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Data sheet



Version 03.00

October 2004

Digital Radio Tester R&S®CTS

Tester family for fast and conclusive GSM, GPRS and DECT measurements in service

- Compact modular tester
- For fast and precise measurements with and without signaling in service and production
- Manual and remote control of customized tests of all service levels

GSM 850/900/1800/1900
GPRS and DECT

ROHDE&SCHWARZ

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The tester family with four models for servicing

R&S® CTS 30: cost-effective solution for GSM (850/900/1800/1900) measurements under manual and remote control (remote control software included)





R&S® CTS 55: for GSM (850/900/1800/1900) measurements under manual and remote control

R&S® CTS 60: for DECT measurements (portable and fixed part) under manual and remote control





R&S® CTS 65: for GSM (850/900/1800/1900) and DECT measurements under manual and remote control

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Testing a mobile phone is so easy

GSM, DECT and GPRS measurements with one and the same tester

The Digital Radio Tester R&S®CTS is an extremely compact, modular yet powerful measuring instrument. It combines great ease of operation and the necessary test depth for use in all service areas for mobile and cordless phones from a simple functional test at the counter to repairs at module level in the service shop. Owing to the clear-cut, logical menu structure, both the newcomer and the service specialist will be able to conveniently carry out fast automatic functional tests as well as complex and comprehensive manual measurements down to component level.

Fast automatic functional test

The automatic test routines of the R&S®CTS enable you to demonstrate the reliable functioning of a GSM or DECT mobile phone to the customer in a convincing manner. Even in case of complaints, you will be able to show your technical expertise right in front of the customer. The R&S®CTS detects whether the mobile phone is defective or whether the origin of the problems is to be sought elsewhere. The user-configurable automatic test routines are also ideal for saving and calling the manufacturer-specific requirements for testing each individual mobile phone type.

Precise manual fault location

Additional manual measurement routines are provided to permit exact fault location on the basis of the conclusive results of the automatic test. The R&S®CTS allows in-depth measurements of bit error ratio, phase, frequency and modulation errors as well as analysis of timing and power ramp to be performed with great speed and high precision. The grounds for perfect mobile radio service are thus well prepared.

Module test down to component level

Equipped with the GSM Module Test Option R&S®CTS-K7, the tester provides additional functions allowing repairs down to component level (see page 8).

All under remote control

The GSM Remote Control Option R&S®CTS-K6 provides remote control and individual automatic test runs (see page 10).

Convenient, ergonomic servicing

The R&S®CTS adapts itself to the user and not vice versa. Operation is extremely easy and does not require any special GSM or DECT knowledge. Functional tests can immediately be performed without any action being required from the user. Automatic test runs or manual test routines with a large variety of preset system-specific parameters are called up menu-driven via softkeys. The R&S®CTS immediately recognizes any input parameters that are not meaningful and limits them to the maximum permissible values. Inappropriate entries are thus largely excluded.

Despite its great variety of test and measurement capabilities, the R&S®CTS follows one important principle: to encompass as many features as required and to keep them as simple as possible. The R&S®CTS is an ergonomically designed mobile tester for service environments which presents the essential test parameters clearly and extremely user-friendly.

Sum of experience

Rohde&Schwarz as one of the world's leading companies in the field of mobile radio measurements was able to put its wide range of know-how and expertise into the development of type-approval systems such as the GSM system simulator or the digital radiocommunication testers for production and service environments. This background was fully utilized in the development of the Digital Radio Testers R&S®CTS, which are also fit for the measurement tasks of the future.

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Technical features

The R&S®CTS at a glance

- GSM 850/900/1800/1900
- GPRS signaling (attach and detach) (option R&S®CTS-K4)
- Universal DECT frequency range
- Different tests for all service levels
- User-friendly menu-guided operation via softkeys
- Menus in seven languages (English, German, French, Italian, Spanish, Dutch and Chinese)
- AM suppression, sensitivity and power measurements in line with requirements of mobile phone manufacturers
- Handy and robust in a compact metal enclosure
- Dynamic range for power ramp measurements, for GSM >55 dB and for DECT >60 dB
- Built-in reference oscillator TCXO or OCXO (option R&S®CTS-B1)
- Combined RF input/output for GSM and DECT
- DECT off-air measurements via additional input/output
- Remote control via RS-232-C
- Connectors for external monitor and keyboard for operating convenience
- Measurements in line with GSM and DECT specifications with the following functionality:
  - Quick test (fast functional test)
  - Flexible autotest
  - Manual test for locating faults
  - Module test (RF measurements without signaling) (option R&S®CTS-K6)
    - Burst analysis
    - RF generator
    - Narrowband spectrum monitor
  - Windows Application Program R&S®CTSgo for customized autotest

Results at a keystroke

The specific parameters of the networks and the mobile phones can be preset. An automatic test run that immediately produces conclusive results can be started simply at a keystroke.

Universal shielded chamber for interference-free test results

For measuring the receiver sensitivity of mobile phones, transmit levels below –90 dBm for DECT phones and even –100 dBm with GSM mobile phones are required. The measurement may be impaired by external interference, which occurs, for instance, in the immediate vicinity of base stations.

A universal shielded chamber comprising the Antenna Coupler R&S®CMU-Z10/ RF Shielding Cover R&S®CMU-Z11 ensures an interference-free measurement environment in all cellular mobile radio bands. It allows error-free measurement of the bit error ratio (BER) as well as of the RxLev and RxQual receiver parameters of the mobile phone even under strong interference.

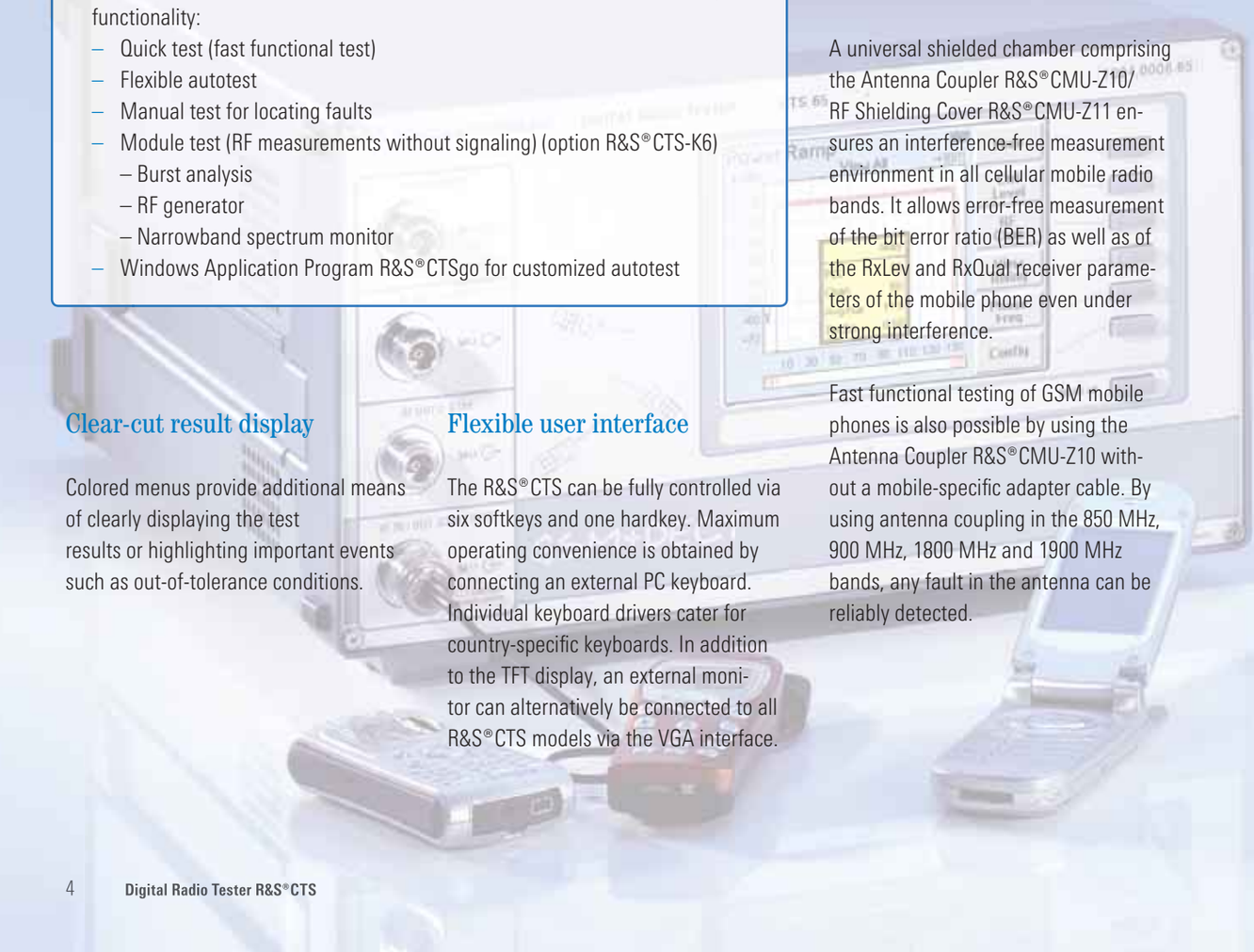
Fast functional testing of GSM mobile phones is also possible by using the Antenna Coupler R&S®CMU-Z10 without a mobile-specific adapter cable. By using antenna coupling in the 850 MHz, 900 MHz, 1800 MHz and 1900 MHz bands, any fault in the antenna can be reliably detected.

Clear-cut result display

Colored menus provide additional means of clearly displaying the test results or highlighting important events such as out-of-tolerance conditions.

Flexible user interface

The R&S®CTS can be fully controlled via six softkeys and one hardkey. Maximum operating convenience is obtained by connecting an external PC keyboard. Individual keyboard drivers cater for country-specific keyboards. In addition to the TFT display, an external monitor can alternatively be connected to all R&S®CTS models via the VGA interface.



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All “cableless” couplers are sensitive to radiated interference and should therefore be effectively screened.

The broadband Antenna Coupler R&S®CMU-Z10 as the base is connected to the RF Shielding Cover R&S®CMU-Z11 to form a closed shielded chamber.

The R&S®CTS ensures optimum interplay between the shielded chamber and the universal coupler. All essential parameters such as input and output coupling, adapter cable losses and other device-specific parameters for various mobile phones can be stored in the R&S®CTS and recalled simply at a keystroke.

GSM functionality at a glance

- Synchronization of mobile phone with base station (simulated by the R&S®CTS)
- Location update
- Call setup (incoming/outgoing)
- Call release (incoming/outgoing)
- Control and measurement of transmitter power
- Handover (channel change)
- Sensitivity
  - Bit error ratios BER, RBER and FER
  - Input sensitivity via search routine
  - RxLev and RxQual
- Phase and frequency error
- Power ramp versus time
- Timing error
- AFC (automatic frequency correction) and RSSI (radio signal strength indication) with optional GSM Module Test R&S®CTS-K7
- I/Q modulator adjustment via narrowband spectrum monitor (option R&S®CTS-K7)
- Echo test (voice test, includes also testing of loudspeaker and microphone)
- Functional test of mobile phone’s keypad through display of dialed number
- Display of
  - IMSI (international mobile subscriber identity)
  - IMEI (international mobile equipment identity)
  - Power class
  - Revision level
- Short message service (SMS)

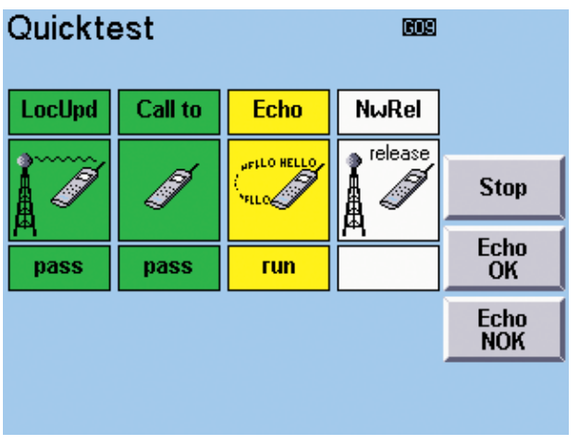
GPRS (option R&S®CTS-K4)

- GPRS attach/detach
- GPRS routing area update (RAU)
- Block error ratio (BLER) measurements (single shots)

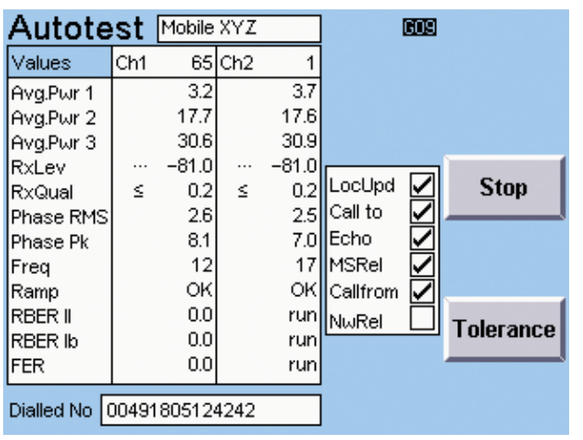


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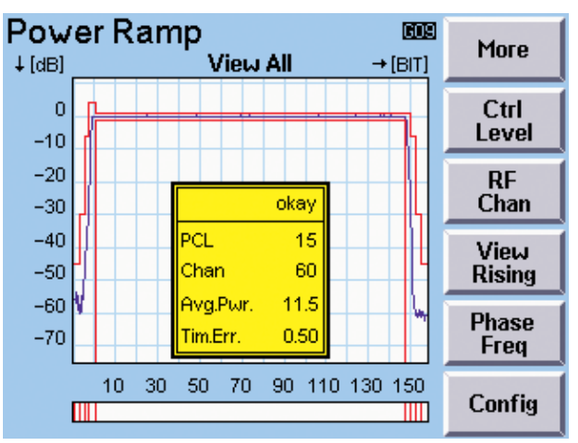
GSM measurements



1



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Quick test (1)

The quick test provides an extremely fast Go/NoGo information covering all essential parts of the mobile phone. A speech test (echo test) is carried out immediately after the call setup.

Echo test
Speech received by the microphone of the mobile phone is sent to the R&S®CTS, stored in a buffer memory and sent back to the phone. This makes it possible to check the whole signal path from the microphone via the RF transmitter/receiver section, modulator, demodulator, signaling section, speech coder/decoder, analog audio components to the loudspeaker. The measurement sequences and results are clearly displayed in graphical form.

Autotest (2)

The autotest routines allow complete functional tests to be started at a keystroke. The tests cover all essential signaling functions as well as the transmitter and receiver characteristics of the mobile phone. In addition to the various signaling functions, the R&S®CTS checks the transmitter power of the different power classes and the receiver sensitivity by measuring the RxLev and RxQual parameters output by the mobile phone. A digital signal processor also enables measurement of the phase and frequency error, bit error ratio and power ramp.

Versatile testing
The scope of measurements and the automatic test run time are variable. You can decide whether you want a short test or more in-depth testing. The number of channels or measured values can, for instance, also be adapted to the individual requirements.

Display modes
The individual results can be displayed as follows:

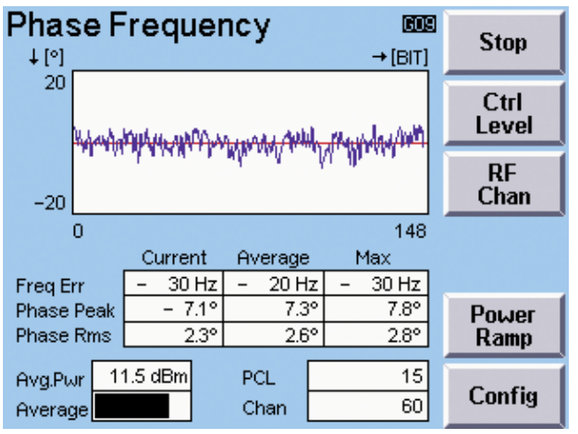
- As a Go/NoGo statement in the Pass/Fail mode
- In full detail with accurate values in the Value mode, in tabular form on the display and, if desired, as a printout

The default tolerance values can be displayed in addition.

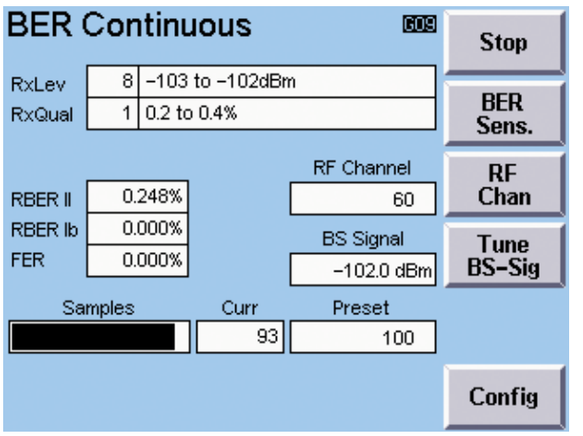
Manual test (6)

The digital radio tester provides autotest routines as well as extensive manual test functions. Transmitter power and characteristic receiver parameters such as RxLev and RxQual are displayed. Moreover, the following signaling functions are available: location update, call setup and release by the R&S®CTS or the mobile phone. The dialed number as

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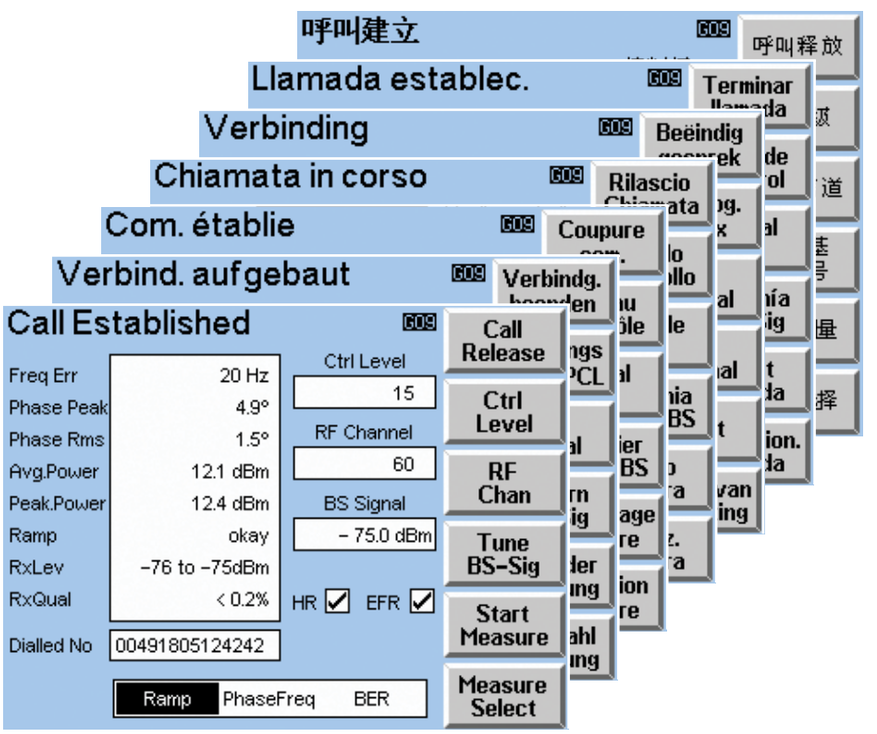


5

well as IMSI, IMEI, power class and revision level are indicated. The R&S®CTS also allows the transmission and reception of short messages SMS (point-to-point short message service).

GSM-specific RF measurements

Power ramp (3)
The power ramp can be measured by the R&S®CTS with a dynamic range of >55 dB and displayed in numeric or graphic form. In the graphic display mode, the user can choose between overall view and partial view selected with the zoom function. The power ramp is evaluated with reference to the training sequence. Out-of-tolerance values are highlighted.



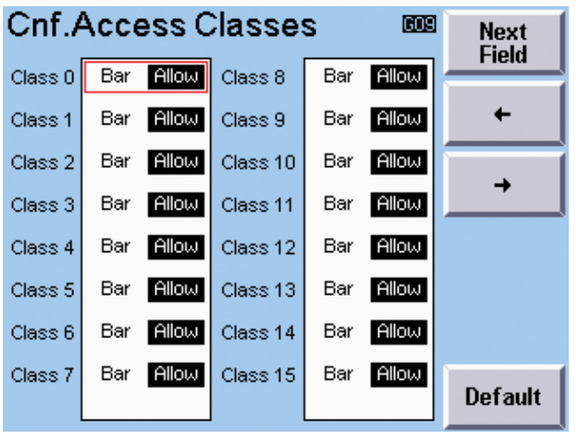
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Phase and frequency error (4)
As soon as the training sequence is recognized, the R&S®CTS carries out these measurements in accordance with the GSM specifications. The results are displayed graphically and numerically.

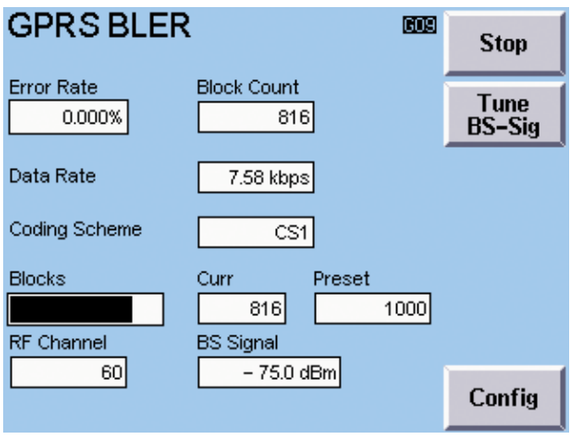
Bit error ratio (5)
The BER is an essential criterion for evaluating the receiver characteristics of the mobile phone. The R&S®CTS measures these characteristics by using various test routines such as RBER (class Ib; II; FER) and BER (class Ib; II). A search routine allows fast and precise determination of the limit sensitivity of mobile phones.

Also packet-oriented (8)
The R&S®CTS-K4 option for the R&S®CTS provides GPRS signaling to enhance GSM for data services. The R&S®CTS is thus able to test attach and detach as well as block error ratio (BLER) methods. It supports all four coding schemes (CS1 to 4).

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Menus in seven languages (6)

The multilingual R&S®CTS provides a choice of seven working languages, i.e. English, German, French, Italian, Spanish, Dutch and Chinese.

User-selectable network parameters (MCC, MNC, NCC, LAC)

The R&S®CTS is able to simulate any GSM network. This is of advantage in the following cases:

- The mobile phone is to be checked together with the SIM card of the network
- The test SIM card is not accepted by the mobile phone (SIM lock)
- A test SIM card is not available

Configuration of access classes (7)
A special SIM card in the R&S®CTS allows access classes to be defined in order to test several mobile phones "quasi"-simultaneously. This reduction in test time makes the R&S®CTS suitable for use in production or assembly lines, e.g. in the automobile industry.

Testing at component level

GSM module test (option R&S®CTS-K7)

The GSM module test provides additional functions allowing repairs down to component level:

- Burst analysis
- RF generator
- Narrowband spectrum monitor for adjustment of the I/Q modulator

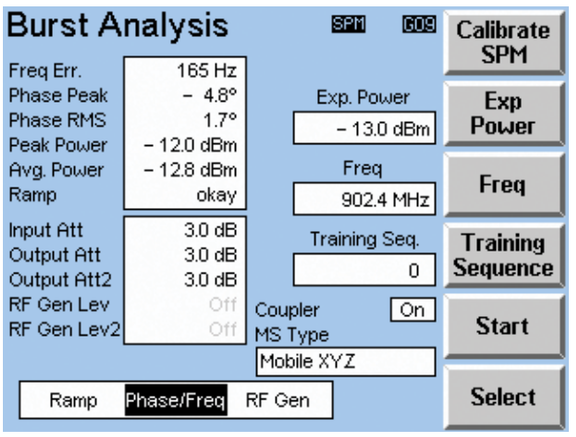
The mobile phone is set to a special service mode. Usually an external PC is used to control the mobile phone and trigger it to send. The R&S®CTS is then able to measure the RF parameters of the transmitter section without the signaling section of the mobile phone being required.

Burst analysis (9)

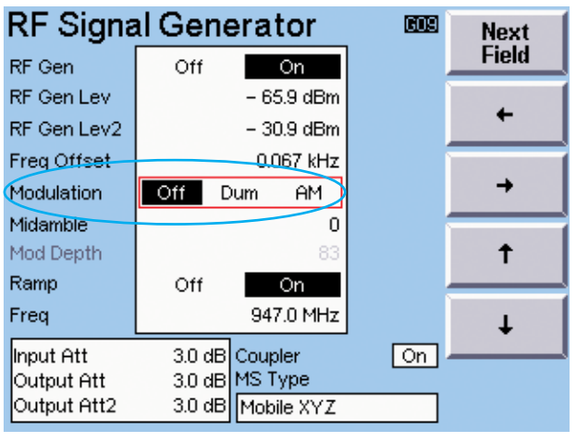
All characteristic test parameters of the transmitter such as output power or phase and frequency error are clearly displayed in a menu. The R&S®CTS is able to recognize and analyze typical modulation patterns (training sequence 0 to 8).

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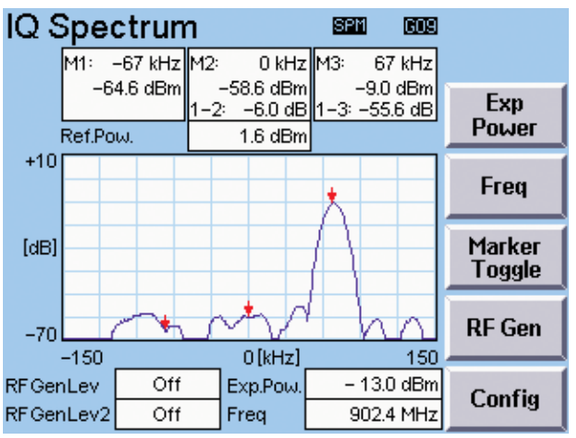
Testing at component level (continued)



9



10



11

RF signal generator (10)

An independent RF generator generates GSM-specific signals required for adjustments such as AFC or RSSI. In addition to the typical modulation patterns (training sequence 0 to 7) a frequency offset corresponding to a permanent 0 or 1 modulation can alternatively be entered.

A second RF output enhances the power range of the R&S®CTS (RF OUT2, –15 dBm to –75 dBm).

AM suppression (see blue frame in Fig. 10)
An LF signal of 1 kHz can be modulated onto the RF carrier signal to test the AM suppression of the mobile phone.

Narrowband spectrum monitor (11)

The narrowband spectrum monitor in the GSM module test option ensures fast and convenient adjustment of the I/Q modulator of mobile phones.

The menu is optimized for typical applications to ensure problem-free interplay with existing software.

OCXO reference oscillator (option R&S®CTS-B1)

This option ensures the following:

- Excellent absolute accuracy
- Minimum temperature drift
- Long-term stability (aging 0.2×10^{-6}/year)

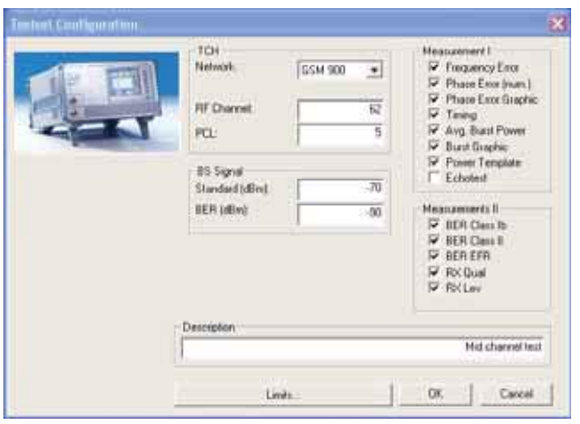
In the service mode, the absolute frequency error of the mobile phone is measured rather than the error relative to the R&S®CTS. Since the stability of the reference oscillator directly influences the measurement accuracy, the R&S®CTS-B1 should be used for this application.

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All under remote control

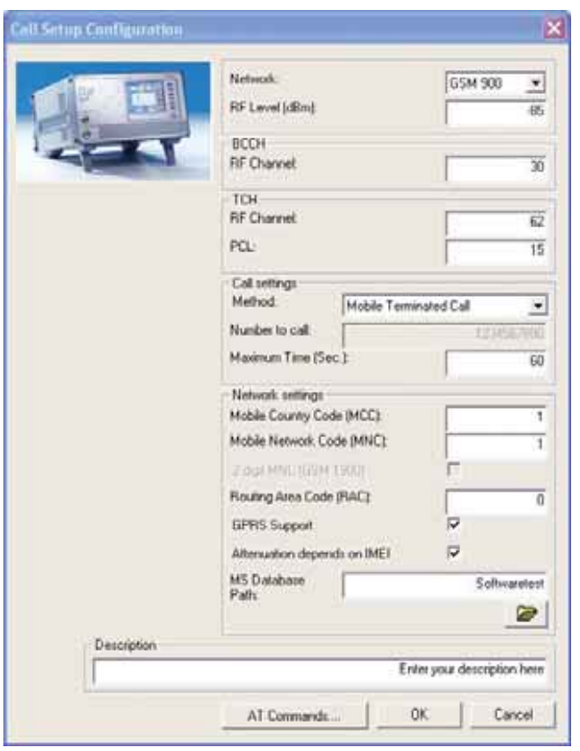
Remote control (option R&S®CTS-K6)

The R&S®CTS-K6 allows the R&S®CTS to be remote-controlled via the serial interface (RS-232-C). The settings of the manual test and of the module test can be called up via the RS-232-C interface and the results and displays read out. The Windows Application Program R&S®CTSgo supplied with this option allows extremely fast and easy generation of automatic test runs. A test program with customized tolerance evaluation can be configured with just a few mouse clicks. Customer-specific tolerance values can be stored for each automatic test run, which ensures maximum flexibility. Manufacturer-specific requirements can thus be taken into account by selecting appropriate tolerance values (12).



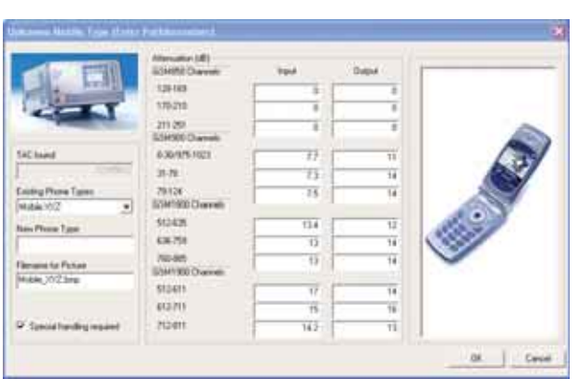
12

R&S®CTSgo allows a database to be maintained that contains all possible mobile phones (producer-independent) plus their attenuation values for all frequency bands and channels (13). This ensures valid and reproducible measurement results and saves time because the correct attenuation values can be supplied simply by connecting the mobile phone via a coupler.



13

These attenuation settings are applied automatically because R&S®CTSgo detects the mobile phone model via the IMEI. Even models of the same type but with different software versions (which changes the TAC field of the IMEI) are taken into consideration (14).



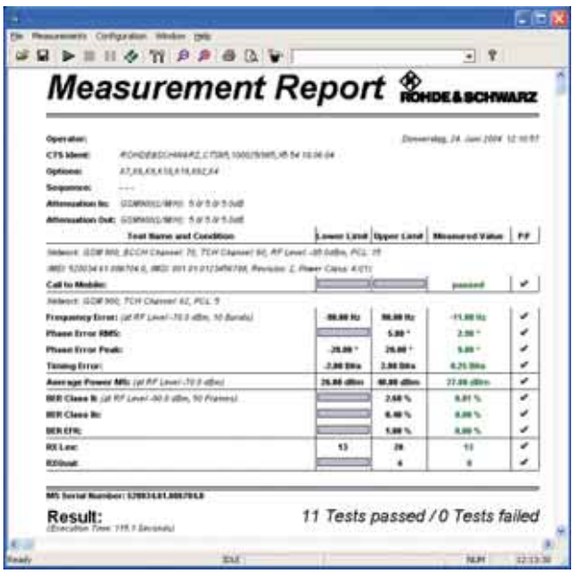
14

A popup message provides additional information about the position of the mobile phone if required (15). The database for the antenna factors can be run on a server, which allows central maintenance and ensures that all users have access to the same information. Last but not least, it is possible to use more than one database in order to support RF couplers from other suppliers.

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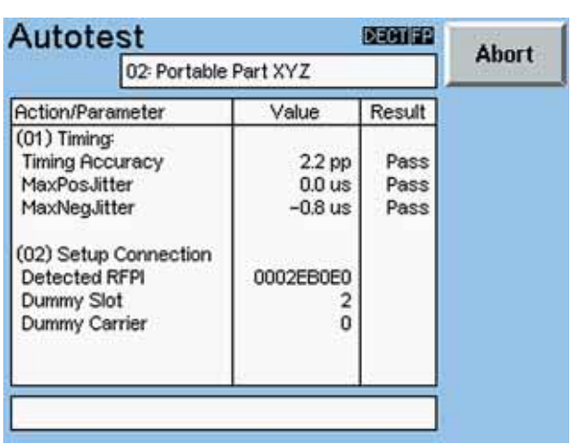
The R&S®CTS outputs the results in a clear-cut measurement report (16). The results can also be stored on a PC for archiving or exported via data filters to other programs (e.g. Excel). This allows statistical evaluation.

DECT measurements

DECT measurements with the R&S®CTS 60 and R&S®CTS 65

These two R&S®CTS models provide DECT measurements on the fixed part (FP) and on the portable part (PP) in the service mode (CTR06 mode). They measure the relevant RF parameters and check the standard signaling. Fast automatic functional tests as well as comprehensive manual measurements can of course be carried out.

Both models feature a high-level output which in conjunction with the additional sensitive input allows off-air measurements (via the antenna).



17

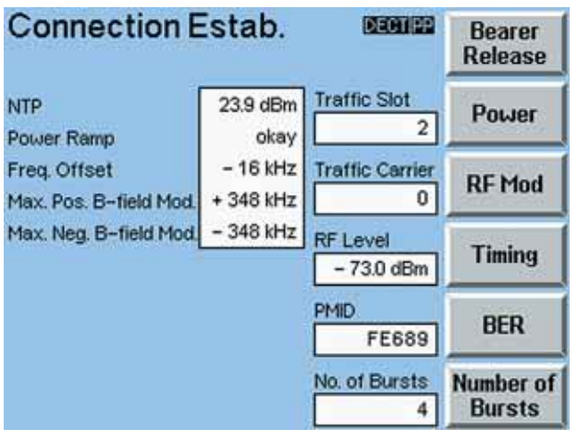
Autotest (17)

Customized DECT autotests can simply be generated and started at the push of a button.

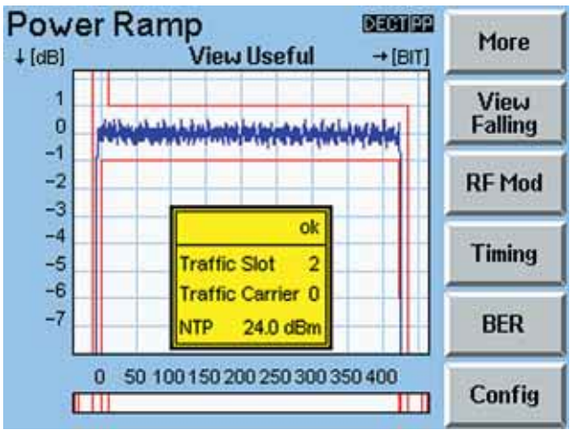
Each individual function, e.g. call setup or power measurement, is available as a test step and can be selected from a list. Tolerance limits for the Go/NoGo statement are separately stored for each macro and allow a user-specific configuration. With the aid of conditional branching, the test run can be modified depending on the results, i.e. certain parts of the measurement can be repeated multiple times or not carried out at all.

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DECT measurements (continued)



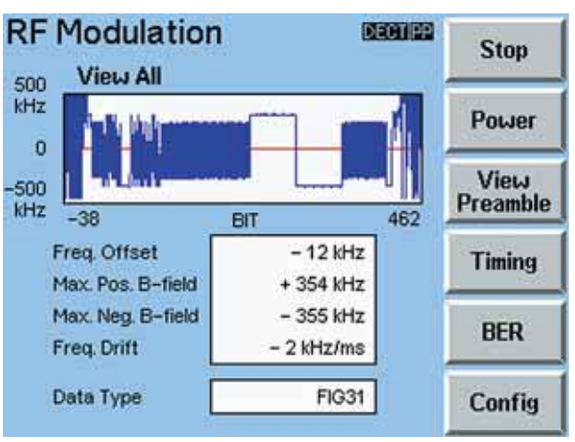
18



19

Manual test (18)

Central test menu
Faulty functions detected in the automatic test can be exactly located by means of the manual test. A central test menu shows the main RF parameters at a glance. All further test routines are directly available in submenus.



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RF modulation (20)
In the RF modulation menu, the demodulated signal is graphically displayed in an oscilloscope window for simple and fast detection of typical data patterns with the aid of various zoom functions. Characteristic modulation parameters can be measured and numerically displayed for the data patterns "Figure 31; 01010101, 00001111".

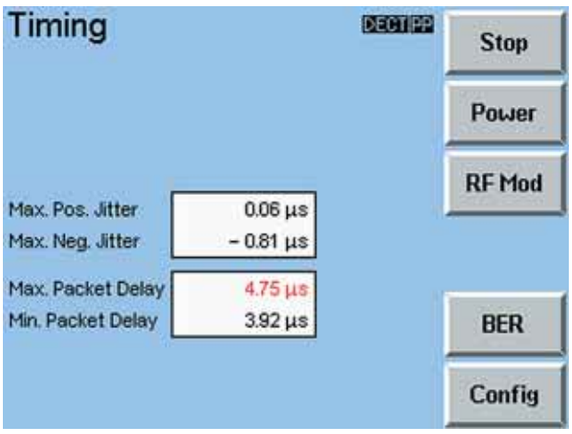
Power ramp (19)

The R&S®CTS measures the power ramp of the signal sent by an FP or PP with a dynamic range of >60 dB. The power ramp is evaluated with reference to the P0 bit and allows an accurate timing analysis of the signal in addition to the transmit power measurement. Out-of-tolerance values are quickly and precisely determined with the aid of zoom functions and color highlighting.

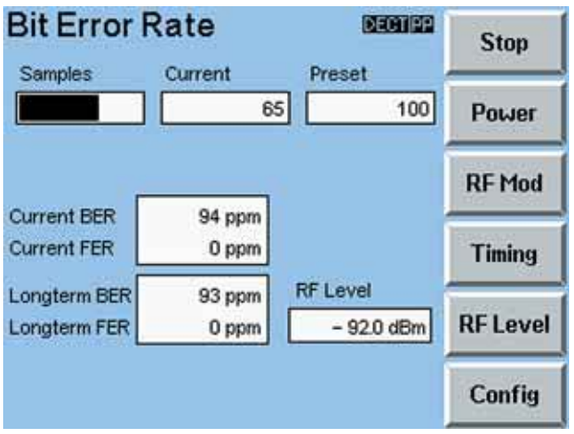
DECT functionality at a glance

- Measurements in CTR06 mode (fixed and portable part)
- Synchronization of DUT with the R&S®CTS
- Call setup
- Call release
- Echo test
- Detection and display of RFPI (FP)
- GAP signaling (optional)
- IPUI detection (optional)
- Normal transmit power (NTP)
- Power ramp versus time
- Modulation characteristics versus time
- Frequency offset
- Maximum modulation deviation
- Frequency drift
- Timing (jitter, packet delay)
- Bit error ratio (BER), frame error ratio (FER)

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Timing (21)
The test parameters "Timing Accuracy" (FP test only), "Jitter" and "Packet Delay" (PP test only) provide information about the accuracy and stability of the sent frame intervals.

Bit error ratio (22)
The bit error ratio measurement furnishes reliable information about the receiver characteristics in the FP or PP. The R&S®CTS measures the bit and frame error ratios (BER, FER) and displays both the current measured value and a statistical value averaged over a defined number of frames.

To obtain DECT measurements of highest accuracy, an OCXO reference oscillator (option R&S®CTS-B1) should be used.

Abbreviations

Abbreviations relating to GSM/GPRS

AFC	Automatic frequency control
BCCH	Broadcast control channel
BER	Bit error ratio
BLER	Block error ratio
DECT	Digital enhanced cordless telecommunications
FER	Frame error ratio
GPRS	General packet radio service
GSM	Global system for mobile communications
IMEI	International mobile equipment identity
IMSI	International mobile subscriber identity
LAC	Location area code
MCC	Mobile country code
MNC	Mobile network code
NCC	Network country code
OCXO	Oven-controlled crystal oscillator
PCL	Power control level
RAU	Routing area update
RBER	Residual bit error ratio
RSSI	Radio signal strength indicator
SIM	Subscriber identity module
SMS	Short message service
TAC	Type approval code (first 6 bits of IMEI)
TCH	Traffic channel
TCXO	Temperature-compensated crystal oscillator

Abbreviations relating to DECT

BER	Bit error ratio
FER	Frame error ratio
FP	Fixed part
GAP	Generic access profile
IPUI	International portable user identity
NTP	Normal transmitted power
PP	Portable part
RFPI	Radio fixed part identity

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Specifications

Common data

Built-in reference oscillator	standard
Frequency drift in temperature range +5 °C to +40 °C	≤1 × 10^{-6}
Aging	≤0.5 × 10^{-6}/year at 35 °C
OCXO reference oscillator	option R&S®CTS-B1
Frequency drift in temperature range +5 °C to +40 °C	±0.1 × 10^{-6}
Aging	≤0.2 × 10^{-6}/year at 35 °C

GSM

GSM signal generator	
Frequency range GSM 850 band GSM 900 band including R-GSM GSM 1800 band GSM 1900 band	 869 MHz to 894 MHz 935 MHz to 960 MHz 921 MHz to 960 MHz 1805 MHz to 1880 MHz 1930 MHz to 1990 MHz
Resolution	GSM channel spacing 200 kHz
Output level RF IN/OUT with 0 dB external attenuation RF OUT2 GSM with 0 dB external attenuation	 –50 dBm to –110 dBm –20 dBm to –75 dBm
Level error RF IN/OUT RF OUT2 GSM	 ≤1.5 dB ≤2.0 dB
Modulation	GMSK, B × T = 0.3
Narrowband spectrum monitor in GSM Module Test option R&S®CTS-K7	
Span	300 kHz
Resolution bandwidths	4/10/20/50/100 kHz
Dynamic range (P > 5 dBm) Δf = 0 Hz to 30 kHz Δf = 30 kHz to 150 kHz	 typ. 35 dBc typ. 50 dBc
Markers	3 markers and delta marker
GSM signal generator in GMS Module Test Option R&S®CTS-K7	
Frequency offset	–100 kHz to +100 kHz
Resolution	approx. 33 Hz
Power ramp	CW, burst
Bit modulation	none/dummy burst (midamble 0 to 8)
GSM peak power meter	
Frequency range GSM 850 band GSM 900 band including R-GSM GSM 1800 band GSM 1900 band	 824 MHz to 849 MHz 850 MHz to 915 MHz 876 MHz to 915 MHz 1710 MHz to 1785 MHz 1850 MHz to 1910 MHz
Measurement range With 0 dB external attenuation With 15 dB external attenuation	 –15 dBm to +39 dBm (peak values up to 41 dBm) 0 dBm to +39 dBm (peak values up to 41 dBm)
Resolution	0.1 dB
Error with 0 dB external attenuation P >5 dBm –5 dBm < P ≤ 5 dBm –15 dBm < P ≤ – 5 dBm	 ≤1 dB ≤1.5 dB ≤2 dB

GSM measurement of phase and frequency error	
Frequency range GSM 850 band GSM 900 band including R-GSM GSM 1800 band GSM 1900 band	 824 MHz to 849 MHz 850 MHz to 915 MHz 876 MHz to 915 MHz 1710 MHz to 1785 MHz 1850 MHz to 1910 MHz
Measurement mode	frequency error phase error (rms) and (peak); current value, average value and maximum value over several bursts
Level range	–15 dBm to +39 dBm (peak values up to 41 dBm)
Internal phase error GSM 850/900 band GSM 1800/1900 band	 <1.4 ° (rms) (peak <4.5 °) <2.0 ° (rms) (peak <5.5 °)
Frequency measurement uncertainty	<15 Hz + drift of timebase
GSM measurement of burst power	
Frequency range GSM 850 band GSM 900 band including R-GSM GSM 1800 band GSM 1900 band	 824 MHz to 849 MHz 850 MHz to 915 MHz 876 MHz to 915 MHz 1710 MHz to 1785 MHz 1850 MHz to 1910 MHz
Measurement modes	power ramp (power time template) rms and peak power of burst
Display modes	full burst (view all) rising edge useful range falling edge zoom
Reference level for full dynamic range with 0 dB external attenuation	0 dBm to +39 dBm (peak values up to 41 dBm)
Dynamic range (P > 5 dBm)	≥55 dB
Total error of peak power measurement (P > 0 dBm)	≤1.5 dB + resolution
Resolution	0.1 dB
GPRS Channel coder Number of slots	 CS 1 to 4 1

DECT

DECT signal generator	
Frequency range	1876.608 MHz to 1935.360 MHz and half channels
Frequency drift	same as reference oscillator
Output level RF IN/OUT RF OUT2 DECT	 –100 dBm to –40 dBm –40 dBm to 0 dBm (–20 dBm to 0 dBm, if RF IN2 DECT is active), usable up to 5 dBm
Burst switch-off	>30 dB
Resolution	0.1 dB
Level error RF IN/OUT RF OUT2 DECT	 ≤1.5 dB ≤2.0 dB
Modulation	GFSK (B × T = 0.5)
Modulation error	<5 % (at 288 kHz frequency deviation)

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DECT analyzer	
Frequency range	same as signal generator
Measurement range RF IN/OUT RF OUT2 DECT	with 0 dB external attenuation 30 dBm to –30 dBm –35 dBm to –55 dBm
FM demodulator Frequency range Frequency resolution DC offset Residual FM RF IN/OUT RF IN2 DECT	 0 Hz to 450 kHz 1 kHz <3 kHz <15 kHz, peak, 95 % confidence (30 dBm to 5 dBm) <5 kHz, peak, 95 % confidence (30 dBm to 15 dBm) <15 kHz, peak, 95 % confidence (–35 dBm to –55 dBm) 5 kHz, peak, 95 % confidence (–35 dBm to –40 dBm)
Level meter Range RF IN/OUT RF IN2 DECT Dynamic range Resolution Accuracy RF IN/OUT RF IN2 DECT	 30 dBm to –30 dBm –35 dBm to –55 dBm –60 dB (at P = 24 dBm) 0.5 dB <1 dB + resolution (30 dBm to 5 dBm) <2 dB + resolution (<5 dBm) 2 dB + resolution (–35 dBm to –51 dBm) <2.5 dB + resolution (<–51 dBm)
Audio interface	
Output Range Output impedance S/N + THD Passband ripple	unbalanced 558 mV, 300 Hz to 3 kHz <10 Ω (R_L > 2 kΩ) 30 dB at maximum level 0.5 dB
Input Range Input impedance S/N + THD Passband ripple	unbalanced 80 mV, 300 Hz to 3 kHz 22 kΩ 30 dB at maximum level 0.5 dB
DECT applications	averaging 10 bursts
Accuracy and stability of RF carrier Error	 <2 kHz + reference
Accuracy and stability of timing Error	 <0.1 µs + reference
Modulation section 1, 2, 4 Error	 approx. 11 kHz with min. (202 kHz) permissible deviation approx. 13 kHz with max. (403 kHz) permissible deviation
Frequency drift Error	 approx. 1 kHz/ms (over 200 bursts)
Transmit power Measurement accuracy RF IN/OUT RF IN2 DECT	 <1 dB + resolution (30 dBm to 5 dBm) <2 dB + resolution (<5 dBm) <2 dB + resolution (–35 dBm to –51 dBm) <2.5 dB + resolution (<–51 dBm)
Power versus time Power measurement accuracy RF IN/OUT RF IN2 DECT Timing measurement accuracy	 <1 dB + resolution (30 dBm to 5 dBm) <2 dB + resolution (<5 dBm) <2 dB + resolution (–35 dBm to –51 dBm) <2.5 dB + resolution (<–51 dBm) <0.1 µs + reference

General data

VSWR at all RF connectors	≤1.5
Operating temperature range	+5 °C to +40 °C
Permissible temperature range	+5 °C to +45 °C
Storage temperature range	–25 °C to +60 °C
Electromagnetic compatibility	complies with requirements of European EMC Directives EN 55011/22 and EN 61326
Mechanical resistance Vibration, sinusoidal Vibration, random Shock	 EN 60068-2-6 EN 60068-2-64 EN 60068-2-27, MIL-STD-801
Relative humidity	EN 60068-2-30
Power supply	200 V to 240 V AC ±10 %, 100 V to 120 V AC ±10 %, 50 Hz to 60 Hz ±5 %
Power consumption	approx. 60 W
Electrical safety	EN 61010-1, VDE 0411 Part 1
Dimensions (W × H × D)	319 mm × 177 mm × 350 mm
Weight R&S®CTS 55, R&S®CTS 60 R&S®CTS 65 R&S®CTS 30	 approx. 7.8 kg approx. 8.8 kg approx. 7.0 kg

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Ordering information

Designation	Type	Order No.
Digital Radio Tester (GSM)	R&S®CTS 30	1094.0006.30
Digital Radio Tester (GSM)	R&S®CTS 55	1094.0006.55
Digital Radio Tester (DECT)	R&S®CTS 60	1094.0006.50
Digital Radio Tester (GSM and DECT)	R&S®CTS 65	1094.0006.65
Options		
OCXO Reference Oscillator (aging 0.2×10^{-6}/year)	R&S®CTS-B1	1079.0809.02
GPRS Signaling Extension	R&S®CTS-K4	1079.1905.02
GSM Remote Control with application software for Windows	R&S®CTS-K6	1079.2001.02
GSM Module Test	R&S®CTS-K7	1079.2501.02
GSM 850 Signaling Extension (new analog board required)	R&S®CTS-K8	1079.1157.02
GAP signaling for DECT	R&S®CTS-K62	1079.2601.02
Upgrade kits		
Modification Kit for R&S®CTS 30/50/55 Linkhandler upgrade providing AM generator and GPRS for GSM (for devices delivered before August 2000)	R&S®CTS-U1	1079.2701.02
Modification Kit for R&S®CTS 30/50/55 Analog-board upgrade for GSM 850 Requires R&S®CTS-U1 (for devices delivered before January 2004)	R&S®CTS-U2	1079.0909.02
Recommended extras		
Antenna Coupler (700 MHz to 960 MHz, 1700 MHz to 2200 MHz)	R&S®CMU-Z10	1150.0801.02
RF Shielding Cover for R&S®CMU-Z10	R&S®CMU-Z11	1150.0801.02
USB Feedthrough	R&S®CMU-Z13	1079.1200.02
GSM/GPRS Test SIM for loopback mode, required for BER and other applications	R&S®CRT-Z2	1039.9005.02
Compact Keyboard, German	R&S®PSP-Z1	1091.4000.02
Compact Keyboard, US	R&S®PSP-Z2	1091.4100.02
Production Calibration	R&S®CTS-DCV	0240.2187.08
Service Manual		1094.3405.24

More information at
www.rohde-schwarz.com
(search term: CTS)

Certified Quality System ISO 9001 DQS REG. NO 1954 QM

Certified Environmental System ISO 14001 DQS REG. NO 1954 UM

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