



**ROHDE & SCHWARZ**

Measuring Instruments  
and Systems Division

**Operating manual**

**RADIOCOMMUNICATION**

**TESTER**

**CMT**

**802.2020.52**

**802.2020.54**



**Manuals required for the various instrument types.**

Instrument type		Manual
without oscilloscope	with oscilloscope	
CMT model .52	CMT model .54	RADIOCOMMUNICATION TESTER CMT, models .52 / .54
CMT model .52 with option CMT-B10	CMT model .54 with option CMT-B10	RADIOCOMMUNICATION TESTER CMT, models .52 / .54 + SSB/AF ANALYSIS CMT-B10
CMT model .53	CMT model .55	RADIOCOMMUNICATION TESTER CMT, models .52 / .54 + 2-GHZ EXTENSION
CMT model .56	CMT model .58	RADIOCOMMUNICATION TESTER CMT, models .52 / .54 + CELLULAR RADIO SIMULATOR, NETWORK C
CMT 60	CMT 62	RADIOCOMMUNICATION TESTER CMT, models .52 / .54 + CELLULAR RADIO SIMULATOR R2000
CMT 64	CMT 66	RADIOCOMMUNICATION TESTER CMT, models .52 / .54 + CELLULAR RADIO SIMULATOR NMT 450/900
CMT 70	CMT 72	RADIOCOMMUNICATION TESTER CMT, models .52 / .54 + CELLULAR RADIO SIMULATOR AMPS/TACS
CMT 82	CMT 84	RADIOCOMMUNICATION TESTER CMT, models .52 / .54 + CELLULAR RADIO SIMULATOR NETWORK C CELLULAR RADIO SIMULATOR R2000 CELLULAR RADIO SIMULATOR NMT450/900 CELLULAR RADIO SIMULATOR AMPS/TACS



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Certificate No.: 9502175

This is to certify that:

Equipment type	Order No.	Designation
CMT52	0802.2020.52	Radiocommunication Tester
CMT54	0802.2020.54	"

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electrical equipment for use within defined voltage limits  
(73/23/EEC revised by 93/68/EEC)
- relating to electromagnetic compatibility  
(89/336/EEC revised by 91/263/EEC, 92/31/EEC)

Conformity is proven by compliance with the following standards:

EN61010-1 : 1991  
EN50081-1 : 1992  
EN50082-1 : 1992

Affixing the EC conformity mark as from 1995

**ROHDE & SCHWARZ GmbH & Co. KG**  
Mühldorfstr. 15, D-81671 München

Munich, 30.11.95

Central Quality Management FS-QZ / Becker



## 2 Preparations and Operation

The values specified in this section are not guaranteed; only the technical data on the data sheet are binding.



Section 2.1 "Switching-On" must be referred to before applying an operating voltage.

### 2.1 Switching-On

The radio test assembly CMT can be powered from the mains or from a battery.

The instrument is immediately set to standby mode when an operating voltage is applied. This has the advantage that the frequency accuracy and constancy of the reference crystal is unaffected by frequent switching on and off.

The CMT is switched on and off by pressing the STANDBY key.

#### 2.1.1 Mains Operation



Before connecting the power supply, ensure that the instrument is set to the correct operating voltage and that the correct fuse is fitted.

To change the value set in the factory, set the required voltage on selector 117 and replace the mains fuse 118.

The CMT can be connected to any power supply with a protective earth and a voltage of 100 V, 120 V, 220 V oder 240 V (rated value  $\pm 10\%$ ) at 50 to 440 Hz. The power consumption is approx. 100 VA in the basic design.

Fuses required: 100 V/120 V T4  
220 V/240 V T2



Certain parts of the instrument are in operation even in standby mode (temperature-controlled oscillator, option CMT-B1). Complete shut-down is obtained by isolating from the power supply.

## 2.1.2 Battery Operation

Battery mode is automatically selected if a voltage  $>11$  V (with simultaneous AC supply operation  $>24$  V) is applied to terminals 100.

The permissible voltage range is 11 to 30 V with a maximum current consumption of 16 A.

The battery input is protected against incorrect polarity and has a 16 A slow-blow fuse.



The CMT draws a small residual current from the battery even in standby mode (required for the reference crystal). In order to prevent battery discharge over a longer period, it is recommendable to disconnect the CMT from the battery.



## 2.2 Explanation of the Controls



### 2.2.1 Front Panel

(See Figs. 2-1 to 2-9 in the Appendix)

The front panel is divided into fields of different colours to facilitate operation of the instrument. The individual controls are described below in accordance with this division.


In addition to an item number, an unequivocal label is assigned to each control.

Item	Label	Designation and function
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Fig. 2-1</div> RF FREQUENCY AF	<b>Frequency field:</b>  → To set and measure all used frequencies.  → Alphanumeric display for various applications (code, alternative display, instrument messages).
<u>1</u>		<b>Frequency display:</b>  10-digit, for display of measured or set RF values.
<u>2</u>		<b>α display:</b>  14-digit, alphanumeric display for measured or set AF frequencies and selective call; additional display for instrument messages or for measured/setting values from other fields.
<u>3</u>		<b>Key acknowledgement:</b>  Appears above each key as long as the respective function is switched on.


Item	Label	Designation and function
<u>4</u>		<p>Red LED (transmitter test) Green LED (receiver test)</p> <p>The functions labelled in red are assigned to the keys if the red LED lights up.</p> <p>The functions labelled in green are assigned to the keys if the green LED lights up.</p> <p>Functions labelled in black are valid for transmitter and receiver tests.</p>
<u>5</u>	<p>COUNT f</p>  <p>f</p>	<p>COUNT f: (transmitter test)</p> <p>Switch on built-in RF counter.</p> <p>Output in the frequency display.</p> <p>Following each frequency count in transmitter test mode, the operating frequency is automatically set to the corresponding value.</p> <p>SET f RX: (receiver test)</p> <p>Set output frequency of RF test transmitter to fixed value.</p> <p>Output in the frequency display.</p>
<u>6</u>	<p>f SET</p>  <p>Δf</p>	<p>SET f TX: (transmitter test)</p> <p>Transmitter test operating frequency set to fixed values.</p> <p>Output in the frequency display.</p> <p>Δf: (receiver test)</p> <p>Setting of channel spacing (important with ACP measurement).</p> <p>Output in the α display.</p>

Item	Label	Designation and function
<u>7</u>	DECODE <input type="checkbox"/> CODE	<p><b>DECODE:</b> (transmitter test)</p> <p>Switch on tone sequence evaluation circuit. The contents of a received data message are output in the <math>\alpha</math> display.</p> <p><b>CODE:</b> (receiver test)</p> <p>Transmit data message to device under test. The contents of the transmitted message are output in the <math>\alpha</math> display.</p>
<u>8</u>	DEMOD·BEAT <input type="checkbox"/> AF EXT	<p><b>DEMOD·BEAT:</b> (transmitter test)</p> <p>The demodulated AF is measured if this key is pressed once ("DEMOD" is output in front of the measured value in the <math>\alpha</math> display as an identification).</p> <p>The BEAT measurement (counting of difference between operating and input frequencies of the CMT) can be called by pressing the key again, provided function SET f TX is active ("BEAT" and measured value in the <math>\alpha</math> display).</p> <p>Switch off BEAT function by pressing the same key again or by pressing a key in the modulation field (Fig. 2-3).</p> <p><b>AF EXT:</b> (receiver test)</p> <p>Measure frequency at input AF VOLTM. <u>84</u>. Output in the <math>\alpha</math> display.</p>
<u>9</u>	AF INT <input type="checkbox"/> 1	<p><b>AF INT 1:</b> (transmitter/ receiver test)</p> <p>Set modulation generator frequency 1. Output in the <math>\alpha</math> display.</p>

Item	Label	Designation and function
<u>10</u>	AF INT <input type="checkbox"/> 2	AF INT 2:            (transmitter/ receiver test)  Set modulation generator frequency 2 (only with option CMT-B7 fitted).  Output in the $\alpha$ display.

Item	Label	Designation and function
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Fig. 2-2</div>  RF POWER RF LEVEL	<b>RF level field:</b>  For setting and measurement of used RF levels such as: <ul style="list-style-type: none"> <li>→ RF output level of test generator</li> <li>→ RF output power of transceiver</li> <li>→ Results of RF millivoltmeter</li> <li>→ Adjacent-channel power ratio (option CMT-B6)</li> </ul>
<u>12</u>		<b>RF level display:</b>  3 1/2-digit, for display of RF level in W, dBm, V and dBμV.
<u>13</u>		<b>Analog display</b>  Quasi-analog output of the RF level display of measured values (see Section 2.3.7.5 for deviations).
<u>14</u>	POWER  V <sub>0</sub>	<b>POWER:</b> (transmitter test)  Call RF power measurement. Output in the RF level display.  <b>V<sub>0</sub> SYNTH.:</b> (receiver test)  This key can be used to adjust the output level of the RF generator in the CMT.  Output in the RF level display.  The analog display indicates the levels at which the RF attenuation set switches (with short interruption in output signal).

Item	Label	Designation and function
<u>15</u>	ACP <input type="checkbox"/> +6 dB	<p><b>ACP:</b> (transmitter test)</p> <p>Call adjacent-channel power measurement. The ratio of the interfering noise in the upper or lower and 1st or 2nd adjacent channels is measured (option CMT-B6). The selective RF millivoltmeter is switched on via <input type="checkbox"/> 0 <input type="checkbox"/> ACP .</p> <p>Output in the RF level display.</p> <p><b>V<sub>0</sub> SYNTH. +6 dB:</b> (receiver test)</p> <p>The level of the RF generator is increased by 6 dB when this key is pressed. The original value is set again by pressing the key again.</p> <p>Key selection indicated by bar.</p>
<u>16</u>	V <sub>0</sub> OFF <input type="checkbox"/> V <sub>0</sub> OFF	<p><b>V<sub>0</sub> OFF:</b></p> <p>The RF synthesizer can be switched off using this key in both the transmitter and receiver tests.</p> <p>Key selection indicated by bar.</p>
<u>17</u>	PROBE <input type="checkbox"/> PROBE	<p><b>PROBE:</b></p> <p>Call RF level measurement with millivoltmeter (option CM-B8).</p> <p>Output in the RF level display.</p>


Item	Label	Designation and function
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Fig. 2-3</div>	DEMODULATION MODULATION	<p><b>Modulation field:</b></p> <p>The transmitter modulation analysis (transmitter test, DEMOD function) and the test generator modulation setting (receiver test, MOD function) are combined here. The CMT mode determines the unit displayed in this field, where % stands for AM, kHz or Hz for FM and rad for <math>\phi</math>M.</p>
<u>21</u>		<p><b>Modulation display:</b></p> <p>3 1/2-digit, for display of the modulation depth in %, kHz, Hz or rad, or the modulation distortion in % (dB).</p>
<u>22</u>		<p><b>Analog display</b></p> <p>Quasi-analog output of the results in the modulation display (see Section 2.3.7.5 for deviations).</p>
<u>23</u>	MAX PK  INT 1	<p><b>MAX PK:</b> (transmitter test)</p> <p>Call modulation measurement. The maximum value is output in the modulation display. By entering a unit, the test set modulation (AM, FM, <math>\phi</math>M) is determined in both the transmitter and receiver tests.</p> <p>Output in the modulation display.</p> <p><b>INT 1:</b> (receiver test)</p> <p>The modulation depth of the RF generator can be displayed and modified via the built-in first AF generator using this key. Additional entry of a unit determines the test set modulation (AM, FM, <math>\phi</math>M) both in the transmitter and receiver tests.</p> <p>Output in the modulation display.</p>

Item	Label	Designation and function
<u>24</u>	+ ±/2 - <input type="checkbox"/> INT 2	<p><b>POLARITY SELECT:</b> (transmitter test)</p> <p>Call modulation measurement. The positive or negative peak can be specifically evaluated by pressing the key (several times if necessary), or the mean peak modulation can be evaluated.</p> <p>Sequence: <input type="checkbox"/> → + → ±/2 → - → <input type="checkbox"/></p> <p style="text-align: center;">+</p> <p>An entered unit is ignored since this is only determined by MAX PK or INT 1.</p> <p>Output in the modulation display.</p> <p><b>INT 2:</b> (receiver test)</p> <p>The modulation of the test generator can be displayed and modified via the second AF generator (option CMT-B7) using this key.</p> <p>Two-tone modulation is only possible with INT 1, i.e. the unit and thus the type of modulation is determined by INT 1.</p> <p>Output in the modulation display.</p>



Item	Label	Designation and function
<u>25</u>	PK HOLD <input type="checkbox"/> EXT	<p><b>PK HOLD:</b> (transmitter test)</p> <p>This function is used to detect the maximum of short modulation peaks and can be switched on and off using this key.</p> <p>Key selection indicated by bar.</p> <p><b>EXT:</b> (receiver test)</p> <p>This key can be used to modulate the test generator with a signal applied to the MOD EXT jack. AM + FM/PM is possible in addition to two-tone and double modulation.</p> <p>The type of modulation is determined for INT 1 and INT 2 by the unit of INT 1 and MAX PK respectively, for EXT by the entered unit.</p> <p>Output in the modulation display.</p>
<u>26</u>	DIST <input type="checkbox"/> OFF	<p><b>DIST:</b> (transmitter test)</p> <p>Measurement of the transmitter modulation distortion is called using the DIST key. The display is in % or dB (selectable via unit).</p> <p>Output in the modulation display.</p> <p><b>MOD OFF:</b> (receiver test)</p> <p>Used to switch off the test transmitter modulation.</p> <p>Key selection indicated by bar.</p>

Item	Label	Designation and function
<u>27</u>	HP <input type="checkbox"/> 1 V <sub>RMS</sub>	<p><b>HP:</b> (transmitter test)</p> <p>A 300 Hz highpass filter is connected in series with the demodulators using this key (e.g. to suppress pilot tones).</p> <p>Key selection indicated by bar.</p> <p><b>1 V<sub>RMS</sub>:</b> (receiver test)</p> <p>After pressing this key, the displayed EXT modulation corresponds to a reference level of V<sub>RMS</sub> at connector MOD EXT <u>82</u>.</p> <p>Key selection indicated by bar.</p>
<u>28</u>	CCITT <input type="checkbox"/> EXT CAL	<p><b>CCITT TX:</b> (transmitter test)</p> <p>A weighting filter to CCITT guidelines is switched into the demodulation branch using this key. Interaction with the CCITT RX function results.</p> <p>Key selection indicated by bar.</p> <p><b>EXT CAL:</b> (receiver test)</p> <p>The AF voltage at input MOD EXT is measured by pressing the key EXT CAL and an internal calibration is carried out if it is different from the reference level 1 V<sub>RMS</sub>.</p> <p>Key selection indicated by bar.</p>

Item	Label	Designation and function
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Fig. 2-4</div> MODULATION GEN AF VOLTMETER	<b>AF level field:</b>  The analysis of the AF signal applied to connector AF VOLTM and the setting of the modulation generator level at connector MOD GEN are combined here.
<u>30</u>		<b>AF level display:</b>  3 1/2-digit, for output of modulation generator output level or AF input level / SINAD / DIST / S/N.
<u>31</u>		<b>Analog display:</b>  Quasi-analog representation of the results in the AF level display (see Section 2.3.7.5 for deviations).
<u>32</u>	$V_0$  LEVEL	<b><math>V_0</math> MOD GEN:</b> (transmitter test)  Adjustment and display of output level at connector MOD GEN.  If the 2nd modulation generator option is fitted, a double tone can be generated at connector MOD GEN using a SPEC function.  Output in the AF level display.  <b>AF-LEVEL:</b> (receiver test)  Call AF level measurement at connector AF VOLTM.  Output in the AF level display.

Item	Label	Designation and function
<u>33</u>	+20 dB <input type="checkbox"/> SINAD·DIST	<p><b>V<sub>0</sub> MOD +20 dB:</b> (transmitter test)</p> <p>The level at connector MOD GEN can be increased by a factor of 10. The factor is cancelled by pressing the key again.</p> <p>Key selection indicated by bar.</p> <p><b>SINAD·DIST:</b> (receiver test)</p> <p>In order to measure the receiver SINAD value with a defined test generator level, it is sufficient to simply press the SINAD·DIST key once.</p> <p>The receiver distortion is displayed if this key is pressed again.</p> <p>If a number is entered before the SINAD·DIST key is pressed (unit dB), the test generator output level is changed until the SINAD result reaches the set value.</p> <p>If the unit for the numeric input is %, the DIST measurement is called instead of the SINAD measurement.</p> <p>Output in the AF level display.</p>
<u>34</u>	<input type="checkbox"/> S/N	<p><b>S/N:</b> (receiver test)</p> <p>The signal-to-noise ratio is called.</p> <p>If a number is entered before the S/N key is pressed (unit dB), the test generator output level is changed until the S/N result reaches the set value.</p> <p>Output in the AF level display.</p>

Item	Label	Designation and function
<u>35</u>	V <sub>0</sub> OFF <input type="checkbox"/> V <sub>0</sub> OFF	V <sub>0</sub> OFF: (transmitter/ receiver test)  Switch-off of modulation generator.  Key selection indicated by bar.
<u>36</u>	<input type="checkbox"/> CCITT	CCITT RX: (receiver test)  A weighting filter to CCITT guidelines located before the AF voltmeter is switched on or off using this key.  The function alternates with the CCIFF TX function.  Key selection indicated by bar.

Item	Label	Designation and function
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Fig. 2-5</div>	<p><b>Numeric field:</b></p> <p>Numeric keypad to enter any numbers (up to 25 digits).</p>
<u>39</u>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">0</div> ... <div style="border: 1px solid black; padding: 2px; display: inline-block;">9</div>	<p>Numbers 0 to 9 for all inputs</p>
<u>40</u>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">-</div> * E	<p><b>Minus sign:</b></p> <p>(A number is always positive if the minus sign is not entered)</p> <p>Input of tone sequences:</p> <p>* With code DTMF  E With all other codes</p>
<u>41</u>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">.</div> # F	<p><b>Decimal point:</b></p> <p>Input of tone sequences:</p> <p># With code DTMF  F With all other codes</p>
<u>42</u>	MHz mV % <div style="border: 1px solid black; padding: 2px; display: inline-block; width: 20px; height: 10px;"></div> A	<p><b>Dimension key:</b></p> <p>Frequency      MHz  Level            mV  Modulation      % (AM)  Distortion      %  Code             A</p>
<u>43</u>	kHz $\mu$ V W <div style="border: 1px solid black; padding: 2px; display: inline-block; width: 20px; height: 10px;"></div> B	<p><b>Dimension key:</b></p> <p>Frequency      kHz  Level            <math>\mu</math>V  Modulation      kHz (FM)  Power            W  Code             B</p>