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Digital Radio Testers CTS50, CTS55, CTS65 for mobile phones

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



Brief description

Digital Radio Tester CTS – a new tester family from Rohde&Schwarz – comes in three models:

- **CTS55** for mobile phones to GSM900/1800/1900
- **CTS60** for DECT phones (portable part and fixed part)
- **CTS65** for GSM and DECT

Digital Radio Tester 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 to repairs. 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.

Main features

- User-friendly menu-guided control via softkeys

CTS65 (photo 43115-1)

- Logical user prompting without interleaved submenus
- Brilliant TFT colour display: a new dimension in this class of instruments
- Menus in six different languages
- Compact and robust design, low weight
- Eye-strain-free working
- Dynamic range for measuring the power ramp: GSM >55 dB, DECT >60 dB
- Built-in reference oscillator TCXO or OCXO (option CTS-B1)
- Combined RF input/output for GSM and DECT
- DECT off-air measurements via additional input/output
- Remote control via RS-232-C
- Synchronization of mobile phone with base station (which is simulated by CTS)
- Location update
- Call setup (incoming/outgoing)
- Call clear-down (incoming/outgoing)
- Control and measurement of transmitter power
- Handover (channel change)
- Sensitivity
 - Bit error rate BER and RBER
 - RxLev and RxQual
- Phase and frequency error
- Power ramp versus time
- Timing error
- Echo test (voice test, includes also testing of loudspeaker and microphone)
- Function test of mobile's keypad through display of dialled number
- Display of
 - IMSI (international mobile subscriber identity)
 - IMEI (international mobile equipment identity)

GSM measurement functions

CTS55 simulates a GSM base station for testing mobile phones. The following measurements and tests can be performed by automatic test routines or manually.



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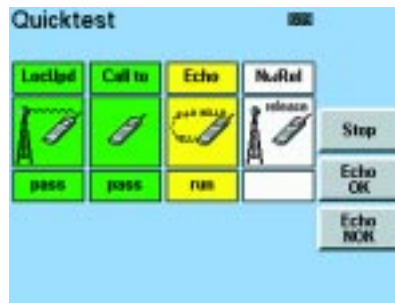
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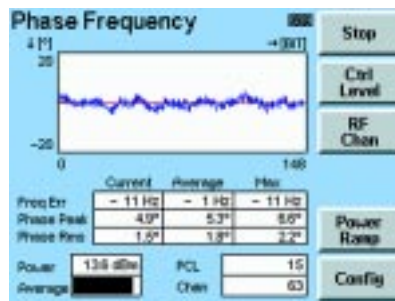
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DECT measurement, test and adjustment capabilities

- Synchronization of DUT with the CTS
- Call setup
- Call release
- Echo test
- Detection and display of RFPI (FP)
- 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 rate (BER), frame error rate (FER)



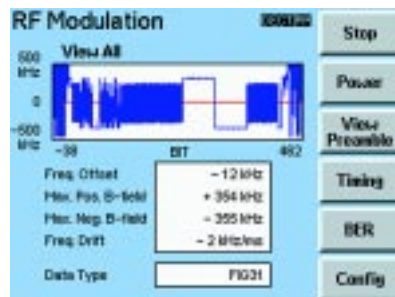
The quick test provides an extremely fast go/nogo information covering all essential parts of the mobile phone. A speech test (echo test) is carried out immediately after the call setup. (GSM)



As soon as the training sequence is recognized, the CTS carries out these measurements in accordance with the GSM specifications. The results are displayed graphically and numerically. (GSM)

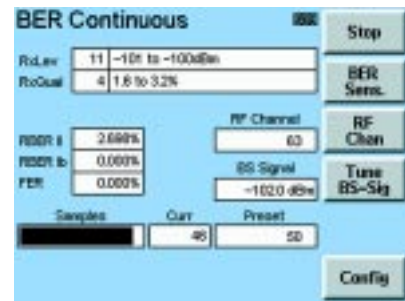
Action/Parameter	Value	Result
(01) Timing		
Timing Accuracy	3.2 µs	Pass
MaxPos.Jitter	0.0 µs	Pass
MaxNeg.Jitter	-0.0 µs	Pass
(02) Setup Connection		
Detected RFPI	00000000	
Dummy Slot	2	
Dummy Carrier	0	

Each individual function, eg call setup or power measurement, is available as a test step. Tolerance limits for the OK/not OK statement are separately stored for each macro and allow an individual configuration. (DECT)

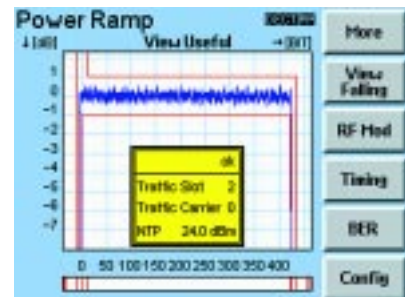


Values	Ch1	Ch2	85
Power +	13.2	14.1	
Power -	22.3	22.4	
Power	33.0	33.1	
RxQual	-101.0	-100.0	
Phase RMS	0.2	0.2	
Phase Pk	1.6	1.7	
Freq	4.9	4.5	
Ramp	0%	0%	
FER	0.0	0.0	
FER	0.0	0.0	

The autotest routines allow complete functional tests to be started at a keystroke. The tests cover all essential signalling functions as well as the transmitter and receiver characteristics of the mobile phone. (GSM)



The BER is an essential criterion for evaluating the receiver characteristics of the mobile phone. The CTS measures these characteristics with the aid of various test routines such as RBER (class Ib; II; FER) and BER (class Ib; II). (GSM)



The CTS measures the power ramp of the signal sent by an FP or PP with a dynamic range of >60 dB. (DECT)

In the RF modulation menu the demodulated signal is graphically displayed in an oscilloscope window in order to allow simple and fast detection of typical data patterns with the aid of various zoom functions. (DECT)



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Specifications in brief

Built-in reference oscillator standard
 Frequency drift in temperature range +5°C to 40°C $\leq 1 \times 10^{-6}$
 Aging $\leq 0.5 \times 10^{-6}$ /year at 35°C

GSM

GSM signal generator
 Frequency range GSM900 band 935 MHz to 960 MHz
 GSM1800 band 1805 MHz to 1880 MHz
 GSM1900 band 1930 MHz to 1990 MHz
 GSM channel spacing 200 kHz
 Resolution
 Output level
 RF IN/OUT with 0 dB ext. attenuation -50 dBm to -110 dBm
 RF OUT2 GSM with 0 dB ext. attenuation -15 dBm to -75 dBm
 Level error RF IN/OUT ≤ 1.5 dB
 RF OUT2 GSM ≤ 2.0 dB
 Modulation GMSK, BxT=0.3
Narrowband Spectrum Monitor Option CTS-B7
 Span 300 kHz
 Resolution bandwidth 4/10/20/50/100 kHz
 Dynamic range (P > 5 dBm)
 $\Delta f = 0$ kHz to 30 kHz typ. 35 dBc
 $\Delta f = 30$ kHz to 150 kHz typ. 50 dBc
 Markers 3 markers and delta-marker

GSM peak power meter
 Frequency range GSM900 band 890 MHz to 915 MHz
 GSM1800 band 1710 MHz to 1785 MHz
 GSM1900 band 1850 MHz to 1910 MHz
 Measurement range with 0 dB ext. attenuation -20 dBm to +39 dBm (peak values up to 41 dBm)
 with 15 dB ext. attenuation 0 dBm to +39 dBm (peak values up to 41 dBm)

GSM measurement of phase and frequency error
 Frequency range GSM900 band 890 MHz to 915 MHz
 GSM1800 band 1710 MHz to 1785 MHz
 GSM1900 band 1850 MHz to 1910 MHz
 Level range -15 dBm to 39 dBm (peak values up to 41 dBm)

GSM measurement of burst power
 Frequency range GSM900 band 890 MHz to 915 MHz
 GSM1800 band 1710 MHz to 1785 MHz
 GSM1900 band 1850 MHz to 1910 MHz
 Reference level for full dynamic range with 0 dB ext. attenuation 0 dBm to +39 dBm (peak values up to 41 dBm)
 Dynamic range (P > 5 dBm) ≥ 55 dB
 Resolution 0.1 dB

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 -100 dBm to -40 dBm
 RF OUT2 DECT -40 dBm to 0 dBm (-20 dBm to 0 dBm if RF IN2 DECT is active)
 useable up to 5 dBm

Level error
 RF IN/OUT ≤ 1.5 dB
 RF OUT2 DECT ≤ 2.0 dB
 Modulation GFSK (BxT = 0.5)

DECT analyzer
 Frequency range same as signal generator
 Measurement range with 0 dB external attenuation 30 dBm to -30 dBm
 RF IN/OUT 30 dBm to -30 dBm
 RF IN2 DECT -35 dBm to -55 dBm

FM demodulator
 Frequency range 0 kHz to 450 kHz
 Resolution 1 kHz
 DC offset <3 kHz
 Residual FM
 RF IN/OUT <15 kHz, peak, 95% confidence (30 dBm to 5 dBm)
 RF IN2 DECT <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 30 dBm to -30 dBm
 RF IN2 DECT -35 dBm to -55 dBm
 Dynamic range ≥ 60 dB (for P = 24 dBm)
 Resolution 0.5 dB
 Accuracy
 RF IN/OUT <1 dB + resolution (30 dBm to 5 dBm)
 RF IN2 DECT <2 dB + resolution (<5 dBm)
 <2 dB + resolution (-35 dBm to -51 dBm)
 <2.5 dB + resolution (<-51 dBm)

Audio Interface
 Output unbalanced
 Range 558 mV, 300 Hz to 3 kHz
 Output impedance <10 Ω ($R_L > 2$ k Ω)
 S/N + THD 30 dB at max. level
 Passband ripple 0.5 dB
 Input unbalanced
 Range 80 mV, 300 Hz to 3 kHz
 Input impedance 22 k Ω
 S/N + THD 35 dB at max. level
 Passband ripple 0.5 dB

DECT applications
 Modulation section 1, 2, 4 Error averaging 10 bursts
 approx. 11 kHz with min. (202 kHz) permissible deviation
 approx. 13 kHz with max. (403 kHz) permissible deviation

Frequency drift approx. 1 kHz/ms (over 200 bursts)
 Error
 Transmit power
 Measurement accuracy
 RF IN/OUT <1 dB + resolution (30 dBm to 5 dBm)
 <2 dB + resolution (<5 dBm)
 RF IN2 DECT <2 dB + resolution (-35 dBm to -51 dBm)
 <2.5 dB + resolution (<-51 dBm)



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General data

VSWR at all RF connectors	≤1.5
Rated temperature range	+5 °C to +40 °C
Operating temperature range	+0 °C to +45 °C
Storage temperature range	-25 °C to +60 °C
Electromagnetic compatibility	complies with requirements of European EMC Directives EN 50081-1 and EN 50082-1
Mechanical resistance	
Sine vibration	IEC 68-2-6, IEC 1010-1, VG standard 95332-24-A2, MIL-T-28800 D class 5
Random vibration	DIN 40046, IEC 68-2-34
Shock	MIL-STD-810 D, MIL-T-28800 D classes 3 and 5
Rel. humidity	IEC 68-2-3
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	ENG 1010-1; IEC 1010-1, VDE 0411 Part 1
Dimensions (W x H x D)	319 mm x 177 mm x 350 mm
Weight	CTS55, CTS60 approx. 7.8 kg CTS65 approx. 8.8 kg

Ordering information

Digital Radio Tester (GSM)	CTS 55	1094.0006.55
(DECT)	CTS 60	1094.0006.60
(GSM and DECT)	CTS 65	1094.0006.65
Options		
OCXO Reference Oscillator		
Aging 0.2 x 10 ⁻⁶ /year	CTS-B1	1079.0809.02
GSM Remote Control (with Application Software for Windows)	CTS-K6	1079.2001.01
GSM Module Test ¹⁾	CTS-K7	1079.2501.02
Modification and upgrade kits		
Upgrade CTS55 to CTS65 ¹⁾	CTS-U56	1079.1605.02
Upgrade CTS60 to CTS65	CTS-U65	1079.1705.02
Modification: new front panel with RF OUT2 on front	CTS-U7	1079.1805.02
Extras		
Universal shielded Chamber	CTS-Z12	1079.1605.02
Antenna Coupler for Handheld Phones 900/1800/1900 MHz	CTS-Z10	1079.1240.02
DECT-Antenna with N connector		1086.3116.00
GSM Test SIM	CRT-Z2	1039.9005.02
Kompakt keyboard		
German	PSP-Z1	1091.4000.02
US	PSP-Z2	1091.4100.02
Production Calibration	DCV-1	0240.8733.08
Service Manual		1094.3405.24

¹⁾ CTS-U7 is required for units manufactured in May 1998 or before.



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