# Specifications

## CDMA

### Signal generator

**Frequency**

| | | |
|---|---|---|
| Range | US Cellular | 869 MHz to 894 MHz |
| | Japan Cellular | 832 MHz to 870 MHz |
| | China Cellular | 934 MHz to 969 MHz |
| | PCS (US) | 1930 MHz to 1990 MHz |
| | PCS (Korea) | 1805 MHz to 1870 MHz |
| Resolution | | 1 Hz |
| Error | | same as timebase |

**Output level**

| | |
|---|---|
| RF IN/OUT | –124 dBm to –20 dBm |
| RF OUT 2 | –105 dBm to 0 dBm |
| Resolution | 0.1 dB |
| Error (RF IN/OUT) | <1.5 dB |

| | |
|---|---|
| **Modulation** | QPSK |
| Carrier suppression | 30 dB |

### Analyzer

**Frequency**

| | | |
|---|---|---|
| Range | US Cellular | 824 MHz to 849 MHz |
| | Japan Cellular | 887 MHz to 925 MHz |
| | China Cellular | 889 MHz to 924 MHz |
| | PCS (US) | 1850 MHz to 1910 MHz |
| | PCS (Korea) | 1715 MHz to 1780 MHz |
| Resolution | | 1 Hz |
| Error | | same as timebase |

**Power measurement**

| | |
|---|---|
| Reference level range | |
| RF IN/OUT (full scale) | –28 dBm to +41 dBm |
| RF IN 2 (full scale) | –69 dBm to 0 dBm |
| Measurement error, absolute | <1.5 dB |
| Measurement error, relative | <0.3 dB (reference level –30 dB) |
| Dynamic range within the following range | 50 dB below reference level |
| RF IN/OUT (full scale) | –65 dBm to +41 dBm |
| RF IN 2 (full scale) | –75 dBm to 0 dBm |

| | |
|---|---|
| **Demodulation** | O-QPSK |
| Modulation analyzer error of ρ factor (25 ±10) °C | <0.003 (for ρ: 0.9 to 1) |
| Frequency measurement range | –3 kHz to +3 kHz |
| Frequency measurement error | <reference ±30 Hz |
| Timing measurement error | <60 ns |

| | |
|---|---|
| **Rate set support** | |
| Rate set 1 (8 k) | standard |
| Rate set 2 (13 k) | **option B14** |
| **AWGN generator** | **option B81** |
| Equivalent noise bandwidth | 1.8 MHz typ. |
| Gain adjustment range | –20 dB to +6 dB of forward channel power |
| **Signaling** | |
| Digital modes | IS-95, UB-IS-95, J-STD008, T53 |

## TDMA – option B84

### Signal generator

**Frequency**

| | | |
|---|---|---|
| Range | US Cellular | 869 MHz to 894 MHz |
| | PCS (US) | 1930 MHz to 1990 MHz |
| Resolution | | 1 Hz |
| Error | | same as timebase |

**Output level**

| | |
|---|---|
| RF IN/OUT | –120 dBm to –20 dBm |
| RF OUT 2 | –100 dBm to 0 dBm |
| Resolution | 0.1 dB |
| Error (RF IN/OUT) | <1.5 dB |

| | |
|---|---|
| **Modulation** | π/4 DQPSK or unmodulated |
| Error | <4 % (EVM rms) |
| Mod. distortion 3rd order | <–45 dBc |
| Carrier feedthrough | <–25 dB |

| | |
|---|---|
| **Spectral purity** | |
| SSB phase noise | –94 dBc (1 Hz at 50 kHz offset) |
| | –106 dBc (1 Hz at 100 kHz offset) |

### Analyzer

**Frequency**

| | | |
|---|---|---|
| Range | US Cellular | 824 MHz to 849 MHz |
| | PCS (US) | 1850 MHz to 1910 MHz |
| Resolution | | 1 Hz |
| Error | | same as timebase |

**Power measurement**

| | |
|---|---|
| Reference level range | |
| RF IN/OUT (full scale) | 0 dBm to 39 dBm |
| RF IN 2 (full scale) | –40 dBm to 0 dBm |
| Residual level | <–65 dBm (RF IN/OUT) |

| | |
|---|---|
| **Spectral purity** | |
| Phase noise | –94 dBc at 50 kHz offset |
| | –106 dBc at 100 kHz offset |

**Modulation analyzer**

| | |
|---|---|
| CR band: 824 MHz to 849 MHz | |
| EVM RMS (residual) | 1% |
| EVM Pk (residual) | 3% |
| CR band: 1850 MHz to 1950 MHz | |
| EVM RMS (residual) | 1.5% |
| EVM Pk (residual) | 5% |
| I/Q offset (residual) | 50 dB (0.3%) |
| I/Q imbalance (residual) | 50 dB (0.3 %) |
| Frequency measurement range | –1 kHz to +1 kHz |
| Frequency measurement error | <5 Hz + reference |

**Power versus time**

| | |
|---|---|
| Level error | <1.5 dB down to 20 dB below reference level, 3 dB else, dynamic limit 66 dB (IS-136 BW) |
| Leakage power | –65 dBm |

**Adjacent channel power**

| | |
|---|---|
| Dynamic range | |
| 1st adjacent channel | 36 dB |
| 2nd and 3rd adjacent channel | 55 dB |

| | |
|---|---|
| **Signaling** | |
| Digital modes | IS-136A |

## Analog – option B82

### RF signal generator

**Frequency**

| | | |
|---|---|---|
| Range | AMPS | 869 MHz to 894 MHz |
| | N-AMPS | 869 MHz to 894 MHz |
| | TACS | 935 MHz to 960 MHz |
| | J-TACS | 860 MHz to 870 MHz |
| | E-TACS | 917 MHz to 950 MHz |
| | N-TACS | 843 MHz to 846 MHz |
| | | 863.5 MHz to 867 MHz |
| Resolution | | 1 Hz |
| Error | | same as timebase + resolution |

**Output level**

| | |
|---|---|
| RF IN/OUT | –124 dBm to -20 dBm |
| RF OUT 2 | –105 dBm to 0 dBm |
| Resolution | 0.1 dB |
| Error (RF IN/OUT) | <1.5 dB |

**Modulation**

| | |
|---|---|
| FM deviation | 0 Hz to 12 kHz |
| FM resolution | 1 Hz |
| FM rate | 50 Hz to 15 kHz |
| FM distortion (THD + noise) | ≤0.5% (dev. 8 kHz, rate 1 kHz, BW 0.3 Hz to 3 kHz, (25 ±5) °C) |
| Residual FM | <10 Hz (rms, CCITT) |
| Deviation error | ≤2 % of setting + residual FM + FM resolution + timebase error (0.3 kHz ≤FM rate ≤3 kHz, measurement bandwidth 30 Hz to 20 kHz) |

### RF analyzer

**Frequency**

| | | |
|---|---|---|
| Range | AMPS | 824 MHz to 849 MHz |
| | N-AMPS | 824 MHz to 849 MHz |
| | TACS | 890 MHz to 915 MHz |
| | J-TACS | 915 MHz to 925 MHz |
| | E-TACS | 872 MHz to 905 MHz |
| | N-TACS | 898 MHz to 901 MHz |
| | | 918.5 MHz to 922 MHz |
| Resolution | | 1 Hz |

| | |
|---|---|
| Reference level range | |
| RF IN/OUT (full scale) | –28 dBm to +41 dBm |
| RF IN 2 (full scale) | –69 dBm to 0 dBm |

**RF frequency measurement**

| | |
|---|---|
| Dynamic range (from ref. level) | >40 dB |
| Resolution | 1 Hz |
| Error | <resolution + timebase error |

**RF power measurement**

| | |
|---|---|
| Narrowband (RF IN/OUT, DSP): | |
| Reference level range | 0 dBm to +41 dBm |
| Range | 0 dB to 50 dB below reference level |
| Error | <1.5 dB |
| Wideband: | |
| Range | |
| RF IN/OUT | 0 dBm to +41 dBm |
| RF IN 2 | –16 dBm to 0 dBm |
| Error | <1.5 dB |

**FM measurement**

| | |
|---|---|
| RF bandwidth | |
| (( 2 x deviation) + (4 x rate)) | ≤60 kHz |
| Deviation range | 0 kHz to 30 kHz |
| Resolution | 1 Hz |
| FM rate range | 0 kHz to 12 kHz |
| Sensitivity (BW 0.3 to 3 kHz, SINAD 12 dB, dev. 2.9 kHz, FM rate 1 kHz) | |
| RF IN/OUT connector (ref. level = –28 dBm) | typ. 13 µV (–85 dBm) |
| RF IN 2 connector (ref. level = –69 dBm) | typ. 1.3 µV (–105 dBm) |
| Residual FM | |
| RF IN/OUT | typ. ≤7 Hz (BW 0.3 to 3 kHz, rms) |
| RF IN 2 | typ. ≤9 Hz (BW 0.3 to 3 kHz, rms) |
| Error | <4% of reading + 30 Hz + residual FM (FM rate ≤12 kHz, deviation ≤30 kHz) |

**Signaling**

| | |
|---|---|
| Analog mode | AMPS, N-AMPS<br>TACS, J/E/N-TACS |

## Audio source

**Frequency**

| | |
|---|---|
| Range | 50 Hz to 4 kHz (single tone) |
| Resolution | 1 Hz |
| Error | half resolution |

**Output voltage**

| | |
|---|---|
| Range | 0.1 mV to 5 V, rms |
| Resolution | 0.1 mV |
| Maximum output current | 20 mA peak |
| Output impedance | <5 Ω |
| Level error | <5% (output voltage >1 mV) |
| Distortion (THD + noise) | ≤0.1% (BW 100 kHz, output voltage ≥200 mV) |

## AF analyzer

**Frequency measurement**

| | |
|---|---|
| Range | 50 Hz to 15 kHz |
| Resolution | 1 Hz |
| Error | <1 Hz + timebase |
| Input voltage range | 10 mV to 30 V |

**AC voltage measurement**

| | |
|---|---|
| Input range | 0.1 mV to 30 V, rms |
| Error | < 5% + resolution |
| Nominal input impedance | 1 MΩ ll 100 pF |

**Distortion measurement**

| | |
|---|---|
| Bandwidth | limited by C-message filter |
| Frequency | 1004 Hz |
| Input voltage range | 100 mV to 30 V, rms |
| Inherent distortion | <0.2 % |
| Resolution | 0.1% distortion |
| Error | <5% + inherent distortion |

**SINAD measurement**

| | |
|---|---|
| Bandwidth | limited by C-message filter |
| Frequency | 1004 Hz |
| Input voltage range | 100 mV to 30 V, rms |
| Inherent distortion | <0.2% |
| Resolution | 0.1 dB |
| Error | <5% + inherent distortion |

**Audio filters, notch filters** automatically selected based on the specific measurement configuration

## Timebase

**Standard timebase**

| | |
|---|---|
| Nominal frequency | 10 MHz |
| Frequency drift in temperature range 5 °C to 35 °C | ≤1.5 x $10^{-6}$ |
| Frequency aging | ≤0.5 x $10^{-6}$ / year (at 35 °C) |

| | |
|---|---|
| **OCXO reference oscillator** | **option B1** |
| Nominal frequency | 10 MHz |
| Frequency drift in temperature range 5 °C to 45 °C | ≤1 x $10^{-7}$ |
| Frequency aging | ≤2 x $10^{-7}$ / year, ≤0.5 x $10^{-9}$ /day after 30 days of operation |
| Warmup time (at 25 °C) | approx. 5 min |

| | |
|---|---|
| **Reference frequency inputs/outputs** | **option B3** |
| Synchronization input | 1, 2, 5 or 10 MHz, selectable |
| Impedance | approx. 100 Ω |
| Input voltage range | 632 mV (pp) to 5 V (pp) |
| Synchronization output | |
| Frequency | 10 MHz or frequency at sync input |
| Voltage | 5 V (pp), $R_{out}$ = 50 Ω |
| Additional synchronization signals | see Carrier Board option B60 |

| | |
|---|---|
| **Carrier board** | **option B60** |
| Synchronization output | selectable between:<br>2 s (even second pulse)<br>80 ms super frame<br>20 ms paging frame<br>26.67 ms sync frame<br>1.25 ms power control frame<br>19.6608 MHz system clock<br>for D-AMPS: 80 ms super frame |

Option B60 is required for options B61, B62 and B82

**VSWR**

| | |
|---|---|
| RF IN/OUT (N connector) | typ. 1.3 |
| RF IN 2 (BNC connector) | typ. 1.8 |
| RF OUT 2 (N connector) | typ. 1.8 |

## DC measurements

**DC voltage measurement**

| | |
|---|---|
| Range | ± (0 to 30) V |
| Resolution | 10 mV |
| Error | <2% + resolution |

**DC current measurement**

| | |
|---|---|
| Mode | averaging, +peak, –peak |
| Range | ±(0 to 10) A |
| Common-mode rejection | ± 30 V |
| Shunt resistance | 50 mΩ |
| Resolution for averaging | 1 mA / 10 mA |
| Resolution for peak | 10 mA |
| Residual indication | <10 mA at 25°C and common mode rejection ± voltage 10 V |
| Error | <2% + resolution + residual indication |

## Interfaces

| | |
|---|---|
| IEEE/IEC-bus interface | **option B61**<br>interface to IEC625-1 |
| Other interfaces | RS232C (9-contact)<br>Centronics (25-contact) |

## Special calibration (Modcal)

**Service option Z8, special calibration for TX path**
**valid for CDMA output signals** (all values at room temperature (25 ± 5) °C)

| | |
|---|---|
| Absolute level error | |
| RF IN/OUT (–108 to –20 dBm) | typ. <1 dB |
| RF OUT 2 (–103.5 to 0 dBm) | typ. <1 dB |
| Relative level error (linearity at one frequency) | |
| RF IN/OUT (–108 to –38 dBm) | all values are in a range of ±0.5 dB |
| RF OUT 2 (–103.5 to –18 dBm) | all values are in a range of ±0.5 dB |

*Important note:*
*The range of 1 dB has to be determined over all measured values inclusive (it is not determined ±0.5 dB with respect to any one particular value).*