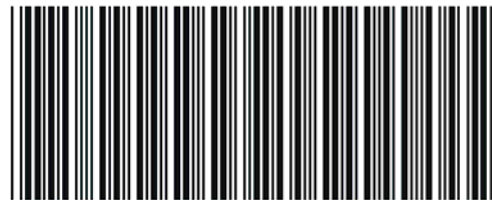


Installation Note

**Agilent Technologies ESG Vector Signal Generator
Upgrade Kit for Option UN7
(Internal Bit Error Rate Analyzer)
Kit Part Number E4400-60633**



**Part Number E4400-90552
Printed in USA May 2005
Supersedes April 2004**



E4400-90552

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ESG Vector Signal Generator Upgrade Kit for Option UN7 (Internal Bit Error Rate Analyzer) Kit Part Number E4400-60633

Product Affected:	E4438C
Serial Numbers:	All
Options:	501, 502, 503, 504, 506
To Be Performed By:	(X) Agilent Technologies Service Center (X) Personnel Qualified by Agilent Technologies (X) Customer
Estimated Installation Time:	1.5 hours
Estimated Verification Time:	0.5 hours

Introduction

This upgrade kit adds an internal bit-error-rate (BER) analyzer to the E4438C Options 501, 502, 503, 504, and 506.

Installation includes the following major steps:

1. Check the signal generator's operation.
2. Remove the outer and inner instrument covers.
3. Install additional cables and connectors to the rear panel.
4. Install the A11 Internal Bit Error Rate analyzer board.
5. Redeem and install the license key.
6. Install new firmware.
7. Verify installation of option UN7.
8. Option UN7 (BERT) Check.
9. Re-assemble the signal generator.

Installation Kit Parts List

Item	Quantity	Description	Part Number
1	1	ESG-C Firmware Upgrade Kit	E4400-60597
2	1	Option UN7 Label	7121-1232
3	1	A11 Internal BER	E4400-60519
4	3	Cables W23, W24, W25	8121-0659
5	3	Washers	2190-0124
6	3	Nut-hex 10-32	2950-0078
7	1	Ribbon Cable W10	8121-0679
8	1	Color Clip: Red ^a	7121-5602
9	1	Color Clip: Orange ^a	7121-5603
10	1	Color Clip: Yellow ^a	7121-5604
11	3	Color Clip: Black ^a	7121-5610
12	1	Installation Note ^a	E4400-90552
13	1	Entitlement Certificate ^b	5964-5143

a. This item cannot be ordered separately.

b. Must be ordered separately if installed by the Agilent Service Center.

IMPORTANT

If the Agilent Service Center orders the Option UN7 upgrade kit using the 5x5 part number, then they must contact Agilent and order the entitlement certificate.

Tools Required

- TORX T-10 driver
- TORX T-15 driver
- TORX T-20 driver
- Long-Nose pliers
- 5/8 socket
- 9/16 socket
- 9/32 socket
- Ratchet 21 in-lb
- Hand Torque wrench 6 in-lb
- Hand Torque wrench 9 in-lb

Safety Considerations

WARNING	Before you disassemble the instrument, turn the power switch off and disconnect the line cord. Failure to unplug the signal generator 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.
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Check the Signal Generator's Operation

Use the following procedure to confirm that the signal generator powers up and that the internal check identifies no errors. The internal check evaluates the operation of the signal generator and returns an error message if it detects a problem.

NOTE	When signal generators with Option 1E5 are first connected to ac line power, the error message ERROR 514, Reference Oven Cold occurs which causes both the OVEN COLD annunciator and the ERR annunciator to turn on.
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After approximately five minutes, the **OVEN COLD** annunciator automatically clears, but the **ERR** annunciator remains on until all errors are cleared from the error queue.

1. Turn on the signal generator and let it warm up for at least five minutes.
2. Run the instrument self-test by pressing, **Utility > Instrument Info/Help Mode > Self Test > Run Complete Self Test**. Upon completion a summary of the self-test will be displayed. Use the service guide to troubleshoot any failures detected by the test.

NOTE	Some circuits may require up to 50 minutes to warm up before passing the self-test. If self-tests continue to fail after 50 minutes of warm up, troubleshoot the instrument.
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3. Check to see if the **ERR** annunciator is on.
 - If the **ERR** annunciator is on, review the error messages in the error queue by pressing **Utility > Error Info > View Next Error Message**. The first error message in the error queue appears in the display text area. (Refer to the signal generator error messages document for information about each error message.)

After resolving all problems causing errors, press **Clear Error Queue(s)**.
 - If the **ERR** annunciator is off, the signal generator functionality check has passed.

Remove the Outer and Inner Instrument Covers

Tools Required

- T-10 driver
- T-15 driver
- T-20 driver

Removing the Outer Cover

Refer to [Figure 1](#).

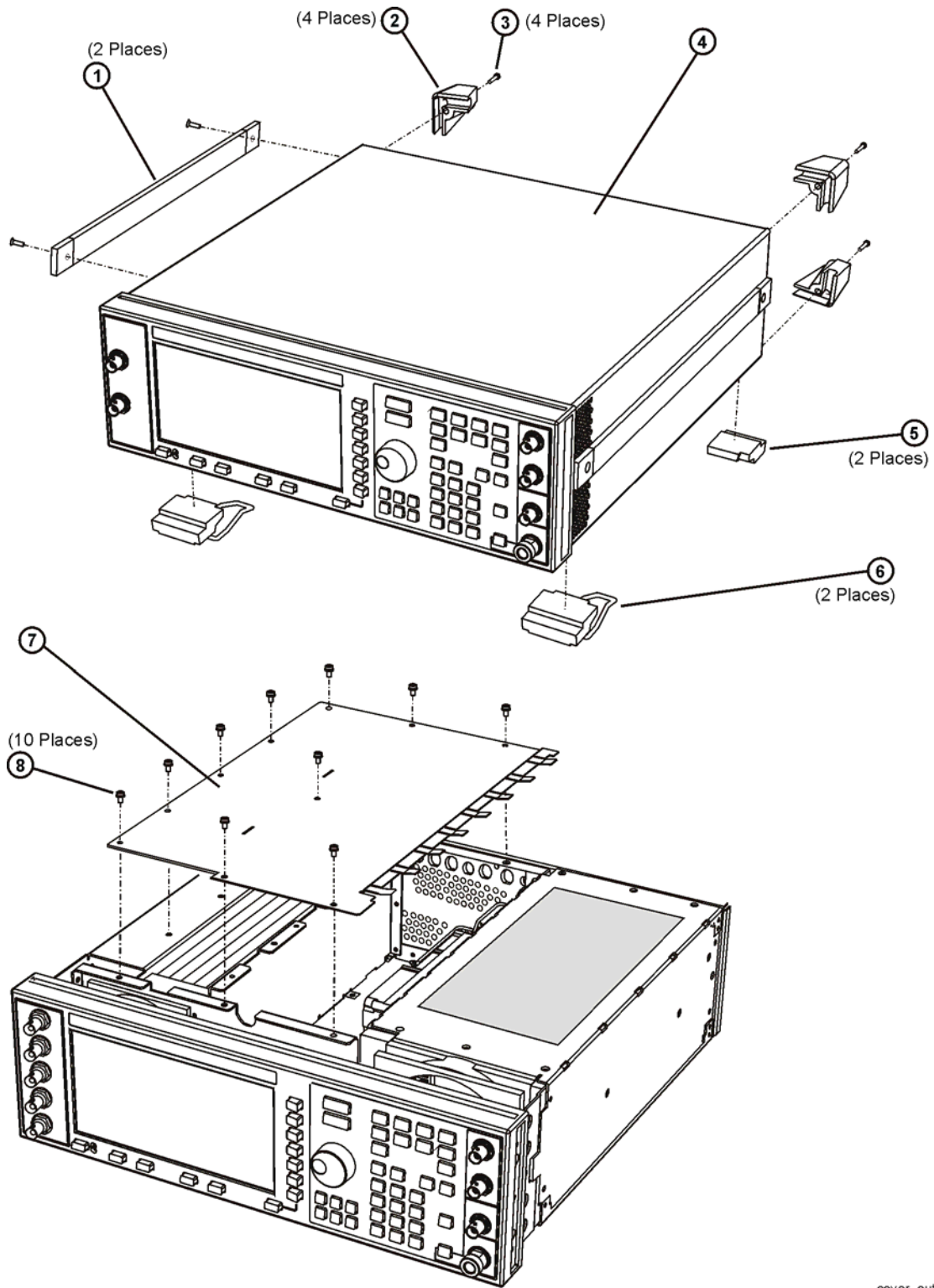
1. Disconnect the power cord.
2. Using a T-20 driver, remove the two strap handles (1) by loosening the screws.
3. Using a T-15 driver, remove the center screws (3) on the four rear-panel feet (2).
4. Remove the four bottom feet (5) and (6) from the cover by pushing and pulling the tab.
5. Slide the outer cover (4) off the frame.

Removing the Inner Top Cover

Refer to [Figure 1](#).

1. Using a T-10 driver, remove the ten screws (8) from the inner-top cover (7).
2. Remove the inner-top cover.

Figure 1 **Outer and Inner Instrument Cover Removal**



Install Additional Cables and Connectors to the Rear Panel

Tools Required

- T-10 driver
- 5/8" hex-nut driver
- 9/32" nut driver
- 3/16" nut driver
- long-nose pliers

Removing the Rear Panel

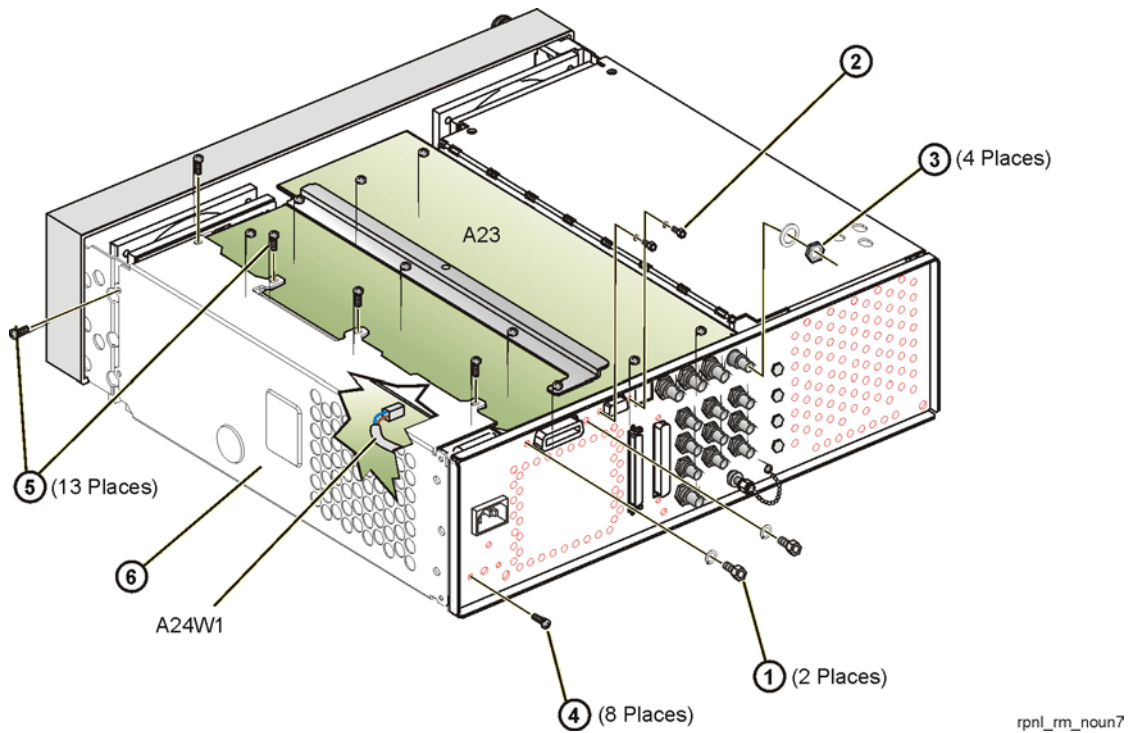
Refer to [Figure 2](#).

1. Disconnect all cables connected to the rear panel.
2. Using the 9/32" nut driver, remove the nuts on the GPIB connector (1).
3. Using the 3/16" nut driver, remove the nuts on the RS-232 connector (2).
4. Using the 5/8" hex-nut driver, remove the nuts and washers from the 10 MHz OUT, 10 MHz IN, TRIG IN, and TRIG OUT (3) connectors.

NOTE	Do not remove the screw that secures the chain and cap for the COH CARRIER.
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5. Using the T-10 driver, remove the eight screws (4) from the rear panel.
6. Using the T-10 driver, remove the 13 screws (5) from the A6 power supply's shielding.
7. Disconnect the A24W1 (6) from the A6 power supply.
8. Remove the rear panel from the chassis.

Figure 2 Rear Panel



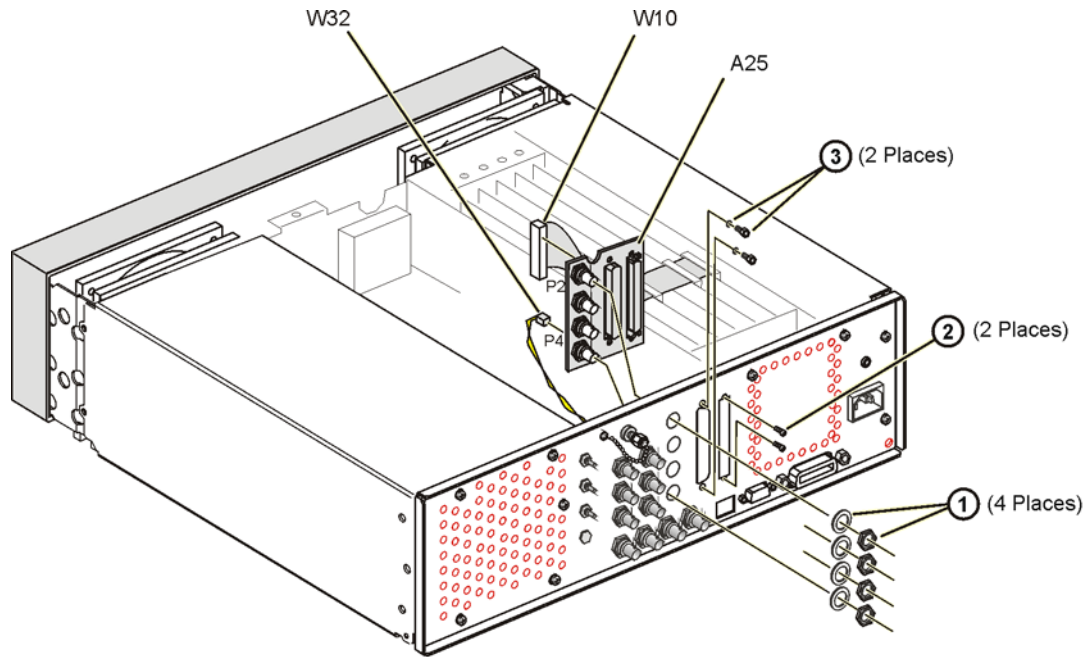
Installing New Connectors on the Rear Panel

Refer to [Figure 3](#).

1. Disconnect the ribbon cable W10 from the small rear panel board and all other boards located in the card cage. Place to the side for later reassembly.

NOTE Signal generators without Option 001, 002 or 601, 602, do not have the W10 cable. A W10 cable is provided in this kit.

Figure 3 Rear Panel Board



rpanel_noOp30C

2. Remove the three plastic plugs from the rear panel, located at BER DATA IN, BER CLK IN, and BER GATE IN.
3. Choose one of the three RF cables provided in the kit. Install one end of the cable to the rear panel through the hole for BER IN. Use a lock washer and a hex-nut to secure the connector to the rear panel. Repeat this procedure with the other two cables for BER CLK IN and BER GATE IN.
4. Re-attach the rear panel to the instrument.

NOTE Direct the free ends of the newly attached cables to the card cage area.

Color Coding the RF Cables

1. Attach one red and one black color clip to the free end of the RF cable originating from the rear panel at BER DATA IN.
2. Attach one orange and one black color clip to the free end of the RF cable originating from the rear panel at BER CLK IN.
3. Attach one yellow and one black color clip to the free end of the RF cable originating from the rear panel at BER GATE IN.

Reinstall the Rear Panel

Reinstall the signal generator's rear panel by reversing the removal procedure. Refer to ["Removing the Rear Panel" on page 8](#).

Install the A11 Internal Bit Error Rate Analyzer Board

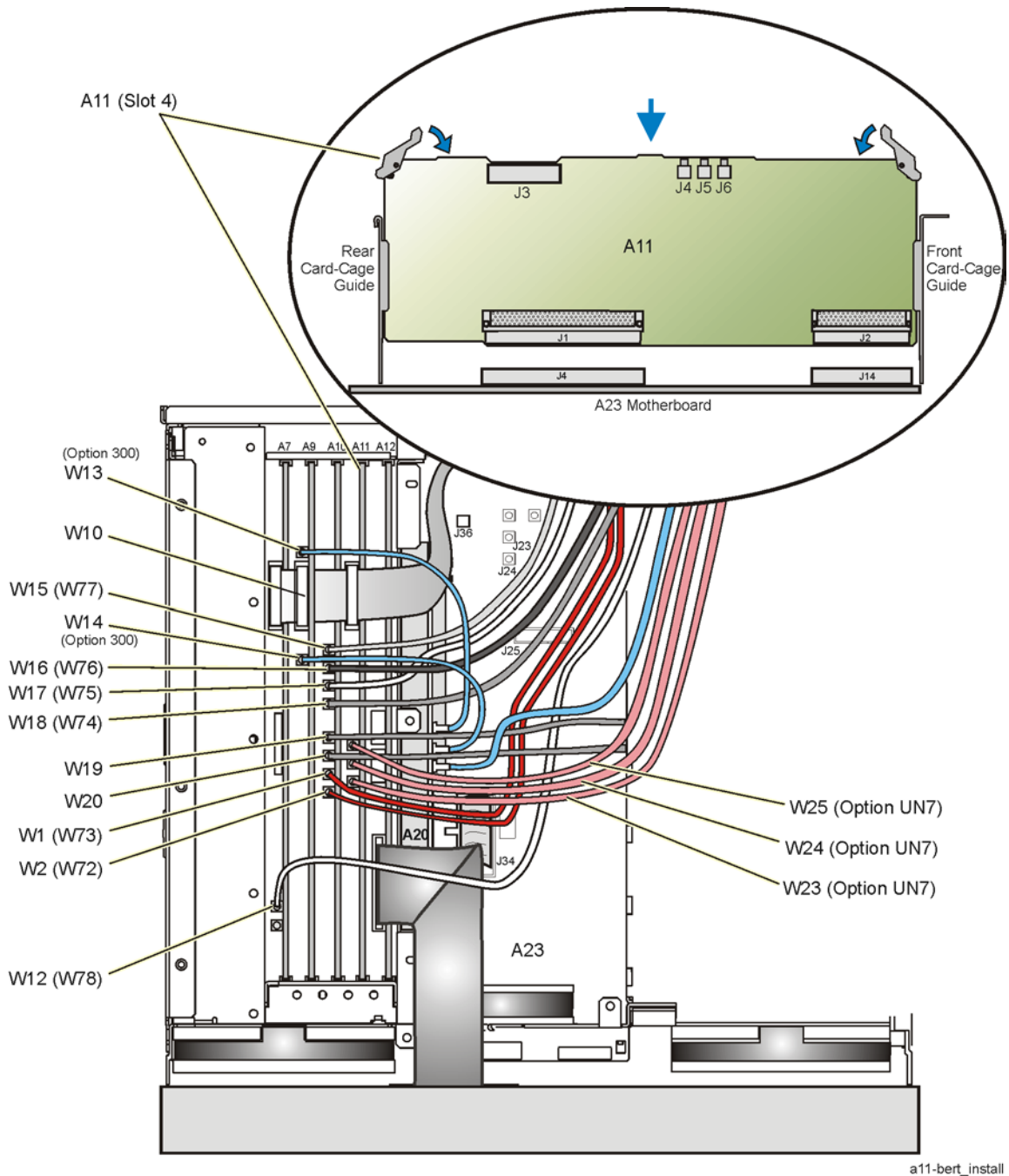
Refer to [Figure 4](#).

1. Using needle-nose pliers, disconnect the following cables:
 - W15 cable from A10J14
(This is W77 on an Option 1EM.)
 - W16 cable from A10J13
(This is W76 on an Option 1EM.)
 - W17 cable from A10J12
(This is W75 on an Option 1EM.)
 - W18 cable from A10J11
(This is W74 on an Option 1EM.)
 - W19 cable from A10J10
 - W20 cable from A10J9
 - W1 cable from A10J8
(This is W73 on an Option 1EM.)
 - W2 cable from A10J7
(This is W72 on an Option 1EM.)
 - W12 cable from A7J800.
(This is W78 on an Option 1EM.)
2. For signal generators with Option 506, use long-nose pliers to disconnect the following cables:
 - W21 cable from A10J6
 - W22 cable from A10J5

For signal generators with Option 300, use the long-nose pliers to disconnect the following cables:

 - W13 cable from A9J4
 - W14 cable from A9J5
3. Locate Top-SLOT 4, insert the A11 (Internal BER Analyzer) board assembly. Ensure that the board connectors, J1 and J2, seat properly into the motherboard connectors, J4 and J14.
4. Attach the BER connectors from the rear panel to the appropriate mating connectors on the board:
 - Red/Black to J4: BER DATA IN
 - Orange/Black to J5: BER CLK IN
 - Yellow/Black to J6: BER GATE IN
5. Attach ribbon cable W10 to the rear panel connector and to the newly installed BER board and to all other boards it was disconnected from.
6. Re-connect all cables disconnected in steps 1 and 2.

Figure 4 A11 Internal Bit Error Rate Analyzer (Option UN7)



a11-bert_install

Redeem and Install the License Key

1. Turn on the signal generator.
2. Retrieve the signal generator's Host ID. Press **Utility > Instrument Adjustments > Instrument Options > Software Options**. The Host ID is shown in the front-panel display. You need this number order to obtain the license key for Option UN7.
3. Obtain the license key. Go to the Global Software Distribution Center (GSDC) website,

“<http://www.agilent.com/find/softwarelicense>” with your Entitlement certificate. Follow the instructions shown on this website to retrieve the license key. An email will be sent to you with the license key and a procedure for installing the license key in the signal generator.

Verify Installation of Option UN7

1. Press **Utility > Instrument Info/Help Mode > Options Info**. The display should list “UN7” in the column for Options.
2. Press **Return > Installed Board Info**. The display should list the newly installed BERT board, E4400-60519. The status of this board should be, DETECTED √.
3. Verify BERT operation by following the BERT option check procedure.

Install the Latest Firmware

1. The firmware upgrade kit contains an installation note. Use the instructions given in the firmware upgrade installation note to install the latest firmware.
2. Perform the verification procedure described in the firmware upgrade installation note.

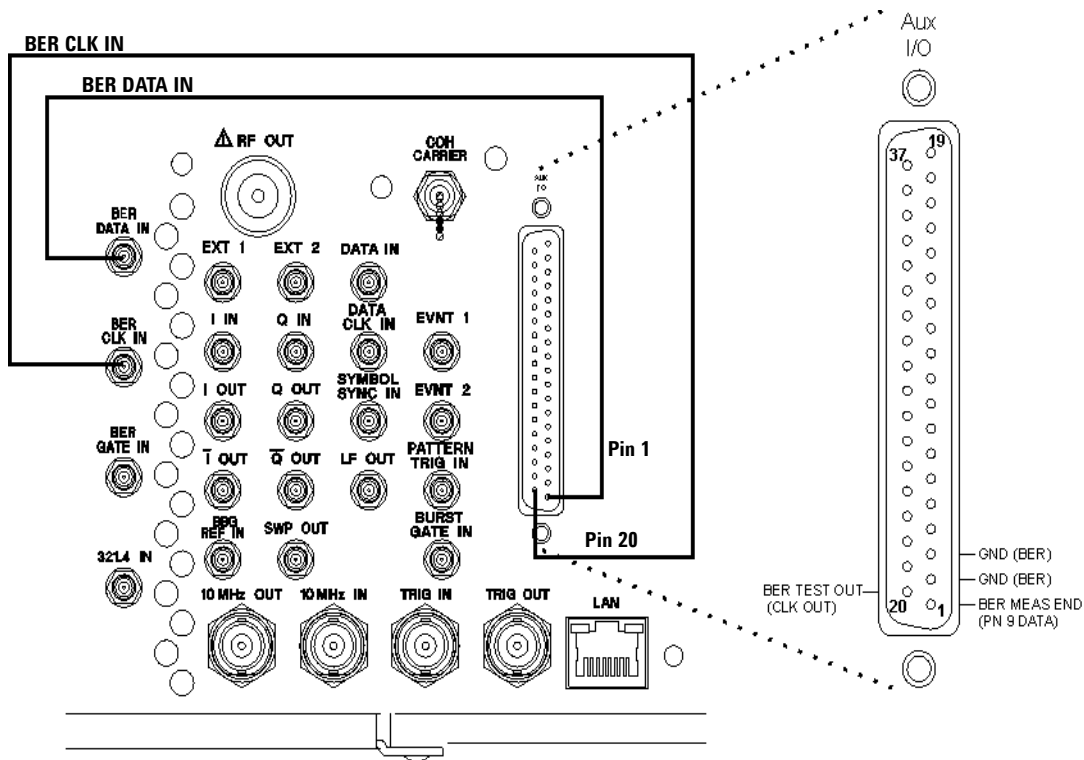
Option UN7 (BERT) Check

This procedure is only for the E4438C and verifies the operation of the bit error rate test (BERT) function.

Verification Setup

1. Refer to [Figure 4-1](#) below and make the following connections on the signal generator's rear panel.
 - DATA OUT (Aux I/O connector pin 1) to BER DATA IN.
 - DATA CLK OUT (Aux I/O connector pin 20) to BER CLK IN.

Figure 4-1 E4438C Rear Panel



Configuring the Data

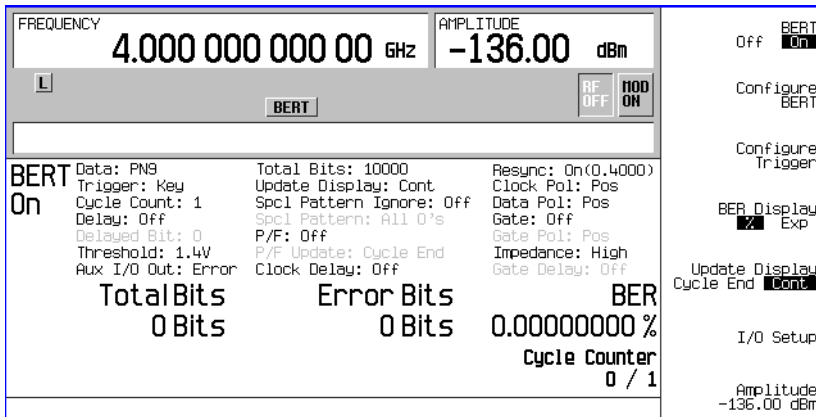
1. Press Preset.
2. For signal generators with Option UN7 only press:
Aux Fctn > BERT > BERT Off On to On.
 For signal generators with Option UN7 and Option 300 press:
Aux Fctn > BERT > Baseband BERT > BERT Off On to On.

Configuring BERT Parameters

The following steps configure BERT measurement parameters.

1. Press **Configure BERT > Data > PN9.**
2. Press **Total Bits to 10 Mbits.**
3. Press **More (1 of 2) > BERT Resync Off On to Off.**
4. Press **Return > I/O Setup > Polarity Setup > Clock Polarity Pos Neg to Neg.**
5. Press **Return > Aux I/O Out > PN9 Out.**
6. Press **Return > Configure Trigger > Cycle Count 0 > Enter.**

The following figure shows the signal generator's front-panel display after completion of the above steps.



Verifying BERT Operation 1.Press BERT Trigger > Immediate.

The Total Bits counter, in the lower left of the display, counts the number of bits received during each trigger. In this test, the Total Bits counter counts from 0 to 10000000.

The Cycle Counter, at the lower right of the display, counts the number of measurement triggers received. With the trigger configured to immediate, this count will continue until you change triggers or turn off the BERT measurement. The following figure shows the front-panel display with the Total Bits counter updated.

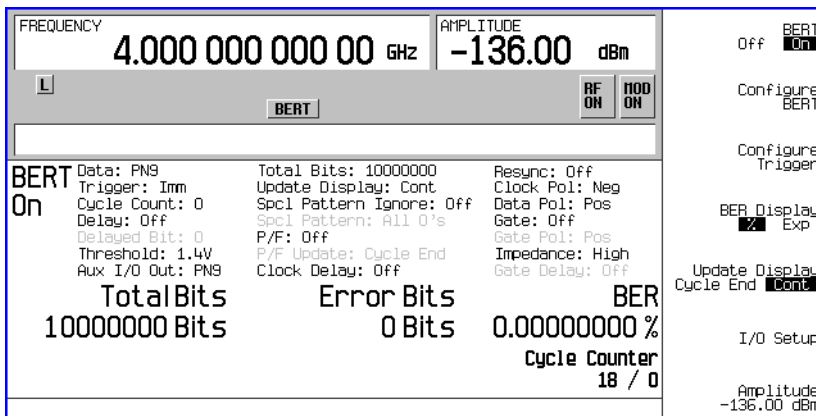


Table 4-1

Display Reading	Expected Results
Total Bits	counting up to 10 000 000 Bits
Error Bits	0 Bits
BER	0.00000000%
Cycle Counter	updates with each trigger

If the results are different than those indicated in the table above then re-check the rear-

panel Aux I/O to SMB connections and restart the testing with “[Configuring the Data](#)” on page 14. If the results are still not correct, contact the Agilent Technologies service center for information and help. See the section “Contacting Agilent Sales and Service Offices” on page 19 for contact information.

2. Disconnect the cable from the BER DATA IN connector.

The following figure shows the front-panel display after disconnecting the cable from the BER DATA IN connector.

Total Bits	Error Bits	BER
77563819 Bits	38857794 Bits	50.09783492 %
No Data		Cycle Counter 76 / 0

Table 4-2 Expected Results

Display Reading	Expected Results
Total Bits	counting up to 10 000 000 Bits
Error Bits	no longer 0 Bits
BER	approximately 50.00000000%
No Data	No Data appears in the lower left display

3. Re-connect the cable to the BER DATA IN connector.

Table 4-3 Expected Results

Display Reading	Expected Results
Total Bits	counting up to 10 000 000 Bits
Error Bits	0 Bits
BER	0.00000000%

4. Disconnect the cable from DATA CLK OUT connector.

The following figure shows the front-panel display when the DATA CLK OUT connector is

disconnected.

TotalBits	Error Bits	BER
92429900 Bits	4809 Bits	0.00520286 %
No Clock		Cycle Counter 59 / 0

Table 4-4 Expected Results

Display Reading	Expected Results
Total Bits	any number from 0 to 10 000 000 Bits (count does not update)
Error Bits	no longer 0 Bits (count does not update)
BER	no longer 0.00000000% (count does not update)
No Clock	No Clock appears in the lower left on the display.

5. Press **Return** > **BERT Off On** softkey to Off and to On.

The following figure shows the front-panel display after toggling the **BERT Off On** softkey with DATA CLK OUT connector disconnected.

TotalBits	Error Bits	BER
0 Bits	0 Bits	0.00000000 %
No Clock Sync Loss		Cycle Counter 1 / 0

Table 4-5 Expected Results

Display Reading	Expected Results
Total Bits	0 Bits (count does not update)
Error Bits	0 Bits (count does not update)
BER	0.00000000% (count does not update)
No Clock	No Clock appears in the lower left of the display
Sync Loss	Sync Loss appears in the lower left of the display

6. Reconnect the DATA CLOCK OUT connector.

The signal generator returns to normal BERT operation. The following figure shows the front-panel display when the DATA CLK OUT connector is reconnected.

Total Bits	Error Bits	BER
52349492 Bits	0 Bits	0.00000000 %
		Cycle Counter
		3 / 0

Table 4-6 Expected Results

Display Reading	Expected Results
Total Bits	any number from 0 to 10 000 000 Bits (count updates)
Error Bits	0 Bits
BER	0.00000000%

If the results of these tests are different from those listed in the Expected Results tables then contact the Agilent Technologies service center for more information and help. See the section “Contacting Agilent Sales and Service Offices” on page 19 for contact information.

Re-Assemble the Instrument

Refer to [Figure 1](#).

1. Reinstall the inner and outer instrument covers by reversing the order for removal.
2. Torque all T-10 screws to 9 in-lbs.
3. Torque all T-15 and T-20 screws to 21 in-lbs.
4. Attach the Option UN7 label provided to the rear panel, near the original serial number label.

Run Instrument Self Test

Run the instrument self-test by pressing, **Utility > Instrument Info/Help Mode > Self Test > Run Complete Self Test**. Upon completion a summary of the self-test will be displayed. Use the service guide to troubleshoot any failures detected by the test.