Keysight Low Frequency Extension Upgrade Kit For Version 6, Single-Source Synthesizers

To Upgrade PNA N5227B
Option 201 to Option 205

Upgrade Kit Order Number:
N5227BU-205

Kit Number: N5227-60115

This is Installation Note is for upgrading the N5227B Microwave Network Analyzers from Option 201 to Option 205.

Safety Notices

CAUTION

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

WARNING

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

Keysight Low Frequency Extension Upgrade Kit
Upgrade Kit Number: N5227-60115
Installation Note

Description of the Upgrade

This upgrade converts your standard 2-port configurable test set analyzer (N5227B Option 201) to a low frequency extension model by adding:

— LFE bias combiners

— LFE PC assembly

— new cables

After installation of this upgrade, your analyzer will be an N5227B Option 205.

Refer to "Overview of the Installation Procedure" on page 13.

> **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** (Contact) 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!** 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[1].

— 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),".

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].

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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(s) file 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. This upgrade only applies to B models.

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, 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
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.

About Installing the Upgrade

Products affected	N5227B Option 201
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.

Table 1   Contents of Upgrade Kit N5227-60115

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5227-90115
--	Software Entitlement Certificate (provided separately)	1	5964-5145
--	China RoHS Addendum	1	9320-6722
A71	LFE Bias-T combiner - port 1	2	5087-7403
A74	LFE Bias-T combiner - port 2		
A75	LFE PC assembly	1	N5291-60005
--	Bracket, lower (For IF MUX/LFE)	1	N5240-00011
--	Bracket, lower (For Bias-T combiner, 70 GHz)	2	N5247-20149
--	Machine screw, M3.0 x 8, pan head ((x4) to attach bracket N5240-00011 to IF MUX and (x4 – 2 each) Bias tee combiner assemblies to chassis)	8	0515-0372
--	Machine screw, M3 x 14 mm, pan head (to attach A75 LFE board on standoffs)	2	0515-0665
--	Machine screw, M3 x 25 mm, pan head (to attach to attach TSMB to deck)	3	0515-0667
--	Machine screw, M3 x 6 mm, 90-DEG-Flat head (to attach port 1 and port 2 bias tee combiners to brackets (x2 each))	4	0515-1227
--	Machine screw, M2.5 x 14 mm, pan head (to attach cable clamps and cables N5240-60097 (x2) to port 1 and port 2 bias tee RF connectors)	2	0515-2141
--	Protective caps for front panel RF ports 1 and 2	2	1401-0214
--	Key lock, bottom foot	4	5021-2840
--	clamps, cable (LFE DC bias cables)	4	1400-1334
--	Cable clamp (A71 and A74 Bias Tee RF connector x2)	2	5023-3299
--	Nameplate – N5227B with LFE	1	N5227-80029
--	Lower Front panel overlay – N5227B with Option 205	1	N5227-80030
--	Cable, ribbon assembly – MB/IFMUX/LFE/SMB (A18 system mother board J1 to A23 test set motherboard to A75 LFE board to A24 IF Multiplier board J1)	1	N5240-60089
--	Cable, DC, 2–pin to R/A SMP (A71 Port 1 bias combiner DC to A23 bias T1 and A74 Port 2 bias-T combiner DC to A23 Bias T2)	2	N5240-60091
W181	Cable, assy, RF, Front panel CPLR THRU to A71 port 1 bias combiner	1	N5247-20167

Table 1   Contents of Upgrade Kit N5227-60115

Ref Desig.	Description	Qty	Part Number
W187	Cable, assy-RF, front panel port 2 CPLR THRU to A74 port 2 bias combiner	1	N5247-20163
W191	A4 Synth Source 1 J102 to A75 LFE SRC1 J20	1	N5245-60027
W193	A15 LO Synth J102 to A75 LFE LO J18	1	N5242-60080
W194	Cable (long), coax, A75 LFE J2 to A71 port 1 bias combiner, (Port 1 bias combiner "RF-IN" to "Port1" A75 LFE board)	1	N5240-60097
W197	Cable (long), coax, A75 LFE J3 to A74 port 2 bias combiner (Port 2 bias combiner "RF-IN" to "Port2" A75 LFE board)		
W198	Cable, assy-RF, FP, A33 port 1 front panel test coupler to A71 port 1 bias combiner	1	N5247-20166
W199	Cable, assy-RF, FP, A36 port 2 test coupler to A74 port 2 bias combiner	1	N5247-20168
W211	RF cable, A70/A75 LFE J14 to A24 IF Multiplexer P4	1	8120-5014
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
W215	RF cable, A70 LFE J11 to A24 IF Multiplexer P804	1	8120-5021

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 Inner and Outer Covers."

"Step 3. Inspect and (If Necessary) Remove the A4, A11, and A13 Synthesizer Boards, if They Are Not Version H."

"Step 4. Remove the Front Panel Assembly."

"Step 5. Remove the A23 Test Set Motherboard."

"Step 6. Remove the Stabilizer Bracket from the IF MUX Shield."

"Step 7. Remove the A24 IF Multiplexer Board."

"Step 8. Remove Some Bottom-Side (Test Set) Cables."

"Step 9. Assemble the Bias Tee Combiner Assemblies."

"Step 10. Install the A71 and 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 Multiplexer (IF MUX) Board Shield."

"Step 16. Connect and Route New LFE Cables (8120-5014 (x2), 8120-5017 (x1), and 8120-5021 (x1)) and the Other Ends of the New Cables Connected to the IF Multiplexer (IF MUX) Board."

"Step 17. Install the A75 Low Frequency Extension (LFE) Board."

"Step 18. Connect A71 and A74 Bias-Tee Combiner's New Cables to the A75 Low Frequency Extension (LFE) Board and the Other Ends of the Cables Connected to the IF Multiplier (IF MUX)."

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

"Step 20. Reinstall the A19 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 Front Panel Assembly."

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

"Step 26. Position the Cables and Wires to Prevent Pinching."

"Step 27. Reinstall Front Panel Jumpers."

"Step 29. Position the Cables and Wires to Prevent Pinching."

"Step 30. Reinstall the Inner and Outer Covers."

"Step 31. Remove Option 201 License."

"Step 32. Enable Options 205."

"Step 33. Perform Post-Upgrade Adjustments and Calibration."

"Step 34. 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 (B models) has been received and the information verified, you can proceed with the installation at "Step 2. Remove the Inner and Outer Covers" on page 15.

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 Inner and Outer Covers

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

Step 3. Inspect and (If Necessary) Remove the A4, A11, and A13 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 on Page 15).

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 version H or greater, then 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 16.

Figure 1   EERPOM Header Info Window

3. If your boards are **not** version H or greater, proceed to "Step 4. Remove the Front Panel Assembly".

   Else, you need to remove the synthesizer boards and proceed to step 4.

4. Removing 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-A13 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),".

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

Step 4. Remove the Front Panel Assembly

For instructions, click the Chapter 7 bookmark "Removing and Replacing the Front Panel Assembly" in the PDF Service Guide[1].
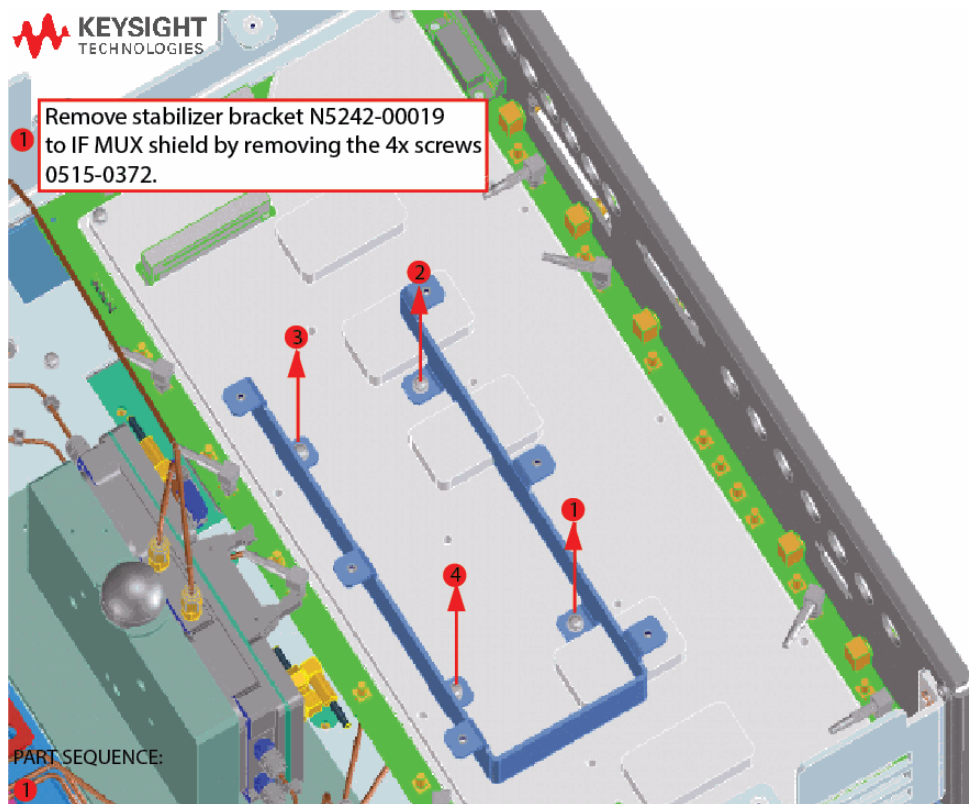
Step 5. Remove the A23 Test Set Motherboard

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

Step 6. Remove the Stabilizer Bracket from the IF MUX Shield

1. Follow the process steps in Figure 2.
2. Once removed, discard the stabilizer bracket and screws.

Figure 2   Remove the N5242-00019 stabilizer bracket

Step 7. Remove the A24 IF Multiplexer Board

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

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1. See .

Step 8. Remove Some Bottom-Side (Test Set) Cables

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

NOTE	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.

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

2. Remove and discard the following semirigid cables–they will not be reinstalled:

   To see an image showing the location of these cables, click the Chapter 6 bookmark "Bottom RF Cables, Standard 2-Port Configuration, Option 201 (S/N Prefixes <6021)" in the PDF Service Guide[1].

   See also, the instrument's top cable images, click the Chapter 6 bookmark "Top Cables, All Cables - All Options (S/N Prefixes <6021)" in the PDF Service Guide[1].

   — W32 (N5247-20049) Port 1 CPLR THRU to A33 port 1 coupler

   — W44 (N5247-20050) Port 2 CPLR THRU to A36 port 2 coupler

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

Step 9. Assemble the Bias Tee Combiner Assemblies

Refer to Figure 3 for this step of the procedure. New parts are listed in Table 1 on page 11. Use a T–10 TORX driver to tighten all screws.

Figure 3   Bias-Tee combiner assembly (N5247-30149, 5087-7403, & 0515-1227)
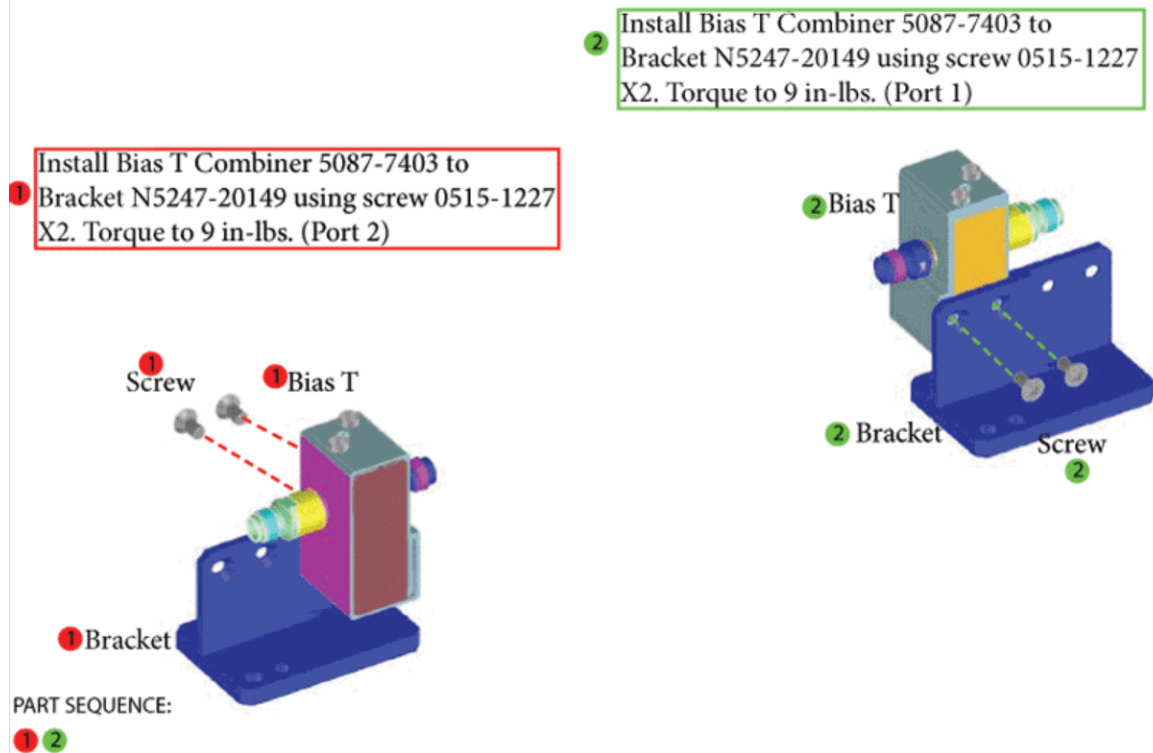
Step 10. Install the A71 and A74 Bias Tee Combiner Assemblies

Refer to **Figure 4** for this step of the procedure. New parts are listed in **Table 1 on page 11**. Use a T–10 TORX driver to tighten all screws.
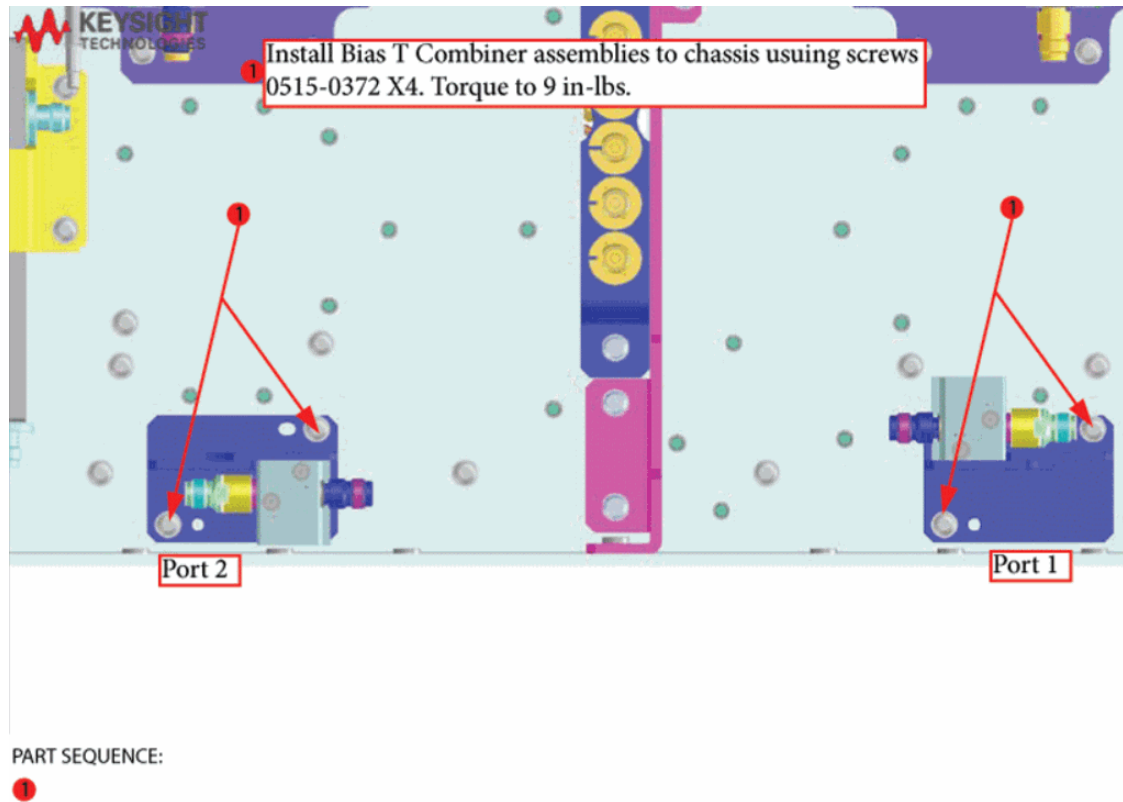
Figure 4   Bias-Tee combiner Installation (0515-0372)

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

Refer to Figure 5 for this step of the procedure. New parts are listed in Table 1 on page 11.

1. Remove the N5242-60004 Motherboard/IF MUX/Test set motherboard (TSMB)) ribbon cable from the A18 system motherboard connector J1 and discard this cable (item ①). Refer to Figure 5 (N5240-60089 is shown, but N5242-60004 is similar).

2. Install the N5240-60089 ribbon cable to the A14 system motherboard J1(item ① and ②). Refer to Figure 5.

| NOTE	**IMPORTANT!** Be careful to route the cable as shown in Figure 5 to avoid interference with the IF MUX board installation.

Figure 5   Install the ribbon cable on the A18 system mother board (N5240-60089)
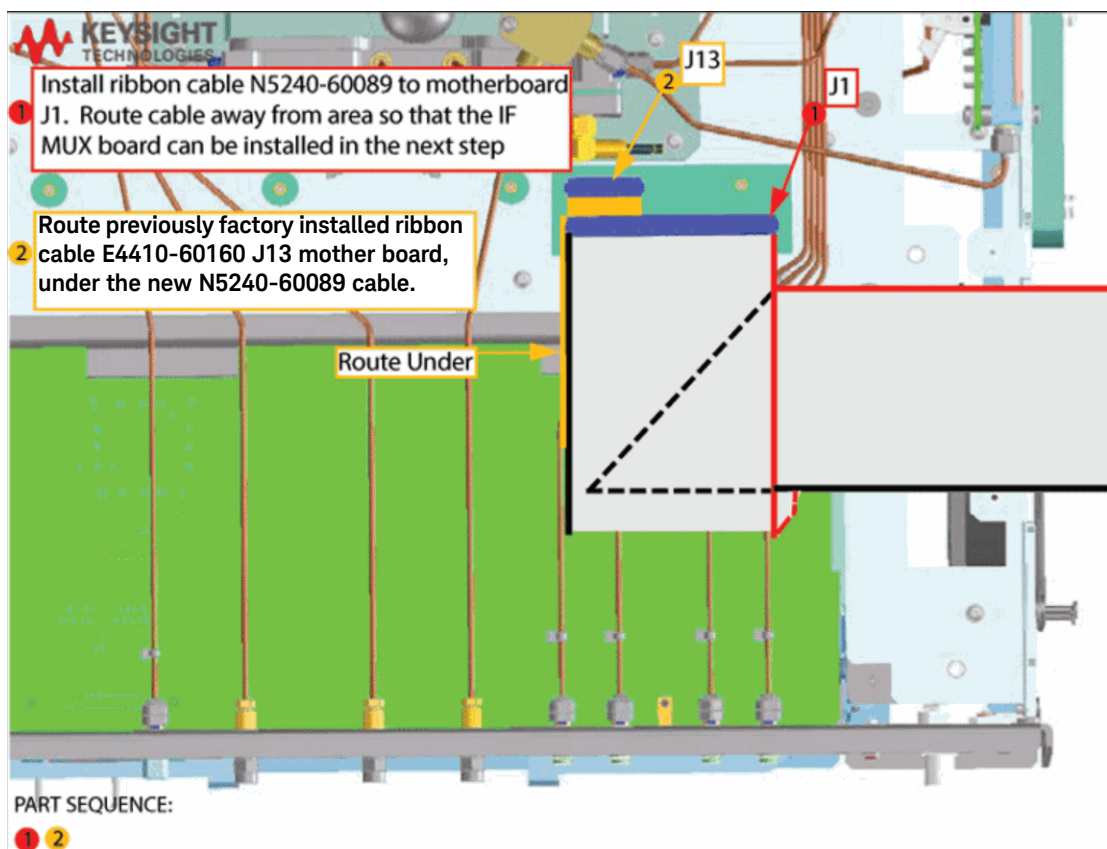
Step 12. Reinstall the A24 IF Multiplexer (IF MUX) Board and Connect the Motherboard / IF Multiplexer / Low Frequency Extension (LFE)/ Test set motherboard (MB/IF MUX/LFE/TSMB) ribbon cable (N5240-60089) and the IF MUX Rear Panel Hardware

1. Reinstall the IF MUX board using 0515-0669 (x4) screws (item ①).

2. For now, hand tighten only (item ②). Refer to Figure 6.

Figure 6   Reinstall the A24 IF MUX Board (N5240-60062 and 0515-0669)
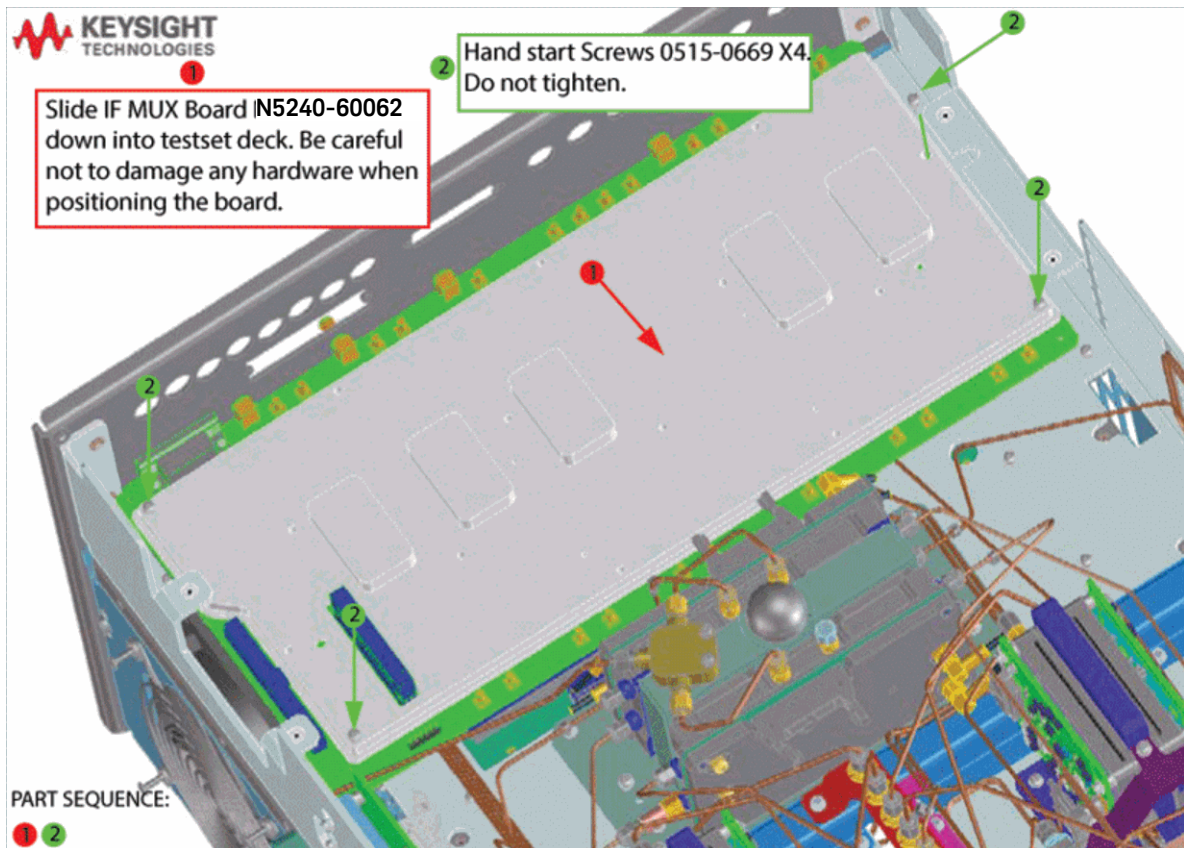
3. Reinstall the IF MUX board rear panel connectors using the washers and nuts removed in "Step 7. Remove the A24 IF Multiplexer Board" on page 17 (items ① and ②). Refer to Figure 7.

4. Torque the 0515-0669 IF MUX board screws that were previously hand-tightened to 21 in-lbs (item ③).

Figure 7   Reinstall the A24 IF MUX board rear panel hardware (N5240-60062 and 0515-0669)
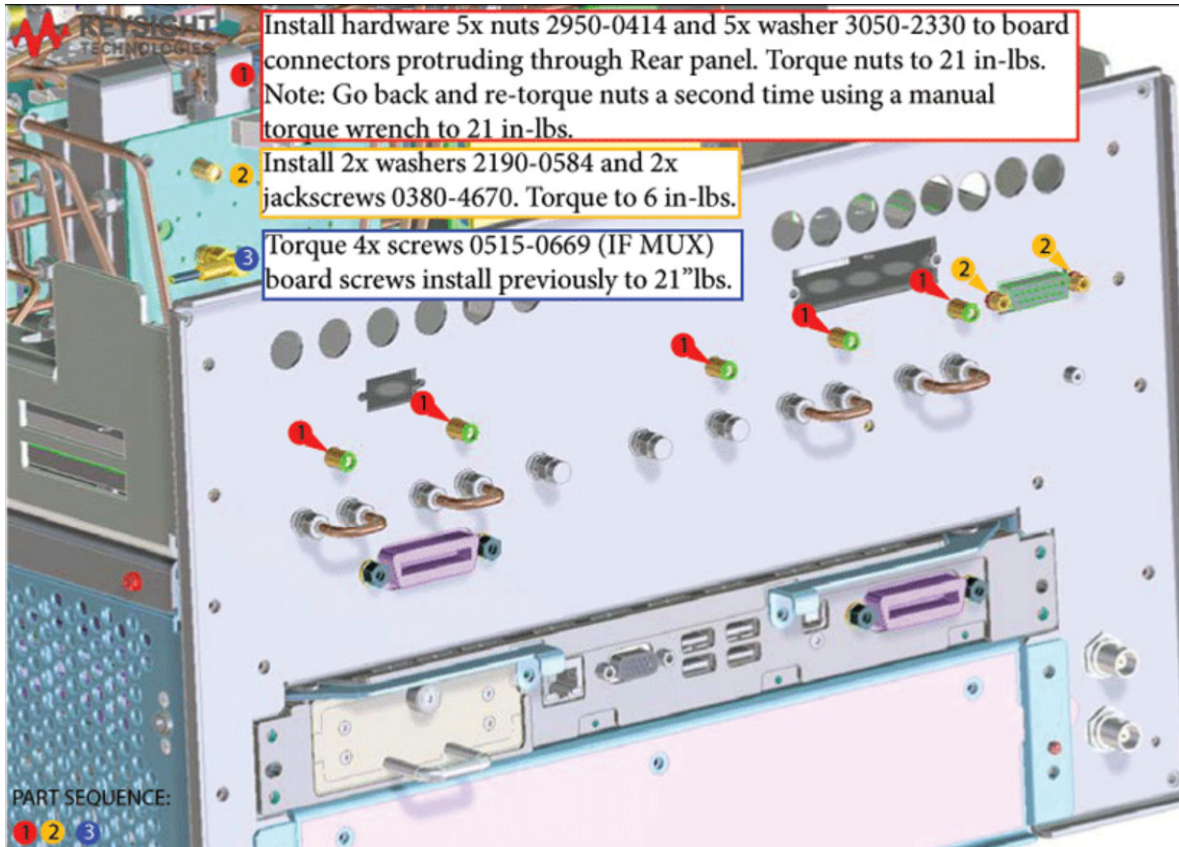
5. Connect N5240-60089 Motherboard / IF Multiplexer / Low Frequency Extension (LFE)/ Test set motherboard (MB/IF MUX/LFE/TSMB) ribbon cable to IF MUX J1 and fold—to relieve tension—as shown (item ①). Refer to Figure 8 on page 24.

6. Reconnect the IF Multiplexer /SPAM gray cables to the A24 IF MUX board as indicated in Figure 8 on page 24 (items ② through ⑥).

Figure 8 Connect the MB/IF MUX/ low frequency extension (LFE)/TSMB ribbon cable to A24 IF MUX J1 and reconnect the IF MUX gray cables. Fold to relieve tension as shown (N5240-60089).
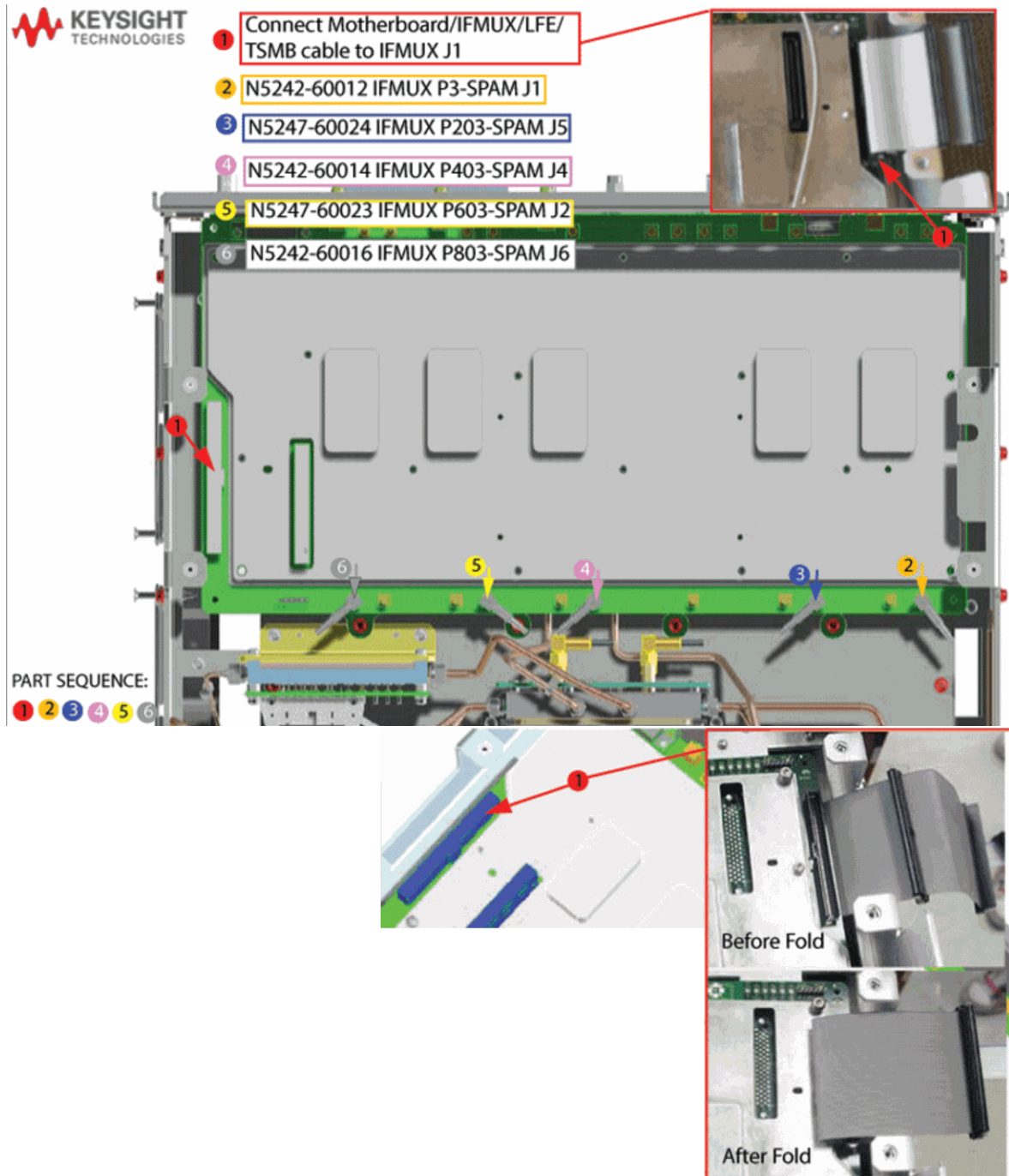
Step 13. Reinstall the handler, Power and Other I/O Assemblies

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 9.

Figure 9   Reinstall handler I/O cable, I/O cable assembly, power I/O assembly, and I/O Cables.
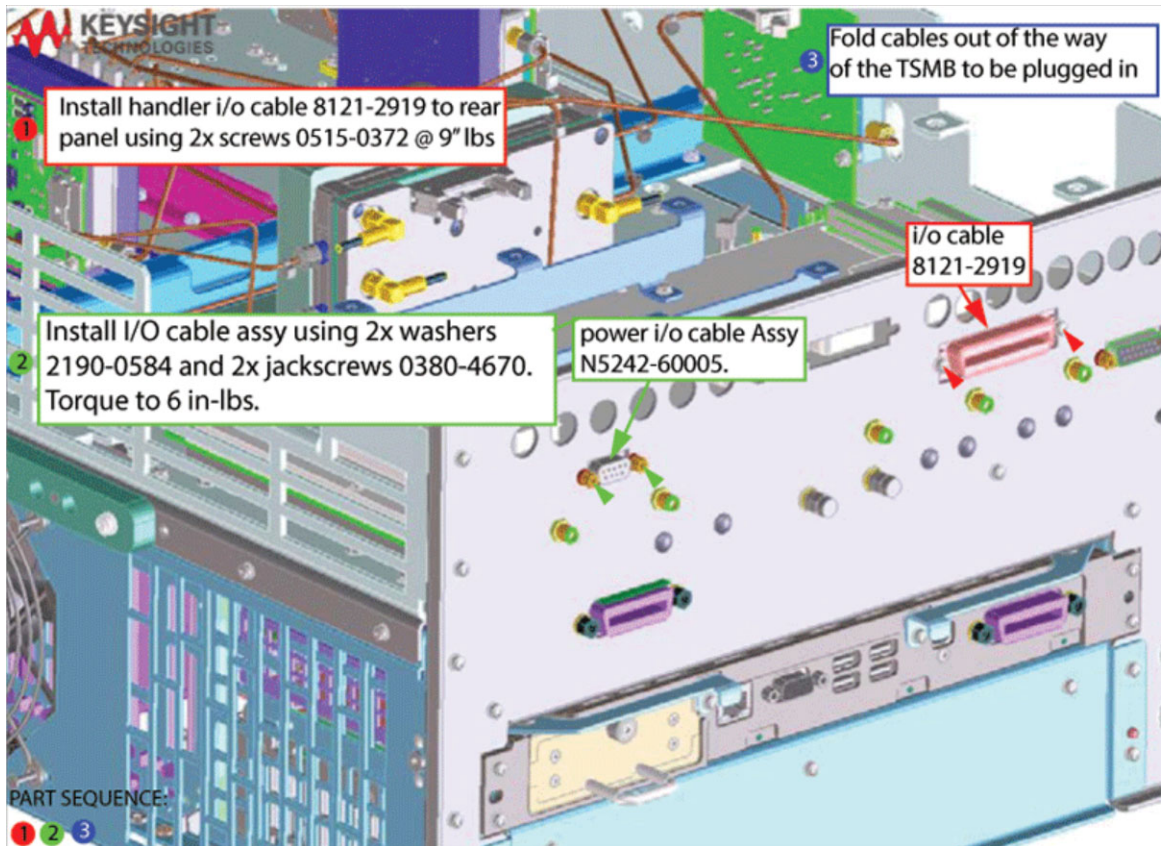
2. Reinstall and route Power I/O and Handler I/O cables. Refer to Figure 9-1.

Figure 9-1   Reinstall and route the ribbon cables (8121-2919 and N5242-60005)
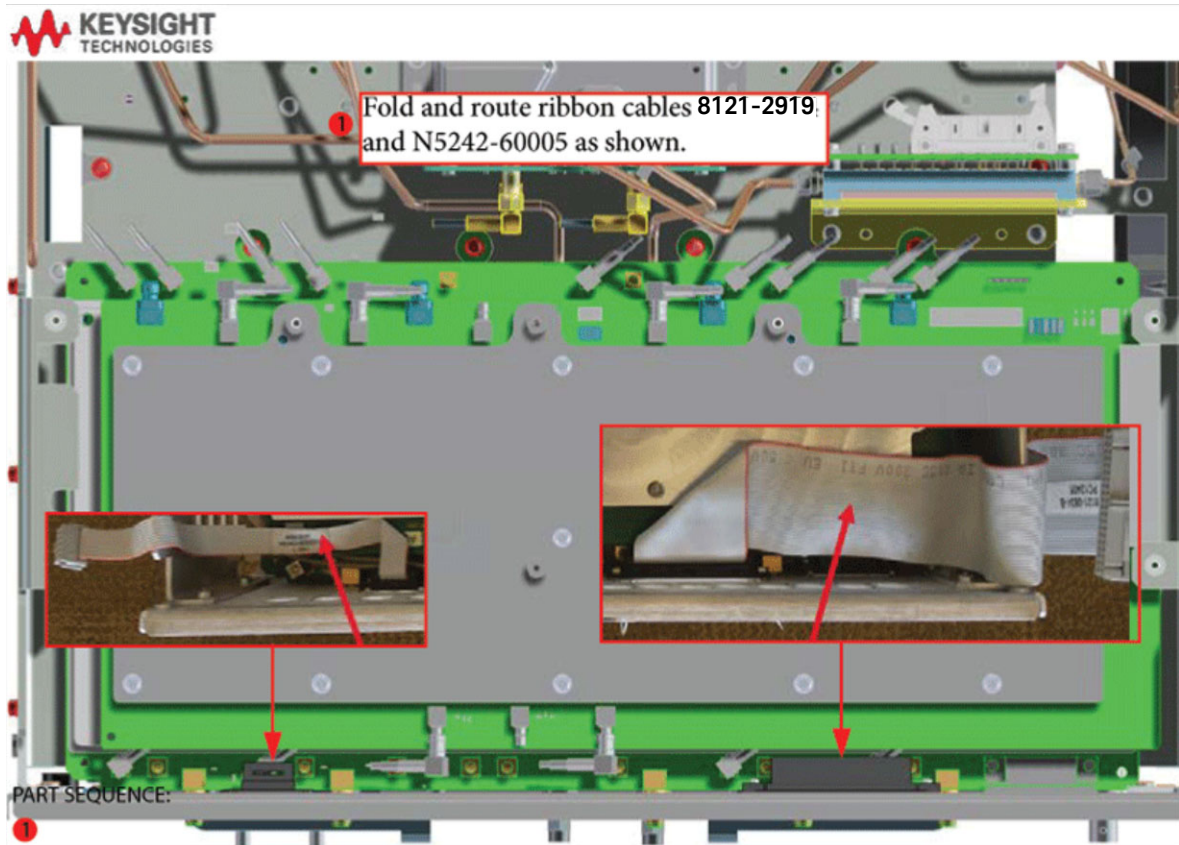
Step 14. Reinstall the Mixer Brick (MXB) Cables

Reinstall the other end of the mixer brick (MXB) cable (item ①) and all of the IF multiplexer (IF MUX) gray cables (IF MUX board as shown (items ② through ⑤). Refer to **Figure 10**.

Figure 10   Reconnect the other end of the IF gray cables to the IF MUX board

Connect the other end of the MXB cables as shown in step 2 through 5.

2 N5242-60017 IFMUX P1-BRK1 A
3 N5247-60018 IFMUX P201-BRK1 B
4 N5242-60025 IFMUX P601-BRK1 R1
5 N5242-60026 IFMUX P801-BRK1 R2

PART SEQUENCE:
① ② ③ ④ ⑤
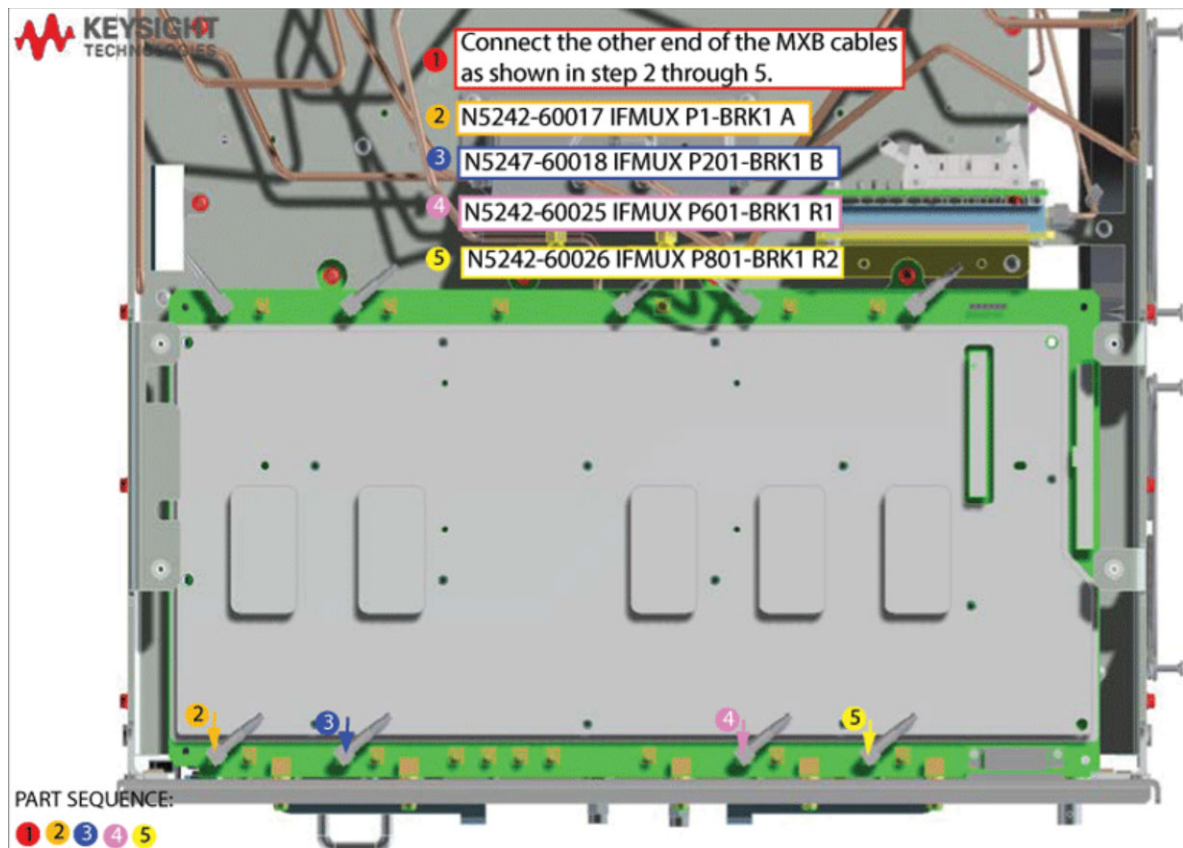
Step 15. Attach Lower Bracket (N5240-00011) to IF Multiplexer (IF MUX) Board Shield

Attach N5240-00011 lower bracket to IF MUX board using 0515-0372 screws (x4). Torque to 9 in-lbs. Refer to Figure 11 for this step of the procedure. New parts are listed in Table 1 on page 11. Use a T-10 TORX driver to tighten all screws.

Figure 11   Attach lower bracket (N5240-00011) to IF MUX shield using screws (x4) (0515-0372)
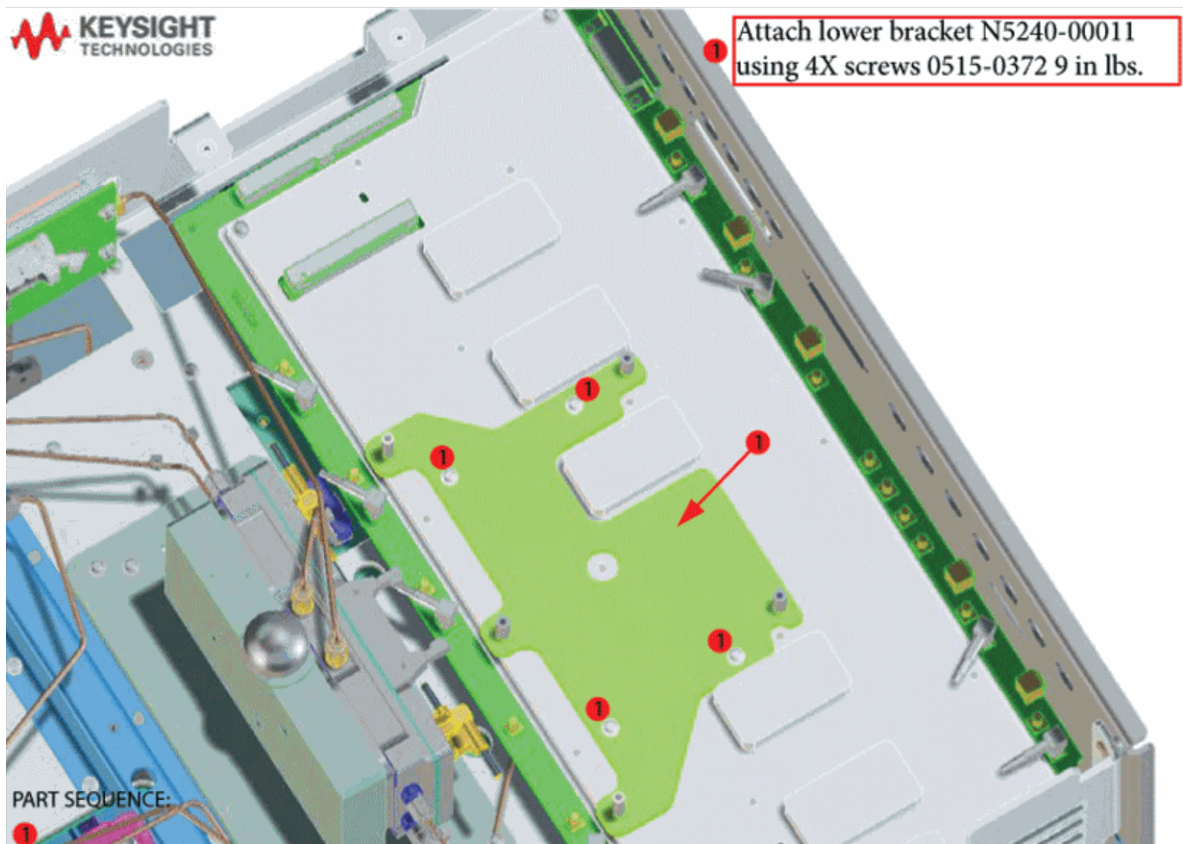
Step 16. Connect and Route New LFE Cables (8120-5014 (x2), 8120-5017 (x1), and 8120-5021 (x1)) and the Other Ends of the New Cables Connected to the IF Multiplexer (IF MUX) Board

1. Connect and route the 8120-5014 (x2), 8120-5017 (x1), and 8120-5021(x1) cables and connect the N5240-60089 MB/IF MUX/ Low Frequency Extension (LFE)/TSMB ribbon cable 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 12

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

Figure 12   Connecting and routing the gray cables and MB/IF MUX/ Low Frequency Extension (LFE)/TSMB ribbon cable (N5240-60089) on the IF MUX board (8120-5014 (x2), 8120-5017 (x1), and 8120-5021(x1))
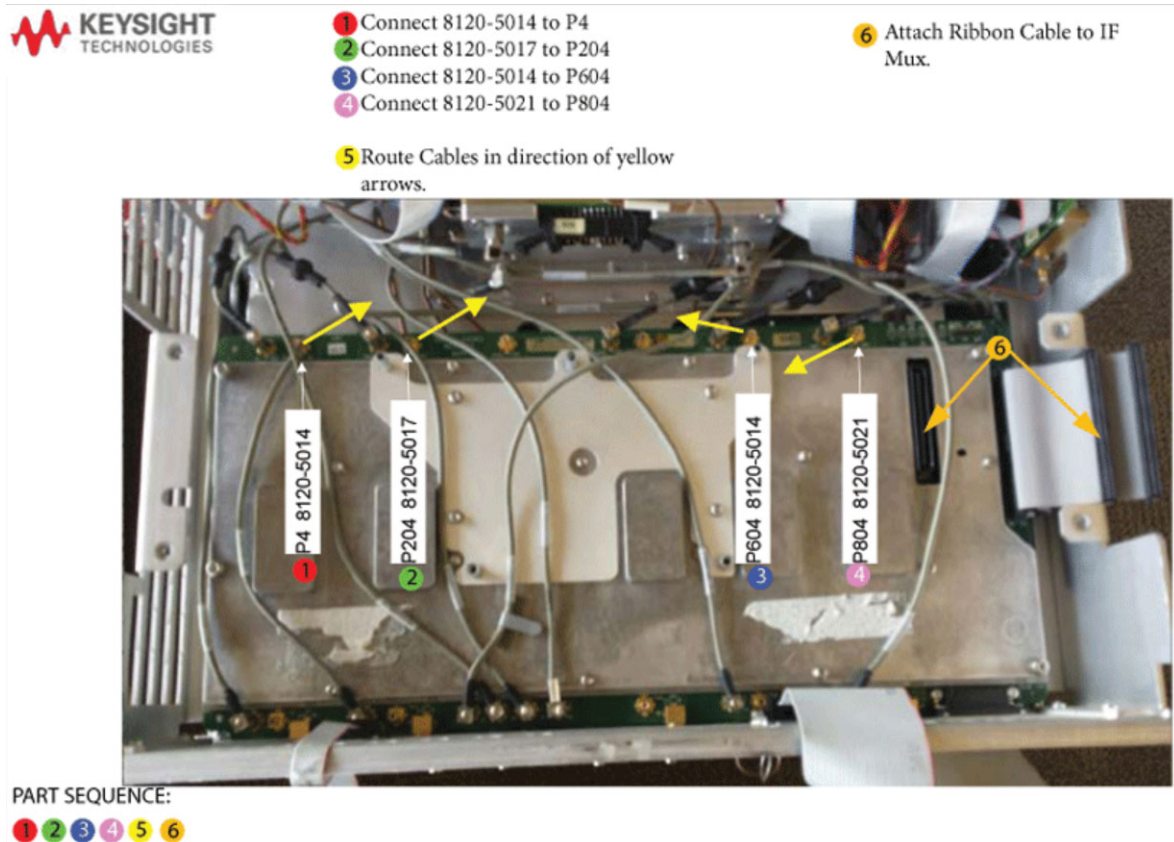
Step 17. Install the A75 Low Frequency Extension (LFE) Board

1. Install the LFE A75 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 13.

3. Install the A75 LFE board using the 0515-0665 screws x2. Torque to 9 in-lbs (item ②). Refer to Figure 13.

Figure 13   Install the A75 LFE Board (N5291-60005, N5240-60089, and 0515-0666)
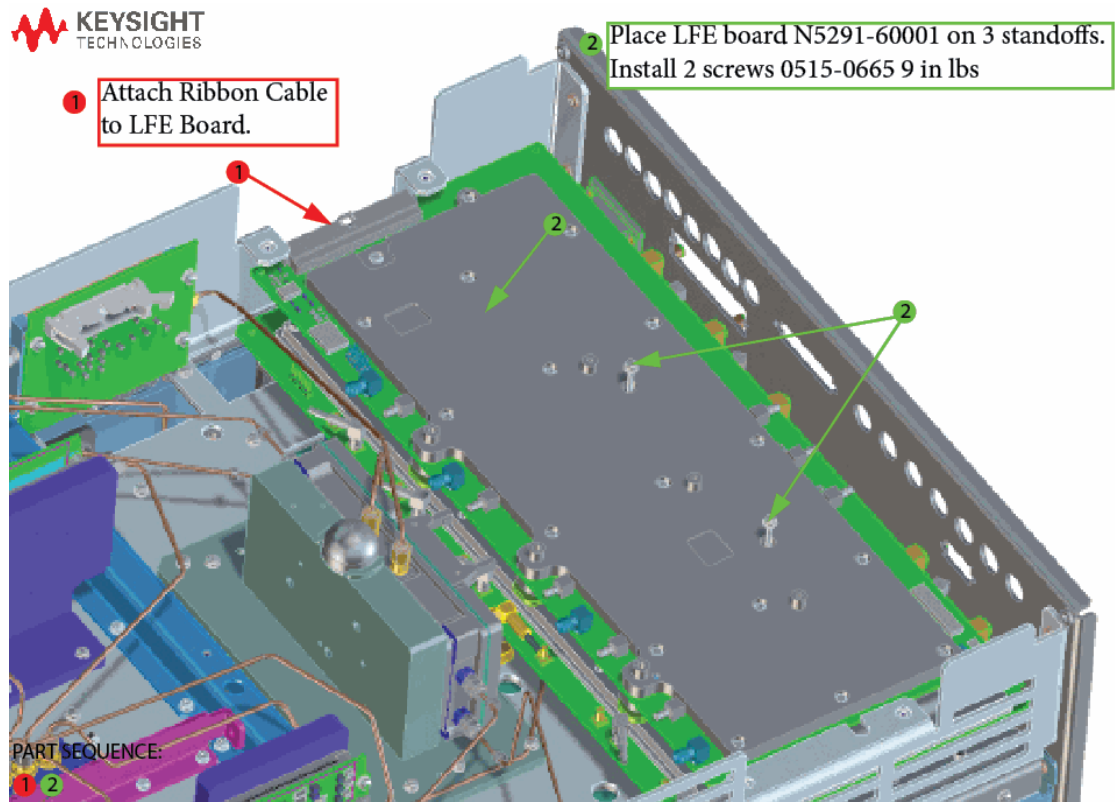
Step 18. Connect A71 and A74 Bias-Tee Combiner's New Cables to
the A75 Low Frequency Extension (LFE) Board and the Other Ends of
the Cables Connected to the IF Multiplier (IF MUX)

1. Connect the (8120-5014 (x2), 8120-5017 (x1)) IF gray cables item ①
   through item ④ as shown in Figure 14. (i.e., one end was installed in
   Figure 12 on page 29.)

2. Connect the N5245-60027 Source 1 and N5242-60080 LO Source cables
   to the LFE board as shown – (items ⑤ and ⑥). The other end of the
   N5245-60027 and N5242-60080 cables are connected to the Source1 and
   LO Source boards in a later step. Refer to Figure 14.

Figure 14   Connect A71 and A74 bias-T combiners new cables to the A75 LFE board the
               other ends of the new LFE cables to the LFE Board (8120-5014 (x2),
               8120-5017 (x1), 82120-5021 (x1), N5245-60027 and N5242-60080)
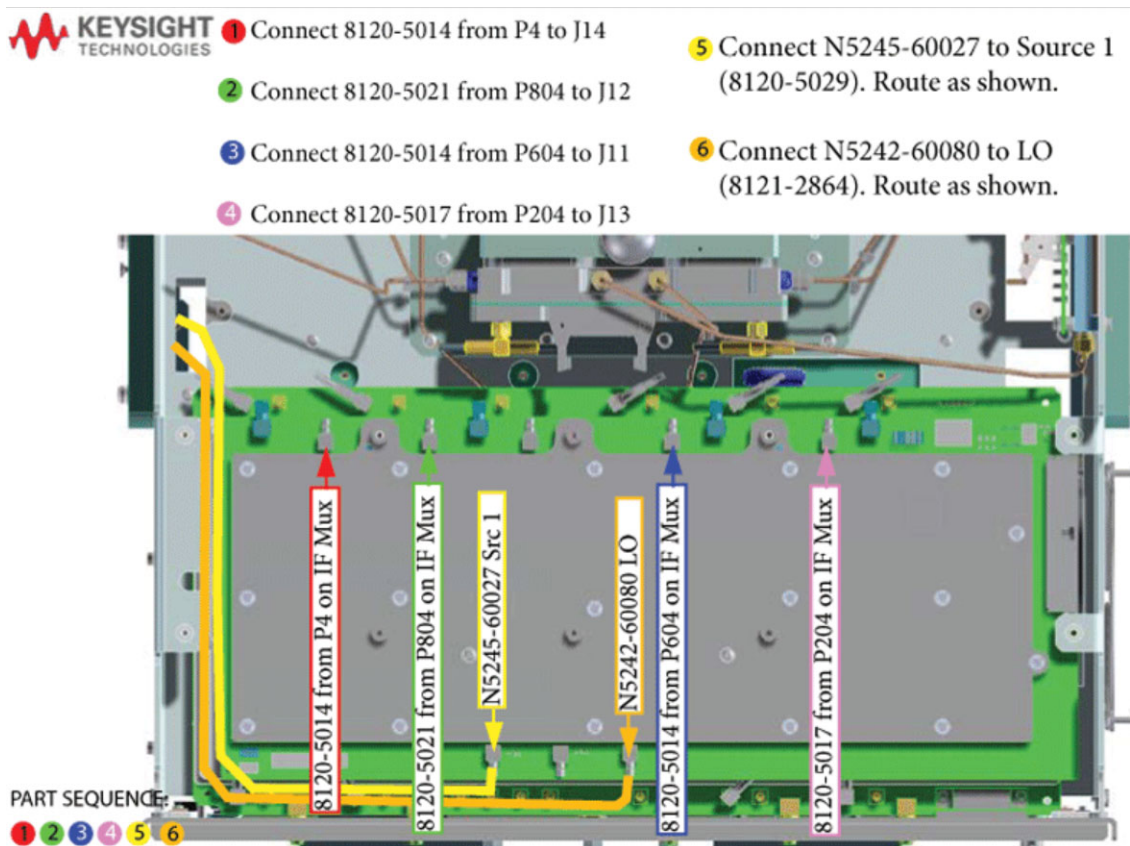
Step 19. Install the New Bias Tee Combiner's Semirigid Test Set Cables, Blue Cables, and Install Cable Clamps Onto the Ferrite Beads

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.

CAUTION	Be careful not to damage the center pins of the semi-rigid 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.

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

This step contains the following sections:

— "Install the New Test Semi-rigid Cables"

— "Install Blue Bias-Tee Combiner Cables and Clamps From the A71 and A74 Bias Tees "RF-IN" to the A75 LFE Board "Port1" and "Port2" Connectors, and Cable Clamps Onto Ferrite Beads" on page 35

Install the New Test Semi-rigid Cables

To see images showing the location of these cables, click the Chapter 6 bookmark "Bottom RF Cables, 2-Port, Option 205 (**S/N Prefixes** <6021)" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 11.

1. Install the following new cables in the order listed:

Refer to Figure 15 on page 33.

— ①—W181 (N5247-20167) Cable, assy-RF, front panel port 1 CPLR THRU to A71 port 1 bias combiner

— ②—W198 (N5247-20166) Cable, assy-RF, FP, 33 test coupler to A71 port 1 bias combiner

Refer to Figure 16 on page 34.

— ①—W187 (N5247-20163) Cable, assy-RF, front panel port 2 CPLR THRU to A74 port 2 bias combiner

---

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

– ②–W199 (N5247-20168) Cable, assy-RF, FP, A36 port 2 test
coupler to A74 port 2 bias combiner

Figure 15   Install A71 port 1 bias-T semirigid cables (N5247-20166 and N5247-20167)
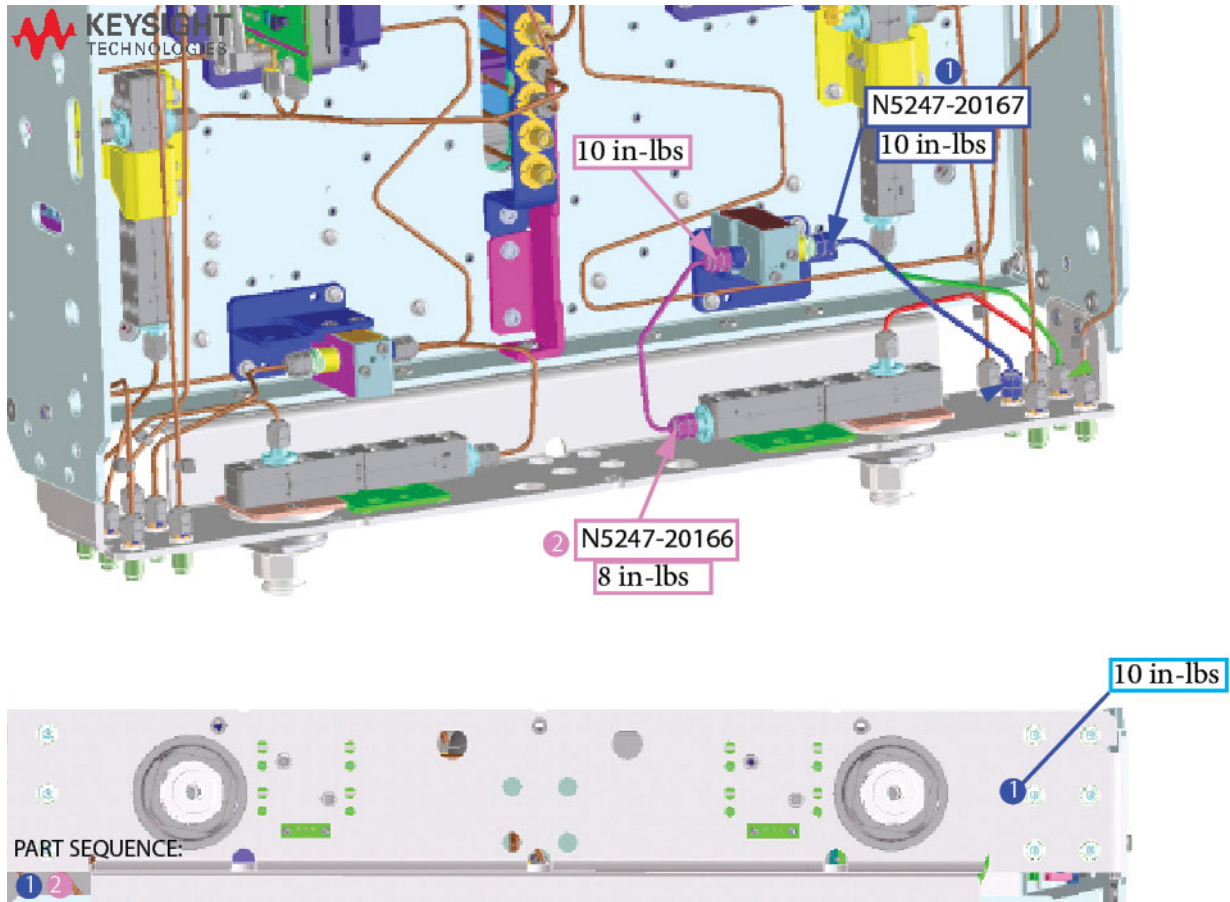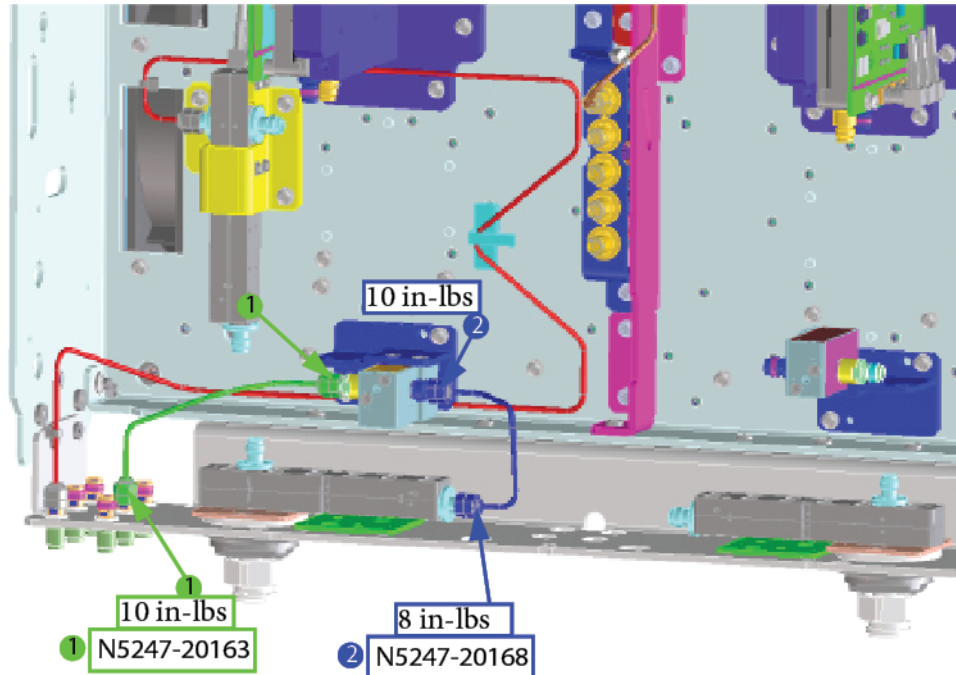
Figure 16   Install A74 port 2 bias-T semirigid cables (N5247-20163 and N5247-20168)

Install Blue Bias-Tee Combiner Cables and Clamps From the A71 and A74 Bias Tees "RF-IN" to the A75 LFE Board "Port1" and "Port2" Connectors, and Cable Clamps Onto Ferrite Beads

2. Install the N5240-60097 (x2) blue cables and route cables as shown in Figure 17. Torque to 10 in-lbs.

Figure 17   Connect N5240-60097 from A71 Bias Tee Combiner to A75 LFE Board and Install Clamps on Ferrite Beads Install the N5240-60097 Blue Cables from A74 and N5240-60097 A74 "RF–IN" to the LFE board's "BC1" and "BC2" connectors (N5240-60097 (x2) and 1400-1391 (x1))
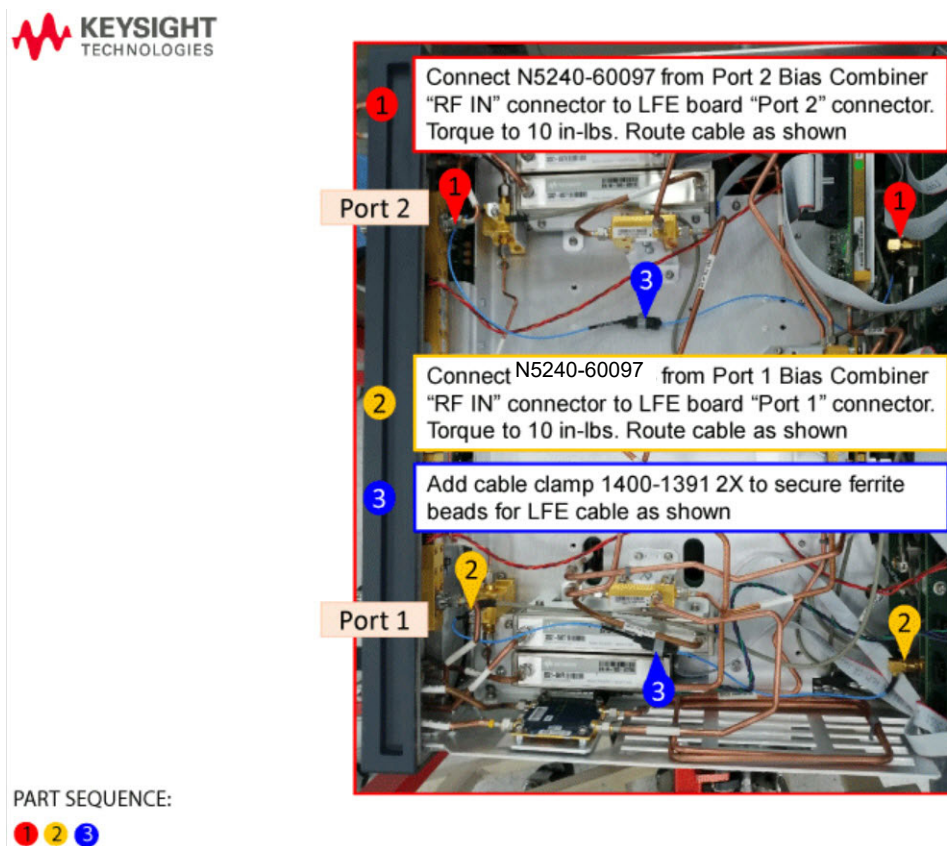
Step 20. Reinstall the A19 Test Set Motherboard

For instructions, click the Chapter 7 bookmark "Removing and Replacing the A19 Test Set Motherboard" in the PDF Service Guide.

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.

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 sections:

— "Install the A71 and 74 bias-Tee Combiner's Gray Low Frequency Extension (LFE) DC bias Cables"

— "Route Cables As Shown" on page 38

### Install the A71 and 74 bias-Tee Combiner's Gray Low Frequency Extension (LFE) DC bias Cables

To see an image showing the location of these cables, refer to Figure 18. See also the Chapter 6 bookmarks "Bottom Ribbon Cables and Wire Harnesses, 2-port, Option 205" in the PDF Service Guide[1]. New parts are listed in Table 1 on page 11.

NOTE	**IMPORTANT!** The N5240-60091 (x2) bias combiner cables only connect to the DC bias of the Bias Tee Combiner.

3. Connect A71 and A74 blue DC cables to the test set motherboard (TSMB) as follows:

   – ①–(N5242-60091) A19 test set motherboard J521 to A71 port 1 bias-T combiner

   – ②–(N5242-60091) A19 test set motherboard J522 to A37 port 2 bias-T combiner

Figure 18   Install N5240-60091 DC combiner cables (x2) to A71 and A72 Bias-Tees
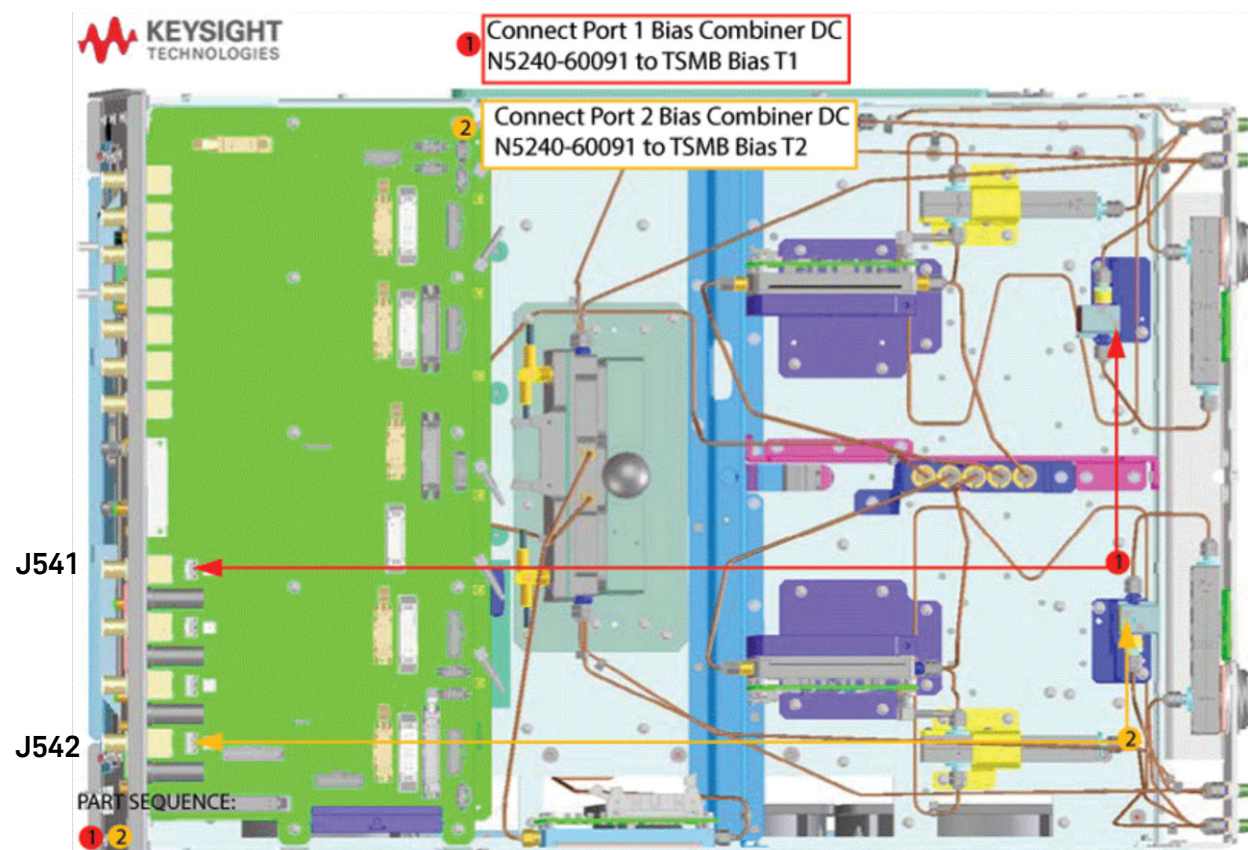
1. See "Downloading the Online PNA Service Guide" on page 8.

Route Cables As Shown

4. 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 18.

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

Refer to Figure 19. 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. Connect flexible cable N5245-60027 (item ①) and N5242-60080 (item ②) as indicated in Figure 19.

Figure 19   Connect the other end of the N5242-60080 and N5245-60027 cables
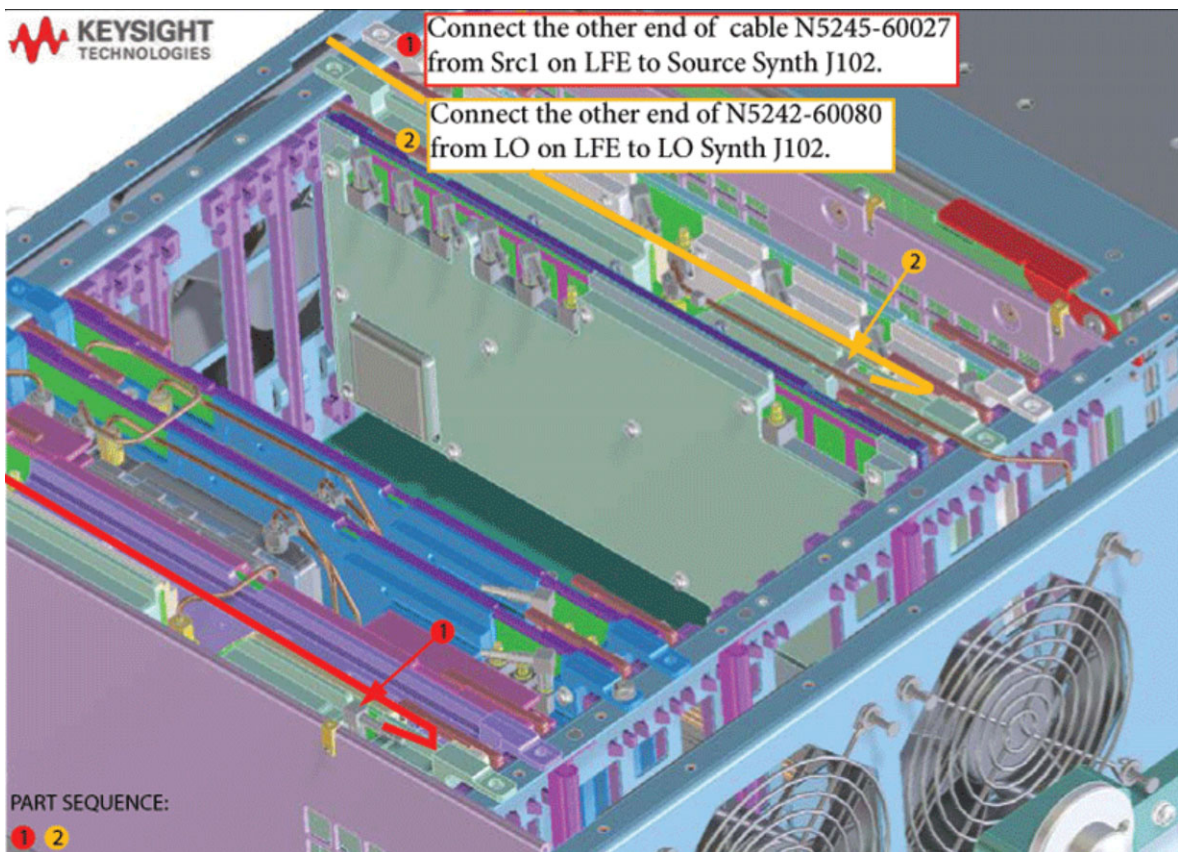
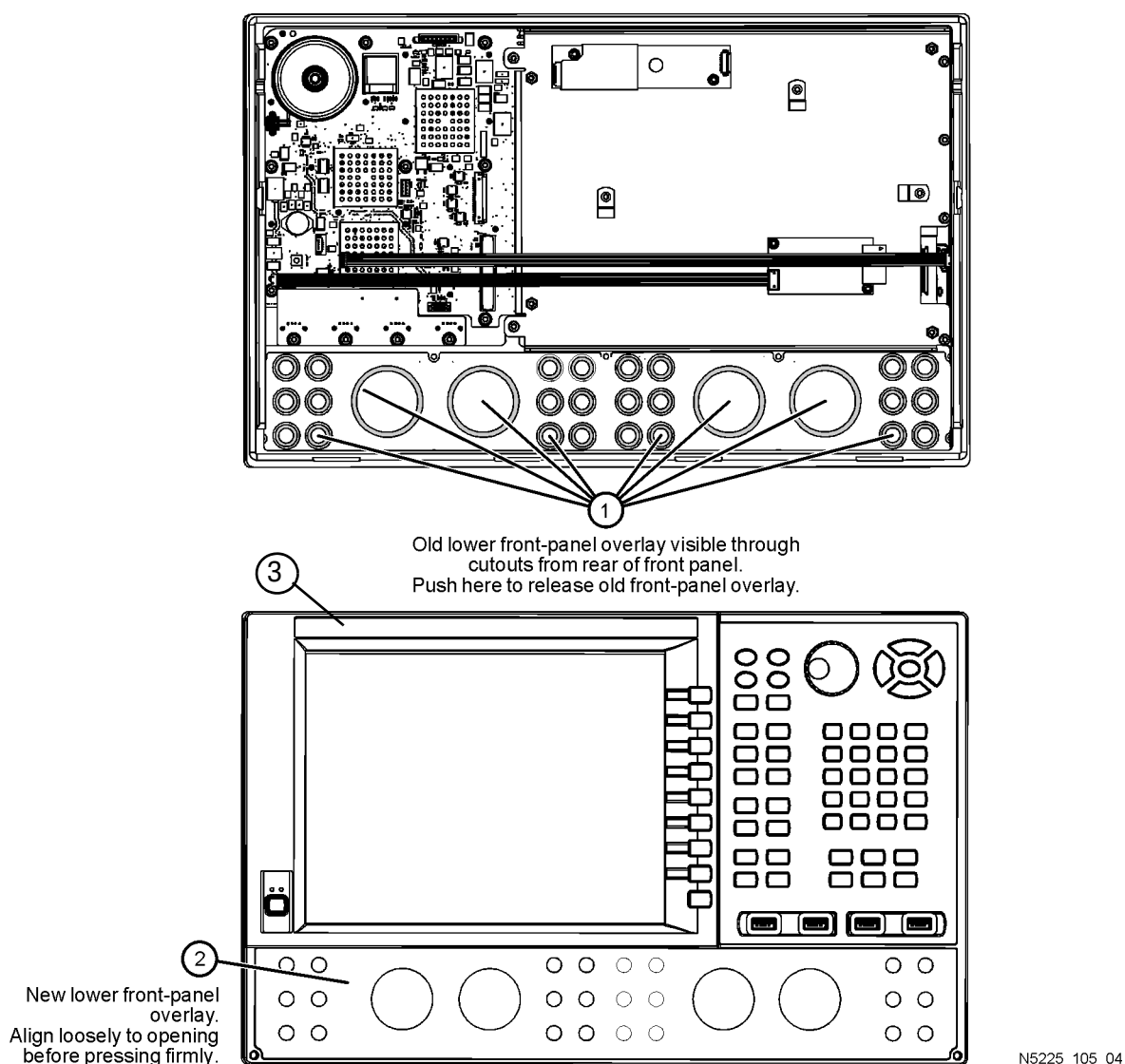## Step 23. Remove the Old Lower Front Panel Overlay

Refer to **Figure 20** for this step of the procedure. Although this figure shows a 4-port PNA, the concept is the same for a 2-port PNA. New parts are listed in **Table 1 on page 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.

Figure 20   Lower Front Panel Overlay Replacement

Old lower front-panel overlay visible through cutouts from rear of front panel.
Push here to release old front-panel overlay.

New lower front-panel overlay. Align loosely to opening before pressing firmly.

N5225_105_04

Step 24. Reinstall Front Panel Assembly

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

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

Refer to Figure 20 on page 40 for this step of the procedure. New parts are listed in Table 1 on page 11.

1. Remove the protective backing from the new lower front panel overlay, N5227-80030 — (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. Remove the protective backing and Install the nameplate (N5227-80029, item ③).

Step 26. 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 27. Reinstall Front Panel Jumpers

Reinstall the front panel jumper cables.

---

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

Step 28. 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, Blue Cables, and Install Cable Clamps Onto the Ferrite Beads" on page 32 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 36 are connected correctly and not open or shorted.

Step 29. 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 30. Reinstall the Inner and Outer Covers

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

Step 31. Remove Option 201 License

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 201 License Removal Procedure

1. To start the Keysight License Manager, press Start > Keysight License Manager > Keysight License Manager. A Keysight License Manager dialog box will appear.

2. Right click the on the desired option and click **Delete**.

3. In the Keysight License Manager dialog box that appears, press or click **Yes** to confirm delete.

4. A message displays stating that the option removal was successful.

Step 32. Enable Options 205

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.

— Refer to the license message you received from Keysight: Verify that the analyzer's model and serial numbers match those on the license message you received from Keysight.

— A keyboard and mouse 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 a result of Step 3 on .

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.

NOTE	A single license file may contain more than one feature.

3. Insert the USB flash drive to the PNA's USB drive slot. 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.

4. Disconnect the USB flash drive from the PNA.

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

Step 32. Verify the PNA Analyzer Program is Running with the Correct Options

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

1. Start the Network Analyzer program.

2. Refer to the license message you received from Keysight:

   — Press **Help** > **About NA** and verify that Option 205 is listed in the PNA application.

NOTE	If the option has not been enabled or if Option 201 has 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 33. 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)

— source adjustment

— IF gain adjustment

— receiver characterization

— receiver adjustment

— LFE Receiver Adjustment

— IF Response adjustment (Options S93090xA/B, S93092A/B, S93093A/B, or S93094A/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.

---

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

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.

Figure 21   EEPROM Backup Menu
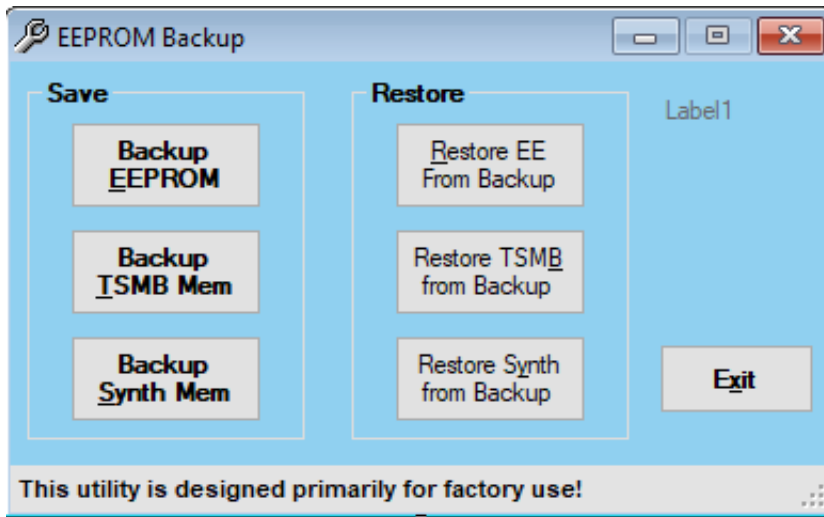
Operator's Check

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 34. 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 3. Inspect and (If Necessary) Remove the A4, A11, and A13 Synthesizer Boards, if They Are Not Version H" on page 15.

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 4. Remove the Front Panel Assembly" on page 17. After this section is completed, your synthesizer board will be a version H synthesizer board. Refer to Figure 2 on page 53.

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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 51.

3. Clean pads.

4. Replace with resistor 1 kΩ (0699-3947). Refer to Figure 1 on page 51.

5. Remove capacitor C252.

6. Clean pads.

7. Replace with capacitor 22µF (0161-4279). Refer to Figure 1 on page 51.

Figure 1 Remove old resistor and capacitor and replace with resistor 1 kΩ (0699-3947) and 22µF (0161-4279).
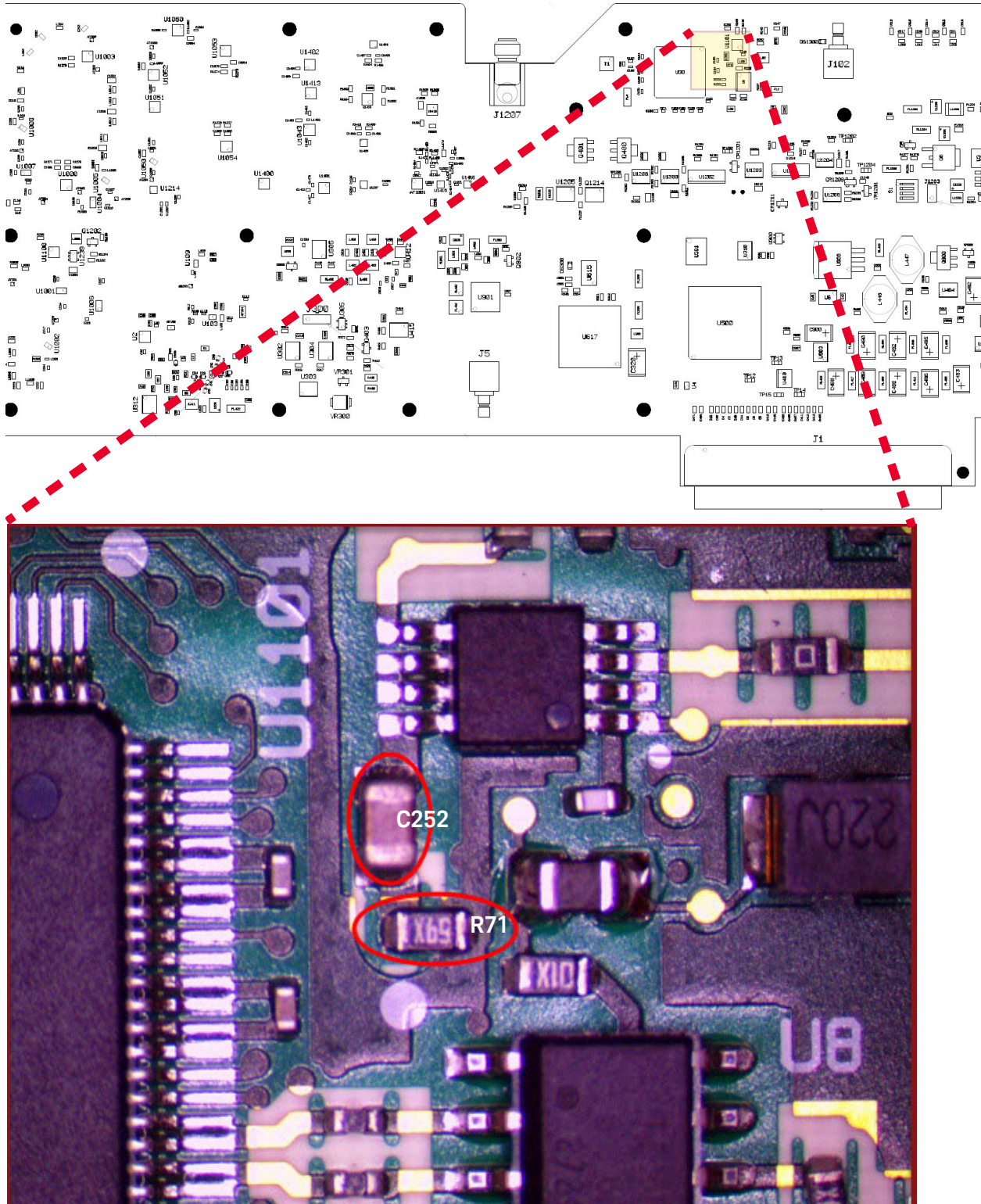
8. Re-assemble shield, screws, and torque:

   – 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 EEPROM 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 53.

   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 54.

   e. Press **Enter**. Refer to Figure 3 on page 54.

   f. Press **Save Changes**. Refer to Figure 3 on page 54.

   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 4. Remove the Front Panel Assembly."

Figure 2   EEPROM Header Info Window

Figure 3   EEPROM Editor Window

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