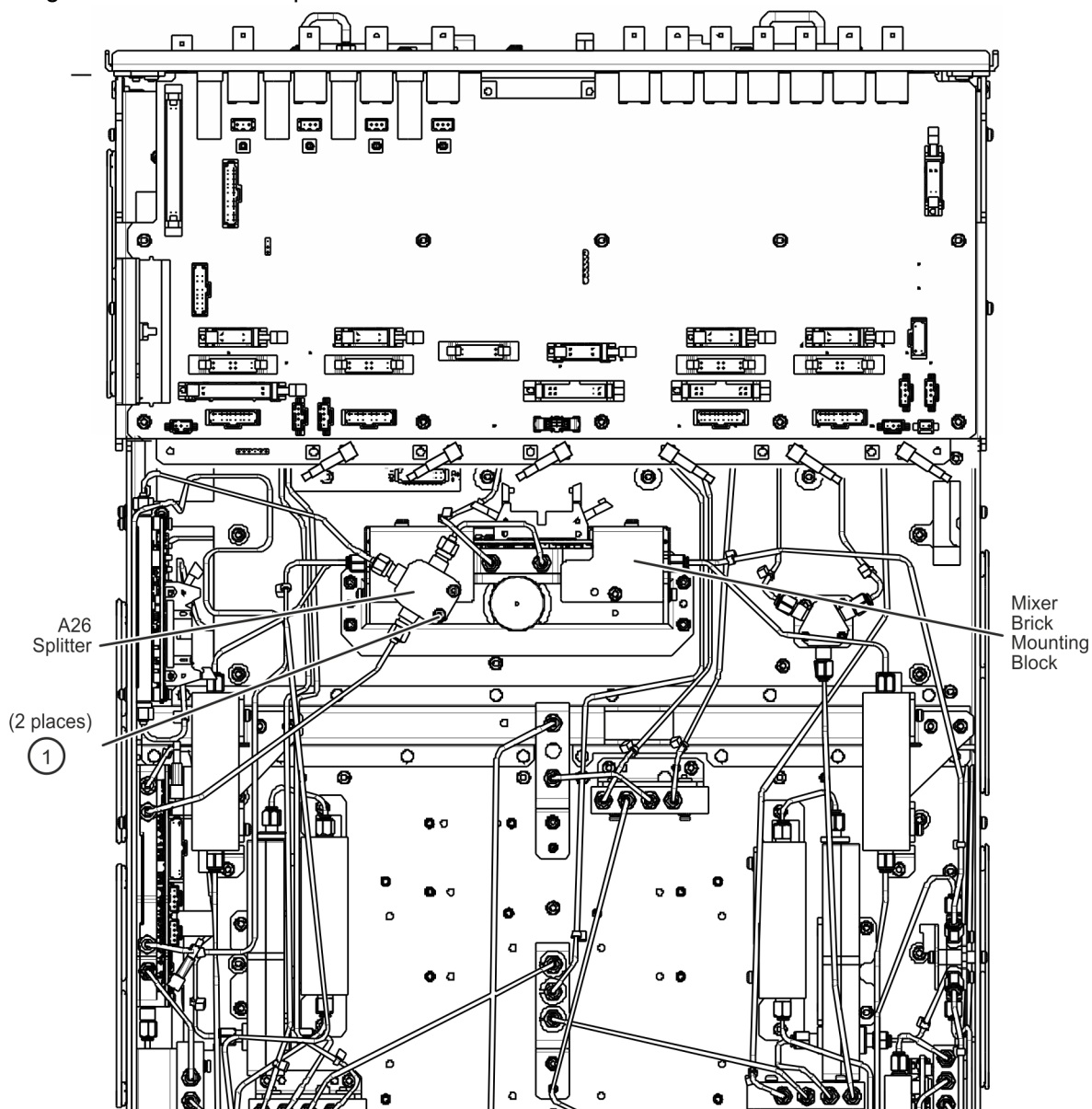
- N5245-20076 Front-panel Port 1 CPLR THRU to A42 port 1 bias tee

Step 7. Install the A26 Splitter

Refer to **Figure 3** for this step of the procedure. Although only Option 222 is shown in the illustration, Option 224 is similar in appearance. New parts are listed in **Table 2 on page 12**.

1. Position the A26 splitter on top of the mixer brick mounting block as shown.
2. Secure the A26 splitter with two screws (item ①) as indicated.

Figure 3 A26 Splitter Installation



Step 8. Assemble the A59 Noise Downconverter (Receiver) and Bracket and Install to the Chassis

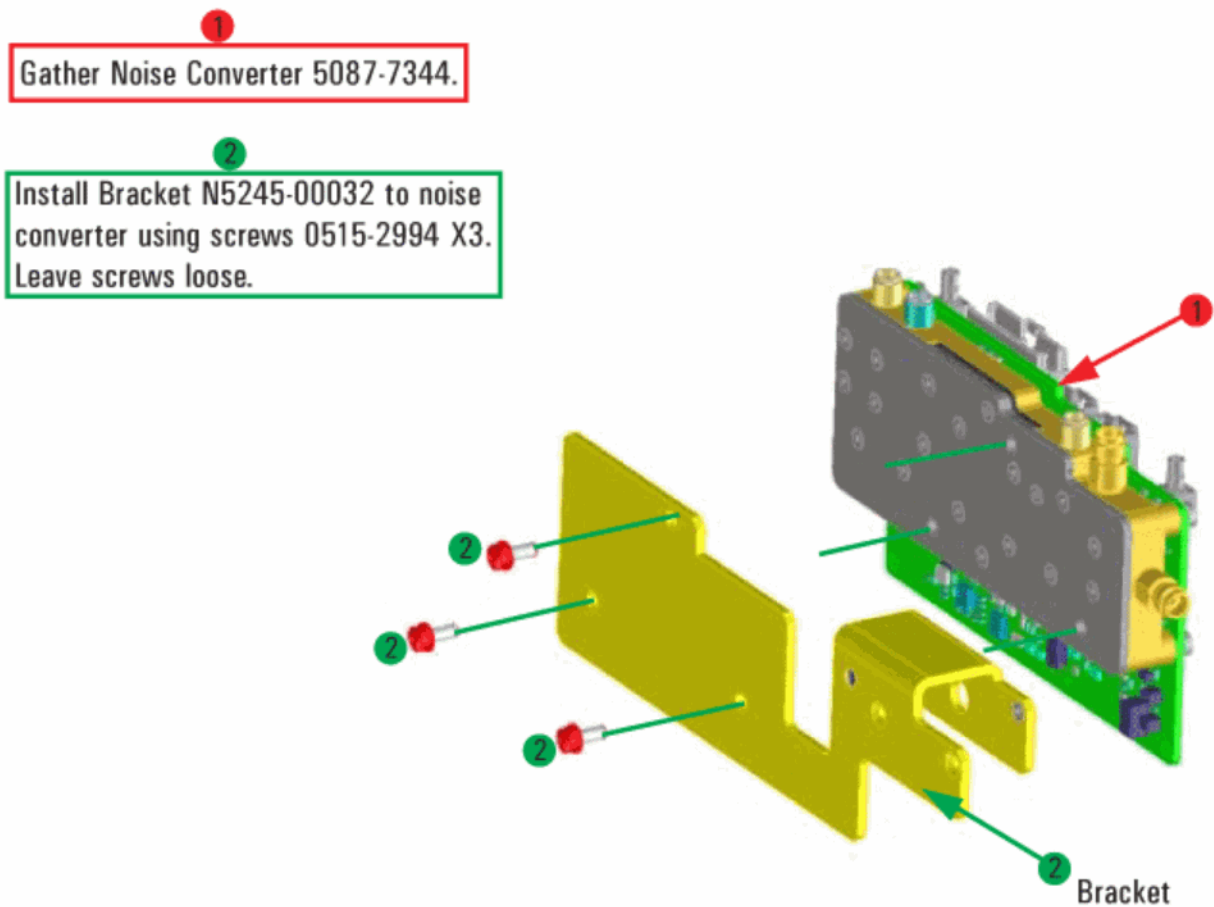
Step 8. Assemble the A59 Noise Downconverter (Receiver) and Bracket and Install to the Chassis

Refer to **Figure 4** for this step of the procedure. New parts are listed in Table 1 on page 7.

1. Position the new noise downconverter receiver (item ①) on a new bracket as shown (item ②).
2. Secure the noise downconverter receiver to its bracket using three screws (item ②) for each.

Figure 4

Noise Receiver and Bracket Assembly (5087-7344, N5245-00032, & 0515-2994)



PART SEQUENCE:



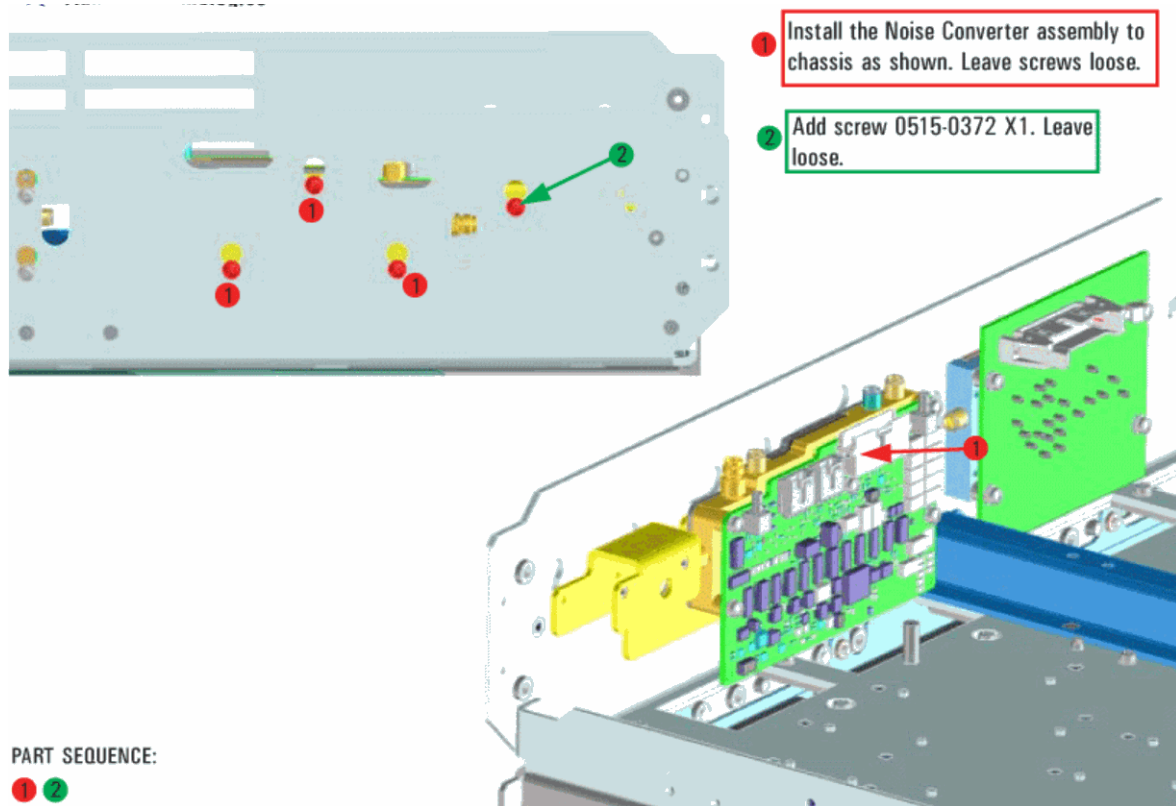
Step 9. Install the A59 Noise Downconverter (Receiver) and Bracket Onto the Chassis

Step 9. Install the A59 Noise Downconverter (Receiver) and Bracket Onto the Chassis

Refer to **Figure 5** for this step of the procedure. New parts are listed in **Table on page 12**.

1. Install the Noise Converter to chassis (item ①) using 3 existing screws, and add one screw (item ②) as shown in **Figure 5**. Leave screws loose. The screws will be torqued after the semi-rigid cables are installed.

Figure 5 Install Noise Receiver and Bracket Assembly onto Chassis (0515-0372)



Step 10. Install the A57 Noise Switch (Port 2) to Bracket and Attach Cables to A59 Noise Downconverter (Receiver) Assembly

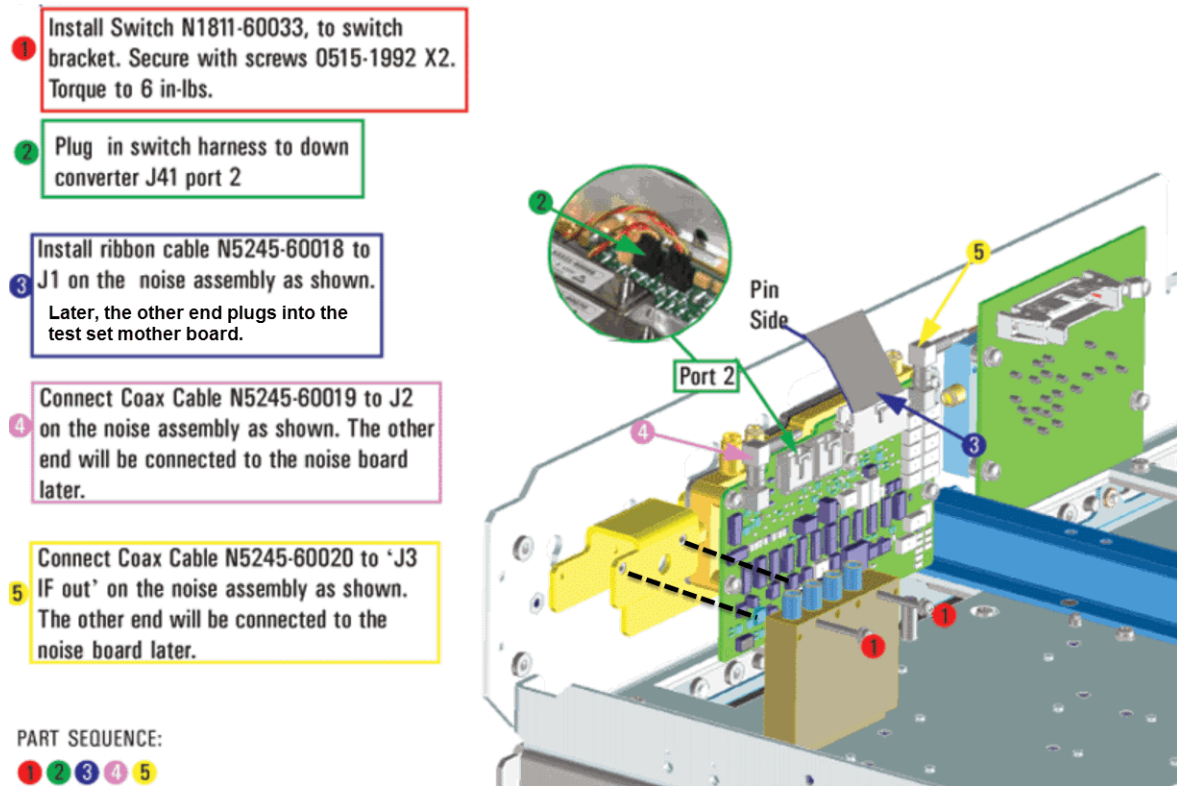
Step 10. Install the A57 Noise Switch (Port 2) to Bracket and Attach Cables to A59 Noise Downconverter (Receiver) Assembly

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

1. Install the A57 Switch to the switch bracket using two screws (item ①). Torque to 6 in-lbs.
2. Plug in switch harness (Item ②) to downconverter J41 port 2.
3. Install ribbon cable (Item ③ - N5245-60018) to J1 on the noise assembly as shown in **Figure 6**. Later the other end plugs into the A23 test set motherboard.
4. Connect coax cable (Item ④ - N5245-60019) to J2 on the noise assembly as shown in **Figure 6**. The other end connects to the noise board later.
5. Connect coax cable (Item ⑤ - N5245-60020) to 'J3 IF out' on the noise assembly as shown in **Figure 6**. The other end connects to the noise board later.

Figure 6

Install the A57 Switch/Bracket to Chassis and Attach Cables to A59 Noise Downconverter (Receiver) Assembly (N1811-60033, N5245-60018, N5245-60019, N5245-60020, & 0515-0372)



Step 11. Install the A56 Noise Switch (Port 1), A64 Tuner to Bracket, and Bracket to the Chassis

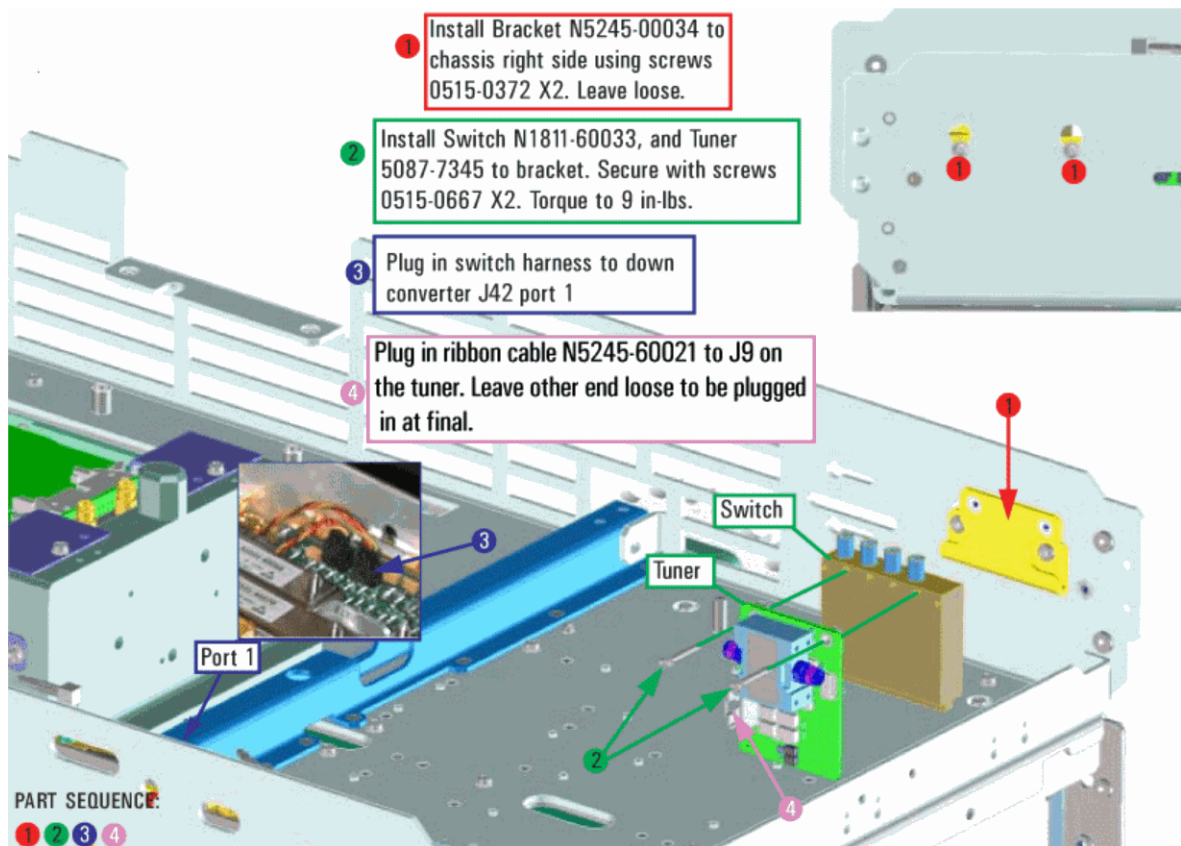
Step 11. Install the A56 Noise Switch (Port 1), A64 Tuner to Bracket, and Bracket to the Chassis

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

1. Install the bracket (item ① – N5245-00034) to the chassis using two screws. Leave loose. The screws will be torqued after the semirigid cables are installed.
2. Install switch (Item ② – N1811-60033) and tuner to bracket. Secure with two screws. Torque to 9 in-lbs.
3. Plug in switch harness (Item ③) to downconverter J42 port 1.
4. Plug in ribbon cable (Item ④ – N5245-60021) to J9 on the A64 tuner. The other end of the cable is connected at final.

Figure 7

Install the A56 Noise Switch (Port 1) to Bracket and Attach Cables to A64 Tuner Assembly (N5245-00034, N1811-60033, N5245-60021, 0515-0372, & 0515-0667)



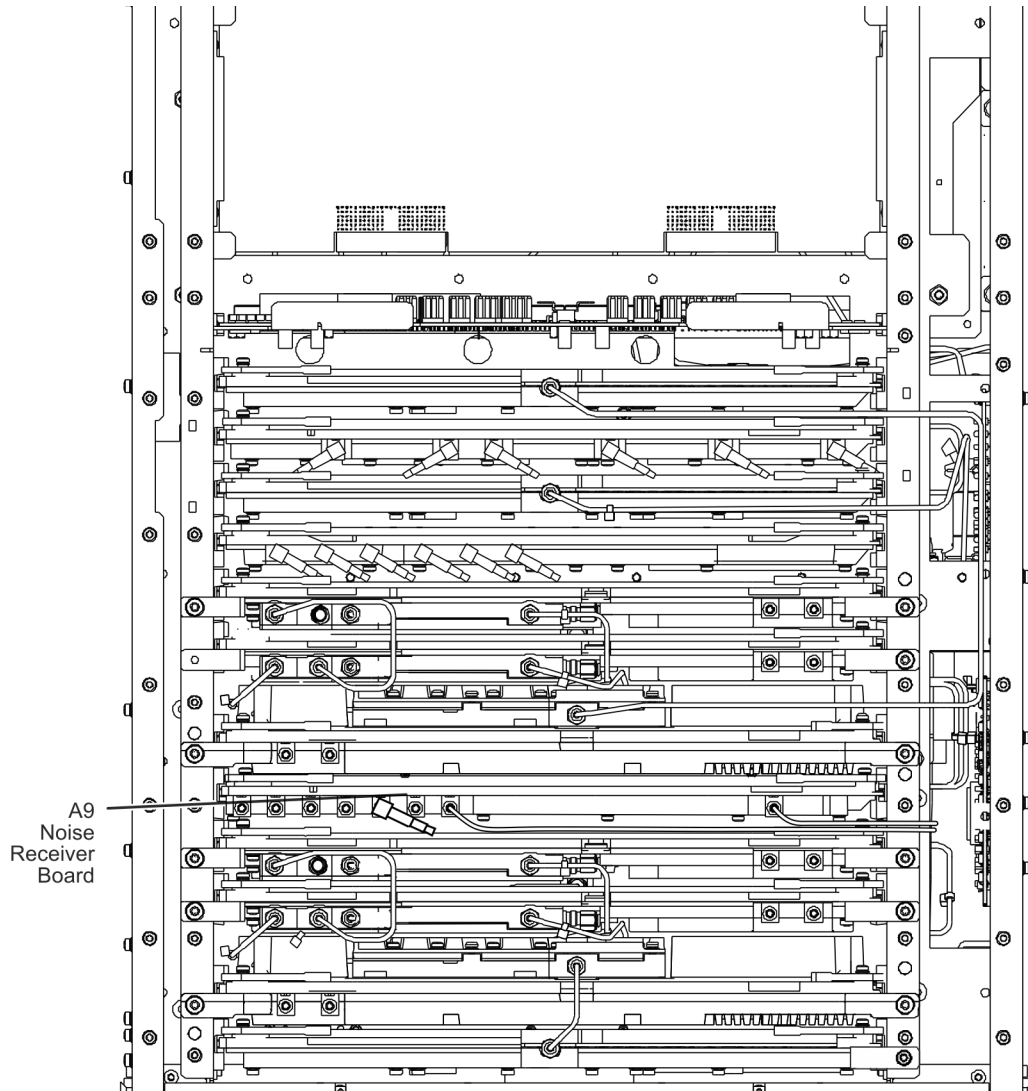
Step 12. Install the A9 Noise Receiver Board

Refer to **Figure 8** for this part of this step of the procedure. Although only Option 422 is shown in the illustration, Option 224 is 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 A9 noise receiver board in the analyzer as shown. Make sure it is fully seated in the motherboard connector.

Figure 8

Noise Receiver Board Installation



Step 13. Install the 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.

CAUTION

Some of these cables may have different dimensions from those shown in the graphics.

To see an image showing the location of these cables, click the appropriate Chapter 6 bookmark for your serial number prefix (S/N Prefixes <6021) or (S/N Prefixes ≥6021): (Ex: “2-Port Configuration, Options 224/029”) in the PDF Service Guide¹. New parts are listed in [Table 2 on page 12](#).

1. Connect the following wire harness and ribbon cables:

NOTE

The reference designators for this step correspond to the figures [Figure 10 on page 28](#) through [Figure 13 on page 32](#). But, some of the previous steps are provided for your reference.

Connect the following, by referring to [Figure 10 on page 28](#):

- ①–(N5245-20145) A59 noise downconverter to A9 noise board.
- ②–(N5245-20144) A59 noise downconverter to A9 noise board

Connect the following by referring to [Figure 11 on page 29](#) (See also [Figure 6 on page 21](#)):

- ①–(N5245-60020) Verify A59 noise downconverter assembly J3 to A9 noise board J1.
- ②–(N5245-60019) Verify A59 noise downconverter assembly J2 to A9 noise board J5

Connect the following by referring to [Figure 12 on page 30](#) (See also [Figure 6 on page 21](#) and [Figure 7 on page 22](#)):

- ①–(N5245-60018) A59 noise receiver to the A23 test set motherboard J550

1. See [“Downloading the Online PNA-X Service Guide” on page 9](#).

Step 13. Install the Test Set Cables

- ②–(N5245-60021) Verify A64 tuner to A23 test set motherboard J7
2. Install the following semi-rigid cables in the order listed. Use a 5/16-in torque wrench set to 10 in-lbs to tighten all cable connectors.

For Option 224 with 029—all analyzer serial numbers

- W167 (N5245-20105) A57 port 2 noise bypass switch to A45 port 2 bias tee

For all analyzer serial numbers

- W166 (N5245-20080) RF cable, A57 port 2 noise bypass switch to port 2 CPLR THRU
- W169 (N5245-20147) RF cable, A59 noise downconverter to A57 port 2 noise bypass switch
- W168 (N5245-20146) RF cable, A59 noise downconverter to A57 port 2 noise bypass switch

For Option 222 with 029—all analyzer serial numbers

- W158 (N5245-20161) A36 port 2 coupler to A57 Port 2 noise bypass switch

For all analyzer serial numbers

- W170 (N5245-20150) RF cable, A26 splitter to A59 noise downconverter

For Option 222 with 029—all analyzer serial numbers

- W157 (N5245-20160) A33 port 1 coupler to A56 Port 1 noise bypass switch

For Option 224 with 029—all analyzer serial numbers

- W165 (N5245-20152) A42 port 1 bias tee to A56 port 1 noise bypass switch

For all analyzer serial numbers

- W164 (N5245-20148) RF cable, A64 tuner to A56 port 1 noise bypass switch
- W161 (N5245-20151) RF cable, A38 port 1 source attenuator to front panel port 1 SOURCE OUT
- W162 (N5245-20153) RF cable, Front panel port 1 CPLR THRU to A56 port 1 noise bypass switch
- W163 (N5245-20149) RF cable, A64 tuner to A56 port 1 noise bypass switch
- W53 (N5245-20023) RF cable, A26 splitter to A27 mixer brick
- W52 (N5245-20013) RF cable, A25 HMA26.5 to A26 splitter

Step 13. Install the Test Set Cables

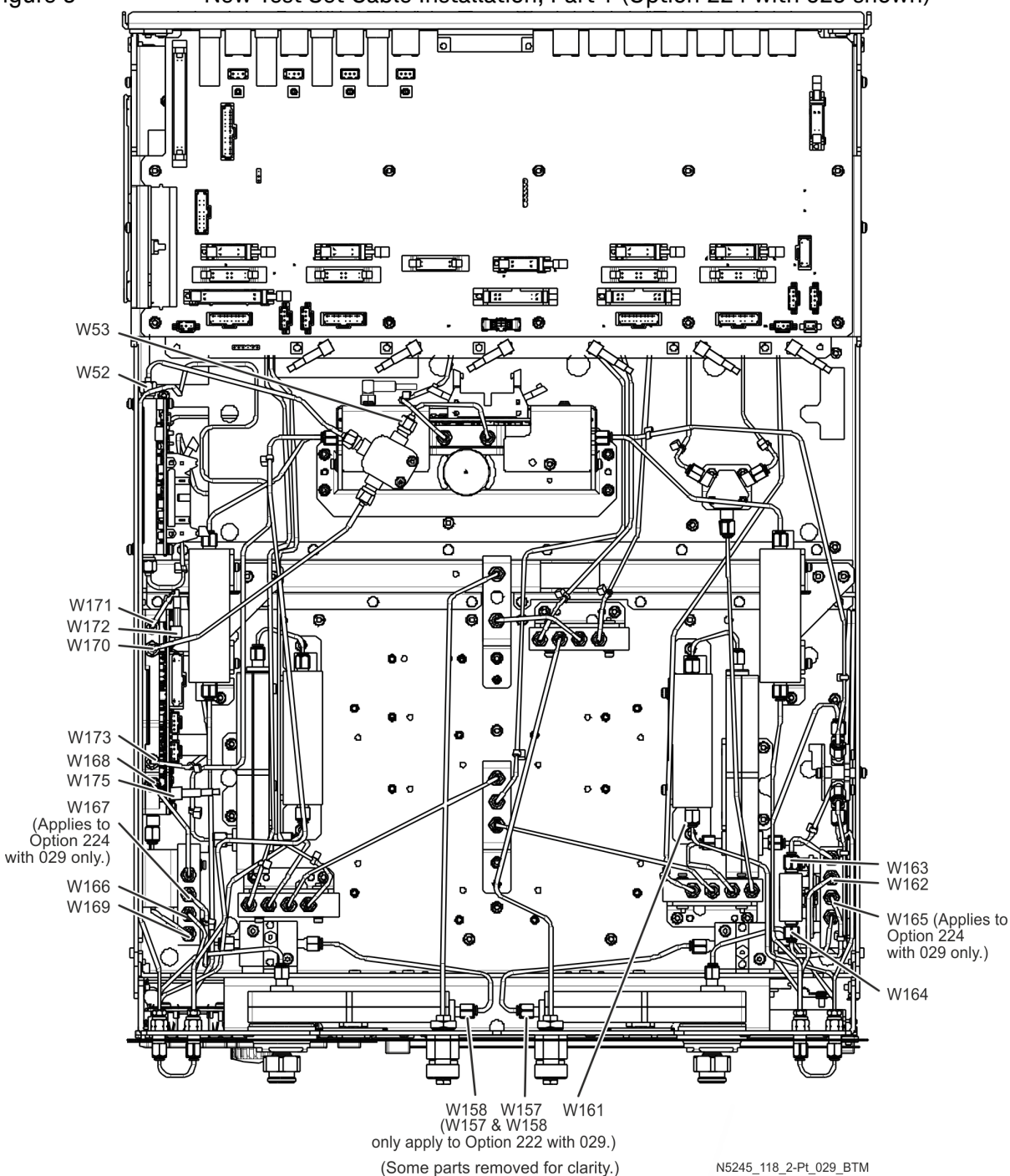
3. Position the analyzer as shown in **Figure 9 on page 27** through **Figure 12 on page 30** (fans facing upwards) and loosely install the following cables. Route each of the cables through the opening in the test set deck to the top side of the analyzer. The other ends will be connected in the next step.
 - W173 (N5245-20145) Ribbon cable, A59 noise downconverter to A9 noise board
 - W171 (N5245-20144) RF cable, A59 noise downconverter to A9 noise board
 - W175 (N5245-60018) Flexible cable, A59 noise receiver to the A23 test set motherboard J550
 - N5245-60019 Flexible cable, A59 noise downconverter assembly J2 to A9 noise board J5
 - W172 (N5245-60020) Flexible cable, A59 noise downconverter assembly J3 to A9 noise board J1
 - N5245-60021 Flexible cable, A64 tuner to A23 test set motherboard J7

Refer to **Figure 9 on page 27** and **Figure 12 on page 30** for this part of this step of the procedure. Although your instrument may look different than the one shown in the illustration, Option 222 with 029, is similar in appearance (i.e., bias tees do not apply to Option 222 with 029). 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 semi-rigid cables W171 (item ②) and W173 (item ①) as indicated in **Figure 10 on page 28**. Torque connectors to 10 in-lbs.
6. Connect flexible cable W172 (item ②) and W175 (item ①) as indicated in **Figure 11 on page 29**.
7. Connect flexible cable N5245-60018 (item ①) and N5245-60021 (item ②) as indicated in **Figure 12 on page 30**.
8. Go back and torque the connectors on the other ends of W171 and W173 to 10 in-lbs.

Step 13. Install the Test Set Cables

Figure 9 New Test Set Cable Installation, Part 1 (Option 224 with 029 shown)^{1, 2}

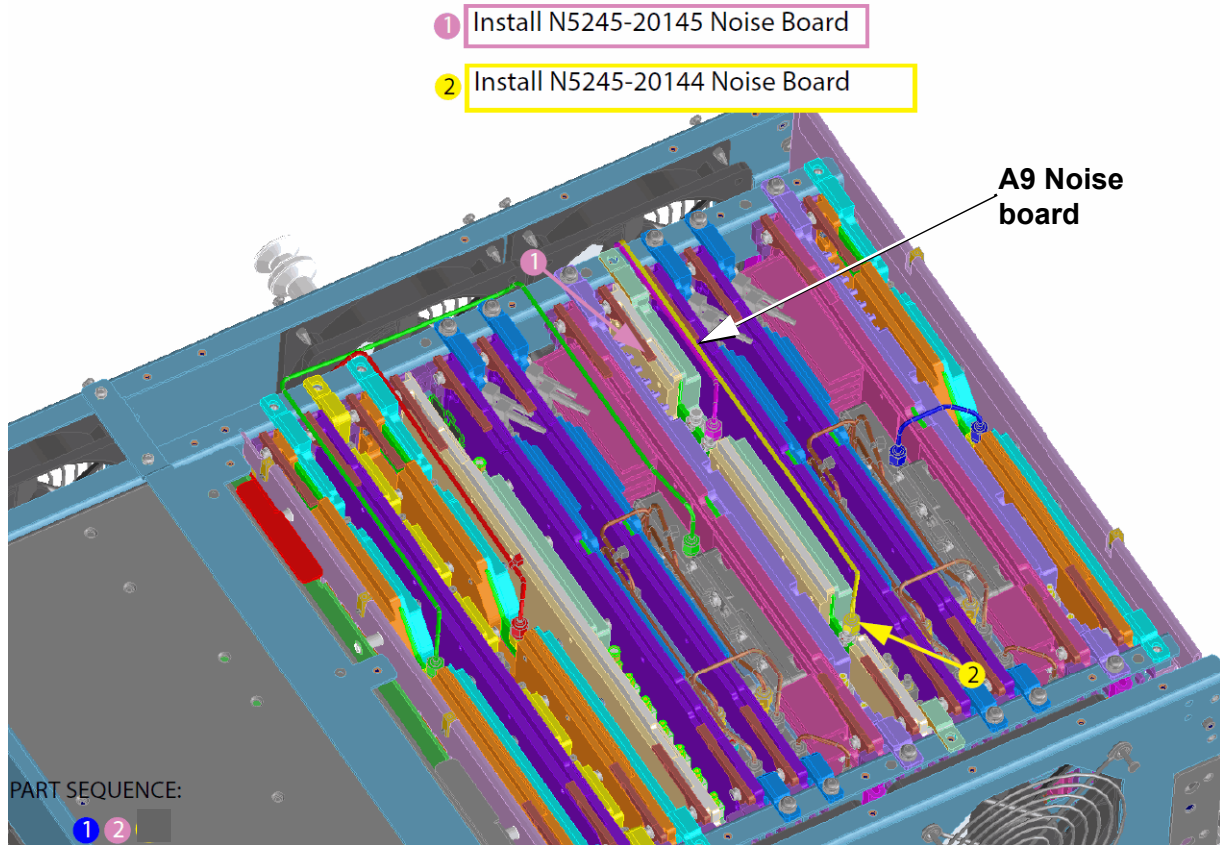


1. The A26 splitter (5067-4086) and N5245-20013, N5245-20022, N5245-20023, N545-20101, and N5245-20150 cables are only used with a legacy HMA26.5 p/n: 5087-7765. If you are unclear which HMA26.5 assembly your PNA-X has installed, refer to Chapter 7 Repairs and **Figure 1 on page 10** and for details on A26 splitter and cabling, refer to your option-model in Chapter 6 "2-Port Configurations, Serial Number Prefix <6021" and "4-Port Configuration, Serial Number Prefix <6021".
2. Attenuator 08490-60039 is shown in the figure, but is not included in this upgrade and not required with the A28 mixer brick (5087-7417).

Step 13. Install the Test Set Cables

Figure 10

New Test Set Cable Installation, Part 2 (N5245-20144, N5245-20145)



Step 13. Install the Test Set Cables

Figure 11

New Test Set Cable Installation, Part 3 (N5245-60019, N5245-60020)

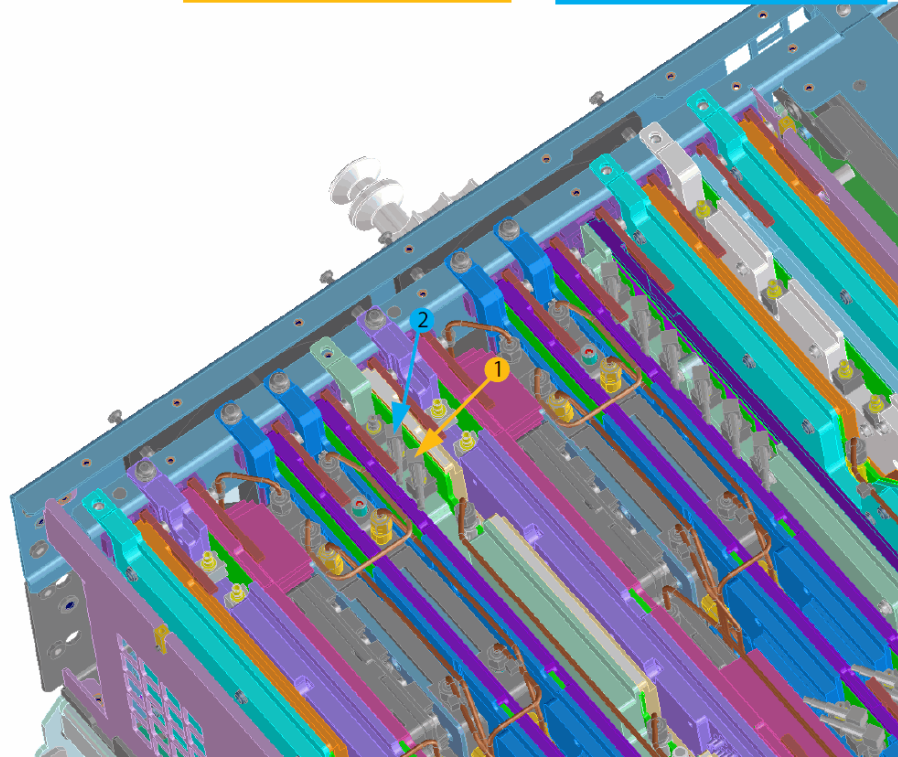


1

Connect the other end of the down converter N5245-60020 gray cable to the J1 "IF IN"

2

Connect the other end of the downconverter N5245-60019 gray cable to the J5 "DET IN"

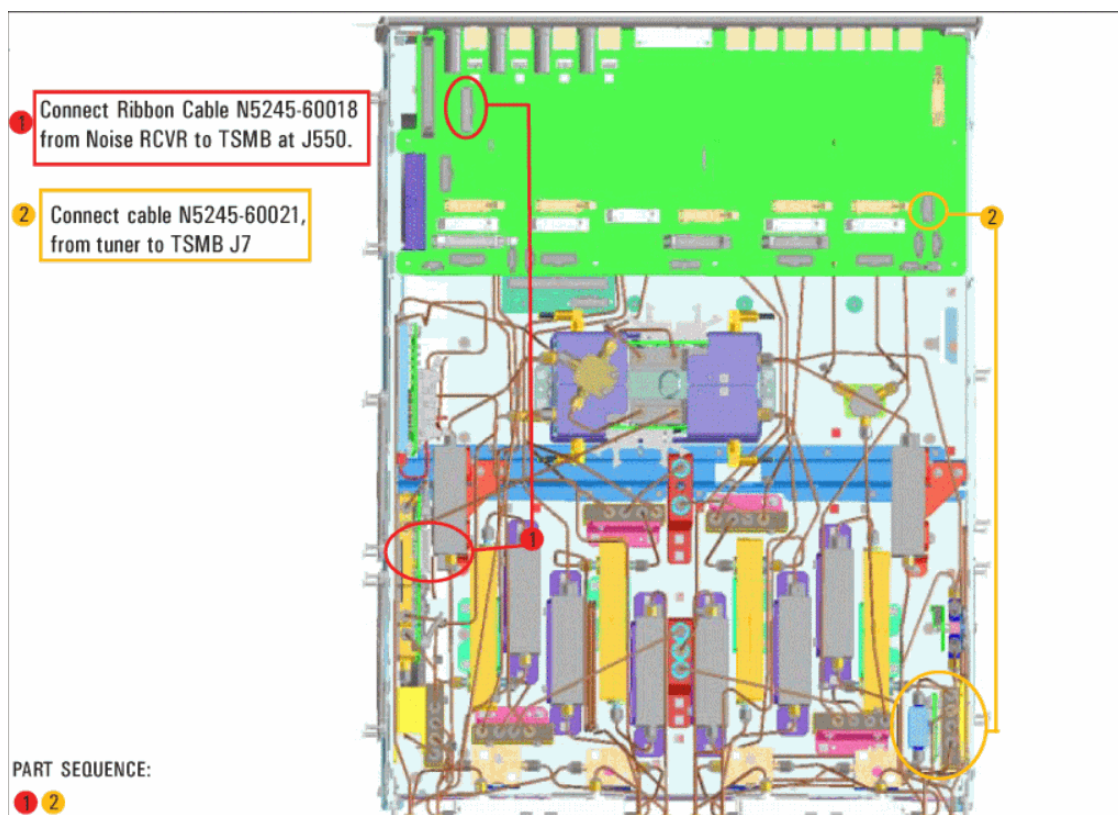


PART SEQUENCE:

1 2

Step 13. Install the Test Set Cables

Figure 12 New Test Set Cable Installation, Part 4 (N5245-60018, N5245-60021)^{1, 2}



1. The A26 splitter (5067-4086) and N5245-20013, N5245-20022, N5245-20023, N545-20101, and N5245-20150 cables are only used with a legacy HMA26.5 p/n: 5087-7765. If you are unclear which HMA26.5 assembly your PNA-X has installed, refer to Chapter 7 Repairs and **Figure 1 on page 10** and for details on A26 splitter and cabling, refer to your option-model in Chapter 6 "2-Port Configurations, Serial Number Prefix <6021" and "4-Port Configuration, Serial Number Prefix <6021".
2. Attenuator 08490-60039 is shown in the figure, but is not included in this upgrade and not required with the A28 mixer brick (5087-7417).

Step 14. Remove the Old Lower Front Panel Overlay

Refer to **Figure 13** for this step of the procedure. New parts are listed in **Table 2 on page 12**.

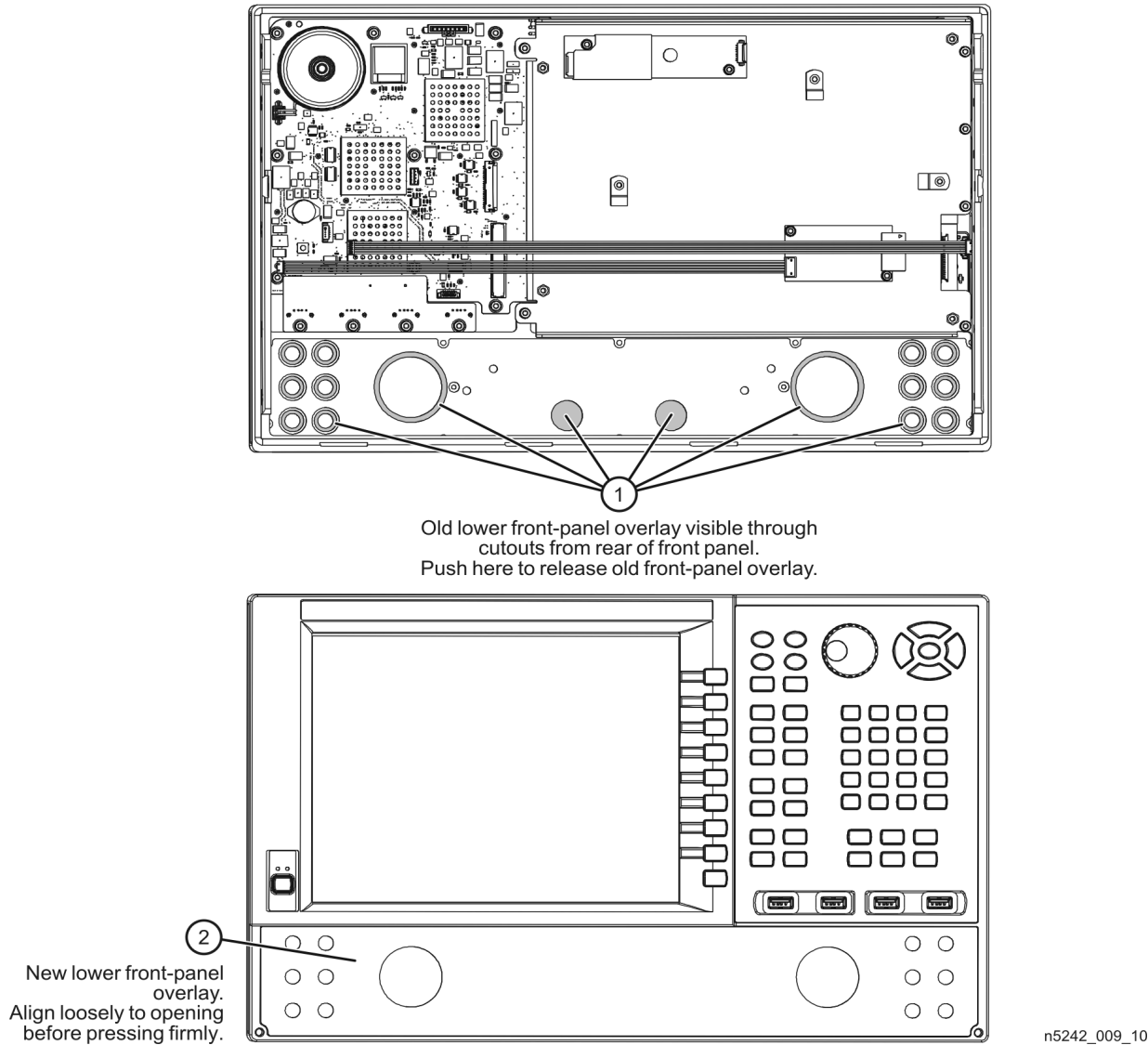
1. From the back side of the front panel, use a blunt object in the cutouts in the lower front dress panel to push on the old overlay (item ①) and separate it from the front dress panel.
2. From the front side of the front panel, pull off the overlay completely and discard it.
3. Remove any adhesive 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 16. Install the New Lower Front Panel Overlay and Front Panel Jumpers” on page 34.**

Step 14. Remove the Old Lower Front Panel Overlay

Figure 13 Lower Front panel Overlay Replacement



Step 15. Reinstall the Front Panel Assembly

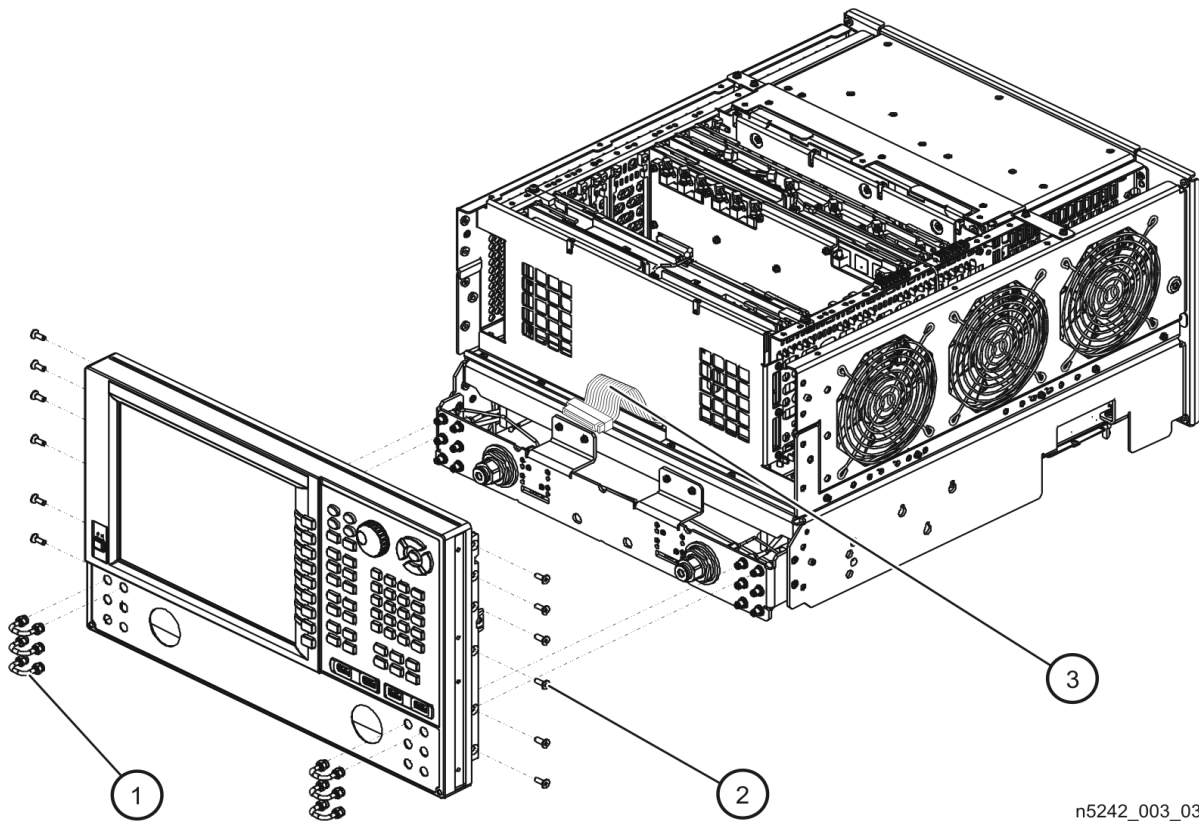
CAUTION

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

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

1. Reconnect the ribbon cable (item ③) to the A1 front panel interface board.
2. Slide the front panel over the front-panel connectors.
3. With a T-10 TORX driver, reinstall the 12 screws (item ②) in the sides of the frame.

Figure 14 Front Panel Assembly Re-installation



Step 16. Install the New Lower Front Panel Overlay and Front Panel Jumpers

Refer to [Figure 13 on page 32](#) 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, N5245-80022 (N5244/5A Option 224 with 029), N5245-80029 (N5244/5B Option 224 with 029), or N5245-80033 (N5244/5B Option 222 with 029) – (item ②).

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.
4. Reinstall the semirigid jumpers (item ②) on the front panel, and tighten each of the connectors to 10 in-lbs. Refer to [Figure 14 on page 33](#).

Step 17. Position the Cables and Wires to Prevent Pinching

On the top side of the PNA, carefully position the gray 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 18. Reinstall the Inner Cover

For instructions, click the Chapter 7 bookmark "Removing the Covers" in the PDF Service Guide¹.

1. See ["Downloading the Online PNA-X Service Guide" on page 9](#).

Step 19. Reinstall the Outer Cover

For instructions, click the Chapter 7 bookmark “Removing the Covers” in the PDF Service Guide¹.

Step 20. Remove Option 028 License

NOTE

If Option 28 is not loaded on your PNA, proceed to “**Step 21. Enable Option 029**” on page 36.

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 Select Desired Option list, click 028.
4. In the Keysight License Manager dialog box that appears, press or click **Yes** to confirm delete.
5. A message displays stating that the option removal was successful.
6. Restart the PNA Analyzer application: Press **File** > **Exit**.
7. In the Exit NA Application dialog box that opens, press **OK**.

Step 21. 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.
- A keyboard and mouse must be connected to the network analyzer.
- 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.
- Obtain your license key file(s) for installation of this upgrade by following the instructions on the supplied Software Entitlement Certificate.

For "A" models, refer to:

- ["Option Enable Procedure for "A" Model Instruments" on page 36.](#)
- [""A" Model Option Verification Procedure" on page 37.](#)

For "B" models refer to:

- ["Option Enable Procedure for "B" Model Instruments " on page 37.](#)
- [""B" Model Option Verification Procedure" on page 39.](#)

Option Enable Procedure for "A" Model Instruments

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 **029** - Noise Figure.
4. Using the keyboard, enter the license key in the box provided. The license key is printed on the license message you received from Keysight. Enter this key exactly as it is printed on the message.
5. Click **Enable**.
6. Click Yes in answer to the displayed question in the **Restart Analyzer?** box.
7. When the installation is complete, click **Exit**.

“A” Model Option Verification Procedure

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

1. On the analyzer's **Help** menu, press About Network Analyzer.
2. Under Options, verify that “029” is listed.
3. Click OK.

NOTE

If Option 029 has not been enabled, contact Keysight Technologies. Refer to [“Getting Assistance from Keysight” on page 6](#).

Option Enable Procedure for “B” Model Instruments

NOTE

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

A license file may contain more than one feature.

1. Locate the email(s) from Keysight which contain license file attachments. These emails are a result of [“Step 1. Obtain a Keyword and Verify the Information” on page 15](#).
2. Copy the license file(s) from the email(s) to the **root directory** of the USB flash drive.
More than one license file may be copied to the USB flash drive.
3. Insert the USB flash drive to the PNA-X's USB drive slot. Within 5 seconds, the PNA-X should display a small “New licenses installed” message.

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

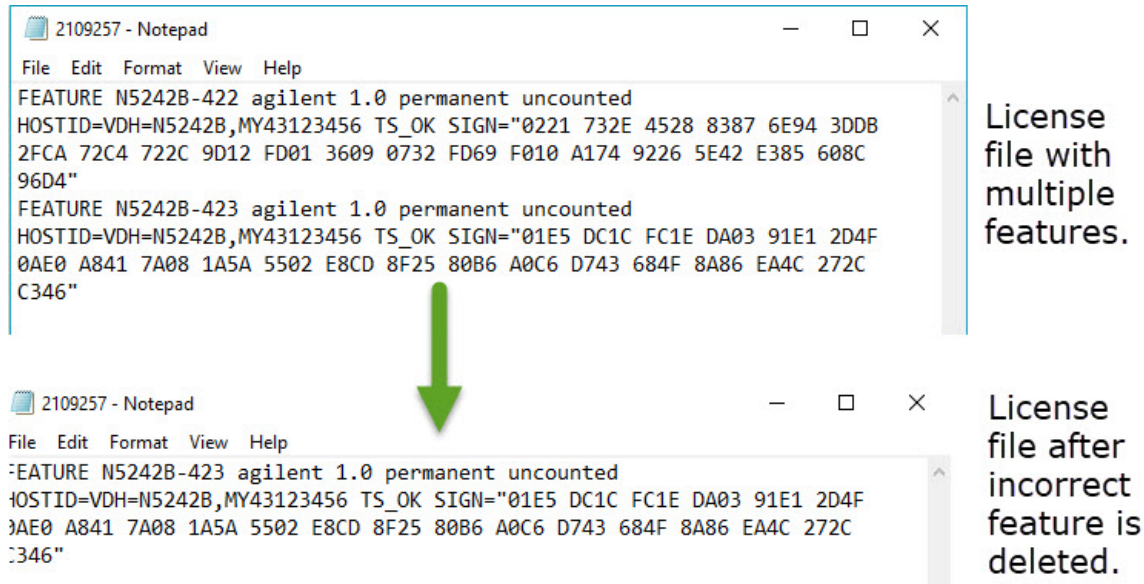
4. Verifying and editing the license file:

For these steps, refer to the example in [Figure 15 on page 38](#).

- a. Verify your USB flash drive is connected to a PC.
- b. Open your license file using a text read/write program similar to Notepad.
- c. If you have more than one licensed feature, delete the feature that is **not** required for this upgrade. (e.g., in this case N5242B-423 is the correct upgrade. So, N5242B-422 is to be deleted from the text file.)

Figure 15 Editing a Keysight License File Using a Text Editor.

Note: This figure may not contain your specific features and is an example only. In this example N5242B-422 is the incorrect feature. N5242B-423 is the correct feature.



- d. Re-save the text license file to the root directory of your USB flash drive.
 - e. Verify that only the single correctly edited text license file is in the root directory of your USB drive.
 - f. Eject your USB flash drive and remove the USB flash drive from your PC.
5. Connect the USB flash drive to the PNA-X. Within 5 seconds, the PNA-X should display a small “New licenses installed” message.

Else, load the license key file(s), manually move your license file(s) to C:\Program Files\Agilent\licensing. It may take Keysight License 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.

6. Disconnect the USB flash drive from the PNA-X.
7. 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.

“B” Model Option Verification Procedure

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

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

NOTE

If the option has not been enabled, 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 22. Perform Post-Upgrade Adjustments and Calibration

Adjustments

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

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.

- 10 MHz frequency reference adjustment
- Default EE adjustment – select the LO Drive-NF adjustment and either adjust or initialize the values.
- synthesizer bandwidth adjustment (only run when EE default adjust is not sufficient)
- source adjustment
- IF gain adjustment
- receiver characterization

Step 22. Perform Post-Upgrade Adjustments and Calibration

- receiver adjustment
- IF response adjustment (N5244/5A with Option 090, 093, 094, or N5244/5B with Option S93090xA/B, S93093A/B, or S93094A/B Only)
- noise figure adjustment (N5244/5A with Option 029 or N5244/5B with option 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 Guide¹.

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.

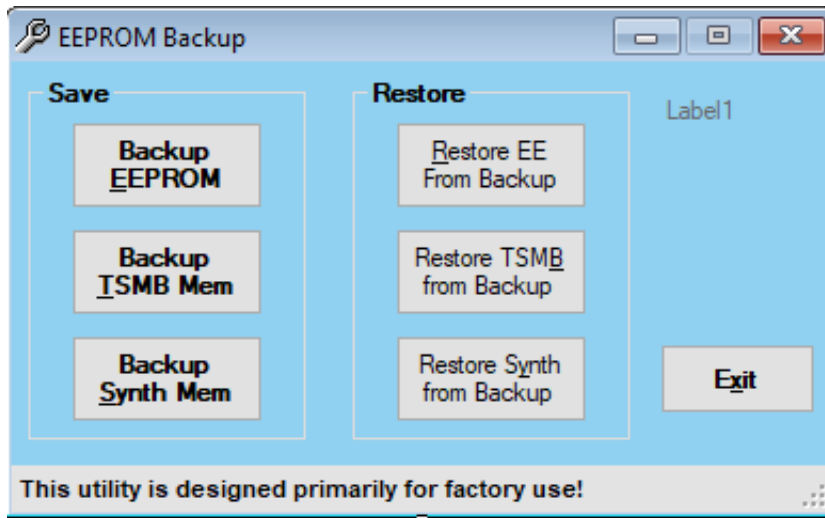
The adjustments listed here generate new correction constants. The analyzer must have a backup of this new data in case any of the data becomes corrupted.

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 Mem.
- Click Backup Synth Mem. (Applies to Version 7 Synthesizers Only)
- Click Exit when the program has finished.

1. See “[Downloading the Online PNA-X Service Guide](#)” on page 9.

Figure 16 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 Guide¹.

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 Guide¹.

Step 23. Prepare the PNA-X for the User

1. If necessary, reinstall front jumper cables.
2. If necessary, reinstall the cable guards, pushing them over the front jumper cables until the cushioning material touches the front panel of the PNA-X.
3. Install the dust caps on the test ports.
4. Clean the analyzer, as needed, using a damp cloth.



This information is subject to change
without notice.

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