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R&S® CBT/CBT32 Bluetooth® Testers

Data sheet



ROHDE & SCHWARZ

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Specifications apply under the following conditions: Data without tolerance limits is not binding.

In line with the Bluetooth® Core Specification, bit rates are specified in Mbps (million bits per second).

Mbps is not an SI unit.

The specifications for the R&S®CBT/R&S®CBT32 refer to a fully equipped unit with all applicable options installed.

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Unit specifications

Standards		Bluetooth® Core Specification Version 1.1 Version 2.0+EDR: test mode supported RF Test Specification V1.2/V2.0/V2.1+EDR
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TCXO time base

Max. frequency drift	in temperature range +5 °C to +45 °C	$\pm 1 \times 10^{-6}$
Max. aging		$\pm 1 \times 10^{-6}$ /year

Reference frequency input

Synchronization input		BNC connector REF IN
Frequency	sinewave	10 MHz
	squarewave (TTL level)	10 MHz
Max. frequency variation		$\pm 5 \times 10^{-6}$
Input voltage range		0.5 V to 2 V, rms
Impedance		50 Ω

RF generator

RF channel definition	Bluetooth® menu	2402 MHz + k × 1 MHz, k = 0 to 93
Frequency range	RF menu	2398 MHz to 2499 MHz
	Bluetooth® menu	2402 MHz to 2495 MHz
Frequency resolution	channel spacing in line with standard	1 MHz
Frequency offset range		± 250 kHz
Frequency offset resolution		1 kHz
Frequency uncertainty	RF menu	± 5 Hz + drift of time base
	Bluetooth® menu	± 100 Hz + drift of time base
Hopping scheme	modes in line with standard	Europe (except France), USA France RX/TX single frequency reduced hopping
Output level range		
RF IN/OUT	for basic rate packets	-90 dBm to +0 dBm
	for EDR packets (2-DHx, 3-DHx)	-90 dBm to -3 dBm
Output level uncertainty	in temperature range +20 °C to +35 °C	
RF IN/OUT	output level <-10 dBm	<1.0 dB
	output level \geq -10 dBm	<1.5 dB
	in temperature range +5 °C to +45 °C	
	output level <-10 dBm	<1.5 dB
	output level \geq -10 dBm	<2.0 dB
Output level resolution		0.1 dB
Generator RF output level repeatability	typical values after 1 h warm-up time at constant ambient temperature	<0.03 dB

VSWR		
RF IN/OUT		<1.5

Attenuation of harmonics		
RF IN/OUT	$f_0 = 2398 \text{ MHz to } 2499 \text{ MHz, up to } 7 \text{ GHz}$	>30 dB

Attenuation of nonharmonics		
		>50 dB

GFSK modulation		
GFSK bit rate	DHx packet types	1 Mbps, $B \times T = 0.5$
Modulation index	11110000 pattern, frequency deviation 160 kHz	0.32
Modulation index range	frequency deviation 100 kHz to 220 kHz	0.20 to 0.44
Modulation index resolution		0.01
Modulation index uncertainty	11110000 pattern, frequency deviation 160 kHz	$\pm 5 \%$

DPSK modulation		
$\pi/4$ DQPSK bit rate	2-DHx packet types	2 Mbps
8DPSK bit rate	3-DHx packet types	3 Mbps
Symbol rate		1 Msps
Modulation uncertainty	DEVM	$\leq 5 \%$, rms

Dirty TX (non-EDR)		
Frequency offset range		$\pm 250 \text{ kHz}$
Frequency offset resolution		1 kHz
Frequency offset uncertainty		$\pm 5 \text{ Hz} + \text{drift of time base}$
Modulation index range		0.20 to 0.44
Modulation index resolution		0.01
Modulation index uncertainty		$\pm 5 \%$
Symbol time error range		$\pm 20 \text{ ppm}$
Symbol time error resolution		1 ppm
Symbol time error uncertainty		same as time base
Drift mode	Drift is dependent on packet type: DH1: frequency modulation with $\pm 25 \text{ kHz}$ deviation and 1600 Hz sinewave modulation frequency DH3: frequency modulation with $\pm 40 \text{ kHz}$ deviation and 500 Hz sinewave modulation frequency DH5: frequency modulation with $\pm 40 \text{ kHz}$ deviation and 300 Hz sinewave modulation frequency Successive packets have alternating start phases of $0^\circ/180^\circ$.	ON/OFF
Drift resolution		N/A
Drift uncertainty (FM deviation)		$\pm 5 \text{ kHz}$

Dirty TX (EDR)		
Frequency offset range		±250 kHz
Frequency offset resolution		1 kHz
Frequency offset uncertainty		±5 Hz + drift of time base
Symbol time error range		±20 ppm
Symbol time error resolution		1 ppm
Symbol time error uncertainty		same as time base
Drift mode	frequency modulation with ±10 kHz deviation and sinewave modulation period of 100 µs; successive packets have alternating start phases of 0°/180°	ON/OFF
Drift resolution		N/A
Drift uncertainty (FM deviation)		±0.5 kHz

Note: Both the EDR and non-EDR dirty transmitter, with the Specification Table setting, are in line with the Bluetooth® RF Test Specification V1.2/V2.0+EDR/V2.1+EDR, supporting both single-slot and multi-slot ACL packets.

RF analyzer

VSWR		
RF IN/OUT	2398 MHz to 2499 MHz	<1.5
RF channel definition	Bluetooth® menu	2402 MHz + k × 1 MHz, k = 0 to 93
Frequency range	RF menu	2398 MHz to 2499 MHz
	Bluetooth® menu	2402 MHz to 2495 MHz
Frequency resolution	channel spacing in line with standard	1 MHz
Frequency uncertainty		±5 Hz + drift of time base
Hopping scheme	modes in line with standard	Europe (except France), USA France RX/TX single frequency reduced hopping

Power meter (frequency-selective) and power versus time

Measurement bandwidth	filter definition: passband	
	Bluetooth® menu	
	filter bandwidth → wide	2.0 MHz
	filter bandwidth → narrow	1.3 MHz
	RF menu	10 Hz to 1 MHz in 1/2/3/5 steps

Level range		
RF IN/OUT	continuous power peak envelope power ¹ (PEP)	-40 dBm to +22 dBm +26 dBm (400 mW)

Level uncertainty	in temperature range +20 °C to +35 °C	
	Bluetooth® menu	
	from full scale down to -25 dB	<1.0 dB
	RF menu	
	input level -40 dBm to +22 dBm	<1.0 dB

Level uncertainty	in temperature range +5 °C to +45 °C	
	Bluetooth® menu	
	from full scale down to -25 dB	<1.5 dB
	RF menu	
	input level -40 dBm to +22 dBm	<1.5 dB

Level resolution	in manual mode	0.1 dB
	in remote control mode	0.01 dB

Reference level for full dynamic range		
RF IN/OUT	GFSK signal continuous power peak envelope power ¹ (PEP)	-25 dBm to +22 dBm +26 dBm (400 mW)

Dynamic range	filter bandwidth → wide	>55 dB, rms
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RF level measurement repeatability	typical values after 1 h warm-up time at constant ambient temperature	<0.03 dB
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Modulation analyzer

Measurement bandwidth	filter definition: passband	
	filter bandwidth → wide	2.0 MHz
	filter bandwidth → narrow	1.3 MHz

Level range		
RF IN/OUT	GFSK signal	from full-scale setting down to -25 dB

Level range		
RF IN/OUT	DPSK signal	from full-scale setting down to -25 dB

Total measurement range for frequency offset and frequency deviation (GFSK)		-250 kHz to +250 kHz
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Nominal measurement range for DPSK signals	filter bandwidth → wide	-75 kHz to +75 kHz
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¹ Mean value of power versus time must be equal to or less than permissible continuous power.

Frequency offset uncertainty in preamble (GFSK)	for deviation ≤ 160 kHz	≤ 2 kHz
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Frequency stability uncertainty (DPSK)	for $\omega_i \leq 75$ kHz, for deviation ≤ 160 kHz	≤ 2 kHz
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Frequency deviation uncertainty in payload (GFSK)	for deviation ≤ 200 kHz	
	11110000 pattern	≤ 2 %
	10101010 pattern	≤ 4 %
	for deviation ≥ 115 kHz and ≤ 160 kHz; 10101010 pattern; in temperature range $+20$ °C to $+35$ °C; filter bandwidth \rightarrow narrow	≤ 4 kHz

Frequency deviation uncertainty in payload (DPSK)	PRBS pattern in temperature range $+20$ °C to $+35$ °C	
	DEVm	≤ 3 %, rms
	DEVm	≤ 8 %, peak

Uncertainty of frequency drift measurement (GFSK)	measured in burst related to frequency offset in preamble	
	10101010 pattern	≤ 2 kHz

Relative frequency drift uncertainty (GFSK)	referenced to frequency offset value in preamble	
	10101010 pattern	≤ 1 kHz

Frequency drift uncertainty (DPSK)	for $\omega_o \leq 10$ kHz	≤ 1 kHz
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Frequency resolution (GFSK)	in manual mode	1 kHz
	in remote control mode	1 Hz

Frequency resolution (DPSK)	in manual mode	100 Hz
	in remote control mode	1 Hz

Packet timing measurement

Range		± 20 μ s
Resolution		0.25 μ s
Uncertainty		≤ 0.25 μ s + resolution

Guard time measurement

Resolution		0.01 μ s
Uncertainty		≤ 0.05 μ s

Speech codec

Speech decoder output	SPEECH CODEC OUT	BNC connector
Output impedance		< 10 Ω
Maximum output current		20 mA, peak
Full range output level		1 V, peak

Speech coder input	SPEECH CODEC IN	BNC connector
Input impedance		100 k Ω
Full range input level	low sensitivity	1.0 V, peak
	high sensitivity	0.1 V, peak

R&S® CBT-B41 audio generator/analyzer option

AF generator

Output impedance		<4 Ω
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Maximum output current		20 mA, peak
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AF sinewave generator	AF 1 OUT, AF 2 OUT	BNC connector
Frequency range		20 Hz to 20 kHz
Frequency uncertainty		same as time base + half resolution, see base unit specifications
Frequency resolution		0.1 Hz
Output level range		10 μ V to 5 V
Output level resolution	at level <10 mV	10 μ V
	at level \geq 10 mV	0.1 %
Output level uncertainty	at level \geq 1 mV and frequency \leq 10 kHz	\leq 1.5 % + resolution
THD+N ²	at level \geq 100 mV into load \geq 600 Ω	\leq 0.05 %

AF analyzer

Input impedance		1 M Ω 100 pF
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AF voltmeter	AF 1 IN, AF 2 IN	BNC connector
Frequency range		50 Hz to 20 kHz
Level range		50 μ V to 30 V
Level resolution	at level <1 mV	1 μ V
	at level \geq 1 mV	0.1 %
Level uncertainty	at 1 mV \leq level \leq 2 V	<1.5 % + resolution
	at 2 V < level \leq 20 V	<2.0 % + resolution

THD+N meter		
Measurement bandwidth		21 kHz
Frequency range		100 Hz to 10 kHz
Level range		10 mV to 30 V
Resolution		0.01 % THD+N
Inherent distortion	at 100 mV \leq level \leq 20 V	<0.05 % THD+N
Uncertainty	at 100 mV \leq level \leq 2 V	<1 % + inherent resolution
	at 2 V < level \leq 20 V	<2 % + inherent resolution

R&S® CBT-B42 digital audio interface

S/P-DIF	S/P-DIF IN, S/P-DIF OUT	in line with IEC 60958-3
Sampling rate		48 kHz

² Measurement bandwidth 21.9 kHz.

Inputs and outputs (rear panel)

Remote control interfaces		
IEC/IEEE bus	IEC 60625-2 (IEEE 488.2)	24-pin Amphenol connector
Serial interface COM 1	RS-232-C (COM)	9-pin D-Sub connector
Printer interface LPT		
	parallel (Centronics compatible)	25-pin D-Sub connector
Keyboard		
		USB connector
Analog monitor (VGA)		
		15-pin D-Sub connector
Trigger output		
	RF menu	
	test trigger	BNC connector TRIG OUT
	Bluetooth® menu	
	burst trigger	BNC connector TRIG OUT
External reference REF IN		
	10 MHz	BNC connector

General data

Operating temperature range		+5 °C to +45 °C, in line with EN 60068-2-1 and -2
Storage temperature range		-25 °C to +60 °C, in line with EN 60068-2-1 and -2
Humidity	+40 °C, non-condensing	80 % relative humidity, in line with EN 60068-2-78

Electromagnetic compatibility		in line with EMC Directive 89/336/EEC, applied standard: EN 61326 (immunity for industrial environment; class A emissions)
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Note:

The instrument complies with the emission requirements stipulated by EN 55011 class A. This means that the instrument is suitable for use in industrial environments. In line with EN 61000-6-4, operation in residential, commercial and business areas or in small-size companies is not covered.

Thus, the instrument may not be operated in residential, commercial and business areas or in small-size companies, unless additional measures are taken to ensure that EN 61000-6-3 is complied with.

Electrical safety		IEC 61010-1, EN 61010-1, UL 3111-1, CAN/CSA-C22.2 No. 1010.1
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Mechanical resistance	non-operating mode	
Vibration	sinusoidal	in line with EN 60068-2-6, EN 61010-1, MIL-T-28800 D class 5, 5 Hz to 150 Hz, max. 2 g at 55 Hz, 55 Hz to 150 Hz, 0.5 g const.
	random	in line with EN 60068-2-64, 10 Hz to 300 Hz, acceleration 1.2 g rms
Shock		in line with EN 60068-2-27, MIL-STD-810D, 40 g shock spectrum

Power supply		power factor correction, in line with EN 61000-3-2
Input		100 V to 240 V \pm 10 % (AC), max. 220 VA, 47 Hz to 63 Hz
Power consumption	R&S®CBT	approx. 60 W
	R&S®CBT32	approx. 50 W

Display	not included in the R&S®CBT32	21 cm TFT color display (8.4")
Resolution		640 × 480 pixels (VGA resolution)
Pixel failure rate		$<2 \times 10^{-5}$

Dimensions (W × H × D)	R&S®CBT	411 mm × 193 mm × 317 mm (16.2 in × 7.6 in × 12.5 in) (7/8 × 19"; 4 height units)
	R&S®CBT32	465 mm × 93 mm × 417 mm (18.3 in × 3.7 in × 16.4 in) (19"; 2 height units)

Weight	R&S®CBT	approx. 7 kg (15.4 lb)
	R&S®CBT32	approx. 6 kg (13.2 lb)

Ordering information

Designation	Type	Order No.
Bluetooth® Tester with display, 4 HU	R&S®CBT	1153.9000.35
Bluetooth® Tester without display, 19", 2 HU, for remote control	R&S®CBT32	1153.9000.32
Hardware option for R&S®CBT: Dual- Channel Audio Generator and Analyzer	R&S®CBT-B41	1170.3406.05
Hardware option for R&S®CBT32: Dual- Channel Audio Generator and Analyzer	R&S®CBT-B41	1170.3406.02
Hardware option for R&S®CBT/CBT32: Digital Audio Interface (S/P-DIF; R&S®CBT-B41 required)	R&S®CBT-B42	1170.3706.03
Software option for R&S®CBT/CBT32: A2DP Stereo Profile and SBC Codec (R&S®CBT-B41 required)	R&S®CBT-K52	1170.4002.02
Software option for R&S®CBT/CBT32: Handsfree and Headset Profiles	R&S®CBT-K54	1170.3806.02
Software option for R&S®CBT/CBT32: Enhanced Data Rate (EDR)	R&S®CBT-K55	1170.3206.02
19" Adapter, 2 HU, for R&S®CBT32	R&S®ZZA-211	1096.3260.00
19" Adapter, 4 HU, for R&S®CBT	R&S®ZZA-S03	1105.6756.00
Documentation of Calibration Values	R&S®DCV-1	0240.2187.08
Antenna Coupler for mobile phones	R&S®CMU-Z10	1150.0801.10
RF Shielded Cover, extension for R&S®CMU-Z10	R&S®CMU-Z11	1150.1008.02
Bluetooth® Antenna, extension for R&S®CMU-Z10	R&S®CMU-Z12	1150.1043.02



For product brochure, see PD 0758.1287.12
and www.rohde-schwarz.com
(search term: CBT, CBT32)



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