MPEG-2 Realtime Monitor R&S DVRM

Realtime monitoring and analysis of MPEG-2 transport streams

- 26 DVB or18 ATSC realtime measurements at a time
- Integrated long-term report
- Analysis of data rates
- MIP monitoring
- Trigger-on-error function
- Remote control via supplied PC software
- 12 built-in relays for error signalling
- PC Software STREAM EXPLORER™ is available as an option for in-depth analysis down to bit level.

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Characteristics

The 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. Error signalling is via:

- front-panel LEDs,
- 12 relay contacts,
- a remote-control interface.

The R&S DVRM is controlled via the remote interface. It is designed for continuous operation, so all settings are stored in a non-volatile memory ensuring that the unit is immediately ready for operation again after a power failure. New remote settings are required only to modify operating parameters or read error statistics.

The R&S DVRM comes with a PC software for remote control of the unit (MPEG-2 Realtime Monitor). The software runs under Windows operating systems (95/98 or Windows NT/2000/XP). It communicates with the R&S DVRM via a serial interface (RS-232-C) and offers a COM/DCOM software interface.

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

Realtime analyzer

The analyzer functions of the R&S DVRM include realtime protocol analysis of the measured MPEG-2 transport stream. All measurements in DVB mode are in compliance with the Measurement Guidelines for DVB Systems (ETR290) issued for the European DVB project, which today serves as an international standard for digital TV transmissions via satellite, cable and terrestrial links. The guidelines define possible error conditions in terms of three different priorities.

In addition to the measurements to ETR290, the repetition rates of EIT/SDT/NIT "other" tables are measured in realtime and checked for compliance with predefined upper and lower limits. This function ensures the correct transmission of program-related EPG data in a digital TV network in which several transport streams are transmitted.

For the North American ATSC standard, which is only applied to cable or terrestrial transmission, the guidelines A65 and A54 are considered. Realtime measurements performed by the R&S DVRM in ATSC mode are, therefore, largely based on ETR290. They are adjusted to match the various ATSC-specific system and program information tables, with ATSC-specific parameters being added.

Moreover, the transport stream identification (TS_Id) is monitored and the data rate of the stuffing bytes checked against a lower and an upper limit in realtime both in the DVB and the ATSC mode. With fixed multiplex, the limit monitoring function makes it easy to detect whether the transport stream contains the desired quantity of video services, or if services are missing.

Any error can be included or excluded from realtime monitoring. Tolerable errors can thus be masked to save memory.

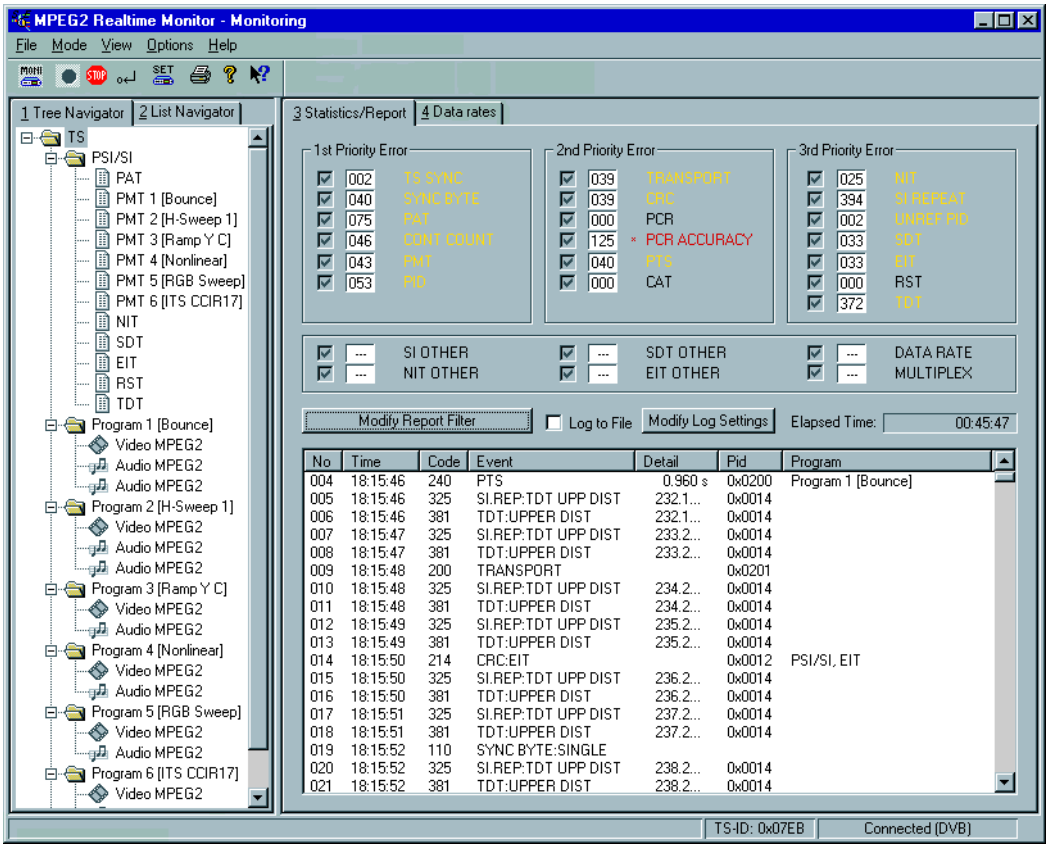

Fig. 1: Display of complete error information

Error signalling

All errors picked up are first stored in the unit. the R&S DVRM also detects sporadic errors. The error statistics of the R&S DVRM provide information on the frequency of occurrence and duration (error seconds) of the various types of error during a measurement period. At the same time, another list is generated with information on errors occurring together with the date and time. This list contains up to 1000 entries in chronological order and can be configured to show selected types of error. When the list is full, it is cyclically overwritten so that the last 1000 entries are stored in each case.

Errors of the first (highest) priority as well as two errors of the second priority are signalled each by a separate LED on the front panel. All other errors are signalled by an additional, common LED. Detailed error information can be queried via the remote control interface.

If the supplied PC software is used, three information blocks are available simultaneously (Fig. 1):

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

Besides being displayed on the monitor, the chronological error report can be stored continuously on any PC data medium (eg hard disk). In contrast to storage in the R&S DVRM, there is no limitation in length for the report stored on a PC medium.

Abbreviations

ATSC	Advanced Television Systems Committee
BAT	Bouquet Association Table
CAT	Conditional Access Table
CETT	Channel Extended Text Table
CVCT	Cable Virtual Channel Table
DIT	Discontinuity Information Table
DTS	Decoding Time Stamp
DVB	Digital Video Broadcast
EIT	Event Information Table
EPG	Electronic Program Guide
ETT	Extended Text Table
MGT	Master Guide Table
MIP	Megaframe Initialisation Packet
MPEG	Motion Picture Experts Group
NIT	Network Information Table
PAT	Program Association Table
PCR	Program Clock Reference
PES	Packetized Elementary Stream
PID	Packet Identification
PIT	Program Identification Table
PMT	Program Map Table
PSI	Program Specific Information
PSIP	Program and System Information Protocol
PT	Private Table
PTS	Presentation Time Stamp
RRT	Rating Region Table
RST	Running Status Table
SDT	Service Description Table
SI	Service Information
SIT	Selection Information Table
ST	Stuffing Table
STT	System Time Table
TDT	Time and Date Table
TOT	Time Offset Table
TS	Transport Stream
TVCT	Terrestrial Virtual Channel Table

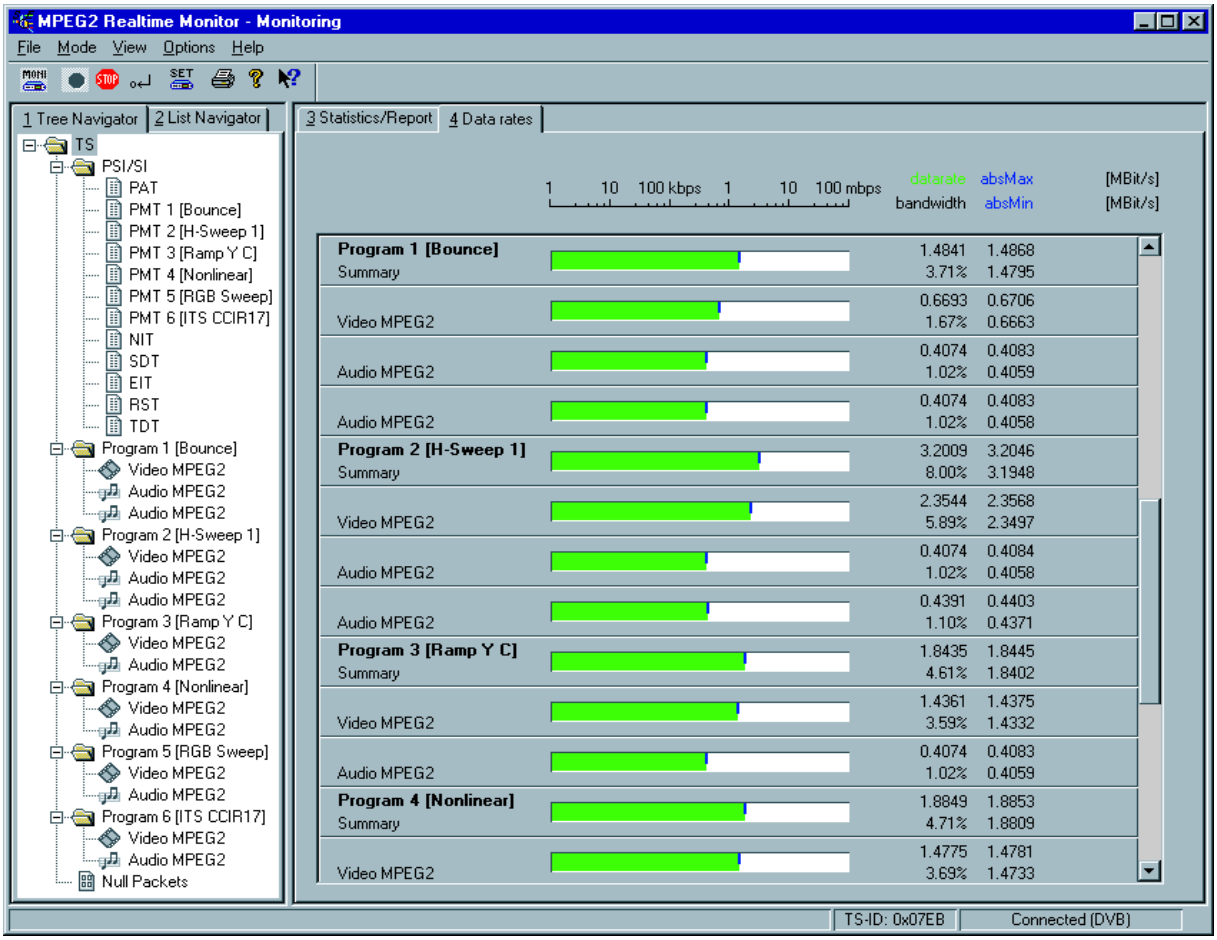

Fig. 3: Graphic display of data rates of all transport stream elements as bargraphs by means of realtime monitor software

In addition, the R&S DVRM offers 12 alarm lines for error signalling available at a 15-pin sub-D connector on the rear of the unit. Each alarm line can be allocated to one or several types of error (ORed). The contacts close to ground and can be chosen to close or open in the event of an error.

If desired or in case of an error, part of the transport stream (approx. 2 Mbit) can be frozen using the trigger/capture functions of the R&S DVRM, output via the RS-232-C interface and analyzed down to bit and byte level.

Remote control

In addition to readout and display of complete error information (Fig.1), the MPEG-2 Realtime Monitor software allows full remote control of the R&S DVRM (Fig. 2). Moreover, it offers moving graphical representation of the data rates of all transport stream elements in the form of bargraphs (Fig. 3).

Apart from continuous storage of the error report on hard disk, the software enables integration of the R&S DVRM into networked monitoring systems via the COM/DCOM interface.

The MPEG-2 Realtime Monitor software thus becomes a server application, capable of data exchange with other software packages (client applications) also in networks.

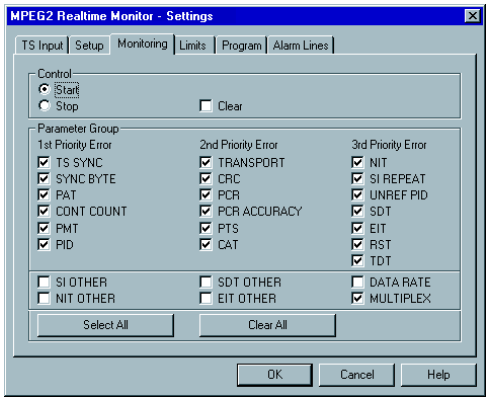

Fig. 2: Full remote control of the R&S DVRM

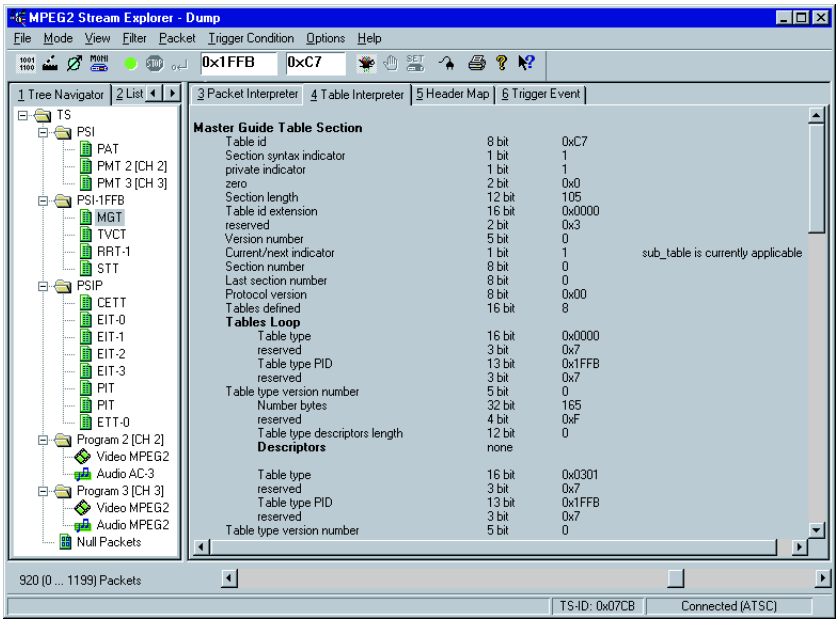

Fig. 4: Enhanced analysis with optional Stream Explorer™ R&S DVMD-B1

Optional Stream Explorer™ R&S DVMD-B1

This software enhances MPEG-2 Realtime Monitor the R&S DVRM to form a universal analysis system for MPEG-2 transport streams. The software runs under Windows 95/98 /NT/2000/XP on any PC or laptop connected to the R&S DVRM via a serial interface. The easy-to-operate software and the clear presentation of test results in two windows of variable size ensure fast and effective working right from the start.

The R&S DVRM can store a transport stream of up to 2 Mbit and transfer it on request via the serial interface to the Stream Explorer™. The unit uses several data or event filters or a trigger-on-error function which can be activated via the Stream Explorer™. The investigated data quantity of the transport stream can thus be considerably increased if required.

The allocation of all transport stream packets to the transport stream elements and the order of the packets are visible at a glance. Moreover, packet and table contents to ATSC as well as DVB standard are represented in a transparent way in hexadecimal notation together with their meaning.

In addition, Stream Explorer™ can activate realtime analyses in the R&S DVRM and output the results as moving graphic representations on the PC monitor. This considerably enhances the analysis functions of the R&S DVRM.

(For more information on Stream Explorer™ see data sheet PD 0757.3628)

Option the R&S DVRM-B2

The MPEG-2 Realtime Monitor R&S DVRM can handle both the DVB and the ATSC standard. It is factory-configured for DVB, without option R&S DVRM-B2. When ordered with the option R&S DVRM-B2, the unit comes preconfigured for ATSC. For changeover of the R&S DVRM to the respective other standard, a PC Windows software is supplied with the R&S DVRM for downloading the required system components from an external PC or notebook.

SMPTE 310M-Schnittstelle R&S DV-B310

Die Option R&S DV-B310 wird für die Basisbandgeräte R&S DVG, R&S DVMD, R&S DVRM und R&S DVQ angeboten. Sie ermöglicht den Anschluss von Transportströmen gemäß SMTPE-310M und ersetzt einen TS-ASI Aus- bzw. Eingang (Generator oder Analysator) an der Geräterückseite (beim R&S DVQ wird der Eingang an der Gerätefront ersetzt). Entsprechend der ATSC-8VSB Norm ist eine feste Transportstromdatenrate von 19,392658 MBit/s bei 188 Byte/Paket zulässig.

Realtime measurement functions for ATSC and DVB

Messung	Priorität	Fehleranzeige			PID-Info	Trigger auf Fehler	Fehlernummer (TR 101 290)	ATSC	DVB
		LED	LCD/OSD [1]	Fehlerbedingung					
TS_sync_loss	1	TS	TS-Sync	Loss	-	*	5.2.1 - 1.1	x	x
				OK	-	*		x	x
Sync_byte_error	1	SYNC	Sync Byte	Single	-	*	5.2.1 - 1.2	x	x
				Burst	-	*		x	x
PAT_error	1	PAT	PAT	Upper Distance	fix	-	5.2.1 - 1.3	x	x
				Table ID	*	*		x	x
				Scrambled	fix	*		x	x
Continuity_count_error [2]	1	CONT	Cont. Cnt	Packet Order	*	*	5.2.1 - 1.4	x	x
				More Than Twice	*	*		x	x
				Lost Packet	*	*		x	x
PMT_error [2]	1	PMT	PMT	Upper Distance	*	-	5.2.1 - 1.5	x	x
				Scrambled	*	*		x	x
PID_error [2]	1	PID	PID Missing	Video+Audio	*	-	5.2.1 - 1.6	x	x
				Data+Other	*	-			
Transport_error	2	TRANS	Transport		*	*	5.2.2 - 2.1	x	x
CRC_error [2]	2	CRC	CRC	PAT	*	*	5.2.2 - 2.2	x	x
				CAT	*	*		x	x
				PMT	*	*		x	x
				NIT	*	*			x
				EIT (DVB)	*	*			x
				BAT	*	*			x
				SDT	*	*			x
				TOT	*	*			x
				MGT	*	*		x	
				TVCT	*	*		x	
				CVCT	*	*		x	
				RRT	*	*		x	
				STT	*	*		x	
				EIT (ATSC) [3]	*	*		x	
				ETT [4]	*	*		x	
PCR_error [2]	2	OTHER	PCR	Discontinuity	*	*	5.2.2 - 2.3	x	x
				PCR Upp/Low Dist.	*	?-		x	x
PCR_accuracy_error [2]	2				*	-	5.2.2 - 2.4	x	x
PTS_error [2]	2	OTHER	PTS		*	-	5.2.2 - 2.5	x	x
CAT_error	2	OTHER	CAT	Table ID	*	*	5.2.2 - 2.6	x	x
				Missing	*	*		x	x
NIT_error	3	OTHER	NIT	Table ID	*	*	5.2.3 - 3.1		x
				NIT Upper Dist.	*	-			
SI_repetition_error	3	OTHER	SI REP	PAT Upp/Low Dist.	*	-	5.2.2 - 3.2	x	
				CAT Upp/Low Dist.	*	-		x	x
				PMT Upp/Low Dist.	*	-		x	x
				NIT Upp/Low Dist.	*	-			x
				SDT Upp/Low Dist.	*	-			x
				BAT Upp/Low Dist.	*	-			x
				EIT (DVB) Upp/Low Dist.	*	-			x
				RST Low Dist.	*	-			x
				TDT Upp/Low Dist.	*	-			x
				TOT Upp/Low Dist.	*	-			x
				MGT Upp Dist.	*	-		x	x
				TVCT Upp Dist.	*	-		x	
				CVCT Upp Dist.	*	-		x	
				RRT Upp Dist.	*	-		x	
				STT Upp Dist.	*	-		x	
				EIT (ATSC) [3] Upp Dist	*	-		x	
Unreferenced_PID [2]	3	OTHER	Unref. PID		*	*	5.2.3 - 3.4	x	x
SDT_error	3	OTHER	SDT	Table ID	*	*	5.2.3 - 3.5		x
				SDT Upper Dist.	*	-			x
EIT_error	3	OTHER	EIT	Table ID	*	*	5.2.3 - 3.6		x
				EIT Upper Dist.	*	-			x
RST_error	3	OTHER	RST	Table ID	*	*	5.2.3 - 3.7		x

Messung	Priorität	Fehleranzeige			PID-Info	Trigger auf Fehler	Fehlernummer (TR 101 290)	ATSC	DVB
		LED	LCD/OSD [1]	Fehlerbedingung					
TDT_error	3	OTHER	TDT	Table ID	*	*	5.2.3 - 3.8		x
				TDT Upper Dist.	*	-			x
Base_PID_error	3	OTHER	Base PID	Table ID	*	*		x	
Paradigm_error	3	OTHER	PARADIGM		*	-		x	
Multiplex_error	-	OTHER	MULTIPLEX	TS ID	-	-		x	x
Datarate_error	-	OTHER	DATARATE	Null Upp/Low Limit	*	-		x	x
SI_other_error	-	OTHER	SI OTHER	NIT Upp/Low Dist.	*	-			x
				SDT Upp/Low Dist.	*	-			x
				EIT Upp/Low Dist.	*	-			x
NIT_other_error	-	OTHER	NIT OTHER	NIT Upp/Low Dist.	*	-			x
SDT_other_error	-	OTHER	SDT OTHER	SDT Upp/Low Dist.	*	-			x
EIT_other_error	-	OTHER	EIT OTHER	EIT Upp/Low Dist.	*	-			x
				Present Extra	*	-			x
				Present Missing	*	-			x
				Struct TS Head	*	-			x
				Struct Length	*	-			x
				Struct Max Dly	*	-			x
MIP_error	-	OTHER	MIP	Struct STS	*	-	9.20		x
				Struct CRC	*	-			x
				Pointer	*	-			x
				Period Pointer	*	-			x
				Period MF Size	*	-			x
				Timing	*	-			x
				TS Rate	*	-			x

Specifications

Input signals

Transport stream	to ISO/IEC 1-13818
Data rate of transport stream	up to 54 Mbit/s
Length of data packets	188/204 bytes with DVB 188/208 bytes with ATSC

Signal inputs

Synchronous parallel MPEG-2 transport stream (SPI, LVDS, to DVB-A010)	25-pin connector on front panel, 100 mV_{pp} to 2 V_{pp}, 100 Ω
Asynchronous serial MPEG-2 transport stream, 270 Mbit/s (ASI, to DVB-A010)	BNC connector on front and rear panel, 200 mV_{pp} to 1 V_{pp}, 75 Ω
Control	remote control via RS-232-C interface
Interfaces	
Serial interface	9-pin sub-D connector on rear panel
Type	RS-232-C
Use	remote control or printer
Relay outputs	15-pin sub-D connector on rear panel
Number	12 with arbitrary assignment to different types of error, ORed in case of multiple assignment
Active state	open or closed, selected jointly

MPEG-2 Realtime Monitor software	Windows operating software for the R&S DVRM
System requirements:	PC or notebook with Pentium processor (recommended clock frequency min. 100 MHz), Windows 95/98/NT operating system, min. 16 MB RAM (Windows NT: 32 MB), approx. 10 MB hard disk memory, 1 RS-232-C interface (recommended data rate 115 kbit/s), CD-ROM drive

Monitoring

Number of different PMT PIDs	max. 20 with ATSC max. 25 with DVB
Number of programs	max. 64
Error types:	
DVB:	ETR290 repetition rates of NIT/SDT/EIT "other" tables
ATSC:	to ETR290 program paradigm
Both:	transport stream ID (TS_Id), data rate of stuffing bytes

Rear view of R&S DVRM

General data

Nominal temperature range	+ 5°C to +40°C (guaranteed spec)
Operating temperature range	0°C to +50°C
Storage temperature range	– 40°C to +70°C
Mechanical resistance	
Sinewave vibration	5 Hz to 150 Hz, max. 2 g at 55 Hz, 0.5 g from 55 Hz to 150 Hz, complies with IEC 68-2-6, IEC1010-1, MIL-T-28800 D class 5
Random vibration	10 Hz to 300 Hz, at 1.2 g_{rms}
Shock	40 g shock spectrum, complies with MIL-STD 810 D and MIL-T-28800 D class 3 and 5
Climatic stressing	+25°C/+40°C cyclically at 95% rel. humidity, to IEC 68-2-30
Electromagnetic compatibility	to EN50081-1and EN50082-2 (EMC directive of EU)
Power supply	88 V to 264 V, 47 Hz to 63 Hz, power consumption 50 W
Electrical safety	to EN 61010-1
Dimensions (W x H x D)	434 mm x 43 mm x 460 mm
Weight	4.9 kg

Ordering information

MPEG-2 Realtime Monitor	the R&S DVRM	2068.8580.02
Equipment supplied	1 unit the R&S DVRM, power cable, modem bypass cable, operating manual, CD-ROM with setup program for installation of MPEG-2 Realtime Monitor 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™[1] software	R&S DVMD-B1	2068.9406.02
Documentation of calibration values	R&S DRM-DCV	2082.0490.24

Recommended extras

19" adapter (1HU)	R&S ZZA-91	0396.4870.00
Service manual		2069.0348.24

[1] See data sheet PD 757.3628

Certified Quality System
ISO 9001
DQS REG. NO 1954

Certified Environmental System
ISO 14001
REG. NO 1954

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