



for GSM900, GSM1800 and GSM1900 mobile stations

Photo 42221

Brief description

CRTP02 and CRTC02 are extremely powerful test sets providing all simulation and analysis capabilities from measurement of GSM900/1800 and 1900-specific RF parameters through to detailed checking for errors in the signalling protocol.

Radiocommunication Test Set CRTP02 simulates a base station (BTS, cell) with two independent radio channels in the GSM900 or GSM1800 band. The CRTC02 covers in addition the GSM1900 standard in the US PCS frequency band. With CRTP02 and CRTC02 almost every GSM feature relevant for the communication between mobile and network can be tested.

Besides the standard speech service the instruments optionally support the following services:

- Short message service
- Supplementary services
- Transparent data services
- Non-transparent data services (RLP)

- Ciphering A5-1 and A5-2
- GSM phase II

The sets consist of a digital unit, analog unit, colour monitor and keyboard. Due to their flexible structure the instruments can easily follow the evolution of the GSM standard by software upgrades.

Applications

Development

- Measurements on GMSK-modulated RF signals and receiver testing
- Testing of all signalling functions and validation of data transmission protocols and timing
- Simple generation of customized test procedures

Type-approval preparation and quality assurance

Testing of conformance with GSM Specification 11.10. Phase I and Phase II with respect to

- channel coding
- datalink protocols
- network signalling

- GSM-specific RF parameters

Chip design

Thanks to built-in TTL input/output of bits and an optional I/Q interface at the baseband, the instruments are ideal for use in development and validation of integrated circuits and modules.

Operation

CRTP02 and CRTC02 may be operated in three different ways:

- via convenient menus
- by running ready-to-use test cases selected from a pick list
- by running user-programmed tests

Menu interface

The convenient, menu-guided user interface permits simple and fast call-up of test routines and RF measurements.

Test routines

- Synchronization of mobile
- Location update of mobile

- Incoming/outgoing call setup
- Power level control of mobile
- Bit error in loopback mode
- Channel change
- Call clearing by mobile
- Call clearing by network
- SACCH measurements
- Speech loopback

RF measurements

- Phase error
- Frequency error
- Power level
- Power characteristics versus time

Test routines and measurements are clearly indicated on the screen and activated by simple selection. Test results are displayed in graphical and numerical form.

Ready-to-use programs

About 20 of the ready-to-use test programs complying with GSM Spec. 11.10 GSM 900 and GSM 1800/1900 are delivered with the instrument's basic operating software. Numerous additional test programs are available as software options.

Signalling

The instrument performs all channel coding and layer 2 signalling func-

tions automatically in real time. The detailed signalling sequence is determined by the user-written or ready-to-use C program, defining the order in which layer 3 messages have to be transmitted.

The messages are generated by a special editor which can handle the coding rules of GSM 4.08. The same tool is also used to examine the log memory. In order to test the layer 2 or RLP function, the layer 2 functionality can be modified during the execution of a test. In particular, it is possible to ignore a certain number of layer 2 frames, wait for the arrival of a specific frame or modify the layer 2 status variables V(R), V(S) and V(A). A built-in speech encoder/decoder may be used to test voice transmission. Data traffic may be routed to the display or the COM interface of the instruments.

Protocol analysis

Every transmitted or received layer 3 or layer 2 message, or even the bits of a burst, are marked with a frame number, channel type and recorded in the log memory. The menu-controlled message editor operating in line with the coding rules of GSM 4.08 can be

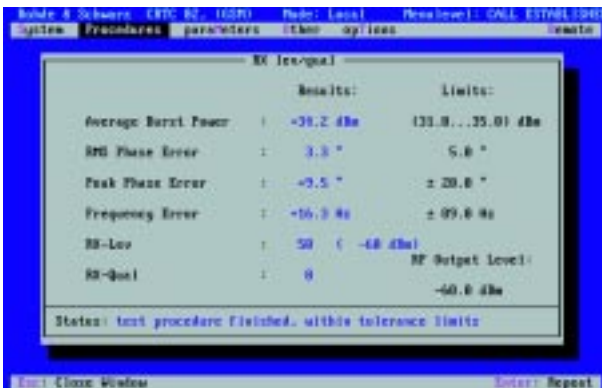
used to navigate through the log memory and to display the recorded sequence at the various layers in mnemonic form. The user may look at the message sequence or in more detail at all the elements of a single layer 3 message. Besides the message type and a frame number the channel type is displayed. The BsChan column allows to distinguish between the two radio channels of the instrument.

Data services

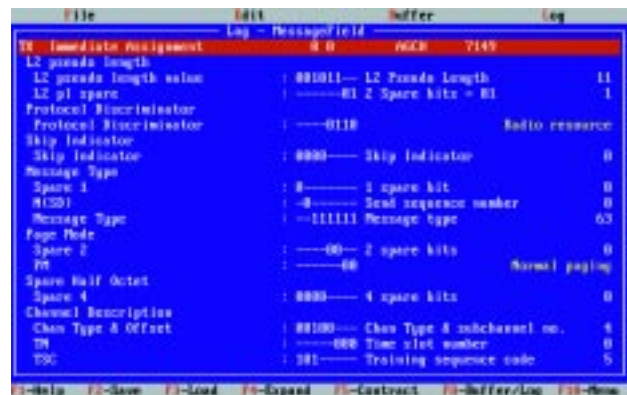
CRTPO2 and CRTCO2 support the testing of transparent and non-transparent data services. In the transparent, asynchronous case the instrument performs rate adaptation and checks for missing stop bits, wrong parity bits etc. The instrument is also able to generate data streams with over- and under-speed.

Supplementary services

The instrument is able to test supplementary services such as call forwarding, call restriction and call charging by using a set of ready-to-use test programs.

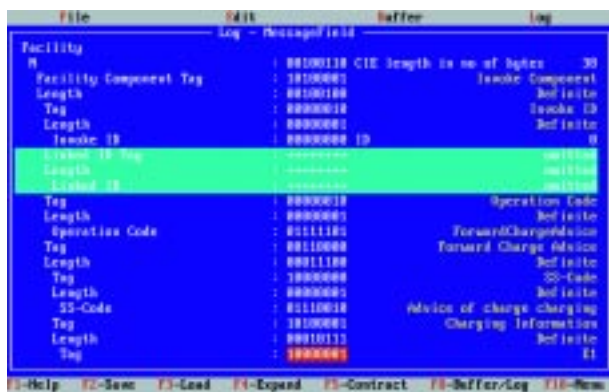


Menu-driven RF measurements



Facility information element for charging supplementary services

Digital Radiocommunication Test Sets CRTP02, CRTC02



Display of detailed content of a layer 3 message



Display of message sequence at layer 3 level

Overview of hardware options

Designation	Type	Order No.	Description
AF Measurement Unit	CRTP-B1	1052.9505.02	A great variety of audio measurements can be performed on the AF section of the mobile under test. The AF generator provides single or double tones. The following measurement facilities are implemented: <ul style="list-style-type: none"> – AF voltmeter with rms or peak weighting – continuously tunable distortion and SINAD meter – AF frequency counter – DC ammeter/voltmeter
I/Q Inputs/Outputs	CRTP-B7	1052.9257.02	This option provides access to the interface between the modulator and the radio section of the instrument and enables the testing of mobiles at module level. The digital section of a mobile can be examined in the baseband at an early stage when the RF module is not yet available
GSM Test SIM	CRT-Z2	1039.9005.02	A special SIM card with known content enables the testing of authentication and ciphering

Overview of software options

GSM Phase I

Designation	Type	Order No.	Description
GSM900 Test Cases	CRTS-K22 CRTS-K23 CRTS-K24	1034.4286.02 1034.4305.02 1034.4328.02	These three options together contain more than 150 ready-to-use test programs for GSM 900 in accordance with GSM Spec. 11.10. The test programs follow the GSM evolution. For detailed content and current version of GSM 11.10. please contact your local sales office
GSM1800/1900 Test Cases	CRTP-K22 CRTP-K23 CRTP-K24	1053.1050.02 1053.1108.02 1053.1150.02	These options are the GSM1800 and GSM1900 version of CRTS-K22 to CRTS-K24
Non-Transparent Data Services/RLP	CRTS-K28	1034.4405.02	Adds non-transparent data services (radio link protocol) capability to the instrument. The option covers both GSM phase I and phase II

Designation	Type	Order No.	Description
Supplementary Services incl. 17 tests	CRTS-K38	1034.4457.02	This option consists of the message editor for supplementary services and ready-to-use test programs. The software can be used for GSM900, GSM1800 and GSM1900
Transparent Data Services/SMS	CRTS-K48	1034.4670.02	This option consists of the message editor support for short message service, ready-to-use test programs for SMS and the basic software for transparent data services. The software can be used for GSM900, GSM1800 and GSM1900

GSM Phase II

Designation	Type	Order No.	Description
GSM-Phase II Basic Software	CR02PH2	1053.0501.02	This option is the GSM phase II operating software for CRTCO2 and CRTPO2
Transparent Data Services/SMS Phase II	CR48PH2	1057.8157.02	This option consists of the message editor for short message service and the basic software for transparent data services. The software can be used for GSM900, GSM1800 and GSM1900
Non-Transparent Data Services/RLP	CR28PH2	1081.6852.02	Adds non-transparent data services (radio link protocol) capability to the instrument.
GSM900 Test Cases	CRTP-K52 CRTP-K53 CRTP-K54 CRTP-K56	1053.1308.02 1053.1350.02 1053.1408.02 1101.3698.02	These options together contain more than 150 ready-to-use test programs for GSM 900 in accordance with GSM Specification 11.10 phase II. The test programs follow the GSM evolution. For detailed content and current version of GSM 11.10. please contact your local sales office
GSM900 Test Cases Supplementary Services	CRTP-K58	1075.8105.02	This option consists of the message editor support for supplementary services for GSM 900 phase II and a set of ready-to use test programs
GSM900 Test Cases/SMS	CRTP-K59	1075.8357.02	This option consists of a set of ready- to-use test programs for short message services for GSM 900 phase II
GSM Test Cases	CRTPK5A	1101.4607.02	GSM Test Cases for transparent data services (CR48PH2 required).
GSM Test Cases	CRTPK5B	1101.4759.02	GSM Test Cases for non-transparent data services (RLP) (CR28PH2 required)
GSM1800 Test Cases	CRTP-K62 CRTP-K63 CRTP-K64 CRTP-K66	1075.8505.02 1075.8557.02 1075.8605.02 1101.3846.02	These options are the GSM 1800 version of CRTP-K52 to CRTP-K56.
GSM1800 Test Cases	CRTP-K68	1075.8705.02	This is the GSM 1800 version of CRTP-K58
GSM1800 Test Cases	CRTP-K69	1075.8757.02	This is the GSM 1800 version of CRTP-K59
GSM1800/1900 Test Cases	CRTPK6A	1101.4907.02	GSM1800/1900 Test Cases for transparent data services (CR48PH2 required)
GSM1800 Test Cases	CRTPK6B	1101.5055.02	GSM 1800 Test Cases for non-transparente data services (RLP) (CR28PH2 required)
Software GSM1900	CRTPK72 CRTPK73 CRTPK74 CRTPK75 CRTPK76 CRTPK78 CRTPK79	1111.3484.02 1111.3632.02 1111.3784.02 1111.3932.02 1111.4080.02 1111.4239.02 1111.4380.02	Software: GSM1900 , Test Cases Phase II. Software: GSM1900, Test Cases Phase II. Software: GSM1900, Test Cases Phase II. Software. GSM1900, Handover Test Cases Phase II. Software: GSM1900, Test Cases Phase II. Software: GSM1900, Supplementary Services Test Cases Phase II. Software: GSM1900, Short Message Service Test Cases Phase II, (CR48PH2 required)
Software GSM1900	CRTPK7A	1111.4539.02	Software: GSM1900; transparent data services Test Cases Phase II (CR48PH2 required)

Digital Radiocommunication Test Sets CRTP02, CRTC02

Designation	Type	Order No.	Description
Software GSM1900	CRTPK7B	1111.4680.02	Software: GSM1900, non-transparent data services Phase II (CR28PH2 required)
Ciphering A5-1	CRTS-K1	1034.4228.02	Adds A5-1 ciphering to the instrument
Ciphering A5-2	CRTS-K2	1034.4105.02	Adds A5-2 ciphering to the instrument
GSM 1800/1900 Hand- over Test Cases	C RTP-K55	1035.1450.02	This option contains a set of phase II handover tests for GSM 900 and GSM 1800/1900 mobiles
	C RTP-K65	1075.8657.02	

Specifications in brief

GSM 1900 data are only applicable to CRTC02.

Analog unit

Signal generator

Frequency range	GSM 900	935.2 to 959.8 MHz
	GSM1800	1805.2 to 1879.8 MHz
	GSM1900	1930.2 to 1989.8 MHz
Temperature variation		$< 2 \times 10^{-9}/^{\circ}\text{C}$
Maximum output level		13 dBm
Static attenuation setting		0 to 135 dB
Resolution		5 dB
Dynamic attenuation		0 to 35 dB (electronic)
Modulation		GMSK, bit rate 270 833 bit/s acc. to GSM Spec. 05.04

Analyzer

Frequency range	GSM 900	890.2 to 914.8 MHz
	GSM1800	1710.2 to 1784.8 MHz
	GSM1900	1930.2 to 1989.8 MHz
Reference level for full dynamic range		
	GSM900	13 to +47 dBm (RF _{IN/OUT}) -17 to +19 dBm (RF _{IN2}),
	GSM1800/1900	9 to +36 dBm (RF _{IN/OUT}) -21 to +6 dBm (RF _{IN2})

RF inputs/outputs

Fading simulator		2 N connectors, 50 Ω (output level 8 to 13 dBm)
RF _{IN/OUT} and RF _{IN2}		N connectors, 50 Ω

Digital unit

CPU

Processor	80486 DX
RAM	8 Mbyte
Floppy disk drive	3 1/2", 1.44 Mbyte
Hard disk	200 Mbyte
Graphics	VGA
Interfaces	parallel Centronics, RS-232-C

Channels supported

CO channels with FCCH + SCH + BCCH + CCCH + CBCH + SDCCH/4 + SACCH
traffic channel (voice and data) with TCH + FACCH + SACCH,
SDCCH/8 + SACCH

AF Measurement Unit (CRTP-B1)

AF generator

Signal source	single or dual tone
Frequency range	20 Hz to 20 kHz
Output voltage	10 μV to 5 V _{rms}

AF voltmeter

Operating modes	RMS, +peak, -peak
Frequency range	50 Hz to 5 kHz
Voltage range	0.1 mV to 30 V _{rms}
Weighting filter	CCITT filter, complying with CCITT 0.41

Distortion meter

Frequency range	20 Hz to 20 kHz
Measurement range	0 to 50%

AF frequency counter

Frequency range	50 Hz to 5 kHz
Resolution	0.1 Hz/1 Hz
Input voltage range	10 mV to 30 V (up to 20 kHz)

DC measurements

Voltage/current	0 to ±30 V/0 to ±10 A
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I/Q Inputs/Outputs (CRTP-B7)

Input level/output level	±1.5 V _{pp} The option is required separately for each of the two channels of CRTC02/CRTP02
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General data

Power supply	110/220 V ±10% 47 to 63 Hz (max. 500 VA)
Dimensions (W x H x D); weight	
Analog unit	435 mm x 236 mm x 570 mm; 27 kg
Digital unit	435 mm x 192 mm x 570 mm; 18 kg

Ordering information

Digital Radiocommunication Test Set	CRTP02	1052.6506.02
	CRTC02	1081.6000.02