

# Universal Radio Communication Tester R&S<sup>®</sup> CMU200

Technical Information

Options R&S<sup>®</sup> CMU-K86, CMU-K869, CMU-K88



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The specifications for the R&S CMU200 (Order No. 1100.0008.02/10/30/53) refer to a fully equipped unit with all possible options installed.

## Overview

As of the R&S<sup>®</sup> CMU200 SW V4.20 (and higher) the CDMA2000<sup>®</sup> 1x and CDMA2000<sup>®</sup> 1xEV-DO options add support for band class 13, 16 and 17 which require an extension of the technical data. These modifications are described in the following document.

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CDMA2000<sup>®</sup> is a registered trademark of the Telecommunications Industry Association (TIA - USA)

# CDMA2000<sup>®</sup> specifications – mobile station test

<b>Standards</b>	CDMA2000 <sup>®</sup> standards CDMA2000 <sup>®</sup> test standards CDMA2000 <sup>®</sup> is a registered trademark of the Telecommunications Industry Association (TIA -- USA)	TIA/EIA IS-2000 Rev. 0 TIA/EIA IS-98-F
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## RF generator

<b>Frequency range</b>		
	US / Korean Cellular (band class 0)	860.025 MHz to 893.985 MHz
	North American PCS (band class 1)	1930.000 MHz to 1990.000 MHz
	TACS Band (band class 2)	917.0125 MHz to 959.9875 MHz
	JTACS Band (band class 3)	832.0125 MHz to 869.9875 MHz
	Korean PCS (band class 4)	1840.000 MHz to 1870.000 MHz
	NMT-450 (band class 5)	421.675 MHz to 493.480 MHz
	IMT-2000 (band class 6)	2110.000 MHz to 2169.950 MHz
	North American 700 MHz Cellular Band (band class 7)	746.000 MHz to 764.000 MHz
	1800 MHz Band (band class 8)	1805.000 MHz to 1879.950 MHz
	900 MHz Band (band class 9)	925.000 MHz to 958.750 MHz
	Secondary 800 MHz Band (band class 10)	851.000 MHz to 939.975 MHz
	400 MHz European PAMR (band class 11)	421.675 MHz to 493.475 MHz
	800 MHz PAMR band (band class 12)	915.0125 MHz to 920.9875 MHz
	2.5 GHz IMT-2000 Extension (band class 13)	2620.000 MHz to 2690 MHz
	US PCS 1.9GHz Band (band class 14)	1930.000 MHz to 1995.000 MHz
	AWS Band (band class 15)	2110.000 MHz to 2155.000 MHz
	US 2.5 GHz Band (band class 16)	2624.000 MHz to 2690.000 MHz
	US 2.5 GHz Forward Link Only Band (band class 17)	2624.000 MHz to 2690.000 MHz

<b>Frequency resolution</b>	channel spacing in line with standard	
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<b>Frequency uncertainty</b>		same as time base, see base unit specifications
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<b>Output level range</b>	modulated signal	
RF 1	f < 2200 MHz f ≥ 2200 MHz	-120 dBm to -33 dBm -120 dBm to -39 dBm
RF 2	f < 2200 MHz f ≥ 2200 MHz	-120 dBm to -16 dBm -120 dBm to -22 dBm
RF 3 OUT	f < 2200 MHz f ≥ 2200 MHz	-99 dBm to +5 dBm -99 dBm to -1 dBm

<b>Output level resolution</b>	modulated signal	0.1 dB
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<b>Output level uncertainty</b>	in temperature range +20 °C to +35 °C	
RF 1, RF 2	output level ≥ -108 dBm f < 2200 MHz f ≥ 2200 MHz	<0.5 dB <0.7 dB
RF 3 OUT	-80 dBm to +4 dBm f < 2200 MHz f ≥ 2200 MHz	<0.7 dB <0.9 dB

<b>Output level uncertainty</b>	in temperature range +5 °C to +45 °C	
RF 1, RF 2	output level $\geq -108$ dBm f <2200 MHz f $\geq$ 2200 MHz	<0.7 dB <1.5 dB
RF 3 OUT	-80 dBm to +4 dBm f <2200 MHz f $\geq$ 2200 MHz	<0.9 dB <1.5 dB

<b>Modulation</b>		
Dual BPSK, multiple QPSK		1.2288 Mcps
AWGN		see AWGN generator
Carrier suppression		>35 dB
Waveform quality factor ( $\rho$ )		>0.985
Code channel level uncertainty	relative to the total CDMA power F-PICH, F-PCH, F-FCH, F-SCH1, F-SCH2 all other channels	approx. 0.1 dB approx. 0.25 dB
Code channel resolution		0.1 dB

<b>AWGN generator</b>		
Bandwidth		>1.8 MHz
Output level resolution		0.1 dB
Output level uncertainty	bandwidth 1.23 MHz	approx. 0.2 dB
Output level range	relative to total CDMA output power	-20 dB to +4 dB

<b>Supported service options</b>	in Signaling mode	
Loopback service options		SO 2, 9, 55
Speech service options		SO 1, 3, 17, 0x8000
Test data service option		SO 32
Packet data service option		SO 33
Messaging tele service option		SO 6, 14

## RF analyzer

<b>Frequency range</b>		
	US/Korean Cellular (band class 0)	815.025 MHz to 848.985 MHz
	North American PCS (band class 1)	1850.000 MHz to 1910.000 MHz
	TACS Band (band class 2)	872.0125 MHz to 914.9875 MHz
	JTACS Band (band class 3)	887.0125 MHz to 924.9875 MHz
	Korean PCS (band class 4)	1750.000 MHz to 1780.000 MHz
	NMT-450 (band class 5)	411.675 MHz to 483.480 MHz
	IMT-2000 (band class 6)	1920.000 MHz to 1979.950 MHz
	North American 700 MHz Cellular Band (band class 7)	776.000 MHz to 794.000 MHz
	1800 MHz Band (band class 8)	1710.000 MHz to 1784.950 MHz
	900 MHz Band (band class 9)	880.000 MHz to 913.750 MHz
	Secondary 800 MHz Band (band class 10)	806.000 MHz to 900.975 MHz
	400 MHz European PAMR (band class 11)	411.675 MHz to 483.475 MHz
	800 MHz PAMR band (band class 12)	870.0125 MHz to 875.9875 MHz
	2.5 GHz IMT-2000 Extension (band class 13)	2500.000 MHz to 2570.000 MHz
	US PCS 1.9GHz Band (band class 14)	1850.000 MHz to 1915.000 MHz
	AWS Band (band class 15)	1710.000 MHz to 1755.000 MHz
	US 2.5 GHz Band (band class 16)	2502.000 MHz to 2568.000 MHz

<b>Measurement filter</b>	in line with standard	bandwidth 1.23 MHz
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<b>Frequency resolution</b>	channel spacing in line with standard	
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<b>Frequency uncertainty</b>		same as time base, see base unit specifications
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### Power meter (frequency-selective)

<b>Level range</b>	HPSK, O-QPSK signal	
RF 1	f <2200 MHz f ≥2200 MHz	-40 dBm to +44 dBm -34 dBm to +44 dBm
RF 2	f <2200 MHz f ≥2200 MHz	-54 dBm to +30 dBm -48 dBm to +30 dBm
RF 4 IN	f <2200 MHz f ≥2200 MHz	-80 dBm to -9 dBm -74 dBm to -9 dBm

<b>Level uncertainty</b>		
RF 1, RF 2, RF 4 IN	in temperature range +20 °C to +35 °C f <2200 MHz f ≥2200 MHz	<0.5 dB <0.7 dB
	in temperature range +5 °C to +45 °C f <2200 MHz f ≥2200 MHz	<0.7 dB <0.9 dB

<b>Level resolution</b>		0.1 dB
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## Modulation analyzer

<b>Level range</b>	HPSK, O-QPSK signal	
RF 1	f <2200 MHz f ≥2200 MHz	-40 dBm to +44 dBm -34 dBm to +44 dBm
RF 2	f <2200 MHz f ≥2200 MHz	-54 dBm to +30 dBm -48 dBm to +30 dBm
RF 4 IN	f <2200 MHz f ≥2200 MHz	-80 dBm to -9 dBm -74 dBm to -9 dBm

<b>RC1, RC2 (O-QPSK)</b>	waveform quality, error vector magnitude, magnitude error, phase error	
ρ uncertainty	for ρ 0.9 to 1	<0.003
Frequency measurement range		-3 kHz to +3 kHz
Frequency measurement uncertainty	f <2200 MHz f ≥2200 MHz	<10 Hz + drift of time base, <25 Hz + drift of time base, see base unit specifications

<b>RC3, RC4 (HPSK)</b>	waveform quality, error vector magnitude, magnitude error, phase error, channel power, code domain power, peak code domain error power,	
ρ uncertainty	for ρ 0.9 to 1	<0.003
Frequency measurement range		-3 kHz to +3 kHz
Frequency measurement uncertainty	f <2200 MHz f ≥2200 MHz	<10 Hz + drift of time base, <25 Hz + drift of time base, see base unit specifications
Relative measurement uncertainty	result >-33 dB	<0.1 dB

<b>Measurements</b>		
Modulation		Overview EVM versus time, graphical ME versus time, graphical PE versus time, graphical I/Q analyzer
Power		Standby/Access-Probe Power Open Loop Time Response Gated Output Power Maximum Output Power Minimum Output Power
Spectrum		
Code Domain Power		Code Domain Power Code Domain Error Power Channel Power Time/Phase Offset relative to Pilot
Receiver		FER for FCH, SCH RLP / Throughput Statistics Forward Power Control

## Option Speech Codec R&S CMU-B85

<b>Speech decoder output</b>	SPEECH HANDSET OUT	9-pin sub-D connector
Output impedance		<10 $\Omega$
Maximum output current		20 mA, peak
Full-range output level		1 V, peak

<b>Speech coder input</b>	SPEECH HANDSET IN	9-pin sub-D connector
Input impedance		100 k $\Omega$
Full-range input level	low sensitivity high sensitivity	1.4 V, peak 0.1 V, peak



# 1xEV-DO specifications – access terminal test

<b>Standards</b>	1xEV-DO standards 1xEV-DO test standards (access terminal)	TIA/EIA IS-856-2 TIA/EIA IS-866
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## RF generator

<b>Frequency range</b>		
	US / Korean Cellular (band class 0)	860.025 MHz to 893.985 MHz
	North American PCS (band class 1)	1930.000 MHz to 1990.000 MHz
	TACS Band (band class 2)	917.0125 MHz to 959.9875 MHz
	JTACS Band (band class 3)	832.0125 MHz to 869.9875 MHz
	Korean PCS (band class 4)	1840.000 MHz to 1870.000 MHz
	NMT-450 (band class 5)	421.675 MHz to 493.480 MHz
	IMT-2000 (band class 6)	2110.000 MHz to 2169.950 MHz
	North American 700 MHz Cellular Band (band class 7)	746.000 MHz to 764.000 MHz
	1800 MHz Band (band class 8)	1805.000 MHz to 1879.950 MHz
	900 MHz Band (band class 9)	925.000 MHz to 958.750 MHz
	Secondary 800 MHz Band (band class 10)	851.000 MHz to 939.975 MHz
	400 MHz European PAMR (band class 11)	421.675 MHz to 493.475 MHz
	800 MHz PAMR band (band class 12)	915.0125 MHz to 920.9875 MHz
	2.5 GHz IMT-2000 Extension (band class 13)	2620.000 MHz to 2690 MHz
	US PCS 1.9GHz Band (band class 14)	1930.000 MHz to 1995.000 MHz
	AWS Band (band class 15)	2110.000 MHz to 2155.000 MHz
	US 2.5 GHz Band (band class 16)	2624.000 MHz to 2690.000 MHz
	US 2.5 GHz Forward Link Only Band (band class 17)	2624.000 MHz to 2690.000 MHz

<b>Frequency resolution</b>	channel spacing in line with standard	
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<b>Frequency uncertainty</b>		same as time base, see base unit specifications
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<b>Statistics</b>		
Statistic count		1 to 1000
Values		current, average, min/max

<b>Trigger</b>		
Trigger sources		free run, internal, external, IF power, RF power
Trigger output	24-pin sub-D connector AUX 3	Super Frame, Power Control Frame, Paging Frame, Sync Frame, PP2S

<b>Output level range</b>	modulated signal	
RF 1	f < 2200 MHz f ≥ 2200 MHz	-120 dBm to -33 dBm -120 dBm to -39 dBm
RF 2	f < 2200 MHz f ≥ 2200 MHz	-120 dBm to -16 dBm -120 dBm to -22 dBm
RF 3 OUT	f < 2200 MHz f ≥ 2200 MHz	-99 dBm to +5 dBm -99 dBm to -1 dBm

<b>Output level resolution</b>	modulated signal	0.1 dB
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<b>Output level uncertainty</b>	in temperature range +20 °C to +35 °C	
RF 1, RF 2	output level $\geq -108$ dBm f <2200 MHz f $\geq 2200$ MHz	<0.5 dB <0.7 dB
RF 3 OUT	-80 dBm to +4 dBm f <2200 MHz f $\geq 2200$ MHz	<0.7 dB <0.9 dB

<b>Output level uncertainty</b>	in temperature range +5 °C to +45 °C	
RF 1, RF 2	output level $\geq -108$ dBm f <2200 MHz f $\geq 2200$ MHz	<0.7 dB <1.5 dB
RF 3 OUT	-80 dBm to +4 dBm f <2200 MHz f $\geq 2200$ MHz	<0.9 dB <1.5 dB

<b>Modulation</b>		
Dual BPSK		1.2288 Mcps
AWGN		see AWGN generator
Carrier suppression		>35 dB
Waveform quality factor ( $\rho$ )		>0.985
Code channel level uncertainty	relative to total 1xEV-DO output power	approx. 0.1 dB
Code channel resolution		0.1 dB
Code channel level range		-25.0 dB to -7.0 dB

<b>AWGN generator</b>		
Bandwidth		>1.8 MHz
Output level resolution		0.1 dB
Output level uncertainty	bandwidth 1.23 MHz	approx. 0.2 dB
Output level range	relative to total 1xEV-DO output power	-20 dB to +4 dB

<b>Supported applications</b>	in Signaling mode	
Test Applications		FTAP / RTAP
Default Signaling Application		
Default Packet Application		

## RF analyzer

<b>Frequency range</b>		
	US/Korean Cellular (band class 0)	815.025 MHz to 848.985 MHz
	North American PCS (band class 1)	1850.000 MHz to 1910.000 MHz
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	AWS Band (band class 15)	1710.000 MHz to 1755.000 MHz
	US 2.5 GHz Band (band class 16)	2502.000 MHz to 2568.000 MHz

<b>Measurement filter</b>	in line with standard	bandwidth 1.23 MHz
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<b>Frequency resolution</b>	channel spacing in line with standard	
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<b>Frequency uncertainty</b>		same as time base, see base unit specifications
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<b>Statistics</b>		
Statistic count		1 to 1000
Values		current, average, min/max

<b>Trigger</b>		
Trigger sources		free run, internal, external, IF power, RF power
Trigger output	24-pin sub-D connector AUX 3	ControlSlot, ControlChannel, Slot, PP2S

### Power meter (frequency-selective)

<b>Level range</b>	modulated signal	
RF 1	f < 2200 MHz f ≥ 2200 MHz	-40 dBm to +44 dBm -34 dBm to +44 dBm
RF 2	f < 2200 MHz f ≥ 2200 MHz	-54 dBm to +30 dBm -48 dBm to +30 dBm
RF 4 IN	f < 2200 MHz f ≥ 2200 MHz	-80 dBm to -9 dBm -74 dBm to -9 dBm

<b>Level uncertainty</b>		
RF 1, RF 2, RF 4 IN	in temperature range +20 °C to +35 °C f <2200 MHz f ≥2200 MHz	<0.5 dB <0.7 dB
	in temperature range +5 °C to +45 °C f <2200 MHz f ≥2200 MHz	<0.7 dB <0.9 dB

<b>Level resolution</b>		0.1 dB
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### Modulation analyzer

<b>Level range</b>	modulated signal	
RF 1	f <2200 MHz f ≥2200 MHz	-40 dBm to +44 dBm -34 dBm to +44 dBm
RF 2	f <2200 MHz f ≥2200 MHz	-54 dBm to +30 dBm -48 dBm to +30 dBm
RF 4 IN	f <2200 MHz f ≥2200 MHz	-80 dBm to -9 dBm -74 dBm to -9 dBm

<b>Waveform quality (ρ) uncertainty</b>	for ρ 0.9 to 1	<0.003
<b>Frequency measurement range</b>		-3 kHz to +3 kHz
<b>Frequency measurement uncertainty</b>	f <2200 MHz f ≥2200 MHz	<10 Hz + drift of time base, <25 Hz + drift of time base, see base unit specifications
<b>Relative measurement uncertainty</b>	result > -33 dB	<0.1 dB

<b>Measurements</b>		
Modulation		Overview EVM versus time, graphical ME versus time, graphical PE versus time, graphical I/Q analyzer
Power		
Spectrum		
Code Domain Power		Code Domain Power Code Domain Error Power Channel Power
Receiver	in Signaling mode	FTAP/RTAP



For product brochure, see  
PD 0758.0039.12  
and [www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
(search term: CMU200)



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