Keysight Add Low Frequency Extension (LFE) For Version 6 & Version 7 Synthesizers

To Upgrade PNA-X N5247B Option 423 to Option 425 or Option 423 with 029 to Option 425 with 029

Upgrade Kit Order Number:
N5247BU-425 and
N5247BU-429

Keysight Kit Number:
N5247-60113

This is Installation Note is for upgrading the N5247B Microwave Network Analyzers from Option 423 or Option 423 with Option029 to Option 425 or Option 425 with Option 029.

KEYSIGHT

INSTALLATION GUIDE

Notices

Trademark Acknowledgments

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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.**

Keysight Low Frequency Extension (LFE) Upgrade Kit
Upgrade Kit Number: N5247-60113
Installation Note

Description of the Upgrade

This upgrade adds the Option 425 low frequency extension (LFE) to an N5247B Option 423 or to N5247B Option 423 with 029. When you complete this upgrade your PNA-X will be a N5247B Option 425 or a N5247B Option 425 with 029:

- PC assembly, low frequency extension (LFE)
- bias combiners to all ports
- additional new cables

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 5.**

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.

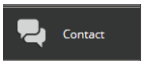
Contacting Keysight

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.

KEYSIGHT TECHNOLOGIES

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!

Before you begin this upgrade:

- Verify your instrument's firmware is A.13.55 or greater.
- Verify your instrument's IF Multiplexer (IF MUX) board, has P4, P204, P404, P604, P804 connectors. If not, Keysight will purchase a new IF MUX board. Refer to your instrument's Service Guide, Chapter 7 bookmark "Removing and Replacing the A20 IF Multiplexer Board" in the PDF Service Guide and to "Contacting Keysight" on page 5[a].
- Verify your Synthesizer board is version H or greater. If not, refer to Appendix A:, "Synthesizer Board Upgrade (N5240-60074 (with Tabs)/N5240-60076 (Without Tabs) Version F/G to Version H),".

a. See "Downloading the Online PNA Service Guide" on page 8.

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 9.
- Enough time - refer to "About Installing the Upgrade" on page 10.
- Test equipment for the post-upgrade adjustments and full instrument calibration. To view the equipment list, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide[1].

1. See "Downloading the Online PNA Service Guide" on page 8.

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 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 for the instrument that will receive the option.

To enable the option product, you must request license key files(s) 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
  - Model number
  - Serial number

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

You will need to provide an email address, Keysight will promptly email your license key file(s) as a message attachment.

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 5.

Downloading the Online PNA Service Guide

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

1. Go to www.keysight.com.
2. In the Search box, enter the model number of the analyzer (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.

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

Tools Required for the Installation

Description	Qty	Part Number
T-6 TORX driver - set to 6 in-lbs (0.68 N.m)	1	N/A
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
5/16-in (8 mm) nutsetter or open end torque wrench- set to 8 in-lbs (0.9 N.m)	1	N/A
5/16-in (8 mm) nutsetter or open end torque wrench - set to 21 in-lbs (2.38 N.m)	1	N/A
5/16-in (8 mm) nutsetter or open end wrench (to stabilize the bias tee combiner when torquing cables)	1	N/A
3/16-in (5 mm) nutsetter or open end torque wrench - set to 6 in-lbs (0.68 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
1/4-in (6 mm) open end wrench	1	N/A

CAUTION

Use a 5/16-in torque wrench set to 10 in-lbs on all cable connections, except the front panel coupler to Bias-T combiner cable connections. Torque these to 8 in-lbs.

Additional exception: Torque the front and rear panel bulkhead connectors and these connections to 21 in-lb.

1. See “Downloading the Online PNA Service Guide” on page 8.

About Installing the Upgrade

Products affected	N5247B Option 423 and N5247B Option 423 with 029
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	5 hours
Estimated adjustment time	2.5 hours
Estimated full instrument calibration time	8.0 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 5.

CAUTION

This upgrade kit contains cables for Version 6 synthesizers and Version 7 direct digital synthesizer (DDS) assemblies. Please refer to your instrument's Service Guide, if you are unclear which assembly you have installed. Refer to "Downloading the Online PNA Service Guide" on page 8.

Table 1 Contents of Upgrade Kit N5247-60113

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5247-90113
--	Software Entitlement Certificate	1	5964-5145
--	China ROHs	1	9320-6722
A71	Port 1 LFE Bias-T combiner - port 1	4	5087-7403
A72	Port 3 LFE Bias-T combiner - port 3		
A73	Port 4 LFE Bias-T combiner - port 4		
A74	Port 2 LFE Bias-T combiner - port 2		
A70	PC assy, low frequency extension (LFE)	1	N5291-60001
--	Bracket for IF MUX, low frequency extension (LFE)	1	N5240-00011
--	Bracket for Bias-T combiner	2	N5247-20149
--	Machine screw, M3 x 14, pan head (2 to attach A70 LFE board to the deck)	2	0515-0665
--	Machine screw, M3 x 25, pan head (3 to reattach TSMB assembly to deck)	3	0515-0667
--	Machine screw, M3.0 x 8, flat head 4 to attach bias T-combiner assemblies to deck and 4 to attach lower bracket N5240-00011 to IF MUX board)	8	0515-0372
--	Machine screw, M3.0 x 6, flat head (8 to attach Bias T-combiners to bracket)	8	0515-1227
--	Machine screw, M2.5 x 14, pan head (4 to attach clamps to bias t combiners)	4	0515-2141
--	Cap, protective	4	1401-0214
--	clamps, cable	4	5023-3299
--	clamps, cable (LFE DC bias cables)	6	1400-1334
--	Nameplate, Option 425 and 425 with 029	1	N5247-80026
--	Dress panel, overlay – Option 425	1	N5247-80027
--	Dress panel, overlay – Option 425 with 029	1	N5247-80028

Table 1 Contents of Upgrade Kit N5247-60113

Ref Desig.	Description	Qty	Part Number
--	Cable, ribbon assy, motherboard (MB/IF MUX/LFE/TSMB))	1	N5240-60089
--	Cable, DC, 2 pin to R/A SMP	4	N5240-60091
W181	Cable, assy-RF, Port 1 CPLR THRU to port 1A71 port 1 bias combiner (without Option 029 Only)	1	N5247-20167
W182	Cable, assy–RF A33 test port coupler to A71 port 1 bias combiner	1	N5247-20162
W183	Cable, assy-RF, Port 3 CPLR THRU to A72 bias combiner, port 3	1	N5247-20170
W184	Cable, assy-RF, A34 port 3 test port coupler to A72 port 3 bias combiner	1	N5247-20164
W185	Cable, assy-RF, Port 4 /FP CPLR THRU to A73 port 4 bias combiner	1	N5247-20165
W186	Cable, assy-RF, A35 port 4 test port coupler to A73 port 4 bias combiner	1	N5247-20171
W187	Cable, assy-RF, A36 port 2 FP CPLR THRU to A74 port 2 bias combiner (425 without Option 029 Only)	1	N5247-20163
W188	Cable, assy-RF, A36 port 2 test port coupler to A74 port 2 bias combiner	1	N5247-20169
W189	Cable, assy-RF, A71 port 1 bias combiner to A56 port 1 noise switch (425 with Option 029 Only)	1	N5247-20172
W190	Cable, assy-RF, - A74 port 2bias combiner to A57 port 2 noise switch (425 Option 029 Only)	1	N5247-20173
W191[a]	Cable, assy RF CA, LFE SRC1 J20 - Synth SRC1 J102	1	N5245-60027
W192[a]	Cable, assy RF CA, LFE SRC2 J21 - Synth SRC2 J102	1	N5242-60079
W193[a]	Cable, assy RF CA, LFE LO J18 - Synth LO J102	1	N5242-60080
W194	Cable (long), assy, coaxial LFE, RF (Port 1 bias combiner “RF-IN” to “Port1” A70 LFE board)	4	N5240-60097
W195	Cable (long), assy, coaxial LFE, RF (Port 3 bias combiner “RF-IN” to “Port3” A70 LFE board)		
W196	Cable (long), assy, coaxial LFE, RF (Port 4 bias combiner “RF-IN” to “Port4” A70 LFE board)		
W197	Cable (long), assy, coaxial LFE, RF (Port 2 bias combiner “RF-IN” to “Port2” A70 LFE board		
W208[b]	A70/A75 LFE board to A15 DD Synth Source 1 J12	1	N5240-60112
W209[b]	A70 LFE board to A15 DD Synth Source 2 J14	1	N5240-60114
W210[b]	A70/A75 LFE board to A15 DD Synth LO J13	1	N5240-60113
W211	RF cable, A70/A75 LFE J14 to A24 IF Multiplexer P4	1	8120-5014

Table 1 Contents of Upgrade Kit N5247-60113

Ref Desig.	Description	Qty	Part Number
W212	RF cable, A70/A75 LFE J13 to A24 IF Multiplexer P204	1	8120-5017
W213	RF cable, A70/A75 LFE J7 to A24 IF Multiplexer P404	1	8120-5014
W214	RF cable, A70 LFE J12 to A24 IF Multiplexer P604	1	8120-5017
W215	RF cable, A70 LFE J11 to A40 IF Multiplexer P804 (4-port only)	1	8120-5017

a. Version 6 synthesizers use these cables. If you have a Version 7 direct digital synthesizer (DDS) assembly installed, these cables may be be discarded.
b. Version 7 direct digital synthesizer (DDS) assemblies use these cables. If you have a Version 6 synthesizers installed, these cables may be discarded.

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.

NOTE **IMPORTANT!** Save all screws, nuts, and washers for reuse that have been removed.

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. Inspect and (If Necessary) Remove the A4, A15, and A17 Synthesizer Boards, if They Are Not Version H."

"Step 5. Remove the Front Panel Assembly."

"Step 6. Remove the A23 Test Set Motherboard."

"Step 7. Remove the A24 IF Multiplexer (IF MUX) Board."

"Step 8. Remove the Existing Test Set Cables."

"Step 9. Remove the A38–A41 Bias Tee Assemblies."

"Step 10. Assemble and Install the A71–A74 Bias Tee Combiner Assemblies."

"Step 11. Connect the A18 Motherboard/IF Multiplexer (IF MUX)/Low Frequency Extension (LFE)/Test Set Motherboard (TSMB) Ribbon Cable (N5240-60089)."

"Step 12. Reinstall the A24 IF Multiplexer (IF MUX) Board and Connect the Motherboard / IF Multiplexer / Low Frequency Extension (LFE)/ Test set motherboard (MB/IF MUX/LFE/TSMB) ribbon cable (N5240-60089) and the IF MUX Rear Panel Hardware."

"Step 13. Reinstall the handler, Power and Other I/O Assemblies."

"Step 14. Reinstall the Mixer Brick (MXB) Cables."

"Step 15. Attach Lower Bracket (N5240-00011) to IF MUX Board Shield."

"Step 16. Connect and Route New LFE Cables (8120-5014 (x2) and 8120-5017 (x3)) to the on the IF Multiplexer (IF MUX) Board."

"Step 17. Install A70 Low Frequency Extension (LFE) Board."

"Step 18. Connect A71-A74 Bias Tee Combiner's New Cables to A70 Low Frequency Extension (LFE) Board and the Other Ends of the New Cables Connected to the IF Multiplier (IF MUX) Board."

"Step 19. Install the New Bias Tee Combiner's Semirigid Test Set Cables, the Blue cables, and Install the Cable Clamps Onto the Ferrite Beads."

"Step 20. Reinstall the A23 Test Set Motherboard."

"Step 21. Install the A71 and 74 Bias-Tee Combiner's Gray Low Frequency Extension (LFE) DC Bias Cables and Route Cables."

"Step 22. Install the Other End of the Bias-Tee Combiner Cables to the Source Synthesizer and LO Synthesizer Board Gray Cables."

"Step 23. Remove the Old Lower Front Panel Overlay."

"Step 24. Reinstall the Front Panel Assembly."

"Step 25. Install the New Lower Front Panel Overlay and Nameplate."

"Step 26. Reinstall Front Panel Jumpers."

"Step 27. DC Continuity Test the LFE Board and Test Ports."

"Step 28. Position the Cables and Wires to Prevent Pinching."

"Step 29. Reinstall the Inner Cover."

"Step 30. Reinstall the Outer Cover."

"Step 31. Remove Option 423 License."

"Step 32. Enable Option 425."

"Step 33. Verify the PNA Analyzer Program is Running with the Correct Options."

"Step 34. Perform Post-Upgrade Adjustments and Calibration."

"Step 35. Prepare the PNA 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 7.

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 5.

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 8.

Step 4. Inspect and (If Necessary) Remove the A4, A15, and A17 Synthesizer Boards, if They Are Not Version H

NOTE

The N5240-60074 (with tabs) or N5240-60076 (without tabs) pretested synthesizer boards will both show `Board P/N: N5240-63074` in the EEPROM window (as shown in Figure 1).

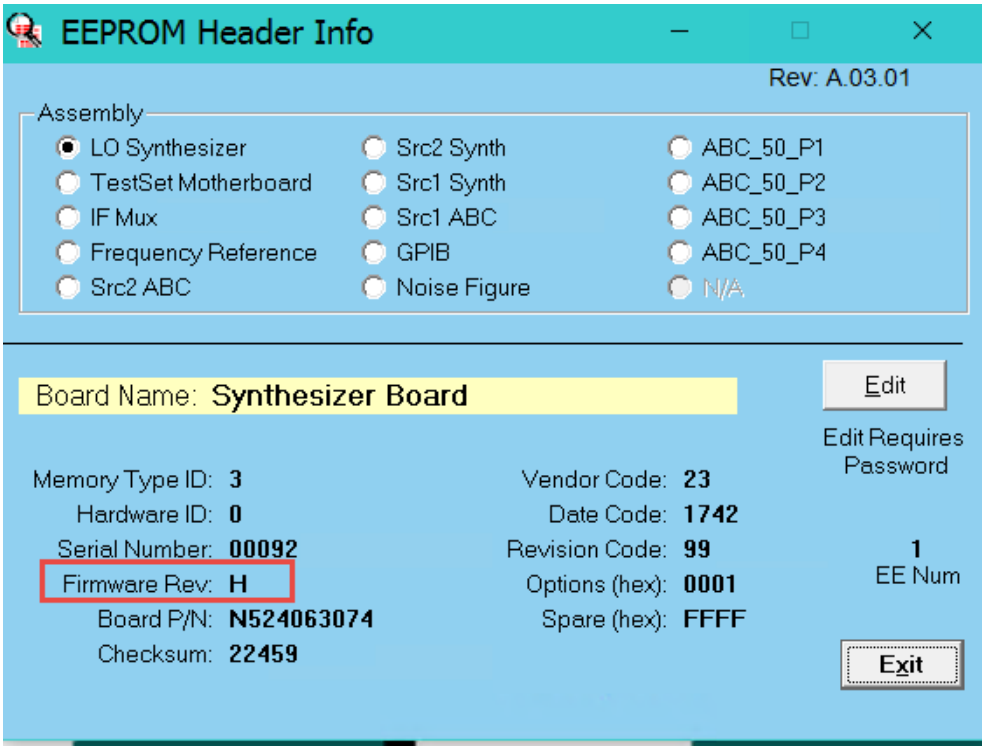
If the synthesizer board part number displayed in the EEPROM Header window is not N5240-63074 (e.g. N5242-63150), you will need to order new synthesizer boards. Refer to "Contacting Keysight" on page 5. Refer to "Contacting Keysight" on page 5.

Verify that the synthesizer boards are all version H or greater.

1. If your synthesizer boards are all H or greater, on the PNA: Press **Utility** > **System** > **Service** > **Utilities** > **View EEPROM Headers**.
2. Verify the LO Synthesizer, Src1 Synth, and Src2 Synth boards are all version H or greater.

Refer to Figure 1 on page 17.

Figure 1 EERPOM Header Info Window



3. If all of the boards are version H or greater, proceed to "Step 5. Remove the Front Panel Assembly".
4. If your boards are **not** version H or greater, remove the synthesizer boards for upgrading:

NOTE

IMPORTANT! This step includes disconnecting and laying aside several gray cables. Ensure that they are labeled.

For instructions, click the Chapter 7 bookmark "Removing and Replacing the A4-A17 Boards" (i.e., refer to your PNA's serial number prefix section) in the PDF Service Guide[1].

Save all mounting hardware (except the stabilizer bracket) for reuse.

Refer to Appendix A:, "Synthesizer Board Upgrade (N5240-60074 (with Tabs)/N5240-60076 (Without Tabs) Version F/G to Version H),".

Step 5. Remove the Front Panel Assembly

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

Step 6. Remove the A23 Test Set Motherboard

For instructions, click the Chapter 7 bookmark "Removing and Replacing the A23 Test Set Motherboard" in the PDF Service Guide[1].

Step 7. Remove the A24 IF Multiplexer (IF MUX) Board

NOTE

IMPORTANT! This step includes disconnecting and laying aside several gray cables. Ensure that they are labeled.

For instructions, click the Chapter 7 bookmark "Removing and Replacing the A24 IF Multiplexer Board" in the PDF Service Guide[1].

Save all mounting hardware (except the stabilizer bracket) for reuse.

1. See "Downloading the Online PNA Service Guide" on page 8.

Step 8. 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.

NOTE When removing a cable, also remove the plastic cable clamp, if present. It is normal for some of the cable clamp's adhesive to remain.

To see an image showing the location of some of the cables, click the Chapter 6 bookmark "Top Cables, All Cables - All Options (**S/N Prefixes** <6021)" or "Top Cables, All Cables - All Options (**S/N Prefixes** ≥6021)" in the PDF Service Guide[1].

And, to see an image showing the location of the other cables, click the Chapter 6 bookmark and then choose from the following:

– "Bottom RF Cables, 4-Port, Option 423 (**, S/N Prefixes** <6021)" and then "Bottom RF Cables, 4-Port, Option 423 with 029 (serial numbers <6021)"[1]

– "Bottom RF Cables, 4-Port, Option 423 (**, S/N Prefixes** ≥6021)" and then "Bottom RF Cables, 4-Port, Option 423 with 029 (**, S/N Prefixes** ≥6021)"[1].

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 analyzers with Option 029:

– N5247-20120 A71 port 1 bias tee to A56 port 1 noise bypass switch

For all analyzers with Option 423 without 029:

– N5247-20058 A32 port 2 ref coupler to front-panel REF 2 SOURCE OUT

For all analyzers with Option 029:

– N5247-20123 A57 port 2 noise bypass switch to A74 port 2 bias tee

For all analyzers with Option 423 without 029:

– N5247-20081 Front-panel port 1 CPLR THRU to A42 port 1 bias tee

1. See "Downloading the Online PNA Service Guide" on page 8.

For all analyzers:

- N5247-20028 A72 port 3 bias tee to A34 port 3 coupler
- N5247-20010 Port 3 CPLR THRU to A72 port 3 bias tee
- N5247-20022 A33 port 1 coupler to A71 port 1 bias tee
- N5247-20021 Port 4 CPLR THRU to A73 port 4 bias tee
- N5247-20029 A73 port 4 bias tee to A35 port 4 coupler
- N5247-20080 A74 port 2 bias tee to A36 port 2 coupler

For all analyzers with Option 423 without 029:

- N5247-20027 Front-panel port 2 CPLR THRU to A45 port 2 bias tee

For all analyzers:

- N5247-60021 A71 port 1 bias tee to A23 test set motherboard J541
- N5247-60021 A72 port 3 bias tee to A23 test set motherboard J543
- N5247-60021 A73 port 4 bias tee to A23 test set motherboard J544
- N5247-60021 A74 port 2 bias tee to A23 test set motherboard J542

Step 9. Remove the A38–A41 Bias Tee Assemblies

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A38-A41 Bias Tees” in the PDF Service Guide[1].

The bias tee assemblies will not be reused.

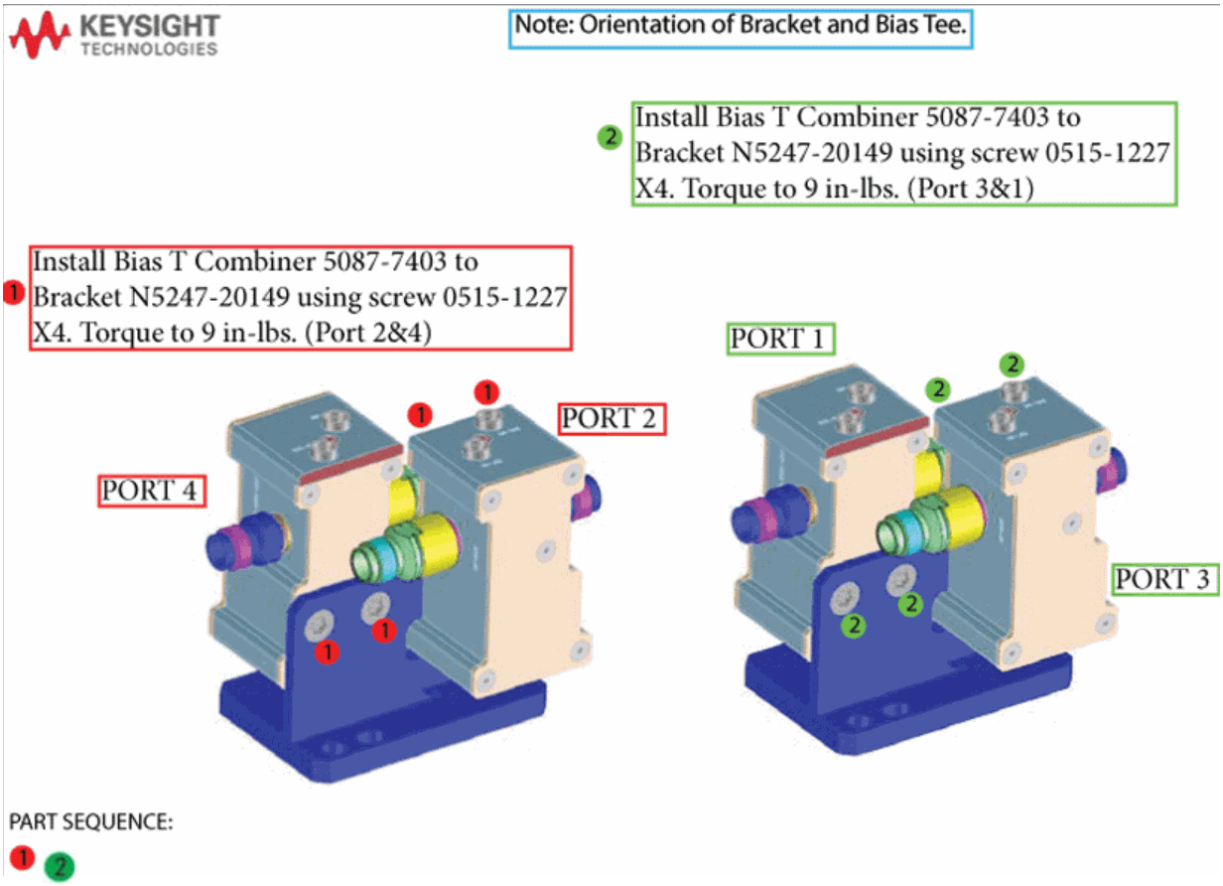
1. See “Downloading the Online PNA Service Guide” on page 8.

Step 10. Assemble and Install the A71–A74 Bias Tee Combiner Assemblies

Refer to Figure 2 for this step of the procedure. New parts are listed in Table 1 on page 11.

1. Assemble the Bias T combiners 5087-7403 (x4) to brackets N5247-20149 (x2) using 0515-1227 screws (x8) (items ① and ②). Torque to 9 in-lbs. Refer to Figure 2.

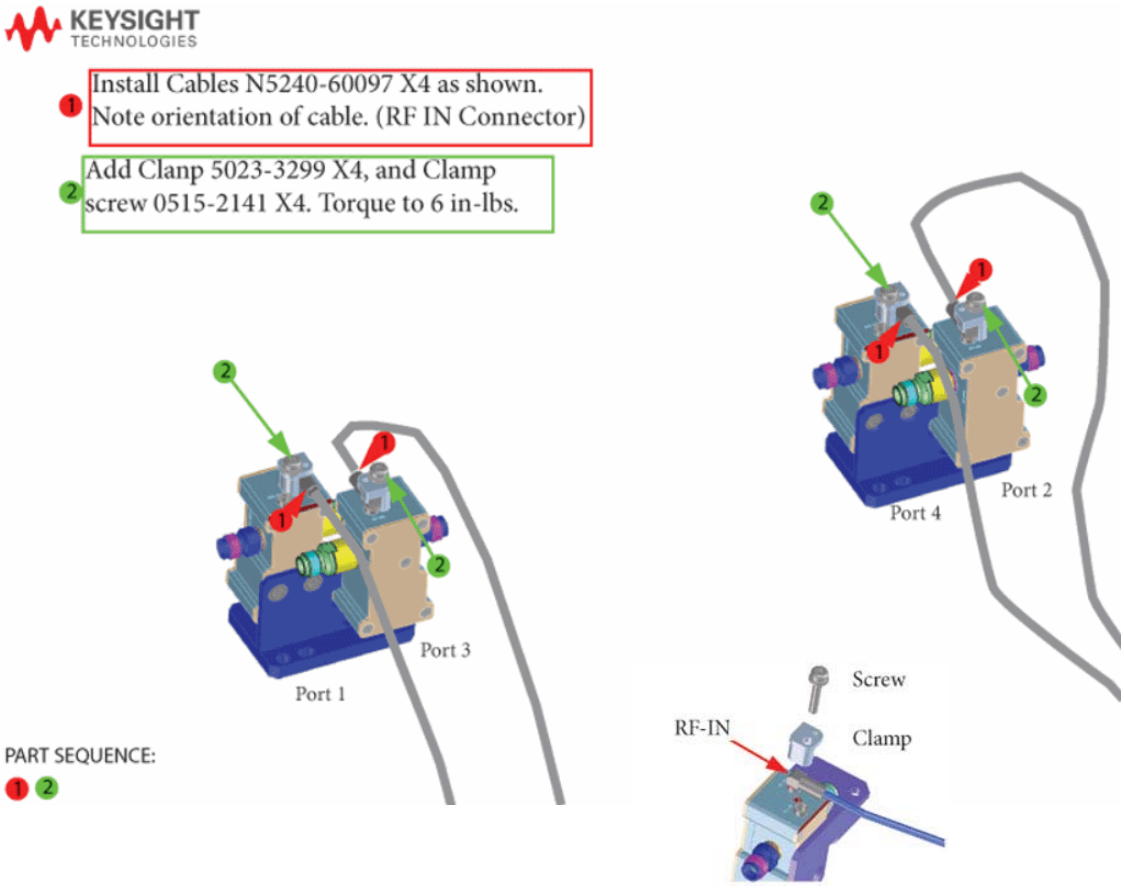
Figure 2 Assemble Bias T Combiners to brackets (5087-7403, N5247-20149, and 0515-1227)



Refer to Figure 3 for this step of the procedure. New parts are listed in Table 1 on page 11.

2. Install the N5240-60097 (x4) cables onto the bias tee combiners using 5023-3299 clamps (x4) and clamp screws 0515-2141 screws (x4) (items ① and ②). Torque to 6 in-lbs. Refer to Figure 2.

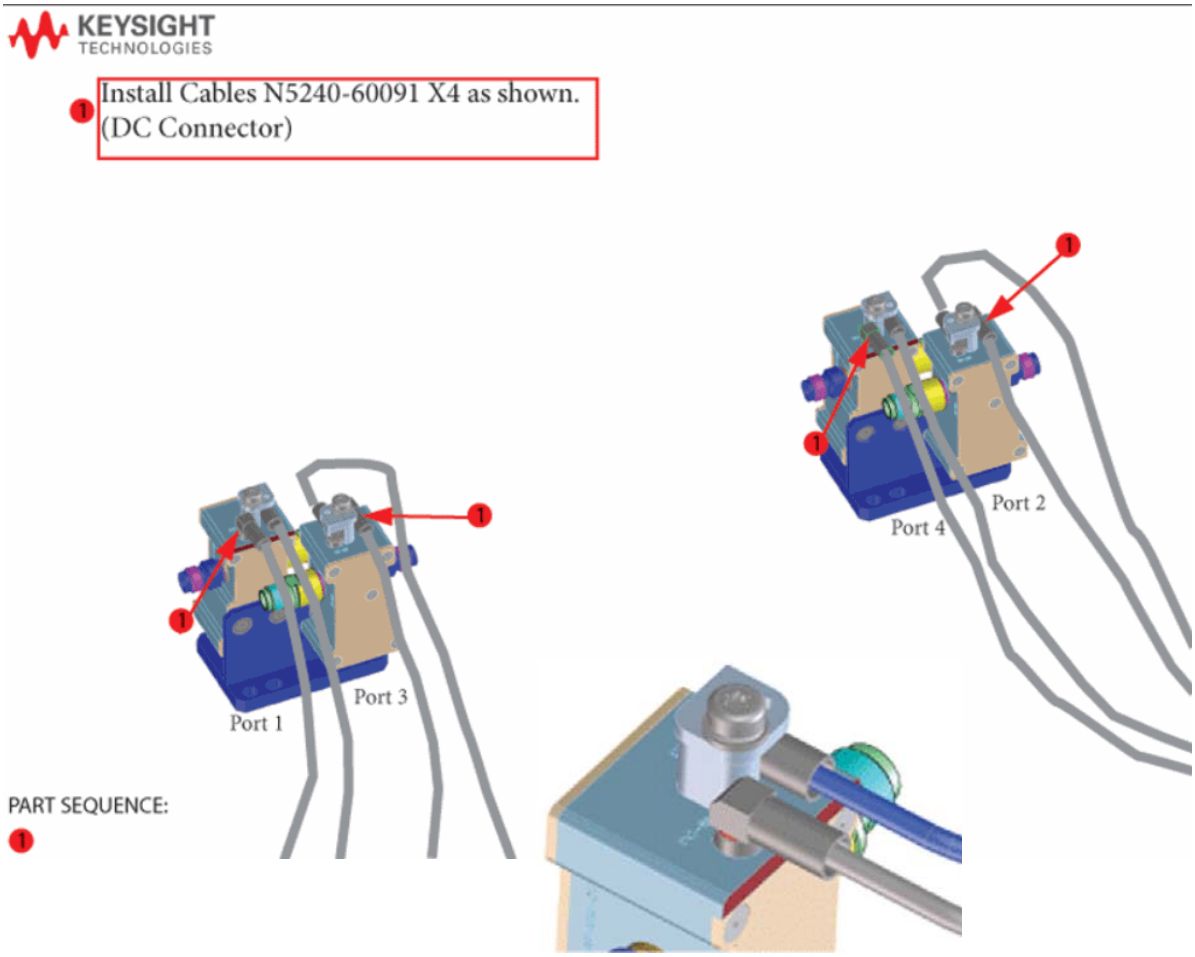
Figure 3 Install cables and clamps to the bias tee combiners (N5240-60097, 5023-3299, and 0515-2141)



Refer to Figure 4 for this step of the procedure. New parts are listed in Table 1 on page 11.

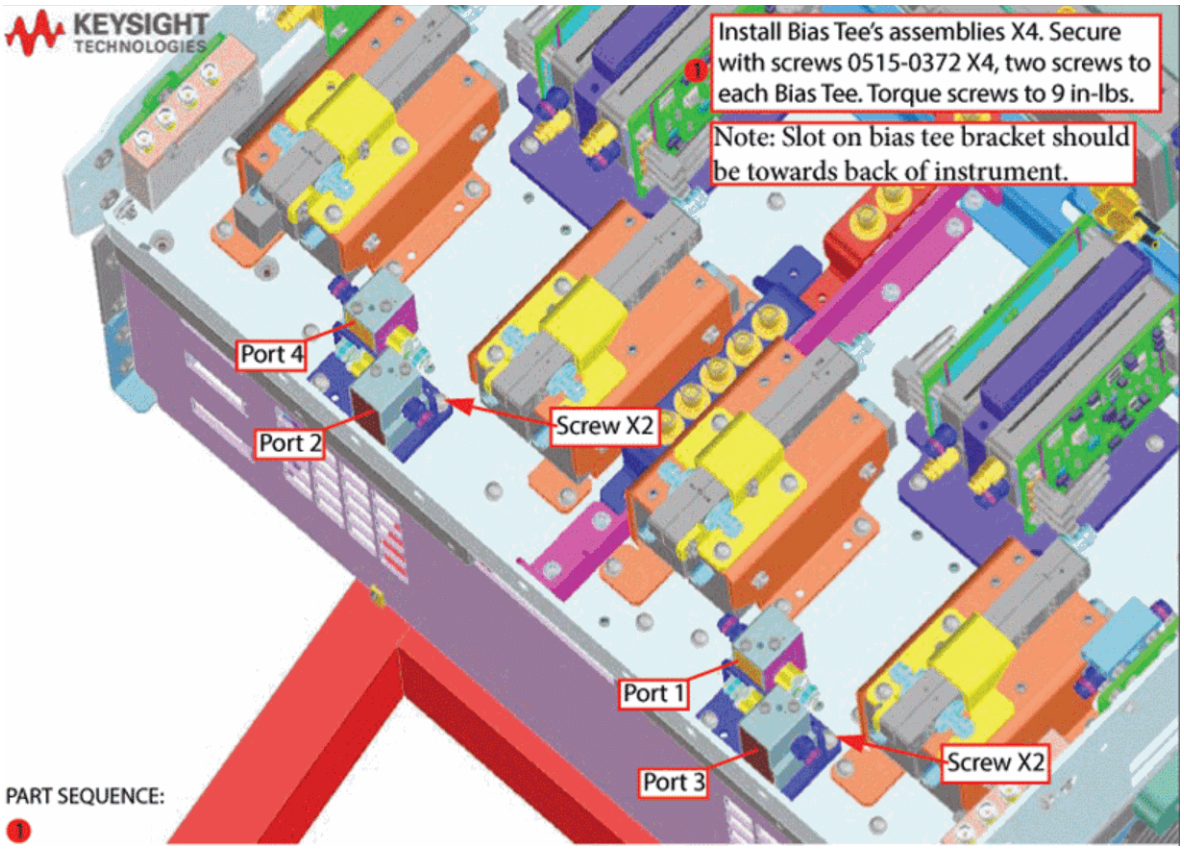
3. Install the cables N5240-60091 (x4) onto the bias tee combiners (item ①).

Figure 4 Install DC cables to the bias tee combiners (N5240-60091)



4. Install the Bias T combiners A71-A74 to using 0515-0372 (x4) screws. Torque screws to 9 in-lbs. Refer to Figure 5.

Figure 5 Install the A71-A74 Bias T Combiners to brackets (5087-7403, N5247-20149, and 0515-0372)



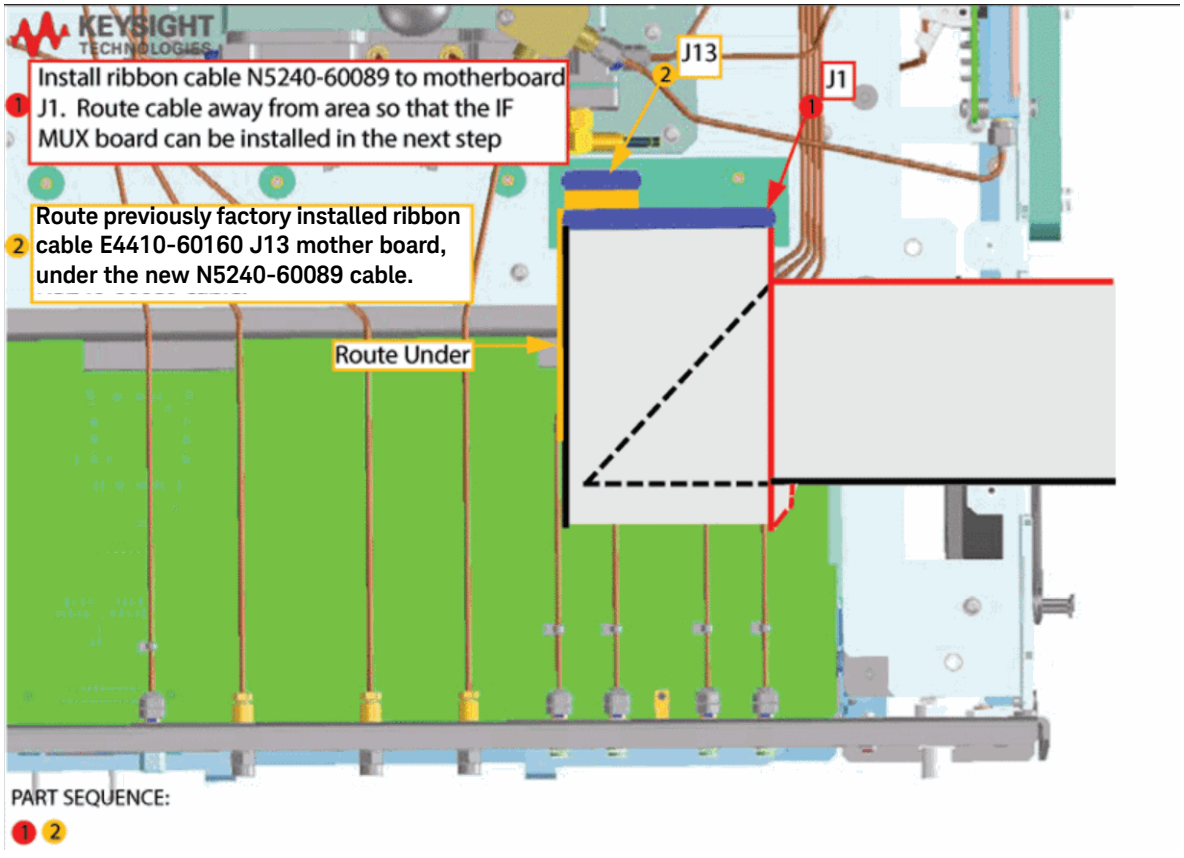
Step 11. Connect the A18 Motherboard/IF Multiplexer (IF MUX)/Low Frequency Extension (LFE)/Test Set Motherboard (TSMB) Ribbon Cable (N5240-60089)

1. Remove the N5242-60004 Motherboard/IF MUX/Test set motherboard (MB)/IF MUX/TSMB) ribbon cable from the A18 system motherboard connector J1 and discard this cable (item ①). Refer to Figure 6 (N5240-60089 is shown, but N5242-60004 is similar).
2. Install the N5240-60089 to A18 system motherboard J1(items ① and ②). Refer to Figure 6.

NOTE

IMPORTANT! Be careful to route the cable as shown in Figure 6 to avoid interference with the IF MUX board installation.

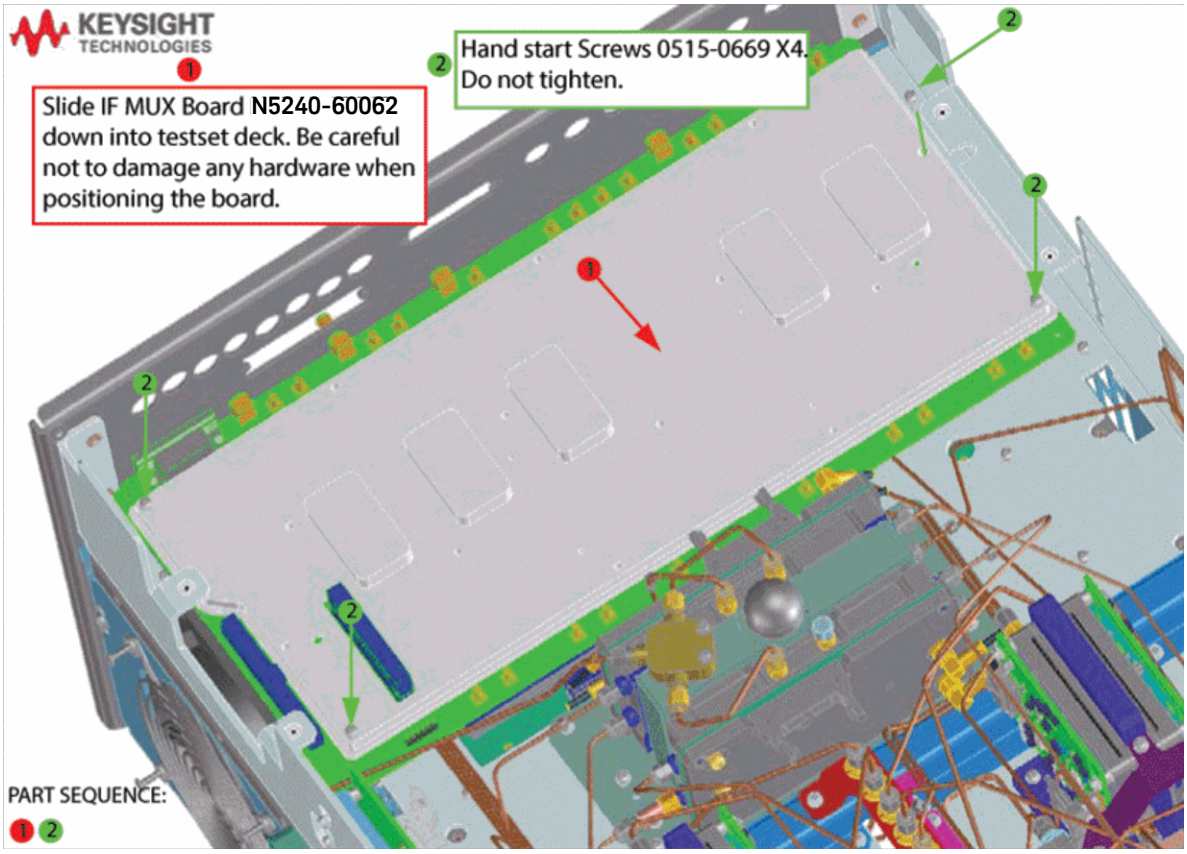
Figure 6 Install the N5240-60089 MB/IF MUX/TSMB Ribbon Cable to A18 Motherboard J1



Step 12. Reinstall the A24 IF Multiplexer (IF MUX) Board and Connect the Motherboard / IF Multiplexer / Low Frequency Extension (LFE)/ Test set motherboard (MB/IF MUX/LFE/TSMB) ribbon cable (N5240-60089) and the IF MUX Rear Panel Hardware

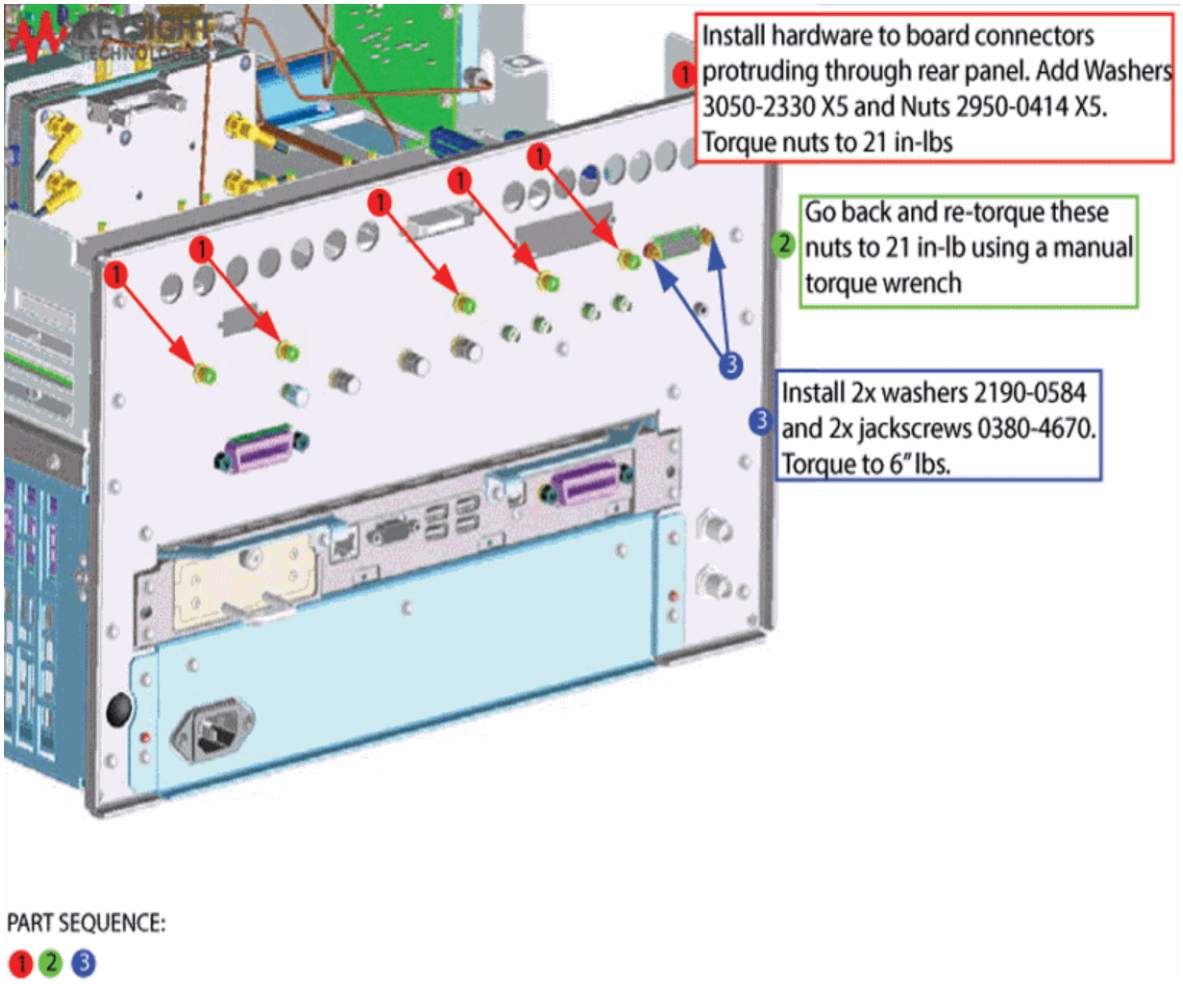
1. Reinstall the IF MUX board using 0515-0669 (x4) screws (item ①).
2. For now, hand tighten only (item ②). Refer to Figure 7.

Figure 7 Reinstall the A24 IF MUX Board (N5240-60062 and 0515-0669)



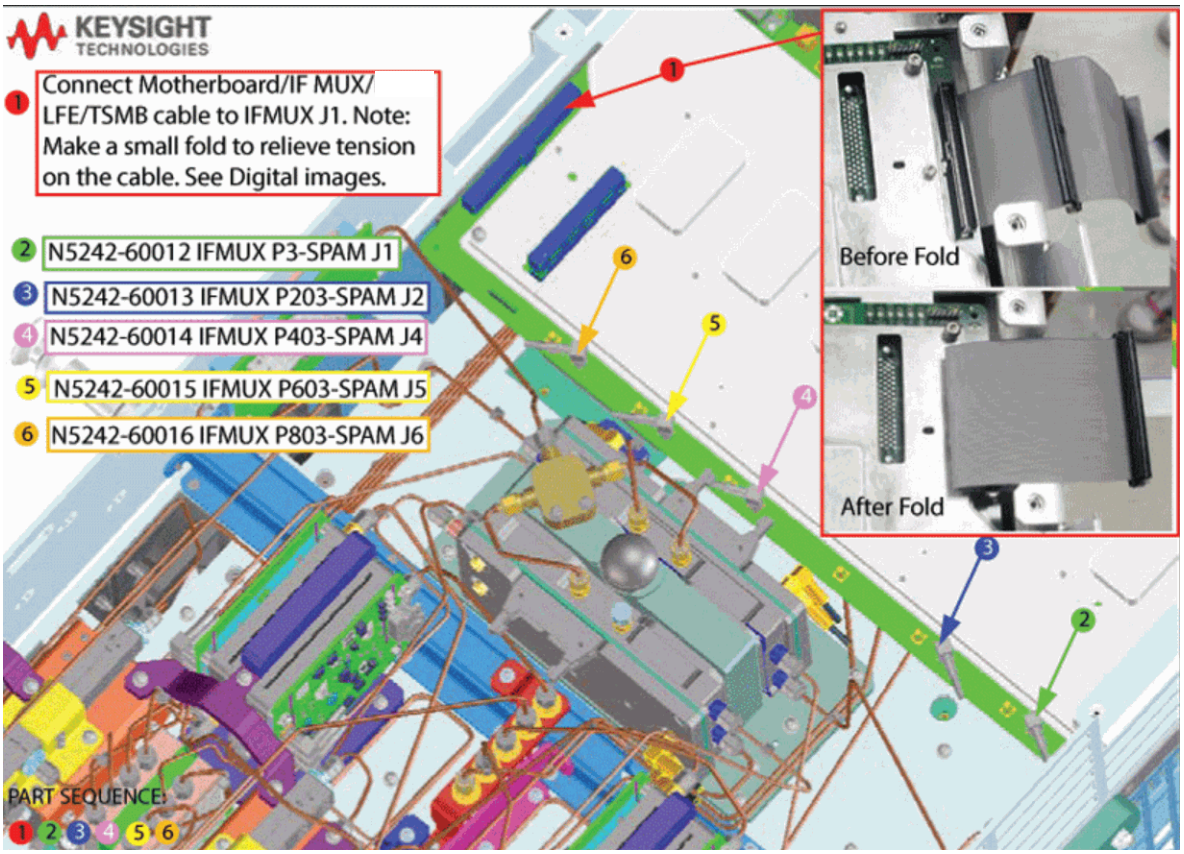
3. Reinstall the IF MUX board rear panel connectors using the washers and nuts removed in "Step 7. Remove the A24 IF Multiplexer (IF MUX) Board" on page 18 (item ① and ②). Torque to 6 in-lbs. Refer to Figure 8.
4. Torque the 0515-0669 IF MUX board screws that were previously hand-tightened to 21 in-lbs (item ③).

Figure 8 Install the A24 IF MUX Board (N5240-60062 and 0515-0669)



5. Connect N5240-60089 Motherboard / IF Multiplexer / Low Frequency Extension (LFE)/ Test set motherboard (MB/IF MUX/LFT/LFE/TSMB) ribbon cable to IF MUX J1 and fold as shown (item ①). Refer to Figure 9.
6. Reconnect the IF MUX/SPAM gray cables to the A24 IF MUX board as indicated in Figure 9 (items ② through ⑥).

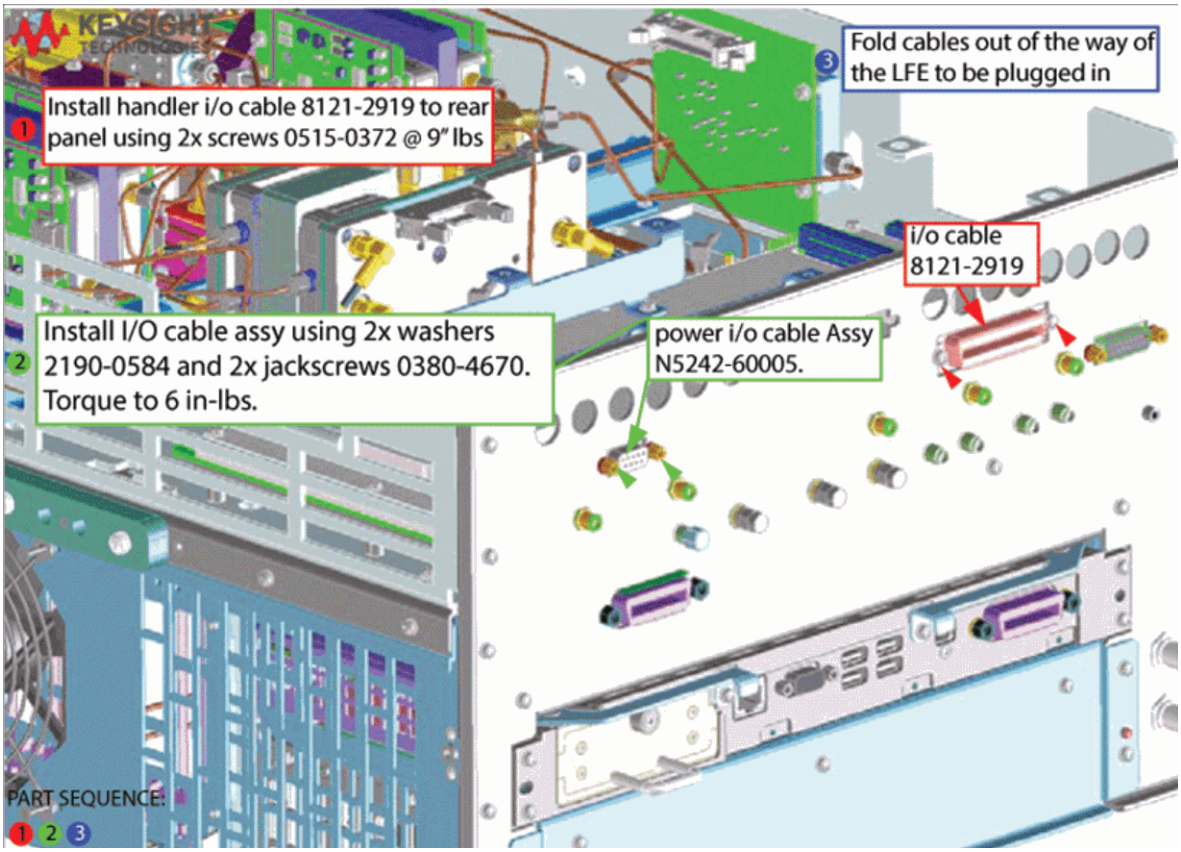
Figure 9 Connect the MB/IF MUX/ Low Frequency Extension (LFE)/TSMB ribbon cable to A24 IF MUX J1 (N5240-60089)



Step 13. Reinstall the handler, Power and Other I/O Assemblies

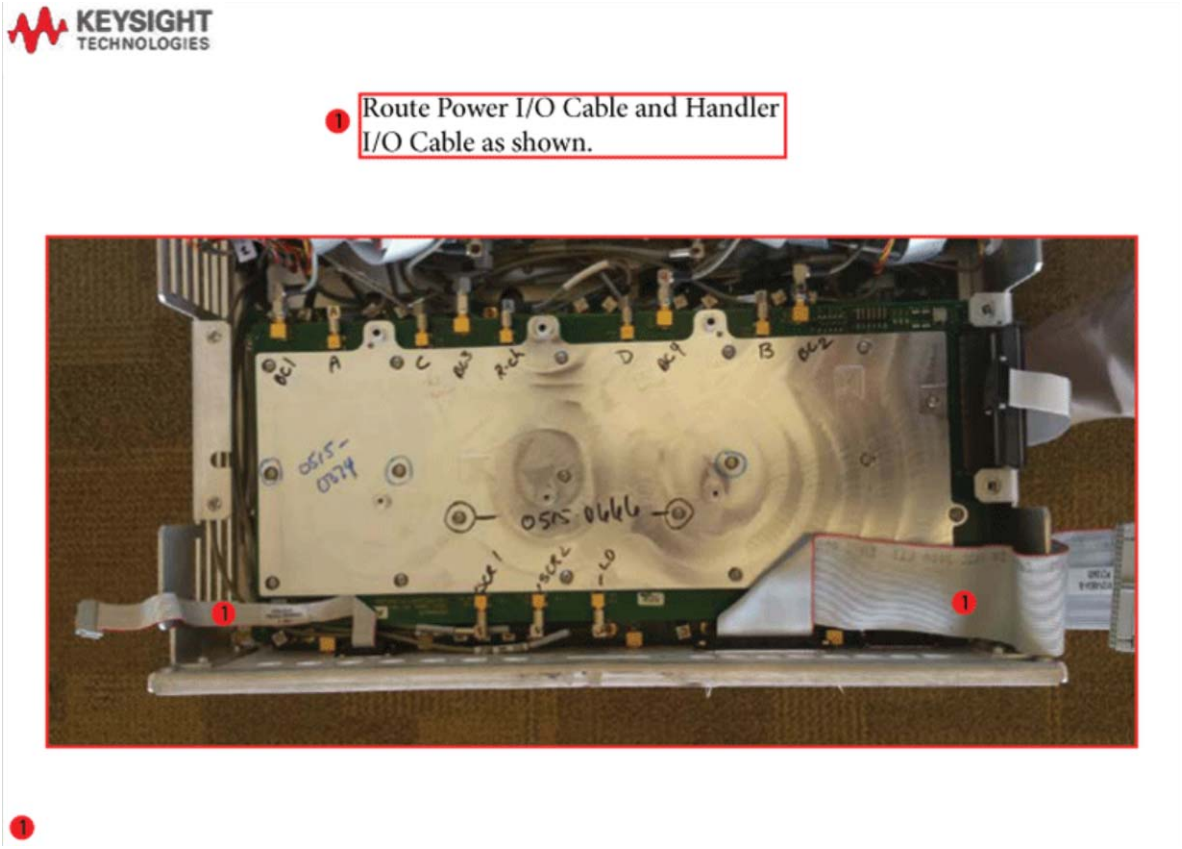
1. Reinstall the handler, power, and other I/O assemblies and fold cables out of the way of the LFE board to be plugged in (items ① through ③). Refer to Figure 10.

Figure 10 Reinstall handler I/O cable, I/O cable assembly, power I/O assembly, and I/O Cables.



2. Route Power I/O and Handler I/O cables. Refer to Figure 11.

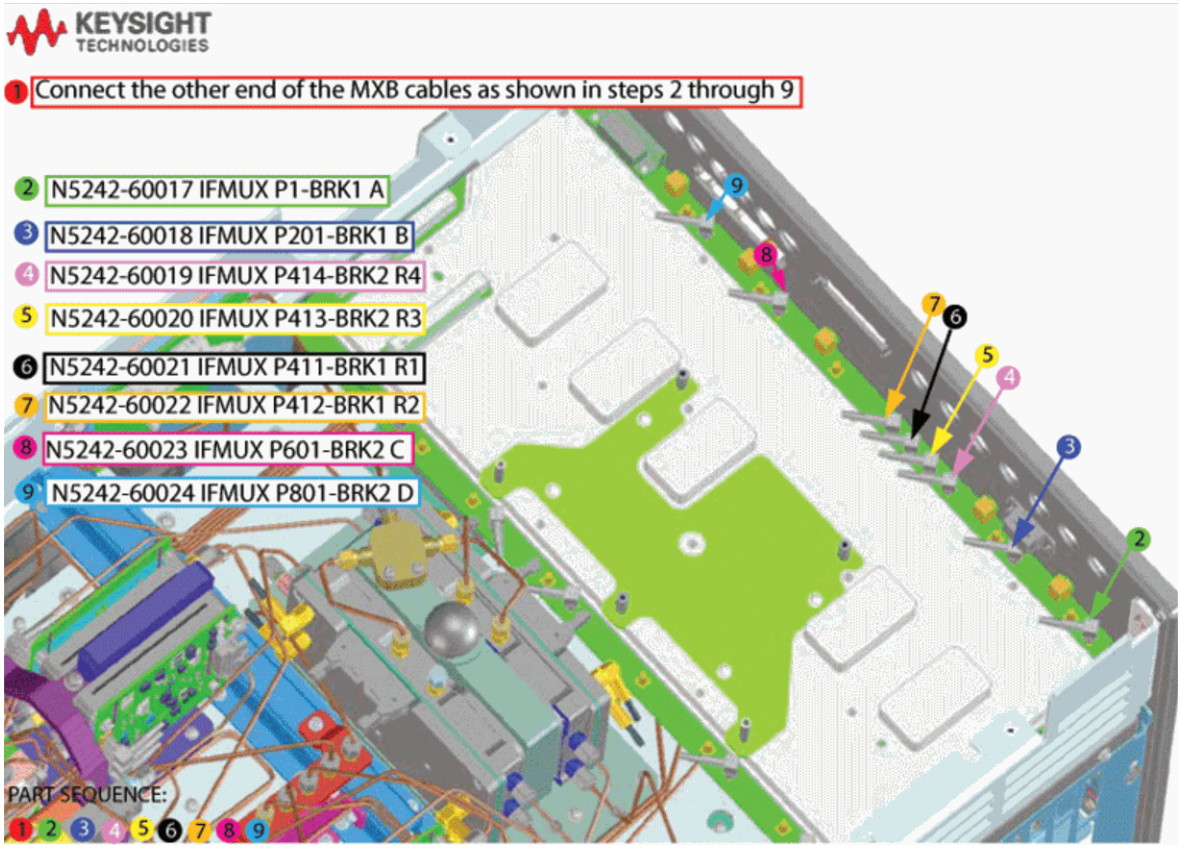
Figure 11 Route Power I/O and Handler I/O cables (8121-2919 and N5242-60005)



Step 14. Reinstall the Mixer Brick (MXB) Cables

Reconnect the other end of the mixer brick (MXB) cables (item ①) and all of the IF multiplexer (IF MUX) gray cables (IF MUX board as shown (items ② through ⑨). Refer to Figure 12.

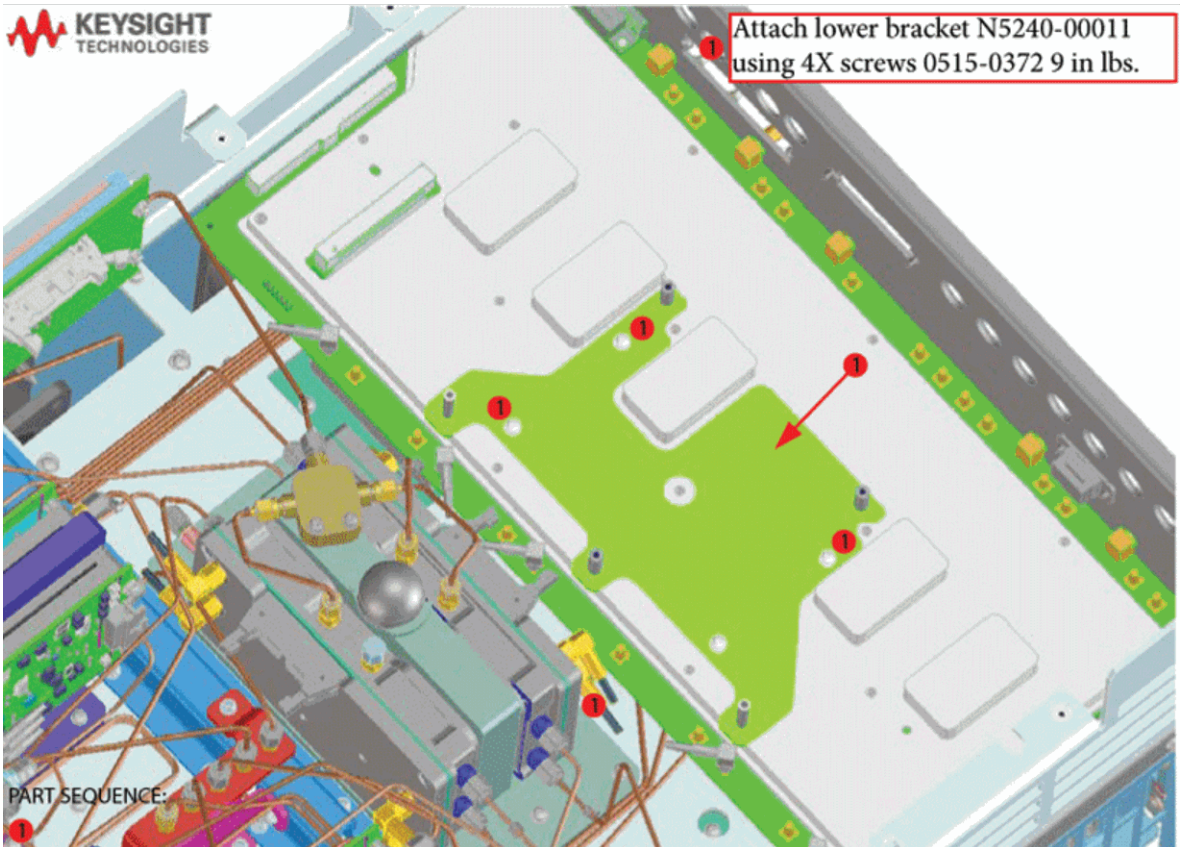
Figure 12 Reconnect the other end of the IF gray cables to the IF MUX board (N5242-60017, -60018, 60019, -60020, -60021, -60022, -60023, and -60024)



Step 15. Attach Lower Bracket (N5240-00011) to IF MUX Board Shield

Attach lower bracket (N5240-00011) to IF MUX board using 0515-0372 screws (x4). Torque to 9 in-lbs. Refer to Figure 13.

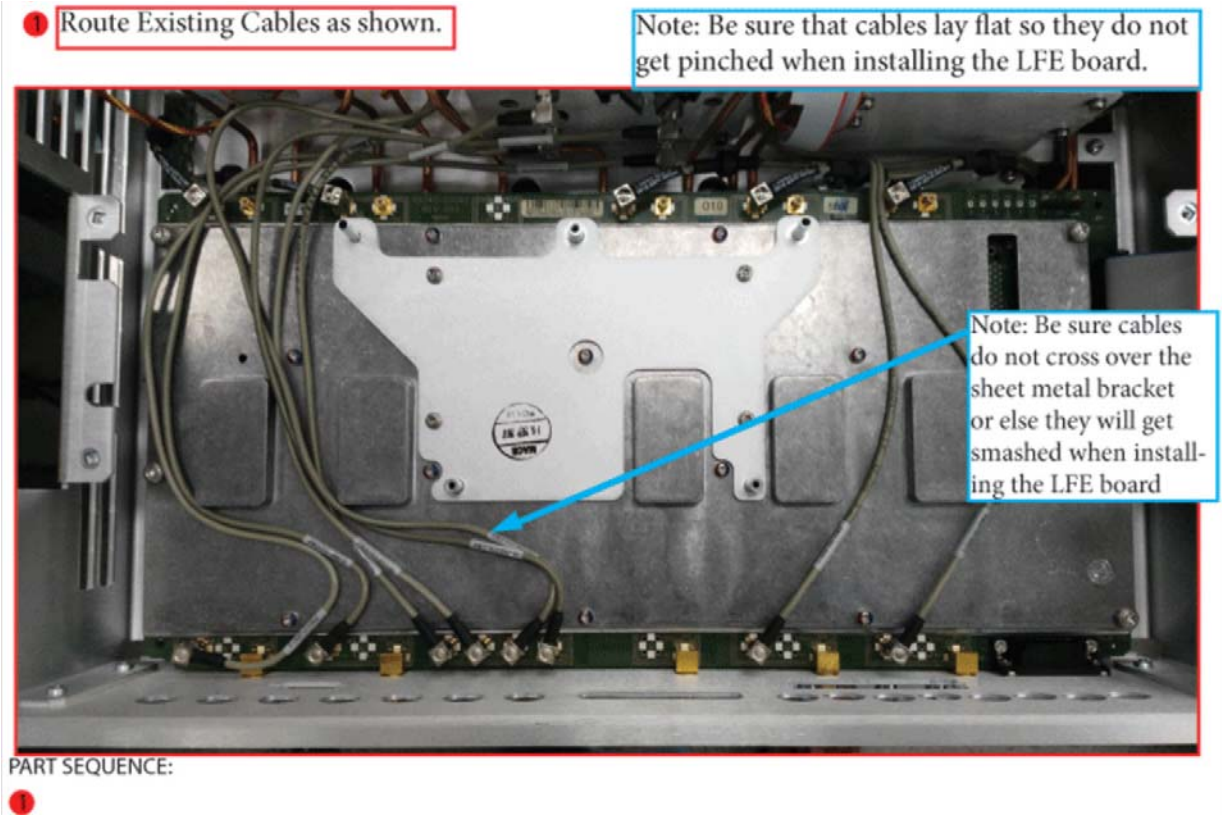
Figure 13 Attach lower bracket to IF MUX board (N5240-00011 and 0515-0372)



Step 16. Connect and Route New LFE Cables (8120-5014 (x2) and 8120-5017 (x3)) to the on the IF Multiplexer (IF MUX) Board

1. Route existing cables as shown to avoid pinching (item ①). Refer to Figure 14.

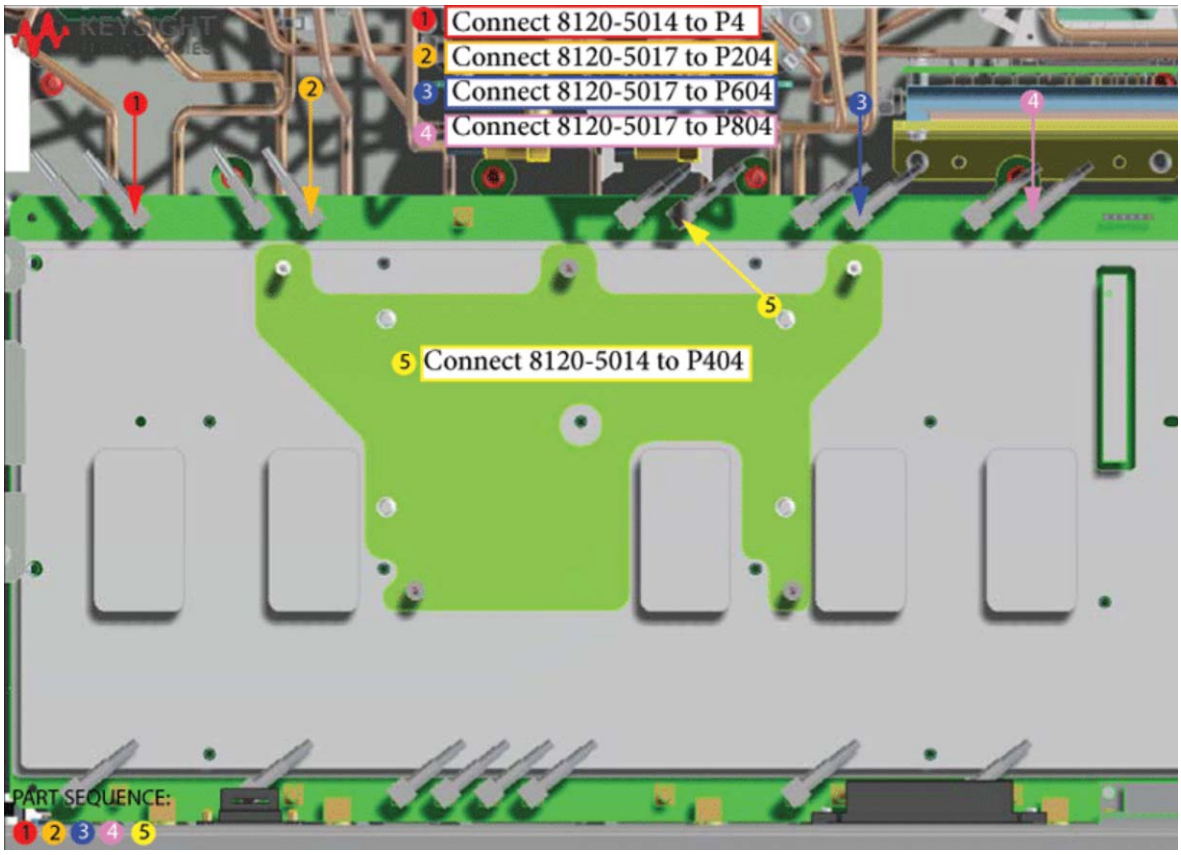
Figure 14 To avoid pinching cables, route the existing cables as shown



2. Connect and route the 8120-5014 (x1) and 8120-5017 (x3) cables as shown on the IF MUX board (items ① through ⑤). You will connect the other ends of the IF gray cables later on the process. Refer to Figure 15

NOTE When connecting the IF gray cables, be careful to look for the correct connector labels on the IF multiplexer (IF MUX) board.

Figure 15 Connecting and Routing the Gray Cables on the IF MUX board (8120-5014 (x2) and 8120-5017 (x3))



3. Route the reconnected mixer brick (MXB) and IF multiplexer (IF MUX) gray cables that were reconnected in “Step 14. Reinstall the Mixer Brick (MXB) Cables” on page 31. Refer to Figure 16.

Figure 16 Routing the reconnected MXB and IF MUX Gray Cables on the IF MUX board

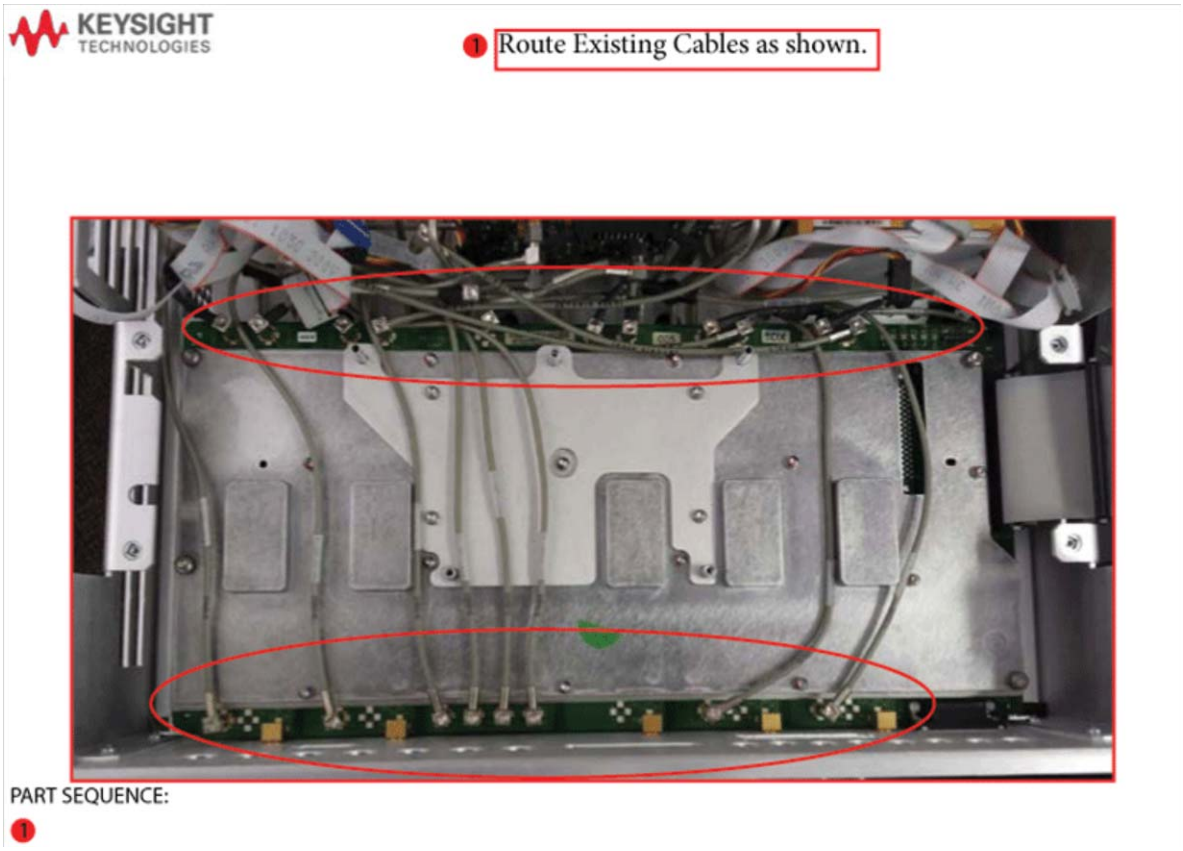
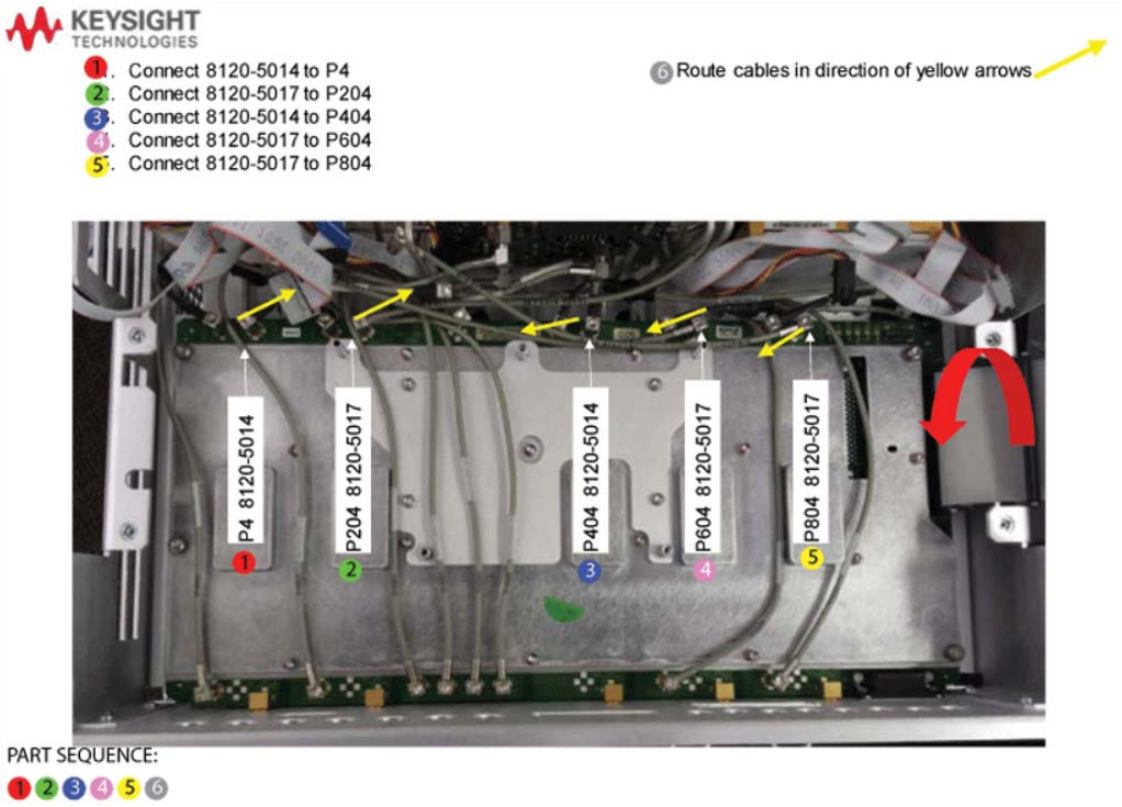


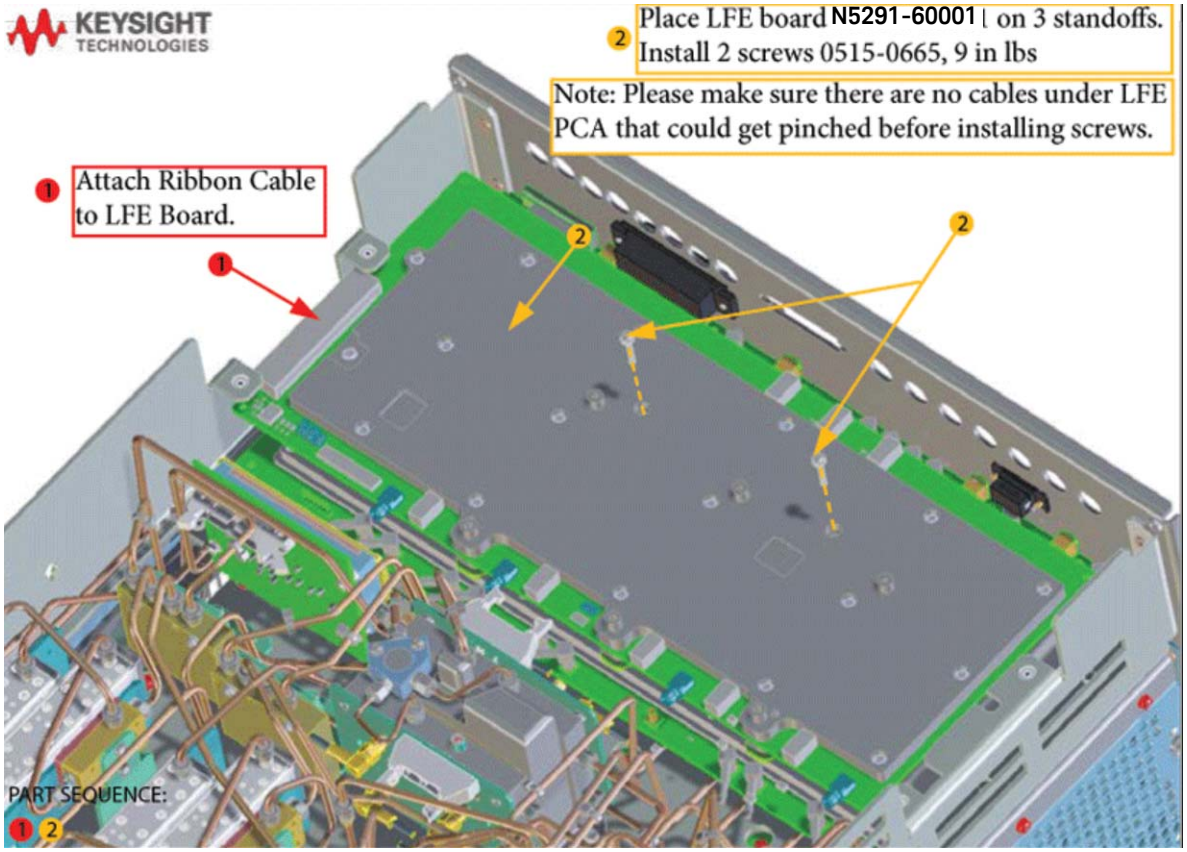
Figure 17 Routing the new low frequency extension (LFE) Gray Cables on the IF MUX board (8120-5014 (x2) and 8120-5017 (x3))



Step 17. Install A70 Low Frequency Extension (LFE) Board

1. Install the LFE A70 board using the standoffs as a guide.
2. Connect N5240-60089 Motherboard / IF Multiplexer / LFT/ LFE/ Test set motherboard (MB/IF MUX/LFT/LFE/TSMB) ribbon cable to LFE board J1 (item ①). Refer to Figure 18.
3. Install the N5291-60001 A70 LFE board using the 0515-0665 screws (x2). Torque to 9 in-lbs (item ②). Refer to Figure 18.

Figure 18 Install the A70 LFE board (N5240-60089, N5291-60001 and 0515-0665)



Step 18. Connect A71-A74 Bias Tee Combiner's New Cables to A70 Low Frequency Extension (LFE) Board and the Other Ends of the New Cables Connected to the IF Multiplier (IF MUX) Board

CAUTION

This upgrade kit contains cables for Version 6 synthesizers and Version 7 direct digital synthesizer (DDS) assemblies. Please refer to your instrument's Service Guide, if you are unclear which assembly you have installed. Refer to "Downloading the Online PNA Service Guide" on page 8.

1. Connect the IF gray cables items ① through ⑤ as shown in Figure 19 on page 39 and Figure 20 on page 40. (8120-5014 (x2), 8120-5017 (x3)). (i.e., one end was installed in Figure 15 on page 34.)
2. Then choose one of the following:
   - **Version 6 Synthesizers**: Connect the Source 1, Source 2, and LO Source cables to the LFE board as shown (N5245-60027, N5242-60079, and N5242-60080) – (items ⑥ through ⑧). The other end of the N5245-60027, N5242-60079, and N5242-60080 are connected to Source1, Source 2, and LO Source boards in a later step. Refer to Figure 19 on page 39.
   - **Version 7 Synthesizers**: Connect the direct digital synthesizer (DDS) assembly cables Source 1, Source 2, and LO Source cables to the LFE board as shown (N5240-60112, N5240-60113, and N5240-60114) – (items ⑥ through ⑧). The other end of the N5240-60112, N5240-60113, and N5240-60114 are connected to Source1, Source 2, and LO Source boards in a later step. Refer to Figure 20 on page 40.

Figure 19 **Version 6 Synthesizers**: Connect the other ends of the IF gray cables and connect the Source 1, Source 2, and LO Source cables as shown (8120-5014 (x2), 8120-5017 (x3), N5245-60027, N5242-60079, and N5242-60080)

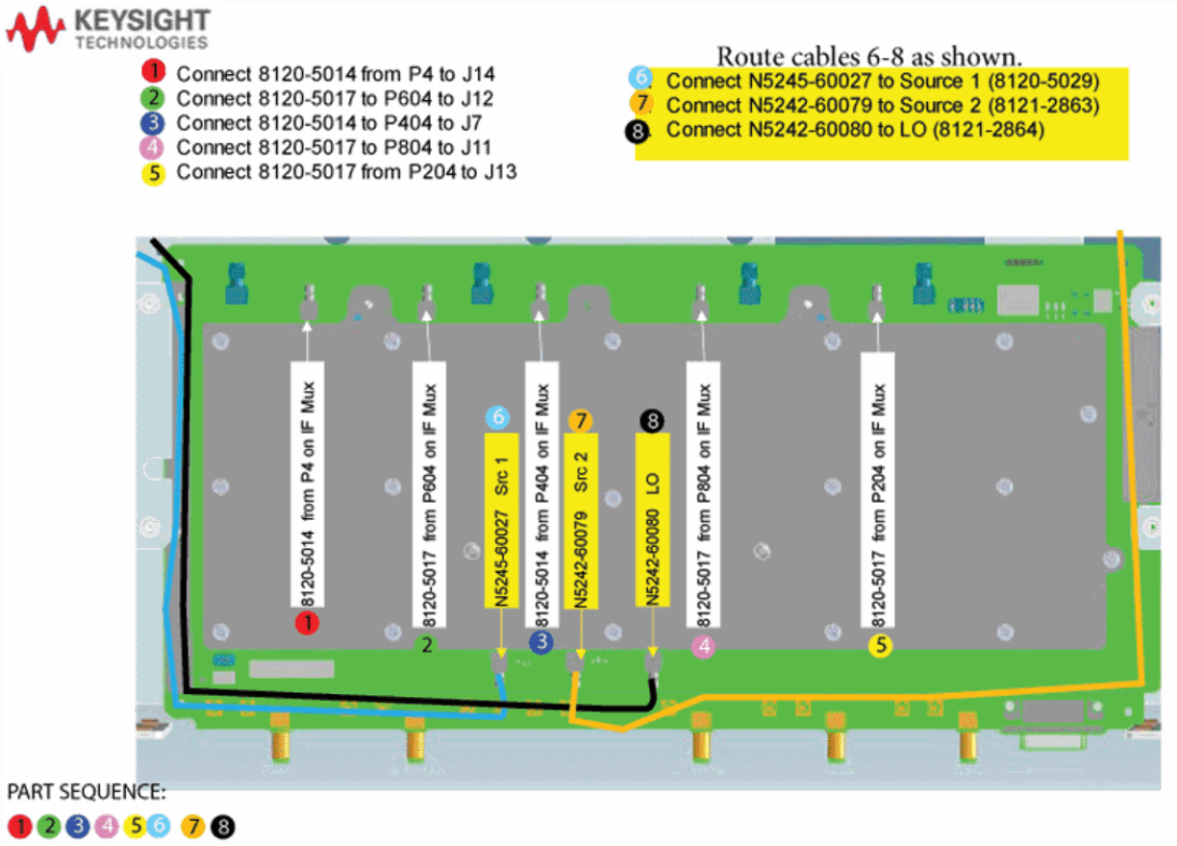
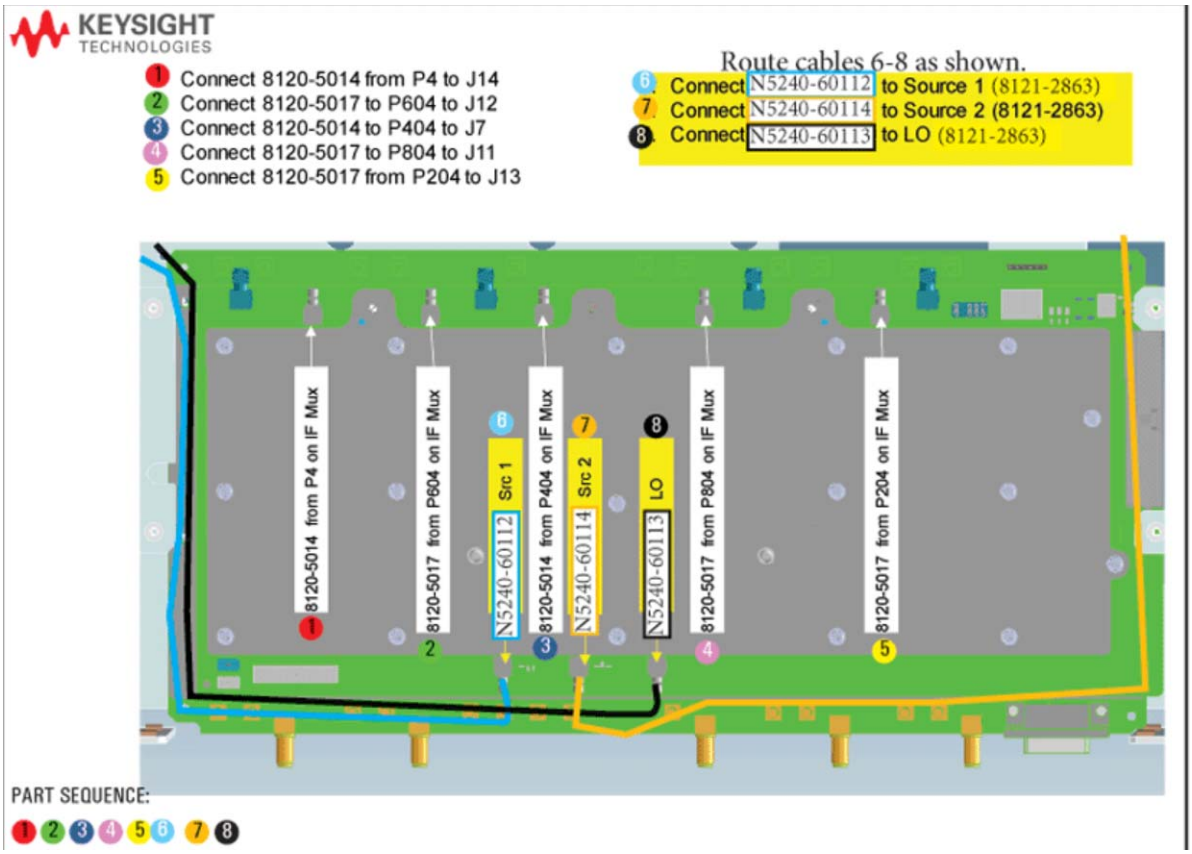


Figure 20 **Version 7 Synthesizers**: Connect the other ends of the IF gray cables and connect the Source 1, Source 2, and LO Source cables as shown (8120-5014 (x2), 8120-5017 (x3), N5240-60112, N5240-60113, and N5240-60114)



Step 19. Install the New Bias Tee Combiner's Semirigid Test Set Cables, the Blue cables, and Install the Cable Clamps Onto the Ferrite Beads

CAUTION

Unless otherwise specified, use a 5/16-in torque wrench set to 10 in-lbs on all cable connections (i.e., except for the cable ends that connect to the couplers, torque these to 8 in-lbs. Refer to Figure 22 on page 44 through Figure 25 on page 48).

And, the front and rear panel bulkhead connectors use a 9 mm nutsetter or open end torque wrench set to 21 in-lb.

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

To avoid damage when connecting and torquing the bias T combiner semirigid cables, always use a wrench to hold the bias T combiner connectors.

This step contains the following:

– "Install the New Semirigid Test Set Cables" on page 41
– "Install New Blue Bias-Tee Combiner Cables and Clamps N5240-60097 From the A71–A74 Bias Tees "RF-IN" to the A70 LFE Board "Port1"–"Port4" Connectors" on page 48
– "Install clamps onto the Ferrite Beads" on page 49

Install the New Semirigid Test Set Cables

Refer to Figure 21 on page 43 through Figure 30 on page 57 for this step of the procedure. Although only Option 423 is shown in the illustrations, Option 425 is similar in appearance. To see an image showing the location of these cables, click the appropriate Chapter 6 bookmark (e.g., "4-Port Configuration, Options 425/029 (S/N Prefixes <6021)" or "4-Port Configuration, Options 425/029 (S/N Prefixes ≥6021)") in the PDF Service Guide[1]. New parts are listed in Table 1 on page 11.

1. See "Downloading the Online PNA Service Guide" on page 8.

1. Install the following new Option 425 LFE cables in the order listed:

NOTE

The reference designators in this step correspond to the figures Figure 21 on page 43 through Figure 23 on page 45. But, some of the previous steps are provided for your reference.

Option 425 without 029—Ports 2 and 4: Connect the following, by referring to Figure 22 on page 44 (See also Figure 21 on page 43.):

- ①—(**Option 425 without 029 Only**) W187 (N5247-20163) A74 Bias Tee combiner to CPLR THRU, port 2
- ②—W186 (N5247-20171) A35 test port coupler to A73 Bias Tee combiner, Port 4
- ③—W188 (N5247-20169) A36 test port coupler to A74 Bias Tee combiner, Port 2
- ④—W185 (N5247-20165) A73 Bias Tee combiner, Port 4 to front panel CPLR THRU

Option 425 with 029—Ports 2 and 4: Connect the following, by referring to Figure 23 on page 45 (See also Figure 21 on page 43.):

- ②—W186 (N5247-20171) A35 test port coupler to A73 Bias Tee combiner, Port 4
- ③—W188 (N5247-20169) A36 test port coupler to A74 Bias Tee combiner, Port 2
- ④—W185 (N5247-20165) A73 Bias Tee combiner, Port 4 to front panel CPLR THRU
- ⑤—(**Option 425 with 029 Only**) W190 (N5247-20173) A74 Bias Tee combiner, Port 2 to A57 noise switch, port 2

Option 425 without 029—Ports 1 and 3: Connect the following by referring to Figure 23-1 on page 46 (See also Figure 21 on page 43.):

- ①—W182 (N5247-20162) A33 test port coupler to A71 Bias Tee combiner, Port 1
- ②—W183 (N5247-20170) A72 Bias Tee combiner, Port 3 to front panel CPLR THRU
- ③—W184 (N5247-20164) A34 test port coupler to A72 Bias Tee combiner, Port 3
- ④—(**Option 425 without 029 Only**) W181 (N5247-20167) A71 Bias Tee combiner, to CPLR THRU, port 1

Option 425 with 029—Ports 1 and 3: Connect the following by referring to Figure 24 on page 47 (See also Figure 21 on page 43.):

- ①—W182 (N5247-20162) A33 test port coupler to A71 Bias Tee combiner, Port 1
- ②—W183 (N5247-20170) A72 Bias Tee combiner, Port 3 to front panel CPLR THRU
- ③—W184 (N5247-20164) A34 test port coupler to A72 Bias Tee combiner, Port 3
- ⑤—(**Option 425 with 029 Only**) W189 (N5247-20172) A71 Bias Tee combiner, Port 1 to A56 noise switch, port 1

Figure 21 New Test Set Cable Installation (Option 423 with 029 Shown. Option 425 with 029 is similar.)

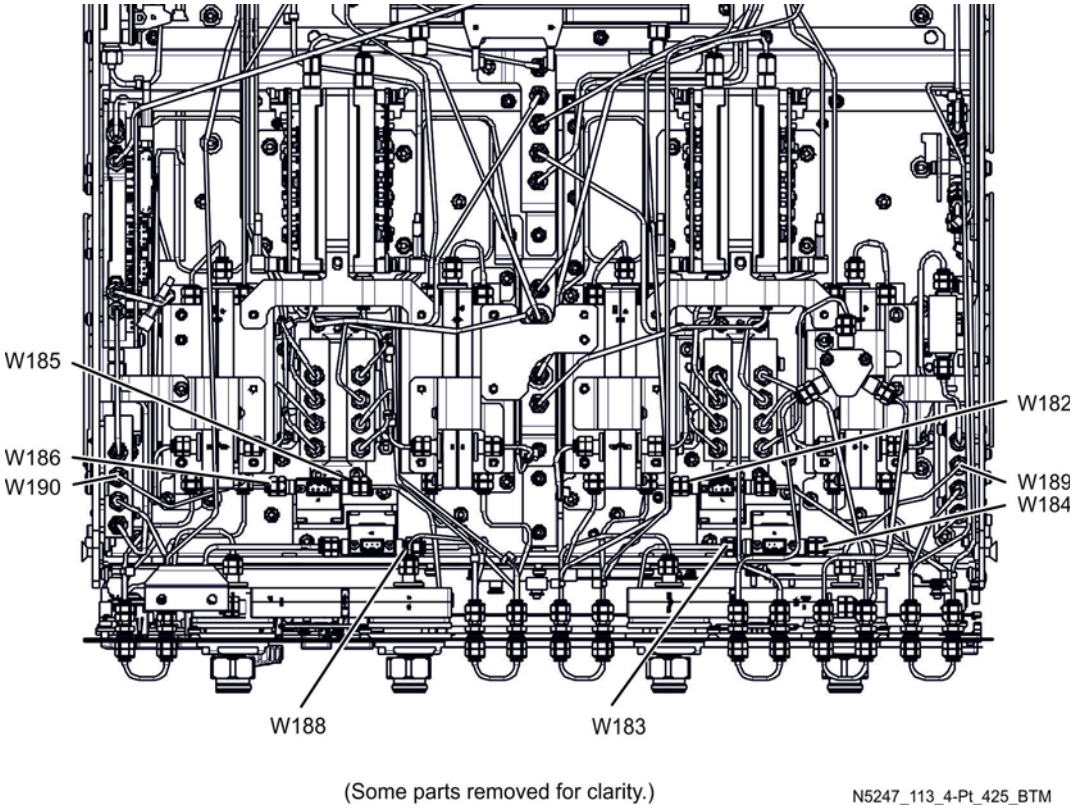


Figure 22 New Option 425 (**without** 029) Test Set Cables Installation (N5247-20165, N5247-20169, N5247-20171 and f**or 425 without 029 only**, N5247-20163)

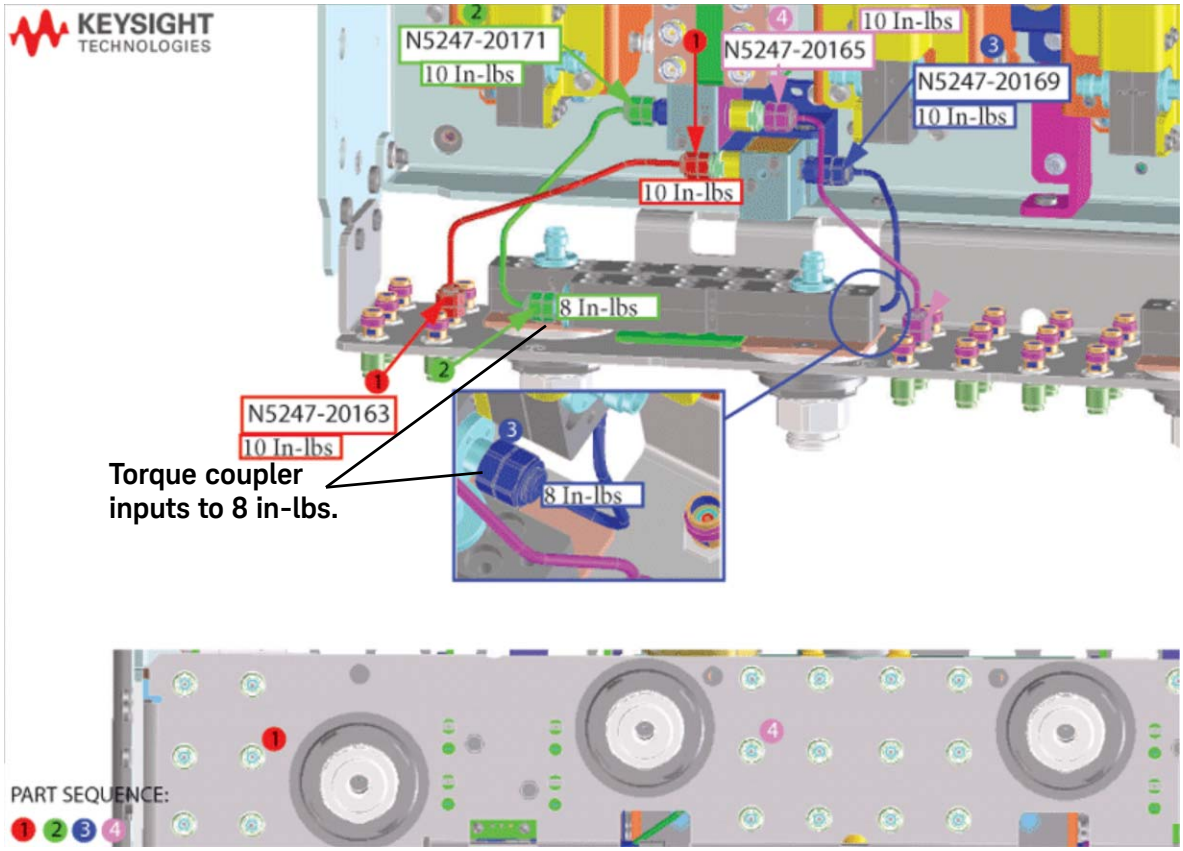


Figure 23 New Option 425 with 029 Test Set Cables Installation (N5247-20165, N5247-20169, N5247-20171 and f**or Option 029 only**, N5247-20173)

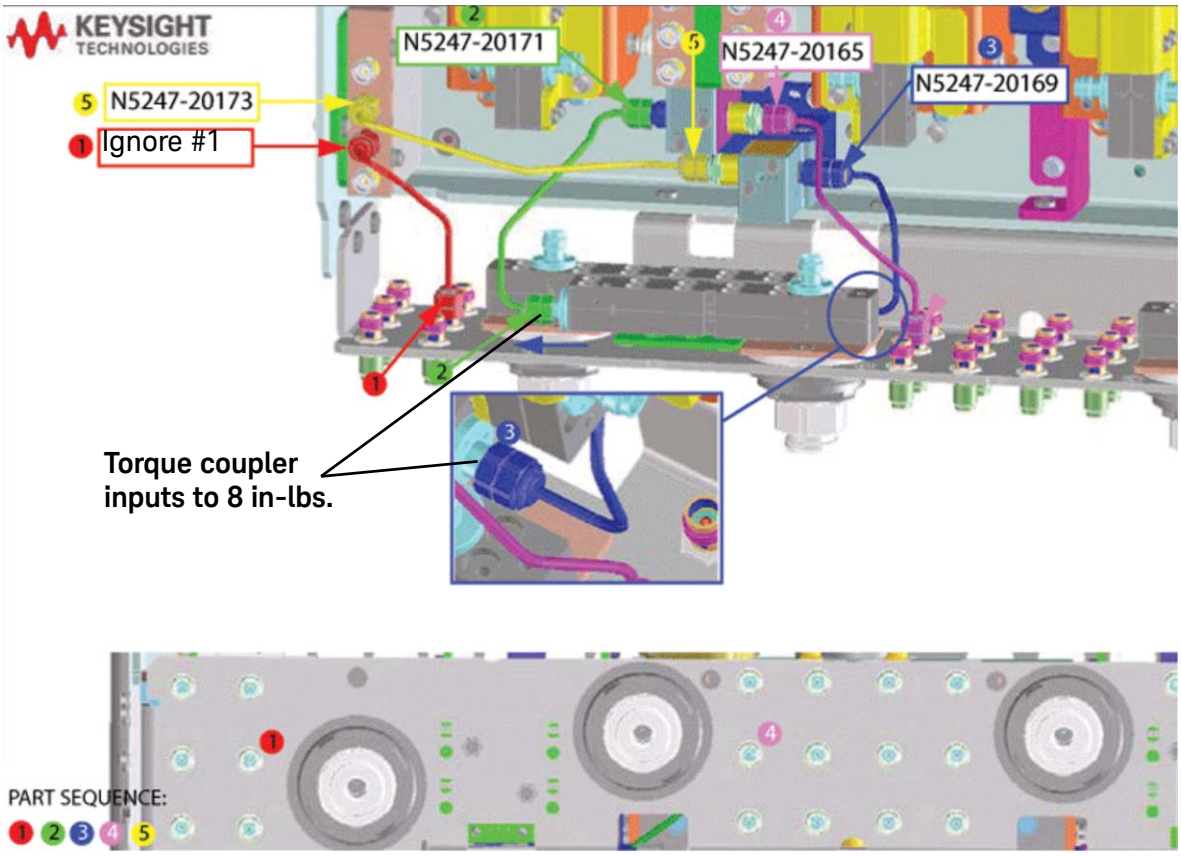


Figure 23-1 New Option 425 (**without** 029) LFE Test Set Cables Installation (N5247-20162, N5247-20170, N5247-20164, and **for Option 425 without 029 only**, N5247-20167)

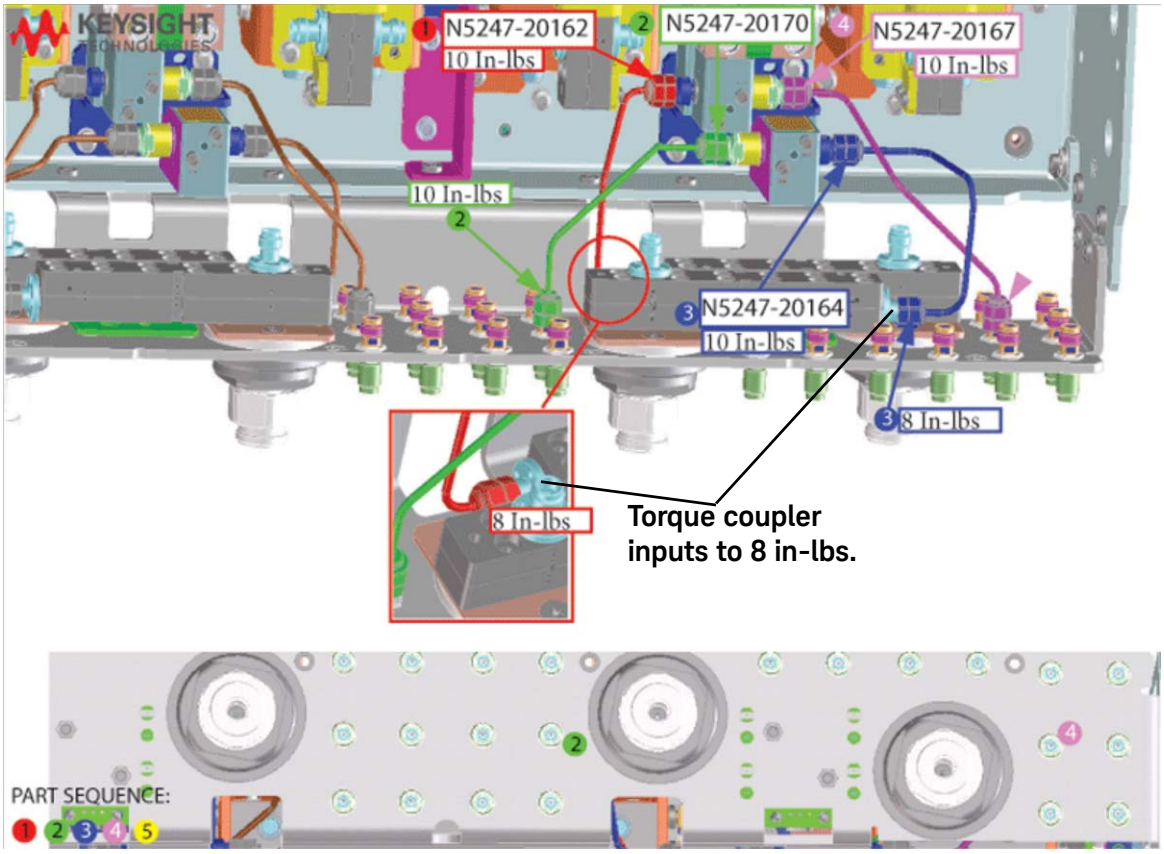
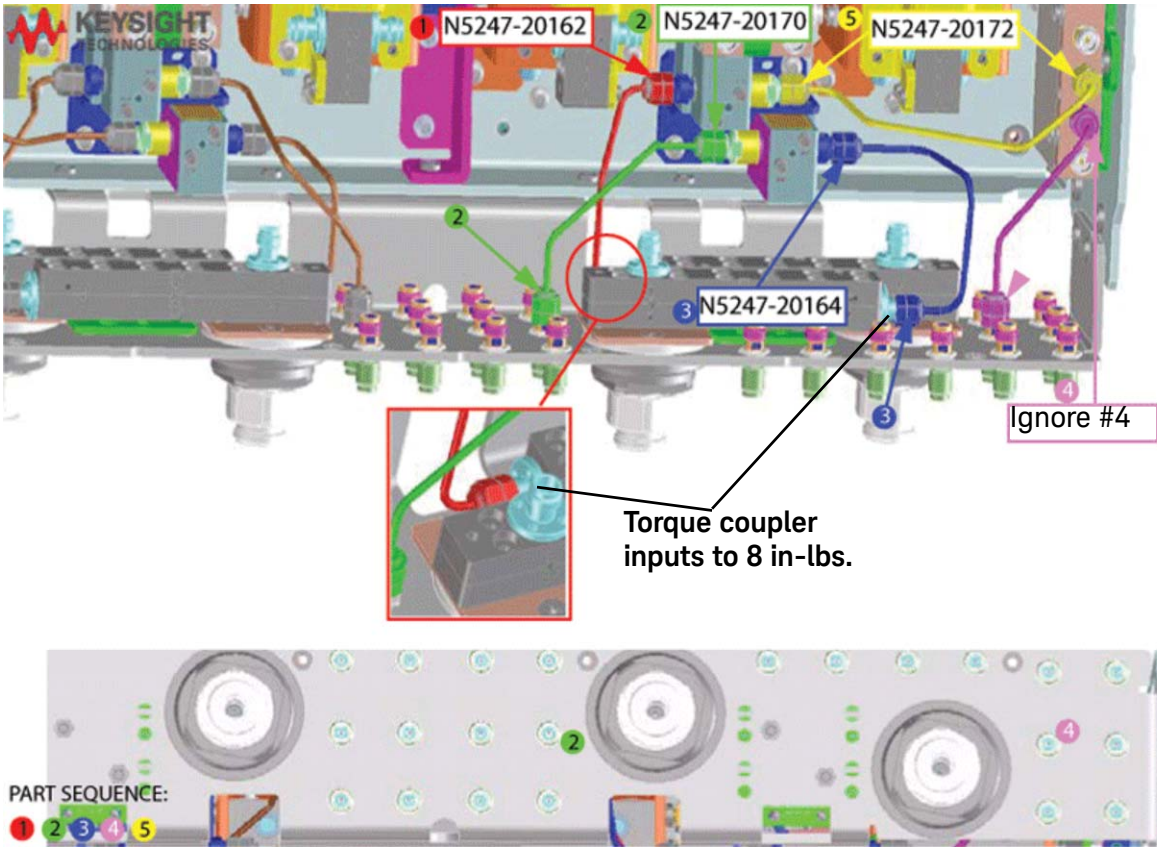


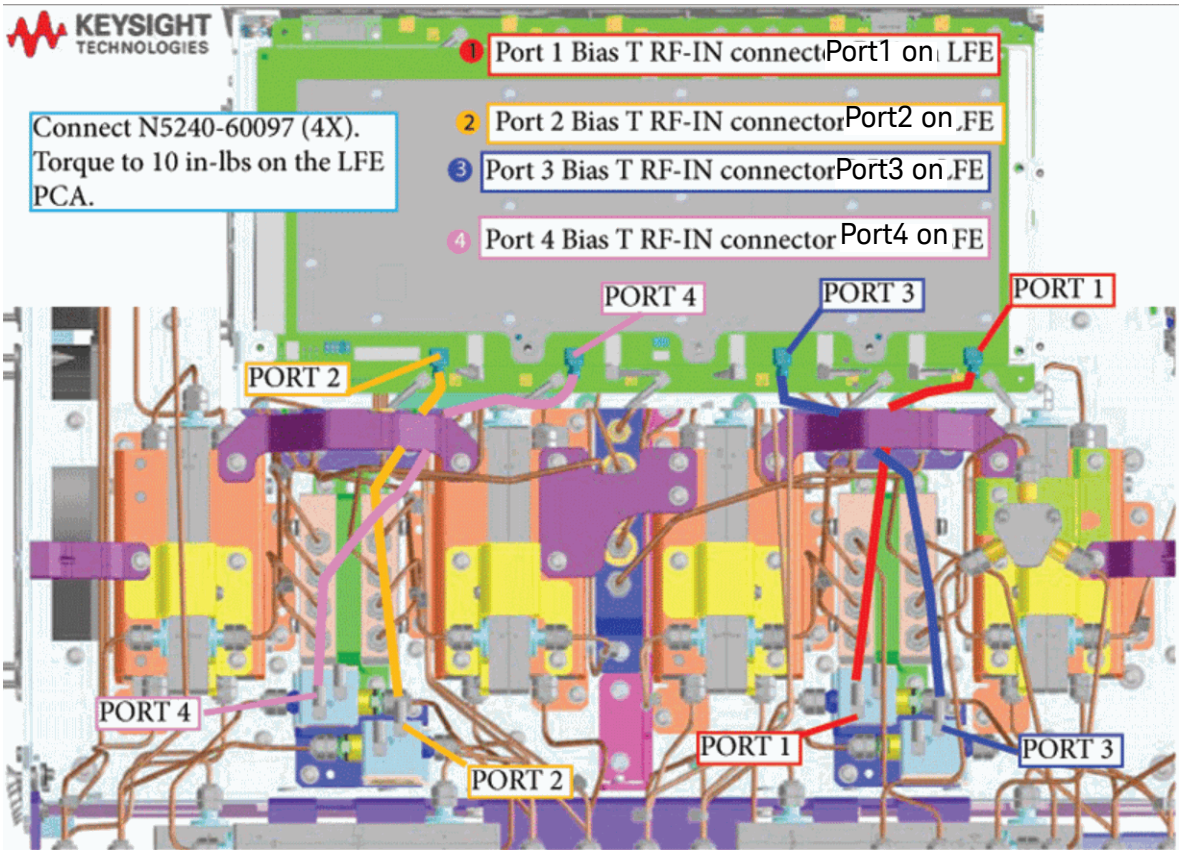
Figure 24 New Option 425 with 029 LFE Test Set Cables Installation (N5247-20162, N5247-20170, N5247-20164, and **for Option 029 only**, N5247-20172)



Install New Blue Bias-Tee Combiner Cables and Clamps N5240-60097 From the A71–A74 Bias Tees “RF-IN” to the A70 LFE Board “Port1”–“Port4” Connectors

2. Connect new cables N5240-60097 (x4) from A71-A74 bias tee combiners to the A70 LFE board connectors (items ① through ④). Torque to 10 in-lbs on the LFE board. Refer to Figure 25.

Figure 25 Connect N5240-60097 from A71-A74 Bias Tee Combiners to A70 LFE Board (N5240-60097 (x4))

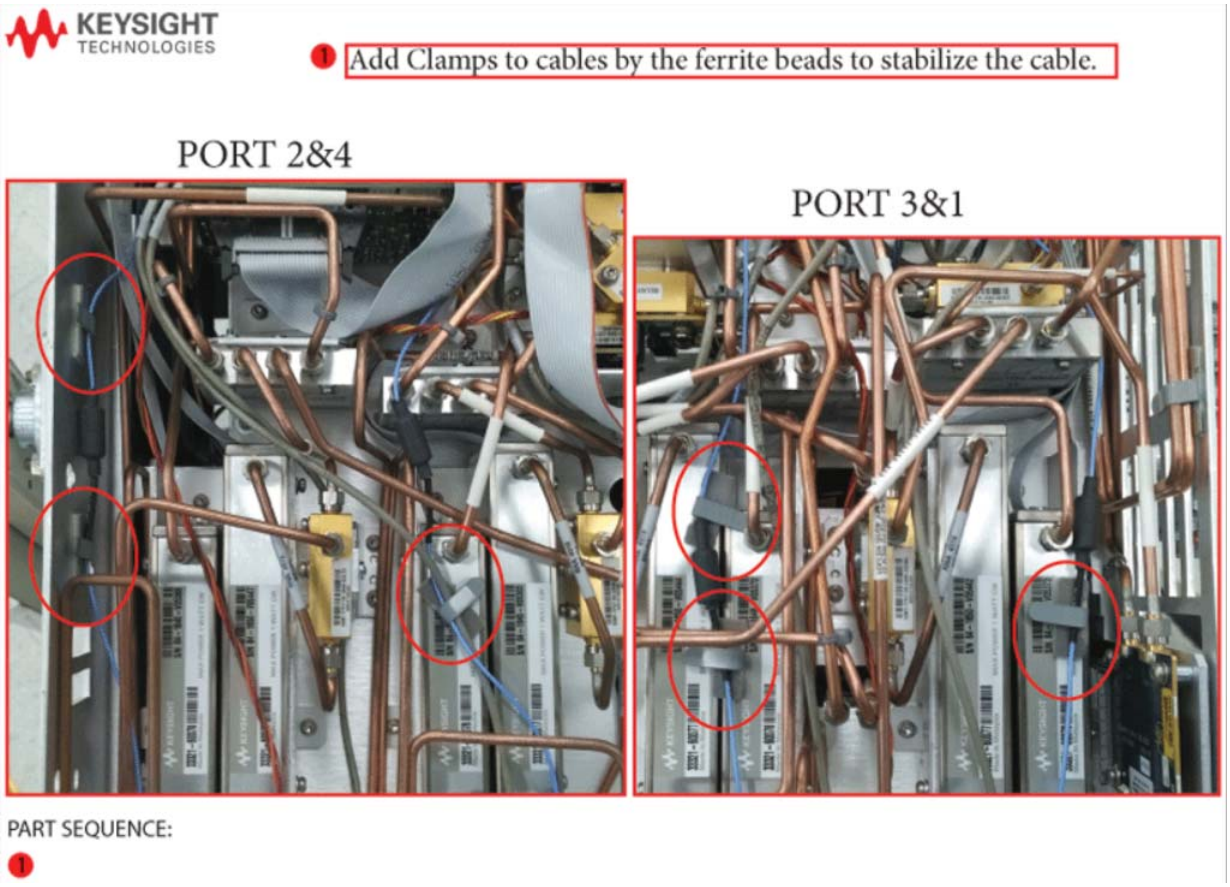


Install clamps onto the Ferrite Beads

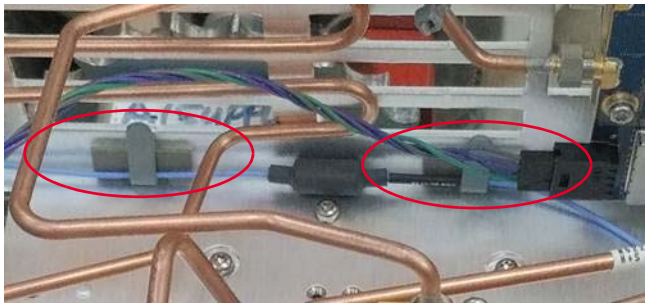
3. Install clamps onto bias cables as shown.

Refer to Figure 26.

Figure 26 Install the clamps (1400-1334 x6) onto the bias cables as shown



Close up example of clamps installed on a bias cable



Step 20. Reinstall the A23 Test Set Motherboard

For instructions, click the Chapter 7 bookmark “Removing and Replacing the A23 Test Set Motherboard” in the PDF Service Guide[1].

You will install the rest of the ports 1 through 4 switch, receiver attenuator, and source attenuator cables to the test set motherboard in the next step. Proceed to “Step 21. Install the A71 and 74 Bias-Tee Combiner’s Gray Low Frequency Extension (LFE) DC Bias Cables and Route Cables” on page 51.

NOTE

IMPORTANT! Use the N5240-60089 ribbon cable from this kit in lieu of ribbon cable N5242-60004. Refer to Table 1 on page 11.

NOTE

STOP! Do not install the port 1 through 4 switch, receiver attenuator, and source attenuator cables to the test set motherboard J101 though J104 connectors until the next step. Refer to “Step 21. Install the A71 and 74 Bias-Tee Combiner’s Gray Low Frequency Extension (LFE) DC Bias Cables and Route Cables” on page 51.

1. See “Downloading the Online PNA Service Guide” on page 8.

Step 21. Install the A71 and 74 Bias-Tee Combiner's Gray Low Frequency Extension (LFE) DC Bias Cables and Route Cables

This step contains the following:

– "Install the A71–74 bias-Tee combiner's Gray Low Frequency Extension (LFE) DC bias Cables" on page 51

– "Route the bias cables" on page 52

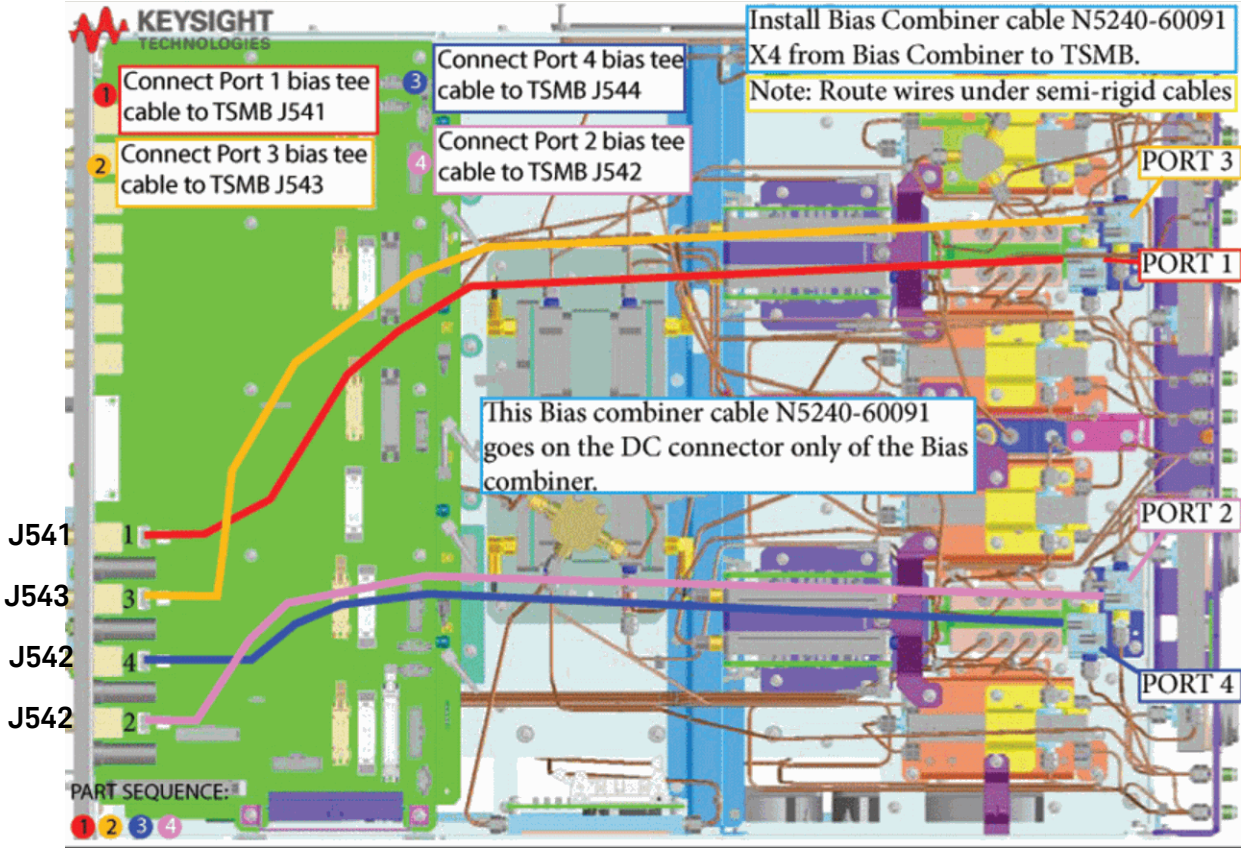
Install the A71–74 bias-Tee combiner's Gray Low Frequency Extension (LFE) DC bias Cables

4. Connect the N5291-60091 (x4) cables as shown in Figure 27 (items ① through ④). Refer to Figure 27 for the following steps.

NOTE

IMPORTANT! The N5240-60091 (x4) bias tee combiner cables only connect to the DC bias of the Bias Tee Combiner.

Figure 27 Connect the (x4) cables as shown (N5291-60091)



5. Connect the rest of the switch, receiver attenuator, and source attenuator cables to the test set motherboard. For instructions, click the Chapter 7 bookmark “Removing and Replacing the A23 Test Set Motherboard” in the PDF Service Guide[1]

Route the bias cables

6. Route bias cables as shown.
   - Separate cables as much as possible.
   - It is OK to cross the cables.
   - Avoid running cables parallel or next to each other.
   - Avoid tie wrapping to semirigid cables.

   Refer to Figure 27 on page 51.

1. See “Downloading the Online PNA Service Guide” on page 8.

Step 22. Install the Other End of the Bias-Tee Combiner Cables to the Source Synthesizer and LO Synthesizer Board Gray Cables

CAUTION

This upgrade kit contains cables for Version 6 synthesizers and Version 7 direct digital synthesizer (DDS) assemblies. Please refer to your instrument's Service Guide, if you are unclear which assembly you have installed. Refer to "Downloading the Online PNA Service Guide" on page 8.

Refer to Figure 28 on page 54 and Figure 29 on page 55. New parts are listed in Table 1 on page 11.

1. The analyzer should be positioned on its left side (fans facing upwards) as shown.
2. Then choose from the following:
   - **Version 6 Synthesizers:** Connect N5245-60027 (item ①), N5242-60079 (item ②), and N5242-60080 (item ③) flexible cables as indicated in Figure 28 on page 54.
   - **Version 7 Synthesizers:** Connect N5240-60112 (item ①), N5240-60114 (item ②), and N5240-60113 (item ③) flexible cables as indicated in Figure 29 on page 55.

Figure 28 **Version 6 Synthesizers:** New Test Set Cables Installation. Connect the other end of gray cables—Part 2 (N5245-60027, N5242-60079, and N5242-60080)

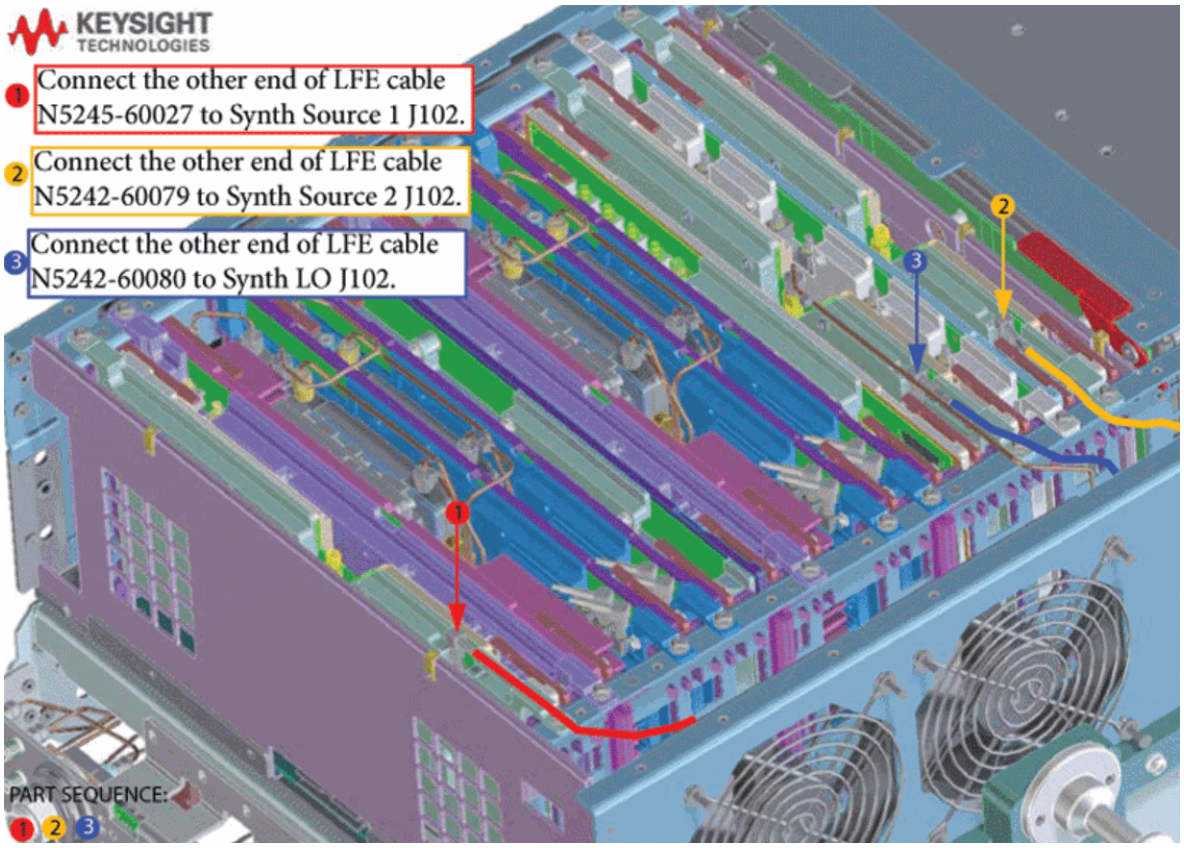
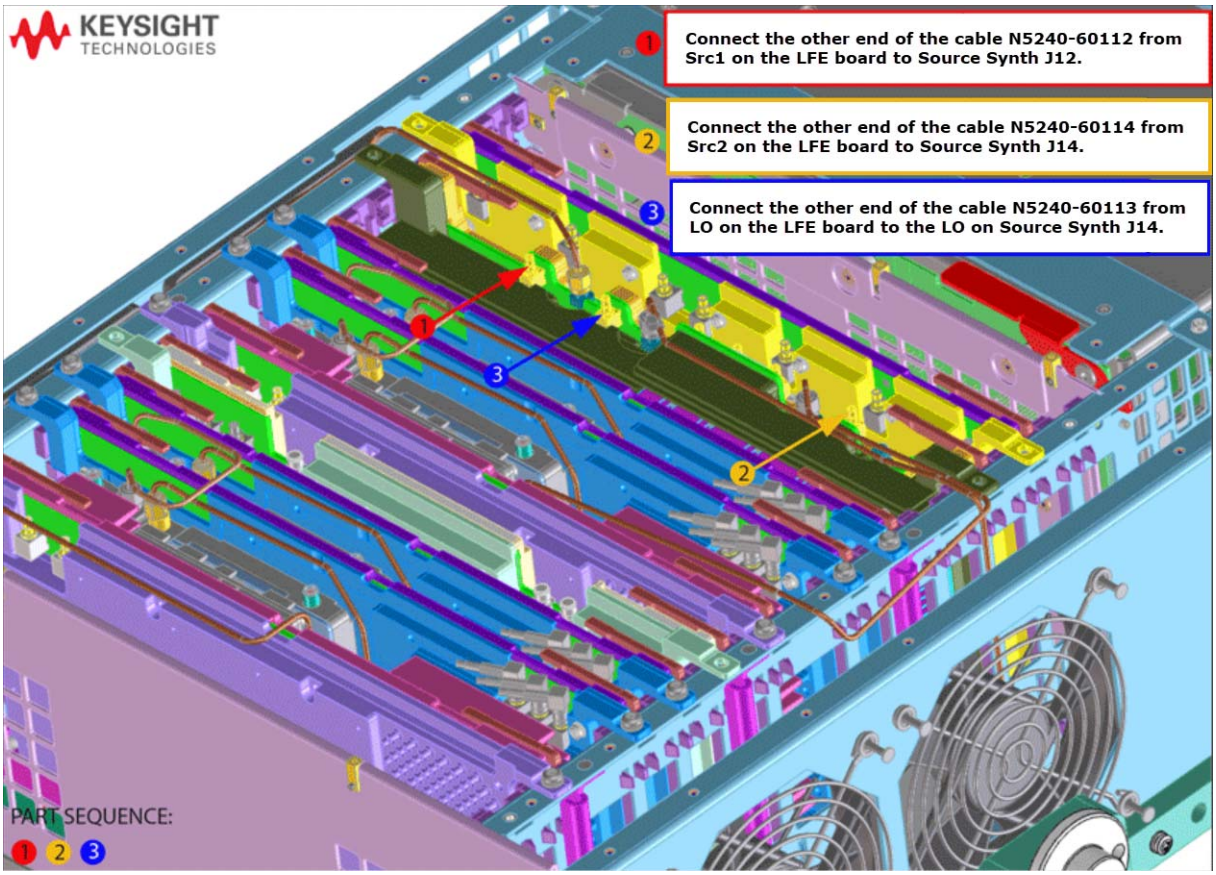


Figure 29 **Version 7 Synthesizers:** New Test Set Cables Installation. Connect the other end of gray cables—Part 2 (N5240-60112, N5240-60113, and N5240-60114)



Step 23. Remove the Old Lower Front Panel Overlay

Refer to Figure 30 for this step of the procedure. New parts are listed in Table 1 on page 11.

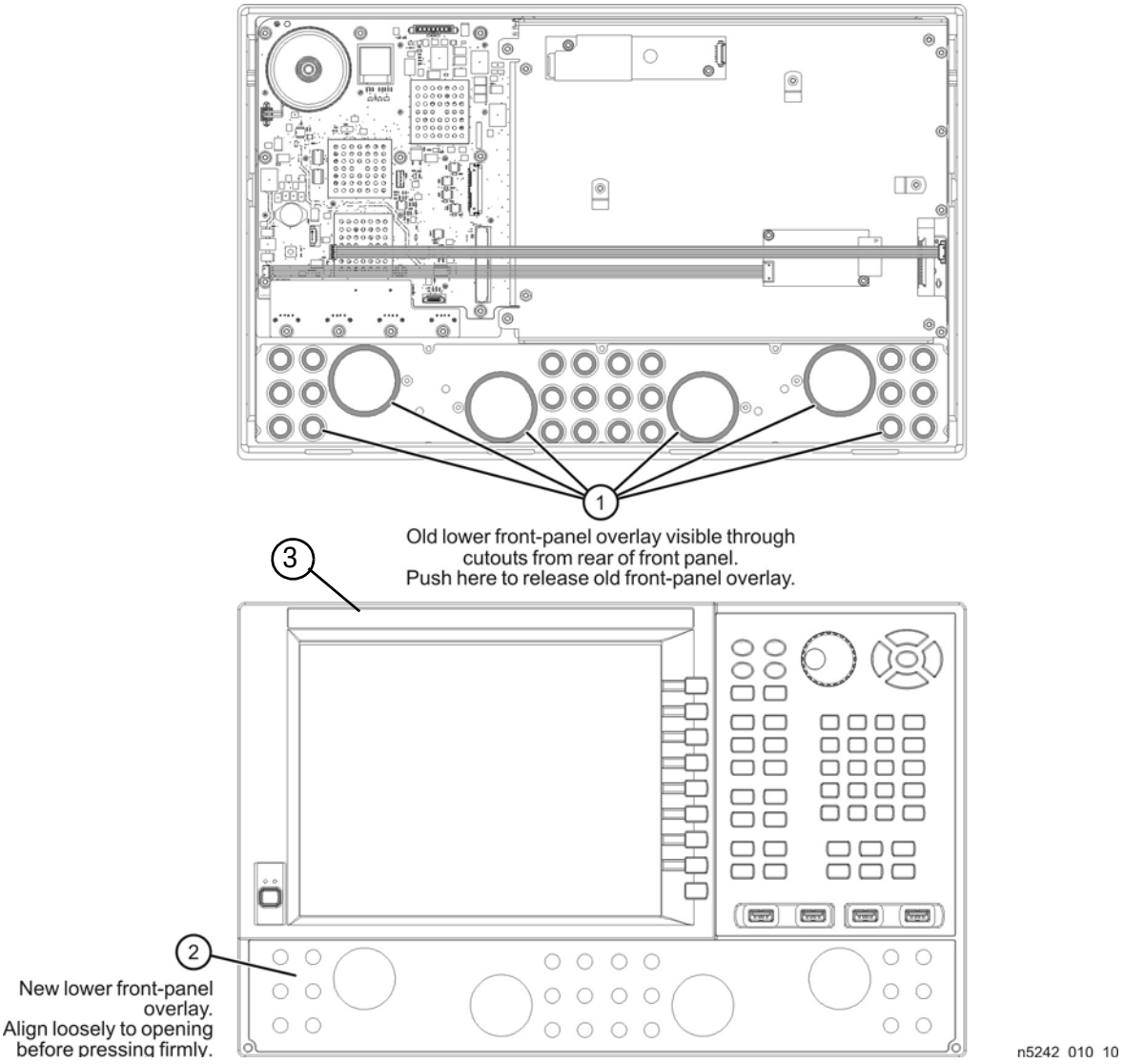
1. From the back side of the front panel, use a blunt object in the cutouts in the lower front dress panel to push on the old overlay (item ①) and separate it from the front dress panel.
2. From the front side of the front panel, pull off the overlay completely and discard it.
3. Remove the nameplate 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 25. Install the New Lower Front Panel Overlay and Nameplate” on page 59.

Figure 30 Lower Front Panel Overlay Replacement



Step 24. Reinstall the Front Panel Assembly

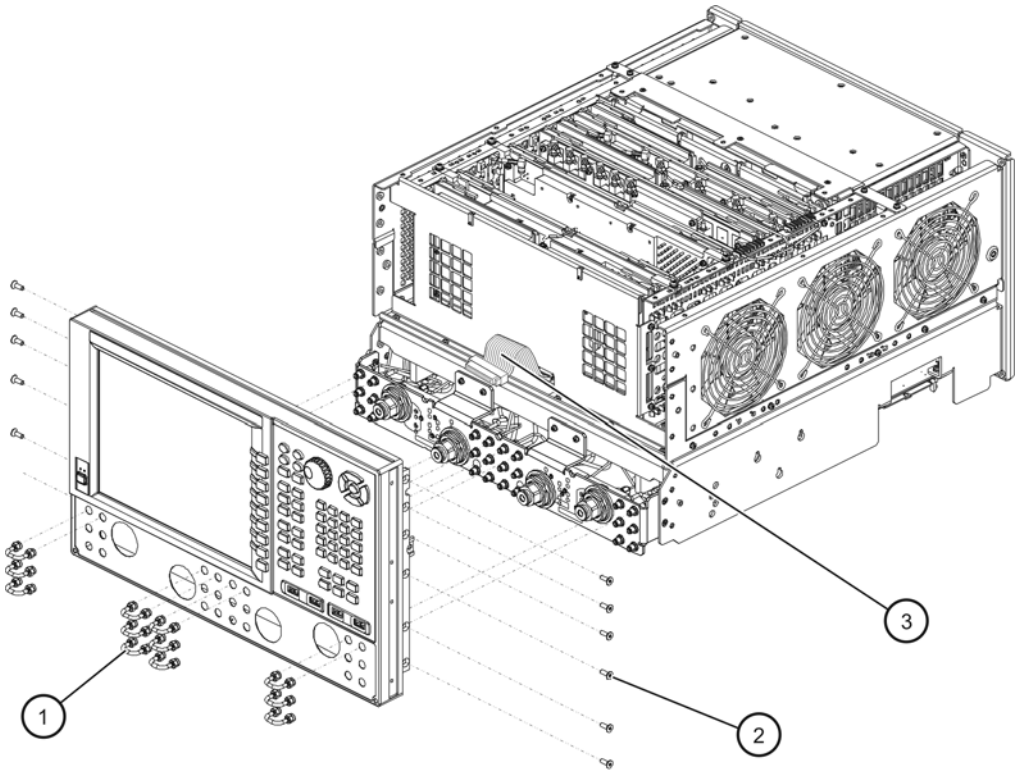
CAUTION **Before installing the front panel assembly onto the analyzer, lift and support the front of the analyzer chassis.**

Refer to Figure 31 for this step of the procedure. New parts are listed in Table 1 on page 11.

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.

– Be sure to install the two new screws (0515-1946) in the front panel, next to test ports 3 and 4. Torque these screws to 9 in-lbs.

Figure 31 Front Panel Assembly Re-installation



Step 25. Install the New Lower Front Panel Overlay and Nameplate

Refer to Figure 30 on page 57 for the lower overlay and to Figure 31 on page 58 for the hex nuts installation for this step of the procedure. New parts are listed in Table 1 on page 11.

1. Remove the protective backing from the N5247-80028 new front panel overlay (Option 425) or N5247-80027 (Option 425 with 029) – (item ②).
2. Starting from either side, **loosely** place the overlay in the recess on the lower front panel, ensuring that it fits tightly against the edges of the recess.
3. Once the overlay is in place, press it firmly onto the frame to secure it.
4. Reinstall all of the semirigid jumpers (item ①) on the front-panel, and tighten each of the connectors using a 5/16-in torque wrench set to 8 in-lbs. Refer to Figure 31 on page 58.
5. Remove the protective backing and Install the nameplate (N5247-80026, item ③).

Step 26. Reinstall Front Panel Jumpers

Reinstall the front panel jumper cables.

Step 27. DC Continuity Test the LFE Board and Test Ports

The DC continuity test verifies that the LFE board is installed correctly and does not have any opens or shorts in the DC path.

1. Using a DVM, connect one test probe to the center conductor of the RF port 1 on the front panel.
2. Connect the other test probe to the port 1 bias input (**BIAS 1 IN**) on the rear panel.
3. Verify the DVM measures <10Ω.
4. Repeat these steps for each of the other test ports.

NOTE

If the DVM value is 0Ω or >10Ω, then something is incorrectly installed or there is an open or short somewhere in the LFE board/cable path:

- Verify the cables installed in "Step 19. Install the New Bias Tee Combiner's Semirigid Test Set Cables, the Blue cables, and Install the Cable Clamps Onto the Ferrite Beads" on page 41 and "Step 21. Install the A71 and 74 Bias-Tee Combiner's Gray Low Frequency Extension (LFE) DC Bias Cables and Route Cables" on page 51 are connected correctly and not open or shorted.

Step 28. 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 29. Reinstall the Inner Cover

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

Step 30. Reinstall the Outer Cover

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

Step 31. Remove Option 423 License

NOTE If Option 423 is not loaded on your PNA, proceed to "Step 32. Enable Option 425" on page 61.

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 423 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.

1. See "Downloading the Online PNA Service Guide" on page 8.

Step 32. Enable Option 425

Procedure Requirements

NOTE

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

A single license file may contain more than one feature.

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

Option Enable Procedure

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 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:

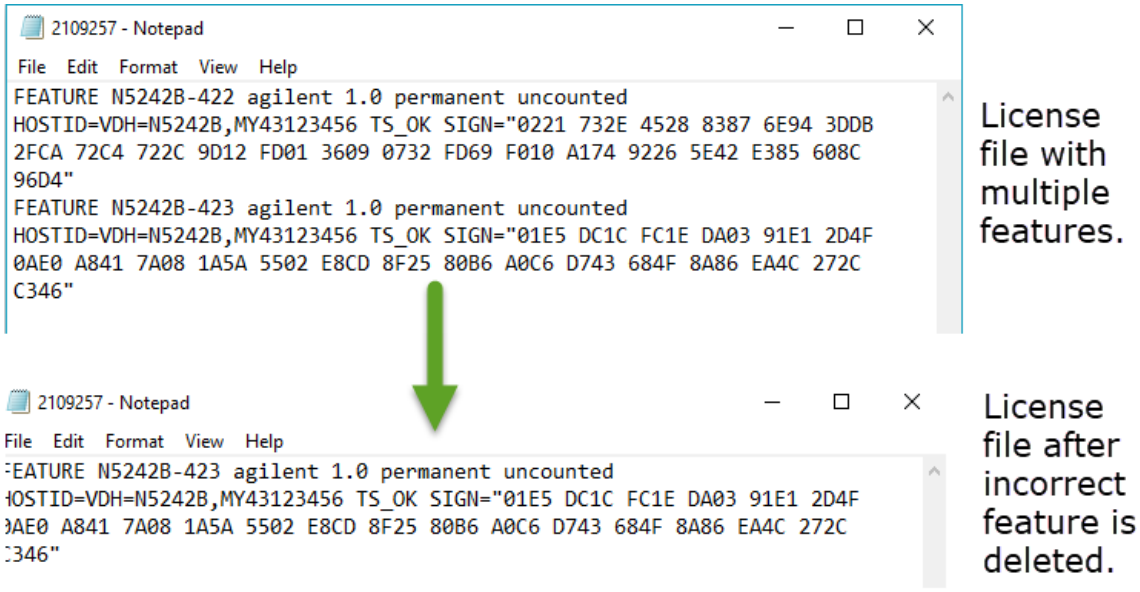
   For these steps, refer to the example in Figure 32 on page 62.

   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 32 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. Within 5 seconds, the PNA 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.

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**.

Step 33. Verify the PNA Analyzer Program is Running with the Correct Options

Verify that the Options Correct and are Enabled

1. Start the Network Analyzer program.
2. Once the Network Analyzer program is running:
   - Press **Help** > **About NA** and verify that Option 425 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 5.

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 34. 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
- EE default adjustment: Synth LO only (Version 6 synthesizers), All Synthesizers (Version 7 synthesizers)
- synthesizer bandwidth adjustment (This test is only required when the EE default adjustment is not sufficient)
- Source Adjustment
- IF Gain Adjustment
- Receiver Characterization

- Receiver Adjustment
- LFE Receiver Adjustment
- IF Response Adjustment (Options 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.

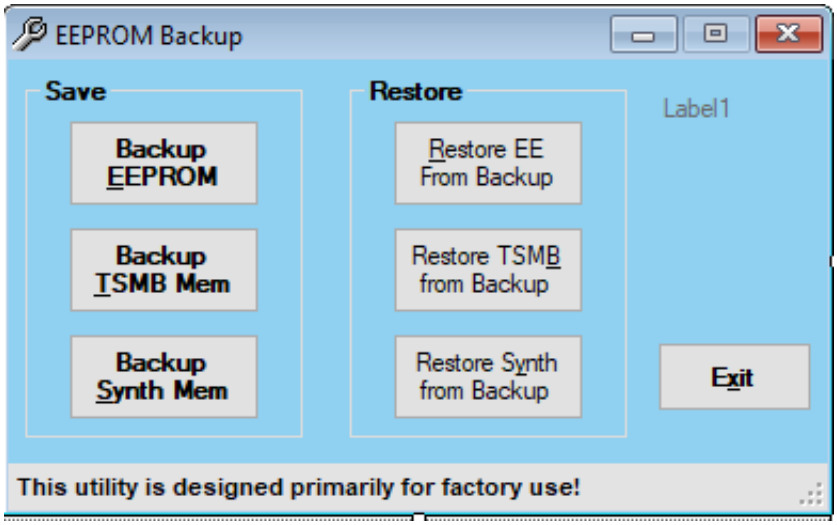
The adjustments listed here generate new correction constants. The analyzer must have a backup of this new data in case any of the data becomes corrupted.

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 Mem.
- 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 8.

Figure 33 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 5.

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 35. 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.

A: Synthesizer Board Upgrade (N5240-60074 (with Tabs)/N5240-60076 (Without Tabs) Version F/G to Version H)

CAUTION

STOP!!! Please read all content before proceeding with this upgrade procedure. This is a complex procedure that requires Keysight support training, before beginning any repairs! If you have not been properly trained by Keysight support personnel, attempting to do this procedure could result in damage to the synthesizer board and or the instrument! See also "Step 4. Inspect and (If Necessary) Remove the A4, A15, and A17 Synthesizer Boards, if They Are Not Version H" on page 17.

If you do not have the following equipment, do not attempt to the process in the Appendix, because you may damage the board and or your instrument. Stop and return the instrument to Keysight for repair. Refer to "Getting Assistance from Keysight" on page 5.

This process requires the following:

- Training by Keysight support personnel to perform this upgrade
- RoHS compliant soldering materials and components
- Variable power soldering iron for surface-mount components
- 10x magnifier or greater
- Else, you may damage your synthesizer board and/or your instrument

This section is only required if the synthesizer boards N5240-60074/76 are not a version H or greater. If your synthesizer boards do not require this modification, skip this process and continue to the "Step 5. Remove the Front Panel Assembly" on page 18. After this section is completed, your synthesizer board will be a version H synthesizer board. Refer to Figure 2 on page 5.

Table 1 Parts List for Synthesizer Board Upgrade Kit Modification[a]

Part number	Description
0699-3947	1 kΩ Resistor
0161-4279	22 μF capacitor

a. The factory will provide these items upon request.

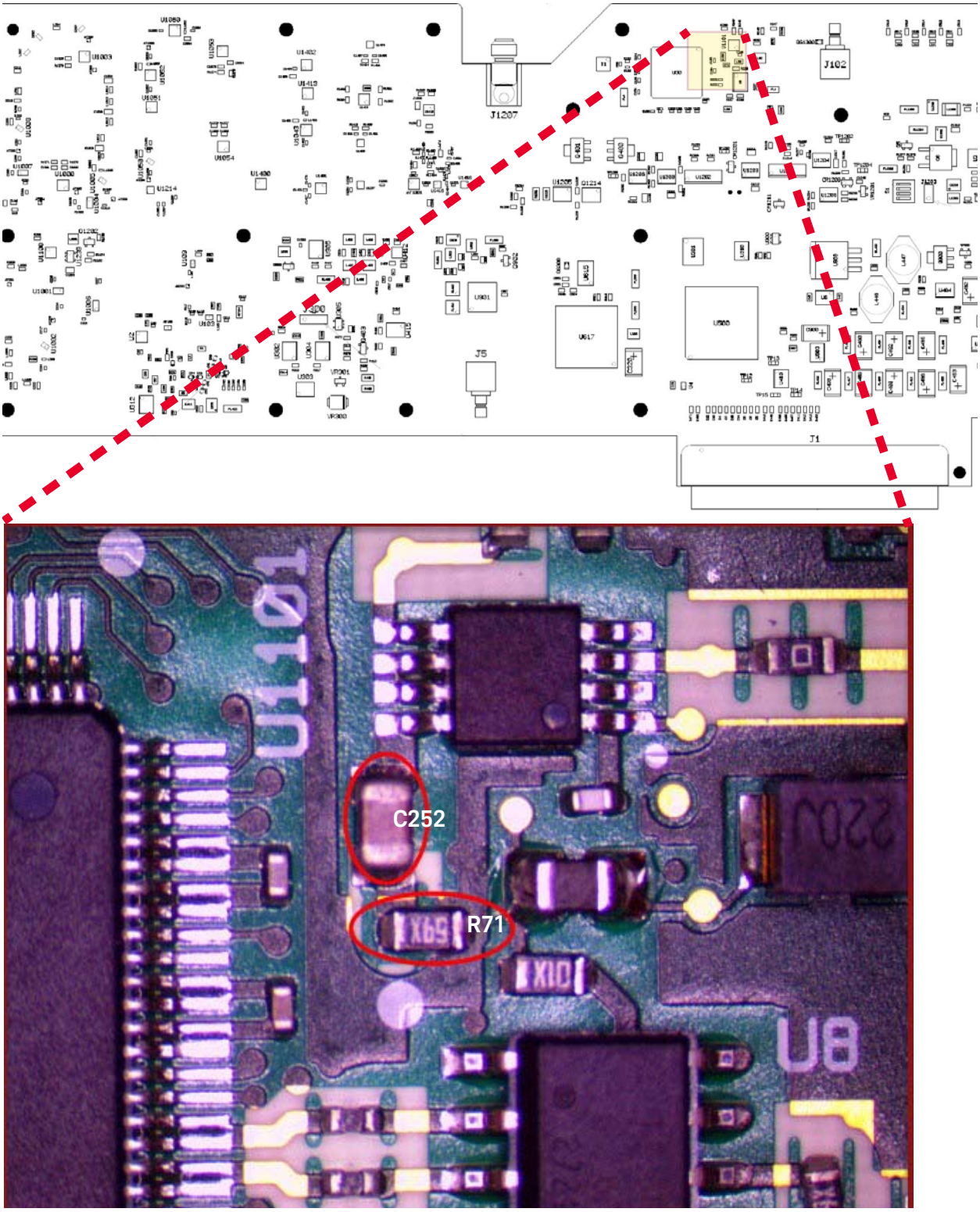
Procedure

1. If you have already removed your synthesizer board, proceed to step 2.

   Else, to remove your synthesizer board, refer to the Service Guide for your instrument that can be downloaded from www.keysight.com.
2. Remove resistor R71. Refer to Figure 1 on page 3.
3. Clean pads.
4. Replace with resistor 1 kΩ (0699-3947). Refer to Figure 1 on page 3.
5. Remove capacitor C252.
6. Clean pads.

7. Replace with capacitor 22µF (0161-4279). Refer to Figure 1 on page 3.

Figure 1 Remove old resistor and capacitor and replace with resistor 1 kΩ (0699-3947) and 22µF (0161-4279).



8. Re-assemble shield, screws, and torque:
   - M3 screws (0515-0372) to 9 in-lbs
   - M4 screws (0515-0669) to 21 in-lbs
9. Repeat steps 1 through 8 for all of the non-version H synthesizer boards.
10. Reinstall all upgraded version H synthesizer boards.
11. Power up the PNA and if necessary, start the PNA application.
12. Changing the EEPROGM header data for your updated synthesizer board:
    a. Press **Utility** > **System** > **Service** > **Utilities** > **View EEPROM Headers**.
    b. In the `EEPROM Header Info` window that opens press **Edit**. Refer to Figure 2 on page 5.
    c. In the window that opens: Enter the password (i.e., “tsunami”).
    d. In the **Keysight PNA EEPROM Editor** window that opens: Scroll down to the **FW Revision:** box and select the “F” or “G” and replace by typing “H”. Refer to Figure 3 on page 6.
    e. Press **Enter**. Refer to Figure 3 on page 6.
    f. Press **Save Changes**. Refer to Figure 3 on page 6.
    g. Repeat steps d through f for the other synthesizer boards requiring upgrade.
    h. Press **Exit** to close the EEPROM Header Info window when you have completed updating all of the synthesizer boards and continue with “Step 5. Remove the Front Panel Assembly.”

Figure 2 EEPROM Header Info Window

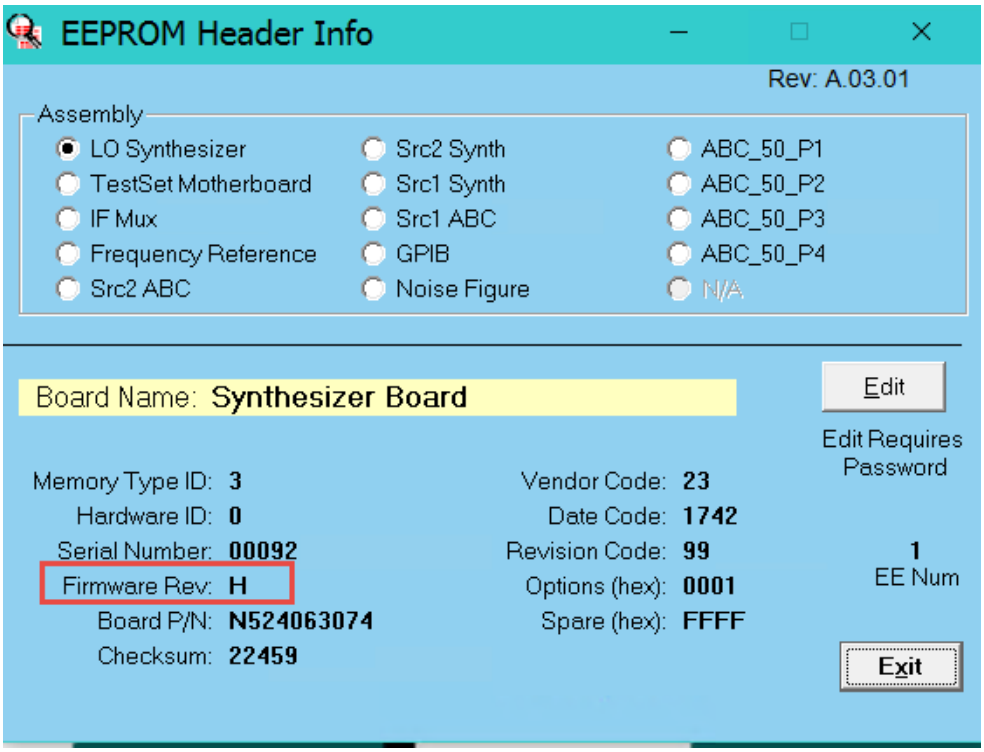
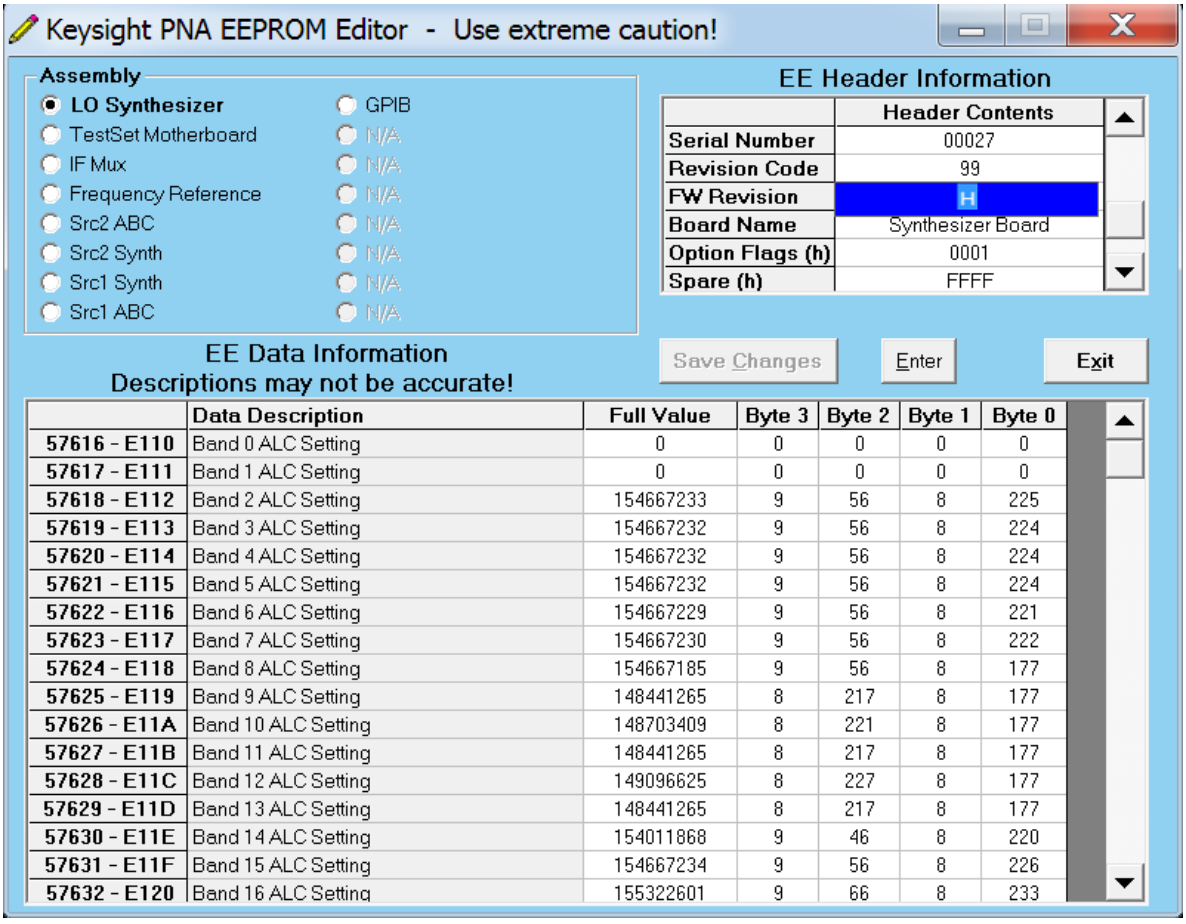


Figure 3 EEPROM Editor Window



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