

Installation Note

Second Source, Combiner, and Mechanical Switches Upgrade Kit

To Upgrade Option 419 to Option 423

Upgrade Kit Order Number: N5242AU- 927



Agilent Kit Number: N5242-60104

Agilent Document Number: N5242-90005

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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. |
|----------------|---|

| | |
|----------------|---|
| 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. |
|----------------|---|

Getting Assistance from Agilent

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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.

Description of the Upgrade

This upgrade converts your Option 419 4-port analyzer (with configurable test set, extended power range, and bias tees) to an Option 423 analyzer by adding a mechanical switch to each source port channel and a source combiner to the port 1 channel.

In addition, source outputs are routed to the rear panel and rear-panel test set inputs are added.

About Installing the Upgrade

| | |
|--|---|
| Products affected | N5242A Option 419 |
| Installation to be performed by | Agilent service center or personnel qualified by Agilent |
| Estimated installation time | 5.0 hours |
| Estimated adjustment time | 0.5 hours |
| Estimated full instrument calibration time | 4.5 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 Agilent Technologies. Refer to [“Getting Assistance from Agilent” on page 3](#).

Table 1 Contents of Upgrade Kit N5242-60104

| Ref Desig. | Description | Qty | Part Number |
|------------|--|-----|-------------|
| | Installation note (this document) | | N5242-90005 |
| A46 | Port 1 mechanical switch | 4 | N1811-60006 |
| A47 | Port 3 mechanical switch | | |
| A48 | Port 4 mechanical switch | | |
| A49 | Port 2 mechanical switch | | |
| A50 | Combiner (bridge) | 1 | 5087-7315 |
| | Switch bracket | 4 | N5242-00009 |
| | Machine screw, M2.5 x 20, pan head (to attach mechanical switch to switch bracket) | 8 | 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) | 8 | 0515-0430 |
| W95 | RF cable, W3 to A46 port 1 mechanical switch | 1 | N5242-20020 |
| W96 | RF cable, A46 port 1 mechanical switch to A25 test port 1 bridge | 1 | N5242-20007 |
| W97 | RF cable, A46 port 1 mechanical switch to rear-panel PORT 1 SW SRC OUT (J11) | 1 | N5242-20086 |
| W98 | RF cable, rear-panel PORT 1 COMB THRU IN (J10) to A50 combiner | 1 | N5242-20087 |
| W99 | RF cable, rear-panel PORT 1 COMB ARM IN (J9) to A50 combiner | 1 | N5242-20088 |
| W100 | RF cable, A50 combiner to A46 port 1 mechanical switch | 1 | N5242-20008 |
| W101 | RF cable, W5 to A47 port 3 mechanical switch | 1 | N5242-20017 |
| W102 | RF cable, A47 port 3 mechanical switch to A26 test port 3 bridge | 1 | N5242-20006 |
| W103 | RF cable, A47 port 3 mechanical switch to PORT 3 SW SRC OUT (J8) | 1 | N5242-20081 |
| W104 | RF cable, rear-panel PORT 3 SW TSET IN (J7) to A47 port 3 mechanical switch | 1 | N5242-20080 |
| W105 | RF cable, W7 to A48 port 4 mechanical switch | 1 | N5242-20018 |
| W106 | RF cable, A48 port4 mechanical switch to A27 test port 4 bridge | 1 | N5242-20003 |
| W107 | RF cable, A48 port 4 mechanical switch to PORT 4 SW SRC OUT (J4) | 1 | N5242-20082 |
| W108 | RF cable, rear-panel PORT 4 SW TSET IN (J3) to A48 port 4 mechanical switch | 1 | N5242-20083 |
| W109 | RF cable, W9 to A49 port 2 mechanical switch | 1 | N5242-20019 |
| W110 | RF cable, A49 port 2 mechanical switch to A28 test port 2 bridge | 1 | N5242-20004 |
| W111 | RF cable, A49 port 2 mechanical switch to rear-panel PORT 2 SW SRC OUT (J2) | 1 | N5242-20084 |
| W112 | RF cable, rear-panel PORT 2 SW TSET IN (J1) to A49 port 2 mechanical switch | 1 | N5242-20085 |
| W113 | Rear panel jumper | 4 | E8356-20072 |

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.**

Electrostatic Discharge Protection

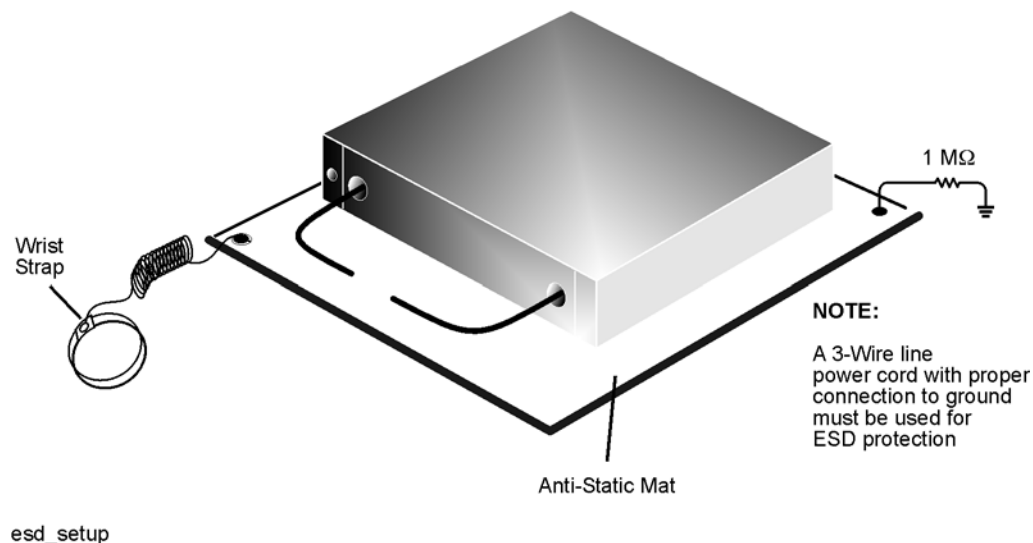
Protection against electrostatic discharge (ESD) is essential while removing or connecting cables or assemblies within the network analyzer.

Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the instrument:

- *always* have a grounded, conductive table mat in front of your test equipment.
- *always* wear a grounded wrist strap, connected to a grounded conductive table mat, having a 1 M Ω resistor in series with it, when handling components and assemblies or when making connections.
- *always* wear a heel strap when working in an area with a conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
- *always* ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port or cable connector briefly.

Figure 1 shows a typical ESD protection setup using a grounded mat and wrist strap. Refer to “Tools and Equipment Required for the Installation” on page 6 for part numbers.

Figure 1 ESD Protection Setup



Tools and Equipment 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 cable connectors. Torque these connections to 21 in-lb.

ESD Equipment and Supplies 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 |

Overview of the Installation Procedure

- Step 1. Remove the Outer Cover.
- Step 2. Remove the Front Panel Assembly.
- Step 3. Remove the Existing Test Set Cables.
- Step 4. Assemble the Mechanical Switches.
- Step 5. Install the Mechanical Switches.
- Step 6. Remove the A19 Test Set Motherboard and the A20 IF Multiplexer Board.
- Step 7. Install the New Test Set Cables.
- Step 8. Reinstall the A20 IF Multiplexer Board and the A19 Test Set Motherboard.
- Step 9. Reinstall the Front Panel Assembly and Front Panel Jumpers.
- Step 10. Reinstall the Outer Cover.
- Step 11. Enable Option 423.
- Step 12. Perform Post-Upgrade Adjustments and Calibration.

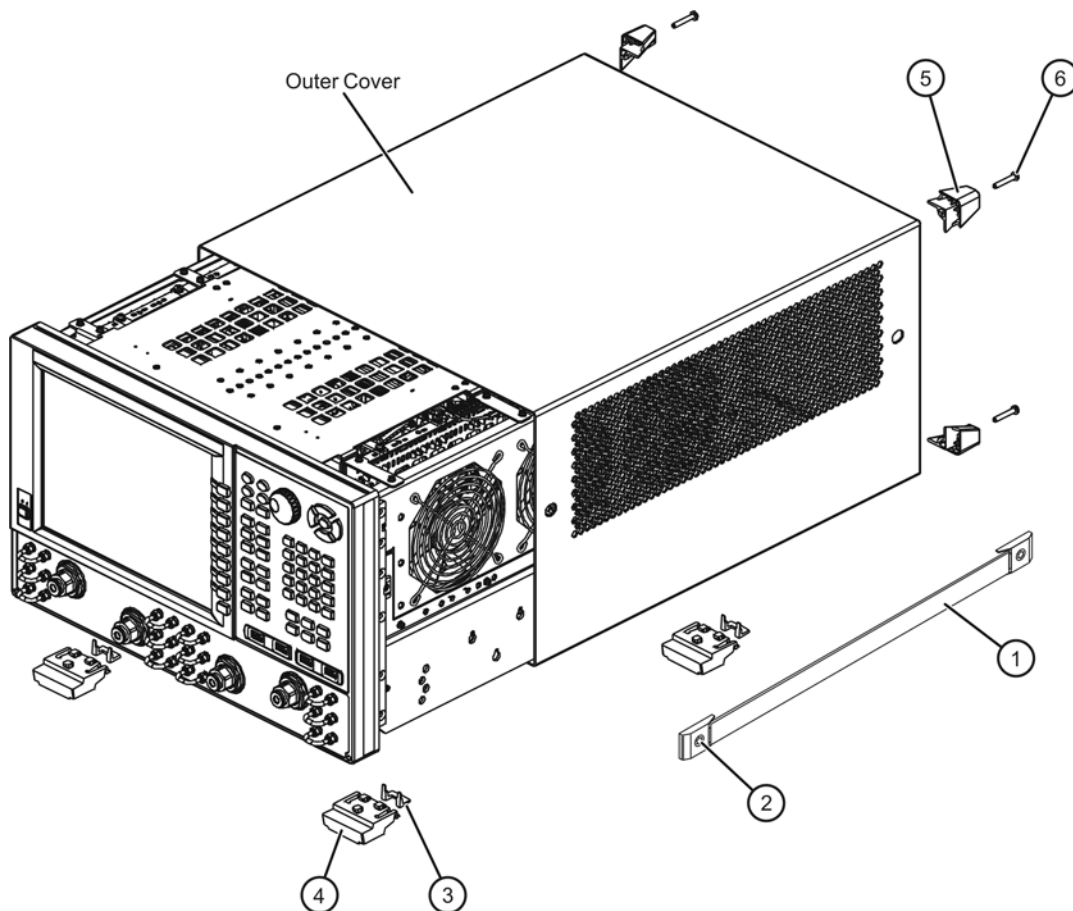
Step 1. Remove the Outer Cover

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 2](#) 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 2 Outer Cover Removal



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Step 2. Remove the Front Panel Assembly

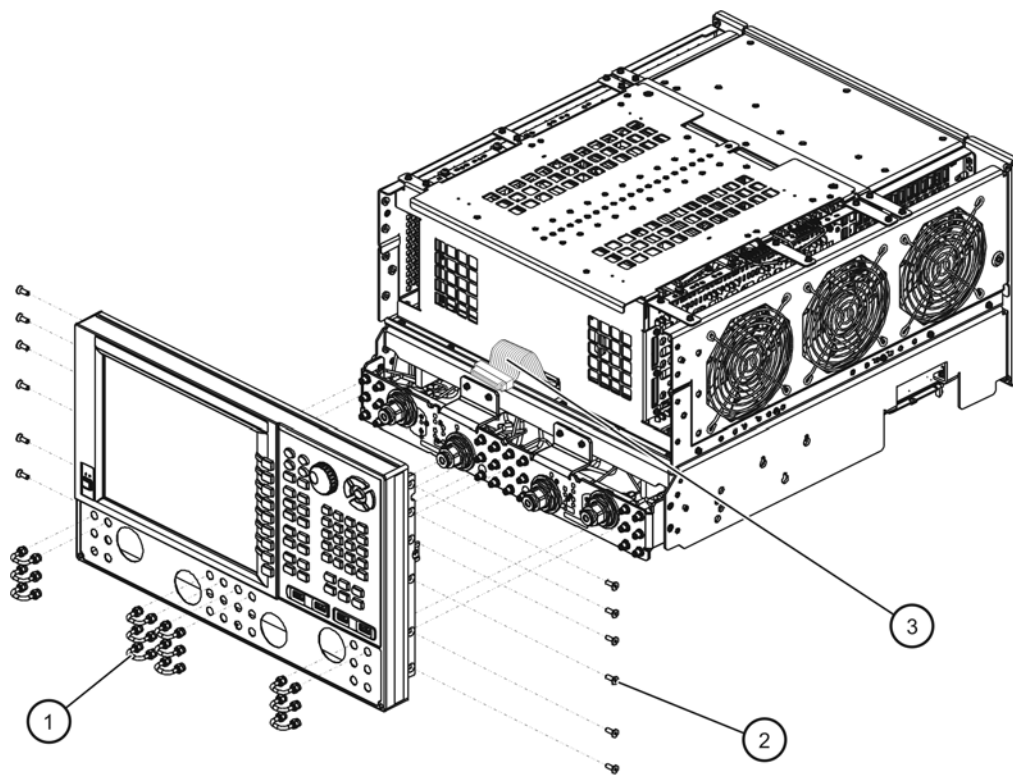
Refer to [Figure 3](#) for this step of the procedure.

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 3 Front Panel Assembly Removal



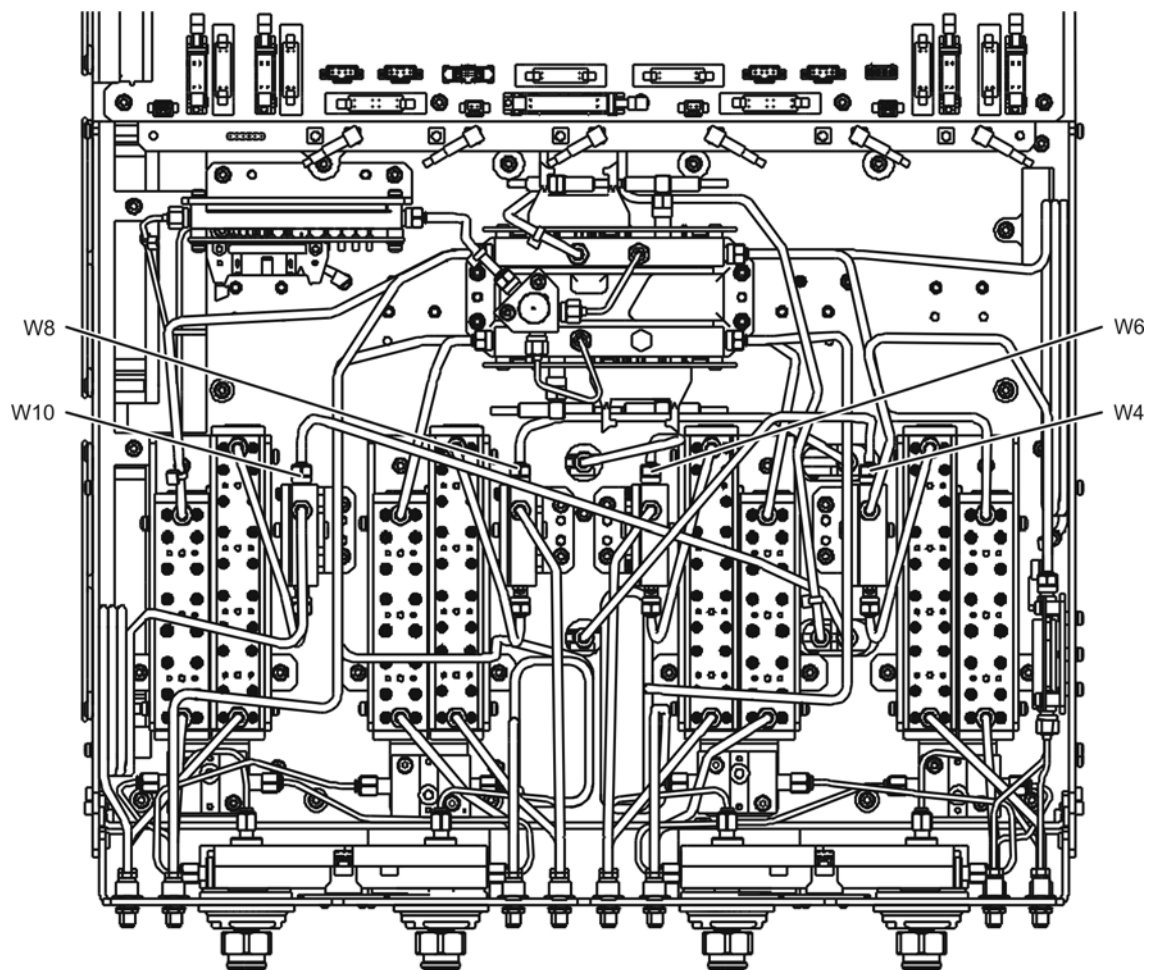
n5242_004_02

Step 3. Remove the Existing Test Set Cables

Refer to [Figure 4](#) 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:
 - W4 W3 (from A5 26.5 GHz source 1 board OUT 1) to A25 port 1 bridge
 - W6 W5 (from A8 26.5 GHz source 2 board OUT 1) to A26 port 3 bridge
 - W8 W7 (from A8 26.5 GHz source 2 board OUT 2) to A27 port 4 bridge
 - W10 W9 (from A5 26.5 GHz source 1 board OUT 2) to A28 port 2 bridge

Figure 4 Existing Test Set Cables Removal



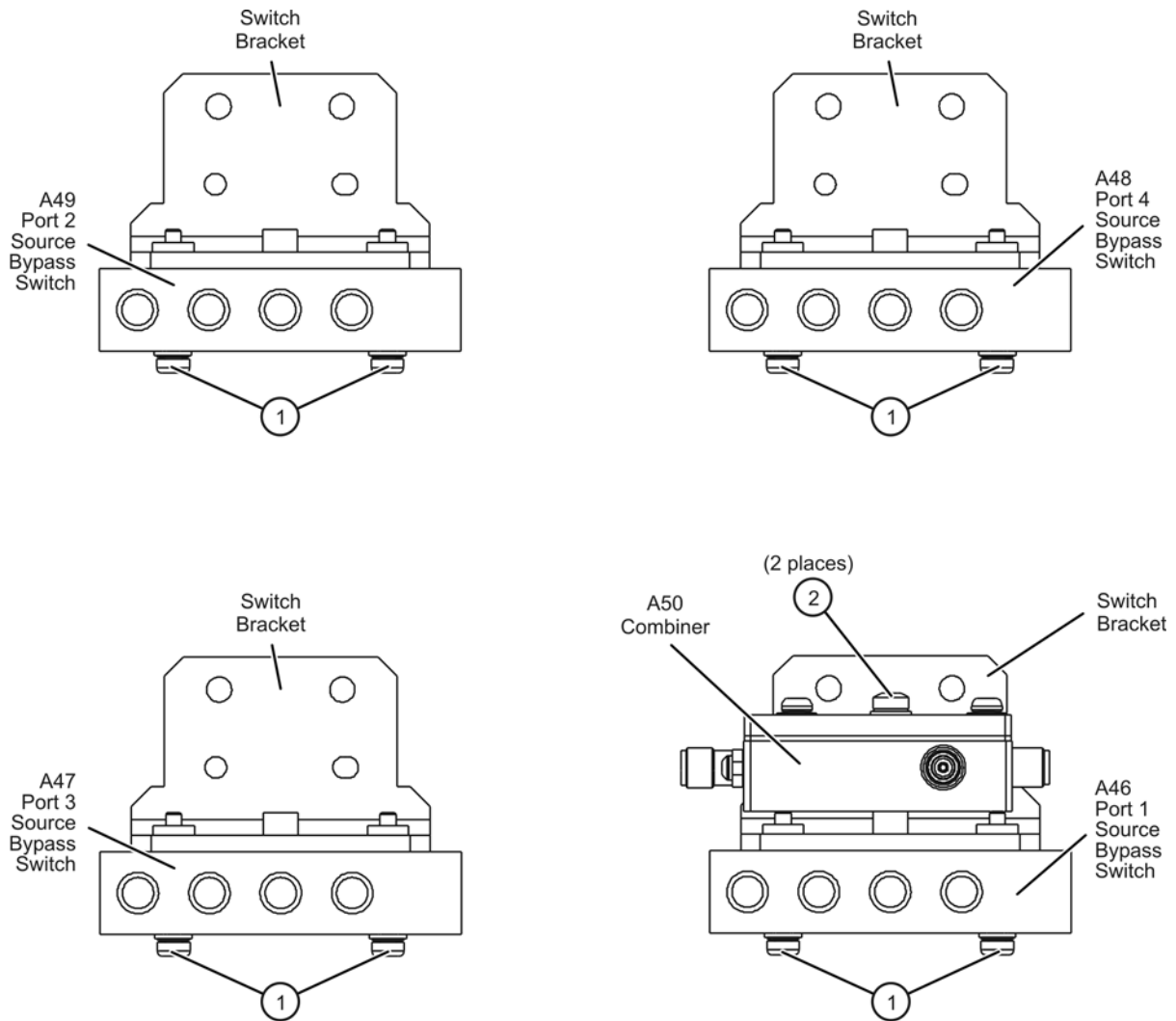
n5242_005_01

Step 4. Assemble the Mechanical Switches

Refer to [Figure 5](#) for this step of the procedure. New parts are listed in [Table 1](#) on page 4.

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 5 Mechanical Switches Assembly



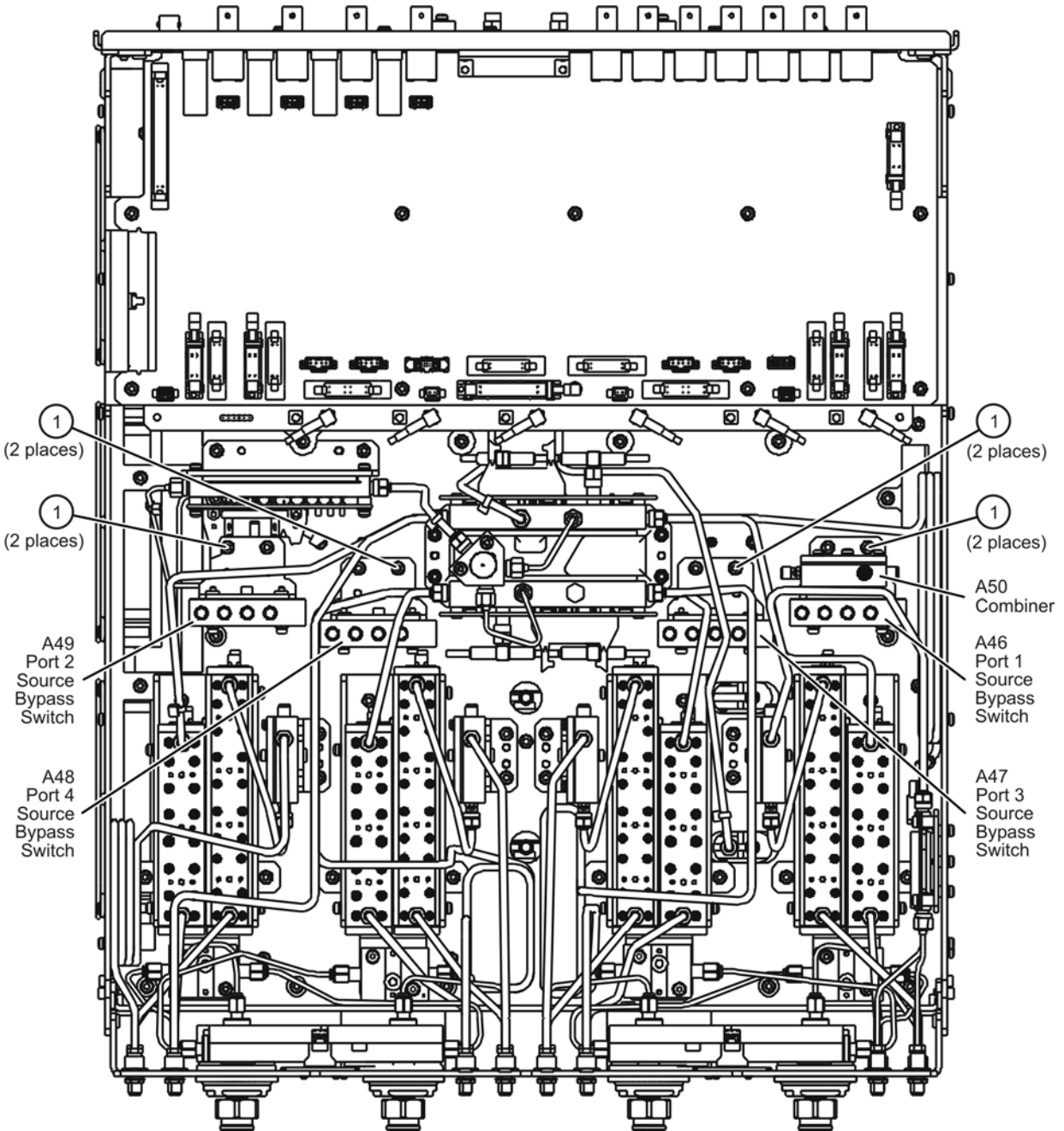
n5242_005_02

Step 5. Install the Mechanical Switches

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

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 6 Mechanical Switches Installation into the Analyzer



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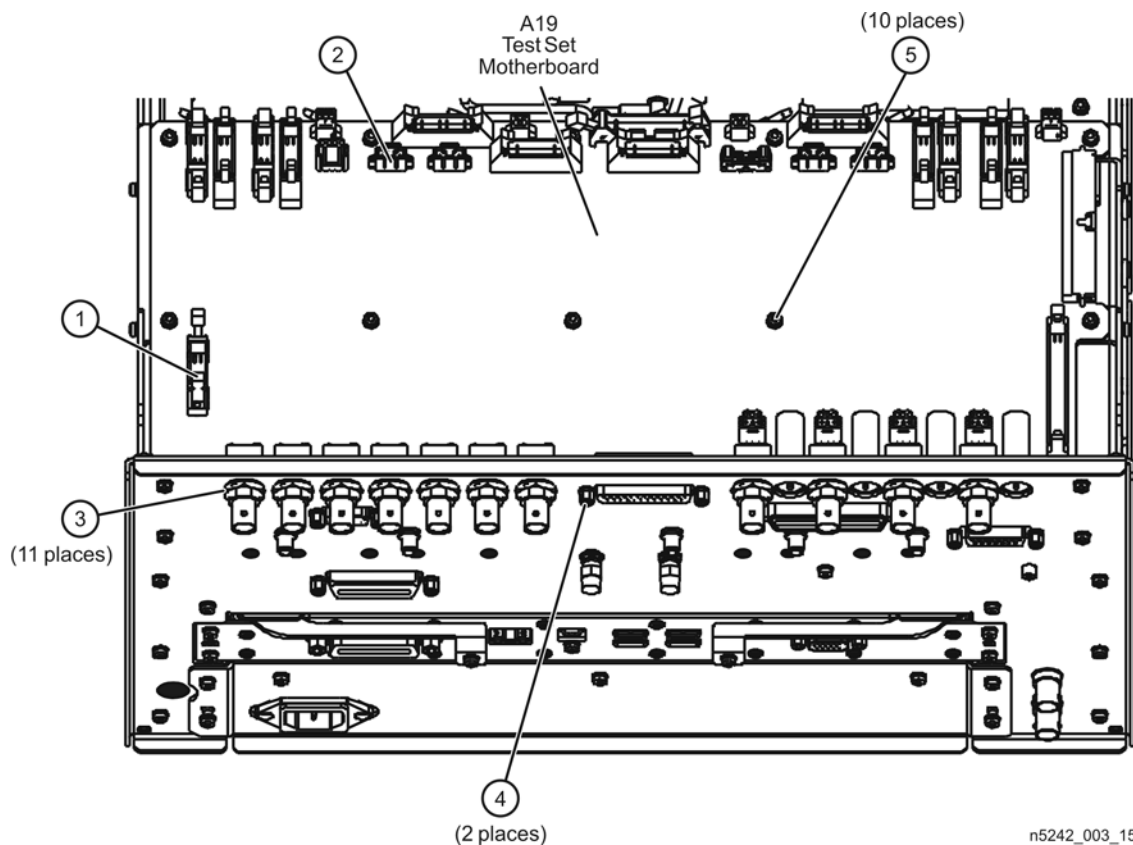
Step 6. Remove the A19 Test Set Motherboard and the A20 IF Multiplexer Board

Remove the A19 Test Set Motherboard

Refer to [Figure 7](#) 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 7 A19 Test Set Motherboard Removal

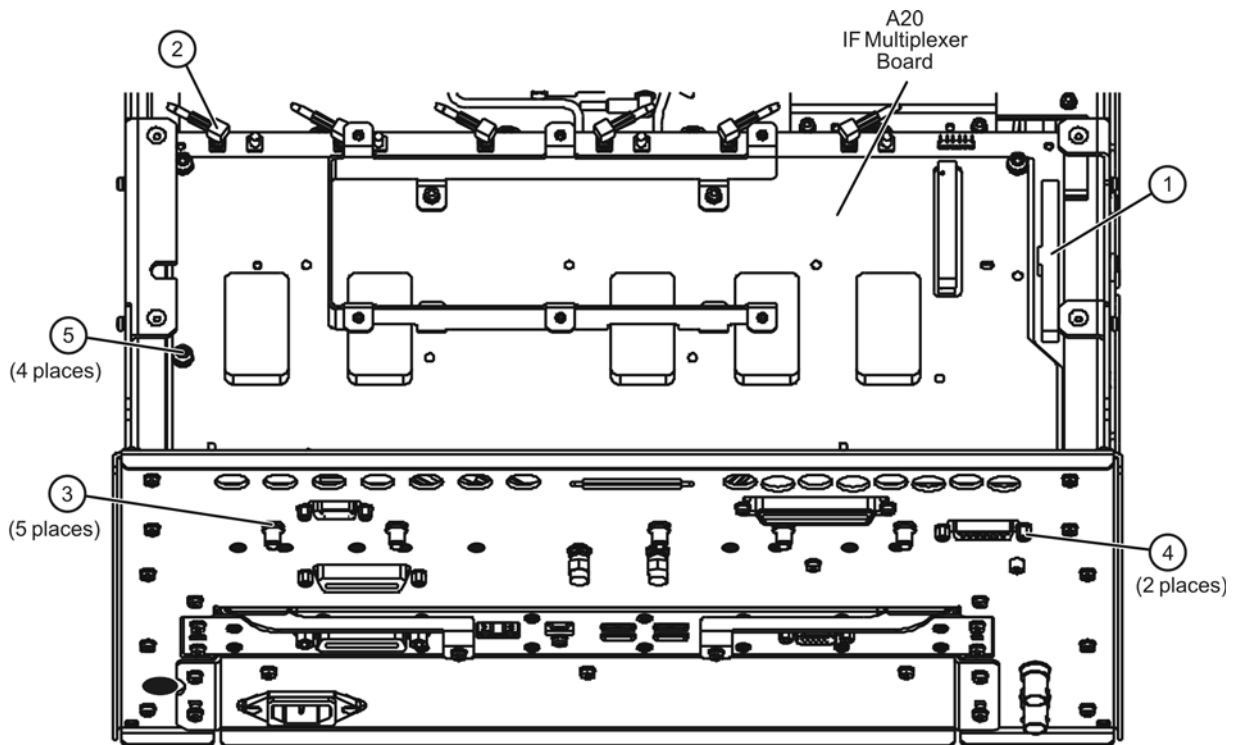


Remove the A20 IF Multiplexer Board

Refer to [Figure 8](#) 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 8 A20 IF Multiplexer Board Removal



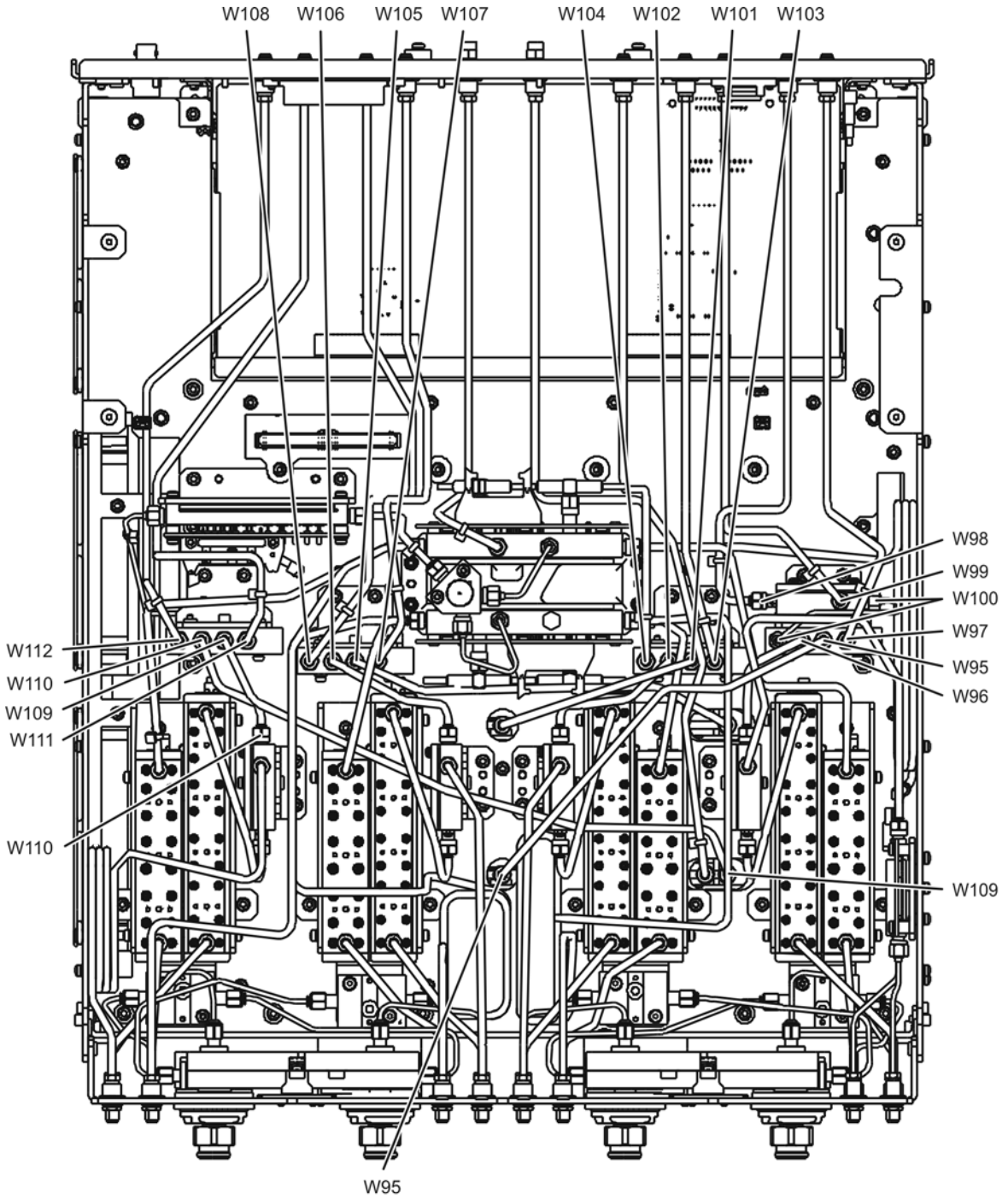
n5242_003_16

Step 7. Install the New Test Set Cables

Refer to [Figure 8-2](#) for this part of this step. New parts are listed in [Table 1 on page 4](#).

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 4—SW TSET IN (J3) and SW SRC OUT (J4)
 - PORT 2—SW TSET IN (J1) and SW SRC OUT (J2)
2. 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.
 - W95 W3 (from A5 26.5 GHz source 1 board) to A46 port 1 mechanical switch (connector 2)
 - W96 A46 port 1 mechanical switch (connector 3) to A25 test port 1 bridge
 - W97 A46 port 1 mechanical switch (connector 1) to rear-panel PORT 1 SW SRC OUT (J11)
 - W98 Rear-panel PORT 1 COMB THRU IN (J10) to A50 combiner
 - W99 Rear-panel PORT 1 COMB ARM IN (J9) to A50 combiner
 - W100 A50 combiner to A46 port 1 mechanical switch (connector 4)
 - W101 W5 (from A8 26.5 GHz source 2 board) to A47 port 3 mechanical switch (connector 2)
 - W102 A47 port 3 mechanical switch (connector 3) to A26 test port 3 bridge
 - W103 A47 port 3 mechanical switch (connector 1) to rear-panel SRC 2 SW SRC OUT (J8)
 - W104 Rear-panel PORT 3 SW TSET IN (J7) to A47 port 3 mechanical switch (connector 4)
 - W105 W7 (from A8 26.5 GHz source 2 board) to A48 port 4 mechanical switch (connector 2)
 - W106 A48 port 4 mechanical switch (connector 3) to A27 test port 4 bridge
 - W107 A48 port 4 mechanical switch (connector 1) to rear-panel PORT 4 SW SRC OUT (J4)
 - W108 Rear-panel PORT 4 SW TSET IN (J3) to A48 port 4 mechanical switch (connector 4)
 - W109 W9 (from A5 26.5 GHz source 1 board) to A49 port 2 mechanical switch (connector 2)
 - W110 A49 port 2 mechanical switch (connector 3) to A28 test port 2 bridge
 - W111 A49 port 2 mechanical switch (connector 1) to rear-panel PORT 2 SW SRC OUT (J2)
 - W112 Rear-panel PORT 2 SW TSET IN (J1) to A49 port 2 mechanical switch (connector 4)

Figure 8-2 **New Test Set Cable Installation, Part 1**

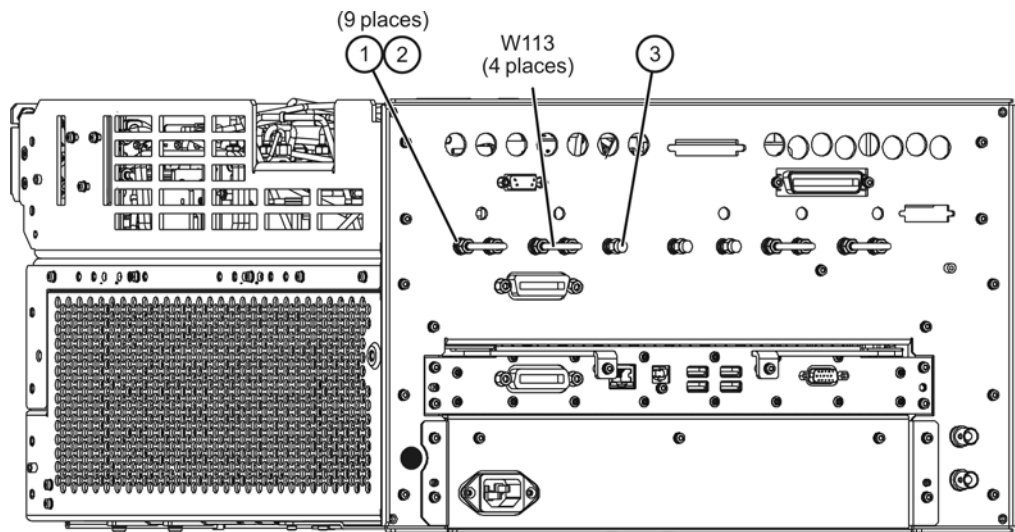


n5242_005_04

Refer to [Figure 9](#) for this part of this step of the procedure. New parts are listed in [Table 1](#) on [page 4](#).

1. Install lock washers (item ①) and hex nuts (item ②) on the nine new rear panel cable connectors.
2. Using a 5/16-in torque wrench set to 21 in-lbs, tighten the hex nuts on the rear panel cable connectors.
3. Install the four 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 4 SW TSET IN (J3) to PORT 4 SW SRC OUT (J4)
 - d. Jumper PORT 2 SW TSET IN (J1) to PORT 2 SW SRC OUT (J2)
4. 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 9 New Test Set Cable Installation, Part 2



n5242_005_06

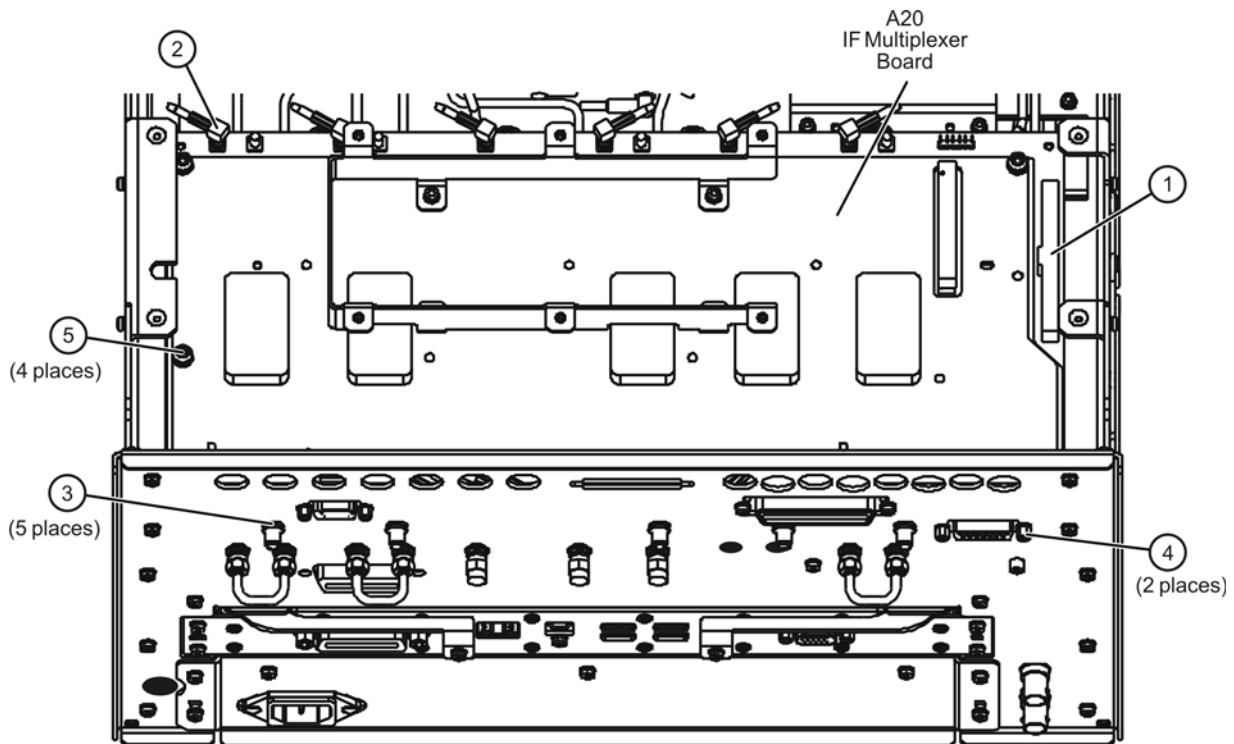
Step 8. Reinstall the A20 IF Multiplexer Board and the A19 Test Set Motherboard

Reinstall the A20 IF Multiplexer Board

Refer to [Figure 10](#) 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 10 A20 IF Multiplexer Board Reinstallation



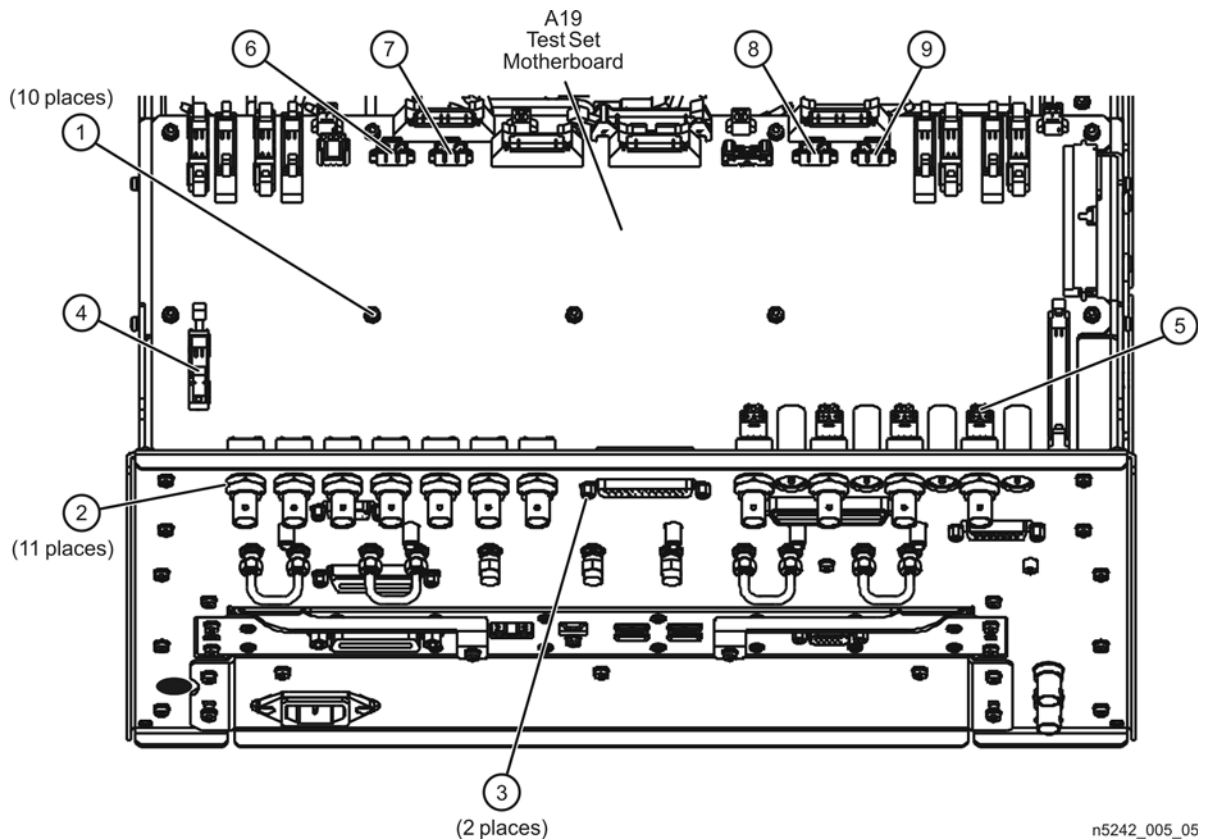
n5242_003_17

Reinstall the A19 Test Set Motherboard

Refer to [Figure 11](#) 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 6 on page 11](#) for locations of A46 through A49.

Figure 11 A19 Test Set Motherboard Reinstallation



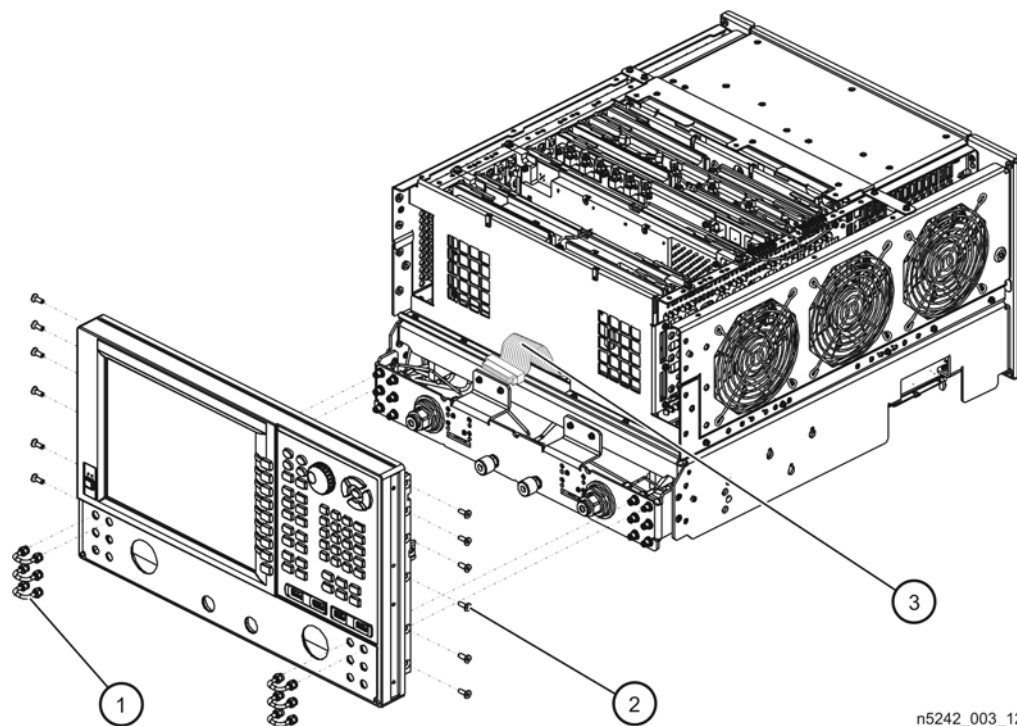
Step 9. Reinstall the Front Panel Assembly and Front Panel Jumpers

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

Refer to [Figure 12](#) for this step of the procedure. New parts are listed in [Table 1 on page 4](#).

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 12 Front Panel Assembly Reinstallation



n5242_003_12

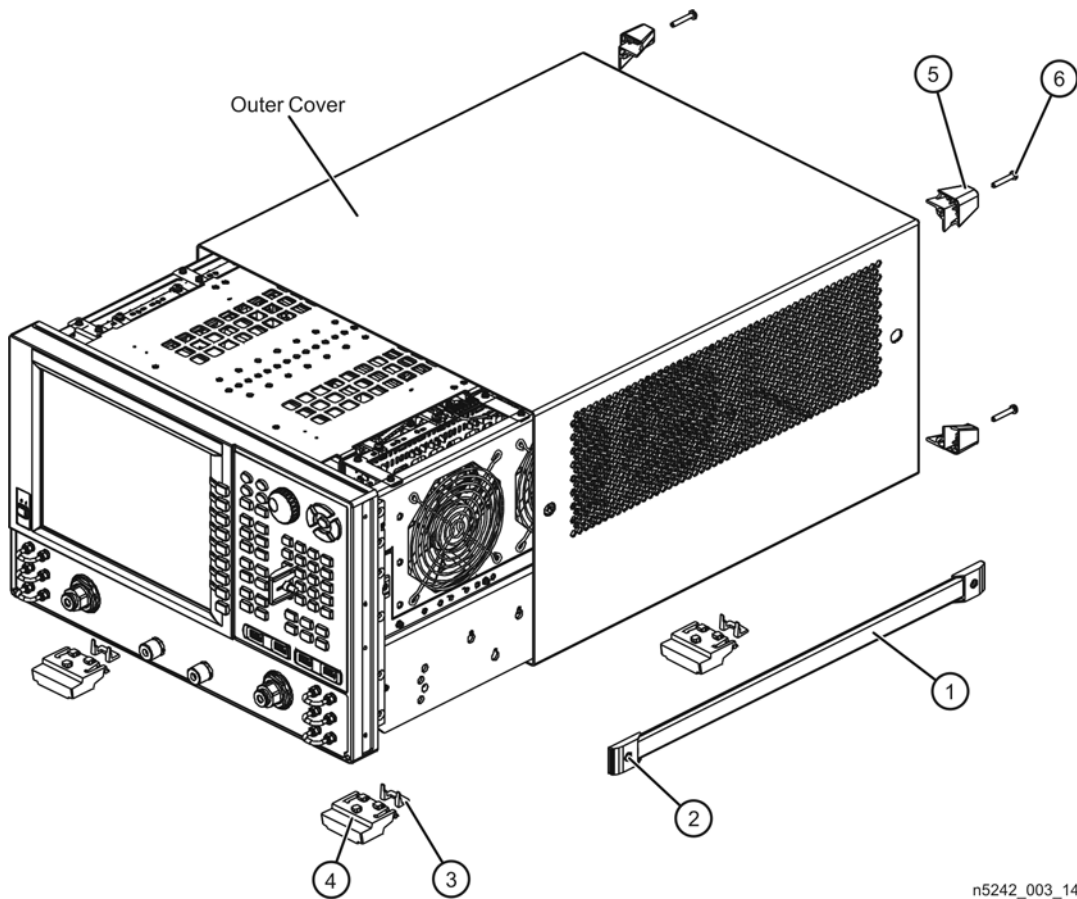
Step 10. Reinstall the Outer Cover

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 13](#) 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 each strap handle with a T-20 TORX driver.

Figure 13 Outer Cover Reinstallation



n5242_003_14

Step 11. Enable Option 423

Procedure Requirements

- The analyzer must be powered up and operating to perform this procedure.
- The Network Analyzer program must be running.

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 **423 - Combiner & Switches**. Click **Enable**.
4. Click **Yes** in answer to the displayed question in the **Restart Analyzer?** box.
5. 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 "423" is listed after "Options:" in the display. Click **OK**.

NOTE If Option 423 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 12. 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 the Service Guide online, use the following steps:

1. Go to www.agilent.com.
2. In the Search box, enter the model number of your analyzer, N5242A, and click **Search**.
3. Click [Technical Support > Manuals](#).
4. Click [Service Manual](#).
5. Click the service guide title to load the PDF file.
6. When the PDF of the Service Guide is displayed, scroll through the Contents section bookmarks to locate the “Tests & Adjustments” chapter.

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, refer to the “Tests & Adjustments” chapter of the Service Guide.

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. Refer to the analyzer’s service guide for information on this performance test software.