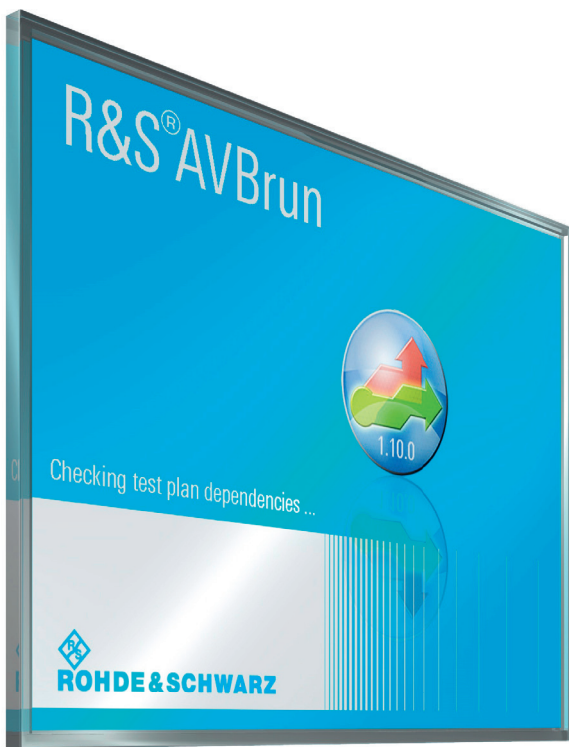


R&S® AVBrun Test Suite Software Pre-conformance testing in line with D-Book, NorDig and E-Book



R&S® AVBrun Test Suite Software At a glance

Set-top boxes, Blu-ray™ players and other multimedia devices that use audio, video and wireless protocols require a reliable, high-performance, efficient automated test system. The R&S® AVBrun test suite software allows users to organize, manage and execute test sequences for product validation and production testing.

R&S® AVBrun test suite software supports Composite, Component and HDMI input signals and offers a comprehensive solution for video and audio quality analysis. The entire test suite software runs on a single box, the R&S® BTC, and reduces the complexity of test setups and handling procedures. The minimum hardware translates to minimum service and maintenance. R&S® AVBrun reduces testing and development time, effectively lowers investment and maintenance costs and increases manpower efficiency.

The R&S® AVBrun test suite software is based on the digital terrestrial television (DTT) precompliance testing requirements for interoperable TV as specified in D-Book, European E-Book¹⁾ and NorDig Unified Test Specifications for Integrated Receiver Decoders¹⁾. R&S® AVBrun features an easy-to-use user interface and covers testing configurations such as loss compensation, multiple interfering signals, and smart learning for controlling the DUT using infrared remote control.

Users simply click the run button to execute the test sequences. The performance of the DUT is then compared against the threshold limits defined in each standard specification, and a report log of the test results is generated. The flexible R&S® AVBrun test suite software also allows users to customize their test methods and to define their own threshold limits for evaluating picture degradation and BER measurements.

For further data processing, users can save and export the test results as a report in different common file formats, such as CSV, PDF or TXT. The report summarizes all test cases and includes test parameters and status as measured against the specified limits.

Key facts

- Upgradeable to other TV and radio broadcast standards
- Customizable test methods and parameters
- User-friendly drag and drop test execution with path compensation
- Perceptual evaluation of video quality using the R&S® VTC
- Ensured reproducibility and consistency in test results

R&S® AVBrun test suite software startup screen.



¹⁾ In preparation.

R&S® AVBrun Test Suite Software Benefits and key features

Automated test software for use with modular platform

- ▮ One-box solution with R&S®BTC
 - ▮ Automated test software
- ▷ [page 4](#)

Product precompliance with D-Book, E-Book and NorDig

- ▮ Precompliance testing
 - ▮ Well-structured test program, intuitive user interface
 - ▮ Easy DUT control
 - ▮ Time saving with smart learning and infrared remote control
- ▷ [page 5](#)

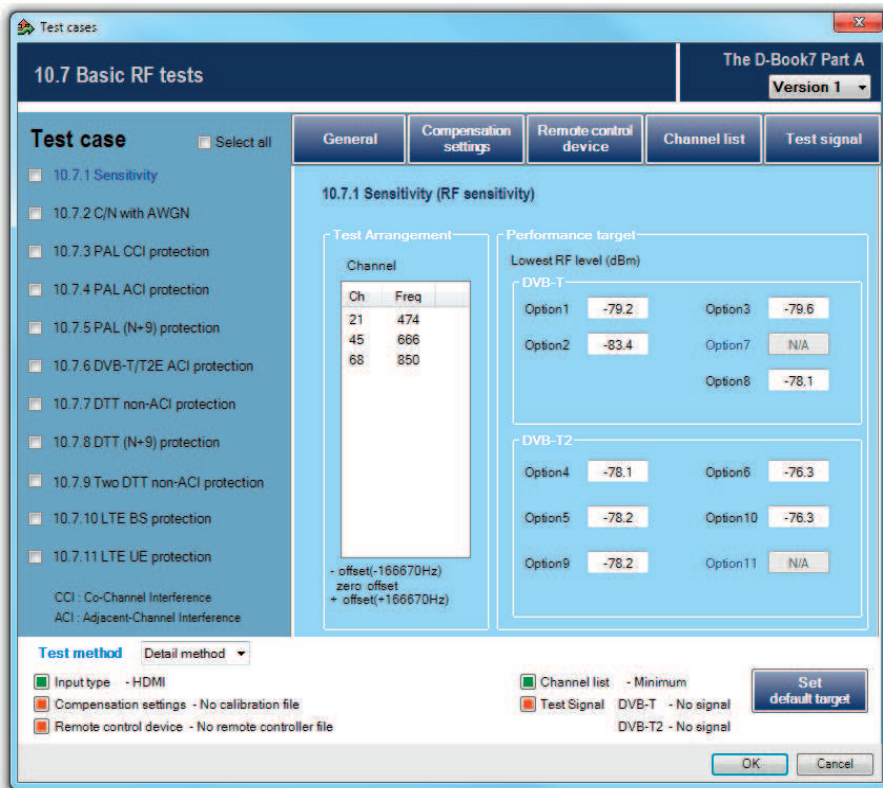
A/V distortion test with A/V distortion analyzer

- ▮ Reliable testing of A/V distortion
- ▷ [page 6](#)

High operational efficiency

- ▮ Minimal configuration effort
 - ▮ Autocompensation to ensure precise results
 - ▮ Effective test program and report generation
- ▷ [page 7](#)

User-friendly interface for easy RF configuration.



Automated test software for use with modular platform

The ready-to-run software uses dedicated modules and the scalability of the R&S®BTC broadcast test center to provide a one-box solution that perfectly fits into the required test environment.

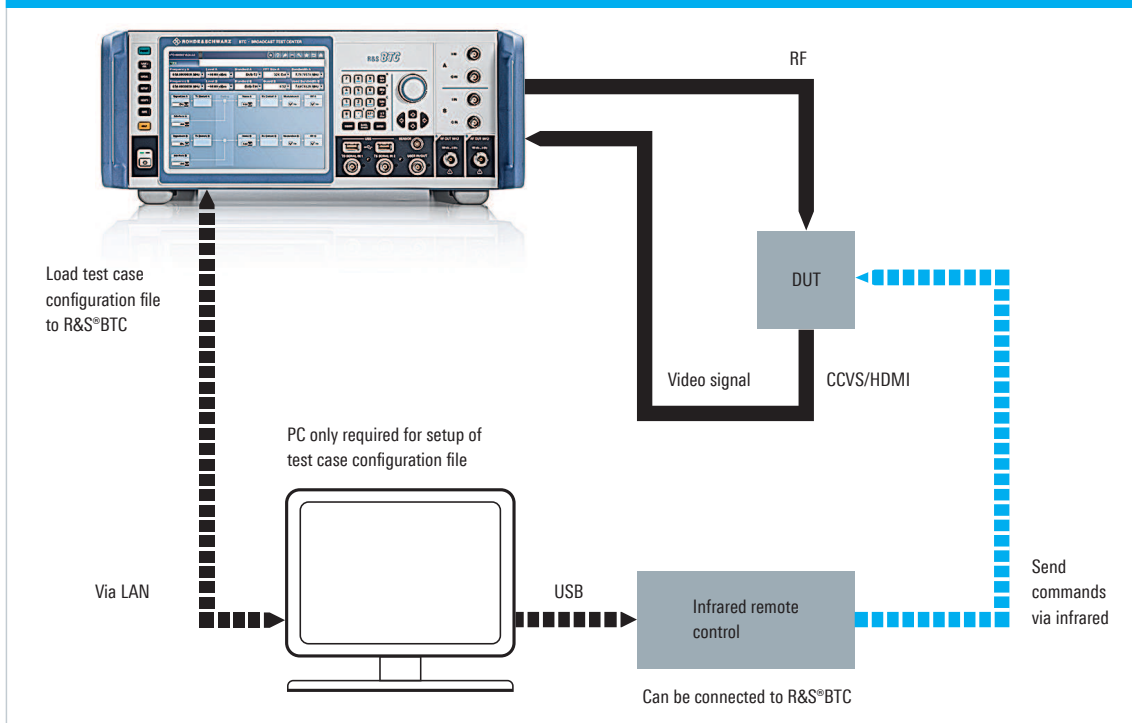
One-box solution with R&S®BTC

The R&S®BTC with integrated R&S®AVBrun test suite software generates audio and video transport streams in realtime and provides high-precision RF signals that can be fed into the DUT. At the same time, the R&S®BTC adds interference signals to the wanted signal and simulates a wide range of test scenarios as defined in certain test requirement specifications. The Composite, Component or HDMI output of the DUT is then fed into the R&S®BTC for analysis. The entire process loop is effectively performed using one box supported by software applications.

Automated test software

Generally product testing can be performed manually. Running these tests is usually laborious, time-consuming, prone to human errors and very costly. Now users can take advantage of fully automated test software. The integration of R&S®AVBrun into the R&S®BTC helps users to reduce testing time, delivers reproducible tests and allows more efficient utilization of resources. This one-box solution eliminates the need for a rack of instruments, which maximizes space usage and reduces the time and cost of service and maintenance.

The R&S®BTC with R&S®AVBrun test suite software offers users an automated test environment



Product pre-compliance with D-Book, E-Book and NorDig

Many set-top box, Blu-ray™ player and chipset manufacturers are required to meet the compliance specifications established by standard associations in order to bring products to market.

Precompliance testing

The advantage of R&S®AVBrun test suite software provides users with a set of automatic test sequences to test the precompliance of their products against a range of industry standards, including DTG D-Book, EICTA E-Book and NorDig Unified Test Specifications. R&S®AVBrun allows users to perform preconformance tests to reveal any non-conformity before the official acceptance test.

Well-structured test program, intuitive user interface

Increasingly complicated testing is simplified into simple and easy configuration steps. Users easily understand the operation and quickly configure the test settings. The R&S®AVBrun test suite software provides a clearly structured concept. Users follow function tabs to easily configure the settings. Without spending time reading each test requirement specification, they quickly configure the test and run the measurement to obtain the desired result.

Easy DUT control

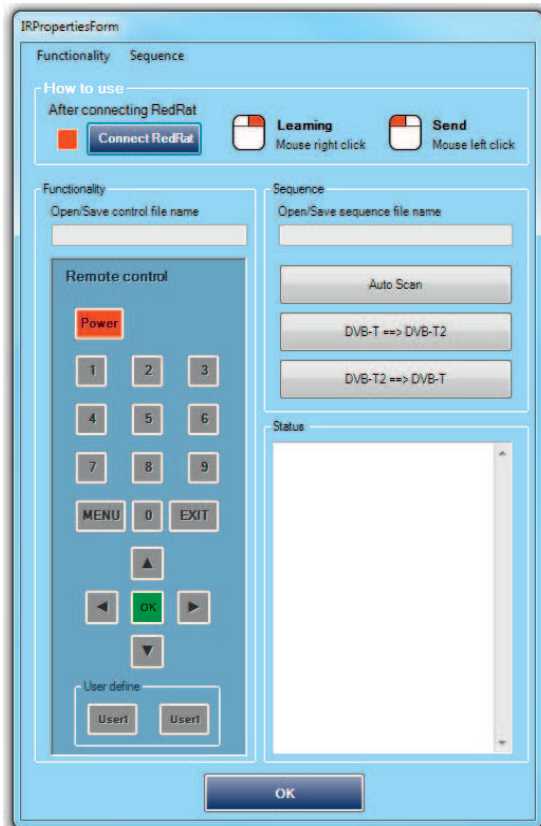
The smart learning system integrated into the R&S®AVBrun test suite software enables users to construct remote control sequences to control the DUT.

Time saving with smart learning and infrared remote control

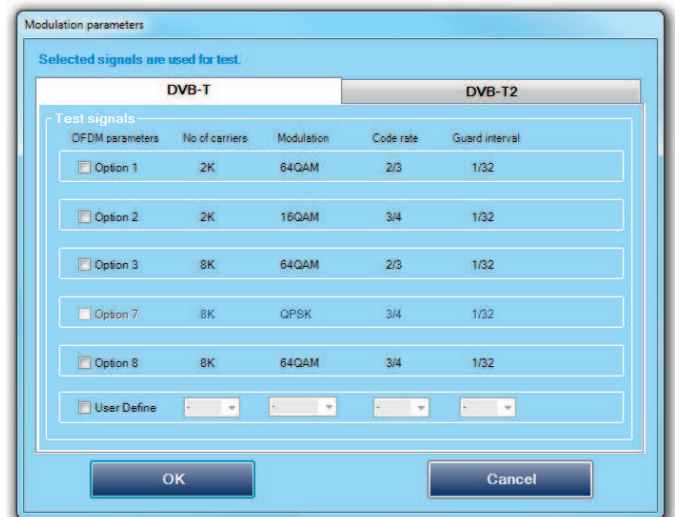
Using RedRat¹⁾ infrared remote control with the R&S®AVBrun test suite software facilitates the testing process. First the remote control learning system is executed, then the desired sequences are constructed and saved as a sequence file. The user can simply recall the saved sequence and the program will control DUT operation.

¹⁾ Recommended accessories.

Remote control learning and sequence.



Test signal configuration based on test specification.



A/V distortion test with A/V distortion analyzer

The A/V distortion analyzer hardware module, together with the R&S®VT-KT3360 A/V distortion test option integrated into the R&S®BTC, provides detailed numerical and graphical inspection by quantifying the visibility of errors (differences) between an ideal image and a distorted image.

Reliable testing of A/V distortion

The R&S®VT-KT3360 A/V distortion test option provides users with highly accurate graphical and numerical results. The numerical analysis shows PSNR, SSIM and MPS at the frame level. The PSNR is the most commonly used objective quality measurement for image compression. SSIM is the improved method for measurement that is more consistent with human eye perception. MOS is the technique of correlating objective metrics.

Picture difference analysis function to detect video degradations by using suitable metrics.

The screenshot shows the AV Distortion Analyzer software interface. At the top, it displays 'BTC-100005 V0.75.4.0' and a set of icons. Below this is the 'AV Distortion Analyzer' title bar. The main interface is divided into several sections:

- Signal:** OK
- Frame:** 156 of 480
- Cycle:** 18
- Synchronization:** Loop - APL
- Reference:** tmp.avr
- Input:** HDMI

The central part of the interface shows two side-by-side images: 'Signal' and 'Reference'. Below these are two sets of vertical bars representing signal levels for channels C1 through C8. A 'Difference' image is shown below the reference image, highlighting the differences between the signal and reference. At the bottom, there are buttons for 'Signal', 'Reference', and 'Difference'.

On the right side, there is a table of metrics:

	Current	Worst
Signal	OK	
Loop Detection	Passed	
Detection Time	00:00:02.678	
[−] Failure Point		
Visible Error	OK	OK
Picture Failure Point	OK	OK
[−] Video		
Freeze	Fail	Fail
Dropped Frames	0	0
Black Frame	OK	OK
Avg. Picture Level	47.1 %	
Pixel Error Y	0	154
PSNR Y	100.0 dB	74.5 dB
SSIM	1.000	1.000
Mos-V	5.00	5.00
[+] Audio Loss		
[−] Audio Level		
CH 1	0.0 dB	7.3 dB
CH 2	0.0 dB	7.3 dB
CH 3	---	---
CH 4	---	---

At the bottom right, there are buttons for 'Start', 'Stop', 'Clear', 'Set Ref.', and 'Settings'.

High operational efficiency

The R&S®AVBrun test suite software was designed to reduce time and effort. It is efficient and effective to operate, has an intuitive user interface and requires minimal configuration.

Minimal configuration effort

All R&S®AVBrun test suite software test cases are structured in line with the standards' test requirement specifications. Each test case includes the threshold limit defined in the test requirement specification. The test sequencer executes the measurement and returns pass or fail based on the picture degradation point or BER value.

Autocompensation to ensure precise results

The R&S®AVBrun test suite software autocompensates for any cable loss during measurement. Users simply need to measure the cable loss one time using the setup shown in the R&S®AVBrun user interface. The value will then be taken into account for all measurements. Cable loss should not be neglected since it impacts the accuracy of results.

Effective test program and report generation

The R&S®AVBrun test suite software executes the test by first saving the ideal image as a reference for comparison and then executing each test case. The test sequencer compares the result against the specified threshold limit and indicates the status of the test as "Passed" or "Failed". The complete measurement report can be exported for further processing to different file formats, e.g. CSV, TXT or PDF.

Export of test result in different common file formats.

Report Info: Date: 4/15/2013 1:21:30 PM

Testplan: C:\Program Files\Rohde-Schwarz\AVBrun\1.19.4\Tests\My Tests\Debug\DBook_10_7_Basic_RF_tests.dll
User: Jang_h
Comment: AVBrun dll Version : 01.00
Test Executive: R&S AVBrun 1.19.4
Instrument ID 1: R&S VTE 1.31.0.0
Options:

Summary:

Test Start Time: 4/15/2013 1:21:30 PM
Test End Time: 4/15/2013 2:20:59 PM
Total Test Time: 00:59:29
Weighted Test Time: 00:59:29
Test Items Passed: 25
Test Items Failed: 1
Number of Test Items: 26
Errors: 1

Channel list : Ideal
DVB-T Signal : 1
DVB-T2 Signal : No signal
Compensation settings : C:\Users\jang_h\Desktop\DBookTest\Calibration File\stall_Freq_by8MHz.comp
Remote control device : C:\Users\jang_h\Desktop\DBookTest\remocon file\RemoteController.seq

10.7.1
RF sensitivity

Signal Option and Channel number	Offset	Limit	Result	Unit	Status
DVB-T					
SignalOption1					
21 (474MHz)		-79.2	-83.3	dBm	Passed
22 (482MHz)			-83.1	dBm	Passed
23 (490MHz)			-83.5	dBm	Passed
24 (498MHz)			-83.4	dBm	Passed
25 (506MHz)			-83.2	dBm	Passed
26 (514MHz)			-83.2	dBm	Passed
27 (522MHz)			-83.1	dBm	Passed
28 (530MHz)			-83.1	dBm	Passed
29 (538MHz)			-82.7	dBm	Passed

Application examples

Precompliance testing of set-top boxes in line with standards' test requirement specifications

In order to obtain market acceptance, set-top box manufacturers typically submit their products to a test house for compliance or logo testing to certify that their products meet one or more test requirement specifications. Most set-top box manufacturers perform in-depth precompliance testing to ensure that their products will pass the costly compliance testing performed by a test house or testing organization.

The R&S®AVBrun test suite software integrated into the R&S®BTC broadcast test center is ideal for this application. The R&S®BTC is a one-box solution with generator and analyzer functionality for stimulating and analyzing the DUT. With its integrated testing environment, the R&S®BTC generates a precise RF signal that is fed into a

DUT. The output of the DUT, either the Composite, Component or HDMI output, is then fed back into R&S®BTC for analysis. The test sequence is supported by R&S®AVBrun to perform all required test cases automatically. One of the most critical tests is manual picture failure point detection. The picture quality tests not only consume a lot of testing time, they are also highly prone to human error and inconsistency due to varying human perception. To accelerate this process and to reduce the error rate and variance, the R&S®AVBrun test suite software with the A/V distortion analyzer provides users with a detailed evaluation of picture quality by quantifying the visibility of errors or differences between an ideal image and a distorted image. The results are numerically and graphically displayed and are reproducible.

In addition to precompliance testing, the R&S®AVBrun test suite software is suitable for use in research and development environments, especially in the design stage, to verify product performance against preformance test requirement. On the production line, where tests need to be run frequently and repetitively, the reliable R&S®AVBrun is ideal for saving time and resources.

R&S®AVBrun test suite software integrated into the R&S®BTC.



Test specifications

Test specifications		
DTG D-Book	in line with D-Book 7.0 Part A	
Test descriptions	Chapter 9	UHF transmission and reception
Test cases	Chapter 10	RF test procedures for DVB-T and DVB-T2 receivers
	10.7	Basic RF tests
	10.7.1	RF sensitivity
	10.7.2	Performance with AWGN
	10.7.3	Performance with PAL CCI interference
	10.7.6	Performance with ACI DVB-T/T2E interference
	10.7.7	Performance with non-ACI DVB-T interference
	10.7.8	Performance with (N+9) DVB-T interference (image)
	10.7.9	Performance with two DVB-T interfering signals
	10.7.10	Performance with adjacent and non-adjacent LTE BS interference
	10.7.11	Performance with non-adjacent LTE UE interference
	10.8	Multipath tests
	10.8.4	Performance with short delay echoes
	10.8.5	Performance with long delay echoes
	10.8.6	Performance with a single 0 dB echo within guard interval
	10.8.7	Performance with a single 0 dB echo with Doppler
	10.8.8	Performance with a single echo outside guard interval
	10.9	Impulsive interference tests
	10.9.5	Complete impulsive interference test system
	10.10	Diversity receiver tests
	10.10.1	Simple diversity test
	10.10.2	Multichannel diversity test

For NorDig and E-Book test specifications, see data sheet PD 3606.8550.22 and www.rohde-schwarz.com.

Ordering information

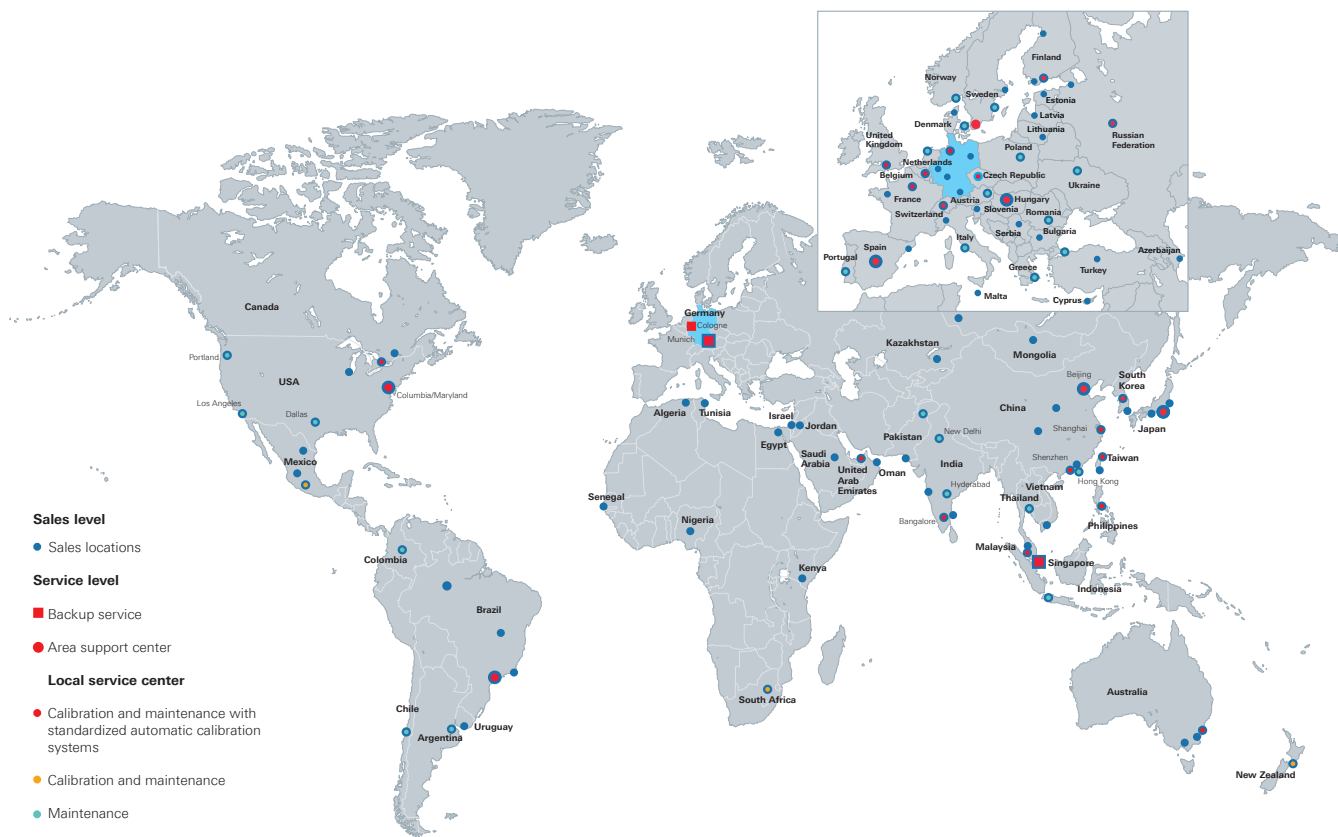
Designation	Type	Order No.
Hardware		
Broadcast Test Center	R&S®BTC ¹⁾	2114.3000.02
Baseband Generator, 1st channel	R&S®BTC-B1	2114.3500.02
Baseband Generator, 2nd channel	R&S®BTC-B2	2114.3600.02
Baseband Main Module, two I/Q paths to RF	R&S®BTC-B12	2114.6600.02
Fading Simulator (path A)	R&S®BTC-B1031	2114.3700.02
Fading Simulator (path B)	R&S®BTC-B1032	2114.3800.02
RF Path A 100 kHz to 6 GHz	R&S®BTC-B3106	2114.3200.02
RF Path B 100 kHz to 6 GHz	R&S®BTC-B3206	2114.3400.02
Multi-ARB Waveform Generator	R&S®BTC-K35	2114.6974.02
Coder DVB-T/DVB-H	R&S®BTC-K501	2114.6980.02
Coder DVB-T2	R&S®BTC-K516	2114.7035.02
AWGN after Fading	R&S®BTC-K1040	2114.7770.02
Extended Noise Generator	R&S®BTC-K1043	2114.7235.02
Analog Signals	R&S®WV-K816	2116.9935.02
DTV Interferers	R&S®WV-K1114	2114.7293.02
Basic Stream Library	R&S®LIB-K70	2116.9558.02
HDMI RX 225 MHz Analyzer Module	R&S®VT-B2360	2115.7616.06
HDMI RX 300 MHz Analyzer Module	R&S®VT-B2361	2115.7639.06
Analog A/V RX	R&S®VT-B2370	2115.7600.06
A/V Inspection	R&S®VT-K2110	2115.8035.02
A/V Distortion Analysis	R&S®VT-K2111	2115.8041.02
Software		
D-Book Test Suite	R&S®BTC-KT3310	2114.7987.02
NorDig Test Suite	R&S®BTC-KT3311	2114.7993.02
E-Book Test Suite	R&S®BTC-KT3312	2114.8002.02
A/V Distortion Test	R&S®VT-KT3360	2115.8387.02
Recommended accessories		
RedRat Infrared Remote Control Input/Output Device	RedRat3-II	
EPC IP power control	NET 8212	

¹⁾ For a detailed configuration of the R&S®BTC, visit the Rohde & Schwarz website, R&S®BTC product page.

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Environmental commitment

- ▮ Energy-efficient products
- ▮ Continuous improvement in environmental sustainability
- ▮ ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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