Keysight - N5241/2/9A&B Source Combiner and Mechanical Switches Upgrade Kit (For Version 6 Single-Source Synthesizers) - Installation Guide

To Upgrade N5241/2/9A&B Series
Option 217/219 to Option 217/224 -

For Analyzers with Serial Numbers
Prefixed MY/SG/US5201 and Above

Upgrade Kit Order Numbers:
N5241AU- 932, N5242AU- 932,
N5249AU- 932, N5241BU- 224,
N5242BU- 224, N5249BU- 224

Keysight Kit Number: N5242-60114

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

Notices

Trademark Acknowledgments

Manual Part Number

N5242-90114

Edition

Edition 2, December 2022

Printed in USA/Malaysia

Published by:
Keysight Technologies
1400 Fountaingrove Parkway
Santa Rosa, CA 95403

Warranty

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

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

U.S. Government Rights

The Software is "commercial computer software," as defined by Federal Acquisition Regulation ("FAR") 2.101. Pursuant to FAR 12.212 and 27.405-3 and Department of Defense FAR Supplement ("DFARS") 227.7202, the U.S. government acquires commercial computer software under the same terms by which the software is customarily provided to the public. Accordingly, Keysight provides the Software to U.S. government customers under its standard commercial license, which is embodied in its End User License Agreement (EULA), a copy of which can be found at http://www.keysight.com/find/sweula The license set forth in the EULA represents the exclusive authority by which the U.S. government may use, modify, distribute, or disclose the Software. The EULA and the license set forth therein, does not require or permit, among other things, that Keysight: (1) Furnish technical information related to commercial computer software or commercial computer software documentation that is not customarily provided to the public; or (2) Relinquish to, or otherwise provide, the government rights in excess of these rights customarily provided to the public to use, modify, reproduce, release, perform, display, or disclose commercial computer software or commercial computer software documentation. No additional government requirements beyond those set forth in the EULA shall apply, except to the extent that those terms, rights, or licenses are explicitly required from all providers of commercial computer software pursuant to the FAR and the DFARS and are set forth specifically in writing elsewhere in the EULA. Keysight shall be under no obligation to update, revise or otherwise modify the Software. With respect to any technical data as defined by FAR 2.101, pursuant to FAR 12.211 and 27.404.2 and DFARS 227.7102, the U.S. government acquires no greater than Limited Rights as defined in FAR 27.401 or DFAR 227.7103-5 (c), as applicable in any technical data.

Safety Notices

CAUTION

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

WARNING

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

NOTICE: This document contains references to Agilent Technologies. Agilent's former Test and Measurement business has become Keysight Technologies. For more information, go to **www.keysight.com.**

Description of the Upgrade

NOTE Options 217 and 222 do not apply to A model instruments.

NOTE Some of the assembly drawings in this document may be different from your instrument, but the process is similar for both an “A” model and “B” model instruments.

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

NOTE The following may apply to your “B” model PNA: In June 2013, the N5241A/AS and N5242A/AS analyzers underwent significant hardware changes. Some components that have 2.4 mm connectors (bias tees, couplers, and some semi-rigid cables) were replaced with components that have 3.5 mm connectors.
If your analyzer’s serial number prefix is MY/SG/US5310 and below:
Your analyzer was originally shipped with 2.4 mm components. Bias tees with 2.4 mm connectors are no longer available, so the bias tees and connecting cables included in this kit have 3.5 mm connectors. Since they are interconnected, the 2.4 mm couplers and connecting cables in your analyzer must be replaced with the new 3.5 mm items included in this kit.
If your analyzer’s serial number prefix is MY/SG/US5321 and above:
Your analyzer was shipped with 3.5 mm components, so it is not necessary to replace the couplers and connecting cables. These items are included in this kit, but will not be used for your upgrade. Set them aside for possible use in the future.
Be very careful to use the appropriate hardware in your analyzer. Using the wrong hardware can ruin analyzer components, resulting in additional customer costs.

This upgrade converts your Option 217 2-port analyzer (with configurable test set and extended power range) to Option 222 analyzer or Option 219 2-port analyzer (with configurable test set, extended power range, and bias tees) to an Option 224 analyzer by adding:

- a second source
- source outputs routed to the front panel
- source outputs routed to the rear panel
- a mechanical switch to each source port channel
- a source combiner to the port 1 channel
- rear-panel test set inputs

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 6.**

Getting Assistance from Keysight

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

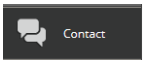
Contacting Keysight

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

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

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

If You Have Problems With the Upgrade Kit Contents

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

) link.

Getting Prepared

CAUTION

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

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

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

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, for A models, refer to the https://www.keysight.com/us/en/assets/9018-01616/installation-guides/9018-01616.pdf (N5242-90006).

for B models, refer to the https://www.keysight.com/us/en/assets/9018-04534/installation-guides/9018-04534.pdf (N5242-90024).

NOTE

The enclosed Option 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(s), you must request license key(s) file from the Keysight Software Manager: http://www.keysight.com/find/softwaremanager:

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

- From the certificate

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

  - Order number
  - Certificate number
- From your instrument
  - Model number
  - Serial number
- **A models ONLY:** From the online Keysight HostID utility

    Part of the OEC procedure to obtain the 12-digit license key online requires you to provide the HostID number of the PNA. This HostID number is NOT the one currently shown on the PNA. To determine your new HostID, Keysight personnel should use the new model number with the utility at go to http://mktwww.srs.is.keysight.com/field/service/network/pna/upgrades.html. Non-Keysight personnel should contact Keysight at http://www.keysight.com/key/contactus.

  - Host ID

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

You will need to provide an email address, to which Keysight will promptly email your license key file. Refer to "License Key Redemption" on page 7.

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 6.

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-10 TORX driver (set to 9 in-lbs)	1	N/A
T-20 TORX driver (set to 21 in-lbs)	1	N/A
5/16-in torque wrench (set to 10 in-lbs)	1	N/A
5/16-in torque wrench (set to 21 in-lbs)	1	N/A

CAUTION

Use a 5/16-in torque wrench set to 10 in-lbs on all cable connections except the front and rear panel bulkhead connectors and the bias tees. The bias tees should be torqued to 9 in-lbs. And, on the front and rear bulkhead connectors, use a 5/16 inch nutsetter or open end torque wrench set to 21 in-lb.

About Installing the Upgrade

Products affected	N5241/2/9/A Option 219 and N5241/2/9B Option 217 and Option 219
Installation to be performed by	Keysight service center or personnel qualified by Keysight
Estimated installation time	5 hours
Estimated adjustment time	0.5 hours
Estimated full instrument calibration time	4.5 hours

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

Items Included in the Upgrade Kit

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

Table 1 Contents of Upgrade Kit N5242-60114[a]

Ref Desig.	Description	Qty	Part Number
--	Installation note (this document)	1	N5242-90114
--	Software Entitlement Certificate (provided separately)	1	5964-5145
--	China RoHS Addendum	1	9320-6722
A8	26.5 GHz source 2 board	1	5087-7837
A13	13.5 GHz source 2 synthesizer board	1	N5240-60074
A46	Port 1 mechanical switch	3	N1811-60028
A47	SRC 2 OUT mechanical switch		
A49	Port 2 mechanical switch		
A50	Combiner (bridge)	1	5087-7757
--	Switch bracket	3	N5242-00009
--	Machine screw, M3.0 x 8, pan head	5	0515-0372
--	Machine screw, M2.5 x 20, pan head (to attach mechanical switch to switch bracket)	6	0515-1992
--	Machine screw, M3.0 x 20, pan head (to attach combiner to switch bracket)	2	0515-1410
--	Machine screw, M3.0 x 6, pan head (to attach switch bracket to analyzer)	6	0515-0430
--	Bulkhead connector assembly (for rear panel)	7	1250-3805
--	Termination, 50 ohm (for rear-panel PORT 3 SW TSET IN (J7)	1	1250-4261
--	Dust cap for test port	4	1410-0214
--	Dust cap for test port (Source 2 output- Front Panel)	2	1410-0225
--	Bulkhead connector (front-panel SRC 2 OUT s1 and SRC 2 OUT 2)	2	08673-60040
--	Washer (for bulkhead connector)	2	2190-0016
--	Hex nut (for bulkhead connector)	2	2950-0001
--	Lower front panel overlay (Option 224) - A models	1	N5242-80002
--	Lower front panel overlay (Option 224) - B models	1	N5242-80024
--	Lower front panel overlay (Option 224) - B models with 029	1	N5242-80027
W2	RF cable, A13 13.5 GHz source 2 synthesizer J1207 to A8 26.5 GHz source 2 P1	1	N5222-20090
W5	RF cable, A8 26.5 GHz source 2 to W101	1	N5222-20062

Table 1 Contents of Upgrade Kit N5242-60114[a]

Ref Desig.	Description	Qty	Part Number
W7	RF cable, A8 26.5 GHz source 2 to W68	1	N5222-20063
W57	RF flex cable, A10 frequency reference board J7 to A13 13.5 GHz source 2 synthesizer J5	1	N5242-60030
W67	RF cable, A47 SRC 2 mechanical switch to front-panel SRC 2 OUT 1	1	N5242-20290
W68	RF cable, W7 (from A8 26.5 GHz source 2) to front-panel SRC 2 OUT 2	1	N5242-20291
W95	RF cable, W3 (from A5 26.5 GHz source 1) to A46 port 1 mechanical switch	1	N5242-20269
W96	RF cable, A46 port 1 mechanical switch to A25 test port 1 bridge	1	N5242-20264
W97	RF cable, A46 port 1 mechanical switch to rear-panel PORT 1 SW SRC OUT (J11)	1	N5242-20287
W98	RF cable, rear-panel PORT 1 COMB THRU IN (J10) to A50 combiner	1	N5242-20288
W99	RF cable, rear-panel PORT 1 COMB ARM IN (J9) to A50 combiner	1	N5242-20289
W100	RF cable, A50 combiner to A46 port 1 mechanical switch	1	N5242-20265
W101	RF cable, W5 (from A8 26.5 GHz source 2) to A47 SRC 2 mechanical switch	1	N5242-20266
W103	RF cable, A47 SRC 2 mechanical switch to rear-panel SRC 2 SW SRC OUT (J8)	1	N5242-20282
W104	RF cable, rear-panel PORT 3 SW TSET IN (J7) to A47 SRC 2 mechanical switch	1	N5242-20281
W109	RF cable, W9 (from A5 26.5 GHz source 1) to A49 port 2 mechanical switch	1	N5242-20268
W110	RF cable, A49 port 2 mechanical switch to A28 test port 2 bridge	1	N5242-20262
W111	RF cable, A49 port 2 mechanical switch to rear-panel PORT 2 SW SRC OUT (J2)	1	N5242-20285
W112	RF cable, rear-panel PORT 2 SW TSET IN (J1) to A49 port 2 mechanical switch	1	N5242-20286
W113	Rear panel jumper	3	N5222-20091
W154	RF cable, front panel REF 2 RCVR R2 IN to A23 mixer brick (R2)	1	N5242-20308

a. In addition to the upgrade kit, the shipment includes an Option Entitlement Certificate. Refer to "License Key Redemption" on page 7 for important information about this certificate.

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

NOTE Some of the following figures provided in this procedure contain bias tees. Bias tees are included in the Option 219/419 upgrade kits and can be ignored for Options 217/417 and 222/422.

"Step 21. Enable Option 222 (B Models Only) /Option 224 Licenses."

"Step 22. Perform Post-Upgrade Adjustments and Calibration."

"Step 23. 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 file 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 (A models) or license key file (B models) 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 (A models) or license key file (B models), you will not be able to install the option. If this is the case, contact Keysight for assistance before beginning the installation of this upgrade. Refer to "Contacting Keysight" on page 6.

Step 2. Remove the Outer Cover

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

Step 3. Remove the Inner Cover

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

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

Step 4. Remove the Front Panel Assembly

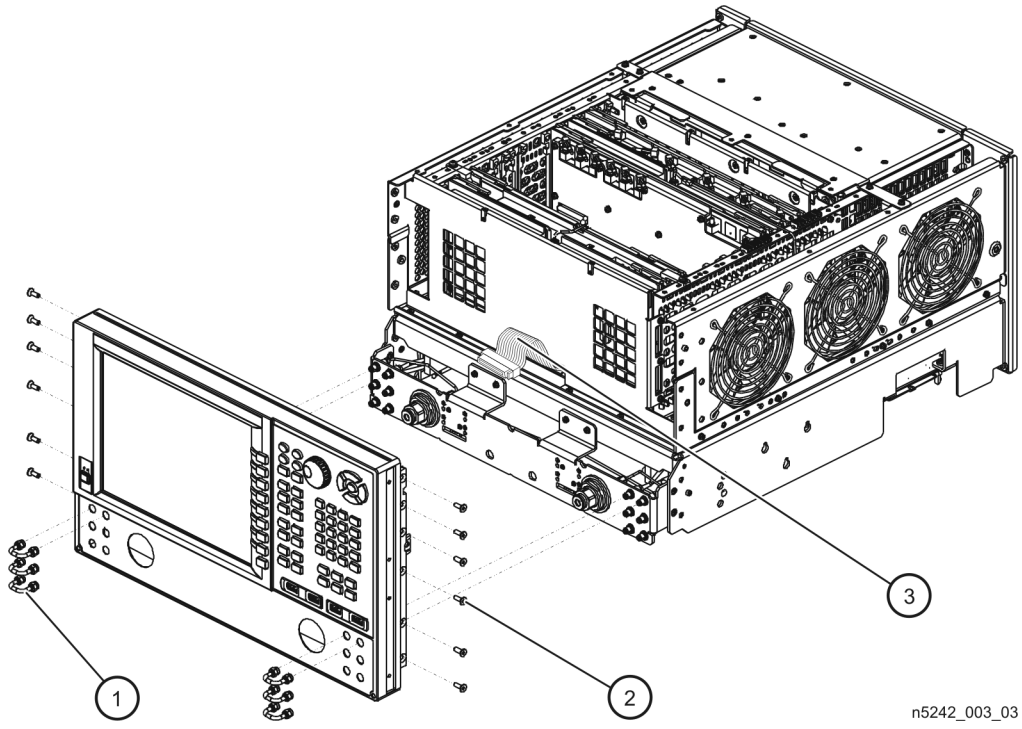
Refer to Figure 2 for this step of the procedure.

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

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

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

Figure 2 Front Panel Assembly Removal



Step 5. Remove the Existing Test Set Cables

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

NOTE Leave the gray flexible cables, the wire harnesses, and the ribbon cables connected where possible. Any that are removed should be labeled for reconnection later.

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.

Refer to Figure 3 for this step of the procedure.

1. Place the analyzer bottom-side up on a flat surface.
2. Remove the following cables in the order listed:

   To see an image showing the location of these cables, click the Chapter 6 bookmark with the s/n prefix for your instrument (i.e., S/N Prefixes <6021), "Bottom RF Cables, Standard 2-Port Configuration, Option 217" or "Bottom RF Cables, Standard 2-Port Configuration, Option 219" in the PDF Service Guide[1].

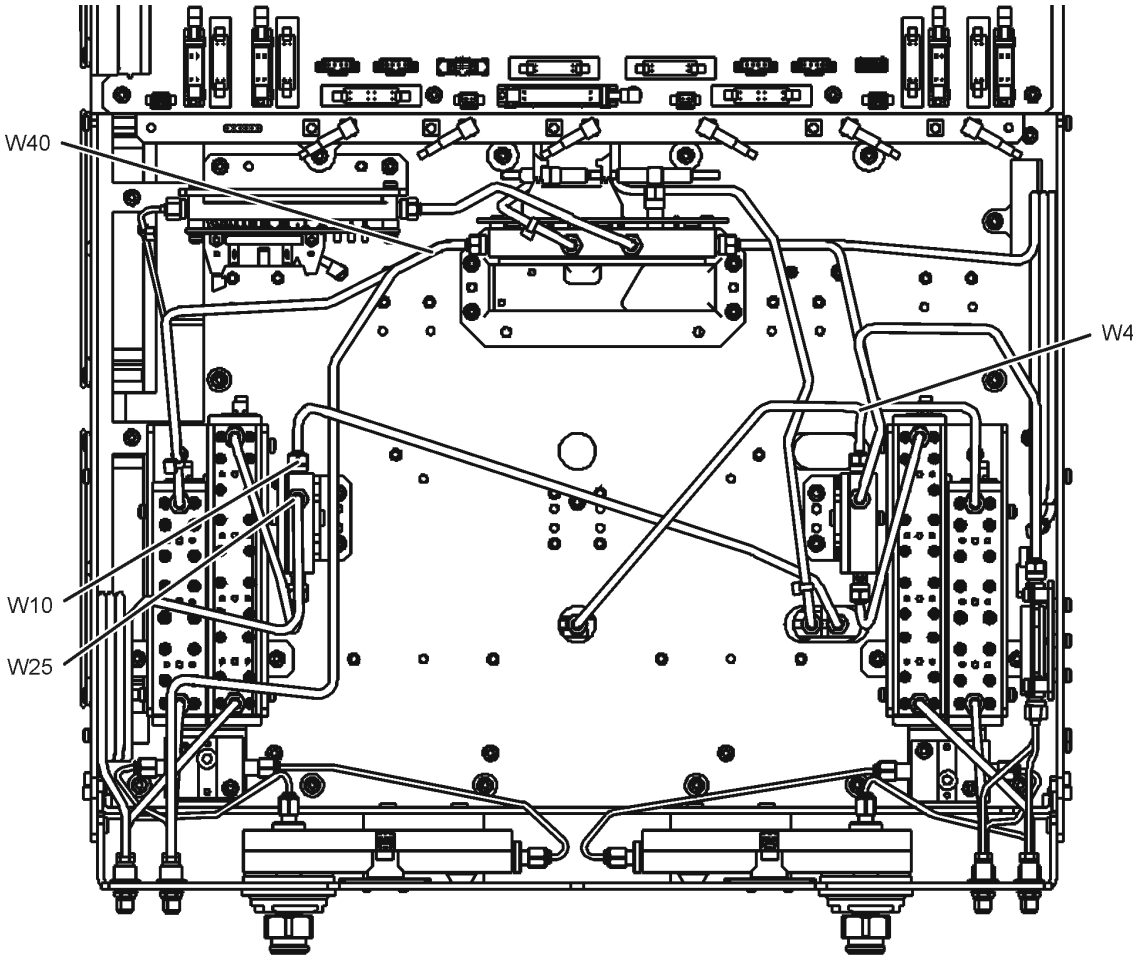
– W4 – A25 port 1 bridge to W3 (from A5 26.5 GHz source 1 board OUT 1)
– W10 – A28 port 2 bridge to W9 (from A5 26.5 GHz source 1 board OUT 2)
– W40 – Front-panel REF 2 RCVR R2 IN to A23 mixer brick (R2)

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

– W25 – A28 port 2 bridge to front-panel REF 2 SOURCE OUT

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

Figure 3 Existing Test Set Cables Removal

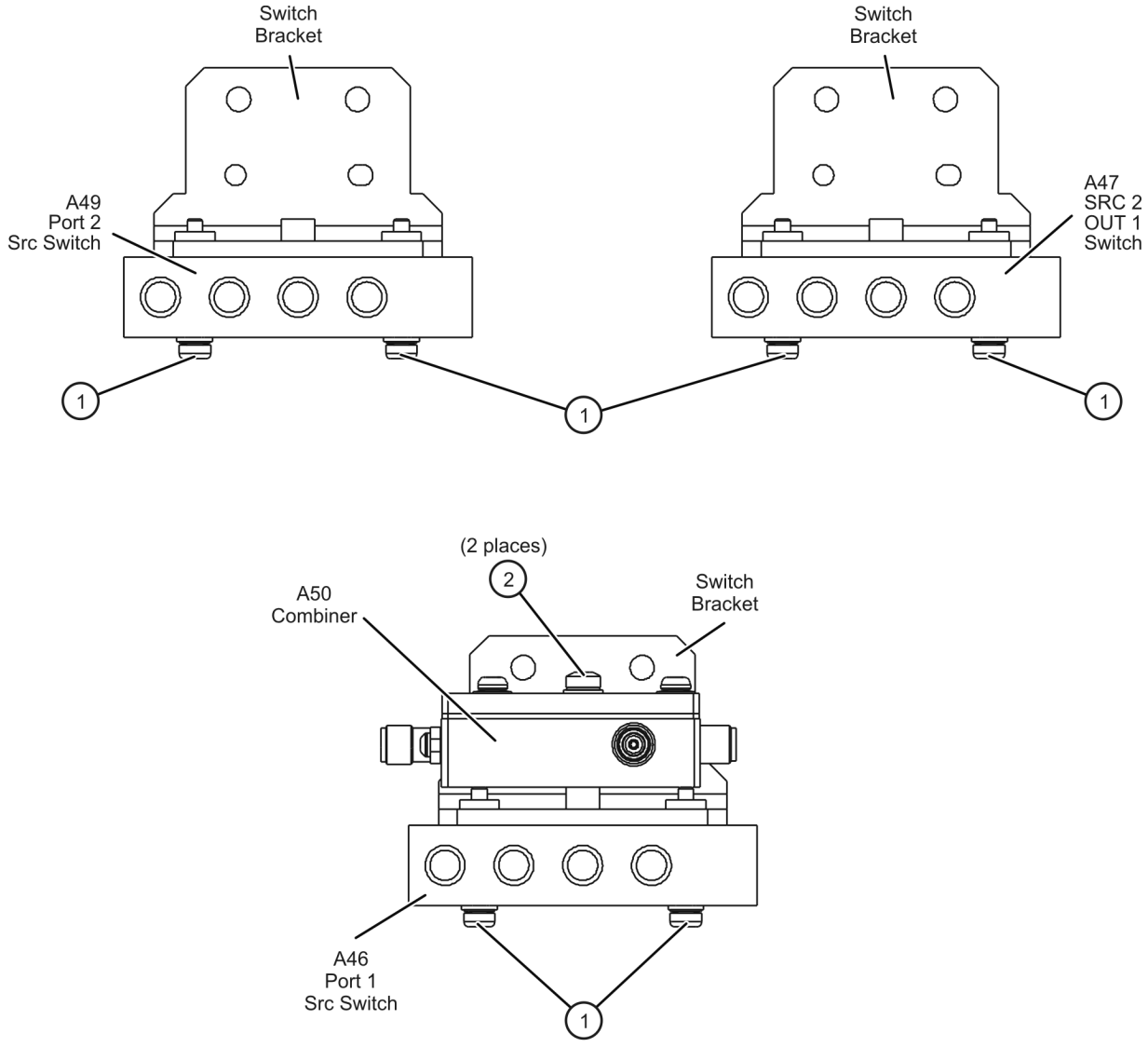


Step 6. Assemble the Mechanical Switches

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

1. Position each mechanical switch on a switch bracket as shown.
2. Secure each switch to its bracket using two screws (item ①, 0515-1992) for each. Make sure that the switches are oriented as shown.
3. Position the A50 combiner on one of the switch brackets as shown. This will be the bracket with the A46 port 1 mechanical switch.
4. Secure the A50 combiner to the bracket using two screws (item ②, 0515-1410). Make sure that the A50 combiner is oriented as shown.

Figure 4 Mechanical Switches Assembly

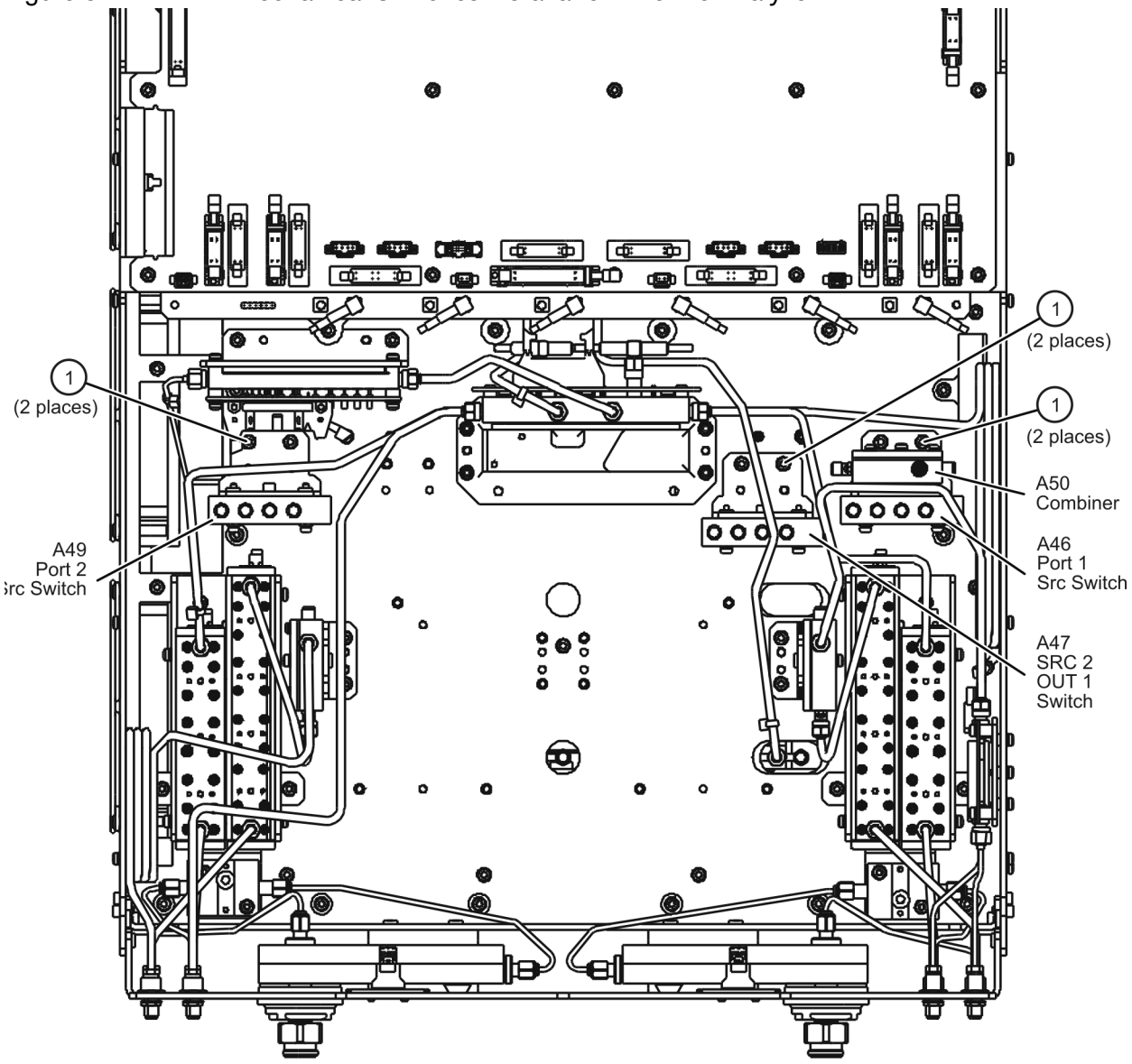


Step 7. Install the Mechanical Switches

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

1. Position the switch brackets (with the switches and combiner attached) in the analyzer as shown. Make sure that the switch bracket with the A50 combiner is in the location shown.
2. Secure the switch brackets to the analyzer test set deck using two screws (item ①, 0515-0430) each.

Figure 5 Mechanical Switches Installation into the Analyzer



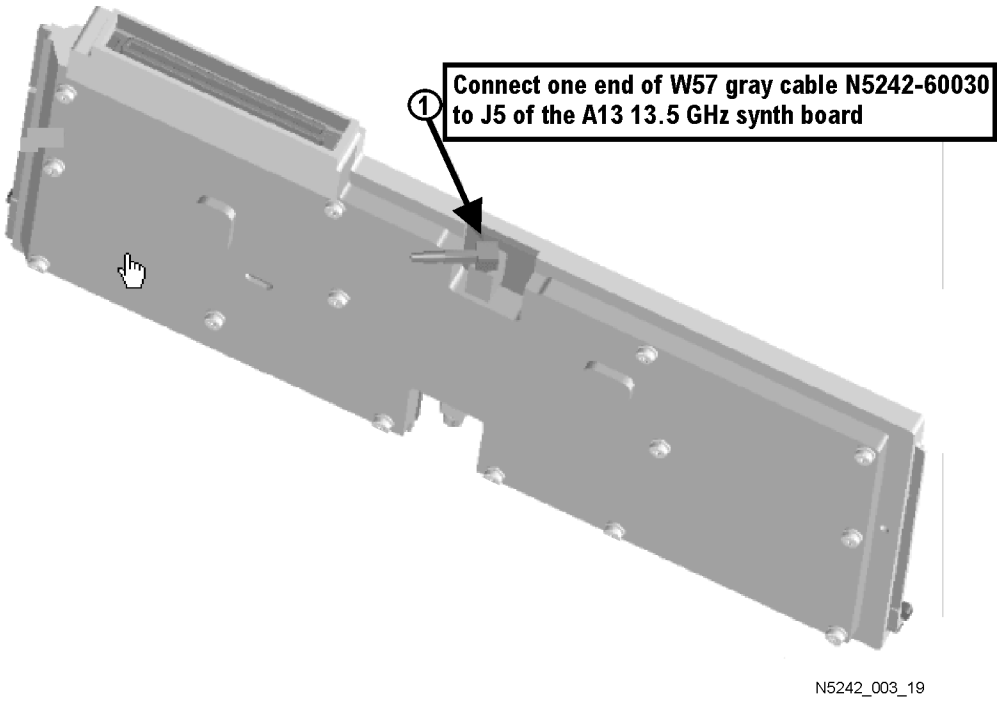
Step 8. Install the Second Source Boards

Part 1: Install Cables on Second Source Boards

Refer to Figure 6 and Figure 7 for this step of the procedure. New parts are listed in Table 1 on page 11.

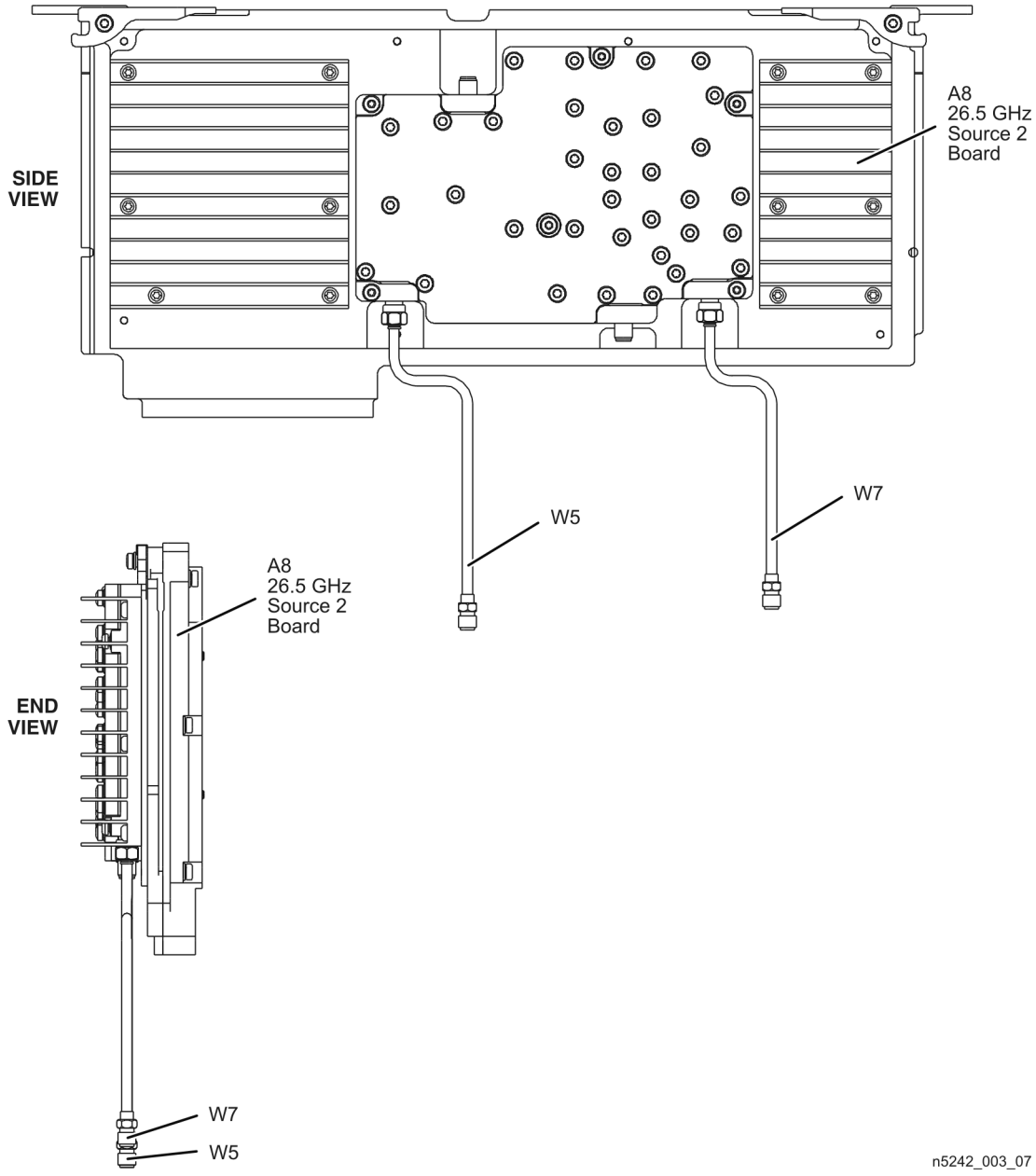
1. Attach gray flex cable W57 to the J5 connector on the A13 13.5 GHz synthesizer board as shown. The other end of the cable will be connected to the A10 frequency reference board later. Unlike the board shown in the graphic below, the board included in this kit has tabs that connect to the chassis side rails with screws.

Figure 6 Cable Connections to the Second Source Boards, Part 1a



2. Attach semi-rigid cables W5 and W7 to the A8 26.5 GHz source 2 board as shown. Make sure that both cables are parallel to the A8 26.5 GHz source board as shown in the END VIEW. Cable W5 is the longer of the two cables.
3. Use a 5/16-in torque wrench set to 10 in-lbs to tighten the semi-rigid cable connectors.

Figure 7 Cable Connections to the Second Source Boards, Part 1b



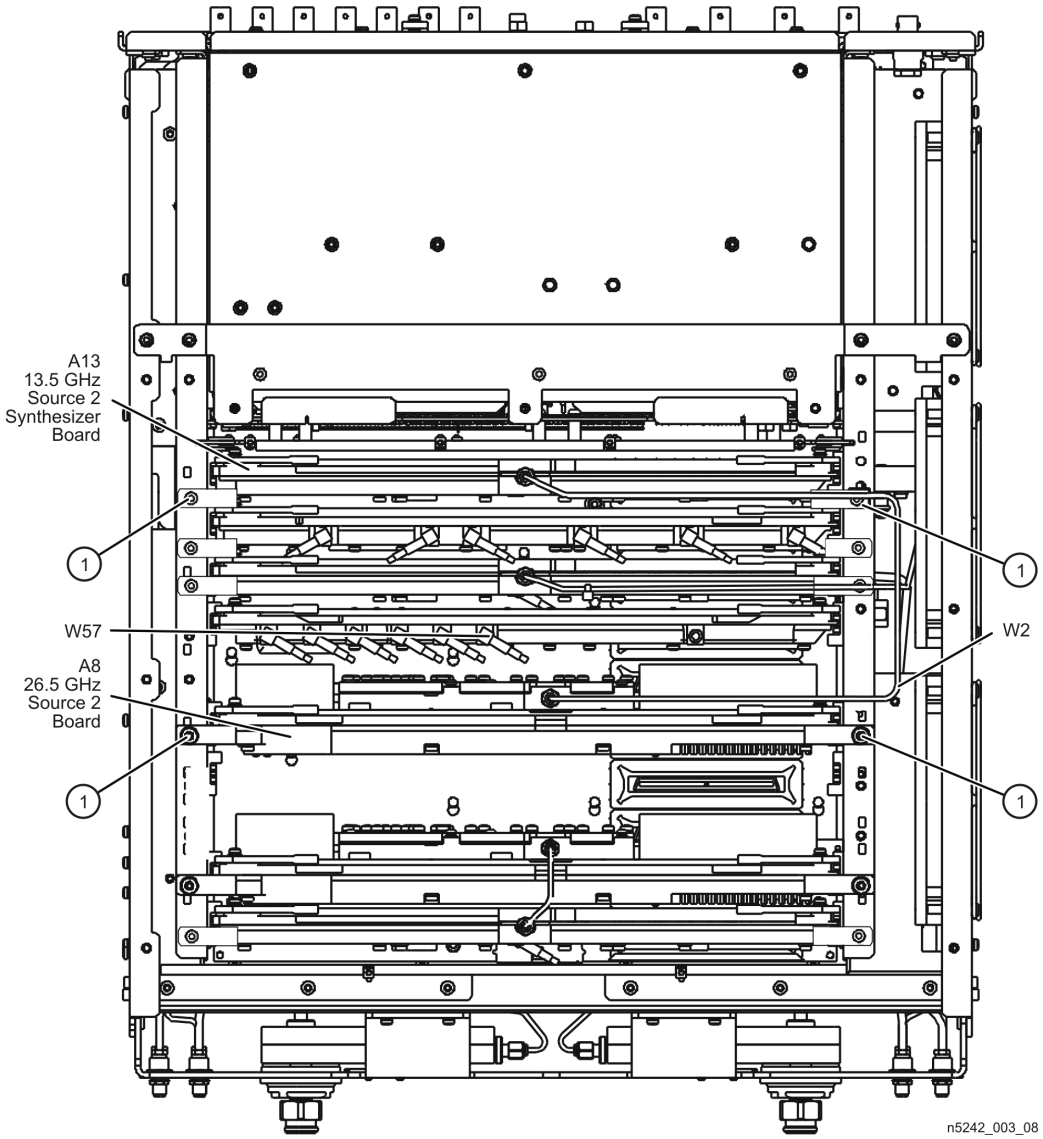
Part 2: Install the Second Source Boards into the Analyzer

Refer to Figure 8 for this part of this step of the procedure. New parts are listed in Table 1 on page 11.

1. Install the A8 26.5 GHz source 2 board and the A13 13.5 GHz source 2 synthesizer board in the analyzer as shown.
2. Secure both boards with two screws (item ①) – one on each side of each board.

3. Connect the other end of gray flex cable W57 on the A13 13.5 GHz synthesizer board to the J7 connector on the A10 frequency reference board as shown.
4. Connect cable W2 between the A8 26.5 GHz source 2 board and the A13 13.5 GHz source 2 synthesizer board as shown. Tighten the cable connectors to 10 in-lbs using a 5/16-in torque wrench.

Figure 8 Second Source Boards Installation, Part 2

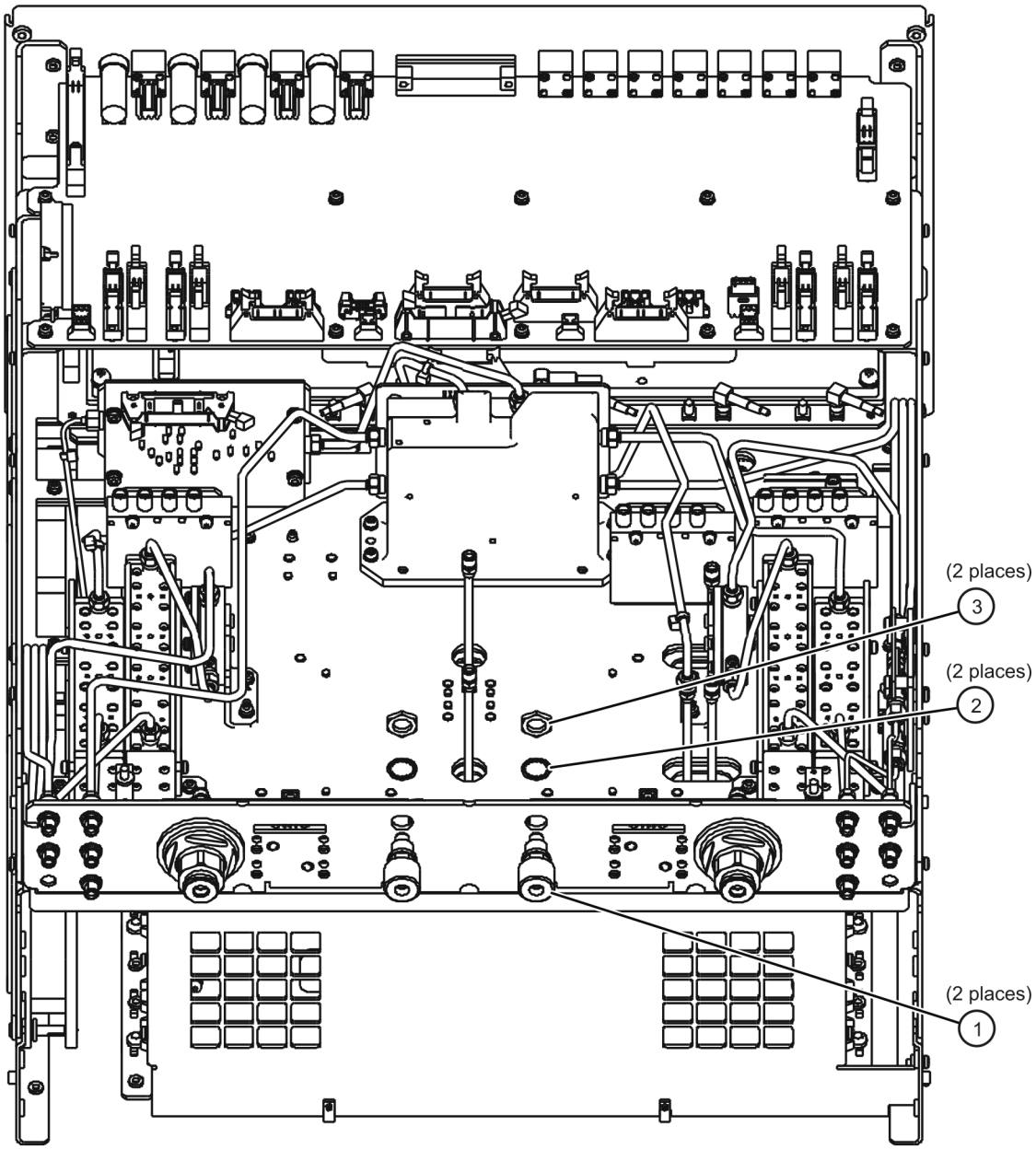


Step 9. Install the Source 2 Front Panel Connectors

Refer to Figure 9 for this step of the procedure. New parts are listed in Table 1 on page 11.

1. Insert two bulkhead connectors (item ①) through the holes in the test set deck front panel as shown.
2. Secure the bulkhead connectors with two lock washers (item ②) and two hex nuts (item ③) as shown.
3. Torque the hex nuts to 21 in-lbs.

Figure 9 Source 2 Front Panel Connectors Installation



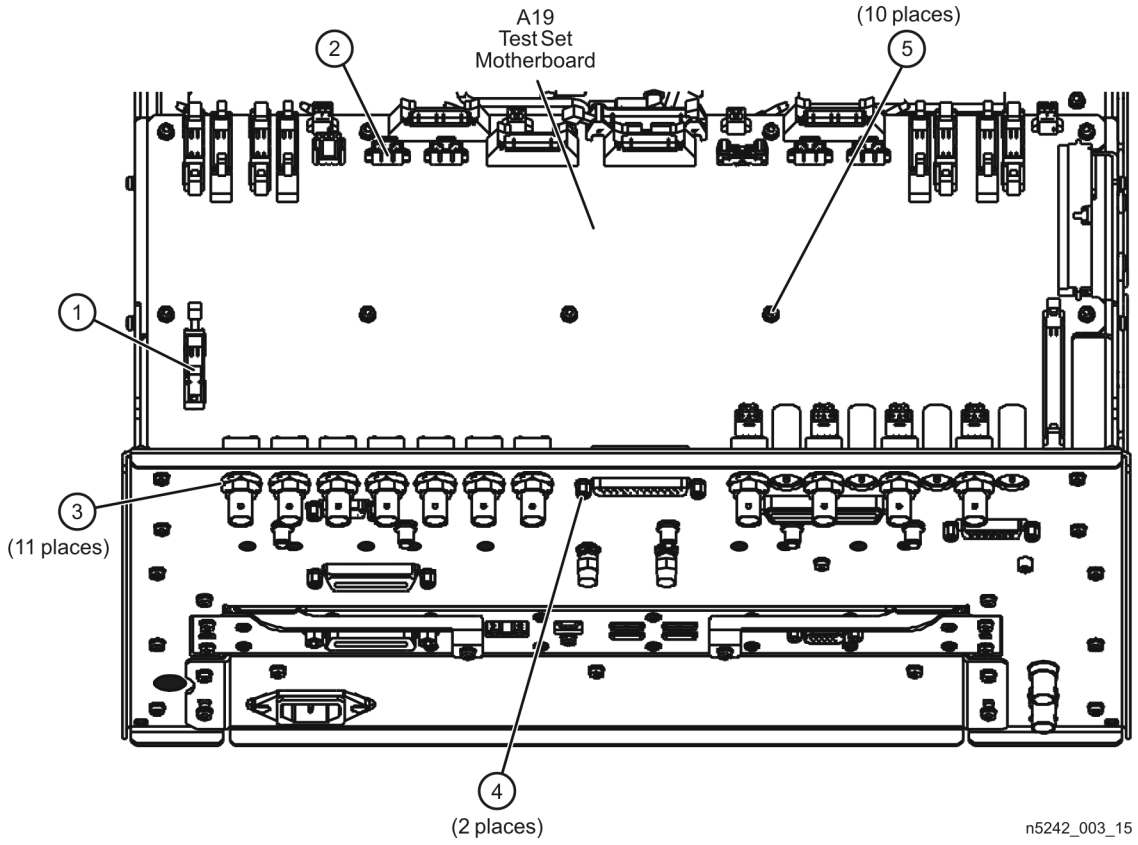
Step 10. Remove the A19 Test Set Motherboard and the A20 IF Multiplexer Board

Remove the A19 Test Set Motherboard

Refer to Figure 10 for this part of this step of the procedure.

1. Disconnect ALL ribbon cables (item ①) and ALL wire harnesses (item ②) from the A19 test set motherboard. Make sure they are labeled for re-connection later.
2. Remove connector hardware (item ③) from 11 rear panel BNC connectors.
3. Remove connector hardware (item ④) from the rear panel TEST SET I/O connector.
4. Remove 10 screws (item ⑤) from the A19 test set motherboard.
5. Slide the A19 test set motherboard toward the front of the instrument until the rear panel BNC connectors are free of the rear panel, then lift the motherboard and remove it from the analyzer.

Figure 10 A19 Test Set Motherboard Removal

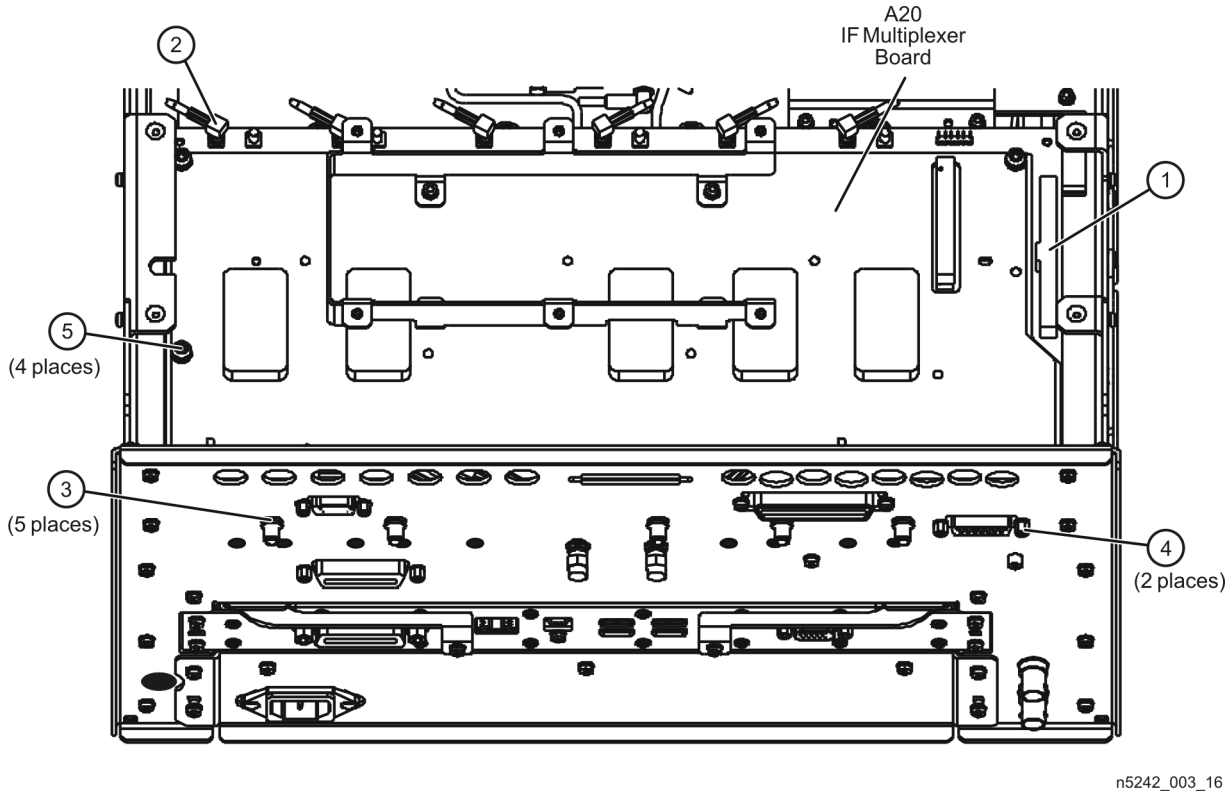


Remove the A20 IF Multiplexer Board

Refer to Figure 11 for this part of this step of the procedure.

1. Disconnect the ribbon cable (item ①) from the A20 IF multiplexer board.
2. Disconnect ALL gray flexible RF cables (item ②) from the A20 IF multiplexer board. Make sure they are labeled for re-connection later.
3. Remove connector hardware (item ③) from five rear panel RF connectors.
4. Remove connector hardware (item ④) from the rear panel PULSE I/O connector.
5. Remove four screws (item ⑤) from the A20 IF multiplexer board.
6. Slide the A20 IF multiplexer board toward the front of the instrument until the rear panel connectors are free of the rear panel, then lift the board and remove it from the analyzer.

Figure 11 A20 IF Multiplexer Board Removal

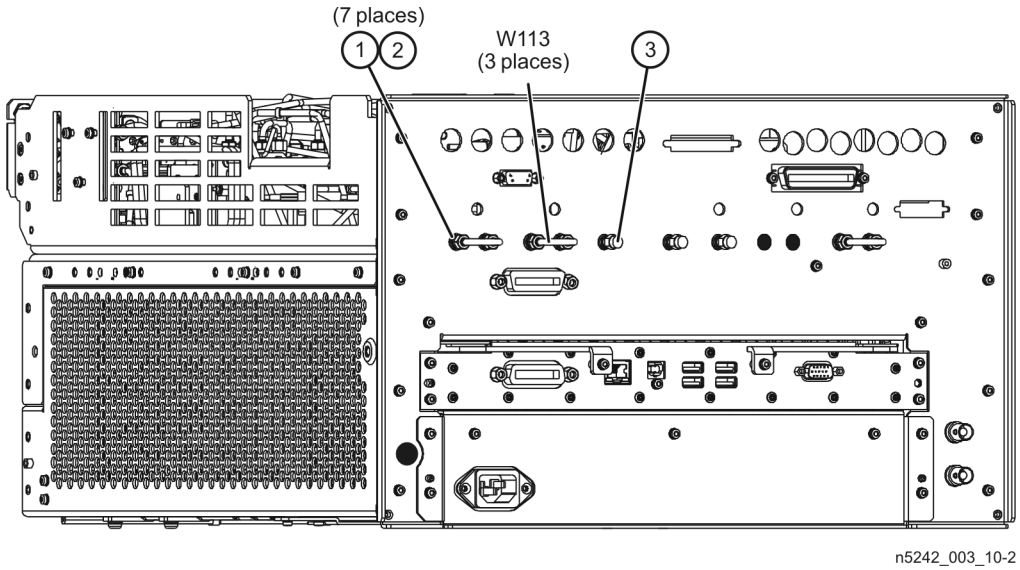


Step 11. Install the Bulkhead Connectors and Jumpers on the Rear Panel

1. Remove hole plugs from the following rear panel connector openings:
   - PORT 1—COMB THRU IN (J10) and SW SRC OUT (J11)
   - PORT 1—COMB ARM IN (J9) and SRC 2 SW SRC OUT (J8)
   - PORT 3—SW TSET IN (J7)
   - PORT 2—SW TSET IN (J1) and SW SRC OUT (J2)

   Refer to Figure 12 for this part of this step of the procedure. New parts are listed in Table 1 on page 11.
2. Install bulkhead connectors, lock washers (item ①) and hex nuts (item ②) for the seven new rear panel cables. These cables will be installed later.
3. Using a 5/16-in torque wrench set to 21 in-lbs, tighten the hex nuts on the bulkhead connectors.
4. Install the three rear panel jumpers, W113, in the locations shown (and as listed below) and torque the connectors to 10 in-lbs:
   a. Jumper PORT 1 COMB THRU IN (J10) to PORT 1 SW SRC OUT (J11)
   b. Jumper PORT 1 COMB ARM IN (J9) to SRC 2 SW SRC OUT (J8)
   c. Jumper PORT 2 SW TSET IN (J1) to PORT 2 SW SRC OUT (J2)
5. Install a 50-ohm termination (item ③) on the PORT 3 SW TSET IN (J7) connector, as indicated, and torque the termination connector to 10 in-lbs.

Figure 12 Bulkhead Connectors and Jumpers on Rear Panel



Step 12. Install the New Test Set Cables

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

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

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

Refer to Figure 13 for this part of this step of the procedure. New parts are listed in Table 1 on page 11.

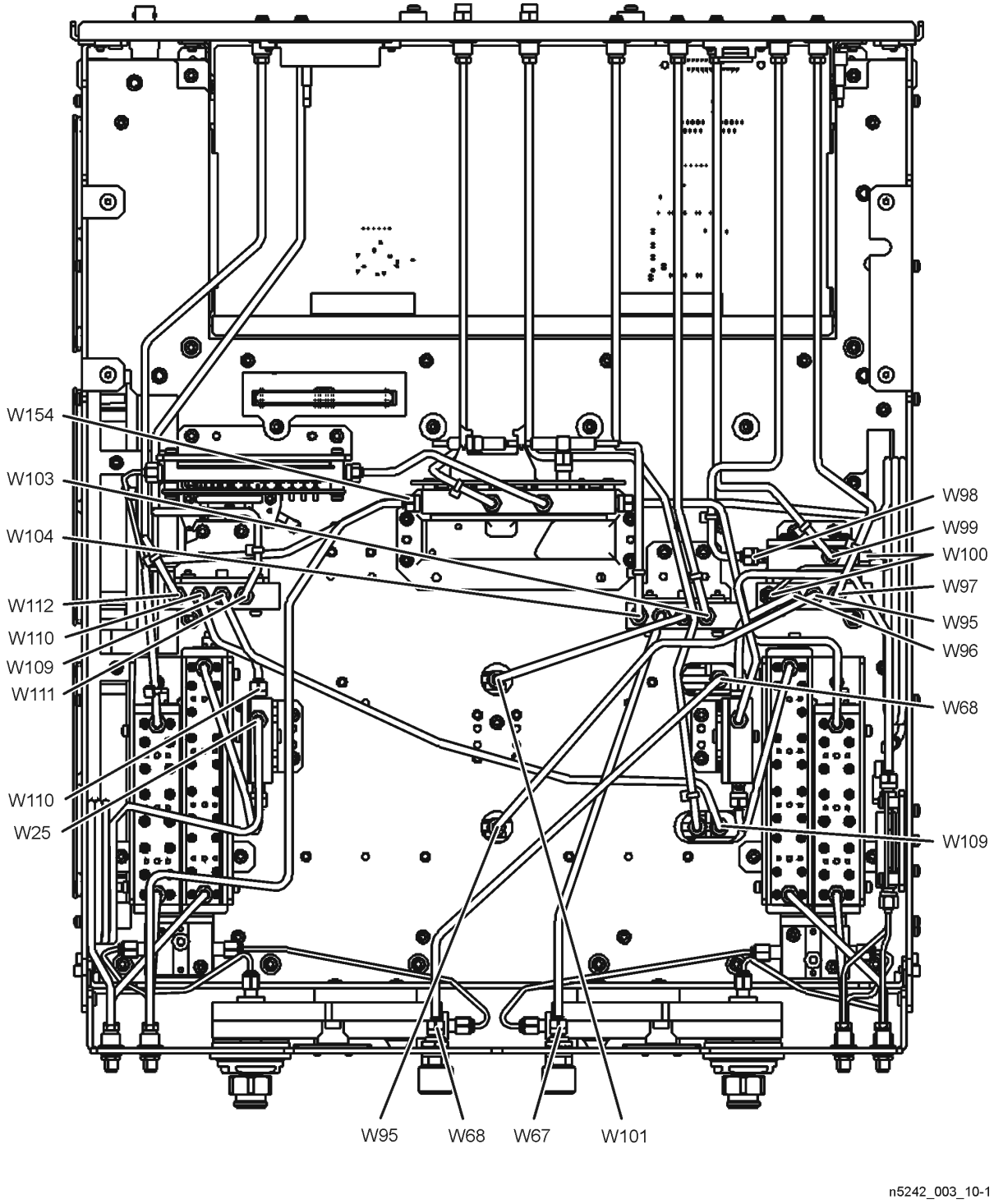
Install the following cables in the order listed. Use a 5/16-in torque wrench set to 10 in-lbs to tighten all cable connectors.

To see an image showing the location of these cables, click the Chapter 6 bookmark with the s/n prefix for your instrument (i.e., S/N Prefixes <6021), “Bottom RF Cables, Standard 2-Port Configuration, Option 222" or “Bottom RF Cables, Standard 2-Port Configuration, Option 224" in the PDF Service Guide[1].

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

- W95 (N5242-20269) A46 port 1 mechanical switch (connector 2) to W3 (from A5 26.5 GHz source 1 board)
- W96 (N5242-20264) A46 port 1 mechanical switch (connector 3) to A25 test port 1 bridge
- W97 (N5242-20287) A46 port 1 mechanical switch to (connector 1) rear-panel PORT 1 SW SRC OUT (J11)
- W98 (N5242-20288) Rear-panel PORT 1 COMB THRU IN (J10) to A50 combiner
- W99 (N5242-20289) Rear-panel PORT 1 COMB ARM IN (J9) to A50 combiner
- W100 (N5242-20265) A50 combiner to A46 port 1 mechanical switch (connector 4)
- W101 (N5242-20266) W5 (from A8 26.5 GHz source 2 board) to A47 SRC 2 mechanical switch (connector 2)
- W103 (N5242-20282) A47 SRC 2 mechanical switch (connector 1) to rear-panel SRC 2 SW SRC OUT (J8)
- W104 (N5242-20281) Rear-panel PORT 3 SW TSET IN (J7) to A47 SRC 2 mechanical switch (connector 4)
- W109 (N5242-20268) W9 (from A5 26.5 GHz source 1 board) to A49 port 2 mechanical switch (connector 2)
- W154 (N5242-20308) front panel REF 2 RCVR R2 IN to A23 mixer brick (R2)
- W110 (N5242-20262) A49 port 2 mechanical switch (connector 3) to A28 test port 2 bridge
- W111(N5242-20285) A49 port 2 mechanical switch (connector 1) to rear-panel PORT 2 SW SRC OUT (J2)
- W112 (N5242-20286) Rear-panel PORT 2 SW TSET IN (J1) to A49 port 2 mechanical switch (connector 4)
- W68 (N5242-20291) W7 (from A8 26.5 GHz source 2 board) to front-panel SRC 2 OUT 2
- W67 (N5242-20290) A47 SRC 2 mechanical switch (connector 3) to front-panel SRC 2 OUT 1

Figure 13 New Test Set Cable Installation



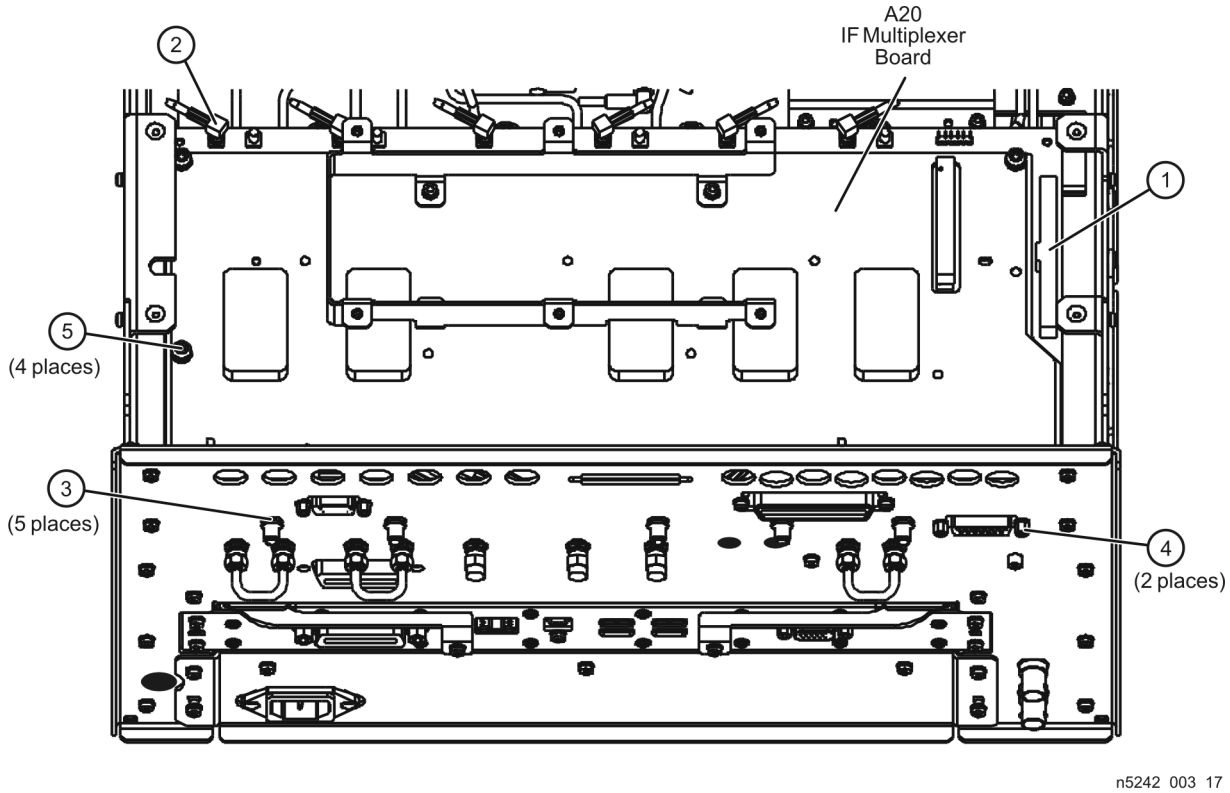
Step 13. Reinstall the A20 IF Multiplexer Board and the A19 Test Set Motherboard

Reinstall the A20 IF Multiplexer Board

Refer to Figure 14 for this part of this step of the procedure.

1. Position the A20 IF multiplexer board in the analyzer and slide it toward the rear of the instrument until the rear panel connectors are completely through the rear panel.
2. *Loosely* reinstall four screws (item ⑤) in the A20 IF multiplexer board.
3. Reinstall connector hardware (item ③) on five rear panel RF connectors. Torque the hex nuts to 21 in-lbs.
4. Reinstall connector hardware (item ④) on the rear panel PULSE I/O connector. Torque the connector nuts to 6 in-lbs.
5. Torque the four screws (item ⑤) to 21 in-lbs.
6. Reconnect ALL gray flexible RF cables (item ②) to the A20 IF multiplexer board.
7. Reconnect the ribbon cable (item ①) to the A20 IF multiplexer board.

Figure 14 A20 IF Multiplexer Board Re–installation

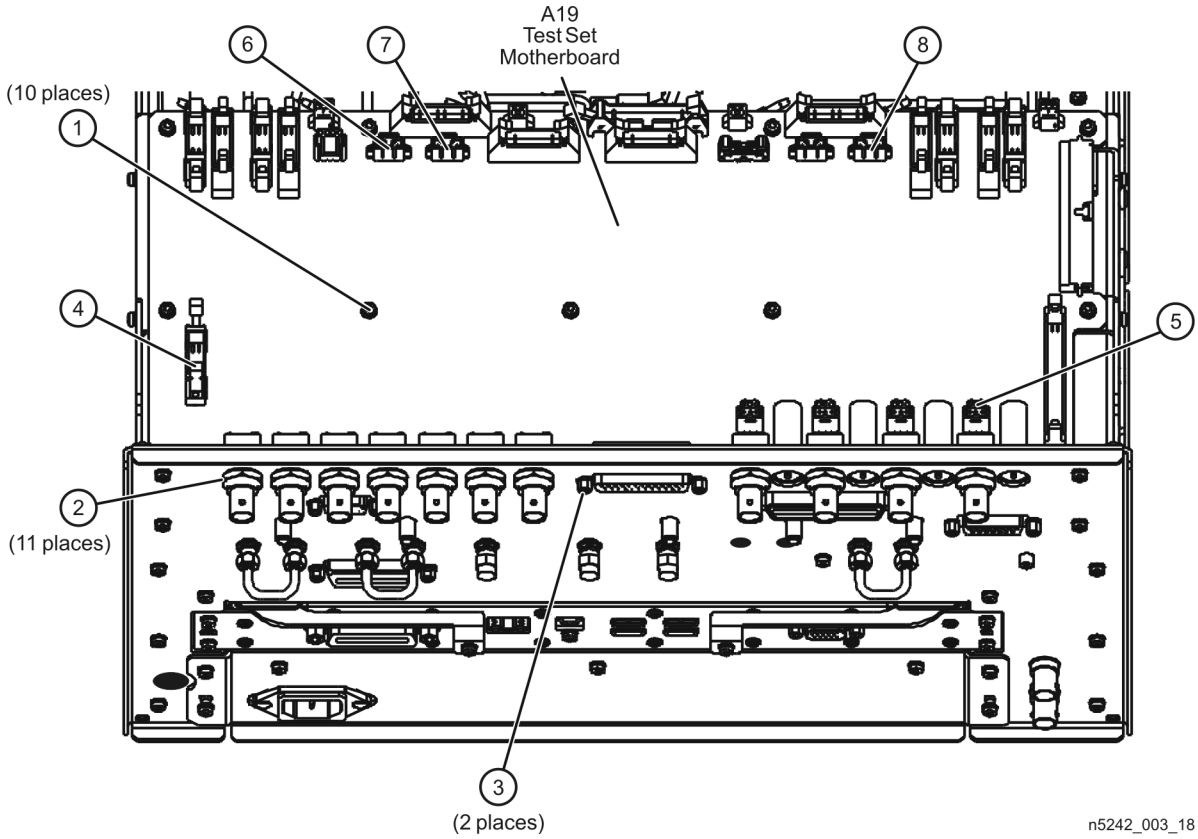


Reinstall the A19 Test Set Motherboard

Refer to Figure 15 for this part of this step of the procedure.

1. Position the A19 test set motherboard in the analyzer and slide it toward the rear of the instrument until the rear panel BNC connectors are completely through the holes in the rear panel.
2. *Loosely* reinstall 10 screws (item ①) in the A19 test set motherboard.
3. Reinstall connector hardware (item ②) on 11 rear panel BNC connectors. Torque hex nuts to 21 in-lbs.
4. Reinstall connector hardware (item ③) on the rear panel TEST SET I/O connector. Torque connector nuts to 6 in-lbs.
5. Torque the 10 screws (item ①) to 9 in-lbs.
6. Reconnect ALL ribbon cables (item ④) and ALL wire harnesses (item ⑤) to the A19 test set motherboard.
7. Connect the mechanical switch control cables to the A19 test set motherboard as follows: A46 to item ⑥ (J101), A47 to item ⑦ (J102), A48 to item ⑧ (J103), A49 to item ⑨ (J104). Refer, if necessary, to Figure 15 for locations of A46 through A49.

Figure 15 A19 Test Set Motherboard Re–installation



Step 14. Remove the Old Lower Front Panel Overlay

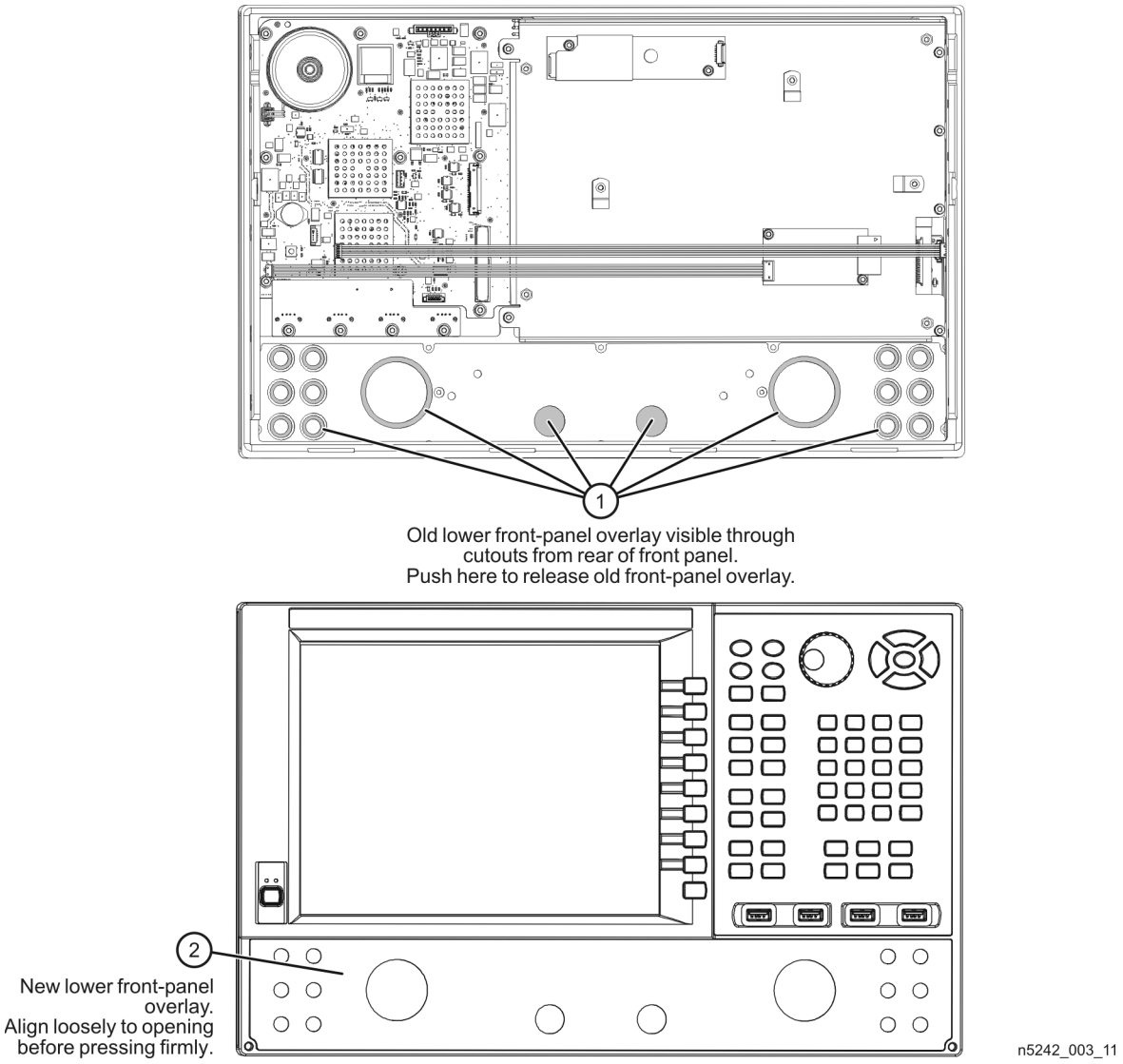
Refer to Figure 16 on page 32 for this step of the procedure. New parts are listed in Table 1 on page 11.

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 any adhesive remaining on the front panel.

NOTE

IMPORTANT! To avoid possible damage to the lower front panel overlay, do not attempt to attach the lower front panel label until "Step 16. Install the New Lower Front Panel Overlay" on page 33.

Figure 16 Lower Front Panel Overlay Replacement



Step 15. Reinstall the 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 16. Install the New Lower Front Panel Overlay

Refer to Figure 16 on page 32 for this step of the procedure. Although a 4-port PNA is shown in the graphic, the concept is the same for the 2-port PNA. New parts are listed in Table 1 on page 11.

1. **Remove the protective backing from the new front panel overlay, N5242-80002 (A models) or N5242-80024 (B models), or N5242-80024 (B models with Option 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. **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.**
5. **Reinstall front panel jumpers.**

Step 17. Position the Cables and Wires to Prevent Pinching

On the top side of the PNA, carefully position the gray flex cables so they can’t be pinched between the covers and the rails.

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

Step 18. Reinstall the Inner Cover

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

Step 19. Reinstall the Outer Cover

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

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 20. Remove Option 217 (B models Only) or 219 Licenses

NOTE **IMPORTANT!** For A model instruments, skip to "Step 21. Enable Option 222 (B Models Only) /Option 224 Licenses".

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.

A Model Option 219 License Removal Procedure

For B models, refer to "B Model Option 217 or 219 License Removal Procedure."

1. To start the option enable utility, press UTILITY System, then Service, then Option Enable. An option enable dialog box will appear.
2. Click the arrow in the Select Desired Option box. A list of available options will appear.
3. In the Select Desired Option list, click **419**.
4. Click **Remove**.

B Model Option 217 or 219 License Removal Procedure

For B models, refer to "A Model Option 219 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 21. Enable Option 222 (B Models Only) /Option 224 Licenses

Procedure Requirements

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

For “A” models, refer to:

– “Option Enable Procedure for “A” Model Instruments” on page 35

– ““A” Model Option Verification Procedure” on page 35

For “B” models refer to:

– “Option Enable Procedure for “B” Model Instruments ” on page 36

– ““B” Model Option Verification Procedure” on page 36

Option Enable Procedure for “A” Model Instruments

1. To start the option enable utility, press UTILITY **System**, then **Service**, then **Option Enable**. An option enable dialog box will appear.
2. Click the arrow in the **Select Desired Option** box. A list of available options will appear.
3. In the Select Desired Option list, click **222– 2nd Src w/ Combiner & Switches** or **224 - 2nd Src w/Combiner & Switches**.
4. Using the keyboard, enter the license key in the box provided. The license key is printed on the license message you received from Keysight. Enter this key exactly as it is printed on the message.
5. Click **Enable**.
6. Click Yes in answer to the displayed question in the **Restart Analyzer?** box.
7. When the installation is complete, click **Exit**.

“A” Model Option Verification Procedure

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

1. On the analyzer’s Help menu, click **About Network Analyzer**.
2. Verify that “222” or “224” is listed after “Options:” in the display. Click **OK**.

NOTE If Option 222 or 224 has not been enabled, contact Keysight Technologies. Refer to “Getting Assistance from Keysight” on page 6.

Option Enable Procedure for "B" Model Instruments

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

A single license file may contain more than one feature.

1. Locate the email(s) from Keysight which contain license file attachments. These emails are a result of Step 3 on "License Key Redemption" on page 7.
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-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. Disconnect the USB flash drive from the PNA.

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

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.

"B" Model Option Verification Procedure

NOTE If Option 222 or 224 has not been enabled or if your older options have not been removed, contact Keysight Technologies. Refer to "Getting Assistance from Keysight" on page 6.

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

1. Start the Network Analyzer program.
2. Once the Network Analyzer program is running:
   - Press **Help** > **About NA** and verify that Option 222 or 224 is listed in the PNA application.

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

Step 22. Perform Post-Upgrade Adjustments and Calibration

Adjustments

NOTE

IMPORTANT!

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

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

- 10 MHz frequency reference adjustment
- EE default adjustment
- source adjustment: Synth LO only (Version 6 synthesizers)
- synthesizer bandwidth adj. (Only run this test if the EE default adjustment is not sufficient)
- IF gain adjustment
- receiver characterization
- receiver adjustment
- IF Response adjustment (For A models: Options 090, 093, or 094 Only. For B models: Options S93090xA/B, S93093A/B, or S93094A/B Only.)
- noise adjustment (For A models: Option 029. For B models: 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.

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

EEPROM Backup

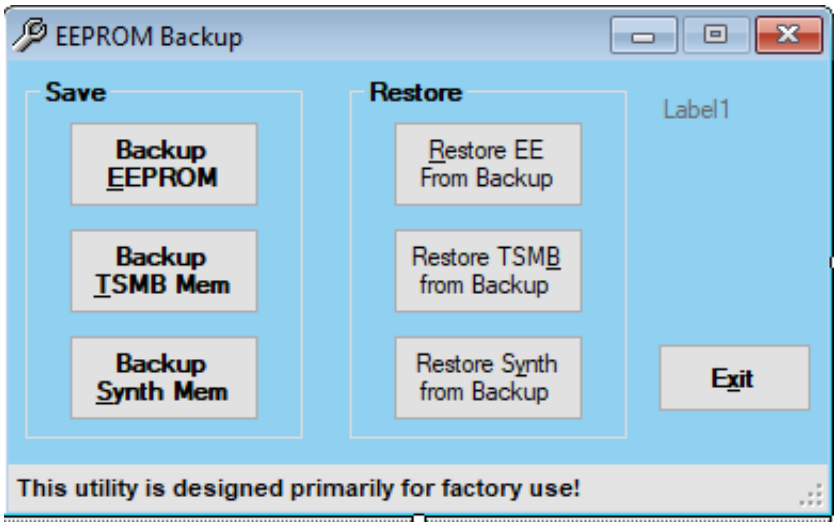
The analyzer uses arrays of correction constants to enable the analyzer to produce accurate, leveled source signals and receive clean test signals. These constants are stored in non-volatile EEPROM memory and in flash memory files.

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

To store the backup data, perform these steps:

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

Figure 17 EEPROM Backup Menu



Operator's Check

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

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

Calibration

Although the analyzer functions, its performance relative to its specifications has not been verified. It is recommended that a full instrument calibration be performed using the analyzer's internal performance test software. To view information on the performance test software, click the Chapter 3 bookmark "Tests and Adjustments" in the PDF Service Guide[1].

Step 23. 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.

Edition 2, December 2022
N5242-90114
www.keysight.com