

KEITHLEY

Keithley Instruments, Inc.
28775 Aurora Road
Cleveland, Ohio 44139
(440) 248-0400
www.keithley.com

Model 2800 RF Power Analyzer

Release Notes

Specification Update

This release note contains the latest Model 2800 specifications.

Refer to www.keithley.com for specification updates.

Model 2800 RF Power Analyzer Specifications

FREQUENCY RANGE: 824 - 849MHz, 880 - 915MHz, 1710 - 1785MHz, 1850 - 1980MHz

FREQUENCY SETTINGS:

Cellular Standard	Channel number, N	Center Frequency, MHz	Frequency Band, MHz
CDMAOne Cellular Band	1 - 777	825.000 + 0.030*N	824.7MHz - 848.31MHz
	1013 - 1023	825.000+0.030*(N-1023)	
CDMAOne PCS Band	0 - 1199	1850.000 + 0.050*N	1850.00MHz - 1909.95MHz
North American Digital Cellular (NADC) Cellular Band	1 - 799	825.000+ 0.030*N	824.01MHz - 848.97MHz
	990 - 1023	825.000+0.030*(N-1023)	
North American Digital Cellular (NADC) PCS Band	1 - 1999	1849.980+0.030*N	1850.01MHz - 1909.95MHz
AMPS	1 - 799	825.000+0.030*N	824.01MHz - 848.97MHz
	990 - 1023	825.000+0.030*(N-1023)	
GSM Cellular Band	0 - 124	890.0 + 0.2*N	880.2MHz - 914.8MHz
	975 - 1023	890.0 + 0.2*(N-1024)	
DCS Band	512 - 885	1710.2 + 0.2*(N-512)	1710.2MHz - 1748.8MHz
GSM PCS Band	512 - 810	1850.2 + 0.2*(N-512)	1850.2MHz - 1909.8MHz
CDMA2000 Band Class 0	1 - 799	825.000+0.030*N	824.04MHz - 848.97MHz
	991 - 1023	825.000+0.030*(N-1023)	
CDMA2000 Band Class 1	0 - 1199	1850.000+0.050*N	1850.00MHz - 1909.95MHz
CDMA2000 Band Class 4	0 - 599	1750.000+0.050*N	1750.00MHz - 1779.95MHz
CDMA2000 Band Class 6	0 - 1199	1920.000+0.050*N	1920.00MHz - 1979.95MHz
CDMA2000 Band Class 8	0 - 1499	1710.000 +0.050*N	1710.00MHz - 1784.95MHz
CDMA2000 Band Class 9	0 - 699	880.000 + 0.050*N	880.00MHz - 914.95MHz
WCDMA Operating Band 1	9612 - 9888	0.2*N	1922.4MHz - 1977.6MHz
WCDMA Operating Band 2	9262 - 9538	0.2*N	1852.4MHz - 1907.6MHz
	12, 37, 62, 87, 112, 137, 162, 187, 212, 237, 262, 287	1850.1+0.2*N	
WCDMA Operating Band 3	8562 - 8913	0.2*N	1712.4MHz - 1782.6MHz

INTERNAL REFERENCE OSCILLATOR REFERENCE:

Aging per year: 1ppm
 Temperature Drift: (5 to 40°C): 0.5ppm

EXTERNAL FREQUENCY REFERENCE INPUT:

Frequency: 10MHz ± 5ppm
 Power: ≥2dBm
 Input Impedance: 50Ω, nominal

INPUT:

Connector: Type N Female
 Impedance: 50Ω
 Maximum Overload Value: 24dBm, continuous
 VSWR: <1.2:1 with input attenuator > 4dB
 <1.3:1 with input attenuator ≤ 4dB

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PRIMARY CHANNEL: MEASUREMENT RANGES

	CDMAOne	NADC	AMPS	GSM	CDMA2000 1X	CDMA2000 3X	WCDMA
Measurement Bandwidth ⁹	1.23MHz	30kHz	30kHz	400kHz	1.23MHz	3.69MHz	3.84MHz
Repeatability: Mod. ³ CW ¹²	± 0.1dB ±0.05dB	± 0.1dB ±0.05dB	± 0.1dB ±0.05dB	± 0.1dB ±0.05dB	± 0.1dB ±0.05dB	± 0.1dB ±0.05dB	± 0.1dB ±0.05dB
Noise Floor: Cellular Band DCS Band PCS Band	≤-78dBm ≤-84dBm	≤-93dBm ≤-101dBm	≤-93dBm	≤-80dBm ≤-84dBm ≤-89dBm	Band Class 0 ≤-78dBm Band Class 1 ≤-84dBm Band Class 4,8 ≤-78dBm Band Class 6 ≤-74dBm Band Class 9 ≤-75dBm	Band Class 0 ≤-74dBm Band Class 1 ≤-80dBm Band Class 4,8 ≤-74dBm Band Class 6 ≤-69dBm Band Class 9 ≤-71dBm	Operating Band 1 ≤-69dBm Operating Band 2 ≤-80dBm Operating Band 3 ≤-74dBm

Accuracy (23°C ± 5°C)¹:

	CDMAOne Cell	NADC Cell	AMPS	GSM Cell	CDMA2000 BC0	CDMA2000 BC1	CDMA2000 BC6	CDMA2000 BC4	CDMA2000 BC8	CDMA2000 BC9
20 dBm to -40dBm	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB
-40.01 dBm to -50dBm	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB
-50.01dBm to -60dBm	± 0.73 dB	± 0.73 dB	± 0.73 dB	± 0.73 dB	± 0.73 dB	± 0.73 dB	± 0.73 dB	± 0.73 dB	± 0.73 dB	± 0.73 dB
-60.01 dBm to -70dBm	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 1.65 dB

	CDMAOne PCS	NADC PCS	GSM PCS	GSM DCS	CDMA2000 3x BC0	CDMA2000 3x BC1	CDMA2000 3x BC6	CDMA2000 3x BC4	CDMA2000 3x BC8	CDMA2000 3x BC9
20 dBm to -40dBm	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB	± 0.35 dB
-40.01 dBm to -50dBm	± 0.5 dB	± 0.4 dB	± 0.4 dB	± 0.4 dB	± 0.4 dB	± 0.4 dB	± 0.4 dB	± 0.4 dB	± 0.4 dB	± 0.4 dB
-50.01dBm to -60dBm	± 0.73 dB	± 0.6 dB	± 0.6 dB	± 0.6 dB	± 0.6 dB	± 0.6 dB	± 0.6 dB	± 0.6 dB	± 0.6 dB	± 0.6 dB
-60.01 dBm to -70dBm	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB	± 0.94 dB

	WCDMA OB1	WCDMA OB2	WCDMA OB3
20 dBm to -40dBm	± 0.35 dB	± 0.35 dB	± 0.35 dB
-40.01 dBm to -50dBm	± 0.4 dB	± 0.4 dB	± 0.4 dB
-50.01dBm to -60dBm	± 0.7 dB	± 0.6 dB	± 0.6 dB

ADJACENT CHANNEL: (PRIMARY CHANNEL INPUT SIGNAL IN RANGE 5dBm TO 20dBm)

	CDMAOne	NADC	GSM	CDMA2000 1X	CDMA2000 3X	WCDMA
Measurement Bandwidth ⁹	30kHz	25kHz	30kHz	30kHz	30kHz	3.84MHz
Offset from Center Frequency: Cellular DCS, PCS	± 885kHz, ± 900kHz ± 900kHz, ± 1250kHz	± 30kHz	± 200kHz	± 885kHz, ± 900kHz ± 900kHz, ± 1250kHz	± 2.65MHz	± 5MHz
Range at Specified Accuracy ¹⁵	>55dBc	>36dBc	>40dBc	>55dBc	>55dBc	>33dBc
Accuracy (23°C ± 5°C) ¹ Relative to primary channel	± 1.0dB	± 1.0dB	± 1.0dB	Band Classes 0,1,4,8,9: ± 1.0dB Band Class 6: 1.5dB	Band Classes 0,1,4,8,9: ± 1.0dB Band Class 6: 1.5dB	± 2.0dB ²
Repeatability ³ : CW	± 0.5dB ⁴	± 0.5dB ¹¹	± 0.5dB ¹¹	± 0.5dB ⁴	± 0.5dB ⁴	± 1.0dB ²

ALTERNATE CHANNEL: (PRIMARY CHANNEL INPUT SIGNAL IN RANGE 5dBm TO 20dBm)

	CDMAOne	NADC	GSM	CDMA2000 1X	CDMA2000 3X	WCDMA
Measurement Bandwidth ⁹	30kHz	25kHz	30kHz	30kHz	30kHz	3.84MHz
Offset from Center Frequency: Cellular DCS, PCS	± 1.98MHz ± 1.98MHz	± 60kHz	± 400kHz	± 1.98MHz	± 3.10MHz	± 10MHz
Range at Specified Accuracy ¹⁵	>55dBc	>48dBc	>60dBc	>55dBc	>55dBc	>43dBc
Accuracy (23°C ± 5°C) ¹ Relative to primary channel	± 1.0dB	± 1.0dB	± 1.0dB	Band Classes 0,1,4,8,9: ± 1.0dB Band Class 6: 1.5dB	Band Classes 0,1,4,8,9: ± 1.0dB Band Class 6: 1.5dB	± 2.0dB ²
Repeatability ³ : CW	± 0.5dB ⁴	± 0.5dB ¹¹	± 0.5dB ¹¹	± 0.5dB ⁴	± 0.5dB ⁴	± 1.0dB ²

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OTHER MEASUREMENTS

UPPER SIDEBAND POWER (AMPS STANDARD ONLY):

MEASUREMENT OF POWER RELATIVE TO CARRIER @ 10KHZ OFFSET

Frequency Range: 824 - 849MHz

Carrier Measurement Bandwidth: 1kHz

Level: 20dBm to -40dBm

Accuracy: ± 0.5 dB

Dynamic Range: 28dB

FREQUENCY RANGE¹⁶: 824 - 849MHz, 880 - 915MHz, 1710 - 1785MHz, 1850 - 1980MHz

Resolution: 50Hz

Displayed Value: Difference between measured frequency and entered center frequency

Measurement Window: ± 90 kHz, nominal, from entered channel number or center frequency

Level: 20dBm to -35dBm

Accuracy: ± 50 Hz (with external reference)

PEAK FUNCTION: Computes power level and frequency of 5 highest power components in primary channel power spectrum

Range: 824 - 849MHz, 880 - 915MHz, 1710 - 1785MHz, 1850 - 1980MHz

Frequency Resolution: 5kHz

Displayed Values: Power in dBm, Frequency in MHz

Measurement Window: ± 1.82 MHz from entered channel number or center frequency

Level: 20dBm to -40dBm

Level Resolution: ± 0.01 dBm

Level Accuracy: ± 0.5 dBm¹⁸

TRIGGER METHODS:

	Latency
Level	3 μ s
External Trigger	100 μ s
IEEE-488 Bus Command	2.5ms

MEASUREMENT PARAMETERS

	CDMAOne	NADC	GSM	CDMA2000 1X	CDMA2000 3X	WCDMA
Trigger Delay: Range	0 - 999.999ms	0 - 12.790ms	0 - 3.990ms	0 - 999.999ms	0 - 999.999ms	0 - 999.999ms
Resolution	1 μ s	3 μ s	1 μ s	1 μ s	1 μ s	1 μ s
Acquisition Time:						
Primary Channel	200 μ s	3 μ s - 12.790ms	1 μ s - 3.990ms	200 μ s	200 μ s	200 μ s
Adjacent/Alternate Channel	4 - 999.999ms	3 μ s - 12.790ms	1 μ s - 3.990ms	4 - 999.999ms	4 - 999.999ms	200 μ s
Resolution	4 μ s	3 μ s	1 μ s	4 μ s	4 μ s	
Number of Averages:	1 - 100	1 - 100	1 - 100	1 - 100	1 - 100	1 - 100

MEASUREMENT TIME (TYPICAL)⁷:

	CDMAOne	NADC ¹¹	AMPS	GSM ¹¹	CDMA2000 1X	CDMA2000 3X	WCDMA
Primary Channel Power Measurement ⁵	6ms	11ms ¹³	40ms	4ms ¹³	6ms	7ms	7ms
Primary Channel Power Measurement, Two Adjacent Channel Power Measurements, and Two Alternate Channel Power Measurements ^{5,6}	26ms	16ms ^{10, 13}	N/A	10ms ^{10, 13}	47ms	47ms	86ms ¹⁷
Time to complete 10 different power measurements at a single frequency ^{5,8,14}	70ms	141ms ¹³	444ms	81ms ¹³	71ms	76ms	81ms
Time to complete 10 power measurements of a single power level at different frequencies ^{5,14}	178ms	371ms ¹³	652ms	325ms ¹³	180ms	184ms	235ms ¹⁷

Model 2800 RF Power Analyzer Specifications

GENERAL

PROGRAMMABILITY: IEEE-488.2 (SCPI – 1995.0), 3 user-definable power-up states plus factory default and *RST

MEMORY BUFFER: 2500 SETS OF 5 READINGS – primary channel power, upper and lower adjacent channel power, upper and lower alternate channel power, with time stamp, peak reading, average reading, and standard deviation

DIGITAL INTERFACE:

Digital I/O: 1 - digital input, 4 – digital outputs with 250mA sink capability, maximum clamp voltage-30V_{DC}

REAR CONNECTIONS: RF Input – Type N connector, External Trigger, Meter Complete, External Reference In, Cal Output – BNC connector, Digital I/O – DB9 connector, IEEE-488 – 24-Pin EMI-shielded receptacle, Power – Power Switch/Line Entry Module with DPDT switch, 2 fuses, and IEC 320 plug

POWER SUPPLY: 100V/120V/220V/240V

LINE FREQUENCY: 50Hz to 60Hz

POWER CONSUMPTION: 100VA

ENVIRONMENT:

Operating: 5° to 40°C, 70%R.H., non-condensing, up to 35° C

Storage: 0° to 50°C

WARRANTY: 1year

SAFETY: Complies with European Union Directive 73/23/EEC, EN61010-1

EMC: Complies with European Union Directive 89/336/EEC, EN61326-1

VIBRATION: MIL-PRF-28800F Class 3 Random

WARM-UP: 1-hour to rated accuracy

DIMENSIONS:

Bench configuration (with handle and feet): 104mm highx485mm widex478mm deep (4.125in x19in x18.75in)

Rack Mounting: 89mm highx485mm widex478mm deep (3.5in x19in x18.75in)

WEIGHT:

Net Weight: 13.14 kg (28.9 lbs)

Shipping Weight: 14.5kg (32lbs)

ACCESSORIES SUPPLIED: Hardcopy User's manual, RF Product Information CD-ROM, rack mount kit, bench assembly kit.

Notes:

1. Based on measurements of NIST traceable CW signals, and locked to the source reference. Exclusive of input mismatch. Derate by $\pm 0.05\text{dB}/^\circ\text{C}$ beyond $23^\circ\text{C} \pm 5^\circ\text{C}$
2. Based on an average of 6 measurements
3. Defined as 2 standard deviations of 100 consecutive readings while measuring a modulated signal
4. Measurement acquisition time: 10ms
5. Range: 20dBm to -60dBm (except CDMA2000 3X and WCDMA which are for 20dBm to -50dBm), averaging off, display off, input protection off, temperature compensation off, binary transfer, and 488.1 protocol. For measurements of only the primary channel, the adjacent channel measurements and the alternate channel measurements are disabled.
6. Adjacent channel power and alternate channel power measurement acquisition time: 10ms
7. Times are defined at specified repeatability and include IEEE-488 transfer times
8. Includes time required to make two attenuator changes
9. Bandwidths are nominal $\pm 15\%$ specified over 1.0dB passband ripple
10. Acquisition times include primary channel and upper and lower adjacent channel power measurements
11. Acquisition time is one time slot: NADC = 6.67ms, GSM = 577us. Level trigger is used.
12. Defined as 2 standard deviations of 100 consecutive measurements spaced evenly over an 8 hour period with ambient temperature of $23 \pm 1^\circ\text{C}$
13. Pulse measurement times are defined from the time the rising edge of each power pulse is detected to the completion of the data transfer.
14. Times are exclusive of DUT settling times
15. Dynamic range is defined as the maximum detectable difference between the primary channel power and the adjacent (or alternate) channel power for the specified accuracy and specified measurement bandwidth.
16. Defined for measurements on un-modulated carrier waveforms.
17. Times are based on measurements in Operating Band One.
18. Defined for signals whose carrier is at the programmed center frequency or offset by an integer multiple of 5kHz.