Agilent Technologies 8960 Series 10 Wireless Communications Test Set
Agilent Technologies E1966A 1xEV-DO Terminal Test Application

Manual Operation Guide

Making C.S0033 Tests Manually

E1966A 1xEV-DO Terminal Test Application Revision: A.01

1000-1870 (not orderable)

www.agilent.com/find/8960/

Agilent Technologies

Notice

Agilent Technologies, Inc.
Learning Products Department
24001 E. Mission
Liberty Lake, WA 99019-9599
U.S.A.

Contents

Contents

Introduction

The intent of this guide is to help you quickly learn how to use the E1966A 1xEV-DO Terminal Test Application to manually make access terminal receiver and transmitter tests as specified in the C.S0033 standard.

The Appendix includes additional information to help you perform the C.S0033 tests:

- Test Adherence to Standards table that shows which tests are supported by the test set.
- General procedures that are required to set up the measurements.
- Calibration procedures that must be performed periodically when testing access terminals with the test set.

The scope of this guide does not cover the numerous features and capabilities of the test set. For additional information, refer to the E1966A Online User's Guide which is available at:

- http://www.agilent.com/find/e1966a, or
- User Documentation CD-ROM shipped with your application.

Performing Individual Measurements

This chapter demonstrates the step-by-step procedures for making the following tests specified in the C.S0033 standard:

To learn more about which tests are supported by the test set, see "Test Adherence to Standards" on page 34.

Measuring Access Probe Power

General Procedure

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the access probe power measurement. See "Calibrating the Test Set" on page 36 for details.

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session. See "How Do I Open a Session and Connection?" on page 39 for more details.
2. Initialize the access probe power measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Access Probe Power` measurement and press the knob.
3. Select `Access Probe Power Setup` (**F1**) to access the `Access Probe Power Setup` menu. From this menu you can configure measurement parameters such as `Measurement Timeout` and `Trigger Arm`, and also access parameters (such as `Open Loop Adjust` and `Preamble Length`), specified for some C.S0033 tests.

Access Probe Power Setup	Value
Open Loop Adjust	71 dB
Probe Power Step	0.0 dB
Probe Num Step	5
Probe Sequence Max	1
Preamble Length (Frames)	7
Trigger Arm	Continuous
Measurement Timeout	Off

4. Select `Close Menu` (**F6**) to close the `Access Probe Power Setup` window.
5. Set the access network to ignore all access attempts by setting `Call Limit Mode` to `On` (**F10** on the `Call Parms 2 of 3` menu). See "How Do I Change Call Parameters?" on page 42 for more details.

NOTE It is recommended that you always turn Call Limit Mode on when measuring access probe power. The easiest way to induce access probes from the access terminal is to page the access terminal. If you do not have call limit mode set to on, when you page the access terminal, the connection will complete, which clears the access probe power result from the measurement screen.

Set call limit mode back to off when you have finished measuring access probe power.

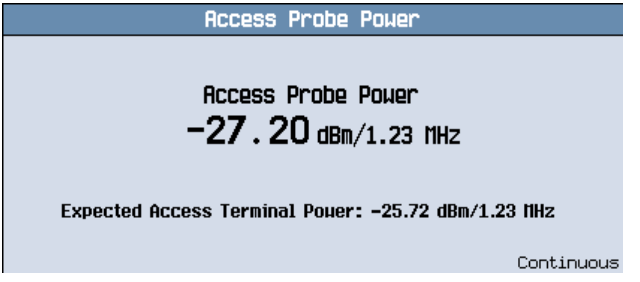
6. If you wish to only capture the first access probe, set `Trigger Arm` to `Single` and press the **START SINGLE** key. When the `Trigger Arm` is set to `Continuous`, the test set will display the power level of the most recent access probe power measurement. In either case, a measurement result will not be returned until you complete step 7.

IMPORTANT If `Trigger Arm` is set to `Single`, you must press the **Start Single** key to arm the measurement. The measurement will not operate until you arm it by pressing the **Start Single** key.

7. In order to perform the access probe power measurement, the access terminal must send an access probe. The easiest way to induce this is to page the AT (open a connection) by selecting `Start Data Connection` (**F3** on the `Control 2 of 2` menu). When the AT sends an access probe in response the page, its power level will be measured and displayed.
8. After finishing the measurements:
   - End the connection attempt by selecting `End Data Connection` (**F3** on the `Control 2 of 2` menu).
   - Turn the `Call Limit Mode` back to `Off`.
   - Turn the access probe power measurement off by pressing the **Measurement selection** key, selecting `Access Probe Power`, then `Close Measurement` (**F4**).

IMPORTANT If the access probe power measurement is on and waiting to measure a probe, all other measurements (except digital average power) will not be able to execute. It is therefore recommended that you turn off the access probe power measurement before attempting any other measurements.

A typical display is shown below:



Testing 3.1.2.3.1 Range of Open Loop Output Power

For details on performing the steps below, see the "General Procedure" on page 7 above.

1. Initialize the access probe measurement.
2. Set `Probe Power Step` to `0 dB`. This ensures that all access probes in the probe sequence will transmit at the same power level, rather than incrementing in power. This is beneficial in manual operation if you are running the measurement in continuous mode for the purpose of measuring the power level of all of the probes rather than just the first probe in the sequence.
3. Set `Probe Sequence Max` to `1`.
4. Set `Preamble Length` to 7.
5. Set `Open Loop Adjust` to `78 dB` or `81 dB`, depending upon band class.
6. C.S0033 specifies to set the AN forward packet activity to 100%. Forward packet activity is fixed in the test set, always set to 100%.
7. Set the access network to ignore all access attempts by setting `Call Limit Mode` to `On`.
8. Set $\hat{I}_{or}$ (`Cell Power`) to `-25`, `-65` or approximately `-95 dBm/1.23 MHz` (value depends on band class and access terminal class) for tests 1-3 as specified by C.S0033.

IMPORTANT If `Trigger Arm` is set to `Single`, you must press the **Start Single** key to arm the measurement. The measurement will not operate until you arm it by pressing the **Start Single** key.

---

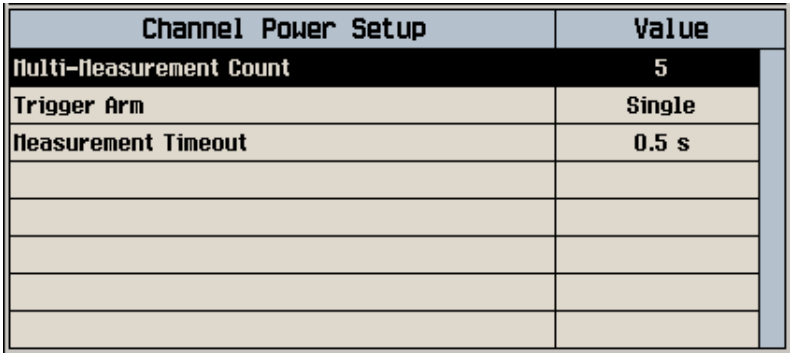
9. Send a page to the access terminal by selecting `Start Data`.
10. Measure access probe power.
11. Stop the page to the access terminal by selecting `Stop Data Connection`.
12. Perform steps 8-11 for tests 1-3.

Measuring Channel Power

General Procedure

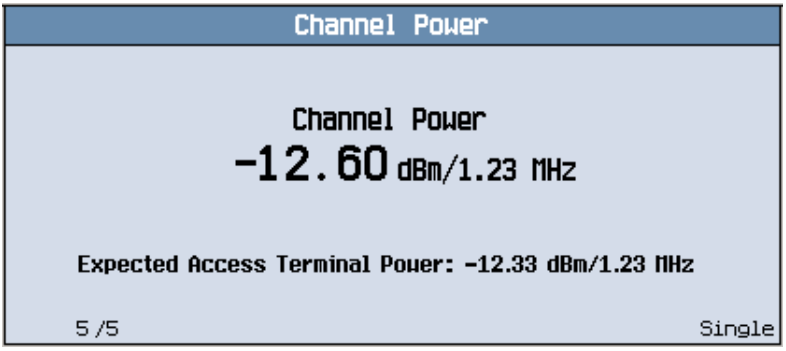
NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. See "Calibrating the Test Set" on page 36 for details.

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session. See "How Do I Open a Session and Connection?" on page 39 for more details.
2. Open an RTAP connection (see "How Do I Open a Session and Connection?" on page 39 for more details):
   - Select `Application Config` (**F10** on the `Call Parms` menu).
   - Set `Application` to RTAP. Select `Close Menu` (**F6**)
   - Set `RTAP Rate` (**F12** on the `Call Parms` menu), as needed.
   - Select `Start Data Connection` (**F3** on the `Control 2 of 2` menu).
3. Initialize the channel power measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Channel Power` measurement and press the knob.
4. Select `Channel Power Setup` (**F1**) to access the `Channel Power Setup` menu. From this menu you can configure measurement parameters such as `Multi-Measurement Count` and `Trigger Arm`. For statistical measurement results, highlight the `Multi-Measurement Count` parameter and press the **ON** key. The number of averages will default to 10.



5. Select `Close Menu` (**F6**) to close the `Channel Power Setup` window.
6. From the `Call Parms` menu, configure `Cell Power` (**F7**), as needed.
7. Measure channel power:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous` the measurement began executing as soon as you initialized it in step 3.

A typical measurement result is shown below:



Testing 3.1.2.3.5 Minimum Controlled Output Power

For details on performing the steps below, see the "General Procedure" on page 10 above.

1. Set up a Test Application session and open an RTAP connection with a Reverse Data Channel rate of 9.6 kbps.
2. Initialize the channel power measurement.
3. Set the `Call Drop Timer` to `Off` (**F9** on the `Call Parms 2 of 3` menu) to keep the test set from closing the connection based on the very low output power level of the access terminal.
4. Set $\hat{I}_{or}$ (`Cell Power`, **F7** on the `Call Parms 1 of 3` menu) to -25 dBm/1.23 MHz.
5. Set `Rvs Power Ctrl` to `All Down bits` (**F7** on the `Call Parms 2 of 3` menu) to transmit continuous down power control bits.
6. Measure channel power.

NOTE When you have finished testing, be sure to set Reverse Closed Loop Power control back to Active Bits to ensure that subsequent signalling is successful.

Measuring Digital Average Power

General Procedure

NOTE Digital average power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. See "Calibrating the Test Set" on page 36 for details.

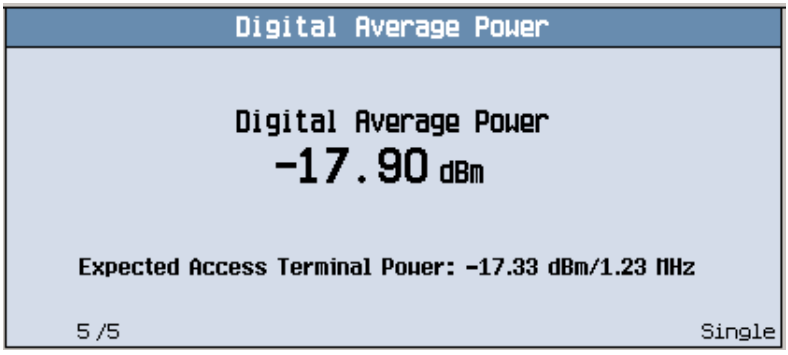
1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session. See "How Do I Open a Session and Connection?" on page 39 for more details.
2. Open an RTAP connection (see "How Do I Open a Session and Connection?" on page 39 for more details):
   - Select `Application Config` (**F10** on the `Call Parms` menu).
   - Set `Application` to RTAP. Select `Close Menu` (**F6**)
   - Set `RTAP Rate` (**F12** on the `Call Parms` menu), as needed.
   - Select `Start Data Connection` (**F3** on the `Control 2 of 2` menu).
3. Initialize the digital average power measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Digital Average Power` measurement and press the knob.
4. Select `Digital Average Power Setup` (**F1**) to access the `Digital Average Power Setup` menu. From this menu you can configure measurement parameters such as `Multi-Measurement Count` and `Trigger Arm`. For statistical measurement results, highlight the `Multi-Measurement Count` parameter

and press the **ON** key. The number of averages will default to 10.

Digital Average Power Setup	Value
Multi-Measurement Count	5
Trigger Arm	Single
Measurement Timeout	1.0 s

5. Select `Close Menu` (**F6**) to close the `Digital Average Power Setup` window.
6. From the `Call Parms` menu, configure `Cell Power` (**F7**), as needed.
7. Measure digital average power:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous`, the measurement began executing as soon as you initialized it in step 3.

A typical measurement result is shown below:



Testing 3.1.2.3.4 Maximum RF Output Power

For details on performing the steps below, see the "General Procedure" on page 12 above.

1. Initialize the digital average power measurement.
2. Set the following access parameters (see "How Do I Change Access Parameters?" on page 44):

- Set `Open Loop Adjust` to 81 dB or 84 dB, depending upon band class.
- Set `Probe Initial Adjust` to 15 dB.
- Set `Probe Power Step` to 7.5 dB/step (this step will be removed from C.S0033 in January 2003).
- Set `Probe Num Step` to 15 probes/sequence (this step will be removed from C.S0033 in January 2003).
- Set `Probe Sequence Max` to 15 sequences (this step will be removed from C.S0033 in January 2003).

3. Set up a Test Application session and open an RTAP connection with a Reverse Data Channel rate of 153.6 kbps.
4. C.S0033 specifies to configure the Test Application FTAP with a Forward Traffic Channel rate of 307.2 kbps (2-slot version), such that the ACK Channel is transmitted at all the slots. To do this, set `FTAP Rate` (**F11** on the `Call Parms` menu) to `307.2 (2 Slot)` and set `ACK Channel Bit Fixed Mode` to `On` (under `Application Config`, **F10**).
5. Set $\hat{I}_{or}$ (`Cell Power`) to -105.5 dBm/1.23 MHz.
6. Set `Rvs Power Ctrl` to `All Up bits` (**F7** on the `Call Parms 2 of 3` menu) to transmit continuous up power control bits.
7. Measure digital average power.

NOTE When you have finished testing, be sure to set Reverse Closed Loop Power control back to Active Bits to ensure that subsequent signalling is successful.

Measuring Packet Error Rate (PER)

General Procedure

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session. See "How Do I Open a Session and Connection?" on page 39 for more details.
2. Open an FTAP connection (see "How Do I Open a Session and Connection?" on page 39 for more details):
   - Select `Application Config` (**F10** on the `Call Parms` menu).
   - Set `Application` to FTAP. Select `Close Menu` (**F6**)
   - Set `FTAP Rate` (**F11** on the `Call Parms` menu), as needed.
   - Select `Start Data Connection` (**F3** on the `Control 2 of 2` menu).
3. Initialize the PER measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Packet Error Rate` measurement and press the knob.
4. Select `Packet Error Rate Setup` (**F1**) to access the `Packet Error Rate Setup` menu. From this menu you can configure measurement parameters such as `Confidence Level` and `PER Requirement`, and also `Control Channel Data Rate`, which is specified for some C.S0033 tests. You can also set `AT Directed Packets`, which helps you optimize PER test throughput.

NOTE If "Limited TAP" is on while Application is set to FTAP, "AT Directed Packets" must not be greater than 50%.

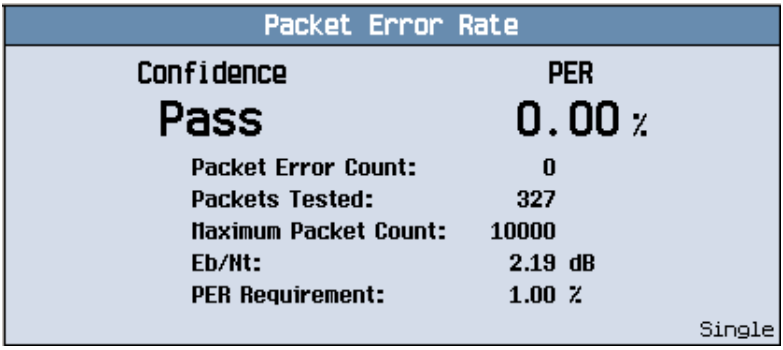
Packet Error Rate Setup	Value
Confidence Level	95.00 %
PER Requirement	1.00 %
Maximum Packet Count	10000
Control Channel Data Rate	76.8 kbps
AT Directed Packets	50 %
Trigger Arm	Continuous
Measurement Timeout	Off

5. Select `Close Menu` (**F6**) to close the `Packet Error Rate Setup` window.
6. From the `Call Parms` menu, configure `Cell Power` (**F7**) and `FTAP Rate` (**F11**), as needed.

NOTE If "Limited TAP" is on while "Application" is set to FTAP, "RTAP Rate" must be set to 9.6 kbps.

7. From the `Control` menu, configure `AWGN Power` (**F3**), as needed. (If you set AWGN Power too high relative to Cell Power, you may drop the connection).
8. Measure PER:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous` the measurement began executing as soon as you initialized it in step 3.

A typical display is shown below:



Testing 3.1.1.2.1 Demodulation of Forward Traffic Channel in AWGN

For details on performing the steps below, see the "General Procedure" on page 15 above.

1. C.S0033 specifies to set the AN forward packet activity to 100%. Forward packet activity is fixed in the test set, always set to 100%.
2. Set up a Test Application session and open an FTAP connection.
3. Initialize the PER measurement.
4. Set `AT Directed Packets` as needed (if "Limited TAP" is on, "AT Directed Packets" must not be greater than 50%, and "RTAP Rate" must be set to 9.6 kbps).
5. Set the `Control Channel Data Rate` to `38.4 kbps`.
6. C.S0033 specifies to set Pilot Drop to -14 dB. Pilot Drop is a fixed parameter in the test set, always set to -14 dB.
7. Set $\hat{I}_{or}$ (`Cell Power`) to `-55 dBm/1.23 MHz`.
8. Set I_{oc} (`AWGN Power`) and Data Rate/Slots per Physical Layer Packet (`FTAP Rate`) for tests 1-20 as specified by C.S0033.
9. Set `Confidence Level` to `95%` and `PER Requirement` as specified by C.S0033.
10. Set `Maximum Packet Count` as desired.
11. Measure PER for tests 1-20.

Testing 3.1.1.3.1 Receiver Sensitivity and Dynamic Range

For details on performing the steps below, see the "General Procedure" on page 15 above.

1. Set up a Test Application session and open an FTAP connection.
2. Initialize the PER measurement.
3. Set `AT Directed Packets` as needed (if "Limited TAP" is on, "AT Directed Packets" must not be greater than 50%, and "RTAP Rate" must be set to 9.6 kbps).
4. Test 1 Receiver Sensitivity: Set `FTAP Rate` to `307.2 (2 Slot)` and $\hat{I}_{or}$ (`Cell Power`) to -105.5 dBm/1.23 MHz.
5. Test 2 Dynamic Range: Set `FTAP Rate` to `2457.6 (1 Slot)` and $\hat{I}_{or}$ (`Cell Power`) to -25 dBm/1.23 MHz.
6. Set `Confidence Level` to `95%` and `PER Requirement` to 0.50%.
7. Set `Maximum Packet Count` as desired.
8. Measure PER for each test.

Measuring Time Response of Open Loop Power Control (TROLPC)

General Procedure

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the TROLPC measurement.

1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session.
2. Open an RTAP connection (see "How Do I Open a Session and Connection?" on page 39 for more details):
   - Select `Application Config` (**F10** on the `Call Parms` menu).
     — Set `Application` to `RTAP`.
     — C.S0033 does not specify that the R-ACK Channel must be active for 3.1.2.3.2 Time Response of Open Loop Power Control. If the R-ACK Channel is active during this test, the access terminal's power may fall outside of the mask specifications. To help ensure that your access terminal does not fail this test, you should disable the R-ACK Channel as follows:
       — Set `ACK Channel Bit Fixed Mode Attribute` to `Off`.
       — Set `AT Directed Packets` to `0%`.

IMPORTANT After completing TROLPC testing, you must return "ACK Channel Bit Fixed Mode Attribute" to on and set "AT Directed Packets" to a non-zero value, if needed.

     — Select `Close Menu` (**F6**).
   - Set `RTAP Rate` (**F12** on the `Call Parms` menu), as needed.
   - Select `Start Data Connection` (**F3** on the `Control 2 of 2` menu).
3. Initialize the TROLPC measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Time Response of Open Loop Power Control` measurement and press the knob.

NOTE If any measurements are open during initiation of a TROLPC, the test set will automatically close them and display an error message indicating the last measurement that was closed.

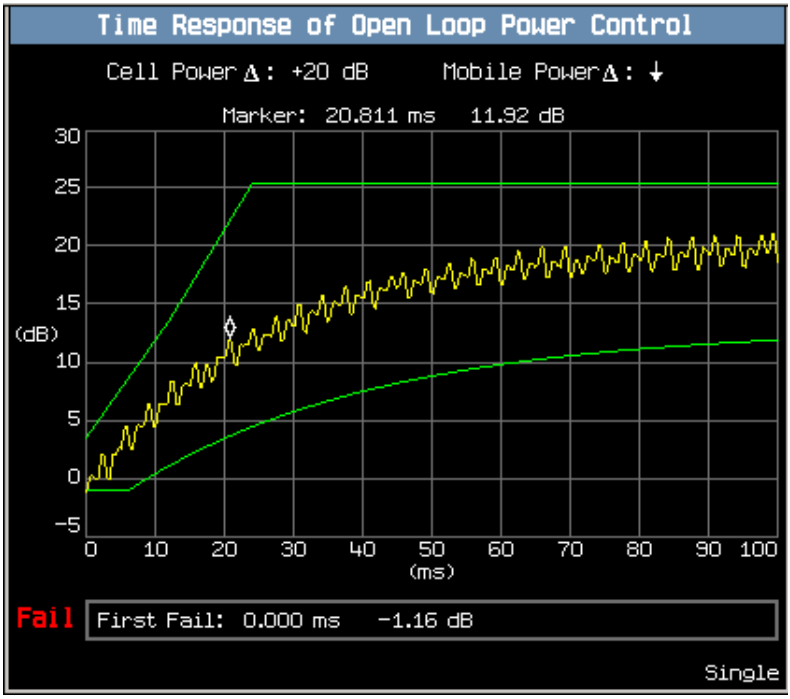
4. Select `Time Response of OLPC Setup` (**F1**) to access the `Time Response of OLPC Setup` menu. You can also configure AT directed packets and ACK channel bit fixed mode attribute from this menu.

Time Response of OLPC Setup	Value
AT Directed Packets	50 %
ACK Channel Bit Fixed Mode Attribute	Off
Measurement Timeout	Off

5. Select `Close Menu` (**F6**) to close the `Time Response of OLPC Setup` window.
6. From the `Call Parms` menu, configure `Cell Power` (**F7**), as needed.
7. Measure TROLPC:
   - Select `Start Meas Up` (**F2**), which automatically increases `Cell Power` by 20 dB and captures the resulting access terminal output power for 100 ms, or
   - Select `Start Meas Down` (**F3**) which automatically decreases `Cell Power` by 20 dB and captures the resulting access terminal output power for 100 ms.
   - You may also select START SINGLE to start the measurement. The cell power will increase by 20 dB if Start Meas Up was last performed (or if the test set is in a preset state), or decrease by 20 dB if Start Meas Down was last performed.
8. After the measurement has completed, select `Marker` (**F4**) and turn the knob to display power at points along the access terminal output power trace. If the test failed, next to the word “Fail,” the first data point at which the test failed is displayed.

NOTE As specified by C.S0033, the AT output power level curve is shown in absolute terms. The delta expressions above the display indicate the direction of power change.

An example of a “Fail” test result is shown below.



IMPORTANT After completing TROLPC testing, you must return “ACK Channel Bit Fixed Mode Attribute” to on and set “AT Directed Packets” to a non-zero value appropriate for your test setup.

Testing 3.1.2.3.2 Time Response of Open Loop Power Control

For details on performing the steps below, see the “General Procedure” on page 19 above.

1. Set up a Test Application session and open an RTAP connection with a Reverse Data Channel rate of 9.6 kbps.
2. Configure the Test Application FTAP so that the ACK Channel is not transmitted by the access terminal, by setting `ACK Channel Bit Fixed Mode Attribute` to `Off` and `AT Directed Packets` to `0`%.
3. Initialize the TROLPC measurement.
4. Set $\hat{I}_{or}$ (`Cell Power`) to -60 dBm/1.23 MHz.
5. C.S0022 specifies to send alternating ‘0’ and ‘1’ power control bits on the Forward Traffic Channel. When you start the TROLPC measurement, the test set automatically sends alternating closed loop power control

bits during the test.

6. Measure TROLPC:

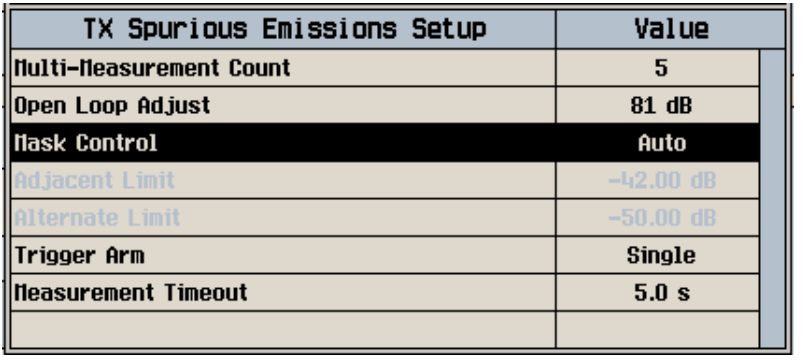
   - Select `Start Meas Up` (**F2**), (cell power transitions to -40 dBm/1.23 MHz), and note the pass/fail result.
   - Select `Start Meas Down` (**F3**), (cell power transitions to -60 dBm/1.23 MHz), and note the pass/fail result.
   - Select `Start Meas Down` (**F3**), (cell power transitions to -80 dBm/1.23 MHz), and note the pass/fail result.
   - Select `Start Meas Up` (**F2**), (cell power transitions to -60 dBm/1.23 MHz), and note the pass/fail result.

Measuring TX Spurious Emissions

General Procedure

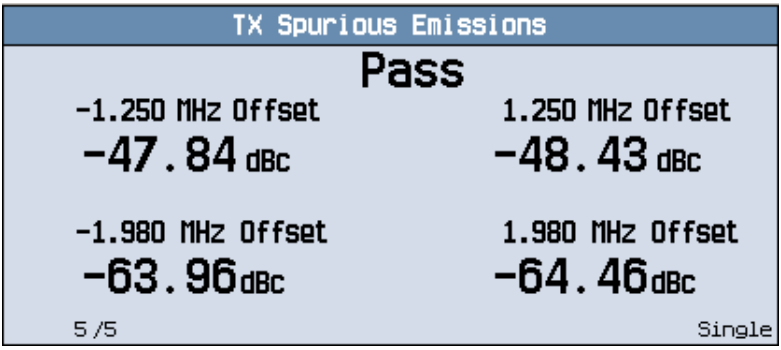
NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the TX spurious emissions measurement. See "Calibrating the Test Set" on page 36 for details.

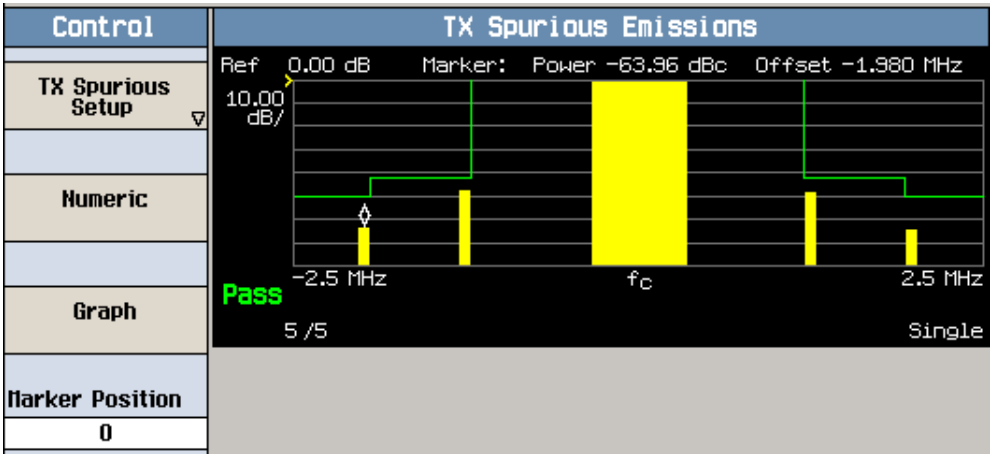
1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session. See "How Do I Open a Session and Connection?" on page 39 for more details.
2. Open an RTAP connection (see "How Do I Open a Session and Connection?" on page 39 for more details):
   - Select `Application Config` (**F10** on the `Call Parms` menu).
   - Set `Application` to RTAP. Select `Close Menu` (**F6**)
   - Set `RTAP Rate` (**F12** on the `Call Parms` menu), as needed.
   - Select `Start Data Connection` (**F3** on the `Control 2 of 2` menu).
3. Initialize the TX spurious emissions measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `TX Spurious Emissions` measurement and press the knob.
4. Select `TX Spurious Emissions Setup` (**F1**) to access the `TX Spurious Emissions Setup` menu. From this menu you can configure measurement parameters such as `Mask Control` and `Adjacent Limit` and `Alternate Limit`. (These parameters are only available when `Mask Control` is set to `Manual`. For statistical measurement results, highlight the `Multi-Measurement Count` parameter and press the **ON** key. The number of averages will default to 10.



5. Select `Close Menu` (**F6**) to close the `TX Spurious Emissions Setup` window.
6. From the `Call Parms` menu, configure `Cell Power` (**F7**), as needed.
7. Measure TX spurious emissions:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous`, the measurement began executing as soon as you initialized it in step 3.
8. Select `Graph` (**F3**) to display a graphical view of the results, or `Numeric` (**F2**) to display numeric results.
9. When viewing the graphical display, you can select `Marker Position` (**F4**) and turn the knob to display the spurious emissions levels at each of the frequency offsets.

Typical numeric and graphical measurement results are shown below:





Testing 3.1.2.4.1 Conducted Spurious Emissions

For details on performing the steps below, see the "General Procedure" on page 23 above.

1. Initialize the TX spurious emissions measurement.
2. Set `Open Loop Adjust` to 81 dB or 84 dB, depending upon band class (`Open Loop Adjust` is available from the `TX Spurious Emissions Setup` (**F1**) window).
3. Set the following access parameters (see "How Do I Change Access Parameters?" on page 44):
   - Set `Probe Initial Adjust` to 15 dB.
   - Set `Probe Power Step` to 7.5 dB/step (this step will be removed from C.S0033 in January 2003).
   - Set `Probe Num Step` to 15 probes/sequence (this step will be removed from C.S0033 in January 2003).
   - Set `Probe Sequence Max` to 15 sequences (this step will be removed from C.S0033 in January 2003).
4. Set up a Test Application session and open an RTAP connection with a Reverse Data Channel rate of 153.6 kbps.
5. C.S0033 specifies to configure the Test Application FTAP with a Forward Traffic Channel rate of 307.2 kbps (2-slot version), such that the ACK Channel is transmitted at all the slots. To do this, set `FTAP Rate` (**F11** on the `Call Parms` menu) to `307.2 (2 Slot)` and set `ACK Channel Bit Fixed Mode` to `On` (under `Application Config`, **F10**).
6. Set $\hat{I}_{or}$ (`Cell Power`) to -105.5 dBm/1.23 MHz.
7. Set `Rvs Power Ctrl` to `All Up bits` (**F7** on the `Call Parms 2 of 3` menu) to transmit continuous up power control bits.
8. Measure TX Spurious Emissions, and note the pass/fail result.

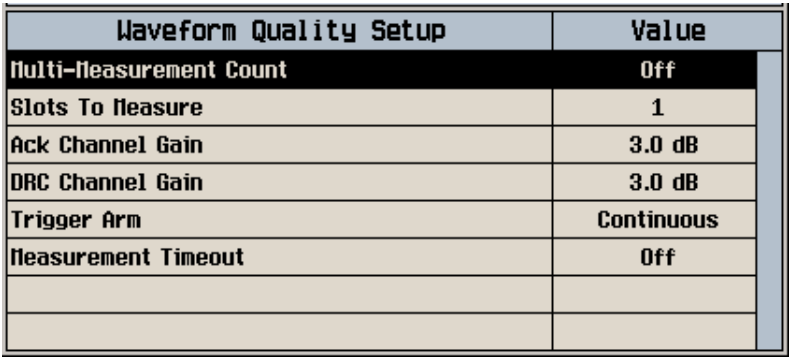
NOTE When you have finished testing, be sure to set Reverse Closed Loop Power control back to Active Bits to ensure that subsequent signalling is successful.

Measuring Waveform Quality + Code Domain Power

General Procedure

NOTE Channel power calibration should be performed if the test set is being used for the first time or the operating environment has changed significantly since the last calibration was performed. The channel power calibration also calibrates the waveform quality + code domain measurement. See "Calibrating the Test Set" on page 36 for details.

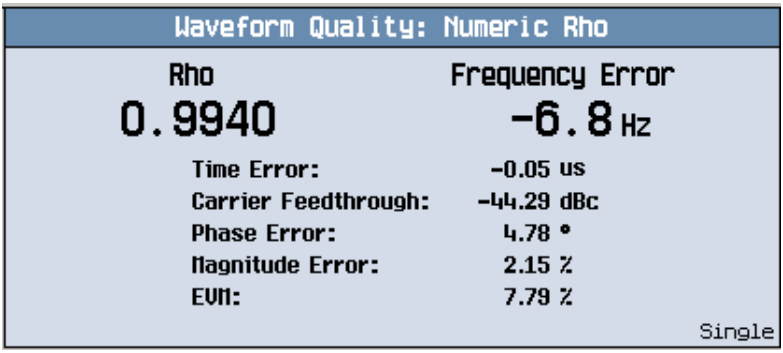
1. Connect the access terminal to the test set's front panel **RF IN/OUT** connector and power it on. If the access terminal does not automatically open a session, perform whatever actions are necessary to open a session. See "How Do I Open a Session and Connection?" on page 39 for more details.
2. Open an RTAP connection (see "How Do I Open a Session and Connection?" on page 39 for more details):
   - Select `Application Config` (**F10** on the `Call Parms` menu).
   - Set `Application` to RTAP. Select `Close Menu` (**F6**)
   - Set `RTAP Rate` (**F12** on the `Call Parms` menu), as needed.
   - Select `Start Data Connection` (**F3** on the `Control 2 of 2` menu).
3. Initialize the waveform quality + code domain measurement:
   - Press the **Measurement selection** key.
   - Turn the knob to highlight the `Waveform Quality + Code Domain` measurement and press the knob.
4. Select `Waveform Quality + Code Domain Setup` (**F1**) to access the `Waveform Quality + Code Domain Setup` menu. From this menu you can configure measurement parameters such as `Slots to Measure` and `DRC Channel Gain`. For statistical measurement results, highlight the `Multi-Measurement Count` parameter and press the **ON** key. The number of averages will default to 10.

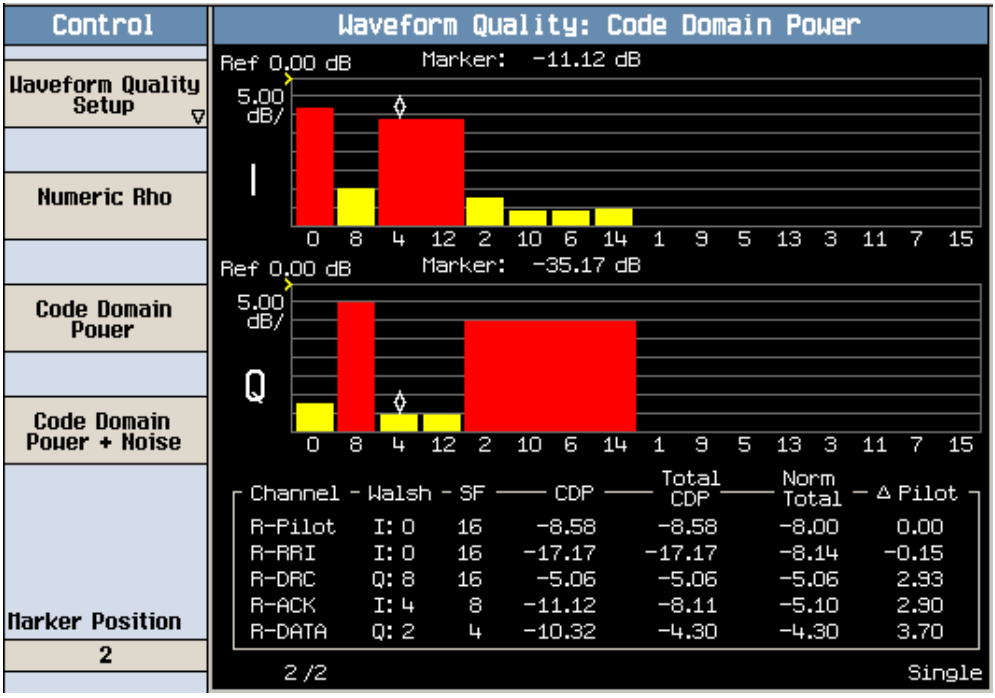


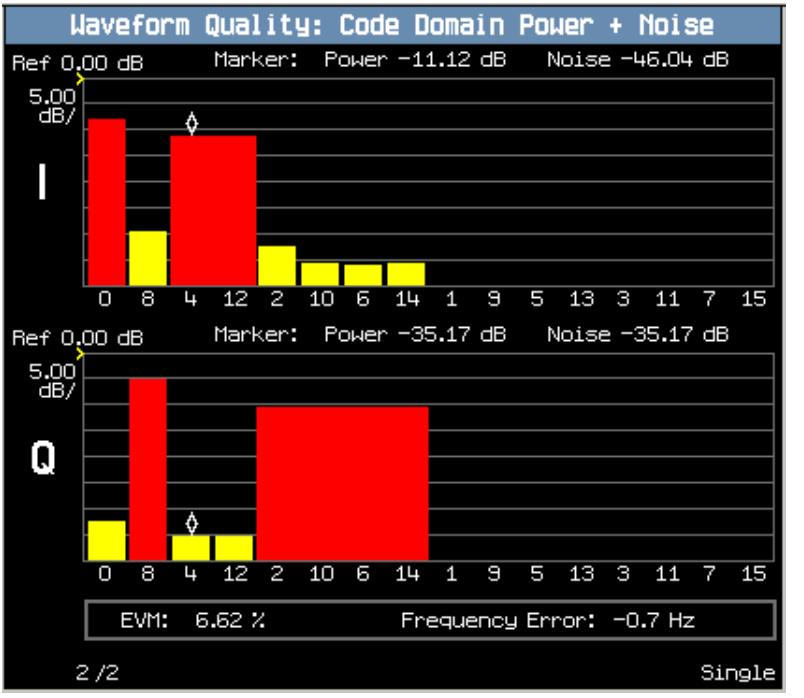
Waveform Quality Setup	Value
Multi-Measurement Count	Off
Slots To Measure	1
Ack Channel Gain	3.0 dB
DRC Channel Gain	3.0 dB
Trigger Arm	Continuous
Measurement Timeout	Off

5. Select `Close Menu` (**F6**) to close the `Waveform Quality + Code Domain Setup` window.
6. From the `Call Parms` menu, configure `Cell Power` and `RTAP Rate`, as needed.
7. Measure waveform quality + code domain noise:
   - If the `Trigger Arm` field is set to `Single`, press the **START SINGLE** key to trigger each measurement.
   - If the `Trigger Arm` field is set to `Continuous`, the measurement began executing as soon as you initialized it in step 3.
8. Select `Numeric Rho` (**F2**) to view the waveform quality results, `Code Domain Power` (**F3**) or `Code Domain Power + Noise` (**F4**) to view the code domain results.
9. When viewing the code domain results, you can select `Marker Position` (**F6**) and turn the knob to select a Walsh code and display its power.

Typical measurement results are shown below:







Testing 3.1.2.2.2 Waveform Quality and Frequency Accuracy

For details on performing the steps below, see the "General Procedure" on page 27 above.

1. Set up a Test Application session and open an RTAP connection with `RTAP Rate` set to `9.6 kbps`.
2. C.S0033 specifies to configure the Test Application FTAP with a Forward Traffic Channel rate of 38.4 kbps, and such that the ACK Channel is transmitted at all the slots. To do this, set `FTAP Rate` (**F11**) to `38.4 kbps` and set `ACK Channel Bit Fixed Mode` to `On` (under `Application Config`, **F10**).
3. Initialize the waveform quality + code domain measurement.
4. Set `Slots to Measure` to 1.
5. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
6. Measure waveform quality + code domain.
7. Select `Numeric Rho` (**F2**) to view the `Rho`, `Frequency Error` and `Time Error` results.

Testing 3.1.2.3.7 RRI Channel Output Power

For details on performing the steps below, see the "General Procedure" on page 27 above.

1. Set up a Test Application session and open an RTAP connection.
2. Initialize the waveform quality + code domain measurement.
3. Set `Slots to Measure` to 8.
4. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
5. Measure waveform quality + code domain.
6. Select `Code Domain Power` (**F3**) to view the R-RRI Δ Pilot result (available in the last column of the table of data).

Testing 3.1.2.3.8 Code Domain Power

For details on performing the steps below, see the "General Procedure" on page 27 above.

Testing 3.1.2.3.8.1 DRC Channel Output Power

1. Initialize the waveform quality + code domain measurement.
2. Set `Slots to Measure` to 2.
3. Set `DRC Channel Gain` to 0 dB.
4. Set up a Test Application session and open an RTAP connection.
5. C.S0033 specifies to configure the Test Application FTAP with a Forward Traffic Channel rate of 38.4 kbps, and such that the ACK Channel is transmitted at all the slots. To do this, set `FTAP Rate` (**F11**) to `38.4 kbps` and set `ACK Channel Bit Fixed Mode` to `On` (under `Application Config`, **F10**).
6. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
7. Measure waveform quality + code domain.
8. Select `Code Domain Power` (**F3**) to view the R-DRC Δ Pilot result (available in the last column of the table of data).
9. Set `DRC Channel Gain` to 3 dB and repeat steps 5 and 6.

Testing 3.1.2.3.8.2 ACK Channel Output Power

1. Initialize the waveform quality + code domain measurement.
2. Set `Slots to Measure` to 2.
3. Set `ACK Channel Gain` to 0 dB.
4. Set up a Test Application session and open an RTAP connection.
5. C.S0033 specifies to configure the Test Application FTAP with a Forward Traffic Channel rate of 38.4 kbps, and such that the ACK Channel is transmitted at all the slots. To do this, set `FTAP Rate` (**F11**) to `38.4 kbps` and set `ACK Channel Bit Fixed Mode` to `On` (under `Application Config`, **F10**).
6. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
7. Measure waveform quality + code domain.
8. Select `Code Domain Power` (**F3**) to view the R-ACK Δ Pilot result (available in the last column of the table of data).
9. Set `ACK Channel Gain` to 3 dB and repeat steps 5 and 6.

Testing 3.1.2.3.8.3 Data Channel Output Power

1. Initialize the waveform quality + code domain measurement.
2. Set `Slots to Measure` to 2.
3. Set `Data Offset Nom` and `Data Offset` <rate> (for all rates) to 0 dB (see "How Do I Change Channel Gain Parameters?" on page 46).
4. Set up a Test Application session and open an RTAP connection with `RTAP Rate` set to `9.6 kbps`.
5. C.S0033 specifies to configure the Test Application FTAP with a Forward Traffic Channel rate of 38.4 kbps, and such that the ACK Channel is transmitted at all the slots. To do this, set `FTAP Rate` (**F11**) to `38.4 kbps` and set `ACK Channel Bit Fixed Mode` to `On` (under `Application Config`, **F10**).
6. Set $\hat{I}_{or}$ (`Cell Power`) to -75 dBm/1.23 MHz.
7. Measure waveform quality + code domain.
8. Select `Code Domain Power` (**F3**) to view the R-Data Δ Pilot result (available in the last column of the table of data).
9. Repeat steps 5 and 6 with RTAP rates of 19.2, 38.4 and 76.8 kbps.
10. Repeat steps 5 and 6 with an RTAP rate of 153.6 kbps. Then use the marker to measure the power in all inactive Walsh codes.

Appendix

This Appendix includes some general setup procedures that are required to perform the tests, and other helpful information:

Test Adherence to Standards

Standards Table

This table lists the capabilities of the E1966A 1xEV-DO Terminal Test Application. This test capability is effective with the release of revision A.01.20.

Table 1. Support of C.S0033 Tests

C.S0033 Test	Supported by E1966A?	Comments
3.1.1 Receiver Tests		
3.1.1.1 Frequency Coverage Requirements	Yes	Supports Band Classes 0, 1, 3, 4, 5, 6 and 9.
3.1.1.2.1 Demodulation of Forward Traffic Channel in AWGN	Yes	See "Testing 3.1.1.2.1 Demodulation of Forward Traffic Channel in AWGN" on page 17.
3.1.1.2.2 Demodulation of Forward Traffic Channel in Multipath Fading Channel	Partially	Requires external fader and AWGN generator.
3.1.1.2.3 Decision of Power Control Bit for Channels Belonging to Different Power Control Sets During Soft Handoff	No	Requires soft handoff capability.
3.1.1.2.4 Decision of Power Control Bit for Channels Belonging to the Same Power Control Set	No	Requires soft handoff capability.
3.1.1.2.5 Demodulation of Reverse Power Control Channel During Soft Handoff	No	Requires soft handoff capability.
3.1.1.3.1 Receiver Sensitivity and Dynamic Range	Yes	See "Testing 3.1.1.3.1 Receiver Sensitivity and Dynamic Range" on page 18.
3.1.1.3.2 Single Tone Desensitization	Partially	Requires external CW signal generator.
3.1.1.3.3 Intermodulation Spurious Response Attenuation	Partially	Requires two external CW signal generators.
3.1.1.3.4 Adjacent Channel Selectivity	Partially	Requires external HRPD (1xEV-DO) and CDMA sources.
3.1.1.3.5 Receiver Blocking Characteristics	Partially	Requires external CW signal generator.
3.1.1.4.1 Conducted Spurious Emissions	No	Requires full spectrum analyzer
3.1.1.4.2 Radiated Spurious Emissions	No	Requires full spectrum analyzer
3.1.2 Transmitter Tests		

Table 1. Support of C.S0033 Tests

C.S0033 Test	Supported by E1966A?	Comments
3.1.2.1.1 Frequency Coverage	Yes	Supports Band Classes 0, 1, 3, 4, 5, 6 and 9.
3.1.2.1.2 Frequency Accuracy	Yes	See "Testing 3.1.2.2.2 Waveform Quality and Frequency Accuracy" on page 30.
3.1.2.2.1 Time Reference	Partially	Supports static time reference only. See "Testing 3.1.2.2.2 Waveform Quality and Frequency Accuracy" on page 30.
3.1.2.2.2 Waveform Quality and Frequency Accuracy	Yes	See "Testing 3.1.2.2.2 Waveform Quality and Frequency Accuracy" on page 30.
3.1.2.2.3 Redundant ACK Transmission	No	Requires dynamic ACK response.
3.1.2.3.1 Range of Open Loop Output Power	Partially	Supports 100% forward packet activity only. See "Testing 3.1.2.3.1 Range of Open Loop Output Power" on page 9
3.1.2.3.2 Time Response of Open Loop Power Control	Yes	See "Testing 3.1.2.3.2 Time Response of Open Loop Power Control" on page 21
3.1.2.3.3 Range of Closed Loop Power Control	Partially	Supports tests 1 and 3-6, Minimum Standard (a) only, by remote program only.
3.1.2.3.4 Maximum RF Output Power	Yes	See "Testing 3.1.2.3.4 Maximum RF Output Power" on page 13
3.1.2.3.5 Minimum Controlled Output Power	Yes	See "Testing 3.1.2.3.5 Minimum Controlled Output Power" on page 11
3.1.2.3.6 Standby Output Power	Partially	Supports idle standby output power fully. Supports measurement of standby power between access probe bursts by remote program only.
3.1.2.3.7 RRI Channel Output Power	Yes	See "Testing 3.1.2.3.7 RRI Channel Output Power" on page 31
3.1.2.3.8.1 DRC Channel Output Power	Yes	See "Testing 3.1.2.3.8 Code Domain Power" on page 31
3.1.2.3.8.2 ACK Channel Output Power	Yes	See "Testing 3.1.2.3.8 Code Domain Power" on page 31
3.1.2.3.8.3 Data Channel Output Power	Partially	Does not support test 6. See "Testing 3.1.2.3.8 Code Domain Power" on page 31
3.1.2.4.1 Conducted Spurious Emissions	Yes	Supports adjacent and alternate channels only. "Testing 3.1.2.4.1 Conducted Spurious Emissions" on page 26
3.1.2.4.2 Radiated Spurious Emissions	Partially	Requires external spectrum analyzer.
3.1.2.4.3 Occupied Bandwidth	Partially	Requires external spectrum analyzer.

Calibrating the Test Set

Calibration Strategy

Various calibration routines must be run to ensure measurement accuracy. The type of calibration and appropriate intervals for performing calibrations vary with each application.

Description

There are four calibrations that must be performed periodically on the test set:

- Channel Power calibration
- Digital Average Power calibration
- I/Q calibration
- Spectrum Monitor calibration

Calibration Procedures

- Channel Power Calibration

  To perform the channel power calibration from the front panel, initialize the Channel Power measurement and press the Calibrate Channel Power softkey. To perform a channel power calibration from a remote program, use the “CALibration:CPOWer?” command. During Channel Power calibration no power should be applied to the front panel.

  Channel Power calibration takes about two minutes.

  This calibration generates calibration data for the following measurements:

  — “Access Probe POwer Measurement Description”

  — “Channel Power Measurement Description”

  — “Time Response of Open Loop Power Control (TROLPC) Measurement Description”

  — “TX Spuirious Emissions Measurement Description”

  — “Waveform Quality + Code Domain Measurement Description”

  — Spectrum Monitor

  During calibration the internal temperature of the test set will be measured and calibration data will be generated that covers the measurement amplitude range of the available frequency bands. During channel power measurements, the test set will once again measure the internal temperature and calibrate the temperature measurement that was made when calibration data was generated.

  An integrity bit is set true and is returned with Channel Power measurement results when the measurement is uncalibrated due to temperature drift.

- Digital Average Power Calibration

  To perform the digital average power calibration, initialize the Digital Average Power measurement and press the Calibrate Digital Avg Pwr softkey. To perform a digital average power calibration from a remote program, use the “CALibration DAPower?” command. During Digital Average Power calibration no power should be applied to the front panel RF IN/OUT connector.

  Digital average power measurement calibration loops back a CDMA signal from within the test set to the average power meter to generate a table of calibration values.

  Digital Average Power measurement calibration takes about ten minutes.

  Power must be cycled off then back on after the Digital Average Power calibration routine has completed.

- I/Q Calibration

  This calibration is required if the Baseband Generator or the Vector Output modules are serviced or swapped. The CALibration:IQ subsystem should not be used as part of frequent (i.e. daily, weekly or monthly) test set calibration.

  Manually initiating the IQ calibration routines requires pressing the SYSTEM CONFIG hardkey, then pressing the 1 of 2 hardkey, then pressing the Service softkey.

- Spectrum Monitor Calibration

  The spectrum monitor must be calibrated for each test application or lab application in your test set, as well as for each format within in a fast switching test application or lab application. For example, if you calibrate the spectrum monitor while the GSM format of the GSM_AMPS/136_GPRS_W-CDMA fast switching test application is active, you must also calibrate the spectrum monitor while the AMPS/136, GPRS, and W-CDMA formats are active, individually.

  The spectrum monitor is automatically calibrated when performing a channel power calibration (see “Channel Power Calibration” on page 36). Similarly, the channel power calibration is run as part of the spectrum monitor calibration.

  To perform the spectrum monitor calibration from the front panel, initiate the spectrum monitor by pressing **Instrument selection**, and then selecting `Spectrum Monitor` from the menu. Next, select `Trigger Setup` (**F4**), then Calibrate Measurement (F11). To perform this calibration from a remote program, use the “CALibration SMONitor” command. During spectrum monitor calibration, no power should be applied to the front panel RF IN/OUT connector.

  The spectrum monitor calibration takes less than 5 minutes.

Remotely initiating any of the calibration routines is accomplished through the use of single query-only headers. The test set returns a numeric value indicating the outcome of the calibration attempt.

Recommended Calibration Intervals

Table 2.

Condition:	Calibrating Channel Power Measurements	Calibrating Digital Average Power Measurements	I/Q Calibration	Spectrum Monitor Calibration
When Test Set is being used for the first time (allow 30-minute warm-up period).	✓			✓
After firmware is upgraded or after switching between revisions of the application	✓	✓		✓
If the ambient temperature changes more than 10 degrees C since latest calibration	✓			✓
Once every month	✓			✓
Once every year	✓	✓		✓
If Baseband Generator or Vector Output modules are serviced			✓	

How Do I Open a Session and Connection?

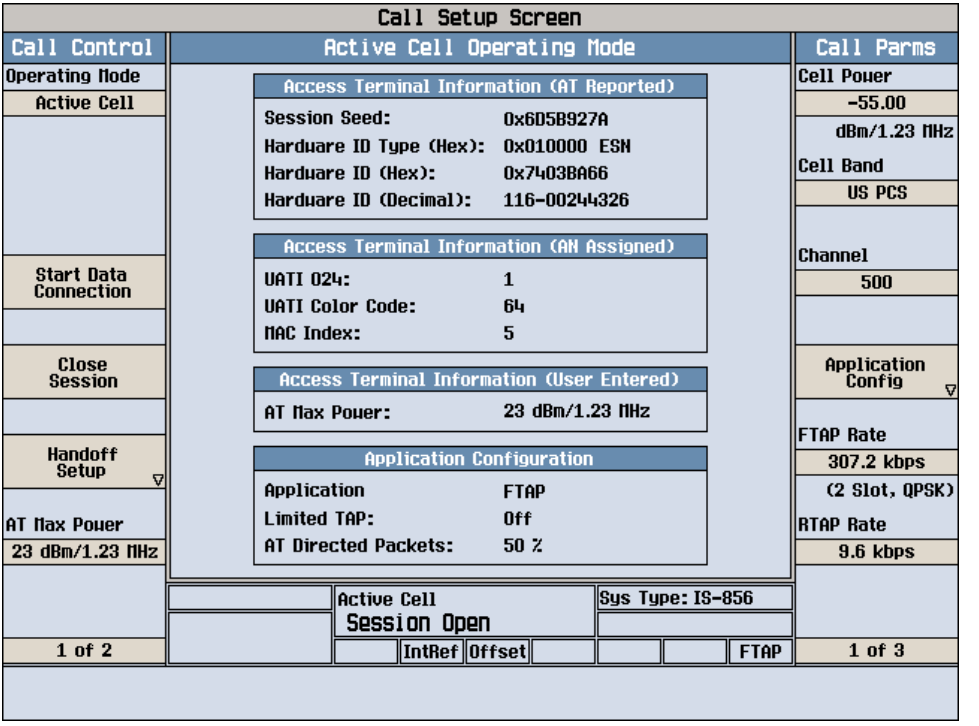
A. Configure Call Parameters

1. Press the **CALL SETUP** key.
2. Select `Operating Mode` (**F1**) and set the operating mode to `Active Cell`.
3. Configure the parameters necessary for your access terminal to find service with the test set, such as `Cell Power`, `Cell Band` and `Channel` (see "How Do I Change Call Parameters?" on page 42).

B. Open a Session

A session can only be established from the access terminal. The test set can not open a session.

1. Turn on the access terminal and wait for it to open a session.
2. Check for `Session Open` in the `Active Cell` status field.



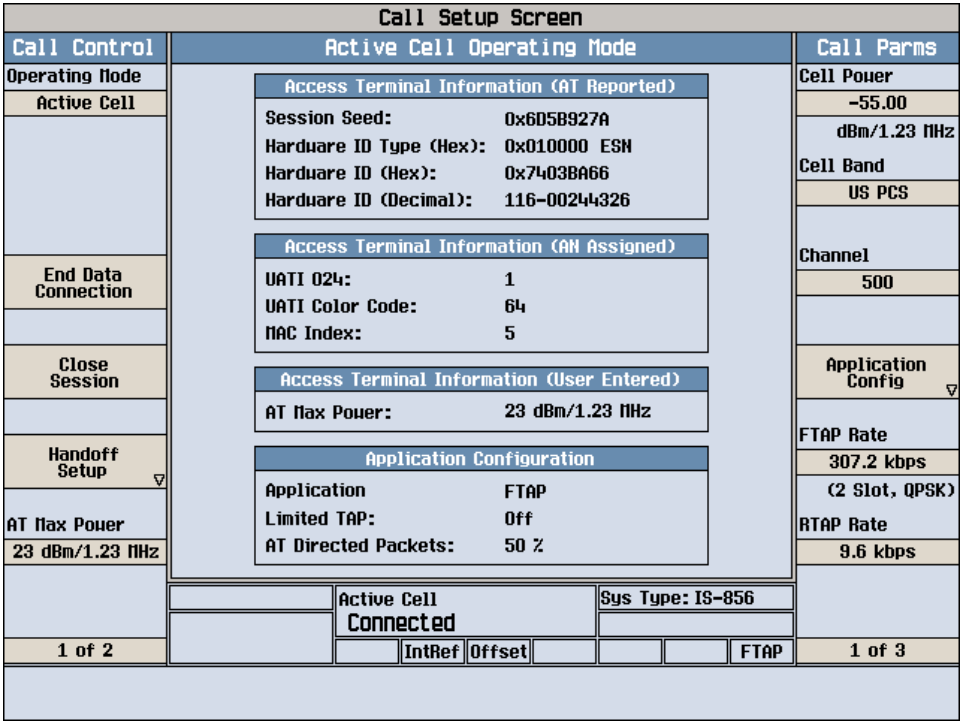
The `Access Terminal Information` will also become populated with values.

C. Configure the Connection

1. Select Application Config (**F10**) and set Application, Limited TAP, and AT Directed Packets as needed (see "How Do I Change Call Parameters?" on page 42).
2. Set FTAP Rate and RTAP Rate as needed (see "How Do I Change Call Parameters?" on page 42).

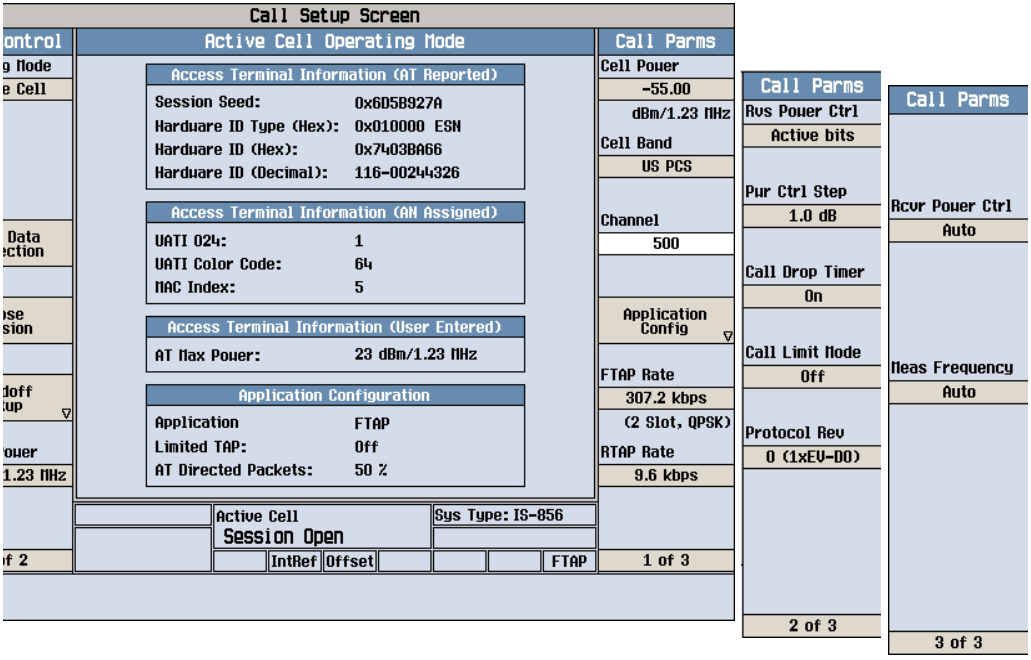
D. Open a Connection

1. Select Start Data Connection (**F3** on Call Control 1 of 2) to page the access terminal.



2. Check for Connected in the Active Cell status field.

How Do I Change Call Parameters?

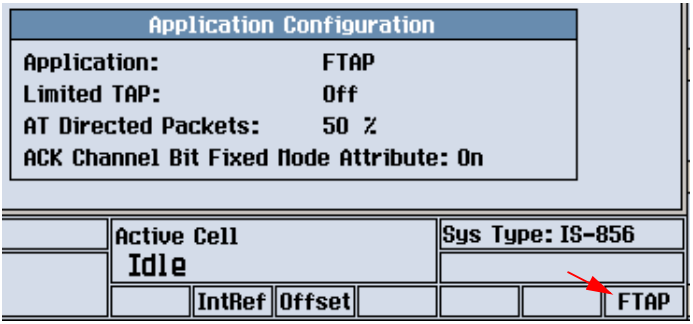


1. Press the **CALL SETUP** key.
2. Select any `Call Parms` softkey (**F7** to **F12**) to select a parameter.
3. Change the parameter as needed using the knob and/or keypad.
4. Select **More** (`1 of 3`) under `Call Parms` for additional call parameters.

Select `Application Config` (**F10**) to configure `Application`, `Limited TAP`, `AT Directed Packets` and `ACK Channel Bit Fixed Mode Attribute`

Application Configuration	Value
Application	FTAP
Limited TAP (AT Firmware Rel 3.1)	Off
AT Directed Packets	50 %
ACK Channel Bit Fixed Mode Attribute	On

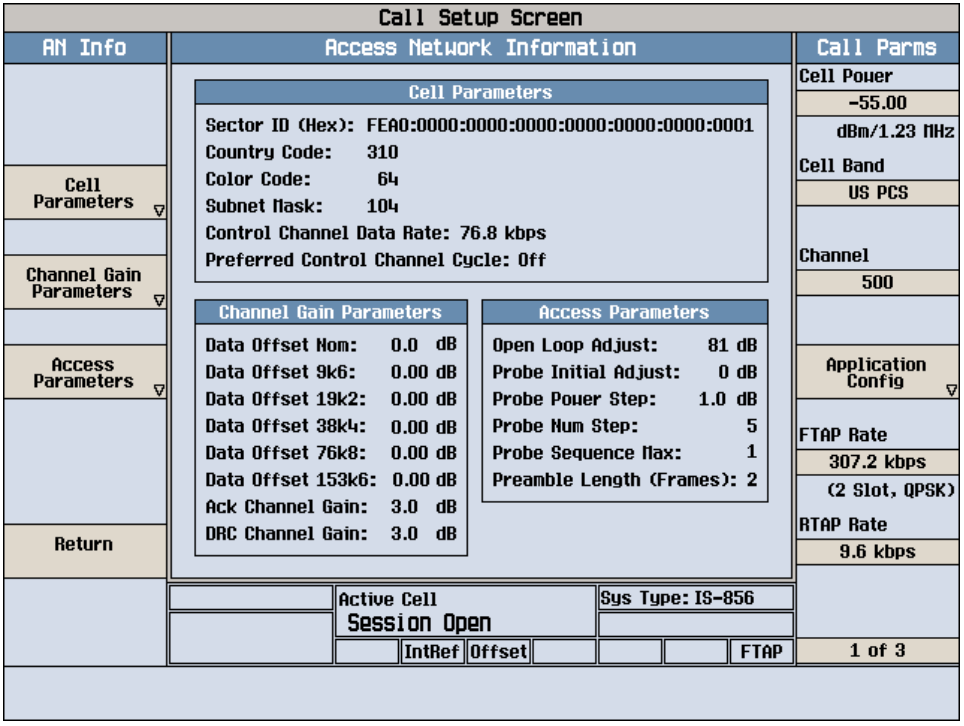
Your settings are displayed in the Application Configuration window on the Call Setup screen (and FTAP or RTAP is displayed at the bottom of the screen, to indicate the Application setting).



How Do I Change Access Parameters?

A. Select the Access Parameters Menu.

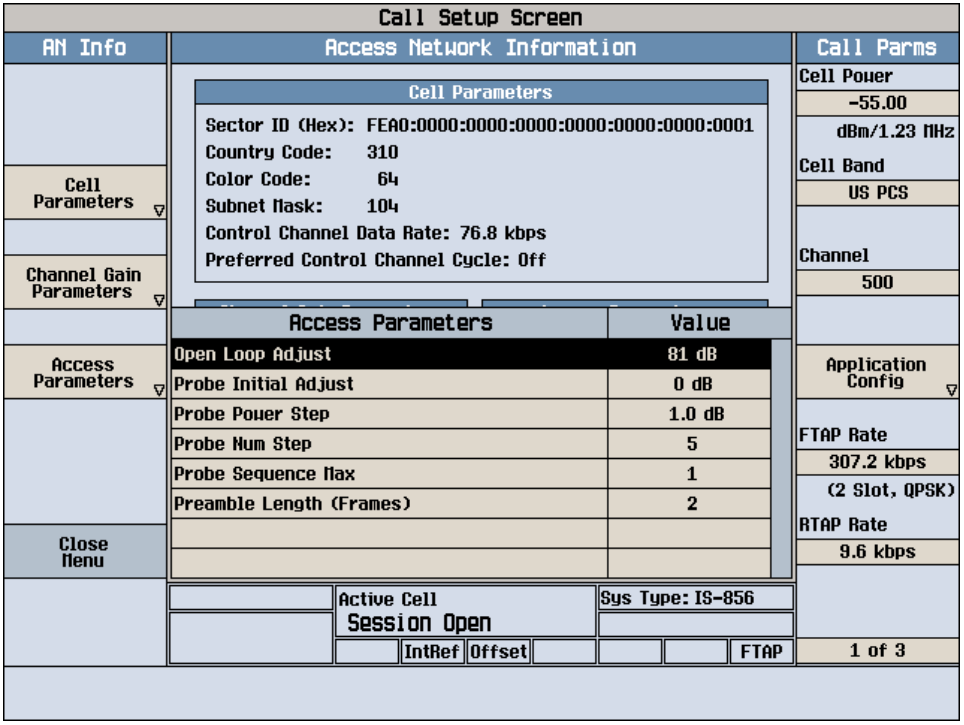
1. Press the **CALL SETUP** key.
2. Select **More** (`1 of 2`) under `Call Control`.
3. Select `Access Network Info` (**F2**).



4. Select `Access Parameters` (**F4**).

B. Set an Access Parameter.

1. Turn the knob to highlight a parameter and then press the knob.

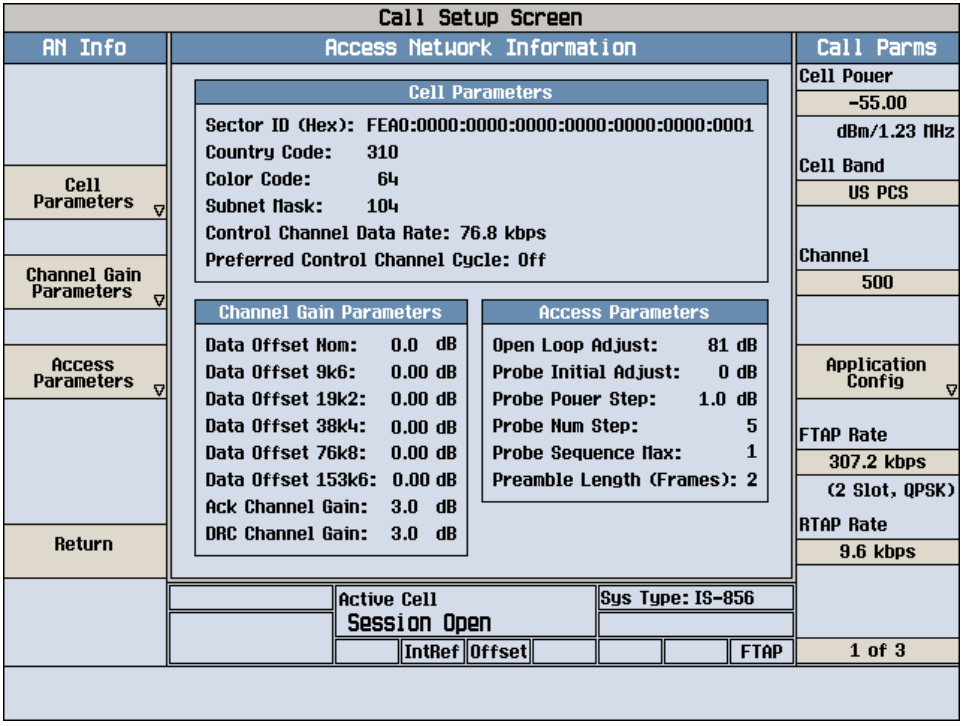


2. Enter a value or selection and press the knob.
3. Select `Close Menu` (**F6**).

How Do I Change Channel Gain Parameters?

A. Select the Channel Gain Parameters Menu.

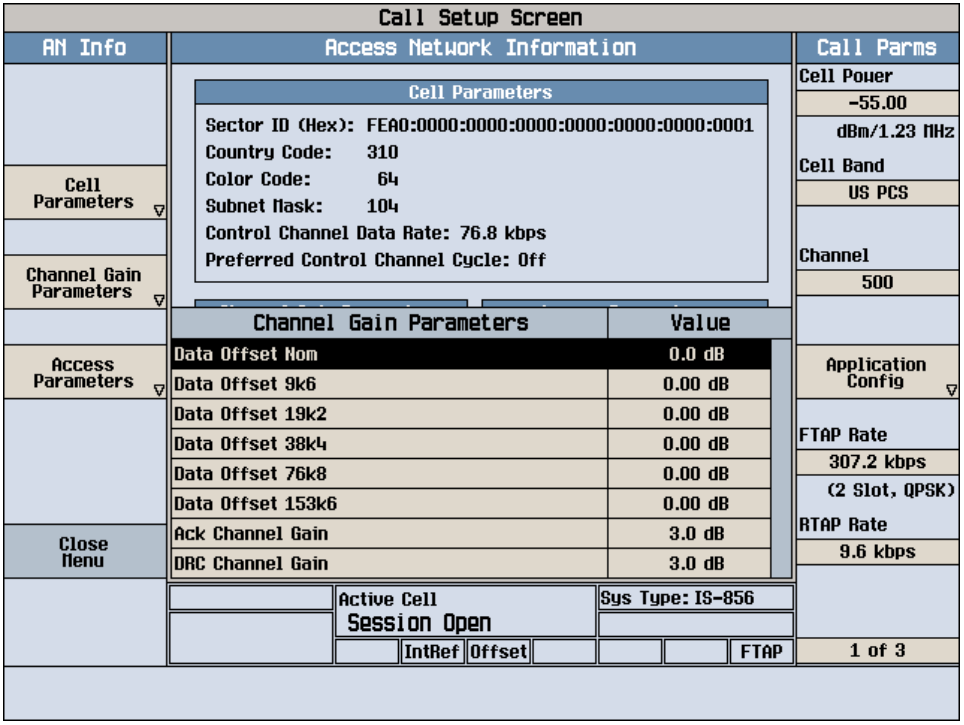
1. Press the **CALL SETUP** key.
2. Select **More** (`1 of 2`) under `Call Control`.
3. Select `Access Network Info` (**F2**).



4. Select `Channel Gain Parameters` (**F3**).

B. Set a Channel Gain Parameter.

1. Turn the knob to highlight a parameter and then press the knob.



2. Enter a value or selection and press the knob.
3. Select `Close Menu` (**F6**).

How Do I Change Channel Gain Parameters?