

Installation Note

Extended Power Range and Bias Tees Upgrade Kit

To Upgrade PNA-X N5241A or N5242A Option 400 to Option 419

Upgrade Kit Order Numbers: N5241AU-926 and N5242AU- 926



Agilent Kit Number: N5242-60103
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Safety Notes

The following safety notes are used throughout this document. Familiarize yourself with each of these notes and its meaning before performing any of the procedures in this document.

WARNING	Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.
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CAUTION	Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.
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Description of the Upgrade

This upgrade converts your standard 4-port configurable test set analyzer (Option 400) to an extended power range analyzer with bias tees by adding:

- a 60-dB source attenuator in each source port channel
- a bias tee in each source port channel
- a 35-dB receiver attenuator in each receiver channel

After installation of this upgrade, your analyzer will be an Option 419.

Getting Assistance from Agilent

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

Contacting Agilent

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

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

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

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

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 5.
- Enough time - refer to “[About Installing the Upgrade](#)” on page 6.
- Test equipment for the post-upgrade adjustments. To view the equipment list, click the Chapter 3 bookmark “[Tests and Adjustments](#)” in the PDF Service Guide¹.

License Key Redemption

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 an Agilent Web page to request a license key for the instrument that will receive the option.

To enable the option product, you must request a license key from: <http://www.agilent.com/find/softwarelicense>. 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
 - Host ID

1. See “[Downloading the Online PNA Service Guide](#)” on page 5.

The instrument information is available on the network analyzer – on the analyzer’s **Help** menu, click **About Network Analyzer**.

If you provide an email address, Agilent will promptly email your license key. Otherwise, you will receive your license key via postal mail.

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.agilent.com.
2. In the Search box, enter the model number of the analyzer (Ex: N5242A) and click **Search**.
3. Click [Technical Support > Manuals](#).
4. Click [Service Manual](#).
5. Click the service guide title to download the PDF file.
6. 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 Guide¹.

ESD Equipment Required for the Installation

Description	Agilent 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-panel cable connectors. Use a 5/16-in torque wrench set to 21 in-lbs for these connections.

1. See “[Downloading the Online PNA Service Guide](#)” on page 5.

About Installing the Upgrade

Products affected.	N5241A and N5242A Option 400
Installation to be performed by	Agilent service center or personnel qualified by Agilent
Estimated installation time	3.0 hours
Estimated adjustment time	0.5 hours
Estimated full instrument calibration time	4.5 hours

Items Included in the Upgrade Kit¹

Check the contents of your kit against the following list. If any part is missing or damaged, contact Agilent Technologies. Refer to [“Getting Assistance from Agilent” on page 3](#).

Table 1 Contents of Upgrade Kit N5242-60103

Ref Desig.	Description	Qty	Part Number
	Installation note (this document)	1	N5242-90004
A34–A37	0–60 dB source step attenuator	4	33321-60070
A38–A41	Bias tee (includes wire harness, part number 8121-0836)	4	5087-7781
A42–A45	0-35 dB receiver step attenuator	4	33321-60066
	Attenuator bracket	4	N5242-00007
	Machine screw, M3 x 8, pan head (to attach attenuator to attenuator bracket)	16	0515-0372
	Machine screw, M3 x 14, pan head (to attach bias tee to attenuator bracket)	8	0515-2994 Was 0515-0665
	Machine screw, M3 x 6, pan head (to attach attenuator bracket to analyzer)	12	0515-0430
W25	RF cable, A28 port 2 bridge to front-panel REF 2 SOURCE OUT	1	N5242-20048
W37	RF cable, A33 reference mixer switch to A23 mixer brick (R1)	1	N5242-20009
W38	RF cable, front-panel REF 3 RCVR R3 IN to A24 mixer brick (R3)	1	N5242-20034
W39	RF cable, front-panel REF 4 RCVR R4 IN to A24 mixer brick (R4)	1	N5242-20037
W71	RF cable, A25 test port 1 bridge to A34 test port 1 source attenuator	1	N5242-20005
W72	RF cable, A34 test port 1 source attenuator to front-panel Port 1 SOURCE OUT	1	N5242-20038
W73	RF cable, front-panel Port 1 CPLR THRU to A38 test port 1 bias tee	1	N5242-20039

1. In addition to the upgrade kit, the shipment includes an Option Entitlement Certificate. Refer to [“License Key Redemption” on page 4](#) for important information about this certificate.

Table 1 Contents of Upgrade Kit N5242-60103

Ref Desig.	Description	Qty	Part Number
W74	RF cable, A38 test port 1 bias tee to A29 test port 1 coupler	1	N5242-20022
W75	RF cable, A26 test port 3 bridge to A35 test port 3 source attenuator	1	N5242-20005
W76	RF cable, A35 test port 3 source attenuator to front-panel Port 3 SOURCE OUT	1	N5242-20029
W77	RF cable, front-panel Port 3 CPLR THRU to A39 test port 3 bias tee	1	N5242-20026
W78	RF cable, A39 test port 3 bias tee to A30 test port 3 coupler	1	N5242-20021
W79	RF cable, A27 test port 4 bridge to A36 test port 4 source attenuator	1	N5242-20002
W80	RF cable, A36 test port 4 source attenuator to front-panel Port 4 SOURCE OUT	1	N5242-20030
W81	RF cable, front-panel Port 4 CPLR THRU to A40 test port 4 bias tee	1	N5242-20027
W82	RF cable, A40 test port 4 bias tee to A31 test port 4 coupler	1	N5242-20024
W83	RF cable, A28 test port 2 bridge to A37 test port 2 source attenuator	1	N5242-20002
W84	RF cable, A37 test port 2 source attenuator to front-panel Port 2 SOURCE OUT	1	N5242-20046
W85	RF cable, front-panel Port 2 CPLR THRU to A41 test port 2 bias tee	1	N5242-20045
W86	RF cable, A41 test port 2 bias tee to A32 test port 2 coupler	1	N5242-20023
W87	RF cable, front-panel Port 1 RCVR A IN to A42 port 1 receiver attenuator	1	N5242-20041
W88	RF cable, A42 port 1 receiver attenuator to A23 mixer brick (A)	1	N5242-20010
W89	RF cable, front-panel Port 3 RCVR C IN to A43 port 3 receiver attenuator	1	N5242-20031
W90	RF cable, A43 port 3 receiver attenuator to A24 mixer brick (C)	1	N5242-20012
W91	RF cable, front-panel Port 4 RCVR D IN to A44 port 4 receiver attenuator	1	N5242-20032
W92	RF cable, A44 port 4 receiver attenuator to A24 mixer brick (D)	1	N5242-20036
W93	RF cable, front-panel Port 2 RCVR B IN to A45 port 2 receiver attenuator	1	N5242-20047
W94	RF cable, A45 port 2 receiver attenuator to A23 mixer brick (B)	1	N5242-20016
	Ribbon cable, A19 test set motherboard J205 to A42 port 1 receiver attenuator	4	N5242-60007
	Ribbon cable, A19 test set motherboard J206 to A43 port 3 receiver attenuator		
	Ribbon cable, A19 test set motherboard J207 to A44 port 4 receiver attenuator		
	Ribbon cable, A19 test set motherboard J208 to A45 port 2 receiver attenuator		
	Ribbon cable, A19 test set motherboard J201 to A34 test port 1 source attenuator	4	N5242-60008
	Ribbon cable, A19 test set motherboard J202 to A35 test port 3 source attenuator		
	Ribbon cable, A19 test set motherboard J203 to A36 test port 4 source attenuator		
	Ribbon cable, A19 test set motherboard J204 to A37 test port 2 source attenuator		

Installation Procedure for the Upgrade

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

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

Overview of the Installation Procedure

- Step 1. [Obtain a Keyword and Verify the Information.](#)
- Step 2. [Remove the Outer Cover.](#)
- Step 3. [Remove the Front Panel Assembly.](#)
- Step 4. [Remove the Existing Cables.](#)
- Step 5. [Assemble the Step Attenuators and Bias Tees.](#)
- Step 6. [Install the Step Attenuators and Bias Tees into the Analyzer.](#)
- Step 7. [Install the New Cables.](#)
- Step 8. [Reinstall the Front Panel Assembly and Front Panel Jumpers.](#)
- Step 9. [Reinstall the Outer Cover.](#)
- Step 10. [Enable Option 419.](#)
- Step 11. [Perform Post-Upgrade Adjustments and Calibration.](#)

Step 1. Obtain a Keyword and Verify the Information

Follow the instructions on the Option Entitlement Certificate supplied to obtain a license key for installation of this upgrade. Refer to [“License Key Redemption” on page 4](#).

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.

If the model number, serial number, or option number do not match those on your license key, you will not be able to install the option. If this is the case, contact Agilent for assistance before beginning the installation of this upgrade. Refer to [“Contacting Agilent” on page 3](#).

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

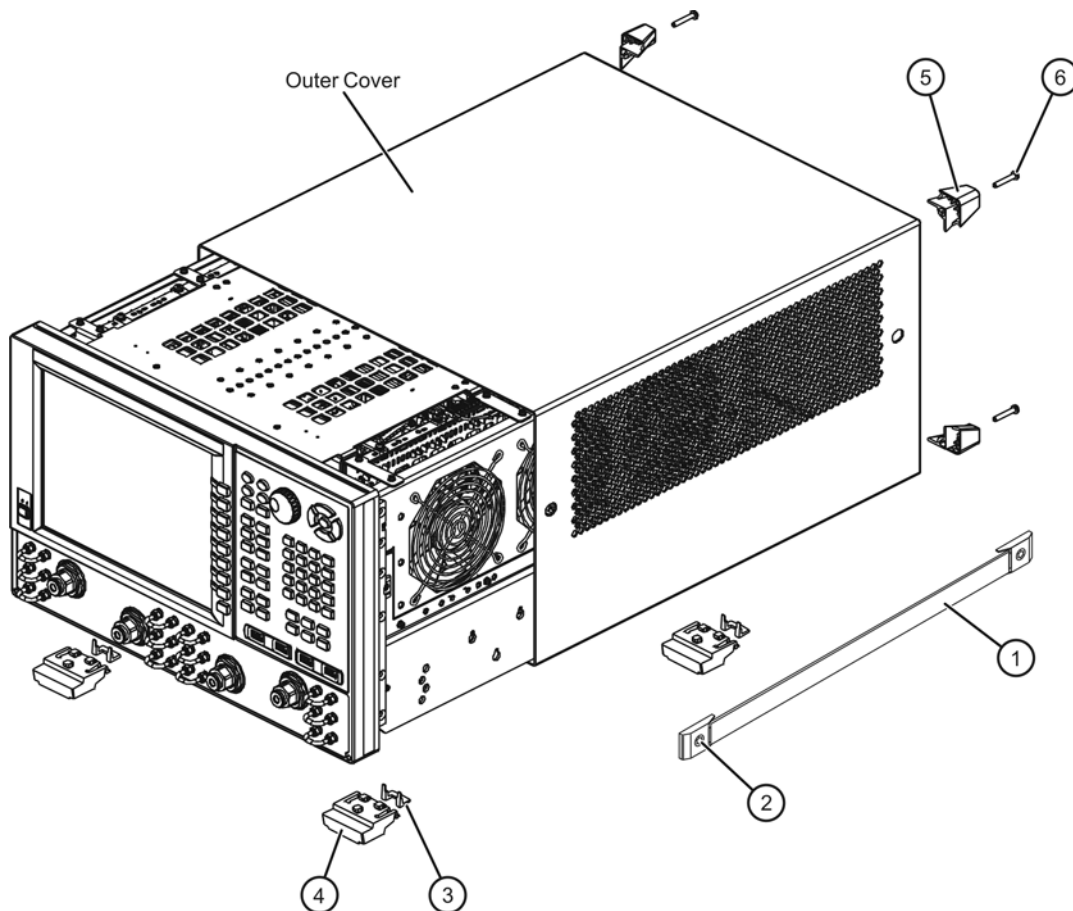
Step 2. Remove the Outer Cover

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

Refer to [Figure 1](#) for this step of the procedure.

1. Disconnect the power cord (if it has not already been disconnected).
2. Remove the strap handles (item ①) by loosening the screws (item ②), with a T-20 TORX driver, on both ends until the handle is free of the analyzer.
3. Remove the foot locks (item ③) from the four bottom feet (item ④) and then remove the four bottom feet from the outer cover.
4. Remove the four rear panel feet (item ⑤) by removing the center screws (item ⑥) with a T-20 TORX driver.
5. Slide the outer cover toward the rear of the analyzer and remove it.

Figure 1 Outer Cover Removal



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Step 3. Remove the Front Panel Assembly

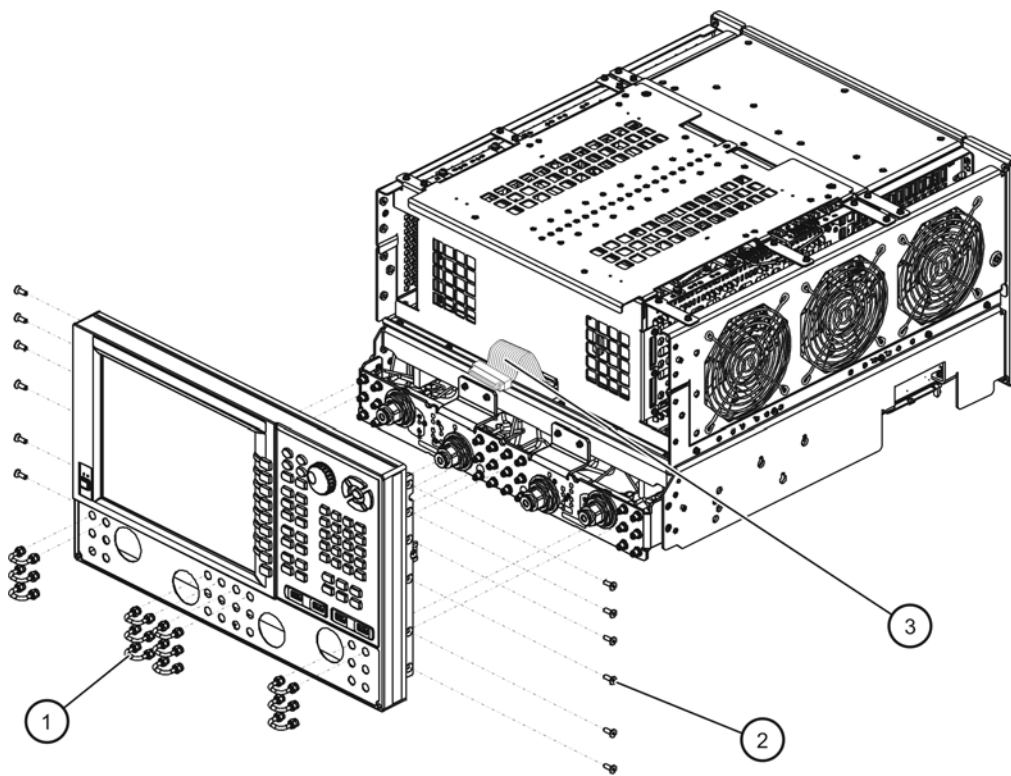
Refer to [Figure 2](#) for this step of the procedure.

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



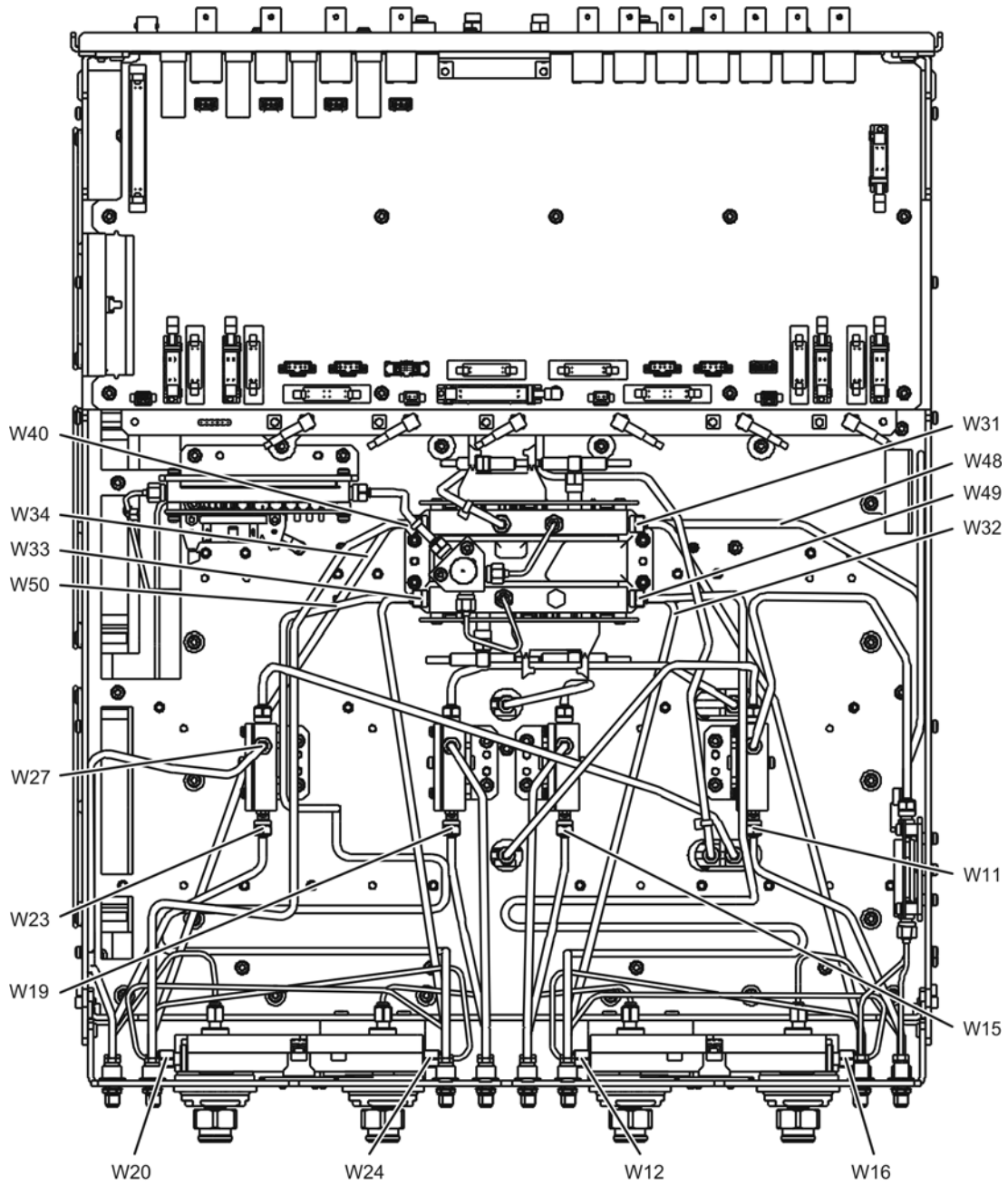
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Step 4. Remove the Existing Cables

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:
 - W40 Front-panel REF 2 RCVR R2 IN to A23 mixer brick (R2) Set this cable aside for re-installation later. It is being removed to allow access; it will not be replaced with a new cable.
 - W48 A33 reference mixer switch to A23 mixer brick (R1)
 - W11 A25 test port 1 bridge to front-panel Port 1 SOURCE OUT
 - W15 A26 test port 3 bridge to front-panel Port 3 SOURCE OUT
 - W16 Front-panel Port 3 CPLR THRU to A30 test port 3 coupler
 - W12 Front-panel Port 1 CPLR THRU to A29 test port 1 coupler
 - W31 Front-panel Port 1 RCVR A IN to A23 mixer brick (A)
 - W32 Front-panel Port 3 RCVR C IN to A24 mixer brick (C)
 - W27 A28 test port 2 bridge to front-panel REF 2 SOURCE OUT
 - W23 A28 test port 2 bridge to front-panel Port 2 SOURCE OUT
 - W19 A27 test port 4 bridge to front-panel Port 4 SOURCE OUT
 - W20 Front-panel Port 4 CPLR THRU to A31 test port 4 coupler
 - W24 Front-panel Port 2 CPLR THRU to A32 test port 2 coupler
 - W33 Front-panel Port 4 RCVR D IN to A24 mixer brick (D)
 - W34 Front-panel Port 2 RCVR B IN to A23 mixer brick (B)
 - W49 Front-panel REF 3 RCVR R3 IN to A24 mixer brick (R3)
 - W50 Front-panel REF 4 RCVR R4 IN to A24 mixer brick (R4)

Figure 3 Existing Cable Removal



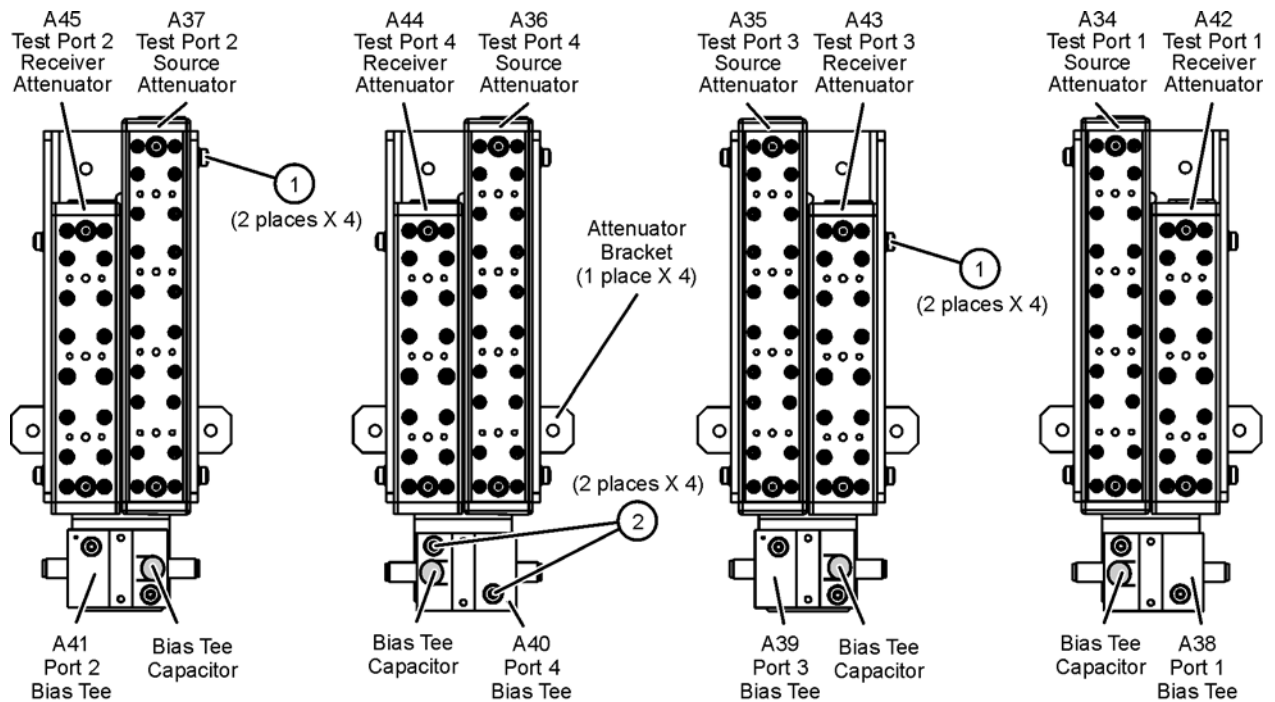
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Step 5. Assemble the Step Attenuators and Bias Tees

Refer to [Figure 4](#) for this step of the procedure. New parts are listed in [Table 1 on page 6](#).

1. Position the source and receiver attenuators on the attenuator brackets as shown.
2. Secure each attenuator to its attenuator bracket using two screws (item ①, 0515-0372) for each. Make sure that the attenuators are oriented as shown.
3. As shown, position the bias tees on the attenuator brackets so that the port 1 and port 3 bias tees capacitors face each other. The port 2 and port 4 bias tee capacitors should also face each other.
4. Secure each bias tee to the attenuator brackets using two screws (item ②, 0515-2994) for each. Make sure that the attenuators are oriented as shown.

Figure 4 Step Attenuators and Bias Tees Assembly



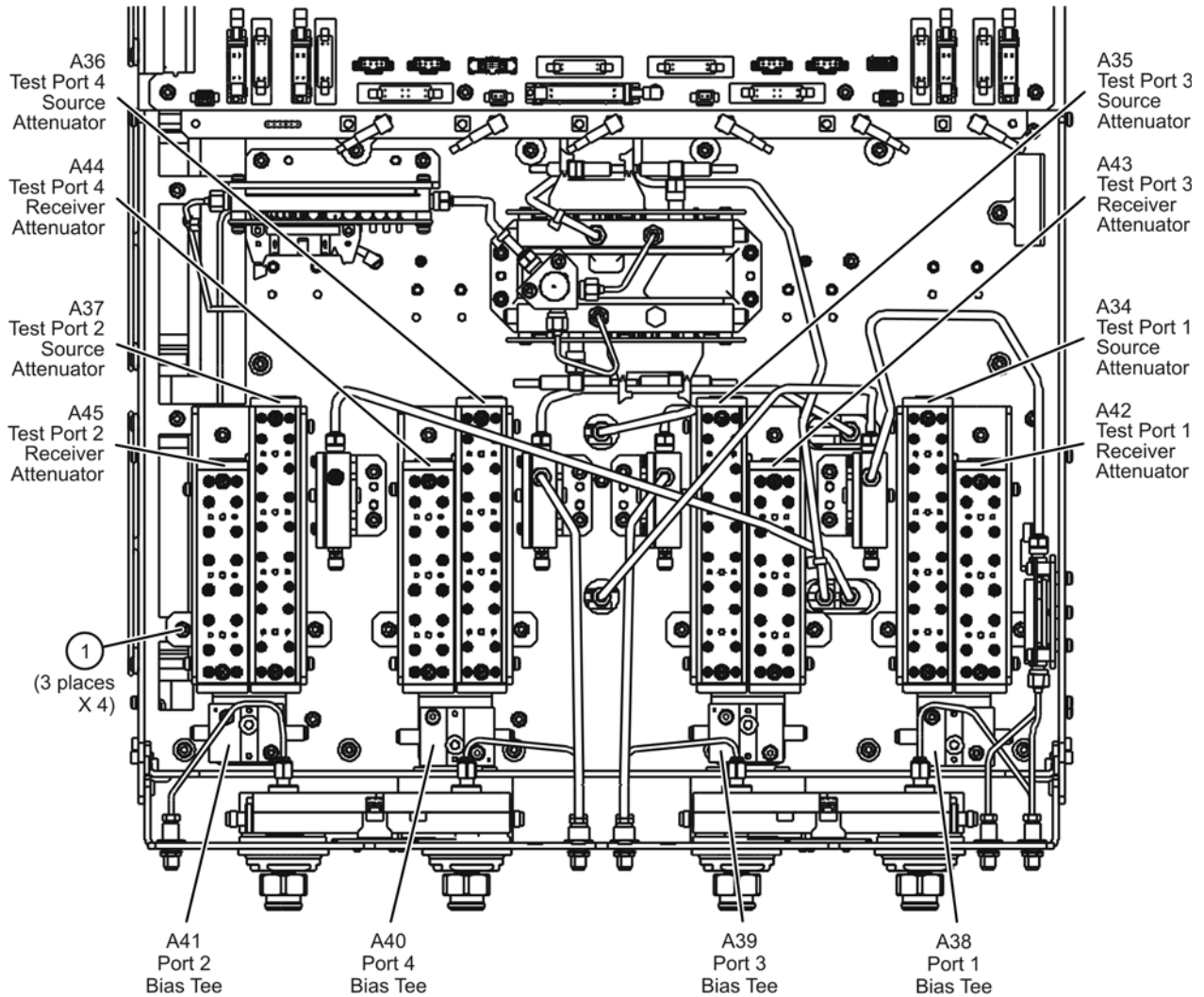
n5242_004_04

Step 6. Install the Step Attenuators and Bias Tees into the Analyzer

Refer to [Figure 5](#) for this step of the procedure. New parts are listed in [Table 1](#) on [page 6](#).

1. Position the attenuator brackets (with the attenuators and bias tees attached) in the analyzer as shown.
2. Secure the attenuator brackets to the analyzer test set deck using three screws (item ①, 0515-0430) each.

Figure 5 Step Attenuators and Bias Tees Installation into the Analyzer



N5242_004_05

Step 7. Install the New Cables

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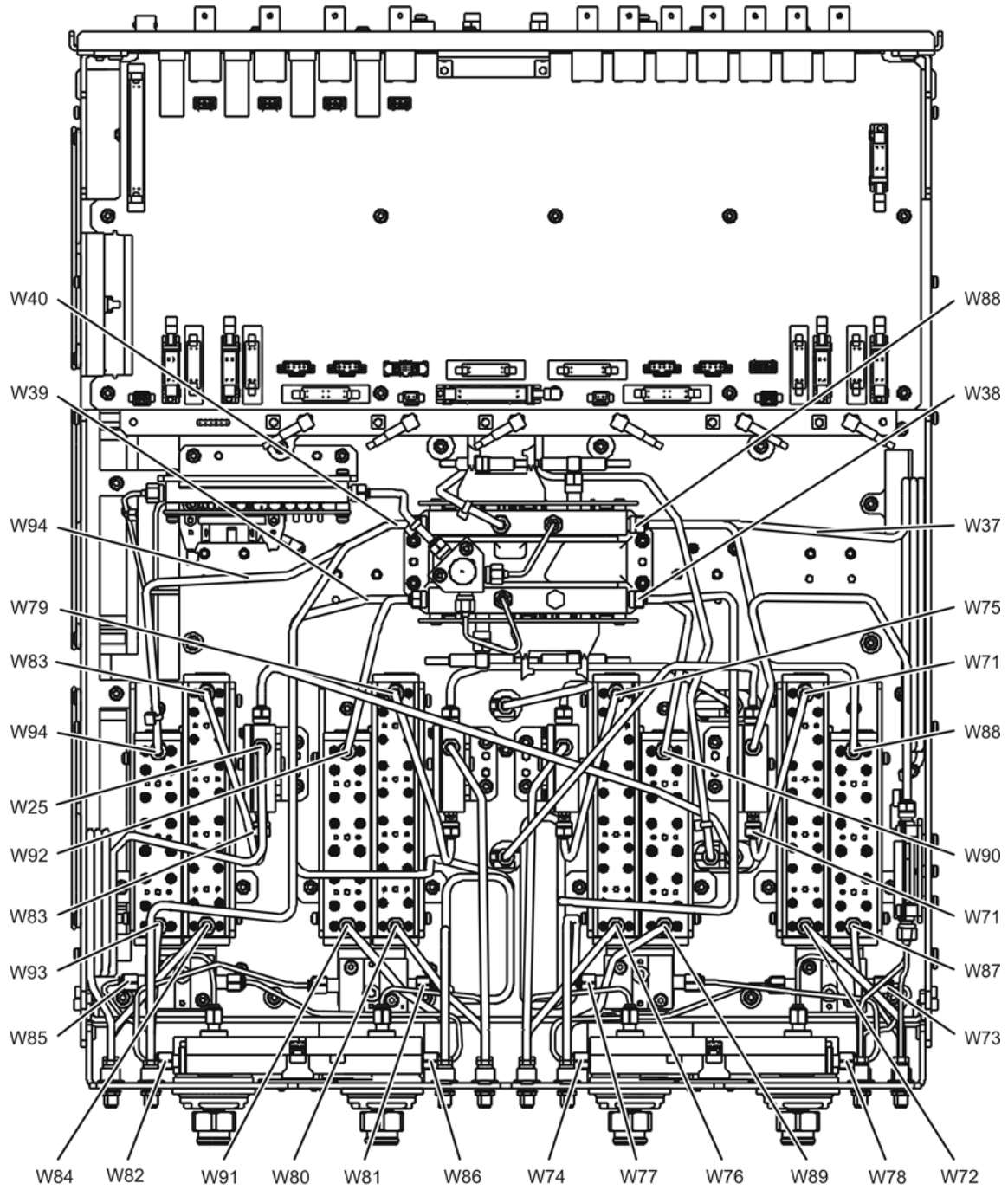
Install the RF Cables

Refer to [Figure 6](#) for this part of this step of the procedure. New parts are listed in [Table 1 on page 6](#).

1. 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, except front panel connectors; tighten these to 21 in-lbs.
 - W93 Front-panel Port 2 RCVR B IN to A45 port 2 receiver attenuator
 - W85 Front-panel Port 2 CPLR THRU to A41 test port 2 bias tee
 - W84 A37 test port 2 source attenuator to front-panel Port 2 SOURCE OUT
 - W86 A41 test port 2 bias tee to A32 test port 2 coupler
 - W91 Front-panel Port 4 RCVR D IN to A44 port 4 receiver attenuator
 - W82 A40 test port 4 bias tee to A31 test port 4 coupler
 - W81 Front-panel Port 4 CPLR THRU to A40 test port 4 bias tee
 - W80 A36 test port 4 source attenuator to front-panel Port 4 SOURCE OUT
 - W39 Front-panel REF 4 RCVR R4 IN to A24 mixer brick (R4)
 - W89 Front-panel Port 3 RCVR C IN to A43 port 3 receiver attenuator
 - W74 A38 test port 1 bias tee to A29 test port 1 coupler
 - W77 Front-panel Port 3 CPLR THRU to A39 test port 3 bias tee
 - W76 A35 test port 3 source attenuator to front-panel Port 3 SOURCE OUT
 - W38 Front-panel REF 3 RCVR R3 IN to A24 mixer brick (R3)
 - W87 Front-panel Port 1 RCVR A IN A42 port 1 receiver attenuator
 - W73 Front-panel Port 1 CPLR THRU to A38 test port 1 bias tee
 - W72 A34 test port 1 source attenuator to front-panel Port 1 SOURCE OUT
 - W78 A39 test port 3 bias tee to A30 test port 3 coupler
 - W83 A28 test port 2 bridge to A37 test port 2 source attenuator
 - W25 A28 port 2 bridge to front-panel REF 2 SOURCE OUT
 - W75 A26 test port 3 bridge to A35 test port 3 source attenuator
 - W79 A27 test port 4 bridge to A36 test port 4 source attenuator
 - W90 A43 port 3 receiver attenuator to A24 mixer brick (C)
 - W71 A25 test port 1 bridge to A34 test port 1 source attenuator
 - W37 A33 reference mixer switch to A23 mixer brick (R1)
 - W88 A42 port 1 receiver attenuator to A23 mixer brick (A)

- W94 A45 port 2 receiver attenuator to A23 mixer brick (B)
- W92 A44 port 4 receiver attenuator to A24 mixer brick (D)
- W40 Front-panel REF 2 RCVR R2 IN to A23 mixer brick (R2) This cable was removed and set aside in [“Step 4. Remove the Existing Cables”](#). It is not a new cable.

Figure 6 New RF Cable Installation



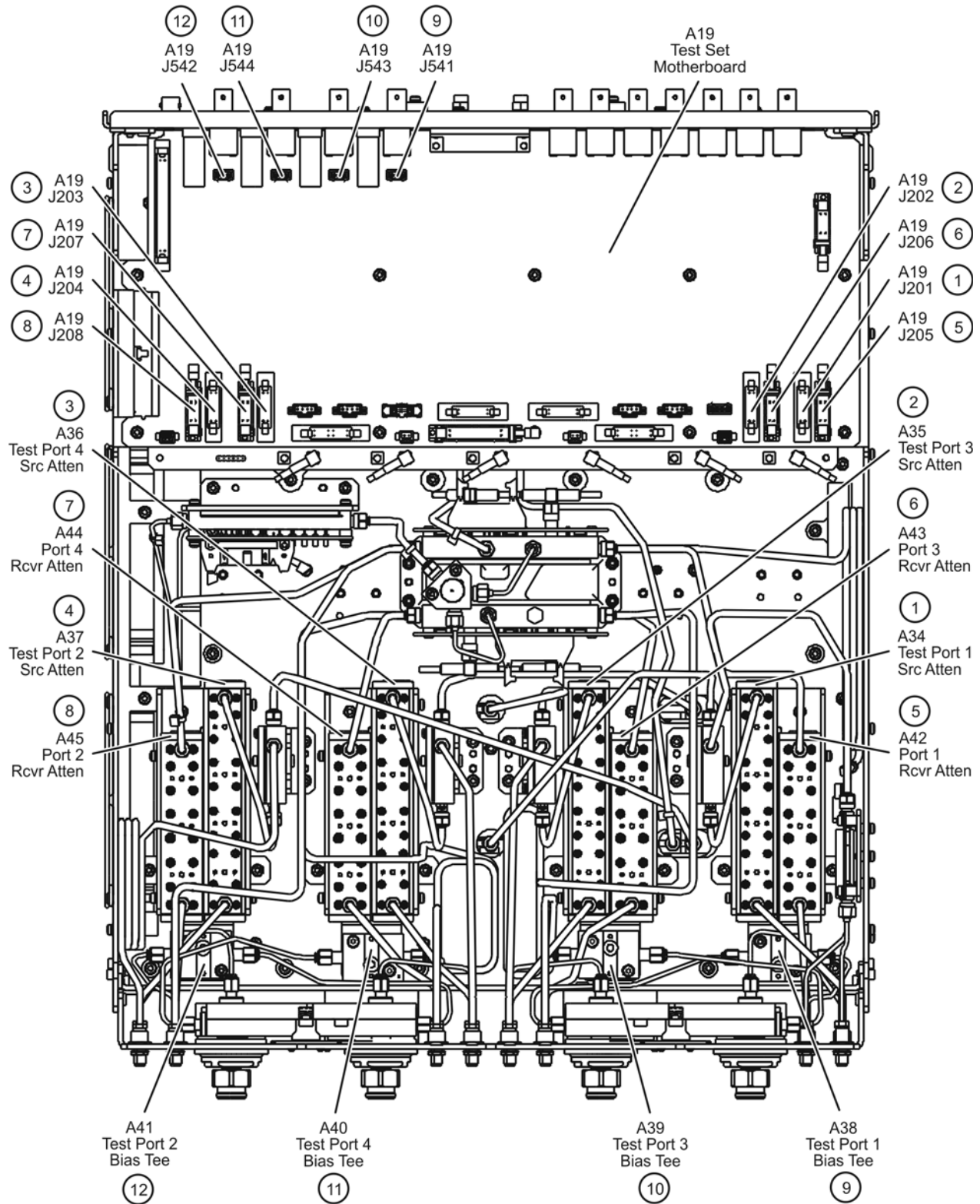
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Install the Ribbon Cables and Wire Harnesses

Refer to [Figure 7](#) for this part of this step of the procedure. New parts are listed in [Table 1 on page 6](#).

1. Connect step attenuator ribbon cables as follows:
 - a. Item ① – A42 port 1 source step attenuator to A19 test set motherboard J201
 - b. Item ② – A43 port 3 source step attenuator to A19 test set motherboard J202
 - c. Item ③ – A44 port 4 source step attenuator to A19 test set motherboard J203
 - d. Item ④ – A45 port 2 source step attenuator to A19 test set motherboard J204
 - e. Item ⑤ – A34 port 1 receiver step attenuator to A19 test set motherboard J205
 - f. Item ⑥ – A35 port 3 receiver step attenuator to A19 test set motherboard J206
 - g. Item ⑦ – A36 port 4 receiver step attenuator to A19 test set motherboard J207
 - h. Item ⑧ – A37 port 2 receiver step attenuator to A19 test set motherboard J208.
2. Connect bias tee cable harnesses as follows:
 - a. Item ⑨ – A38 port 1 bias tee to A19 test set motherboard J541
 - b. Item ⑩ – A39 port 3 bias tee to A19 test set motherboard J543
 - c. Item ⑪ – A40 port 4 bias tee to A19 test set motherboard J544
 - d. Item ⑫ – A41 port 2 bias tee to A19 test set motherboard J542.

Figure 7 New Ribbon Cable and Wire Harness Installation



n5242_004_06-2

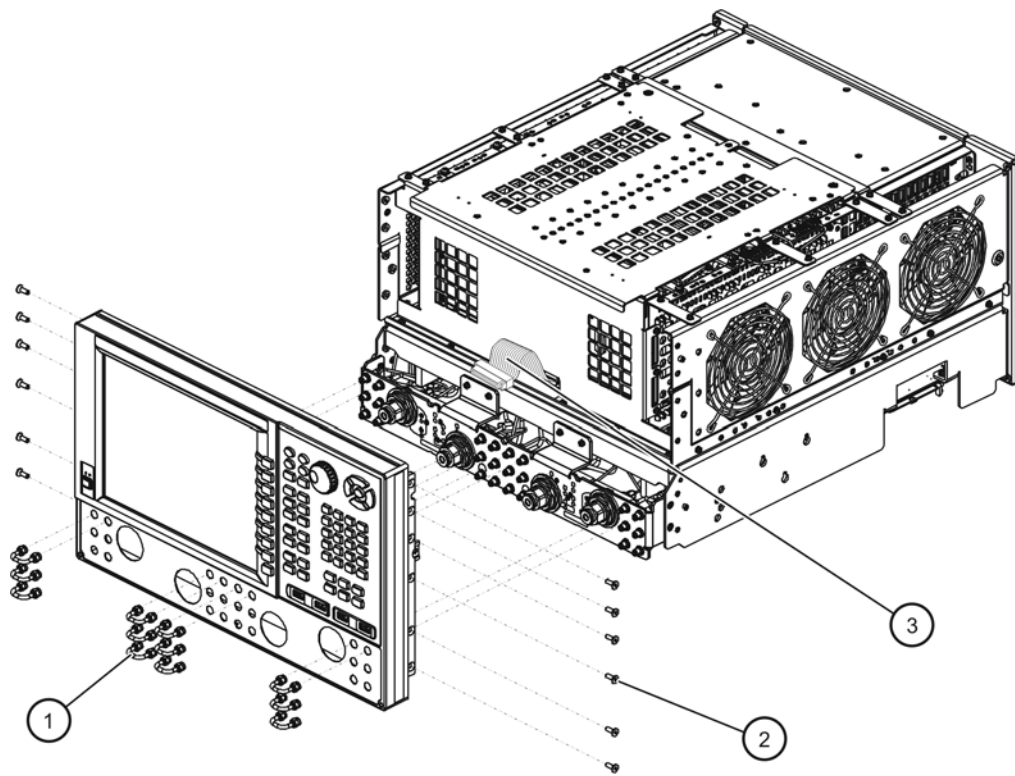
Step 8. Reinstall the Front Panel Assembly and Front Panel Jumpers

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

Refer to [Figure 8](#) for this step of the procedure. New parts are listed in [Table 1 on page 6](#).

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

Figure 8 Front Panel Assembly Reinstallation



n5242_004_02

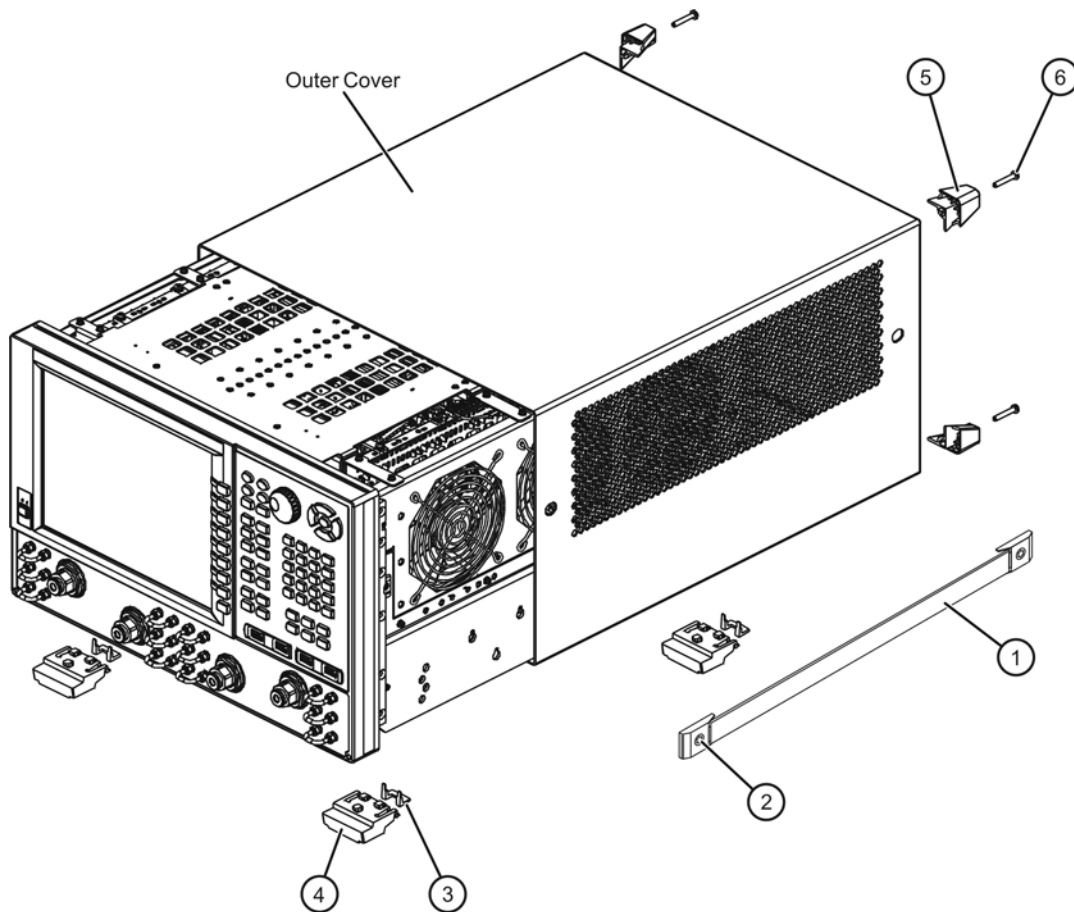
Step 9. Reinstall the Outer Cover

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

Refer to [Figure 9](#) for this step of the procedure.

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

Figure 9 Outer Cover Reinstallation



n5242_004_01

Step 10. Enable Option 419

Procedure Requirements

- The analyzer must be powered up and operating to perform this procedure.
- The Network Analyzer program must be running.
- A keyboard and mouse must be connected to the network analyzer.

Option Enable 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 - Src/Rcvr Atten & Bias Ts 4-Port**. Click **Enable**.
4. Using the keyboard, enter the license key in the box provided. The license key is printed on the license message you received from Agilent. 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**.

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 "419" is listed after "Options:" in the display. Click **OK**.

NOTE If Option 419 has not been enabled, perform the "[Option Enable Procedure](#)" again. If the option is still not enabled, contact Agilent Technologies. Refer to "[Getting Assistance from Agilent](#)" on page 3.

Step 11. Perform Post-Upgrade Adjustments and Calibration

Adjustments

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

- source adjustment
- receiver adjustment

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

To view this service guide information, click the Chapter 3 bookmark “Tests and Adjustments” in the PDF Service Guide¹.

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

Operator’s Check

Perform the Operator’s Check to check the basic functionality of the analyzer. For instructions, click the Chapter 3 bookmark “Tests and Adjustments” in the PDF Service Guide¹.

If you experience difficulty with the basic functioning of the analyzer, contact Agilent. Refer to [“Contacting Agilent” on page 3](#).

Calibration

Although the analyzer functions, its performance relative to its specifications has not been verified. It is recommended that a full instrument calibration be performed using the analyzer’s internal performance test software. To view information on the performance test software, click the Chapter 3 bookmark “Tests and Adjustments” in the PDF Service Guide¹.

1. See [“Downloading the Online PNA Service Guide” on page 5](#).

