

# Keysight Technologies N9010B EXA Signal Analyzer N9020B MXA Signal Analyzer

Option HL3, 2nd IF Output (CR3) and  
Arbitrary IF Output (CRP) Upgrade Kit

# Notices

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N9010-90066

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## Option HL3, 2nd IF Output (CR3) and Arbitrary IF Output (CRP) Upgrade Kit

Products Affected:	N9010B, EXA Signal Analyzer N9020B, MXA Signal Analyzer
Serial Numbers:	All
Options	CR3, CRP
To Be Performed By:	(X) Keysight Service Center (X) Personnel Qualified by Keysight <sup>a</sup> ( ) Customer
Estimated Installation Time:	2.0 Hours
Estimated Adjustment Time:	4.5 Hours
Estimated Verification Time:	3.5 Hours

- a. To ensure that these newly installed options are functioning properly, the procedure that follows includes the requirement of performing certain adjustments and performance verification tests. However, the completion of these tests does not guarantee that the instrument meets all advertised specifications.

Software and test equipment is required for making adjustments and for performance verification testing.

Information on how to obtain this software can be found at:

[www.keysight.com/find/calibrationsoftware](http://www.keysight.com/find/calibrationsoftware)

While Keysight does recommend that a full calibration be performed after the installation of this upgrade, the end user must ultimately determine whether they want this service or not. If a full calibration is required, arrangements regarding the level of calibration must be made between the end user and the calibration provider

### Introduction

This kit includes parts to upgrade any EXA or MXA signal analyzer, regardless of age, to add options CR3, 2nd IF Output, and CRP, Arbitrary IF Output. As a result, some parts included in this kit will not be needed for upgrading some analyzers (newer analyzers require fewer parts to be changed). Also, some parts might not be necessary if other certain options are already installed.

In addition to installing the hardware to support options CR3 and CRP, licenses for the following options will also be installed (the 'x' is either 1 for EXA or 2 for MXA):

- N90x0A-CR3, Connector Rear, 2nd IF Output
- N90x0A-CRP, Connector Rear, Arbitrary IF Output

The installation procedure begins with an “inventory” of the analyzer serial number, currently-installed options, installed hardware, and software version. This information will be used to determine which sub-procedures, if any, can be skipped.

## Contents

Quantity	Description	Keysight Part Number
1	A15 Front End Controller w/ IF MUX	N9020-60172
1	Opt HL3 Cable Kit with Wire Markers (includes cables W36, W37, and W39, listed below)	N9020-60170
1	Cable Assembly, Coaxial 530 mm LG (W37)	8121-1401 <sup>a</sup> with ends labeled '900' and '100'
1	Cable Assembly, Coaxial 240 mm LG (W36)	8121-1862 <sup>a</sup> with ends labeled '902' and '7'
1	Cable Assembly, Coaxial 525 mm LG (W39)	8121-2028 <sup>a</sup> with one end labeled '1100'
14	Screw M3 x 0.5 (6 mm long) Flathead	0515-1946
3	Cable Tie, Self-Locking, Nylon Gray	1400-0249
1	Entitlement Certificate	5964-5178
1	Entitlement Certificate Envelope	5967-7169
1	Installation Note	This note

a. This cable is included in the Opt HL3 Cable Kit with Wire Markers, p/n N9020-60170

## Introduction

### Tools Required

- T-10 TORX Driver
- T-20 TORX Driver
- 5/16-inch torque wrench
- 9/16-inch nut driver
- Scissors or knife
- Diagonal cutters
- Keysight Calibration and Adjustment Software, N7814A (revision E.16.00 or later)
- Test equipment and computer supported by the X- Series Performance Tests and Adjustment Software
- EXA or MXA Signal Analyzer Service Guide (as appropriate). This manual is available online at the following URL:  
[www.keysight.com/find/N9010B\\_service\\_guide](http://www.keysight.com/find/N9010B_service_guide)  
[www.keysight.com/find/N9020B\\_service\\_guide](http://www.keysight.com/find/N9020B_service_guide)
- Microsoft Windows based personal computer with internet access and USB port
- USB storage device with >2GB free memory

### Initial Instrument Functionality Check

Power on the instrument and allow the instrument to boot up. Run an alignment and display the measurement screen. (The instrument will probably display a spectrum analyzer screen and you will see the instrument sweeping.)

There should be no alignment failures. If there are failures, investigate and fix the problem before continuing.

#### **WARNING**

Before you disassemble the instrument, turn the power switch to Standby. After the instrument has completely shut down, unplug the instrument. Failure to unplug the instrument can result in personal injury.

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#### **CAUTION**

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation. Refer to the documentation that pertains to your instrument for information about static-safe workstations and ordering static-safe accessories.

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## Installation Procedure

### Analyzer Information

1. Connect a power cord to the analyzer and turn on the analyzer.
2. After the analyzer has completed turning on, press **System, Show System**. Make note of the following information from the Show System screen:  
 Product Number \_\_\_\_\_  
 Serial Number \_\_\_\_\_  
 Instrument S/W Revision \_\_\_\_\_
3. Check for the presence of the options listed below in the Show System screen (“x” is 1 for an EXA and 2 for an MXA). Put a check mark or “X” after each option listed below that appears in the Show System menu.  
 N90x0B-503 \_\_\_\_\_  
 N90x0B-CR3 \_\_\_\_\_  
 N90x0B-CRP \_\_\_\_\_  
 N90x0B-B40 \_\_\_\_\_  
 N90x0B-DP2 \_\_\_\_\_  
 N90x0B-MPB \_\_\_\_\_
4. On the analyzer, press **System, Show Hardware**. Note the Part #, Matl Rev, Rev, OF Rev, and Hw Id of the Front End Controller in the table below.

Assembly Name	Part #	Matl Rev	Rev	OF Rev	Hw Id
Front End Controller					

5. Refer to the data in [step 3](#) and [step 4](#) above. If the analyzer has N90x0B-B40, N90x0B-DP2, and/or N90x0B-MPB installed, verify that it also has a Front End Controller with a Hw Id of 75. If the Front End Controller has a Hw Id of 75, you do not need this upgrade kit, since the necessary hardware is already present. Refer instead to upgrade products N90x0BU-CR3 and N90x0BU-CRP.

6. Refer to the data in **step 3** and **step 4** above. If the analyzer has N90x0B-CR3 and/or N90x0B-CRP installed, verify that it also has a Front End Controller with Hw Id of 75. If the Front End Controller has a Hw Id of 75, you do not need this upgrade kit, since the necessary hardware is already present. Refer instead to upgrade products N90x0BU-CR3 and N90x0BU-CRP.
7. Refer to the data in **step 3** and **step 4** above. If the analyzer has N9010B-532 or N9010B-544 installed, verify that it also has a Front End Controller with Hw Id of 75. If the Front End Controller has a Hw ID of 75, you do not need this upgrade kit, since the necessary hardware is already present. Refer instead to upgrade products N9010BU-CR3 and N9010BU-CRP.
8. Refer to the data in **step 3** and **step 4** above. If the analyzer has N90x0B-CR3 and/or N90x0B-CRP installed, and the Front End Controller does not have a Hw Id of 75, proceed to the next step. Although the licenses for N90x0B-CR3 and/or N90x0B-CRP are installed, the necessary hardware has not been installed.

## Update Instrument Software

Go to the following website and determine whether or not the analyzer has the latest instrument software already installed:

[http://www.keysight.com/find/xseries\\_software](http://www.keysight.com/find/xseries_software)

If the analyzer does not have the latest instrument software already installed, download and install the latest version.



## Licensing the New Options

### Installation Procedure over USB

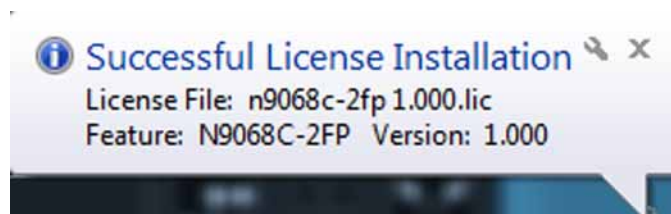
1. Locate the Option Upgrade Entitlement Certificate (5964-5178) from the kit.
2. Redeem the Option Upgrade Entitlement Certificate by following the instructions on the Certificate.
3. After redeeming your Option Upgrade Entitlement Certificate you will receive an email with an attached License File.
4. Locate a USB storage device. Perform a virus scan on this device before use.
5. Save the License File to the root directory of the USB Storage Device.
6. Connect the USB Storage Device to one of the analyzer's USB ports. Connect a mouse to another USB port. Windows will detect the new hardware and may display the configuration menu shown in **Figure 1**. This menu may be configured according to your preferences.

**Figure 1** USB Storage Device Configuration Menu



7. The analyzer will automatically consume the License File. (This may take a few minutes) When the License File is consumed the Keysight License Manager will display a "Successful License Installation" message similar to the one shown in **Figure 2**.

**Figure 2** Successful License Installation



### Alternate Installation Procedure

The License File can be manually installed over USB or LAN by placing the license file in the following folder on the signal analyzer

C:\Program Files\Agilent\licensing

### Verify the License Installation

1. Before the licenses will be recognized, the XSA application must be restarted. Press **System, Exit Program**. An Exit Analyzer dialog box will appear; press **Enter** to confirm the exit.
2. Double-click on the LaunchXSA icon on the Windows desktop. Wait for the XSA application to finish starting (the analyzer should be sweeping).
3. Press **System, Show System** on the analyzer to display a list of installed options. You should see the following options listed ("x" is 1 for an EXA and 2 for an MXA).
  - N90x0B-CR3    Connector Rear, 2nd IF Output
  - N90x0B-CRP    Connector Rear, Arbitrary IF Output

## Analyzer Disassembly

**CAUTION**

If the instrument is placed on its face during any of the following procedures, be sure to use a soft surface or soft cloth to avoid damage to the front panel, keys, or input connector.

**NOTE**

If the analyzer has Option PRC, Portable Configuration, refer to the “**Portable Instrument (Option PRC)**” section on **page 13** to remove the outer case.

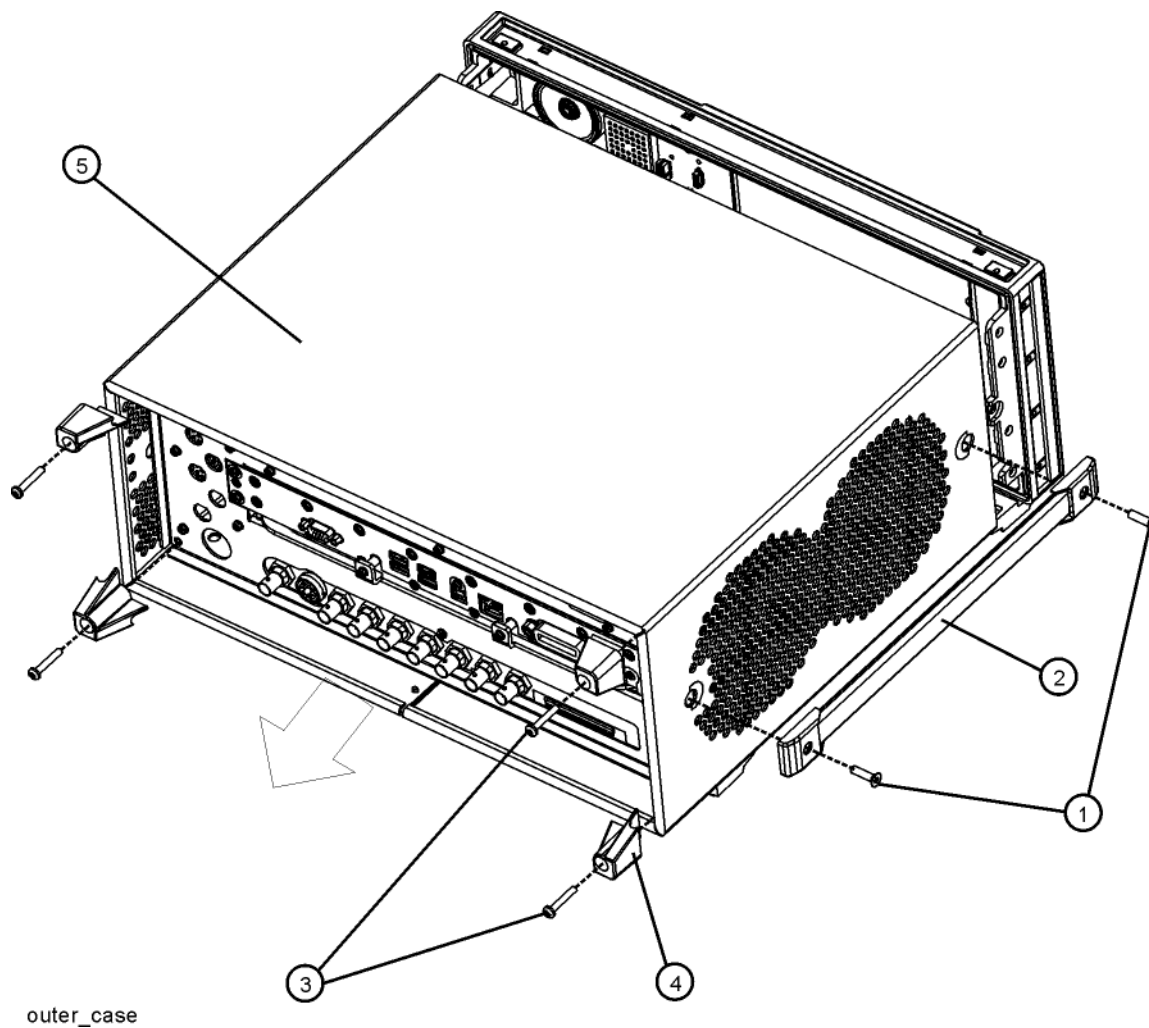
**NOTE**

Make sure any adapters on the front panel are removed.

### Standard Instrument (Benchtop Configuration)

1. Disconnect the instrument from ac power.
2. Refer to **Figure 3**. Using the T-20 driver, remove the 4 screws (1) (two on each side) that attach the strap handles (2) on each side of the instrument.
3. Remove the four key locks from the instrument four bottom feet.
4. Remove the four instrument bottom feet.
5. Using the T-20 driver, remove the four screws (including washers) (3) that hold the rear feet (4) in place.
6. Pull the instrument cover (5) off towards the rear of the instrument.

**Figure 3** Benchtop Configuration Outer Case Removal



7. Proceed to the Front Frame Assembly Removal section to remove the front frame.

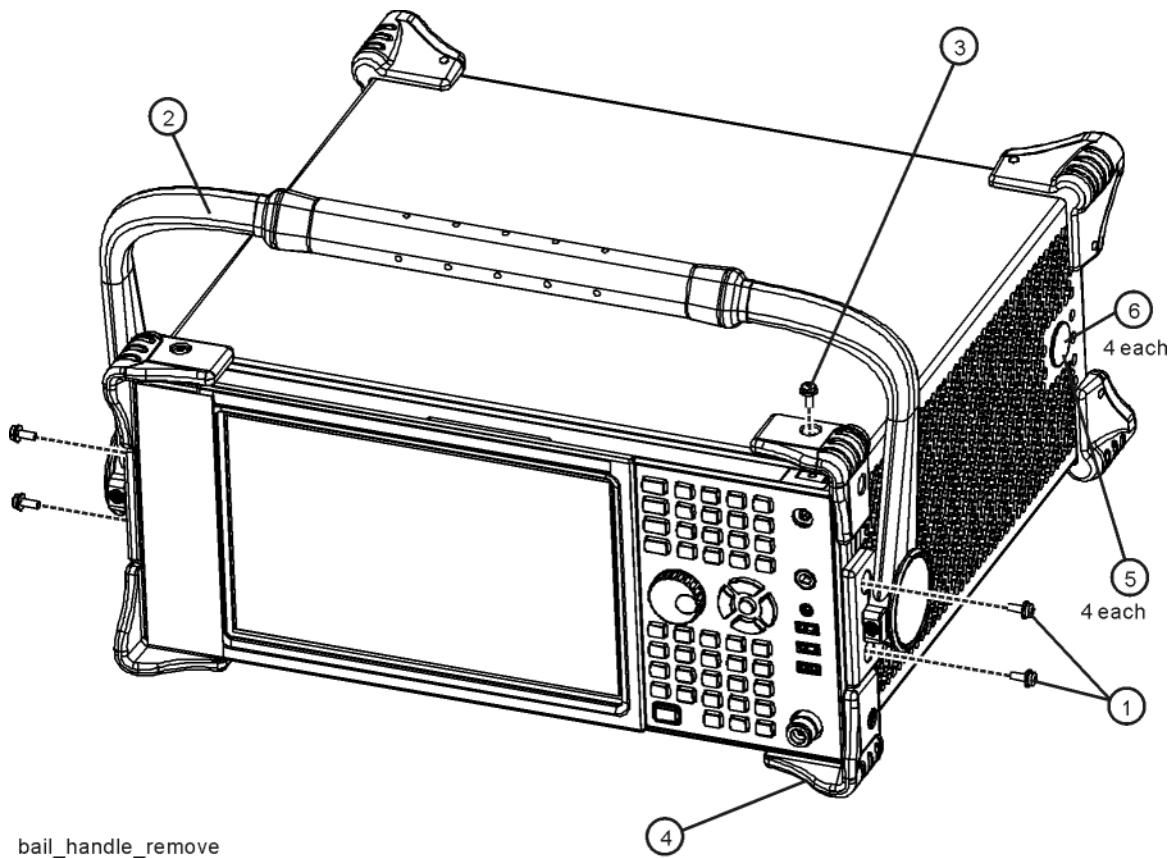
## Portable Instrument (Option PRC)

**NOTE**

Make sure any adapters on the front panel are removed.

1. Disconnect the instrument from ac power.
2. Refer to **Figure 4**. Using the T-20 driver, remove the four screws (1), two on each side, to detach the Bail Handle Assembly (2) from the front frame.

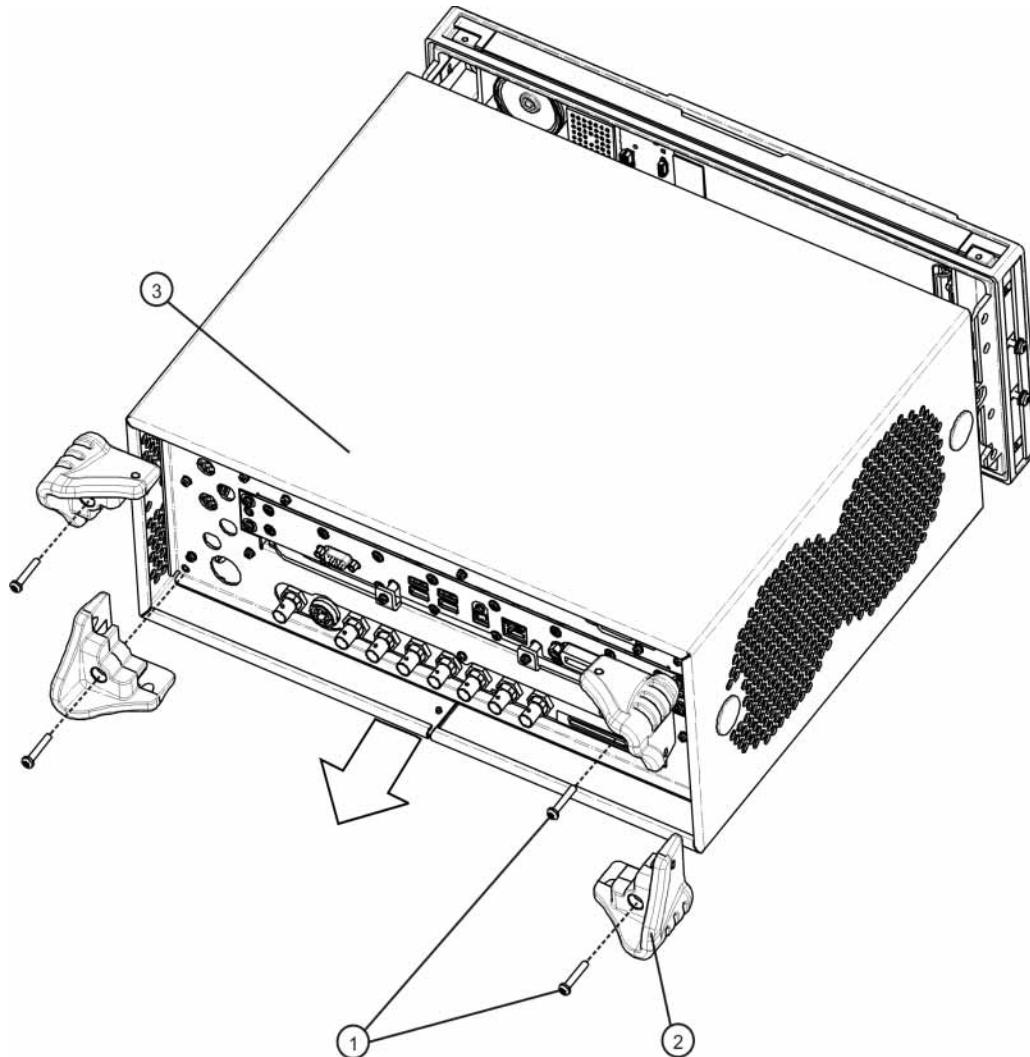
**Figure 4** Bail Handle and Front Bumpers Removal (Option PRC)



3. Using the T-20 driver, remove the four screws (6) (two on each side) that attach the four strap handle plugs (5) from both sides of the instrument.

4. Refer to **Figure 5**. Using the T-20 driver, remove the four screws (including washers) (1) that hold the rear bumpers (2) in place.
5. Pull the instrument cover (3) off towards the rear of the instrument.

**Figure 5**      Portable Instrument Outer Case Removal (Option PRC)

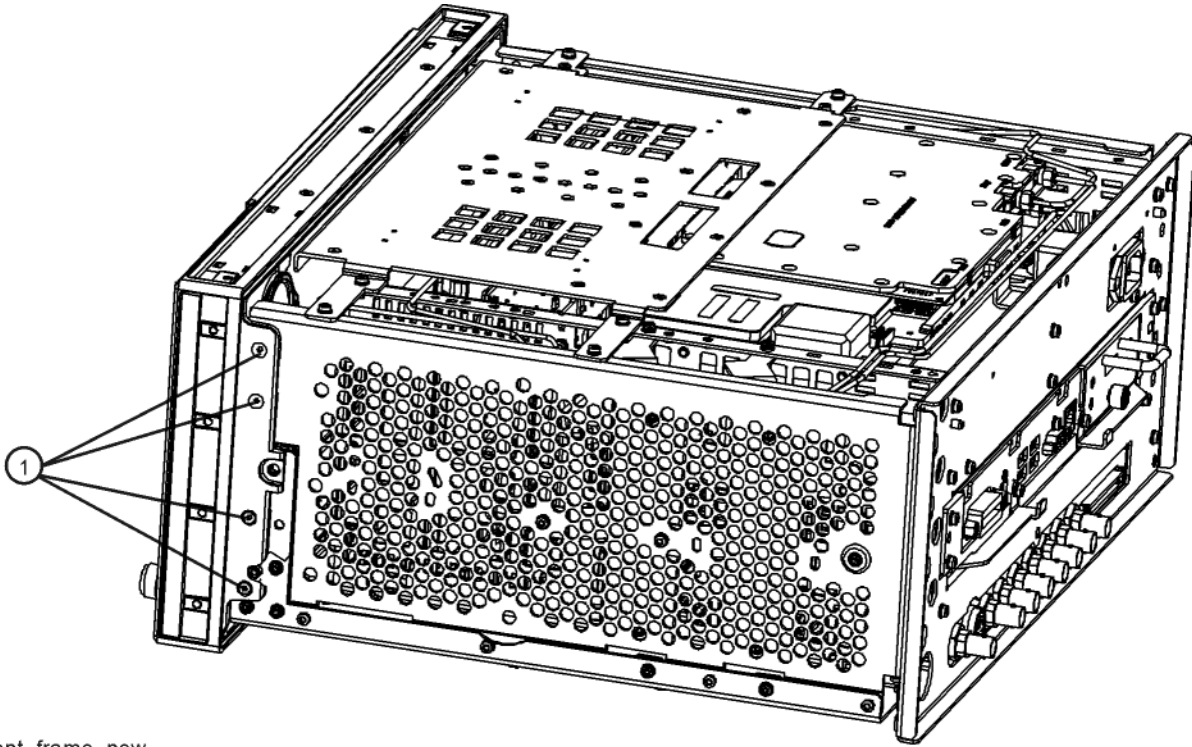


rear\_bumper\_remove

## Front Frame Assembly Removal

1. Refer to **Figure 6**. Using the T-10 driver, remove the eight screws (1), four on each side, to detach the front frame from the chassis.

**Figure 6** Front Frame Removal



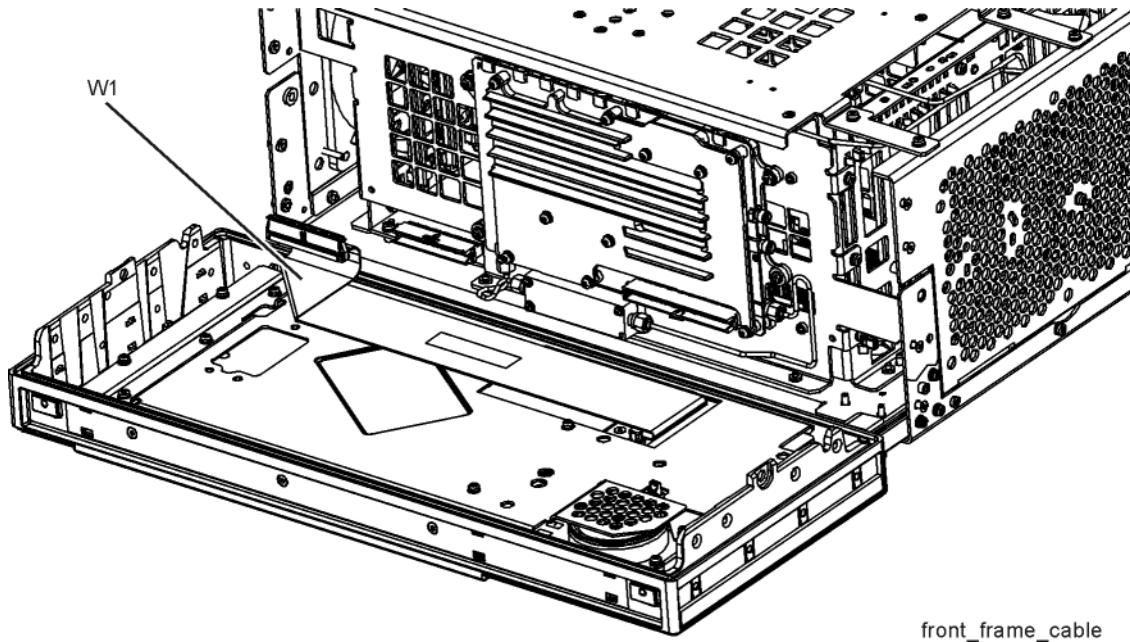
front\_frame\_new

2. Refer to **Figure 7**. Pull the front frame carefully away from the chassis. Remove the ribbon cable W1 from the A8 Motherboard.

**NOTE**

W1 may have locking springs on each side. Depress the spring on each side of the connector to remove from the motherboard.

**Figure 7** Front Panel Cable



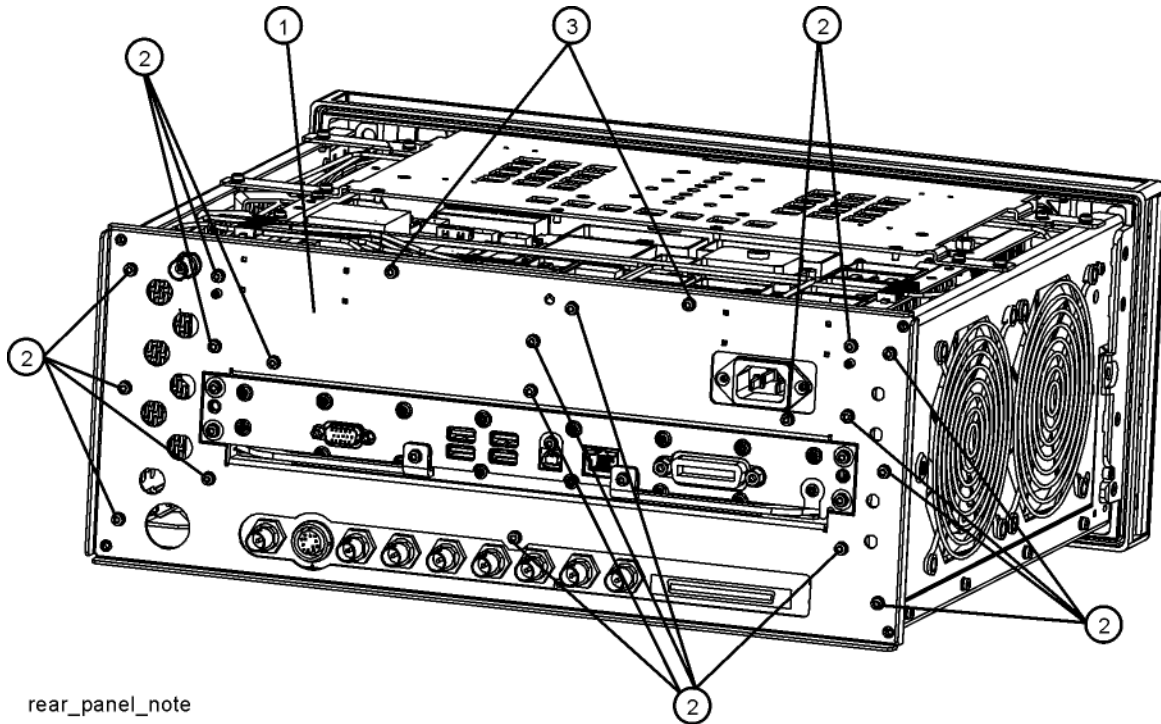
3. If the analyzer has Option BBA (BBIQ inputs), there will be an additional cable (W24) that will need to be removed. W24 connects to the A18 BBIQ Interface Board. Pull the Front Frame assembly carefully away from the chassis. Remove the ribbon cable W24 from the A18 BBIQ Interface Board.



## Rear Panel Removal

1. Refer to **Figure 8**. Using the T-10 driver, remove the twenty screws (2) and (3) attaching the rear panel (1) to the chassis.
2. Use a 9/16-inch socket wrench to remove the nut securing the EXT REF IN connector from the rear panel.
3. The rear panel can now be removed.

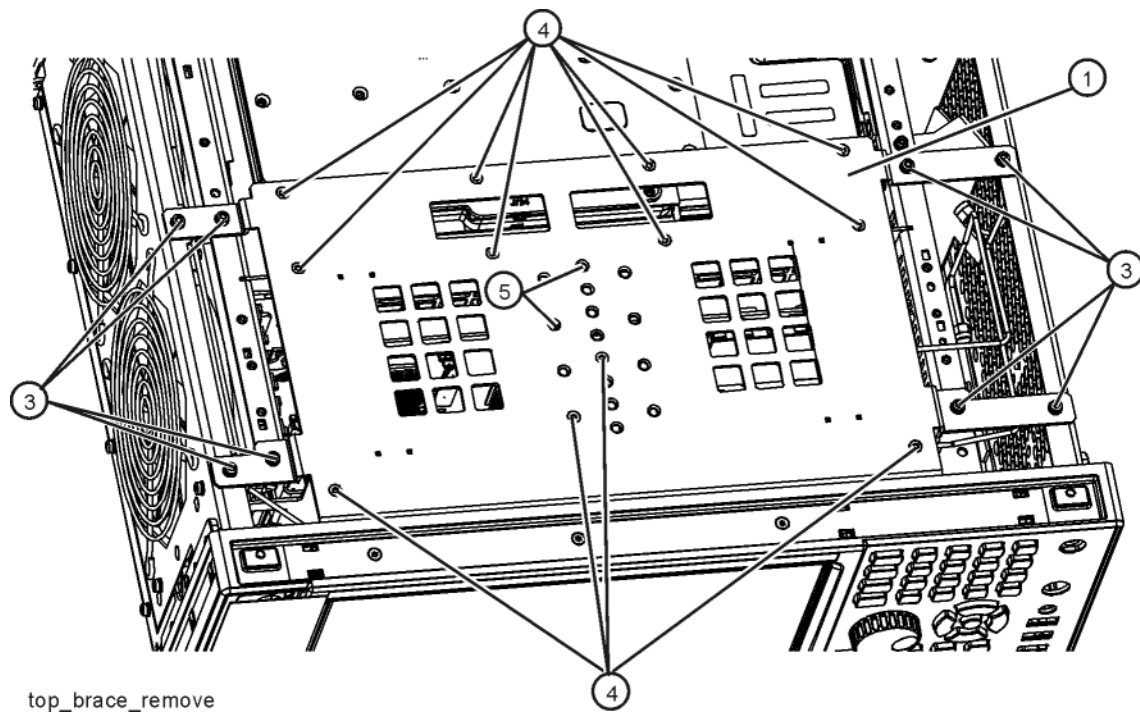
Figure 8 Rear Panel Removal



## Top Brace

1. Refer to **Figure 9**. To remove the top brace (1), use the T-10 driver to remove the eight panhead screws (3) (0515-0372), four on each side, attaching the braces to the chassis. Also remove and discard the twelve flathead screws (4) (0515-1946) attaching the top brace to the boards.

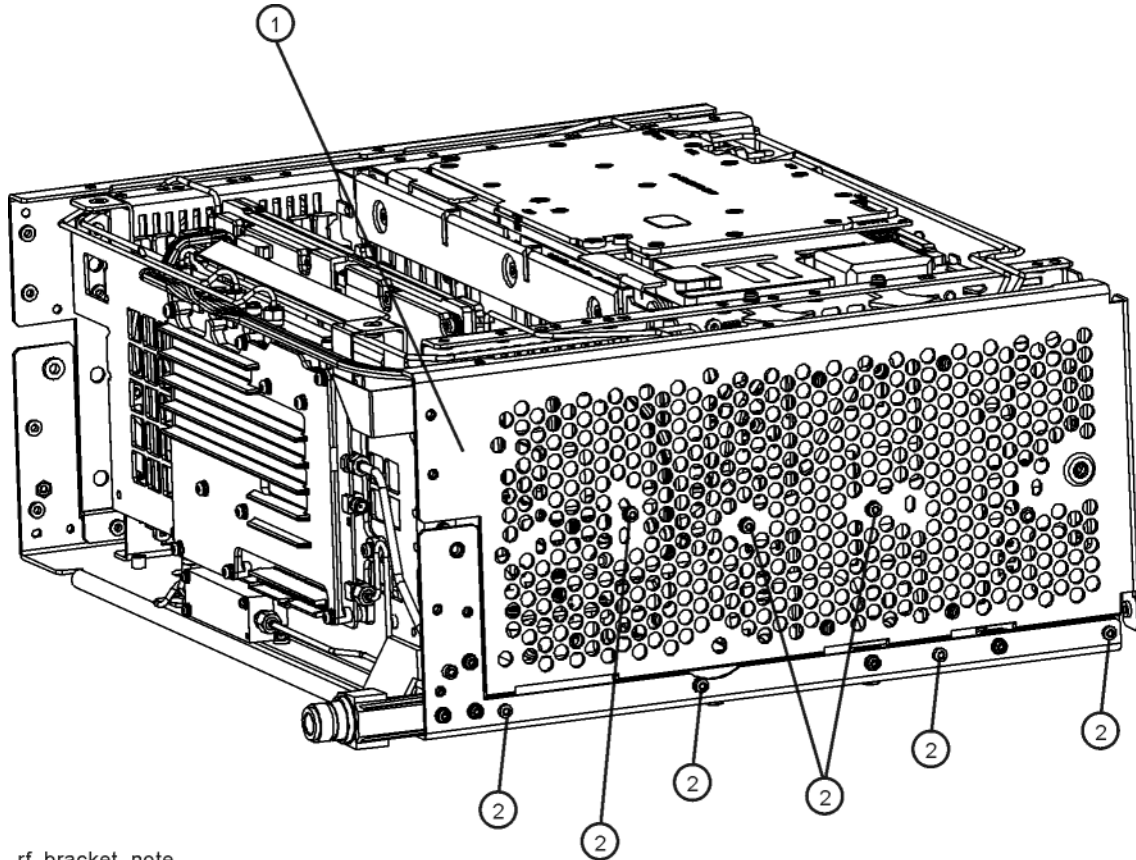
Figure 9 Top Brace Removal



## RF Bracket Removal

1. Refer to **Figure 10**. Remove the RF bracket (1) by removing the remaining seven screws (2) using the T-10 driver.

**Figure 10** RF Bracket Removal



rf\_bracket\_note

## Replace Front End Control Assembly

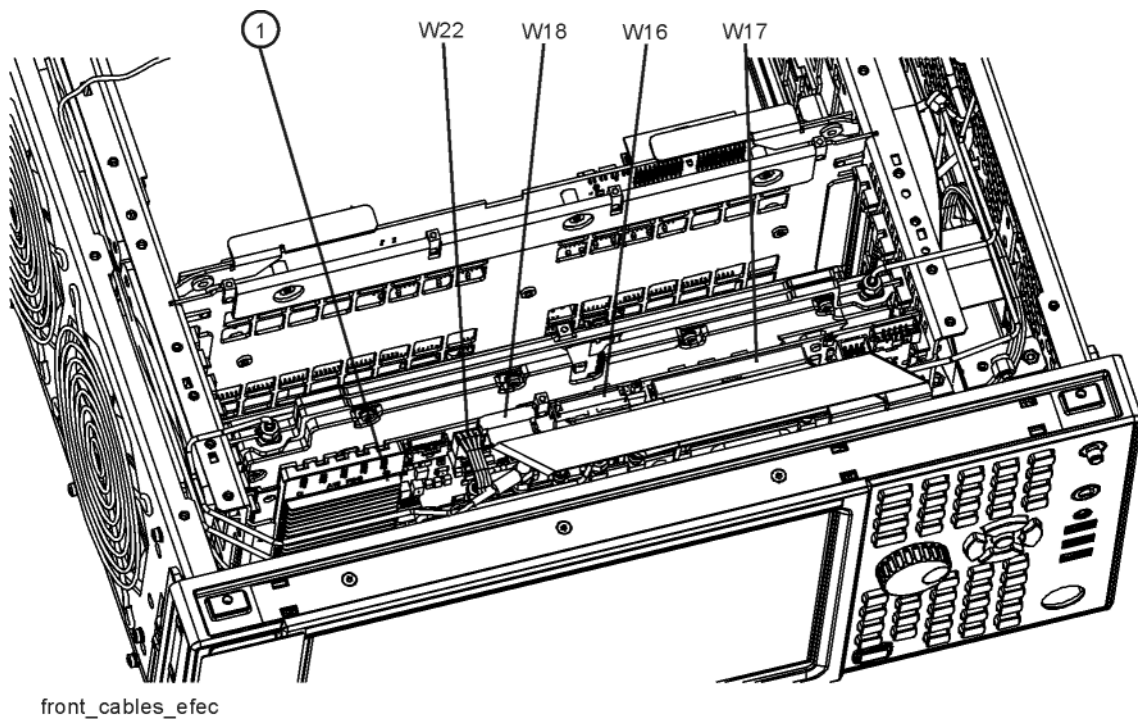
1. Refer to **Figure 11**. Remove the ribbon cables W16, W17, and W18 and the wire harness W22 from the Front End Control assembly (1).

### NOTE

W22 will not be present in instruments with Option 503.

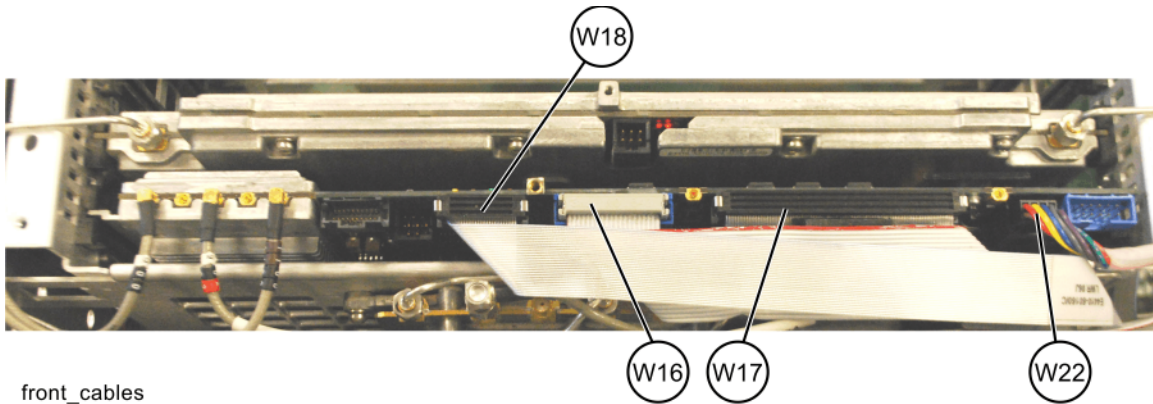
2. The Front End Control assembly can now be unplugged from the motherboard by leveraging up on the ejector and lifting the board up on the other side.

**Figure 11** Front End Control Assembly Removal



3. Refer to **Figure 12**. Install the Enhanced Front End Control assembly included in this kit into slot 6 in the chassis securing with the ejector.
4. Reattach the ribbon cables W16, W17, and W18 to the Front End Control assembly (1).

**Figure 12** Enhanced Front End Control Assembly Installation

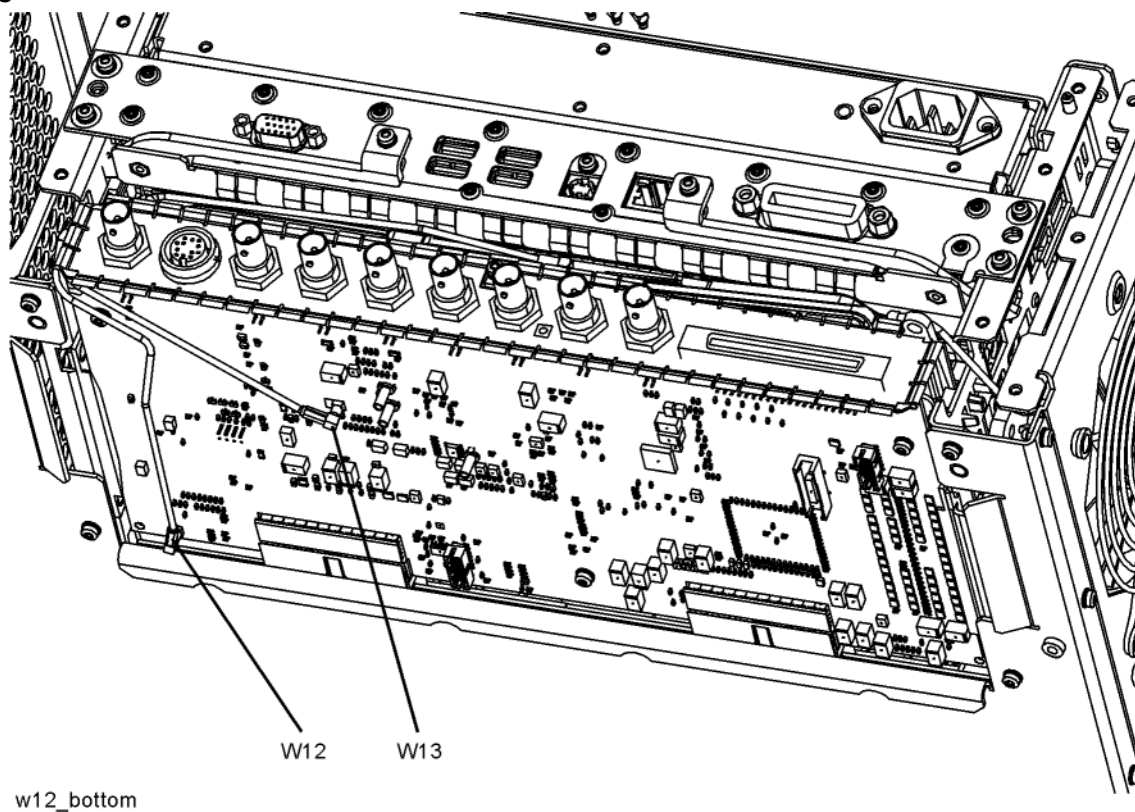




## Install New Cables

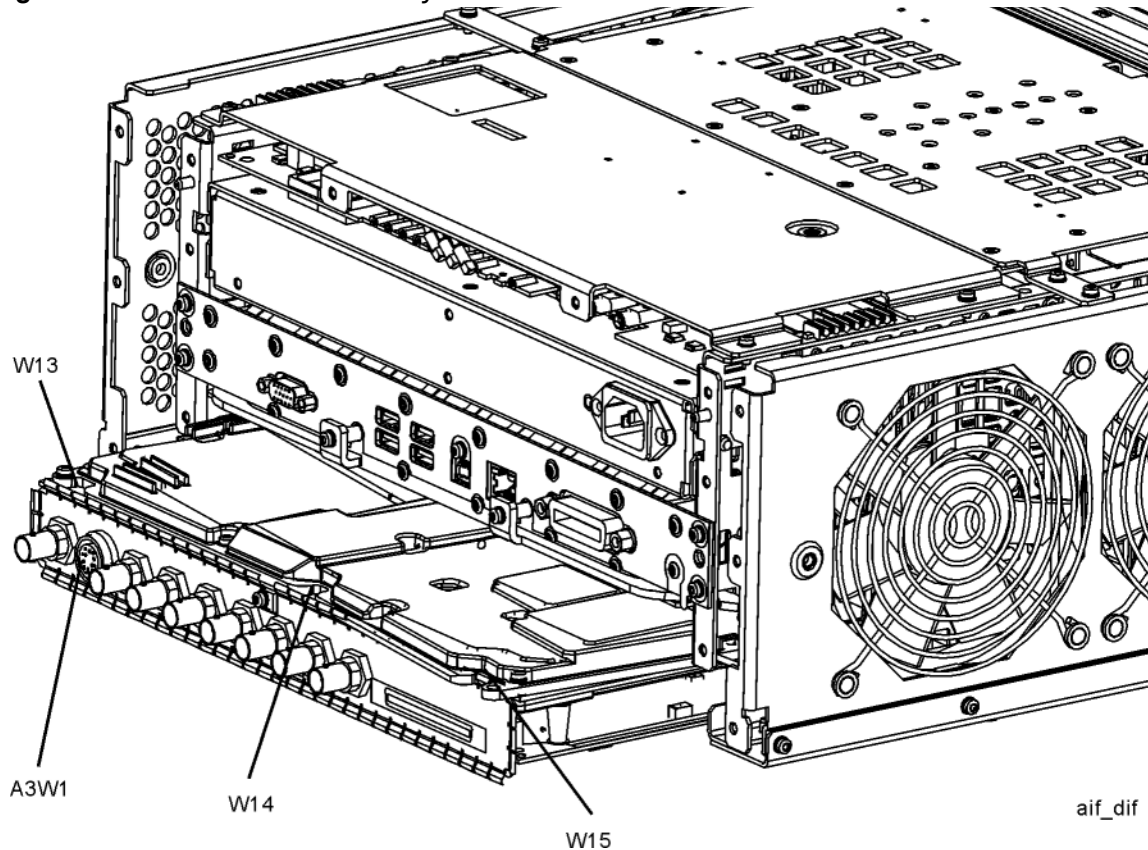
1. Refer to **Figure 13**. Disconnect cables W12 and W13 from the bottom of the DIF assembly.

**Figure 13** Disconnect W12 and W13



2. Refer to **Figure 14**. Pull the AIF/DIF assembly part way out of the chassis. Disconnect cable W15 from the analyzer.
3. Completely remove W15 from the analyzer.

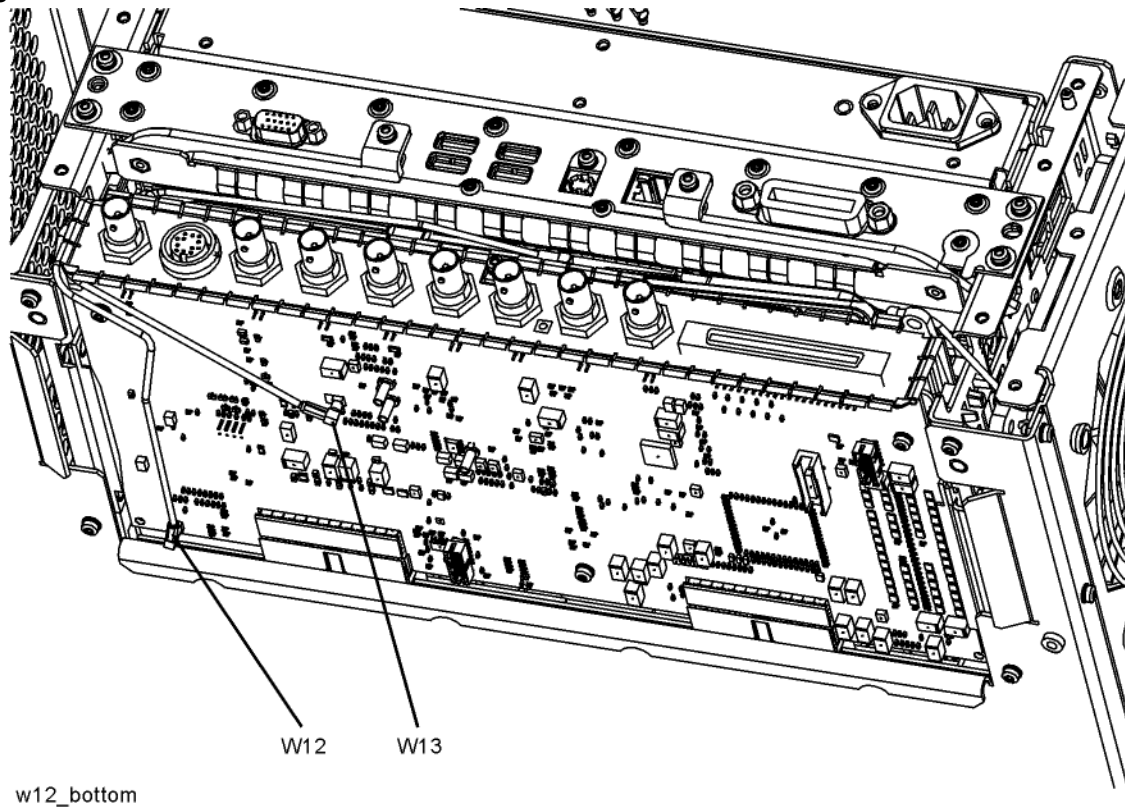
**Figure 14** AIF/DIF Assembly Partial Removal



4. Locate W36 in the Opt HL3 Cable Kit. This cable will have part number 8121-1862 and will be labeled "902" on one end and "7" on the other. Connect the end labeled "902" to A15J902 on the A15 EFEC Assembly. Connect the other end to A13J7 on the A13 Front End Assembly. Torque the connector on A13J7 to 10 inch-pounds.
5. Locate W37 in the Opt HL3 Cable Kit. This cable will have part number 8121-1401 and will be labeled "900" on one end and "100" on the other. Connect the end labeled "900" to A15J900 on the A15 EFEC Assembly. Route the cable along the left side of the instrument above the fans. Route the cable down behind the rear of the second (rearmost) fan. Connect the cable to A2J100 on the A2 EAIF Assembly
6. Slide the AIF/DIF assembly into the slot at the rear of the instrument and push on the assembly to mate the connectors to the motherboard assembly.

7. Refer to **Figure 15**. Reconnect W12 to A3J14. Reconnect W13 to A3J15.

**Figure 15** Reconnect W12 and W13

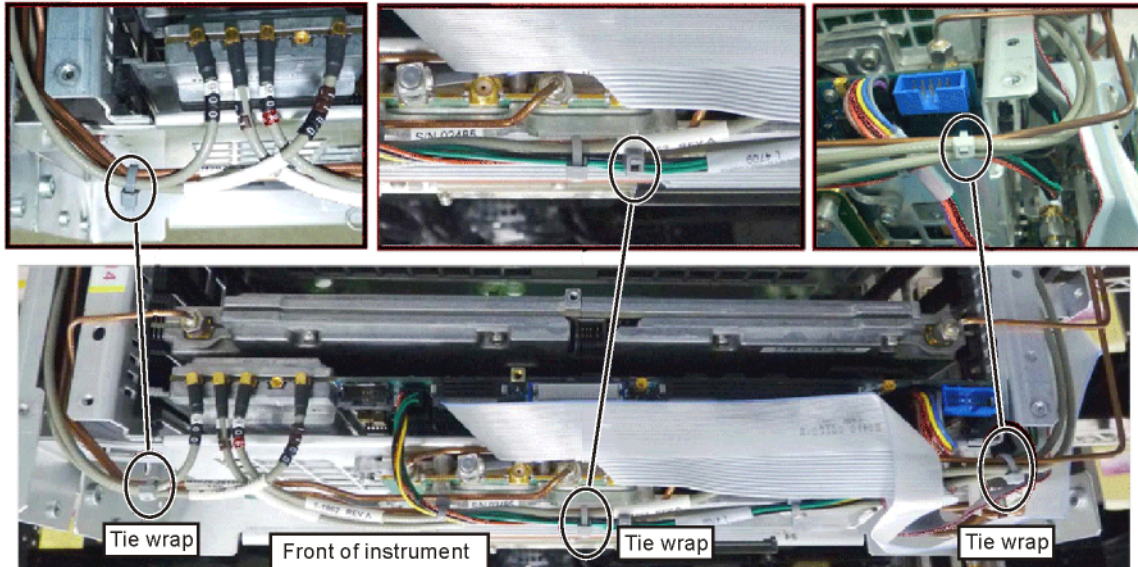


8. Locate W39 in the Opt HL3 Cable Kit. This cable will have part number 8121-2028 and will be labeled "1100" one end and no label on the other. Connect the end labeled "1100" to A15J1100 on the A15 EFEC Assembly. Route the cable along the left side of the chassis above the fans toward the rear panel. The other end of the connector will be secured to the rear panel later.



9. Refer to **Figure 16**. Dress the coaxial cables and semi-rigid cables neatly and tie together using cable ties (1400-0249) at the locations indicated.

**Figure 16** Adding Cable Ties near A13 and A15 Assemblies

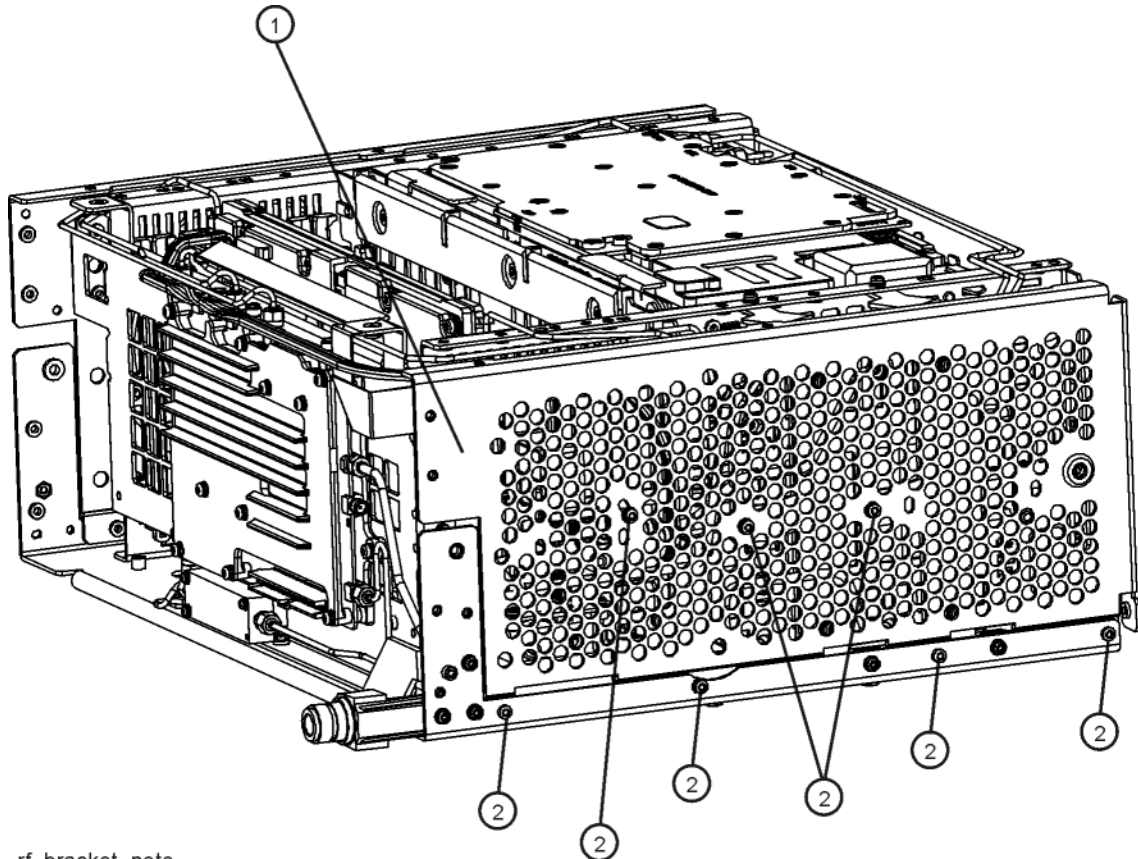


tiewrap

## Reassembly

1. Refer to **Figure 17**. Position the RF bracket (1) onto the chassis and replace the seven screws (2) Torque to 9 inch-pounds.

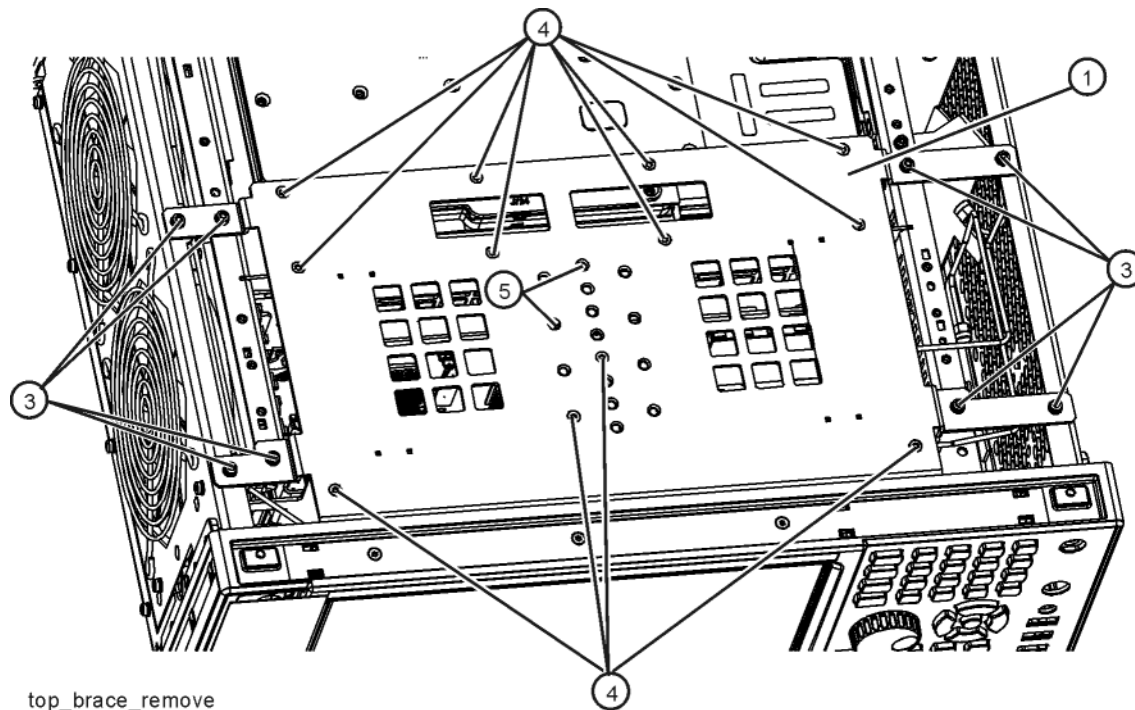
**Figure 17** RF Bracket Replacement



rf\_bracket\_note

2. Refer to **Figure 18**. To replace the top brace (1), place it in the correct position and attach using the screws included in the kit. There are two additional screws (0515-1946) (5) that are required to attach the top brace to either the BBIQ Main board, or Wideband Analog IF and Wideband Digital IF boards, if installed. Torque to 9 inch-pounds.

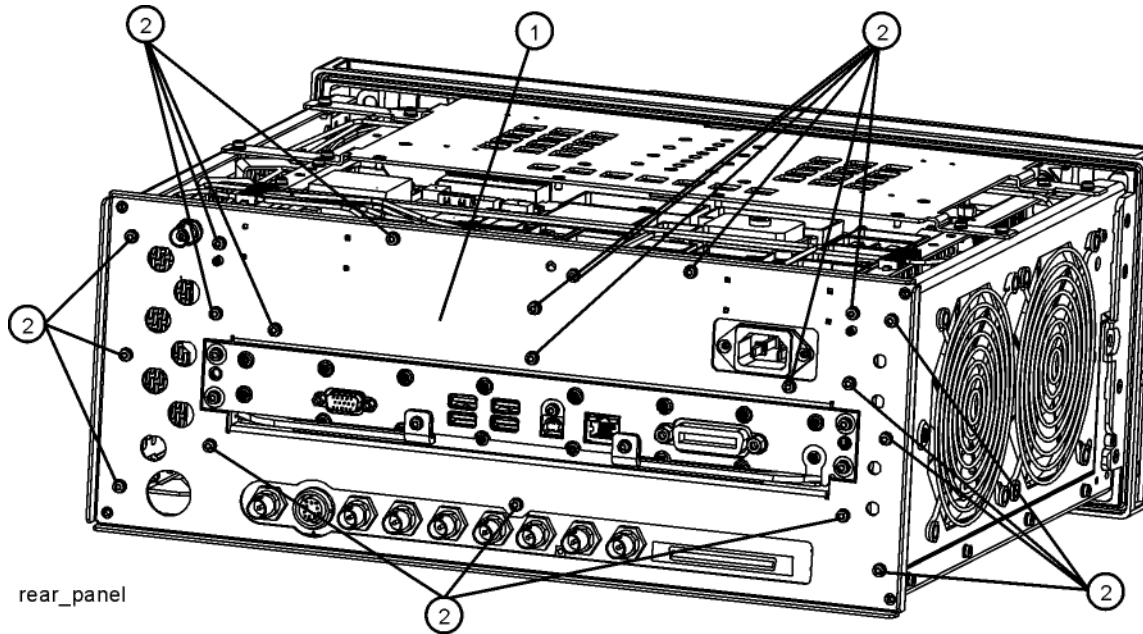
**Figure 18** Top Brace Replacement



3. Attach the top brace to the new A15 Front End Control assembly using an additional screw (0515-1946) (6) included in the kit.
4. Lay the rear panel on the table with the silk-screened side facing up and the text right-side up. Along the right side of the rear panel are a number of holes with hole plugs. The top right hole will be labeled either "AUX IF OUT".
5. Remove the hole plug from the AUX IF OUT hole.
6. Attach the W23 External Reference cable to the rear panel and secure with a lock washer (2190-0102) and nut (0590-2332). Torque to 21 inch-pounds using a 9/16" nut driver.
7. Attach the W39 Aux IF Out cable to the rear panel and secure with the lock washer and nut that came with the cable. Torque to 9 inch-pounds with a 5/16" nut driver.

8. Refer to **Figure 19**. Place the rear panel (1) into position in the chassis. Replace the twenty screws (2) to attach the rear panel to the chassis. Torque to 9 inch-pounds.

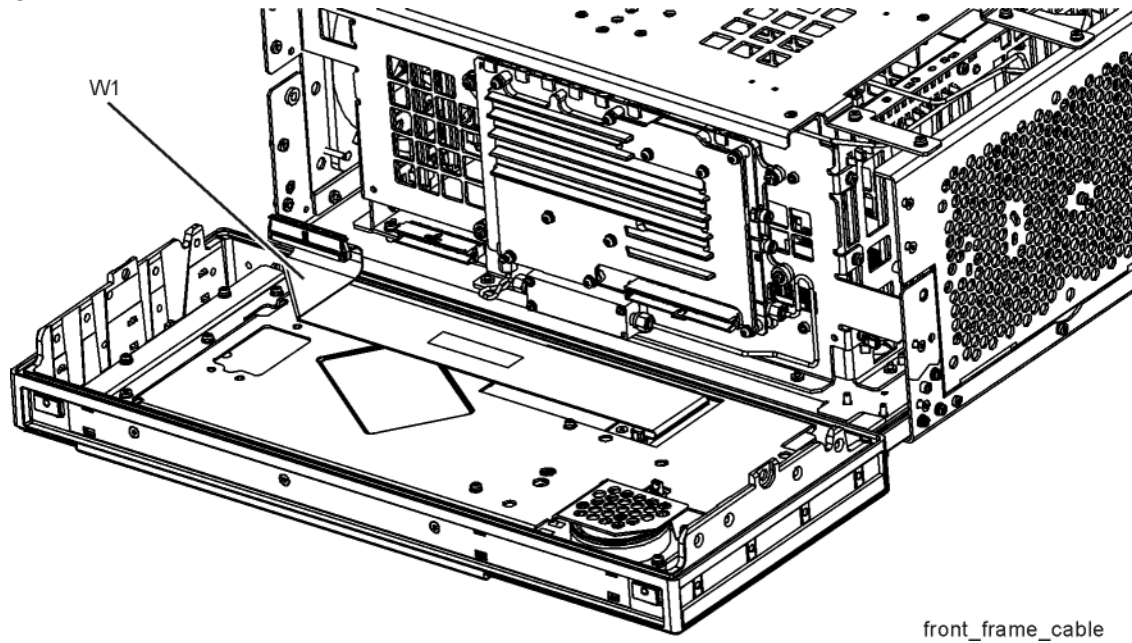
**Figure 19**      Rear Panel Replacement



9. Refer to **Figure 20**. Reattach the ribbon cable W1.

**Figure 20**

Front Panel Cable

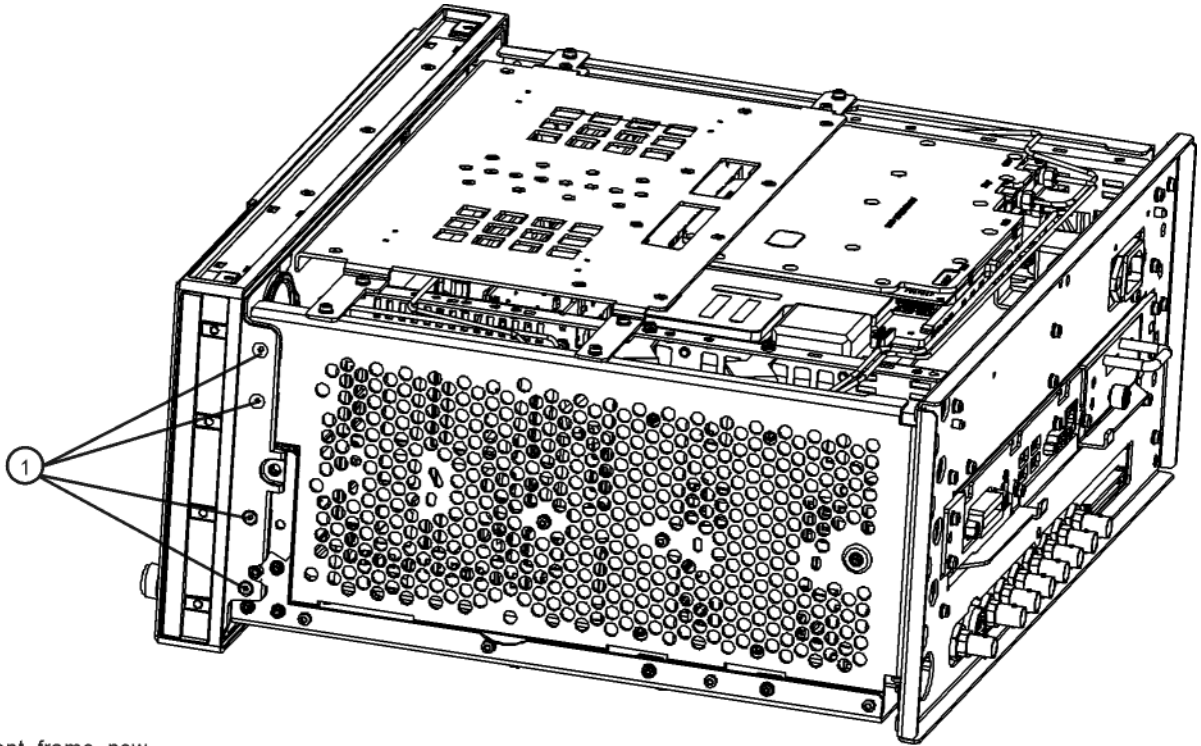


10. If the analyzer has Option BBA, reconnect the ribbon cable W24 to A18 BBIQ Interface Board.



11. Refer to **Figure 21**. Carefully position the Front Frame Assembly onto the chassis. Ensure no cables are crushed. Replace the eight screws (1), four on each side of the chassis. Torque to 9 inch-pounds.

**Figure 21** Front Frame Replacement



front\_frame\_new

## Final Installation for Standard Instruments (Benchtop Configuration)

1. Refer to **Figure 3**. Carefully slide the instrument cover back onto the instrument from the rear of the analyzer, making sure not to damage any internal cables. The seam on the cover should be on the bottom of the instrument. Be sure the cover seats into the gasket groove in the Front Frame Assembly.
2. Replace the four rear feet (4) to the rear of the instrument using the four screws (3). Torque to 21 inch-pounds.
3. Replace the strap handles (2) on both sides of the instrument using the four screws (1). Torque to 21 inch-pounds.
4. Replace the four instrument bottom feet.
5. Replace the four key locks to the bottom feet.

## Final Installation for Portable Instruments (Option PRC)

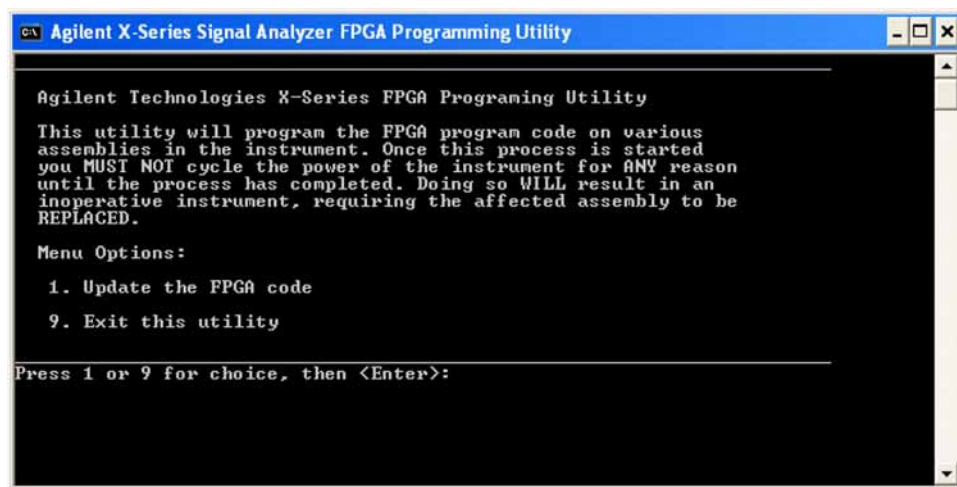
1. Refer to **Figure 5**. Carefully slide the instrument cover back onto the instrument from the rear of the analyzer, making sure not to damage any internal cables. The seam on the cover should be on the bottom of the instrument. Be sure the cover seats into the gasket groove in the Front Frame Assembly.
2. Refer to **Figure 5**. Replace the four rear bumpers (2) to the rear of the instrument using the four screws (1). Torque to 21 inch-pounds.
3. Refer to **Figure 4**. Replace the four hole plugs (5) to both sides of the instrument.
4. Refer to **Figure 4**. Replace the bail handle (2) (using the four screws (1)) to the Front Frame Assembly. Torque to 21 inch-pounds.

### Update FPGA Code

On the first boot-up after installing the new hardware, the analyzer will detect the new A15 Front End Controller. However, the FPGA code in the new A15 will not necessarily be synchronized with the instrument software installed earlier. The following procedure ensures that the FPGA code in the new A15 is updated to the correct revision.

1. Turn on the analyzer and wait for the XSA application to launch.
2. Close the instrument application software by pressing **System, Exit Program, Enter**.
3. Connect a USB mouse and keyboard to the instrument front panel USB ports.
4. Using the mouse, click **Start, Shutdown, Log Off**.
5. Relogin as “administrator”. The default password is “Keysight4u!”. Click **OK**.
6. Using the mouse, double-click on the Windows Explorer link on the desktop and navigate to the following folder:  
C:\Program Files\Keysight\SignalAnalysis\Physics
7. In this folder find and execute the file named:  
FPGA\_Prog.bat
8. The FPGA Programming Utility will start and a window as shown in **Figure 22** will appear.

**Figure 22**      FPGA Programming Utility



9. To program the FPGA code enter **1** and press **Enter**. You will need to confirm this selection by pressing **1** and **Enter** one more time.
10. The programming of the FPGA code could take several minutes to complete. Once it has finished the instrument will reboot itself to use the new code and this process will then be completed.



## Verify Hardware Installation

1. Wait for the instrument to fully boot up.
2. Verify the spectrum analyzer application loads and sweeps as expected. Press **System, Show Hardware** on the analyzer and verify that the Front End Controller board identifies itself with a Hw Id of 75.

## Verify Optional Functionality

1. Press **MODE/MEAS, Spectrum Analyzer, Swept SA, OK**.
2. Press **Input/Output, Output, Aux IF Out**.
3. Verify that selections appear labeled **“Second IF”** and **“Arbitrary IF”**.

## Perform Preselector Characterization

(Only applies to analyzers with Option 507, 508, 513, or 526)

1. Press **System, Alignments, More, Advanced**.
2. Press **Characterize Preselector, Enter**. The characterization will take several minutes.
3. Wait until the analyzer resumes sweeping.

## Utilities, Adjustments, and Performance Verification Tests

Calibration Software and specified test equipment is required to perform the adjustments, and can be used to automate the performance verification testing. Information on how to obtain this software can be found at

<http://www.keysight.com/find/calibrationsoftware>

### Utilities Required

- None

### Adjustments Required

The following adjustments are the minimum set required to ensure that this newly installed hardware is functioning properly.

- Perform all adjustments

### Performance Testing Required

The following performance verification tests are the minimum set required to ensure that this newly installed option is functioning properly.

- Perform all performance tests

### **A full calibration is required to assure the instrument meets all specifications**

The end user must ultimately determine whether they want a full calibration to be performed after the installation of this upgrade or not. If a full calibration is required, arrangements regarding the level of calibration must be made between the end user and the calibration provider.

For assistance, contact your nearest Keysight Technologies Sales and Service Office. To find your local Keysight office access the following URL, or if in the United States, call the following telephone number:

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

1-800-829-4444 (8 am - 8 pm ET, Monday - Friday)



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without notice.

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[www.keysight.com](http://www.keysight.com)