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Agilent 8924E

CDMA Mobile Station Service Test Set—30 MHz to 1000 MHz, 1700 MHz to 2000 MHz

Technical Specifications

- **Agilent 83236B PCS Interface**
- **Agilent 83217A CDMA Dual-Mode Mobile Station Test Software**
- **Agilent E8290A CDMA Dual-Mode Point of Service Test (PoST) Software**



The Agilent Technologies 8924E CDMA mobile station test set provides the key set of measurements to verify the performance of dual-mode CDMA mobile phones operating from 500 to 1000 MHz. With the Agilent Technologies 83236B PCS Interface, the 8924E additionally offers CDMA mobile testing from 1700 to 2000 MHz. Acting as a calibrated, high performance CDMA base station, the 8924E verifies not only the parametric characteristics of CDMA phones, but also the functional aspects of phone performance.

The 8924E's full AMPS, NAMPS, EAMPS, TACS, NTACS, ETACS and JTACS test capability saves you space, cost, and training expenses by allowing you to make both analog and CDMA digital measurements with the same instrument.

For complete, call processing verification, the 8924E supports both mobile and base station initiated call connect and disconnect. Once a phone call is established, verifying the overall functionality of a CDMA mobile is simple using the 8924E's voice echo mode. For testing a variety of protocol formats, the 8924E offers six user selectable protocol stacks: IS-95, IS-95A, TSB-74, J-STD-008, ARIB T53, and KOREAN PCS. The 8924E also supports a number of service options, including 9600 BPS and 14,400 BPS traffic channel configurations.

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High Accuracy CDMA Source for CDMA Receiver Test

The 8924E provides active cell site emulation by supporting the following CDMA channels: pilot, sync, paging, traffic, and orthogonal channel noise source (OCNS). An additive white Gaussian noise (AWGN) source is also included to provide the interference generated by adjacent cells in a working CDMA network. The 8924E measures receiver frame-error-rate (FER) at all four date rates used in the CDMA system: full, half, quarter, and one-eighth. Confidence limit technology is used to reduce receiver test time to an absolute minimum.

CDMA Transmitter Measurements

The 8924E provides an average power measurement based on new DSP technology. A DSP based channel power measurement enables the 8924E to achieve accurate low level CDMA power measurements. Access probe power measurements are also available. The 8924E measures transmitted waveform quality by using the IS-98A/J-STD-018 recommended correlated power method, also known as the rho (ρ) measurement. In addition, the rho measurement reports the frequency error, modulation phase and amplitude error, and the carrier feedthrough.

Handoff Verification

To speed testing, the 8924E supports hard hand-offs between RF channels. CDMA to analog hand-offs from both cellular and PCS bands are also supported.

Authentication and Short Message Service Support

The 8924E provides the necessary features for testing a CDMA mobile station's ability to perform call processing functions with authentication for Korea and the United States. Also, the 8924E supports mobile terminated SMS.

Automated Software

The Agilent Technologies E8290A PoST (point of service test) software makes the 8924E an automated CDMA test solution. The E8290A quickly provides accurate phone performance and quality data at the point of sale. This PC-based solution is very easy to use, reduces churn, reduces no trouble found (NTF), and improves customer care.

The Agilent Technologies 83217A CDMA dual-mode mobile station test software can also be used to automate CDMA and analog mobile phone measurements. The 83217A solution does not require a PC. Rather, automatic tests can be completely set up using the front panel of the 8924E. Options are available to meet your test needs for CDMA, AMPS, NAMPS, JTACS, NTACS, U.S. PCS, and Korean PCS phones.

Specifications describe the instrument's warranted performance and apply after a 30 minute warm-up. These specifications are valid over the 8924E's entire operating environmental range unless otherwise noted.

Supplemental Characteristics *(shown in italics) are intended to provide additional information, useful in applying the instrument by giving typical expected, but non-warranted performance.*

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8924E Analog Mode Specifications

Call Processing Functionality

Standards: AMPS, NAMPS, TACS, JTACS, and NTACS

Registration Support: Zone Registration

Call Control: BS call originate and disconnect, MS call originate, and disconnect

Authentication: Registration, paging, origination, SSD update, and unique challenge

Orders: Power levels 0 through 7, maintenance, and alert

Handoff Support: Handoff to new frequency, between narrow channel and wide channel

Signal Generator

RF Frequency

Range:
Standard: 30 MHz to 1000 MHz
With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz
Usable from 1700 to 1999.999999 MHz

Accuracy and Stability: Same as reference oscillator ±0.015 Hz

Switching Speed: *<150 ms to be within 100 Hz of carrier frequency*

Resolution: *1 Hz*

Output

RF IN/OUT Connector

Level Range:
Standard: –127 dBm to –10.5 dBm into 50 Ω
With the 83236B: –130 dBm to –20 dBm into 50 Ω

Level Accuracy:
Standard: ±1.2 dB (Level ≥–127 dBm)
Typically ±1.0 dB for all levels

With the 83236B:
±1.8 dB, at 25 °C ±10 °C
±2.0 dB, at 0 °C to 55 °C
±1.0 dB typically

Reverse Power:
Standard: 3 W
With the 83236B: 10 W

SWR: Standard: <1.5:1
With the 83236B: <1.2:1

DUPLEX OUT/RF OUT Only Connector

Level Range:
Standard: –127 dBm to +3.5 dBm into 50 Ω
With the 83236B: –130 dBm to –10 dBm into 50 Ω

Level Accuracy:
Standard: ±1.0 dB
With the 83236B:
±1.8 dB, at 25 °C ±10 °C
±2.0 dB, at 0 °C to 55 °C
±1.0 dB typically

Reverse Power: 200 mW maximum

SWR: Standard: <2.0:1 (level <–7.5 dBm)
With the 83236B: <1.6:1

Resolution: *0.1 dB (settable in 0.01 dB increments)*

Spectral Purity

All specifications are for ≤–2.5 dBm output level at DUPLEX OUT or ≤–15 dBm output level at RF IN/OUT

Harmonics: <–30 dBc

Non-Harmonic Spurious: <–60 dBc (at >5 kHz offset from carrier)

Residual FM (CCITT, rms):
Standard:
<7 Hz for 500 MHz <f_c <1000 MHz
<4 Hz for 250 MHz ≤f_c ≤500 MHz
<7 Hz for 30 MHz ≤f_c <250 MHz

With the 83236B:
<7 Hz for 810 MHz <f_c <960 MHz
<10 Hz for 1710 MHz <f_c <1990 MHz

SSB Phase Noise:
Standard: *<–116 dBc/Hz (for >20 kHz offsets at a 1000 MHz carrier frequency)*

With the 83236B: *<–100 dBc/Hz at >20 kHz offsets*

FM

FM Deviation (rates >25 Hz):
Standard:
100 kHz; 30 to <249 MHz
50 kHz; 249 to <501 MHz
100 kHz; 501 to 1000 MHz

With the 83236B:
100 kHz; 800 MHz to 960 MHz, 1710 MHz to 1785 MHz; 1805 MHz to 1910 MHz, 1930 MHz to 1990 MHz

FM Rate (1 kHz reference):
Internal: DC to 25 kHz (1 dB BW)
External: *AC Coupled: 20 Hz to 75 kHz (typical –3 dB BW)*

FM Accuracy (1 kHz rate):
<10 kHz deviation: ±3.5% of setting ±50 Hz
>10 kHz deviation: ±3.5% of setting ±500 Hz

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FM Distortion (THD+Noise, 0.3 to 3 kHz BW):
<0.5 % at >4 kHz deviation and 1 kHz rate

External Modulation Input Impedance: *600 Ω nominal*

Resolution:
50 Hz for <10 kHz deviation
500 Hz for ≥10 kHz deviation

Audio Source

Frequency

Range: 300 Hz to 10 kHz

Accuracy: 0.025 % of setting

Resolution: *0.1 Hz*

Output Level

Range: 0.1 mV to 4 Vrms

Maximum Output Current: 20 mA peak

Output Impedance: <2.5 Ω (at 1 kHz)

Accuracy: ±2% of setting plus resolution

Residual Distortion (THD + Noise, level ≥200 mVrms):
<0.125%; 300 Hz to 10 kHz in an 80 kHz BW

Resolution:
Level ≤0.01 V: ±50 µV
Level ≤0.1 V: ±0.5 mV
Level ≤1 V: ±5 mV
Level <10 V: ±50 mV

RF Analyzer

RF Frequency Measurement

Measurement Range:
Standard: 30 MHz to 1000 MHz
With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz
Usable from 1700 to 1999.999999 MHz

Level Range:
Standard:
RF IN/OUT: –10 dBm to +35 dBm (0.1 mW to 3 W)
ANT In: –36 dBm to +20 dBm

With the 83236B:
RF IN/OUT: –10 dBm to +40 dBm (0.1 mW to 10 W)

Accuracy: ±1 Hz plus timebase accuracy

Minimum Resolution: *1 Hz*

RF Power Measurement

Note: To achieve the specified accuracy when measuring power at the RF IN/OUT port, the internal signal generator level must be 40 dB below the measured power or less than –20 dBm at the DUPLEX OUT port.

Frequency Range:
Standard: 30 MHz to 1000 MHz
With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz

Input Connector: RF IN/OUT connector only

Measurement Range:
Standard: –10 dBm to +35 dBm (0.1 mW to 3 W)
With the 83236B: –13 dBm to +40 dBm (50 µW to 10 W)

Accuracy (after power meter zero):
Standard:
±5% of reading ±0.01 µW from 15 °C to 35 °C
±10% of reading ±0.01 µW from 0 °C to 55 °C

With the 83236B:
±5% of reading ±2.5 µW at 23 °C ±10 °C
±10% of reading ±2.5 µW

SWR:
Standard: <1.5:1
With the 83236B: <1.2:1

Resolution:
Standard:
Power <10W: 1 mW
Power <100 mW: 0.1 mW
Power <10 mW: 0.01 mW

With the 83236B: *0.01 dB or 10 µW*

FM Measurement

Frequency Range:
Standard: 30 MHz to 1000 MHz
With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz

Deviation Range: 20 Hz to 75 kHz

Sensitivity: 2 µV (15 kHz IF BW, High Sensitivity Mode, 0.3 to 3 kHz BW)[1] *Typically <1 µV (12 dB SINAD, fc >30 MHz)*

1. Possible degradation in the 1700 to 1999 MHz bandwidth

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Accuracy (20 Hz to 25 kHz rates, deviation <25 kHz):
±4 % of reading plus residual FM and noise contribution

Bandwidth (3 dB): 2 Hz to 70 kHz

THD+Noise: <1% for >5 kHz Deviation and 1 kHz rate in a 0.3 to 3 kHz BW[1]

Input Level Range for Specified Accuracy:
Standard:
–28 to +35 dBm at RF IN/OUT (1.6 µW to 3 W)
–50 to +14 dBm at Ant In

With the 83236B: –36 dBm to +40 dBm

Residual FM and Noise (0.3 to 3 kHz, rms):
Standard: <7 Hz
With the 83236B: <10 Hz

Resolution:
Deviation <10 kHz: 1 Hz
Deviation ≥10 kHz: 10 Hz

Spectrum Analyzer (Option 102 required)

Frequency Range: (Center frequency coupled to RF Analyzer setting)
Standard: 30 MHz to 1000 MHz
With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz

Frequency Span/Resolution Bandwidth (coupled):

Standard:

Span	Bandwidth
<50 kHz	300 Hz
<200 kHz	1 kHz
<1.5 MHz	3 kHz
<18 MHz	30 kHz
>18 MHz	300 kHz

With the 83236B:

Span	Bandwidth
<50 kHz	300 Hz
<200 kHz	1 kHz
<1.5 MHz	3 kHz

Display: Log with 10 dB/division, 2 dB/division, or 1 dB/division

Display Range: 80 dB

Reference Level Range: +50 to –50 dBm

Residual Responses: <–70 dBm (no input signal, 0 dB attenuation)

Image Rejection: >50 dB

Non-harmonic Spurious Responses: *>70 dB (for input signals ≤–30 dBm)*

Level Accuracy: *±2.5 dB*

Log Scale Linearity: *±2 dB (for input levels <–30 dBm and/or 60 dB range)*

Displayed Average Noise Level: *<–114 dBm (≤50 kHz spans)*

Other Features: *Peak hold, marker with frequency and level read-out, marker to peak, marker to next peak, trace comparison A-B*

Tracking Generator

(Not available when used with the 83236B)

Frequency Range: 30 MHz to 1000 MHz

Frequency Offset: Frequency span endpoints ± frequency offset cannot be <30 MHz or >1000 MHz

Output Level Range: Same as signal generator

Sweep Modes: Normal and Inverted

Audio Analyzer

Frequency Measurement

Measurement Range: 20 Hz to 400 kHz

Accuracy: ±0.02% plus resolution plus reference oscillator accuracy

External Input: 20 mV to 30 Vrms

Resolution:
f <10 kHz: 0.01 Hz
f <100 kHz: 0.1 Hz
f ≥100 kHz: 1 Hz

AC Voltage Measurement

Measurement Range: 0 to 30 Vrms

Accuracy (20 Hz to 15 kHz, >1 mV): ±3% of reading

Residual THD+Noise (15 kHz BW):
With a load (<=600 Ω) connected to Audio In Hi: 150 µV
Without load: 480 µV

3 dB Bandwidth: *Typically 2 Hz to 100 kHz*

Nominal Input Impedance: *Switchable between 1 M Ω in parallel with 95 pF or 600 Ω floating*

Resolution:
4 digits for inputs ≥100 mV
3 digits for inputs <100 mV

1. Possible degradation in the 1700 to 1999 MHz bandwidth.

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DC Voltage Measurement

Voltage Range: 100 mV to 42 V

Accuracy: ±1.0 % of reading plus DC offset

DC Offset: ±45 mV

Resolution: *1 mV*

Distortion Measurement

Fundamental Frequency Range: 300 Hz to 10 kHz

Input Level Range: 30 mV to 30 Vrms

Display Range: 0.1% to 100%

Accuracy: ±1 dB for frequencies from 300 to 1500 Hz, measured with the 15 kHz LPF (0.5 to 100% distortion)

±1.5 dB for frequencies from 300 Hz to 10 kHz, measured with the >99 kHz LPF (1.5 to 100% distortion)

Residual THD + Noise: –60 dB or 150 µV, whichever is greater for frequencies from 300 Hz to 1500 Hz measured with the 15 kHz LPF

–57 dBc or 450 µV, whichever is greater for frequencies from 300 Hz to 10 kHz measured with the >99 kHz LPF

Resolution: *0.1% distortion*

SINAD Measurement

Fundamental Frequency Range: 300 Hz to 10 kHz

Input Level Range: 30 mV to 30 Vrms

Display Range: 0 to 60 dB

Accuracy: ±1 dB for frequencies from 300 to 1500 Hz, measured with the 15 kHz LPF (0 to 46 dB SINAD)

±1.5 dB for frequencies from 300 Hz to 10 kHz, measured with the >99 kHz LPF (0 to 36 dB SINAD)

Residual THD + Noise: –60 dB or 150 µV, whichever is greater for frequencies from 300 Hz to 1500 Hz measured with the 15 kHz LPF

–57 dBc or 450 µV, whichever is greater for frequencies from 300 Hz to 10 kHz measured with the >99 kHz LPF

Resolution: *0.01 dB*

Audio Filters

High Pass Filters: <20 Hz, 50 Hz, and 300 Hz

Low Pass Filters: 300 Hz, 3 kHz, 15 kHz, >99 kHz

Other Filters: C-Message Weighting Filter, and 6 kHz Bandpass Filter

Optional Filters: Option 011, CCITT Weighting Filter replaces the C-Message filter (for TACS phones)

Variable Frequency Notch Filter

Frequency Tuning Range: 300 Hz to 10 kHz

Notch Depth: >60 dB

Notch Width: *Typically ±5% of the notch center frequency*

Audio Detectors: RMS, Pk+, Pk–, Pk+hold, Pk–hold, Pk±/2, Pk±/2 hold, Pk±max, Pk±max hold

Oscilloscope

Frequency Range (–3 dB BW): 2 Hz to 50 kHz
Typically >100 kHz

Scale/Division: 10 mV to 10 V

Amplitude Accuracy (20 Hz to 10 kHz): ±1.5% of reading ±0.1 division

Time/Division: 10 µs to 100 ms

Trigger Delay: 20 µs to 3.2 seconds

Internal DC Offset: *<=0.1 division (≥50 µV/division sensitivity)*

Signaling

Capability for Generating and Analyzing the Following Formats: AMPS, NAMPS, TACS, JTACS, NTACS, EAMPS, ETACS

DC Current Meter

Measurement Range: 0 to 10A *(Usable to 20A)*

Accuracy: The greater of ±10% of reading after zeroing or 30 mA (levels >100 mA)

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Agilent 8924E CDMA Mode Specifications

Call Processing Functionality

User Settable Parameters

Protocol Stack: IS-95, IS-95A, TBS-74, ARIB-T53, Korean PCS, and J-STD-008

Channel Standards: MS AMPS, US PCS, Korean PCS 0, Korean PCS 1, Japan CDMA, MS NAMPS Upper/Middle/Lower, MS TACS, MS ETACS, MS NTACS, MS JTACS, and User Defined (PCS bands require the 83236B PCS Interface)

Base Station Parameters: NID, SID, Country Code, Network Code, CDG Esc Mode on/off, Register SID, Register NID, and Power-On Registration on/off

Access Probe Parameters: NOM_PWR, NOM_PWR_EXT, INIT_PWR, PWR_STEP, NUM_STEP, MAX_REQ_SEQ, and MAX_RSP_SEQ.

Paging Channel Parameters: Paging Data Rate (full or half rate)

Service Option Support:
Service Option 001 (Normal Voice)
Service Option 002 (9600 bps Data Loopback)
Service Option 003 (EVRC 9600 bps Voice)
Service Option 006 SMS for Rate Set 1 (9600 bps)
Service Option 014 SMS for Rate Set 2 (14,400 bps)
Service Option 009 (14.4 kbps Data Loopback)
Service Option 32768 (14.4 kbps Voice)

Call Control: BS call originate, BS call disconnect, MS call originate, MS call disconnect.

Hand-off Support:
CDMA to CDMA Hard (RF frequency)
CDMA to Analog cellular (intra band)
CDMA PCS to Analog cellular

CDMA to Analog Hand-off: Execute, System Type, Channel, SAT, and Power Level

Authentication: Registration, paging, origination, SSD update, data burst, and unique challenge

Short Message Service: Mobile terminated on paging or traffic channel

Call Status Indicators: Transmitting (cell active), Registering, Page Sent, Access Probe Received, Connected, Softer Handoff, Hard Handoff, Service. Option 002/009. SMS In Progress, MS Acknowledge Received. All indicators are also available over GPIB.

Speech Encoding: None

Speech Echo Mode: Fixed delay to 0 seconds

CDMA Data Source:
Pseudorandom data (CCITT 2^{15-1} pattern)
Voice Echo
1 kHz tone
400 Hz tone
Audio Chirp (3 second sweep from 5 Hz to 3.75 kHz)

Closed Loop Power Control:
Supports True Closed Loop Power Control
Open Loop (Alternating 0 and 1 power control bits)
Always Up
Always Down
Off (no puncturing, requires special mode in mobile)

Open Loop Power Control: Supported through varying the level of CDMA Generator. CDMA analyzer auto-ranges to the ideal RF power level for the nominally expected open loop response.

Ideal Mobile Power Display: Reports the ideal open loop power for the mobile's transmitter based upon the forward link power set on the 8924E, the current protocol mode, and the set values of NOM_PWR, NOM_PWR_EXT (J-STD-008 mode only), and INIT_PWR.

Mobile Station FER Reporting: User selectable number of frames (from predefined list). Report by number of frames or by user defined number of errors.

Neighbor List Support: Automatically generates a list of 7 neighbors based on the user entry of the CDMA Sector PN offset using a fixed value of 12 for the internal parameter Pilot Increment.

Mobile Station Identification: Uses power-on or user initiated registration to obtain the mobile ID.

Registration: Supports mobile power-on registration, timer based registration (registration period parameter settable from 29 to 85, 12.18 to 199515 seconds), implicit, or user initiated registration (modulates SID to force the mobile to perform a zone based registration) via GPIB command or front panel button.

IMSI Support: Class 0 only in TSB-74 and J-STD-008 protocols:
Auto Mode: The phone's registration sub class is used by the instrument to page the phone

Mobile Database: Upon registration, the database contains the following information:

IS-95 Mode: ESN, MIN1, MIN2, Phone Number, Dual-Mode, Slot Class, Slot Index, Protocol Revision, Power Class, Transmit Mode, and Called Number

IS-95A, ARIB T-53, and TSB74 Modes: ESN, MCC, MNC, MSIN, Dual-Mode, Slot Class, Slot Index, Protocol Revision, Power Class, Transmit Mode, and Called Number

Korean PCS, and J-STD-008 Modes: ESN, MCC, MNC, MSIN, Slot Class, Slot Index, Protocol Revision, Band Class, EIRP Class, Operation Modes, and Called Number

Retrievable Mobile Parameters:

IS-95/IS-95A Modes: MUX1_REV_(1 to 8, 11 to 14), MUX1_FOR_(1 to 14), PAG_(1 to 7), ACC_(1 to 8), and LAYER2_RTC(1 to 5)

TSB-74/J-STD-008 Modes: In addition to the above parameters, these parameters are available: MUX2_REV_(1 to 25), and MUX2_FOR_(1 to 26)

Protocol Logging: Two rear panel serial ports allow logging of paging/access channel messages and forward/reverse traffic channel messages. Requires an external PC running terminal emulation software connected to the rear panel serial ports.

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CDMA Signal Generator

CDMA Channels

Additive White Gaussian Noise

Sector Power with Selectable PN Offset:
Pilot Channel at Walsh Code 0
Sync Channel at Walsh Code 32
Paging Channel at Walsh Code 1
Traffic Channel with selectable Walsh Code
OCNS Channel with selectable Walsh Code

Frequency

Frequency Range:

Standard: 501 MHz to 1000 MHz
Usable from 30 MHz to 248.9 MHz

With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz
Usable from 1700 to 1999.999999 MHz

Frequency Resolution: 1 Hz

Frequency Accuracy: Same as reference oscillator accuracy ±0.015 Hz

AWGN Bandwidth: *Nominal bandwidth of 1.8 MHz*

Amplitude

Composite Signal Output Level Range:

Standard:
RF IN/OUT: –109 dBm/1.23 MHz to –21.5 dBm/1.23 MHz
DUPLEX OUT: –109 dBm/1.23 MHz to –7.5 dBm/1.23 MHz

With the 83236B:
RF IN/OUT: –109 dBm/1.23 MHz to –20.01 dBm/1.23 MHz (–23 dBm/1.23 MHz max. if AWGN only is on)

RF OUT Only: –109 dBm/1.23 MHz to –10.01 dBm/1.23 MHz (–13 dBm/1.23 MHz max. if AWGN only is on)

Composite Signal Output Level Accuracy: (Using the IS-98A sensitivity setup)

Standard:
AWGN Off: ±1.5 dB
±1.0 dB typically

AWGN On: ±2.0 dB

With the 83236B:
AWGN Off:
±2.1 dB, at 25 °C ±10 °C
±2.3 dB. at 0 °C to 55 °C
±1.3 dB typically

AWGN On:
±2.6 dB. at 25 °C ±10 °C
±2.8 dB. at 0 °C to 55 °C

Attenuator Hold:

Standard: *–15 dB from attenuator setting when hold is enabled*

With the 83236B: *Up to –60 dB from attenuator setting when hold is enabled depending upon the initial setting level. Holds mechanical attenuator in the 83236B and uses the electronic attenuator in the 8924E to provide low glitch amplitude transitions.*

Composite Signal Output Power: Equal to the sum of the individually settable power levels of the CDMA sector and AWGN

Maximum Individual Signal Dynamic Range: The maximum dynamic range of any CDMA channel (AWGN, or CDMA Sector: Pilot, Sync, Paging, Traffic, or OCNS) is from 0 dB to –30 dB relative to the total composite output power. Paging and Traffic channels may have more or less dynamic range depending on the data rate in use.

AWGN Bandwidth: *Typically >1.8 MHz bandwidth. Because the reported total composite power and AWGN power is in terms of dBm in a 1.23 MHz bandwidth, the actual broadband output power as seen by a power meter on the front panel will be higher than reported on the front panel.*

Sector CDMA OCNS Channel Relative Level Range: Automatically calculated from other Sector channel relative levels to provide the set Sector power

Individual Channel Amplitude Resolution: 0.01 dB

Relative CDMA Channel Level Accuracy:

AWGN to Traffic Channel: <0.2 dB, ±5 °C from the last temperature at which PCB_CAL was run for values of E_b/N_t from 1 dB to 10 dB

Between any Two CDMA Channels: <0.2, dB ±5 °C from the last temperature at which PCB_CAL was run

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CDMA Modulation

Modulation Type: QPSK per TIA/EIA-98-B

Residual ρ: Better than 0.97, *typically >0.98*

Carrier Feedthrough: Better than –25 dBc, *typically better than –30 dBc*

Adjacent Channel Spectral Purity: *<–45 dBc at ±895 kHz offset from carrier frequency relative to the total carrier power in a 1.23 MHz bandwidth.*

Rate Set Support: Rate set 1 (9600 bps traffic (8 kbps voice)) Rate set 2 (14.4 kbps traffic (13 kbps voice))

Data Rate Transmission Modes: IS-95A/J-STD-008 defined base station modes including full rate, half rate, quarter rate, one-eighth rate data transmission, and variable rate with equally weighted, randomly spaced occurrences of each rate.

Data Generator Patterns:
Pseudorandom data (CCITT 2^{15}–1 pattern)
1 kHz tone (IS-96A vocoder only)
400 Hz tone (IS-96A vocoder only)
Audio Chirp (3 second sweep from 5 Hz to 3.75 kHz, IS-96A vocoder only)
Tones and chirp conform to IS-96A (Service Option 1), IS-127 (Service Option 3), and CDG-27

CDMA Analyzer

CDMA Average Power Measurement

Note: To achieve the specified accuracy when measuring power at the RF IN/OUT port of the Agilent 8924E or the 83236B, the internal signal generator level must be 40 dB below the measured power or less than –20 dBm at the 8924E's DUPLEX OUT port or the 83236B's RF OUT Only port.

Input Frequency Range:
Standard: 30 MHz to 1000 MHz
With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz
Usable from 1700 to 1999.999999 MHz

Input Connector:
Standard: RF IN/OUT connector on the 8924E
With the 83236B: RF IN/OUT connector on the 83236B

Measurement Bandwidth: Provides an accurate measure of the total power for all present signals within ±2 MHz of the specified operating frequency. If other signals are present outside of this frequency range, reduced measurement accuracy will result.

Maximum Input Level:
Standard: +35 dBm (3 W continuous)
With the 83236B: +37 dBm (5 W continuous)

Measurement Range:
Standard: –10 dBm to +35 dBm
Usable to –20 dBm with degraded accuracy
With the 83236B: –13 dBm to +37 dBm

Measurement Method: Reports the overall average power for all active power control groups captured

Measurement Period: Measures over 1/2 of a CDMA frame (eight power control groups) in full, half, quarter or one-eighth rate modes

Measurement Update Rate: *Typically 1.2 readings per second*

Measurement Accuracy (after power meter zero):
Standard:
±5% ±1 µW at 25 °C ±10 °C
±10% ±1 µW from 0 °C to +55 °C

With the 83236B:
±5% ±2.5 µW at 23 °C ±10 °C
±10% ±2.5 µW from 0 °C to +55 °C

CDMA Tuned Channel Power and Access Probe Power Measurement

Input Frequency Range:
Standard: 30 MHz to 1000 MHz

With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz
Usable from 1700 to 1999.999999 MHz

Input Connector:
Standard: RF IN/OUT connector on the 8924E
With the 83236B: RF IN/OUT connector on the 83236B

Measurement Bandwidth: Measures the total power in a 1.23 MHz bandwidth centered on the active reverse channel center frequency.

Maximum Input Level:
Standard: +35 dBm (3 W continuous)
With the 83236B: +37 dBm (5 W continuous)

Measurement Range:
Standard: –50 dBm to +30 dBm, *usable to –60 dBm*

Measurement Update Rate: *Typically 2 readings per second*

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Measurement Accuracy:

Relative Mode (Uncalibrated against average power):
0 to –10 dB relative level: ±0.1 dB
–10 to –20 dB relative level: ±0.2 dB
–20 to –40 dB relative level: ±0.5 dB

Calibrated Mode (Calibrated against average power):

Standard: ±1.0 dB at ±10 °C from the calibration temperature, *typically ±0.5 dB*

With the 83236B Cellular Bands (source level <–35 dBm/1.23 MHz): ±1.0 dB at ±10 °C from the calibration temperature, *typically ±0.5 dB*

With the 83236B PCS Bands (source level <–35 dBm/1.23 MHz): ±1.6 dB at ±10 °C from the calibration temperature, *typically +1.0 dB*

Temperature Drift: *Typically 0.1 dB per 10 °C temperature change*

Measurement Period: Measures power in a 1.23 MHz bandwidth over 1/2 of a CDMA frame (eight power control groups) in full, half, quarter, or one-eighth rate modes.

Calibrate: Calibrates the channel power measurement over the entire operating frequency range of the currently selected RF Channel Standard. This calibration requires the user to connect the DUPLEX OUT Port to the RF IN/OUT port (or to connect the RF OUT Only Port to the RF IN/OUT Port when using the 83236B) before initiating the calibration.

Alternate Channel Standard: Allows the selection of a second channel standard to be calibrated when the channel power calibration is performed. Also allows calibrating the entire cell band, PCS band, or all bands at one time. This allows switching between two standards without having to recalibrate after each RF Channel Standard change.

Uncalibrated Flag: Displays "Uncal" under the Channel Power measurement whenever the unit detects that the channel power calibration has not been run for the currently set RF Channel Standard.

Access Probe Power Measurement Triggering: Measurement automatically triggers above –55 dBm.

CDMA Modulation Measurement

Input Frequency Range:

Standard: 30 MHz to 1000 MHz

With the 83236B:
800 MHz to 960 MHz
1710 MHz to 1785 MHz
1805 MHz to 1910 MHz
1930 MHz to 1990 MHz
Usable from 1700 to 1999.999999 MHz

Modulation Measurement Format: OQPSK per TIA/EIA-98-B

ρ **(rho) Measurement Input Level Range:**

Standard: –20 dBm to +35 dBm
Usable to –25 dBm with degraded accuracy

With the 83236B: –25 dBm to +37 dBm
Usable to –28 dBm with degraded accuracy

Range of ρ Measurement for specified accuracy: 0.45 to 1.00

ρ **Measurement Interval:**

Traffic Channel ρ: 1.042 msec (5 Walsh symbols)
Test Mode ρ: 1.25 msec (6 Walsh symbols)

Measurement Update Rate: *Typically 1.7 readings per second*

ρ **Measurement Accuracy:** ρ ±0.003

Frequency Error Measurement Range: ±1 kHz

Frequency Error Measurement Accuracy: ±30 Hz

Other Reported Parameter with ρ Measurement: Transmit Time Error (τ, time offset), Frequency Error, Carrier Feedthrough, Amplitude Error, and Phase Error

CDMA Frame Error Rate Measurement

FER Measurement Method: Data loopback per Service Option 002 or Service Option 009 supporting confidence limits as outlined in TIA/EIA-98-B

Supported Data Rates for FER Measurement: Full, Half, Quarter, or One-eighth Rate

95% Confidence Limit: On or off

Confidence Limit Statistical Model: Meets IS-98A statistical model parameters

FER Reported Parameters: Measured FER, Number of Errors, Number of Frames tested, and one of the following: Passed Confidence limit, Failed Confidence limit, or Max Frames (test indeterminate)

Conditions for Terminating FER Test (with confidence limits on):

Max Frames: Maximum number of frames to test completed, indicative of an indeterminate test result

Failed: Measured FER failed the specified FER limit with 95% confidence

Passed: Measured FER passed the specified FER limit with 95% confidence

FER Measurement Indicators: Testing, Passed, Failed, and Max Frames. All indicators are available over GPIB.

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One Button Min/Max Power Measurement

Measurement Method: Automatically sets the 8924E to the nominal IS-98A/J-STD-018 test conditions for the minimum power measurement and then maximum power measurement. Restores the 8924E to the instrument state active before the measurement in initiated.

Measurement Output: Maximum TX power and minimum TX power measured

Measurement Rate: Approximately 7.5 to 8 seconds per measurement

CDMA Reverse Channel Spectrum

Option 102 required

Frequency Range: Fixed to the active CDMA reverse channel setting. Not independently adjustable.

Frequency Span/Resolution Bandwidth (coupled, maximum span of 5 MHz):

Span	Bandwidth
<50 kHz	300 Hz
<200 kHz	1 kHz
<1.5 MHz	3 kHz
5 MHz	30 kHz

Display: Log with 10 dB/division

Display Range: 80 dB

Reference Level Range: +50 to –50 dBm

Residual Responses: <–70 dBm (no input signal, 0 dB attenuation)

Image Rejection: >50 dB

Non-harmonic Spurious Responses: *>70 dB (for input signals ≤–30 dBm)*

Level Accuracy: *±2.5 dB*

Log Scale Linearity: *±2 dB (for input levels <–30 dBm and/or 60 dB range)*

Displayed Average Noise Level: *<–114 dBm (<50 kHz spans)*

Other Features: *Peak hold, marker with frequency and level readout, marker to peak, marker to next peak, trace comparison A-B.*

CDMA Triggers

Output Trigger Signals: Open loop power trigger (line toggles whenever the output level of the 8924E's CDMA source is changed)

Agilent 8924E Common Specifications

Remote Programming

GPIB: Agilent Technologies's implementation of IEEE Standard 488.2

Remote Front Panel Lockout: Allows remote user to disable the front panel display to improve GPIB measurement speed

Functions Implemented: SH1, AH1, T6, L4, SR1, RL1, LE0, TE0, PP0, DC1, DT1, C4, C11, E2

RS-232: 3-wire RJ-11 connector used for serial data in and out (no hardware handshake capability, two available in standard mode, one available with the 83236B)

Baud Rates: 300, 600, 1200, 2400, 4800, 9600, and 19200 selectable

Centronics Port: Industry standard parallel printer port for hardcopies of test results or screen dumps

Timebase Subsystem

(For proper operation, this reference must be locked to either the 8924E's high stability 10 MHz timebase output on the rear panel or to an external, high quality reference)

Locking Range: ±10 ppm

Input: Rear panel coaxial BNC

Accepted Input Frequencies: 19.6608 MHz, 15 MHz, 10 MHz, 9.8304 MHz, 5 MHz, 4.9152 MHz, 2.4576 MHz, 2 MHz, 1.2288 MHz, and 1 MHz

Outputs (All on Rear Panel):

Coaxial BNC's: 10 MHz

Frame Clock BNC Output (CDMA Mode Only): User selectable output of one of the following clocks via this BNC:

- 1.25 msec
- 20 msec frame clock
- 26.67 msec short sequence clock
- 80 msec clock
- Every even second (PP2S)

TTL Sub Min. D Connector: Individual pins for 1.25 msec, 20 msec frame clock, 26.67 msec short sequence clock, 80 msec clock, and every even second (PP2S)

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Ovenized Reference

Aging Rate: <0.005 ppm pk-pk/day, <±0.1 ppm per year (±85 Hz at 850 MHz in one year)

Warm-up: ±0.1 ppm in 5 minutes, ±0.01 ppm in 15 minutes

Temperature: <0.01 ppm

Supply Voltage: *2 × 10^{-9} (±1%)*

Rear Panel BNC Connectors:

Output Frequency: *10 MHz*

Output Level: *0 dBm ±3 dB into 50 Ω*

Store/Recall

Available RAM: *Approximately 928 Kbytes of user available RAM. When running the 83217A Dual-mode CDMA Mobile Station Test Software, about 280 Kbytes of RAM is available for save/recall use.*

Memory Card

Card Compatibility: Single industry standard PCMCIA slot that accepts type I and type II SRAM and ROM cards

Storage Capability: Allows for the storage and retrieval of IBASIC programs, IBASIC program parameter and results data, input of new calibration data, and long-term storage of Store/Recall information

Firmware Upgrades: Accepts PCMCIA memory cards to allow automatic loading of new firmware for the Host CPU, Protocol CPU, DSP, and Channel Card CPU's without opening the 8924E. (Order 8924CRT Option R58 for latest version.)

General Specifications

Dimensions (H × W × D):

Standard: 177H × 426W × 629D mm (7 × 16.75 × 24.75 inches)

With the 83236B: 254H × 426W × 629D mm (10 × 16.75 × 24.75 inches) Using the optional desktop rack mount kit

Weight:

Standard: 27 kg, 59 lbs

With the 83236B: 32.6 kg, 72 lbs

CRT Size: 7 × 10 cm

Operating Temperature: 0 °C to +55 °C

Storage Temperature: –55 °C to +75 °C

Power:

8924E: 100 V to 240 V, 50/60 Hz, *nominally 400 VA*

83236B: 90 V to 132 V, 198 V to 264 V, 47 to 63 Hz, 100 VA maximum

Calibration Interval: One year

EMI:

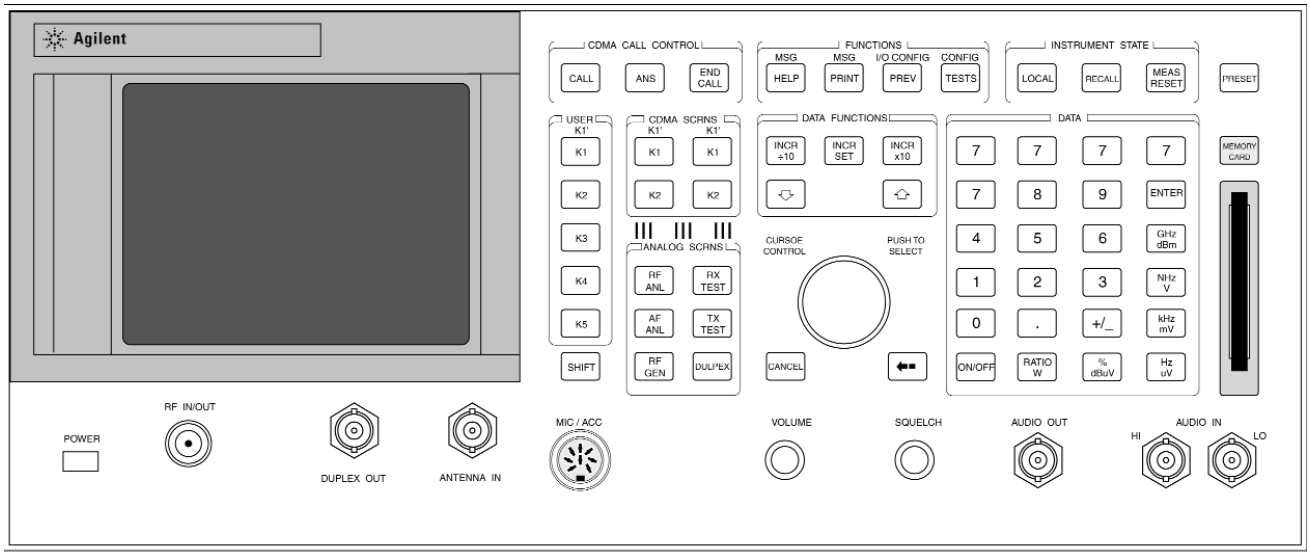
Standard: Conducted and Radiated interference meets CISPR-11, IEC 801-2, IEC 801-3, and IEC 801-4

With the 83236B: Conducted and Radiated interference meets IEC 801-3

Leakage: *At RF Generator output levels <–40 dBm, typical radiated leakage is <1 µV induced in a resonant dipole antenna 25 mm (one inch) away from any surface except the rear panel. Spurious leakage levels are typically <5 µV in a resonant dipole antenna 25 mm (one inch) away from any surface except the rear panel. Spurious leakage levels at the rear panel are typically <5 µV in a resonant dipole antenna at a distance of 250 mm (ten inches).*

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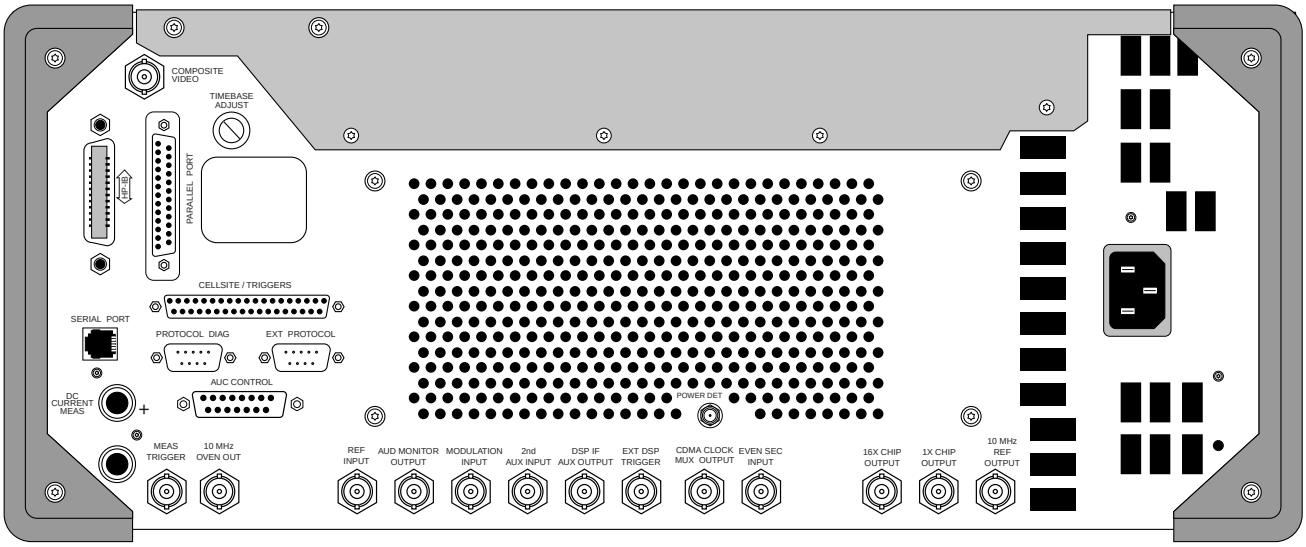
Front Panel



Front Panel Inputs:
RF Input/Output: Type N
Antenna Input: BNC
Microphone/Accessory: 8-pin DIN
Audio Input: Dual BNC'sRear Panel Outputs:

Front Panel Outputs:
RF Input/Output: Type N
DUPLEX OUT: BNC
Audio Output: BNC

Rear Panel



Rear Panel Inputs:
Modulation Input (Analog): BNC
Reference Input: BNC
Power Detector (Input for 83236B): SMA
DC Current Measure (Input): Dual banana jacks

Rear Panel Digital Ports:
Parallel Printer Port: Centronics 25 pin sub-min D
Serial Port (RS-232): RJ-11
Protocol Diag: Not functional

Rear Panel Outputs:
CRT Video Output: BNC
Audio Monitor Output: BNC
10 MHz Oven Output: BNC
10 MHz Reference Output: BNC
CDMA (Frame) Clock Multiplexer Output: BNC
Cellsite/Triggers: 37 pin sub-min D (protocol logging output)

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Agilent 83217A Test List

Option 001
AMPS/NAMPS/CDMA

CDMA Quick General Test
CDMA Call Processing Check
CDMA Softer Handoff Add and Drop Check
CDMA RX Sensitivity and Dynamic Range
CDMA RX Demodulation of Traffic Channel with AWGN
CDMA TX Modulation Quality (includes frequency accuracy)
CDMA TX Open Loop Power Control Accuracy
CDMA TX Closed Loop Power Control Range
CDMA TX Maximum RF Output Power
CDMA TX Minimum Controlled Output Power
CDMA/AMPS Digital to Analog Handoff
AMPS/NAMPS Call Processing Registration
AMPS/NAMPS Call Processing Page
AMPS/NAMPS Call Processing Release
AMPS/NAMPS Call Processing Origination
AMPS/NAMPS Call Processing Hook Flash
AMPS/NAMPS Flow Chart (manual phone test)
AMPS/NAMPS TX Frequency Error
AMPS/NAMPS TX RF Output Power
AMPS/NAMPS TX Modulation Deviation Limiting
AMPS/NAMPS RX Audio Frequency Response
AMPS/NAMPS RX Audio Distortion
AMPS/NAMPS TX Signaling Tone/DST
AMPS/NAMPS RX Hum and Noise
AMPS/NAMPS TX SAT/DSAT
AMPS/NAMPS TX RVC Data Deviation
AMPS/NAMPS TX Current Drain
AMPS/NAMPS TX DTMF Frequency Error
AMPS/NAMPS TX Quick General Test
AMPS/NAMPS RX Expandor Response
AMPS/NAMPS RX Audio Frequency Response
AMPS/NAMPS RX Audio Distortion
AMPS/NAMPS RX Hum and Noise
AMPS/NAMPS RX Sensitivity (SINAD)
AMPS/NAMPS RX FVC Order Message Error Rate
AMPS/NAMPS RX Quick General Test
NAMPS RX MRI Performance

Option 003
NTACS/JTACS/CDMA

JTACS/NTACS Registration
JTACS/NTACS Page
JTACS/NTACS TX Frequency Error
JTACS/NTACS TX Carrier Power
JTACS/NTACS TX Peak Frequency Deviation
JTACS/NTACS TX Audio Frequency Response
JTACS/NTACS TX Audio Distortion
JTACS/NTACS TX Signaling Tone/DST
JTACS/NTACS TX FM Hum and Noise
JTACS/NTACS TX SAT/DSAT
JTACS/NTACS TX RVC Data Deviation
JTACS/NTACS TX Compressor Response
JTACS/NTACS TX Current Drain
JTACS/NTACS RX Expandor
JTACS/NTACS RX Audio Frequency Response
JTACS/NTACS RX Audio Distortion
JTACS/NTACS RX Hum and Noise
JTACS/NTACS RX SINAD
JTACS/NTACS RX FVC Order Message Error Rate
JTACS/NTACS Release
JTACS/NTACS Origination
JTACS/NTACS No Audio Functional
JTACS/NTACS TX Quick General
JTACS/NTACS RX Quick General
JTACS/NTACS Flow Chart
JTACS/NTACS TX Switch Channels
JTACS/NTACS Hook Flash
JTACS/NTACS TX DTMF Frequency Error
CDMA Registration
CDMA Origination
CDMA Page
CDMA TX Waveform Quality and Freq. Acc.
CDMA TX Open Loop Power Control
CDMA TX Closed Loop Power Control
CDMA TX Maximum RF Output Power
CDMA TX Min. Controlled Output Power
CDMA RX Traffic Channel FER
CDMA RX Sensitivity and Dynamic Range
CDMA Softer Handoff
CDMA RX/TX CDMA Quick General
CDMA Voice Quality
CDMA TX Spectrum Emissions
CDMA Release
CDMA/AMPS Digital to Analog Handoff

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Option 004 (Requires 83236B PCS Interface) CDMA/PCS/AMPS/NAMPS

AMPS/NAMPS Registration
AMPS/NAMPS Page
AMPS/NAMPS TX Frequency Error
AMPS/NAMPS TX RF Power Output
AMPS/NAMPS TX Modulation Deviation Limiting
AMPS/NAMPS TX Audio Frequency Response
AMPS/NAMPS TX Audio Distortion
AMPS/NAMPS TX Signaling Tone/DST
AMPS/NAMPS TX FM Hum and Noise
AMPS/NAMPS TX SAT/DSAT
AMPS/NAMPS TX RVC Data Deviation
AMPS/NAMPS TX Compressor Response
AMPS/NAMPS TX Current Drain
AMPS/NAMPS RX Expandor
AMPS/NAMPS RX Audio Frequency Response
AMPS/NAMPS RX Audio Distortion
AMPS/NAMPS RX Hum and Noise
AMPS/NAMPS RX SINAD
AMPS/NAMPS RX FVC Order Message Error Rate
AMPS/NAMPS Release
AMPS/NAMPS Origination
AMPS/NAMPS No Audio Functional
AMPS/NAMPS TX Quick General
AMPS/NAMPS RX Quick General
AMPS/NAMPS Flow Chart
AMPS/NAMPS TX Switch Channels
AMPS/NAMPS Hook Flash
AMPS/NAMPS TX DTMF Frequency Error
AMPS/NAMPS RX MRI
CDMA Registration
CDMA Origination
CDMA Page
CDMA TX Waveform Quality and Freq. Acc.
CDMA TX Open Loop Power Range
CDMA TX Closed Loop Power Control
CDMA TX Maximum RF Output Power
CDMA TX Minimum Controlled Output Power
CDMA RX Traffic Channel FER
CDMA RX Sensitivity and Dynamic Range
CDMA Softer Handoff
CDMA RX/TX CDMA Quick General
CDMA Voice Quality
CDMA TX Spectrum Emissions
CDMA Release
CDMA/AMPS Digital to Analog Handoff

Agilent E8290A Test List

E8290A Point of Service Test (PoST)

CDMA Registration
CDMA Origination
CDMA Page
CDMA Base Station Release
CDMA Quick General
CDMA Waveform Quality and Frequency Accuracy
CDMA Open Loop Power Range
CDMA Closed Loop Power Control
CDMA Maximum RF Output Power
CDMA Minimum RF Output Power
CDMA Traffic Channel FER with AWGN
CDMA Sensitivity and Dynamic Range
CDMA Softer Handoff
CDMA Voice Quality
CDMA Spectrum Emissions
CDMA Talk Time
CDMA Sensitivity Level Search
CDMA Digital to Analog Handoff
Analog Registration
Analog Page
Analog Origination
Analog Base Station Release
Analog TX Quick General
Analog RX Quick General
Analog No Audio Functional
Analog TX Frequency Error
Analog TX RF Power Output
Analog TX Modulation Deviation Limiting
Analog TX Audio Frequency Response
Analog TX Audio Distortion
Analog Signaling Tone/DST
Analog TX FM Hum and Noise
Analog SAT/DSAT
Analog RVC Data Deviation
Analog Compressor Response
Analog Current Drain
Analog Expandor Response
Analog RX Audio Frequency Response
Analog RX Audio Distortion
Analog RX Hum and Noise
Analog SINAD
Analog FVC Order Message Error Rate
Analog No Audio Functional
Analog Switch Channels
Analog Hook Flash
Analog DTMF Frequency Error
Analog NAMPS MRI
Change Global Parameters
Change Channel For
Change Channel List
Access to a User DLL

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