

## Agilent E6380A 8935 Series AMPS/CDMA Base Station Test Set

Data Sheet

0.4 to 1000 MHz  
1.4 to 2.0 GHz

- Cellular and PCS frequency coverage
- Analog and digital (IS-95B and IS-2000 1XRTT) capabilities
- Built-in average power meter with  $\pm 7.5\%$  accuracy
- Waveform quality  $\epsilon$  ( $\rho$ ), frequency error, code domain power, timing, and phase analysis
- Built-in AWGN source for calibrated  $E_b/N_0$  settings
- Dedicated, one-button user interface keys
- Firmware upgradeable (via PCMCIA to Flash Memory)
- Network equipment manufacturer (NEM) base station specific automation software increases measurement repeatability and enhances technician efficiency



The Agilent Technologies 8935 Series E6380A AMPS/CDMA Cellular/PCS base station test set is the next generation in CDMA base station test equipment. The E6380A is a full featured, one-box test set designed to meet the needs of installation teams, service providers, and network equipment manufacturers.

Building on the success of our third generation of base station test equipment, the new test set heavily incorporates feedback from PCS and Cellular users. For example, the E6380A utilizes a large, bright, easy-to-read, electroluminescent display. A convenient connector section on the side of the test set allows unobtrusive, out-of-the-way hook up, as well as protects the connectors from damage. A suitcase form factor provides better portability.

The new "rugged design" includes a reliable membrane keypad, a gasketed display, and filtered airflow to resist dirt and moisture. The unit's enclosure provides for stand up operation, and helps protect itself from bumps and shocks.

More importantly, the E6380A incorporates a user-friendly interface with one-key measurement execution. This interface, coupled with test set's fast measurement speed and automated software for LGIC, Lucent, Nortel, and Samsung base stations, results in less off-line time and improved system performance. Errors due to test variability are reduced, and measurement data can be output to a printer or to the PCMCIA memory card. Additionally, new features and capabilities can be added to the E6380A without returning the unit to a service center. The test set's firmware is user upgradeable via a PCMCIA card to Flash Memory.

To complete the CDMA parametric test solution, Agilent also offers a technician training program to provide install teams and service providers with a comprehensive understanding of base station test.

For more information about the 8935 series E6380A, refer to the **products** link on our Web site at: [www.agilent.com/find/basestations](http://www.agilent.com/find/basestations)



Specifications describe the instrument's warranted performance and are valid over the entire operating/environmental range unless otherwise noted.

*Supplemental Characteristics are intended to provide additional information useful in applying the instrument by giving typical, but non-warranted performance parameters. These characteristics are shown in italics or labeled as "typical," "usable to," or "nominal."*

## CDMA Signal Generator Specifications

**Frequency Range:** 800 MHz to 1000 MHz, and 1.7 GHz to 2.0 GHz (usable 4 to 200 MHz)

**Output Level Range:**

**RF IN/OUT:** -120 dBm to -40 dBm

**DUPLEX OUT:** -120 dBm to -10 dBm

**Output Level Accuracy:**

**RF IN/OUT:** ±1.5 dB, *Typically ±1 dB*

**DUPLEX OUT:** ±1.5 dB, *Typically ±1 dB*

**Modes:** Noise only, data only, and user selectable  $E_b/N_0$  settings

**CDMA Signal Generator RF Level Accuracy (when in  $E_b/N_0$  mode):** *Typically ±1.5 dB*

## Modulation

**Reverse Link Source Modulation:** OQPSK per TIA IS-95

**Reverse Link Source Modulation Data:** Internal data buffer, Idle (all zeroes)

**Forward Link Source Modulation:** QPSK per TIA IS-95

**Forward Link Source Modulation Data:** Internal (Pilot Channel)

**Residual rho ( $\tau$ ):** Better than 0.96, *Typically better than 0.98*

**Carrier Feedthrough:** *Typically <-35 dBc*

**Adjacent Channel Noise:** *Typically <-50 dBc measured in a 30 kHz BW filter relative to the total carrier power at  $f_c \pm 900$  kHz for output levels <-40 dBm at the RF IN/OUT connector (<-10 dBm when using the DUPLEX OUT connector)*

## Data Buffer

**Size/Length:** 1800 frames per data rate set

**Modes:** Single, Continuous Looping, and Idle

**Coding:** IS-95 CDMA full rate reverse link channel coding, interleaving and spreading

**Long Code Mask:** 42 zeros

**Input Data:** 9600 bps and 14.4 kbps entered via GPIB

**Data Source:** For each data rate set there are 300 frames of random data factory loaded, 1800 frames additional user definable data which can be entered via GPIB.

## AWGN Source

(Additive White Gaussian Noise)

**Bandwidth:** 2 MHz nominally

**Distribution:** Gaussian to >3 sigma

**$E_b/N_0$  Resolution:** 0.1 dB

**$E_b/N_0$  Range:** -5 to 25 dB

**$E_b/N_0$  Accuracy:** ±0.5 dB for  $E_b/N_0$  of 5 to 20 dB, 25° C ±10° C, *Typically ±1 dB for  $E_b/N_0$  of 0 to +5 dB and +20 dB to +25 dB*

## CDMA Analyzer Specifications

### Average Power Measurement

**Input Frequency Range:** 30 MHz to 1000 MHz, and 1.7 to 2.0 GHz

**Input Connector:** RF IN/OUT only

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

**Maximum Input Level:** 15 W average for CDMA signals

**Measurement Range:**

4 mW to 15 W for  $f > 100$  MHz (+6 to +42 dBm)

4 mW to 1 W for  $f < 100$  MHz (+6 to +30 dBm)

**Measurement Period:** 0.25 ms to 26.66 ms

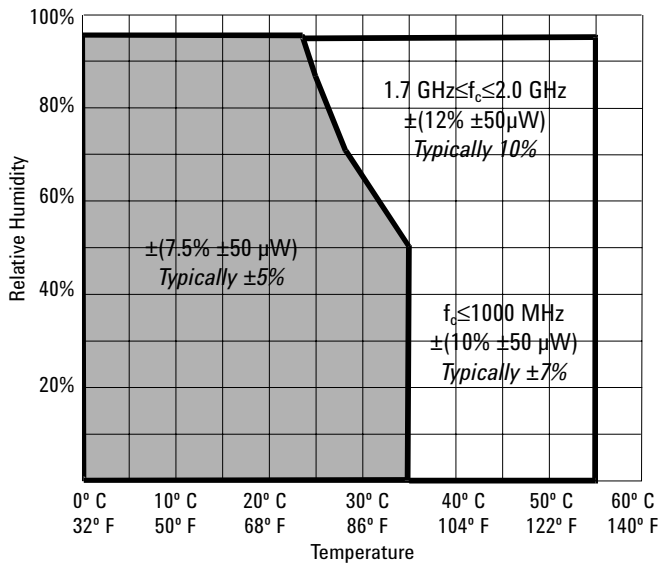


Figure 1. Average Power Measurement Accuracy

## Channel Power Measurement (1.23 MHz)

**Input Frequency Range:** 800 MHz to 1000 MHz, and 1.7 to 2.0 GHz

**Measurement Bandwidth:** Measures the total average power in a 1.23 MHz bandwidth centered on the selected frequency

**Measurement Range:**

**RF IN/OUT:** 0.1  $\mu$ W to 15 W average (–40 to +42 dBm)

**ANTENNA:** Typically, 16 pW to 1.25 W average (–78 to +4 dBm)

**Measurement Accuracy** (within five minutes of calibration (user initiated) and within the 7.5% average power environmental window):

**RF IN/OUT:** 800 to 1000 MHz  $\pm$  (0.75 dB  $\pm$ 25 nW) at 4.95 MHz  $\pm$  (1 dB  $\pm$ 40 nW)

**ANTENNA:** 800 to 1000 MHz typically,  $\pm$  (0.75 dB  $\pm$ 6.5 pW) at 4.95 MHz typically,  $\pm$  (0.75 dB  $\pm$ 10 pW)

**Measurement Period:** 0.25 ms to 26.66 ms

## Channel Power Measurement (30 kHz)

**Input Frequency Range:** 30 MHz to 1000 MHz, and 1.7 to 2.0 GHz

**Measurement Bandwidth:** Measures the total average power in a 30 kHz bandwidth centered on the selected frequency

**Measurement Range:**

**RF IN/OUT:** 2.4 nW to 15 W average (–56 to +42 dBm)

**ANTENNA:** Typically, 0.39 pW to 1.25 W average (–94 to +4 dBm)

**Measurement Accuracy** (within five minutes of calibration (user initiated) and within the 7.5% average power environmental window):

**RF IN/OUT:** 30 to 1000  $\mu$ Hz  $\pm$  (0.75 dB  $\pm$ 0.61 nW) at 4.95 MHz  $\pm$  (1 dB  $\pm$ 0.61 nW)

**ANTENNA:** At 4.95 MHz, 30 to 1000 MHz typically,  $\pm$ (0.75 dB  $\pm$ 0.16 pW)

**Measurement Period:** 0.25 ms to 26.66 ms

## Adjacent Channel Power

**Frequency Range:** 800 MHz to 1000 MHz and 1.7 GHz to 2.0 GHz

**Adjacent Channel Power Bandwidth:** 10 kHz to 1.23 MHz (for BW >100 kHz, refer to ACP Filter in Reference Guide)

**Adjacent Channel Power Offset:** 100 kHz to 3 MHz

**Measurement Range:**

**RF IN/OUT:** 0.1  $\mu$ W to 15 W average (–40 to +42 dBm)

**ANTENNA:** Typically 16 pW to 1.25 W average (–78 to +4 dBm)

**Measurement Accuracy:**

**RF IN/OUT:**

Typically  $\pm$ (0.75 dBc  $\pm$ ( $2 \times 10^{-14}$ )(ACP BW)) W

**ANTENNA**

Typically  $\pm$ (0.75 dBc  $\pm$ ( $5.3 \times 10^{-18}$ )(ACP BW)) W

## Waveform Quality Measurement

**Frequency Range:** 4 MHz to 1000 MHz, and 1.7 to 2.0 GHz

**Input Level Range:**

**RF IN/OUT:** –20 dBm to +42 dBm

**ANTENNA:** –58 dBm to +7 dBm

**Measurement Period:** 0.25 ms to 20 ms forward link 0.25 ms to 10 ms reverse link

**Measurement Range:** 0.509 to 1.00

**Rho Measurement Accuracy:** Within  $\pm$ 0.005

**Input Frequency Error Range:**  $\pm$ 900 Hz

**Frequency Error Measurement Accuracy:**  $\pm$ 30 Hz using a measurement interval >0.5 ms

**Other Reported Parameters:** Pilot Time Offset, Carrier Feedthrough Error, Vector Magnitude, Amplitude Error, and Phase Error

**Pilot Time Offset Measurement Accuracy:** Typically < $\pm$ 500 nsec from even second signal to start of PN sequence

## Code Domain Analyzer

**Frequency Range:** 4 MHz to 1000 MHz, and 1.7 to 2.0 GHz

**Input Connector:** RF IN/OUT or ANT IN

**Input Frequency Error Range:**  $\pm$ 900 Hz

**Input Level Range:**

**RF IN/OUT:** –20 dBm to +42 dBm

**ANTENNA:** –58 dBm to +7 dBm

## Code Domain Power Measurement

**Displayed Dynamic Range:** 40 dB

**Relative Code Domain Power Accuracy:**  $\pm$ 0.5 dB

(using a measurement interval >0.5 ms and Walsh channel power >1% of channel power)

**Absolute Code Domain Power Accuracy:**  $\pm$ 1.25 dB

(using a measurement interval >0.5 ms and Walsh channel power >1% of channel power)

**Measurement Resolution:** 0.01 dB

**Carrier Frequency Offset Accuracy:**  $\pm$ 30 Hz using a measurement interval  $\geq$ 0.5 ms

**Pilot Time Offset Accuracy:** Typically <500 nsec from even second signal to start of PN sequence

**Other Reported Parameters:** Estimated Rho, marker readings of individual code power and noise

## Code Domain Timing Measurement<sup>1</sup>

(Pilot to Code Channel Time Tolerance)

**Measurement Range:**  $\pm$ 200 nsec

**Measurement Accuracy:**  $\pm$ 10 nsec using a measurement interval of 12.5 ms

**Measurement Resolution:** 0.01 nsec

## Code Domain Phase Measurement<sup>1</sup>

(Pilot to Code Channel Phase Tolerance)

**Measurement Range:**  $\pm$ 200 mrad

<sup>1</sup> IS-95B only

**Measurement Accuracy:**  $\pm 20$  mrad using a measurement interval of 12.5 ms

**Measurement Resolution:** 0.01 mrad

## Signal Generator Specifications

### RF Frequency

**Range:** 400 kHz to 1000 MHz, and 1.7 to 2.0 GHz

**Accuracy and Stability:**  $\pm(0.065$  Hz plus reference oscillator accuracy)

### Output

#### RF IN/OUT Connector

**Level Range:**  $-137$  to  $-40$  dBm into 50 W

**Level Accuracy:**  $\pm 1.0$  dB (level  $> -127$  dBm); if RF Analyzer is also connected add  $\pm 0.1$  dB

*Typically  $\pm 1.0$  dB for levels below  $-127$  dBm*

**Reverse Power:** 100 watts continuous, temperature  $< 40^\circ$  C, 75 W continuous, for temperature  $< 55^\circ$  C

**SWR:**  $< 1.5:1$

#### DUPLEX OUT Connector

**Level Range:**  $-125$  to  $-10$  dBm into 50  $\Omega$

**Maximum Power Output:** +3 dBm

**Level Accuracy:**  $\pm 1.5$  dB, *Typically  $\pm 1.0$  dB for all levels*

**Reverse Power:** 200 mW max

**SWR:**  $< 1.7:1$

#### Supplemental Characteristics

**Resolution:** 0.1 dB

### Spectral Purity

(For output levels of  $< -10$  dBm at DUPLEX OUT or  $< -40$  dBm at RF IN/OUT)

**Harmonics:**  $< -25$  dBc

#### Non-Harmonic Spurious ( $> 5$ kHz from carrier):

250 kHz  $\leq f_c$   $< 249$  MHz  $< -45$  dBc

249 MHz  $\leq f_c$   $\leq 1000$  MHz  $< -60$  dBc

1700 MHz  $\leq f_c$   $\leq 2000$  MHz  $< -55$  dBc

#### Residual FM (rms, CCITT filter):

250 kHz  $\leq f_c$   $< 249$  MHz  $< 7$  Hz

249 MHz  $\leq f_c$   $< 501$  MHz  $< 4$  Hz

501 MHz  $\leq f_c$   $\leq 1000$  MHz  $< 7$  Hz

1700 MHz  $\leq f_c$   $\leq 2000$  MHz  $< 14$  Hz

#### Supplemental Characteristics

##### SSB Phase Noise (20 kHz offset):

$f_c < 1$  GHz  $< -116$  dBc/Hz

1.7 GHz  $< f_c < 2.0$  GHz  $< -90$  dBc/Hz

## FM

#### FM Deviation Maximum (For rates $> 25$ Hz):

400 kHz  $< f_c$   $< 249$  MHz 100 kHz

249 MHz  $< f_c$   $< 501$  MHz 50 kHz

501 MHz  $< f_c$   $< 1000$  MHz 100 kHz

1.7 GHz  $< f_c$   $< 2.0$  GHz 100 kHz

[FM not specified for ( $f_c$  minus FM dev)  $< 400$  kHz]

#### FM Rate (1 kHz reference):

**Internal:** DC to 25 kHz (1 dB BW)

**External:** AC Coupled: 20 to 75 kHz (typically 3 dB BW)

DC Coupled: DC to 75 kHz (typically 3 dB BW)

#### FM Accuracy (1 kHz rate):

$< 10$  kHz dev:  $\pm 3.5\%$  of setting  $\pm 50$  Hz

$> 10$  kHz dev:  $\pm 3.5\%$  of setting  $\pm 500$  Hz

#### FM Distortion (THD + noise, in a 0.3 to 3 kHz BW):

$< 0.5\%$  at  $> 3$  kHz dev. and 1 kHz rate,  $f_c < 1000$  MHz

$< 1.0\%$  at  $> 3$  kHz dev. and 1 kHz rate, 1.7 GHz  $< f_c < 2.0$  GHz

#### Center Frequency Accuracy in DC FM mode

(external source impedance  $< 1k \Omega$ ):

$\pm 500$  Hz (after DC FM zero), typically  $\pm 50$  Hz

#### Supplemental Characteristics

**Ext. Mod. Input Impedance:** 600  $\Omega$  nominal

#### Resolution:

50 Hz for  $< 10$  kHz deviation

500 Hz for  $> 10$  kHz deviation

## AM

#### Supplemental Characteristics

**AM Depth:** 0 to 60%

**External Modulation Input Impedance:**

600  $\Omega$  nominal

## RF Analyzer Measurements

#### SWR:

**RF IN/OUT Port:**  $< 1.5:1$

**ANT IN Port:**  $< 1.6:1$ , except  $< 1.8:1$  for 0 dB attenuation in 1.7 to 2.0 GHz band

#### RF Frequency Measurements

**Measurement Range:** 400 kHz to 1 GHz, 1.7 to 2.0 GHz

#### Level Range:

**RF IN/OUT:**

1 mW to 100 watts continuous, temp.  $< 40^\circ$  C,

75 W continuous, for temperatures  $< 55^\circ$  C

**ANT IN:**  $-38$  dBm to  $+15$  dBm

**Accuracy:**  $\pm 1$  Hz plus timebase accuracy

#### Supplemental Characteristics

**Frequency Resolution:** 1 Hz (The user must set the instrument within 15 kHz of the signal under test)

## RF Power Measurements

**Frequency Range:** 30 MHz to 1 GHz, 1.7 to 2.0 GHz

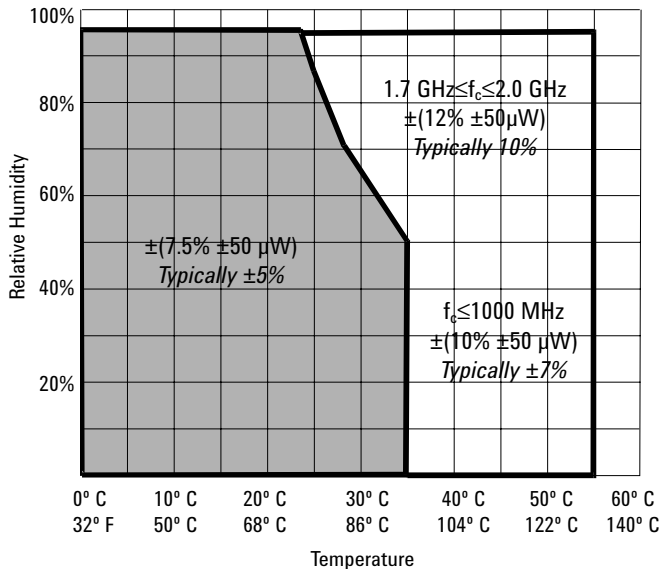


Figure 2. Accuracy

### Measurement Range RF IN/OUT:<sup>2</sup>

**100 MHz <math>< f\_c < 2.0</math> GHz:**

4 mW to 100 W continuous, temperatures <math>< 40^\circ\text{C}</math>, 75 W continuous, for temperatures <math>< 55^\circ\text{C}</math>

**30 MHz <math>< f\_c < 100</math> MHz:** 4 mW to 1 W continuous

### Supplemental Characteristics

**Resolution:** 3 digits (Example: Resolution of 10 mW for powers <math>< 10</math> W and <math>> 1</math> W)

## FM Measurement

**Frequency Range:** 5 MHz to 1 GHz (usable to 400 kHz), and 1.7 to 2.0 GHz

**Deviation:** 20 Hz to 75 kHz

**Sensitivity:** 4  $\mu\text{V}$  for 12 dB SINAD, (30 kHz IF BW, high sensitivity mode, 0.3 to 3 kHz BW)  
Typically: <math>< 2 \mu\text{V}</math> (12 dB SINAD,  $f_c > 10</math> MHz)$

**Accuracy:**  $\pm 4\%$  of reading plus residual FM and noise contribution (20 Hz to 25 kHz rates, deviation <math>< 25</math> kHz, 230 kHz IF BW)

**Bandwidth (3 dB):** 20 Hz to 70 kHz

**THD + Noise:** <math>< 1\%</math> rms, (for deviation >math>5</math> kHz and at a rate of 1 kHz in a 0.3 to 3 kHz BW, 230 kHz IF BW)

### Input Level Range for Specified Accuracy:

–6 to +50 dBm at RF IN/OUT

–44 to +12 dBm at ANTENNA IN

### Residual FM and Noise (0.3 to 3 kHz, rms):

<math>< 7</math> Hz, for  $f_c < 1000</math> MHz$

<math>< 14</math> Hz, for  $1.7 < f_c < 2.0</math> GHz$

### Supplemental Characteristics

**Resolution:** 1 Hz,  $f < 10</math> kHz ; 10 Hz,  $f > 10</math> kHz$$

## AM Measurement

**Frequency Range:** 10 MHz to 1 GHz (usable to 400 kHz), 1.7 to 2.0 GHz

**Depth:** 0 to 95%

### Input Level Range (levels in PEP):

–6 to +52 dBm at RF IN/OUT

–44 to +14 dBm at ANTENNA IN

### Supplemental Characteristics

**Accuracy:**  $\pm 5\%$  of reading  $\pm 1.5\%$  AM, ( 50 Hz to 10 kHz rates, modulation <math>< 80\%</math>)

**THD + Noise:** <math>< 2\%</math> rms for modulation <math>< 80\%</math> AM, (at 1 kHz rate in a 0.3 to 3 kHz bandwidth)

**Residual AM:** <math>< 0.2\%</math> in a 0.3 to 3 kHz bandwidth

**Resolution:** 0.1%

## Spectrum Analyzer Specifications

**Frequency Range:** 400 kHz to 1 GHz, 1.4 to 2.0 GHz

**Frequency Span/Resolution Bandwidth (coupled):**

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

**Span Capability:**<sup>3</sup> Full span capability 1 GHz

**Display:** Log with 1, 2, and 10 dB per division

**Display Range:** 80 dB or 8 divisions

**Reference Level Range:** +50 to –50 dBm

**Residual Responses:** <math>< -70</math> dBm (ANT IN port, no input signal, 0 dB attenuation)

**Image rejection:** >math>50</math> dB

### Supplemental Characteristics

#### Non-harmonic Spurious Responses:

>math>65</math> dB down (for input signals >math>50</math> MHz, <math>< -30</math> dBm),

>math>55</math> dB down (for input signals <math>< 50</math> MHz, <math>< -30</math> dB)

**Log Scale Linearity:**  $\pm 2</math> dB, (for input levels <math>< -30</math> dBm within 6 divisions of reference level)$

**Displayed Average Noise Level:** <math>< -114</math> dBm, for <math>< 50</math> kHz span, –50 dBm reference level

**Level Accuracy (at center frequency and within 1 division of reference level):**  $\pm 2.5</math> dB$

## Tracking Generator Specifications

**Tracking Generator Frequency Range:** 400 kHz to 1 GHz, 1.7 to 2.0 GHz

**Frequency Offset:** Frequency span endpoints  $\pm$  frequency offset cannot be <math>< 400</math> kHz or >math>1</math> GHz in the 1 GHz band and cannot be <math>< 1.7</math> GHz or >math>2.0</math> GHz in the 2 GHz band

**Output Level Range:** Same as signal generator, page 4

**Sweep Modes:** Normal and inverted

2. To achieve the specified accuracy when measuring power at the RF IN/OUT port, the internal signal generator level must be 60 dB below the measured power or less than –20 dBm at the Duplex port.

3. Center frequency must be <math>< 1.0</math> GHz or between 1.7 to 2.0 GHz

## Oscilloscope Specifications

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

**Scale/Division:** 10 mV to 10 V

**Amplitude Accuracy:**  $\pm 1.5\%$  of reading  $\pm 0.1$  division (20 Hz to 10 kHz)

**Time/Division:** 10  $\mu$ sec to 100 msec

**Trigger Delay:** 20  $\mu$ sec to 3.2 seconds

### Supplemental Characteristics

**3 dB Bandwidth:** Typically >100 kHz

**Internal DC Offset:** <0.1 div (>50  $\mu$ V/div sensitivity)

## AF Analyzer Specifications

### Frequency Measurement

**Measurement Range:** 20 Hz to 400 kHz

**Accuracy:**  $\pm 0.02\%$  plus 0.1 Hz plus timebase accuracy

**External Input:** 20 mV to 30 Vrms

### Supplemental Characteristics

#### Resolution:

0.01 Hz,  $f < 10$  kHz; 0.1 Hz,  $f < 100$  kHz;

and 1 Hz for  $f > 100$  kHz

### AC Voltage Measurement

**Measurement Range:** 0 to 30 Vrms

**Accuracy:**  $\pm 3\%$  of reading + residual noise (20 Hz to 15 kHz, inputs >1 mV)

**Residual Noise:** 150  $\mu$ V (15 kHz LPF) 450  $\mu$ V (>99 kHz LPF)

### Supplemental Characteristics

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

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

**Minimum Resolution:** 4 digits for inputs >100 mV; 3 digits for inputs <100 mV

### DC Voltage Measurement

**Voltage Range:** 100 mV to 42 V

**Accuracy:**  $\pm 1.0\%$  of reading  $\pm 45$  mV

**DC offset:**  $\pm 25$  mV

### Supplemental Characteristics

**Resolution:** 1 mV

### Distortion Measurement

**Frequency Range:** 300 Hz to 10 kHz  $\pm 5\%$

**Input Level Range:** 30 mV to 30 Vrms

**Display Range:** 0.1% to 100 %

**Accuracy:**  $\pm 1$  dB (0.5 to 100% distortion) for tones from 300 to 1500 Hz measured with the 15 kHz LPF

$\pm 1.5$  dB (1.5 to 100% distortion) for tones from 300 Hz to 10 kHz measured with the >99 kHz LPF

**Residual THD + Noise:**  $-60$  dB or 150  $\mu$ V whichever is greater, for tones from 300 to 1500 Hz measured with the 15 kHz LPF

*Typically  $-52$  dB or 450  $\mu$ V, whichever is greater, for tones from 300 Hz to 10 kHz measured with >99 kHz LPF*

### Supplemental Characteristics

**Resolution:** 0.1 % distortion

## SINAD Measurement

**Frequency Range:** 300 Hz to 10 kHz,  $\pm 5\%$

**Input Level Range:** 30 mV to 30 Vrms

**Display Range:** 0 to 60 dB

**Accuracy:**  $\pm 1$  dB (0 to 46 dB SINAD) for tones from 300 to 1500 Hz measured with the 15 kHz LPF

$\pm 1.5$  dB (0 to 36 dB SINAD) for tones from 300 Hz to 10 kHz measured with the >99 kHz LPF

**Residual THD + Noise:**  $-60$  dB or 150  $\mu$ V, whichever is greater, for tones from 300 to 1500 Hz measured with the 15 kHz LPF

*Typically  $-52$  dB or 450  $\mu$ V, whichever is greater, for tones from 300 Hz to 10 kHz measured with >99 kHz LPF*

### Supplemental Characteristics

**Resolution:** 0.01 dB

## Audio Filters

**Standard Fixed:** <20 Hz HPF, 50 Hz HPF, 300 Hz HPF, 300 Hz LPF, 3 kHz LPF, 15 kHz LPF, >99 kHz LPF, 750  $\mu$ sec de-emphasis, 6 kHz BPF, and C-Message

### Variable Frequency Notch Filter:

**Frequency Range:** 300 Hz to 10 kHz

**Notch Depth:** >60 dB

**Notch Width:** Typically  $\pm 5\%$

## Audio Detectors

RMS, Pk+, Pk-, Pk+hold, Pk-hold, Pk $\pm$ /2, Pk $\pm$ /2 hold, Pk  $\pm$  max, and Pk  $\pm$  max hold.

## Signaling

### Capability for Generating and Analyzing the Following Formats:

CDCSS, DTMF, 1 Tone, 2 Tone, 5/6 Tone, Sequential, RPC1 (POCSAG), EIA, CCITT, CCIR, ZVEI, DZVEI, GOLAY, EEA, AMPS, NAMPS, TACS, NTACS, NMT-450, NMT-900, LTR, EDACS, and MPT 1327.

**Function Generator Waveforms:** Sine, square, ramp, triangle, dc, white Gaussian and white uniform noise

**Function Generator Frequency Range and Level:** Same as audio source

## Audio Source Specifications

(Applicable to both internal sources)

### Frequency

**Range:** DC to 25 kHz

**Accuracy:** 0.025% of setting

#### Supplemental Characteristics

**Minimum Resolution:** 0.1 Hz

### Output Level

**Range:** 0.1 mV to 4 Vrms

**Maximum Output Current:** 20 mA peak

**Output Impedance:** < 1.5  $\Omega$  (1 kHz)

**Accuracy:**  $\pm 2\%$  of setting plus step size

**Residual Distortion:** 0.125%, (THD plus noise, for amplitudes >200 mVrms), for tones 20 Hz to 25 kHz measured in an 80 kHz BW

#### Supplemental Characteristics

##### Step Size:

Level <0.01V:  $\pm 50 \mu V$  pk

Level <0.1V:  $\pm 0.5$  mV pk

Level <1V:  $\pm 5$  mV pk

Level <10V:  $\pm 50$  mV pk

**Offset in DC Coupled Mode:** <50 mV

## RF Tools Measurements

(All specifications are typical and assume the use of the E6554A RF Tools Accessories Kit)

#### Swept Insertion Loss Test:

**Frequency Range:** 0.4 to 1000 MHz, 1.7 to 2.0 GHz

**Swept Signal Level:** -54 dBm to +10 dBm

**Insertion Loss Accuracy:**  $\pm 0.75$  dB

#### Swept Gain Test:

**Frequency Range:** 0.4 to 1000 MHz, 1.7 to 2.0 GHz

**Swept Signal Level:** -54 dBm to +10 dBm

#### Swept Return Loss Test:

**Frequency Range:** 0.4 to 1000 MHz, 1.7 to 2.0 GHz

**Swept Signal Level:** -54 dBm to +10 dBm

**Swept Return Loss Accuracy:**  $\pm 2$  dB  $\pm 10\%$  of reading, for readings between 0 dB and 30 dB

#### Cable Fault Test:

**Cable Types Tested:** Helix, RG, Custom

**Cable Length Range:** 0 to 1000 feet, 0 to 300 meters

**Distance Accuracy:**  $\pm 5\%$  of the cable length value entered by the user

## Precision Calibration

### Option 012 / R12 Time Offset Precision Calibration

Cal factor accuracy +/- 21 nsec

## General Specifications

**Dimensions (H x W x D):** 8.75 x 15.6 x 21.5 inches (222 x 396 x 546 mm)

**Weight:** 49 lbs. (22 kgs)

**Operating Temperature:** 0° C to +55° C

**Operating Humidity:** <95% relative humidity, 0° C to 40° C

**Storage Temperature:** -40° C to +70° C

**Power:** 100 Vac to 240 Vac  $\pm 10\%$ , 50 to 60 Hz, nominally 350 VA

**Display Size:** 9.7 cm x 13 cm, electroluminescent (EL)

**Calibration Interval:** Two years

**Operating Altitude:** 4500 m max

#### Supplemental Characteristics

**Minimum Frequency Resolution:** 1 Hz

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

**Leakage:** At RF generator output levels  $\leq -40$  dBm, typical radiated leakage is  $< 10 \mu V$  induced in a resonant dipole antenna 25 mm (1 inch) away from any surface. Spurious leakage levels are typically  $< 10 \mu V$  in a resonant dipole antenna 25 mm (1 inch) away from any surface.

## Side Panel Connectors

#### External Ref In:

**Input Frequencies:** 1, 2, 5, 10, and 15 MHz;

1x, 2x, 4x, 8x, and 16x chip clock

**Input Level:** >0.15 Vrms

#### 10 MHz Ref Out:

**Output Frequency:** 10 MHz

**Output Level:** >0.5 Vrms

**Waveform:** Sine wave

#### Chip Clock - 1.2288 MHz Out:

**Output Level:** Nominally, TTL with 50  $\Omega$  impedance

**Waveform:** Square wave with ~50% duty cycle

#### 16X Chip Clock - 19.6608 MHz Out:

**Output Level:** Nominally, TTL with 50  $\Omega$  impedance

**Waveform:** Square wave with ~50% duty cycle

#### Frame Clock Out:

**Clock Selections:** 20 ms, 26.67 ms, 80 ms, or 2.00 s

**Output:** ~800 ns pulse, 1.5 Vpk into 50  $\Omega$

**Even Second - Sync In:** A positive edge starts CDMA frame clocks and Pilot PN sequence generation

**Trig Qualifier In:** A rising edge is used to start the trigger delay timer

**Audio Out:** Provides output signals from the audio frequency generators

**Audio In:** A switchable (1 M $\Omega$  and 600  $\Omega$ ) inputs to the AF analyzer

**Analog Modulation In:** Provides an external modulation (AM or FM) connection for the RF Generator

**Scope Monitor Out:** External output from the AF analyzer

**External Scope Trig In:** Provides an external trigger input for the oscilloscope

**Video Out:** Provides a signal for any standard PAL monitor (15.7 kHz scan rate)

**Data In:** Provides a data input to the CDMA generator

**Base-band Out (I and Q):** Provides buffered versions of the I and Q drive signals from the CDMA generator

## Remote Programming

**GPIB:** Implementation of IEEE Standard 488.2

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

**RS-232:** Three serial ports through DB-9 connectors used for serial data in and out

**Rates:** 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 Baud

## Standard User Memory, RAM

Approximately 928 Kbytes of RAM are available for nonvolatile **save/recall** of settings. This typically will allow you to save >500 sets of instrument settings; depending on the type of information saved.

## Reference Oscillator

### Standard TCXO: (Temperature controlled crystal oscillator)

**Temperature:** 0.1 ppm (0° C to +55° C)

**Aging:** <0.5 ppm/year (<1 ppm in first year)

**Warm-up Time:** <15 minutes to be within ±0.1 ppm of final frequency

### Option 1D5 High Stability Reference: (Oven controlled crystal oscillator)

**Temperature:** 0.05 ppm (0° C to +55° C)

**Aging:** <0.5 ppm/year (<1 ppm in first year)

**Warm-up Time:** <15 minutes to be within ±0.1 ppm of final frequency

## Memory Card Specifications

**Card Compatibility:** Single industry standard PCMCIA slot accepts Type I or Type II SRAM and ROM memory cards

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

**Firmware Upgrades:** Accepts PCMCIA flash memory cards (4 Mbytes) to allow automatic loading of new firmware from the front panel. Upgrade time is about eight minutes

## Ordering Number

8935 Series CDMA Cellular/PCS Base Station Test Set ordering number: **E6380A**

## For More Product Information

For more information visit our Web site: [www.agilent.com/find/basestations](http://www.agilent.com/find/basestations)

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