

# Installation Note

---

## Agilent PSA Series Spectrum Analyzers Option 110 Preamplifier Retrofit Kit



**Agilent Technologies**

Part Number E4440-90321  
Printed in USA June 2006



E4440-90321

**Notice.**

The information contained in this document is subject to change without notice.

Agilent Technologies makes no warranty of any kind with regard to this material, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Agilent Technologies shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

---

## Preamplifier Installation Kit

Products Affected:	PSA E4446A PSA E4447A PSA E4448A
Serial Numbers:	US0000/US9999 MY0000/MY9999 SG0000/SG9999
To Be Performed By:	<input checked="" type="checkbox"/> Agilent Service Center <input checked="" type="checkbox"/> Personnel Qualified by Agilent <input type="checkbox"/> Customer
Estimated Installation Time:	3 Hours
Estimated Adjustment and Verification Time for Hardware Kit following Installation:	5 Hours (See note 2)
Additional Recommended Task	Agilent recommends that a full calibration be performed to verify instrument specifications. (See note 3)

### Introduction

This retrofit kit provides all parts and instructions for retrofitting the 10 MHz to 50 GHz 30 dB Preamplifier Option 110 into the PSA series analyzers.

The Option Driver Board from the kit is required to bias the preamplifier and to control the switch that switches the preamplifier in and out of the signal path. This board also contains the flatness compensation data for the preamplifier.

---

### NOTE

1. This option is not compatible with the Option 1DS, 3 GHz preamplifier. Option 1DS must be uninstalled before installing Option 110. Damage to the instrument may result if they are both installed.
  2. The installation of this kit requires that some performance testing be performed in order to assure the new option is functioning properly. This installation note includes a list of required performance tests. Completing the performance tests does not guarantee the instrument meets all specifications.
  3. The instrument end user must determine whether they need a full instrument calibration following the installation of the kit. If a full calibration is required, arrangements regarding the level of calibration must be made between the end user and the calibration provider.
  4. This option is licensed for one instrument model/serial number combination. The license key will only install on the designated instrument.
-

## Preamplifier Installation Kit

### Contents

Quantity	Description	Agilent Part Number
1	Installation Note	This note
1	User's and Programmers Guide Vol. 1	--
1	Specs Guide	--
1	Option Upgrade Entitlement Certificate	5964-5141
1	Attenuator, 3 db, 2.4mm	08490-60010
1	Microwave Amplifier	0955-1617
1	Switch 4, Microwave Switch, SW4	87222-60015
1	Option Driver Board	E4440-60253
1	Bracket, Main	E4440-00062
1	Bracket, Switch	E4440-00063
1	Bracket, Preamp	E4440-00075
1	W37, Cable, semi-rigid, low-pass filter to A20 Low-band assembly	E4446-20037
1	W102, Cable, semi-rigid, A15 Attenuator out to switch SW4 port 1	E4446-20077
1	W103, Cable, semi-rigid, Preamp Input to switch SW4 port 2	E4446-20078
1	W104, Cable, semi-rigid, Preamp Output to switch SW4 port 3	E4446-20083
1	W106, wire harness, Option Driver P1 to Preamp	E4446-60076
1	W107, Cable, semi-rigid, switch SW4 port 4 to W34 on the RYTHM/SBTX	E4446-20072
1	W101, Cable, semi-rigid, switch SW4 port 4 to switch SW5 port 1	E4446-20081
1	W91, Cable, ribbon, Option Driver Assembly J3 to switch SW4	E4440-60455
4	Washer-LK HLCL NO. 2, .088-IN-ID	2190-0112
4	Screw, 2-56 .312 IN-LG PAN-HD-POZI	0520-0129
8	Screw, M3x0.5, 8mm long	0515-0372
3	Screw, M2.5 x 0.45, 20mm long	0515-1934
2	Screw, M3.5x0.6, 8mm long	0515-0458
1	Cable Tie	1400-0429
1	Clamp, cable, PVC	1400-0611

**Tools Required**

1. T-8 Torx driver
  2. T-10 Torx driver
  3. T-15 Torx driver
  4. T-20 Torx driver
  5. 5/16-inch open end wrench
  6. 7/16-inch open end wrench
  7. POZI-1 driver
- PSA Series Spectrum Analyzer and Service Guide. This manual is available as part of the E4446AU, E4447AU, or E4448AU Option OBW kits.
  - Calibration software. Latest software information and downloads available at <http://www.agilent.com/find/calibrationsoftware>
  - Test equipment supported by the calibration software.
  - Microsoft Windows based personnel computer with LAN card and CD-ROM drive
  - Windows 2000 or Windows XP
  - Crossover cable if PC or analyzer is not connected to network. Use a CAT, RJ45 cable with cross pinning, Agilent p/n 8121-0545.
  - Firmware revision A.09.10 or later. Download the latest version from [http://www.agilent.com/find/psa\\_firmware](http://www.agilent.com/find/psa_firmware), or order the Firmware Update kit.

Depending on your model number, the firmware update kit is ordered as:

Order E444xAU (Qty.1) Option UE2 (Qty. 1), where the “x” is the last digit of the model number. For example: E4446AU option UE2

## Installation Procedure

For assistance at any time during this procedure, get in touch with your nearest Agilent Technologies Sales and Service Office. To find your local Agilent office access the following URL:

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

### Preliminary Hardware Verification

1. Check for the presence of Option 1DS by pressing **System, Show System**, and look at the option list.
  - If Option 1DS is present it must be uninstalled before Option 110 can be installed.
    - a. Delete Option 1DS License by pressing **System, More, More, Licensing, Option**. Use the front panel numerical key pad to enter the option designator 1DS and press the **Enter** key. Press **Delete Option**.
    - b. Check that Option 1DS has been removed by pressing **System, More, Show System**, and looking at the option list.
    - c. Follow the instructions in this installation note in the section named “Uninstalling Option 1DS” to remove the Option 1DS hardware.\*
  - If Option 1DS is not present then continue with the installation of Option 110.

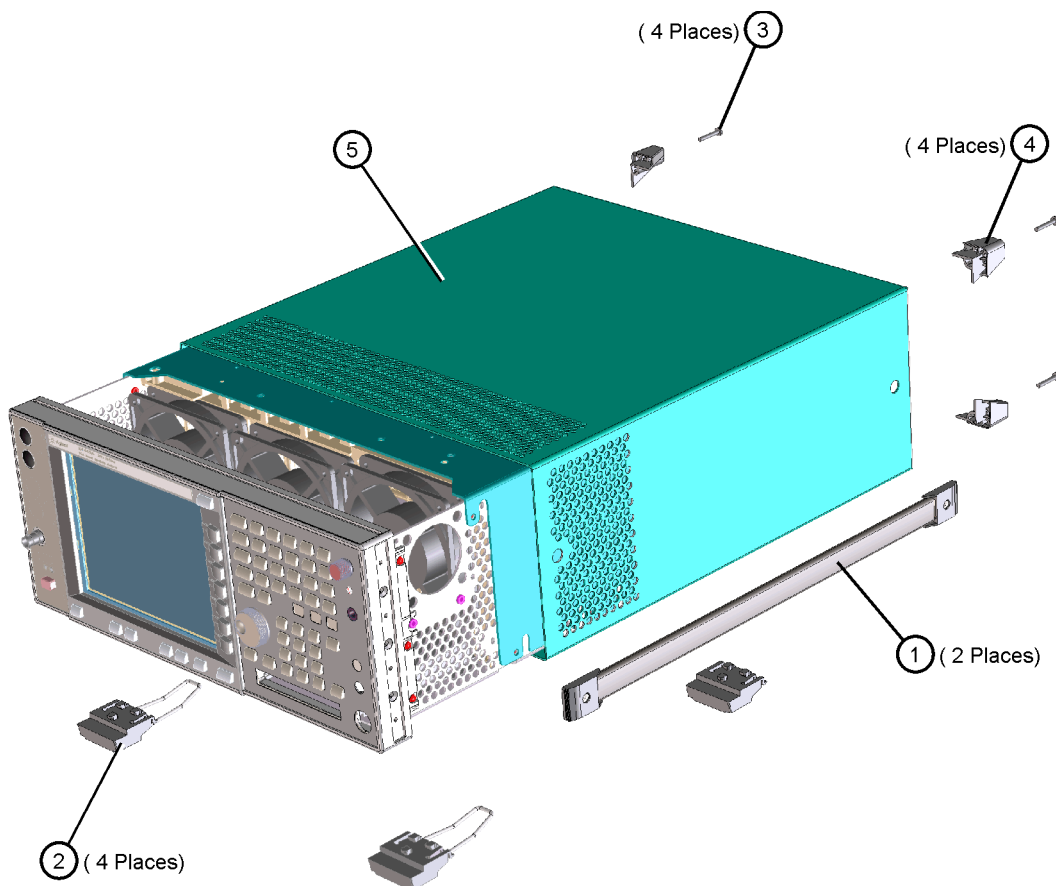
\*Option 110 and Option 1DS are not compatible. Damage to the instrument may result if they are both installed.
2. Check for the presence of Option 123, Preselector Bypass by pressing **System, More, Show System**, and look at the option list.
  - If Option 123 is present then follow the instructions in this installation note in the section named “Installing the Preamplifier with Option 123”.
  - If Option 123 is not present then follow the instructions in this installation note in the section named “Installing the Preamplifier without Option 123”.

## Remove the Outer Case

**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.

1. Disconnect the instrument from ac power.
2. Refer to Figure 1. Remove the two handles on the sides of the instrument as shown. Use the T-20 driver to loosen the screws that attach each handle (1). Remove the handles.
3. Remove the four bottom feet (2). Lift up on the tabs on the feet, and slide the feet in the direction indicated by the arrows.
4. Remove the four screws (3) that hold the rear feet (4) in place.
5. Pull the instrument cover (5) off toward the rear of the instrument.

**Figure 1 Instrument Outer Case Removal**

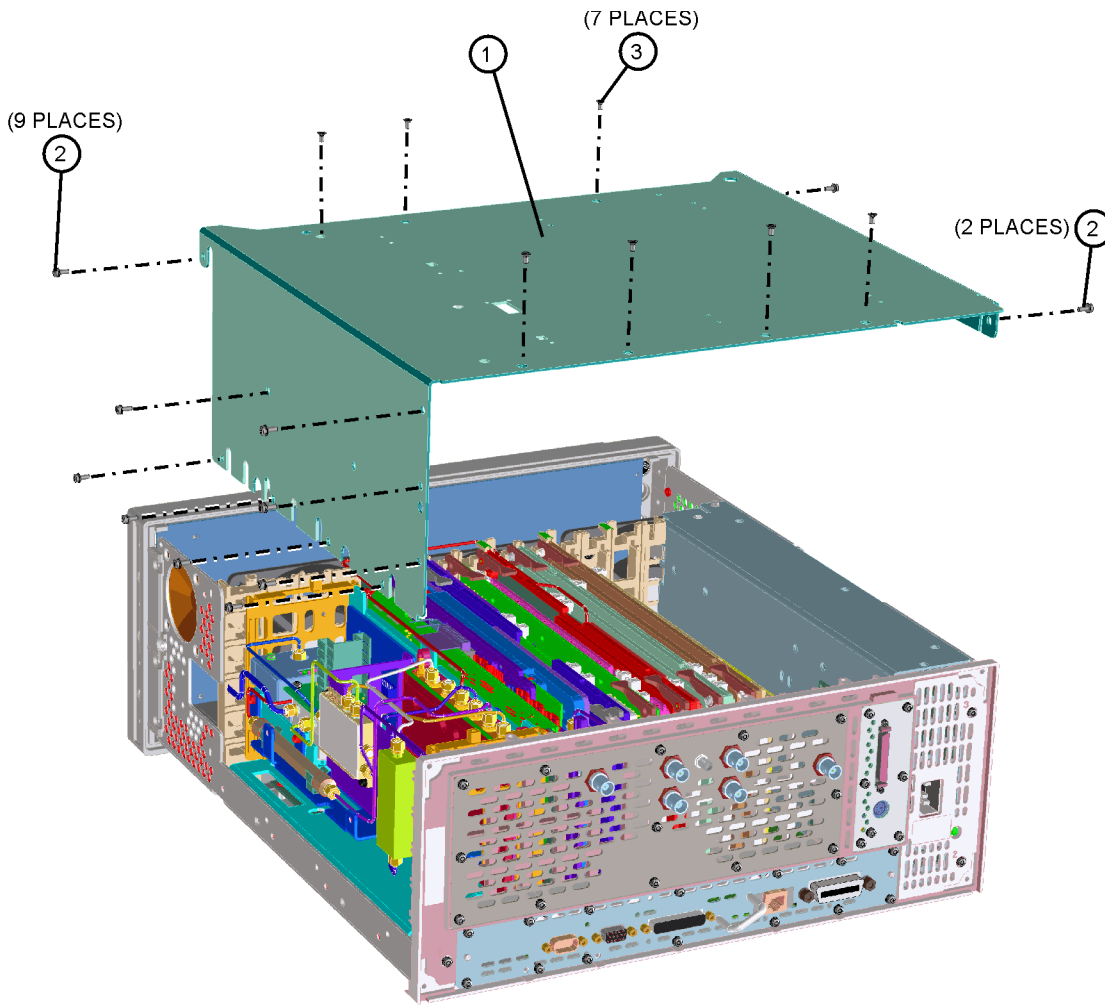


de83a

## Remove the Top Brace

1. Refer to Figure 2. Use the T-10 driver to remove the top screws (3) (one screw is under the security label), and the side screws (2) attaching the top brace (1) to the deck.
2. Remove the top brace from the deck.

**Figure 2**      **Top Brace Removal**



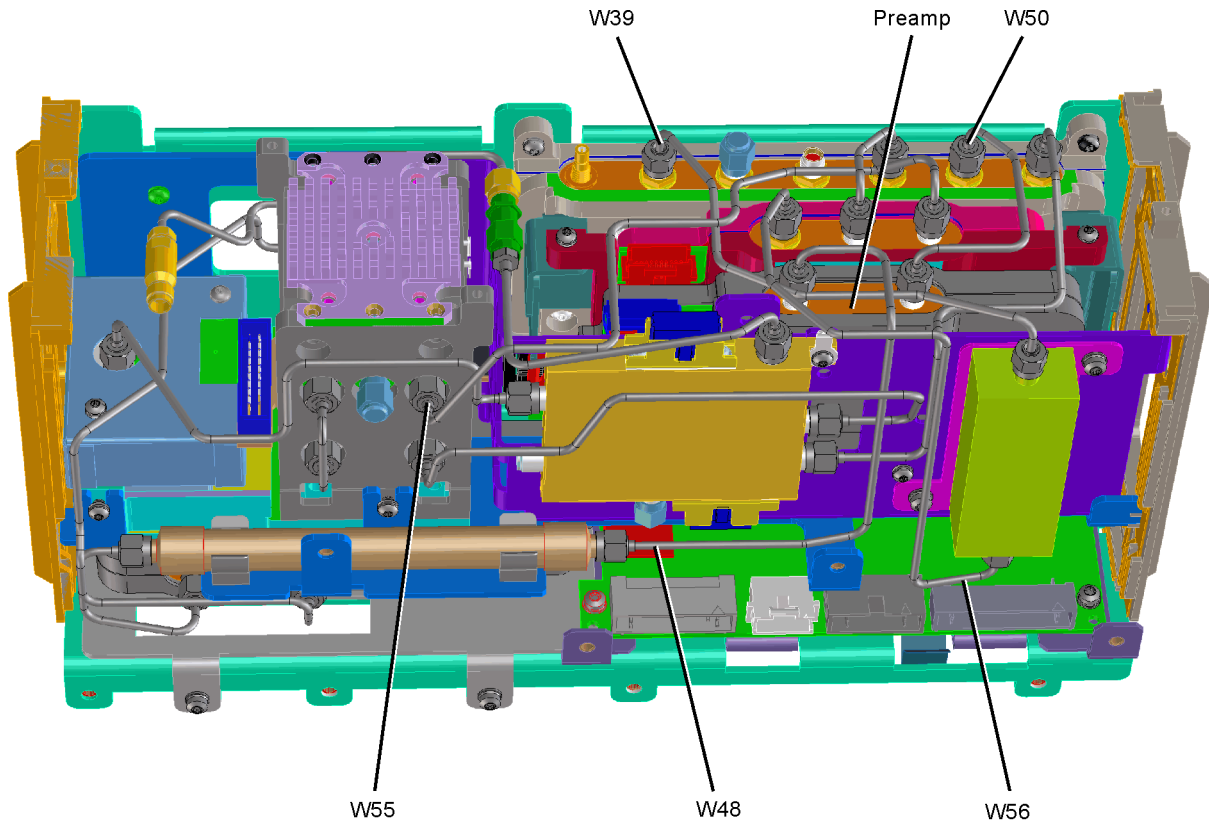
se85a



## Uninstalling Option 1DS

1. Locate the RF section on the right side of the instrument. Figure 3 shows cable locations and the preamplifier mounting orientation.

**Figure 3 Preamplifier Location**



de812a

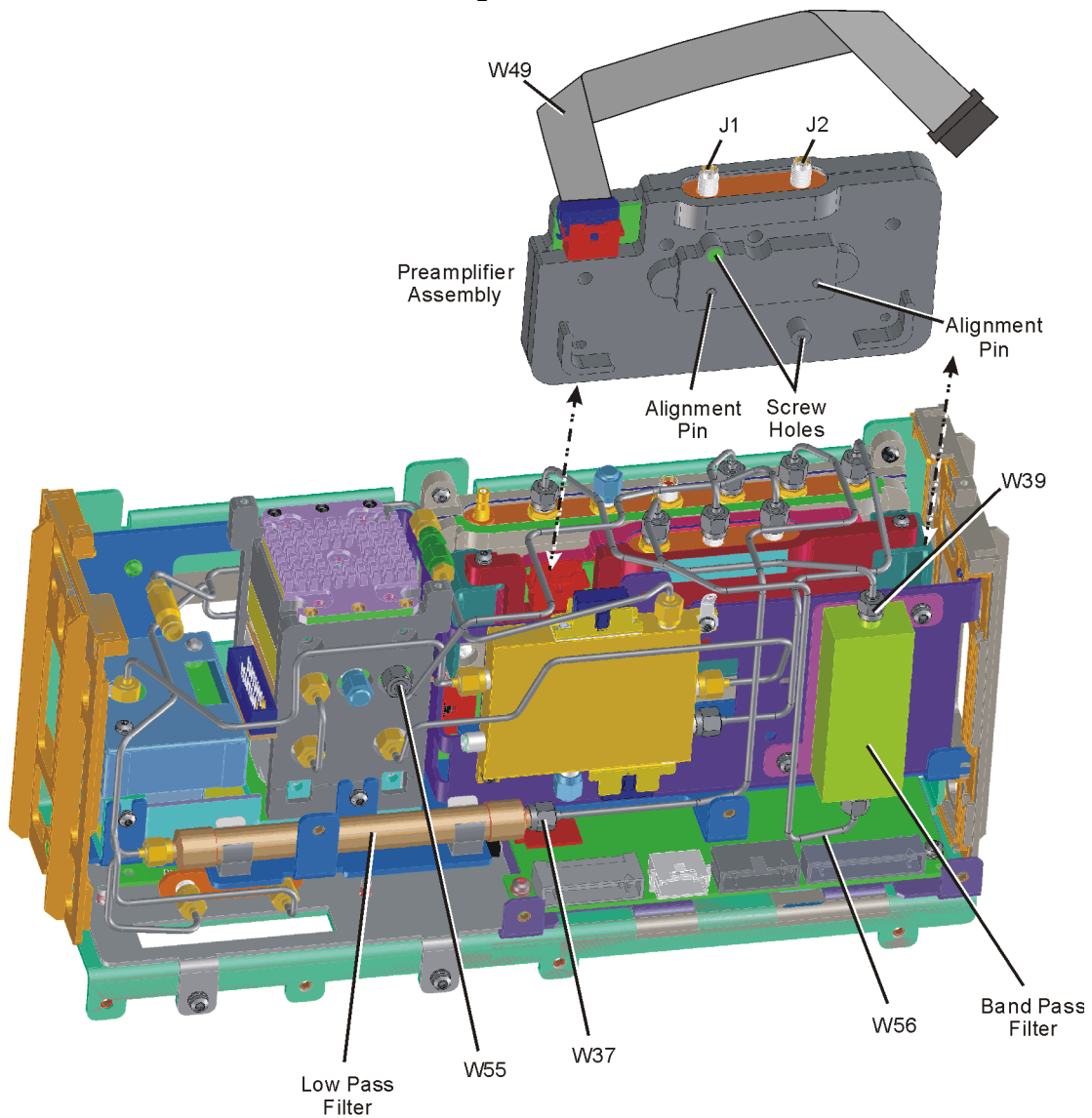
2. Locate and remove cable W55 (SBTX to FIFA rear connector), E4446-20045. This cable will be replaced later. It is removed to allow the preamplifier assembly to be removed.
3. Locate and remove cable W56 (FIFA front connector to Band Pass filter), E4446-20046. This cable will be replaced later. It is removed to allow the preamplifier assembly to be removed.
4. Locate and remove cable W39 (low band assembly J4 to band pass filter), E4446-20058, using the 5/16-inch wrench. This cable will be replaced later. It is removed to allow the preamplifier assembly to be removed.
5. Locate and remove cable W50 (preamplifier J2 and low band assembly J1 RF IN). Discard this cable, since it will be replaced by another cable.

**CAUTION**

In the following step, use a 7/16-inch wrench on one of the wrench flats at the ends of the filter to prevent the filter body from rotating when removing the cable. Cables can be damaged if the low pass filter is allowed to rotate when loosening or tightening the cable connector.

6. Locate and remove cable W48 (low pass filter and J1 on the preamplifier). Discard this cable, since it will be replaced by another cable.
7. Uninstall the preamplifier and the ribbon cable. Use a T-10 Torx driver to remove the two screws.

**Figure 4 Remove the Preamplifier**



preamp\_remove

8. Reconnect cable W39 (low band assembly J4 to band pass filter), E4440-20081. Torque to 10 in-lbs.
9. Reconnect cable W56 (FIFA front connector to band pass filter), E4446-20046. Torque to 10 in-lbs.
10. Reconnect cable W55 (SBTX to FIFA rear connector), E4446-20045. Torque to 10 in-lbs.

---

**CAUTION**

In the following step, use a 7/16-inch wrench on one of the wrench flats at the ends of the filter to prevent the filter body from rotating when removing the cable. Cables can be damaged if the low pass filter is allowed to rotate when loosening or tightening the cable connector.

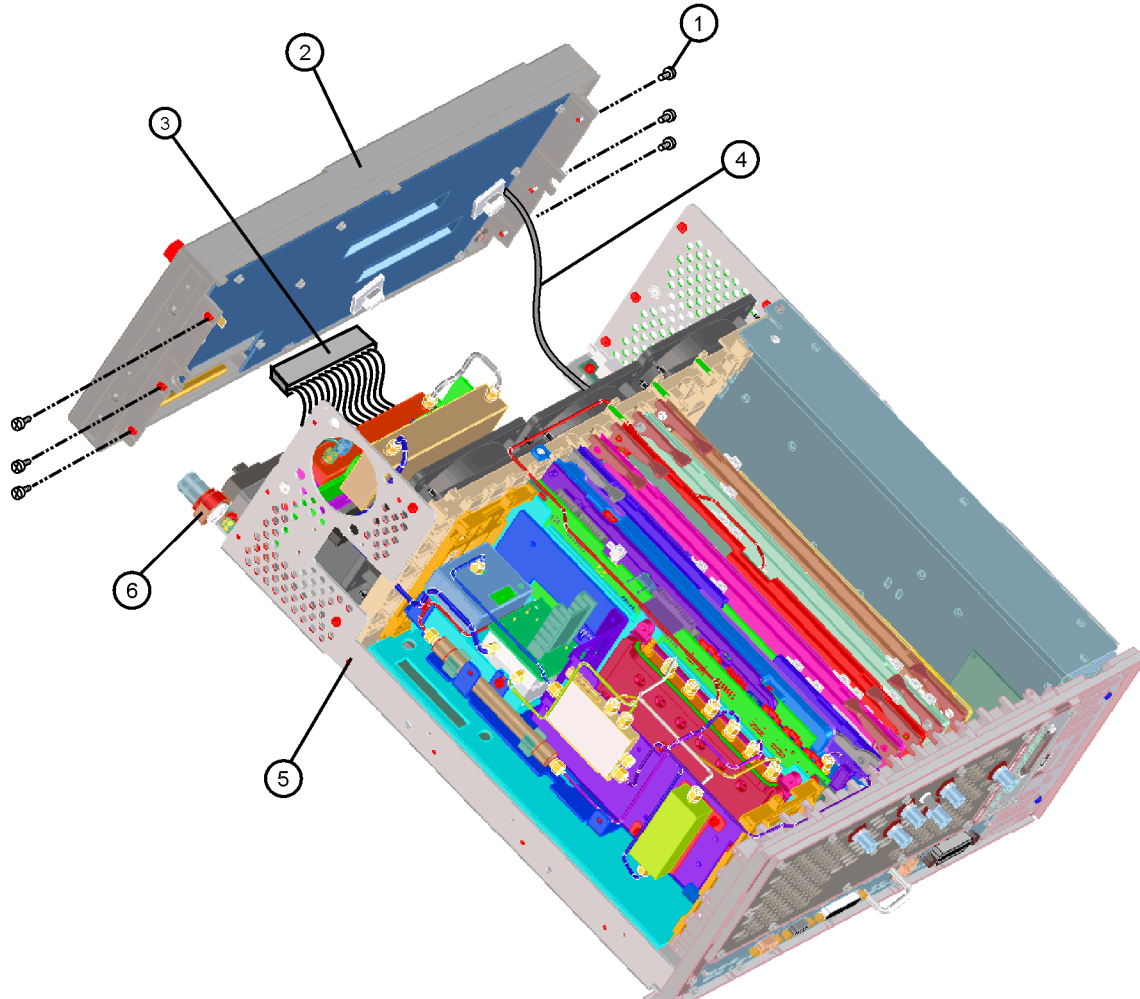
---

11. Locate semi-rigid cable W37 (E4446-20037) from the kit. Install the cable from the low band assembly J1 to the low pass filter. Torque to 10 in-lbs.

## Drop the Front Frame

1. Refer to Figure 5. Using the T-10 driver, remove the 7 screws (1) that attach the front frame assembly (2) to the deck.
2. Pull the front frame off of the deck until it is disengaged from the disc drive.

**Figure 5**      **Front Frame Assembly Removal**  
(6 PLACES)

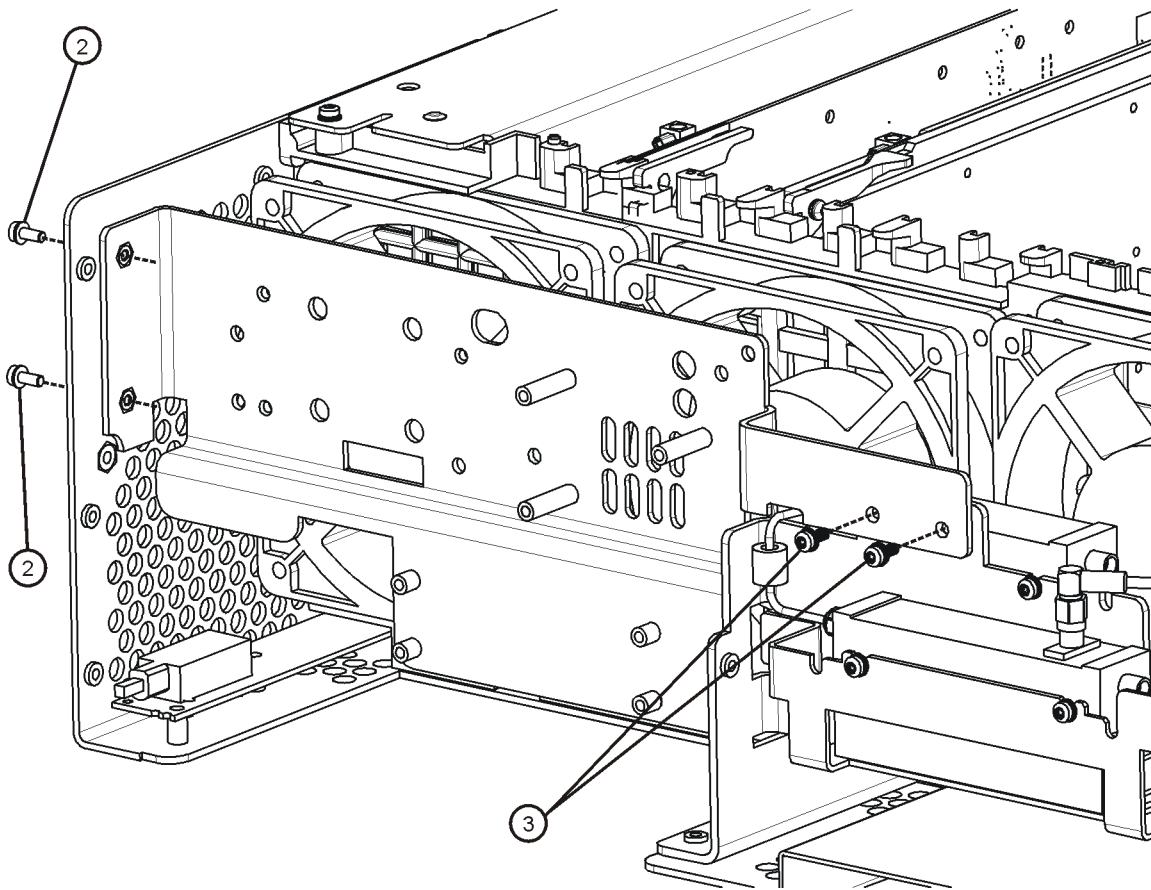


3. At this point, the front frame can be placed flat on the bench for service while still attached to the instrument.

## Installing the Preamplifier without Option 123

1. Locate the Main Bracket (E4440-00062) from the kit and install it as shown (1). Refer to Figure 6.
  - a. Insert two screws (0515-0458) labeled as (2). Use T-15 driver to torque to 9 in-lbs.
  - b. Insert two screws (0515-0372) labeled as (3). Use T-15 driver to torque to 9 in-lbs.

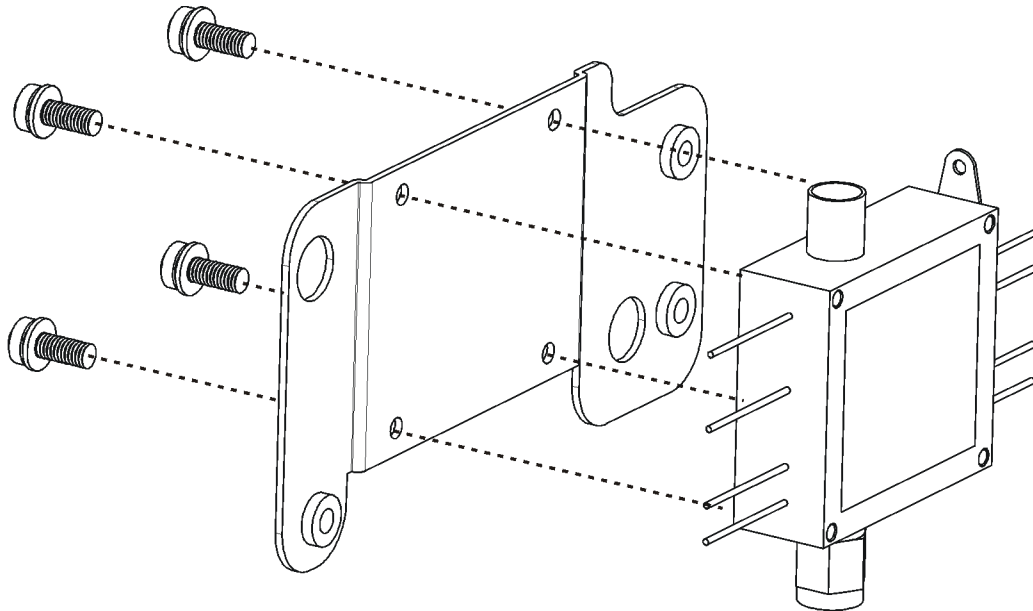
**Figure 6** Installing Bracket



## Installation Procedure

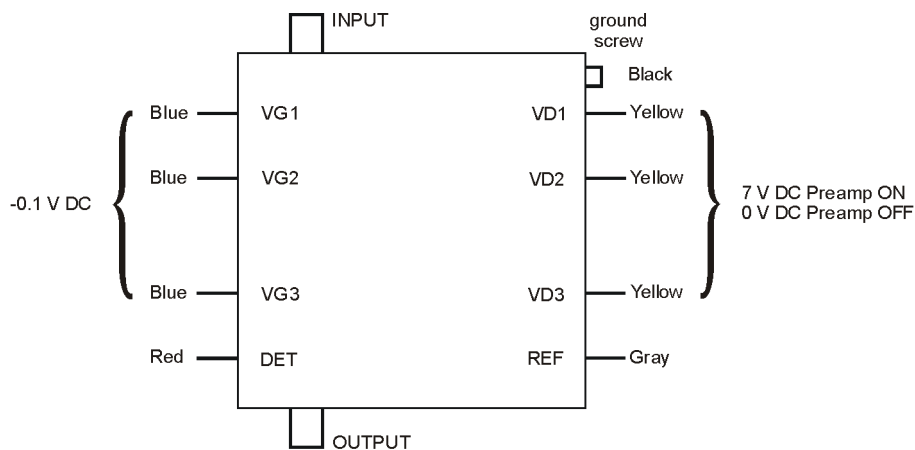
2. Refer to Figure 7. Mount the Preamplifier (0955-1617) to the Preamplifier Bracket (E4440-00075) with 4 screws (0520-0129) and 4 washers (2190-0112). Torque to 3 in-lbs with POZI-1 driver.

**Figure 7 Preamplifier and Bracket**



3. Locate wire harness W106 (E4446-60076) from the kit and connect it to the preamplifier as shown in Figure 8. The black wire with the ground lug attaches under the ground screw.

**Figure 8 Preamplifier Wires**

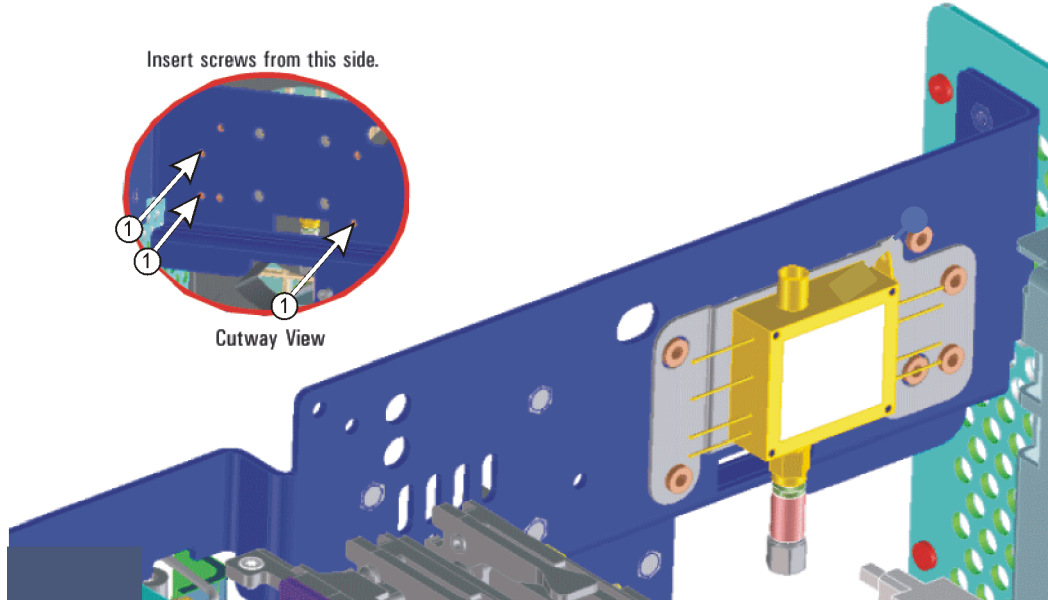


opt110\_preamp\_inote

4. Locate the 3 dB Attenuator (08490-60010) from the kit and put it on the output of the preamplifier. Use a 7 mm wrench and torque to 10 in-lbs.

- Refer to Figure 9. Mount the Preamplifier Bracket (E4440-00075) to the Main Bracket (E4440-00062) and secure with 3 screws (0515-0372) (1). Torque to 9 in-lbs.

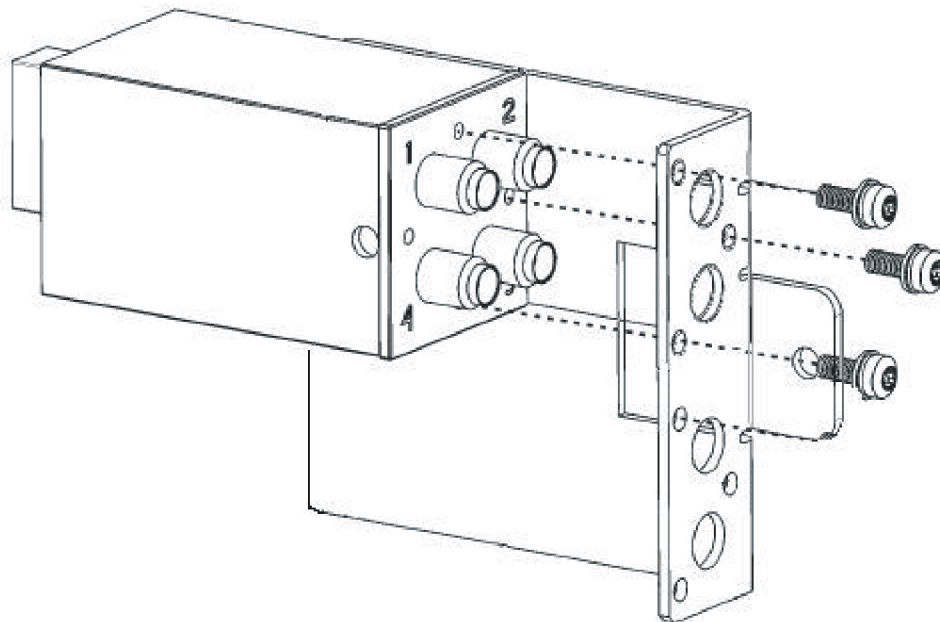
**Figure 9 Preamplifier Bracket to Main Bracket**



- Locate switch SW4 (87222-60015) and Switch Bracket (E4440-00063) from the kit and secure the switch to the switch bracket with three screws (0515-1934) as shown in Figure 10.\* Torque to 6 in-lbs.

\* Switch ports 1 & 4 will not be covered by the switch bracket.

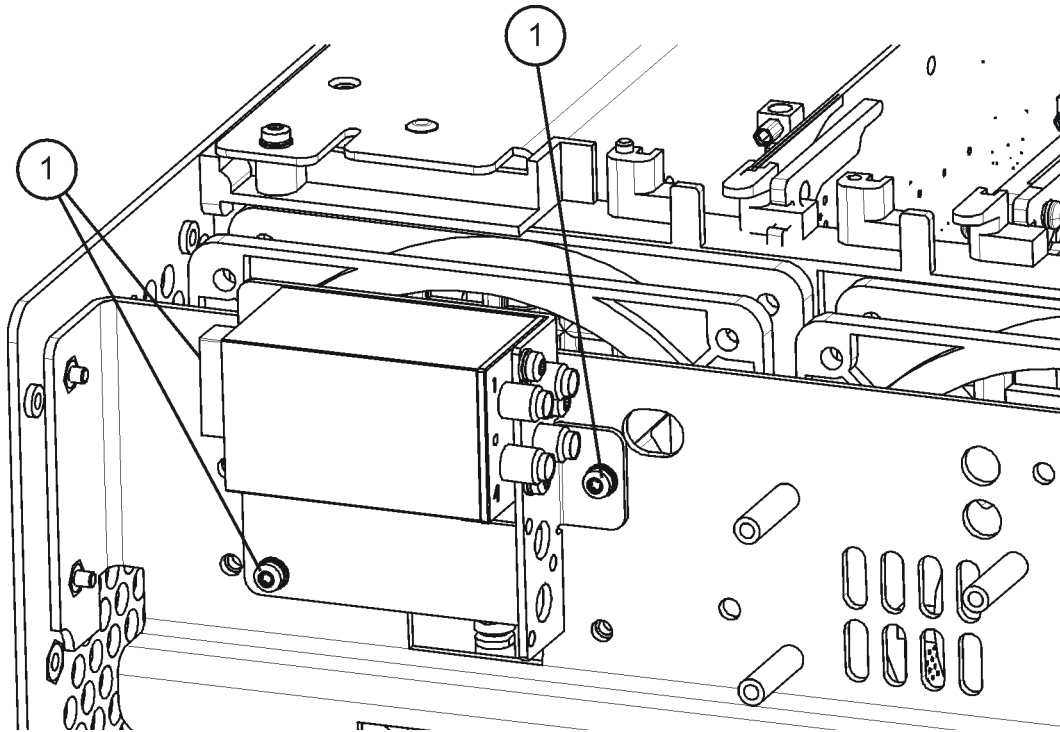
**Figure 10 Switch Bracket**



## Installation Procedure

7. Locate ribbon cable W91 (E4440-60455) from the kit and attach the it to switch SW4.
8. Refer to Figure 11. Attach the switch assembly to the main bracket with 3 screws (0515-0372) (1). Torque to 9 in-lbs.

**Figure 11** Switch to Main Bracket

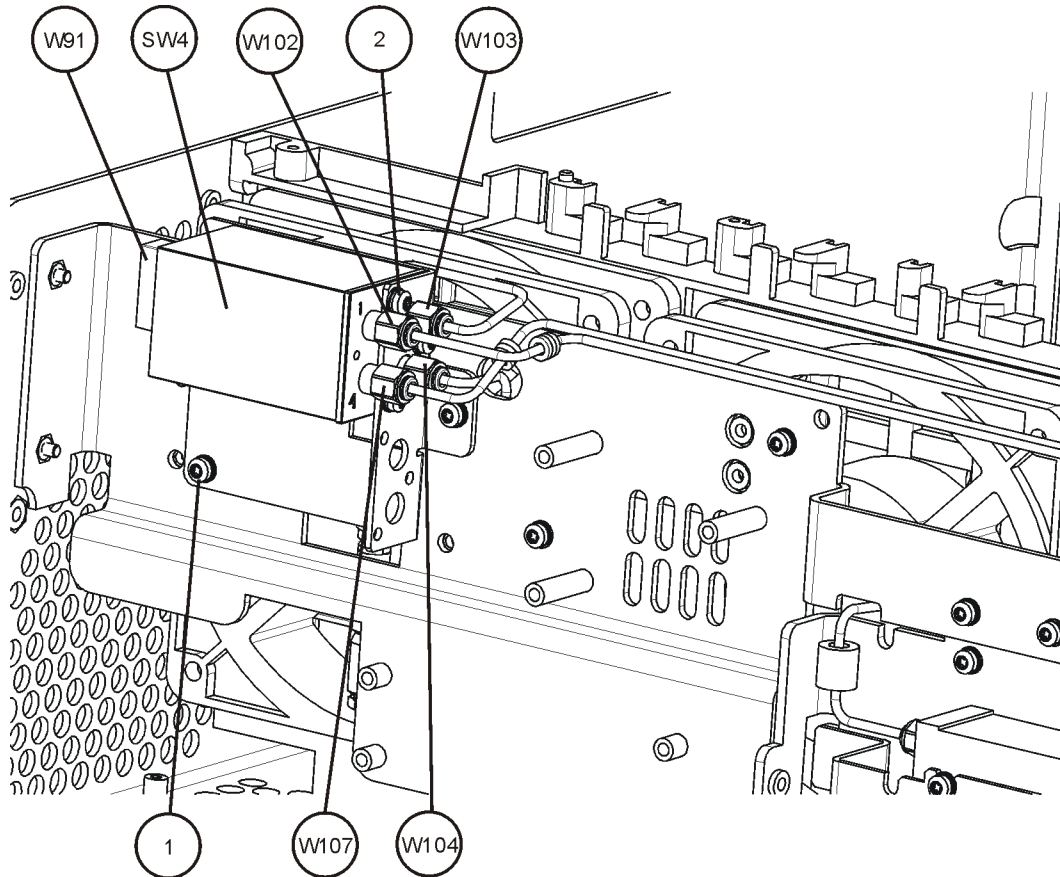


9. Locate and remove semi-rigid cable W33 (attenuator A14 to W34 on the RYTHM/SBTX), E4446-20022. Discard this cable, since it will be replaced by another cable.



10. Refer to Figure 12. Locate semi-rigid cable W103 (E4446-20078) from the kit. Install the cable from switch SW4 port 2 to the preamplifier input. Torque to 10 in-lb.

**Figure 12 Semi-Rigid Cables**



46\_110\_only

---

**CAUTION**

In the following step, use a 5/16 inch wrench on the attenuator to prevent the attenuator from rotating when installing the cable. The attenuator can be damaged if it is allowed to rotate when loosening or tightening the cable connector.

---

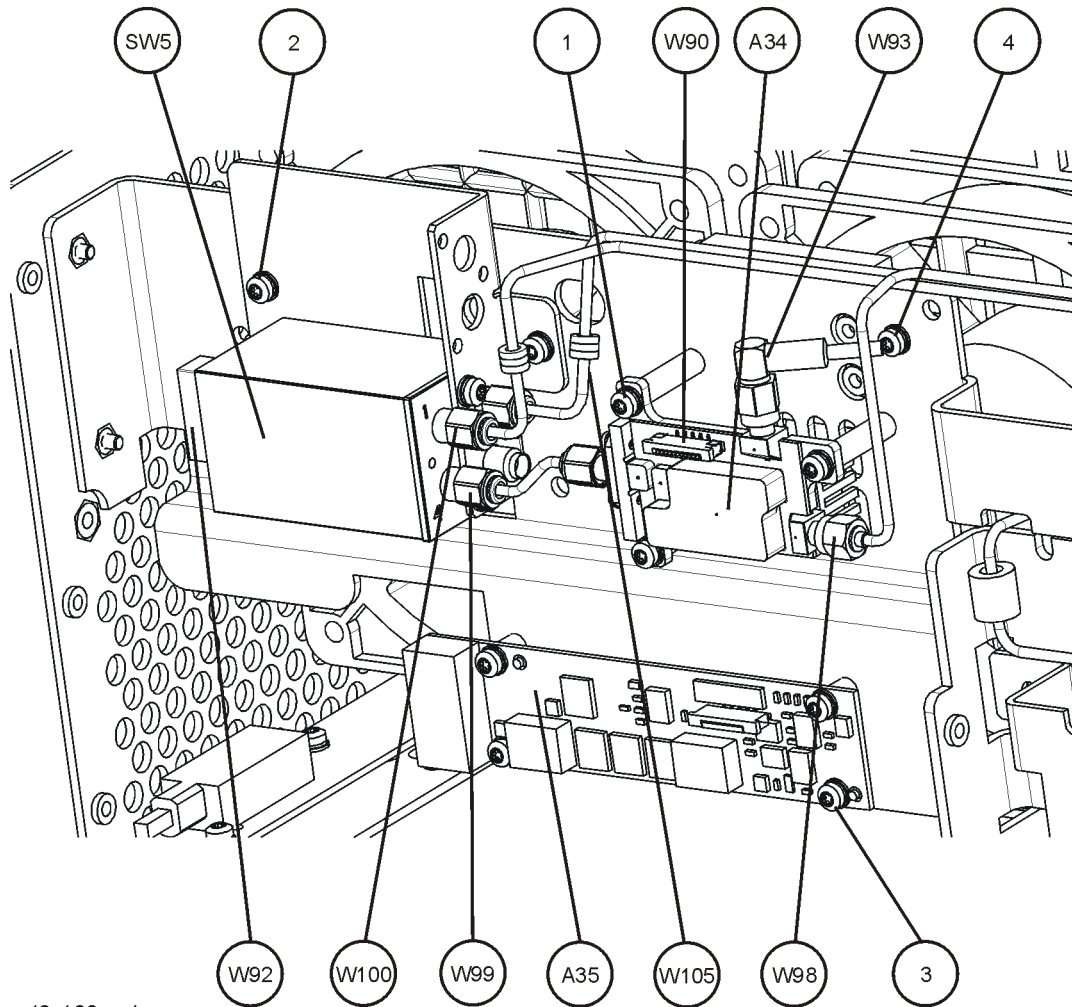
11. Locate semi-rigid cable W104 (E4446-20083) from the kit. Install the cable from the attenuator on the preamplifier output to switch SW4 port 3. Torque to 10 in-lb.
12. Locate semi-rigid cable W107 (E4446-20072) from the kit. Install the cable from switch SW4 port 4 to W34 on the RYTHM/SBTX. Torque to 10 in-lb.
13. Locate semi-rigid cable W102 (E4446-20077) from the kit. Install the cable from switch SW4 port 1 to Attenuator A14. Torque to 10 in-lb.
14. Use the cable tie to secure cables W107 and W102 to each other above the input connector of the input attenuator "B".

Continue with the section "Replace the Front Panel".

## Installing the Preamplifier with Option 123

1. Locate and remove semi-rigid cable W100 (attenuator to switch SW5 port 1), E4446-20071. Discard this cable, since it will be replaced by another cable.

**Figure 13 Option 123 Assembly and Cable Locations**

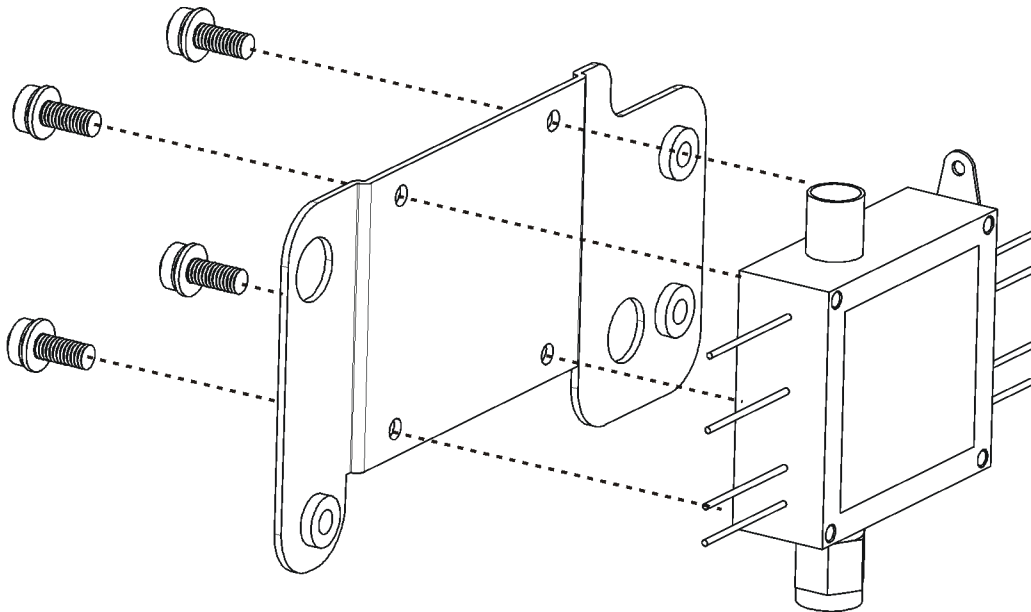


46\_123\_only

2. Locate and remove cable W105 (switch SW5 port 2 to W34 on the RYTHM/SBTX), E4446-20080. This cable will be replaced later. It is removed to allow the switch assembly to be removed.
3. Locate and remove ribbon cable W92 (switch SW5 to Option Driver Board J8), E4440-60455. This cable will be replaced later. It is removed to allow the switch assembly to be removed.
4. Loosen the three screws (2) that attach the switch bracket to the main bracket. This will allow the cable W99 to be removed.
5. Locate and remove cable W99 (Unpreselected Mixer A34 output to switch SW5 port 4), E4446-20318. This cable will be replaced later. It is removed to allow the switch assembly to be removed.

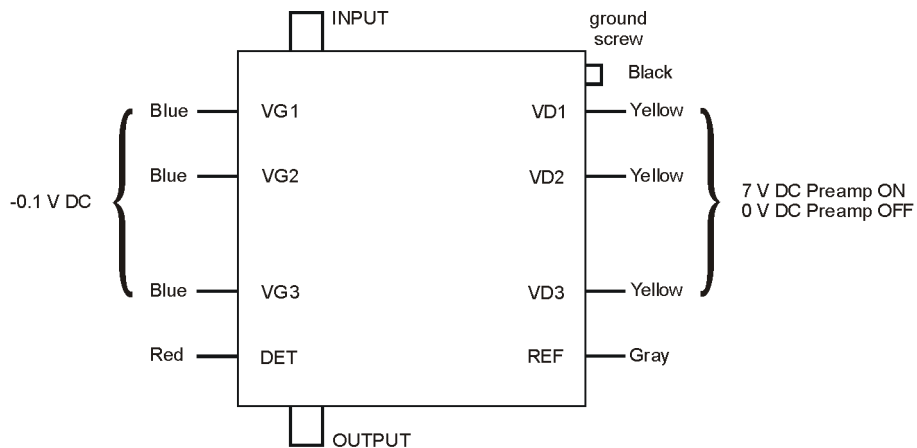
6. Remove the three screws (2) that attach the switch bracket to the main bracket. Lift the switch bracket assembly from the instrument.
7. Refer to Figure 14. Mount the Preamplifier (0955-1617) to the Preamplifier Bracket (E4440-00075) with 4 screws (0520-0129) and 4 washers (2190-0112) Torque to 3 in-lbs with POZI-1 driver.

**Figure 14 Preamplifier and Bracket**



8. Locate wire harness W106 (E4446-60076) from the kit and connect it to the preamplifier as shown in Figure 15.

**Figure 15 Preamplifier Wires**



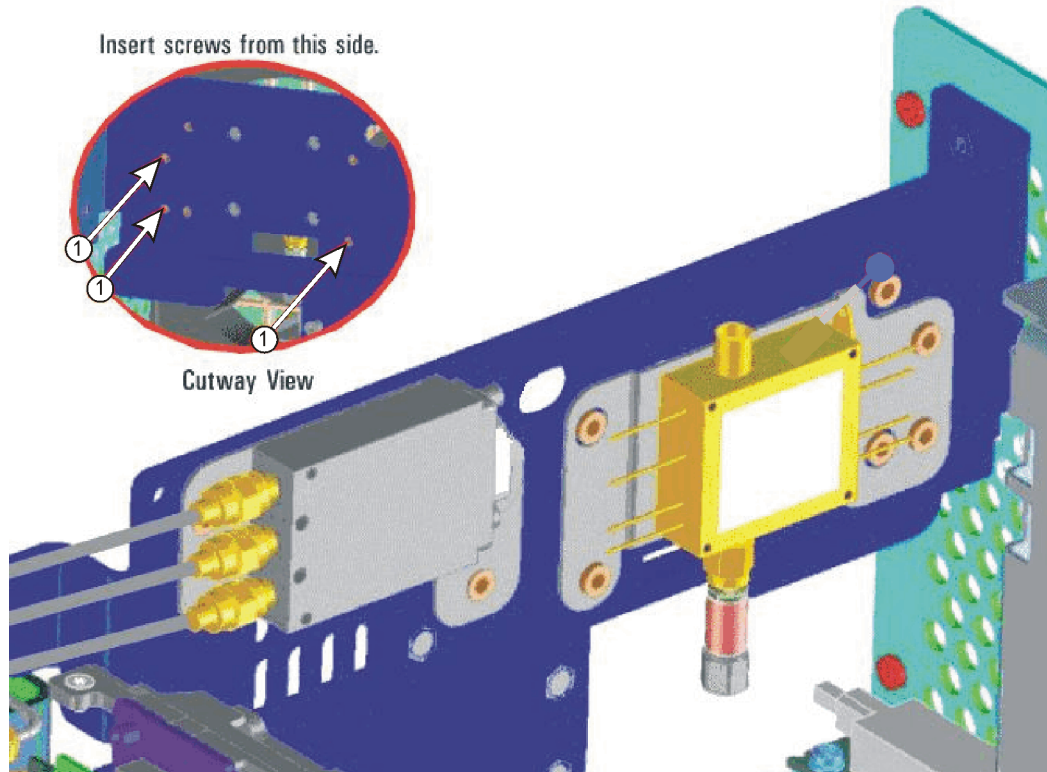
opt110\_preamp\_inote

9. Locate the 3 dB Attenuator (08490-60010) from the kit and put it on the output of the preamplifier. Use a 7 mm wrench and torque to 10 in-lbs.

## Installation Procedure

10. Refer to Figure 16. Mount the Preamplifier Bracket (E4440-00075) to the Main Bracket (E4440-00062) and secure with 3 screws (0515-0372) Torque to 9 in-lbs.

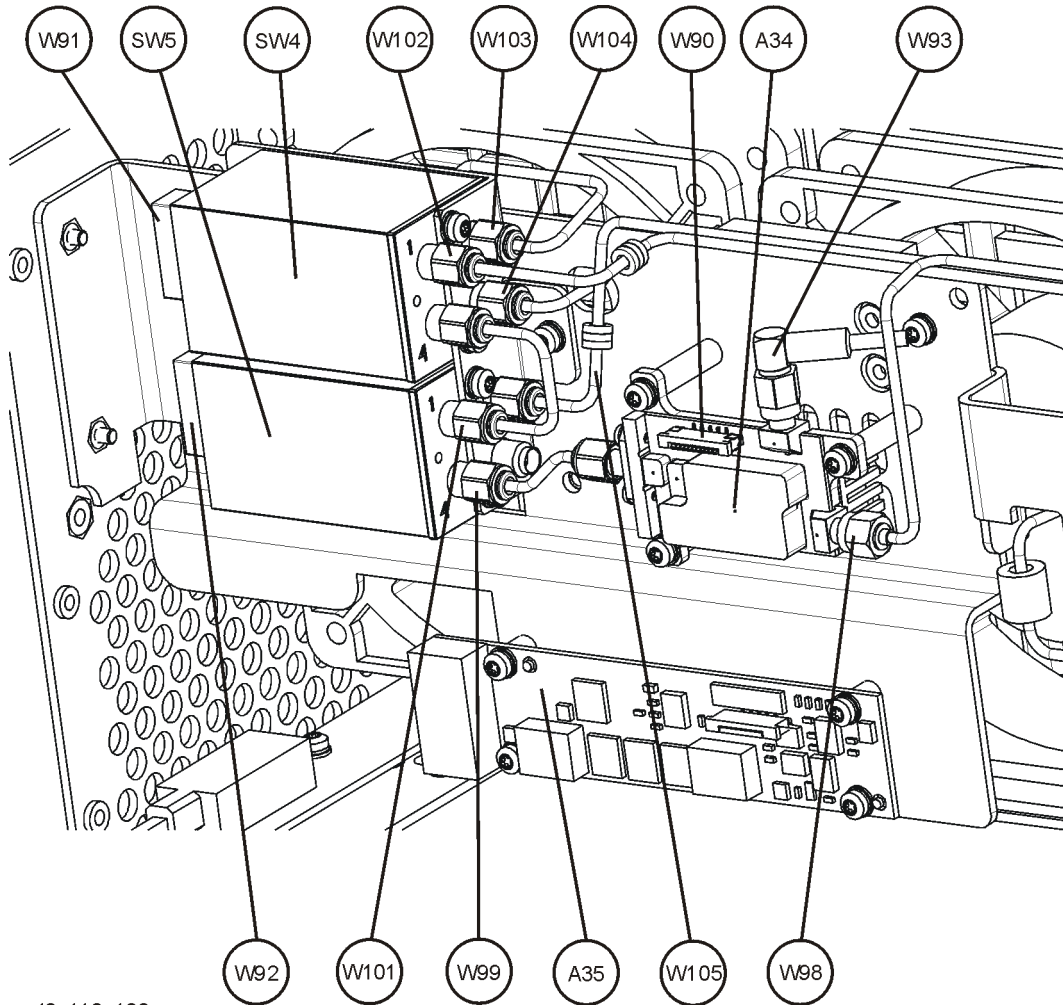
**Figure 16 Preamplifier Bracket**



11. Locate switch SW4 (87222-60015) from the kit and secure it to the switch bracket above switch SW5 with three screws (0515-1934).
12. Reattach the switch assembly to the main bracket with 3 screws (0515-0372). Leave the screws loose.
13. Reconnect semi-rigid cable W99 (Unpreselected Mixer A34 output to switch SW5 port 4), E4446-20318. Torque to 10 in-lbs.
14. Tighten the three screws that attach the switch assembly to the main bracket. Torque to 9 in-lbs.
15. Refer to Figure 17. Reconnect ribbon cable W92 (switch SW5 to Option Driver Board J8), E4440-60455.
16. Locate the ribbon cable W91 (switch SW4 to Option Driver Board J3), E4440-60455 from the kit and attach it to switch SW4.

17. Reconnect semi-rigid cable W105 (switch SW5 port 2 to W34 on the RYTHM/SBTX), E4446-20080. Torque to 10 in-lbs.

**Figure 17** Options 110 and 123  
E4446A, E4447A, E4448A



46\_110\_123

---

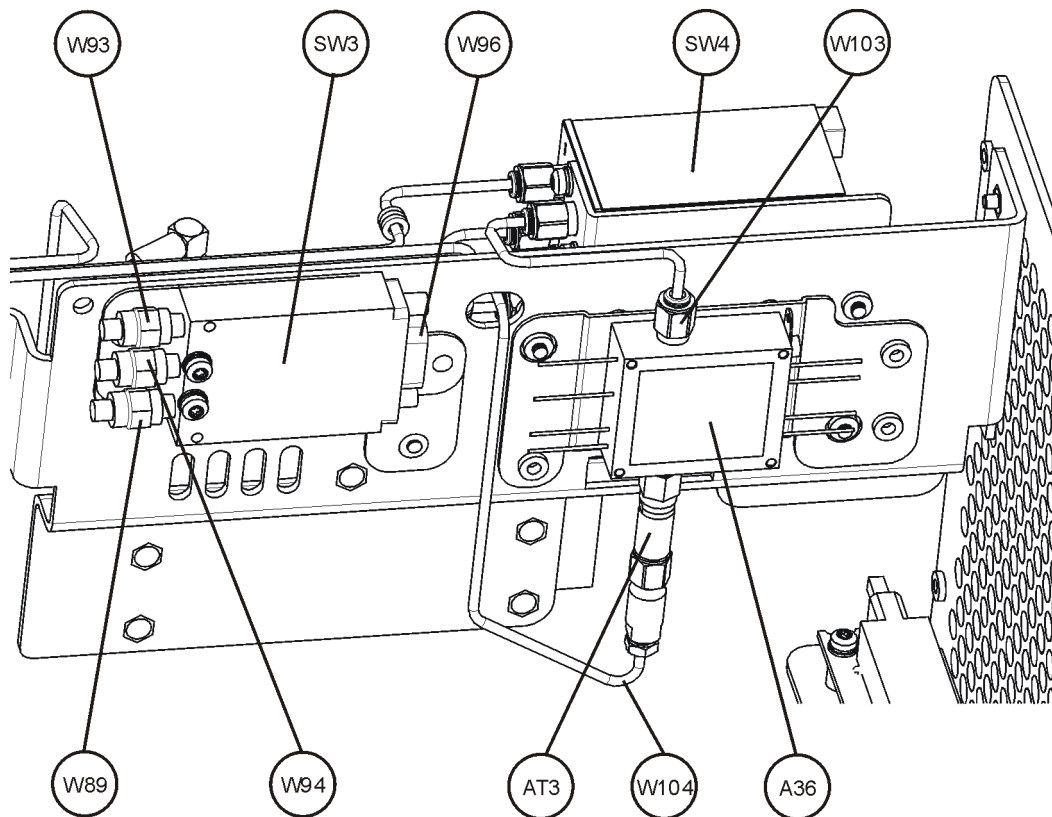
**CAUTION**

In the following step, use a 5/16 inch wrench on the attenuator to prevent the attenuator from rotating when installing the cable. The attenuator can be damaged if it is allowed to rotate when loosening or tightening the cable connector.

---

18. Refer to Figure 18. Locate semi-rigid cable W104 (E4446-20083) from the kit. Install this cable from the attenuator on the preamplifier output through the main bracket to switch SW4 port 3. Torque to 10 in-lb.

**Figure 18 Options 110 and 123  
E4446A, E4447A, E4448A (Rear View)**

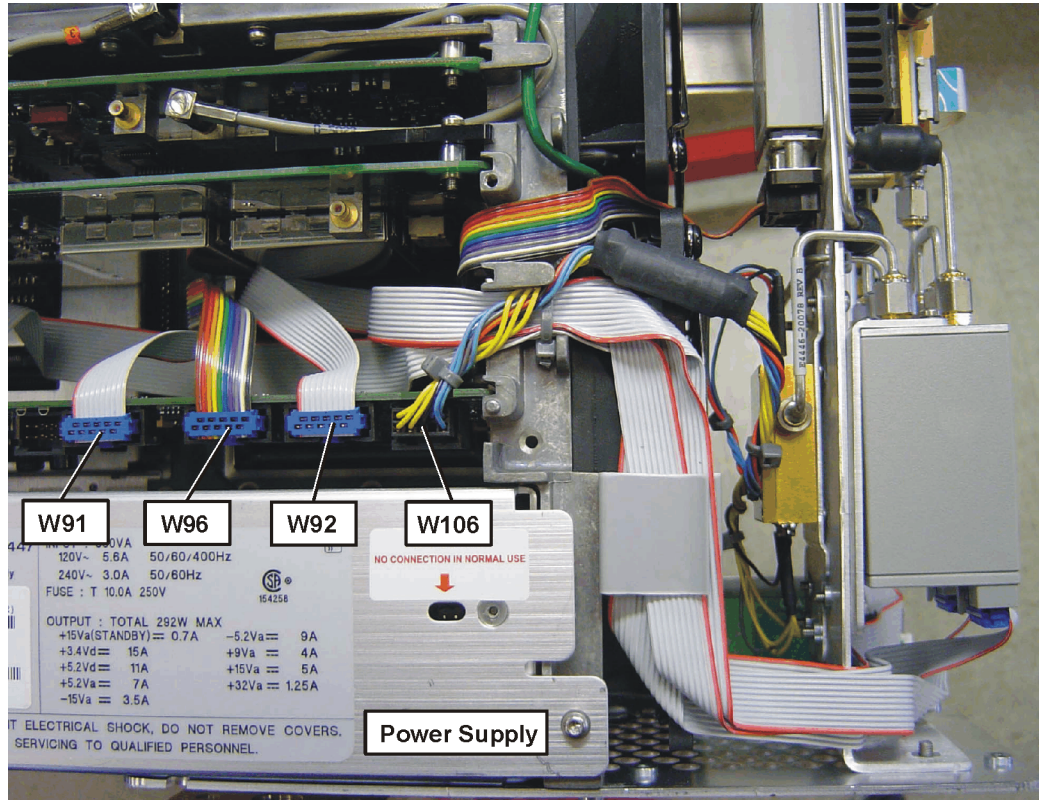


46\_110\_123\_rear

19. Refer to Figure 17. Locate semi-rigid cable W103 (E4446-20078) from the kit. Install this cable from switch SW4 port 2 to the preamplifier input. Torque to 10 in-lb.
20. Locate semi-rigid cable W102 (E4446-20077) from the kit. Install this cable from Attenuator B output to switch SW4 port 1. Torque to 10 in-lb.
21. Locate semi-rigid cable W101 (E4446-20081) from the kit. Install this cable from switch SW4 port 4 to switch SW5 port 1. Torque to 10 in-lb.

22. Refer to Figure 19. Connect wire harness W106 from the A36 Preamplifier to Option Driver Board P1.

**Figure 19 Option Driver Board Cables**



23. Connect ribbon cable W91 from switch SW4 to Option Driver Board J3.
24. Use the cable tie to secure cables W105 and W102 to each other above the input connector of input attenuator "B".

## Replace the Front Panel

Refer to Figure 5. Position the front frame on the deck using the alignment bosses on the deck. Remember to tuck the ribbon cable under the fans when pushing the frame onto the deck. This will insure proper airflow to cool the instrument. Using the T-10 driver, replace the 7 screws that secure the front frame to the deck. Torque to 9 inch pounds.

## Installing the Option Driver Board

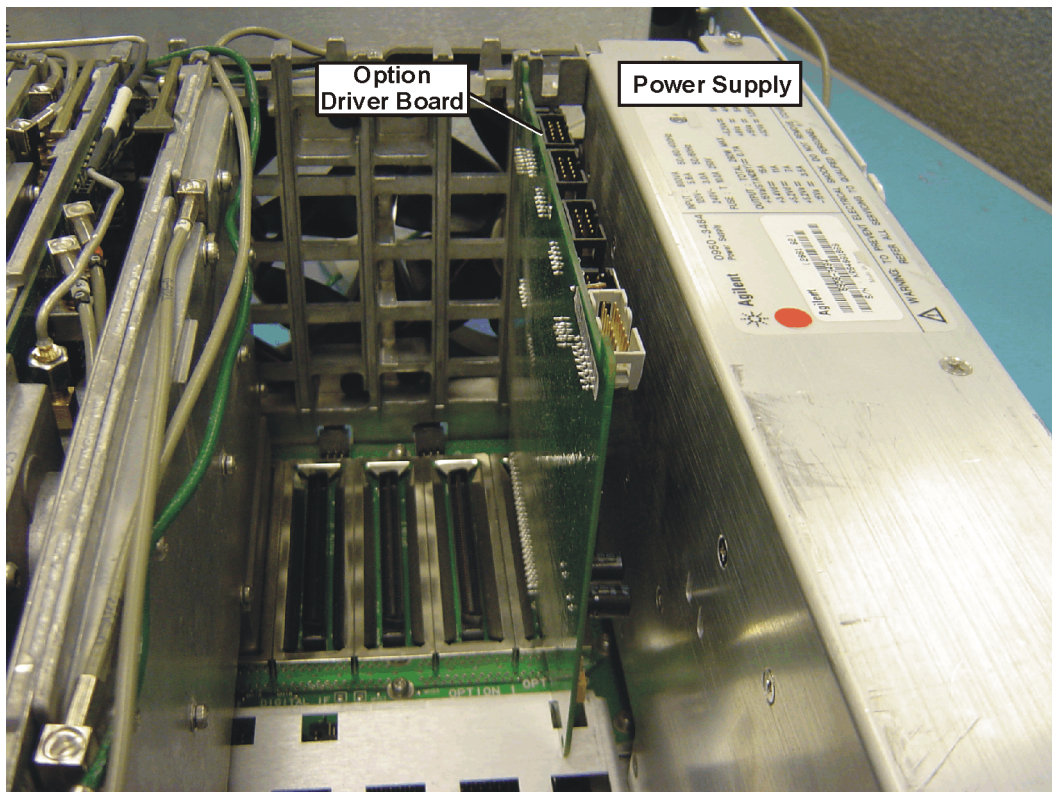
---

**NOTE** Not required if Option 123 is currently installed.

---

1. Locate the Option Driver Board (E4440-60253) from the kit. Install the board into Option slot 0 as shown in Figure 20. Ensure the board is fully seated.

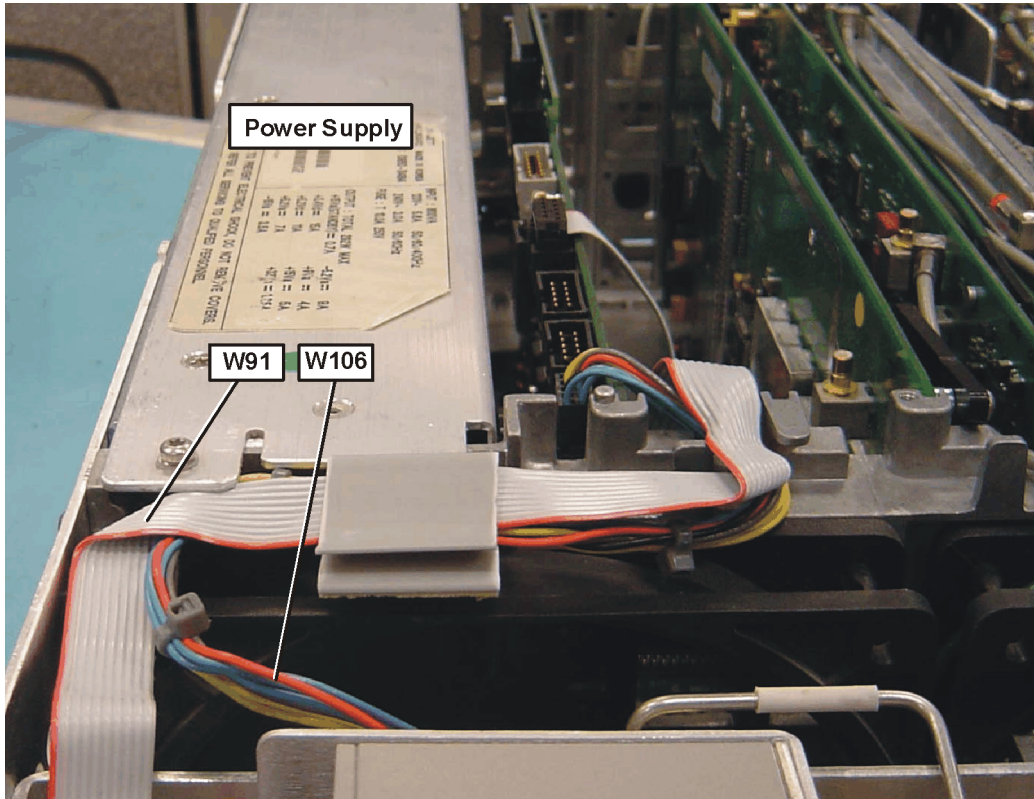
**Figure 20** Option Driver Board Installation





2. Locate the PVC Cable Clamp (1400-0611) from the kit. Remove the paper backing and adhere the clamp to the top of the fan and dress ribbon cable W91 and wire harness W106 through the clamp as shown in Figure 21.

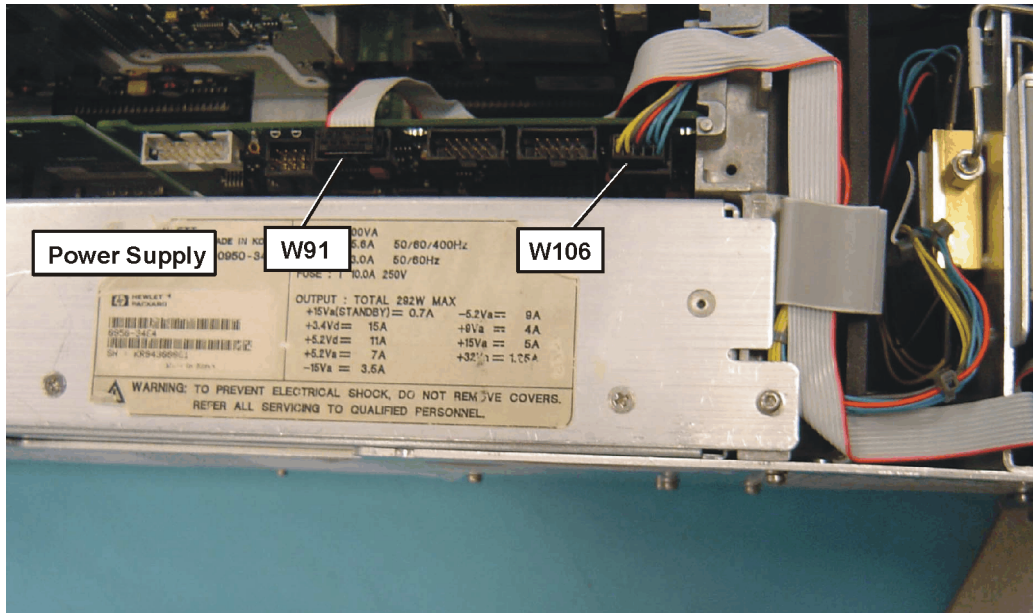
**Figure 21 Cable Clamp**



## Installation Procedure

3. Refer to Figure 22. Connect wire harness W106 from the A36 Preamplicator to Option Driver Board P1.
4. Connect ribbon cable W91 from switch SW4 to Option Driver Board J3.

**Figure 22 Option Driver Board Cables**



## Replace the Top Brace and Outer Case

1. Refer to Figure 2.
2. Carefully position the top brace on the deck. The alignment pin at the center of the web/fan assembly must mate with the alignment hole on the top brace. Make sure that no coaxial cables will get pinched underneath the brace.
3. Use the T-10 driver to replace and tighten the top screws first; then replace the side screws. Torque to 101 Ncm (9 in-lb).
4. Refer to Figure 1.
5. Slide the instrument cover back onto the deck from the rear. The seam on the cover should be on the bottom. Be sure the cover seats into the gasket groove in the front frame.
6. Replace the four rear feet onto the rear of the instrument. Torque to 236 Ncm (21 in-lb).
7. Use the T-20 driver to replace the handles. Torque to 236 Ncm (21 in-lb).
8. Replace the four bottom feet by pressing them into the holes in the case and sliding them in the opposite direction of the arrows until they click into place. Note that the feet at the front have the tilt stands.

## Obtain a License Key and Activate the Option

The entitlement certificate supplied in this kit allows you to obtain a license key from our Agilent website so you can enable this upgrade option. Once you have retrieved the license key, you can begin the process of activating the option.

---

**NOTE** The option designator 110 and the license keyword must be entered into instrument memory in addition to the correct firmware before the hardware will function.

---

1. Locate the License Key Entitlement Certificate in the kit and follow the directions to redeem it. A license keyword will be e-mailed to you.
2. Plug in instrument and power up. There may be alignment error messages since new hardware was installed.
3. On the instrument front panel press: **System, More**, until the **Licensing** softkey is visible. Press **Licensing** and **Option**. This will activate the alpha editor menu. Use the alpha editor and the front panel numerical keypad to enter the upper-case option designator 110. Enter the letters using the alpha editor and the numeric keypad to enter the numbers. Press the **Enter** key. Note that 110 now appears on the **Option** key.
4. Press **License Key**. The license key number is a hexadecimal number that will require the entry of both letters and numbers. Use the alpha editor and the front panel numerical keypad to enter the license key number. Your entry will appear in the active function area of the display. If you make a typing error, use the backspace key to correct the error. Check the license key number you entered. Press **Enter, Activate License**.

## Install New Instrument Firmware

Download the PSA Update Program and the PSA Firmware Procedure from

[http://www.agilent.com/find/psa\\_firmware](http://www.agilent.com/find/psa_firmware)

Follow the directions to install the firmware.

Alternate method:

Install the Firmware Upgrade Kit E4440AU Option UE2.

## Verify the Option is Enabled

Check for the presence of Option 110 by pressing **System, Show System** and verify that 110 appears in the option field.

Check for the recognition of hardware by pressing **System, Show Hardware** and looking for Option Driver Board.

## Utilities, Adjustments and Performance Verification Tests Required

### Utilities Required

Under the Utilities test plan, perform the Calibration Constant Reset for Installing Option 110.

### Adjustments Required

<b>Adjustments</b>
Frequency Response adjustment less than 3 GHz
Frequency Response adjustment above 3 GHz
Frequency Response adjustment (Option 110)
Frequency Response adjustment (Option 123) if Option 123 is present

### Performance Testing Required

The performance tests listed below are the minimum set that will verify the hardware retrofit just installed is functioning correctly. Performing only these tests does not guarantee the instrument meets all specifications.

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

<b>Performance Tests</b>
Absolute Amplitude Accuracy
Residual Responses
Displayed Average Noise Level
Frequency Response 300 kHz to 3 GHz
Frequency Response above 3 GHz
Frequency Response (Option 110)
Frequency Response (Option 123) if Option 123 is present

Adjustments and performance testing requires the use of the calibration software. The latest software information and downloads are available at:

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

### End of Installation

For assistance, get in touch with your nearest Agilent Technologies Sales and Service Office. To find your local Agilent office access the following URL, or call the following telephone number:

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

1-800-452-4844 (8am-8pm EST)

