

Communications Test Sets

CMS50 • CMS52

★ Features


CMS50/CMS52

- Compact, Versatile and Full-featured Radiotelephone Tester
- Low Weight and Small Size for Stationary, Portable, and Mobile Use
- High-contrast Backlit LCD Screen with Large Characters and Simultaneous Indication of All Settings and Results
- Numerous Additional Features Such As Spectrum Monitor, Oscilloscope, Continuously Tunable Distortion Meter, and Adjustable AF Filters
- Learn Mode for Easy Programming
- Signaling Unit for Cellular Radio, e.g., E-AMPS, Trunked Radio, Paging Systems, and ZVEI Digital
- High-sensitivity Second IF Input for Off-air Measurements; Can Be Used Independently for Testing Modules, Including Frequency Converting DUTs
- Full-duplex Operation Without Compromise on Measurements
- Remote Control via IEC/IEEE Bus
- Automatic Self-adjustment Functions and Comprehensive Self-test
- Built-in Automatic Test Routines for Recurring Test Sequences

Ⓐ Applications

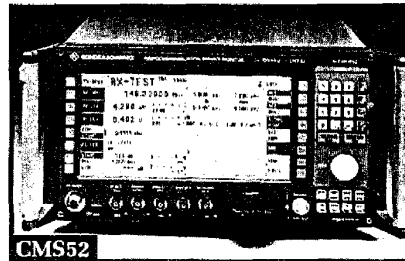
- Radiocom Tests
- Portable and Handheld Mobile
- Phone Test

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1933, inside the U.S. call: 1-800-426-2200.

 Product(s) complies with IEEE Standard 488.2.

ROHDE&SCHWARZ

Rohde & Schwarz' quality system complies with the DIN ISO 9001 standard and has been certified by DQS (German Association for the Certification of Quality Systems).



CMS50/CMS52 Radiocommunication Service Monitor

The CMS52 Radiocommunication Service Monitor is the ideal radio tester for service, maintenance, and test departments. With its full-featured configuration plus additional test facilities, it not only satisfies all requirements of radio measurements, but is also able to perform tests in related fields. The lightweight and compact instrument is particularly suitable for mobile use. With its extensive test facilities, it's also a valuable aid in development laboratories.

The CMS50 Radiocommunication Service Monitor is a budget-priced version of the CMS52, providing many of the same measurement capabilities. Differences are in the basic configuration, variety of options, and data tolerances (see following information).

OVERVIEW OF OPERATION

The CMS has a large, high-resolution LCD screen with backlighting and graphics capability. It's operated via softkeys at both sides of the display. A straightforward menu structure allows fast, direct access to the test facilities provided by the CMS50/52. Numbers and units can be entered directly via the keyboard; settings can be varied by means of the spinwheel with variable step size.

In the learn mode, the CMS stores all manual settings and measurements and produces a ready-to-start automatic test routine. The user doesn't need to have any programming knowledge or learn equipment-specific command sets. Tolerances, comments, and conditions (e.g., loops, jumps, queries, and control commands) can be easily inserted into these test routines. Generated programs and test results can be saved on a memory card. Programs and test results can be output to an optional printer.

Characteristics

TIMEBASE

Timebase/Standard –

Temperature effect (0° to +35°C): $\leq 1 \times 10^{-6}$
Aging: $\leq 1 \times 10^{-7}$ /day; $\leq 1 \times 10^{-6}$ /month;
 $\leq 2 \times 10^{-6}$ /year.

RECEIVER MEASUREMENTS

Signal Generator –

Frequency range: 0.4 MHz to 1 GHz.
Frequency resolution: CMS52, 10 Hz; CMS50, 50 Hz.
Frequency error: Same as timebase.
Level – FM: ϕ M, CW: ≤ -134 to 0 dBm.
AM: -134 to -3 dBm.
Level resolution: 0.1 dB.
Fine variation of level – FM: ϕ M, CW: 0 to -19.9 dB, non-interrupting. AM: 0 to -4.9 dB, non-interrupting.
Level error (level ≤ -3 dBm, $f > 1$ MHz): ≤ 2 dB.
Harmonics: CMS52, ≤ -25 dBc; CMS50, ≤ -20 dBc.
Non-harmonics: ≤ -50 dBc (≤ 5 kHz from carrier, level -3 dBm).
Residual AM (CCITT, RMS): CMS52, $\leq 0.03\%$; CMS50, $\leq 0.1\%$.
Residual FM (CMS52) (CCITT, RMS) – 400 kHz to 250 MHz, 500 MHz to 1 GHz: ≤ 10 Hz, 250 to 500 MHz: ≤ 5 Hz.
Residual FM (CMS50) (CCITT, RMS): ≤ 10 Hz.
Phase noise (CMS52): ≤ -110 dBc/Hz (20 kHz from carrier).

Modulation –

Frequency range: CMS52, 0.4 MHz to 1 GHz; CMS50, 2 to 500 MHz.
AM modulation depth: 0 to 99%.
Resolution: 0.5%.
Modulation frequency range (CMS52): $f < 8$ MHz, DC to 10 kHz; $f \geq 8$ MHz, DC to 20 kHz. (CMS50): 15 Hz to 10 kHz, $f < 8$ MHz.
Modulation distortion ($m < 0.8$, $f_{AF} = 1$ kHz): $\leq 2\%$.
Modulation error ($m < 0.8$, $f_{AF} = 300$ Hz to 3 kHz): $\leq 5\%$ + resolution + residual AM.
FM deviation: CMS52, 0 to 100 kHz; CMS50, 50 Hz to 50 kHz.
Resolution: $\Delta f < 100$ Hz, 1 Hz; $\Delta f \geq 100$ Hz, 1%.
Modulation frequency range: 20 Hz to 20 kHz; suitable for POCSAG. Modulation distortion ($f_{AF} = 1$ kHz, $\Delta f < 1$ kHz): $\leq 1\%$.
Modulation error: $\leq 5\%$ + resolution + residual FM.
 ϕ M deviation (internal): 0 to 10 rad.

Communications Test Sets

CMS50 • CMS52

Resolution: $\Delta\varphi < 0.1$ rad, 1 mrad; $\Delta\varphi \geq 0.1$ rad, 1%.
Modulation frequency range: 100 Hz to 6 kHz.
Modulation distortion ($f_{AF}=1$ kHz, $\Delta\varphi \leq 1$ rad): $\leq 1\%$.

Modulation error: $\leq 5\%$ + resolution + residual φM .

Modulation modes: Internal (single tone/two-tone), external, internal + external.

AF Voltmeter –

Frequency range: 50 Hz to 20 kHz.
Measurement range: 0.1 mV to 30 V.
Resolution: $V < 10$ mV: 100 μV ; $V \geq 10$ mV: 1%.
Error: $< 5\%$ + resolution.
Input impedance: Approximately 1 M Ω .

Distortion Meter, SINAD Meter, AF Frequency Counter – See transmitter and receiver measurements.

TRANSMITTER MEASUREMENTS

RF Power Meter –

Frequency range: CMS52, 1.5 MHz to 1 GHz; CMS50, 2 MHz to 1 GHz.
Measurement range: 5 mW to 50 W.
Resolution – $P < 100$ mW: 1 mW.
 $P \geq 100$ mW: 1%.
Error ($P > 20$ mW, AM – 0%): ≤ 0.4 dB + resolution.

RF Frequency Counter –

Frequency range: 0.5 MHz to 1 GHz.
Input level range: 5 mW to 50 W.
Resolution: 10 Hz, 1 Hz.
Error: Same as timebase + resolution.

Frequency Deviation Meter –

Operating modes: +PK, –PK, $\pm PK/2$, PK HOLD, RMS, RMS $\sqrt{2}$.
Input level range: 5 mW to 50 W.
RF frequency range: 1.5 MHz to 1 GHz.
Deviation measurement range: CMS52, 0 Hz to 100 kHz; CMS50, 0 Hz to 50 kHz.
AF frequency range: CMS52, 20 Hz to 20 kHz; CMS50, 20 Hz to 15 kHz.
Resolution – $\Delta f < 1$ kHz: 1 Hz. $\Delta f \geq 1$ kHz: 1%.
Residual FM (CCITT, RMS): ≤ 10 Hz.
Error: $\leq 5\%$ + resolution + residual FM.

Phase Deviation Meter –

Operating modes: +PK, –PK, $\pm PK/2$, RMS, RMS $\sqrt{2}$.
Input level range: 5 mW to 50 W.
RF frequency range: 1.5 MHz to 1 GHz.
Measurement range: 0.001 to 5 rad.
AF frequency range: 300 Hz to 6 kHz.
Resolution: $\Delta\varphi \leq 0.1$ rad: 0.001 rad.
 $\Delta\varphi > 0.1$ rad: 1%.
Error: Same as frequency deviation meter + 2% frequency response.

AM Depth Meter –

Operating modes: +PK, –PK, $\pm PK/2$, RMS, RMS $\sqrt{2}$.
Input level range: 20 mW to 50 W.
RF frequency range: 1.5 MHz to 1 GHz.
Modulation depth measurement range: 0.01% to 99%.
AF frequency range: CMS52, 50 Hz to 20 kHz; CMS50, 50 Hz to 10 kHz.
Resolution – $m < 0.1$: 0.01%. $m \geq 0.1$: 0.1%.
Residual AM (CCITT, RMS): $\leq 0.03\%$.
Error ($m \leq 0.8$, $f_{AF} = 0.3$ to 3 kHz): $\leq 7\%$ + resolution + residual AM.
Distortion meter, SINAD meter, AF frequency counter: See transmitter and receiver measurements.

RF Spectrum Monitor –

Frequency range: 1 MHz to 1 GHz.
Reference level: +47 to –47 dBm (Input 1).
Display dynamic range: > 60 dB (≥ 7 dBm reference level at input 1).
Span: 0 (zero span) to 50 MHz.
Filters (3-dB bandwidth): 150 Hz, 6 kHz, 16 kHz, 50 kHz, 300 kHz, 1/3 MHz (coupled to span).
Error: ≤ 3 dB + resolution.

Tracking Generator (Option U4 or 24 required) –

Frequency range: 400 kHz to 1 GHz.
Reference level: –27 to –67 dBm.
Display dynamic range – $f = 1$ to 500 MHz: 50 dB. $f = 500$ MHz to 1 GHz: 45 dB.
Span: 0 (zero span) to full span.
Filters (3-dB bandwidth): 150 Hz, 6 kHz, 16 kHz, 50 kHz, 300 kHz, 1/3 MHz (coupled to span).
Error: < 3 dB (< 0.5 dB with relative measurement).
Resolution 0.4 dB: Output Level: 0 to –128 dBm.
Frequency offset: 0 to ± 999 MHz (depending on span and center frequency).

TRANSMITTER MEASUREMENTS

AT 2ND RF INPUT

Second RF Input –

Measurement of RF frequency, modulation (AM, FM, φM), modulation frequency and spectrum (level) of small RF signals (e.g., in off-air or module measurements, for low input levels).

RF Frequency Counter –

30 μV (selective frequency counter with presetting).

Modulation Meter –

IF narrow: 5 μV .
IF narrow, selective measurement: 1 μV .

Selective Level Measurement –

Without weighting filter: –75 to –35 dBm.
With 2 kHz resonance filter: –100 to –35 dBm.

TRANSMITTER AND

RECEIVER MEASUREMENTS

Modulation Generator I and II –

Frequency range: CMS52, 20 Hz to 30 kHz; CMS50, 20 Hz to 20 kHz.
Frequency resolution: 0.1 Hz.
Frequency error: Same as timebase + 1/2 x resolution.
Output level range: 10 μV to 5 V.
Resolution – $V < 1$ mV: 10 μV ; $V \geq 1$ mV: 1%.
Error: $V > 1$ mV: $\leq 5\%$.
Output impedance: $\leq 4 \Omega$.
Maximum output current (peak): 20 mA.
Distortion: $\leq 0.5\%$.

Distortion Meter –

Frequency: CMS52, 100 Hz to 5 kHz in 10-Hz steps; CMS50, 100 Hz to 3 kHz in 10-Hz steps.
Input level range: 100 mV to 30 V.
Measurement range: 0.1 to 50%.
Resolution: 0.1%.
Inherent distortion: $\leq 0.5\%$.
Measurement bandwidth weighting: 12 kHz.
Error: $\leq 5\%$ + inherent distortion.

SINAD Meter –

Frequency: CMS52, 100 Hz to 5 kHz ± 10 Hz; CMS50, 1 kHz ± 10 Hz.
Measurement Range: 1 to 46 dB.
Input level range: 100 mV to 30 V.
Resolution: 0.1 dB.
Weighting bandwidth: 12 kHz.
Error: ≤ 1 dB + inherent distortion.

AF Frequency Counter –

Operating modes: Demodulation, AF, beat (frequency offset), external.
Frequency range: CMS52, 20 Hz to 500 kHz; CMS50, 20 Hz to 20 kHz (superimposed RF).
Input level range ($f < 20$ kHz): 10 mV to 30 V.
Resolution: 1 Hz/0: 1 Hz.
Error: Same as timebase + resolution.

Oscilloscope –

Bandwidth – DC: DC to 20 kHz.
AC: 10 Hz to 20 kHz.
Horizontal deflection: 20 to 0.1 ms/div.
Vertical deflection: Scaled in kHz (FM), rad (φM), % (AM), mV/V (AF).
Input level range: 0 to 40 V peak.
Input impedance: Approximately 1 M Ω .

Communications Test Sets

CMS50 • CMS52

AF Filters –

Highpass $f_{\text{cutoff}} = 300$ Hz (attenuation at 200 Hz, typical 40 dB).

Lowpass $f_{\text{cutoff}} = 3.4$ kHz (attenuation at 10 kHz, typical 40 dB).

Bandpass (broadband): Highpass + lowpass.

Bandpass (narrowband): CMS52, 50 Hz to 5 kHz in 10-Hz steps; attenuation typical 40 dB for $0.8 \times f$ and $1.2 \times f$. CMS50, 50 Hz to 3 kHz in 10-Hz steps, attenuation typical 40 dB for $0.8 \times f$ and $1.2 \times f$.

Notch filter: CMS52, 100 Hz to 5 kHz in 10-Hz steps, +40 dB; CMS50, 100 Hz to 3 kHz in 10-Hz steps, typ. 40 dB.

CCITT filter: See Opt. 03 or 06.

Selective Call Encoder/Decoder –

Tone sequences: ZVE11, 2/CCIR/EIA/EEA/EURO/NATEL/CCITT/VDEW/DTMF/VDEW direct dialing/user-defined sequences.

Audio Monitor (loudspeaker) – Demodulated signal, AF signal, beat (frequency offset).

OTHER CHARACTERISTICS

IEC/IEEE Bus (CMS52 only) – Interface to IEC 625-1 (IEEE 488) with listener/talker function.

POWER REQUIREMENTS

AC –

Line voltage: 100, 120, 220, 240 V AC $\pm 10\%$.

Line frequency: 47 to 420 Hz.

DC – 11 to 32 V.

Power Consumption – 50 W.

ENVIRONMENTAL CHARACTERISTICS

RFI Suppression – To VDE 0871/0875 and postal regulations 1046/84.

Operating Temperature Range – 0 to +50°C.

Storage Temperature Range – -40 to +70°C.

Shock, Vibration, and Humidity Testing –

To MIL-T-28800, type III, class 3, style C.

PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
Height	175	6.9
Width	320	12.6
Depth	375	14.8
Weight	kg	lb.
Net	13	28.7

ORDERING INFORMATION

For price information: Outside the U.S. contact your local Tektronix representative, inside the U.S. see the price list in the back of this catalog.

CMS50

Radiocommunication Service Monitor.

Includes: Power Cable, Spare Fuses, Manual.

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Radiocommunication Service Monitor

Includes: Power Cable, Spare Fuses, Manual.

Opt. 01/CMS-B1 – OCXO Reference Oscillator for high long-term stability. Temperature effect 0 to 50°, $\leq 1 \times 10^{-7}$; aging, $\leq 5 \times 10^{-9}$ /day after 30 days of operation $\leq 2 \times 10^{-7}$ /year.

Opt. 02/CMS-B2 – OCXO Reference Oscillator for more exacting requirements on long-term stability. Specifications same as Opt. 01 except for aging: $\leq 1 \times 10^{-7}$ /year.

Opt. 03/CMS-B5 – Control Interface.

Opt. 04/CMS-B9 (CMS52 only) – Duplex Modulation Meter for measurements on duplex radios, cellular radio phones, relay stations, and frequency-converting modules (two-part measurements, also, on frequency-converting DUTs). Including Adjacent Channel Power (ACP) meter. Dynamic range, ≥ 70 dB with 25 kHz Channel Spacing.

Opt. 05/CMS-B13 (CMS52 only) – Signaling Unit for Cellular Radio. (also requires Opt. 04 or 24) Same as Opt. 20 with the addition of C-Net.

Note: Opt. 20 may be used as an alternative to Opt. 05.

Opt. 06/CMS-B20 – UA DC Meter, CCIT Filter, DTMF Decoder.

Opt. 07/CMS-B21 (CMS52 only) – Programmable Universal Modem for FSK Signals (instead of Opt. 05). For modulation and demodulation of data. Bit rate, 10 to 2400 Hz.

Opt. 08/CMS-B22 – 10-MHz Reference Frequency Input/Output for external synchronization of measuring systems. Output, TTL levels: Z_{out} , 50 Ω ; 1, 10 MHz. Input, level $> 1.5 V_{0-dB}$; Z_{in} , 50 Ω ; 1, 10 MHz ± 500 Hz.

Opt. 09/CMS-B25 (CMS52 only) – NMT Base Station Test Software for Opt. 05 in conjunction with Opt. 18.

Opt. 10/CMS-B26 (for Opt. 05 or 20) – POCSAG, ZVEI/VDEW Digital Signaling Software for testing of POCSAG radio-paging receivers and ZVEI/VDEW mobile and base stations.

Opt. 11/CMS-B28 (for Opt. 05 or 20) – MPT 1327/1343 Software Signaling for testing of trunked radio networks.

Opt. 13/CMS-B30 – RS-232-C Interface for remote control of DUTs.

Opt. 14/CMS-B31 – Additional RF Input/Output for two-signal measurements, and connection of further measuring instruments; bidirectional RF connector for additional measuring instruments. Maximum input power, 20 mW; Attenuation RF_{in} to RF_{out} , 32 dB.

Opt. 15/CMS-B32 – 100-W RF Power Meter for measurement of high RF input power. Measurement range, 10 mW to 100 W.

Opt. 16/CMS-B33 (for Opt. 03 or 22) – 300 Hz Lowpass Filter for fast frequency and deviation measurement of unknown modulated subaudio tones. Attenuation approximately 50 dB at frequencies above 300 Hz.

Opt. 17/CMS-B34 – 13 dBm Output.

Opt. 18/CMS-B39 – 600 Ω AF Transformer.

Opt. 19/ZZA-99 – 19 inch Rack Adapter.

Opt. 20/CMS-B53 – Signaling Unit for Cellular Radio. (also requires Opt. 04 or 24) NMT 450 (SIS), NMT 900 (SIS), E-AMPS, E-TACS, J-TACS, TACS Issue 4, R 2000.

Note: Opt. 05 may be used as an alternative to Opt. 20.

Opt. 21/CMS-B54 (CMS50) – IEC/IEEE Bus Interface.

Opt. 22/CMS-B55 – Centronics Interface.

Opt. 23/CMS-Z30 – ERMES Coder with Software

Opt. 24/CMS-B27 – Same as Opt. 04, but without Adjacent Channel Power (ACP) meter.

SERVICE ASSURANCE OPTIONS

Opt. R2 – Adds two years of post-warranty Repair Protection.

ADDITIONAL ACCESSORIES – Also see page 434.

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