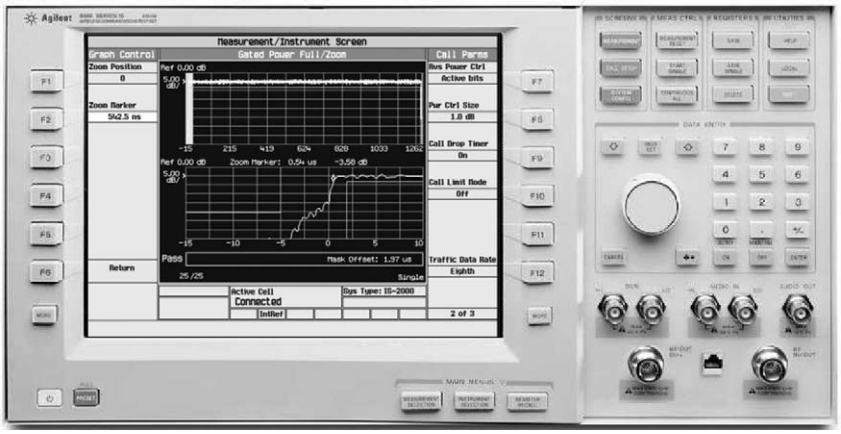
Agilent
E6702B cdma2000/IS-95/AMPS Lab Application

Data Sheet

For use with the E5515C (8960) mainframe



Accelerate your design of cdma2000 wireless devices

Key Features

- External protocol logging and analysis software finds and resolves difficult signaling functionality and timing issues faster
- Simulate two CDMA base station signals, giving you the flexibility to test soft and softer handoff capabilities
- Troubleshoot design issues or test setup problems with enhanced frame error rate measurement
- Data channel connectivity tests high-speed packet data connection to a network
- External, high-precision digital fading when used with the Agilent Baseband Studio Channel Simulator
- The E6702B includes all E1962B test application manufacturing-specific features and measurements, helping smooth the transition from development to manufacturing

What's new?

- **Hybrid mode support** with full verification capabilities when used in conjunction with another E5515C running the E6706A 1xEV-DO lab application and the Software Concepts MOB-IP-SIM
- **Multi-unit synchronization** for supporting idle handoff tests and hybrid mode operation
- **MEID support** for testing mobiles equipped with the new mobile equipment ID rather than ESN
- **CDMA authentication** enables verification of authentication call processing functions such as SSD update, unique challenge, and authenticated call procedures
- **Settable system time** allows the user to set any desired system time and date for CDMA modes
- **Real time vocode**r allows functional test of speech connections using the 13 k or EVRC vocoders
- **Support for the new band class 0** allows testing mobiles that conform to this revised frequency plan, including channels for the Japanese market
- **Enhanced AMPS measurements** includes new, one-button call processing send maintenance order and send alert order commands along with dedicated signaling tone, DTMF tone, and wideband data measurements

E6702B Functionality Overview

Meet aggressive time-to-market and production schedules

Growing demand for high-speed data services means the roll out of cdma2000 wireless devices is essential. The Agilent E6702B cdma2000 Lab Application, combined with the E5515C (8960) test set provides the critical capabilities needed to verify and ensure quality RF performance in your cdma2000, IS-95, and AMPS devices. This lab application, designed for high-volume manufacturing and wireless device development, allows you to finalize product designs and minimize time-to-volume.

Comprehensive protocol support

The E6702B supports numerous protocol features to enable fast and accurate regression test of phones. For example, Service Option 033 support provides the ability for the test set to function as a live packet data network. Simply connect to an external server or the internet via the rear panel LAN port, and you can test packet data connections on IS-2000 mobile stations. Support for $1/8^{th}$ rate traffic gating mode allows accurate talk time testing. Comprehensive SMS capability allows full testing of a mobile's SMS capabilities according to industry test standards. Other features include IS-2000 Release A protocol support, full hybrid mode test capability (in conjunction with another E5515C running the E6706A 1xEV-DO lab application), CDMA authentication capability, real time vocoder that supports functional verification, and caller ID.

CDMA forward link emulation

Comprehensive signal generation capabilities including all applicable CDMA channels, modulation, and an AWGN source (1.8 MHz minimum bandwidth). Support is also included for the new cdma2000 release A forward link channels such as the F-BCCH and F-CCCH. Flexible user control of the forward link emulation is provided through easy-to-use front panel control and remote GPIB.

CDMA transmitter tests

- Maximum power
- Minimum power
- Multi-code waveform quality
- Handoff waveform quality
- Open loop power accuracy
- Open loop power calibration
- Access probe power
- Graphical access probe power
- Code domain power
- Gated power
- Code channel timing and phase
- Spurious emissions
- Time response of open loop
- Tx dynamic power

CDMA receiver tests

- Fundamental/traffic channel sensitivity
- Demodulation of F-FCH in multipath fading
- Demodulation of F-FCH in multipath fading with closed loop power control (FPC_Mode=000)
- Demodulation of F-FCH in multipath fading with outer loop and closed loop power control (FPC_Mode=000)
- Supplemental channel sensitivity
- Dynamic range
- Demodulation with AWGN
- Slotted paging channel MER

AMPS transmitter tests

- RF power output
- RF frequency and frequency error
- FM modulation limiting
- FM deviation and distortion
- Audio frequency response
- Audio distortion
- FM hum and noise
- SAT deviation and frequency error
- Compressor response
- Signaling tone frequency and deviation
- DTMF symbol, frequency, and deviation
- Wideband data deviation

AMPS receiver tests

- SINAD
- Audio frequency response
- Audio distortion
- FM hum and noise
- Expander response

Fading tests

Option 004 adds a rear panel digital bus that enables fading when used with Agilent's Baseband Studio for fading solution. In conjunction with the N5101A Baseband Studio PCI card and the N5115A Baseband Studio for fading software, the E6702B provides receiver fading tests with unprecedented accuracy and repeatability at a very attractive price point. Baseband I/Q data from the E5515C is sent via the digital bus to the N5101A fading card in an external PC. The N5115A fading software configures the PCI card to perform the user-selected fading profile. After digital fading, AWGN can be digitally added to the waveform. The resulting waveform is then returned to the test set via the digital bus for modulation. This solution eliminates almost all associated calibrations and provides rock-solid repeatability. Typical E_b/N_t repeatability for fading tests with fast forward power control enabled is less than 0.1 dB!

Get the proven benefits of the Agilent 8960 test set

Because this cdma2000 test solution is based on the high-performance 8960 Series 10 test set, you gain the additional benefits of extremely fast measurement speed, ease of programming, accuracy, reliability, and worldwide service and support. These proven features help you shorten test development time, increase throughput, and minimize support costs.

Technical Specifications

These specifications apply to an E5515C mainframe with Option 003 for serial number US40410101, GB40410101, or higher when used with an E6702B lab application of firmware revision B.03.21 or higher.

Specifications describe the test set's warranted performance and are valid for the unit's operation within the stated environmental ranges unless otherwise noted. All specifications are valid after a 30-minute warm-up period of continuous operation.

Supplemental characteristics are intended to provide typical, but non-warranted, performance parameters that may be useful in applying the instrument. These characteristics are shown in *italics* and labeled as *"typical"*, or *"supplemental"*. All units shipped from the factory meet these typical numbers at 25 °C ambient temperature without including measurement uncertainty.

Analog specifications

AMPS active cell call processing functionality

Call control ("one button commands"): register, BS call originate, BS call disconnect, MS call originate (auto answer), and MS call disconnect

Call setup parameters: control channel, voice channel, SID, SAT, and power level

Handoff support: hard handoff to new channel

Registration reported mobile information: ESN in decimal, ESN in hex, MIN1, MIN2, phone number, station class mark (SCM), and called number

AMPS test mode functionality

Usage: the mobile station must be setup on a channel without the test set (using internal test mode commands in the mobile). The test set provides RF generator output and RF and audio analysis input. This mode provides no signaling

Spectrum monitor

Input frequency ranges:

- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Reference level: auto or manual

Manual reference level range: +37 to –50 dBm

Display dB per division: 20.0 to 0.1 dB per division

Level measurement accuracy: *(calibrated against average power and within ±10 degrees of calibration temperature. Calibration must occur between 20 to 55 °C): typically < ±1.0 dB 15 to 55 °C*

Display frequency span and resolution bandwidth (coupled):

- 0 Hz span
- 125 kHz span 300 Hz RBW
- 500 kHz span 1 kHz RBW
- 1.25 MHz span 1 kHz RBW
- 2.5 MHz span 10 kHz RBW
- 4 MHz span 30 kHz RBW
- 5 MHz span 30 kHz RBW
- 10 MHz span 100 kHz RBW
- 12 MHz span 100 kHz RBW
- 20 MHz span 100 kHz RBW
- 40 MHz span 300 kHz RBW
- 80 MHz span 1 MHz RBW
- 100 MHz span 5 MHz RBW

Trigger: immediate, RF rise, protocol, or external

Trigger arm: single or continuous

Trigger delay: –50 to 50 ms

Zero span trace time: 60 µs to 70 ms

Zero span resolution bandwidth: 100 kHz, 300 kHz, or 1 MHz

Detector: peak detection or sample detection

Trace mode: clear write, max hold, or min hold

Markers: three user markers

Marker modes: off, position, or delta

Marker functions: peak search, marker to expected frequency, and marker to expected power

CW RF generator

Frequency

Available frequency range: 292 to 2700 MHz
Specified frequency ranges: 421 to 494 MHz, 800 to 960 MHz, and 1700 to 2000 MHz
Accuracy and stability: same as listed under FM RF generator
Test signal: CW, AM (56% depth with 20 kHz rate), or DSB-SC (carrier + upper side-band spaced 20 kHz apart); requires approximately 3 seconds to switch between test signal selections

Amplitude

Available output level range: –127 to –10 dBm
Specified output level range: –116 to –15 dBm
Absolute output level accuracy: < ±1.0 dB, *typically < ±0.5 dB* (level accuracy at RF generator output levels > –30 dBm may be degraded by simultaneous reception and transmission when applied Tx power is > 32 dBm)
VSWR at RF IN/OUT: < 1.14:1, 400 to 1000 MHz
Nominal ambient test signal level accuracy: *< ±1.1 dB*

FM RF generator

Frequency

Frequency range: 800 to 960 MHz
Accuracy and stability: same as timebase reference
CW frequency switching speed: *typically < 10 ms to be within < 0.1 ppm of final frequency*
Setting resolution: *typically 1 Hz*

Amplitude

Output level range: –116 to –15 dBm
Absolute output level accuracy: < ±1.0 dB, *typically < ±0.5 dB* (level accuracy at RF generator output levels > –30 dBm may be degraded by simultaneous reception and transmission when applied Tx power is > 32 dBm)
RF IN/OUT reverse power: +37 dBm peak (5 W peak)
VSWR at RF IN/OUT: < 1.14:1, 400 to 1000 MHz
Output level repeatability (returning to the same frequency and level): *typically < ±0.1 dB*
Output level setting resolution: *typically 0.1 dB*
Output level switching time: *typically < 50 ms to be within 0.1 dB of final level*

Spectral purity

Harmonics: –25 dBc for levels < –17 dBm
Subharmonics: < –40 dBc
Non-harmonics:

- < –55 dBc for 100 to < 1500 kHz offsets from carrier
- < –68 dBc for > 1500 kHz offsets from carrier
- *typically < –55 dBc for 3 to < 100 kHz offsets*
- *typically < –53 dBc for line-related non-harmonics*

Spurious due to receiver LO leakage: spurious at 105 ±2.5 MHz below expected transmitter frequency and its second harmonic is typically < –50 dBm

FM and SAT signal generation

FM rate range: 100 Hz to 20 kHz
FM deviation range: 0 to 20 kHz for combined SAT, internal, and external deviation
Residual FM: < 7 Hz rms in a CCITT bandwidth
Internal FM accuracy: < ±(3.5% + residual FM) at a 1 kHz rate
External FM accuracy: < ±(5% + residual FM) at a 1 kHz rate
FM flatness: < ±5% relative to a 1 kHz rate
FM distortion (THD plus noise): < 0.5% for > 4 kHz deviation at a 1 kHz rate in a CCITT bandwidth
External FM input sensitivity: 20 kHz deviation per V
Maximum external FM input level: 1 V peak
SAT frequencies: 5970, 6000, or 6030 Hz
SAT deviation: fixed at 2 kHz
FM rate resolution: *typically 5 Hz*
FM deviation resolution: *typically 5 Hz*

Audio generator

Frequency

Operating range: 100 Hz to 20 kHz, typically 1 Hz to 20 kHz
Accuracy: same as timebase reference
Frequency resolution: *typically 0.1 Hz*

Output level (from AUDIO OUTPUT connector)

Ranges: 0 to 1 V peak, 1 to 9 V peak into > 600 Ω
Accuracy: < ±(1.5% of setting + resolution) when output is DC coupled
Distortion: < 0.1% for 0.2 to 9 V peak into > 600 Ω
Coupling mode: selectable as DC or AC (5 µF in series with output)
Maximum output current: *typically 100 mA peak into 8 Ω*
Output impedance: *typically < 1.5 Ω at 1 kHz when output is DC coupled*
DC offset (when output is DC coupled):

- *typically < 1 mV peak for 0 to 1 V peak*
- *typically < 10 mV peak for 1 to 9 V peak*

Output level resolution: *typically < 0.5 mV for 0 to 1 V peak output, < 5.0 mV for 1 to 9 V peak output*

AMPS RF analyzer

Unless otherwise noted, all specifications apply to frequencies of 800 to 960 MHz for signals with peak input power at the test set's RF IN/OUT not higher than +34 dBm and temperatures of 0 to 55 °C. Input signal Tx power at the test set's RF IN/OUT must be within ±3 dB of the test set's expected power for warranted performance.

Analog Tx power measurement

Types of signals measured: CW or AMPS signals with or without SAT
Frequency capture range: signal must be within ±100 kHz of test set's expected frequency
Maximum input level: +37 dBm peak (5 W peak)
Minimum input level: > –30 dBm
Extended amplitude range: *typically results are provided for signals at test set's RF IN/OUT with analog Tx power within –10 and +5 dB of expected power*
Measurement accuracy (for 20 to 55 °C): < ±0.32 dB for 800 to 960 MHz, *typically < ±0.14 dB for 800 to 960 MHz*
Measurement resolution: *typically 0.01 dB*
Measurement repeatability: *typically < ±0.1 dB*
VSWR at RF IN/OUT: < 1.14:1, 800 to 1000 MHz
Measurement trigger source: immediate
Available result: output power
Multi-measurement capabilities: 1 to 999 bursts, minimum, maximum, average, and standard deviation results
Concurrency capabilities: analog Tx power measurements can be made concurrently with all analog and audio measurements

Frequency modulation measurement

Types of signals measured: analog and AMPS signals with or without SAT

Frequency capture range: signal must be within ±2.5 kHz of test set's expected frequency

Deviation and frequency measurement rate range: 100 Hz to 15 kHz

Distortion measurement rate range: 100 Hz to 10 kHz

Measurement deviation range: 0 to 16 kHz

Minimum input level: signal at test set's RF IN/OUT must have analog Tx power > –15 dBm

rms deviation measurement accuracy: < ±(2% of reading + residual FM effects)

Peak deviation measurement accuracy: < ±(3% of reading + residual FM effects)

Distortion measurement accuracy: < ±12% of reading (±1.0 dB) ± residual FM effects

Frequency measurement accuracy (for input signals with ratio of deviation to residual FM > 30 dB):

- < ±0.1 Hz averaged over 10 measurements
- < ±1.0 Hz for a single measurement

Residual FM: < 7 Hz rms in a C-message bandwidth, < 1.5 Hz rms in a 100 Hz bandwidth using the tunable band pass filter

Measurement trigger source: immediate

Measurement detector: selectable choices of rms, peak+, and peak–, peak +/– max, peak +/– max/2

Measurement gate time: 50 ms to 6.0 s with 50 ms resolution; default value of 50 ms

Measurement filtering: settable choices of none, 100 Hz bandwidth band pass tunable over 300 Hz to 15 kHz, C-message, 50 Hz to 3 kHz band pass, 50 Hz to 15 kHz band pass,or 300 Hz to 15 kHz band pass

Measurement de-emphasis: 750 µs settable as off or on

Measurement expandor: settable as off or on

Available results: FM deviation level, FM distortion, and modulation frequency

Multi-measurement capabilities: 1 to 999 measurements, minimum, maximum, average, and standard deviation results

Concurrency capabilities: frequency modulation measurements can be made concurrently with all analog and audio measurements

Deviation measurement resolution: *typically 1 Hz*

Distortion measurement resolution: *typically 0.1%*

Frequency measurement resolution: *typically 0.1 Hz*

External audio output: selectable source for the front panel Audio Out port of either the audio source (default) or the demodulated FM output

Frequency stability measurement

Types of signals measured: analog and AMPS signals with or without SAT and with frequency modulation index (β) < 3.0 radians

Frequency capture range: signal must be within ±200 kHz of test set's expected frequency

Measurement rate range: 100 Hz to 15 kHz

Minimum input level: signal at test set's RF IN/OUT must have analog Tx power > –30 dBm

Frequency and frequency error measurement accuracy:

Measurement accuracy	Input signal modulation	Input signal frequency range
< ±(1 Hz + time-base accuracy)	None	800 to 960 MHz
< ±(10 Hz + time-base accuracy)	Frequency modulation with β < 3.0 radians	800 to 960 MHz

Measurement accuracy: *typically < ±(1 Hz + timebase accuracy) for an input signal with SAT, < ±(3.3 Hz + timebase accuracy) for an input signal with* β *= 1 radian*

Measurement trigger source: immediate

Available results: RF frequency and RF frequency error

Multi-measurement capabilities: 1 to 999 measurements, minimum, maximum, average, and standard deviation in Hz for all results and worst case RF frequency error in ppm result

Concurrency capabilities: frequency stability measurements can be made concurrently with all analog and audio measurements

Measurement resolution for frequency and frequency error measurement results in Hz: *typically 1 Hz*

Measurement resolution for frequency error measurement result in ppm: *typically 0.01 ppm*

Signaling tone measurement

Types of signals measured: AMPS 10 kHz signaling tone with or without SAT

Measurement setup requirements: in the AMPS active cell mode, the user must trigger the test set to send a maintenance order in order to force the DUT to transmit the signaling tone; in the AVC test mode, the user must force the DUT to transmit the signaling tone using a test mode in the DUT

Frequency capture range: RF signal must be within ±2.5 kHz of test set's expected frequency

Measurement deviation range: 0 to 16 kHz

Minimum input level: signal at test set's RF IN/OUT must have analog Tx power > –15 dBm

Peak deviation measurement accuracy: same as FM measurement

Residual FM: same as FM measurement

Measurement trigger source: immediate

Measurement detector: peak+ and peak–

Measurement filtering: fixed to 100 Hz band pass filter centered on the 10 kHz signaling tone

Available results: signaling tone peak+ and peak– deviation level, signaling tone frequency, and signaling tone frequency error

DTMF measurement

Types of signals measured: AMPS DTMF modulated signals

Measurement setup requirements: in the AMPS active cell mode or AVC test mode, the user must trigger the DUT to transmit the desired DTMF symbols

Supported DTMF symbols: 1, 2, 3, A, 4, 5, 6, B, 7, 8, 9, C, *, 0, #, and D

DTMF symbol frequency capture range: DTMF symbols individual high and low tones must be within ±2% of their defined frequencies for correct detection

DTMF symbol defined frequencies:

	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

Measurement deviation range: 2.0 to 6.0 radians

Minimum input level: signal at test set's RF IN/OUT must have analog Tx power > –15 dBm

Peak deviation measurement accuracy: same as FM measurement

Residual FM: same as FM measurement

Measurement trigger source: immediate

Measurement detector: rms, peak+, peak–, peak +/– max, and peak +/– max/2

Measurement gate time: 100 ms to 6.0 s with 100 ms resolution; default value of 2.0 s

Measurement filtering: fixed to 100 Hz band pass filter centered on the symbol's nominal high and low tone frequencies

Available results: reports the following parameters for up to 16 DTMF symbols (those captured during the measurement gate time): detected symbol; low tone frequency, frequency error, radian deviation; high tone frequency, frequency error, radian deviation; symbol on time; and symbol off time

Wideband data deviation measurement

Types of signals measured: AMPS wideband data bursts

Measurement setup requirements: in the AMPS active cell mode, the user must arm the measurement and then force the DUT to send a wideband data burst by changing the MS Tx level (causes the test set to send a signaling message that the DUT must respond to); in the AVC test mode, the user must force the DUT to transmit a wideband data burst using a test mode in the DUT

Frequency capture range: RF signal must be within ±2.5 kHz of test set's expected frequency

Measurement deviation range: 4 to 16 kHz

Minimum input level: signal at test set's RF IN/OUT must have analog Tx power > –15 dBm

Peak deviation measurement accuracy: same as FM measurement

Residual FM: same as FM measurement

Measurement trigger source: immediate

Measurement detector: peak+ and peak–

Measurement gate time: 100 ms to 6.0 s with 100 ms resolution; default value of 2.0 s

Measurement filtering: fixed to 50 Hz high-pass filter

Available results: wideband data peak+ and peak– frequency deviation, and wideband data settled peak+ and peak– frequency deviation; settled results are taken 30 ms after the detected front edge of the wide band data burst

Audio analyzer specifications

All specifications for the audio analyzer apply to signals present at test set's AUDIO IN ports.

Audio analyzer de-emphasis: 750 µs, de-emphasis settable as off or on

Audio analyzer expandor: settable as off or on with reference level setting of 10 mV to 10 V

Audio analyzer filters: settable choices of none, C-message, 50 Hz to 15 kHz band pass, 300 Hz to 15 kHz band pass, or 100 Hz bandwidth tunable band pass tunable over 300 Hz to 15 kHz

Audio level measurement

Types of signals measured: sinusoidal audio signals

Measurement frequency range: 100 Hz to 15 kHz

AUDIO IN level range: 7.1 mV to 20 V peak (5 mV to 14.1 V rms)

Measurement accuracy: < ±(2% of reading + resolution) for 100 Hz to 8 kHz, < ±(3% of reading + resolution) for > 8 to 15 kHz

Measurement THD plus noise: < 200 µV rms

Measurement detector: selectable choices of rms and peak

Measurement trigger source: immediate

Available result: audio level

Multi-measurement capabilities: 1 to 999 measurements, average, minimum, maximum, and standard deviation results

Concurrency capabilities: audio level measurements can be made concurrently with all other measurements

External input impedance: *typically 100 k Ω in parallel with 105 pF*

Measurement resolution: *typically 0.3% of expected level setting or 0.2 mV, whichever is greater*

SINAD measurement

Types of signals measured: sinusoidal audio signals

Measurement frequency range: 100 Hz to 10 kHz

AUDIO IN level range: 42.4 mV to 20 V peak, (30 mV to 14.1 V rms)

Measurement accuracy: < ±1.0 dB for SINAD < 44 dB

Residual THD plus noise: < –60 dB or 200 µV rms, whichever is greater

Measurement trigger source: immediate

Available result: SINAD ratio

Multi-measurement capabilities: 1 to 999 measurements, minimum, maximum, average, and standard deviation results

Concurrency capabilities: SINAD measurements can be made concurrently with all analog and audio measurements

Measurement resolution: *typically 0.01 dB*

Distortion measurement

Types of signals measured: sinusoidal audio signals

Measurement frequency range: 100 Hz to 10 kHz

AUDIO IN level range: 42.4 mV to 20 V peak (30 mV to 14.1 V rms)

Measurement accuracy: < ±12% of reading (±1.0 dB) for distortion > 0.67%

Residual THD plus noise: < –60 dB or 200 µV rms, whichever is greater

Measurement trigger source: immediate

Available result: audio distortion

Multi-measurement capabilities: 1 to 999 measurements, minimum, maximum, average, and standard deviation results

Concurrency capabilities: distortion measurements can be made concurrently with all analog and audio measurements

Measurement resolution: *typically 0.1%*

Audio frequency measurement

Types of signals measured: sinusoidal audio signals

Measurement frequency range: 100 Hz to 15 kHz

AUDIO IN level range: 7.1 mV to 20 V peak (5 mV to 14.1 V rms)

AUDIO IN signal conditions: signal at test set's AUDIO IN must have signal-to-noise ratio > 30 dB

Measurement accuracy: < 0.1 Hz averaged over 10 measurements, < 1.0 Hz for a single measurement

Measurement THD plus noise: < 200 µV rms

Measurement trigger source: immediate

Available result: audio frequency

Multi-measurement capabilities: 1 to 999 measurements, minimum, maximum, average, and standard deviation results

Concurrency capabilities: frequency measurements can be made concurrently with all other measurements

Measurement resolution: *typically 0.1 Hz*

CDMA specifications

cdma2000 active cell call processing functionality

Resident formats: IS-2000 SR1 (cdma2000)

Call processing timing tolerance: *mobile transmissions typically must be within ±6 µs of test set's transmitted pilot channel clock timing for proper reverse channel acquisition*

Protocol stack: IS-2000 release 0 with addendum (PREV=6) or IS-2000 release A (PREV=7)

Control channel configuration (PREV=7 only): PCH/ACH or BCCH/CCCH/EACH

Cell 1 overhead channels (PREV=6 and PREV=7 with Control Channels=PCH/ACH):

- **F-Pilot:** with settable PN offset
- **F-Sync:** with real-time long code and system time update and updates for entered parameters
- **F-Paging:** with real-time overhead messages
- **F-QPCH:** indicates if active page will be in the next paging channel slot

Cell 1 overhead channels (PREV=7 with Control Channels=BCCH/CCCH/EACH):

- **F-Pilot:** with settable PN offset
- **F-Sync:** with real-time long code and system time update and updates for entered parameters
- **F-BCCH:** with real-time overhead messages
- **F-CCCH:** with real-time signaling messages
- **F-QPCH:** indicates if active page will be in the next paging channel slot

Cell 2 overhead channels:

- **F-Pilot:** with settable PN offset

Cell 1 overhead messages (PREV=6 and PREV=7 with Control Channels=PCH/ACH): system parameters message, channel list message, access parameters message, extended system parameters message, and extended neighbor list message

Cell 1 overhead messages (PREV=7 with Control Channels=BCCH/CCCH/EACH): ANSI-41 system parameters message, MM-RC parameters message, extended channel list message, enhanced access parameters message, and universal neighbor list message

Cell parameters: NID, SID, country code (MCC), network code (MNC), CDG esc mode, max slot cycle index, and reverse link traffic pilot gain

Control channel parameters (PREV=6): paging rate, F-QPCH rate, F-QPCH state, and F-QPCH relative level

Control channel parameters (PREV=7 and Control Channels=BCCH/CCCH/EACH): F-BCCH rate, F-CCCH rate, F-QPCH rate, F-QPCH state, and F-QPCH relative level

Paging channel data rate (PREV=6): selectable from either full or half rate

F-BCCH rate (PREV=7 and Control Channels= BCCH/CCCH/EACH): 4.8 kb/s (1/2 rate coding, 160 ms slot), 9.6 kb/s (1/2 rate coding, 80 ms slot), or 19.2 kb/s (1/2 rate coding, 40 ms slot)

F-CCCH rate (PREV=7 and Control Channels= BCCH/CCCH/EACH): 9.6 kb/s (1/4 rate coding, 20 ms frame), 9.6 kb/s (1/2 rate coding, 20 ms frame), and 19.2 kb/s (1/2 rate coding, 20 ms frame)

F-QPCH data rate: selectable from either full or half rate

Access parameters (PREV=6): nominal power, nominal power extended, initial power, power step number of steps, maximum request sequence, maximum response sequence, and preamble size

Enhanced access parameters (PREV=7 and Control Channels=BCCH/CCCH/EACH): maximum request sequence, maximum response sequence, RL gain common to pilot, interference correction threshold, interference correction maximum, EACH nominal power, EACH initial power, EACH power step, and EACH number of steps

R-EACH data rate supported (PREV=7 and Control Channels=BCCH/CCCH/EACH): 9.6 kb/s with a 20 ms frame only, 19.2 kb/s with a 20 ms frame only or all rates with a 20 ms frame

Threshold parameters: T_Add, T_Drop, T_Comp, T_Tdrop, Soft_Slope, Add_Intercept, and Drop_Intercept

Call control ("one button commands"):

- register
- BS call originate
- BS call disconnect
- MS call originate (auto answer)
- MS call disconnect

Registration support: user-initiated (zone-based), power up (with on/off support), timer based (with on/off support), implicit registration (mobile originated call), or direct user entry of mobile IMSI

Registration reported mobile information: ESN (hex), ESN (decimal), MCC, MNC, MSIN, slot class, slot cycle index, protocol revision, band class, operating mode, MAX EIRP, registration type, QPCH support, enhanced RC support, minimum power control step size, and MS called party number, MEID supported, MEID (hex), and MEID (decimal)

IMSI support: class 0 only

Supported IMSI class 0 types: MSIN only (00), MNC + MSIN (01), MCC + MSIN (10), or MCC + MNC + MSIN (11)

IMSI page: allows making a phone call without performing a registration by entering values for the following parameters: paging type, paging MSID, paging MNC, and paging MCC

Paging type: all, MCC+MSIN, MNC+MSIN, or MSIN only

Paging MSIN: up to 10 numeric digits

Paging MCC: 0 to 999

Paging MNC: 0 to 99

Status request query control: selectable between on and off; default of "on" causes test set to perform the status queries during registration or mobile origination when a new ESN is received by the test set

Max EIRP: user must enter the mobile's maximum power in dBW when the status request query field is set to off

Query mobile capabilities function: uses signaling to request the mobile's capabilities; requested parameters include:

- **FCH:** FCH supported, FCH 5 ms frames supported, F-FCH radio configurations, R-FCH radio configurations
- **DCCH:** DCCH supported, DCCH frame size, F-DCCH radio configurations, R-DCCH radio configurations
- **F-SCH:** F-SCH supported, number of F-SCH channels supported, turbo encoder supported, turbo encoded rate set 1 maximum data rate, turbo encoded rate set 2 maximum data rate, convolutional encoder supported, convolutional encoded rate set 1 maximum data rate, convolutional encoded rate set 2 maximum data rate
- **R-SCH:** R-SCH supported, number of R-SCH channels supported, turbo encoder supported, turbo encoded rate set 1 maximum data rate, turbo encoded rate set 2 maximum data rate, convolutional encoder supported, convolutional encoded rate set 1 maximum data rate, convolutional encoded rate set 2 maximum data rate

TCH/FCH service option support:

- **SO1:** 9.6 kb/s voice
- **SO2:** 9.6 kb/s data loopback
- **SO3:** 9.6 kb/s EVRC voice
- **SO6**: 9.6 kb/s SMS
- **SO9:** 14.4 kb/s data loopback
- **SO14:** 14.4 kb/s SMS
- **SO17:** 14.4 kb/s voice
- **SO55:** RC1/2/3/4/5 data loopback
- **SO32768:** 14.4 kb/s voice
- **SO33:** 9.6/14.4 kb/s packet data

Loopback service option traffic data source: PRBS (CCITT 2^{15}–1 pattern)

Voice service option modes: echo with variable delay, 400 Hz sinewave, 1 kHz sinewave, swept sinewave, multi-tone audio, real-time vocoder, and null frames

Echo delay: selectable short, medium, and long

Handoff support: hard handoff (new channel, band), PN offset handoff, soft handoff, softer handoff, IS-2000 to IS-95, and IS-2000 to AMPS

Soft handoff type: selectable as either soft or softer; cell 1 and cell 2 reverse power control can be set the same or independently without regard to the soft handoff type selected

Soft handoff functions: on/off, request pilot strength message, and clear mobile pilot report

Soft handoff mobile reported parameters: pilot strength request timestamp (40 ms resolution), pilot strength received timestamp (40 ms resolution), PN status (candidate, active, to add, to drop), keep status, pilot strength, and PN offset

IS-2000 to IS-95 handoff parameters: execute, channel, band, protocol, and service option

IS-2000 to AMPS handoff parameters: execute, channel, SAT, and power level

Supported TCH/FCH radio configuration combinations:

- forward RC1 + reverse RC1
- forward RC2 + reverse RC2
- forward RC3 + reverse RC3
- forward RC4 + reverse RC3
- forward RC5 + reverse RC4

Forward TCH/FCH data rates:

RC1: random (40% duty cycle), 1.2, 2.4, 4.8, 9.6 kb/s
RC2: random (40% duty cycle), 1.8, 3.6, 7.2, 14.4 kb/s
RC3: random (40% duty cycle), 1.5, 2.7, 4.8, 9.6 kb/s
RC4: random (40% duty cycle), 1.5, 2.7, 4.8, 9.6 kb/s
RC5: random (40% duty cycle), 1.8, 3.6, 7.2, 14.4 kb/s

Forward SCH support: 1 SCH only

Forward SCH data rates:

RC3: 9.6, 19.2, 38.4, 76.8, or 153.6 kb/s
RC4: 9.6, 19.2, 38.4, 76.8, or 153.6 kb/s

Forward SCH data source: eight bit fixed pattern or PRBS (default)

Forward SCH coding: convolutional or turbo

Forward SCH service option support:

- **SO32 (+F-SCH):** TDSO supporting all SR1 rates up to 153.6 kb/s for F-RC3 and F-RC4
- **SO32 (+SCH):** TDSO supporting all SR1 rates up to 153.6 kb/s for F-RC3 or F-RC4 at the same time with R-RC3
- **SO33 (+F-SCH):** high-speed packet data supporting all SR1 rates up to 153.6 kb/s for F-RC3, or F-RC4 on the F-SCH with reverse link packet data on R-FCH (no R-SCH)

Reverse link access support: access channel for PREV=6, access channel or enhanced access channel for PREV=7, or both using basic access mode

Reverse FCH data rate:

RC1: 1.2, 2.4, 4.8, 9.6 kb/s
RC2: 1.8, 3.6, 7.2, 14.4 kb/s
RC3: 1.5, 2.7, 4.8, 9.6 kb/s
RC4: 1.8, 3.6, 7.2, 14.4 kb/s

Reverse FCH 1/8th rate gating: selectable on/off for R-RC3 and R-RC4

Reverse SCH support: SO32 assign for a single channel

Reverse SCH data rates:

RC3: 9.6, 19.2, 38.4, 76.8, or 153.6 kb/s

Reverse link closed loop bit rate: fixed to 800 per second

Cell 1 reverse link closed loop power control modes:

- active
- alternating – alternating 0 and 1 power bits
- alt 20 up/down – alternating 20 up/20 down bits
- all up
- all down

Cell 1 reverse link closed loop power control transient: user start function that interrupts the current cell 1 reverse link closed loop power control mode and substitutes the user-defined number and direction of closed loop power control bits; once the transient is sent, the closed loop power control reverts to the original state

Cell 1 reverse link closed loop power control transient modes:

- up
- down
- up–down–up

Cell 1 transient number of steps: 1 to 400

Cell 2 reverse link closed loop power control modes:

- active
- alternating – alternating 0 and 1 power bits
- alt 20 up/down – alternating 20 up/20 down bits
- all up
- all down
- cell 1 bits – sets cell 2's bits identical to cell 1's

Fast forward power control

Forward link power control mode: supports the following three selectable modes: ignore (test set ignores all power control data sent by the mobile station), mode "000" (800 b/s for F-FCH), and mode "011" (send erasure indicator bits)

Forward link power control parameters: FPC maximum F-FCH level, FPC F-FCH target FER, FPC F-FCH initial set point, FPC F-FCH minimum set point, FPC F-FCH maximum set point, and FPC F-FCH step size

FPC maximum F-FCH level range: –2.00 to –30.00 dB

FPC F-FCH target FER: selectable from the following fixed values for the target FER: 0.2%; 0.5 to 10% in 0.5% increments; 11, 12, 13 , 14 , 15, 18, 21, 24, 27, and 30%

FPC F-FCH initial set point range: 0 to 31.75 dB in 0.25 dB steps

FPC F-FCH minimum set point range: 0 to 31.75 dB in 0.25 dB steps

FPC F-FCH maximum set point range: 0 to 31.75 dB in 0.25 dB steps

Request outer loop report: performs an over-the-air query of the mobile station's current outer loop set point; displays the returned set point value from the mobile station

Current F-FCH level under FFPC: reports the average power in the F-FCH over the previous 25 frames (no history)

EIB counters (FPC Mode=011-EIB): displays the mobile reported number of good frames and bad frames that match the transmitted pattern, the number that don't match the transmitted pattern, and the number of frames not reported

SMS

SMS support: mobile terminated or mobile originated

SMS mobile terminated service types: point to point or broadcast

SMS mobile terminated teleservice types: wireless paging teleservice, wireless messaging teleservice, voice mail notification, or WAP

SMS broadcast service categories: unknown, broadcast emergency, administrative, maintenance, general news local, general news regional, general news national, general news international, business and financial news local, business and financial news regional, business and financial news national, business and financial news international, sports news local, sports news regional, sports news national, sports news international, entertainment news local, entertainment news regional, entertainment news national, entertainment news international, local weather, area traffic reports, local flight schedules, restaurants, lodgings, retail directory, advertisements, stock quotes, employment opportunities, medical, technology news, and multi-category

SMS mobile terminated originating address: maximum of 14 numeric digits

SMS mobile terminated message priority: none, normal, interactive, urgent, and emergency

SMS mobile terminated message privacy: none, not restricted, restricted, confidential, and secret

SMS mobile terminated message alert: default, low, medium, high, and none

SMS mobile terminated message encoding: octet, 7-bit ASCII, IA5, UNICODE, shift-JIS, Korean, Latin/Hebrew, Latin, and GSM 7-bit default alphabet

SMS mobile terminated message optional user data: include or exclude

SMS mobile terminated call back number: include or exclude; set to the originating address when included

SMS mobile terminated message entry: hex or ASCII

SMS mobile terminated message length: maximum of 255 ASCII characters or 510 hex characters

SMS mobile terminated message repeat: 1 up to 255 repetitions of the entered data

SMS mobile terminated messaging editing: append data, overwrite data, insert data, clear to end, backspace, and delete character

SMS mobile terminated message status: provides status of SMS message transmission and reports cause codes

SMS mobile originated protocol control: enabled, disabled, not supported, or unknown address

SMS mobile originated display: auto, ASCII, or hex

SMS mobile originated message status: message count, teleservice type, destination address, destination address encoding, priority, call back number, call back number encoding, message encoding, and message length

SO33 data channel

SO33 data channel operation: allows the test set to emulate a complete data network by providing transparent connectivity to a packet data capable mobile; supports simple IP connections; requires that the test be connected to an external server via the rear panel LAN connector

SO33 dormant mode: supported

IP throughput monitor: displays a graph of the data throughput for forward and reverse packets at the IP layer and at the RLP layer

IP throughput monitor numeric results: provides numeric results for the current, average, and peak data rates in bits per second as well as total number of bytes transferred for forward and reverse IP packets and forward and reverse OTA (over the air–RLP) packets

IP throughput monitor display axis controls:
Time span: 0 to 600 s
Start data rate: 0 to 600 kb/s
Stop data rate: 0 to 600 kb/s

IP throughput monitor trace controls: on/off function and marker function for IP Tx trace, IP Rx trace, OTA (RLP) Tx trace, and OTA (RLP) Rx trace

IP throughput monitor graph controls: clear display and freeze display

Ping function: allows the user to test network connections required for SO33 data channel capability; reports number of packets transmitted, number of packets received, percent lost, and round trip time min/avg/max

Mobile IP support: provides support for Software Concepts Inc.'s Mobile IP simulator models MIP-5800 MOB-IP-SIM or MIP-5850 MOB-IP-SIM; user control for internal simple IP support or external mobile IP support for SO33 operation; interfaces to the Mobile IP simulator through the test set's LAN port; when in external mobile IP mode, the test set sends the data out through the LAN port in PPP over Ethernet format

Mobile IP functions:
External PDSN state: on or off; when "on," outputs PPP data via the LAN connector to the external MIP-5800 or MIP 5850 Mobile IP simulators
External PDSN IP address: accepts IPv4 standard address
External PDSN TCP port: 0 to 65535

Paging message error rate

Paging channel MER report (PREV=6 and PREV=7 with Control Channels=PCH/ACH): provides the calculated paging channel message error rate, the mobile reported PAG_3, the number of paging messages transmitted by the test set, and the paging MER test time

Paging MER procedure control: start and stop; only available when a call is connected; "start" resets the phone's PAG_3 value and starts the paging MER timer and counter; "stop" retrieves the mobile's PAG_3 value and stops the Paging MER timer and counter

Paging MER calculation: computes the MER from the ratio of the mobile reported value of PAG_3 and the number of paging messages sent by the test set during the test interval

Audit order control: settable on/off

Clear paging MER procedure parameters function: clears all of the paging MER related parameters

Paging channel E_b/N_t display: displays the signal-to-noise ratio of the paging channel when AWGN is on

Quick paging channel E_b/N_t display: displays the signal-to-noise ratio of the quick paging channel when AWGN is on

F-FCH frame pattern

F-FCH frame pattern: selectable repeating pattern of good, and corrupted frames with on and off control

F-FCH/Traffic good and bad frame pattern: selectable on and off; "on" setting generates a pattern of good frames and bad (corrupted) frames

F-FCH/Traffic frame pattern good frames: selectable from 1 to 300; default setting of 3 good frames

F-FCH/Traffic frame pattern bad frames: selectable from 1 to 300; default setting of 3 bad (corrupted) frames (50% FER)

Signaling frame quality: selectable from good (ignores the F-FCH/Traffic frame pattern) or bad (follows the F-FCH/Traffic frame pattern) for outer loop report; when a reports is received, the mobile reported set point is displayed

Mobile station reported frame error rate

Mobile station reported frame error rate: periodic report or threshold report

Frame interval of report: 5, 7, 10, 14, 20, 28, 40, 56, 80, 113, 160, 226, 320, 452, 640, or 905 frames

Frame delay of report: 0 to 124 frames in 4 frame steps

Bad frame threshold: 1 to 31 frames

Mobile station reported frame error rate results: MS reported FER, MS reported bad frame, and MS reported total frames

Calling party number

Calling party number inclusion: include or exclude

Calling party number: up to 20 characters consisting of 0-9, *, #, a, b, or c

Number type: unknown, international, national, network, subscriber, and abbreviated

Number plan: unknown, ISDN/telephony, data, telex, and private

Presentation indicator: allowed, restricted, and number not available

Screening indicator: user no screen, user verify pass, user verify fail, and network

MEID

MEID functionality: user on or off control

PLCM type: ESN based, BS assigned, or MEID

Query MEID: one button query of the mobile station for its MEID information

CDMA authentication

Functionality: provides basic authentication capabilities for call processing; does not support encryption

Authentication commands: unique challenge and SSD update

Global challenge: on or off

Authentication user parameters: A-key (decimal), RAND (hex), RANDU (hex), and RANDSSD (hex)

Global challenge results: AUTHU expected value, AUTHU received value and pass/fail result; RANDC expected value, RANDC received value and pass/fail result; COUNT (call history); AUTH_MODE

Unique challenge results: AUTHU expected value, AUTHU received value and pass/fail result

SSD update results: pass/fail result

Real-time vocoder

Functionality: provides real-time encoding of external audio applied to the front panel audio in port and real time decoding of audio output via the front panel audio out port

Real-time vocoder support: 13 k vocoder in service options 17 and 32768 and the EVRC vocoder in service option 3

Encoder data rate mode: auto, fixed or limited; in auto mode the vocoder algorithm selects the rate based on the sampled audio; fixed mode locks the rate to the user selected rate; limited allows the vocoder to use the user-selected rate and any lower rate, if available

Encoder data rate: full, half, quarter, or eighth

Expected input voltage: 0 to 2 V; sets the input gain for external audio applied to the front-panel audio in port

Max output voltage: 0 to 5 V; sets the output level of the decoded audio routed to the front-panel audio out port

Vocoder limitations: when active, no measurements are allowed during real-time vocoding

Settable system time

Functionality: allows user to set the system time for the CDMA system; system time is retain during power-off using the internal real-time clock

CDMA system date: user settable in the format of yyyy.mm.dd for the year, month, and day

CDMA system time: settable in the format of hh.mm.ss for the hour, minute, and seconds; input resolution is 2 seconds

Leap seconds: settable from 0 to 255 seconds

Local time offset: settable in the format of hh.mm from 00.00 to 15.30 in 30 minute increments

Daylight savings time indicator: on or off

Multi-unit synchronization

Functionality: allows any test set to be time synchronized to another running either the E6706A or E6702B; synchronization requires one unit be designated as the time server and one as the client; the timebase and trigger outputs of the server must be connected to the client's timebase and trigger inputs; the test sets must also be on a LAN using the same address segment

Sync to external test set: one button command to perform the synchronization

External test set LAN address: user entry of the time server's LAN address (IPv4 address)

Synchronization fanout: maximum of four client test sets can be driven from a single timing server; unlimited number can be synchronized when they are daisy-chained together (one unit to another)

Synchronization results: server operation complete and client operation complete

Synchronization accuracy: *typically < 1 μs*

Hybrid mode

Functionality: supports cdma2000/1xEV-DO hybrid mode operation when used with an E5515C running the E6706A 1xEV-DO lab application; requires that the two units are synchronized using the built-in multi-unit synchronization capability

Basic hybrid mode test capabilities:

- Hybrid mode system acquisition
- 1xEV-DO power save mode
- Preferred control channel cycle negotiation
- Dual-idle operation on CDMA and 1xEV-DO
- CDMA voice call origination in dual-idle state
- CDMA voice call origination in dormant 1xEV-DO state
- CDMA voice call origination in 1xEV-DO connected state
- CDMA voice call termination in dual-idle state
- CDMA voice call termination in CDMA idle/1xEV-DO dormant state
- CDMA voice call termination in 1xEV-DO connected state
- SMS origination in dual-idle state
- SMS origination in CDMA idle/1xEV-DO dormant state
- SMS origination in 1xEV-DO connected state
- SMS termination in dual-idle state
- SMS termination in CDMA idle/1xEV-DO dormant state
- SMS termination in 1xEV-DO connected state
- 1xEV-DO packet data call origination in dual-idle state
- 1xEV-DO packet data call re-origination in 1xEV-DO dormant state
- 1xEV-DO packet data call termination in 1xEV-DO dormant state
- CDMA packet data call when 1xEV-DO service is unavailable

Advanced hybrid mode test capabilities (requires the use of the Software Concepts MOB-IP-SIM):

- MIP call when using static home IP
- MIP call when using dynamic home IP
- MIP to SIP fallback if MIP call fails while trying packet data call on 1xEV-DO
- MIP to SIP fallback if MIP call fails while trying packet data call on CDMA
- Active 1xEV-DO to CDMA data session handoffs
- Dormant 1xEV-DO to CDMA data session handoff
- Dormant CDMA to 1xEV-DO data session handoff
- 1xEV-DO to CDMA to 1xEV-DO data session hand-back

Protocol logging functionality

E6702A logging functions: start protocol logging and stop protocol logging

Protocol support: PREV=6 and PREV=7 messages; provides correct binary output for lower PREVs, but decodes using PREV=6 messages formats

Wireless Protocol Advisor (WPA)

Logging software: Agilent Wireless Protocol Advisor PC software included with the purchase of the E6702A

WPA hardware requirements: at least a Pentium® III 700 MHz PC with 128 MB of memory, 500 MB of free disc space, and a TCP/IP LAN port

WPA supported operating systems: English versions of Windows® 98, Windows NT® 4.0 (with at least service pack 4), and Windows 2000®

WPA connection: a 10 Mb/s 10 base T Ethernet connection (RJ-45 connector) using a crossover cable for direct connection to the PC or with a standard cable through a switch or hub

WPA operating modes: real-time or post capture

WPA display modes: traffic overview of real-time messages, decode view with full detail of selected message, measurement setup view for trigger, and filter configuration

Traffic overview functionality

Display: provides single line display of individual protocol messages in sequential order as received

Traffic overview configurable display columns: message number, message direction, CDMA system time, event type, timestamp (based on PC's real-time clock), channel type, L2 message, L3 message, and order

Measurement setup functionality

Display: provides a graphical block diagram of the available test set filters, triggers, real-time filters, data log, and post-capture filters available to the user; also displays whether any triggers or filters are currently selected

Decode view functionality

Decode view displayed information types:

Test set information (indicated by blue text): CDMA system time message was sent or received with frame accuracy (20 ms), event type (PDU or duplicate PDU), and channel type

Message contents (indicated by green text): individual octet display of message or line per field display of each parameter in the message

Decode view configurable display columns: Octet number, decimal value, binary value, hex value, and field description (English)

Test filter functionality

WPA test set filter: selectable list of message types to be sent from the test set to the logging PC via the LAN connection; message types not selected are NOT transmitted to the PC

Test set filter message types: sync channel messages, overhead messages, mobile station directed messages, access channel messages, forward traffic channel messages, reverse traffic channel messages, forward fundamental channel frames, reverse fundamental channel frames, and quick paging channel slots

Trigger functionality

Logging triggers: selectable start logging trigger and stop logging trigger; defined triggers may be saved and recalled

Trigger start and stop criteria: start and stop triggers can be configured to pre-capture or post-capture a specific number of messages; stop trigger can also be defined as a time duration after the start trigger occurred

Trigger types: event, message match, time, and trigger counts

Event trigger: message dropped, received message, and received message overflow

Message match parameters: triggers can be defined as any fields, not a match to, or any specific values for the following parameters:

- f-csch (f-synch) MSG_TYPE
- f-csch MSG_TYPE
- CONFIG_MSG_SEQ
- ACC_MSG_SEQ
- f-csch/f-dsch ORDER
- ORDQ
- PAGE_CLASS
- MSG_ID
- r-csch/r-dsch ORDER
- f-dsch MSG_TYPE
- r-dsch MSG_TYPE
- paging indicator 1
- paging indicator 2

Time trigger: definable start trigger on specific timestamp and day based on PC real-time clock

Trigger counts: specified number of start trigger occurrences before log capture begins

Log filter functionality

Log filter: definable filter for data is captured into the log file; defined filters may be saved and recalled

Filter types: event, message match, and time

Event filter: message received

Message match parameters: filters can be defined as any fields, not a match to, or any specific values for the following parameters:

- f-csch (f-synch) MSG_TYPE
- f-csch MSG_TYPE
- CONFIG_MSG_SEQ
- ACC_MSG_SEQ
- f-csch/f-dsch ORDER
- ORDQ
- PAGE_CLASS
- MSG_ID
- r-csch/r-dsch ORDER
- f-dsch MSG_TYPE
- r-dsch MSG_TYPE
- paging indicator 1
- paging indicator 2

Time filter: allows events to pass though if timestamp is after specified time, before specified time, or between specified start and stop time

Log file

WPA log file storage: captured log file can be saved in proprietary binary format that allows full functionality of WPA features in the post capture mode; the real-time overview log can also be saved in a comma-separated file; the user can also select a range of messages in the overview mode to be saved in an ASCII text file using the decode view format

View filter functionality

View filter: definable filter that limits what data is displayed on a previously captured log file; defined filters may be saved and recalled

Filter types: event, message match, time, and message validity

Event filter: message dropped, received message, and received message overflow

Message match parameters: filters can be defined as any fields, not a match to, or any specific values for the following parameters:

- f-csch (f-synch) MSG_TYPE
- f-csch MSG_TYPE
- CONFIG_MSG_SEQ
- ACC_MSG_SEQ
- f-csch/f-dsch ORDER
- ORDQ
- PAGE_CLASS
- MSG_ID
- r-csch/r-dsch ORDER
- f-dsch MSG_TYPE
- r-dsch MSG_TYPE
- paging indicator 1
- paging indicator 2

Time filter: allows events to pass though if timestamp is after specified time, before specified time, or between specified start and stop time

Message validity: show unsuccessfully decoded messages, and show successfully decoded messages

IS-95 active cell call processing functionality

Resident formats: IS-95

Call processing timing tolerance: *mobile transmissions must be typically within ±6 µs of test set's transmitted pilot channel clock timing for proper reverse channel acquisition*

Cell 1 overhead channels:

- **F-pilot:** with settable PN offset
- **F-sync:** with real-time long code and system time update and updates for entered parameters such as SID, NID, PRAT, CDMA_FREQ, and PN OFFSET
- **F-paging:** with real-time overhead messages

Cell 2 overhead channels:

- **F-pilot:** with settable PN offset

Protocol stack: TSB-74, J-STD-008, TIA/EIA-95-B, ARIB T53, and Korean PCS

Base station parameters: NID, SID, country code (MCC), network code (MNC), paging rate, and CDG esc mode

Call control ("one button commands"):

- register
- BS call originate
- BS call disconnect
- MS call originate (auto answer)
- MS call disconnect

Access parameters: nominal power, nominal power extended, initial power, power step number of steps, maximum request sequence, maximum response sequence, and preamble size

Threshold parameters: T_Add, T_Drop, T_Comp, T_Tdrop, Soft_Slope, Add_Intercept, and Drop_Intercept

Registration support: user-initiated (zone-based), power up, timer-based, implicit registration (mobile originated call), or direct entry of mobile IMSI

Registration reported mobile information: ESN (hex), ESN (decimal), MCC, MNC, MSIN, slot class, slot cycle index, protocol revision, band class, operating mode, MAX IERP, registration type, QPCH support, enhanced RC support, minimum power control step size, and MS called party number

IMSI support: class 0 only

Supported IMSI Class 0 types: MSIN only (00), MNC + MSIN (01), MCC + MSIN (10), or MCC + MNC + MSIN (11)

IMSI page: allows making a phone call without performing a registration by entering values for the following parameters: paging type, paging MSID, paging MNC, and paging MCC

Paging type: all, MCC+MSIN, MNC+MSIN, or MSIN only

Paging MSIN: up to 10 numeric digits

Paging MCC: 0 to 999

Paging MNC: 0 to 99

Paging channel data rate: selectable full or half rate

Status request query control: selectable between on and off; default of "on" causes test set to perform the status queries during registration or mobile origination when a new ESN is received by the test set

Max EIRP: user must enter the mobile's maximum power in dBW when the status request query field is set to off

Service option support:

- **SO1:** 9.6 kb/s voice
- **SO2:** 9.6 kb/s data loopback
- **SO3:** 9.6 kb/s EVRC voice
- **SO6:** 9.6 kb/s SMS
- **SO9:** 14.4 kb/s data loopback
- **SO14:** 14.4 kb/s SMS
- **SO17:** 14.4 kb/s voice
- **SO32768:** 14.4 kb/s voice

Loopback service option traffic data source: PRBS (CCITT 2^{15}–1 pattern)

Traffic data rate: random (40% duty cycle), eighth, quarter, half, and full

Voice service option modes: echo with variable delay, 400 Hz sinewave, 1 kHz sinewave, swept sinewave, multi-tone audio, real-time vocoder, and null frames

Echo delay: selectable short, medium, and long

Handoff support: hard handoff (new channel, band), PN offset handoff, soft handoff, softer handoff, and IS-95 to AMPS

Soft handoff type: selectable as either soft or softer; cell 1 and cell 2 reverse power control can be set the same or independently without regard to the soft handoff type selected

Soft handoff functions: on/off, request pilot strength message, and clear mobile pilot report

Soft handoff mobile reported parameters: pilot strength message request timestamp (20 ms resolution), pilot strength message received timestamp (20 ms resolution), PN status (candidate, active, to add, to drop), keep status, pilot strength, and PN offset

CDMA to AMPS handoff parameters: execute, system type, channel, SAT, and power level

Cell 1 reverse link closed loop power control modes:

- active
- alternating – alternating 0 and 1 power bits
- alt 20 up/down – alternating 20 up/20 down bits
- all up
- all down

Cell 1 reverse link closed loop power control transient: user start function that interrupts the current cell 1 reverse link closed loop power control mode and substitutes the user defined number and direction of closed loop power control bits; once the transient is sent, the closed loop power control reverts to the original state

Cell 1 reverse link closed loop power control transient modes:

- up
- down
- up–down–up

Cell 1 transient number of steps: 1 to 400

Cell 2 reverse link closed loop power control modes:

- active
- alternating – alternating 0 and 1 power bits
- alt 20 up/down – alternating 20 up/20 down bits
- all up
- all down
- cell 1 bits – sets cell 2's bits identical to cell's

SMS

SMS support: mobile terminated or mobile originated

SMS mobile terminated service types: point-to-point or broadcast

SMS mobile terminated teleservice types: wireless paging teleservice, wireless messaging teleservice, voice mail notification, or WAP

SMS broadcast service categories: unknown, broadcast emergency, administrative, maintenance, general news local, general news regional, general news national, general news international, business and financial news local, business and financial news regional, business and financial news national, business and financial news international, sports news local, sports news regional, sports news national, sports news international, entertainment news local, entertainment news regional, entertainment news national, entertainment news international, local weather, area traffic reports, local flight schedules, restaurants, lodgings, retail directory, advertisements, stock quotes, employment opportunities, medical, technology news, and multi-category

SMS mobile terminated originating address: maximum of 14 numeric digits

SMS mobile terminated message priority: none, normal, interactive, urgent, and emergency

SMS mobile terminated message privacy: none, not restricted, restricted, confidential, and secret

SMS mobile terminated message alert: default, low, medium, high, and none

SMS mobile terminated message encoding: octet, 7-bit ASCII, IA5, UNICODE, shift-JIS, Korean, Latin/Hebrew, Latin, and GSM 7-bit default alphabet

SMS mobile terminated message optional user data: include or exclude

SMS mobile terminated call back number: include or exclude; set to the originating address when included

SMS mobile terminated message entry: hex or ASCII

SMS mobile terminated message length: maximum of 255 ASCII characters or 510 hex characters

SMS mobile terminated message repeat: 1 up to 255 repetitions of the entered data

SMS mobile terminated messaging editing: append data, overwrite data, insert data, clear to end, back space, and delete character

SMS mobile terminated message status: provides status of SMS message transmission and reports cause codes

SMS mobile originated protocol control: enabled, disabled, not supported, or unknown address

SMS mobile originated display: auto, ASCII, or hex

SMS mobile originated message status: message count, teleservice type, destination address, destination address encoding, priority, call back number, call back number encoding, message encoding, and message length

Paging channel data rate: selectable full or half rate

Paging channel MER report: provides the calculated paging channel message error rate, the mobile reported PAG_3, the number of paging messages transmitted by the test set, and the paging MER test time

Paging message error rate

Paging MER procedure control: start and stop; only available when a call is connected; “start” resets the phone’s PAG_3 value and starts the paging MER timer and counter; “stop” retrieves the mobile’s PAG_3 value and stops the Paging MER timer and counter

Paging MER calculation: computes the MER from the ratio of the mobile reported value of PAG_3 and the number of paging messages sent by the test set during the test interval

Audit order control: settable on/off

Clear paging MER procedure parameters function: clears all of the paging MER-related parameters

Paging channel E_b/N_t display: displays the signal-to-noise ratio of the paging channel when AWGN is on

F-FCH frame pattern

F-FCH frame pattern: selectable repeating pattern of good and corrupted frames with on and off control

F-FCH/Traffic good and bad frame pattern: selectable on and off; “on” setting generates a pattern of good frames and bad (corrupted) frames

F-FCH/Traffic frame pattern good frames: selectable from 1 to 300; default setting of 3 good frames

F-FCH/Traffic frame pattern bad frames: selectable from 1 to 300; default setting of 3 bad (corrupted) frames (50% FER)

Signaling frame quality: selectable from good (ignores the F-FCH/Traffic frame) pattern, or bad (follows the F-FCH/Traffic frame pattern) for outer loop report; when a reports is received, the mobile reported set point is displayed

Mobile station reported frame error rate

Mobile station reported frame error rate: periodic report or threshold report
Frame interval of report: 5, 7, 10, 14, 20, 28, 40, 56, 80, 113, 160, 226, 320, 452, 640, or 905 frames
Frame delay of report: 0 to 124 frames in 4 frame steps
Bad frame threshold: 1 to 31 frames
Mobile station reported frame error rate results: MS reported FER, MS reported bad frame, and MS reported total frames

Calling party number

Calling party number inclusion: include or exclude
Calling party number: up to 20 characters consisting of 0-9, *, #, a, b, or c
Number type: unknown, international, national, network, subscriber, or abbreviated
Number plan: unknown, ISDN/telephony, data, telex, or private
Presentation indicator: allowed, restricted, or number not available
Screening indicator: user no screen, user verify pass, user verify fail, and network

CDMA authentication

Functionality: provides basic authentication capabilities for call processing; does not support encryption
Authentication commands: unique challenge and SSD update
Global challenge: on or off
Authentication user parameters: A-key (decimal), RAND (hex), RANDU (hex), and RANDSSD (hex)
Global challenge results: AUTHU expected value, AUTHU received value and pass/fail result; RANDC expected value, RANDC received value and pass/fail result; COUNT (call history); AUTH_MODE
Unique challenge results: AUTHU expected value, AUTHU received value and pass/fail result
SSD update results: pass/fail result

Real-time vocoder

Functionality: provides real-time encoding of external audio applied to the front panel audio in port and real time decoding of audio output via the front panel audio out port
Real-time vocoder support: 13 k vocoder in service options 17 and 32768 and the EVRC vocoder in service option 3
Encoder data rate mode: auto, fixed or limited; in auto mode the vocoder algorithm selects the rate based on the sampled audio; fixed mode locks the rate to the user selected rate; limited allows the vocoder to use the user selected rate and any lower rate, if available
Encoder data rate: full, half, quarter, or eighth
Expected input voltage: 0 to 2 V; sets the input gain for external audio applied to the front-panel audio in port
Max output voltage: 0 to 5 V; sets the output level of the decoded audio routed to the front-panel audio out port
Vocoder limitations: when active, no measurements are allowed during real-time vocoding

Settable system time

Functionality: allows user to set the system time for the CDMA system; system time is retain during power-off using the internal real-time clock
CDMA system date: settable in the format of yyyy.mm.dd for the year, month, and day
CDMA system time: settable in the format of hh.mm.ss for the hour, minute, and seconds; input resolution is 2 seconds
Leap seconds: settable from 0 to 255 seconds
Local time offset: settable in the format of hh.mm from 00.00 to 15.30 in 30 minute increments
Daylight savings time indicator: on or off

Multi-unit synchronization

Functionality: allows any test set to be time synchronized to another running either the E6706A or E6702B; synchronization requires one unit be designated as the time server and one as the client; the timebase and trigger outputs of the server must be connected to the client's timebase and trigger inputs; the test sets must also be on a LAN using the same address segment
Sync to external test set: one button command to perform the synchronization
External test set LAN address: user entry of the time server's LAN address (IPv4 address)
Synchronization fanout: maximum of four client test sets can be driven from a single timing server; unlimited number can be synchronized when they are daisy-chained together (one unit to another)
Synchronization results: server operation complete and client operation complete
Synchronization accuracy: *typically < 1 µs*

IS-2000 test mode functionality

Resident formats: IS-2000 SR1
Control channel configuration: PCH/ACH or BCCH/CCCH/EACH
Cell 1 overhead channels (Control channels=PCH/ACH):
- **F-Pilot:** with settable PN offset
- **F-Sync:** with real-time long code and system time update and updates for user entered parameters
- **F-Paging:** with real-time overhead messages
- **F-QPCH:** indicates if active page will be in the next paging channel slot

Cell 1 overhead channels (Control channels=BCCH/CCCH/EACH):
- **F-Pilot:** with user settable PN offset
- **F-Sync:** with real-time long code and system time update and updates for user entered parameters
- **F-BCCH:** with real-time overhead messages
- **F-CCCH:** with real-time signaling messages
- **F-QPCH:** indicates if active page will be in the next paging channel slot

Cell 2 overhead channels:
- **F-Pilot:** with settable PN offset

Cell 1 overhead messages (Control channels= PCH/ACH): system parameters message, channel list message, access parameters message, extended system parameters message, and extended neighbor list message
Cell 1 overhead messages (Control channels= BCCH/CCCH/EACH): ANSI-41 system parameters message, MM-RC parameters message, extended channel list message, enhanced access parameters message, and universal neighbor list message
F-BCCH rate (Control channels=BCCH/CCCH/EACH): 4.8 kb/s (1/2 rate coding, 160 ms slot), 9.6 kb/s (1/2 rate coding, 80 ms slot), or 19.2 kb/s (1/2 rate coding, 40 ms slot)
F-CCCH rate (Control channels=BCCH/CCCH/EACH): 9.6 kb/s (1/4 rate coding, 20 ms frame), 9.6 kb/s (1/2 rate coding, 20 ms frame), and 19.2 kb/s (1/2 rate coding, 20 ms frame)
F-QPCH data rate: selectable from either full or half rate
Base station parameters: NID, SID, country code (MCC), network code (MNC), paging rate, CDG esc mode, F-QPCH state, F-QPCH relative level, F-QPCH data bits (all on or all off), and reverse link traffic pilot gain
Call control ("one button commands"): none
Access parameters: none
Registration support: none
Service option support: none
Handoff support: none
R-Access channel: not supported
Chip rate: 1.2288 Mc/s
Supported radio configuration combinations:
- forward RC1 + reverse RC1
- forward RC2 + reverse RC2
- forward RC3 + reverse RC3
- forward RC4 + reverse RC3
- forward RC5 + reverse RC4

Channel coding: convolutional or turbo on all rates with the exception that turbo coding is not available on RC3 at 9.6 kb/s, RC4 at 9.6kb/s, or RC5 at 14.4 kb/s per IS-2000
Traffic data source: PRBS (CCITT 215–1 pattern)
Forward FCH data rate:
- **RC1:** random (40% duty cycle), 1.2, 2.4, 4.8, 9.6 kb/s
- **RC2:** random (40% duty cycle), 1.8, 3.6, 7.2, 14.4 kb/s
- **RC3:** random (40% duty cycle), 1.5, 2.7, 4.8, 9.6 kb/s
- **RC4:** random (40% duty cycle), 1.5, 2.7, 4.8, 9.6 kb/s
- **RC5:** random (40% duty cycle), 1.8, 3.6, 7.2, 14.4 kb/s

Forward SCH support: one supplemental channel
F-SCH data rate:
- **RC3:** 9.6, 19.2, 38.4, 76.8, or 153.6 kb/s
- **RC4:** 9.6, 19.2, 38.4, 76.8, or 153.6 kb/s
- **RC5:** 14.4, 28.8, 57.6, 115.2, or 230.4 kb/s

Power control groups: 16 per frame
Reverse link closed loop support: transmits bits only (no reverse link demodulation)
Reverse link closed loop bit rate: fixed to 800 per second

Cell 1 reverse link closed loop power control modes:
- alternating – alternating 0 and 1 power bits
- alt 20 up/down – alternating 20 up/20 down bits
- all up
- all down

Cell 1 reverse link closed loop power control transient: user start function that interrupts the current cell 1 reverse link closed loop power control mode and substitutes the user defined number and direction of closed loop power control bits; once the transient is sent, the closed loop power control reverts to the original state

Cell 1 reverse link closed loop power control transient modes:
- up
- down
- up–down–up

Cell 1 transient number of steps: 1 to 400

Cell 2 reverse link closed loop power control modes:
- alternating – alternating 0 and 1 power bits
- alt 20 up/down – alternating 20 up/20 down bits
- all up
- all down
- cell 1 bits – sets cell 2's bits identical to cell 1's

Forward link power support: none

Mobile station identification: user entry of ESN (hex); entry of all "F" hex data results in using a zero long code mask on the source

F-FCH frame pattern

F-FCH frame pattern: selectable repeating pattern of good and corrupted frames with on and off control

F-FCH/Traffic good and bad frame pattern: selectable on and off; "on" setting generates a pattern of good frames and bad (corrupted) frames

F-FCH/Traffic frame pattern good frames: selectable from 1 to 300; default setting of 3 good frames

F-FCH/Traffic frame pattern bad frames: selectable from 1 to 300; default setting of 3 bad (corrupted) frames (50% FER)

Signaling frame quality: selectable from good (ignores the F-FCH/Traffic frame pattern) or bad (follows the F-FCH/Traffic frame pattern) for outer loop report; when a reports is received, the mobile reported set point is displayed

CDMA RF generator

Channels

Additive white Gaussian noise source: yes

AWGN bandwidth: *typically 1.8 MHz < BW < 2.1 MHz*

CDMA channels:

CDMA cell 1 code channels (PREV<=6):

F-pilot:	fixed at Walsh code 0
F-sync:	fixed at Walsh code 32
F-paging:	fixed at Walsh code 1
F-QPCH: (IS-2000 only)	fixed at Walsh code 80
F-FCH:	selectable Walsh code from the following set: 10, 14, 26, 30, 42, 46, 58, or 62
F-SCH: (IS-2000 only)	fixed to Walsh code 3
F-OCNS:	selectable Walsh code from the following set: 5, 13, 21, 29, 37, 45, 53, and 61

CDMA cell 1 PN offset: selectable from 0 to 511

CDMA cell 2 consisting of these code channels:

F-pilot:	fixed at Walsh code 0
F-FCH:	selectable Walsh code from the following set: 10, 14, 26, 30, 42, 46, 58, or 62
F-OCNS:	selectable Walsh code from the following set: 5, 13, 21, 29, 37, 45, 53, and 61

CDMA cell 2 PN offset: selectable from 0 to 511

Frequency

Frequency range:
- US cellular band (860.04-893.97 MHz, channels 1-799, 991-1023, 1024-1323)
- Japan CDMA band (approx. 832-869.9875 MHz, channels 1-799, 801-1039, 1041-1199, 1201-1600)
- US PCS band (1930-1990 MHz, channels 1-1199)
- Korean PCS band (1840-1870 MHz, channels 0-599)
- NMT- 450 band (approx. 421-494 MHz, channels 1-300, 539-871, 1039-1473, 1792-2016)
- IMT- 2000 band (2110-2169.950 MHz, channels 0-1199)
- Secondary 800 MHz band (approx. 851-869 MHz, and 935-940 MHz, channels 0-719, 720-919)

Frequency setting: by channel number or MHz (IS-2000 test mode only)

Frequency setting resolution: *typically 1 Hz*

Amplitude

Output port control: user control of RF source routing to either the RF in/out port or the RF out only port

RF in/out composite signal level: sum of the set values of the CDMA cell 1 power, CDMA cell 2 power, and the AWGN source power

RF in/out CDMA cell 1 output level range (AWGN off): –120 dBm/1.23 MHz to –13 dBm/1.23 MHz

RF in/out CDMA cell 2 output level range (AWGN off): –120 dBm/1.23 MHz to –13 dBm/1.23 MHz

RF in/out AWGN output level range: –120 dBm/1.23 MHz to –20 dBm/1.23 MHz; *over-range available with reduced performance to –15 dBm/1.23 MHz*

RF in/out CDMA cell absolute output level accuracy (AWGN off): < ±1.1 dB, –109 to –15 dBm/1.23 MHz, *typically ±0.62 dB, –109 to –15 dBm/1.23 MHz*

RF in/out composite absolute output level accuracy (AWGN on): < ±1.2 dB, –109 to –20 dBm/1.23 MHz, *typically ±0.7 dB, –109 to –20 dBm/1.23 MHz*

RF in/out reverse power: +37 dBm peak (5 W peak)

RF in/out VSWR: < 1.14:1, 400 to 1000 MHz,
< 1.2:1, 1700 to 2000 MHz,
< 1.32:1, 2010 to 2180 MHz

RF out only composite signal level: sum of the set values of the CDMA cell 1 power, CDMA cell 2 power, and the AWGN source power

RF out only CDMA cell 1 output level range (AWGN off): –115 dBm/1.23 MHz to –5 dBm/1.23 MHz

RF out only CDMA cell 2 output level range (AWGN off): –115 dBm/1.23 MHz to –5 dBm/1.23 MHz

RF out only AWGN output level range: –115 dBm/1.23 MHz to –12 dBm/1.23 MHz; *over-range available with reduced performance to –7 dBm/1.23 MHz*

RF out only CDMA cell absolute output level accuracy (AWGN off): < ±1.1 dB, –109 to –7 dBm/1.23 MHz, *typically < ±0.62 dB, –109 to –7 dBm/1.23 MHz*

RF out only composite absolute output level accuracy (AWGN on): < ±1.2 dB, –109 to –12 dBm/1.23 MHz, *typically < ±0.7 dB, –109 to –12 dBm/1.23 MHz*

RF out only reverse power: +24 dBm peak (250 mW peak)

RF out only VSWR: *typically < 1.3:1 for 400 to 500 MHz, < 1.4:1 for 800 to 1000 MHz, and < 1.45:1 for 1.7 to 2.2 GHz*

Isolation (from RF out only port to RF in/out when the RF source is routed to the RF out only port): *typically > 40 dB*

F-pilot relative level: –20 to 0 dB, or off

F-sync relative level: –20 to 0 dB, or off

F-paging relative level (PREV<=6): –20 to 0 dB, or off

F-FCH channel relative level: settable from –30 to 0 dB with 0.01 dB resolution, or off

F-SCH channel relative level: settable from –20 to 0 dB with 0.01 dB resolution, or off

AWGN channel relative level range: settable to ±15 dB relative to the set CDMA cell power with 0.01 dB resolution

F-OCNS Walsh code length: fixed to 64 bits

F-OCNS relative level range: automatically calculated from other code channel relative levels to provide the set CDMA cell power (range of –30 to 0 dB, or off)

Relative CDMA channel level accuracy: *typically < ±0.2 dB*

Cell 2 delay: settable timing delay of cell 2 signal relative to cell 1 timing in 0.813 µs (1 chip) intervals from 0.0 to –13.02 µs (0 to 15 chips)

CDMA modulation

Modulation type: parallel BPSK for IS-95 channels and IS-2000 pilot, sync, and paging channels and complex QPSK for the F-FCH per IS-2000

Modulation quality:

IS-95, RC1, and RC2 residual rho: > 0.98, *typically > 0.995*

RC3, RC4, and RC5 residual rho (pilot only): > 0.98, *typically > 0.995*

Residual EVM: < 10%, *typically < 3.1%*

Carrier feedthrough: < –25 dBc, typically –40 dBc

CDMA RF analyzer (measurements only)

Frequency range (reverse channels):

US cellular band:	1-799, 991-1023, 1024-1323
US PCS band:	1-1199
Korean PCS band:	0-599
Japan CDMA band:	1-799, 801-1039, 1041-1199, 1201-1600
IMT-2000 band:	0-1199
NMT-450 band:	1-300, 539-871, 1039-1473, 1792-2016
Secondary 800 band:	0-719, 720-919

Maximum input level: +37 dBm peak (5 W peak)

Input level range: –71 to +30 dBm/1.23 MHz

Receiver ranging:

Auto mode: Autoranges to the ideal RF power level for the nominally expected open loop response; provides calibrated results if actual received power is within ±9 dB of the expected open loop power

Manual mode: user enters expected power; if the "active" mode is selected, the test set uses closed loop power control to drive the mobile to the expected power, otherwise, the mobile's Tx power must be within ±9 dB of the expected power to provide calibrated results

CDMA analyzer

Average power measurement

Input frequency ranges:
- 411 to 484 MHz
- 800 to 1000 MHz
- 1700 to 2000 MHz

Detector types:
Peak detector: in IS-95, R-RC1, and R-RC2 modes
Thermal detector: in R-RC3 and R-RC4 modes

Maximum input level: +37 dBm peak (5 W peak)

Measurement range: –10 to +30 dBm; *usable from –10 to –20 dBm with reduced accuracy (peak detector only)*

Measurement level ranging: auto

Measurement data capture period: 10 ms

Measurement result: average power

Concurrency support: average power measurements can be made concurrently with all CDMA measurements that support concurrency

Peak detector measurement accuracy (20 to 55 °C, after calibration, IS-95 or reverse RC1, RC2):
–10 to +30 dBm:
- 400 to 500 MHz: < ±7.3%, *typically* < *±3.0%*
- 800 to 1000 MHz: < ±7.0%, *typically* <*±3.0%*
- 1700 to 2000 MHz: < ±7.4%, < ±8.3% when the RF Out Only port is selected, *typically* < *±4.4%*

–10 to –20 dBm:
- *400 to 500 MHz: typically* < *±4.4%*
- *800 to 1000 MHz: typically* < *±4.2%*
- *1700 to 2000 MHz: typically* < *±4.8%,* < *±5.6% when the RF Out Only port is selected*

Thermal detector measurement accuracy (accuracy with 10 internal averages; reverse RC3 or RC4):
–10 to +30 dBm:
- 400 to 500 MHz: < ±6.6%, *typically* < *±3.0%*
- 800 to 1000 MHz: < ±6.0%, *typically* < *±3.0%*
- 1700 to 2000 MHz: < ±7.2%, < ±8.2% when the RF Out only port is selected, *typically* < *±3.3%*

Measurement repeatability: *typically* < *±0.05 dB*

Measurement resolution: 0.01 dBm

Zero function: auto zeroes (no user control)

Tuned channel power measurement

Input frequency ranges:
- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Measurement method: measures the total power in a 1.23 MHz bandwidth centered on the active reverse channel center frequency

Measurement data capture period: 0.3125 ms (very fast mode), 1.25 ms (fast mode,) or 10 ms (normal mode)

Measurement trigger: 20 ms clock (frame trigger)

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Measurement range: –61 to +30 dBm, *useable to* < *–69 dBm/1.23 MHz with reduced accuracy*

Measurement level ranging: auto and manual

Measurement accuracy: calibrated against average power and within ±10 degrees of calibration temperature; calibration must occur between 20 to 55 °C): < ±1 dB 15 to 55 °C, *typically* < *±0.5 dB*

Measurement resolution: 0.01 dBm/1.23 MHz

Measurement result: channel power in a 1.23 MHz bandwidth

Concurrency capabilities: channel power measurements can be made concurrently with all CDMA measurements that support concurrency

Calibrate function: calibrates the channel power measurement over the entire operating frequency range of the test set against the average power measurement; no external cabling is required

Calibration time: *typically* < *120 s*

Access probe power measurement

Input frequency ranges:
- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Measurement method: measures the total power in a 1.23 MHz bandwidth centered on the active reverse channel center frequency

Measurement data capture period: 2.5 ms

Measurement trigger: amplitude rise only

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Measurement range: –54 to +30 dBm

Measurement level ranging: auto and manual

Measurement accuracy: calibrated against average power and within ±10 degrees of calibration temperature; calibration must occur between 20 to 55 °C: < ±1 dB 15 to 55 °C, *typically* < *±0.5 dB*

Measurement result: access probe power in a 1.23 MHz bandwidth

Concurrency capabilities: none

Graphical access probe power measurement

Input frequency ranges:

- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Measurement method: measures the total power in a 1.23 MHz bandwidth centered on the active reverse channel center frequency

Measurement data capture period: 2.5 ms

Measurement trigger: amplitude rise only

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Measurement range: –54 to +30 dBm

Measurement level ranging: auto and manual; in auto mode, the test set ranges based on the set values of the parameters: power step, number of steps, and maximum response sequence

Measurement dynamic range: *in auto ranging mode, typically provides accurate measurement results for access probes < +15 dB above the initial mobile expected power (open loop estimate)*

Measurement accuracy: calibrated against average power and within ±10 degrees of calibration temperature; calibration must occur between 20 to 55 °C: < ±1 dB 15 to 55 °C, *typically < ±0.5 dB*

Measurement results: provides a bar graph for up to 20 captured probes and a result table that reports absolute power in each probe and the power delta from the previous access probe; access probe power is reported in a 1.23 MHz bandwidth

Concurrency capabilities: none – selecting graphical access probe power closes all other active measurements

Handoff modulation quality measurement

Input frequency ranges:

- 411 to 484 MHz
- 800 to 1000 MHz
- 1700 to 2000 MHz

Measurement chip rate: 1.2288 Mc/s

Modulation measurement method: PN offset handoff for IS-2000 R-RC3 or R-RC4 to generate reverse pilot only preamble; measures single code rho on the preamble with HPSK (R-Pilot only); performs two handoffs: one to initiate the preamble and a second to return to the initial PN offset

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Input level range: –25 to +30 dBm/1.23 MHz, *usable to –50 dBm/1.23 MHz with reduced accuracy*

Modulation quality measurement range: 0.40 to 1.00 rho (for signals with < ±6 µs time error and < ±1 kHz frequency error)

Measurement interval: 1.042 ms (5 Walsh symbols)

Modulation quality measurement accuracy: < ±0.003 + residual error for 0.8 < rho < 1.0

Modulation quality measurement residuals:

Residual rho: > 0.999

Residual EVM: < 4% rms

Residual time error: ±0.11 µs

Frequency error: ±15 Hz plus timebase error

Measurement results: rho, frequency error, time error, carrier feedthrough, phase error, amplitude error, and EVM

Concurrency capabilities: none

Modulation quality measurement

Input frequency ranges:
- 411 to 484 MHz
- 800 to 1000 MHz
- 1700 to 2000 MHz

Measurement chip rate: 1.2288 Mc/s

Modulation measurement method:
IS-95, RC1, or RC2: single code rho
RC3, RC4, or RC5: multi-code rho and EVM with code domain results

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Input level range: –25 to +30 dBm/1.23 MHz, *usable to –50 dBm/1.23 MHz with reduced accuracy*

Modulation quality measurement range (for signals with < ±6 µs time error and < ±1 kHz frequency error):
IS-95, RC1, or RC2: 0.40 to 1.00 rho
RC3, RC4, or RC5: 1 to 40% EVM

Measurement interval: 1.042 ms (5 Walsh symbols)

Modulation quality measurement accuracy:
IS-95, RC1, or RC2 rho: < ±0.003 + residual error for 0.8 < rho < 1.0
RC3, RC4, or RC5 EVM: < ±1.25% rms + residual error for 1% < EVM < 20%

Modulation quality measurement residuals:
Residual rho: > 0.999
Residual EVM: < 4% rms, *typically < 3.1% rms*
Residual time error: ±0.11 µs
Frequency error: ±15 Hz plus timebase error
Residual code domain power: < –35 dBc

Code domain power relative measurement accuracy (IS-2000 R-RC3 and R-RC4 only): < ±0.005 relative to total power for linear code domain powers from 0.05 to 1.0

Code domain power offset relative to reverse pilot channel (IS-2000 R-RC3 and R-RC4 only): < ±0.20 dB

Code domain results (IS-2000 R-RC3 and R-RC4 only):
Code domain power graph: displays the power in all 16 Walsh coded channels (16 bit) for both the I channel and the Q channel; reported power in each graph is relative to the total combined I and Q channel power; red bars indicate active channels, while yellow bars indicate inactive channels
Code domain table: displays the Walsh code, spread factor, code domain power (at SF=16), total code domain power, and code power relative to the R-Pilot channel for each active reverse channel; possible active channels per IS-2000 include the R-Pilot, R-FCH, R-DCCH, R-SCH1 and R-SCH2
Code domain power and noise graph: displays the power and noise in all 16 Walsh coded channels (16 bit) for both the I channel and the Q channel; reported power in each graph is relative to the total combined I and Q channel power; red bars indicate active channels, while yellow bars indicate noise in each channel

Code domain measurement results: pass/fail indication based on IS-98E standard specifications

Modulation quality measurement results: rho, frequency error, time error, carrier feedthrough, phase error, amplitude error, and EVM

Statistical measurement results: provides minimum, maximum, and average for rho, frequency error, time error, carrier feedthrough, phase error, amplitude error, and EVM when multi-measurement mode is active; no statistical results are available for any of the code domain power results

Concurrency capabilities: modulation quality measurements can be made concurrently with all CDMA measurements that support concurrency

Code channel time and phase error measurement

Input frequency ranges:

- 411 to 484 MHz
- 800 to 1000 MHz
- 1700 to 2000 MHz

Measurement chip rate: 1.2288 Mc/s

Measurement method (IS-2000 R-RC3 and R-RC4 only): measures all active reverse code channel's time and phase error relative to the mobile's transmitted R-pilot channel

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Input level range: –25 to +30 dBm/1.23 MHz, *usable to –50 dBm/1.23 MHz with reduced accuracy*

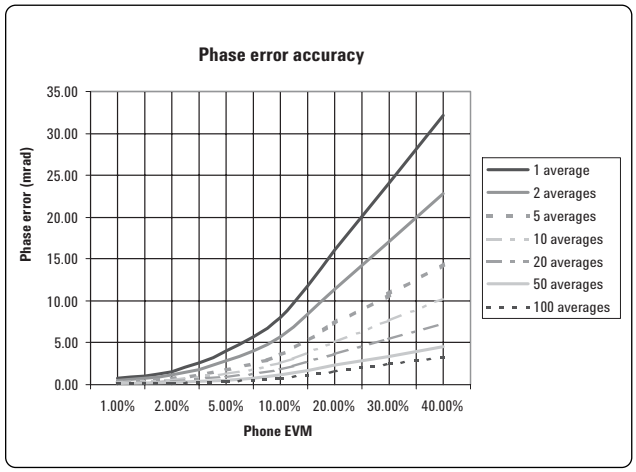
Code channel time and phase error measurement range (for signals with < ±6 µs static time error and < ±1 kHz frequency error):

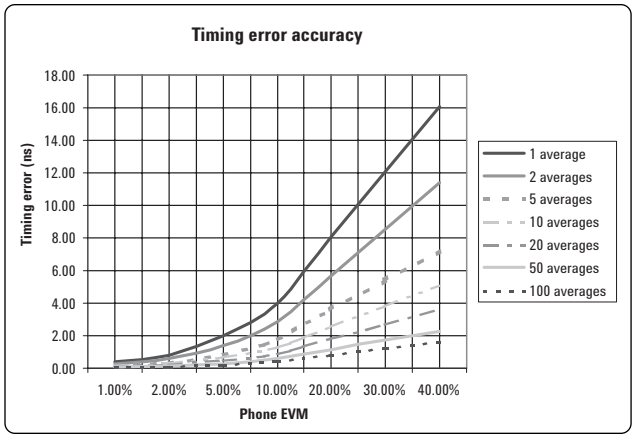
Code channel time error: up to ±100 ns

Code channel phase error: up to ±0.5 radians

Measurement interval: 1.042 ms (5 Walsh symbols)

Relative code channel measurement accuracy: these tables display the accuracy versus the residual EVM of the phone for a given number of measurement averages; these graphs are valid for all reverse channel configurations where each active channel has at least 10 percent of the total power:





Measurement residuals:

Code channel residual time error: ±3 ns, *typically ±16 ns at –50 dBm/1.23 MHz*

Code channel residual phase error: ±7 milli-radians, *typically ±26 milli-radians at –50 dBm/1.23 MHz*

Graphical results:

Code channel time error graph: displays the relative time error in all 15 Walsh coded channels (16 bit) for both the I channel and the Q channel relative to the R-Pilot channel; red bars indicate time error in each detected active channel

Code channel phase error graph: displays the relative phase error in all 15 Walsh coded channels (16 bit) for both the I channel and the Q channel relative to the R-Pilot channel; red bars indicate phase error in each detected active channel

Concurrency capabilities: code channel time and phase error measurements can be made concurrently with all CDMA measurements that support concurrency

Pass/fail limits: settable with default value set to the IS-98D limits of ±10 ns for code channel time error and ±0.15 radians for code channel phase error

Other measurement results: pass/fail for each graph

Time response of open loop power control measurement

Input frequency ranges:

- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Measurement method: measures the open loop power versus time response of a mobile to a 20 dB step in the test set's cell power

Measurement data capture period: 100 ms

Measurement trigger: user-initiated

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Measurement range: –46 to +30 dBm (final level after ±20 dB step in cell power)

Measurement level ranging: auto

Measurement cell power step size: +20, –20 dB

Marker relative level accuracy: ±0.5 dB

Marker time accuracy: ±540 µs

Measurement limits: time versus amplitude mask per IS-98D

Graphical results:

Graph: single trace with IS-98D standard limit lines

Time display resolution: 270 µs

Time display range: 0 to +100 ms

Amplitude range: –5 to +30 dB

Available results: pass or fail result and trace of 371 data points available via GPIB

Concurrency capabilities: none; selecting this measurement automatically closes all other active measurements

Tx spurious emissions

Input frequency ranges:

- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Measurement method: measures the active carrier power in a 1.23 MHz bandwidth, then measures the power in a 30 kHz bandwidth at two offsets above and below the active carrier and displays the ratio of the offset powers to the active carrier power in dBc; measurement returns valid results for full rate only in R-RC1 or R-RC2; all rates are support in R-RC3 and R-RC4

Measurement data capture period: 5 ms

Measurement offsets:

Frequencies < 1000 MHz: ±885 kHz, ±1.98 MHz

Frequencies > 1000 MHz: ±1.25 MHz, ±1.98 MHz

Measurement bandwidth:

Active carrier: 1.23 MHz

Offsets: 30 kHz synchronously tuned, five pole filter with approximately Gaussian shape

Measurement trigger: 20 ms frame clock

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Measurement range: 0 to +30 dBm

Measurement level ranging: auto

Marker relative level accuracy:

±885 kHz, ±1.25 MHz offsets: < ±0.4 dB, *typically* < *±0.2 dB*

±1.98 MHz offsets: < ±0.8 dB, *typically* < *±0.5 dB*

Measurement residual relative power:

±885 kHz, ±1.25 MHz offsets: < –62 dBc/30 kHz BW

±1.98 MHz offsets: < –66 dBc/30 kHz BW

Mobile pass/fail limits (per IS-98D):

Auto mode:

Frequencies < 1000 MHz:

- –42 dBc/30 kHz for ±885 kHz offsets
- –54 dBc/30 kHz for ±1.98 MHz offsets

Frequencies > 1000 MHz:

- –42 dBc/30 kHz for ±1.25 MHz offsets
- –50 dBc/30 kHz for ±1.98 MHz offsets

Manual mode: settable from –10 to –65 dBc with 0.01 dB resolution

Numeric results: relative power in dBc/30 kHz for each of the four offset frequencies

Graphical results:

Graph: single trace with IS-98D standard limit lines and one bar representing the channel power and four bars representing the relative power at the four offset frequencies

Amplitude range: 0 to –80 dB

Concurrency capabilities: Tx spurious emissions measurements can be made concurrently with all CDMA measurements that support concurrency

Gated power measurement

Input frequency ranges:
- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Measurement method: displays the time domain pulse of an IS-95, RC1, or RC2, 1/8th rate frame

Measurement data capture period: 1.277 ms

Measurement trigger: 20 ms clock (frame trigger)

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Measurement input level range: –20 to +30 dBm

Measurement averaging: default of 100, selectable

Marker relative level accuracy (averages > 25):

+5 to –22 dB: < ±0.4 dB + 0.1 dB for signal fall times less than 2 µs, *typically* < *±0.30 dB*

–22 to –25 dB: < ±0.7 dB + 0.2 dB for signal fall times less than 2 µs, *typically* < *±0.55 dB*

Marker level resolution: 0.01 dB

Measurement limits: time domain mask per IS-98D

Graphical results: zoom view

Full trace: displays a time window of 1277 µs centered on the burst; grey bar indicates which section of the full trace appears in the zoomed trace

Time display range: –15 to +1262 µs

Level display range: –35 to +5 dB

Zoom position: 0 to 13

Zoomed trace: displays a zoomed section of the full graph

Zoomed time display resolution:

zoom views 0, 13: 68 ns

zoom views 1 to 12: 276 ns

Time display range:

zoom view 0: –15.06 to +10.04 µs

zoom view 1: +10.21 to +112.21 µs

zoom view 2: +112.47 to +214.47 µs

zoom view 3: +214.74 to +316.74 µs

zoom view 4: +317.00 to +419.01 µs

zoom view 5: +419.28 to +521.27 µs

zoom view 6: +521.55 to +623.54 µs

zoom view 7: +623.81 to +725.54 µs

zoom view 8: +725.81 to +827.81 µs

zoom view 9: +828.08 to +930.07 µs

zoom view 10: +930.35 to +1032.34 µs

zoom view 11: +1032.61 to +1134.61 µs

zoom view 12: +1134.88 to +1236.88 µs

zoom view 13: +1237.05 to +1262.14 µs

Level display range: –35 to +5 dB

Graphical results: rise/fall view

Rise trace:

Time display range: –15 to +1262 µs

Time display resolution: 68 ns

Level display range: –35 to +5 dB

Fall trace:

Time display range: –15 to +1262 µs

Time display resolution: 68 ns

Level display range: –35 to +5 dB

Other measurement results: pass/fail indicator, first fail point time and level, and mask shift (indicates the time shift required to center IS-98D mask on the burst); full trace is available via GPIB

Concurrency capabilities: none

Frame error rate measurement

FER measurement method: data loopback in service options 002, 009, and 055 with confidence limits

FER input level measurement range: –65 dBm/1.23 MHz to +30 dBm/1.23 MHz

FER measurement residual error rate: < 1 x 10^{-6} for inputs levels in the specified input level range and within ±9 dB of the expected input power

Confidence limit range: definable from 80.0 to 99.9% and off

FER requirement range: definable from 80.0 to 99.9% and off

E_b/N_t limit range (FPC on): definable from –30.00 to +42.00 dB; used for pass/fail criteria when using fast forward power control

Minimum frame count: definable number of frames to test before confidence limit checking is started; must be set properly to obtain accurate test results when fading is enabled and if confidence limit testing is active

FER reported parameters (FPC off):

Intermediate results: measured FER, number of errors, number of frames tested, number of forward erasures (mobile reported), number of mobile errors (test set detected), and number of reverse erasures (indicating poor reverse link signal quality) updated every 25 frames

Final results: measured FER, total number of errors, number of frames tested, number of forward erasures (mobile reported), number of mobile errors (test set detected), and number of reverse erasures (indicating poor reverse link signal quality) and one of the following: passed confidence limit, failed confidence limit, or max frames

FER reported parameters (FPC on):

Intermediate results: measured FER, number of errors, number of frames tested, number of forward erasures (mobile reported), number of mobile errors (test set detected), and number of reverse erasures (indicating poor reverse link signal quality) and average E_b/N_t updated every 25 frames

Final results: measured FER, total number of errors, number of frames tested, number of forward erasures (mobile reported), number of mobile errors (test set detected), number of reverse erasures (indicating poor reverse link signal quality), and average E_b/N_t, maximum E_b/N_t, minimum E_b/N_t, and passed FER confidence limit, or failed FER confidence limit, or max frames along with passed E_b/N_t or failed E_b/N_t

Concurrency capabilities: FER measurements can be made concurrently with all CDMA measurements that support concurrency

Conditions for terminating FER test:

Max frames: maximum number of frames to test completed – indeterminate test result

Failed: measured FER failed the specified FER limit with specified confidence

Passed: measured FER passed the specified FER limit with specified confidence

TDSO measurement

TDSO measurement method: once a SO32 call is connected, up to a 10.24 second wait is required to synchronize the mobile and test set; once sync is achieved, the first measurement result will be returned in 10.24 seconds (one sync frame)

TDSO test length (frame count): settable in 512 frame increments from 512 to 999,936 frames

FER requirement: settable from 0.1 to 10%

TDSO measurement data pattern: selectable eight bit data pattern to fill each frame in whole bytes (padded with zeroes to fill each frame as needed, pattern 00000000 not allowed) or PRBS

TDSO reported parameters:

Intermediate results: Tx good frames sent, Tx blank frames sent, Rx blank frames received, Rx good frames received, confidence, and FER; results are updated every 512 frames

Final results: Tx good frames sent, Tx blank frames sent, Rx blank frames received, Rx good frames received, confidence, and FER

Concurrency capabilities: TDSO measurements can be made concurrently with all other concurrent measurements except for frame error rate

Tx dynamic power measurement

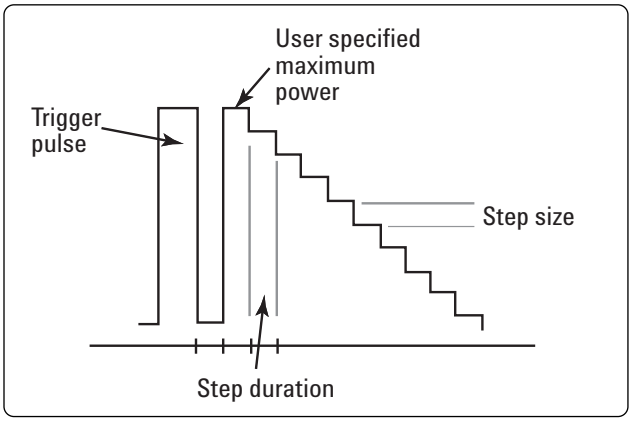
Input frequency ranges:

- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Measurement method: captures a user-defined trace consisting of 20, 40, or 80 ms duration power steps with user-defined step size produced by a test mode in the mobile station under test; measures the total power in a 1.23 MHz bandwidth centered on the active reverse channel center frequency in each step period

Measurement data capture period: 1.25 ms

Measurement trigger: Tx signal output by the mobile station must provide a pulse (off-on-off) followed by the stepped power burst beginning at the specified output power



Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Measurement range: –61 to +30 dBm, *usable to < –69 dBm/1.23 MHz with reduced accuracy*

Measurement level ranging: none; user must set the test set's receiver power control field to manual and set the receiver power to the expected full power of the power sweep produced by the mobile station

Measurement accuracy: calibrated against average power and within ±10 degrees of calibration temperature; calibration must occur between 20 to 55 °C: < ±1 dB 15 to 55 °C, *typically* < *±0.5 dB*

Measurement resolution: 0.01 dBm/1.23 MHz

Measurement step duration (time): 20, 40, or 80 ms

Measurement step size: –0.01 to –90.00 dB

Measurement number of steps: 0 to 99

Measurement result: a graph displaying the discrete power at each power step along with numeric power results for each step

Measurement graphical controls: marker on/off with position, trace start step, trace span, and return to default scale

Concurrency capabilities: none

Calibrate function: uses the channel power calibration function

Maximum/minimum power measurement

Input frequency ranges:

- 411 to 420 MHz
- 450 to 484 MHz
- 824 to 934 MHz
- 1750 to 1780 MHz
- 1850 to 1980 MHz

Measurement method: performs this sequence:

- sets the test set source to a user-specified value for the maximum power measurement
- ranges the receiver to the expected power
- sends all up power control bits
- uses the average power meter to measure the maximum power
- sets the test set source to a user-specified value for the minimum power measurement
- ranges the receiver to the expected power
- sends all down power control bits
- uses the channel power meter to measure the minimum power
- returns the test set to the same state before the measurement was initiated

Measurement data capture period: 1.25 ms

Maximum input level: +37 dBm/1.23 MHz peak (5 W peak)

Measurement range:

Maximum power measurement: –10 to +30 dBm; *usable from –10 to –20 dBm with reduced accuracy (peak detector only)*

Minimum power measurement: –61 to +30 dBm, *usable to < –69 dBm/1.23 MHz with reduced accuracy*

Measurement level ranging: auto for the maximum power measurement, and either auto or manual for the minimum power measurement

Measurement accuracy:

Maximum power measurement: same as the average power measurement accuracy

Minimum power measurement: same as the channel power measurement accuracy

Measurement settings: maximum power measurement cell power, maximum power measurement F-FCH level, maximum power measurement F-Pilot level, minimum power measurement cell power, minimum power measurement F-FCH level, and minimum power measurement F-Pilot level

Measurement result: the measured maximum power and minimum power

Concurrency capabilities: none

Calibrate function: uses the channel power calibration function

Multi-tone audio measurement

Multi-tone analyzer supported service options: SO3, SO17, and SO32768

Multi-tone audio measurement mode: downlink audio (base station to mobile station) or uplink audio (mobile station to base station)

Multi-tone analyzer 0 dB reference mode: relative or absolute

Multi-tone analyzer 0 dB reference tone (relative mode): tone 0 through 20

Multi-tone analyzer downlink reference level (absolute mode): 1 mV to 5.000 V

Multi-tone analyzer uplink reference level (absolute mode): 0.1 to 100.0%

Multi-tone analyzer expected audio input peak voltage (downlink mode): 1 mV to 20.000 V

Multi-tone analyzer device settling time: 10 to 1000 ms

Multi-tone analyzer SINAD/distortion state (in the 1 tone mode only): selectable on or off

Multi-tone analyzer downlink encoder settling: 0 to 100 frames

Multi-tone downlink generator frequency presets:

narrow: 300 Hz, 400 Hz, 500 Hz, 600 Hz, 700 Hz, 800 Hz, 900 Hz, 1 kHz, 1.1 kHz, 1.2 kHz, 1.3 kHz, 1.4 kHz, 1.6 kHz, 1.8 kHz, 2.0 kHz, 2.2 kHz, 2.4 kHz, 2.6 kHz, 2.8 kHz, and 3.0 kHz

normal: 300 Hz, 600 Hz, 800 Hz, 1 kHz, 1.2 kHz, 1.6 kHz, 2.0 kHz, 2.4 kHz, 2.8 kHz, and 3.0 kHz

wide: 100 Hz, 200 Hz, 300 Hz, 400 Hz, 500 Hz, 600 Hz, 700 Hz, 800 Hz, 900 Hz, 1 kHz, 1.2 kHz, 1.4 kHz, 1.6 kHz, 1.8 kHz, 2.0 kHz, 2.4 kHz, 2.8 kHz, 3.0 kHz, 3.3 kHz, and 3.6 kHz

Multi-tone downlink generator frequency single tones: 300 Hz, 600 Hz, 800 Hz, 1 kHz, 1.2 kHz, 1.6 kHz, 2 kHz, 2.4 kHz, 2.8 kHz, or 3 kHz

Multi-tone downlink generator frequency level: 10, 30, or 50% of total level

Multi-tone uplink generator frequency presets: same as downlink presets or user selectable for up to 20 tones; user frequency range from 10 Hz to 4.0 kHz

Multi-tone uplink generator frequency level: specified total rms voltage range from 20 mV to 1.42 V

Multi-tone analyzer measurement results (SINAD/distortion mode off): graphical display of up to twenty tones with level (frequency response)

Multi-tone analyzer measurement results (SINAD/distortion mode on): tone audio level, tone audio frequency, tone SINAD, and tone distortion

Multi-tone analyzer measurement limits: upper and lower tone pas/fail limit for each active tone; range of –100 to +100 dB for each limit

Concurrency capabilities: none

Option 004 Digital Bus

Functionality: allows baseband, digital I/Q data from the signal generator to be sent to an external N5101A Baseband Studio PCI Card for fading and then returned to the test set for modulation

Connector: rear panel, 50 pin high density

Signal generator ALC mode: closed or open (default of closed); open loop mode must be used during fading to maintain the desired signal characteristics

ALC open loop calibration: calibrates the RF source when operating in the ALC open loop mode; the accuracy remains valid with a ±5 °C window of the temperature at which the calibration was performed

ALC open loop RF in/out composite absolute output level accuracy degradation (must add this to the main level accuracy specification for temperatures within ±5 °C of the last ALC open loop calibration):
< ±0.75 dB, –109 to –70 dBm/1.23 MHz,
< ±0.50 dB, –70 to –35 dBm/1.23 MHz,
< ±0.75 dB, –35 to –13 dBm/1.23 MHz

ALC open loop RF out only composite absolute output level accuracy degradation (must add this to the main level accuracy specification):
< ±0.75 dB, –109 to –70 dBm/1.23 MHz,
< ±0.50 dB, –70 to –35 dBm/1.23 MHz,
< ±0.75 dB, –35 to –13 dBm/1.23 MHz

ALC open loop carrier feedthrough:
typically < 40 dBc, (nominal ambient < 47 dBc after IQ calibration)

General Specifications

Timebase specifications

Internal high stability 10 MHz oven-controlled crystal oscillator (OCXO)

Aging rates: < ±0.1 ppm per year, < ±0.005 ppm peak-to-peak per day during any 24-hour period starting 24 hours or more after a cold start

Temperature stability: < ±0.01 ppm frequency variation from 25 °C over the temperature range 0 to 55 °C

Warm-up times: 5 minutes to be within ±0.1 ppm of frequency at one hour, 15 minutes to be within ±0.01 ppm of frequency at one hour

Accuracy after a 30-minute warm-up period of continuous operation is derived from:
typically ±[(time since last calibration) x *(aging rate) + (temperature stability) + (accuracy of calibration)]*

Initial adjustment: *typically ±0.03 ppm*

External reference input

Input frequency: 10 MHz

Input frequency range: *typically < ±5 ppm of nominal reference frequency*

Input level range: *typically 0 to +13 dBm*

Input impedance: *typically 50* Ω

External reference output

Output frequency: same as timebase (internal 10 MHz OCXO or external reference input)

Output level: *typically > 0.5 V rms*

Output impedance: *typically 50* Ω

Trigger output

Frame clock output: selectable output of 20 ms, 80 ms, or 2 s

Remote programming

GPIB: IEEE Standard 488.2

GPIB help: pressing the front panel Help key and then any other key will cause the test set to display the GPIB syntax for that command at the bottom of the front panel display; pressing the Help key again exits this mode of operation

Remote front panel lockout: allows remote user to disable the front panel display to improve GPIB measurement speed

Implemented functions: T6, TE0, L4, LE0, SH1, AH1, RL1, SR1, PP0, DC1, DT0, C0, and E2

Save/Recall registers

Storage capacity: five registers that store the complete instrument state except for active cell call processing status (fixed labels of register 1 to 5); registers are non-volatile

Recall: allows user to recall one of the 5 stored instrument states

General specifications

Dimensions (H x W x D): 8.75 x 16.75 x 24.63 inches (222 x 426 x 625 mm), 7 rack spaces high

Weight: 66 lbs (30 kg)

Display: 10.5 inches (26.7 cm), active matrix, color, liquid crystal

LAN (local area network) port (for firmware upgrades and protocol logging only): RJ-45 connector, 10 base T Ethernet with TCP/IP support

Operating temperature: 0 to +55 °C

Storage temperature: –20 to +70 °C

Power: 100 to 240 Vac, 50 to 60 Hz, 550 VA maximum

Calibration interval: two years

EMI: conducted and radiated interference meets CISPR-11

Radiated leakage due to RF generator: *typically < 1 µV induced in a resonant dipole antenna one inch from any surface except the underside and rear panel at set RF generator output frequency and output level of –40 dBm*

Spurious leakage: *typically < 5 µV induced in a resonant dipole antenna one inch from any surface except the underside and rear panel at frequencies other than the RF generator output frequency and output level of –40 dBm*

Power consumption: *typically 400 to 450 W continuous*

Measurement speed: *typical measurement speed based on using at least a 600 MHz Pentium II processor PC and with the display off mode selected on the E5515C; measurement speeds include the total time from GPIB measurement request until the controller receives the result using the INT/FETCH commands; due to variations of trigger latencies and internal test set processor loading, individual measurement times may be faster or slower; measurement speeds also vary depending on the controller GPIB environment and processor speed*

Analog measurements

Measurement name	One measurement	Five measurements
Analog Tx power	*15 ms*	*41 ms*
Frequency modulation (with deviation result)	*134 ms*	*448 ms*
Frequency modulation (with deviation and distortion results)	*163 ms*	*528 ms*
Frequency stability	*174 ms*	*754 ms*
Audio analyzer (with level result)	*65 ms*	*284 ms*
Audio analyzer (with level, SINAD and distortion results)	*96 ms*	*314 ms*

CDMA measurements

Measurement name	One measurement	Ten measurements
Channel power (normal mode)	*73 ms*	*616 ms*
Channel power (fast mode)	*28 ms*	*210 ms*
Channel power (very fast mode)	*9 ms*	*34 ms*
Average power (RC3)	*199 ms*	*1773 ms*
Waveform quality IS-95, RC1, or RC2	*170 ms*	*1001 ms*
Waveform quality IS-2000 RC3/4	*202 ms*	*1385 ms*
Code channel time and phase error	*299 ms*	*2326 ms*
Handoff waveform quality	*735 ms*	*NA*
Gated power (100 measurements)	*157 ms*	*3352 ms*
Tx spurious response	*338 ms*	*2566 ms*
Time response of open loop power	*1210 ms*	*NA*

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