

# Installation Note

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## **Receiver Attenuators Upgrade Kit**

**To Add Option 016**

**Upgrade Kit Order Numbers: E8361AU-016 and E8361CU-016  
For E8361A/C PNA Series Microwave Network Analyzers**



**Agilent Kit Number: E8361-60102**

**Agilent Document Number: E8361-90003**

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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.

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<b>WARNING</b>	<b>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.</b>
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<b>CAUTION</b>	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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## Contacting Agilent

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

[www.agilent.com/find/assist](http://www.agilent.com/find/assist)

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

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<b>NOTE</b>	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.
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## About Installing the Upgrade Kit

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<b>IMPORTANT</b>	Option 016 can only be installed on analyzers with the option combinations listed below as “Products affected”. If your analyzer does not have the proper options (as listed below), it will be necessary to install those options <b>BEFORE</b> installing this option (Option 016).
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Products affected. . . . .	E8361A/C with Options 014 and UNL (with or without Options 080 and 081)
Installation to be performed by . . . . .	Agilent service center or personnel qualified by Agilent
Estimated installation time . . . . .	1.0 hour
Estimated adjustment time . . . . .	1.0 hour
Estimated full instrument calibration time . .	4.5 hours

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## Description of Option 016 Receiver Attenuators

This option adds a 50-dB step attenuator in the channel A and channel B signal paths.

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## Items Included in the Upgrade Kit

Check the contents of your kit against this list. If any item is missing or damaged, contact Agilent Technologies. Refer to [“Contacting Agilent” on page 3](#).

**Table 1     Contents of Option 016 Upgrade Kit (E8361-60102)**

Ref. Desig.	Description	Qty	Part Number
	Installation note (this document)	1	E8361-90003
	ROHS addendum	1	9320-6722
	Machine screw, M3.0 x 8 (for attaching attenuators)	4	0515-0372
A43, A44	50-dB step attenuator	2	84905-60001
	Ribbon cable (for A43 and A44 step attenuators)	2	8121-0819
W20	RF cable, A8 synthesizer J106 to A17 LOMA 12 J2	1	E8361-20046
W21	RF cable, A8 synthesizer J101 to A17 LOMA 12 J3	1	E8361-20045
W47	RF cable, A43 channel A step attenuator to A27 channel A mixer	1	E8361-20064
W48	RF cable, A44 channel B step attenuator to A30 channel B mixer	1	E8361-20025
W49	RF cable, PORT 1 RCVR A IN to A43 channel A step attenuator	1	E8361-20032
W50	RF cable, PORT 2 RCVR B IN to A44 channel B step attenuator	1	E8361-20029

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## Installation Procedure for the Upgrade Kit

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.

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**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.**

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### Electrostatic Discharge Protection

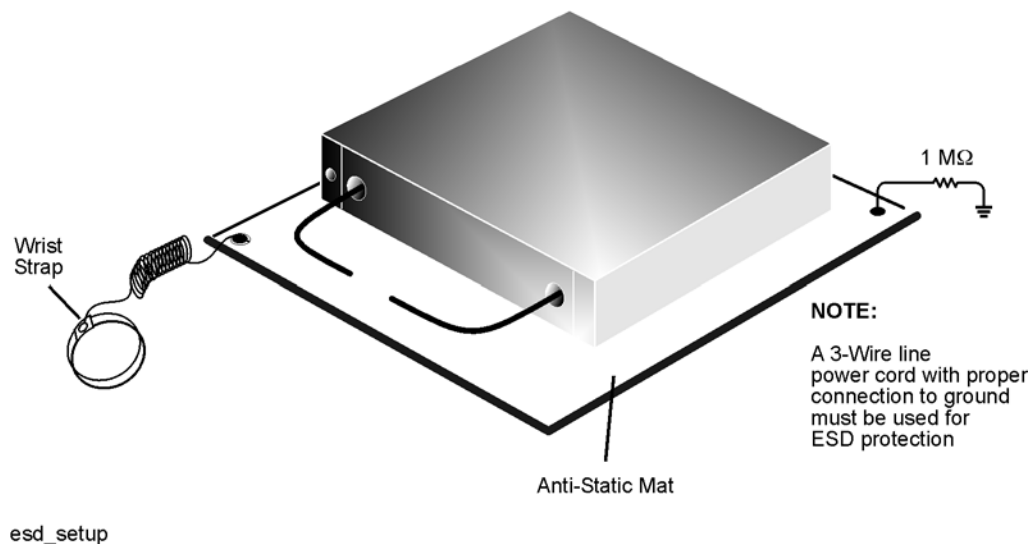
Protection against electrostatic discharge (ESD) is essential while removing or connecting cables or assemblies within the network analyzer.

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* wear a grounded wrist strap having a 1 M $\Omega$  resistor in series with it when handling components and assemblies.
- *always* use a grounded, conductive table mat while working on the instrument.
- *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.

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 7 for part numbers.

**Figure 1    ESD Protection Setup**



## **Overview of the Installation Procedure**

Step 1. Remove the Outer Cover.

Step 2. Replace (if necessary) Cables W20 and W21.

Step 3. Remove the Front Panel Assembly.

Step 4. Raise the Receiver Deck.

Step 5. Remove the Existing Cables.

Step 6. Install the Attenuators and New Cables.

Step 7. Lower and Fasten the Receiver Deck.

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

Step 9. Reinstall the Outer Cover.

Step 10. Enable Option 016.

Step 11. Perform Post-Upgrade Adjustments and Calibration.

## 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-inch torque wrench (set to 10 in-lbs)	1	N/A
5/16-inch torque wrench (set to 21 in-lbs) (Option 014 only)	1	N/A
ESD grounding wrist strap	1	9300-1367
5-ft grounding cord for wrist strap	1	9300-0980
2 x 4 ft conductive table mat and 15-ft grounding wire	1	9300-0797
ESD heel strap (for use with conductive floors)	1	9300-1308

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**CAUTION** Use a 5/16-inch torque wrench set to 10 in-lbs on all cable connections except the front-panel connectors to which the front-panel jumpers attach (Option 014).  
Use a 5/16-inch torque wrench set to 21 in-lbs for these connections.

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## Test Equipment Required for Post-Upgrade Adjustments

Description	Agilent Part Number
Power meter	E4418B/E4419B
Power sensor, Type-N (100 kHz–4.2 GHz)	8482A
Power sensor, 2.4 mm (4.2 GHz–50 GHz)	8487A
Power sensor, V-Band (50 GHz–67 GHz) <sup>a</sup>	V8486A
Adapter, WR-15 to 1.85 mm (m) <sup>a</sup>	V281B
Adapter, 1.85 mm (f) to 1.85 mm (f) <sup>b</sup>	85058-60114
Adapter, 2.4 mm (f) to 2.4 mm (f) <sup>b</sup>	11900B
Adapter, Type-N (f) to 2.4 mm (f)	11903B
Test cable, 2.4 mm (f) to 2.4 mm (f) <sup>b</sup> or	85133C
Test cable, 1.85 mm (f) to 1.85 mm (f) <sup>b</sup>	N4697E

- This sensor and adapter must be calibrated together by the Agilent factory. The data supplied are only valid as long as the sensor and adapter remain connected.
- The 1.85 mm connector has the same ruggedness and is compatible with the 2.4 mm connector. 1.85 mm and 2.4 mm connectors and adapters may be used interchangeably.

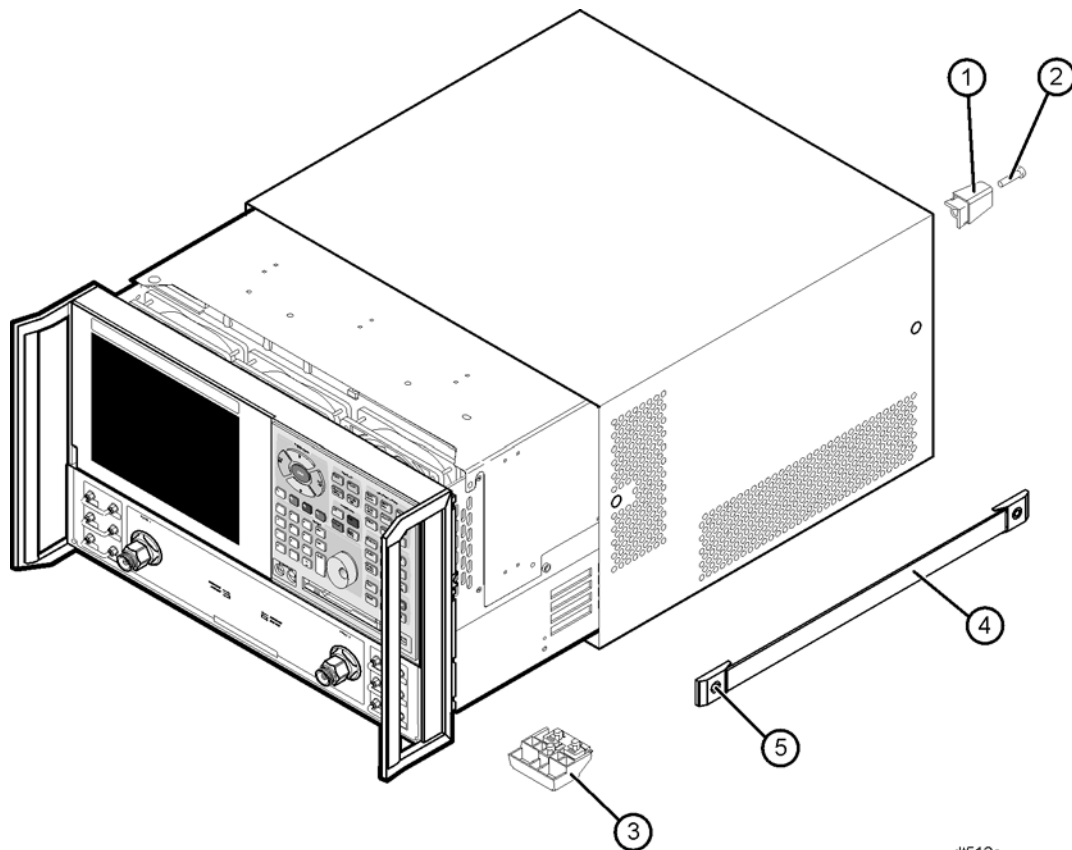
## Step 1. Remove the Outer Cover

**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](#).

1. Disconnect the power cord (if it has not already been disconnected).
2. With a T-20 TORX driver, remove the four rear panel feet (item ①) by removing the center screws (item ②).
3. Slide the four bottom feet (item ③) off the cover.
4. With a T-20 TORX driver, remove the strap handles (item ④) by loosening the screws (item ⑤) on both ends until the handle is free of the analyzer.
5. Slide the cover off of the frame.

**Figure 2 Outer Cover Removal**



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**NOTE** The figure above shows the E8361A front panel and floppy disk drive. The E8361C front panel has a slightly different appearance and does not include a floppy disk drive.

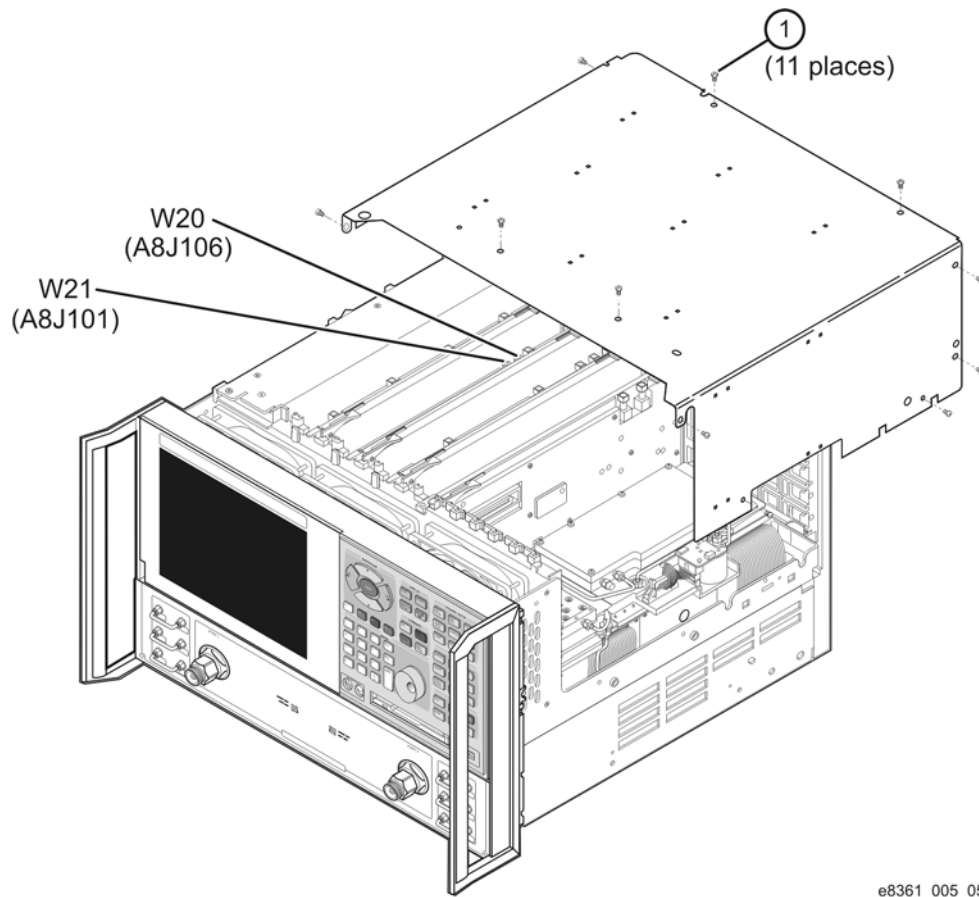


## Step 2. Replace (if necessary) Cables W20 and W21

Refer to [Figure 3](#) and [Figure 4](#).

1. Place the analyzer top-side up.
2. With a T-10 TORX driver, remove the 11 screws (item ①) used to attach the inner cover and lift off the inner cover.
3. Examine the part number labels on cables W20 (connected to A8J106) and W21 (connected to A8J101).
  - If the part numbers are E8361-20045 and E8361-20046 respectively, then they do not need to be replaced. Proceed to step 5 on the next page.
  - If the part numbers ARE NOT E8361-20045 and E8361-20046 respectively, they need to be replaced. Continue at step 4 on the next page.

**Figure 3 Inner Cover Removal to Verify W20 and W21 Part Numbers**



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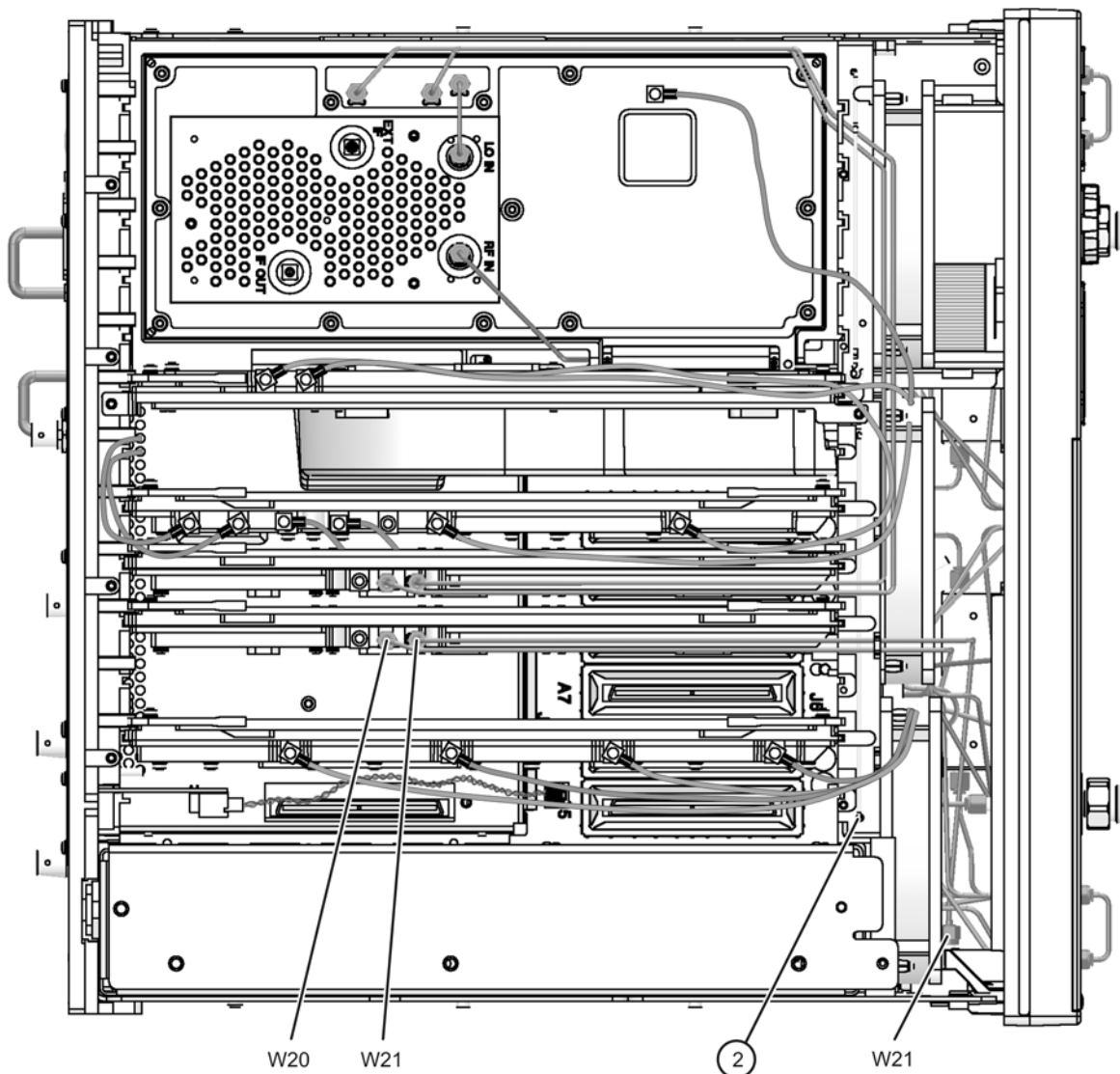
**NOTE** The figure above shows the E8361A front panel and floppy disk drive. The E8361C front panel has a slightly different appearance and does not include a floppy disk drive.

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4. To replace cables W20 and W21:

- a. Place the analyzer on its side as shown in [Figure 4](#).
- b. Remove the cable hold-down wire (item ②).
- c. Disconnect cables W20 and W21 at both ends; two top side connections and two bottom side connections. Remove the cables from the analyzer.
- d. Position the new cables in the analyzer and connect them as follows: W20–A8J106 to A17J2; W21–A8J101 to A17J3. Tighten the connectors to 10 in-lbs.
- e. Reinstall the cable hold-down wire (item ②).

**Figure 4 Replacing Cables W20 and W21**



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5. Replace the inner cover by reinstalling the 11 attachment screws (item ①).

### Step 3. Remove the Front Panel Assembly

Refer to [Figure 5](#).

1. With a 5/16-inch wrench, remove the six front panel semirigid jumper cables (item ①).
2. With a T-10 TORX driver, remove the eight screws (item ②) from the sides of the frame.

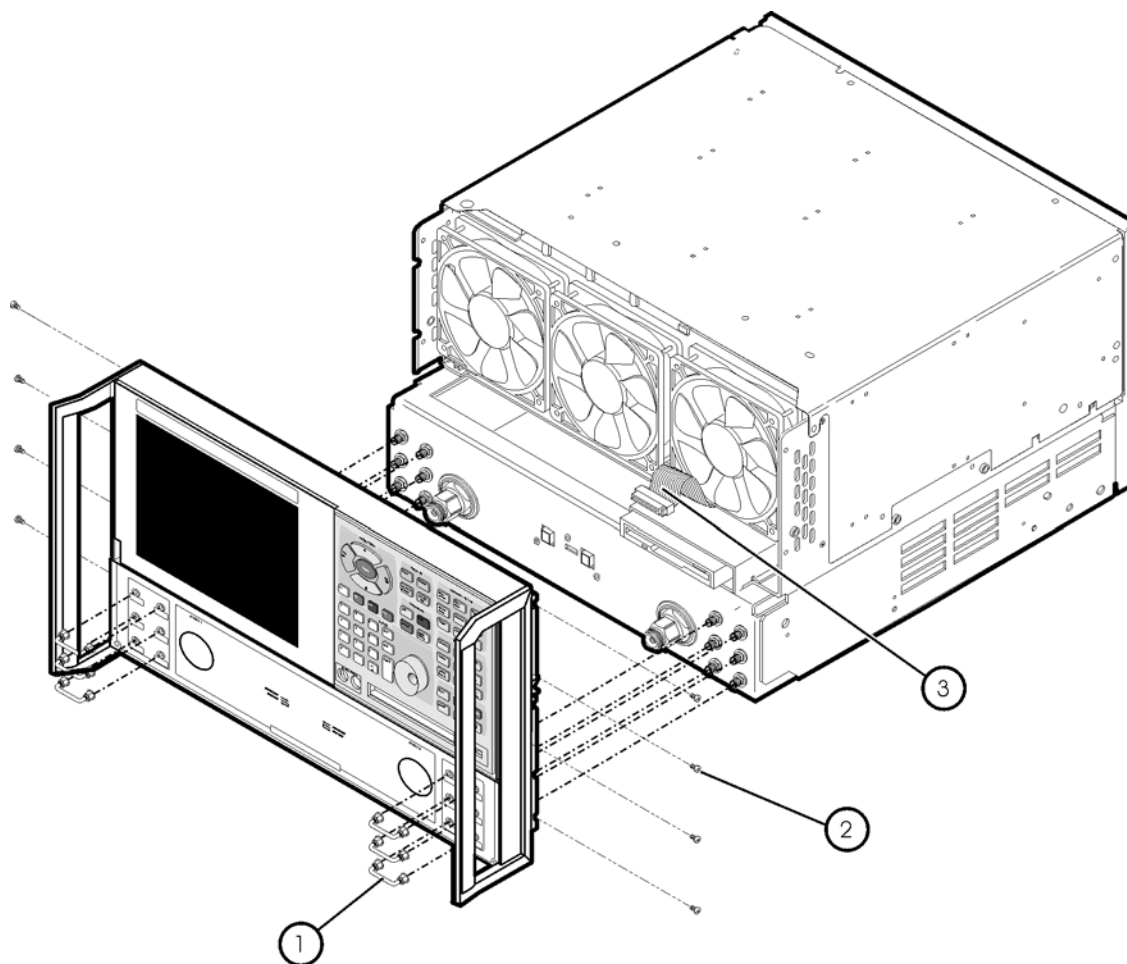
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**CAUTION** Before removing the front panel from the analyzer, lift and support the front of the analyzer chassis.

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3. Slide the front panel over the test port connectors.
4. Disconnect the front panel interface ribbon cable (item ③) from the A3 front panel interface board. The front panel is now free from the analyzer.

**Figure 5 Front Panel Assembly Removal**



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**NOTE** The figure above shows the E8361A front panel and floppy disk drive. The E8361C front panel has a slightly different appearance and does not include a floppy disk drive.

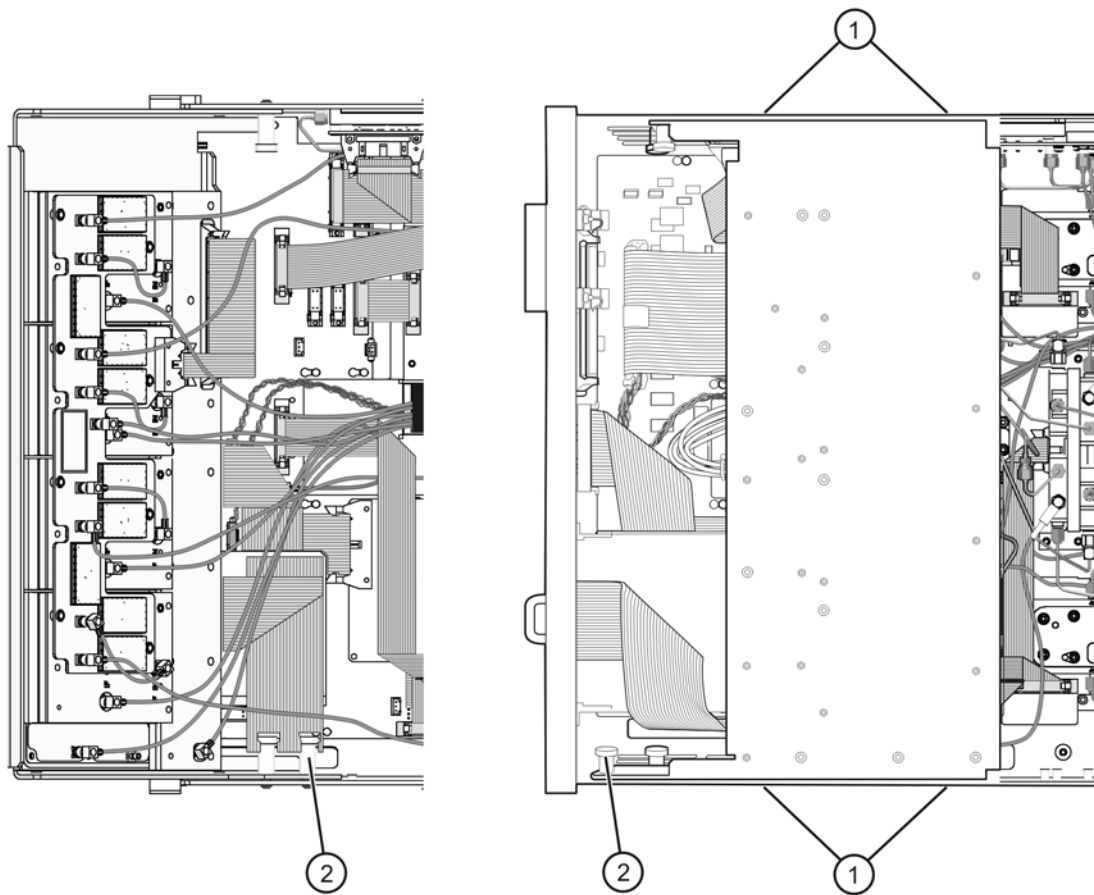
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## Step 4. Raise the Receiver Deck

Refer to [Figure 6](#).

1. Place the analyzer bottom-side up on a flat surface.
2. With a T-10 TORX driver, remove the four screws (item ①) that secure the receiver deck.
3. Pull the latch pin (item ②) towards the opposite side of the analyzer to release the receiver deck.
4. Lift the receiver deck to partially raise it, then release the latch pin (item ②). Lift the receiver deck to its fully raised position and ensure that the latch pin latches in the raised position.

**Figure 6 Receiver Deck Raising**



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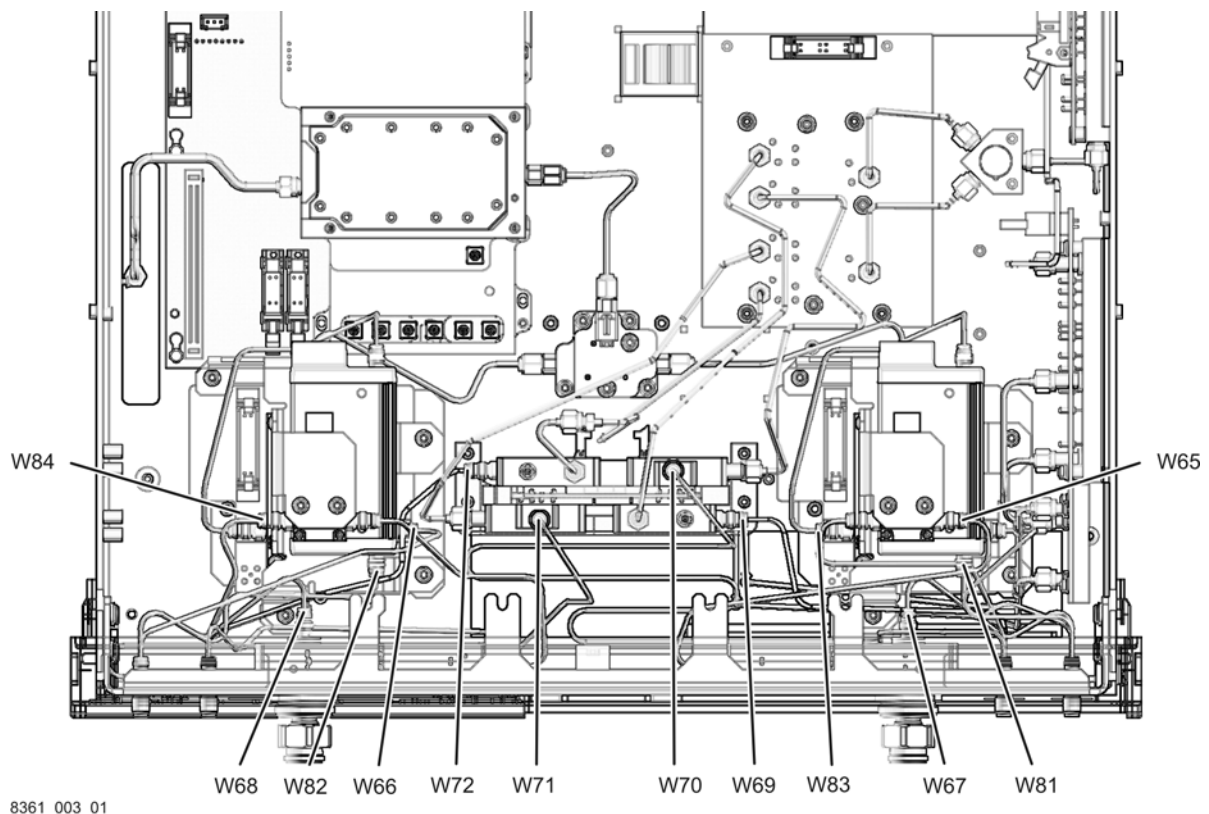
## Step 5. Remove the Existing Cables

Refer to [Figure 7](#).

Remove the following cables but do not discard them; some of them will be reinstalled later.

- W71 E8361-20020 REFERENCE 2 RCVR R2 IN to A29 channel R2 mixer
- W66 E8361-20016 A24 SOMA 70 to REFERENCE 2 SOURCE OUT
- W84 E8361-20028 PORT 2 CPLR THRU to A39 bias tee
- W82 E8361-20026 A37 step attenuator to PORT 2 SOURCE OUT
- W68 E8361-20018 A26 test port 2 coupler to PORT 2 CPLR ARM
- W72 E8361-20048 PORT 2 RCVR B IN to A30 channel B mixer
- W65 E8361-20015 A23 SOMA 70 to REFERENCE 1 SOURCE OUT
- W70 E8361-20049 REFERENCE 1 RCVR R1 IN to A28 channel R1 mixer
- W81 E8361-20035 A36 step attenuator to PORT 1 SOURCE OUT
- W83 E8361-20034 PORT 1 CPLR THRU to A38 bias tee
- W67 E8361-20018 A25 test port 1 coupler to PORT 1 CPLR ARM
- W69 E8361-20047 PORT 1 RCVR A IN to A27 channel A mixer

**Figure 7 Existing Cables Removal**



## Step 6. Install the Attenuators and New Cables

Refer to [Figure 8](#). The new parts referenced in this step are listed in [Table 1 on page 4](#).

1. Attach one step attenuator to each bracket, using two M3.0 x 8 screws for each.

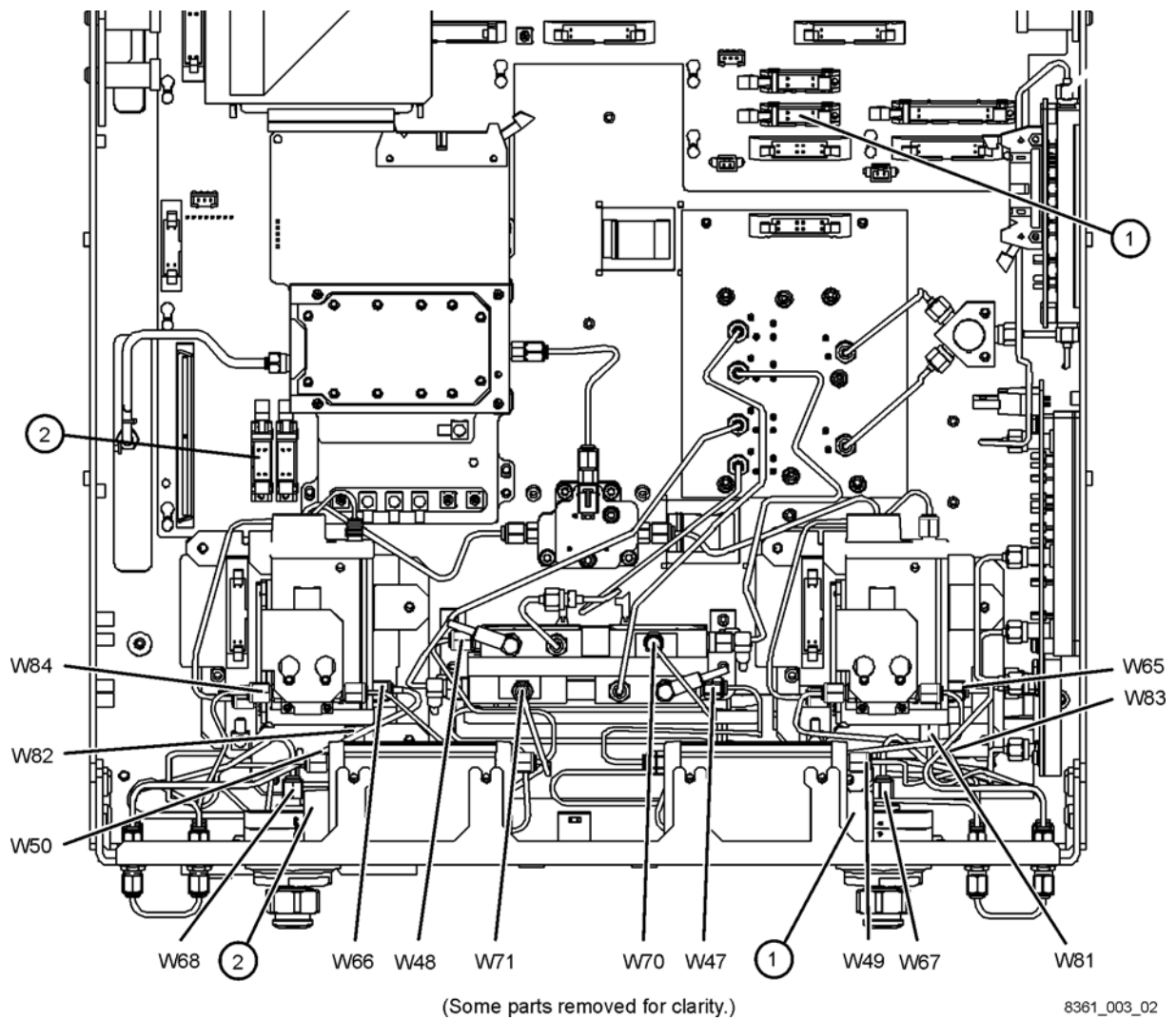
Be careful to position the step attenuators so that the necessary cables can be attached. The end of the step attenuator with the ribbon cable connector must face toward the outside of the analyzer.

2. Install the following cables in the order listed. Some of these cables are new and provided in the kit and some of them were removed in a previous step.

- Ribbon cable ① 8121-0819 A43 ch A attenuator to A16 motherboard (P1 RCVR ATT)
- Ribbon cable ② 8121-0819 A44 ch B attenuator to A16 motherboard (P2 RCVR ATT)
- W71 E8361-20020 REFERENCE 2 RCVR R2 IN to A29 channel R2 mixer
- W68 E8361-20018 A26 test port 2 coupler to PORT 2 CPLR ARM
- W50 E8361-20029 PORT 2 RCVR B IN to A44 channel B step attenuator
- W82 E8361-20026 A37 step attenuator to PORT 2 SOURCE OUT
- W84 E8361-20028 PORT 2 CPLR THRU to A39 bias tee
- W66 E8361-20016 A24 SOMA 70 to REFERENCE 2 SOURCE OUT
- W70 E8361-20049 REFERENCE 1 RCVR R1 IN to A28 channel R1 mixer
- W49 E8361-20032 PORT 1 RCVR A IN to A43 channel A step attenuator
- W67 E8361-20018 A25 test port 1 coupler to PORT 1 CPLR ARM
- W83 E8361-20034 PORT 1 CPLR THRU to A38 bias tee
- W81 E8361-20035 A36 step attenuator to PORT 1 SOURCE OUT
- W65 E8361-20015 A23 SOMA 70 to REFERENCE 1 SOURCE OUT
- W47 E8361-20064 A43 channel A step attenuator to A27 channel A mixer
- W48 E8361-20025 A44 channel B step attenuator to A30 channel B mixer



**Figure 8 Attenuators and New Cables Installation**

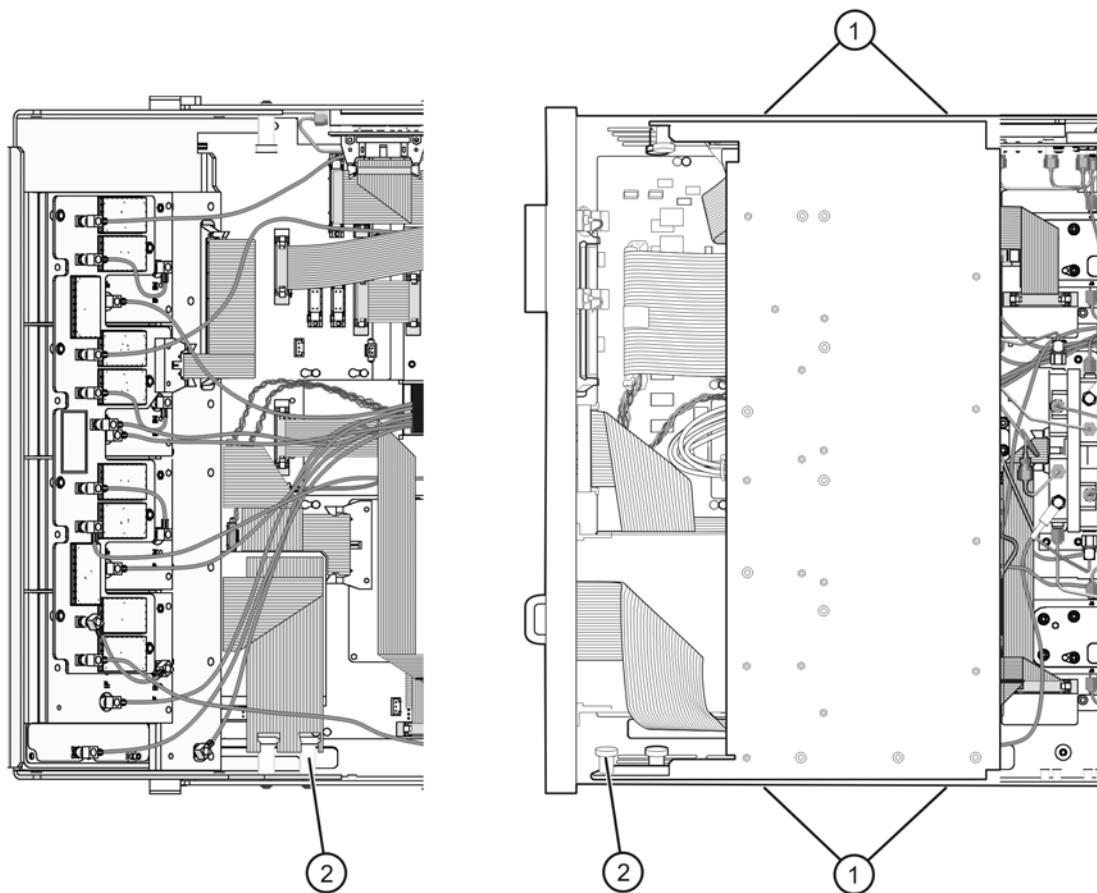


## Step 7. Lower and Fasten the Receiver Deck

Refer to [Figure 9](#).

1. Pull the latch pin (item ②) toward the center of the analyzer to release the receiver deck.
2. Lift the receiver deck to partially lower it, then release the latch pin (item ②). Lower the receiver deck to its fully lowered position and ensure that the latch pin latches in the lowered position.
3. With a T-10 TORX driver, install the four screws (item ①) to secure the receiver deck.

**Figure 9 Receiver Deck, Lowering**



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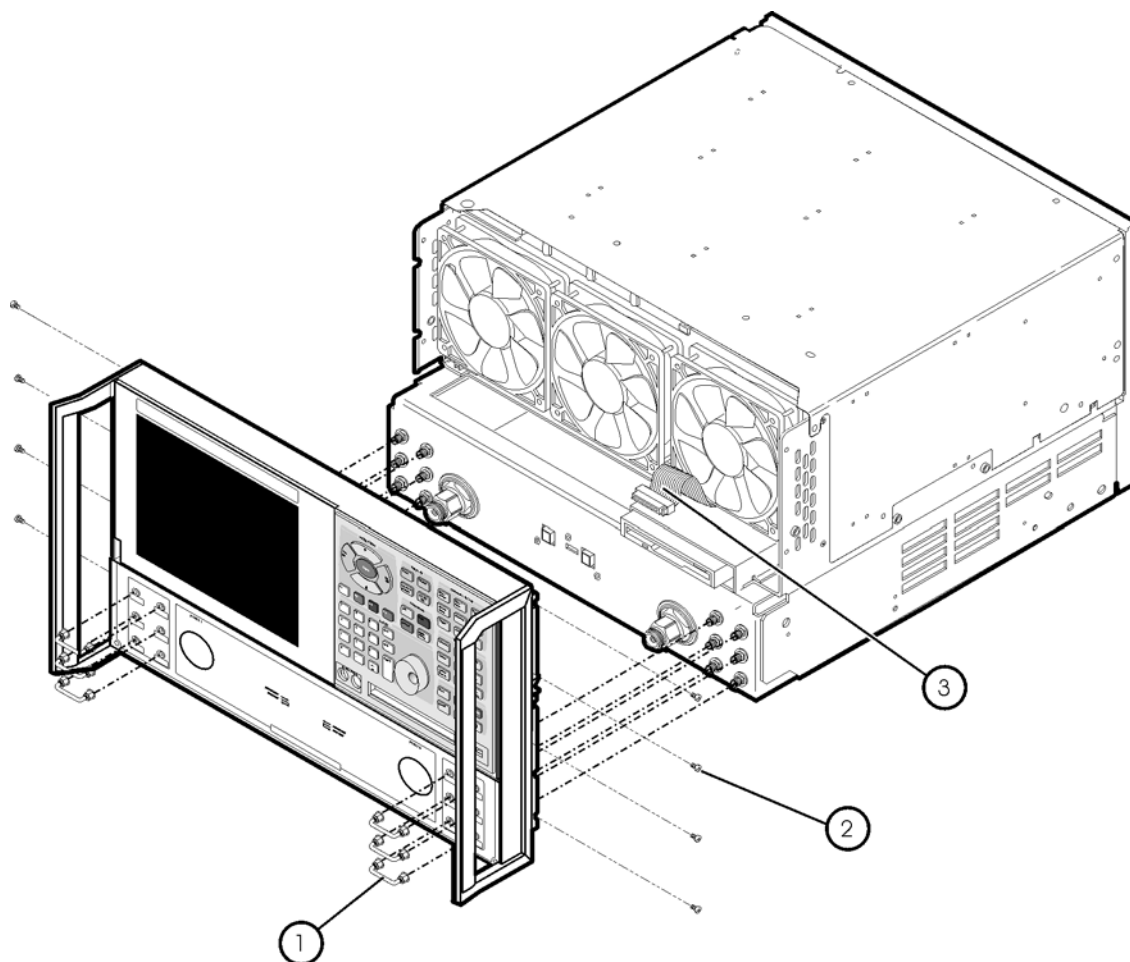


## Step 8. Reinstall the Front Panel Assembly and Front Panel Jumpers

Refer to [Figure 10](#).

1. Lift and support the front of the analyzer chassis.
2. Tighten all 12 of the front-panel feed-through connectors using a 5/16-inch torque wrench set to 21-in lbs.
3. Reconnect the ribbon cable (item ③) to the A3 front panel interface board.
4. Slide the front panel over the test port connectors being careful to align the power switch and floppy disk drive to their corresponding front panel cutouts. Ensure that the ribbon cable ③ is located below the fan to prevent it from being damaged by the fan blades.
5. With a T-10 TORX driver, install the eight screws (item ②) in the sides of the frame.
6. Install the six semirigid jumpers (item ①) on the front panel and tighten to 10-in lbs.

**Figure 10 Front Panel Assembly Reinstallation**



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<b>NOTE</b>	The previous figure shows the E8361A front panel and floppy disk drive. The E8361C front panel has a slightly different appearance and does not include a floppy disk drive.
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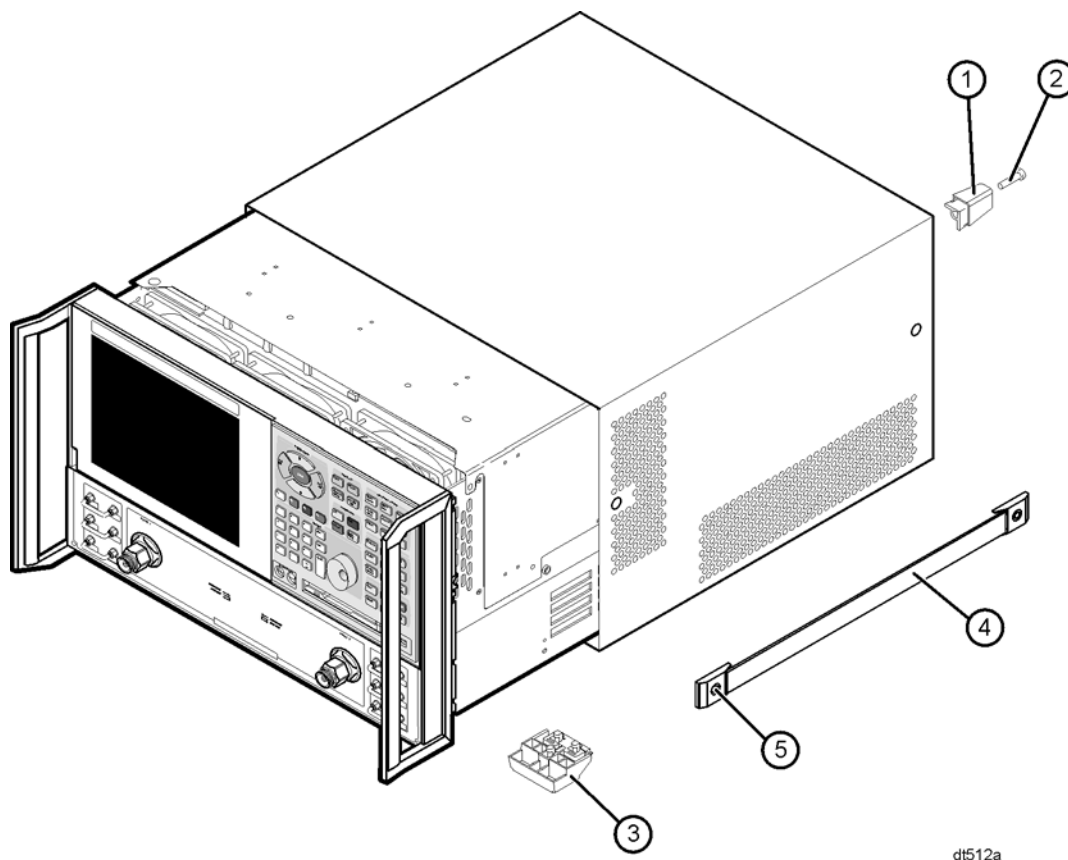
## Step 9. Reinstall the Outer Cover

**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 11](#).

1. Slide the cover over the analyzer frame.
2. With a T-20 TORX driver, install the four rear panel feet (item ①) by installing the center screws (item ②).
3. Slide the four bottom feet (item ③) into position on the cover.
4. With a T-20 TORX driver, install the strap handles (item ④) by installing the screws (item ⑤) on both ends of the handle.

**Figure 11 Outer Cover Reinstallation**



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**NOTE** The figure above shows the E8361A front panel and floppy disk drive. The E8361C front panel has a slightly different appearance and does not include a floppy disk drive.

## Step 10. Enable Option 016

### Procedure Requirements

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

### Enable Option 016

1. On the analyzer's **System** menu, point to **Service**, and then click **Option Enable**.
2. In the **Select Desired Option** list, click **016 - Receiver Attenuators**.
3. Click **Enable**.
4. Click **Yes** in answer to the displayed question in the **Restart Analyzer?** box.
5. When the installation is complete, click **Exit**.

### Verify that Option 016 is Enabled

1. On the analyzer's **Help** menu, click **About Network Analyzer**.
2. Verify that "016" is listed after "Options:" in the display.
3. Click OK.

If Option 016 has not been enabled, perform this step again. If the option is still not enabled, contact Agilent Technologies. Refer to ["Contacting Agilent" on page 3](#).

## Step 11. Perform Post-Upgrade Adjustments and Calibration

### Adjustments

The following adjustments must be made due to the change in the full frequency range of the analyzer.

- source calibration
- phase lock IF gain
- receiver calibration

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 can be found at [“Test Equipment Required for Post-Upgrade Adjustments” on page 7](#).

### Calibration

The analyzer should now operate and phase lock over its entire frequency range.

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

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