Installation Note

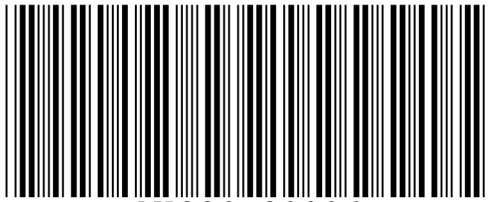
Configurable Test Set Upgrade Kit

Upgrade Kit Number: N5230-60104

For N5230A Standard Test Set, 20 GHz, 4-Port PNA-L

Agilent Technologies

Agilent Part Number: N5230-90006
Printed in USA January 2005
Supersedes all previous printings.



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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.

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Description of the Upgrade

This upgrade converts your standard test set analyzer to a configurable test set analyzer by adding Option 014, Configurable Test Set and Option 1E1, Source Attenuators.

Option 014, Configurable Test Set adds the additional cabling necessary to allow your analyzer to perform measurements on high power devices and on devices with high dynamic range.

Option 1E1, Source Attenuators adds a 60-dB step attenuator in the signal path of the measurement ports. This attenuator is used to adjust the power level (in 10 dB steps) to the device under test (DUT) without changing the power in the reference path.

About Installing the Upgrade

Products affected	N5230A; standard test set, 20 GHz, 4-port
Installation to be performed by	Agilent service center or personnel qualified by Agilent
Estimated installation time	2.0 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 N5230-60104

Ref Desig.	Description	Qty	Part Number
	Installation note (this document)	1	N5230-90006
A25	0–60 dB step attenuator	1	33321-60065
	Machine screw, M3 x 10, pan head (to attach attenuator to side frame)	2	0515-0374
	Ribbon cable, A25 step attenuator to A16 test set motherboard P510	1	8121-0819
	Cable tie (to secure cable W57 to the side frame)	4	1400-0249
	Lower front panel overlay (for configurable test set)	1	N5230-80007
W40	RF cable, A19 MASSQuad to PORT 1 SOURCE OUT	1	N5230-20064
W41	RF cable, A19 MASSQuad to PORT 2 SOURCE OUT	1	N5230-20067
W42	RF cable, A19 MASSQuad to PORT 3 SOURCE OUT	1	N5230-20069
W43	RF cable, A19 MASSQuad to PORT 4 SOURCE OUT	1	N5230-20071
W44	RF cable, PORT 1 CPLR THRU to A21 test port 1 coupler	4	N5230-20063
W45	RF cable, PORT 2 CPLR THRU to A22 test port 2 coupler		
W46	RF cable, PORT 3 CPLR THRU to A23 test port 3 coupler		
W47	RF cable, PORT 4 CPLR THRU to A24 test port 4 coupler		
W48	RF cable, A19 MASSQuad to REFERENCE SOURCE OUT	1	N5230-20075
W49	RF cable, A21 test port 1 coupler arm to PORT 1 CPLR ARM	4	N5230-20065
W50	RF cable, A22 test port 2 coupler arm to PORT 2 CPLR ARM		
W51	RF cable, A23 test port 3 coupler arm to PORT 3 CPLR ARM		
W52	RF cable, A24 test port 4 coupler arm to PORT 4 CPLR ARM		
W53	RF cable, PORT 1 RCVR A IN to A20 mixer brick (A)	1	N5230-20066
W54	RF cable, PORT 2 RCVR B IN to A20 mixer brick (B)	1	N5230-20068
W55	RF cable, PORT 3 RCVR C IN to A20 mixer brick (C)	1	N5230-20070
W56	RF cable, PORT 4 RCVR D IN to A20 mixer brick (D)	1	N5230-20072
W57	RF cable, REFERENCE RCVR IN to A20 mixer brick (R)	1	N5230-20076
W58	RF cable, A19 MASSQuad to A25 step attenuator input	1	N5230-20073
W59	RF cable, A25 step attenuator output to A19 MASSQuad	1	N5230-20074
W60	Front-panel jumper	9	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

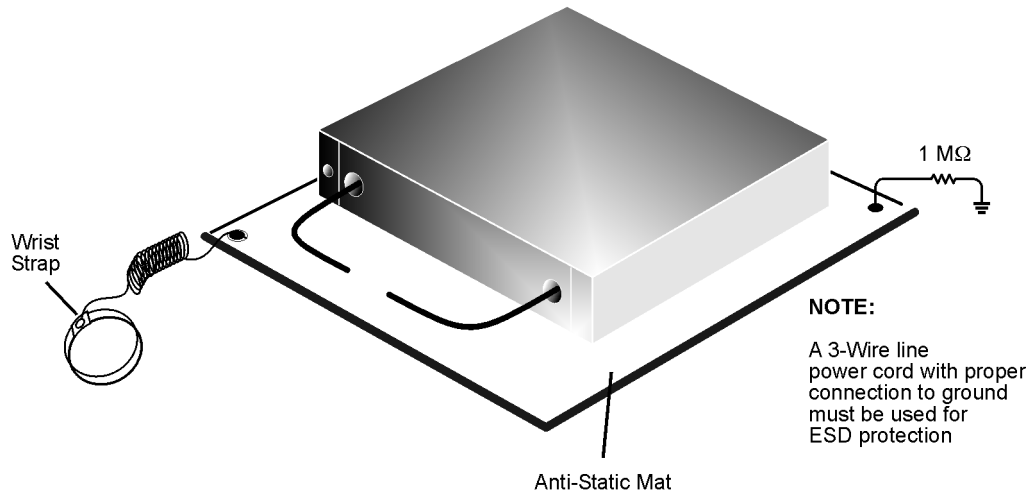
Protection against electrostatic discharge (ESD) is essential while removing or connecting cables or assemblies within the network analyzer.

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 MΩ 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 7 for part numbers.

Figure 1 ESD Protection Setup



esd_setup

Overview of the Installation Procedure

Step 1. Remove the Outer Cover.

Step 2. Remove the Front Panel Assembly.

Step 3. Remove the Existing Cables.

Step 4. Install the Step Attenuator.

Step 5. Install the New Cables.

Step 6. Replace the Lower Front Panel Overlay.

Step 7. Reinstall the Front Panel Assembly and Install the Front Panel Jumpers.

Step 8. Reinstall the Outer Cover.

Step 9. Enable Options 014 and 1E1.

Step 10. 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-in torque wrench (set to 10 in-lbs)	1	N/A
5/16-in torque wrench (set to 21 in-lbs)	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

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.

Equipment Required for Post-Upgrade Adjustments

Equipment Type	Model or Part Number	Alternate Model or Part Number
Power meter	E4418B/E4419B	E4418A/E4419A
Power sensor, 3.5 mm	E4413A	8485A
Adapter, 3.5 mm (f) to 3.5 mm (f)	83059B	85052-60012
RF cable, 3.5 mm (f) to 3.5 mm (f)	85131C	85131E

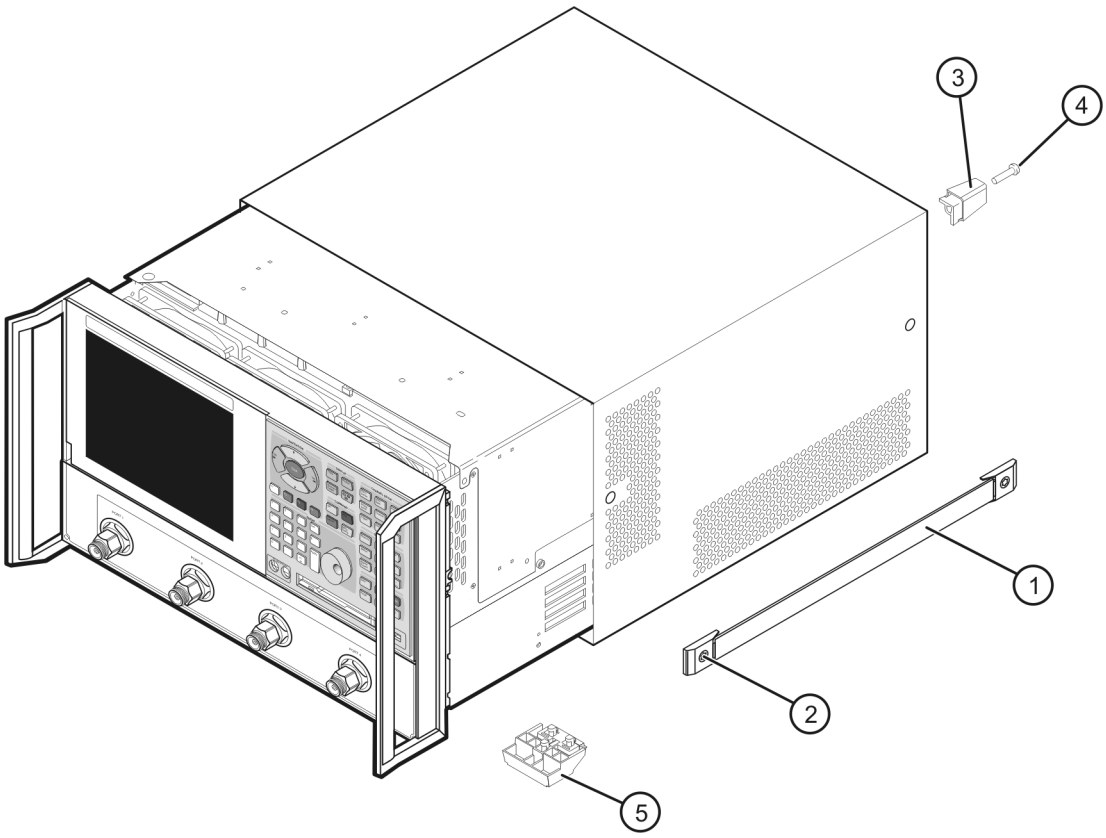
Step 1. Remove the Outer Cover

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 procedure.

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

Figure 2 Outer Cover Removal



Step 2. Remove the Front Panel Assembly

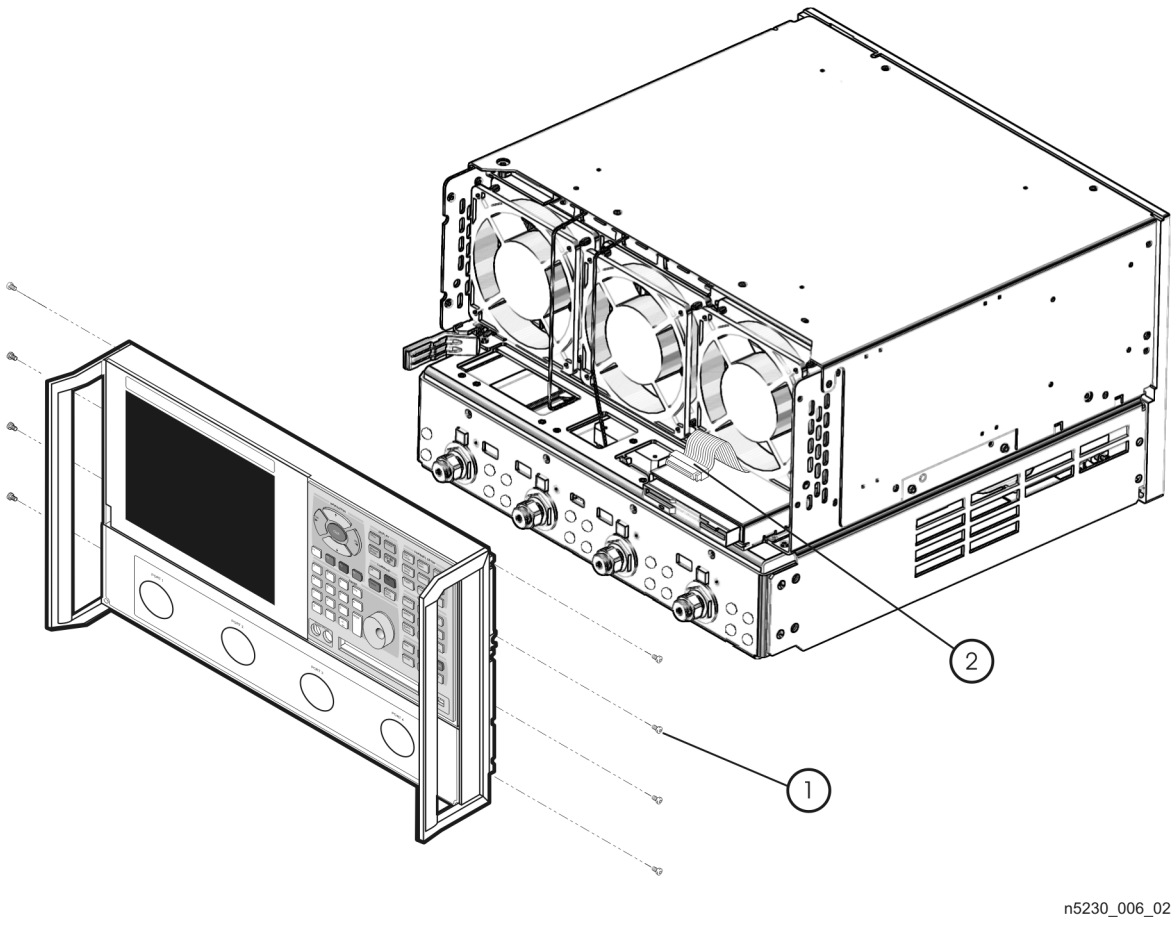
Refer to Figure 3 for this procedure.

1. With a T-10 TORX driver, remove the eight screws (item ①) from the sides of the frame.

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

2. Slide the front panel over the test port connectors.
3. Disconnect the front panel interface ribbon cable (item ②). The front panel is now free from the analyzer.

Figure 3 Front Panel Assembly Removal

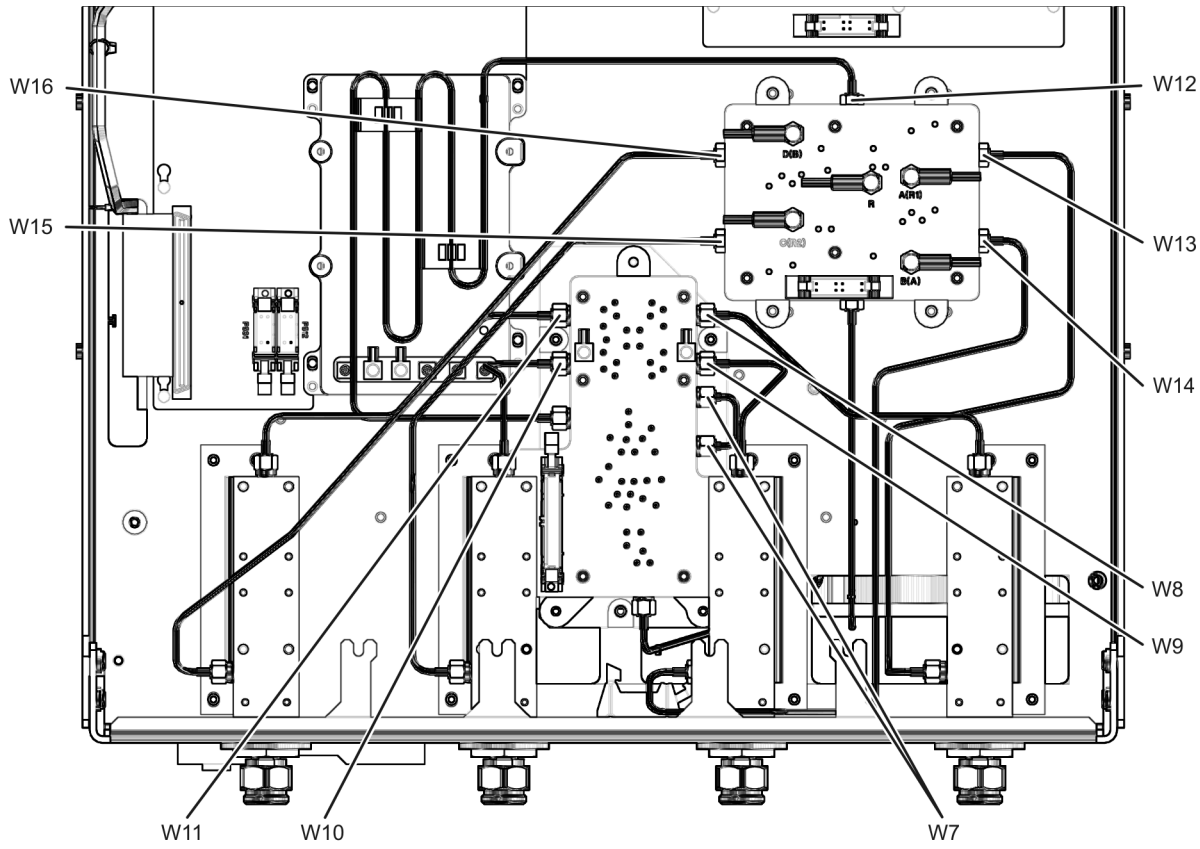


Step 3. Remove the Existing Cables

Refer to Figure 4 for this procedure.

1. Place the analyzer bottom-side up on a flat surface.
2. Remove the following cables in the order listed. It may be convenient to disconnect flexible cables and ribbon cables located in the area but, if you do so, be sure they are labeled for re-connection later.
   - W7 A19 MASSQuad to A19 MASSQuad jumper cable
   - W9 A19 MASSQuad to A22 test port 2 coupler
   - W14 A22 test port 2 coupler to A20 mixer brick (B)
   - W13 A21 test port 1 coupler to A20 mixer brick (A)
   - W8 A19 MASSQuad to A21 test port 1 coupler
   - W11 A19 MASSQuad to A24 test port 4 coupler
   - W10 A19 MASSQuad to A23 test port 3 coupler
   - W15 A23 test port 3 coupler to A20 mixer brick (C)
   - W16 A24 test port 4 coupler to A20 mixer brick (D)
   - W12 A19 MASSQuad to A20 mixer brick (R)

Figure 4 Old Cable Removal

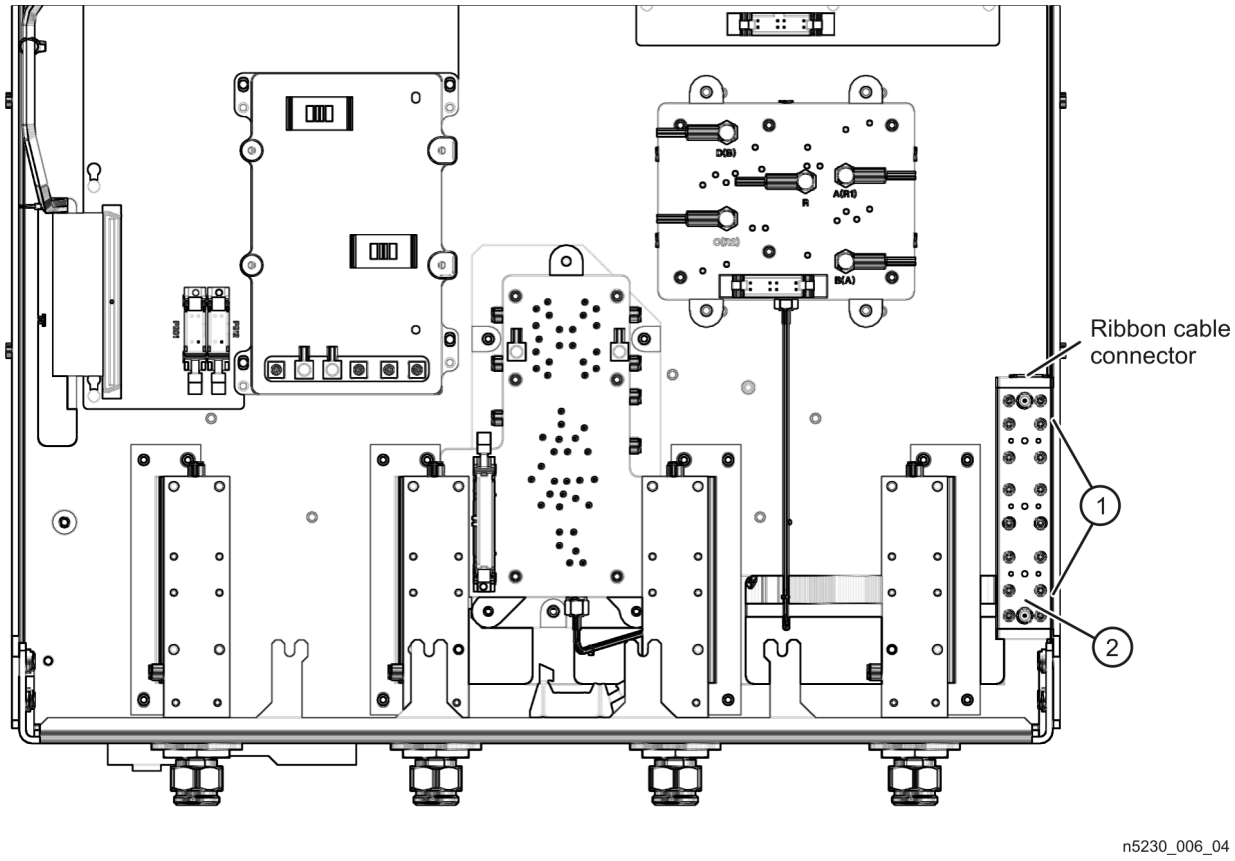


Step 4. Install the Step Attenuator

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

1. Orient the attenuator as shown with the ribbon cable connector toward the rear of the analyzer. Start two screws (item ①) in the side of the attenuator (item ②). Insert the screws only a few threads at this time.
2. Position the attenuator in the analyzer as shown and align the screws with the slotted holes in the side of the analyzer frame. Tighten the screws to secure the attenuator.

Figure 5 Step Attenuator Installation

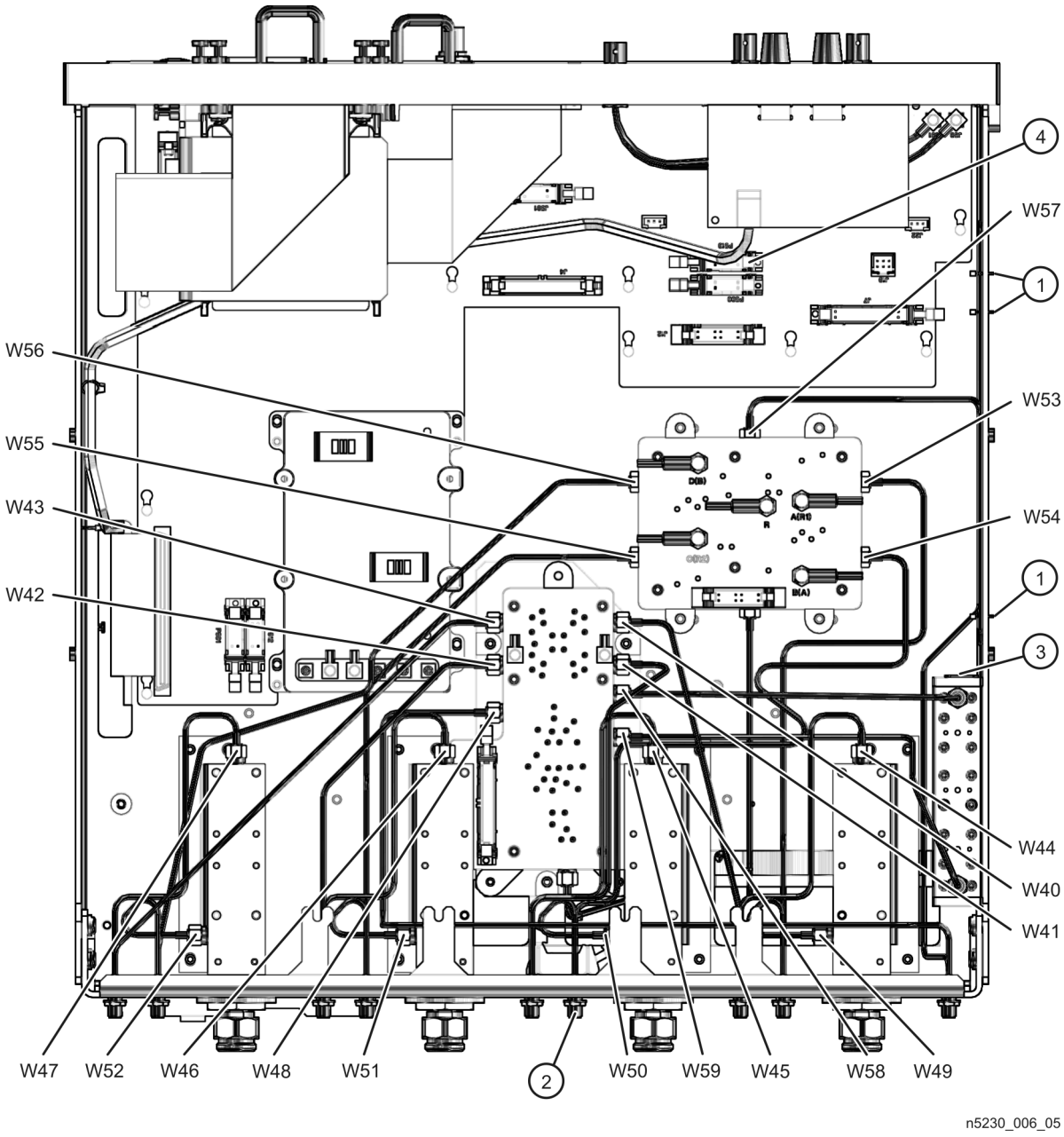


Step 5. Install the New Cables

Refer to Figure 6 for the following procedure. New parts are listed in Table 1 on page 5.

1. Install the following cables in the order listed. Use a 5/16-in torque wrench set to 10 in-lbs.
   - W56 PORT 4 RCVR D IN to A20 mixer brick (D)
   - W55 PORT 3 RCVR C IN to A20 mixer brick (C)
   - W53 PORT 1 RCVR A IN to A20 mixer brick (A)
   - W54 PORT 2 RCVR B IN to A20 mixer brick (B)
   - W57 REFERENCE RCVR IN to A20 mixer brick (R)
   - W58 A19 MASSQuad (ATTN) to A25 step attenuator
   - W59 A25 step attenuator to A19 MASSQuad (ATTN)
   - W44 PORT 1 CPLR THRU to A21 test port 1 coupler
   - W45 PORT 2 CPLR THRU to A22 test port 2 coupler
   - W46 PORT 3 CPLR THRU to A23 test port 3 coupler
   - W47 PORT 4 CPLR THRU to A24 test port 4 coupler
   - W49 A21 test port 1 coupler to PORT 1 CPLR ARM
   - W50 A22 test port 2 coupler to PORT 2 CPLR ARM
   - W51 A23 test port 3 coupler to PORT 3 CPLR ARM
   - W52 A24 test port 4 coupler to PORT 4 CPLR ARM
   - W43 A19 MASSQuad to PORT 4 SOURCE OUT
   - W42 A19 MASSQuad to PORT 3 SOURCE OUT
   - W41 A19 MASSQuad to PORT 2 SOURCE OUT
   - W40 A19 MASSQuad to PORT 1 SOURCE OUT
   - W48 A19 MASSQuad (R) to REFERENCE SOURCE OUT
2. Secure cable W57 to the analyzer side frame using cable ties (item ①) in the locations shown.
3. Install the lock washers and hex nuts on the 18 front panel connectors (item ②) and, using a 5/16-in torque wrench, torque the hex nuts to 21 in-lbs.
4. Connect a ribbon cable between the step attenuator (item ③) and the A16 test set motherboard connector (item ④) P510 (P1 SRC ATT).
5. Reconnect any flexible RF cables and ribbon cables that were previously disconnected to aid the removal of the old semi-rigid cables.

Figure 6 New Cable Installation

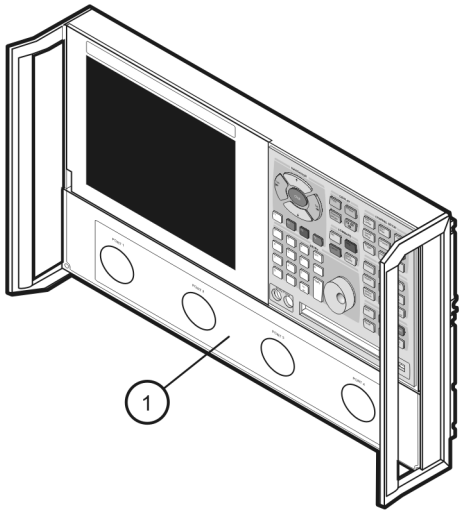


Step 6. Replace the Lower Front Panel Overlay

Refer to Figure 7 for this procedure. New parts are listed in Table 1 on page 5.

1. From the back side of the front panel, use a blunt object in one of the cutouts in the lower frame to push the overlay (item ①) and separate it from the front 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.
4. Remove the protective backing from the new front panel overlay (item ①).
5. Starting from either the left or right side, *loosely* place the overlay in the recess on the lower front panel, ensuring that it fits tightly against the edges of the recess.
6. Once the overlay is in place, press it firmly onto the frame to secure it.

Figure 7 Lower Front Panel Overlay Replacement



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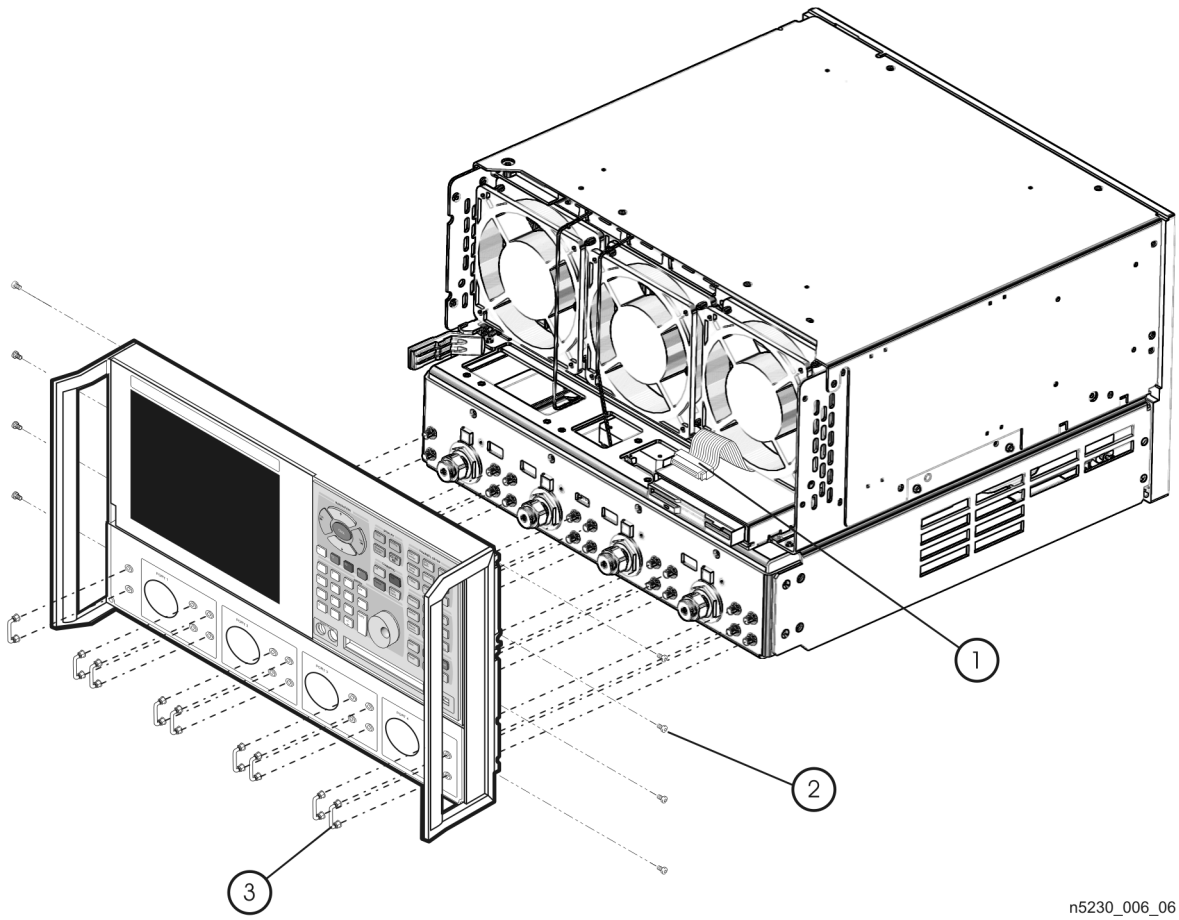
Step 7. Reinstall the Front Panel Assembly and Install the Front Panel Jumpers

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 procedure. New parts are listed in Table 1 on page 5.

1. Make sure all 18 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 ①) to the A3 front panel interface board.
3. 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 (item ①) is located below the fan to prevent it from being damaged by the fan blades.
4. With a T-10 TORX driver, install the eight screws (item ②) in the sides of the frame.
5. Install the nine semirigid jumpers (item ③) on the front panel, and tighten to 10-in lbs.

Figure 8 Front Panel Assembly Reinstallation



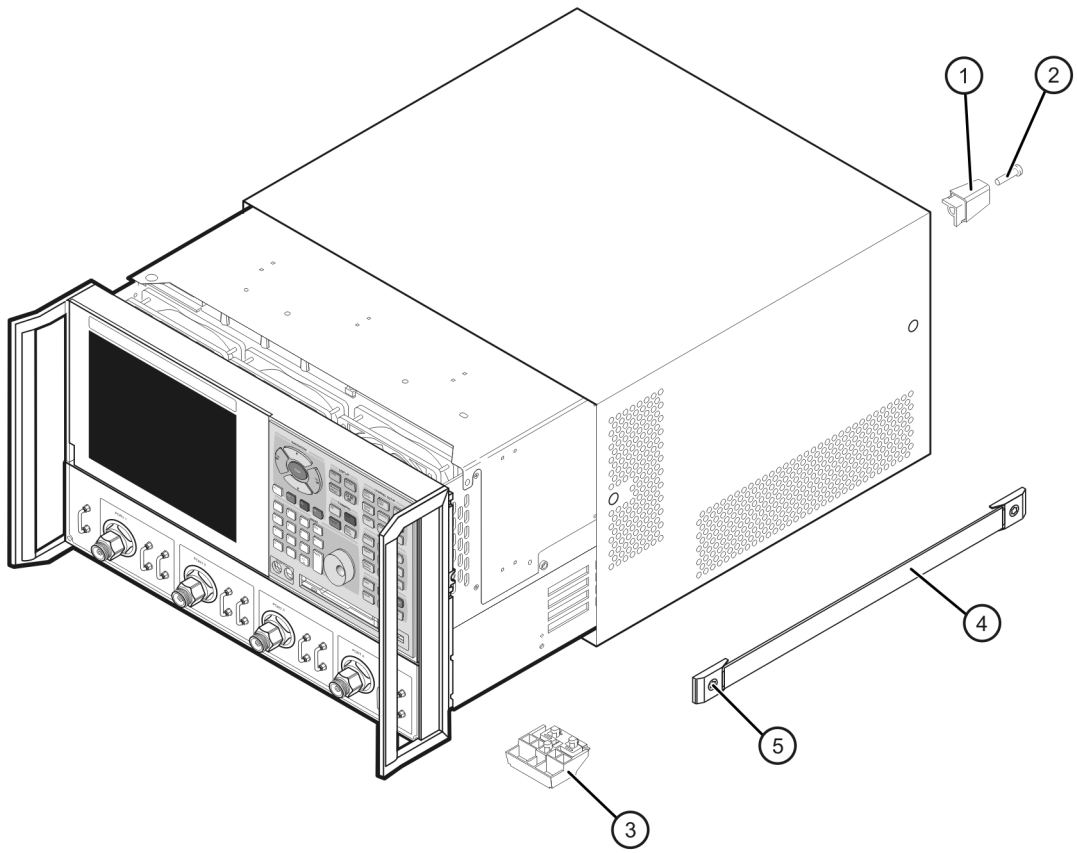
Step 8. Reinstall the Outer Cover

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 procedure.

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 handles.

Figure 9 Outer Cover Reinstallation



Step 9. Enable Options 014 and 1E1

Procedure Requirements

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

Option Enable Procedure

1. On the analyzer's **System** menu, point to **Service**, and then click **Option Enable**.
2. In the **Select Desired Option** list, click **014 - Configurable Test Set**. Click **Enable**.
3. In the **Select Desired Option** list, click **1E1 - Source Attenuators**. 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 "014" and "1E1" are listed after "Options:" in the display. Click **OK**.

NOTE If Options 014 and 1E1 have not been enabled, perform the "Option Enable Procedure" again. If the options are still not enabled, contact Agilent Technologies. Refer to "Getting Assistance from Agilent" on page 3.

Step 10. Perform Post-Upgrade Adjustments and Calibration

Adjustments

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

- source calibration
- 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 "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 "Getting Assistance from 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 N2721A performance test software.
- Refer to the analyzer's service guide for information on the performance test software.