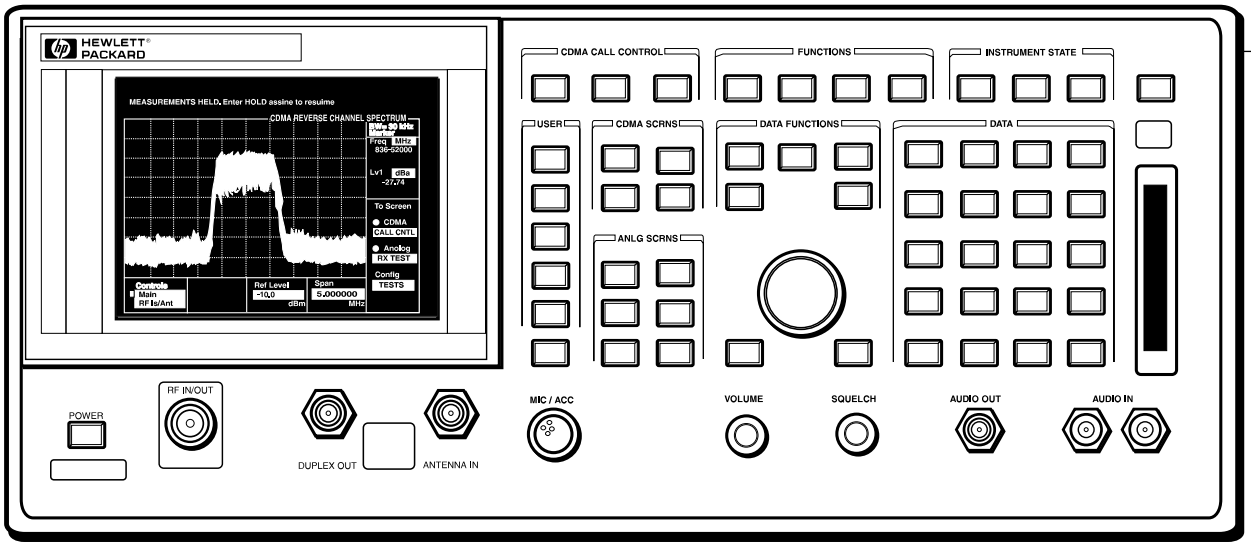
HP 8924C
CDMA mobile station test set
250 kHz to 1000 MHz
HP 83217A
CDMA dual-mode mobile station test software

Technical specifications



The HP 8924C CDMA Mobile Station Test Set provides the key set of measurements to verify the performance of dual-mode CDMA mobile telephones. Acting as a calibrated, high performance CDMA base station, the HP 8924C verifies not only the parametric characteristics of CDMA phones, but also the functional aspects of phone performance. The HP 8924C is optimized to provide high accuracy measurements in minimum time.

CDMA and Analog Testing

In addition to its CDMA functionality, the HP 8924C includes full AMPS, NAMPS and TACS analog phone test capability. Based on the analog capabilities of the HP 8920B RF communications test set, the HP 8924C's analog mode is fully HP-IB mnemonic compatible with programs written for the HP 8920B. With the HP 8924C, you save space, cost, and training expenses by making both analog and CDMA digital cellular measurements with the same instrument.

One-Button Call Processing

With the press of a single button, the HP 8924C automatically handles the complex, over-the-air call processing required to make a CDMA phone call. For complete call processing verification, the HP 8924C 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 HP 8924C's voice echo mode. When active, the voice echo mode delays and then retransmits to the mobile any audio spoken into the CDMA mobile.

In addition to CDMA call processing, the HP 8924C has new analog cellular call processing. While in this mode, analog cellular call processing is as easy as pressing a single key. User settable cell configuration parameters include control channel number, SID, SAT tone, and VMAC. Single button commands initiate power level changes, handoffs, and registration.

CDMA Transmitter Measurements

The HP 8924C incorporates a next generation average power measurement based on new DSP technology. The HP 8924C also provides a DSP-based channel power measurement that reports the power in a 1.23 MHz bandwidth measured at its internal IF. By calibrating the channel power measurement against the average power measurement, the HP 8924C achieves accurate low-level CDMA power measurements.

The HP 8924C measures transmitted waveform quality by the IS-98 recommended correlated power method also known as the rho measurement ("ρ"). In addition, the rho measurement reports the frequency error, modulation phase and amplitude error, and the carrier feedthrough.

High Accuracy CDMA Source for CDMA Receiver Test

The HP 8924C generates all of the channels required by the IS-95A air interface, just like an operational CDMA base station. The active cell site simulation in the HP 8924C is supplied by Sector A. The Sector A source supports the following CDMA channels: Pilot, Sync, Paging, Traffic, and OCNS (Orthogonal Channel Noise Source). In addition, the HP 8924C has a second sector for testing softer handoffs. Sector B is a partial sector that has a Pilot channel, a Traffic channel and an OCNS channel. An Additive White Gaussian Noise (AWGN) source is also included to provide the interference generated by adjacent cells in a working CDMA network.

CDMA Receiver Tests

The key performance parameter for CDMA mobile station receivers is Frame-Error-Rate in the presence of AWGN. The HP 8924C fully supports Service Option 2 (RF data loopback mode) to test receiver FER (frame error rate) performance. With Service Option 002, the HP 8924C actually compares the received 9600 bps data to the transmitted 9600 bps pseudorandom data and performs a bit-by-bit comparison to calculate the true FER. The HP 8924C uses the industry standard CCITT 2^{15-1} PRBS pattern for its data source. For complete receiver characterization, the HP 8924C measures FER at all four data rates used in the CDMA system: 9600, 4800, 2400, and 1200 bps.

To reduce CDMA receiver test time to an absolute minimum, the HP 8924C uses confidence limit technology to determine FER test results. Simply set the target FER specification and confidence limit, then start the test. The HP 8924C then uses a statistical model compliant with the IS-98 standard to determine if and when the CDMA phone has passed the test. If few errors are detected, the test passes in a minimum period of time. As more errors are detected, the test lengthens to provide confidence that the true FER performance of the mobile meets the target specification.

An HP innovation also extends the confidence limit methodology to stop the test early if the phone fails the confidence limit with the requested confidence interval. Early termination on FER tests eliminates wasted time when defective mobiles are detected.

Hard and Softer Handoff Verification

HP 8924C supports hard handoffs between RF channels. Hard handoff support means that once a CDMA phone call is established, testing can continue on different RF channels without having to tear the call down. To make a hard handoff with the HP 8924C, establish a CDMA call, then just enter a new RF channel number.

With two configurable CDMA sectors, the HP 8924C can verify the ability of a CDMA mobile to support softer handoffs. Softer handoffs are similar to soft handoffs and only differ in that the HP 8924C sends identical power control bits to both CDMA cell sectors. This capability provides a low cost method of verifying soft handoff functionality and diversity combining in CDMA mobile telephones.

HP 83217A Dual-Mode Mobile Station Test Software

Besides its many measurement functions, the HP 8924C includes a programmable IBASIC controller. This controller allows the creation of custom measurement software. For those who do not wish to write their own software, Hewlett-Packard offers the HP 83217A dual-mode mobile station test software. The HP 83217A automates cellular mobile measurements using the HP 8924C. Automated testing improves consistency and reduces operator errors resulting in lower operating costs and improved product quality.

The HP 83217A offers two options for testing cellular mobile stations. Option 001 supports testing of mobiles that are AMPS, NAMPS, and CDMA compliant, while Option 002 supports testing of TACS, ETACS, and CDMA mobiles. Both software packages provide a comprehensive suite of analog and digital tests that can be customized to fit specific requirements. Test points, test limits, and test sequences can be stored for future retrieval.

HP 8924C/83217A analog mode specifications

Specifications describe the instruments warranted performance and apply after a 30 minute warm-up. These specifications are valid over the HP 8924C'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 not warranted performance.*

Signal generator

RF Frequency

Range:	250 kHz to 1000 MHz.
Accuracy & 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:	-127 to -9 dBm into 50 ohms.
Level Accuracy:	±1.2 dB (Level [3]-127 dBm).
	typically ±1.0 dB for all levels.
Reverse Power:	6 watts continuous.
	10 watts for 10 sec/minute.
SWR:	<1.5:1.
Duplex Out Connector:	
Level Range:	-127 to +7 dBm into 50 ohms.
Level Accuracy:	±1.0 dB.
Reverse Power:	200 mW maximum.
SWR:	<2.0:1 (level <-4 dBm).
Resolution:	*0.1 dB.*

Spectral Purity

Spurious Signals:	(for ≤+1 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):	<7 Hz for 500 MHz $<f_c \leq$1000 MHz.
	<4 Hz for 250 MHz $\leq f_c \leq$500 MHz.
	<7 Hz for 250 kHz $\leq f_c <$250 MHz.
SSB Phase Noise:	*<-116 dBc/Hz (for >20 kHz offsets at a 1000 MHz carrier frequency).*

FM

FM Deviation (rates >25 Hz): 100 kHz; 0.25 to <249 MHz.

50 kHz; 249 to <501 MHz.

100 kHz; 501 to 1000 MHz
(FM not specified for {f_c - FM deviation} <250 kHz).

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).*

DC Coupled: *DC to 75 kHz (typical -3 dB BW).*

FM Accuracy (1 kHz rate): ≤10 kHz dev: ±3.5% of setting ±50 Hz.

>10 kHz dev: ±3.5% of setting ±500 Hz.

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

Center Frequency Accuracy in DC FM Mode: (external source impedance <1 k ohms): ±500 Hz (after DCFM zero), *typically ±50 Hz.*

Ext. Mod Input Impedance: *600 ohms nominal.*

Resolution: *50 Hz for <10 kHz deviation.*

500 Hz for ≥10 kHz deviation.

Audio source (both internal sources)

Frequency

Range: dc to 25 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 ohm (at 1 kHz).

Accuracy: ±2% of setting plus resolution.

Residual Distortion (THD + Noise, level ≥ 200 mVrms): <0.125%; 20 Hz to 25 kHz in an 80 kHz BW.

Resolution:

Level ≤0.01V: *±50 uV.*

Level ≤0.1V: *±0.5 mV.*

Level ≤1V: *±5 mV.*

Level <10V: *±50 mV.*

Offset in DC coupled mode: <50 mV.

RF analyzer

RF Frequency Measurement

Meas. Range: 400 kHz to 1000 MHz.

Level Range:

RF In/Out: 0.1 mW to 6 W continuous.

10 W for 10 seconds per minute.

ANT In: -36 dBm to +20 dBm.

Accuracy: ±1 Hz + 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 output port.

Frequency Range: 30 MHz to 1000 MHz.

Input Connector: RF In/Out connector only.

Measurement Range: 0.1 mW to 6 W continuous.

10 W for 10 seconds per minute.

Accuracy: ±5% of reading ±1 µW from 15^0 C to 35^0 C.

±10% of reading ±1 µW from 0^0 C to 55^0 C.

SWR: <1.5:1.

Resolution:

Power < 10W: 1 mW.

Power <100mW: 0.1 mW.

Power <10 mW: *0.01 mW.*

FMMeasurement

Frequency Range: 5 to 1000 MHz *(usable to 400 kHz).*

Deviation Range: 20 Hz to 75 kHz.

Sensitivity: 2 µV (15 kHz IF BW, High Sensitivity Mode, 0.3 - 3 kHz BW),

Typically <1 µV (12 dB SINAD, f_c ≥10 MHz).

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

Bandwidth (3 dB): 2 Hz to 70 kHz (DCFM measurements also available).

THD+Noise: <1% for ≥5 kHz Deviation and 1 kHz rate in a 0.3 - 3 kHz BW.

Input Level Range for Specified Accuracy: -28 to +38 dBm at RF In/Out (1.6 µW to 6 W).

-50 to +14 dBm at Ant In.

Residual FM & Noise (0.3 - 3 kHz, rms): <7 Hz.

Resolution: *Deviation <10 kHz: 1 Hz.*

Deviation. ≥10 kHz: 10 Hz.

Spectrum Analyzer

Frequency Range: 400 kHz to 1000 MHz. Center frequency coupled to RF Analyzer setting.

Frequency Span/Resolution Bandwidth (coupled):

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

Plus full span capability

Display: Log with 10 dB/div, 2 dB/div, or 1 dB/div.

Display Range: 80 dB.

Reference Level Range: +50 to -50 dBm.

Residual Responses: <-70 dBm (Ant input, 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.*

Tracking generator

Frequency Range: 400 kHz to 1000 MHz.

Frequency Offset: Frequency span endpoints ±frequency offset cannot be <400 kHz or >1000 MHz.

Output Level Range: same as signal generator.

Sweep Modes: Normal and Inverted.

Adjacent channel power

Relative Measurements

Level Range:

RF In/Out: -10 dBm to +38 dBm continuous (6 W).

up to +40 dBm (10 W) for 10 seconds per minute.

ANT In: -40 dBm to +20 dBm.

Dynamic Range: *typical values for channel offsets.*

Offset	*Res BW*	*Dyn. Range*
12.5 kHz	*8.5 kHz*	*-65 dBc*
20 kHz	*14 kHz*	*-68 dBc*
25 kHz	*16 kHz*	*-68 dBc*
30 kHz	*16 kHz*	*-68 dBc*
60 kHz	*30 kHz*	*-65 dBc*

Relative Accuracy: ±2.0 dB

Absolute Measurements

Level: Results of absolute power in Watts or dBm are deter mined by adding the ACP ratio from the Spectrum Analyzer to the carrier power measurement obtained from the input section RF power detector.

Level Range:

RF In/Out: 0.1 mW to 6 W continuous. up to10 W for 10 seconds per minute.

ANT In: Not available.

Dynamic Range: *typical values for channel offsets.*

Offset	*Res BW*	*Dyn. Range*
12.5 kHz	*8.5 kHz*	*-65 dBc*
20 kHz	*14 kHz*	*-68 dBc*
25 kHz	*16 kHz*	*-68 dBc*
30 kHz	*16 kHz*	*-68 dBc*
60 kHz	*30 kHz*	*-65 dBc*

Absolute Accuracy: is the sum of the RF Power Measurement Accuracy found in the RF Analyzer section and the ACP Relative Accuracy of ±2.0 dB.

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: 0.1Hz.

f ≥100 kHz: 1 Hz.

AC Voltage Measurement

Measurement Range: 0 to 30 Vrms.

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

Residual THD+Noise (15 kHz BW): 150 µV.

3 dB Bandwidth: *typically 2 Hz - 100 kHz.*

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

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

DC Voltage Measurement

Voltage Range: 100 mV to 42V.

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 ±5%.

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 ±5%.

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

Frequency Range (-3 dB BW): 2 Hz to 50 kHz.

Scale / Division: 10 mV to 10 V.

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

Time / Division: 10 µs to 100 ms.

Trigger Delay: 20 µs to 3.2 seconds.

3 dB Bandwidth: *typically >100 kHz.*

Internal DC Offset: *≤0.1 div (≥50 µV / div sensitivity).*

Signaling

Formats

Capability for generating and analyzing the following formats: AMPS, EAMPS, NAMPS, TACS, JTACS, NTACS, ETACS, NMT-450S, NMT-900S, LTR, EDACS, MPT 1327.

Function generator waveforms: Sine, square, triangle, ramp, dc, White Gaussian and White Uniform noise.

Function Generator Frequency Range & Level: same as audio source.

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)

HP 8924C/83217A CDMA mode specifications

Call processing functionality

Base Station User Settable Parameters: NID, SID, BASE_ID, SRCH_WIN_A, SRCH_WIN_N, SRCH_WIN_R, Pilot Inc, register NID, and register SID

Access Probe User Settable Parameters: NOM_PWR, INIT_PWR, PWR_STEP, PAM_SZ, NUM_STEP, MAX_REQ_SEQ, and MAX_RSP_SEQ.

Paging Channel User Settable Parameters: Paging Data Rate (full or half rate), and SLOT_CYCLE_INDEX.

Base Station Threshold User Settable Parameters: T_ADD, T_DROP, T_COMP, and T_TDROP.

Service Option Modes: Service Option 001 (normal voice) and Service Option 002.

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

Handoff Support: Hard (RF Frequency), and Softer.

Call Status Indicators: Transmitting (cell active), Registering, Page Sent, Access Probe Received, Connected, Softer Handoff, Hard Handoff, Service Option 002.

Speech Encoding: none.

Speech Echo Mode: Three user selectable fixed delays - 0 sec, 2 sec, and 5 sec.

CDMA Data Source: Pseudorandom data (CCITT 2^{15-1} pattern) or Voice Echo.

Closed Loop Power Control: Supports True Closed Loop Power Control Mode, Open Loop Mode (Alternating 0's and 1's power control bit pattern), n Up, n Down, or a ramp of 100 Up followed by 100 Down power control bits, and off (no puncturing).

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

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

Adjacent Cell Mobile Reporting: Displays status, PN offset, strength, and keep bit for all pilots found by the CDMA mobile and reported via pilot strength messages.

Neighbor List Support: Automatically generates a list of 8 neighbors based on user entry of Sector A PN offset, Sector B PN offset and Pilot Inc.

Mobile Station Identification: 10 digit phone number, or MIN (hex entry only), or auto (requests an automatic zone base registration).

Registration: Supports zone based registration via HP-IB command or front panel button. Also supports mobile power on registration.

Retrievable Mobile Parameters: Supports **IS-95A** message format only. Does not work properly with IS-95 Phones.
MUX_REV_(1 to 14), MUX1_FOR_(1 to 14),
PAG_(1 to 7), ACC_(1 to 8), LAYER2_RTC(1 to 5),
OTHER_SYS_TIME.

Mobile database: Upon registration, the database contains the following parameters -ESN, MIN1, MIN2, phone number, dual-mode status, slot class, slot index, power class, transmit mode and the called number.

CDMA signal generator

CDMA Channels:

Additive White Gaussian Noise (Ioc)

Sector Awith 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

Sector Bwith selectable PN offset: Pilot Channel at Walsh Code 0

Traffic Channel with selectable Walsh Code

OCNS Channel with selectable Walsh Code

Frequency

Frequency Range: 501 MHz to 1000 MHz.*Also usable from 10 MHz to 248.9 MHz with reduced accuracy.*

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:

RF In/Out: -109 dBm/1.23 MHz to -20 dBm/1.23 MHz.
Usable to -127 dBm / 1.23 MHz with reduced level accuracy.

Duplex Out: -109 dBm/1.23 MHz to -4 dBm/1.23 MHz.
Usable to -127 dBm / 1.23 MHz with reduced level accuracy.

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

RF In/Out:

AWGN Off: ±1.5 dB.

AWGN On: ±2.0 dB.

Duplex Out:

AWGN Off: ±1.5 dB.

AWGN On: ±2.0 dB.

Composite Signal Output Power: equal to the sum of the individually settable power levels for AWGN, Sector A, and Sector B.

Maximum Individual Signal Dynamic Range: The maximum dynamic range of any CDMA channel (AWGN, Sector A: Pilot, Sync, Paging, Traffic, or OCNS, Sector B: Pilot, 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 A OCNS Channel Relative Level Range: Automatically calculated from other Sector A channel relative levels to provide the set Sector A total power.

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

Individual Channel Amplitude Resolution: 0.01 dB.

Relative CDMA Channel Level Accuracy:

AWGN to Traffic Channel: <0.2 dB ±5^0 C from last temperature at which PCB-CAL was run for values of E_b/N_t from 1dB to 10 dB.

Between any two CDMA channels: <0.2 dB ±5^0 C from last calibration temperature at which PCB-CAL was run.

CDMA Modulation

Modulation Type: QPSK per TIA IS-95.

Residual ρ: better than 0.97, *typically >0.98.*

Carrier Feedthrough: Better than -30 dBc, *typically better than -34 dBc from +10^0 C to +40^0 C.*

Adjacent Channel Spectral Purity: *<-45 dBc in a 30 kHz BW at ±895 kHz offset from carrier frequency relative to the total carrier power in a 1.23 MHz bandwith.*

Data Rate Transmission Modes: IS-95 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: Pseudo-random data (CCITT 2^{15-1} pattern).

Analyzer

CDMA Average 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 output port.

Input Frequency Range: 30 MHz to 1000 MHz.

Input Connector: RF In/Out Connector Only.

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: +38 dBm (6 Watts cont., 10 Watts allowable for 10 seconds per minute).

Measurement Range: -10 dBm to +38 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 (8 power control groups) in full, half, quarter or one-eighth rate modes.

Measurement Update Rate: *typically 1.5 readings per second.*

Measurement Accuracy: ±5% ±1 µW at 25° C $\pm 10^{0}$ C.

±10% ±1 µW from 0° C to +55° C.

CDMA Tuned Channel Power Measurement

Input Frequency Range: 4 MHz to 1000 MHz.

Input Connector: RF In/Out *(Usable on Ant Input with relative power measurement capability only).*

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

Maximum Input Level: +38 dBm (6 Watts cont., 10 Watts allowable for 10 seconds per minute).

Measurement Range: -50 dBm to +10 dBm. *Usable to +38 dBm with degraded accuracy.*

Measurement Update Rate: *typically 2 readings per second.*

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):

±1.0 dB at ±5 °C from the calibration temperature.

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

Measurement Period: Measures power in a 1.23 MHz bandwidth over 1/2 of a CDMA frame (8 power control groups) in full, half, quarter or one-eighth rate modes.

CDMA Modulation Measurement

Input Frequency Range: 4 MHz to 1000 MHz.

Modulation Measurement Format: OQPSK per TIA IS-95.

Measurement Type: Traffic channel ρ, and test mode ρ (requires a special firmware test mode in the CDMA mobile under test).

ρ Measurement Input Level Range: -20 dBm to +38 dBm. *Usable to -30 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 1.5 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: Static Timing Accuracy, Carrier Feedthrough, Amplitude Error, Phase Error.

CDMA Frame Error Rate Measurement

FER Measurement Method: Data loopback per Service Option 2 supporting Confidence limits as outlined in TIA IS-98.

Supported Data Rates for FER Measurement: Full, Half, Quarter, or Eighth Rate.

Confidence Limit Range: User definable from 80.0% to 99.9% and Off.

Confidence Limit Statistical Model: Meets IS-98 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 specified confidence.

Passed: Measured FER passed the specified FER limit with specified confidence.

CDMA reverse channel spectrum display

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
5MHz	30 kHz

Display: Log with 10 dB/div.

Display Range: 80 dB.

Reference Level Range: +50 to -50 dBm.

CDMA triggers

Output Trigger Signals: Power control bit send (some error is in this signal's timing), CDMA flag, Protocol Flag.

Trigger Inputs: DSP trigger.

HP 8924C/83217A common specifications

Remote programming

Programming

HP-IB: Hewlett-Packard's implementation of IEEE Standard 488.2.

Remote Front Panel Lockout: Allows remote user to disable the front panel display to improve HP-IB 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, 2 available).

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.

Time base subsystem

(for proper operation, this reference must be locked to either the HP 8924C'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: 19.6608 MHz, 10 MHz, 1.2288 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).

Ovenized reference

Aging Rate:	<0.005 ppm pk-pk/day, <±0.1 ppm per year (±85 Hz @ 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 ±3dB into 50* Ω.

Store/recall

Available RAM:

Approximately 928 KBytes of user available RAM. When running the HP 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 HP 8924C.

General specification

Dimensions (HxWxD):	177H x 426W x 574D mm., (7 x 16.75 x 23 inches).
Weight:	27 kg, 59 lbs.
CRT Size:	7 x 10 cm.
Operating Temperature:	0° C to +55° C.
Storage Temperature:	-55° C to +75° C.
Power:	100 V to 240 V, 48 to 66 Hz, *nominally 200 VA.*
Calibration Interval:	one year.
EMI:	Conducted and Radiated interference meets MIL STD 461B RE03, CE03 narrowband and CE03 broadband above 200 kHz. Conducted susceptibility meets MIL STD 461B CS01 and CS02.

Leakage: *At RF Generator output levels <-40 dBm, typical radiated leakage is <1 µV induced in a resonant dipoleantenna 25 mm (1 inch) away from any surface except the rear panel. Spurious leakage levels are typically <5 µV in a resonant dipole antenna 25 mm (1 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 254 mm (10 inches).*

CDMA Mobile Station Test Set

HP 8924C	CDMA Mobile Station Test Set
Option 011	ETACS CCITT Filter (replaces the C-Message Filter)
Option 0BW	Assembly Level Repair Manual (PN 08924-90112)
Option 0B1	Extra Manual Set (includes 1 extra User's Guide and 2 Assembly Level Repair Manuals)
Option AX4	Rack Mount Flange Kit

CDMA Dual-Mode Mobile Station Test Software

HP 83217A	CDMA Dual-Mode MS Software

(Must order one of the two available options)

Option 001	AMPS/NAMPS/CDMA
Option 002	TACS/ETACS/CDMA

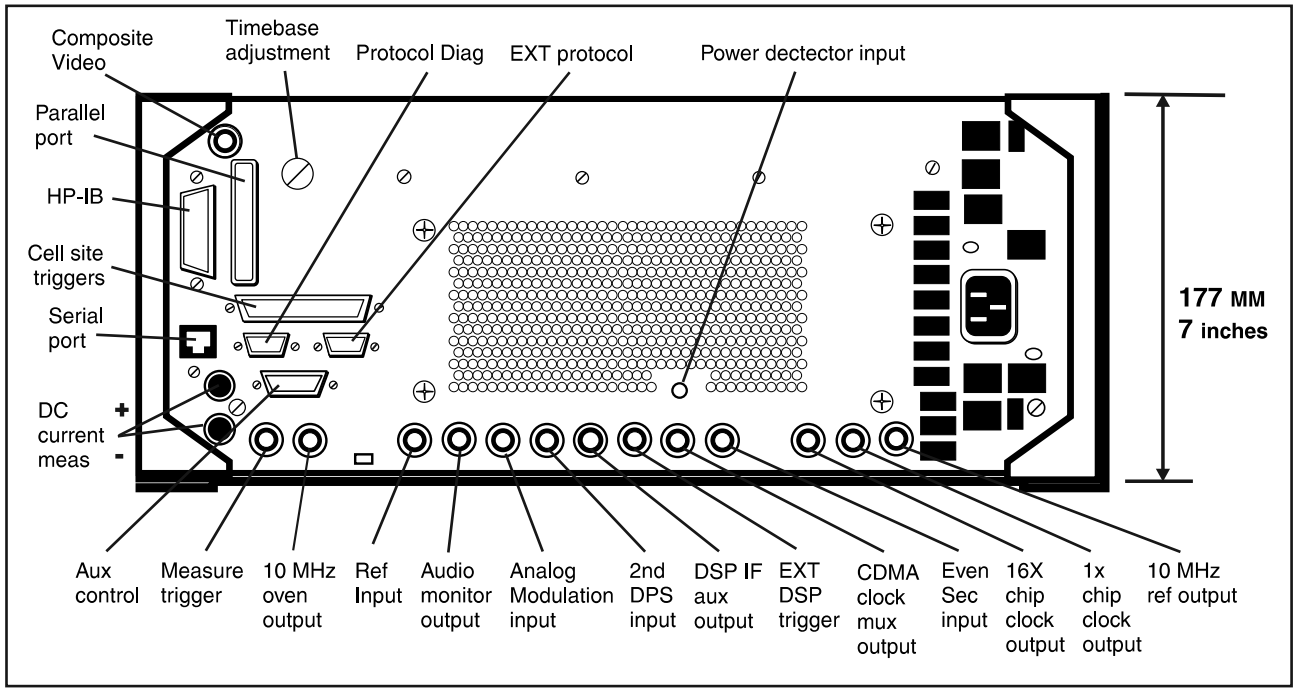
Supported Printers for Screen and Test Printouts

C2164A	DeskJet 660C Printer
C2003A	LaserJet 4L Printer

PCMCIA Memory Cards for IBASIC Program and Data Storage

HP 83230A	64 KByte PCMCIA SRAM Card
HP 83231A	1 MByte PCMCIA SRAM Card

Back pannel location



Front and rear panel conections

Front Panel Inputs:	**Front Panel Outputs:**
RF Input/Output: Type N.	RF Input/Output: Type N.
Antenna Input: BNC.	Duplex Output: BNC.
Microphone/Accessory: 8-pin DIN.	Audio Output: BNC.
Audio Input: dual BNC's.	
Rear Panel Inputs:	**Rear Panel Outputs:**
Modulation Input: BNC.	CRT Video Output: BNC.
External Scope Trigger Input: BNC.	Audio Monitor Output: BNC.
Reference Input: BNC.	10 MHz Oven Output: BNC.
Auxiliary DSP Baseband Input: BNC.	10 MHz Reference Output: BNC.
Every Even Second Input: BNC.	Frame Clock Multiplexer Output: BNC.
DSP Trigger Input: BNC.	19.6608 MHz Clock Output: BNC.
Translator Power Detector Input: SMA.	1.2288 MHz Clock Output: BNC.
Current Sense Input: dual banana jacks.	3.6864 MHz IF Output: BNC.
	CDMA Clocks & Triggers: 37 pin sub-min D.
Rear Panel Digital Ports:	**Rear Panel Digital Ports:**
HP-IB Port: 24 pin GP-IB.	Protocol Ext. RS-232 Port: 9 pin sub-min D.
Translator Interface Port (Aux Control): 15 pin sub-min D.	Protocol Diagnostic RS-232 Port: 9 pin sub-min D.
Parallel Printer Port: Centronics 25 pin.	
Host RS-232 Port: RJ-11.	

HP 83217A Test listing (with the HP 8924C)

Option 001 AMPS / NAMPS / CDMA

CDMA Quick General Test

CDMA Call Processing Check

CDMA CP 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

AMPS/NAMPS CP Call Processing Registration

AMPS/NAMPS CP Call Processing Page

AMPS/NAMPS CP Call Processing Release

AMPS/NAMPS CP Call Processing Origination

AMPS/NAMPS CP Call Processing Hook Flash

AMPS/NAMPS CPA 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 & 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 002 TACS / ETACS / CDMA

CDMA Quick General Test

CDMA Call Processing Check

CDMA CP 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

TACS/ETACS CP Call Processing Registration

TACS/ETACS CP Call Processing Page

TACS/ETACS CP Call Processing Release

TACS/ETACS CP Call Processing Origination

TACS/ETACS CP Call Processing Hook Flash

TACS/ETACS CP TACS-2 Page and Release

TACS/ETACS CPA Flow Chart (manual phone test)

TACS/ETACS TX Frequency Error

TACS/ETACS TX Carrier Power

TACS/ETACS TX Peak Frequency Deviation

TACS/ETACS TX Audio Frequency Response

TACS/ETACS TX Audio Distortion

TACS/ETACS TX Signaling Tone

TACS/ETACS TX FM Hum & Noise

TACS/ETACS TX SAT

TACS/ETACS TX RVC Data Deviation

TACS/ETACS TX Compressor Response

Option 002 TACS/ETACS/CDMA (cont.)

TACS/ETACS TX Current Drain
TACS/ETACS TX DTMF Frequency Error
TACS/ETACS TX Quick General Test
TACS/ETACS RX Expandor Response
TACS/ETACS RX Audio Frequency Response
TACS/ETACS RX Audio Distortion
TACS/ETACS RX Hum & Noise
TACS/ETACS RX Sensitivity (SINAD)
TACS/ETACS RX FVC Order Message Error Rate
TACS/ETACS RX Quick General Test

For more information on Hewlett-Packard Test & Measurement products, applications or services please call your local Hewlett-Packard sales offices. A current listing is available via Web through Access HP at **http://www.hp.com**. If you do not have access to the internet please contact one of the HP centers listed below and they will direct you to your nearest HP representative.

United States:
Hewlett-Packard Company
Test and Measurement Organization 5301
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1-800-452-4844

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P.O. Box 999
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Printed in U.S.A. 12/95
5964-3564E