



Contents Overview

Chapter Overview

Type Index

R&S Addresses



From top to down: TV Test Receiver R&S® EFA, MPEG-2 Measurement Decoder and MPEG-2 Measurement Generator R&S® DVG



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Contents of Chapter 3

Designation	Type	Description	Page
DTV Recorder Generator	R&S® DVRG	Recording and generation of digital video streams	110
HDTV Sequences	R&S® DV-HDTV	Comprehensive collection of high-resolution transport and elementary streams	113
TestCard M Sequences	R&S® DV-TCM	Special transport stream collection for testing DTV receivers and decoders	115
MPEG-2 Measurement Generator	R&S® DVG	Digital test signals at a keystroke: large choice of signals (525- and 625-line standard), endless MPEG-2 sequence loop thanks to realtime updating of all time stamps	116
Stream Combiner™	R&S® DVG-B1	Generating user-specific MPEG-2 transport streams with the PC	118
Digital Video Quality Analyzer	R&S® DVQ	Indispensable tool in the quality assessment of digital DCT-coded video sequences	120
Quality Explorer™	R&S® DVQ-B1	Comprehensive quality and MPEG-2 elementary stream analysis	122
Multichannel Video Quality Analyzer	R&S® DVQM	Quality-of-service monitoring for up to 12 channels	123
MPEG-2 Measurement Decoder	R&S® DVMD	Analyzer and decoder in one unit: 19 realtime measurements at a time, analysis of data rates, integrated long-term report	127
MPEG-2 Realtime Monitor	R&S® DVRM	Realtime monitoring and analysis of MPEG-2 transport streams	129
Stream Explorer™	R&S® DVMD-B1	Enhanced MPEG-2 analysis with MPEG-2 Measurement Decoder DVMD	131
MPEG-2 Monitoring System	R&S® DVM	Transport stream monitoring in diverse DTV distribution networks	133
Digital Video Measurement System	R&S® DVM 400	Monitoring, analysis, recording and generation of MPEG-2 transport streams	135
MPEG-2/ATM Test Set	R&S® DVATM	Multifunctional MPEG-2 and ATM test set	138
DVD Compendium	R&S® TestDVD	Offers a unique compilation of many different video and audio streams for professional applications	140
TV Test Receiver Family	R&S® EFA	Test receivers and demodulators for analog and digital (DVB-C and DVB-T) TV signals	142
Measurement Software EFA-SCAN	R&S® EFA-K1	Fast recording and documentation of measurement values for the digital Test Receivers R&S® EFA	148
Portable SAT/TV/FM Test Receiver	R&S® EFL 100	Measurement features for analog TV, digital TV and FM radio in a single unit	150
CCVS+Component Generator	R&S® SAF	Multistandard generator for all TV applications; optionally PALplus and ITU-R 601: CCVS, YC _B C _R , RGB, S-VHS	152
CCVS Generator	R&S® SFF	Same as SAF, but CCVS only	
TV Test Transmitter	R&S® SFM	Vision and sound signals to all common TV standards	154
TV Test Transmitter	R&S® SFL	Digital signals for use in production	156
TV Test Transmitter	R&S® SFQ	Generation of DVB signals for satellite and cable and of analog broadband FM signals and noise signals	158
TV Generators	R&S® SGxF	Generation of video signals to PAL (SGPF), SECAM (SGSF) or NTSC (SGMF) standard	161
Video Analyzer	R&S® UAF	Fast analysis of 29 video parameters in studio quality	162
Digital Video Component Analyzer	R&S® VCA	Analyzer for digital studio signals	164
DTL Analysis	R&S® VCA-B11	Jitter analysis and spectral measurements	164
Video Measurement System	R&S® VSA	Video analyzer, vectorscope, oscilloscope, monitor and PC all in one unit; measurement of all video parameters	165
TV Test Receiver Option	R&S® VSA-B10	RF parameter measurement and monitoring in conjunction with Video Measurement System R&S® VSA	168



Contents Overview

Chapter Overview

Type Index

R&S Addresses



DTV-Recorder Generator R&S® DVRG

Recording and generation of digital video streams



Brief description

R&S® DVRG is a universal processing platform for digital video streams. It allows the record and play of MPEG-2 transport streams. This is done either degradation free using the RAM when the transport stream is of limited length or directly using the hard disk. Minimum wear and tear can thus be achieved during continuous operation.

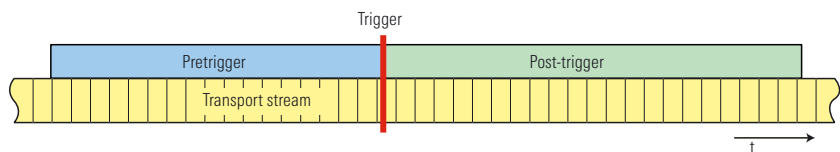
Main features

- ◆ Replay of recorded transport streams
- ◆ Endless and seamless MPEG-2 generation
- ◆ Triggered recording for error analysis
- ◆ RAM or hard-disk based operation
- ◆ Hard disk space up to 144 GByte
- ◆ Large choice of test signals
- ◆ Compliant to ATSC and DVB
- ◆ TS data rate up to 214 Mbit/s
- ◆ Optional record and replay of uncompressed SDI video streams (to ITU-R BT. 601/656 or SMPTE 259M) at a data rate of 270 Mbit/s
- ◆ Embedded WindowsNT platform
- ◆ HDTV Sequences optional
- ◆ Test card M streams optional
- ◆ Software options
- ◆ Stream Combiner™ for creating user-specific transport streams
- ◆ Quality Explorer™ for analyzing video elementary streams
- ◆ Easy and self-explanatory operation

Modes

Recording

A transport stream is first recorded in the RAM. If the volume of recorded data exceeds the available RAM capacity or if



The length of the pretrigger and posttrigger parts of a transport stream can be defined for a triggered recording with R&S® DVRG

the transport stream is to be achieved, storage is in the form of a file on the hard disk in TRP format. For error analysis, recording can be controlled by means of an external trigger signal. The stored signal includes time sections of different lengths before and after the trigger event.

Replay of TRP files

Recorded transport streams can be replayed as often as required. The replay starts immediately after selecting the file with the data being buffered in the RAM. Any other data rate can be used for test purposes. In this mode, R&S® DVRG supports files in TRP/TS format.

Replay of GTS files

In this mode, transport stream files are replayed in an endless loop. The use of the GTS format provides discontinuity-

free signal generation in an endless and seamless loop. During replay a jitter of up to ± 10 ms with settable frequency and waveform can be superimposed on the PCR values (i.e. for stress tests of multiplexers and decoders).

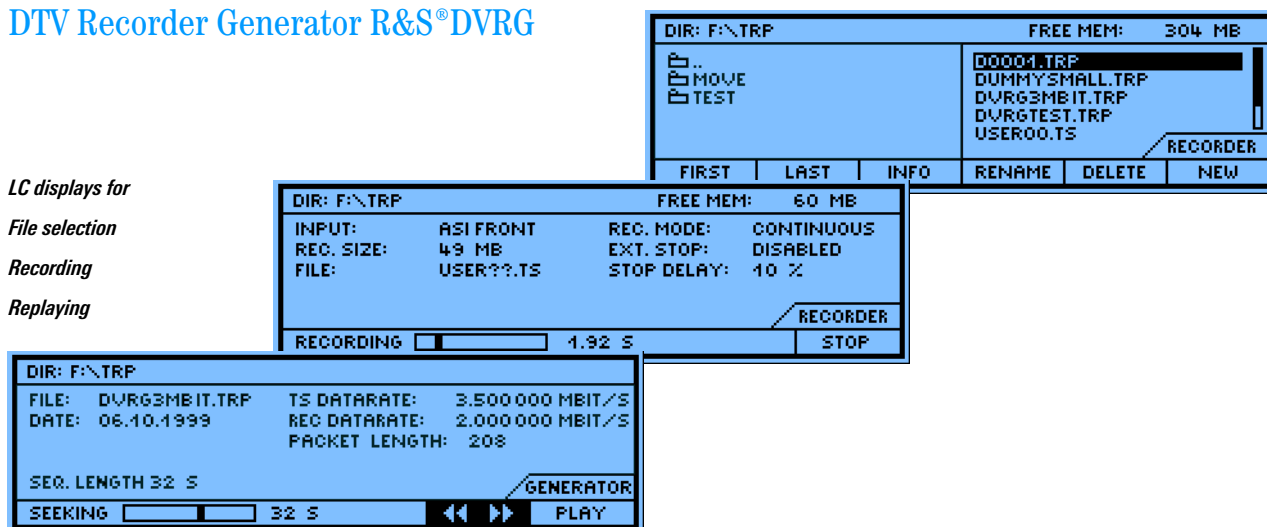
Test signals

R&S® DVRG produces a large number of predefined MPEG-2 transport streams to the ATSC and DVB standards at a key-stroke. The transport streams contain several elementary streams and consist of video, audio and other data (e.g. teletext or PRBS). Video streams with different data rates, formats, frame rates and contents are available.

The signal set comprises sequences with moving picture contents and some static test patterns. It includes known test patterns such as colour bar signals, zone plate, ITU-R 17/18/331, ITS1 to 4 and many others as well as the Rohde & Schwarz CODEC test pattern. Thanks to integrated test signals the analog outputs of a set-top box (or IRD) can be tested within seconds with the aid

DTV Recorder Generator R&S®DVRG

LC displays for
File selection
Recording
Replaying



of a suitable video analyzer, e.g. R&S®VSA. In addition, integrated moving picture elements allow visual checking of the decoder functionality.

Audio data streams with different rates and frequencies contain the accompanying sound for the video sequences as well as special audio test signals.

Moreover, a large choice of further test signals is available: the option

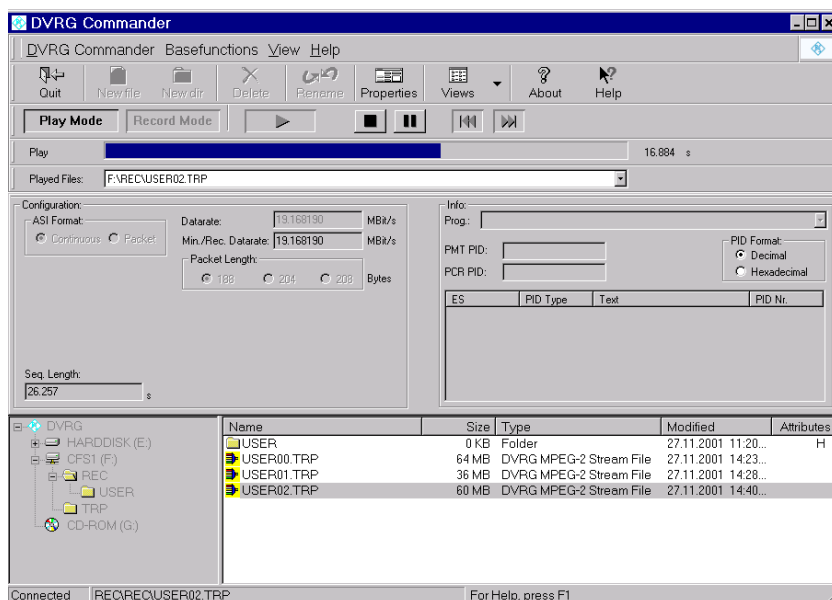
R&S®DV-HDTV provides test sequences for high-definition TV. Both DVB and ATSC formats are supported. Due to its versatility, this collection allows testing of diverse devices to practically all world-wide standards. Further test signals are provided by the option R&S®DV-TCM. This option enables special tests through transport streams with dynamically varying structure. The transport streams also contain a large number of elementary streams in different formats. The formats

are partly changed even within a transport stream to enable easy testing of a large variety of decoder functions.

Applications

Thanks to its versatility, flexibility and wide range of options, R&S®DVRG is the MPEG-2 platform for a whole variety of applications:

- ◆ Development of set-top boxes and all other instruments that process digital TV signals to the MPEG-2 standard
- ◆ Quality management by replaying standardized transport streams
- ◆ Production of digital TV components (e.g. set-top boxes, MPEG-2 decoders and multiplexers)
- ◆ Substitution signal source for playout center, cable headend and satellite uplink or downlink
- ◆ Error analysis by recording a part of the transport stream either before or after an external trigger event



Windows user interface of R&S®DVRG for local and remote mode



Contents Overview

Chapter Overview

Type Index

R&S Addresses



DTV Recorder Generator R&S®DVRG

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/DVRG.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVRG

Ordering information

DTV Recorder Generator	R&S®DVRG	2083.1302.04
Accessories supplied	power cable, operating manual	
Hardware options		
Additional hard disk internal, 72 GB	R&S®DVRG-B2	2083.1919.02
SDI (ITU-R B.T. 601/656) Record&play	R&S®DVRG-B4	2083.1931.02
CD-R R/W drive (DVD read only)	R&S®DVRG-B5	2083.1948.02
SMPT-E-310 Interface	R&S®DVRG-B6	2083.1954.02
Software options		
Stream Combiner ^{TM1)}	R&S®DVG-B1	2068.9835.02
Quality Explorer ^{TM2)}	R&S®DVQ-B1	2079.7151.02
HDTV Sequences	R&S®DV-HDTV	2085.7650.02
TestCard M Sequences	R&S®DV-TCM	2085.7708.02
Extras		
Documentation of calibration test values	R&S®DRG-DCV	2082.0409.21
19" Adapter (2 HU) for installation with handles	R&S®ZZA-211	1096.3260.00
(rackmount without handles on request)		
Service manual		

1) See data sheet PD 0757.3611.

2) See data sheet PD 0757.5450.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



HDTV Sequences R&S®DV-HDTV

Comprehensive collection of high-resolution transport and elementary streams

Brief description

The R&S®DV-HDTV option is a versatile combination of MPEG-2-coded streams for high-definition TV. Its versatility enables the testing of diverse units to almost all worldwide standards. In addition to several video formats for the European and American television, MPEG-coded and AC-3-coded audio data are supplied.

All video streams, with audio streams combined to transport streams, can be loaded to the R&S®DVG and R&S®DVRG from Rohde&Schwarz, and directly replayed. To combine individual transport streams with the Stream Combiner™ software, all the elementary streams used are stored individually on the CD-ROMs. This allows easy creation of customized MPEG-2-compliant transport streams.

The transport streams supplied are stored in the GTS format, which was developed by Rohde&Schwarz, and which allows endless, continuous and errorfree replay also at the transition between the beginning and the end of a stored sequence. The Stream Combiner™ software can also create transport streams in the GTS format.

Transport Streams PRK1080IGTS and PRK1080I_L.GTS

	PRK1080I.GTS	PRK1080I_L.GTS
TS ID:	5002 (0 × 138A)	5003 (0 × 138B)
Length:	240 videoframes (9.600 s)	720 videoframes (38.400 s)
Runs on:	<input type="checkbox"/> DVG (20 MByte) <input checked="" type="checkbox"/> DVG (32 MByte) <input checked="" type="checkbox"/> DVRG	<input type="checkbox"/> DVG (20 MByte) <input type="checkbox"/> DVG (32 MByte) <input checked="" type="checkbox"/> DVRG
Tables:	<input checked="" type="checkbox"/> DVB <input type="checkbox"/> ATSC	
Transmission: (description)	<input type="checkbox"/> Satellite <input checked="" type="checkbox"/> Cable <input type="checkbox"/> Terrestrial	

Program:

Program 1: Service_name: PARK MPEG

Program 2: Service_name: PARK AC-3

Video:



Park scene from the transport and elementary stream combination

MPEG-2 MP@HL		Single stream shared by both programs (PID 0x0100)		
Frames/s	Lines/picture	Pixels/line	Mbit/s	
<input checked="" type="checkbox"/> 25	<input type="checkbox"/> 480	<input type="checkbox"/> 704	<input checked="" type="checkbox"/> 16	<input checked="" type="checkbox"/> Seamless at sequence end
<input type="checkbox"/> 29.97	<input type="checkbox"/> 720	<input type="checkbox"/> 1280		<input checked="" type="checkbox"/> Scene cuts
<input type="checkbox"/> 50	<input checked="" type="checkbox"/> 1080	<input checked="" type="checkbox"/> 1920		<input checked="" type="checkbox"/> Moving Picture
<input type="checkbox"/> 59.94				
<input type="checkbox"/> 24				
				<input checked="" type="checkbox"/> One PES per videoframe

Audio:

Background noise

Program 1: MPEG-1 Layer 2 Stereo

Program 2: AC-3 (3/2 LFE)

ksample/s	kbit/s	PRK1080I.GTS	PRK1080I_L.GTS
<input type="checkbox"/> 32	<input type="checkbox"/> 192	<input type="checkbox"/> Seamless at sequence end	<input checked="" type="checkbox"/> Seamless at sequence end
<input type="checkbox"/> 44.1	<input type="checkbox"/> 256	<input type="checkbox"/> Continuous tone	<input type="checkbox"/> Continuous tone
<input checked="" type="checkbox"/> 48	<input checked="" type="checkbox"/> 384		



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



HDTV Sequences R&S®DV-HDTV

Main features

- ◆ Large choice of transport streams compatible with DVB and ATSC
- ◆ All video streams also available as elementary streams for individual combination with Stream Combiner™ software
- ◆ Ready for use with R&S®DVRG or R&S®DVG
- ◆ Support of all customary video formats and frame rates
- ◆ Different audio formats: MPEG-1 Layer 2 and AC-3
- ◆ Endless replay with non-interrupting transition from sequence end to sequence start for video and audio in the event of replay by R&S®DVRG

Characteristics

Video and audio formats

The collection of transport and elementary streams comprises a variety of sequences. They are based on several test patterns and real film sequences. All video sequences are available as elementary streams in various resolutions and frame rates. They are complemented by audio signals in different formats, both in MPEG-1 Layer 2 and AC-3. The transport streams are designed to comply with the DVB and ATSC standards according to the formats of the video streams included. Furthermore, the transmission path (terrestrial, cable or satellite), defined by the transport stream, varies.



Frame examples taken from the transport and elementary stream collection

Specifications

Video formats supported

Frequency in Hz	Sampling	Number of lines	Number of columns
24	progressive	1080	1920
25	interlaced	1080	1920
50	progressive	720	1280
29	interlaced	1080	1920
59	progressive	720	1280
59	progressive	480	704

Audio formats supported

MPEG-1 Layer 2 and AC-3	
Video contents	Fireworks Public park Shark and other fish in the aquarium HDTV test pattern Colour bars Horizontal ramp Horizontal frequency sweep
Sequence length	up to 32.032 seconds

Ordering information

HDTV Sequences		
for R&S®DVG and R&S®DVRG	R&S®DV-HDTV	2085.7650.02
Transport Stream Upgrade on CD-ROM with special parallel cable for installation on R&S®DVG		
Stream Combiner™	R&S®DVG-Z1	2069.0419.00
MPEG-2 Measurement Generator	R&S®DVG-B1	2068.9835.02
DTV Recorder Generator	R&S®DVG	2068.8600.03
	R&S®DVRG	2083.1302.02



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Test Card M Sequences R&S®DV-TCM

Special transport stream collection for testing DTV receivers and decoders

Example from transport stream collection



Brief description

This option from Rohde&Schwarz enhances the wide choice of already available transport streams by a large number of special streams particularly designed for testing and development of DTV decoders and receivers. The transport streams provided by this option have been derived from the Test Card M libraries of Snell & Wilcox. They have been adapted by Rohde&Schwarz for endless¹⁾, continuous and error-free replay by the R&S®DVRG and R&S®DVG, and allow simple and effective testing of standard as well as special DTV receiver and decoder functions without the need of any additional measuring equipment.

- ◆ Large variety of DVB- and ATSC-specific transport streams
- ◆ Immediately ready for replay by MPEG-2 players R&S®DVRG and R&S®DVG
- ◆ Endless replay
- ◆ Comprehensive PSI, SI and PSIP data
- ◆ SDTV and HDTV test sequences
- ◆ MPEG-1 Layer II and AC-3 audio formats
- ◆ Testing of DVB- and ATSC-specific functions
- ◆ Testing of audio/video synchronism

Supported video and audio formats

All elementary video streams are encoded in 4:2:0 format.

DVB			
Frequency ¹⁾	Sampling	No. of columns	No. of lines
25	interlaced	720	576
Audio: MPEG-1 Layer II			
ATSC			
29.97	interlaced	1920	1080
59.94	progressive	1280	720
29.97	interlaced	720	480
59.94	progressive	720	480
Audio: AC-3			

¹⁾ The repetition frequency refers to frames. In interlaced display mode, the field repetition frequency is twice the specified frame rate.

Main features

¹⁾ Realtime calculation of all time-relevant parameters ensures error-free replay even at the transition from the start to the end of the stored sequence. This refers to the transport stream syntax as well as to the elementary streams.

Ordering information

Test Card M Sequences ¹⁾	R&S®DV-TCM	2085.7708.02
Transport Stream Update on CD with special parallel cable for installation on R&S®DVG	R&S®DVG-Z1	2069.0419.00
MPEG-2 Measurement Generator	R&S®DVG	2068.8600.03
DTV Recorder Generator	R&S®DVRG	2083.1302.02

¹⁾ If you order the option for MPEG players already supplied, please specify Serial No. and Type of the instrument on which the option is to be installed.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



MPEG-2 Measurement Generator R&S®DVG

Large choice of digital TV test signals (525- and 625-line standard), endless MPEG-2 sequence loop thanks to realtime updating of all time stamps



Brief description

MPEG-2 Measurement Generator R&S®DVG is a universal generator for digital TV signals in the form of transport streams in line with the MPEG-2 standard. The structure of these streams and the data reduction methods employed were developed and standardized by the Moving Picture Experts Group (MPEG) and the Digital Video Broadcasting (DVB) project. The transport stream contains several programs, each consisting of several substreams carrying video, audio and data signals.

R&S®DVG generates in an endless loop a large variety of selectable MPEG-2 transport streams with combined video, audio and data sequences as contents and is thus a favourably priced and compact alternative to expensive MPEG-2 encoders with multiplexer and external standard generators.

Complementary to R&S®DVG, MPEG-2 Measurement Decoder R&S®DVMD is offered for realtime monitoring, analyzing and decoding of MPEG-2 transport streams.

Main features

- ◆ Endless MPEG-2 sequence loop: all the required time information is continuously updated during playback of the transport stream, and the signal is available without any interruption
- ◆ The output data rate can be varied as desired and thus adapted to the specifications of the transmission link or devices under test
- ◆ Thanks to the settable PID of the program elements, R&S®DVG is ideal for use as a substitution signal source
- ◆ A built-in PCR (program clock reference) jitter generator is available for stress testing of decoder PLLs

The optional Stream Combiner™ software can be used to configure any new transport streams from the supplied or customer-specific elementary streams (ES) in addition to stored transport streams.

A PC card interface on the front panel allows the exchange of user-defined transport streams via a small exchangeable hard disk.

Applications

The digital data streams generated by R&S®DVG are used as test signals for a variety of equipment employed on digital TV transmission links – from the studio to the domestic receiver. One field of application of R&S®DVG therefore is in the development, production, quality management and servicing of equipment processing MPEG-2-coded signals.

Further applications are in the field of signal distribution and transmission (e.g. cable headends), where the generator can be used as a substitution signal source.

Test signals

R&S®DVG offers a variety of predefined MPEG-2 transport streams which can be called at a keystroke. Video data streams of different contents and data rates are available. The set of signals stored comprises moving picture sequences as well as stationary test patterns. For fast testing of set-top boxes, i.e. integrated receiver decoders (IRT), R&S®DVG provides the Rohde&Schwarz codec test pattern.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

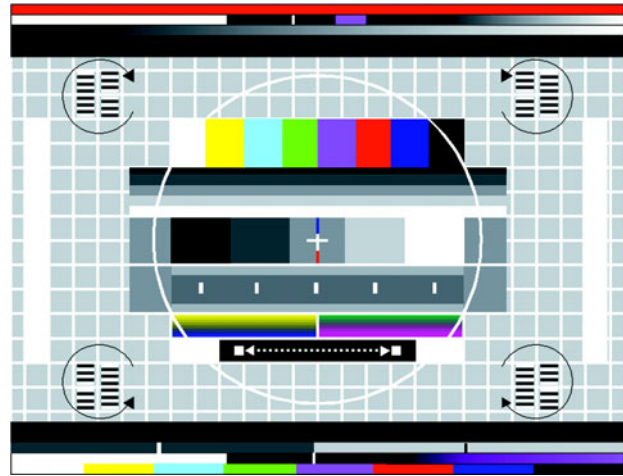
R&S Addresses



MPEG-2 Measurement Generator R&S®DVG

Thanks to integrated test signals in the upper and lower picture area and using a suitable video analyzer such as R&S®VSA, analog interfaces can be tested out within a few seconds. In addition, moving elements at the corners and in the center of the picture allow visual checking of the decoder functions. Audio data streams, which are also available at different data rates, comprise the sound component accompanying the video sequences as well as special audio test signals.

Moreover, a large choice of further test signals is available: the option R&S®DV-HDTV provides test sequences for high-definition TV. Both DVB and ATSC formats are supported. Due to its versatility, this collection allows testing of diverse devices to practically all worldwide standards. Further test signals are provided by the option R&S®DV-TCM. This option enables special tests through transport streams with dynamically varying structure. The transport streams also contain a large number of elementary streams in different formats. The formats are partly changed even within a transport stream to enable easy testing of a large variety of decoder functions.



Rohde & Schwarz codec test pattern

Specifications

You will find detailed and binding data on the enclosed CD (*../DATASHEET/DVG.pdf*), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVG

Ordering information

MPEG-2 Measurement Generator	R&S®DVG	2068.8600.03
Accessories supplied	power cable, operating manual, null modem cable	
Options		
Stream Combiner™ Software	R&S®DVG-B1	2068.9835.02
Calibration Data Documentation	R&S®DVG-DCV	2082.0490.14
Transport Stream Update on CD-ROM with special parallel cable	R&S®DVG-Z1	2069.0419.00
HDTV Sequences	R&S®DV-HDTV	2085.7650.02
TestCard M Sequences	R&S®DV-TCM	2085.7708.02
Extras		
19" Adapter (1 HU)	R&S®ZZA-91	0396.4870.00
Service Manual		2069.0354.24



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Stream Combiner™ R&S® DVG-B1

Generating user-specific MPEG-2 transport streams with the PC

Brief description

Stream Combiner™ Software R&S® DVG-B1 in conjunction with MPEG-2 Generator R&S® DVG allows user-specific transport streams to be generated. The software runs under Windows9x/NT/2000 on any PC or laptop. The data are loaded into the R&S® DVG via a parallel interface or a PC card hard disk. The user-friendly operating concept with integrated help function ensures fast and efficient working right from the start without any special knowledge of MPEG-2 or DVB being required.

Main features

- ◆ Generation of user-specific transport streams
- ◆ Elementary stream library
- ◆ Insertion of external elementary stream files
- ◆ Editing PSI and SI tables as required
- ◆ Setting of defined nonconformal states
- ◆ Windows9x/NT/2000/XP operating system

Defining a user-specific transport stream

A new transport stream can be defined very easily step by step with the Stream

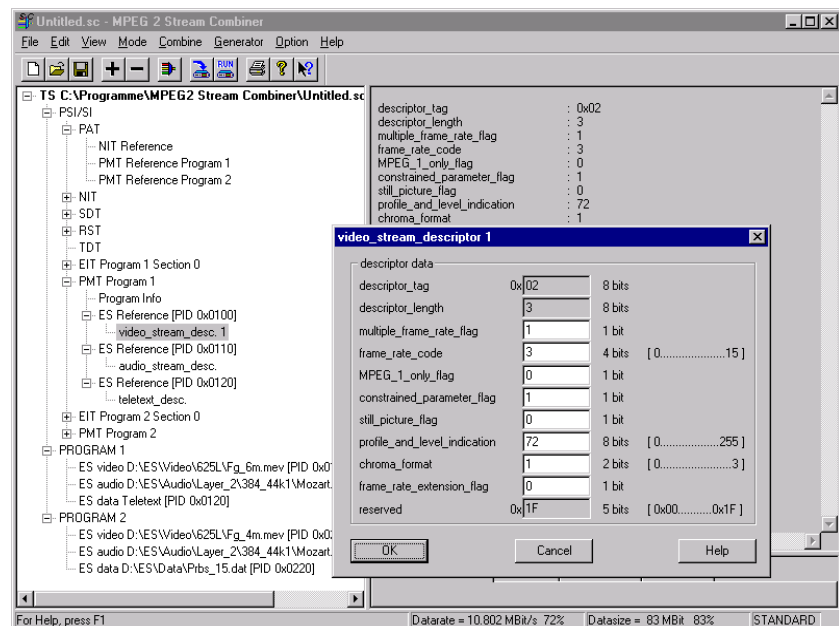


Fig. 1: Display of transport stream structure with information on individual elements

Combiner™. In the lefthand part of the program window (Fig. 1), all elements of the transport stream that have already been defined are represented as a tree structure. In the righthand part of the window, detailed information on the individual elements is displayed. The elements can be selected by means of a mouseclick.

Adding programs

In the first step, the user adds the desired number of programs (max. 6) to the transport stream. Stream Combiner™ automatically generates the required PSI tables, e.g. PAT and PMT, and represents these tables in the tree structure. The tables contain predefined default settings which can be changed as required.

Adding elementary streams

In the second step the desired elementary streams such as video, audio or data are added to the programs. Each program may contain up to 6 elementary streams. The software comes with a comprehensive elementary stream library from which the user can configure his specific

transport stream. Stream Combiner™ automatically updates the relevant PSI tables every time a new elementary stream is added.

Adding service information

In the third step, further SI and PSI tables (PAT, PMT, CAT, NIT, BAT, SDT, EIT, RST, TDT, TOT, ST, SIT, DIT) can be added to the transport stream. Each of these tables can be fully edited; the repetition rates can be set independently for each table.

Generating the transport stream data file for the R&S® DVG

As a final step, Stream Combiner™ generates a transport stream data file for the MPEG-2 Generator R&S® DVG. The file can be transferred to the R&S® DVG directly via cable. Alternatively, a PC card hard disk can be used. This is expedient if the generated transport stream is to be installed in several generators. R&S® DVG generates the new transport stream in the same way as the preconfigured stored signals as an endless MPEG-2 sequence with all time stamps being continuously updated.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Stream Combiner™ R&S® DVG-B1

Inserting external elementary streams (data files)

Besides the elementary streams from the library supplied, Stream Combiner™ allows external elementary streams (binary files to ISO/IEC 13818, MP@ML) to be inserted. Such files are offered by various suppliers on the Internet or on CD-ROMs (MPG, VID, M2V, MP2, AUD, M2A file extensions). Stream Combiner™ first checks whether the external file is suitable for integration, and then processes the file so that it can be inserted into the new transport stream. Thus it is ensured that the R&S® DVG plays back the new transport stream as an endless MPEG-2 loop.

With option R&S® DV-HDTV Rohde&Schwarz also offers special signals for high-resolution TV. All included video sequences are also available for simple integration with the Stream Combiner™ as an elementary stream.

Editing a user-specific transport stream

All transport streams generated with the Stream Combiner™ can subsequently be modified. This is possible for the elementary streams and for all tables of a trans-

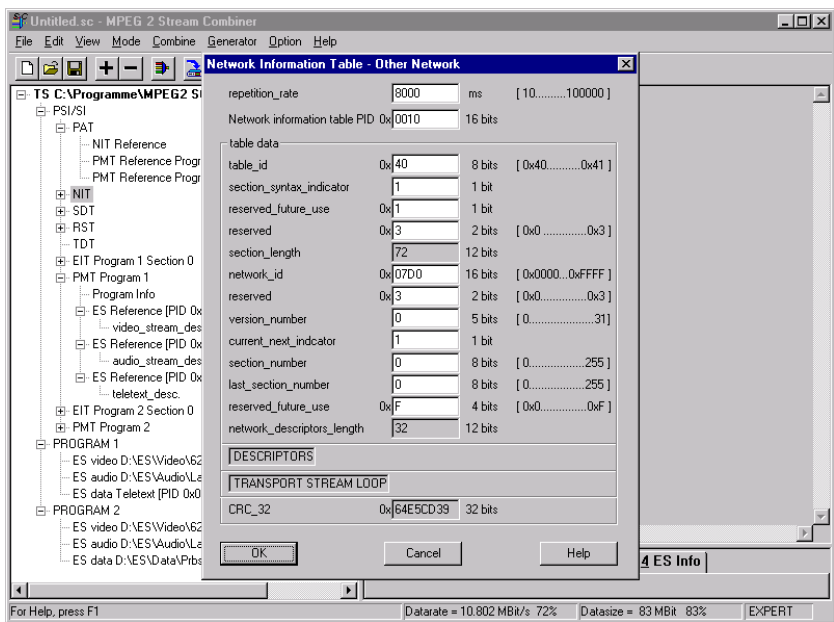


Fig. 2: Editing individual tables using the Network Information Table (NIT) as an example

port stream. Editing can be performed after the respective file has been opened. The Stream Combiner™ operates in the same mode as for generating a new transport stream, i.e. the tree structure and the contents of the tables are displayed. Any desired element can be modified, deleted from or added to the transport stream.

Generating defined nonconformal states

Stream Combiner™ offers various possibilities of integrating nonconformal states into a transport stream:

- ◆ Insertion of descriptors into tables for which they are not intended
- ◆ Insertion of wrong information into tables and descriptors
- ◆ Changing the repetition rate of tables
- ◆ Removing specific tables
- ◆ Introducing an offset between elementary stream clock (PTS, DTS) and PCR
- ◆ Switching off PCR, PTS and DTS updating at the end of a video/audio sequence

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/DVG-B1.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVG-B1

Ordering information

Stream Combiner™	R&S® DVG-B1	2068.9835.02
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Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Digital Video Quality Analyzer R&S® DVQ

Getting the picture on picture quality



Brief description

With Digital Video Quality Analyzer R&S® DVQ the assessment of picture quality according to subjective criteria becomes an objective realtime measurement method. This method is based on the analysis of video data and can thus also be used where no reference video material is available.

To this end, the optional PC software Quality Explorer™ is available, allowing complete display and analysis of all coding data as well as convenient remote control of R&S® DVQ and display of the recorded quality data.

The increasing use of digital, data-compressed TV signals calls for monitoring and assessment of the picture quality. Picture quality assessment is very strongly influenced by the subjective perception of the human eye. R&S® DVQ is a tool that ideally satisfies both requirements. It determines the picture quality in

relation to digital compression and evaluates the results according to the subjective criteria of visual perception.

Applications

- ◆ Quality monitoring in distribution networks
- ◆ Program quality assessment
- ◆ Development, evaluation and setting of operational hardware
- ◆ Testing of set-top boxes

Main features

- ◆ Realtime measurement
- ◆ No reference signal required
- ◆ SSCQE scaling of quality levels
- ◆ Monitoring of picture freeze, picture and audio loss
- ◆ Recording of quality profile (long-term)
- ◆ ITU-R601 and MPEG-2 inputs
- ◆ Histogram representation of quality levels
- ◆ Internal event and error report and statistics
- ◆ Program decoding

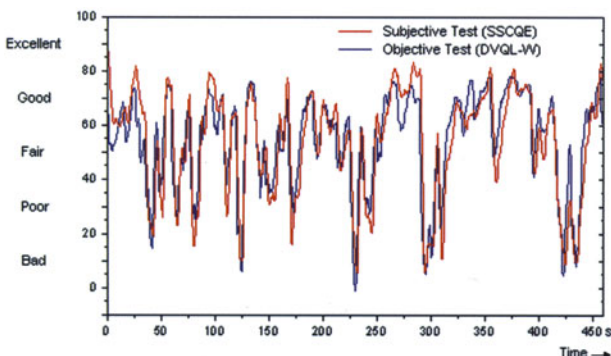
Characteristics

In addition to the analysis unit, R&S® DVQ also has a built-in decoder for audio and video data in the format Mainprofile@MainLevel and 4:2:2 Profile@MainLevel. The program being analyzed is decoded and can simultaneously be viewed on a connected video monitor (CCVS or ITU-R 601 formats). The audio signals are available at the connectors both in analog and digital form (AES/EBU).

A MPEG-2 transport stream usually contains several programs made up of video and audio data streams. For automatic monitoring of all programs, a scan mode is provided in R&S® DVQ allowing all or selected programs to be successively analyzed for picture quality and interference over a selectable period of time.

R&S® DVQ has a built-in 32-Mbit memory for transport stream data. Depending on the data rate of the video stream, the memory is sufficient for storing a video data sequence of approx. 5 s to 10 s. The sequence can be read out for in-depth analysis via one of the remote-control interfaces using for instance the Quality Explorer™.

For comparative quality measurements the quality analysis can simultaneously be carried out on two different signals. Quality analysis is carried out completely



Comparison of objective test results (R&S® DVQL-W) and subjective quality assessments (SSCQE) for 480 s sample sequence



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Digital Video Quality Analyzer R&S® DVQ

independently for each signal and the final result is formed from the differences found. There is no pixel comparison of two video data sources in this mode either.

Altogether 12 relay outputs which can be allocated to one or several (ORed) events are fitted as standard. The switching mode (active when open or closed) can

be set separately for each relay. In addition to the data interfaces floating switching contacts are thus available for external signalling of failures and quality degradations.

Operation

R&S® DVQ can be controlled manually via the keypad with fast-access keys for the

main menus and softkeys for the sub-menus.

The displayed contents of the clearly arranged LCD is inserted into the decoded picture at the video output. With a recorder connected the quality ratings can be logged together with the associated picture contents.

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/DVQ.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVQ

Ordering information

Digital Video Quality Analyzer	R&S® DVQ	2079.6003.02
Accessories supplied	power cable, operating manual, audio adapter (Lemo-Triax to XLR), modem bypass cable	
Options		
Quality Explorer™ Software	R&S® DVQ-B1	2079.7151.02
Calibration Data Documentation	R&S® DVQ-DCV	2082.0490.20
Extras		
19" Rack Adapter (2 HU)	R&S® ZZA-211	1096.3260.00
Service Manual		



Contents Overview

Chapter Overview

Type Index

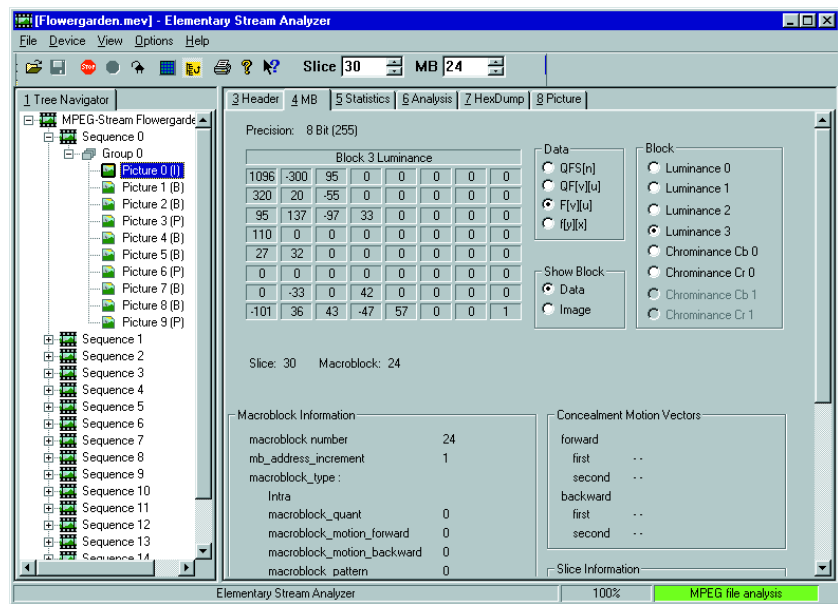
R&S Addresses



Quality Explorer™ R&S®DVQ-B1

**Comprehensive quality
and MPEG-2 elementary stream
analysis**

*Clear display of header information with
Elementary Stream Analyzer, illustrated by
picture header*



Brief description

Quality Explorer™ R&S®DVQ-B1 is a software package that performs comprehensive analysis on MPEG-2-coded transport streams. It can be used either on an external PC connected to R&S®DVQ or fully independently of R&S®DVQ for elementary stream analysis from data media (e.g. hard disk, CD-ROM).

R&S®DVQ-B1 comprises two independent tools: The Quality Monitor reads the quality parameters provided by the Digital Video Quality Analyzer R&S®DVQ in real time via the remote-control interface. It displays the quality levels graphi-

cally as a histogram. Archiving on data storage media is also possible.

The Elementary Stream Analyzer analyzes the content of MPEG-2-coded video elementary streams. For this purpose R&S®DVQ has a 32-Mbit internal buffer memory for the elementary stream to be analyzed. The elementary stream buffered in R&S®DVQ can also be stored as a PC file.

Alternatively, elementary streams available in the form of PC files can be analyzed. Therefore, Quality Explorer™ can be used on other instrument platforms without the R&S®DVQ.

Full remote control of R&S®DVQ is provided by a library routine (DLL) supplied with the software and the Quality Monitor's user interface.

The software runs under Windows9x or WindowsNT/2000/XP on any PC or laptop connected to the R&S®DVQ via an RS-232-C interface or network (10BaseT) interface. The easy-to-operate software, as well as the clear presentation of the analysis results in windows of variable size, ensure speed and success right from the start.

Specifications

Elementary Stream Analyzer	
MPEG-2 formats	
Profile	MP (main profile 4:2:0) 422P (4:2:2 profile)
Aspect ratios	any, e.g. 4:3, 14:9, 16:9
Picture formats	any SDTV&HDTV

System requirements

PC or laptop with Pentium processor (Pentium II with 266 MHz clock frequency recommended, min. Pentium I with 100 MHz), Windows9x or WindowsNT/2000/XP operating system, min. 32 Mbyte RAM, required memory on hard disk approx. 20 Mbyte, 1 free serial RS-232-C interface (recommended data rate 115 kbit/s) or 1 free 10BaseT-network interface, CD-ROM drive, 1 parallel printer interface

Ordering information

Quality Explorer™	R&S®DVQ-B1	2079.7151.02
Equipment supplied	CD-ROM with setup program, serial cable for connecting R&S®DVQ to the PC, dongle for the parallel printer output of the PC, manual	



Contents Overview

Chapter Overview

Type Index

R&S Addresses



Multichannel Digital Video Quality Analyzer R&S®DVQM

Always in the picture about picture quality in all channels

Brief description

The R&S®DVQM is the multichannel version of the successful Digital Video Quality Analyzer R&S®DVQ. The R&S®DVQM can combine the performance of up to twelve R&S®DVQs. The resulting large variety of configurations allows the R&S®DVQM to be optimally adapted to different requirement profiles.

For configuration of the individual analyzer boards and for readout of the measurement results, the R&S®DVQM comes with the R&S®DTV NetView PC software running under Windows. This software enables remote communication with all instruments via the Ethernet interface where the instruments are not used at the same place or there are major distances between the measuring instruments and the PC. The software can be individually adapted to different instrument configurations and provides a fast overview of the analysis results of all the instruments.

Video quality analysis is optionally available (R&S®DVQM-B4) for the individual analyzer boards of the R&S®DVQM.

Main features

- ◆ Simultaneous monitoring of up to 12 channels
- ◆ Optional monitoring of video quality with SSCQE scaling of quality levels
- ◆ No reference signal required

- ◆ 12 programmable alarm relay contacts per channel
- ◆ Selectable alarm thresholds
- ◆ SDI interface
- ◆ Video outputs: SDI and CCVS
- ◆ Compatible with DVB and ATSC
- ◆ Ethernet interface (TCP/IP-SNMP)
- ◆ Windows software for remote control
- ◆ Internal event and error report and statistics
- ◆ Optional decoding of CA programs

Possible configurations

The basic unit of the R&S®DVQM comes with two analyzer boards. The instrument can accommodate another 10 boards. These may be analyzer boards for simultaneous monitoring of 12 channels, or descrambling boards for decoding of pay TV programs. Up to six scrambled programs can be monitored simultaneously (6 descrambling boards and 6 analyzer boards).

The analyzer boards can be inserted into any of the 12 slots, whereas the descrambling boards are subject to the following condition: they must be inserted into the slot immediately following the associated analyzer board. This means that slot 1 may not contain a descrambling board.

Analyzer boards with and without associated descrambling boards may be combined as desired. Altogether, up to 12 unscrambled or 6 scrambled programs can be analyzed simultaneously.



Analyzer board characteristics

Test parameters

Each analyzer board can be used to monitor all the relevant parameters of the video and audio elementary streams of the selected program. Moreover, they determine whether a valid transport stream is present or whether there are failures. The hysteresis for the detection of transport streams or failures can be set by the user.

The video stream is checked for picture freeze and picture loss. The check is made using the threshold values for spatial and temporal activities as well as the period for which the threshold values have not been adhered to. All threshold values for the determination of picture freeze and picture loss can be set by the user.

The audio stream, if available (audio sync), is checked for its volume separately for the right and left channels. If the volume is below a certain threshold for a defined period, this indicates a sound loss. Minimum volume and maxi-



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Multichannel Digital Video Quality Analyzer R&S®DVQM

imum period can be set by the user. AC-3-coded audio streams are also monitored in this way. For this purpose, the audio signal is downconverted to a stereo signal according to a method especially specified by Dolby so that this signal can be monitored in the described way. The R&S®DVQM-B4 option allows additional continuous monitoring of the picture quality.

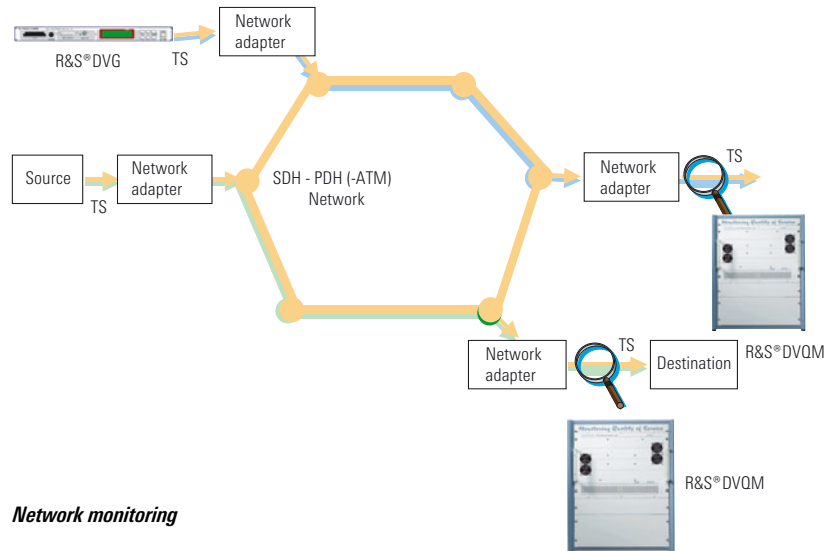
Applications

The unique combination of realtime capability and independence from a reference signal opens up a wide field of applications for the R&S®DVQM. Long-term recording and evaluation of the quality parameters allows a quality assessment that is closer to reality than that of short standardized test sequences.

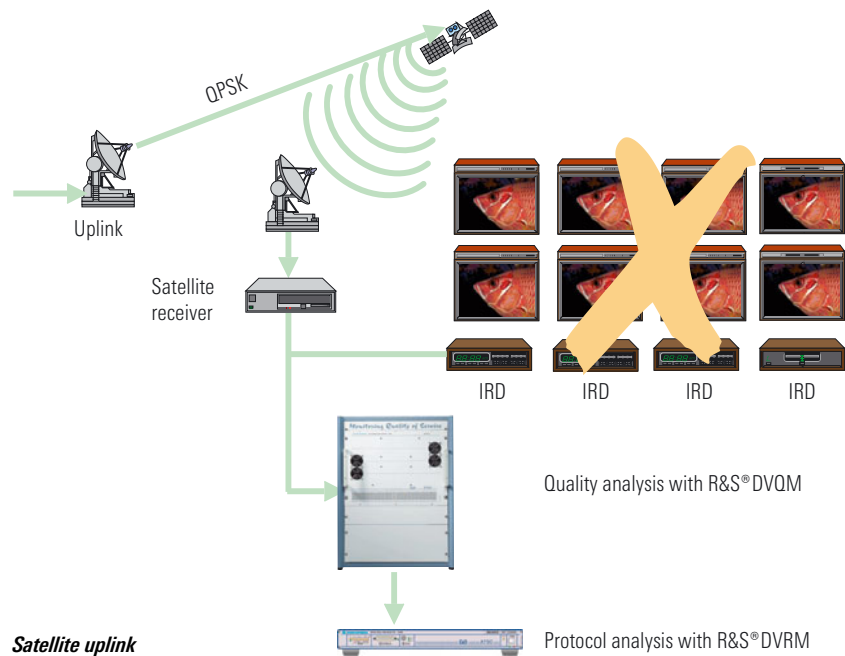
Quality monitoring in distribution networks

The R&S®DVQM allows the picture quality to be monitored during program transmission and in realtime. Degradations in quality and failures can be recognized at an early stage so that remedial measures can be taken in time. Since the analysis method employed does not require any reference signals, the R&S®DVQM is suitable for use wherever MPEG-2-coded video data is transmitted or received. The R&S®DVQM can be used to document the picture quality versus time at the gateway between two different networks. This can, for example, be used as an evidence for the contractual performance of services.

The network compatibility of the R&S®DVQM ensures optimum integration into monitoring systems.



Network monitoring



Satellite uplink

The R&S®DVQM in conjunction with the DTV Recorder Generator R&S®DVRG (see data sheet PD 0757.5708) and, optionally, the Realtime Monitor R&S®DVRM (see data sheet PD 0757.5566) forms a complete monitoring system with recording capability even for very rare disturbances.

The relay outputs of the R&S®DVQM and the R&S®DVRM are connected to the trigger input of the R&S®DVRG, whose elaborate trigger characteristics make it possible to save a transport stream section of arbitrary length before and after an error event for subsequent detailed analysis.



Contents Overview

Chapter Overview

Type Index

R&S Addresses



Multichannel Digital Video Quality Analyzer R&S® DVQM

Program quality assessment

Again, it is a benefit that the measurement method is based on the analysis of video data and does not need reference pictures. Instead of lengthy observations carried out by a test person, unknown program material can automatically be checked for its picture quality (e.g. satellite uplink).

Options

Analyzer Board (R&S® DVQM-B2)

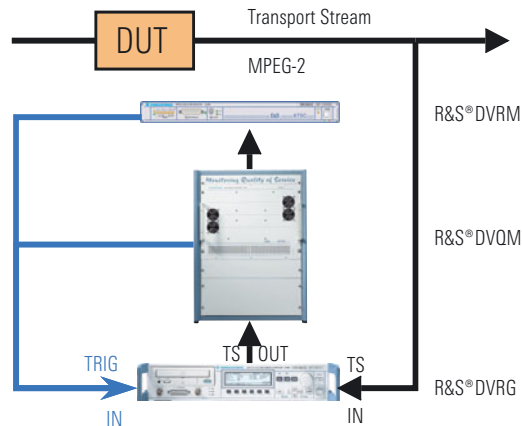
An additional Analyzer Board R&S® DVQM-B2 can be ordered for monitoring a further channel. It corresponds to the two analyzer boards contained in the basic R&S® DVQM model. The video quality analysis for this board is activated – same as for the boards contained in the basic unit – via the R&S® DVQM-B4 option.

Video Quality Analysis R&S® DVQM-B4

Video quality analysis of the individual R&S® DVQM analyzer boards is optionally available. The measurement functions of the analyzer board are enhanced by this option to include determination of the picture quality. The option allows continuous analysis of the video quality of a video elementary stream according to a patented weighting algorithm, which takes into account the masking effects of the eye and thus furnishes measurement results that are adapted to the human perception. If the result is below a defined quality level, an alarm message and a report entry are generated.

Descrambling Options R&S® DVQMB1x

As a rule, pay TV programs are transmitted in scrambled form to protect them against unauthorized access. Different CA systems are used, and the programs



Stream Explorer™ Transport Stream Analysis
Quality Explorer™ Video Elementary Stream Analysis

Error analyses using R&S® DVRG and realtime analyzers

have to be descrambled accordingly in order to analyze, decode and display the picture and sound contents.

The R&S® DVQM comes with options for the most common CA systems. The options include a card reader, the slot for which is provided on the rear of the R&S® DVQM. It takes up the smart card that is issued by the program broadcaster and serves as the subscriber's identity card. The smart card is not included in the R&S® DVQMB1x options.

Software

The R&S® DVQM functions are considerably enhanced by several software packages. The R&S® DTV NetView software comes with the R&S® DVQM for easy detection and clear display of the errors detected by the R&S® DVQM, as well as for easy configuration of all devices connected.

The Quality Monitor, which also comes with the R&S® DVQM, allows continuous display and recording of the measurement results of an analyzer board and can conveniently be started from R&S® DTV NetView for individual analyzer boards. The Elementary Stream Analyzer allows in-depth analysis of an MPEG-2 video elementary stream monitored by an analyzer board (option R&S® DVQ-B1).

R&S® DTV NetView

One of the assets of R&S® DTV NetView is its high flexibility allowing it to be adapted to quite different monitoring system configurations. The adaptation is made with the aid of a special file reflecting the configuration of the monitoring system. Several R&S® DVQMs and R&S® DVQs can be integrated. R&S® DTV NetView also allows the integration of the R&S® DVRM and the R&S® DVMD; these are Rohde&Schwarz instruments for monitoring and analyzing of the transport stream syntax.



Contents Overview

Chapter Overview

Type Index

R&S Addresses

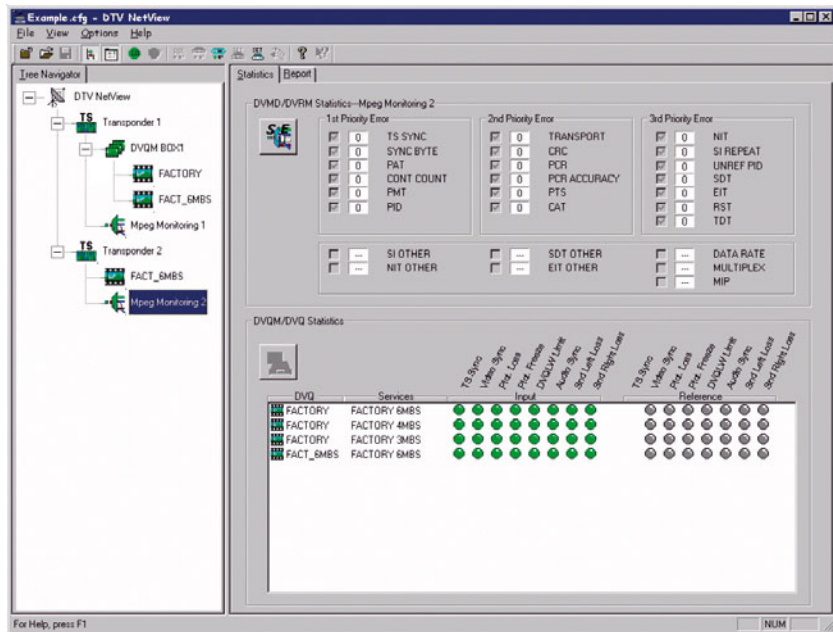


Multichannel Digital Video Quality Analyzer R&S® DVQM

After opening the configuration file via R&S® DTV NetView, all devices mentioned above are initialized and the structure read is displayed as a tree structure in the program window to provide a good overview of all the devices contained in the system. This tree structure also serves for selecting individual devices in order to start further programs (Quality Monitor™ or Stream Explorer™), to configure these devices, or to display the status information for selected devices only.

Quality Monitor

This software, which is also ideal for use with a R&S® DVQ, allows remote control of each analyzer board (R&S® DVQM-B2) in the same way as the R&S® DTV NetView software. In addition, it allows easy and continuous reading of the measured values: spatial and temporal activities, data rate and R&S® DVQL-W quality levels. The Quality Monitor can be installed on an external PC with Windows 9x or NT/2000/XP operating system. The connection to the R&S® DVQM is established via an RS-232-C or Ethernet interface. Using a compatible interchange format (CSV), the measured values can be continuously



R&S® DTV NetView

stored in a data memory and graphically displayed. An automatic, user-definable save function allows convenient storage of measurement results over any period of time.

Specifications

You will find detailed and binding data on the enclosed CD (./DATASHEET/DVQM.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVQM

Ordering information

Multichannel Digital Video Quality Analyzer		
Basic unit with two analyzer boards (R&S® DVQM-B2) plus R&S® DTV NetView remote-control software	R&S® DVQM	2088.0004.02
Options		
Additional Analyzer Board (max. 10 optional R&S® DVQM-B2 per R&S® DVQM)	R&S® DVQM-B2	2088.0027.02
Video Quality Analysis for R&S® DVQM-B2 (activates digital video quality determination for an Analyzer Board R&S® DVQM-B2)	R&S® DVQM-B4	2088.0062.02
Quality Explorer™ (only one license required for several analyzer boards)	R&S® DVQ-B1	2079.7151.02

CA systems		
One slot required per system (max. 6 per R&S® DVQM)		
Conax, Nagravision or Viaccess	R&S® DVQMB10	2088.0491.02
Irdeto	R&S® DVQMB11	2088.0504.02
Mediaguard	R&S® DVQMB12	2088.0510.02
NDS-Videoguard B SkyB	R&S® DVQMB15	2088.0540.02
BetaCrypt		
BetaDigital	R&S® DVQMB16	2088.0556.02
DTAG	R&S® DVQMB16	2088.0556.03
ORF	R&S® DVQMB16	2088.0556.04
Cryptoworks	R&S® DVQMB17	2088.0562.02



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



MPEG-2 Measurement Decoder R&S®DVMD

25 DVB or 18 ATSC realtime measurements at a time, analyzer and decoder in one unit, analysis of data rates, integrated long-term report, on-screen display on video monitor



MPEG-2 Measurement Decoder R&S®DVMD

Brief description

MPEG-2 Measurement Decoder R&S®DVMD monitors and analyzes the MPEG-2 transport stream. It indicates the contents and provides comprehensive information on the quality of the transport stream.

The combination of decoder and analyzer in one unit with conventional operating concept (no PC system) makes R&S®DVMD the waveform monitor of digital television. It is suitable for use wherever MPEG-2 signals have to be checked.

Realtime measurements and simultaneous in-depth analysis yield extremely fast results. This makes R&S®DVMD an indispensable tool in development, in troubleshooting as well as in quality management and production.

Another important application is in the final inspection of MPEG-2 signals before they leave the studio. While R&S®DVMD checks the video and audio signals at the output, error information is inserted directly into the decoded program (on-screen display).

Remote control capability allows integration into automatic monitoring networks. R&S®DVMD is thus ideal for network operators.

Complementary to Decoder R&S®DVMD, MPEG-2 Measurement Generator R&S®DVG (page 92) is offered for providing continuous MPEG-2 transport streams made up of video, audio and data sequences in an endless loop.

Analyzer

The analyzer functions of R&S®DVMD comprise a protocol analysis of the measured MPEG-2 transport stream in real-time. All measurements are in conformance with the Measurement Guidelines for DVB Systems (ETR 290) of the European DVB project or based on these guidelines (ATSC-Standard). In the DVB mode, the repetition rates of all EIT/SDT/NIT "other" tables are monitored in real-time in addition to ETR 290.

Any error occurring is directly indicated by front-panel LEDs. R&S®DVMD also detects sporadic errors. Moreover it provides error statistics showing how often a particular type of error has occurred within a specified time interval. A list (REPORT; see lower figure on righthand page) giving detailed information on the errors occurred including date and time

can be obtained. The list contains up to 1000 entries and may be edited to cover exclusively a single type of error.

In addition, the R&S®DVMD analyzes the MIP packets (megaframe initialization packets) that are inserted into the transport stream in order to synchronize the transmitters of DVB-T single-frequency networks. If there is an error, the trigger/capture facilities of R&S®DVMD can be used to freeze part of the transport stream affected by the error (approx. 2 Mbit) and output it, analyzed down to bit level, via the RS-232-C interface.

In addition to in-depth analysis, the optional Stream Explorer™ software (see page 107) allows further online measurements with graphic display on the screen (e.g. data rates, PCR jitter, etc).

Decoder

An MPEG-2 transport stream usually consists of a number of programs which may contain video, audio and data streams (elementary streams). R&S®DVMD decodes a video and an audio stream from the selected program. The decoded video signal is simultaneously output in CCVS, analog Y/C and digital serial ITU-R601 formats. Audio signals are output as analog stereo signals and as digital AES/EBU signals.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



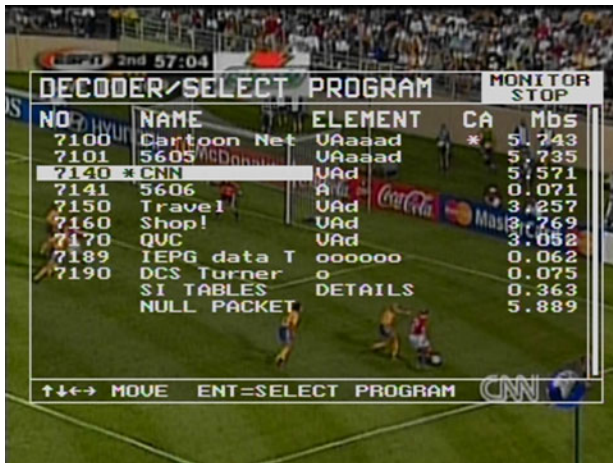
MPEG-2 Measurement Decoder R&S®DVMD

Optional alarm lines and parallel printer interface

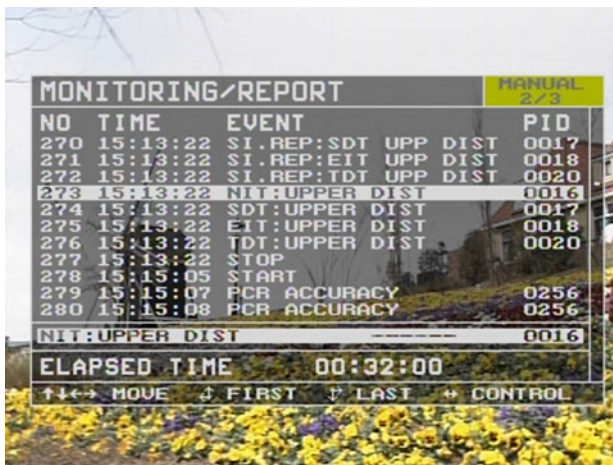
In addition to a second parallel printer interface, 12 alarm lines for signalling errors detected in the transport stream are available. Each alarm line can be allocated to one or several (ORed) types of errors. The contacts close to ground and in case of an error they can be chosen to close or open.

Specifications

You will find detailed and binding data on the enclosed CD (./DATASHEET/DVMD.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVMD



List of all elementary streams of a program



Error report with detailed information on causes of errors

Ordering information

MPEG-2 Measurement Decoder (DVB)	R&S®DVMD	2068.8597.02
Accessories supplied	power cable, operating manual, audio adapter (LEMO Triax to XLR)	
Options		
Stream Explorer™ Software	R&S®DVMD-B1	2068.8597.02
Distribution as ATSC standard	R&S®DVMD-B2	2068.9341.00
Alarm Lines + Parallel Printer Interface	R&S®DVMD-B5	2068.9393.02
Calibration Data Documentation	R&S®DVMD-DCV	2082.0490.15
Extras		
19" Adapter (1 HU)	R&S®ZZA-91	0396.4870.00
Service Manual		2069.0348.24



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



MPEG-2 Realtime Monitor R&S® DVRM

Realtime monitoring and analysis of MPEG-2 transport streams



MPEG-2 Realtime Monitor R&S® DVRM

Brief description

R&S® DVRM is the optimized solution for the continuous monitoring of MPEG-2 transport streams in real time. The measurements performed are necessary to ensure smooth interplay of all components of a DTV transmission network.

Local control and display elements are not provided because the R&S® DVRM is intended for use in networked monitoring systems with one or more the R&S® DVRMs being integrated.

Main features

- ◆ 26 DVB or 19 ATSC realtime measurements at a time
- ◆ Integrated long-term report
- ◆ Analysis of data rates
- ◆ Trigger-on-error function
- ◆ Remote control via supplied PC software
- ◆ 12 built-in relays for error signalling

If the supplied PC software running under Windows 9x or NT/2000/XP is used, three information blocks are available simultaneously:

1. Structure of transport stream with all elements shown in the form of a tree or list (left)
2. Current status as well as error seconds of each error measured in realtime (top right)
3. Chronological list of all errors detected (bottom right)

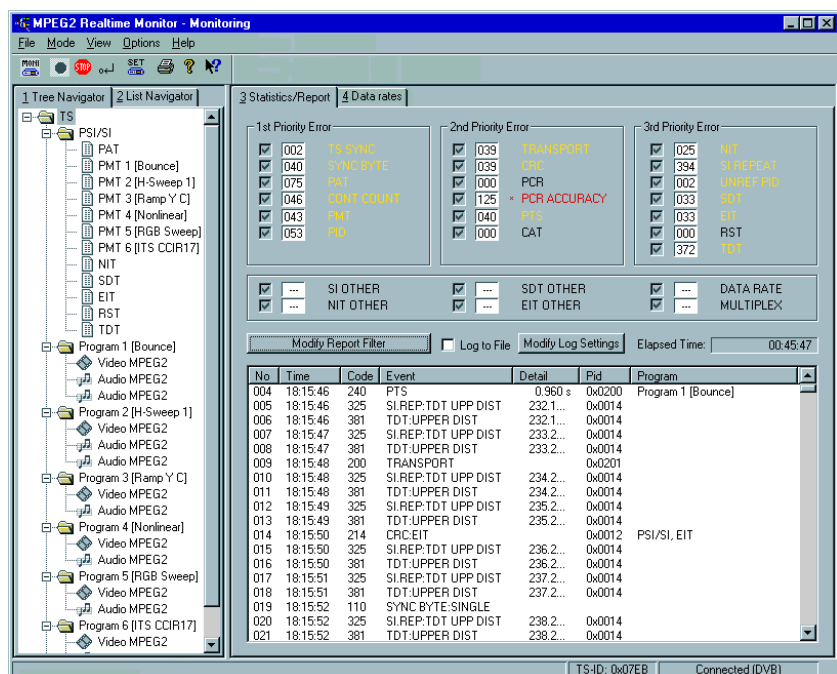
Analyzer

The analyzer functions of R&S® DVRM comprise a protocol analysis of the measured MPEG-2 transport stream in real-time. All measurements are in conformance with the Measurement Guidelines for DVB Systems (ETR 290) of the European DVB project or based on these guidelines (ATSC-Standard). In the DVB mode, the repetition rates of all EIT/SDT/NIT "other" tables are monitored in real-time in addition to ETR 290.

Any error occurring is directly indicated by front-panel LEDs. R&S® DVRM also

detects sporadic errors. Moreover it provides error statistics showing how often a particular type of error has occurred within a specified time interval. A list (REPORT) giving detailed information on the errors occurred including date and time can be obtained. The list contains up to 1000 entries and may be edited to cover exclusively a single type of error.

In addition, the R&S® DVRM analyzes the MIP packets (megaframe initialization packets) that are inserted into the transport stream in order to synchronize the transmitters of DVB-T single-frequency networks.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



MPEG-2 Realtime Monitor R&S®DVRM

If there is an error, the trigger/capture facilities of R&S®DVRM can be used to freeze part of the transport stream affected by the error (approx. 2 Mbit) and output it, analyzed down to bit and byte level, via the RS-232-C interface.

In addition to in-depth analysis, the optional Stream Explorer™ software (see page 107) allows further online measurements with graphic display on the screen (e.g. data rates, PCR jitter, etc).

Remote control

In addition to readout and display of complete error information, the MPEG-2 Realtime Monitor software allows full remote control of R&S®DVRM. Moreover, it offers moving graphical representation of the data rates of all transport stream elements in the form of bargraphs. Apart from continuous storage of the error report on hard disk, the software enables integration of R&S®DVRM into networked monitoring systems via the COM/DCOM interface.

ATSC-Standard R&S®DVRM-B2

When ordered with option R&S®DVRM-B2, the unit comes preconfigured for ATSC. For changeover of R&S®DVRM to the respective other standard, a PC Windows software is supplied with R&S®DVRM.

Specifications

You will find detailed and binding data on the enclosed CD (./DATASHEET/DVRM.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVRM

Ordering information

MPEG-2 Realtime Monitor	R&S®DVRM	2068.8580.02
Equipment supplied	power cable, modem bypass cable, operating manual, CD-ROM with PC operating software, update firmware for ATSC and DVB standards, factory-configured for DVB standard	
Options		
Configuration for ATSC standard	R&S®DVRM-B2	2068.9606.00
Stream Explorer™ software	R&S®DVMD-B1	2068.9406.02
Documentation of calibration values	R&S®DRM-DCV	2082.0490.24
Extras		
19" adapter (1 HU)	R&S®ZZA-91	0396.4870.00
Service manual		2069.0348.24



Contents Overview

Chapter Overview

Type Index

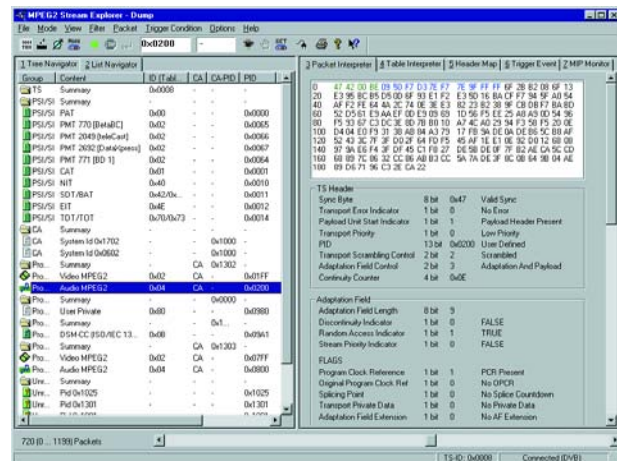
R&S Addresses



Stream Explorer™ R&S® DVMD-B1

**Enhanced MPEG-2 analysis with
MPEG-2 Measurement Decoder
R&S® DVMD or Realtime Monitor
R&S® DVRM**

Fig. 1: All transport stream details under control with List Navigator and Packet Interpreter (DVB mode)



Brief description

Stream Explorer™ Software R&S® DVMD-B1 enhances the MPEG-2 Measurement Decoder R&S® DVMD (page 103) to form a universal analysis system for MPEG-2 transport streams. The software runs under Windows9x/NT/2000 on any PC or laptop connected to the R&S® DVMD via a serial interface. The easy-to-operate software and the clear presentation of test results ensure efficient working right from the start. R&S® DVMD can buffer a transport stream of up to 2 Mbit and transfer it on request via the serial interface to the Stream Explorer™. R&S® DVMD uses several data or event filters (TRIGGER), which can be activated via the Stream Explorer™. The investigated data quantity of the transport stream can thus be considerably increased if required. Moreover, the software can activate realtime analyses in the R&S® DVMD and output the results as moving graphic representations. The realtime measurement functions of R&S® DVMD are thus considerably enhanced.

Five operating modes

- ◆ **DUMP:** for comprehensive analysis of transport stream contents
- ◆ **TRIGGER:** for detailed investigation of errors in transport streams
- ◆ **MEASURE:** for graphic display of transport stream parameters in real-time

- ◆ **MONITORING:** for remote control
- ◆ **OFFLINE:** for storage and subsequent recall of any test scenarios (available for all four operating modes named above)

DUMP

This operating mode allows detailed analysis of the contents of transport streams (TS). The transport stream contents is represented by Stream Explorer™ in hexadecimal format as well as in an interpreted form. This makes it very easy for the user to recognize any irregularities that may occur.

The analyzed transport stream data can be filtered as follows:

- ◆ only TS packets with a specific PID
- ◆ only TS packets with adaptation field
- ◆ only TS packets with start of a PES packet (payload unit start indicator set)

Combinations of the above selection criteria are also possible. Irrespective of the filter settings, Stream Explorer™ additionally determines the complete contents structure of the transport stream.

Display modes

- ◆ **NAVIGATOR:** Display of transport stream contents as a tree structure

(Fig. 2, left) or in tabular form (Fig. 1, left) with general information about elementary streams such as PID, stream ID, data rate and information about scrambling. This display mode is always available together with a second display mode

- ◆ **PACKET INTERPRETER:** (Fig. 1, right) Display of a TS packet in hexadecimal format and at the same time as an interpreted list of all elements contained in the transport stream. A colour code for the various parts of the packet (header, adaptation field, payload, etc) makes for a clear representation. The packets are selected either via the NAVIGATOR or via a software slide switch allowing all buffered packets to be addressed in their original sequence

- ◆ **TABLE INTERPRETER:** (Fig. 2, right) Lists all elements of a selected table and interprets the contents. The following tables can be selected:
 - All standards: CAT, PAT, PMT, PT
 - DVB: BAT, DIT, EIT, NIT, RST, SDT, SIT, ST, TDT, TOT
 - ATSC: CVCT, EIT, ETT, MGT, PIT, RRT, STT, TVCT

- ◆ **HEADER MAP:** Gives an overview of the distribution of elementary stream packets within the transport stream. The headers of a selected elementary stream are highlighted

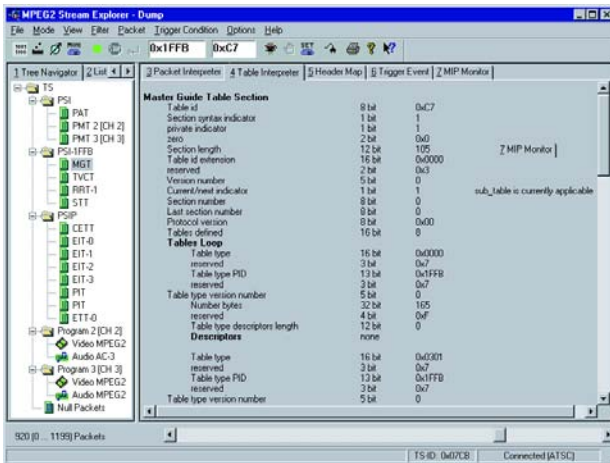


Fig. 2: Clear representation of transport stream structure with Tree Navigator and of Table Interpreter (ATSC mode)

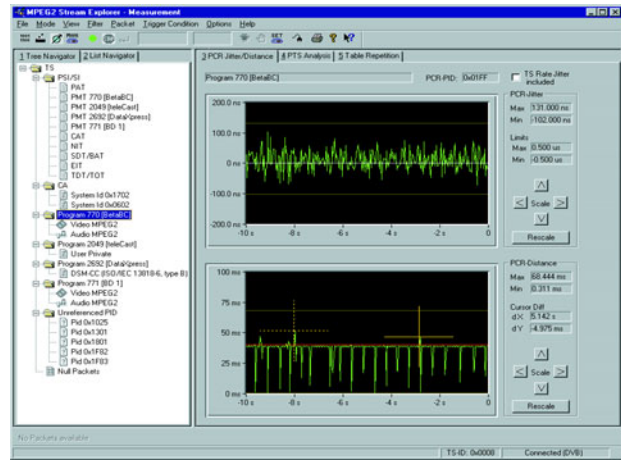


Fig. 3: Realtime measurement of PCR jitter and PCR spacings (DVB mode)

TRIGGER

If an error occurs in the transport stream applied to R&S® DVMD, the data in the region of the error are stored in the R&S® DVMD and made available to Stream Explorer™ for evaluation. The cause of the error can thus reliably be detected and displayed in detail.

TRIGGER EVENT: This display mode is additionally available for error investigation. It shows the structure elements in which the error occurred. Faulty data are shown in red. The type of error is explained in addition.

MIP MONITOR: Regularly updated display of MIP (megaframe initialization packets) data. These data are indispensable in SFNs (single frequency networks) to enable synchronized operation of the various transmitters.

MEASURE

This operating mode allows realtime analysis of several transport stream parameters and graphic display in the form of bargraphs or traces:

- ◆ PCR jitter (Fig. 3): accuracy and overall jitter MGF1, MGF2 and MGF3
- ◆ Spacing of PCR values in transport stream (Fig. 3)
- ◆ Spacing of elementary-stream-related PTS values
- ◆ PTS/PCR difference
- ◆ Spacing of PSI, SI and PSIP tables
- ◆ Data rates of elementary streams

MONITORING

Full remote control of the R&S® DVMD is integrated in this operating mode, including display, filtering and storage of the monitoring report.

System requirements

PC or laptop with Pentium processor (recommended clock frequency min. 100 MHz), Windows 9x or NT/2000/XP operating system, min. 16 Mbyte RAM (Windows NT/2000/XP: 32 Mbyte), required space on hard disk approx. 10 Mbyte, 1 free RS-232-C interface (recommended data rate: 115 kbit/s), 1 parallel printer interface, 3.5" disk drive

Ordering information

Stream Explorer™	R&S® DVMD-B1	2068.9406.02
Equipment supplied	3.5" floppy disks with setup program; cable for connecting the R&S® DVMD to the PC, manual and dongle for connection to the parallel printer output of the PC	

Other features

By switching to offline mode, the current contents of the transport stream can be stored in all operating modes for subsequent analysis.

Stream Explorer™ supports the software interface COM/DCOM (**D**istributed **C**omponent **O**bject **M**odule) which allows data and commands to be exchanged between Windows programs. In networked monitoring systems the Stream Explorer™ can be remote-controlled as an OLE automation server by application software packages.



Contents Overview

Chapter Overview

Type Index

R&S Addresses



MPEG-2 Monitoring System R&S®DVM100/R&S®DVM120

Transport stream monitoring in diverse DTV distribution networks



MPEG-2 Monitoring System R&S®DVM100

Brief description

Monitoring complex DTV transmission systems becomes child's play with the R&S®DVM. Its scalability ensures optimum adaptation to the system to be monitored.

The R&S®DVM100 occupies only 1 HU and allows parallel monitoring of either two, three or four transport streams. The R&S®DVM120, also just 1 HU, can be used to expand the R&S®DVM100 up to 12 or 20 (two R&S®DVM120) transport stream inputs. Expansion is in single-channel steps.

The user interface of the R&S®DVM100 provides a concise overview of signal monitoring. The user-defined hierarchical display of the transport stream inputs enables quick navigation. The individual elements of a transport stream are also hierarchically displayed in a tree structure and can thus be easily selected for more in-depth analyses, for example.

The displays described are also used to signal errors by means of coloured symbols, allowing easy and quick error source localization.

The user can classify measurement parameters separately to obtain a quick overview of signalling. Since individual

components can be entirely excluded from monitoring and limit values individually set, the user is not inundated with messages, and the messages are prioritized according to user definitions.

The R&S®DVM system provides a variety of tools for more detailed analyses, including PCR and data rate measurements with comprehensive graphic displays, tables and packet interpreters, and much more.

Main features

- ◆ Monitoring of up to four transport streams in 1 HU
- ◆ Expandable up to 20 transport streams in 3 HU with the R&S®DVM120
- ◆ Data rates up to 216 Mbit/s
- ◆ Monitoring of TR101290 priorities 1, 2 and 3 (except buffer)
- ◆ Data rate monitoring



R&S®DVM100 (top; left: analyzer board, right: controller) expansion by R&S®DVM120 (below: 2 analyzer boards each), shown with monitor, keyboard and mouse for local operation.

A quick Ethernet interface supports network integration. With SNMP support, the R&S®DVM system can be easily integrated into a central network management system.

The R&S®DVM system is therefore ideal for transport stream monitoring in diverse DTV distribution networks.

- ◆ Single frequency network (SFN) monitoring
- ◆ Comprehensive analysis tools
 - PCR jitter
 - Table/packet interpreter
 - Data rates
 - Table refresh rates
- ◆ 12 user-definable alarm relays
- ◆ Alarm & Event navigator



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



MPEG-2 Monitoring System R&S®DVM100/R&S®DVM120

- ◆ Local control
 - WindowsXP Embedded
 - XVGA (1024 × 786 pixel) output
 - USB
- ◆ Ethernet 100 Mbit/s
- ◆ System integration via SNMP
- ◆ Concise signalling overview on front panel via multicolour LEDs

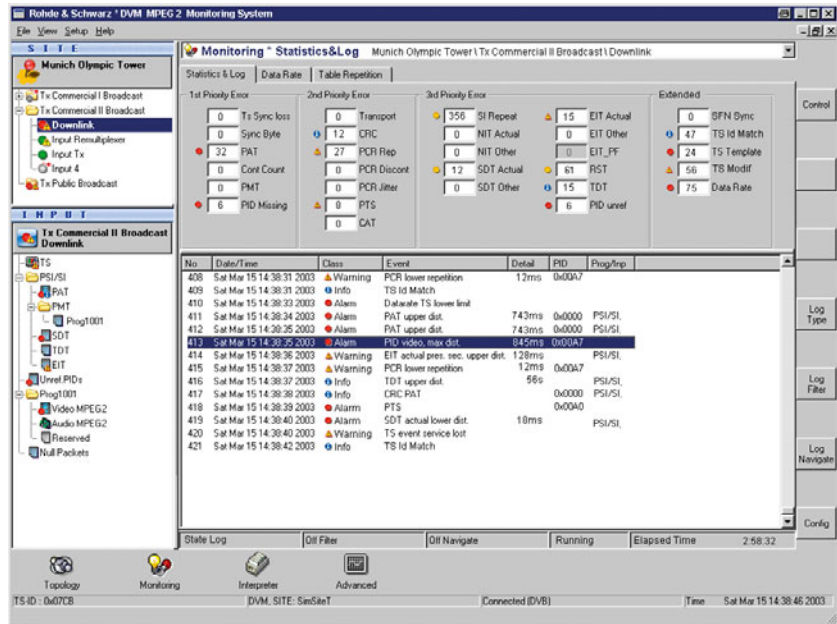
Measurement and analysis functions

In addition to continuous monitoring, optional measurement functions are available (In-Depth Analysis option):

- ◆ **PCR jitter:** For comprehensive PCR jitter measurements; "overall" or "accuracy" measurements can be selected. As with monitoring, the filters used can be set (MGF1 to MGF3). Measurement and filter characteristic comply with the TR 101 290 definition. The measurement results are displayed as a trace
- ◆ **PCR distance:** Graphically displays the distances between the individual PCR values of a program
- ◆ **PTS/PCR difference:** Displays the difference between PTS and PCR in a diagram

Specifications

You will find detailed and binding data on the enclosed CD (./DATASHEET/DVM.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVM100, DVM120



R&S® DVM GUI with report and error counter display.

- ◆ **SI/PSI table interpreter:** Lists all elements of a selected table and interprets the contents
- ◆ **TS packet interpreter:** Displays a transport stream packet in hex format and simultaneously as an interpreted list of contents for the header and the adaptation field
- ◆ **PES header interpreter:** Lists all elements of a selected PES header and interprets the contents
- ◆ **Header map:** Provides an overview of the packet distribution of individual elementary streams, the first four bytes of each transport stream packet being displayed in hex format

Ordering information

MPEG-2 Monitoring System	R&S®DVM100	2085.1600.02
	R&S®DVM120	2085.1700.02
Hardware option		
Analyzer Board	R&S®DVM-B1	2085.3283.02
Software option		
Additional TS Input	R&S®DVM-K1	2085.5211.02
In-Depth Analysis	R&S®DVM-K10	2085.5228.02
Accessories		
19" Adapter (1 HU)	R&S®ZZA-111	1096.3254.00



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

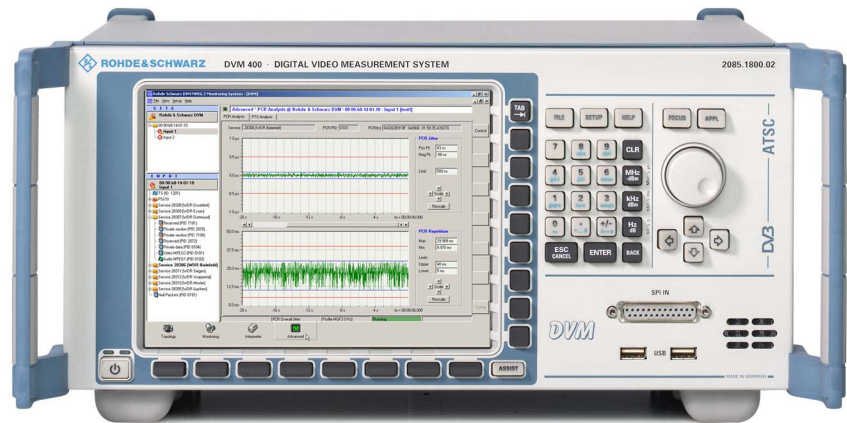
R&S Addresses



Digital Video Measurement System R&S® DVM400

New

Monitoring, analysis, recording and generation of MPEG-2 transport streams



Brief description

The R&S® DVM400 is a highly compact, portable MPEG-2 platform that offers a wealth of test, analysis and monitoring functions for digital TV. Users require neither a laptop nor an external monitor to operate the system since it comes equipped with an integrated, high-resolution colour display. The system is operated by means of its keys and rotary knob, or via the supplied USB mouse. An external monitor and keyboard can be connected. Versatile options ensure that customer requirements are optimally satisfied. Functions can usually be added simply by installing a software key.

The R&S® DVM400 includes a powerful computer platform with various interfaces and space for three plug-in cards. A broadband recorder and generator board can be installed in the first slot. A fast analyzer board as is used in other systems of the R&S® DVM family is available for the second slot. This board allows parallel monitoring of up to four transport streams. Since both boards function independently of each other, the R&S® DVM400 can be configured either

as a pure recorder and generator or as a pure analyzer. If both boards are installed, special features are available. For example, a recorded signal can be sent directly within the system to the analyzer board for later analysis. Or, if a signal is monitored, the analyzer board can directly trigger the recorder and generator board to perform event-driven recording.

Both boards support a variety of functions, some of which are optionally available. The analyzer board allows not only transport stream monitoring, but also the analysis of data rates, PCR and PTS values, the interpretation of tables and packets plus the analysis of diverse data services.

Various test signals are available for the recorder and generator board. By using the Stream Combiner™ software, users can generate their own transport streams on the R&S® DVM400.

Like the R&S® DVM100, the R&S® DVM400 can be expanded by the R&S® DVM120 to monitor more than four transport streams; parallel monitoring of

up to 20 transport streams is thus possible via the GUI of the R&S® DVM400 (two R&S® DVM120 plus options are required).

Main features

- ◆ Transport stream monitoring
 - Monitoring of all TR101290 first, second and third priority parameters (except buffer)
 - Data rate monitoring
 - Single frequency network monitoring
 - Data rates up to 214 Mbit/s
 - Event-controlled transport stream capture function
 - User-definable alarm relays
 - Flexible definition of monitoring parameters
- ◆ Transport stream analysis
 - Data rates
 - PCR and PTS analysis
 - Table/packet interpreter
 - Data broadcast analysis
- ◆ Transport stream generation, recording and replaying
 - Bit rates up to 214 Mbit/s
 - Memory up to 160 Gbyte
 - Extensive test signal library
 - Transport stream generation software



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Digital Video Measurement System R&S®DVM400

- ◆ Operating features
 - Event Navigator
 - Assistant
- ◆ Large colour display
- ◆ USB interfaces on front and rear panels
- ◆ Ethernet interface (100 Mbit/s)
- ◆ Simple remote control
- ◆ System integration via SNMP for monitoring applications
- ◆ Flexible option management

Monitoring functions

Up to four transport streams can be monitored in parallel. One transport stream can be monitored with the analyzer option, another three with one R&S®DVM-K1 option each. In addition to the monitoring functions, numerous analysis functions are available. Analysis can be performed on one of the transport streams at the same time it is being monitored.

Transport streams are monitored in accordance with Measurement Guidelines TR101290. Well over 100 parameters are monitored on each transport stream, including:

- ◆ All first, second and third priority parameters (with the exception of 3.3, buffer)
- ◆ Bit rates of all transport stream elements (different calculation methods according to TR101290 can be selected (MGB1, MGB2 and MGB5 with $\tau = 5$ s))
- ◆ Availability and contents of the megabyte initialization packet (MIP), used in single frequency networks (SFN)
- ◆ Modification of conditional access information
- ◆ Transport stream modifications (TSID, addition or omission of elements, etc)

Event navigator

As a special feature, the R&S®DVM400 supports filter functions for the report entries.

- ◆ All entries for a PID (e.g. all entries for PID100 (e.g. video))
- ◆ All entries of the same type (e.g. all entries for an incorrect PMT repetition period)
- ◆ All entries for a PID of the same type

Analysis functions

Each analysis function can be performed at the same time transport streams are being monitored.

In-depth analysis

- ◆ **PCR jitter:** For comprehensive measurement of PCR jitter; selection of one of the two measurements "Overall" or "Accuracy"; setting of the filters used (MGF1 to MGF3) also for monitoring; measurement and filter characteristics as defined in TR101290
- ◆ **PCR distance:** Graphical representation of the distance between individual PCR values of a program
- ◆ **PTS/PCR difference:** Graphical representation of the difference between PTS and PCR
- ◆ **PTS distance:** Graphical representation of the distance between individual PTS values of a program
- ◆ **SI/PSI table interpreter:** Detects a corresponding section in the TS and interprets its contents
- ◆ **TS packet interpreter:** Displays a transport stream packet in hex format and simultaneously as an interpreted list of contents for the header and adaptation field
- ◆ **PES header interpreter:** Lists all header elements of a selected PES and interprets their contents.

- ◆ **Header map:** Provides an overview of the packet distribution of individual elementary streams; displays the first four bytes of each transport stream packet in hex format.

Data broadcast analysis

A wide scope of analysis functions is available for data broadcast applications. The R&S®DVM400-B1 base option alone provides the following functionalities. All transmission techniques and related applications listed below are recognized and entered in the transport stream elements list under the appropriate designation:

- ◆ DVB object carousel, e.g. for downloading of MHP applications
- ◆ DVB data carousel, e.g. for system software updates (SSU)
- ◆ Multi-protocol encapsulation (MPE), e.g. for IP data transmission
- ◆ Data streaming, e.g. for teletext, subtitles, VPS, WSS and transmission of personal data
- ◆ Data piping, e.g. for transmission of personal data

The following tables are also listed

- ◆ Application information table AIT (MHP)
- ◆ IP/MAC notification table INT (IP data via MPE)
- ◆ System software update notification table UNT (SSU)

The bit rates of a data service can also be measured by means of the associated PID. In-depth analysis functions:

- ◆ Interpretation of related tables (AIT, INT and UNT)
- ◆ Interpretation of PES headers (data streaming)
- ◆ Interpretation of TS packets (all profiles)



Contents Overview

Chapter Overview

Type Index

R&S Addresses



Digital Video Measurement System R&S®DVM400

Overview of all available measurements

	Data piping	Data streaming	MPE	Data carousel	Object carousel
Overview	display of used descriptors and name of tables containing the descriptors				
Interpreter	TS header	PES header	section	section (DSI, DII and DDB header)	
Raw data	TS packet contents	PES packet contents	section contents	DDB section contents	
Timing measurements	<ul style="list-style-type: none"> – ES bit rate – repetition time of payload unit start indicators 	<ul style="list-style-type: none"> – PES bit rate – repetition time of PES header 	<ul style="list-style-type: none"> – bit rate of se-lected section – repetition time of selected section 	<ul style="list-style-type: none"> – bit rate of selected module, DSI, DII section – repetition time of selected DII, DSI section – loading time of selected module 	

Specifications

You will find detailed and binding data on the enclosed CD

(../DATASHEET/DVM400.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: DVM400

Overview of options and functions, ordering information

Description	Type	Function	Order No
Base unit			
Base unit	R&S®DVM400	Computer platform <ul style="list-style-type: none"> – motherboard, hard disk, RAM, Windows XP Embedded – colour display, loudspeaker, keys and rotary knob – USB wheel mouse – 3 slots, 2 SPI connectors (input and output), 10 MHz reference input – 12 alarm lines2), trigger input, Ethernet interface – 4 × USB connectors, expansion connector for R&S®DVM120 	2085.1800.02
Analyzer functions			
Analyzer	R&S®DVM400-B1	Analyzer board (4 ASI/310M connectors) <ul style="list-style-type: none"> – unblocking function for one transport stream (TS Input) – monitoring functions – analysis functions: in-depth analysis – event navigator – assistant 	2085.5505.02
Additional TS Input	R&S®DVM-K1	Unblocking function for parallel monitoring of one additional transport stream	2085.5211.02
TS Capture	R&S®DVM-K2	Storage and recording of transport stream sections	2085.5234.02
Data Broadcast Analysis	R&S®DVM-K11	Analysis of data broadcast services	2085.5311.02
Recorder and generator functions			
TS Generator (GTS format only)	R&S®DVM400-B2	Generator board (ASI/310M connectors) <ul style="list-style-type: none"> – support of GTS mode – transport stream generation – test signal library 	2085.5511.02
Upgrade TS Recorder TRP 90 Mbit/s	R&S®DVM400-B3	Hard disk (option R&S®DVM400-B2 required) <ul style="list-style-type: none"> – recording, replaying – bit rates up to 90 Mbit/s (hard disk) and 214 Mbit/s (memory) 	2085.5528.02
Upgrade TS Recorder TRP 214 Mbit/s	R&S®DVM400-B4	Bit rates up to 214 Mbit/s (hard disk and memory) (options R&S®DVM400-B2 and R&S®DVM400-B3 required) <ul style="list-style-type: none"> – doubling of hard disk memory (additional hard disk) 	2085.5534.02
Test Card M Streams	R&S®DV-TCM	Additional test signals	2085.7708.02
HDTV Sequences	R&S®DV-HDTV	Additional test signals	2085.7650.02
Stream Combiner™	R&S®DVG-B1	Offline TS multiplexer software <ul style="list-style-type: none"> – elementary stream library 	2068.9835.02
Recommended extras			
Documentation of Calibration Values	R&S®DVM-DCV		2082.0490.29
Service Manual			2085.1839.02



Contents Overview

Chapter Overview

Type Index

R&S Addresses



MPEG-2/ATM Test Set R&S® DVATM

Multifunctional MPEG-2 and ATM test set



R&S® DVATM with opened 15"-TFT display

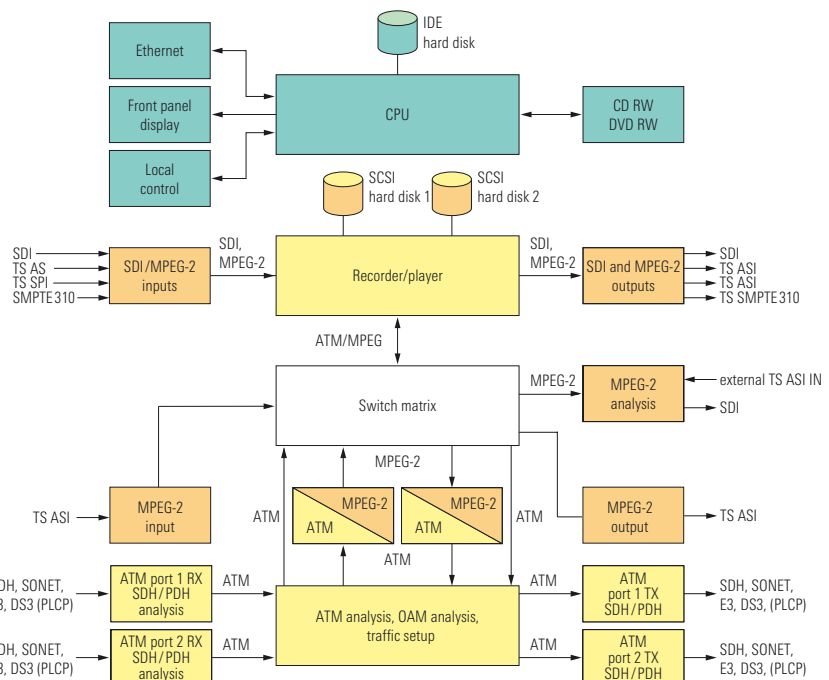
Brief description

The R&S® DVATM is a multifunctional MPEG-2 and ATM test set. It is intended for all measurement applications in which MPEG-2 signals are transported over ATM telecommunication interfaces. For all these applications it offers the necessary tools from the MPEG-2 and telecommunication world, providing the required interfaces for all layers involved as well as test signals and analysis functions.

The R&S® DVATM is the first unit worldwide that is able to process both MPEG-2 and ATM signals. The user interface is designed in the style commonly found in sound and TV broadcasting. It gives the user a clear overview of the complex relations and operations at all times.

Main features

- ◆ Integrated MPEG-2 and ATM test set
- ◆ Compact design
- ◆ Flexible telecommunication interfaces
- ◆ Portable
- ◆ Wide range of test functions
- ◆ Straightforward operating concept



Measurement at any point of transmission route with R&S® DVATM



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses

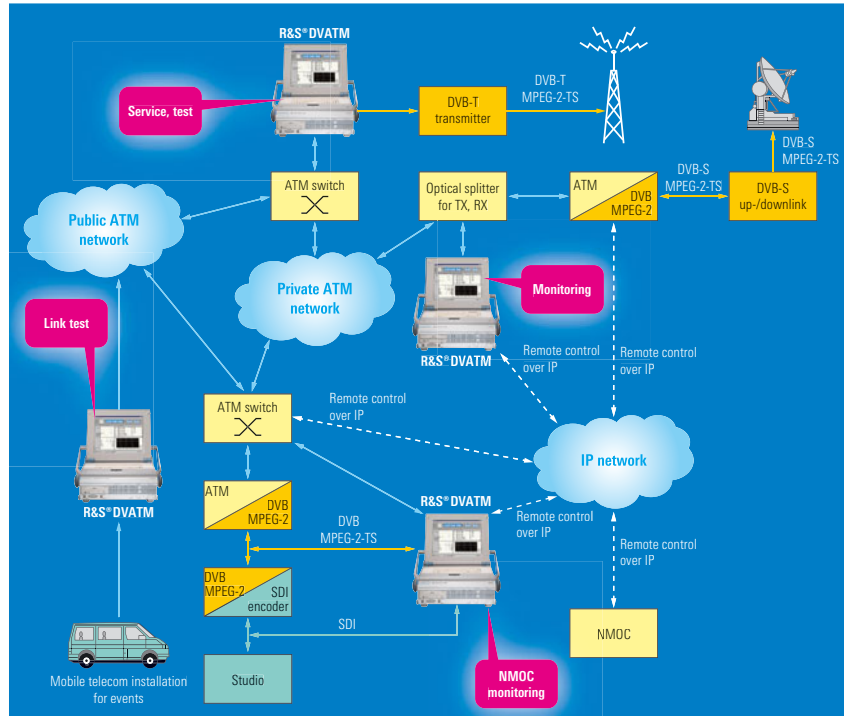


MPEG-2/ATM Test Set R&S® DVATM

Applications

One application is the installation and startup of transmission routes, network elements, MPEG-2/ATM adapters and SDI encoders. The R&S® DVATM allows bench testing of the entire equipment plus transmission simulation prior to installation. All required settings can be made in advance. This cuts installation and commissioning costs and saves unnecessary field trials on equipment already in place. Testing transmission routes prior to use allows early identification of possible connection problems. This ensures subsequent errorfree transmission, in which the test set can also be used to monitor quality.

In monitoring mode, the R&S® DVATM can log and record data streams of the layers. Used in a network management operation center, the test set can monitor connections under remote control. The user interface of the test set can be exported to any PC over IP networks. In the event of problems, specific path sections can thus be tested and analyzed from a remote location.



Examples of R&S® DVATM application versatility

Ordering information

MPEG-2/ATM Test Set	R&S® DVATM	2084.7004.02
(only available in combination with R&S® DVATM-B31 and ATM Interface)		
Options		
ATM Interface SO2	R&S® DVATM-B2	2084.7479.02
ATM Interface SO15	R&S® DVATM-B3	2084.7485.02
ATM Interface TP155	R&S® DVATM-B5	2084.7504.02
ATM Interface E3/DS3	R&S® DVATM-B11	2084.7562.02
Local Control	R&S® DVATM-B20	2084.7440.02
MPEG-2 Analyzer	R&S® DVATM-B30	2084.7591.02
MPEG-2 Generator/Recorder	R&S® DVATM-B31	2084.7604.02
ATM Record/Play	R&S® DVATM-B40	2084.7533.02
SCSI Hard disk 36 GB	R&S® DVRG-B2	2083.1919.02
SDI (ITU-R B.T. 601/656; Record/Play)	R&S® DVRG-B4	2083.1931.02
SMPTE-310M Interface	R&S® DVRG-B6	2083.1954.02
Software		
Test Card M Sequences	R&S® DV-TCM	2085.7708.02
HDTV Sequences	R&S® DV-HDTV	2085.7650.02
Stream Explorer™ (included in R&S® DVATM-B30)	R&S® DVMD-B1	2068.9406.02
Stream Combiner™	R&S® DVG-B1	2068.9835.02



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

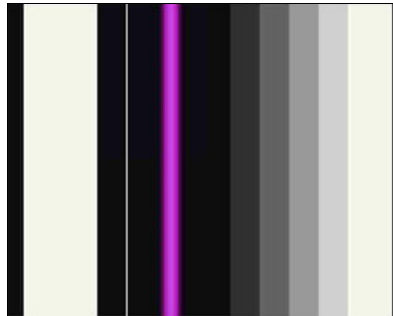
Type Index

R&S Addresses

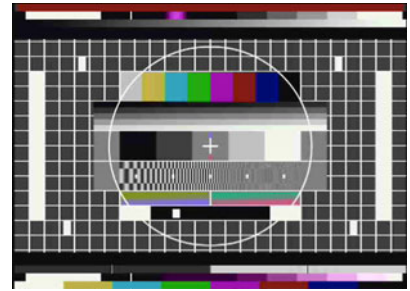


DVD Compendium Professional R&S®TestDVD

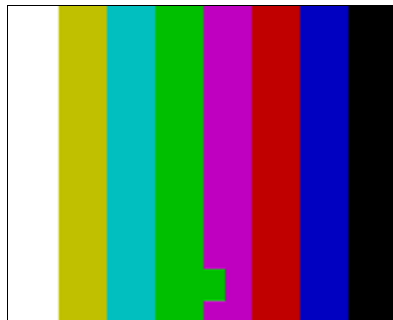
Comprises 5 DVDs with professional test patterns and test data streams for audio, video and EMC applications – particularly designed for use with DVD players and recorders



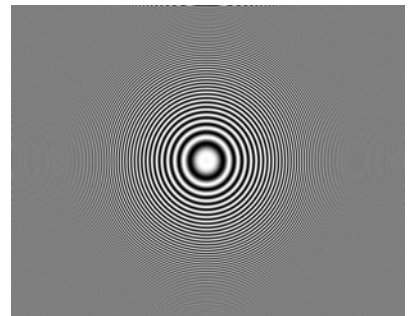
CCIR 17



Codec43



ITU-R BT.801-1 with moving element



Zone plate

Brief description

In many cases, measurement quality is determined to a considerable extent by the scope and quality of the available test signals. The DVD compendium offers a unique compilation of many different video and audio streams for professional applications.

Main features

- ◆ Precompliance measurements on video and audio equipment
- ◆ Objective measurement and assessment of video and audio signals, especially those used in DVD systems (DVD video and DVD audio), for example by means of video analyzers (R&S® UAF, R&S® DVO, R&S® VSA) and audio analyzers (R&S® UPL)

- ◆ Subjective quality tests of video and audio equipment
- ◆ Type approval tests in accordance with international standards, e.g. with EMS Test System R&S® TS9980, to determine electromagnetic susceptibility of sound and TV broadcast receivers as well as satellite and DVB receivers

Characteristics

The compendium consists of three albums for different types of tests:

- ◆ Album 1 contains more than 150 test patterns, video and audio sequences on a DVD VIDEO including tests for measuring electromagnetic susceptibility

- ◆ Album 2 contains one DVD AUDIO and one DVD VIDEO with stereo and multi-channel test sequences
- ◆ Album 3 comprises two DVDs with data streams for testing the reliability of systems containing DVD components, including automatic error correction tests and endurance tests of DVD equipment

Particular importance was attached to the digital test sequences meeting relevant quality standards. Offering a choice of suitable picture structures and audio frequencies, the test sequences allow standard-conforming measurements of maximum quality as well as the subjective assessment of audio and video equipment.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



DVD Compendium Professional R&S®TestDVD

The DVDs also contain special test sequences enabling automatic measurements and evaluation in conjunction with equipment or test systems from Rohde&Schwarz.

For example, the video DVD includes:

- ◆ CCIR 17 test pattern for measuring nonlinearities, level and group-delay errors
- ◆ Codec43 test pattern combining a variety of test signals in one pattern for the simultaneous, automatic measurement of significant parameters of a video signal
- ◆ Test data stream based on ITU-R BT.801-1 including a moving element for the automatic, objective picture assessment with analog and digital degradations

Numerous live video sequences for visual quality assessment are also provided, including:

- ◆ Sequences containing elements with rotating or back-and-forth motion for the assessment of smearing effects on monitors, TFT displays, plasma tubes or projectors as contrasted with conventional TV picture tubes
- ◆ Special video test streams such as zone-plate signals that support the visual assessment of artefacts generated in scaling conversion

The video sequences also contain audio signals ranging from 997 Hz reference signals and pink noise up to AC-3 test signals for the simultaneous and complete assessment of audio and video streams.

The test sequences are provided for PAL or NTSC systems as well as for 4:3 and 16:9 aspect ratios.

The audio signals on the audio DVDs allow the exact measurement of multi-channel frequency response as well as the precise determination of S/N ratios and distortion. In addition, numerous sequences are available for the control of discrete channels, for example to test downmix functions or loudspeaker parameters set in the decoder.

Descriptions of the data streams can be downloaded from the following Internet address:

www.testdvd.rohde-schwarz.com

The test DVDs are provided by Rohde&Schwarz and Burosch with support from Audiovision and TESTfactory.

DVDs included

DVD-1, video ¹⁾	Test patterns and data streams for video and EMC applications
DVD-2 video ¹⁾ , DVD-3 audio	Test sequences for stereo and multichannel systems
DVD-4, video ¹⁾	Test sequences for laser and error correction measurements
DVD-5, video ¹⁾	Endurance tests of DVD equipment

¹⁾ TV standard PAL or NTSC.

General data

5 DVDs	1 × DVD-9, 4 × DVD-5
Regional code	0
TV standard	PAL or NTSC
Aspect ratio	4:3; 16:9 (not for all test sequences)

Ordering information

DVD Compendium Professional	R&S®TestDVD	
PAL		1159.6090.02
NTSC		1159.6090.03



Contents Overview

Chapter Overview

Type Index

R&S Addresses



TV Test Receiver Family R&S®EFA

Test receivers and demodulators for analog and digital (DVB-C, J.83/B, DVB-T or ATSC/8VSB) TV signals

R&S®EFA63



Brief description

DTV

R&S®EFA's powerful digital signal processing provides fast and thorough analysis of the received digitally modulated TV signal. The MPEG-2 transport stream is permanently available for decoding as well as for video and audio reproduction. Due to its real-time analysis capability, the high number of measured values necessary for the complex calculation and display processes are made available for subsequent mathematical/statistical processing in an extremely short and as yet unequalled time. Because of its high-speed data acquisition, the TV Test Receiver R&S®EFA is the ideal choice not only for R&D but also for production environments where short measurement cycles are essential.

Analog TV

The analog R&S®EFA models provide high precision demodulated baseband signals (vision and sound) for measurements in various applications (TV transmitters, cable headends, coverage measurements, R&D). At the same time, all relevant RF parameters are monitored at high speed and represented in a logical manner. User-configurable alarm messages permit unattended monitoring of the received signals as well as switchover to alternative links in the event of a failure.

The high-end demodulator version is used for on-site measurements on TV transmitters. This version offers particularly low-distortion demodulation of the broadcast signal. It is perfectly suited for these types of measurements; its low measurement uncertainty permits optimal alignment as well as permanent quality control of transmitters.

Applications

- ◆ Production of modulators and transmitters (calibration and test)
- ◆ Transmitter installation and adjustment of Single Frequency Networks (SFN in DVB-T)
- ◆ Coverage measurements on terrestrial signals
- ◆ Monitoring of TV transmitters, transposers and cable head-ends
- ◆ Research and development
- ◆ Service
- ◆ Measurement of noise margin of digital signals
- ◆ Monitoring of MPEG-2 transport streams

Main features

Common features

- ◆ Simple, user-friendly operation
- ◆ Modular design easy retrofitting of options
- ◆ Alarm messages for measurement functions, internal storage

- ◆ IEC/IEEE-bus and RS-232-C interface
- ◆ Error report
- ◆ Input of any IF frequency with the aid of the R&S®EFA-B3 option: frequency range continuously tunable from 5 MHz to 1000 MHz
- ◆ Special function: invert spectrum feature (with option R&S®EFA-B3)

Standard test receiver

(model .12/40/50/60/70/78/90)

- ◆ Selective receiver
- ◆ Typical use in the field where adjacent channels need to be filtered
- ◆ Excellent price/performance ratio

High-end demodulator

(model .33/43/53/63/73/89/93)

- ◆ Wideband input (non-selective receiver), tunable
- ◆ Typically used for transmitter testing
- ◆ Outstanding SNR, excellent intermodulation characteristics
- ◆ High-end synthesizer with extremely low phase noise

High-end test receiver (model .33/43/53/63/73/89/93 + option R&S®EFA-B3)

- ◆ Outstanding SNR and improved intermodulation characteristics
- ◆ Rejection of image frequency and IF
- ◆ Two additional selective RF inputs (50 Ω and 75 Ω)
- ◆ Extended frequency range from 4.5 MHz to 1000 MHz



Contents Overview

Chapter Overview

Type Index

R&S Addresses



Test Receiver Family R&S®EFA – The family members, specific features

DTV

Model	Description	Features
40	DVB-T Test receiver	selective
43	DVB-T Test demodulator	broadband
50	ATSC/8VSB Test receiver	selective
53	ATSC/8VSB Test demodulator	broadband
60	DVB-C Test receiver	selective
63	DVB-C Test demodulator	broadband
70	ITU-T J.83/B Test receiver (US cable)	selective
73	ITU-T J.83/B Test demodulator (US cable)	broadband

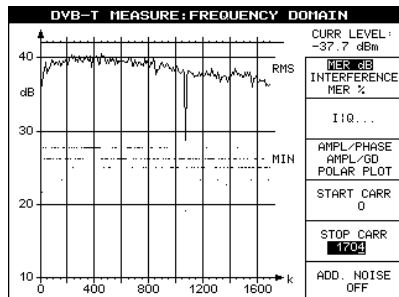
Analog TV

Model	Description	Features
12	Analog TV Test receiver	standard B/G, selective
33	Analog TV Test demodulator	standard B/G, broadband
78	Analog TV Test receiver	standard D/K or I, selective
89	Analog TV Test demodulator	standard D/K or I, broadband
90	Analog TV Test receiver	standard M/N NTSC/BTSC, selective
93	Analog TV Test demodulator	standard M/N NTSC/BTSC, broadband

Specific features

DVB-T

DVB-T Test Receiver R&S®EFA, fully compatible with the EN300744 standard, receives, demodulates, decodes and analyzes OFDM (orthogonal frequency division multiplex) signals.



MER as a function of the frequency is one of the most powerful measurements that the R&S®EFA can perform. It displays the MER for every QAM modulated carrier of the OFDM signal. At a glance, the overall quality of the transmitter under test can be measured.

With 'START CARR' and 'STOP CARR', any impaired QAM carrier in the OFDM signal can be quickly located. Co-channel interference can also be measured and displayed when an interference measurement is performed (interference-to-carrier measurement).

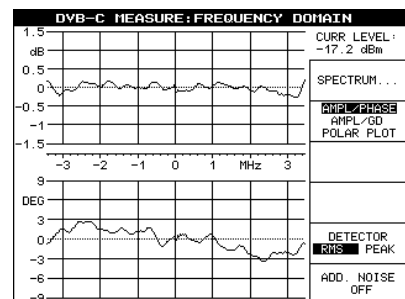
All key parameters for demodulating the receive signal can be selected automatically or manually:

- ◆ 6, 7 or 8 MHz operating bandwidth
- ◆ 2K or 8K OFDM modulation
- ◆ QPSK, 16QAM or 64QAM
- ◆ Constellation diagram
- ◆ 1/2, 2/3, 3/4, 5/6 or 7/8 code rate
- ◆ 1/4, 1/8, 1/16 or 1/32 guard interval
- ◆ $\alpha = 1, 2$ or 4 hierarchical demodulation
- ◆ Reed-Solomon error correction 204/188
- ◆ 6, 7z or 8 MHz SAW filter bandwidth (selectable)
- ◆ General measurement functions for
 - RF input level
 - Carrier frequency offset
 - Bit rate offset
 - BER (before Viterbi, before and after Reed-Solomon)
- ◆ In-depth measurement capabilities
 - OFDM parameter analysis
 - MER analysis over frequency
 - Q analysis over frequency
 - Frequency domain analysis (channel estimation)
 - Time domain analysis (impulse response and amplitude distribution)
 - History function

- ◆ Integrated noise generator for measurement of noise margin
- ◆ MPEG-2 transport stream output (serial or parallel)

DVB-C

Fully compatible with the DVB-C standard (EN300429), the R&S®EFA 60/63 models receive, demodulate, decode and analyze all orders of QAM (Quadrature Amplitude Modulated) signals.



The coefficients of the equalizer are used to display the amplitude and phase frequency response (shown here), the group delay (not shown here) and the polar plot representation.

The polar plot representation — which is the complex representation of amplitude and phase — may help to interpret very short echoes that are difficult to visualize on the echo pattern display.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



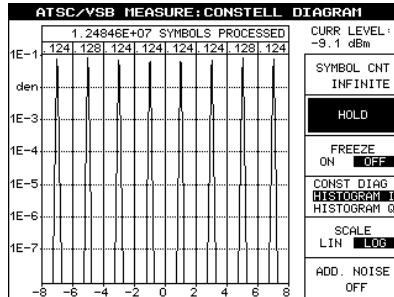
Test Receiver Family R&S®EFA – Specific features

All key parameters for demodulating the received signal can be automatically or manually selected:

- ◆ 6, 7 or 8 MHz bandwidth
- ◆ 4, 16, 32, 64, 128 or 256QAM modulation
- ◆ Variable symbol rate for special modulator tests and lab analysis (1 Msymbol/s to 6.999 Msymbol/s)
- ◆ Reed-Solomon error correction 203/187/8
- ◆ Optional SAW filter bandwidths: 6, 7, 8 MHz and 2 MHz
- ◆ General measurement functions for
 - RF input level
 - Carrier frequency offset
 - Bit rate offset
 - BER (before and after Reed-Solomon)
- ◆ In-depth measurement capabilities
 - QAM parameter analysis
 - Constellation diagram (including histogram function)
 - Eye monitoring
 - Frequency domain analysis (from equalization)
 - Spectrum analysis (including automatic shoulder attenuation measurement)
 - Time domain analysis (Echo pattern and amplitude distribution)
 - History function
- ◆ Integrated noise generator for measurement of noise margin
- ◆ Special function: invert spectrum feature
- ◆ MPEG-2 transport stream output (serial or parallel)

ATSC/8VSB

The ATSC/8VSB Test Receiver R&S®EFA, fully compatible with the ATSC Doc. A/53 standard, receives, demodulates,



Histogram I represents the distribution of the eight-level vestigial sideband modulation (8VSB) on the X axis, and can be expressed in a linear or logarithmic scale.

It allows an estimate of the interferer's origin (interferer, Gaussian noise, etc).

Hint: Check the position of the sync pulse (± 5), and check the impact on the distribution.

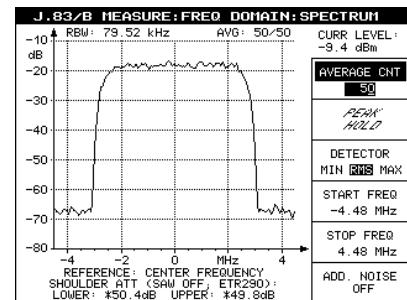
decodes and analyzes 8VSB (eight-level vestigial sideband) signals. All key parameters for demodulating the received signal can be automatically or manually selected:

- ◆ 8VSB modulation
- ◆ Trellis decoder (code rate 2/3)
- ◆ Fixed symbol rate for normal use (10.762238 Msymbol/s)
- ◆ Variable symbol rate for special modulator tests and lab analysis (2 Msymbol/s to 11 Msymbol/s)
- ◆ Reed-Solomon error correction 207/187/10
- ◆ Optional SAW filter bandwidths: 6 MHz, 8 MHz and 2 MHz
- ◆ General measurement functions for
 - RF input level
 - Carrier frequency offset
 - Bit rate offset
 - BER (before and after Reed-Solomon)
- ◆ In-depth measurement capabilities
 - 8VSB parameter analysis
 - Constellation diagram (including histogram function)

- Eye monitoring
- Frequency domain analysis (from equalization)
- Spectrum analysis (including automatic shoulder attenuation measurement according to FCC rec.)
- Time domain analysis (Ghost pattern and amplitude distribution)
- History function
- ◆ Integrated noise generator for measurement of noise margin
- ◆ MPEG-2 transport stream output (serial or parallel)
- ◆ Additional SMPTE310M MPEG-2 transport stream output

ITU-T J.83/B (US cable)

Fully compatible with the ITU-T J.83/B standard, the R&S®EFA 70/73 models receive, demodulate, decode and analyze 64QAM or 256QAM (quadrature amplitude modulated) signals.



Thanks to this integrated feature, a separate spectrum analyzer is not required anymore.

All basic spectrum analyzer functions are provided: start/stop frequency (or center/span) and several detection and averaging modes.

All key parameters for demodulating the received signal can be automatically or manually selected:

- ◆ 64QAM or 256QAM modulation
- ◆ Trellis decoder (code rate 14/15 for 64QAM and 19/20 for 256QAM)



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Test Receiver Family R&S®EFA – Specific features

- ◆ Fixed symbol rate for normal use (5.056941 Msymbol/s for 64QAM and 5.360537 Msymbol/s for 256QAM)
- ◆ Variable symbol rate for special modulator tests and lab analysis (1 Msymbol/s to 6999 Msymbol/s)
- ◆ Reed-Solomon error correction 128/122/3
- ◆ Optional SAW filter bandwidth: 6 MHz, 8 MHz and 2 MHz
- ◆ General measurement functions for
 - RF input level
 - Carrier frequency offset
 - Bit rate offset
 - BER (before and after Reed-Solomon)
- ◆ In-depth measurement capabilities
 - QAM parameter analysis
 - Constellation diagram (including histogram function)
 - Eye monitoring
 - Frequency domain analysis (from equalization)
 - Spectrum analysis (including automatic shoulder attenuation measurement)
 - Time domain analysis (Ghost pattern and amplitude distribution)
 - History function
- ◆ Integrated noise generator for measurement of noise margin
- ◆ MPEG-2 transport stream output (serial or parallel)

Analog TV

Fully compatible with analog standards, the analog R&S®EFA models receive and demodulate the analog TV standards B/G, D/K and I.

NYOU FM MEASURE			
SET RF	CHANNEL	ATTEN : 15 dB	STANDARD
503.25 MHz	25	84.2 dBuV	B/G
VISION CARRIER:			
LEVEL		84.2 dBuV	
SET RF	503.250000 MHz		
MEASURED RF	503.250000 MHz		
CONTROLLED RF	503.250000 MHz		
VIDEO LEVEL		100 %	
SOUND CARRIER:			
VISION/SOUND1 CARRIER RATIO		12.9 dB	
VISION/SOUND2 CARRIER RATIO		20.1 dB	
INTERCARRIER1 FREQUENCY	5.5345 MHz		
INTERCARRIER2 FREQUENCY	5.7476 MHz		
FM DEVIATION SOUND1	27.2 kHz		
FM DEVIATION SOUND2	31.2 kHz		
FM DEVIATION PILOT AVERAGE	2.54 kHz		
PILOT FREQUENCY	54.888 kHz		
PILOT		DUAL SOUND	

All parameters for the demodulated standard B/G TV channel are displayed on a single screen and can be checked at a glance:

- Vision carrier level
- Video modulation depth
- Sound intercarrier measurements
- Vision/sound level ratio
- Sound 1 & 2 FM deviation
- Pilot decoding

All key parameters for demodulating the received signal can be automatically or manually selected:

- ◆ Switchable group delay correction
- ◆ Switchable synchronous detector (5 different modes)
- ◆ Demodulation using intercarrier method
- ◆ Balanced audio outputs
- ◆ Measurement functions for
 - vision/sound carrier spacing (level and frequency)
 - FM sound carrier and pilot deviation
 - RPC (Residual Picture Carrier) or video modulation depth

Analog TV standard M/N NTSC/BTSC

Fully compatible with the FCC standard, the R&S®EFA 90/93 models receive and demodulate any analog TV signals to standard M/N (NTSC/BTSC and PAL).

NTSC/BTSC MEASURE			
SET RF	CHANNEL	ATTEN : 20 dB	STANDARD
61.25 MHz	3	90.7 dBuV	M/N
VISION CARRIER:			
LEVEL		90.7 dBuV	
MODULATION DEPTH		68.9 %	
BAR AMPLITUDE		79.2 IRE	
SYNC AMPLITUDE		31.0 IRE	
VIDEO AMPLITUDE		110.2 IRE	
SOUND CARRIER:			
VISION / SOUND CARRIER RATIO		12.9 dB	
FM DEVIATION MAIN CHANNEL		31.1 kHz	
FM DEVIATION BTSC CHANNEL		44.8 kHz	
FM DEVIATION MTS PILOT		5.38 kHz	
MULTICHANNEL TV SOUND		STEREO + SAP	

All parameters for the demodulated standard M/N TV channel are displayed on a single screen and can be checked at a glance:

- Vision carrier level
- Video modulation depth
- Bar/sync/video amplitudes (expressed in IRE)
- Vision/sound level ratio
- Main and BTSC channel FM deviation
- FM deviation of MTS pilot
- Sound mode indication (Mono, Stereo, SAP)

All key parameters for demodulating the received signal can be automatically or manually selected:

- ◆ Switchable group delay correction
- ◆ Switchable envelop or synchronous detector (5 different modes)
- ◆ Demodulation using intercarrier or split carrier method
- ◆ Integrated BTSC/MTS decoder
- ◆ Balanced audio outputs
- ◆ Measurement functions for
 - vision/sound carrier spacing (level)
 - FM sound carrier and MTS pilot deviation
 - RPC (Residual Picture Carrier) or video modulation depth



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Test Receiver Family R&S®EFA – Options overview

Option	Description
Hardware	
NICAM demodulator/decoder (R&S®EFA-B2)	<ul style="list-style-type: none"> Demodulation and decoding of signals to NICAM-728 standard Measurement parameters: bit error ratio, eye height, clock and data jitter I and Q signal output
MPEG-2 decoder (R&S®EFA-B4)	<ul style="list-style-type: none"> Real-time analysis to ETR 101290 Error report Video and audio output
Video distributor (R&S®EFA-B6)	<ul style="list-style-type: none"> 2 video outputs on front panel, 2 video outputs on rear panel 1 additional Q output on front panel
Switchable sound trap (R&S®EFA-B7)	<ul style="list-style-type: none"> Only available for standard B/G (R&S®EFA models .12/33) Allows video bandwidth measurements up to 6 MHz
OFDM demodulator (R&S®EFA-B10)	<ul style="list-style-type: none"> Option for analog R&S®EFA models DVB-T demodulation, according to EN 300 744
6 MHz SAW filter (R&S®EFA-B11)	<ul style="list-style-type: none"> Adjacent-channel rejection Meets US requirements
7 MHz SAW filter (R&S®EFA-B12)	<ul style="list-style-type: none"> Designed to DVB-T standards Adjacent-channel rejection Meets European and Australian standards
8 MHz SAW filter (R&S®EFA-B13 model .02)	<ul style="list-style-type: none"> Designed to DVB-T standards Adjacent-channel rejection Meets European standards
8 MHz SAW filter (R&S®EFA-B13 model .03)	<ul style="list-style-type: none"> Adjacent-channel rejection Meets European and US standards, recommended for spectrum measurement
2 MHz SAW filter (R&S®EFA-B14)	<ul style="list-style-type: none"> Adjacent-channel rejection Meet channel return requirements
Digital demodulator platform (R&S®EFA-B20)	<ul style="list-style-type: none"> Upgrade for analog R&S®EFA models Supporting DVB-C demodulation (with option R&S®EFA-K21), ATSC/8VSB demodulation (with option R&S®EFA-K22), ITU-T J.83/B demodulation (with option R&S®EFA-K23) Included in basic R&S®EFA 50/53/60/63/70/73 models
Software	
DVB-C firmware (R&S®EFA-K21)	<ul style="list-style-type: none"> Analysis, demodulation and monitoring of DVB-C signals according to EN 300 429 standard Included in basic R&S®EFA 60/63 models
ATSC/8VSB firmware (R&S®EFA-K22)	<ul style="list-style-type: none"> Analysis, demodulation and monitoring of ATSC/8VSB signals according to ATSC Doc. A/53 Included in basic R&S®EFA 50/53 models Additional SMPTE310M MPEG-2 transport stream output
ITU-T J.83/B firmware (R&S®EFA-K23)	<ul style="list-style-type: none"> Analysis, demodulation and monitoring of American digital cable signals according to ITU-T J.83/B standard Included in basic R&S®EFA 70/73 models
FIR coefficient readout firmware (R&S®EFA-K25)	<ul style="list-style-type: none"> Output of FIR coefficients of the equalizer Available for R&S®EFA 50/53 or option R&S®EFA-B20 with R&S®EFA-K22 Coefficient file transfer via RS-232-C interface
M/N NTSC/BTSC demodulator (R&S®EFA-B30)	<ul style="list-style-type: none"> Meets FCC requirements (group delay correction) Switchable sound trap Switchable group delay correction Switchable synchronous or envelope detector Integrated BTSC/MTS decoder



Contents Overview

Chapter Overview

Type Index

R&S Addresses



TV Test Receiver Family R&S® EFA – Specifications, ordering information

Specifications

You will find detailed and binding data on the enclosed CD (./DATASHEET/EFA.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: EFA

Ordering information

DTV

DVB-T Test Receiver¹⁾		
Selective, constellation diagram, output MPEG-2 data stream	R&S®EFA40	2067.3004.40
DVB-T Test Demodulator¹⁾		
Broadband, constellation diagram, output MPEG-2 data stream	R&S®EFA43	2067.3004.43
ATSC/8VSB Test Receiver¹⁾		
Selective, constellation diagram, output MPEG-2 data stream	R&S®EFA50	2067.3004.50
ATSC/8VSB Test Demodulator¹⁾		
Broadband, constellation diagram, output MPEG-2 data stream	R&S®EFA53	2067.3004.53
DVB-C Test Receiver¹⁾		
Selective, 4/16/32/64/128/256QAM, output MPEG-2 data stream, constellation diagram	R&S®EFA60	2067.3004.60
DVB-C Test Demodulator¹⁾		
Broadband, 4/16/32/64/128/256QAM, output MPEG-2 data stream, constellation diagram	R&S®EFA63	2067.3004.63
ITU-T J.83/B Test Receiver¹⁾		
Selective, 4/16/32/64/128/256QAM, output MPEG-2 data stream, constellation diagram	R&S®EFA70	2067.3004.70
ITU-T J.83/B Test Demodulator¹⁾		
Broadband, 4/16/32/64/128/256QAM, output MPEG-2 data stream, constellation diagram	R&S®EFA73	2067.3004.73

¹⁾ Note: please fill in configuration sheet (available from your local representative) so that your test receiver/demodulator can be tailored to your requirements.

ANALOG TV

TV Test Receiver¹⁾		
Standard B/G, dual sound, IF 38.9 MHz, RF 45 MHz to 860 MHz, selective	R&S®EFA12	2067.3004.12
TV Test Demodulator¹⁾		
Standard B/G, dual sound, IF 38.9 MHz, RF 45 MHz to 1000 MHz, broadband	R&S®EFA33	2067.3004.33

TV Test Receiver¹⁾		
Standard D/K, or I (mono), IF 38.9 MHz, RF 45 MHz to 860 MHz, selective	R&S®EFA78	2067.3004.78
TV Test Demodulator¹⁾		
Standard D/K or I (mono), IF 38.9 MHz, RF 45 MHz to 1000 MHz, broadband	R&S®EFA89	2067.3004.89
TV Test Receiver¹⁾		
Standard M/N, mono, selective, RF 45 MHz to 860 MHz, IEEE bus	R&S®EFA90	2067.3004.90
TV Test Demodulator¹⁾		
Standard M/N (mono), broadband, RF 45 MHz to 1000 MHz, IEEE bus	R&S®EFA93	2067.3004.93

¹⁾ Note: please fill in configuration sheet (available from your local representative) so that your test receiver/demodulator can be tailored to your requirements.

Accessories supplied	Lemo Triax adapter to XLR stereo (only when audio signals are available), power cable, operating manual	
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Options		
NICAM Demodulator Std. B/G, D/K	R&S®EFA-B2	2067.3610.02
NICAM Demodulator Standard I	R&S®EFA-B2	2067.3610.04
RF Selection for Demodulator	R&S®EFA-B3	2067.3627.02
MPEG-2 Decoder	R&S®EFA-B4	2067.3633.02
Video Distributor	R&S®EFA-B6	2067.3656.02
Switchable Sound Trap (only R&S®EFA12/33)	R&S®EFA-B7	2067.3710.02
COFDM Demodulator (for analog TV units)	R&S®EFA-B10	2067.3740.02
Digital Demodulator Platform (for analog TV units)	R&S®EFA-B20	2067.3585.02
Std. M/N Demodulator (for digital units)	R&S®EFA-B30	2067.3556.02
6 MHz SAW Filter (for digital units)	R&S®EFA-B11	2067.3691.00
7 MHz SAW Filter (for digital units)	R&S®EFA-B12	2067.3591.00
8 MHz SAW Filter (for DVB-T digital units)	R&S®EFA-B13	2067.3579.02
8 MHz SAW Filter (for DVB-C/ATSC/J83/B units)	R&S®EFA-B13	2067.3579.03
2 MHz SAW Filter (for digital units)	R&S®EFA-B14	2067.3562.00
DVB-C Firmware (for R&S®EFA5x/7x or R&S®EFA-B20)	R&S®EFA-K21	2067.4000.02
ATSC/8VSB Firmware (for R&S®EFA6x/7x or R&S®EFA-B20)	R&S®EFA-K22	2067.4017.02
J.83/B Firmware (for R&S®EFA5x/6x or R&S®EFA-B20)	R&S®EFA-K23	2067.4023.02
FIR Coefficient Readout Firmware (for R&S®EFA5x or R&S®EFA-B20 and R&S®EFA-K22)	R&S®EFA-K25	2067.4046.02
Extras		
Measurement Software EFA-SCAN	R&S®EFA-K1	2067.9202.02
R&S®EFA Calibration values	R&S®EFA-DCV	2082.0490.09
R&S®EFA-B4 Calibration values	R&S®EFA-DCV	2082.0490.15
19" Adapter	R&S®ZZA-93	0396.4892.00
Lemo Triax connector (mono) with connecting cable (open)		2067.7451.00
Service manual	R&S®ERST.2	2068.0950.24
Bag for units 19", 3 HU, depth 460 mm	R&S®ZZT-314	1001.0523.00



Contents Overview

Chapter Overview

Type Index

R&S Addresses



Measurement Software EFA-SCAN R&S®EFA-K1



User Field	Channel 32	Channel 33	Channel 34	Channel 35	Channel 36	Channel 37
Center Frequency (MHz)	394,0000000	402,0000000	410,0000000	418,0000000	426,0000000	434,0000000
Symbol Rate (MSymb/s)	6,9000000	6,9000000	6,9000000	6,9000000	6,9000000	6,9000000
Status	Done	Done	Done	Done	Done	Done
Time Stamp	24.06.2003 15:40:27	24.06.2003 15:42:52	24.06.2003 15:45:18	24.06.2003 15:47:34	24.06.2003 15:50:00	24.06.2003 15:52:24
RF Level (dBm)	-56,6	-57,3	-57,4	-51,1	-57,6	-57,7
Frequency Offset (Hz)	-421,6	926,5	-475,8	---	-935,9	277,8
Symbol Rate Offset (Hz)	5	0,8	3	---	12,1	3,2
BER before RS	0,00E+00 (391/1000)	1,40E-09 (390/1000)	0,00E+00 (392/1000)	---	0,00E+00 (388/1000)	0,00E+00 (386/1000)
BER after RS	0,00E+00 (401/1000)	0,00E+00 (399/1000)	0,00E+00 (402/1000)	---	0,00E+00 (397/1000)	0,00E+00 (395/1000)
Packet Err Ratio	0,00E+00 (401/1000)	0,00E+00 (403/1000)	0,00E+00 (402/1000)	---	0,00E+00 (401/1000)	0,00E+00 (395/1000)
Packet Err / s	0	0	0	---	0	0
TS Bitrate (Mbit/s)	38,153	38,153	38,153	---	38,153	38,153
10 MHz Ref Sync	OK	OK	OK	OK	OK	OK
Carrier Loop Sync	OK	OK	OK	UNSYNC	OK	OK
MPEG TS Sync	OK	OK	OK	UNSYNC	OK	OK
Ampl. Response (dB)	1,03	1,5	1,41	---	0,83	1,05
Phase Response (°)	9,5	9,4	8,9	---	8,9	8,5
Group Delay (µs)	0,0765	0,0709	0,0708	---	0,0573	0,0668
Shoulder Lower (dB)	---	---	---	---	---	---
Shoulder Upper (dB)	---	---	---	---	---	---
Crest Factor - Margin (dB)	12,8	12,8	12,8	12,2	12,8	12,8
Crest Factor - Max (dB)	11,2	11,2	11,2	11	11,3	11,3
Crest Factor - Current (dB)	11,2	11,2	11,2	11	11,3	11,3
Echo Pattern Attn. 1 (dB)	-36,7	---	---	---	---	---
Echo Pattern Delay 1 (µs)	0,59	---	---	---	---	---
Echo Pattern Attn. 2 (dB)	---	---	---	---	---	---
Echo Pattern Delay 2 (µs)	---	---	---	---	---	---
I/Q Ampl. Imbal. (%)	0,01	0,01	0	---	0	0
I/Q Quad. Error (°)	0	0	0	---	0	0
Carrier Suppression (dB)	>60	>60	>60	---	>60	>60
Phase Jitter (° RMS)	0,17	0,16	0,12	---	0,22	0,15
S/N (dB)	33,9	33,4	33,8	---	30,5	33,5
MER (dB RMS)	33,6	33,1	33,4	---	30,2	33,2
Sync Errors (%)	0,0	0,0	0,0	100,0	0,0	0,0

FIG 1: Table for displaying the measurement values (in this case, R&S®EFA6x)

Fast recording and documentation of measurement values for the digital Test Receivers R&S®EFA

Brief description

Recording entire measurement sequences (e.g. at a cable headend) can be very time-consuming, which means that users immediately start looking for a solution that will save them time and effort. Such a solution has now been developed specifically for the digital models .2x, .4x, .5x, .6x and .7x of the R&S®EFA test receiver family – it is called R&S®EFA-K1.

The software runs on any PC under Windows98/NT/2000 or XP. The connection between the PC and the Test Receiver R&S®EFA can be set up via the RS-232-C interface or the IEC/IEEE bus. Another option is the use of a terminal server to establish the connection via LAN/WAN (FIG 2).



Contents Overview

Chapter Overview

Type Index

R&S Addresses



Measurement Software EFA-SCAN R&S®EFA-K1

Main features

- ◆ Repeated measurements in any number of loops
- ◆ Run mode (frequency scan)
- ◆ Snapshot mode
- ◆ Saving of measurement values to a file
- ◆ Use for R&S®EFA2x/4x/5x/6x/7x
- ◆ PC connection via RS-232-C, IEC/IEEE bus or TCP/IP
- ◆ For Windows98/NT/2000 and XP

Operation

The sequence of registers in the entry dialog specifies the steps that need to be carried out one after the other. After the interface and model have been selected, a dialog window appears for defining the measurement task at hand. First, the default setting of the receiver is determined, e.g. bandwidth, SAW filter or signal input.

In the next step, the user must enter the frequencies at which the measurements are to be performed. The measurement parameters are then defined in a list that depends on the model and standard. The user can decide for each measurement

parameter whether the measurand is only to be displayed and/or also stored to a file.

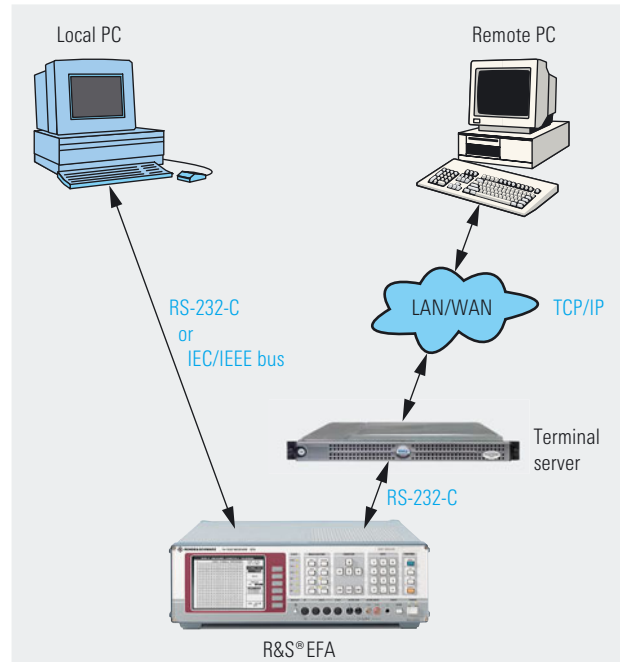
Two measurement modes

The measurements are started at a key-stroke. Two modes are offered: In the Snapshot mode, the previously defined frequency list is processed just once; in the Run mode, it is cyclically performed

until the measurements are explicitly stopped. The measurement values thus obtained are displayed in tables for each frequency (FIG 1).

The measurement values to be stored are saved in CSV format (comma-separated values) which is a commonly used file format enabling data to be ported to Excel or a database, for example.

FIG 2: Connecting options between PC and R&S®EFA.



Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/EFA-K1.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: EFA-K1

Ordering information

Measurement Software EFA-SCAN	R&S®EFA-K1	2067.9202.02
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Contents Overview

Chapter Overview

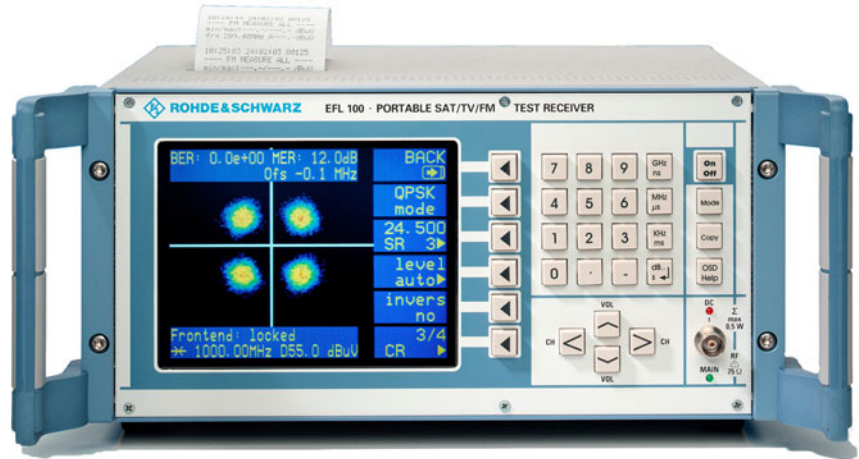
Type Index

R&S Addresses



Portable SAT/TV/FM Test Receiver R&S®EFL 100

Measurement features for analog TV, digital TV and FM radio in a single unit



Brief description

A cost-efficient, mobile solution for installing, checking and maintaining transmitters, antennas and signal distribution equipment is needed. The Test Receiver R&S®EFL 100 meets all requirements. In many cases, the R&S®EFL 100 is also the ideal complement to a high-end TV test receiver used for more in-depth signal analysis.

Depending on the specific requirements, users can choose between three models. With the fully equipped model .04 of the R&S®EFL 100, detailed quality measurements of DVB-C, DVB-S and DVB-T signals can be carried out along with level measurements of analog and digital TV, FM radio and satellite reception signals.

Main features

- ◆ Easily portable due to compact, robust design and integrated battery
- ◆ User-friendly interface for fast measurements
- ◆ Built-in printer for documentation of measurement results and spectrum
- ◆ On-screen TV picture
- ◆ Control signals for LNBs of satellite antennas

All models at a glance

	Model .02	Model .03	Model .04
Equipment	Basic model, analog	Model .02 + QAM/QPSK	Model .03 + DVB-T
Analog TV/FM basic module	✓	✓	✓
QPSK/QAM module		✓	✓
DVB-T module			✓
MPEG-2 decoder module		✓	✓
Return path module		✓	✓
MPEG-2 TS parallel output		✓	✓
SCART connector	✓	✓	✓
Modem connector	✓	✓	✓
Earphone connector	✓	✓	✓
12 V DC input		✓	✓
LNB control	✓	✓	✓
Features			
Signal level min./max.	✓	✓	✓
S/N measurement (video)	✓	✓	✓
NICAM audio	✓	✓	✓
Spectrum representation via monitor and printer	✓	✓	✓
Scope function	✓	✓	✓
DVB carrier level	✓	✓	✓
BER		✓	✓
MER		✓	✓
Constellation diagram		✓	✓
Analog TV program on screen	✓	✓	✓
DVB program on screen (free TV)		✓	✓
Memory for 100 settings	✓	✓	✓
Teletext	✓	✓	✓
Date and time	✓	✓	✓



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Portable SAT/TV/FM Test Receiver R&S®EFL 100

Description

The R&S®EFL 100 has been developed for the standards B/G, D/K, I, L, M, N, M Korea, M Japan and NICAM. The video signal can be processed and reproduced in line with the colour TV standards PAL, SECAM and NTSC.

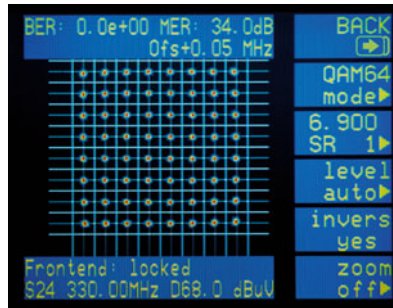
Four different detectors for peak, average, maximum and minimum values are available for level measurements of analog and digital signals. Correction values are determined by the level calibration of the R&S®EFL 100 and stored in a memory. This allows precise level measurements to be performed with the R&S®EFL 100.

The front-panel display provides a bar-graph that helps the user to locate transmitters. In addition, a level-dependent acoustic tracking signal simplifies antenna alignment without requiring a look at the screen.

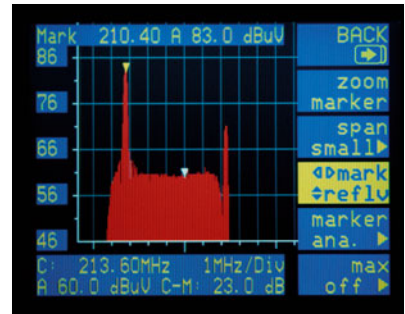
The LNB (low-noise block) supply voltage is 10 V DC to 20 V DC for max. 500 mA in increments of 0.1 V DC. For control of the receiving system, the 22 kHz signal as well as the commands for DiSEqC 2.0, UFO μ -DiSEqC or V-SEC can be produced.

Level values, frequencies and the entire frequency spectrum can be printed out via the integrated dot-matrix printer.

The R&S®EFL 100 comes with a built-in battery. The battery is rechargeable via the integrated power supply unit.



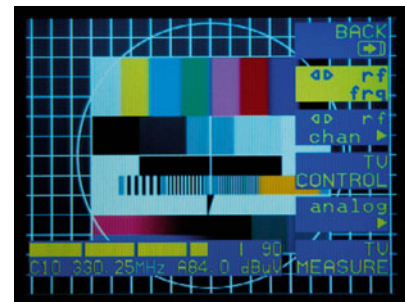
Constellation diagram of a QAM64 signal



RF spectrum of an analog TV signal



OFDM parameters



On-screen TV picture

Specifications

You will find detailed and binding data on the enclosed CD (./DATASHEET/EFL100.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: EFL100

Ordering information

Portable SAT/TV/FM Test Receiver		
Analog	R&S®EFL 100	2111.2055.02
Analog, DVB-C, DVB-S, MPEG-2, Return path	R&S®EFL 100	2111.2055.03
Analog, DVB-C, DVB-S, DVB-T, MPEG-2, Return path	R&S®EFL 100	2111.2055.04
Options		
Measuring Amplifier with FM Filter	R&S®EFL 100-Z3	2111.2132.02
Measuring Amplifier	R&S®EFL 100-Z4	2111.2149.02
Extras		
Leather Bag	R&S®EFL 100-Z1	2111.2103.00
Antiglare Device	R&S®EFL 100-Z2	2111.2110.00



Contents Overview

Chapter Overview

Type Index

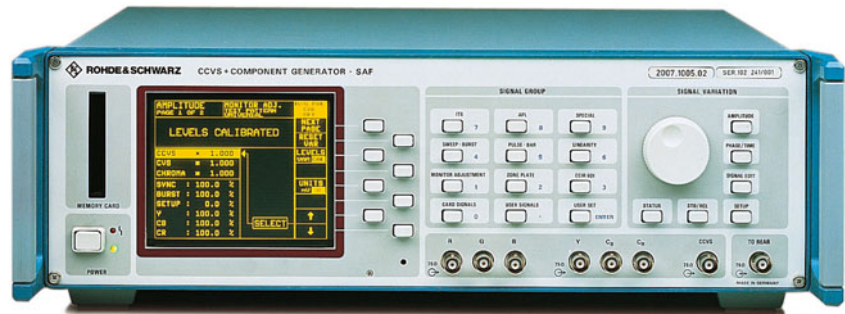
R&S Addresses



CCVS+Component Generator R&S®SAF, CCVS Generator R&S®SFF

R&S®SAF:**CCVS, $Y_C C_R$, RGB, S-VHS****R&S®SFF: CCVS**

Multi-standard generators for all TV applications; optionally PALplus and ITU-R BT. 601

**R&S®SAF****Brief description**

TV Generators R&S®SAF and R&S®SFF are two multistandard instruments (B G/PAL, M/NTSC, M/PAL, N/PAL) suitable for all applications in the field of television. CCVS+Component Generator R&S®SAF are applied to three D/A converters. An analog matrix converts the three components into the RGB format. Therefore the RGB signals are made available simultaneously with the $Y_C C_R$ components. The digital CCVS in R&S®SAF and R&S®SFF is determined from the $Y_C C_R$ components in realtime with the aid of two LSI gate arrays.

R&S®SAF and R&S®SFF also generate all test signals to ITU-R Rec. 801, a number of common pathological test signals, and shallow ramps with a resolution of 10 bits. The PALplus test pattern option provides all PALplus reference signals and the bits required for wide screen signalling (WSS).

Both generators afford extensive signal variations via softkey-controlled menus. Such amplitude and phase adjustments of signal components enable testing of gain controls, white-level limiting circuits and video analyzers over the whole range of the devices. User-specific signals can be defined by front-panel entry and stored in the generator or on a memory card.

Function

The generator section is of digital design. A transputer – a high-speed RISC processor – calculates the three components Y, C_B and C_R of all test signals which in CCVS+Component Generator R&S®SAF are applied to three D/A converters. An analog matrix converts the three components into the RGB format. Therefore the RGB signals are made available simultaneously with the $Y_C C_R$ components. The digital CCVS in R&S®SAF and R&S®SFF is determined from the $Y_C C_R$ components in realtime with the aid of two LSI gate arrays.

Digital Video Interface R&S®SAF-Z1

The optional Digital Video Interface R&S®SAF-Z1 upgrades the R&S®SAF and R&S®SFF for use in digital TV studios. In addition to the analog video signals, a parallel and two serial digital video signals are thus simultaneously available.

Main features

- ◆ Clear menu-guided operation on large-size EL display
- ◆ 12 signal groups with up to 8 signal menu pages each; each page may contain 7 signals
- ◆ Superposition of hum, sweep, noise or other signals with different clamping modes

- ◆ APL and bounce signals with preselectable parameters
- ◆ Insertion of external test signals such as teletext or data lines
- ◆ Free programming of test-line coding and monitoring
- ◆ Entry of texts as source identification or scrolling text
- ◆ Program monitoring + substitution pattern
- ◆ System compatibility and full remote control capability (IEC625/IEEE488 bus)
- ◆ Definition of customer-specific signals by "Signal Edit" via the front panel
- ◆ Zone-plate signals, 8 coefficients freely selectable



Contents Overview

Chapter Overview

Type Index

R&S Addresses



CCVS+Component Generator R&S®SAF, CCVS Generator R&S®SFF

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/SAF.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: SAF, SFF

Ordering information

CCVS+Component Generator	R&S®SAF	2007.1005.02
CCVS Generator	R&S®SFF	2007.1057.02
Options		
Digital Video Interface	R&S®SAF-Z1	2007.1063.02
	R&S®SFF-Z1	2007.1063.03
PALplus Test Pattern for R&S®SAF and R&S®SFF	R&S®SAF-B20	2007.1011.02
Calibration Data Documentation	R&S®SAF-DCV	2082.0490.02
	R&S®SAF-DCV	2082.0490.03
Extras		
32 kbyte Memory Card	R&S®ZM-32	2005.4394.02
512 kbyte Memory Card	R&S®ZM-512	2005.4388.02
Service Kit	R&S®SAF-Z	2007.1111.00
	R&S®SFF-Z	2007.1105.00



Contents Overview

Chapter Overview

Type Index

R&S Addresses

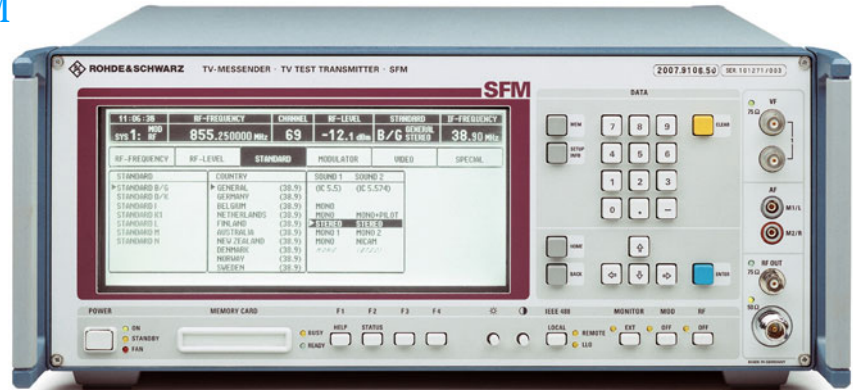


TV Test Transmitter R&S®SFM

5 MHz to 1000 MHz

Vision and sound signals

for all common analog AM TV standards



Brief description

TV Test Transmitter R&S®SFM supplies vision and sound signals to all common TV standards for the IF (32 MHz to 46 MHz) and RF ranges (5 MHz to 1000 MHz).

Thanks to a very flexible modular concept based on plug-ins, R&S®SFM is the compact solution for all analog applications in development, production and servicing. Each R&S®SFM frame can accommodate up to ten plug-ins so that standards B/G, D/K, I, L/L', M and N can be implemented in a single R&S®SFM.

R&S®SFM is ideal for use in EMC measurements: In Europe, EMC requirements are set down in special regulations and laws. Full compliance with prescribed limits is a prerequisite for certification with the European conformity mark CE.

For the American BTSC method, a multiplex signal with a frequency of up to 120 kHz can be applied. The frequency

deviation and output level of the sound carriers are also set automatically as per standard.

Many parameters for the vision, NICAM and sound modulators can be set to non-standard values. The display outputs a warning that non-standard parameters are being used; however, compliance with the appropriate standard can be restored with a single keystroke.

Main features

- ◆ Generation of TV signals to standards B/G, D/K, I, L/L', M and N, including stereo/dual sound and digital sound (NICAM)
- ◆ Double-sideband test modulator for all IFs between 32 MHz and 46 MHz
- ◆ Internal audio generator, stereocoder and NICAM generator
- ◆ High frequency resolution of 1 Hz for precision offset
- ◆ Frequency locking for all oscillators

Operation

R&S®SFM outputs all information on a large LCD graphics display; if required an external monitor can be connected. The display is divided into different areas. The currently valid key setting parameters are displayed in the top half, these being frequency, TV channel, output level and the selected standard with the associated vision IF. Below there is the main selection line with menus such as frequency, level and standard. A special menu enables intermodulation measurements and sweep mode to be selected.

R&S®SFM is equipped with an IEC/IEEE-bus interface to SCPI and an RS-232-C interface. Thanks to a PC card interface, complete setups can be loaded from or to a memory card. Software updates can be carried out via the serial interface or memory-card interface.



Contents Overview

Chapter Overview

Type Index

R&S Addresses



TV Test Transmitter R&S®SFM

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/SFM.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: SFM

Ordering information

TV Test Transmitter		
Basic Unit with vision modulator and FM modulator sound 1, without upconverter	R&S®SFM	2007.9106.10
Basic Unit with vision modulator and FM modulator sound 1, with upconverter 5 MHz to 1000 MHz, 50 Ω	R&S®SFM	2007.9106.50
Basic Unit with upconverter 5 MHz to 1000 MHz, 50 Ω, without vision/sound modulator	R&S®SFM	2007.9106.90
Options		
Multistandard Plug-In	R&S®SFM-B7	2008.0248.02
Sound Modulator 2 (switchable FM/AM), including dual-sound coder (IRT)	R&S®SFM-B9	2008.0183.02
QPSK Sound Modulator for NICAM 728 with internal NICAM generator	R&S®SFM-B10	2008.0302.02
RF Output 75 Ω (switchable)	R&S®SFM-B16	2007.9212.02



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



TV Test Transmitter R&S®SFL

5 MHz to 1.1 GHz/3.3 GHz

Digital signals for use in production



TV Test Transmitter R&S®SFL

Brief description

The TV Test Transmitter Family R&S®SFL is a complete solution for testing digital TV receivers and integrated receiver modules, as well as for testing digital TV links for broadcasting via terrestrial antennas and cable. It covers all main standards currently used worldwide as well as those to be introduced soon.

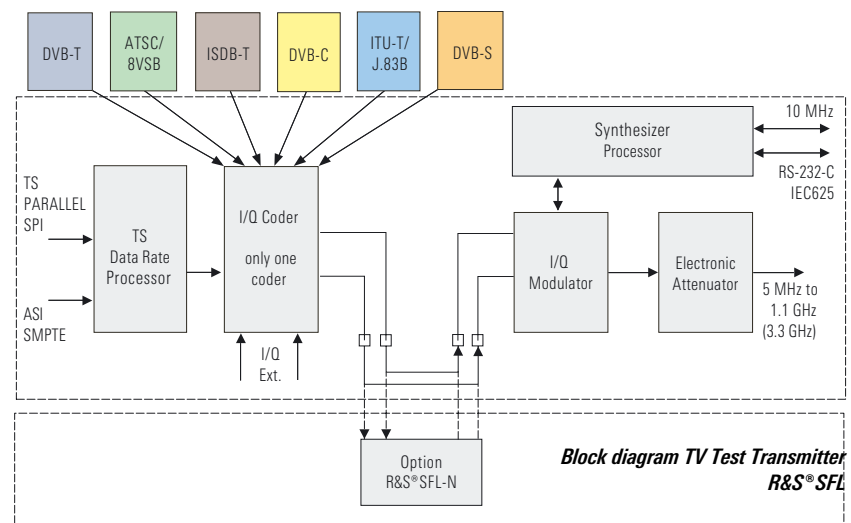
The standard-conformant test signals exhibit a high level of precision. To determine the full functionality and the performance of your products at their limits, the test signal parameters can be varied within a wide range and provided with predefined errors. Realistic transmission/reception conditions can be reproducibly simulated with the aid of the noise generator option.

- ◆ Different optimized models:
 - R&S®SFL-T for standard DVB-T
 - R&S®SFL-V for standard ATSC/8VSB
 - R&S®SFL-I for standard ISDB-T (Japan)
 - R&S®SFL-C for standard DVB-C
 - R&S®SFL-J for standard ITU-T/J.83B (US cable)
 - R&S®SFL-S for standard DVB-S, DVB-DSNG

- ◆ Antenna DVB-T
 - 2K- and 8K-COFDM
 - 6 MHz, 7 MHz and 8 MHz
 - QPSK, 16QAM, 64QAM
- ◆ Antenna ATSC
 - 8VSB
- ◆ Antenna ISDB-T
 - mode 1, 2, 3 (2K, 4K, 8K)
 - max. 3 layer (A, B, C)
 - 13 segments per layer (selectable)
- ◆ Cable DVB-C
 - 16-, 32-, 64-, 128-, 256-QAM
- ◆ Cable ITU-T/J.83B (US cable)
 - 64 QAM, 256 QAM
 - Data interleaver level 1 and level 2
- ◆ Satellite DVB-S, DVB-DSNG
 - QPSK
 - 8PSK
 - 16-QAM

Main features

- ◆ Wide frequency range 5 MHz to 1.1 GHz or 3.3 GHz
- ◆ Large level range for transmission and receiver measurements
- ◆ Wear-free electronic attenuator
- ◆ Fast setting times
- ◆ Operating parameters modifiable
- ◆ Special signals and error signals
- ◆ Sweep mode for frequency and level
- ◆ Status menu for overview of settings
- ◆ Storage of instrument settings
- ◆ List function for automatic command sequence, e.g. measurement of frequency and amplitude response
- ◆ Online help
- ◆ IEC625/IEEE bus, RS-232-C
- ◆ Software update via RS-232-C



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



TV Test Transmitter R&S®SFL

Applications

The high signal quality and the versatile parameter variation capabilities make the R&S®SFL family ideally suited as a standard signal generator for use in production environments. The wide output frequency range allows testing beyond the limits defined by the relevant standard. The benefit of the large level range is that, on the one hand, the functional limits of LSI circuits can be quickly determined and recorded during production; on the other hand, it is easy to simulate a receive link for a TV receiver.

The operating parameters (e.g. roll-off, puncturing, QPSK mode, QAM mode, pilot level, interleaver level, etc) can easily be varied even beyond the limits defined by the relevant standard.

A number of special signals or signals with predefined errors are provided in order to determine the true functional limits or to quickly detect malfunctions; it is also possible to switch off signal characteristics defined in the standard or partial signal functions (e.g. modulation, individual carriers and groups of carriers, pilot, etc).

Irrespective of the model, a sweep mode is available for the total frequency range, as well as an external I/Q input for signals with external coding.

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/SFL.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: SFL

Ordering information

TV Test Transmitter		
DVB-S/-DSNG	R&S®SFL-S	2084.4005.10
DVB-C	R&S®SFL-C	2084.4005.15
DVB-T	R&S®SFL-T	2084.4005.20
ATSC/8VSB	R&S®SFL-V	2084.4005.30
J.83/B	R&S®SFL-J	2084.4005.40
ISDB-T	R&S®SFL-I	2084.4005.50
Options		
Noise Generator	R&S®SFL-N	on request
BER Measurement	R&S®SFL-K17	on request
Extras		
Documentation of R&S®SFL Calibration Values	R&S®SFL-DCV	2082.0490.22
Service Kit		2084.4340.02
Service Manual		2084.4128.24
19" Adapter for rackmounting	R&S®ZZA-211	1096.3260.00
Matching Pads 50 Ω/75 Ω		
Matched at both ends, attenuation 5.7 dB, no DC isolation	R&S®RAM	0358.5414.02
Matched at one end, attenuation 1.7 dB	R&S®RAZ	0358.5714.02
Case (2 HU)	R&S®ZZT-214	1109.5119.00



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses

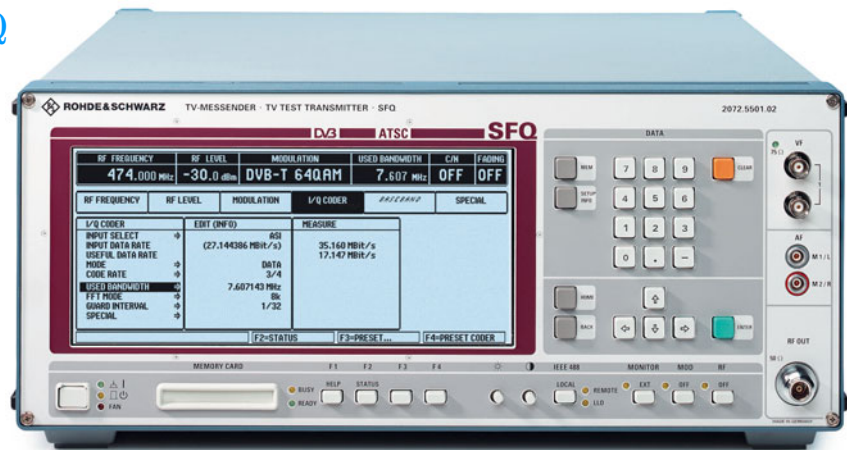


TV Test Transmitter R&S®SFQ

0.3 MHz to 3.3 GHz

Digital signals for antenna,
satellite and cable

TV Test Transmitter R&S®SFQ



Brief description

TV Test Transmitter R&S®SFQ is a complete solution for testing digital TV links and receivers (set-top boxes). An open-end software system and modular hardware configuration make for future-proofness. The ETSI standards for DVB-T, DVB-S, DVB-DSNG and DVB-C as well as the ATSC/8VSB and ITU-T/J.83B (US cable) standard for DTV are fully complied with. Thanks to its adaptability to future system changes, R&S®SFQ is a useful and rewarding investment for your launch onto the digital TV market.

Moreover, R&S®SFQ also processes analog frequency-modulated satellite signals in line with PAL, SECAM, NTSC standards. The sound signals are transmitted using analog FM and digital ADR sound subcarriers.

The test signals produced are of high precision and comply with the standards, but can also be varied over a wide range and provided with predefined errors to determine the performance of your products at their limits. The reproducible simulation of real transmission conditions by means of the noise generator and the fading simulator enables the specification of modules under test.

Main features

- ◆ Wide output frequency range from 0.3 MHz to 3300 MHz
- ◆ Large output level range for transmission, receiver and module measurements
- ◆ Standard DVB, ATSC, ITU-T/J.83B signals and FM satellite signals
- ◆ Several standards in one unit
- ◆ Satellite FM
 - PAL, SECAM, NTSC
 - FM and ADR sound subcarrier
- ◆ Antenna DVB-T
 - 2K and 8K COFDM
 - 6/7/8 MHz bandwidth
 - Hierarchical coding
- ◆ Antenna ATSC
 - 8VSB
- ◆ Cable DVB-C
 - Selectable QAM (quadrature amplitude modulation):
16, 32, 64, 128, 256QAM
- ◆ Satellite DVB-S, DVB-DSNG, Turbo coder
 - QPSK, QPSK Turbo
 - 8PSK, 8PSK Turbo
 - 16QAM
- ◆ Internal noise generator for high-precision C/N settings
- ◆ Internal bit error measurement (BE) for all digital modulation modes (DVB-C, DVB-S, DVB-DSNG, Turbo coder, DVB-T, 8VSB)

- ◆ Internal fading simulator
 - 6 or 12 paths
 - Predefined profiles
 - User-definable profiles
- ◆ Flexible input interfaces
 - ASI
 - SPI
- ◆ Output and input for external I/O signals

Other features

- ◆ Symbol rate 0.1 to 80 MSymbol/s
- ◆ Energy dispersal, Reed-Solomon coder and interleaver selectable
- ◆ Variable roll-off factor of pulse shaping
- ◆ Data, pseudo random bit sequence (PRBS) and null transport stream packets as modulation signal selectable
- ◆ Output level: -99 dBm to +4 dBm (CW: +13 dBm)
- ◆ Error simulation with I/Q modulation by means of defined signal distortion

Applications

Because of its high signal quality and versatile ways of varying parameters, R&S®SFQ is ideal as a source for digital terrestrial signals (DVB-T and ATSC), for testing satellite (DVB-S, DVB-DSNG, Turbo coder and FM) and digital cable links (DVB-C), as a standard-signal generator in development, as a reference in



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



TV Test Transmitter R&S®SFQ

quality monitoring, EMC labs, inspection and test centers and for use in production.

The output frequency range allows R&S®SFQ to be used as a back-channel generator and covers future extensions of the satellite IF range.

Operational parameters (e.g. roll-off, puncturing rate or QAM mode) can easily be varied. For laboratory applications, values outside those defined in the standard can be selected. For special measurements, it is possible to switch off i.e. interleaver, FEC, modulation, individual carriers or groups of carriers. Sweeps can be performed over the complete RF range.

The analog R&S®SFQ supplies frequency-modulated satellite signals conforming to standards. Various TV standards can be selected, and up to six sound subcarriers (FM and ADR) can be integrated. In addition, external sound subcarriers can be applied. Operational parameters are in line with standards; parameters such as amplitude, frequency and deviation are variable. Signals such as noise or energy dispersal can be added. It is thus possible to test satellite links and receivers using standard signals and to check the response to nonstandard signals.

Equipment and options

The basic model .02 of R&S®SFQ has to be ordered with at least one coder option, i.e. with

- ◆ R&S®SFQ-B10 for DVB-T
- ◆ R&S®SFQ-B21 for DVB-C
- ◆ R&S®SFQ-B23 for DVB-S, DVB-DSNG and Turbo coder
- ◆ R&S®SFQ-B12 for ATSC/8VSB
- ◆ R&S®SFQ-B13 for ITU-T/J.83B (US cable)
- ◆ R&S®SFQ-B2 for FM Modulation

DVB/VSF options

- ◆ DVB-T coder
- ◆ DVB-S, DVB-DSNG, Turbo coder
- ◆ DVB-C coder
- ◆ Hierarchical coding for DVB-T coder
- ◆ ATSC/8VSB coder
- ◆ ITU-T/J.83B coder (US cable)
- ◆ Noise generator
- ◆ Fading simulator (6 or 12 paths)
- ◆ Input interface (ASI; selectable symbol rate, precise data clock)
- ◆ BER
- ◆ I/Q output/input

Specifications

You will find detailed and binding data on the enclosed CD

(../DATASHEET/SFQ.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: SFQ

Optional broadband FM modulator

- ◆ FM satellite signals to standard
- ◆ Standard for FM transmission selectable (PAL, SECAM, NTSC)
- ◆ FM sound subcarriers with internal audio generators (two sound subcarriers installed as standard)
- ◆ Input for external sound subcarriers
- ◆ Input for external FM
- ◆ Baseband output
- ◆ Option: additional FM sound subcarriers
- ◆ Option: ADR (Astra Digital Radio) sound subcarrier with internal MUSICAM generators
- ◆ Noise generator



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



TV Test Transmitter R&S®SFQ

Ordering information

TV Test Transmitter (0.3 MHz to 3300 MHz) for		
DVB-C	R&S®SFQ.02+ R&S®SFQ-B21	2072.5501.02 2072.8912.02
DVB-S/-DSNG	R&S®SFQ.02+ R&S®SFQ-B23	2072.5501.02 2072.5830.02
DVB-T, 2K/8K	R&S®SFQ.02+ R&S®SFQ-B10	2072.5501.02 2072.6166.02
ATSC/8VSB	R&S®SFQ.02+ R&S®SFQ-B12	2072.5501.02 2072.6220.02
ITU-T, J.83B (US cable)	R&S®SFQ.02+ R&S®SFQ-B13	2072.5501.02 2072.6243.02
Broadband FM	R&S®SFQ.02+ R&S®SFQ-B2	2072.5501.02 2072.6108.02
Options		
Please state serial number of unit when submitting new orders for options.		
Input Interface (ASI/SPI input and selectable symbol rate, SMPTE310 input), can be retrofitted	R&S®SFQ-B6	2072.7679.03
DVB-T Coder, 2K/8K COFDM Modulator, 6 MHz/7 MHz/8 MHz bandwidth (for R&S®SFQ delivered before 1999 see R&S®SFQ-B18)	R&S®SFQ-B10	2072.6166.02
DVB-T/Hierarchical Coding	R&S®SFQ-B16	2072.5782.02
ATSC Coder, 8VSB (HW + FW)	R&S®SFQ-B12	2072.6220.02
ITU-T/J.83B (FW)	R&S®SFQ-B9	2072.6143.02
ITU-T/J.83B Coder (HW + FW)	R&S®SFQ-B13	2072.6243.02
ATSC/8VSB (FW)	R&S®SFQ-B8	2072.6120.02
DVB-C Coder (HW + FW)	R&S®SFQ-B21	2081.8912.02
DVB-C (only FW)	R&S®SFQ-B22	2072.5824.02
DVB-S/-DSNG Coder (HW + FW)	R&S®SFQ-B23	2072.5830.02
DVB-S/-DSNG (only FW)	R&S®SFQ-B24	2072.5847.02
I/Q Output/Input	R&S®SFQ-B14	2072.6266.02

Power Supply Upgrade for R&S®SFQ model .10, delivered before 1999; serial number of R&S®SFQ must be stated	R&S®SFQ-B18	2072.7191.02
Factory-fitting of R&S®SFQ-B18 to R&S®SFQs delivered before 1999	R&S®SFQ-U11	2072.7040.02
Fading Simulator, paths 1 to 6 (for R&S®SFQ delivered before 1999 see R&S®SFQ-B18)	R&S®SFQ-B11	2072.6189.02
Fading Simulator, paths 7 to 12	R&S®SFQ-B11	2072.6189.04
Noise Generator, can be retrofitted and calibrated	R&S®SFQ-B5	2072.7579.03
Impulsive Noise	R&S®SFQ-B27	2210.0407.02
BER Measurement	R&S®SFQ-B17	2072.7056.02
Broadband FM Modulator for baseband (PAL, SECAM, NTSC) and FM sound (2 subcarriers)	R&S®SFQ-B2	2072.6108.02
2 FM Sound Subcarriers 5 MHz to 9 MHz with 2 audio generators and 2 external audio inputs	R&S®SFQ-B3	2072.7379.02
2 ADR Sound Subcarriers 0.1 MHz to 9 MHz with 2 MUSICAM generators and 1 external data input	R&S®SFQ-B4	2072.7479.02
Extras		
Documentation of R&S®SFQ calibration values	R&S®SFQ-DCV	2082.0490.12
Cable Set for diversity	R&S®SFQ-Z5	2081.9158.02
Common Interface TS OUT	R&S®SFQ-Z17	2081.9364.02
Service Kit	R&S®SFQ-Z1	2072.5960.02
Service Manual (English)		2072.6489.22
Memory Card 10 Mbyte (Flash)		0048.5877.00
19" Adapter (4 HU) for rackmounting	R&S®ZZA-94	0396.4905.00
Matching Pads 50 Ω/75 Ω, 0 Hz to 2.7 GHz, N connectors		
matched at both ends, attenuation 5.7 dB, no DC isolation	R&S®RAM	0358.5414.02
matched at one end, attenuation 1.7 dB	R&S®RAZ	0358.5714.02



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Brief description

With its TV Generators R&S®SGxF for all traditional colour standards, Rohde&Schwarz has the right unit for any production, studio and service requirement.

Main features

- ◆ More than 30 baseband signals
- ◆ General-purpose test pattern with optional text insertion for source identification
- ◆ Signal output on the front and rear panel
- ◆ Remote control of all generator functions via IEC/IEEE bus
- ◆ Insertion test signals included in every signal
- ◆ Insertion of external test signals into the field blanking interval or application of sweep signals to the active picture area
- ◆ Use as test signal inserter with the genlock option fitted

Digital picture generation

With the PAL generator, the three components Y , C_B and C_R are stored for digital generation of the realtime composite colour video signal (CCVS).

For generation of the test signals to PAL, NTSC and SECAM, about 1000 different video lines are stored digitally and can be combined to obtain the desired pattern under program control.

Test signals

For all three generators the assignment of a test signal to a specific line can be programmed via DIP switches. Eight complete test signal configurations can be stored and recalled enabling the user to tackle any measurement task.

Output signal

The signal amplitude can be set via the IEC/IEEE bus or manually by a potentiometer. On all models separate amplifiers ensure decoupling between the front and the rear outputs.

Options

For options see ordering information. Some options cannot be retrofitted. With the genlock option for test signal insertion fitted, switchover to the selected substitution pattern is ensured in the case of program failure.

The right generator for every standard: PAL, SECAM and NTSC

Specifications

You will find detailed and binding data on the enclosed CD (./DATASHEET/SGxF.pdf), or for the latest updates, visit www.rohde-schwarz.com, search term: SGPF, SGSF, SGMF

Ordering information

TV Generator for		
PAL	R&S®SGPF	2016.4049.03
SECAM	R&S®SGSF	2016.7048.03
NTSC	R&S®SGMF	2016.0943.03
Options		
(some options cannot be retrofitted)		
Source Identification	R&S®SG.F-B1	2016.1004.02
Test Signal Insertion	R&S®SGPF-B2	2016.4278.02
	R&S®SGSF-B2	2016.7190.02
	R&S®SGMF-B2	2016.1185.02
FuBK Test Pattern French	R&S®SGPF-B3	2016.4284.02
French Front-panel Labelling	R&S®SGSF-B3	2016.7225.02
General-purpose Test Pattern of 16:9 aspect ratio	R&S®SGPF-B4	2016.4290.02
Extras		
Junction Panel with bypass	R&S®SG.F-Z	2016.1679.02
19" Adapter	R&S®ZZA-91	0396.4870.00
Calibration Data Documentation	R&S®SG.-DCV	2082.0490.04



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Video Analyzer R&S®UAF

Standards B/G, D/K, I, M

Perfection in video analysis:

fast, precise, reliable



Brief description

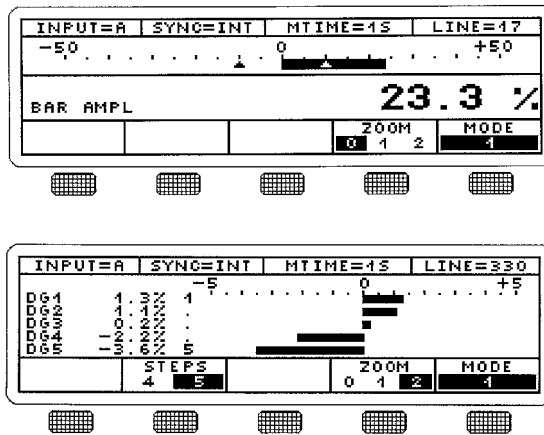
Thanks to its characteristics, Video Analyzer R&S®UAF meets all requirements as regards high measurement accuracy for the studio and fast measurements down to a few seconds. User-friendly operation and a clear display with graphics support afford straightforward measurements.

Main features

- ◆ 3 signal inputs
- ◆ 29 video parameters
- ◆ Limit monitoring
- ◆ Full-field measurements
- ◆ Freely selectable test signal
- ◆ Memory card, printer interface

The core of the digital section is a micro-processor plus an arithmetic coprocessor. The signal analysis comprises 29 video and test line parameters and covers all important levels as well as linear and nonlinear distortion such as 2T K rating, frequency response and hum. Optionally 50 Hz tilt, 200 ns overshoot, NICAM and dual-sound intermodulation can be measured. The position of the test lines can be freely selected over the entire picture area and in the field blanking interval; storage of up to eight test configurations is possible.

Thanks to its variable integration time, the R&S®UAF can be adapted to all test conditions. Using the shortest integration



Video Analyzer R&S®UAF

The test results are displayed either in the form of numeric values or as a bar

time of less than 1 s, the R&S®UAF is for all alignments. In the case of very noisy signals, stable results can be obtained by increasing the integration time to 2.5, 5 or 10 s.

For use in quality and production control of video recorders, the R&S®UAF also handles the S-VHS component signals Y/C. Distorted test signals do not affect the operation of the R&S®UAF.

Using a plug-in memory card, customer-defined test programs can be loaded and test results stored on the card. Moreover, the memory card permits storage of complete instrument setups.

Operation

The logical arrangement of the R&S®UAF front-panel controls offers a clear overview of its functions and ensures ease of operation. Each parameter is assigned its

own key. The associated LED above the key blinks if the limit values are exceeded.

The keypad to the left of the display permits the setup menus of the R&S®UAF to be selected directly. Such a menu is inserted as a window above the normal result display. Thus it is possible to use the softkeys for changing general settings such as the input, synchronization, printer mode, etc.

The "option" function allows further test parameters, e.g. an external level or future extensions, to be called up.

Special modes are the difference and the reference measurement modes with which signal errors at the input of the device under test can be eliminated. The AUTORUN menu permits test sequences to be programmed on the R&S®UAF front panel; these sequences are executed automatically and can be repeated cyclically.



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Video Analyzer R&S®UAF

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/UAF.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: UAF

Ordering information

Video Analyzer		
Standard B/G	R&S® UAF	2013.0807.02
Standard D/K	R&S® UAF	2028.5780.02
Standard M	R&S® UAF	2028.5774.02
Standard I	R&S® UAF	2028.5768.05
Other standards	on request	
Accessories supplied	four 75 Ω Terminations RMF2, 32 kbyte memory card	
Options		
50 Hz tilt, 200 ns overshoot	R&S® UAF-B1	2028.6406.02
S/N extension		
552 kHz (NICAM)	R&S® UAF-B2	2028.6412.02
242 kHz (dual sound)	R&S® UAF-B3	2028.6429.02
Calibration Data Documentation	R&S® UAF-DCV	2082.0490.05
Extras		
Memory card		
32 Kbyte	R&S® ZM-32	2005.4394.02
512 Kbyte	R&S® ZM-512	2013.1684.24
Service Manual		



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses

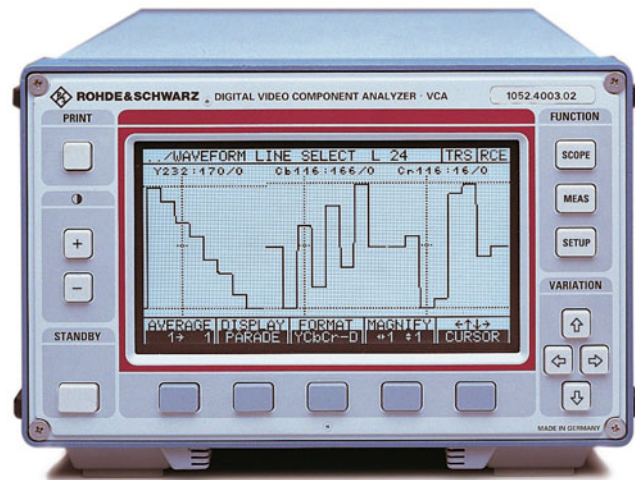


Digital Video Component Analyzer R&S®VCA, DTL Analysis R&S®VCA-B11

R&S®VCA: combined waveform monitor and analyzer

With R&S®VCA-B11: additional jitter analysis and spectral measurements

Digital Video Component Analyzer R&S®VCA



Brief description

Digital Video Component Analyzer R&S®VCA is designed to solve measurement problems in the digital studio, in operation and servicing as well as in the development of digital studio equipment. Combining the characteristics of a waveform monitor and an analyzer and including all conventional display modes, the R&S®VCA is suitable for a great variety of measurements and so makes working with digital video signals easy. An optional remote control unit permits the R&S®VCA to be readily integrated into large measuring systems for comprehensive monitoring in the studio.

Main features

- ◆ To standards ITU-R BT. 601/656, SMPTE125M/259M, 8 bits, 10 bits, 625/525 lines
- ◆ Waveform display
- ◆ Numeric output of video data
- ◆ Analysis of data frame/contents
- ◆ Timing and level measurements
- ◆ Hardcopy of screen via external printer
- ◆ DTL analysis (optional)
- ◆ Remote control (optional)

Equipped with a digital-parallel and a digital-serial video input as well as SCOPE and MEASURE functions,

R&S®VCA is capable of monitoring the digital video signal at all the transfer points of a digital TV studio. Measurement results are clearly displayed on a large-size monitor. Compared to the purely visual information obtained from an oscilloscope, R&S®VCA reads out precise measurement values. A graphic display facilitates evaluation of the results.

SCOPE functions

These functions allow waveforms and numerical values of the digital video signal to be analyzed.

MEASURE functions

These functions are used for monitoring and measuring live signals and for measuring special test signals. In the SCOPE mode, too, two monitoring functions are active in the background for checking the sync frame. The results of measurements on live signals are shown on the ERROR RATE display or on a new type of HISTORY display.

DTL analysis option (R&S®VCA-B11)

The DTL analysis option (digital transport layer) allows to search for the physical causes of data errors in serial-digital video

signals, with signal jitter playing an important role in this respect. R&S®VCA performs jitter measurements according to the demodulator method and also supports measurements to the clock extractor method.

Specifications

You will find detailed and binding data on the enclosed CD (./DATASHEET/VCA.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: VCA, VCA-B11

Ordering information

Digital Video Component Analyzer	R&S®VCA	1052.4003.02
Options		
Remote Control (RS-232-C/RS-422)	R&S®VCA-B1	1052.5600.02
DTL Analysis	R&S®VCA-B11	1052.5800.02
SWR Bridge 5 MHz to 850 MHz	R&S®VCA-Z1	1052.5900.02
Calibration Data Documentation	R&S®VCA-DCV	2082.0490.06
Same for R&S®VCA-B11	R&S®VCA-DCV	2082.0490.07



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

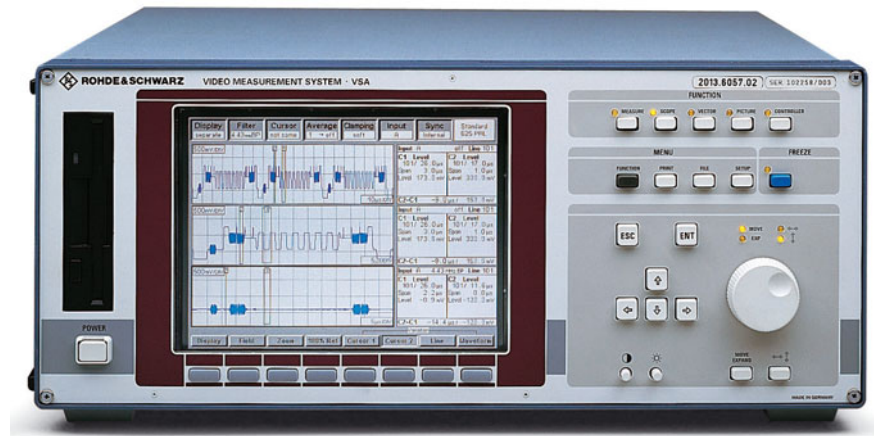
R&S Addresses



Video Measurement System R&S®VSA

DC to 9 MHz

Compact platform for video signal analysis: measurements of all relevant video parameters in the baseband, graphic and numeric result display, vector and waveform display



Video Measurement System R&S®VSA

Brief description

Video Measurement System R&S®VSA combines the functions of a video analyzer, vectorscope, oscilloscope, monitor and controller (PC) in a 19" desktop.

Fields of applications are

- ◆ laboratory and service
- ◆ automatic test and monitoring systems
- ◆ production and quality assurance

The instrument features convenient operation as well as high measurement accuracy and speed. The compact design makes it also suitable for mobile applications. Thanks to the great number of integrated functions and system interfaces the R&S®VSA is an essential tool for measurements and system applications in all fields of video.

In addition to the versatile measurement capabilities provided, the modular software and hardware configuration offers sufficient capacity for future expansions.

Main features

- ◆ Four loopthrough video signal inputs with analog 9 MHz bandwidth
- ◆ DOS- and Windows-compatible PC with IEC/IEEE-bus controller
- ◆ Multitasking operating system
- ◆ Connectors for external keyboard and colour monitor
- ◆ Colour graphic LCD display
- ◆ Two serial interfaces
- ◆ SCPI remote control via IEC/IEEE or serial interface
- ◆ Printer interface
- ◆ 3.5" floppy disk drive (DOS format) for result transfer and software options
- ◆ Hard disk
- ◆ Modular design with hardware and software options

Five instruments in one

- ◆ **Video and FFT analyzer**
- ◆ Simultaneous computation of up to **150 different signal parameters**
- ◆ Automatic limit monitoring
- ◆ Automatic overall measurement of all parameters

- ◆ Individual measurements using extended test capabilities
- ◆ Test-signal and test-location display
- ◆ Standard or reference measurement for each parameter separately
- ◆ **3-channel oscilloscope**
- ◆ Simultaneous display of up to three video signals in separate displays
- ◆ Separate test input for each part display (e.g. components, RGB, YC_BC_R)
- ◆ Simultaneous display of the same signal with different time scales in up to three separate windows
- ◆ Displayed signal section variable in the x and y direction from 200 ns to 20 ms
- ◆ Digital filters for simulating signal manipulations, e.g. all CCIR filters for insertion signal measurements
- ◆ Scale automatically matched to the display
- ◆ Two cursors for each window: LEVEL, PEAK, SLOPE and PULSE functions allow analysis of complete signal elements



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Video Measurement System R&S®VSA

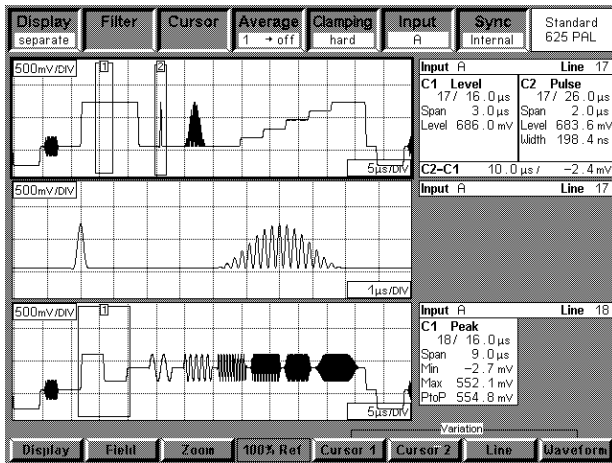


Fig. 1: With a single sin x/x measurement the result display is divided, one part showing the amplitude frequency response and the other the group delay. An info and a cursor window are assigned to each spectrum

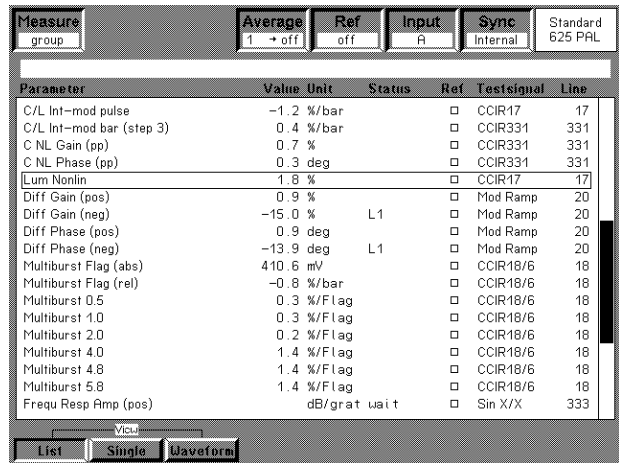


Fig. 2: In the list mode, selected video parameters and their measured values are displayed in the form of a list

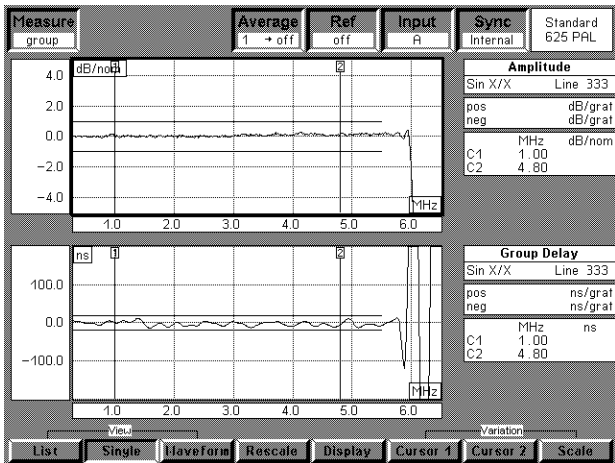


Fig. 3: In the SCOPE mode the screen is divided in a signal, an info and a cursor window. The waveform of one video signal can be displayed simultaneously in up to three windows with continuously variable time and amplitude scaling

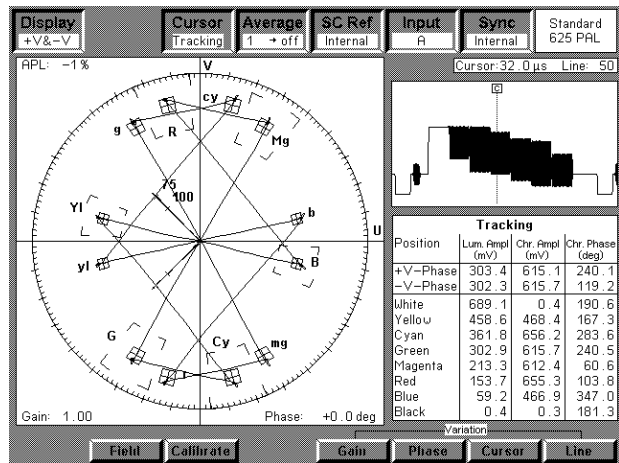
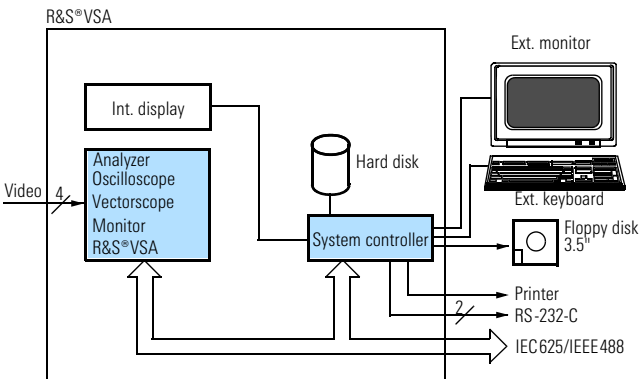


Fig. 4: In the vectorscope function the magnitude and phase of all colour parameters of a video line are shown in a graphics display; the line is also displayed in the waveform window. A cursor line in the waveform display of the video line marks the measurement time for colour subcarrier amplitude and phase. The cursor corresponds to one or two markers in the vector diagram. When the cursor line is shifted, the markers track the vector curve



Contents Overview

Chapter Overview

Type Index

R&S Addresses





Contents Overview

Chapter Overview

Type Index

R&S Addresses



Video Measurement System R&S®VSA

Vectorscope

- ◆ Graphic display of all colour parameters of a video line in magnitude and phase
- ◆ Accurate measurement of phase difference of two colour signal subcarriers by alternate suppression of colour subcarrier reference
- ◆ Permanent waveform display of video line
- ◆ Automatic computation and display of all colour subcarrier amplitudes and phases when a standard colour bar signal is applied

Monitor

- ◆ Easy identification of selected video signal
- ◆ Display of a video signal as monochrome TV picture with eight grey levels
- ◆ Simultaneous display of any rollkey-selected video line of the TV picture

System controller

- ◆ Comprehensive automatic test system
- ◆ Control of external devices via IEC/IEEE bus or serial interface
- ◆ Complete PC (DOS + Windows) with integrated IEC/IEEE-bus card
- ◆ Computing and measurement functions independent of each other
- ◆ Simple switch-over between measurement display and DOS display
- ◆ VGA colour monitor and external keyboard available as accessories

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/VSA.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: VSA

Ordering information

Video Measurement System	R&S®VSA	2013.6057.04
Option		
Calibration Data Documentation	R&S®VSA-DCV	2082.0490.08



Contents Overview

Chapter Overview

Type Index

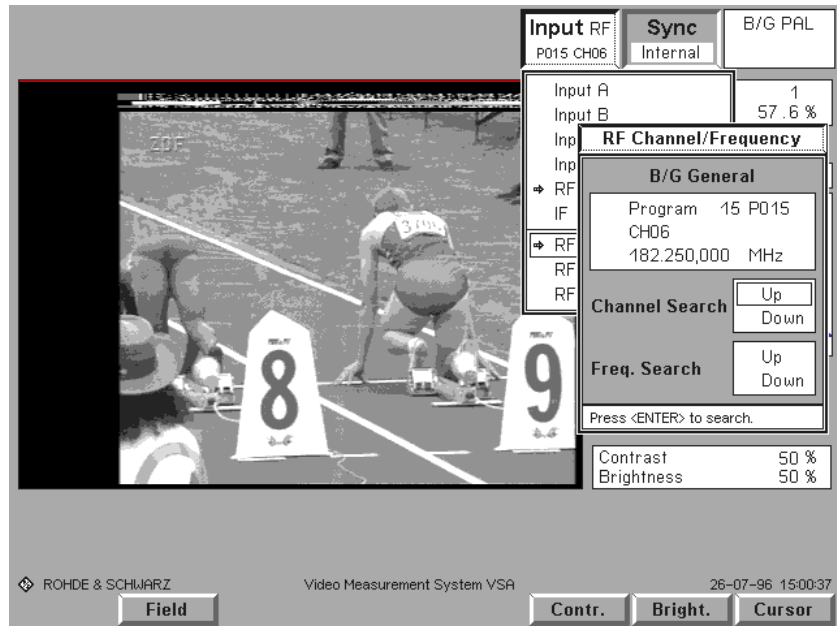
R&S Addresses



TV Test Receiver Option R&S®VSA-B10

47 MHz to 862 MHz

RF parameter measurement and monitoring with Video Measurement System R&S®VSA



R&S®VSA screen with channel setting of Test Receiver, option R&S®VSA-B10

Brief description

TV Test Receiver Option R&S®VSA-B10 enhances the Video Measurement System R&S®VSA (page 165) for the reception and analysis of RF and IF TV signals. The system allows all important RF and VF quality parameters to be analyzed in a single unit. R&S®VSA-B10 can easily be retrofitted – even on site – without calibration and level adjustment and with no problems regarding interfaces or cabling.

R&S®VSA with Option R&S®VSA-B10 provides the following functions:

- ◆ TV test receiver for standards B/G, I, D/K, K1
- ◆ Video and FFT analyzer
- ◆ 3-channel oscilloscope
- ◆ Vectorscope
- ◆ Monitor
- ◆ System controller

Features of R&S®VSA with Option R&S®VSA-B10

- ◆ RF/video analysis in a single unit
- ◆ Measurement of all relevant RF and VF quality parameters
- ◆ High-speed analysis
- ◆ No external cabling
- ◆ Easy to transport
- ◆ Little space required
- ◆ Uniform user interface for all measurement functions
- ◆ RF test parameters displayed in parameter list of R&S®VSA
- ◆ Display of test receiver configuration on R&S®VSA screen

R&S®VSA-B10 allows measurement of the following additional parameters:

- ◆ Incidental carrier phase modulation (ICPM) of vision carrier
- ◆ Vision and sound carrier level and frequency

- ◆ Modulation depth of vision carrier (residual carrier) and sound carrier (FM deviation)
- ◆ Pilot deviation and frequency
- ◆ Pilot decoding

Features of TV test receiver

- ◆ Models with 50 Ω or 75 Ω input
- ◆ IF input and IF output
- ◆ Video and audio outputs
- ◆ Dynamic range 40 dB μ V to 120 dB μ V
- ◆ Low-noise and low-distortion mode
- ◆ Low-noise preamplifier can be switched on to improve noise figure of receiver
- ◆ Video S/N ratio (weighted at 66 dB μ V) >56 dB
- ◆ Inter-carrier S/N ratio (weighted) >46 dB
- ◆ Program, channel and frequency entry
- ◆ Channel and frequency search
- ◆ Synthesizer with low phase noise and high frequency resolution (1 Hz)



Contents Overview

Chapter Overview

Type Index

R&S Addresses



TV Test Receiver Option R&S®VSA-B10

- ◆ Digital frequency control
- ◆ Manual and automatic gain control
- ◆ Integrated zero clamping for defining vision modulation depth
- ◆ Selectable synchronous detector mode with sampled or continuous phase control as well as selectable time constants
- ◆ Sound demodulation and decoding according to IRT dual-sound carrier method
- ◆ Linear distortion of video frequency response <0.5 dB (luminance/chrominance error <±20 ns)
- ◆ Video group-delay correction of receiver and sound deemphasis can be switched off
- ◆ Sound monitoring via loudspeaker of basic unit
- ◆ Very easy installation in R&S®VSA

Specifications

You will find detailed and binding data on the enclosed CD (../DATASHEET/VSA-B10.pdf), or, for the latest updates, visit www.rohde-schwarz.com, search term: VSA-B10

Ordering information

TV Test Receiver Option		
Standard B/G Europe, dual sound, 50 Ω	R&S®VSA-B10	2014.0000.02
IF 38.9 MHz + 33.4/33.158 MHz, 75 Ω	R&S®VSA-B10	2014.0000.03
Standard B/G Europe, mono sound, 50 Ω	R&S®VSA-B10	2014.0000.06
IF 38.9 MHz + 33.4 MHz, 75 Ω	R&S®VSA-B10	2014.0000.07
Standard B/G Australia, dual sound, 50 Ω	R&S®VSA-B10	2014.0000.10
IF 38.9 MHz + 33.4/33.158 MHz, 75 Ω	R&S®VSA-B10	2014.0000.11
Standard D/K CCIR, dual sound, 50 Ω	R&S®VSA-B10	2014.0000.40
IF 38.9 MHz + 32.4/32.642 MHz, 75 Ω	R&S®VSA-B10	2014.0000.41
Standard D/K CCIR, dual sound, 50 Ω	R&S®VSA-B10	2014.0000.42
IF 38.9 MHz + 32.4/32.158 MHz, 75 Ω	R&S®VSA-B10	2014.0000.43
Standard D/K NICAM, 50 Ω		
IF 32.4 MHz	R&S®VSA-B10	2014.0000.44
Standard I UK, mono sound, 50 Ω	R&S®VSA-B10	2014.0000.70
IF 38.9 MHz + 32.9 MHz, 75 Ω	R&S®VSA-B10	2014.0000.71
Standard I SABC, mono sound, 50 Ω	R&S®VSA-B10	2014.0000.72
IF 38.9 MHz + 32.9 MHz, 75 Ω	R&S®VSA-B10	2014.0000.73
Other standards on request.		
Calibration Data Documentation	R&S®VSA-DCV	2082.0490.10



Contents Overview

Chapter Overview

Type Index

R&S Addresses

