

R&S®BTC

Broadcast Test Center

Reference signal generator with audio/video analysis functions



R&S®BTC Broadcast Test Center At a glance

The R&S®BTC broadcast test center is a reference signal generator featuring analysis functions and automated tests for audio, video and multimedia applications. It is a unique combination of outstanding technical features and a modular, flexible design to meet the highest demands.

The multistandard R&S®BTC offers a complete DUT environment in a single instrument. As a high-end signal generator, it generates RF signals for all global broadcasting standards, performs transmission simulation and, at the same time, makes audio and video analyses for the DUTs. All this is made possible by using diverse interface, generator and analysis modules.

Due to its extremely fine scalability, the R&S®BTC can be tailored to meet different customer and test requirements while simultaneously optimizing costs. This eliminates the need for expensive and time-consuming test setups with many separate T&M instruments.

Integrated and automated test sequence control as well as test suites ensure that test results are reproducible while reducing test times.

Key facts

- ▮ Signal generation and DUT analysis
- ▮ Modular design
- ▮ Automated test sequences in line with recognized test specifications
- ▮ Realtime video/audio transport stream generation
- ▮ Realtime signal generation for all global broadcasting standards



R&S®BTC

Broadcast

Test Center

Benefits and key features

Modular multistandard test platform

- ▮ Signal generation and DUT analysis
- ▮ Scalable, future-ready test platform
- ▮ Generation, coding and modulation of realtime signals

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Automated certification and logo tests

- ▮ Automated test sequences and programs
- ▮ Test suites for D-Book, E-Book and NorDig

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Realtime video and audio stream generation

- ▮ Flexible transport stream generation based on elementary video and audio streams
- ▮ Seamless modification of transport stream structures and capabilities for defining error injection
- ▮ Transport stream multiplexer/remultiplexer and T2-MI gateway
- ▮ Replay and recording of transport streams and bit streams

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Simulation of the transmission channel

- ▮ Complex generation of multiple interferer signals
- ▮ MISO and MIMO fading scenarios
- ▮ Variety of noise sources
- ▮ Predistortion and nonlinearities
- ▮ Testing of satellite transmission links

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High-end realtime reference signal generator

- ▮ Generation of multiple signals with outstanding RF quality
- ▮ Digital and analog TV standards for cable, satellite and terrestrial transmission
- ▮ Digital and analog audio broadcasting standards
- ▮ Second-generation broadcasting standards and interfaces

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Chip design with configurable I/Q sample rates

- ▮ I/Q data interfaces at many system levels
- ▮ I/Q data output with flexible I/Q data rates

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End-to-end tests in realtime

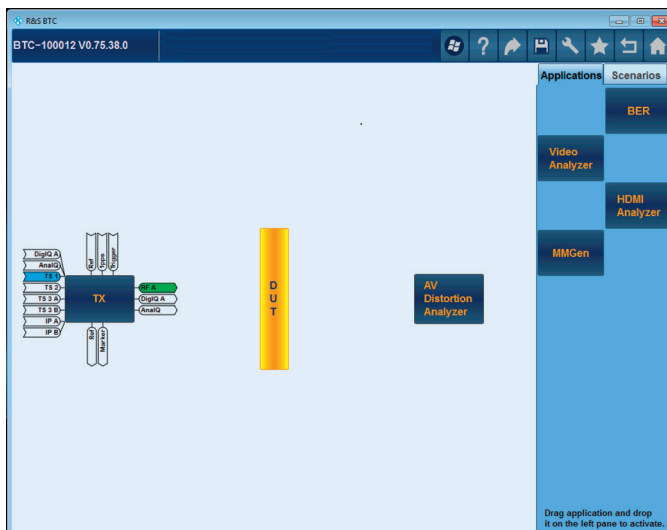
- ▮ Realtime audio and video link testing
- ▮ Complete DUT embedding
- ▮ Decoder tests with objective picture failure point (PPF) analysis

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Easy operation and remote control

- ▮ Intuitive operation via touchscreen
- ▮ Graphical user interface with hierarchical function blocks
- ▮ Overview and configuration of entire test setup
- ▮ Remote control commands compatible with R&S®SFx family
- ▮ Intelligent license concept for flexible adaptation to requirements

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Overview page of the R&S®BTC user interface:
Users can keep track of the entire test scenario together with all applications that are active and in use.

Modular multistandard test platform

Software and hardware options enable users to scale the R&S®BTC, making it a future-ready test platform perfectly tailored to meet user requirements.

Due to its modular design, the R&S®BTC hardware can be ideally adapted to different measurement tasks.



The R&S®BTC with a connected DUT.



Signal generation and DUT analysis

The R&S®BTC is a unique combination of signal generator and DUT analyzer and offers a complete test environment for optimum DUT integration. All this is possible due to the tester's modular design and the wide variety of configuration options provided in a single instrument.

Scalable, future-ready test platform

The modular design of the R&S®BTC permits customized configurations with audio, video and multimedia interfaces as well as with generator and analyzer modules. The test center offers a wide variety of digital and analog interface modules from the R&S®VTx family, such as MHL, HDMI, analog audio/video or IP interfaces. These plug-in modules allow users to perform detailed analyses of the interfaces or of audio/video capabilities, e.g. PFP analysis. If needed, further signal generator modules make additional realtime signals available for the base unit's two RF paths. The R&S®BTC architecture is ideal for adapting to measurement tasks and specific requirements. Its optimum range of configuration options make it ready for the future while simultaneously saving time and money.

Generation, coding and modulation of realtime signals

The R&S®BTC supports almost all global TV and broadcasting standards and is fully capable of generating signals for next-generation standards. Since it allows users to flexibly generate, code and modulate signals in realtime, it is the ideal test platform for quickly solving complex tasks. In addition to conventional broadcasting applications, integrated realtime coders make it possible to test professional services as well as associated receivers and components.

Automated certification and logo tests

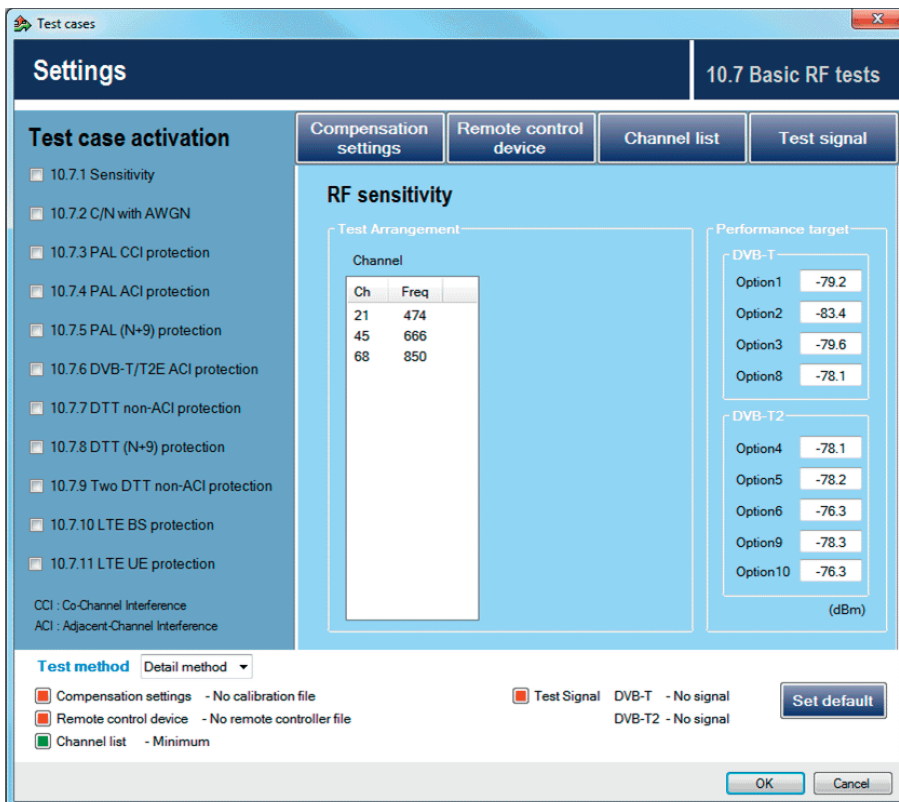
The R&S®BTC supports automated test sequences in line with recognized test specifications while reducing test costs.

Automated test sequences and programs

Certifications and logo tests are becoming increasingly important. Many chip, component and equipment manufacturers subject their products to standard compliance or logo tests to gain a competitive edge. Network operators, too, award the rights to employ logos to ensure interoperability, and consequently quality, within their networks. Such compliance or logo certifications involve extensive and time-consuming testing. Thanks to its integrated functions, the R&S®BTC supports automated test sequences and significantly reduces test times, test setup requirements and costs.

Test suites for D-Book, E-Book and NorDig

The R&S®BTC test suites for D-Book, E-Book and NorDig reduce test times and ensure that tests and results are reproducible. The test software configures all settings required for signal generation and DUT analysis. A test plan makes it possible to establish a test scope, covering individual tests to running all available test cases. Each test case is logged in a report together with its results.



Test suites offer predefined, selectable test cases that can be automated in a test plan and with test sequence control, while ensuring that test sequences and results are reproducible at any time.

Realtime video and audio stream generation

Thanks to its software based platform and the integrated multimedia generator, the R&S®BTC can generate and process a wide variety of different video and audio stream formats in realtime.

Flexible transport stream generation based on elementary video and audio streams

A wide variety of precoded elementary streams with audio, video and data contents ensures optimum flexibility for transport stream generation. Any transport stream, as appropriate for the test at hand, can be generated in realtime.

Seamless modification of transport stream structures and capabilities for defining error injection

To test the behavior of decoders in connection with dynamic switchover scenarios, users can dynamically and seamlessly modify the transport stream structure. In addition, program-specific information (PSI) such as NIT, PMT and PAT can be changed, and defined errors can

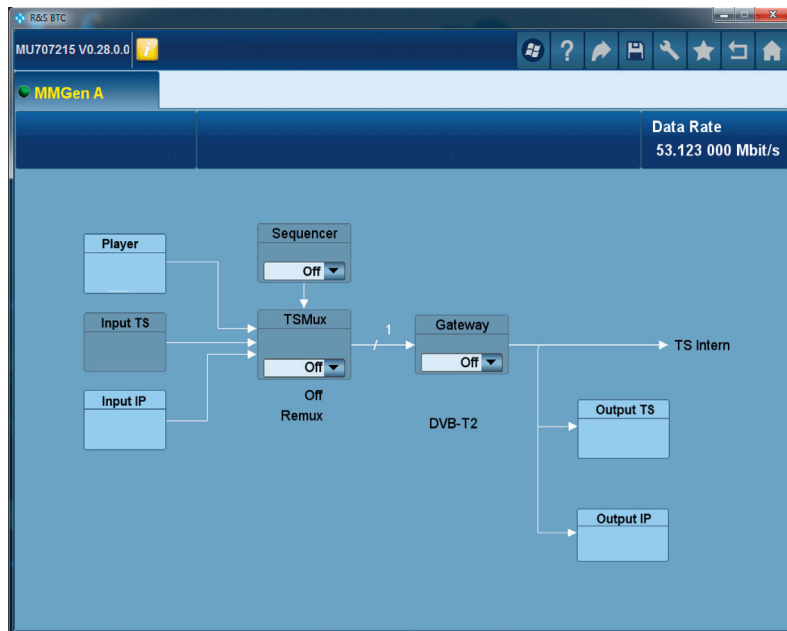
be injected into the transport stream. This also applies to externally fed transport stream data. A transport stream analyzer examines the external or internally generated transport stream in realtime along with its structure including tables and contents.

Transport stream multiplexer/remultiplexer and T2-MI gateway

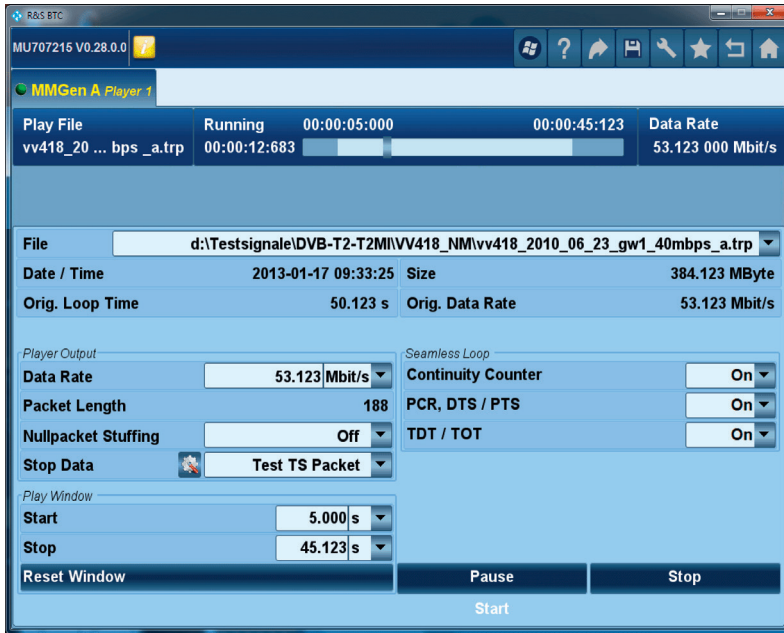
The integrated multiplexer/remultiplexer allows users to compile a new transport stream in realtime based on transport streams fed via IP or ASI interfaces (similar to internally replayed transport streams). The T2-MI streams required for the DVB-T2 multi PLP mode can be generated using an integrated T2-MI gateway. This software based gateway makes it possible to generate a T2-MI stream in realtime and feed it directly into the DVB-T2 coder.

Replay and recording of transport streams and bit streams

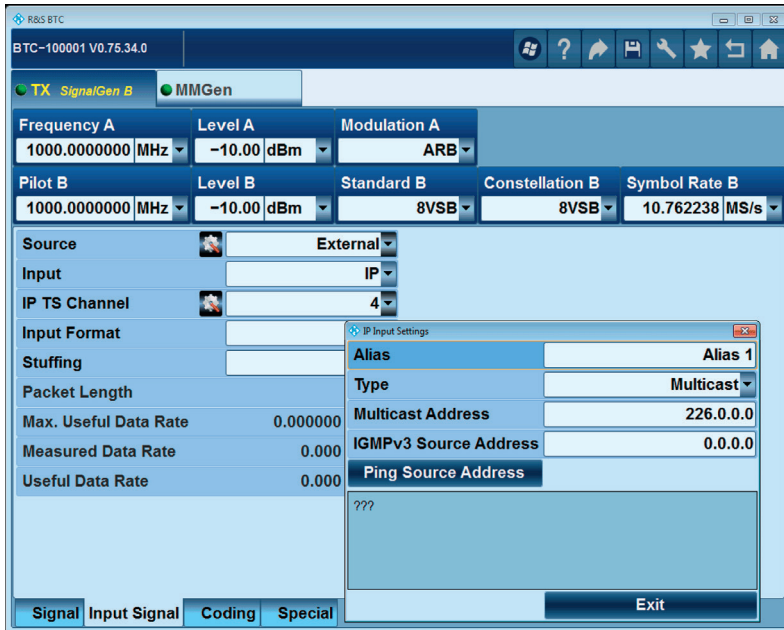
The integrated multimedia generator replays and records transport streams and bit streams in a wide variety of formats, such as T2-MI, MPEG-2 TS, ETI, MFS and PMS. The player functionality also makes it possible to replay contents from proprietary Rohde&Schwarz transport stream libraries.



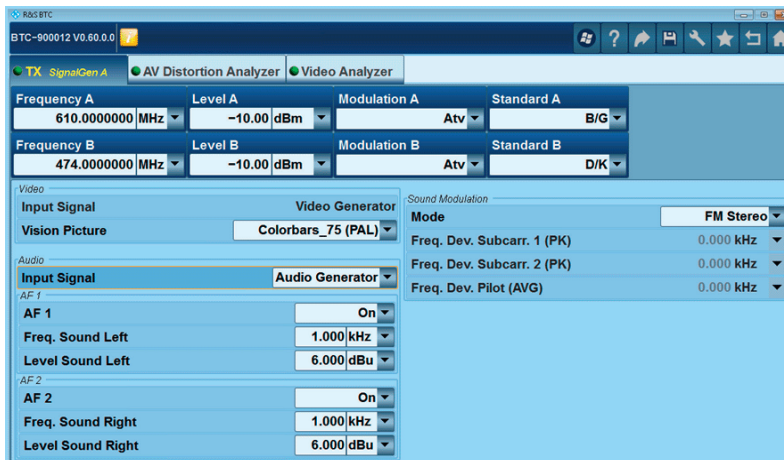
The R&S®BTC multimedia generator offers a wide range of applications: ASI and IP inputs, realtime transport stream generation, TRP player, remultiplexer, sequencer, error injection and gateway functionality.



The multimedia generator includes two independent bitstream players, with one player for each signal path.



IP streams can be directly fed into the realtime coder, where they are prepared and processed. The screenshot shows options for configuring the coder IP input.



The R&S®BTC also supports analog TV standards with an analog multistandard realtime coder. The internal audio and video generator provides maximum flexibility in generating analog A/V streams. A file can be loaded and replayed from a library with an A/V stream.

Simulation of the transmission channel

The R&S®BTC features impressive RF characteristics as well as versatile and comprehensive channel simulation functions. Rohde & Schwarz has many years of experience as a market leader for reference signal generators, and all this expertise has gone into this all-in-one solution.

Complex generation of multiple interferer signals

A key task in the development and testing of receivers and their components is the simulation of realistic – and often complex – interferer scenarios. To simulate such interferer scenarios, the R&S®BTC provides up to eight independent arbitrary waveform generators (ARB) in each of its two RF paths. Each of these eight ARBs is fully independent and employs a shared memory concept for data storage. Any I/Q waveform files can be loaded into the individual ARBs and replayed. The level and frequency offset for each ARB signal can be varied in the range of ± 60 dB and ± 70 MHz with reference to the wanted signal.

All I/Q waveforms in Rohde & Schwarz format can be loaded into the ARBs. Other I/Q waveform formats can be converted into the Rohde & Schwarz format using available software tools.

A wide range of I/Q signal libraries for different transmission standards is available for simulating broadcast and interferer signals.

Wireless communications signals required as interferer signals can be generated using the R&S®WinIQSIM2™ simulation software. As a result, the R&S®BTC ARBs enable users to simulate scenarios such as the digital dividend, which is used by LTE signals.

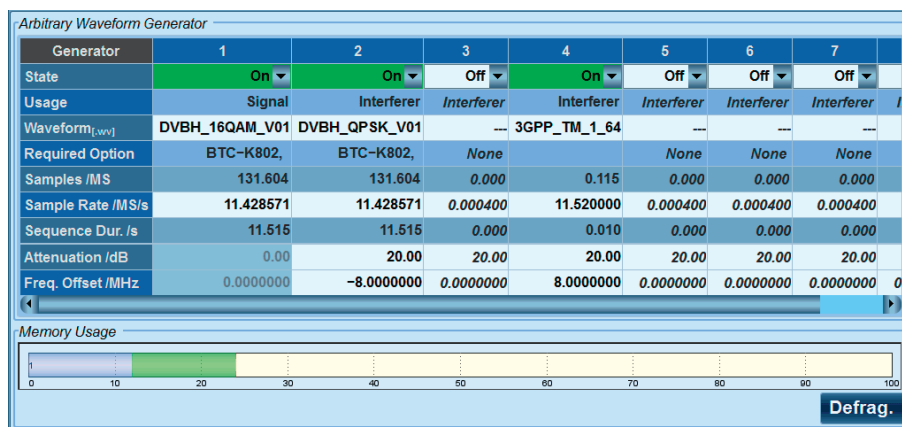
MISO and MIMO fading scenarios

Owing to its powerful fading simulators, the R&S®BTC can simulate MISO and 2x2 MIMO fading scenarios, which are currently being evaluated for use with DVB-T2 transmissions, in addition to common fading profiles. The R&S®BTC has already been prepared for the support of future 4x4 MIMO scenarios¹⁾.

Variety of noise sources

The functional range of the R&S®BTC includes a variety of noise sources, such as broadband noise generators with additive white Gaussian noise (AWGN), impulsive noise generators and a phase noise generator. The AWGN can be generated across the entire I/Q bandwidth or within a limited bandwidth and can be added to the wanted signal before and after fading. The impulse noise generator allows users to define the impulse width, the number and the impulse interval. The phase noise generator makes it possible to directly enter the reference points of the phase noise trace via touchscreen. Users can also load predefined waveforms as files into the R&S®BTC for use by the phase noise generator.

¹⁾ 4x4 MIMO requires additional R&S®BTC options as well as a second R&S®BTC broadcast test center.



It is easy to handle complex interferer scenarios with the multiple arbitrary waveform generator. The frequency and level of the independent interferers can be configured in realtime.

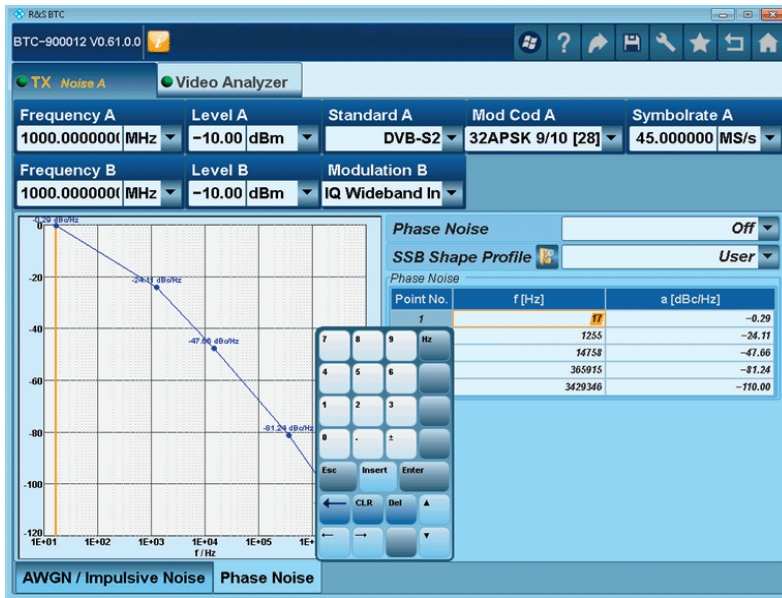
Predistortion and nonlinearities

The R&S®BTC can simulate linear and nonlinear behavior that might occur when signals are generated in the transmitter and at the signal input of a receiver. The tester also allows users to configure the predistortion in order to control the power amplifiers.

Testing of satellite transmission links

The R&S®BTC can reproduce the nonlinearities of traveling wavetube amplifiers (TWTA) as well as IMUX and OMUX curves to simulate satellite transmissions.

The use of R&S®BTC fading options permits users to simulate other typical environmental influences that impair satellite transmissions, such as rain scatter or a satellite in orbit. Background interferers that occur when receiving the wanted signal are added with the multiple ARB. It is also possible to simulate the influence of terrestrial interferers on an earth station or on a receiver. In addition to additive white Gaussian noise (AWGN), which can be added before and after fading, users can also add phase noise to the wanted satellite signal.



It is possible to directly enter and alter phase noise traces. The trace characteristics can be easily changed by touching the screen. The R&S®BTC calculates the trace internally. Users can also enter the values directly via the soft keypad, by connecting a keyboard or by using a loadable file.

Predistortion and nonlinearities



By using nonlinearities, the R&S®BTC also enables users to simulate IMUX and OMUX trace characteristics that occur in satellites. Predistortion can also be configured to control power amplifiers or for cable applications.

High-end realtime reference signal generator

Generation of multiple signals with outstanding RF quality

As a high-end reference signal generator, the R&S®BTC features very low single sideband phase noise of up to -135 dBc (1 Hz) and an I/Q modulation bandwidth of up to 160 MHz combined with output power levels of up to +18 dBm (PEP) per RF output signal. The signal quality can be boosted even further by using a low phase noise option with FM/φM functionality.

Digital and analog TV standards for cable, satellite and terrestrial transmission

The R&S®BTC offers high-performance FPGA-based multi-standard solutions that provide realtime support for all global digital and analog TV standards. Users can select and switch over transmission standards on the graphical user interface by a single tap on the capacitive touchscreen. The R&S®BTC broadcast test center supports cable, terrestrial and satellite standards. Integrated single-frequency network (SFN) adapters make it possible to simulate real terrestrial SFN networks.

Digital and analog audio broadcasting standards

Besides TV standards, the R&S®BTC also supports digital and analog audio broadcasting. Each of the two realtime coders can transmit signals based on the same or different audio broadcasting standards simultaneously, allowing the simulation of dynamic switchover scenarios in the receiver.

Second-generation broadcasting standards and interfaces

Also second-generation DVB standards (DVB-T2, DVB-C2 and DVB-S2 and their input data interfaces) are provided in the R&S®BTC as a realtime solution. In addition to broadcast services, the R&S®BTC DVB-S2 realtime coder also offers DSNG services, interactive services and professional services. The audio/video content is fed via a conventional ASI connection or via the IP interface.

Realtime support for all global TV and audio broadcasting standards

The screenshot shows the 'SignalGen A' interface with several dropdown menus. The 'Dtv' menu is expanded, showing options like DVB-T2, DVB-C2, DVB-T/H, DVB-C, DVB-S, 8VSB, J.83/B, ISDB-T, DTMB, and DVB-S2. The 'Atv' menu is also expanded, showing options like B/G, D/K, I, M/N, and L. The 'Audio Bc' menu is expanded, showing options like AM and FM. The 'IQ Wideband In' menu is also visible.

The powerful R&S®BTC platform offers all global TV and audio broadcasting standards that can be implemented by means of FPGA software coders. The required realtime coder is loaded into the FPGA by tapping the touchscreen. The user will then have access to all required parameters.

Chip design with configurable I/Q sample rates

I/Q data interfaces at many system levels

The I/Q data interfaces of the R&S®BTC offers chip and tuner manufacturers ideal testing and design options. Digital I/Q interfaces, whose data can be fed to external DUTs, are provided at different system levels. Digital I/Q signals can be fed into the R&S®BTC and processed, if necessary. These signals can then be RF modulated and output.

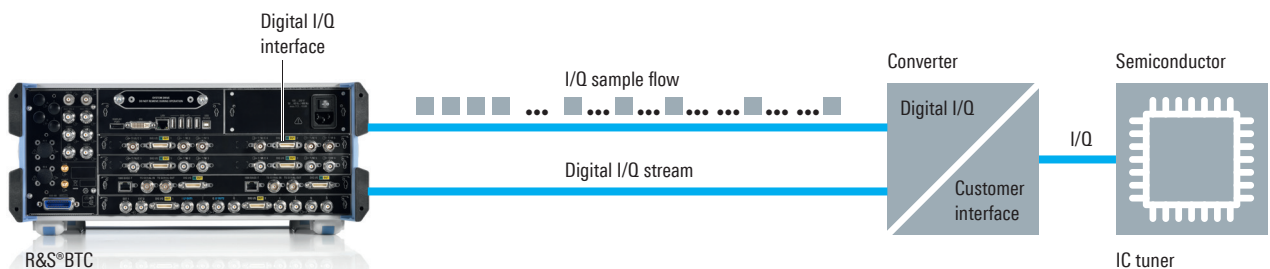
I/Q data output with flexible I/Q data rates

Chip development requires maximum flexibility (when handling digital I/Q data) in terms of data rates and data formats. The R&S®BTC provides this flexibility by offering configurable I/Q sample rates for its digital I/Q data input and output.



Rear view of the R&S®BTC with I/Q interfaces.

I/Q data processing with different sample rates



The digital I/Q interface of the R&S®BTC enables I/Q data processing with different sample rates and provides this data to the user.

End-to-end tests in realtime

Realtime audio and video link testing

The R&S®BTC can generate and replay video, audio and data content in realtime, or output externally fed content in modulated form. Interface modules and their analysis functions enable end-to-end measurements on the DUT. As a result, the link transmission quality can be assessed under realistic realtime conditions.

The R&S®BTC is the ideal all-in-one solution for end-to-end testing: It generates audio/video and broadcast signals and provides analysis functions to assess the audio/video data of the DUT.



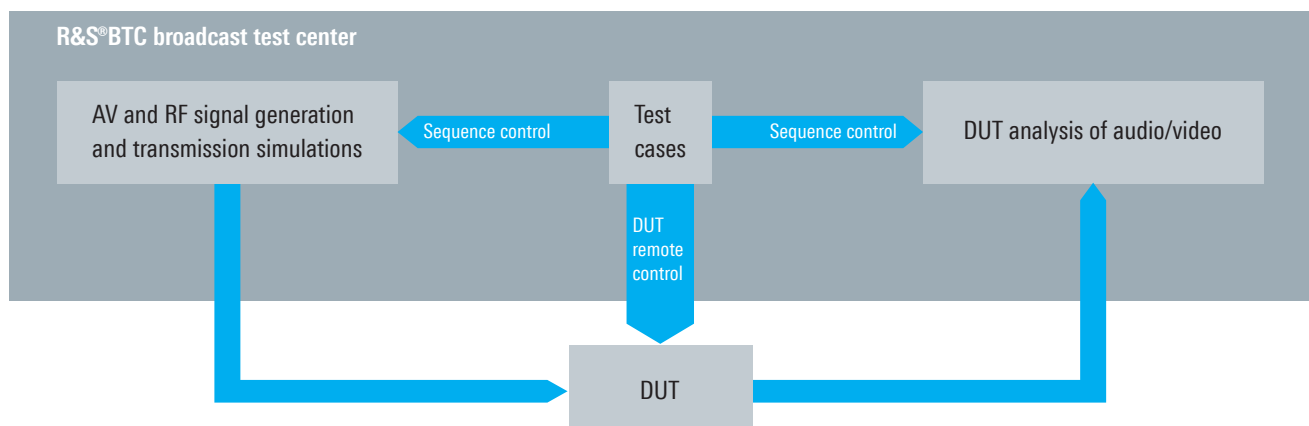
Complete DUT embedding

The R&S®BTC permits users to embed the DUT in the automated test sequence. The USB interfaces are used to connect additional interface adapters, such as a USB-to-infrared converter for an IR remote control device or an RS-232/RS-485 or CAN bus interface adapter. The external adapter is incorporated directly into the R&S®AVBrun sequencer tool and integrated into the test sequence.

Decoder tests with objective picture failure point (PFP) analysis

The R&S®BTC offers a unique combination of signal generation, DUT embedding and decoder analysis while simultaneously determining the PFP – all in a single instrument. The decoded audio and video information output at the DUT interfaces is fed through the appropriate AV, RGB, MHL or HDMI interface modules and analyzed in the R&S®BTC. The information is processed with the PFP analysis software, which provides an objective assessment of the transmitted signal by using the source signal as a reference. Transmission simulations offered by the R&S®BTC allow users to precisely determine the point at which video degradation initially occurs. Unlike subjective assessments performed by test persons, this objective picture quality assessment ensures that the PFP is reproducible at any time, which saves time and money.

Typical CE receiver test setup



The R&S®BTC offers a complete test environment, from the application layer at the signal generation end for terrestrial, cable and satellite transmissions to the DUT application layer and the analysis of transmitted audio, video and data contents.

Easy operation and remote control

Intuitive operation via touchscreen

The capacitive, high-resolution 8.4" touchscreen allows users to operate the instrument directly and intuitively without the need for a keyboard or mouse. A simple tap on the touchscreen is all that is needed to activate the application and integrate it into the test environment. Another tap opens the application for configuration settings.

Graphical user interface with hierarchical function blocks

The design of the graphical R&S®BTC user interface has been optimized for touchscreen use. The well-organized menus permit fast and reliable navigation within the individual applications and function blocks. The hierarchical operating concept makes it possible to configure complex scenarios in just a few steps. Pressing the appropriate soft button brings the user directly back to the overview page, to the device setup or to the user-defined favorites.

Overview and configuration of entire test setup

The R&S®BTC allows users to graphically display the entire test setup including signal generation, test sequence control, analysis and the DUT – even when complex test setups are used. One glance at the graphical start page is all that it takes to gain an overview of the settings and states

for all function blocks and of the operating status for all interfaces. Users are provided with a clear overview of the test setup at any time – an essential feature when it comes to quickly and reliably performing complex measurement tasks.

Remote control commands compatible with R&S®SFx family

Since the R&S®BTC is compatible with the remote control commands used by the R&S®SFx family, it can be easily integrated into existing test environments that are equipped with R&S®SFx instruments. Users can continue to employ existing remote control programs without investing too much time in porting efforts.

Intelligent license concept for flexible adaptation to requirements

The R&S®BTC offers a new, highly flexible license concept that makes it possible to use licenses dynamically. If, for example, only one license is purchased, this license is kept ready for use in the R&S®BTC for both paths. An option license that is not being used on one path can be used on the other path. When two licenses are activated, they are available on both paths simultaneously. In addition, there are portable licenses which can be transferred from one R&S®BTC to another via an Internet connection to a Rohde&Schwarz license server. It is also possible to purchase and use options with a one or three-month license to handle projects that are limited in time. This new, intelligent license and option concept meets the growing need for flexibility in development and makes the modular R&S®BTC test platform ideal, also for companies that rent out T&M equipment.

Intuitive operation

1.) Activate application with a simple click

2.) Drop into the active area

3.) Simple click to enter application

A simple tap on the touchscreen is all that is needed to activate the application and integrate it into the test environment. A second tap opens the application for configuration settings. This allows the user to always maintain a clear overview of the test environment and to receive status information of the signals and interfaces.

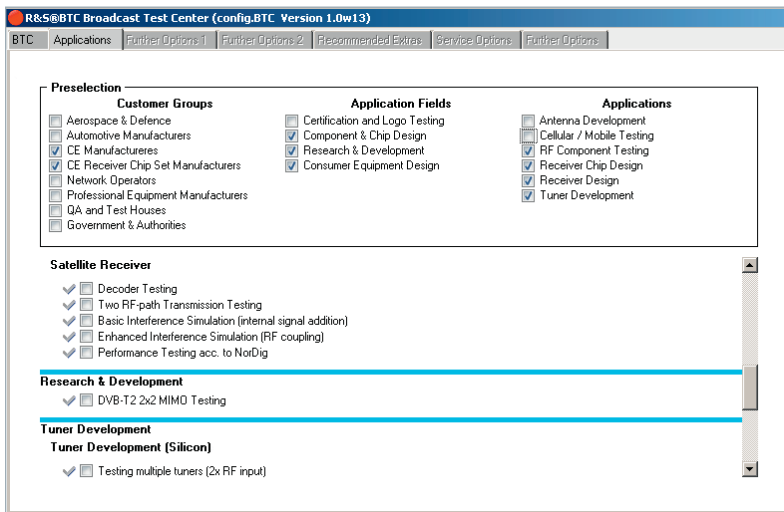
Configuration examples demonstrating the modular and flexible architecture

The R&S®BTC broadcast test center is an all-in-one solution that can be optimally configured to meet customer requirements.

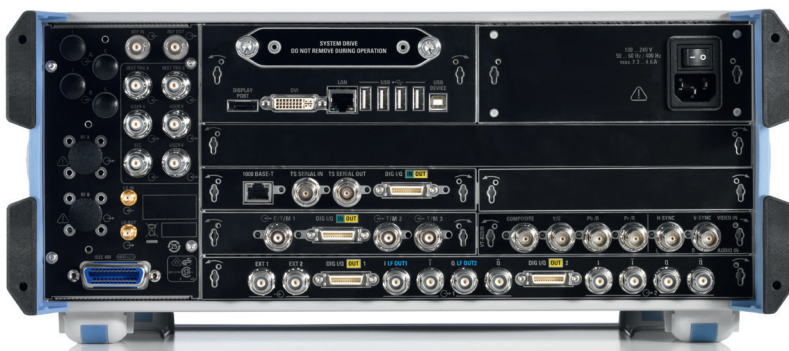
Due to its extremely fine scalability, the R&S®BTC can be tailored to meet different customer and test requirements. The R&S®BTC is an all-in-one solution, eliminating the need for test setups with many separate T&M instruments. Since the broadcast test center has a modular design, customers can save even more as they invest only in the functions they need. This provides safety of investment and makes the instrument ready for future requirements.

To meet their specific needs, users can choose from a wide variety of software and hardware options. The configurable hardware modules include the hard disk, the computer platform and the audio and video interface platform modules of the R&S®VTx family, which can also be used in the R&S®BTC. With a few clicks, the smart configurator of the R&S®BTC conveniently offers users a preselection based on the wide range of software and hardware options to match the application at hand.

The figures below show a small selection of possible configurations with different hardware modules. Users can also activate all software options themselves.



The R&S®BTC configurator.



Basic configuration of the R&S®BTC: prepared for two RF paths with a realtime coder and a 40-path hardware unit. In this configuration, it is possible to add up to three additional hardware modules from the R&S®VTx family or from the R&S®BTC options.



With a single-channel RF solution, a realtime coder and a 40-path hardware module, this R&S®BTC configuration delivers a high-quality RF signal. The installed broadcast modulator module generates an additional broadcast signal, which is available at the SMA port on the back of the instrument.



This R&S®BTC configuration for a complete test environment is used to stimulate the DUT and analyze the video/audio content. The configuration includes a solution with two RF paths, two realtime coders and two 40-path fading hardware modules. Plus, an analog VT interface module and a digital VT interface module with an optical SPDIF input as well as HDMI input and output have been installed for DUT analysis.



This R&S®BTC configuration specializes in audio and video testing – with two RF paths and two realtime coders, but without fading hardware.



All hardware modules supported by the R&S®BTC, including those of the R&S®VTx family, can be installed at any time. Future modules can be retrofitted. Trained Rohde & Schwarz personnel can quickly and reliably exchange installed modules and perform new configurations also at the customer's premises.

Specifications in brief

Specifications in brief		
RF signal		
Frequency range	R&S®BTC-B3103/R&S®BTC-B3203	100 kHz to 3300 MHz
	R&S®BTC-B3106/R&S®BTC-B3206	100 kHz to 6000 MHz
Frequency resolution		0.001 Hz
Level	R&S®BTC base unit	-120 dBm to +18 dBm (PEP)
Level accuracy	auto mode: 100 kHz ≤ f ≤ 6 GHz	< 0.5 dB
Internal I/Q bandwidth		160 MHz
Broadband noise	in 1 Hz at > 10 MHz offset	< -157 dBc (typ.)
Modulation systems		
Terrestrial TV and mobile TV		<ul style="list-style-type: none"> ▮ DVB-T2 ▮ DVB-T2 Lite ▮ DVB-T, DVB-H ▮ DTMB ▮ CMMB ▮ T-DMB ▮ ISDB-T, ISDB-Tmm, ISDB-T_B, ISDB-T 1 seg ▮ ASTC/8VSB, ATSC-M/H
Cable TV		<ul style="list-style-type: none"> ▮ DVB-C2 ▮ DVB-C (J.83/A), ISDB-C (J.83/C) ▮ J.83/B (US cable)
Satellite TV		<ul style="list-style-type: none"> ▮ DVB-S2 ▮ DVB-S ▮ DSNG ▮ DirecTV
Analog TV		B/G, D/K, I/I1, M/N, L/L'
Digital audio broadcasting		<ul style="list-style-type: none"> ▮ DAB, DAB+ ▮ ISDB-T_{SB}
Analog audio broadcasting		AM, FM mono, FM stereo with RDS
Additional functions		
Multimedia generator		<ul style="list-style-type: none"> ▮ elementary stream generator ▮ transport stream player ▮ transport stream analyzer ▮ transport stream multiplexer ▮ error injection ▮ table editor and table masking ▮ T2-MI realtime gateway (optional)
Audio/video generator	file format	Rohde&Schwarz proprietary
AWGN noise generator	signal-to-noise ratio (SNR)	-30 dB to +60 dB
Noise generator extension	operating modes	<ul style="list-style-type: none"> ▮ impulsive noise ▮ phase noise ▮ noise with bandwidth limitation
Fading simulator	up to max. 4 fading simulators, with 2x2 and 4x4 MIMO profiles	40 paths per fading simulator
BER measurement		PRBS, MPEG-2 TS measurement
General data		
Display		capacitive 8.4" touchscreen
Operating temperature range		+5°C to +45°C
Dimensions (without handles)	W × H × D	435 mm × 192 mm × 460 mm (17.1 in × 7.6 in × 18.1 in)
Weight	fully equipped instrument	21 kg (46.3 lb)

For data sheet, see PD 3606.8550.22 and www.rohde-schwarz.com

Ordering information

Designation	Type	Order No.
Base unit		
Broadcast Test Center ¹⁾ including power cable, quick start guide and CD-ROM (with operating and service manual)	R&S®BTC	2114.3000.02
Options		
Frequency options		
Low Phase Noise	R&S®BTC-B3100	2114.6000.02
RF Path A		
100 kHz to 3 GHz	R&S®BTC-B3103	2114.3100.02
100 kHz to 6 GHz	R&S®BTC-B3106	2114.3200.02
RF Path B		
100 kHz to 3 GHz	R&S®BTC-B3203	2114.3300.02
100 kHz to 6 GHz	R&S®BTC-B3206	2114.3400.02
Baseband main modules		
Baseband Main Module, one I/Q path to RF	R&S®BTC-B11	2114.6500.02
Baseband Main Module, two I/Q paths to RF	R&S®BTC-B12	2114.6600.02
Baseband		
Baseband Generator, 1st channel	R&S®BTC-B1	2114.3500.02
Baseband Generator, 2nd channel	R&S®BTC-B2	2114.3600.02
Extended I/Q Interfaces	R&S®BTC-K2500	2114.7293
Audio/video generation		
Multimedia Generator Suite	R&S®BTC-K20	included in base unit
DVB-T2 Multiprofile Gateway	R&S®BTC-K24	in preparation
Transmission standards		
DVB-T2 Coder	R&S®BTC-K516	2114.7035
DVB-T/DVB-H Coder	R&S®BTC-K501	2114.6980
DAB/DAB+/T-DMB Coder	R&S®BTC-K511	2114.7106
ATSC M/H, 8VSB Coder	R&S®BTC-K518	2114.7135
DTMB Coder (GB20600-2006)	R&S®BTC-K512	2114.7112
CMMB Coder	R&S®BTC-K515	2114.7129
ISDB-T/ISDB-T _g /ISDB-T _{sb} Coder	R&S®BTC-K506	2114.7087
ISDB-Tmm Coder	R&S®BTC-K507	2114.7029
DVB-C2 Coder	R&S®BTC-K517	2114.7041
J.83/A/B/C Coder (DVB-C, US-Cable, ISDB-C)	R&S®BTC-K502	2114.6997
DVB-S/DVB-S2, DSNG Coder	R&S®BTC-K508	2114.7093
DIRECTV Legacy Coder	R&S®BTC-K509	2114.7270
AM/FM RDS RDBS Coder	R&S®BTC-K570	2114.7141
ATV Multistandard Coder	R&S®BTC-K595	2114.7287
Transmission simulations		
Arbitrary Waveform Generator	R&S®BTC-K35	2114.6974
Fading Simulator (path A)	R&S®BTC-B1031	2114.3700.02
Fading Simulator (path B)	R&S®BTC-B1032	2114.3800.02
Fading Simulator Extension (path A and path B)	R&S®BTC-B1034	in preparation
Dynamic Fading	R&S®BTC-K1031	2114.7158
Extended Statistic Functions	R&S®BTC-K1032	2114.7164
MIMO Fading	R&S®BTC-K1034	in preparation
Additive White Gaussian Noise (AWGN)	R&S®BTC-K1040	2114.7070
Extended Noise Generator	R&S®BTC-K1043	2114.7235
Distortion Simulation	R&S®BTC-K1200	2114.7329
BER Measurement	R&S®BTC-K2060	2114.7264

¹⁾ The base unit can only be ordered with an R&S®BTC-B1xx frequency option.

Designation	Type	Order No.
Other options		
Rear Panel Connectors (path A)	R&S®BTC-B3121	2114.6300.02
Rear Panel Connectors (path B)	R&S®BTC-B3122	2114.6400.02
Analyzer modules and analyzer module software		
MHL™ options		
MHL™ RX/TX	R&S®VT-B2350	2115.7622.06
MHL™ CTS System Sink Test	R&S®VT-K355	2115.8006.02
MHL™ CTS System Source Test	R&S®VT-K2355	2115.8012.02
HDMI™ options		
HDMI™ RX 225 MHz	R&S®VT-B2360	2115.7616.06
HDMI™ RX 300 MHz	R&S®VT-B2361	2115.7639.06
HDMI™ CTS System Source Test	R&S®VT-K2365	2115.8270.02
Analog options		
Analog AV RX	R&S®VT-B2370	2115.7600.06
Component Support	R&S®VT-K2371	2115.8258.02
Analyzer software options		
Video Analysis	R&S®VT-K2100	2115.8029.02
Video Measurements	R&S®VT-K2101	2115.8264.02
AV Inspection	R&S®VT-K2110	2115.8035.02
AV Distortion Analysis	R&S®VT-K2111	2115.8041.02
Audio Analysis	R&S®VT-K2150	2115.8235.02
Video Analysis	R&S®VT-K2100	2115.8029.02
Automated testing (R&S®AVBrun sequencer tools)		
D-Book Test Suite	R&S®BTC-KT3310	2114.7987.02
NorDig Test Suite	R&S®BTC-KT3311	in preparation
E-Book Test Suite	R&S®BTC-KT3312	in preparation
PFP Analysis	R&S®VT-KT3360	2115.8387.02
MHL™ CTS Sink	R&S®VT-KT3351	2115.8087.02
MHL™ CTS Source	R&S®VT-KT3352	2115.8093.02
Stream libraries		
Analog Video Signal Library	R&S®LIB-K50	2116.9358.02
T-DMB/DAB Streams	R&S®LIB-K51	2116.9364.02
DAB+ Streams	R&S®LIB-K53	2116.9387.02
ISDB-T Transport Streams	R&S®LIB-K54	2116.9393.02
CMMB Transport Streams	R&S®LIB-K55	2116.9406.02
ATSC-M/H Transport Streams	R&S®LIB-K56	2116.9412.02
DVB-T2 MI Streams	R&S®LIB-K57	2116.9429.02
EMC Streams	R&S®LIB-K58	2116.9435.02
DMB Streams, France	R&S®LIB-K59	2116.9441.02
Basic Stream Library	R&S®LIB-K70	2116.9558.02
Extended SDTV Library	R&S®LIB-K71	2116.9564.02
Extended HDTV Library	R&S®LIB-K72	2116.9570.02
3D Library	R&S®LIB-K73	2116.9587.02
Waveform libraries		
T-DMB/DAB Waveforms	R&S®WV-K801	2116.9787.02
DVB-H Waveforms	R&S®WV-K802	2116.9793.02
DRM Waveforms	R&S®WV-K803	2116.9806.02
HD Radio™ Waveforms ²⁾	R&S®WV-K804	2116.9812.02
CMMB Waveforms	R&S®WV-K808	2116.9858.02
DVB-T2 Waveforms	R&S®WV-K809	2116.9864.02
DRM+ Waveforms	R&S®WV-K811	in preparation
ISDB-S Waveforms	R&S®WV-K812	2116.9893.02
MoCA Waveforms	R&S®WV-K814	2116.9912.02

²⁾ HD Radio™ is a proprietary trademark of iBiquity Digital Corp. HD Radio™ waveforms require a license agreement with iBiquity Digital Corporation.

Designation	Type	Order No.
ISDB-Tmm Waveforms	R&S®WV-K815	2116.9929.02
Analog Signals	R&S®WV-K816	2116.9935.02
Interferer signals		
Digital TV Interferers	R&S®WV-K1114	2116.9964.02
Cable Interferers	R&S®WV-K1116	2116.9970.02
Satellite Interferers	R&S®WV-K1123	2116.9987.02
Digital Standard GSM/EDGE	R&S®WV-K1140	2114.8260.02
Digital Standard EDGE Evolution	R&S®WV-K1141	2114.8277.02
Digital Standard 3GPP FDD	R&S®WV-K1142	2114.8283.02
Digital Standard GPS 1 Satellite	R&S®WV-K1144	2114.8302.02
Digital Standard CDMA2000®	R&S®WV-K1146	2114.8325.02
Digital Standard 1xEV-DO	R&S®WV-K1147	2114.8331.02
Digital Standard IEEE 802.16	R&S®WV-K1149	2114.8354.02
Digital Standard TD-SCDMA	R&S®WV-K1150	2114.8360.02
Digital Standard TD-SCDMA Enhanced	R&S®WV-K1151	2114.8377.02
Digital Standard IEEE 802.11a/b/g/n	R&S®WV-K1154	2114.8402.02
Digital Standard EUTRA/LTE	R&S®WV-K1155	2114.8419.02
Digital Standard Bluetooth® EDR	R&S®WV-K1160	2114.8431.02
Multicarrier CW Signal Generation	R&S®WV-K1161	2114.8448.02
Additive White Gaussian Noise	R&S®WV-K1162	2114.8454.02
Digital Standard TETRA Release 2	R&S®WV-K1168	2114.8460.02
Digital Standard 3GPP FDD HSPA/HSPA+	R&S®WV-K1183	2114.8477.02
Digital Standard LTE Release 9	R&S®WV-K1184	2114.8483.02
Digital Standard LTE Release 10	R&S®WV-K1185	2114.8490.02
Digital Standard IEEE 802.11ac	R&S®WV-K1186	2114.8502.02
Digital Standard 1xEV-DO Rev.B	R&S®WV-K1187	2114.8519.02
Digital Standard NFC A/B/F	R&S®WV-K1189	2114.8525.02
Recommended extras		
19" Rack Adapter	R&S®ZZA-KN4	1175.3033.00
Keyboard with USB Interface (US assignment)	R&S®PSL-Z2	1157.6870.04

Service options		
Extended Warranty, one year	R&S®WE1BTC	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2BTC	
Extended Warranty, three years	R&S®WE3BTC	
Extended Warranty, four years	R&S®WE4BTC	
Extended Warranty with Calibration Coverage, one year	R&S®CW1BTC	
Extended Warranty with Calibration Coverage, two years	R&S®CW2BTC	
Extended Warranty with Calibration Coverage, three years	R&S®CW3BTC	
Extended Warranty with Calibration Coverage, four years	R&S®CW4BTC	

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