Digital Radiocommunication Testers CMD50/52, CMD53/55, CMD65

Multimode compact testers for digital mobile phones to GSM900/1800/1900 and DECT standard

CMD65 (photo 40882-1)

Brief description

CMD50/52 is a compact unit for testing GSM mobiles. CMD53/55 is furthermore capable of testing GSM1800 mobile phones. The CMD65 combines the functionality of CMD55 and that of CMD60 (see page 36). CMD53/55 can optional be extended to include the DECT standard. All models can optionally be extended to include the GSM1900 standard.

All models combine small dimensions with high measurement accuracy and speed. The testers' range of capabilities includes all signalling, generator and measurement functions required for verifying the correct operation of the DUT. Thanks to their fast go/nogo tests and accurate analysis using optional extensions, CMD52 and 55 are equally suited for use in service and production.

For use in service and maintenance, models CMD50 and CMD53, which are based on CMD52 and CMD55 but have a reduced number of facilities, are available.

Main differences of CMD52/53 to CMD52/55

- Remote control via RS-232 only (no IEC/IEEE bus)
- No multifunction connector on front panel
- Speech coder/decoder cannot be integrated
- Optional ammeter and voltmeter
- High-sensitivity 2nd RF input available as an option

Operation

Operation of the CMD is extremely user-friendly and requires no detailed GSM knowledge. The high-contrast, backlit LCD provided with softkeys on both sides allows convenient callup of test routines under menu control.

Remote control

- CMD controlled via RS-232 or IEC/IEEE-bus interface uses SCPI-compatible commands
- Designed for fast speed to yield high throughputs in production

Autotest

The autotest function enables complete measurement routines to be started at a keystroke.

Test capabilities

To test mobile phones, the CMD simulates a GSM base station. Two RF synthesizers, one of which delivers a continuous BCCH signal, are available for this purpose. The major test functions are:

- mobile-to-base station synchronization
- location update
- incoming call setup
- outgoing call setup
- mobile power level control
- handover (channel change, timeslot change)
- dual-band handover
- peak power measurement
- SACCH measurement (eg RxLev, RxQual, power level)
- echo test
- call clearing by mobile
- call clearing by network
- DC current/voltage measurement
- phase and frequency error measurement (option CMD-B4)
- measurement of power ramp as a function of time (option CMD-B4)
- bit-error rate (BER) measurement (option CMD-B4)

Echo test

The echo test allows very rapid go/nogo analysis covering all essential parts of the mobile including microphone and loudspeaker.

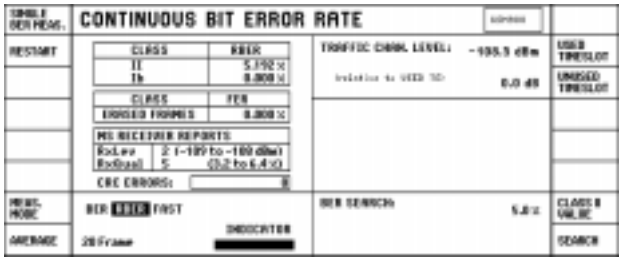
Voltage and power measurements

The DC ammeter/voltmeter designed for pulsed signals allows correct measurement of the power consumption of the mobile phone.

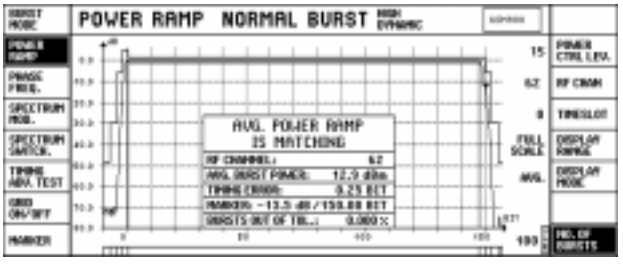
Module test

Fault localization in mobile telephones requires various measurement functions that can also be used without signalling so that defective units can be tested down to module level. The basic model of CMD already provides some of these functions, other functions are available as optional extensions:

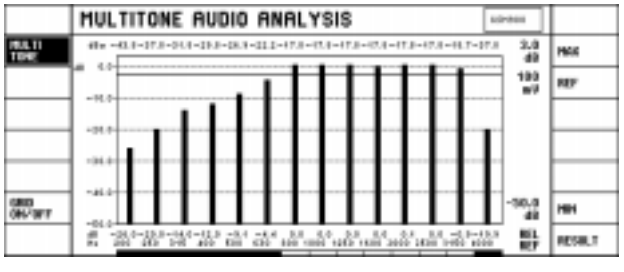
- power measurement
- signal generation
- phase and frequency error measurement
- measurement of power ramp



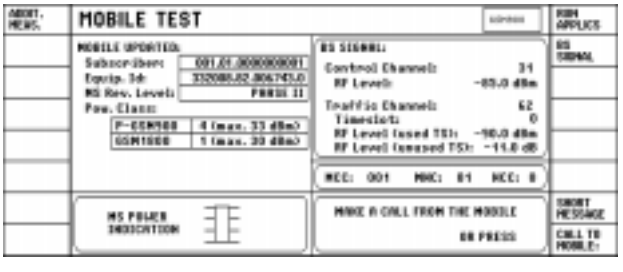
The BER search function allows the absolute sensitivity of a mobile to be determined



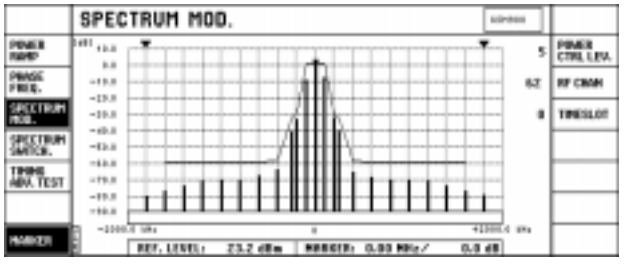
The full dynamic range (>72 dB) of a GSM normal and access burst can be verified with the CMD-B42 option



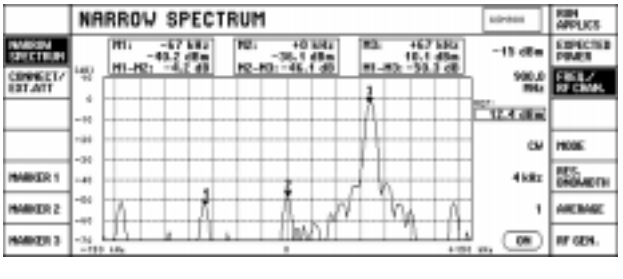
The audio measurement option CMD-B44 is capable of generating and analyzing up to 14 freely configurable tones in about 1 second. Measurements in absolute and relative mode are possible



After location update, it is indicated whether a mobile is a dual-band version. For realistic simulation of the real networks, the CMD-U20 offers the option to have the BCCH present in either band during dual-band simulation



Option CMD-B43 provides measurements of spectrum due to modulation and switching according to GSM recommendations



The narrowband spectrum analyzer option CMD-K43 is used to determine the I/Q modulator balance by measuring the suppressed carrier and sidebands

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Overview of applications and options

	GSM900	GSM1800	GSM1900	DECT	RS232	IEEE-bus	V/I meas.	Service	Production
CMD50	•	CMD-U1	CMD-U1 CMD-B19	CMD-U1 CMD-U56	•	–	CMD-B20	•	–
CMD52	•	CMD-U1	CMD-U1 CMD-B19	CMD-U1 CMD-U56	•	•	•	•	•
CMD53	•	•	CMD-B19	CMD-U56	•	–	CMD-B20	•	–
CMD55	•	•	CMD-B19	CMD-U56	•	•	•	•	•
CMD65	•	•	CMD-B19	•	•	•	•	•	•

Designation, functions	Option	Order No.
GSM1900 mobile station test (for CMD53/55 and CMD65 only)	CMD-B19	1059.6201.02
OCXO Reference Oscillator: frequency drift ≤1 × 10^{-7}	CMD-B1	1059.6002.02
Reference Frequency Inputs/Outputs: synchronization to internal or external frequency (2.048, 10, 13.26, 52 MHz) or GSM bit clock (270.8 kHz) 1 to 13 MHz, input signal min. 0 dBm, max. TTL signal	CMD-B3	1051.6202.02
Fast Power Ramp, Phase/Frequency Error and BER Measurement: numeric/graphic display, various BER, RBER, FER test routines; required for fitting CMD-B41 and CMD-B42	CMD-B4	1051.6654.02
AF Measurement Unit with Frequency Counter: comprises AF generator, voltmeter, distortion meter and frequency counter, measurements up to 60 MHz	CMD-B41	1051.6902.02
High-Dynamic Burst Analysis: dynamic range >72 dB (CMD-B4 required)	CMD-B42	1051.7150.02
GSM900/1800/1900-Specific Measurement of spectra due to switching/modulation (CMD-B4 and CMD-B42 required)	CMD-B43	1059.6001.02
Multitone Generator and Analyzer for CMD5x and CMD6x: comprehensive audio tests up to 8460 Hz (CMD-B4 and CMD-B41 required)	CMD-B44	1099.3203.02
Realtime Speech Encoder/Decoder	CMD-B5	1051.8657.02
TDMA Signals ans Adapter for CMD-B6x Options: required for fitting CMD-B61 and CMD-B62	CMD-B6	1051.7409.02
IEC/IEEE-Bus Interface: alternative for RS-232 interface (standard, CMD-B6 required)	CMD-B61	1051.7609.02
Memory Card Interface: archiving of results, etc. (CMD-B6 required)	CMD-B62	1051.8205.02
I/Q Demodulator Output and Trigger Input (BNC connector on the rear panel)	CMD-U5	1059.6901.02
I/Q Demodulator Output and Trigger Input for Fading Simulation	CMD-B17	1099.3003.02
Modification Kit for upgrading CMD50/52 to CMD53/55	CMD-U1	1051.8957.02
DECT Extension for CMD53/55	CMD-U56	1051.8004.02
Narrowband RF Spectrum Analyzer (CMD-B4 required)	CMD-K43	1082.4830.02
Extra Frequency Range for R-GSM, International Railway System (UIC)	CMD-K80	1082.4930.02
Modification Kit for CMD53/65: dual-band handover with BCCH present; for CMD53 only with CMD-U10	CMD-U20	1099.5606.02

Specifications in brief

For CMD65 see also CMD60, page 36

Timebase TCXO standard, 10 MHz
Frequency drift (0 to +35°C) ≤1.5x10^{-6}
Aging ≤0.5x10^{-6}/year (at 35 °C)

Timebase OCXO with option CMD-B1, 10 MHz
Nominal frequency 10 MHz
Frequency drift (0 to +50°C) ≤1x10^{-7}
Aging ≤2x10^{-7}/year

DC voltmeter 0 to ±30 V
Resolution/accuracy 10 mV/2%

DC ammeter current averaging with GSM-adapted time constant, current peak measurement (positive and negative)
Measurement range 0 to ±10 A
Resolution/accuracy 10 mA/2%

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Specific data of CMD 52

RF generator 1		
Frequency range		935.2 to 959.8 MHz (GSM channel spacing)
Frequency settling time		≤3 ms for phase error <2°
Output level (RF IN / OUT)		–33 to –120 dBm
Output level (RF OUT 2)		+13 to –77 dBm
Resolution		0.1 dB
Harmonics (RF IN / OUT)		< –30 dBc
Modulation		GMSK, B × T = 0.3
RF generator 2		same as RF generator 1, but
Output level (RF IN / OUT)		–35 dBm (RF OUT 2: +11 dBm)
Peak power meter (RF IN / OUT)		
Frequency range		800 to 1000 MHz
Measurement range / resolution		10 to 47 dBm / 0.1 dB
VSWR		≤1.3
GSM phase and frequency error measurement		with option CMD-B4
Frequency range		890.2 to 914.8 MHz (GSM900 band)
Level range (RF IN / OUT		10 to 47 dBm (RF IN 2: –60 to 0 dBm)
GSM burst power measurement		with option CMD-B4
Frequency range		890.2 to 914.8 MHz (GSM900 band)
Reference level range (RF IN / OUT		10 to 47 dBm (RF IN 2: –37 to 0 dBm)
High-dynamic burst analysis		with option CMD-B42
Relative error of individual test sample		≤1.5 dB to 72 dB below peak power
Dynamic range		>72 dB
Measurement limit (RF IN / OUT)		<–36 dBm (RF IN 2: <–83 dBm)

Specific data of CMD 55

RF generator 1		same as CMD52, but
Frequency range	GSM900 band	935.2 to 959.8 MHz
	GSM1800 band	1805.2 to 1879.8 MHz
	GSM1900 band	1930.2 to 1989.8 MHz
Output level	RF IN / OUT	–35 to –120 dBm
	OUT2	+11 to –77 dBm
RF generator 2		same as RF generator 1, but
Max. output level (RF IN / OUT)		–37 dBm (RF OUT 2: +9 dBm)
Peak power meter (RF IN / OUT)		
Frequency range		800 to 1000 MHz
		1700 to 1900 MHz
Measurement range / resolution		
	GSM900 band	0 to 47 dBm / 0.1 dB
	GSM1800 / 1900	0 to 33 dBm / 0.1 dB
VSWR		≤1.3
Phase and frequency error measurement		with option CMD-B4
Frequency range	GSM900 band	890.2 to 914.8 MHz
	GSM1800 band	1710.2 to 1784.8 MHz
	GSM1900 band	1850.2 to 1909.8 MHz
Level range		
RF IN / OUT	GSM900 band	0 to 47 dBm
	GSM1800 / 1900	0 to 33 dBm
RF IN 2		–60 to 0 dBm
Burst power measurement		with option CMD-B4
Frequency range	GSM900 band	890.2 to 914.8 MHz
Frequency range	GSM1800 band	1717.2 to 1784.8 MHz
	GSM1900 band	1850.2 to 1909.8 MHz
Reference level range		
RF IN / OUT	GSM900 band	10 to 47 dBm
	GSM1800 / 1900	0 to 33 dBm
RF IN 2		–37 to 0 dBm
High-dynamic burst analysis		with option CMD-B42
Dynamic range		>72 dB
Measurement limit		
RF IN / OUT)	GSM900 band	<–36 dBm
	GSM1800 / 1900	<–48 dBm
RF IN 2	GSM900 band	<–83 dBm
	GSM1800 / 1900	<–85 dBm

AF Measurement Unit

option CMD-B41

AF generator	
Frequency range / resolution	50 Hz to 10 kHz / 0.1 Hz
Frequency drift	same as timebase + half resolution
Voltage range / resolution	10 µV to 5 V / 10 µV (1%)
Distortion	≤0.5%
AF voltmeter	
Frequency range	50 Hz to 10 kHz
Measurement range / resolution	0.1 mV to 30 V / 100 µV (1%)
Distortion meter	
Frequency range	300 Hz to 3 kHz
Input voltage range / resolution	100 mV to 30 V / 0.1%
Inherent distortion	≤0.5%
AF counter	
Frequency range / resolution	20 Hz to 10 kHz / ≤1 Hz
Input voltage range	10 mV to 30 V
IF counter	
Frequency range / resolution	10 kHz to 60 MHz / 1 Hz
Input signal	min.: 100 mV; max.: TTL signal

Interfaces

IEC / IEEE-Bus Interface	option CMD-B61 IEC625-1 (IEEE 488), SCPI-compatible
Other interfaces	RS-232-C, Centronics
Reference Frequency Inputs / Outputs	option CMD-B3
Synchronization input	
Frequency (selectable)	GSM bit clock (270.8 kHz), 2xGSM bit clock, 4xGSM bit clock, 16xGSM bit clock, 1 to 13 MHz in 1 MHz steps, 2.048 MHz, 26, 39, 52 MHz
Input signal	min.: 0 dBm; max.: TTL signal
Synchronization output 1	
Frequency	10 MHz with internal reference or frequency at synchronization input with external frequency
Input signal	TTL signal, Z_{out} = 50 Ω
Synchronization output 2	
Frequency (selectable)	GSM bit clock, 2x, 4 x, 16x GSM bit clock, 1, 2, 4 or 13 MHz
Input signal	TTL signal, Z_{out} = 50 Ω

Ordering information

Mobile Station Tester		
GSM900	CMD 50	1050.9008.50
GSM900	CMD 52	1050.9008.52
GSM900 and GSM1800	CMD 53	1050.9008.53
GSM900 and GSM1800	CMD 55	1050.9008.55
GSM900, GSM1800 and DECT	CMD65	1050.9008.65
For all models GSM1900 optional	CMD-B19	1059.6201.02