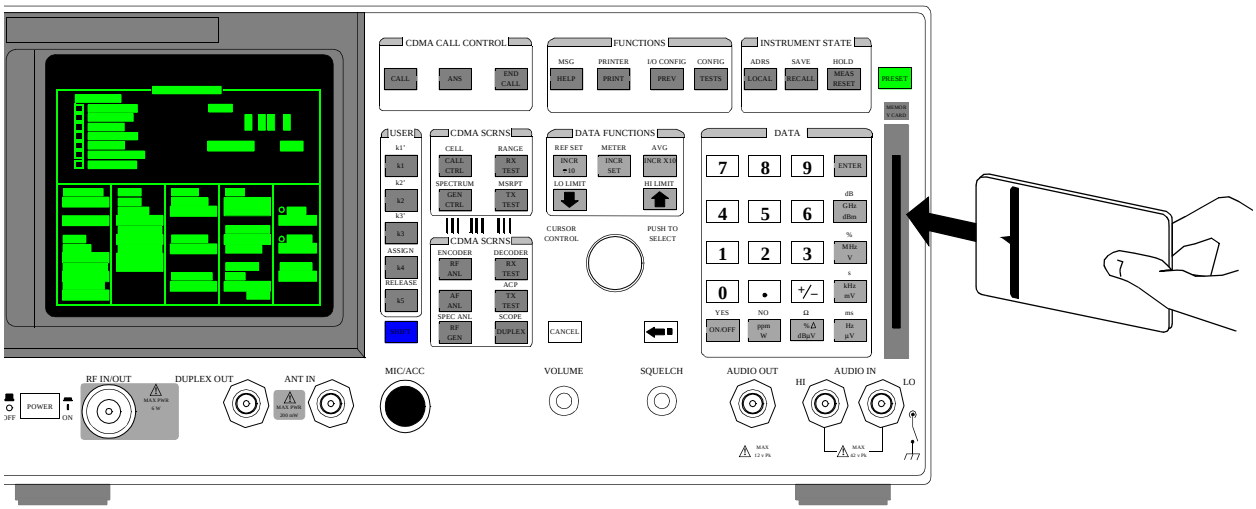
HP 83217A Option 001 CDMA/AMPS/NAMPS TESTS

Reference Guide

Software Revision A.03.03 and above



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Hewlett-Packard Company
Learning Products Department
24001 E. Mission
Liberty Lake, WA 99019-9599
U.S.A.

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Product Description

Description

The HP 83217A Option 001 Software when used with the HP 8924C CDMA Mobile Test Set provides parametric test capability for 800 MHz CDMA/AMPS/ NAMPS Mobile Stations.

The HP 83217A Option 001 Software can be used for the installation, maintenance, and/or repair of CDMA or CDMA/AMPS/NAMPS Mobile Stations.

Software Functions

- Parametric verification of CDMA mobile station transmitter and receiver performance.
- Parametric verification of AMPS/NAMPS mobile station transmitter and receiver performance.
- In-depth call processing, including registration and handoffs.
- Digital to Analog Handoffs.

Software Features

- Test results and pass/fail indications are displayed on the Test Set's screen, and can be output to a printer, disk drive, memory card, PC, or HP Palmtop computer.
- Tests order, pass/fail limits, testing conditions and equipment configurations can be changed.
- RF path losses can be compensated for.
- Test procedures can be modified and saved to a memory card (included with the software).
- Tests can be executed continuously or in single steps.
- Test procedures can be secured with a password to prevent unauthorized modifications.

Items Included in the HP 83217A, Option 001 Software

- Memory cards:
  - (1) 2 Mbyte Flash (containing the HP 83217A option 001 software), part number 83217-10001.
  - (1) Uninitialized 64 Kbyte SRAM (for storage), part number HP 83230A.
- *HP 83217A Test Software Introduction to Operation*.
- *HP 83217A Test Software User's Guide*.
- *HP 83217A Opt. 001 CDMA/AMPS/NAMPS Test Reference Guide*.
- HP software product license agreement.

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Test Descriptions

Introduction

A test is made up of a series of programming commands which configure the Test Set for a particular measurement environment. After the Test Set is properly configured the desired measurement is made and the measurement results are available to the user. One or more tests make up a procedure. While you may change the tests that make up a procedure, you may not change the measurements the test will perform. For more information about test procedures, see "The Tests Subsystem" in the *HP 83217A Test Software User's Guide.*

Standards Used

The tests contained in this Test Package are derived from:

- EIA/TIA IS-90 Recommended Minimum Performance Standards for 800 MHz Dual-Mode Narrowband Analog Cellular Subscriber Units
- EIA/TIA IS-95 Mobile Station - Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System
- EIA/TIA IS-98 Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations

With the exception of tests:

TEST_13 - TXA Current Drain

TEST_19 - RXA FVC Order Message Error Rate

Which are not derived from any particular standard, but instead are derived from customer needs relating to standard mobile phone operation.

Test Nomenclature

The prefixes used with the individual test descriptions are defined as follows:

- CPA - Call Processing, Analog tests
- CPD - Call Processing, Digital tests
- OTA - Other Tests, Analog
- RXA - Receiver, Analog tests
- RTD - Receiver/Transmitter, Digital tests
- RXD - Receiver, Digital tests
- TXA - Transmitter, Analog tests
- TXD - Transmitter, Digital tests

Other Nomenclature

- MSUT - Mobile Station Under Test

TEST_01 - CPA Registration

Description

This test reads and decodes the phone's Reverse Control Channel (RECC) and outputs the following registration information:

- Phone number: <decimal number>
- MIN: <hexadecimal number>
- Serial number: <decimal number>, <decimal number>, < hexadecimal number>
- Power Class: <class I, II, or III>
- Transmission: <continuous or discontinuous>
- Bandwidth: <20 MHz or 25 MHz>

NOTE:

Regarding the serial number data shown above, the numbers are as follows:
First Decimal Number: The first three digits represent the manufacturer's code. The next eight digits represent a combination of the reserve bits and the unit serial number.
Second Decimal Number: The first three digits represent the manufacturer's code. The next two digits represent the reserve bits. The next six digits represent the unit serial number.
Hexadecimal Number: A hexadecimal representation of the above two numbers.

The test works as follows:

- The test system transmits the Registration ID message repeatedly, with the value of the **`REGID`** field set alternately to 0 and 500. This induces the phone to register with the test system.
- If an error occurs in this test, all testing is stopped.

A CPA/CPD Registration or CPA/CPD Origination test must be run at least once before any analog tests can be run, otherwise the operator is prompted to enter the MSUT phone number during testing. After a CPA/CPD Registration or CPA/CPD Origination test is run once it does not need to be run again for the test system to be able to perform other analog tests. The registration data is remembered unless it is erased by loading new test software, registering a different radio, or executing a **`SCRATCH C`** command in IBASIC.

Pass/Fail Limits Used

- None

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_02 - CPA Page

Description

Initiates a call to the mobile station from the base station. Specifically, this test does the following:

1. Performs a page to the MSUT
2. Performs 3 of 5 majority voting on the Reverse Control Message
3. Performs BCH (Bose-Chaudhuri-Hocquenghem) error detection and correction of the Reverse Control Message
4. Tests each section of the page response, bit by bit
5. Sends an Initial-Voice-Channel-Designation order to the MSUT, directing it to tune to a voice channel obtained from the **`Channel Information`** table. If the channel number from the table has an L, M, or U suffix, the phone will be directed to a narrow voice channel. If the channel number has no suffix, the phone will be directed to a wide voice channel.
6. Sends an ALERT order to the MSUT by way of the Forward Voice Channel (FVC)
7. Makes a power measurement on the initial voice channel to verify that the voice channel was obtained. The power measurement result is not displayed in this test.

Pass/Fail Limits Used

- None

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_03 - TXA Frequency Error

Description

This test measures the difference between the unmodulated carrier frequency and the assigned carrier frequency. TXA frequency error is measured on a voice channel with voice modulation off, and SAT modulation on. This test is performed at the nominal supply voltage.

This test can only be performed at the high and low supply voltage settings if an HP-IB programmable power supply is configured into the test system and **parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** is set to 1. See **TEST_13 - TXA Current Drain** for details on configuring an HP-IB programmable power supply.

The frequency error is expressed in parts-per-million (ppm).

Pass/Fail Limits Used

- **20. TXA Frequency Error (ppm)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]** 0
- **6. CPA SAT Tone (Hz)**
- **15. RT High Supply Voltage (Vdc)**
- **16. RT Low Supply Voltage (Vdc)**
- **17. RT Nominal Supply Voltage (Vdc)**
- **20. RT Test at Extreme Settings [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_04 - TXA RF Power Output

NOTE: This test will not run if all three of the following conditions are true:
1. The test set is an HP 8924E.
2. The test set does not include a spectrum analyzer (hardware Option 012).
3. Parameter 21 is set to YES.

If any of these conditions is not true, the test will run.

Description

This test measures the output power of the mobile station's transmitter into a 50-ohm load. The power is measured at the antenna terminals of the mobile station. This test is performed at the nominal supply voltage.

This test can also be performed at the high and low supply voltage settings if an HP-IB programmable power supply is configured into the test system and **parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** is set to 1. See **TEST_13 - TXA Current Drain** for details on configuring an HP-IB programmable power supply.

Output power can be expressed in dBm or watts by appropriately setting **parameter *36. TX Units for Pwr Meas [0=dBm 1=Watts]***.

Pass/Fail Limits Used

- **26. TXA Output Power at Level 0 (dBm)**
- **27. TXA Output Power at Level 1 (dBm)**
- **28. TXA Output Power at Level 2 (dBm)**
- **29. TXA Output Power at Level 3 (dBm)**
- **30. TXA Output Power at Level 4 (dBm)**
- **31. TXA Output Power at Level 5 (dBm)**
- **32. TXA Output Power at Level 6 (dBm)**
- **33. TXA Output Power at Level 7 (dBm)**

NOTE: Normally, all power levels are tested; however, **parameter *44. TXA Output Power Levels Tested [BWD #]*** allows you to select only the levels you want tested.

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]** 0
- **6. CPA SAT Tone (Hz)**
- **15. RT High Supply Voltage (Vdc)**
- **16. RT Low Supply Voltage (Vdc)**
- **17. RT Nominal Supply Voltage (Vdc)**
- **20. RT Test at Extreme Settings [0=no 1=yes]**
- **21. RT Use DUPLEX OUT & ANT IN [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **44. TXA Output Power Levels Tested [BWD #]**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_05 - TXA Modulation Deviation Limiting

Description

This test measures the ability of the transmitter circuits to prevent the transmitter from producing deviations in excess of rated system deviation. This test measures the Peak+ and the Peak– values of the instantaneous (INST) and steady state (SS) modulation. Symmetry is based upon the difference between positive and negative swings of the carrier at any level of modulation.

1. The audio generator's frequency is set to 1 kHz.
2. The audio generator's level is set to produce 8 kHz deviation by the MSUT (3 kHz deviation for narrow analog operation).
3. The audio generator's level is increased by 20 dB.
4. Steps 2 and 3 are repeated 3 times, and the maximum peak frequency deviation is held and reported.
5. The audio generator's frequency is stepped from 300 Hz to 3 kHz while the audio generator's level is maintained at the 20 dB overdrive. The size of the frequency steps is obtained from the **parameter *42. TXA Frequency Deviation Step Frequency (kHz)***. If this parameter is set to 0, then the test will run at 1 kHz only. Peak frequency deviation is repeated at each step.

NOTE: Audio connections from the radio to the test system are required for this test.

Pass/Fail Limits Used

- **21. TXA Modulation Limiting (kHz)**
- **25. TXA NAMPS Modulation Limiting (kHz)**

Parameters Used

High and low supply voltages are measured only if an external power supply has been configured to be used over HP-IB by the test system and if the **parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** is set to 1. See **TEST_13 - TXA Current Drain** for details on configuring an HP-IB power supply.

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]** 0
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **15. RT High Supply Voltage (Vdc)**
- **16. RT Low Supply Voltage (Vdc)**
- **17. RT Nominal Supply Voltage (Vdc)**
- **20. RT Test at Extreme Settings [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **42. TXA Frequency Deviation Step Frequency (kHz)**
- **43. TXA Mod Dev Limit 50 Hz HPF [0=off 1=on]**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_06 - TXA Audio Frequency Response

Description

This test measures how closely the frequency deviation of the transmitter follows a 6 dB/octave pre-emphasis slope over a given frequency range. This test will check the audio response frequencies of 300 Hz to 3 kHz .

NOTE:

Audio connections from the radio to the test system are required for this test.

The test results indicate the flatness of the audio output as frequency is varied. Audio frequency response is expressed in dB error from the 6 dB/octave pre-emphasis slope.

Background

- Audio frequency response is measured at 2.9 kHz peak deviation for wide voice channels and 1.5 kHz peak deviation for narrow voice channels.
- The frequency response measurement is made with the rms detector and is made with respect to a 1 kHz reference rate.

Pass/Fail Limits Used

- **12. TXA Audio Response Dev from 6 dB/oct (dB)**
- **13. TXA Audio Response Roll >2.5 kHz (dB/oct)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **37. TXA Audio Response Step Frequency (kHz)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_07 - TXA Audio Distortion

Description

This test measures the level of the demodulated carrier's audio distortion.

NOTE:

Audio connections from the radio to the test system are required for this test.

The test system does not have expandor circuitry. If your testing conditions require correction for this situation, you must change the limits set in **pass/fail limit *11. TXA Audio Distortion (%)***, as required.

Transmitter audio distortion is expressed in percent.

Pass/Fail Limits Used

- **11. TXA Audio Distortion (%)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_08 - TXA Signaling Tone/DST

Description

If the channel is a wide voice channel, this test measures the signaling tone's frequency and peak deviation. Since the SAT tone is always on during this test, deviation is measured with the rms detector, with and without the signaling tone on. The peak deviation of the signaling tone is calculated from the two readings. Therefore, test results indicate peak deviation, not peak+ or peak–.

If the channel is a narrow voice channel, the peak deviation of the digital signaling tone (DST) is measured and the DST sequence is decoded and reported in hexadecimal.

Since this test is run in the "maintenance mode" where the base station is waiting for an answer, the operator must press the send key on the handset to exit the test.

Background

The signaling tone (ST) is a 10-kHz tone generated by the phone on a wide voice channel and is transmitted to the cell site for confirming orders (Alert, Audit, Change Power, etc.), and for signaling flash and release requests.

The digital signaling tone (DST) performs the same function on the narrow voice channel that ST performs on the wide voice channel. The DST is a 24-bit digital sequence transmitted continuously at 200 NRZ bits/second and produces an average peak deviation of 700 Hz. Each DST sequence is the logical inverse of a corresponding digital supervisory audio tone (DSAT) sequence.

Pass/Fail Limits Used

- **23. TXA NAMPS DSAT Deviation (Hz)**
- **36. TXA Signaling Tone Deviation (kHz)**
- **37. TXA Signaling Tone Frequency (kHz)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_09 - TXA FM Hum and Noise

Description

This test measures the ratio of residual frequency modulation to the standard test modulation.

NOTE:

Audio connections from the radio to the test system are required for this test.

The test system does not have expandor circuitry. If your testing conditions require correction for this situation, you must change the limits set in the **pass/fail limit *19. TXA FM Hum and Noise (dB)***, as required.

FM hum and noise is expressed in dB, from the formula:

$-20 \times \text{Log}$ (Reference Deviation ÷ Present Deviation)

CAUTION:

An open microphone on your MSUT can affect the results of this test. If your MSUT has an open microphone, this test must be performed in a quiet environment.

Pass/Fail Limits Used

- **19. TXA FM Hum and Noise (dB)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_10 - TXA SAT/DSAT

Description

If the channel is a wide voice channel, this test measures the frequency error and peak deviation of the three SAT tones. The rms detector is used for measuring SAT deviation. The SAT deviation is then converted to a peak reading.

Also, this test uses the 6 kHz BPF.

If the channel is a narrow voice channel, the test system transmits DSAT sequence #3=25AD4D in hexadecimal. The peak deviation of the DSAT returned by the phone is measured and reported. An eye-pattern test is performed on the DSAT and the closure and phase jitter are measured and reported.

Background

The supervisory audio tones (SAT) are the 5970, 6000, and 6030 Hz tones used for signaling. One of the three tones is added to the wide channel voice transmission by a cell site. The radio then detects the tone and modulates the transmitted voice-channel carrier with a constant (relative) phase tone which is regenerated from the received tone to establish a closed loop between the mobile (cellular radio) and the cell site. Transmission of the SAT is suspended during transmission of wideband data on the reverse voice channel (RVC), but is not suspended when the signaling tone (ST) is sent.

The digital supervisory tone (DSAT) performs the same function on the narrow voice channel that the SAT performs on the wide voice channel. The DSAT is a 24-bit digital sequence transmitted continuously at 200 NRZ bits/second and produces an average peak deviation of 700 Hz. Seven different sequences are defined.

TEST_10 - TXA SAT/DSAT

Pass/Fail Limits Used

- **22. TXA NAMPS DSAT Closure**
- **23. TXA NAMPS DSAT Deviation (Hz)**
- **24. TXA NAMPS DSAT Phase Jitter**
- **34. TXA SAT Deviation (kHz)**
- **35. TXA SAT Frequency Error (Hz)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_11 - TXA RVC Data Deviation

Description

This test provides three possible modes of operation, determined by:

The first method, selected by setting **parameter *48. TXA Transient/ss data [0=tran 1=bth 2=ss]*** to 0=tran, measures the Peak+ and Peak– frequency deviation of the data in the entire Reverse Voice Channel (RVC) burst to ensure that it is within the specified limits.

The entire burst is tested by sending the FVC message 5 times while the peak+ hold detector is on, and another 5 times while the peak– hold detector is on.

The second method, selected by setting **parameter *48. TXA Transient/ss data [0=tran 1=bth 2=ss]*** to 1=bth, first performs the test on just the steady state portion of the RVC data signal, followed by a test of the entire signal (described above).

The steady state portion of the test is performed by measuring the RVC data signal between 20 ms and 50 ms following the beginning of the data burst. The peak + and – results are compared to values in **pass/fail limit *38. TXA Wideband Data Deviation Steady State (kHz)***. The results of the transient portion of the test are compared to values in the **pass/fail limit *39. TXA Wideband Data Deviation Transient (kHz)***.

The third method, selected by setting **parameter *48. TXA Transient/ss data [0=tran 1=bth 2=ss]*** to 2=ss, performs the test on just the steady state portion of the RVC data signal (as described above).

NOTE: In all three methods, the MSUT should blank the SAT tone before sending the RVC message; therefore, SAT deviation should not be included in the deviation measurement. If the MSUT has an open microphone, the readings may be affected by background noise. In this case, mute the handset. Using the first method, 0=tran, Hewlett-Packard Company has found that some cellular telephones fail this test because the telephones produce a carrier frequency transient, typically during the first 10 mS of the data burst. This causes the peak frequency deviation to exceed the maximum specification of ±8 kHz ±10% (or a total of ±8.8 kHz) specified in the EIA/TIA IS-98 Standard. This test, while conforming to the EIA/TIA IS-98 Standard, captures the peak deviation during the first 10 mS of the data burst and will indicate a failed test result if the MSUT exceeds the specified limits.

Applications

RVC data is Manchester-encoded data that is used for cellular system signaling and control. Manchester encoding is accomplished by transforming each NRZ (non-return to zero) binary one to a zero-to-one transition and each NRZ binary zero to a one-to-zero transition. The data stream is then used to modulate the transmitter carrier using direct, binary, frequency-shift keying (FSK).

On the wide voice channels, the data rate is 10 kilobytes/second and the nominal peak transmitted deviation is 8 kHz. All other modulation sources to the transmitter are inhibited when the data is transmitted (“blank and burst”).

On the narrow voice channels, the data rate is 100 bits/second and the nominal peak transmitter deviation is 700 Hz. The data words are inserted into the DSAT data stream. The transmitter is modulated simultaneously by voice audio and the data stream.

Pass/Fail Limits Used

- **23. TXA NAMPS DSAT Deviation (Hz)**
- **38. TXA Wideband Data Deviation Steady State (kHz)**
- **39. TXA Wideband Data Deviation Transient (kHz)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0’s,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **48. TXA Transient/ss data [0=tran 1=bth 2=ss]**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_12 - TXA Compressor Response

Description

This test measures the compressor's zero reference deviation and operating range. For every 2 dB change in input level, there should be a nominal output level change of 1 dB.

NOTE: Audio connections from the radio to the test system are required for this test.

Compressor response is expressed in dB of tracking error over the indicated operating range.

- Compressor response to different input levels is measured.
- The deviation is set to 2.9 kHz (1.5 kHz for narrow analog) and a reference is taken with both the rms*sqr(2) and pk+ detectors.
- The input is varied from a start level equal to **parameter *38 TXA Compressor Start Level (dB)*** to a stop level equal to **parameter *40 TXA Compressor Stop Level (dB)*** using the step level **parameter *39 TXA Compressor Step Level (dB)***.
- If **parameter *38 TXA Compressor Start Level (dB)*** is less than **parameter *40 TXA Compressor Stop Level (dB)*** then the step value retrieved from **parameter *39 TXA Compressor Step Level (dB)*** is made positive. Otherwise, it is made negative. The peak deviation is measured at each step using either the rms*sqr(2) or pk+ detector and the compressor response relative to the reference is calculated using the appropriate reference value for the detector used.
- The compressor typically limits relative inputs ≥17.6 dB; therefore, the lower limit is calculated from the upper limit when the relative input deviation is ≥17.6 dB using the formula: (8.8-upper limit)-(present input deviation/2).

Background

A compressor is used in the phone's voice input circuitry to decrease the variability of the modulation due to volume changes from the talker. In combination with an expandor in the cell site receiver, this provides improved signal-to-noise-ratio in the demodulated audio.

TEST_12 - TXA Compressor Response

Pass/Fail Limits Used

- **14 TXA Compressor Tracking Error <0dB (dB)**
- **15 TXA Compressor Tracking Error >0dB (dB)**

Parameters Used

- **1 CPA Control Channel [1-799 or 991 -1023]**
- **2 CPA DSAT Vector**
- **3 CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4 CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5 CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6 CPA SAT Tone (Hz)**
- **14 RC Compandor is Always On [0=no 1=yes]**
- **23 RX RF Level for Signaling (dBm)**
- **38 TXA Compressor Start Level (dB)**
- **39 TXA Compressor Step Level (dB)**
- **40 TXA Compressor Stop Level (dB)**
- **49 TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_13 - TXA Current Drain

Description

This test measures the average power supply current drawn by the MSUT when it is operating. The transmitter's current drain is expressed in amps. This test can measure current drain using two methods. The test software first looks to see if an HP-IB power supply has been configured in the **`External Devices`**. If one has been configured, the current drain will be measured via the programmable power supply over HP-IB. See "To Configure a Programmable Power Supply" in the "Setting Up the Test Set for External Devices" chapter of the *HP 83217A Test Software User's Guide.*

If an HP-IB power supply is not available, (HP-IB power supply not configured in **`External Devices`** the software measures current drain through the rear-panel dc current measurement capability of the test system, see the procedure *Configuring the Rear Panel dc-Current Measurement* that follows.

This test is not specified by EIA/TIA standards.

A Hewlett-Packard programmable dc power supply is required for this test if an HP-IB power supply is to be configured. A power supply with sufficient voltage and current capabilities from the following series must be used:

- HP 664xA
- HP 665xA
- HP 667xA
- HP 668xA

Configuring the Rear-Panel DC-Current Measurement

1. The DC-current measurement must be zeroed before the measurement. Access the test system's **TESTS** screen by pushing the TESTS key on the front panel.
2. Position the cursor at the **AF ANL** field under **To Screen** and select it.
3. Position the cursor at the **DC Current** field and select it (this should be done before any current is applied to the test system's measurement terminals). The dc-current measurement is now zeroed.
4. Use a power supply that provides the appropriate voltage and current for your MSUT.
5. Connect the positive lead of the power supply to the positive terminal (banana) of the dc-current measurement connector on the lower-left rear panel of the test system.
6. Connect the negative terminal (banana) of the dc-current measurement connector to the positive terminal of the mobile unit's supply input.
7. Connect the negative terminal of the power supply directly to the negative terminal of the mobile unit's supply input.
8. The software will automatically measure the current passing through the rear-panel connection. Be sure that there is no HP-IB power supply configured in the **External Devices** screen of the test system.

Pass/Fail Limits Used

- **16. TXA Current Drain @Levels 0-3 (Amps)**
- **17. TXA Current Drain @Levels 4-7 (Amps)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **22. RX RF Level for Signaling (dBm)**
- **41. TXA Current Drain Levels Tested [BWD #]**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_14 - RXA Expandor

Description

This test measures the expandor's zero reference level and operating range. For every 1 dB change in input level, there should be a nominal output level change of 2 dB.

NOTE: Audio connections from the radio to the test system are required for this test.

Expandor response is expressed in dBV for the zero reference level, and in dB for the tracking error over the indicated operating range.

- The expandor response is measured at a 1 kHz rate and an RF input level of −50 dBm.
- A 2.9 kHz (1.5 kHz for narrow analog operation) deviation is applied and the "zero crossing" of the receiver is measured. This value is retained as the reference level.
- The input is varied from a high level of +10.6 dB above the measured reference level to a level of −21 dB below the measured reference level in steps set by **parameter *24. RXA Expandor Step Level (dB)***. The rms deviation is measured and the expandor response relative to the reference is calculated.
- Deviation is varied over the range and the expandor response relative to the "zero crossing" point is calculated.
- The sweep will go from a high level (+10.6 dB) to a low level (–21 dB) if the sign of the step level set by **parameter *24. RXA Expandor Step Level (dB)*** is negative. The sweep will go from a low to high level if the sign of parameter 23 is positive.

Background

An expandor is used to provide the complement of the compressor in the cell site transmitter. Together, the compressor and expandor provide improved signal-to-noise-ratio in the demodulated audio.

Pass/Fail Limits Used

- **4. RXA Expandor Tracking Error <0dB (dB)**
- **5. RXA Expandor Tracking Error >0dB (dB)**
- **6. RXA Expandor Zero Reference Level (dBV)**
- **8. RXA NAMPS Expandor Zero Reference Level (dBV)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **24. RXA Expandor Step Level (dB)**
- **31. RXA Set Audio Lvl [0=no xx=level volts]**
- **32. RXA Tolerance for Setting Audio Level (% error)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_15 - RXA Audio Frequency Response

Description

NOTE: Audio connections from the radio to the test system are required for this test.

This test measures the ability of the receiver's audio output circuitry to follow a 6 dB/octave de-emphasis curve, as well as to follow an audio-bandpass response. An RF signal with a level specified by **parameter *22. RX RF Level for Signaling (dBm)*** is applied with a constant deviation. The modulation rate is swept over the audio frequency-response range in steps determined by the **parameter *23. RXA Audio Response Step Frequency (kHz)***.

Receiver audio frequency response is expressed in dB error from a 6 dB/octave curve.

- A –50 dBm RF signal is applied to the receiver's antenna.
- The –50 dBm RF signal is modulated to deviate to 2.9 kHz at a 1 kHz rate with a SAT tone present and a reference reading is made.
- The frequency rate is then swept over the desired range and the response measured.
- If the compandor is always on, a 2:1 correction is applied to the measured results.
- Narrow analog operation uses 1.5 kHz deviation and DSAT.

Pass/Fail Limits Used

- **2. RXA Audio Response Dev From –6 dB/oct R1 (dB)**
- **3. RXA Audio Response Dev from –6 dB/oct R2 (dB)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **23. RXA Audio Response Step Frequency (kHz)**
- **31. RXA Set Audio Lvl [0=no xx=level volts]**
- **32. RXA Tolerance for Setting Audio Level (% error)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_16 - RXA Audio Distortion

Description

This test measures the distortion from the receiver when a standard test tone is applied to the radio.

NOTE:

Audio connections from the radio to the test system are required for this test.

Also, this test uses the C-Message audio filter or the CCITT audio filter if it is installed in the test system.

- A –50 dBm RF signal is applied to the receiver's antenna.
- The –50 dBm RF signal is modulated to deviate to 8 kHz at a 1 kHz rate with a 6000 Hz SAT tone present.
- Narrow analog operation uses 3 kHz deviation and DSAT.

Pass/Fail Limits Used

- **1. RXA Audio Distortion (%)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **31. RXA Set Audio Lvl [0=no xx=level volts]**
- **32. RXA Tolerance for Setting Audio Level (% error)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_17 - RXA Hum and Noise

Description

This test measures the ratio, expressed in dB, of:

- The residual audio output in the absence of modulation,
- To the rated audio output.

NOTE:

Audio connections from the radio to the test system are required for this test.

- A –50 dBm RF signal is applied to the receiver's antenna.
- The –50 dBm RF signal is modulated to deviate to 8 kHz at a 1 kHz rate with a SAT tone present.
- The SAT tone is always on during this test.
- Narrow analog operation uses 3 kHz deviation and DSAT.

Pass/Fail Limits Used

- **7. RXA Hum and Noise (dB)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **31. RXA Set Audio Lvl [0=no xx=level volts]**
- **32. RXA Tolerance for Setting Audio Level (% error)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_18 - RXA SINAD

Description

This test sets and measures the ratio, expressed in dB, of:

- Signal + Noise + Distortion,
- to Noise + Distortion.

The receiver's SINAD is measured at the RF level specified by the **parameter *29. RXA RF Level for SINAD (dBm)***.

NOTE: Audio connections from the radio to the test system are required for this test.

Receiver SINAD is measured at the receiver's audio output. This measurement differs from a distortion measurement in that it is conducted at low RF input levels where the noise contribution is significant.

This test is intended to measure receiver sensitivity. Receivers are typically required to provide at least 12 dB SINAD (less than 25% noise and distortion) for RF input levels below 1 microvolt.

- The RF signal (level set by the **parameter *29. RXA RF Level for SINAD (dBm)*** is modulated to deviate to 8 kHz at a 1 kHz rate with a SAT tone present.
- The measurement is repeated at high and low supply voltages if **parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** is set to 1.
- Narrow analog operation uses 3 kHz deviation and DSAT.

Pass/Fail Limits Used

- **10. RXA SINAD (dB)**

Parameters Used

High and low supply voltages are measured only if an external power supply has been configured to be used over HP-IB by the test system and if **parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** is set 1. See **TEST_13 - TXA Current Drain** for details on configuring an HP-IB power supply.

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **15. RT High Supply Voltage (Vdc)**
- **16. RT Low Supply Voltage (Vdc)**
- **17. RT Nominal Supply Voltage (Vdc)**
- **20. RT Test at Extreme Settings [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **27. RXA NAMPS RF Level for SINAD (dBm)**
- **28. RXA NAMPS RF Level for SINAD at Extremes (dBm)**
- **29. RXA RF Level for SINAD (dBm)**
- **30. RXA RF Level for SINAD at Extremes (dBm)**
- **31. RXA Set Audio Lvl [0=no xx=level volts]**
- **32. RXA Tolerance for Setting Audio Level (% error)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_19 - RXA FVC Order Message Error Rate

Description

This test simulates a Forward Voice Channel (FVC) order message being sent from a cell site to the cellular radio and measures the Order Message Error Rate.

The test works as follows:

- A Forward Voice Channel (FVC) audit message is sent 100 times and the number of acknowledgments from the MSUT is counted.
- The RF level is set by the **parameter *25. RXA FVC Message Error Rate RF Level (dBm)***.
- If the MSUT misses 10 acknowledgments in a row the test terminates.

FVC order message error rate is expressed in %.

This test is not specified by TIA/EIA standards.

Pass/Fail Limits Used

- **9. RXA Order Message Error Rate (OMER) (%)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **22. RX RF Level for Signaling (dBm)**
- **25. RXA FVC Message Error Rate RF Level (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_20 - CPA Release

NOTE: As part of the release test, the test software ordinarily measures power and time. However, if the test set is an HP 8924E, and the test set does not include a spectrum analyzer (hardware Option 012), and parameter 22 is set to YES, the test will perform only the call processing release function. In such case, no measurements are made.

Description

This test provides the necessary commands to release the mobile unit.

The test works as follows:

- The mobile unit is set onto a voice channel (if not already on a voice channel).
- A release message is sent from the test system.
- Power is monitored continuously until the power drops below +5 dBm or until 6 seconds has passed, whichever occurs first.
- The test fails if the 6 second limit is reached.

Pass/Fail Limits Used

- None

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **21. RT Use DUPLEX OUT & ANT IN [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_21 - CPA Origination

Description

This test simulates a call from the cellular phone to the base station (cell site) by putting the phone in service and having the operator originate a call from the handset. Specifically, this test performs the following:

1. The test system simulates a control channel.
2. The operator is instructed to dial 123 123 4567 after the MSUT has service. (Service is indicated by the NO SERVICE light going off or the SERVICE light illuminating on the MSUT.)
3. Performs 3 of 5 majority voting on the Reverse Control Message
4. Performs BCH error detection and correction of the Reverse Control Message, Wide-band data
5. Tests each section of the origination message, bit by bit
6. Sends an Initial-Voice-Channel-Designation order to the MSUT directing it to tune to a voice channel obtained from the **`Channel Information`** table.
7. Makes a power measurement on the initial voice channel to verify that the voice channel was obtained. The power level measurement result is not displayed in this test.

It is not necessary to register the phone with the test set by running **TEST_01 - CPA Registration** before running this test. **TEST_21 - CPA Origination** will read the MSUT's Mobile Identification Number (MIN) and the test set will retain it for use in performing other tests.

If the channel number from the table has an L, M, or U suffix, the phone will be directed to a narrow voice channel. If the channel number has no suffix, the phone will be directed to a wide voice channel.

Pass/Fail Limits Used

- None

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_22 - OTA No Audio Functional

Description

This test contains a collection of tests designed to provide a quick evaluation of the MSUT without the need to make audio connections from the MSUT to the test system. The following tests are included:

TEST_21 - CPA Origination
TEST_03 - TXA Frequency Error
TEST_04 - TXA RF Power Output
TEST_08 - TXA Signaling Tone/DST
TEST_10 - TXA SAT/DSAT
TEST_11 - TXA RVC Data Deviation
TEST_27 - CPA Hook Flash
RXA Tones Functional
RXA SINAD Functional
TXA Microphone Functional

The first seven tests in the above list are described individually in this chapter. The final three tests are available only as part of this test and they work as follows:

- When prompted, the operator is required to listen for tones from the receiver and then select whether the test passed or failed. The pass/fail decision is qualitative, and is usually based on whether the tones are heard clearly.
- When prompted, the operator is required to listen to a 1 kHz tone that is modulated on a low power level carrier signal. The power level of the carrier signal is set by **parameter *29. RXA RF Level for SINAD (dBm)***. The operator must select whether the test passed or failed. The pass/fail decision is qualitative and is usually based on whether the 1 kHz tone could be heard adequately among the static.
- The operator is required to whistle into the transmitter, to observe the deviation on the test system, and then select whether the test passed or failed. The pass/fail decision is qualitative, and is usually based on whether the change in deviation corresponds with the amplitude of the whistle into the transmitter.

Pass/Fail Limits Used

- **20. TXA Frequency Error (ppm)**
- **22. TXA NAMPS DSAT Closure**
- **23. TXA NAMPS DSAT Deviation (Hz)**
- **24. TXA NAMPS DSAT Phase Jitter**
- **26. TXA Output Power at Level 0 (dBm)**
- **27. TXA Output Power at Level 1 (dBm)**
- **28. TXA Output Power at Level 2 (dBm)**
- **29. TXA Output Power at Level 3 (dBm)**
- **30. TXA Output Power at Level 4 (dBm)**
- **31. TXA Output Power at Level 5 (dBm)**
- **32. TXA Output Power at Level 6 (dBm)**
- **33. TXA Output Power at Level 7 (dBm)**
- **34. TXA SAT Deviation (kHz)**
- **35. TXA SAT Frequency Error (Hz)**
- **36. TXA Signaling Tone Deviation (kHz)**
- **37. TXA Signaling Tone Frequency (kHz)**
- **38. TXA Wideband Data Deviation Steady State (kHz)**
- **39. TXA Wideband Data Deviation Transient (kHz)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **15. RT High Supply Voltage (Vdc)**
- **16. RT Low Supply Voltage (Vdc)**
- **17. RT Nominal Supply Voltage (Vdc)**
- **20. RT Test at Extreme Settings [0=no 1=yes]**
- **21. RT Use DUPLEX OUT & ANT IN [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **27. RXA NAMPS RF Level for SINAD (dBm)**
- **29. RXA RF Level for SINAD (dBm)**
- **32. RXA Tolerance for Setting Audio Level (% error)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **44. TXA Output Power Levels Tested [BWD #]**
- **48. TXA Transient/ss data [0=tran 1=bth 2=ss]**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_23 - TXA Quick General

Description

NOTE: Audio connections from the radio to the test system are required for this test.

These tests are designed to provide you with a quick evaluation of the cellular radio's transmitter's capabilities See the individual tests for descriptions. The following tests are included:

TEST_03 - TXA Frequency Error
TEST_04 - TXA RF Power Output
TEST_05 - TXA Modulation Deviation Limiting
TEST_06 - TXA Audio Frequency Response
TEST_07 - TXA Audio Distortion
TEST_08 - TXA Signaling Tone/DST
TEST_09 - TXA FM Hum and Noise
TEST_10 - TXA SAT/DSAT
TEST_11 - TXA RVC Data Deviation
TEST_12 - TXA Compressor Response

Pass/Fail Limits Used

- **11. TXA Audio Distortion (%)**
- **12. TXA Audio Response Dev from 6 dB/oct (dB)**
- **13. TXA Audio Response Roll >2.5 kHz (dB/oct)**
- **19. TXA FM Hum and Noise (dB)**
- **20. TXA Frequency Error (ppm)**
- **21. TXA Modulation Limiting (kHz)**
- **22. TXA NAMPS DSAT Closure**
- **23. TXA NAMPS DSAT Deviation (Hz)**
- **24. TXA NAMPS DSAT Phase Jitter**
- **25. TXA NAMPS Modulation Limiting (kHz)**
- **26. TXA Output Power at Level 0 (dBm)**
- **27. TXA Output Power at Level 1 (dBm)**
- **28. TXA Output Power at Level 2 (dBm)**
- **29. TXA Output Power at Level 3 (dBm)**
- **30. TXA Output Power at Level 4 (dBm)**
- **31. TXA Output Power at Level 5 (dBm)**
- **32. TXA Output Power at Level 6 (dBm)**
- **33. TXA Output Power at Level 7 (dBm)**
- **34. TXA SAT Deviation (kHz)**
- **35. TXA SAT Frequency Error (Hz)**
- **36. TXA Signaling Tone Deviation (kHz)**
- **37. TXA Signaling Tone Frequency (kHz)**
- **38. TXA Wideband Data Deviation Steady State (kHz)**
- **39. TXA Wideband Data Deviation Transient (kHz)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **15. RT High Supply Voltage (Vdc)**
- **16. RT Low Supply Voltage (Vdc)**
- **17. RT Nominal Supply Voltage (Vdc)**
- **20. RT Test at Extreme Settings [0=no 1=yes]**
- **21. RT Use DUPLEX OUT & ANT IN [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **32. RXA Tolerance for Setting Audio Level (% error)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **37. TXA Audio Response Step Frequency (kHz)**
- **39. TXA Compressor Step Level (dB)**
- **42. TXA Frequency Deviation Step Frequency (kHz)**
- **43. TXA Mod Dev Limit 50 Hz HPF [0=off 1=on]**
- **44. TXA Output Power Levels Tested [BWD #]**
- **48. TXA Transient/ss data [0=tran 1=bth 2=ss]**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_24 - RXA Quick General

Description

NOTE: Audio connections from the radio to the test system are required for this test.

These tests are designed to provide you with a quick evaluation of the cellular radio's receiver's capabilities. See the individual tests for descriptions. The following tests are performed:

TEST_14 - RXA Expandor
TEST_15 - RXA Audio Frequency Response
TEST_16 - RXA Audio Distortion
TEST_17 - RXA Hum and Noise
TEST_18 - RXA SINAD

Pass/Fail Limits Used

- **1. RXA Audio Distortion (%)**
- **2. RXA Audio Response Dev From –6 dB/oct R1 (dB)**
- **3. RXA Audio Response Dev from –6 dB/oct R2 (dB)**
- **4. RXA Expandor Tracking Error <0dB (dB)**
- **5. RXA Expandor Tracking Error >0dB (dB)**
- **6. RXA Expandor Zero Reference Level (dBV)**
- **7. RXA Hum and Noise (dB)**
- **8. RXA NAMPS Expandor Zero Reference Level (dBV)**
- **10. RXA SINAD (dB)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **15. RT High Supply Voltage (Vdc)**
- **16. RT Low Supply Voltage (Vdc)**
- **17. RT Nominal Supply Voltage (Vdc)**
- **20. RT Test at Extreme Settings [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **23. RXA Audio Response Step Frequency (kHz)**
- **24. RXA Expandor Step Level (dB)**
- **27. RXA NAMPS RF Level for SINAD (dBm)**
- **28. RXA NAMPS RF Level for SINAD at Extremes (dBm)**
- **29. RXA RF Level for SINAD (dBm)**
- **30. RXA RF Level for SINAD at Extremes (dBm)**
- **31. RXA Set Audio Lvl [0=no xx=level volts]**
- **32. RXA Tolerance for Setting Audio Level (% error)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_25 - CPA Flow Chart

NOTE: As part of the CPA flow chart test, the test software ordinarily measures power. However, if the test set is an HP 8924E, and the test set does not include a spectrum analyzer (hardware Option 012), and parameter 22 is set to YES, the test will perform the rest of the tests, but not the power measurements.

Description

This test displays a flow-chart representing a cellular phone as it gains access to a system. It operates with AMPS and NAMPS phones. Once you have established a voice channel using the flow chart for AMPS and NAMPS phones, you can test cellular-radio functions including hand-offs, power level changes, SAT/DSAT changes, hook flashes, and clear the system. At each stage, reverse-channel data is displayed for analysis, along with measurements of power, frequency error, and deviation.

Running the MANUAL test procedure

1. At the beginning of this test, the test system simulates a control channel. The cellular phone must tune to this control channel and decode the data stream in order to obtain service. When the phone succeeds at obtaining service, the NO SERVICE indicator on the phone will turn-off or the SERVICE light will illuminate. If NO SERVICE continues, try changing the control channel to the other band by selecting the **`Cntl Chan`** field and entering the appropriate channel number.
2. When the cellular phone first obtains service, you may originate a call by dialing a phone number and pressing SEND, or you may perform a registration by pressing the softkey on the test set corresponding to register. You must originate a call, or perform a registration before paging the phone. The origination and registration provide the phone number of the MSUT to the test set.
   - To register the phone, select the **`Register`** field.
   - To originate a call from an AMPS or NAMPS phone, dial a phone number and press the phone's SEND.
3. You can perform a page after you register the phone or you have previously performed an origination and the phone indicates service. You can page or originate onto an analog voice channel.
   - To page an AMPS or NAMPS phone, select the **`Anl Page`** field.
   - To originate an AMPS or NAMPS phone, dial a number and press the phone's SEND key.
4. Once you establish a voice channel, refer to the flow-chart on the screen and the associated fields to the right of the screen for operating functions.

Analog functions

- **`chng chan`** allows you to change cellular phone channels.
- **`chng pwr`** allows you to change cellular phone transmit power.
- **`clear ls`** allows you to clear the land station (ls). This terminates the connection from the land station.
- **`clear ms`** allows you to clear the mobile station (ms). This terminates the connection from the mobile station.
- **`Quit`** allows you to exit the test.
- **`chng sat`** allows you to change the Supervisory Audio Tone (SAT).
- **`chng dsat`** allows you to change the digital supervisory audio tone (DSAT) for NAMPS phones.
- **`DTMF`** allows you to measure the frequency error of the high and low tones from the DTMF generator in the phone.
- **`maintence`** allows you to run a maintenance check of the phone's signaling tone frequency and deviation.
- **`Hook Flsh`** allows you to transmit a hook flash number from the phone, receive it, and display it on the test system.

Pass/Fail Limits Used

- None (Since this test only monitors, there are no pass/fail limits applied to the results.)

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **21. RT Use DUPLEX OUT & ANT IN [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_26 - TXA Switch Channels

NOTE: As part of the TXA switch channels test, the test software ordinarily measures power, RF frequency error, and SAT frequency error. However, if the test set is an HP 8924E, and the test set does not include a spectrum analyzer (hardware Option 012), and parameter 22 is set to YES, the test will perform only the RF frequency error and SAT frequency error measurements.

Description

This test measures transmitter frequency error, power, and SAT frequency error over a range of channels defined by **parameter *45. TXA Switch Channels Start Channel (Chan No.)***, **parameter *46. TXA Switch Channels Step Channel (Chan No.)***, and **parameter *47. TXA Switch Channels Stop Channel (Chan No.)***.

The test works as follows:

- The MSUT's channel number is changed over the desired range indicated by above parameters.
- The channels will all be wide voice channels or they will all be narrow voice channels as determined by the currently active entry in the **`Channel Information`** table.
- For each wide channel, the TX output power, RF frequency error, and SAT frequency error is measured.
- For each narrow channel, the TX output power and RF frequency error are measured and the DSAT sequence coming from the phone is decoded and displayed.
- Each time the channel is changed, the SAT frequency is changed to the next valid SAT tone or DSAT value.

Pass/Fail Limits Used

- **26. TXA Output Power at Level 0 (dBm)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **21. RT Use DUPLEX OUT & ANT IN [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **45. TXA Switch Channels Start Channel (Chan No.)**
- **46. TXA Switch Channels Step Channel (Chan No.)**
- **47. TXA Switch Channels Stop Channel (Chan No.)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_27 - CPA Hook Flash

Description

This test verifies that the correct hook-flash number (3 digits) is correctly sent by the cellular radio.

The test works as follows:

1. A voice channel is established.
2. The operator is prompted to dial a 3-digit number and press the SEND key on the MSUT.
3. If the channel is a wide voice channel, the test detects the resulting signaling tone from the MSUT and sends a “send-called-address” order to the MSUT on the Forward Voice Channel (FVC). This step does not occur on narrow voice channels.
4. The test receives the hook-flash number from the MSUT on the Reverse Voice Channel and displays it. (The number is not compared to a specific value or number.)

Pass/Fail Limits Used

- None

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0’s,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_28 - TXA DTMF Frequency Error

Description

This test measures the transmitter's Dual-Tone Multifrequency (DTMF) frequency error for the phone's key pad. The low tone (LT) and high tone (HT) DTMF frequencies for each selected key are checked to make sure that the frequencies are within the DTMF frequency error limits for their nominal values.

DTMF frequency error is expressed in%.

Background

There are two groups of sinusoidal high and low frequencies consisting of 1209, 1336, and 1477 Hz (HT's) in one group, and 609, 770, and 941 Hz (LT's) in the other group.

A DTMF signal is generated when a key is pressed on the handset. Each dialing key makes use of one assigned frequency from each group. The DTMF signal is encoded and transmitted for control purposes when dialing an origination from the phone.

Pass/Fail Limits Used

- **18. TXA DTMF Frequency Error (%)**

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **6. CPA SAT Tone (Hz)**
- **14. RC Compandor is Always On [0=no 1=yes]**
- **22. RX RF Level for Signaling (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_29 - RXA MRI

Description

This test sweeps the level of the RF carrier generated by the test system on a forward voice channel. The RF level is stepped from a higher level to a lower level where the step size is set by the user via the parameter table. The start and stop RF levels are hardcoded to -50 dBm and -110 dBm. At each level step, the MRI Parameter Message is sent to the MSUT with the RSSI and BER threshold fields set to zero. This induces the MSUT to report the current status of its RSSI and BER measurements via the reverse voice channel. These RSSI and BER values are then displayed.

Background

MRI stands for Mobile Reported Interference, RSSI stands for Received Signal Strength Indicator, and BER stands for Bit Error Rate. NAMPS phones are able to report RSSI and BER values to the base station on command. The BER pertains to the signaling used on narrow voice channels. This test can only be run on a narrow voice channel on an NAMPS mobile unit.

Pass/Fail Limits Used

- None

Parameters Used

- **1. CPA Control Channel [1-799 or 991 -1023]**
- **2. CPA DSAT Vector**
- **3. CPA Enter Ph# [0=If Needed,1=Always,Here]**
- **4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]**
- **5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]**
- **22. RX RF Level for Signaling (dBm)**
- **26. RXA MRI Step Level (dBm)**
- **49. TXA TS Atten for Signaling [0, 20, 40] (dB)**

TEST_30 - CPD Registration

Description

This test performs a CDMA registration on the mobile station as follows:

1. An analog release is performed if the MSUT is on an analog voice channel.
2. A CDMA release is performed if the MSUT is on a digital traffic channel.
3. A standard CDMA setup for call processing is performed. The standard CDMA setup performs the following instrument functions:
   a. Sets Sector A Power to a level set in **parameter *22. RX RF Level for Signaling (dBm)***.
   b. Sets the RF Channel to the present channel as defined in the TESTS (Channel Information) screen.
4. The MS Database is cleared to make sure the registration data is current.
5. A command is sent to the Test Set to register the MSUT and wait until the MSUT has registered or the registration attempt times out. If the registration times out, the operator is asked if the registration test should be repeated or aborted by selecting the appropriate softkey. The registration will continue to be repeated if the registration times out and the operator answers ‘Yes’ to the question “Select ‘Yes’ to repeat registration, ‘No’ to abort.” and will abort the test only if the operator selects ‘No’. This is done for phones that for one reason or another take a long time (>30 seconds) to go into service after testing is started.
6. The MS Database is read and the following data is displayed:
   - Phone number: <decimal number>
   - MCC: <hexadecimal number>
   - MNC: <hexadecimal number>
   - Serial number: <decimal number>, <decimal number>, < hexadecimal number>
   - Power Class: <class I, II, or III>
   - Transmission: <continuous or discontinuous>
   - Slot Class: <non-slotted or slotted>
   - Slot Index: <decimal number>
   - Dual Mode <dual mode or CDMA only>

NOTE: Regarding the serial number data shown above, the numbers are as follows:
First Decimal Number: The first three digits represent the manufacturer's code. The next eight digits represent a combination of the reserve bits and the unit serial number.
Second Decimal Number: The first three digits represent the manufacturer's code. The next two digits represent the reserve bits. The next six digits represent the unit serial number.
Hexadecimal Number: A hexadecimal representation of the above two numbers.

Refer to the *HP 8924C Reference Guide* for information about the Sector A Power, RF Channel, Register, MS ID, and MS Database fields.

NOTE: A **TEST_30 - CPD Registration** or a **TEST_31 - CPD Origination** must be run at least once before any digital tests can be run. The Test Set remembers the registration data unless the power is cycled on the Test Set. If power is cycled on the Test Set, the **TEST_30 - CPD Registration** or the **TEST_31 - CPD Origination** must be run again before running other digital tests.

Pass/Fail Limits Used

- None

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **22. RX RF Level for Signaling (dBm)**

TEST_31 - CPD Origination

Description

This test performs a CDMA MSUT-originated call as follows:

1. An analog release is performed if the MSUT is on an analog voice channel.
2. A CDMA release is performed if the MSUT is on a digital traffic channel.
3. The Answer Mode field is set to AUTO.
4. The MSUT-originated call is made. The software routine for obtaining a traffic channel performs the following tasks:
   a. Performs a standard CDMA setup for call processing (refer to CPD Registration).
   b. Displays a message prompting the user to enter a phone number and press the SEND key on the MSUT handset.
   c. Wait until the call is connected or 30 seconds elapses, whichever occurs first.
   d. Monitors the call for error conditions.
5. The following information is printed to the TESTS (IBASIC Controller) screen:
   - Phone number: <decimal number>
   - MCC: <hexadecimal number>
   - MNC: <hexadecimal number>
   - Serial number: <decimal number>, <decimal number>, < hexadecimal number>
   - Power Class: <class I, II, or III>
   - Transmission: <continuous or discontinuous>
   - Slot Class: <non-slotted or slotted>
   - Slot Index: <decimal number>
   - Dual Mode <dual mode or CDMA only>

NOTE:

Regarding the serial number data shown above, the numbers are as follows:
First Decimal Number: The first three digits represent the manufacturer's code. The next eight digits represent a combination of the reserve bits and the unit serial number.
Second Decimal Number: The first three digits represent the manufacturer's code. The next two digits represent the reserve bits. The next six digits represent the unit serial number.
Hexadecimal Number: A hexadecimal representation of the above two numbers.

This test provides and indication of the MSUT's ability to originate a CDMA call and establish a link.

Refer to the *HP 8924C Reference Guide* for information about the Answer Mode and MS ID fields.

Pass/Fail Limits Used

- None

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

TEST_32 - CPD Page

Description

This test makes a CDMA MSUT-terminated (Test Set originated) call as follows:

1. An analog release is performed if the MSUT is on an analog voice channel.
2. A CDMA release is performed if the MSUT is on a digital traffic channel.
3. The MSUT-terminated call is made. The software routine for obtaining a traffic channel performs the following tasks:
   a. Performs a standard CDMA setup for call processing (refer to CPD Registration).
   b. Attempts a CDMA call by sending a command that performs the remote equivalent of pressing the CALL key.
   c. Monitors the Test Set to display a message prompting the operator to answer the phone when the Test Set call processing state is alerting.
   d. Monitors the Test Set to indicated that the call has connected or 30 seconds has elapsed, whichever occurs first.
4. The following information is printed to the TESTS (IBASIC Controller) screen:
   - Page Successful: <Yes or No>

This test provides and indication of the MSUT's ability to be paged by a base station originated call and establish a link.

Refer to the *HP 8924C Reference Guide* for information about the Answer Mode and MS ID fields.

Pass/Fail Limits Used

- None

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

TEST_33 - TXD Waveform Quality & Freq Acc

Description

This test measures the CDMA waveform quality factor, ρ (rho), and a suite of related transmitter carrier measurements as follows:

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. Power levels are set up according to values found in TIA/EIA/IS-98 standards.
3. The Rho suite of measurements is triggered.
4. When Rho suite of measurements are returned, the call status is checked. If the call has been dropped, this test will start again. If another call is dropped, the test will end and an error message will be displayed indicating the call could not be maintained.
5. The following measurements are printed to the TESTS (IBASIC Controller) screen:
   - TXD Rho <Rho value>
   - TXD Frequency Error <frequency error in Hz>
   - TXD Static Timing Offset <timing offset in microseconds>
   - TXD Amplitude Error <amplitude error in percent>
   - TXD Phase Error <phase error in degrees>
   - TXD Carrier Feedthrough <carrier feedthrough in dB>

Pass/Fail Limits Used

- **41. TXD Frequency Error (Hz)**
- **47. TXD Rho**
- **48. TXD Timing Offset (us)**

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

TEST_34 - TXD Traffic Channel Open Loop Power

Description

This test measures the range of the MSUT's output power in response to changes in the Test Set's output power, Ior, while on a traffic channel.

This test is performed as follows:

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. Power levels are set up according to values found in TIA/EIA/IS-98 standards.
3. Specification limits are set based on the MSUT power class and the parameter TXD Antenna Gain.
4. The Test Set is put in Open Loop power control mode. In this mode, the Test Set's power control subchannel does not adjust the MSUT's output power based on signal strength measurements. Instead, the Test Set's power control subchannel outputs a fixed pattern of up and down bits, holding the MSUT power level at or near its open loop estimate.
5. Three power measurements are made on the MSUT as the Test Set Ior is varied. The Channel Power measurement is used for the first measurement and the Average Power measurement is used for the following two measurements. The Test Set uses Open Loop power control mode for this test. The call drop timer is turned off for Ior=-25dBm so the call will not be dropped if the reverse link power is too low for the test set to demodulate the data.
6. The following information is printed to the TESTS (IBASIC Controller) screen:
   - TXD Open Loop Pwr @-25 dBm <Channel Power measurement>
   - TXD Open Loop Pwr @-65 dBm <Average Power measurement>
   - TXD Open Loop Pwr @-104 dBm <Average Power measurement>

Refer to the *HP 8924C Reference Guide* for information about the Open Loop power control mode, see the Closed Loop Pwr Cntl field description.

TEST_34 - TXD Traffic Channel Open Loop Power

Pass/Fail Limits Used

- **44. TXD Open Loop Output Power @ Ior=-104 dBm (dBm)**
- **45. TXD Open Loop Output Power @ Ior=-25dBm (dBm)**
- **46. TXD Open Loop Output Power @ Ior=-65dBm (dBm)**

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **50. TXD Antenna Gain (dB)**

TEST_35 - TXD Closed Loop Power Control

Description

This test measures the range of the MSUT's output power in response to the Test Set's power control subchannel.

This test is performed as follows:

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. The forward channel power is adjusted to yield an open loop estimate power level from the MSUT of approximately -15 dBm.
3. The Test Set's "call drop" timer is disabled so that when "all down" power control bits are sent to the MSUT, the call is not dropped by the Test Set.
4. The Test Set is put in Open Loop power control mode and the actual reverse power from the MSUT is measured. This value will serve as the reference power level for determining the range of closed loop power control. In this mode, the Test Set's power control subchannel does not adjust the MSUT's output power based on signal strength measurements. Instead, the Test Set's power control subchannel outputs a fixed pattern of up and down bits, holding the MSUT power level at or near its open loop estimate.
5. The Test Set is programmed to send continuous "always up" power control bits at full data rate. This series of power control bits will increase the MSUT's power level from its open loop estimate (-15 dBm) to its maximum transmitted output power.
6. The Test Set's input attenuator is put in "Hold" mode, and the attenuation is set to its maximum value (40 dB).
7. An Average Power measurement is made while the "always up" power control bits are being sent.
8. The Closed Loop Up Range value is calculated and displayed. The Closed Loop Up Range value is calculated by taking the difference between the Average Power measurement taken while "up" power control bits were being received by the MSUT, and the reference measurement made on the MSUT's open loop estimate from step 2.
9. The Test Set is programmed to send continuous "always down" power control bits at full data rate.
10. The Test Set's input attenuator is set to its minimum value (0 dB).

11. A Channel Power measurement is made while the continuous “always down” power control bits are being sent.
12. The Closed Loop Down Range value is calculated and displayed. The Closed Loop Down Range value is calculated by taking the difference between the Channel Power measurement taken while “down” power control bits were being received by the MSUT, and the reference measurement made on the MSUT’s open loop estimate from step 2.
13. The procedure, beginning with Step 2, is repeated for half, quarter, and eighth rate data.

The following information is displayed as testing is performed:

- Closed Loop Power Control @ Full Rate <Up Range and Down Range>
- Closed Loop Power Control @ Half Rate <Up Range and Down Range>
- Closed Loop Power Control @ Quarter Rate <Up Range and Down Range>
- Closed Loop Power Control @ Eighth Rate <Up Range and Down Range>

Refer to the *HP 8924C Reference Guide* for information about the Open Loop power control mode, see the Closed Loop Pwr Cntl field description.

Refer to the *HP 8924C Reference Guide* for information about the Input Atten field and Hold mode.

Pass/Fail Limits Used

- **40. TXD Closed Loop Power Control Range (dB)**

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

TEST_36 - TXD Maximum RF Output Power

Description

This test measures the maximum RF output power that the mobile station transmits.

1. The Cell Site Configuration screen is set up to send the parameters in the Access Parameters Message that are specified in EIA/TIA IS-98 for this test.
2. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
3. The forward channel power is adjusted to -104 dBm.
4. The Test Set is programmed to send continuous "always up" power control bits at full data rate. This series of power control bits will increase the MSUT's power level from its open loop estimate to its maximum transmitted RF power.
5. An Average Power measurement is made while the "always up" power control bits are being sent.
6. The TXD Antenna Gain parameter is retrieved and used to determine the upper and lower test limits.
7. The following information is printed to the TESTS (IBASIC Controller) screen:
   - TXD Max RF Output Power <Average Power measurement>

Refer to the *HP 8924C Reference Guide* for information about the Open Loop power control mode, see the Closed Loop Pwr Cntl field description.

Refer to the *HP 8924C Reference Guide* for information about the Input Atten field and Hold mode.

Output power can be expressed in dBm or watts by appropriately setting **parameter *36. TX Units for Pwr Meas [0=dBm 1=Watts]***.

Pass/Fail Limits Used

The Pass/Fail limits for this test are hard-coded into the software. The values used were obtained from TIA/EIA IS-98 minimum standard for the Maximum RF Output Power test.

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **50. TXD Antenna Gain (dB)**

TEST_37 - TXD Minimum Controlled Output Power

Description

This test measures the minimum controlled RF output power of the mobile station. The minimum controlled output power is the output power, measured at the mobile station antenna connector, when both closed loop and open loop power control indicate minimum output.

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. The forward channel power is set to -25 dBm.
3. The Test Set's "call drop" timer is disabled so that when "all down" power control bits are sent to the MSUT, the call is not dropped by the Test Set
4. The Test Set is programmed to send continuous "always down" power control bits at full data rate. This series of power control bits will decrease the MSUT's power level from its open loop estimate to the minimum transmitted output power.
5. A Channel Power measurement is made while the "always down" power control bits are being sent.
6. The TXD Antenna Gain parameter is retrieved and used to determine the upper test limit.
7. The following measurement result is printed to the TESTS (IBASIC Controller) screen:
   - TXD Min RF Output Power <Channel Power measurement>

Refer to the *HP 8924C Reference Guide* for information about the Open Loop power control mode, see the Closed Loop Pwr Cntl field description.

Refer to the *HP 8924C Reference Guide* for information about the Input Atten field and Hold mode.

TEST_37 - TXD Minimum Controlled Output Power

Pass/Fail Limits Used

- **42. TXD Maximum RF Output Power (dBm)**

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**
- **36. TX Units for Pwr Meas [0=dBm 1=Watts]**
- **50. TXD Antenna Gain (dB)**

TEST_38 - RXD Traffic Channel FER

Description

This test measures the performance of the mobile station when demodulating a forward traffic channel in an additive white gaussian noise (AWGN) environment (no fading or multipath). The performance of the mobile station is determined by the frame error rate (FER).

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 or 9 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message “Failed to establish a call in test <>” will be displayed. To correct this problem, perform the CPD Registration test.
2. Sector A Power is set to -55 dBm.
3. AWGN is set to -54 dBm.
4. The RXD Maximum Frames for FER parameter is retrieved and that value is entered in the Max Frames field.
5. The FER test is turned on with a confidence limit of 95%.
6. Traffic Channel level and data rates are set up and the first test is triggered. The software waits for an HP-IB interrupt to determine when the test is done. The test times out and continues if the interrupt does not occur within a period bounded by the RXD Maximum Frames for FER parameter. If a timeout occurs, a timeout message is displayed. This process is repeated for each of the six tests specified in EIA/TIA IS-98A.
7. The following measurement results are printed to the TESTS (IBASIC Controller) screen. (For each test, FER %, number of frames counted and number of errors counted is displayed):
   - Traf Chan FER w/AWGN Ec/Ior=-16.3 & Eb/Nt=3.8[1]
   - Traf Chan FER w/AWGN Ec/Ior=-15.8 & Eb/Nt=4.3
   - Traf Chan FER w/AWGN Ec/Ior=-15.6 & Eb/Nt=4.5
   - Traf Chan FER w/AWGN @ 4800bps & Eb/Nt=4.0
   - Traf Chan FER w/AWGN @ 2400bps & Eb/Nt=4.5
   - Traf Chan FER w/AWGN @ 1200bps & Eb/Nt=4.6

Refer to the *HP 8924C Reference Guide* for information about the FER measurement field and the Max Frames and Confidence setting fields.

1. These measurement results are for cellular and rate set 1 only.

Pass/Fail Limits Used

The Pass/Fail limits for this test are hard-coded into the software. The values used were obtained from TIA/EIA IS-98 minimum standard for the Demodulation of Forward Traffic Channel in Additive White Gaussian Noise test.

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**
- **33. RXD Maximum Frames for FER**

TEST_39 - RXD Sensitivity & Dynamic Range

Description

This test measures the receiver's sensitivity by verifying that the frame error rate (FER) does not exceed 0.5% with 95% confidence level at a mobile station received power of -104 dBm.

This test measures the receiver's dynamic range by verifying that the frame error rate (FER) does not exceed 0.5% with 95% confidence level at a mobile station received power of -25 dBm.

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 or 9 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. The RXD RF Level for Sensitivity parameter is retrieved and that value is entered in the Sector A Power field. (This is performed in two steps to prevent the call from being dropped).
3. The RXD Maximum Frames for FER parameter is retrieved and that value is entered in the Max Frames field.
4. The FER test is turned on with a confidence limit of 95%.
5. The FER Spec field is set to 0.5%.
6. Traffic Channel level and data rates are set up and the first FER measurement is triggered. The software waits for an HP-IB interrupt to determine when the test is done. The test times out and continues if the interrupt does not occur within a period bounded by the RXD Maximum Frames for FER parameter. If a timeout occurs, a timeout message is displayed and the test continues.
7. Sector A Power is set to -25 dBm/BW and another FER measurement is triggered.
8. The following information is printed to the TESTS (IBASIC Controller) screen. (For each test, FER%, number of frames counted and number of errors counted is displayed):
   - RXD Sensitivity FER@ <RXD RF Level for Sensitivity><FER %>
   - RXD Dynamic Rng FER@ -25 dBm<FER %>

Refer to the *HP 8924C Reference Guide* for information about the FER measurement field and the Max Frames and Confidence setting fields.

Pass/Fail Limits Used

The Pass/Fail limits for this test are hard-coded into the software. The values used were obtained from TIA/EIA IS-98 minimum standard for the Receiver Sensitivity and Dynamic Range test.

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**
- **33. RXD Maximum Frames for FER**
- **34. RXD RF Level for Sensitivity (dBm)**

TEST_40 - CPD Softer Handoff

NOTE: This test will only run on the HP 8924C test set. It will not run on the HP 8924E test set because that unit does not include a Sector B source.

Description

This test measures the MSUT's ability to correctly detect Neighbor Set pilots and Candidate Set pilots.

Settings for mobile-reporting parameters include T_ADD, T_DROP and T_TDROP. These values are converted to signal strength by the following equation: P*-0.5 dB, where P is the mobile-reporting parameter. For example, T_ADD is set to 28, the threshold for mobile-station detection of a Neighbor Set pilot is 28 *-0.5 dB = -14 dB.

This test is performed as follows:

1. A Service Option 2 (or 9 if **parameter *20. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 or 9 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. The power levels for Sector A and Sector B pilots, and the mobile reporting parameters T_ADD and T_DROP, and T_TDROP are set up. Sector B is set to a power level much less than T_ADD (Ior/Ioc-10dB) insuring that it is detected as a drop.
3. The Sector B pilot strength is gradually increased until the mobile station detects signal strength greater than T_ADD. The Sector A and Sector B signal strength settings (E_c/I_o) are displayed, along with the mobile-reported signal strength and the handoff Sector B Ec/Io compared to T_ADD.
4. The Sector B pilot strength is increased further until the mobile station detects that it has exceeded T_COMP. Once again, the Sector A and Sector B signal strength settings are displayed, along with the mobile-reported pilot signal strengths and whether T_COMP was detected correctly.
5. A Softer Handoff is attempted, and an indication whether it was successful is displayed.
6. The Sector B pilot strength is decreased until the mobile station detects signal strength below T_DROP for a time period greater than T_TDROP. Once again, the Sector A and Sector B signal strength settings are displayed, along with the mobile-reported pilot signal strength and the handoff Sector B Ec/Io compared to T_DROP.

7. The following information is printed to the TESTS (IBASIC Controller) screen.

   For a neighbor Ec/Io=-14.5 & active Ec/Io=-10.5

   - The reported neighbor pilot strength= 28
   - Sector B Ec/Io for T_ADD -14.5dB

   For a candidate Ec/Io=-10.5 & active Ec/Io=-12.5

   - The reported candidate pilot strength= 23
   - The reported active pilot strength= 27
   - Softer Handoff successful: <YES/NO>

   For a candidate Ec/Io=-16.5 & active Ec/Io=-10.5

   - The reported candidate pilot strength= 34
   - Sector B Ec/Io for T_DROP -16.5dB

Most Test Set functions used during this test are found on the CDMA Mobile Reporting screen.

Pass/Fail Limits Used

- None

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **13. CPD SID Number**
- **19. RT Protocol Standard [0 thru 5]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

TEST_41 - RTD RX/TX CDMA Quick General

Description

This is a CDMA quick test to verify the functionality of the mobile stations's receiver and transmitter. The test begins by making a mobile station terminated call (service option 2). It then starts a FER measurement at a mobile station received power of-104 dBm and then moves to the transmitter test screen and measures Rho and maximum power. The test then returns to the receiver test screen and reads the FER. The test concludes by releasing the call.

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 or 9 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. The RXD RF Level for Sensitivity parameter is retrieved and that value is entered in the Sector A Power field. (This is performed in two steps to prevent the call from being dropped).
3. The RXD Maximum Frames for FER parameter is retrieved and that value is entered in the Max Frames field.
4. The FER test is turned on with a confidence limit of 95 %.
5. The FER Spec field is set to 0.5 %.
6. An FER test is triggered.
7. A Rho measurement is triggered and the results are displayed.
8. The maximum RF output power is measured and the test results are displayed. (Refer to the TXD Maximum RF Output Power test for this procedure).
9. The software waits for an HP-IB interrupt to determine when the FER test is done. The test times out and continues if the interrupt does not occur within a period bounded by the RXD Maximum Frames for FER parameter. If a timeout occurs, a timeout message is displayed.
10. The following information is printed to the TESTS (IBASIC Controller) screen. (For each test, FER %, number of frames counted and number of errors counted is displayed):
    - TXD Rho
    - TXD Frequency Error <Hz>
    - TXD Static Timing Offset <uS>
    - TXD Amplitude Error <%>
    - TXD Phase Error <deg>
    - TXD Carrier Feedthrough <dB>
    - TXD Max RF Output Power <dBm>
    - RXD Sensitivity FER@<RXD RF Level for Sensitivity><FER %>

Pass/Fail Limits Used

- **41. TXD Frequency Error (Hz)**
- **47. TXD Rho**
- **48. TXD Timing Offset (us)**

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**
- **33. RXD Maximum Frames for FER**
- **34. RXD RF Level for Sensitivity (dBm)**
- **50. TXD Antenna Gain (dB)**

TEST_42 - CPD CDMA Voice Quality

Description

This test checks the MSUT's voice quality by using the Test Set's echo mode. The operator is responsible for determining if the voice quality passes or fails.

1. A Service Option 1 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 1 or 9 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. The Data Type field is set to "Echo" mode.
3. The operator is prompted to speak into the MSUT and then enter either "Pass" or "Fail" for the test.

Pass/Fail Limits Used

- None

Parameters Used

- **9. CPD BID Number**
- **10. CPD Echo Delay [0, 2 or 5] (Seconds)** [1,2]
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

1. Parameter 10 is used if you have a HP 8924C or HP 8924E with firmware A.02.03 or later.
2. The Echo Delay in a HP 8924E with firmware earlier thatn A.02.03 is fixed at 0 seconds.

TEST_43 - TXD Spectrum Emissions

NOTE: To run this test on an HP 8924E, Option 012 must be installed.

Description

This test measures the level of emissions at 900 kHz and 1.98 MHz offset from the mobile station's carrier frequency.

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 or 9 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. Sector A power is set up so that the MSUT will provide -13 dBm to the Test Set's spectrum analyzer (including path loss).
3. The trigger mode is set to repetitive and video averaging turned on.
4. The spectrum analyzer level measurement at the center frequency marker is retrieved.
5. The frequency marker is moved 900 kHz from the center frequency and a level measurement is retrieved.
6. The frequency marker is moved 1.98 MHz from the center frequency and another level measurement is retrieved.
7. A dBc value for the 900 kHz and 1.98 MHz marker levels is calculated by taking the difference between the marker levels measured in steps 5 and 6 and the reference level measured in step 4.
8. The following measurement results are printed to the TESTS (IBASIC Controller) screen:
   - TXD Spectrum Lvl @ 900 kHz <dBc/30 kHz>
   - TXD Spectrum Lvl @ 1.98 MHz <dBc/30 kHz>

Refer to the *HP 8924C Reference Guide* for information about the Marker fields and the No Pk/Avg field, (used for video averaging).

Pass/Fail Limits Used

The Pass/Fail limits for this test are hard-coded into the software. The values used were obtained from TIA/EIA IS-98 minimum standard for the Conducted Spurious Emissions test.

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **13. CPD Spectrum Averages [10,20,50,100]**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

TEST_44 - CPD CDMA Release

Description

This test performs a CDMA Base-station-initiated release.

1. A Service Option 2 (or 9) call is attempted, unless a call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
2. An attempt is made to end the call.
3. The average power measurement is monitored until its level reaches -45 dBm or a timer expires. If the average power measurement reaches -45 dBm or less, the call was successfully terminated.
4. The following measurement results are printed to the TESTS (IBASIC Controller) screen:
   - Land Station Clear <YES/NO>

Pass/Fail Limits Used

- None

Parameters Used

- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

TEST_45 - CPD Digital to Analog Handoff

Description

This test performs a handoff from a CDMA digital traffic channel to an AMPS analog traffic channel.

1. A Service Option 1 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 1 or 9 call is already connected, and the operator is prompted to answer the call. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.

NOTE: Service Option 1 is selected for this test because Service Option 2 is not defined in the AMPS/NAMPS standards. Using Service Option 1 will allow the MSUT to have analog tests performed once the handoff has completed.

2. The analog channel is retrieved from the parameter "CPD Analog Channel for D/A Handoff".
3. The SAT tone is retrieved from the parameter "CPA SAT Tone" and converted to SAT code 0-2.
4. A handoff direction message is sent to the MSUT. This test configures the Test Set as an analog cell site, and provides several analog measurements, including SAT frequency.
5. A SAT frequency measurement is made to determine if the handoff was successful.
6. The following information is printed to the TESTS (IBASIC Controller) screen:
   - TXA SAT freq err @ 6000 Hz <Hz>
   - D/A Handoff successful: <YES/NO>

Refer to the *HP 8924C Reference Guide* for information about the Channel, SAT and Pwr Level fields.

NOTE: The analog Call Control screen, which is the primary screen for the analog Call Processing Subsystem, cannot have its Active field selected without losing the analog call that is set up during the digital to analog handoff test. The reason is because this software does not use the analog call control subsystem to do call processing.

Pass/Fail Limits Used

- **35. TXA SAT Frequency Error (Hz)**

Parameters Used

- **6. CPA SAT Tone (Hz)**
- **8. CPD Analog Channel for D/A Handoff**
- **9. CPD BID Number**
- **11. CPD NID Number**
- **12. CPD SID Number**
- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **19. RT Rate Set Selection [0=9600 1=14400]**
- **22. RX RF Level for Signaling (dBm)**

TEST_46 - CPD Talk Time

Description

This test measures the mobile station battery life/talk time by simulating the battery load conditions experienced in a typical system.

1. Before a call is started, two questions are asked:
   "Test urban topography or suburban topography?"
   & "Loopback data mode or echo data mode?"

   Where both questions are answered by pressing the appropriated USER key K1 or K2. The first question determines which mobile station transmit power statistics will be used during the test as defined by CDG Stage 4 Optional System performance Tests Revision 2.0. The second question determines which service option and data type or data rate in the CDMA CALL CONTROL screen will be used. Selecting loopback data mode sets Service Option 2 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 0 (rate set = 9600) or Service Option 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1(rate set =14400). It also sets the data rate to 'random' which statistically spends an equal amount of time at each of the four data rates (about 47% on 53% off). Selecting echo data mode sets Service Option 1 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 0 (rate set = 9600) or Service Option 32768 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1 (rate set = 14400)). It also sets the data type to 'echo' where **parameter *10. CPD Echo Delay [0, 2 or 5] (Seconds)*** sets the echo delay. This allows the user to couple custom voice data into the mobile for voice echo.

NOTE: **Parameter *10. CPD Echo Delay [0, 2 or 5] (Seconds)*** is used if you have a HP 8924C or HP 8924E with firmware A.02.03 or later.

2. The correct type of service option call as defined in step 1 above is attempted, unless that type of call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message "Failed to establish a call in test <>" will be displayed. To correct this problem, perform the CPD Registration test.
3. The forward link power is then cycled through a statistical profile to simulate actual system use.The Sector A power level is displayed at each new power level.
4. This is continued until the mobile station ends the call and the test software detects an HP-IB interrupt to determine when the connected state is false.
5. The timer is stopped and the talk time is displayed.
   - Mobile Talk Time is <talk time in minutes>

Pass/Fail Limits Used

- None

Parameters Used

- **19. RT Rate Set Selection [0=9600 1=14400]**
- **10. CPD Echo Delay [0, 2 or 5] (Seconds)**

TEST_47 - RXD Sensitivity Level Search

Description

This test brackets the actual receiver sensitivity by measuring the frame error rate (FER) as the mobile station received power is reduced from that specified by parameter **parameter *34. RXD RF Level for Sensitivity (dBm)*** to a level that generates an FER greater than that specified by **parameter *35. RXD Sensitivity FER Search Specification (%)***. The actual search sensitivity will be at some point between the last two measured mobile station received power levels.

1. A Service Option 2 (or 9 if **parameter *19. RT Rate Set Selection [0=9600 1=14400]*** is set to 1) call is attempted, unless a Service Option 2 or 9 call is already connected. If the MSUT has not registered, the call attempt may be unsuccessful and the error message “Failed to establish a call in test <>” will be displayed. To correct this problem, perform the CPD Registration test.
2. The parameter “RXD RF Level for Sensitivity” is retrieved and that value is entered in the Sector A Power field.
3. The parameter “RXD Maximum Frames for FER” is retrieved and that value is entered in the Sector A Max Frames field.
4. The FER test is turned on with a confidence level of 95 percent.
5. The FER Spec field is set to the value specified in **parameter *35. RXD Sensitivity FER Search Specification (%)***.
6. Traffic Channel level and data rates are set up and the first FER measurement is triggered. The test software waits for the HP-IB interrupt to determine when the test is complete. The test times out and continues if the interrupt does not occur within a period bounded by the value specified in **parameter *33. RXD Maximum Frames for FER***. If a timeout occurs, a timeout message displays and the test continues.
7. Sector A Power is reduced in 0.5-dB steps until the measured FER is greater than that specified in **parameter *35. RXD Sensitivity FER Search Specification (%)*** . The test then stops.
8. The following information is printed to the TESTS (IBASIC Controller) screen for all FER measurements after the first one greater than 0.0 percent:
   - RXD Senstvty FER@ <current mobile received power in dBm> <FER in %>

Pass/Fail Limits Used

- None

Parameters Used

- **33. RXD Maximum Frames for FER**
- **34. RXD RF Level for Sensitivity (dBm)**
- **35. RXD Sensitivity FER Search Specification (%)**

TEST_48 - CPD SMS & Authentication

Description

This test brings the SMS (Short Message Service) and Authentication test functionality provided by the HP 8924C/E firmware in the SMS and Authentication screens to this software. The test is provided in this software for test and result reporting convenience. The test is entirely menu driven with no associated parameters in the TESTS (Test Parameters) screen.

1. When the test is run, the user's first menu will have the following choices:
   SMS test
   Authentication Test
   Quit
2. By selecting the SMS test menu, the following menu becomes available:

Execute SMS	
Data Mode	:ASCII
Encoder Mode	:7-bit ASCII
User Data	:ABCDE
Duplicate User Data	:1
Alert	:Off
Priority	:None
Privacy	:None
Originator	:89204001
Channel Type	:Page
SMS Service Option	:None
Return	

Each SMS menu item is discussed below:

Execute SMS - when this item is selected, the SMS message in the User Data field is sent to the phone. The MS Acknowledge message must be sent to the test set confirming the receipt of the message for this activity to have a passing result.

Data Mode - this parameter can be set to ASCII or HEX. It indicates the type of data in the User Data field.

Encoder Mode - available choices are Octet or 7-bit ASCII. Sets the Encoder Mode for the data in the SMS message.

User Data - If the Data Mode is ASCII this field will accept up to 45 ASCII characters. If the Data Mode is HEX this field will accept up to 45 hexadecimal characters.

Duplicate User Data - determines the maximum number of copies of the entered ACSII or HEX data that will be sent in the SMS Data Burst Message. If a large number of copies are desired, and the length of the message times the number of copies exceeds the maximum length of an SMS message, the number of copies will be reduced until the entire message can be sent in each copy.

Alert- available choices are On or Off. Sets the Alert parameter in the SMS message.

Priority - available choices are None/Normal/Interactive/Urgent/Emergency. Sets the Priority parameter in the SMS message.

Privacy - available choices are None/No Restrict/Restricted/Confident/Secret. Sets the Privacy parameter in the SMS message.

Originator Address - This field will accept entries up to eleven digits long. This sets the originating address for the SMS message and is required for authentication testing of data burst messages.

Channel Type - available choices are Page or Traffic. This determines what channel the SMS message will be transmitted on.

SMS Service Option - available choices are None/Option 6/Option 14. This determines what service option is used when sending the SMS message. If None is selected, the current service option is used.

Return - returns to the main menu.

3. By selecting the Authentications test menu, the following menu becomes available

Register

MS Page

MS Origination

SSD Update

Unique Challenge

A-key: 00000000000000000 Check Bits:

Return

Each Authentication menu item is discussed below:

Register - available choices are Zone/Timer/Return. Selecting either Zone or Time will cause a registration. This activity generates the Check bits. The AUTH_MODE, AUTHR, RANDC, COUNT, and REG_TYPE parameters are also obtained from this activity. The test will report if each of the received parameters from the phone match the expected values.

MS Page - Once the phone responds to the page, the AUTH_MODE, AUTHR, RANDC and COUNT parameters are obtained. The test will report if each of the received parameters from the phone match the expected values.

MS Origination - Once the phone sends the origination message, the AUTH_MODE, AUTHR, RANDC, and COUNT parameters are obtained. The test will report if each of the received parameters from the phone match the expected values.

SSD Update - A registration is required prior to this operation. If a registration is not performed, this operation will fail. This activity can be performed on the paging or traffic channel. There are no parameters that are received from the phone's response to the SSD Update. If the phone responses to the SSD Update correctly, the operation passes.

Unique Challenge - A registration is required prior to this operation . If a registration is not performed, this operation will fail. This activity can be performed on the paging or traffic channel. The AUTHU parameter is obtained from the mobile's response to the Unique Challenge request. The test will report if the received parameter from the phone match the expected value.

A-key - this is a user entry field, allowing up to 20 decimal digital. If the user does not enter anything into this field, the default data (all zero's) will be used.

Check Bits - The 6 decimal check digits are generated based on the A-key information, the ESN of the phone and appropriate encryption algorithm.

Return - returns to the main menu.

Pass/Fail Limits Used

- None

Parameters Used

- User entered at run time. See menu descriptions above.

Test 49_TXD Access Probe Open Loop Power

This test measures the range of the mobile's access probe output power (reverse link) in response to changes in the Test Set's output power (forward link) while the mobile is being paged.

The test limits the page to the access channel where there is no closed loop power control, sets the access probe power step to 0 dB and measures the mobile's reverse link access probe power at the three specified forward link power levels.

Pass/Fail Limits Used

- **40. TXD Open Loop Output Power @ Ior=-104 dBm (dBm)**
- **41. TXD Open Loop Output Power @ Ior=-25dBm (dBm)**
- **42. TXD Open Loop Output Power @ Ior=-65dBm (dBm)**

Parameters Used

- **18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]**
- **35. TX Units for Power Meas [0=dBm 1=Watts]**
- **50. TXD Antenna Gain (dB)**

3

Pass/Fail Limit (Specification) Descriptions

Introduction

Pass/fail limits are values you enter that set limits for tests. Default values are available in the test software. They have been derived from standard methods of measurement. Pass/fail limits remain in the test system's battery-backed-up memory until you select a new procedure to run.

Set the pass/fail limits to the standards for your MSUT.

The first few capital letters in the title of each pass/fail limit indicate what the pass/fail limit refers to:

RXA = Receiver, Analog

TXA = Transmitter, Analog

TXD = Transmitter, Digital

1. RXA Audio Distortion (%)

This sets the pass/fail limits used when the receiver's audio distortion is measured while receiving the Standard RF Level. Only the upper limit is used which must be entered in %.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA/TIA Standard: Audio Harmonic Distortion

Example

If you desire that the audio distortion should not exceed 5% at a normal audio output, enter **5** as the Upper Limit.

2. RXA Audio Response Dev From –6 dB/oct R1 (dB)

This sets the pass/fail limits used in **TEST_15 - RXA Audio Frequency Response** for the receiver's audio output circuitry, when its audio response is tested against the standard 6 dB/octave de-emphasis curve. The audio response should not deviate beyond the specification limits over the frequency range of 400 to 2400 Hz. Upper and lower limits must be entered in dB.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA/TIA Standard: Voice Audio Frequency Response

Example

If your receivers are normally used with a handset or a line, and the audio response should not deviate more than +1 to –3 dB over the frequency range of 400 to 2400 Hz, enter –**3** as the Lower Limit and **1** as the Upper Limit.

3. RXA Audio Response Dev from –6 dB/oct R2 (dB)

This sets the pass/fail limits used in **TEST_06 - TXA Audio Frequency Response** for the receiver's audio output circuitry, when its audio response is tested against the standard 6 dB/octave de-emphasis curve. The audio response should not deviate beyond the pass/fail limits in the regions of 300 to 400 Hz and 2400 to 3000 Hz. Upper and lower limits must be entered in dB.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA/TIA Standard: Voice Audio Frequency Response

Example

If your receivers are normally used with a handset or a line, and the audio response should not deviate more than +1 to –6 dB over the frequency range of 300 to 400 Hz and 2400 to 3000 Hz, enter –**6** as the Lower Limit and **1** as the Upper Limit.

4. RXA Expandor Tracking Error <0dB (dB)

This sets the pass/fail limits used when the expandor's output level is measured at input levels below the 0 dB reference level. The output voltage tolerance should be within the pass/fail limits. Lower and Upper Limits must be entered in dB.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA/TIA Standard: Expandor

Example

If you desire the output voltage tolerance below the 0 dB reference level to be ±2 dB, enter –**2** as the Lower Limit and **2** as the Upper Limit.

5. RXA Expandor Tracking Error >0dB (dB)

This sets the pass/fail limits used when the expandor's output level is measured at input levels above the 0 dB reference level. The output voltage tolerance should be within the pass/fail limits. Upper and lower limits must be entered in dB.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA/TIA Standard: Expandor

Example

If you desire the output voltage tolerance above the 0 dB reference level to be ±1 dB, enter **–1** as the Lower Limit and **1** as the Upper Limit.

6. RXA Expandor Zero Reference Level (dBV)

This sets the pass/fail limits used when the expandor's output voltage at the 0 dB reference level is measured. Upper and lower limits must be entered in dBV rms.

Pass/fail limits are determined by using any applicable standard, such as:

- MSUT Specification

The test is performed and pass/fail limits are available so that the operator can measure the RXA Expandor Zero Reference Level and compare the result to specifications that meet his or her needs.

If the operator does not wish to compare the measurement results to specifications, the "check" setting for **pass/fail limit *15. TXA Compressor Tracking Error >0dB (dB)*** can be set to "none." See "To Change Pass/Fail Limits" in the *HP 83217A Test Software User's Guide*.

Example

If you desire the output voltage from the receiver to be –20 dBV rms ±1 dB, enter **–21** as the Lower Limit and **–19** as the Upper Limit.

7. RXA Hum and Noise (dB)

This sets the pass/fail limits used in **TEST_17 - RXA Hum and Noise** and **TEST_24 - RXA Quick General** for the hum and noise level of the receiver. Only the upper limit is used, which must be entered in dB.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Hum and Noise

Example

If you desire the hum and noise level of the receiver to be at least 32 dB below the audio output for a 1 kHz modulated RF carrier at –50 dBm having a ±8 kHz peak frequency deviation, enter –**32** as the Upper Limit.

8. RXA NAMPS Expandor Zero Reference Level (dBV)

This sets the pass/fail limits that are used when the expandor's 0 dB reference level is measured on narrow voice channels. Lower and Upper Limits must be entered in dBV rms.

Pass/fail limits are determined by using any applicable standard, such as:

- MSUT Specification

RXA NAMPS Expandor Zero Reference Level is not specified in the EIA/TIA standard for NAMPS phones. The test is performed and pass/fail limits are available so that the operator can measure the RXA NAMPS Expandor Zero Reference Level and compare the result to specifications that meet his or her needs.

If the operator does not wish to compare the measurement results to pass/fail limits, the "check" setting for **pass/fail limit *15. TXA Compressor Tracking Error >0dB (dB)*** can be set to "none." See "To Change Pass/Fail Limits" in the *HP 83217A Test Software User's Guide*.

Example

If your standard states that the output voltage from the receiver should be –20 dBV rms ±1 dB for a given frequency deviation (to produce the 0 dB reference level as shown in the following figure), you would enter –**21** as the Lower Limit and –**19** as the Upper Limit. (Check both limits.)

9. RXA Order Message Error Rate (OMER) (%)

This pass/fail limit sets the limits for testing the receiver as it processes the Forward Voice Control (FVC) order message.

Pass/fail limits are determined by using any applicable standard, such as:

- MSUT Specification

Example

If your standard states that the order-message error rate should not exceed 5%, you would enter **5** as the Upper Limit. (Check upper limits.)

10. RXA SINAD (dB)

This sets the pass/fail limits used when SINAD is measured at the audio output of the receiver. Limits must be entered in dB.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA Standard: RF Sensitivity

Example

If your standard defines the usable sensitivity measurement that results in 12 dB SINAD at the audio output of the receiver, you would enter **12** as the Lower Limit.

11. TXA Audio Distortion (%)

This sets the pass/fail limits used when measuring the audio distortion that is acceptable in the transmitter. Only the upper limit is used which must be entered in %.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Modulation Distortion and Noise

Example

If you desire that the transmitter distortion should not exceed 5%, enter **5** as the Upper Limit.

12. TXA Audio Response Dev from 6 dB/oct (dB)

This sets the pass/fail limits used in **TEST_06 - TXA Audio Frequency Response** for the degree of closeness with which the frequency deviation of the transmitter follows the prescribed 6 dB/octave pre-emphasis characteristic curve. Upper and lower limits must be entered in dB.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Transmit-Audio Response

Example

If you desire that from 300 to 3000 Hz the audio frequency response should not vary more than ±2 dB from a true 6 dB/octave pre-emphasis curve, enter –**2** as the Lower Limit and **2** as the Upper Limit.

13. TXA Audio Response Roll >2.5 kHz (dB/oct)

This sets the pass/fail limits of the transmitter's audio frequency response roll-off that is acceptable when the audio input is greater than 2.5 kHz. Enter this limit as an upper limit in dB (dB/octave).

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Transmit-Audio Response

Example

If an audio frequency roll-off of 6 dB/octave is permissible at audio input frequencies greater than 2.5 kHz, enter **6** as the Upper Limit.

14. TXA Compressor Tracking Error <0dB (dB)

This sets the pass/fail limits used when the compressor output level is measured at input levels below the 0 dB reference level. The output voltage tolerance should be within the pass/fail limits. Lower and Upper Limits must be entered in dB.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA/TIA Standard: Compressor

Example

If you desire the output voltage tolerance below the 0 dB reference level to be ±1 dB, enter –**1** as the Lower Limit and **1** as the Upper Limit.

15. TXA Compressor Tracking Error >0dB (dB)

This sets the pass/fail limits used when the compressor output level is measured at input levels above the 0 dB reference level. The output voltage tolerance should be within the pass/fail limits. Lower and Upper Limits must be entered in dB.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA/TIA Standard: Compressor

Example

If you desire the output voltage tolerance below the 0 dB reference level to be ±0.5 dB, enter –**`0.5`** as the Lower Limit and **`0.5`** as the Upper Limit.

16. TXA Current Drain @Levels 0-3 (Amps)

This sets the pass/fail limits for current consumption used in transmitter tests at RF output power levels 0-3. Upper and lower limits must be entered in amps.

Pass/fail limits are determined by using any applicable standard such as:

- MSUT Specification: Current Consumption, Transmit

Example

If you desire your transmitter's current consumption to be 3.0 amps ±0.5 amps for RF output power levels 0-3, enter **`2.5`** as the Lower Limit and **`3.5`** as the Upper Limit.

17. TXA Current Drain @Levels 4-7 (Amps)

This sets the pass/fail limits for current consumption used in transmitter tests at RF output power levels 4-7. Upper and lower limits must be entered in amps.

Pass/fail limits are determined by using any applicable standard such as:

- MSUT Specification: Current Consumption, Transmit

Example

If your MSUT specification defines the transmitter's current consumption to be 2.5 amps ±0.5 amps for RF output power levels 4-7, enter **`2.0`** as the Lower Limit and **`3.0`** as the Upper Limit.

18. TXA DTMF Frequency Error (%)

This sets the pass/fail limits for the amount of frequency error allowed for the DTMF (Dual-Tone Multi-Frequency) signals. Upper and lower limits must be entered in %.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Dual Tone Multifrequency (DTMF) Signaling, Transmitted Pulse Characteristics

Example

If you desire that the seven tone frequencies in the high and low group DTMF signals should be within ±1.5% of their nominal values, enter –**1.5** as the Lower Limit and **1.5** as the Upper Limit.

19. TXA FM Hum and Noise (dB)

This sets the pass/fail limits for the transmitter's residual FM hum and noise. Only the upper limit is used, which must be entered in dB.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: FM Hum and Noise

Example

If you desire that FM hum and noise should be at least 32 dB below the level of a 1 kHz tone at ±8 kHz deviation, enter –**32** as the Upper Limit.

20. TXA Frequency Error (ppm)

This sets the pass/fail limits for the transmitter's carrier frequency error. Upper and lower limits must be entered in ppm (parts per million).

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Frequency Requirements, Frequency Stability

Example

If you desire that the carrier frequency should be maintained within ±2.5 parts per million (ppm) of any assigned channel frequency, enter –**2.5** as the Lower Limit and **2.5** as the Upper Limit.

21. TXA Modulation Limiting (kHz)

This sets the pass/fail limits for the transmitter's peak frequency deviation. Only the upper limit is used, which is entered in kHz.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Modulation Deviation Limiting

Example

If the instantaneous peak and steady-state deviations of the transmitter should not exceed the rated system peak frequency deviation of ±12 kHz, you would enter **12** as the Upper Limit.

22. TXA NAMPS DSAT Closure

This sets the pass/fail limits that are used when closure of the eye pattern is measured for the DSAT transmitted by the MSUT on a narrow voice channel.

Pass/fail limits are determined using any applicable standard, such as:

- TIA Standard: Sub-Audible Data

Example

If your standard states that the eye pattern closure must be greater than .65, you would enter **.65** as the lower limit and **1** as the upper limit.

23. TXA NAMPS DSAT Deviation (Hz)

This sets the pass/fail limits that are used for peak frequency deviation measurements of the DSAT sequence transmitted by the MSUT on a narrow voice channel.

Pass/fail limits are determined using any applicable standard, such as:

- TIA Standard: Sub-Audible Data

Example

If your standard states that the peak frequency deviation for the DSAT sequence shall be ±700 Hz with a ±10 % tolerance, you would enter **`630`** as the lower limit and **`770`** as the upper limit.

24. TXA NAMPS DSAT Phase Jitter

This sets the pass/fail limits that are used when phase jitter of the eye pattern is measured for the DSAT transmitted by the MSUT on a narrow voice channel.

Pass/fail limits are determined using any applicable standard, such as:

- TIA Standard: Sub-Audible Data

Example

If your standard states that the phase jitter of the eye pattern must be less than .15, you would enter **`.15`** as the upper limit and **`0`** as the lower limit.

25. TXA NAMPS Modulation Limiting (kHz)

This sets the pass/fail limits when the transmitter circuits are tested for their ability to prevent the transmitter from producing deviation in excess of the rated system deviation for narrow voice channels. Limits must be entered in kHz.

Pass/fail limits are defined by any applicable standard, such as:

- EIA Standard: Modulation Deviation Limiting

Example

If your standard states that the instantaneous peak and steady-state deviations of the transmitter should not exceed the rated system peak-frequency deviation of ±5 kHz, you would enter **5** as the Upper Limit.

26. TXA Output Power at Level 0 (dBm)

Pass/fail limits 26. through 33. set the pass/fail limits for output power levels 0 through 7 measured at the transmitter's output terminal. Units for this pass/fail limit are set by **parameter *36. TX Units for Pwr Meas [0=dBm 1=Watts]***. If Watts (1) is selected the software will automatically covert test limijts to Watts when comparing and displaying results.

All power level limits are separate pass/fail limits and each can be set as desired.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Transmitter Output Power

NOTE: Values for power levels in the standard are for effective radiated power (ERP) and not as measured directly from the mobile unit. Power levels will be higher when measured directly from the mobile unit.

Example

If you are testing Power Class I radios and you desire that the output power levels should be maintained within the range of +2 dB and –4 dB of the nominal values over a specified temperature range, enter the values in the following table for the Lower Limit and the Upper Limit for power levels of 0 through 7.

Power Level	Nominal Value (dBm)	Lower Limit(dBm)	Upper Limit (dBm)
Level 0	36	32	38
Level 1	32	28	34
Level 2	28	24	30
Level 3	24	20	26
Level 4	20	16	22
Level 5	16	12	18
Level 6	12	8	14
Level 7	8	4	10

27. TXA Output Power at Level 1 (dBm)

See **pass/fail limit *26. TXA Output Power at Level 0 (dBm)*** for more information about this pass/fail limit.

28. TXA Output Power at Level 2 (dBm)

See **pass/fail limit** ***26. TXA Output Power at Level 0 (dBm)*** for more information about this pass/fail limit.

29. TXA Output Power at Level 3 (dBm)

See **pass/fail limit *26. TXA Output Power at Level 0 (dBm)*** for more information about this pass/fail limit.

30. TXA Output Power at Level 4 (dBm)

See **pass/fail limit** ***26. TXA Output Power at Level 0 (dBm)*** for more information about this pass/fail limit.

31. TXA Output Power at Level 5 (dBm)

See **pass/fail limit *26. TXA Output Power at Level 0 (dBm)*** for more information about this pass/fail limit.

32. TXA Output Power at Level 6 (dBm)

See **pass/fail limit** ***26. TXA Output Power at Level 0 (dBm)*** for more information about this pass/fail limit.

33. TXA Output Power at Level 7 (dBm)

See **pass/fail limit *26. TXA Output Power at Level 0 (dBm)*** for more information about this pass/fail limit.

34. TXA SAT Deviation (kHz)

This sets the pass/fail limits for the SAT tone's peak frequency deviation. Upper and lower limits must be entered in kHz.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Supervisory Audio Tone (SAT)

Example

If you desire that the peak frequency deviation of each transponded SAT should be 2 kHz ±0.2 kHz, you would enter **`1.8`** as the Lower Limit and **`2.2`** as the Upper Limit.

35. TXA SAT Frequency Error (Hz)

This sets the pass/fail limits for the SAT tone's frequency accuracy. Upper and lower limits must be entered in Hz.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Supervisory Audio Tone (SAT)

Example

If you desire that any one of the three SAT tones should not vary in frequency more than ±1 Hz, you would enter –**1** as the lower limit and **1** as the upper limit.

36. TXA Signaling Tone Deviation (kHz)

This sets the pass/fail limits for the signaling tone's peak frequency deviation. Upper and lower limits must be entered in kHz.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Signaling Tone (ST)

Example

If you desire that the nominal peak frequency deviation of the carrier produced by the signaling tone should be ±8 kHz with a ±10% tolerance, enter **7.2** as the Lower Limit and **8.8** as the Upper Limit.

37. TXA Signaling Tone Frequency (kHz)

This sets the pass/fail limits for the signaling tone's frequency accuracy. Upper and lower limits must be entered in Hz.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Signaling Tone (ST)

Example

If you desire that the Signaling Tone frequency should be 10 kHz ±1 Hz, enter **`9.999`** as the Lower Limit and **`10.001`** as the Upper Limit.

38. TXA Wideband Data Deviation Steady State (kHz)

This sets the pass/fail limits for the Wideband Data deviation.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA Standard: Wideband Data

Example

If your standard states that the Wideband Data frequency deviation should be ±8 kHz with a ±10% tolerance, you would enter **`7.2`** as the Lower Limit and **`8.8`** as the Upper Limit.

Lower and Upper Limits must be entered in kHz.

39. TXA Wideband Data Deviation Transient (kHz)

This sets the pass/fail limits for the Wideband Data deviation.

Pass/fail limits are determined by using any applicable standard, such as:

- EIA Standard: Wideband Data

Example

If your standard states that the Wideband Data frequency deviation should be ±8 kHz with a ±10% tolerance, you would enter **`7.2`** as the Lower Limit and **`8.8`** as the Upper Limit.

Lower and Upper Limits must be entered in kHz.

40. TXD Closed Loop Power Control Range (dB)

This sets the pass/fail limits for closed loop power control. Only the lower limit is used. The value must be entered in dB.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Range of Closed Loop Power Control

Example

If you desire the closed loop power control range to be at least ±24 dB around the open loop estimate, enter **24** as the lower limit.

41. TXD Frequency Error (Hz)

This sets the pass/fail limits for the frequency stability of the MSUT. Upper and lower limits must be entered in Hz.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Frequency Tolerance For Digital Mode Operation

Example

If you desire that the carrier frequency should be maintained within ±300 Hz of any assigned channel frequency, enter –**300** as the Lower Limit and **300** as the Upper Limit.

42. TXD Maximum RF Output Power (dBm)

This sets the pass/fail limits for the maximum controlled RF output power The value must be entered in dBm.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Minimum Controlled Output Power

Example

If you desire the range of maximum RF output power to be `+23 dBm to` +30 dBm for the lower limit and 30 for the upper limit.

43. TXD Minimum Controlled Output Power (dBm)

This sets the pass/fail limits for the minimum controlled output power. Only the upper limit is used. The value must be entered in dBm.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Minimum Controlled Output Power

Example

If you desire the minimum controlled output power to be less than –50 dBm, enter –**50** as the upper limit.

44. TXD Open Loop Output Power @ Ior=-104 dBm (dBm)

This sets the pass/fail limits for the range of open loop output power. The upper and lower limit are used. The value must be entered in dBm.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Range of Open Loop Output Power

Example

If you desire the range of open loop output power for I_{or} = –104 dBm to be 18 dBm to the maximum allowable ERP for the mobile station class, then enter 18 as the lower limit and specify “Lower” for the check field. Any number placed in the upper field will be ignored if check field is set to “Lower”. If the “Check” field is set to “Lower” then the upper limit will be set by the maximum RF output power for the class of mobile station being tested.

45. TXD Open Loop Output Power @ Ior=-25dBm (dBm)

This sets the pass/fail limits for the range of open loop output power. The upper and lower limit are used. The value must be entered in dBm.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Range of Open Loop Output Power

Example

If you desire the range of open loop output power for I_{or} = –25 dBm to be –48 dBm ±9.5 dB, then enter –57.5 as the lower limit and –38.5 as the upper limit.

46. TXD Open Loop Output Power @ Ior=-65dBm (dBm)

This sets the pass/fail limits for the range of open loop output power. The upper and lower limit are used. The value must be entered in dBm.

Pass/fail limits are determined by using any applicable standard such as:

- EIA/TIA Standard: Range of Open Loop Output Power

Example

If you desire the range of open loop output power for I_{or} = –65 dBm to be –8 dBm ±9.5 dB, then enter –17.5 as the lower limit and 1.5 as the upper limit.

47. TXD Rho

This sets the pass/fail limits for Rho.

Rho is the MSUT's measured waveform quality factor. It indicates the portion of the transmitted waveform that correlates with an ideal waveform modulated with the same data.

Example If you desire that Rho pass/fail limits be ≥ 94.4%, enter 0.944 in the lower limit field.

48. TXD Timing Offset (us)

This sets the upper limits for timing offset. Timing offset is derived from the Rho measurement, and indicates how well the MSUT has synchronized to the pilot PN (pseudo-noise) sequence.

Example

If you would like the Timing Offset pass/fail limits to be ±1 µS, enter -1 in the lower limit field, and enter 1 in the upper limit field.

4

Parameter Descriptions

Introduction

Parameters are values you enter that optimize test environment or conditions of the software. Many of the parameters are determined by examining your test needs. Other parameters are determined by performing measurements to calibrate items in your system. Default values are set into the software. Some of these values are derived from standard methods of measurement and some are derived from the radio test standards that are applicable.

For information on editing parameters, see *Using the Software*, chapter 3.

Parameters remain in battery-backed-up memory until you select a procedure to run. If you wish to prevent them from being lost when a new procedure is selected, you will have to save them in a procedure. See *Making a Procedure*.

To print the parameters list, see *Printing Test Screens*.

The first few capital letters in the title of each parameter indicate what the parameter refers to:

CPA = Call Processing, Analog
CPD = Call Processing, Digital
RC = Running Conditions
RT = Receiver and Transmitter, Analog and Digital
RTD = Receiver and Transmitter, Digital
RX = Receiver, Analog and Digital
RXA = Receiver, Analog
RXD = Receiver, Digital
TX = Transmitter, Analog and Digital
TXA = Transmitter, Analog
TXD = Transmitter, Digital

1. CPA Control Channel [1-799 or 991 -1023]

This parameter is used to identify the control channel used by the MSUT. Primary control channels for System A are numbered from 313 to 333. Primary control channels for System B are numbered from 334 to 354. Some cellular phones are designed to work only on System A or only on System B. For these phones, the control channel specified by this parameter must correspond to the correct system in order to allow the phone to obtain service.

Example If you desire to use control channel 333 to set up a call with the MSUT, enter 333 as the value.

2. CPA DSAT Vector

This parameter allows you to set the Digital Supervisory Audio Tone (DSAT) sequence to be used on narrow voice channels:

The seven valid sequences are as follows:

#0 = 2556CB
#1 = 255B2B
#2 = 256A9B
#3 = 25AD4D
#4 = 26AB2B
#5 = 26B2AD
#6 = 2969AB

Example If you want the first sequence shown above, you would enter a **`0`** as the value.

3. CPA Enter Ph# [0=If Needed,1=Always,Here]

This parameter specifies from where the test will get the phone number of the MSUT. You may enter one of three options:

- **`0`**
- **`1`**
- the 10 digit phone number of the MSUT

Setting this parameter to **`0=If Needed`** tells the Test Set to prompt the user for the phone number of the MSUT if:

- The phone number is needed to perform the first test in a test sequence, AND
- A MIN was not obtained by the Test Set running a previous test procedure.

Setting this parameter to **`1=Always,`** tells the Test Set to prompt the user for the phone number of the MSUT each time the test procedure is run. (Note that if **parameter *4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]*** is set to **`1=All 0's`** indicating an all zero MIN, the user is not prompted for a phone number). Setting **parameter 3.** to anything other than **`0=If Needed`** or **`1=Always`** will cause the Test Set to use the number entered as a ten digit phone number for paging the MSUT if one of the following conditions are also true:

- **parameter *4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]*** is set to **`2=Phone #`**, indicating to the Test Set to get the MIN from the phone number.
- **parameter *4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]*** is set to **`0=RECC`** and a MIN has not been previously entered into the Test Set by running a previous test procedure.

Example

If **parameter 3.** is set to **`1231234567`** and **parameter 4.** is set to **`2=Phone#`**, the Test Set will use a MIN corresponding to phone number 123-123-4567 to page the MSUT.

NOTE: If a registration or an origination is performed that causes a new MIN to be entered into the test, this new MIN will then be used instead of the MIN derived from the entered phone number.

4. CPA MIN From? [0=RECC,1=All 0's,2=Phone #]

This parameter specifies from where the Test Set will get the Mobile Identification Number (MIN) of the MSUT.

Setting **parameter 4.** to **0=RECC** causes the Test Set to get the MIN from the Reverse Control Channel (RECC) Data. The RECC Data (data sent on the control channel from the MSUT to the Test Set) sent during a registration or an origination is read by the Test Set to obtain the MIN.

Setting **parameter 4.** to **1=All 0's** causes the Test Set to use a MIN consisting of all zeros. An all zero MIN is an invalid MIN according to the IS-95 standard. Because some phones initially have an all zero MIN after being manufactured or serviced, this parameter (when set to **1=All 0's**) allows the Test Set to page phones with an all zero MIN.

NOTE: An all zero MIN can also be entered into the Test Set by setting **parameter 4.** to **0=RECC** and getting the MIN from the RECC Data from a MSUT that has an all zero MIN.

NOTE: If **parameter 4.** is set to **1=All 0's**, then **parameter *3. CPA Enter Ph# [0=If Needed,1=Always,Here]*** is not used.

Setting **parameter 4.** to **2=Phone #** causes the Test Set to derive the MIN from the phone number, depending on the entry in **parameter *3. CPA Enter Ph# [0=If Needed,1=Always,Here]*** described below:

- If **parameter 3.** contains a phone number, the phone number is used to derive a MIN.
- If **parameter 3.** is set to **0=If Needed** or **1=Always,** the user will be prompted for a phone number if needed. This phone number will be used to derive the MIN.

NOTE: If a registration or an origination test is performed that causes a new MIN to be entered into the Test Set, this new MIN will then be used instead of the MIN obtained as specified by **parameter 4.**.

5. CPA Prt RECC RVC Data [0=no 1=yes 2=fail]

This parameter allows you to print the Reverse Control Channel (RECC) and Reverse Voice Channel (RVC) messages to the display or printer.

The RECC message is a wideband data stream sent from the mobile station to the land station, and can consist of up to five words. The types of messages that can be transmitted over the RECC are:

- Page Response Message
- Origination Message
- Order Confirmation Message
- Order Message

The RVC message is a wideband data stream sent from the mobile station to the land station, and can consist of one or two words. The types of messages that can be transmitted over the RVC are:

- Order Confirmation Message
- Called-Address Message

6. CPA SAT Tone (Hz)

This parameter sets the frequency of the SAT (supervisory audio tone) that will be used on all analog voice channels. The supervisory audio tones are out-of-voice-band audio tones used for cell site identification. One of three frequencies may be assigned: 5970, 6000, and 6030 Hz. One of the three tones is added to the voice transmission of all call within an individual cell. The MSUT then detects the tone and modulates the transmitted voice channel carrier with a constant (relative) phase tone which is filtered or regenerated from the received tone to establish a closed loop between the mobile (MSUT) and the cell site. Transmission of the SAT by a MSUT is suspended during transmission of wideband data on the reverse voice channel, but is not suspended when the signaling tone (ST) is sent.

Example

If you want the SAT to be at 6000 Hz, you would enter **`6000`** as the value. All values are entered in Hz.

7. CPA SID Number

This parameter identifies the mobile station's analog System Identification (SID) number. The SID is stored as a 15-bit binary number in the mobile station's permanent security and identification memory.

This parameter should be equal to the MSUT home system ID to perform testing in a non-roaming environment. Use an ID different than the MSUT to test in a roaming environment.

Enter any number from 0 to 32767.

Example If your MSUT's SID number is decimal 11111, you would enter **`11111`** as the value.

8. CPD Analog Channel for D/A Handoff

This parameter allows entry of an analog voice channel for digital-to-analog handoffs.

During a CDMA-to-analog handoff, the Test Set commands the mobile station to re-tune to this analog voice channel.

Make sure the MSUT is programmed to allow handoffs to the selected channel's system (system A or B).

Example

If the MSUT is programmed to allow calls on system B only, enter an analog channel number that is 334 or higher. For system B, enter an analog channel that is 333 or lower.

9. CPD BID Number

This parameter sets the BID (Base Station Identification) for the Test Set. The mobile station receives and stores this number from the Test Set.

Example

Entering **39** for this parameter will cause the Test Set to send the decimal value 39 as its base identification.

10. CPD Echo Delay [0, 2 or 5] (Seconds)

This parameter sets the time period between when you talk into the mobile station and when you hear your voice echoed back.

Example Entering **2** for this parameter delays your voice 2 seconds.

11. CPD NID Number

This parameter sets the mobile station's NID (Network ID) number. The mobile station receives both SID (System ID) and NID numbers from the Test Set, and compares them with its home SID/NID to determine if it is roaming. This parameter, as well as CPD SID Number, do not have to match the mobile station's programmed values to register or make a call, unless the mobile station is programmed to operate "home only".

If the SID and NID values programmed into the mobile station's NAM (number assignment module) match the values entered in the parameters CPD NID Number and CPD SID Number, the mobile station's roam indicator will not be lit after the mobile station has acquired service from the Test Set.

Example

If you want the mobile station to be tested in a non-roaming environment, enter the NID that is programmed into the mobile station's NAM into this parameter. You must also enter the corresponding SID in the parameter CPD SID Number.

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12. CPD SID Number

This parameter sets the mobile station's SID (System ID) number. The mobile station receives both SID and NID (Network ID) numbers from the Test Set, and compares them with its home SID/NID to determine if it is roaming. This parameter, as well as CPD NID Number, do not have to match the mobile station's programmed values to register or make a call, unless the mobile station is programmed to operate "home only".

If the SID and NID values programmed into the mobile station's NAM (number assignment module) match the values entered in the parameters CPD NID Number and CPD SID Number, the mobile station's roam indicator will not be lit after the mobile station has acquired service from the Test Set.

Example

If you want the mobile station to be tested in a non-roaming environment, enter the SID that is programmed into the mobile station's NAM into this parameter. You must also enter the corresponding NID in the parameter CPD NID Number.

13. CPD Spectrum Averages [10,20,50,100]

This parameter sets the number of measurements the Test Set will use when applying video averaging to spectrum analyzer measurements.

Example

If you want spectrum analyzer measurement to be less sensitive to transient signal conditions, increase the CPD Spectrum Averages parameter to 20, 50, or 100. Increasing this parameter, however, also increases test time.

14. RC Compandor is Always On [0=no 1=yes]

This parameter allows you to indicate whether or not the compandor is always on.

If this parameter is set to **1** (Yes), the program assumes that the MSUT's compressor circuitry is located before the pre-emphasis circuitry on the transmitter, and behind the de-emphasis circuitry in the receiver.

With the compandor always "ON" (set to **1**), the effects of an "ideal expandor" are removed from the test results. TEST_15 - RXA Audio Frequency Response results are reduced in half. Also, the test operator is not prompted to turn the compandor "ON" and "OFF".

If this parameter is set to **0** (No), then the test operator will be prompted to "turn the Radio compandor ON" during testing. Some manual control of the phone's compandor state is required.

Example

If you do not want the compandor always on, you would enter **0** as the value. The value must be either a **0** for no, or a **1** for yes.

15. RT High Supply Voltage (Vdc)

This parameter is used to set the MSUT to its highest specified voltage ratings. The value must be entered in Vdc with a range from 0 to 60. **Parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** must be set to “yes” for **parameter *15. RT High Supply Voltage (Vdc)*** to be activated.

The software requires that an HP-IB programmable power supply be used in order to adjust the voltage to the desired value. See **parameter *20. RT Test at Extreme Settings [0=no 1=yes]* on page 172** for more information.

Example

If you desire the power supply voltage set to operate the MSUT at +20% of the normal (Nominal) supply voltage, and the Nominal Supply Voltage is 13.2 V, enter **`15.8`** as the value.

16. RT Low Supply Voltage (Vdc)

This parameter is used to set the MSUT to its lowest specified voltage rating. The value must be entered in Vdc with a range from 0 to 60. **Parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** must be set to “yes” for **parameter *13. CPD Spectrum Averages [10,20,50,100]*** to be activated.

The software requires that an HP-IB programmable power supply be used in order to adjust the voltage to the desired value. See **parameter *20. RT Test at Extreme Settings [0=no 1=yes]* on page 172** for more information.

Example

If you desire the power supply voltage to operate the MSUT at –20% of the normal (nominal) supply voltage, and the nominal supply voltage is 13.2 V, enter **`10.6`** as the parameter value.

17. RT Nominal Supply Voltage (Vdc)

This parameter is used to set the mobile unit to its nominal specified voltage rating under normal conditions. The value must be entered in Vdc with a range from 0 to 60.

The software requires that an HP-IB programmable power supply be used in order to adjust the voltage to the desired value. See **parameter *20. RT Test at Extreme Settings [0=no 1=yes]* on page 172** for more information.

Example

If you desire the power supply voltage to operate the mobile unit at 13.2 Vdc, enter a nominal **`13.2`** as the value.

18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]

This parameter is used to set the protocol field in the CDMA CALL CONTROL screen. The value must be entered as 0, 1, 2 or 3.

Example If you want to use TSB-74 as the a CDMA Protoco standard, enter **2** as the value.

19. RT Rate Set Selection [0=9600 1=14400]

This parameter is used to set the proper service option in the CDMA CALL CONTROL screen. **Parameter *18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]*** must be set to 2 (TSB-74) if this parameter is set to 1 and the user expects the software to do rate set 2 (14400) testing. If **parameter *18. RT Prot Std [0=95 1=95A 2=TSB74 3=ARIB]*** is set to 0 or 1 then this parameter is ignored by the software and rate set 1 is always used. Rate set 2 is not supported with IS-95 and IS-95A protocol standards. The value must be entered as 0 or 1:

Example If you want to test at rate set 2, enter **1** as the value.

20. RT Test at Extreme Settings [0=no 1=yes]

This parameter is used to activate all of the parameters that set extreme testing conditions for the MSUT. If this parameter is set to **1** (yes) the following parameters will be used:

Parameter *15. RT High Supply Voltage (Vdc)*
Parameter *16. RT Low Supply Voltage (Vdc)*
Parameter *28. RXA NAMPS RF Level for SINAD at Extremes (dBm)*
Parameter *30. RXA RF Level for SINAD at Extremes (dBm)*

The software offers the capability to run certain tests at extreme supply voltage conditions. Extreme supply voltage conditions are high and low supply voltages that are used while testing is conducted. In order to use the extreme testing conditions an HP-IB programmable power supply must be used. This power supply must be interfaced to the test system through an HP-IB interface cable. For more information on the types of power supplies supported by the software and how to configure the test system to control the power supply.

See "To Configure a Programmable Power Supply" in the *HP 83217A Test Software User's Guide*

The following tests can be run at extreme testing conditions.

TEST_03 - TXA Frequency Error
TEST_04 - TXA Carrier Power
TEST_05 - TXA Modulation Deviation Limiting
TEST_18 - RXA SINAD

21. RT Use DUPLEX OUT & ANT IN [0=no 1=yes]

This parameter allows you to select which RF ports on the test system will be used for cellular phone tests. A value of 0 causes the RF IN/OUT port to be used for both forward and reverse channels. A value of 1 causes the DUPLEX OUT port to be used for the forward channel and the ANT IN port to be used for the reverse channel.

Use of the DUPLEX OUT and ANT IN ports allows the RF link between the test system and the cellular phone to be established via antennas instead of coaxial cable.

CAUTION: If the RF link is accomplished with antennas, it must be done inside a shielded environment to avoid interference with local cellular telephone service.

Do not overdrive the antenna port's 200 mW maximum input, particularly when measuring the maximum RF power of the MSUT.

22. RX RF Level for Signaling (dBm)

This parameter sets the RF signal level used in all call processing tests. The RF signal level must be entered in units of dBm with a range from **`-120`** to **`-30`**.

Example

If you desire an RF level of –50 dBm, enter –**`50`**.

Used in Tests

- All tests

23. RXA Audio Response Step Frequency (kHz)

This parameter is the step-size used between 300 Hz and 3 kHz to vary the audio input signal frequency in **TEST_15 - RXA Audio Frequency Response**. The values must be entered in kHz.

Example

To step in 500 Hz increments enter 0.5.

24. RXA Expandor Step Level (dB)

This parameter is the step-size used to vary the input level to the expandor that is used in **TEST_14 - RXA Expandor**. The value must be entered in dB.

Example

If you desire to step the input level to the expandor from high level to low level in 5 dB steps, enter –5.

25. RXA FVC Message Error Rate RF Level (dBm)

This parameter sets the RF level for testing the Forward Voice Control (FVC) order message error rate.

Example

If you want the RF level for testing the FVC order message error rate to be at –110 dBm, you would enter –**`110`** as the value.

26. RXA MRI Step Level (dBm)

This parameter sets the step size used by the test system to vary the level of the RF carrier output during **TEST_29 - RXA MRI**. The level is decremented.

Example If you want the RF level to be stepped in 5 dB steps, enter –**5** as the step level.

27. RXA NAMPS RF Level for SINAD (dBm)

This parameter sets the RF signal level for measuring SINAD on narrow voice channels at the nominal power supply voltage. The value must be entered in dBm.

Example

If you want the RF signal level to be at –118 dBm for SINAD measurements, you would enter –**118** as the value.

28. RXA NAMPS RF Level for SINAD at Extremes (dBm)

This parameter sets the RF signal level for measuring SINAD on narrow voice channels at the power supply voltage extremes. The value must be entered in dBm. **Parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** must be set to “yes” for **parameter *30. RXA RF Level for SINAD at Extremes (dBm)*** to be activated.

Example

If you want the RF signal level to be at –115 dBm for SINAD measurements, you would enter –**115** as the value.

29. RXA RF Level for SINAD (dBm)

This parameter sets the RF signal level for measuring SINAD on wide voice channels at the nominal power supply voltage. The value must be entered in dBm.

Example

If you want the RF signal level to be at –116 dBm for SINAD measurements, you would enter –**116** as the value.

30. RXA RF Level for SINAD at Extremes (dBm)

This parameter sets the RF signal level needed at extreme conditions. The value must be entered in dBm with a range from –150 to –15. **Parameter *20. RT Test at Extreme Settings [0=no 1=yes]*** must be set to “yes” for **parameter *30. RXA RF Level for SINAD at Extremes (dBm)*** to be activated.

Example If you desire the RF signal level to be at –113 dBm, enter –**113** as the value.

31. RXA Set Audio Lvl [0=no xx=level volts]

This parameter determines whether or not screen prompts are displayed to help the operator set the volume control during all of the receiver tests.

To use this parameter, the test operator must have control or have access to the audio power (volume control) from the MSUT's transceiver unit.

Example

If your radio is to be tested at 50% of rated audio power, enter the audio level in volts, for example **`0.2`** for 200 mV. The test operator is prompted to adjust to the correct volume level during testing. (The test system displays an analog meter. Correct adjustment is made when the meter needle is set between the two longer lines on the meter.)

The value must be either a **`0`** for no, or a value for audio level in volts.

32. RXA Tolerance for Setting Audio Level (% error)

This parameter is used as the value of the maximum percentage of error that you are allowed for setting the MSUT volume.

The value sets the tolerance window in the analog meter screen that is used to manually set the MSUT's volume during testing; the meter needle must be within the tolerance window (shown by two longer lines on the meter) before the program will accept the manually set MSUT's volume. The tolerance should be as accurate as the volume control will allow.

NOTE: This parameter is only active when **parameter *31. RXA Set Audio Lvl [0=no xx=level volts]*** is set to accept audio level in volts.

Example Enter the value as a percentage of the desired audio level. For example, if the MSUT's maximum audio power is 10 watts, and the tolerance for setting volume is set to 5%, the window will be 1 watt (which is ±5% of 10 watts, the tolerance allows settings above and below the point determined by the audio level value converted from volts to watts).

33. RXD Maximum Frames for FER

This parameter sets the maximum frame count for each FER test.

The software tests apply confidence limits to FER testing as described in EIA/TIA IS-98. The frame count entered in this parameter, along with the actual number of frame errors counted and FER Spec, will determine whether the maximum number of frames is reached before Pass or Fail criteria is met.

The probability that an FER test will end with a Pass or Fail indication increases when the maximum frames parameter is increased. Decreasing the value in this parameter could cause testing to end before either Pass or Fail criteria is met.

Example If the RXD Maximum Frames for FER is 5000, and you want to increase the likelihood that the FER test will end with either a Pass or Fail indication, enter 6000 for this parameter.

34. RXD RF Level for Sensitivity (dBm)

This parameter sets the RF signal level that is used in the digital sensitivity tests.

Example If you desire to apply a –104 dBm signal, enter **–104** as the value.

35. RXD Sensitivity FER Search Specification (%)

This parameter sets the FER specification that will be used to determine when to stop **TEST_47 - RXD Sensitivity Level Search** Entering larger numbers in this parameter lowers the number of frames that must be measured in order to achieve the 95-percent confidence level and stop the test. Larger numbers therefore shorten test time. As an illustration of this process, an FER of 0.5 percent requires that at least 600 frames be measured at each power level, an FER of 1.0 percent requires that at least 300 frames be measured, an FER of 2.0 percent requires that at least 150 frames be measured, and so forth. This parameter is used only in **TEST_47 - RXD Sensitivity Level Search** and not in **TEST_39 - RXD Sensitivity & Dynamic Range** .

Example

If you wish to perform an FER sensitivity search to an FER sensitivity specification of 2.0 percent, enter **`2.0`** as the value.

36. TX Units for Pwr Meas [0=dBm 1=Watts]

This parameter sets the measurement units (dBm or watts) that will be used in transmitter tests. Select the type of unit required for your application.

37. TXA Audio Response Step Frequency (kHz)

This parameter is the step size used to vary the input signal frequency in **TEST_06 - TXA Audio Frequency Response**. The values must be entered in kHz.

Example

If you desire the modulation frequency to be varied from 300 Hz to 3000 Hz in 500 Hz steps, enter **.5** as the value.

38. TXA Compressor Start Level (dB)

This parameter sets the start level used to vary the input level to the compressor in **TEST_12 - TXA Compressor Response**. The values must be entered as dB.

Example If you desire to start the relative input level at 20 dB, enter 20.

39. TXA Compressor Step Level (dB)

This parameter sets the step size used to vary the input level to the compressor in **TEST_12 - TXA Compressor Response**. The values must be entered as dB.

Example If you desire to step the relative input level in 5 dB steps, enter 5.

40. TXA Compressor Stop Level (dB)

This parameter SETS the stop level used to vary the input level to the expandor in **TEST_12 - TXA Compressor Response**. The values must be entered as dB.

Example If you desire to stop the relative input level at -30 dB, enter -30.

41. TXA Current Drain Levels Tested [BWD #]

This parameter allows you to measure current drain at any or all of the power levels listed in the table below.

This parameter's range is based upon a Binary Weighted Decimal (BWD). As shown in the table below, you choose the Power Levels that will be measured for current drain and add their weighted values.

The value must be entered as a BWD with a range from 1 to 255.

Power Level	0	1	2	3	4	5	6	7
Weighted Value	1	2	4	8	16	32	64	128

NOTE: Power levels are defined by the IS-98 Standard.

Example

If you desire to measure the analog transmitter power on the MSUT when it is at Power Levels 1 and 4, enter **18** (2 + 16) as the value.

42. TXA Frequency Deviation Step Frequency (kHz)

This parameter is the step size used to vary the input signal frequency in **TEST_05 - TXA Modulation Deviation Limiting**. This value must be entered in kHz.

Example

If you desire the modulation frequency to be varied from 300 Hz to 3000 Hz in 500 Hz steps, enter **.5** as the value.

43. TXA Mod Dev Limit 50 Hz HPF [0=off 1=on]

This parameter activates a 50 Hz HPF in **TEST_05 - TXA Modulation Deviation Limiting**. The HPF is set to <20 Hz in TEST_05 if this parameter is set to **0** (off). The HPF is set to 50 Hz in TEST_05 if this parameter is set to 1 (on).

Example If you want to turn the 50 HPF on in lieu of the <20 Hz HPF, enter **1**.

44. TXA Output Power Levels Tested [BWD #]

This parameter selects which output power levels will be tested in **TEST_04 - TXA RF Power Output**. This parameter's range is based upon a Binary Weighted Decimal (BWD). As shown in the table below, choose the Power Levels that will be measured and add their weighted values. The value must be entered as a BWD with a range from 1 to 255.

Power Level	0	1	2	3	4	5	6	7
Weighted Value	1	2	4	8	16	32	64	128

NOTE: Power levels are defined by the IS-98 Standard.

Example If you desire to measure the analog transmitter power on the MSUT when it is at Power Levels 1 and 4, enter **18** (2 + 16) as the value.

45. TXA Switch Channels Start Channel (Chan No.)

This parameter sets the start channel used in **TEST_26 - TXA Switch Channels**. The start channel may be any channel in the range from 1 to 1023.

Example If you want to set the start channel to channel 300, enter **`300`**.

46. TXA Switch Channels Step Channel (Chan No.)

This parameter sets the number of channels (step size) to increment between the start and stop channels. This parameter is used in **TEST_26 - TXA Switch Channels**. This step size may be any integer bounded by **parameter *45. TXA Switch Channels Start Channel (Chan No.)*** and **parameter *47. TXA Switch Channels Stop Channel (Chan No.)***l.

Example If you want to set the step channel size to 10 channels, enter **`10`**.

47. TXA Switch Channels Stop Channel (Chan No.)

This parameter sets the stop channel used in **TEST_26 - TXA Switch Channels**. The stop channel may be any channel in the range from 1 to 1023.

Example If you want to set the stop channel to channel 600, enter **`600`**.

48. TXA Transient/ss data [0=tran 1=bth 2=ss]

This parameter allows the user to select between three modes of operation for the execution of TEST_11 TXA RVC Data Deviation.

- Select 0=tran (transient) to perform the test on the entire RVC data signal returned from the MSUT.
- Select 1=bth (both) to perform the test on just the steady state portion of the RVC data signal followed by a test of the entire signal.
- Select 2=ss (steady state) to test only the steady state portion of the signal.

49. TXA TS Atten for Signaling [0, 20, 40] (dB)

This parameter sets the input attenuation in the test system's RF Analyzer to attenuate the signal which is input to the test system. Values are entered as 0, 20, or 40 dB.

Example If you need 20 dB input attenuation to the test system, enter **`20`** as the value.

NOTE: All analog tests require 20 dB input attenuation.

50. TXD Antenna Gain (dB)

This parameter specifies the mobile station's antenna gain for CDMA tests. This parameter is required to relate power measurements made by the Test Set with the MSUT's ERP (effective radiated power). (Minimum test standards are given in ERP in the EIA/TIA IS-98 standards.)

No Antenna Gain parameter is used during analog tests.

Example If the manufacturer specifies 1 dB of gain in the MSUT's antenna, enter 1 in the TXD Antenna Gain field.

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