ROHDE&SCHWARZ

Test and
Measurement Division

Operating Manual

DIGITAL RADIOCOMMUNICATION TESTER CMD 80

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Certified Quality System

ISO 9001

DQS REG. NO 1954-04

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Use Proper Voltage Setting. Before applying power, ensure that the line selector is in the proper position for the power source being used.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and marking on the product. Consult the product manual for further ratings information before making connections to the product.

The common terminal is at ground potential. Do not connect the common terminal to elevated voltages.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Wear Eye Protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:

WARNING
High Voltage

Protective Ground
(Earth) Terminal

CAUTION
Refer to Manual

Double
Insulated

Preface

This manual is divided into six sections. The sections are:

- *Getting Started* – This section contains information you need to know before you use the CMD 80 Digital Radiocommunication Tester.
- *Operating Basics* – This section describes the front and rear panel controls and connectors. It also includes an overall view of the menu structure.
- *Reference* – This section describes the tests that can be performed using the tester. The section is divided into two subsections: *CDMA Measurements* and *Analog Measurements*. *Analog Measurements* provides analog test information for testers with Option 17 (Analog Mode) installed.
- *Appendices* – Five appendices are included:
  - *Appendix A: Specifications* describes the characteristics of the tester.
  - *Appendix B: Remote Control* describes the general use of and gives programming information for the remote control interfaces.
  - *Appendix C: Remote Control Commands* lists the specific commands used to operate the tester remotely.
  - *Appendix D: Remote Control Command Tables* is a tabular listing of remote control commands and related information.
  - *Appendix E: Special Commands* describes special-purpose remote commands that provide for nonstandard operation of the tester.
- *Glossary* – The glossary describes technical terms and acronyms that might not be familiar.
- *Index* – The index provides a quick way to find information relating to a particular subject.

Getting Started

This section briefly describes the CMD 80 Digital Radiocommunication Tester and explains how to operate the tester for the first time.

Product Description

The CMD 80 Digital Radiocommunication Tester tests mobile radiotelephones that are based on the EIA IS-95, EIA IS-95A, TSB-74, and J-STD-008 CDMA standards. The tester emulates a CDMA base station, makes a call to the mobile, and tests for all essential characteristics of a CDMA mobile telephone. The tester can measure the following key parameters:

- FER service option 2 or 9
- Frame errors
- Waveform quality
- Error vector magnitude
- Phase error
- Magnitude error
- Carrier feedthrough
- Frequency accuracy
- Power measurements
- Base station signaling for mobile testing

In today's wireless environment, manufacturers are developing mobile phones to support both digital (CDMA-based) and analog (AMPS-based) wireless technologies. Installing Option 17 in the tester adds Analog Mode testing capabilities that allow you to perform analog tests on dual-mode, CDMA/Analog Mode handsets.

With Option 17 (Analog Mode) installed, the tester can measure the following key analog parameters:

Receiver Measurements

- SINAD
- Distortion
- Frequency response

- Hum and noise

Transmitter Measurements

- Frequency and deviation (SAT) frequency error
- RF power
- Distortion
- Hum and noise
- Frequency response
- Modulation limits

Options

Table 1–1 lists the options that are available for the tester.

Table 1–1: List of options

Tektronix Option	Rohde & Schwarz Option	Function
396-4905-00	ZZA-94	19 inch rack mount kit
01	CMD-B1	High-stability reference oscillator
02	CMD-B81	Additive White Gaussian Noise (AWGN) generator
03	CMD-B3	Multireference frequency inputs and outputs
04	CMD-B60	Adapter for B61 and B62
07	CMD-B61	IEEE 488 (GPIB) bus interface
08	CMD-B62	Memory card interface
14	CMD-B14	13k vocoder rate (14.4k data rate)
15	— — —	Deletes PCS operation
16	— — —	Deletes cellular operation
17	CMD-B82	Adds Analog Mode
— — —	CMD-K1	Adds cellular operation
— — —	CMD K-2	Adds PCS operation

Refer to *Options* on page 3–34 to determine the options that are installed in your instrument. Contact the nearest sales representative for additional information.

Configuration

Yolu can specify test and operating parameters by pressing the CONFIG MENU softkey of the home menu display (see Figure 1–2 on page 1–5). Refer to *CONFIG MENU* on page 3–28 for a description of the various menus used to configure the tester.

You can access configuration menus for many of the test menus by pressing the CONFIG hardkey followed by the softkey for the item you want to configure. The CONFIG hardkey is located in the group of hardkeys located below the memory card slot.

First Time Operation

This subsection contains information for new users who are unfamiliar with the tester. After unpacking, use the following procedure to verify proper operation of the tester.

Power Connection

Use the power cord supplied with the tester to connect to the local supply as follows:

1. Connect the power cord from the rear panel to the AC supply.

   The tester is equipped with an AC voltage detector which automatically sets the supply voltage to the proper range (refer to *Appendix A:Specifications*, Table A–5 on page A–3).

2. Switch the tester power on by first pressing the rear panel power switch and then pressing the front-panel power switch. If necessary, adjust the front-panel CONTRAST control to optimize the display legibility.

NOTE. *When the main power switch (on the rear panel above the power connector) is in the OFF position, the tester is disconnected from the AC power supply.*

When the front-panel power switch is in the STANDBY position, voltage is supplied to only the reference frequency oscillator and the front-panel STANDBY indicator (yellow LED). When the switch is in the ON position (green LED lighted), all of the tester modules are supplied with proper operating voltage.

Connect the Mobile Phone

Connect the mobile phone to the tester as follows:

1. Connect the RF IN/RF OUT N-type connector of the tester to the antenna connector of the mobile phone as illustrated in Figure 1–1.

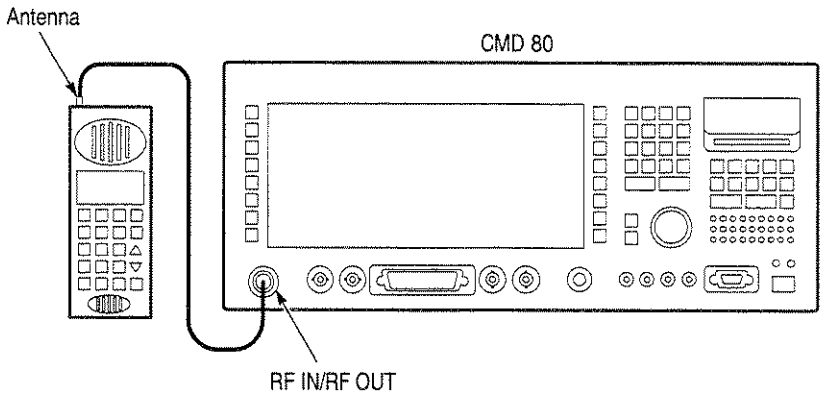


Figure 1–1: Mobile phone input to the tester

NOTE. *For accurate measurements, use a high quality RF cable with an attenuation of less than 0.5 dB.*

2. Check that the mobile phone is supplied with the correct operating voltage (battery or power supply).

CDMA Functional Check

Use the following procedure to establish communications between the tester and the mobile phone:

1. Press the **MENU HOME** hardkey and check that the display area is similar to that shown in Figure 1–2.

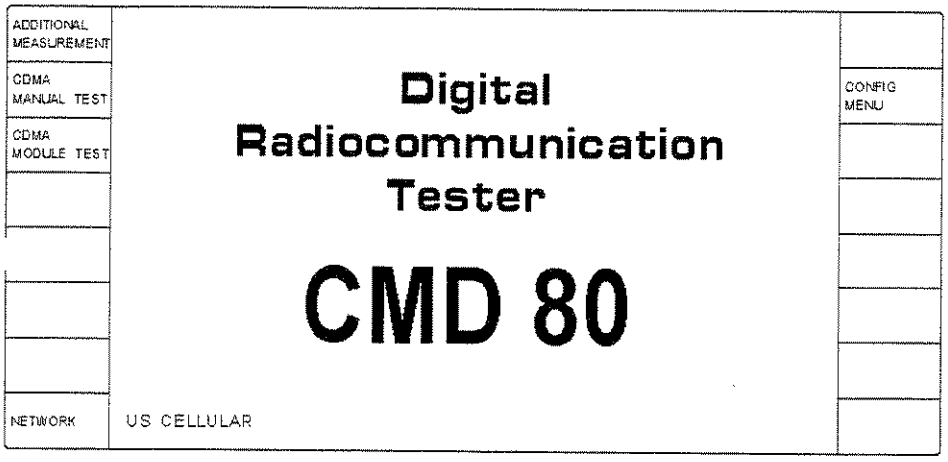


Figure 1–2: CDMA home menu display

2. Press the **CDMA MANUAL TEST** softkey to display the MS UNREGISTERED menu. See Figure 1–3.

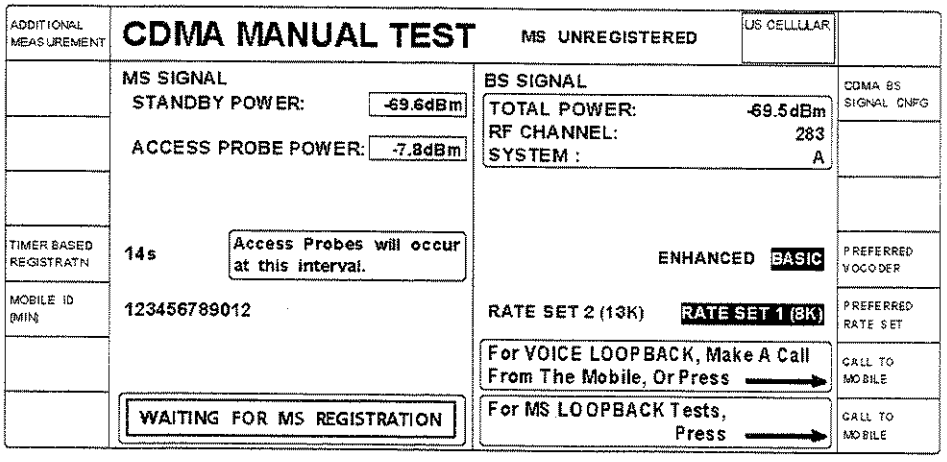


Figure 1–3: CDMA MS UNREGISTERED menu (initialization state)

NOTE. *During initialization, the "Waiting for..." text block blinks on and off until the registration is complete (approximately 10 to 40 seconds).*

When initialization is complete, the tester displays a CDMA MS REGISTERED menu similar to Figure 1–4. If the mobile unit does not connect, go to the CDMA BS SIGNAL CNFG menu via the CONFIG MENU softkey in the home menu and verify that the base station parameters are correctly configured.

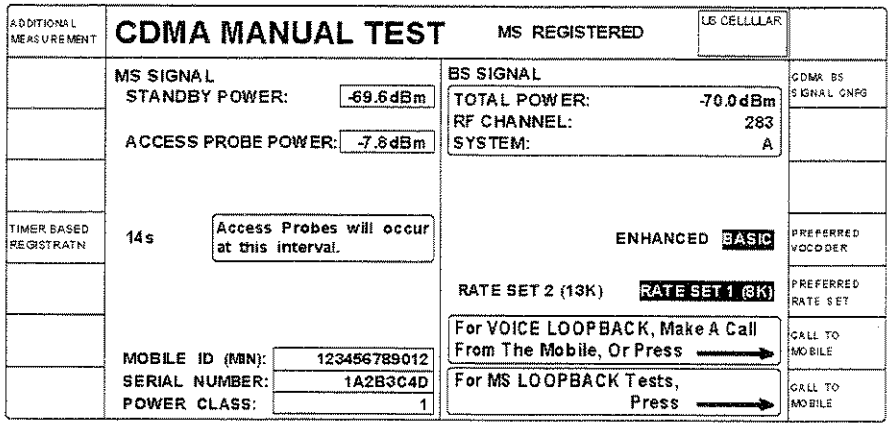


Figure 1–4: CMDA MS REGISTERED menu (idle/access state)

3. Using the mobile phone keypad, enter any telephone number (the number is not important and can be up to 32 digits), and press **SEND** on the mobile unit to initiate the call.

4. Check that the tester indicates that the call has been established by displaying the CDMA VOICE LOOPBACK menu illustrated in Figure 1–5. Establishing this connection verifies that the mobile phone was able to communicate properly with the tester.

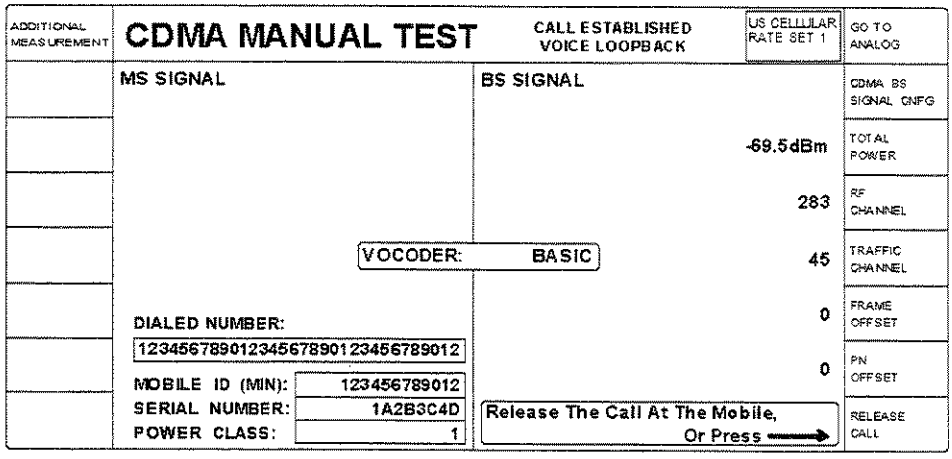


Figure 1–5: CDMA VOICE LOOPBACK menu

5. To disconnect the call to the mobile phone, press the **RELEASE CALL** softkey at the bottom right of the display area, or press the **END** key on the mobile phone.

Analog Functional Check (Option 17 Only)

If you have Option 17 (Analog Mode) installed in the tester, use the following procedure to test the functionality of the analog features of your mobile station.

1. Perform the steps in *Power Connection* on page 1–3 and in *Connecting the Mobile Phone* on page 1–4.
2. Press the **MENU HOME** hardkey and check that the display area is similar to that shown in Figure 1–6.

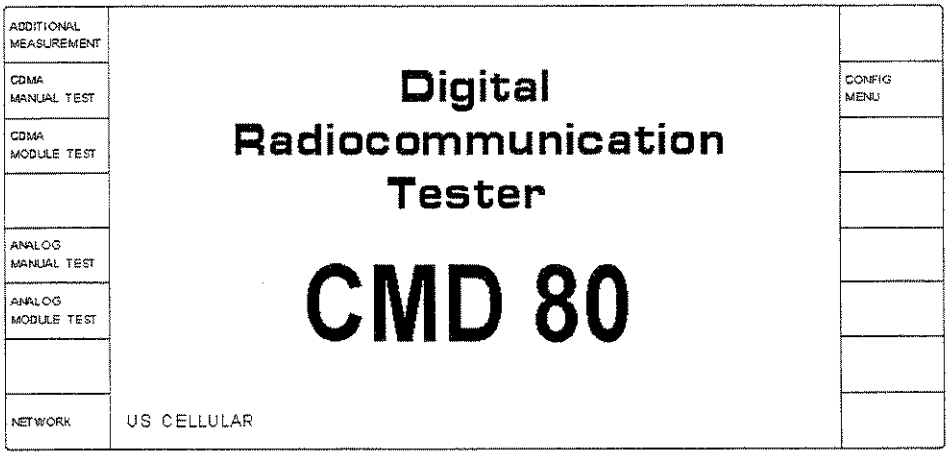


Figure 1–6: Analog Home menu display

3. Press the **ANALOG MANUAL TEST** softkey to display the analog MS UNREGISTERED menu. See Figure 1–7.

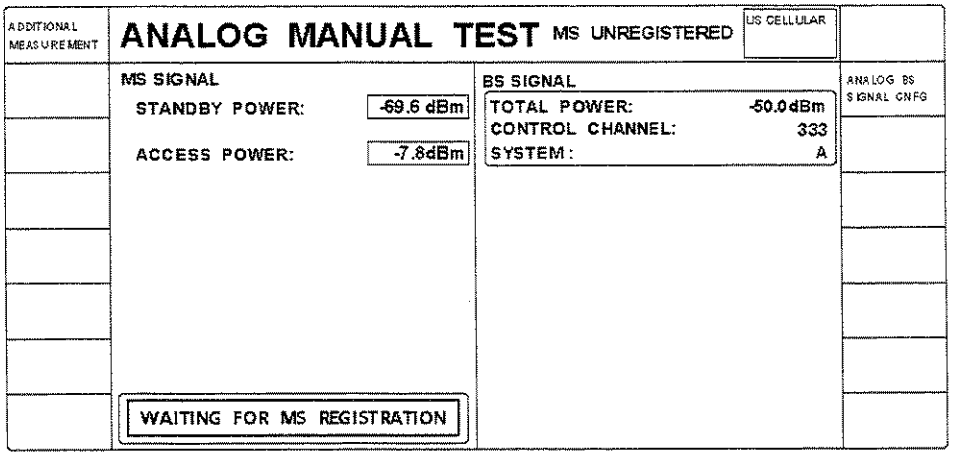


Figure 1–7: Analog MS UNREGISTERED menu (initialization state)

NOTE. *During initialization, the "Waiting for..." text block blinks on and off until the registration is complete (approximately 10 to 40 seconds).*

When initialization is complete, a menu similar to Figure 1–8 is displayed. If the mobile unit does not connect, go to the ANALOG BS SIGNAL CNFG page via the CONFIG MENU softkey in the home menu and verify that the base station parameters are correctly configured.

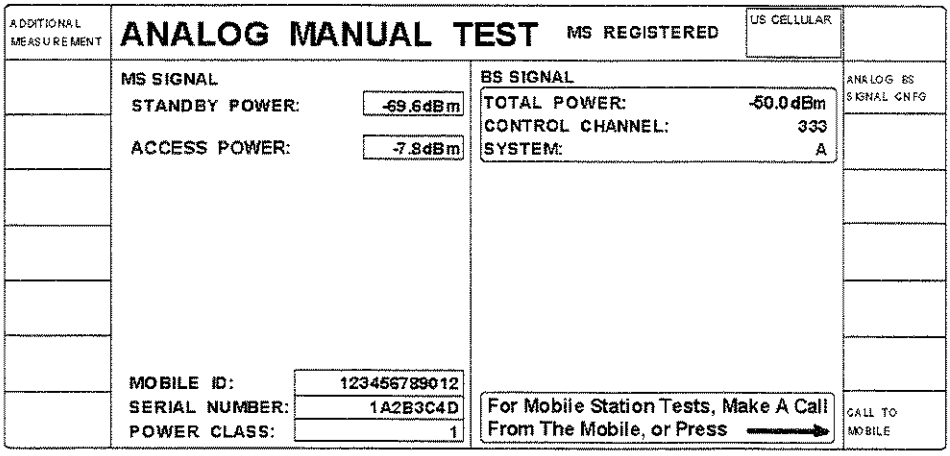


Figure 1–8: Analog MS REGISTERED menu (idle/access state)

4. Using the mobile phone keypad, enter any telephone number (the number is not important and can be up to 32 digits), and press **SEND** on the mobile unit to initiate the call.

5. Check that the tester indicates that the call has been established by displaying the analog CALL ESTABLISHED menu shown in Figure 1–9. Establishing this connection verifies that the mobile phone was able to communicate properly with the tester.

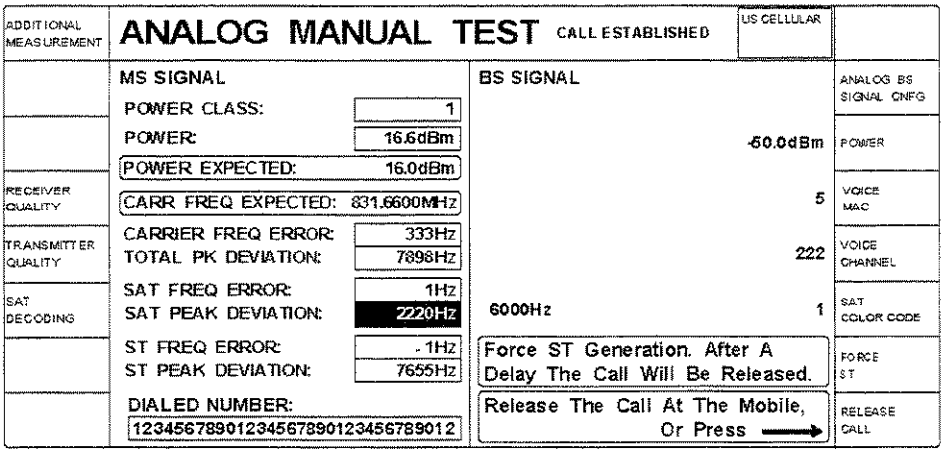


Figure 1–9: Analog CALL ESTABLISHED menu

6. To disconnect the call to the mobile phone, press the **RELEASE CALL** softkey at the bottom right of the display area, or press the **END** key on the mobile phone.

Operating Basics

This section describes the front and rear panel controls and connectors. It also provides a brief description of the menu selections and how they are used.

Front-Panel Display, Controls, and Connectors

The front panel is illustrated in Figure 2–1. Refer to this illustration when reading the description for a particular area.

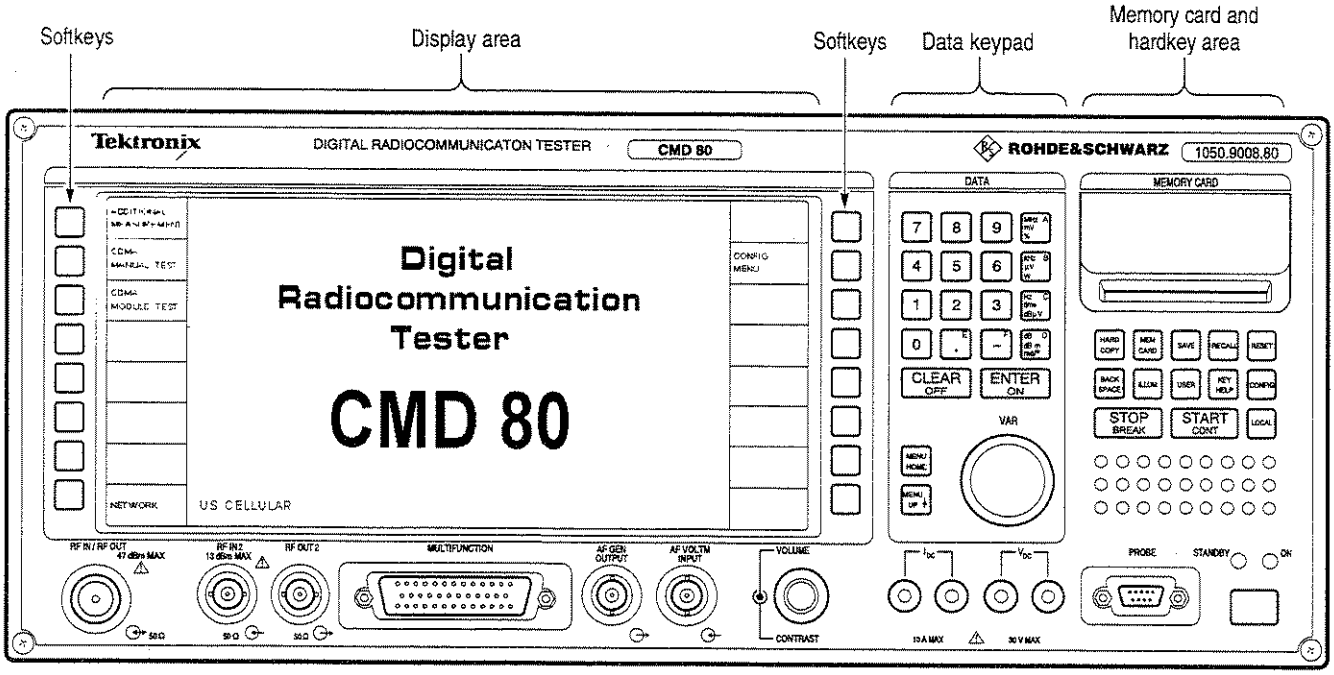


Figure 2–1: CMD 80 Digital Radiocommunicaton Tester

Display Area The display area shows the menu headings, descriptions of the softkey functions, settings, measured values, and status messages. The contents of the display change depending on the menu selected. The display also may be affected by the options that are installed in your tester.

Softkeys The softkeys are the eight keys to the left and eight keys to the right of the display area. The current function is displayed directly next to the softkey in the display area.

Data Keypad

This area is used to enter data for a particular function. The controls in this area are illustrated in Figure 2–2.

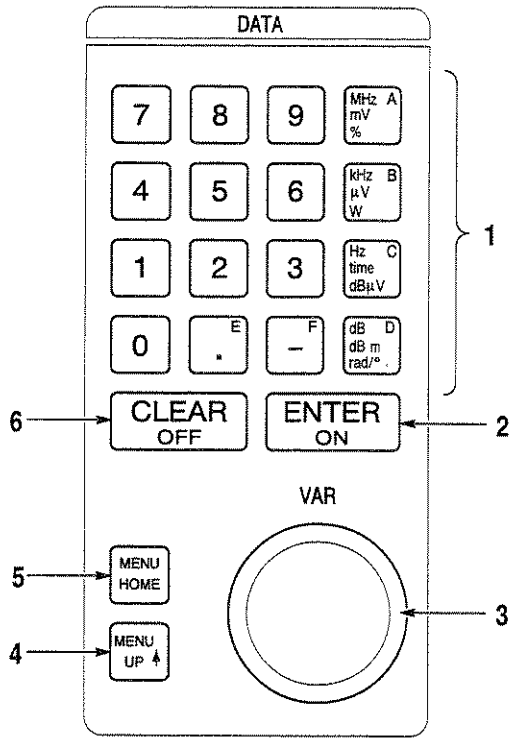


Figure 2–2: Detail of data keypad area

1. Numeric Keypad. Use the numeric keypad to enter digits 0 through 9.

   The multifunction unit keys are located to the right of the numeric keypad. These keys supply the appropriate units for an entry and are context sensitive.

For example, if you press the top key it is interpreted as MHz, mV, %, or the hexadecimal digit A, depending on the parameter you are specifying. The key units and corresponding functions are as follows:

Key Marked:	Function:
MHz	Frequency
mV	Voltage
%	Distortion, for example
A	Hexadecimal digit
kHz	Frequency
µV	Voltage
W	Power
B	Hexadecimal digit
Hz	Frequency
time	Time
dBµV	Level
C	Hexadecimal digit
dB	Relative power setting
dBm	Power level
rad/°	Phase deviation
D	Hexadecimal digit
–	Minus sign (any number without a minus sign is positive)
F	Hexadecimal digit
.	Decimal point
E	Hexadecimal digit

2. ENTER ON. This key performs the following functions:

   - Terminates all numeric entries not having or not requiring a unit key termination
   - Activates the functions that were deactivated by OFF (usually measurements or levels)

3. VAR. This spinwheel is used to vary a number of functions, usually relating to the softkey parameters. The spinwheel is also used to position the MARKER on a display.

4. MENU UP. This key displays the next higher level menu.

5. MENU HOME. This key displays the highest level menu.

6. CLEAR OFF. This key performs the following functions:
   - Aborts entries not yet concluded
   - Switches off or selects the minimum value when entering values
   - Switches off various functions (for example, AWGN or BS frequency offset)

Memory Card, Hardkey, and Loudspeaker Area

The slot in the memory card area is used to insert the optional memory card. Keys in the hardkey area perform dedicated functions. The keys are located below the MEMORY CARD slot (see Figure 2–3).

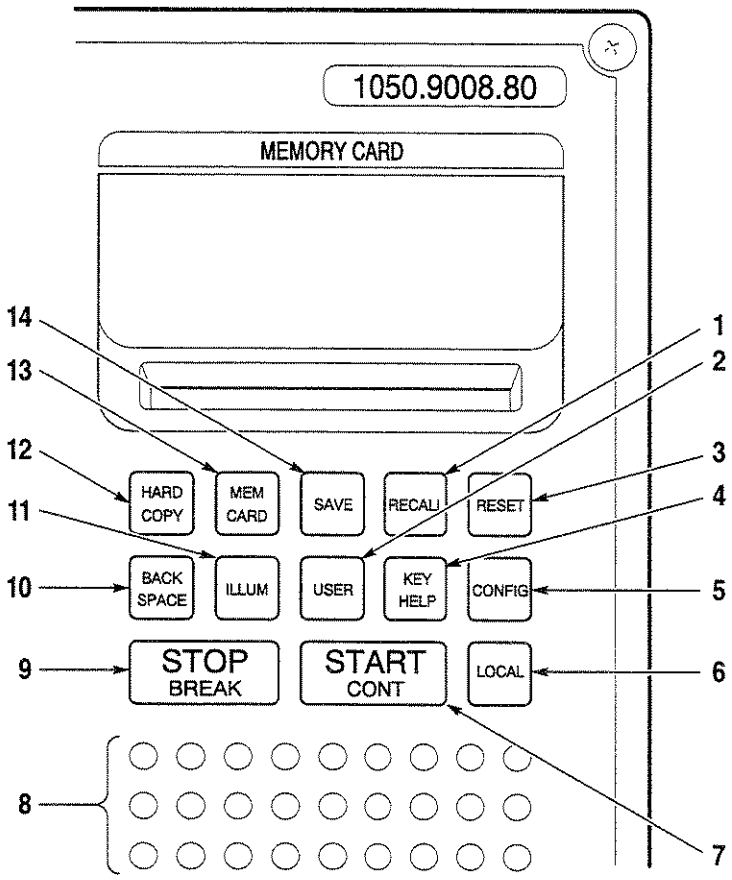


Figure 2–3: Detail of memory card, hardkey, and loudspeaker areas

NOTE. *Not all hardkeys have functions assigned to them. Keys that do not have functions assigned are for future enhancements.*

1. RECALL.This hardkey recalls tester states.
2. USER. This hardkey displays a menu from which you select the user number. Each user number has its own set of states that can be recalled when you press the RECALL key. You can store the tester states using the SAVE key.
3. RESET. This hardkey sets the tester to a defined state.
4. KEY HELP. This hardkey is not used.
5. CONFIG. When you press this hardkey, a special menu is displayed. This menu offers access to configuration menus for particular functions of the original menu. Not all menus use this function.
6. LOCAL. This hardkey switches from Remote (GPIB or RS-232 control) to Local (manual control).
7. START CONT. This hardkey is not used.
8. Loudspeaker. The loudspeaker is used when you have the key click function or audible warnings turned on.
9. STOP BREAK. Press this hardkey to abort editor entries.
10. BACK SPACE. This hardkey deletes the figure last entered from the keypad.
11. ILLUM. This hardkey is not used.
12. HARD COPY. This hardkey sends a copy of the display area to the printer.
13. MEM CARD. This hardkey is not used.
14. SAVE. This hardkey saves tester states.

Front-Panel Controls and Connectors

The remaining front-panel controls and connectors are located at the bottom of the front panel as illustrated in Figure 2–4.

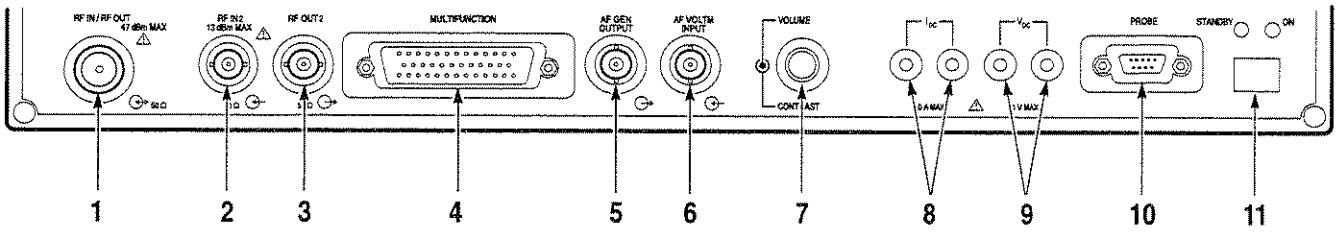


Figure 2–4: Front-panel controls and connectors

1. RF IN/RF OUT. This is a bidirectional RF connector. It provides both an input and output for RF signals from instruments. The antenna connection of a mobile phone is usually connected here.
2. RF IN 2. This connector is a sensitive RF input which can be used as an alternative to the RF IN/RF OUT signal.
3. RF OUT 2. This connector provides a high-level RF output signal as an alternative to the RF IN/RF OUT signal.
4. MULTIFUNCTION. This 50-contact connector provides a number of functions, depending on the options installed.
5. AF GEN OUTPUT. This connector provides audio-frequency tones. This output is active only if the tester has Option 17 (AMPS) installed in it.
6. AF VOLTM INPUT. This connector is used to measure audio-frequency tones. This connector is active only if the tester has Option 17 (AMPS) installed in it.
7. VOLUME/CONTRAST. The center knob has no function. The outer knob adjusts the contrast of the display area.
8. I_{DC}. These connectors are used to measure the DC current of the mobile phone. The left connector is positive.
9. V_{DC}. These connectors are used to measure the DC voltage of the mobile phone. The left connector is positive.
10. PROBE. This connector is reserved for future options.
11. STANDBY / ON. This is the front-panel power switch that switches between the STANDBY and ON modes.

Rear-Panel Controls and Connectors

The rear-panel controls and connectors are shown in Figure 2–5. Refer to the figure when reading the description for each area.

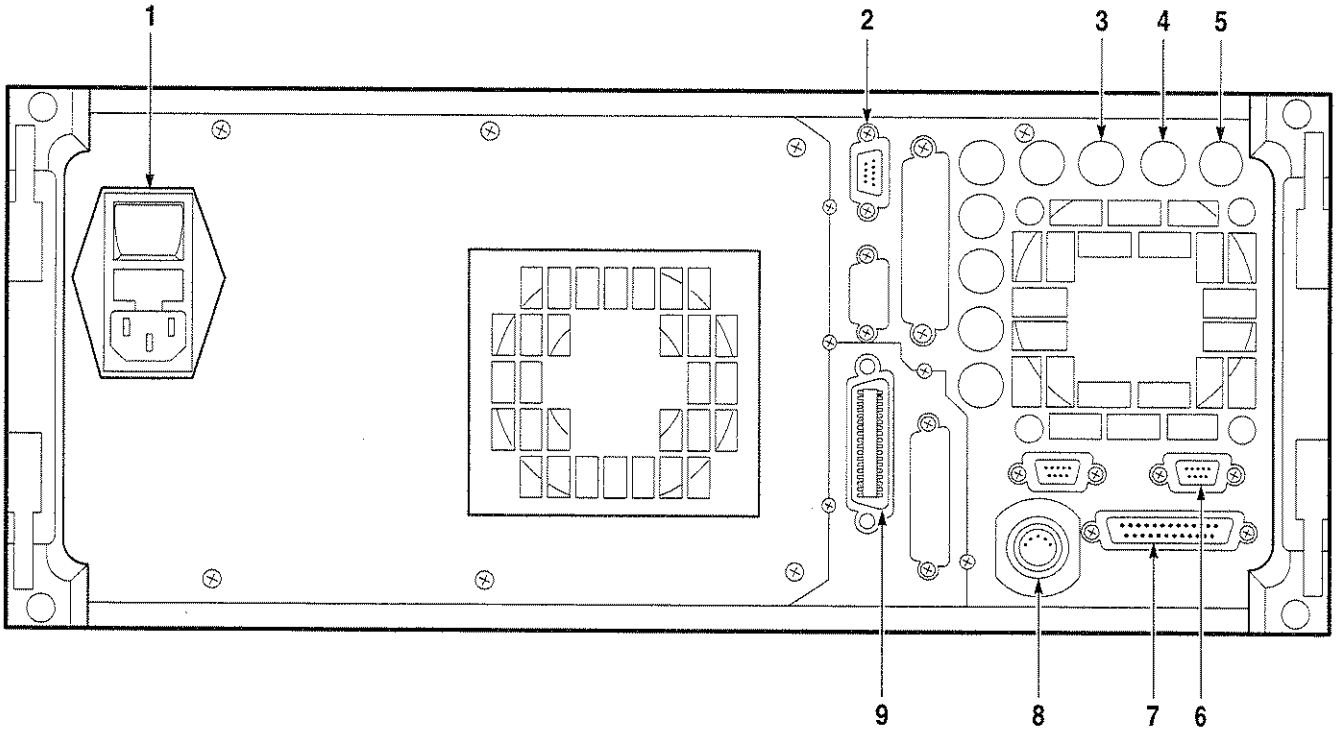


Figure 2–5: Rear panel controls and connectors

1. Power Connector Area. This area has the following items:
   - Power connector. Use this to connect external power to the tester.
   - Fuse holder. This holder contains the power line fuse.
   - Power switch. This is the master power switch that isolates all poles of the power supply.
2. SERVICE. This connector is for use by factory personnel only.

CAUTION. *To prevent equipment damage, do not make any connection to the SERVICE connector on the rear panel.*

3. RF OUT 10 MHz/REF IN. This is an optional output connector for the reference frequency of the measuring instrument: 10 MHz or signal of REF IN connector (without resynchronization). Refer to the *Reference Timing* section on page 3–30 for details.
4. REF OUT 2. This is an optional output connector for CDMA timing signals. Refer to *Reference Timing* on page 3–30 for details.
5. REF IN. This is an optional reference frequency input connector.
6. RS-232. This connector is a remote control interface and is also used to update the tester operating system.
7. PRINTER. This is a 25-contact Centronics connector which is used to connect a printer.
8. KEYBOARD. This connector is not used.
9. IEEE BUS. This connector is an optional IEEE 488/IEC 625 (GPIB) interface.

Other rear panel connectors are provided for future expansion.

CAUTION. *To prevent equipment damage, open ports should not be used even when a connector is present.*

Basic Operation

The following topics describe rules which must be observed for the operation of the softkeys and other front-panel controls.

Numerical Entry

With the softkey on a bright background, data cannot be entered. Pressing a softkey changes the softkey display to a dark background and allows data to be entered. For some entries, a small VAR symbol appears, indicating that the VAR control can be used. Entry is as follows:

- Rotating the VAR control increases or decreases the setting value.
- Pressing the first key in the data area causes an input window to open displaying the first digit. At this point, the VAR control cannot be used. Enter additional digits using the keypad. The BACKSPACE key deletes the last digit, the CLEAR key clears the complete entry, and the STOP BREAK key closes the input window without recording the value. Press the ENTER key or a unit key to set the value and close the input window. Once this is done, the VAR control is reactivated.

Selection With Softkeys

In addition to numeric entry, softkeys are used to select various displays. For example, the POWER CONTROL GATED OUTPUT display is available in one of three formats:

- Full display
- Rising edge
- Falling edge

The active display is indicated by a dark background.

Loop Toggle

Two (or more) operating states can be displayed next to a softkey. The active state is indicated by an inverse display. You can switch operating states by pressing the softkey.

Hardkeys

The hardkeys are on the touchpad located on the left half of the tester.

CONFIG. A number of configuration menus are provided that permit you to specify and vary parameters and basic settings for measurements. Select the configuration menus by pressing the CONFIG key in a measurement menu and then pressing a softkey to call up the configuration menu associated with the measurement or setting.

MENU UP. This key displays the next higher menu.

MENU HOME. This key returns the display directly to the home menu.

Save/Recall

You can store and recall setups to the internal hard drive or a PCMCIA memory card (option installation required). It is recommended that you use a PC card with 128 Kb or greater memory capacity.

NOTE. *You must format the memory card on an MS-DOS personal computer prior to use with the tester.*

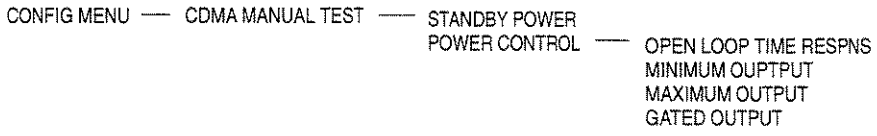
Press either the SAVE or RECALL hardkey to access the save and recall menus. Select either MEMCARD or INTERNal to access either the memory card or internal storage.

Menu Structures

You control the tester by selecting the configurations and tests that you want from the displayed menu selections. Pressing a softkey to select a test may display subsequent tests or choices.

The menu structure divides logically into two main sections: test menus and configuration menus. For the standard tester, these menus are used to set up and perform tests on CDMA (digital) mobile stations. If you have Option 17 installed, your tester also has menus that allow you to set up and perform tests on analog mobile stations.

The following illustration shows the partial menu structure of the CONFIGURATION MENU.



To access the Power Control Config menu for the Gated Output function, you perform the following steps:

1. Press the **MENU HOME** button to display the home menu.
2. Press the **CONFIG MENU** softkey to display the CONFIGURATION MENU.
3. Press the **CDMA MANUAL TEST** softkey to display the CDMA MANUAL TEST CONFIGURATION menu.
4. Press the **POWER CONTROL** softkey to display the POWER CONTROL CONFIGURATION menu.
5. Press the softkey for the function whose parameters you want to set.

Figure 3–2 on page 3–4 shows a complete listing of the CDMA menu tree; Figure 3–18 on page 3–29 shows a complete listing for the CDMA configuration menu.

NOTE. *For the analog test and configuration menus to appear on the display, your tester must have Option 17 (AMPS) installed in it.*

Figure 3–25 on page 3–36 shows a complete listing of the analog menu tree; Figure 3–52 on page 3–65 shows a complete listing of the analog configuration menu.

Reference

This section contains more detailed information about using the CMD 80 Digital Radiocommunication Tester. To simplify usage, this section is divided into two subsections: *CDMA Measurements* and *Analog Measurements*.

CMDA Measurements contains information about using the tester to emulate a CDMA base station and the tests that you can perform on CDMA mobile stations. This information is applicable to all testers.

If Option 17 (Analog Mode) is installed in your instrument, your tester can also emulate an analog base station. *Analog Measurements* contains information about the tests that you can perform on analog mobile stations.

NOTE. *The menus and tests discussed in* Analog Measurements *are only available if Option 17 (Analog Mode) is installed in your instrument.*

CDMA Measurements

This subsection describes the operation of the CDMA tests that the CMD 80 Digital Radiotelephone Tester can perform. Some menu items and softkeys are associated with a specific option. If you do not have that option installed, the supporting menus and softkeys do not appear in the display.

Using the Home Menu

After power on, the home menu illustrated in Figure 3–1 is displayed. You can press the MENU HOME front-panel key to return to this menu at any time. The softkeys displayed by this menu allow you to select from a number of main topics.

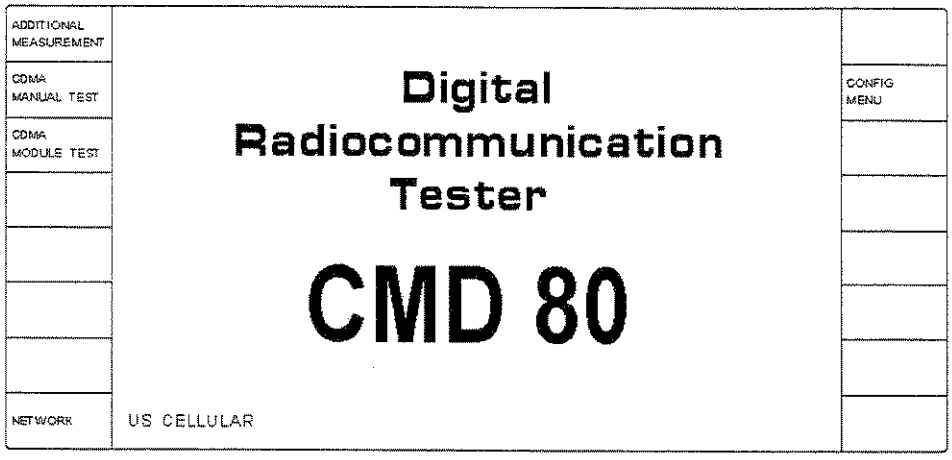
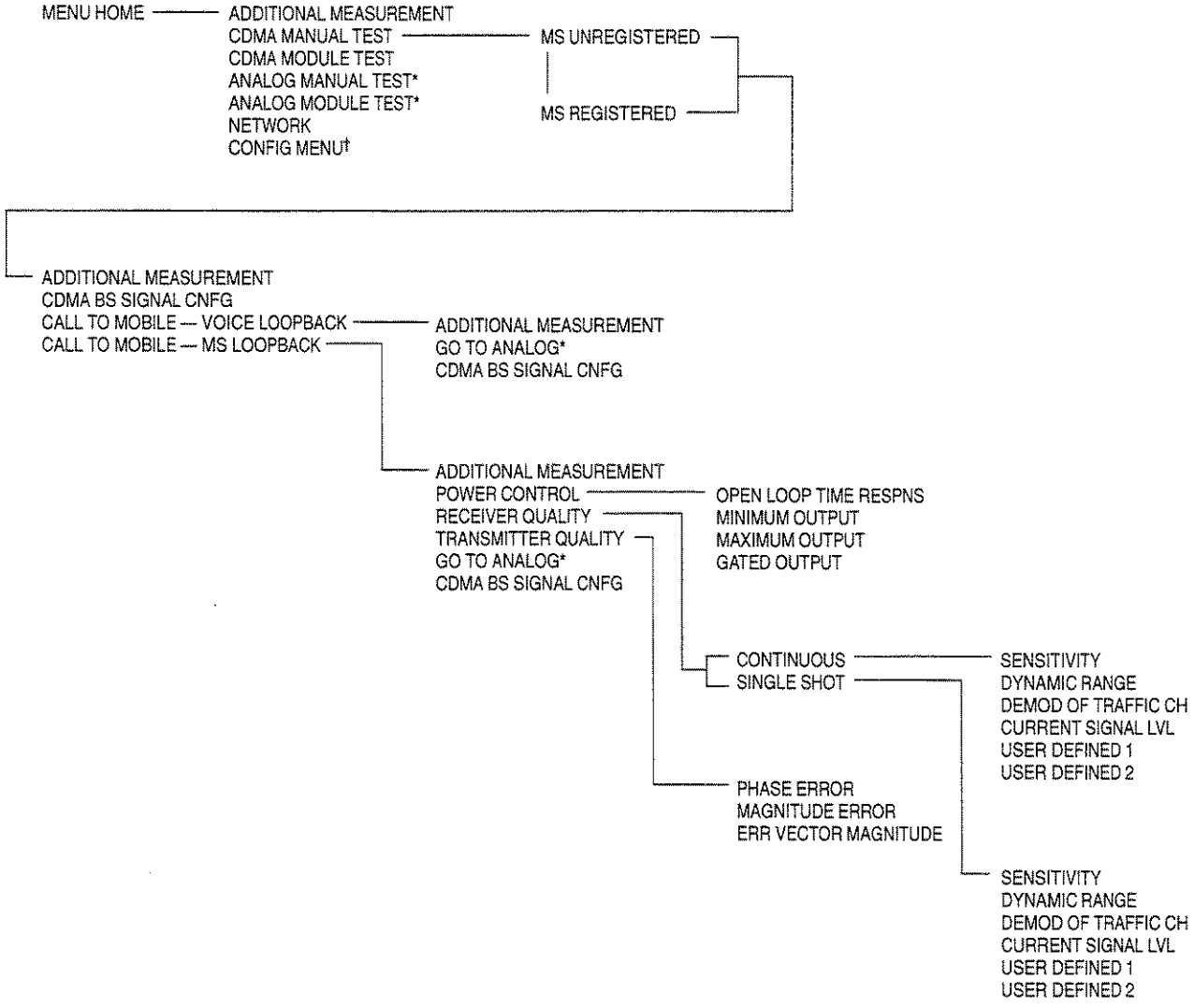


Figure 3–1: Home menu display

Some of the menu selections have several levels of submenus associated with them. Figure 3–2 shows the CDMA menu structure for the tester. This subsection contains a description of each of these softkeys.



* This selection is available only if the tester has Option 17 (Analog Mode) installed in it; refer to Figure 3–25 on page 3–36 for a listing of the analog menus.

† Refer to Figure 3–18 on page 3–29 for a listing of the CONFIG MENU.

Figure 3–2: CDMA menu tree

ADDITIONAL MEASUREMENT

This softkey displays a menu in which conventional (not CDMA) measurements are offered. Measurements that are available are DC voltage and several DC current measurements. The voltage and current measurements are illustrated in Figure 3–3.

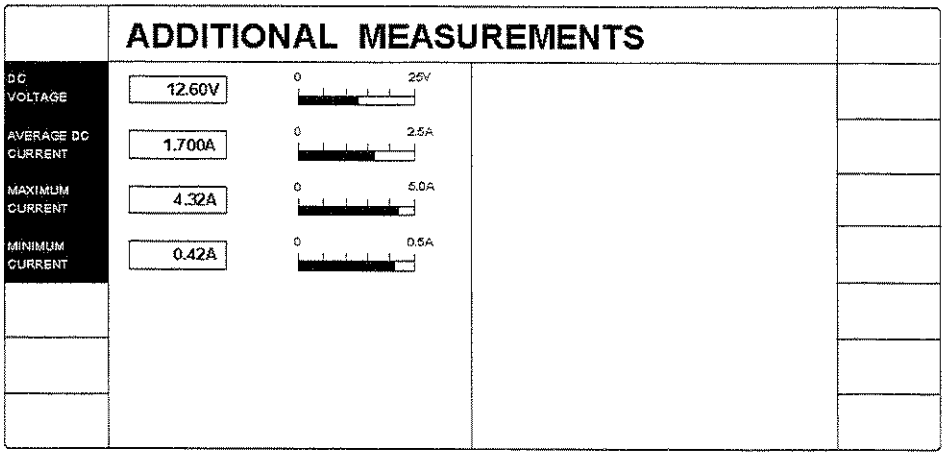


Figure 3–3: ADDITIONAL MEASUREMENTS display

CDMA MANUAL TEST

This softkey displays the menu used to perform measurements on CDMA mobile stations. Selecting this test initiates a sequence composed of three states:

- Initialization (MS Unregistered)
- Idle/access (MS Registered)
- Call established

During each of these states, you can make various tests. The states and related tests are described in this subsection.

INITIALIZATION

The first stage of the manual test is the initialization state, which is started by pressing the CDMA MANUAL TEST softkey. During this initialization state, the tester establishes contact with the mobile station and enables the output power from the tester. Figure 3–4 shows the display during this state.

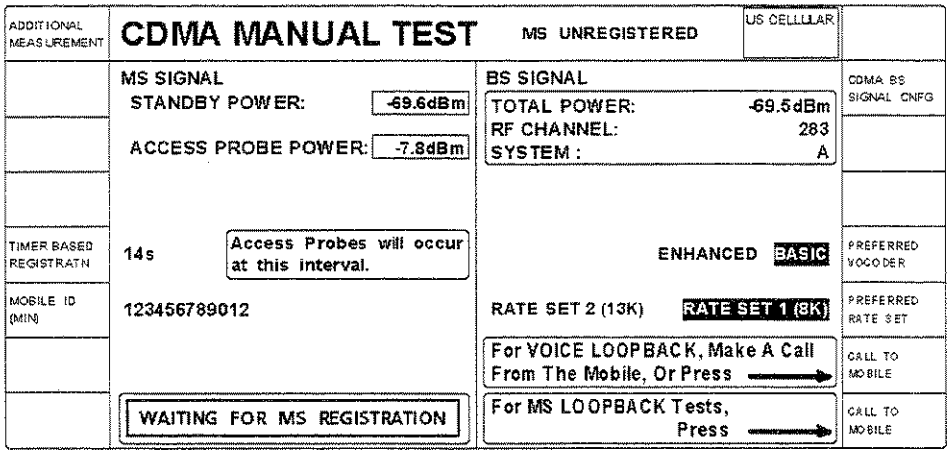


Figure 3–4: MS UNREGISTERED menu (initialization state)

You can use either of the two CALL TO MOBILE softkeys to initiate a call to the mobile station, or you can place a voice loopback call from the mobile station by entering any telephone number on the mobile station and pressing SEND.

The following softkeys are available during the initialization state:

- ADDITIONAL MEASUREMENT. Refer to *ADDITIONAL MEASUREMENT* on page 3–5.
- TIMER BASED REGISTRATN. Press this softkey to set the interval that the mobile station is to use to register with the tester. You can use the VAR control to set a range of values from 12 seconds to approximately 2 minutes. If you select OFF, the mobile station discontinues periodic registration with the tester.
- MOBILE ID. Press this softkey to enter the MIN or IMSI of the mobile station. This provides the tester with the necessary information so that you can use the CALL TO MOBILE softkey immediately and not have to wait for registration.

NOTE. *The tester requires either a MIN or an IMSI mobile identification type. (You select the mobile ID type in the CDMA BS PARAMETERS CONFIGURATION menu.) For some protocol revisions, you can choose either a MIN or an IMSI mobile ID. For other protocol revisions, a choice of mobile ID is not available. In these cases, the CDMA BS PARAMETERS CONFIGURATION menu does not display the MOBILE ID TYPE softkey; instead, it displays the mobile ID type in a rounded box below the protocol revision field.*

- CDMA BS SIGNAL CNFG. This softkey displays the configuration menu where you can define the components of the base station signal. These include the levels of the pilot, sync, and paging channels and other parameters, such as traffic channel and frame offset that are used when a call is set up.
- PREFERRED VOCODER. This softkey is displayed only if you have selected RATE SET 1 (8K) as the preferred rate set. Press this softkey to select the preferred vocoder, either BASIC or ENHANCED. If the rate selected is not supported by the mobile station, the tester reverts to the supported rate.
- PREFERRED RATE SET. This softkey enables you to select either the 8K or 13K vocoder rates (option installation required). If the rate selected is not supported by the mobile station, the tester reverts to the supported rate.
- CALL TO MOBILE. Activation of the upper softkey causes the tester to initiate a voice loopback call to the mobile station. Pressing the lower softkey initiates the mobile station loopback tests.

IDLE/ACCESS

After the mobile station is powered on and registered, the tester enters the idle/access state. Figure 3–5 shows the display during this state. The tester displays the mobile station information on the left side of the screen and the base station information on the right side. You can use either of the two CALL TO MOBILE softkeys to initiate a call to the mobile station, or you can place a voice loopback call from the mobile station by entering any telephone number on the mobile station and pressing SEND.

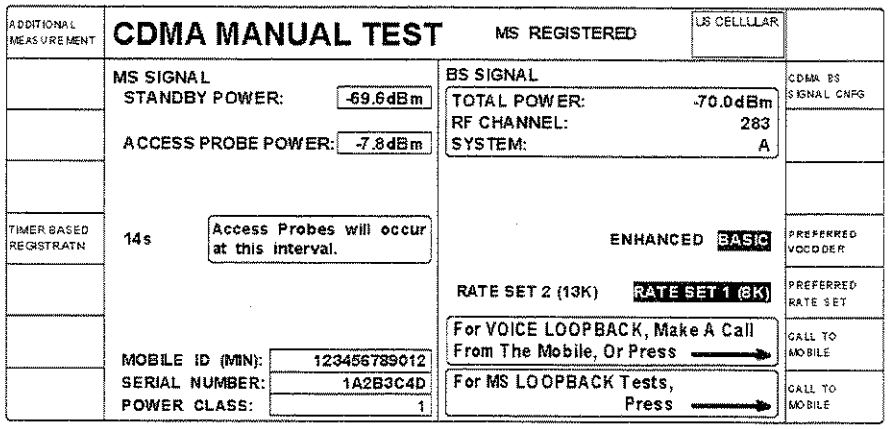


Figure 3–5: MS REGISTERED menu (idle/access state)

NOTE. *If the power class information of a J-STD-008 mobile station is not reported, the Power Class field displays "——" instead of a value; also, the tester assumes that the mobile station is a Power Class 5 mobile station and limits its output power to +8 dBm (except in the Maximum Output Power test).*

During the idle/access state, the following softkeys are available:

- ADDITIONAL MEASUREMENT. Refer to *ADDITIONAL MEASUREMENT* on page 3–5.
- CDMA BS SIGNAL CNFG. Refer to *CDMA BS SIGNAL CNFG* on page 3–7.
- PREFERRED VOCODER. This softkey is displayed only if you have selected RATE SET 1 (8K) as the preferred rate set. Press this softkey to select the preferred vocoder, either BASIC or ENHANCED. If the rate selected is not supported by the mobile station, the tester reverts to the supported rate.
- PREFERRED RATE SET. This softkey enables you to select either the 8K or 13K vocoder rates (option installation required). If the rate selected is not supported by the mobile station, the CMD 80 reverts to the supported rate.

- CALL TO MOBILE. Activation of the upper softkey causes the tester to initiate a voice loopback call to the mobile station. Pressing the lower softkey initiates the mobile station loopback tests.

CALL ESTABLISHED

When you press the CALL TO MOBILE softkey for voice loopback and establish a call, the tester displays the menu shown in Figure 3–6. In this mode, a message spoken into the mobile phone is returned in approximately two seconds. This allows you to test the quality of the call.

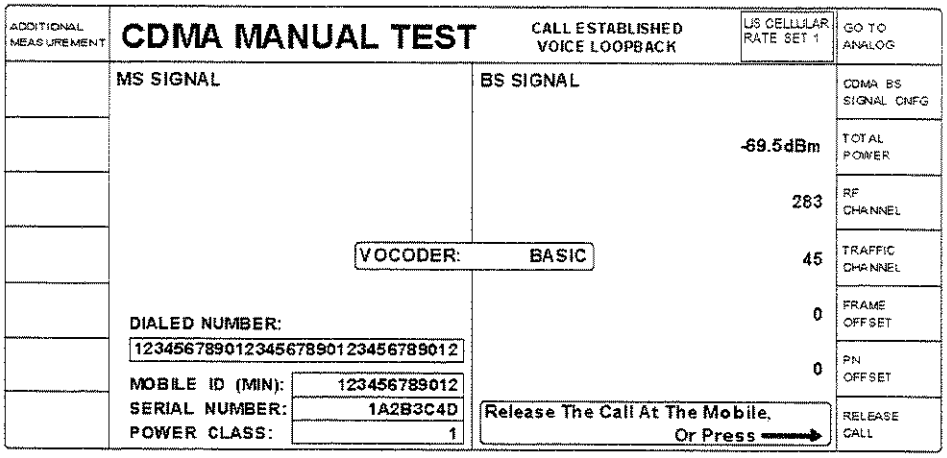


Figure 3–6: CALL ESTABLISHED menu for voice loopback

Once the voice loopback call is established, the following softkeys are available:

- GO TO ANALOG. The tester displays the GO TO ANALOG softkey in the upper right corner of the VOICE LOOPBACK menu (see Figure 3–6) only if you have Option 17 (Analog Mode) installed. Press the GO TO ANALOG softkey to handoff from CDMA mode to analog mode when you are testing a dual-mode mobile station. The tester displays the analog CALL ESTABLISHED menu (see Figure 3–33 on page 3–43). This allows you to test the analog functions of a dual-mode mobile station without dropping the call.

NOTE. *Although you can switch from the CDMA mode to the analog mode without dropping the call; the tester does not have a similar method for switching from the analog mode to the CDMA mode.*

- CDMA BS SIGNAL CONFIGURATION (refer to page 3–7)
- TOTAL POWER (refer to page 3–22)
- RF CHANNEL (refer to page 3–23)

- TRAFFIC CHANNEL (refer to page 3–23)
- FRAME OFFSET (refer to page 3–23)
- PN OFFSET (refer to page 3–23)
- RELEASE CALL

MS Loopback Within Manual Test

When you press the CALL TO MOBILE softkey for MS loopback, the tester displays the menu shown in Figure 3–7.

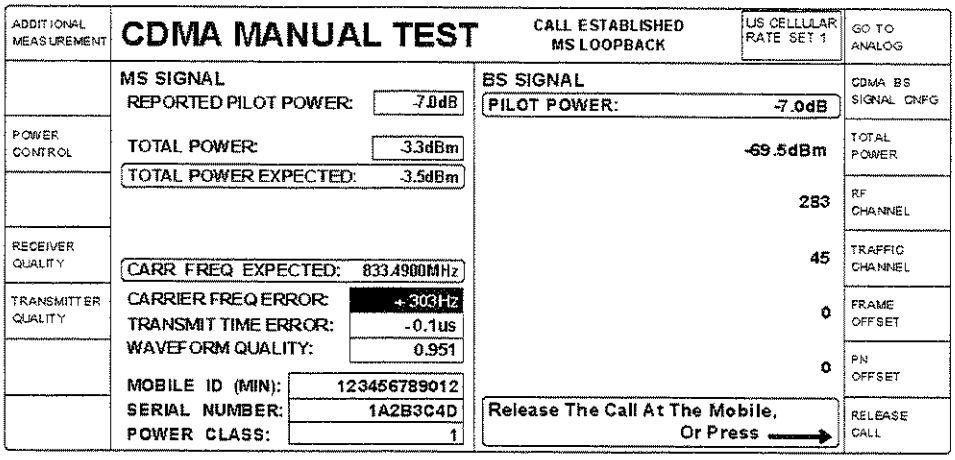


Figure 3–7: CALL ESTABLISHED menu for MS loopback

This menu displays measurements for the mobile station on the left side of the display and displays base-station parameters on the right. The displayed results are updated about once a second. The tester displays any value that exceeds the limits established during configuration as inverse video (white on black).

At this menu level, data transfers to the mobile unit at the full rate. The network status box in the upper right corner of the display shows the rate set that is in use for the call.

The "Total Power Expected" value of the mobile station is an internal tester calculation based on the openloop power control estimates made by the tester. The maximum value is limited by the reported power class of the mobile station. (J-STD-008 mobile stations report the power class information in the status response message.) This method of determining expected power is used for all tests except the Maximum/Minimum Output Power test.

NOTE. *For accurate expected power readings, ensure that you have properly set the external gain or attenuations settings (refer to* RF CONNECT/EXT ATTEN *on page 3–31).*

Once the MS loopback call is established, the following softkeys are available:

- ADDITIONAL MEASUREMENT (refer to page 3–5)
- POWER CONTROL (refer to page 3–12)
- RECEIVER QUALITY (refer to page 3–16)
- TRANSMITTER QUALITY (refer to page 3–19)
- GO TO ANALOG. The tester displays the GO TO ANALOG softkey in the upper right corner of the VOICE LOOPBACK menu (see Figure 3–7) only if you have Option 17 (Analog Mode) installed. Press the GO TO ANALOG softkey to handoff from CDMA mode to analog mode when you are testing a dual-mode mobile station. The tester will display the analog CALL ESTABLISHED menu (see Figure 3–33 on page 3–43). This allows you to test the analog functions of a dual-mode mobile station without dropping the call.

NOTE. *Although you can switch from the CDMA mode to the analog mode without dropping the call, the tester does not have a similar method for switching from the analog mode to the CDMA mode.*

- CDMA BS SIGNAL CONFIGURATION (refer to page 3–7)
- TOTAL POWER (refer to page 3–22)
- RF CHANNEL (refer to page 3–23)
- TRAFFIC CHANNEL (refer to page 3–23)
- FRAME OFFSET (refer to page 3–23)
- PN OFFSET (refer to page 3–23)
- RELEASE CALL

ADDITIONAL MEASUREMENT

Refer to *ADDITIONAL MEASUREMENT* on page 3–5.

POWER CONTROL

Press this softkey to configure and perform tests of the power control system. The tests available are: Open Loop Time Response, Minimum Output, Maximum Output, and Gated Output. Selection of a test item activates the test and begins the display of results.

If the test displays a waveform, an area at the bottom of the display shows the time in segments. If the test results are outside the template limit for a particular time segment, that segment is darkened.

Open Loop Time Response. Press this softkey to test the open-loop power control of the mobile station in response to an increase or decrease in base station total power. The default increase or decrease for this test is 20 dB. Figure 3–8 shows the response to this test.

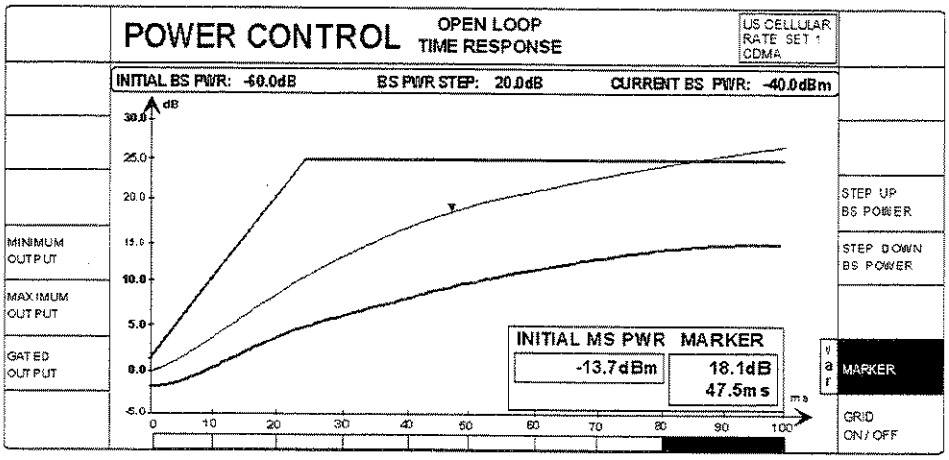


Figure 3–8: OPEN LOOP TIME RESPONSE display

The tester performs an initial test when it opens this menu; you can perform additional measurements by pressing the STEP UP and STEP DOWN softkeys. You can change the step size and direction by pressing the CONFIG hard key.

NOTE. *The measurement display indicates all step changes with a positive slope.*

During the open-loop test, the closed-loop power is controlled to prevent unwanted interaction; this is achieved by alternately sending up and down power control bits to the mobile station.

Minimum Output/Maximum Output. Selecting either of these softkeys starts the tests using the values selected for total power, traffic level, and pilot level. You can set the initial values for the base station power by pressing the CONFIG hardkey. The results (MS Signal values) are on the left of the display as shown in Figure 3–9.

You can change the specific power levels for total power, traffic level, and pilot level by selecting their softkeys. Use the VAR control or the DATA keypad to change the power level values.

NOTE. *The connection to the mobile station can be lost when running the maximum output test if the total power is set too low.*

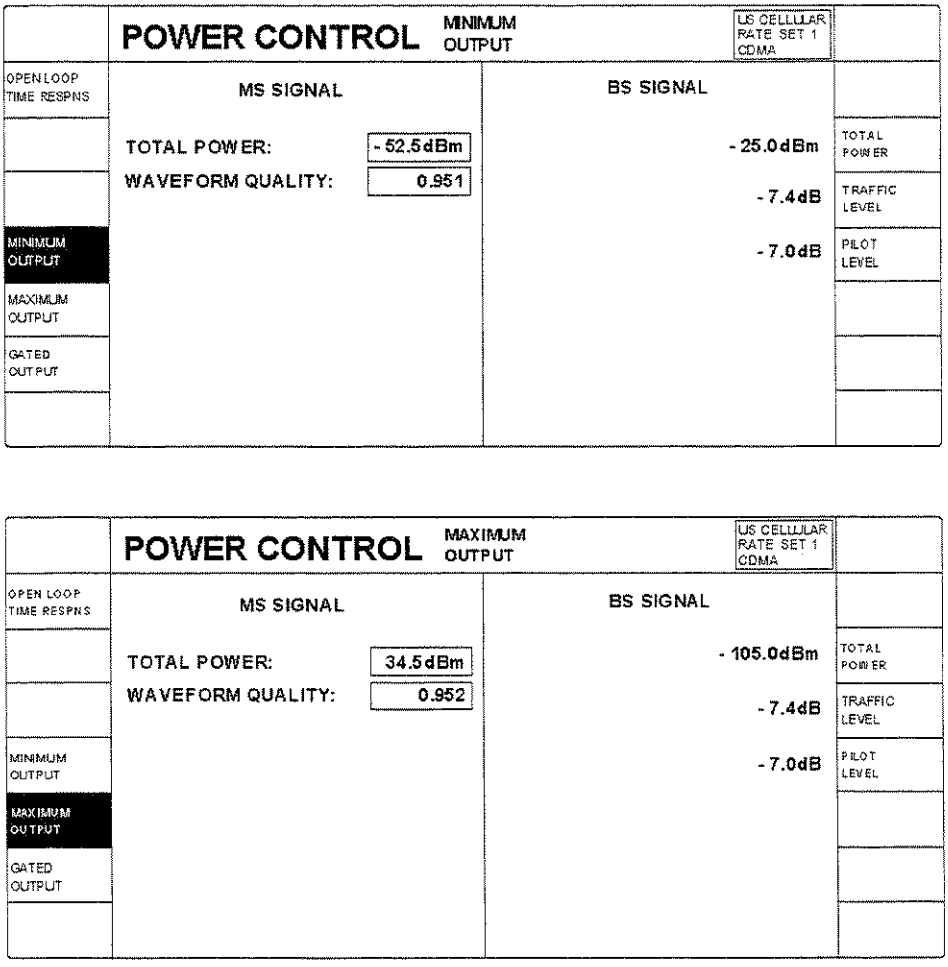


Figure 3–9: MINIMUM OUTPUT and MAXIMUM OUTPUT menus

Gated Output. Selecting this test allows you to display the gated output of the RF carrier in several formats.

NOTE. *This test reduces the data transmission rate with the mobile station to one-eighth the standard rate.*

Select FULL DISPLAY to display the total period of the IS-98 specified gated output template. The period of the full display is approximately 1500 µs.

Select RISING EDGE or FALLING EDGE to zoom in to display the 17 µs period of the rising or falling edge of the waveform. During each of these displays, a MARKER is activated to display both power amplitude and relative time. See Figure 3–10.

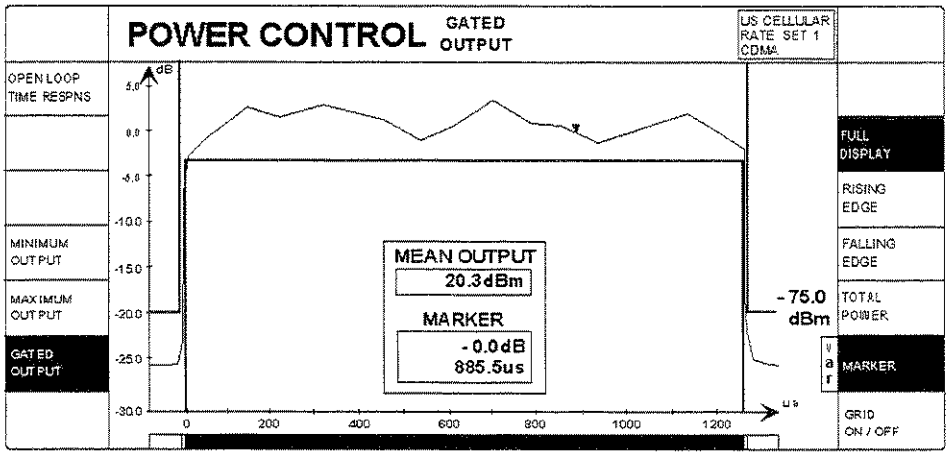


Figure 3–10: Gated output (full display)

For a more detailed view of the segment illustrated in Figure 3–10, press the RISING EDGE or FALLING EDGE softkey. The details of the rising and falling edges are displayed as shown in Figure 3–11.

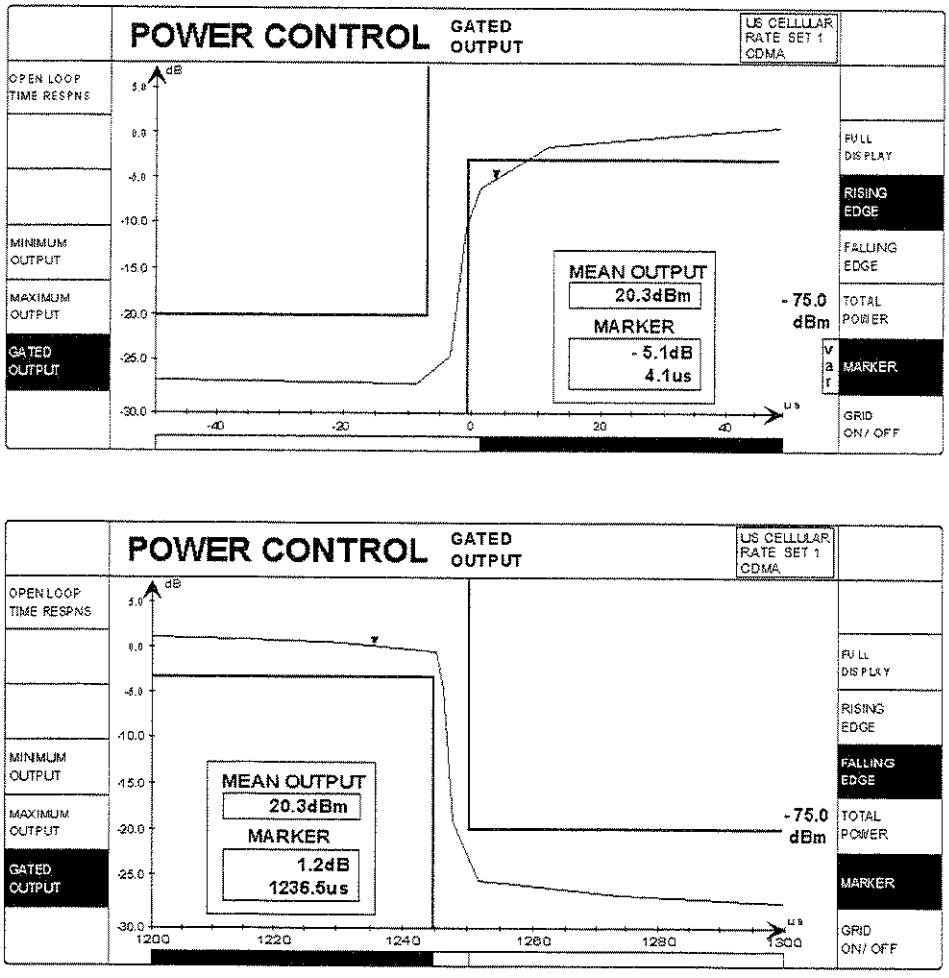


Figure 3–11: GATED OUTPUT (rising edge and falling edge)

Receiver Quality

Use this softkey to set up tests of the performance of the mobile receiver. Two modes of operation are available: continuous mode or single shot mode (see Figure 3–12). You can toggle between the modes by pressing the upper left softkey. When you select the continuous mode, you can press the softkey for the BS Signal or Environmental parameter you want to change and vary the value by using the VAR control.

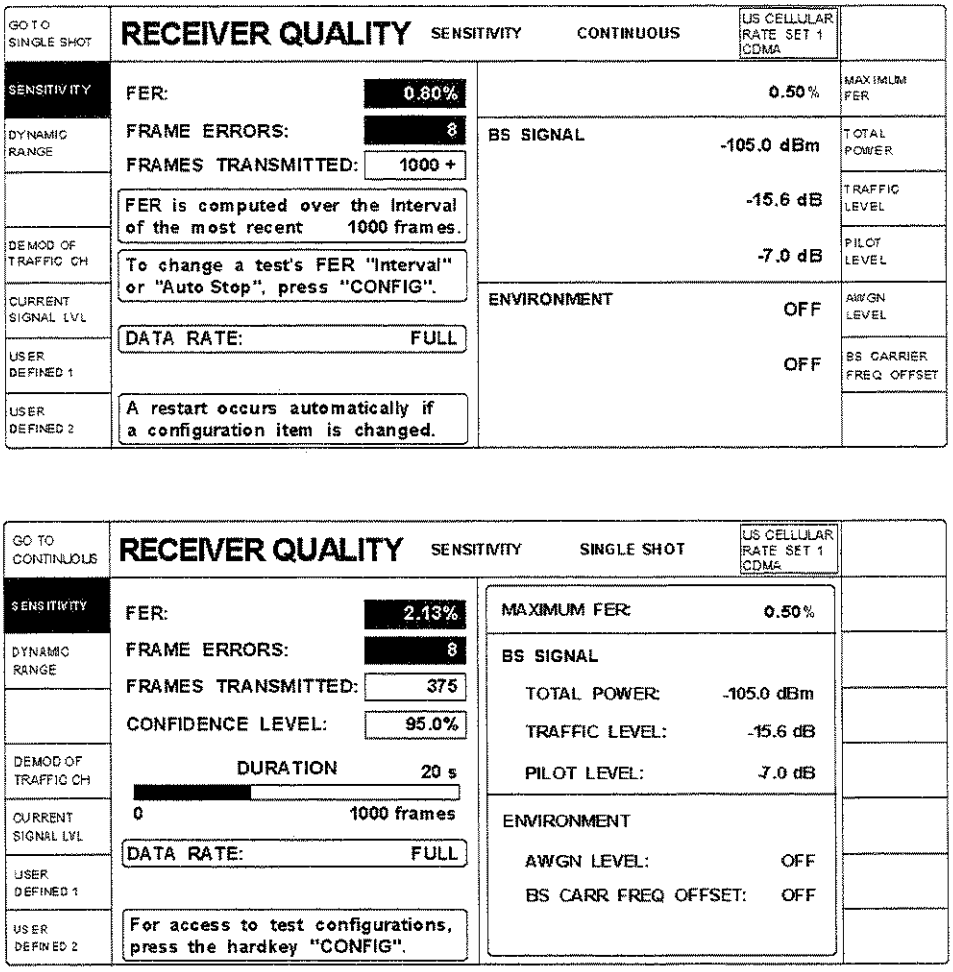


Figure 3–12: RECEIVER QUALITY menus

In continuous mode, the tester continuously performs the receiver quality test and displays the frame error rate over the interval of the most recent number of frames. You can set this frame error rate interval (CONTINUOUS INTERVAL) in the configuration menu (see Figure 3–13). If the FER exceeds the maximum FER limit, the FER is displayed in inverse video (white on black), but the test does not stop. the frame errors are also displayed in reverse video if they exceed the number delimited by the selelcted maximum FER and continuous level.

When you select the single shot mode, the tester will stop the receiver quality test under the following conditions:

- If you have the auto stop function turned off, the test stops when the number of frames that you set (single shot duration) is reached.
- If you have the auto stop function turned on, the test stops when one of the following conditions occurs:
  - The confidence level that you set is reached.
  - The frame errors reach the maximum limit that you set.
  - The number of frames that you set (single shot duration) is reached.

Receiver Quality Configuration Menu. While in a receiver quality test menu, you can press the CONFIG hardkey to display the configuration menu for that particular test (see Figure 3–13).

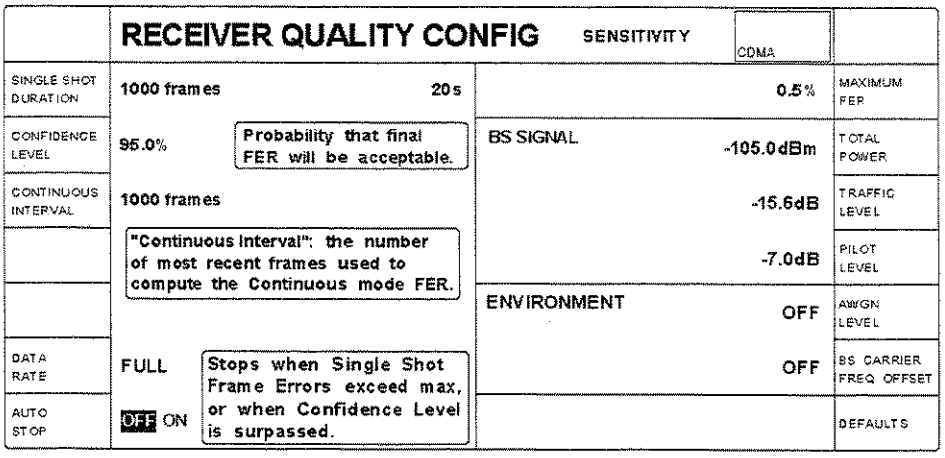


Figure 3–13: SENSITIVITY configuration menu

You can use the configuration menu to set the following parameters for the receiver quality tests:

- Single shot duration. Press the SINGLE SHOT DURATION softkey to set the the number of frames that are tested. This parameter is used when you perform a reciever quality test in the single shot mode. The test stops when the number of frames that you set is reached.

- Confidence level. Press the CONFIDENCE LEVEL softkey to set the level of confidence to which you want to test. The tester uses this parameter when you have selected the single shot mode of operation, and you have turned on the auto stop function. If the frame errors do not exceed the maximum, the tester will execute the test until the probability of an acceptable frame error rate reaches the confidence level that you set. At this time, the tester will stop the test. (If the confidence level is not reached, the test stops when the single shot duration is reached.)

  Use of the confidence level allows a manufacturer to improve the throughput of a test station by running the receiver quality test only long enough to obtain the desired confidence level.

- Continuous Interval. Press the CONTINUOUS INTERVAL softkey to set the number of frames that you want the tester to use to compute the frame error rate for the continuous mode.

- Data rate. Press the DATA RATE softkey to set the traffic channel data rate. The selections for the data rate are: FULL, HALF, QUARTER, or EIGHTH.

- Auto stop. Press the AUTO STOP softkey to toggle the auto stop function on or off. When auto stop is on, the tester performs a single shot receiver quality test until the number of frames that you set (single shot duration) is reached or until one of two conditions occurs:

  - The confidence level that you set is reached.

  - The frame errors reach the maximum limit that you set.

- Maximum frame error rate. Press the MAXIMUM FER softkey to set the maximum frame error rate. the frame error rate is the percentage bad frames with respect to the total number of frames tested. The maximum frame error rate is the frame error rate limit used to control the inverse video display of the FER and the FRAME ERRORS fields. For example, in Figure 3–13 the maximum frame error rate is set to 0.5%. The single shot duration is 1000 frames. Therefore, the maximum number of frame errors is 5.

- Total power. Press the TOTAL POWER softkey to set the transmitted power.

- Traffic level. Press the TRAFFIC LEVEL softkey to adjust the level of the forward traffic channel in the forward CDMA channel.

NOTE. *The TRAFFIC LEVEL softkey specifies the the FULL rate traffic channel level. When the data rate is set to HALF, the actual traffic channel level is 3 dB less than the indicated setting. When the data rate is set to QUARTER, the actual traffic channel level is 6 dB less than the indicated setting. When the data rate is set to EIGHTH, the actual traffic channel level is 9 dB less than the indicated setting.*

- Pilot level. Press the PILOT LEVEL softkey to adjust the level of the pilot channel in the forward CDMA channel.
- Additive white gaussian noise level. This option provides additional noise to more closely simulate actual operating conditions. The tester displays the AWGN LEVEL softkey when the optional AWGN system is installed. Press the AWGN LEVEL softkey to adjust the level of the AWGN generator. Press the ON or OFF hardkeys to turn the AWGN generator on or off.

NOTE. *The total output power of the tester is the sum of the Forward CDMA signal plus the AWGN signal. When the Forward CDMA signal is within 10 dB of its maximum power output, the AWGN signal is turned off. Once the Forward CDMA signal is no longer within 10 dB of its maximum power, the AWGN signal level may be set to a new value.*

- Base station carrier frequency offset. Press the BS CARRIER FREQ OFFSET softkey to enter the frequency offset by which you want to shift the base station carrier. This allows you to test if the mobile station tracks the base station frequency.
- Defaults. Press the DEFAULTS softkey to set all the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

NOTE. *The ENVIRONMENT region is present only if the Additive White Gaussian Noise option is installed. This option provides additional noise to more closely simulate actual operating conditions.*

Transmitter Quality Use this softkey to test the mobile station transmitter quality. Three sets of tests are performed by default:

- Carrier feedthrough and I/Q imbalance
- Carrier frequency error and transmit time error
- Waveform quality

One additional test can be selected by pressing one of the following softkeys:

- Phase Error
- Magnitude Error
- Error Vector Magnitude

When you press the softkey associated with a particular test, the graphical output and the first two lines of the numeric results output change to reflect the results of that test. Figure 3–14 shows a typical display for the PHASE ERROR test. This measurement is performed at the FULL data rate.

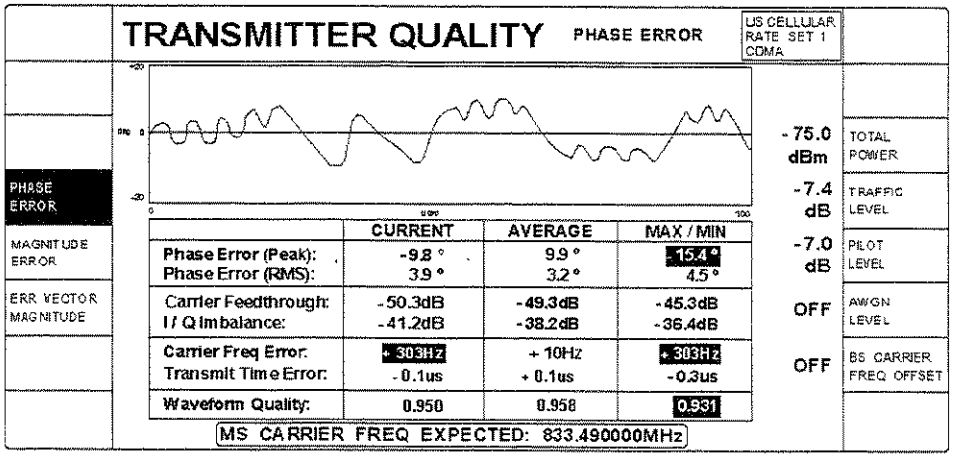


Figure 3–14: TRANSMITTER QUALITY menu

The tester displays "——" when it is not able to make a valid measurement of the input signal.

You can use this menu to set the following parameters:

- Total Power. Press the TOTAL POWER softkey to enable the VAR control to set the tester default total power output level. You can also set the default total power using the CDMA BS SIGNAL CNFG softkey in any other menu page.
- Traffic level. Press the TRAFFIC LEVEL softkey to adjust the level of the forward traffic channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the forward traffic signal on and off. This sets the power for a FULL rate traffic channel.

If a data rate other than FULL is used, the actual test traffic level must be determined using the following table:

Rate	Correction
FULL	0 dB
HALF	–3 dB
QUARTER	–6 dB
EIGHTH	–9 dB

Real level = displayed + correction.

- Pilot Level. Press the PILOT LEVEL softkey to adjust the level of the pilot channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the pilot signal on and off.
- AWGN level. The AWGN LEVEL softkey is available when the optional AWGN system is installed. Press this softkey to adjust the amount of power that the AWGN system contributes to the ACTUAL BS TOTAL POWER. The tester displays the power level as a ratio of the AWGN power to the NOMINAL BS TOTAL POWER. The power range is –20 dB to +6 dB; however, the system is disabled when NOMINAL BS TOTAL POWER is within 10 dB of the tester's maximum power output. The maximum output level depends on which RF connections are in use and the attenuation/gain settings for the connector in use.
- Base station carrier frequency offset. Press the BS CARRIER FREQ OFFSET softkey to enter the frequency offset by which you want to shift the base station carrier. This allows you to test if the mobile station tracks the base station frequency.

CDMA BS SIGNAL CNFG

Press the CDMA BS SIGNAL CNFG softkey to display the main configuration menu for the call established state. You can use this menu to set the following parameters:

- Total Power. Press the TOTAL POWER softkey to enable the VAR control to set the tester default total power output level. You can also set the default total power using the CDMA BS SIGNAL CNFG softkey in any other menu page.
- Traffic level. Press the TRAFFIC LEVEL softkey to adjust the level of the forward traffic channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the forward traffic signal on and off. This sets the power for a FULL rate traffic channel.

If a data rate other than FULL is used, the actual test traffic level must be determined using the following table:

Rate	Correction
FULL	0 dB
HALF	–3 dB
QUARTER	–6 dB
EIGHTH	–9 dB

Real level = displayed + correction.

- Paging level. Press the PAGING LEVEL softkey to adjust the level of the paging channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the paging signal on and off.
- Sync level. Press the SYNC LEVEL sofkey to adjust the level of the sync channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the sync signal on and off.
- Pilot Level. Press the PILOT LEVEL softkey to adjust the level of the pilot channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the pilot signal on and off.

Total Power This softkey enables the VAR control to set the tester default total power output level. You can also set the default total power using the CDMA BS SIGNAL CNFG softkey in any other menu page.

NOTE. *The total power setting is the system default level unless overridden by a test. For example: the receiver sensitivity test overrides the total power value with the parameters established for the receiver sensitivity test. This is also true for the traffic level, page level, sync level and pilot level.*

Implicit Handoff Functions

Four functions within the MS LOOPBACK and VOICE LOOPBACK modes initiate a hard handoff whenever you change their settings:

- RF Channel
- Traffic Channel
- Frame Offset
- PN Offset

Use these softkeys to switch to new settings through the use of a hard handoff. After selecting a key, use the keypad to change the value. The VAR control is not active for these selections.

RF Channel You can set the RF channel to one of the following RF channels:

- US Cellular: 1 to 799, 990 to 1023
- Japan Cellular: 0 to 1199
- PCS: 0 to 1199
- Korean PCS: 0 to 1300

You can make any number of changes; however, when the call is released, the tester resumes operation on the RF channel specified in the main base station configuration.

NOTE. *You can change the RF channel only during the call established state or when using the CDMA BS SIGNAL CNFG menu described on page 3–31.*

Traffic Channel You can set the traffic channel to values 2 through 31 and 33 through 63, inclusive.

Frame Offset You can set the frame offset to any value between 0 and 15, inclusive.

PN Offset You can set the PN offset to any value between 0 and 511, inclusive. This new PN offset becomes the PN offset of the tester for the current and subsequent calls.

NOTE. *You can change the PN offset only during the call established state or when using the CDMA BS SIGNAL CNFG described on page 3–31.*

CDMA MODULE TEST

The module test feature supports testing the components of a mobile station before it is capable of completing a call. The module test feature provides CDMA signals and measures the output power and waveform quality; the tester can perform these tests without the mobile station having call-processing capability installed.

The tester ignores the information content of the reverse link while in the Module Test mode. The tester forward link can contain a pilot, sync, paging, forward traffic, and five OCNS channels; you can individually set or disable the relative power of these signals. The Module Test mode also supports the optional AWGN signal injection.

In the Module Test mode, you can set the baseline output power using the NOMINAL BS OUTPUT POWER softkey. The ACTUAL BS TOTAL POWER display indicates the same value set by the NOMINAL BS OUTPUT POWER when all of the CDMA channels are enabled. If a CDMA channel is disabled, the ACTUAL BS TOTAL POWER display is reduced by the amount contributed by the CDMA channel. The individual CDMA and AWGN channel levels remain constant when other channels are enabled or disabled.

The AWGN system adds energy to the ACTUAL BS TOTAL POWER display; however, the tester disables the AWGN when the NOMINAL BS TOTAL POWER is within 10 dB of the maximum output level of the tester.

The maximum output level depends on which RF connections are in use and the attenuation/gain settings for the connector in use.

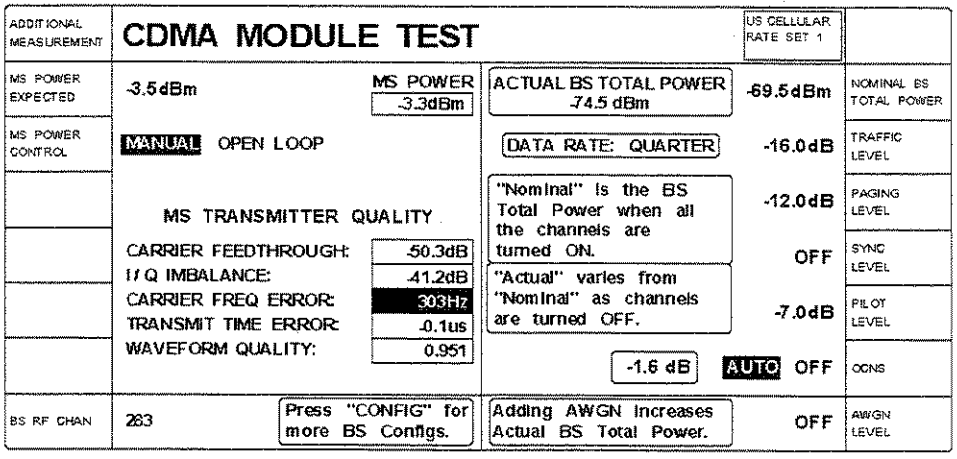


Figure 3–15: CDMA MODULE TEST menu

Additional Measurement

Use this softkey to perform voltage and current measurements using the front panel connections on the tester.

MS Power Expected Use this softkey set a value for the expected MS power when the MS POWER CONTROL is set to MANUAL. This softkey disappears when MS POWER CONTROL is set to "Open Loop." Under this state, the expected MS power, calculated according to the open loop power control algorithm, is displayed in a rounded information box. The MS POWER display reads LOW or OVL (overload) when the power level of the mobile station is above or below the measurement window.

MS Power Control Use this softkey to select how the expected power of the mobile station i s calculated. The MANUAL mode uses the power level set when you press the MS POWER EXPECTED softkey. The OPEN LOOP mode uses the open loop power estimate based on the current network selection and the NOMINAL BS TOTAL POWER setting.

Transmitter Quality The tester cannot perform carrier frequency error, transmit time error, and waveform quality measurements unless the input CDMA signal is synchronized to the tester. Refer to *Transmitter Quality* on page 3–19.

BS RF Channel Use this softkey to set the operating channel. The Module Test mode shifts immediately to the new channel without performing any handoff operation.

Nominal BS Total Power Use this softkey to set the nominal output power of the tester. The choice of RF connector and the external attenuation or gain settings limit the output power. Press the ON or OFF hardkeys to turn the output signal on and off.

Traffic Level Use this softkey to adjust the level of the forward traffic channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the forward traffic signal on and off. This sets the power for a FULL rate traffic channel.

If a data rate other than FULL is used, the actual test traffic level must be determined using the following table:

Rate	Correction
FULL	0 dB
HALF	–3 dB
QUARTER	–6 dB
EIGHTH	–9 dB

Real level = displayed + correction.

Paging Level Use this softkey to adjust the level of the paging channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the paging signal on and off.

Sync Level Use this softkey to adjust the level of the sync channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the sync signal on and off.

Pilot Level Use this softkey to adjust the level of the pilot channel in the forward CDMA channel. Press the ON or OFF hardkeys to turn the pilot signal on and off.

OCNS Press this softkey to enable or disable the Orthogonal Channel Noise Simulator (OCNS). The OCNS adds power along with the sum of the data, traffic, paging, sync, and pilot levels so that their sum equals the NOMINAL BS TOTAL POWER. The tester displays the OCNS power level when it displays the softkey AUTO selection.

AWGN Level The tester displays this softkey when the optional AWGN system is installed. Press this softkey to adjust the amount of power that the AWGN system contributes to the ACTUAL BS TOTAL POWER. The tester displays the power level as a ratio of the AWGN power to the NOMINAL BS TOTAL POWER. The power range is –20 dB to +6 dB; however, the system is disabled when NOMINAL BS TOTAL POWER is within 10 dB of the tester's maximum power output. The maximum output level depends on which RF connections are in use and the attenuation/gain settings for the connector in use.

Module Test Configuration Menu

Access the menu shown in Figure 3–16 by pressing the CONFIG hardkey while in the Module Test mode. You can also access the menu by pressing the Module Test softkey in the Configuration menu.

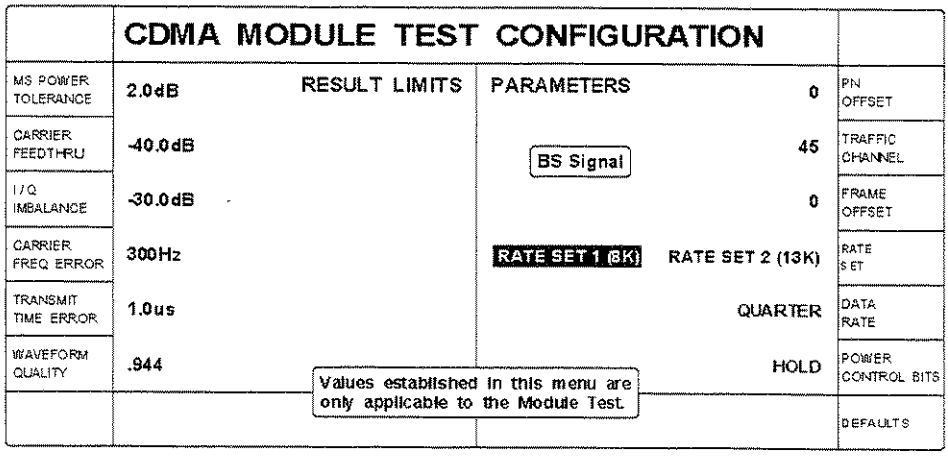


Figure 3–16: CDMA MODULE TEST CONFIGURATION menu

MS Power Tolerance. Press this softkey to set the tolerance for the MS Power Expected. The tester displays the MS Power value in reverse video when it differs from the MS Power Expected by a value greater than this amount.

Carrier Feedthru. Press this softkey to set the carrier feedthrough limit. The tester displays the carrier feedthrough value in reverse video when the value exceeds this limit.

I/Q Imbalance. Press this softkey to set the I/Q imbalance limit. The tester displays the I/Q imbalance value in reverse video when the value exceeds this limit.

Carrier Freq Error. Press this softkey to set the carrier frequency error limit. The tester displays the error value in reverse video when the value exceeds this limit.

Transmit Time Error. Press this softkey to set the transmit time error limit. The tester displays the error value in reverse video when the value exceeds this limit.

Waveform Quality. Press this softkey to set the waveform quality limit. The tester displays the error value in reverse video when the value is less than this limit.

PN Offset. Press this softkey to set the PN offset to a value between 0 and 511. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Traffic Channel. Press this softkey to set the traffic channel to a value between 2 and 31 or 33 and 63. The tester automatically shifts an OCNS channel if channel conflicts occur. Changing this value immediately changes the traffic channel, snf no handoff is performed. Refer to page 3–26 for more information on OCNS channels

Frame Offset. Press this softkey to set the frame offset to a value between 0 and 15 (inclusive). Changing this value immediately changes the traffic channel timing, and no handoff is performed.

Rate Set. Press this softkey to set the rate that data is generated for the traffic channel. This softkey requires that option B14 (Rate Set 2) be installed.

Data Rate. Press this softkey to set the traffic channel data rate. Select one of the following rates: FULL, HALF, QUARTER, or EIGHTH. Selecting a rate other than FULL reduces the power contributed to the actual BS total power. Refer to *Traffic Level* on page 3–25.

Power Control Bits. Press this softkey to select the power control bit mode. The HOLD mode sends alternating up/down power control bits. The ALL DOWN mode forces the power control bits to the down state. The ALL UP mode forces the power control bits to the up state. The RANGE TEST mode sends eight frames of UP power bits followed by eight frames of DOWN power bits. For example, the RANGE TEST mode sends 128 bits in each direction at the FULL rate, and 16 bits in each direction at the EIGHTH rate. OFF disables the power control bits, and the bits are not sent to the mobile station.

Defaults. Press this softkey to set the module test parameters to their default settings. This softkey does not affect any other parameters or modes.

NETWORK

Press the NETWORK softkey to select the network for the mobile phone you are testing. The tester does not display this softkey and its associated field if it can test only one network. Instead, the tester displays the network information in a rounded box below the text *CMD 80*.

CONFIG MENU

Press the CONFIG MENU softkey to display the CONFIGURATION MENU shown in Figure 3–17. You can use this menu to configure parameters for the tester.

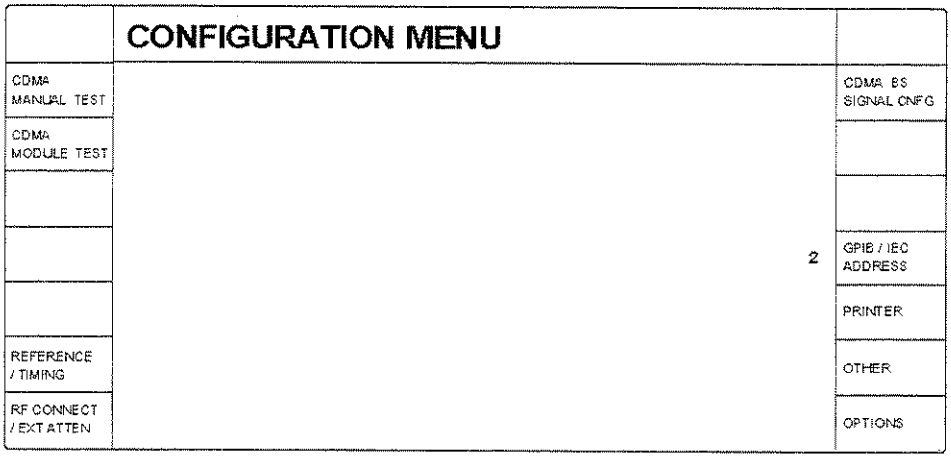
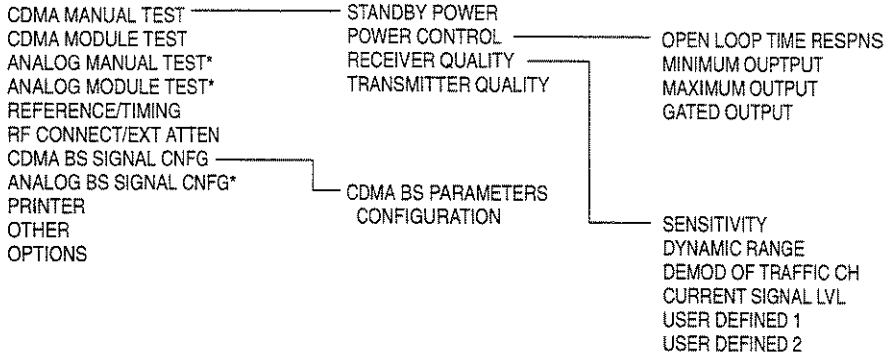


Figure 3–17: Configuration menu

Press the appropriate key for the specific item you want to configure. Some items contain submenus (see Figure 3–18). Each of the softkeys is described in the following section.



* **This selection is available only if Option 17 (Analog Mode) is installed in the tester; refer to *CONFIG MENU* in *Analog Measurements* on page 3–64 for more information.**

Figure 3–18: CONFIGURATION MENU (CDMA) structure

CDMA MANUAL TEST This softkey displays a selection of test configuration menus. You can use these menus to establish the parameters for those tests done while in the CDMA Manual Test mode.

CDMA MODULE TEST Press this softkey to display the menu that is used to set the parameters for the CDMA Module Test mode.

ANALOG MANUAL TEST The tester displays this selection only if you have Option 17 (Analog Mode) installed in your instrument. For the menu structure and discussion of the Analog Manual Test mode, refer to *Analog Measurements* on page 3–35.

REFERENCE/TIMING This softkey displays a menu to select the timing reference input and output sources (see Figure 3–19). The instrument uses either its internal reference or an external reference that you connect to the REF IN connector on the rear panel. You can use 1 MHz, 2 MHz, 5 MHz, or 10 MHz inputs as external references.

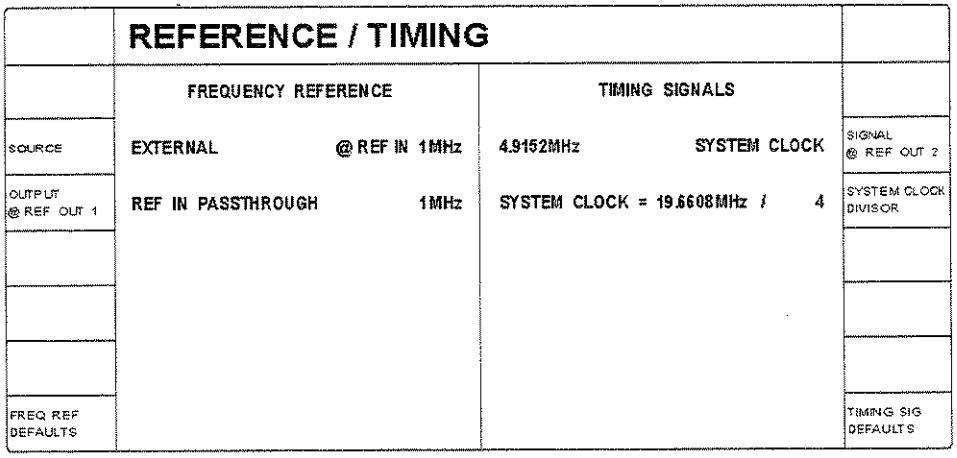


Figure 3–19: Reference/Timing menu

The REF OUT 1 connector on the rear panel provides either the internal oscillator signal or a feedthrough signal from the REF IN connector. The REF OUT 2 connector provides the following signals:

- PP2S (pulse per 2 seconds)
- Super frame
- Paging frame
- Sync frame
- Power control frame
- System clock

The 19.6608 MHz system clock can be divided by 1 to 1024 to synthesize a custom frequency.

RF CONNECT/EXT ATTEN This softkey displays a menu to select the front-panel RF IN/OUT connectors and external attenuation for your test setup (see Figure 3–20). Use the softkeys on the left of the display to select the input and output connectors, and use the softkeys on the right to select the external attenuation.

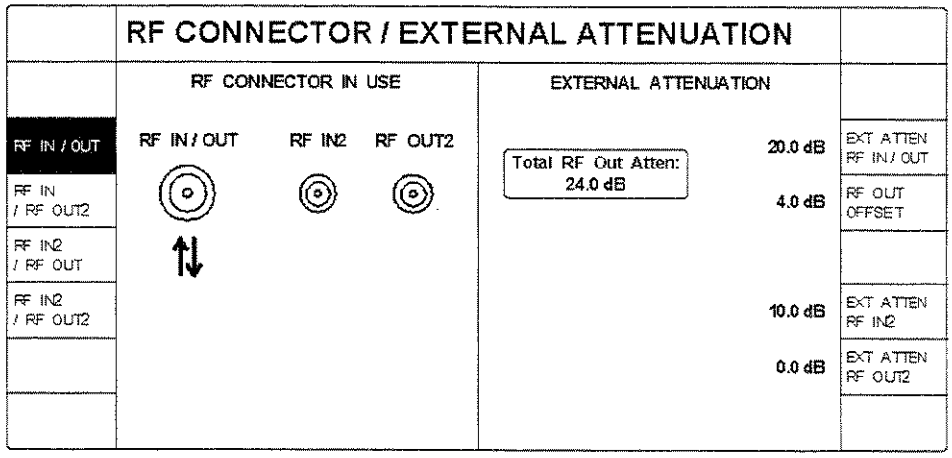


Figure 3–20: RF CONNECTOR/EXTERNAL ATTENUATION menu

CDMA BS SIGNAL CNFG This softkey displays the configuration menu where you can define the components of the base-station signal. These include the levels of the pilot, sync and paging channels, and other components, such as traffic channel and frame offset. You can use this menu to specify the default RF channel.

NOTE. *The level settings set in the CDMA BS SIGNAL CONFIGURATION menu are the system default levels unless overridden by a test. For example, the receiver sensitivity test overrides the traffic and pilot level values with the parameters established for the receiver sensitivity test.*

CDMA BS PARAMETERS. This softkey displays a submenu of the CDMA BS SIGNAL CONFIGURATION MENU. You can use this menu to specify parameters for the simulated base station (default values are available).

Press the CDMA BS PARAMETERS softkey to display the CDMA BS PARAMETERS CONFIGURATION menu.

If you have selected US Cellular or PCS (upbanded IS-95) as the network, you can select one of the following protocols from the CDMA BS PARAMETERS CONFIGURATION menu:

- PROTOCOL REVISION 1 (IS-95)
- PROTOCOL REVISION 2 (IS-95A)
- PROTOCOL REVISION 3 (TSB-74)

You can also select the mobile identification type. Press the MOBILE ID TYPE softkey to select either the MIN or IMSI. The mobile ID provides the tester with the necessary information so that you can use the CALL TO MOBILE softkey in the MS UNREGISTERED menu (refer to page 3–7). The MOBILE ID TYPE specifies the format of the mobile ID as either Mobile Identification Number (MIN) or International Mobile Station Identification (IMSI).

NOTE. *The tester requires either a MIN or an IMSI mobile identification type. For some protocol revisions, you can choose either a MIN or an IMSI mobile ID. For other protocol revisions, a choice of mobile ID is not available. In these cases, the tester does not display the MOBILE ID TYPE softkey. Instead, the tester displays the mobile ID type in a rounded box below the protocol revision field.*

ANALOG BS SIGNAL CNFG The tester displays this softkey only if you have Option 17 (Analog Mode) installed. For the menu structure and discussion of the ANALOG BS SIGNAL CNFG softkey, refer to *ANALOG BS SIGNAL CNFG* on page 3–80.

GPIB/IEC ADDRESS Use this softkey to set the GPIB/IEC address for the tester.

PRINTER This softkey allows you to specify the type of printer connected to the rear panel printer port (see Figure 3–21). Refer to Figure 2–5, item 7, on page 2–7 for the location of the printer port.

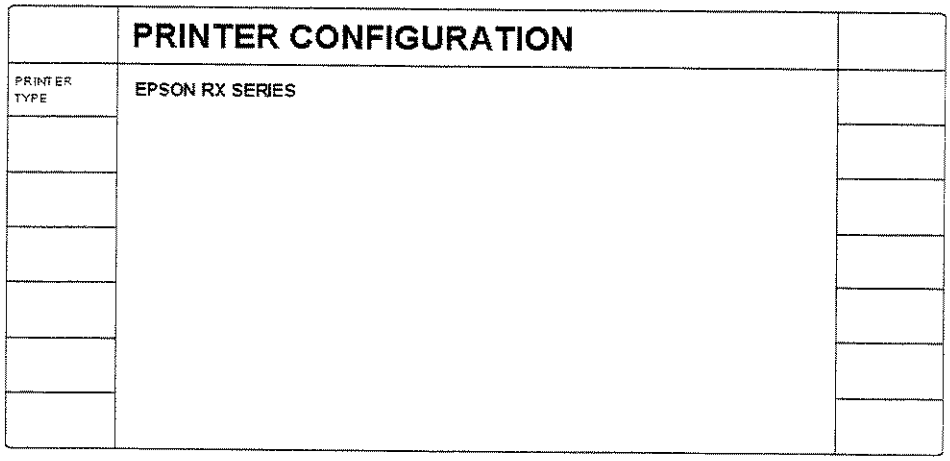


Figure 3–21: PRINTER CONFIGURATION menu

OTHER Press the OTHER softkey to display the OTHER CONFIGURATIONS menu (see Figure 3–22). You can use this menu to do the following:

- Turn on the key click function, which produces an audible click each time you press a hardkey
- Turn on the acoustic warnings function, which produces a beep if you attempt to perform an illegal action
- Set the date
- Set the time

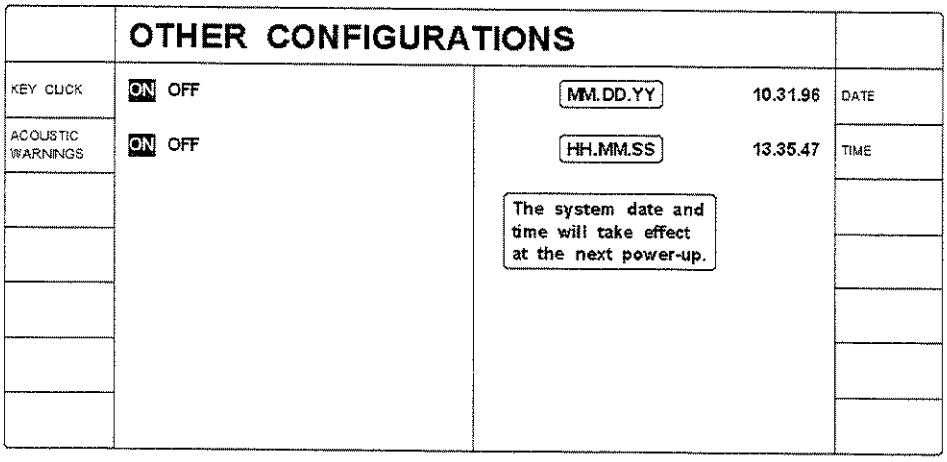


Figure 3–22: OTHER CONFIGURATIONS menu

OPTIONS This softkey displays the list of options that are installed in your tester. Options that are installed are indicated by a check mark (✓) in their fields. See Figure 3–23.

You can use the CODE softkey in the options menu to enable firmware options. Contact your sales representative for details.

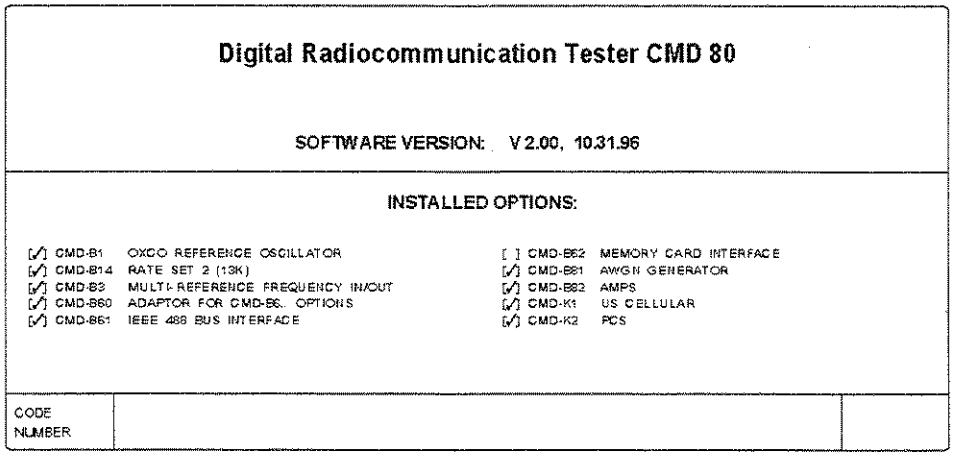


Figure 3–23: Options display

Analog Measurements

This subsection describes the analog tests that the CMD 80 Digital Radiocommunication Tester can perform on analog mobile radiotelephones when Option 17 (Analog Mode) is installed in the tester.

NOTE. *The following menus and operations are available only if you have Option 17 (Analog Mode) installed in your tester.*

Using the Home Menu

After power on, the tester displays the home menu (see Figure 3–24). You can press the MENU HOME front-panel key to return to this menu at any time. You can use the softkeys in this menu to select from a number of main topics.

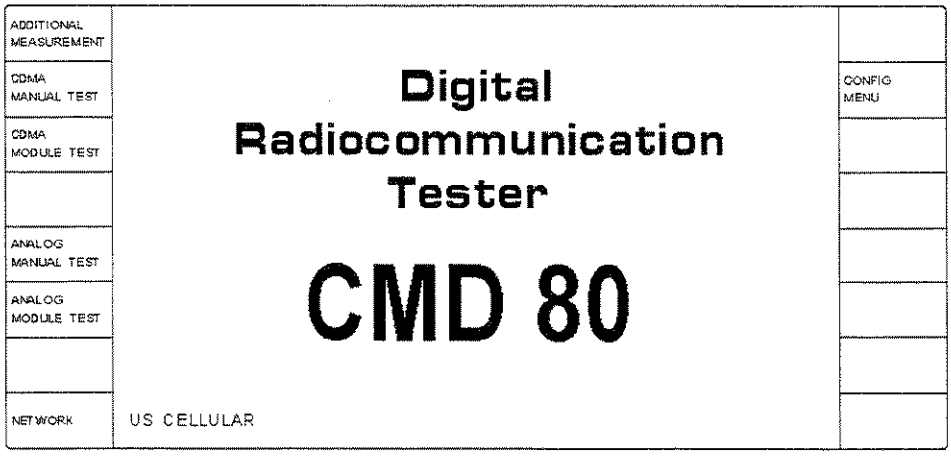
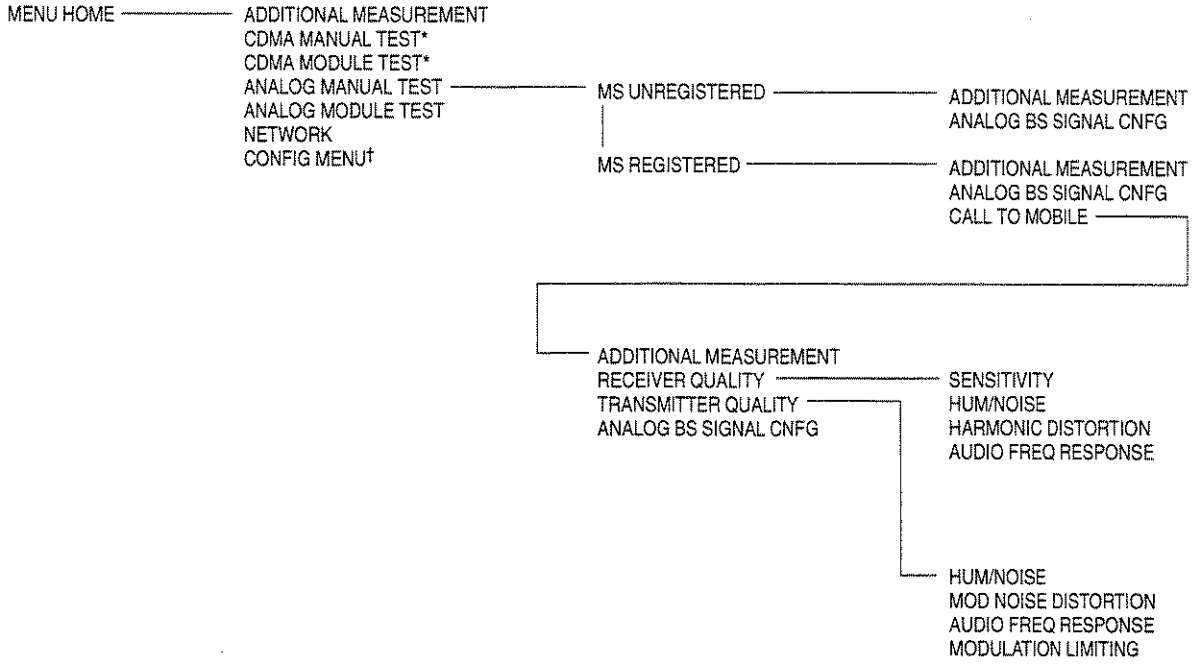


Figure 3–24: Home menu display

Some of the menu selections have several levels of submenus associated with them. Figure 3–25 shows the analog menu structure for the tester. This subsection contains a description of each of these softkeys.



* This menu selection is for CDMA measurements; refer to Figure 3–2 on page 3–4 for the CDMA MANUAL TEST menu structure.

† Refer to Figure 3–52 on page 3–65 for a listing of the submenus for the CONFIG MENU.

Figure 3–25: Analog test menu structure

ADDITIONAL MEASUREMENT

Press the ADDITIONAL MEASUREMENT softkey to display the ADDITIONAL MEASUREMENTS menu (see Figure 3–26). Using the selections in this menu, you can take conventional measurements, such as measuring the voltage across the battery terminals of the mobile radiotelephone and the current level. The following measurements are available:

- DC voltage
- Average DC current
- Maximum current
- Minimum current

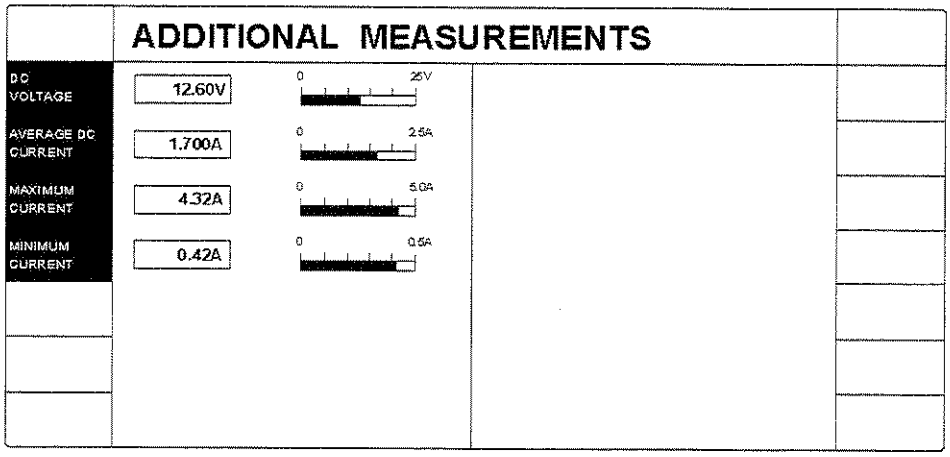


Figure 3–26: ADDITIONAL MEASUREMENTS menu

CDMA MANUAL TEST

This menu selection is for CDMA measurements; refer to Figure 3–2 on page 3–4 for the CDMA MANUAL TEST menu structure.

CDMA MODULE TEST

Use this menu selection when taking CDMA measurements. Refer to *CDMA MODULE TEST* on page 3–23 for more information.

ANALOG MANUAL TEST

NOTE. *The tester displays the ANALOG MANUAL TEST softkey only if you have the US CELLULAR network selected (refer to* NETWORK *on page 3–64).*

This softkey displays the menu used to perform measurements on the analog mobile station. Selecting this test initiates a sequence composed of three states:

- Initialization
- Idle/Access
- Call established

During each of these states various tests can be made. The states and related tests are described in the following topics.

Initialization

The first stage of the manual test is the initialization state, which you start by pressing the ANALOG MANUAL TEST softkey. During the initialization state, the tester establishes contact with the mobile station and enables the output power from the tester. Figure 3–27 shows the display during this state.

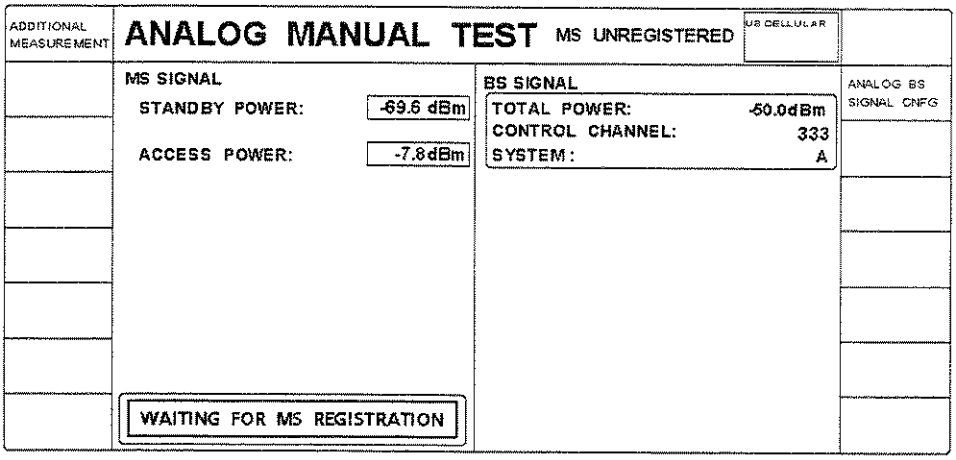


Figure 3–27: Analog MS UNREGISTERED menu

There are two selections available from the MS UNREGISTERED menu. You can select ADDITIONAL MEASUREMENT (see *ADDITIONAL MEASUREMENT* on page 3–36) or ANALOG BS SIGNAL CNFG.

Press the ANALOG BS SIGNAL CNFG softkey to display the menu shown in Figure 3–28.

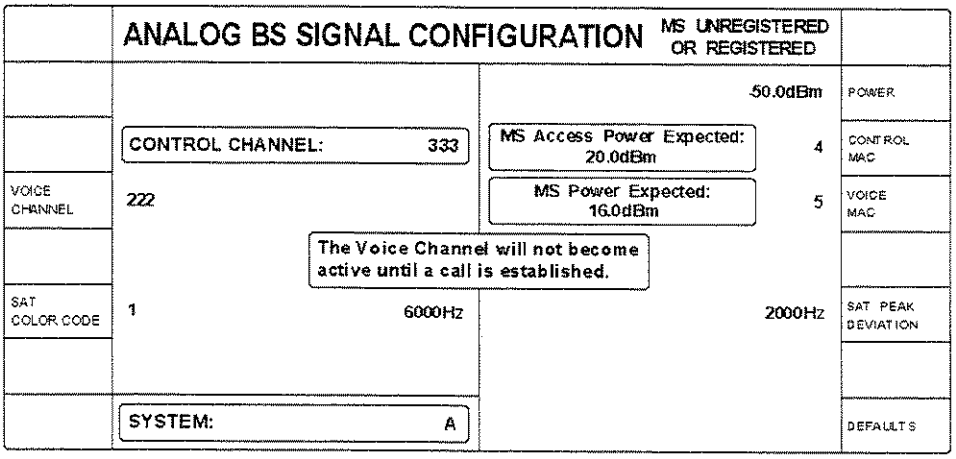


Figure 3–28: Analog MS UNREGISTERED OR REGISTERED menu

You can set the following parameters in the ANALOG BS SIGNAL CONFIGURATION menu:

- Voice channel. The voice channel is the channel over which voice communications occur. Press the VOICE CHANNEL softkey to select a voice channel.
- Supervisory audio tone color code. The SAT color code is used to identify the base station with which the mobile phone is communicating. There are three SAT color codes that correspond to the SAT frequencies:

SAT color code 0	5970 Hz
SAT color code 1	6000 Hz
SAT color code 2	6030 Hz

  Press the SAT COLOR CODE softkey to select the SAT color code you want.
- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Control mobile attenuation code. The control mobile attenuation code is a code sent by the base station to control the output power of the mobile phone when the mobile station is operating on the control channel. Press the CONTROL MAC softkey to select the control MAC you want.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.
- Supervisory audio tone peak deviation. The supervisory audio tone deviation is the amount of deviation that the base station uses to transmit the SAT to the mobile station. Press the SAT PEAK DEVIATION softkey to set the amount of deviation used.
- Defaults. Press the DEFAULTS softkey to set all the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

You can also press the CONFIG hardkey to display a configuration menu that is dependent on the state of the call sequence. See Figure 3–29.

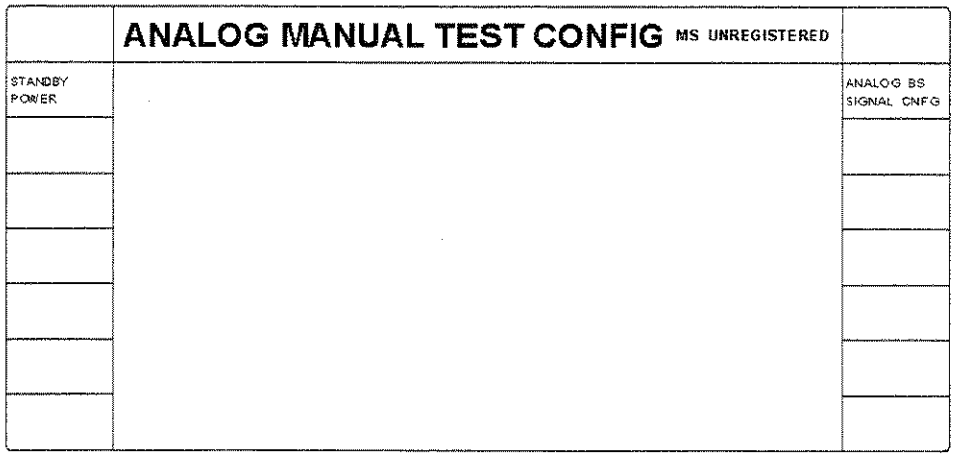


Figure 3–29: MS UNREGISTERED configuration menu displayed by CONFIG hardkey

Press the STANDBY POWER softkey to display the STANDBY POWER CONFIGURATION menu. See Figure 3–30.

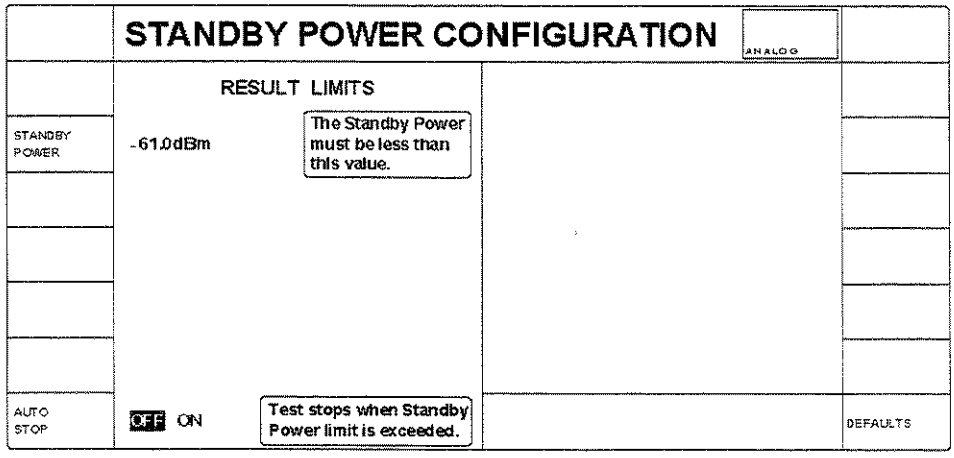


Figure 3–30: Analog STANDBY POWER CONFIGURATION menu

While in the STANDBY POWER CONFIGURATION menu, you can do the following:

- Press the STANDBY POWER softkey to set the upper limit for the standby power level. This is the output power level of the mobile station when the transmitter is disabled.
- Press the AUTO STOP softkey to toggle the auto stop function on or off. If the auto stop function is on, testing stops if the standby power limit is exceeded.
- Press the DEFAULTS softkey to set all the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

Press the ANALOG BS SIGNAL CNFG softkey to display the MS UNREGISTERED OR REGISTERED menu for the base station signal configuration. See Figure 3–28 on page 3–38.

Idle/Access

Once the mobile station is powered on and registered, the tester enters the idle/access state and displays the menu shown in Figure 3–31. The mobile station information is displayed on the left side of the screen and base station information on the right. You can press the CALL TO MOBILE softkey to initiate a call to the mobile station, or you can place a call from the mobile station by entering any telephone number on the mobile station and pressing SEND.

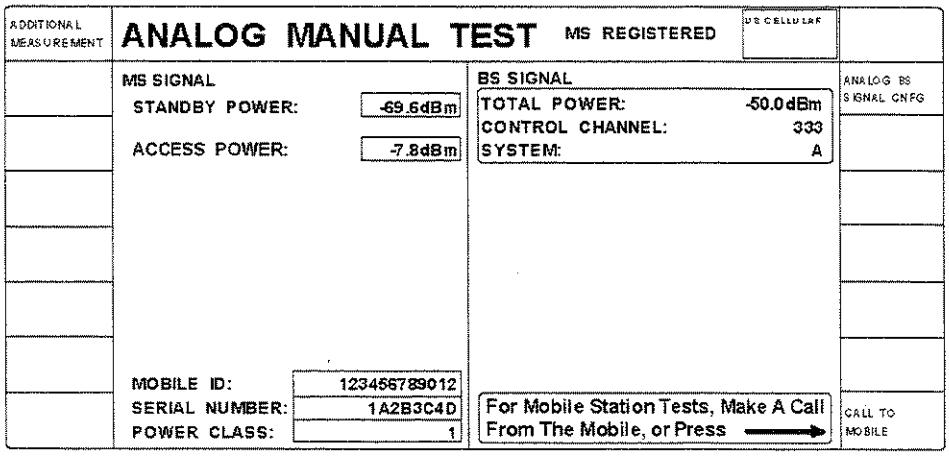


Figure 3–31: Analog MS REGISTERED menu

During the idle/access state, the following softkeys are available:

- ADDITIONAL MEASUREMENT. Refer to *ADDITIONAL MEASUREMENT* on page 3–36.
- ANALOG BS SIGNAL CNFG. Refer to Figure 3–28 on page 3–38.
- CALL TO MOBILE. Press this softkey to initiate the mobile station tests.

You can also press the CONFIG hardkey to display a configuration menu that is dependent on the state of the call sequence. See Figure 3–32.

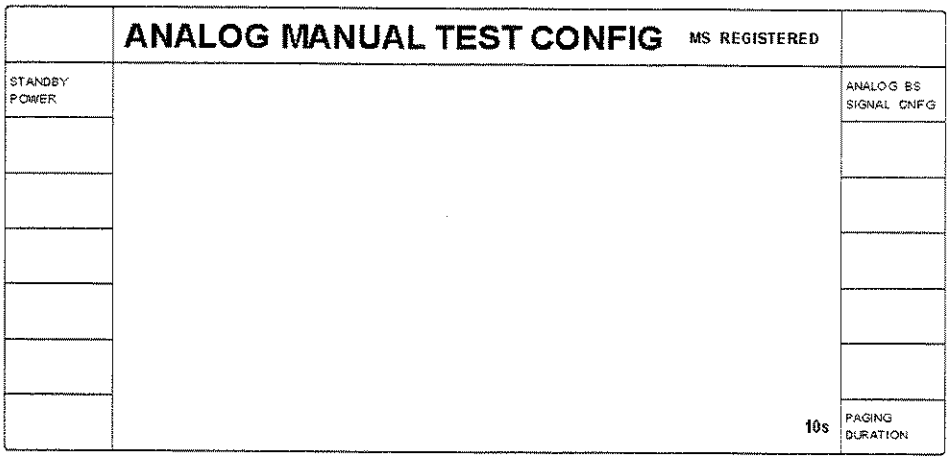


Figure 3–32: MS REGISTERED configuration menu displayed by CONFIG hardkey

Call Established

When you press the CALL TO MOBILE softkey and establish a call, the menu shown in Figure 3–33 is displayed. For information about the ADDITIONAL MEASUREMENT, RECEIVER QUALITY, TRANSMITTER QUALITY, and ANALOG BS SIGNAL CNFG menu selections, refer to *CALL ESTABLISHED Menu Selections* on page 3–45.

NOTE. *The tester uses the following internal filters in determining the results in the CALL ESTABLISHED menu:*

- *50 Hz highpass*
- *15 kHz lowpass*
- *SAT bandpass*
- *ST bandpass*
- *300 Hz to 3000 Hz bandpass*

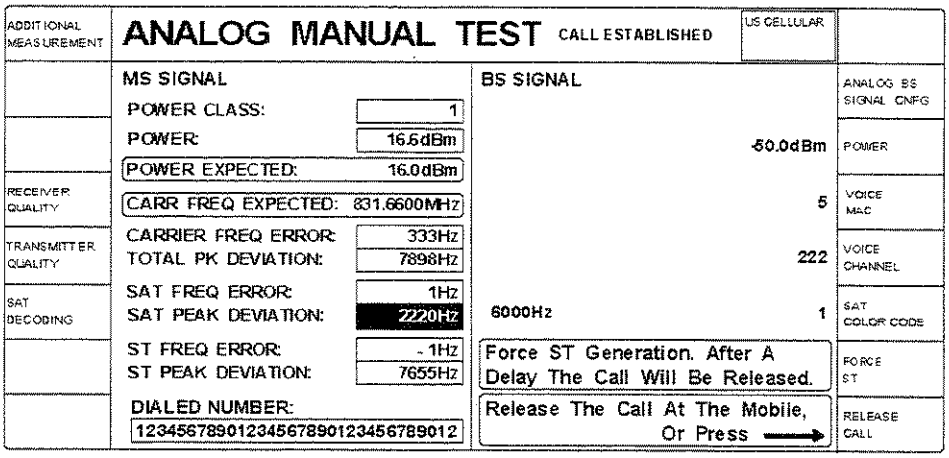


Figure 3–33: Analog CALL ESTABLISHED menu

NOTE. *The tester will not display a value in the SAT FREQ ERROR and ST FREQ ERROR fields if the deviation reading is less than 100 Hz.*

In the BS SIGNAL side of the display, you can adjust the following parameters:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.
- Voice channel. The voice channel is the channel over which voice communications occur. Press the VOICE CHANNEL softkey to select a voice channel.
- SAT color code. The supervisory audio tones (SAT) are out-of-voice band audio tones used for signaling. There are three assigned frequencies of 5970 Hz, 6000 Hz, and 6030 Hz with corresponding supervisory color codes (SCC) of SCC 0, SCC 1, and SCC 2, respectively. Press the SAT COLOR CODE softkey to select the SAT color code that you want.

You can press the FORCE ST softkey to test the 10 kHz signaling tone. The signaling tone is used for the following functions:

- Handoff request. The signaling tone signals confirmation of a handover request.
- Flash request. The signaling tone is used as a flash request, which alerts the base station that additional services will be requested.

- Release. The signaling tone is used to alert the base station when the mobile station terminates its call.
- Confirmation of alert. After a mobile station is alerted (notified of a call), the signal tone is sent via the return voice channel until the call is answered.

When you press the FORCE ST softkey, the signaling tone is sent for approximately 60 seconds and then the call is released. For efficiency, it is suggested that you perform the signaling tone test as the last procedure in your test sequence.

You can terminate a call by using one of two methods:

- You can release the call at the mobile station by hanging up the mobile phone (press END on the mobile station).
- You can press the RELEASE CALL softkey to simulate termination of the call by the base station.

You can press the CONFIG hardkey to display a configuration menu that is dependent on the state of the call sequence. See Figure 3–34.

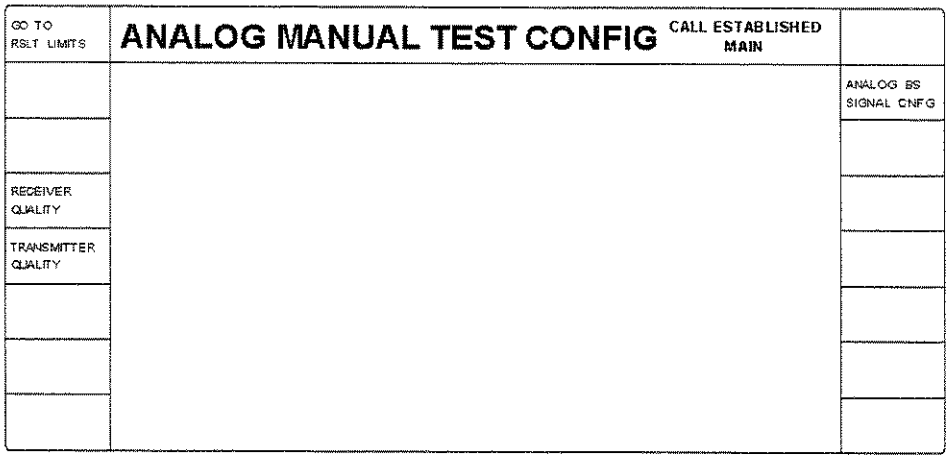


Figure 3–34: Analog MAIN menu

You can use the selections in the MAIN menu to access the following configuration menus:

- RECEIVER QUALITY (refer to *RECEIVER QUALITY* on page 3–66)
- TRANSMITTER QUALITY (refer to *TRANSMITTER QUALITY* on page 3–72)
- ANALOG BS SIGNAL CNFG (refer to *ANALOG BS SIGNAL CNFG* on page 3–61)

Press the GO TO RSLT LIMITS softkey to display the RESULT LIMITS menu shown in Figure 3–35. You can use the selections in this menu to set the limit values for the listed parameters.

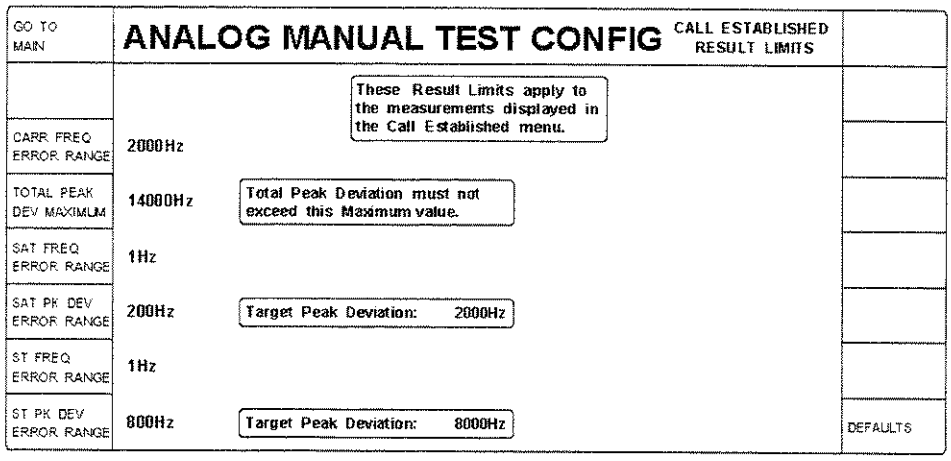


Figure 3–35: ANALOG MANUAL TEST CONFIG: CALL ESTABLISHED: RESULTS LIMITS menu

Press the DEFAULTS softkey to set all the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

Press the GO TO MAIN softkey to return to the MAIN menu (see Figure 3–34).

You can press the MENU UP hardkey to return directly to the CALL ESTABLISHED menu (see Figure 3–33 on page 3–43).

CALL ESTABLISHED Menu Selections

The following text describes each of the menu selections that are available in the analog CALL ESTABLISHED menu (see Figure 3–33 on page 3–43).

ADDITIONAL MEASUREMENT

Press this softkey to make voltage, current, and audio frequency measurements without quitting the CALL ESTABLISHED state. Refer to *ADDITIONAL MEASUREMENT* on page 3–36 for more information.

RECEIVER QUALITY

Press this softkey to display the tests that you can use to measure the performance of the mobile receiver. Select the test that you want to perform from the menu selections on the left side of the menu. See Figure 3–36.

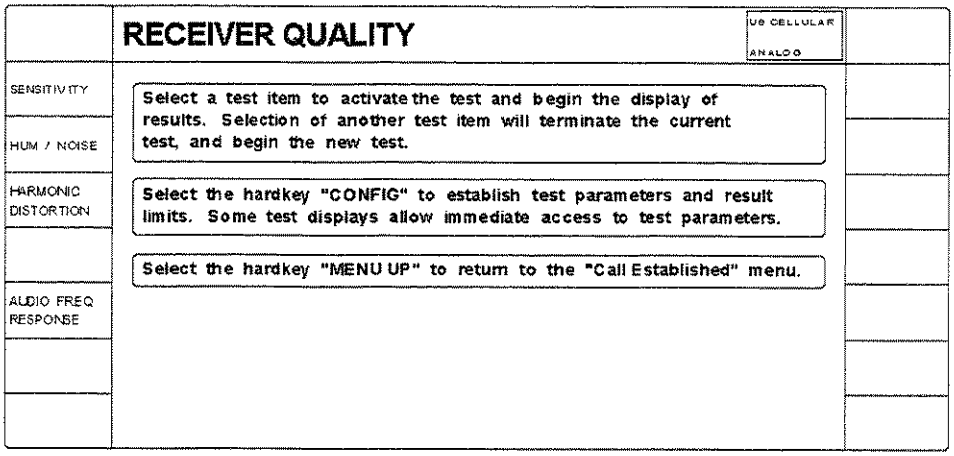


Figure 3–36: RECEIVER QUALITY test menu

Normally, you set up the parameters for the tests you want to make using the configuration menus that you access from the home menu. However, returning to the home menu after establishing a call will drop the connection between the mobile station and the tester. If you want to set up or change the test parameters after a call is established, press the CONFIG hardkey. This displays the RECEIVER QUALITY CONFIGURATION menu that is associated with the selected test. You can use this menu to set or change the test parameters. Use the MENU UP hardkey to return to the RECEIVER QUALITY test menu after making the configuration changes.

In some of the test menus, you can vary the base station and AF Generator parameters from within the test menu. The changes you make within the test menu change the settings you made in the associated configuration menu.

To perform mobile receiver tests, your mobile station must be connected to the tester. Figure 3–37 shows the recommended connections. Other methods of connecting are possible (refer to *RF CONNECT/EXT ATTEN* on page 3–80).

The following text discusses each of the RECEIVER QUALITY menu selections.

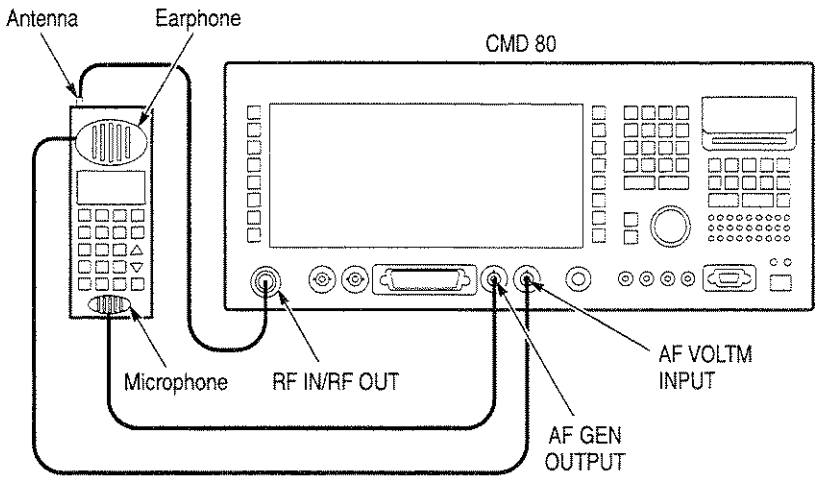


Figure 3–37: Setup for testing receiver quality

SENSITIVITY. Press the SENSITIVITY softkey to measure the sensitivity of the mobile receiver (see Figure 3–38). The tester displays the SINAD measurement. The purpose of the SINAD measurement is to ensure that a received signal can be heard when the RF input power to the mobile station is very low. The test measures the degree of signal quality at the minimum RF power conditions.

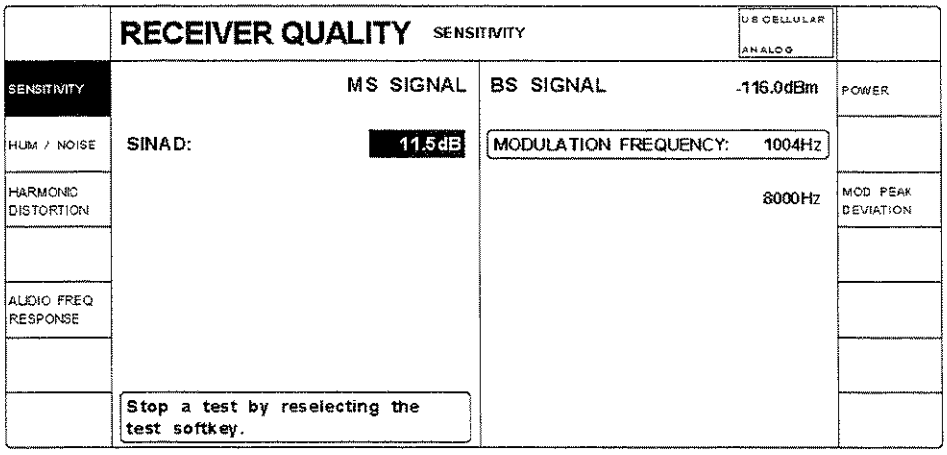


Figure 3–38: Analog SENSITIVITY menu

The tester measures the SINAD value as a ratio of the sum of the received audio signal, noise, and distortion to the sum of the noise and distortion. The value is expressed in decibels.

NOTE. *The tester uses the following internal filters in determining the results in the SENSITIVITY menu:*

- *50 Hz highpass*
- *15 kHz lowpass*
- *1004 Hz notch*
- *C-message*

The SINAD value is highlighted if the result is less than the SINAD limit that you specified in the SENSITIVITY configuration menu (refer to *SENSITIVITY* on page 3–67).

NOTE. *The display of the test results may toggle between normal and highlighted if you have set AUTO STOP to OFF in the SENSITIVITY configuration menu.*

While in this menu, you can vary the following parameters of the base station:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Modulation peak deviation. Press the MOD PEAK DEVIATION softkey to set the deviation used to modulate the test tone in the RF output of the tester.

HUM/NOISE. Press the HUM/NOISE softkey to measure the hum/noise of the mobile receiver. The test measures how much unwanted signal the receiver circuitry generates under normal RF power conditions. The tester measures the hum/noise as a ratio of the unmodulated audio output to the the modulated audio output. The tester displays the hum/noise test result in decibels. The tester also displays the audio peak deviation in hertz. See Figure 3–39.

NOTE. *The tester uses the following internal filters in determining the results in the HUM/NOISE menu:*

- *50 Hz highpass*
- *15 kHz lowpass*
- *C-message*

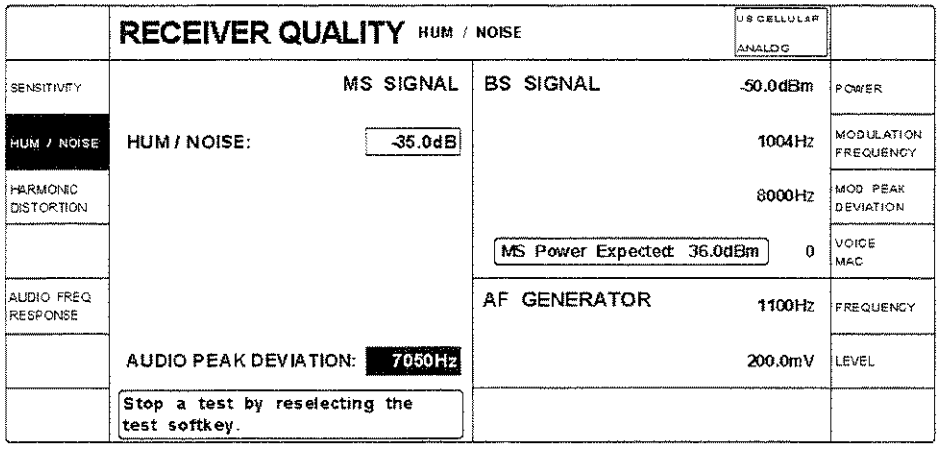


Figure 3–39: Analog HUM/NOISE menu

A test result is highlighted if the value exceeds the hum/noise limit that you specified in the HUM/NOISE configuration menu (refer to *HUM/NOISE* on page 3–68).

NOTE. *The display of the test results may toggle between normal and highlighted if you have set AUTO STOP to OFF in the HUM/NOISE configuration menu.*

While in this menu, you can vary the following parameters of the base station:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Modulation frequency. Press the MODULATION FREQUENCY softkey to set the audio frequency of the signal that modulates the base station carrier.
- Modulation peak deviation. Press the MOD PEAK DEVIATION softkey to set the deviation used to modulate the test tone in the RF output of the tester.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

You can also change the following AF Generator settings:

- Press the FREQUENCY softkey to adjust the frequency of the internal AF Generator.
- Press the LEVEL softkey to adjust the level of the internal AF Generator or to turn it off. Set the level so that the audio peak deviation is within the audio peak deviation error range.

NOTE. *The tester performs the hum/noise measurement only when the audio peak deviation is within the limits set in the HUM/NOISE configuration menu (refer to* HUM/NOISE on page 3–68).

HARMONIC DISTORTION. Press the HARMONIC DISTORTION softkey to measure the harmonic distortion of the mobile receiver. The test measures how cleanly the amplifier in the mobile station reproduces a tone. The receiver generates harmonics (unwanted frequencies) at integer multiples of the tone frequency received by the mobile receiver.

NOTE. *You must turn off the mobile station's expandor when performing this test.*

The tester measures the harmonic distortion as the percentage of the RMS value of the sum of the second and higher harmonic components to the RMS value of the total signal at the output of the mobile receiver for a specified signal applied to the receiver input. The test displays the harmonic distortion as a percentage. See Figure 3–40.

NOTE. *The tester uses the following internal filters in determining the results in the HARMONIC DISTORTION menu:*

- *50 Hz highpass*
- *15 kHz lowpass*
- *1004 Hz notch*
- *C-message*

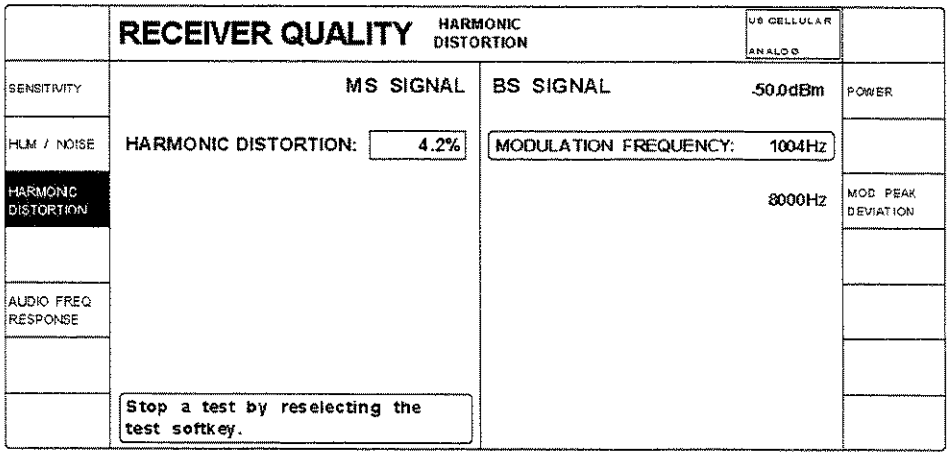


Figure 3–40: Analog HARMONIC DISTORTION menu

A test result is highlighted if the harmonic distortion percentage exceeds the limit that you specified in the HARMONIC DISTORTION configuration menu (refer to *HARMONIC DISTORTION* on page 3–69).

NOTE. *The display of the test results may toggle between normal and highlighted if you have set AUTO STOP to OFF in the HARMONIC DISTORTION configuration menu.*

While in this menu, you can vary the following parameters of the base station:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Modulation peak deviation. Press the MOD PEAK DEVIATION softkey to set the deviation used to modulate the test tone in the RF output of the tester.

NOTE. *The tester performs the harmonic distortion measurement only when the audio peak deviation is within the limits set in the HARMONIC DISTORTION configuration menu (refer to* HARMONIC DISTORTION on page 3–69).

Changing the preceding values in this menu changes the initial values that you set in the HARMONIC DISTORTION configuration menu.

AUDIO FREQ RESPONSE. Press the AUDIO FREQ RESPONSE softkey to measure the audio frequency response of the mobile receiver. This test ensures that the volume level of any frequency transmitted by the base station and received by the mobile station falls within a predefined window.

NOTE. *You must turn off the mobile station's expandor when performing this test.*

The tester measures the audio frequency response as the ratio of the electrical audio output of the mobile receiver to the modulated signal output of the base station (tester) as a function of frequency. See Figure 3–41.

NOTE. *The tester uses the following internal filters in determining the results in the AUDIO FREQUENCY RESPONSE menu:*

- *6 Hz highpass*
- *15 kHz lowpass*
- *4000 Hz lowpass*

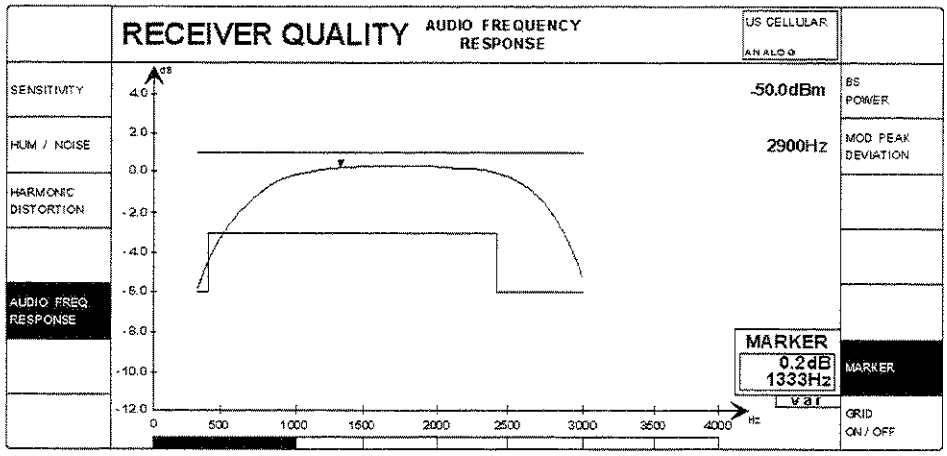


Figure 3–41: Analog AUDIO FREQ RESPONSE menu

NOTE. *When performing the receiver audio frequency response test, the tester compensates for the mobile station's de-emphasis filter.*

When you press the AUDIO FREQ RESPONSE softkey, the tester displays the audio frequency response curve plotted between the upper and lower limit lines. Frequencies of the response curve that are not within the limit lines are indicated in inverse video at the bottom of the display.

The 0 dBm reference point amplitude is determined by the value you set with the MOD PEAK DEVIATION softkey. You can use the AUDIO FREQUENCY RESPONSE configuration menu to set the 0 dBm reference frequency with the MODULATION FREQUENCY softkey. You can also use the configuration menu to set the upper limit line, lower limit line, and the number of points sampled. Refer to AUDIO FREQ RESPONSE on page 3–71.

Press the MARKER softkey to position the marker along the frequency response curve. The values at the marker are displayed in the MARKER box.

Press the GRID ON/OFF softkey to toggle a grid display on or off.

You can vary the following base station parameters while in the AUDIO FREQUENCY RESPONSE test menu:

- BS Power. Press the BS POWER softkey to set the level of the base station transmitter power.
- Modulation peak deviation. Press the MOD PEAK DEVIATION softkey to set the deviation used to modulate the test tone in the RF output of the tester.

TRANSMITTER QUALITY Press this softkey to display the TRANSMITTER QUALITY menu. From the menu selections on the left side of the menu, you can select the transmitter tests that you want to perform. See Figure 3–42.

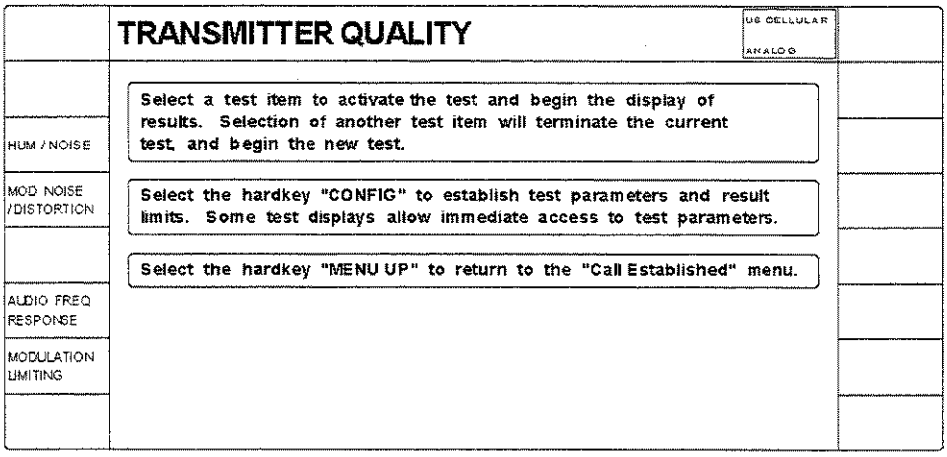


Figure 3–42: Analog TRANSMITTER QUALITY menu

Normally, you set up the parameters for the tests you want to make using the configuration menus that you access from the home menu. However, returning to the home menu after establishing a call will drop the connection between the radiotelephone and the tester. If you want to set up or change the test parameters after a call is established, press the CONFIG hardkey. This displays the TRANSMITTER QUALITY CONFIGURATION menu that is associated with the selected test. You can use this menu to set or change the test parameters. Use the MENU UP hardkey to return to the TRANSMITTER QUALITY test menu after making the configuration changes.

In some of the test menus, you can vary the base station and AF Generator parameters from within the test menu. The changes you make within the test menu change the initial settings you made in the associated configuration menu.

To perform mobile transmitter tests, your mobile station must be connected to the tester. Figure 3–43 shows the recommended connections. Other methods of connecting are possible (refer to *RF CONNECT/EXT ATTEN* on page 3–80).

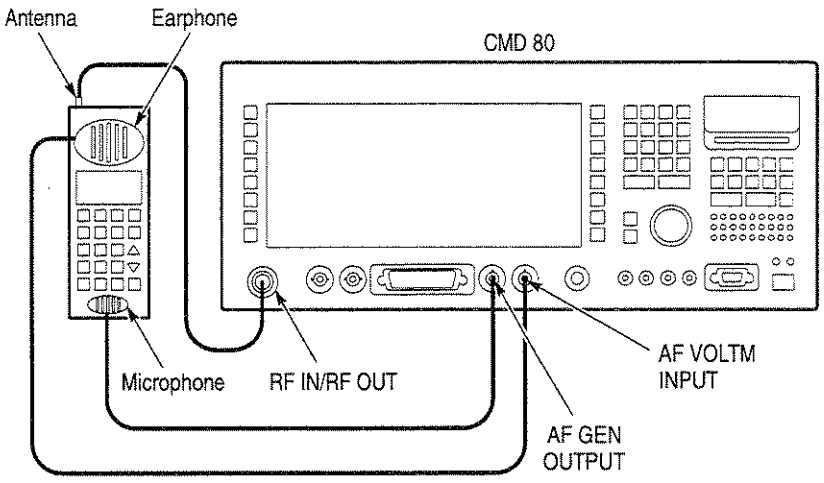


Figure 3–43: Setup for testing transmitter quality

The following text discusses each of the TRANSMITTER QUALITY menu selections.

HUM/NOISE. Press the HUM/NOISE softkey to measure the hum/noise of the mobile transmitter and the audio peak deviation. The transmitter hum/noise is the ratio of the residual frequency modulation to test modulation measured on the test mobile receiver. The test displays the hum/noise in decibels and the audio peak deviation in hertz. See Figure 3–44.

NOTE. *The tester uses the following internal filters in determining the results in the HUM/NOISE menu:*

- *50 Hz highpass*
- *15 kHz lowpass*
- *C-message*
- *Expandor*
- *750 µs de-emphasis*

A test result is highlighted if the level of the hum/noise exceeds the limit that you specified in the configuration menu (refer to *HUM/NOISE* on page 3–73).

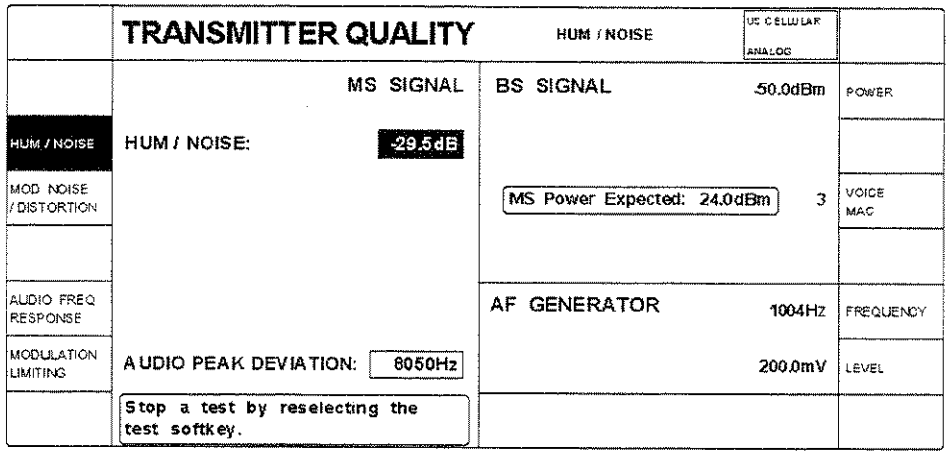


Figure 3–44: Analog HUM/NOISE menu

NOTE. *The display of the test results may toggle between normal and highlighted if you have set AUTO STOP to OFF in the RESIDUAL AM configuration menu.*

While in this menu, you can vary the following parameters of the base station:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

You can also change the following AF Generator settings:

- Frequency. Press the FREQUENCY softkey to adjust the frequency of the internal AF Generator.
- Level. Press the LEVEL softkey to adjust the level of the internal AF Generator or to turn it off. Set the level so that the audio peak deviation is within the audio peak deviation error range that you specify in the HUM/ NOISE configuration menu (refer to *HUM/NOISE* on page 3–73).

NOTE. *The tester performs the hum/noise measurement only when the audio peak deviation is within the limits set in the HUM/NOISE configuration menu (refer to* HUM/NOISE on page 3–73).

MOD NOISE/DISTORTION. Press the MOD NOISE/DISTORTION softkey to measure the modulation noise and distortion of the mobile transmitter and the audio peak deviation. This test measures how much noise (unwanted signal) is transmitted with the intended signal.

The tester measures the modulation noise and distortion as the level of demodulated carrier audio RMS noise produced by audio distortion in the transmitter. The tester displays this value as a percentage and the audio peak deviation in hertz. See Figure 3–45.

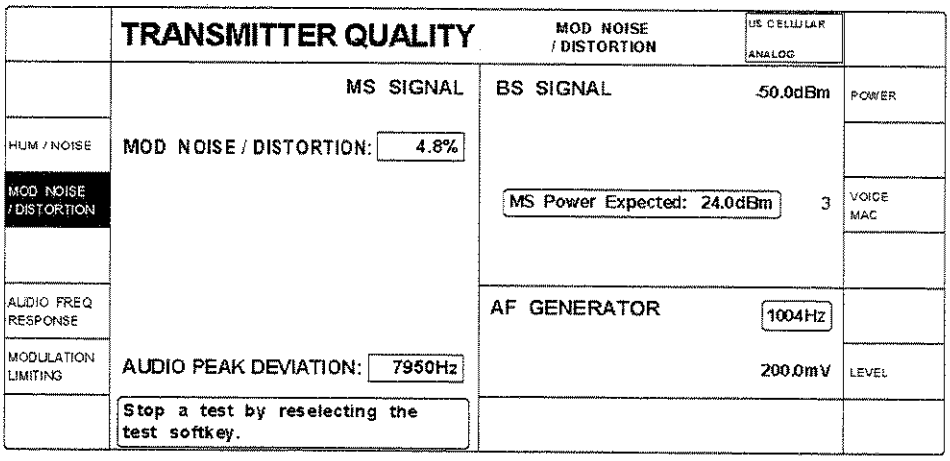


Figure 3–45: Analog MOD NOISE/DISTORTION menu

NOTE. *The tester uses the following internal filters in determining the results in the MOD NOISE/DISTORTION menu:*

- *50 Hz highpass*
- *15 kHz lowpass*
- *1004 Hz notch*
- *C-message*
- *Expandor*
- *750 µs de-emphasis*

The modulation noise and distortion result is highlighted if the percentage of modulation noise and distortion exceeds the limit that you specified in the configuration menu (refer to *MOD NOISE/DISTORTION* on page 3–74).

NOTE. *The display of the test results may toggle between normal and highlighted if you have set AUTO STOP to OFF in the MOD NOISE/DISTORTION configuration menu.*

While in this menu, you can vary the following parameters of the base station:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

You can also change the following AF Generator settings:

- Frequency. Press the FREQUENCY softkey to adjust the frequency of the internal AF Generator.
- Level. Press the LEVEL softkey to adjust the level of the internal AF Generator or to turn it off. Set the level so that the audio peak deviation is within the audio peak deviation error range that you specify in the MOD NOISE/DISTORTION configuration menu (refer to *MOD NOISE/DISTORTION* on page 3–74).

NOTE. *The tester performs the modulation/distortion measurement only when the audio peak deviation is within the limits set in the MOD NOISE/DISTORTION configuration menu (refer to* MOD NOISE/DISTORTION *on page 3–74).*

AUDIO FREQ RESPONSE. Press the AUDIO FREQ RESPONSE softkey to measure the audio frequency response of the mobile transmitter. Refer to Figure 3–46. This test ensures that the volume level of any frequency transmitted by the base station falls within a predefined window. The purpose of the test is to ensure that high frequencies and low frequencies are reproduced at the same volume levels.

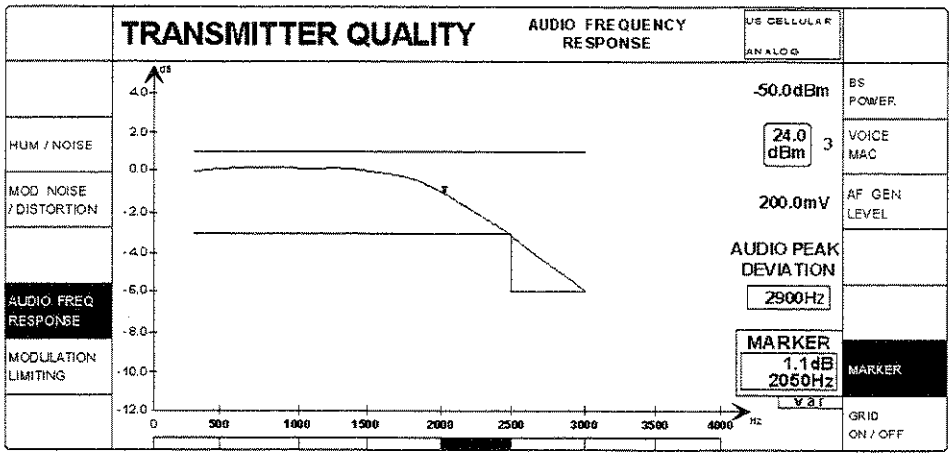


Figure 3–46: Analog TRANSMITTER QUALITY — AUDIO FREQUENCY RESPONSE menu

NOTE. *You must turn off the mobile station's compressor when performing this test.*

The tester measures the audio frequency response as the ratio of the demodulated signal output of the mobile station to the electrically coupled (acoustic) signal input of the mobile station (driven by the tester) as a function of frequency. See Figure 3–46.

NOTE. *The tester uses the following internal filters in determining the results in the AUDIO FREQUENCY RESPONSE menu:*

- *6 Hz highpass*
- *15 kHz lowpass*
- *4000 Hz lowpass*

When performing the tramsmitter audio frequency response test, the tester compensates for the user's pre-emphasis filter.

When you press the AUDIO FREQ RESPONSE softkey, the tester displays the audio frequency response curve plotted between the upper and lower limit lines. Frequencies of the response curve that are not within the limit lines are indicated in inverse video at the bottom of the display.

You can set the 0 dB reference point amplitude with the AF GEN LEVEL softkey. Adjust this level until the audio peak deviation is within the target range (nominally, 2900 kHz). The value of the audio peak deviation is the 0 dBm amplitude reference. You can use the AUDIO FREQUENCY RESPONSE configuration menu to set the 0 dBm reference frequency with the AF Generator

FREQUENCY softkey. You can also use the configuration menu to set the upper limit line, lower limit line, and the number of points sampled. Refer to *AUDIO FREQUENCY RESPONSE* on page 3–75.

Press the MARKER softkey to position the marker along the frequency response curve. The values at the marker are displayed in the MARKER box.

Press the GRID ON/OFF softkey to toggle a grid display on or off.

You can vary the following base station parameters while in the AUDIO FREQUENCY RESPONSE test menu:

- BS Power. Press the BS POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.
- Audio frequency generator level. Press the LEVEL softkey to adjust the level of the internal AF Generator or to turn it off. Set the level so that the audio peak deviation is within the audio peak deviation error range that you specify in the AUDIO FREQUENCY RESPONSE configuration menu (refer to *AUDIO FREQUENCY RESPONSE* on page 3–75).

NOTE. *The tester performs the audio frequency response measurement only when the audio peak deviation is within the limits set in the AUDIO FREQUENCY RESPONSE configuration menu (refer to* AUDIO FREQ RESPONSE *on page 3–75).*

MODULATION LIMITING. Press the MODULATION LIMITING softkey to measure the maximum frequency deviation that the mobile transmitter allows. See Figure 3–47. The Modulation Limiting test checks that the mobile transmitter does not produce a deviation greater than the rated system deviation.

NOTE. *The tester uses the following internal filters in determining the results in the MODULATION LIMITING menu:*

- *50 Hz highpass*
- *15 kHz lowpass*

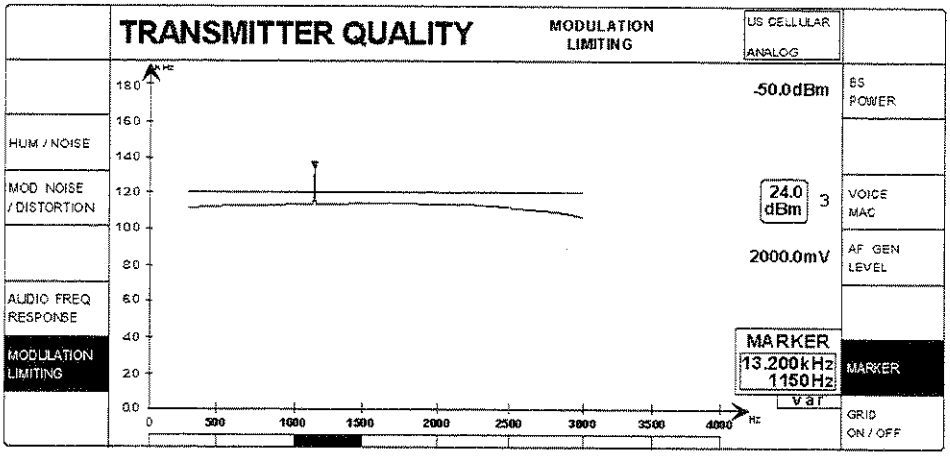


Figure 3–47: Analog MODULATION LIMITING menu

The upper line in the display is the result limit for the test. You can set this limit line in the configuration menu for the MODULATION LIMITING test (refer to *MODULATION LIMITING* on page 3–78).

The lower line in the display represents the audio peak deviation over the specified frequency range. You can set the frequency range in the configuration menu for the MODULATION LIMITING test (refer to *MODULATION LIMITING* on page 3–78).

If the audio peak deviation exceeds the limit line, a range of frequencies within which the test failed is shown in reverse video at the bottom of the display. In Figure 3–47, the range of frequencies between 1000 Hz and 1500 Hz is in reverse video.

Press the MARKER softkey to position the marker along the curve to measure the audio peak deviation and the corresponding frequency. In Figure 3–47, the marker indicates a peak audio deviation of 13,200 kHz at a frequency of 1150 Hz.

Press the GRID ON/OFF softkey to superimpose a grid over the display.

While in this menu, you can vary the following parameters of the base station:

- Base station power. Press the BS POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

Press the AF GEN LEVEL softkey to adjust the level of the internal AF Generator.

ANALOG BS SIGNAL CNFG

Press the ANALOG BS SIGNAL CNFG softkey to display the ANALOG BS SIGNAL CONFIGURATION menu associated with the CALL ESTABLISHED state. See Figure 3–48. Use this menu to set the operating parameters of the base station signal.

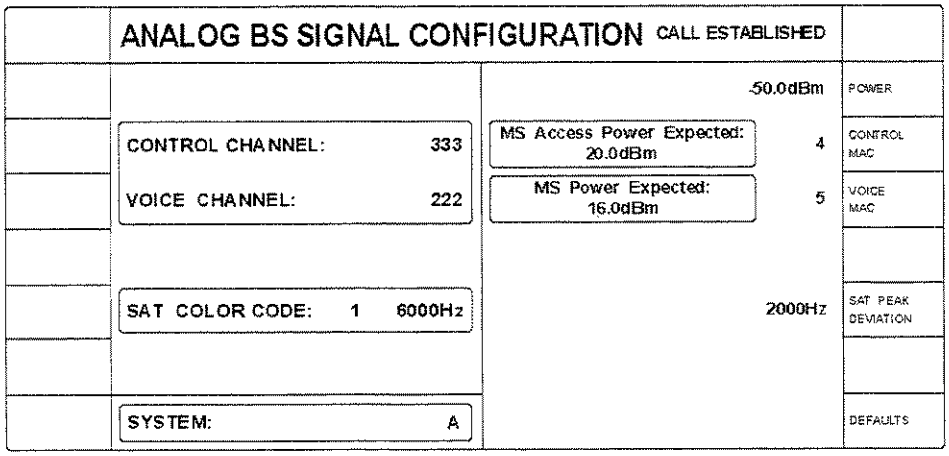


Figure 3–48: ANALOG BS SIGNAL CONFIGURATION menu for CALL ESTABLISHED

While in this menu, you can vary the following parameters of the base station:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Control mobile attenuation code. The control mobile attenuation code is a code sent by the base station to control the output power of the mobile phone. Press the CONTROL MAC softkey to select the control MAC you want.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the parameter for the voice mobile attenuation code.
- Supervisory audio tone peak deviation. The supervisory audio tone deviation is the amount of deviation that the base station uses to transmit the SAT to the mobile station. Press the SAT PEAK DEVIATION softkey to set the amount of deviation used.
- Defaults. Press the DEFAULTS softkey to set all the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

ANALOG MODULE TEST

Press the ANALOG MODULE TEST softkey to display the ANALOG MODULE TEST menu (see Figure 3–49). The menu displays the test results of the transmitter quality of the mobile station. If a measurement exceeds its result limit, the measurement is displayed in inverse video. You can set the limits in the ANALOG MODULE TEST CONFIG menu, which you access by pressing the CONFIG hardkey (see Figure 3–50).

NOTE. *The tester uses the following internal filters in determining the results in the ANALOG MODULE TEST menu:*

- *50 Hz highpass (call peak deviations)*
- *15 kHz lowpass (total peak deviations)*
- 300 – 3000 Hz bandpass (audio peak deviation)
- 20 Hz bandpass around appropriate frequencies (SAT/ST)

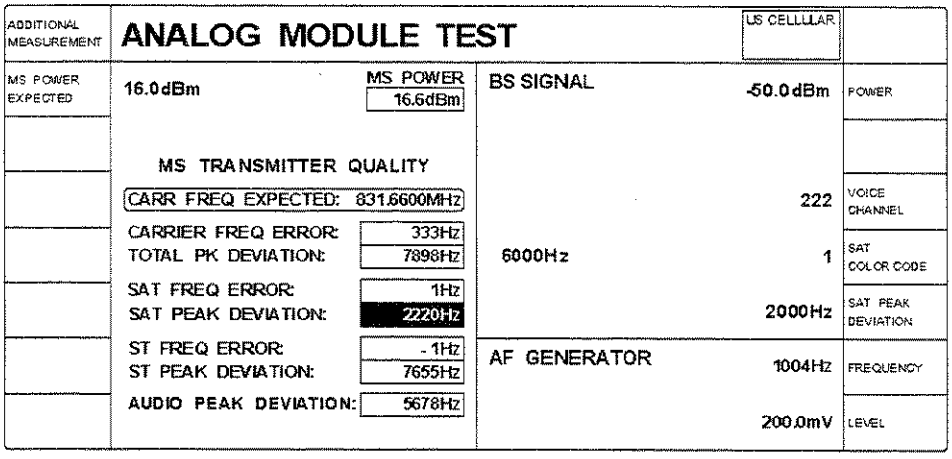


Figure 3–49: ANALOG MODULE TEST menu

NOTE. *The tester will not display a value in the SAT FREQ ERROR and ST FREQ ERROR fields if the deviation reading is less than 100 Hz.*

Press the ADDITIONAL MEASUREMENT softkey to display the ADDITIONAL MEASUREMENTS menu, which you can use to take conventional measurements. Refer to *ADDITIONAL MEASUREMENT* on page 3–36.

Press the MS POWER EXPECTED softkey to set the power of the mobile station.

While in this menu, you can vary the following parameters of the base station:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Voice channel. The voice channel is the channel over which voice communications occur. Press the VOICE CHANNEL softkey to select a voice channel.
- SAT color code. The supervisory audio tones (SAT) are out-of-voice band audio tones used for signaling. There are three assigned frequencies of 5970 Hz, 6000 Hz, and 6030 Hz with corresponding saturation color codes (SCC) of SCC 0, SCC 1, and SCC 2, respectively. Press the SAT COLOR CODE softkey to select the SAT color code that you want.
- Supervisory audio tone peak deviation. The supervisory audio tone deviation is the amount of deviation that the base station uses to transmit the SAT to the mobile station. Press the SAT PEAK DEVIATION softkey to set the amount of deviation used.

You can also change the following AF Generator settings:

- Frequency. Press the FREQUENCY softkey to adjust the frequency of the internal AF Generator.
- Level. Press the LEVEL softkey to adjust the level of the internal AF Generator. You can adjust the level to achieve the audio peak deviation target value that is displayed in the menu.

Press the CONFIG hardkey to display the ANALOG MODULE TEST CONFIG menu (see Figure 3–51). You use this menu to set the result limits for the ANALOG MODULE TEST.

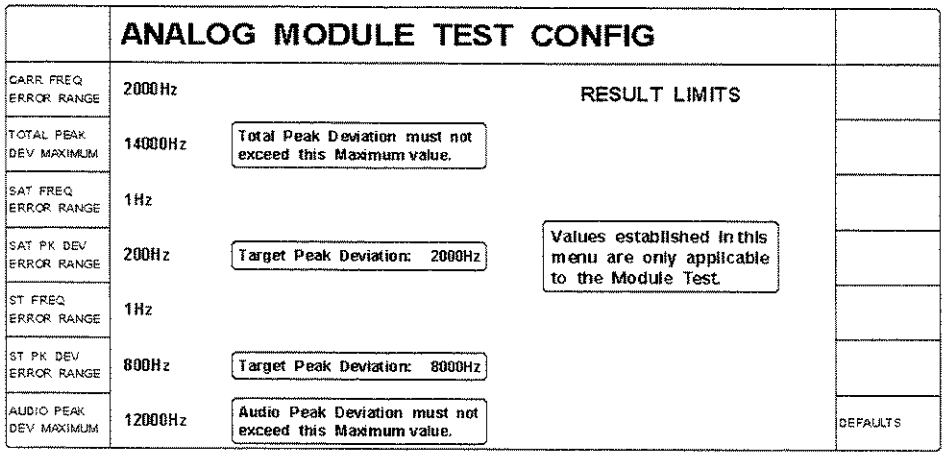


Figure 3–50: ANALOG MODULE TEST CONFIG menu

To change a limit, press the corresponding softkey on the left side of the menu and set the value you want.

Press the DEFAULTS softkey to set all the limits to their preset conditions (typically, the default limits are based on IS-98 specifications).

NETWORK

Press the NETWORK softkey to select the network for the mobile phone you are testing. If your tester is capable of testing only one network, this softkey and its associated field are not displayed. Instead, the network information is displayed in a rounded box below the text *CMD 80*.

NOTE. *The tester displays the* ANALOG MANUAL TEST *softkey only if you have selected US CELLULAR as the network.*

CONFIG MENU

Press the CONFIG MENU softkey to display the functions for which there are configuration menus that you use to set the parameters for the tester. See Figure 3–51.

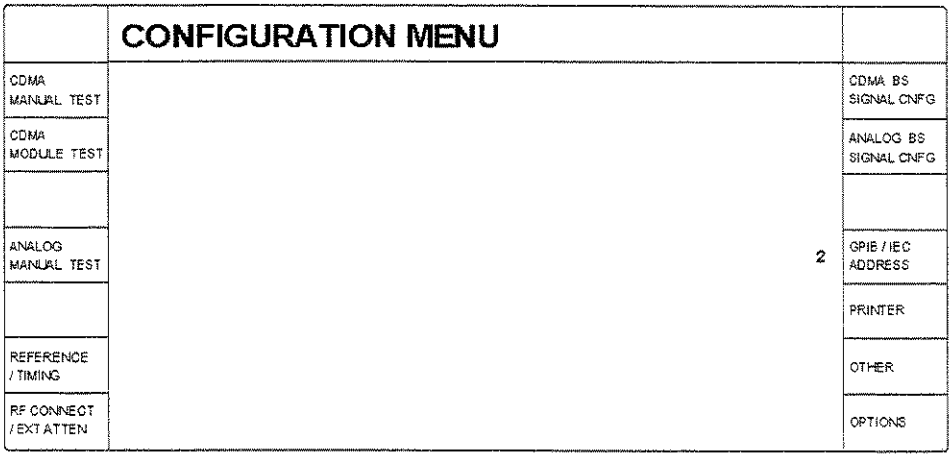
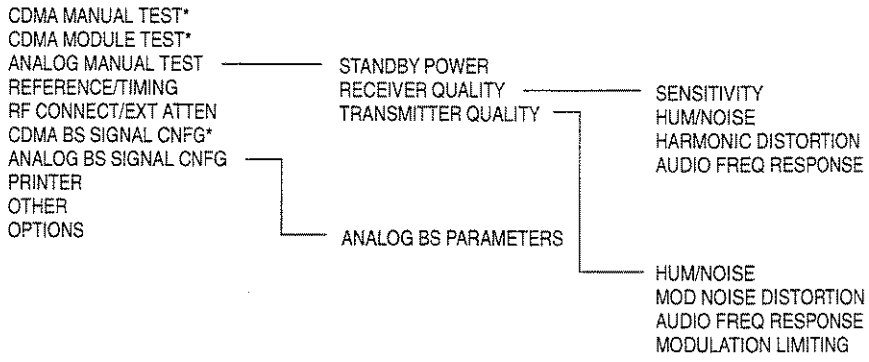


Figure 3–51: CONFIGURATION MENU

Press the appropriate key for the specific item you want to configure. Some selections contain submenus (see Figure 3–52). Each of the softkeys is described in the following subsection.



* **This menu selection is for CDMA measurements; refer to *CONFIG MENU* in *CDMA Measurements* on page 3–28 for more information.**

Figure 3–52: CONFIGURATION MENU structure (analog)

CDMA MANUAL TEST Use this menu selection to configure the tester when you are taking CDMA measurements. Refer to *CDMA MANUAL TEST* on page 3–29 for more information.

ANALOG MANUAL TEST Press this softkey to display a menu with selections that you use to set parameters for tests done while in the ANALOG MANUAL TEST mode. See Figure 3–53.

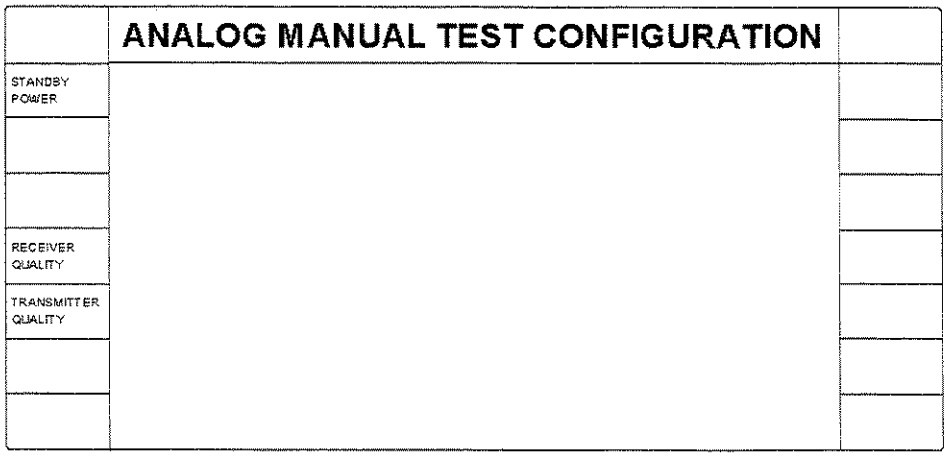


Figure 3–53: ANALOG MANUAL TEST CONFIGURATION menu display

The following text discusses each of the ANALOG MANUAL TEST CONFIGURATION menu selections.

STANDBY POWER. Press this softkey to set the parameters that the tester uses when taking standby power measurements. See Figure 3–54.

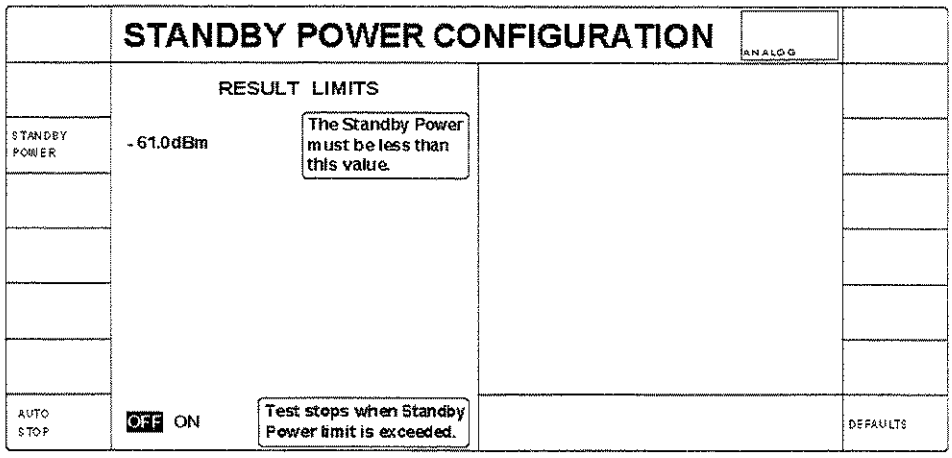


Figure 3–54: Analog STANDBY POWER CONFIGURATION menu

Press the STANDBY POWER softkey to set the maximum limit of the standby power. The standby power is the power level of the mobile station when the transmitter is disabled.

Press the AUTO STOP softkey to toggle the auto stop function on or off. If AUTO STOP is on, the test stops if the standby power exceeds the limit you set. Otherwise, the test runs continuously.

Press the DEFAULTS softkey to set all the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

RECEIVER QUALITY. Press the RECEIVER QUALITY softkey to display the RECEIVER QUALITY CONFIGURATION menu, which has selections that you use to set parameters for the various receiver quality tests. See Figure 3–55.

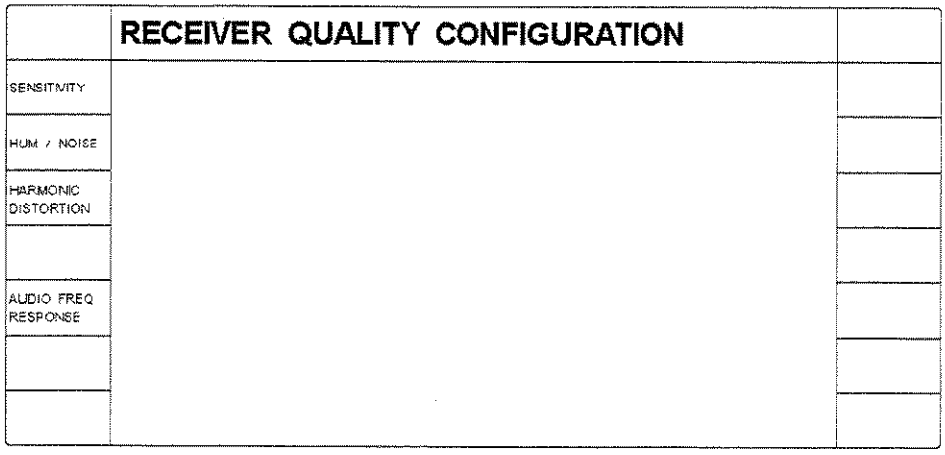


Figure 3–55: Analog RECEIVER QUALITY CONFIGURATION menu

Each of the RECEIVER QUALITY CONFIGURATION menu choices is discussed in the following text.

- **SENSITIVITY.** Press the SENSITIVITY softkey to display the SENSITIVITY menu. See Figure 3–56. Use this menu to set the parameters for the RECEIVER QUALITY SENSITIVITY test.

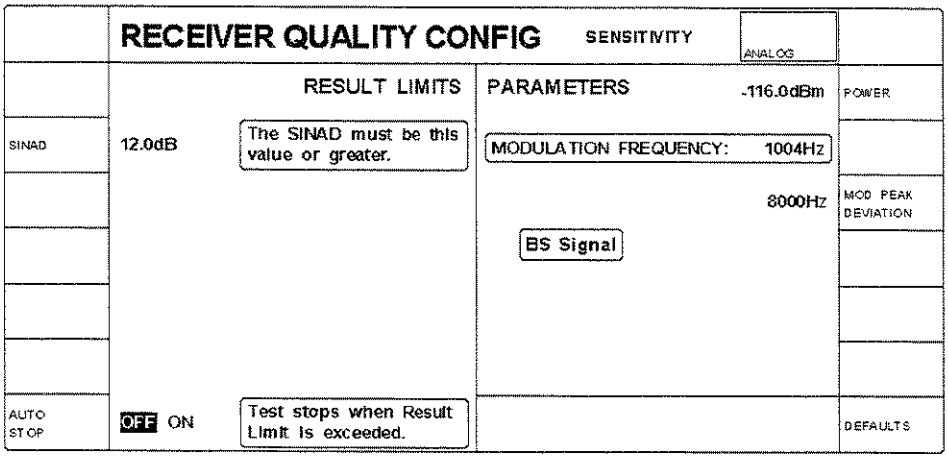


Figure 3–56: Analog SENSITIVITY menu

You can set the following test parameters:

- SINAD. Press the SINAD softkey to set the lower limit for the SINAD.
- Auto stop. Press the AUTO STOP softkey to toggle the auto stop function on and off. If the auto stop function is on, the test stops if the SINAD value is less than the value you set. Otherwise, the test runs continuously.

You can also set the following base station signal parameters from within this menu:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Modulation frequency. Press the MODULATION FREQUENCY softkey to set the audio frequency of the signal that modulates the base station carrier.
- Modulation peak deviation. Press the MOD PEAK DEVIATION softkey to set the deviation used to modulate the test tone in the RF output of the tester.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

- **HUM/NOISE.** Press the HUM/NOISE softkey to display the HUM/NOISE menu. See Figure 3–57. Use this menu to set the parameters for the RECEIVER QUALITY HUM/NOISE test.

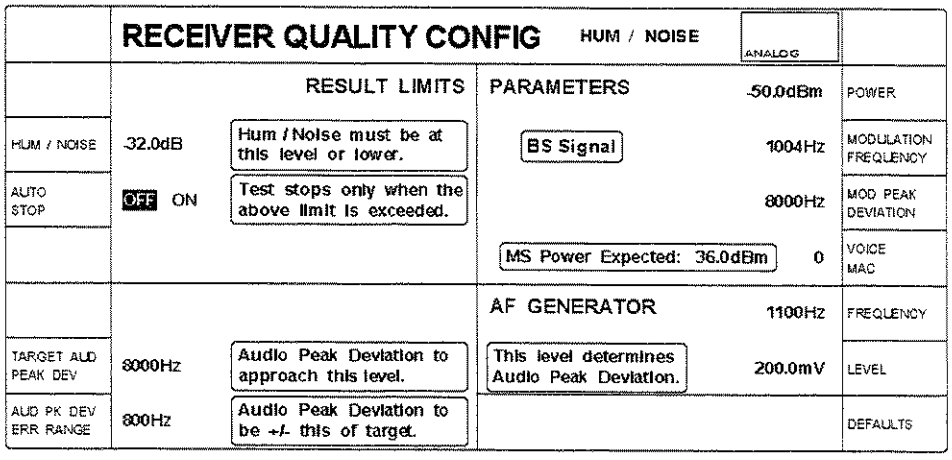


Figure 3–57: Analog HUM/NOISE menu

You can set the following test parameters:

- Hum/Noise. Press the HUM/NOISE softkey to set the maximum test limit for the hum/noise level.
- Auto stop. Press the AUTO STOP softkey to toggle the auto stop function on and off. If the auto stop function is on, the test stops if the hum/noise level is greater than the value you set. Otherwise, the test runs continuously.
- Target audio peak deviation. Press the TARGET AUD PEAK DEVIATION softkey to set the desired audio peak deviation.
- Audio peak deviation error range. Press the AUDIO PK DEV ERR RANGE softkey to set the allowable deviation (±) from the target audio peak deviation value.

Within this menu you can also set the following base station signal parameters:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Modulation frequency. Press the MODULATION FREQUENCY softkey to set the audio frequency of the signal that modulates the base station carrier.
- Modulation peak deviation. Press the MOD PEAK DEVIATION softkey to set the deviation used to modulate the test tone in the RF output of the tester.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

You can also change the following AF Generator settings:

- Press the FREQUENCY softkey to adjust the frequency of the internal AF Generator.
- Press the LEVEL softkey to adjust the level of the internal AF Generator or to turn it off.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

- **HARMONIC DISTORTION.** Press the HARMONIC DISTORTION softkey to display the HARMONIC DISTORTION menu. See Figure 3–58. You use the selections in this menu to set the parameters for the RECEIVER QUALITY HARMONIC DISTORTION test.

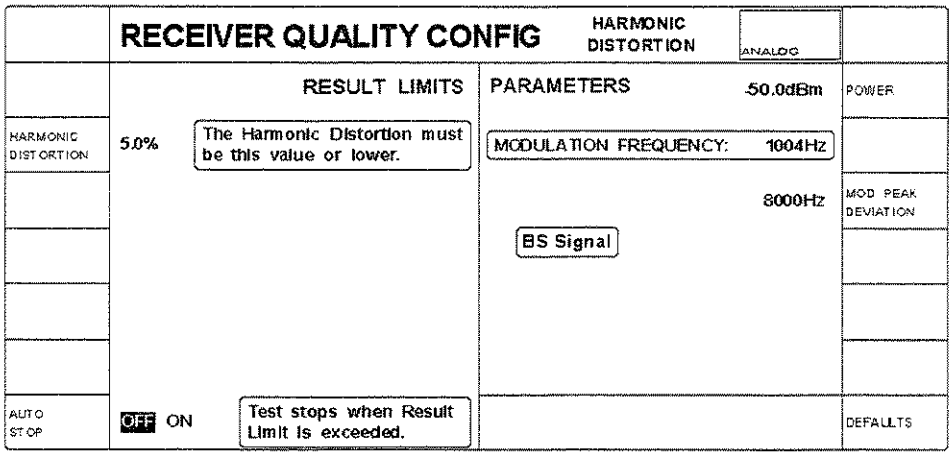


Figure 3–58: Analog HARMONIC DISTORTION menu

You can set the following test parameters:

- Harmonic Distortion. Press the HARMONIC DISTORTION softkey to set the maximum test limit for the harmonic distortion level.
- Auto stop. Press the AUTO STOP softkey to toggle the auto stop function on and off. If the auto stop function is on, the test stops if the harmonic distortion level is greater than the value you set. Otherwise, the test runs continuously.

Within this menu you can also set the following base station signal parameters:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Modulation peak deviation. Press the MOD PEAK DEVIATION softkey to set the deviation used to modulate the test tone in the RF output of the tester.

You can also change the following AF Generator settings:

- Press the FREQUENCY softkey to adjust the frequency of the internal AF Generator.
- Press the LEVEL softkey to adjust the level of the internal AF Generator or to turn it off.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

- **AUDIO FREQ RESPONSE.** Press the AUDIO FREQ RESPONSE softkey to set the parameters for measuring the audio frequency response of the mobile receiver. See Figure 3–59.

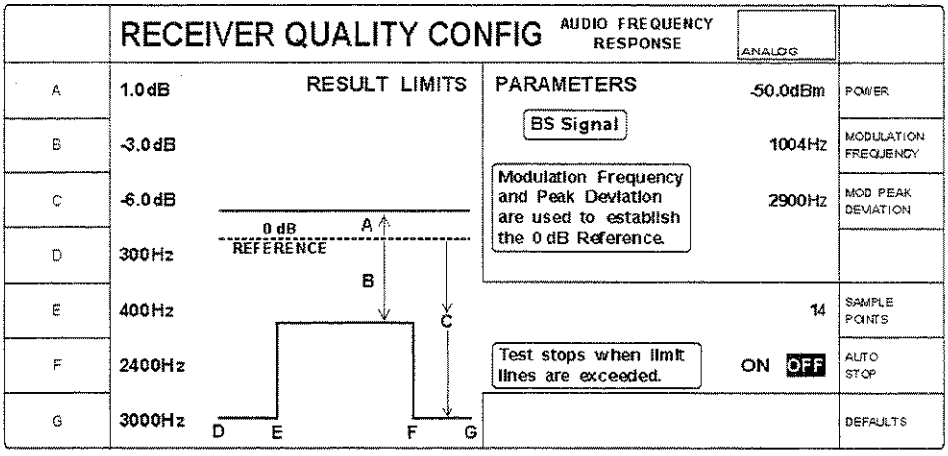


Figure 3–59: Analog AUDIO FREQUENCY RESPONSE menu

You use the softkeys on the left side of the menu to set the result limits. The lower limit line is defined by three sections (see Figure 3–59):

- Press the D softkey to set the start frequency.
- Press the E softkey to set the end of the first section (D to E).
- Press the F softkey to set the end of the second section (E to F).
- Press the G softkey to set the end of the third section (F to G).

The levels for each section are set as follows (see Figure 3–59):

- Press A to set the level for the upper limit line (D to G).
- Press the B softkey to set the level for the lower limit line, section E to F.
- Press the C softkey to set the level for the lower limit line, sections D to E and F to G.

Within the AUDIO FREQUENCY RESPONSE menu, you can set the following base station parameters:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Modulation frequency. Press the MODULATION FREQUENCY softkey to set the audio frequency of the signal that modulates the base station carrier.
- Modulation peak deviation. Press the MOD PEAK DEVIATION softkey to set the deviation used to modulate the test tone in the RF output of the tester.

Press the SAMPLE POINTS softkey to select the number of points that are sampled when the tester takes the audio frequency response measurements.

Press the AUTO STOP softkey to toggle the auto stop function on and off. If the auto stop function is on, the test stops if the audio frequency response exceeds the limits that you set. Otherwise, the test runs continuously.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

TRANSMITTER QUALITY. Press the TRANSMITTER QUALITY softkey to display the TRANSMITTER QUALITY CONFIGURATION menu, which has selections that you use to set parameters for the various transmitter quality tests. See Figure 3–60.

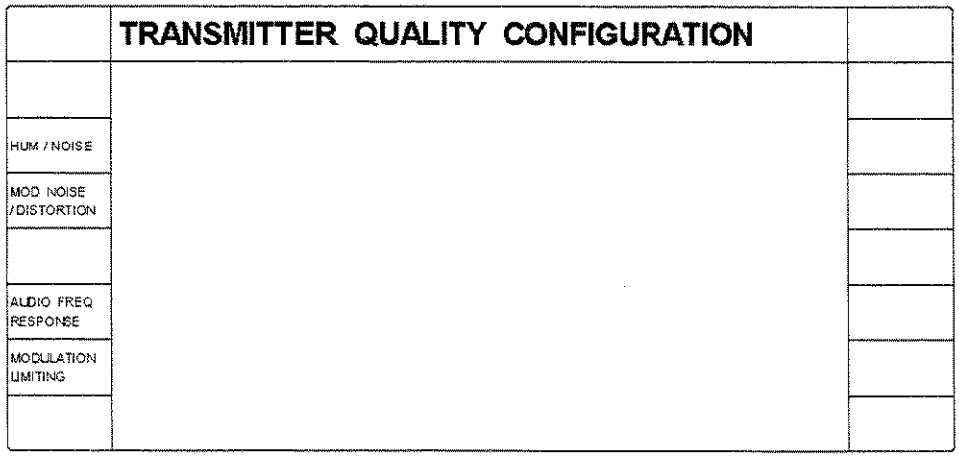


Figure 3–60: Analog TRANSMITTER QUALITY CONFIGURATION menu

Each of the TRANSMITTER QUALITY CONFIGURATION menu choices is discussed in the following text.

- **HUM/NOISE.** Press the HUM/NOISE softkey to display the HUM/NOISE menu. See Figure 3–61. Use this menu to set the parameters for the TRANSMITTER QUALITY HUM/NOISE test.

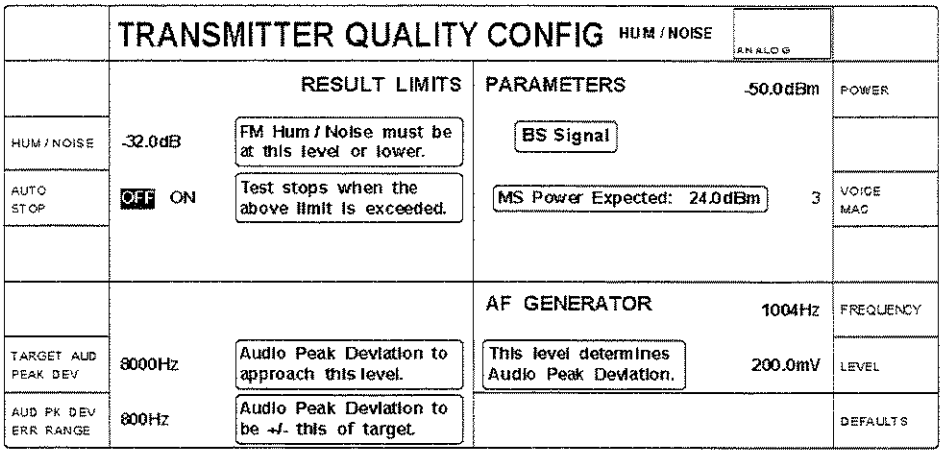


Figure 3–61: Analog HUM NOISE menu

You can set the following test parameters:

- Hum/Noise level. Press the HUM/NOISE softkey to set the maximum test limit for the hum/noise level.
- Auto stop. Press the AUTO STOP softkey to toggle the auto stop function on and off. If the auto stop function is on, the test stops if the hum/noise level exceeds the value that you set. Otherwise, the test runs continuously.

NOTE. *Use the TARGET AUD PEAK DEV and AUDIO PK DEV ERR RANGE softkeys to set the range of audio peak deviation that must be achieved before the tester will make the hum/noise measurement.*

- Target audio peak deviation. Press the TARGET AUD PEAK DEV softkey to set the desired audio peak deviation.
- Audio peak deviation error range. Press the AUDIO PK DEV ERR RANGE softkey to set the allowable deviation (±) from the target audio peak deviation value.

Within this menu you can set the following base station signal parameters:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

You can also change the following AF Generator settings:

- Press the FREQUENCY softkey to adjust the frequency of the internal AF Generator.
- Press the LEVEL softkey to adjust the level of the internal AF Generator or to turn it off.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

- **MOD NOISE/DISTORTION.** Press the MOD NOISE/DISTORTION softkey to display the MOD NOISE/DISTORTION menu. See Figure 3–62. Use this menu to set the parameters for the TRANSMITTER QUALITY MOD NOISE/DISTORTION test.

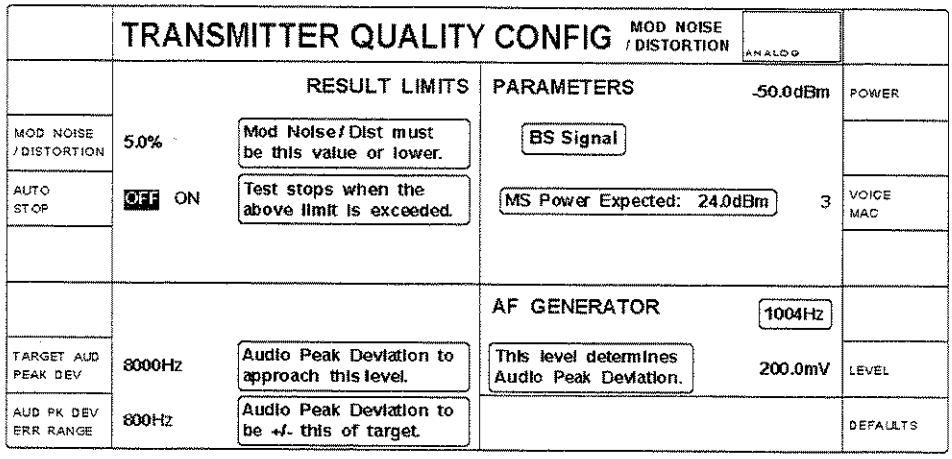


Figure 3–62: Analog MOD NOISE DISTORTION menu

You can set the result limits for the following test parameters:

- Modulation noise/distortion level. Press the MOD NOISE/DISTORTION softkey to set the maximum test limit for the modulation noise/distortion level.
- Auto stop. Press the AUTO STOP softkey to toggle the auto stop function on and off. If the auto stop function is on, the test stops if the modulation noise/distortion level exceeds the value that you set. Otherwise, the test runs continuously.

NOTE. *Use the TARGET AUD PEAK DEV and AUDIO PK DEV ERR RANGE softkeys to set the range of audio peak deviation that must be achieved before the tester will make the mod noise distortion measurement.*

- Target audio peak deviation. Press the TARGET AUD PEAK DEV softkey to set the desired audio peak deviation.
- Audio peak deviation error range. Press the AUDIO PK DEV ERR RANGE softkey to set the allowable deviation (±) from the target audio peak deviation value.

Within this menu you can set the following base station signal parameters:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

Press the LEVEL softkey to adjust the level of the internal AF Generator. You can adjust the level to achieve the audio peak deviation target value that is displayed in the menu.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

- **AUDIO FREQ RESPONSE.** Press the AUDIO FREQ RESPONSE softkey to display the AUDIO FREQ RESPONSE PARAMETERS menu. See Figure 3–63. You can use this menu to set the parameters for the TRANSMITTER QUALITY AUDIO FREQ RESPONSE test.

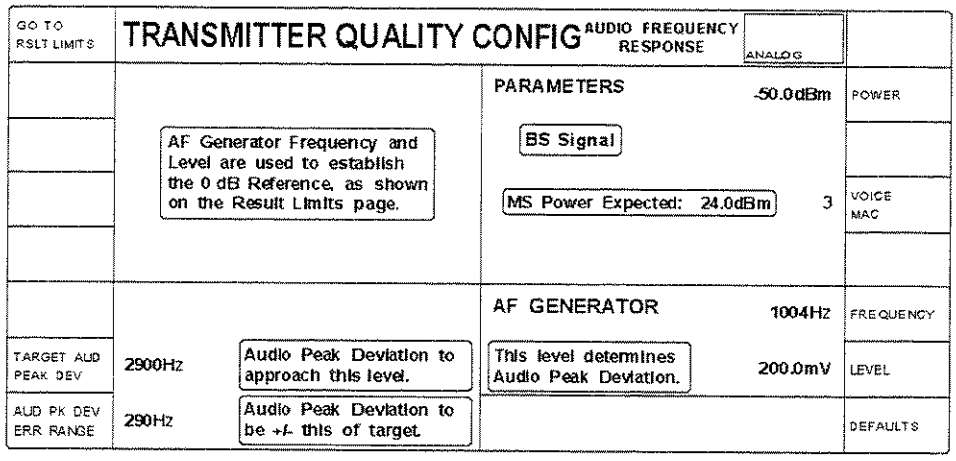


Figure 3–63: Analog AUDIO FREQUENCY RESPONSE PARAMETERS menu

NOTE. *Use the TARGET AUD PEAK DEV and AUDIO PK DEV ERR RANGE softkeys to set the range of audio peak deviation that must be achieved before the tester will make the audio frequency response measurement.*

Press the TARGET AUD PEAK DEV softkey to set the target value for the audio peak deviation. This is the target peak deviation at the that frequency you specify with the AF Generator FREQUENCY softkey. When you perform the audio frequency test, the audio peak deviation must within the error range (which you set) of this value for the test to be accurate.

Press the AUD PK DEV ERR RANGE softkey to set the amount of audio peak deviation error that is acceptable for your test.

Within this menu you can set the following base station signal parameters:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

You can also change the following AF Generator settings:

- Press the FREQUENCY softkey to adjust the frequency of the internal AF Generator. This sets the frequency of the reference point for this measurement.
- Press the LEVEL softkey to adjust the level of the internal AF Generator or to turn it off. You adjust the level to establish the 0 dB reference in the RESULTS menu (see Figure 3–64).

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

Press the GO TO RSLT LIMITS softkey to display the RESULT LIMITS menu (see Figure 3–64). You can use this menu to set the limits for the AUDIO FREQUENCY RESPONSE test.

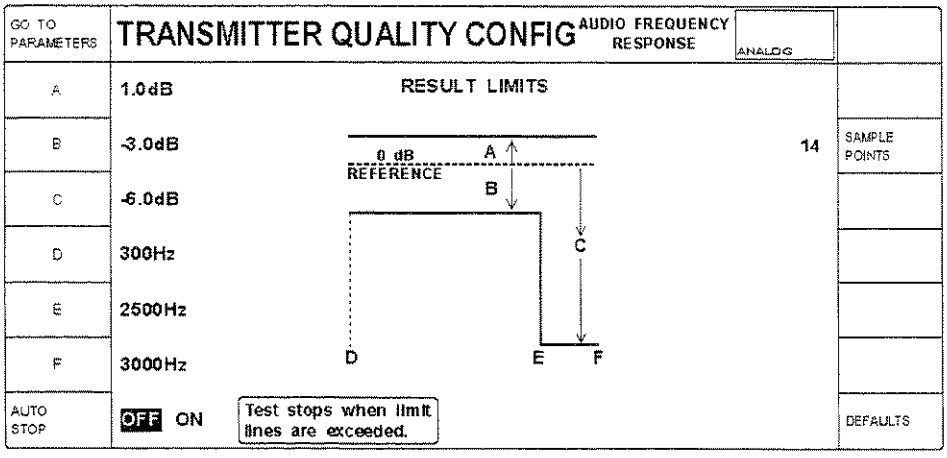


Figure 3–64: AUDIO FREQUENCY RESPONSE RESULTS LIMITS menu

Press the D softkey to set the start frequency of the limit lines, and press the F softkey to set the end frequency of the limit lines.

Press the A softkey to set the level for the upper limit line.

The lower limit line contains two sections. Press E to set the transition frequency (frequencies D to E, and E to F). Press the B softkey to set the level for the first section of the lower limit line. Press C to set the level for the second section of the lower limit line.

Press the AUTO STOP softkey to toggle the auto stop function on and off. If the auto stop function is on, the test stops if the audio frequency response exceeds the limit lines. Otherwise, the test runs continuously.

Press the SAMPLE POINTS softkey to select the number of points that are sampled when the tester takes the test measurements.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

Press the GO TO PARAMETERS softkey to return to the AUDIO FREQUENCY RESPONSE PARAMETERS menu.

- **MODULATION LIMITING.** Press the MODULATION LIMITING softkey to display the TRANSMITTER QUALITY CONFIG MODULATION LIMITING menu. See Figure 3–65. Use this menu to set the result limits and parameters for the MODULATION LIMITING test.

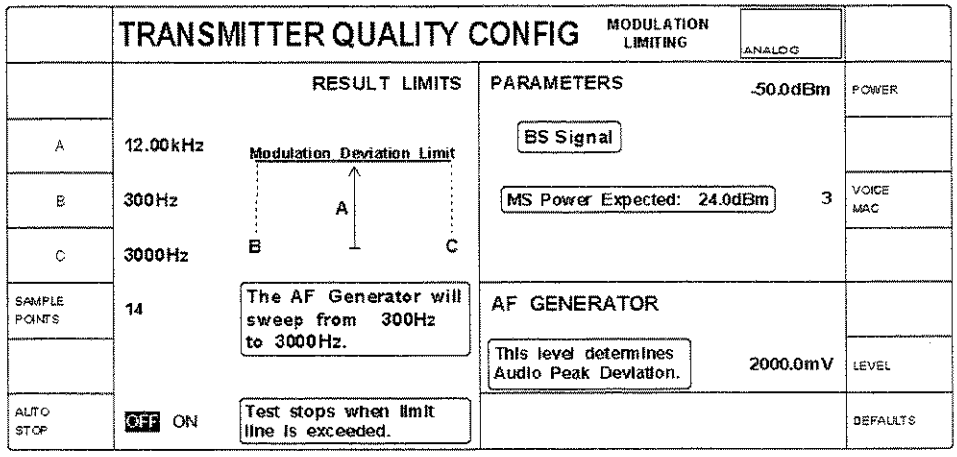


Figure 3–65: Analog MODULATION LIMITING menu

You can set the following test parameters:

- A. Press the A softkey to set the audio peak deviation (modulation) limit for the test.
- B. Press the B softkey to set the starting frequency.
- C. Press the C softkey to set the ending frequency.
- Sample points. Press the SAMPLE POINTS softkey to select the number of points that are sampled when the tester takes the test measurements.
- Auto stop. Press the AUTO STOP softkey to toggle the auto stop function on and off. If the auto stop function is on, the test stops if the audio peak deviation exceeds the modulation limit value that you set. Otherwise, the test runs continuously.

Within this menu you can set the following base station signal parameters:

- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.

Press the LEVEL softkey to adjust the level of the internal AF Generator. You can adjust the level to achieve the audio peak deviation value that you want.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

REFERENCE/TIMING This soft key displays a menu to select the timing reference input and output sources (see Figure 3–66). The tester uses either its internal reference or an external reference that you connect to the REF IN connector on the rear panel. You can use 1 MHz, 2 MHz, 5 MHz, or 10 MHz inputs as external references.

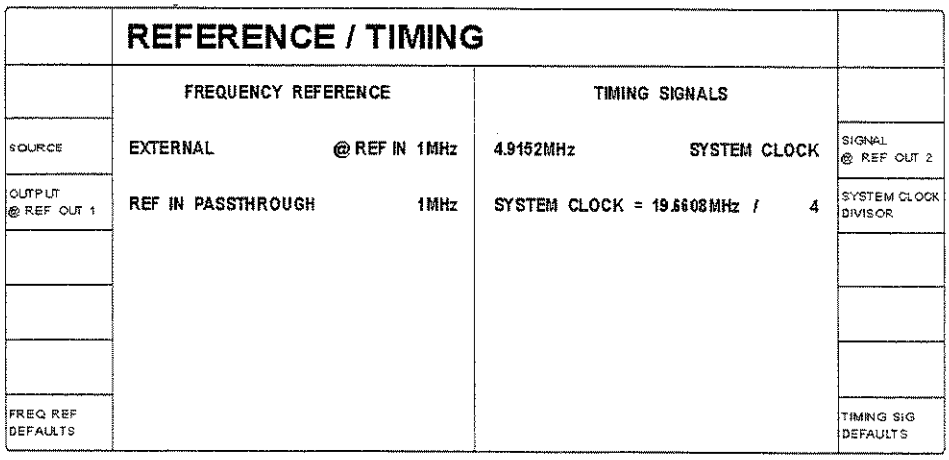


Figure 3–66: Reference/Timing menu

Either the internal oscillator signal or a feedthrough signal from the REF IN connector is available at the REF OUT 1 connector on the rear panel. The REF OUT 2 connector provides the following signals:

- PP2S (pulse per 2 seconds)
- Super frame
- Paging frame
- Sync frame
- Power control frame
- System clock

The 19.6608 MHz system clock can be divided by 1 to 1024 to synthesize a custom frequency.

RF CONNECT/EXT ATTEN This softkey displays a menu to select the front-panel RF IN/OUT connectors and external attenuation for your test setup (see Figure 3–67). Use the softkeys on the left of the display to select the input and output connectors, and use the softkeys on the right to select the external attenuation.

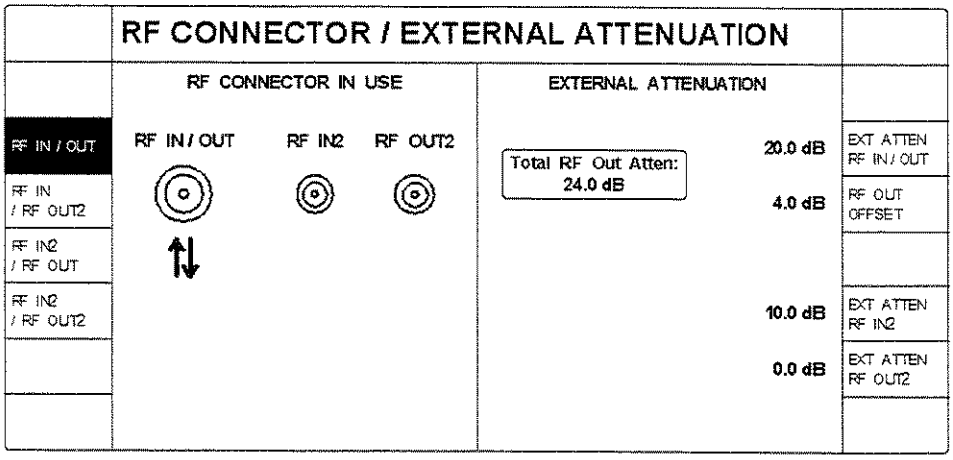


Figure 3–67: RF CONNECTOR/EXTERNAL ATTENUATION menu

CDMA BS SIGNAL CNFG Use this menu selection when taking CDMA measurements. Refer to *CDMA BS SIGNAL CNFG* in *CDMA Measurements* on page 3–31 for more information.

ANALOG BS SIGNAL CNFG This softkey displays the configuration menu where you can define the operating parameters of an analog base station signal (see Figure 3–68).

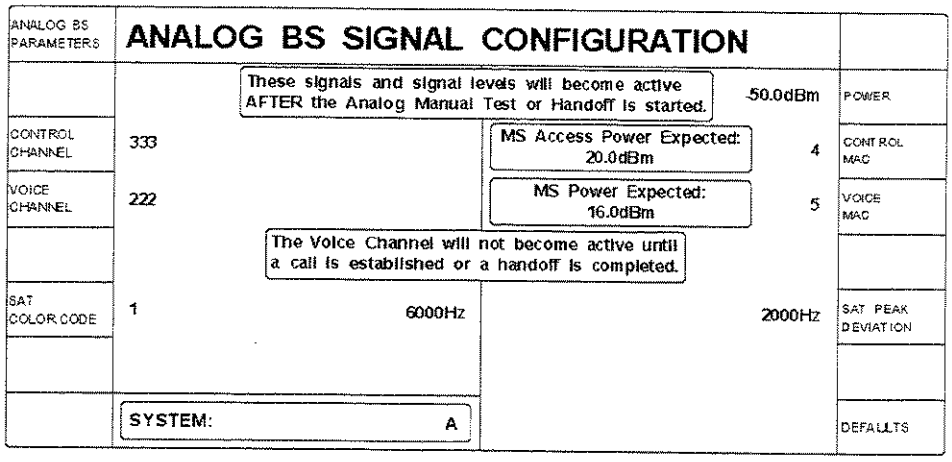


Figure 3–68: ANALOG BS SIGNAL CONFIGURATION menu

NOTE. *The level settings set in the ANALOG BS SIGNAL CONFIGURATION MENU are the system default levels unless overridden by a test. For example, the modulation limiting test overrides the volice MAC value with the parameter established for modulation limiting test.*

You can set the following analog base station parameters:

- Control channel. The base station uses the control channel to page and call the mobile station (initiate communication). Press the CONTROL CHANNEL softkey to select a control channel.
- Voice channel. The voice channel is the channel over which voice communications occur. Press the VOICE CHANNEL softkey to select a voice channel.
- SAT color code. The supervisory audio tones (SAT) are out-of-voice band audio tones used for signaling. There are three assigned frequencies of 5970 Hz, 6000 Hz, and 6030 Hz with corresponding saturation color codes (SCC) of SCC 0, SCC 1, and SCC 2, respectively. Press the SAT COLOR CODE softkey to select the SAT color code that you want.
- Power. Press the POWER softkey to set the level of the base station transmitter power.
- Control mobile attenuation code. The control mobile attenuation code is a code sent by the base station to control the output power of the mobile phone. Press the CONTROL MAC softkey to select the control MAC you want.

- Voice mobile attenuation code. The voice mobile attenuation code is a code sent by the base station to control the output power for voice transmissions. Press the VOICE MAC softkey to set the voice MAC parameter.
- Supervisory audio tone peak deviation. The supervisory audio tone deviation is the amount of deviation that the base station uses to transmit the SAT to the mobile station. Press the SAT PEAK DEVIATION softkey to set the amount of deviation used.

Press the DEFAULTS softkey to set the parameters to their preset conditions (typically, the default values are based on IS-98 specifications).

ANALOG BS PARAMETERS. This softkey displays a menu to specify parameters for the simulated base station (see Figure 3–69).

You can set the following parameters for the base station:

- Location identification. Press the LOCATION ID softkey to set a location identification number. This is a number that identifies a location area with a particular system.
- System identification. Press the SID softkey to set a system number. This is a number that uniquely identifies a cellular system.
- Paging duration. Press the PAGING DURATION softkey to set the paging duration. The paging duration is how long the base station sends a paging message over the control channel to the mobile station when a call is being established. If you set this time too short, the mobile station may not receive the paging message (if it is in a low-power state), and the call setup will fail.

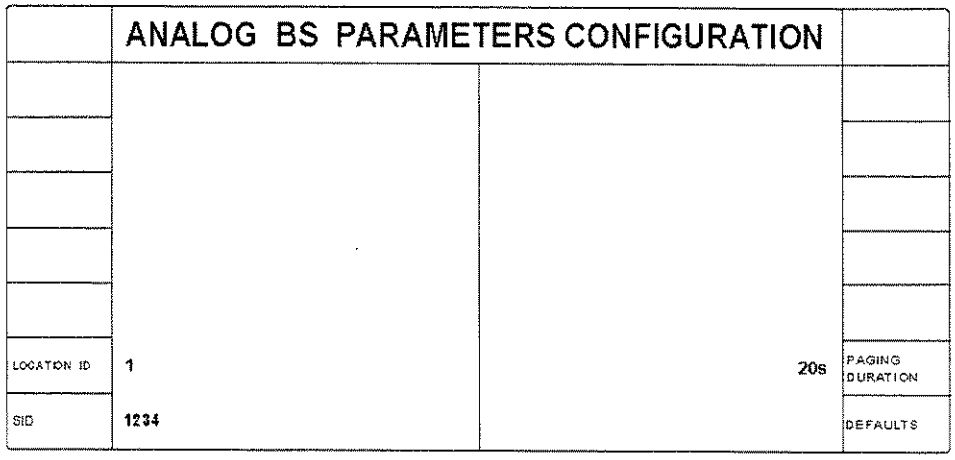


Figure 3–69: ANALOG BS PARAMETERS CONFIGURATION menu

PRINTER Press the PRINTER softkey to display the PRINTER CONFIGURATION menu (see Figure 3–70). You can use this menu to specify the type of printer connected to the rear panel printer connector. Refer to Figure 2–5, item 7, on page 2–7 for the location of the printer connector.

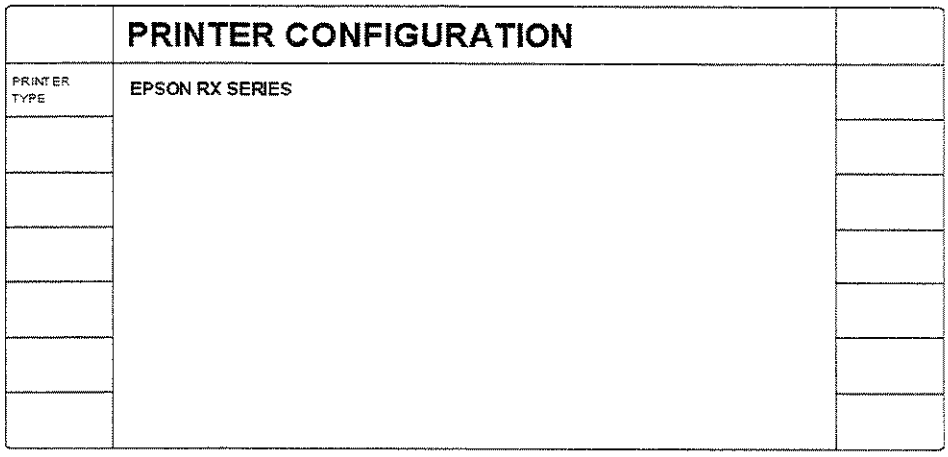


Figure 3–70: PRINTER CONFIGURATION menu

OTHER Press the OTHER softkey to display the OTHER CONFIGURATIONS menu (see Figure 3–71). You can use this menu to do the following:

- Turn on the key click function, which produces an audible click each time you press a hardkey
- Turn on the acoustic warnings function, which produces a beep if you attempt to perform an illegal action
- Set the date
- Set the time

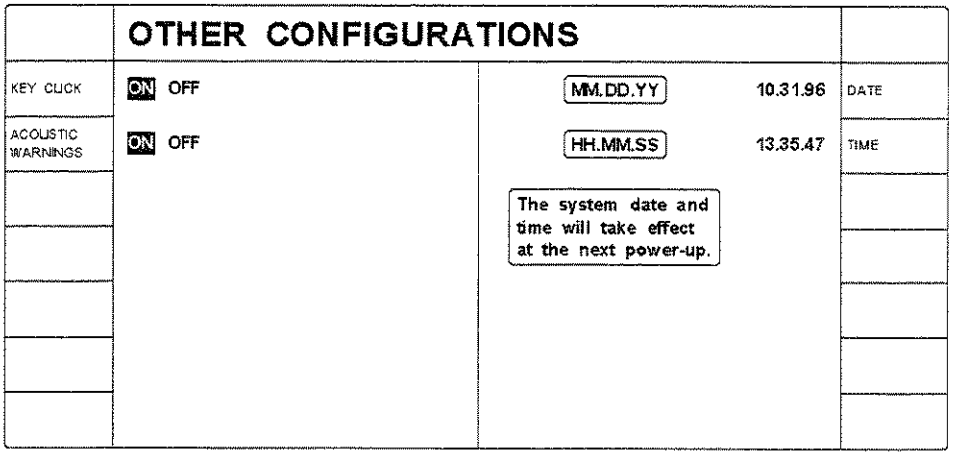


Figure 3–71: OTHER CONFIGURATIONS menu

OPTIONS Press the OPTIONS softkey to display a list of the options that are installed in your tester. A check mark (✓) adjacent to an option indicates that the option is installed. See Figure 3–72.

The CODE softkey in the options menu is used to enable firmware options. Contact your sales representative for details.

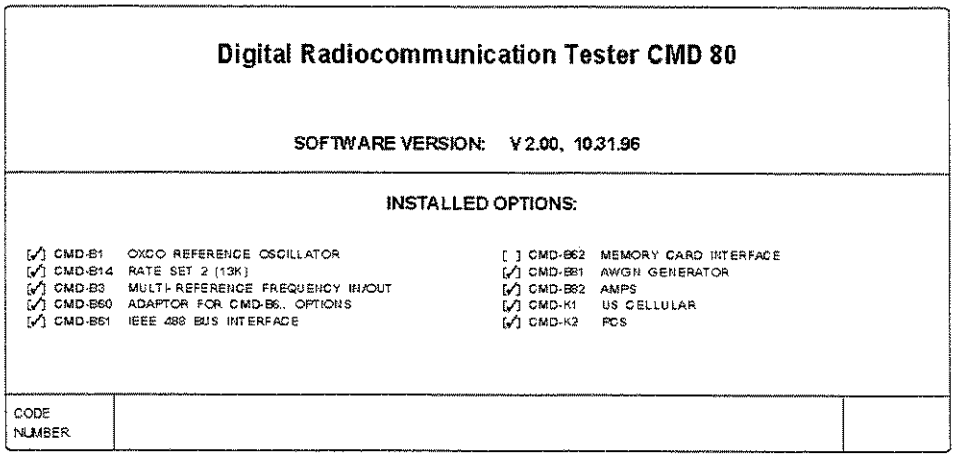


Figure 3–72: Options display

Appendix A: Specifications

Tables A–1 through A–5 list the characteristics of the standard CMD 80 Radiocommunication Tester.

Table A–1: Signal generator related characteristics

Characteristic	Description
Frequency	
Range	US Cellular Xmit: 869 MHz to 894 MHz
	US Cellular Rcv: 824 MHz to 849 MHz
	PCS Xmit: 1930 MHz to 1990 MHz
	PCS Rcv: 1850 MHz to 1910 MHz
	Korean PCS Xmit: 1805 MHz to 1870 MHz
	Korean PCX Rcv: 1715 MHz to 1780 MHz
Resolution	1 Hz
Error	Same as timebase
Output level	
RF IN/OUT	–20 dBm to –132 dBm
RF OUT 2	0 dBm to –113 dBm
Resolution	0.1 dB
Error (RF IN/OUT)	≤1.5 dB
Modulation	
Carrier suppression	–30 dBc

Table A–2: Modulation analyzer related characteristics

Characteristic	Description
ρ error (25 ±10)°C	0.003 (for ρ 0.9 to 1)
Frequency measurement range	±3 kHz
Frequency measurement error	Reference ±30 Hz
Timing measurement error	±60 ns

Table A–3: Timebase related characteristics

Characteristic	Description
Standard time base	
Nominal frequency	10 MHz
Frequency drift in temperature range 0 to 35°C	$\leq 1.5 \times 10^{-6}$
Frequency aging	$\leq 0.5 \times 10^{-6}$/year (at 35° C)
Warm-up time (at 25°C)	Approximately 5 minutes
OCXO Reference Oscillator (Option CMD-B1)	
Nominal frequency	10 MHz
Frequency drift in temperature range 0 to 45°C	$\leq 1.1 \times 10^{-7}$
Frequency aging	$\leq 2 \times 10^{-7}$/year $\leq 0.5 \times 10^{-9}$/day after 30 days of operation
Warm-Up time (at 25°C)	Approximately 5 minutes
Reference Frequency Inputs/Outputs (Option CMD-B3)	
Synchronization input (frequency selectable)	1, 2, 5, 10 MHz
Impedance	Approximately 100 Ω
Level	0 dBm to TTL
Synchronization output	
Frequency	10 MHz or frequency at synchronization input
Level	TTL, R_{out} = 50 Ω
AWGN Generator (Option CMD-B81)	
Equivalent noise bandwidth	1.8 MHz (typical)
Gain adjustment range	–20 dB to +6 dB of forward channel power

Table A–4: DC measurement characteristics

Characteristic	Description
DC voltage measurements	
Range	0 to ±30 V
Resolution	10 mV
Error	2% + resolution
DC current measurements	
Mode	Average, +peak, – peak
Range	0 to ±10 A
Common mode rejection	±30 V
Shunt resistance	50 mΩ
Resolution for averaging	1 mA / 10 mA
Resolution for peak	10 mA
Residual indices	<10 mA
Error	<2% + resolution + residual indication

Table A–5: General characteristics

Characteristic	Description
Rated temperature range	0 to 45° C to DIN IEC 68-2 1/2
Storage temperature range	–40 to +60° C
Power supply	110 to 120 V (AC) ±10% 200 to 240 V (AC) ±10% 50 to 400 Hz ±5%
Dimensions (W x H x D)	435 mm × 192 mm × 363 mm
Weight (without options)	Approximately 15 kg

Tables A–6 through A–9 list the characteristics of Analog Mode (Option 17).

Table A–6: Signal generator related characteristics

Characteristic	Description
RF Frequency	
Range	869 MHz to 894 MHz
Resolution	1 Hz
Error	Same as timebase + resolution
Output level	
RF IN/OUT	–20 dBm to –124 dBm
RF OUT 2	0 dBm to –105 dBm
Resolution	0.1 dB
Error (RF IN/OUT)	≤1.5 dB
Modulation	
FM Deviation	0 Hz to 12 kHz
FM Resolution	1 Hz
FM Rate	50 Hz to 15 kHz
FM Distortion (THD + Noise)	≤0.5% (8 kHz dev., 1 kHz rate, 0.3 kHz to 3 kHz BW, 25° C ± 5° C)
Residual FM	<10 Hz (rms, 0.3 Hz to 3 kHz BW)
Deviation Accuracy	≤ 2% of setting + residual FM + FM resolution + timebase error (0.3 kHz ≤ FM rate≤ 3 kHz; measurement bandwidth 30 Hz to 20 kHz)

Table A–7: RF analyzer characteristics

Characteristic	Description
Frequency Range	824 MHz to 849 MHz
Resolution	1 Hz
Reference Level Range	
RF IN/OUT	+41 dBm to –28 dBm
RF IN2	0 dBm to –69 dBm
RF Frequency Measurement	
Dynamic Range (from reference level)	>40 dB
Resolution	1 Hz
Accuracy	Resolution + timebase error

Table A–7: RF analyzer characteristics (Cont.)

Characteristic	Description
RF Power Measurement (RF IN/OUT, wide band)	
Range	0 dBm to 41 dBm
Error	≤1.5 dB
FM Measurements	
RF Bandwidth ((2 × deviation) + (4 × rate))	≤60 kHz
Deviation Range	0 Hz to 30 kHz
Resolution	1 Hz
FM Rate Range	0 Hz to 12 kHz
Sensitivity (0.3 kHz to 3 kHz BW, 12 dB SINAD, 2.9 kHz deviation, 1 kHz FM rate)	
RF IN/OUT Connector (Ref. Lev. = –28 dBm)	13 µV (–85 dBm), typical
RF IN2 Connector (Ref. Lev. = –69 dBm)	1.3 µV (–105 dBm), typical
Residual FM	
RF IN/OUT	≤7 Hz (0.3 kHz to 3 kHz BW, rms), typical
RF IN2	≤9 Hz (0.3 kHz to 3 kHz BW, rms), typical
Error	≤4 % of reading + 30 Hz + residual FM (FM rate ≤12 kHz, deviation ≤30 kHz)

Table A–8: Audio source characteristics

Characteristic	Description
Frequency	
Range	50 Hz to 4 kHz (single tone)
Resolution	1 Hz
Accuracy	Half resolution
Ouput Voltage	
Range	0.1 mV to 5 V_{RMS}
Resolution	0.1 mV
Maximum Output Current	20 mA_{peak}
Output Impedance	<5 Ω

Table A–8: Audio source characteristics (Cont.)

Characteristic	Description
Accuracy	5 % (output voltage > 1 mV)
Distortion (THD + Noise)	≤0.1 % (100 kHz BW, output voltage ≥200 mV)

Table A–9: AF analyzer characteristics

Characteristic	Description
Frequency Measurement	
Range	50 Hz to 15 kHz
Resolution	1 Hz
Accuracy	1 Hz + timebase accuracy
Input Volatage Range	10 mV to 30 mV
AC Voltage Measurement	
Input Range	0.1 mV to 30 V_{RMS}
Accuracy	5 % + resolution
Nominal Input Impedance	1 MΩ in parallel with 100 pF
Distortion Measurement	
Bandwidth	Limited by C-message filter
Frequency	1004 Hz
Input Voltage range	100 mV to 30 V_{RMS}
Inherent Distortion	0.2 %
Resolution	0.1 % distortion
Error	≤5 % + inherent distortion
SINAD Measurement	
Bandwidth	Limited by C-message filter
Frequency	1004 Hz
Input Voltage Range	100 mV to 30 V_{RMS}
Inherent Distortion	0.2 %
Resolution	0.1 dB
Error	≤5 % + inherent distortion
Audio Filters	Audio filters are automatically selected based on the configuration of the specific measurement.
Notch Filter	Notch filters are automatically selected based on the configuration of the specific measurement.

Table A–10 lists the Certifications and compliances for the CMD 80 Radiocommunications Tester.

Table A–10: Certifications and compliances

EC Declaration of Conformity – EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities: EN 50081-1 Emissions: EN 55022 — Class B Radiated and Conducted Emissions EN 60555-2 — AC Power Line Harmonic Emissions EN 50082-1 Immunity: IEC 801-2 — Electrostatic Discharge Immunity IEC 801-3 — RF Electromagnetic Field Immunity IEC 801-4 — Electrical Fast Transient/Burst Immunity
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC EN 61010-1:1993 — Safety requirements for electrical equipment for measurement, control, and laboratory use
Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are: CAT III — Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location CAT II — Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected CAT I — Secondary (signal level) or battery operated circuits of electronic equipment

Appendix B: Remote Control

This section contains information about remote operation of the CMD 80. Either the RS-232 or the IEC/IEEE bus (GPIB) can be used as an interface for remote operation. Figure 2–5 on page 2–7 illustrates the location of both connectors.

NOTE. *For remote control via the serial interface, some controllers send characters to the serial interface during booting. This causes the instrument to switch to the REMOTE state as soon as it receives these characters, since no explicit addressing is possible with the serial remote control. If this occurs, you can press the LOCAL key to switch from the REMOTE state to the LOCAL state.*

The CMD 80 IEC/IEEE bus interface corresponds to the IEC 625-1, IEEE 488.1, and the IEEE 488.2 standards. This standard describes data transfer formats and common commands. Further, the CMD 80 command syntax closely conforms to standard SCPI 1995.0.

Figure B–1 illustrates the IEC/IEEE 488 connector on the CMD 80 rear panel. It also illustrates the connector pin number and corresponding line.

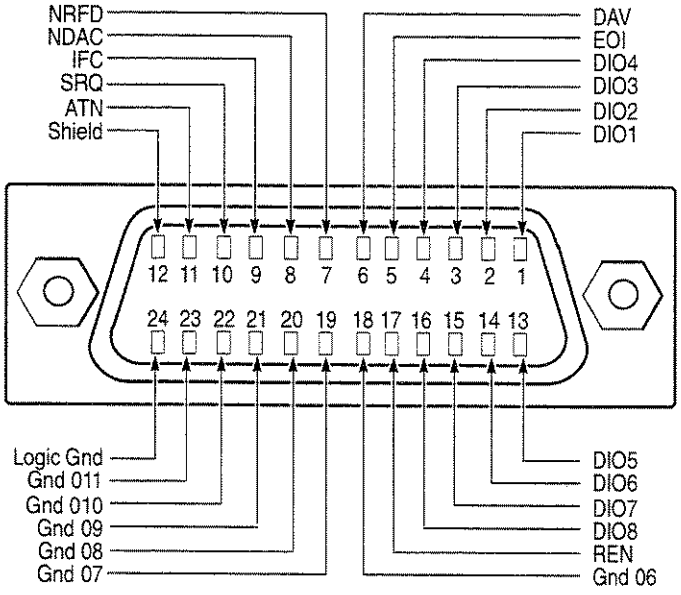


Figure B–1: IEC/IEEE 488 Connector

The bus connections are in accordance with the IEEE 488 standard. The interface contains three groups of bus lines as follows:

- Data bus with 8 lines DIO 1 to DIO 8

  Data transmission is bit-parallel and byte-serial with the characters in ISO 7-bit code (ASCII code).

  DIO 1 represents the least significant bit and DIO 8 the most significant bit.

- Control bus with 5 lines

  This is used to transmit control functions as follows:

  ATN (Attention) – becomes active low when addresses, universal commands, or addressed commands are transmitted to the connected device.

  REN (Remote Enable) – enables the device to be switched to the remote status.

  SRQ (Service Request) – enables a connected device to send a Service Request to the controller by activating this line.

  IFC (Interface Clear) – is activated by the controller to set the interface to a defined status.

  EOI (End or Identify) – is used to identify the end of data transfer and is used with a parallel poll.

- Handshake bus with 3 lines

  This is used to control the data transfer timing as follows:

  NRFD (Not Ready For Data) – an active low on this line signals to the talker/controller that one of the connected devices is not ready to accept data.

  DAV (Data Valid) – is activated by the talker/controller shortly after a new data byte has been applied to the data bus.

  NDAC (Not Data Accepted) – is held at active low by the connected device until it has accepted the data present on the data bus.

Detailed information on the data transfer timing is available in the IEC 625-1 standard.

According to the IEC 625-1 standard, devices controlled by means of the GPIB bus can be equipped with different interface functions. Table B–1 lists the interface functions applicable to the instrument.

Table B–1: Interface functions

Control Characters	Interface Function
SH1	Source Handshake function, complete capability
AH1	Acceptor Handshake function, complete capability
L4	Listener function, complete capability, unaddress if MTA
T6	Talker function, complete capability, capability to relay to serial poll, unaddress if MTA
SR1	Service Request function, complete capability
PP1	Parallel Poll function, complete capability
RL1	Remote/Local switchover function, complete capability
DC1	Device Clear function, complete capability
DT0	Device Trigger function, no Device Trigger
C0	Controller function, no controller function

Setting the Device Address

The device address can be set in the CONFIG menu using the IEEE ADDRESS function. The address between 0 and 30 is entered using the numeric keys and remains stored when the device is switched off. The instrument is factory set to address 1. The address is the decimal equivalent of bits DI01 to DI05 of the Talker or Listener address.

Serial Interface

The instrument is equipped with a serial interface (RS-232C) as standard equipment. The 9-pin connector is located at the rear of the instrument. A controller for remote control can be connected through the interface. The connection is effected using a null modem cable.

NOTE. *For remote control via the serial interface, some controllers send characters to the serial interface during booting. This causes the instrument to switch to the REMOTE state as soon as it receives these characters, since no explicit addressing is possible with the serial remote control. If this occurs, you can press the LOCAL key to switch from the REMOTE state to the LOCAL state.*

Characteristics of the Interface

Interface characteristics are as follows:

- serial data transfer
- bidirectional data transfer
- software or hardware handshake
- possible length of connecting cable > 20 m

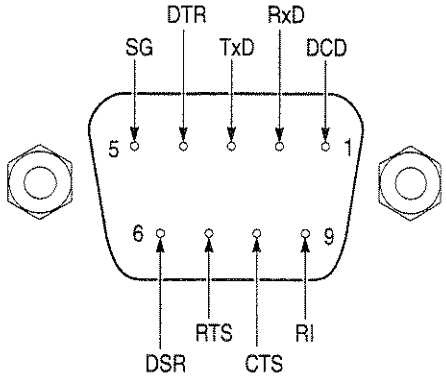


Figure B–2: RS-232 Interface connector

Table B–2: Interface connections

Designation		Pin Number (9-pin)	Pin Number (25-pin)
Data Carrier Detected	DCD	1	8
Receive Data	RxD	2	3
Transmit Data	TxD	3	2
Data Terminal Ready	DTR	4	20
Signal Ground	SG	5	7
Data Set Ready	DSR	6	6
Request To Send	RTS	7	4
Clear To Send	CTS	8	5
Ring Indicator	RI	9	21

Data Lines

RxD (receive data) and **TxD** (Transmit data)

The transmission is bit-serial in the ASCII code starting with the LSB. The two lines are necessary as the minimum requirement for a transmission; however, no hardware handshake is possible, but only the XON/XOFF protocol.

Control Lines

DCD (Data Carrier Detected), active LOW

Input; using this signal, the data terminal recognizes that the modem of the remote station receives valid signals with sufficient level. DCD is used to disable the receiver in the data terminal and prevent reading of false data if the modem cannot interpret the signals of the remote station.

DTR (Data Terminal Ready), active LOW

Output indicating that the data terminal is ready to receive data.

DSR (Data Set Ready), active LOW

Input indicating that the external device is ready to receive data.

RTS (Request To Send), active LOW

Output that can be used to indicate the readiness to receive data.

CTS (Clear To Send), active LOW

Input used to enable the transmission of data.

RI (Ring Indicator) active LOW

Input used by a modem to indicate that a remote station wants to set up a connection.

Default Settings

The serial interface is set to the following values:

Table B–3: RS-232 default settings

Parameter	Setting Value
Baud rate	2400 baud
Data bits	8 bits
Stop bits	1 bits
Parity	none

Handshake

Software Handshake. In the case of the software handshake, the data transfer is controlled using the two control characters XON and XOFF.

The CMD 80 uses the control character XON to indicate that it is ready to receive data. If the receive buffer is full, it sends the XOFF character via the interface to the controller. The controller then interrupts the data output until it receives another XON from the CMD. The controller indicates to the CMD 80 that it is ready to receive data in the same way.

Cable for Local Controller Coupling in the Case of Software Handshake. The connection of the CMD 80 with the controller in the case of software handshake is effected by crossing the data lines. The following wiring diagram applies to a controller with 9-pin or 25-pin configuration.

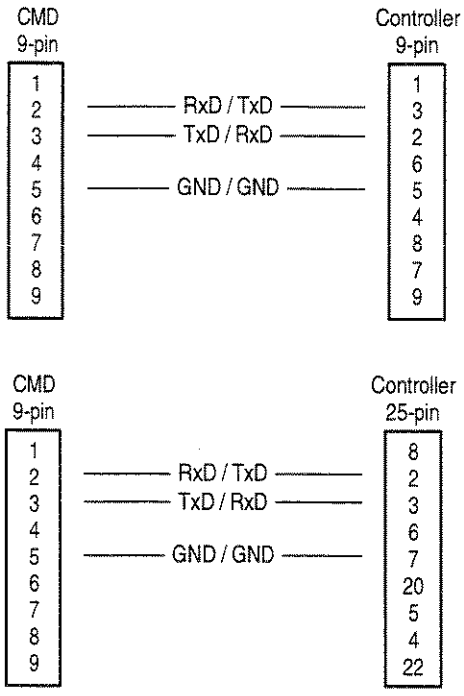


Figure B–3: Wiring of the data lines for software handshake

Hardware Handshake. In the case of the hardware handshake, the CMD 80 indicates that it is ready to receive data via the lines DTR and RTS. A logic 0 on both lines means "ready" and a logic 1 means "not ready". The RTS line is always active (logic 0) as long as the serial interface is switched on. The DTR line thus controls the readiness of the CMD 80 to receive data.

The readiness of the remote station to receive data is reported to the CMD 80 via the CTS and DSR lines. A logic 0 on both lines activates the data output and a logic 1 on both lines stops the data output of the CMD 80. The data output is via the TxD line.

Cable for Local Controller Coupling in the Case of Hardware Handshake. The connection of the CMD 80 to a controller is effected with a "null modem cable". In the case of this cable, the data, control, and report lines must be crossed. The following wiring diagram applies to a controller with 9-pin or 25-pin configuration.

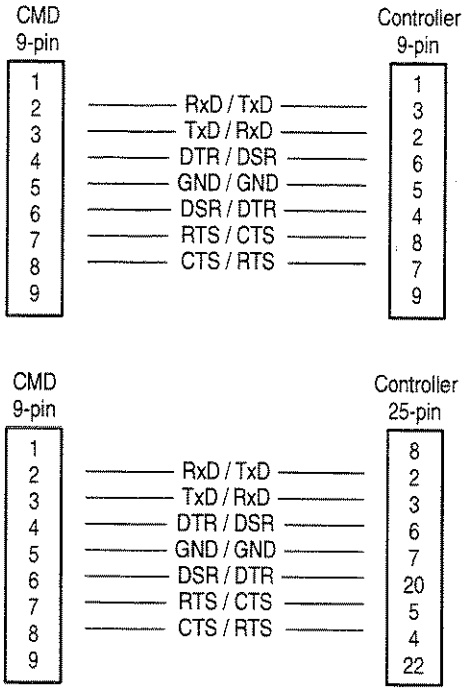


Figure B–4: Wiring of the data, control, and report lines for hardware handshake

Local/Remote Switchover

The device is in the Local state (manual mode) when powered on.

If the instrument is addressed as a Listener by a GPIB controller or if it receives a character over the serial interface, it enters the Remote state and remains in this state after data transfer has been completed. All controls on the front panel except the LOCAL key are disabled.

The two methods to return to the Local status are as follows:

- The controller sends the addressed command GTL (Go to Local).
- The user presses the LOCAL key. Data output from the controller to the instrument should be stopped before pressing the LOCAL key, or else the instrument immediately enters the Remote state again. The LOCAL key can be disabled by the controller sending the universal command LLO (Local Lockout).

When the CMD 80 is switched to the Local state, it returns to the home menu.

Interface Messages

GPIB interface messages are transmitted to the device on the data lines when the Attention line ATN is active (low).

Universal Commands (GPIB only)

The universal commands have codes between 10 and 1F hexadecimal (see Table B–5 on page B–10). The commands act, without previous addressing, on all devices connected to the bus. The universal commands are described in Table B–4.

Table B–4: Universal commands

Command	Function
DCL (Device Clear)	Aborts processing of the currently received commands and sets the command processing software to a defined initial status. The device setting is not changed.
LLO (Local Lockout)	The LOCAL key is disabled.
SPE (Serial Poll Enable)	Ready for serial poll.
SPD (Serial Poll Disable)	End of serial poll.

Table B–5: ASCII and GPIB code chart

B7 B6 B5 BITS / B4 B3 B2 B1	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0 0	20 DLE 10 16	40 SP 0 20 32	60 0 16 30 48	100 @ 0 40 64	120 P 16 50 80	140 ` 0 60 96	160 p 16 70 112
0 0 0 1	1 GTL SOH 1 1	21 LLO DC1 11 17	41 ! 1 21 33	61 1 17 31 49	101 A 1 41 65	121 Q 17 51 81	141 a 1 61 97	161 q 17 71 113
0 0 1 0	2 STX 2 2	22 DC2 12 18	42 " 2 22 34	62 2 18 32 50	102 B 2 42 66	122 R 18 52 82	142 b 2 62 98	162 r 18 72 114
0 0 1 1	3 ETX 3 3	23 DC3 13 19	43 # 3 23 35	63 3 19 33 51	103 C 3 43 67	123 S 19 53 83	143 c 3 63 99	163 s 19 73 115
0 1 0 0	4 SDC EOT 4 4	24 DCL DC4 14 20	44 $ 4 24 36	64 4 20 34 52	104 D 4 44 68	124 T 20 54 84	144 d 4 64 100	164 t 20 74 116
0 1 0 1	5 PPC ENQ 5 5	25 PPU NAK 15 21	45 % 5 25 37	65 5 21 35 53	105 E 5 55 69	125 U 21 55 85	145 e 5 65 101	165 u 21 75 117
0 1 1 0	6 ACK 6 6	26 SYN 16 22	46 & 6 26 38	66 6 22 36 54	106 F 6 46 70	126 V 22 56 86	146 f 6 66 102	166 v 22 76 118
0 1 1 1	7 BEL 7 7	27 ETB 17 23	47 ' 7 27 39	67 7 23 37 55	107 G 7 47 71	127 W 23 57 87	147 g 7 67 103	167 w 23 77 119
1 0 0 0	10 GET BS 8 8	30 SPE CAN 18 24	50 (8 28 40	70 8 24 38 56	110 H 8 48 72	130 X 24 58 88	150 h 8 68 104	170 x 24 78 120
1 0 0 1	11 TCT HT 9 9	31 SPD EM 19 25	51) 9 29 41	71 9 25 39 57	111 I 9 49 73	131 Y 25 59 89	151 i 9 69 105	171 y 25 79 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 * 10 2A 42	72 : 26 3A 58	112 J 10 4A 74	132 Z 26 5A 90	152 j 10 6A 106	172 z 26 7A 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 + 11 2B 43	73 ; 27 3B 59	113 K 11 4B 75	133 [27 5B 91	153 k 11 6B 107	173 { 27 7B 123
1 1 0 0	14 FF C 12	34 FS 1C 28	54 , 12 2C 44	74 < 28 3C 60	114 L 12 4C 76	134 \ 28 5C 92	154 l 12 6C 108	174 | 28 7C 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 – 13 2D 45	75 = 29 3D 61	115 M 13 4D 77	135] 29 5D 93	155 m 13 6D 109	175 } 29 7D 125
1 1 1 0	16 SO E 14	36 RS 1E 30	56 . 14 2E 46	76 > 30 3E 62	116 N 14 4E 78	136 ^ 30 5E 94	156 n 14 6E 110	176 ~ 30 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 / 15 2F 47	77 UNL ? 3F 63	117 O 15 4F 79	137 UNT _ 5F 95	157 o 15 6F 111	177 DEL (RUBOUT) 7F 127
	ADDRESSED COMMANDS	UNIVERSAL COMMANDS	LISTEN ADDRESSES		TALK ADDRESSES		SECONDARY ADDRESSES OR COMMANDS	

KEY octal / hex — 25 PPU / NAK / 15 21 — *GPIB code* / ASCII character / decimal

REF: ANSI STD X3.4-1977
IEEE STD 488.1-1987
ISO STD 646-2973

Addressed Commands (GPIB only)

The addressed commands have codes between 00 and 0F hexadecimal (see Table B–5). They act only on devices addressed as Listeners. The addressed commands are described in Table B–6.

Table B–6: Addressed commands

Command	Function
SDC (Selected Device Clear)	Aborts processing of the currently received commands and sets the command processing software to a defined initial status. The device setting is not changed.
GTL (Go To Local)	Changes to Local state (manual operation)

Commands Received by the CMD 80 in Listen Mode (Controller to Device Messages)

Input Buffer. All commands received are buffered in a memory with a maximum capacity of 256 bytes. To process command lines that are longer, the part of the command line that was first received is processed before accepting the next part.

Command Syntax. Figure B–5 shows the syntax of a command line (program message).

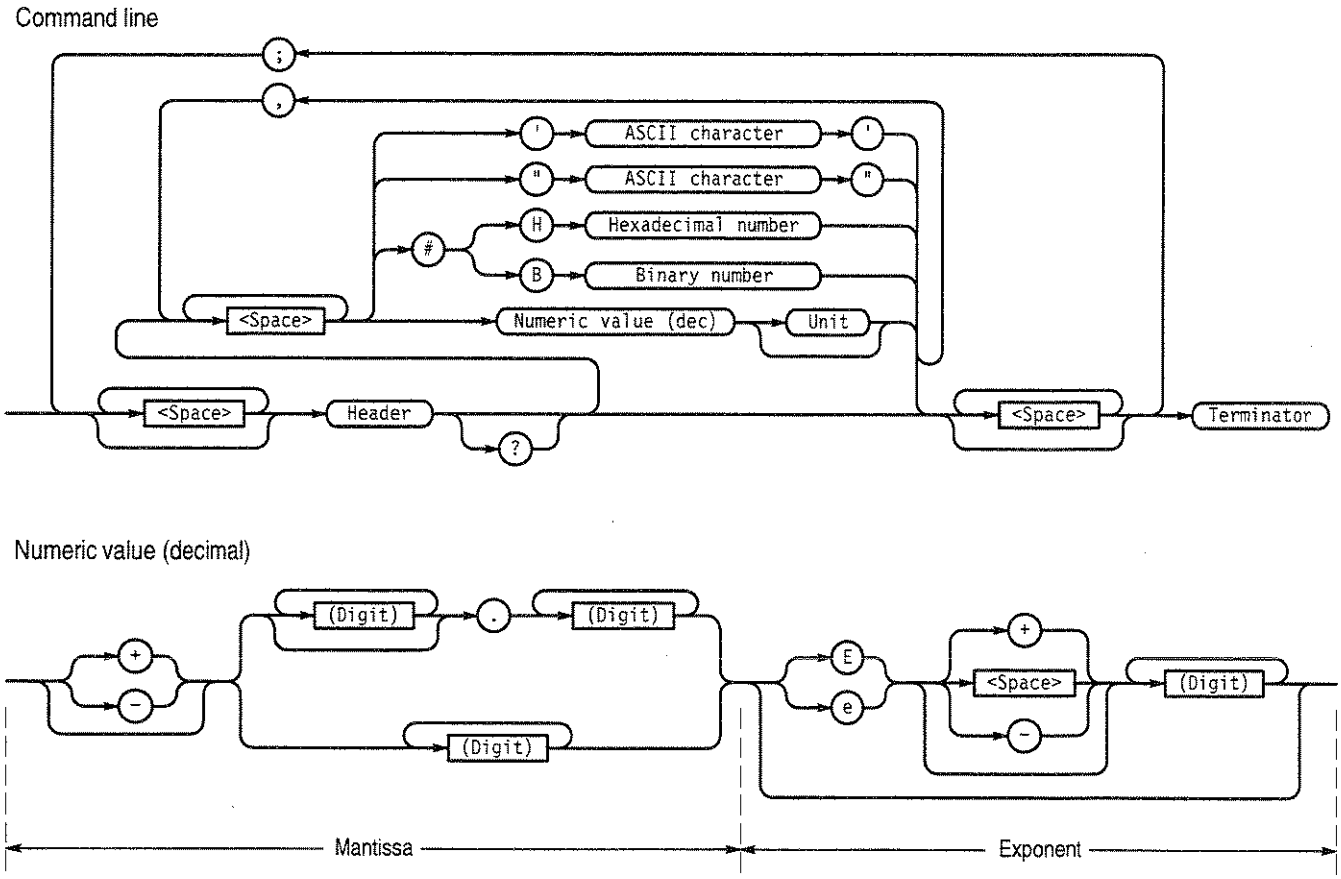


Figure B–5: Syntax diagram of a command line

Commands consist of a header and, in most cases, one or more following parameters. A query is formed by appending a '?' to the header. Queries may, but usually do not, have parameters.

Except for common or device independent commands (those beginning with '*'), a command header consists of several keywords with ':' separators.

Several conventions apply when listing keywords and commands. The first is the notation for the long form and the short form of keywords. The long form of a keyword is the full keyword. The short form is an abbreviation permitted if the keyword contains more than four characters. This abbreviation consists of the first four characters of the keyword unless the fourth character is a vowel, in which case the abbreviation is the first three characters. The short form is indicated by capitalizing the characters that make up this form, as in "CONFigure." The capitalization is for notation only; keywords are case insensitive and either upper, lower, or mixed case may be used when sending commands to the instrument.

The conversion to the short form is done separately and independently for each keyword. Thus, the header "CONFigure:CLEVels:DURation" may also be given as (lowercase used just for the example), "conf:clev:dur," "conf:clev:duration," "conf:clevels:dur," "conf:clevels:duration," "configure:clev:dur," "configure:clev:duration," or "configure:clevels:dur." Keyword abbreviations other than the specified short or long forms (for example, "config") are not allowed.

A second convention concerns optional keywords. Optional keywords (also known as default nodes in the SCPI standard) are keywords that, although they are needed for a full description of the command, may be omitted because they are assumed by the command interpreter. An optional keyword is indicated by surrounding it and its associated ':' separator with brackets. For example, the header indicated as "CONFigure:BSTation:SOURce[:CDMA]:POWer" may be sent to the instrument as "CONFigure:BSTation:SOURce:CDMA:POWer" or as "CONFigure:BSTation:SOURce:POWer" (or as one of the corresponding short forms).

The majority of commands have parameters that either choose a value for or directly set the value of the item selected by the command header. Parameters can be predefined (in association with the command) character parameters, numeric values, or, less commonly, strings. The parameter or parameters must be separated from the header by one or more whitespace characters (those with decimal ASCII codes between 0 and 9 or 11 and 32, inclusive).

Depending upon the command, a parameter may have optional units. For instance, when entering a frequency value, HZ, KHZ, MHZ, or GHZ may be used as units. If no explicit units are used, the basic unit for the parameter (HZ in the case of a frequency parameter) is assumed.

Commands that accept numeric parameters can also accept the special character parameters "MAXimum" and "MINimum." These arguments set the value of the command item to the upper or the lower limits of the range accepted by the instrument. Such a command also has associated queries for the maximum and minimum values: if the command header is "<xxxx>," then the queries are "<xxxx>? MAXimum" and "<xxxx>? MINimum." These queries give the respective ends of the range and not the current value.

NOTE. *The STATus and common (*) commands do not accept the MAX or MIN arguments.*

The same conventions apply when listing parameters as when listing headers: short and long forms are distinguished by showing the acceptable short form in upper case (just as with headers, the case used when sending parameters to the instrument is not important) and optional parameters are shown by surrounding them with square brackets.

There are also several conventions specific to parameters. The parameter description is surrounded by angle brackets ('<' and '>') to distinguish it from the header. Alternate parameters, only one of which may be given, are separated by 'I'. Thus, the parameters for a command that accepted a numeric power, "MAXimum," or "MINimum" would be described by:<power [DBM] | MAXimum | MINimum>.

Multiple commands can be sent to the instrument on one command line. The individual commands are separated by a ';'. The second command is interpreted in one of two ways:

- If the command header starts with a ':', it is interpreted as a separate header with no connection to the previous command.
- If the header starts with a keyword, the header of the previous command (except for the last keyword) is prepended to the given command.

The following example illustrates the use of multiple commands sent on one command line:

- "CONFigure:BSTation:CHANnel:TRAFfic 8;:CONFigure:BSTation:FREQuency:CHANnel 283" is equivalent to "CONFigure:BSTation:CHANnel:TRAFfic 8" followed by"CONFigure:BSTation:FREQuency:CHANnel 283"

NOTE. *If the commands are sent on different command lines, the full header for each command must be given. The initial ':' should not be used.*

Every command line must end with a terminator. Terminators are:

- New line (ASCII code 10 decimal)
- End (EOI line active) together with the last useful character of the command line or the new line character (GPIB only)

  Since the carriage return character (ASCII code 13 decimal) is permissible as a filler without effect before the terminator, the combination of carriage return and new line is permissible. A command line may require more than one line of the controller screen since it is only limited by the terminator. The terminator is automatically added to the end of command text with most GPIB-bus controllers.

Spaces. Additional spaces may be inserted at the following points:

- before a header
- between header and number
- before and after commas (,) and semicolons (;)

- before the terminator

Decimal Numbers. The following notations are permissible for decimal numbers:

- With and without sign (for example: 5, +5, and –5)
- With and without decimal point; any position of the decimal point is permissible (for example: 1.234, –100.5, and .327)
- With or without exponent to base 10, "E" or "e" is used as the exponent character (for example: .451, 451E–3, and 4.51e–2)
- The exponent is permissible with or without a sign; also, a space is permissible instead of the sign (for example: 1.5E +3, 1.5E–3, and 1.5E 3)
- Leading zeros are permissible in the mantissa and exponent (for example: +001.5 and –01.5E–03)
- The length of the number, including the exponent, may be up to 30 characters. The number of digits for the mantissa and exponent is limited only by this condition. Digits that exceed the resolution of the device are rounded up or down; they are always considered for the order of magnitude (power of ten). Examples are 150000000 and 0.00000032.

NOTE. *Specification of the exponent alone (for example, E–3) is not permissible. 1E–3 is the correct notation.*

Hexadecimal and Binary Numbers. Hexadecimal numbers and binary numbers are permissible only without exponent and unit. The following notations are permissible:

- Hexadecimal number (for example: #H12ffab, #h12FFAB, and #HFf19a)
- Binary number (for example: #b101011 and #B11001)
- String entries as follows:

  '01234567890abcdef'
  '01234567890ABCDEF'
  "01234567890abcdef"
  "01234567890AbcdEF"

Messages Sent by the CMD 80 in Talker Mode (Device to Controller Messages)

The CMD 80 sends messages over the remote interface under the following conditions:

- The CMD 80 has been requested to provide data in its output buffer by one or more query messages with a question mark within one command line.
- The CMD 80 indicates by setting bit 4 (message available) in the status byte that the requested data is now present in the output buffer (see *Service Request and Status Registers* on page B–21) or indicates messages in the error queue by setting bit 2.
- If using GPIB, the CMD 80 has been addressed as a talker.

NOTE. *The command line with the data request must be transmitted immediately before the talker is addressed. If another command line is present in between, the output is cleared.*

If the CMD 80 is addressed as a Talker immediately after the query message, the bus handshake is disabled until the requested data is available.

The syntax of the messages sent by the CMD 80 is shown in Figure B–6.

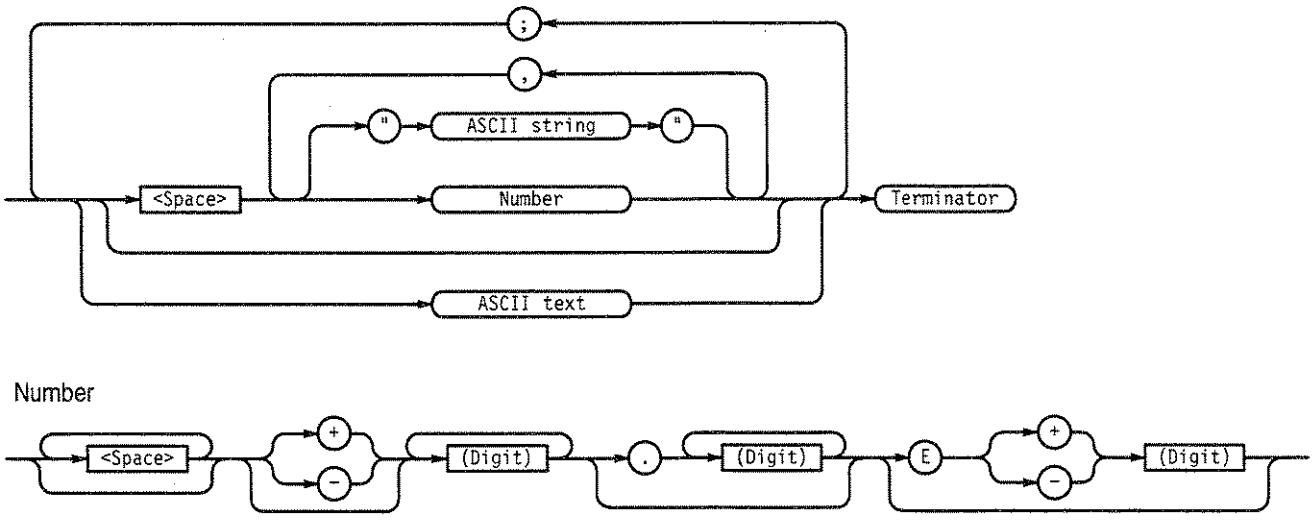


Figure B–6: Syntax diagram of messages sent by the CMD 80

The syntax is similar to that of the commands received by the CMD 80. Specific syntax rules are as follows:

- A carriage return/new line (ASCII code 13 and 10 decimal) together with an end message (line EOI active — applies to GPIB only) is used as a terminator.
- If the CMD 80 receives several query messages, it also returns several messages within one line separated by semicolons (;).
- Several numbers can be sent as a reply to certain query messages; they are separated by commas (,).
- The syntax of the numbers is described in Figure B–6.
- Messages sent by the CMD 80 do not contain units. In the case of physical variables, the numbers refer to the basic form of the unit (V, A, W, OHM, S, Hz, RAD, %, DB).

Device-Independent Commands (Common Commands)

The device-independent commands are listed in Table B–7 and B–8. The commands are of the following types:

- Commands that refer to the GPIB Service Request function, with the associated status and mask registers
- Commands for device identification
- Commands that refer to the GPIB Parallel Poll function
- Commands for device internal sequences (reset, calibration) and for synchronizing sequences

The commands are taken from the IEEE 488.2 standard which ensures that these commands have the same effect in different devices.

The headers of these commands consist of a star (*) followed by three letters.

Table B–7: Device-independent commands received by the CMD 80

Command	Number, range	Definition
*RST	—	Reset Acts on the instrument setting like the RESET key. This command does not change the status of the GPIB-bus interface, the set-GPIB-bus address, the mask register of the Service Request function, or the output buffer. A current Service Request is reset only if it has not been produced by a message in the output buffer.
*PSC	–32767 ... +32767	Power On Status Clear (reset on power-up) If the argument is nonzero, the Service Request Enable mask register (SRE) and the Event Status Enable mask registers (ESE) are cleared at power-up. If the argument is zero, the above mentioned registers retain their contents when the device is switched on and off. This enables a Service Request when the device is switched on.
*OPC	—	Operation Complete (ready signal) Sets bit 0 (Operation Complete) in the ESR, when all previous commands have been processed (see *Command Processing Sequence and Synchronization* on page B–27).
*CLS	—	Clear Status Sets the Status registers (ESR and STB) to zero. The mask register of the Service Request function (ESE and SRE) is not changed. Clears the output buffer. The present Service Request is cleared (see *Service Request and Status Registers* on page B–21).
*ESE	0 to 255	Event Status Enable The ESE mask register is set to the specific value that is interpreted as a decimal number (see *Service Request and Status Registers* on page B–21).
*SRE	0 to 255	Service Request Enable The SRE mask register is set to the specified value that is interpreted as a decimal number (see *Service Request and Status Registers* on page B–21).

Table B–7: Device-independent commands received by the CMD 80 (Cont.)

Command	Number, range	Definition
*PRE	0 to 255	Parallel Poll Enable The Parallel Poll Enable mask register is set to the specified value that is interpreted as a decimal number (see *Service Request and Status Registers* on page B–21).
*WAI	—	Wait To Continue Process the subsequent commands only when all previous commands have been completely executed (see *Command Processing Sequence and Synchronization* on page B–27).

Table B–8: Device-independent commands sent by the CMD 80

Command	Output Message Data Value		Definition
	Number of Digits	Range	
*IDN?	up to 72	alphanumeric	Identification Query The following identification text is sent as a reply to the *IDN? command. Tektronix/Rohde&Schwarz, CMD80,030113/001 AT:X.X BR:X.X LH:X.X Tektronix/Rohde&Schwarz = manufacturer CMD80 = model 030113/001 = reserved for serial number X.X = firmware/software version (for example: 1.2)
*PSC?	1	0 or 1	Power On Status Clear Query To read the status of the Power On Clear Flags (see *PSC* in Table B–7)
*OPC?	1	1	Operation Complete Query (ready message) The message *OPC 1 is entered into the output buffer and bit 4 (message available) set in the status byte when all previous commands have been completely executed. Bit 0 (operation complete) is also set in the ESR (see *Command Processing Sequence and Synchronization* on page B–27.

Table B–8: Device-independent commands sent by the CMD 80 (Cont.)

Command	Output Message Data Value		Definition
	Number of Digits	Range	
*OPT?	—	—	Option Identification Query This queries the options included in the instrument and returns a list of the options installed. The options are separated from each other by means of commas.
*ESR?	1 to 3	0 to 255	Event Status Register Query The contents of the ESR are output in decimal form and the register then set to zero.
*ESE?	1 to 3	0 to 255	Event Status Enable Query The contents of the ESE mask register are output in decimal form.
*STB?	1 to 3	0 to 255	Status Byte Query The contents of the status byte are output in decimal form.
*SRE?	1 to 3	0 to 255	Service Request Enable Query The contents of the SRE mask register are output in decimal form.
*TST?	1 to 3	0 to 255	Self Test Query The output value 0 indicates the completion of the self-test without error.
*IST?	1	0 or 1	Instrument Status Query Reads the instrument status (see *Service Request and Status Registers* on page B–21).
*PRE?	1 to 3	0 to 255	Parallel Poll Enable Query The contents of the Parallel Poll Enable register are output in decimal form.

Device-Specific Commands

All CMD 80 functions that can be set using the keyboard can also be controlled through the GPIB bus. The effect of the remote commands is the same as the corresponding entry from the keyboard. The GPIB bus can also be used to read the values set for all parameters.

The headers are designed in conformance with SCPI.

Service Request and Status Registers

Figure B–7 shows the status registers and the effective links between them. To comply with the IEEE 488.2/SCPI 1995.0 standard, the Status Byte (STB) and its associated mask register (SRE) (that are also present in older devices) have been supplemented by the Event Status Register (ESR) and its Event Status Enable Mask Register (ESE).

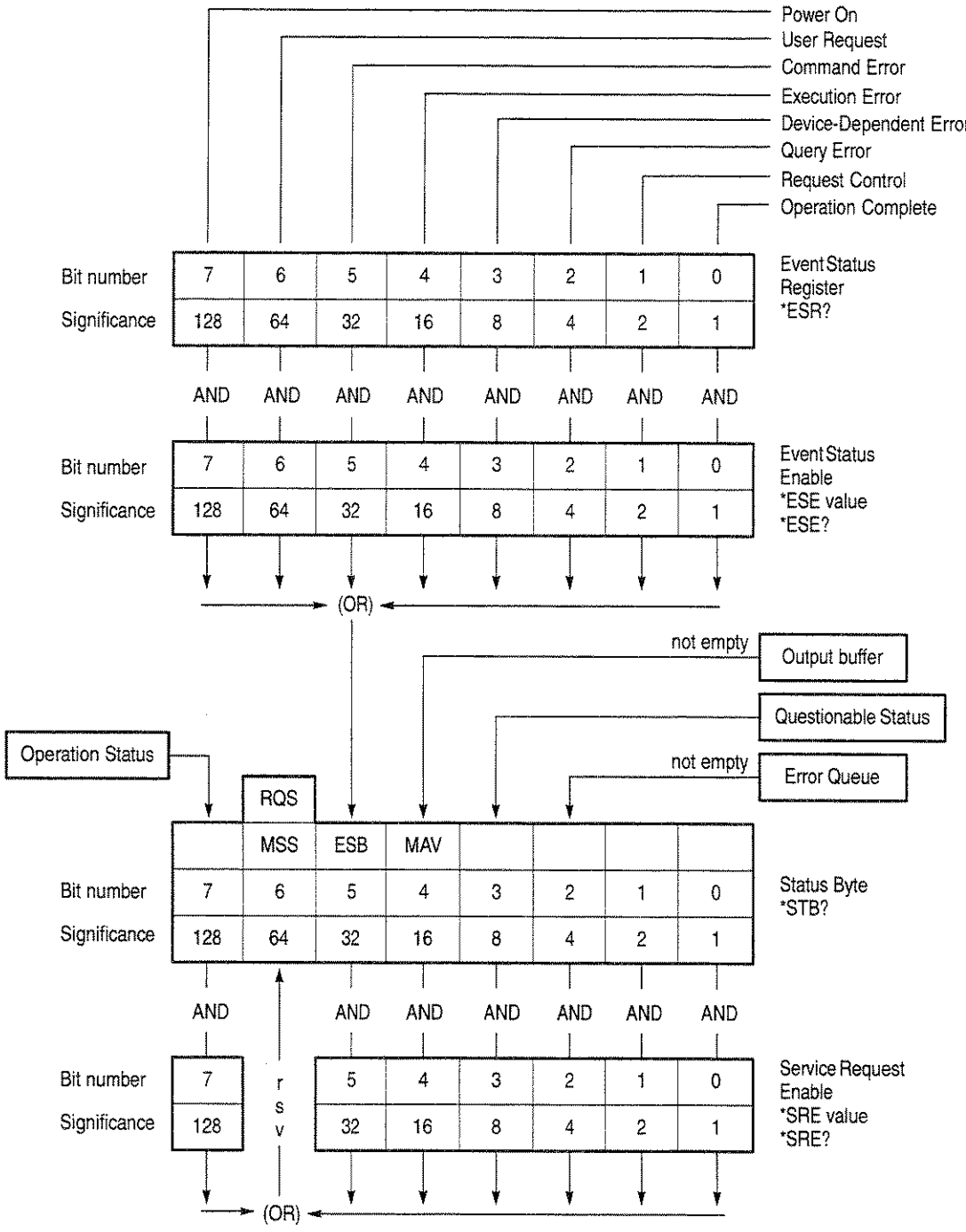


Figure B–7: Status registers

A bit is set to 1 in the ESR in the case of certain events (for example: fault, ready signal). Refer to Table B–10. These bits remain set until they are cleared by reading the ESR (by the command *ESR?) or by the following conditions:

- The commands *RST or *CLS
- Switching the AC supply (note that the power-on bit is set in this case)

Using the ESE mask register, the user can select the bits in the ESR that also set the sum bit ESB (bit 5 in the status byte) and trigger the service request. The sum bit is therefore only set if at least one bit in the ESR and the corresponding bit in the ESE are set to 1. The sum bit is automatically cleared again if the previous condition is no longer fulfilled (for example, if the bits in the ESR have been cleared by reading the ESR or if the ESE has been modified).

The ESE mask register is written by the command *ESE <*value*> (value is the register contents in decimal form) and can be read again by the command *ESE?. The value is set to 0 at AC power on if the power-on status clear flag is 1 (*PSC 1). The ESE mask register is not changed by other commands or interface messages (DCL, SDC).

The bits listed in Table B–9 are used in the status byte (STB).

Table B–9: Bit allocation of status byte

Bit Number*	Bus Line	Description	Meaning
2	DOI 3	—	There is an entry in the error queue
3	DOI 4	—	Sum bit of the Questionable status
4	DOI 5	MAV	Message Available Indicates that there is a message to be read in the output buffer. The bit is 0 if the output buffer is empty.
5	DOI 6	ESB	Sum bit of the Event Status Register
6	DOI 7	RSQ	Request Service
7	DOI 8	—	Sum bit of the Operation status

*Bits 0 and 1 are not used.

NOTE. *The status register bits are numbered from 0 to 7 in compliance with the standard, but the bus data lines are designated DIO 1 to DIO 8.*

Table B–10 shows the bit allocation for Event Status Register (ESR).

Table B–10: Bit allocation of ESR

Bit Number	Meaning
7	Power On This bit is set when the instrument is switched on or if the power returns following a failure.
6	User Request This function is not implemented in the CMD 80.
5	Command Error This bit is set if one of the following faults is detected in the received commands: Syntax error Illegal unit Illegal header A number has been combined with a header where no number is allowed.
4	Execution Error This bit is set if one of the following errors was detected during execution of the received commands: A number is outside the permissible range (for the respective parameter) A received command is not compatible with the current device setting
3	Device-Dependent Error This bit is set when a functional errors occur.
2	Query Error This bit is set if one of the following conditions occurs: The controller wants to read data from the CMD 80 but no query message has previously been output. (GPIB only) The data present in the output buffer of the CMD 80 has not been read and a new command was sent to the instrument instead. The output buffer is cleared in this case.
1	Request Control This function is not implemented in the CMD 80.
0	Operation Complete This bit is set by the commands *OPC and *OPC? when all previous commands have been executed.

Using the SRE mask register, the user can determine whether the RQS bit of the status byte is set and a Service Request sent to the controller by activating the SRQ line with a set bit of the status byte. Since each bit in the SRE mask register is assigned to the corresponding bit in the status byte, the possibilities are indicated in Table B–11.

Table B–11: SRE bit status

Contents of SRE (decimal)	Set Bit Number in SRE	Effect
0	—	No Service Request
4	2	Service Request if there is a message in the error queue
8	3	Service Request if bit(s) is set in the Questionable status (and not masked)
16	4	Service Request if MAV bit is set (message in output buffer)
32	5	Service Request if ESB bit is set (at least 1 bit set and not masked in the ESR)
128	7	Service Request if bit(s) is set in the Operation status (and not masked)

The Service Request Enable mask register (SRE) is written by the command *SRE <*value*> (value is the contents in decimal form) and can be read again by the command *SRE?. The SRE is set to 0 when the AC power is switched on (if the power on clear flag is 1). The Service Request function of the CMD 80 is thus disabled. The SRE mask register is not changed by other commands or interface messages (DCL, SDC).

Several devices can trigger a Service Request simultaneously. The controller must read the status bytes of the devices to identify the device or devices that triggered the Service Request. A set RQS bit (bit 6/DIO7) indicates that the device is sending a Service Request.

The status byte of the CMD 80 can be read in the following manner:

- By the command *STB?

  The status byte is output in decimal form. The status byte is not changed by being read, and the Service Request is not cleared.

- By a Serial Poll

  The contents are transferred in binary form as one byte. The RQS bit is then set to 0 and the Service Request becomes inactive; the other bits of the status byte are not changed.

The status byte of the CMD 80 is cleared in the following manner:

- By the command *CLS

  This command clears the ESR and the output buffer; the ESB and MAV bits in the status byte are also set to 0. This in turn clears the RQS bit and the Service Request.

- By reading the ESR (*ESR? command) or setting the ESE mask register to 0 (*ESE command) and by reading the contents of the output buffer

- By reading out the error queue using SYSTEM:ERROR?

- By reading the Questionable/Operation status register or zeroing the respective enable register

Resetting the Device Functions

Table B–12 lists the various commands and events that cause individual device functions to be reset.

Table B–12: Device reset functions

Event	Power On Clear Flag		DCL, SDC (Device Clear, Selected Device Clear)	Commands	
	0	1		*RST	*CLS
Basic device setting	—	—	—	Yes	—
Set Event Status Register ESR to zero	Yes	Yes	—	Yes	Yes
Set mask register ESE and SRE to zero	—	Yes	—	—	—
Clear output buffer	Yes	Yes	Yes	—	Yes
Clear Service Request	Yes	1	2	3	Yes
Reset command processing input buffer	Yes	Yes	Yes	—	—

1 **Yes, but "Service Request on power on" is possible.**

2 **Yes, if only caused by message in the output buffer.**

3 **Yes, if not caused by message in the output buffer.**

Command Processing Sequence and Synchronization

The commands received by the CMD 80 are first stored in an input buffer and are processed in the order in that they were sent. During this time, the GPIB bus can be used for communication with other devices. Command lines that exceed the capacity of the input buffer are processed in several sections. The bus is occupied during this time.

OPERATION COMPLETE Command

The commands *OPC and *OPC? (Operation complete) are used as feedback to indicate the following:

- the time when processing of the received commands was terminated
- whether a measurement (if any) has been completely performed

The *OPC command sets bit 0 in the ESR, and a Service Request can then be triggered when all previous commands have been executed.

The *OPC? query additionally provides a message in the output buffer and sets bit 4 (MAV) in the status byte.

WAIT Command

Synchronization can be established within a command line by the command *WAI. All subsequent commands are executed only when the previous commands have been completely executed. This is sometimes useful in the case of very short measurement times.

Error Handling

All errors detected by the CMD 80 in connection with remote operation are indicated in the ESR by setting a bit (bit 2, 4, or 5, see Table B–10). Function faults are signalled by setting bit 3. At the same time, a message is entered into the error queue. These bits remain set until the ESR is read or is cleared by the command *RST or *CLS. This is complies with the standard IEEE 488.2/SCPI 1995.0 and enables triggering of a Service Request and program-controlled evaluation of the type error.

Appendix C: Remote Control Commands

This appendix describes the use of the remote command set for control of the CMD 80. This command set is designed to be compliant with IEEE 488.2 and, as much as possible, with SCPI 1995.0

The command language is SCPI-like in cases where deviation from SCPI is needed. The main deviation from the SCPI standard is in configuring and running predefined tests and in returning the data from these tests to the host or controller. Configuration in the CMD 80 relates mainly to the parameters of the test being run, while configuration in the SCPI model relates mainly to the characteristics of the signal to be measured.

Because of the large number of test results, more than one data item may be returned (depending upon the test) in response to a query. This feature is not part of the SCPI standard.

The information in this appendix is based on *Standard Commands for Programmable Instruments (SCPI)*, Version 1996.0

Command Set Organization

The keywords form a hierarchy. For example, all headers for commands for instrument configuration start with the keyword "CONFigure." Further keywords limit the command. Command headers for configuring the base station simulator begin with "CONFigure:BSTation"; those for configuring the RF source in the simulator begin with "CONFigure:BSTation:SOURce." This hierarchy can be represented as as tree structure. Figure C–1 shows a partial structure for configuration headers.

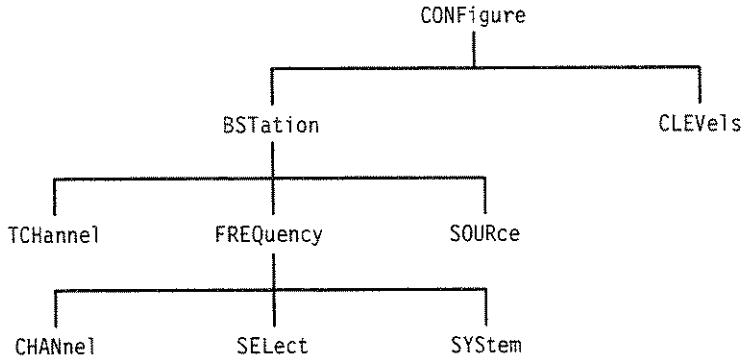


Figure C–1: Partial command tree for headers starting with "CONFigure"

The root or first keyword of a command indicates to which instrument system or command group the command belongs. The areas of the instrument controlled by commands beginning with different keywords are as follows:

- Commands beginning with '*' that do not follow the model of keywords with ':' separators are commands required by IEEE 488.2 and by SCPI.
- Commands beginning with "CONFigure" configure the instrument and tests that the CMD 80 can perform. Configuration includes both setting of test conditions, such as source levels, and setting of limits for acceptable test results.
- The command beginning with "DISPlay" affects what is shown on the front-panel display.
- Queries beginning with "FETCh" return data without performing a new measurement. A new measurement is not needed in two cases: when the data is always available without performing a measurement and when the data is from a previous measurement that started with a "READ" query. If the second keyword of the query is "[:SCALar]," the returned data consists of either one item or of several different items. If the second keyword is "ARRay," the returned data consists of an array of items of the same type.
- Commands beginning with "MMEMory" are associated with storage and recall of instrument settings.
- Commands beginning with "PROCedure" cause the CMD 80 and/or the mobile station under test to change states. No tests are performed and no data is returned.
- Queries beginning with "READ" perform predefined tests on the CMD 80 and return results after the test is complete. Queries ending with the keyword "[:ALL]" return more than one data item; other queries return only one data item. For some tests, additional data can be returned with a "FETCh" query.
- Commands beginning with "ROUTe" control which of the signal inputs and outputs on the CMD 80 front panel are used to connect to the mobile station under test.
- Commands beginning with "SENSe" affect settings associated with the input signals to the CMD 80.
- Commands beginning with "SOURce" affect settings associated with the output signals from the CMD 80.
- Commands beginning with "STATus" report the internal condition of the CMD 80 and determine which error conditions are reported.
- Commands beginning with "SYStem" control miscellaneous items in the instrument that are unrelated to the measurements made.

Keywords other than the first can also organize groups of commands. For example, commands related to the transmitter quality test, whether for configuring the test, performing the test, or returning additional test results, all contain the keyword "TQUality." Likewise, there are particular keywords associated with each of the other CMD 80 tests.

Instrument Model

The Figure C–2 shows the conceptual model of the CMD 80 in terms of the interconnection of SCPI subsystems used in programming the instrument. The model is used to relate programming commands and queries to the areas of the instrument that they control. Commands that relate to a given block often start with the keyword that is the block name. Not all blocks shown necessarily have associated programming commands and queries; some may have fixed, unalterable functions.

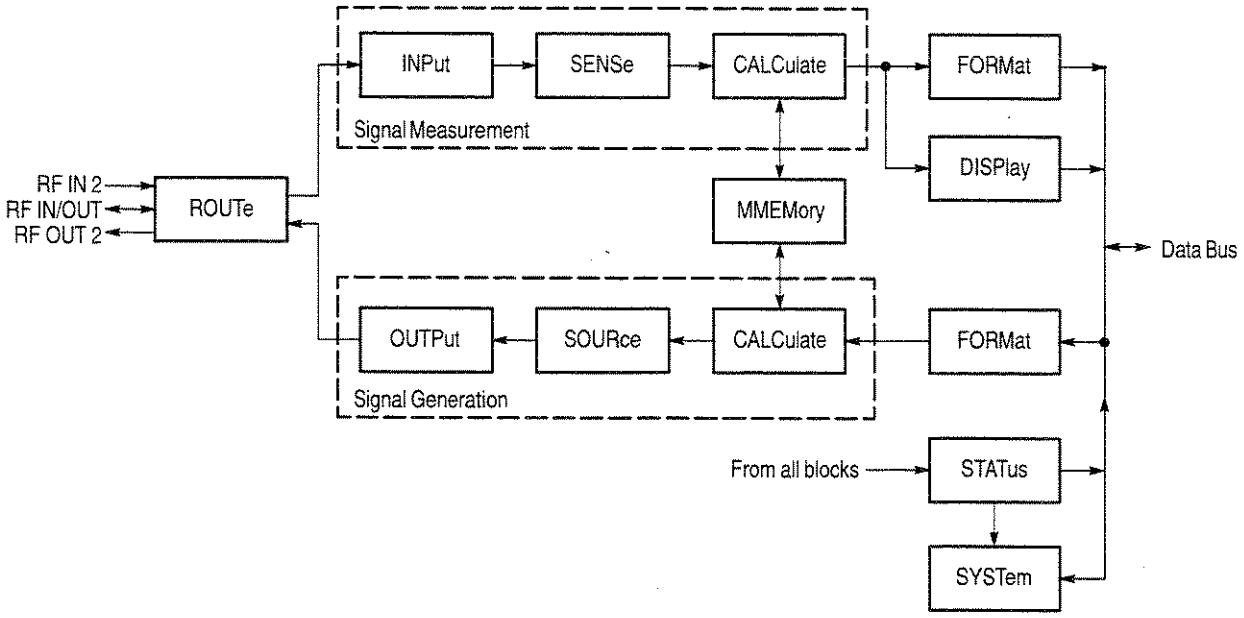


Figure C–2: Instrument concept model

State-Based Operation

At any given time, the CMD 80 is in one of several internal states, each of which is related to the state of the mobile station under test. Certain remote commands may be given only in certain states. For example: commands that change the settings of the base station simulator in the CMD 80 may only be used when such changes do not cause the CMD 80 to lose contact with the mobile station; tests that require that there be an active call to the mobile station may be run only when the CMD 80 is in the proper call established state.

The states and the methods that the instrument changes between states are summarized in the Figure C–3. The items in parentheses are the mnemonic names by which the states are known.

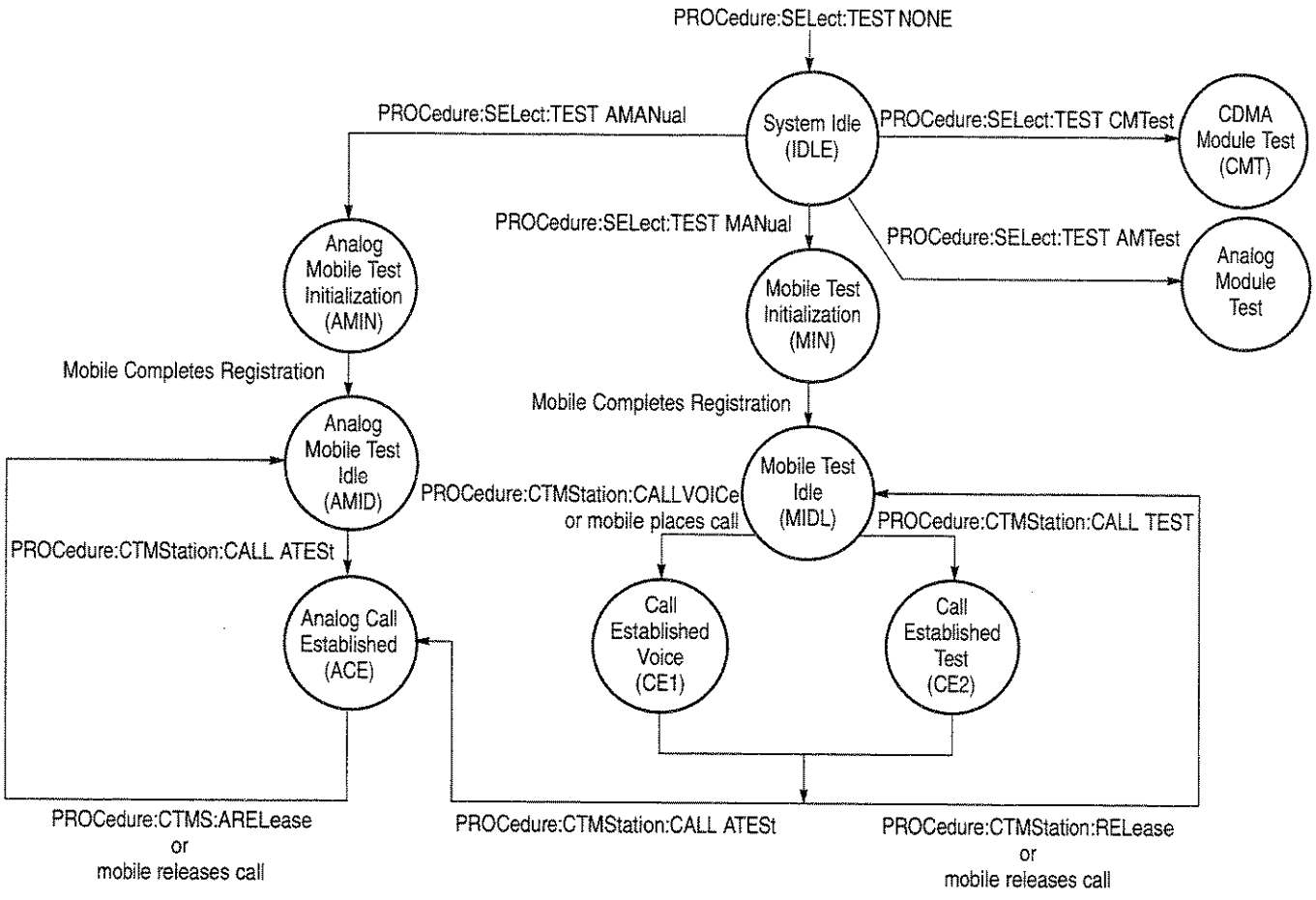


Figure C–3: State-based operation diagram

Changing States

The internal state of the CMD 80 changes as a result of the actions of the user, either through the front panel or the remote interface, and of the mobile station.

The following example shows the steps in a remote control program that establishes a call with the mobile station using CDMA service options 2 or 9. This type of call must be made to do most of the tests possible with the CMD 80.

When the CMD 80 is first powered up, after a reset ("*RST" command or "SYSTem:PRESet" command), or after the "PROCedure:SELect:TEST NONE" command, the instrument is in the "IDLE" state. In this state, the instrument is inactive, with its internal RF source turned off. There is no communication with the mobile station under test.

When it receives the "PROCedure:SELect:TEST MANual" command, the CMD 80 turns on its CDMA RF source with the setting established by the "CONFigure:BSTation" tree of commands. The instrument then enters the "MIN" state while it waits for the phone to register.

Registration is the process whereby the mobile station under test receives the signal from the base station simulator in the CMD 80, decodes it, synchronizes to the system timing, and sends back a signal identifying itself. The registration process is under control of the mobile station. However, since most further commands affecting the mobile station cannot be sent until it is registered, a remote control program must know when registration is accomplished. This information can be obtained in several ways, either by polling the CMD 80 until the mobile station registers or by enabling and then waiting for a GPIB SRQ when the phone registers.

One way of determining registration is through the CMD condition register. Registration causes an event to be recorded in the CMD register that can be read with the "STATus:OPERation:CMD[:EVENt]?" query. This event can be enabled to cause a GPIB SRQ. (No SRQ is possible when using RS-232 control.) Alternatively to the above, the state of the CMD 80 can be read with the "STATus:DEVice?" query. When registration occurs, the CMD 80 automatically changes to the "MIDL" state.

In the "MIDL" state, the "PROCedure:CTMStation:CALL TEST" command establishes a call to the mobile station using CDMA service option 2. The state of the CMD 80, as shown by the "STATus:DEVice?" query, changes to "CE2" when the call is established.

NOTE. *Service option 9 is used when a call is established using the 13k rate; however, the instrument state is CE2.*

When switching between local and remote, in either direction, the CMD 80 goes to the IDLE state.

Analog (Option 17). When the CMD 80 receives the "PROCedure:SELect:TEST AMANual" command, the CMD 80 turns on its Analog RF source with the setting established by the "CONFigure:ABSTation" tree of commands. The instrument then enters the "AMIN" state while it waits for the mobile station to register.

Registration is the process where the mobile station under test receives the signal from the base station simulator in the CMD 80, decodes, it, and sends back a signal identifying itself. When the mobile station registers, the state of the CMD 80, as shown by the "STATus:DEVice?" query, will change to "AMID".

In the "AMID" state, the "PROCedure:CTMStation:CALL ATESt" command establishes a call to the mobile station. The state of the CMD 80, as shown by the "STATus:DEVice?" query, changes to "ACE" when the call is established.

Non-Allowed Commands

A command sent when the CMD 80 is in a state when the command is not allowed is ignored.

Non-Allowed Queries

A query sent when the CMD 80 is in a state when the query is not allowed returns a response using NANs for the state-specific fields of the response.

Unplanned State Changes

If the mobile station under test is not working properly, it may terminate a call or even lose registration at any time. Such changes affect the state of the CMD 80. Some tests (such as the sensitivity test for receiver quality) involve a low signal level to the mobile station and are more likely to cause problems than others.

If the CMD 80 state changes during a test, the behavior is similiar to when the instrument is not in the proper state when the command is given. The CMD 80 detects the state change, immediately terminates the test, and if there is a query (a "READ" query) pending, returns a response to the query; however, the response data will contain NANs for the state-specific fields of the response. Proper completion of the test can be checked for by sending a "STATus:DEVice?" query after the test. The query checks if the CMD 80 is still in the same state as when the test started. Another method to verify proper completion is to parse the output results for NAN values

Command Descriptions

NOTE. *Some commands are described in groups in which all of the command headers in the group begin with the same keyword or keywords. Commands within the group are described by referring to their final keyword or keywords. Complete commands are formed by combining the beginning keyword(s) and the final keyword(s), using the usual ':' separator. For example, if a command has the beginning keywords of "CONFigure:BSTation" and final keywords of "FREQuency:SELect", the complete command header is: CONFigure:BSTation:FREQuency:SELect*

The same method can be used to form command headers when the keywords of the header are broken into more than two parts.

This section divides the remote commands into different groups, listing the commands in each group and describing them in general terms. The command set can be divided into several categories: common commands that are required by the IEEE and SCPI standards; status reporting commands, also required by these standards; and device specific commands unique to the CMD 80. The device specific commands set up and release calls with the mobile station under test, configure the CMD 80 hardware (both in general and in connection with specific tests), set test parameters, and run and return results from predefined tests of the mobile station.

Refer to *Appendix D: Remote Control Command Table* for a listing of all commands and more information about each command than is given in this section. Included are argument ranges, default values, the instrument state or states when the command may be used, and programming notes.

NOTE. *When operating the CMD 80 from the front panel, many predefined tests can run continuously, either in all cases or as the result of a mode selection. However all tests are run in the single-shot mode in remote operation. A test normally runs to completion and reports its results; however, in tests that require a substantial amount of time (for example, 20 seconds), the user may select for the test to terminate early if the CMD 80 detects that the test failed.*

Common Commands

Common commands, also known as device independent commands, are not specific to the CMD 80, but rather are specified for all instruments in the IEEE 488.2 standard and/or the SCPI standard. All common commands begin with the character '*.'

The common commands in the CMD 80 are: "*CLS," "*ESE" and "*ESE?," "*ESR?," "*IDN?," "*IST?," "*OPC" and "*OPC?," "*OPT?," "*PRE" and "PRE?," "*PSC" and "*PSC?," "*RST," "*SRE" and "*SRE?," "STB?," "*TST?," and "*WAI." The operation of these commands is described in *Appendix B: Remote Control.*

The "SYStem:OPTions?" query is identical in effect to the "*OPT?" query.

The "SYStem:PREset" command (no associated query) is identical in effect to the "*RST" command.

Status Reporting Commands and Queries

Refer to *Appendix B: Remote Control for* the operation of the commands and queries applied to status operation, questionable registers, and error reporting.

The CMD 80 has another status register, known as the CMD register, that records events dealing with the mobile station under test which occur asynchronously with the operation of the instrument. The bits are assigned as follows (bit 0 is the LSB):

- Bit 0 — Mobile station initiated call
- Bit 1 — Mobile station released call
- Bit 2 — Mobile station registered
- Bit 3 — Mobile station lost registration

All other bits are unassigned.

The commands and queries associated with the CMD register are similar to those associated with the status operation register.

- "STATus:OPERation:CMD:CONDition?" (query only) — This query is included to make the set of queries dealing with the CMD register the same as that dealing with the status operation register. Since the bits in the CMD register represent events, not conditions, the response to this query is always '0.'
- "STATus:OPERation:CMD:ENABle <number>" (query "STATus:OPERation:CMD:ENABle?") — controls which events in the CMD 80 register are reported to the status operation register. If a bit in the CMD 80 enable register corresponding to one of the bits listed above is set, the occurrence of the event assigned to that bit sets the CMD 80 register bit (bit 8) in the status operation register. If the bit is cleared, this does not happen.
- "STATus:OPERation:CMD:EVENt?" (query only) — indicates whether an event has taken place. When one of the events assigned to the CMD register occurs, the corresponding bit is set in the event register. This query clears the register; a query response contains only events that have occurred since the last query.

The "SYStem:VERSion?" query returns the version of the SCPI standard with which the CMD 80 complies. The response has the form "YYYY.V", where "YYYY" is the year of SCPI compliance and "V" is the version number within the year.

The "STATus:DEVice" query returns the internal state of the CMD 80. The internal states are diagrammed in Figure C–3 on page C–4. This query returns the mnemonic state names given there.

Settings Store and Recall

Instrument settings can be stored in internal memory or, if the correct option is present, on a memory card. All instrument settings except for the remote interface settings are saved. The commands to store and recall settings that have no associated queries are as follows:

- "MMEMory<n>:SAVE" saves the present settings in the specified memory.
- "MMEMory<n>:RECall" recalls new instrument settings from the specified memory.

In the above commands, "<n>" is a number between 1 and 13 that identifies the storage location to be used. The number is part of the command, not a parameter, and should not be separated with spaces (for example, "MMEMory7:SAVE").

The storage location for the instrument settings can be chosen with the "MMEMory:TYPE <INTernal | MEMCard>" command (query "MMEMory:TYPE?"). The proper option must be installed to use the "MEMCard" parameter.

A name can be assigned to each stored setting. The assigned name appears for each setting in the front-panel "Save" and "Recall" menus. The "MMEMory<n>:SAVE:NAME <name string>" command (query "MMEMory<n>:SAVE:NAME?") command assigns the name. The assigned name may be up to 29 characters long. The parameter "<n>" has the same meaning here as it does for the commands listed above.

Settings can be stored separately for up to 14 users. Each user can store up to 13 settings. The following commands are associated with user selection:

- "SYSTem:USER:SELect <USER1 | USER2 | . . . | USER14>" (query "SYStem:USER:SELect?") — selects the user for the settings that are stored and recalled.
- "SYSTem:USER<n>:NAME <name string>" (query "SYSTem:USER<n>:NAME?") — assigns a user name for the specified user. The assigned name appears in front panel menus. The name may be up to 29 characters long. ("<n>" is a number between 1 and 14 that identifies the desired user. The number is part of the command, not a parameter, and should not be separated with spaces; for example, "SYSTem:USER6:NAME?".)

External Signal Configuration

The CMD 80 has a common RF input and output as well as separate input and output connectors. The input and output can be separately set to either the common connector or the alternate connector for the chosen function (input or output. The routing command is "ROUTe:IOConnector <parameter>." The allowable values for "<parameter>" are as follows:

- "I1O1" — selects the common input/connector as both the input and output.
- "I1O2" — selects the common input/connector as the input to the CMD 80 and the alternate output connector as the output from the CMD 80.
- "I2O1" — selects the alternate input connector as the input to the CMD 80 and the common input/connector as the output from the CMD 80.
- "I2O2" — selects the alternate input and output connectors. The common input/output connector is not used.

The CMD 80 can compensate for externally applied attenuation or gain at any of the RF inputs or outputs. The signal levels output from the CMD 80 are adjusted (within the limits imposed by the hardware) such that the levels after any gain or attenuation are at the levels set by the configuration commands. Also, the levels reported for mobile station power account for attenuation or gain to report the values at the the mobile station.

Attenuation or gain can be accounted for only if its value is reported to the system. In the following commands, positive values indicate attenuation and negative values indicate gain:

- "SENSe:CORRection:LOSS[:INPut][:MAGNitude]:RIALternate <loss [DB]>" (query "SENSe:CORRection:LOSS[:INPut][:MAGNitude]:RIALternate?") sets the loss (or gain) applied externally to the alternate RF input.
- "SENSe:CORRection:LOSS[:INPut][:MAGNitude]:RIOutput <loss [DB]>" (query "SENSe:CORRection:LOSS[:INPut][:MAGNitude]:RIOutput?") — sets the loss (or gain) applied externally to the input signal of the common RF input/output.
- "SOURce:CORRection:LOSS[:OUTPut]:OFFSet:RIOutput <loss offset [DB]>" (query "SOURce:CORRection:LOSS[:OUTPut]:OFFSet:RIOutput?") — sets the loss (or gain) applied externally to the output signal of the common RF input/output with respect to the loss (or gain) applied to the input signal of that connector. Because this is a common connector, the loss (or gain) that can be applied to the output signal with respect to that of the input signal is limited.
- "SOURce:CORRection:LOSS[:OUTPut][:MAGNitude]:RIOutput?") — returns the net loss (or gain) applied externally to the output signal of the common RF input/output. This command is a query only.

- "SOURce:CORRection:LOSS[:OUTPut][:MAGNitude]:ROALternate <loss [DB]>" (query "SOURce:CORRection:LOSS[:OUTPut][:MAGNitude]:ROALternate?") — sets the loss (or gain) applied externally to the alternate RF output.

CAUTION. *The input can be overdriven resulting in damage to the CMD 80 if an external amplifier is connected and the maximum input level is exceeded.*

Miscellaneous Commands

The command "DISPlay:ENABle <ON | OFF> " (query "DISPlay:ENable?") controls whether the remote commands and queries received by the CMD 80 are displayed on the front-panel display. When the CMD 80 is under remote control, the menus displayed during manual control are replaced by a display indicating that the instrument is in remote mode. If the display enable function is set to "on," commands, queries, and responses to queries are a part of this display.

The CMD 80 can make several measurements that are not part of the predefined tests. The first set of measurements use the DC voltmeter and DC ammeter inputs on the front panel. The queries associated with the DC meters are as follows:

- "READ[:SCALar]:VOLTage[:DC]?" — reads the DC voltage.
- "READ[:SCALar]:CURRent[:DC][:AVERage]?" — reads the average DC current.
- "READ[:SCALar]:CURRent[:DC][:MAXimum]?" — reads the maximum DC current.
- "READ[:SCALar]:CURRent[:DC][:MINimum]?" — reads the minimum DC current.

Base Station Configuration

All command headers for configuring the base station simulator in the CMD 80 begin with "CONFigure:BSTation."

CDMA. The commands set or query the following parameters:

- Frequency and CDMA channel parameters
- Source level
- Network
- Base station ID
- Preferred rate

- Actual rate (query only)
- Network ID
- System ID

Some of the frequency and CDMA configuration commands can only be used when the CMD 80 is in a particular state, while the other commands have different effects in different states. Almost all commands can be used in the IDLE state to set the values with which the base station turns on. In other states the commands are limited to prevent disruption of communication between the base station and the mobile station. The limitations associated with each command are given as part of the command descriptions below. All queries may be used in any system state.

NOTE. *The PNOFfset. TCHannel, FOFFset, and FREQuency:CHANnel commands will perform a hard handoff to perform the settings change when the instrument is in the CE1 or CE2 state*

The frequency and CDMA configuration commands have the following final header keywords and parameters:

- "FOFFset <number>" (query "FOFFset?") — sets the frame offset for the base station. The frame offset sets the starting position of the traffic frame, in terms of the power control group number. This command is allowed in all states. When in the CE1 or CE2 state, this command changes the current frame offset.
- "FREQuency:CHANnel <number>" (query "FREQuency:CHANnel?") — sets the channel number for the base station simulator. The command response depends on the state of the instrument. When in the IDLE state this command sets or queries the default channel. When in the CE1 or CE2 state, this command changes the current RF channel number. The query always returns the actual channel number being used.
- "CONFigure:BSTation:NETWork <USCellular | JPCellular | PJS008 | PUIS95 | PKJS008 | PKUis95>" (query "CONFigure:BSTation:NETWork?") — selects which network the CMD 80 will simulate. For PCS, this command also selects which standard (IS–95 or J–STD–008) will be supported. "USCellular" selects the U.S. cellular band; "JPCellular" selects the Japanese cellular band; "PJS008" selects PCS using J–STD–008; "PUIS95" selects PCS using an upbanded IS–95; "PKJS008" selects Korean PCS using J–STD–008; "PKUis95" selects Korean PCS using an upbanded IS–95.
- "PNOFfset <number>" (query "PNOFfset?") — sets the PN offset for the base station.This command may be given only in the IDLE state or one of the call established states, CE1 or CE2.

- "CONFigure:BSTation:PREVision <protocol revision number>" (query "CONFigure:BSTation:PREVision?") — for networks using IS–95, this command is used to select which revision of that standard is to be supported. IS–95 is version 1; IS–95–A is version 2; IS–95–A with TSB–74 is version 3. At the present time, only one version of J–STD–008 is supported.
- "TCHannel <number>" (query "TCHannel?") — sets the CDMA Walsh traffic channel number. This is not a frequency, but rather specifies the Walsh code that is used to encode the traffic channel portion of the CDMA signal. This command may be given in all system states.

The source level configuration commands discussed in this section control the settings of the base station simulator when a test is not being run and during the "Current Signal Levels" receiver quality test. Commands associated with specific tests can override some of the levels (which ones depends upon the particular test) while the test is being run. These commands are listed as part of the test description for each test.

The level configuration commands can be used in any system state.

The source level configuration commands can be divided into two groups: those that set the relative levels of different components of the signal and a command to set the total absolute signal power.

The commands that set relative levels continue (after the "CONFigure:BSTation" keywords) with the keywords "SOURce[:CDMA]:LEVel." The final keywords for the command headers and the parameters are as follows:

- "PAGing <relative level [DB] | MAXimum | MINimum>" (query "PAGing? [<MAXimum | MINimum>]") — sets the level of the paging channel relative to the total output power of the base station simulator.
- "PILot <relative level [DB] | MAXimum | MINimum>" (query "PILot? [<MAXimum | MINimum>]") — sets the level of the pilot channel relative to the total output power of the base station simulator.
- "SYNC <relative level [DB] | MAXimum | MINimum>" (query "SYNC? [<MAXimum | MINimum>]") — sets the level of the sync channel relative to the total output power of the base station simulator.
- "TRAFfic <relative level [DB] | MAXimum | MINimum>" (query "TRAFfic? [<MAXimum | MINimum>]") — sets the level of the full rate traffic channel relative to the total output power of the base station simulator.
- "OCNS?" (query only) — returns the level of the orthogonal channel noise source. This level is that of the signal from the base station simulator representing the signals from all other users of the channel. This signal appears as noise to the mobile station under test since the encoding of these other signals is orthogonal (noninterfering) with the encoding of the system under test.

The complete command to set the total base station power is "CONFigure:BSTation:SOURce[:CDMA]:POWER <power [DBM] | MAXimum | MINimum>." The query is "CONFigure:BSTation:SOURce [:CDMA]:POWER? [<MAXimum | MINimum>]."

The command "CONFigure:BSTation[:SETTings]:DEFault" (no query) sets the configuration values for the base station simulator to their default values.

NOTE. *This command always resets the level configuration values. The frequency and CDMA configuration values that are reset are only those with corresponding CDMA commands that may be used in the current state of the CMD 80. Values that may not be changed in the current state are not affected.*

Analog. Analog operation is possible only if the U.S. Cellular network is selected and if Option 17 (Analog Mode) is installed.

All command headers for configuring the analog base station simulator in the CMD 80 begin with "CONFigure:ABSTation". The commands set or query the following parameters:

- Frequency parameters for the control channel and voice channel
- Source level
- SAT color code
- SAT peak deviation
- Mobile attenuation code to control mobile power level
- Location ID
- System ID
- Paging duration

Some of the configuration commands can only be used when the CMD 80 is in a particular state, while the other commands have different effects in different states. Almost all commands can be used in the IDLE state to set the values with which the analog base station turns on. In other states the commands are limited to prevent disruption of communication between the analog base station and the mobile station. The limitations associated with each command are given as part of the command descriptions below. All queries may be used in any system state.

NOTE. *The FREQuency:VCHannel and FREQuency:SCCode commands will perform a handoff to perform the settings change when the instrument is in the ACE state.*

The frequency configuration commands have the following final header keywords and parameters:

- "FREQuency:CCHannel <RF channel number>" (query "FREQuency:CCHannel?") — sets the channel number for the control channel.
- "FREQuency:VCHannel <RF channel number>" (query "FREQuency:VCHannel?") — sets the channel number for the voice channel.
- "FREQuency:SCCode <SAT color code number>" (query "FREQuency:SCCode?") — sets the SAT color code value used when a call is established.
- "FREQuency:SYSTem?" — returns the system indicator (A or B) for the control channel as defined in IS–95.

The level configuration commands discussed in this subsection control the settings of the analog base station simulator when a test is not being run. Commands associated with specific tests can override some of the levels (which ones depends upon the particular test) while the test is being run. These commands are listed as part of the test description for each test.

The following level configuration commands can be used in any system state.

- "SOURce:POWer <analog power level [DBM]>" (query "SOURce:POWer?") — establishes the analog base station power level.
- "CMAC <control channel mobile attenuation code>" (query "CMAC?") — sets the control channel mobile attenuation code. The mobile station sets its output power level for the reverse control channel according to the control mobile attenuation code.
- "VMAC <voice channel mobile attenuation code>" (query "VMAC?") — sets the voice channel mobile attenuation code. The mobile station sets its output power level for the reverse voice channel according to the voice mobile attenuation code.
- "SOURce:FM:DEViation:SAT <SAT peak deviation [HZ]>" (query "SOURce:FM:DEViation:SAT?") — sets the peak deviation of the SAT when an analog call is established.

The command "CONFigure:ABStation[:SETTings]:DEFault" (no query) sets the configuration values for the analog base station simulator to their default values.

NOTE. *This command always resets the level configuration values. The frequency configuration values that are reset are only those with corresponding commands that may be used in the current state of the CMD 80. Values that may not be changed in the current state are not affected.*

RF Source Control

Before any measurements can be made on the mobile station under test, the RF sources in the CMD 80 must be turned on in order to provide synchronizing signals to the mobile and to cause it to respond. This is accomplished for CDMA with the command "PROCedure:SELect[:TEST] MANual. " This is accomplished for analog with the command "PROCedure:SELect[:TEST] AMANual". The corresponding command to turn the RF sources off is "PROCedure:SELect[:TEST] NONE." The query "PROCedure:SELect[:TEST]?" returns the mode that the instrument is in.

NOTE. *No call shutdown is performed before the RF sources are turned off. If a call is established when the "PROCedure:SELect:TEST NONE" command is given, the call is immediatly terminated.*

The RF sources must be turned off before switching between CDMA and analog modes of operation (except when performing a CDMA to analog handoff).

Information in the Registered State

When the mobile station registers, it sends identification information to the CMD 80.

CDMA. For CDMA operation, this information is available via the "FETCh[:SCALar]:MSINfo[:ALL]?" query. This query returns, in order, the mobile station's mobile identification number, serial number, and power class.

When the mobile station is registered but the call is not established, the power transmitted by the mobile station can be obtained for different conditions:

- "READ[:SCALar]:IACCess:POWer:APRobe?" — returns the power transmitted by the mobile station when it is sending access probes.
- "READ[:SCALar]:IACCess:POWer:STANdby?" — returns the power transmitted by the mobile station between access probes.

The command "CONFigure:IACCess:LIMit:POWer:STANdby <power [DBM]>" (query "CONFigure:IACCess:LIMit:POWer[:STANdby]?") sets the maximum power that the mobile station is permitted to output in the standby state. The command "CONFigure:IACCess[:SETTings]:DEFault" (no query) resets this value to its default setting.

A query is available to determine the pass/fail status of the most recent standby power measurement. This query "FETCh[:SCALar]:IACCess:POWer:STANdby:LIMit:FAIL?" returns 0 for pass or 1 for fail.

The "CONFigure:BSTation:RPERiod <S12 | S14 | S17 | S20 | S24 | S29 | S34 | S41 | S49 | S58 | S69 | S82 | S97 | S116 | OFF>" (query "CONFigure:BSTation:RPERiod?") sets the time interval between timer based registrations. This controls how often access probes will be sent by the mobile station. Ample time should be allowed when access probe power or standby output power measurements are performed.

Analog. When the mobile station registers, it sends identification information to the CMD 80. This information is available via the "FETCh[:SCALar]:MSINfo[:ALL]?" query (the same query used for CDMA). This query returns, in order, the mobile station's mobile identification number, serial number, and power class.

When the mobile station is registered with the analog base station but the call is not established, the power transmitted by the mobile station can be obtained for different conditions:

- "READ[:SCALar]:AIACcess:POWer:APRObe?" — returns the power transmitted by the mobile station when it is sending access probes.
- "READ[:SCALar]:AIACcess:POWer:STANdby?" — returns the power transmitted by the mobile station between access probes.

The query "FETCh[:SCALar]:AIACcess:POWer:STANdby:LIMit:FAIL?" returns 0 for pass or 1 for fail for the most recent standby power measurement.

The command "CONFigure:AIACcess:LIMit:POWer:STANdby <power [DBM]>" (query "CONFigure:AIACcess:LIMit:POWer:STANdby?") sets the maximum power that the mobile station is permitted to output in the standby state. The command "CONFigure:AIACcess[:SETTings]:DEFault" (no query) resets this value to its default setting.

Establishing a Call

The following subsection discusses the CDMA and analog commands that are used to establish and release calls.

CDMA. Calls are established and released by commands that start with the keywords "PROCedure:CTMStation." There are no queries associated with these commands. The final keywords and parameters are as follows:

- "CALL <TEST>" — establishes a call to the mobile station using service option 2 for the 8K rate and service option 9 for 13K rate. This type of call must be established before running the CMD 80's automated tests.

- "CALL <VOICe>" — establishes a voice call to the mobile station. Voice data packets from the mobile station are stored briefly in the CMD 80 and then sent back to the mobile station as a transmission quality check.
- "RELease" — releases the call to the mobile station.

The identification number of the mobile station under test can be preloaded in the CMD 80 to speed registration. Preloading the mobile identification number enables a PROC:CTMS:CALL command to be sent without waiting for the transition from MINItialization to MIDLe. The PROC:CTMS:CALL command can normally only be sent in the MIDL state.

The mobile station only has one mobile identification number. If the mobile station reports a different number during registration than the number sent with the command, this number overwrites the one sent and is returned by the query. The command is "PROCedure:CTMStation:MINumber <mobile identification number>" (query "PROCedure:CTMStation:MINumber?").

The type of identification number of the mobile station should be set when the identification is preloaded. The command used to set the identification type is "CONFigure:BSTation:ATYPe <MIN | IMSI>" (query "CONFigure:BSTation:ATYPe?"). Ten digits should be included in the identification number sent to the CMD 80 if MIN is selected. Fifteen digits should normally be included in the identification number if IMSI is selected.

If the mobile station reports a different type of identification number during registration than the type sent with the command, this type overwrites the one sent and is returned by the query.

The type of identification number may be restricted for certain standards. For example, J–STD–008 supports only IMSI and the original IS–95 supports only MIN. Subsequent revisions of IS–95 added IMSI support.

The rate set to be used for a call is selected using "CONFigure:BSTation:PRSet <RS1 | RS2>" (query "CONFigure:BSTation:PRSet?"). This command configures the preferred rate set. The actual rate set in use for a call may be obtained using the "CONFigure:BSTation:ARSet?" query. Rate Set 2 is available only if option B14 is installed.

The vocoder support to be used for a Rate Set 1 voice call is selected using "CONFigure:BSTation:PVOCoder <BASic | ENHanced>" (query "CONFigure:BSTation:PVOCoder?"). This command configures the preferred vocoder. The actual vocoder in use for a call may be obtained using the "CONFigure:BSTation:AVOCoder?" query.

Analog. Calls are established and released by commands that start with the keywords "PROCedure:CTMStation". There are no queries associated with these commands. The final keywords and parameters are as follows:

- "CALL <ATESt>" — establishes a call on the analog voice channel. This type of call must be established before running the CMD 80's automated tests.
- "ARELease" — releases the call to the mobile station on the analog voice channel.

As with CDMA, the identification number of the mobile station under test can be preloaded in the CMD 80 to speed registration. Preloading the mobile identification number enables a "PROC:CTMS:CALL <VOICE>" command to be sent without waiting for the transition from AMIN to AMID. The "PROC:CTMS:CALL <ATESt>" command is normally sent in the AMID state.

The command used to preload the identification number is the same for both CDMA and analog: "PROCedure:CTMStation:MINumber <mobile identification number>" (query "PROCedure:CTMStation:MINumber?").

Information in Call Established State

After a call has been established, but when no predefined tests are being run, certain information is available from the mobile station through several queries.

CDMA. The following queries are available for CDMA operation:

- "READ[:SCALar]:POWer:MSTation[:ALL]?" — returns, in order, the total power measured from the mobile station and the power that would be expected for the current base station level.
- "READ[:SCALar]:POWer:RPILot?" — returns the pilot power that the mobile station is receiving from the base station.
- "READ[:SCALar]:WQUality[:ALL]?" — returns, in order, the carrier frequency error, the transmit time error, and the waveform quality.

For calls that were originated by the mobile station, the number dialed may be obtained using the "FETCh[:SCALar]:DNUMber?" query. For calls that were originated by the CMD 80, the response will be a string containing a single dash ("–").

Analog. The following queries are available for analog operation:

- "READ[:SCALar]:APOWer:MSTation[:ALL]?" — returns, in order, the total power measured from the mobile station and the power that would be expected for the current voice mobile attenuation code.

- "READ[:SCALar]:ACEQuality[:ALL]?" — returns, in order, the voice channel frequency error, total peak deviation, SAT frequency error, SAT peak deviation, ST frequency error, and ST peak deviation.

When a call has been established, the ST is normally not sent by the mobile station. To force the mobile station to send ST, the "PROCedure:CTMStation:ASTForce" (no query) may be used. After this command has executed, the mobile station will send ST for approximately 65 seconds and then release the call. If this command is sent again before this time has expired, the mobile station should continue sending ST until 65 seconds have passed since the latest command was sent.

For calls that were originated by the mobile station, the number dialed may be obtained using the "FETCh[:SCALar]:DNUMber?" query. For calls that were originated by the CMD 80, the response will be a string containing a single dash ("–").

Receiver Quality Tests

This subsection discusses the tests for receiver quality that are available for the CDMA and analog modes of operation.

CDMA. There are six different receiver quality tests, each of which has a different mnemonic in the command language. These tests measure the frame error rate at the mobile station for a combination of base station signal level and interfering signal levels, which is different for each test. The tests and the corresponding mnemonics are as follows:

- Current signal levels — "CLEVels"
- Dynamic range — "DRANge"
- Sensitivity — "SENSitivity"
- Traffic channel demodulation — "TCDemod" (requires Additive White Gaussian Noise generator option)
- User defined test 1 — "U1Defined"
- User defined test 2 — "U2Defined"

A test is started and the results are returned with the query:

READ[:SCALar]:<xxxx>[:ALL]?

The "<xxxx>" parameter represents one of the seven test mnemonics listed above. The results returned (in order) are the measured frame error rate in %, the number of transmitted frames, the number of bad frames recorded during the test, and the confidence level in %.

There is a query that returns pass/fail indications for the tests: "FETCh[:SCALar]:<xxxx>:LIMit:FAIL[:ALL]?" returns (in order) 0 (pass) or 1 (fail) indicators for the measured frame error rate, the number of bad frames recorded during the test, and the confidence level.

NOTE. *The receiver quality tests can require significant time to complete. At the default test duration of 1000 frames, the required time is 20 s. The timeout setting of the controller (for GPIB operation) must be able to handle the interval between the time the query is sent and the time the results are received.*

Test configuration involves setting test parameters and setting base station signal levels. All configuration commands begin with "CONFigure:<xxxx>" where "<xxxx"> is replaced by one of the test mnemonics listed above.

The final sections of the commands for test parameter configuration are as follows:

- "ASTop <OFF | ON>" (query "ASTop?") — sets the auto stop function for the test to "off" or "on." If the function is "on," the test terminates before the specified number of frames have been sent to the mobile station if the number of bad frames is such that the test fails. For example, if the test duration is 1000 frames and the frame error limit is 1.0%, the auto stop function (if set to "on") terminates the test after 10 bad frames.
- "BAUD <EIGHth | QUARter | HALF | FULL>" (query "BAUD?") — sets the data rate of the packets sent to the mobile station.
- "DURation <number>" (query "DURation?") — sets the duration of the test in terms of the number of frames to be transmitted to the mobile station.
- "LIMit:CONFidence[:LOWer]<number>" (query "LIMit:CONFidence [:LOWer]?") — sets the minimum permitted confidence level for the test in percent. If the auto stop function is on, the test terminates if the confidence level is greater than this limit value. This permits a successful test to stop early.
- "LIMit:ERRor:FERate <number>" (query "LIMit:ERRor:FERate?" — sets the maximum permitted frame error rate for the test in percent. If the auto stop function is "on," and if the number of bad frames is greater than this percentage of the number of frames specified to be sent to the mobile station during the test, the test terminates.

The final sections of the commands for configuring the base station signal levels during the tests are the following:

- "SOURce[:CDMA]:LEVel:PILot <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:PILot? [<MAXimum | MINimum>]")
- "SOURce[:CDMA]:LEVel:TRAFfic <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:TRAFfic? [<MAXimum | MINimum>]")

  The traffic channel level is specified as the FULL rate level. If a different rate level is used, the actual test level must be determined using the following table:

Rate	Correction
FULL	0 dB
HALF	–3 dB
QUARTER	–6 dB
EIGHTH	–9 dB

Real level = displayed + correction.

- "SOURce[:CDMA]:POWer <number [DBM] | MAXimum | MINimum>" (query "SOURce[:CDMA]:POWer? <MAXimum | MINimum>")

Refer to the descriptions of the commands with similar keywords under the heading *Base Station Configuration* on page C–11 for a discussion of the settings affected by these commands.

If the CMD 80 has the Additive White Gaussian Noise Generator Option, there is an additional configuration command for the base station sources in connection with the receiver quality tests that is not present for the basic base station configuration. This command has the same initial keyword as the commands given above and the final keywords and parameters "SOURce:AWGN:LEVel <number [DB] | MAXimum | MINimum>" (query "SOURce:AWGN:LEVel? <MAXimum | MINimum>"). The command sets the level of the additive white Gaussian noise generator with respect to the total output power of the CDMA source. The additive noise simulates transmissions to other mobile stations communicating with adjacent cells.

NOTE. *If the total output power of the CDMA source is within 10 dB of the maximum output power of the CMD 80, the Additive White Gaussian Noise Generator turns off. It remains off even if the output power is lowered.*

The command with the complete header "CONFigure:<xxxx>[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

Analog. There are four different receiver quality tests, each of which has different mnemonics in the command language.

- Sensitivity. The sensitivity test is started and the results are returned with the query: "READ[:SCALar]:ARQuality:SENSitivity?". The return value is the measured SINAD of the audio output of the mobile station.

  The pass/fail indication of the sensitivity test can be obtained with the query: "FETCh[:SCALar]:ARQuality:SENSitivity:LIMit:FAIL?". The value returned is 0 for pass or 1 for fail.

  Test configuration involves setting test parameters and setting base station signal levels.

  The commands for test parameter configuration are as follows:

  - "CONFigure:ARQuality:SENSitivity:LIMit:SINad <SINAD limit [DB]>" (query "CONFigure:ARQuality:SENSitivity:LIMit:SINad?") — sets the minimum permitted SINAD value for the test in dB.

  The commands for configuring the base station signal levels during the test are:

  - "CONFigure:ARQuality:SENSitivity:SOURce:POWer <power [DBM]>" (query "CONFigure:ARQuality:SENSitivity:SOURce:POWer?") — sets the CMD 80 output power level for the sensitivity test.
  - "CONFigure:ARQuality:SENSitivity:SOURce:FREQuency:MODulation <modulation frequency [HZ]>" (query "CONFigure:ARQuality:SENSitivity:SOURce:FREQuency:MODulation?") — sets the modulation frequency for the sensitivity test.
  - "CONFigure:ARQuality:SENSitivity:SOURce:FM:DEViation:MODulation <peak deviation [HZ]>" (query "CONFigure:ARQuality:SENSitivity:SOURce:FM:DEViation:MODulation?") — sets the peak deviation of the audio modulation for the sensitivity test.

  The command "CONFigure:ARQuality:SENSitivity[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

- Hum/Noise. The hum/noise test is started and the results are returned with the query: "READ[:SCALar]:ARQuality:HNOise[:ALL]?". The values returned are (in order) the relative level of hum/noise in dB and the audio peak deviation in Hz.

The pass/fail indications of the hum/noise test can be obtained with the query: "FETCh[:SCALar]:ARQuality:HNOise:LIMit:FAIL[:ALL]?". This query returns (in order) 0 (pass) or 1 (fail) indicators for the relative level of hum/noise and the audio peak deviation.

Test configuration involves setting test parameters and setting base station signal levels.

The commands for test parameter configuration are as follows:

- "CONFigure:ARQuality:HNOise:LIMit <hum/noise limit [DB]>" (query "CONFigure:ARQuality:HNOise:LIMit?") — sets the maximum permitted hum/noise value for the test in dB.
- "CONFigure:ARQuality:HNOise:TAPDeviation <target audio peak deviation [HZ]>" (query "CONFigure:ARQuality:HNOise:TAPDeviation?") — sets the target audio peak deviation for the hum/noise test. The audio peak deviation must approach this value and be within the range specified by the audio peak deviation error range.
- "CONFigure:ARQuality:HNOise:APDerange <audio peak deviation error range [HZ]>" (query "CONFigure:ARQuality:HNOise:APDerange?") — sets the audio peak deviation error range. The audio peak deviation must be within plus or minus this amount of the target audio peak deviation.

NOTE. *The tester performs the hum/noise measurement only when the audio peak deviation is within the limits set in the HUM/NOISE configuration menu (refer to* HUM/NOISE on page 3–68).

The commands for configuring the base station signal levels during the test are as follows:

- "CONFigure:ARQuality:HNOise:SOURce:POWer <power [DBM]>" (query "CONFigure:ARQuality:HNOise:SOURce:POWer?") — sets the CMD 80 output power level for the hum/noise test.
- "CONFigure:ARQuality:HNOise:SOURce:FREQuency:MODulation <modulation frequency [HZ]>" (query "CONFigure:ARQuality:HNOise:SOURce:FREQuency:MODulation?") — sets the modulation frequency for the hum/noise test.
- "CONFigure:ARQuality:HNOise:SOURce:FM:DEViation:MODulation <peak deviation [HZ]>" (query "CONFigure:ARQuality:HNOise:SOURce:FM:DEViation:MODulation?") — sets the peak deviation of the audio modulation for the hum/noise test.

- "CONFigure:ARQuality:HNOise:VMAC <voice channel mobile attenuation code>" (query "CONFigure:ARQuality:HNOise:VMAC?") — sets the voice channel mobile attenuation code for the hum/noise test.
- "CONFigure:ARQuality:HNOise:AFGen:FREQuency[:CW | :FIXed] <AF generator frequency [HZ]>" (query "CONFigure:ARQuality:HNOise:AFGen:FREQuency[:CW | :FIXed]?") — sets the AF generator frequency for the hum/noise test.
- "CONFigure:ARQuality:HNOise:AFGen:VOLTage <AF generator level [V] | OFF>" (query "CONFIgure:ARQuality:HNOise:AFGen:VOLTage?") — sets the AF generator level for the hum/noise test. Specifying a level turns the AF generator on, specifying "OFF" turns it off. Audio peak deviation in the mobile station is determined by this level.

The command "CONFigure:ARQuality:HNOise[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

- Harmonic Distortion. The harmonic distortion test is started and the results are returned with the query: "READ[:SCALar]:ARQuality:HDIStortion?". The value returned is the harmonic distortion in %.

  The pass/fail indication of the harmonic distortion test can be obtained with the query: "FETCh[:SCALar]:ARQuality:HDIStortion:LIMit:FAIL?". The value returned is 0 for pass or 1 for fail.

  Test configuration involves setting test parameters and setting base station signal levels.

  The commands for test parameter configuration are as follows:

  - "CONFigure:ARQuality:HDIStortion:LIMit <harmonic distortion limit in %>" (query "CONFigure:ARQuality:HDIStortion:LIMit?") — sets the maximum permitted harmonic distortion value for the test in %.

  The commands for configuring the base station signal levels during the test are as follows:

  - "CONFigure:ARQuality:HDIStortion:SOURce:POWer <power [DBM]>" (query "CONFigure:ARQuality:HDIStortion:SOURce:POWer?") — sets the CMD 80 output power level for the harmonic distortion test.
  - "CONFigure:ARQuality:HDIStortion:SOURce:FREQuency:MODulation <modulation frequency [HZ]>" (query "CONFigure:ARQuality:HDIStortion:SOURce:FREQuency:MODulation?") — sets the modulation frequency for the harmonic distortion test.

- "CONFigure:ARQuality:HDIStortion:SOURce:FM:DEViation:MODulation <peak deviation [HZ]>" (query "CONFigure:ARQuality:HDIStortion:SOURce:FM:DEViation:MODulation?") — sets the peak deviation of the audio modulation for the harmonic distortion test.

NOTE. *The tester performs the harmonic distortion measurement only when the audio peak deviation is within the limits set in the HARMONIC DISTORTION configuration menu (refer to* HARMONIC DISTORTION on page 3–69).

The command "CONFigure:ARQuality:HDIStortion[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

- Audio Frequency Response. The audio frequency response test provides a graph of the mobile station audio output as a function of frequency. The following query starts the test, waits for it to finish, and returns the mobile station audio level in dBm: "READ[:SCALar]:ARQuality:AFResponse?".

  After the test has completed, the graphical data of power as a function of frequency can be obtained. Separate queries obtain the 'x' (horizontal or frequency) and 'y' (vertical or power referenced to the mobile station audio level returned by the READ query) data arrays. Corresponding values from each array (the first, the second, etc.) define the individual points of the graph.

  The query "FETCh[:SCALar]:ARQuality:AFResponse:GRAPh:COUNt?" obtains the number of points in the graph.

  The query "FETCh:ARRay:ARQuality:AFResponse:GRAPh:X?" obtains the horizontal data for the graph.

  The query "FETCh:ARRay:ARQuality:AFResponse:GRAPh:Y?" obtains the vertical data for the graph.

  The query "FETCh:ARRay:ARQuality:AFResponse:LIMit:FAIL?" obtains 0 (pass) or 1 (fail) indicators for the three horizontal regions of the graph.

  Test configuration involves setting test parameters and setting base station signal levels.

  The commands for test parameter configuration are as follows:

  - "CONFigure:ARQuality:AFResponse:LIMit:BOTH:FREQuency:LOWest <frequency [HZ]>" (query "CONFigure:ARQuality:AFResponse:LIMit:BOTH:FREQuency:LOWest?") — sets the lowest frequency used on both of the limit lines of the audio frequency response test.

- "CONFigure:ARQuality:AFResponse:LIMit:BOTH:FREQuency:HIGHest <frequency [HZ]>" (query "CONFigure:ARQuality:AFResponse:LIMit:BOTH:FREQuency:HIGHest?") — sets the highest frequency used on both of the limit lines of the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle:LOWest <frequency [HZ]>" (query "CONFigure:ARQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle:LOWest?") — sets the lowest middle frequency used in the lower limit line of the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle:HIGHest <frequency [HZ]>" (query "CONFigure:ARQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle:HIGHest?") — sets the highest middle frequency used in the lower limit line of the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:UPPer:LEVel <level [DB]>" (query "CONFigure:ARQuality:AFResponse:LIMit:UPPer:LEVel?") — sets the level of the upper limit line for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:LOWer:LEVel:UPPer <level [DB]>" (query "CONFigure:ARQuality:AFResponse:LIMit:LOWer:LEVel:UPPer?") — sets the upper level of the lower limit line for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:LOWer:LEVel:LOWer <level [DB]>" (query "CONFigure:ARQuality:AFResponse:LIMit:LOWer:LEVel:LOWer?") — sets the lower level of the lower limit line for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:UPPer:COUNT?" returns the number of points which describe the upper limit line for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:UPPer:GRAPh:X?" returns the horizontal data for the upper limit line for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:UPPer:GRAPh:Y?" returns the vertical data for the upper limit line for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:LOWer:COUNT?" returns the number of points which describe the lower limit line for the audio frequency response test.

- "CONFigure:ARQuality:AFResponse:LIMit:LOWer:GRAPh:X?" returns the horizontal data for the lower limit line for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:LIMit:LOWer:GRAPh:Y?" returns the vertical data for the lower limit line for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:SPOints <sample points>" (query "CONFIgure:ARQuality:AFResponse:SPOints?") — sets the number of sample points to be taken during the audio frequency response test.

The commands for configuring the base station signal levels during the test areas follows:

- "CONFigure:ARQuality:AFResponse:SOURce:POWer <power [DBM]>" (query "CONFigure:ARQuality:AFResponse:SOURce:POWer?") — sets the CMD 80 output power level for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:SOURce:FREQuency:MODulation <modulation frequency [HZ]>" (query "CONFigure:ARQuality:AFResponse:SOURce:FREQuency:MODulation?") — sets the modulation frequency for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:SOURce:FM:DEViation:MODulation <peak deviation [HZ]>" (query "CONFigure:ARQuality:AFResponse:SOURce:FM:DEViation:MODulation?") — sets the peak deviation of the audio modulation for the audio frequency response test.
- "CONFigure:ARQuality:AFResponse:FREQuency:SCCode <SAT color code>" (query "CONFigure:ARQuality:AFResponse:FREQuency:SCCode?") — sets the SAT color code for the audio frequency response test.

The command "CONFigure:ARQuality:AFResponse[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

Open Loop Time Response Test (Power Control)

The open loop time response test (CDMA only) provides a graph of the mobile station output power as a function of time when the mobile station is commanded via open loop power control to change its output power. The following query starts the test, waits for it to finish, and returns the initial power of the mobile station at the start of the test:

READ[:SCALar]:OLTResponse?

After the test has completed, the graphical data of power as a function of time can be obtained. Separate queries obtain the 'x' (horizontal or time) and 'y' (vertical or power referenced to the initial mobile station power) data arrays. Corresponding values from each array (the first, the second, etc.) define the individual points of the graph.

The query "FETCh:ARRay:OLTResponse:LIMit:FAIL?" returns (in order) 0 (pass) or 1 (fail) indicators for each of the ten horizontal graphical regions of the open loop time response test.

The query "FETCh[:SCALar]:OLTResponse:GRAPh:COUNt?" obtains the number of points in the graph.

The query "FETCh:ARRay:OLTResponse:GRAPh:X?" obtains the horizontal data for the graph.

The query "FETCh:ARRay:OLTResponse:GRAPh:Y?" obtains the vertical data for the graph.

The test limit lines, as established by the applicable mobile station standards, can be obtained for comparison to the curve data obtained as indicated above. As is the case with the graphical results data, the limit lines are defined by straight lines between successive points with 'x' and 'y' values. Again, the data is returned over the remote interface as separate 'x' and 'y' arrays.

The beginning keywords of the limit line queries are "CONFigure:OLTResponse." The final keywords areas follow:

- "LIMit:LOWer:COUNt?" — obtains the number of points in the lower limit line.
- "LIMit:LOWer:GRAPh:X?" — obtains the horizontal data for the lower limit line.
- "LIMit:LOWer:GRAPh:Y?" — obtains the vertical data for the lower limit line.
- "LIMit:UPPer:COUNt?" — obtains the number of points in the upper limit line.
- "LIMit:UPPer:GRAPh:X?" — obtains the horizontal data for the upper limit line.
- "LIMit:UPPer:GRAPh:Y?" — obtains the vertical data for the upper limit line.

The configuration commands for the test have the same beginning keywords as the limit line queries. The final keywords and parameters are as follows:

- "MODE <DECRease | INCRease>" (query "MODE?") — sets the direction of the power step made by the base station simulator during the test. Because of the open loop power control, the power step made by the mobile station is in the opposite direction. This command also sets the direction of the first test performed using the front panel controls.
- "SOURce[:CDMA]:POWer:STEP <power change [DB]>" (query "SOURce[:CDMA]:POWer:STEP?") — sets the power step that the base station power changes when performing the test.

The initial keywords of the commands for configuring the base station signal levels during the tests are the same as those given above. The final keywords and parameters are as follows:

- "SOURce[:CDMA]:LEVel:PILot <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:PILot? [<MAXimum | MINimum>]")
- "SOURce[:CDMA]:LEVel:TRAFfic <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:TRAFfic? [<MAXimum | MINimum>]")
- "SOURce[:CDMA]:POWer <number [DBM] | MAXimum | MINimum>" (query "SOURce[:CDMA]:POWer? <MAXimum | MINimum>")

Refer to the descriptions of the commands with similar keywords in *Base Station Configuration* on page C–11 for a discussion of the settings affected by these commands.

The command "CONFigure:OLTResponse[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

Gated Output Test (Power Control)

The gated power output test (CDMA only) measures the mean (average) power of the mobile station during the time it is actually transmitting during a power burst. The following query starts the test, waits for it to finish, and returns the mean power of the mobile station during the burst:

READ[:SCALar]:GOUTput?

NOTE. *This test reduces the communication data rate to one-eighth of the standard rate.*

After the test has completed, you can obtain the graphical data of the power of the gated burst as a function of time. Separate queries obtain the 'x' (horizontal or time) and 'y' (vertical or power with respect to the mean output power) data arrays. Corresponding values from each array (the first, the second, etc.) define the individual points of the graph.

The query "FETCh:ARRay:GOUTput:LIMit:FAIL?" returns (in order) 0 (pass) or 1 (fail) indicators for each of the five horizontal graphical regions of the gated output test.

The query "FETCh[:SCALar]:GOUTput:GRAPh:COUNt?" obtains the number of points in the graph.

The query "FETCh:ARRay:GOUTput:GRAPh:X?" obtains the horizontal data for the graph.

The query "FETCh:ARRay:GOUTput:GRAPh:Y?" obtains the vertical data for the graph.

The commands that configure the parameters of the gated output test all start with the keywords "CONFigure:GOUTput." The final header keywords and parameters for the commands are as follows:

- "ASTop <ON | OFF>" (query "ASTop?") — sets the auto stop function for the test to "off" or "on." If the function is "on," the test terminates if the rise time, the fall time, or one of the mobile station power limits is exceeded.
- "AVERage:COUNt <number>" (query "AVERage:COUNt?") — sets the number of mobile station power control groups that are averaged to determine the measured results.
- "LIMIT:FTIMe[:UPPer] <time [SEC | MS | US]" (query "LIMit:FTIMe [:UPPer]?") — sets the maximum fall time permitted after the end of the power control group. The fall time starts at the end of the power control group and ends when the output power of the mobile station decreases to its maximum permitted "off" value.
- "LIMit:POWer:OFF:ABSolute[:UPPer] <power [DBM]>" (query "LIMit: POWer:OFF:ABSolute[:UPPer]?" — sets the maximum absolute power that the mobile station may output when it is not transmitting a burst.
- "LIMit:POWer:OFF:RELative[:UPPer] <power [DB]>" (query "LIMit: POWer:OFF:RELative[:UPPer]?" — sets the maximum power (with reference to the mean power of the burst) that the mobile station may output when it is not transmitting a burst. For example, if the value is "–30 dB," the power from the mobile station when it is not transmitting a burst must be at least 30 dB below the mean power of the burst.

NOTE. *The commands LIMit:POWer:OFF:ABSolute and LIMit:POWer:OFF:RELative interact. The limit is set to the value that represents the greatest absolute power level. The CMD 80 compares the absolute power to the sum of the relative and mean power output; the greater value is used to set the power limit.*

- "LIMit:POWer:ON:RELative[:LOWer] <power [DB]" (query "LIMit:POWer:ON:RELative[:LOWer]?" — sets the minimum power level that the mobile station may transmit during a burst with reference to the mean power of the burst.
- "LIMIT:RTIMe[:UPPer] <time [SEC | MS | US]" (query "LIMit:RTIMe[:UPPer]?") — sets the maximum risetime permitted before the start of the power control group. The rise time starts when the output power of the mobile station exceeds its maximum permitted "off" value and ends at the start of the power control group.

The limits established above determine limit lines within which the gated mobile station power must remain before, during, and after the burst. The limit line data can be obtained for comparison to the curve data obtained as indicated above. The limit lines are defined as straight lines drawn between successive points defined by 'x' (horizontal) and 'y' (vertical) values. As is the case with the gated power curve, the limit data is returned over the remote interface as separate 'x' and 'y' arrays, and the arrays are interpreted in the same way.

There are only queries associated with the limit lines themselves, since the lines can be set only through the commands listed above. The beginning keywords are the same as those listed above. The final keywords are as follows:

- "LIMit:LOWer:COUNt?" — obtains the number of points in the lower limit line.
- "LIMit:LOWer:GRAPh:X?" — obtains the horizontal data for the lower limit line.
- "LIMit:LOWer:GRAPh:Y?" — obtains the vertical data for the lower limit line.
- "LIMit:UPPer:COUNt?" — obtains the number of points in the upper limit line.
- "LIMit:UPPer:GRAPh:X?" — obtains the horizontal data for the upper limit line.
- "LIMit:UPPer:GRAPh:Y?" — obtains the vertical data for the upper limit line.

The initial keywords of the commands for configuring the base station signal levels during the tests are the same as those given above. The final keywords and parameters are as follows:

- "SOURce[:CDMA]:LEVel:PILot <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:PILot? [<MAXimum | MINimum>]")
- "SOURce[:CDMA]:LEVel:TRAFfic <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:TRAFfic? [<MAXimum | MINimum>]")

NOTE. *Since this measurement is conducted at EIGHTH rate and the traffic level is specified at FULL rate, the actual traffic level is 9 dB less than the displayed value.*

- "SOURce[:CDMA]:POWer <number [DBM] | MAXimum | MINimum>" (query "SOURce[:CDMA]:POWer? <MAXimum | MINimum>")

Refer to the descriptions of the commands with similar keywords under the heading *Base Station Configuration* on page C–11 for discussion of the settings affected by these commands.

The command "CONFigure:GOUTput[:SETTings]:DEFault" (no query) sets the values of all test parameters and source levels to their default values.

Maximum Output Test (Power Control)

The maximum power output test measures the maximum power that the mobile station puts out at a given base station power when the closed loop power control algorithm commands maximum power. The following command starts the test, waits for it to finish, and returns (in order) the power measured from the mobile station and the waveform quality at that power level:

READ[:SCALar]:MAXoutput[:ALL]?

The query "FETCh[:SCALar]:MAXoutput:LIMit:FAIL[:ALL]?" returns (in order) 0 (pass) or 1 (fail) indicators for the maximum output power and waveform quality.

NOTE. *Because of the low output levels that are usually used for this test, it is not uncommon for the call to be dropped if the configured output level is set too low.*

The commands that configure this test begin with the keywords "CONFigure:MAXoutput."

One of the items that can be configured for this test is the range of permitted mobile station output power. There are separate limits for each power class of mobile station. The final keywords and parameters for the commands that set the ends of the range are as follows:

- "POWer:<class keyword>:LOWer <power [DBM]>" (query "POWer:<class keyword>:LOWer?") — sets the lower limit of permitted mobile station power for the given power class.
- "POWer:<class keyword>:UPPer <power [DBM]>" (query "POWer:<class keyword>:UPPer?") — sets the upper limit of permitted mobile station power for the given power class.

In the above two commands, "<class keyword>" is replaced by "CONE" to set the limits for a Class I mobile station, "CTWO" to set the limits for a Class II mobile station, or "CTHRee" to set the limits for a Class III mobile station.

The argument <class keyword> is used to identify the class of mobile station. US Cellular units are identified by CONE, CTWO, or CTHRee. PCS units are identified by PONE, PTWO, PTHRee, PFOur, and PFIVe.

There are other configuration commands with the same initial keywords:

- "MAXoutput:ASTop <ALL | FIRSt | OFF>" command (query "MAXoutput:ASTop?") sets the auto stop function for the test. If the function is set to "FIRSt," the test terminates as soon as one test limit is exceeded. If the function is set to "ALL," the test terminates if all test limits are exceeded.
- "LIMIT:WQUality[:LOWer] <number> (query "LIMit:WQUality[:LOWer]?") — sets the minimum permitted waveform quality at the maximum power output of the mobile station.

The initial keywords of the commands for configuring the base station signal levels during the tests are the same as those given above. The final keywords and parameters are as follows:

- "SOURce[:CDMA]:LEVel:PILot <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:PILot? [<MAXimum | MINimum>]")
- "SOURce[:CDMA]:LEVel:TRAFfic <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:TRAFfic? [<MAXimum | MINimum>]")
- "SOURce[:CDMA]:POWer <number [DBM] | MAXimum | MINimum>" (query "SOURce[:CDMA]:POWer? <MAXimum | MINimum>")

Refer to the descriptions of the commands with similar keywords under the heading *Base Station Configuration* on page C–11 for discussion of the settings affected by these commands.

The command "CONFigure:MAXoutput[:SETTings]:DEFault" (no query) sets the values of all test parameters and source levels to their default values.

Minimum Output Test (Power Control)

The minimum power output test (CDMA only) measures the minimum power that the mobile station puts out at a given base station power when the closed loop power control algorithm commands minimum power. The following command starts the test, waits for it to finish, and returns (in order) the power measured from the mobile station and the waveform quality at that power level:

READ[:SCALar]:MINoutput[:ALL]?

The query "FETCh[:SCALar]:MINoutput:LIMit:FAIL[:ALL]?" returns (in order) 0 (pass) or 1 (fail) indicators for the minimum output power and waveform quality.

The commands that configure the parameters of the minimum output test all start with the keywords "CONFigure:MINoutput." The final header keywords and parameters for the commands are as follows:

- "ASTop <ALL | FIRSt | OFF>" command (query "ASTop?") — sets the auto stop function for the test. If the function is set to "FIRSt," the test terminates as soon as one test limit is exceeded. If the function is set to "ALL," the test terminates if all test limits are exceeded.
- "LIMit:POWer:[:UPPer] <power [DBM]>" (query "LIMit:POWer[:UPPer]?" — sets the maximum absolute power that the mobile station may output.
- "LIMIT:WQUality[:LOWer] <number> (query "LIMit:WQUality[:LOWer]?") — sets the minimum permitted waveform quality at the minimum power output of the mobile station.

The initial keywords of the commands for configuring the base station signal levels during the tests are the same as those given above. The final keywords and parameters are as follows:

- "SOURce[:CDMA]:LEVel:PILot <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:PILot? [<MAXimum | MINimum>]")
- "SOURce[:CDMA]:LEVel:TRAFfic <number [DB] | MAXimum | MINimum>" (query "SOURce[:CDMA]:LEVel:TRAFfic? [<MAXimum | MINimum>]")
- "SOURce[:CDMA]:POWer <number [DBM] | MAXimum | MINimum>" (query "SOURce[:CDMA]:POWer? <MAXimum | MINimum>")

Refer to the descriptions of the commands with similar keywords under the heading *Base Station Configuration* on page C–11 for discussion of the settings affected by these commands.

The command "CONFigure:MINoutput[:SETTings]:DEFault" (no query) sets the values of all test parameters and the source levels to their default values.

Transmitter Quality Test

This subsection discusses the tests for transmitter quality that are available for the CDMA and analog modes of operation.

CDMA. The transmitter quality test measures a number of parameters of the signal transmitted by the mobile station to determine how this signal compares to the ideal signal model. These parameters are the phase error, the magnitude error, the error vector magnitude, the carrier feedthrough, the imbalance between the I and Q channels, the carrier frequency error, the transmit time error, and the waveform quality. All measurements are made over 416 µs or 512 PN chips.

There are a number of queries for returning subsets of this test data. You can query the peak and RMS errors (in that order) of each subset using a query of the following form:

READ[:SCALar]:TQUality:ERRor:<test keyword>[:ALL]?

The query starts the test, waits for it to finish, and returns the results. These queries return data on the phase error, the magnitude error, or the error vector magnitude. Queries refer to this data with the test keywords "PHASe", "MAGNitude," and "EVMagnitude", respectively.

After the test has finished, the graphical data of each quantity throughout the frame may be queried. Separate queries obtain the 'x' (horizontal) and 'y' (vertical) data arrays. Corresponding values from each array (the first, the second, and so on) define the individual points of the graph.

The query "FETCh[:SCALar]:TQUality:ERRor:<test keyword>:GRAPh:COUNt?" obtains the number of points in the graph.

The query "FETCh:ARRay:TQUality:ERRor:<test keyword>:GRAPh:X?" obtains the horizontal data for the graph.

The query "FETCh:ARRay:TQUality:ERRor:<test keyword>:GRAPh:Y?" obtains the vertical data for the graph.

After any of the tests have been run (via the appropriate "READ?" query, the remainder of the test results can be returned via the "FETCh[:SCALar]:TQUality:WQUality[:ALL]?" query. The data is returned in the following order:

1. The carrier feedthrough
2. The IQ imbalance
3. The carrier frequency error
4. The transmit time error

5. The waveform quality

The following commands return pass/fail indications for the tests:

- "FETCh[:SCALar]:TQUality:EVMagnitude:LIMit:FAIL[:ALL]?" returns (in order) 0 (pass) or 1 (fail) indicators for the error vector magnitude peak and RMS values for the error vector magnitude test.
- "FETCh[:SCALar]:TQUality:MAGNitude:LIMit:FAIL[:ALL]?" returns (in order) 0 (pass) or 1 (fail) indicators for the magnitude error peak and RMS values for the magnitude error test.
- "FETCh[:SCALar]:TQUality:PHASe:LIMit:FAIL[:ALL]?" returns (in order) 0 (pass) or 1 (fail) indicators for the phase error peak and RMS values for the phase error test.
- "FETCh[SCALar]:TQUality:WQUality:LIMit:FAIL[:ALL?" returns (in order) 0 (pass) or 1 (fail) indicators for the carrier feedthru, IQ imbalance, carrier frequency error, transmit time error, and waveform quality values for the most recent transmitter quality test.

The command "CONFigure:TQUality:ASTop <OFF | ON>" (query "CONFigure:TQUality:ASTop?") sets the auto stop function for the test to "off" or "on." If the function is "on," the test terminates if one of the test limits is exceeded.

The command "CONFigure:TQUality[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

The remaining configuration commands for the transmitter quality test are divided into a group to set the test limits and a group to set the power levels of the source in the base station simulator. The test limit configuration commands start with the keywords "CONFigure:TQUality:LIMit." The final keywords and parameters for these commands are as follows:

- "CFEedthrough[:UPPer] <relative feedthrough [DB]>" (query "CFEedthrough[:UPPer]?) — sets the maximum level of the residual carrier feedthrough relative to the total output power of the mobile station.
- "ERRor:CFRequency <maximum frequency error [MHZ|KHZ|HZ]>" (query "ERRor:CFRequency?") — sets the maximum permitted error in carrier frequency.
- "ERRor:EVMagnitude:PEAK <max error>" (query "ERRor:EVMagnitude:PEAK?") — sets the maximum permitted peak error vector magnitude.
- "ERRor:EVMagnitude:RMS <max error>" (query "ERRor:EVMagnitude:RMS?") — sets the maximum permitted RMS error vector magnitude.
- "ERRor:MAGNitude:PEAK <max error>" (query "ERRor:MAGNitude:PEAK?") — sets the maximum permitted peak magnitude error.

- "ERRor:MAGNitude:RMS <max error>" (query "ERRor:MAGNitude:RMS?") — sets the maximum permitted RMS magnitude error.
- "ERRor:PHASe:PEAK <max error in degrees>" (query "ERRor:PHASe:PEAK?") — sets the maximum permitted peak phase error.
- "ERRor:PHASe:RMS <max error in degrees>" (query "ERRor:PHASe:RMS?") — sets the maximum permitted RMS phase error.
- "ERRor:TTIMe <max error [S | MS | US]>" (query "ERRor:TTIMe?") — sets the maximum permitted transmit time error.
- "IMBalance[:UPPer] <max imbalance [DB]>" (query "IMBalance[:UPPer]?") — sets the maximum permitted imbalance between the I and Q modulation channels.
- "WQUality[:LOWer] <min waveform quality>" (query "WQUality[:LOWer]?") — sets the minimum permitted waveform quality.

The commands for configuring the base station signal levels during the tests areas follow:

- "CONFigure:TQUality:SOURce[:CDMA]:LEVel:PILot <number [DB] | MAXimum | MINimum>" (query "CONFigure:TQUality:SOURce [:CDMA]:LEVel:PILot? [<MAXimum | MINimum>]")
- "CONFigure:TQUality:SOURce[:CDMA]:LEVel:TRAFfic <number [DB] | MAXimum | MINimum>" (query "CONFigure:TQUality:SOURce [:CDMA]:LEVel:TRAFfic? [<MAXimum | MINimum>]")
- "CONFigure:TQUality:SOURce[:CDMA]:POWer <number [DBM] | MAXimum | MINimum>" (query "CONFigure:TQUality:SOURce [:CDMA]:POWer? <MAXimum | MINimum>")

Refer to the descriptions of the command with similar keywords under the heading *Base Station Configuration* on page C–11 for discussion of the settings affected by these commands.

Analog. There are four different transmitter quality tests, each of which has different mnemonics in the command language.

- Hum/Noise

  The hum/noise test is started and the results are returned with the query: "READ[:SCALar]:ATQuality:HNOise[:ALL]?". The values returned are (in order) the relative level of hum/noise in dB and the audio peak deviation in Hz.

The pass/fail indications of the hum/noise test can be obtained with the query: "FETCh[:SCALar]:ATQuality:HNOise:LIMit:FAIL[:ALL]?". This query returns (in order) 0 (pass) or 1 (fail) indicators for the relative level of hum/noise and the audio peak deviation.

Test configuration involves setting test parameters and setting base station signal levels.

The commands for test parameter configuration are as follows:

- "CONFigure:ATQuality:HNOise:LIMit <hum/noise limit [DB]>" (query "CONFigure:ATQuality:HNOise:LIMit?") — sets the maximum permitted hum/noise value for the test in dB.
- "CONFigure:ATQuality:HNOise:TAPDeviation <target audio peak deviation [HZ]>" (query "CONFigure:ATQuality:HNOise:TAPDeviation?") — sets the target audio peak deviation for the hum/noise test. The audio peak deviation must approach this value and be within the range specified by the audio peak deviation error range before the hum/noise measurement will be taken.
- "CONFigure:ATQuality:HNOise:APDerange <audio peak deviation error range [HZ]>" (query "CONFigure:ATQuality:HNOise:APDerange?") — sets the audio peak deviation error range. The audio peak deviation must be within plus or minus this amount of the target audio peak deviation before the hum/noise measurement will be taken.

The commands for configuring the base station signal levels during the test are:

- "CONFigure:ATQuality:HNOise:SOURce:POWer <power [DBM]>" (query "CONFigure:ATQuality:HNOise:SOURce:POWer?") — sets the CMD 80 output power level for the hum/noise test.
- "CONFigure:ATQuality:HNOise:VMAC <voice channel mobile attenuation code>" (query "CONFigure:ATQuality:HNOise:VMAC?") — sets the voice channel mobile attenuation code for the hum/noise test.
- "CONFigure:ATQuality:HNOise:AFGen:FREQuency[:CW | :FIXed] <AF generator frequency [HZ]>" (query "CONFigure:ATQuality:HNOise:AFGen:FREQuency[:CW | :FIXed]?") — sets the AF generator frequency for the hum/noise test.
- "CONFigure:ATQuality:HNOise:AFGen:VOLTage <AF generator level [V] | OFF>" (query "CONFIgure:ATQuality:HNOise:AFGen:VOLTage?") — sets the AF generator level for the hum/noise test. Specifying a level turns the AF generator on, specifying "OFF" turns it off. Audio peak deviation in the mobile station is determined by this level.

The command "CONFigure:ATQuality:HNOise[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

- Modulation Noise/Distortion

  The modulation noise/distortion test is started and the results are returned with the query: "READ[:SCALar]:ATQuality:MNDistortion[:ALL]?". The values returned are (in order) the modulation noise/distortion in % and the audio peak deviation in Hz.

  The pass/fail indications of the modulation noise/distortion test can be obtained with the query: "FETCh[:SCALar]:ATQuality:MNDistortion:LIMit:FAIL[:ALL]?". This query returns (in order) 0 (pass) or 1 (fail) indicators for the modulation noise/distortion and the audio peak deviation.

  Test configuration involves setting test parameters and setting base station signal levels.

  The commands for test parameter configuration are as follows:

  - "CONFigure:ATQuality:MNDistortion:LIMit <modulation noise/distortion limit>" (query "CONFigure:ATQuality:MNDistortion:LIMit?") — sets the maximum permitted modulation noise/distortion value for the test in %.
  - "CONFigure:ATQuality:MNDistortion:TAPDeviation <target audio peak deviation [HZ]>" (query "CONFigure:ATQuality:MNDistortion:TAPDeviation?") — sets the target audio peak deviation for the modulation noise/distortion test. The audio peak deviation must approach this value and be within the range specified by the audio peak deviation error range before the modulation noise/distortion measurement will be taken.
  - "CONFigure:ATQuality:MNDistortion:APDerange <audio peak deviation error range [HZ]>" (query "CONFigure:ATQuality:MNDistortion:APDerange?") — sets the audio peak deviation error range. The audio peak deviation must be within plus or minus this amount of the target audio peak deviation before the modulation noise/distortion measurement will be taken.

  The commands for configuring the base station signal levels during the test are:

  - "CONFigure:ATQuality:MNDistortion:SOURce:POWer <power [DBM]>" (query "CONFigure:ATQuality:MNDistortion:SOURce:POWer?") — sets the CMD 80 output power level for the modulation noise/distortion test.
  - "CONFigure:ATQuality:MNDistortion:VMAC <voice channel mobile attenuation code>" (query "CONFigure:ATQuality:MNDistortion:VMAC?") — sets the voice channel mobile attenuation code for the modulation noise/distortion test.

- "CONFigure:ATQuality:MNDistortion:AFGen:FREQuency[:CW | :FIXed] <AF generator frequency [HZ]>" (query "CONFigure:ATQuality:MNDistortion:AFGen:FREQuency[:CW | :FIXed]?") — sets the AF generator frequency for the modulation noise/distortion test.

- "CONFigure:ATQuality:MNDistortion:AFGen:VOLTage <AF generator level [V] | OFF>" (query "CONFIgure:ATQuality:MNDistortion:AFGen:VOLTage?") — sets the AF generator level for the modulation noise/distortion test. Specifying a level turns the AF generator on, specifying "OFF" turns it off. Audio peak deviation in the mobile station is determined by this level.

The command "CONFigure:ATQuality:MNDistortion[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

- Audio Frequency response

  The audio frequency response test provides a graph of the mobile station transmitted audio as a function of frequency. The following query starts the test, waits for it to finish, and returns the mobile station audio level in dBm: "READ[:SCALar]:ATQuality:AFResponse?".

  After the test has completed, the graphical data of power as a function of frequency can be obtained. Separate queries obtain the 'x' (horizontal or frequency) and 'y' (vertical or power referenced to the mobile station audio level returned by the READ query) data arrays. Corresponding values from each array (the first, the second, etc.) define the individual points of the graph.

  The query "FETCh[:SCALar]:ATQuality:AFResponse:GRAPh:COUNt?" obtains the number of points in the graph.

  The query "FETCh:ARRay:ATQuality:AFResponse:GRAPh:X?" obtains the horizontal data for the graph.

  The query "FETCh:ARRay:ATQuality:AFResponse:GRAPh:Y?" obtains the vertical data for the graph.

  The query "FETCh:ARRay:ATQuality:AFResponse:LIMit:FAIL?" obtains 0 (pass) or 1 (fail) indicators for the two horizontal regions of the graph.

  Test configuration involves setting test parameters and setting base station signal levels.

The commands for test parameter configuration are as follows:

- "CONFigure:ATQuality:AFResponse:LIMit:BOTH:FREQuency:LOWest <frequency [HZ]>" (query "CONFigure:ATQuality:AFResponse:LIMit:BOTH:FREQuency:LOWest?") — sets the lowest frequency used on both of the limit lines of the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:BOTH:FREQuency:HIGHest <frequency [HZ]>" (query "CONFigure:ATQuality:AFResponse:LIMit:BOTH:FREQuency:HIGHest?") — sets the highest frequency used on both of the limit lines of the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle <frequency [HZ]>" (query "CONFigure:ATQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle?") — sets the middle frequency used in the lower limit line of the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:UPPer:LEVel <level [DB]>" (query "CONFigure:ATQuality:AFResponse:LIMit:UPPer:LEVel?") — sets the level of the upper limit line for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:LOWer:LEVel:UPPer <level [DB]>" (query "CONFigure:ATQuality:AFResponse:LIMit:LOWer:LEVel:UPPer?") — sets the upper level of the lower limit line for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:LOWer:LEVel:LOWer <level [DB]>" (query "CONFigure:ATQuality:AFResponse:LIMit:LOWer:LEVel:LOWer?") — sets the lower level of the lower limit line for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:UPPer:COUNT?" returns the number of points which describe the upper limit line for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:UPPer:GRAPh:X?" returns the horizontal data for the upper limit line for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:UPPer:GRAPh:Y?" returns the vertical data for the upper limit line for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:LOWer:COUNT?" returns the number of points which describe the lower limit line for the audio frequency response test.

- "CONFigure:ATQuality:AFResponse:LIMit:LOWer:GRAPh:X?" returns the horizontal data for the lower limit line for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:LIMit:LOWer:GRAPh:Y?" returns the vertical data for the lower limit line for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:SPOints <sample points>" (query "CONFIgure:ATQuality:AFResponse:SPOints?") — sets the number of sample points to be taken during the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:TAPDeviation <target audio peak deviation [HZ]>" (query "CONFigure:ATQuality:AFResponse:TAP-Deviation?") — sets the target audio peak deviation for the audio frequency response test. This value and the audio peak deviation increment determine the audio level input to the mobile station.
- "CONFigure:ATQuality:AFResponse:APDincrement <deviation increment [HZ]>" (query "CONFigure:ATQuality:AFResponse:AP-Dincrement?") — sets the audio peak deviation increment value. This value and the target audio peak deviation determine the audio level input to the mobile station.

The commands for configuring the base station signal levels during the test are as follows:

- "CONFigure:ATQuality:AFResponse:SOURce:POWer <power [DBM]>" (query "CONFigure:ATQuality:AFResponse:SOURce:POW-er?") — sets the CMD 80 output power level for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:SOURce:FREQuency:MODula-tion <modulation frequency [HZ]>" (query "CONFigure:ATQual-ity:AFResponse:SOURce:FREQuency:MODulation?") — sets the modulation frequency for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:SOURce:FM:DEViation:MODula-tion <peak deviation [HZ]>" (query "CONFigure:ATQuality:AFRes-ponse:SOURce:FM:DEViation:MODulation?") — sets the peak deviation of the audio modulation for the audio frequency response test.
- "CONFigure:ATQuality:AFResponse:VMAC <voice channel mobile attenuation code>" (query "CONFigure:ATQuality:AFRes-ponse:VMAC?") — sets the voice channel mobile attenuation code for the audio frequency response test.

The command "CONFigure:ATQuality:AFResponse[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

- Modulation Limiting

  The modulation limiting test is started and the results are returned with the query: "READ[:SCALar]:ATQuality:MLIMiting?". The value returned is the audio peak deviation in Hz.

  The pass/fail indications of the modulation limiting test can be obtained with the query: "FETCh[:SCALar]:ATQuality:MLIMiting:LIMit:FAIL?". This query returns 0 (pass) or 1 (fail) indicators for the audio peak deviation.

  Test configuration involves setting test parameters and setting base station signal levels.

  The commands for test parameter configuration are:

  - "CONFigure:ATQuality:MLIMiting:LIMit <audio peak deviation limit [HZ]>" (query "CONFigure:ATQuality:MLIMiting:LIMit?") — sets the maximum permitted audio peak deviation value for the test in Hz.

  The commands for configuring the base station signal levels during the test are as follows:

  - "CONFigure:ATQuality:MLIMiting:SOURce:POWer <power [DBM]>" (query "CONFigure:ATQuality:MLIMiting:SOURce:POWer?") — sets the CMD 80 output power level for the modulation limiting test.
  - "CONFigure:ATQuality:MLIMiting:VMAC <voice channel mobile attenuation code>" (query "CONFigure:ATQuality:MLIMiting:VMAC?") — sets the voice channel mobile attenuation code for the modulation limiting test.
  - "CONFigure:ATQuality:MLIMiting:AFGen:FREQuency[:CW | :FIXed] <AF generator frequency [HZ]>" (query "CONFigure:ATQuality:MLIMiting:AFGen:FREQuency[:CW | :FIXed]?") — sets the AF generator frequency for the modulation limiting test.
  - "CONFigure:ATQuality:MLIMiting:AFGen:VOLTage <AF generator level [V] | OFF>" (query "CONFIgure:ATQuality:MLIMiting:AFGen:VOLTage?") — sets the AF generator level for the modulation limiting test. Specifying a level turns the AF generator on; specifying "OFF" turns it off. Audio peak deviation in the mobile station is determined by this level.

  The command "CONFigure:ATQuality:MLIMiting[:SETTings]:DEFault" (no query) sets all of the test parameters and source levels to their default values.

Analog Handoffs

When testing a dual mode (CDMA/Analog Mode) mobile station, the CMD 80 can instruct the mobile station to switch from the digital mode to the analog mode. This simulates the handoff of a call from a CDMA base station to an analog base station. Option B82 must be installed to support this operation.

The "PROCedure:CTMS:CALL ATESt" command (no query) performs the handoff.

The parameters of the handoff may be configured with the commands that start with "CONFigure:ABSTation" described previously.

Power Level Maintenance

When testing a mobile station, it may be desirable to repeat a measurement several times. Under normal operation, the CMD 80 may change the power level between the base station configuration level and the measurement-specific level. To maintain the measurement-specific level, the "CONFigure:SPECial:MPOWer[:STATe] ON" command should be used. To restore normal operation, the "CONFigure:SPECial:MPOWer[:STATe] OFF" command should be used. Repeated measurements can be done in less time if the power is kept at the measurement-specific level.

Appendix D: Remote Control Command Tables

This appendix contains a listing of the remote command catagories and a brief explanation about reading the data in the command tables.

Remote Command Groups

The remote commands are organized into the following groups and subgroups:

Common (*) Commands Use these common commands to set and query registers and machine information.

Instrument State Use these command to set and query the CMD 80 instrument setup.

- configuration and results
- external attenuation and gain
- timing and synchronization
- save and recall
- additional measurements

CDMA Base Station Use these commands to set and query the CMD 80 base station configuration.

- configuration and results
- parameters

CDMA Manual Test Use these commands to configure and query the results for manual tests.

- configuration and results
- power control
  - gated power
  - open loop time response
  - maximum and minimum output
- receiver quality
  - sensitivity
  - dynamic range

- traffic channel demodulation
- user defined

- transmitter quality
- handoff

CDMA Module Test

Use these commands to configure and query the results for module tests.

Analog Commands

These commands are available when the tester has Option 17 (Analog Mode) installed. The commands are grouped into the following categories:

- Analog BS parameters
- Analog BS signal
- Unregistered and registered states — general measurements
- Call established state
  - General measurements
  - Receiver quality measurements
    - Sensitivity
    - Hum/Noise
    - Harmonic distortion
    - Audio frequency response
  - Transmitter quality measurements
    - Hum/Noise
    - Modulation noise/distortion
    - Audio frequency response
    - Modulation limiting

Interpreting the Command Tables

The headings for the tables in the *Remote Commands* section starting on page D–5 have the following meanings:

Command This column lists the command string, consisting of the command keywords, separated by colons (:), and possible command arguments. The table uses the general SCPI conventions for short and long forms, optional keywords, and listing parameters (see *Appendix B: Remote Control).*

Values This column gives the limits of the argument, if any, to the command or which will be returned by the query. If a command has an associated query and the range of values returned by the query is the same as the range accepted by the command (the usual case), no values will be indicated for the query. If the values returned by the query are different or if there is only a query for the function, the possible return values are indicated under the *Values* heading for the query.

The argument equivalent to the value the command will have after reset (or after an "xxxx[:SETTings]:DEFault" command affecting the value) is underlined as follows:

- If the arguments are character arguments, the underlining is done in the *Command* column.
- If the arguments are numeric, the underlining is done in the *Values* column.
- If necessary, an intermediate value will be included in the *Values* column. (For example, assume that a command has possible argument values of –10.0 to 20.0. With a default of –10.0, the range is indicated as –10.0 to 20.0. With a default of 0.0, the range is indicated as –10.0 to 0.0 to 20.0.)
- The precision of an argument is equal to the the unit value of the least significant digit of an argument. For example, the precision of an argument with a range of 0 to 999 is 1; the precision of an argument with a range of 0.000 to 0.999 is o.001

Commands that accept numeric parameters can also accept the special character parameters "MAXimum" and "MINimum." These arguments set the value of the command item to the upper or the lower limits of the range accepted by the instrument. Such a command also has associated queries for the maximum and minimum values: if the command header is "<xxxx>," then the queries are "<xxxx>? MAXimum" and "<xxxx>? MINimum." These queries give the respective ends of the range and not the current value.

NOTE. *The STATus and common (*) commands do not accept the MAX or MIN arguments.*

States This column lists the state or states of the CMD 80 when the command is valid using the mnemonics shown in Figure C–3 on page C–4. ALL indicates that the command is valid in all states.

NOTE. *All queries are accepted in all states; however, query results are meaningful only when they are issued in a state when they are specified as valid.*

Notes The notes indicated in this column contain information that is important in programming with the command.

CMD 80 Remote Commands

Table D–1: CMD 80 common commands

Command	Values	State	Notes
*CLS		ALL	
*ESE <number for Event Status Enable register>	0 to 255	ALL	
*ESE?		ALL	
*ESR?	0 to 255	ALL	
*IDN?	See note	ALL	1
*IST?	0 | 1	ALL	
*OPC		ALL	2
*OPC?	1	ALL	2
*OPT?	See note	ALL	3
*PRE <number for Parallel Poll Enable register>	0 to 255	ALL	
*PRE?		ALL	
*PSC <numeric>	–32767 to 1 to 32767	ALL	4
*PSC?	0 | 1	ALL	
*RST		ALL	
*SRE <number for Service Request Enable register>	0 to 191	ALL	
*SRE?		ALL	
*STB?	0 to 255	ALL	
*TST?	0 to 255	ALL	5
*WAI		ALL	

1 **The response to the "*idn?" query is "Tektronix/Rohde&Schwarz, CMD80, {serial number}, AT:a.a BR:b.b LH:l.l." The a's are replaced by the version number of the main instrument software. The b's are replaced by the version number of the boot ROM on the link handler board. The l's are replaced by the version number of the link handler firmware.**

2 **Also influences the OPC bit in the event status register.**

3 **The options string consists of a comma-separated list. There is a position in the list for every option. If the option is present, the option designator is given. If the option is not present, the designator is replaced with a '0.' For example, the response for an instrument with only GPIB installed is "0,0,B60,B61,0,0,0."**

4 **Any numeric value is accepted, but the result is rounded to either 0 or 1. A 0 enables the power-on SRQ, while a 1 disables the power-on SRQ.**

5 **A return value of 0 indicates no errors in the self test.**

Table D–2: Instrument state commands

Command	Values	State	Notes
DISPlay:ENABle <OFF | ON>		ALL	
PROCedure:SELect[:TEST] <MANual | CMTest | AMANual | AMTest | NONE>		See note	1
STATus:OPERation:CMD:ENABle <enable mask>	0 – 32767	ALL	
STATus:OPERation:ENABle <enable mask>	0 – 32767	ALL	
STATus:PRESet		ALL	
STATus:QUEStionable:ENABle <enable mask>	0 – 32767	ALL	
SYSTem:COMMunicate[:SELF]:ADDRess <GPIB address>	1 – 30	ALL	
SYSTem:PRESet		ALL	2
SYSTem:VERSion?	YYYY.V	ALL	3
Instrument state queries			
DISPlay:ENABle?		ALL	
PROCedure:SELect[:TEST]?	MAN, CMT, NONE, AMAN, AMT	ALL	
STATus:DEVIce?	IDLE, MINI, MIDL, CE1, CE2, CMT, AMIN. AMID, ACE, AMT	ALL	4
STATus:OPERation:CMD:CONDition?	0 – 15	ALL	
STATus:OPERation:CMD:ENABle?		ALL	
STATus:OPERation:CMD[:EVENt]?	0 – 15	ALL	
STATus:OPERation:CONDition?	0 – 32767	ALL	
STATus:OPERation:ENABle?		ALL	
STATus:OPERation[:EVENt]?	0 – 32767	ALL	
STATus:QUEStionable:CONDition?	0 – 32767	ALL	
STATus:QUEStionable:ENABle?		ALL	
STATus:QUEStionable[:EVENt]?		ALL	
SYSTem:COMMunicate[:SELF]:ADDRess <GPIB address>	1 – 30	ALL	

1 **The "NONE" argument can be given in all states. The "MANual", "CMTest", "AMANual", and "AMTest"arguments can be given only in the IDLE state.**

2 **This command is equivalent to "*RST?"**

3 **"YYYY" is the year of SCPI compliance. "V" is the version number within the year.**

4 **Status commands do not have, use, or respond to MAX and MIN arguments.**

Table D–2: Instrument state commands (Cont.)

Command	Values	State	Notes
SYStem:ERRor[:NEXT]?	–32768 – 32767 and error string	ALL	5
SYSTem:OPTions?		ALL	6
Instrument state – external attenuation and gain			
ROUTe:IOConnector <I1O1 | I1O2 | I2O1 | I2O2>		IDLE	7
ROUTe:IOConnector?		ALL	7
SENSe:CORRection:LOSS[:INPut][:MAGNitude]:RIALternate <loss [DB]>	–40.0 dB to 0.0 dB to +90.0 dB	ALL	8
SENSe:CORRection:LOSS[:INPut][:MAGNitude]:RIALternate?		ALL	8
SENSe:CORRection:LOSS[:INPut][:MAGNitude]:RIOutput<loss[DB]>	–40.0 dB to 0.0 dB to +50.0 dB	ALL	8, 9
SENSe:CORRection:LOSS[:INPut][:MAGNitude]:RIOutput?		ALL	8
SOURce:CORRection:LOSS[:OUTPut][:MAGNitude]:ROALternate <loss [DB]>	–40.0 dB 0.0 dB +90.0 dB	ALL	8
SOURce:CORRection:LOSS[:OUTPut][:MAGNitude]:ROALternate?		ALL	8
SOURce:CORRection:LOSS[:OUTPut]:OFFSet:RIOutput<value>	–40.0 dB 0.0 dB +50.0 dB	ALL	8, 9
SOURce:CORRection:LOSS[:OUTPut]:OFFSet:RIOutput?			
SOURce:CORRection:LOSS[:OUTPut][:MAGNitude]:RIOutput?		ALL	8

5 **Negative numbers are SCPI-defined errors. Positive numbers are instrument-specific errors. 0 indicates no errors.**

6 **This query is equivalent to "*OPT?".**

7 **In the argument or response "I<x>O<y>," <x> specifies the input connector and <y> specifies the output connector. In each case, a value of "1" indicates the common RF IN/RF OUT connector, and a value of "2" indicates the separate input or output connector. Only one input and one output are active at any one time; those not selected are unavailable for use.**

8 **Negative values indicate gain. Positive values indicate loss.**

9 **Since "RIOutput" represents the common input/output connector, setting the external loss in either the "SENSe" or the "SOURce" subsystems will set the loss for this connector in the other subsystem. If both commands are sent, either in the same message or in different messages, the last loss value sent will take effect.**

Table D–2: Instrument state commands (Cont.)

Command	Values	State	Notes
Instrument state – reference and timing			
CONFigure:TSIGnal:SCDivisor <divisor>	1, 4, 8, 12, ...1024	ALL	10
CONFigure:TSIGnal:SCDivisor?			
CONFigure:TSIGnal:SCLock? (query only)		ALL	11
CONFigure:TSIGnal:SELect <NONE | PP2S | FSUPer | FPAGing | FSYNc | FPControl | SCLock>		ALL	12
CONFigure:TSIGnal:SELect?			
CONFigure:TSIGnal[:SETTings]:DEFault		ALL	
SENSe:ROSCillator:SOURce <I10Mhz | E1MHz | E2MHz | E5MHz | E10Mhz>			13
SENSe:ROSCillator:SOURce?			
SENSe:ROSCillator:OUTPut <SREFerence | RIPassthrough>			14
SENSe:ROSCillator:OUTPut?			
SENSe:ROSCillator[:SETTings]:DEFault			
SOURce:ROSCillator:OUTPut <SREFerence | RIPassthrough>			14
SOURce:ROSCillator:OUTPut?			
SOURce:ROSCillator[:SETTings]:DEFault			
SOURce:ROSCIllator:SOURce <I10Mhz | E1MHz | E2MHz | E5MHz | E10Mhz>			13
SOURce:ROSCIllator:SOURce?			
Instrument state – save and recall			
MMEMory1:RECall		ALL	15
MMEMory2:RECall		ALL	15
MMEMory3:RECall		ALL	15
MMEMory4:RECall		ALL	15
MMEMory5:RECall		ALL	15
MMEMory6:RECall		ALL	15
MMEMory7:RECall		ALL	15

10 **Use this command to select or query the value used to divide the 19.6608 MHz system clock to generate the timing signal when the system clock is selected as the timing signal.**

11 **Use this query to list the timing signal frequency (in MHz) when the system clock is selected.**

12 **Use this command to select or query the source of the timing signal.**

13 **Selects the source of the reference frequency as either the internal 10 MHz or an external 1, 2, 5, or 10 MHz source applied to the rear panel REF IN connector.**

14 **Selects the origin of the reference frequency output signal at the REF OUT connector on the rear panel. The signal can either be the system reference or the signal passed through the REF IN.**

15 **The short form of the first keyword is formed by the characters "MMEM" with an appended number of from 1 to 13.**

Table D–2: Instrument state commands (Cont.)

Command	Values	State	Notes
MMEMory8:RECall		ALL	16
MMEMory9:RECall		ALL	16
MMEMory10:RECall		ALL	16
MMEMory11:RECall		ALL	16
MMEMory12:RECall		ALL	16
MMEMory13:RECall		ALL	16
MMEMory1:SAVE		ALL	16
MMEMory2:SAVE		ALL	16
MMEMory3:SAVE		ALL	16
MMEMory4:SAVE		ALL	16
MMEMory5:SAVE		ALL	16
MMEMory6:SAVE		ALL	16
MMEMory7:SAVE		ALL	16
MMEMory8:SAVE		ALL	16
MMEMory9:SAVE		ALL	16
MMEMory10:SAVE		ALL	16
MMEMory11:SAVE		ALL	16
MMEMory12:SAVE		ALL	16
MMEMory13:SAVE		ALL	16
MMEMory1:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	16
MMEMory1:SAVE:NAME?		ALL	16
MMEMory2:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	16
MMEMory2:SAVE:NAME?		ALL	16
MMEMory3:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	16
MMEMory3:SAVE:NAME?		ALL	16
MMEMory4:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	16
MMEMory4:SAVE:NAME?		ALL	16
MMEMory5:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	16
MMEMory5:SAVE:NAME?		ALL	16
MMEMory6:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	16
MMEMory6:SAVE:NAME?		ALL	16
MMEMory7:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	16

16 **The short form of the first keyword is formed by the characters "MMEM" with an appended number of from 1 to 13.**

Table D–2: Instrument state commands (Cont.)

Command	Values	State	Notes
MMEMory7:SAVE:NAME?		ALL	17
MMEMory8:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	17
MMEMory8:SAVE:NAME?		ALL	17
MMEMory9:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	17
MMEMory9:SAVE:NAME?		ALL	17
MMEMory10:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	17
MMEMory10:SAVE:NAME?		ALL	17
MMEMory11:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	17
MMEMory11:SAVE:NAME?		ALL	17
MMEMory12:SAVE:NAME <name string (≤30 characters) to be associated with memory>		AL	17
MMEMory12:SAVE:NAME?		ALL	17
MMEMory13:SAVE:NAME <name string (≤30 characters) to be associated with memory>		ALL	17
MMEMory13:SAVE:NAME?		ALL	17
MMEMory:TYPE <INTernal | MEMCard>		ALL	18
MMEMory:TYPE?		ALL	
SYSTem:USER1:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER1:NAME?		ALL	
SYSTem:USER2:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER2:NAME?		ALL	
SYSTem:USER3:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER3:NAME?		ALL	
SYSTem:USER4:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER4:NAME?		ALL	
SYSTem:USER5:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER5:NAME?		ALL	
SYSTem:USER6:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER6:NAME?		ALL	
SYSTem:USER7:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER7:NAME?		ALL	
SYSTem:USER8:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER8:NAME?		ALL	
SYSTem:USER9:NAME <name string (≤30 characters) to be associated with this user>		ALL	

17 **The short form of the first keyword is formed by the characters "MMEM" with an appended number of from 1 to 13.**

18 **The "MEMCard" argument is applicable only with Option B62, Memory Card Interface.**

Table D–2: Instrument state commands (Cont.)

Command	Values	State	Notes
SYSTem:USER9:NAME?		ALL	
SYSTem:USER10:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER10:NAME?		ALL	
SYSTem:USER11:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER11:NAME?		ALL	
SYSTem:USER12:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER12:NAME?		ALL	
SYSTem:USER13:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER13:NAME?		ALL	
SYSTem:USER14:NAME <name string (≤30 characters) to be associated with this user>		ALL	
SYSTem:USER14:NAME?		ALL	
SYSTem:USER:SELect <USER1 | USER2 | USER3 | USER4 | USER5 | USER6 | USER7 |USER8 | USER9 | USER10 | USER11 | USER12 | USER13 | USER14>		ALL	
SYSTem:USER:SELect?		ALL	
Instrument state – additional measurements			
READ[:SCALar]:CURRent[:DC][:AVERage]?	0.000 A to 10.000 A	ALL	
READ[:SCALar]:CURRent[:DC]:MAXimum?	0.000 A to 10.000 A	ALL	
READ[:SCALar]:CURRent[:DC]:MINimum]?	0.000 A to 10.000 A	ALL	
READ[:SCALar]:VOLTage[:DC]?	0.00 volt to 20.00 volt	ALL	

Table D–3: CDMA base station commands

Command	Values	State	Notes
CONFigure:BSTation:NETWork <USC | PJS008 | PUIS95 | PKOR | JPC>		IDLE	1
CONFigure:BSTation:NETWork?	USC, PJS, PUIS, PKOR	ALL	
CDMA base station – configuration			
CONFigure:BSTation:FOFFset <frame offset>	0 to 15	ALL	
CONFigure:BSTation:FOFFset?		ALL	
CONFigure:BSTation:FREQuency:CHANnel <RF channel number>		CE1, CE2, IDLE	2
CONFigure:BSTation:FREQuency:CHANnel?		ALL	
CONFigure:BSTation:FREQuency:SYSTem?		ALL	
CONFigure:BSTation:PNOFfset <PN offset>	0 to 511	IDLE, CE1, CE2	
CONFigure:BSTation:PNOFfset?		ALL	
CONFigure:BSTation[:SETTings]:DEFault		ALL	3
CONFigure:BSTation:SOURce[:CDMA]:LEVel:OCNS?		ALL	
CONFigure:BSTation:SOURce[:CDMA]:LEVel:PAGing <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –12.0 dB to –7.0 dB	ALL	
CONFigure:BSTation:SOURce[:CDMA]:LEVel:PAGing?		ALL	

1 **Establishes the network protocol and frequency parameters that the CMD 80 will operate under. "Selection Error" is returned if a network selection is made that is not installed. This value is reset by *RST and SYSTem:PRESet.**

2 **US Cellular range is 1 to 799, 990 to 1023. PCS range is 0 to 25 to 1199. Korean PCS range is 0 to 25 to 1300. Japan Cellular range is 0 to 75 to1199.**

3 **The settings associated with the commands which cannot be used in the present state of the CMD 80 will not be affected.**

Table D–3: CDMA base station commands (Cont.)

Command	Values	State	Notes
CONFigure:BSTation:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:BSTation:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:BSTation:SOURce[:CDMA]:LEVel:SYNC <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –16.0 dB to –7.0 dB	ALL	
CONFigure:BSTation:SOURce[:CDMA]:LEVel:SYNC?		ALL	
CONFigure:BSTation:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –14.0 dB to –7.0 dB	ALL	
CONFigure:BSTation:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	
CONFigure:BSTation:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	4, 5,6
CONFigure:BSTation:SOURce[:CDMA]:POWer?		ALL	6
CONFigure:BSTation:TCHannel <traffic channel>	2 to 8 to 31, 33 to 63	ALL	
CONFigure:BSTation:TCHannel?		ALL	
CDMA base station – parameters			
CONFigure:BSTation:ATYPe <MIN | IMSI>		IDLE	7
CONFigure:BSTation:ATYPe ?		ALL	
CONFigure:BSTation:BSIDentity <base station identity>	0 to 1 to 65535	IDLE	
CONFigure:BSTation:BSIDentity?		ALL	
CONFigure:BSTation:NIDentity <network identity>	0 to 1 to 65534	IDLE	

4 **The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –70.0 dBm to –19.0 dBm. When using the "RF OUT 2" connector under the same conditions, the power range is –113.0 dBm to –70.0 dBm to +1.0 dBm.**

5 **If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –70 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.**

6 **If the CMD 80 is in the "IDLE" state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state, the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.**

7 **The default value depends on the network selection and protocol revision.**

Table D–3: CDMA base station commands (Cont.)

Command	Values	State	Notes
CONFigure:BSTation:NIDentity?		ALL	
CONFigure:BSTation:PARameters[:SETTings]:DEFault		ALL	
CONFigure:BSTation:PREVision <protocol revision>	1 to 3 for IS-95, 1 for J-STD-008	IDLE	
CONFigure:BSTation:PREVision?		ALL	
CONFigure:BSTation:PRSet <RS1 | RS2>		IDLE, MINI, MIDL	8
CONFigure:BSTation:SIDentity <system identity>	1 to 32767	IDLE	
CONFigure:BSTation:SIDentity?		ALL	

8 **Establishes the user's preference of the data "rate set" used during a call. The actual rate set may vary from this depending on the mobile station capabilities. Note: The 13k rate is only supported if the option is installed. This value is reset by *RST and SYSTem:PRESet.**

Table D–4: CDMA manual test commands

Command	Values	State	Notes
CDMA manual test – configuration			
CONFigure:IACCess:ASTop <OFF|ON>			
CONFigure:IACCess:ASTop?			
CONFigure:IACCess:LIMit:POWer:STANdby[:UPPer] <maximum mobile station standby power [DB]>	–81.0 dBm to –61.0 dBm to –41.0 dBm	ALL	
CONFigure:IACCess:LIMit:POWer:STANdby[:UPPer]?		ALL	
CONFigure:IACCess[:SETTings]:DEFault		ALL	
CDMA manual test – results			
FETCh[:SCALar]:MSINfo[:ALL]?	See note	ALL	1
FETCh[:SCALar]:IACCess:POWer:STANdby:LIMit:FAIL?			2
FETCh[:SCALar]:WQUality:LIMit:FAIL[:ALL]?			3
PROCedure:CTMStation:MINumber?		ALL	4
READ[:SCALar]:IACCess:POWer:APRobe?	See note	MIDL	5
READ[:SCALar]:IACCess:POWer:STANdby?	See note	MIDL	6
READ[:SCALar]:POWer:MSTation[:ALL]	See note	CE2	7, 8
READ[:SCALar]:POWer:RPILot?	See note	CE2	9
READ[:SCALar]:WQUality[:ALL]?	See note	CE2	10

1 The values of the mobile station identification number and the serial mumber are determined by what has been programmed into the phone. The value of the power class is 1 to 3 based on the most recent mobile registration.

2 The result returned is the pass/fail value for the standby powr measurement.

3 The values returned are the pass/fail values for the carrier frequency error, transmit time error, and waveform quality measurements.

4 The Mobile Station Identification Number (MIN) is provided by the remote command to let the CMD 80 page the mobile station to speed up the process of registration. When the mobile station registers, it will provide its internal MIN. The CMD 80 stores only the last received MIN, regardless of its source.

5 The result returned is the measured power of the last access probe sent by the mobile station.

6 The result returned is the measured power of the mobile station between access probes.

7 The returned results are the measured power from the mobile station and the expected power from the mobile station based on the current power of the base station.

8 Returns the pilot power of the base station as reported by the mobile station.

9 From experience, some mobile stations do not properly report the pilot power. When this happens, this query will never return a response.

10 The results returned are: carrier frequency error, transmit time error, and waveform quality.

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CDMA manual test – operations			
CONFigure:BSTation:ARSet?	RS1, RS2	ALL	11
CONFigure:BSTation:AVOCoder?	BAS, ENH		
CONFigure:BSTation:FREQuency:BLOCk?	A, B, C, D, E, F	ALL	12
CONFigure:BSTation:FREQuency:CHANnel <RF channel number>		CE1, CE2, IDLE	13, 14, 15
CONFigure:BSTation:FREQuency:CHANnel?		ALL	
CONFigure:BSTation:PNOFfset <PN offset>	0 to 511	IDLE, CE1, CE2	
CONFigure:BSTation:PNOFfset?		ALL	
CONFigure:BSTation:PRSet <RS1 | RS2>		ALL	
CONFigure:BSTation:PRSet?		ALL	
CONFigure:BSTation:PVOCoder <BASic | ENHanced>			
CONFigure:BSTation:PVOCoder?			
CONFigure:BSTation:RPERiod <S12 | S14 | S17 | S20 | S24 | S29 | S34 | S41 | S49 | S58 | S69 | S82 | S97 | S116 | OFF>			16
CONFigure:BSTation:RPERiod?			17
CONFigure:BSTation:TCHannel <traffic channel>	2 to 8 to 31, 33 to 63	ALL	
CONFigure:BSTation:TCHannel?		ALL	
FETCh[:SCALar]:DNUMber?			
PROCedure:CTMStation:CALL <TEST | VOICe>		MIDL, MINI, AMID, AMIN	18

11 **Returns the actual data "rate set" used during a call.**

12 **Query only. Returns the PCS block of the currently selected PCS RF channel.**

13 **US Cellular range is 1 to 799, 990 to 1023. PCS range is 0 to 25 to 1199. Korean PCS rante is 0 to 25 to 1300.**

14 **IDLE state permitted in PCS networks only.**

15 **When the call is released, the channel sent with this command will be overwritten with the one indicated by the values associated with the "CONFigure:BSTation:FREQuency:SELect " and "CONFigure:BSTation:FREQuency:SYSTem" commands.**

16 **This command controls the periodic registration time period. the reset value is S12.**

17 **Returns S12, S14, S17, S20, S24, S29, S34, S41, S49, S58, S69, S82, S97, S116, or OFF.**

18 **When executed in the MINI state the CMD 80 uses the most recent MIN to address the mobile station. The MIN source is either the most recent registration or from the PROC:CTMS:MIN command.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
PROCedure:CTMStation:MINumber <string containing mobile ID number>	Number up to 16 digits	ALL	19
PROCedure:CTMStation:MINumber?		ALL	
PROCedure:CTMStation:RELease		ALL	
CDMA manual test – power control (gated output power)			
CONFigure:GOUTput:ASTop <ON | OFF>		ALL	
CONFigure:GOUTput:ASTop?		ALL	
CONFigure:GOUTput:AVERage:COUNt <number of power control groups averaged>	2 to 100 to 1000	ALL	
CONFigure:GOUTput:AVERage:COUNt?		ALL	
CONFigure:GOUTput:LIMit:FTIMe[:UPPer] <maximum fall time [US | MS | S |SEC]>	0.0 µs to 6.0 µs to 8.0 µs	ALL	
CONFigure:GOUTput:LIMit:FTIMe[:UPPer]?		ALL	
CONFigure:GOUTput:LIMit:LOWer:COUNt?	4	ALL	
CONFigure:GOUTput:LIMit:LOWer:GRAPh:X?	0 to 131	ALL	20
CONFigure:GOUTput:LIMit:LOWer:GRAPh:Y?	–30 dB to +5 dB	ALL	21
CONFigure:GOUTput:LIMit:POWer:OFF:ABSolute[:UPPer] <maximum mobile station off power [DBM]>	–70.0 dBm to –54.0 dBm to 0.0 dBm	ALL	
CONFigure:GOUTput:LIMit:POWer:OFF:ABSolute[:UPPer]?		ALL	
CONFigure:GOUTput:LIMit:POWer:OFF:RELative[:UPPer] <maximum mobile station off power with respect to mean power [DB]>	–25.0 dB to –20.0 dB to 0.0 dB	ALL	
CONFigure:GOUTput:LIMit:POWer:OFF:RELative[:UPPer]?		ALL	
CONFigure:GOUTput:LIMit:POWer:ON:RELative[:LOWer] <minmum mobile station on power with respect to mean power [DB]>	–25.0 dB to –3.0 dB to 0.0 dB	ALL	
CONFigure:GOUTput:LIMit:POWer:ON:RELative[:LOWer]?		ALL	
CONFigure:GOUTput:LIMit:RTIMe[:UPPer] <maximum rise time [US | MS | S |SEC]>	0.0 µs to 6.0 µs to 8.0 µs	ALL	

19 **The Mobile Station Identification Number (MIN or IMSI) is provided by the remote command to let the CMD 80 page the mobile station to speed up the process of registration. When the mobile station registers, it will provide its internal MIN or IMSI. The CMD 80 stores only the last received MIN or IMSI, regardless of its source.**

20 **Each unit on the X-axis represents 10 µs.**

21 **The values are with reference to the mean power of the gated burst.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:GOUTPut:LIMit:RTIMe[:UPPer]?		ALL	
CONFigure:GOUTput:LIMit:UPPer:COUNt?	6	ALL	
CONFigure:GOUTput:LIMit:UPPer:GRAPh:X?	0 to 131	ALL	20
CONFigure:GOUTput:LIMit:UPPer:GRAPh:Y?	–30 dB to +5 dB	ALL	21, 22
CONFigure:GOUTput[:SETTings]:DEFault		ALL	
CONFigure:GOUTput:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:GOUTput:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:GOUTput:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –7.4 dB to –7.0 dB	ALL	
CONFigure:GOUTput:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	
CONFigure:GOUTput:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	23, 24, 25
CONFigure:GOUTput:SOURce[:CDMA]:POWer?		ALL	25
FETCh:ARRay:GOUTput:GRAPh:X?	0 to 131	CE2	26
FETCh:ARRay:GOUTput:GRAPh:Y?	–30 dB to +5 dB	CE2	27, 28
FETCh:ARRay:GOUTput:LIMit:FAIL?			29

22 **Returned values may be outside of this range. A value outside of the range indicates that there effectively is no limit.**

23 **The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –75.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –75.0 dBm to +1.0 dBm.**

24 **If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS: ..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –75.0 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.**

25 **If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.**

26 **Each unit on the X-axis represents 10 µs.**

27 **If the test has not been run, the response will consist of all 0s.**

28 **The values are with reference to the mean power of the gated burst.**

29 **The results returned are the pass/fail values for the 5 graphic regions of the gated output measurement.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
FETCh[:SCALar]:GOUTput:GRAPh:COUNt?	1664	ALL	
READ[:SCALar]:GOUTput?	See note	CE2	30
CDMA manual test – power control (open loop time response)			
CONFigure:OLTResponse:LIMit:LOWer:COUNt?	101	ALL	
CONFigure:OLTResponse:LIMit:LOWer:GRAPh:X?	0.0 to 10.0	ALL	31
CONFigure:OLTResponse:LIMit:LOWer:GRAPh:Y?	–5.0 dB to +30.0 dB	ALL	32
CONFigure:OLTResponse:LIMit:UPPer:COUNt?	4	ALL	
CONFigure:OLTResponse:LIMit:UPPer:GRAPh:X?	0.0 to 10.0	ALL	31
CONFigure:OLTResponse:LIMit:UPPer:GRAPh:Y?	–5.0 dB to +30.0 dB	ALL	32
CONFigure:OLTResponse:MODE <DECRease | INCRease>		ALL	
CONFigure:OLTResponse:MODE?		ALL	
CONFigure:OLTResponse[:SETTings]:DEFault		ALL	
CONFigure:OLTResponse:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:OLTResponse[:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:OLTResponse:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –7.4 dB to –7.0 dB	ALL	
CONFigure:OLTResponse:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	

30 **The result returned is the mean power (in dBm) of the mobile station during the burst.**

31 **Each unit on the X-axis represents 10 ms.**

32 **The values are with reference to the initial mobile station power.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:OLTResponse:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	33, 34, 35
CONFigure:OLTResponse:SOURce[:CDMA]:POWer?		ALL	36
CONFigure:OLTResponse:SOURce[:CDMA]:POWer:STEP <base station power step [DB]>	10.0 dB to 20.0 dB to 30.0 dB	ALL	
CONFigure:OLTResponse:SOURce[:CDMA]:POWer:STEP?		ALL	
FETCh:ARRay:OLTResponse:GRAPh:X?	0.0 to 10.0	CE2	37
FETCh:ARRay:OLTResponse:GRAPh:Y?	–5.0 dB to +30.0 dB	CE2	38, 39
FETCh[:SCALar]:OLTResponse:GRAPh:COUNt?	320	ALL	
FETCh:ARRay:OLTResponse:LIMit:FAIL?			40
READ[:SCALar]:OLTResponse?		ALL	

33 The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –60.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –60.0 dBm to +1.0 dBm.

34 If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –60.0 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.

35 If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.

36 If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.

37 Each unit on the X-axis represents 10 ms.

38 The values are with reference to the initial mobile station power.

39 If the test has not been run, the response will consist of all 0s.

40 The values returned are the pass/fail values for the 10 graphic regions of the open loop time response measurement.

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CDMA manual test – power control (maximum / minimum output power)			
CONFigure:MAXoutput:ASTop <ALL | FIRSt | OFF>		ALL	
CONFigure:MAXoutput:ASTop?		ALL	
CONFigure:MAXoutput:LIMit:POWer:CONE:LOWer <minimum mobile station output power [DBM]>	–70.0 dBm to +31.0 dBm to +40.0 dBm	ALL	41, 42
CONFigure:MAXoutput:LIMit:POWer:CONE:LOWer?		ALL	42
CONFigure:MAXoutput:LIMit:POWer:CONE:UPPer <maximum mobile station output power [DBM]>	–70.0 dBm to +38.0 dBm to +40.0 dBm	ALL	41, 42
CONFigure:MAXoutput:LIMit:POWer:CONE:UPPer?		ALL	42
CONFigure:MAXoutput:LIMit:POWer:CTHRee:LOWer <minimum mobile station output power [DBM]>	–70.0 dBm to +23.0 dBm to +40.0 dBm	ALL	41, 42
CONFigure:MAXoutput:LIMit:POWer:CTHRee:LOWer?		ALL	42
CONFigure:MAXoutput:LIMit:POWer:CTHRee:UPPer <maximum mobile station output power [DBM]>	–70.0 dBm to +30.0 dBm to +40.0 dBm	ALL	36, 42
CONFigure:MAXoutput:LIMit:POWer:CTHRee:UPPer?		ALL	42
CONFigure:MAXoutput:LIMit:POWer:CTWO:LOWer <minimum mobile station output power [DBM]>	–70.0 dBm to +27.0 dBm to +40.0 dBm	ALL	41, 42
CONFigure:MAXoutput:LIMit:POWer:CTWO:LOWer?		ALL	41
CONFigure:MAXoutput:LIMit:POWer:CTWO:UPPer <maximum mobile station output power [DBM]>	–70.0 dBm to +34.0 dBm to +40.0 dBm	ALL	41, 42
CONFigure:MAXoutput:LIMit:POWer:CTWO:UPPer?		ALL	42

41 **The upper power limit must be greater than or equal to the lower power limit. If a power limit is entered which would violate this restriction, the other limit will be changed as needed.**

42 **Used for US Cellular and Up Banded PCS operation only.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:MAXoutput:LIMit:POWer:PFIVe:LOWer <minimum mobile station output power [DBM]>	–70.0 dBm to + 8.0 dBm to +40.0 dBm	ALL	43, 44
CONFigure:MAXoutput:LIMit:POWer:PFIVe:LOWer?		ALL	43
CONFigure:MAXoutput:LIMit:POWer:PFIVe:UPPer <maximum mobile station output power [DBM]>	–70.0 dBm to +21.0 dBm to +40.0 dBm	ALL	43, 45
CONFigure:MAXoutput:LIMit:POWer:PFIVe:UPPer?		ALL	
CONFigure:MAXoutput:LIMit:POWer:PFOur:LOWer <minimum mobile station output power [DBM]>	–70 dBm to +13.0 dBm to +40.0 dBm	ALL	43, 46
CONFigure:MAXoutput:LIMit:POWer:PFOur:LOWer?		ALL	43
CONFigure:MAXoutput:LIMit:POWer:PFOur:UPPer <maximum mobile station output power [DBM]>	–70 dBm to +24.0 dBm to +40.0 dBm	ALL	43, 47
CONFigure:MAXoutput:LIMit:POWer:PFOur:UPPer?		ALL	43
CONFigure:MAXoutput:LIMit:POWer:PONE:LOWer <minimum mobile station output power [DBM]>	–70 dBm to +28.0 dBm to +40.0 dBm	ALL	43, 48
CONFigure:MAXoutput:LIMit:POWer:PONE:LOWer?		ALL	43
CONFigure:MAXoutput:LIMit:POWer:PONE:UPPer <maximum mobile station output power [DBM]>	–70 dBm to +33.0 dBm to +40.0 dBm	ALL	43, 49
CONFigure:MAXoutput:LIMit:POWer:PONE:UPPer?		ALL	43
CONFigure:MAXoutput:LIMit:POWer:PTHRee:LOWer <minimum mobile station output power [DBM]>	–70 dBm to +18.0 dBm to +40.0 dBm	ALL	43, 50
CONFigure:MAXoutput:LIMit:POWer:PTHRee:LOWer?		ALL	43

43 **Used for PCS (J-STD-008) operation only.**

44 **Use this command to set or query the lower result limit for PCS Class Five (V) mobile stations.**

45 **Use this command to set or query the upper result limit for PCS Class Five (V) mobile stations.**

46 **Use this command to set or query the lower result limit for PCS Class Four (IV) mobile stations.**

47 **Use this command to set or query the upper result limit for PCS Class Four (IV) mobile stations.**

48 **Use this command to set or query the lower result limit for PCS Class One (I) mobile stations.**

49 **Use this command to set or query the upper result limit for PCS Class One (I) mobile stations.**

50 **Use this command to set or query the lower result limit for PCS Class Three (III) mobile stations.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:MAXoutput:LIMit:POWer:PTHRee:UPPer <maximum mobile station output power [DBM]>	–70 dBm to +27.0 dBm to +40.0 dBm	ALL	51, 52
CONFigure:MAXoutput:LIMit:POWer:PTHRee:UPPer?		ALL	52
CONFigure:MAXoutput:LIMit:POWer:PTWO:LOWer <minimum mobile station output power [DBM]>	–70 dBm to +23.0 dBm to +40.0 dBm	ALL	52, 53
CONFigure:MAXoutput:LIMit:POWer:PTWO:LOWer?		ALL	52
CONFigure:MAXoutput:LIMit:POWer:PTWO:UPPer maximum mobile station output power [DBM]>	–70 dBm to +30.0 dBm to +40.0 dBm	ALL	52, 54
CONFigure:MAXoutput:LIMit:POWer:PTWO:UPPer?		ALL	52
CONFigure:MAXoutput:LIMit:WQUality[:LOWer] <minimum waveform quality>	0.000 to 0.944 to 1.000	ALL	
CONFigure:MAXoutput:LIMit:WQUality[:LOWer]?		ALL	
CONFigure:MAXoutput[:SETTings]:DEFault		ALL	55
CONFigure:MAXoutput:SOURce:[CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:MAXoutput[:SOURce:[CDMA]:LEVel:PILot?		ALL	
CONFigure:MAXoutput:SOURce:[CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –7.4 dB to –7.0 dB	ALL	
CONFigure:MAXoutput:SOURce:[CDMA]:LEVel:TRAFfic?		ALL	

51 **Use this command to set or query the upper result limit for PCS Class Three (III) mobile stations.**

52 **Used for PCS (J-STD-008) operation only.**

53 **Use this command to set or query the lower result limit for PCS Class Two (II) mobile stations.**

54 **Use this command to set or query the upper result limit for PCS Class Two (II) mobile stations.**

55 **Default values used are dependent on current network configuration.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:MAXoutput:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	56, 57, 58
CONFigure:MAXoutput:SOURce[:CDMA]:POWer?		ALL	58
CONFigure:MINoutput:ASTop <ALL | FIRSt | OFF>		ALL	
CONFigure:MINoutput:ASTop?		ALL	
CONFigure:MINoutput:LIMit:POWer:UPPer <maximum mobile station output power [DBM]>	–70.0 dBm to –50.0 dBm to +40.0 dBm	ALL	
CONFigure:MINoutput:LIMit:POWer:UPPer?		ALL	
CONFigure:MINoutput:LIMit:WQUality[:LOWer] <minimum waveform quality>	0.000 to 0.944 to 1.000	ALL	
CONFigure:MINoutput:LIMit:WQUality[:LOWer]?		ALL	
CONFigure:MINoutput[:SETTings]:DEFault		ALL	
CONFigure:MINoutput:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:MINoutput[:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:MINoutput:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –7.4 dB to –7.0 dB	ALL	
CONFigure:MINoutput:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	

56 **The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –105.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –105.0 dBm to +1.0 dBm.**

57 **If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –105.0 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.**

58 **If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOURce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:MINoutput:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	59, 60, 61
CONFigure:MINoutput:SOURce[:CDMA]:POWer?		ALL	61
FETCh[:SCALar]:MAXoutput:LIMit:FAIL[:ALL]?			62
FETCh[:SCALar]:MINoutput:LIMit:FAIL[:ALL]?			63
READ[:SCALar]:MAXoutput[:ALL]?	See note	CE2	64
READ[:SCALar]:MINoutput[:ALL]?	See note	CE2	64
CDMA manual test – receiver quality (sensitivity)			
CONFigure:SENSitivity:ASTop <OFF | ON>		ALL	
CONFigure:SENSitivity:ASTop?		ALL	
CONFigure:SENSitivity:BAUD <EIGHth | QUARter | HALF | FULL>		ALL	
CONFigure:SENSitivity:BAUD?		ALL	
CONFigure:SENSitivity:DURation <number of frames in test>	25 to 1000 to 20,000	ALL	
CONFigure:SENSitivity:DURation?		ALL	
CONFigure:SENSitivity:FREQuency:OFFSet <offset frequency in Hz [HZ]>	50,000 Hz to 0 Hz to 50,000 Hz	ALL	
CONFigure:SENSitivity:FREQuency:OFFSet?		ALL	
CONFigure:SENSitivity:LIMit:CONFidence[:LOWer] <confidence limit in %>	85.0 to 95.0 to 99.9	ALL	
CONFigure:SENSitivity:LIMit:CONFidence[:LOWer]?		ALL	
CONFigure:SENSitivity:LIMit:ERRor:FERate <max frame error rate in %>	0.1 to 0.5 to 5.0	ALL	

59 **The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –25.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –25.0 dBm to +1.0 dBm.**

60 **If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –29.0 dBm. Note that in this case, the default power with no attenuation could not be maintained with the specified attenuation, so the default changed to the closest value possible.**

61 **If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOURce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.**

62 **The results returned are the pass/fail values for the maximum output power and waveform quality measurements.**

63 **The results returned are the pass/fail values for the minimum output power and waveform quality measurements.**

64 **Results are returned in the following order: mobile station measured power, and waveform quality at measured power.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:SENSitivity:LIMit:ERRor:FERate?		ALL	
CONFigure:SENSitivity[:SETTings]:DEFault		ALL	
CONFigure:SENSitivity:SOURce:AWGN:LEVel <relative level [DB] | MAXimum | MINimum | OFF>	–20.0 dB to +6.0 dB	ALL	65, 66
CONFigure:SENSitivity:SOURce:AWGN:LEVel?		ALL	66
CONFigure:SENSitivity:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:SENSitivity:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:SENSitivity:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –15.6 dB to –7.0 dB	ALL	
CONFigure:SENSitivity:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	
CONFigure:SENSitivity:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	67, 68, 69
CONFigure:SENSitivity:SOURce[:CDMA]:POWer?		ALL	69
FETCh[:SCALar]:SENSitivity:LIMit:FAIL[:ALL]?			70
READ[:SCALar]:SENSitivity[:ALL]?	See note	CE2	71

65 If the power of the CDMA source is within 10 dB of the maximum power available with the current instrument settings, the AWGN will be turned off. It will remain off even if the power is lowered.

66 This command is only applicable if the CMD 80 has Option B81, AWGN generator.

67 The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –105.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –105.0 dBm to +1.0 dBm.

68 If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –105.0 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.

69 If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.

70 The results returned are the pass/fail values for the sensitivity FER, frame errors, and confidence level measurements.

71 Values are returned in the following order: FER (%), transmitted frames, frame errors, and the confidence level.

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CDMA manual test – receiver quality (dynamic range)			
CONFigure:DRANge:ASTop <OFF I ON>		ALL	
CONFigure:DRANge:ASTop?		ALL	
CONFigure:DRANge:BAUD <EIGHth I QUARter I HALF I FULL>		ALL	
CONFigure:DRANge:BAUD?		ALL	
CONFigure:DRANge:DURation <number of frames in test>	25 to 1000 to 20.000	ALL	
CONFigure:DRANge:DURation?		ALL	
CONFigure:DRANge:FREQuency:OFFSet <offset frequency in hz [HZ]>	50,000 Hz to 0 Hz to 50,000 Hz	ALL	
CONFigure:DRANge:FREQuency:OFFSet?		ALL	
CONFigure:DRANge:LIMit:CONFidence[:LOWer] <confidence limit in %>	85.0 to 95.0 to 99.9	ALL	
CONFigure:DRANge:LIMit:CONFidence[:LOWer]?		ALL	
CONFigure:DRANge:LIMit:ERRor:FERate <max frame error rate in %>	0.1 to 0.5 to 5.0	ALL	
CONFigure:DRANge:LIMit:ERRor:FERate?		ALL	
CONFigure:DRANge[:SETTings]:DEFault		ALL	
CONFigure:DRANge:SOURce:AWGN:LEVel <relative level [DB] I MAXimum I MINimum I OFF>	–20 dB to +6 dB	ALL	72, 73
CONFigure:DRANge:SOURce:AWGN:LEVel?		ALL	73
CONFigure:DRANge:SOURce[:CDMA]:LEVel:PILot <relative level [DB] I MAXimum I MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:DRANge:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:DRANge:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] I MAXimum I MINimum>	–20.0 dB to –15.6 dB to –7.0 dB	ALL	
CONFigure:DRANge:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	

72 **If the power of the CDMA source is within 10 dB of the maximum power available with the current instrument settings, the AWGN will be turned off. It will remain off even if the power is lowered.**

73 **This command is only applicable if the CMD 80 has Option B81, AWGN generator.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:DRANge:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	74, 75, 76
CONFigure:DRANge:SOURce[:CDMA]:POWer?		ALL	76
FETCh[:SCALar]:DRANge:LIMit:FAIL[:ALL]?			77
READ[:SCALar]:DRANge[:ALL]?	See note	CE2	78
CDMA manual test – receiver quality (traffic channel demodulation)			
CONFigure:TCDemod:ASTop <OFF | ON>		ALL	
CONFigure:TCDemod:ASTop?		ALL	
CONFigure:TCDemod:BAUD <EIGHth | QUARter | HALF | FULL>		ALL	
CONFigure:TCDemod:BAUD?		ALL	
CONFigure:TCDemod:DURation <number of frames in test>	25 to 1000 to 20,000	ALL	
CONFigure:TCDemod:DURation?		ALL	
CONFigure:TCDemod:FREQuency:OFFSet <offset frequency in Hz [HZ]>	50,000 Hz to 0 Hz to 50,000 Hz	ALL	
CONFigure:TCDemod:FREQuency:OFFSet?		ALL	
CONFigure:TCDemod:LIMit:CONFidence[:LOWer] <confidence limit in %>	85.0 to 95.0 to 99.9	ALL	
CONFigure:TCDemod:LIMit:CONFidence[:LOWer]?		ALL	
CONFigure:TCDemod:LIMit:ERRor:FERate <max frame error rate in %>	0.1 to 0.5 to 5.0	ALL	
CONFigure:TCDemod:LIMit:ERRor:FERate?		ALL	
CONFigure:TCDemod[:SETTings]:DEFault		ALL	

74 **The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –25.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –25.0 dBm to +1.0 dBm.**

75 **If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –25 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.**

76 **If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.**

77 **The returned results are the pass/fail values for the dynamic range FER, frame errors, and confidence level measurements.**

78 **Values are returned in the following order: FER (%), transmitted frames, frame errors, and the confidence level.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:TCDemod:SOURce:AWGN:LEVel <relative level [DB] | MAXimum | MINimum | OFF>	–20.0 dB to +1.0 dB to +6.0 dB	ALL	79, 80
CONFigure:TCDemod:SOURce:AWGN:LEVel?		ALL	80
CONFigure:TCDemod:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:TCDemod:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:TCDemod:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –15.6 dB to –7.0 dB	ALL	
CONFigure:TCDemod:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	
CONFigure:TCDemod:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	81, 82, 83
CONFigure:TCDemod:SOURce[:CDMA]:POWer?		ALL	83
FETCh[:SCALar]:TCDemod:LIMit:FAIL[:ALL]?			84
READ[:SCALar]:TCDemod[:ALL]?	See note	CE2	85

79 If the power of the CDMA source is within 10 dB of the maximum power available with the current instrument settings, the AWGN will be turned off. It will remain off even if the power is lowered.

80 This command is only applicable if the CMD 80 has Option B81, AWGN generator.

81 The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –75.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –75.0 dBm to +1.0 dBm.

82 If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –75.0 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.

83 If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside of the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.

84 The returned results are the pass/fail values for the traffic channel demodulation FER, frame errors, and confidence level measurements.

85 Values are returned in the following order: FER (%), transmitted frames, frame errors, and the confidence level.

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CDMA manual test – receiver quality (user defined)			
CONFigure:U1Defined:ASTop <OFF | ON>		ALL	
CONFigure:U1Defined:ASTop?		ALL	
CONFigure:U1Defined:BAUD <EIGHth | QUARter | HALF | FULL>		ALL	
CONFigure:U1Defined:BAUD?		ALL	
CONFigure:U1Defined:DURation <number of frames in test>	25 to 1000 to 20,000	ALL	
CONFigure:U1Defined:DURation?		ALL	
CONFigure:U1Defined:FREQuency:OFFSet <offset frequency in Hz [HZ]>	50,000 Hz to 0 Hz to 50,000 Hz	ALL	
CONFigure:U1Defined:FREQuency:OFFSet?		ALL	
CONFigure:U1Defined:LIMit:CONFidence[LOWer] <confidence limit in %>	85.0 to 95.0 to 99.9	ALL	
CONFigure:U1Defined:LIMit:CONFidence[LOWer]?		ALL	
CONFigure:U1Defined:LIMit:ERRor:FERate <max frame error rate in %>	0.1 to 0.5 to 5.0	ALL	
CONFigure:U1Defined:LIMit:ERRor:FERate?		ALL	
CONFigure:U1Defined[:SETTings]:DEFault		ALL	
CONFigure:U1Defined:SOURce:AWGN:LEVel <relative level [DB] | MAXimum | MINimum | OFF>	–20.0 dB to +6.0 dB	ALL	86, 87
CONFigure:U1Defined:SOURce:AWGN:LEVel?		ALL	87
CONFigure:U1Defined:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:U1Defined:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:U1Defined:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –14.0 dB to –7.0 dB	ALL	
CONFigure:U1Defined:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	

86 **If the power of the CDMA source is within 10 dB of the maximum power available with the current instrument settings, the AWGN will be turned off. It will remain off even if the power is lowered.**

87 **This command is only applicable if the CMD 80 has Option B81, AWGN generator.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:U1Defined:SOURce[:CDMA]:POWer <power level [DBM] I MAXimum I MINimum>	See notes	ALL	88, 89, 90
CONFigure:U1Defined:SOURce[:CDMA]:POWer?		ALL	90
CONFigure:U2Defined:ASTop <OFF I ON>		ALL	
CONFigure:U2Defined:ASTop?		ALL	
CONFigure:U2Defined:BAUD <EIGHth I QUARter I HALF I FULL>		ALL	
CONFigure:U2Defined:BAUD?		ALL	
CONFigure:U2Defined:DURation <number of frames in test>	25 to 1000 to 20,000	ALL	
CONFigure:U2Defined:DURation?		ALL	
CONFigure:U2Defined:FREQuency:OFFSet <offset frequency in Hz [HZ]>	50,000 Hz to 0 Hz to 50,000 Hz	ALL	
CONFigure:U2Defined:FREQuency:OFFSet?		ALL	
CONFigure:U2Defined:LIMit:CONFidence[:LOWer] <confidence limit in %>	85.0 to 95.0 to 99.9	ALL	
CONFigure:U2Defined:LIMit:CONFidence[:LOWer]?		ALL	
CONFigure:U2Defined:LIMit:ERRor:FERate <max frame error rate in %>	0.1 to 0.5 to 5.0	ALL	
CONFigure:U2Defined:LIMit:ERRor:FERate?		ALL	
CONFigure:U2Defined[:SETTings]:DEFault		ALL	
CONFigure:U2Defined:SOURce:AWGN:LEVel <relative level [DB] I MAXimum I MINimum I OFF>	–20.0 dB to +6.0 dB	ALL	91, 92
CONFigure:U2Defined:SOURce:AWGN:LEVel?		ALL	92

88 **The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –70.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –70.0 dBm to +1.0 dBm.**

89 **If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –70.0 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.**

90 **If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.**

91 **If the power of the CDMA source is within 10 dB of the maximum power available with the current instrument settings, the AWGN will be turned off. It will remain off even if the power is lowered.**

92 **This command is only applicable if the CMD 80 has Option B81, AWGN generator.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:U2Defined:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:U2Defined:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:U2Defined:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –14.0 dB to –7.0 dB	ALL	
CONFigure:U2Defined:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	
CONFigure:U2Defined:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	93, 94, 95
CONFigure:U2Defined:SOURce[:CDMA]:POWer?		ALL	95
FETCh[:SCALar]:U1Defined:LIMit:FAIL[:ALL]?			96
FETCh[:SCALar]:U2Defined:LIMit:FAIL[:ALL]?			97
READ[:SCALar]:U1Defined[:ALL]?	See note	CE2	99
READ[:SCALar]:U2Defined[:ALL]?	See note	CE2	99
CDMA manual test – receiver quality (current signal level)			
CONFigure:CLEVels:ASTop <OFF | ON>		ALL	
CONFigure:CLEVels:ASTop?		ALL	
CONFigure:CLEVels:BAUD <EIGHth | QUARter | HALF | FULL>		ALL	
CONFigure:CLEVels:BAUD?		ALL	

93 The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –70.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –70.0 dBm to +1.0 dBm.

94 If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –70.0 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.

95 If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range that can be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.

96 The returned results are the pass/fail values for the first user defined FER, frame errors, and confidence level measurements.

98 The returned results are the pass/fail values for the second user defined FER, frame errors, and confidence level measurements.

99 The results returned are: FER (%), transmitted frames, frame errors, and the confidence level.

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:CLEVels:DURation <number of frames in test>	25 to 1000 to 20,000	ALL	
CONFigure:CLEVels:DURation?		ALL	
CONFigure:CLEVels:FREQuency:OFFSet <offset frequency in Hz [HZ]>	50,000 Hz to 0 Hz to 50,000 Hz	ALL	
CONFigure:CLEVels:FREQuency:OFFSet?		ALL	
CONFigure:U2CLEVels:LIMit:CONFidence[LOWer] <confidence limit in %>	85.0 to 95.0 to 99.9	ALL	
CONFigure:CLEVels:LIMit:CONFidence[LOWer]?		ALL	
CONFigure:CLEVels:LIMit:ERRor:FERate <max frame error rate in %>	0.1 to 0.5 to 5.0	ALL	
CONFigure:CLEVels:LIMit:ERRor:FERate?		ALL	
CONFigure:CLEVels[:SETTings]:DEFault		ALL	
CONFigure:CLEVels:SOURce:AWGN:LEVel <relative level [DB] | MAXimum | MINimum | OFF>	–20.0 dB to +6.0 dB	ALL	100, 101
CONFigure:CLEVels:SOURce:AWGN:LEVel?		ALL	
FETCh[:SCALar]:CLEVels:LIMit:FAIL[:ALL]?			102
READ[:SCALar]:CLEVels[:ALL]?	See note	CE2	103
CDMA manual test – transmitter quality			
CONFigure:TQUality:ASTop <OFF | ON>		ALL	
CONFigure:TQUality:AVERage:COUNt <averaging interval>	1 to 3 to 10	ALL	104
CONFigure:TQUality:AVERage:COUNt?		ALL	
CONFigure:TQUality:FREQuency:OFFSet <offset frequency in Hz [HZ]>	50,000 Hz to 0 Hz to 50,000 Hz	ALL	
CONFigure:TQUality:FREQuency:OFFSet?		ALL	
CONFigure:TQUality:LIMit:CFEedthrough[:UPPer] <maximum carrier feedthrough [DB]>	–120.0 dB to –40.0 dB to –20.0 dB	ALL	

100 **If the power of the CDMA source is within 10 dB of the maximum power available with the current instrument settings, the AWGN will be turned off. It will remain off even if the power is lowered.**

101 **This command is only applicable if the CMD 80 has Option B81, AWGN generator.**

102 **The results returned are the pass/fail values for the current signal level FER, frame errors, and confidence level measurements.**

103 **Values are returned in the following order: FER (%), transmitted frames, frame errors, and confidence level.**

104 **Use this command to set or query the Transmitter Quality Averaging Count used in the computation of the Carrier Frequency Error, Transmit Time Error, and Waveform Quality values displayed in the Call Established – MS Loopback menu. This value is reset by *RST and SYSTem:PRESet.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:TQUality:LIMit:CFEedthrough[:UPPer]?		ALL	
CONFigure:TQUality:LIMit:ERRor:CFRequency <maximum carrier frequency error [HZ | KHZ | MHZ]>	0 Hz to 300 Hz to 1000 Hz	ALL	105
CONFigure:TQUality:LIMit:ERRor:CFRequency?		ALL	
CONFigure:TQUality:LIMit:ERRor:EVMagnitude:PEAK <maximum peak error vector magnitude>	0.0% to 17.7% to 100.0%	ALL	
CONFigure:TQUality:LIMit:ERRor:EVMagnitude:PEAK?		ALL	
CONFigure:TQUality:LIMit:ERRor:EVMagnitude:RMS <maximum RMS error vector magnitude>	0.0% to 12.5% to 100.0%	ALL	
CONFigure:TQUality:LIMit:ERRor:EVMagnitude:RMS?		ALL	
CONFigure:TQUality:LIMit:ERRor:MAGNitude:PEAK <maximum peak magnitude error>	0.0% to 17.7% to 100.0%	ALL	106
CONFigure:TQUality:LIMit:ERRor:MAGNitude:PEAK?		ALL	
CONFigure:TQUality:LIMit:ERRor:MAGNnitude:RMS <maximum RMS magnitude error>	0.0% to 12.5% to 100.0%	ALL	106
CONFigure:TQUality:LIMit:ERRor:MAGNitude:RMS?		ALL	
CONFigure:TQUality:LIMit:ERRor:PHASe:PEAK <maximum peak phase error>	0.0° to 10.2° to 45.0°	ALL	106
CONFigure:TQUality:LIMit:ERRor:PHASe:PEAK?		ALL	
CONFigure:TQUality:LIMit:ERRor:PHASe:RMS <maximum RMS phase error>	0.0° to 7.2° to 45.0°	ALL	106
CONFigure:TQUality:LIMit:ERRor:PHASE:RMS?		ALL	
CONFigure:TQUality:LIMit:ERRor:TTIMe <maximum transmit time error> [S | SEC | MS | US]	0.0 µs to 1.0 µs to 10.0 µs	ALL	106
CONFigure:TQUality:LIMit:ERRor:TTIMe?		ALL	
CONFigure:TQUality:LIMit:IMBalance[:UPPer] <maximum carrier imbalance [DB]>	–120.0 dB to –30.0 dB to –20.0 dB	ALL	
CONFigure:TQUality:LIMit:IMBalance[:UPPer]?		ALL	

105 **The absolute value of the test result is compared to the value selected.**

106 **The absolute value of the test result is compared to the value selected.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
CONFigure:TQUality:LIMit:WQUality[:LOWer] <minimum waveform quality>	0.000 to 0.944 to 1.000	ALL	
CONFigure:TQUality:LIMit:WQUality[:LOWer]?		ALL	
CONFigure:TQUality[:SETTings]:DEFault		ALL	
CONFigure:TQUality:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | MAXimum | MINimum>	–10.0 dB to –7.0 dB to –5.0 dB	ALL	
CONFigure:TQUality:SOURce[:CDMA]:LEVel:PILot?		ALL	
CONFigure:TQUality:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | MAXimum | MINimum>	–20.0 dB to –7.4 dB to –7.0 dB	ALL	
CONFigure:TQUality:SOURce[:CDMA]:LEVel:TRAFfic?		ALL	
CONFigure:TQUality:SOURce[:CDMA]:POWer <power level [DBM] | MAXimum | MINimum>	See notes	ALL	107, 108, 109
CONFigure:TQUality:SOURce[:CDMA]:POWer?		ALL	109
FETCh:ARRay:TQUality:ERRor:EVMagnitude:GRAPh:X?	0 to 5.12	CE2	110
FETCh:ARRay:TQUality:ERRor:EVMagnitude:GRAPh:Y?	0% to 50%	CE2	111
FETCh:ARRay:TQUality:ERRor:MAGNitude:GRAPh:X?	0 to 5.12	CE2	110
FETCh:ARRay:TQUality:ERRor:MAGNitude:GRAPh:Y?	–50% to 50%	CE2	111
FETCh:ARRay:TQUality:ERRor:PHASe:GRAPh:X?	0 to 5.12	CE2	110
FETCh:ARRay:TQUality:ERRor:PHASe:GRAPh:Y?	–30° to 30°	CE2	111
FETCh[:SCALar]:TQUality:ERRor:EVMagnitude:GRAPh:COUNt?	512	ALL	
FETCh[:SCALar]:TQUality:ERRor:MAGNitude:GRAPh:COUNt?	512	ALL	

107 **The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –75.0 dBm to –19.0 dBm. When using the RF OUT 2 connector under the same conditions, the power range is –113.0 dBm to –75.0 dBm to +1.0 dBm.**

108 **If external gain or attenuation is used (through the command tree "SOURce:CORRection:LOSS:..."), the internal power of the CMD 80 is adjusted to maintain the commanded power after the attenuation or gain. However, the limits will change. For example, if there is 10 dB of external loss (attenuation), the output range for the RF IN/RF OUT connector will be –142.0 dBm to –75.0 dBm to –29.0 dBm. Note that the default power remains the same provided that the CMD 80 can output the required power, given the external attenuation or gain.**

109 **If the CMD 80 is in the IDLE state, the power range accepted as defined by the MAXimum and MINimum arguments, or as returned in response to the MAXimum or MINimum queries, is the widest range which can ever be obtained using either RF output and the full range of attenuation and gain values accepted by the "SOUrce:CORRection:LOSS:..." command tree. If the output power is set outside the limits that the CMD 80 can produce, when the instrument leaves the IDLE state the power will be set to the closest end of the range for the output connector and external attenuation (or gain) in use.**

110 **Each unit on the X-axis represents 81.25 µs or 100 PN chips.**

112 **If the test has not been run, the response will consist of all 0s.**

Table D–4: CDMA manual test commands (Cont.)

Command	Values	State	Notes
FETCh[:SCALar]:TQUality:ERRor:PHASe:GRAPh:COUNt?	512	ALL	
FETCh[:SCALar]:TQUality:WQUality[:ALL]?	See note	ALL	113
FETCh[:SCALar]:TQUality:EVMagnitude:LIMit:FAIL[:ALL]?			114
FETCh[:SCALar]:TQUality:MAGNitude:LIMit:FAIL[:ALL]?			115
FETCh[:SCALar]:TQUality:PHASe:LIMit:FAIL[:ALL]?			116
READ[:SCALar]:TQUality:ERRor:EVMagnitude[:ALL]?	See note	CE2	117
READ[:SCALar]:TQUality:ERRor:MAGNitude[:ALL]?	See note	CE2	117
READ[:SCALar]:TQUality:ERRor:PHASe[:ALL]?	See note	CE2	117

113 **Data is returned in the following order: carrier feedthrough, IQ imbalance, carrier frequency error, transmit time error, and waveform quality.**

114 **The values returned are the pass/fail values for the error vector magnitude peak and RMS measurements.**

115 **The values returned are the pass/fail values for the magnitude error peak and RMS measurements.**

116 **The values returned are the pass/fail values for the phase error peak and RMS measurements.**

117 **The results returned are the peak value and the RMS value of the requested measurement.**

Table D–5: CDMA module test commands

Command	Values	State	Notes
CDMA module test			
CONFigure:CMTest:BAUD <FULL | HALF | QUARter | EIGHth>		IDLE, CMT	1
CONFigure:CMTest:BAUD?	FULL, HALF, QUAR, EIGH	ALL	
CONFigure:CMTest:FOFFset <frame offset>	0 to 15	IDLE, CMT	2
CONFigure:CMTest:FOFFset?		ALL	
CONFigure:CMTest:FREQuency:CHANnel <RF channel number>	See note	IDLE, CMT	3
CONFigure:CMTest:FREQuency:CHANnel?		IDLE, CMT	
CONFigure:CMTest:LIMit:CFEedthrough[:UPPer] <maximum carrier feedthrough [DB]>	–120.0 dB to –40.0 dB to –20.0 dB	ALL	4
CONFigure:CMTest:LIMit:CFEedthrough[:UPPer]?		ALL	
CONFigure:CMTest:LIMit:ERRor:CFRequency <maximum carrier frequency error> [HZ | KHZ | MHZ]	0 Hz to 300 Hz to 1000 Hz	ALL	4
CONFigure:CMTest:LIMit:ERRor:CFRequency?		ALL	
CONFigure:CMTest:LIMit:ERRor:POWer:MSTation <error limit [DB]>	0.0 dB to 3.5 dB to 10.0 dB	ALL	4
CONFigure:CMTest:LIMit:ERRor:POWer:MSTation?		ALL	
CONFigure:CMTest:LIMit:ERRor:TTIMe <maximum transmit time error> [S | SEC | MS | US]	0.0 µs to 1.0 µs to 10.0 µs	ALL	4
CONFigure:CMTest:LIMit:ERRor:TTIMe?		ALL	
CONFigure:CMTest:LIMit:IMBalance[:UPPer] <maximum carrier imbalance> [DB]	–120.0 dB to –30.0 dB to –20.0 dB	ALL	4
CONFigure:CMTest:LIMit:IMBalance[:UPPer]?		ALL	
CONFigure:CMTest:LIMit:WQuality[:LOWer] <minimum waveform quality>	0.000 to 0.944 to 1.000	ALL	4
CONFigure:CMTest:LIMit:WQuality[:LOWer]		ALL	

1 **Use this command to set the CDMA forward traffic channel frame rate. Any argument but FULL reduces the actual output power of the CMD 80. This command affects the information content of the foward traffic channel frame.**

2 **Use this command to change the frame offset of the CDMA forward traffic channel. This command does no handoffs.**

3 **Use this command to change the RF channel for the module test system. This command does no handoffs. The following are legal RF channel values: US Cellular: 0 to 25 to 1199 for PCS (J-STD-008 and Upbanded IS-95); Korean PCS: 0 to 25 to 1300.**

4 **Use this command to set the error limit for the measurement. The displayed value (in LOCAL control) goes to reverse video when the error limit is exceeded.**

Table D–5: CDMA module test commands (Cont.)

Command	Values	State	Notes
CONFigure:CMTest:OCNS[:STATe] <OFF, ON>			
CONFigure:CMTest:OCNS?	OFF, ON		
CONFigure:CMTest:PCBits:MODE <OFF | HOLD | ADOWn | AUP | RTESt>		IDLE, CMT	5
CONFigure:CMTest:PCBits:MODE?	OFF, HOLD, ADOWn, AUP, RTESt	ALL	
CONFigure:CMTest:PNOFfset <PN offset value>	0 to 511	IDLE, CMT	6
CONFigure:CMTest:PNOFfset?		ALL	
CONFigure:CMTest:POWer:MSTation:MANual <power level> [DBM]	–88 dB to 0 dB to +31 dB	CMT	7
READ[:SCALar]:CMTest:POWer:MSTation?	See note	CMT	8
CONFigure:CMTest:POWer:MSTation:MANual?	MAX, MIN	CMT	
CONFigure:CMTest:POWer:MSTation:MODE <MANual | OLOop>		CMT	9
CONFigure:CMTest:POWer:MSTation:MODE?	MAN, OLO	CMT	
CONFigure:CMTest:POWer:MSTation:OLOop?		CMT	10
CONFigure:CMTest:RSET <RS1 | RS2 | RS1_8K | RS2_13K>		IDLE, CMT	11
CONFigure:CMTest:RSET?	RS1, RS2	ALL	
CONFigure:CMTest[:SETTings]:DEFault		ALL	12

5 Use this command to select how the power control bits in the foward CDMA traffic channel are calculated. The OFF mode disables the insertion of power control bits. The HOLD mode sends alternating up/down power control bits. The ALL DOWN mode forces the power control bit to the down state. The ALL UP mode forces the power control bit to the up state. The RANGE TEST mode sends eight frames of UP power bits followed by eight frames of DOWN power bits.

6 Use this command to set the PN offset of the CMD 80. This command immediatly changes the sync channel timing and content, and the paging channel content and long code mask. Changes are performed without any handoff.

7 Use this command to set the expected power from the mobile station when you are using CONFigure:CMTest:POWer:MSTation:MODE in the MANual mode.

8 Query retuns the mobile transmit power in dBm. Returns "INF" if the signal level is too high; returns "NINF" if the signal level is too low.

9 Use this command to set the method for determining the expected power from the mobile station. The MANual mode requires that the user enter the expected value; the OLOop mode estimates the open loop power using the network type and the NOMINAL BS TOTAL POWER setting.

10 This query returns the expected power from the mobile station when you are using CONFigure:CMTest:POWer:MSTation:MODE in the OLOop mode.

11 Use this command to set the forward channel frame rate. This command changes the encoding and information of the CDMA forwarward traffic channel. No negotiation or handoff is performed. This command requires installation of Option B14.

12 Use this command to reset the Module Test configuration menu parameters to the default settings. This command does not affect the settings in the Module Test main menu.

Table D–5: CDMA module test commands (Cont.)

Command	Values	State	Notes
CONFigure:CMTest:SOURce:AWGN:LEVel <relative level [DB] | OFF | MAXimum | MINimum>	OFF, –20 dB to +6.0 dB	IDLE, CMT	13
CONFigure:CMTest:SOURce:AWGN:LEVel?		IDLE, CMT	
CONFigure:CMTest:SOURce[:CDMA]:LEVel:OCNS?		IDLE, CMT	14, 15
CONFigure:CMTest:SOURce[:CDMA]:LEVel:PILot <relative level [DB] | OFF | MAXimum | MINimum>	–10 dB to –7.0 dB to –5.0 dB	IDLE, CMT	15
CONFigure:CMTest:SOURce[:CDMA]:LEVel:PILot?		IDLE, CMT	15, 16
CONFigure:CMTest:SOURce[:CDMA]:POWer:NOMinal <relative level [DB] | OFF | MAXimum>	See note	IDLE, CMT	17, 18
CONFigure:CMTest:SOURce[:CDMA]:POWer:NOMinal?		IDLE, CMT	18

13 Use this command to set the power level of the AWGN channel. The power level is expressed as the ration of the AWGN output power to the nominal CDMA forward channel power. The "OFF" argument disables the AWGN channel. Enabling the AWGN channel incleases the actual power output of the CMD 80. This command requires installation of Option B81.

14 Use this query to return the current power level of the OCNS channel. "OFF" is returned if the OCNS channel is disabled.

15 The power level of a CDMA channel in the Module Test mode is set relative to the nominal CDMA forward channel power (with all of the CDMA channels present and active). The actual level of a CDMA channel does not change when another CDMA channel is disabled in the Module Test mode.

16 Use this query to return the current power level of the pilot channel. "OFF" is returned if the pilot channel is disabled.

17 Use this command to set the nominal output power of the CMD 80 when in the Module Test mode. The actual power differs from the nominal power when one or more CDMA channels are disabled, the frame rate is not FULL, or the AWGN system is in use. Use the "OFF" argument to disable the transmitter.

The output power range values assume no external gain or attenuation. RS IN/RS OUT: –132 dBm to –70 dBm to –19 dBm; RF OUT 2: –113 dBm to –70 dBm to +1 dBm.

The CMD 80 maintains commanded power when external attenuation or gain using SOURce:CORRection:LOSS:... commands is specified; however, the range of available power will change. For example: the output rante at the RF IN/RF OUT connector changes to –142 dBm to –70 dBm to –29 dBm when an external attenuation of 10 dB is commanded. Nothe that the default power remains constant provided that the CMD 80 can produce it given the external gain or attenuation.

18 When the CMD 80 is in the IDLE mode the power range accepted or defined by the MAX/MIN arguments is the widest range possible using either of the RF outputs along with the maximum external gain or attenuation values set by SOURce:CORRection:LOSS:... commands. If the output power is set outside the limits that the CMD 80 can product, the power is set to the clossest end of the range for the output connector and external attenuation (or gain) in use when the instrument leaves the IDLE state.

Table D–5: CDMA module test commands (Cont.)

Command	Values	State	Notes
CONFigure:CMTest:SOURce[:CDMA]:LEVel:PAGing <relative level [DB] | OFF | MAXimum>	–20 dB to –12 dB to –7 dB	IDLE, CMT	19, 20
CONF[illegible]:CMTest:SOURce[:CDMA]:LEVel:PAGing?		IDLE, CMT	21
CONFigure:CMTest:SOURce[:CDMA]:LEVel:SYNC <relative level [DB] | OFF | MAXimum | MINimum>	–20 dB to –16 dB to –7 dB	IDLE, CMT	22, 23
CONFigure:CMTest:SOURce[:CDMA]:LEVel:SYNC?		IDLE, CMT	22, 24
CONFigure:CMTest:SOURce[:CDMA]:LEVel:TRAFfic <relative level [DB] | OFF | MAXimum | MINimum>	–20 dB to –14 dB to –7 dB	IDLE, CMT	22, 25
CONFigure:CMTest:SOURce[:CDMA]:LEVel:TRAFfic?		IDLE, CMT	22, 26
CONFigure:CMTest:SOURce[:CDMA]:POWer:ACTual?		CMT	27
CONFigure:CMTest:TCHannel <traffic channel>	2 to 8 to 31, 33 to 63	IDLE, CMT	28
CONFigure:CMTest:TCHannel?		ALL	

19 The power level of a CDMA channel in the Module Test mode is set relative to the nominal CDMA forward channel power (with all of the CDMA channels present and active). The actual level of a CDMA channel does not change when another CDMA channel is disabled in the Module Test mode.

20 Use this command to set the power level of the pilot channel. Use the "OFF" argument to disable the channel and reduce the actual output power of the CMD 80.

21 Use this query to return the current power setting for the pilot channel. The query returns "OFF" if the pilot channel has been disabled.

22 The power level of a CDMA channel in the Module Test mode is set relative to the nominal CDMA forward channel power (with all of the CDMA channels present and active). The actual level of a CDMA channel does not change when another CDMA channel is disabled in the Module Test mode.

23 Use this command to set the power level of the sync channel. Use the "OFF" argument to disable the channel and reduce the actual output power of the CMD 80.

24 Use this query to return the current power setting for the sync channel. The query returns "OFF" if the sync channel has been disabled.

25 Use this command to set the power level of the forward traffic channel. The "OFF" argument truns off the channel and reduces the actual power output from the CMD 80. The power level of the traffic channel is based on a full rate traffic channel; the actual output power of the CMD 80 is reduced when the traffic channel is configured to operate at frame rates other than FULL.

26 Use this query to return the current power setting for the forward traffic channel. The query returns "OFF" if the sync channel has been disabled. This query always returns the power level for a full rate traffic chnnel even if the traffic channes is not operating at the full rate.

27 Use this query to return the actual output power (dBm) of the CMD 80 when in the Module Test mode. The actual power differs from the nominal power when one or more CDMA channels are disabled, the frame rate is not FULL, or the AWGN system is in use. The query returns "OFF" if there is no output power when in the Module Test mode.

28 Use this command to change the channel (Walsh code) for the forward traffic channel. The CMD 80 automatically shifts an OCNS channel if channel conflicts occur (no handoff is performed).

Table D–5: CDMA module test commands (Cont.)

Command	Values	State	Notes
FETCh[:SCALar]:CMTest:POWer:MSTation:LIMit:FAIL? Returns the pass/fail value for module test MS power measurement.			
FETCh[:SCALar]:CMTest:WQUality:LIMit:FAIL[:ALL]?			29
READ[:SCALar]:CMTest:WQUality[:ALL]?	See note	CMT	30

29 The results returned are the pass/fail values for the carrier feedthru, I/Q imbalance, carrier frequency error, transmit time error, and waveform quality measurements.

30 Results are returned in the following order: carrier feedthrough, I/Q imbalance, carrier frequency error, transmit time error, and waveform quality. "NAN" is returned for measurements that cannot be completed.

Table D–6: Analog Commands

Command	Values	State	Notes
Configuration – Analog BS Parameters			
CONFigure:ABSTation:LIDentity <location identity> Establishes the location identity value.	0 to 1 to 4095	IDLE	
CONFigure:ABSTation:LIDentity?		ALL	
CONFigure:ABSTation:SIDentity <system identity> Establishes the analog mode system identity value. A similar command exists for CDMA.	0 to 0 to 16383	IDLE	
CONFigure:ABSTation:SIDentity?		ALL	
CONFigure:ABSTation:PDURation <paging duration [S]> Establishes the paging duration in seconds.	5 s to 20 s to 60 s	ALL	
CONFigure:ABSTation:PDURation?			
CONFigure:ABSTation:PARameters[:SETTings]:DEFault Resets all analog base station parameter settings to the default values.		ALL	1
Configuration – Analog BS Signal			
CONFigure:ABSTation:FREQuency:CCHannel <RF channel number> Establishes the control channel value.	1 to 333 to 1023	IDLE	
CONFigure:ABSTation: FREQuency:CCHannel?		ALL	
CONFigure:ABSTation:FREQuency:VCHannel <RF channel number> Establishes the voice channel value.	1 to 333 to 1023	ALL	
CONFigure:ABSTation:FREQuency:VCHannel?		ALL	
CONFigure:ABSTation:FREQuency:SCCode <SAT color code number> Establishes the SAT color code value.	0 to 1 to 2	ALL	
CONFigure:ABSTation:FREQuency:SCCode?		ALL	
CONFigure:ABSTation:FREQuency:SYSTem? (query only) Returns the analog system type. A similar query exists for CDMA.	A or B	ALL	
CONFigure:ABSTation:SOURce:POWer <analog power level [DBM] | MAXimum | MINimum> Establishes the base station power level. A similar command exists for CDMA.	–181.0 dBm to –70.0 dBm to 43 dBm	ALL	2
CONFigure:ABSTation:SOURce:POWer? <MAXimum | MINimum>		ALL	

1 **The settings associated with the commands which cannot be used in the present state of the CMD 80 will not be affected.**

2 **The power available from the CMD 80 depends on the connector in use. When using the RF IN/RF OUT connector, the power range, assuming no external attenuation or gain, is –132.0 dBm to –70.0 dBm to –18.0 dBm. When using the "RF OUT 2" connector under the same conditions, the power range is –113.0 dBm to –70.0 dBm to +2.0 dBm.**

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ABSTation:CMAC <control channel mobile attenuation code> Establishes the control channel mobile attenuation code.	0 to 2 to 7	ALL	
CONFigure:ABSTation:CMAC?		ALL	
CONFigure:ABSTation:VMAC <voice channel mobile attenuation code> Establishes the voice channel mobile attenuation code.	0 to 2 to 7	ALL	
CONFigure:ABSTation:VMAC?		ALL	
CONFigure:ABSTation:SOURce:FM:DEViation:SAT <SAT peak deviation [HZ] | MAXimum | MINimum> Establishes the SAT peak deviation value.	1800 Hz to 2000 Hz to 2200 Hz	ALL	
CONFigure:ABSTation:SOURce:FM:DEViation:SAT? <MAXimum | MINimum>		ALL	
CONFigure:ABSTation[:SETTings]:DEFault Resets all analog base station settings to the default values.		ALL	3
Unregistered and Registered States – General Measurements			
CONFigure:AIACcess:LIMit:POWer:STANdby[:UPPer] Establishes the limit for the standby power measurement.	–80.0 dBm to –60.0 dBm to –40.0 dBm	ALL	
CONFigure:AIACcess:LIMit:POWer:STANdby[:UPPer]?		ALL	
CONFigure:AIACcess:ASTop <OFF|ON> Establishes the auto stop state for the standby power measurement.		ALL	
CONFigure:AIACcess:ASTop?		ALL	
CONFigure:AIACcess:[SETTings]:DEFault Resets all standby power settings to the default values.		ALL	
READ[:SCALar]:AIACCess:POWer:ACTive? Measures and returns the analog mode active access power. A similar command exists for CDMA.	See Note	AMID	4
READ[:SCALar]:AIACCess:POWer:STANdby? Measures and returns the analog mode standby access power. A similar command exists for CDMA.	See Note	AMID	5
FETCh[:SCALar]:AIACCess:POWer:STANdby:LIMit:FAIL? Returns the pass/fail value for the analog standby power measurement.			

3 **The settings associated with the commands which cannot be used in the present state of the CMD 80 will not be affected.**

4 **The result returned is the measured power of the last access probe sent by the mobile station.**

5 **The result returned is the measured power of the mobile station between access probes.**

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
Call Established State – General Measurements			
PROCedure:CTMStation:CALL[TEST | *ATESt* | VOICe] Establishes a call to a mobile station under analog test mode. Tests of the MS power control, receiver, transmitter, etc. can then be made. Voice loopback will also be active.		AMID, AMIN	6
READ[:SCALar]:APOWer:MSTation[:ALL]? Measures and returns the analog mode mobile station power and the expected mobile station power (based on the voice MAC value).	See Note	ACE	7
READ[:SCALar]:ACEQuality[:ALL]? Measures and returns the voice channel frequency error, voice channel peak deviation, SAT frequency error, SAT peak deviation, ST frequency error, and ST peak deviation.	See Note	ACE	8
FETCh[:SCALar]:ACEQuality:LIMit:FAIL[:ALL]? Returns the pass/fail value for the voice channel frequency error, voice channel peak deviation, SAT frequency error, SAT peak deviation, ST frequency error, and ST peak deviation.			
READ[:SCALar]:AAQUality[:ALL]? Measures and returns the audio frequency and peak deviation.	See Note	ACE	8
FETCh[:SCALar]:DNUMber? Returns a string conatining the dialed number.			
Call Established State – Receiver Quality Measurements – Sensitivity			
CONFigure:ARQuality:SENSitivity:LIMit:SINad < sinad limit [DB]> Establishes the limit for the sensitivity measurement's SINAD value. The SINAD must be this value or greater.	0.0 dB to 12.0 dB to 30.0 dB	ALL	
CONFigure:ARQuality:SENSitivity:LIMit:SINad?		ALL	
CONFigure:ARQuality:SENSitivity:ASTop <OFF | ON> Establishes the auto stop state for the sensitivity measurement.		ALL	
CONFigure:ARQuality:SENSitivity:ASTop?		ALL	
CONFigure:ARQuality:SENSitivity:SOURce:POWer <power [DBM] | MAXimum | MINimum> Establishes the base station power level for the sensitivity measurement.	–181.0 dBm to –116.0 dBm to 43.0 dBm	ALL	
CONFigure:ARQuality:SENSitivity:SOURce:POWer? <MAXimum | MINimum>		ALL	

6 **When executed in the MIN! state the CMD 80 uses the most recent MIN to address the mobile station. The MIN source is either the most recent registration or from the PROC:CTMS:MIN command.**

7 **The returned results are the measured power from the mobile station and the expected power from the mobile station based on the current power of the base station.**

8 **The results returned are: carrier frequency error, transmit time error, and waveform quality.**

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ARQuality:SENSitivity:SOURce:FM:DEViation:MODulation <peak deviation [HZ] | MAXimum | MINimum> Establishes the base station modulation peak deviation for the sensitivity measurement.	0.0 Hz to 8000 Hz to 8800 Hz	ALL	
CONFigure:ARQuality:SENSitivity:SOURce:FM:DEViation:MODulation? <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:SENSitivity[:SETTings]:DEFault Resets all receiver quality sensitivity settings to the default values.		ALL	
FETCh[:SCALar]:ARQuality:SENSitivity:LIMit:FAIL? Returns the pass/fail value for the sensitivity measurement.			
READ[:SCALar]:ARQuality:SENSitivity? Measures and returns a SINAD value as an indication of sensitivity of the mobile station's reciever.		ACE	
Call Established State – Receiver Quality Measurements – Hum / Noise			
CONFigure:ARQuality:HNOise:LIMit <hum/noise limit [DB]> Establishes the limit for the hum/noise measurement. The hum/noise must be this level or lower.	0 dB to –32.0 dB to –50.0 dB	ALL	
CONFigure:ARQuality:HNOise:LIMit?		ALL	
CONFigure:ARQuality:HNOise:ASTop: <OFF | ON> Establishes the auto stop state for the hum/noise measurement.		ALL	
CONFigure:ARQuality:HNOise:ASTop?		ALL	
CONFigure:ARQuality:HNOise:TAPDeviation <target audio peak deviation [HZ]> Establishes the target audio peak deviation for the hum/noise measurement. Audio Peak Deviation must approach this value and be within the range specified by the audio peak deviation error range.	0 Hz to 8000Hz to 14,000 Hz	ALL	
CONFigure:ARQuality:HNOise:TAPDeviation?		ALL	
CONFigure:ARQuality:HNOise:APDErange <audio peak deviation error range [HZ]> Establishes the audio peak deviation errorrange for the hum/noise measurement. Audio peak deviation must be within plus or minus this amount of the target audio peak deviation.	100 Hz to 800 Hz to 4000 Hz	ALL	
CONFigure:ARQuality:HNOise:APDErange?		ALL	

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ARQuality:HNOise:SOURce:POWer <power [DBM] | MAXimum | MINimum> Establishes the base station power level for the hum/noise measurement.	–181.0 dBm to –50.0 dBm to 43 dBm	ALL	
CONFigure:ARQuality:HNOise:SOURce:POWer? <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:HNOise:SOURce:FREQuency:MODulation <power [DBM]> Establishes the base station modulation frequency for the hum/noise measurement.	800 Hz to 1004Hz to 3000 Hz	ALL	
CONFigure:ARQuality:HNOise:SOURce:FREQuency:MODulation?		ALL	
CONFigure:ARQuality:HNOise:SOURce:FM:DEViation:MODulation <peak deviation [HZ] | MAXimum | MINimum> Establishes the base station modulation peak deviation for the hum/noise measurement.	0 Hz to 8000 Hz to 8800 Hz	ALL	
CONFigure:ARQuality:HNOise:SOURce:FM:DEViation:MODulation? <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:HNOise:VMAC <voice channel mobile attenuation code> Establishes the voice channel mobile attenuation code for the hum/noise measurement.	0 to 2 to 7	ALL	
CONFigure:ARQuality:HNOise:VMAC?		ALL	
CONFigure:ARQuality:HNOise:AFGen:FREQuency[:CWI:FIXed] <af generator frequency [HZ] | MAXimum | MINimum>	300 Hz to 1100 Hz to 3000 Hz	ALL	
CONFigure:ARQuality:HNOise:AFMeas:FREQuency[:CWI:FIXed]? <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:HNOise:AFGen:VOLTage <af generator level [V] | MAXimum | MINimum>	0.0 V to 0.0 V to 5.000 V	ALL	
CONFigure:ARQuality:HNOise:AFMeas:VOLTage? <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:HNOise[:SETTings]:DEFault Resets all receiver quality hum / noise settings to the default values.		ALL	
READ[:SCALar]:ARQuality:HNOise[:ALL]? Measures and returns the relative level of hum/noise (dB), and the current audio peak deviation (Hz), as an indication of the residual audio output of the mobile station's receiver.		ACE	
Call Established State – Receiver Quality Measurements – Harmonic Distortion			
CONFigure:ARQuality:HDIStortion:LIMit <harmonic distortion limit in %> Establishes the limit for the harmonic distortion measurement. The harmonic distortion must be this value or lower.	0 % to 5.0 % to 30.0 %	ALL	
CONFigure:ARQuality:HDIStortion:LIMit?		ALL	

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ARQuality:HDIStortion:ASTop: <OFF | ON> Establishes the auto stop state for the harmonic distortion measurement.		ALL	
CONFigure:ARQuality:HDIStortion:ASTop?		ALL	
CONFigure:ARQuality:HDIStortion:SOURce:POWer <power [DBM] | MAXimum | MINimum> Establishes the base station power level for the harmonic distortion measurement.	–181.0 dBm to –50.0 dBm to 43.0 dBm	ALL	
CONFigure:ARQuality:HDIStortion:SOURce:POWer? <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:HDIStortion:SOURce:FM:DEViation:MODulation <peak deviation [HZ] | MAXimum | MINimum> Establishes the base station modulation peak deviation for the harmonic distortion measurement.	0 Hz to 8000 Hz to 8800 Hz	ALL	
CONFigure:ARQuality:HDIStortion:SOURce:FM:DEViation:MODulation? <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:HDIStortion[:SETTings]:DEFault Resets all receiver quality harmonic distortion settings to the default values.		ALL	
FETCh[:SCALar]:ARQuality:HDIStortion:LIMit:FAIL? Returns the pass/fail value for the harmonic distortion measurement.			
READ[:SCALar]:ARQuality:HDIStortion? Measures and returns a value for harmonic distortion (%) as an indication of the contribution of the harmonic components to the total output of the mobile station's receiver.		ACE	
Call Established State – Receiver Quality Measurements – Audio Frequency Response			
CONFigure:ARQuality:AFResponse:LIMit:BOTH:FREQuency:LOWest <lowest frequency of both limit lines [HZ]> Establishes the lowest frequency used in both of the limit lines of the audio frequency response measurement.	50 Hz to 240 Hz to 365 Hz	ALL	9
CONFigure:ARQuality:AFResponse:LIMit:BOTH:FREQuency:LOWest?		ALL	
CONFigure:ARQuality:AFResponse:LIMit:BOTH:FREQuency:HIGHest <highest frequency of both limit lines [HZ]> Establishes the highest frequency used in both of the limit lines of the audio frequency response measurement.	435 Hz to 3000 Hz to 4000 Hz	ALL	9
CONFigure:ARQuality:AFResponse:LIMit:BOTH:FREQuency:HIGHest?		ALL	

9 **Some Limit values are dynamic and depend on the settings for associated limits (limit settings on the same axis of the graph).**

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ARQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle:LOWest <lowest middle frequency of lower limit line [HZ]> Establishes the lowest middle frequency used in the lower limit line of the audio frequency response measurement.	275 Hz to 400 Hz to 2365 Hz	ALL	10
CONFigure:ARQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle:LOWest?		ALL	
CONFigure:ARQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle: HIGHest <highest middle frequency of lower limit line [HZ]> Establishes the highest middle frequency used in the lower limit line of the audio frequency response measurement.	435 Hz to 2400 Hz to 2965 Hz	ALL	10
CONFigure:ARQuality:AFResponse:LIMit:LOWer:FREQuency:MIDDle:HIGHest?		ALL	
CONFigure:ARQuality:AFResponse:LIMit:UPPer:LEVel <upper limit level [DB]> Establishes the level of the upper limit line for the audio frequency response measurement.	–2.9 dB to 1.0 dB to 4.0 dB	ALL	10
CONFigure:ARQuality:AFResponse:LIMit:UPPer:LEVel?		ALL	
CONFigure:ARQuality:AFResponse:LIMit:LOWer:LEVel:UPPer <upper level of lower limit [DB]> Establishes the upper level of the lower limit line for the audio frequency response measurement.	–150.0 dB to –3.0 dB to 0.9 dB	ALL	10
CONFigure:ARQuality:AFResponse:LIMit:LOWer:LEVel:UPPer?		ALL	
CONFigure:ARQuality:AFResponse:LIMit:LOWer:LEVel:LOWer <lower level of lower limit [DB]> Establishes the lower level of the lower limit line for the audio frequency response measurement.	–150 dB to –6.0 dB to 0.9 dB	ALL	10
CONFigure:ARQuality:AFResponse:LIMit:LOWer:LEVel:LOWer?		ALL	
CONFigure:ARQuality:AFResponse:LIMit:UPPer:COUNt? (query only) Returns the number (count) of points which designate the upper limit line for the audio frequency response measurement.	4	ALL	
CONFigure:ARQuality:AFResponse:LIMit:UPPer:GRAPh:X? (query only) Returns the horizontal (X–axis) graph positions for each of the points which designate the upper limit line of the audio frequency response measurement.	50 Hz to 4000 Hz	ALL	
CONFigure:ARQuality:AFResponse:LIMit:UPPer:GRAPh:Y? (query only) Returns the vertical (Y–axis) graph positions for each of the points which designate the upper limit line of the audio frequency response measurement.		ALL	
CONFigure:ARQuality:AFResponse:LIMit:LOWer:COUNt? (query only) Returns the number (count) of points which designate the lower limit line of the audio frequency response measurement.	6	ALL	

10 **Some Limit values are dynamic and depend on the settings for associated limits (limit settings on the same axis of the graph).**

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ARQuality:AFResponse:LIMit:LOWer:GRAPh:X? (query only) Returns the horizontal (X–axis) graph positions for each of the points which designate the lower limit line of the audio frequency response measurement.	50 Hz to 4000 Hz	ALL	
CONFigure:ARQuality:AFResponse:LIMit:LOWer:GRAPh:Y? (query only) Returns the vertical (Y–axis) graph positions for each of the points which designate the lower limit line of the audio frequency response measurement.		ALL	
CONFigure:ARQuality:AFResponse:SPOints <sample points> Establishes the number of sample points to be taken during the audio frequency response measurement.	2 to 14 to 100	ALL	
CONFigure:ARQuality:AFResponse:SPOints?		ALL	
CONFigure:ARQuality:AFResponse:ASTop: <OFF | ON> Establishes the auto stop state for the audio frequency response measurement.		ALL	
CONFigure:ARQuality:AFResponse:ASTop?		ALL	
CONFigure:ARQuality:AFResponse:SOURce:POWer <power [DBM] | MAXimum | MINimum> Establishes the base station power level for the audio frequency response measurement.	–181 dBm to –50.0 dBm to 43.0 dBm	ALL	
CONFigure:ARQuality:AFResponse:SOURce:POWer? <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:AFResponse:SOURce:FM:DEViation:MODulation <peak deviation [HZ] | MAXimum | MINimum> Establishes the base station modulation peak deviation for the audio frequency response measurement.	0 Hz to 2900 Hz to 8800 Hz	ALL	
CONFigure:ARQuality:AFResponse:SOURce:FM:DEViation:MODulation <MAXimum | MINimum>		ALL	
CONFigure:ARQuality:AFResponse[:SETTings]:DEFault Resets all receiver quality audio frequency response settings to the default values.		ALL	
READ[:SCALar]:ARQuality:AFResponse? Invokes the receiver quality audio frequency response measurement and returns the absolute MS Audio level (dBm). Other values relative to the MS audio level, and their frequency designations, are then available via the corresponding "FETCh" commands. These values denote the audio frequency response of the mobile station's receiver. The number of values returned is equal to the number of sample points set by the user (2 to 100 with 14 the default).		ACE	
FETCh:ARRay:ARQuality:AFResponse:GRAPh:Y? Returns the audio frequency response values (dB) relative to the MS audio level obtained via the corresponding "READ" command. These values denote the audio frequency response of the mobile station's receiver. The number of values returned is equal to the number of sample points set by the user (2 to 100 with 14 the default).		ACE	

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
FETCh:ARRay:ARQuality:AFResponse:GRAPh:X? Returns the frequency designations (Hz) which pair with the 14 audio frequency response values obtained via the corresponding "FETCh" command. These values denote the frequencies at which the audio frequency response values were obtained. The number of values returned is equal to the number of sample points set by the user (2 to 100 with 14 the default).	50 Hz to 4000 Hz	ACE	
FETCh:ARRay:ARQuality:AFResponse:LIMit:FAIL? Returns the pass/fail values for the 14 audio frequency response measurements.			
Call Established State – Transmitter Quality Measurements – Hum/Noise			
CONFigure:ATQuality:HNOise:LIMit <hum / noise [DB]> Establishes the limit for the hum/noise measurement. The hum/noise must be this level or lower.	–50.0 dB to –32.0 dB to 0 dB	ALL	
CONFigure:ATQuality:HNOise:LIMit?		ALL	
CONFigure:ATQuality:HNOise:ASTop: <OFF | ON> Establishes the auto stop state for the hum/noise measurement.		ALL	
CONFigure:ATQuality:HNOise:ASTop?		ALL	
CONFigure:ATQuality:HNOise:TAPDeviation <target audio peak deviation [HZ]> Establishes the target audio peak deviation for the hum/noise measurement. Audio peak deviation must approach this value and be within the range specified by the audio peak deviation error range.	0 Hz to 8000 Hz to 14,000 Hz	ALL	
CONFigure:ATQuality:HNOise:TAPDeviation?		ALL	
CONFigure:ATQuality:HNOise: APDErange <audio peak deviation error range [HZ]> Establishes the audio peak deviation error range for the hum/noise measurement. Audio peak deviation must be within plus or minus this amount of the target audio peak deviation.	100 Hz to 800 Hz to 4000 Hz	ALL	
CONFigure:ATQuality:HNOise:APDErange?		ALL	
CONFigure:ATQuality:HNOise:SOURce:POWer <power[DBM] | MAXimum | MINimum> Establishes the base station power level for the hum/noise measurement.	–181.0 dBm to –50.0 dBm to 43.0 dBm		
CONFigure:ATQuality:HNOise:SOURce:POWer? <MAXimum | MINimum>	ALL		
CONFigure:ATQuality:HNOise:VMAC <voice channel mobile attenuation code> Establishes the voice channel mobile attenuation code for the hum/noise measurement.	0 to 0 to 7	ALL	
CONFigure:ATQuality:HNOise:VMAC?		ALL	
CONFigure:ATQuality:HNOise:AFGen:FREQuency[:CW|:FIXed] <afgenerator frequency [HZ] | MAXimum | MINimum> Establishes the AF Generator frequency for the hum/noise measurement.	300 Hz to 1004 Hz to 3000 Hz	ALL	

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ATQuality:HNOise:AFGen: FREQuency[:CWI:FIXed]? <MAXimum | MINimum>		ALL	
CONFigure:ATQuality:HNOise:AFGen:VOLTage <af generator level [V] | MAXimum | MINimum> Establishes the AF Generator voltage level for the hum/noise measurement. Specifying a level turns the AF Generator on; specifying 0 V turns it off. Audio peak deviation in the mobile station is determined by this level.	0.0 V to 0.0 V to 5.0 V	ALL	
CONFigure:ATQuality:HNOise:AFGen:VOLTage? <MAXimum | MINimum>		ALL	
CONFigure:ATQuality:HNOise: [:SETTings]:DEFault Resets all transmitter quality settings to the default values for the hum/noise measurement.		ALL	
FETCh[:SCALar]:ATQuality:HNOise:LIMit:FAIL[:ALL]? Returns the pass/fail values for the hum/noise level and audio peak deviation measurements.			
READ[:SCALar]:ATQuality:HNOise[:ALL]? Measures and returns the relative level of hum/noise (dB) and the current audio peak deviation (Hz) as an indication of the residual FM generated by the mobile station's transmitter.		ACE	
Call Established State – Transmitter Quality Measurements – Modulation Noise/Distortion			
CONFigure:ATQuality:MNDistortion:LIMit <modulation noise / distortion in %> Establishes the limit for the modulation noise/distortion measurement. The Modulation Noise / Distortion must be this value or lower.	0 % to 5.0 % to 30 %	ALL	
CONFigure:ATQuality:MNDistortion:LIMit?		ALL	
CONFigure:ATQuality:MNDistortion:ASTop: <OFF | ON> Establishes the auto stop state for the modulation noise/distortion measurements.		ALL	
CONFigure:ATQuality:MNDistortion:ASTop?		ALL	
CONFigure:ATQuality:MNDistortion:TAPDeviation <target audio peak deviation [HZ]> Establishes the target audio peak deviation for the modulation noise/distortion measurement. Audio peak deviation must approach this value and be within the range specified by the audio peak deviation error range.	0 Hz to 8000 Hz to 14,000 Hz	ALL	
CONFigure:ATQuality:MNDistortion:TAPDeviation?		ALL	
CONFigure:ATQuality:MNDistortion: APDErange <audio peak deviation error range [HZ]> Establishes the audio peak deviation error range for the modulation noise/distortion measurement. Audio peak deviation must be within plus or minus this amount of the target audio peak deviation.	100 Hz to 800 Hz to 3200 Hz	ALL	
CONFigure:ATQuality:MNDistortion:APDErange?		ALL	

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ATQuality:MNDistortion:SOURce:POWer <power[DBM] | MAXimum | MINimum> Establishes the base station power level for the modulation noise/distortion measurement.	–181.0 dBm to –50.0 dBm to 43.0 dBm		
CONFigure:ATQuality:MNDistortion:SOURce:POWer? <MAXimum | MINimum>	ALL		
CONFigure:ATQuality:MNDistortion:VMAC <voice channel mobile attenuation code> Establishes the voice channel mobile attenuation code for the modulation noise/distortion measurement.	0 to 2 to 7	ALL	
CONFigure:ATQuality:MNDistortion:VMAC?		ALL	
CONFigure:ATQuality:MNDistortion:AFGen:VOLTage <af generator level [V] | MAXimum | MINimum> Establishes the AF Generator voltage level for the modulation noise/distortion measurement. Specifying a level turns the AF Generator on; specifying 0 V turns it off. Audio peak deviation in the mobile station is determined by this level.	0.0 V to 0.0 V to 5.0 V	ALL	
CONFigure:ATQuality:MNDistortion:AFGen:VOLTage? <MAXimum | MINimum>		ALL	
CONFigure:ATQuality:MNDistortion: [:SETTings]:DEFault Resets all transmitter quality settings to the default values for the modulation noise/distortion measurement.		ALL	
FETCh[:SCALar]:ATQuality:MNDistortion:LIMit:FAIL[:ALL]? Returns the pass/fail values for the modulation noise/distortion and audio peak deviation measurements.			
READ[:SCALar]:ATQuality:MNDistortion[:ALL]? Measures and returns the modulation noise/distortion (%) and the current audio peak deviation (Hz) of the mobile station's transmitter.		ACE	
Call Established State – Transmitter Quality Measurements – Audio Frequency Response			
CONFigure:ATQuality:AFResponse:LIMit:BOTH:FREQuency:LOWest <lowest frequency of both limit lines [HZ]> Establishes the lowest frequency used in both of the limit lines of the audio frequency response measurement.	50 Hz to 300 Hz to 2895 Hz	ALL	[11]
CONFigure:ATQuality:AFResponse:LIMit:BOTH:FREQuency:LOWest?		ALL	
CONFigure:ATQuality:AFResponse:LIMit:BOTH:FREQuency:HIGHest <highest frequency of both limit lines [HZ]> Establishes the highest frequency used in both of the limit lines of the audio frequency response measurement.	405 Hz to 4000 Hz to 4000 Hz	ALL	[11]
CONFigure:ATQuality:AFResponse:LIMit:BOTH:FREQuency:HIGHest?		ALL	

[11] **Some Limit values are dynamic and depend on the settings for associated limits (limit settings on the same axis of the graph).**

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ATQuality:AFResponse:LIMit:LOWer:FREQuency:MIDdle <middle frequency of lower limit line [HZ]> Establishes the middle frequency used in the lower limit line of the audio frequency response measurement.	405 Hz to 3000 Hz to 3895 Hz	ALL	
CONFigure:ATQuality:AFResponse:LIMit:ERRor:APDeviation <target audio peak deviation error range [HZ] | MAXimum | MINimum>	100 Hz to 4000 Hz	ALL	
CONFigure:ATQuality:AFResponse:LIMit:ERRor? MAXimum | MINimum>		ALL	
CONFigure:ATQuality:AFResponse:LIMit:LOWer:FREQuency:MIDdle?		ALL	
CONFigure:ATQuality:AFResponse:LIMit:UPPer:LEVel <upper limit level [DB]> Establishes the level of the upper limit line for the audio frequency response measurement.	–2.9 dB to 1.0 dB to 4.0 dB	ALL	12
CONFigure:ATQuality:AFResponse:LIMit:UPPer:LEVel?		ALL	
CONFigure:ATQuality:AFResponse:LIMit:LOWer:LEVel:UPPer <upper level of lower limit [DB]> Establishes the upper level of the lower limit line for the audio frequency response measurement.	–150.0 dB to –3.0 dB to 0.9 dB	ALL	12
CONFigure:ATQuality:AFResponse:LIMit:LOWer:LEVel:UPPer?		ALL	
CONFigure:ATQuality:AFResponse:LIMit:LOWer:LEVel:LOWer <lower level of lower limit [DB]> Establishes the lower level of the lower limit line for the audio frequency response measurement.	–150.0 dB to –12.0 dB to 0.9 dB	ALL	12
CONFigure:ATQuality:AFResponse:LIMit:LOWer:LEVel:LOWer?		ALL	
CONFigure:ATQuality:AFResponse:LIMit:UPPer:COUNt? Returns the number (count) of points which designate the upper limit line for the audio frequency response measurement.	4	ALL	
CONFigure:ATQuality:AFResponse:LIMit:UPPer:GRAPh:X? Returns the horizontal (X–axis) graph positions for each of the points which designate the upper limit line of the audio frequency response measurement.	50 Hz to 4000 Hz	ALL	
CONFigure:ATQuality:AFResponse:LIMit:UPPer:GRAPh:Y? Returns the vertical (Y–axis) graph positions for each of the points which designate the upper limit line of the audio frequency response measurement.		ALL	
CONFigure:ATQuality:AFResponse:LIMit:LOWer:COUNt? Returns the number (count) of points which designate the lower limit line of the audio frequency response measurement.	6	ALL	

12 **Some Limit values are dynamic and depend on the settings for associated limits (limit settings on the same axis of the graph).**

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ATQuality:AFResponse:LIMit:LOWer:GRAPh:X? Returns the horizontal (X–axis) graph positions for each of the points which designate the lower limit line of the audio frequency response measurement.	50 Hz to 4000 Hz	ALL	
CONFigure:ATQuality:AFResponse:LIMit:LOWer:GRAPh:Y? Returns the vertical (Y–axis) graph positions for each of the points which designate the lower limit line of the audio frequency response measurement.		ALL	
CONFigure:ATQuality:AFResponse:SPOints <sample points> Establishes the number of sample points to be taken during the audio frequency response measurement.	2 to 14 to 100	ALL	
CONFigure:ATQuality:AFResponse:SPOints?		ALL	
CONFigure:ATQuality:AFResponse:ASTop: <OFF | ON> Establishes the auto stop state for the audio frequency response measurement.		ALL	
CONFigure:ATQuality:AFResponse:ASTop?		ALL	
CONFigure:ATQuality:AFResponse:SOURce:POWer <power [DBM] | MAXimum | MINimum> Establishes the base station power level for the audio frequency response measurement.	–181.0 dBm to –50.0 dBm to 43.0 dBm	ALL	
CONFigure:ATQuality:AFResponse:SOURce:POWer? <MAXimum | MINimum>		ALL	
CONFigure:ATQuality:AFResponse:TAPDeviation <target audio peak deviation [HZ]> Establishes the target audio peak deviation for the audio frequency response measurement.	0 Hz to 2900 Hz to 14,000 Hz	ALL	
CONFigure:ATQuality:AFResponse:TAPDeviation?		ALL	
CONFigure:ATQuality:AFResponse:VMAC <voice channel mobile attenuation code> Establishes the voice channel mobile attenuation code for the audio frequency response measurement..	0 to 2 to 7	ALL	
CONFigure:ATQuality:AFResponse:VMAC?		ALL	
CONFigure:ATQuality:AFResponse[:SETTings]:DEFault Resets all transmitter quality audio frequency response settings to the default values.		ALL	
FETCh:ARRay:ATQuality:AFResponse:LIMit:FAIL? Returns the pass/fail values for the audio frequency response measurements.			
READ[:SCALar]:ATQuality:AFResponse? Invokes the transmitter quality audio frequency response measurement and returns the absolute MS power level (dBm). The other values relative to the MS power level and their frequency designations are then available via the corresponding "FETCh" commands. These values denote the audio frequency response of the mobile station's transmitter.		ACE	

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
FETCh:ARRay:ATQuality:AFResponse:GRAPh:Y? Returns the audio frequency response values (dB) relative to the MS power level obtained via the corresponding "READ" command. These values denote the audio frequency response of the mobile station's transmitter.		ACE	
FETCh:ARRay:ATQuality:AFResponse:GRAPh:X? Returns the frequency designations (Hz) which pair with the Audio Frequency Response values obtained via the corresponding "FETCh" command. These values denote the frequencies at which the audio frequency response values were obtained. The number of values is determined with CONF:ATQ:AFR:SPO?.	50 Hz to 4000 Hz	ACE	
Call Established State – Transmitter Quality Measurements – Modulation Limiting			
CONFigure:ATQuality:MLIMiting:AFGen:VOLTage <level [V]> Controls the AF Generator level.	0.0 V to 0.0 V to 5.0 V	ALL	
CONFigure:ATQuality:MLIMiting:AFGen:VOLTage?		ALL	
CONFigure:ATQuality:MLIMiting:ASTop <OFF | ON> Controls the auto stop function.		ALL	
CONFIgure:ATQuality:MLIMiting:ASTop?		ALL	
CONFigure:ATQuality:MLIMiting:LIMit:FREQuency:DEViation <deviation [HZ]> Configures the maximum permitted deviation expected.	0 Hz to 12,000 Hz to 16,000 Hz	ALL	13
CONFigure:ATQuality:MLIMiting:LIMit:FREQuency:HIGHest <audio freq [HZ]> Controls the highest AF Generator frequency.	405 Hz to 3000 Hz to 4000 Hz	ALL	13
CONFigure:ATQuality:MLIMiting:LIMit:FREQuency:HIGHest?		ALL	
CONFIgure:ATQuality:MLIMiting:LIMit:FREQuency:LOWest <audio freq [HZ]> Controls the lowest AF Generator frequency.	50 Hz to 300 Hz to 2895 Hz	ALL	13
CONFigure:ATQuality:MLIMiting:LIMit:FREQuency:LOWest?		ALL	
CONFigure:ATQuality:MLIMiting:LIMit[:UPPer]:COUnt? Returns the number of points in the limit graph.	2	ALL	
CONFigure:ATQuality:MLIMiting:LIMit[:UPPer]:GRAPh:X? Returns the X values of the limit graph.		ALL	
CONFigure:ATQuality:MLIMiting:LIMit[:UPPer]:GRAPh:Y? Returns the Y values of the limit graph.		ALL	
CONFigure:ATQuality:MLIMiting[:SETTings]:DEFault Resets the modulation limiting parameters to default values.		ALL	

13 **Some Limit values are dynamic and depend on the settings for associated limits (limit settings on the same axis of the graph).**

Table D–6: Analog Commands (Cont.)

Command	Values	State	Notes
CONFigure:ATQuality:MLIMiting:SOURce:POWer <output power [DBM]> Controls the CMD 80 output power.	–131.0 dBm to –50.0 dBm to 43.0 dBm	ALL	
CONFigure:ATQuality:MLIMiting:SOURce:POWer?		ALL	
CONFigure:ATQuality:MLIMiting:SPOints <number of sample points> Controls the number of sample points.	2 to 14 to 100	ALL	
CONFigure:ATQuality:MLIMiting:SPOints?		ALL	
CONFigure:ATQuality:MLIMiting:VMAC <voice MAC> Controls the voice MAC.	0 to 2 to 7	ALL	
CONFigure:ATQuality:MLIMiting:VMAC?		ALL	
FETCh:ARRay:ATQuality:MLIMiting:GRAPh:X? Returns the result graph X values.		ACE	14
FETCh:ARRay:ATQuality:MLIMiting:GRAPh:Y? Returns the result graph Y values.		ACE	14
FETCh:ARRay:ATQuality:MLIMiting:LIMit:FAIL? Returns the pass (0)/fail (1) value for the peak deviation.		ACE	
READ[:SCALar]:ATQuality:MLIMiting? Returns the maximum peak deviation measured.		ACE	14

14 The number of points returned is equal to the number of sample points (2 to 100).

Appendix E: Special Remote Commands

The CMD 80's remote interface includes several special commands that provide low-level instrument control that is not available from the instrument front panel.

NOTE. *These commands cause the CMD 80 to produce nonstandard output signals that result in incorrect responses to some CMD 80 configuration queries. These commands should be used with caution and only when their effects and the desired results are well understood.*

The settings of these commands are not saved with instrument settings. Recalling any setting resets these commands to their default states.

Command table E–1 is interpreted in the same manner as Table D–5 starting on page D–5.

Table E–1: CMD 80 special remote commands

Command	Values	State	Notes
CONFigure:SPECial:DCLDetection[:STATe] <OFF | ON>		CE1, CE2	1
CONFigure:SPECial:DCLDetection[:STATe]?		ALL	
CONFigure:SPECial:FPCHold[:STATe] <OFF | ON>		CE1, CE2	2
CONFigure:SPECial:FPCHold[:STATe]?		ALL	
CONFigure:SPECial:MPOWer[:STATe] <OFF | ON>			3
CONFigure:SPECial:MPOWer[:STATe]?			
CONFigure:SPECial:OCNS[:STATe] <OFF | ON>		ALL	4
CONFigure:SPECial:OCNS[:STATe]?		ALL	

1 **The ON argument disables the detection of a dropped call. When the system is disabled, the CMD 80 is unable to detect that the mobile station has lost the connection. This does not affect the intentional release of a call. The argument in set to OFF by default at the beginning of each call.**

2 **The ON argument forces the power control system into a hold mode repeating power up and down decisions. The argument is set to OFF by default at the beginning of each call and during measurements that require special power control modes. NOTE: Operation in the CE1 instrument state is not recommended.**

3 **ON maintains the CMD 80 output power when a call is established after a measurement to the level used during that measurement. OFF restores the CMD 80 output power to the CDMA BS Signal Configuration level. The argument is set to OFF by default when the CMD 80 is in local mode. The CMD 80 output power level when a call is not established is the CDMA BS Signal Configuration level.**

4 **This command controls the generation of the OCNS signals that contribute a portion of the total power sent to the mobile station. The total power specified for the base station simulator includes the power of the OCNS signals; when these signals are removed ("OFF"), the total output power of the base station simulator is less than that set by the configuration commands. The power values returned by "CONFigure:. . .:POWer?" queries are in error since the responses include the power in the OCNS signals.**

Table E–1: CMD 80 special remote commands (Cont.)

Command	Values	State	Notes
CONFigure:SPECial:OCW[:STATe] <OFF | ON>		MINI, MIDL, CE1, CE2, CMT	5
CONFigure:SPECial:OCW[:STATe]?	OFF, ON	ALL	
CONFigure:SPECial:OPILot[:STATe] <OFF | ON>		MINI, MIDL, CE1, CE2, CMT	6
CONFigure:SPECial:OPILot[:STATe]?	OFF, ON	ALL	
CONFigure:SPECial:PCBits:MODE <AUTO | HOLD | ADOWn | AUP | RTESt>		CE1, CE2	7
CONFigure:SPECial:PCBits:MODE?	AUTO, MIDL, CE1, CE2, CMT	ALL	
CONFigure:SPECial:PCONtrol[:STATe] <OFF | ON>		CE1, CE2	8
CONFigure:SPECial:PCONtrol[:STATe]?		ALL	

5 "ON" generates a CW tone at the center frequency of the current RF channel. "OFF" restores normal CDMA operation.

6 "ON" disables all CDMA channels except the pilot channel. "OFF" restores all channels to normal operation.

7 This command selects different algorithms to control the closed loop power. Calls are established using the AUTO mode. The HOLD argument sends a pattern of alternating up and down power control bits. The ADOWn argument generates a pattern of continuous down power control bits. The AUP argument generates a pattern of continuous up power control bits. The RTESt arguments generates a pattern of eight frames of up power control bits followed by eight frames of down power control bits.

The "HOLD" argument sets CONFigure:SPECial:FPCHold to "ON". The remaining arguments set CONFigure:SPECial:FPCHold to "OFF".

The "AUTO" mode uses the current state of CONFigure:SPECial:DCLDetection to control the state of the reverse traffic channel receiver. The remaining modes disable the reverse traffic channel receiver. The AUTO mode is enabled whenever a call is terminated.

Using this command in the CE1 state is not recommended since this command requires a stable reverse link frame rate.

8 This command, when used with the "OFF" argument, removes the normal power control bits from the CDMA forward traffic channel. The "ON" argument restores normal operation. Whenever a call is placed or released, the power control bits revert to normal (on). The "OFF" argument must be sent while a call is established to have any effect. Since the resulting signal produced by the CMD 80 is not a standard CDMA signal, the mobile station must be expecting and be prepared to handle this signal. The probability of dropping a call is increased.

Glossary

AMPS
Advanced Mobile Phone Service

ASK
Amplitude Shift Keying

AWGN
Additive White Gaussian Noise source used to simulate the noise from users on adjacent cells.

BER
Bit Error Rate

BPSK
Binary Phase Shift Keying

CDMA
Code Division Multiple Access – A form of mobile communication that uses a specific frequency plus a unique code to distinguish users. This allows simultaneous use by multiple users on the same frequency.

CDMA Pilot Channel
The Pilot Channel is a phase reference used by all mobile stations linked to a cell.

CDMA Paging Channel
The Paging Channel is the control channel for the forward link. The inverse of the Paging Channel is the access channel for the reverse link.

CDMA Sync Channel
The Sync Channel transmits time information to align the mobile and base station clocks.

CDMA Traffic Channel
Equivalent to an analog voice channel where conversations take place.

CW
Continuous Wave

DDS
Direct Digital Synthesis

FER
Frame Erasure Rate

I/Q
In phase / Quadrature phase

OCNS
Orthogonal Channel Noise Source

PCS
Personal Communication System

PN
Pseudo Noise

PRBS
Pseudo Random Bit Sequence

QPSK
Quadrature Phase Shift Keying

Waveform Quality "ρ" (Greek letter rho)
The CDMA transmitter figure of merit. It is a measure of the percentage of transmitter power within the desired code domain related to the ideal value.

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